

2011 Mercury Milan

2011 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan

2011 ENGINE**Engine Mechanical - 3.0L (4V) - Fusion & Milan****SPECIFICATIONS****MATERIAL SPECIFICATIONS****MATERIAL SPECIFICATIONS TABLE**

Item	Specification	Fill Capacity
Motorcraft® Metal Surface Prep ZC-31-A	-	-
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada) XO-5W20-QSP (US); CXO-5W20-LSP12 (Canada)	WSS-M2C945-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	WSE-M4G323-A4	-
Thread Sealant with PTFE TA-24	WSK-M2G350-A2	-

GENERAL SPECIFICATIONS**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	
Combustion chamber volume	51.2 cc +/- 1.5 cc

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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 (0.0017-0.037 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)	15.988-16.000 mm (0.6294-0.6299 in)
Hydraulic leakdown rate	5-25 seconds
Camshaft	
Camshaft journal bore inside diameter	26.987-27.012 mm (1.062-1.063 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)	26.936-26.962 mm (1.060-1.061 in)
Lobe lift (intake)	5.084 mm (0.2 in)
Lobe lift (exhaust)	5.084 mm (0.2 in)

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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 end play	0.100-0.255 mm (0.003-0.010 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)
Connecting rod maximum allowed twist 0.050 mm per 25	(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)

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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 (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**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	40	30	-

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Drive (AWD)			
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 ⁽¹⁾	-	-	-
Engine support insulator bracket bolt	115	85	-
Engine support insulator bracket nuts	63	46	-
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⁾	-	-	-

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Oil pan drain plug	26	19	-
Oil pan-to-front cover bolts	25	18	-
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 bolts	10	-	89

(1) Refer to the appropriate procedure in this service information.

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:

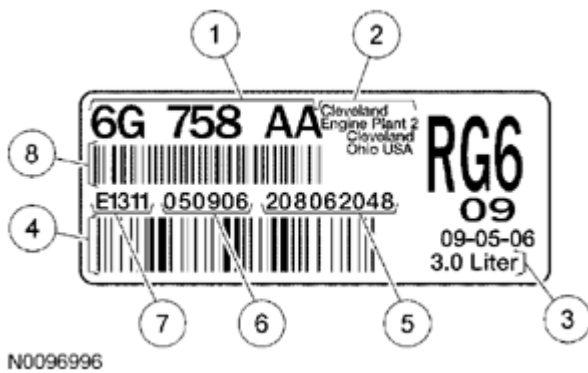
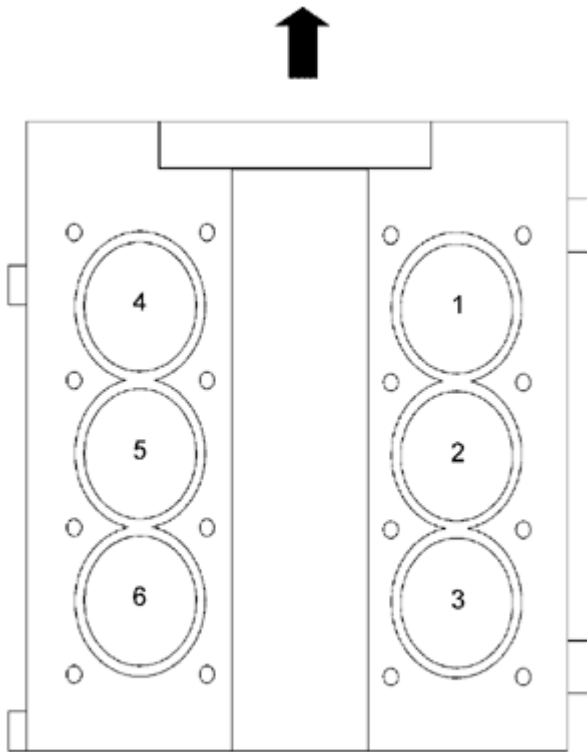


Fig. 1: Identifying Engine Code Information Label
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

Item	Description
1	Engine part number
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 the **ENGINE CONTROLS - INTRODUCTION - GASOLINE MODELS** article

Induction System

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

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

Valve Train

The 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** article.
For driveability concerns, refer to the **INTRODUCTION - GASOLINE MODELS** article.

IN-VEHICLE REPAIR

UPPER INTAKE MANIFOLD

Upper Intake Manifold (View 1 of 2)

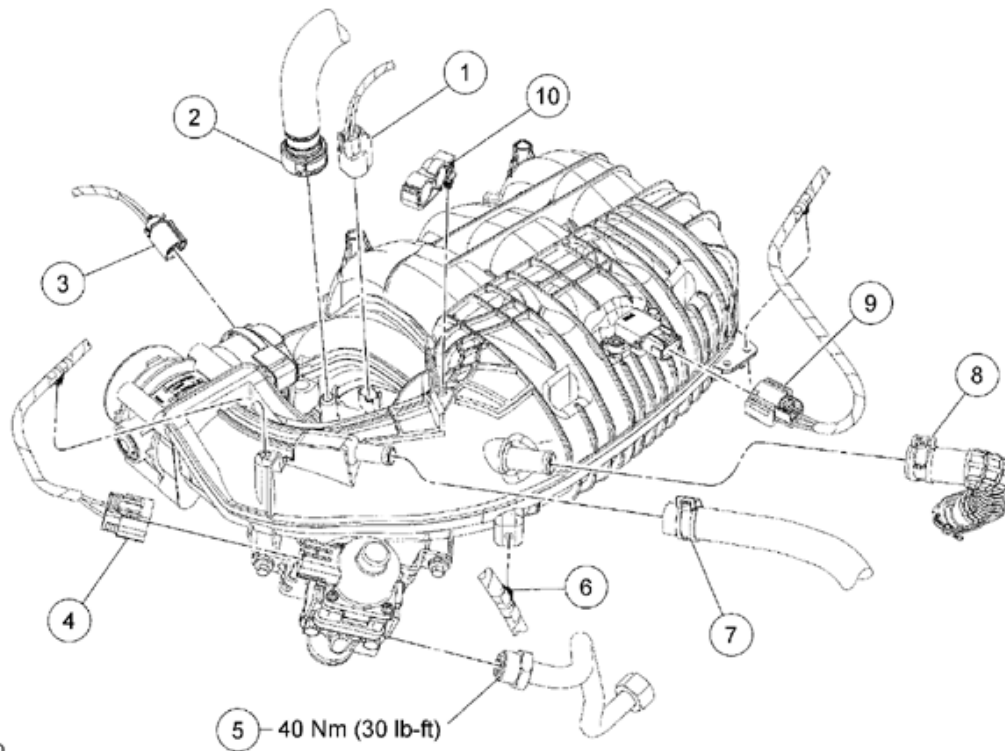


Fig. 3: Identifying Upper Intake Manifold Components With Torque Specifications (View 1 Of 2)
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

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)

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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)

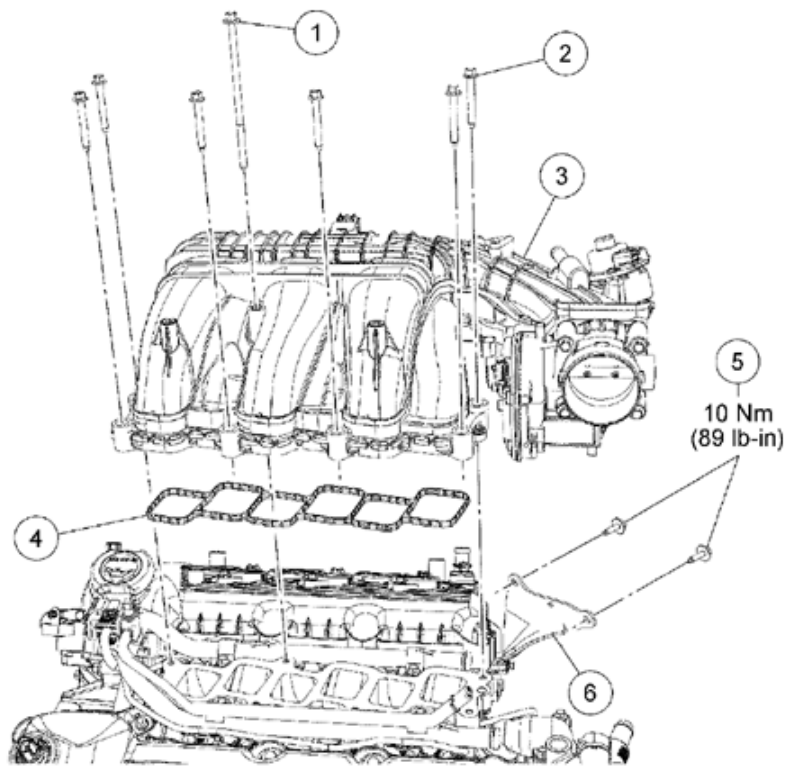


Fig. 4: Identifying Upper Intake Manifold Components With Torque Specifications (View 2 Of 2)
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

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 **INTAKE AIR DISTRIBUTION & FILTERING - 3.0L (4V) -- FUSION & MILAN** article.
2. Remove the battery. For additional information, refer to **BATTERY, MOUNTING & CABLES -- FUSION, MILAN & MKZ** article.
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

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

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

NOTE: Install new upper intake manifold gaskets.

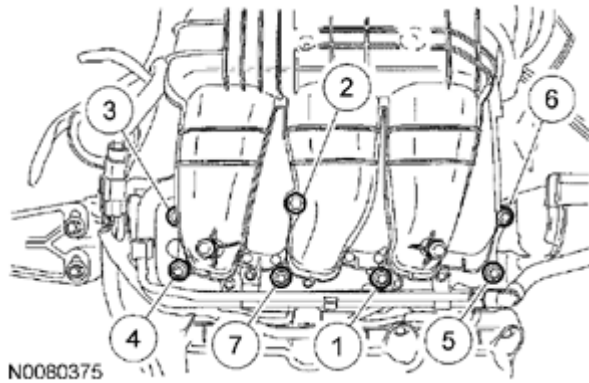


Fig. 5: Identifying Upper Intake Manifold Bolts Tightening Sequence
 Courtesy of FORD MOTOR CO.

2. Position the upper intake manifold and install the 7 bolts.
 - Tighten the bolts in 2 stages in the sequence shown in the illustration.
 - Stage 1: Tighten to 10 Nm (89 lb-in).
 - Stage 2: Tighten an additional 45 degrees.
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 **BATTERY, MOUNTING & CABLES -- FUSION, MILAN & MKZ** article.
13. Install the ACL outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING - 3.0L (4V) -- FUSION & MILAN** article.

LOWER INTAKE MANIFOLD

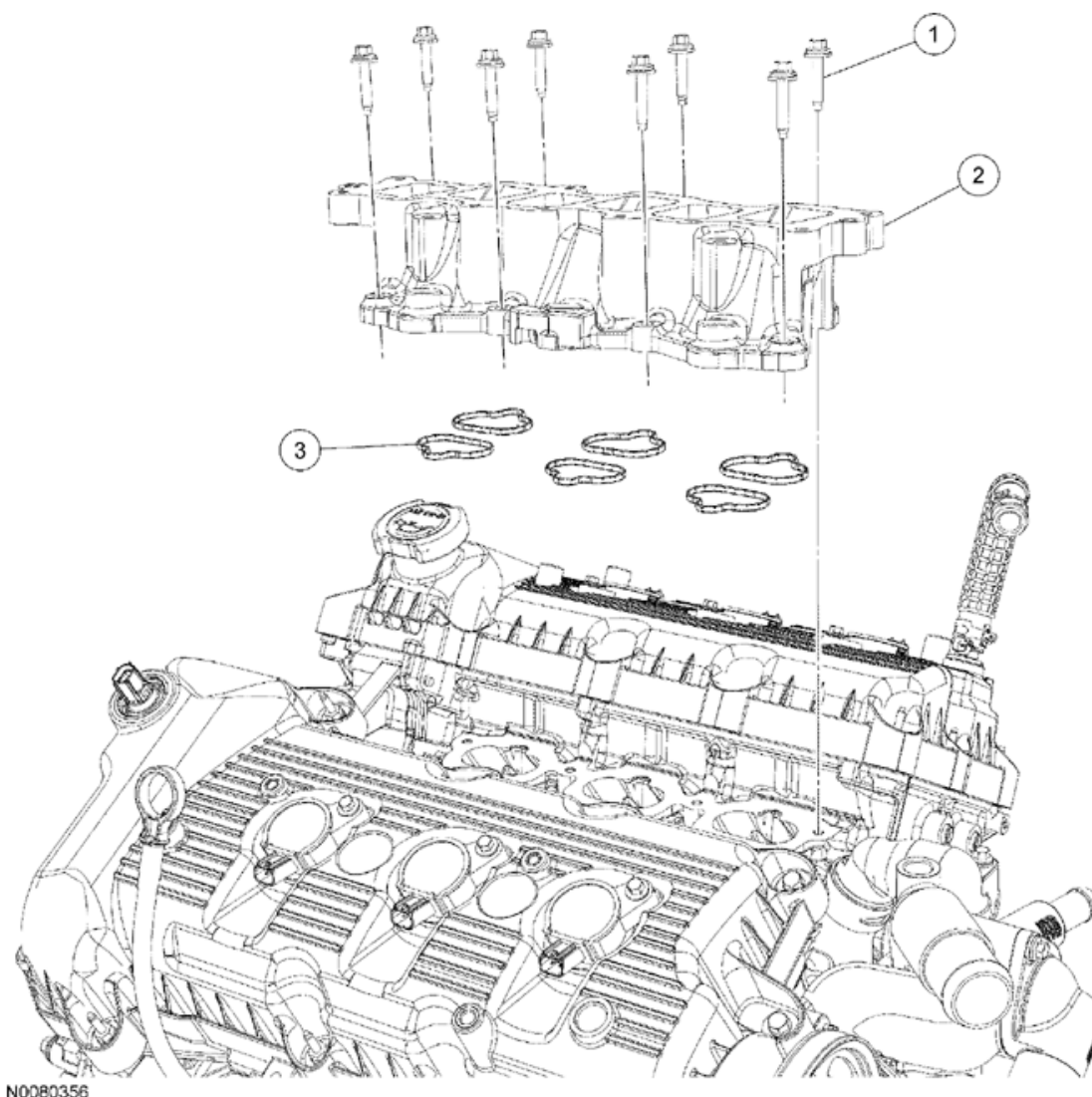


Fig. 6: Identifying Lower Intake Manifold Components
Courtesy of FORD MOTOR CO.

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 - GENERAL INFORMATION - FUSION, MILAN & MKZ** article.
2. Disconnect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING & CABLES -- FUSION, MILAN & MKZ** article.
3. Remove the fuel rail. For additional information, refer to **FUEL CHARGING & CONTROLS - 3.0L (4V) -- FUSION & MILAN** article.
4. Remove the 8 lower intake manifold bolts and the lower intake manifold.
 - Remove and discard the gaskets.

Installation

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

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

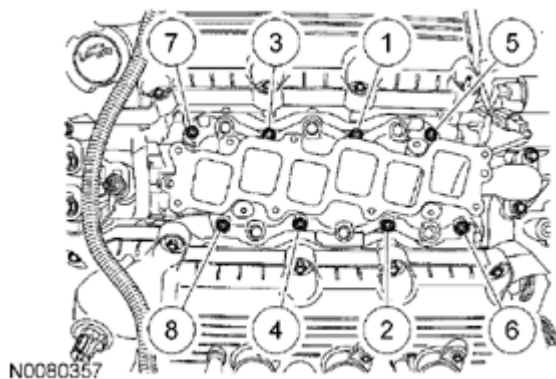


Fig. 7: Identifying Lower Intake Manifold Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

1. Position the lower intake manifold and install the 8 bolts.
 - Tighten in the sequence shown in the illustration to 10 Nm (89 lb-in).
2. Install the fuel rail. For additional information, refer to **FUEL CHARGING & CONTROLS - 3.0L (4V) -- FUSION & MILAN** article.
3. Connect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING & CABLES -- FUSION, MILAN & MKZ** article.

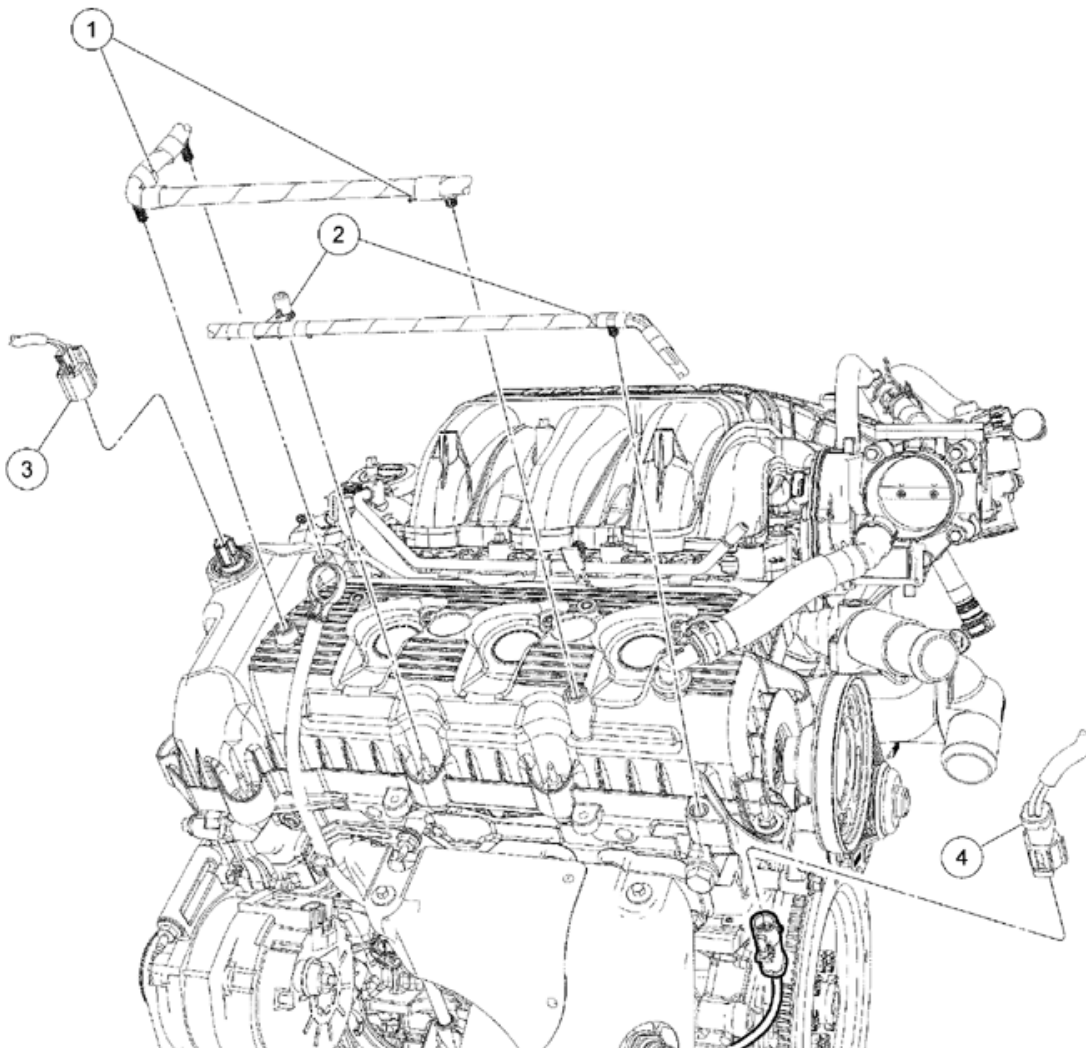
VALVE COVER - LH

Material Specifications

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)



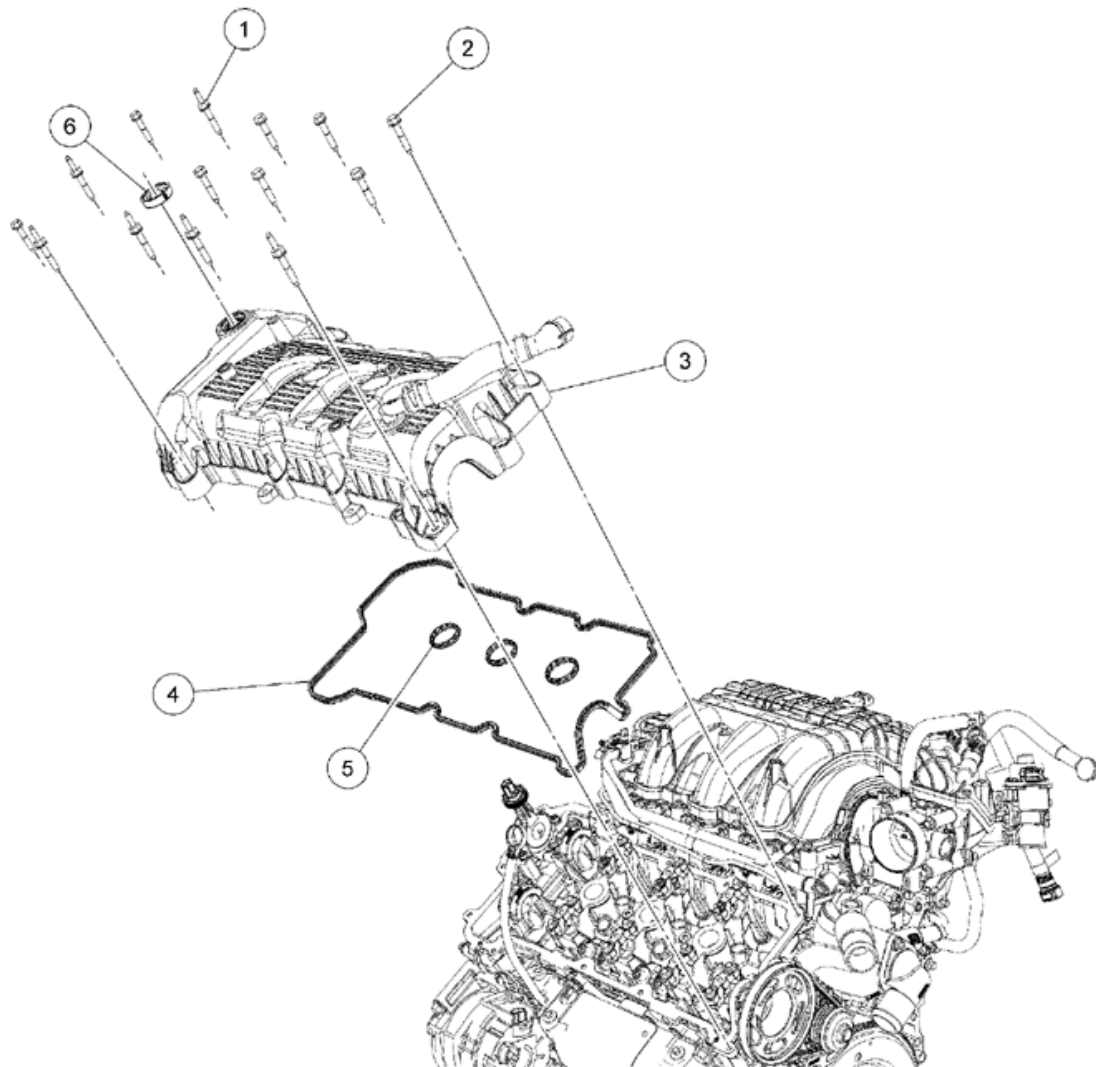
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Fig. 8: Identifying LH Valve Cover Components (View 1 Of 2)
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

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



N0098623

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

ITEM DESCRIPTION TABLE

Item	Part Number	Description

2011 Mercury Milan

2011 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.

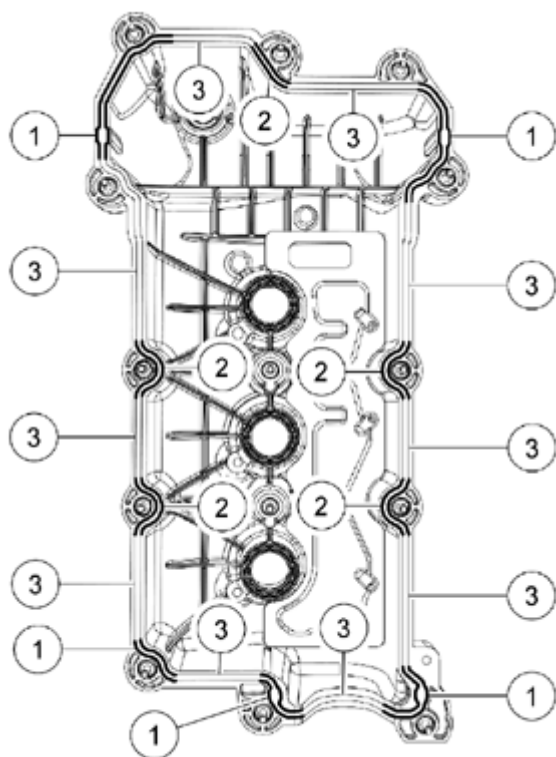
1. Remove the LH ignition coil-on-plugs. For additional information, refer to **ENGINE IGNITION - 3.0L (4V) -- FUSION & MILAN** article.
2. Detach the 3 wiring retainers from the valve cover.
3. Detach the wiring retainer from the valve cover stud bolt and 1 retainer from the valve cover.
4. Disconnect the Variable Camshaft Timing (VCT) electrical connector.
5. Disconnect the Heated Oxygen Sensor (HO2S) electrical connector.

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.

6. Remove the 9 bolts, 5 stud bolts and the valve cover.
 - Remove and discard the gasket.

Installation

1. Install the new gasket in the valve cover in the following sequence.
 1. Install the gasket at waffle pads and then the corners.
 2. Install the gasket around bolt holes.
 3. Install the remaining part of the gasket.



N0114294

Fig. 10: Identifying Valve Cover Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

2. **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 and the cam seal retainer-to-cylinder head surface using metal surface prep before applying silicone gasket and sealant.

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.

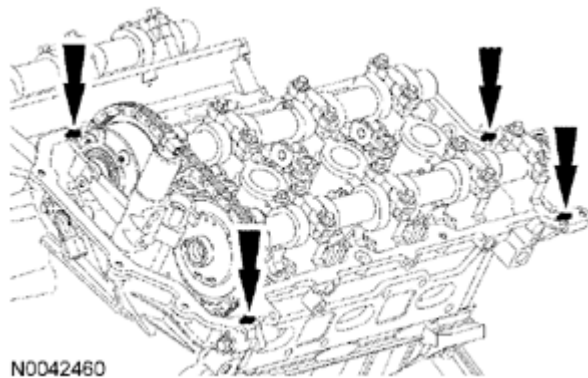


Fig. 11: Locating Sealant At Cylinder Block To Front Cover Mating Surface And Cam Seal Retainer-To-Cylinder Head Joints
 Courtesy of FORD MOTOR CO.

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

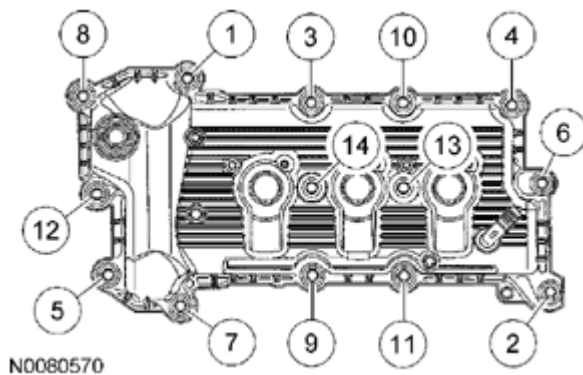


Fig. 12: Identifying Valve Cover Bolts Tightening Sequence
 Courtesy of FORD MOTOR CO.

4. Position the wire harness and connect the HO2S electrical connector.
5. Connect the VCT electrical connector.
6. Attach the wiring retainer to the valve cover stud bolt and attach the pin-type wiring retainer to the valve cover.
7. Attach the 3 wiring retainers to the valve cover.
8. Install the LH ignition coil-on-plugs. For additional information, refer to **ENGINE IGNITION - 3.0L (4V) -- FUSION & MILAN** article.

VALVE COVER - RH

Material Specifications

MATERIAL SPECIFICATIONS TABLE

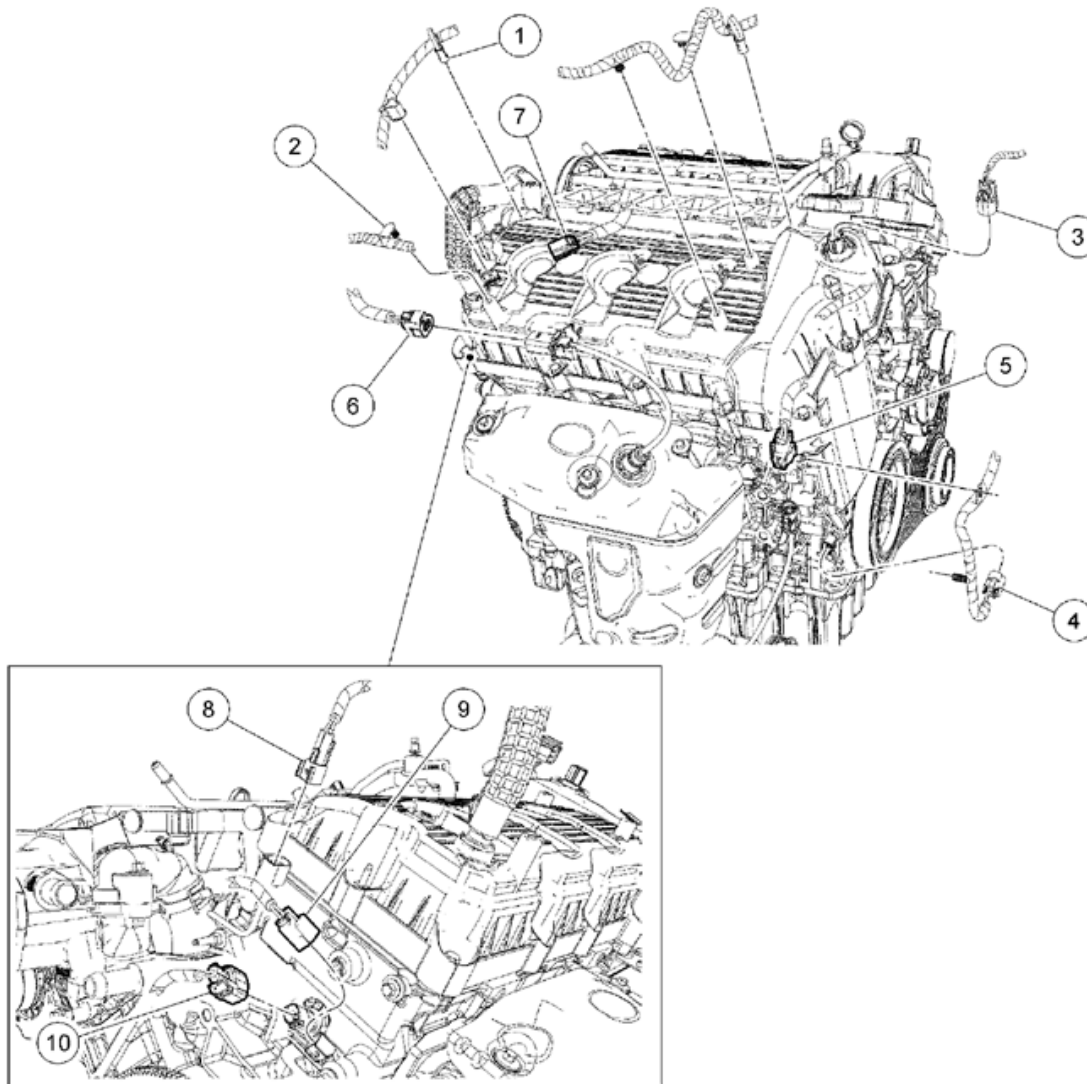
--	--

2011 Mercury Milan

2011 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan

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

ITEM DESCRIPTION TABLE

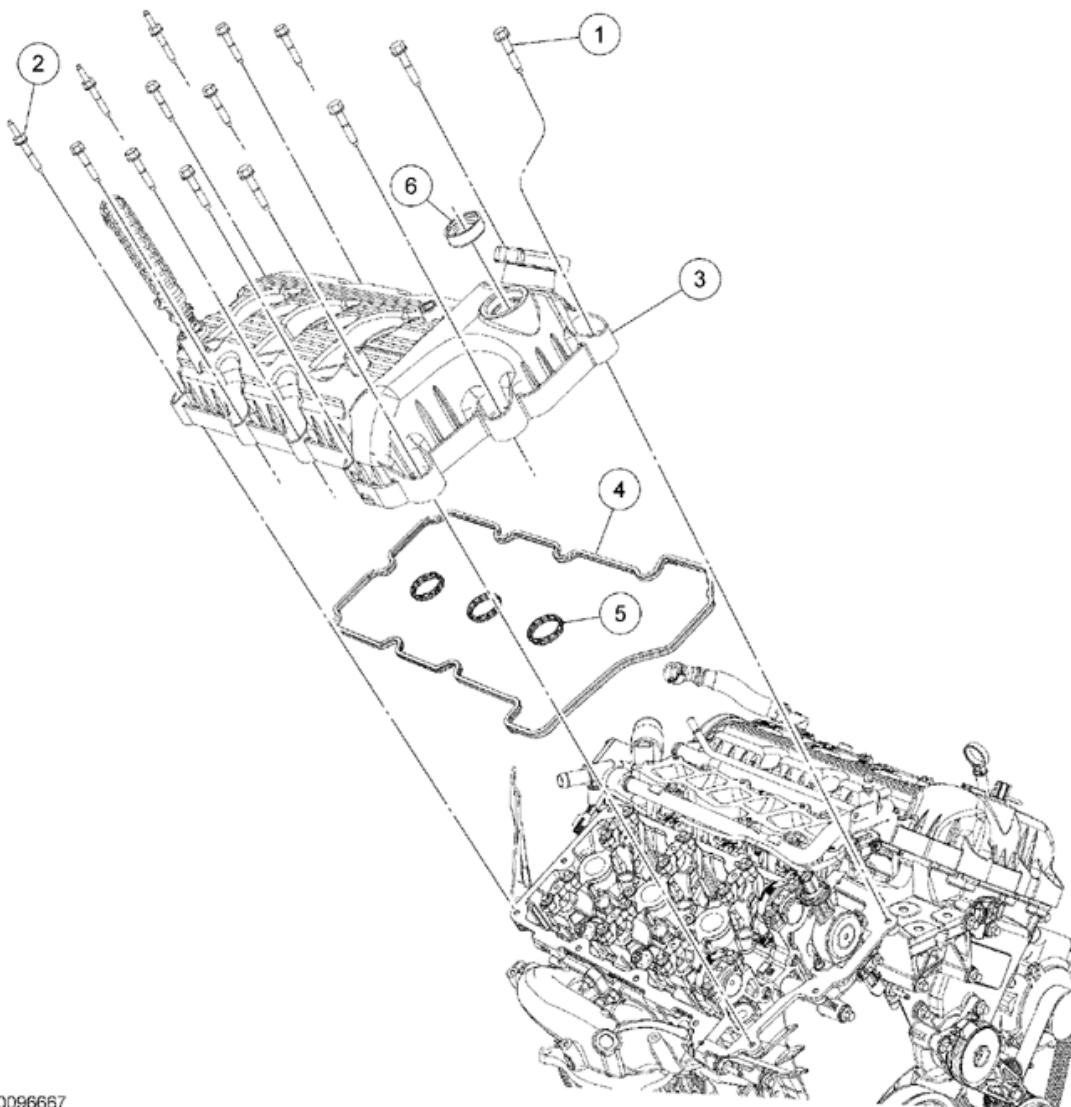
Item	Part Number	Description
1	-	Main engine control wiring harness valve cover stud bolt retainer (part of 12A581) (4 required)

2011 Mercury Milan

2011 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan

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)
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)



N0096667

Fig. 14: Identifying RH Valve Cover Components (View 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

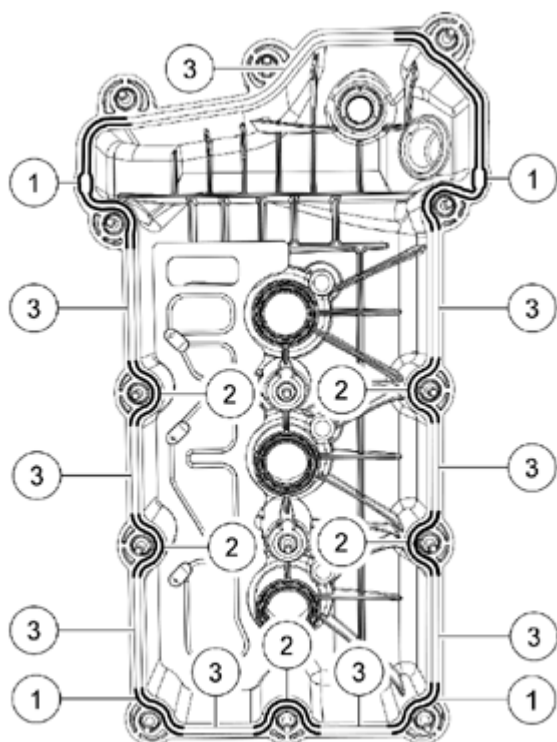
Removal

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 **ENGINE IGNITION - 3.0L (4V) -- FUSION & MILAN**.
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. Install the new gasket in the valve cover in the following sequence.
 1. Install the gasket at waffle pads and then corners.
 2. Install the gasket around bolt holes.
 3. Install the remaining part of the gasket.

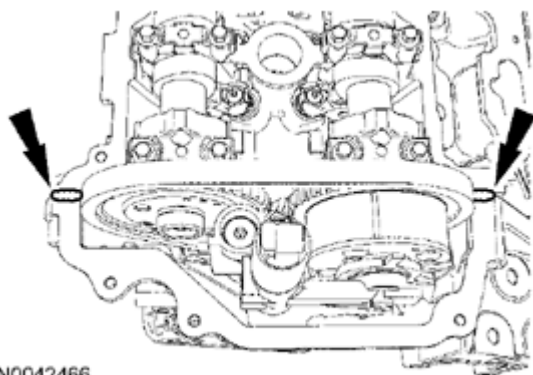


N0114295

Fig. 15: Identifying Valve Cover Bolts Tightening Sequence
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.

NOTE: Clean cylinder head and front cover surface using metal surface prep before applying silicone gasket and sealant.



N0042466

Fig. 16: Locating Silicone Gasket Sealant At Front Cover-To-Cylinder Head Joints
Courtesy of FORD MOTOR CO.

2. Apply an 8 mm (0.31 in) dot of silicone gasket sealant to the front cover-to-cylinder head joints.
3. Position the valve cover and install the bolts and stud bolts.
 - Tighten in the sequence shown in the illustration to 10 Nm (89 lb-in).

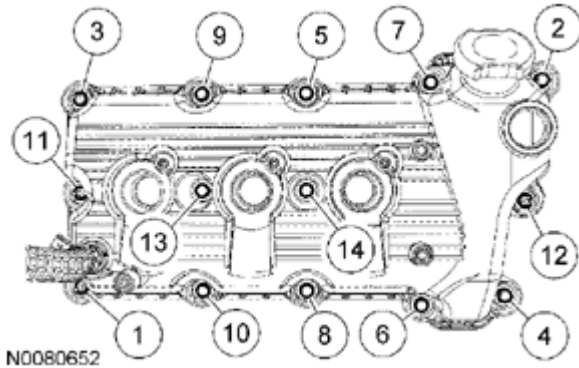
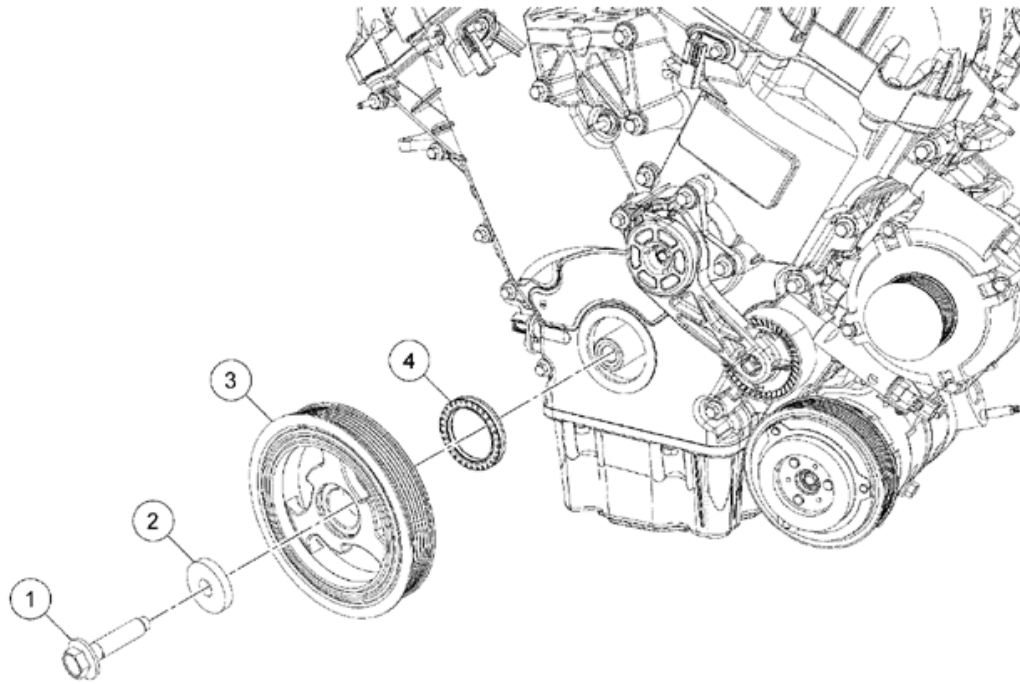


Fig. 17: Identifying Valve Cover Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

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 **ENGINE IGNITION - 3.0L (4V) -- FUSION & MILAN** article.

CRANKSHAFT PULLEY AND CRANKSHAFT FRONT SEAL - EXPLODED VIEW



N0080690

Fig. 18: Exploded View Of Crankshaft Pulley And Crankshaft Front Seal Components
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

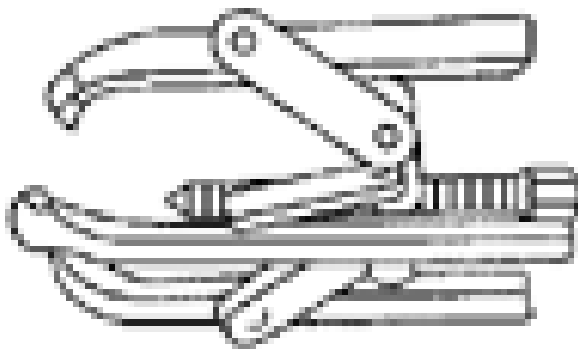
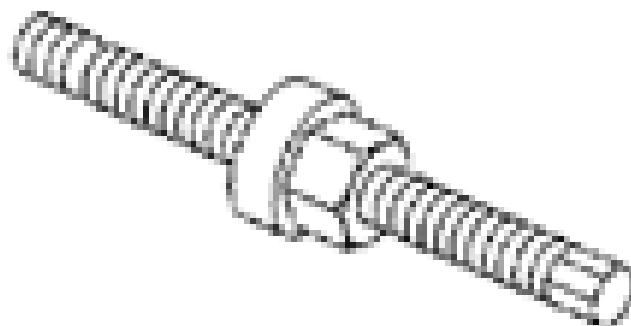
1. For additional information, refer to the appropriate procedures in this service information.

CRANKSHAFT PULLEY

Special Tools

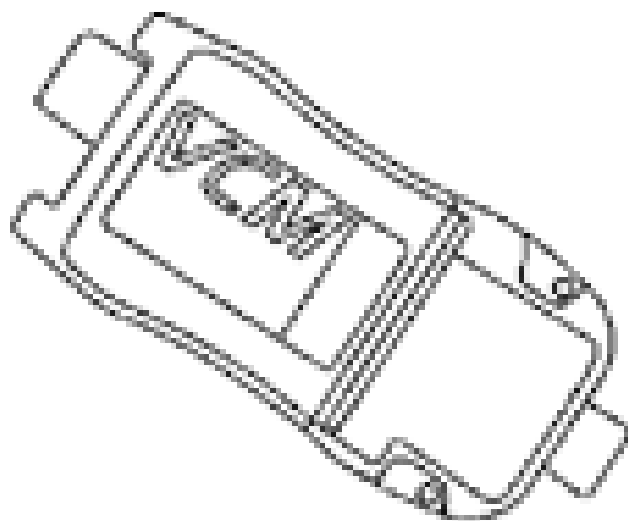
SPECIAL TOOL(S)

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

**ST1184-A****ST1287-A**

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

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



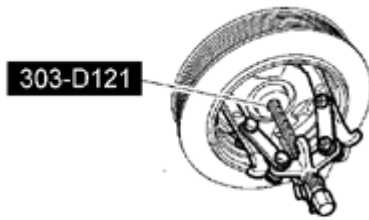
ST2834-A

Material Specifications**MATERIAL SPECIFICATIONS TABLE**

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada) XO-5W20-QSP (US); CXO-5W20-LSP12 (Canada)	WSS-M2C945-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** article.
2. Remove the accessory drive belt. For additional information, refer to **ACCESSORY DRIVE - 3.0L (4V) -- FUSION & MILAN** article.
3. Remove the crankshaft pulley bolt and washer.
 - Discard the crankshaft pulley bolt.
4. Using the 3 Jaw Puller, remove the crankshaft pulley.



N0010528

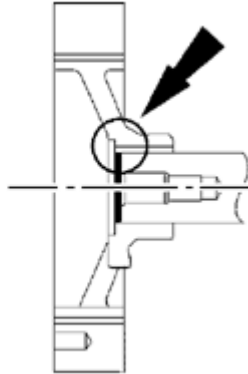
Fig. 19: Removing Crankshaft Pulley Using 3 Jaw Puller
Courtesy of FORD MOTOR CO.

Installation

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

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.



A0010615

Fig. 20: Locating Sealant At End Of Keyway Slot
Courtesy of FORD MOTOR CO.

2. Apply silicone gasket and sealant to the end of the keyway slot.

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

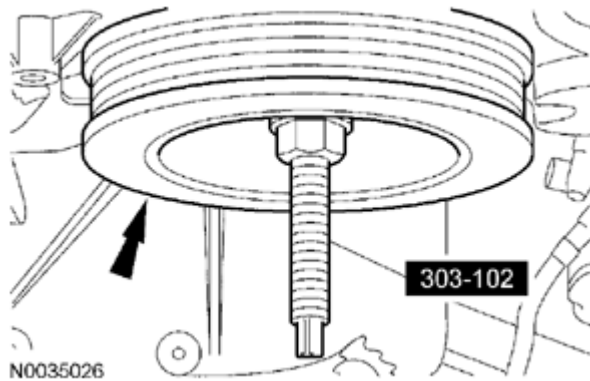


Fig. 21: Installing Crankshaft Pulley Using Crankshaft Vibration Damper Installer
 Courtesy of FORD MOTOR CO.

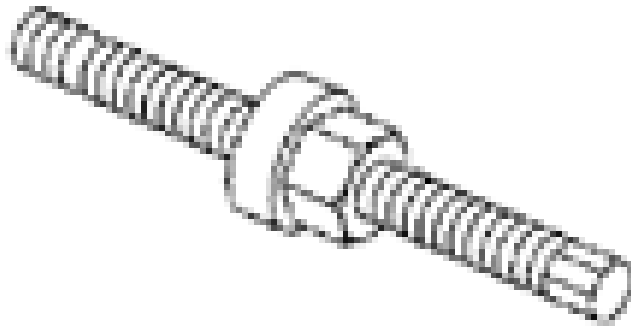
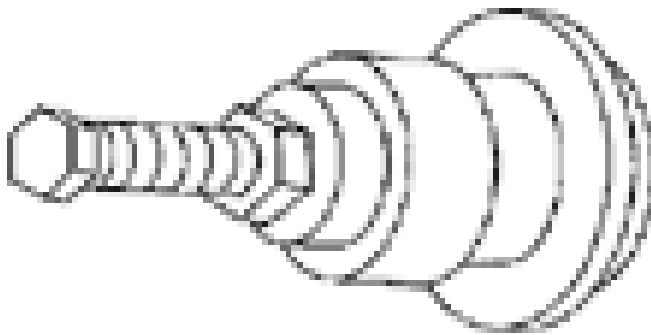
3. Using the Crankshaft Vibration Damper Installer, install the crankshaft pulley.
4. Install the bolt and washer. Tighten the bolt in 4 stages:
 - Stage 1: Tighten to 120 Nm (89 lb-ft).
 - Stage 2: Loosen one full turn.
 - Stage 3: Tighten to 50 Nm (37 lb-ft).
 - Stage 4: Tighten an additional 90 degrees.
5. Install the accessory drive belt. For additional information, refer to **ACCESSORY DRIVE - 3.0L (4V) -- FUSION & MILAN** article.
6. After completing the repairs, use the scan tool to perform the Misfire Monitor Neutral Profile Correction procedure following the on-screen instructions.

CRANKSHAFT FRONT SEAL

Special Tools

SPECIAL TOOL(S)

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

**ST1287-A****ST1328-A**

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

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



ST1385-A

Material Specifications

MATERIAL SPECIFICATIONS TABLE

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada) XO-5W20-QSP (US); CXO-5W20-LSP12 (Canada)	WSS-M2C945-A

Removal

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

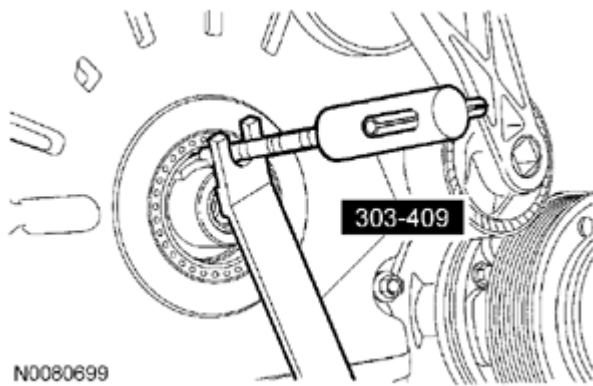


Fig. 22: Removing Crankshaft Front Seal Using Oil Seal Remover
Courtesy of FORD MOTOR CO.

Installation

NOTE: Clean all sealing surfaces with metal surface prep.

1. Apply clean engine oil to the seal lip and seal bore before installing the seal.
2. Using the Front Cover Oil Seal Installer and the Crankshaft Vibration Damper Installer, install a new crankshaft front seal.

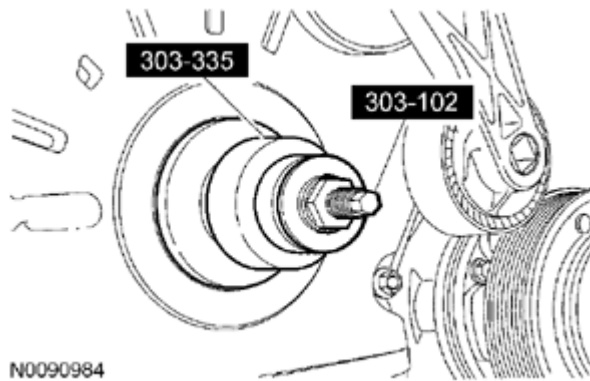
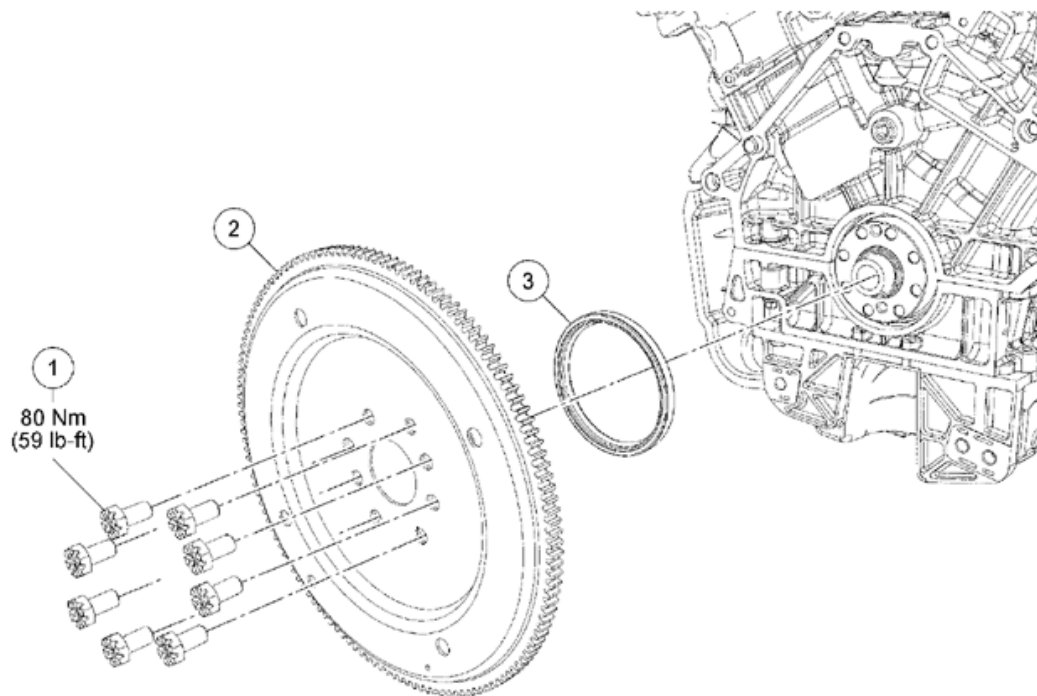


Fig. 23: Installing Crankshaft Front Seal Using Front Cover Oil Seal Installer And Crankshaft Vibration Damper Installer
Courtesy of FORD MOTOR CO.

3. Install the crankshaft pulley. For additional information, refer to **CRANKSHAFT PULLEY** in this service information.

FLEXPLATE OR FLYWHEEL AND CRANKSHAFT REAR SEAL - EXPLODED VIEW



N0062468

Fig. 24: Exploded View Of Flexplate Or Flywheel And Crankshaft Rear Seal Components With Torque Specifications

Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

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

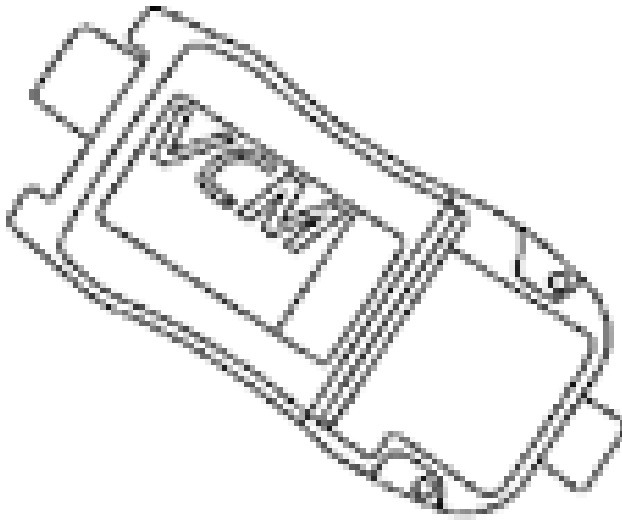
1. For additional information, refer to the appropriate procedures in this service information.

FLEXPLATE

Special Tools

SPECIAL TOOL(S)

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

**ST2834-A****Removal and Installation**

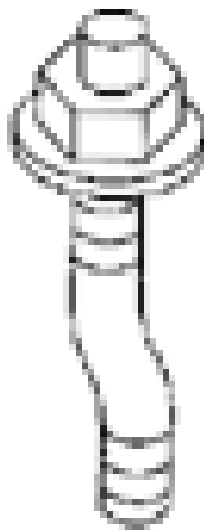
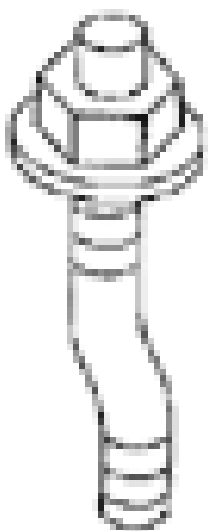
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** article.
2. Remove the transaxle. For additional information, refer to **AUTOMATIC TRANSAXLE/TRANSMISSION - 6F35 -- FUSION & MILAN** article.
3. Remove the bolts and the flexplate.
 - To install, tighten to 80 Nm (59 lb-ft).
4. To install, reverse the removal procedure.
5. After completing the repairs, use the scan tool to perform the Misfire Monitor Neutral Profile Correction procedure following the on-screen instructions.

CRANKSHAFT REAR SEAL**Special Tools****SPECIAL TOOL(S)**

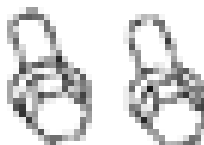
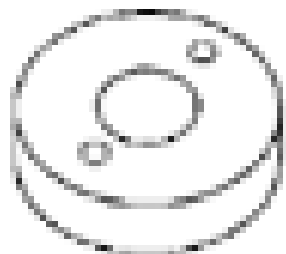
Installer Bolts, Crankshaft Rear Main Oil Seal
303-384 (T91P-6701-A)

2011 Mercury Milan

2011 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan



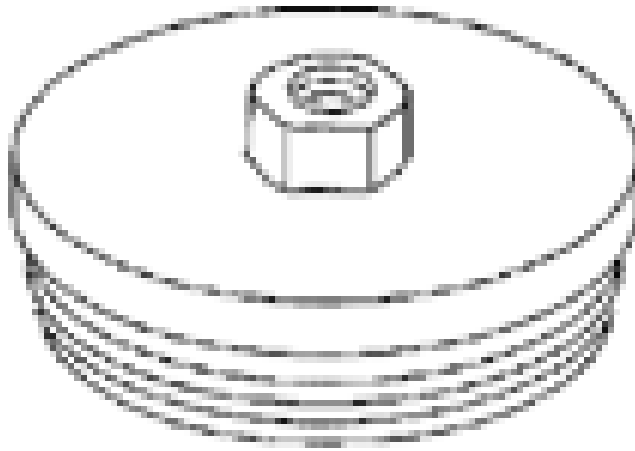
ST1333-A



ST1327-A

Installer, Crankshaft Rear Main Oil Seal
303-178 (T82L-6701-A)

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



ST1382-A



ST1187-A

Slide Hammer
307-005 (T59L-100-B)

Material Specifications

MATERIAL SPECIFICATIONS TABLE

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada) XO-5W20-QSP (US); CXO-5W20-LSP12 (Canada)	WSS-M2C945-A

Removal

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

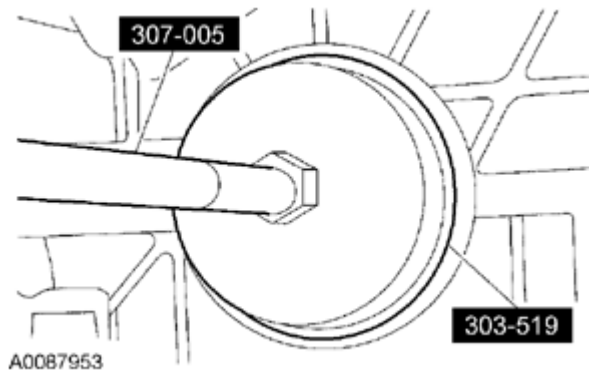


Fig. 25: Removing Crankshaft Rear Oil Seal Using Slide Hammer And Crankshaft Rear Oil Seal Remover

Courtesy of FORD MOTOR CO.

Installation

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.

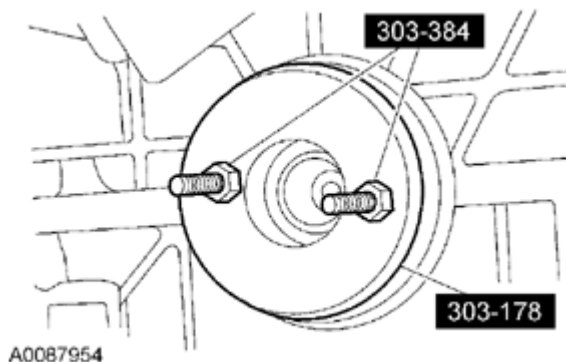


Fig. 26: Installing Crankshaft Rear Oil Seal Using Crankshaft Rear Main Oil Seal Installer Bolts And Crankshaft Rear Main Oil Seal Installer

Courtesy of FORD MOTOR CO.

1. Using the Crankshaft Rear Main Oil Seal Installer Bolts and the Crankshaft Rear Main Oil Seal Installer,

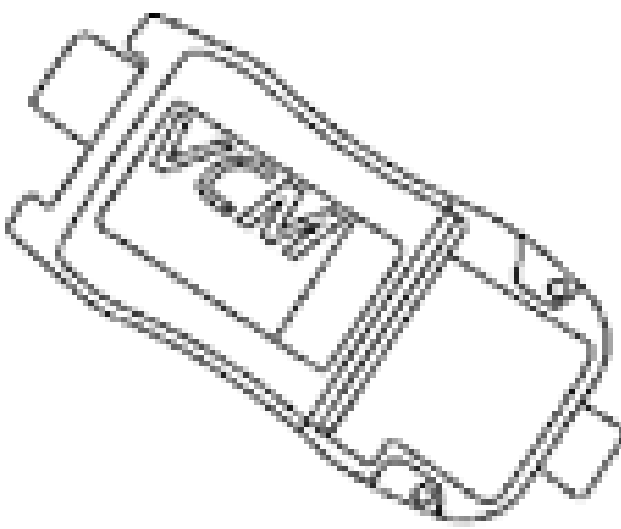
install the crankshaft rear oil seal.

