

2010 Mercury Milan

2010 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan

2010 ENGINE**Engine Mechanical - 3.0L (4V) - Fusion & Milan****SPECIFICATIONS****MATERIAL SPECIFICATIONS TABLE****MATERIAL SPECIFICATIONS TABLE**

Item	Specification	Fill Capacity
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	5.7L (6.0 qt) includes filter change
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A	-
Silicone Gasket and Sealant TA-30	WSEM4G323-A4	-
Thread Sealant with PTFE TA-24	WSKM2G350-A2	-

GENERAL SPECIFICATIONS TABLE**GENERAL SPECIFICATIONS TABLE**

Item	Specification
Engine	
Bore/stroke	89.0 x 79.5 mm (3.12 in)
Compression ratio	10.3:1
Displacement	3.0L (4V) (182 Cubic Inch Displacement (CID))
Engine and transaxle assembly weight (without accessory drive components)	234 kg (516 lb)
Engine weight (without accessory drive components and flexplate)	146 kg (322 lb)
Fire order	1-4-2-5-3-6
No. cylinders	6
Oil pressure (Minimum at 1,500 rpm with engine warmed up after 10 minutes of idling)	172 kPa (25 psi)
Spark plug	CGSF-22F Gap = 1.15-1.25 mm (0.045-0.049 in)
Cylinder Head and Valve Train	

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Combustion chamber volume	51.2 cc +/- 1.5 cc
Cylinder 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) area, 0.15 mm (0.005 in) overall
Roller follower ratio @ max. lift	2.0:1
Valve arrangement (front to rear)	LH intake I-I-I-I-I-I LH exhaust E-E-E-E-E-E RH intake I-I-I-I-I-I RH exhaust E-E-E-E-E-E
Valve face angle	45.5 degrees
Valve face runout	0.04 mm (0.001 in)
Valve guide bore diameter	6.015-6.044 mm (0.236-0.237 in)
Valve head diameter - exhaust	30 mm (1.18 in)
Valve head diameter - intake	35 mm (1.38 in)
Valve head diameter (exhaust) - gauge diameter	28.0 mm (1.10236 in)
Valve head diameter (intake) - gauge diameter	33.5 mm (1.3189 in)
Valve seat angle	44.75 degrees
Valve seat runout	0.04 mm (0.001 in)
Valve seat width - exhaust	1.4-1.7 mm (0.055-0.066 in)
Valve seat width - intake	1.1-1.4 mm (0.043-0.055 in)
Valve spring compression pressure (Nm @ spec. length)	780 Nm @ 32.29 mm (575 lb @ 1.27 in)
Valve spring free length (approx.)	50.52 mm (1.988 in)
Valve spring installed height (Nm @ spec. length)	42.61 mm (1.677 in)
Valve spring installed pressure	280 Nm @ 42.61 mm (206 lb @ 1.677 in)
Valve spring installed pressure - service limit	5% force loss @ specified height
Valve spring squareness	1.2 mm (0.047 in) from ID
Valve stem diameter - exhaust	5.950-5.970 mm (0.2343-0.2350 in)
Valve stem diameter - intake	5.975-5.995 mm (0.2350-0.2358 in)
Valve stem-to-guide clearance - exhaust	0.045-0.094 mm (0.0017-0.0037 in)
Valve stem-to-guide clearance - intake	0.019-0.069 mm (0.0007-0.0027 in)
Hydraulic Lash Adjuster	
Clearance to bore	0.018-0.069 mm (0.0007-0.0027 in)
Collapsed lash adjuster gap	0.50-1.11 mm (0.019-0.043 in)
Diameter (standard)	16-15.988 mm (0.6290-0.6294 in)
Hydraulic leakdown rate	5-25 seconds
Camshaft	

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Camshaft journal bore inside diameter	27.012-26.987 mm (1.063-1.062 in)
Camshaft journal-to-bearing clearance - service limit	0.121 mm (0.0047 in)
Camshaft journal-to-bearing clearance - standard	0.025-0.076 mm (0.001-0.0029 in)
End play - service limit	0.241 mm (0.009 in)
Journal diameter (all)	26.962-26.936 mm (1.061-1.060 in)
Lobe lift (intake)	5.084 mm (0.2 in)
Lobe lift (exhaust)	5.084 mm (0.2 in)
Runout	-
Theoretical valve lift @ 0 lash	10.38 mm (0.408 in)
Cylinder Block	
Cylinder bore diameter - grade 1	89.000-89.010 mm (3.50393-3.504323 in)
Cylinder bore diameter - grade 2	89.011-89.020 mm (3.50437-3.50472 in)
Cylinder bore diameter - grade 3	89.021-82.030 mm (3.50476-3.50511 in)
Cylinder bore maximum out-of-round	0.015 mm (0.0005 in)
Cylinder bore maximum out-of-round - service limit	0.020 mm (0.0007 in)
Cylinder bore maximum taper	0.020 mm (0.0008 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) area, 0.15 mm (0.005 in) overall
Main bearing bore inside diameter	67.998-68.022 mm (2.677-2.6780 in)
Crankshaft	
Connecting rod journal diameter	49.969-49.991 mm (1.967-1.968 in)
Connecting rod journal maximum out-of-round	0.006 mm (0.0002 in)
Connecting rod journal maximum taper	0.008 mm (0.0003 in)
Crankshaft maximum end play	0.100-0.255 mm (0.003-0.100 in)
Main bearing journal diameter	62.968-62.992 mm (2.467-2.479 in)
Main bearing journal maximum out-of-round	0.006 mm (0.0002 in)
Main bearing journal maximum taper	0.008 mm (0.0003 in)
Main bearing journal-to-cylinder block clearance	0.024-0.046 mm (0.0009-0.0018 in) (select fit bearings)
Piston and Connecting Rod	
Connecting rod bearing bore diameter	53.015-53.035 mm (2.0872-2.0879 in)
Connecting rod bearing-to-crankshaft clearance	0.028-0.066 mm (0.001-0.0025 in)
Connecting rod length (center-to-center)	138.06-138.14 mm (5.435-5.38 in)
Connecting rod maximum allowed bend	0.038 mm per 25 (0.0014 per 0.984 in)
	0.050 mm per 25

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Connecting rod maximum allowed twist	(0.0019 per 0.984 in)
Connecting rod pin bore diameter	21.017-21.031 mm (0.827-0.828 in)
Connecting rod side clearance	0.100-0.30 mm (0.0039-0.0118 in)
Connecting rod-to-pin clearance - service limit	0.035 mm (0.0013 in)
Connecting rod-to-pin clearance - standard	0.004-0.02 mm (0.0001-0.0007 in)
Piston diameter - coated, grade 1	88.980-88.995 mm (3.5031-3.5037 in)
Piston diameter - coated, grade 2	88.78-89.007 mm (3.4952-3.5042 in)
Piston diameter - coated, grade 3	89.00-89.015 mm (3.5039-3.5045 in)
Piston diameter - uncoated, grade 1	88.970-88.980 mm (3.50275-3.50314 in)
Piston diameter - uncoated, grade 2	88.978-88.992 mm (3.50306-3.50362 in)
Piston diameter - uncoated, grade 3	88.990-89.000 mm (3.5035-3.5039 in)
Piston pin bore diameter	21.015-21.020 mm (0.8273-0.8275 in)
Piston pin diameter	21.011-21.013 mm (0.8271-0.8273 in)
Piston pin length	60.08-60.51 mm (2.365-2.382 in)
Piston ring end gap - compression (bottom, gauge diameter)	0.27-0.42 mm (0.0106-0.0165 in)
Piston ring end gap - compression (bottom, service limit)	0.65 mm (0.0255 in) max
Piston ring end gap - compression (top, gauge diameter) ⁽¹⁾	0.100-0.250 mm (0.0039-0.0098 in)
Piston ring end gap - compression (top, service limit)	0.50 mm (0.0196 in) max
Piston ring end gap - oil ring (steel rail, gauge diameter)	0.15-0.65 mm (0.0059-0.0255 in)
Piston ring end gap - oil ring (steel rail, service limit)	0.90 mm (0.0354 in) max
Piston ring groove width - compression (bottom)	1.530-1.555 mm (0.0602-0.0612 in)
Piston ring groove width - compression (top)	1.230-1.255 mm (0.0484-0.0494 in)
Piston ring groove width - oil ring	2.53-2.555 mm (0.0996-0.1005 in)
Piston ring-to-groove clearance	-
Piston ring width	-
Piston pin-to-piston fit	0.002 to 0.009 mm (0.00007-0.0003 in)
Piston-to-connecting rod clearance	-
Piston-to-cylinder bore clearance (coated)	0.003 to 0.032 mm (0.0001-0.0012 in)
Piston-to-cylinder bore clearance (uncoated)	0.012 to 0.022 mm (0.0005-0.0009 in)
(1) Specification 82.4 mm (3.2441 in) diameter gauge.	

TORQUE SPECIFICATIONS TABLE

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TORQUE SPECIFICATIONS TABLE

Description	Nm	lb-ft	lb-in
A/C compressor bolts	25	18	-
A/C compressor bracket bolts	25	18	-
A/C manifold bolt	15	-	133
A/C tube nut	8	-	71
A/C tube/windshield washer bottle bracket bolt	10	-	89
Accessory drive belt tensioner bolts	25	18	-
Battery terminal power feed wire nuts	6	-	53
Block heater	21	15	-
Camshaft bearing cap bolts ⁽¹⁾	-	-	-
Camshaft phaser and sprocket bolts	18	-	159
Camshaft oil seal retainer bolts	10	-	89
Catalytic converter nuts - LH	-	-	-
Catalytic converter nuts - RH All-Wheel Drive (AWD)	40	30	-
Catalytic converter studs	12	-	106
Connecting rod cap bolts ⁽¹⁾	-	-	-
Coolant pump housing bolts	10	-	89
Coolant pump housing hose clamps	7	-	62
Crankshaft pulley bolt ⁽¹⁾	-	-	-
Cylinder head bolts ⁽¹⁾	-	-	-
EGR tube fittings	40	30	-
Electronic Power Assist Steering (EPAS) ground wire bolt	10	-	89
Engine front cover bolts a	-	-	-
Engine support insulator bracket bolt	115	85	-
Engine support insulator bracket nuts	63	46	-

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Engine mount damper bolt	23	17	-
Engine mount bolts and nuts	55	41	-
Engine oil filter ⁽¹⁾	-	-	-
Engine Oil Pressure (EOP) switch	14	-	124
Engine roll-restrictor bolts	90	66	-
Exhaust heat shield - LH and RH	10	-	89
Exhaust heat shield bracket bolts (inboard half)	40	30	-
Exhaust heat shield bracket nuts (outboard half)	20	-	177
Exhaust manifold nuts ⁽¹⁾	-	-	-
Exhaust manifold studs	12	-	106
Flexplate bolts	80	59	-
Fuel rail and injectors assembly bolts	10	-	89
Generator B+ terminal nut	8	-	71
Generator nuts and bolt	47	35	-
Generator studs	8	-	71
Ground wire-to-engine mount bracket	10	-	89
Ground wire-to-strut tower bolt	10	-	89
Heated Oxygen Sensor (HO2S) ⁽¹⁾	-	-	-
Ignition coil-on-plug bolts	6	-	53
Intermediate steering shaft bolt	20	-	177
Lower cylinder block bolts ⁽¹⁾	-	-	-
Lower intake manifold bolts ⁽¹⁾	-	-	-
Oil level indicator tube stud bolt	9	-	80
Oil pan baffle nuts ⁽¹⁾	-	-	-
Oil pan bolts ⁽¹⁾	-	-	-
Oil pan drain plug	26	19	-
Oil pan-to-front cover	25	18	-

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bolts			
Oil pan-to-transaxle bolts	40	30	-
Oil pump bolts ⁽¹⁾	-	-	-
Oil pump screen and pickup tube bolts	10	-	89
Oil separator cover bolts	10	-	89
PCM ground wire bolt	10	-	89
Power Transfer Unit (PTU) bracket bolts	55	41	-
PTU -to-transaxle bolts	90	66	-
Radio frequency interference capacitor nut	6	-	53
Rear driveshaft-to- PTU flange bolts	70	52	-
Spark plugs	15	-	133
Stabilizer bar link nuts	40	30	-
Starter motor bolts	27	20	-
Starter (large) terminal nut	12	-	106
Starter (small) terminal nut	5	-	44
Starter ground wire nut	18	-	159
Subframe bracket-to-body bolts	103	76	-
Subframe nuts	150	111	-
Tie-rod end nuts	48	35	-
Timing chain guide bolts	25	18	-
Timing chain tensioner bolts	25	18	-
Torque converter-to-flexplate nuts	40	30	-
Transaxle control cable bracket bolts	23	17	-
Transaxle support through bolt	103	76	-
Transaxle-to-engine bolts	48	35	-
Upper intake manifold bolts ⁽¹⁾	-	-	-
Upper intake manifold support bracket bolts	10	-	89
Valve cover bolts and stud bolts ⁽¹⁾	-	-	-
Variable Camshaft Timing (VCT) assembly	10	-	89

bolts

(1) Refer to the appropriate procedure(s).

DESCRIPTION AND OPERATION

ENGINE

The 3.0L (4V) is a V-6 engine with the following features:

- Dual overhead camshafts
- Four valves per cylinder
- Sequential Multi-Port Fuel Injection (SFI)
- A composite lower intake manifold and a composite upper intake manifold
- Aluminum cylinder heads
- Two-piece design aluminum cylinder block
- Variable Camshaft Timing (VCT) system
- Electronic ignition system with 6 ignition coils

Engine Identification

For quick identification, refer to the safety certification decal.

- The decal is located on the LH front door lock face panel.

Engine Code Information Label

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



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

ITEM DESCRIPTION TABLE

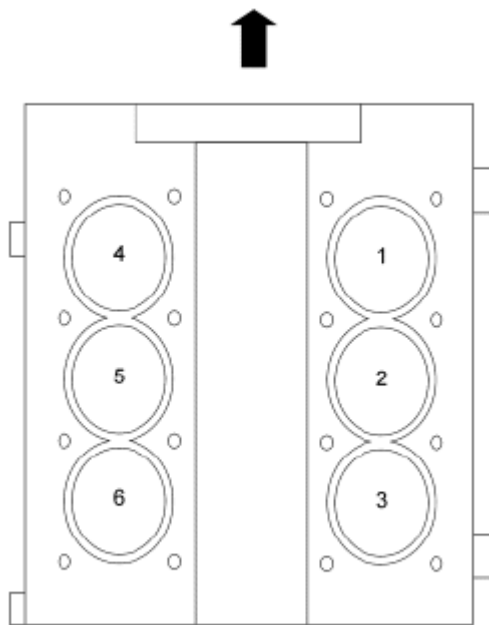
Item	Description
1	Engine part number

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2	Cleveland engine plant 2
3	Engine displacement
4	Bar code
5	Running number
6	Engine build date (DDMMYY)
7	Plant shift line
8	Bar code

Engine Cylinder Identification



N0069904

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

Exhaust Emission Control System

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

Induction System

The **SFI** provides the fuel/air mixture needed for combustion in the cylinders. The 6 solenoid-operated fuel injectors:

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

Valve Train

The camshafts are mounted in the cylinder heads and act against a roller follower to open and close the valves. A hydraulic lash adjuster is located on one side of the roller follower and the valve tip on the opposite end. The camshafts are driven off the front of each cylinder head by 2 chains (one each side). Both of the chains are driven by sprockets that are located on the crankshaft, just in front of the oil pump.

Variable Camshaft Timing (VCT) System

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

PCV System

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

Lubrication System

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

Oil Pump

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

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

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

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

Cooling System

The engine cooling system includes the following components:

- Radiator
- Electric cooling fan motor
- Degas bottle (aids in maintaining the correct volume of engine coolant)
- Coolant thermostat
- Coolant hoses
- Coolant pump housing

DIAGNOSIS AND TESTING

ENGINE

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

IN-VEHICLE REPAIR

UPPER INTAKE MANIFOLD

Upper Intake Manifold (View 1 of 2)

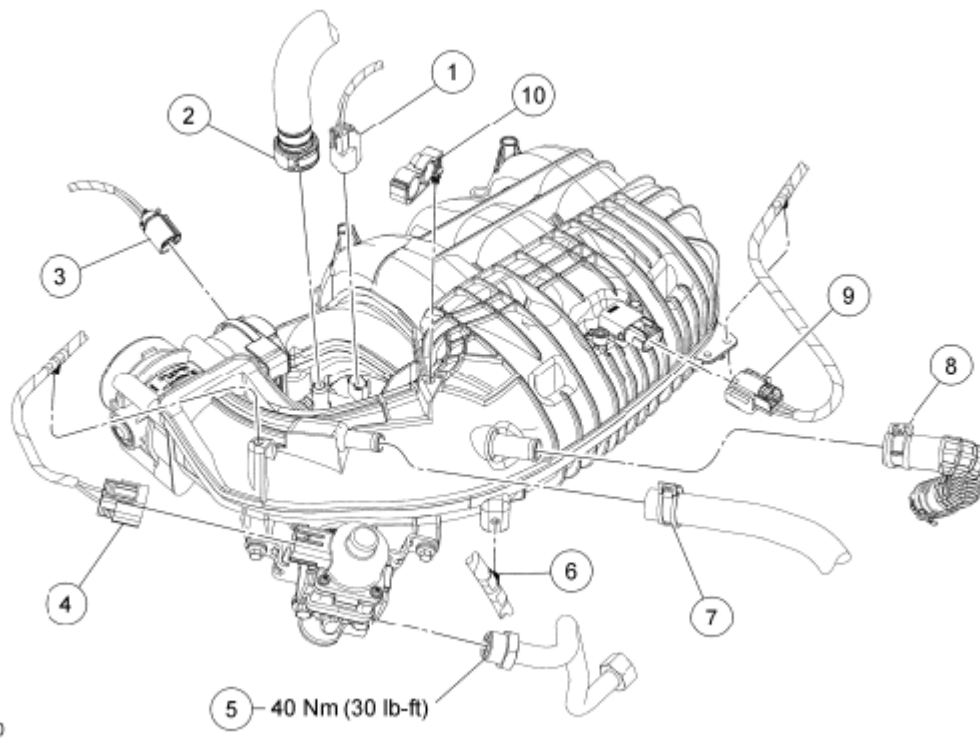


Fig. 3: Exploded View Of Upper Intake Manifold (1 Of 2)

Courtesy of FORD MOTOR CO.

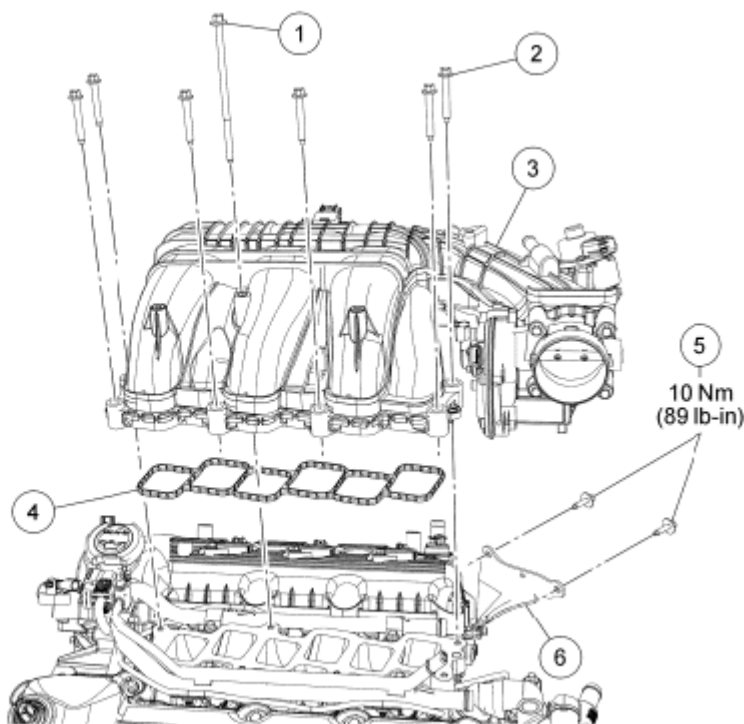
ITEM DESCRIPTION TABLE

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Item	Part Number	Description
1	14A464	Evaporative Emission (EVAP) canister purge valve electrical connector (part of 12C508)
2	9D289	EVAP tube-to- EVAP canister purge valve quick connect coupling
3	14A464	Electronic throttle control electrical connector (part of 12C508)
4	14A464	EGR valve electrical connector (part of 12C508)
5	-	EGR tube fitting (part of 9D477)
6	W700497	Engine control wiring harness retainer (part of 12C508)
7	-	Brake booster vacuum tube
8	6K817	PCV tube
9	14A464	Manifold Absolute Pressure (MAP) sensor electrical connector (part of 12C508)
10	-	Fuel tube and EVAP tube-to- EVAP canister purge valve tube retainer

Upper Intake Manifold (View 2 of 2)



N0096593

Fig. 4: Exploded View Of Upper Intake Manifold (2 Of 2)

Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

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2010 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan

Item	Part Number	Description
1	W713391	Upper intake manifold bolt
2	9Y450	Upper intake manifold bolt (6 required)
3	9424	Upper intake manifold
4	-	Upper intake manifold gasket
5	W701775	Upper intake manifold support bracket bolts (2 required)
6	9J444	Upper intake manifold support bracket

Removal

1. Remove the Air Cleaner (ACL) outlet pipe. For additional information, refer to **REMOVAL AND INSTALLATION**.
2. Remove the battery. For additional information, refer to **REMOVAL AND INSTALLATION**.
3. Remove the EGR tube fitting from the EGR valve.
4. Disconnect the electronic throttle control electrical connector.
5. Disconnect the Evaporative Emission (EVAP) canister purge valve electrical connector.
6. Disconnect the EGR valve electrical connector and detach the wiring retainer.
7. Disconnect the **EVAP** tube-to- **EVAP** canister purge valve quick connect coupling and the brake booster vacuum tube from the upper intake manifold.
 - Detach the fuel tube and **EVAP** tube-to- **EVAP** canister purge valve tube retainer from the upper intake manifold.
8. Detach the engine control wiring harness retainer from the upper intake manifold.
9. Disconnect the PCV tube from the upper intake manifold.
10. Disconnect the Manifold Absolute Pressure (MAP) sensor electrical connector and detach the wiring retainer.
11. Remove the 2 upper intake manifold support bracket bolts from the upper intake manifold.
12. Remove the 7 bolts and the upper intake manifold.
 - Remove and discard the gaskets.

Installation

1. Clean and inspect all of the sealing surfaces of the upper intake manifold.

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.

2. Position the upper intake manifold and install the 7 bolts.
 - Tighten the bolts in 2 stages in the sequence shown below.
 - Stage 1: Tighten to 10 Nm (89 lb-in).

- Stage 2: Tighten an additional 45 degrees.

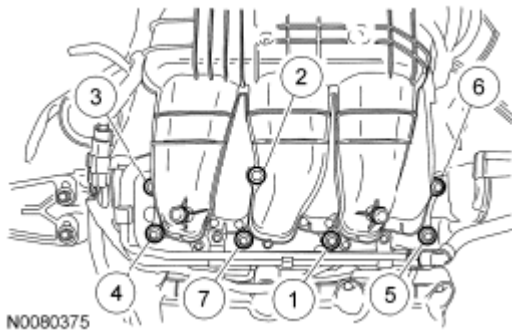


Fig. 5: Identifying Bolts In Tightening Sequence
Courtesy of FORD MOTOR CO.

NOTE: Install new upper intake manifold gaskets.

3. Install the 2 upper intake manifold support bracket bolts.
 - Tighten to 10 Nm (89 lb-in).
4. Connect the **MAP** sensor electrical connector and attach the wiring retainer.
5. Connect the PCV tube to the upper intake manifold.
6. Attach the engine control wiring harness retainer to the upper intake manifold.
7. Connect the **EVAP** tube-to- **EVAP** canister purge valve quick connect coupling and the brake booster vacuum tube to the upper intake manifold.
 - Attach the fuel tube and **EVAP** tube-to- **EVAP** canister purge valve tube retainer to the upper intake manifold.
8. Connect the EGR valve electrical connector and attach the wiring retainer.
9. Connect the **EVAP** canister purge valve electrical connector.
10. Connect the electronic throttle control electrical connector.
11. Install the EGR tube fitting to the EGR valve.
 - Tighten to 40 Nm (30 lb-ft).
12. Install the battery. For additional information, refer to **REMOVAL AND INSTALLATION** .
13. Install the ACL outlet pipe. For additional information, refer to **REMOVAL AND INSTALLATION** .

LOWER INTAKE MANIFOLD

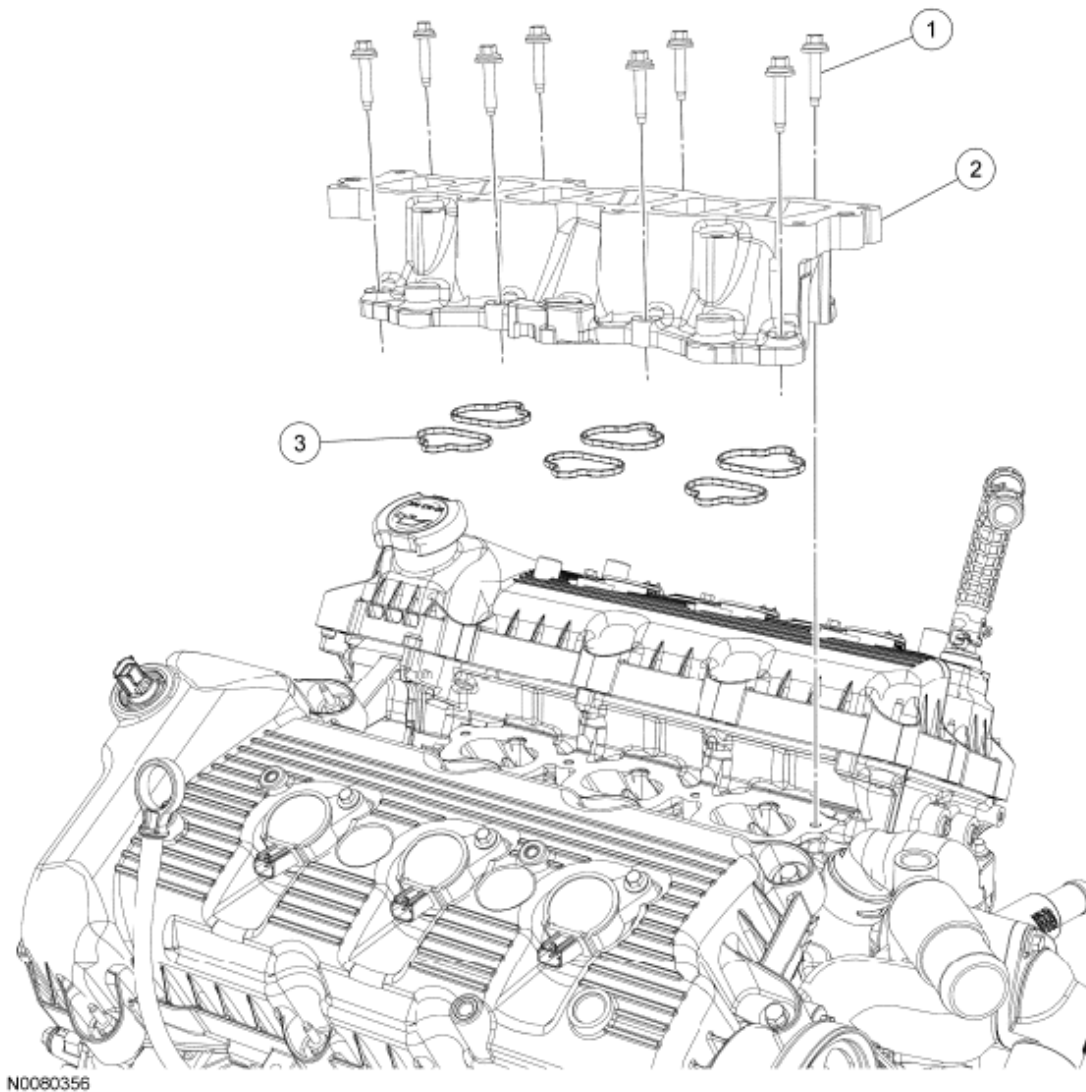


Fig. 6: Identifying Lower Intake Manifold Components
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

Item	Part Number	Description
1	W503279	Lower intake manifold bolt (8 required)
2	9K461	Lower intake manifold
3	9439	Lower intake manifold gasket (6 required)

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. Release the fuel system pressure. For additional information, refer to **FUEL SYSTEM PRESSURE RELEASE**.
2. Disconnect the battery ground cable. For additional information, refer to **REMOVAL AND INSTALLATION**.
3. Remove the fuel rail. For additional information, refer to **REMOVAL**.
4. Remove the 8 lower intake manifold bolts and the lower intake manifold.
 - Remove and discard the gaskets.

Installation

1. Position the lower intake manifold and install the 8 bolts.
 - Tighten in the sequence shown to 10 Nm (89 lb-in).

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: Clean and inspect all sealing surfaces. Install new gaskets.

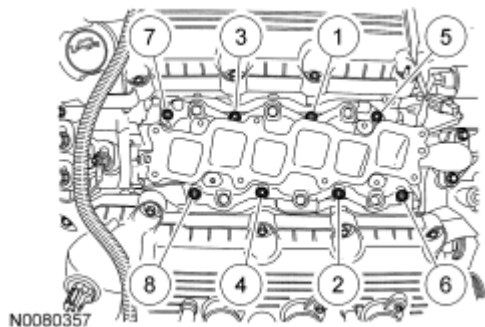


Fig. 7: Identifying Lower Intake Manifold & Bolts In Tightening Sequence
Courtesy of FORD MOTOR CO.

2. Install the fuel rail. For additional information, refer to **INSTALLATION**.
3. Connect the battery ground cable. For additional information, refer to **REMOVAL AND INSTALLATION**.

VALVE COVER - LH

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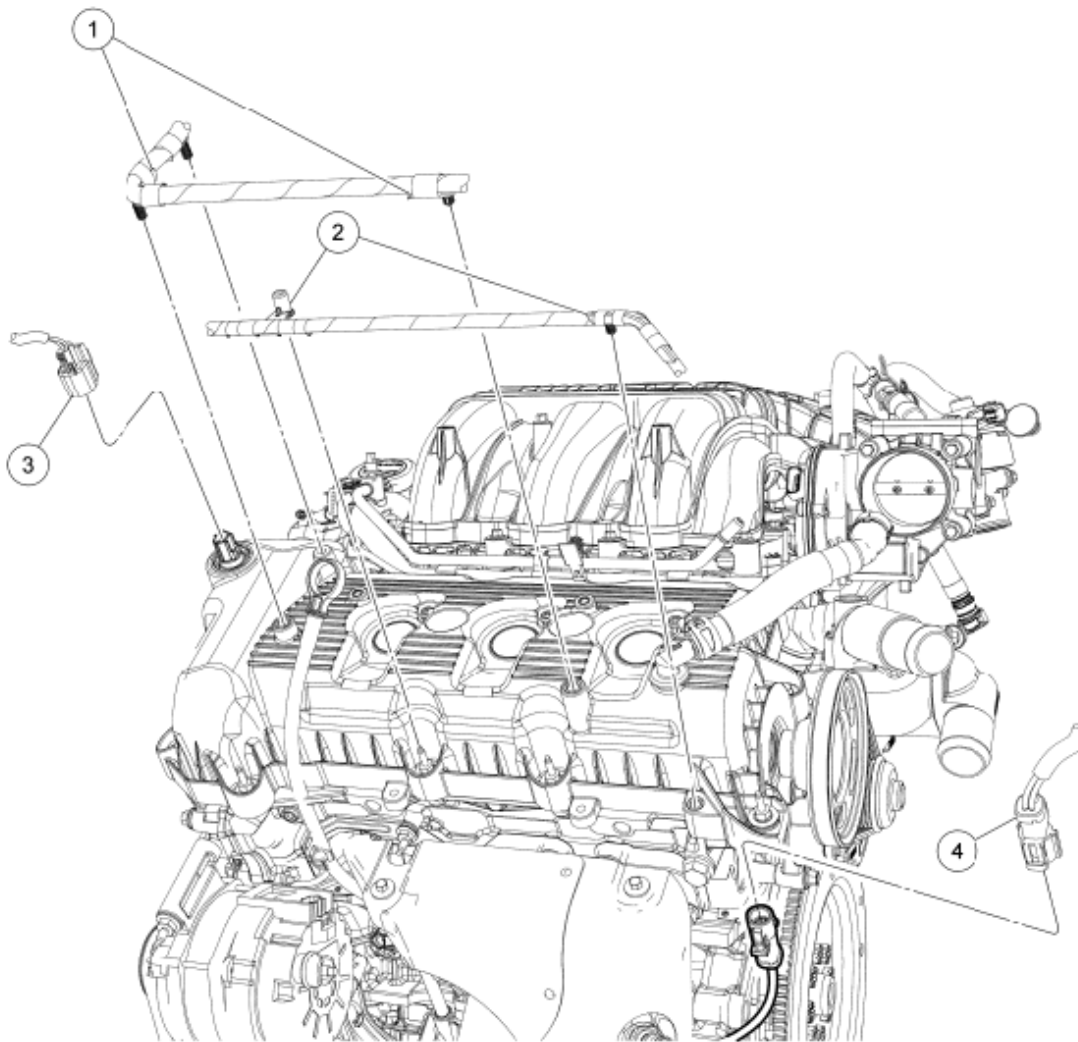
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Material

MATERIAL SPECIFICATIONS TABLE

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

LH Valve Cover (View 1 of 2)



N0096622

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

ITEM DESCRIPTION TABLE

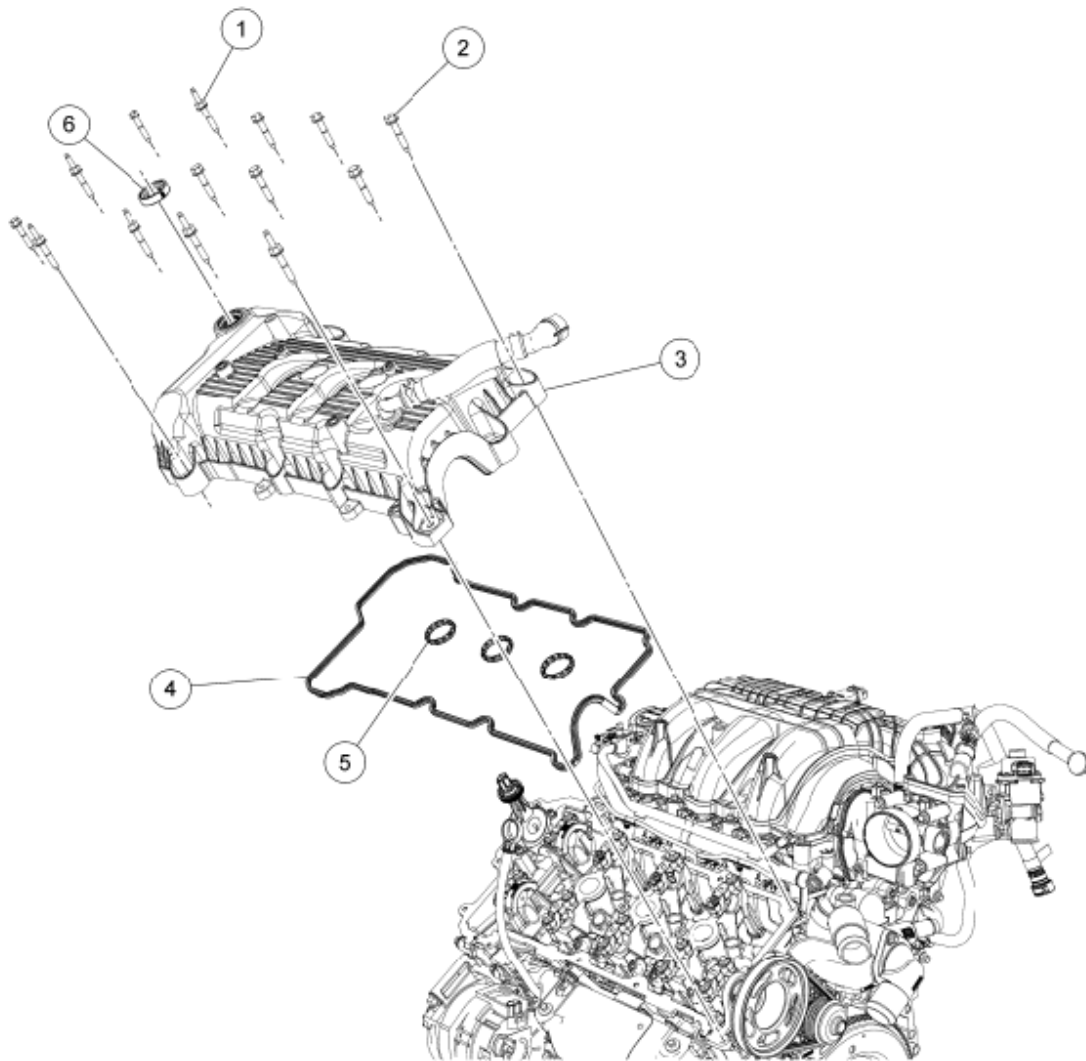
Item	Part Number	Description
1	-	Valve cover wiring retainers (part of

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		12A581)
2	-	B+ cable valve cover stud bolt wiring retainers (part of 14A280)
3	14A464	Variable Camshaft Timing (VCT) electrical connector (part of 12A581)
4	14A464	LH Heated Oxygen Sensor (HO2S) electrical connector (part of 12A581)

LH Valve Cover (View 2 of 2)



N0096623

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

ITEM DESCRIPTION TABLE

Item	Part Number	Description

2010 Mercury Milan

2010 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan

1	6C519	Valve cover stud bolt (6 required)
2	6C519	Valve cover bolt (8 required)
3	6A505	Valve cover
4	6A559	Valve cover gasket
5	6C527	Valve cover spark plug gasket (3 required)
6	6C535	Variable Camshaft Timing (VCT) valve cover seal

Removal

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

1. Remove the LH ignition coil-on-plugs. For additional information, refer to **REMOVAL AND INSTALLATION**.
2. Detach the 3 wiring retainers from the valve cover.
3. Detach the wiring retainer from the valve cover stud bolt and 1 retainer from the valve cover.
4. Disconnect the Variable Camshaft Timing (VCT) electrical connector.
5. Disconnect the Heated Oxygen Sensor (HO2S) electrical connector.
6. Remove the 9 bolts, 5 stud bolts and the valve cover.
 - Remove and discard the gasket.

NOTE: Inspect the crankcase ventilation tube and valve cover sealing area. If either a new valve cover or crankcase ventilation tube is required, both components must be installed new.

Installation

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

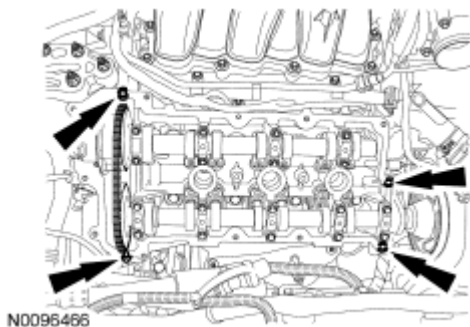


Fig. 10: Locating Valve Cover With Bolts & Stud Bolts

Courtesy of FORD MOTOR CO.

NOTE: If the valve cover is not secured within 4 minutes, the sealant must be removed and the sealing area cleaned with metal surface prep. Failure to follow this procedure can cause future oil leakage.

2. Position the valve cover and install the bolts and stud bolts.
 - Tighten in the sequence shown to 10 Nm (89 lb-in).

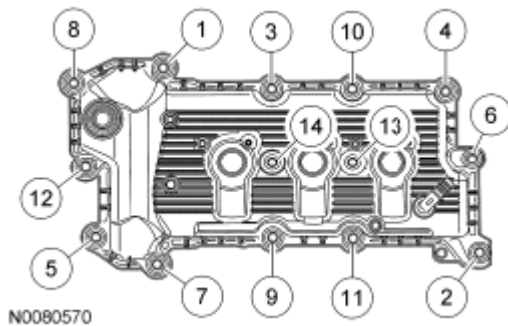


Fig. 11: Identifying Valve Cover & Bolts In Tightening Sequence
Courtesy of FORD MOTOR CO.

3. Position the wire harness and connect the **HO2S** electrical connector.
4. Connect the **VCT** electrical connector.
5. Attach the wiring retainer to the valve cover stud bolt and attach the pin-type wiring retainer to the valve cover.
6. Attach the 3 wiring retainers to the valve cover.
7. Install the LH ignition coil-on-plugs. For additional information, refer to **REMOVAL AND INSTALLATION**.

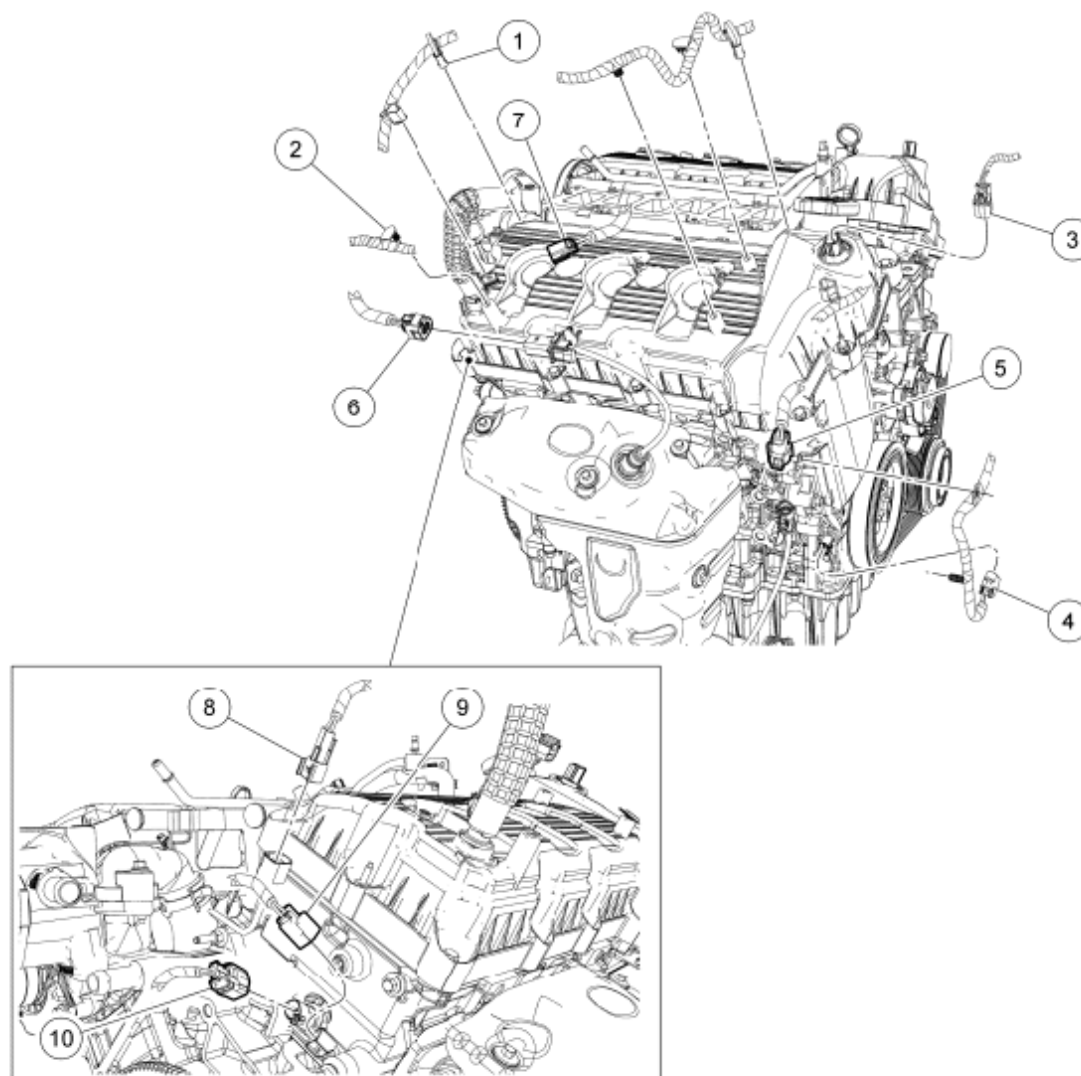
VALVE COVER - RH

Material

MATERIAL SPECIFICATIONS TABLE

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

RH Valve Cover (View 1 of 2)



N0096666

Fig. 12: Identifying RH Valve Cover Components (1 Of 2)
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

Item	Part Number	Description
1	-	Main engine control wiring harness valve cover stud bolt retainer (part of 12A581) (4 required)
2	-	Main engine control wiring harness valve cover retainer (part of 12A581) (3 required)
3	14A464	Variable Camshaft Timing (VCT) electrical connector (part of 12A581)
4	-	Crankshaft Position (CKP) electrical connector and wiring harness retainer (part of 12A581)
5	-	Catalyst Monitor Sensor (CMS) electrical connector (part of 12A581)

2010 Mercury Milan

2010 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan

6	-	Heated Oxygen Sensor (HO2S) electrical connector (part of 12A581)
7	-	Heated PCV electrical connector (part of 12A581)
8	-	Cylinder head Knock Sensor (KS) electrical connector (part of 12A581)
9	-	Cylinder block KS electrical connector (part of 12A581)
10	-	Cylinder Head Temperature (CHT) electrical connector (part of 12A581)

RH Valve Cover (View 2 of 2)

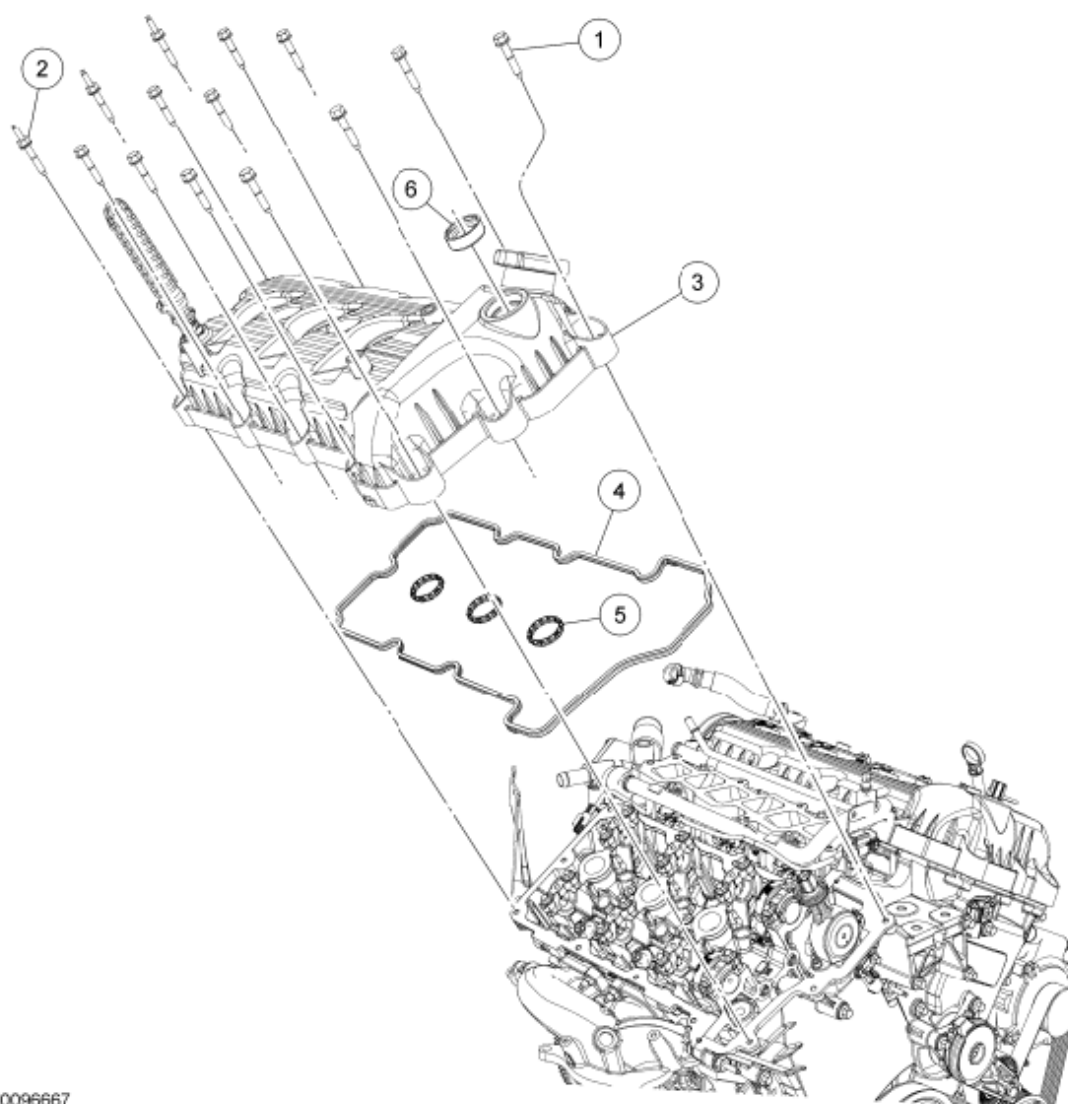


Fig. 13: Identifying RH Valve Cover Components (2 Of 2)
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

Item	Part Number	Description
1	6C519	Valve cover stud bolt (11 required)
2	6C519	Valve cover bolt (3 required)
3	6582	Valve cover
4	6584	Valve cover gasket
5	6C527	Valve cover spark plug gasket (3 required)
6	6C535	Variable Camshaft Timing (VCT) valve cover seal

Removal

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

1. Remove the RH ignition coil-on-plugs. For additional information, refer to **REMOVAL AND INSTALLATION**.
2. Detach the 3 main engine control wiring harness retainers from the valve cover and 4 retainers from the valve cover stud bolts.
3. Disconnect the Variable Camshaft Timing (VCT) electrical connector.
4. Disconnect the Heated Oxygen Sensor (HO2S) electrical connector.
5. Disconnect the Crankshaft Position (CKP) electrical connector and detach the 2 wiring harness retainers.
6. Disconnect the Catalyst Monitor Sensor (CMS) electrical connector.
7. Disconnect the heated PCV electrical connector.
8. Disconnect the Cylinder Head Temperature (CHT) sensor electrical connector and the cylinder head and cylinder block Knock Sensor (KS) electrical connectors.
9. Remove the 11 bolts, 3 stud bolts and the valve cover.
 - Remove and discard the gasket.

Installation

1. Clean the valve cover, cylinder head and front cover sealing surfaces with metal surface prep and install a new valve cover and spark plug cavity gaskets.
2. Apply an 8 mm (0.31 in) dot of silicone gasket sealant to the front cover-to-cylinder head joints.

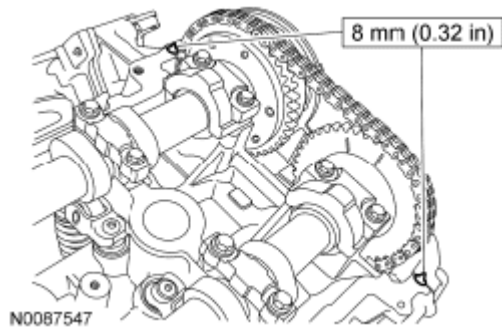


Fig. 14: Applying Dot Of Silicone Gasket Sealant To Front Cover-To-Cylinder Head Joints
Courtesy of FORD MOTOR CO.

NOTE: The valve cover must be installed and the bolts and stud bolts tightened within 4 minutes of sealant application.

3. Position the valve cover and install the bolts and stud bolts.
 - Tighten in the sequence shown to 10 Nm (89 lb-in).

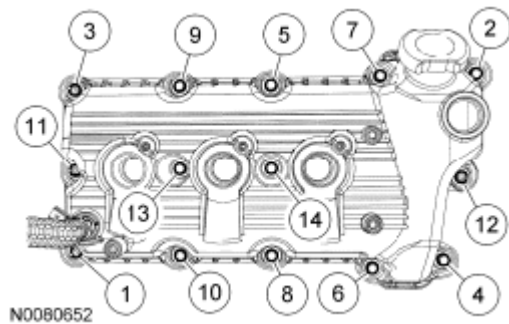
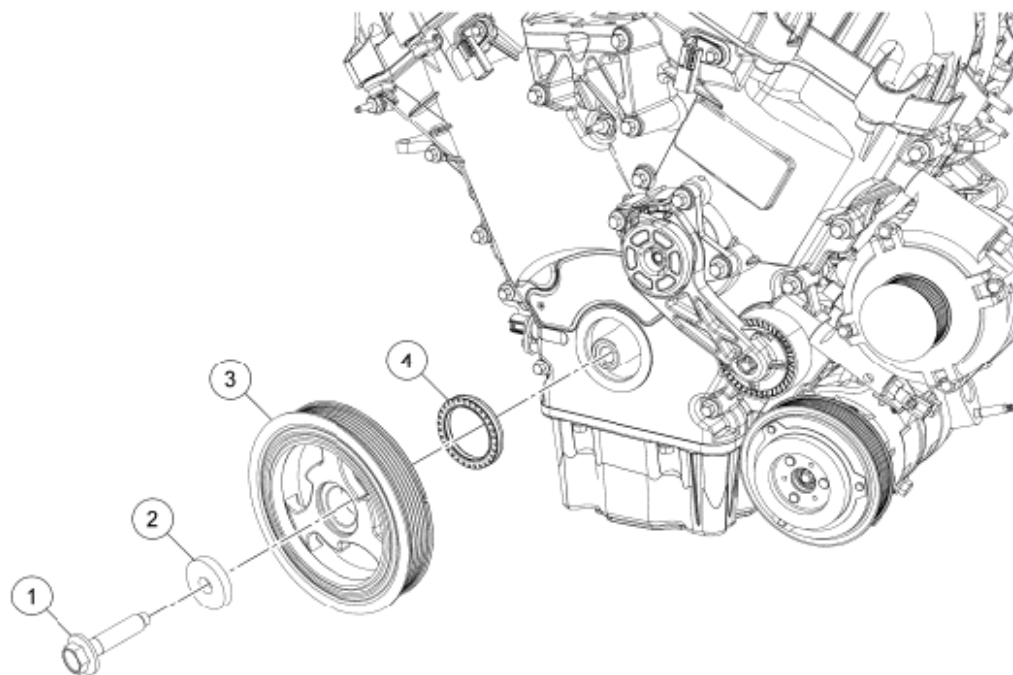


Fig. 15: Identifying Valve Cover & Bolts In Tightening Sequence
Courtesy of FORD MOTOR CO.

4. Connect the **CHT** sensor electrical connector and the cylinder head and cylinder block **KS** electrical connectors.
5. Connect the heated **PCV** electrical connector.
6. Connect the **CMS** electrical connector.
7. Connect the **CKP** electrical connector and attach the wiring harness retainer.
8. Connect the **HO2S** electrical connector.
9. Connect the **VCT** electrical connector.
10. Attach the 3 main engine control wiring harness retainers to the valve cover and the 4 retainers to the valve cover stud bolts.
11. Install the **RH** ignition coil-on-plugs. For additional information, refer to **REMOVAL AND INSTALLATION**.

LOWER END COMPONENTS - EXPLODED VIEW

Crankshaft Pulley and Front Seal



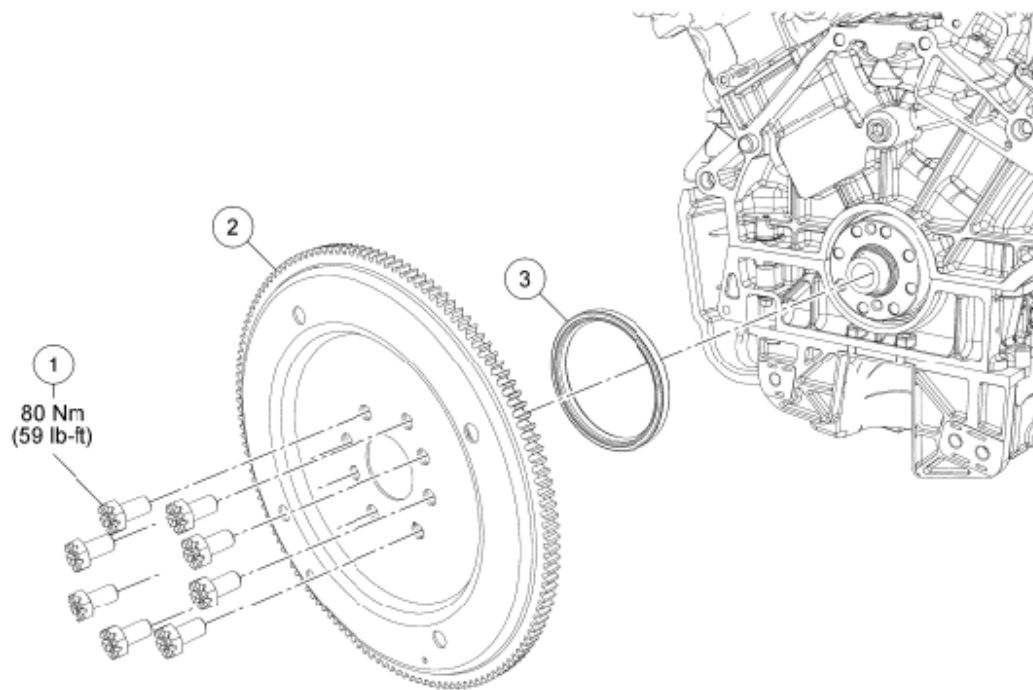
N0080690

Fig. 16: Exploded View Of Crankshaft Pulley & Front Seal
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

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

Flexplate and Rear Seal



N0062468

Fig. 17: Exploded View Of Flexplate & Rear Seal With Torque Specifications
 Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

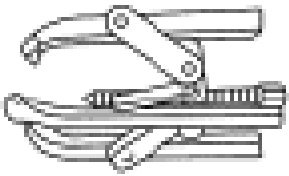
Item	Part Number	Description
1	W701559	Flexplate bolt (8 required)
2	6375	Flexplate
3	6701	Crankshaft rear oil seal

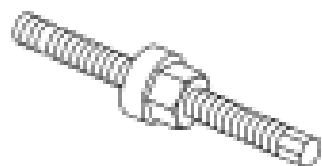
1. For additional information, refer to the appropriate procedures.

CRANKSHAFT PULLEY

Special Tool(s)

SPECIAL TOOLS TABLE

 ST1184-A	3 Jaw Puller 303-D121 (or equivalent)
--	---------------------------------------



ST1287-A

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

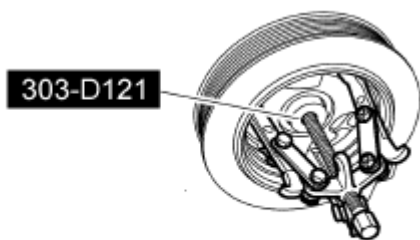
Material

MATERIAL SPECIFICATIONS TABLE

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

Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the accessory drive belt. For additional information, refer to **REMOVAL AND INSTALLATION**.
3. Remove the crankshaft pulley bolt and washer.
 - Discard the crankshaft pulley bolt.
4. Using the 3 Jaw Puller, remove the crankshaft pulley.

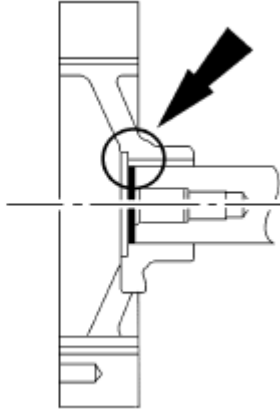


N0010528

Fig. 18: Identifying 3-Jaw Puller (303-D121) On Crankshaft Pulley
 Courtesy of FORD MOTOR CO.

Installation

1. Lubricate the crankshaft front seal inner lip with clean engine oil.
2. Apply silicone gasket and sealant to the end of the keyway slot.



A0010615

Fig. 19: Applying Silicone Gasket & Sealant
Courtesy of FORD MOTOR CO.

NOTE: Clean the keyway and slot using metal surface prep before applying silicone gasket and sealant.

NOTE: The crankshaft pulley must be installed and the bolt tightened within 4 minutes of applying the silicone gasket and sealant.

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

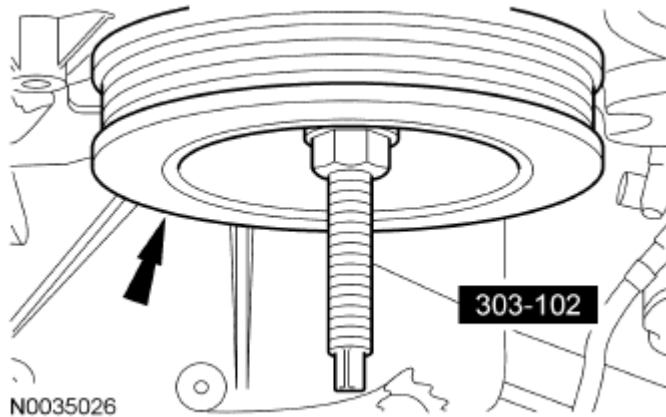


Fig. 20: Installing Crankshaft Pulley
Courtesy of FORD MOTOR CO.

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

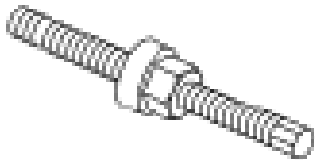
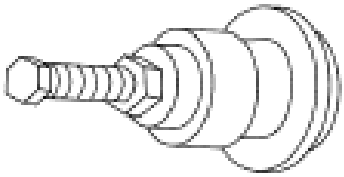
4. Install the bolt and washer. Tighten the bolt in 4 stages:

- Stage 1: Tighten to 120 Nm (89 lb-ft).
 - Stage 2: Loosen one full turn.
 - Stage 3: Tighten to 50 Nm (37 lb-ft).
 - Stage 4: Tighten an additional 90 degrees.
5. Install the accessory drive belt. For additional information, refer to **REMOVAL AND INSTALLATION**.

CRANKSHAFT FRONT SEAL

Special Tool(s)

SPECIAL TOOLS TABLE

 ST1287-A	Installer, Crankshaft Vibration Damper 303-102 (T74P-6316-B)
 ST1328-A	Installer, Front Cover Oil Seal 303-335 (T88T-6701-A)
 ST1385-A	Remover, Oil Seal 303-409 (T92C-6700CH)

Material

MATERIAL SPECIFICATIONS TABLE

Item	Specification

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

Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the crankshaft pulley. For additional information, refer to **Removal**.
3. Using the Oil Seal Remover, remove and discard the crankshaft front seal.

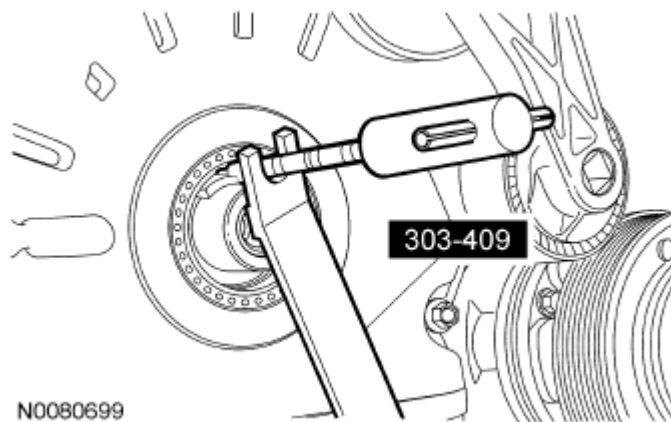


Fig. 21: Removing Crankshaft Front Seal
Courtesy of FORD MOTOR CO.

Installation

1. Apply clean engine oil to the seal lip and seal bore before installing the seal.

NOTE: Clean all sealing surfaces with metal surface prep.

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

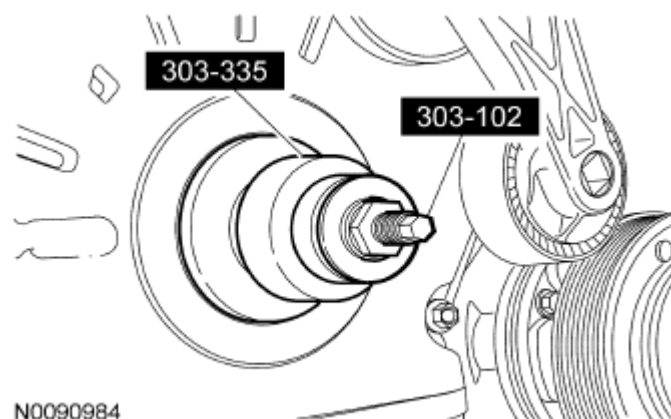


Fig. 22: Installing Crankshaft Front Seal
 Courtesy of FORD MOTOR CO.

3. Install the crankshaft pulley. For additional information, refer to **Installation**.

FLEXPLATE

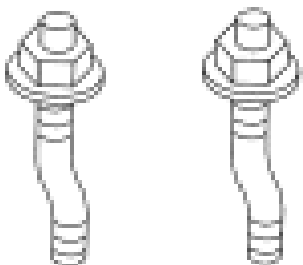
Removal and Installation

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the transaxle. For additional information, refer to **TRANSAXLE -- 3.0L**.
3. Remove the bolts and the flexplate.
 - To install, tighten to 80 Nm (59 lb-ft).
4. To install, reverse the removal procedure.

CRANKSHAFT REAR SEAL

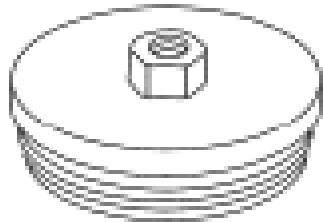
Special Tool(s)

SPECIAL TOOLS TABLE

 ST1333-A	Installer Bolts, Crankshaft Rear Main Oil Seal 303-384 (T91P-6701-A)
	Installer, Crankshaft Rear Main Oil Seal 303-178 (T82L-6701-)

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 ST1327-A	A)
 ST1382-A	Remover, Crankshaft Rear Oil Seal 303-519 (T95P-6701-EH)
 ST1187-A	Slide Hammer 307-005 (T59L-100-B)

Material

MATERIAL SPECIFICATIONS TABLE

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

Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the flexplate. For additional information, refer to **Removal and Installation**.
3. Using the Slide Hammer and the Crankshaft Rear Oil Seal Remover, remove and discard the crankshaft rear oil seal.

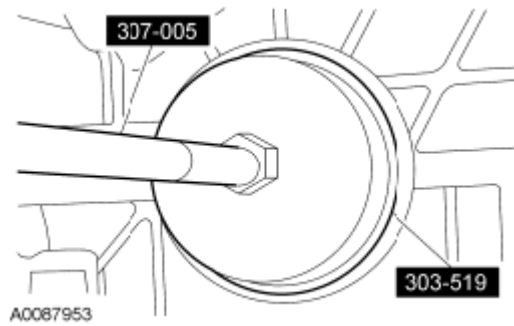


Fig. 23: Removing Crankshaft Rear Oil Seal
Courtesy of FORD MOTOR CO.

Installation

1. Using the Crankshaft Rear Main Oil Seal Installer Bolts and the Crankshaft Rear Main Oil Seal Installer, install the crankshaft rear oil seal.

NOTE: Clean all sealing surfaces with metal surface prep.

NOTE: Apply clean engine oil to the seal lip and seal bore before installing the seal.

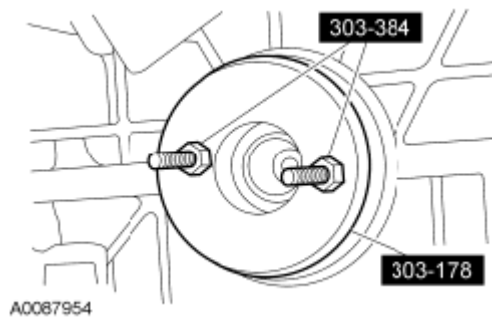


Fig. 24: Installing Crankshaft Rear Oil Seal
Courtesy of FORD MOTOR CO.

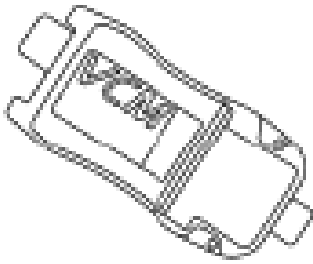
2. Install the flexplate. For additional information, refer to **Removal and Installation**.

ENGINE FRONT COVER

Special Tool(s)

SPECIAL TOOLS TABLE

	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent diagnostic tool
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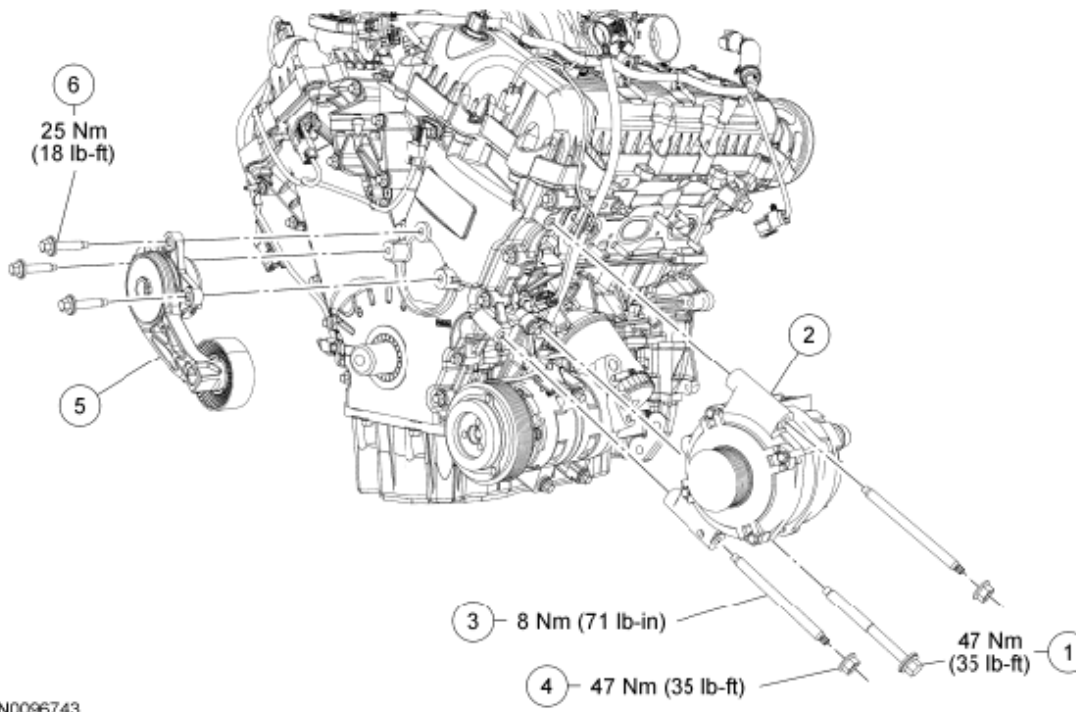
ST2834-A

Material

MATERIAL SPECIFICATIONS TABLE

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

Engine Front Cover (View 1 of 3)



N0096743

Fig. 25: Exploded View Of Engine Front Cover With Torque Specifications (1 Of 3)

2010 Mercury Milan

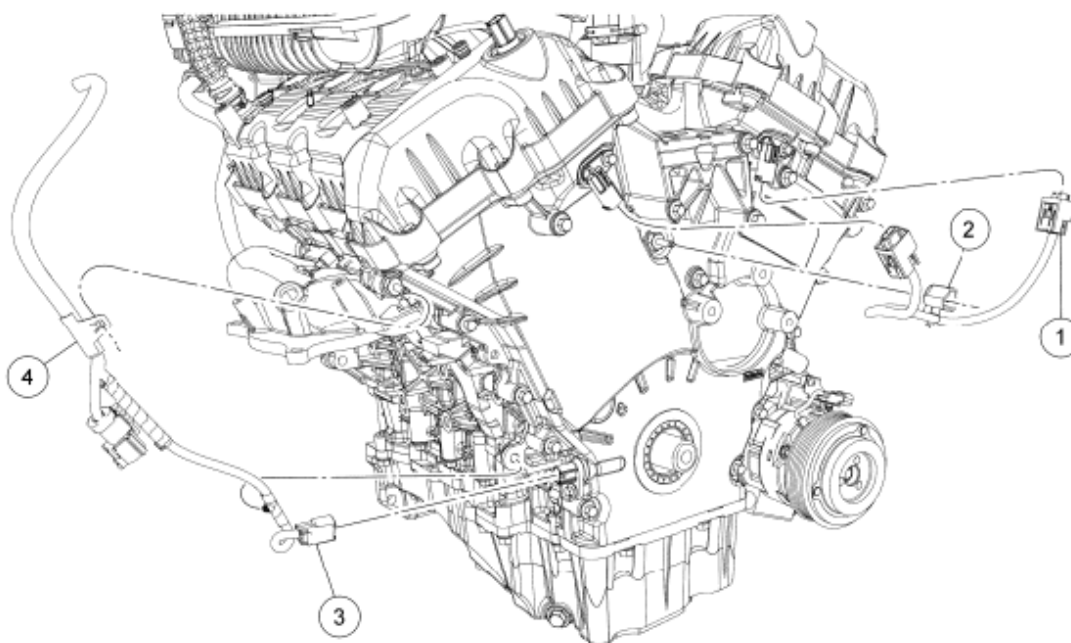
2010 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan

Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

Item	Part Number	Description
1	W709986	Generator bolt
2	10300	Generator
3	W710416	Generator stud
4	W520414	Generator stud nut (2 required)
5	6B209	Accessory drive belt tensioner
6	W503297	Accessory drive belt tensioner bolt (3 required)

Engine Front Cover (View 2 of 3)



N0096744

Fig. 26: Exploded View Of Engine Front Cover (2 Of 3)
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

Item	Part Number	Description
1	14A464	Camshaft Position (CMP) sensor electrical connector (part of 12A581) (2 required)
2	-	CMP sensor wiring harness retainer (part of 12A581)
3	14A464	Crankshaft Position (CKP) electrical connector (part of 12A581)
4	-	CKP wiring harness retainer (part of 12A581)

Engine Front Cover (View 3 of 3)

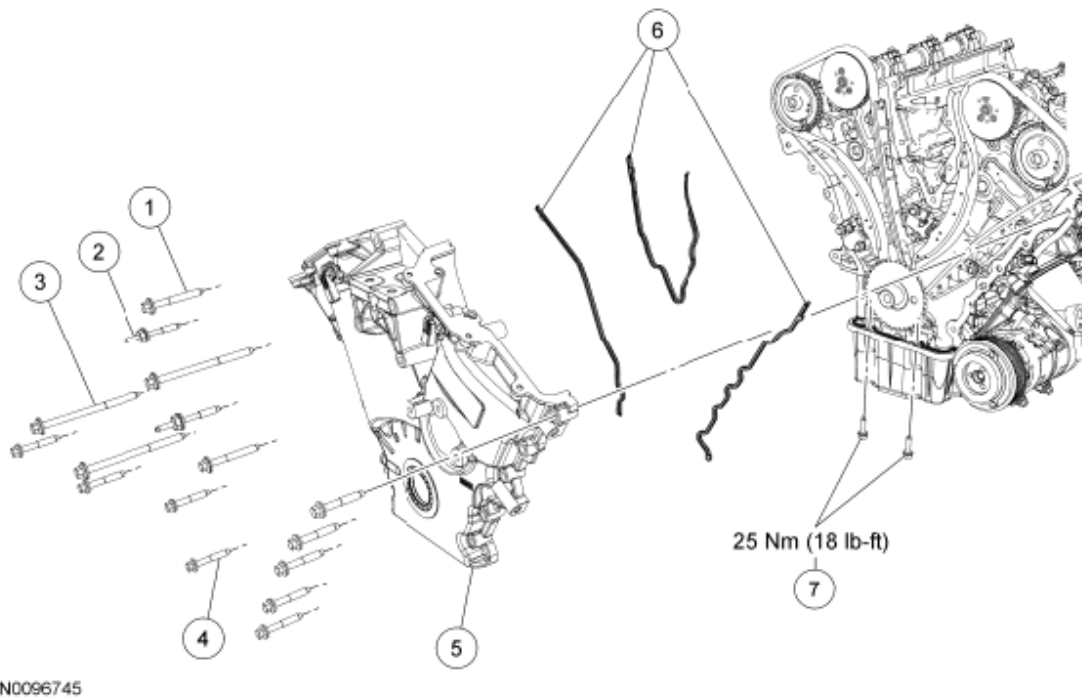


Fig. 27: Exploded View Of Engine Front Cover With Torque Specifications (3 Of 3)
 Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

Item	Part Number	Description
1	W708222	Engine front cover bolt (2 required)
2	W710030	Engine front cover stud bolt (2 required)
3	W708221	Engine front cover bolt (2 required)
4	W701525	Engine front cover bolt (10 required)
5	6019	Engine front cover
6	6D081	Engine front cover gaskets
7	W709678	Oil pan-to-front cover bolts

Removal

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

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Release the fuel system pressure. For additional information, refer to **FUEL SYSTEM PRESSURE**

RELEASE .

3. Disconnect the battery ground cable. For additional information, refer to **REMOVAL AND INSTALLATION** .
4. Remove the crankshaft front seal. For additional information, refer to **LOWER END COMPONENTS - EXPLODED VIEW** and **Removal**.
5. Remove the generator bolt and the 2 nuts.

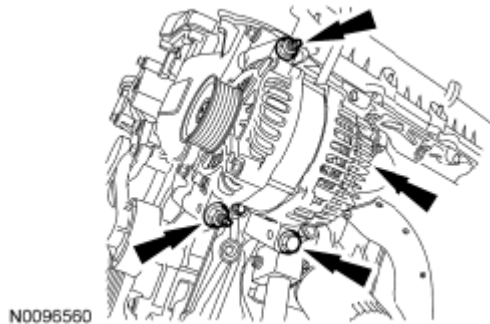


Fig. 28: Locating Generator Bolt & Nuts
Courtesy of FORD MOTOR CO.

6. Remove the 2 studs and position the generator away from the engine.

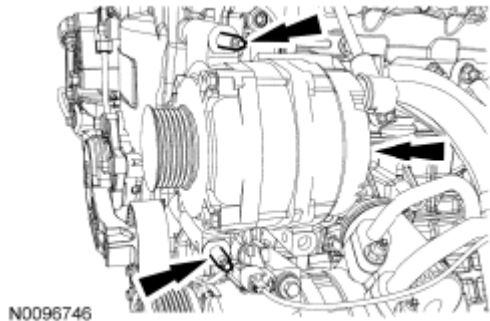


Fig. 29: Locating Studs & Generator From Engine
Courtesy of FORD MOTOR CO.

7. Remove the 3 bolts and the accessory drive belt tensioner.
8. Detach the wiring harness retainer from the engine front cover stud bolt.
9. Disconnect the Crankshaft Position (CKP) electrical connector and detach the wiring harness retainer.

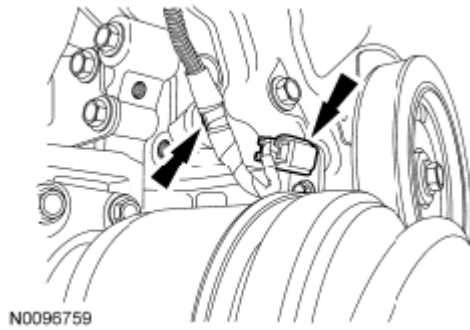


Fig. 30: Locating Crankshaft Position (CKP) Electrical Connector
Courtesy of FORD MOTOR CO.

10. Disconnect the 2 Camshaft Position (CMP) sensor electrical connectors and detach the wiring harness retainer from the engine front cover stud bolt.
11. Remove the LH and RH Variable Camshaft Timing (VCT) oil control solenoids. For additional information, refer to **REMOVAL AND INSTALLATION**.
12. Remove the engine mount. For additional information, refer to **Removal and Installation**.
13. Remove the 2 oil pan-to-front cover bolts.
14. Remove the 14 bolts, 2 stud bolts and the engine front cover.
 - Remove and discard the gaskets.

Installation

1. Use a plastic scraping tool to remove all traces of sealant.
 - Clean all sealing surfaces with metal surface prep and install new gaskets.

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.

NOTE: Do not damage the oil pan gasket while cleaning the sealant from the lower cylinder block-to-oil pan joint.

2. Apply a 6 mm (0.23 in) diameter dot of silicone gasket and sealant to the cylinder block, lower cylinder block, cylinder head and oil pan mating surfaces.

NOTE: The engine front cover must be installed and the bolts tightened within 4 minutes of applying sealant.

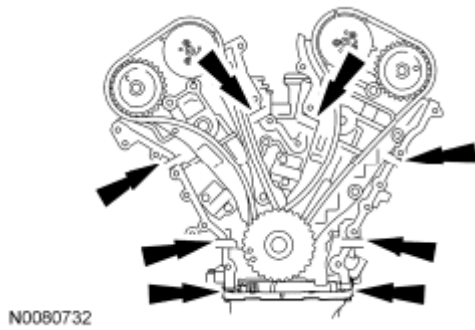


Fig. 31: Locating Engine Front Cover & Bolts
Courtesy of FORD MOTOR CO.

- Position the engine front cover and install the bolts. Tighten in the sequence shown to 25 Nm (18 lb-ft).

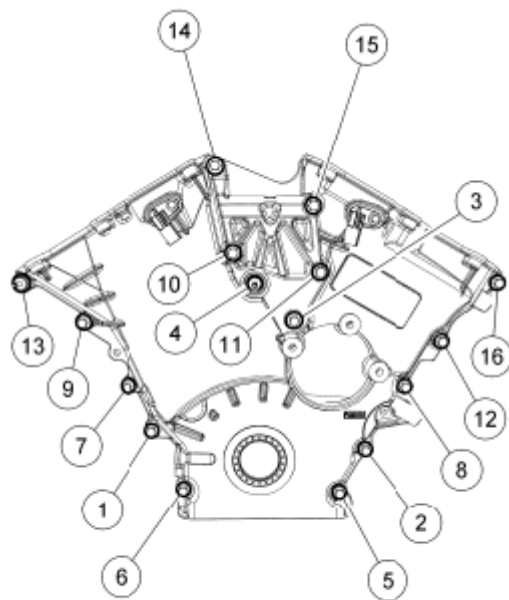
ITEM DESCRIPTION TABLE

Item	Part Number	Description
1	W701525	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 47.5
2	W701525	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 47.5
3	W708222	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 64
4	W710030	Stud, Hex Flange Head Pilot, M6 x 1 x 20/M8 x 1.25 x 47.5
5	W701525	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 47.5
6	W701525	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 47.5
7	W701525	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 47.5
8	W701525	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 47.5
9	W701525	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 47.5
10	W708221	Bolt, Hex Flange

2010 Mercury Milan

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		Head Pilot, M8 x 1.25 x 118
11	W708221	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 118
12	W701525	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 47.5
13	W710030	Stud, Hex Flange Head Pilot, M6 x 1 x 20/M8 x 1.25 x 47.5
14	W708222	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 64
15	W701525	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 118
16	W701525	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 47.5



N0089880

Fig. 32: Identifying Solenoid Body Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

4. Install the 2 oil pan-to-front cover bolts.

- Tighten to 25 Nm (18 lb-ft).
5. Remove the oil pan drain plug and drain the engine oil.
 - Install the plug and tighten to 26 Nm (19 lb-ft).
 6. Install the engine mount. For additional information, refer to **Removal and Installation**.
 7. Install the LH and RH VCT oil control solenoids. For additional information, refer to **REMOVAL AND INSTALLATION**.
 8. Connect the 2 CMP sensor electrical connectors and attach the wiring harness retainer to the engine front cover stud bolt.
 9. Connect the Crankshaft Position (CKP) electrical connector and attach the wiring harness retainer.
 10. Attach the wiring harness retainer to the engine front cover stud bolt.
 11. Install the accessory drive belt tensioner and the 3 bolts.
 - Tighten to 25 Nm (18 lb-ft).
 12. Position the generator and install the 2 studs.
 - Tighten to 8 Nm (71 lb-in).
 13. Install the generator bolt and 2 nuts.
 - Tighten to 47 Nm (35 lb-ft).
 14. Install the crankshaft front seal. For additional information, refer to **LOWER END COMPONENTS - EXPLODED VIEW** and **Installation**.
 15. Fill the engine with clean engine oil.
 16. Connect the battery ground cable. For additional information, refer to **REMOVAL AND INSTALLATION**.
 17. Using the scan tool, perform the Misfire Monitor Neutral Profile Correction procedure following the on-screen instructions.

TIMING DRIVE COMPONENTS

Removal

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

NOTE: Failure to verify correct timing drive component alignment will result in severe engine damage.

1. Remove the engine front cover. For additional information, refer to **Removal**.
2. Remove the LH and RH spark plugs. For additional information, refer to **REMOVAL AND INSTALLATION**.
3. Remove the ignition pulse wheel.

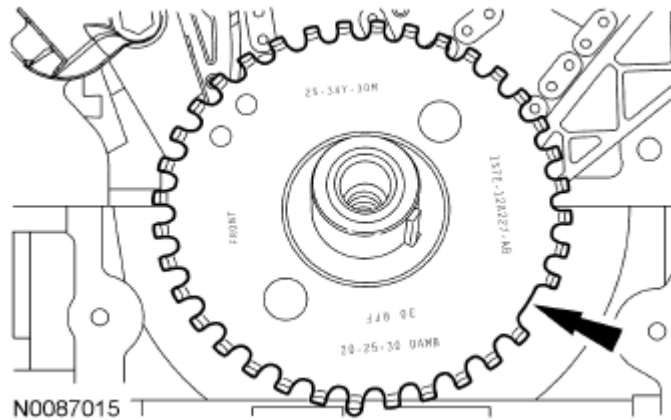


Fig. 33: Locating Ignition Pulse Wheel
Courtesy of FORD MOTOR CO.

NOTE: This pulse wheel is used in several different engines. Install the pulse wheel with the keyway in the slot stamped "30RFF" (orange in color).

4. Install the crankshaft pulley bolt and washer.

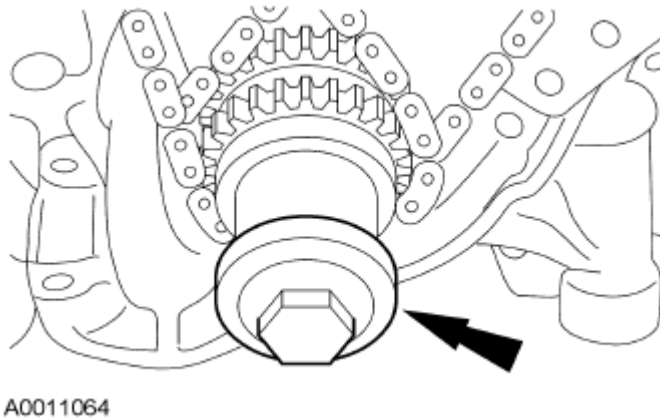


Fig. 34: Identifying Crankshaft Pulley Bolt & Washer
Courtesy of FORD MOTOR CO.

5. Rotate the crankshaft clockwise to position the crankshaft keyway in the 11 o'clock position and position the camshafts in the correct position. This will position the No. 1 cylinder at Top Dead Center (TDC).
 - Verify that the camshafts are correctly located. If not, rotate the crankshaft one additional turn and recheck.

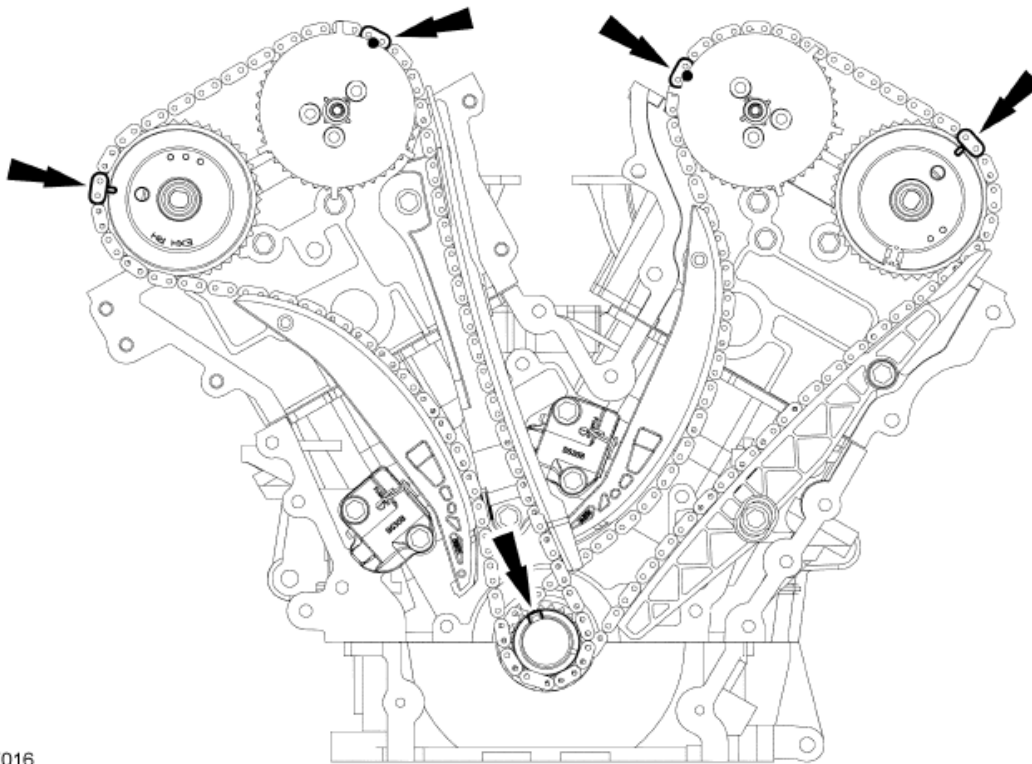


Fig. 35: Identifying Timing Mark Location
Courtesy of FORD MOTOR CO.

6. Rotate the crankshaft clockwise 120 degrees to the 3 o'clock position to position the RH camshafts in the neutral position.

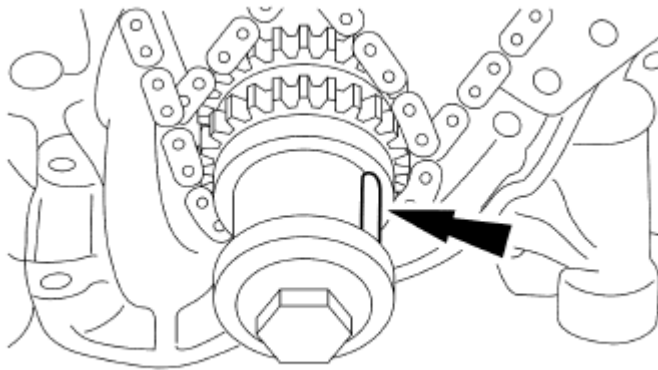


Fig. 36: Identifying Crankshaft Keyway
Courtesy of FORD MOTOR CO.

7. Verify that the RH camshafts are in the neutral position.

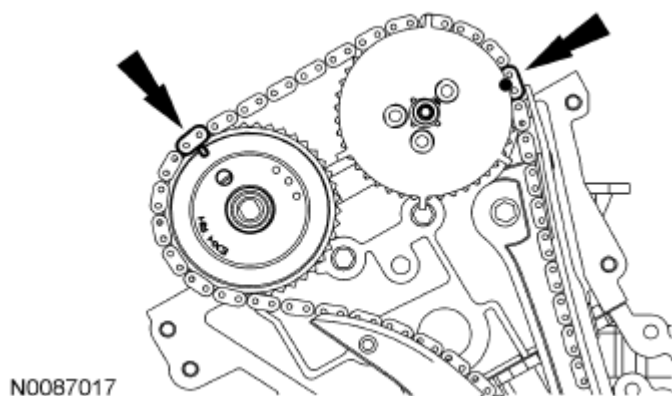


Fig. 37: Identifying Timing Mark On RH Camshafts
Courtesy of FORD MOTOR CO.

8. Remove the RH timing chain tensioner arm.
 1. Remove the 2 bolts.
 2. Remove the tensioner.
 3. Remove the tensioner arm.

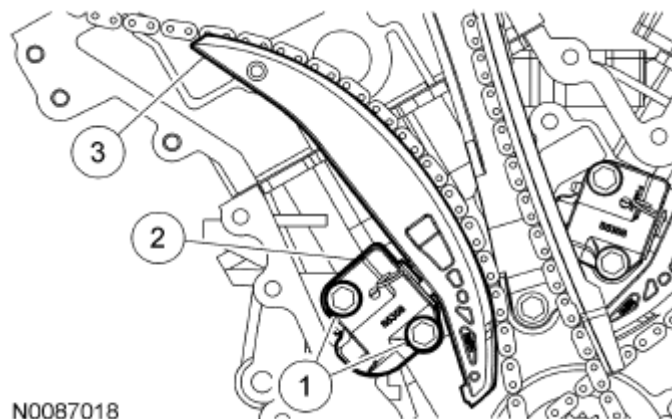


Fig. 38: Identifying RH Timing Chain Tensioner Arm With Bolts
Courtesy of FORD MOTOR CO.

9. Remove the 2 bolts and the RH timing chain guide.
 - Remove the RH timing chain from the engine.

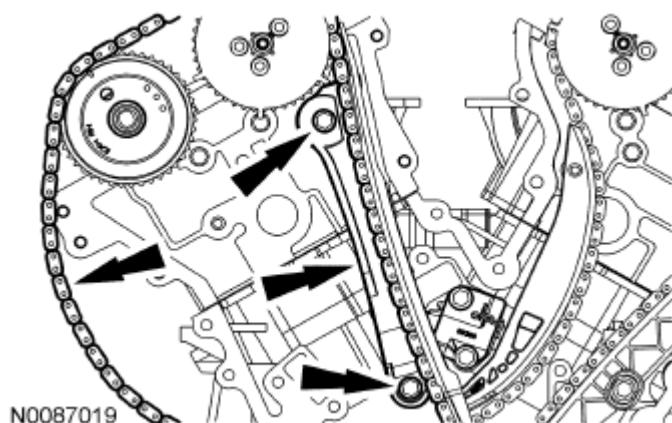


Fig. 39: Locating RH Timing Chain Guide & Bolts
Courtesy of FORD MOTOR CO.

10. Rotate the crankcase clockwise 600 degrees (one and two-third turns) to position the crankcase keyway in the 11 o'clock position. This will position the LH camshafts in the neutral position.

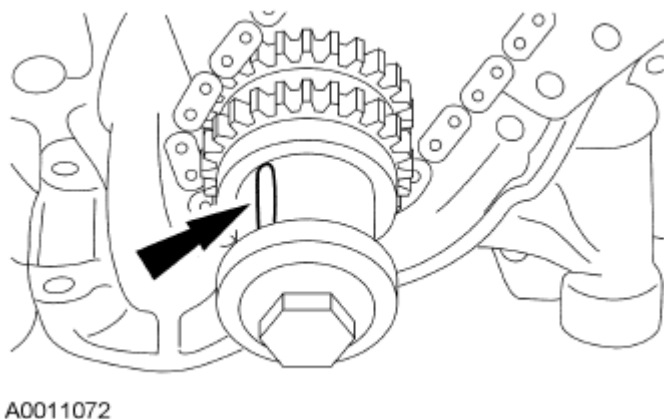


Fig. 40: Locating Crankcase Keyway
Courtesy of FORD MOTOR CO.

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

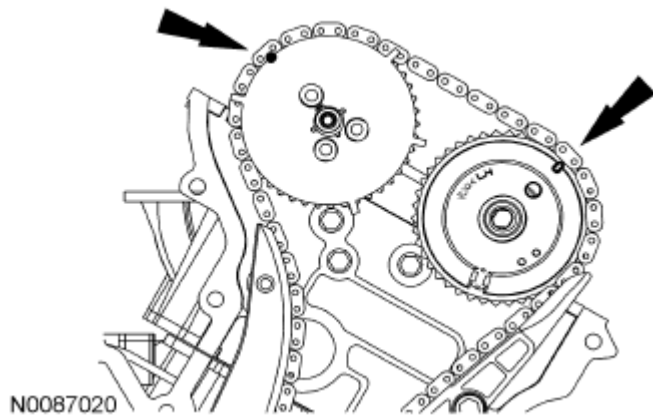


Fig. 41: Identifying Timing Mark On LH Camshafts
Courtesy of FORD MOTOR CO.

12. Remove the LH timing chain and tensioner arm.
 1. Remove the 2 bolts.
 2. Remove the tensioner.
 3. Remove the tensioner arm.

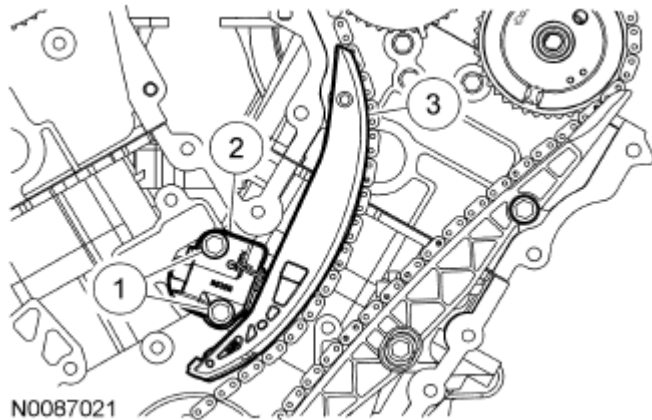


Fig. 42: Identifying LH Timing Chain & Tensioner Arm With Bolts
Courtesy of FORD MOTOR CO.

13. Remove the 2 bolts and the LH timing chain guide.
 - Remove the LH timing chain from the engine.

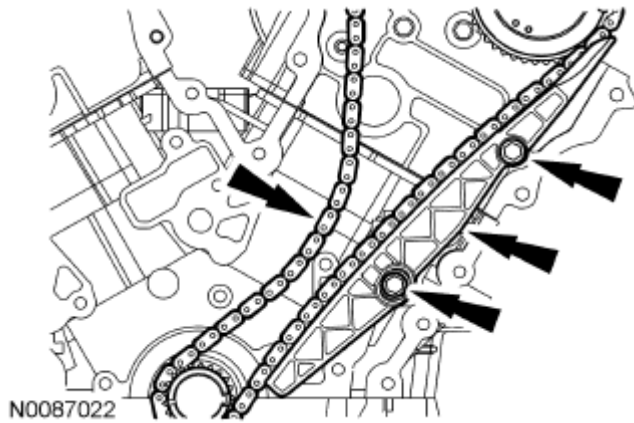


Fig. 43: Locating LH Timing Chain Guide With Bolts
Courtesy of FORD MOTOR CO.

14. Remove the crankshaft pulley bolt and the crankshaft sprocket.

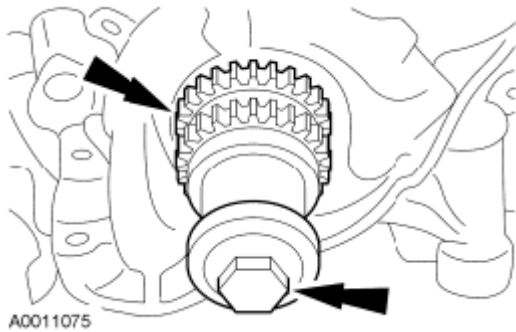


Fig. 44: Locating Crankshaft Pulley Bolt & Crankshaft Sprocket
Courtesy of FORD MOTOR CO.

Installation

1. Install the crankshaft sprocket with the timing mark facing out. The timing mark on the LH and RH timing chains will be aligned to this mark during assembly.

NOTE: Failure to verify correct timing drive component alignment will result in severe engine damage.

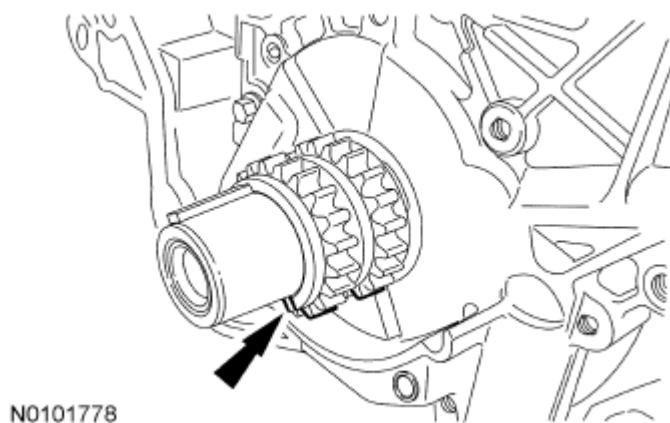


Fig. 45: Locating Crankshaft Sprocket
Courtesy of FORD MOTOR CO.

2. Position the chain tensioner in a soft-jawed vise.

NOTE: LH shown, RH similar.

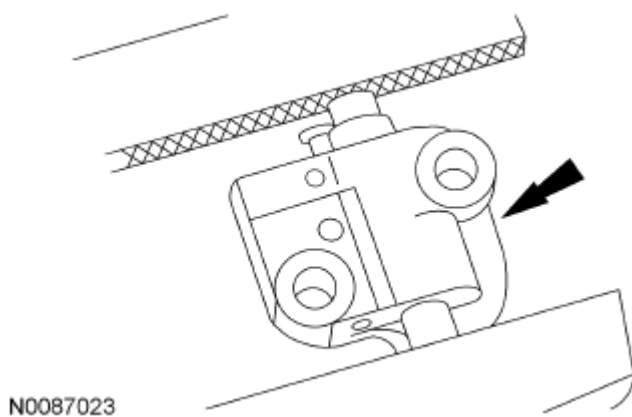


Fig. 46: Positioning Chain Tensioner In Soft-Jawed Vise
Courtesy of FORD MOTOR CO.

3. Hold the chain tensioner ratchet lock mechanism away from the ratchet stem with a small pick.

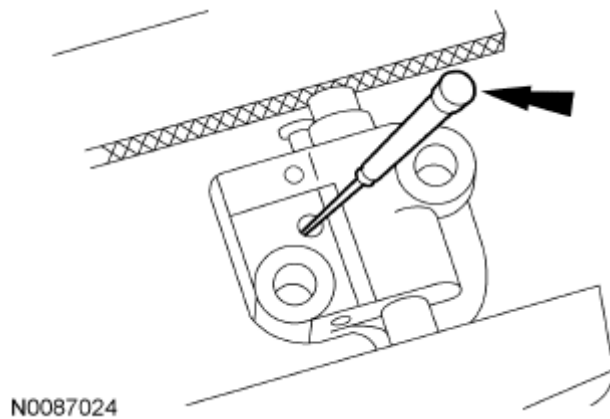


Fig. 47: Holding Chain Tensioner Ratchet Lock Mechanism Away
Courtesy of FORD MOTOR CO.

NOTE: LH shown, RH similar.

4. Slowly compress the timing chain tensioner.

NOTE: During tensioner compression, do not release the ratchet stem until the tensioner piston is fully bottomed in its bore or damage to the ratchet stem will result.

5. Retain the tensioner piston with a 1.5 mm (0.06 in) diameter wire or paper clip.

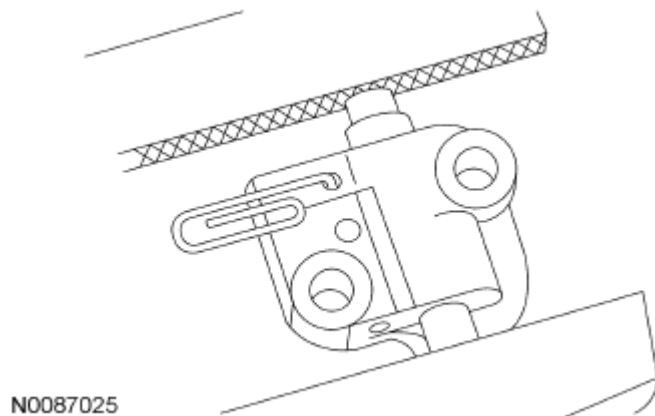
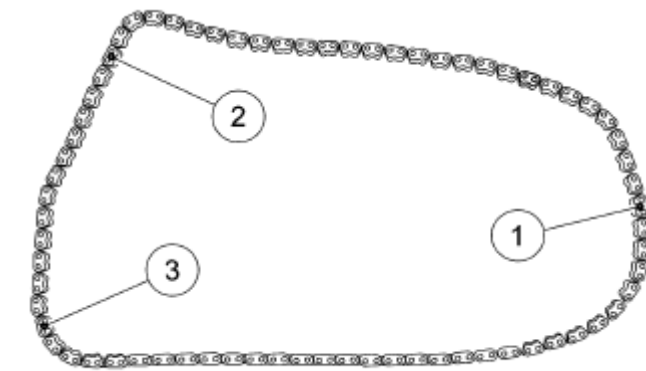


Fig. 48: Compressing Timing Chain Tensioner With Vise
Courtesy of FORD MOTOR CO.

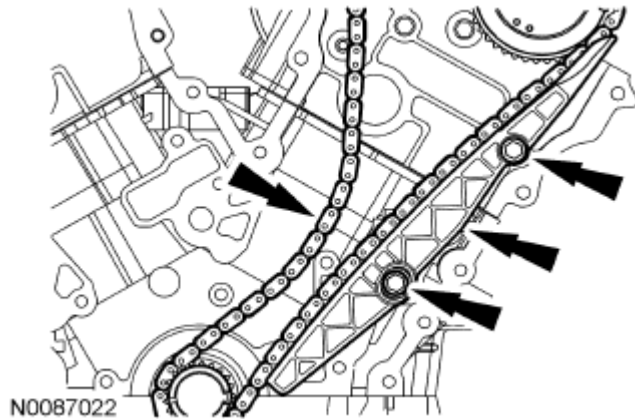
6. If timing marks in the timing chains are not evident, use a permanent-type marker to mark the crankshaft and camshaft timing marks on the LH and RH timing chains.
 1. Mark any link to use as the crankshaft timing mark.
 2. Starting with the crankshaft timing mark, count 29 links and mark the link.
 3. Continue counting to link 42 and mark the link.



N0031781

Fig. 49: Identifying Timing Marks On LH & RH Timing Chains
 Courtesy of FORD MOTOR CO.

7. Position the LH timing chain and guide and install the bolts.
 - Tighten to 25 Nm (18 lb-ft).
 - Align the marks on the timing chain with the marks on the camshaft and crankshaft sprockets.



N0087022

Fig. 50: Locating LH Timing Chain Guide With Bolts
 Courtesy of FORD MOTOR CO.

8. Install the LH timing chain tensioner arm and the LH timing chain tensioner.
 1. Install the tensioner arm.
 2. Position the tensioner.
 3. Install the bolts.
 - Tighten to 25 Nm (18 lb-ft).

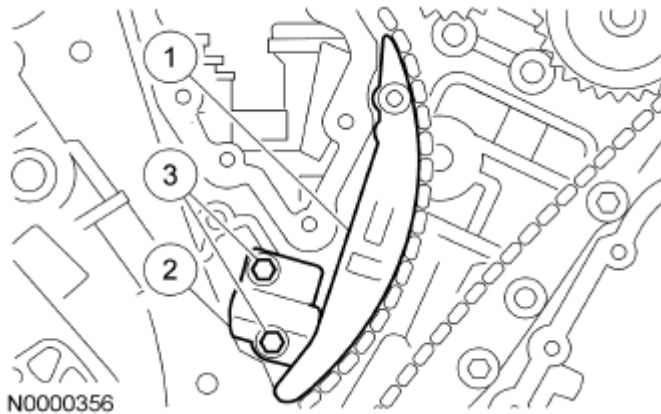


Fig. 51: Identifying LH Timing Chain Tensioner Arm & Bolts
Courtesy of FORD MOTOR CO.

9. Install the crankshaft pulley bolt and rotate the crankshaft clockwise 120 degrees until the crankshaft keyway is in the 3 o'clock position.

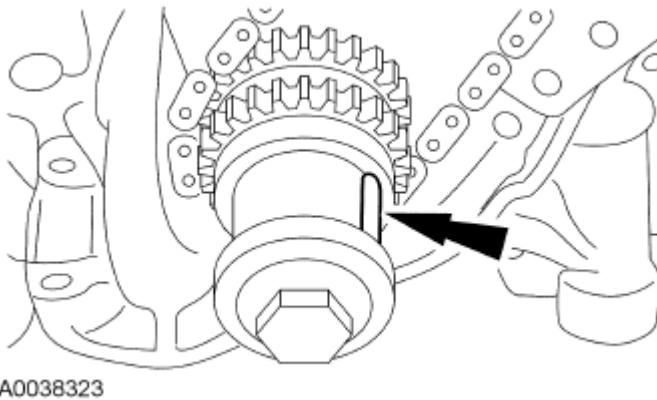


Fig. 52: Installing Crankshaft Damper Bolt
Courtesy of FORD MOTOR CO.

10. Verify that the RH camshafts are correctly positioned.

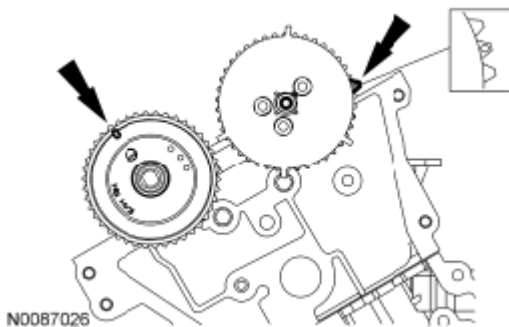


Fig. 53: Locating RH Camshafts Correctly Position
Courtesy of FORD MOTOR CO.

11. Install the RH timing chain and chain guide and install the bolts.
 - Tighten to 25 Nm (18 lb-ft).
 - Align the marks on the timing chain with the marks on the camshaft and crankshaft sprockets.

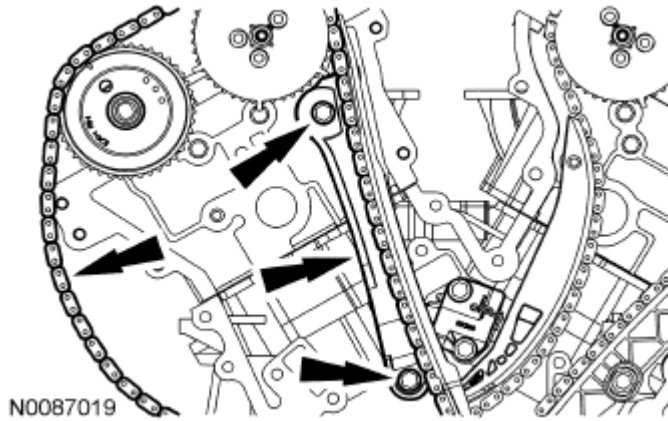


Fig. 54: Locating RH Timing Chain Guide & Bolts
Courtesy of FORD MOTOR CO.

12. Install the RH timing chain tensioner and tensioner arm.
 1. Install the tensioner arm.
 2. Position the tensioner.
 3. Install the bolts.
 - Tighten to 25 Nm (18 lb-ft).

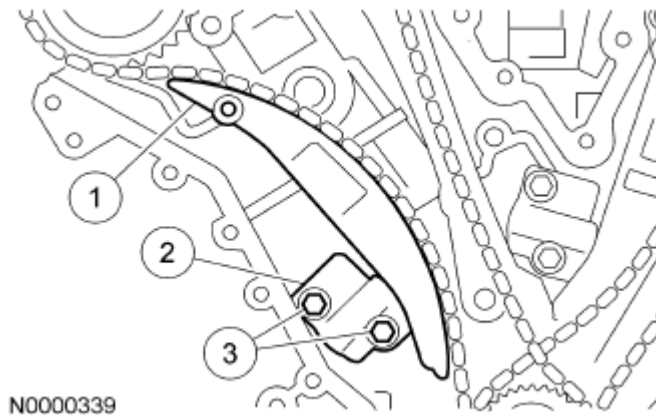
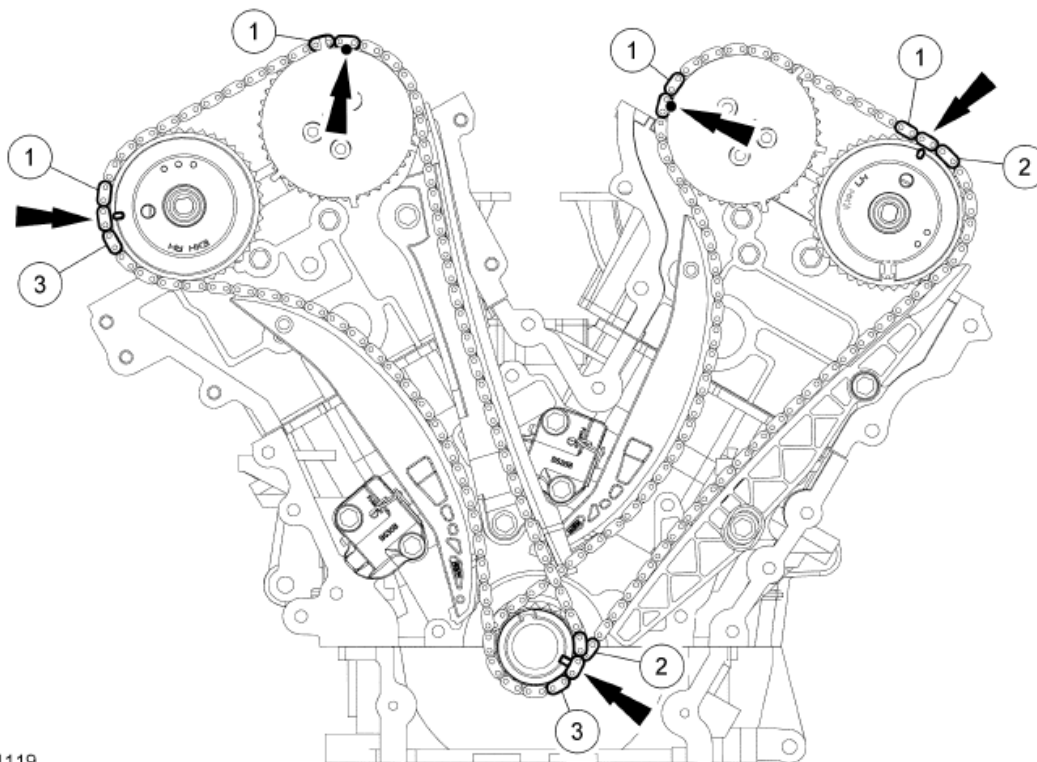


Fig. 55: Identifying RH Timing Chain Tensioner & Tensioner Arm
Courtesy of FORD MOTOR CO.

13. Remove the LH and RH timing chain tensioner piston retaining wires.
14. Rotate the crankshaft counterclockwise 120 degrees to **TDC**.
15. Verify the timing with the following steps.
 1. There should be 12 chain links between the camshaft timing marks.

2. There should be 27 chain links between the camshaft and the crankshaft timing marks.
3. There should be 30 chain links between the camshaft and the crankshaft timing marks.

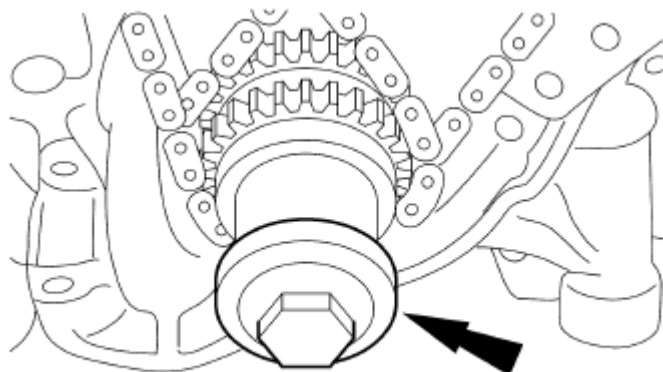
NOTE: Failure to verify correct timing drive component alignment will result in severe engine damage.



N0091119

Fig. 56: Identifying Camshaft Timing Marks Location
Courtesy of FORD MOTOR CO.

16. Remove the crankshaft pulley bolt and washer.



A0011064

Fig. 57: Identifying Crankshaft Pulley Bolt & Washer

Courtesy of FORD MOTOR CO.

17. Install the ignition pulse wheel.

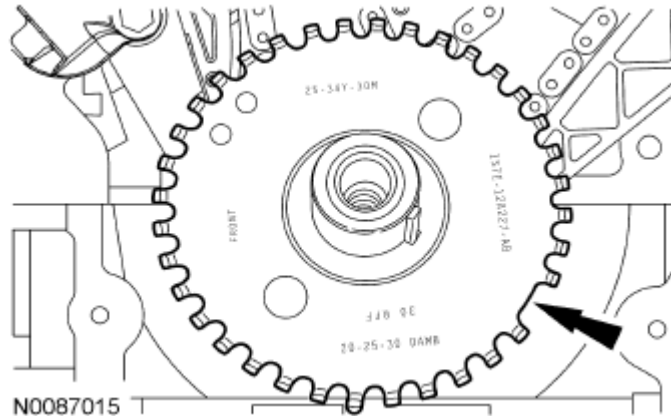


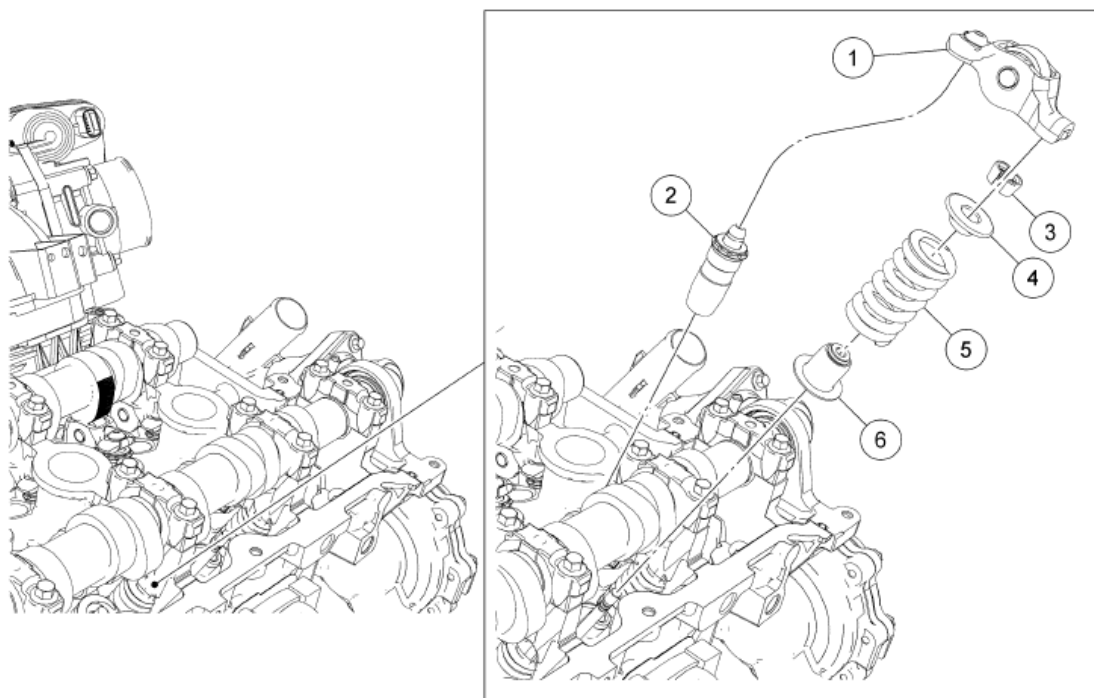
Fig. 58: Locating Ignition Pulse Wheel
Courtesy of FORD MOTOR CO.

NOTE: This pulse wheel is used in several different engines. Install the pulse wheel with the keyway in the slot stamped "30RFF" only (orange in color).

18. Install the LH and RH spark plugs. For additional information, refer to **REMOVAL AND INSTALLATION**.
19. Install the engine front cover. For additional information, refer to **Installation**.

VALVE TRAIN COMPONENTS - EXPLODED VIEW

LH Side Roller Follower, Hydraulic Lash Adjuster and Valve Spring



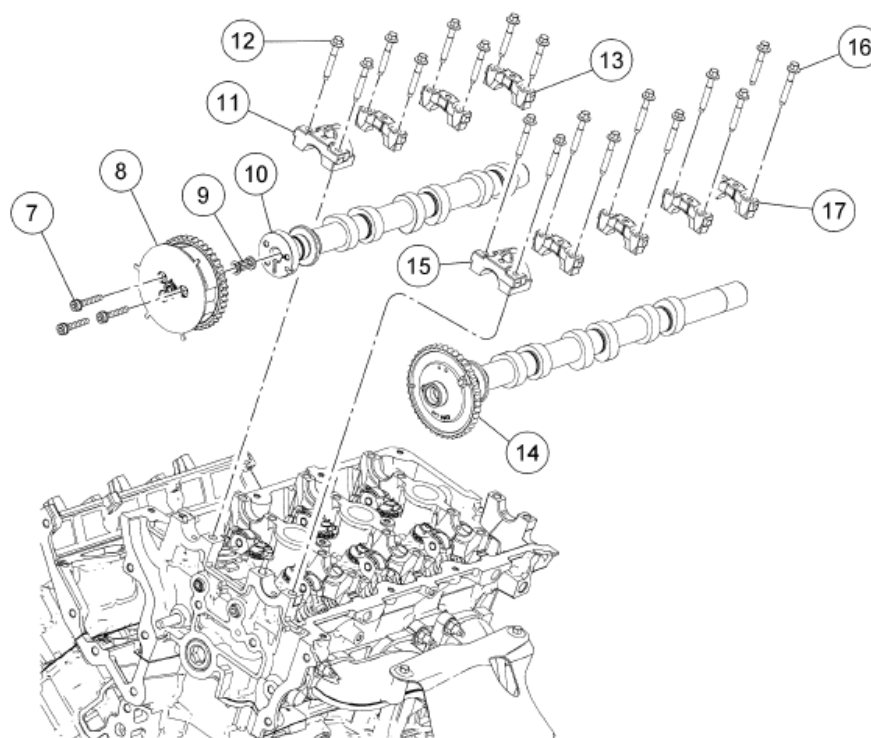
N0074230

Fig. 59: Exploded View Of LH Side Roller Follower, Hydraulic Lash Adjuster & Valve Spring
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

Item	Part Number	Description
1	6529	Roller follower (12 required)
2	6C501	Hydraulic lash adjuster (12 required)
3	6518	Valve spring retainer key (24 required)
4	6514	Valve spring retainer (12 required)
5	6513	Valve spring (12 required)
6	6A517	Valve stem seal (12 required)

LH Side Intake and Exhaust Camshafts



N0087124

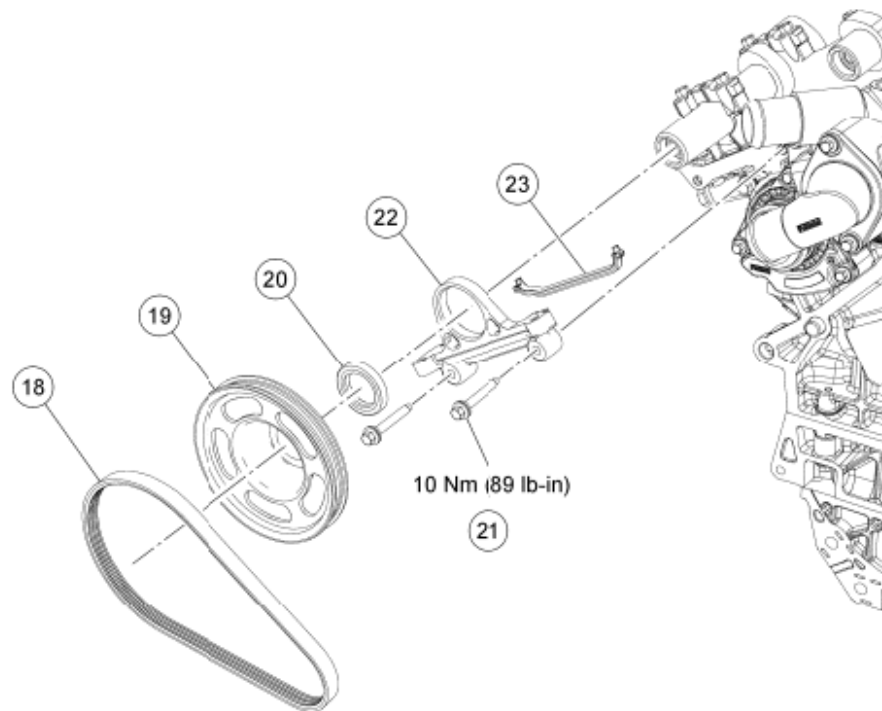
Fig. 60: Exploded View Of LH Side Intake & Exhaust Camshafts

Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

Item	Part Number	Description
7	W713106	Camshaft phaser and sprocket bolt (3 required)
8	6C524	Camshaft phaser and sprocket
9	6C683	Variable Camshaft Timing (VCT) system oil filter
10	6250	LH intake camshaft
11	6B280	Intake camshaft thrust bearing cap
12	W710702	Intake camshaft bearing cap bolt (8 required)
13	6B280	Intake camshaft bearing cap (3 required)
14	6250	LH exhaust camshaft
15	6B280	Exhaust camshaft thrust bearing cap
16	W710702	Exhaust camshaft bearing cap bolt (10 required)
17	6B280	Exhaust camshaft bearing cap (4 required)

Coolant Pump Belt and Pulley



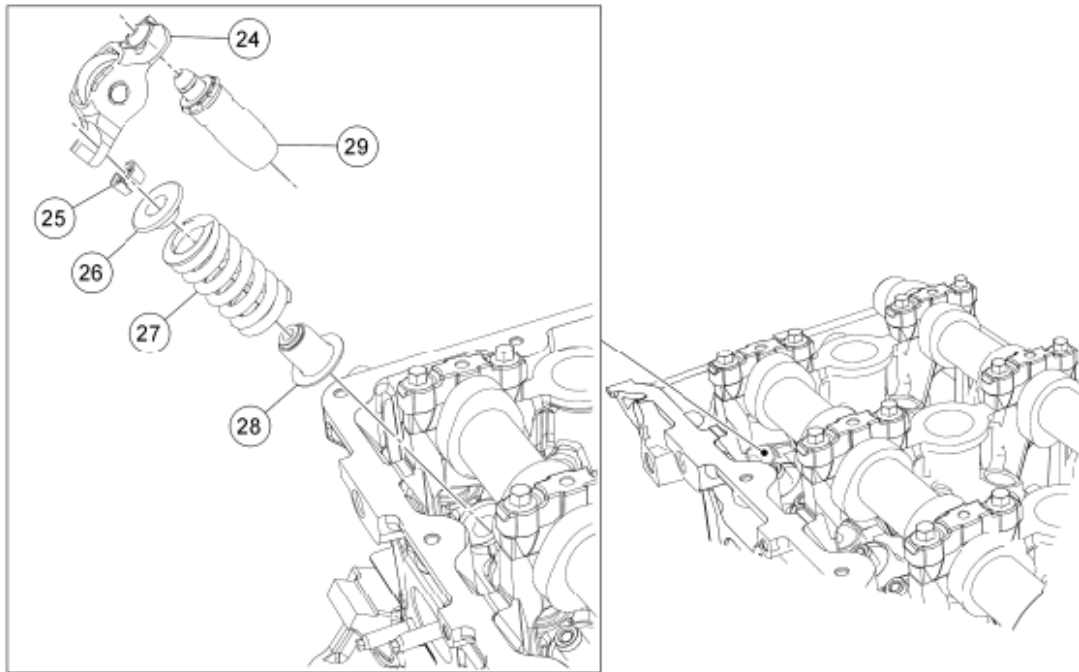
N0087127

Fig. 61: Exploded View Of Coolant Pump Belt & Pulley With Torque Specifications
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

Item	Part Number	Description
18	8K543	Coolant pump drive belt
19	6A359	Coolant pump drive pulley
20	-	Camshaft oil seal
21	W701242	Camshaft oil seal retainer bolt (2 required)
22	6B293	Camshaft oil seal retainer
23	6B295	Camshaft oil seal retainer gasket

RH Side Roller Follower, Hydraulic Lash Adjuster and Valve Spring



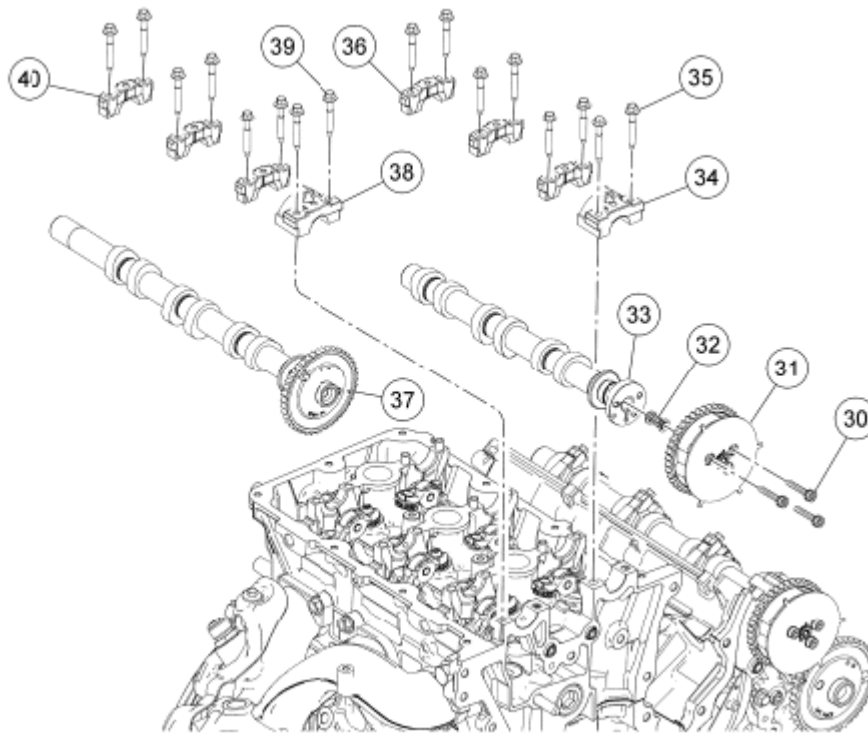
N0087125

Fig. 62: Exploded View Of RH Side Roller Follower, Hydraulic Lash Adjuster & Valve Spring
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

Item	Part Number	Description
24	6529	Roller follower (12 required)
25	6518	Valve spring retainer key (24 required)
26	6514	Valve spring retainer (12 required)
27	6513	Valve spring (12 required)
28	6A517	Valve stem seal (12 required)
29	6C501	Hydraulic lash adjuster (12 required)

RH Side Intake and Exhaust Camshaft



N0087126

Fig. 63: Exploded View Of RH Side Intake & Exhaust Camshaft
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

Item	Part Number	Description
30	W713106	Camshaft phaser and sprocket bolt (3 required)
31	6C524	Camshaft phaser and sprocket
32	6C683	VCT system oil filter
33	6250	LH intake camshaft
34	6B280	Intake camshaft thrust bearing cap
35	W710702	Intake camshaft bearing cap bolt (8 required)
36	6B280	Intake camshaft bearing cap (3 required)
37	6250	LH exhaust camshaft
38	6B280	Exhaust camshaft thrust bearing cap
39	W710702	Exhaust camshaft bearing cap bolt (10 required)
40	6B280	Exhaust camshaft bearing cap (3 required)

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

CAMSHAFT PHASER AND SPROCKET

Removal and Installation

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

LIFTING .

2. Remove the timing drive components. For additional information, refer to **Removal**.
3. Remove the 3 bolts and the LH camshaft phaser and sprocket.
 - Tighten to 18 Nm (159 lb-in).

NOTE: Do not allow the camshaft to rotate from the neutral position while removing the camshaft phaser and sprocket or damage to the engine may occur.

NOTE: Install a 3/8-in ratchet and extension into the D-slot on the rear of the LH intake camshaft to hold the camshaft in place for removal of the camshaft phaser and sprocket bolts.

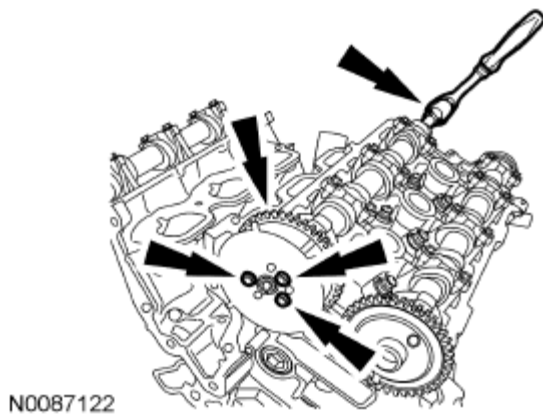


Fig. 64: Removing LH Camshaft Phaser & Sprocket Bolts
Courtesy of FORD MOTOR CO.

4. Remove the 3 bolts and the RH camshaft phaser and sprocket.
 - Tighten to 18 Nm (159 lb-in).

NOTE: Do not allow the camshaft to rotate from the neutral position while removing the camshaft phaser and sprocket or damage to the engine may occur.

NOTE: Install a 3/8-in ratchet and extension into the D-slot on the rear of the RH intake camshaft to hold the camshaft in place for removal of the camshaft phaser and sprocket bolts.

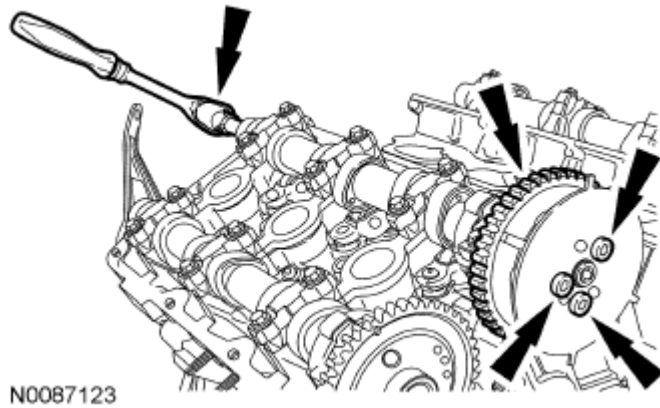


Fig. 65: Locating RH Camshaft Phaser & Sprocket Bolts
Courtesy of FORD MOTOR CO.

5. To install, reverse the removal procedure.

VARIABLE CAMSHAFT TIMING (VCT) SYSTEM OIL FILTER

Removal

1. Remove the camshaft phaser and sprocket. For additional information, refer to **Removal and Installation**.
2. Remove and discard the VCT system oil filter from the camshaft.

NOTE: RH Variable Camshaft Timing (VCT) system oil filter shown, LH similar.

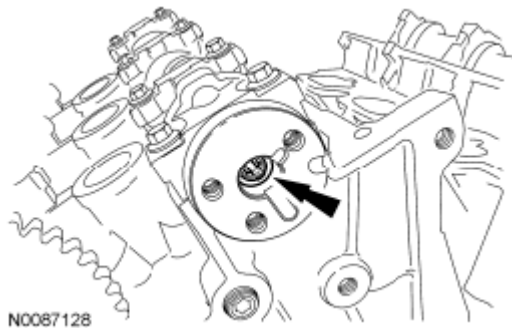


Fig. 66: Locating RH Variable Camshaft Timing (VCT) System Oil Filter
Courtesy of FORD MOTOR CO.

Installation

1. Install the new VCT system oil filter in the camshaft.

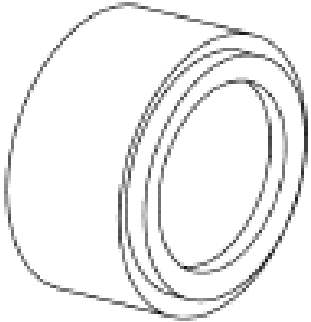
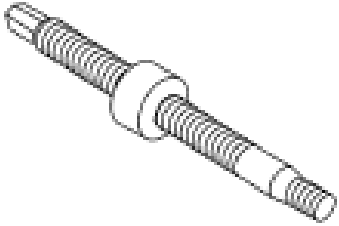
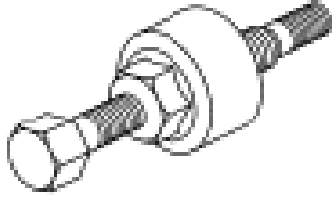
NOTE: RH VCT system oil filter shown, LH similar.

2. Install the camshaft phaser and sprocket. For additional information, refer to **Removal and Installation**.

CAMSHAFTS - LH

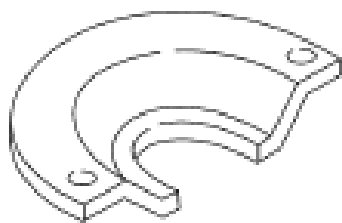
Special Tool(s)

SPECIAL TOOLS TABLE

 ST1970-A	Installer, Camshaft Oil Seal 303-464 (T94P-6256-BH)
 ST3042-A	Installer, Camshaft Pulley 303-458 (T94P-6312-AH3), part of 303-S455
 ST1586-A	Installer, Power Steering Pump Pulley 211-185 (T91P-3A733-A)
	Plate, Water Pump Pulley 303-456 (T94P-6312-AH1), part of 303-S455

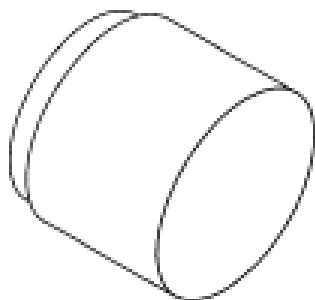
2010 Mercury Milan

2010 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan



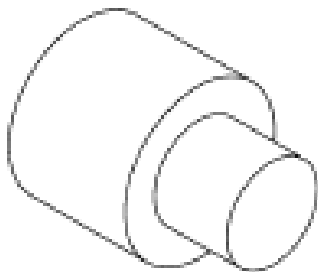
ST3044-A

Protector, Camshaft Oil Seal 303-463 (T94P-6256-AH)



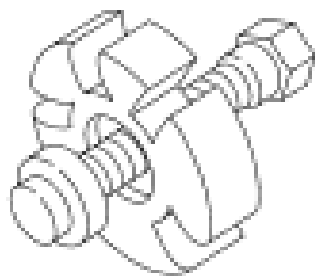
ST2060-A

Protector, Water Pump Shaft 303-457 (T94P-6312-AH2), part of 303-S455



ST3045-A

Remover, Crankshaft Vibration Damper 303-009 (T58P-6316-D)

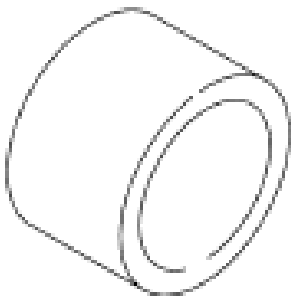


ST1286-A

Remover, Oil Seal 303-409 (T92C-6700-CH)

2010 Mercury Milan

2010 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan

 ST1385-A	
 ST3043-A	Spacer, Water Pump Pulley 303-459 (T94P-6312-AH4), part of 303-S455

Material

MATERIAL SPECIFICATIONS TABLE

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 coolant pump belt. For additional information, refer to **REMOVAL**.
2. Remove the timing drive components. For additional information, refer to **Removal**.
3. Using the Water Pump Pulley Plate, Water Pump Shaft Protector and the Crankshaft Vibration Damper Remover, remove the coolant pump pulley.

NOTE: Failure to use the correct special tools, assembled as shown below, will result in damage to the coolant pump pulley and/or special tools.

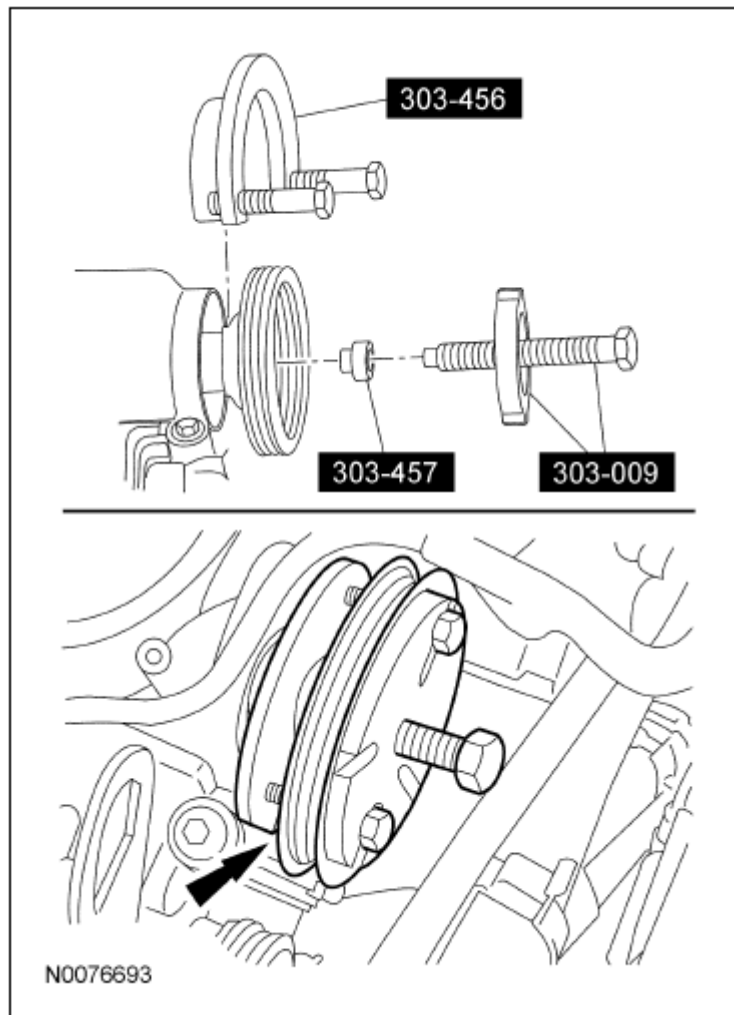


Fig. 67: Removing Coolant Pump Pulley
Courtesy of FORD MOTOR CO.

4. Using the Oil Seal Remover, remove and discard the camshaft oil seal.

NOTE: Do not scratch the camshaft sealing surface while removing the camshaft oil seal. If scratched, camshaft oil seal leakage may occur.

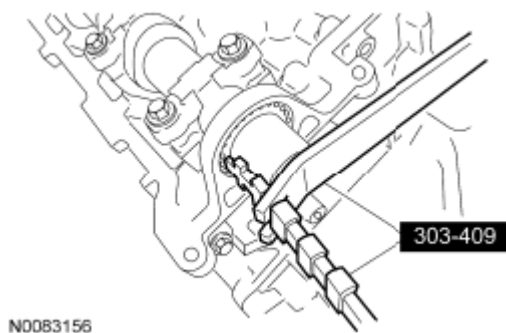


Fig. 68: Removing Camshaft Oil Seal
Courtesy of FORD MOTOR CO.

5. Remove the 2 bolts and the camshaft oil seal retainer.
 - Discard the press-in-place gasket.

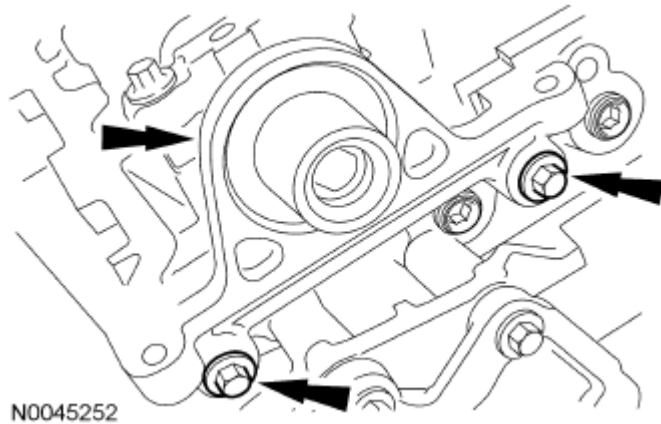


Fig. 69: Locating Camshaft Oil Seal Retainer
Courtesy of FORD MOTOR CO.

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

NOTE: The camshafts must be in the neutral position before removing the bearing caps or damage to the engine may occur.

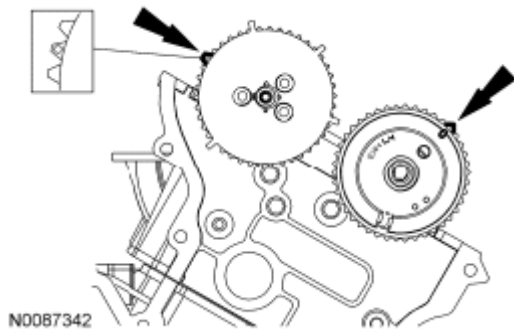


Fig. 70: Locating LH Camshafts In Neutral Position
Courtesy of FORD MOTOR CO.

7. Remove the 3 bolts and the LH camshaft phaser and sprocket.

NOTE: Do not allow the camshaft to rotate from the neutral position while removing the camshaft phaser and sprocket or damage to the engine may occur.

NOTE: Install a 3/8-in ratchet and extension into the D-slot on the rear of the intake camshaft to hold the camshaft in place for removal of the camshaft phaser and sprocket bolts.

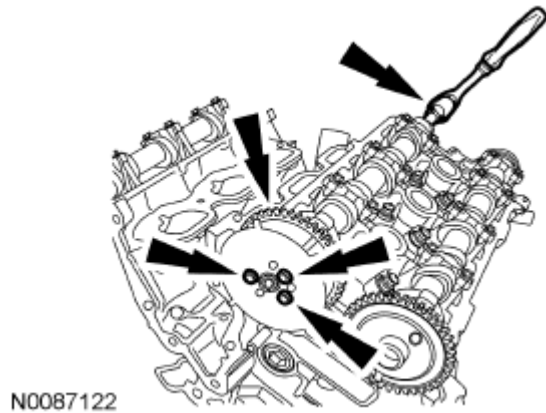
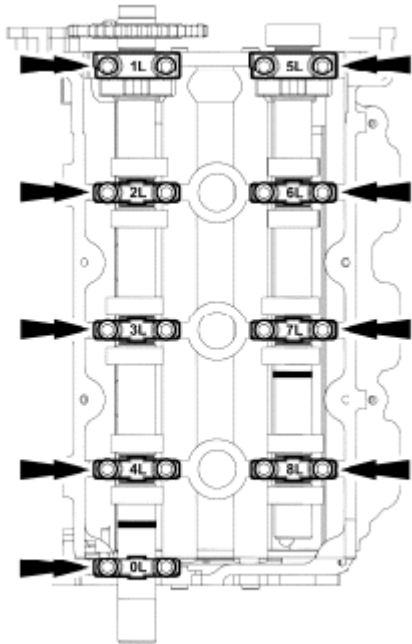


Fig. 71: Removing LH Camshaft Phaser & Sprocket Bolts
Courtesy of FORD MOTOR CO.

8. If necessary, mark the camshaft bearing cap position and orientation as shown below.

NOTE: Cylinder head camshaft bearing caps must be assembled in their original positions. Some engines have factory markings on the camshaft bearing caps (as shown below). Engines that do not have the factory markings must be marked for correct position and orientation prior to removal. Failure to install the camshaft bearing caps in their original positions may result in severe engine damage.



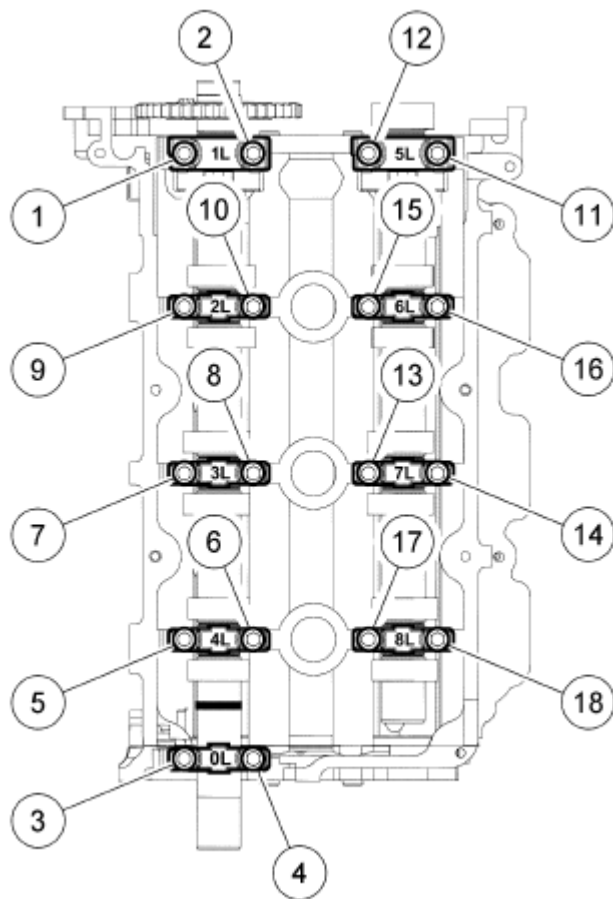
N0081817

Fig. 72: Locating Mark Camshaft Bearing Cap Position
Courtesy of FORD MOTOR CO.

9. Loosen the bolts evenly in the sequence shown below.
 1. Remove the camshaft bearing thrust caps (1L and 5L).
 2. Remove the remaining camshaft bearing caps.
 3. Remove the camshafts from the cylinder head.

NOTE: After loosening all of the camshaft bearing cap bolts, remove the camshaft bearing thrust caps (1L and 5L) first, or damage to the thrust caps may occur.

NOTE: Make sure the camshaft bearing caps are marked as instructed in the previous step.



N0081818

Fig. 73: Identifying Camshaft Bearing Cap Bolts In Tightening Sequence
Courtesy of FORD MOTOR CO.

Installation

1. Position the camshaft phaser and sprocket onto the intake camshaft.
 - Install the 3 bolts finger-tight.
2. Lubricate the LH camshafts with clean engine oil and carefully position the camshafts onto the cylinder head.
 - Align the LH camshafts as shown.

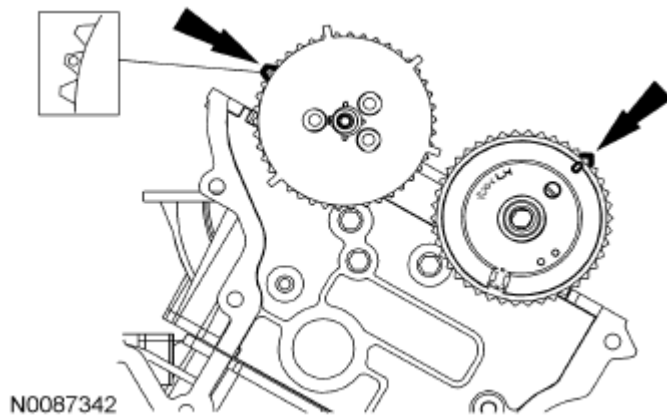


Fig. 74: Identifying Timing Mark On LH Camshafts
Courtesy of FORD MOTOR CO.

3. Lubricate the bearing surfaces of the LH camshaft bearing caps with clean engine oil and install the bearing caps.
 - Loosely install the bolts.

NOTE: Cylinder head camshaft journal caps and cylinder heads are numbered to verify that they are assembled in their original positions. If not reassembled in their original positions, severe engine damage may occur.

NOTE: Do not install the camshaft journal thrust caps until all of the camshaft bearing caps have been installed or damage to the thrust caps can occur.

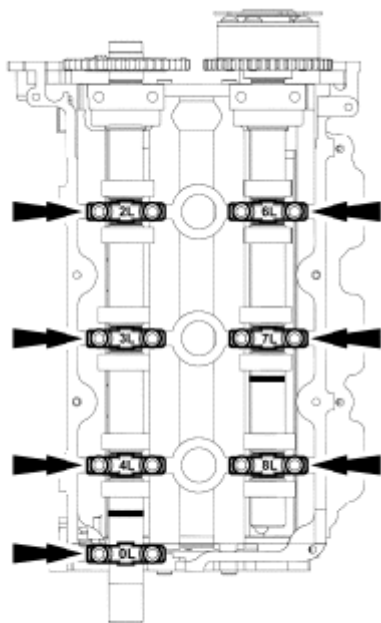
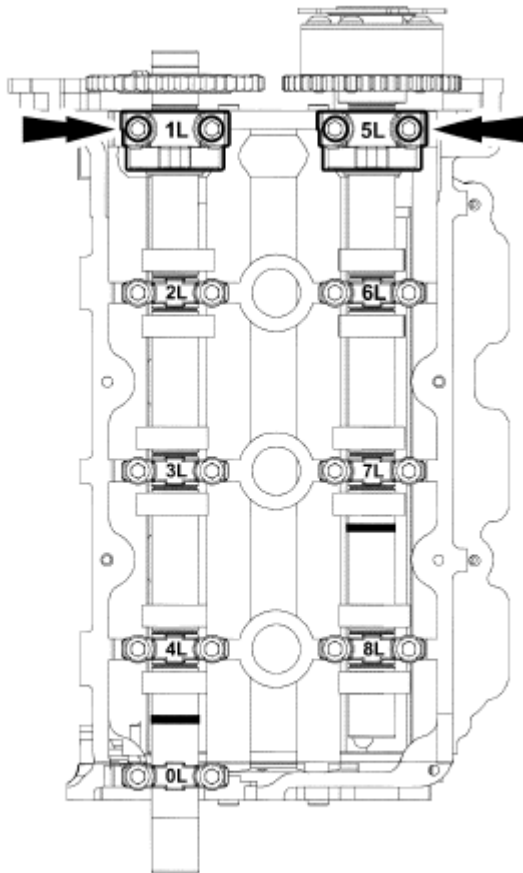


Fig. 75: Identifying LH Camshaft Bearing Caps & Bolts
Courtesy of FORD MOTOR CO.

4. Lubricate the bearing surfaces of the LH camshaft bearing thrust caps with clean engine oil and install the bearing thrust caps.
 - Loosely install the bolts.



N0081820

Fig. 76: Locating Bearing Thrust Caps
Courtesy of FORD MOTOR CO.

5. Tighten the LH camshaft bearing cap bolts in the sequence shown in 2 stages.
 - Stage 1: Tighten to 10 Nm (89 lb-in).
 - Stage 2: Individually loosen and then tighten each camshaft bearing cap to 10 Nm (89 lb-in).