2. Install the flexplate. For additional information, refer to **FLEXPLATE** in this service information.

ENGINE FRONT COVER

Special Tools

SPECIAL TOOL(S)

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

MATERIAL SPECIFICATIONS TABLE

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada) XO-5W20-QSP (US); CXO-5W20-LSP12 (Canada)	WSS-M2C945-A
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4

Engine Front Cover (View 1 of 3)

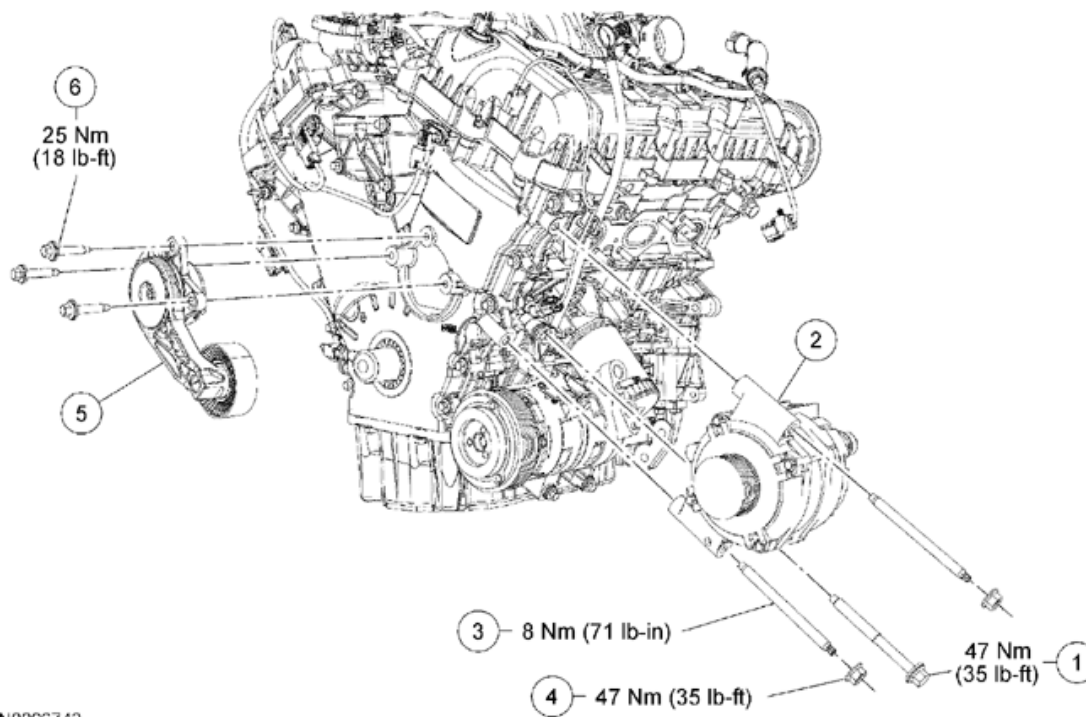
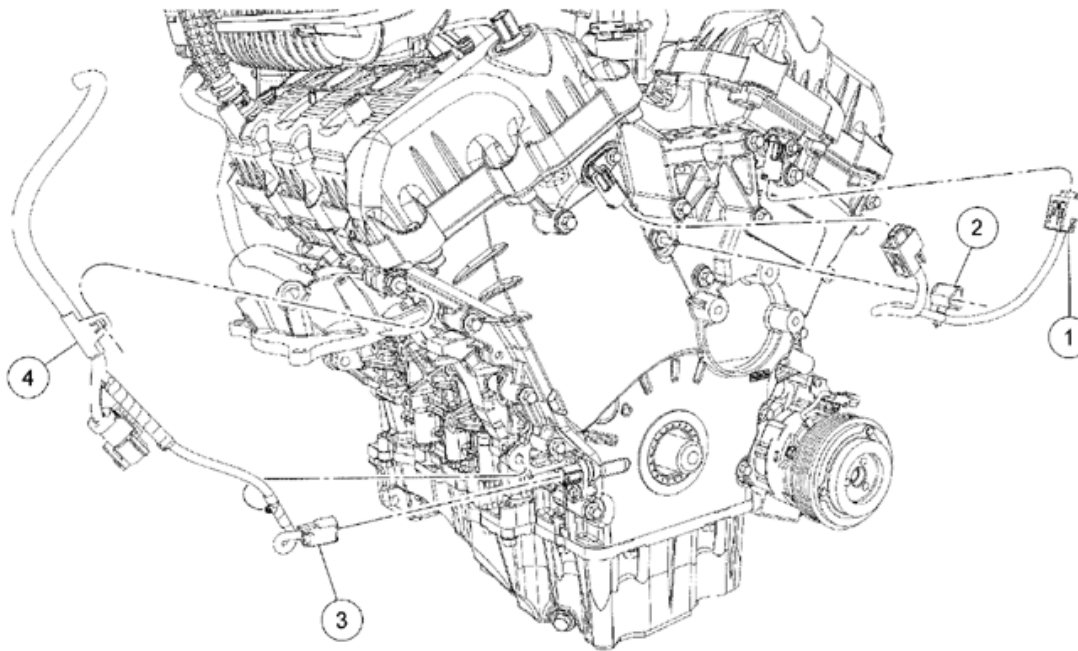


Fig. 27: Identifying Engine Front Cover Components With Torque Specifications (View 1 Of 3)
 Courtesy of FORD MOTOR CO.

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)



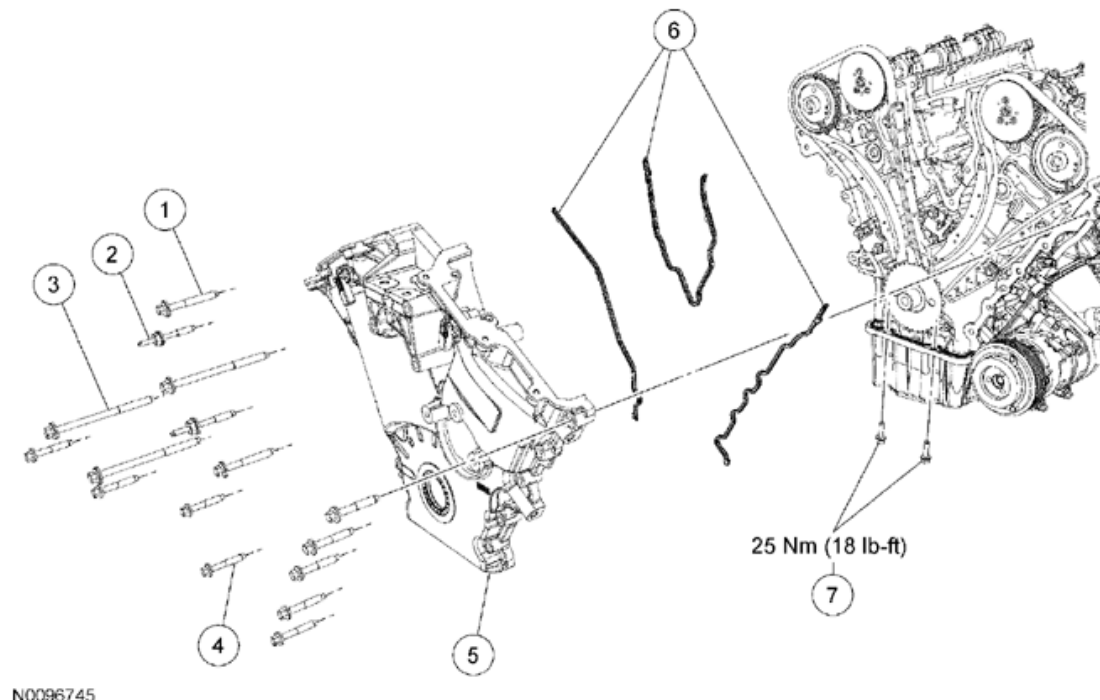
N0095744

Fig. 28: Identifying Engine Front Cover Components (View 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)



N0096745

Fig. 29: Identifying Engine Front Cover Components With Torque Specifications (View 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** article.
2. Release the fuel system pressure. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION - FUSION, MILAN & MKZ** article.
3. Disconnect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING &**

CABLES -- FUSION, MILAN & MKZ article.

4. Remove the crankshaft front seal. For additional information, refer to **CRANKSHAFT PULLEY AND CRANKSHAFT FRONT SEAL - EXPLODED VIEW** and **CRANKSHAFT FRONT SEAL** in this service information.
5. Remove the generator bolt and the 2 nuts.

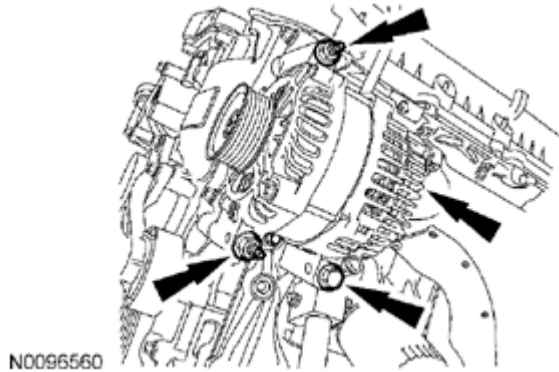


Fig. 30: Locating Generator Bolt And Nuts
Courtesy of FORD MOTOR CO.

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

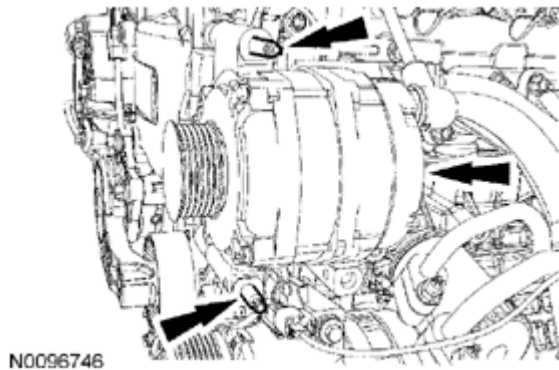


Fig. 31: Locating Studs And Generator
Courtesy of FORD MOTOR CO.

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.

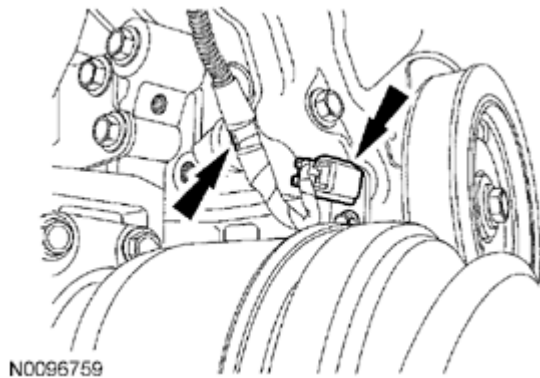


Fig. 32: Locating Crankshaft Position (CKP) Electrical Connector And Wiring Harness Retainer
Courtesy of FORD MOTOR CO.

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 **ELECTRONIC ENGINE CONTROLS - 3.0L (4V) -- FUSION & MILAN** article.
12. Remove the engine mount. For additional information, refer to **ENGINE MOUNT** in this service information.
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

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.

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

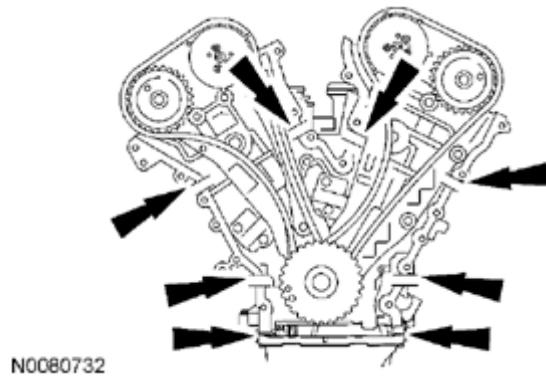


Fig. 33: Locating Sealant At Cylinder Block, Lower Cylinder Block, Cylinder Head And Oil Pan Mating Surfaces

Courtesy of FORD MOTOR CO.

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

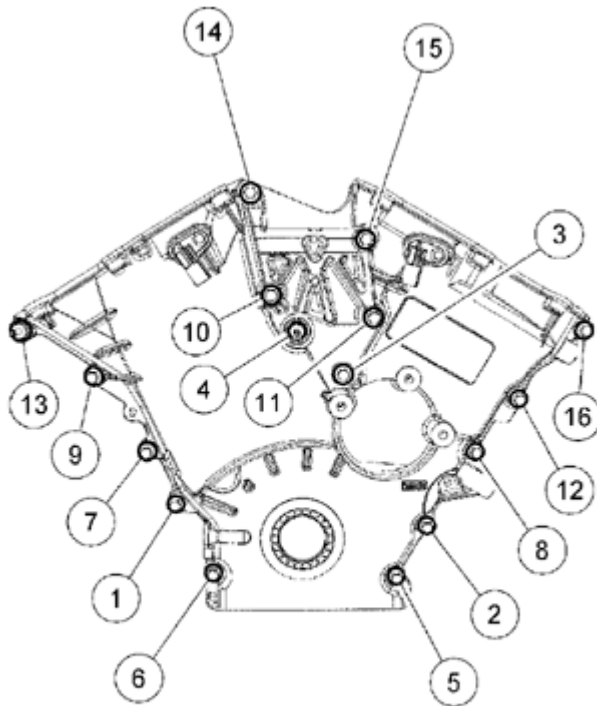


Fig. 34: Identifying Engine Front Cover Bolts Tightening Sequence

Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

2011 Mercury Milan

2011 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan

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 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

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 **ENGINE MOUNT** in this service information.
7. Install the LH and RH VCT oil control solenoids. For additional information, refer to **ELECTRONIC ENGINE CONTROLS - 3.0L (4V) -- FUSION & MILAN** article.
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 **CRANKSHAFT PULLEY AND CRANKSHAFT FRONT SEAL - EXPLODED VIEW** and **CRANKSHAFT FRONT SEAL** in this service information.
15. Fill the engine with clean engine oil.

16. Connect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING & CABLES -- FUSION, MILAN & MKZ** article.
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 **ENGINE FRONT COVER** in this service information.
2. Remove the LH and RH spark plugs. For additional information, refer to **ENGINE IGNITION - 3.0L (4V) -- FUSION & MILAN** article.

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).

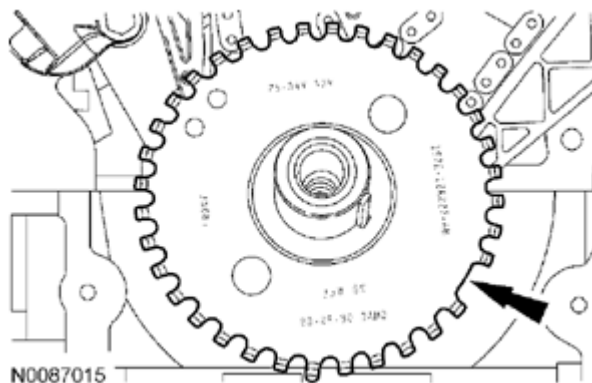
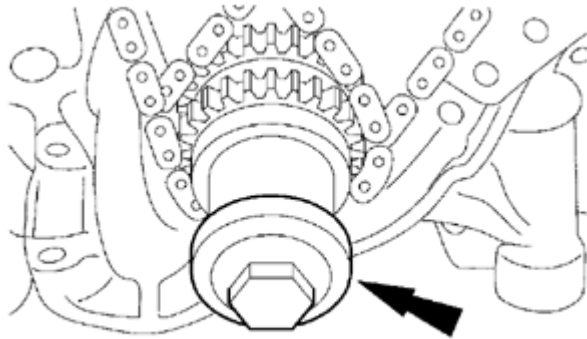


Fig. 35: Identifying Ignition Pulse Wheel
Courtesy of FORD MOTOR CO.

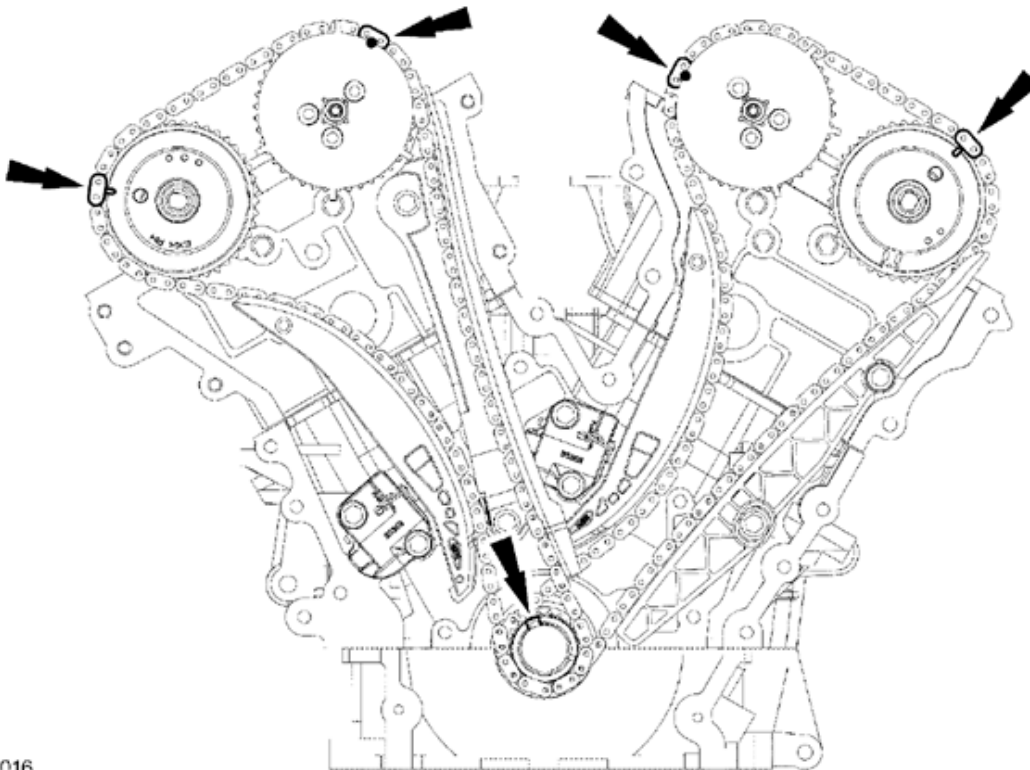
3. Remove the ignition pulse wheel.
4. Install the crankshaft pulley bolt and washer.



A0011064

Fig. 36: Locating Crankshaft Pulley Bolt And Washer
 Courtesy of FORD MOTOR CO.

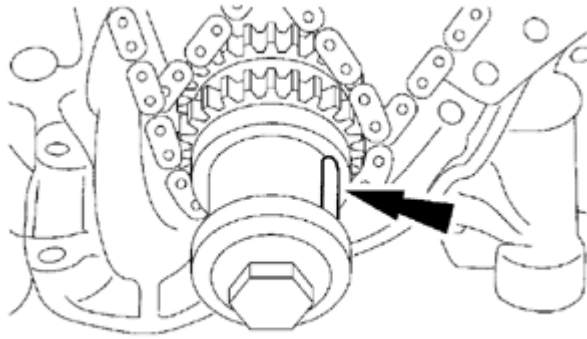
5. Rotate the crankshaft clockwise to position the crankshaft keyway in the 11 o'clock position and position the camshafts in the correct position. This will position the No. 1 cylinder at Top Dead Center (TDC).
 - Verify that the camshafts are correctly located. If not, rotate the crankshaft one additional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



N0087016

Fig. 37: Locating Crankshaft Keyway In 11 O'Clock Position
 Courtesy of FORD MOTOR CO.

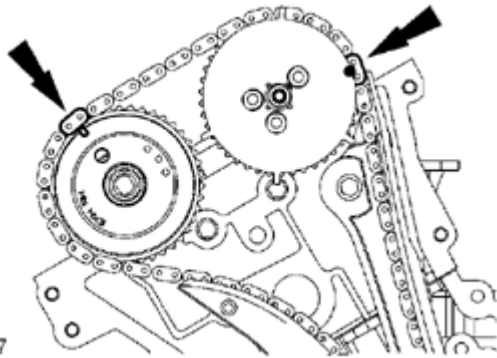
6. Rotate the crankshaft clockwise 120 degrees to the 3 o'clock position to position the RH camshafts in the neutral position.



A0011067

Fig. 38: Locating Crankshaft 3 O'Clock Position
Courtesy of FORD MOTOR CO.

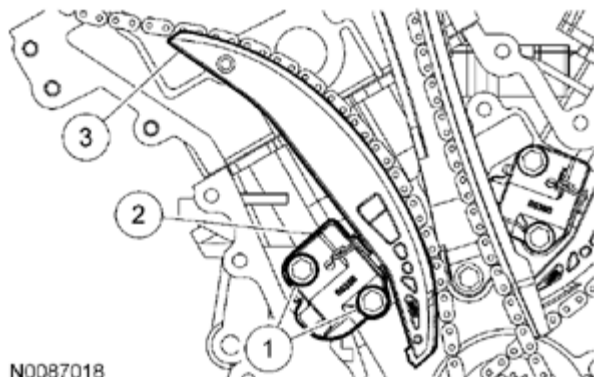
7. Verify that the RH camshafts are in the neutral position.



N0087017

Fig. 39: Identifying RH Camshafts Are In Neutral Position
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.



N0087018

Fig. 40: Identifying RH Timing Chain Tensioner, Tensioner Arm And 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.

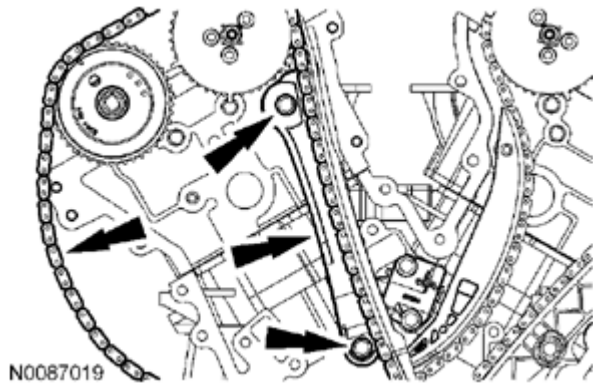


Fig. 41: Locating RH Timing Chain Guide And Bolts
Courtesy of FORD MOTOR CO.

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.

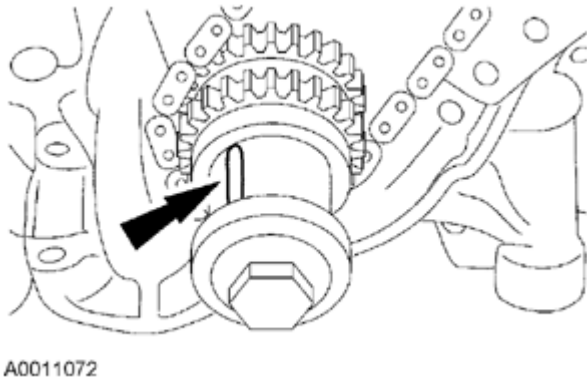


Fig. 42: Locating Crankcase Keyway In 11 O'Clock Position
Courtesy of FORD MOTOR CO.

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

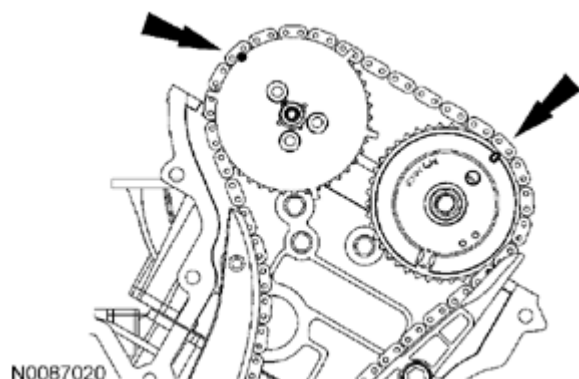


Fig. 43: Identifying LH Camshafts Are In Neutral Position
Courtesy of FORD MOTOR CO.

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

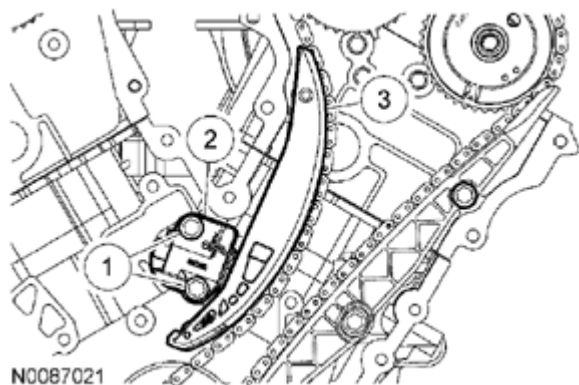


Fig. 44: Identifying LH Timing Chain, Tensioner Arm And Bolts
Courtesy of FORD MOTOR CO.

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

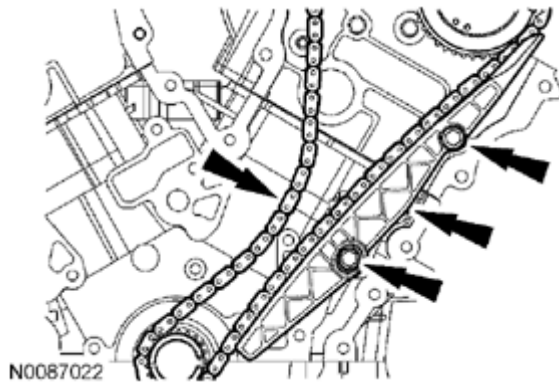


Fig. 45: Locating Bolts And LH Timing Chain Guide
 Courtesy of FORD MOTOR CO.

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

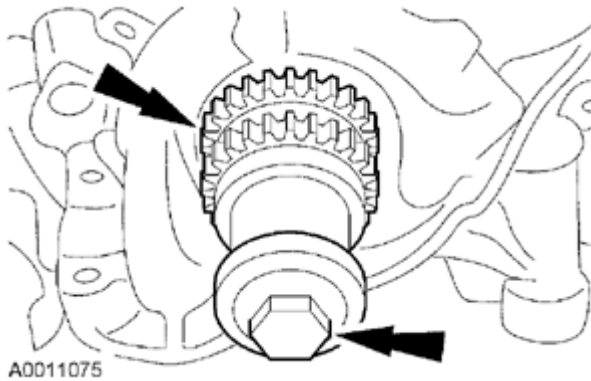


Fig. 46: Locating Crankshaft Pulley Bolt And Crankshaft Sprocket
 Courtesy of FORD MOTOR CO.

Installation

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

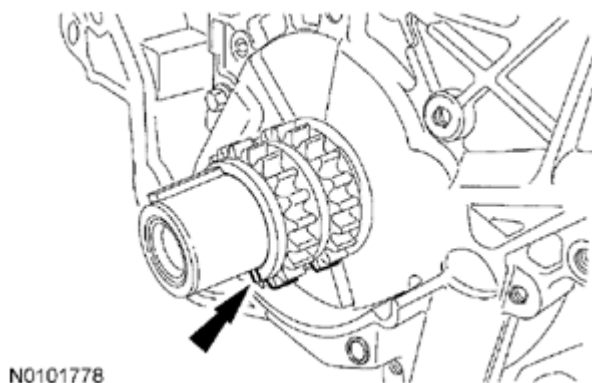


Fig. 47: Locating Crankshaft Sprocket With Timing Mark Facing Out
Courtesy of FORD MOTOR CO.

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: LH shown in the illustration, RH similar.

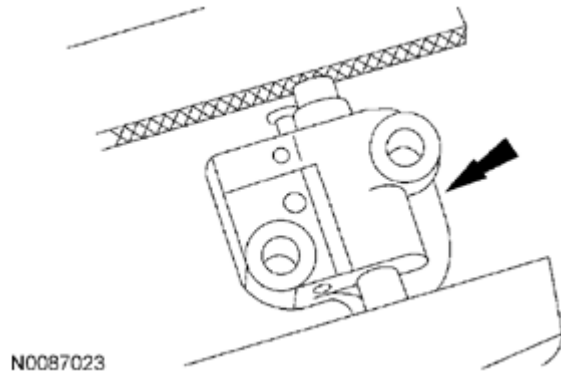


Fig. 48: Positioning Chain Tensioner In Soft-Jawed Vise
Courtesy of FORD MOTOR CO.

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

NOTE: LH shown in the illustration, RH similar.

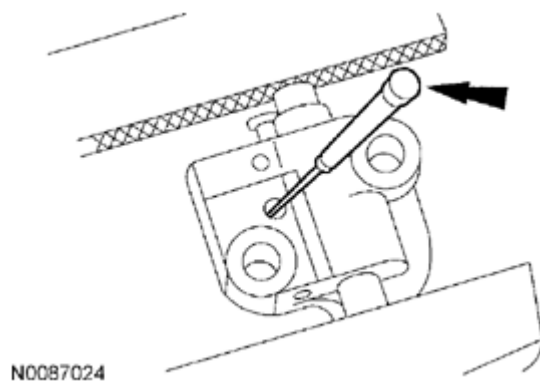


Fig. 49: Holding Chain Tensioner Ratchet Lock Mechanism Away From Ratchet Stem With Small Pick
Courtesy of FORD MOTOR CO.

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

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.

4. Slowly compress the timing chain tensioner.
5. Retain the tensioner piston with a 1.5 mm (0.06 in) diameter wire or paper clip.

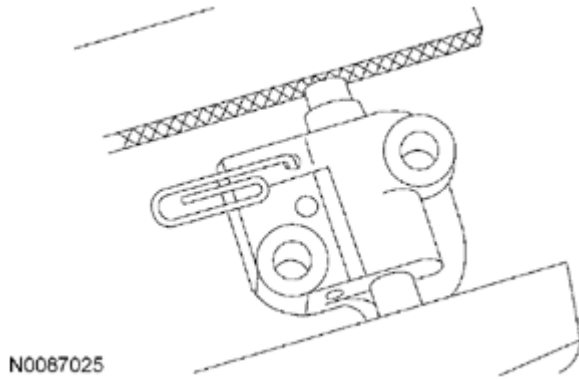


Fig. 50: Retaining Tensioner Piston With 1.5 mm (0.06 in) Diameter Wire Or Paper Clip
 Courtesy of FORD MOTOR CO.

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.

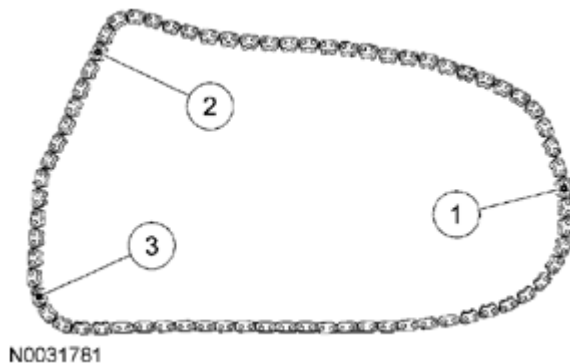


Fig. 51: Identifying Timing Marks On Timing Chain
 Courtesy of FORD MOTOR CO.

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.

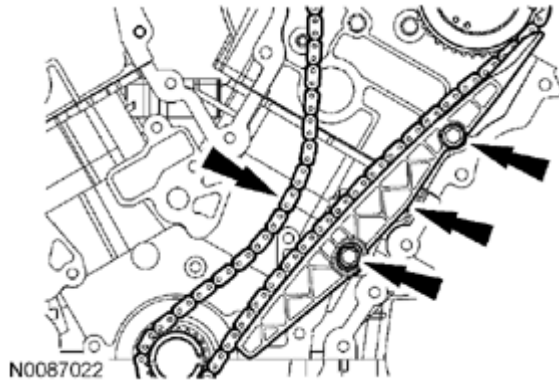


Fig. 52: Locating Bolts And LH Timing Chain Guide
Courtesy of FORD MOTOR CO.

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).

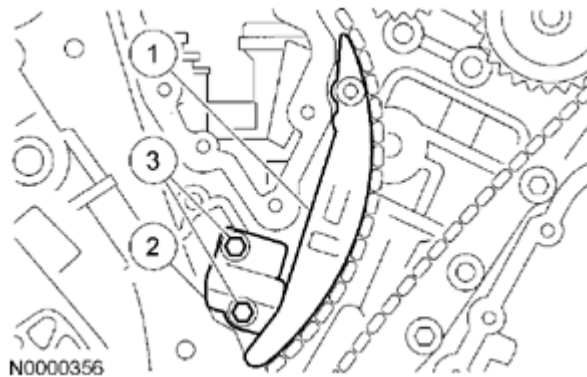


Fig. 53: Identifying LH Timing Chain Tensioner Arm And Bolts
Courtesy of FORD MOTOR CO.

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

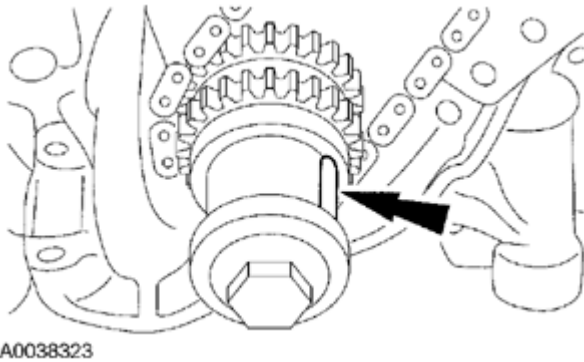


Fig. 54: Locating Crankshaft Keyway Is In 3 O'Clock Position
 Courtesy of FORD MOTOR CO.

10. Verify that the RH camshafts are correctly positioned.

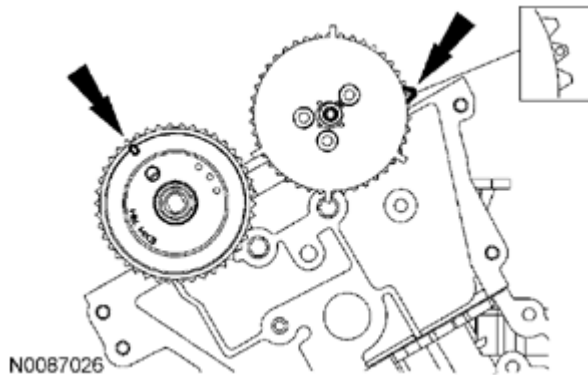


Fig. 55: Identifying RH Camshafts Are In Neutral Position
 Courtesy of FORD MOTOR CO.

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.

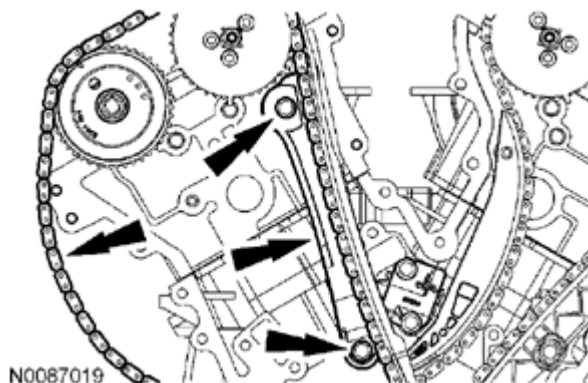


Fig. 56: Locating RH Timing Chain Guide And Bolts

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).

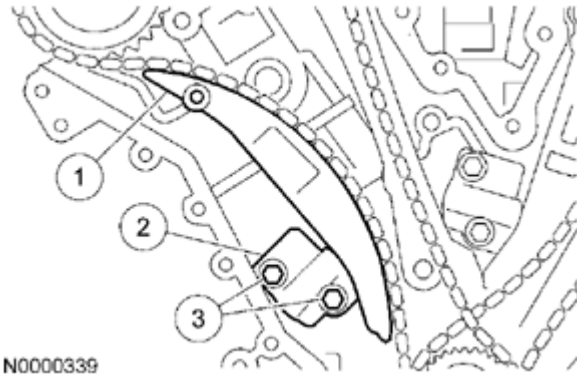


Fig. 57: Identifying RH Timing Chain Tensioner, Tensioner Arm And Bolts
Courtesy of FORD MOTOR CO.

13. Remove the LH and RH timing chain tensioner piston retaining wires.
14. Rotate the crankshaft counterclockwise 120 degrees to TDC.

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

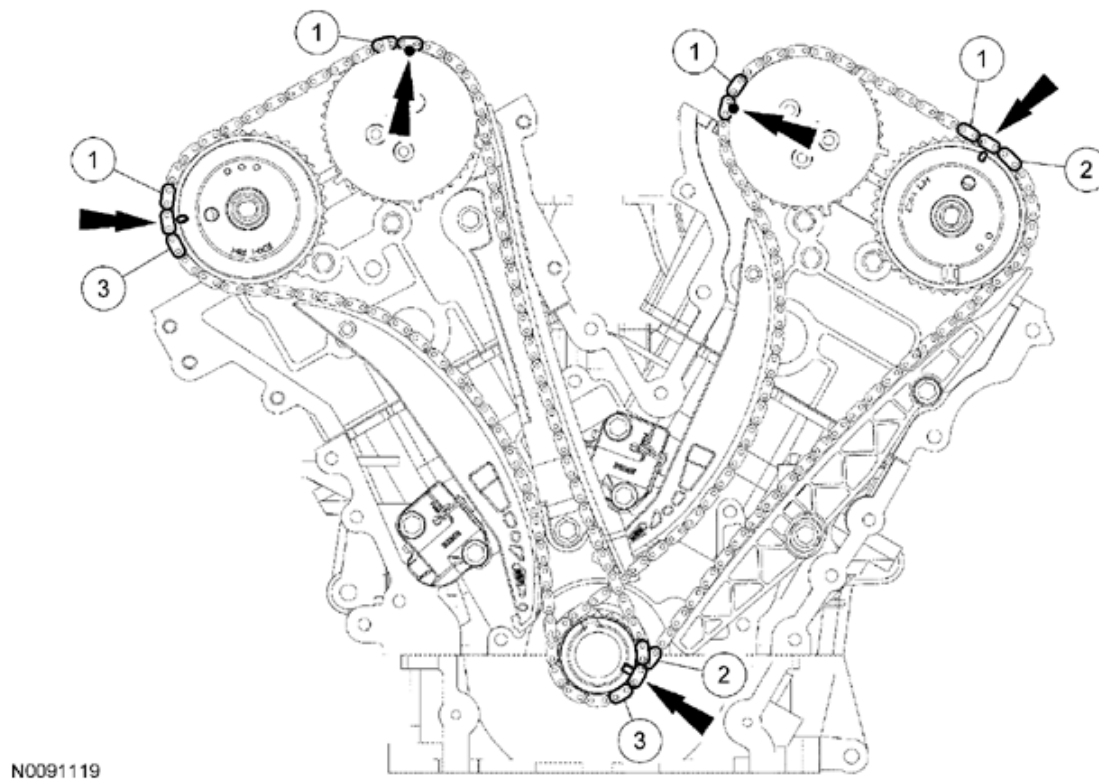


Fig. 58: Identifying Camshaft And Crankshaft Timing Marks Location
Courtesy of FORD MOTOR CO.

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.
16. Remove the crankshaft pulley bolt and washer.

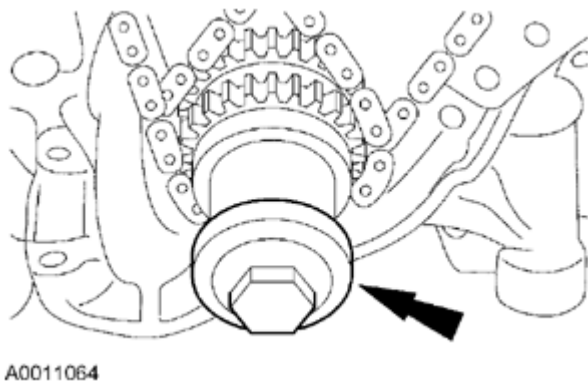


Fig. 59: Locating Crankshaft Pulley Bolt And Washer
Courtesy of FORD MOTOR CO.

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).

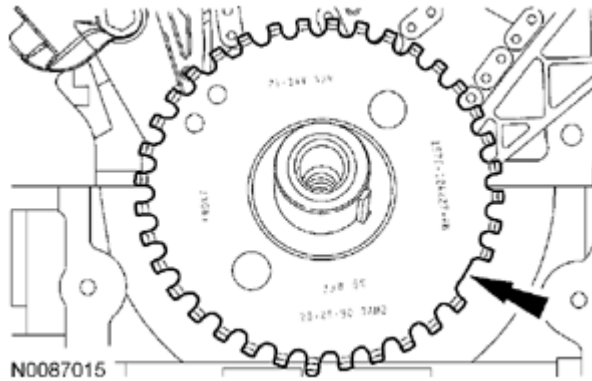
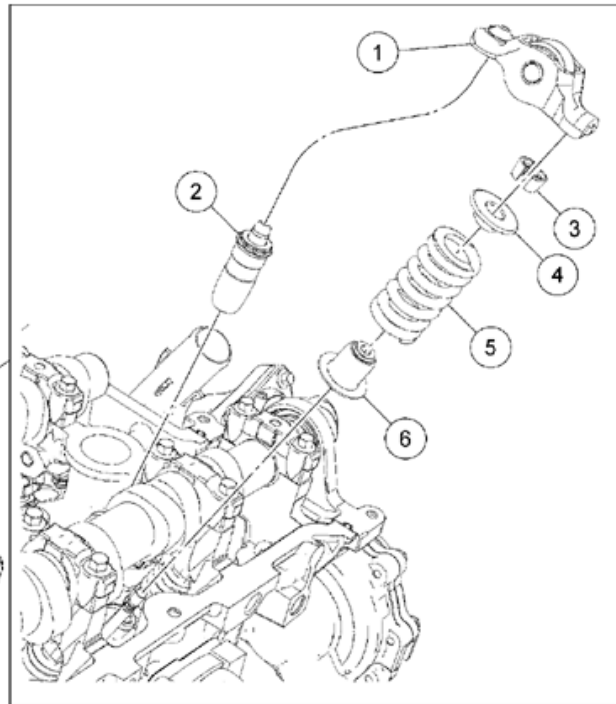
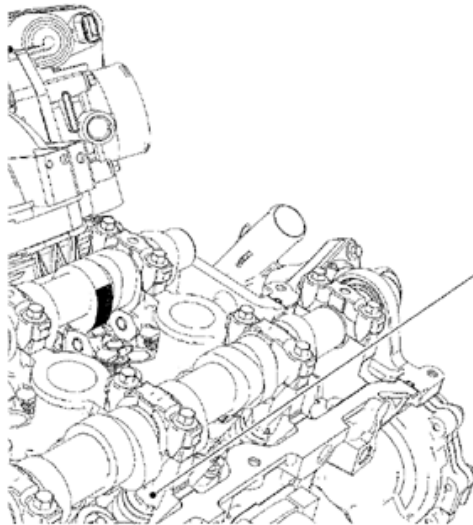


Fig. 60: Identifying Ignition Pulse Wheel
Courtesy of FORD MOTOR CO.

17. Install the ignition pulse wheel.
18. Install the LH and RH spark plugs. For additional information, refer to **ENGINE IGNITION - 3.0L (4V) -- FUSION & MILAN** article.
19. Install the engine front cover. For additional information, refer to **ENGINE FRONT COVER** in this service information.

VALVE TRAIN COMPONENTS - EXPLODED VIEW

LH Side Roller Follower, Hydraulic Lash Adjuster and Valve Spring



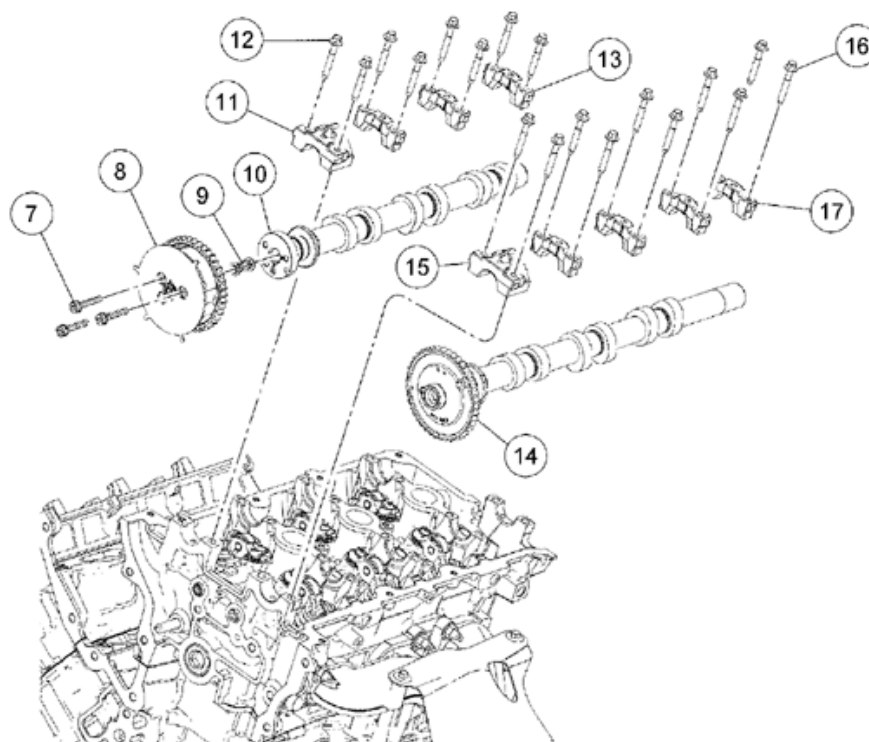
N0074230

Fig. 61: Identifying LH Side Roller Follower, Hydraulic Lash Adjuster And Valve Spring Components
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



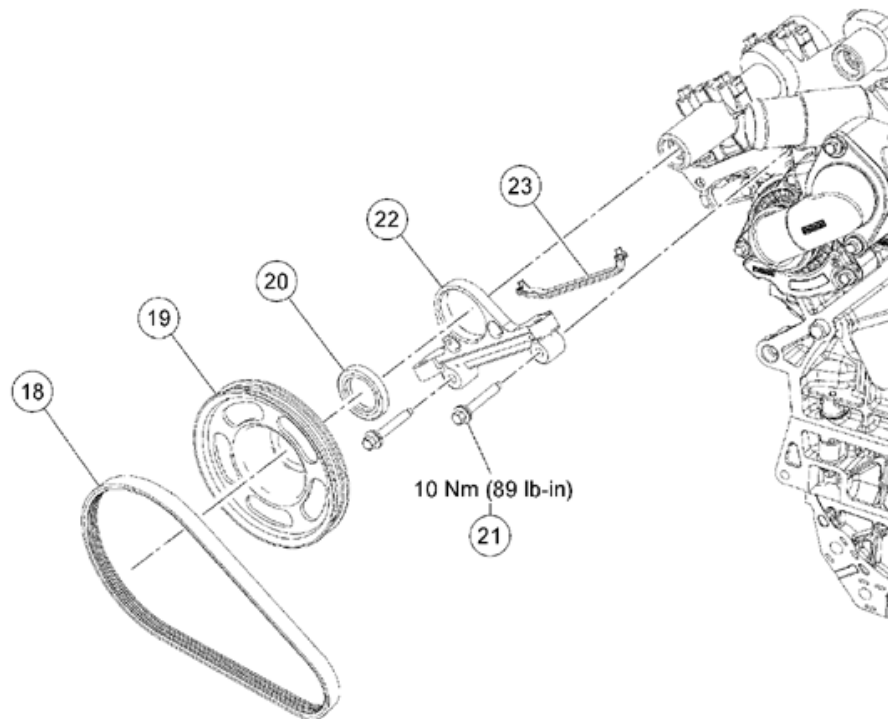
N0087124

Fig. 62: Exploded View Of LH Side Intake And Exhaust Camshafts Components
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



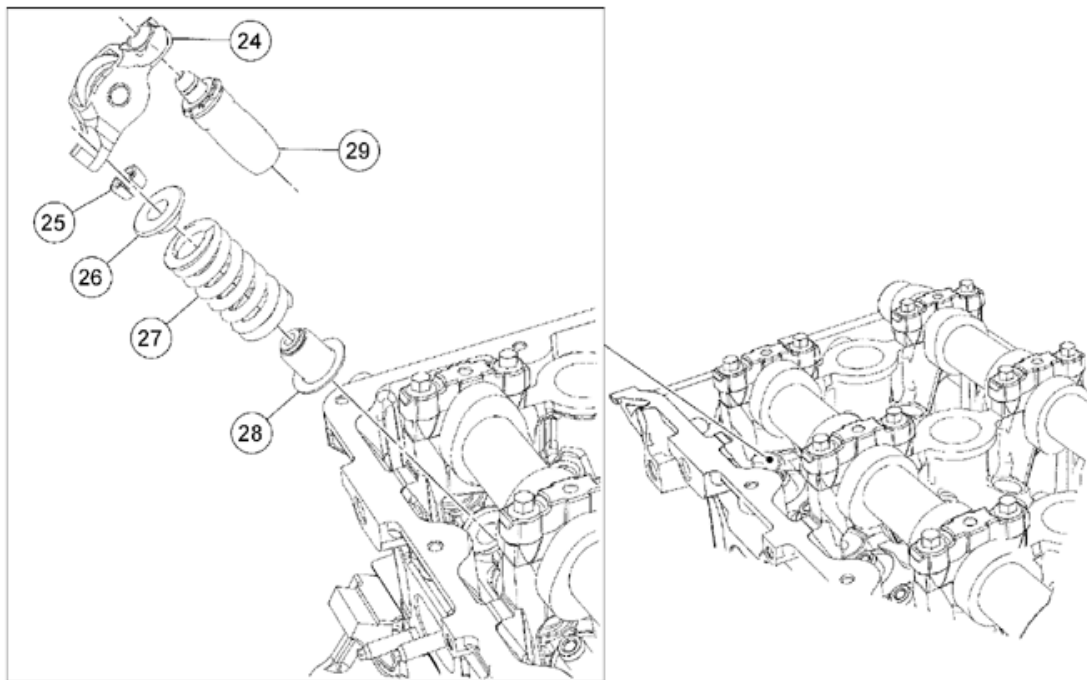
N0087127

Fig. 63: Identifying Coolant Pump Belt And Pulley Components 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. 64: Identifying RH Side Roller Follower, Hydraulic Lash Adjuster And Valve Spring Components
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

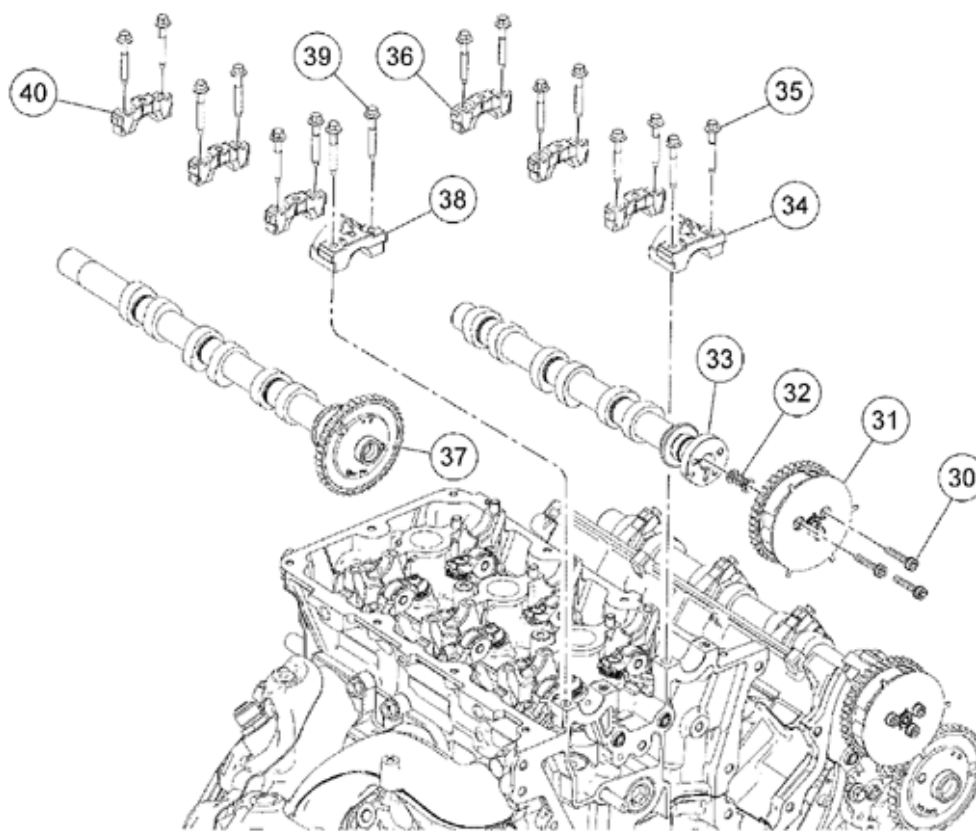


Fig. 65: Exploded View Of RH Side Intake And Exhaust Camshaft Components
Courtesy of FORD MOTOR CO.

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 in this service information.

CAMSHAFT PHASER AND SPROCKET

Special Tools

SPECIAL TOOL(S)

 ST2969-A	Locking Tool, Timing Chain 303-1175
---	--

Material Specifications

MATERIAL SPECIFICATIONS TABLE

Item	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada) XO-5W20-QSP (US); CXO-5W20-LSP12 (Canada)	WSS-M2C945-A

Removal

LH camshaft phaser and sprocket

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** article. A video version of this procedure is available on-line.
2. Remove the LH Variable Camshaft Timing (VCT) oil control solenoid. For additional information, refer to **ELECTRONIC ENGINE CONTROLS - 3.0L (4V) -- FUSION & MILAN** article.
3. Remove the LH Camshaft Position (CMP) sensor. For additional information, refer to **ELECTRONIC ENGINE CONTROLS - 3.0L (4V) -- FUSION & MILAN** article.
4. Remove the 4 screws and position the RH fender splash shield aside.

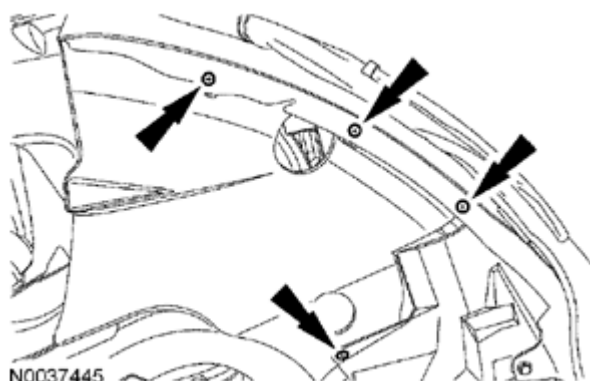


Fig. 66: Locating RH Fender Splash Shield Screws
Courtesy of FORD MOTOR CO.

5. Remove the 6 pin-type retainers and the RH splash shield.

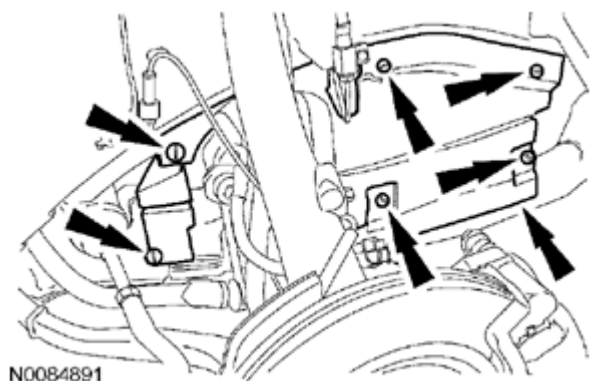


Fig. 67: Locating Pin-Type Retainers And RH Splash Shield
Courtesy of FORD MOTOR CO.

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

NOTE: The engine front cover is removed for clarity.

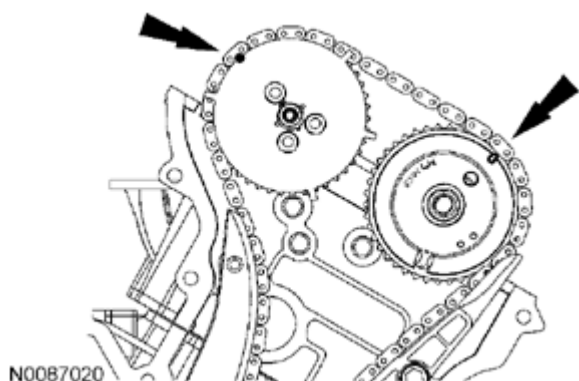


Fig. 68: Identifying LH Camshafts Are In Neutral Position
Courtesy of FORD MOTOR CO.

6. Rotate the crankshaft until the LH camshafts are in the neutral position as shown in the illustration.

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

NOTE: The Timing Chain Locking Tool will lock the timing chain in place.

NOTE: The engine front cover is removed for clarity.

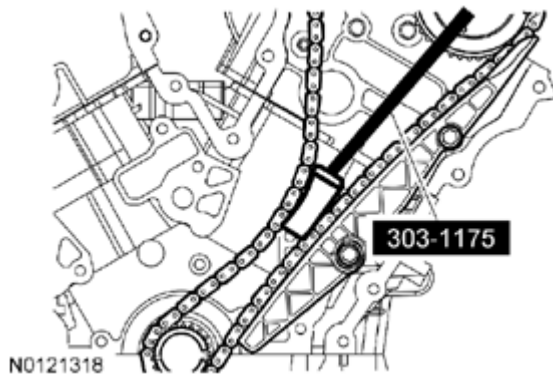


Fig. 69: Identifying Timing Chain Locking Tool In LH Timing Chain
Courtesy of FORD MOTOR CO.

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

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

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

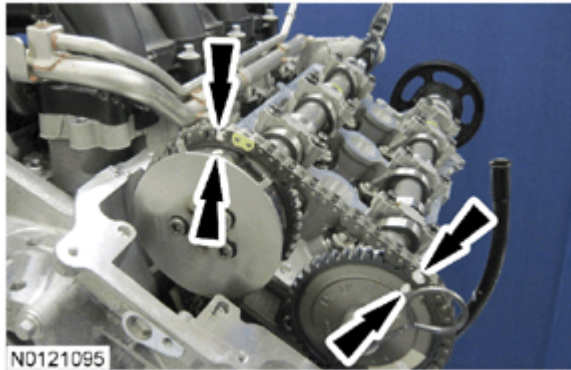
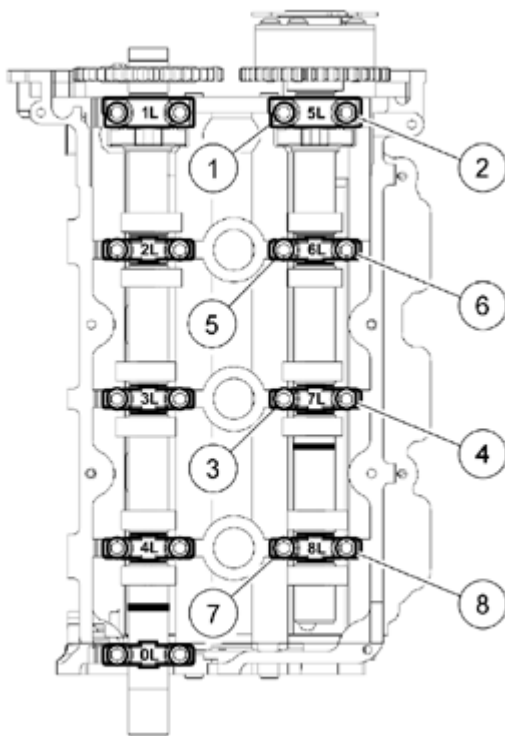


Fig. 70: Marking Timing Chain Links And LH Camshaft Phaser And Sprocket And Exhaust Camshaft Gear
Courtesy of FORD MOTOR CO.

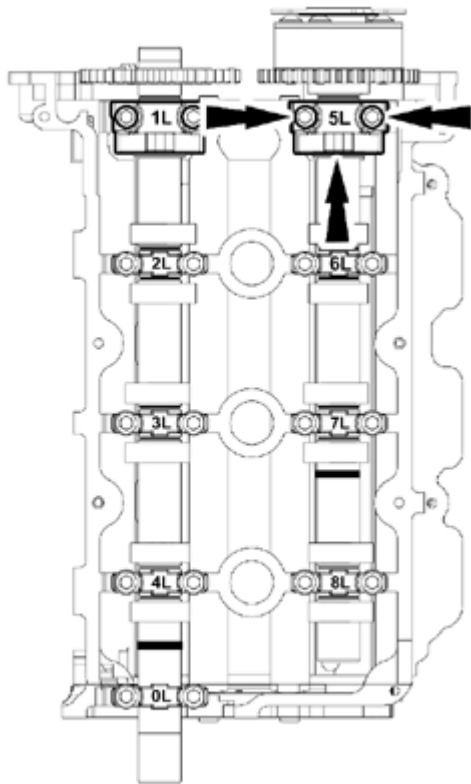
8. Mark the timing chain links and LH camshaft phaser and sprocket and exhaust camshaft gear as shown in the illustration for installation.
9. Loosen the intake camshaft bolts evenly in the sequence shown in the illustration.



N0121091

Fig. 71: Identifying Intake Camshaft Bolts Loosening Sequence
Courtesy of FORD MOTOR CO.

10. Remove the 2 bolts and the intake camshaft bearing thrust cap.



N0121092

Fig. 72: Locating Bolts And Intake Camshaft Bearing Thrust Cap
Courtesy of FORD MOTOR CO.

- 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:** Only use hand tools to remove the camshaft phaser and sprocket bolts or damage may occur to the camshaft or camshaft phaser and sprocket.
- 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.

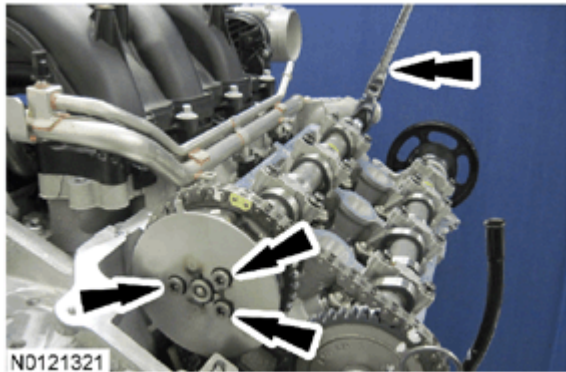


Fig. 73: Removing Camshaft Phaser And Sprocket Bolts
Courtesy of FORD MOTOR CO.