NOTE: **Make sure to tighten the camshaft bearing cap bolts in sequence in 2 stages.**

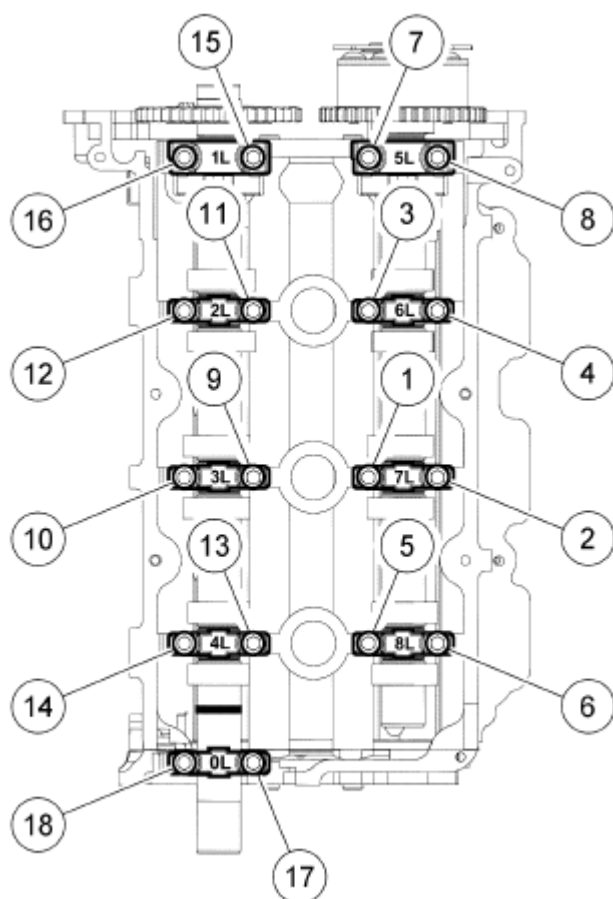


Fig. 77: Identifying Camshaft Bearing Cap Bolt Tightening Sequence
Courtesy of FORD MOTOR CO.

- NOTE:** Do not allow the camshaft to rotate from the neutral position while tightening the camshaft phaser and sprocket bolts or damage to the engine may occur.

- NOTE:** Install a 3/8-in ratchet and extension into the D-slot on the rear of the intake camshaft to hold the camshaft in place for tightening of the camshaft phaser and sprocket bolts.

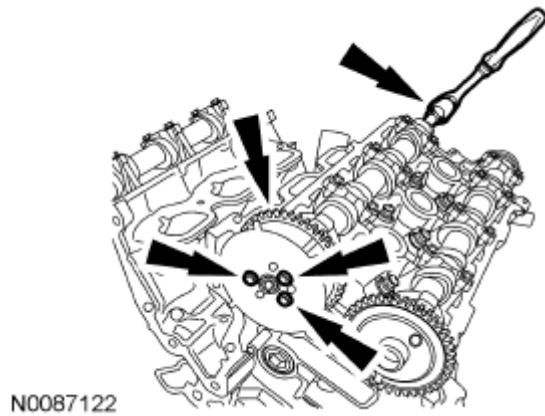


Fig. 78: Removing LH Camshaft Phaser & Sprocket Bolts
Courtesy of FORD MOTOR CO.

7. Install the camshaft oil seal retainer and the 2 bolts.
 - Tighten to 10 Nm (89 lb-in).

NOTE: Clean the sealing surfaces with metal surface prep before installing a new press-in-place gasket.

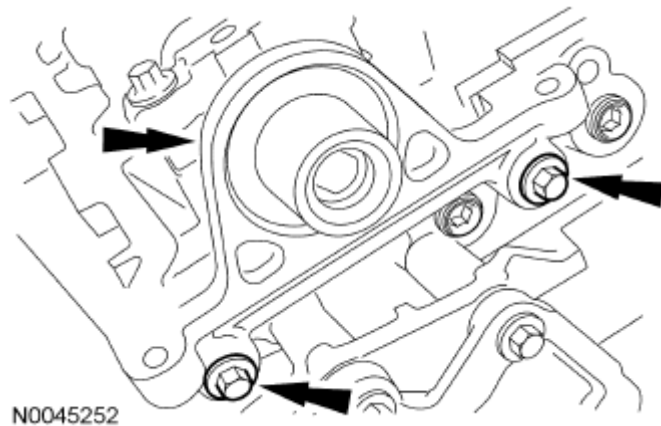


Fig. 79: Locating Camshaft Oil Seal Retainer
Courtesy of FORD MOTOR CO.

8. Using the Camshaft Oil Seal Installer, Camshaft Oil Seal Protector and the Power Steering Pump Pulley Installer, install the camshaft oil seal.

NOTE: Lubricate the camshaft oil seal with clean engine oil.

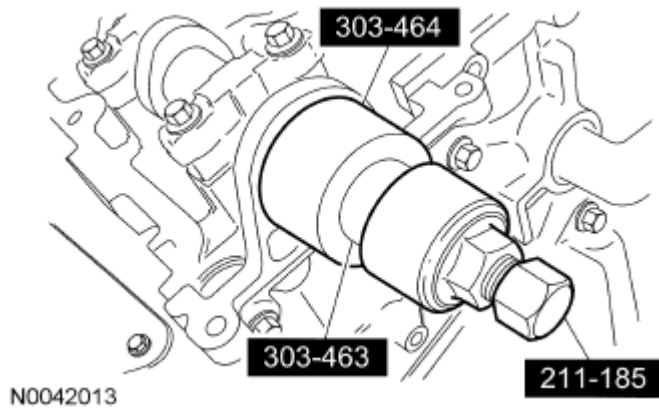


Fig. 80: Installing Camshaft Oil Seal
Courtesy of FORD MOTOR CO.

9. Install the Camshaft Pulley Installer in the camshaft as shown below.
 - Adjust the collar on the Camshaft Pulley Installer screw to get the best thread engagement in the rear of the camshaft.

NOTE: Failure to use the correct special tools, assembled as shown below, will result in damage to the coolant pump pulley and/or special tools.

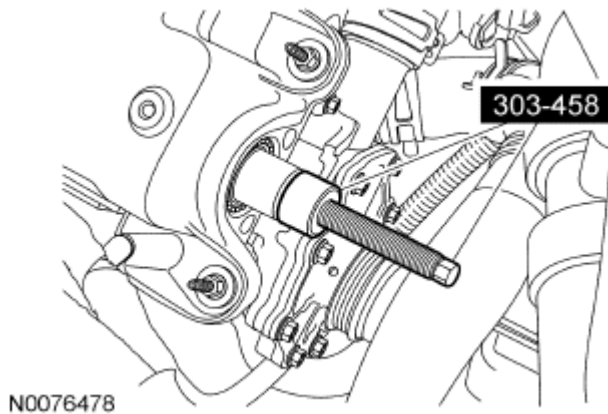


Fig. 81: Identifying Camshaft Pulley Installer Screw
Courtesy of FORD MOTOR CO.

10. Position the coolant pump pulley over the previously installed Camshaft Pulley Installer and on the end of the camshaft. Install the Camshaft Pulley Installer, Power Steering Pump Pulley Installer and the Water Pump Pulley Spacer as shown below.
 - Using the Camshaft Pulley Installer, Power Steering Pump Pulley Installer and the Water Pump Pulley Spacer, install a new service coolant pump pulley flush with the end of the camshaft.

NOTE: Failure to use the correct special tools, assembled as shown below, will result in damage to the coolant pump pulley and/or special tools.

NOTE: Only the roller collared nut from the Power Steering Pump Pulley Installer (211-185) is used on Camshaft Pulley Installer (303-458).

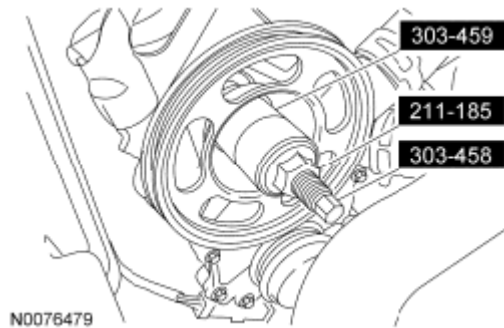


Fig. 82: Exploded View Of Service Coolant Pump Pulley Flush With End Of Camshaft
Courtesy of FORD MOTOR CO.

11. Install the timing drive components. For additional information, refer to **Installation**.
12. Install the coolant pump belt. For additional information, refer to **INSTALLATION**.

CAMSHAFTS - RH

Material

MATERIAL SPECIFICATIONS TABLE

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 timing drive components. For additional information, refer to **Removal**.
2. Verify the RH camshafts are in the neutral position.

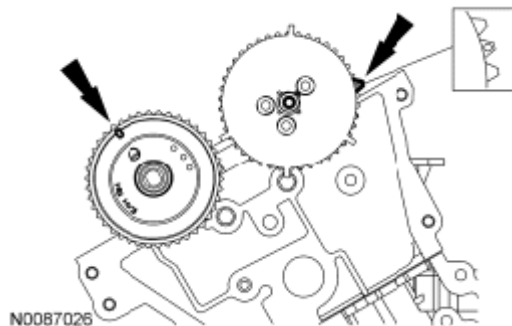


Fig. 83: Locating RH Camshafts In Neutral Position
Courtesy of FORD MOTOR CO.

NOTE: The camshafts must be in the neutral position before removing the bearing caps or damage to the engine may occur.

3. Remove the 3 bolts and the RH camshaft phaser and sprocket.

NOTE: Do not allow the camshaft to rotate from the neutral position while removing the camshaft phaser and sprocket or damage to the engine may occur.

NOTE: Install a 3/8-in ratchet and extension into the D-slot on the rear of the intake camshaft to hold the camshaft in place for removal of the camshaft phaser and sprocket bolts.

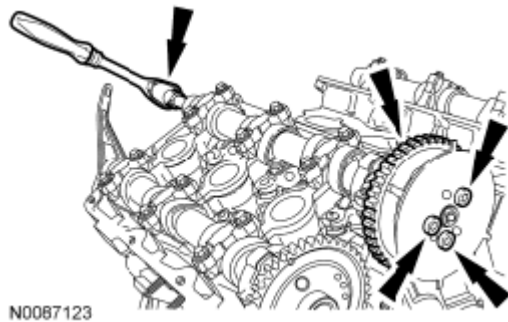
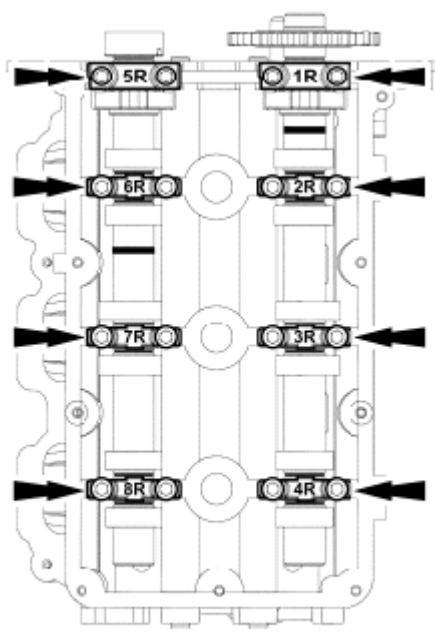


Fig. 84: Identifying RH Camshaft Phaser & Sprocket With Bolts
Courtesy of FORD MOTOR CO.

4. If necessary, mark the camshaft bearing cap position and orientation as shown below.

NOTE: Cylinder head camshaft bearing caps must be assembled in their original positions. Some engines have factory markings on the camshaft bearing caps (as shown below). Engines that do not have the factory markings must be marked for correct position and orientation prior to removal. Failure to install the camshaft bearing caps in their original positions may result in severe engine damage.



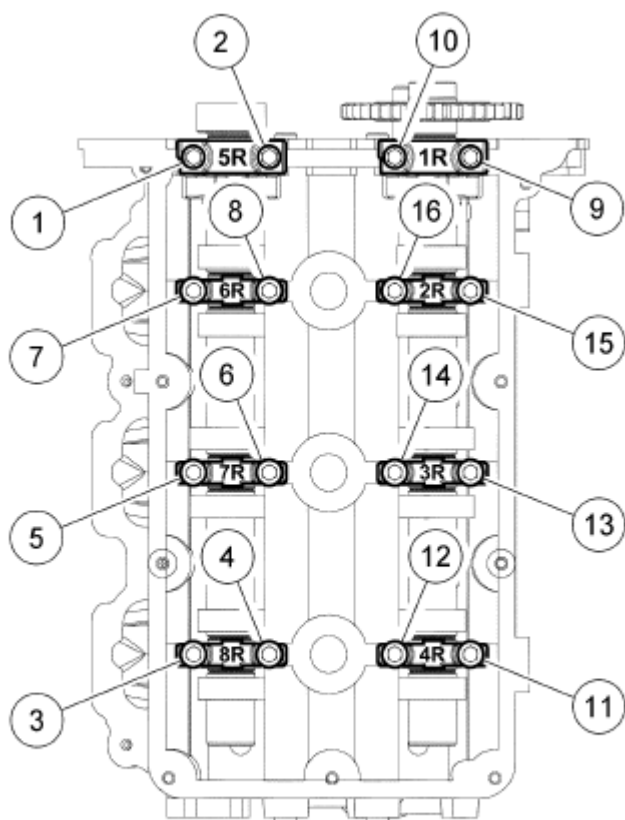
N0071867

Fig. 85: Locating Camshaft Bearing Caps & Bolts
Courtesy of FORD MOTOR CO.

5. Loosen the bolts evenly in the sequence shown below.
 1. Remove the camshaft bearing thrust caps (5R and 1R).
 2. Remove the remaining camshaft bearing caps.
 3. Remove the camshafts from the cylinder head.

NOTE: After loosening all of the camshaft bearing cap bolts, remove the camshaft bearing thrust caps (5R and 1R) first, or damage to the thrust caps may occur.

NOTE: Make sure the camshaft bearing caps are marked as instructed in the previous step.



N0053678

Fig. 86: Identifying Camshaft Bearing Caps Bolts In Tightening Sequence
Courtesy of FORD MOTOR CO.

Installation

1. Position the RH camshaft phaser and sprocket onto the intake camshaft.
 - Install the 3 bolts finger-tight.
2. Lubricate the RH camshafts with clean engine oil and carefully position the camshafts onto the cylinder head.
 - Align the RH camshafts as shown.

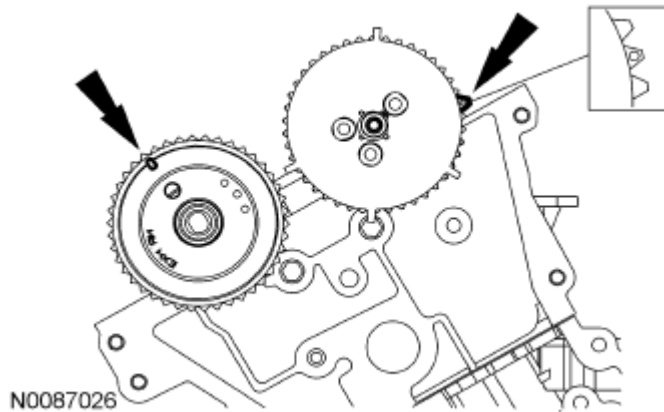
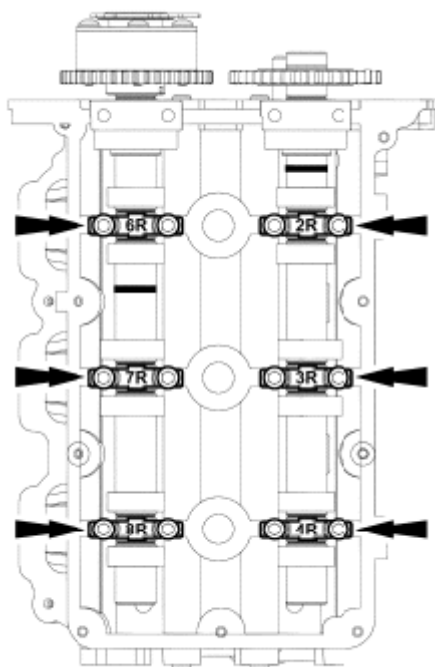


Fig. 87: Compressing Timing Chain Tensioner With Vise
Courtesy of FORD MOTOR CO.

3. Install the camshaft bearing caps.
 - Loosely install the bolts.

- NOTE:** Cylinder head camshaft journal caps and cylinder heads are numbered to verify that they are assembled in their original positions. If not reassembled in their original positions, severe engine damage may occur.
- NOTE:** Do not install the camshaft journal thrust caps until all of the camshaft bearing caps have been installed or damage to the thrust caps can occur.
- NOTE:** Lubricate the bearing surfaces of the RH camshaft bearing caps with clean engine oil.

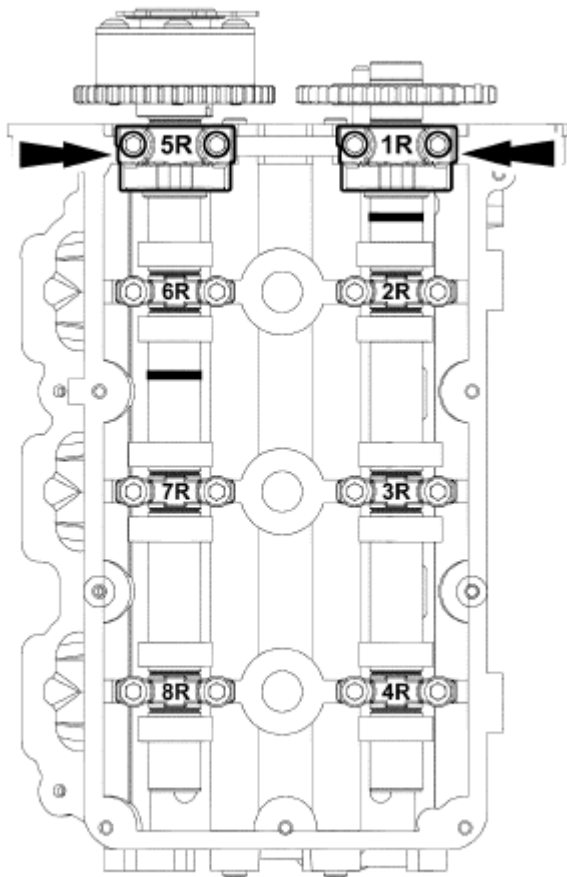


N0042369

Fig. 88: Locating Camshaft Bearing Caps & Bolts
Courtesy of FORD MOTOR CO.

4. Install the camshaft bearing thrust caps.
 - Loosely install the bolts.

NOTE: Lubricate the bearing surfaces of the RH camshaft bearing thrust caps with clean engine oil.

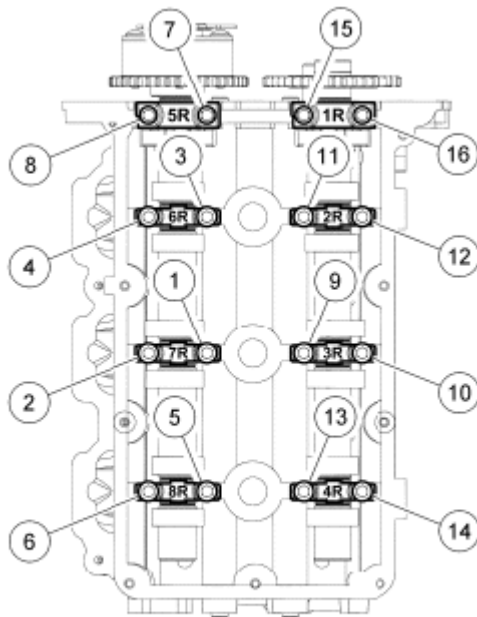


N0042453

Fig. 89: Locating Camshaft Bearing Thrust Caps
Courtesy of FORD MOTOR CO.

5. Tighten the RH camshaft bearing cap bolts in the sequence shown in 2 stages.
 - Stage 1: Tighten to 10 Nm (89 lb-in).
 - Stage 2: Individually loosen and then tighten each camshaft bearing cap to 10 Nm (89 lb-in).

NOTE: **Make sure to tighten the camshaft bearing cap bolts in sequence in 2 stages.**



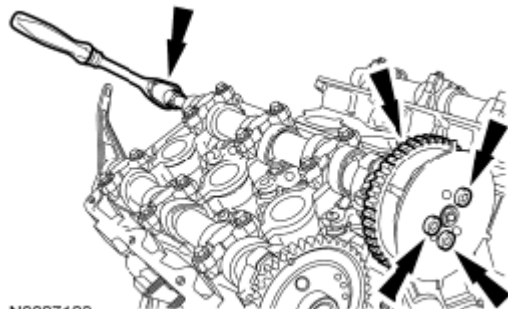
N0081822

Fig. 90: Identifying RH Camshaft Bearing Cap Bolts In Tightening Sequence
Courtesy of FORD MOTOR CO.

6. Tighten the 3 RH camshaft phaser and sprocket bolts to 18 Nm (159 lb-in).

NOTE: Do not allow the camshaft to rotate from the neutral position while tightening the camshaft phaser and sprocket bolts or damage to the engine may occur.

NOTE: Install a 3/8-in ratchet and extension into the D-slot on the rear of the intake camshaft to hold the camshaft in place for tightening of the camshaft phaser and sprocket bolts.

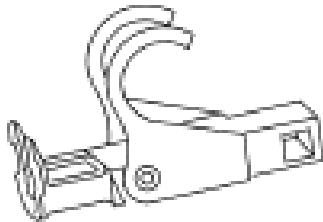


N0087123

Fig. 91: Locating RH Camshaft Phaser & Sprocket Bolts
Courtesy of FORD MOTOR CO.

7. Install the timing drive components. For additional information, refer to **Installation**.

CAMSHAFT ROLLER FOLLOWER**Special Tool(s)****SPECIAL TOOLS TABLE**

 ST1975-A	Compressor, Valve Spring 303-473 (T94P-6565-BH)
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Material**MATERIAL SPECIFICATIONS TABLE**

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

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

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the LH and RH valve covers. For additional information, refer to **Removal** (LH) and **Removal** (RH).
3. Remove the 6 spark plugs.
 - To install, tighten to 15 Nm (133 lb-in).

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

4. Remove the 4 screws and position the RH fender splash shield aside.

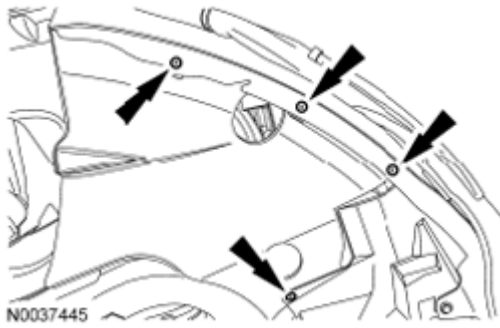


Fig. 92: Locating RH Fender Splash Shield Aside & Screws
Courtesy of FORD MOTOR CO.

5. Remove the 6 pin-type retainers (4 shown) and the RH splash shield.

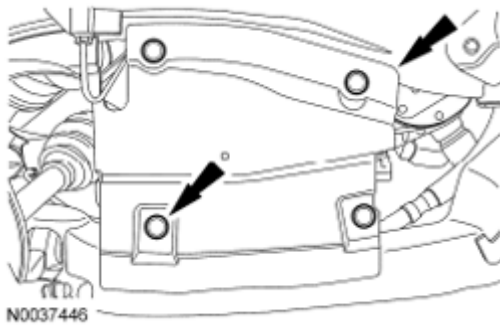


Fig. 93: Locating Pin-Type Retainers & RH Splash Shield
Courtesy of FORD MOTOR CO.

6. Rotate the crankshaft until the camshaft lobe is pointing directly away from the roller follower.
7. Using the Valve Spring Compressor, remove the roller followers.

NOTE: Mark the positions of the roller followers to make sure they are assembled in their original positions.

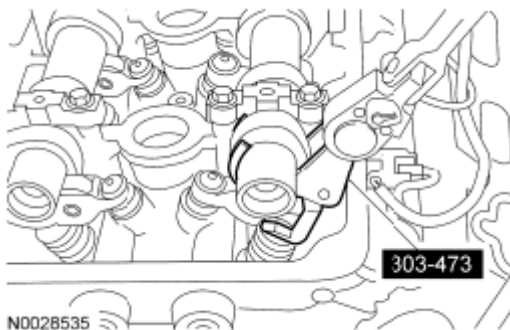


Fig. 94: Removing Roller
Courtesy of FORD MOTOR CO.

8. To install, reverse the removal procedure.

NOTE: Lubricate the roller followers with clean engine oil.

HYDRAULIC LASH ADJUSTER

Material

MATERIAL SPECIFICATIONS TABLE

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

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

1. Remove the camshaft roller followers. For additional information, refer to Removal and Installation.
2. Remove the hydraulic lash adjusters.

NOTE: Mark the positions of the hydraulic lash adjusters to make sure they are assembled in their original positions.

3. To install, reverse the removal procedure.
 - Lubricate the hydraulic lash adjusters with clean engine oil.

NOTE: Inspect the hydraulic lash adjusters for scoring marks and uneven wear in the bore. Install new lash adjusters if necessary.

VALVE SPRING, RETAINER, AND SEAL

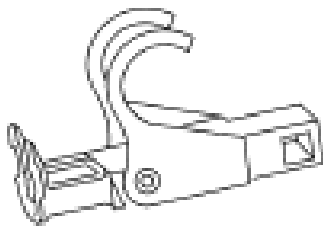
Special Tool(s)

SPECIAL TOOLS TABLE

	Compressor, Valve Spring 303-473 (T94P-6565-BH)
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2010 Mercury Milan

2010 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan

 ST1975-A	
 ST1977-A	Installer, Valve Stem Oil Seal 303-470 (T94P-6510-CH)

Material

MATERIAL SPECIFICATIONS TABLE

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

1. Remove the camshaft roller followers. For additional information, refer to **Removal and Installation**.
2. Pressurize the cylinder using compressed air.

NOTE: If the components are to be reinstalled, they must be installed in their original positions or damage to the engine may occur. Mark the components for installation into their original locations.

NOTE: If air pressure has forced the piston to the bottom of the cylinder, any loss of air pressure will allow the valve(s) to fall into the cylinder. A rubber band, tape or string wrapped around the end of the valve stem will prevent

this from happening.

NOTE: If a valve drops into the cylinder, remove the cylinder head. For additional information, refer to Removal (Cylinder Head - RH) or Removal (Cylinder Head - LH).

3. Using the Valve Spring Compressor, remove the key, retainer and the valve spring.

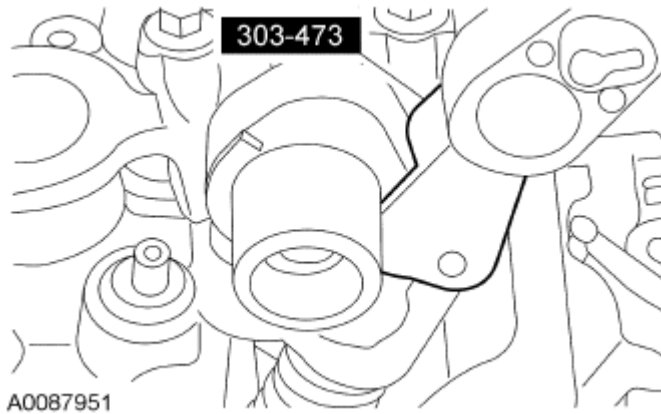


Fig. 95: Identifying Valve Spring, Retainer & Key
Courtesy of FORD MOTOR CO.

4. Remove and discard the valve seal.

NOTE: Camshaft removed for clarity.

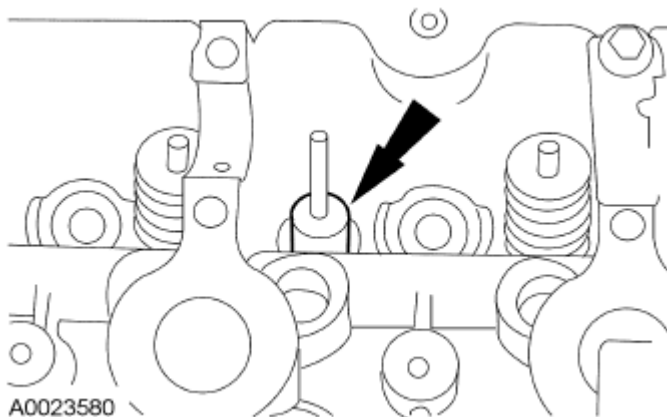


Fig. 96: Locating Valve Seal
Courtesy of FORD MOTOR CO.

Installation

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

NOTE: Lubricate the valve guide with clean engine oil.

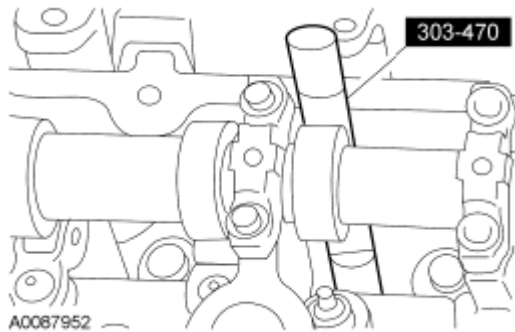


Fig. 97: Installing Valve Seal
Courtesy of FORD MOTOR CO.

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

NOTE: If the components are to be reinstalled, they must be installed in their original positions or damage to the engine may occur.



Fig. 98: Identifying Valve Spring, Retainer & Key
Courtesy of FORD MOTOR CO.

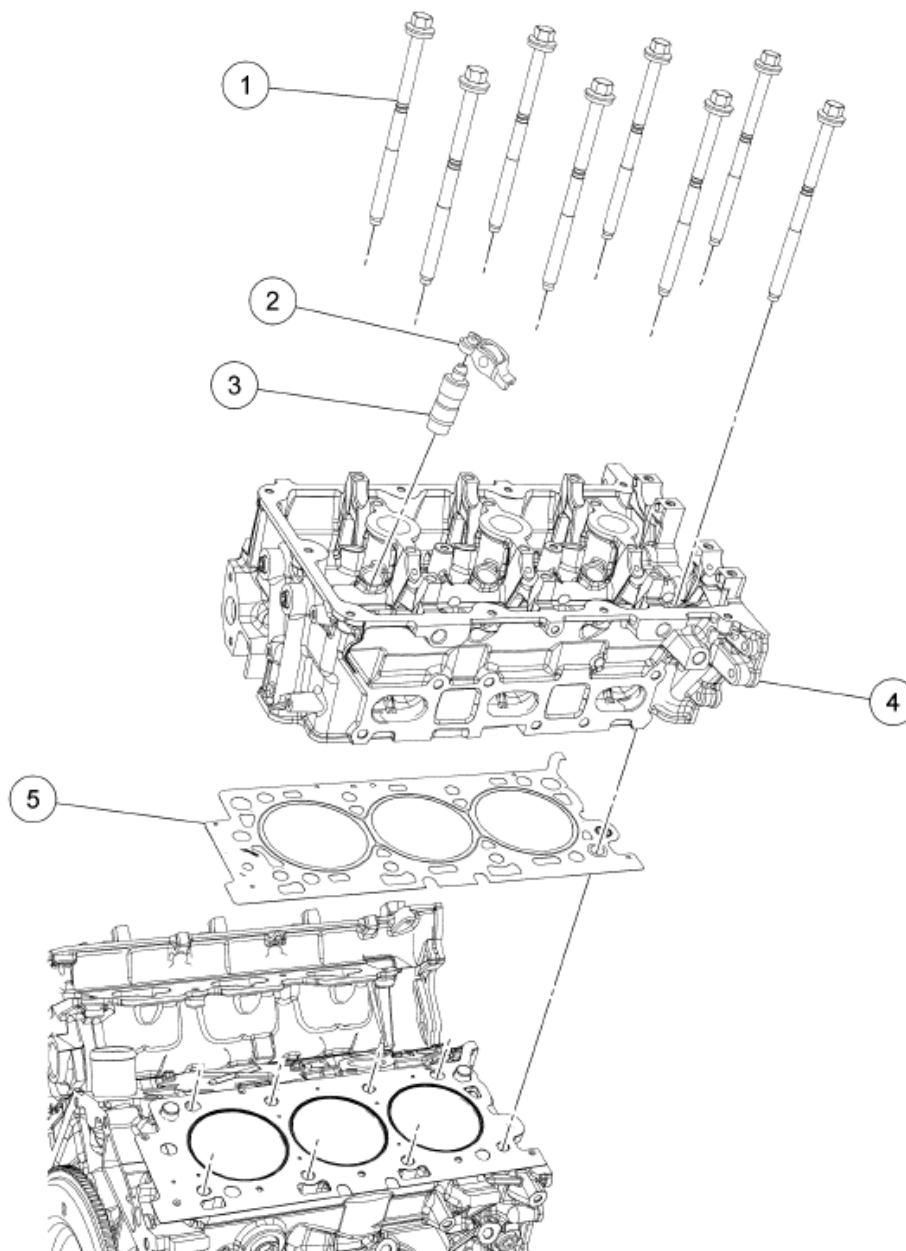
3. Install the camshaft roller followers. For additional information, refer to **Removal and Installation**.

CYLINDER HEAD - RH

Material

MATERIAL SPECIFICATIONS TABLE

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



N0087417

Fig. 99: Exploded View Of RH Cylinder Head
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

Item	Part Number	Description
1	6065	Cylinder head bolt (8 required)
2	6529	Camshaft roller follower (12 required)
3	6C501	Hydraulic lash adjuster (12 required)
4	6049	Cylinder head
5	6051	Cylinder head gasket

Removal

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

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the lower intake manifold. For additional information, refer to **Removal**.
3. Remove the coolant pump housing. For additional information, refer to **REMOVAL AND INSTALLATION**.
4. Remove the RH camshafts. For additional information, refer to **VALVE TRAIN COMPONENTS - EXPLODED VIEW** and **Removal**.
5. Remove the camshaft roller followers.

NOTE: The camshaft roller followers must be installed in their original positions. If not reassembled in their original positions, severe engine damage may occur.

6. Remove the hydraulic lash adjusters.

NOTE: The hydraulic lash adjusters must be installed in their original positions. If not reassembled in their original positions, severe engine damage may occur.

7. Remove the RH exhaust manifold. For additional information, refer to **Removal**.
8. Remove the bolts in the sequence shown.
 - Remove the cylinder head.
 - Discard the bolts and gasket.

NOTE: New cylinder head bolts must be installed. They are a torque-to-yield design and cannot be reused.

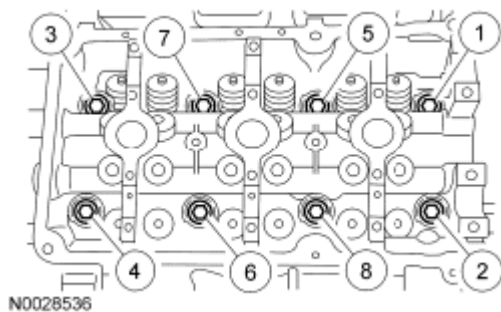


Fig. 100: Identifying Cylinder Head Bolts In Tightening Sequence

Courtesy of FORD MOTOR CO.

9. Support the cylinder head on a bench with the head gasket side up. Check the cylinder head distortion and the cylinder block distortion. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

Installation

1. Use a plastic scraping tool to remove all traces of the head 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.

- Clean all surfaces with metal surface prep.
2. Position a new gasket and the cylinder head.
 3. Install the bolts and tighten in 6 stages in the sequence shown.
 - Stage 1: Tighten to 40 Nm (30 lb-ft).
 - Stage 2: Tighten 90 degrees.
 - Stage 3: Loosen one full turn.
 - Stage 4: Tighten to 40 Nm (30 lb-ft).
 - Stage 5: Tighten 90 degrees.
 - Stage 6: Tighten 90 degrees.

NOTE: New cylinder head bolts must be installed. They are a torque-to-yield design and cannot be reused.

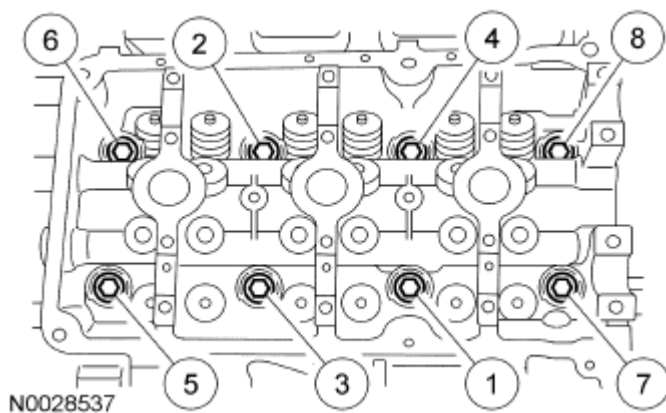


Fig. 101: Identifying Cylinder Head Bolts In Tightening Sequence
Courtesy of FORD MOTOR CO.

4. Install the RH exhaust manifold. For additional information, refer to **Installation**.
5. Install the hydraulic lash adjusters.

- Lubricate the hydraulic lash adjusters with clean engine oil.

NOTE: The hydraulic lash adjusters must be installed in their original positions. If not reassembled in their original positions, severe engine damage may occur.

6. Install the camshaft roller followers.

- Lubricate the camshaft roller followers with clean engine oil.

NOTE: The camshaft roller followers must be installed in their original positions. If not reassembled in their original positions, severe engine damage may occur.

7. Install the RH camshafts. For additional information, refer to VALVE TRAIN COMPONENTS - EXPLODED VIEW and Installation.
8. Install the coolant pump housing. For additional information, refer to REMOVAL AND INSTALLATION.
9. Install the lower intake manifold. For additional information, refer to Installation.

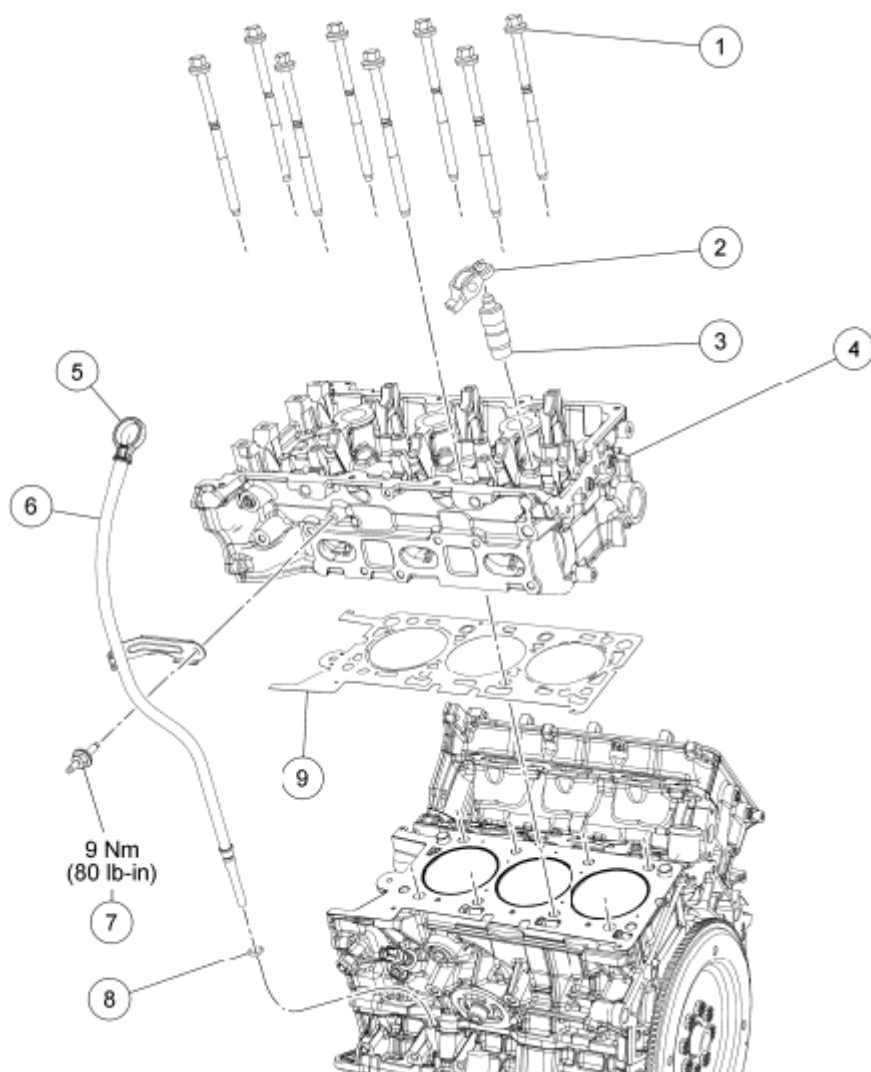
CYLINDER HEAD - LH

Material

MATERIAL SPECIFICATIONS TABLE

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

LH Cylinder Head



N0098591

Fig. 102: Exploded View Of LH Cylinder Head With Torque Specifications
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

Item	Part Number	Description
1	6065	Cylinder head bolt (8 required)
2	6529	Camshaft roller follower (12 required)
3	6C501	Hydraulic lash adjuster (12 required)
4	6050	Cylinder head
5	6750	Oil level indicator
6	6754	Oil level indicator tube
7	W701822	Oil level indicator tube stud bolt
8	110282	Oil level indicator tube O-ring
9	6083	Cylinder head gasket

Removal

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

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the lower intake manifold. For additional information, refer to **Removal**.
3. Remove the coolant pump housing. For additional information, refer to **REMOVAL AND INSTALLATION**.
4. Remove the LH camshafts. For additional information, refer to **VALVE TRAIN COMPONENTS - EXPLODED VIEW** and **Removal**.
5. Remove the camshaft roller followers.

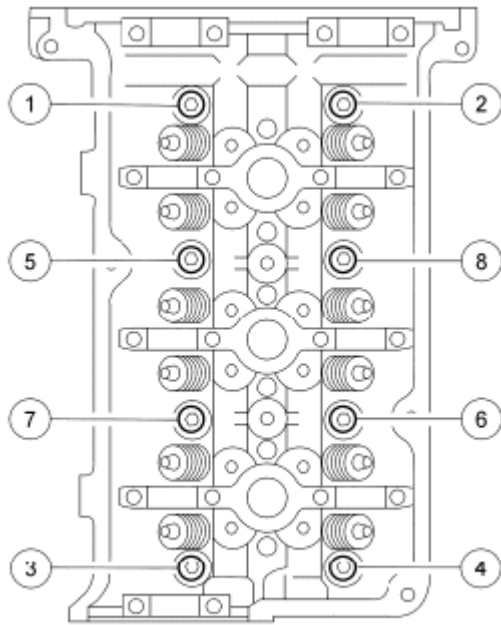
NOTE: The camshaft roller followers must be installed in their original positions. If not reassembled in their original positions, severe engine damage may occur.

6. Remove the hydraulic lash adjusters.

NOTE: The hydraulic lash adjusters must be installed in their original positions. If not reassembled in their original positions, severe engine damage may occur.

7. Remove the LH catalytic converter. For additional information, refer to **REMOVAL**.
8. Remove the oil level indicator.
9. Remove the stud bolt and then remove the oil level indicator tube.
 - Remove and discard the O-ring seal.
10. Remove the bolts in the sequence shown below.

NOTE: New cylinder head bolts must be installed. They are a torque-to-yield design and cannot be reused.



N0001536

Fig. 103: Identifying Cylinder Head Bolts In Tightening Sequence
 Courtesy of FORD MOTOR CO.

11. Support the cylinder head on a bench with the head gasket side up. Check the cylinder head distortion and the cylinder block distortion. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

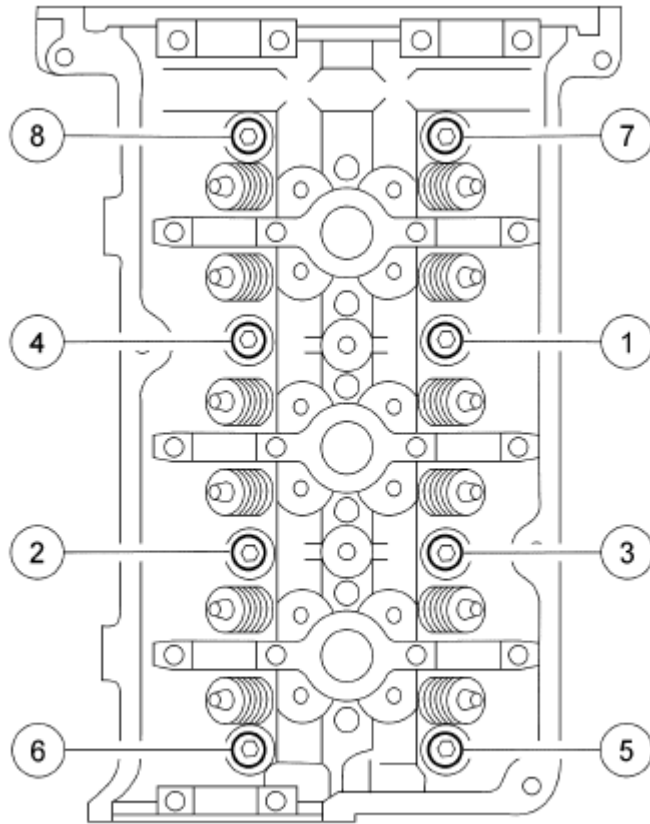
Installation

1. Use a plastic scraping tool to remove all traces of the head gasket.
 - Clean all surfaces with metal surface prep.

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.

2. Position a new gasket and the cylinder head.
3. Install the bolts and tighten in 6 stages in the sequence shown below.
 - Stage 1: Tighten to 40 Nm (30 lb-ft).
 - Stage 2: Tighten 90 degrees.
 - Stage 3: Loosen one full turn.
 - Stage 4: Tighten to 40 Nm (30 lb-ft).
 - Stage 5: Tighten 90 degrees.
 - Stage 6: Tighten 90 degrees.

NOTE: New cylinder head bolts must be installed. They are a torque-to-yield design and cannot be reused.



N0001535

Fig. 104: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

4. Install the oil level indicator tube and install the stud bolt.
 - To install, tighten to 9 Nm (80 lb-in).

NOTE: Installation of the oil level indicator may require the assistance of a second technician to align the tube with the orifice.

NOTE: Install a new O-ring seal and lubricate with clean engine oil.

5. Install the oil level indicator.
6. Install the LH catalytic converter. For additional information, refer to **INSTALLATION**.
7. Install the hydraulic lash adjusters.
 - Lubricate the hydraulic lash adjusters with clean engine oil.

NOTE: The hydraulic lash adjusters must be installed in their original positions. If not reassembled in their original positions, severe engine damage may occur.

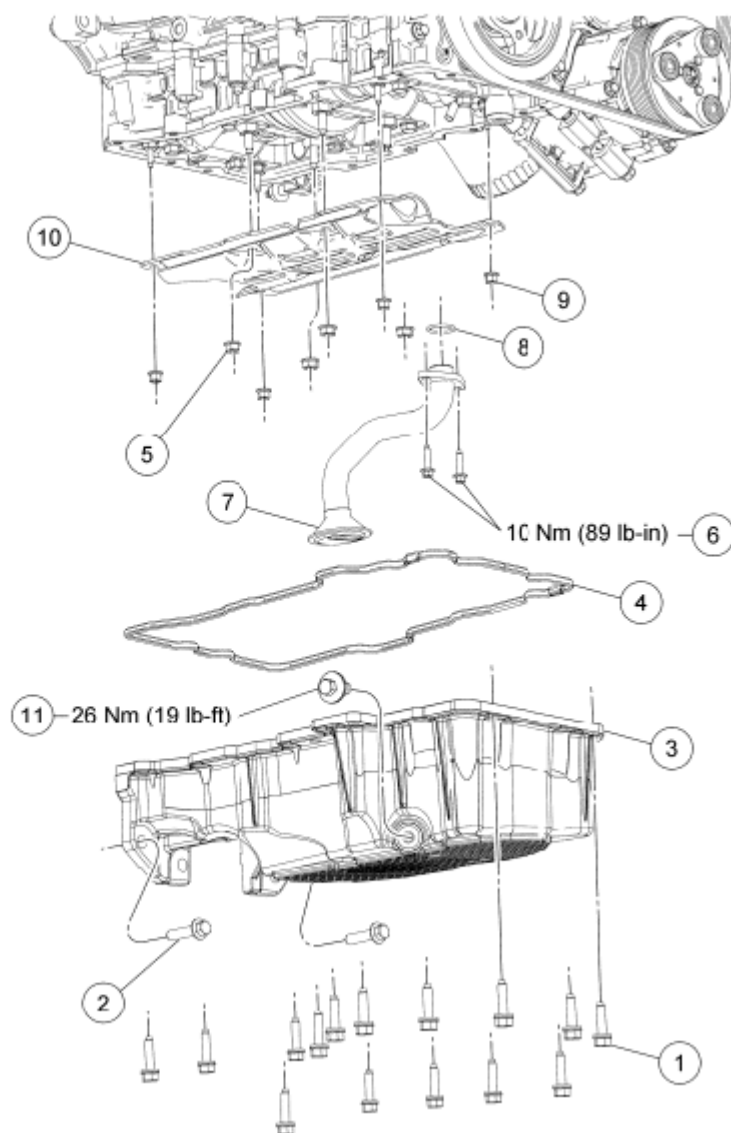
8. Install the camshaft roller followers.
 - Lubricate the camshaft roller followers with clean engine oil.

NOTE: The camshaft roller followers must be installed in their original positions. If not reassembled in their original positions, severe engine damage may occur.

9. Install the camshafts. For additional information, refer to **VALVE TRAIN COMPONENTS - EXPLODED VIEW** and **Installation**.
10. Install the coolant pump housing. For additional information, refer to **REMOVAL AND INSTALLATION**.
11. Install the lower intake manifold. For additional information, refer to **Installation**.

ENGINE LUBRICATION COMPONENTS - EXPLODED VIEW

Oil Pan, Oil Pan Baffle and Oil Pump Screen and Pickup Tube



N0087566

Fig. 105: Exploded View Of Oil Pan, Oil Pan Baffle, Oil Pump Screen & Pickup Tube With Torque Specifications

Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

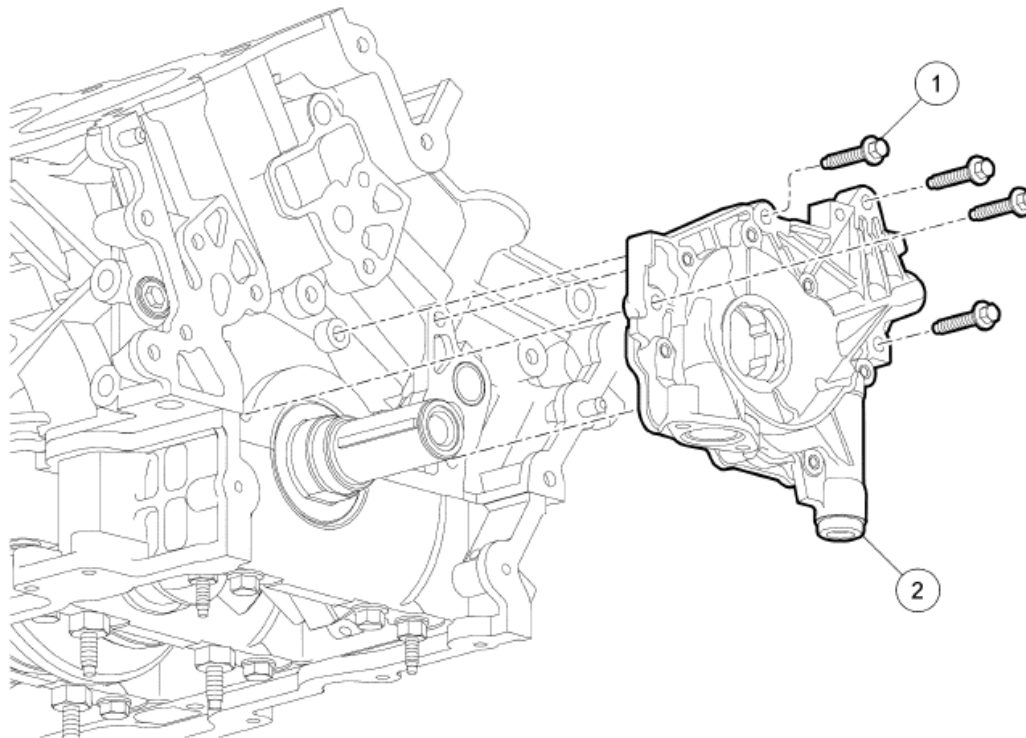
Item	Part Number	Description
1	W709678	Oil pan-to-engine bolt (15 required)
2	W500120	Oil pan-to-transaxle bolt (2 required)
3	6675	Oil pan
4	6710	Oil pan gasket
5	W701582	Oil pan baffle nut (4 required)
6	W700005	Oil pump screen and pickup tube bolts (2 required)
7	6622	Oil pump screen and pickup tube

2010 Mercury Milan

2010 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan

8	6625	Oil pump screen and pickup tube O-ring seal
9	W701542	Oil pan baffle nut (4 required)
10	6687	Oil pan baffle
11	6730	Oil pan drain plug

Oil Pump



N0062159

Fig. 106: Identifying Oil Pump & Bolt
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

Item	Part Number	Description
1	W500300	Oil pump bolt (4 required)
2	6621	Oil pump

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

OIL PAN

Material

MATERIAL SPECIFICATIONS TABLE

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

Removal

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

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the exhaust Y-pipe. For additional information, refer to **EXHAUST SYSTEM**.
3. Drain the engine oil and install the drain plug.
 - Tighten to 26 Nm (19 lb-ft).
4. Remove and discard the oil filter.
5. Remove the access cover.

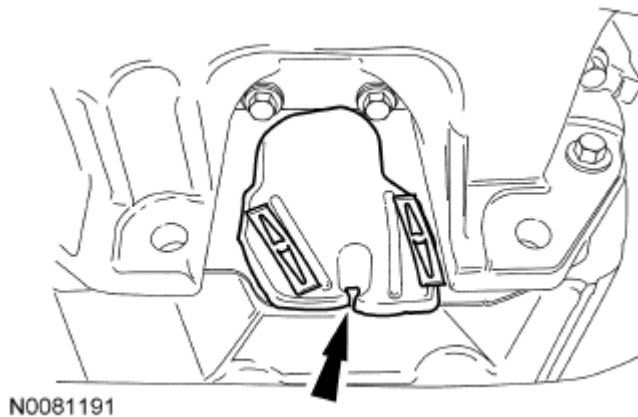


Fig. 107: Locating Access Cover With Bolts
Courtesy of FORD MOTOR CO.

6. Remove the 2 oil pan-to-transaxle bolts.
7. Remove the 15 bolts and the oil pan.
 - Remove and discard the oil pan gasket.

Installation

1. Use a plastic scraping tool to remove all traces of the oil pan gasket.
 - Clean all sealing surfaces with metal surface prep and install a new 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.

2. Apply a 10 mm (0.40 in) diameter dot of silicone sealant to the areas indicated.

NOTE: The oil pan must be installed and the bolts tightened within 4 minutes of sealant application.

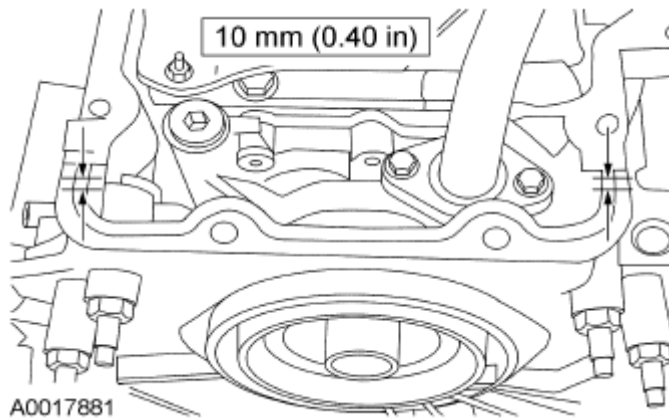


Fig. 108: Identifying Silicone Sealant Apply Areas
Courtesy of FORD MOTOR CO.

3. Position the oil pan and loosely install the bolts.
4. Install the 2 oil pan-to-transaxle bolts.
 - Tighten to 40 Nm (30 lb-ft).
5. Tighten the oil pan-to-engine bolts in the sequence shown to 25 Nm (18 lb-ft).

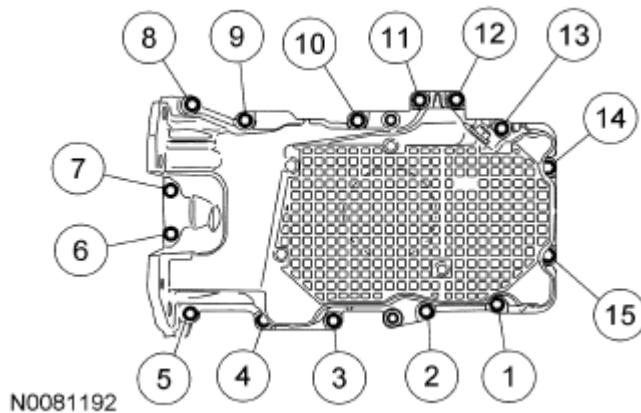


Fig. 109: Identifying Oil Pan Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

6. Install the access cover.

7. Install a new oil filter.

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

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

8. Install the exhaust Y-pipe. For additional information, refer to **EXHAUST SYSTEM**.

9. Fill the engine with clean engine oil.

OIL PUMP SCREEN AND PICKUP TUBE

Material

MATERIAL SPECIFICATIONS

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

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the oil pan. For additional information, refer to **ENGINE LUBRICATION COMPONENTS - EXPLODED VIEW** and **Removal**.
3. Remove the bolts the oil pump screen and pickup tube.
 - Remove and discard the O-ring seal.

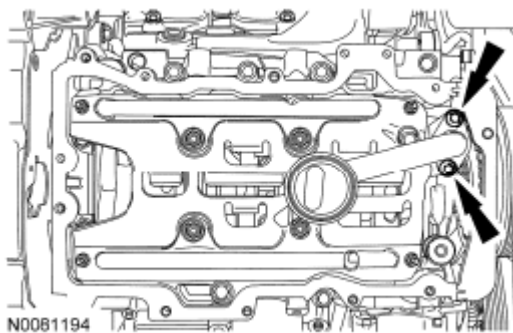


Fig. 110: Locating Oil Pump Screen & Pickup Tube With Bolts

Courtesy of FORD MOTOR CO.

Installation

1. Install a new O-ring seal on the oil pump screen and pickup tube.
 - Lubricate the O-ring seal with clean engine oil.
2. Install the oil pump screen and pickup tube.
 1. Position the oil pump screen and pickup tube.
 2. Install the bolts and tighten to 10 Nm (89 lb-in).

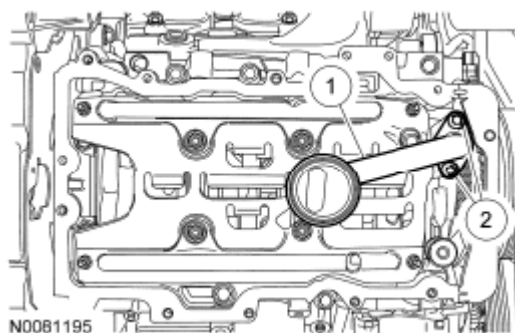


Fig. 111: Identifying Oil Pump Screen & Pickup Tube With Bolts
Courtesy of FORD MOTOR CO.

3. Install the oil pan. For additional information, refer to Installation.

OIL PAN BAFFLE

Removal and Installation

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

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to JACKING & LIFTING.
2. Remove the oil pump screen and pickup tube. For additional information, refer to ENGINE LUBRICATION COMPONENTS - EXPLODED VIEW and Removal.
3. Remove the 8 nuts and the oil pan baffle in the following sequence.
 1. To install, tighten the 4 M6 oil pan baffle nuts in 2 stages.
 - Stage 1: Tighten to 5 Nm (44 lb-in).
 - Stage 2: Tighten an additional 45 degrees.
 2. Then install and tighten the 4 M8 oil pan baffle nuts in 2 stages.
 - Stage 1: Tighten to 15 Nm (133 lb-in).

- Stage 2: Tighten an additional 45 degrees.

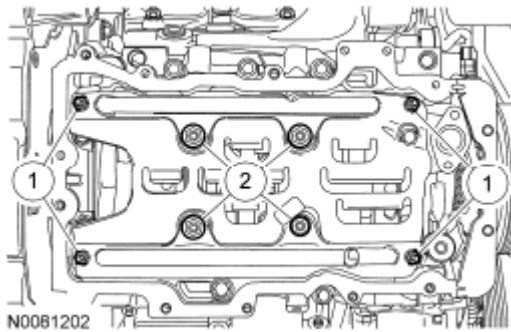


Fig. 112: Identifying Oil Pan Baffle & Nuts
Courtesy of FORD MOTOR CO.

4. To install, reverse the removal procedure.

OIL PUMP

Removal

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

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the timing drive components. For additional information, refer to **Removal**.
3. Remove the oil pump screen and pickup tube. For additional information, refer to **ENGINE LUBRICATION COMPONENTS - EXPLODED VIEW** and **Removal**.
4. Remove the bolts in the sequence shown below.



Fig. 113: Identifying Oil Pump Bolts In Tightening Sequence
Courtesy of FORD MOTOR CO.

Installation

1. Position the oil pump and install the bolts.
 - Tighten in the sequence shown below to 10 Nm (89 lb-in).

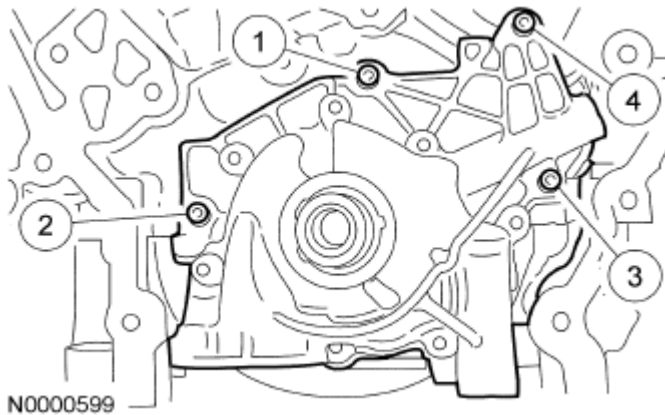


Fig. 114: Tightening Oil Pump Bolts
Courtesy of FORD MOTOR CO.

2. Install the oil pump screen and pickup tube. For additional information, refer to **ENGINE LUBRICATION COMPONENTS - EXPLODED VIEW** and **Installation**.
3. Install the timing drive components. For additional information, refer to **Installation**.

ENGINE OIL PRESSURE (EOP) SWITCH**Material****MATERIAL SPECIFICATIONS TABLE**

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

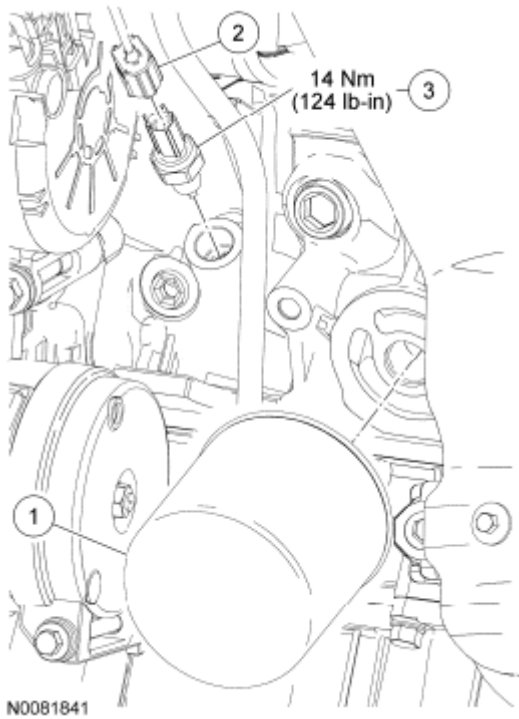


Fig. 115: Identifying Engine Oil Pressure (EOP) Switch Components With Torque Specifications
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

Item	Part Number	Description
1	6714	Engine oil filter
2	14A464	Engine Oil Pressure (EOP) switch electrical connector (part of 12B637)
3	9278	EOP

Removal and Installation

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the engine oil filter.
 - To install, tighten to 5 Nm (44 lb-in) and then rotate an additional 180 degrees.

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

3. Disconnect the Engine Oil Pressure (EOP) switch electrical connector.
4. Remove the **EOP** switch.
 - To install, tighten to 14 Nm (124 lb-in).
5. To install, reverse the removal procedure.

- Apply thread sealant with PTFE to the **EOP** switch threads.

OIL LEVEL INDICATOR AND TUBE

Material

MATERIAL SPECIFICATIONS

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

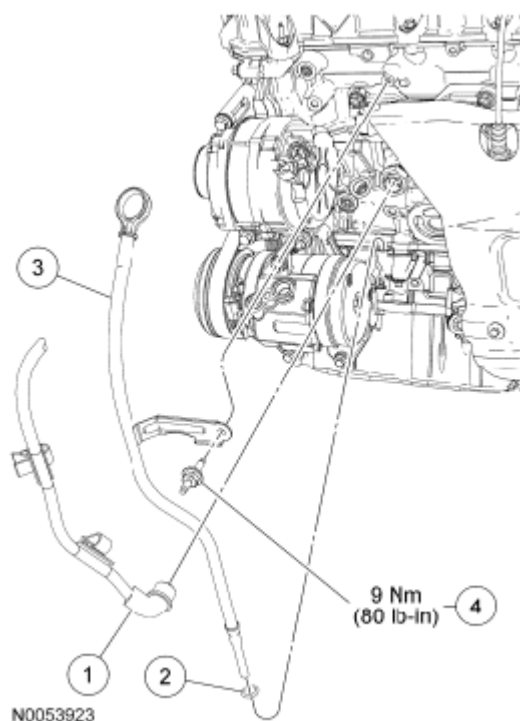


Fig. 116: Identifying Oil Level Indicator & Tube Components With Torque Specifications
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

Item	Part Number	Description
1	-	Block heater wiring harness (if equipped)
2	110282	Oil level indicator O-ring seal
3	6754	Oil level indicator tube
4	W701822	Oil level indicator tube stud bolt

Removal and Installation

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

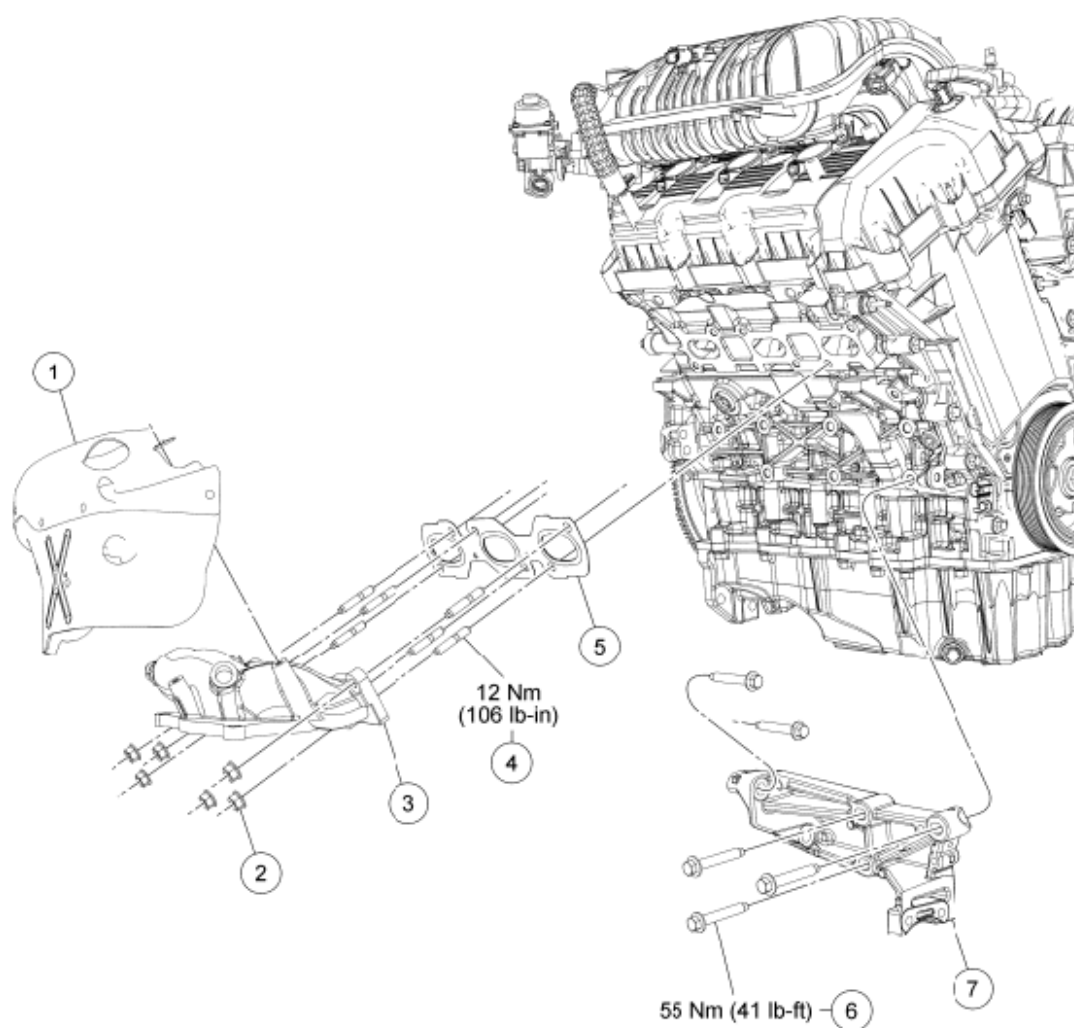
LIFTING .

2. Remove the oil level indicator.
3. If equipped, disconnect the block heater electrical connector and wiring harness retainers.
4. Remove the stud bolt and the oil level indicator tube.
 - Discard the O-ring seal.
 - To install, tighten to 9 Nm (80 lb-in).
5. To install, reverse the removal procedure.

NOTE: **Install a new O-ring seal and lubricate with clean engine oil.**

EXHAUST MANIFOLD - RH**Material****MATERIAL SPECIFICATIONS TABLE**

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



N0096668

Fig. 117: Identifying Exhaust Manifold Components RH With Torque Specifications
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

Item	Part Number	Description
1	5E258	RH catalytic converter heat shield
2	W701706	RH exhaust manifold nut (6 required)
3	9430	RH exhaust manifold
4	W701732	RH exhaust manifold stud (6 required)
5	9448	RH exhaust manifold gasket
6	W500724	Power Transfer Unit (PTU) bracket bolt (5 required)
7	7A444	PTU bracket

Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the EGR tube. For additional information, refer to **ENGINE EMISSION CONTROL - 3.0L (4V)**.
3. Remove the RH catalytic converter. For additional information, refer to **REMOVAL AND INSTALLATION**.
4. Remove the 5 bolts and the PTU bracket.
 - Remove the catalytic converter heat shield from the vehicle.

NOTE: The heat shield that was unbolted from the exhaust manifold during removal of the RH catalytic converter cannot be removed from the vehicle until the Power Transfer Unit (PTU) bracket is removed.

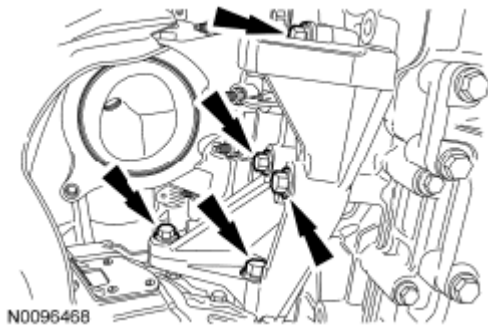


Fig. 118: Locating PTU Bracket & Bolts
Courtesy of FORD MOTOR CO.

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

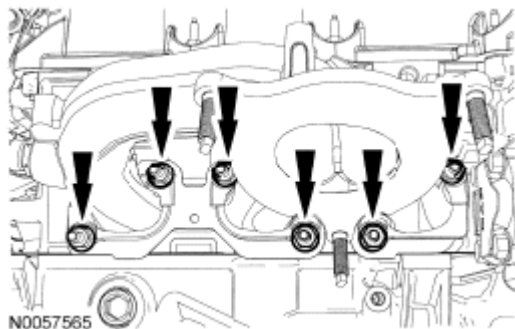


Fig. 119: Locating RH Exhaust Manifold & Nuts
Courtesy of FORD MOTOR CO.

6. Clean and inspect the RH exhaust manifold. For additional information, refer to **EXHAUST MANIFOLD CLEANING AND INSPECTION**.
7. Remove and discard the 6 RH exhaust manifold studs.

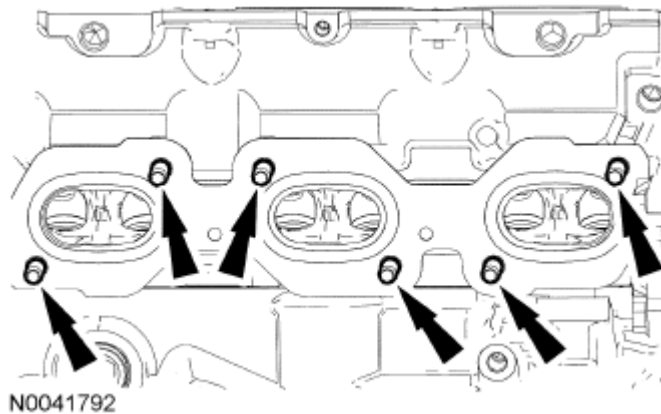


Fig. 120: Locating Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

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

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.

Installation

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

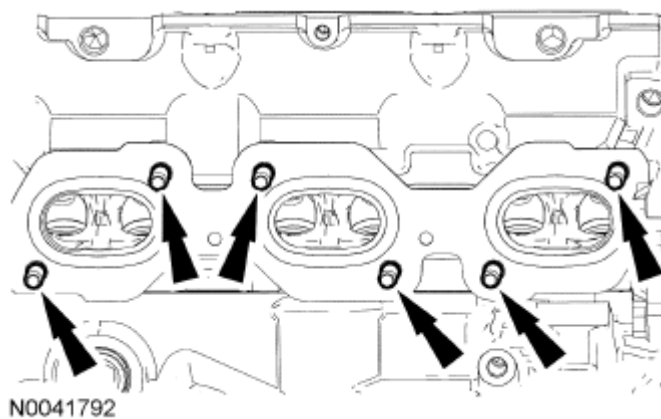


Fig. 121: Locating Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

2. Position the catalytic converter heat shield into the engine compartment.

NOTE: The catalytic converter heat shield must be positioned up into the engine

compartment prior to installing the PTU bracket.

3. Install the **PTU** bracket and the 5 bolts.
 - Tighten to 55 Nm (41 lb-in).

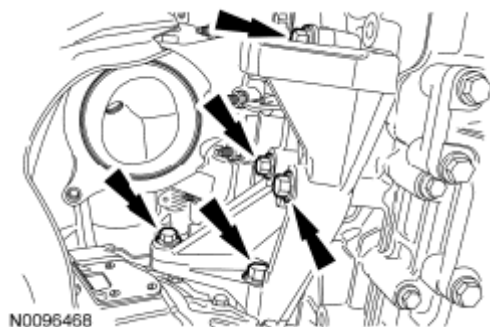


Fig. 122: Locating PTU Bracket & Bolts
Courtesy of FORD MOTOR CO.

4. Install a new gasket, the RH exhaust manifold and 6 new nuts.
 - Tighten to 20 Nm (177 lb-in) in the sequence shown.

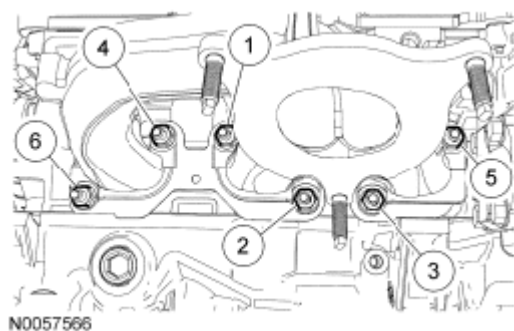


Fig. 123: Locating RH Exhaust Manifold & Nuts
Courtesy of FORD MOTOR CO.

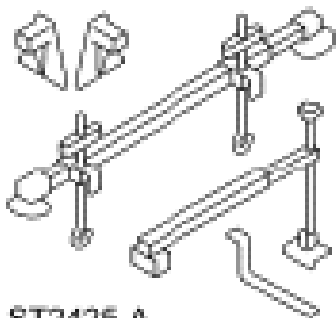
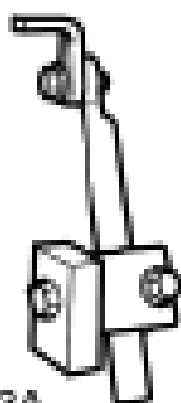
5. Install the RH catalytic converter. For additional information, refer to **REMOVAL AND INSTALLATION**.
6. Install the EGR tube. For additional information, refer to **ENGINE EMISSION CONTROL - 3.0L (4V)**.

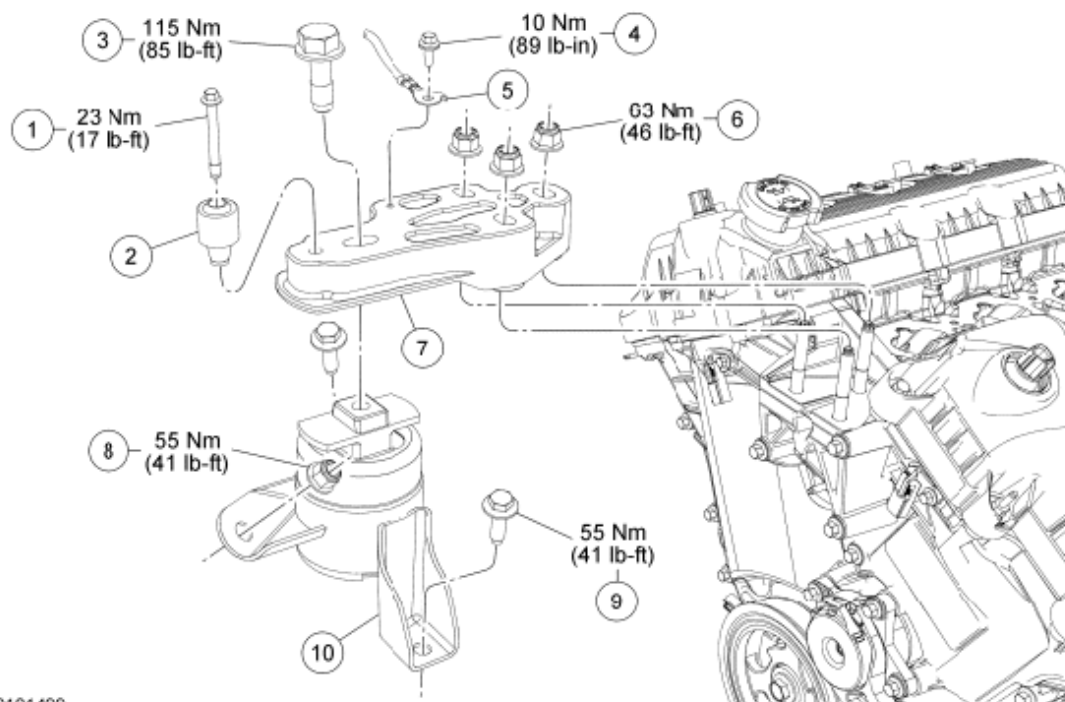
ENGINE MOUNT

Special Tool(s)

SPECIAL TOOLS TABLE

	Support Bar, Engine 303-F072
--	------------------------------

 ST2425-A	
 ST2743A	Universal Adapter Brackets 014-0001 or equivalent



N0101499

Fig. 124: Identifying Engine Mount Components With Torque Specifications

Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

Item	Part Number	Description
1	W711879	Damper bolt
2	7458	Damper
3	W711684	Engine mount bracket bolt
4	W705936	Ground wire bolt
5	19A095	Ground wire
6	W712334	Engine support insulator bracket nut (3 required)
7	6A094	Engine mount bracket
8	W711578	Engine mount nut
9	W706496	Engine mount bolt (2 required)
10	6F012	Engine mount

Removal and Installation

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** .
2. Release the fuel system pressure. For additional information, refer to **FUEL SYSTEM PRESSURE RELEASE** .
3. Remove the engine coolant degas bottle. For additional information, refer to **REMOVAL AND INSTALLATION** .
4. Remove the lower intake manifold. For additional information, refer to **Removal**.
5. Remove the bolt and position aside the ground wire.
 - To install, tighten to 10 Nm (89 lb-in).
6. Remove the bolt and damper.
 - To install, tighten to 23 Nm (17 lb-ft).
7. Remove the engine support insulator bracket bolt.
 - To install, tighten to 115 Nm (85 lb-ft).
8. Install the Engine Support Bar, Universal Adapter Brackets and a suitable piece of chain.
 1. Position the 2 Universal Adapter Brackets on top of the cylinder block.
 2. Install 2 M8 x 1.25 x 36 mm (1.41 in) bolts and tighten to 10 Nm (89 lb-in).
 3. Use a suitable piece of chain.
 4. Fasten the chain to the 2 Universal Adapter Brackets with a suitable nut, washer and bolt.

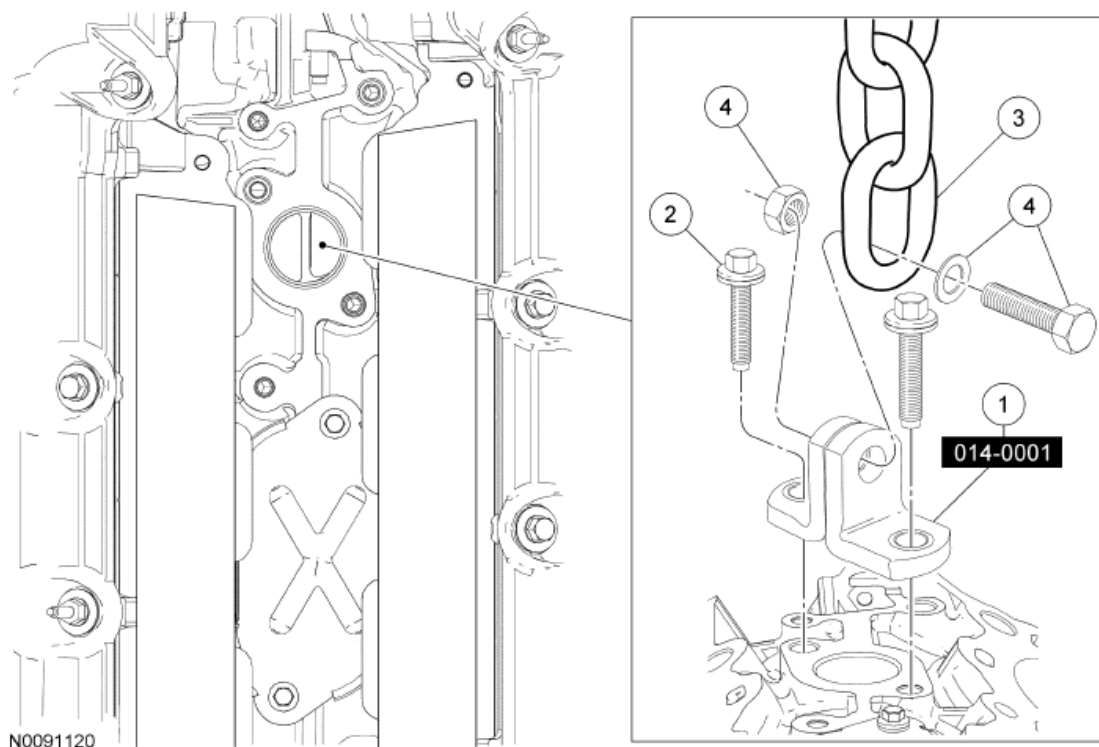


Fig. 125: Positioning Universal Adapter Brackets On Top Of Cylinder Block
Courtesy of FORD MOTOR CO.

9. Using the Engine Support Bar, lift the engine 12 mm (0.47 in).

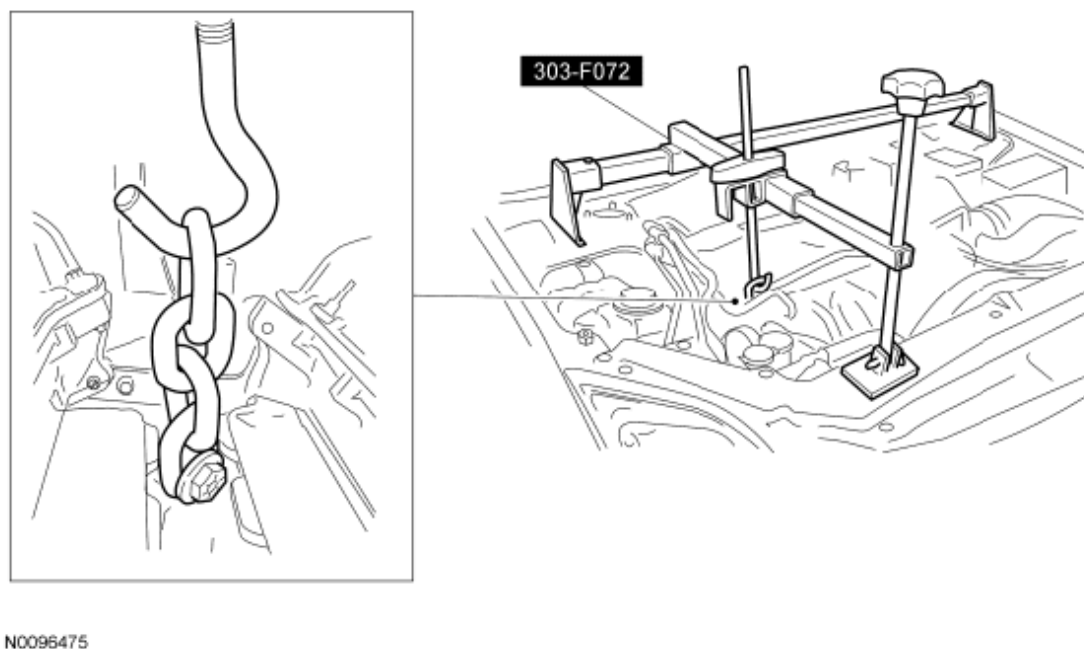


Fig. 126: Lifting Engine & Using Engine Support Bar
Courtesy of FORD MOTOR CO.

10. Remove the 3 nuts and the engine support insulator bracket.
 - To install, tighten to 63 Nm (46 lb-ft).
11. Remove the nut, 2 bolts and the engine mount.
 - To install, tighten to 55 Nm (41 lb-ft).
12. Use the Engine Support Bar to lower the engine 25 mm (0.98 in).
 - Remove the engine mount bracket.

NOTE: If the engine mount bracket is to be removed, the engine must be lowered to avoid contact between the A/C tubes and the engine mount bracket.

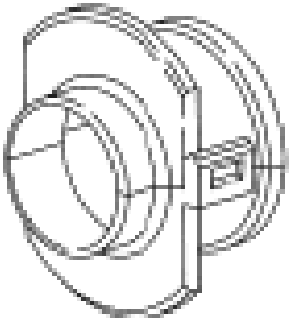
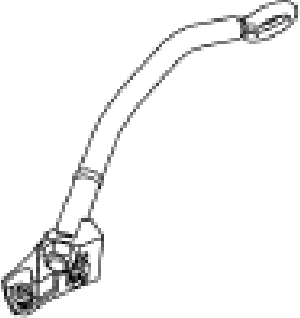
13. To install, reverse the removal procedure.

REMOVAL

ENGINE

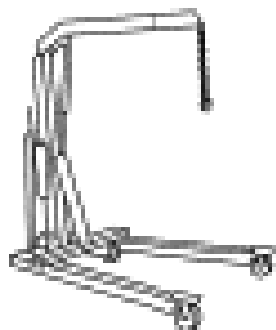
Special Tool(s)

SPECIAL TOOLS TABLE

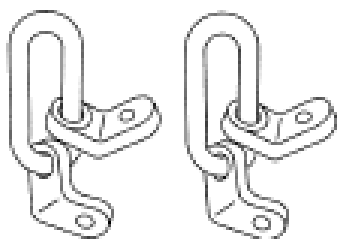
 ST2870-A	Disconnect Tool, Transmission Cooler Line 307-569
 ST2873-A	Engine Lifting Bracket Set 303-1140
	Heavy Duty Floor Crane 014-00071 or equivalent

2010 Mercury Milan

2010 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan

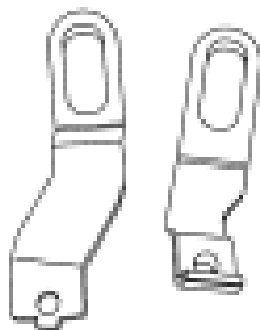


ST1341-A



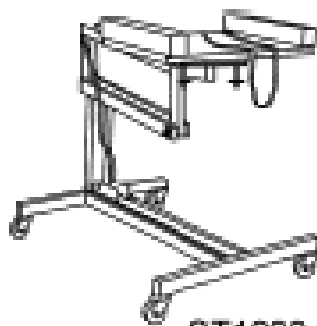
ST2793-A

Lifting Bracket, Engine 303-050 (T70P-6000)



ST2463-A

Lifting Brackets, Engine 134-00243 or equivalent



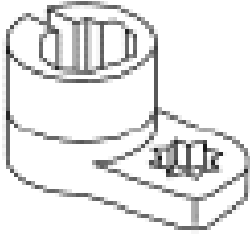
ST1293-A

Powertrain Lift 014-00765

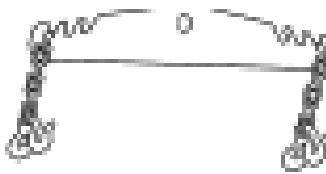
Socket, Exhaust Gas Oxygen Sensor 303-476 (T94P-9472-A)

2010 Mercury Milan

2010 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan

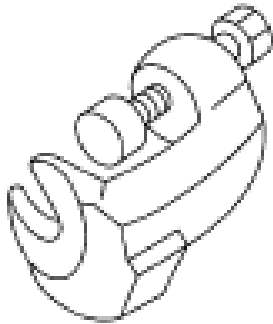


ST1447-A



303-D089 (D93P-6001-A3)

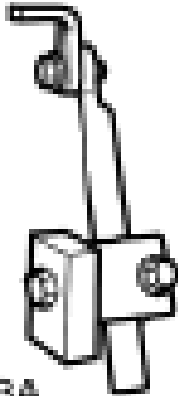
Spreader Bar 303-D089 (D93P-6001-A3) or equivalent



ST1408-A

Tie-Rod End Remover 211-105 (T85M-3395-A)

Universal Adapter Brackets 014-0001



ST2743A

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

All vehicles

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Release the fuel system pressure. For additional information, refer to **FUEL SYSTEM PRESSURE RELEASE**.
3. Disconnect the battery ground cable. For additional information, refer to **REMOVAL AND INSTALLATION**.
4. Recover the A/C system. For additional information, refer to **REFRIGERANT SYSTEM RECOVERY**.
5. Place the steering wheel in the straight-ahead position and the ignition key in the OFF position.
6. Using a suitable holding device, hold the steering wheel in the straight-ahead position.

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

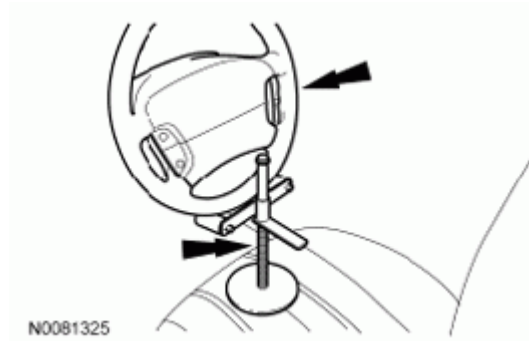


Fig. 127: Holding Steering Wheel In Straight-Ahead Position
Courtesy of FORD MOTOR CO.

7. Remove the 2 nuts and the steering joint cover.

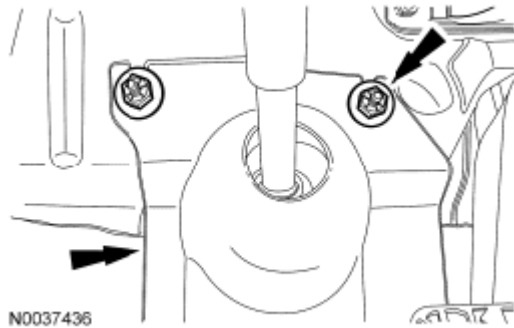


Fig. 128: Locating Steering Joint Cover & Nuts
Courtesy of FORD MOTOR CO.

8. Remove the bolt and disconnect the steering column shaft from the steering gear.

NOTE: Do not allow the intermediate shaft to rotate while it is disconnected from the gear or damage to the clockspring can occur. If there is evidence that the intermediate shaft has rotated, the clockspring must be removed and recentered. For additional information, refer to **REMOVAL** .



Fig. 129: Locating Steering Column Shaft From Steering Gear & Bolt

Courtesy of FORD MOTOR CO.

9. Drain the cooling system. For additional information, refer to **DRAINING**.
10. Remove the 4 screws and position the RH fender splash shield aside.

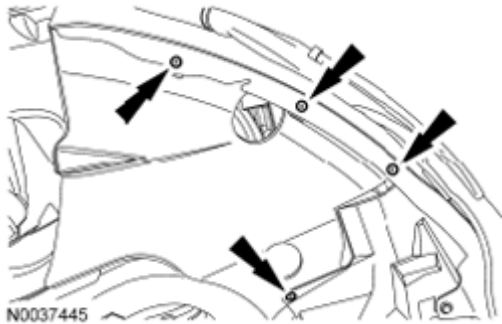


Fig. 130: Locating RH Fender Splash Shield & Screws
Courtesy of FORD MOTOR CO.

11. Remove the 6 pin-type retainers (4 shown) and the RH splash shield.

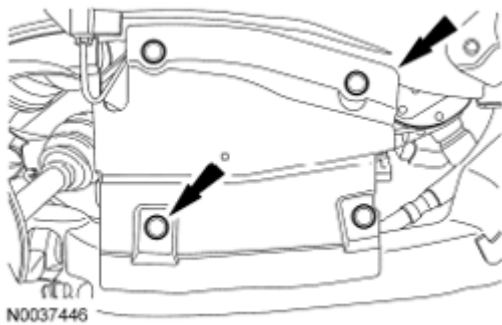


Fig. 131: Locating RH Splash Shield & Pin-Type Retainers
Courtesy of FORD MOTOR CO.

12. Remove the bolt and the Electronic Power Assist Steering (EPAS) wiring ground wire from in the RH front wheel well.

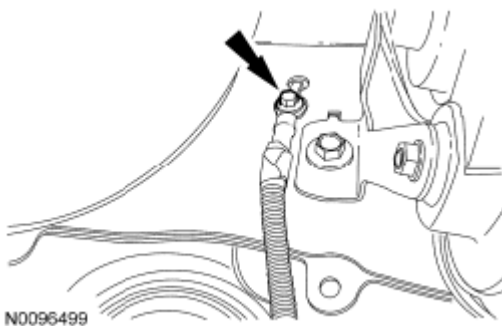


Fig. 132: Locating EPAS Wiring Ground Wire & Bolt

Courtesy of FORD MOTOR CO.

13. Remove the 4 screws and position the LH fender splash shield aside.

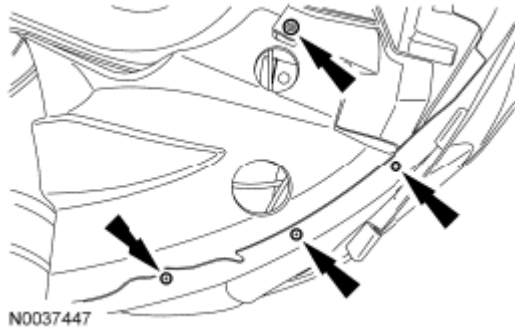


Fig. 133: Locating LH Fender Splash Shield & Screws
Courtesy of FORD MOTOR CO.

14. Remove the 6 pin-type retainers (4 shown) and the LH splash shield.

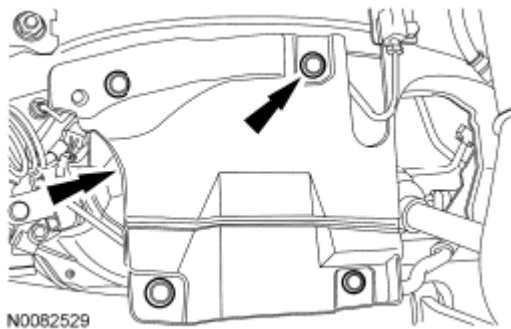


Fig. 134: Locating LH Splash Shield & Pin-Type Retainers
Courtesy of FORD MOTOR CO.

15. Remove the exhaust flexible pipe. For additional information, refer to **REMOVAL**.

All-Wheel Drive (AWD) vehicles

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

NOTE: Index-mark the driveshaft for installation.

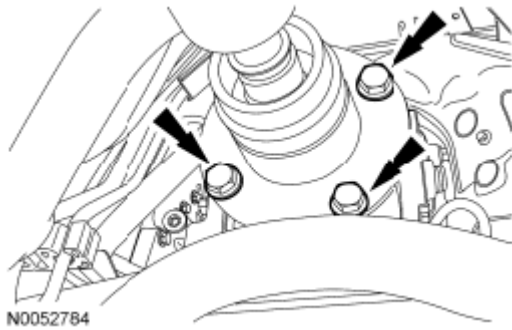


Fig. 135: Locating Support Driveshaft With Bolts
Courtesy of FORD MOTOR CO.

All vehicles

17. Release the 4 clips (2 shown) and slide the steering gear-to-dash seal off of the steering gear and into the passenger compartment.

NOTE: The steering gear-to-dash seal must be removed or it will be damaged when lowering the subframe.

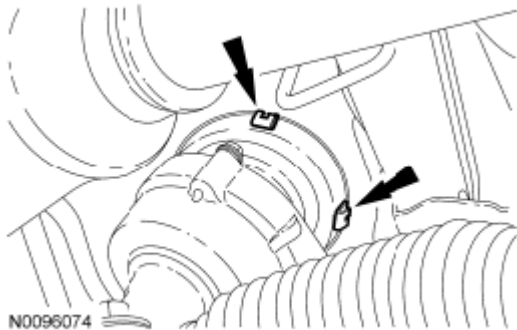


Fig. 136: Locating Steering Gear & Retaining Clips
Courtesy of FORD MOTOR CO.

18. If equipped, remove the 2 bolts and the heat shield.

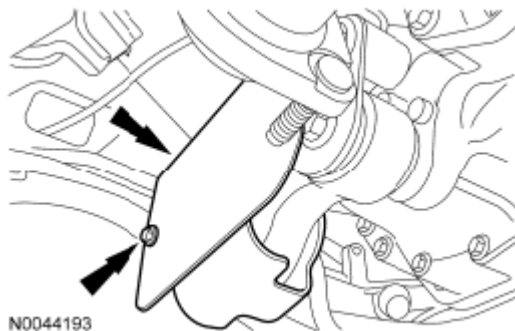


Fig. 137: Locating Heat Shield & Bolts
Courtesy of FORD MOTOR CO.

19. Remove the 2 bolts and the engine roll restrictor.

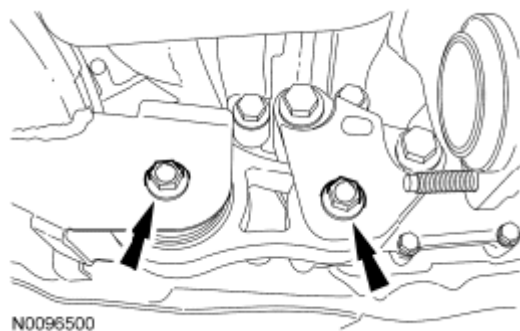


Fig. 138: Locating Engine Roll Restrictor & Bolts
Courtesy of FORD MOTOR CO.

20. Remove the cotter pins and nuts from the tie-rod ends.

NOTE: RH shown, LH similar.

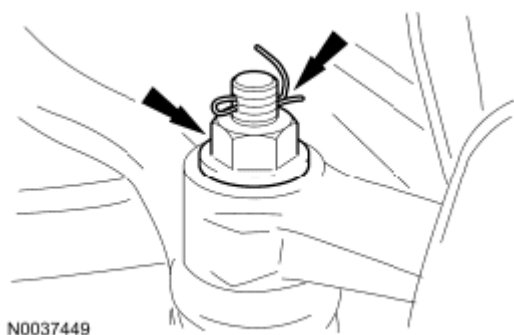


Fig. 139: Locating Cotter Pins & Nuts From Tie-Rod Ends
Courtesy of FORD MOTOR CO.

21. Using the Tie-Rod End Remover, separate the tie-rod ends from the steering knuckles.

NOTE: LH shown, RH similar.

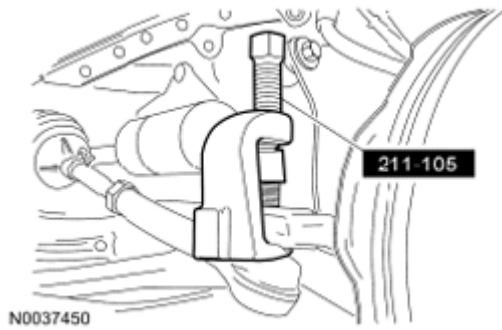


Fig. 140: Separating Tie-Rod Ends From Steering Knuckles
Courtesy of FORD MOTOR CO.

22. Remove the nuts and separate the stabilizer bar links from the struts.

NOTE: RH shown, LH similar.



Fig. 141: Locating Stabilizer Bar Links From Struts And Nuts
Courtesy of FORD MOTOR CO.

23. Remove the LH halfshaft and the intermediate shaft. For additional information, refer to **REMOVAL**.
24. Disconnect the 2 EPAS electrical connectors near the front of the subframe.

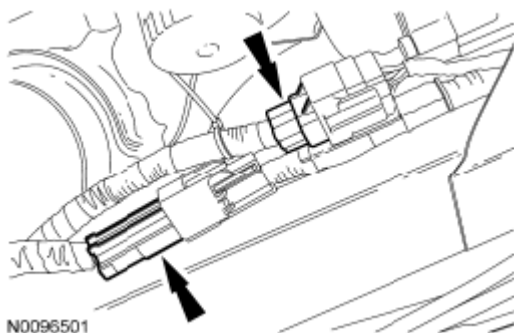


Fig. 142: Locating EPAS Electrical Connectors Front Of Subframe
Courtesy of FORD MOTOR CO.

25. Detach the 3 wiring harness retainers from the LH front of the subframe.

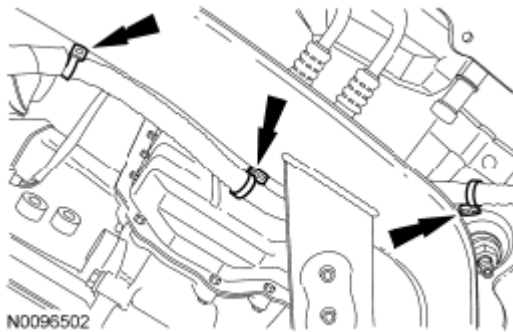


Fig. 143: Locating Wiring Harness Retainers From LH Front Of Subframe
Courtesy of FORD MOTOR CO.

26. Position the Powertrain Lift under the subframe assembly.

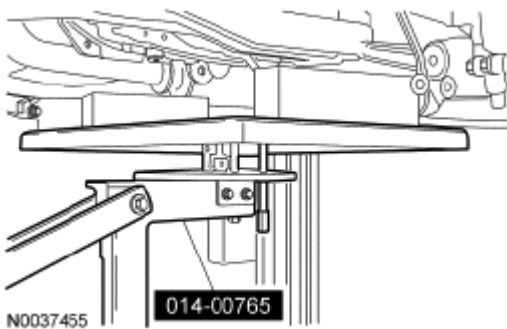


Fig. 144: Positioning Powertrain Lift Under Subframe Assembly
Courtesy of FORD MOTOR CO.

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

NOTE: LH shown, RH similar.

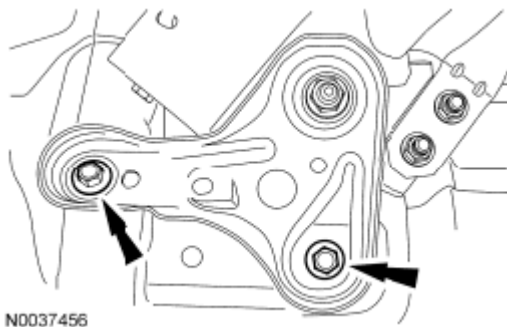


Fig. 145: Locating Subframe Bracket-To-Body Bolts
Courtesy of FORD MOTOR CO.

28. Remove the subframe nuts and the subframe brackets.

NOTE: LH shown, RH similar.

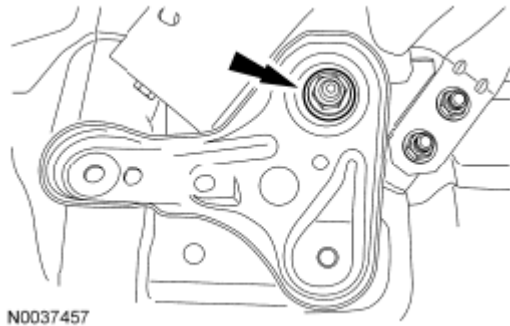


Fig. 146: Locating Subframe Brackets & Subframe Nuts
Courtesy of FORD MOTOR CO.

29. Remove the front subframe nuts.

NOTE: LH shown, RH similar.

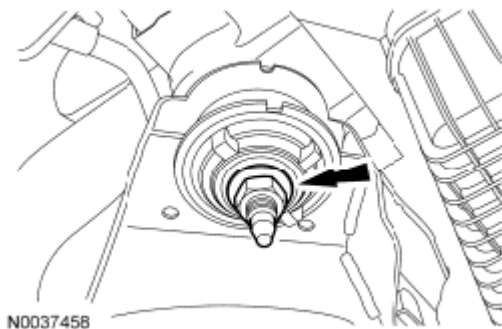


Fig. 147: Locating Front Subframe Nuts
Courtesy of FORD MOTOR CO.

30. Lower the subframe assembly from the vehicle.
31. Remove the 2 transaxle fluid cooler tube secondary latches.

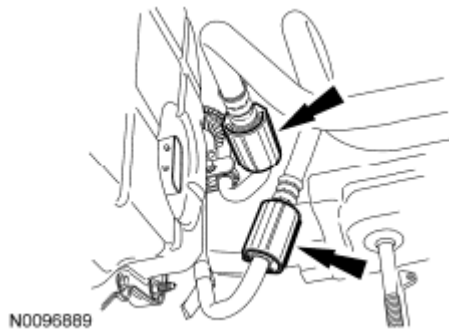


Fig. 148: Locating Transaxle Fluid Cooler Tube Secondary Latches
Courtesy of FORD MOTOR CO.

32. Using the Transmission Cooler Line Disconnect Tool, disconnect the 2 transaxle fluid cooler tubes.

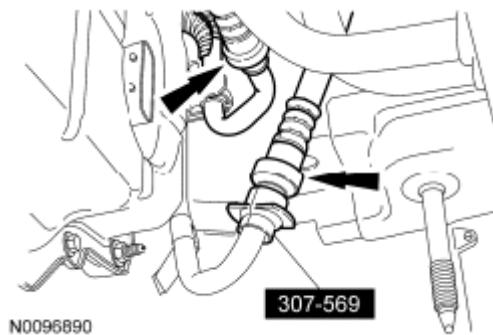


Fig. 149: Locating Transaxle Fluid Cooler Tubes
Courtesy of FORD MOTOR CO.

33. Remove the drain plug and drain the engine oil.
- Install the drain plug and tighten to 26 Nm (19 lb-ft).

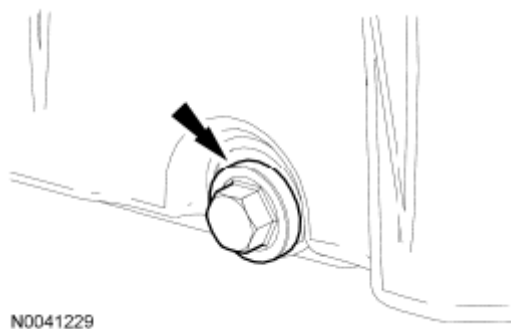


Fig. 150: Locating Drain Plug
Courtesy of FORD MOTOR CO.

34. Remove and discard the engine oil filter.

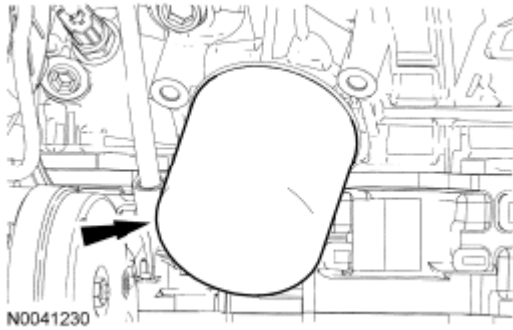


Fig. 151: Locating Engine Oil Filter
Courtesy of FORD MOTOR CO.

35. Remove the engine Air Cleaner (ACL) and ACL outlet pipe. For additional information, refer to **REMOVAL AND INSTALLATION** and **REMOVAL AND INSTALLATION**.
36. Remove the battery tray. For additional information, refer to **REMOVAL AND INSTALLATION**.
37. Remove the 2 nuts and disconnect the power feed wires from the battery terminal.

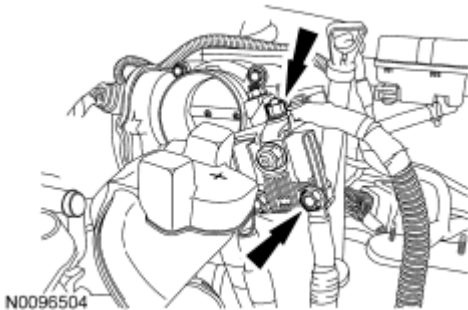


Fig. 152: Locating Power Feed Wires From Battery Terminal & Nuts
Courtesy of FORD MOTOR CO.

38. Disconnect the engine wiring harness electrical connector.

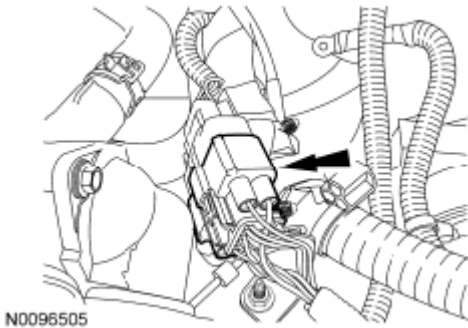


Fig. 153: Locating Engine Wiring Harness Electrical Connector
Courtesy of FORD MOTOR CO.

39. Disconnect the 2 engine wiring harness electrical connectors.



Fig. 154: Locating Engine Wiring Harness Electrical Connectors
Courtesy of FORD MOTOR CO.

40. Remove the bolt and position aside the ground wire.

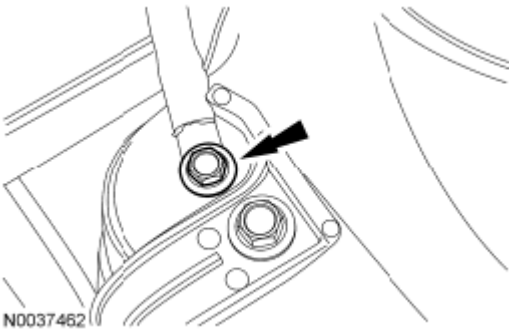


Fig. 155: Locating Position Aside Ground Wire & Bolt
Courtesy of FORD MOTOR CO.

41. Detach the 2 wiring harness retainers from the battery tray bracket and transaxle mount.

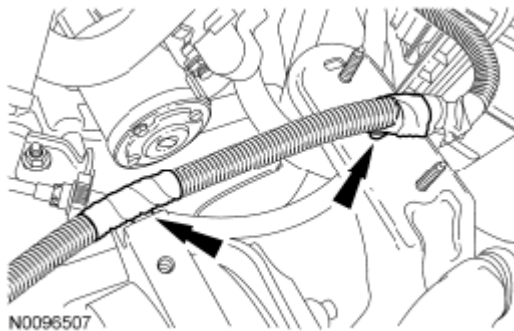


Fig. 156: Locating Wiring Harness Retainers From Battery Tray Bracket & Transaxle Mount
Courtesy of FORD MOTOR CO.

42. Remove the PCM ground bolt and position aside the ground wire.

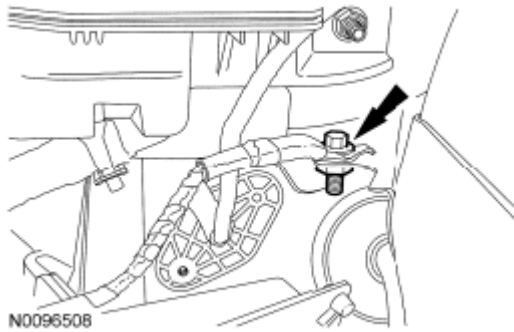


Fig. 157: Locating PCM Ground Bolt
Courtesy of FORD MOTOR CO.

43. Disconnect the 3 PCM electrical connectors.



Fig. 158: Locating PCM Electrical Connectors
Courtesy of FORD MOTOR CO.

44. Disconnect the fuel supply tube from the fuel rail. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION**.
45. Disconnect the **EVAP** tube-to- **EVAP** canister purge valve quick connect coupling and the brake booster vacuum tube from the upper intake manifold.
 - Detach the fuel tube and **EVAP** tube-to- **EVAP** canister purge valve tube retainer from the upper intake manifold.

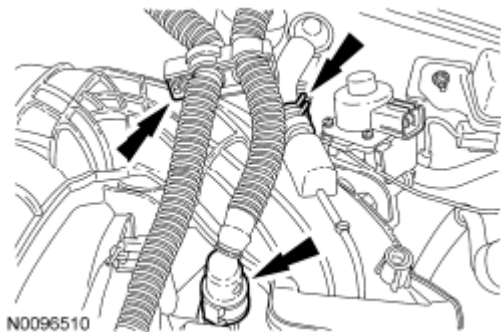


Fig. 159: Locating Fuel Tube & EVAP Tube-To-EVAP Canister Purge Valve Tube Retainer From

Upper Intake Manifold

Courtesy of FORD MOTOR CO.

46. Disconnect the LH Heated Oxygen Sensor (HO2S) electrical connector.

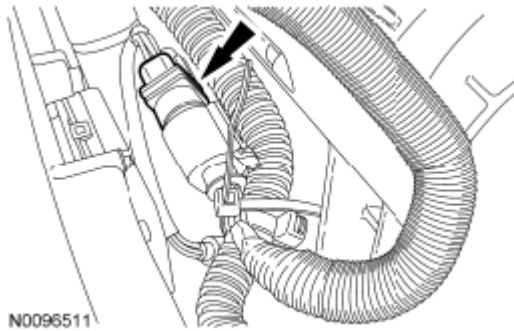


Fig. 160: Locating LH Heated Oxygen Sensor (HO2S) Electrical Connector
Courtesy of FORD MOTOR CO.

47. Disconnect the upper and lower radiator hoses.

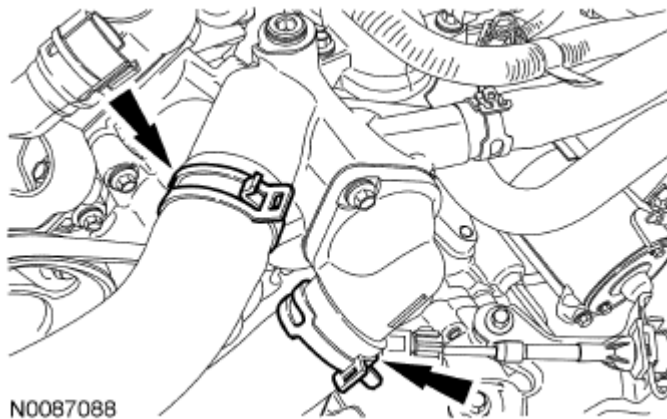


Fig. 161: Locating Upper & Lower Radiator Hoses
Courtesy of FORD MOTOR CO.

48. Disconnect the 2 heater hoses.

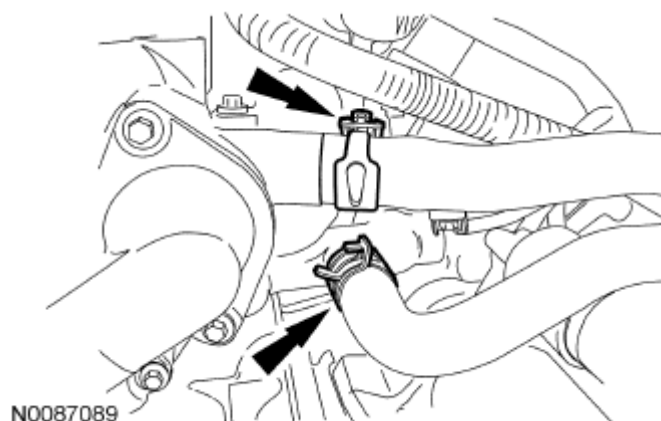


Fig. 162: Locating Heater Hoses
Courtesy of FORD MOTOR CO.

49. Disconnect the gearshift cable from the transaxle.

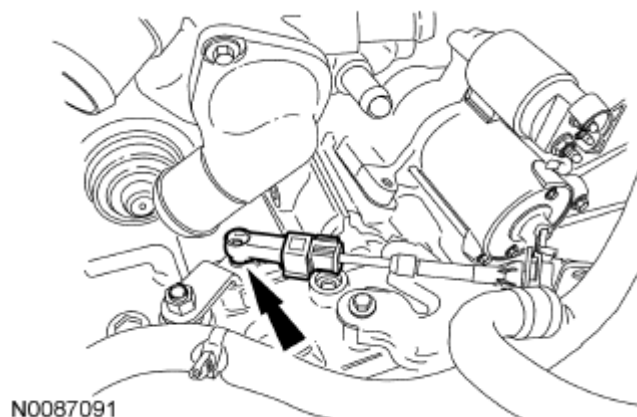


Fig. 163: Locating Gearshift Cable
Courtesy of FORD MOTOR CO.

50. Remove the 2 shift cable bracket bolts, and position the cable and bracket aside.

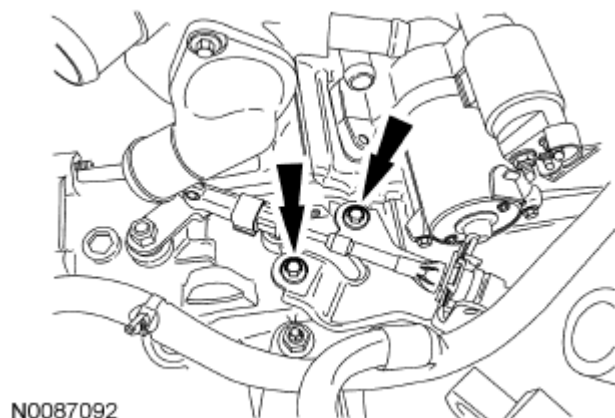


Fig. 164: Locating Shift Cable Bracket Bolts
Courtesy of FORD MOTOR CO.

51. Remove the A/C tube/windshield washer bottle bracket bolt.

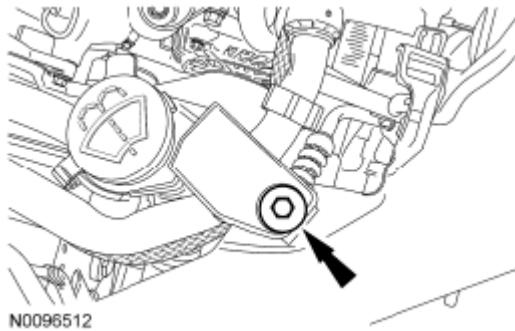


Fig. 165: Locating A/C Tube & Windshield Washer Bottle Bracket Bolt
Courtesy of FORD MOTOR CO.

52. Remove the nut and disconnect the A/C tube.
- Discard the gasket.

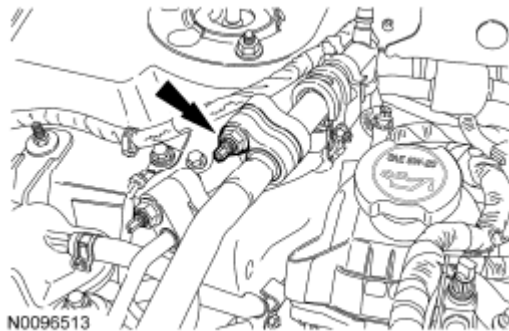


Fig. 166: Locating A/C Tube & Nut
Courtesy of FORD MOTOR CO.

53. Disconnect the LH Catalyst Monitor Sensor (CMS) electrical connector.

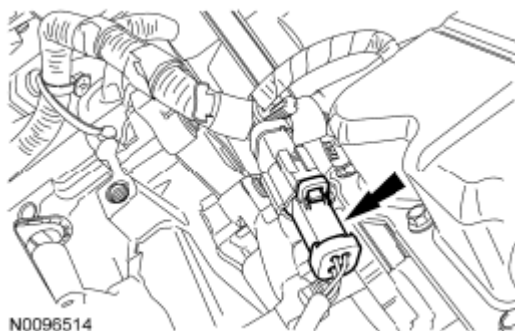


Fig. 167: Locating LH Catalyst Monitor Sensor (CMS) Electrical Connector

Courtesy of FORD MOTOR CO.

54. Remove the 4 bolts (3 shown) and the LH catalytic converter heat shield.

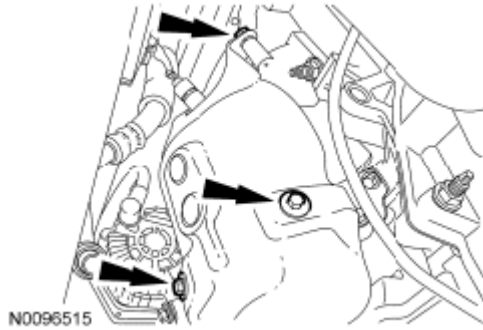


Fig. 168: Locating LH Catalytic Converter Heat Shield & Bolts
Courtesy of FORD MOTOR CO.

55. Remove the 6 nuts and the LH catalytic converter manifold.
- Discard the 6 LH catalytic converter manifold nuts and gasket.

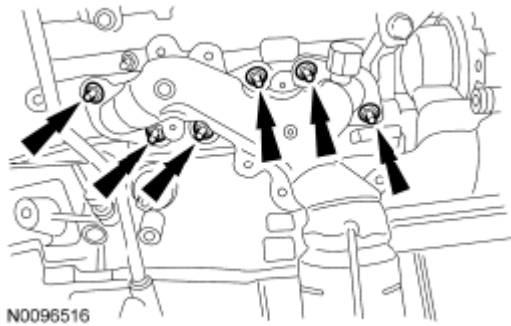


Fig. 169: Locating LH Catalytic Converter Manifold Nuts & Gasket
Courtesy of FORD MOTOR CO.

56. Clean and inspect the LH catalytic converter manifold. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.
57. Remove and discard the 6 LH catalytic converter manifold studs.

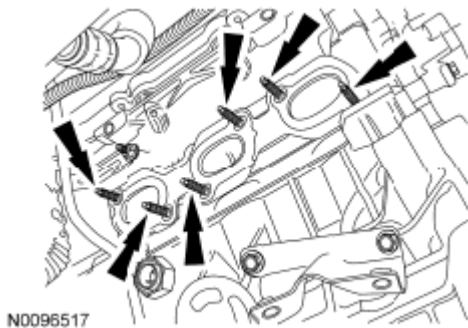


Fig. 170: Locating LH Catalytic Converter Manifold Studs
Courtesy of FORD MOTOR CO.

58. Remove the bolt and separate the A/C manifold from the A/C compressor.
- Discard the gasket.

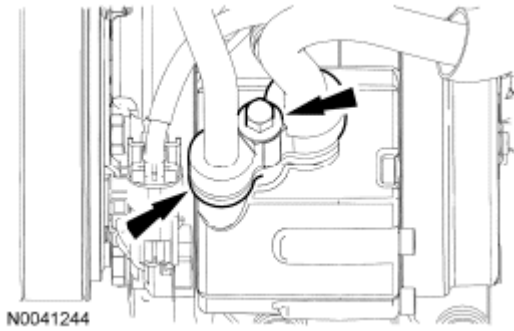


Fig. 171: Locating A/C Manifold From A/C Compressor & Bolt
Courtesy of FORD MOTOR CO.

AWD vehicles

59. Disconnect the RH CMS electrical connector.

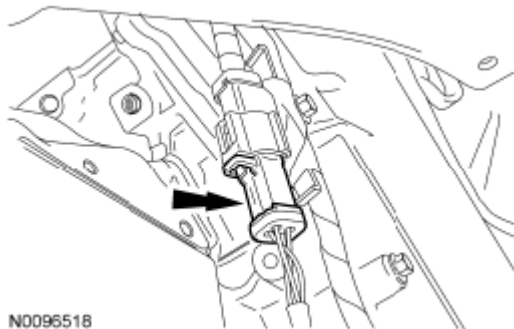


Fig. 172: Locating RH CMS Electrical Connector
Courtesy of FORD MOTOR CO.

60. Disconnect the RH Heated Oxygen Sensor (HO2S) electrical connector.

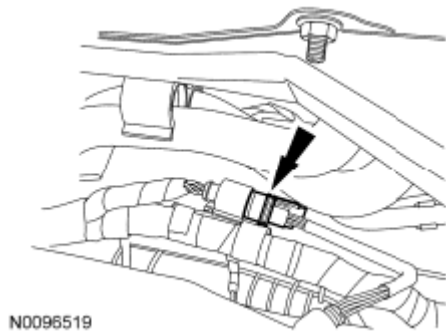


Fig. 173: Locating RH Heated Oxygen Sensor (HO2S) Electrical Connector
Courtesy of FORD MOTOR CO.

61. Using the Exhaust Gas Oxygen Sensor Socket, remove the RH HO2S .

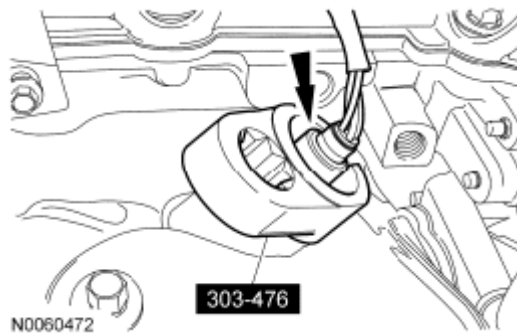


Fig. 174: Removing RH Heated Oxygen Sensor (HO2S)
Courtesy of FORD MOTOR CO.

62. Remove the 5 bolts and the RH exhaust heat shield.

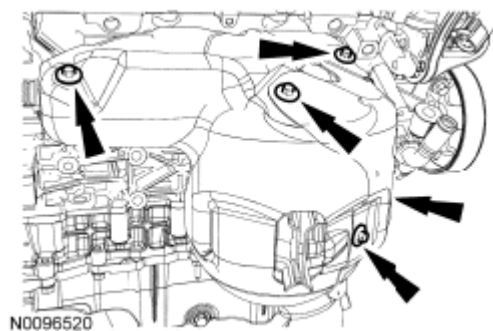


Fig. 175: Locating RH Exhaust Heat Shield & Bolts
Courtesy of FORD MOTOR CO.

63. Remove the 3 nuts and the RH exhaust heat shield bracket (outboard half).

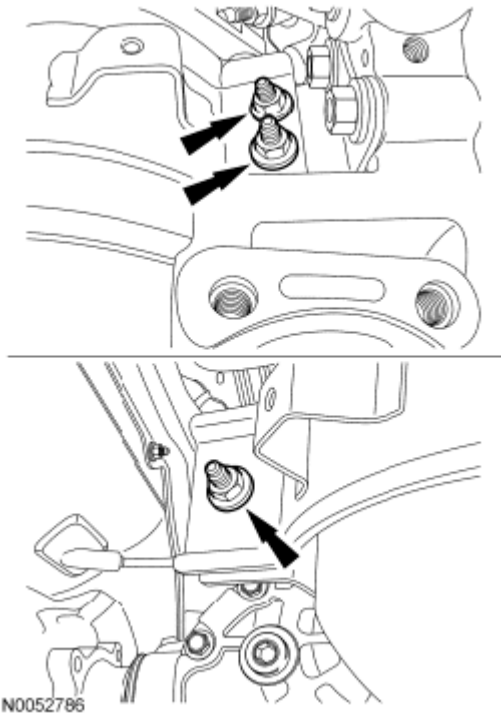


Fig. 176: Locating RH Exhaust Heat Shield Bracket & Nuts
Courtesy of FORD MOTOR CO.

64. Remove the 2 bolts and the RH exhaust heat shield bracket (inboard half).

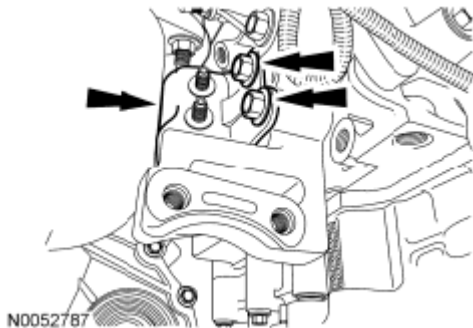


Fig. 177: Locating RH Exhaust Heat Shield Bracket & Bolts
Courtesy of FORD MOTOR CO.

65. Remove the 3 nuts (2 shown) and the RH catalytic converter.
 - Discard the nuts and gasket.

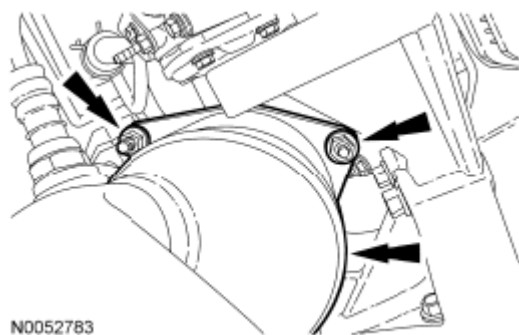


Fig. 178: Locating RH Catalytic Converter & Nuts
Courtesy of FORD MOTOR CO.

66. Remove the 5 bolts and the PTU support bracket.



Fig. 179: Locating PTU Support Bracket & Bolts
Courtesy of FORD MOTOR CO.

67. Remove the 5 bolts and the PTU .

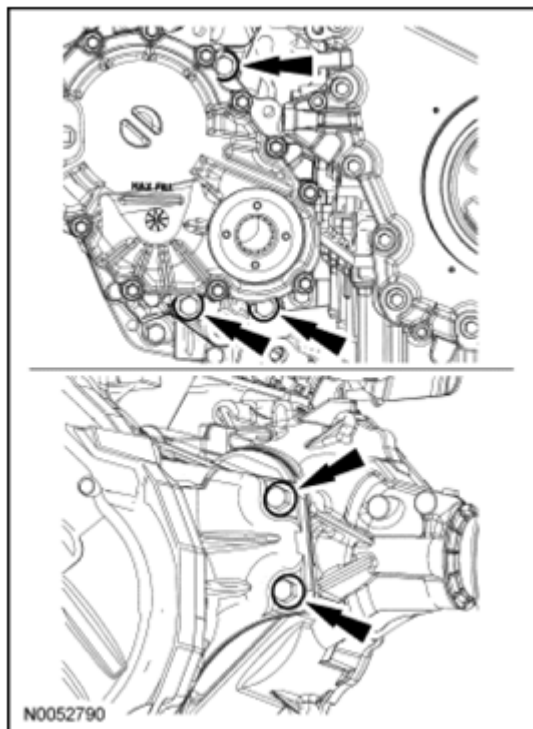


Fig. 180: Locating PTU Bolts
Courtesy of FORD MOTOR CO.

All vehicles

68. Remove the torque converter nut access plug.

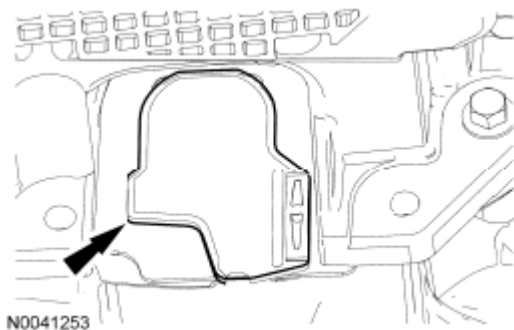


Fig. 181: Locating Torque Converter Nut Access Plug
Courtesy of FORD MOTOR CO.

69. Remove the 4 torque converter nuts.

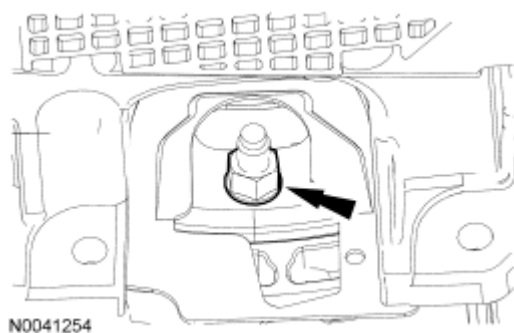


Fig. 182: Locating Torque Converter Nuts
Courtesy of FORD MOTOR CO.

70. Remove the 2 oil pan-to-transaxle bolts.

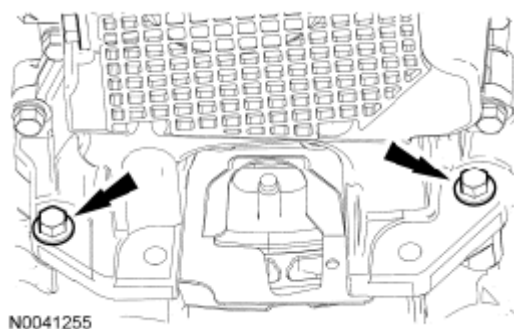


Fig. 183: Locating Oil Pan-To-Transaxle Bolts
Courtesy of FORD MOTOR CO.

71. Remove the 2 nuts and the transaxle-to-engine stud.

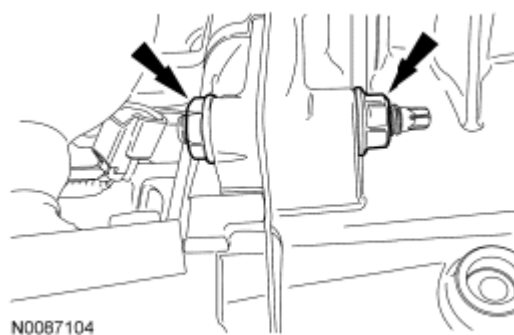


Fig. 184: Locating Transaxle-To-Engine Stud & Nuts
Courtesy of FORD MOTOR CO.

72. Install the Powertrain Lift and the Universal Adapter Brackets onto the engine.
- Raise the engine and transaxle 25.4 mm (1 in) to neutralize the engine and transaxle mounts.

NOTE: Position a suitable block of wood under the transaxle.

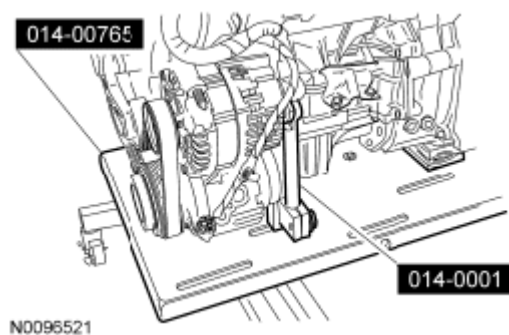


Fig. 185: Installing Powertrain Lift & Universal Adapter Brackets Onto Engine
 Courtesy of FORD MOTOR CO.

73. Remove the rear transaxle support through bolt.

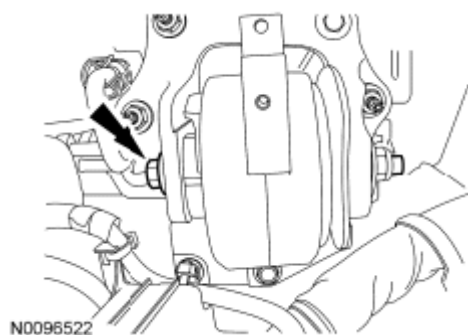


Fig. 186: Locating Rear Transaxle Support Through Bolt
 Courtesy of FORD MOTOR CO.

74. Remove the bolt and ground strap from the engine mount bracket.

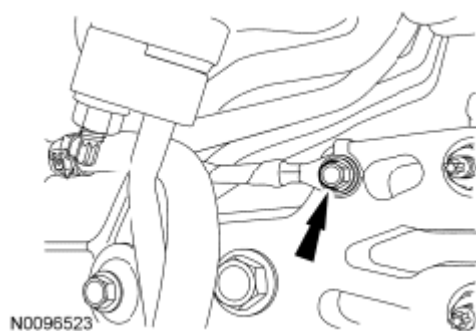


Fig. 187: Locating Ground Strap From Engine Mount Bracket & Bolt
 Courtesy of FORD MOTOR CO.

75. Remove the bolt and damper.

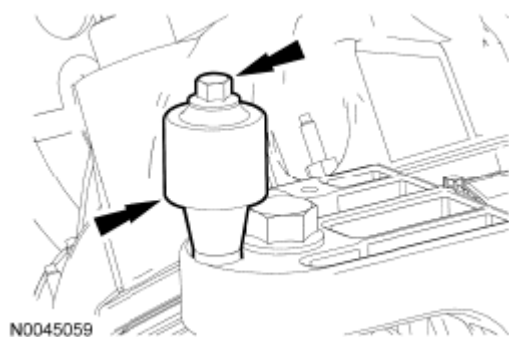


Fig. 188: Locating Damper & Bolt
Courtesy of FORD MOTOR CO.

76. Remove the bolt, 3 nuts and the engine mount bracket.

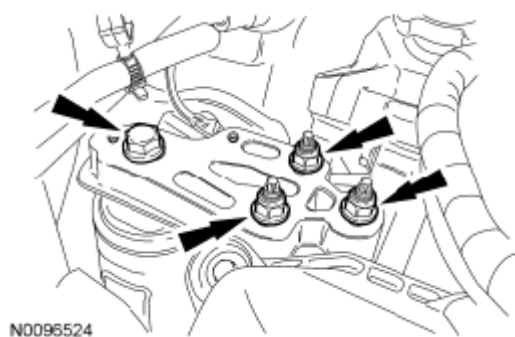


Fig. 189: Locating Engine Mount Bracket With Bolt & Nuts
Courtesy of FORD MOTOR CO.

77. Lower the engine and transaxle from the vehicle.
78. Remove the transaxle-to-engine bolt.

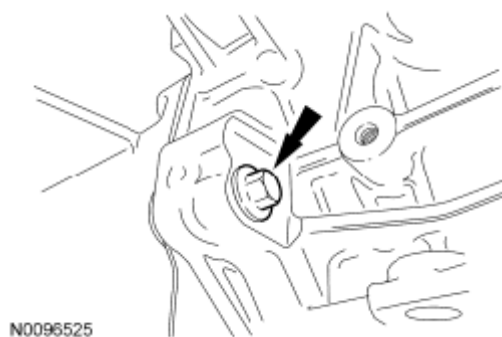


Fig. 190: Locating Transaxle-To-Engine Bolt
Courtesy of FORD MOTOR CO.

79. Install the Universal Adapter Bracket and the Engine Lifting Bracket.

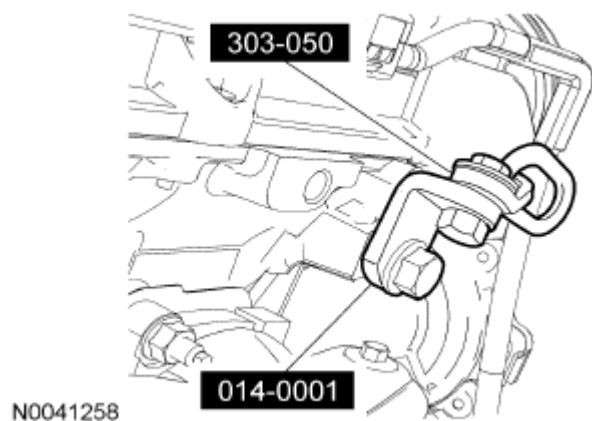


Fig. 191: Lifting Bracket To Rear Of LH Cylinder Head
Courtesy of FORD MOTOR CO.

80. Install the Engine Lifting Bracket.



Fig. 192: Installing Engine Lifting Bracket
Courtesy of FORD MOTOR CO.

81. Install the lower half of the Engine Lifting Bracket Set.

NOTE: When installing the lower half of the lifting bracket it will be easier to loosely install the upper bolt first then install the lower bolt.

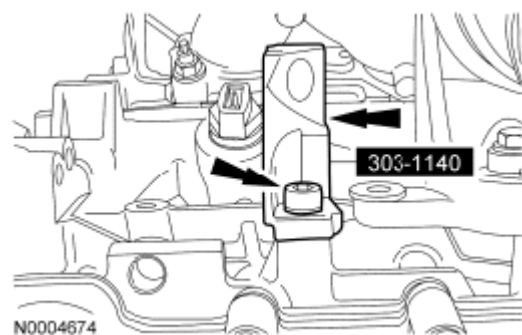


Fig. 193: Locating Lower Half Of Engine Lifting Bracket Set

Courtesy of FORD MOTOR CO.

82. Install the upper half of the Engine Lifting Bracket Set.



Fig. 194: Identifying Upper Half Of Lifting Hook
Courtesy of FORD MOTOR CO.

83. Using the Spreader Bar, Engine Lifting Brackets, Engine Lifting Bracket Set and a suitable engine crane, remove the engine and transaxle from the lift table.

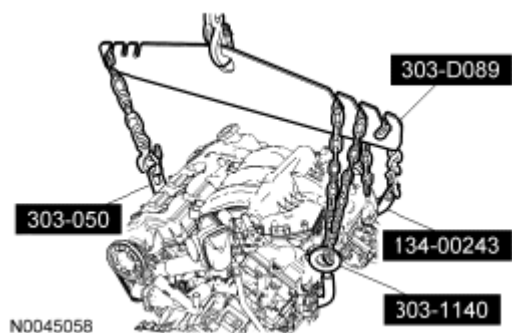


Fig. 195: Removing Engine & Transaxle
Courtesy of FORD MOTOR CO.

84. Remove the nut and the starter wiring ground.

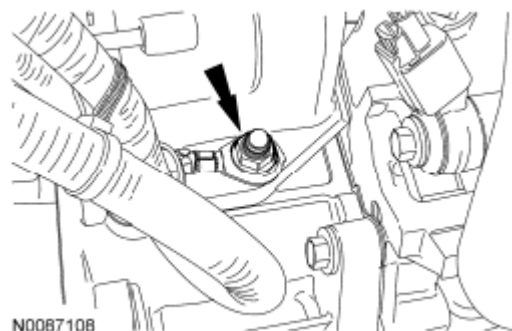


Fig. 196: Locating Starter Wiring Ground & Nut
Courtesy of FORD MOTOR CO.

85. Remove the 2 nuts and the starter wiring.

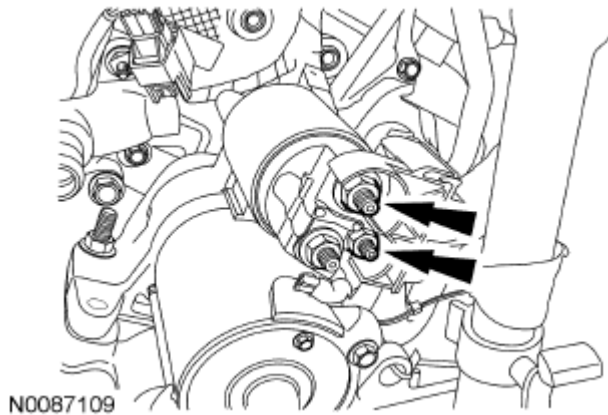


Fig. 197: Locating Starter Wiring Nut
Courtesy of FORD MOTOR CO.

86. Remove the 2 stud bolts and the starter.

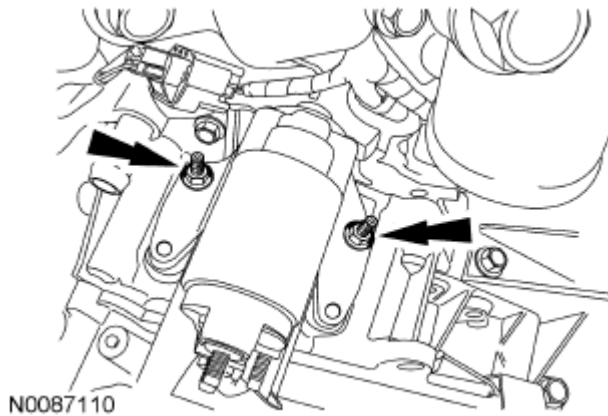


Fig. 198: Locating Starter Stud Bolts
Courtesy of FORD MOTOR CO.

87. Detach the wiring harness retainer from the transmission indicator tube.

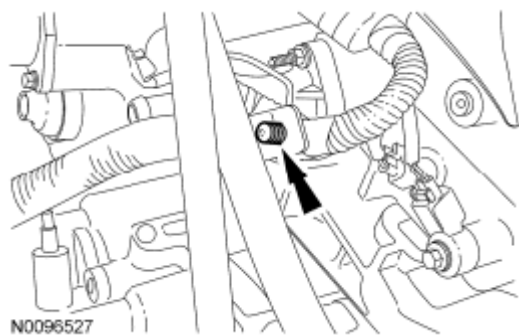


Fig. 199: Locating Wiring Harness Retainer From Transmission Indicator Tube
Courtesy of FORD MOTOR CO.

88. Disconnect the 2 transmission electrical connectors and detach the wiring retainer from the stud bolt.

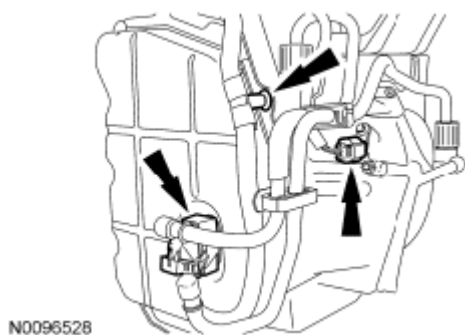


Fig. 200: Locating Wiring Retainer From Stud Bolt
Courtesy of FORD MOTOR CO.

89. Remove the 4 remaining transaxle-to-engine bolts.

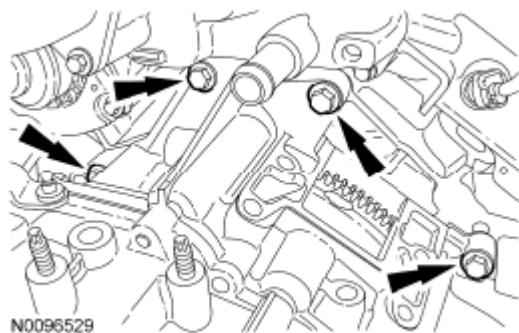


Fig. 201: Removing Remaining Transaxle-To-Engine Bolts
Courtesy of FORD MOTOR CO.

90. Using the Spreader Bar, Engine Lifting Brackets, Engine Lifting Bracket Set and the Heavy Duty Floor Crane, separate the engine and transaxle.

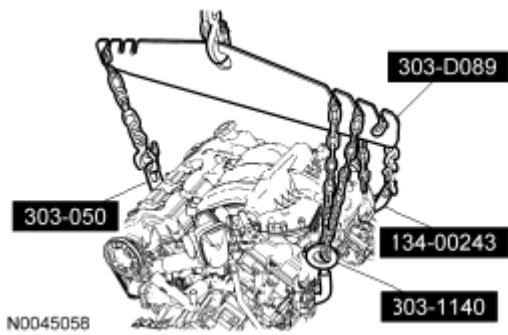


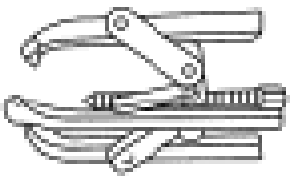
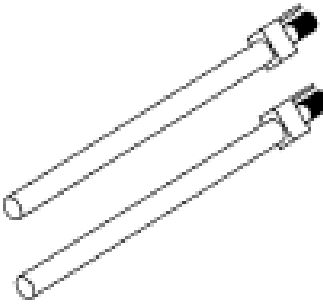
Fig. 202: Removing Engine & Transaxle
Courtesy of FORD MOTOR CO.

DISASSEMBLY

ENGINE

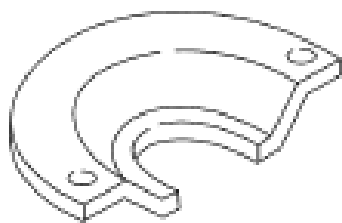
Special Tool(s)

SPECIAL TOOLS TABLE

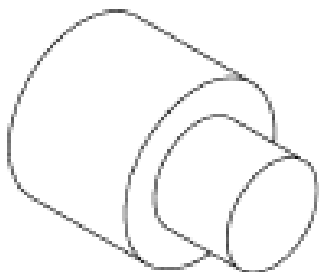
 ST1184-A	3 Jaw Puller 303-D121
 ST1982-A	Installer, Connecting Rod 303-462 (T94P-6136-AH)
	Plate, Water Pump Pulley 303-456 (T94P-6312-AH1), part of 303-S455

2010 Mercury Milan

2010 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan

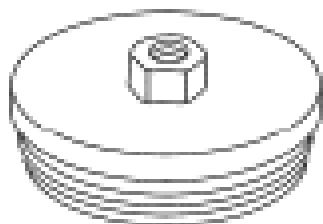


ST3044-A



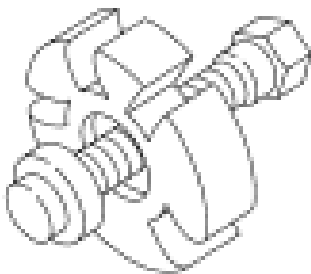
ST3045-A

Protector, Water Pump Shaft 303-457 (T94P-6312-AH2), part of 303-S455



ST1382-A

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



ST1286-A

Remover, Crankshaft Vibration Damper 303-009 (T58P-6316-D)

Remover, Oil Seal 303-409 (T92C-6700CH)

2010 Mercury Milan

2010 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan

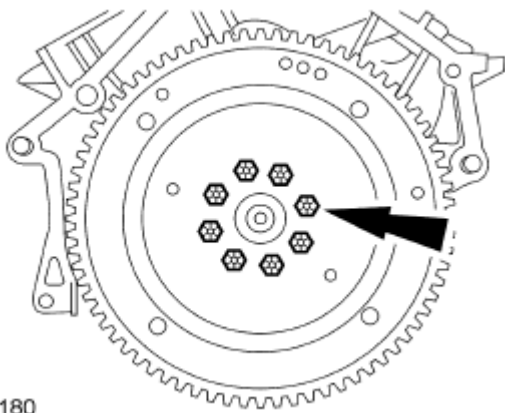
 ST1385-A	
 ST3085-A	Remover, Stretchy Belt 303-1419
 ST1187-A	Slide Hammer 307-005 (T59L-100-B)

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

NOTE: For additional information, refer to the exploded view under **ASSEMBLY** procedure.

All engines

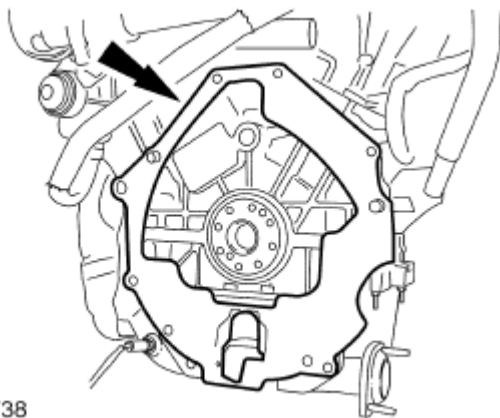
1. Remove the 8 bolts and the flexplate.



A0011180

Fig. 203: Locating Flexplate Bolts
Courtesy of FORD MOTOR CO.

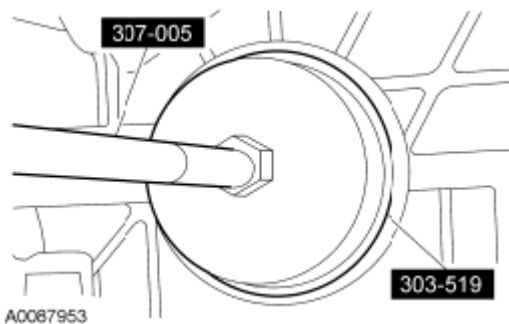
2. Remove the engine-to-transaxle separator plate.



N0041738

Fig. 204: Locating Engine-To-Transaxle Separator Plate
Courtesy of FORD MOTOR CO.

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



A0087953

Fig. 205: Removing Crankshaft Rear Oil Seal

Courtesy of FORD MOTOR CO.

4. Mount the engine on a suitable stand.
5. Detach the 2 B+ wiring harness retainers from the valve cover stud bolts.

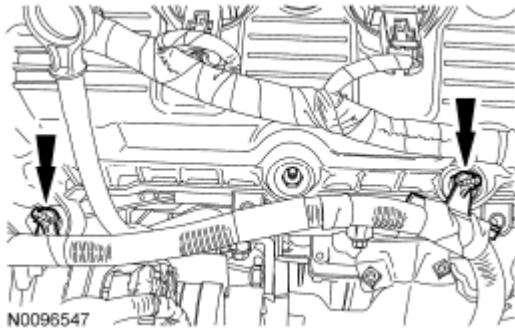


Fig. 206: Locating B+ Wiring Harness Retainers From Valve Cover Stud Bolts
Courtesy of FORD MOTOR CO.

6. Disconnect the A/C compressor clutch electrical connector.

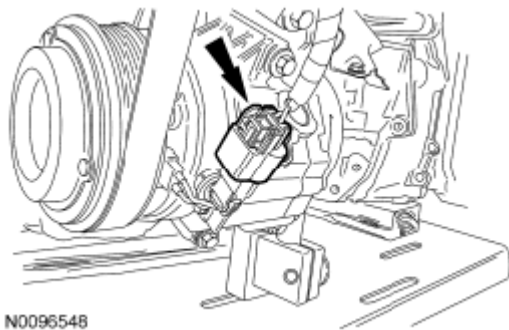


Fig. 207: Locating A/C Compressor Clutch Electrical Connector
Courtesy of FORD MOTOR CO.

7. Disconnect the generator electrical connector.

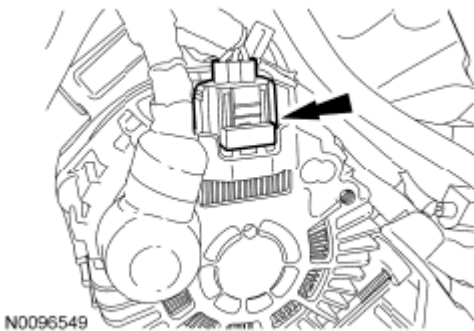


Fig. 208: Locating Generator Electrical Connector
Courtesy of FORD MOTOR CO.

8. Remove the nut and the B+ wire from the generator.
 - Remove the B+ harness from the engine.



Fig. 209: Locating Generator Bolt & Nuts
Courtesy of FORD MOTOR CO.

9. Disconnect the 3 engine wiring connectors.
 - Disconnect the engine block Knock Sensor (KS) electrical connector.
 - Disconnect the Cylinder Head Temperature (CHT) sensor electrical connector.
 - Disconnect the cylinder head **KS** electrical connector.