11. Loosen the 3 bolts for the LH camshaft phaser and sprocket.
 - Tighten to 18 Nm (159 lb-in).

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

NOTE: The camshaft will move and needs to be positioned towards the rear of the engine.

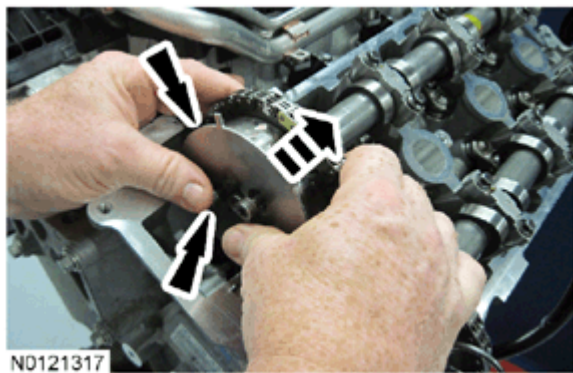


Fig. 74: Pressing LH Camshaft Phaser And Sprocket Bolts Towards Rear Of Engine
Courtesy of FORD MOTOR CO.

12. Using your hands, press the LH camshaft phaser and sprocket bolts towards the rear of the engine while using a rocking motion to release the LH camshaft phaser and sprocket from the camshaft.
 - Once the LH camshaft phaser and sprocket has separated from the camshaft, remove the timing chain from the LH camshaft phaser and sprocket and remove.

RH camshaft phaser and sprocket

13. Remove the RH VCT oil control solenoid. For additional information, refer to **ELECTRONIC ENGINE**

CONTROLS - 3.0L (4V) -- FUSION & MILAN article.

14. Remove the RH CMP sensor. For additional information, refer to **ELECTRONIC ENGINE CONTROLS - 3.0L (4V) -- FUSION & MILAN** article.
15. Remove the 4 screws and position the RH fender splash shield aside.

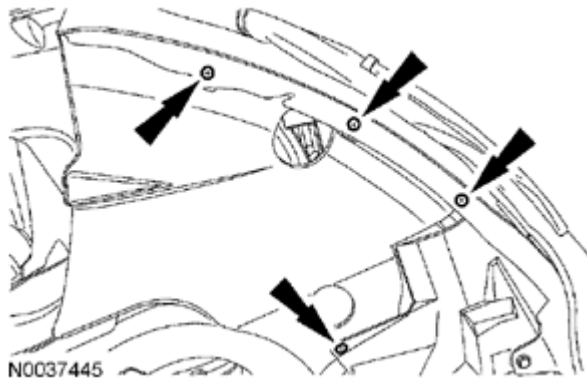


Fig. 75: Locating RH Fender Splash Shield Screws
Courtesy of FORD MOTOR CO.

16. Remove the 6 pin-type retainers and the RH splash shield.

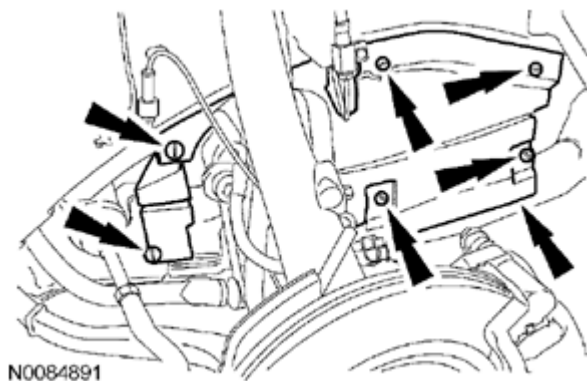


Fig. 76: Locating Pin-Type Retainers And RH Splash Shield
Courtesy of FORD MOTOR CO.

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

NOTE: The engine front cover is removed for clarity.

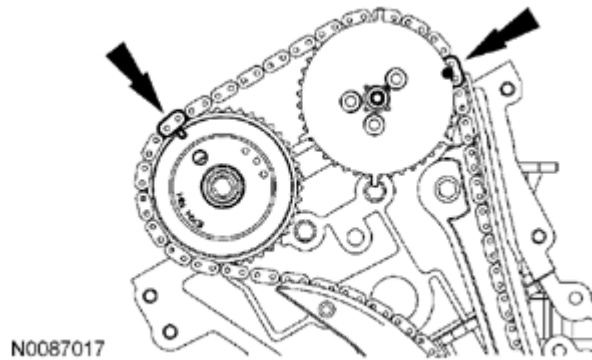


Fig. 77: Identifying RH Camshafts Are In Neutral Position
Courtesy of FORD MOTOR CO.

17. Rotate the crankshaft until the RH camshafts are in the neutral position as shown in the illustration.

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

NOTE: The Timing Chain Locking Tool will lock the timing chain in place.

NOTE: The engine front cover is removed for clarity.

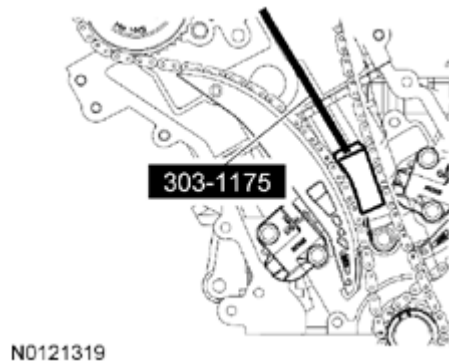


Fig. 78: Installing Timing Chain Locking Tool In RH Timing Chain
Courtesy of FORD MOTOR CO.

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

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

NOTE: The timing chain must be installed in its original position onto the

camshaft phaser and sprocket and exhaust camshaft gear using the marks, or damage to valves and pistons will result.

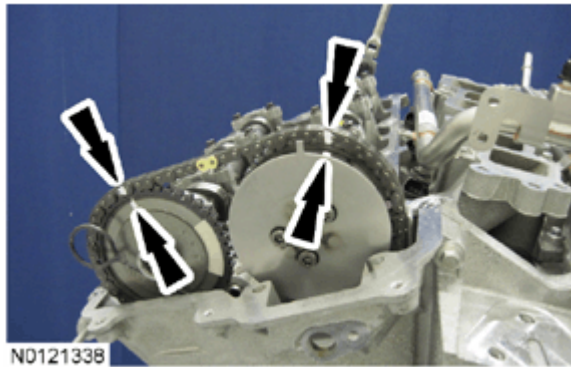
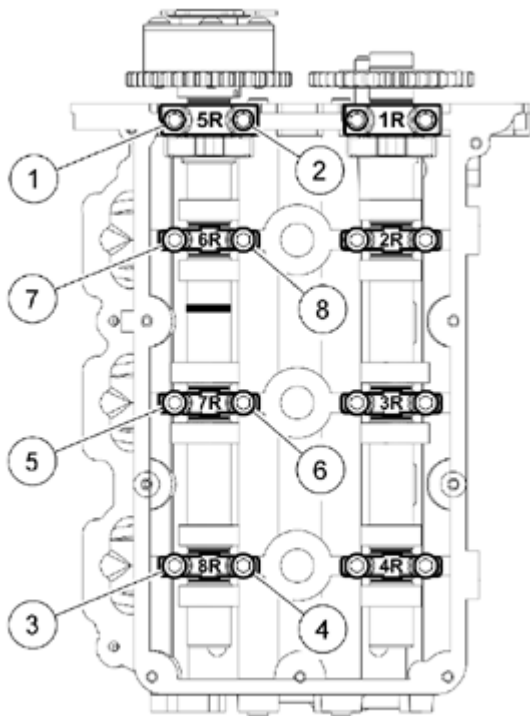


Fig. 79: Marking Timing Chain Links And RH Camshaft Phaser And Sprocket And Exhaust Camshaft Gear

Courtesy of FORD MOTOR CO.

19. Mark the timing chain links and RH camshaft phaser and sprocket and exhaust camshaft gear as shown in the illustration for installation.
20. Loosen the intake camshaft bolts evenly in the sequence shown in the illustration.

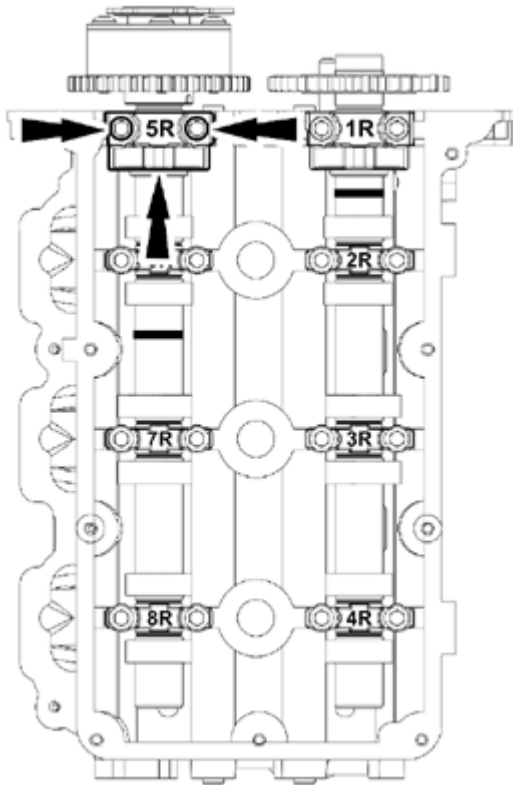


N0121093

Fig. 80: Identifying Intake Camshaft Bolts Loosening Sequence

Courtesy of FORD MOTOR CO.

21. Remove the 2 bolts and the intake camshaft bearing thrust cap.



N0121094

Fig. 81: Locating Bolts And Intake Camshaft Bearing Thrust Cap
Courtesy of FORD MOTOR CO.

- 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:** Only use hand tools to remove the camshaft phaser and sprocket bolt or damage may occur to the camshaft or camshaft phaser and sprocket.
- NOTE:** 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.
- NOTE:** The engine front cover is removed for clarity.

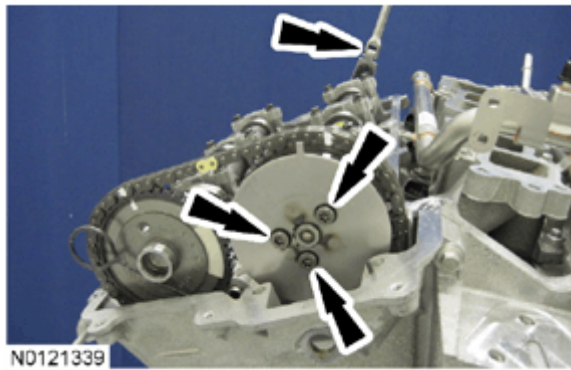


Fig. 82: Remove/Install Camshaft Phaser And Sprocket Bolts
Courtesy of FORD MOTOR CO.

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

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

NOTE: The camshaft will move and needs to be positioned towards the rear of the engine.

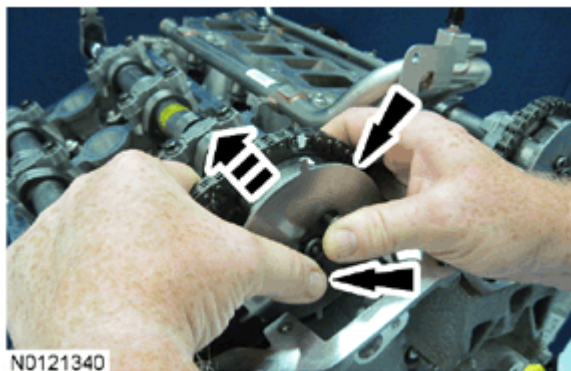


Fig. 83: Pressing RH Camshaft Phaser And Sprocket Bolts Towards Rear Of Engine
Courtesy of FORD MOTOR CO.

23. Using your hands, press the RH camshaft phaser and sprocket bolts towards the rear of the engine while using a rocking motion to release the RH camshaft phaser and sprocket from the camshaft.
- Once the RH camshaft phaser and sprocket has separated from the camshaft, remove the timing chain from the RH camshaft phaser and sprocket and remove.

Installation

RH camshaft phaser and sprocket

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

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

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

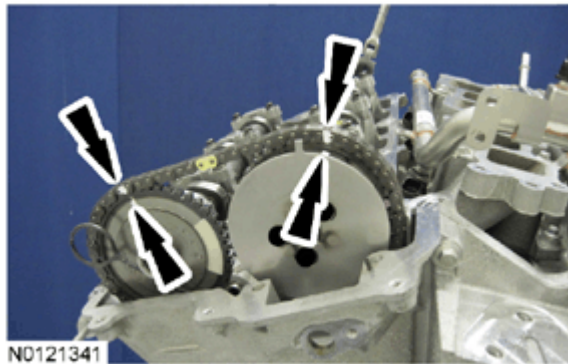


Fig. 84: Positioning RH Camshaft Phaser And Sprocket Into Timing Chain With Alignment Marks
Courtesy of FORD MOTOR CO.

1. Position the RH camshaft phaser and sprocket into the timing chain with the alignment marks.
 - Make sure the timing chain mark is in alignment with the exhaust camshaft gear mark.

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

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

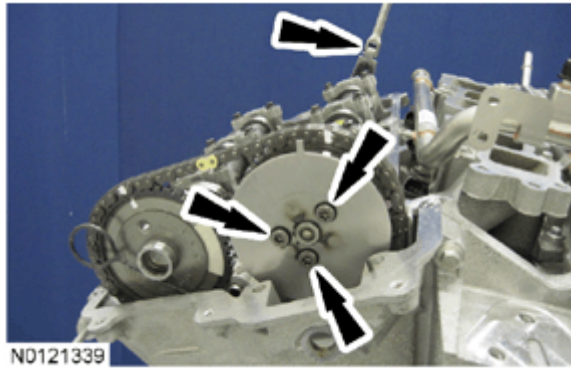


Fig. 85: Remove/Install Camshaft Phaser And Sprocket Bolts
Courtesy of FORD MOTOR CO.

2. Using the 3/8-in ratchet and extension into the D-slot on the rear of the RH intake camshaft, align the RH camshaft phaser and sprocket with the camshaft and install the 3 bolts.
 - Tighten the 3 bolts in a clockwise pattern until the RH camshaft phaser and sprocket is seated on the camshaft.
 - Torque the 3 bolts to 18 Nm (159 lb-in), using the 3/8-in ratchet and extension to hold camshaft from turning.
3. Lubricate the bearing surface of the RH intake camshaft bearing thrust cap with clean engine oil and install the camshaft bearing thrust cap and the 2 bolts.
 - Do not torque at this time.

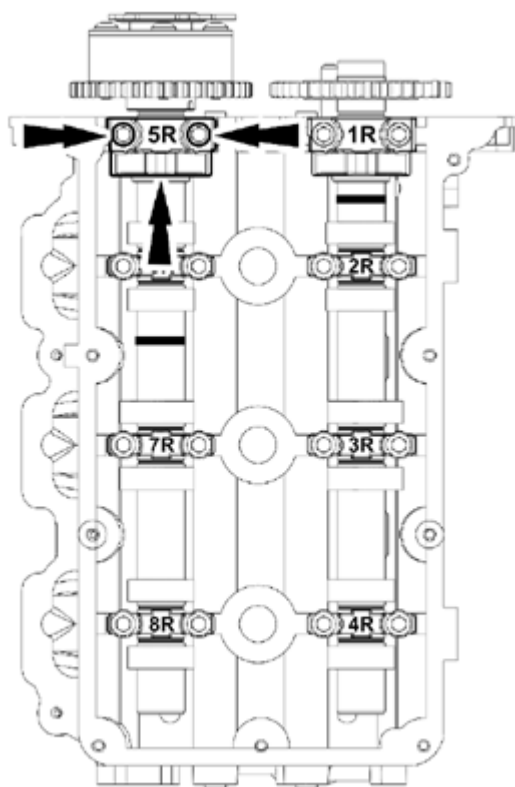
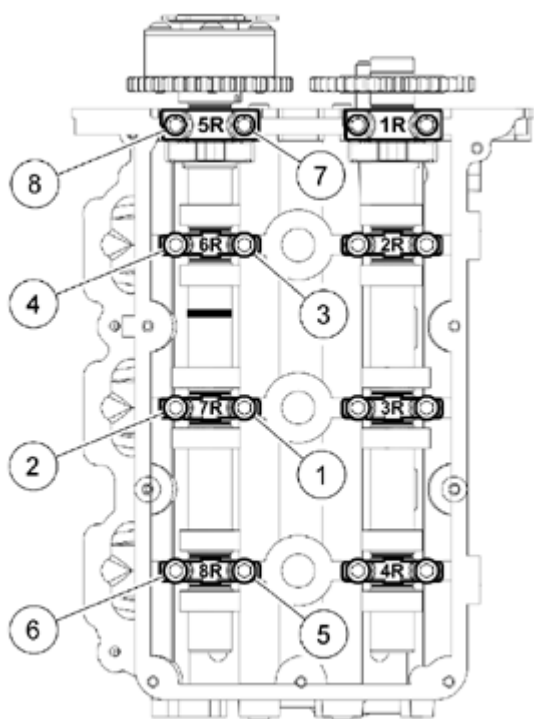


Fig. 86: Locating Bolts And Intake Camshaft Bearing Thrust Cap
Courtesy of FORD MOTOR CO.

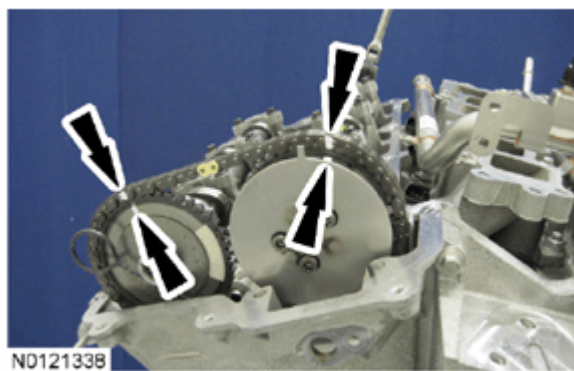
4. Tighten the RH intake camshaft bearing cap bolts in the sequence shown in the illustration in 2 stages.
 - Stage 1: Tighten to 10 Nm (89 lb-in).
 - Stage 2: Individually loosen and then tighten each camshaft bearing cap to 10 Nm (89 lb-in).



N0121337

Fig. 87: Identifying RH Intake Camshaft Bearing Cap Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

5. Verify the timing chain links and RH camshaft phaser and sprocket and exhaust camshaft gear are in alignment.



N0121338

Fig. 88: Aligning Timing Chain Links And RH Camshaft Phaser And Sprocket And Exhaust Camshaft Gear
Courtesy of FORD MOTOR CO.

NOTE: The engine front cover is removed for clarity.

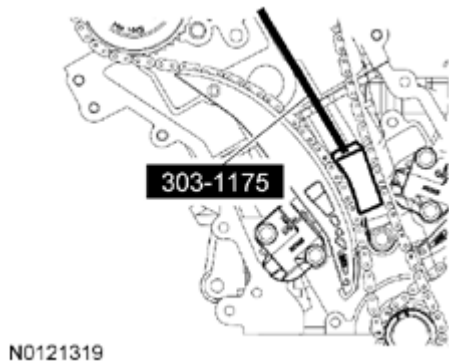


Fig. 89: Installing Timing Chain Locking Tool In RH Timing Chain
Courtesy of FORD MOTOR CO.

6. Remove the Timing Chain Locking Tool from the RH timing chain.
7. Install the RH splash shield and the 6 pin-type retainers.

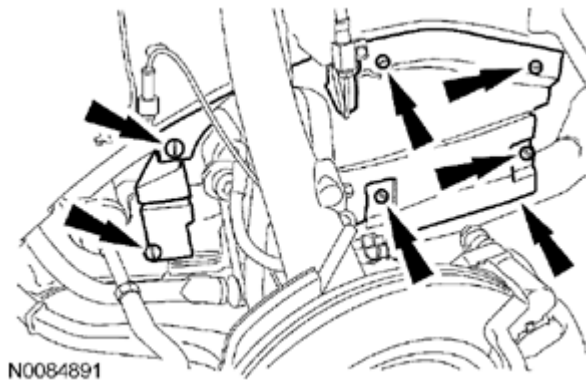


Fig. 90: Locating Pin-Type Retainers And RH Splash Shield
Courtesy of FORD MOTOR CO.

8. Position the RH fender splash shield and install the 4 screws.

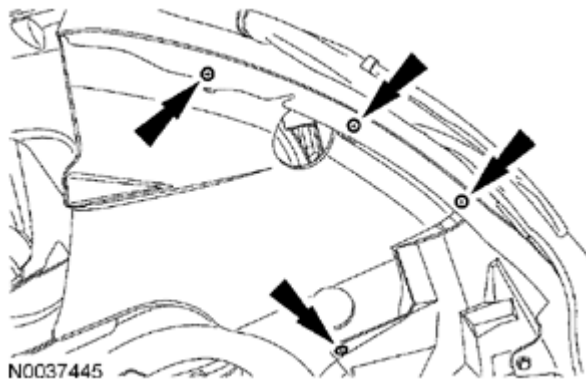


Fig. 91: Locating RH Fender Splash Shield Screws
Courtesy of FORD MOTOR CO.

9. Install the RH CMP sensor. For additional information, refer to **ELECTRONIC ENGINE CONTROLS - 3.0L (4V) -- FUSION & MILAN** article.
10. Install the RH VCT oil control solenoid. For additional information, refer to **ELECTRONIC ENGINE CONTROLS - 3.0L (4V) -- FUSION & MILAN** article.

LH camshaft phaser and sprocket

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

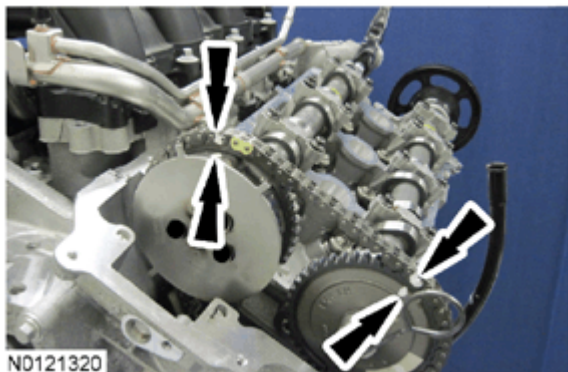


Fig. 92: Positioning LH Camshaft Phaser And Sprocket Into Timing Chain With Alignment Marks
Courtesy of FORD MOTOR CO.

11. Position the LH camshaft phaser and sprocket into the timing chain with the alignment marks.
 - Make sure the timing chain mark is in alignment with the exhaust camshaft gear mark.

- NOTE:** Do not allow the camshaft to rotate from the neutral position while installing the camshaft phaser and sprocket or damage to the engine may occur.
- NOTE:** Only use hand tools to install the camshaft phaser and sprocket bolts or damage may occur to the camshaft or camshaft phaser and sprocket.

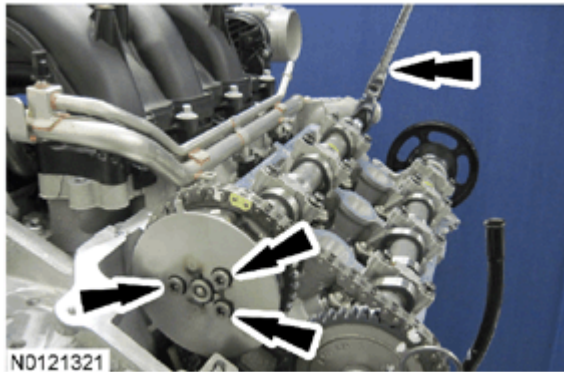
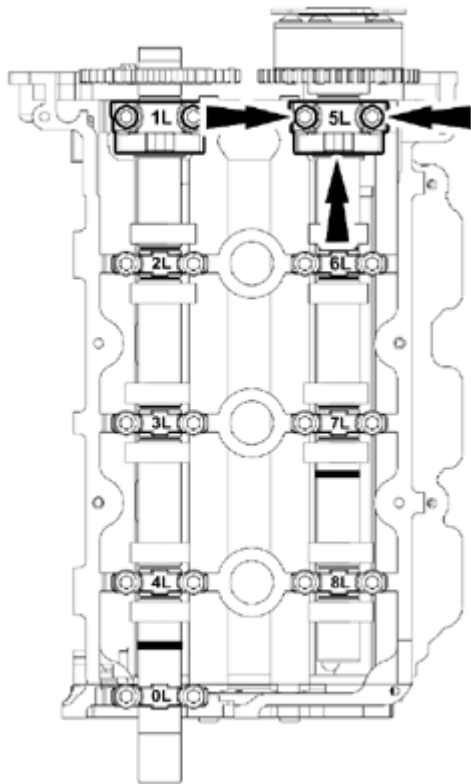


Fig. 93: Installing LH Camshaft Phaser And Sprocket Bolts
Courtesy of FORD MOTOR CO.

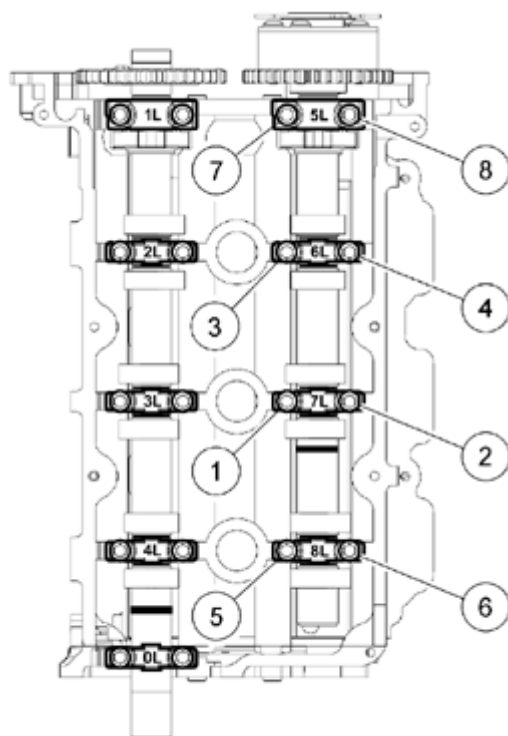
12. Using the 3/8-in ratchet and extension into the D-slot on the rear of the LH intake camshaft, align the LH camshaft phaser and sprocket with the camshaft and install the 3 bolts.
 - Tighten the 3 bolts in a clockwise pattern until the LH camshaft phaser and sprocket is seated on the camshaft.
 - Torque the 3 bolts to 18 Nm (159 lb-in), using the 3/8-in ratchet and extension to hold camshaft from turning.
13. Lubricate the bearing surface of the LH intake camshaft bearing thrust cap with clean engine oil and install the camshaft bearing thrust cap and the 2 bolts.
 - Do not torque at this time.



N0121092

Fig. 94: Locating Bolts And Intake Camshaft Bearing Thrust Cap
Courtesy of FORD MOTOR CO.

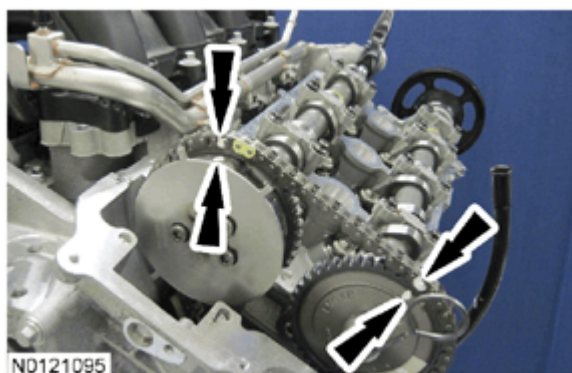
14. Tighten the LH intake camshaft bearing cap bolts in the sequence shown in the illustration in 2 stages.
 - Stage 1: Tighten to 10 Nm (89 lb-in).
 - Stage 2: Individually loosen and then tighten each camshaft bearing cap to 10 Nm (89 lb-in).



N0121322

Fig. 95: Identifying LH Intake Camshaft Bearing Cap Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

15. Verify the timing chain links and LH camshaft phaser and sprocket and exhaust camshaft gear are in alignment.



N0121095

Fig. 96: Aligning Timing Chain Links And LH Camshaft Phaser And Sprocket And Exhaust Camshaft Gear
Courtesy of FORD MOTOR CO.

NOTE: The engine front cover is removed for clarity.



Fig. 97: Identifying Timing Chain Locking Tool In LH Timing Chain
Courtesy of FORD MOTOR CO.

16. Remove the Timing Chain Locking Tool from the LH timing chain.
17. Install the RH splash shield and the 6 pin-type retainers.

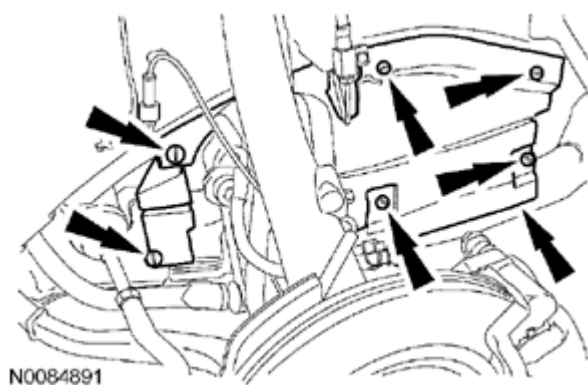


Fig. 98: Locating Pin-Type Retainers And RH Splash Shield
Courtesy of FORD MOTOR CO.

18. Position the RH fender splash shield and install the 4 screws.

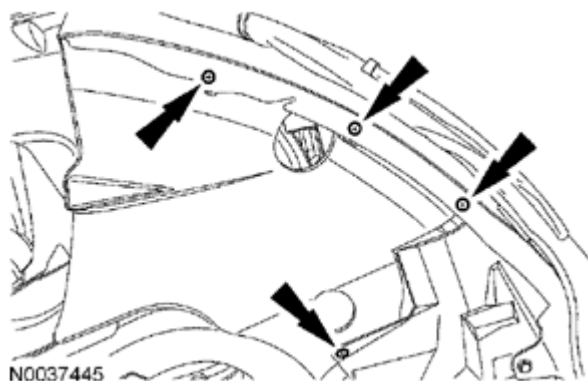


Fig. 99: Locating RH Fender Splash Shield Screws
Courtesy of FORD MOTOR CO.

19. Install the LH CMP sensor. For additional information, refer to **ELECTRONIC ENGINE CONTROLS - 3.0L (4V) -- FUSION & MILAN** article.
20. Install the LH VCT oil control solenoid. For additional information, refer to **ELECTRONIC ENGINE CONTROLS - 3.0L (4V) -- FUSION & MILAN** article.

VARIABLE CAMSHAFT TIMING (VCT) SYSTEM OIL FILTER

Removal

1. Remove the camshaft phaser and sprocket. For additional information, refer to **CAMSHAFT PHASER AND SPROCKET** in this service information.

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

2. Remove and discard the VCT system oil filter from the camshaft.

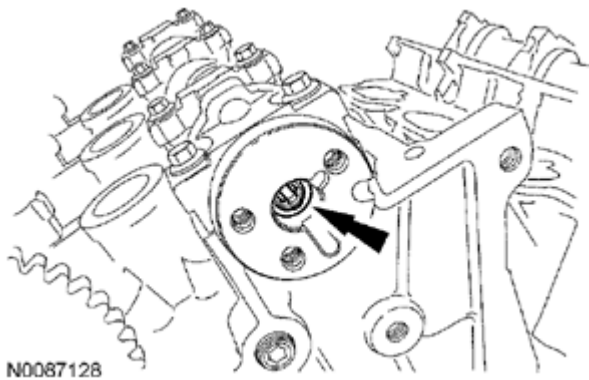


Fig. 100: Locating VCT System Oil Filter Screen
Courtesy of FORD MOTOR CO.

Installation

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

1. Install the new VCT system oil filter in the camshaft.
2. Install the camshaft phaser and sprocket. For additional information, refer to **CAMSHAFT PHASER AND SPROCKET** in this service information.

CAMSHAFTS - LH

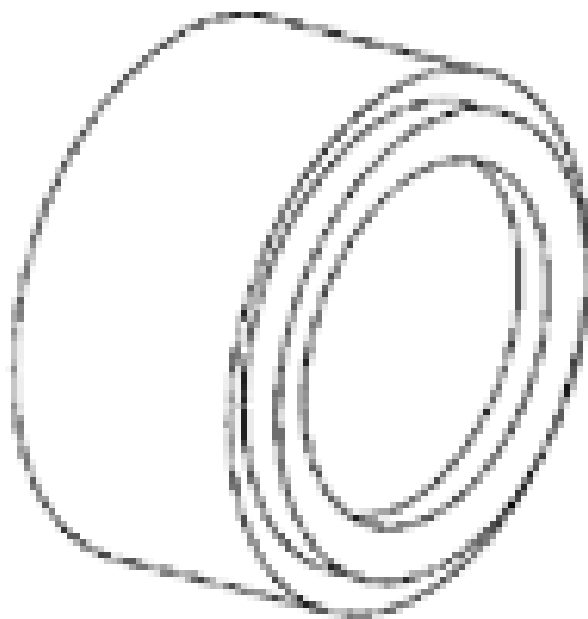
Special Tools

SPECIAL TOOL(S)

Installer, Camshaft Oil Seal

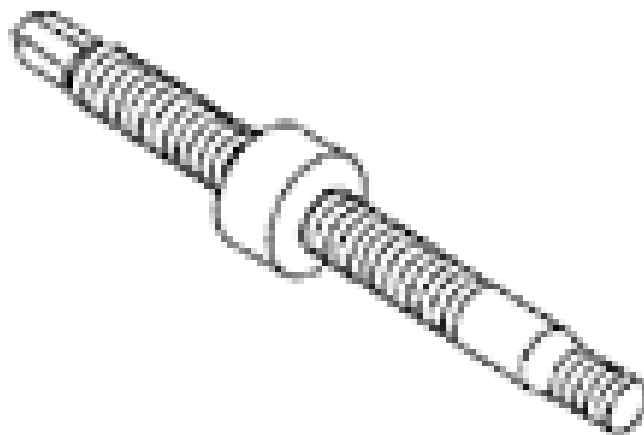
2011 Mercury Milan

2011 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan



ST1970-A

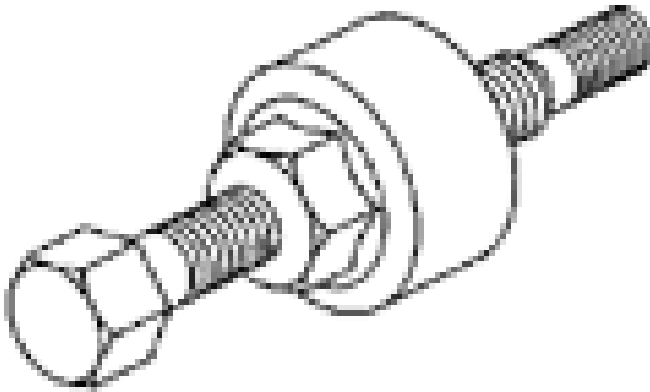
303-464 (T94P-6256-BH)



ST3042-A

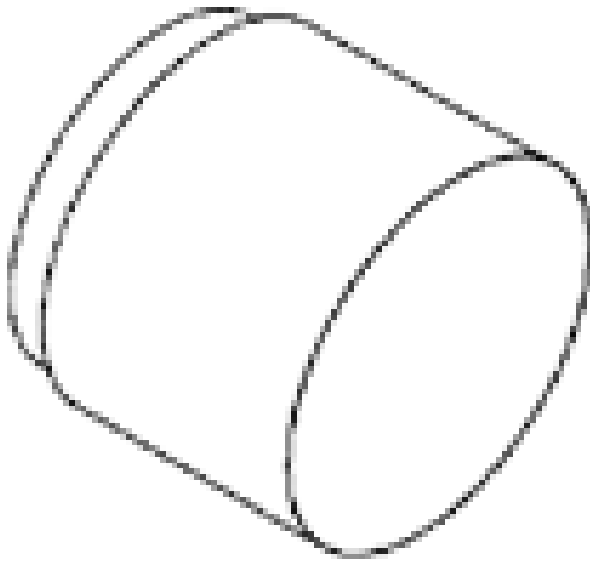
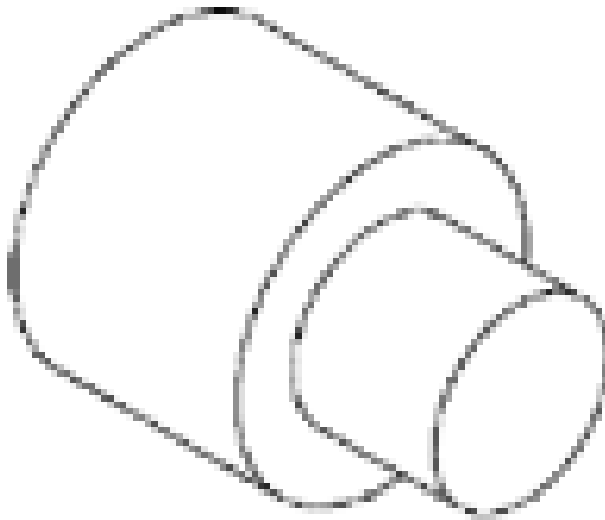
Installer, Camshaft Pulley
303-458 (T94P-6312-AH3), part of 303-S455

Installer, Power Steering Pump Pulley
211-185 (T91P-3A733-A)

**ST1586-A****ST3044-A**

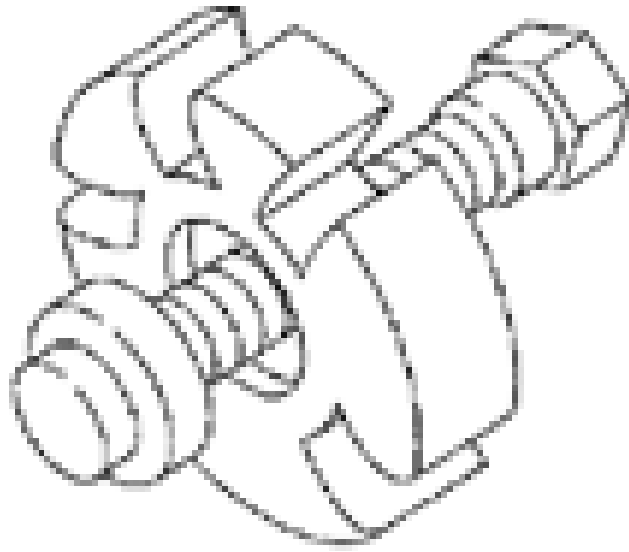
Plate, Water Pump Pulley
303-456 (T94P-6312-AH1), part of 303-S455

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

**ST2060-A****ST3045-A**

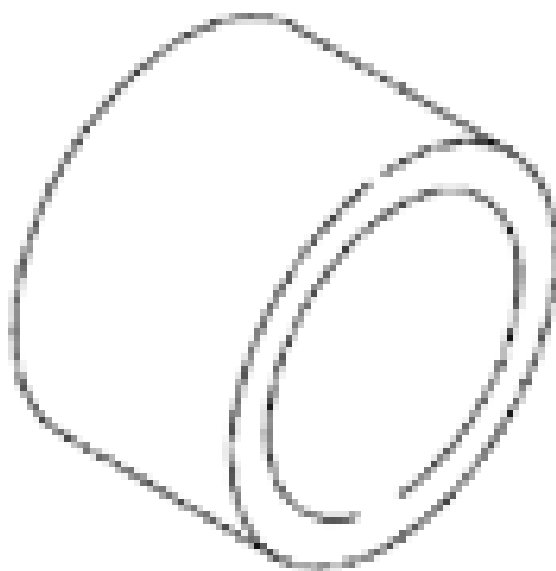
Protector, Water Pump Shaft
303-457 (T94P-6312-AH2), part of 303-S455

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

**ST1286-A****ST1385-A**

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

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



ST3043-A

Material Specifications**MATERIAL SPECIFICATIONS TABLE**

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada) XO-5W20-QSP (US); CXO-5W20-LSP12 (Canada)	WSS-M2C945-A

Removal

1. Remove the coolant pump belt. For additional information, refer to **ACCESSORY DRIVE - 3.0L (4V) -- FUSION & MILAN** article.

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

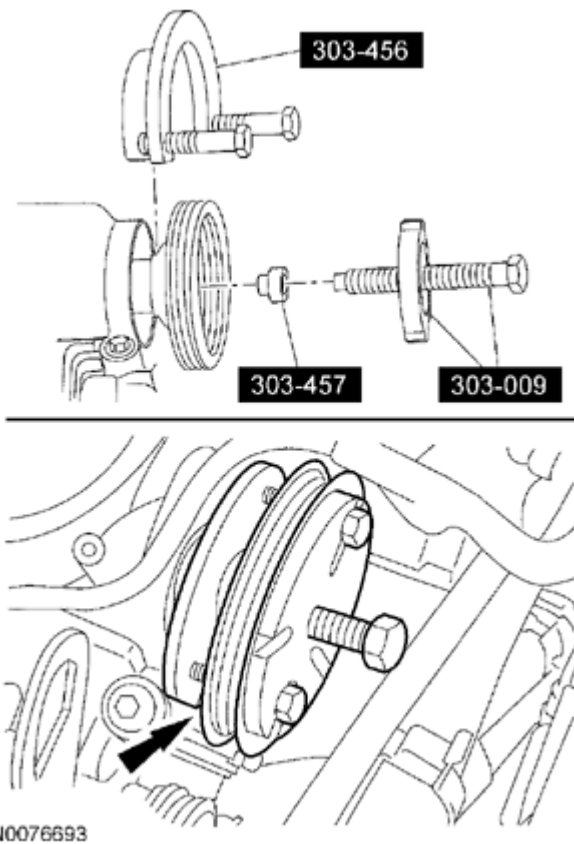


Fig. 101: Removing Coolant Pump Pulley Using Special Tools
Courtesy of FORD MOTOR CO.

2. Using the Water Pump Pulley Plate, Water Pump Shaft Protector and the Crankshaft Vibration Damper Remover, remove the coolant pump pulley.
3. Remove the LH camshaft phaser and socket. For additional information, refer to **CAMSHAFT PHASER AND SPROCKET** in this service information.

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

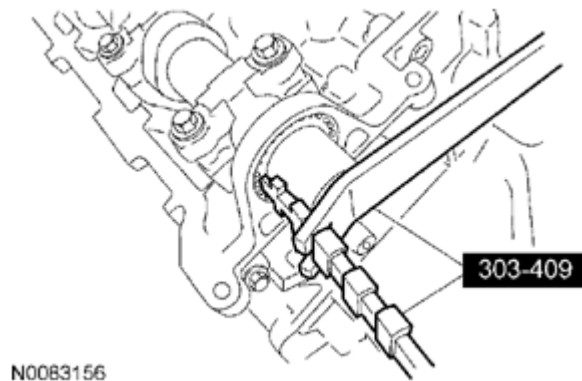


Fig. 102: Removing Camshaft Oil Seal Using Oil Seal Remover
Courtesy of FORD MOTOR CO.

4. Using the Oil Seal Remover, remove and discard the camshaft oil seal.
5. Remove the 2 bolts and the camshaft oil seal retainer.
 - Discard the press-in-place gasket.

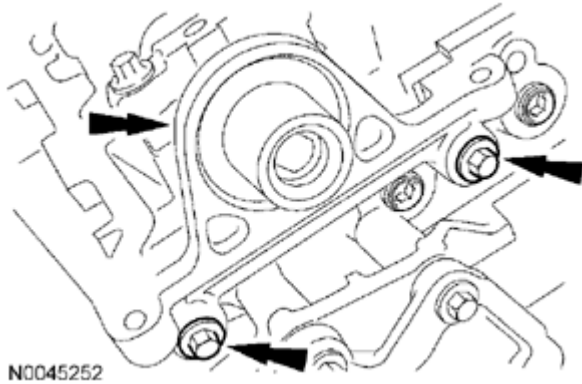
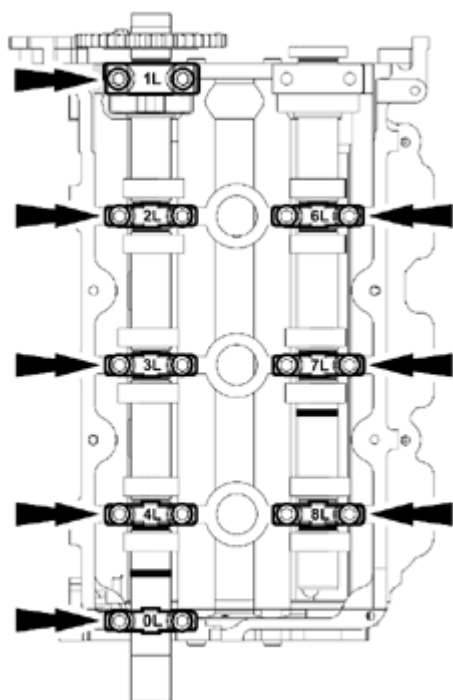


Fig. 103: Locating Bolts And Camshaft Oil Seal Retainer
Courtesy of FORD MOTOR CO.

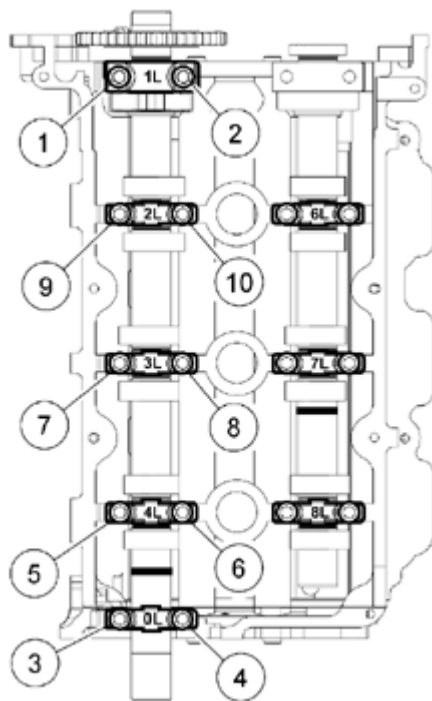
NOTE: Cylinder head camshaft bearing caps must be assembled in their original positions. Some engines have factory markings on the camshaft bearing caps (as shown in illustration). Engines that do not have the factory markings must be marked for correct position and orientation prior to removal. Failure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



N0121361

Fig. 104: Locating Camshaft Bearing Cap Position And Orientation Mark
Courtesy of FORD MOTOR CO.

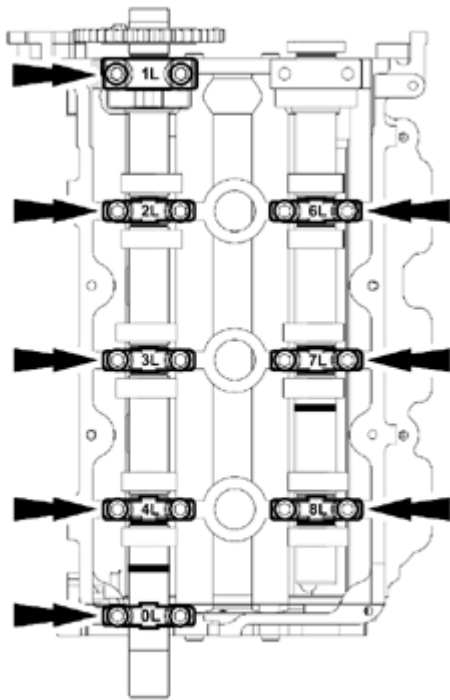
6. If necessary, mark the camshaft bearing cap position and orientation as shown in the illustration.
7. Loosen the bolts evenly in the sequence shown in the illustration.



N0121362

Fig. 105: Identifying Camshaft Bearing Cap Bolts Loosening Sequence
 Courtesy of FORD MOTOR CO.

- NOTE:** After loosening the camshaft bearing cap bolts, remove the camshaft bearing thrust cap (1L) first, or damage to the thrust cap may occur.
- NOTE:** Make sure the camshaft bearing caps are marked as instructed in the previous step.



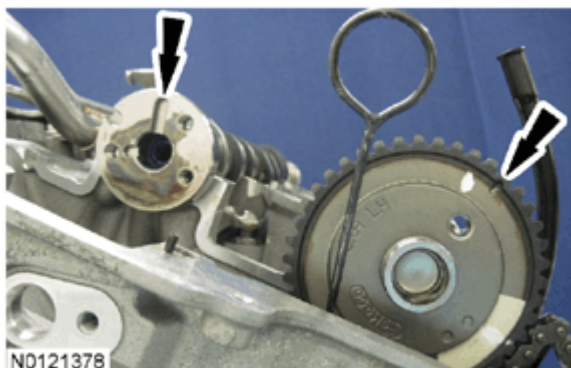
N0121361

Fig. 106: Locating Camshaft Bearing Cap Position And Orientation Mark
Courtesy of FORD MOTOR CO.

8. Remove the camshaft cap bolts.
 1. Remove the camshaft bearing thrust cap (1L).
 2. Remove the remaining camshaft bearing caps.
 3. Remove the camshafts from the cylinder head.

Installation

1. Lubricate the LH camshafts with clean engine oil and carefully position the camshafts onto the cylinder head.
 - Align the LH camshafts as shown in the illustration.



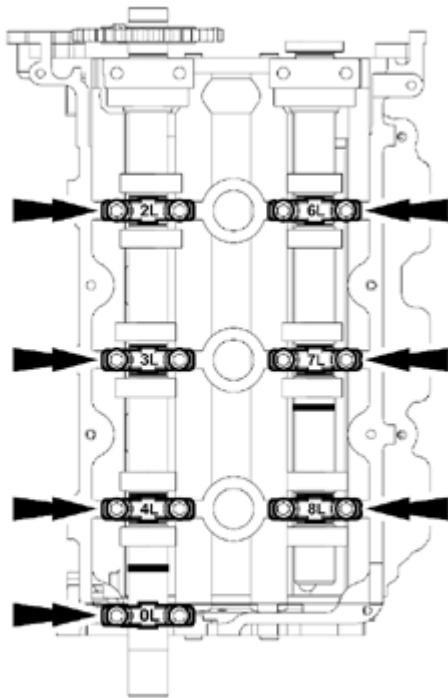
N0121378

Fig. 107: View Of Aligning LH Camshafts

Courtesy of FORD MOTOR CO.

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 cap until all of the camshaft bearing caps have been installed or damage to the thrust cap can occur.

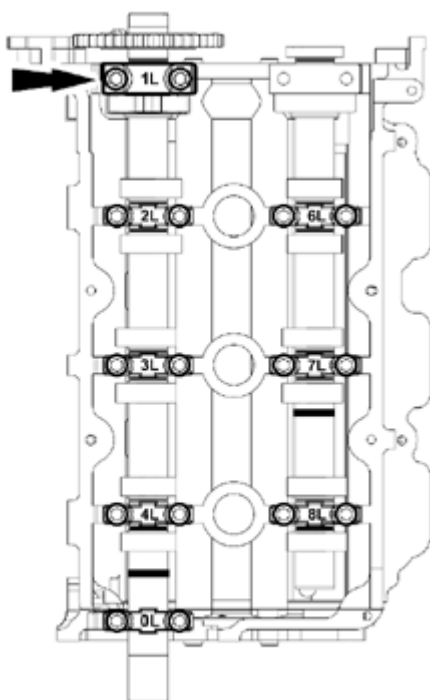


N0121363

Fig. 108: Locating LH Camshaft Bearing Caps And Bolts

Courtesy of FORD MOTOR CO.

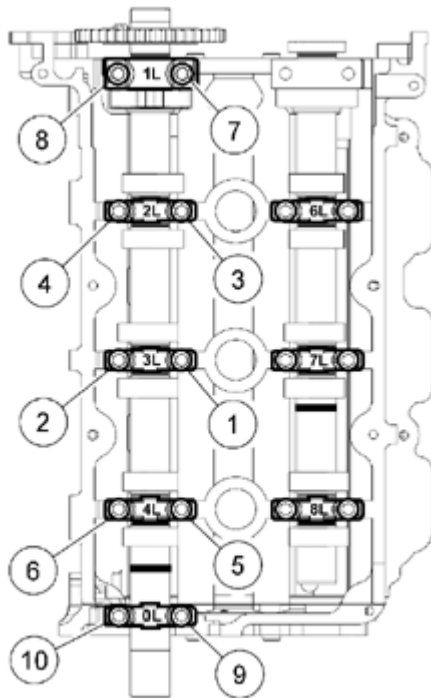
2. Lubricate the bearing surfaces of the LH camshaft bearing caps with clean engine oil and install the bearing caps.
 - Loosely install the bolts.
3. Lubricate the bearing surface of the LH exhaust camshaft bearing thrust cap with clean engine oil and install the bearing thrust cap.
 - Loosely install the bolts.



N0121364

Fig. 109: Locating LH Exhaust Camshaft Bearing Thrust Cap Bolt
Courtesy of FORD MOTOR CO.

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

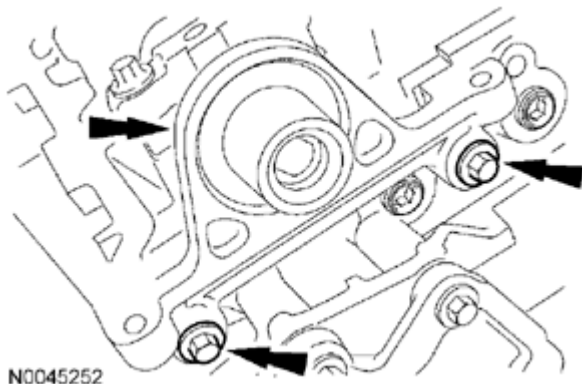


N0121365

Fig. 110: Identifying LH Exhaust Camshaft Bearing Cap Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

4. Tighten the LH exhaust camshaft bearing cap bolts in the sequence shown in the illustration 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: Clean the sealing surfaces with metal surface prep before installing a new press-in-place gasket.



N0045252

Fig. 111: Locating Bolts And Camshaft Oil Seal Retainer
Courtesy of FORD MOTOR CO.

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

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

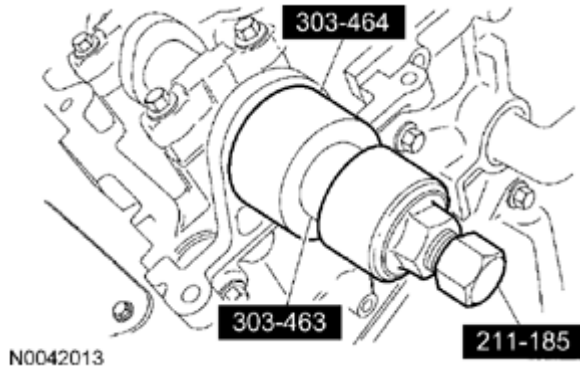


Fig. 112: Installing Camshaft Oil Seal Using Special Tools
Courtesy of FORD MOTOR CO.

6. Using the Camshaft Oil Seal Installer, Camshaft Oil Seal Protector and the Power Steering Pump Pulley Installer, install the camshaft oil seal.
7. Install the LH camshaft phaser and socket. For additional information, refer to **CAMSHAFT PHASER AND SPROCKET** in this service information.

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

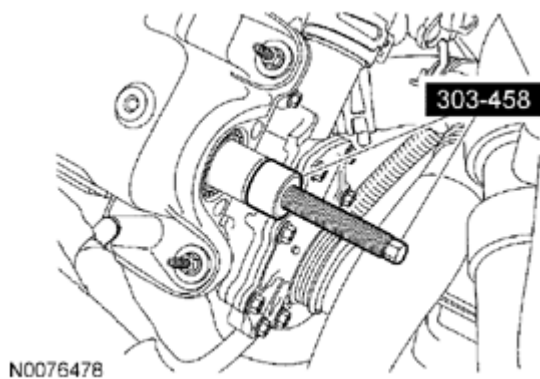


Fig. 113: Installing Camshaft Pulley Installer In Camshaft
Courtesy of FORD MOTOR CO.

8. Install the Camshaft Pulley Installer in the camshaft as shown in the illustration.
 - 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 in the illustration, 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).

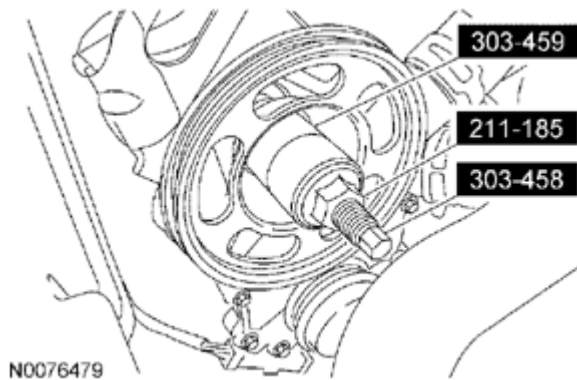


Fig. 114: Installing Special Tools Flush With End Of Camshaft
Courtesy of FORD MOTOR CO.

9. 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 in the illustration.
 - 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.
10. Install the coolant pump belt. For additional information, refer to **ACCESSORY DRIVE - 3.0L (4V) -- FUSION & MILAN** article.

CAMSHAFTS - RH

Material Specifications

MATERIAL SPECIFICATIONS TABLE

Item	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada) XO-5W20-QSP (US); CXO-5W20-LSP12 (Canada)	WSS-M2C945-A

Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** article.
2. Remove the RH camshaft phaser and socket. For additional information, refer to **CAMSHAFT PHASER**

AND SPROCKET in this service information.

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 in illustration). 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.

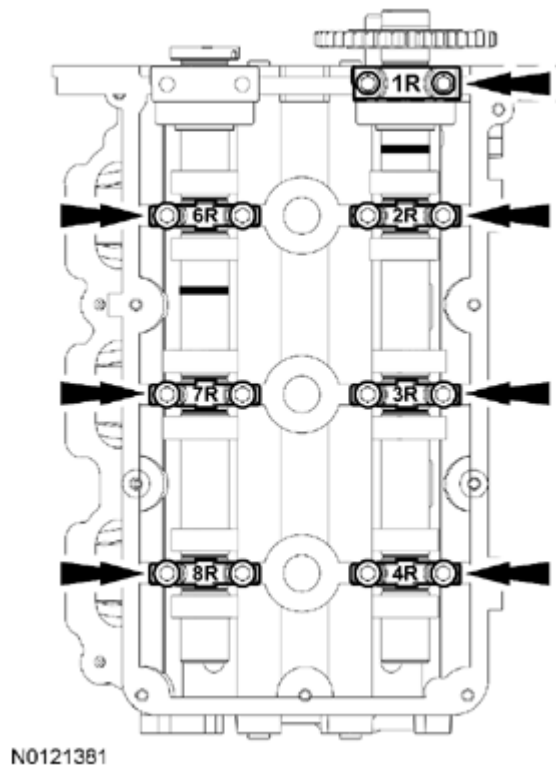


Fig. 115: Locating Camshaft Bearing Cap Position And Orientation Marks
Courtesy of FORD MOTOR CO.

3. If necessary, mark the camshaft bearing cap position and orientation as shown in the illustration.
4. Loosen the bolts evenly in the sequence shown in the illustration.

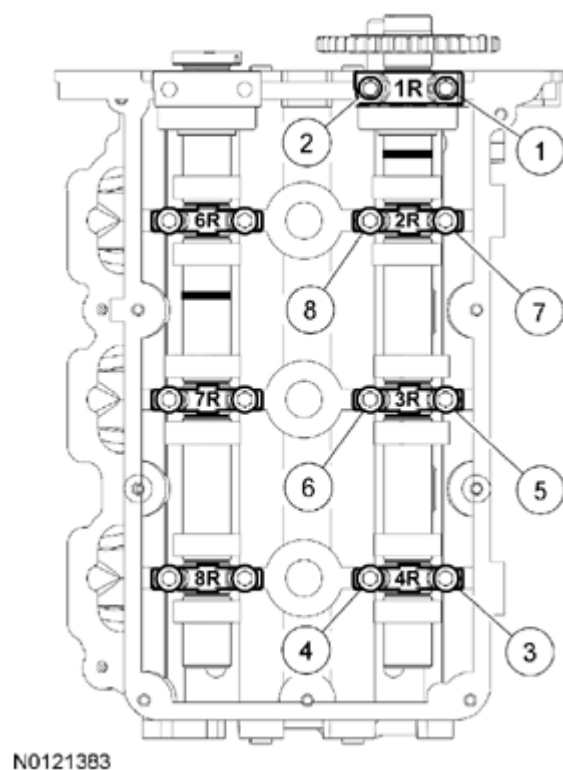


Fig. 116: Identifying Camshaft Bearing Cap Bolts Loosening Sequence
Courtesy of FORD MOTOR CO.

- NOTE:** After loosening the camshaft bearing cap bolts, remove the camshaft bearing thrust cap (1R) first, or damage to the thrust cap may occur.
- NOTE:** Make sure the camshaft bearing caps are marked as instructed in the previous step.

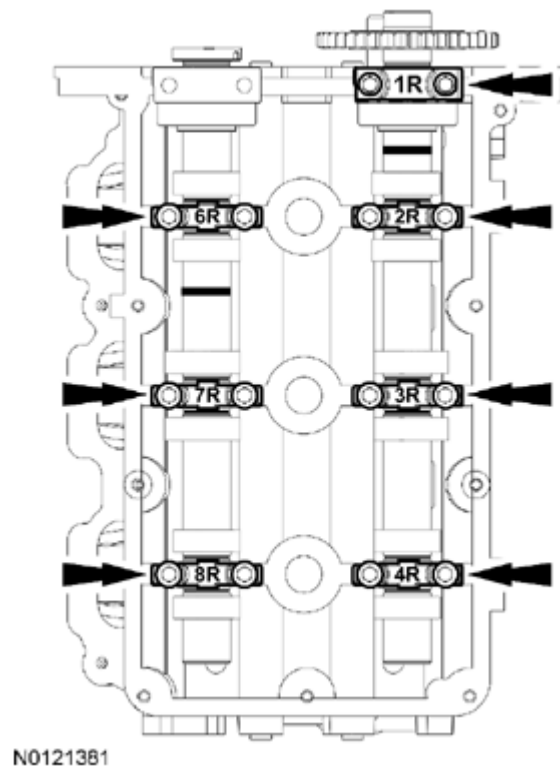


Fig. 117: Locating Camshaft Bearing Cap Position And Orientation Marks
 Courtesy of FORD MOTOR CO.