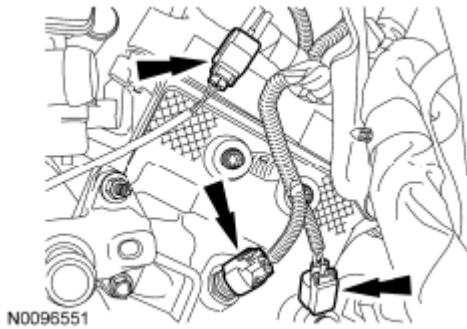


Fig. 210: Locating Cylinder Head Temperature (CHT) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

10. Disconnect the electronic throttle control electrical connector.

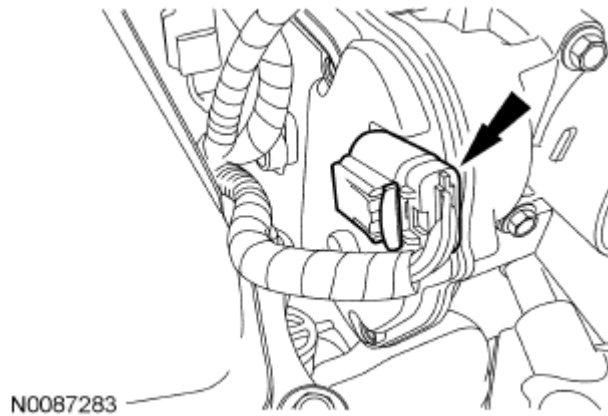


Fig. 211: Locating Electronic Throttle Control Electrical Connector
Courtesy of FORD MOTOR CO.

11. Disconnect the Evaporative Emission (EVAP) canister purge valve electrical connector.

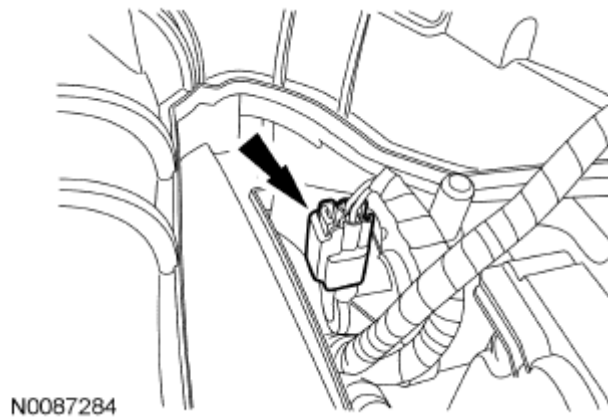


Fig. 212: Locating Evaporative Emission Canister Purge Valve Electrical Connector
Courtesy of FORD MOTOR CO.

12. Disconnect the EGR regulator electrical connector and detach the wiring retainer.

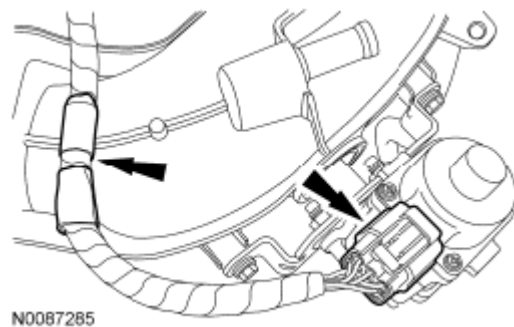


Fig. 213: Locating EGR Regulator Electrical Connector & Wiring Retainer
Courtesy of FORD MOTOR CO.

13. Disconnect the PCV valve electrical connector.

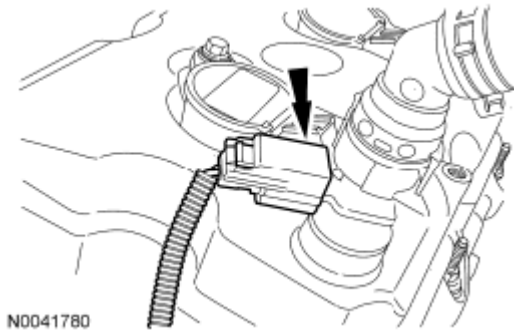


Fig. 214: Locating PCV Valve Electrical Connector
Courtesy of FORD MOTOR CO.

14. Detach the wiring harness retainer from the upper intake manifold.

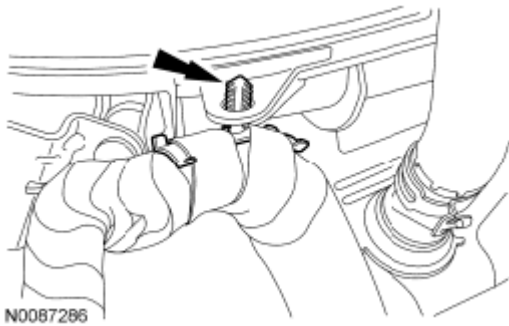


Fig. 215: Locating Wiring Harness Retainer From Upper Intake Manifold
Courtesy of FORD MOTOR CO.

15. Disconnect the Manifold Absolute Pressure (MAP) electrical connector and detach the wiring retainer.

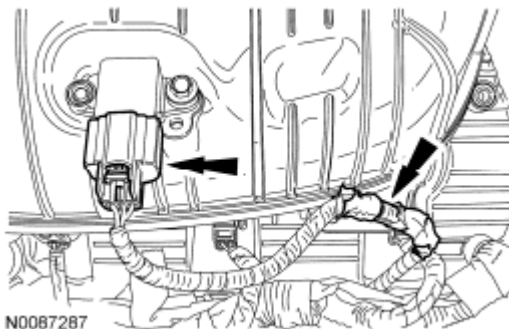


Fig. 216: Locating MAP Electrical Connector & Wiring Retainer
Courtesy of FORD MOTOR CO.

16. Disconnect the RH coil-on-plug electrical connectors.
 - Detach the 2 wiring harness retainers.

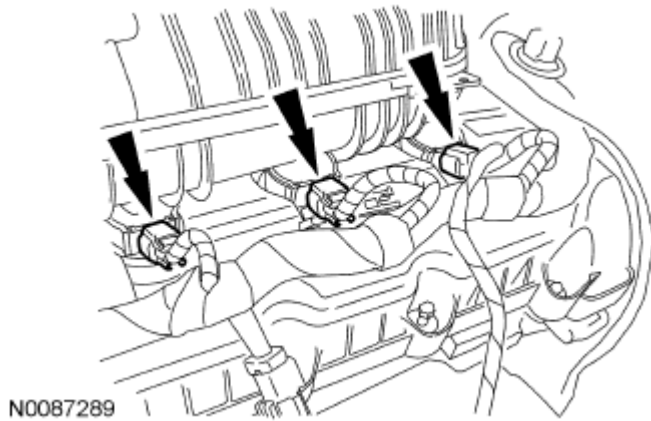


Fig. 217: Locating RH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

17. Disconnect the RH Variable Camshaft Timing (VCT) electrical connector and detach the wiring harness retainer from the valve cover stud bolt.

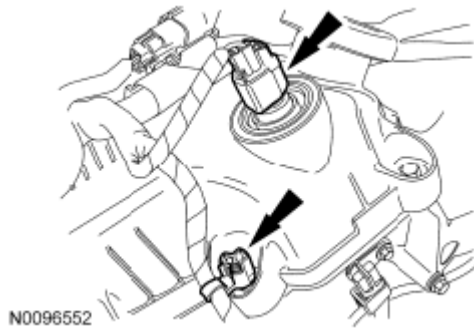


Fig. 218: Locating RH VCT Electrical Connector & Wiring Harness Retainer From Valve Cover Stud Bolt
Courtesy of FORD MOTOR CO.

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

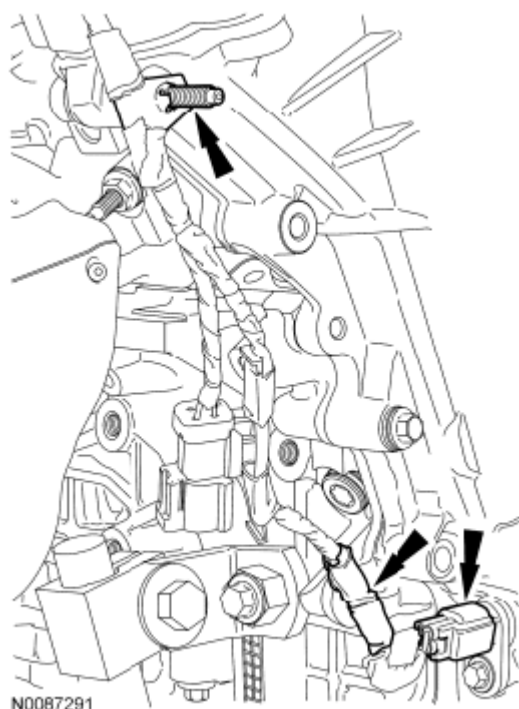


Fig. 219: Locating Crankshaft Position (CKP) Sensor Electrical Connector & Wiring Harness Retainers

Courtesy of FORD MOTOR CO.

19. Disconnect the 2 Camshaft Position (CMP) sensor electrical connectors and detach the wiring harness retainer from the engine front cover stud bolt.

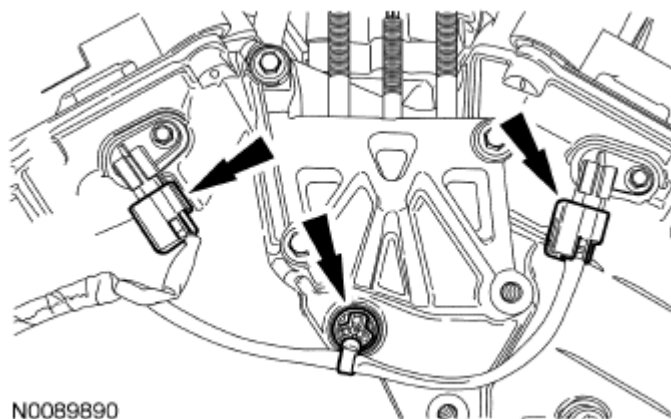


Fig. 220: Locating Camshaft Position Sensor Electrical Connectors

Courtesy of FORD MOTOR CO.

20. Disconnect the fuel injector wiring harness electrical connector and detach the wiring harness retainer.

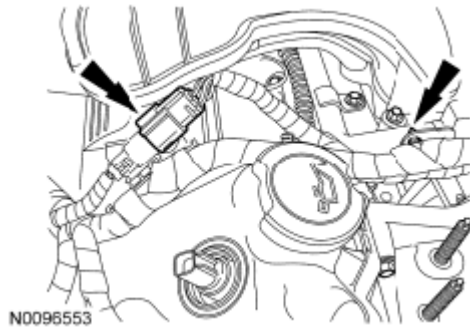


Fig. 221: Locating Fuel Injector Wiring Harness Electrical Connector & Wiring Harness Retainer
Courtesy of FORD MOTOR CO.

21. Disconnect the LH VCT electrical connector.

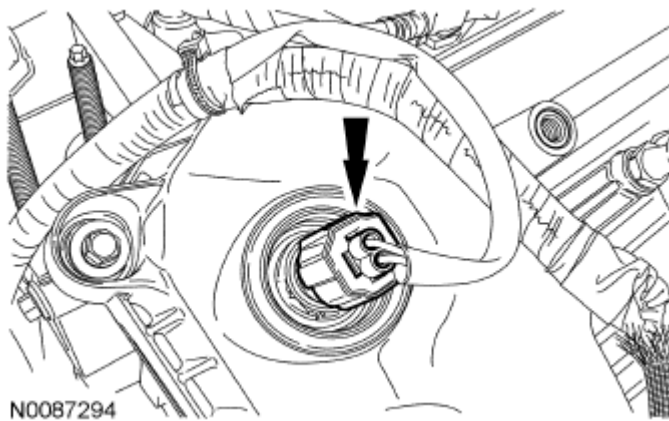


Fig. 222: Locating LH VCT Electrical Connector
Courtesy of FORD MOTOR CO.

22. Remove the nut and the radio frequency interference capacitor.

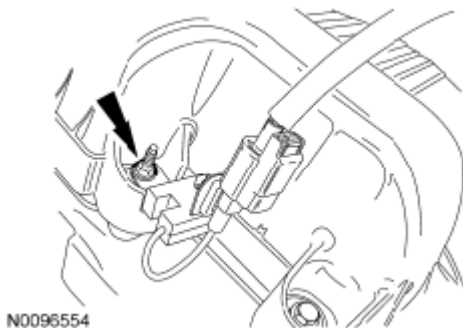


Fig. 223: Locating Radio Frequency Interference Capacitor & Nut
Courtesy of FORD MOTOR CO.

23. Disconnect the Engine Oil Pressure (EOP) switch electrical connector and detach the wiring retainer from the oil indicator tube.

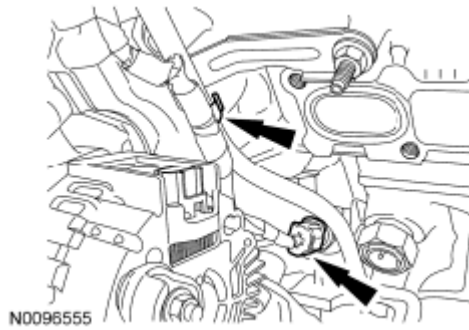


Fig. 224: Locating EOP Switch Electrical Connector & Wiring Retainer From Oil Indicator Tube
Courtesy of FORD MOTOR CO.

24. Disconnect the 3 LH coil-on-plug electrical connectors.
 - Detach the 2 wiring harness retainers.

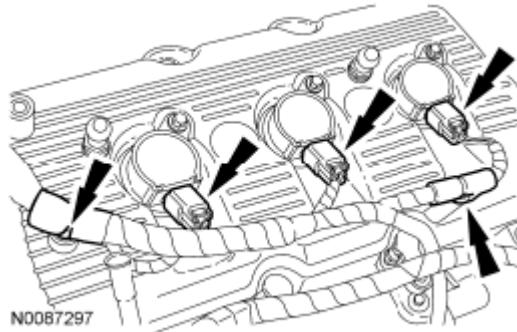


Fig. 225: Locating LH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

25. Remove the 2 upper intake manifold bracket bolts (1 shown).

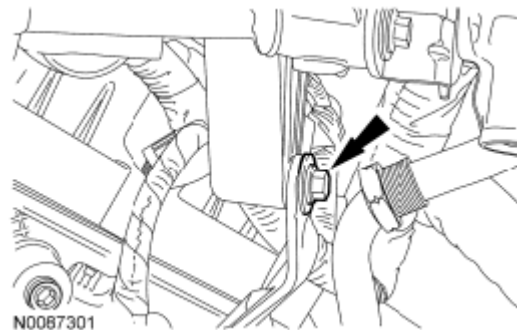


Fig. 226: Locating Upper Intake Manifold Bracket Bolts
Courtesy of FORD MOTOR CO.

26. Remove the 7 bolts and the upper intake manifold.
 - Remove and discard the gaskets.

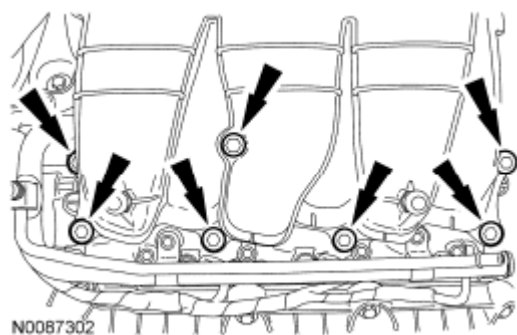


Fig. 227: Locating Upper Intake Manifold & Bolts
Courtesy of FORD MOTOR CO.

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

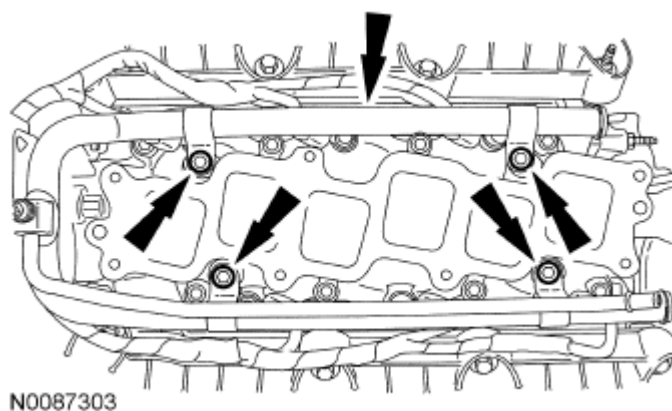


Fig. 228: Locating Fuel Rail & Injectors Assembly Bolts
Courtesy of FORD MOTOR CO.

28. Remove the 8 lower intake manifold bolts and the lower intake manifold.
- Remove and discard the gaskets.

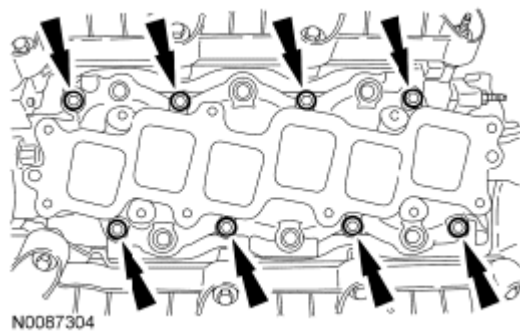


Fig. 229: Locating Lower Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

FWD vehicles

29. Remove the 3 bolts and the RH heat shield.

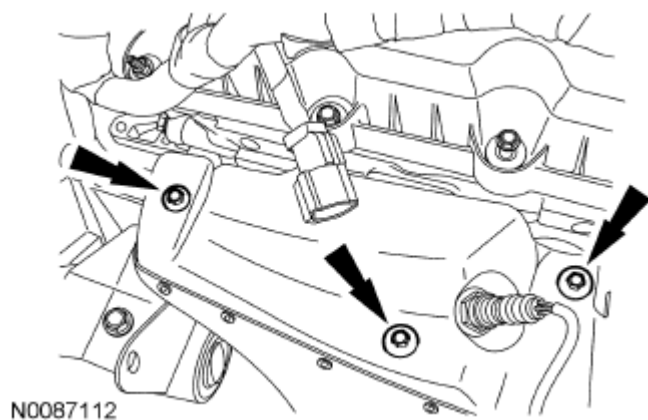


Fig. 230: Locating RH Heat Shield Bolts
Courtesy of FORD MOTOR CO.

30. Remove the 3 nuts and the RH catalytic converter.
- Discard the nuts and gasket.

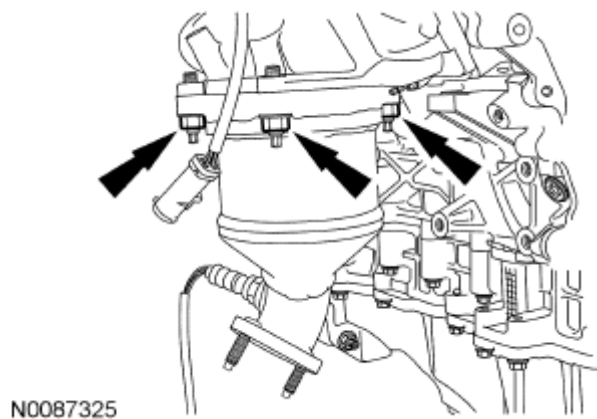


Fig. 231: Locating RH Catalytic Converter Nut
Courtesy of FORD MOTOR CO.

All engines

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

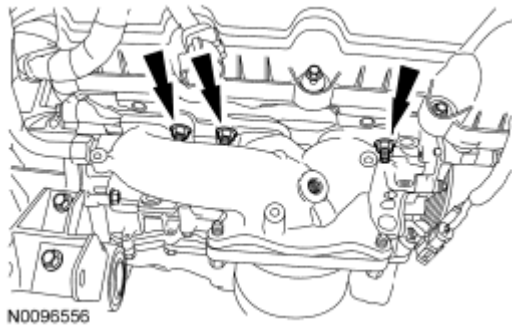


Fig. 232: Locating RH Exhaust Manifold Nuts
Courtesy of FORD MOTOR CO.

32. Clean and inspect the RH catalytic converter manifold. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.
33. Remove and discard the 6 RH catalytic converter manifold studs.

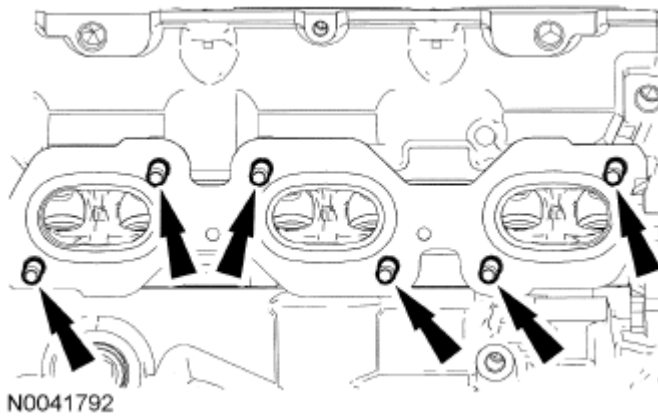


Fig. 233: Locating Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

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

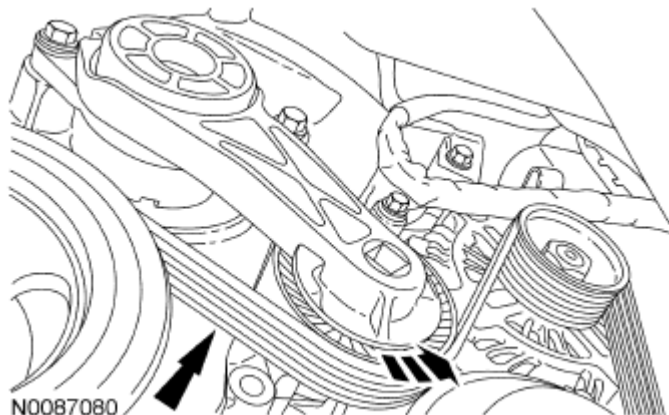


Fig. 234: Locating Accessory Drive Belt
Courtesy of FORD MOTOR CO.

35. Remove the 3 bolts and the A/C compressor.

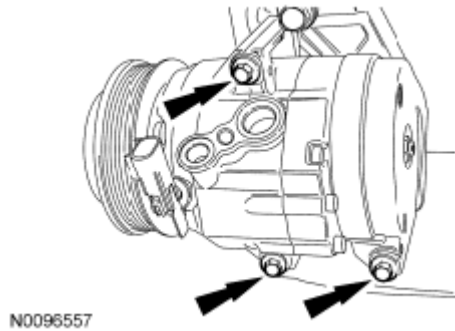


Fig. 235: Locating A/C Compressor & Bolts
Courtesy of FORD MOTOR CO.

36. Remove the bolt, 2 nuts and the generator.

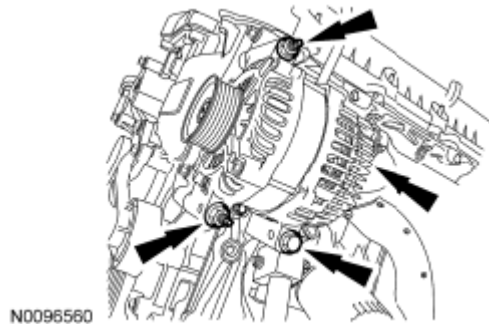


Fig. 236: Locating Generator With Bolt & Nuts
Courtesy of FORD MOTOR CO.

37. Remove the 3 bolts and the A/C compressor bracket.

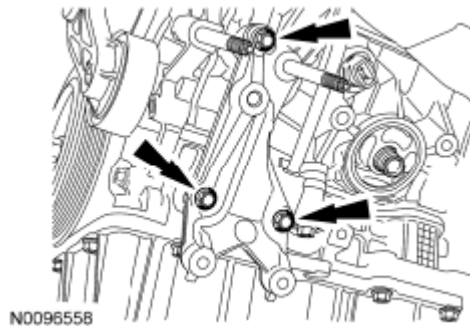


Fig. 237: Locating A/C Compressor Bracket & Bolts
Courtesy of FORD MOTOR CO.

38. Position the Stretchy Belt Remover under the coolant pump belt as shown.

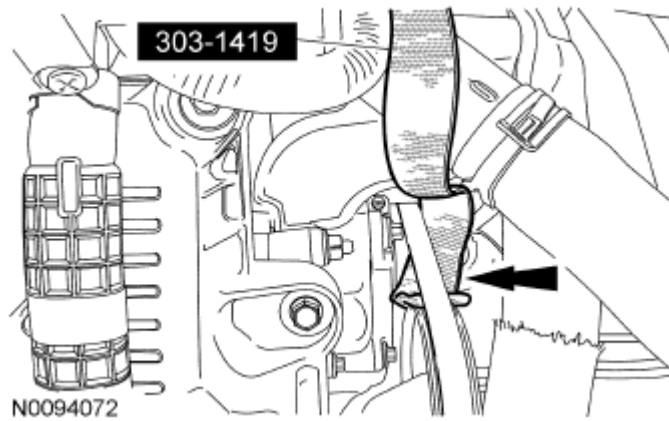


Fig. 238: Positioning Stretchy Belt Remover
Courtesy of FORD MOTOR CO.

39. Turn the crankshaft clockwise and feed the Stretchy Belt Remover evenly on the camshaft coolant pump pulley as shown.

NOTE: Feed the Stretchy Belt Remover on to the camshaft coolant pump pulley 90 degrees.

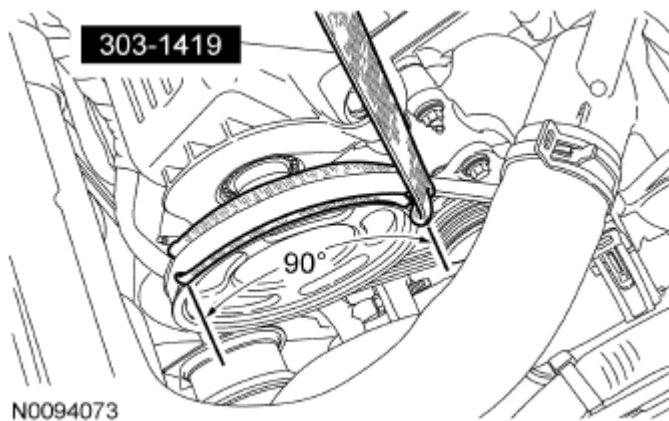


Fig. 239: Identifying Stretchy Belt Remover
Courtesy of FORD MOTOR CO.

40. Remove the coolant pump belt.
- Fold the Stretchy Belt Remover over the top of the coolant pump belt.
 - In one quick motion, pull the Stretchy Belt Remover up and toward the front of the engine removing the coolant pump belt.



Fig. 240: Removing Coolant Pump Belt
Courtesy of FORD MOTOR CO.

41. Using the Water Pump Pulley Plate, Water Pump Shaft Protector and the Crankshaft Vibration Damper Remover, remove the coolant pump pulley.

NOTE: Failure to use the correct special tools, assembled as shown below, will result in damage to the coolant pump pulley and/or special tools.

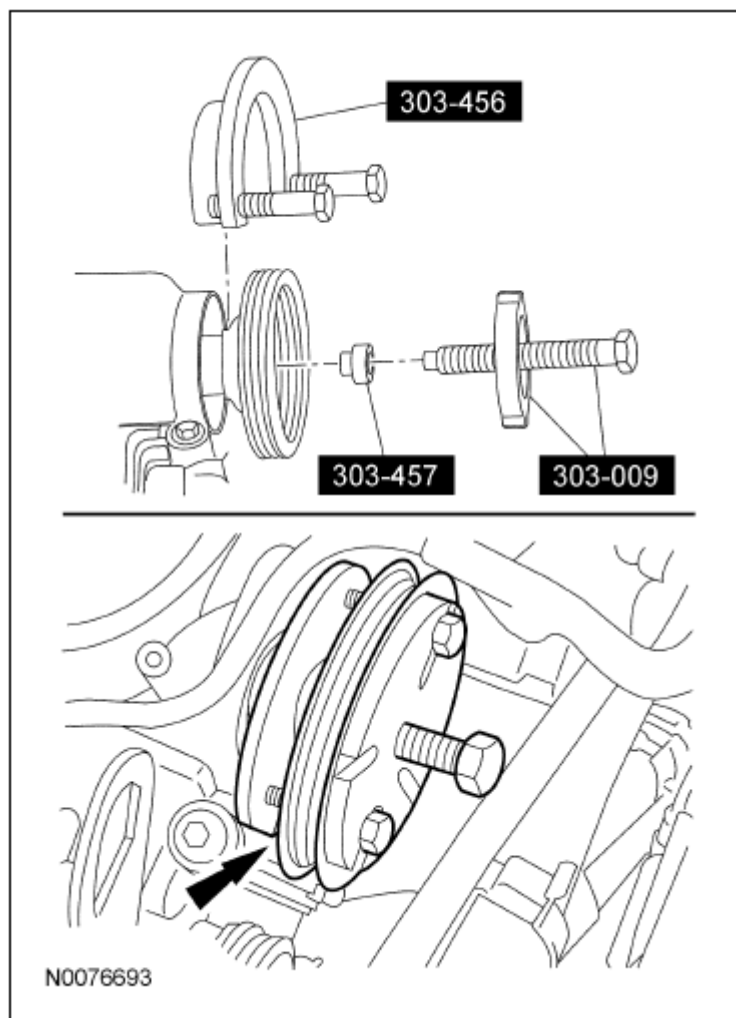


Fig. 241: Removing Coolant Pump Pulley
Courtesy of FORD MOTOR CO.

42. Remove the 5 coolant pump housing bolts.

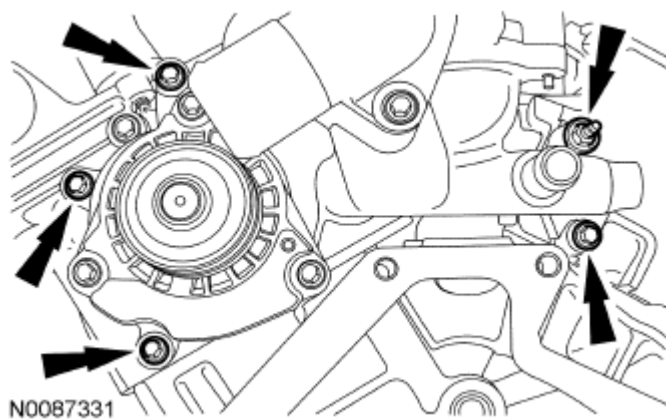


Fig. 242: Identifying Coolant Pump Housing Bolts

Courtesy of FORD MOTOR CO.

43. Loosen the clamp and detach the coolant hose.
 - Remove the coolant pump housing.

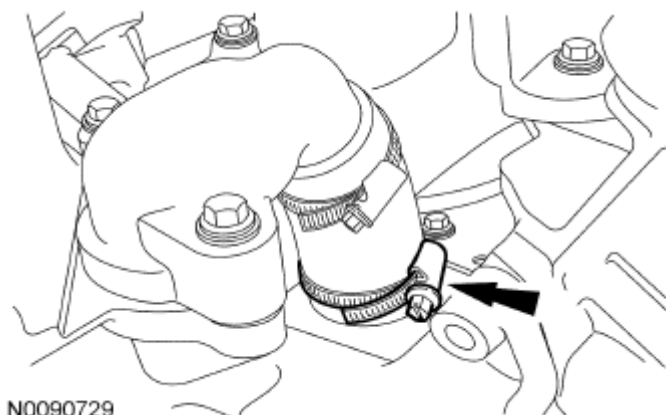


Fig. 243: Identifying Coolant Hose Clamp
Courtesy of FORD MOTOR CO.

44. Remove the stud bolt and the oil level indicator and tube.
 - Remove and discard the O-ring seal.

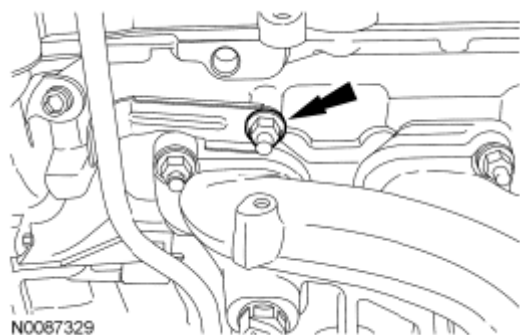


Fig. 244: Locating Oil Level Indicator & Tube With Stud Bolt
Courtesy of FORD MOTOR CO.

45. Remove the EOP switch and, if equipped, the block heater.

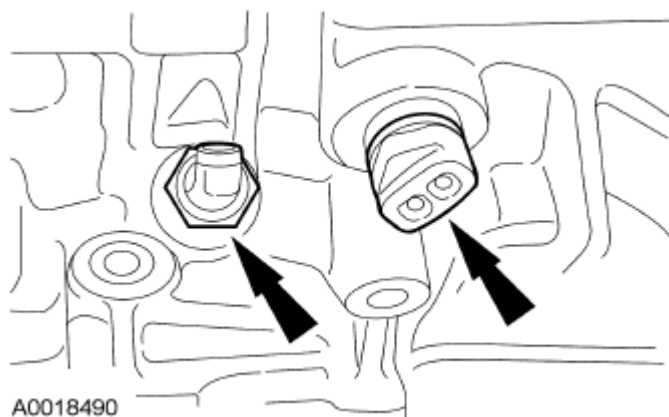


Fig. 245: Locating EOP Switch
Courtesy of FORD MOTOR CO.

46. Remove the bolts and the RH valve cover.
 - Discard the gasket.

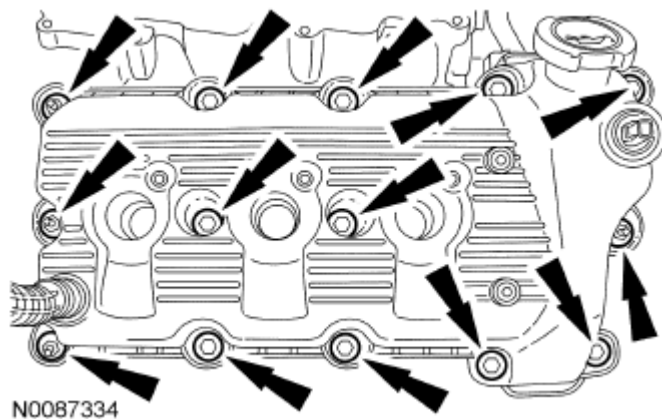


Fig. 246: Locating RH Valve Cover With Bolts
Courtesy of FORD MOTOR CO.

47. Remove the bolts and the LH valve cover.
 - Discard the gasket.

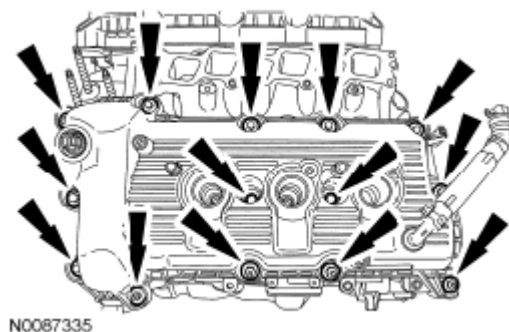


Fig. 247: Locating LH Valve Cover With Bolts
Courtesy of FORD MOTOR CO.

48. Remove the 15 bolts and the oil pan.
 - Discard the gasket.

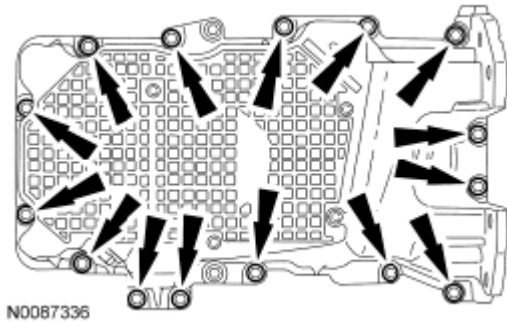


Fig. 248: Locating LH Valve Cover With Bolts
Courtesy of FORD MOTOR CO.

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

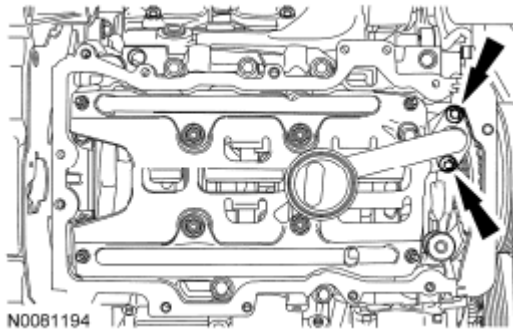


Fig. 249: Locating Oil Pump Screen & Pickup Tube With Bolts
Courtesy of FORD MOTOR CO.

50. Remove and discard the O-ring seal.

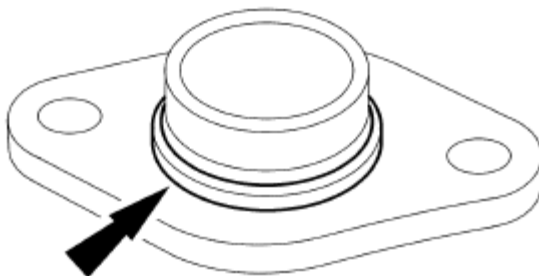


Fig. 250: Locating O-Ring Seal
Courtesy of FORD MOTOR CO.

51. Remove the oil pan baffle.
 1. Remove the 4 M6 oil pan baffle nuts.
 2. Remove the 4 M8 oil pan baffle nuts.

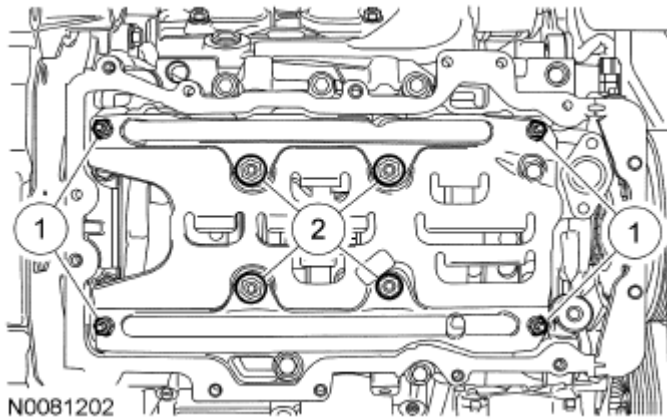


Fig. 251: Identifying Oil Pan Baffle Nuts
Courtesy of FORD MOTOR CO.

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

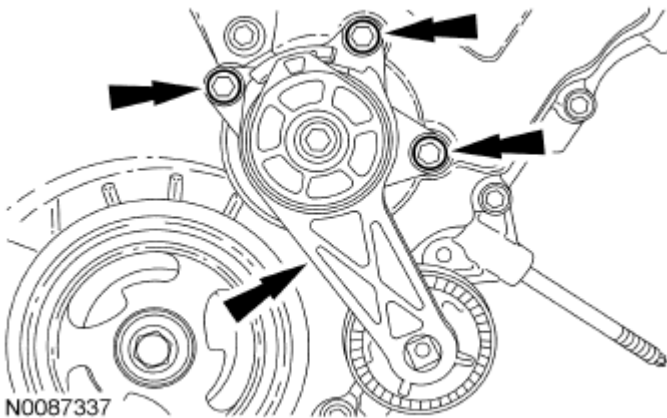


Fig. 252: Locating Accessory Drive Belt Tensioner With Bolts
Courtesy of FORD MOTOR CO.

53. Remove the crankshaft pulley bolt and washer.
 - Discard the crankshaft pulley bolt.

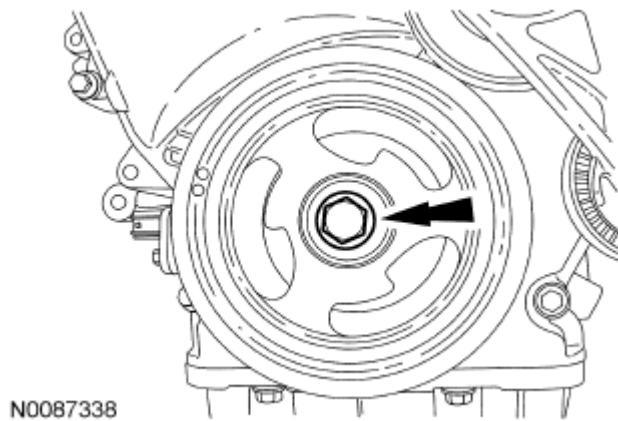


Fig. 253: Locating Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

54. Using the 3 Jaw Puller, remove the crankshaft pulley.

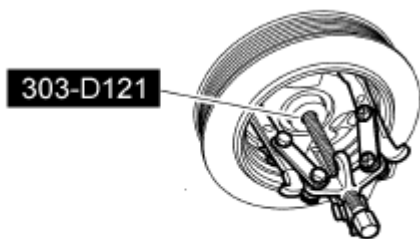


Fig. 254: Identifying 3-Jaw Puller (303-D121) On Crankshaft Pulley
Courtesy of FORD MOTOR CO.

55. Using the Oil Seal Remover, remove and discard the crankshaft front seal.

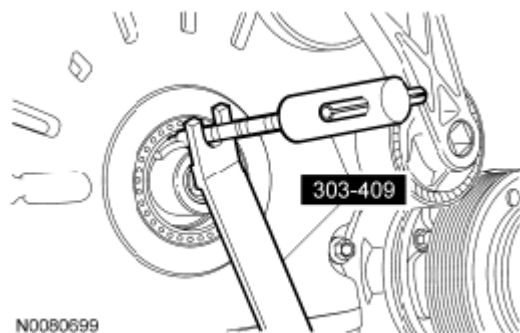


Fig. 255: Removing Crankshaft Front Seal
Courtesy of FORD MOTOR CO.

56. Remove the 2 bolts and the LH VCT .

NOTE: Note the position of the alignment dowel on the engine front cover.

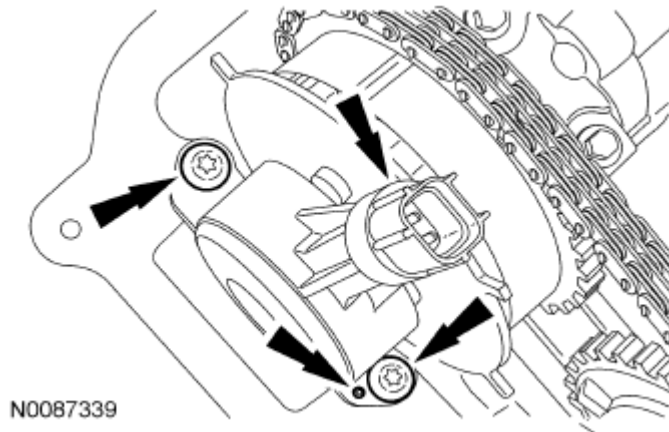


Fig. 256: Locating LH VCT Connector With Bolts
Courtesy of FORD MOTOR CO.

57. Remove the 2 bolts and the RH VCT .

NOTE: Note the position of the alignment dowel on the engine front cover.

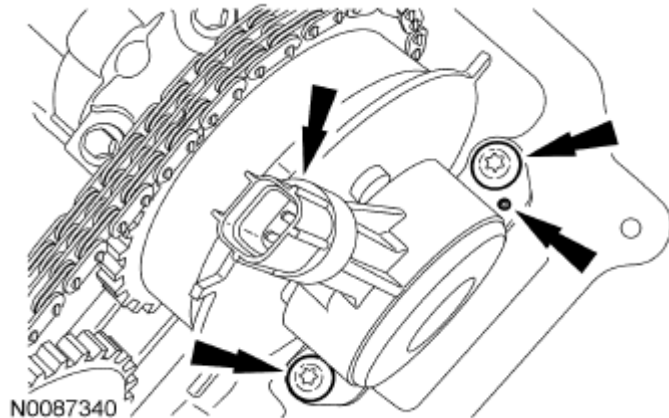


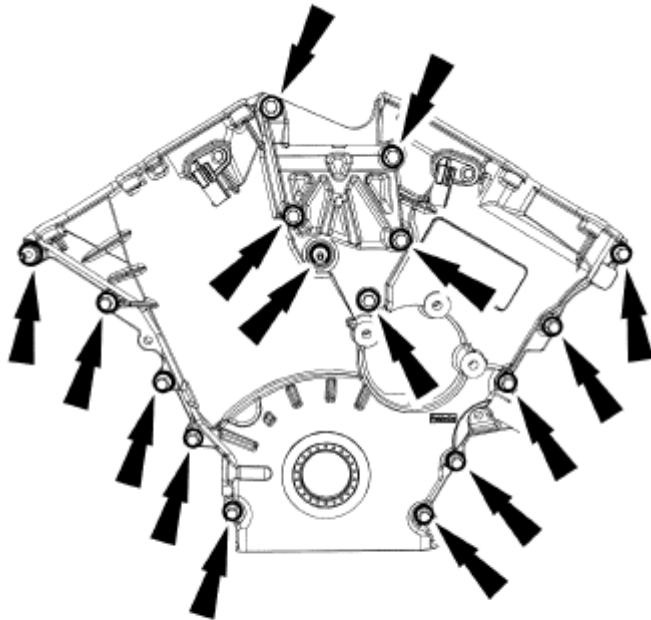
Fig. 257: Locating RH VCT With Bolts
Courtesy of FORD MOTOR CO.

58. Remove the 14 bolts, 2 stud bolts and the engine front cover.

- Discard the gaskets.

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

NOTE: Note the location of all bolts and stud bolts for installation.



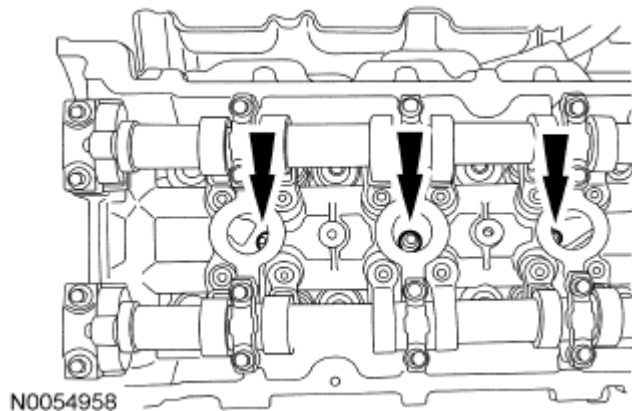
N0089881

Fig. 258: Identifying Engine Front Cover & Stud Bolts
 Courtesy of FORD MOTOR CO.

59. Remove the LH and RH spark plugs.

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

NOTE: LH shown, RH similar.



N0054958

Fig. 259: Locating Spark Plugs
Courtesy of FORD MOTOR CO.

60. Remove the ignition pulse wheel.

NOTE: This pulse wheel is used in several different engines. Install the pulse wheel with the keyway in the slot stamped "30RFF" (orange in color).

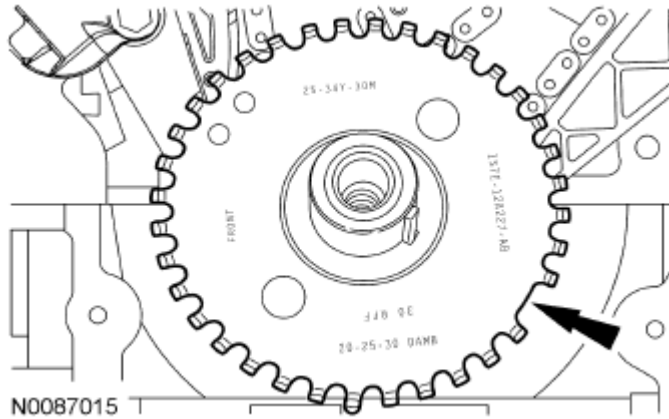


Fig. 260: Locating Ignition Pulse Wheel
Courtesy of FORD MOTOR CO.

61. Install the crankshaft pulley bolt and washer.

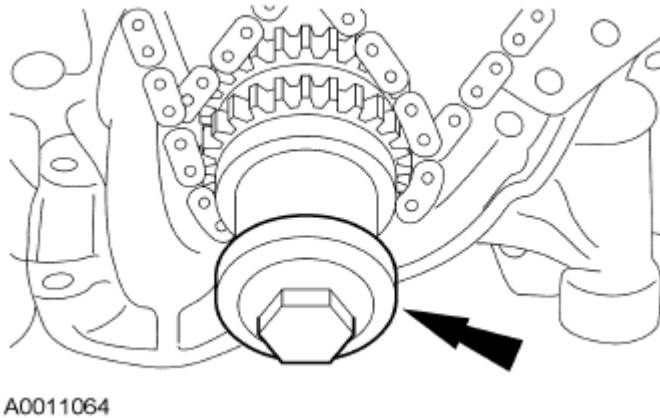
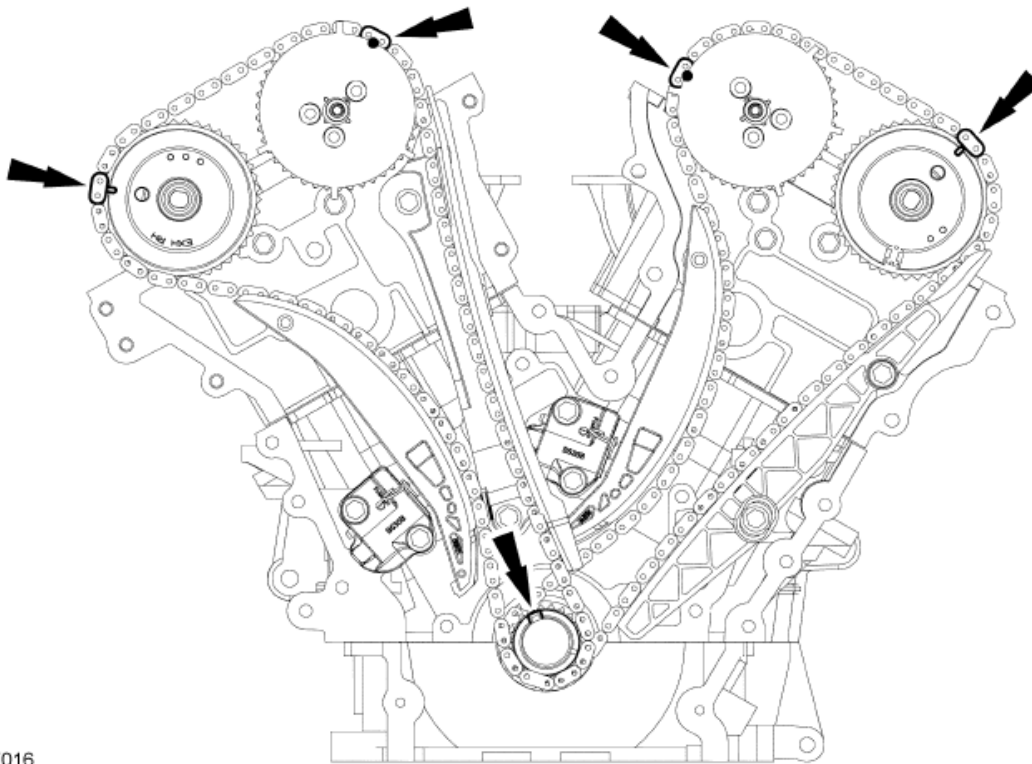


Fig. 261: Identifying Crankshaft Pulley Bolt & Washer
Courtesy of FORD MOTOR CO.

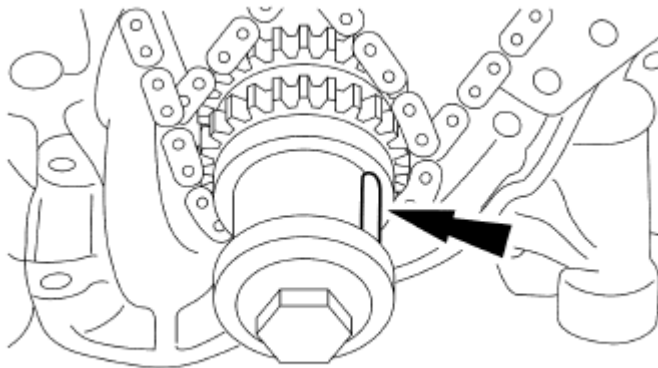
62. Rotate the crankshaft clockwise to position the crankshaft keyway in the 11 o'clock position and position the camshafts in the correct position. This will position the No. 1 cylinder at Top Dead Center (TDC).
- Verify that the camshafts are correctly located. If not, rotate the crankshaft one additional turn and recheck.



N0087016

Fig. 262: Identifying Timing Mark Location
Courtesy of FORD MOTOR CO.

63. Rotate the crankshaft clockwise 120 degrees to the 3 o'clock position to position the RH camshafts in the neutral position.



A0011067

Fig. 263: Identifying Crankshaft Keyway
Courtesy of FORD MOTOR CO.

64. Verify that the RH camshafts are in the neutral position.

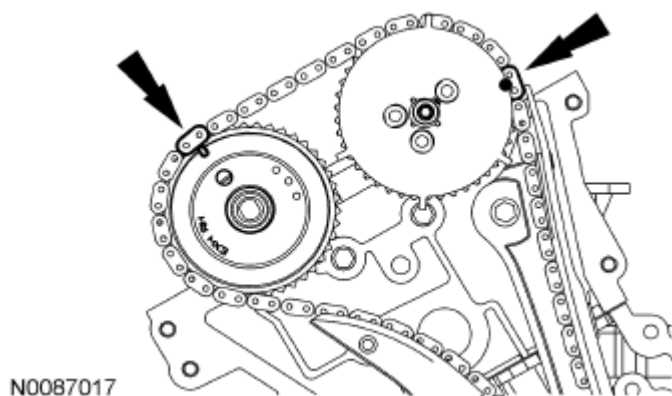


Fig. 264: Identifying Timing Mark On RH Camshafts
Courtesy of FORD MOTOR CO.

65. Remove the RH timing chain tensioner arm.
 1. Remove the 2 bolts.
 2. Remove the tensioner.
 3. Remove the tensioner arm.

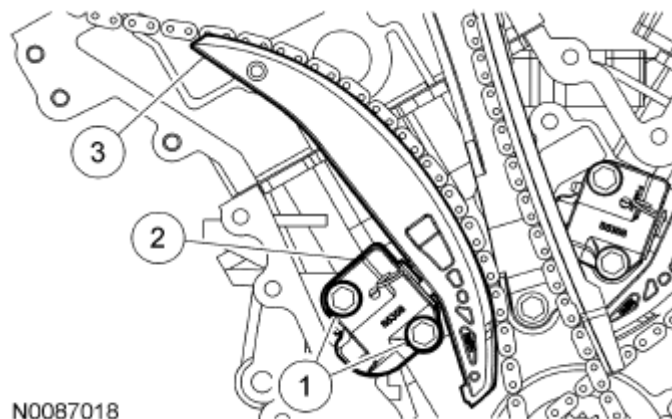


Fig. 265: Identifying RH Timing Chain Tensioner Arm With Bolts
Courtesy of FORD MOTOR CO.

66. Remove the 2 bolts and the RH timing chain guide.
 - Remove the RH timing chain from the engine.

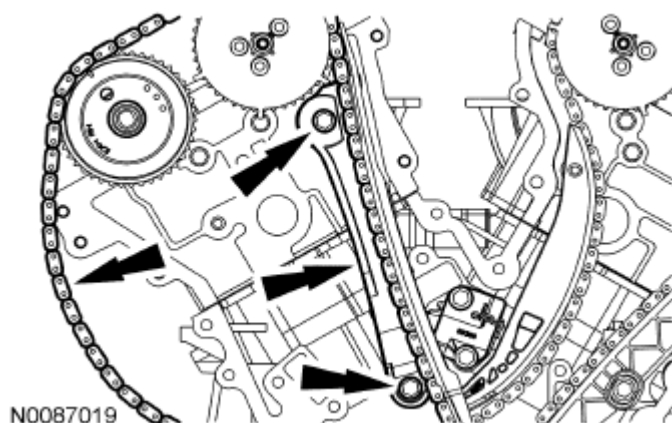


Fig. 266: Locating RH Timing Chain Guide & Bolts
Courtesy of FORD MOTOR CO.

67. Rotate the crankcase clockwise 600 degrees (one and two-thirds turns) to position the crankcase keyway in the 11 o'clock position. This will position the LH camshafts in the neutral position.

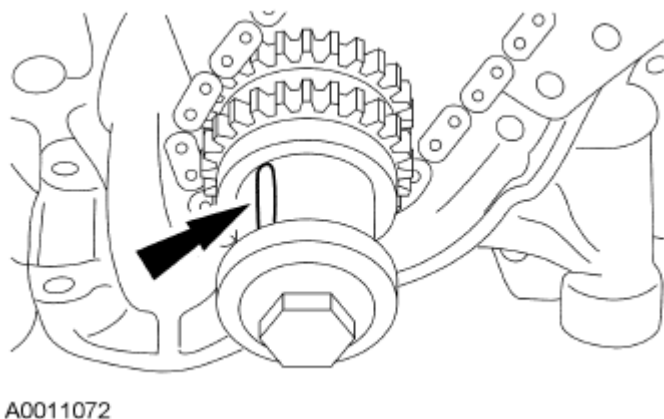


Fig. 267: Locating Crankcase Keyway
Courtesy of FORD MOTOR CO.

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

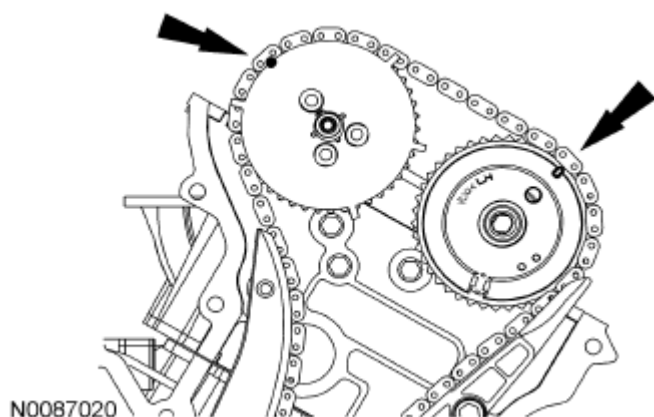


Fig. 268: Identifying Timing Mark On LH Camshafts
 Courtesy of FORD MOTOR CO.

69. Remove the LH timing chain and tensioner arm.
 1. Remove the 2 bolts.
 2. Remove the tensioner.
 3. Remove the tensioner arm.

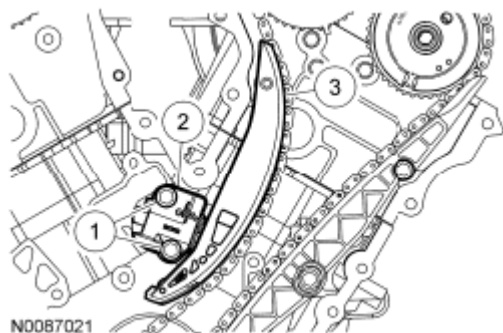


Fig. 269: Identifying LH Timing Chain & Tensioner Arm
 Courtesy of FORD MOTOR CO.

70. Remove the 2 bolts and the LH timing chain guide.
 - Remove the LH timing chain from the engine.

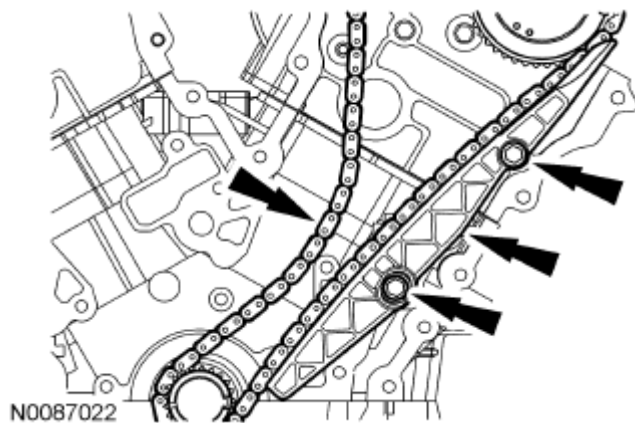


Fig. 270: Locating LH Timing Chain Guide With Bolts
 Courtesy of FORD MOTOR CO.

71. Remove the crankshaft pulley bolt and the crankshaft sprocket.

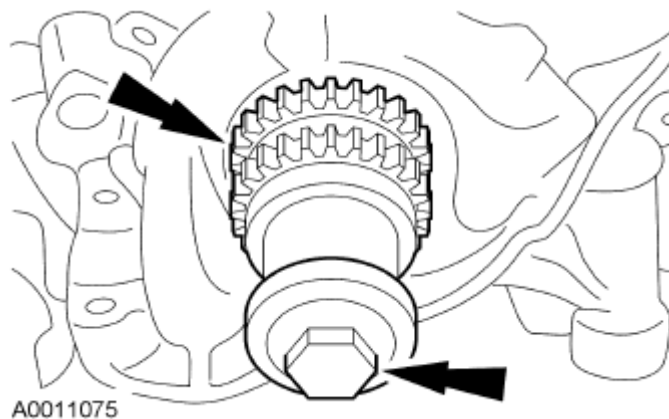


Fig. 271: Locating Crankshaft Pulley Bolt & Crankshaft Sprocket
 Courtesy of FORD MOTOR CO.

72. Remove the 4 bolts in the sequence shown below.
 - Remove the oil pump.

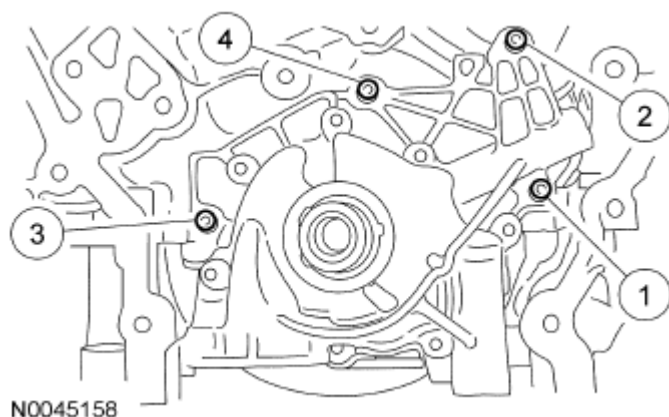


Fig. 272: Identifying Oil Pump Bolts
Courtesy of FORD MOTOR CO.

73. Using the Oil Seal Remover, remove the camshaft oil seal and discard.

NOTE: Do not scratch the camshaft sealing surface while removing the camshaft oil seal. If scratched, camshaft oil seal leakage may occur.

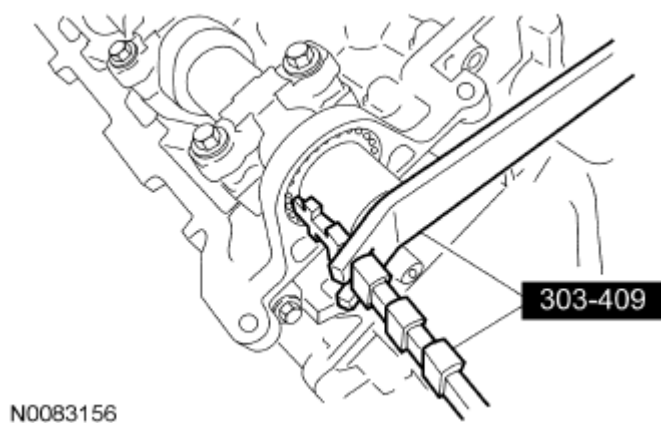


Fig. 273: Removing Camshaft Oil Seal
Courtesy of FORD MOTOR CO.

74. Remove the 2 bolts and the camshaft oil seal retainer.
- Discard the press-in-place gasket.

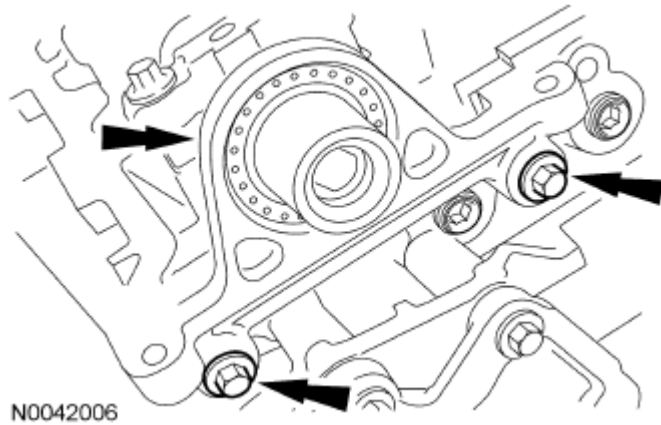


Fig. 274: Locating Camshaft Oil Seal Retainer With Bolts
Courtesy of FORD MOTOR CO.

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

NOTE: The camshafts must be in the neutral position before removing the bearing caps or damage to the engine may occur.

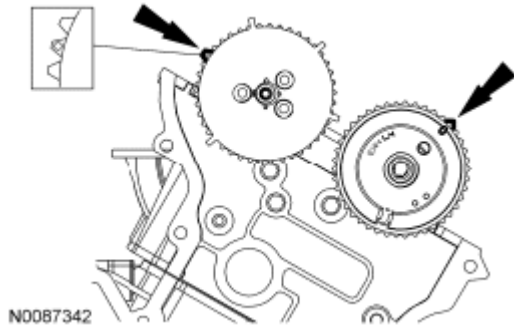


Fig. 275: Locating LH Camshafts In Neutral Position
Courtesy of FORD MOTOR CO.

76. Remove the 3 bolts and the LH camshaft phaser and sprocket.

NOTE: Do not allow the camshaft to rotate from the neutral position while removing the camshaft phaser and sprocket or damage to the engine may occur.

NOTE: Install a 3/8-in ratchet and extension into the D-slot on the rear of the intake camshaft to hold the camshaft in place for removal of the camshaft phaser and sprocket bolts.

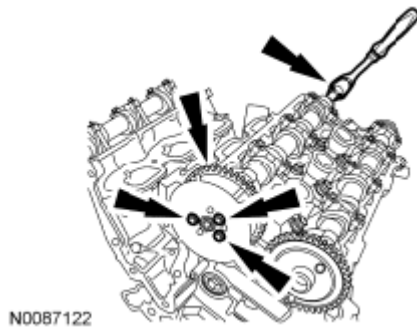


Fig. 276: Locating LH Camshaft Phaser & Sprocket With Bolts
Courtesy of FORD MOTOR CO.

77. Remove and discard the VCT system oil filter screen from the LH camshaft.

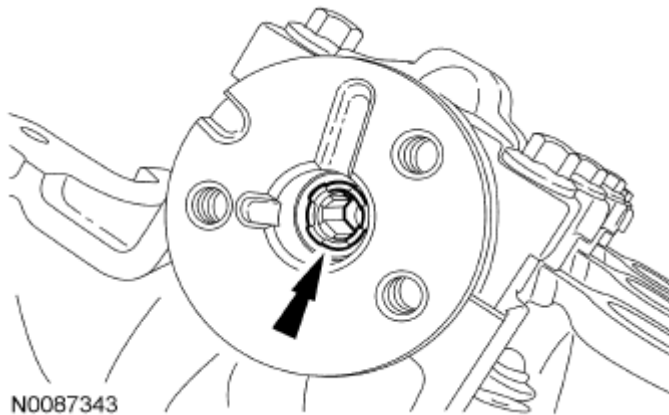
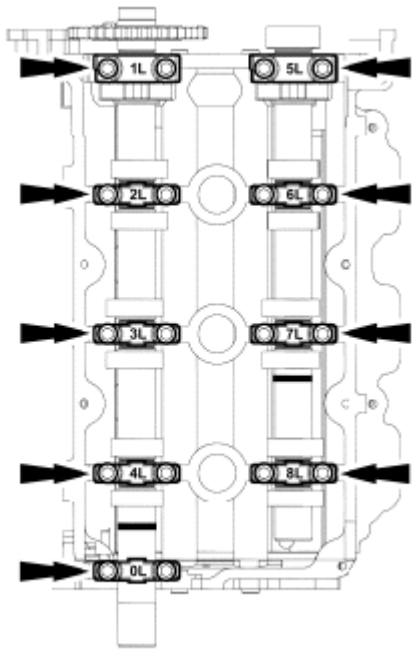


Fig. 277: Locating Oil Filter Screen
Courtesy of FORD MOTOR CO.

78. If necessary, mark the camshaft bearing cap position and orientation as shown below.

NOTE: Cylinder head camshaft bearing caps must be assembled in their original positions. Some engines have factory markings on the camshaft bearing caps (as shown below). Engines that do not have the factory markings must be marked for correct position and orientation prior to removal. Failure to install the camshaft bearing caps in their original positions may result in severe engine damage.



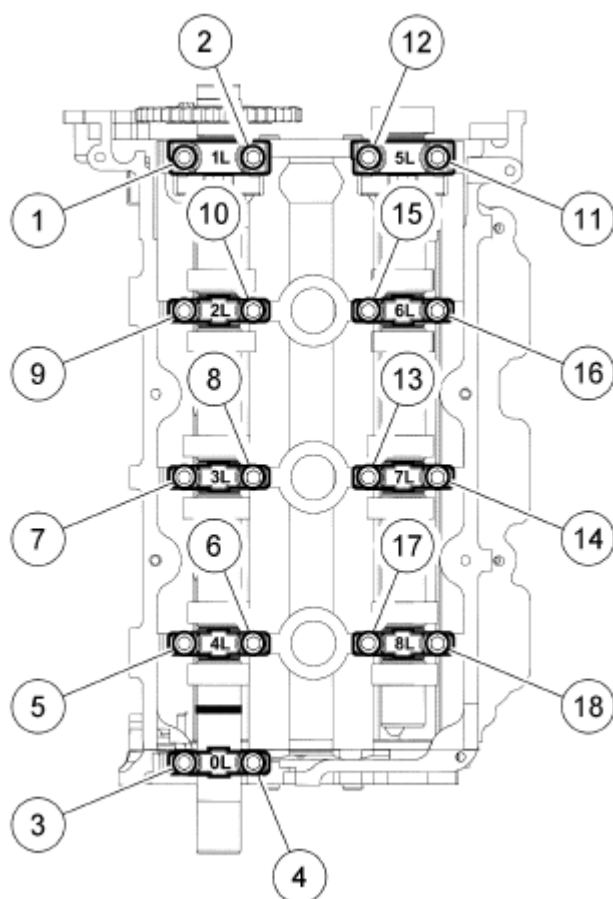
N0081817

Fig. 278: Locating Mark Camshaft Bearing Cap Position & Orientation
Courtesy of FORD MOTOR CO.

79. Loosen the bolts evenly in the sequence shown below.
 1. Remove the camshaft bearing thrust caps (1L and 5L).
 2. Remove the remaining camshaft bearing caps.
 3. Remove the camshafts from the cylinder head.

NOTE: After loosening all of the camshaft bearing cap bolts, remove the camshaft bearing thrust caps (1L and 5L) first, or damage to the thrust caps may occur.

NOTE: Make sure the camshaft bearing caps are marked as instructed in the previous step.

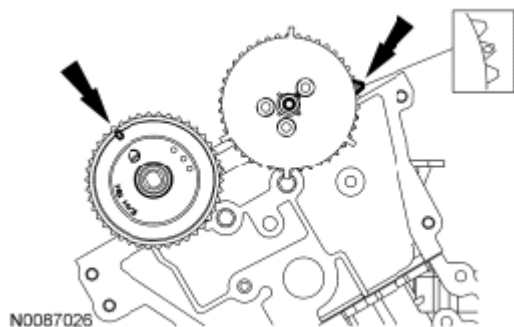


N0081818

Fig. 279: Identifying Camshaft Bearing Cap Bolts In Tightening Sequence
Courtesy of FORD MOTOR CO.

80. Verify the RH camshafts are in the neutral position.

NOTE: The camshafts must be in the neutral position before removing the bearing caps or damage to the engine may occur.



N0087026

Fig. 280: Locating RH Camshafts Correctly Position
Courtesy of FORD MOTOR CO.

81. Remove the 3 bolts and the RH camshaft phaser and sprocket.

NOTE: Do not allow the camshaft to rotate from the neutral position while removing the camshaft phaser and sprocket or damage to the engine may occur.

NOTE: Install a 3/8-in ratchet and extension into the D-slot on the rear of the intake camshaft to hold the camshaft in place for removal of the camshaft phaser and sprocket bolts.

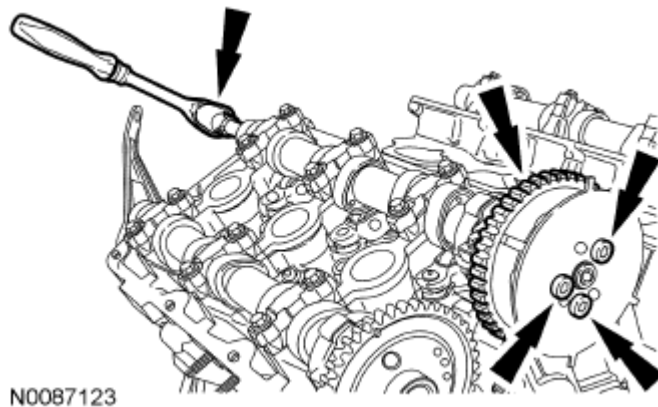


Fig. 281: Locating RH Camshaft Phaser & Sprocket Bolts
Courtesy of FORD MOTOR CO.

82. Remove and discard the VCT system oil filter screen from the RH camshaft.

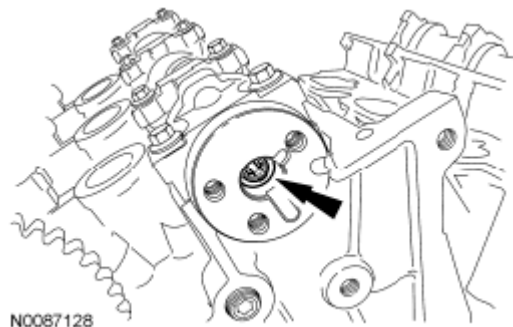
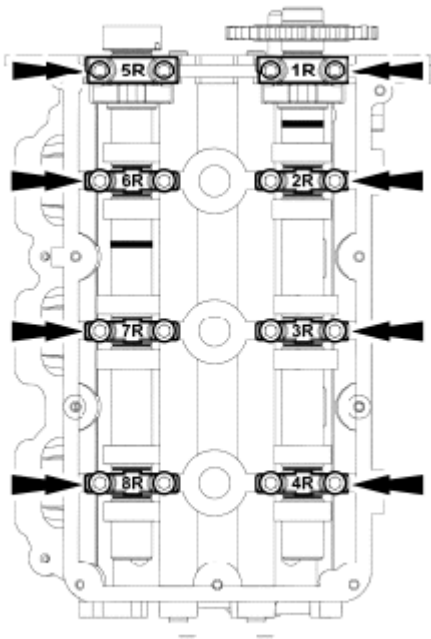


Fig. 282: Locating VCT System Oil Filter Screen From RH Camshaft
Courtesy of FORD MOTOR CO.

83. If necessary, mark the camshaft bearing cap position and orientation as shown below.

NOTE: Cylinder head camshaft bearing caps must be assembled in their original positions. Some engines have factory markings on the camshaft bearing caps (as shown below). Engines that do not have the factory markings must be marked for correct position and orientation prior to removal.

Failure to install the camshaft bearing caps in their original positions may result in severe engine damage.



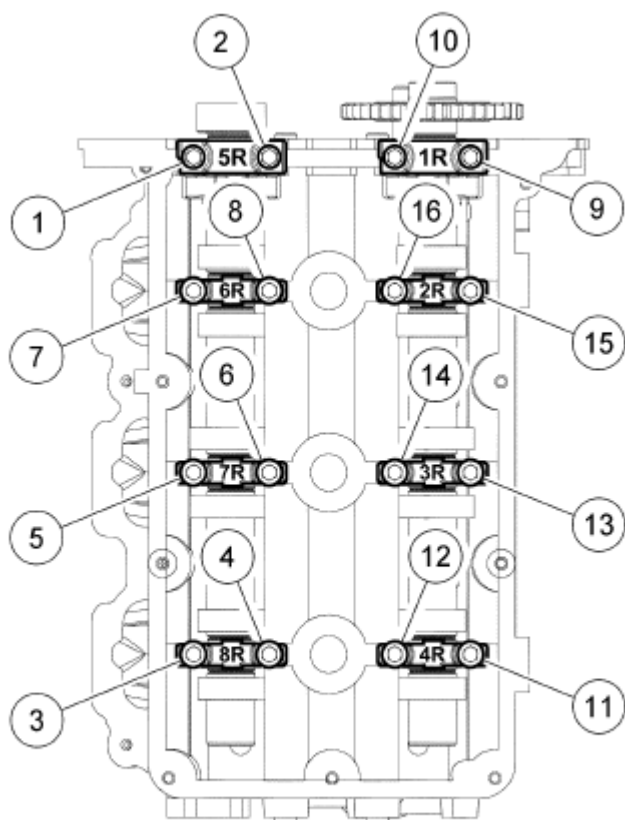
N0071867

Fig. 283: Locating Mark Camshaft Bearing Cap Position & Orientation
Courtesy of FORD MOTOR CO.

84. Loosen the bolts evenly in the sequence shown below.
1. Remove the camshaft bearing thrust caps (5R and 1R).
 2. Remove the remaining camshaft bearing caps.
 3. Remove the camshafts from the cylinder head.

NOTE: After loosening all of the camshaft bearing cap bolts, remove the camshaft bearing thrust caps (5R and 1R) first, or damage to the thrust caps may occur.

NOTE: Make sure the camshaft bearing caps are marked as instructed in the previous step.



N0053678

Fig. 284: Identifying Camshaft Bearing Caps Bolts In Tightening Sequence
Courtesy of FORD MOTOR CO.