5. Remove the camshaft cap bolts.
 1. Remove the camshaft bearing thrust cap (1R).
 2. Remove the remaining camshaft bearing caps.
 3. Remove the camshafts from the cylinder head.

Installation

1. Lubricate the RH camshafts with clean engine oil and carefully position the camshafts onto the cylinder head.
 - Align the RH camshafts as shown in the illustration.

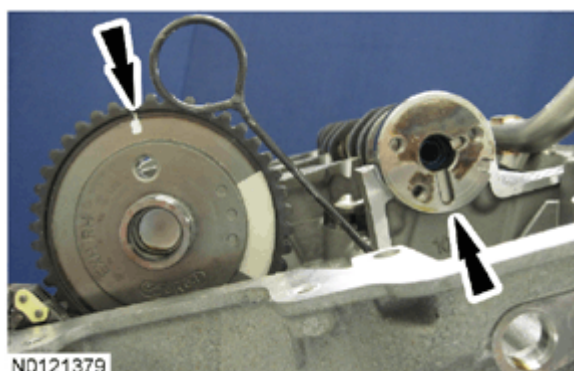


Fig. 118: Aligning RH Camshafts
Courtesy of FORD MOTOR CO.

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 cap until all of the camshaft bearing caps have been installed or damage to the thrust cap can occur.

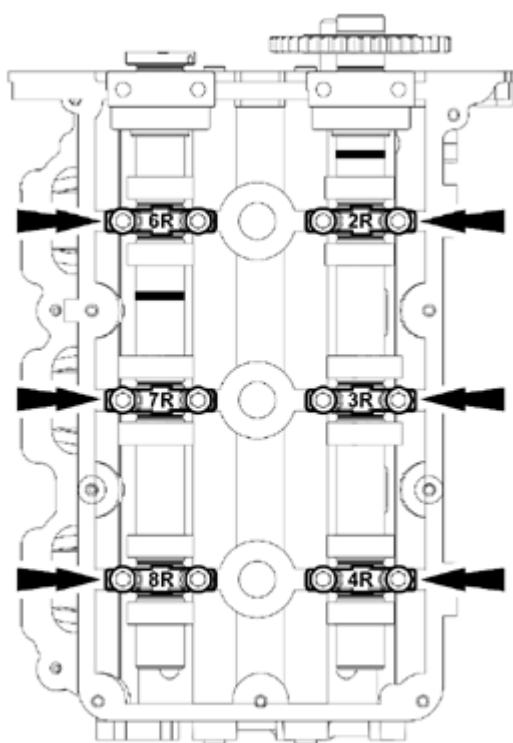
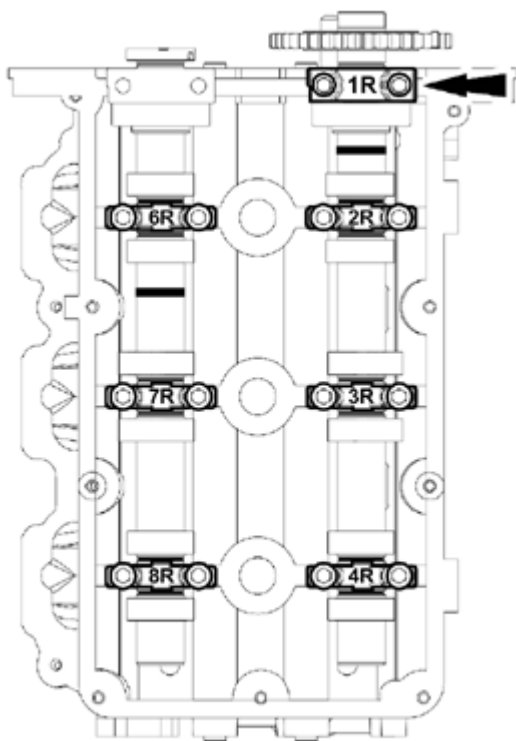


Fig. 119: Locating RH Camshaft Bearing Caps
Courtesy of FORD MOTOR CO.

2. Lubricate the bearing surfaces of the RH camshaft bearing caps with clean engine oil and install the bearing caps.
 - Loosely install the bolts.
3. Lubricate the bearing surface of the RH exhaust camshaft bearing thrust cap with clean engine oil and install the bearing thrust cap.
 - Loosely install the bolts.



N0121382

Fig. 120: Locating RH Exhaust Camshaft Bearing Thrust Cap
Courtesy of FORD MOTOR CO.

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

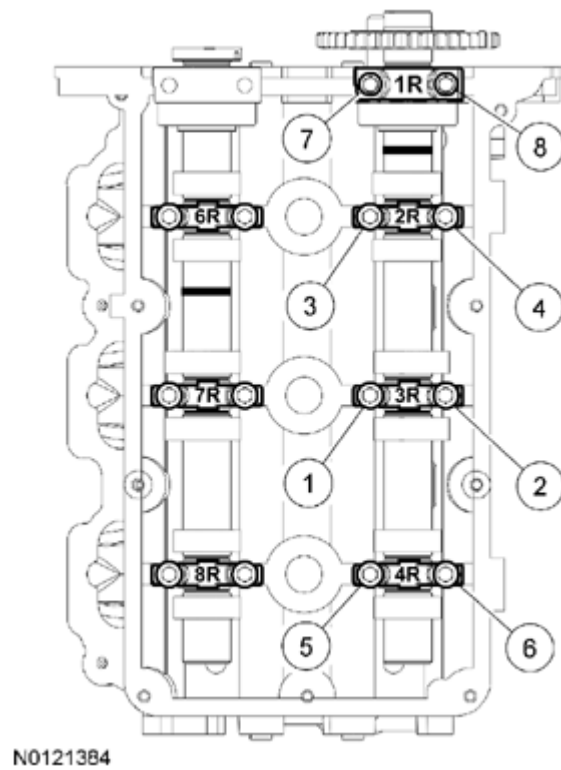


Fig. 121: Identifying RH Camshaft Bearing Cap Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

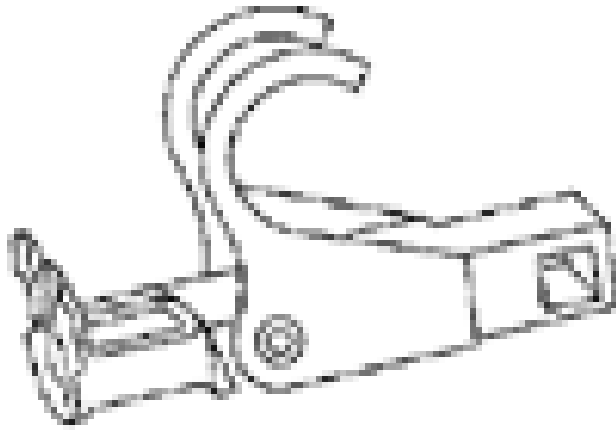
4. Tighten the RH camshaft bearing cap bolts in the sequence shown in the illustration in 2 stages.
 - Stage 1: Tighten to 10 Nm (89 lb-in).
 - Stage 2: Individually loosen and then tighten each camshaft bearing cap to 10 Nm (89 lb-in).
5. Install the RH camshaft phaser and socket. For additional information, refer to **CAMSHAFT PHASER AND SPROCKET** in this service information.

CAMSHAFT ROLLER FOLLOWER

Special Tools

SPECIAL TOOL(S)

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

**ST1975-A****Material Specifications****MATERIAL SPECIFICATIONS TABLE**

Item	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada) XO-5W20-QSP (US); CXO-5W20-LSP12 (Canada)	WSS-M2C945-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** article.
2. Remove the LH and RH valve covers. For additional information, refer to **VALVE COVER - LH** and **VALVE COVER - RH** in this service information.

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

3. Remove the 6 spark plugs.
 - To install, tighten to 15 Nm (133 lb-in).

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

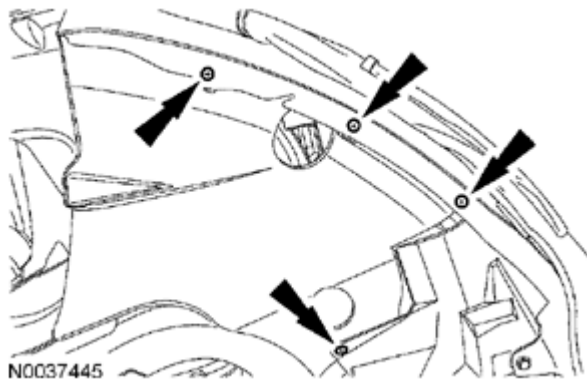


Fig. 122: Locating RH Fender Splash Shield Screws
Courtesy of FORD MOTOR CO.

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

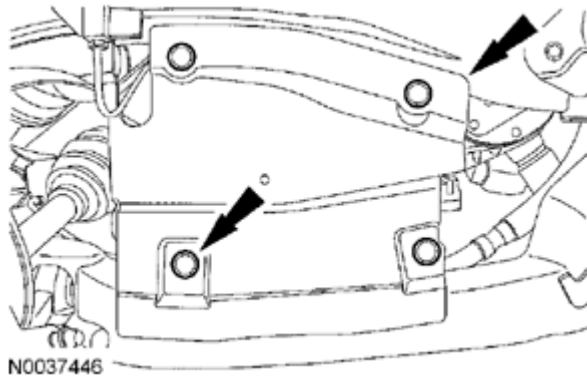


Fig. 123: Locating Pin-Type Retainers And RH Splash Shield
Courtesy of FORD MOTOR CO.

6. Rotate the crankshaft until the camshaft lobe is pointing directly away from the roller follower.

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



Fig. 124: Removing Roller Followers Using Valve Spring Compressor
Courtesy of FORD MOTOR CO.

7. Using the Valve Spring Compressor, remove the roller followers.

NOTE: Lubricate the roller followers with clean engine oil.

8. To install, reverse the removal procedure.

HYDRAULIC LASH ADJUSTER

Material Specifications

MATERIAL SPECIFICATIONS TABLE

Item	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada) XO-5W20-QSP (US); CXO-5W20-LSP12 (Canada)	WSS-M2C945-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 CAMSHAFT ROLLER FOLLOWER in this service information.

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

2. Remove the hydraulic lash adjusters.

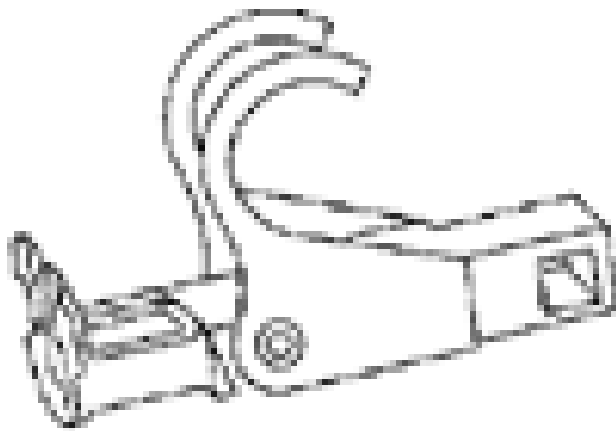
NOTE: Inspect the hydraulic lash adjusters for scoring marks and uneven wear in the bore. Install new lash adjusters if necessary.

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

VALVE SPRING, RETAINER, AND SEAL

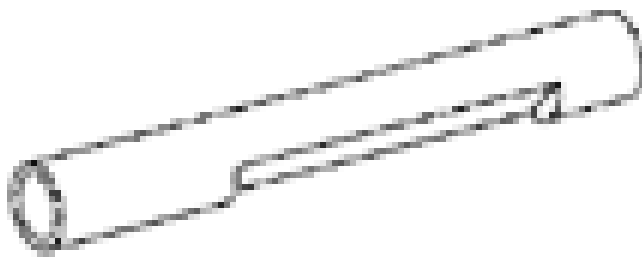
Special Tools

SPECIAL TOOL(S)



ST1975-A

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



ST1977-A

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

Material Specifications

MATERIAL SPECIFICATIONS TABLE

Item	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada) XO-5W20-QSP (US); CXO-5W20-LSP12 (Canada)	WSS-M2C945-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 CAMSHAFT ROLLER FOLLOWER in this service information.

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 CYLINDER HEAD - RH or CYLINDER HEAD - LH in this service information.

2. Pressurize the cylinder using compressed air.
3. Using the Valve Spring Compressor, remove the key, retainer and the valve spring.

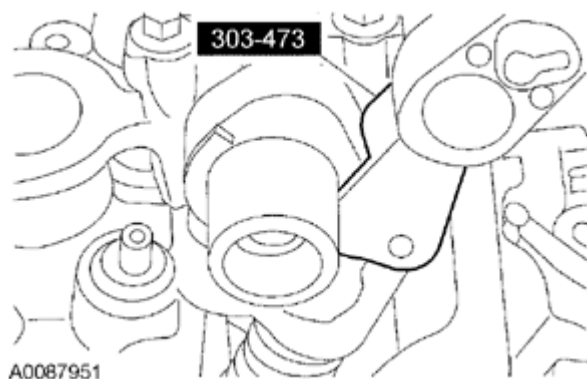


Fig. 125: Remove/Install Key, Retainer And Valve Spring Using Valve Spring Compressor
Courtesy of FORD MOTOR CO.

NOTE: Camshaft removed for clarity.

4. Remove and discard the valve seal.

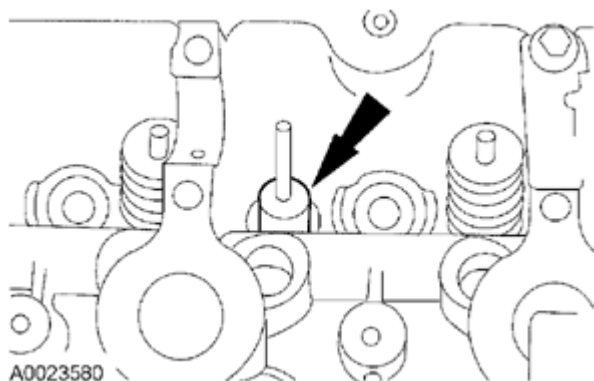


Fig. 126: Locating Valve Seal
Courtesy of FORD MOTOR CO.

Installation

NOTE: Lubricate the valve guide with clean engine oil.

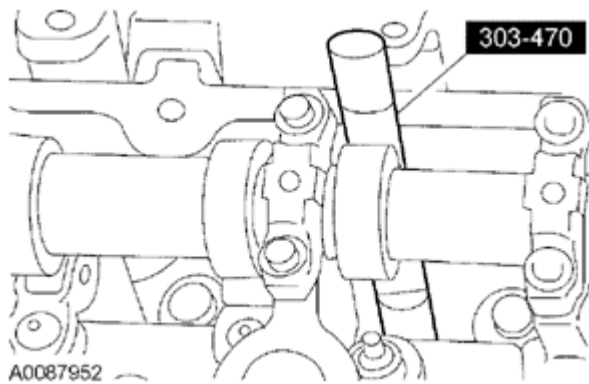


Fig. 127: Installing Valve Seal Using Valve Stem Oil Seal Installer
Courtesy of FORD MOTOR CO.

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

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

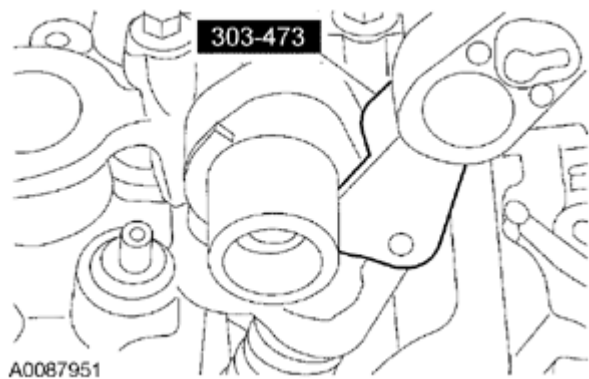


Fig. 128: Remove/Install Key, Retainer And Valve Spring Using Valve Spring Compressor
Courtesy of FORD MOTOR CO.

2. Using the Valve Spring Compressor, install the valve spring, retainer and key.
3. Install the camshaft roller followers. For additional information, refer to **CAMSHAFT ROLLER FOLLOWER** in this service information.

CYLINDER HEAD - RH

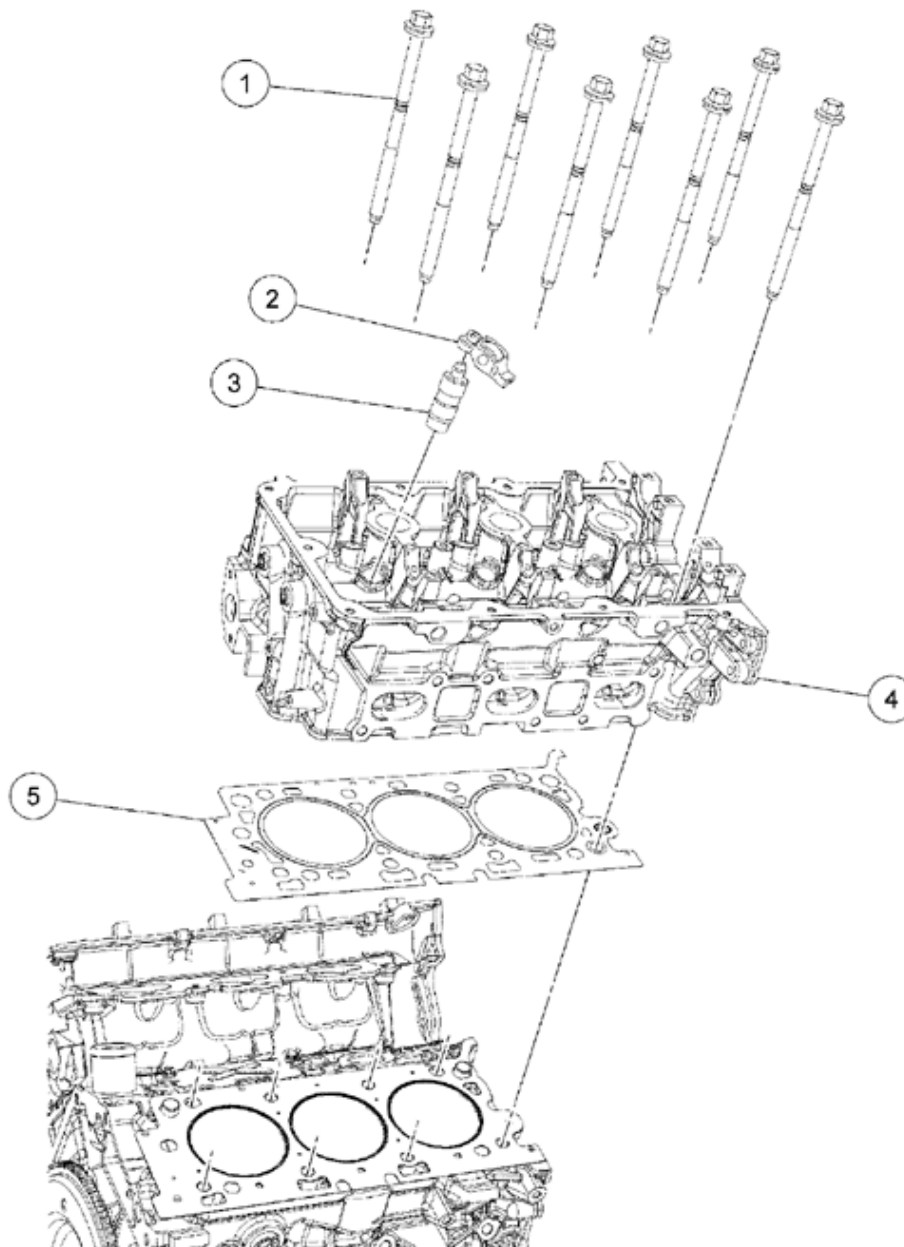
Material Specifications

MATERIAL SPECIFICATIONS TABLE

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

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

WSS-M2C945-A



N0087417

Fig. 129: Identifying RH Cylinder Head Components
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

Item	Part Number	Description
1	6065	Cylinder head bolt (8 required)

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2011 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan

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 **LOWER INTAKE MANIFOLD** in this service information.
3. Remove the RH exhaust manifold. For additional information, refer to **EXHAUST MANIFOLD - RH** in this service information.
4. Remove the coolant pump housing. For additional information, refer to **ENGINE COOLING SYSTEM (EXCEPT HYBRID)** article.
5. Remove the timing drive components. For additional information, refer to **TIMING DRIVE COMPONENTS** in this service information.

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

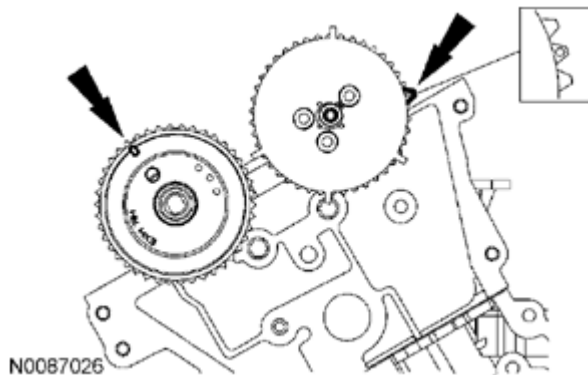


Fig. 130: Identifying RH Camshafts Are In Neutral Position
Courtesy of FORD MOTOR CO.

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

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.

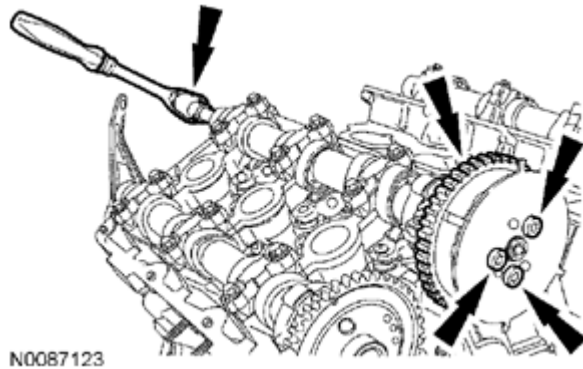
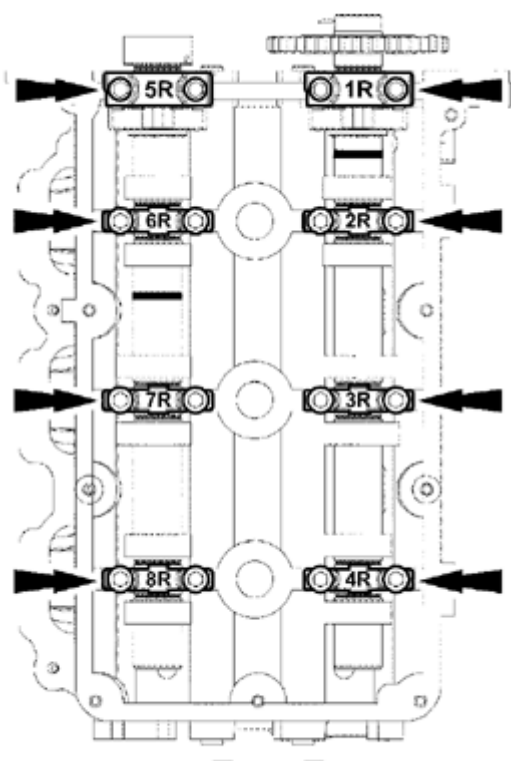


Fig. 131: Remove/Install RH Camshaft Phaser, Sprocket And Bolts
Courtesy of FORD MOTOR CO.

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

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 in illustration). 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.



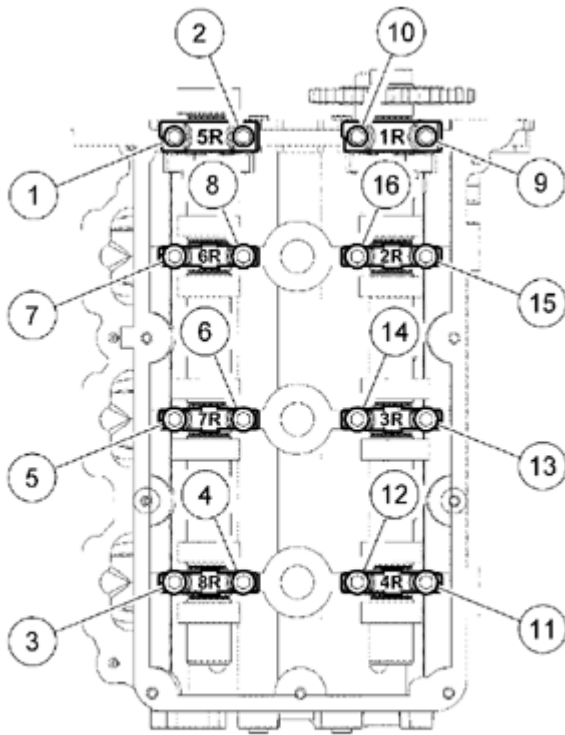
N0071867

Fig. 132: Locating Camshaft Bearing Cap Position And Orientation Mark
Courtesy of FORD MOTOR CO.

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

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. 133: Identifying Camshaft Bearing Caps Loosening Sequence
Courtesy of FORD MOTOR CO.

9. Loosen the bolts evenly in the sequence shown in the illustration.
 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: The camshaft roller followers must be installed in their original positions. If not reassembled in their original positions, severe engine damage may occur.

10. Remove the camshaft roller followers.

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

11. Remove the hydraulic lash adjusters.

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

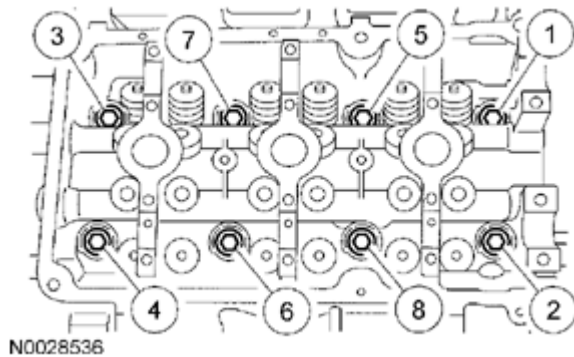


Fig. 134: Identifying Cylinder Head Bolts Removing Sequence
Courtesy of FORD MOTOR CO.

12. Remove the bolts in the sequence shown in the illustration.
 - Remove the cylinder head.
 - Discard the bolts and gasket.
13. 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** article.

Installation

NOTE: Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges which make leak paths.

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

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

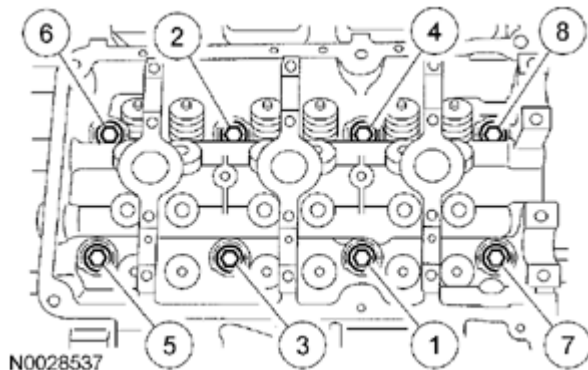


Fig. 135: Identifying Tightening Sequence Of Cylinder Head Bolts
Courtesy of FORD MOTOR CO.

3. Install the bolts and tighten in 6 stages in the sequence shown in the illustration.

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

4. Install the hydraulic lash adjusters.

- Lubricate the hydraulic lash adjusters 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.

5. Install the camshaft roller followers.

- Lubricate the camshaft roller followers with clean engine oil.

6. Position the RH camshaft phaser and sprocket onto the intake camshaft.

- Install the 3 bolts finger-tight.

7. Lubricate the RH camshafts with clean engine oil and carefully position the camshafts onto the cylinder head.

- Align the RH camshafts as shown in the illustration.

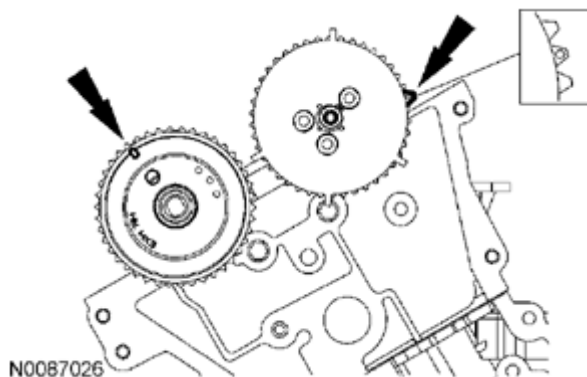
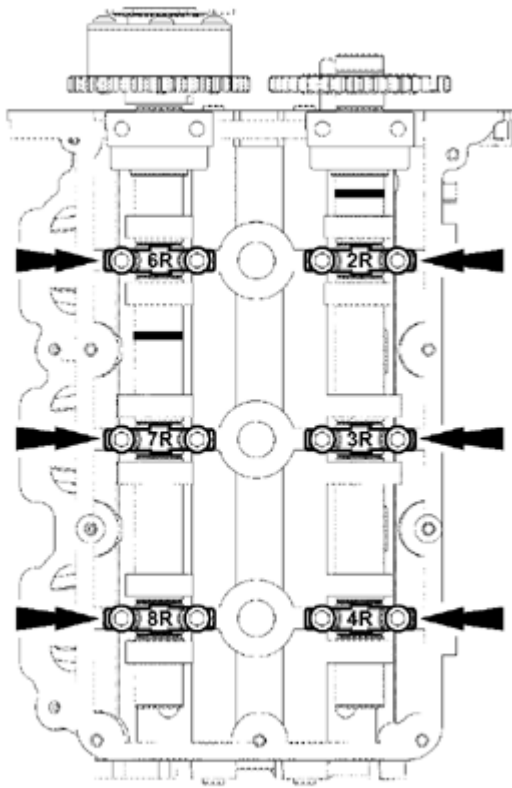


Fig. 136: Identifying RH Camshafts Are In Neutral Position
Courtesy of FORD MOTOR CO.

- 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.

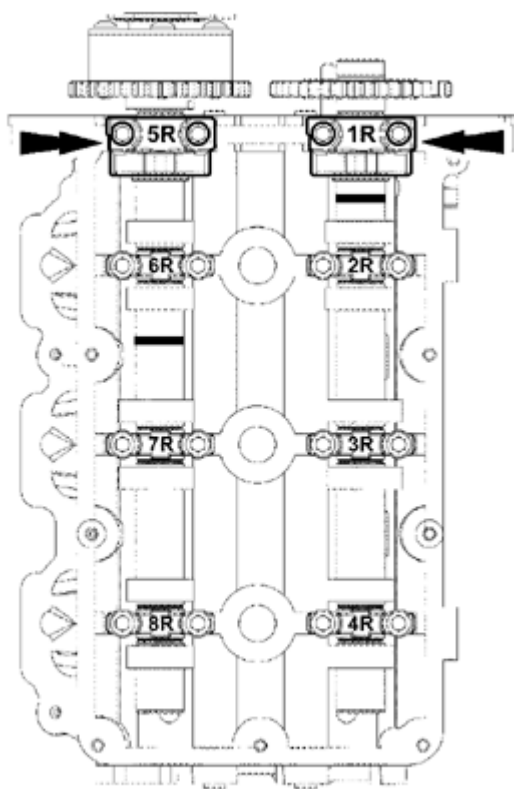


N0042369

Fig. 137: Locating Camshaft Bearing Caps
Courtesy of FORD MOTOR CO.

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

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

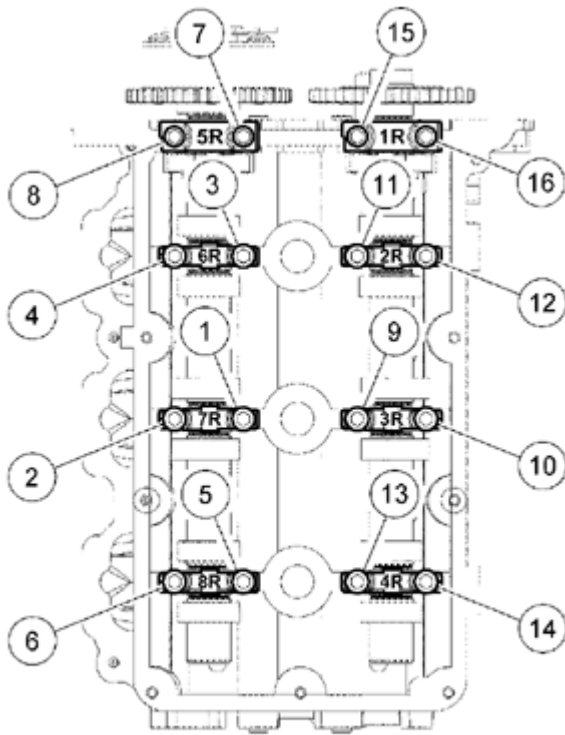


N0042453

Fig. 138: Locating Camshaft Bearing Thrust Caps
Courtesy of FORD MOTOR CO.

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

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



N0081822

Fig. 139: Identifying Camshaft Bearing Cap Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

10. Tighten the RH camshaft bearing cap bolts in the sequence shown in the illustration 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: 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.

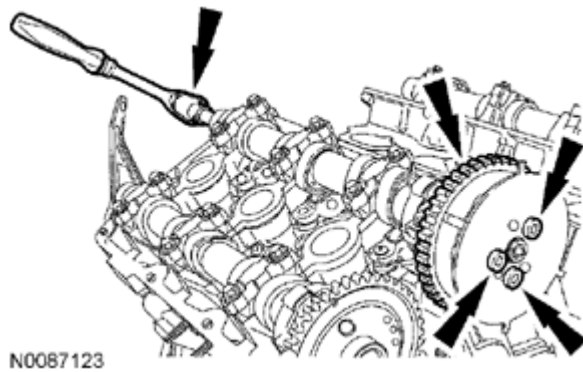


Fig. 140: Remove/Install RH Camshaft Phaser, Sprocket And Bolts
Courtesy of FORD MOTOR CO.

11. Tighten the 3 RH camshaft phaser and sprocket bolts to 18 Nm (159 lb-in).
12. Install the timing drive components. For additional information, refer to **TIMING DRIVE COMPONENTS** in this service information.
13. Install the coolant pump housing. For additional information, refer to **ENGINE COOLING SYSTEM (EXCEPT HYBRID)** article.
14. Install the RH exhaust manifold. For additional information, refer to **EXHAUST MANIFOLD - RH** in this service information.
15. Install the lower intake manifold. For additional information, refer to **LOWER INTAKE MANIFOLD** in this service information.

CYLINDER HEAD - LH

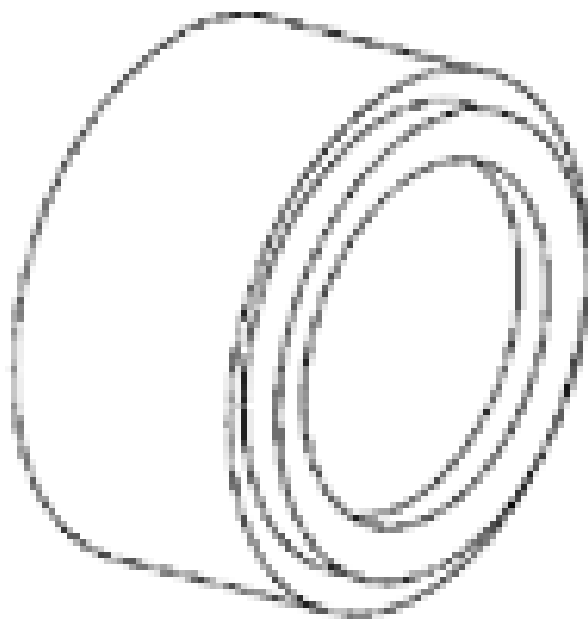
Special Tools

SPECIAL TOOL(S)

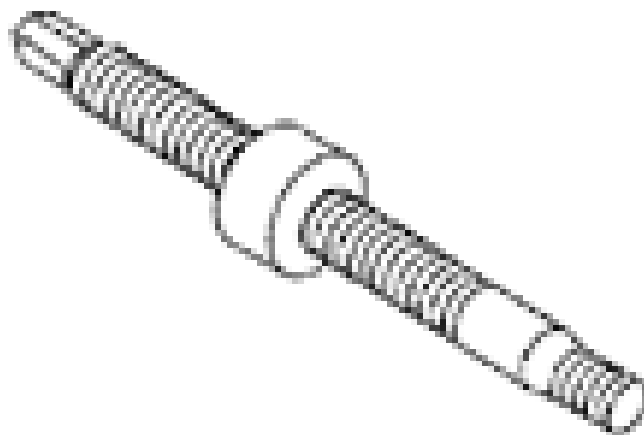
Installer, Camshaft Oil Seal
303-464 (T94P-6256-BH)

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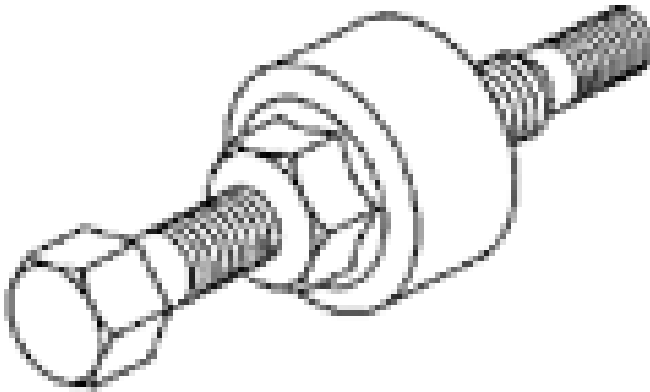
ST1970-A



ST3042-A

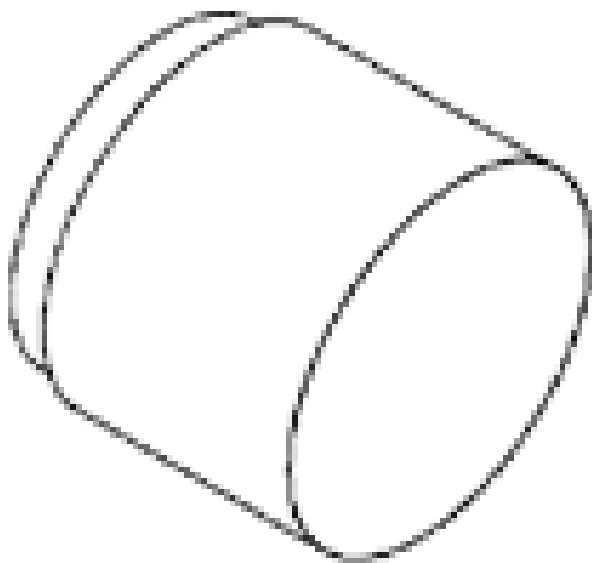
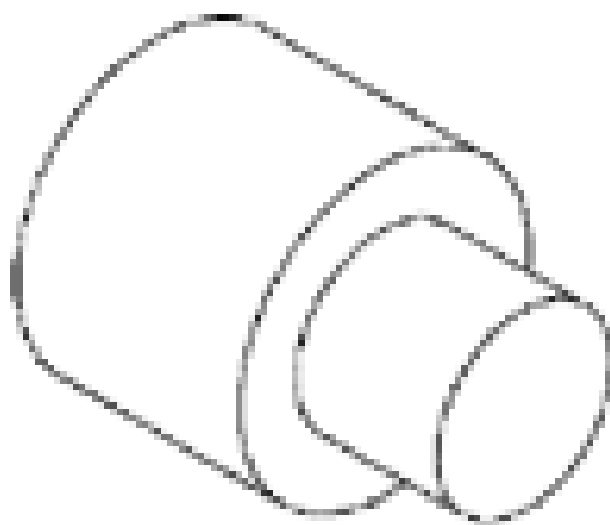
Installer, Camshaft Pulley
303-458 (T94P-6312-AH3), part of 303-S455

Installer, Power Steering Pump Pulley
211-185 (T91P-3A733-A)

**ST1586-A****ST3044-A**

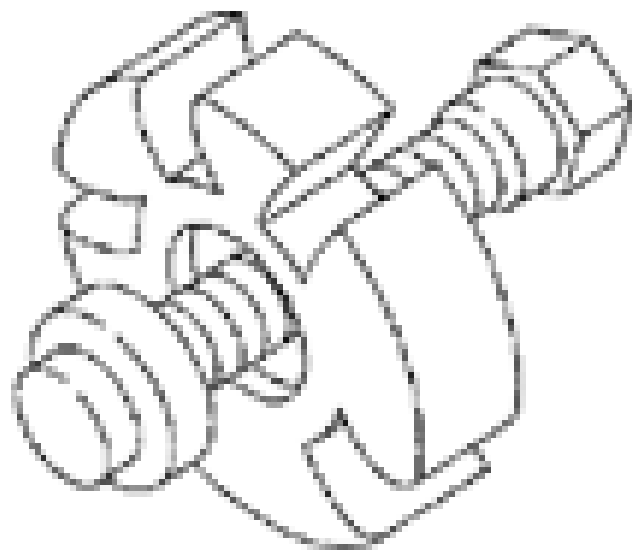
Plate, Water Pump Pulley
303-456 (T94P-6312-AH1), part of 303-S455

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

**ST2060-A****ST3045-A**

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

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

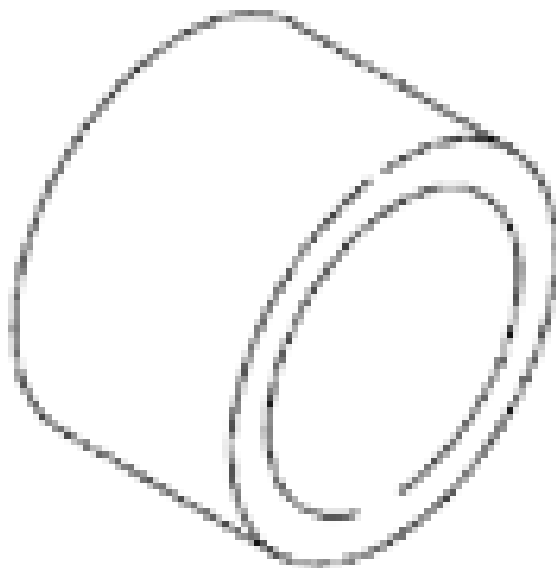
**ST1286-A****ST1385-A**

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

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

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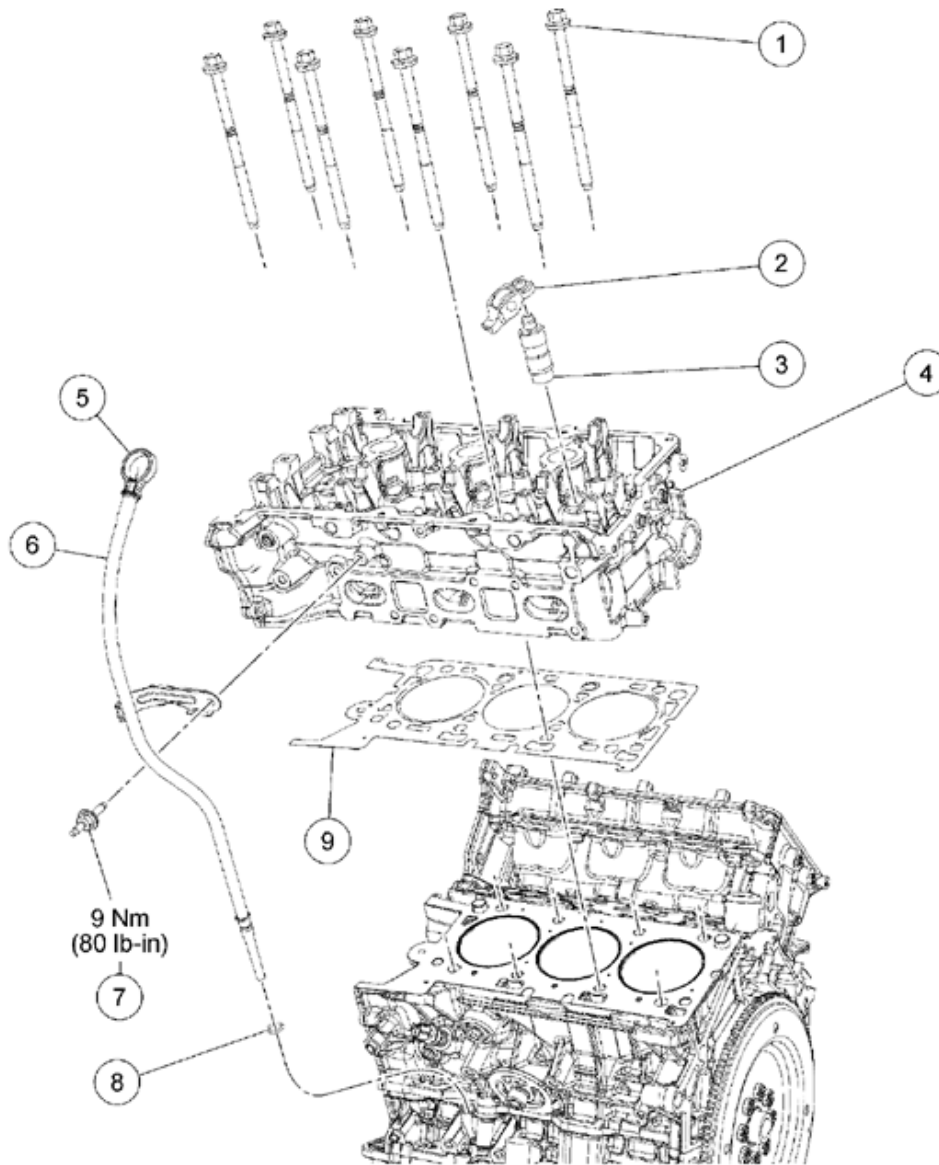
ST3043-A

Material Specifications

MATERIAL SPECIFICATIONS TABLE

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada) XO-5W20-QSP (US); CXO-5W20-LSP12 (Canada)	WSS-M2C945-A

LH Cylinder Head



N0098591

Fig. 141: Exploded View Of LH Cylinder Head Components 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

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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** article.
2. Remove the lower intake manifold. For additional information, refer to **LOWER INTAKE MANIFOLD** in this service information.
3. Remove the LH catalytic converter. For additional information, refer to **EXHAUST SYSTEM -- FUSION, MILAN & MKZ** article.
4. Remove the coolant pump housing. For additional information, refer to **ENGINE COOLING SYSTEM (EXCEPT HYBRID)** article.
5. Remove the timing drive components. For additional information, refer to **TIMING DRIVE COMPONENTS** in this service information.

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

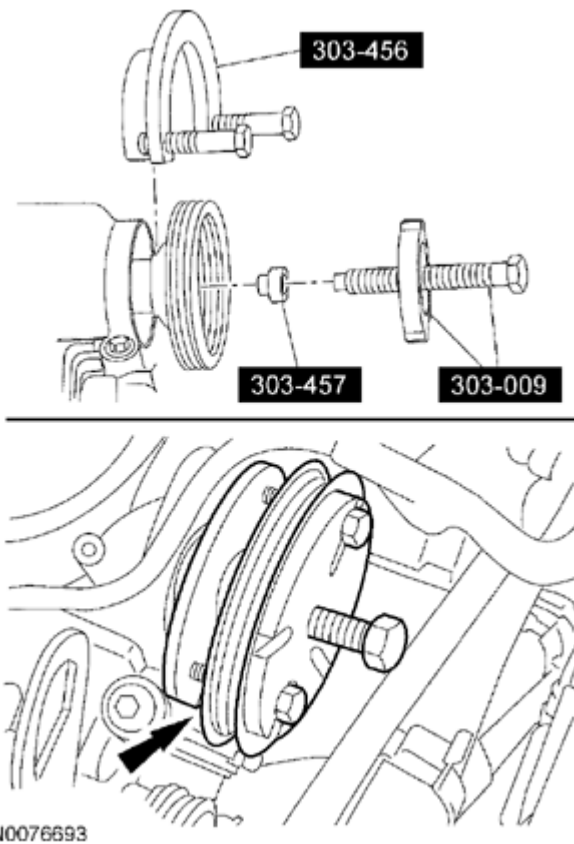


Fig. 142: Removing Coolant Pump Pulley Using Special Tools
Courtesy of FORD MOTOR CO.

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

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

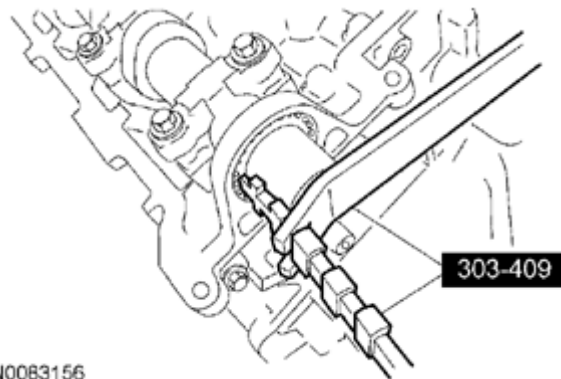


Fig. 143: Removing Camshaft Oil Seal Using Oil Seal Remover
Courtesy of FORD MOTOR CO.

7. Using the Oil Seal Remover, remove and discard the camshaft oil seal.
8. Remove the 2 bolts and the camshaft oil seal retainer.
 - Discard the press-in-place gasket.

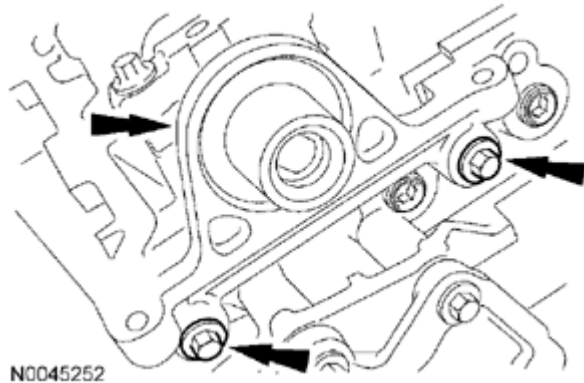


Fig. 144: Locating Bolts And Camshaft Oil Seal Retainer
Courtesy of FORD MOTOR CO.

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

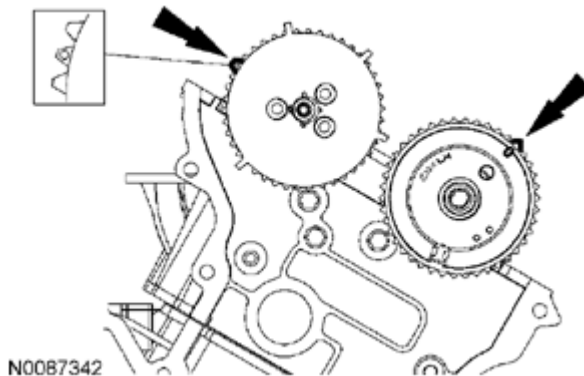


Fig. 145: Identifying LH Camshafts Are In Neutral Position
Courtesy of FORD MOTOR CO.

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

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.

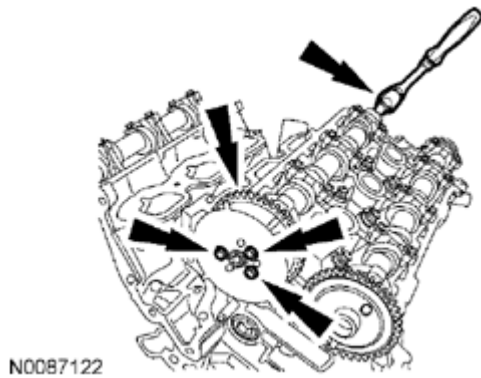


Fig. 146: Remove/Install LH Camshaft Phaser, Sprocket And Bolts
Courtesy of FORD MOTOR CO.

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

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 in illustration). 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.

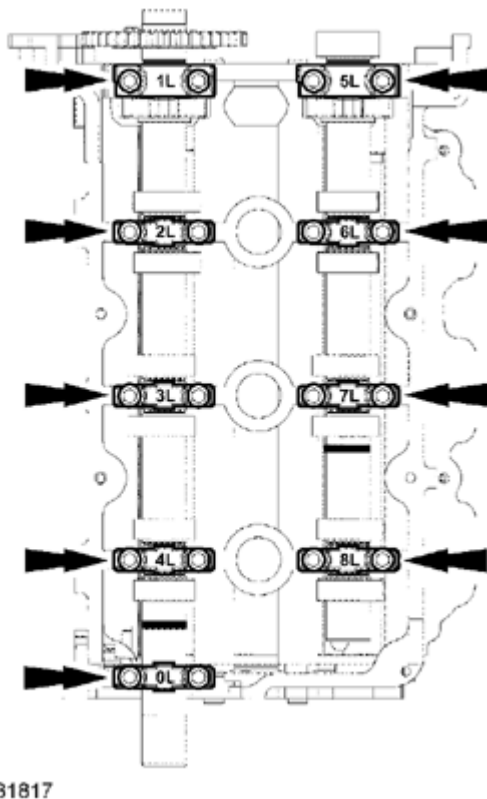


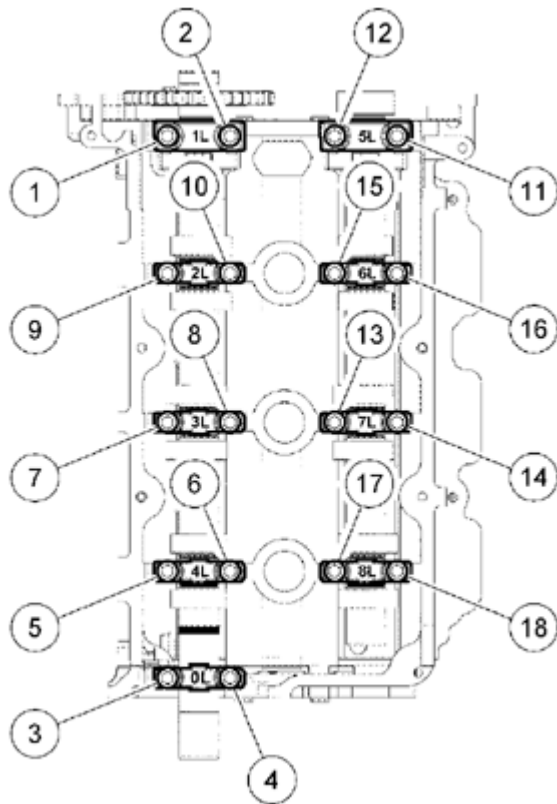
Fig. 147: Locating Cylinder Head Camshaft Bearing Caps

Courtesy of FORD MOTOR CO.

11. If necessary, mark the camshaft bearing cap position and orientation as shown in the illustration.

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. 148: Identifying Camshaft Bearing Cap Bolts Loosening Sequence
Courtesy of FORD MOTOR CO.

12. Loosen the bolts evenly in the sequence shown in the illustration.

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.

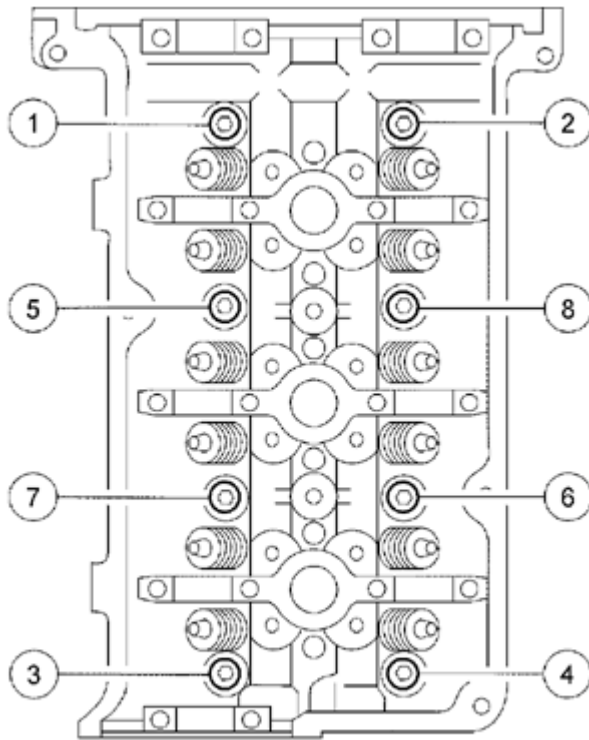
NOTE: The camshaft roller followers must be installed in their original positions. If not reassembled in their original positions, severe engine damage may occur.

13. Remove the camshaft roller followers.

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

14. Remove the hydraulic lash adjusters.
15. Remove the oil level indicator.
16. Remove the stud bolt and then remove the oil level indicator tube.
 - Remove and discard the O-ring seal.

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



N0001536

Fig. 149: Identifying Cylinder Head Bolts Removing Sequence
Courtesy of FORD MOTOR CO.

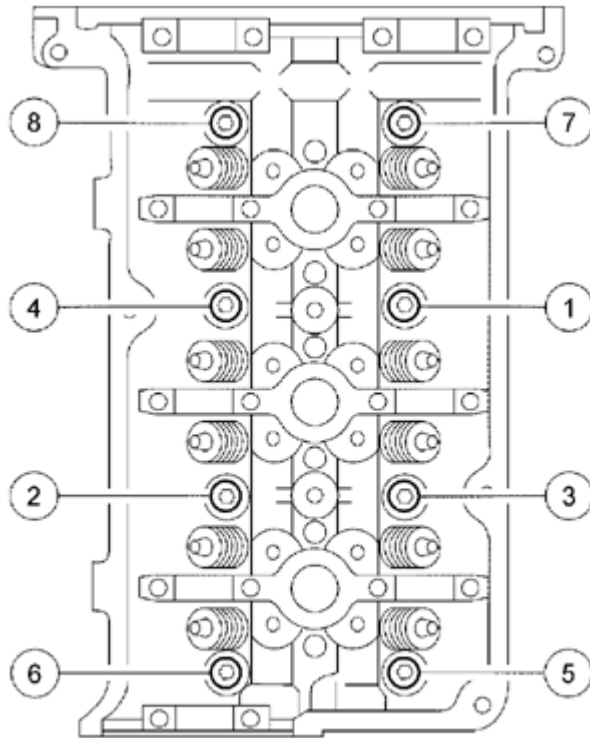
17. Remove the bolts in the sequence shown in the illustration.
18. Support the cylinder head on a bench with the head gasket side up. Check the cylinder head distortion and the cylinder block distortion. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

Installation

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.

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

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



N0001535

Fig. 150: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

3. Install the bolts and tighten in 6 stages in the sequence shown in the illustration.
 - 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: 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.

4. Install the oil level indicator tube and install the stud bolt.

- To install, tighten to 9 Nm (80 lb-in).

5. Install the oil level indicator.

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 hydraulic lash adjusters.

- Lubricate the hydraulic lash adjusters 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 camshaft roller followers.

- Lubricate the camshaft roller followers with clean engine oil.

8. Position the camshaft phaser and sprocket onto the intake camshaft.

- Install the 3 bolts finger-tight.

9. Lubricate the LH camshafts with clean engine oil and carefully position the camshafts onto the cylinder head.

- Align the LH camshafts as shown in the illustration.

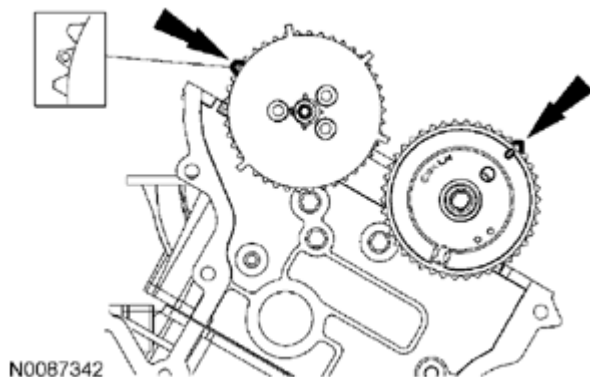
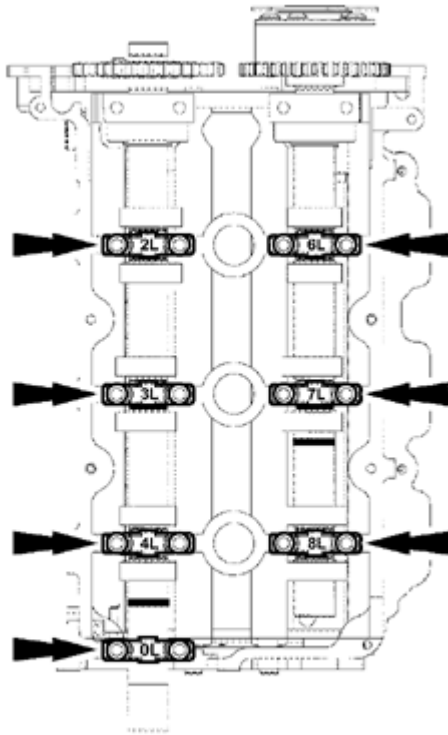


Fig. 151: Identifying LH Camshafts Are In Neutral Position
Courtesy of FORD MOTOR CO.

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.