85. Remove the LH and RH camshaft roller followers.
- Mark the location of the roller followers, using a permanent-type marker.

NOTE: The camshaft roller followers must be installed in their original positions. If not reassembled in their original positions, severe engine damage may occur.

NOTE: RH shown, LH similar.

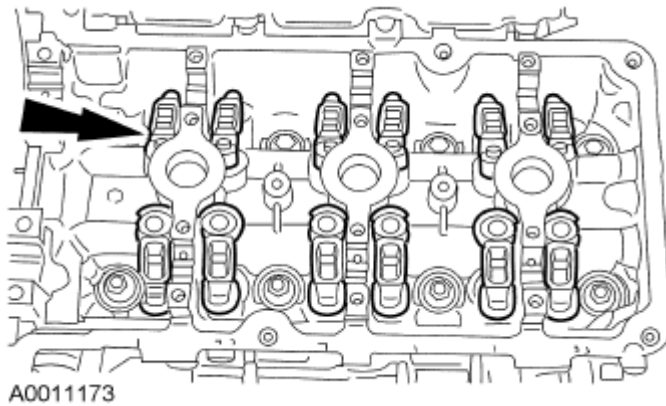


Fig. 285: Locating Camshaft Roller Followers
Courtesy of FORD MOTOR CO.

86. Remove the hydraulic lash adjusters.

NOTE: The hydraulic lash adjusters must be installed in their original positions. If not reassembled in their original positions, severe engine damage may occur.

87. Loosen the bolts in the indicated sequence and remove the LH and RH cylinder heads.
 - Discard the bolts and the gaskets.

NOTE: RH shown, LH similar.

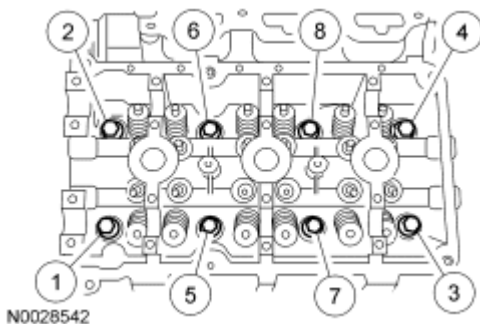


Fig. 286: Locating LH & RH Cylinder Heads Bolts In Loosening Sequence
Courtesy of FORD MOTOR CO.

88. Support the cylinder heads on a bench with the head gasket side up. Check the cylinder head distortion and the cylinder block distortion. For additional information, refer to **CYLINDER HEAD DISTORTION** and **CYLINDER BLOCK DISTORTION**.
89. Remove the bolts and the oil separator cover.
 - Discard the gasket.

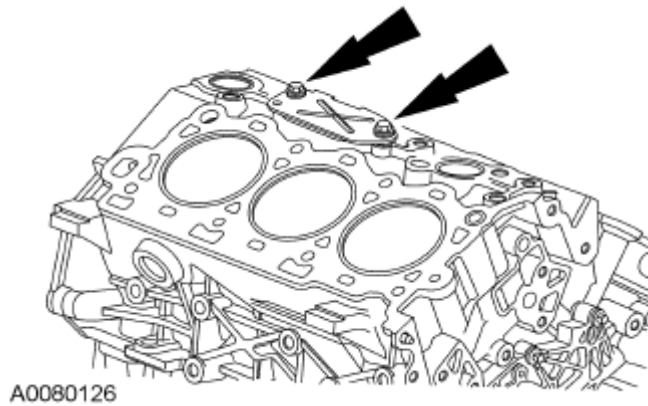


Fig. 287: Locating Crankcase Cover Bolts
 Courtesy of FORD MOTOR CO.

90. Remove the crankshaft key.

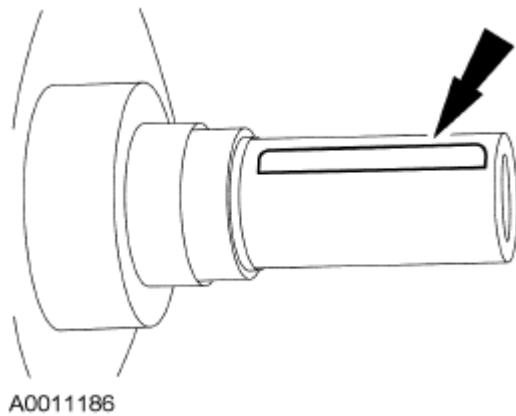


Fig. 288: Locating Crankshaft Key
 Courtesy of FORD MOTOR CO.

91. 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 manufacturer's instructions.
92. Remove the connecting rod cap bolts and cap.
 - Discard the connecting rod cap bolts.

NOTE: Clearly mark the position and orientation of the pistons, connecting rods, connecting rod caps and connecting rod bearings for reassembly.

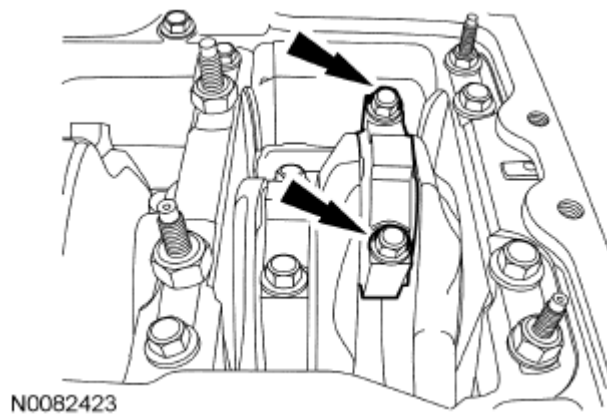


Fig. 289: Locating Connecting Rod Cap Bolts
Courtesy of FORD MOTOR CO.

93. Using the Connecting Rod Installer, remove the piston/rod assembly from the engine block.
 - Repeat these 2 steps until all the piston/rod assemblies are removed from the engine block.

NOTE: Do not scratch the cylinder walls or crankshaft journals with the connecting rod.

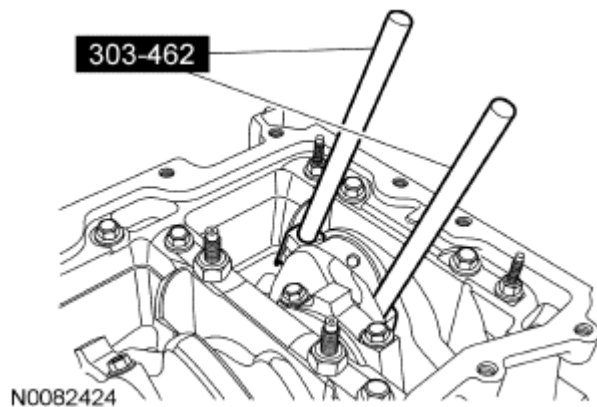


Fig. 290: Removing Piston/Rod Assembly
Courtesy of FORD MOTOR CO.

94. Remove the engine block from the stand and place on a workbench.
95. Remove the bolts and studs in the indicated sequence.
 - Discard the lower cylinder block bolts.
 - Remove the lower cylinder block.

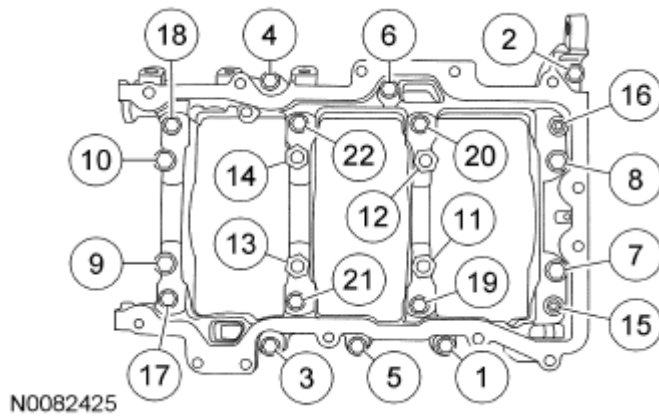


Fig. 291: Identifying Lower Cylinder Block Bolts & Studs In Sequence
Courtesy of FORD MOTOR CO.

96. Remove the crankshaft rear main seal.
 - Remove the crankshaft.

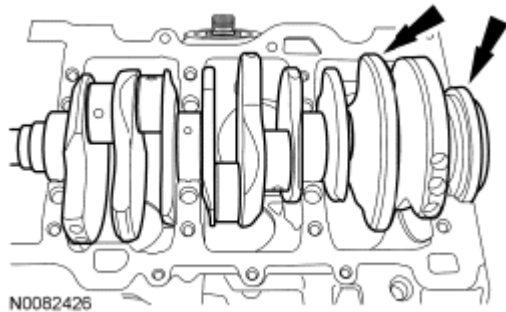


Fig. 292: Locating Crankshaft Rear Main Seal
Courtesy of FORD MOTOR CO.

97. Remove the crankshaft thrust bearing from the cylinder block.

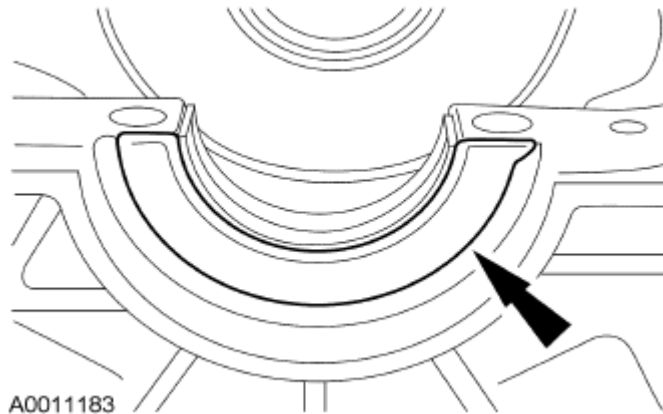


Fig. 293: Locating Crankshaft Thrust Bearing
Courtesy of FORD MOTOR CO.

98. Remove the bearings from the lower cylinder block.

NOTE: If the main bearings are being reused, mark them for correct position and orientation for reassembly.

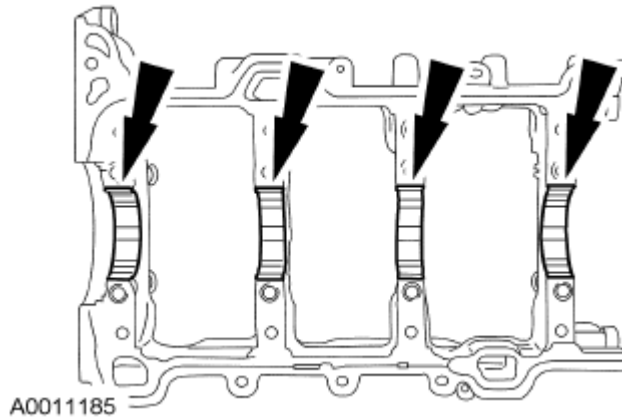


Fig. 294: Identifying Main Bearings Installation Position
Courtesy of FORD MOTOR CO.

99. Remove the crankshaft main bearings from the cylinder block.

NOTE: If the main bearings are being reused, mark them for correct position and orientation for reassembly.

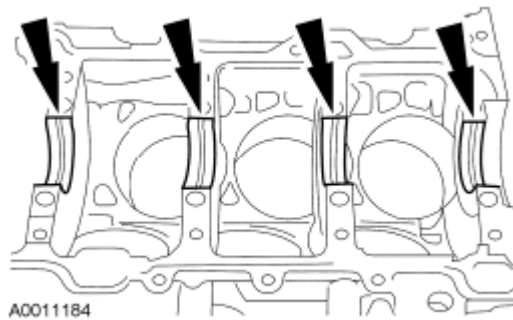


Fig. 295: Locating Crankshaft Main Bearings From Cylinder Block
Courtesy of FORD MOTOR CO.

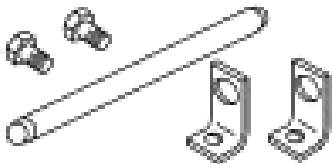
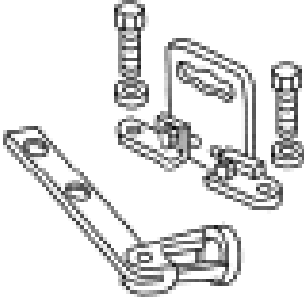
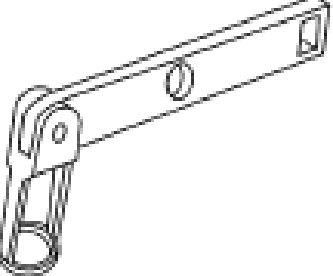
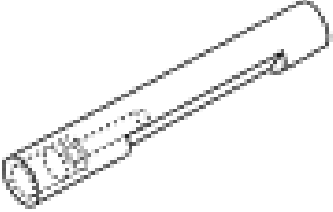
100. Inspect the cylinder block, lower cylinder block, pistons and connecting rods. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

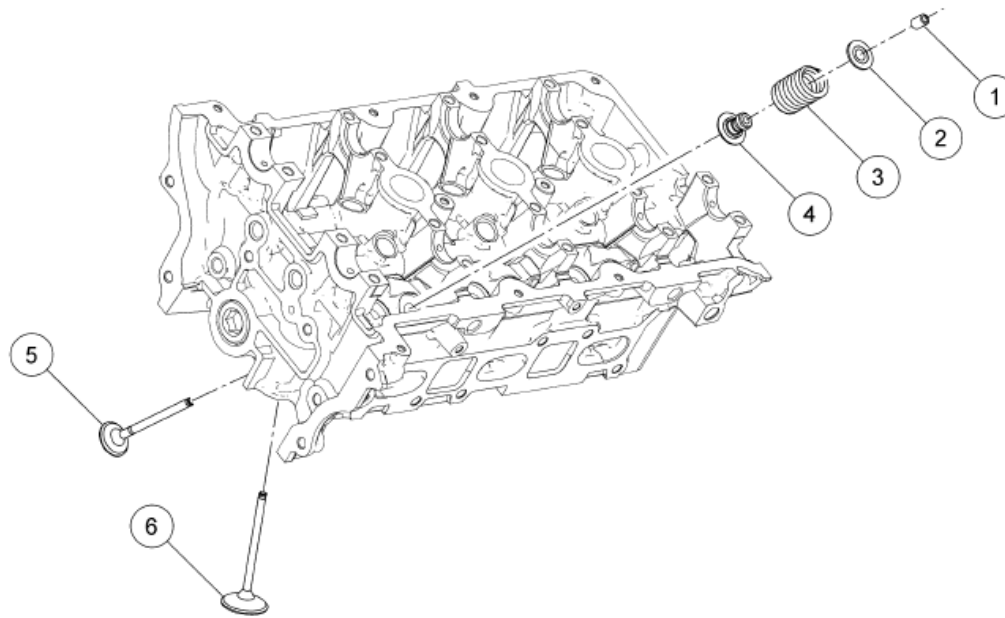
CYLINDER HEAD

Special Tool(s)

SPECIAL TOOLS TABLE

 ST1981-A	Compressor, Valve Spring 303-300 (T87C-6565-A)
 ST1907-A	Compressor, Valve Spring 303-350 (T89P-6565-A)
 ST1902-A	Compressor, Valve Spring 303-1418
 ST1906-A	Installer, Valve Stem Oil Seal 303-470 (T94P-6510-CH)

Cylinder Head



N0063020

Fig. 296: Identifying Cylinder Head Components
Courtesy of FORD MOTOR CO.

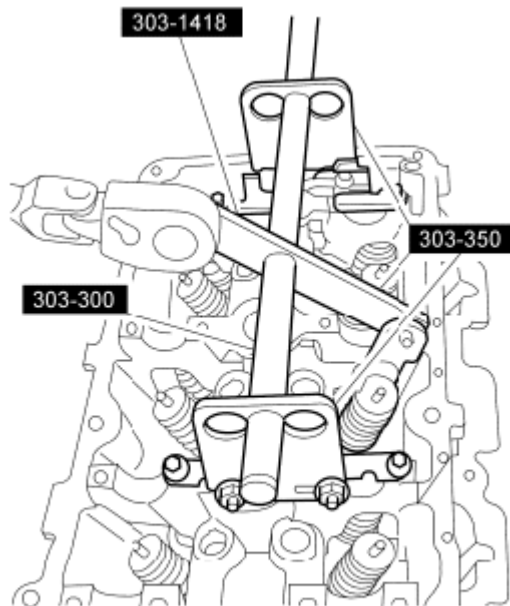
ITEM DESCRIPTION TABLE

Item	Part Number	Description
1	6518	Valve spring retainer key (24 required)
2	6514	Valve spring retainer (12 required)
3	6513	Valve spring (12 required)
4	6A517	Valve stem seal (12 required)
5	6505	Intake valve (6 required)
6	6507	Exhaust valve (6 required)

Disassembly

NOTE: If the components are to be reinstalled, they must be installed in the same positions. Mark the components removed for locations. If not reassembled in their original positions, severe engine damage may occur.

1. Using the Valve Spring Compressors, remove the keys, retainer and spring.



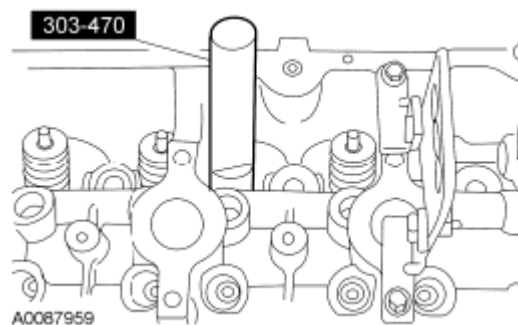
N0087117

Fig. 297: Removing Keys, Retainer & Spring
Courtesy of FORD MOTOR CO.

2. Remove the valve from the cylinder head.
3. Remove the valve stem seal.

Assembly

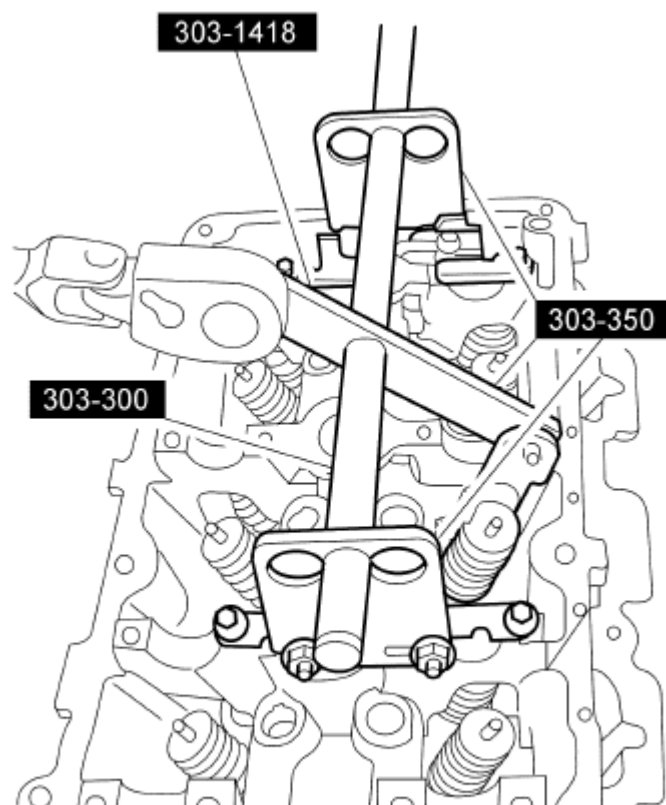
1. Using the Valve Stem Oil Seal Installer, install the valve stem seal.



A0087959

Fig. 298: Installing Valve Stem Seal
Courtesy of FORD MOTOR CO.

2. Install the valve.
3. Using the Valve Spring Compressors, install the valve spring, retainer and keys.



N0087117

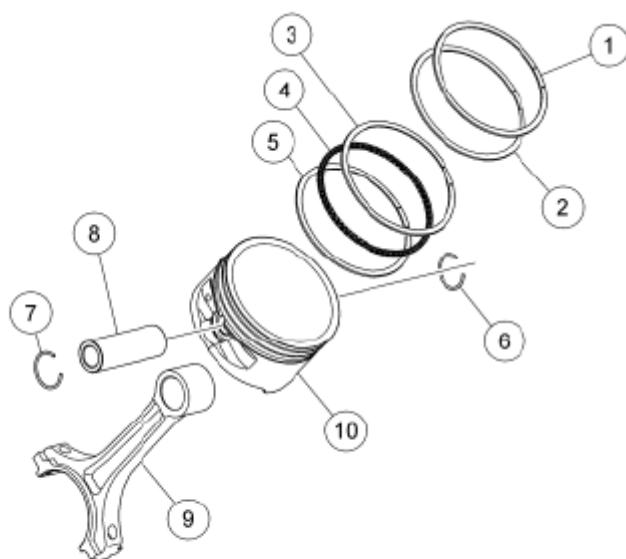
Fig. 299: Installing Keys, Retainer & Spring
Courtesy of FORD MOTOR CO.

PISTON

Material

MATERIAL SPECIFICATIONS TABLE

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



N0010114

Fig. 300: Exploded View Of Piston
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

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	6110	Piston

Disassembly

1. Remove the piston rings from the piston.
 - Discard the piston rings.
2. Remove the 2 piston pin retainers and the piston pin.
3. Separate the piston from the connecting rod.

NOTE: If the piston and connecting rod are to be reinstalled, they must be assembled in the same orientation. Mark the piston orientation to the connecting rod for reassembly.

4. Clean and inspect the piston and connecting rod. For additional information, refer to **PISTON INSPECTION** and **CONNECTING ROD CLEANING**.

Assembly

1. Align the piston-to-connecting rod orientation marks and position the connecting rod in the piston.
2. Lubricate the piston pin and pin bore with clean engine oil.
3. Install the piston pin in the piston and connecting rod assembly.
4. Install the 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 as shown below.
 1. Center line of the piston parallel to the wrist pin bore
 2. Upper compression ring gap location
 3. Upper oil control segment ring gap location
 4. Lower oil control segment ring gap location
 5. Expander ring and lower compression ring gap location

NOTE: The piston compression lower ring should be installed with the "O" mark on the ring face pointing up toward the top of the piston.

NOTE: When installing the piston oil control spacer, orient the gap such that the cut ends are pointed toward the top of the piston.

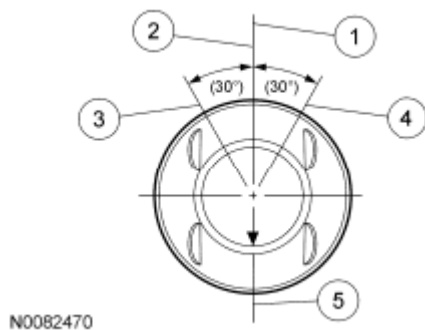


Fig. 301: Identifying Piston Rings Onto Piston Angle
Courtesy of FORD MOTOR CO.

ASSEMBLY

ENGINE

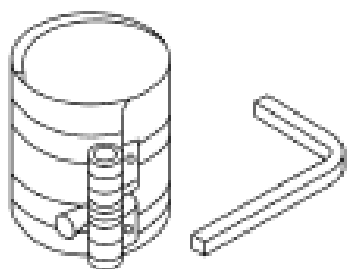
Special Tool(s)

SPECIAL TOOLS TABLE

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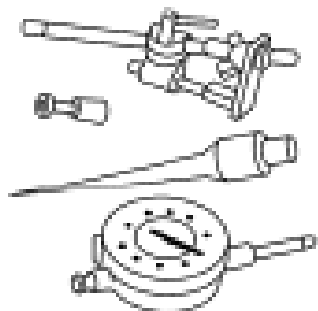
2010 Mercury Milan

2010 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan



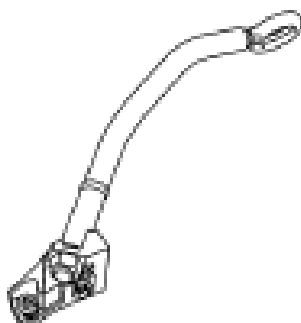
ST1376-A

Compressor, Piston Ring 303-D032 (D81L-6002-C)



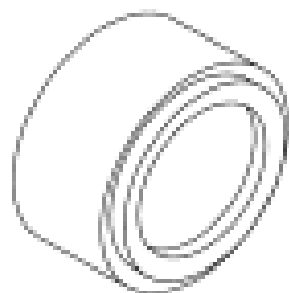
ST1214-A

Dial Indicator Gauge with Holding Fixture 100-002 (TOOL-4201-C)



ST2873-A

Engine Lifting Bracket Set 303-1140



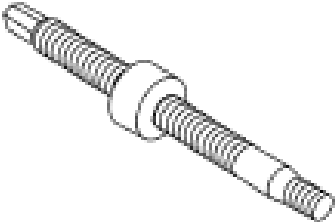
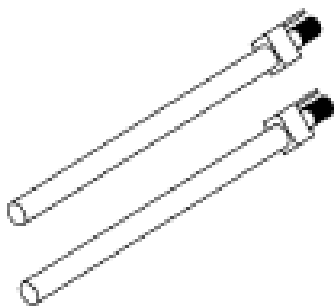
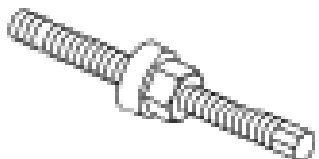
ST1979-A

Installer, Camshaft Oil Seal 303-464 (T94P-6256-BH)

Installer, Camshaft Pulley 303-458 (T94P-6312-AH3), part of

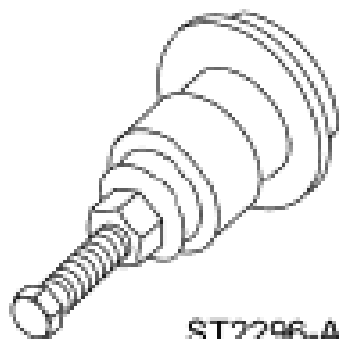
2010 Mercury Milan

2010 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan

 ST3042-A	303-S455
 ST1982-A	Installer, Connecting Rod 303-462 (T94P-6136-AH)
 ST1327-A	Installer, Crankshaft Rear Main Oil Seal 303-178 (T82L-6701-A)
 ST1287-A	Installer, Crankshaft Vibration Damper 303-102 (T74P-6316-B)
	Installer, Front Cover Oil Seal 303-335 (T88T-6701-A)

2010 Mercury Milan

2010 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan

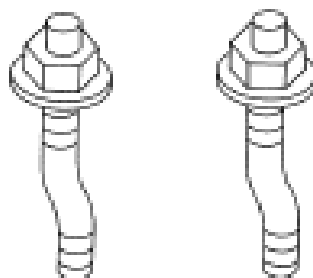


ST2296-A



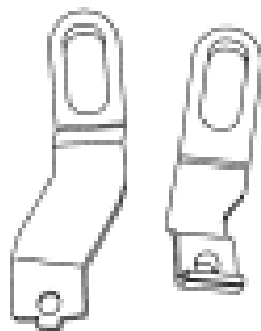
ST1586-A

Installer, Power Steering Pump Pulley 211-185 (T91P-3A733-A)



ST1333-A

Installer Bolts, Crankshaft Rear Main Oil Seal 303-384 (T91P-6701-A)



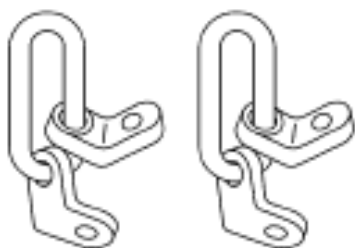
ST2463-A

Lifting Brackets, Engine 134-00243 or equivalent

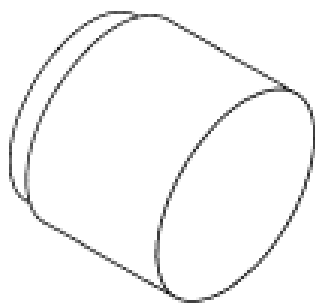
Lifting Brackets, Engine 303-050 (T70P-6000)

2010 Mercury Milan

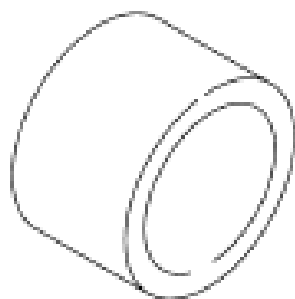
2010 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan



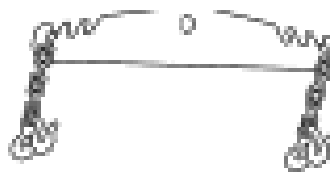
ST1595-A



ST2060-A



ST3043-A



ST1470-A

Protector, Camshaft Oil Seal 303-463 (T91P-6256-AH)

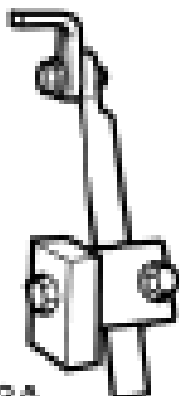
Spacer, Water Pump Pulley 303-459 (T94P-6312-AH4), part of 303-S455

Spreader Bar 303-D089 (D93P-6001-A3) or equivalent

Universal Adapter Brackets 014-0001

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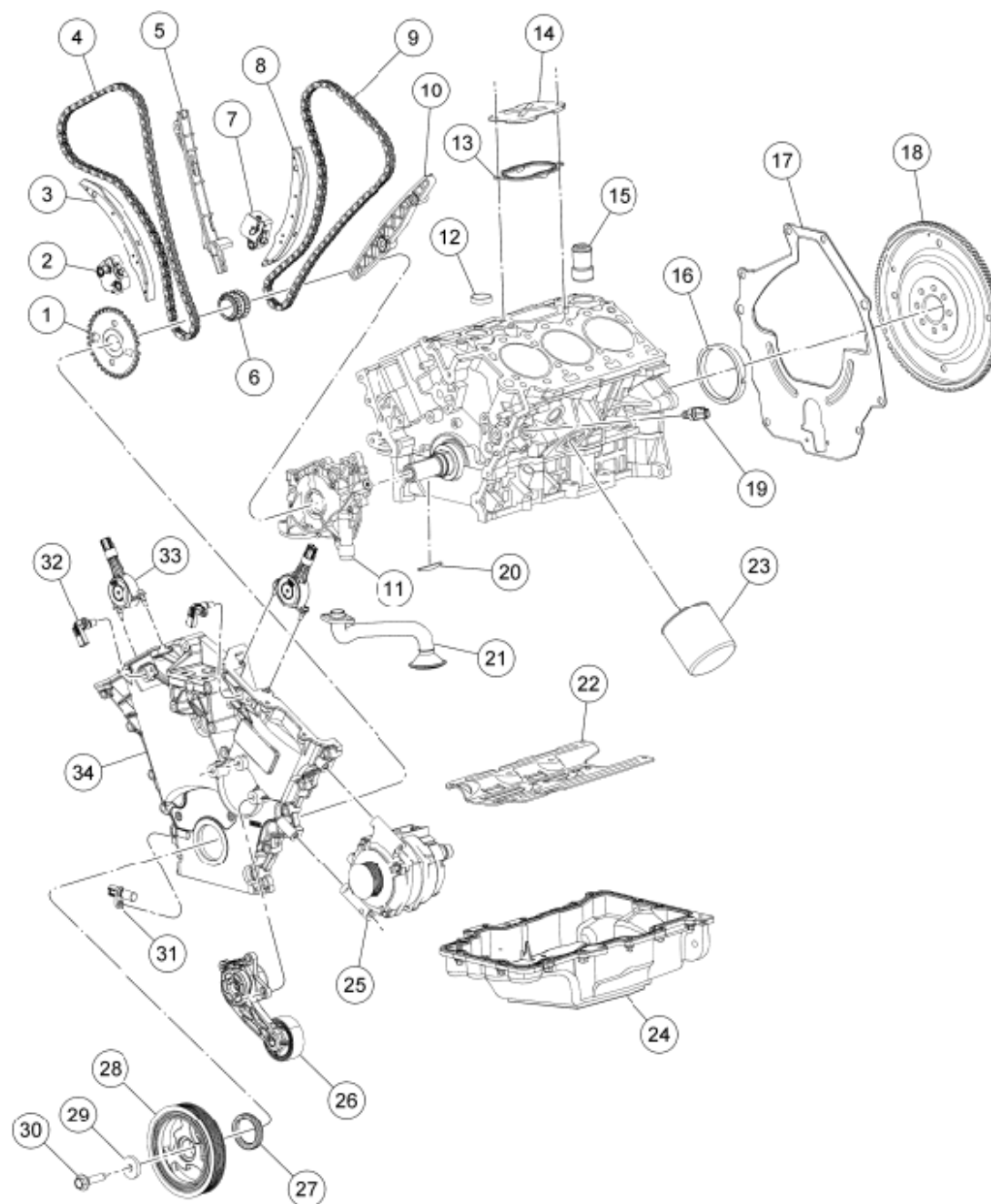
ST2743A

Material

MATERIAL SPECIFICATIONS TABLE

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

Lower Engine Block (View 1)



N0098458

Fig. 302: Exploded View Of Lower Engine Block (1 Of 2)
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

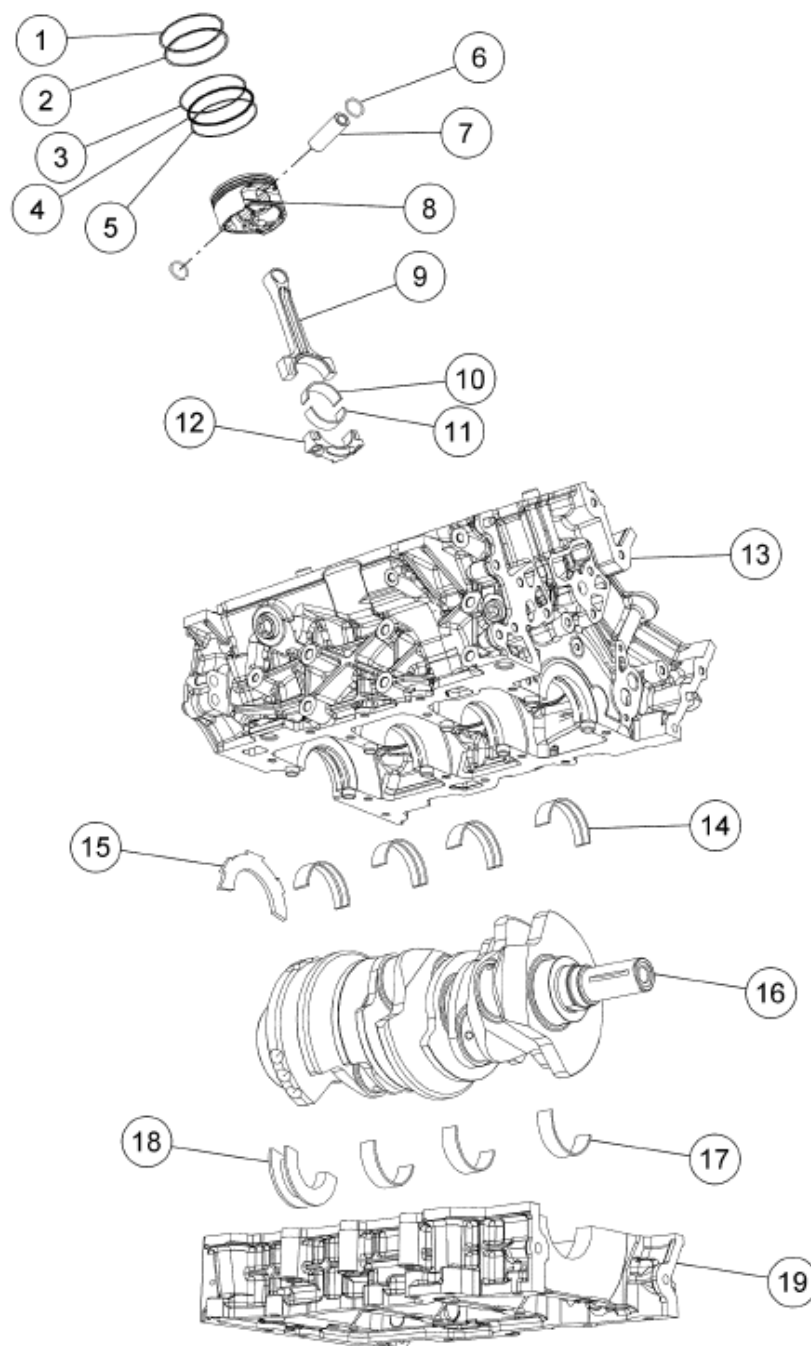
Item	Part Number	Description
1	12A227	Ignition pulse wheel
2	6L266	RH timing chain tensioner
3	6K255	RH timing chain tensioner arm

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4	6268	RH timing chain
5	6M256	RH timing chain guide
6	6306	Crankshaft sprocket
7	6L266	LH timing chain tensioner
8	6K255	LH timing chain tensioner arm
9	6268	LH timing chain
10	6B297	LH timing chain guide
11	6621	Oil pump
12	W701923	Cup plug
13	6B752	Oil separator gasket
14	6869	Oil separator cover
15	8A505	Water inlet tube
16	6701	Crankshaft rear oil seal
17	6A373	Spacer plate
18	6375	Flexplate
19	9278	Engine Oil Pressure (EOP) switch
20	W701528	Woodruff key
21	6622	Oil pickup tube and screen
22	6687	Oil pan baffle
23	6714	Oil filter
24	6675	Oil pan
25	10300	Generator
26	6B209	Accessory drive belt tensioner
27	6700	Crankshaft front seal
28	6316	Crankshaft vibration damper
29	N806165	Crankshaft vibration damper washer
30	W701512	Crankshaft vibration damper bolt
31	6C315	Crankshaft Position (CKP) sensor
32	12K073	Camshaft Position (CMP) sensor (2 required)
33	6M280	Variable Camshaft Timing (VCT) solenoid (2 required)
34	6019	Front cover

Lower Engine Block (View 2)



N0105670

Fig. 303: Exploded View Of Lower Engine Block (2 Of 2)
 Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

Item	Part Number	Description
1	6150	Piston compression upper ring (6 required)
2	6152	Piston compression lower ring (6 required)
3	6159	Piston oil control upper segment ring (6 required)

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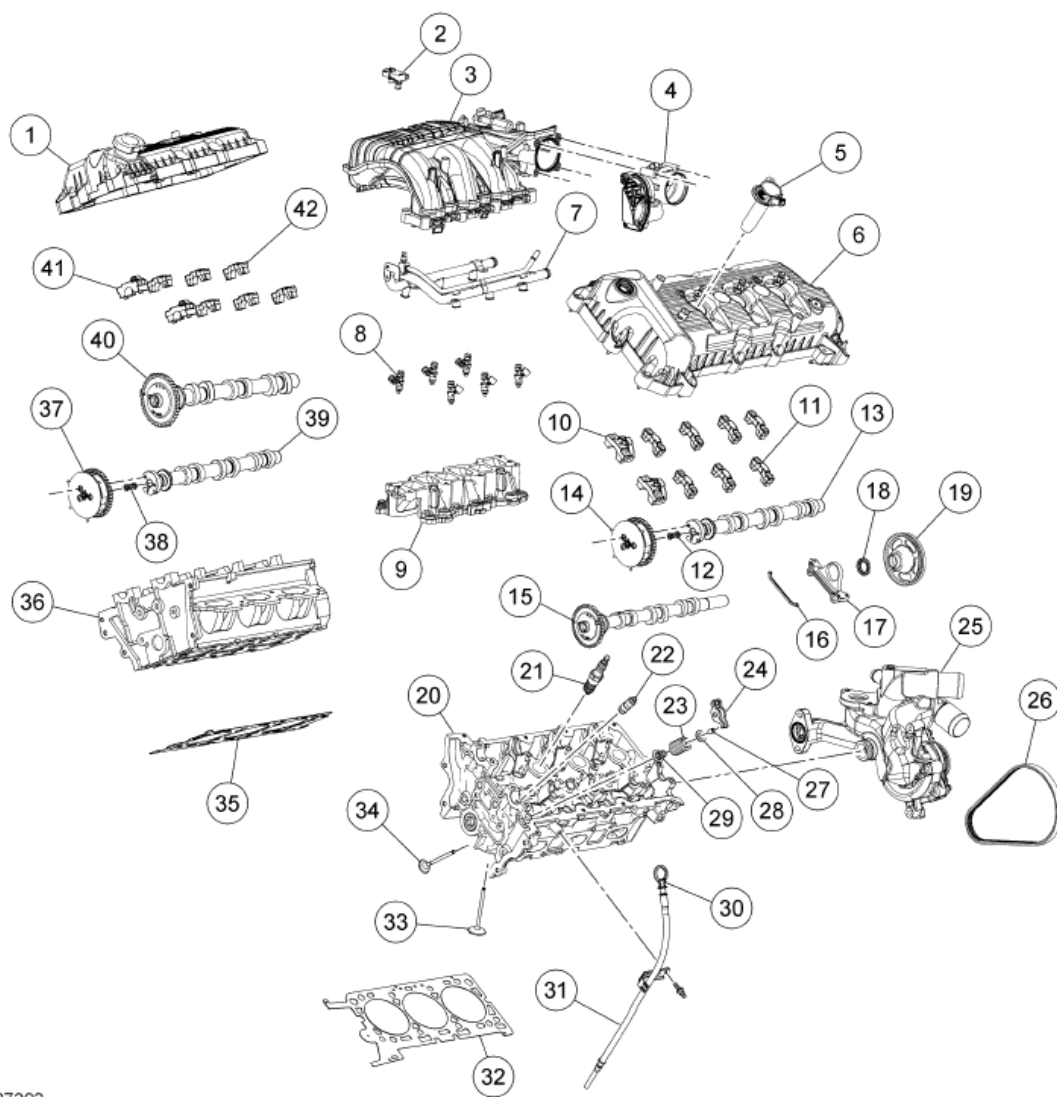
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4	6161	Piston oil control spacer (6 required)
5	6159	Piston oil control lower segment ring (6 required)
6	6140	Piston pin retainer (12 required)
7	6135	Piston pin (6 required)
8	6110	Piston (6 required)
9	6200	Connecting rod (6 required)
10	6211	Connecting rod upper bearing (6 required)
11	6211	Connecting rod lower bearing (6 required)
12	6210	Connecting rod cap (6 required)
13	6010	Cylinder block
14	6333	Cylinder block crankshaft main bearing (4 required)
15	6A341	Crankshaft upper thrust bearing
16	6303	Crankshaft
17	6333	Lower cylinder block crankshaft main bearings (3 required)
18	6337	Lower cylinder block crankshaft main thrust bearing
19	6F095	Lower cylinder block

Cylinder Heads and Intake Manifolds

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2010 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan



N0087393

Fig. 304: Exploded View Of Cylinder Heads & Intake Manifolds
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

Item	Part Number	Description
1	6582	RH valve cover
2	9F479	Mass Air Flow (MAF) sensor
3	9424	Upper intake manifold
4	9F991	Throttle Body (TB)
5	12029	Coil-on-plug (6 required)
6	6A505	LH valve cover
7	9F792	Fuel rail
8	9F593	Fuel injector (6 required)
9	9424	Lower intake manifold

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10	6B280	Camshaft thrust bearing cap
11	6B280	Camshaft bearing cap
12	6C683	LH Variable Camshaft Timing (VCT) system oil filter
13	6A267	LH intake camshaft
14	6C524	LH camshaft phaser and sprocket
15	6A269	LH exhaust camshaft
16	6B295	Camshaft oil seal retainer gasket
17	6B293	Camshaft oil seal retainer
18	-	Camshaft oil seal
19	6A359	Coolant pump drive pulley
20	6050	LH cylinder head
21	12405	Spark plug (6 required)
22	6C501	Hydraulic lash adjuster (24 required)
23	6513	Valve spring (24 required)
24	6529	Camshaft roller follower (24 required)
25	8501	Coolant pump housing
26	8K453	Coolant pump belt
27	6518	Valve spring retainer key (48 required)
28	6514	Valve spring retainer (24 required)
29	6A517	Valve stem seal (24 required)
30	-	Oil level indicator
31	6754	Oil level indicator tube
32	6083	LH cylinder head gasket
33	6507	Intake valve (24 required)
34	6505	Exhaust valve (24 required)
35	6051	RH cylinder head gasket
36	6050	RH cylinder head
37	6C524	RH camshaft phaser and sprocket
38	6C683	RH VCT system oil filter
39	6A266	RH intake camshaft
40	6A268	RH exhaust camshaft
41	6A268	Camshaft thrust bearing cap
42	6A258	Camshaft bearing cap

NOTE: During engine repair procedures, cleanliness is extremely important. All parts must be thoroughly cleaned and any foreign material, including any material created while cleaning gasket surfaces, that enters the oil passages, coolant passages or the oil pan, can cause engine failure.

NOTE: If the oil pan was removed during engine disassembly, it must be installed after the engine and transaxle are assembled and the transaxle-to-engine bolts are installed. Failure to follow this assembly sequence can result in engine oil

leaks.

NOTE: Assembly of the engine requires various inspections/measurements of the engine components (engine block, crankshaft, connecting rods, pistons and piston rings). These inspections/measurements will aid in determining if the engine components will require replacement. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

All engines

1. Select the crankshaft main bearings for each crankshaft journal.
 1. Read the code on the crankshaft flange.
 2. Read the code on the cylinder block rear face.
 - The first 2 numbers after the asterisk make up the code for main No. 1 and the next 2 numbers for main No. 2.
 - The first 2 numbers after the second asterisk make up the code for main No. 3 and the last 2 numbers for main No. 4.

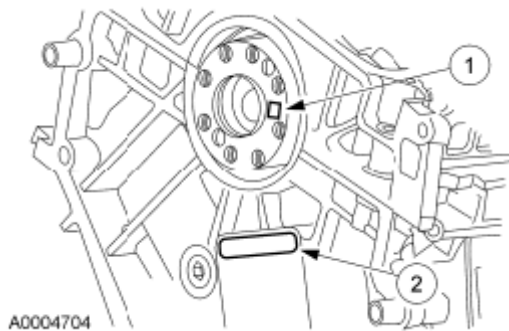


Fig. 305: Identifying Crankshaft Flange & Cylinder Block Rear Face
Courtesy of FORD MOTOR CO.

NOTE: This procedure is for selecting bearings using a new crankshaft.

2. Using the table below, choose a bearing for each main. Match the block and crankshaft code with its corresponding column or row, by reading across the "crankshaft" row and down the "block" column.
 - For example: If the block code is *0609*0711* and the crankshaft code is *8580*8082*, main No. 1 should use grade 1 bearings, as determined by the intersection of the 06 block column and the 85 crankshaft row. Mains 2, 3 and 4 should all be grade 2.

BLOCK CODE

98 99 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22

(C1)

CRANKSHAFT CODE

92	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2
91	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2
90	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
89	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2
88	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2
87	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2
86	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
85	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
84	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3
83	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3
82	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3
81	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3
80	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3
79	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3
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73	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3
72	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
71	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
70	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
69	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
68	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

A0053883

Fig. 306: Bearing Selection Table
Courtesy of FORD MOTOR CO.

- Lubricate the upper crankshaft main bearings with clean engine oil and install the 4 crankshaft main bearings in the cylinder block.

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.

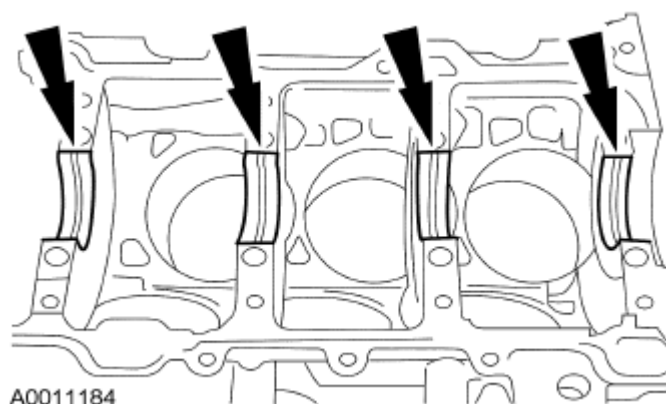


Fig. 307: Locating Crankshaft Main Bearings Installation Position

Courtesy of FORD MOTOR CO.

4. Lubricate the lower crankshaft main bearings with clean engine oil and install the 4 crankshaft main bearings in the lower cylinder block.

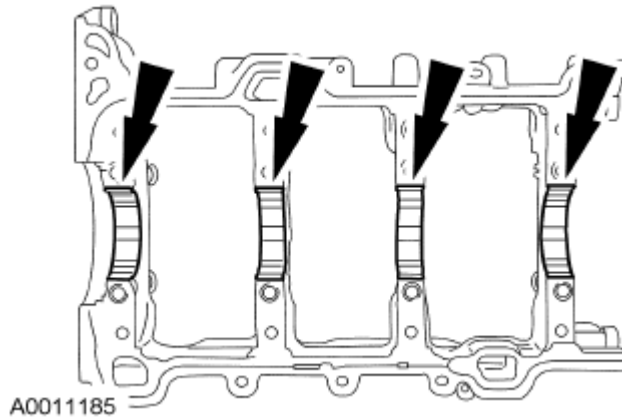


Fig. 308: Locating Main Bearings Installation Position
Courtesy of FORD MOTOR CO.

5. Lubricate the crankshaft thrust bearing with clean engine oil and install in the cylinder block.

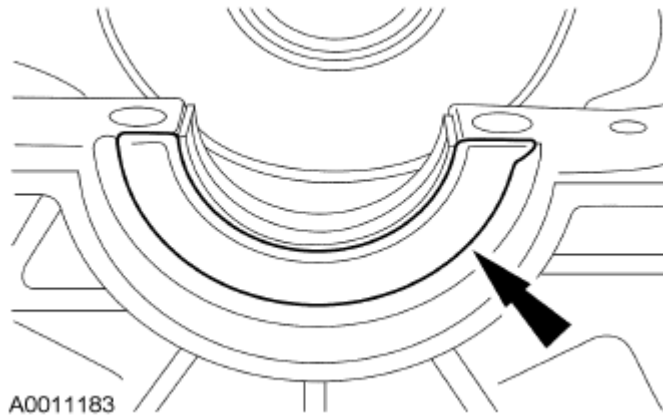


Fig. 309: Locating Crankshaft Thrust Bearing
Courtesy of FORD MOTOR CO.

6. Install the crankshaft key.

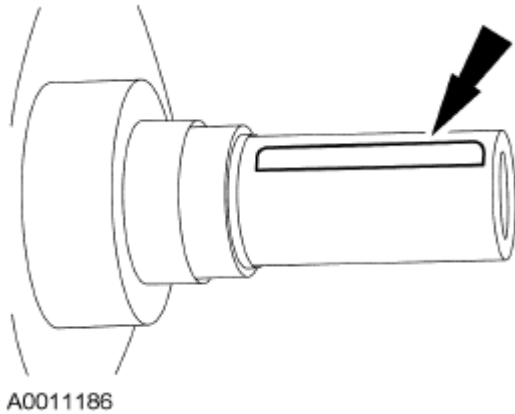


Fig. 310: Locating Crankshaft Key
Courtesy of FORD MOTOR CO.

7. Apply clean engine oil to the crankshaft main and rod bearing journals.
8. Position the crankshaft in the cylinder block.

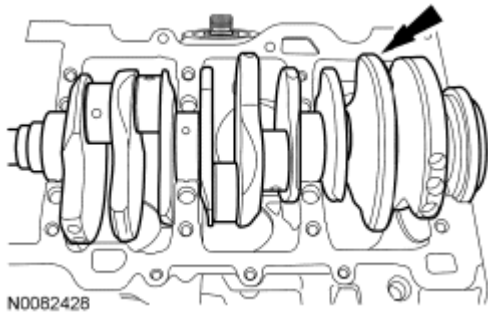
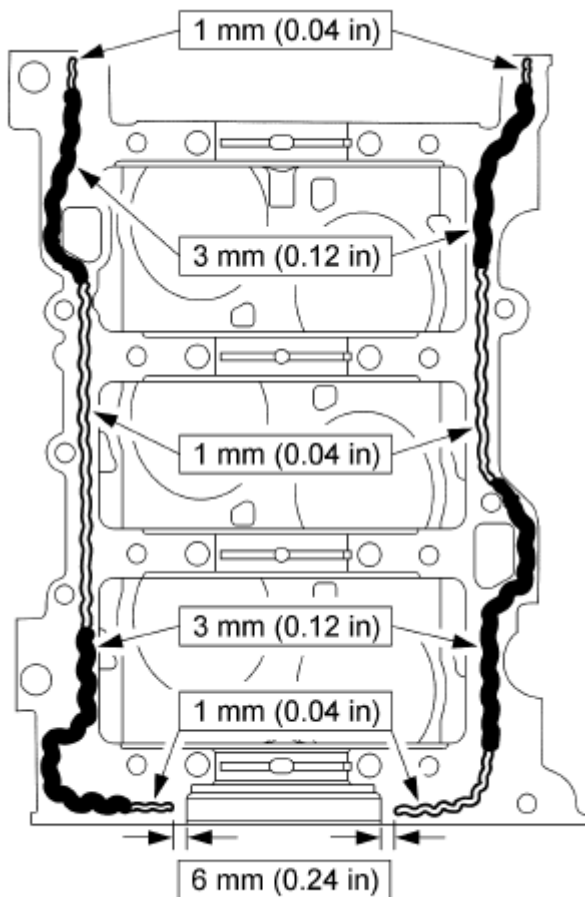


Fig. 311: Locating Crankshaft In Cylinder Block
Courtesy of FORD MOTOR CO.

9. Apply gasket and sealant to the cylinder block as shown below.

NOTE: The lower cylinder block must be installed and the bolts tightened within 4 minutes of applying the sealant.

NOTE: Clean and degrease both surfaces using metal surface prep before applying sealant.



A0011187

Fig. 312: Applying Gasket & Sealant To Cylinder Block
 Courtesy of FORD MOTOR CO.

10. Position the lower cylinder block and install the new bolts and new studs.
 - Tighten the bolts and studs in the sequence shown in 4 stages.
 - Stage 1: Tighten fasteners 1 through 8 to 25 Nm (18 lb-ft).
 - Stage 2: Tighten fasteners 9 through 16 to 40 Nm (30 lb-ft).
 - Stage 3: Tighten fasteners 1 through 16 an additional 90 degrees.
 - Stage 4: Tighten fasteners 17 through 22 to 25 Nm (18 lb-ft).

NOTE: Fasteners No. 5 through 8 are studs. Fasteners No. 18 through 22 are M8 x 1.25 mm x 79.3 mm (0.05 in x 3.12 in) bolts. Fasteners No. 1 through 4, 17 are M8 x 1.25 mm x 96 mm (0.05 in x 3.75 in) bolts. Fasteners 9 through 12 are M10 x 1.5 mm x 106.8 mm (0.06 in x 4.20 in)/M8 x 1.25 mm x 21.5 mm (0.05 in x 0.84 in) studs. Fasteners 13 through 16 are M10 x 1.5 mm x 106.5 mm (0.06 in x 4.17 in) bolts. The bolts and studs must be installed in the correct position or engine damage can result.

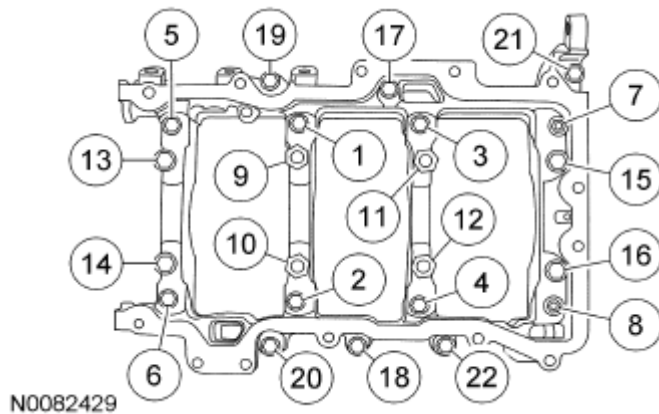


Fig. 313: Identifying Lower Cylinder Block Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

11. Using the Dial Indicator Gauge with Holding Fixture, measure crankshaft end play.
 - Position the crankshaft to the rear of the cylinder block.
 - Zero the Dial Indicator Gauge with Holding Fixture.
 - Move the crankshaft to the front of the cylinder block. Note and record the crankshaft end play.
 - Acceptable crankshaft end play is 0.100-0.255 mm (0.003-0.010 in). If the crankshaft end play exceeds the specified range, install new parts as necessary.

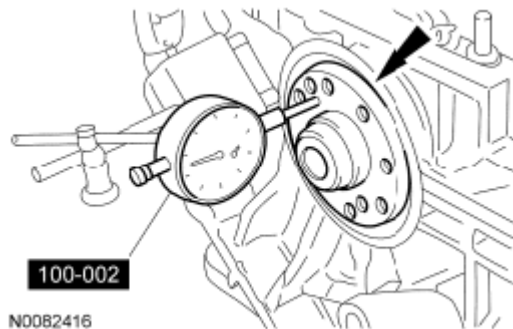


Fig. 314: Measuring Crankshaft End Play
Courtesy of FORD MOTOR CO.

12. Using the Crankshaft Rear Main Oil Seal Installer and the Crankshaft Rear Main Oil Seal Installer Bolts, install the crankshaft rear oil seal.

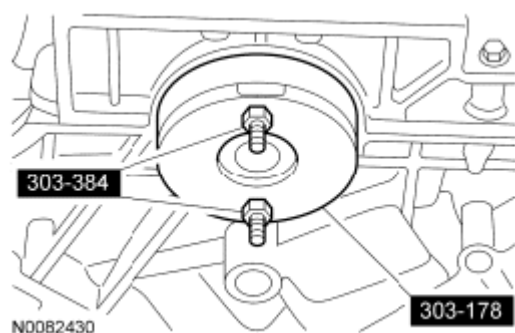


Fig. 315: Installing Crankshaft Rear Oil Seal
Courtesy of FORD MOTOR CO.

13. Install the engine-to-transaxle separator plate.

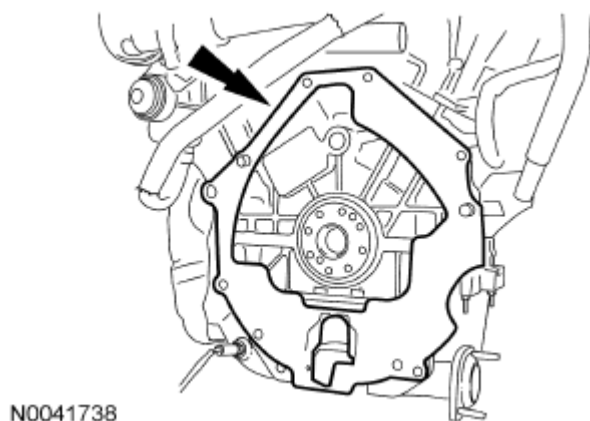


Fig. 316: Locating Engine-To-Transaxle Separator Plate
Courtesy of FORD MOTOR CO.

14. Position the flexplate and install the bolts.
 - Tighten to 80 Nm (59 lb-ft).

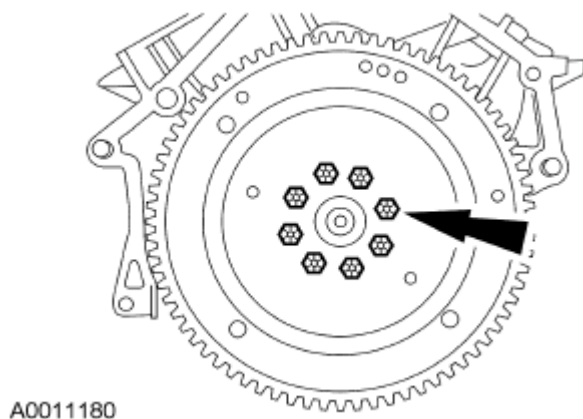


Fig. 317: Locating Flexplate Bolts

Courtesy of FORD MOTOR CO.

15. Mount the engine on an engine stand.
16. Using the table, select the correct piston grade size for the cylinder bores.
 - Measure the cylinder block bore diameter.
 - Mark the outside of the block with the appropriate number(s) to identify bore grade size.
 - Choose the correct piston grade size for the cylinder bore.

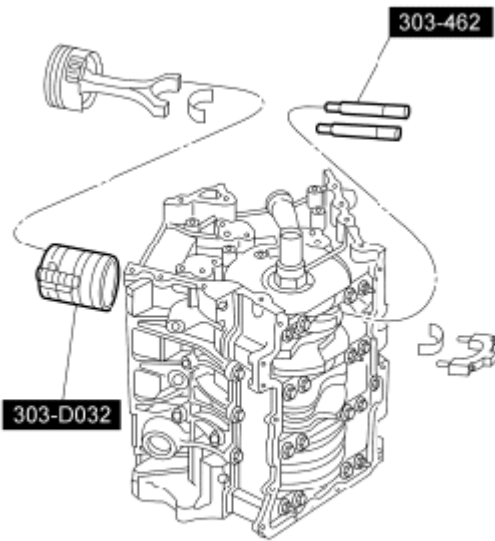
LITER	GRADE	CYLINDER BLOCK BORE DIAMETER	PISTON DIAMETER UNCOATED	PISTON DIAMETER COATED
3.0L	1	89.000-89.010	88.970-88.980	88.990-89.010
3.0L	2	89.010-89.020	88.978-88.992	88.998-89.022
3.0L	3	89.020-89.030	88.990-89.000	89.010-89.030
3.0L	1A	89.000-89.010	88.970-89.980	88.990-89.010
3.0L	2A	89.010-89.020	88.978-89.992	88.998-89.022
3.0L	3A	89.020-89.030	88.990-89.000	89.010-89.030

N0091569

Fig. 318: Cylinder Block Bore Diameter Table
Courtesy of FORD MOTOR CO.

17. Using the Piston Ring Compressor and the Connecting Rod Installer, install the piston and connecting rod assemblies.

- NOTE:** Be sure not to scratch the cylinder wall or crankshaft journal with the connecting rod. Push the piston down until the connecting rod bearing seats on the crankshaft journal.
- NOTE:** Lubricate the pistons, piston rings, connecting rod bearings and the entire cylinder bores with clean engine oil.
- NOTE:** Make sure the piston rings are positioned to specifications for installation. For additional information, refer to PISTON .
- NOTE:** Make sure the piston arrow on top is facing toward the front of the engine.
- NOTE:** After installation of each piston and connecting rod, rotate the crankshaft to verify smooth operation.

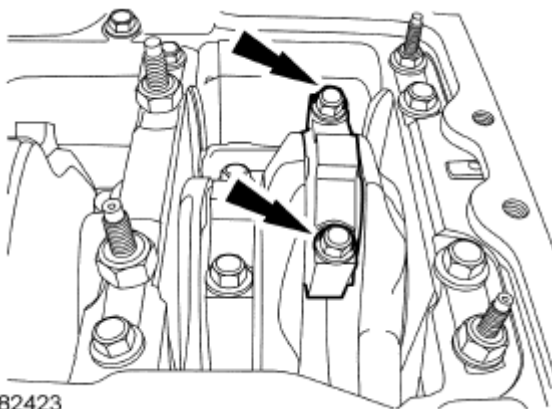


N0082431

Fig. 319: Locating Lower Rear Fender Bolts
Courtesy of FORD MOTOR CO.

18. Install the connecting rod caps and the new bolts.
 - Tighten the bolts in 2 stages.
 - Stage 1: Tighten to 23 Nm (17 lb-ft).
 - Stage 2: Tighten to 43 Nm (32 lb-ft).

NOTE: The rod cap installation must keep the same orientation as marked during disassembly or engine damage may occur.



N0082423

Fig. 320: Locating Connecting Rod Cap Bolts
Courtesy of FORD MOTOR CO.

19. Install the oil separator cover, a new gasket and the bolts.
 - Tighten to 10 Nm (89 lb-in).

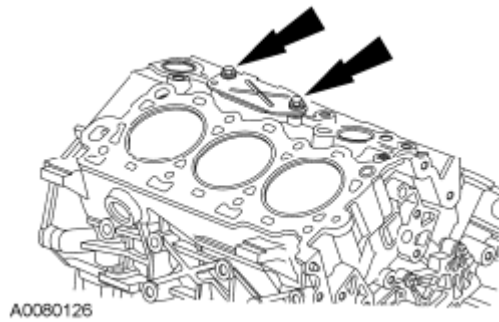


Fig. 321: Locating Oil Separator Cover With Gasket & Bolts
 Courtesy of FORD MOTOR CO.

20. Position the new LH and RH cylinder heads and gaskets. Install new bolts and tighten in the sequence shown in 6 stages.
- Stage 1: Tighten to 40 Nm (30 lb-ft).
 - Stage 2: Tighten to 90 Nm (66 lb-ft).
 - Stage 3: Loosen one full turn.
 - Stage 4: Tighten to 40 Nm (30 lb-ft).
 - Stage 5: Tighten 90 degrees.
 - Stage 6: Tighten 90 degrees.

NOTE: LH shown, RH similar.

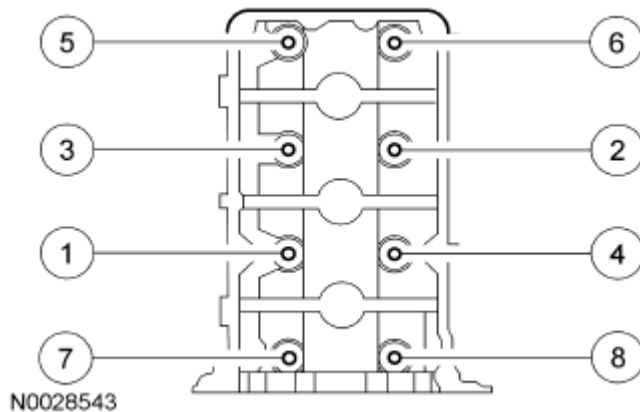
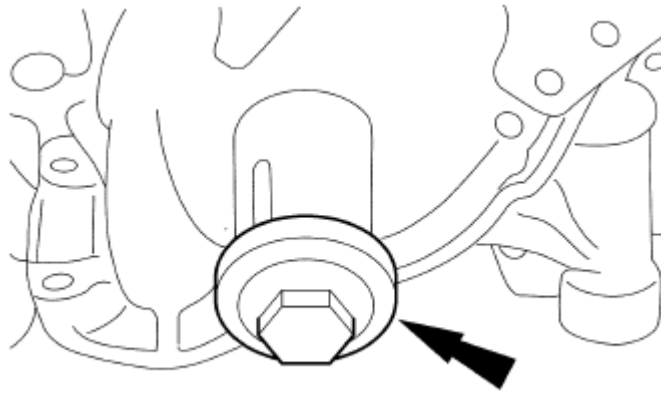


Fig. 322: Identifying LH & RH Cylinder Heads Bolts Tightening Sequence
 Courtesy of FORD MOTOR CO.

21. Install the crankshaft pulley bolt and rotate the crankshaft keyway to the 11 o'clock position to locate Top Dead Center (TDC).



A0011418

Fig. 323: Identifying Crankshaft Damper Bolt
Courtesy of FORD MOTOR CO.

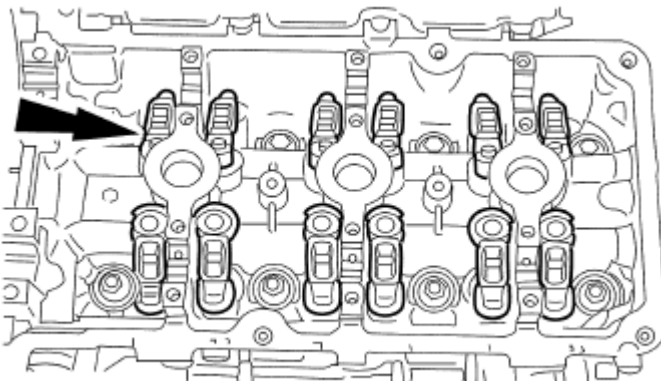
22. Install the hydraulic lash adjusters.
- Lubricate the hydraulic lash adjusters with clean engine oil.

NOTE: The hydraulic lash adjusters must be installed in their original positions. If not reassembled in their original positions, severe engine damage may occur.

23. Apply clean engine oil to the LH and RH camshaft roller followers.
24. Install the LH and RH camshaft roller followers.

NOTE: The camshaft roller followers must be installed in their original positions. If not reassembled in their original positions, severe engine damage may occur.

NOTE: RH shown, LH similar.



A0011173

Fig. 324: Locating Camshaft Roller Followers
Courtesy of FORD MOTOR CO.

25. Install the new LH and RH oil filter screens in the intake camshafts.

NOTE: LH shown, RH similar.

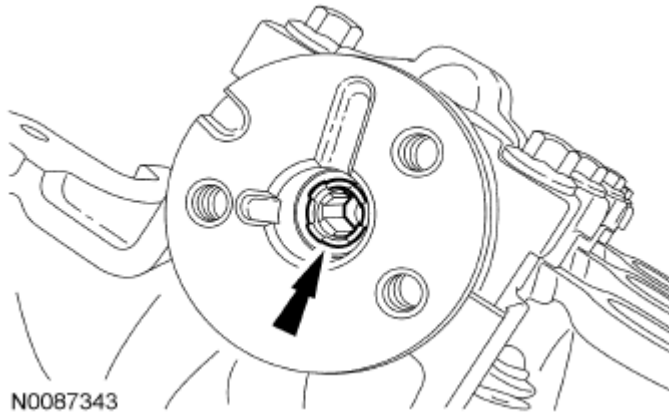


Fig. 325: Locating Oil Filter Screen
Courtesy of FORD MOTOR CO.

26. Position the camshaft phaser and sprockets onto the intake camshafts.
- Install the 3 bolts finger-tight.
27. Lubricate the LH camshafts with clean engine oil and carefully position the camshafts onto the cylinder head.
- Align the LH camshafts as shown.

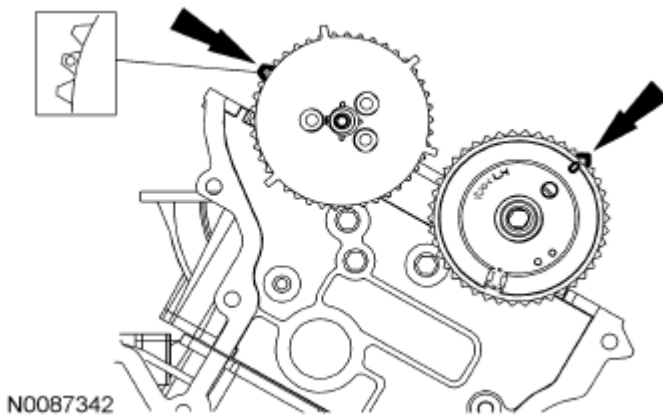


Fig. 326: Identifying Timing Mark On LH Camshafts
Courtesy of FORD MOTOR CO.

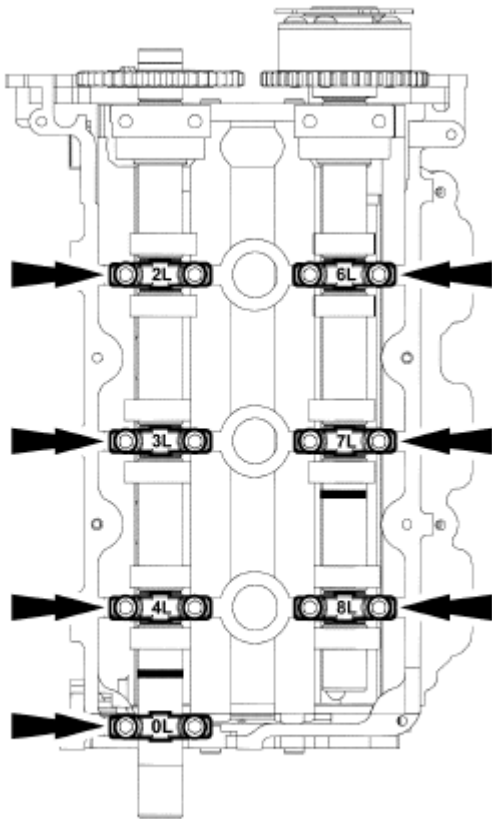
28. Lubricate the bearing surfaces of the LH camshaft bearing caps with clean engine oil and install the bearing caps.

NOTE: Cylinder head camshaft journal caps and cylinder heads are numbered to verify that they are assembled in their original positions. If not

reassembled in their original positions, severe engine damage may occur.

NOTE: Do not install the camshaft journal thrust caps until all of the camshaft bearing caps have been installed, or damage to the thrust caps can occur.

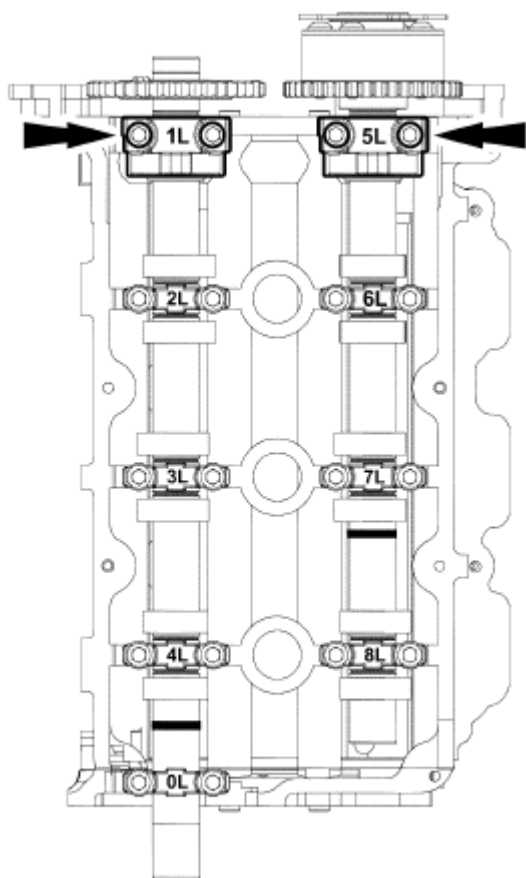
- Loosely install the bolts.



N0081819

Fig. 327: Locating LH Camshaft Bearing Caps
Courtesy of FORD MOTOR CO.

29. Lubricate the bearing surfaces of the LH camshaft bearing thrust caps with clean engine oil and install the bearing thrust caps.
 - Loosely install the bolts.

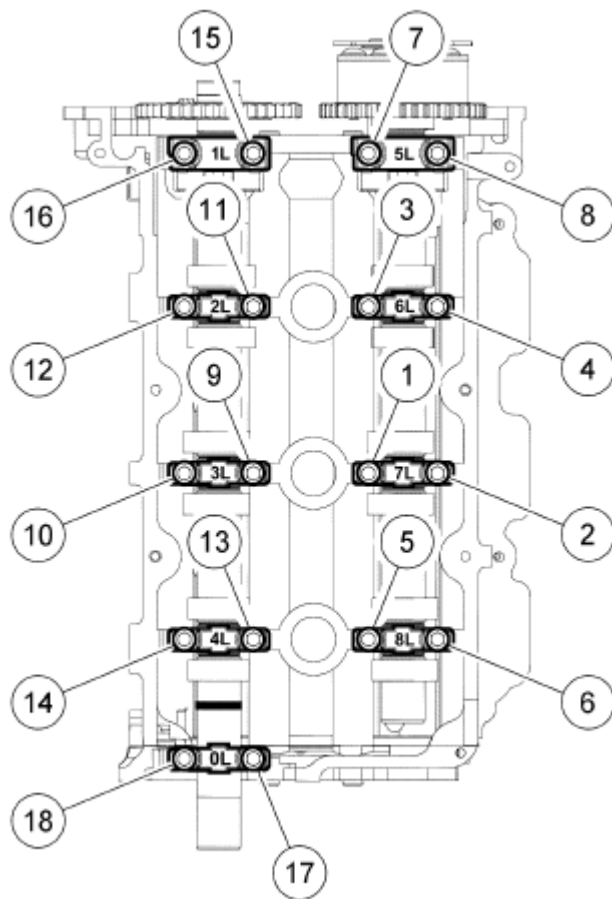


N0081820

Fig. 328: Locating Bearing Thrust Caps
Courtesy of FORD MOTOR CO.

30. Tighten the LH camshaft bearing cap bolts in the sequence shown in 2 stages.
 - Stage 1: Tighten to 10 Nm (89 lb-in).
 - Stage 2: Individually loosen and then tighten each camshaft bearing cap to 10 Nm (89 lb-in).

NOTE: **Make sure to tighten the camshaft bearing cap bolts in sequence in 2 stages.**



N0081821

Fig. 329: Identifying Camshaft Bearing Cap Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

31. Tighten the 3 LH camshaft phaser and sprocket bolts to 18 Nm (159 lb-in).

NOTE: Do not allow the camshaft to rotate from the neutral position while tightening the camshaft phaser and sprocket bolts or damage to the engine may occur.

NOTE: Install a 3/8-in ratchet and extension into the D-slot on the rear of the intake camshaft to hold the camshaft in place for tightening of the camshaft phaser and sprocket bolts.

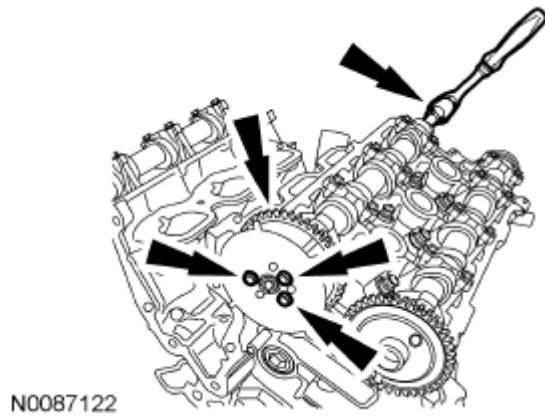


Fig. 330: Removing LH Camshaft Phaser & Sprocket Bolts
Courtesy of FORD MOTOR CO.

32. Install the camshaft oil seal retainer and the 2 bolts.
 - Tighten to 10 Nm (89 lb-in).

NOTE: Clean the sealing surface with metal surface prep before installing a new press-in-place gasket.

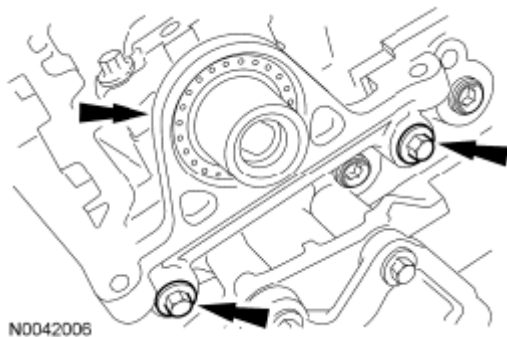


Fig. 331: Locating Camshaft Oil Seal Retainer & Bolts
Courtesy of FORD MOTOR CO.

33. Using the Power Steering Pump Pulley Installer, Camshaft Oil Seal Installer and the Camshaft Oil Seal Protector, install a new camshaft oil seal.

NOTE: Apply clean engine oil to the seal lip and seal bore before installing the seal.

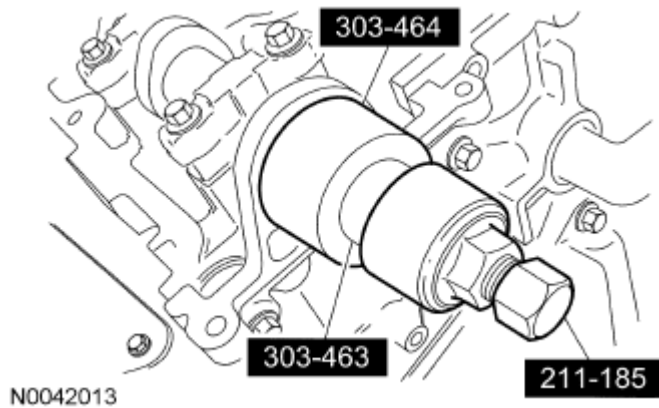


Fig. 332: Installing Camshaft Oil Seal
Courtesy of FORD MOTOR CO.

34. Lubricate the RH camshafts with clean engine oil and carefully position the camshafts onto the cylinder head.
 - Align the RH camshafts as shown.

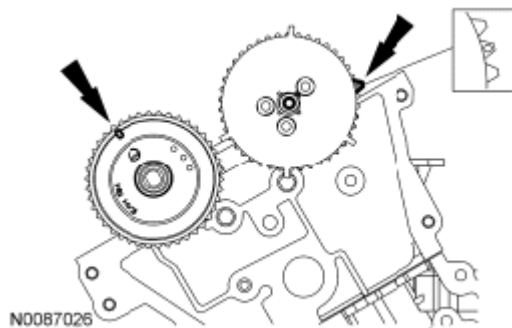


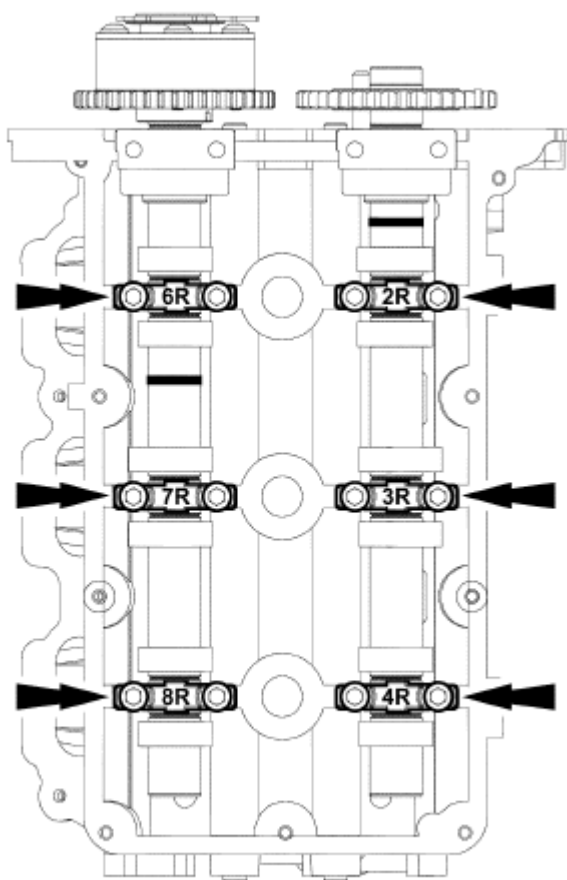
Fig. 333: Locating RH Camshafts Correctly Position
Courtesy of FORD MOTOR CO.

35. Install the camshaft bearing caps.
 - Loosely install the bolts.

NOTE: Cylinder head camshaft journal caps and cylinder heads are numbered to verify that they are assembled in their original positions. If not reassembled in their original positions, severe engine damage may occur.

NOTE: Do not install the camshaft journal thrust caps until all of the camshaft bearing caps have been installed or damage to the thrust caps can occur.

NOTE: Lubricate the bearing surfaces of the RH camshaft bearing caps with clean engine oil.

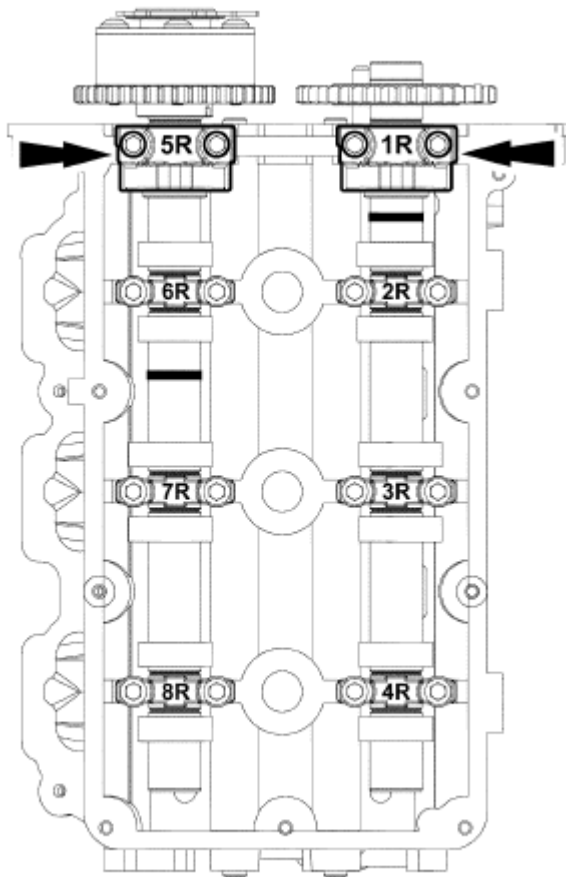


N0042369

Fig. 334: Locating Camshaft Bearing Cap Bolts
Courtesy of FORD MOTOR CO.

36. Install the camshaft bearing thrust caps.
 - Loosely install the bolts.

NOTE: Lubricate the bearing surfaces of the RH camshaft bearing thrust caps with clean engine oil.

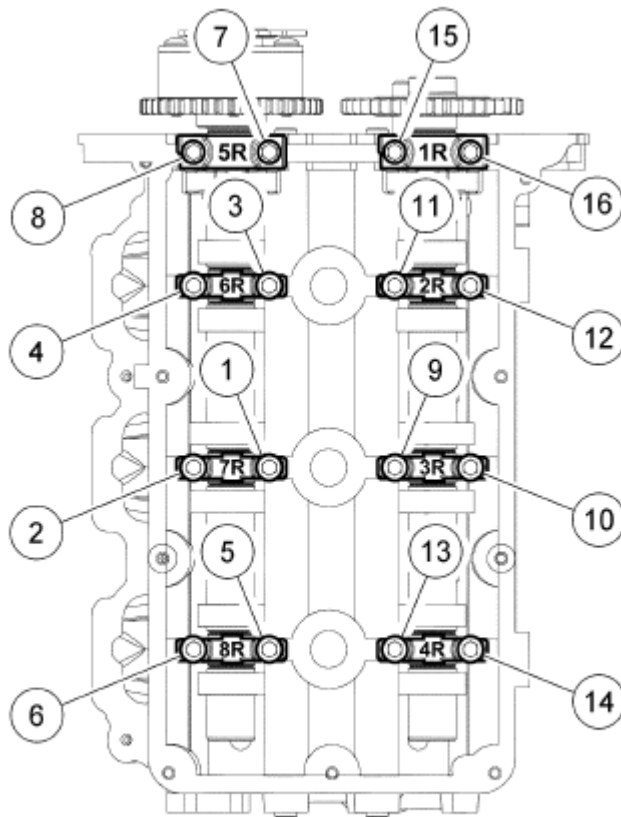


N0042453

Fig. 335: Locating Camshaft Bearing Thrust Caps
Courtesy of FORD MOTOR CO.

37. Tighten the RH camshaft bearing cap bolts in the sequence shown in 2 stages.
- Stage 1: Tighten to 10 Nm (89 lb-in).
 - Stage 2: Individually loosen and then tighten each camshaft bearing cap to 10 Nm (89 lb-in).

NOTE: **Make sure to tighten the camshaft bearing cap bolts in sequence in 2 stages.**



N0081822

Fig. 336: Identifying Camshaft Bearing Cap Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

38. Tighten the 3 RH camshaft phaser and sprocket bolts to 18 Nm (159 lb-in).

NOTE: Do not allow the camshaft to rotate from the neutral position while tightening the camshaft phaser and sprocket bolts or damage to the engine may occur.

NOTE: Install a 3/8-in ratchet and extension into the D-slot on the rear of the intake camshaft to hold the camshaft in place for tightening of the camshaft phaser and sprocket bolts.

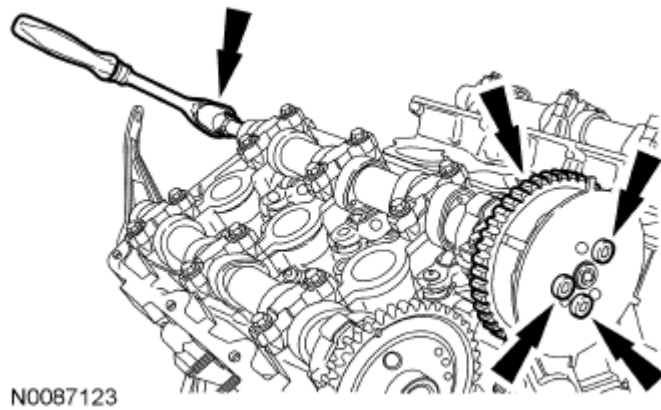


Fig. 337: Locating RH Camshaft Phaser & Sprocket Bolts
Courtesy of FORD MOTOR CO.

39. Position the oil pump and install the bolts.
 - Tighten in the sequence shown below to 10 Nm (89 lb-in).

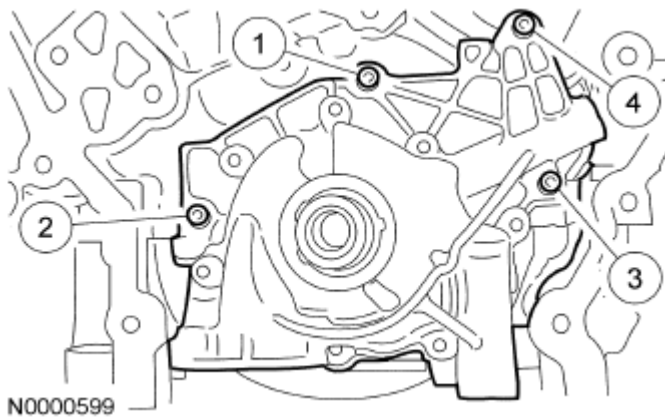
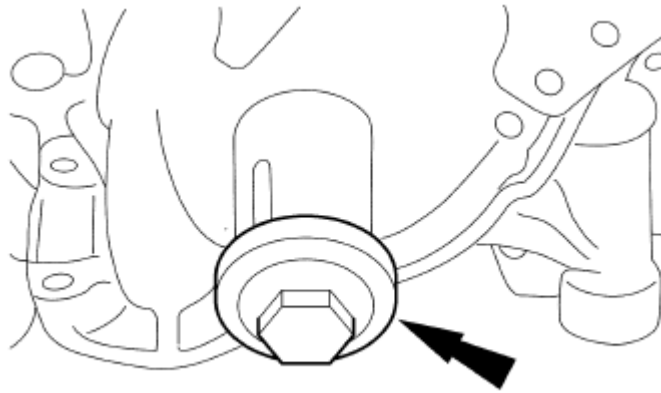


Fig. 338: Tightening Oil Pump Bolts
Courtesy of FORD MOTOR CO.

40. Remove the crankshaft pulley bolt.

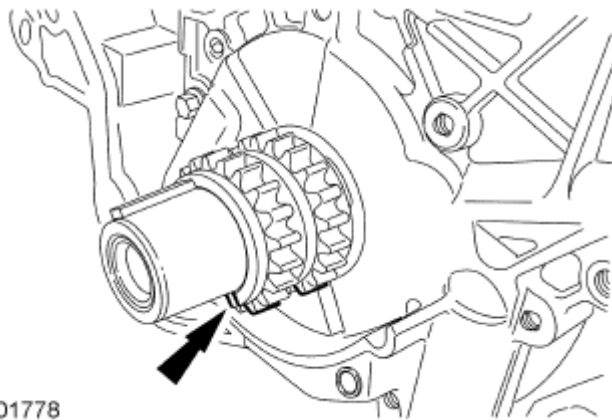


A0011418

Fig. 339: Identifying Crankshaft Damper Bolt
Courtesy of FORD MOTOR CO.

41. Install the crankshaft sprockets with the timing marks facing out. The timing mark on the LH and RH timing chains will be aligned to this mark during assembly.

NOTE: Failure to verify correct timing drive component alignment will result in severe engine damage.



N0101778

Fig. 340: Locating Crankshaft Sprocket
Courtesy of FORD MOTOR CO.

42. Position the chain tensioner in a soft-jawed vise.

NOTE: LH shown, RH similar.

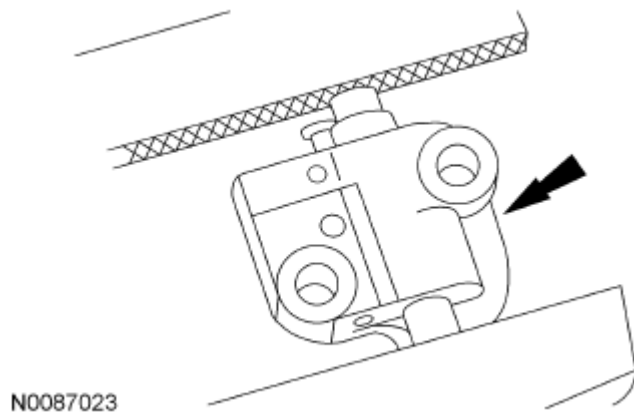


Fig. 341: Positioning Chain Tensioner In Soft-Jawed Vise
Courtesy of FORD MOTOR CO.

43. Hold the chain tensioner ratchet lock mechanism away from the ratchet stem with a small pick.

NOTE: LH shown, RH similar.

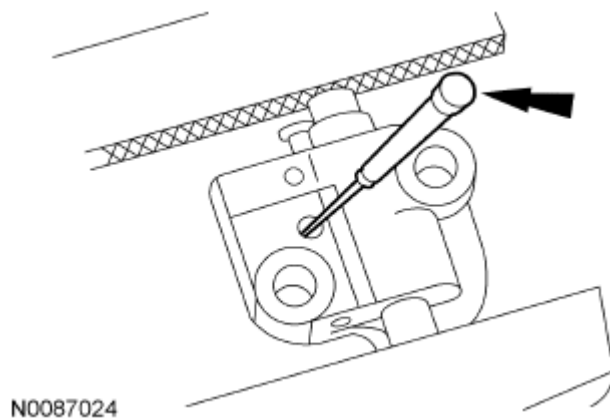


Fig. 342: Holding Chain Tensioner Ratchet Lock Mechanism Away
Courtesy of FORD MOTOR CO.

44. Slowly compress the timing chain tensioner.

NOTE: During tensioner compression, do not release the ratchet stem until the tensioner piston is fully bottomed in its bore or damage to the ratchet stem will result.

45. Retain the tensioner piston with a 1.5 mm (0.06 in) diameter wire or paper clip.

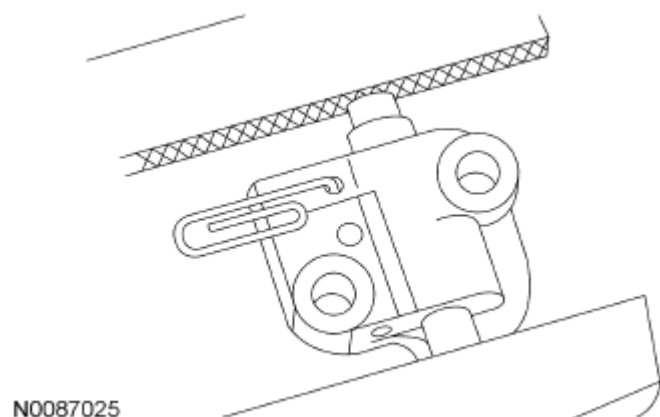


Fig. 343: Compressing Timing Chain Tensioner With Vise
Courtesy of FORD MOTOR CO.

46. If timing marks in the timing chains are not evident, use a permanent-type marker to mark the crankshaft and camshaft timing marks on the LH and RH timing chains.
1. Mark any link to use as the crankshaft timing mark.
 2. Starting with the crankshaft timing mark, count 29 links and mark the link.
 3. Continue counting to link 42 and mark the link.

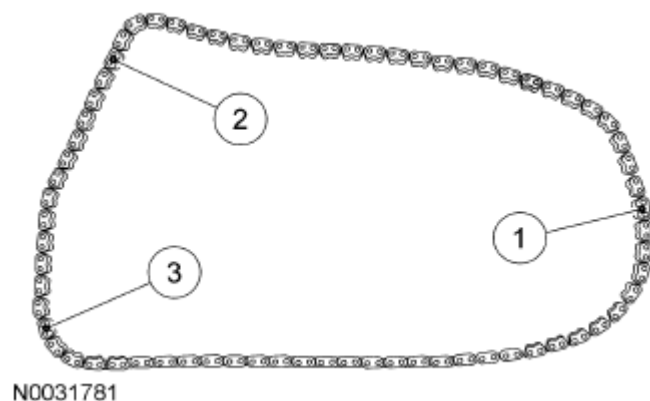


Fig. 344: Identifying Timing Marks On LH & RH Timing Chains
Courtesy of FORD MOTOR CO.

47. Position the LH timing chain and guide and install the bolts.
- Tighten to 25 Nm (18 lb-ft).
 - Align the marks on the timing chain with the marks on the camshaft and crankshaft sprockets.

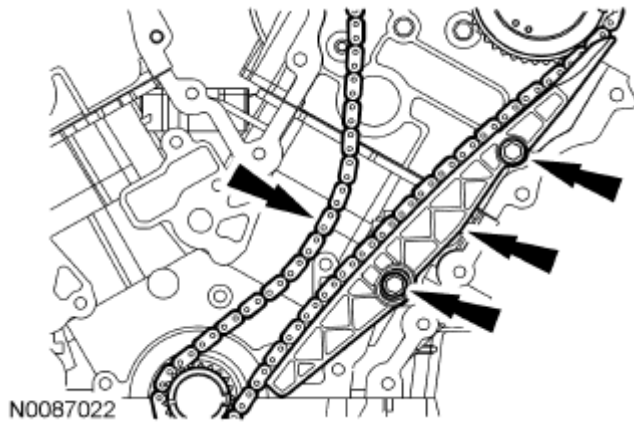


Fig. 345: Locating LH Timing Chain Guide With Bolts
Courtesy of FORD MOTOR CO.

48. Install the LH timing chain tensioner arm and the LH timing chain tensioner.
 1. Install the tensioner arm.
 2. Position the tensioner.
 3. Install the bolts.
 - Tighten to 25 Nm (18 lb-ft).

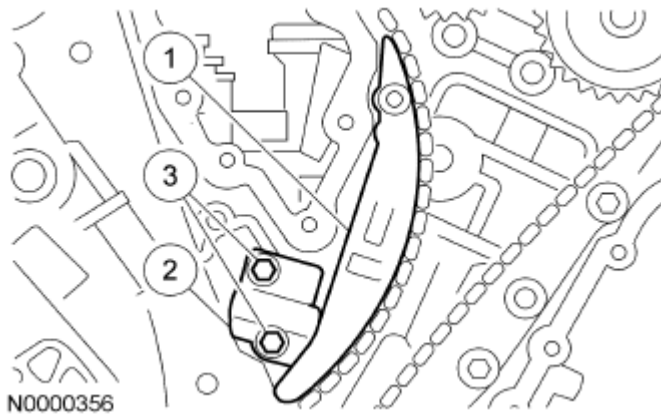
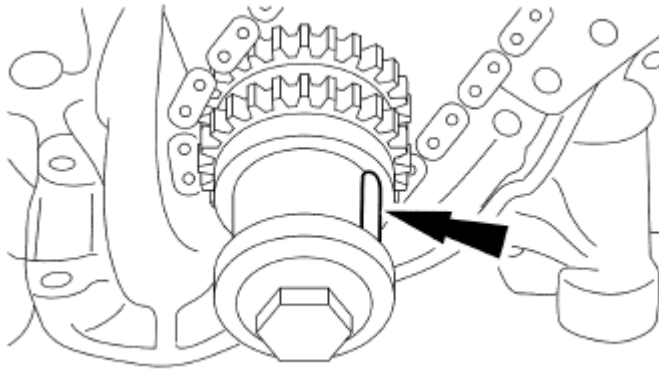


Fig. 346: Identifying LH Timing Chain Tensioner Arm & Bolts
Courtesy of FORD MOTOR CO.

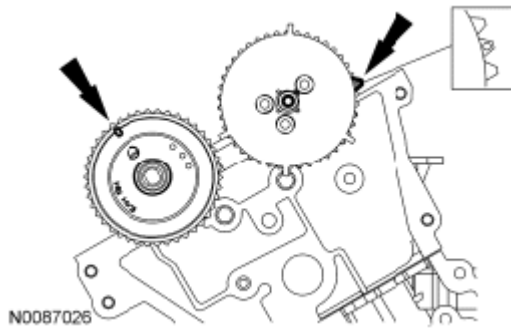
49. Install the crankshaft pulley bolt and rotate the crankshaft clockwise 120 degrees until the crankshaft keyway is in the 3 o'clock position.



A0038323

Fig. 347: Installing Crankshaft Damper Bolt
Courtesy of FORD MOTOR CO.

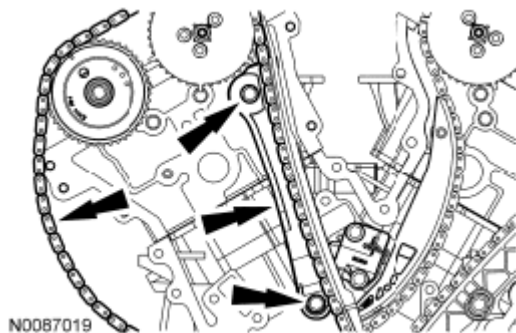
50. Verify that the RH camshafts are correctly positioned.



N0087026

Fig. 348: Locating RH Camshafts Correctly Position
Courtesy of FORD MOTOR CO.

51. Install the RH timing chain and chain guide and install the bolts.
- Tighten to 25 Nm (18 lb-ft).
 - Align the marks on the timing chain with the marks on the camshaft and crankshaft sprockets.



N0087019

Fig. 349: Locating RH Timing Chain & Chain Guide And Bolts
Courtesy of FORD MOTOR CO.

52. Install the RH timing chain tensioner and tensioner arm.

1. Install the tensioner arm.
2. Position the tensioner.
3. Install the bolts.
 - Tighten to 25 Nm (18 lb-ft).

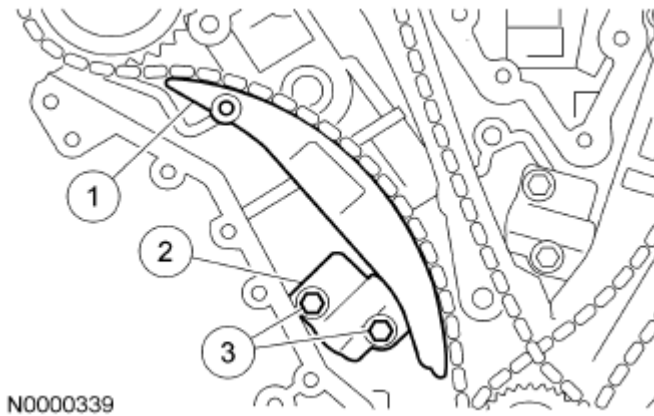


Fig. 350: Identifying RH Timing Chain Tensioner & Tensioner Arm
Courtesy of FORD MOTOR CO.

53. Remove the LH and RH timing chain tensioner piston retaining wires.

54. Rotate the crankshaft counterclockwise 120 degrees to **TDC** .

55. Verify the timing with the following steps.

1. There should be 12 chain links between the camshaft timing marks.
2. There should be 27 chain links between the camshaft and the crankshaft timing marks.
3. There should be 30 chain links between the camshaft and the crankshaft timing marks.

NOTE: **Failure to verify correct timing drive component alignment will result in severe engine damage.**

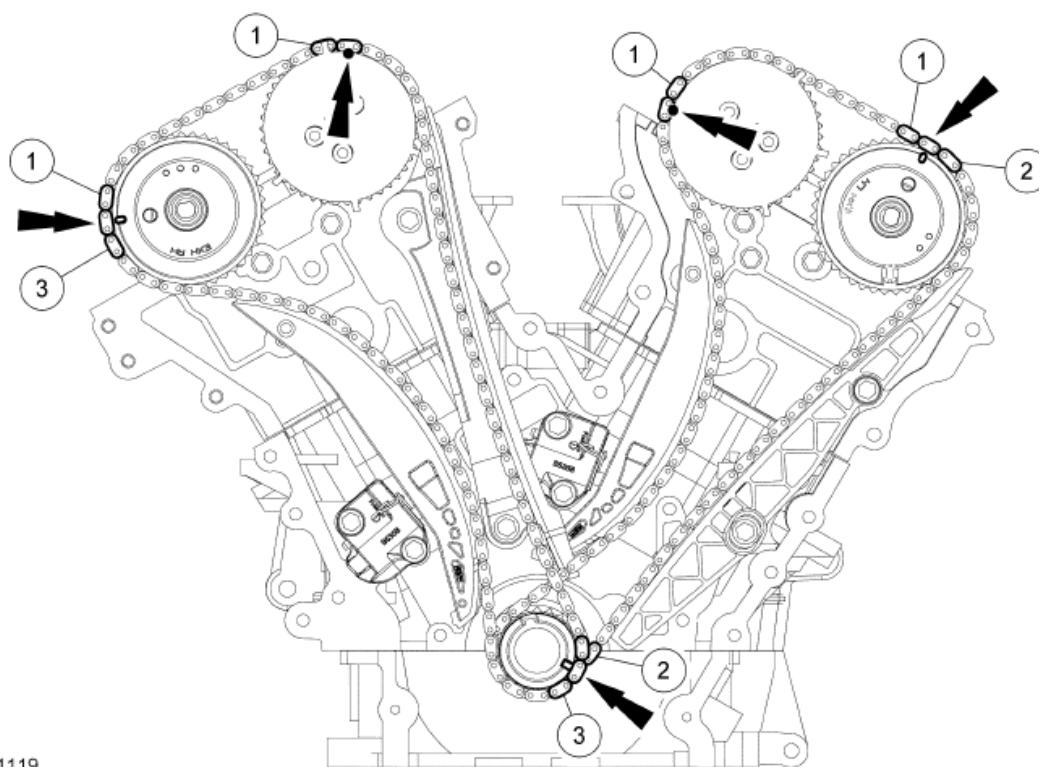


Fig. 351: Identifying Camshaft Timing Marks Location
Courtesy of FORD MOTOR CO.

56. Remove the crankshaft pulley bolt and washer.

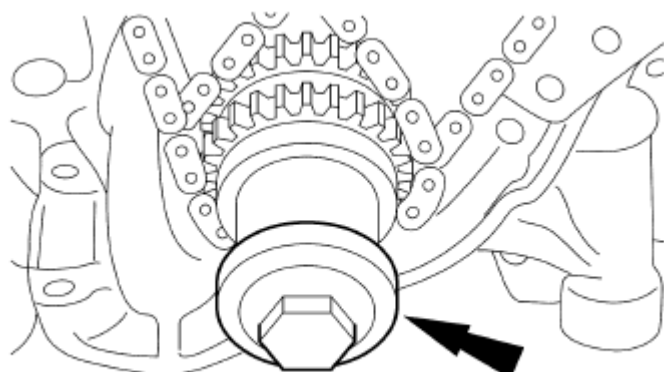


Fig. 352: Locating Crankshaft Pulley Bolt & Washer
Courtesy of FORD MOTOR CO.

57. Install the ignition pulse wheel.

NOTE: This pulse wheel is used in several different engines. Install the pulse wheel with the keyway in the slot stamped "30RFF" only (orange in color).

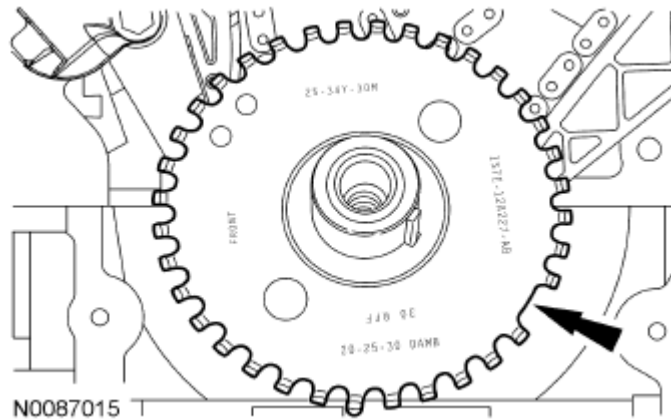


Fig. 353: Locating Ignition Pulse Wheel
Courtesy of FORD MOTOR CO.

58. Install the LH and RH spark plugs.
 - Tighten to 15 Nm (133 lb-in).

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

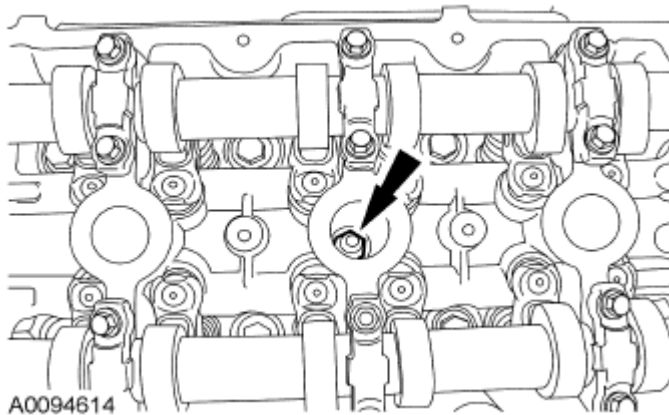


Fig. 354: Locating Spark Plugs
Courtesy of FORD MOTOR CO.

59. Use a plastic scraping tool to remove all traces of sealant.
 - Clean all sealing surfaces with metal surface prep and install new gaskets.

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.

NOTE: Do not damage the oil pan gasket while cleaning the sealant from the lower cylinder block-to-oil pan joint.

60. Apply a 6 mm (0.24 in) dot of silicone gasket and sealant to the cylinder block to lower cylinder block and cylinder head mating surfaces.

NOTE: Clean and degrease the sealing surfaces with metal surface prep before applying gasket and sealant.

NOTE: The front cover must be installed and the bolts tightened within 4 minutes of sealant application.

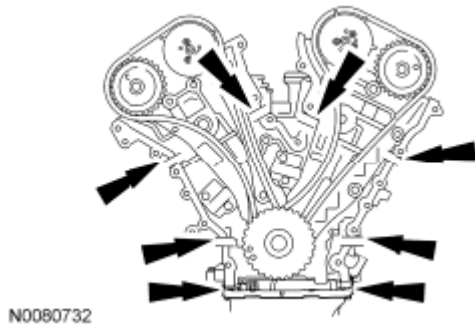
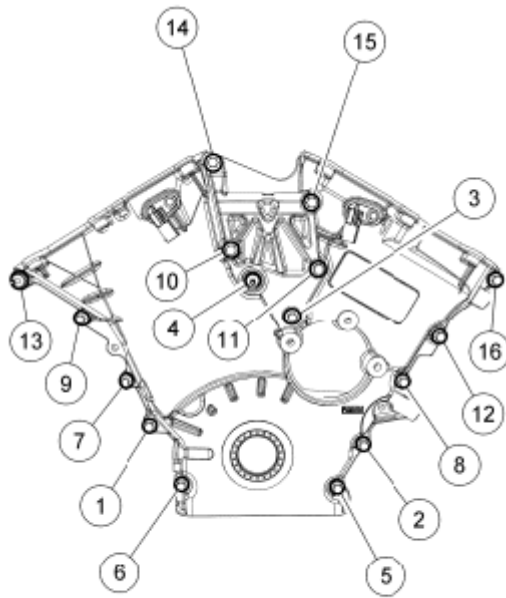


Fig. 355: Locating Front Cover & Bolts
Courtesy of FORD MOTOR CO.

61. Position the front cover and install the bolts and stud bolts.
- Tighten in the sequence shown to 25 Nm (18 lb-ft).

NOTE: Fasteners 4 and 13 are stud bolts.

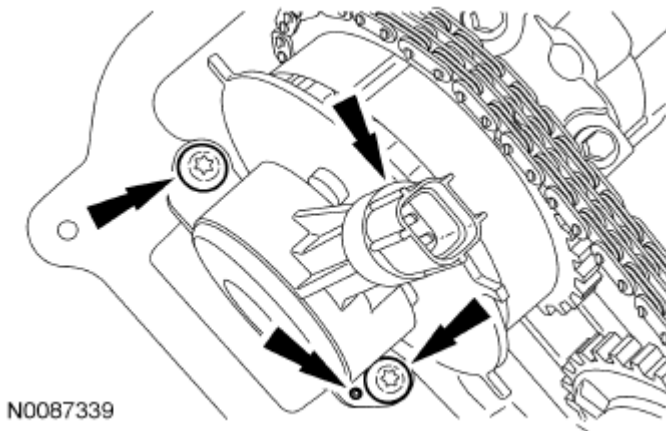


N0089680

Fig. 356: Identifying Front Cover & Bolts & Stud Bolts
Courtesy of FORD MOTOR CO.

62. Install the 2 bolts and the LH Variable Camshaft Timing (VCT) solenoid.
 - Tighten to 10 Nm (89 lb-in).

NOTE: Note the position of the alignment dowel on the engine front cover.



N0087339

Fig. 357: Locating LH VCT Connector With Bolts
Courtesy of FORD MOTOR CO.

63. Install the 2 bolts and the RH VCT solenoid.
 - Tighten to 10 Nm (89 lb-in).

NOTE: Note the position of the alignment dowel on the engine front cover.

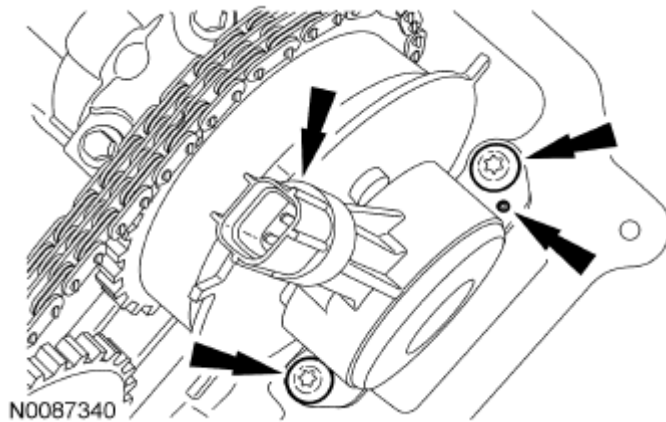


Fig. 358: Locating RH VCT With Bolts
Courtesy of FORD MOTOR CO.

64. Apply clean engine oil to the seal lip and seal bore before installing the seal.

NOTE: Clean all sealing surfaces with metal surface prep.

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

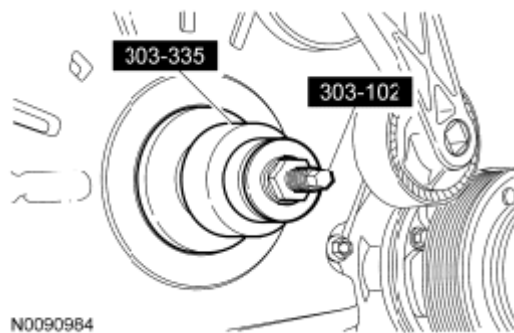


Fig. 359: Installing Crankshaft Front Seal
Courtesy of FORD MOTOR CO.

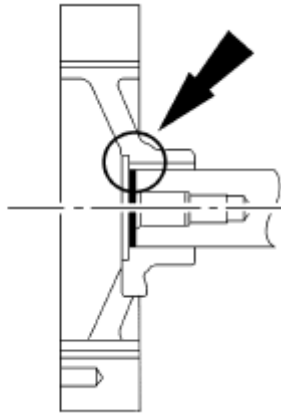
66. Apply silicone gasket and sealant to the end of the crankshaft pulley keyway slot.

NOTE: Clean the keyway and slot using metal surface prep before applying silicone gasket and sealant.

NOTE: Sealing surfaces must be free of dirt and oil.

NOTE: The crankshaft pulley must be installed and the bolt tightened within 4

minutes of sealant application.



A0010615

Fig. 360: Applying Silicone Gasket & Sealant
Courtesy of FORD MOTOR CO.

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

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

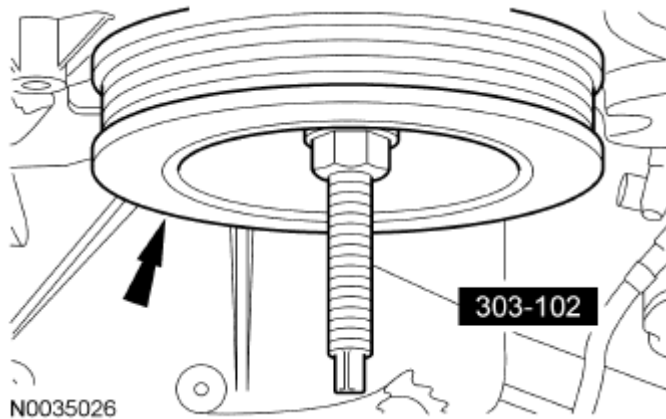


Fig. 361: Installing Crankshaft Pulley
Courtesy of FORD MOTOR CO.

68. Install the bolt and washer. Tighten the bolt in 4 stages:
- Stage 1: Tighten to 120 Nm (89 lb-ft).
 - Stage 2: Loosen one full turn.
 - Stage 3: Tighten to 50 Nm (37 lb-ft).
 - Stage 4: Tighten an additional 90 degrees.

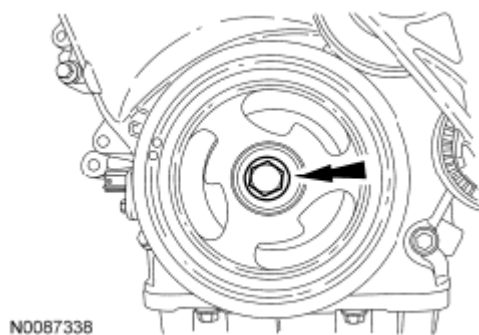


Fig. 362: Locating Washer & Bolt
Courtesy of FORD MOTOR CO.

69. Install the belt tensioner and the 3 bolts.
 - Tighten to 25 Nm (18 lb-ft).

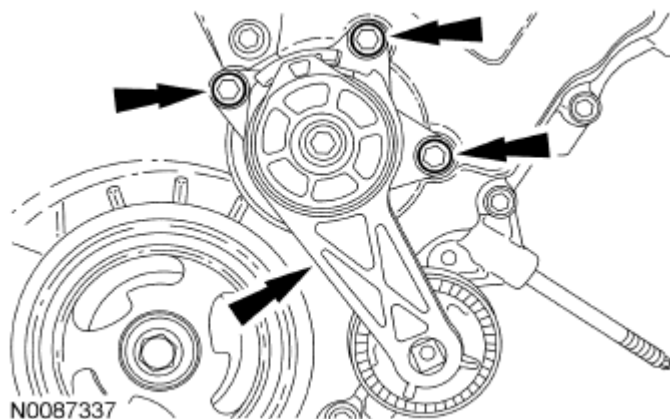


Fig. 363: Locating Accessory Drive Belt Tensioner With Bolts
Courtesy of FORD MOTOR CO.

70. Install the 8 nuts and the oil pan baffle.
 1. Tighten the 4 M6 oil pan baffle nuts in 2 stages.
 - Stage 1: Tighten to 5 Nm (44 lb-in).
 - Stage 2: Tighten an additional 45 degrees.
 2. Then install and tighten the 4 M8 oil pan baffle nuts in 2 stages.
 - Stage 1: Tighten to 15 Nm (133 lb-in).
 - Stage 2: Tighten an additional 45 degrees.

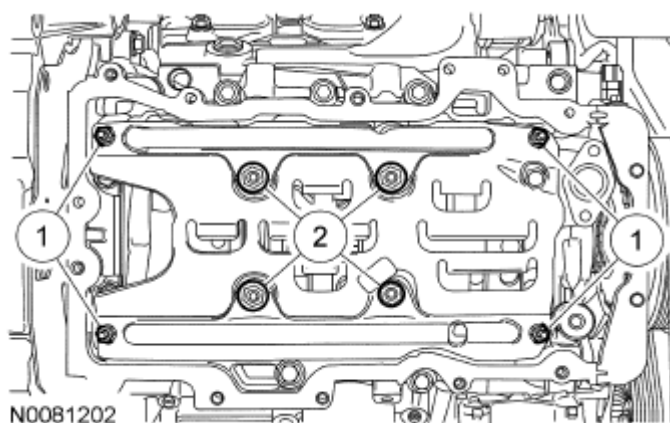
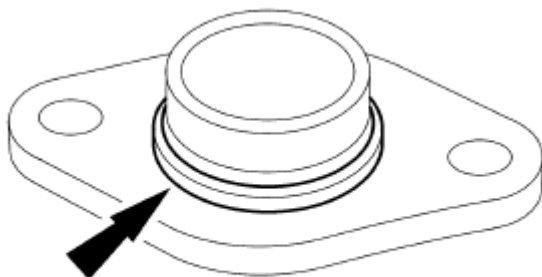


Fig. 364: Identifying Oil Pan Baffle Nuts
Courtesy of FORD MOTOR CO.

71. Install a new O-ring seal on the oil pump screen and pickup tube.
 - Lubricate the O-ring seal with clean engine oil.



A0011413

Fig. 365: Locating O-Ring Seal
Courtesy of FORD MOTOR CO.

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

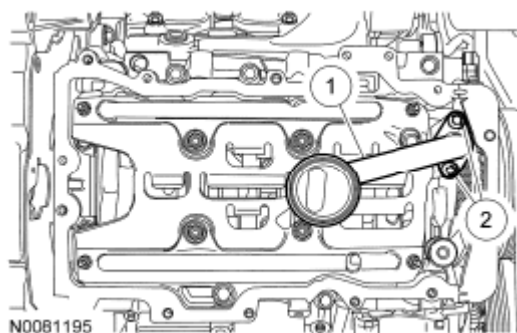


Fig. 366: Identifying Oil Pump Screen & Pickup Tube With Bolts
Courtesy of FORD MOTOR CO.

73. Apply an 8 mm (0.31 in) dot of silicone gasket and sealant at the cylinder block to front cover mating surface and the cam seal retainer-to-cylinder head joints.

NOTE: The valve cover must be installed and the bolts and studs tightened within 4 minutes of sealant application.

NOTE: Clean cylinder head and front cover surface using metal surface prep before applying silicone gasket and sealant.

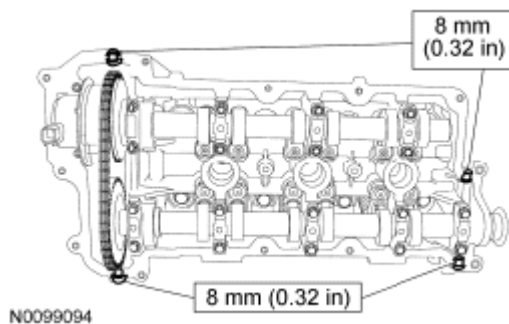


Fig. 367: Applying Dot Of Silicone Gasket & Sealant At Cylinder Block To Front Cover Mating Surface
Courtesy of FORD MOTOR CO.

74. Position the LH valve cover and install the bolts and stud bolts.
- Tighten in the sequence shown below to 10 Nm (89 lb-in).

NOTE: Install a new valve cover gasket.

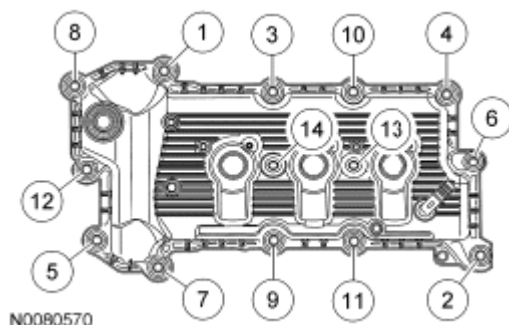


Fig. 368: Identifying Valve Cover & Bolts In Tightening Sequence
Courtesy of FORD MOTOR CO.

75. Apply an 8 mm (0.31 in) dot of silicone gasket sealant to the front cover-to-cylinder head joints.

NOTE: The valve cover must be installed and the bolts and stud bolts tightened within 4 minutes of sealant application.

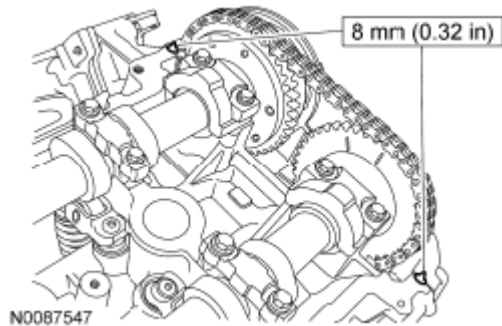


Fig. 369: Applying Dot Of Silicone Gasket Sealant To Front Cover-To-Cylinder Head Joints
Courtesy of FORD MOTOR CO.

76. Position the RH valve cover and install the bolts and stud bolts.
- Tighten in the sequence shown below to 10 Nm (89 lb-in).

NOTE: Install a new valve cover gasket.

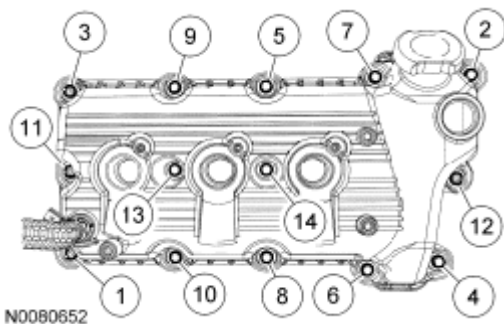


Fig. 370: Identifying RH Valve Cover & Bolts & Stud Bolts In Tightening Sequence
Courtesy of FORD MOTOR CO.

77. If equipped, install the block heater.
- Tighten to 21 Nm (15 lb-ft).

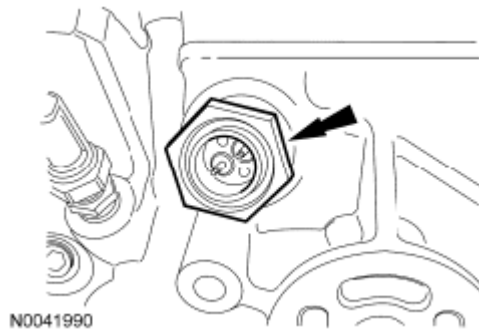


Fig. 371: Identifying Block Heater
Courtesy of FORD MOTOR CO.

78. Install the **EOP** switch.
 - Tighten to 14 Nm (124 lb-in).

NOTE: Apply thread sealant with PTFE to the Engine Oil Pressure (EOP) switch threads.

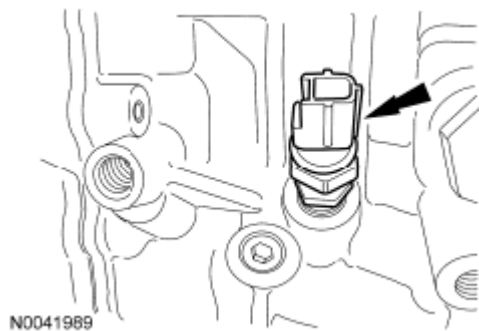


Fig. 372: Locating EOP Switch
Courtesy of FORD MOTOR CO.

79. Position the coolant pump housing and attach the coolant hose.
 - Tighten the clamp to 7 Nm (62 lb-in).

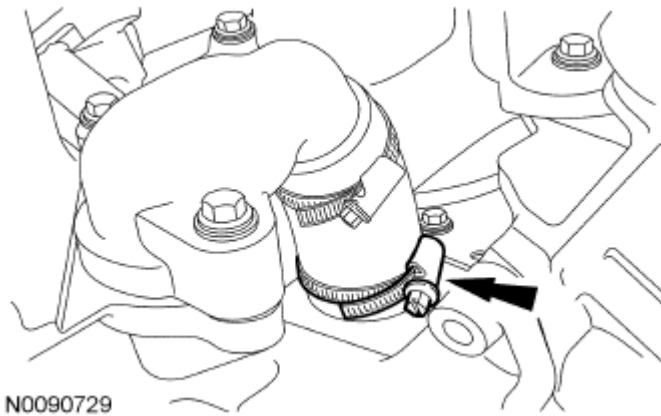


Fig. 373: Identifying Coolant Hose Clamp
Courtesy of FORD MOTOR CO.

80. Install the 5 coolant pump housing bolts.
- Tighten to 10 Nm (89 lb-in).

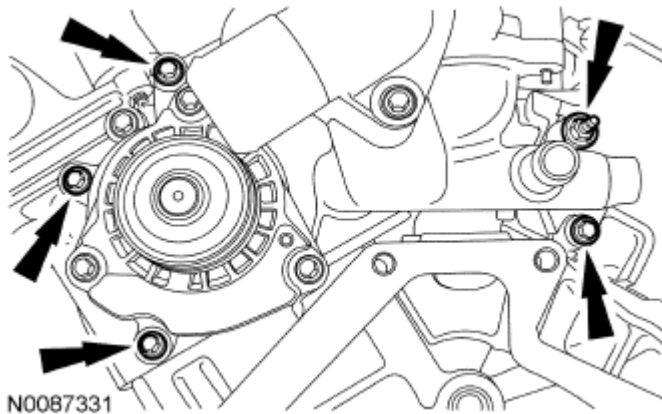


Fig. 374: Identifying Coolant Pump Housing Bolts
Courtesy of FORD MOTOR CO.

81. Install the Camshaft Pulley Installer in the camshaft as shown below.
- Adjust the collar on the Camshaft Pulley Installer screw to get the best thread engagement in the rear of the camshaft.

NOTE: Failure to use the correct special tools, assembled as shown below, will result in damage to the coolant pump pulley and/or special tools.

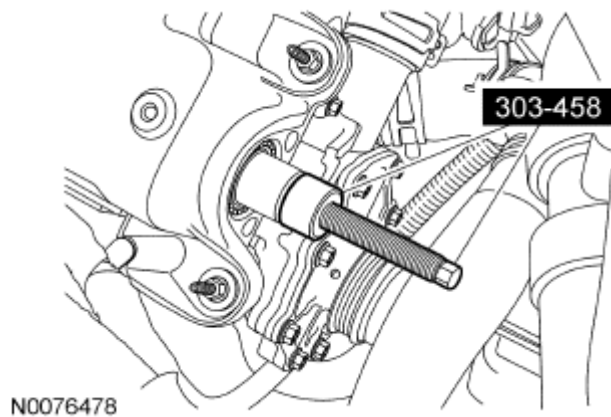


Fig. 375: Identifying Camshaft Pulley Installer Screw
Courtesy of FORD MOTOR CO.

82. Position the coolant pump pulley over the previously installed Camshaft Pulley Installer and on the end of the camshaft. Install the Camshaft Pulley Installer, Power Steering Pump Pulley Installer and the Water Pump Pulley Spacer as shown below.
- Using the Camshaft Pulley Installer, Power Steering Pump Pulley Installer and the Water Pump Pulley Spacer, install a new service coolant pump pulley flush with the end of the camshaft.

NOTE: Failure to use the correct special tools, assembled as shown below, will result in damage to the coolant pump pulley and/or special tools.

NOTE: Only the roller collared nut from the Power Steering Pump Pulley Installer (211-185) is used on Camshaft Pulley Installer (303-485).

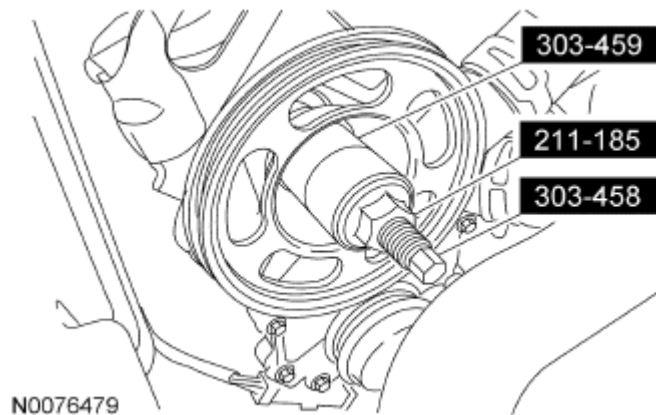


Fig. 376: Identifying Camshaft Pulley Installer, Power Steering Pump Pulley Installer & Water Pump Pulley Spacer
Courtesy of FORD MOTOR CO.

83. Install the coolant pump belt on the coolant pump pulley and position it on the camshaft pulley.

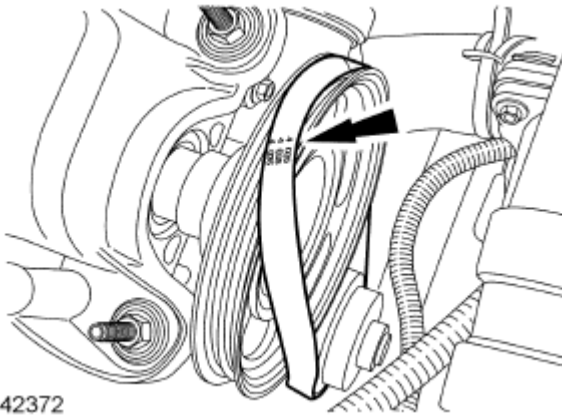


Fig. 377: Locating Coolant Pump Belt
Courtesy of FORD MOTOR CO.

84. Rotate the crankshaft clockwise to seat the water pump belt on the camshaft pulley.

NOTE: Do not use any screwdrivers, pliers or other metal objects that could cause damage to the belt or camshaft pulley while installing the belt.

85. Install a new O-ring on the oil level indicator tube. Apply clean engine oil to the O-ring.

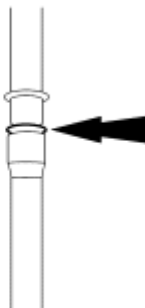


Fig. 378: Locating O-Ring On Oil Level Indicator Tube
Courtesy of FORD MOTOR CO.

86. Position the oil level indicator and tube and install the stud bolt.
- Tighten to 9 Nm (80 lb-in).

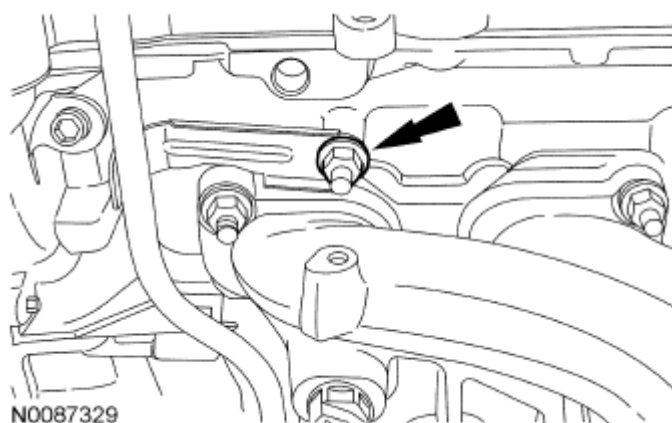


Fig. 379: Identifying Oil Level Indicator & Tube With Stud Bolt
Courtesy of FORD MOTOR CO.

87. Install the 3 bolts and the A/C compressor bracket.
 - Tighten to 25 Nm (18 lb-ft).

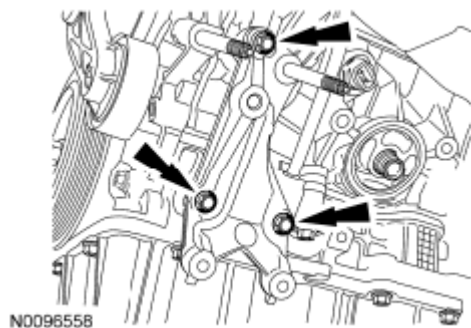


Fig. 380: Locating A/C Compressor Bracket & Bolts
Courtesy of FORD MOTOR CO.

88. Lubricate the O-ring seal with clean engine oil and install the oil filter.
 - Tighten to 5 Nm (44 lb-in) and then rotate an additional 180 degrees.

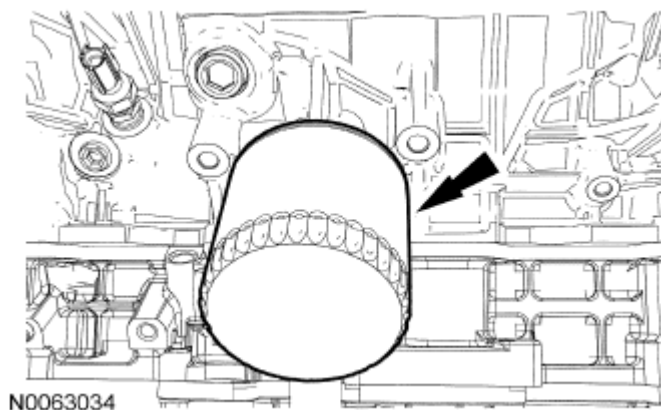
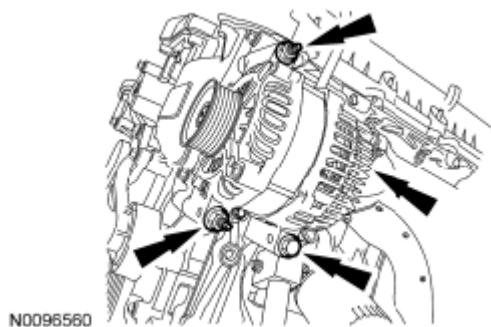


Fig. 381: Locating Oil Filter

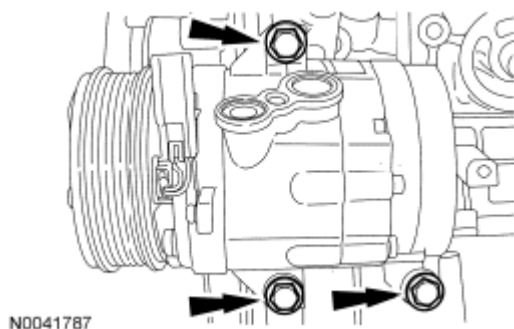
Courtesy of FORD MOTOR CO.

89. Position the generator and install the bolt and 2 nuts.
- Tighten to 47 Nm (35 lb-ft).

**Fig. 382: Locating Generator, Bolt & Nuts**

Courtesy of FORD MOTOR CO.

90. Install the A/C compressor and the 3 bolts.
- Tighten to 25 Nm (18 lb-ft).

**Fig. 383: Locating A/C Compressor & Bolts**

Courtesy of FORD MOTOR CO.

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

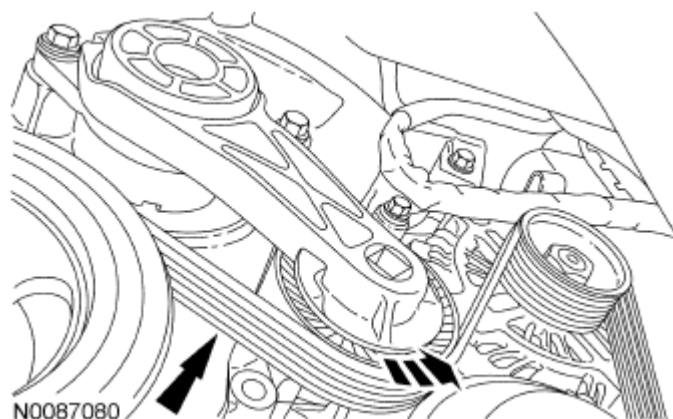


Fig. 384: Locating Accessory Drive Belt
Courtesy of FORD MOTOR CO.

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

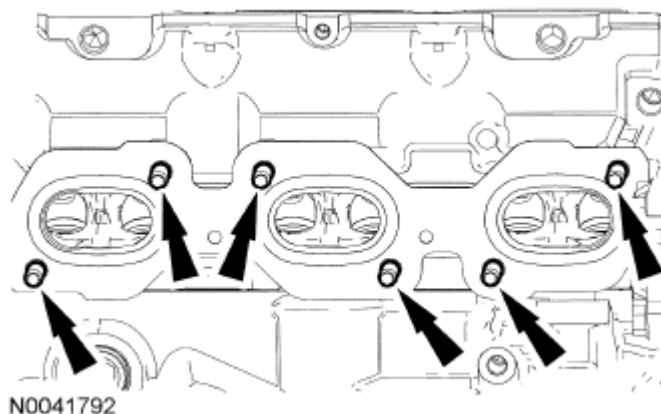


Fig. 385: Locating Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

93. Install a new gasket and the RH exhaust manifold and new nuts.
 - Tighten the nuts in 2 stages in the sequence shown below.
 - Stage 1: Tighten to 20 Nm (177 lb-in).
 - Stage 2: Tighten to 20 Nm (177 lb-in).

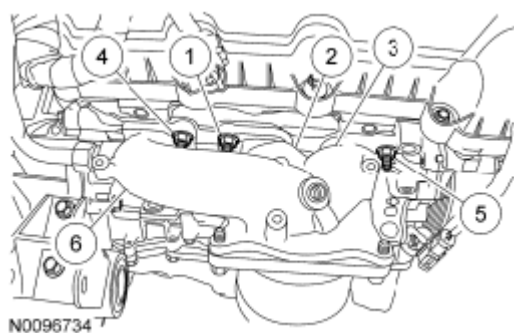


Fig. 386: Identifying RH Exhaust Manifold & Nuts Tightening Sequence
 Courtesy of FORD MOTOR CO.

Front Wheel Drive (FWD)

94. Install a new gasket and the RH catalytic converter and the 3 new nuts.
 - Tighten to 40 Nm (30 lb-ft).

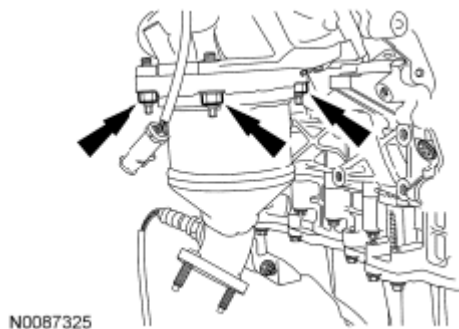


Fig. 387: Locating RH Catalytic Converter & Nuts
 Courtesy of FORD MOTOR CO.

95. Install the 3 bolts and the RH heat shield.
 - Tighten to 10 Nm (89 lb-in).

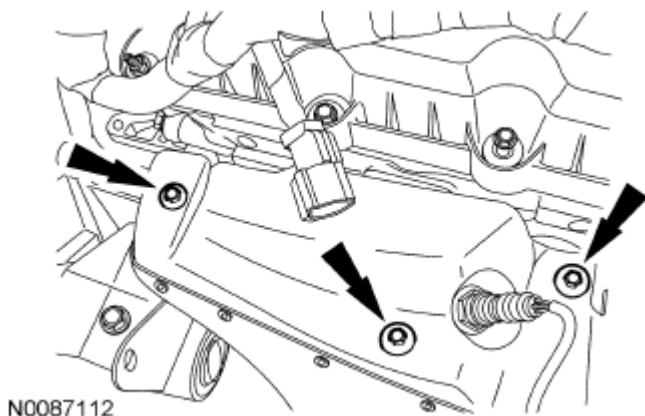


Fig. 388: Locating RH Heat Shield Bolts
Courtesy of FORD MOTOR CO.

All engines

96. Apply a light film of silicone brake caliper grease and dielectric compound to the interior of the spark plug boot prior to installation.

NOTE: LH shown, RH similar.

Install the 6 coil-on-plugs and the bolts.

- Tighten to 6 Nm (53 lb-in).

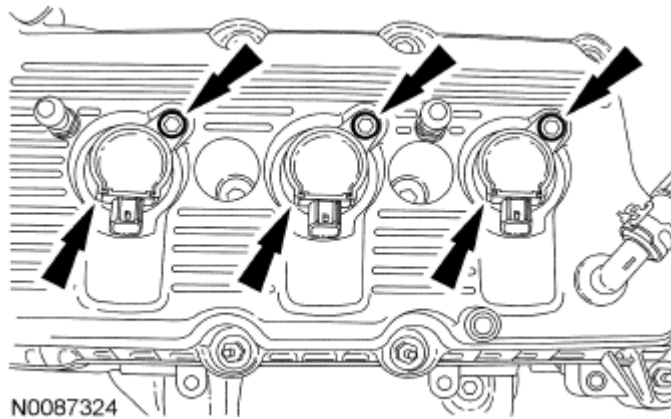


Fig. 389: Locating Coil-On-Plugs With Bolts
Courtesy of FORD MOTOR CO.

97. Position the lower intake manifold and install the 8 bolts.
- Tighten in the sequence shown below to 10 Nm (89 lb-in).

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: Clean and inspect all sealing surfaces. Install new gaskets.

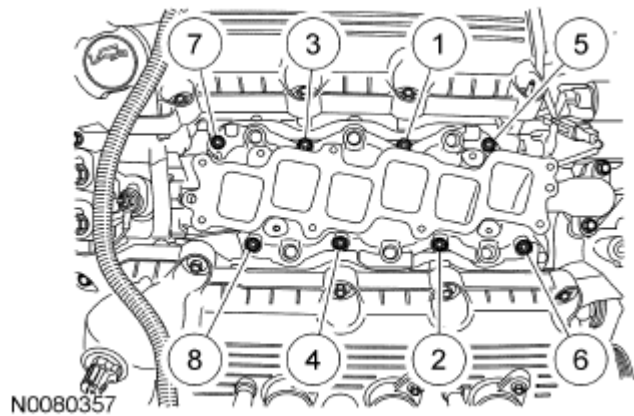
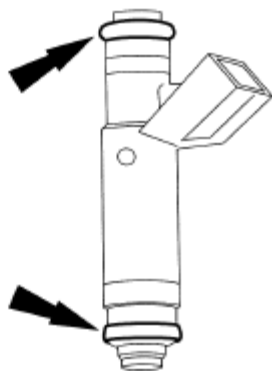


Fig. 390: Identifying Lower Intake Manifold Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

98. Install new fuel injector O-rings.
- Separate the fuel injectors from the fuel rail.
 - Remove and discard the fuel injector O-rings.
 - Install new O-rings and lubricate with clean engine oil.
 - Install the fuel injectors onto the fuel rail.

NOTE: Use O-ring seals that are made of special fuel-resistant material. Use of ordinary O-rings can cause the fuel system to leak. Do not reuse the O-ring seals.



AV1418-A

Fig. 391: Locating Fuel Injector O-Ring Seals
Courtesy of FORD MOTOR CO.

99. Install the 4 bolts and the fuel rail and injectors assembly.
- Tighten to 10 Nm (89 lb-in).

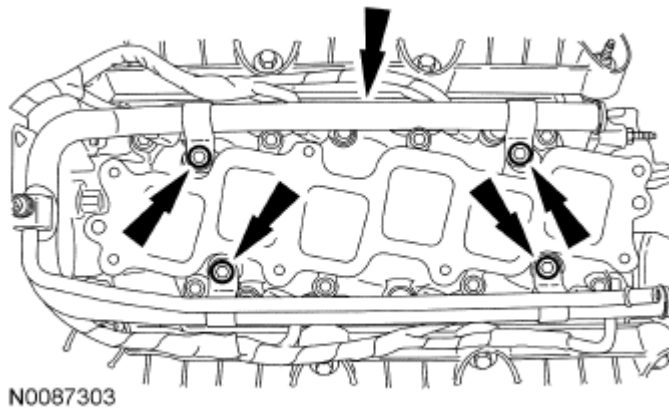


Fig. 392: Locating Fuel Rail & Injectors Assembly Bolts
Courtesy of FORD MOTOR CO.

100. Position the upper intake manifold and install the 7 bolts.
- Tighten the bolts in 2 stages in the sequence shown.
 - Stage 1: Tighten to 10 Nm (89 lb-in).
 - Stage 2: Tighten an additional 45 degrees.

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: Clean and inspect all sealing surfaces. Install new gaskets.

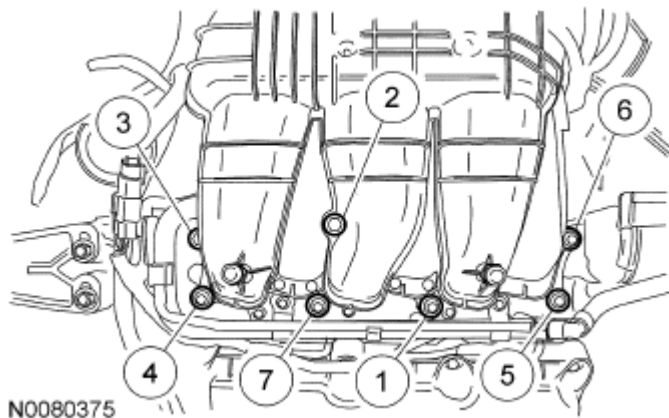


Fig. 393: Identifying Upper Intake Manifold Bolt Tightening Sequence
Courtesy of FORD MOTOR CO.

101. Loosen the upper intake manifold bracket lower bolt. Install the upper bolts (1 shown), then tighten all the bolts.
- Tighten to 10 Nm (89 lb-in).

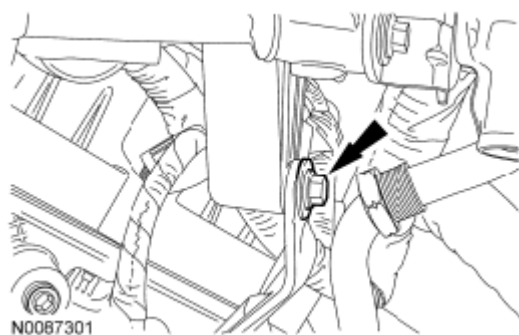


Fig. 394: Locating Upper Intake Manifold Bracket Bolts
Courtesy of FORD MOTOR CO.

102. Connect the 3 LH coil-on-plug electrical connectors.
- Attach the 2 wiring harness retainers.

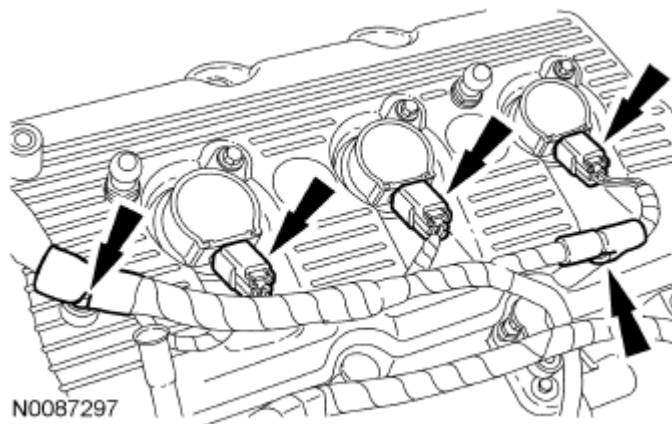


Fig. 395: Locating LH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

103. Connect the Engine Oil Pressure (EOP) switch electrical connector and attach the wiring retainer to the oil indicator tube.

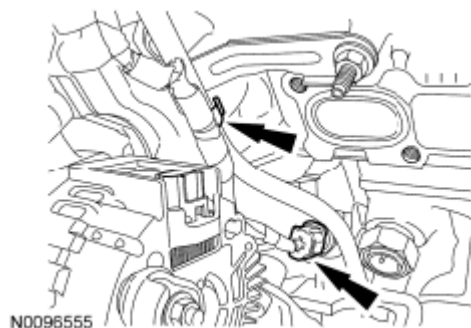


Fig. 396: Locating EOP Switch Electrical Connector & Wiring Retainer From Oil Indicator Tube
Courtesy of FORD MOTOR CO.

104. Install the radio interference capacitor and the nut.
 - Tighten to 6 Nm (53 lb-in).

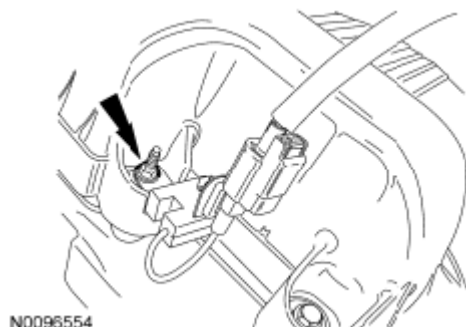


Fig. 397: Locating Radio Frequency Interference Capacitor & Nut
Courtesy of FORD MOTOR CO.

105. Connect the LH VCT electrical connector.

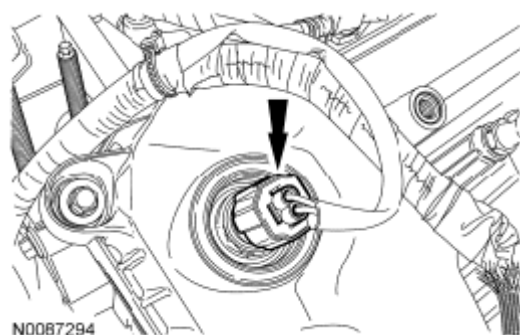


Fig. 398: Locating LH VCT Electrical Connector
Courtesy of FORD MOTOR CO.

106. Connect the fuel injector wiring harness electrical connector and attach the wiring harness retainer.

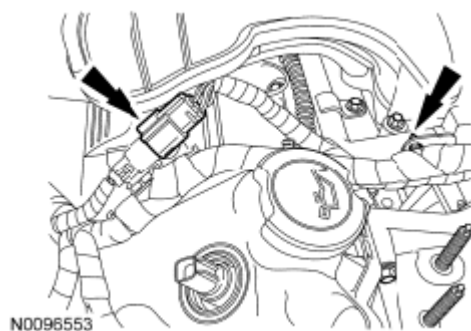


Fig. 399: Locating Fuel Injector Wiring Harness Electrical Connector & Wiring Harness Retainer
Courtesy of FORD MOTOR CO.

107. Connect the 2 Camshaft Position (CMP) sensor electrical connectors and attach the wiring harness retainer from the engine front cover stud bolt.

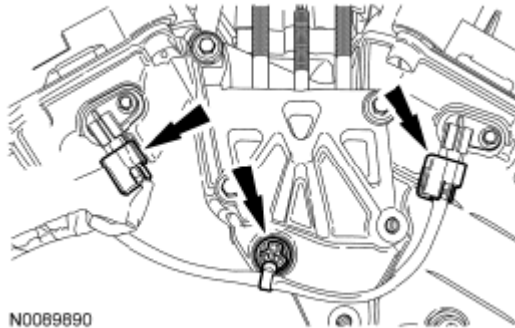


Fig. 400: Locating Camshaft Position (CMP) Sensor Electrical Connectors
Courtesy of FORD MOTOR CO.

108. Connect the Crankshaft Position (CKP) sensor electrical connector and attach the 2 wiring harness retainers.

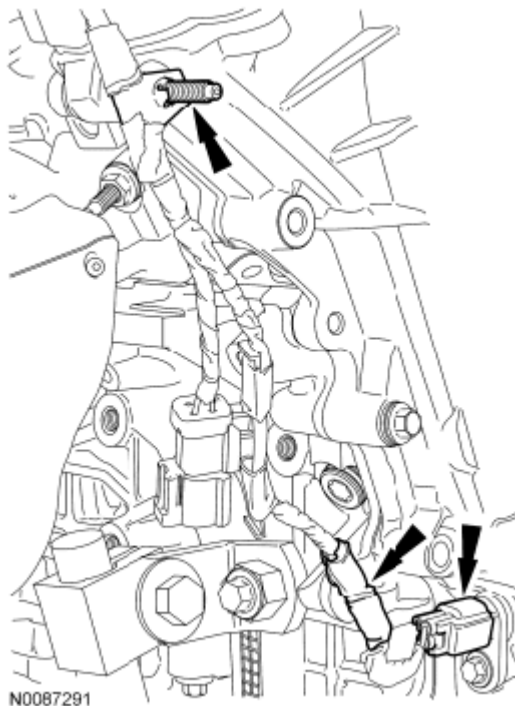


Fig. 401: Locating CKP Sensor Electrical Connector & Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

109. Connect the RH VCT electrical connector and attach the wiring harness retainer to the valve cover stud bolt.

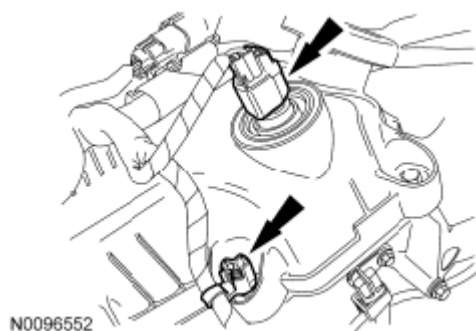


Fig. 402: Locating RH VCT Electrical Connector & Wiring Harness Retainer From Valve Cover Stud Bolt
 Courtesy of FORD MOTOR CO.