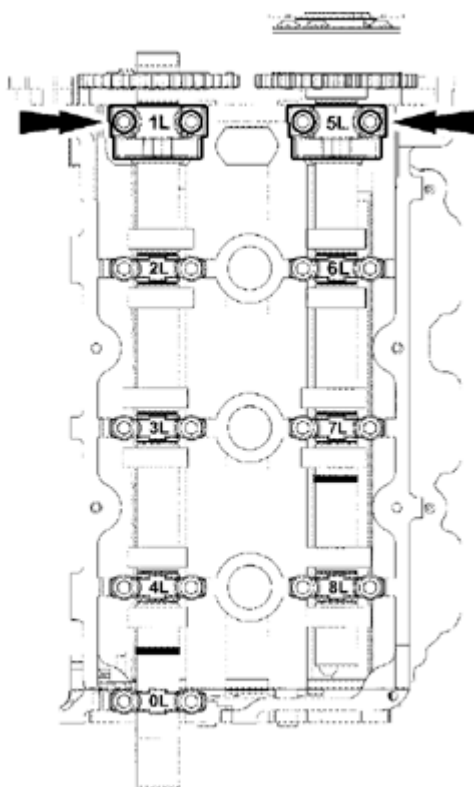
NOTE: Do not install the camshaft journal thrust caps until all of the camshaft bearing caps have been installed or damage to the thrust caps can occur.



N0081819

Fig. 152: Locating LH Camshaft Bearing Caps
Courtesy of FORD MOTOR CO.

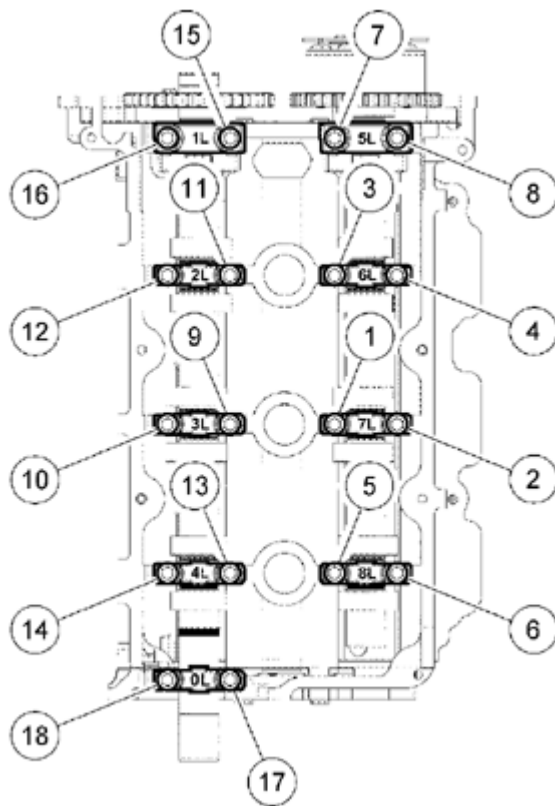
10. Lubricate the bearing surfaces of the LH camshaft bearing caps with clean engine oil and install the bearing caps.
 - Loosely install the bolts.
11. Lubricate the bearing surfaces of the LH camshaft bearing thrust caps with clean engine oil and install the bearing thrust caps.
 - Loosely install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



N0081820

Fig. 153: Locating LH Camshaft Bearing Thrust Caps
Courtesy of FORD MOTOR CO.

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



N0081821

Fig. 154: Identifying Camshaft Bearing Cap Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

12. Tighten the LH camshaft bearing cap bolts in the sequence shown in the illustration 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: 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.

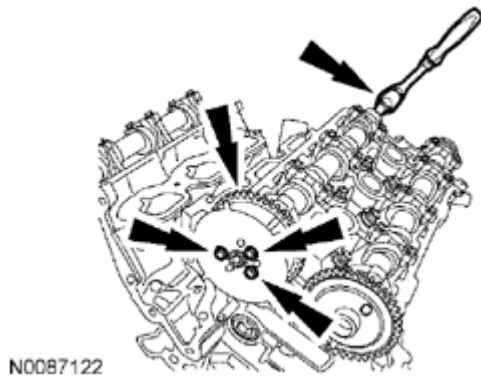


Fig. 155: Remove/Install LH Camshaft Phaser, Sprocket And Bolts
Courtesy of FORD MOTOR CO.

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

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

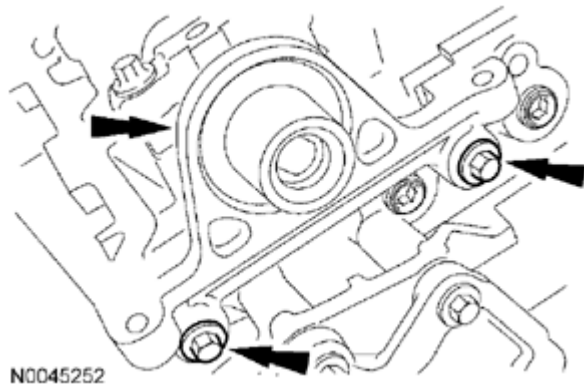


Fig. 156: Locating Bolts And Camshaft Oil Seal Retainer
Courtesy of FORD MOTOR CO.

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

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

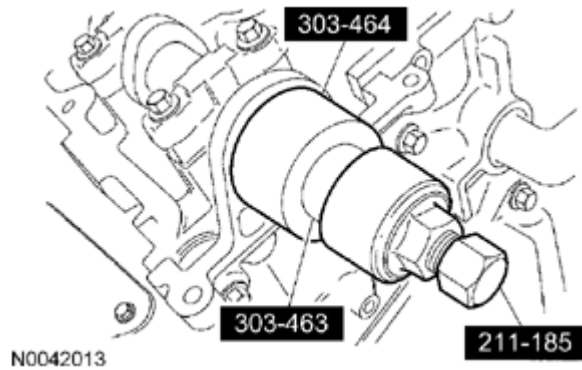


Fig. 157: Installing Camshaft Oil Seal Using Special Tools
Courtesy of FORD MOTOR CO.

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

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

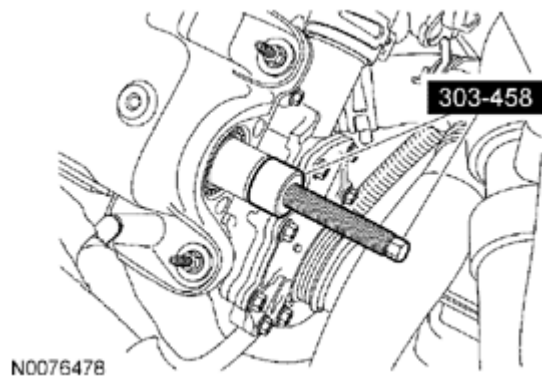


Fig. 158: Installing Camshaft Pulley Installer In Camshaft
Courtesy of FORD MOTOR CO.

16. Install the Camshaft Pulley Installer in the camshaft as shown in the illustration.
 - 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 in the illustration, 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).

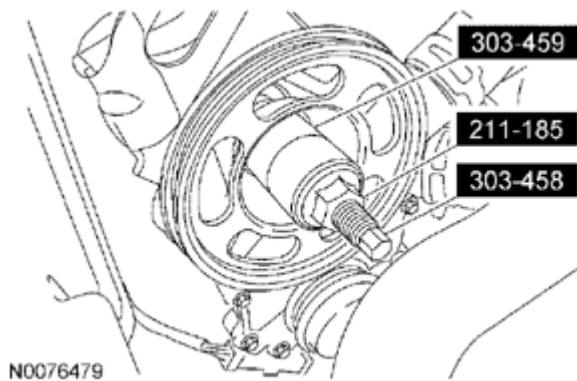


Fig. 159: Installing Special Tools Flush With End Of Camshaft
 Courtesy of FORD MOTOR CO.

17. 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 in the illustration.
 - 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.
18. Install the timing drive components. For additional information, refer to **TIMING DRIVE COMPONENTS** in this service information.
19. Install the coolant pump housing. For additional information, refer to **ENGINE COOLING SYSTEM (EXCEPT HYBRID)** article.
20. Install the LH catalytic converter. For additional information, refer to **EXHAUST SYSTEM -- FUSION, MILAN & MKZ** article.
21. Install the lower intake manifold. For additional information, refer to **LOWER INTAKE MANIFOLD** in this service information.

ENGINE LUBRICATION COMPONENTS - EXPLODED VIEW

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



ITEM DESCRIPTION TABLE

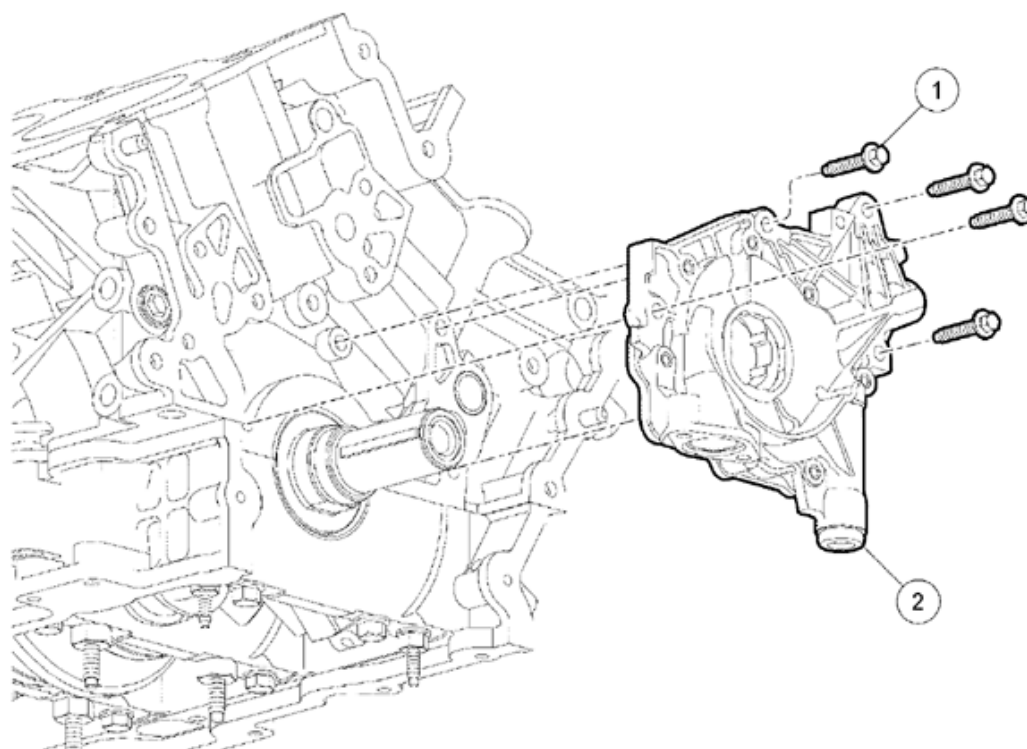
Item	Part Number	Description
1	W709678	Oil pan-to-engine bolt (15 required)
2	W500120	Oil pan-to-transaxle bolt (2 required)

2011 Mercury Milan

2011 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan

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
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. 161: Identifying Oil Pump Components
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 in this service information.

OIL PAN

Material Specifications

MATERIAL SPECIFICATIONS TABLE

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada) XO- 5W20-QSP (US); CXO-5W20-LSP12 (Canada)	WSS-M2C945-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** article.
2. Remove the exhaust Y-pipe. For additional information, refer to **EXHAUST SYSTEM -- FUSION, MILAN & MKZ** article.
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.

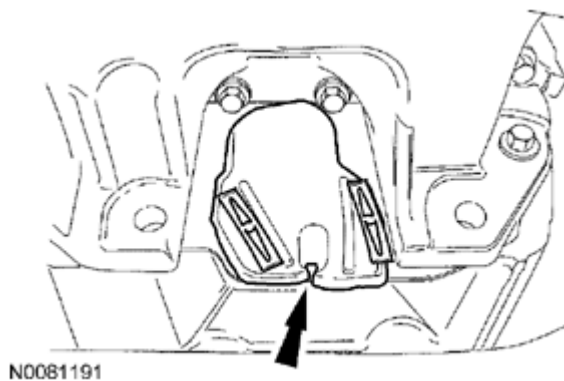


Fig. 162: Locating Access Cover
Courtesy of FORD MOTOR CO.

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

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.

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

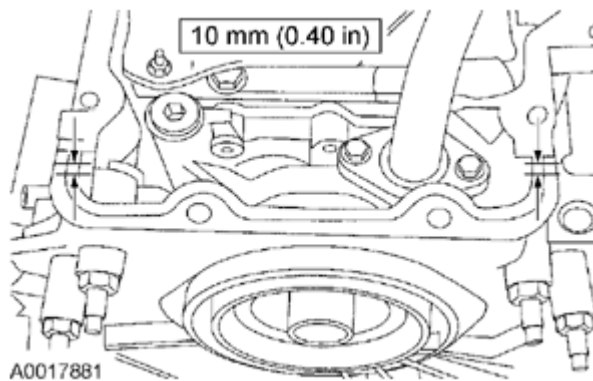


Fig. 163: Identifying Silicone Sealant Applying Diameter
Courtesy of FORD MOTOR CO.

2. Apply a 10 mm (0.40 in) diameter dot of silicone sealant to the areas indicated.
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 in the illustration to 25 Nm (18 lb-ft).

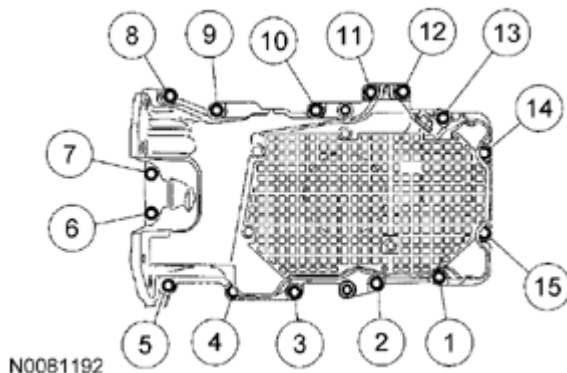


Fig. 164: Identifying Oil Pan-To-Engine Bolts Tightening Sequence
 Courtesy of FORD MOTOR CO.

6. Install the access cover.

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

7. Install a new oil filter.
 - Tighten to 5 Nm (44 lb-in) and then rotate an additional 180 degrees.
8. Install the exhaust Y-pipe. For additional information, refer to **EXHAUST SYSTEM -- FUSION, MILAN & MKZ** article.
9. Fill the engine with clean engine oil.

OIL PUMP SCREEN AND PICKUP TUBE

Material Specifications

MATERIAL SPECIFICATIONS TABLE

Item	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada) XO-5W20-QSP (US); CXO-5W20-LSP12 (Canada)	WSS-M2C945-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** article.
2. Remove the oil pan. For additional information, refer to **ENGINE LUBRICATION COMPONENTS - EXPLODED VIEW** and **OIL PAN** in this service information.
3. Remove the bolts the oil pump screen and pickup tube.
 - Remove and discard the O-ring seal.

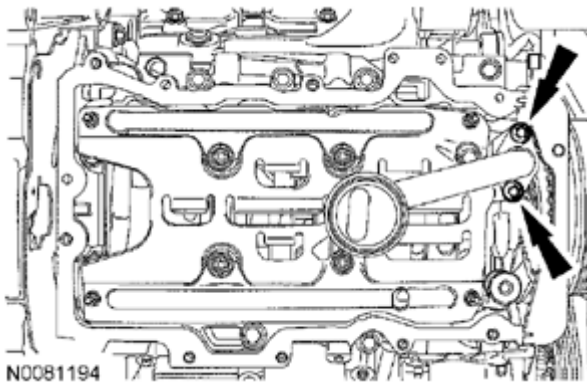


Fig. 165: Locating Oil Pump Screen And Pickup Tube Bolts
Courtesy of FORD MOTOR CO.

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).

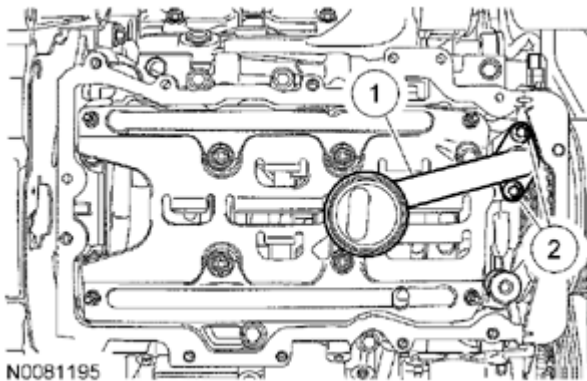


Fig. 166: Identifying Bolts, Oil Pump Screen And Pickup Tube
Courtesy of FORD MOTOR CO.

3. Install the oil pan. For additional information, refer to **OIL PAN** in this service information.

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** article.
2. Remove the oil pump screen and pickup tube. For additional information, refer to **ENGINE LUBRICATION COMPONENTS - EXPLODED VIEW** and **OIL PUMP SCREEN AND PICKUP TUBE** in this service information.
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.

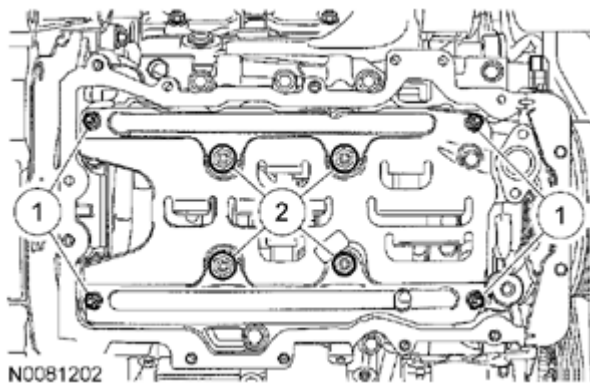


Fig. 167: Identifying M6 And M8 Oil Pan Baffle Nuts
Courtesy of FORD MOTOR CO.

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** article.
2. Remove the timing drive components. For additional information, refer to **TIMING DRIVE COMPONENTS** in this service information.

3. Remove the oil pump screen and pickup tube. For additional information, refer to **ENGINE LUBRICATION COMPONENTS - EXPLODED VIEW** and **OIL PUMP SCREEN AND PICKUP TUBE** in this service information.
4. Remove the bolts in the sequence shown in the illustration.

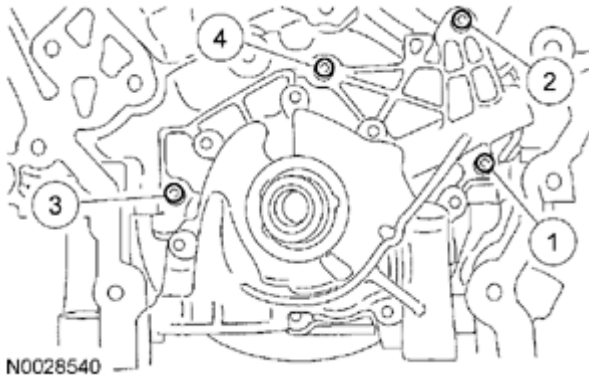


Fig. 168: Identifying Oil Pump Bolts Removing Sequence
Courtesy of FORD MOTOR CO.

Installation

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

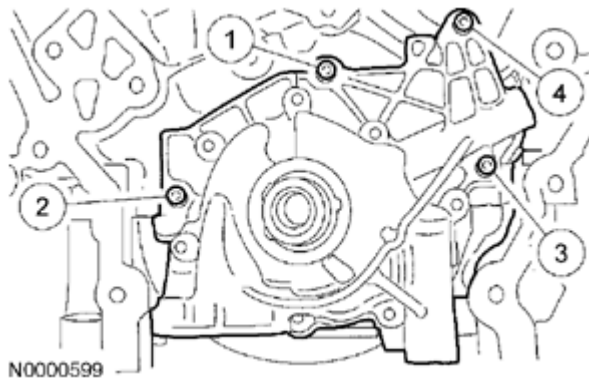


Fig. 169: Identifying Oil Pump Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

2. Install the oil pump screen and pickup tube. For additional information, refer to **ENGINE LUBRICATION COMPONENTS - EXPLODED VIEW** and **OIL PUMP SCREEN AND PICKUP TUBE** in this service information.
3. Install the timing drive components. For additional information, refer to **TIMING DRIVE COMPONENTS** in this service information.

ENGINE OIL PRESSURE (EOP) SWITCH

Material Specifications

MATERIAL SPECIFICATIONS TABLE

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

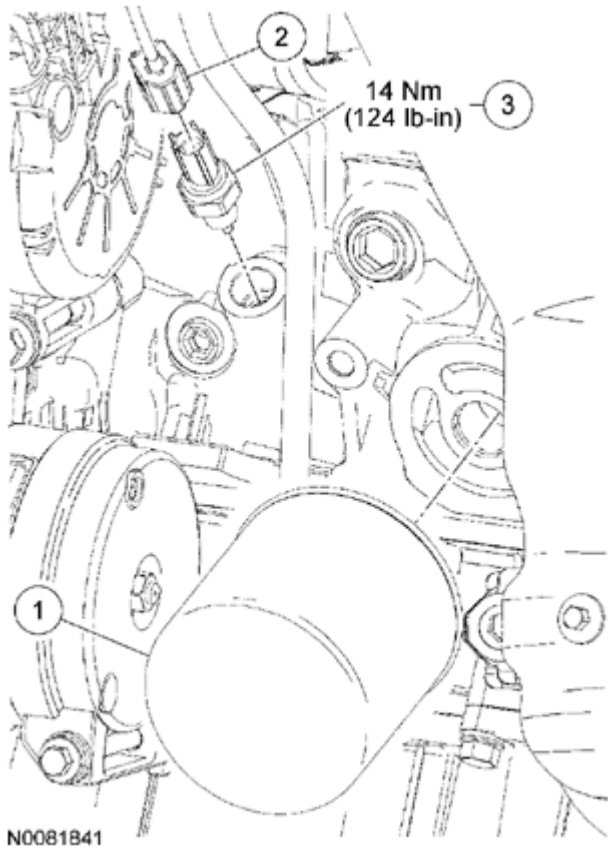


Fig. 170: Identifying Engine Oil Pressure (EOP) Switch Components With Torque Specifications
Courtesy of FORD MOTOR CO.

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** article.

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

installing.

2. Remove the engine oil filter.
 - To install, tighten to 5 Nm (44 lb-in) and then rotate an additional 180 degrees.
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 Specifications****MATERIAL SPECIFICATIONS TABLE**

Item	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada) XO-5W20-QSP (US); CXO-5W20-LSP12 (Canada)	WSS-M2C945-A

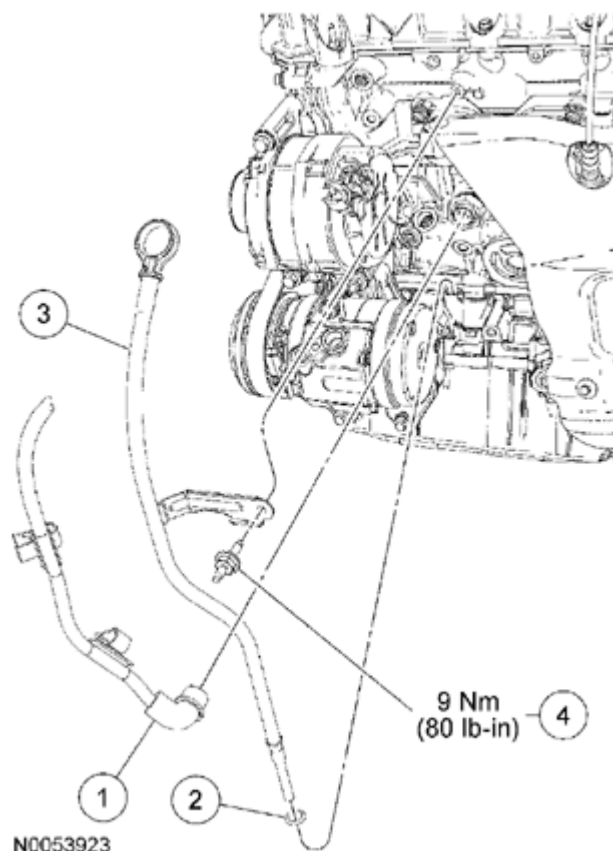


Fig. 171: Identifying Oil Level Indicator And Tube Components With Torque Specifications
 Courtesy of FORD MOTOR CO.

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** article.
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).

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

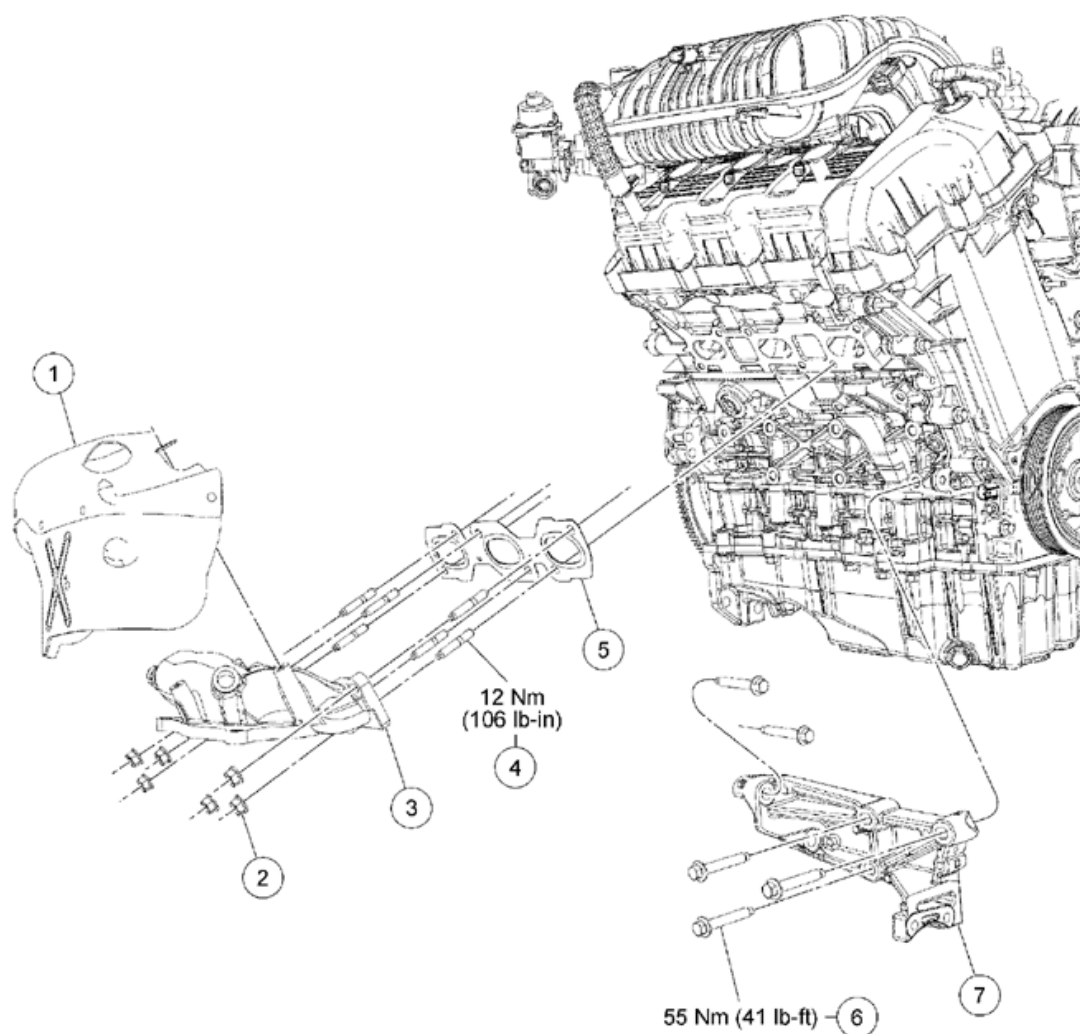
5. To install, reverse the removal procedure.

EXHAUST MANIFOLD - RH

Material Specifications

MATERIAL SPECIFICATIONS TABLE

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



N0096668

Fig. 172: Identifying Exhaust Manifold Components With Torque Specifications - RH
 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 article.

2. Remove the EGR tube. For additional information, refer to **ENGINE EMISSION CONTROL - 3.0L (4V) -- FUSION & MILAN** article.
3. Remove the RH catalytic converter. For additional information, refer to **EXHAUST SYSTEM -- FUSION, MILAN & MKZ** article.

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.

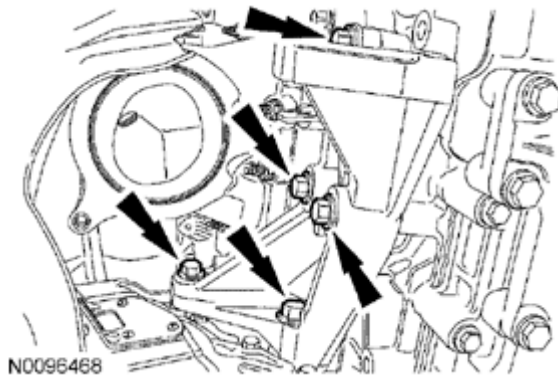


Fig. 173: Locating Bolts And PTU Bracket
Courtesy of FORD MOTOR CO.

4. Remove the 5 bolts and the PTU bracket.
 - Remove the catalytic converter heat shield from the vehicle.
5. Remove the 6 nuts and the RH exhaust manifold.
 - Discard the gasket and nuts.

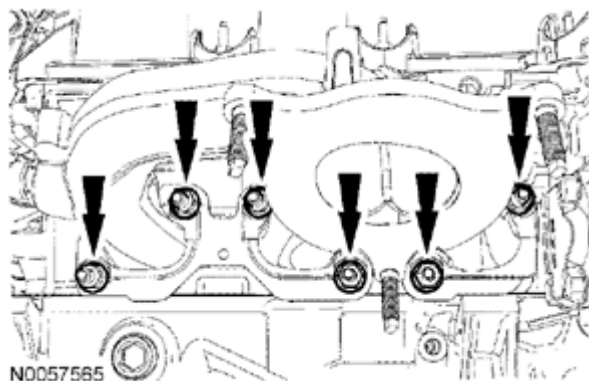


Fig. 174: Locating Nuts And RH Exhaust Manifold
Courtesy of FORD MOTOR CO.

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

7. Remove and discard the 6 RH exhaust manifold studs.

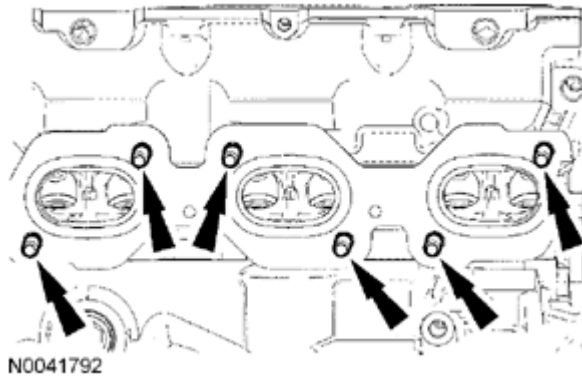


Fig. 175: Locating RH Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

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

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

Installation

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

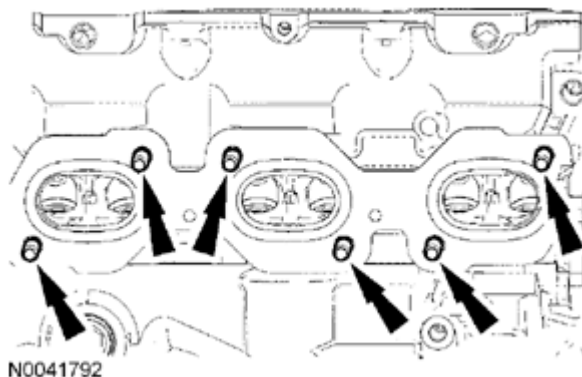


Fig. 176: Locating RH Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

NOTE: The catalytic converter heat shield must be positioned up into the engine compartment prior to installing the PTU bracket.

2. Position the catalytic converter heat shield into the engine compartment.
3. Install the PTU bracket and the 5 bolts.
 - Tighten to 55 Nm (41 lb-in).

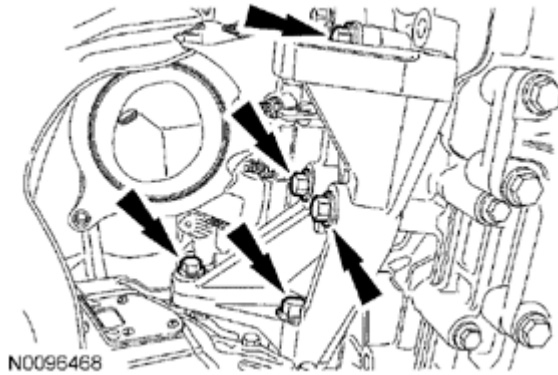


Fig. 177: Locating PTU Bracket And Bolts
Courtesy of FORD MOTOR CO.

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

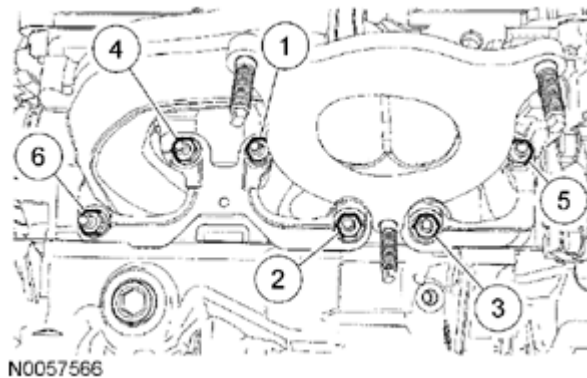
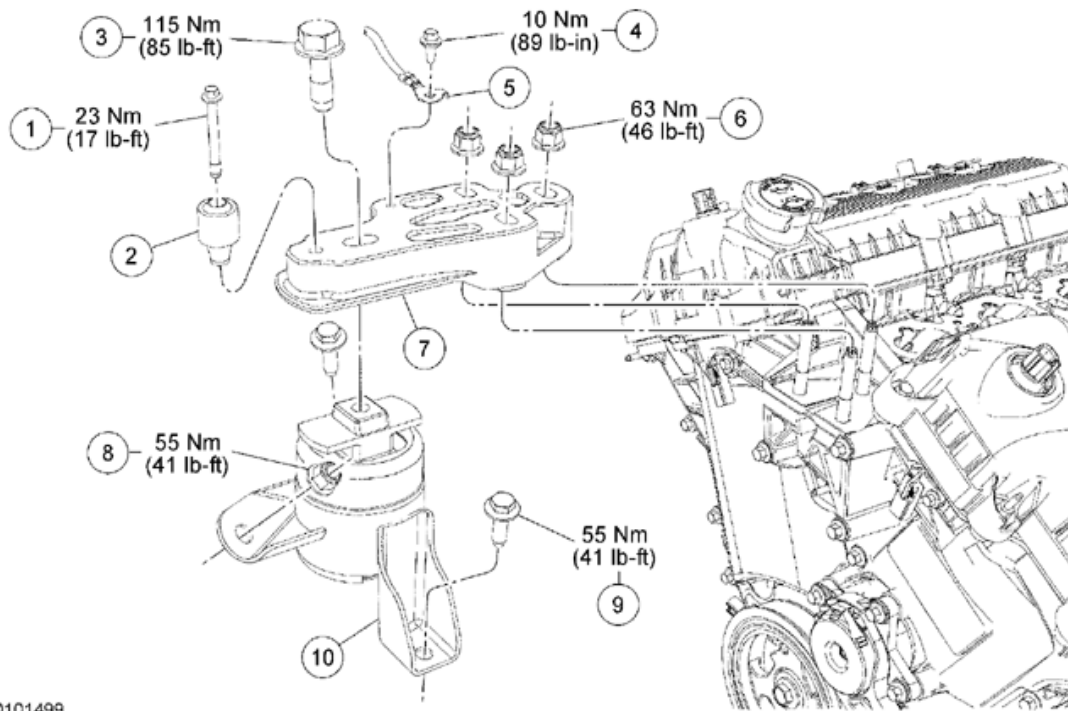


Fig. 178: Identifying RH Exhaust Manifold Nuts Tightening Sequence
Courtesy of FORD MOTOR CO.

5. Install the RH catalytic converter. For additional information, refer to **EXHAUST SYSTEM -- FUSION, MILAN & MKZ** article.
6. Install the EGR tube. For additional information, refer to **ENGINE EMISSION CONTROL - 3.0L (4V) -- FUSION & MILAN** article.

ENGINE MOUNT



N0101499

Fig. 179: Exploded View Of 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	6061	Engine mount bracket
8	W711578	Engine mount nut
9	W706496	Engine mount bolt (2 required)
10	6038	Engine mount

Removal and Installation

1. Remove the engine coolant degas bottle. For additional information, refer to **ENGINE COOLING SYSTEM (EXCEPT HYBRID)** article.
2. Remove the bolt and position aside the ground wire.
 - To install, tighten to 10 Nm (89 lb-in).
3. Remove the bolt and damper.
 - To install, tighten to 23 Nm (17 lb-ft).

4. Remove the engine support insulator bracket bolt.
 - To install, tighten to 115 Nm (85 lb-ft).

NOTE: Failure to position the wood block and floor jack as illustrated can result in damage to the oil pan.

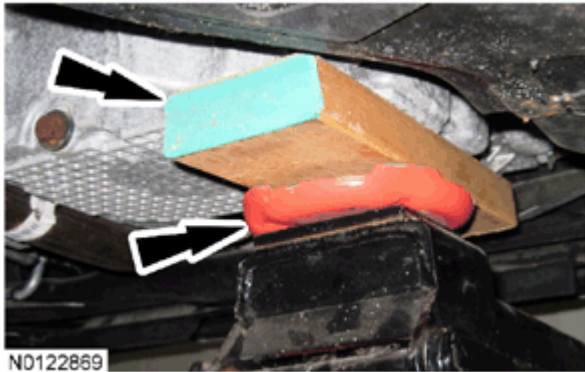


Fig. 180: Positioning Floor Jack With Block Of Wood Under Front Of Oil Pan
Courtesy of FORD MOTOR CO.

5. Position a floor jack with a block of wood under the front of the oil pan.
 - Using the floor jack, lift the engine 12 mm (0.47 in).
6. Remove the 3 nuts and the engine support insulator bracket.
 - To install, tighten to 63 Nm (46 lb-ft).
7. Remove the nut, 2 bolts and the engine mount.
 - To install, tighten to 55 Nm (41 lb-ft).

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.

8. Use the floor jack to lower the engine 25 mm (0.98 in).
 - Remove the engine mount bracket.
9. To install, reverse the removal procedure.

REMOVAL

ENGINE

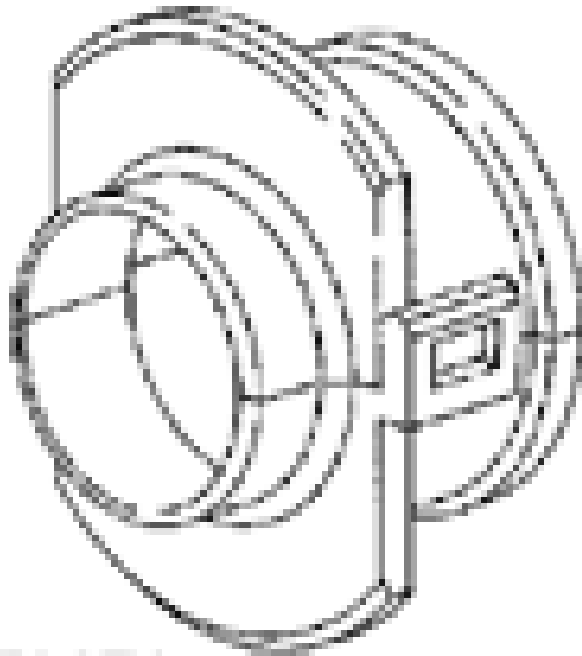
Special Tools

SPECIAL TOOL(S)

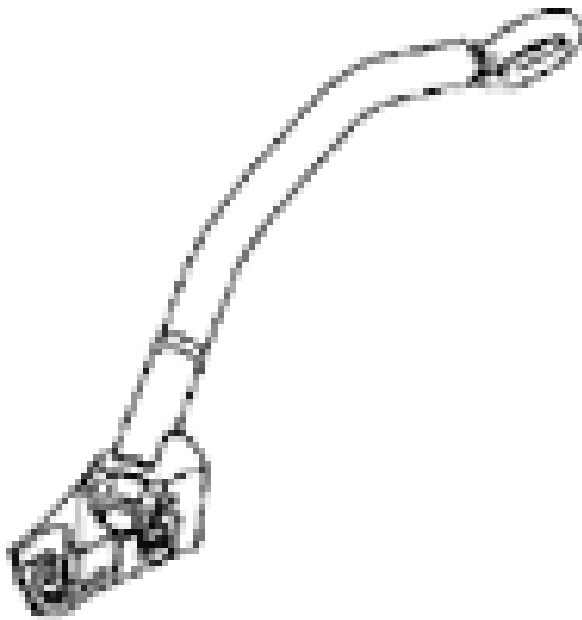
Disconnect Tool, Transmission Cooler Line 307-569
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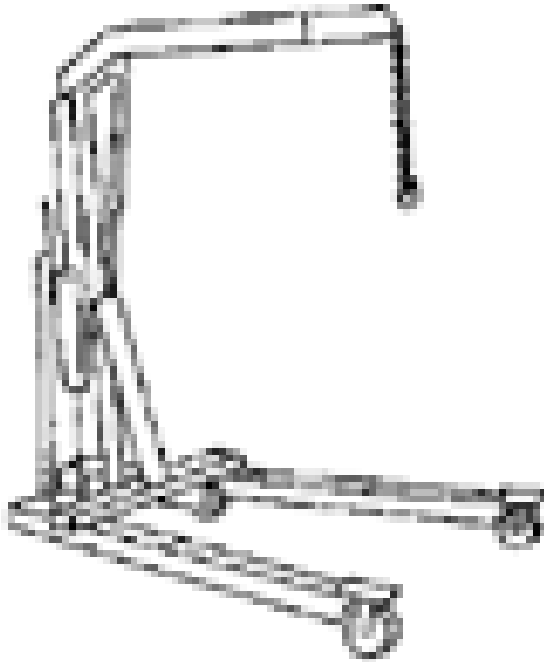
ST2870-A



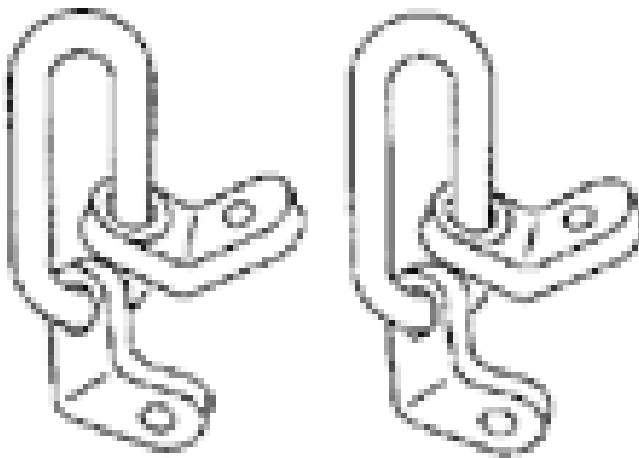
ST2873-A

Engine Lifting Bracket Set
303-1140

2,200# Floor Crane, Fold Away
300-OTC1819E or equivalent



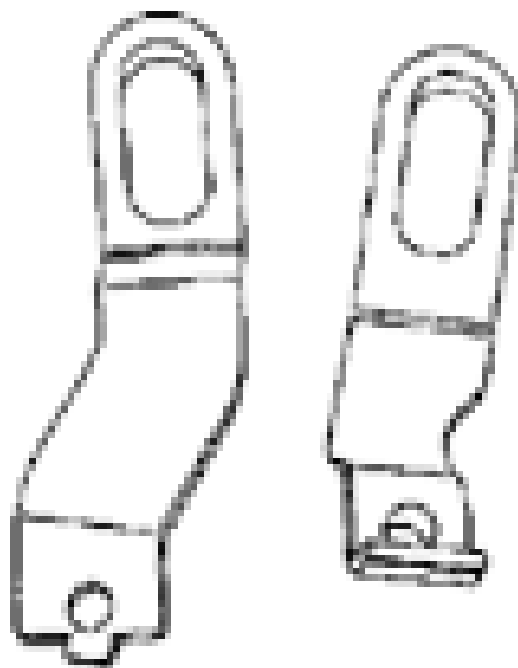
ST1341-A



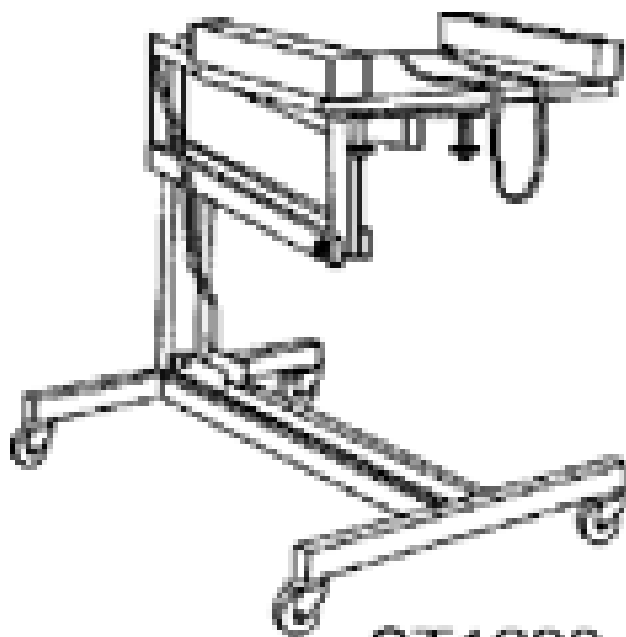
ST2793-A

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

Lifting Brackets, Engine
134-00243 or equivalent



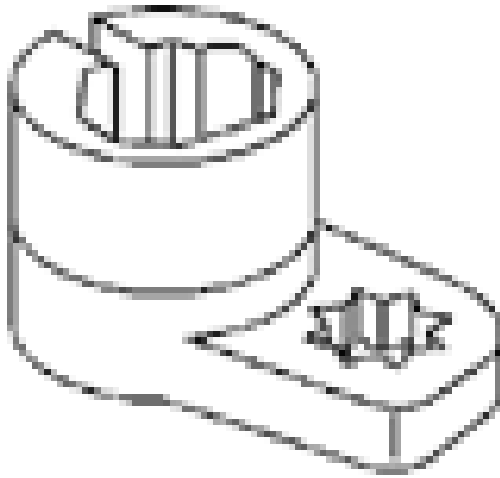
ST2463-A



ST1293-A

Powertrain Lift
300-OTC1585AE or equivalent

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



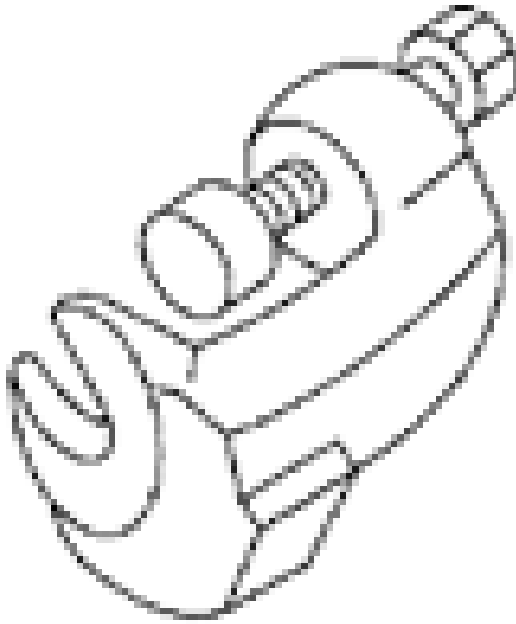
ST1447-A



ST1602-A

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

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



ST1408-A



Adjustable Grip Arm, 1735A
014-00001 or equivalent

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

All vehicles

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** article.
2. Release the fuel system pressure. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION - FUSION, MILAN & MKZ** article.
3. Disconnect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING & CABLES -- FUSION, MILAN & MKZ** article.
4. Recover the A/C system. For additional information, refer to **CLIMATE CONTROL SYSTEM - GENERAL INFORMATION & DIAGNOSTICS -- FUSION, MILAN & MKZ (EXCEPT HYBRID)** article.
5. Place the steering wheel in the straight-ahead position and the ignition key in the OFF position.

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

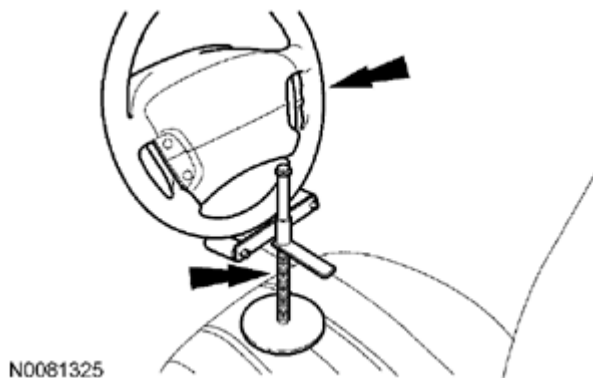


Fig. 181: Holding Steering Wheel In Straight-Ahead Position Using Suitable Holding Device
Courtesy of FORD MOTOR CO.

6. Using a suitable holding device, hold the steering wheel in the straight-ahead position.
7. Remove the 2 nuts and the steering joint cover.

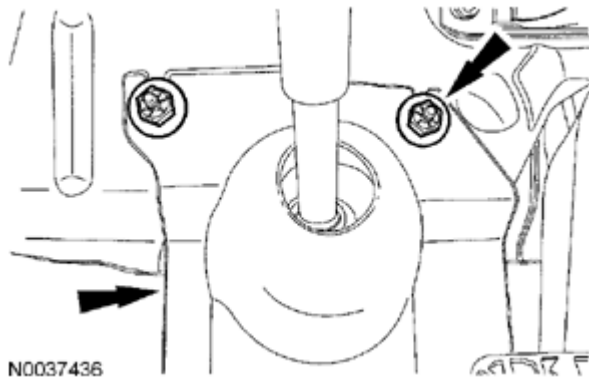


Fig. 182: Locating Nuts And Steering Joint Cover
Courtesy of FORD MOTOR CO.

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 SUPPLEMENTAL RESTRAINT SYSTEM -- FUSION, MILAN & MKZ article.



Fig. 183: Locating Steering Column Shaft Bolt
Courtesy of FORD MOTOR CO.

8. Remove the bolt and disconnect the steering column shaft from the steering gear.
9. Drain the cooling system. For additional information, refer to ENGINE COOLING SYSTEM (EXCEPT HYBRID) article.
10. Remove the 4 screws and position the RH fender splash shield aside.

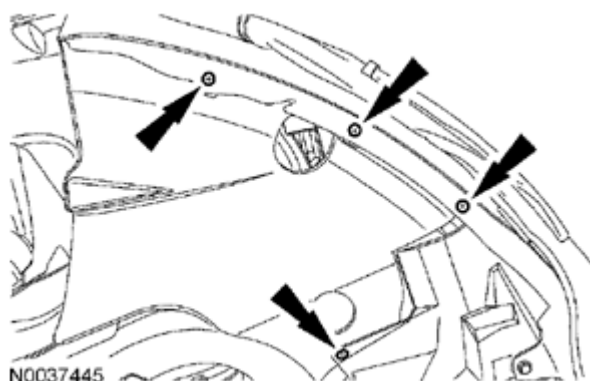


Fig. 184: Locating RH Fender Splash Shield Screws
Courtesy of FORD MOTOR CO.

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

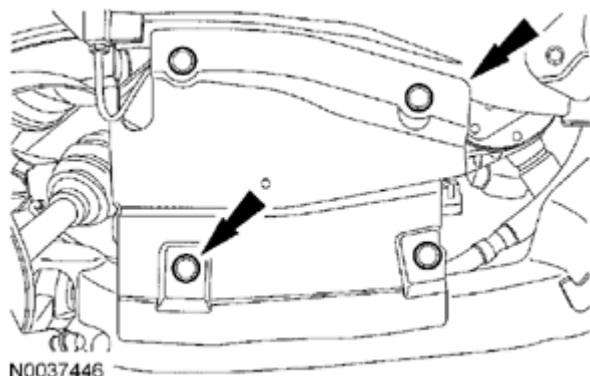


Fig. 185: Locating Pin-Type Retainers And RH Splash Shield
Courtesy of FORD MOTOR CO.

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

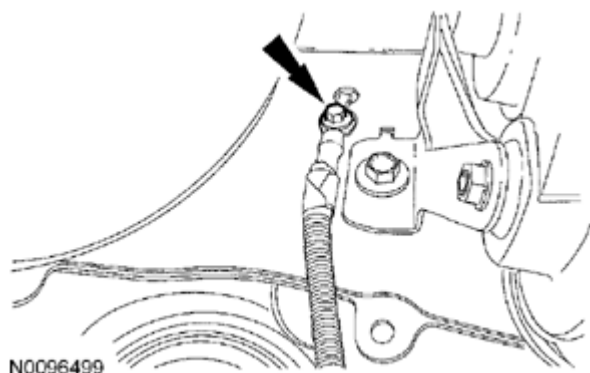


Fig. 186: Locating Electronic Power Assist Steering Wiring Ground Wire Bolt
Courtesy of FORD MOTOR CO.

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

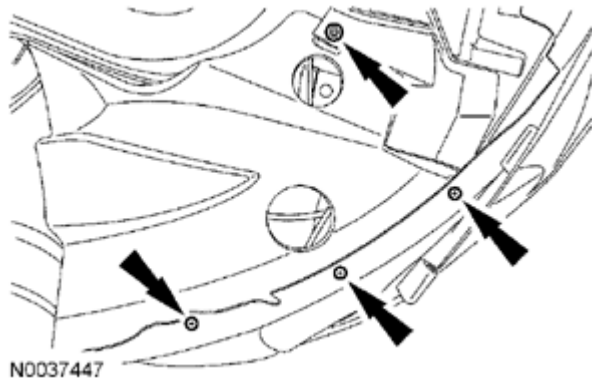


Fig. 187: Locating Screws And LH Fender Splash Shield
Courtesy of FORD MOTOR CO.

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

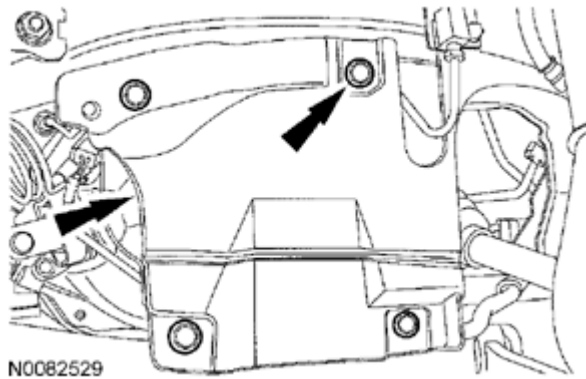


Fig. 188: Locating Pin-Type Retainers And LH Splash Shield
Courtesy of FORD MOTOR CO.

15. Remove the exhaust flexible pipe. For additional information, refer to **EXHAUST SYSTEM -- FUSION, MILAN & MKZ** article.

All-Wheel Drive (AWD) vehicles

NOTE: Index-mark the driveshaft for installation.

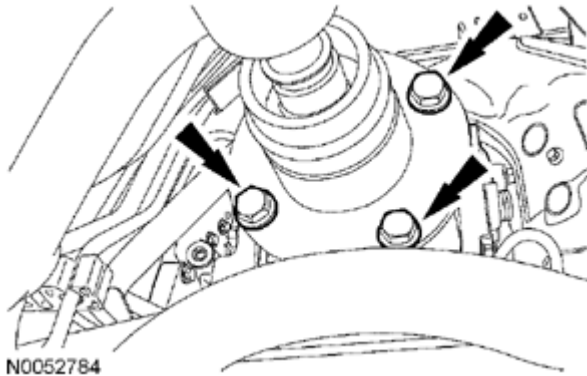


Fig. 189: Locating Driveshaft Bolts
Courtesy of FORD MOTOR CO.

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

All vehicles

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

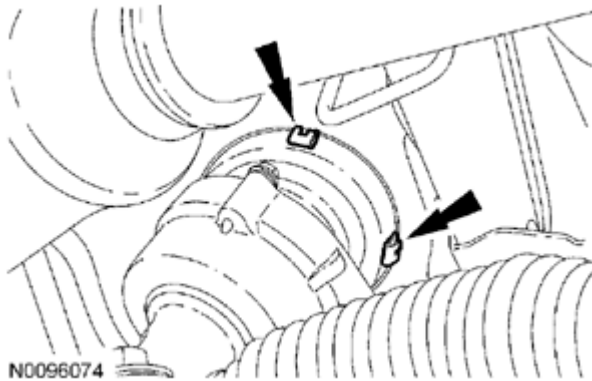


Fig. 190: Locating Clips And Steering Gear-To-Dash Seal
Courtesy of FORD MOTOR CO.

17. Release the 4 clips (2 shown in the illustration) and slide the steering gear-to-dash seal off of the steering gear and into the passenger compartment.
18. If equipped, remove the 2 bolts and the heat shield.

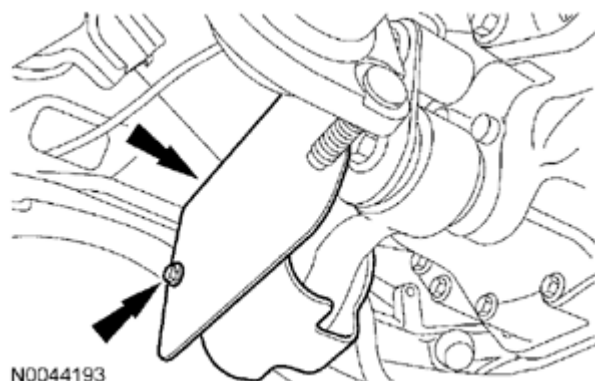


Fig. 191: Locating Bolts And Heat Shield
Courtesy of FORD MOTOR CO.

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

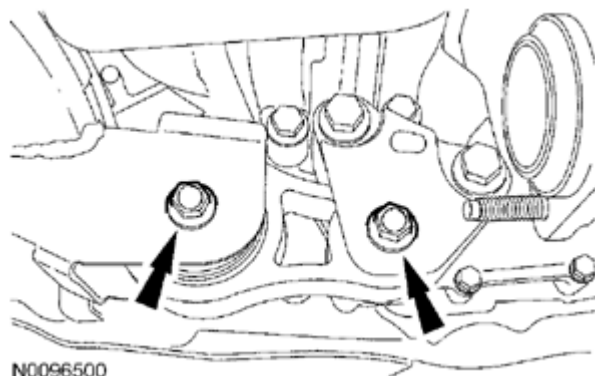


Fig. 192: Locating Bolts And Engine Roll Restrictor
Courtesy of FORD MOTOR CO.

NOTE: RH shown in the illustration, LH similar.

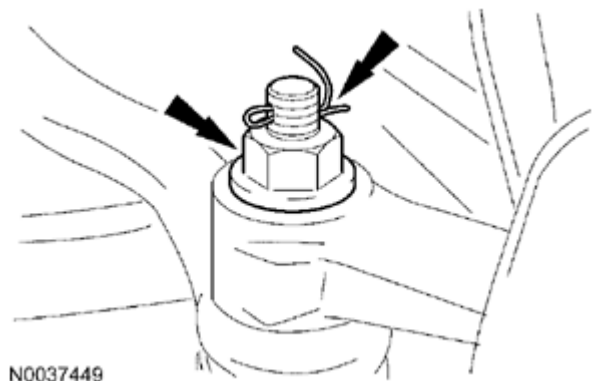


Fig. 193: Locating Tie-Rod Ends Cotter Pins And Nuts
Courtesy of FORD MOTOR CO.

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

NOTE: LH shown in the illustration, RH similar.

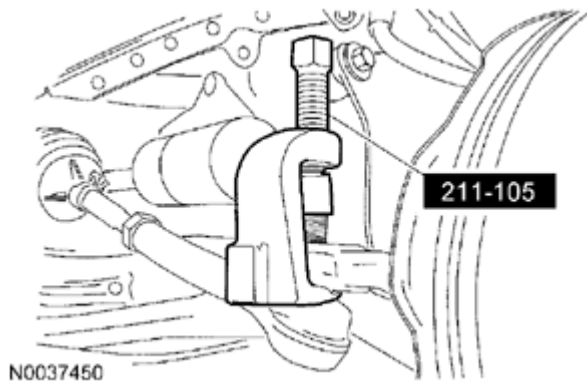


Fig. 194: Separating Tie-Rod Ends From Steering Knuckles Using Tie-Rod End Remover
Courtesy of FORD MOTOR CO.

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

NOTE: RH shown in the illustration, LH similar.

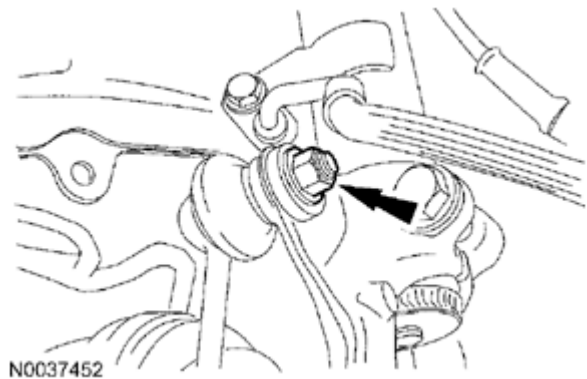


Fig. 195: Locating Stabilizer Bar Links Nut
Courtesy of FORD MOTOR CO.

22. Remove the nuts and separate the stabilizer bar links from the struts.
23. Remove the LH halfshaft and the intermediate shaft. For additional information, refer to **FRONT DRIVE HALFSHAFTS** article.
24. Disconnect the 2 EPAS electrical connectors near the front of the subframe.

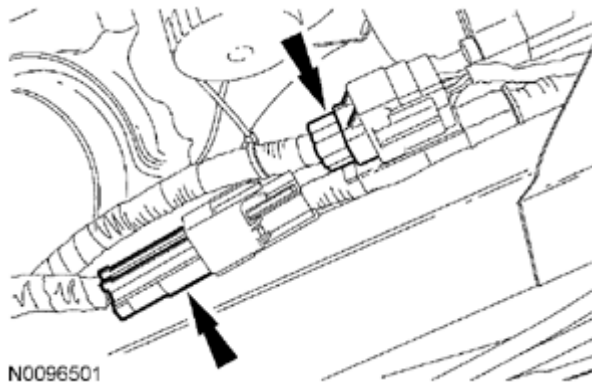


Fig. 196: Locating EPAS Electrical Connectors
Courtesy of FORD MOTOR CO.

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

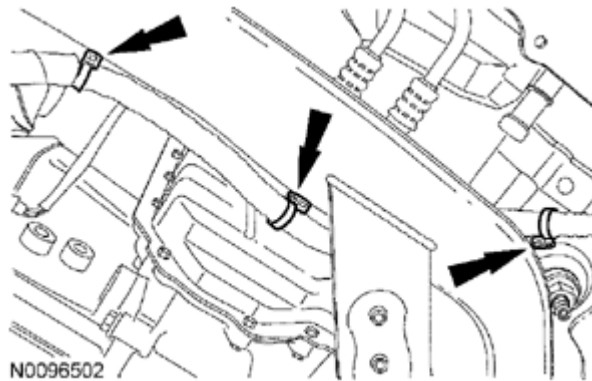


Fig. 197: Locating Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

26. Position the Powertrain Lift under the subframe assembly.

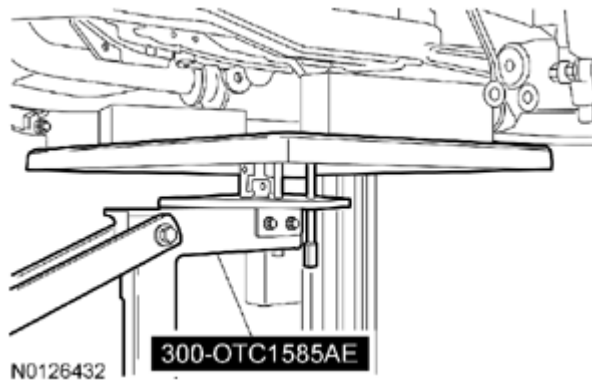


Fig. 198: Positioning Powertrain Lift Under Subframe Assembly
Courtesy of FORD MOTOR CO.

NOTE: LH shown in the illustration, RH similar.

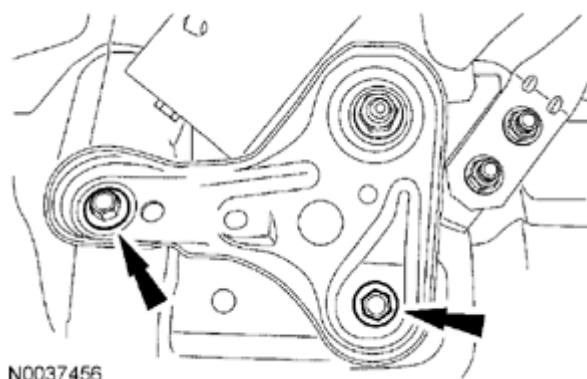


Fig. 199: Locating Subframe Bracket-To-Body Bolts
Courtesy of FORD MOTOR CO.

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

NOTE: LH shown in the illustration, RH similar.

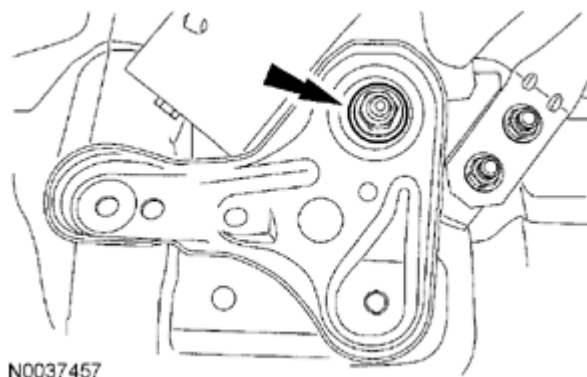


Fig. 200: Locating Subframe Nuts And Subframe Brackets
Courtesy of FORD MOTOR CO.

28. Remove the subframe nuts and the subframe brackets.

NOTE: LH shown in the illustration, RH similar.

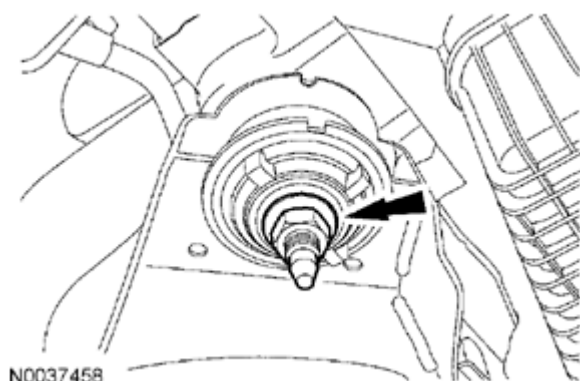


Fig. 201: Locating Front Subframe Nuts
Courtesy of FORD MOTOR CO.

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

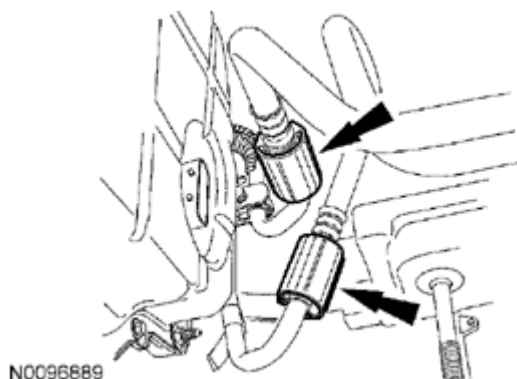


Fig. 202: Locating Transaxle Fluid Cooler Tube Secondary Latches
Courtesy of FORD MOTOR CO.

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

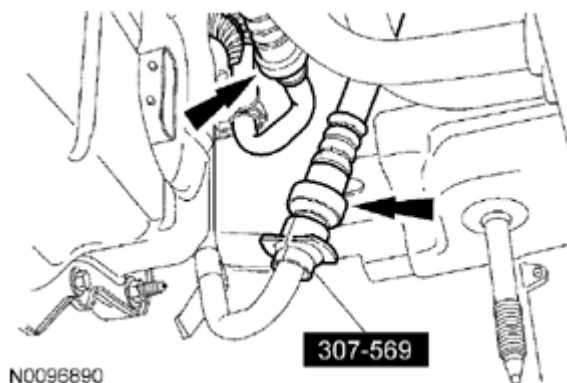


Fig. 203: Disconnecting Transaxle Fluid Cooler Tubes Using Transmission Cooler Line Disconnect Tool

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).

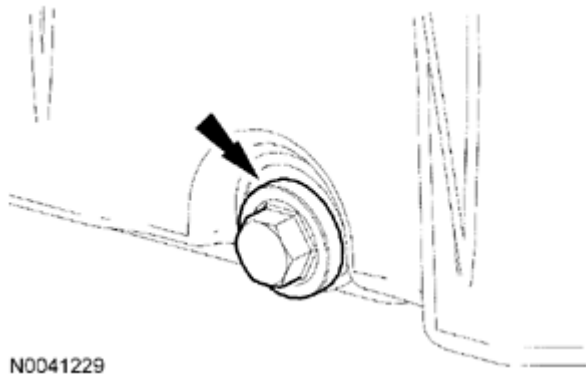


Fig. 204: Locating Drain Plug

Courtesy of FORD MOTOR CO.

34. Remove and discard the engine oil filter.

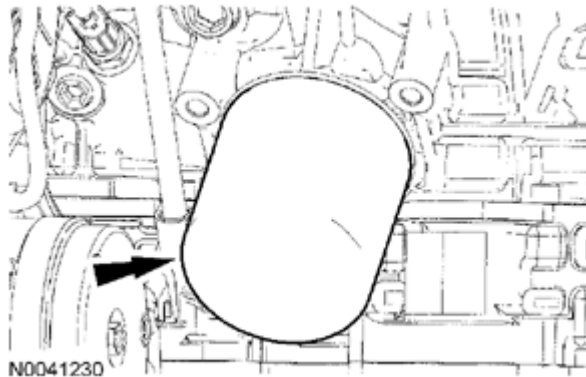


Fig. 205: Locating Engine Oil Filter

Courtesy of FORD MOTOR CO.

35. Remove the engine Air Cleaner (ACL) and ACL outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING - 3.0L (4V) -- FUSION & MILAN** article.
36. Remove the battery tray. For additional information, refer to **BATTERY, MOUNTING & CABLES -- FUSION, MILAN & MKZ** article.
37. Remove the 2 nuts and disconnect the power feed wires from the battery terminal.

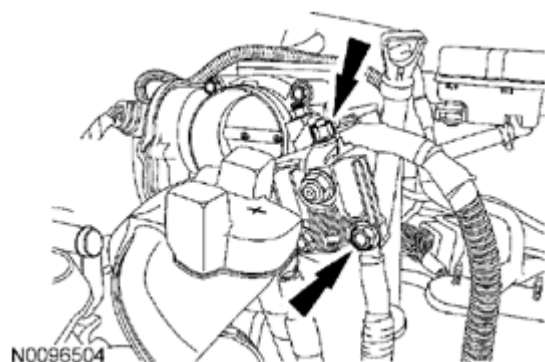


Fig. 206: Locating Nuts And Power Feed Wires
Courtesy of FORD MOTOR CO.

38. Disconnect the engine wiring harness electrical connector.

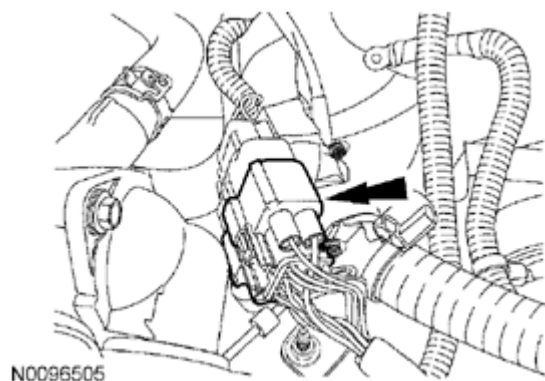


Fig. 207: Locating Engine Wiring Harness Electrical Connector
Courtesy of FORD MOTOR CO.

39. Disconnect the 2 engine wiring harness electrical connectors.

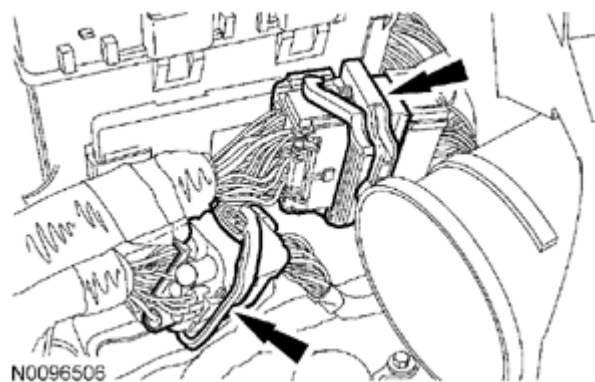


Fig. 208: Locating Engine Wiring Harness Electrical Connectors
Courtesy of FORD MOTOR CO.

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

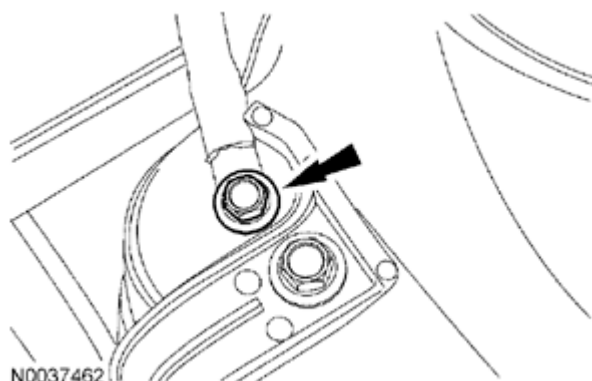


Fig. 209: Locating Bolt And Ground Wire
Courtesy of FORD MOTOR CO.

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

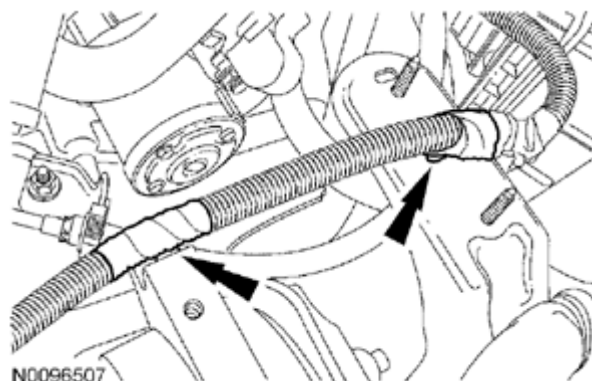


Fig. 210: Locating Wiring Harness Retainers Of Battery Tray Bracket And Transaxle Mount
Courtesy of FORD MOTOR CO.

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

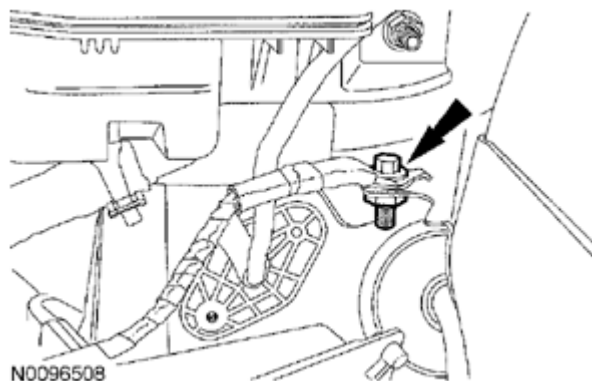


Fig. 211: Locating PCM Ground Bolt
Courtesy of FORD MOTOR CO.

43. Disconnect the 3 PCM electrical connectors.



Fig. 212: 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 - FUSION, MILAN & MKZ** article.
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.

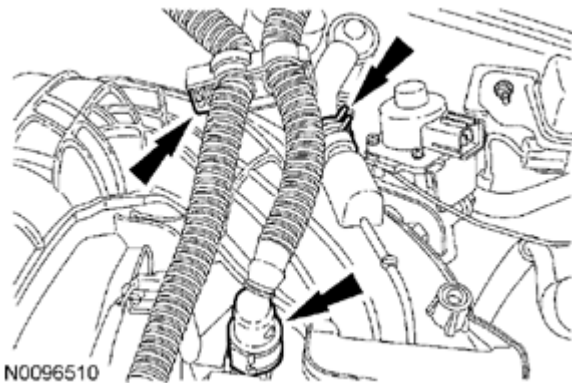


Fig. 213: Locating EVAP Tube-To-EVAP Canister Purge Valve Quick Connect Coupling And Brake Booster Vacuum Tube
Courtesy of FORD MOTOR CO.

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

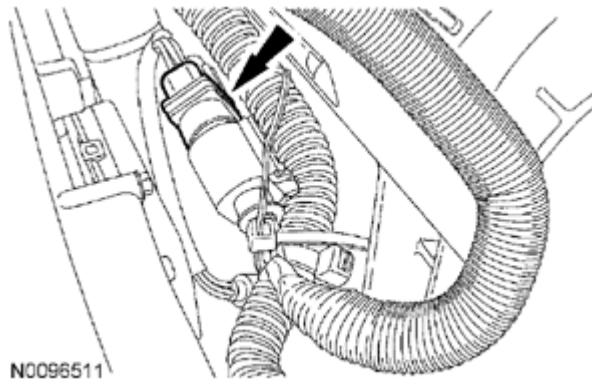


Fig. 214: Locating LH Heated Oxygen Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

47. Disconnect the upper and lower radiator hoses.

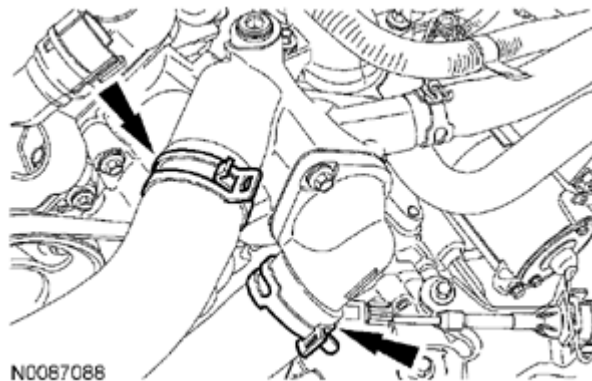


Fig. 215: Locating Upper And Lower Radiator Hoses
Courtesy of FORD MOTOR CO.

48. Disconnect the 2 heater hoses.

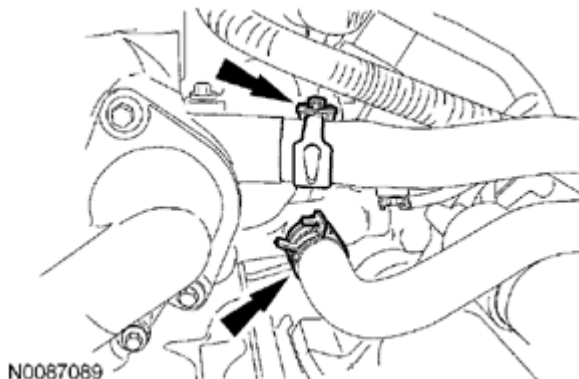


Fig. 216: Locating Heater Hoses
Courtesy of FORD MOTOR CO.

49. Disconnect the gearshift cable from the transaxle.

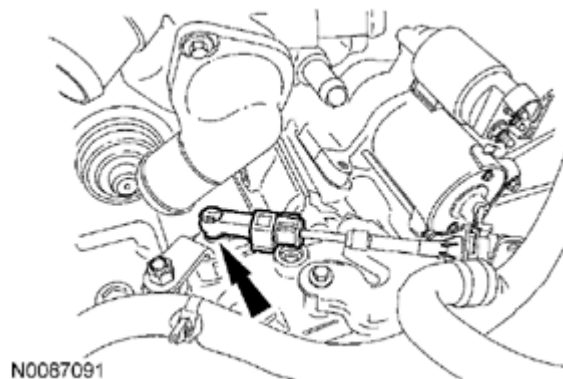


Fig. 217: Locating Gearshift Cable
Courtesy of FORD MOTOR CO.

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

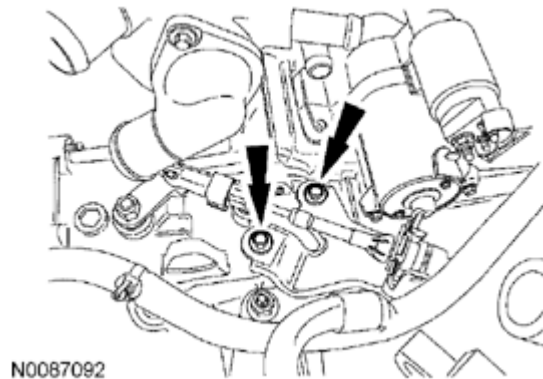


Fig. 218: Locating Shift Cable Bracket Bolts
Courtesy of FORD MOTOR CO.

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

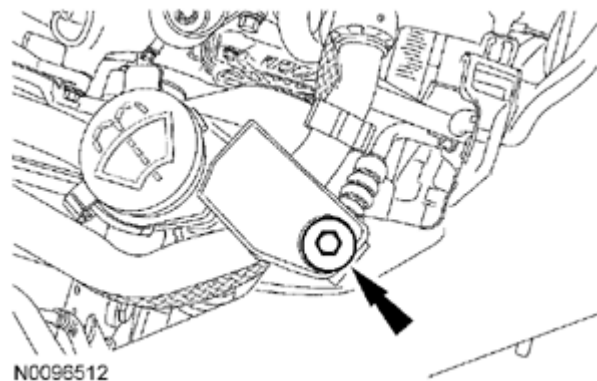


Fig. 219: Locating A/C Tube/Windshield Washer Bottle Bracket Bolt

Courtesy of FORD MOTOR CO.

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

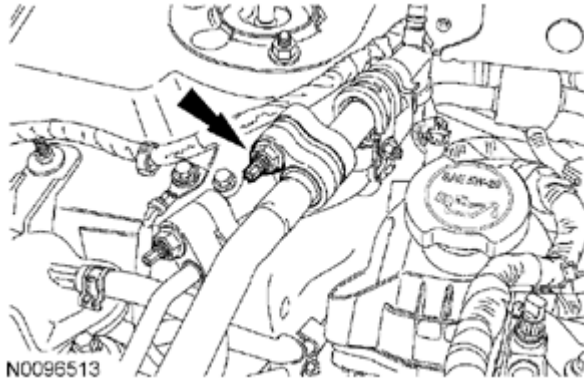


Fig. 220: Locating A/C Tube Nut
Courtesy of FORD MOTOR CO.

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

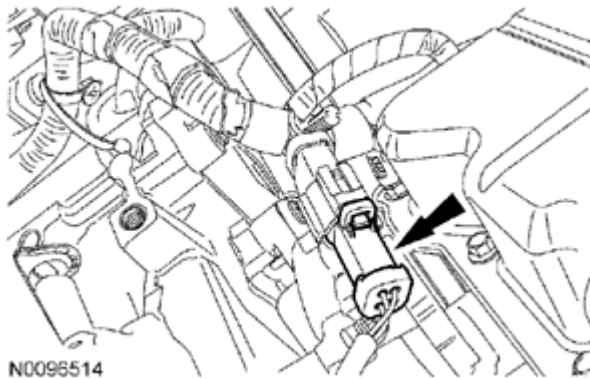


Fig. 221: Locating LH Catalyst Monitor Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

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



Fig. 222: Locating Bolts And LH Catalytic Converter Heat Shield
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.

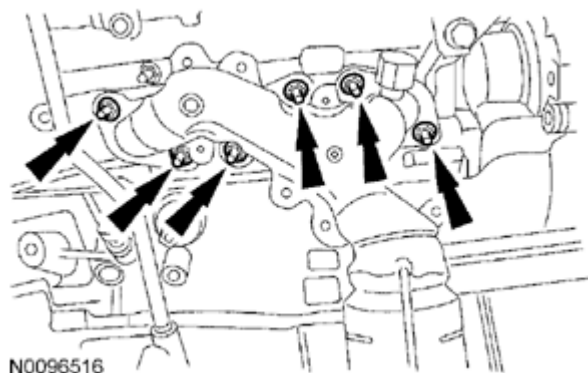


Fig. 223: Locating LH Catalytic Converter Manifold Nuts
Courtesy of FORD MOTOR CO.

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

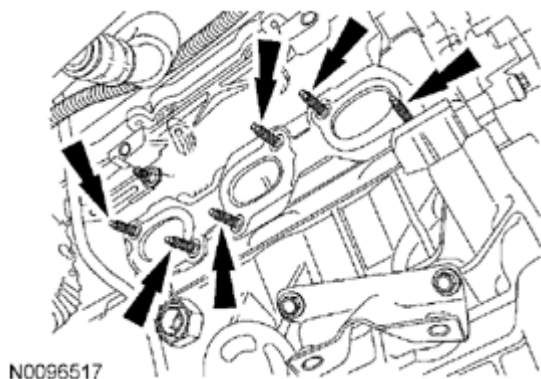


Fig. 224: Locating LH Catalytic Converter Manifold Studs
Courtesy of FORD MOTOR CO.

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

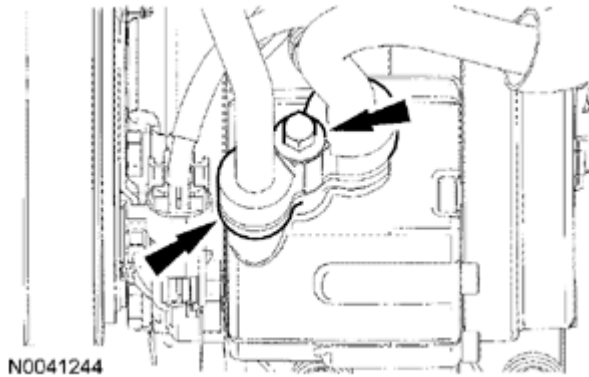


Fig. 225: Locating Bolt And A/C Manifold
Courtesy of FORD MOTOR CO.

AWD vehicles

59. Disconnect the RH CMS electrical connector.

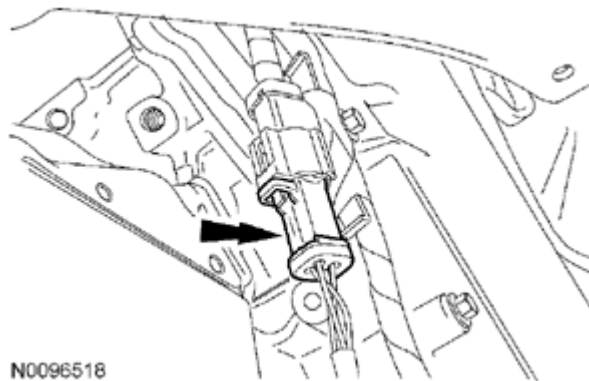


Fig. 226: Locating RH CMS Electrical Connector
Courtesy of FORD MOTOR CO.

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

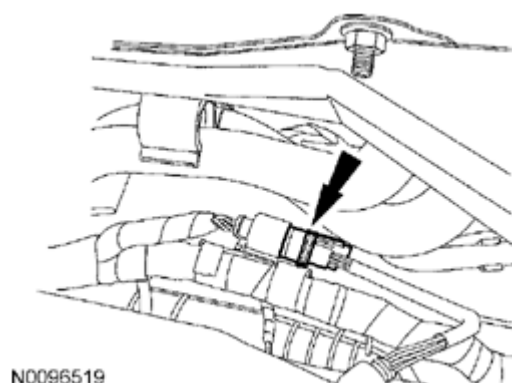


Fig. 227: Locating RH Heated Oxygen Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

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

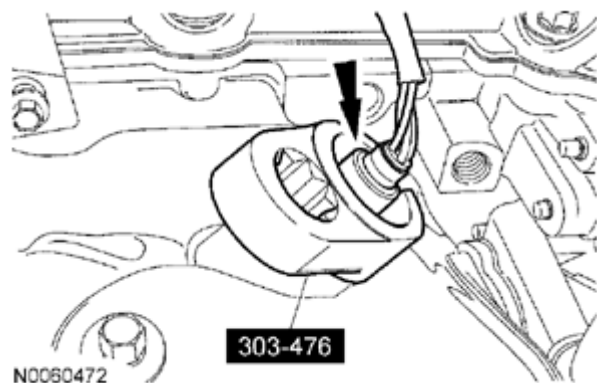


Fig. 228: Removing RH HO2S Using Exhaust Gas Oxygen Sensor Socket
Courtesy of FORD MOTOR CO.

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

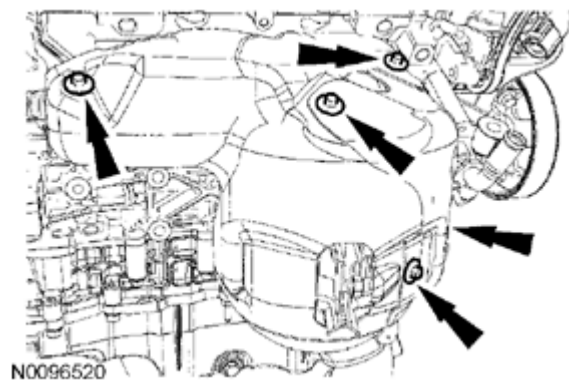


Fig. 229: Locating Bolts And RH Exhaust Heat Shield
Courtesy of FORD MOTOR CO.

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

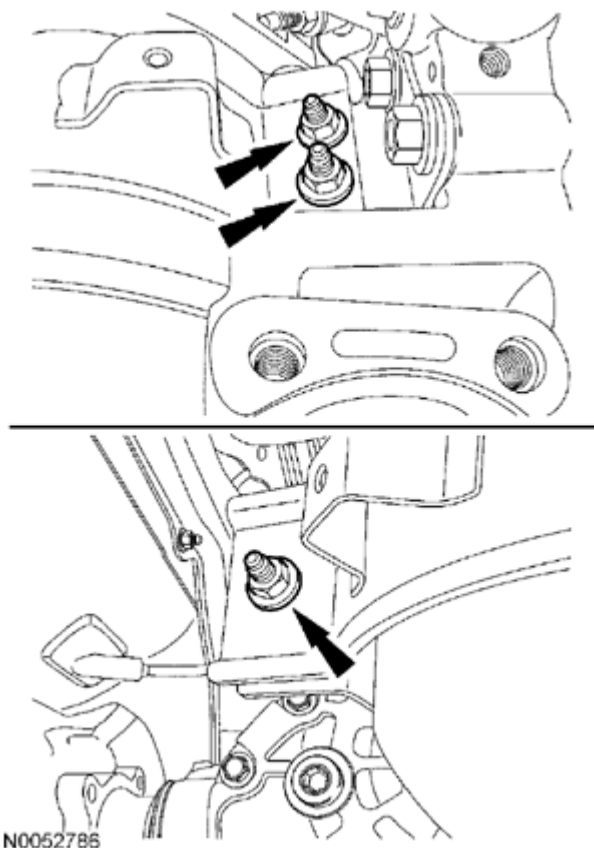


Fig. 230: Locating Nuts And RH Exhaust Heat Shield Bracket (Outboard Half)
Courtesy of FORD MOTOR CO.

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

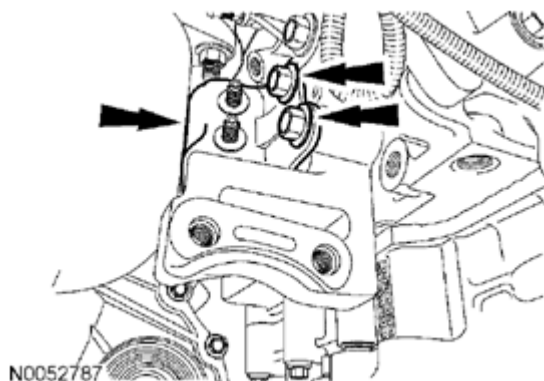


Fig. 231: Locating Bolts And RH Exhaust Heat Shield Bracket (Inboard Half)
Courtesy of FORD MOTOR CO.

65. Remove the 3 nuts (2 shown in the illustration) and the RH catalytic converter.

- Discard the nuts and gasket.

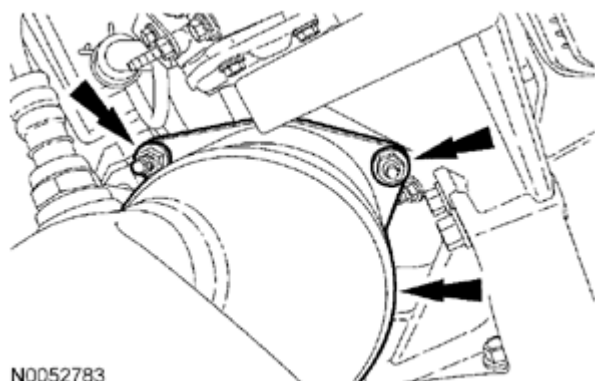


Fig. 232: Locating Nuts And RH Catalytic Converter
Courtesy of FORD MOTOR CO.

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

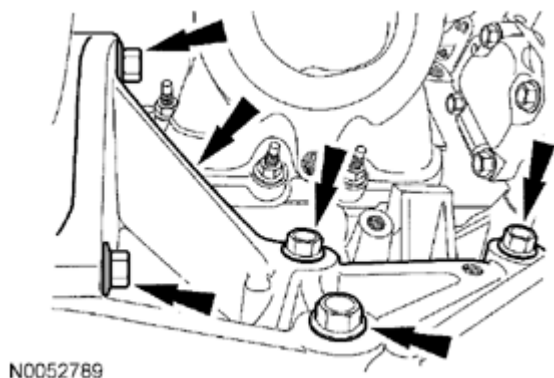


Fig. 233: Locating Bolts And PTU Support Bracket
Courtesy of FORD MOTOR CO.

67. Remove the 5 bolts and the PTU.

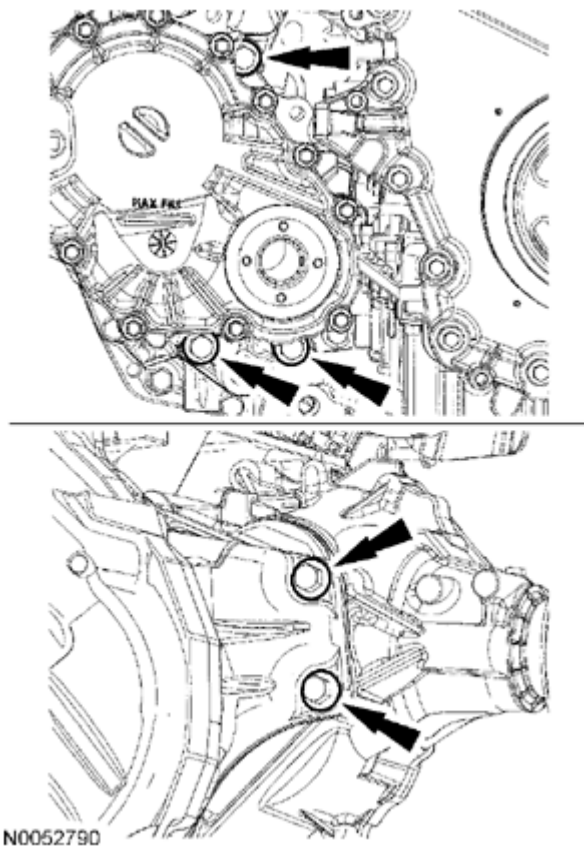


Fig. 234: Locating Bolts And PTU
Courtesy of FORD MOTOR CO.

All vehicles

68. Remove the torque converter nut access plug.

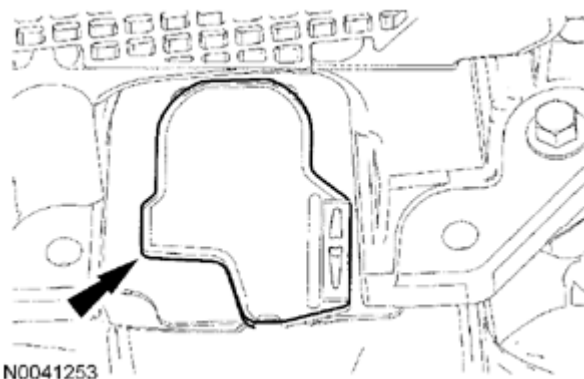


Fig. 235: Locating Torque Converter Nut Access Plug
Courtesy of FORD MOTOR CO.

69. Remove the 4 torque converter nuts.

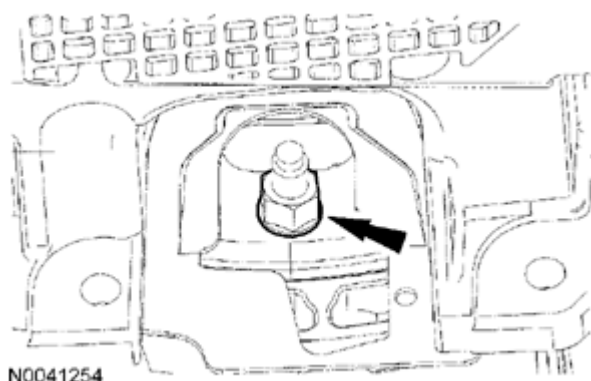


Fig. 236: Locating Torque Converter Nuts
Courtesy of FORD MOTOR CO.

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

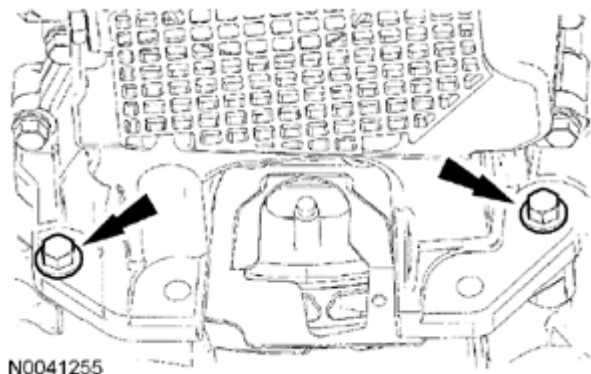


Fig. 237: Locating Oil Pan-To-Transaxle Bolts
Courtesy of FORD MOTOR CO.

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

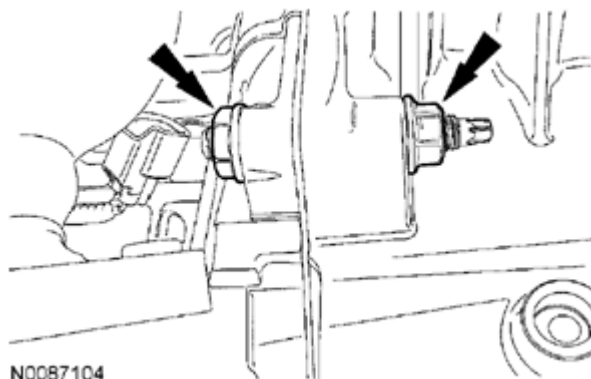


Fig. 238: Locating Nuts And Transaxle-To-Engine Stud
Courtesy of FORD MOTOR CO.

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

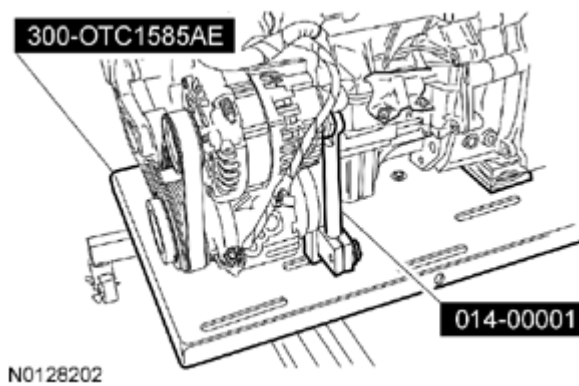


Fig. 239: Installing Powertrain Lift And Adjustable Grip Arm Onto Engine
Courtesy of FORD MOTOR CO.

72. Install the Powertrain Lift and the Adjustable Grip Arm onto the engine.
 - Raise the engine and transaxle 25.4 mm (1 in) to neutralize the engine and transaxle mounts.
73. Remove the rear transaxle support through bolt.

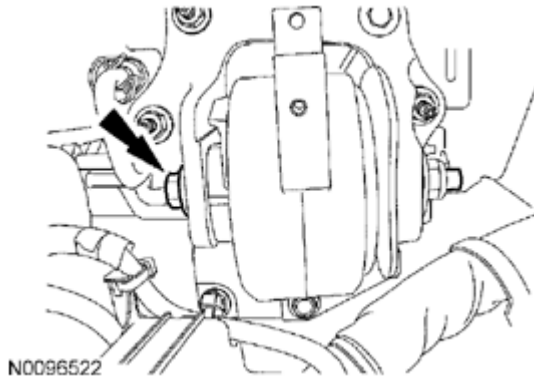


Fig. 240: Locating Rear Transaxle Support Through Bolt
Courtesy of FORD MOTOR CO.

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

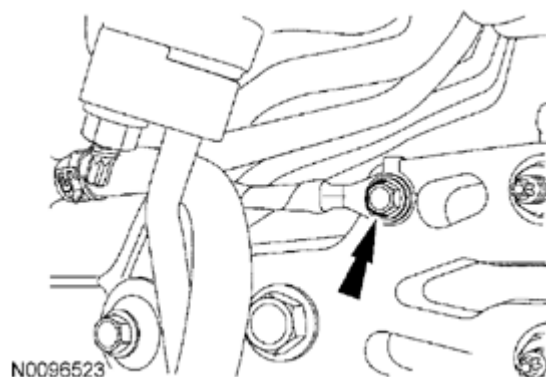


Fig. 241: Locating Bolt And Ground Strap On Engine Mount Bracket
Courtesy of FORD MOTOR CO.

75. Remove the bolt and damper.

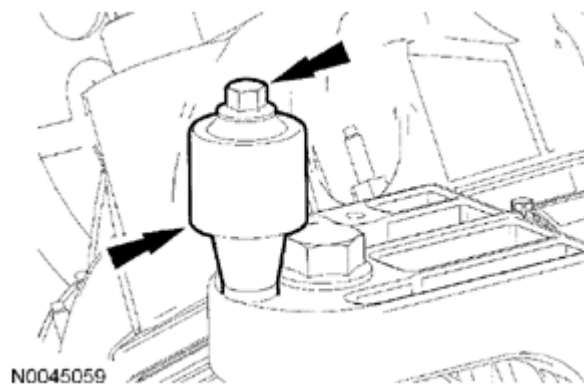


Fig. 242: Locating Bolt And Damper
Courtesy of FORD MOTOR CO.

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

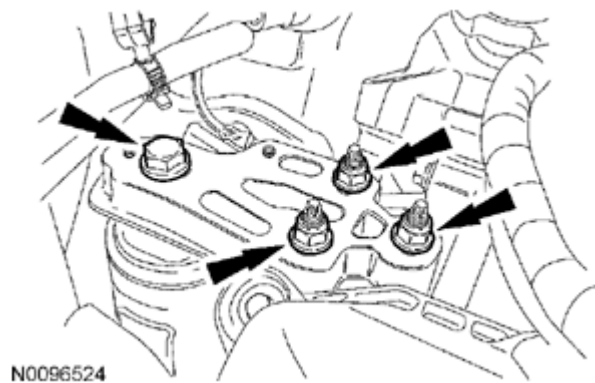


Fig. 243: Locating Bolt, Nuts And Engine Mount Bracket
Courtesy of FORD MOTOR CO.

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

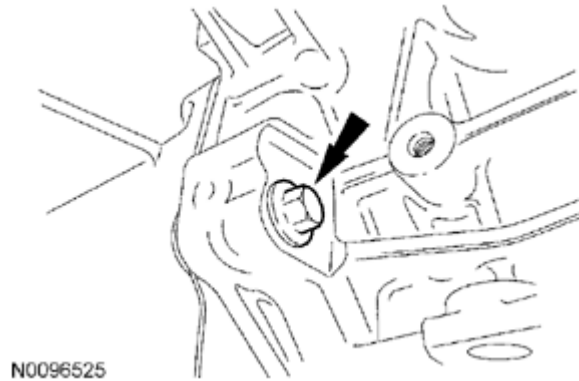


Fig. 244: Locating Transaxle-To-Engine Bolt
Courtesy of FORD MOTOR CO.

79. Install the Adjustable Grip Arm and the Engine Lifting Bracket.

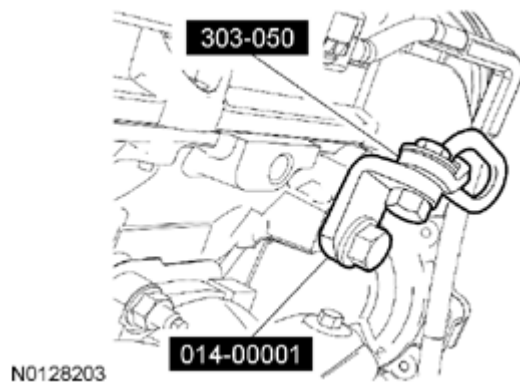


Fig. 245: Installing Adjustable Grip Arm And Engine Lifting Bracket
Courtesy of FORD MOTOR CO.

80. Install the Engine Lifting Bracket.

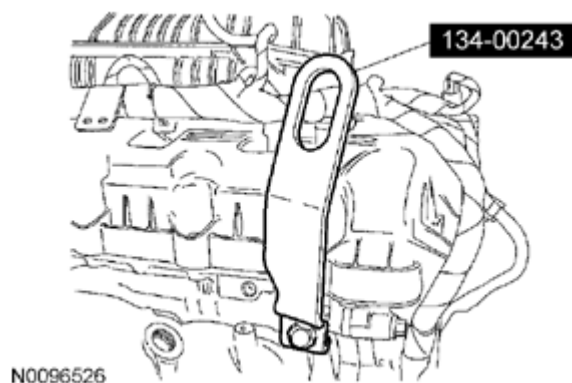


Fig. 246: Identifying Engine Lifting Bracket
Courtesy of FORD MOTOR CO.

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.

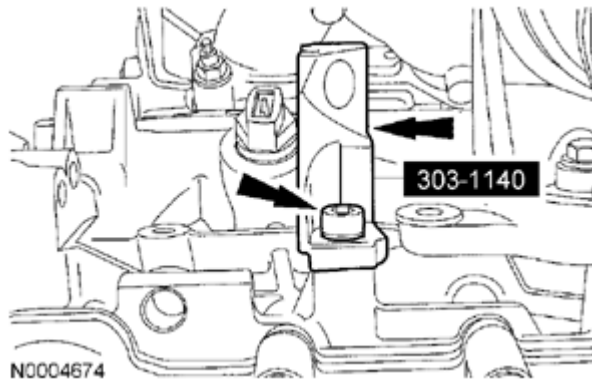


Fig. 247: Locating Lower Half Of Engine Lifting Bracket Set
Courtesy of FORD MOTOR CO.

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

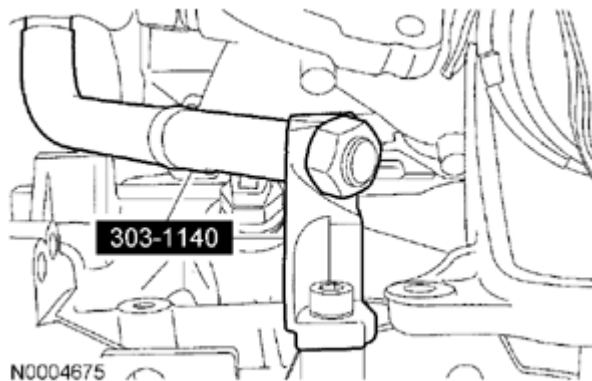


Fig. 248: Locating Upper Half Of Engine Lifting Bracket Set
Courtesy of FORD MOTOR CO.

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.

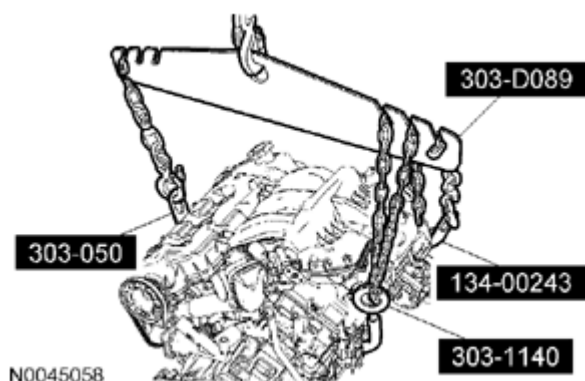


Fig. 249: Removing Engine And Transaxle From Lift Table Using Special Tools
Courtesy of FORD MOTOR CO.

84. Remove the nut and the starter wiring ground.

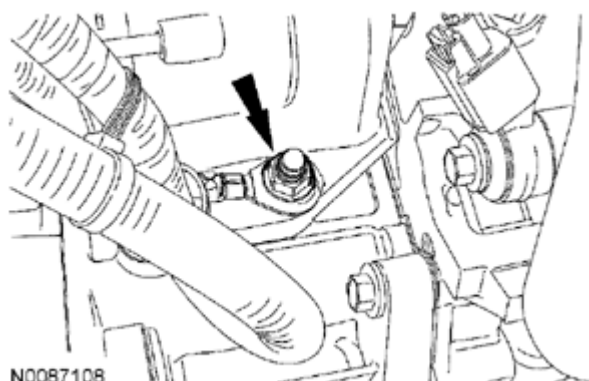


Fig. 250: Locating Starter Wiring Ground Nut
Courtesy of FORD MOTOR CO.

85. Remove the 2 nuts and the starter wiring.

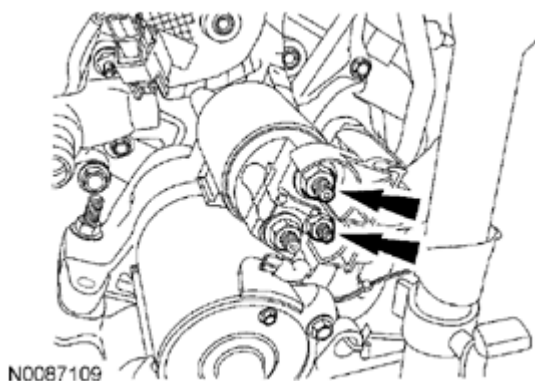


Fig. 251: Locating Starter Wiring Nuts
Courtesy of FORD MOTOR CO.

86. Remove the 2 stud bolts and the starter.

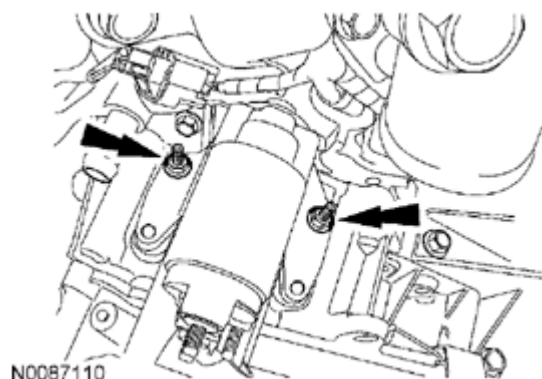


Fig. 252: Locating Starter Stud Bolts
Courtesy of FORD MOTOR CO.

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

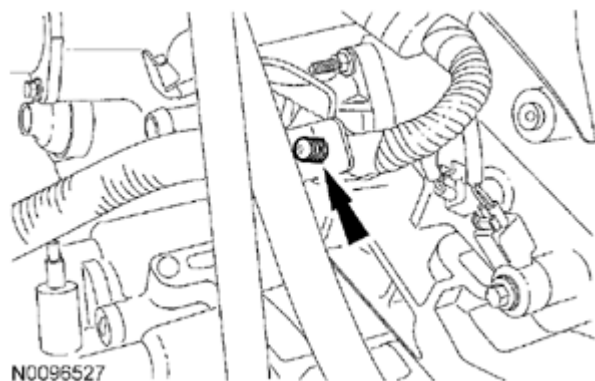


Fig. 253: Locating Wiring Harness Retainer Of Transmission Indicator Tube
Courtesy of FORD MOTOR CO.

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

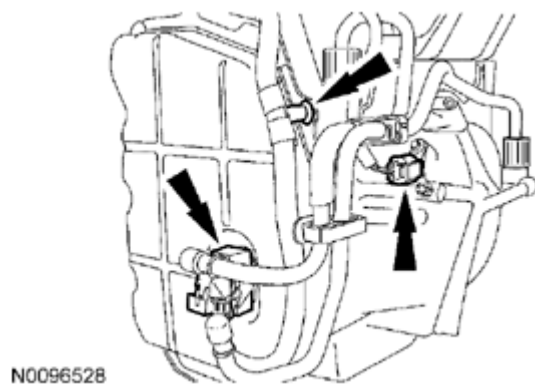


Fig. 254: Locating Transmission Electrical Connectors, Wiring Retainer And Stud Bolt

Courtesy of FORD MOTOR CO.

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

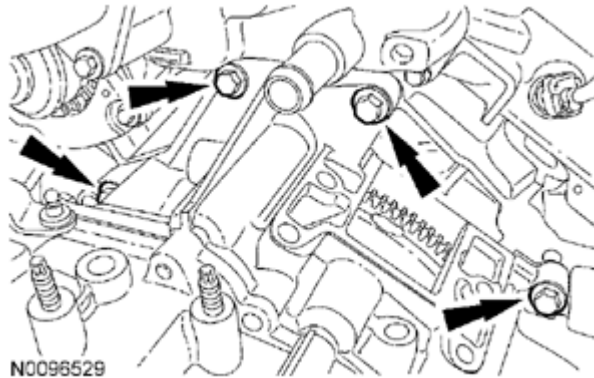


Fig. 255: Locating Transaxle-To-Engine Bolts
Courtesy of FORD MOTOR CO.

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

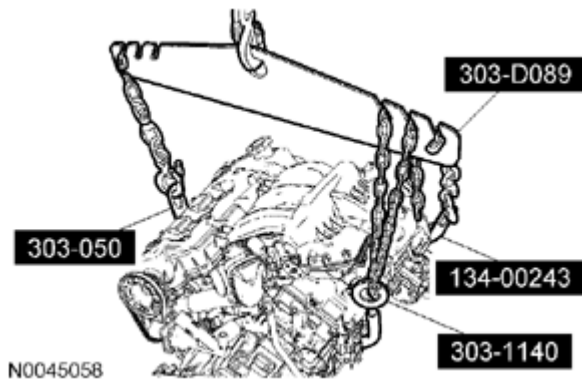


Fig. 256: Separating Engine And Transaxle Using Special Tools
Courtesy of FORD MOTOR CO.

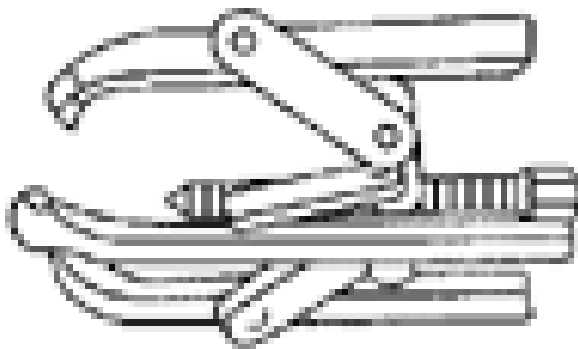
DISASSEMBLY

ENGINE

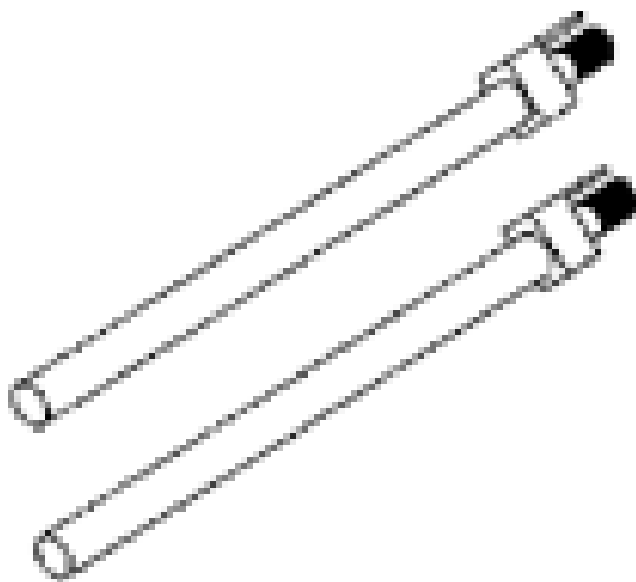
Special Tools

SPECIAL TOOL(S)

3 Jaw Puller
303-D121



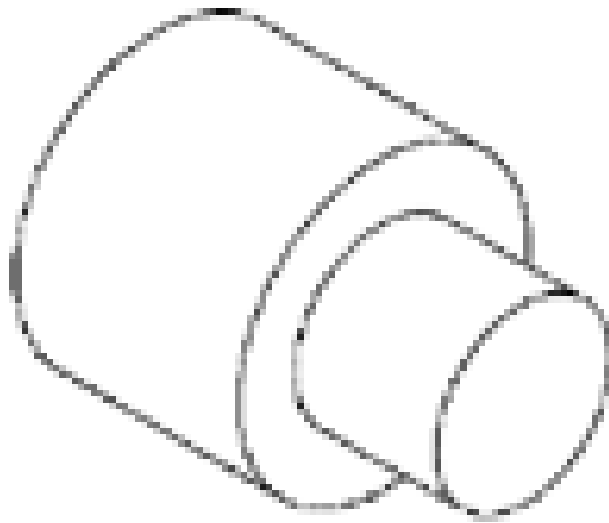
ST1184-A



ST1982-A

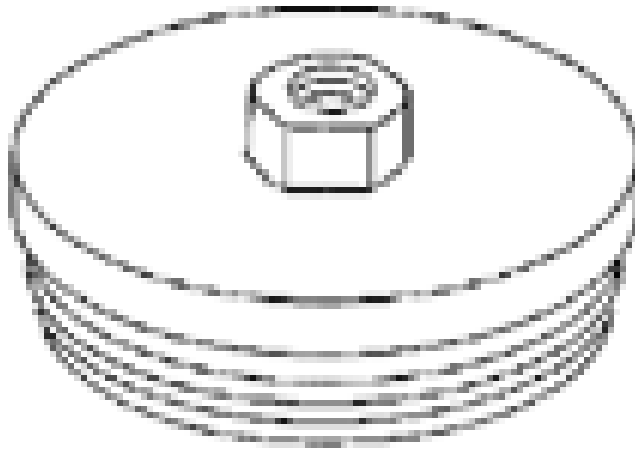
Installer, Connecting Rod
303-462 (T94P-6136-AH)

Plate, Water Pump Pulley
303-456 (T94P-6312-AH1), part of 303-S455

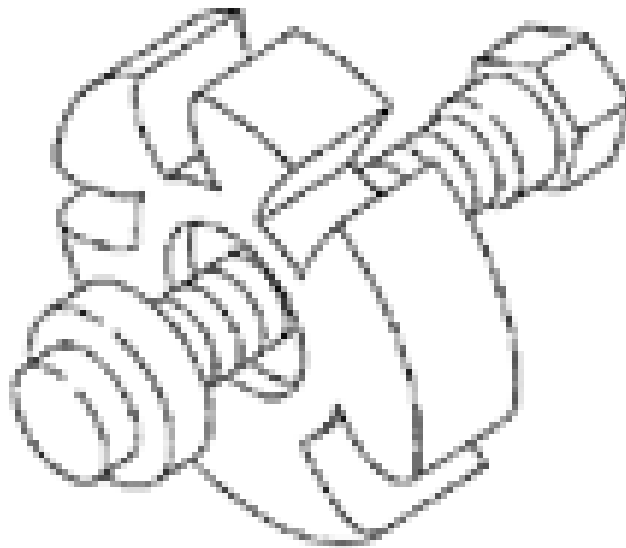
**ST3044-A****ST3045-A**

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

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



ST1382-A



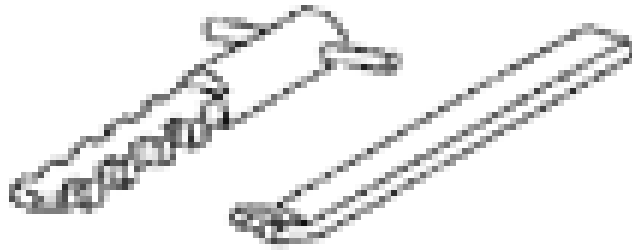
ST1286-A

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

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

2011 Mercury Milan

2011 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan



ST1385-A



ST3085-A

Remover, Stretchy Belt
303-1419

Slide Hammer
307-005 (T59L-100-B)



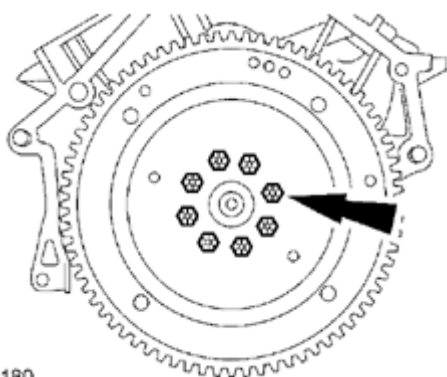
ST1187-A

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

NOTE: For additional information, refer to the exploded view under the Assembly procedure in this service information.

All engines

1. Remove the 8 bolts and the flexplate.



A0011180

Fig. 257: Locating Flexplate Bolts
Courtesy of FORD MOTOR CO.

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

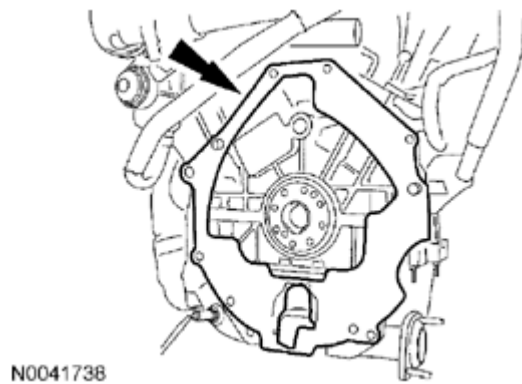


Fig. 258: Locating Engine-To-Transaxle Separator Plate
Courtesy of FORD MOTOR CO.

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

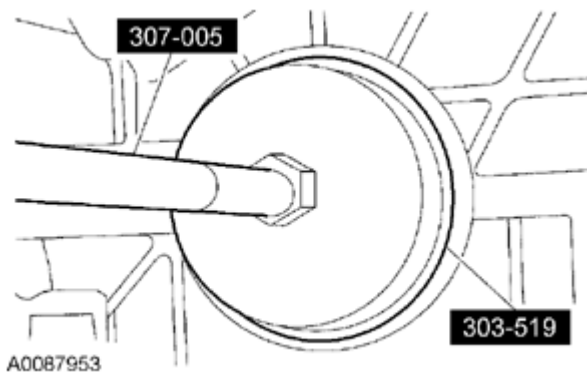


Fig. 259: Removing Crankshaft Rear Oil Seal Using Slide Hammer And Crankshaft Rear Oil Seal Remover
Courtesy of FORD MOTOR CO.

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

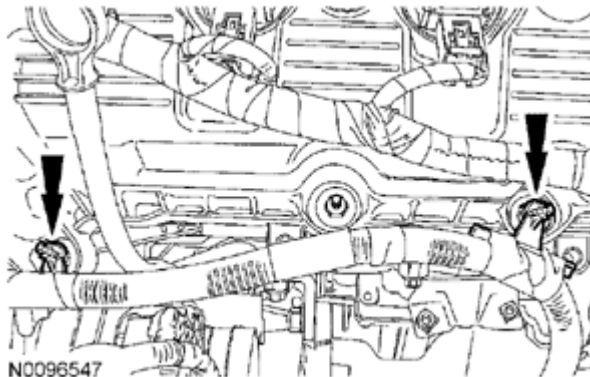


Fig. 260: Locating B+ Wiring Harness Retainers Of Valve Cover Stud Bolts
Courtesy of FORD MOTOR CO.