110. Connect the RH coil-on-plug electrical connectors.
- Attach the 2 wiring harness retainers.

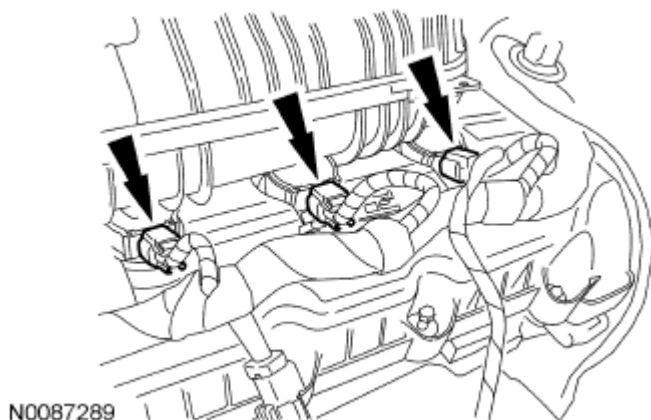


Fig. 403: Locating RH Coil-On-Plug Electrical Connectors
 Courtesy of FORD MOTOR CO.

111. Connect the Manifold Absolute Pressure (MAP) electrical connector and attach the wiring retainer.

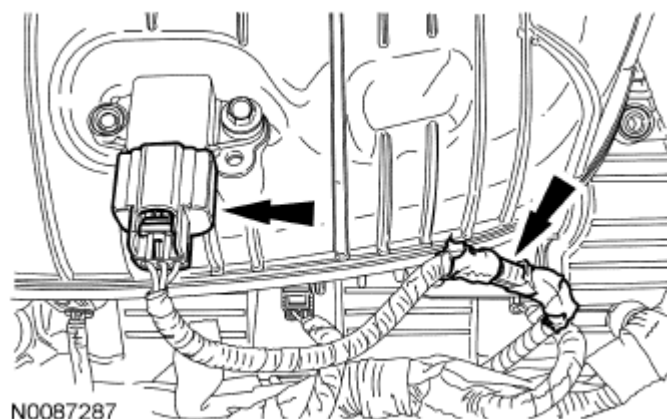


Fig. 404: Locating Manifold Absolute Pressure Electrical Connector
Courtesy of FORD MOTOR CO.

112. Attach the wiring harness retainer to the upper intake manifold.

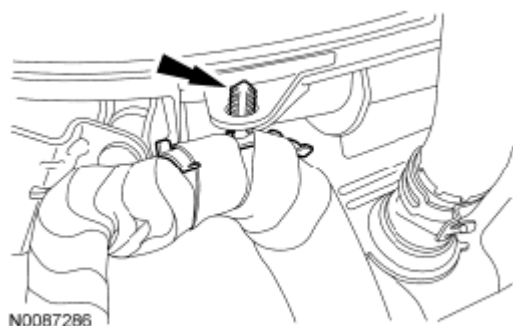


Fig. 405: Locating Wiring Harness Retainer To Upper Intake Manifold
Courtesy of FORD MOTOR CO.

113. Connect the PCV valve electrical connector.

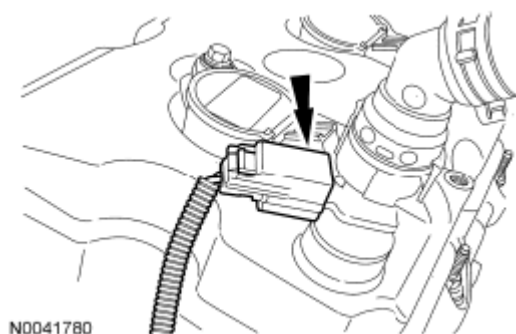


Fig. 406: Locating PCV Valve Electrical Connector
Courtesy of FORD MOTOR CO.

114. Connect the EGR regulator electrical connector and attach the wiring retainer.

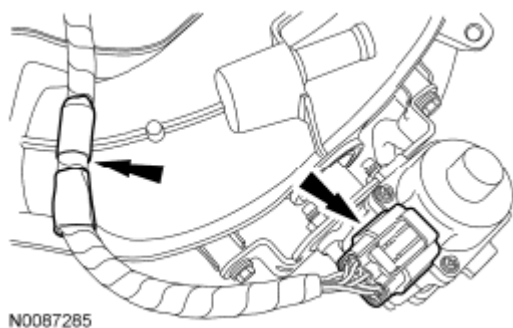


Fig. 407: Locating EGR Regulator Electrical Connector & Wiring Retainer
Courtesy of FORD MOTOR CO.

115. Connect the Evaporative Emission (EVAP) canister purge valve electrical connector.

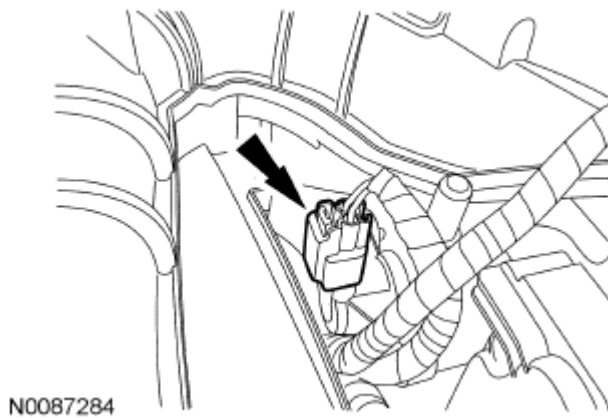


Fig. 408: Locating Evaporative Emission Canister Purge Valve Electrical Connector
Courtesy of FORD MOTOR CO.

116. Connect the electronic throttle control electrical connector.

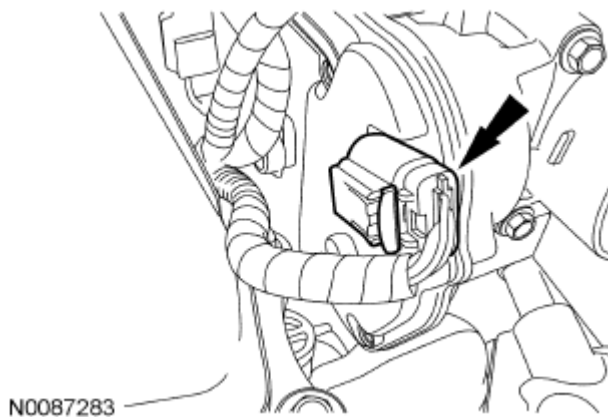


Fig. 409: Locating Electronic Throttle Control Electrical Connector
Courtesy of FORD MOTOR CO.

117. Connect the 3 engine wiring connectors.
- Connect the engine block Knock Sensor (KS) electrical connector.
 - Connect the Cylinder Head Temperature (CHT) sensor electrical connector.
 - Connect the cylinder head **KS** electrical connector.

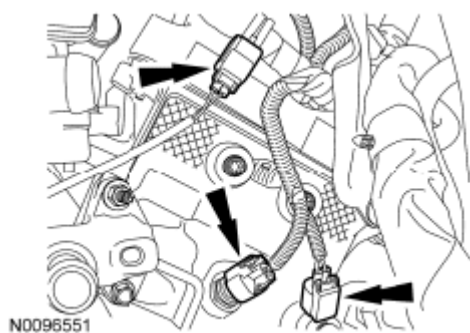


Fig. 410: Locating Cylinder Head Temperature (CHT) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

118. Position the B+ wiring harness and attach the 2 harness retainers to the valve cover stud bolts.



Fig. 411: Locating B+ Wiring Harness Retainers From Valve Cover Stud Bolts
Courtesy of FORD MOTOR CO.

119. Install the B+ wire and nut on the generator.
- Tighten to 8 Nm (71 lb-in).



Fig. 412: Locating B+ Wire & Nut On Generator
Courtesy of FORD MOTOR CO.

120. Connect the generator electrical connector.

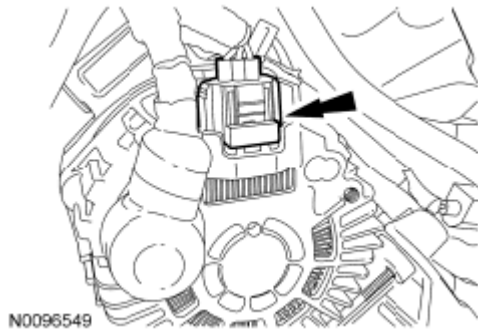


Fig. 413: Locating Generator Electrical Connector
Courtesy of FORD MOTOR CO.

121. Connect the A/C compressor clutch electrical connector.

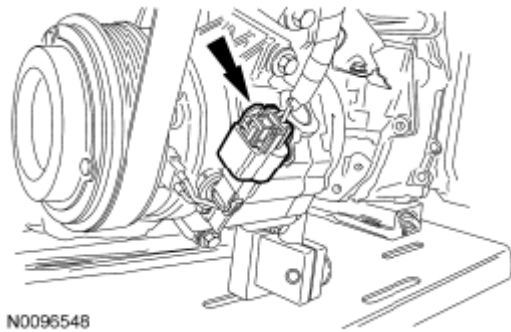


Fig. 414: Locating A/C Compressor Clutch Electrical Connector
Courtesy of FORD MOTOR CO.

122. Install the lower half of the Engine Lifting Bracket Set.

NOTE: When installing the lower half of the lifting bracket it will be easier to loosely install the upper bolt first then install the lower bolt.

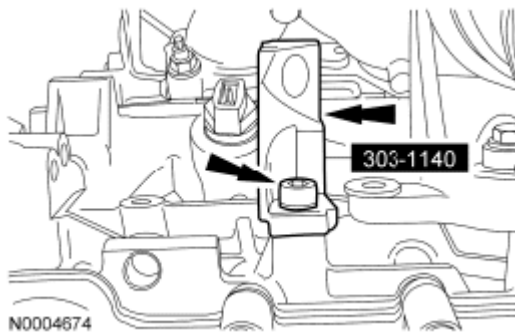


Fig. 415: Installing Lower Half Of Engine Lifting Bracket Set
Courtesy of FORD MOTOR CO.

123. Install the upper half of the Engine Lifting Bracket Set.



Fig. 416: Removing Nuts At Lift Links
Courtesy of FORD MOTOR CO.

124. Install the Engine Lifting Bracket.

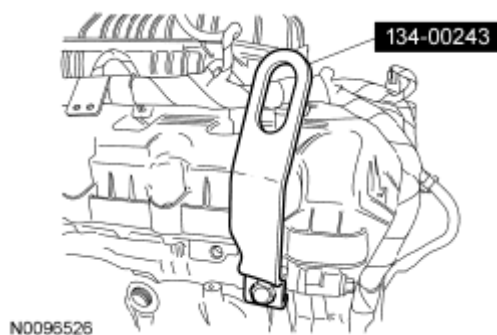


Fig. 417: Locating Engine Lifting Bracket
Courtesy of FORD MOTOR CO.

125. Install the Engine Lifting Bracket and the Universal Adapter Bracket.

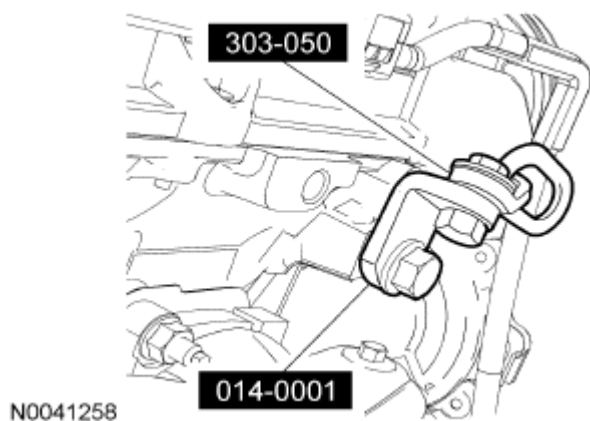


Fig. 418: Lifting Bracket To Rear Of LH Cylinder Head
Courtesy of FORD MOTOR CO.

126. Using the Spreader Bar, Engine Lifting Brackets, Engine Lifting Bracket Set and a suitable engine crane, remove the engine from the engine stand.

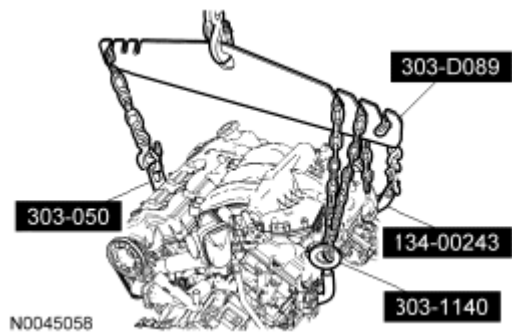


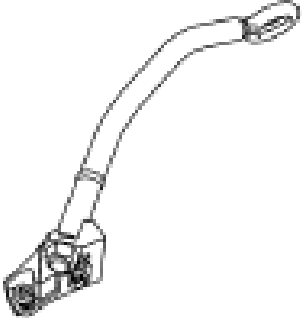
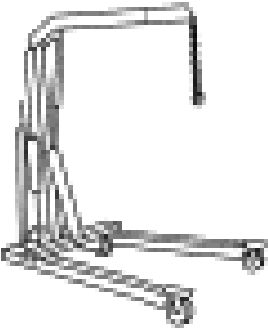
Fig. 419: Removing Engine & Transaxle
Courtesy of FORD MOTOR CO.

INSTALLATION

ENGINE

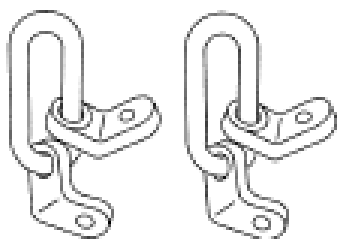
Special Tool(s)

SPECIAL TOOLS TABLE

 ST2873-A	Engine Lifting Bracket Set 303-1140
 ST1341-A	Heavy Duty Floor Crane 014-00071 or equivalent
	Lifting Bracket, Engine 303-050 (T70P-6000)

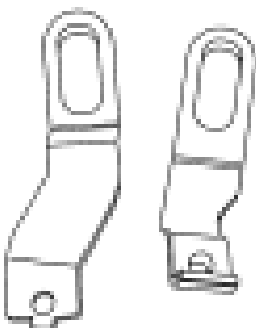
2010 Mercury Milan

2010 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan



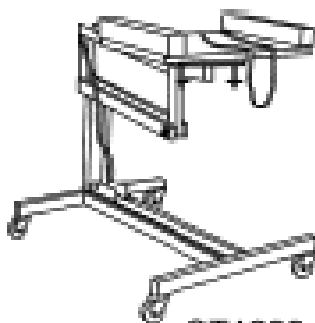
ST2793-A

Lifting Brackets, Engine 134-00243 or equivalent



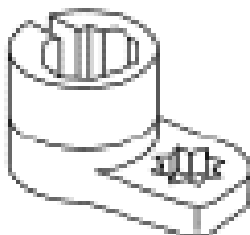
ST2463-A

Powertrain Lift 014-00765



ST1293-A

Socket, Exhaust Gas Oxygen Sensor 303-476

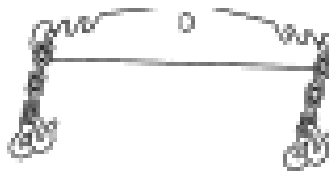


ST1447-A

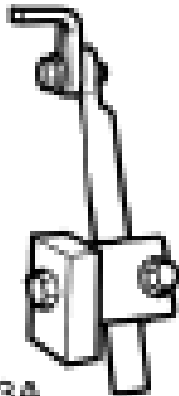
Spreader Bar 303-D089 (D93P-6001-A3) or equivalent

2010 Mercury Milan

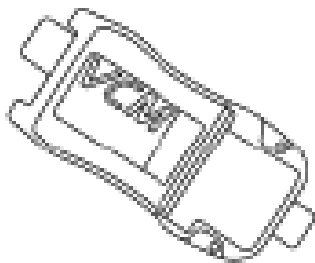
2010 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan



ST1602-A



ST2743A



ST2834-A

Universal Adapter Brackets 014-0001

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

Material

MATERIAL SPECIFICATIONS TABLE

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

Installation

NOTE: If the oil pan was removed during engine disassembly, it must be installed after engine and transaxle are assembled and the transaxle-to-engine bolts are installed. Failure to follow this assembly sequence can result in engine oil leaks.

All vehicles

1. Using the Spreader Bar, Engine Lifting Brackets, Engine Lifting Bracket Set and a suitable engine crane, align the transaxle to the engine.

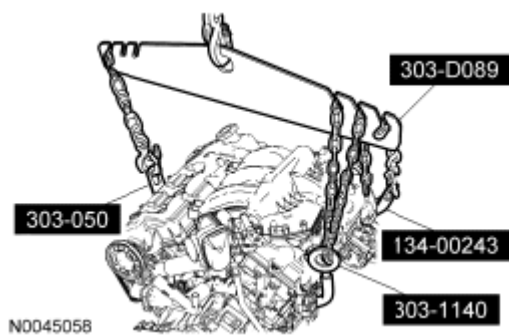


Fig. 420: Removing Engine & Transaxle
Courtesy of FORD MOTOR CO.

2. Install the 4 transaxle-to-engine bolts.
 - Tighten to 48 Nm (35 lb-ft).

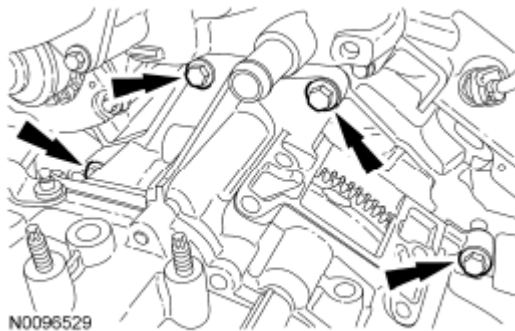


Fig. 421: Locating Transaxle-To-Engine Bolts
Courtesy of FORD MOTOR CO.

3. Install the transaxle-to-engine bolt.
 - Tighten to 48 Nm (35 lb-ft).

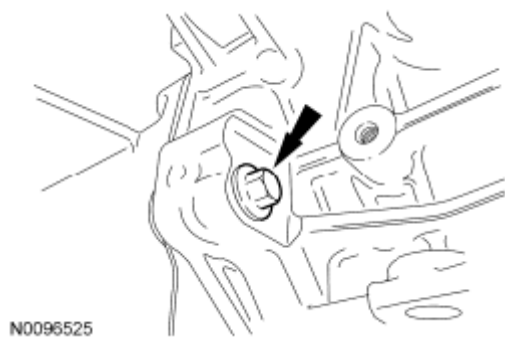


Fig. 422: Locating Transaxle-To-Engine Bolt
Courtesy of FORD MOTOR CO.

4. Connect the 2 transmission electrical connectors and attach the wiring harness retainer to the stud bolt.

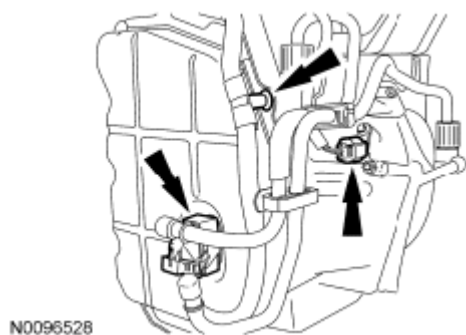


Fig. 423: Locating Wiring Retainer From Stud Bolt
Courtesy of FORD MOTOR CO.

5. Attach the wiring harness retainer to the transmission indicator tube.

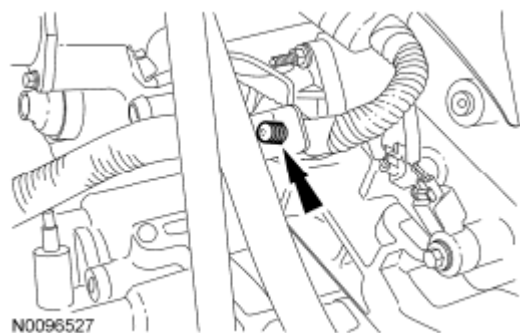


Fig. 424: Locating Wiring Harness Retainer To Transmission Indicator Tube
Courtesy of FORD MOTOR CO.

6. Install the starter and the 2 stud bolts.
 - Tighten to 27 Nm (20 lb-ft).

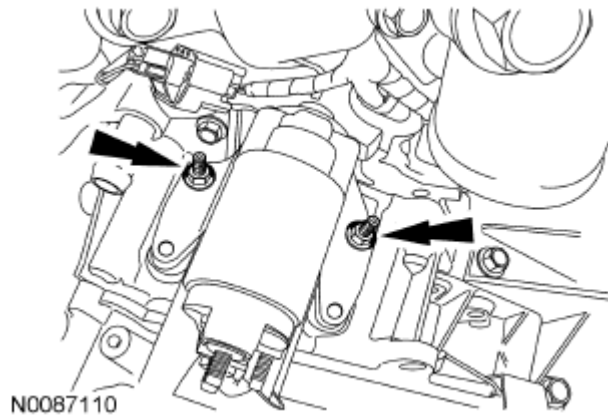


Fig. 425: Locating Starter Stud Bolts
Courtesy of FORD MOTOR CO.

7. Install the starter wiring and the 2 nuts.
 - Tighten the small starter motor solenoid wire nut to 5 Nm (44 lb-in).
 - Tighten the large starter motor solenoid battery cable nut to 12 Nm (106 lb-in).

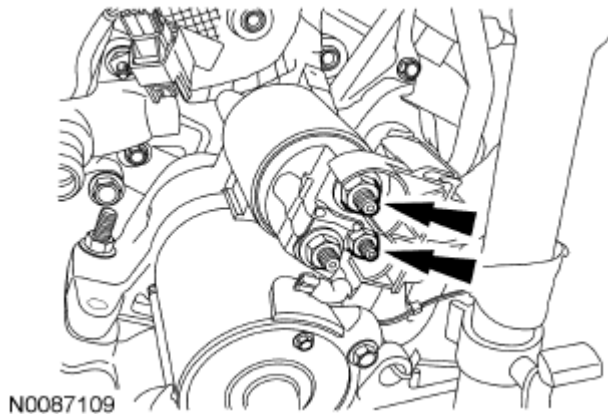


Fig. 426: Locating Starter Wiring Nut
Courtesy of FORD MOTOR CO.

8. Use a plastic scraping tool to remove all traces of the oil pan gasket.
 - Clean all sealing surfaces with metal surface prep and install a new 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.

9. Install the starter wiring ground wire and nut.
 - Tighten to 18 Nm (159 lb-in).

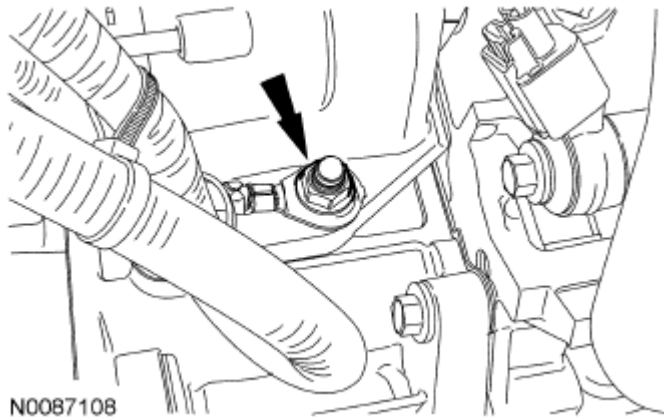


Fig. 427: Locating Starter Wiring Ground Nut
Courtesy of FORD MOTOR CO.

10. Using the Spreader Bar, Engine Lifting Brackets, Engine Lifting Bracket Set and a suitable engine crane, position the engine and transaxle onto the lift table.

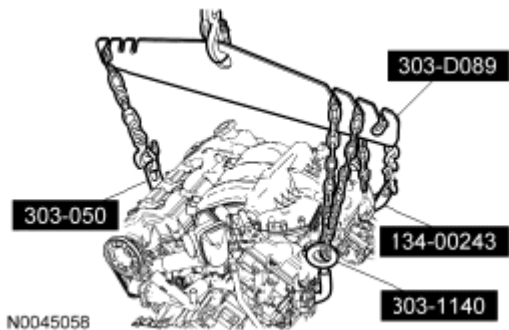


Fig. 428: Removing Engine & Transaxle
Courtesy of FORD MOTOR CO.

11. Install the Universal Adapter Brackets and the Powertrain Lift to the engine.

NOTE: Position a suitable block of wood under the transaxle.

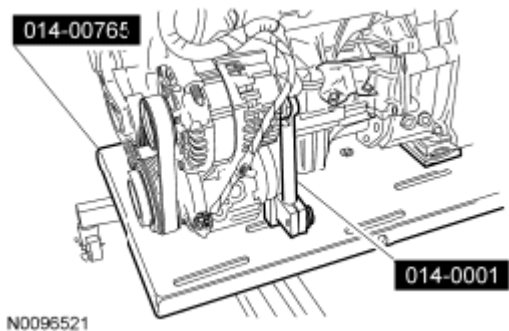


Fig. 429: Installing Powertrain Lift & Universal Adapter Brackets Onto Engine

Courtesy of FORD MOTOR CO.

12. Raise the engine and transaxle up into the vehicle.
13. Install the engine support insulator bracket, 3 nuts and the bolt.
 - Tighten the nuts to 63 Nm (46 lb-ft).
 - Tighten the bolt to 115 Nm (85 lb-ft).

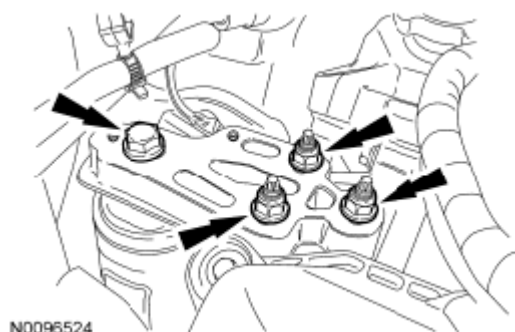


Fig. 430: Locating Engine Mount Bracket With Bolt & Nuts
Courtesy of FORD MOTOR CO.

14. Install the damper and bolt.
 - Tighten to 23 Nm (17 lb-ft).

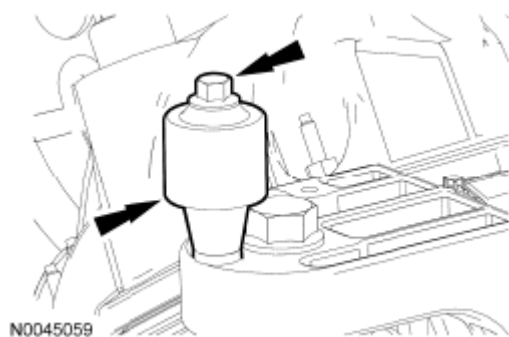


Fig. 431: Locating Damper & Bolt
Courtesy of FORD MOTOR CO.

15. Install the ground strap and bolt on the engine mount bracket.
 - Tighten to 10 Nm (89 lb-in).

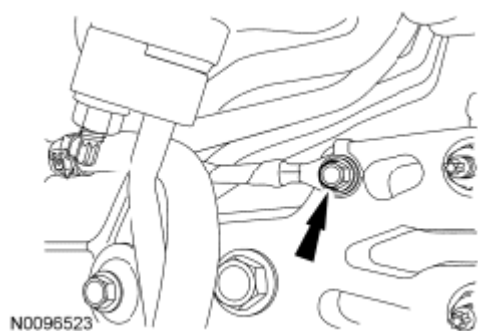


Fig. 432: Locating Ground Strap From Engine Mount Bracket & Bolt
Courtesy of FORD MOTOR CO.

16. Install the rear transaxle support through bolt.
 - Tighten to 103 Nm (76 lb-ft).

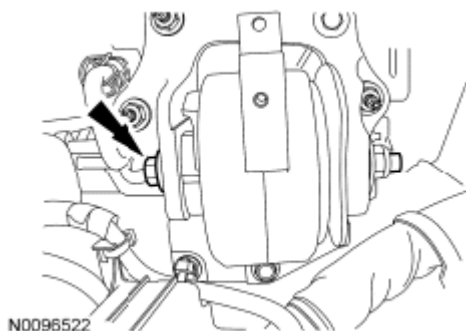


Fig. 433: Locating Rear Transaxle Support Through Bolt
Courtesy of FORD MOTOR CO.

17. Install the transaxle-to-engine stud and 2 nuts.
 - Tighten to 48 Nm (35 lb-ft).

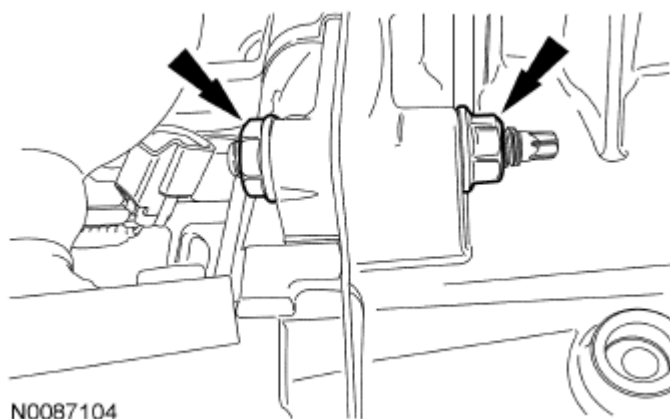


Fig. 434: Locating Nuts & Transaxle-To-Engine Stud
Courtesy of FORD MOTOR CO.

18. Apply a 10 mm (0.39 in) dot of silicone gasket and sealant to the front cover-to-cylinder block sealing surface.

NOTE: Clean and degrease all sealing surfaces with metal surface prep.

NOTE: The oil pan must be installed and the bolts tightened within 4 minutes of the sealant application.

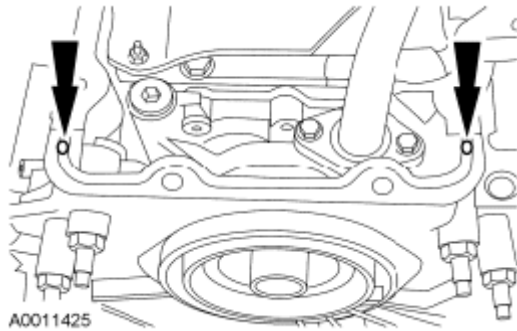


Fig. 435: Identifying Evaporative Emission Canister Purge Valve
Courtesy of FORD MOTOR CO.

19. Position the oil pan and gasket and loosely install the bolts and stud bolts.

NOTE: Install a new oil pan gasket.

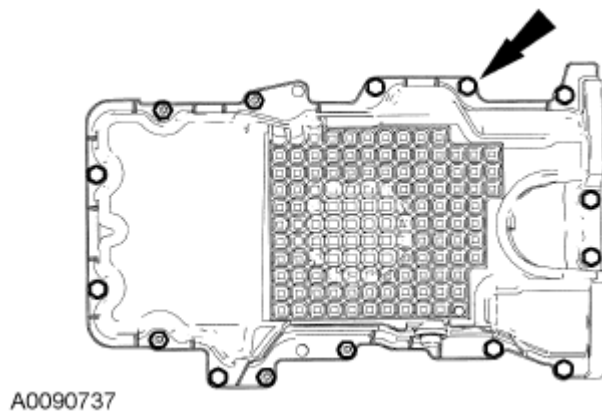


Fig. 436: Identifying Oil Pan Bolts & Stud Bolts
Courtesy of FORD MOTOR CO.

20. Install the 2 oil pan-to-transaxle bolts.
- Tighten to 40 Nm (30 lb-ft).



Fig. 437: Locating Oil Pan-To-Transaxle Bolts
Courtesy of FORD MOTOR CO.

21. Tighten the oil pan bolts in the sequence shown below to 25 Nm (18 lb-ft).

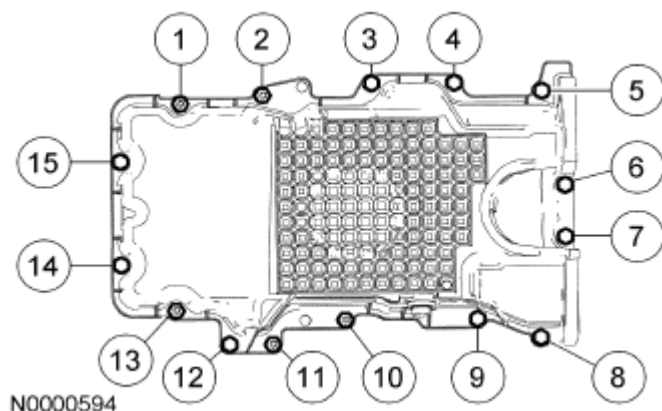


Fig. 438: Identifying Oil Pan Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

22. Install the 4 torque converter nuts.
- Tighten to 40 Nm (30 lb-ft).



Fig. 439: Locating Torque Converter Nuts

Courtesy of FORD MOTOR CO.

23. Install the access cover.

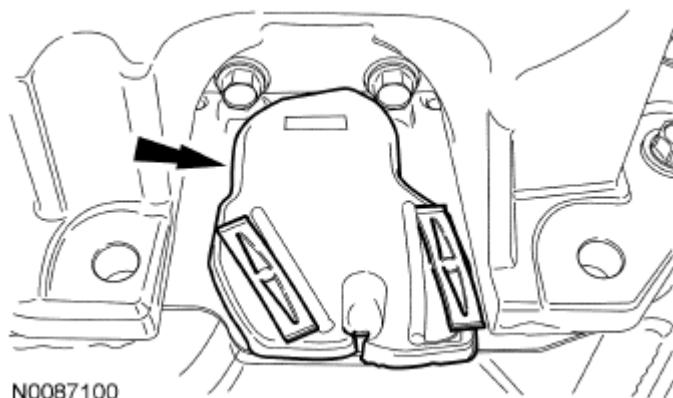


Fig. 440: Locating Access Cover
Courtesy of FORD MOTOR CO.

All-Wheel Drive (AWD) vehicles

24. Install the Power Transfer Unit (PTU) and the 5 bolts.
- Tighten to 90 Nm (66 lb-ft).

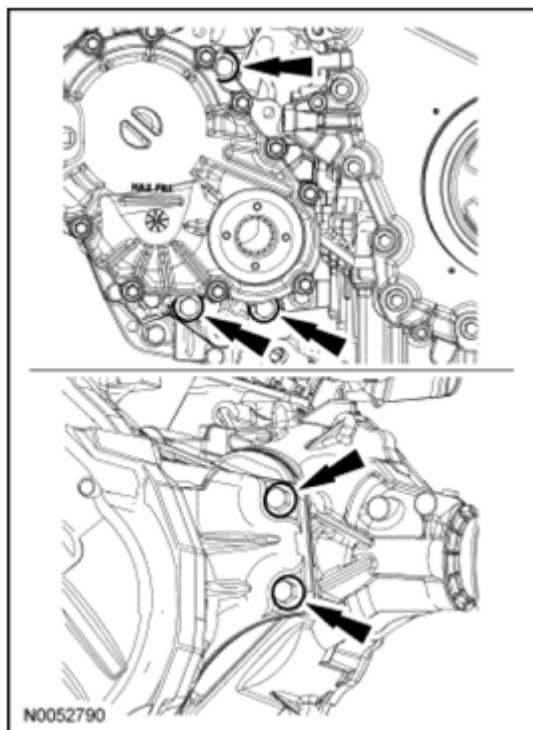


Fig. 441: Locating PTU Bolts
Courtesy of FORD MOTOR CO.

25. Install the **PTU** support bracket and the 5 bolts.
- Tighten to 55 Nm (41 lb-ft).



Fig. 442: Locating PTU Support Bracket And Bolts
Courtesy of FORD MOTOR CO.

26. Install a new **PTU** seal. For additional information, refer to **POWER TRANSFER UNIT (PTU)** .

NOTE: **A new PTU seal must be installed whenever the intermediate shaft is removed.**

27. Using a new gasket, install the RH catalytic converter and 3 new nuts.
- Tighten to 40 Nm (30 lb-ft).

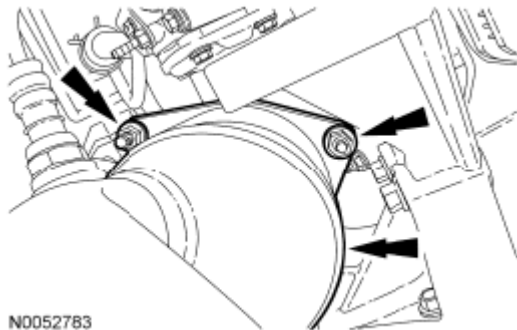


Fig. 443: Locating RH Catalytic Converter & Nuts
Courtesy of FORD MOTOR CO.

28. Install the RH exhaust heat shield bracket (inboard half) and the 2 bolts.
- Tighten to 40 Nm (30 lb-ft).

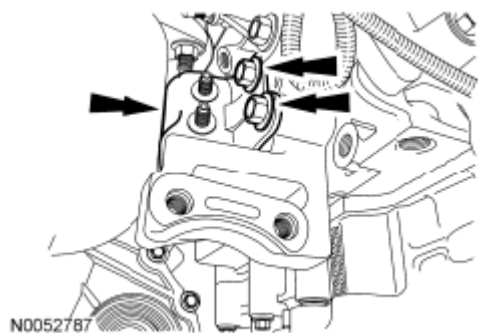


Fig. 444: Locating RH Exhaust Heat Shield Bracket & Bolts
Courtesy of FORD MOTOR CO.

29. Install the RH exhaust heat shield bracket (outboard half) and the 3 nuts.
 - Tighten to 20 Nm (177 lb-in).

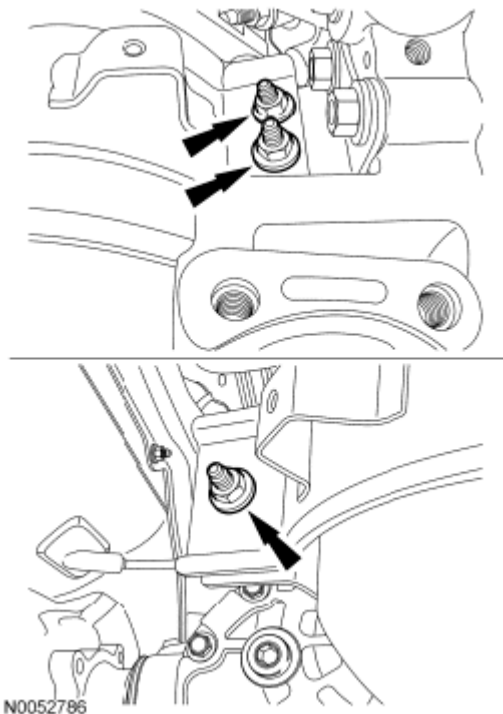


Fig. 445: Locating RH Exhaust Heat Shield Bracket & Nuts
Courtesy of FORD MOTOR CO.

30. Install the RH exhaust heat shield and the 6 bolts.
 - Tighten to 10 Nm (89 lb-in).

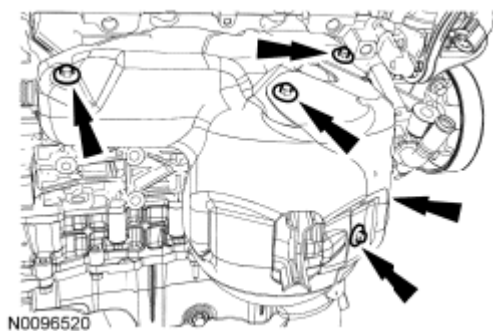
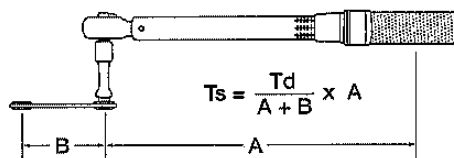
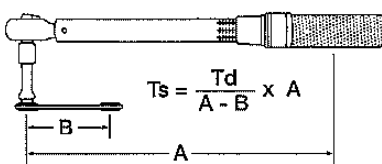
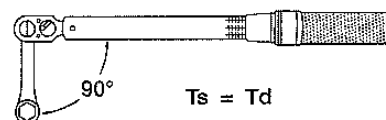
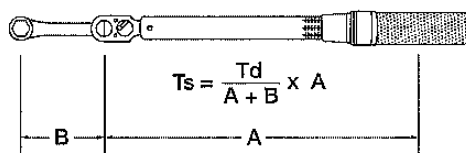
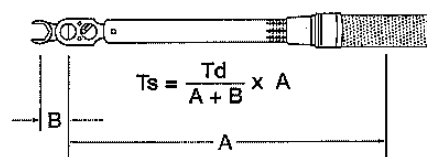
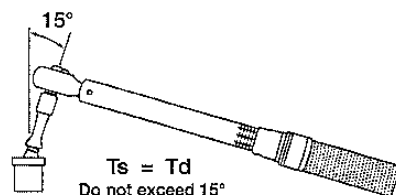
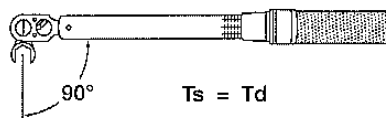
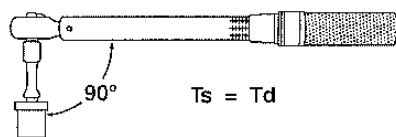


Fig. 446: Locating Solenoid Bracket Bolts
Courtesy of FORD MOTOR CO.

31. Using the Exhaust Gas Oxygen Sensor Socket, install the RH Heated Oxygen Sensor (HO2S).
 - Calculate the correct torque wrench setting for the following torque. Refer to the Torque Wrench Adapter Formulas shown below.

Torque Wrench Adapter Formulas



TORQUE FORMULA LEGEND

T_s = Torque wrench setting
 T_d = Fastener torque desired

A = Torque wrench length
 B = Torque adapter length

G00468730

Fig. 447: Identifying Torque Wrench Adapter Formulas
 Courtesy of FORD MOTOR CO.

- To install, tighten to 48 Nm (35 lb-ft).

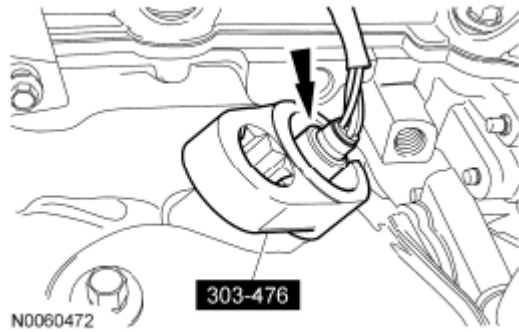


Fig. 448: Installing RH Heated Oxygen Sensor (HO2S)
Courtesy of FORD MOTOR CO.

32. Connect the RH **HO2S** electrical connector.

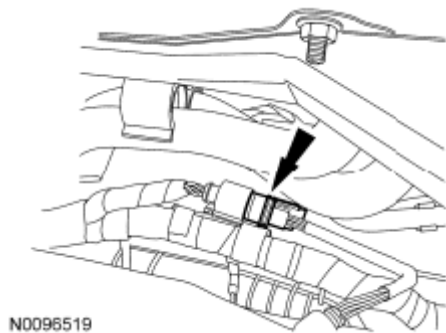


Fig. 449: Locating RH Heated Oxygen Sensor (HO2S) Electrical Connector
Courtesy of FORD MOTOR CO.

33. Connect the RH Catalyst Monitor Sensor (CMS) electrical connector.

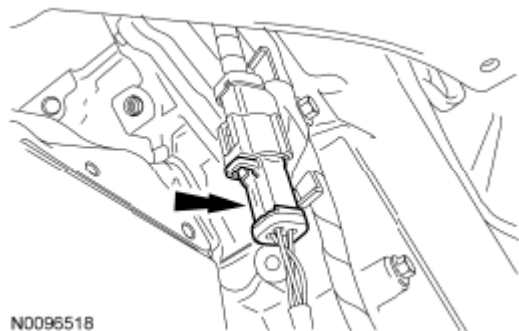


Fig. 450: Locating RH CMS Electrical Connector
Courtesy of FORD MOTOR CO.

All vehicles

34. Position the A/C manifold onto the A/C compressor and install the bolt.
 - Install a new gasket.

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

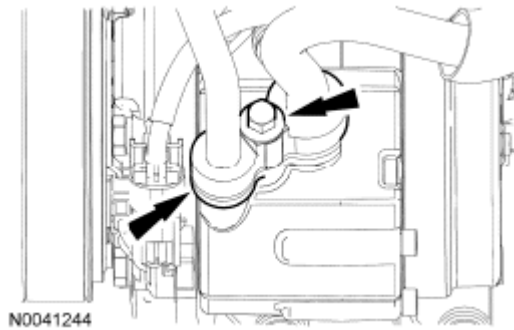


Fig. 451: Locating A/C Manifold From A/C Compressor & Bolt
Courtesy of FORD MOTOR CO.

35. Install 6 new LH catalytic converter studs.
 - Tighten to 12 Nm (106 lb-in).

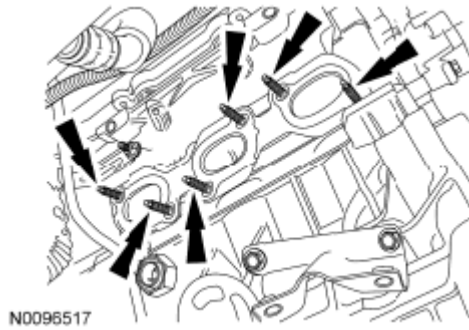


Fig. 452: Locating LH Catalytic Converter Manifold Studs
Courtesy of FORD MOTOR CO.

36. Install a new gasket, the LH catalytic converter and 6 new nuts.
 - Tighten to 20 Nm (177 lb-in) in the sequence shown.

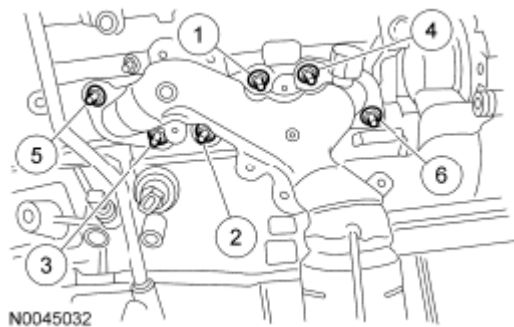


Fig. 453: Locating LH Catalytic Converter & Nuts
Courtesy of FORD MOTOR CO.

37. Install the heat shield and the 4 bolts (3 shown).
 - Tighten to 10 Nm (89 lb-in).

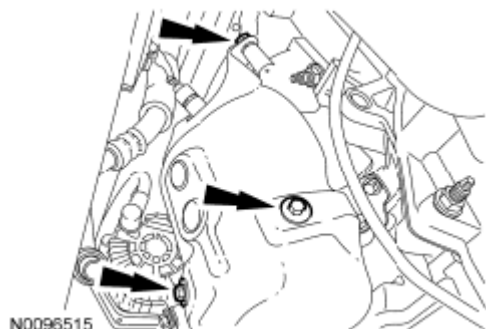


Fig. 454: Locating Heat Shield & Bolts
Courtesy of FORD MOTOR CO.

38. Connect the LH CMS electrical connector.

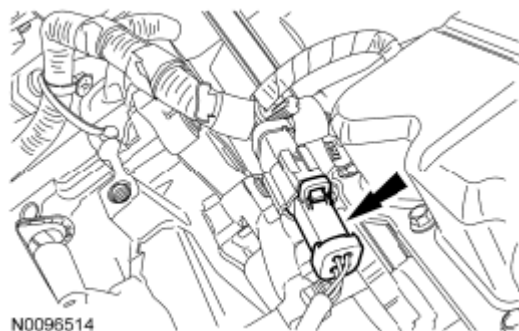


Fig. 455: Locating LH Catalyst Monitor Sensor (CMS) Electrical Connector
Courtesy of FORD MOTOR CO.

39. Connect the A/C tube and install the nut.
 - Install a new gasket.
 - Tighten to 8 Nm (71 lb-in).

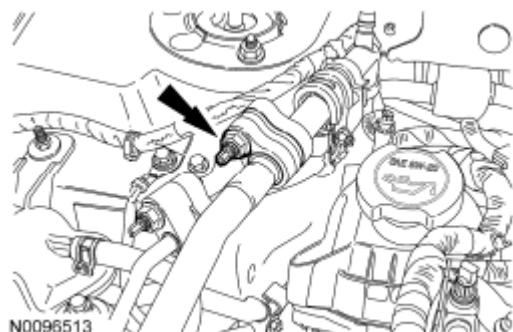


Fig. 456: Locating A/C Tube & Nut

Courtesy of FORD MOTOR CO.

40. Install the A/C tube/windshield washer bottle bracket bolt.
- Tighten to 10 Nm (89 lb-in).

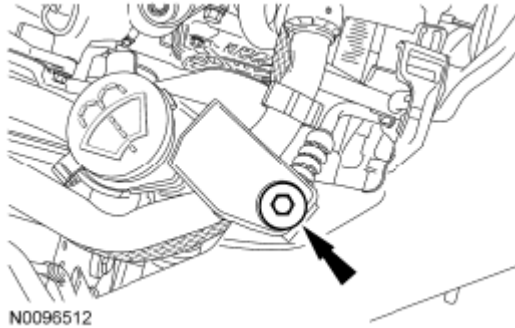


Fig. 457: Locating A/C Tube & Windshield Washer Bottle Bracket Bolt
Courtesy of FORD MOTOR CO.

41. Position the transaxle control cable bracket in place, install the 2 bolts.
- Tighten to 23 Nm (17 lb-ft).

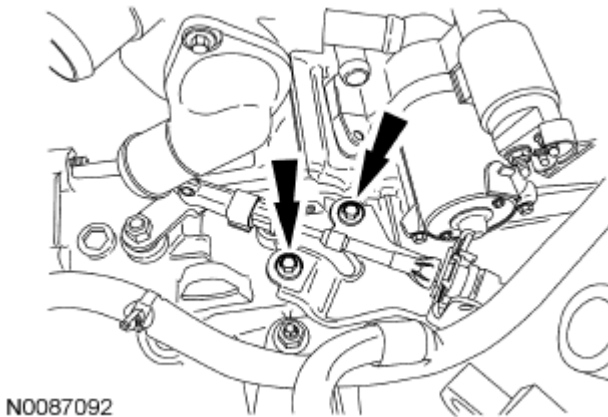


Fig. 458: Locating Shift Cable Bracket Bolts
Courtesy of FORD MOTOR CO.

42. Connect the gearshift cable to the transaxle.

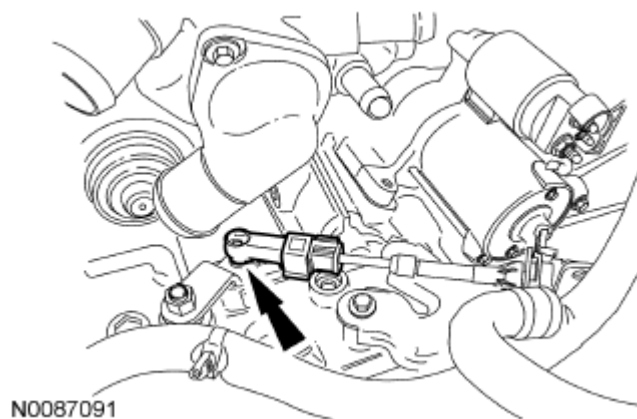


Fig. 459: Locating Gearshift Cable
Courtesy of FORD MOTOR CO.

43. Connect the 2 heater hoses.

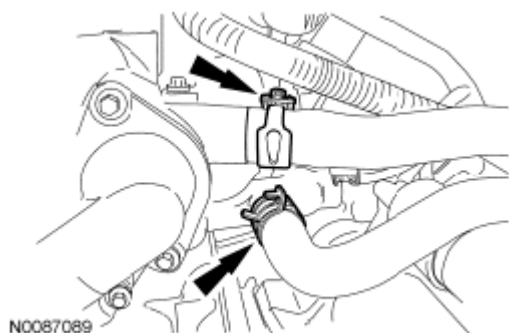


Fig. 460: Locating Heater Hoses
Courtesy of FORD MOTOR CO.

44. Connect the upper and lower radiator hoses.

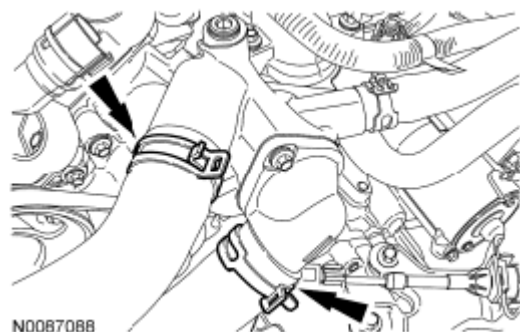


Fig. 461: Locating Upper & Lower Radiator Hoses
Courtesy of FORD MOTOR CO.

45. Connect the LH HO2S electrical connector.

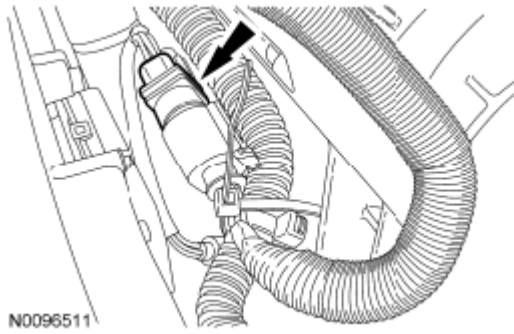


Fig. 462: Locating LH Heated Oxygen Sensor (HO2S) Electrical Connector
Courtesy of FORD MOTOR CO.

46. Connect the Evaporative Emission (EVAP) tube-to-EVAP canister purge valve quick connect coupling and the brake booster vacuum tube to the upper intake manifold.
 - Attach the fuel tube and EVAP tube-to-EVAP canister purge valve tube retainer to the upper intake manifold.

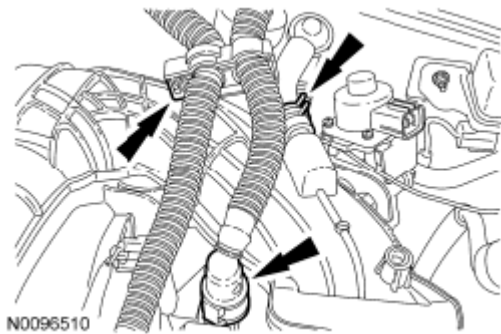


Fig. 463: Identifying Camshaft Phaser & Sprocket, Camshaft Phaser, Sprocket Bolt & Camshaft
Courtesy of FORD MOTOR CO.

47. Connect the fuel supply tube to the fuel rail. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION**.
48. Connect the 3 PCM electrical connectors.



Fig. 464: Locating PCM Electrical Connectors

Courtesy of FORD MOTOR CO.

49. Position the PCM ground wire and install the bolt.
- Tighten to 10 Nm (89 lb-in).

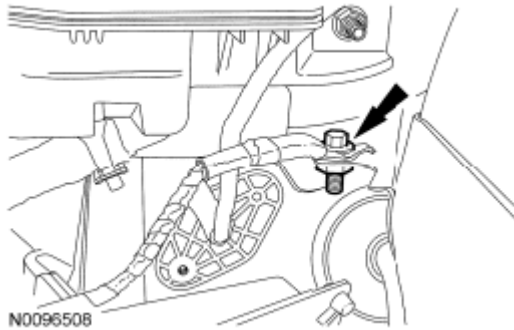


Fig. 465: Locating PCM Ground Wire & Bolt
Courtesy of FORD MOTOR CO.

50. Attach the 2 wiring harness retainers to the battery tray bracket and transaxle mount.

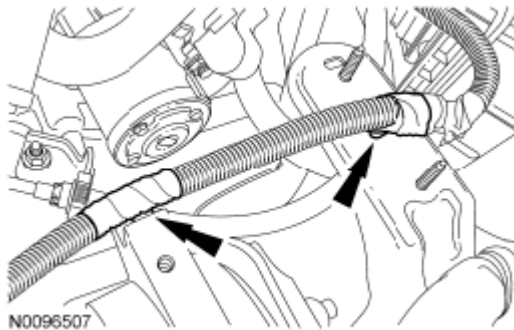


Fig. 466: Locating Wiring Harness Retainers From Battery Tray Bracket & Transaxle Mount
Courtesy of FORD MOTOR CO.

51. Install the ground wire-to-inner fender and bolt.
- Tighten to 10 Nm (89 lb-in).

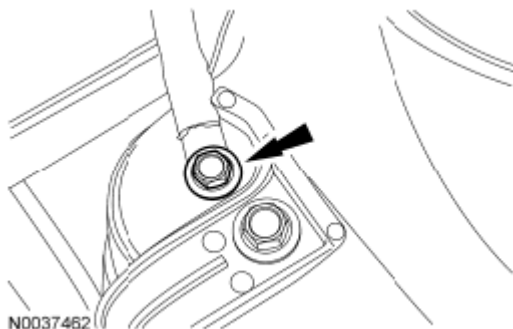


Fig. 467: Locating Ground Wire-To-Inner Fender & Bolt
Courtesy of FORD MOTOR CO.

52. Connect the 2 engine wiring harness electrical connectors.

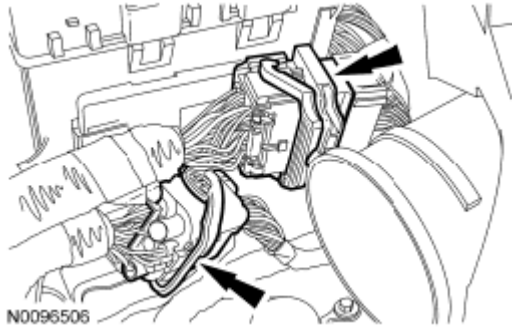


Fig. 468: Locating Engine Wiring Harness Electrical Connectors
Courtesy of FORD MOTOR CO.

53. Connect the engine wiring harness electrical connector.

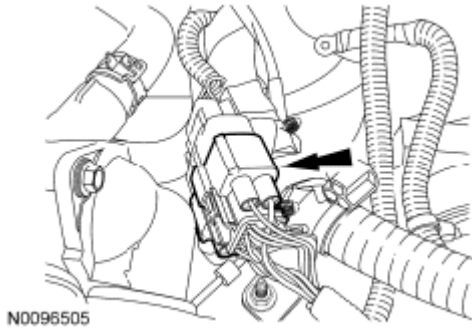


Fig. 469: Locating Engine Wiring Harness Electrical Connector
Courtesy of FORD MOTOR CO.

54. Connect the power feed wires to the battery terminal and install the 2 nuts.
- Tighten to 6 Nm (53 lb-in).

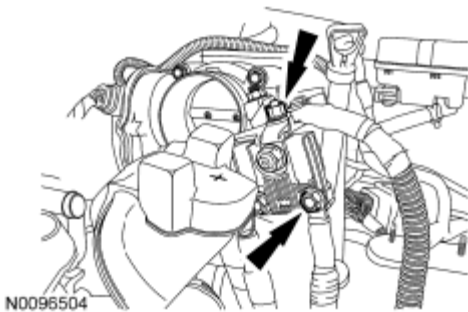


Fig. 470: Locating Power Feed Wires To Battery Terminal & Nuts

Courtesy of FORD MOTOR CO.

55. Install the battery tray. For additional information, refer to REMOVAL AND INSTALLATION.
56. Install the engine Air Cleaner (ACL) and ACL outlet pipe. For additional information, refer to REMOVAL AND INSTALLATION and REMOVAL AND INSTALLATION.
57. Install a new engine oil filter.
 - Tighten to 5 Nm (44 lb-in) and then rotate an additional 180 degrees.

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

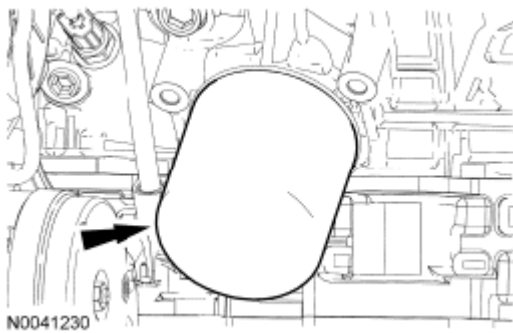


Fig. 471: Locating Engine Oil Filter
Courtesy of FORD MOTOR CO.

58. Position the transmission fluid cooler tubes in place. Install the transmission fluid cooler tubes in the transaxle by inserting the tube into the fitting until a click is heard/felt. Pull back to confirm connection is secure and install the secondary latches.

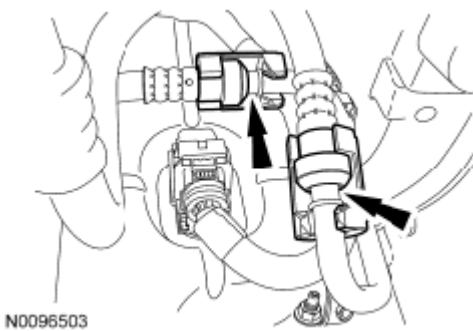


Fig. 472: Locating Transmission Fluid Cooler Tubes
Courtesy of FORD MOTOR CO.

59. Place the subframe assembly on the Powertrain Lift and raise the subframe into the installed position.

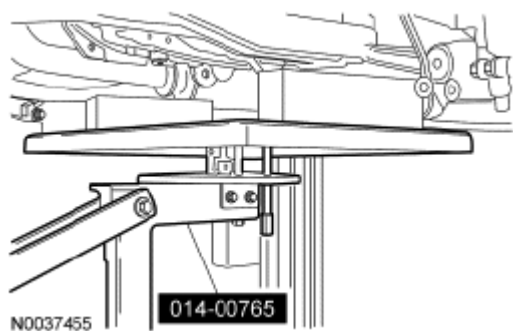


Fig. 473: Positioning Powertrain Lift Under Subframe Assembly
Courtesy of FORD MOTOR CO.

60. Install the front subframe nuts.
 - Tighten to 150 Nm (111 lb-ft).

NOTE: LH shown, RH similar.

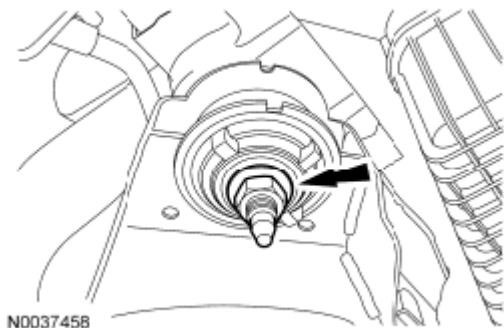


Fig. 474: Locating Front Subframe Nuts
Courtesy of FORD MOTOR CO.

61. Position the subframe brackets and install the bolts finger-tight.

NOTE: LH shown, RH similar.

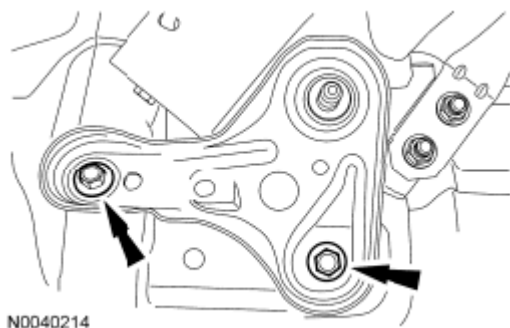


Fig. 475: Locating Subframe Brackets & Bolts
Courtesy of FORD MOTOR CO.

62. Install the subframe nuts.
- Tighten to 150 Nm (111 lb-ft).

NOTE: LH shown, RH similar.

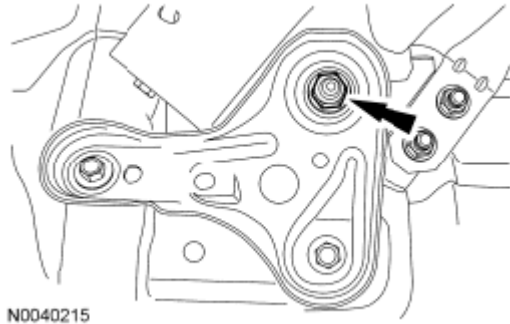


Fig. 476: Locating Subframe Nuts
Courtesy of FORD MOTOR CO.

63. Tighten the subframe bracket-to-body bolts to 103 Nm (76 lb-ft).

NOTE: LH shown, RH similar.

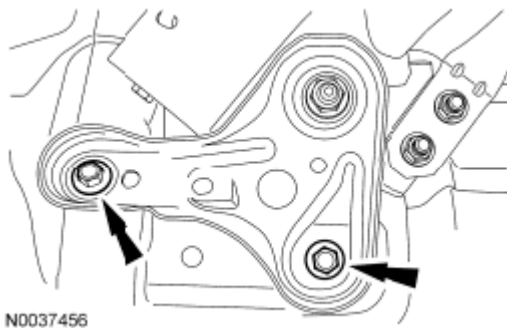


Fig. 477: Locating Subframe Bracket-To-Body Bolts
Courtesy of FORD MOTOR CO.

64. Attach the 3 wiring harness retainers to the LH front of the subframe.

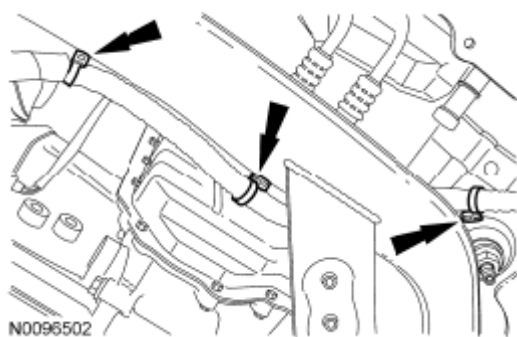


Fig. 478: Locating Wiring Harness Retainers To Front Of Subframe LH
Courtesy of FORD MOTOR CO.

65. Connect the 2 Electronic Power Assist Steering (EPAS) electrical connector on the front of the subframe.

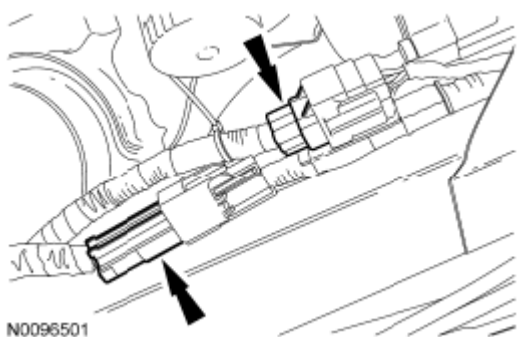


Fig. 479: Locating EPAS Electrical Connector
Courtesy of FORD MOTOR CO.

66. Install the intermediate shaft and the LH halfshaft. For additional information, refer to **INSTALLATION**.
67. Install the stabilizer bar links and nuts to the struts.
- Tighten to 40 Nm (30 lb-ft).

NOTE: LH shown, RH similar.

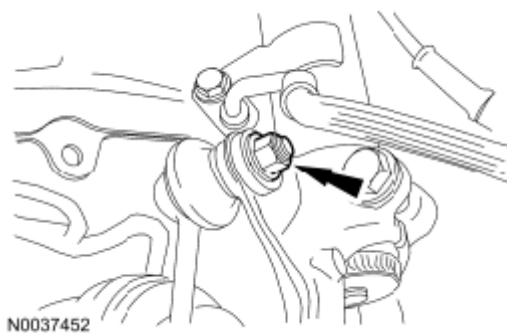


Fig. 480: Locating Stabilizer Bar Links & Nuts
Courtesy of FORD MOTOR CO.

68. Install the tie-rod ends and nuts.
- Tighten to 48 Nm (35 lb-ft).
 - Install the cotter pin.

NOTE: LH shown, RH similar.

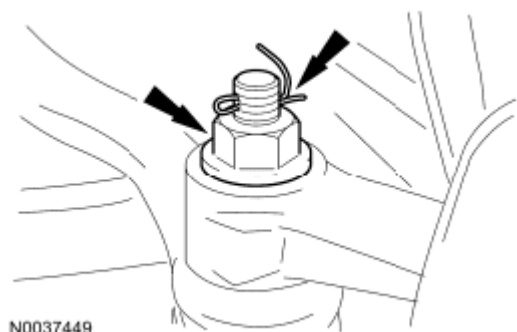


Fig. 481: Locating Cotter Pins & Nuts From Tie-Rod Ends
Courtesy of FORD MOTOR CO.

69. Install the engine roll restrictor and the 2 bolts.
- Tighten to 90 Nm (66 lb-ft).

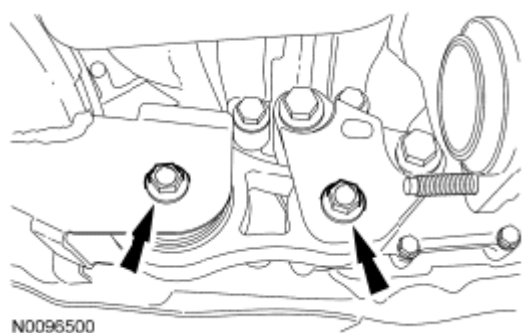


Fig. 482: Locating Engine Roll Restrictor & Bolts
Courtesy of FORD MOTOR CO.

70. If equipped, install the heat shield and the 2 bolts.

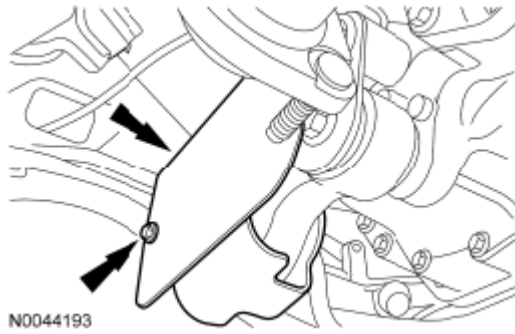


Fig. 483: Locating Heat Shield & Bolts
Courtesy of FORD MOTOR CO.

71. Slide the steering gear-to-dash seal onto the steering gear and engage the 4 retaining clips (2 shown) into the body.
 - From under the vehicle, verify that the seal is properly installed on the steering gear and the retaining clips are fully engaged into the body.

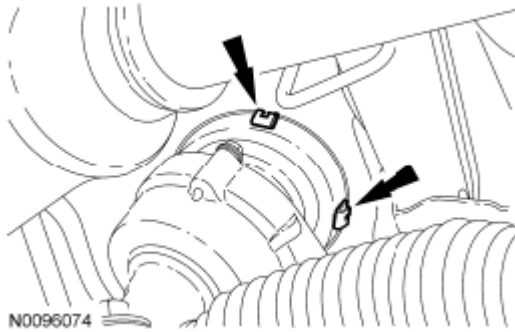


Fig. 484: Locating Steering Gear & Retaining Clips
Courtesy of FORD MOTOR CO.

AWD vehicles

72. Line up the index marks on the rear driveshaft to the index marks on the PTU flange made during removal and install the 4 bolts (3 shown).
 - Tighten to 70 Nm (52 lb-ft).

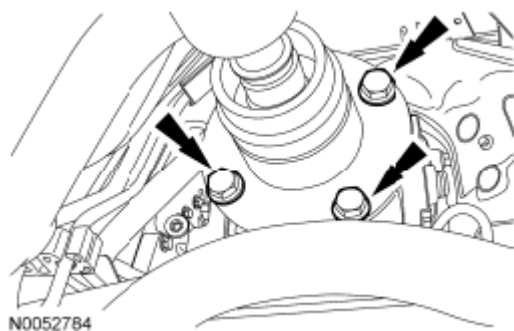


Fig. 485: Locating PTU Flange & Bolts
Courtesy of FORD MOTOR CO.

All vehicles

73. Install the exhaust flexible pipe. For additional information, refer to **INSTALLATION**.
74. Install the LH splash shield and the 6 pin-type retainers (4 shown).

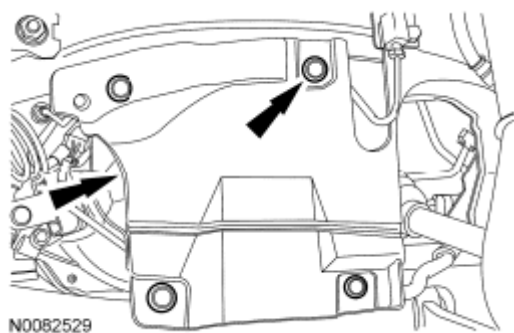


Fig. 486: Locating LH Splash Shield & Pin-Type Retainers
Courtesy of FORD MOTOR CO.

75. Position the LH fender splash shield and install the 4 screws.

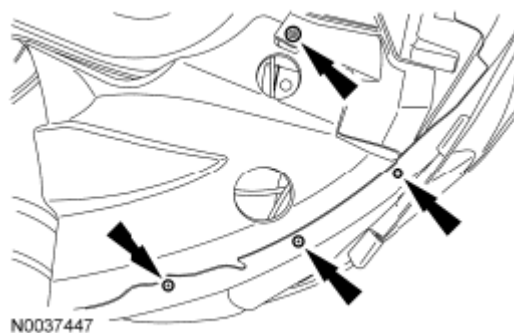


Fig. 487: Locating LH Fender Splash Shield & Screws
Courtesy of FORD MOTOR CO.

76. Install the **EPAS** ground wire and bolt in the RH front wheel well.
 - Tighten to 10 Nm (89 lb-in).

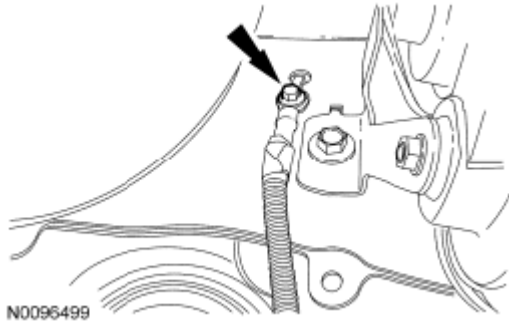


Fig. 488: Locating EPAS Wiring Ground Wire & Bolt
Courtesy of FORD MOTOR CO.

77. Install the RH splash shield and the 6 pin-type retainers (4 shown).

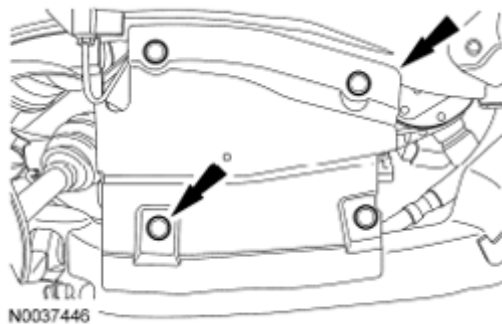


Fig. 489: Locating RH Splash Shield & Pin-Type Retainers
Courtesy of FORD MOTOR CO.

78. Position the RH fender splash shield and install the 4 screws.

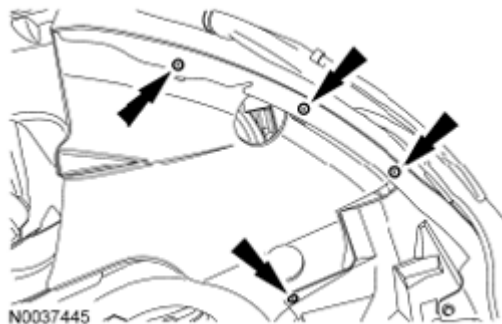


Fig. 490: Locating RH Fender Splash Shield Aside & Screws
Courtesy of FORD MOTOR CO.

79. Install the steering intermediate shaft onto the steering gear and install the bolt.

- Tighten to 20 Nm (177 lb-in).



Fig. 491: Locating Steering Column Shaft From Steering Gear & Bolt
Courtesy of FORD MOTOR CO.

80. Install the steering joint cover and the 2 nuts.

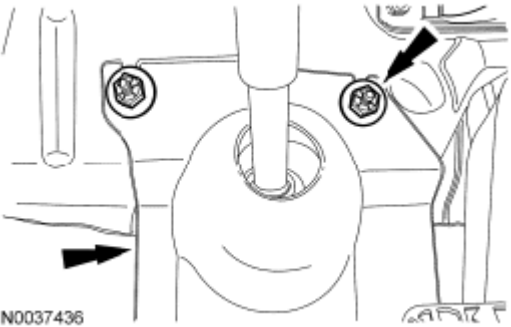


Fig. 492: Locating Steering Joint Cover & Nuts
Courtesy of FORD MOTOR CO.

81. Fill the engine with clean engine oil.
82. Connect the battery ground cable. For additional information, refer to **REMOVAL AND INSTALLATION**.
83. Fill and bleed the cooling system. For additional information, refer to **COOLING SYSTEM DRAINING, FILLING AND BLEEDING**.
84. Check the transaxle fluid and add fluid if necessary. For additional information, refer to the transmission fluid drain and refill procedure in **AUTOMATIC TRANSAXLE/TRANSMISSION - AISIN AW21**.
85. Recharge the A/C system. For additional information, refer to **AIR CONDITIONING (A/C) SYSTEM RECOVERY, EVACUATION AND CHARGING**.
86. If the engine was disassembled, use the scan tool to perform the Misfire Monitor Neutral Profile Correction procedure following the on-screen instructions.