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

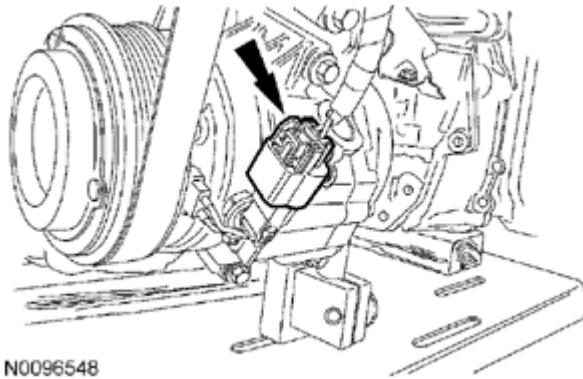


Fig. 261: Locating A/C Compressor Clutch Electrical Connector
Courtesy of FORD MOTOR CO.

7. Disconnect the generator electrical connector.

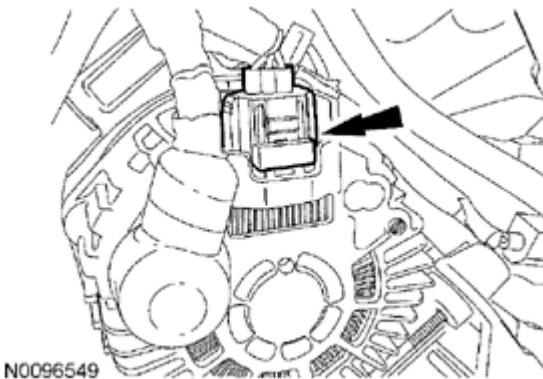


Fig. 262: Locating Generator Electrical Connector
Courtesy of FORD MOTOR CO.

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

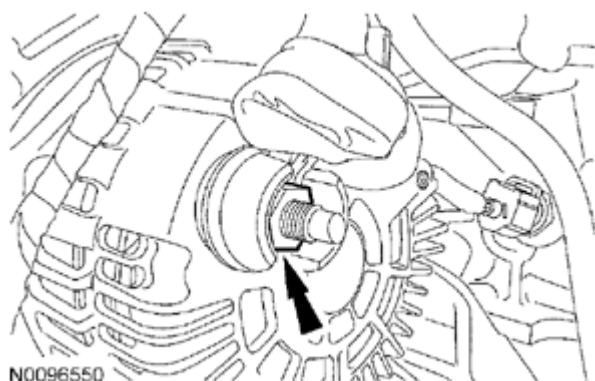


Fig. 263: Locating Generator B+ Wire Nut
Courtesy of FORD MOTOR CO.

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.

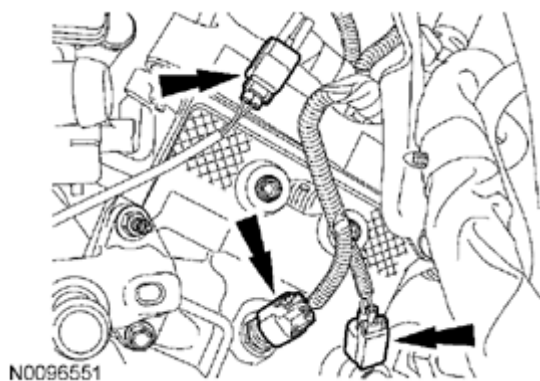


Fig. 264: Locating Engine Block Knock Sensor Electrical Connector And Cylinder Head KS Electrical Connector
Courtesy of FORD MOTOR CO.

10. Disconnect the electronic throttle control electrical connector.

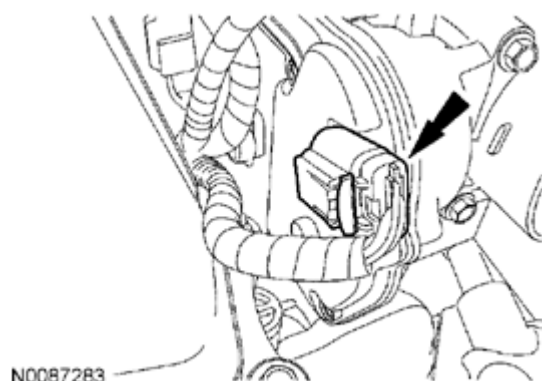


Fig. 265: Locating Electronic Throttle Control Electrical Connector
Courtesy of FORD MOTOR CO.

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

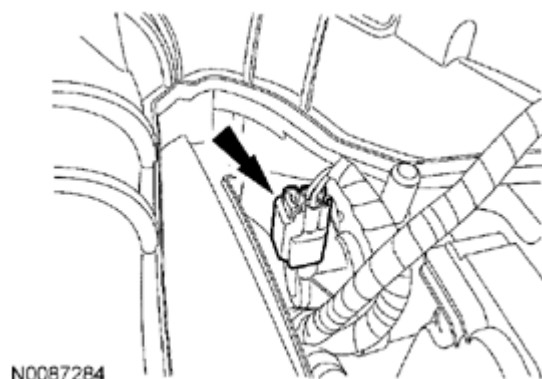


Fig. 266: Locating Evaporative Emission Canister Purge Valve Electrical Connector
Courtesy of FORD MOTOR CO.

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

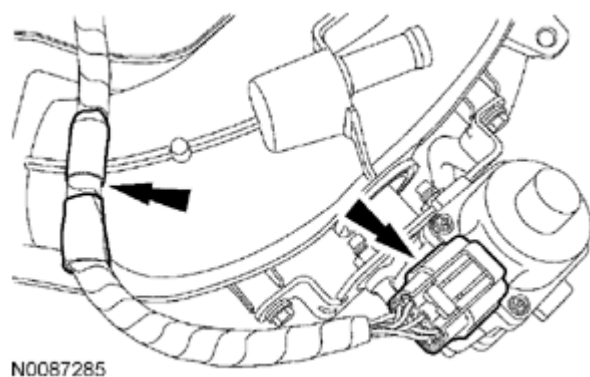


Fig. 267: Locating EGR Regulator Electrical Connector And Wiring Retainer
Courtesy of FORD MOTOR CO.

13. Disconnect the PCV valve electrical connector.

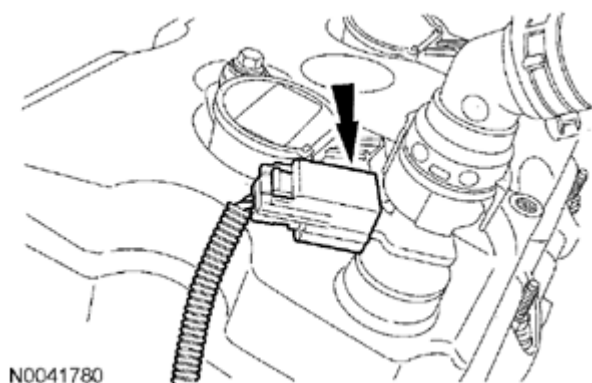


Fig. 268: Locating PCV Valve Electrical Connector
Courtesy of FORD MOTOR CO.

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

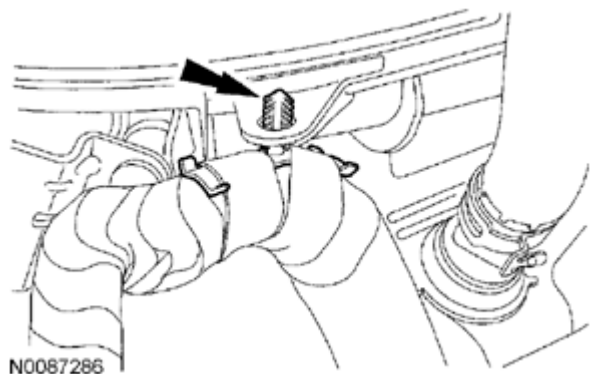


Fig. 269: Locating Wiring Harness Retainer Of Upper Intake Manifold
Courtesy of FORD MOTOR CO.

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

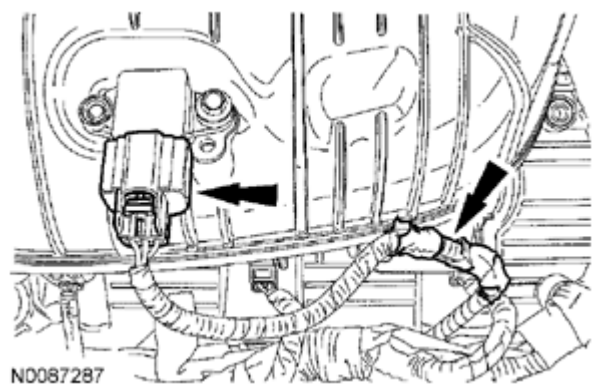


Fig. 270: Locating Manifold Absolute Pressure Electrical Connector And Wiring Retainer

Courtesy of FORD MOTOR CO.

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

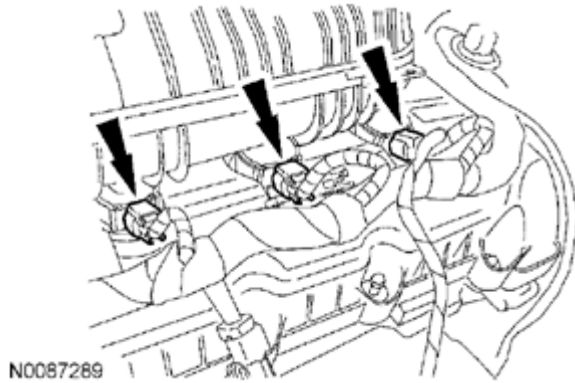


Fig. 271: Locating RH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

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

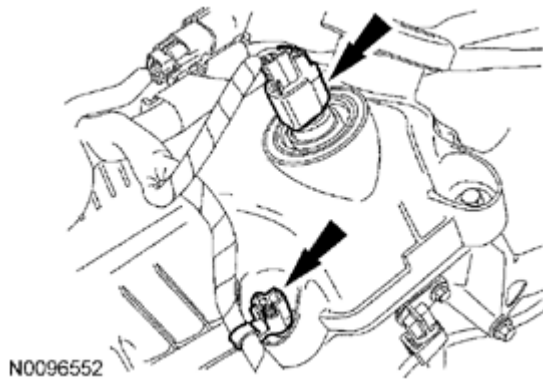


Fig. 272: Locating RH Variable Camshaft Timing Electrical Connector And Wiring Harness Retainer
Courtesy of FORD MOTOR CO.

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

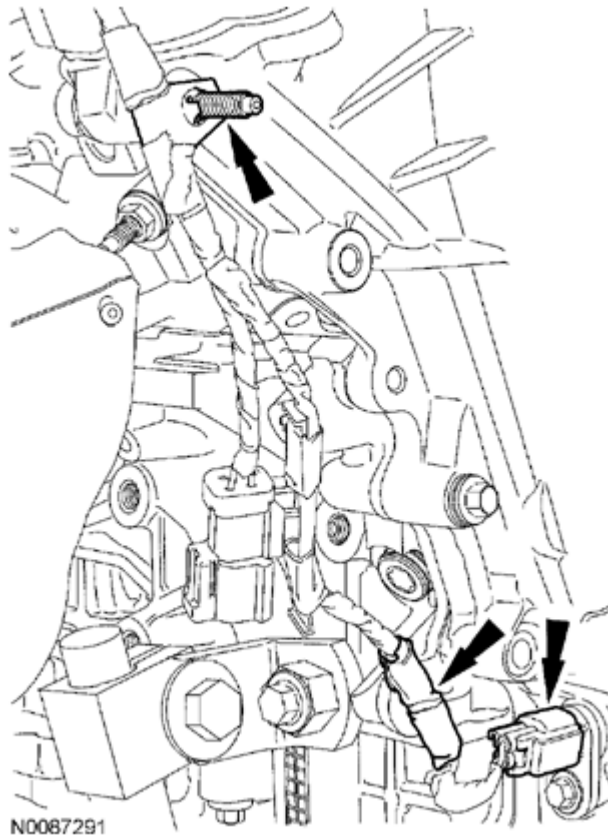


Fig. 273: Locating Crankshaft Position Sensor Electrical Connector And Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

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

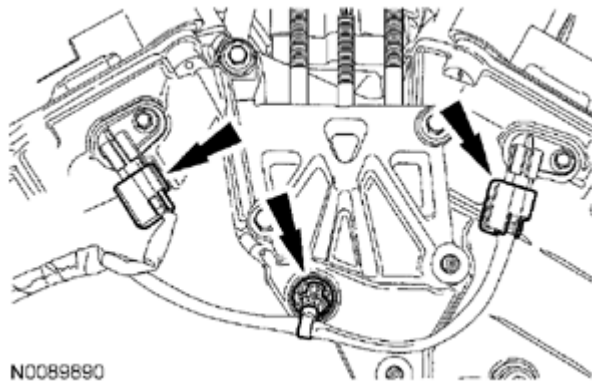


Fig. 274: Locating Camshaft Position Sensor Electrical Connectors, Wiring Harness Retainer And Engine Front Cover Stud Bolt
Courtesy of FORD MOTOR CO.

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



Fig. 275: Locating Fuel Injector Wiring Harness Electrical Connector And Wiring Harness Retainer

Courtesy of FORD MOTOR CO.

21. Disconnect the LH VCT electrical connector.

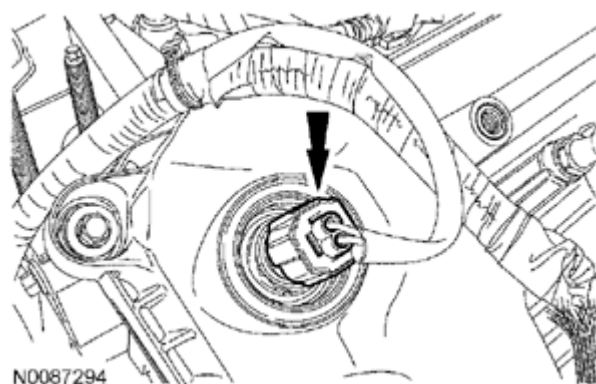


Fig. 276: Locating LH VCT Electrical Connector

Courtesy of FORD MOTOR CO.

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

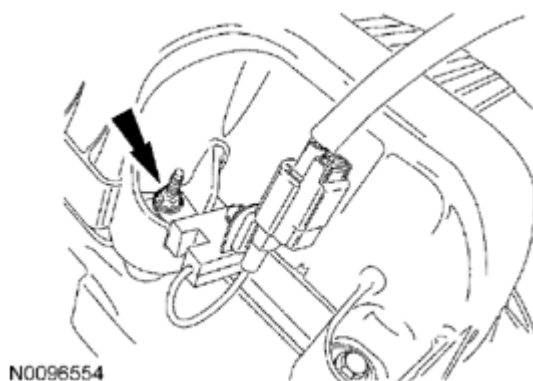


Fig. 277: Locating Radio Frequency Interference Capacitor Nut

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.

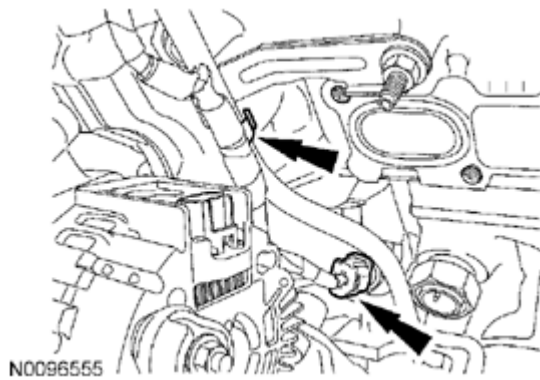


Fig. 278: Locating Engine Oil Pressure Switch Electrical Connector And Wiring Retainer Of Oil Indicator Tube

Courtesy of FORD MOTOR CO.

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

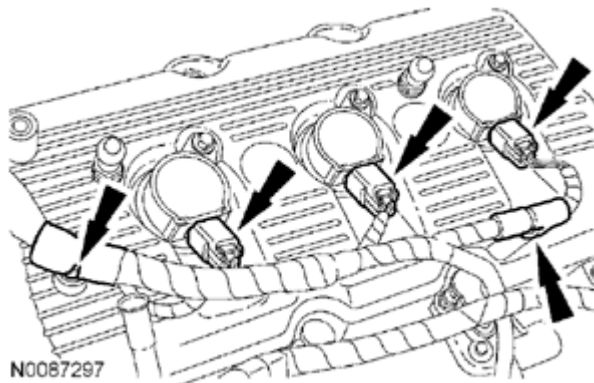


Fig. 279: Locating LH Coil-On-Plug Electrical Connectors

Courtesy of FORD MOTOR CO.

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

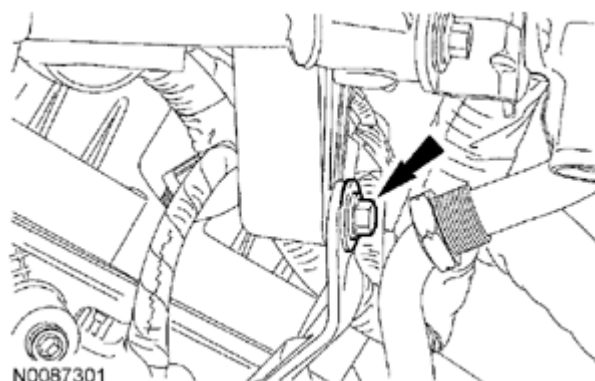


Fig. 280: Locating Upper Intake Manifold Bracket Bolts
Courtesy of FORD MOTOR CO.

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

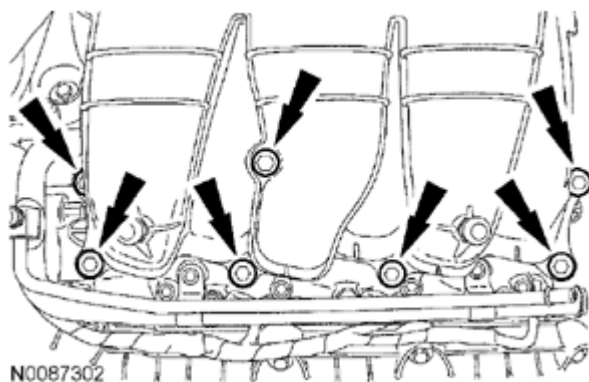


Fig. 281: Locating Upper Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

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

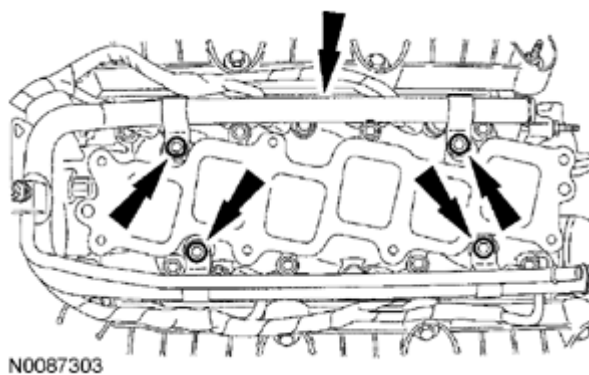


Fig. 282: Locating Fuel Rail And Injectors Assembly Bolts
Courtesy of FORD MOTOR CO.

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

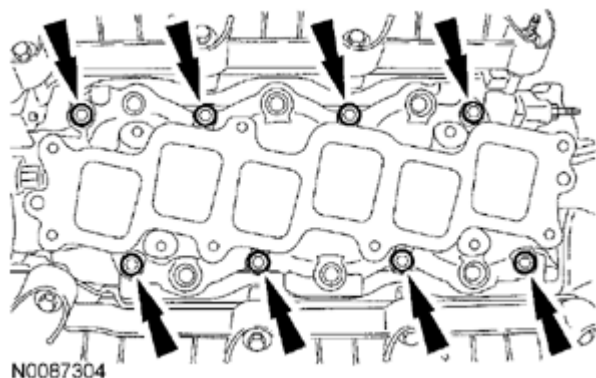


Fig. 283: Locating Lower Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

FWD vehicles

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

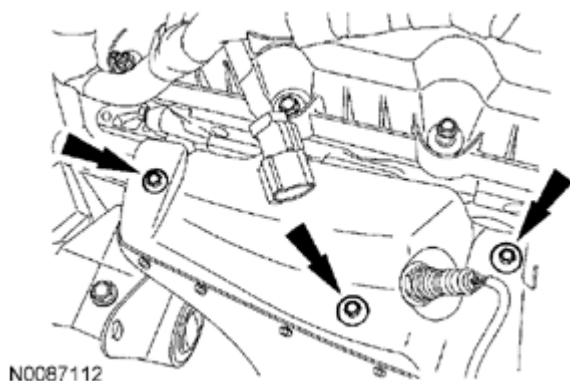


Fig. 284: Locating RH Heat Shield Bolts
Courtesy of FORD MOTOR CO.

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

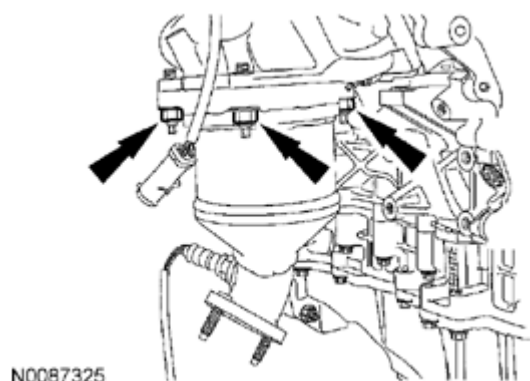


Fig. 285: Locating RH Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

All engines

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

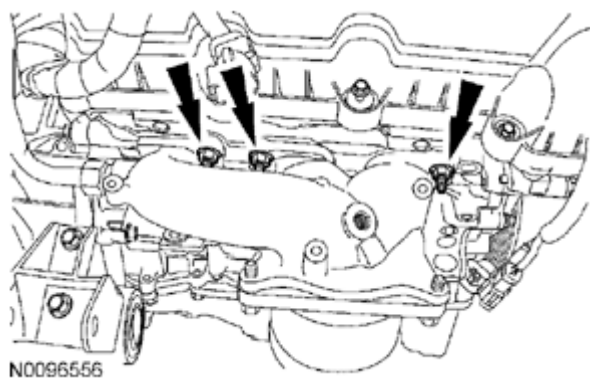


Fig. 286: Locating RH Exhaust Manifold Nuts
Courtesy of FORD MOTOR CO.

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

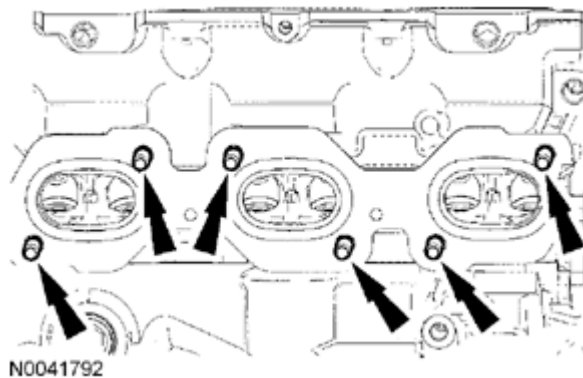


Fig. 287: Locating RH Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

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

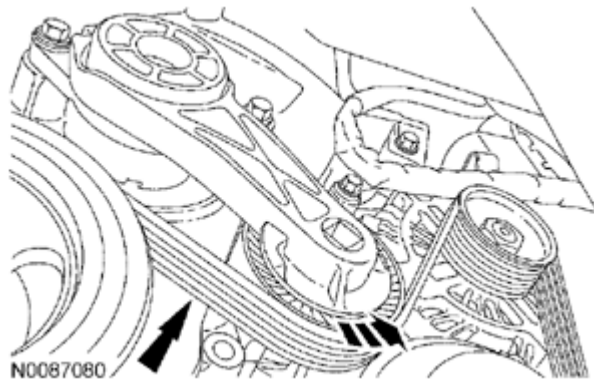


Fig. 288: Rotating Accessory Drive Belt Tensioner Counterclockwise
Courtesy of FORD MOTOR CO.

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

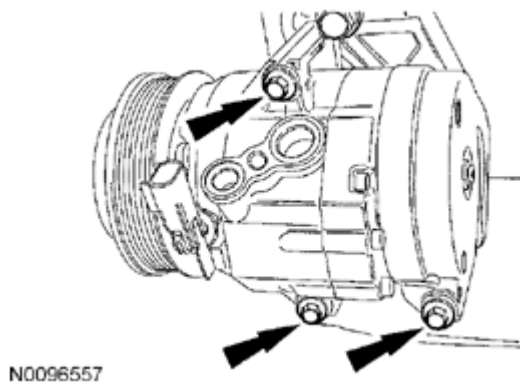


Fig. 289: Locating A/C Compressor Bolts
Courtesy of FORD MOTOR CO.

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

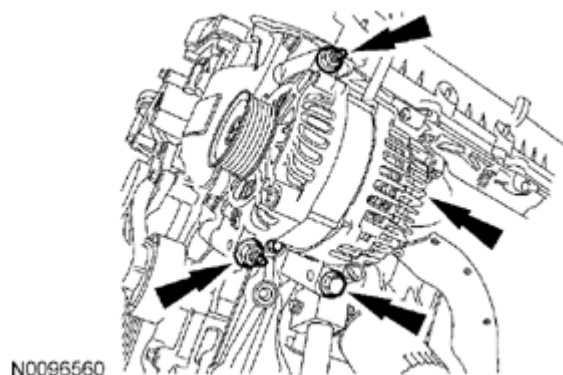


Fig. 290: Locating Generator Bolt And Nuts
Courtesy of FORD MOTOR CO.

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

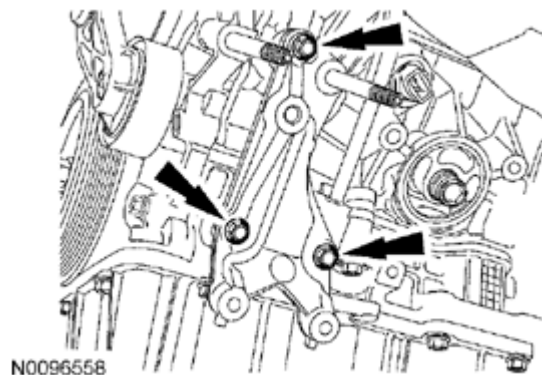


Fig. 291: Locating Bolts And A/C Compressor Bracket
Courtesy of FORD MOTOR CO.

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

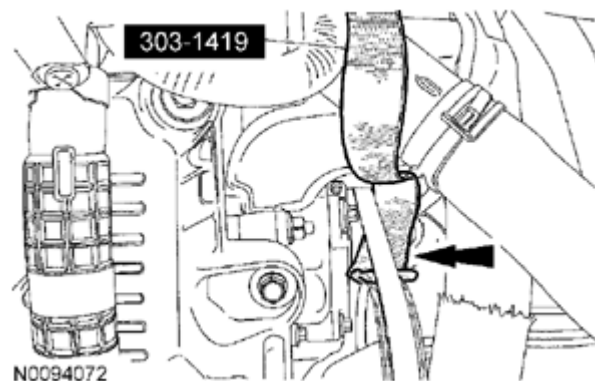


Fig. 292: Positioning Stretchy Belt Remover Under Coolant Pump Belt

Courtesy of FORD MOTOR CO.

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

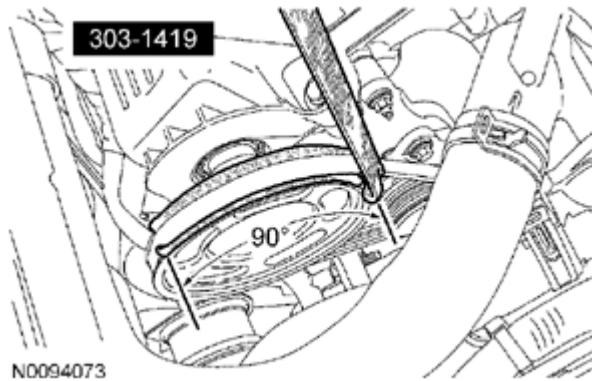


Fig. 293: Turning Crankshaft Clockwise And Feed Stretchy Belt Remover Evenly On Camshaft Coolant Pump Pulley
Courtesy of FORD MOTOR CO.

39. Turn the crankshaft clockwise and feed the Stretchy Belt Remover evenly on the camshaft coolant pump pulley as shown in the illustration.
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. 294: Removing Coolant Pump Belt
Courtesy of FORD MOTOR CO.

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

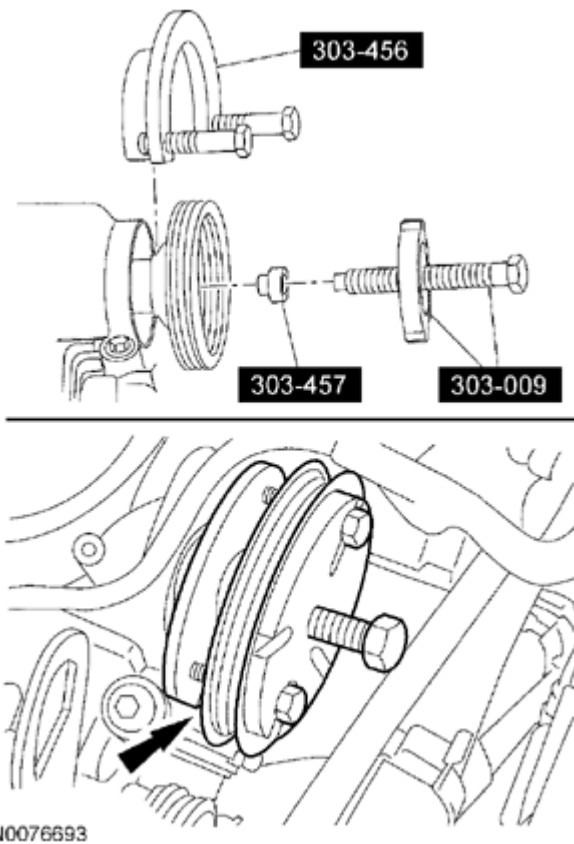


Fig. 295: Removing Coolant Pump Pulley Using Special Tools
Courtesy of FORD MOTOR CO.

41. Using the Water Pump Pulley Plate, Water Pump Shaft Protector and the Crankshaft Vibration Damper Remover, remove the coolant pump pulley.
42. Remove the 5 coolant pump housing bolts.

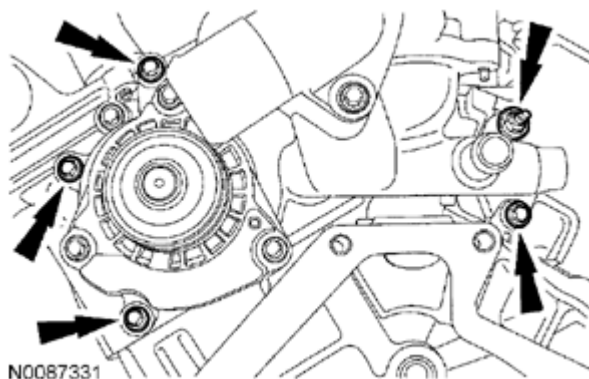


Fig. 296: Locating Coolant Pump Housing Bolts
Courtesy of FORD MOTOR CO.

43. Loosen the clamp and detach the coolant hose.

- Remove the coolant pump housing.

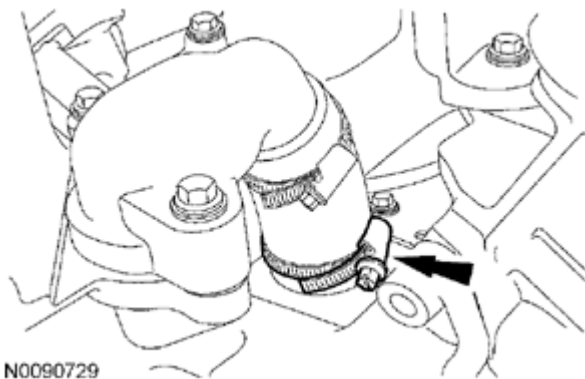


Fig. 297: Locating Coolant Hose Clamp
Courtesy of FORD MOTOR CO.

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

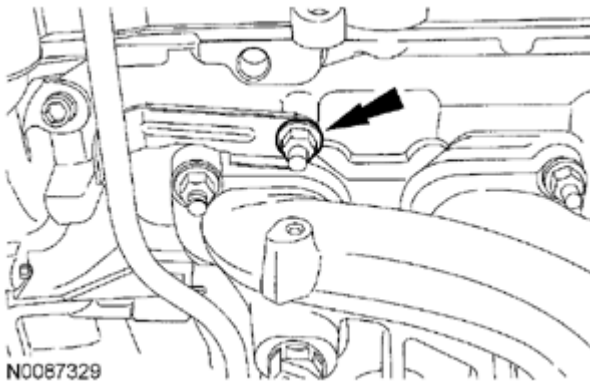


Fig. 298: Locating Oil Level Indicator And Tube Stud Bolt
Courtesy of FORD MOTOR CO.

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

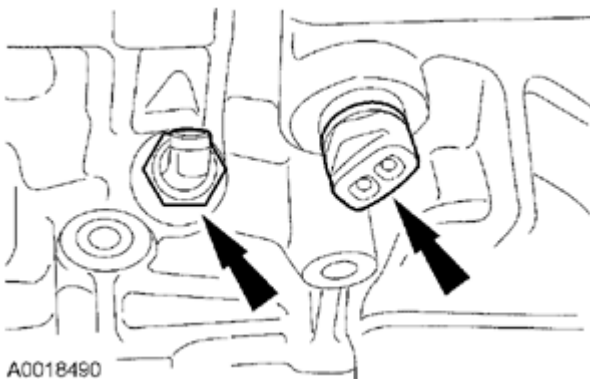


Fig. 299: Locating EOP Switch And Block Heater
Courtesy of FORD MOTOR CO.

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

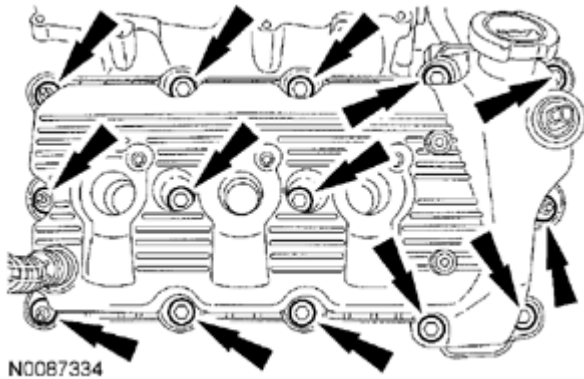


Fig. 300: Locating RH Valve Cover Bolts
Courtesy of FORD MOTOR CO.

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

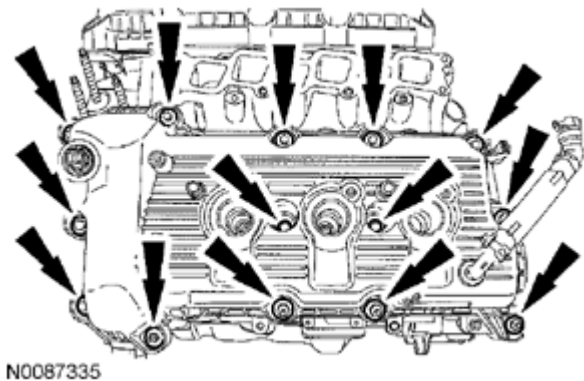


Fig. 301: Locating LH Valve Cover Bolts
Courtesy of FORD MOTOR CO.

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

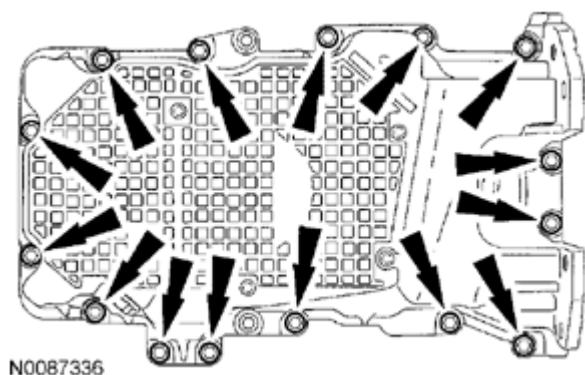


Fig. 302: Locating Oil Pan Bolts
Courtesy of FORD MOTOR CO.

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

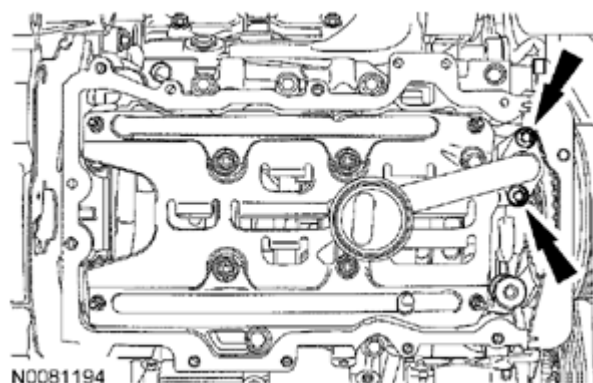


Fig. 303: Locating Oil Pump Screen And Pickup Tube Bolts
Courtesy of FORD MOTOR CO.

50. Remove and discard the O-ring seal.

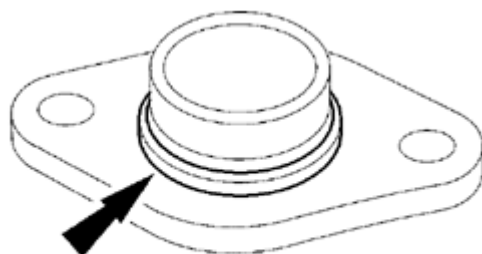


Fig. 304: Locating O-Ring Seal
Courtesy of FORD MOTOR CO.

51. Remove the oil pan baffle.

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

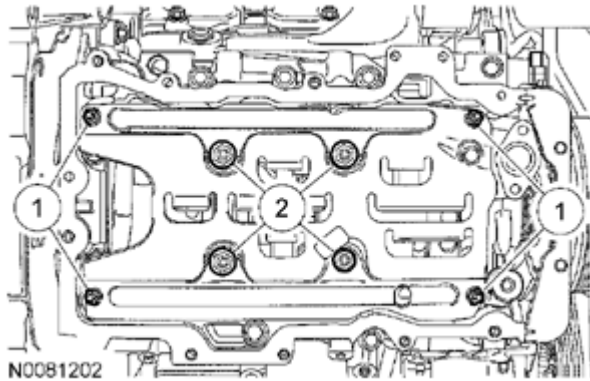


Fig. 305: Identifying M6 And M8 Oil Pan Baffle Nuts
Courtesy of FORD MOTOR CO.

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

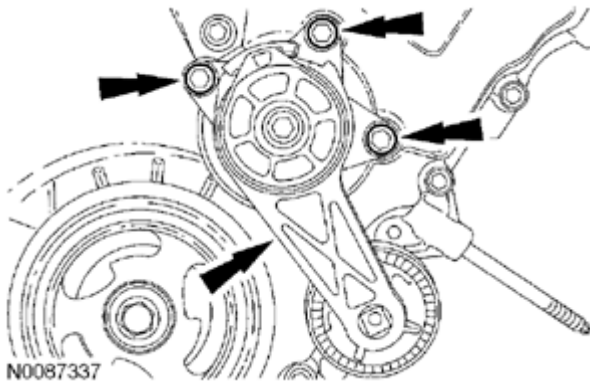


Fig. 306: Locating Accessory Drive Belt Tensioner And Bolts
Courtesy of FORD MOTOR CO.

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

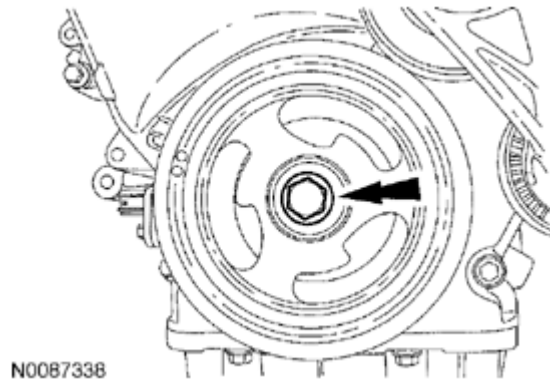
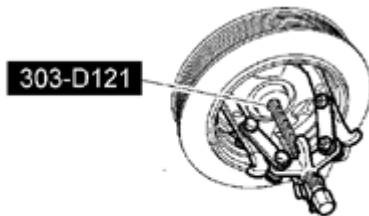


Fig. 307: Locating Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

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



N0010528

Fig. 308: Removing Crankshaft Pulley Using 3 Jaw Puller
Courtesy of FORD MOTOR CO.

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

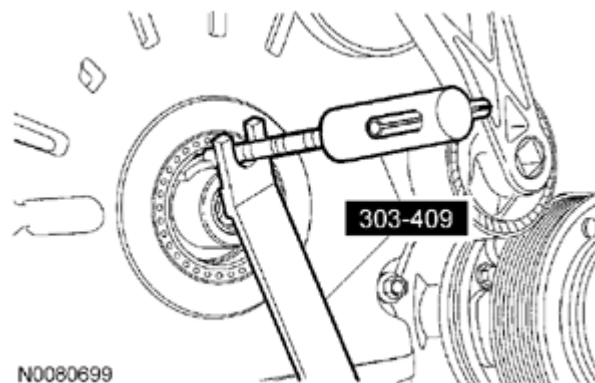


Fig. 309: Removing Crankshaft Front Seal Using Oil Seal Remover
Courtesy of FORD MOTOR CO.

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

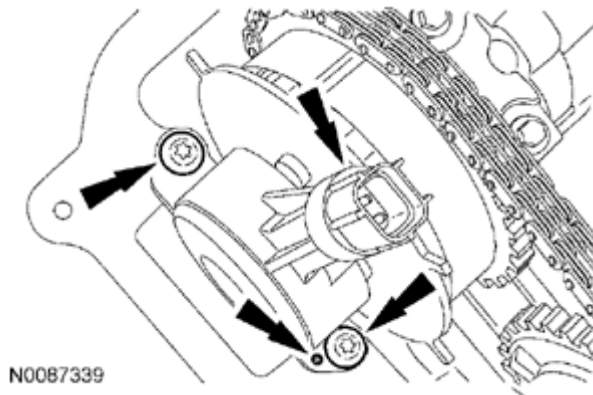


Fig. 310: Locating LH VCT Connector And Bolts
Courtesy of FORD MOTOR CO.

56. Remove the 2 bolts and the LH VCT.

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

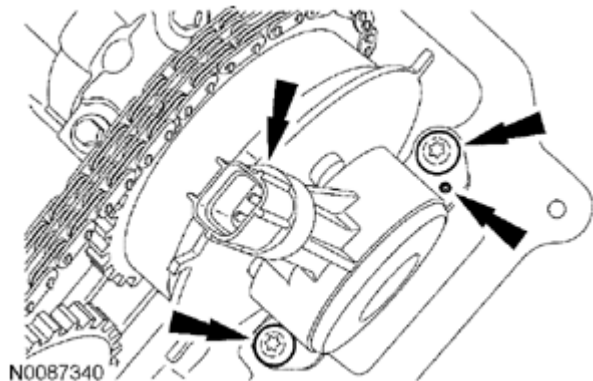
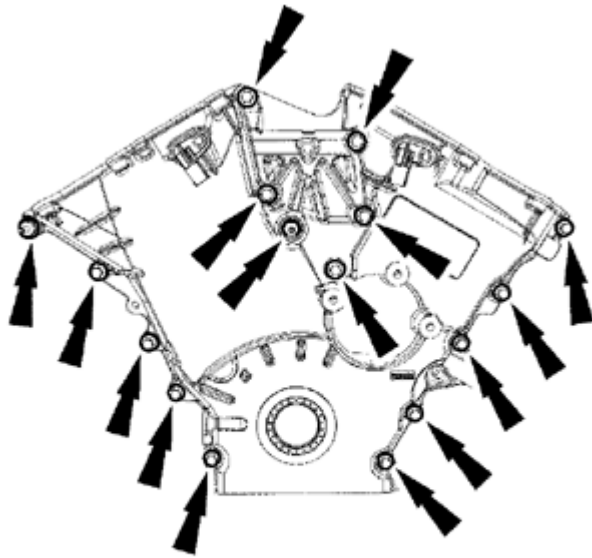


Fig. 311: Locating RH VCT Connector And Bolts
Courtesy of FORD MOTOR CO.

57. Remove the 2 bolts and the RH VCT.

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.



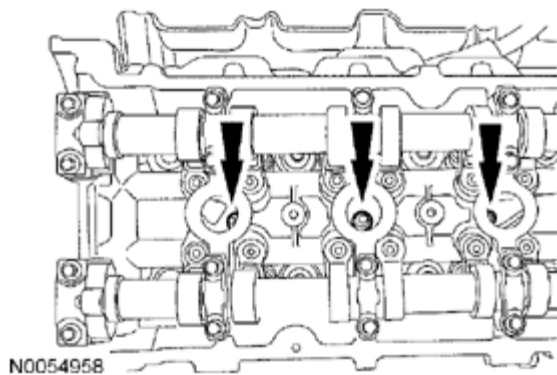
N0089881

Fig. 312: Locating Engine Front Cover, Bolts And Stud Bolts
Courtesy of FORD MOTOR CO.

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

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 in the illustration, RH similar.



N0054958

Fig. 313: Locating Spark Plugs
Courtesy of FORD MOTOR CO.

59. Remove the LH and RH spark plugs.

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).

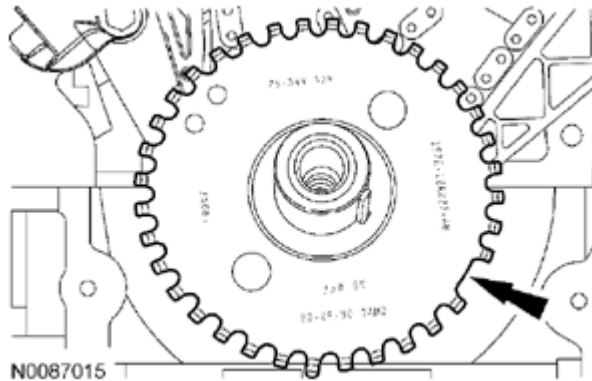


Fig. 314: Identifying Ignition Pulse Wheel
Courtesy of FORD MOTOR CO.

60. Remove the ignition pulse wheel.
61. Install the crankshaft pulley bolt and washer.

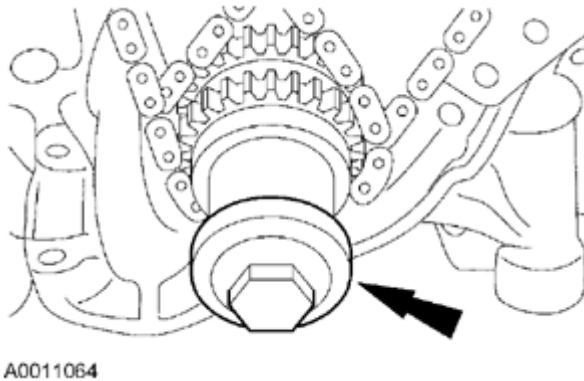
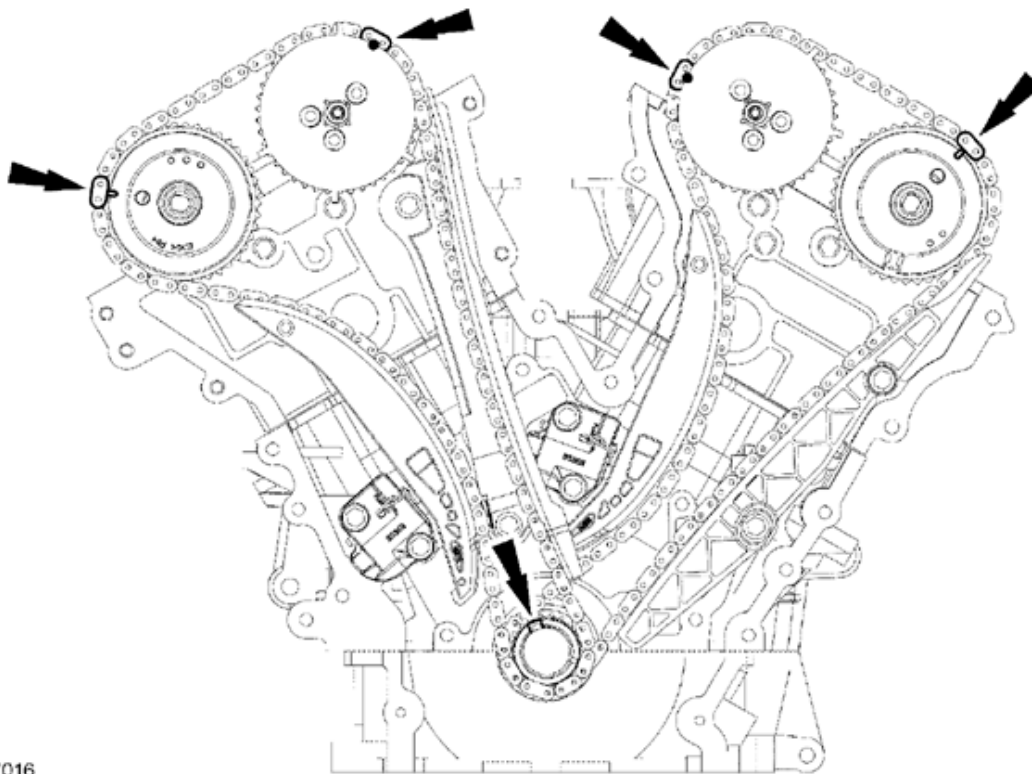


Fig. 315: Locating Crankshaft Pulley Bolt And Washer
Courtesy of FORD MOTOR CO.

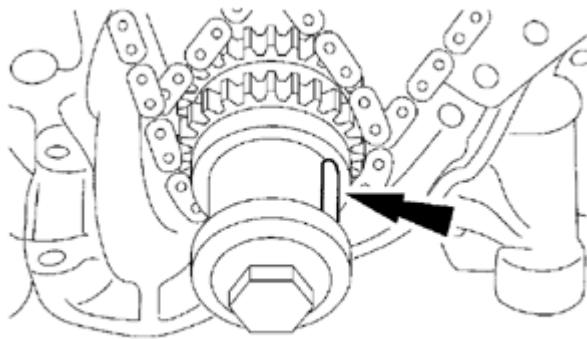
62. Rotate the crankshaft clockwise to position the crankshaft keyway in the 11 o'clock position and position the camshafts in the correct position. This will position the No. 1 cylinder at Top Dead Center (TDC).
 - Verify that the camshafts are correctly located. If not, rotate the crankshaft one additional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



N0087016

Fig. 316: Locating Crankshaft Keyway In 11 O'Clock Position
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. 317: Locating Crankshaft 3 O'Clock Position
Courtesy of FORD MOTOR CO.

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

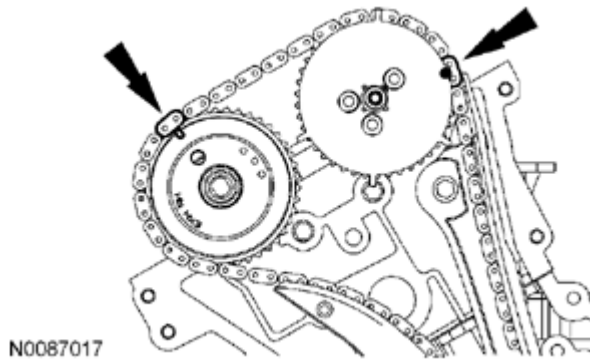


Fig. 318: Identifying RH Camshafts Are In Neutral Position
Courtesy of FORD MOTOR CO.

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

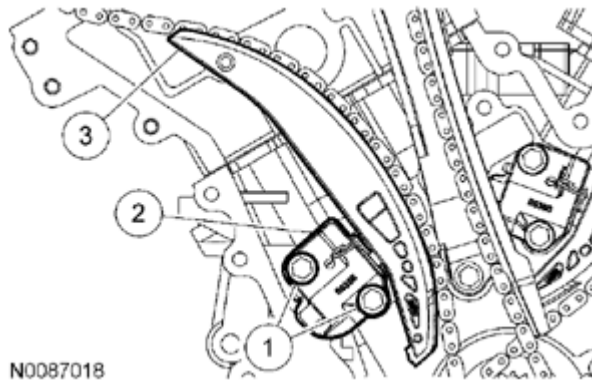


Fig. 319: Identifying RH Timing Chain Tensioner, Tensioner Arm And Bolts
Courtesy of FORD MOTOR CO.

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

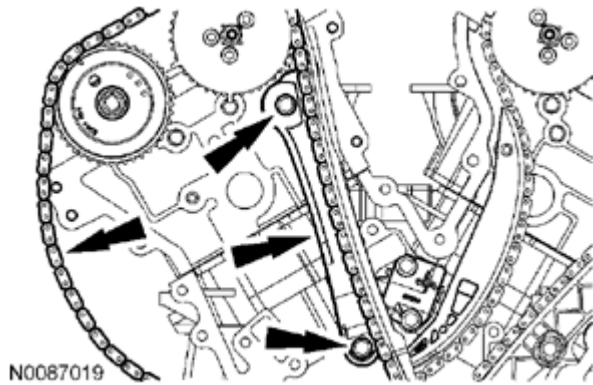


Fig. 320: Locating RH Timing Chain Guide And Bolts
Courtesy of FORD MOTOR CO.

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.

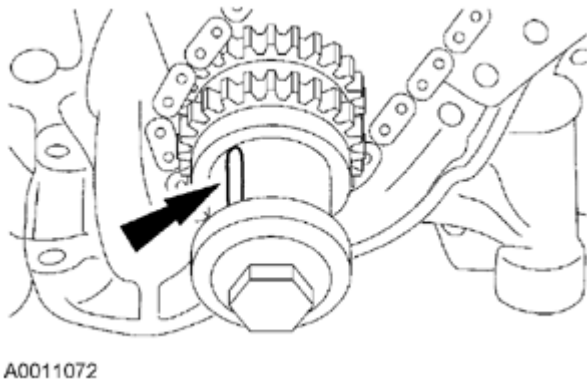


Fig. 321: Locating Crankcase Keyway In 11 O'Clock Position
Courtesy of FORD MOTOR CO.

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

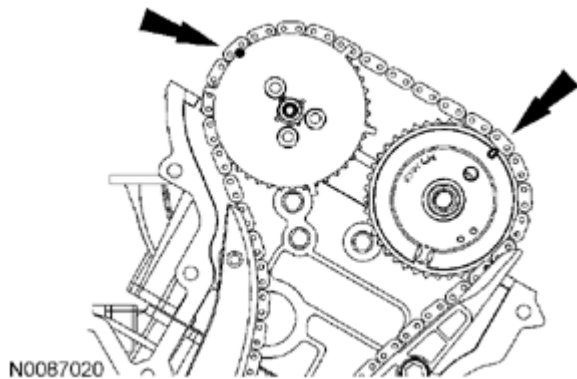


Fig. 322: Identifying LH Camshafts Are In Neutral Position
Courtesy of FORD MOTOR CO.

69. Remove the LH timing chain and tensioner arm.

1. Remove the 2 bolts.
2. Remove the tensioner.
3. Remove the tensioner arm.

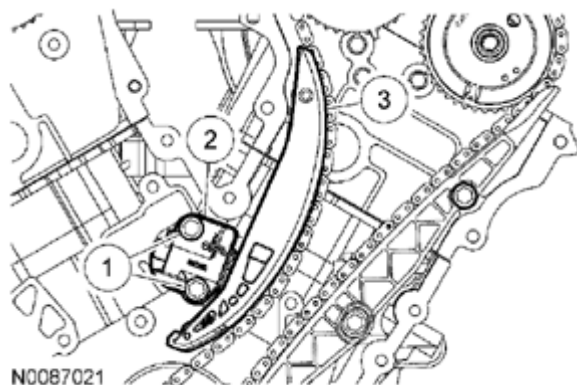


Fig. 323: Identifying LH Timing Chain, Tensioner Arm And Bolts
Courtesy of FORD MOTOR CO.

70. Remove the 2 bolts and the LH timing chain guide.

- Remove the LH timing chain from the engine.

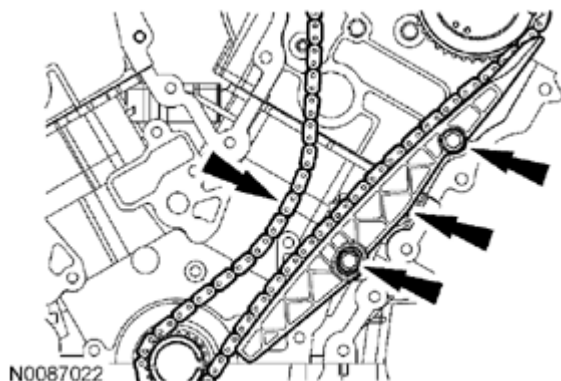


Fig. 324: Locating Bolts And LH Timing Chain Guide
Courtesy of FORD MOTOR CO.

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

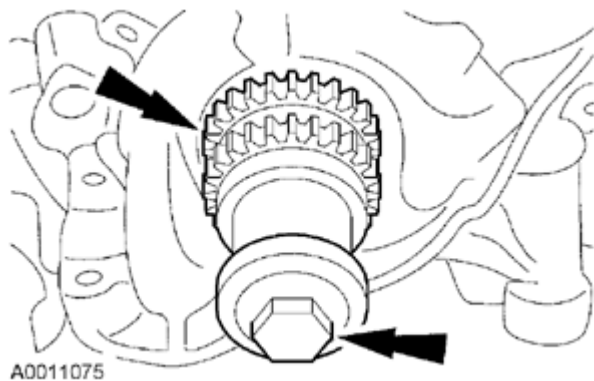


Fig. 325: Locating Crankshaft Pulley Bolt And Crankshaft Sprocket
 Courtesy of FORD MOTOR CO.

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

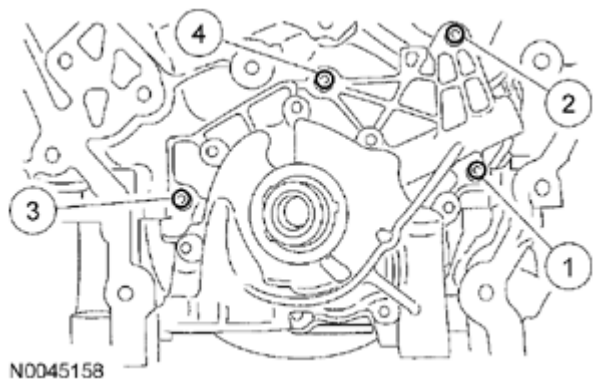


Fig. 326: Identifying Oil Pump Bolts Removing Sequence
 Courtesy of FORD MOTOR CO.

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

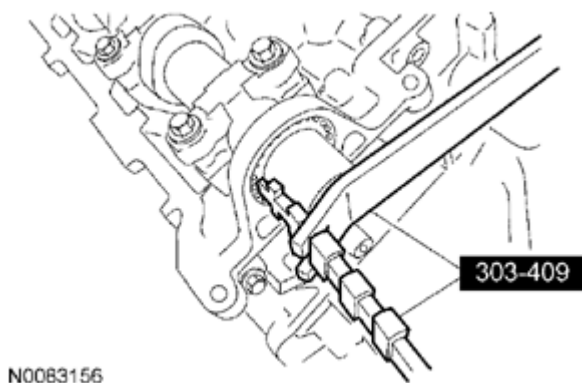


Fig. 327: Removing Camshaft Oil Seal Using Oil Seal Remover
Courtesy of FORD MOTOR CO.

73. Using the Oil Seal Remover, remove the camshaft oil seal and discard.
74. Remove the 2 bolts and the camshaft oil seal retainer.
 - Discard the press-in-place gasket.

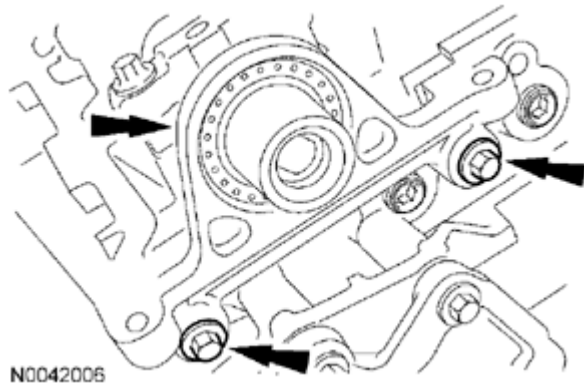


Fig. 328: Locating Camshaft Oil Seal Retainer And Bolts
Courtesy of FORD MOTOR CO.

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

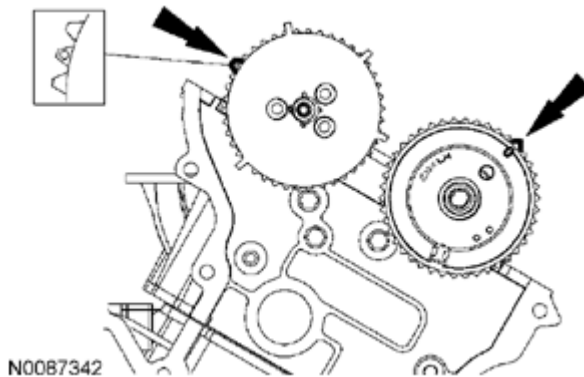


Fig. 329: Identifying LH Camshafts Are In Neutral Position
Courtesy of FORD MOTOR CO.

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

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.

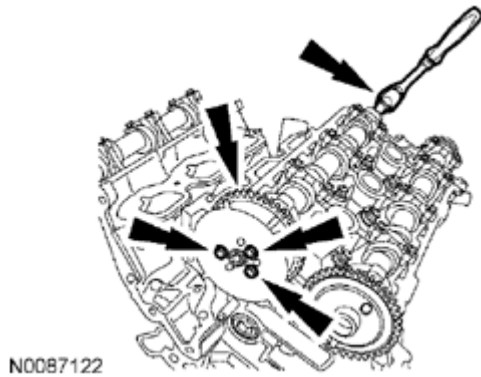


Fig. 330: Remove/Install LH Camshaft Phaser, Sprocket And Bolts
Courtesy of FORD MOTOR CO.

76. Remove the 3 bolts and the LH camshaft phaser and sprocket.
77. Remove and discard the VCT system oil filter screen from the LH camshaft.

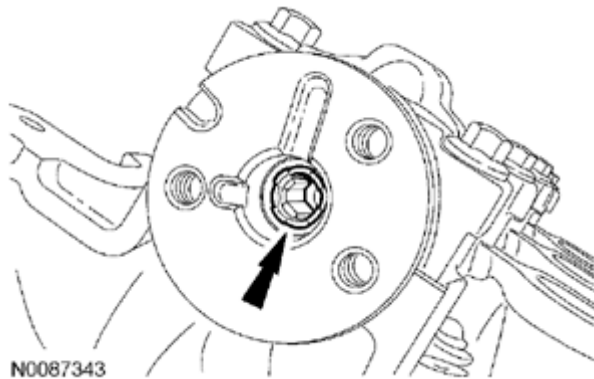
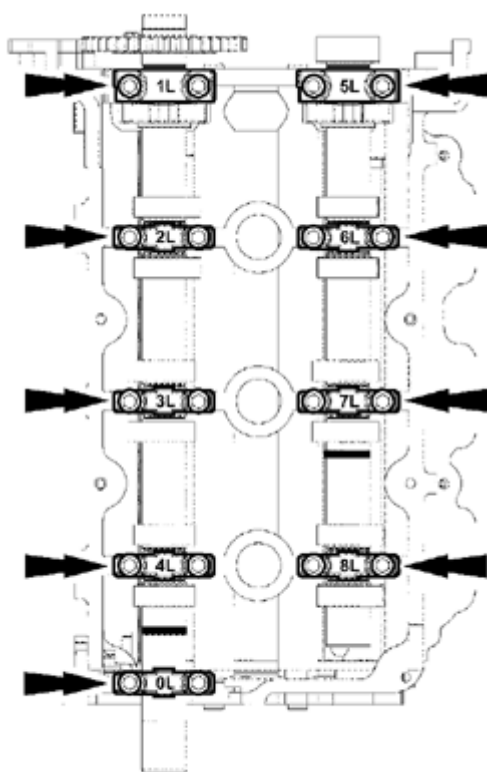


Fig. 331: Locating VCT System Oil Filter Screen
Courtesy of FORD MOTOR CO.

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 in illustration). 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.



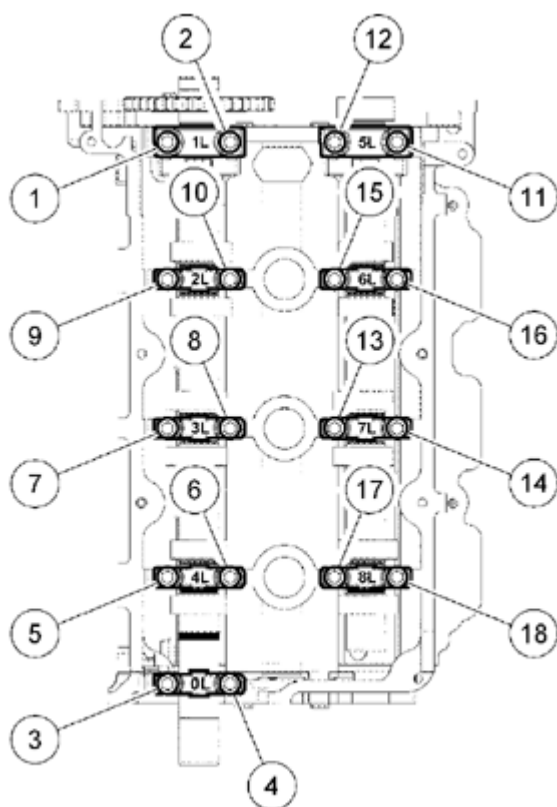
N0081817

Fig. 332: Locating Cylinder Head Camshaft Bearing Caps
Courtesy of FORD MOTOR CO.

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

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.



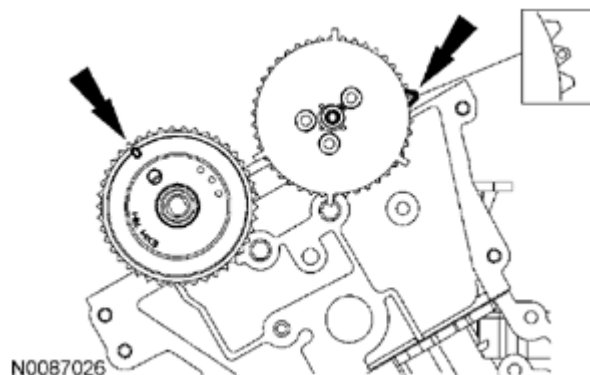
N0081818

Fig. 333: Identifying Camshaft Bearing Cap Bolts Loosening Sequence
Courtesy of FORD MOTOR CO.

79. Loosen the bolts evenly in the sequence shown in the illustration.

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



N0087026

Fig. 334: Identifying RH Camshafts Are In Neutral Position
Courtesy of FORD MOTOR CO.

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

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.

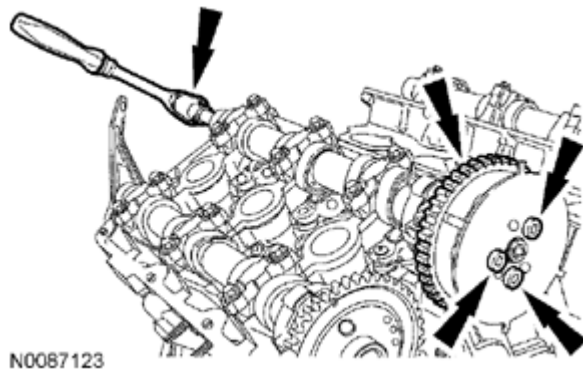


Fig. 335: Remove/Install RH Camshaft Phaser, Sprocket And Bolts
Courtesy of FORD MOTOR CO.

81. Remove the 3 bolts and the RH camshaft phaser and sprocket.
82. Remove and discard the VCT system oil filter screen from the RH camshaft.

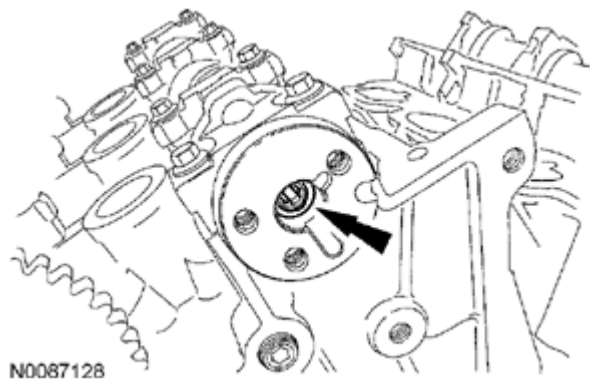
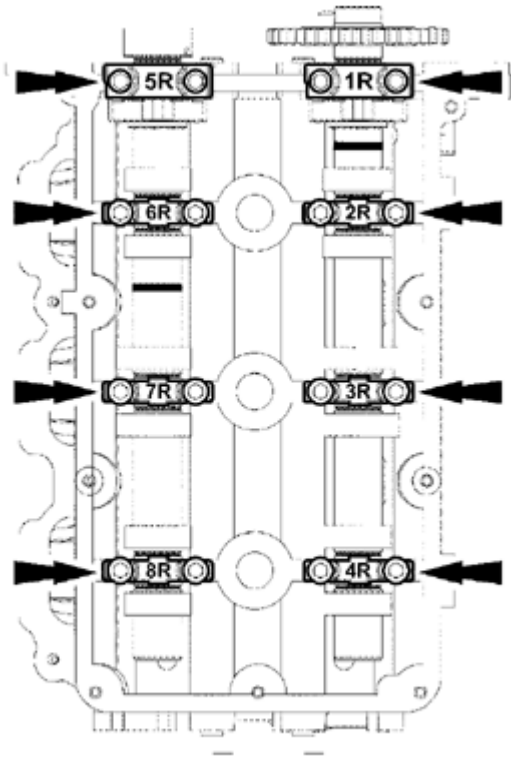


Fig. 336: Locating VCT System Oil Filter Screen
Courtesy of FORD MOTOR CO.

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 in illustration). 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.



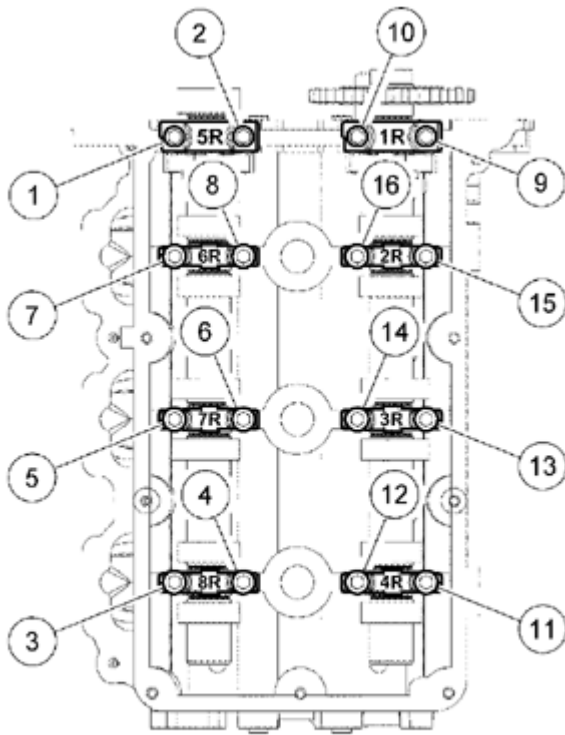
N0071867

Fig. 337: Locating Camshaft Bearing Cap Position And Orientation Mark
Courtesy of FORD MOTOR CO.

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

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. 338: Identifying Camshaft Bearing Caps Bolts Loosening Sequence
Courtesy of FORD MOTOR CO.

84. Loosen the bolts evenly in the sequence shown in the illustration.

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: 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 in the illustration, LH similar.

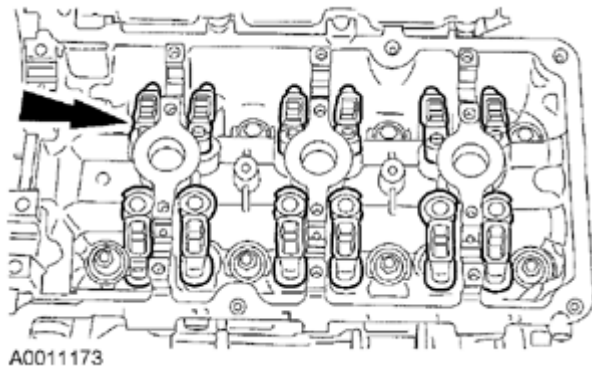


Fig. 339: Locating Camshaft Roller Followers
Courtesy of FORD MOTOR CO.

85. Remove the LH and RH camshaft roller followers.

- Mark the location of the roller followers, using a permanent-type marker.

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

86. Remove the hydraulic lash adjusters.

NOTE: RH shown in the illustration, LH similar.

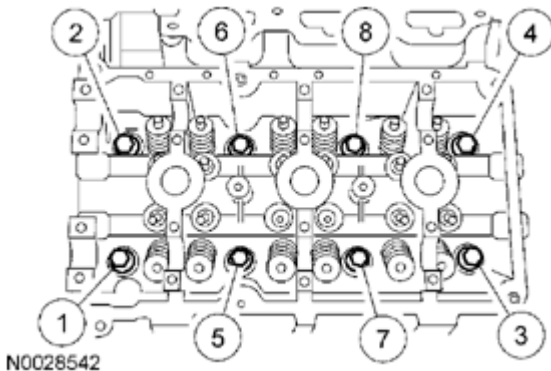


Fig. 340: Identifying Cylinder Head Bolts Loosening Sequence
Courtesy of FORD MOTOR CO.

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

- Discard the bolts and the gaskets.

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 **ENGINE SYSTEM - GENERAL INFORMATION** article.

89. Remove the bolts and the oil separator cover.

- Discard the gasket.

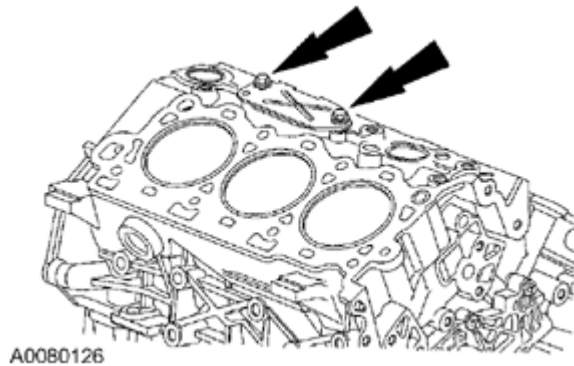


Fig. 341: Locating Oil Separator Cover Bolts
Courtesy of FORD MOTOR CO.

90. Remove the crankshaft key.

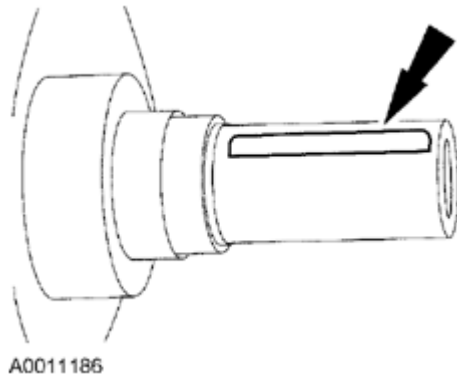


Fig. 342: Locating Crankshaft Key
Courtesy of FORD MOTOR CO.

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.

NOTE: Clearly mark the position and orientation of the pistons, connecting rods, connecting rod caps and connecting rod bearings for reassembly.

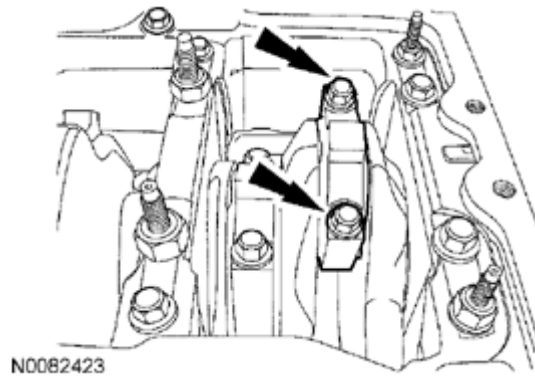


Fig. 343: Locating Connecting Rod Cap Bolts
Courtesy of FORD MOTOR CO.

92. Remove the connecting rod cap bolts and cap.
 - Discard the connecting rod cap bolts.

NOTE: Do not scratch the cylinder walls or crankshaft journals with the connecting rod.

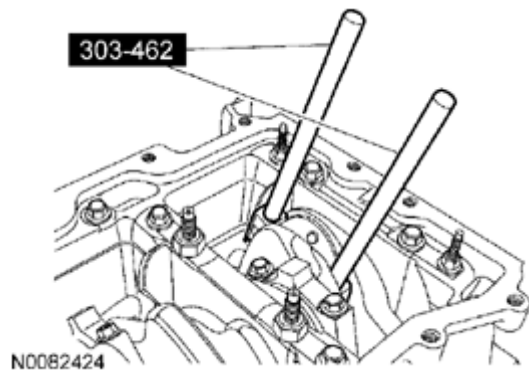


Fig. 344: Removing Piston/Rod Assembly From Engine Block Using Connecting Rod Installer
Courtesy of FORD MOTOR CO.

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.
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.

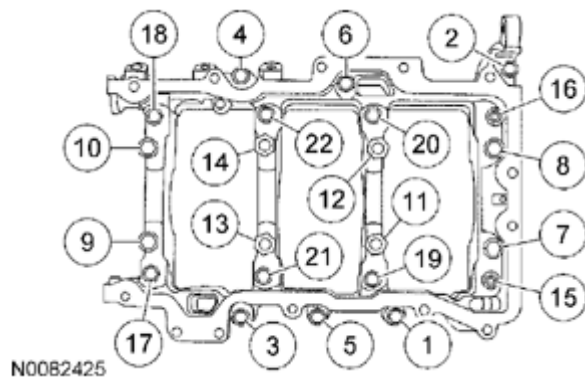


Fig. 345: Identifying Lower Cylinder Block Bolts And Studs Removing Sequence
Courtesy of FORD MOTOR CO.

96. Remove the crankshaft rear main seal.
 - Remove the crankshaft.

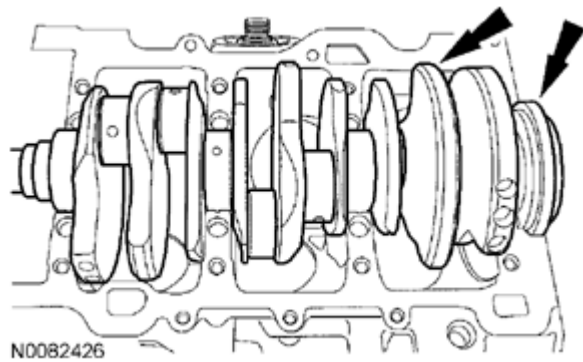


Fig. 346: Locating Crankshaft Rear Main Seal And Crankshaft
Courtesy of FORD MOTOR CO.

97. Remove the crankshaft thrust bearing from the cylinder block.

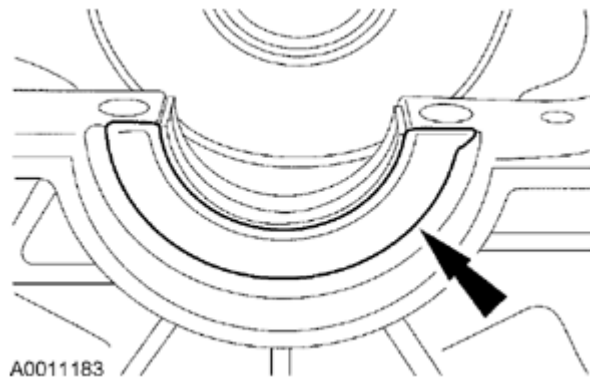


Fig. 347: Locating Crankshaft Thrust Bearing
Courtesy of FORD MOTOR CO.

NOTE: If the main bearings are being reused, mark them for correct position and orientation for reassembly.

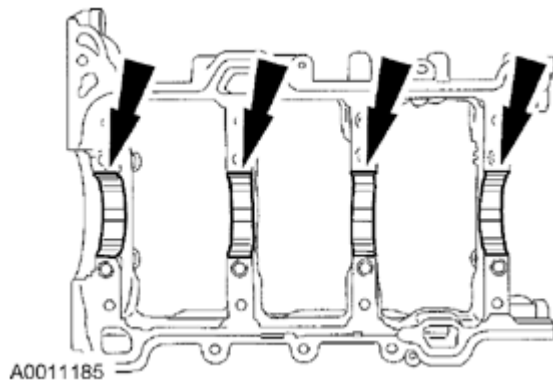


Fig. 348: Locating Main Bearings In Lower Cylinder Block
Courtesy of FORD MOTOR CO.

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.

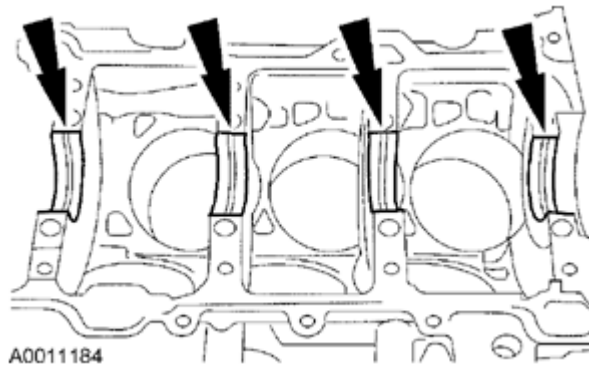


Fig. 349: Locating The Crankshaft Main Bearings In Cylinder Block
Courtesy of FORD MOTOR CO.

99. Remove the crankshaft main bearings from the cylinder block.
100. Inspect the cylinder block, lower cylinder block, pistons and connecting rods. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** article.

CYLINDER HEAD

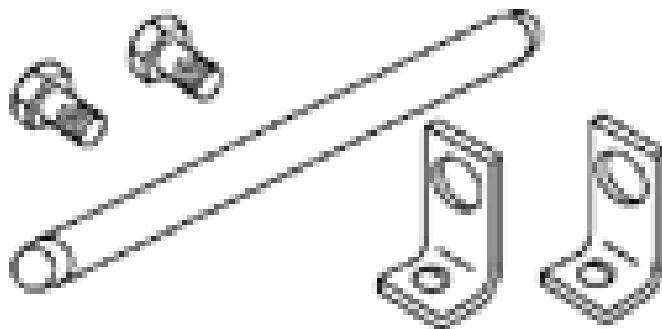
Special Tools

SPECIAL TOOL(S)

Compressor, Valve Spring

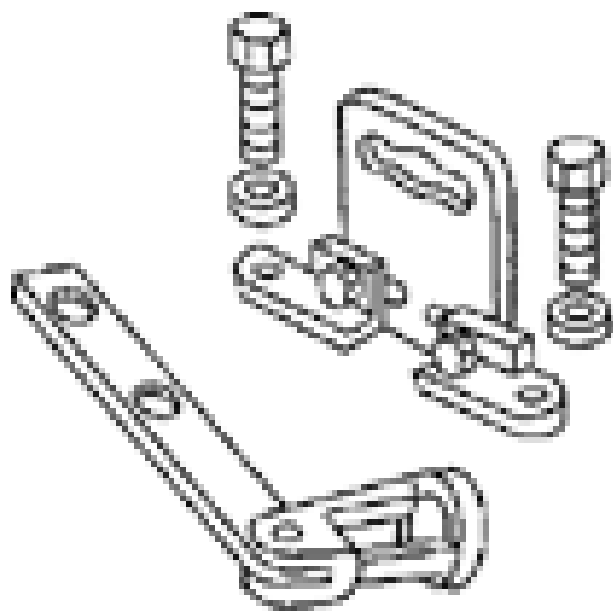
2011 Mercury Milan

2011 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan



ST1981-A

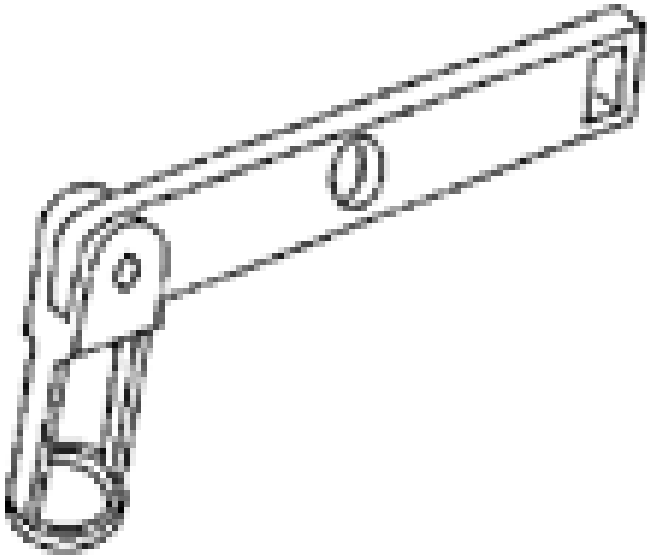
303-300 (T87C-6565-A)



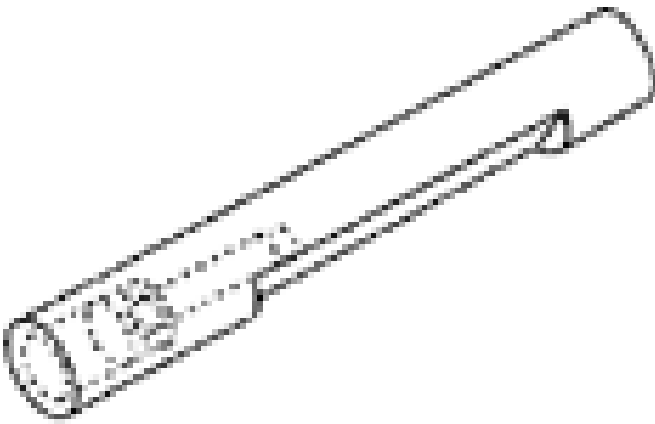
ST1907-A

Compressor, Valve Spring
303-350 (T89P-6565-A)

Compressor, Valve Spring
303-1418



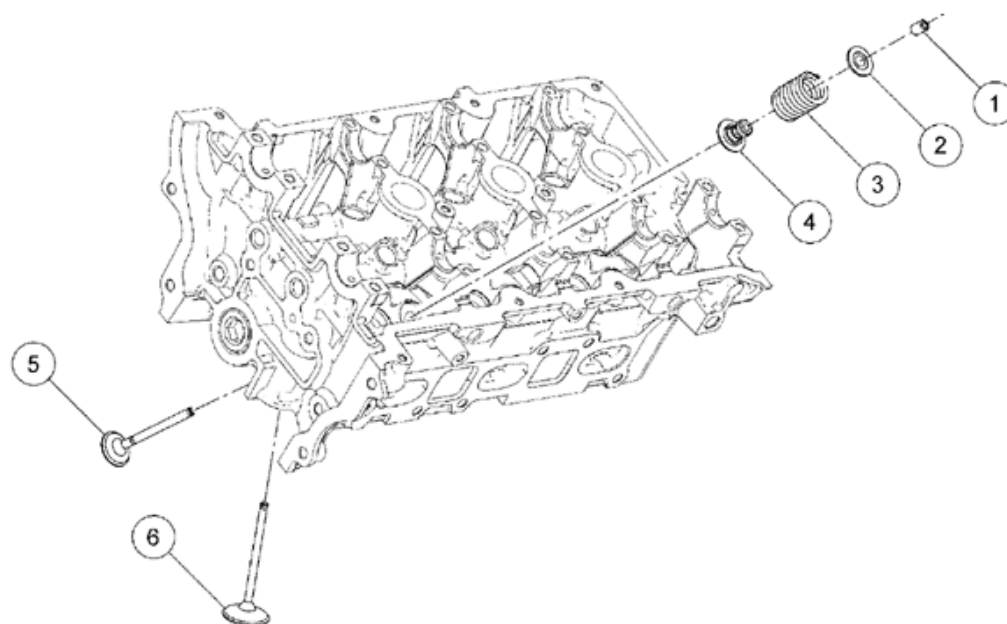
ST1902-A



ST1906-A

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

Cylinder Head



N0063020

Fig. 350: Identifying Cylinder Head Components
 Courtesy of FORD MOTOR CO.

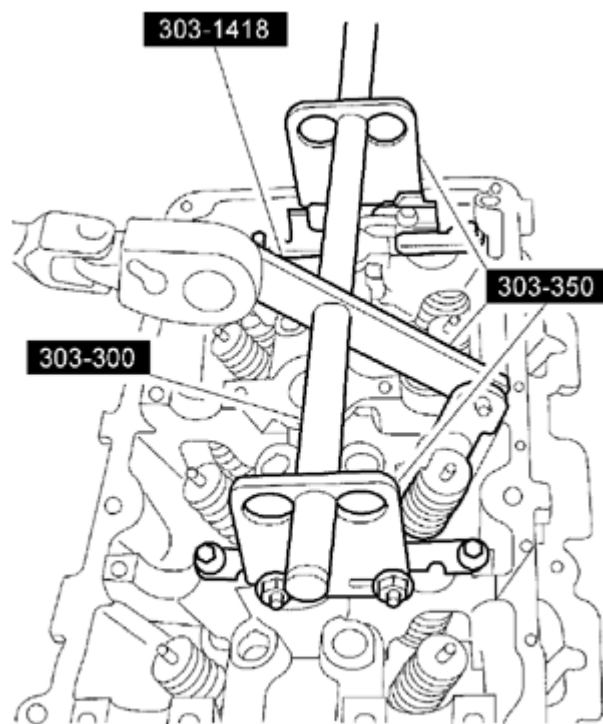
ITEM DESCRIPTION TABLE

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. 351: Remove/Install Keys, Retainer And Spring Using Valve Spring Compressors
 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.

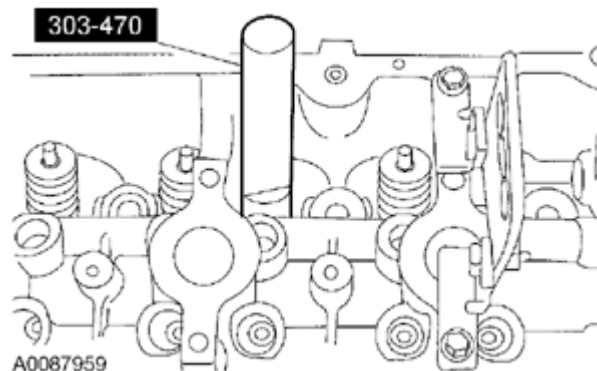
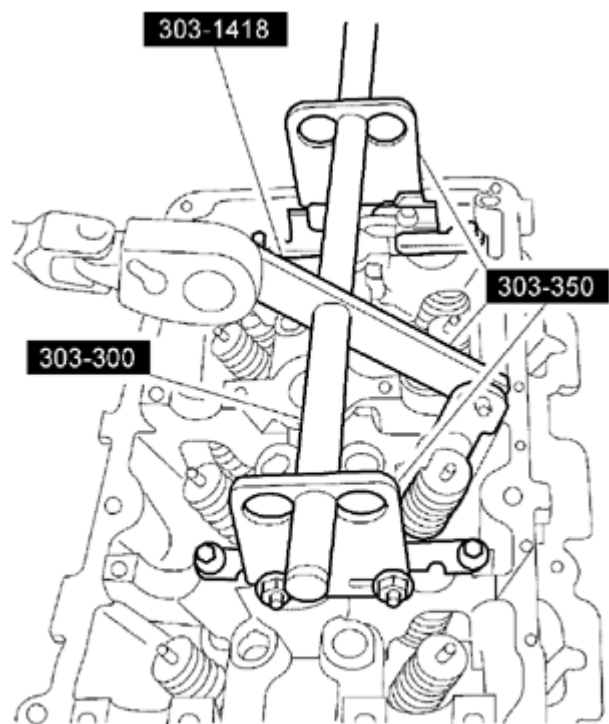


Fig. 352: Installing Valve Stem Seal Using Valve Stem Oil Seal Installer
 Courtesy of FORD MOTOR CO.

2. Install the valve.
3. Using the Valve Spring Compressors, install the valve spring, retainer and keys.



N0087117

Fig. 353: Remove/Install Keys, Retainer And Spring Using Valve Spring Compressors
Courtesy of FORD MOTOR CO.

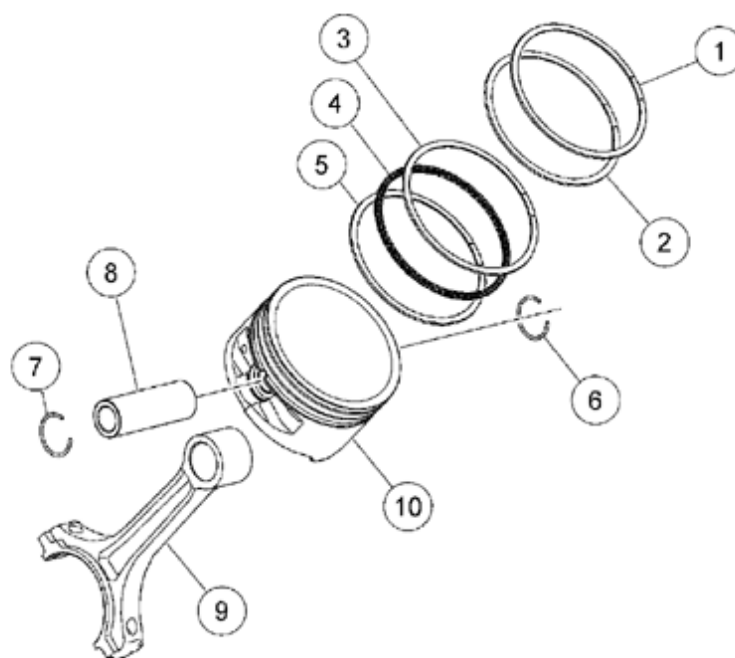
DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

PISTON

Material Specifications

MATERIAL SPECIFICATIONS TABLE

Item	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada) XO- 5W20-QSP (US); CXO-5W20-LSP12 (Canada)	WSS-M2C945-A



N0010114

Fig. 354: Exploded View Of Piston Components
 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.

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.

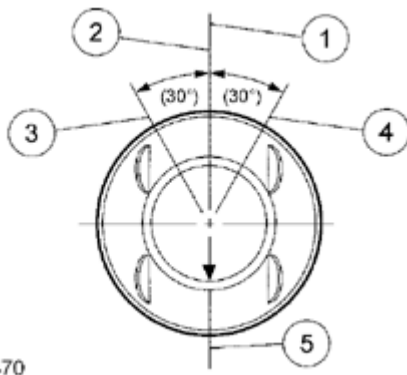
3. Separate the piston from the connecting rod.
4. Clean and inspect the piston and connecting rod. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** article.

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.

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.



N0082470

Fig. 355: Identifying Piston Rings Gap Location
Courtesy of FORD MOTOR CO.

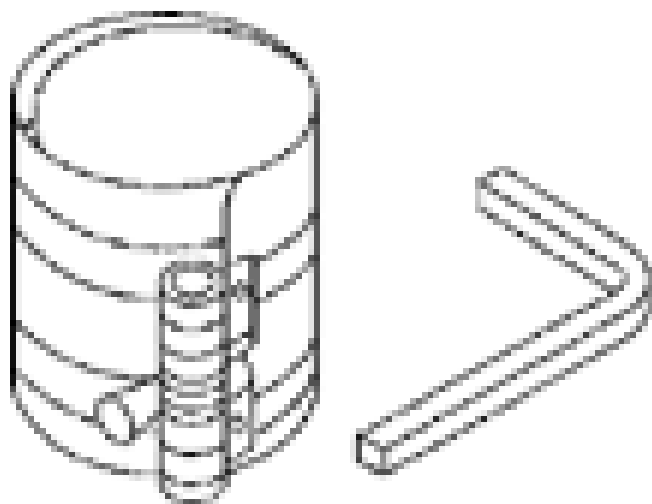
6. Install the piston rings onto the piston as shown in the illustration.
 1. Center line of the piston parallel to the wrist pin bore
 2. Upper compression ring gap location
 3. Upper oil control segment ring gap location
 4. Lower oil control segment ring gap location
 5. Expander ring and lower compression ring gap location

ASSEMBLY

ENGINE

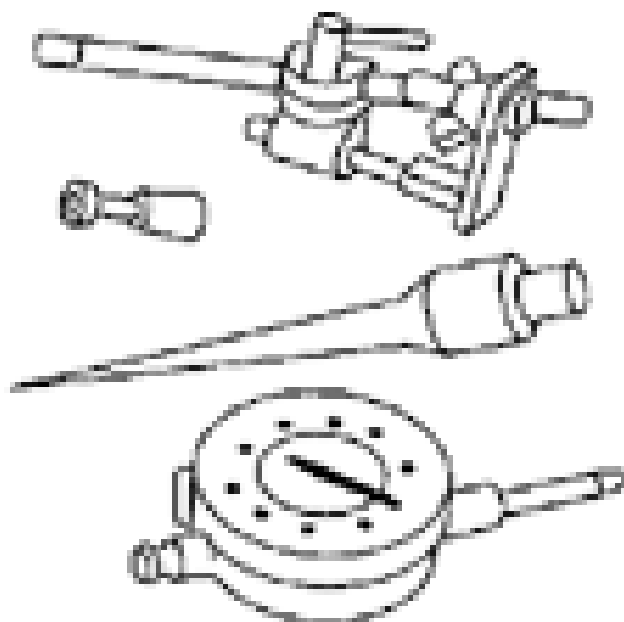
Special Tools

SPECIAL TOOL(S)



ST1376-A

Compressor, Piston Ring
303-D032 (D81L-6002-C)

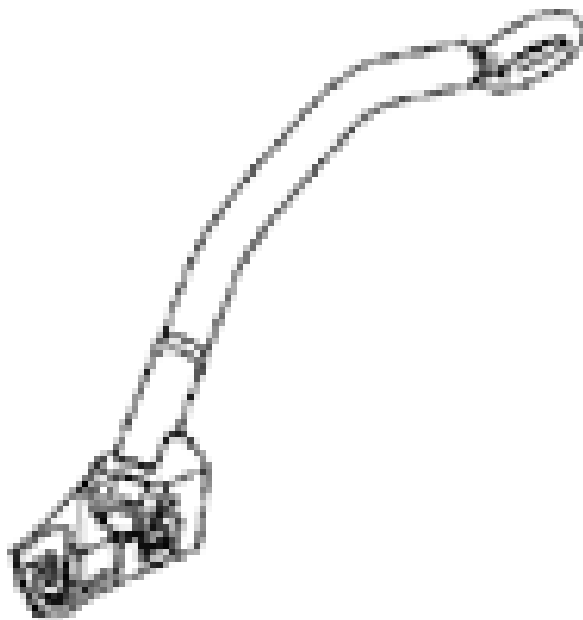


ST1214-A

Dial Indicator Gauge with Holding Fixture
100-002 (TOOL-4201-C)

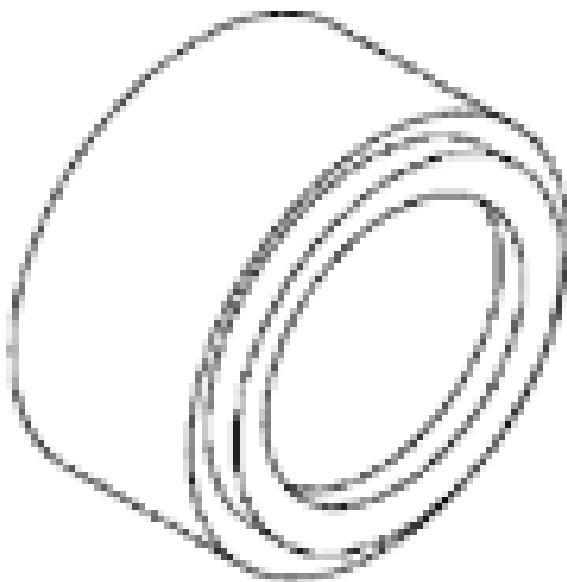
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ST2873-A

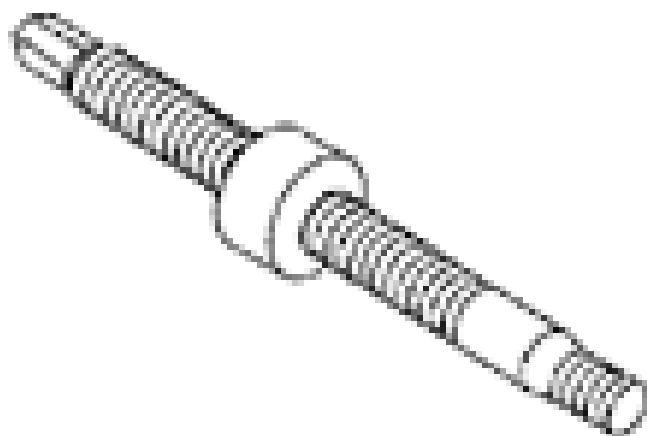
Engine Lifting Bracket Set
303-1140



ST1979-A

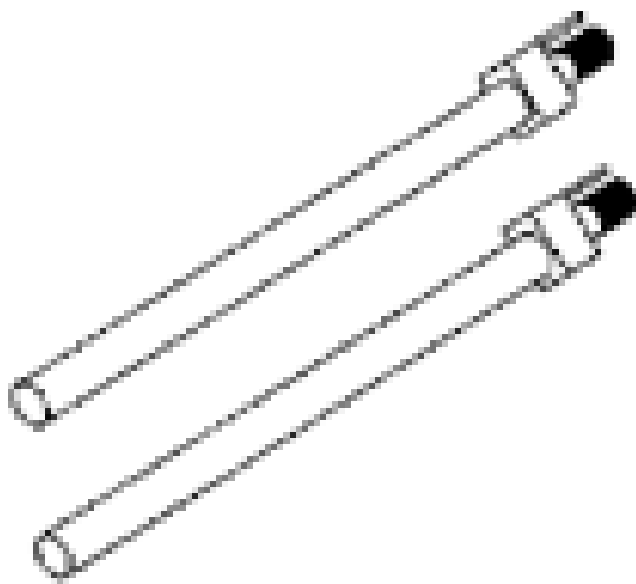
Installer, Camshaft Oil Seal
303-464 (T94P-6256-BH)

Installer, Camshaft Pulley
303-458 (T94P-6312-AH3), part of 303-S455



ST3042-A

Installer, Connecting Rod
303-462 (T94P-6136-AH)

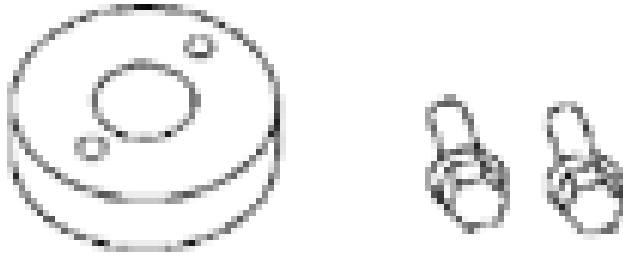


ST1982-A

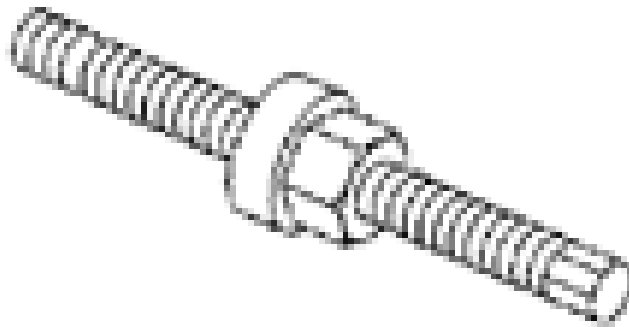
Installer, Crankshaft Rear Main Oil Seal
303-178 (T82L-6701-A)

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ST1327-A



ST1287-A

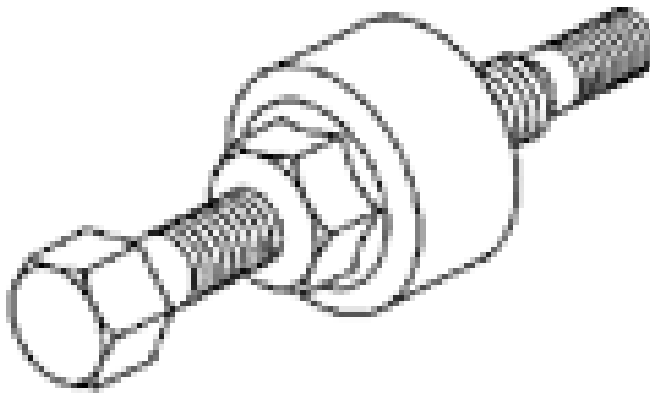
Installer, Crankshaft Vibration Damper
303-102 (T74P-6316-B)

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



ST2296-A

Installer, Power Steering Pump Pulley
211-185 (T91P-3A733-A)

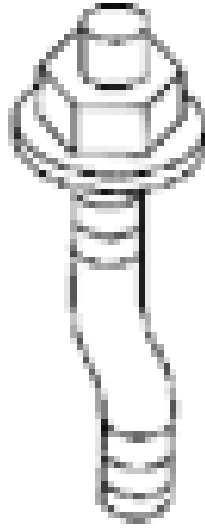


ST1586-A

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

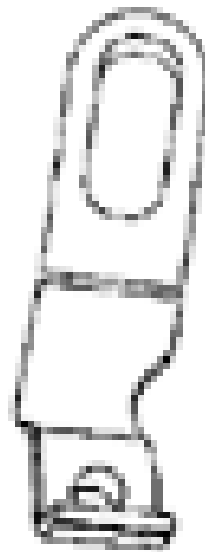
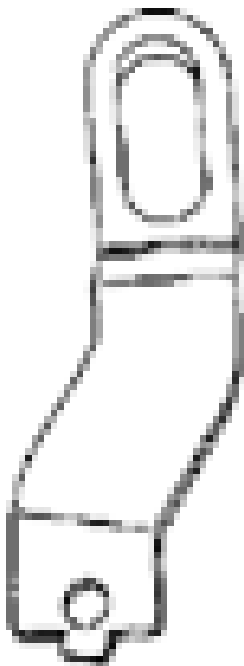
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ST1333-A

Lifting Brackets, Engine
134-00243 or equivalent

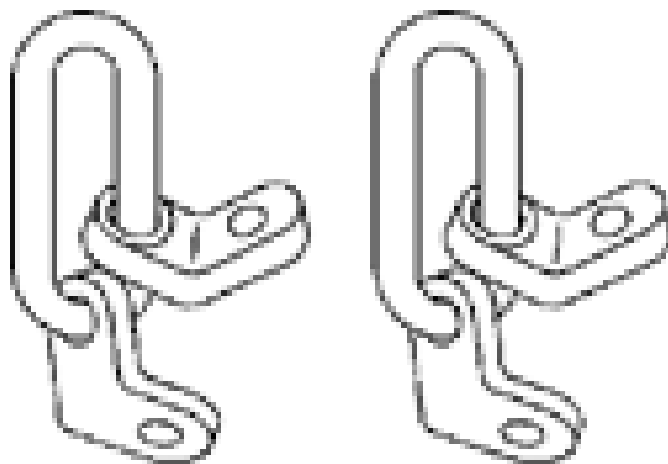


ST2463-A

Lifting Brackets, Engine

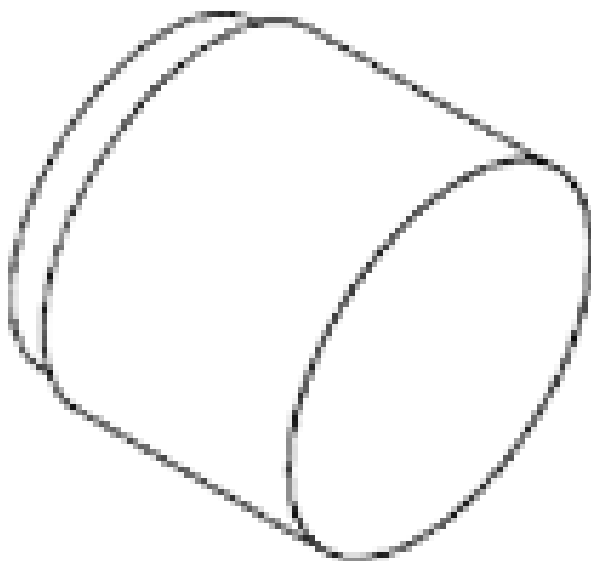
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2011 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan



ST1595-A

303-050 (T70P-6000)



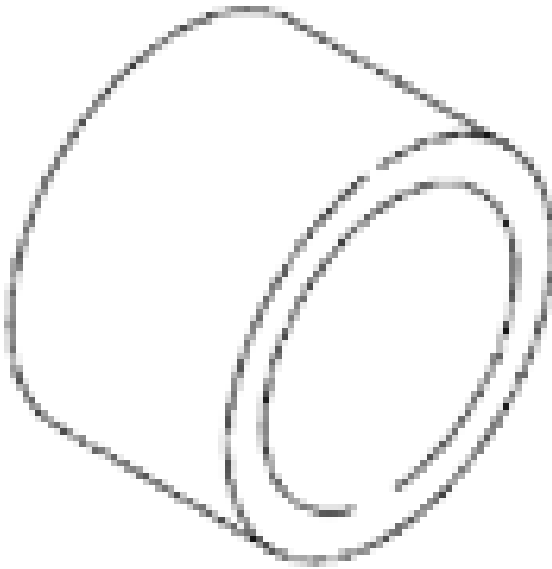
ST2060-A

Protector, Camshaft Oil Seal
303-463 (T91P-6256-AH)

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

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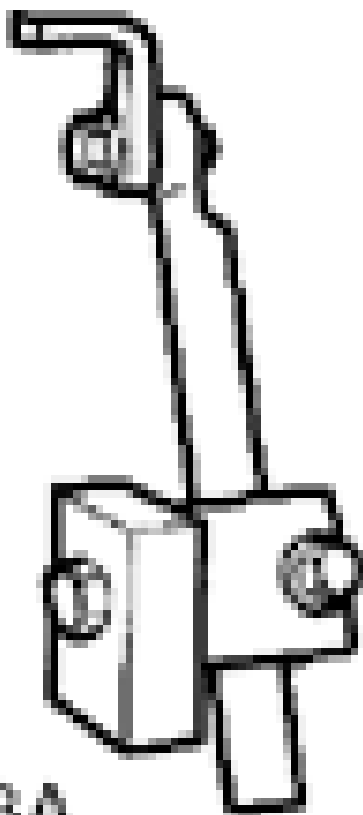
ST3043-A



ST1602-A

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

Universal Adapter Brackets
014-0001



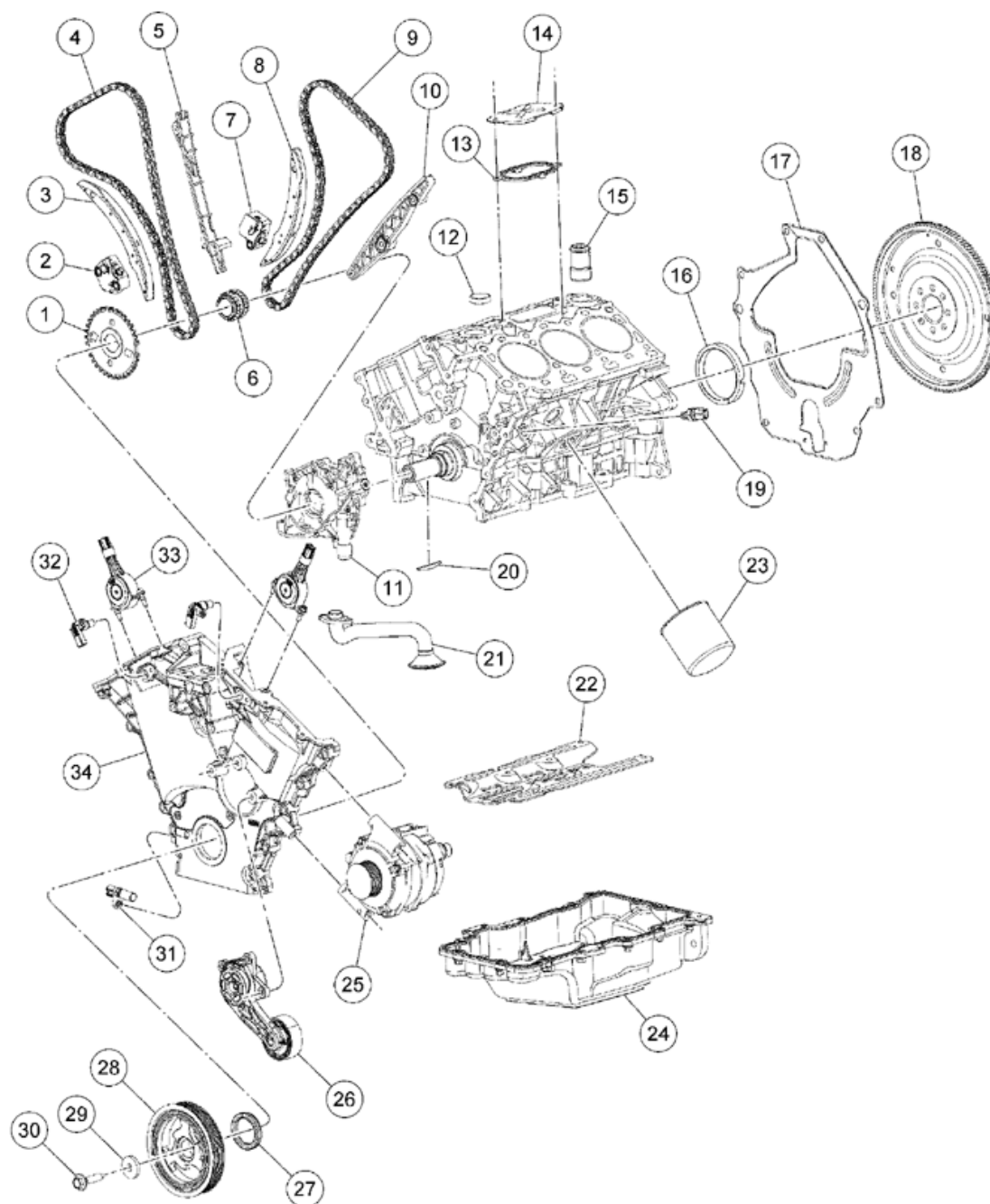
ST2743A

Material Specifications

MATERIAL SPECIFICATIONS TABLE

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada) XO-5W20-QSP (US); CXO-5W20-LSP12 (Canada)	WSS-M2C945-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. 356: Exploded View Of Lower Engine Block Components
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

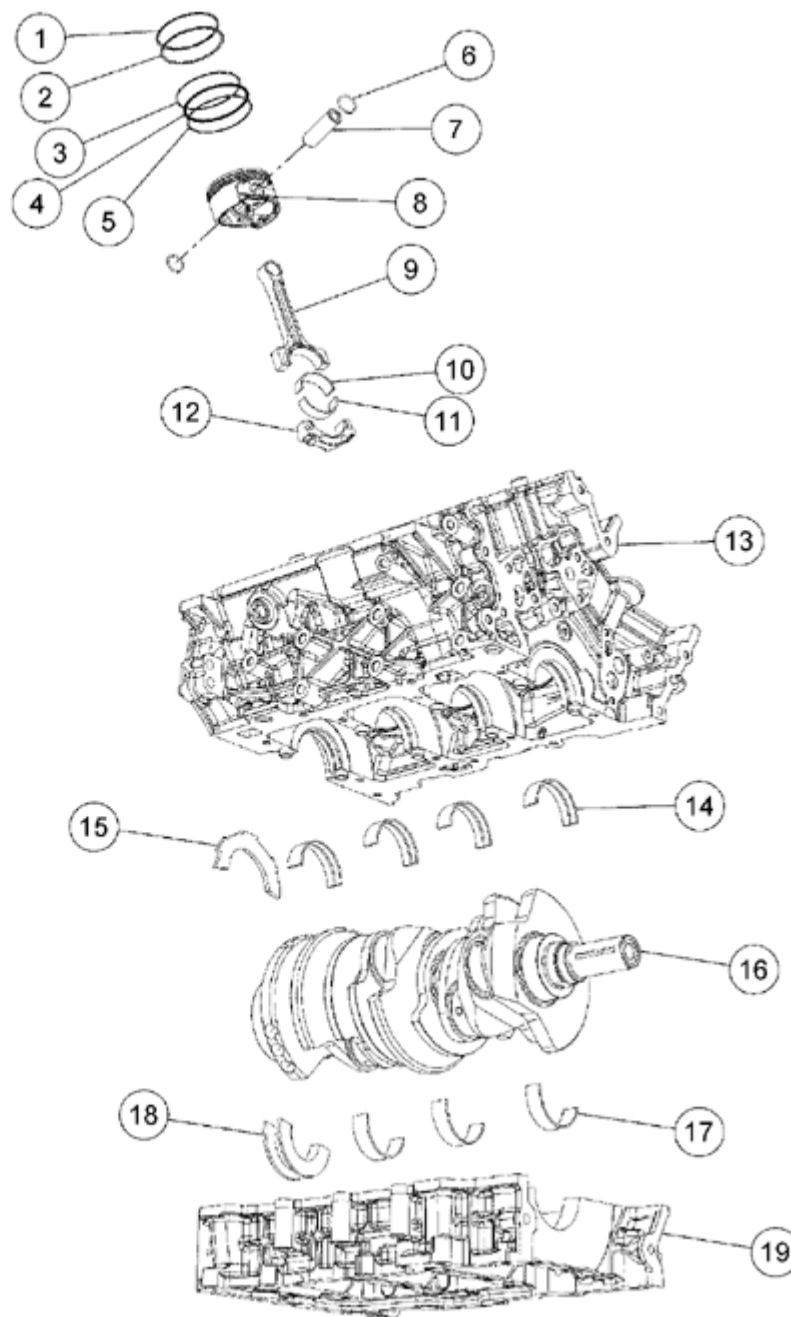
Item	Part Number	Description
1	12A227	Ignition pulse wheel
2	6L266	RH timing chain tensioner
3	6K255	RH timing chain tensioner arm

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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. 357: Exploded View Of Lower Engine Block Components
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION TABLE

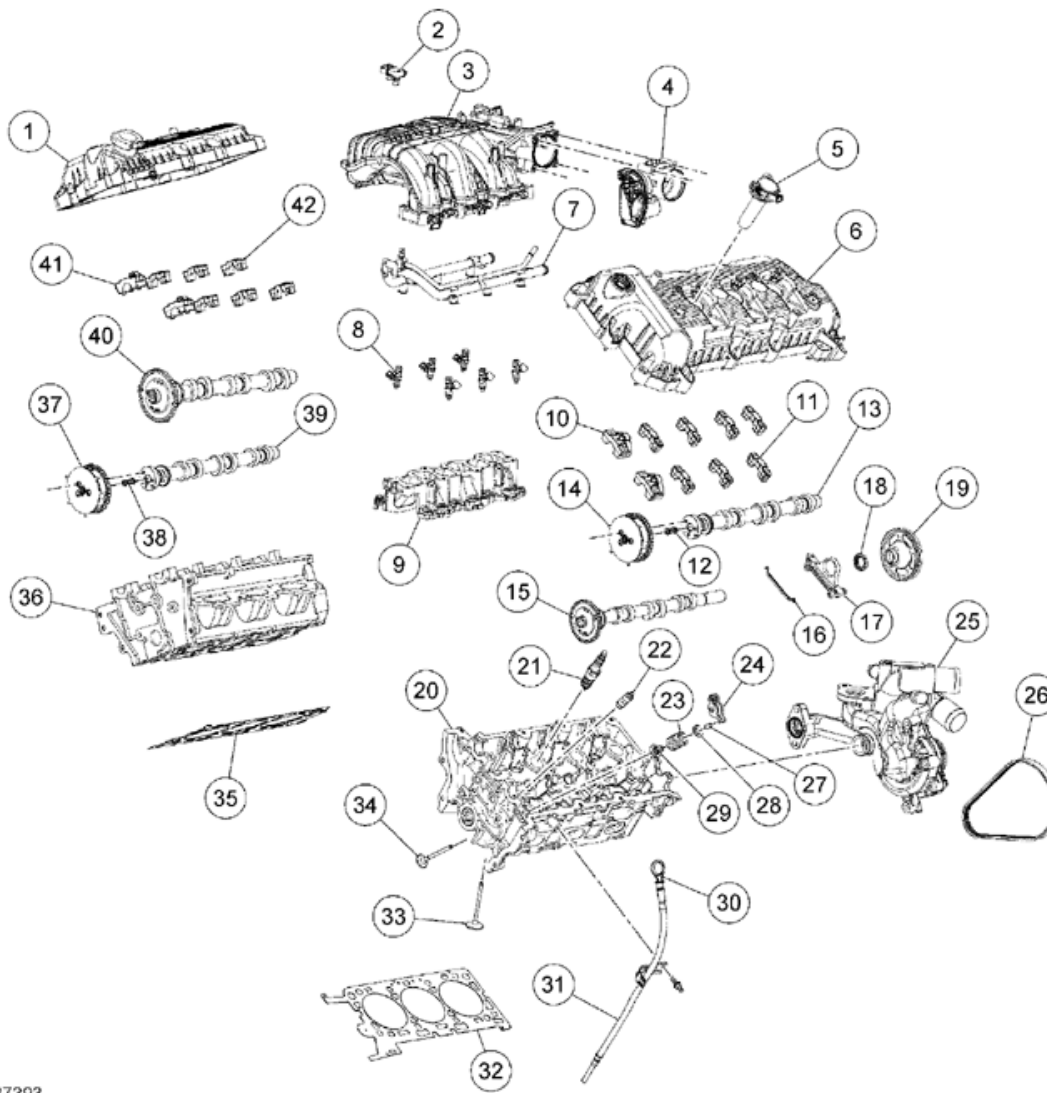
Item	Part Number	Description
1	6150	Piston compression upper ring (6 required)
2	6152	Piston compression lower ring (6 required)
3	6159	Piston oil control upper segment ring (6 required)
4	6161	Piston oil control spacer (6 required)

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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



N0087393

Fig. 358: Exploded View Of Cylinder Heads And Intake Manifolds Components
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** article.

All engines

NOTE: This procedure is for selecting bearings using a new crankshaft.

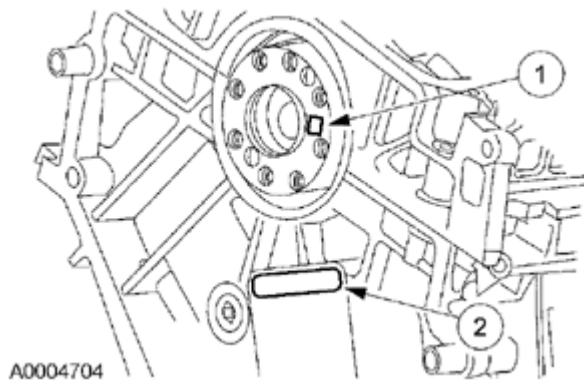


Fig. 359: Locating Code On Crankshaft Flange And Code On Cylinder Block Rear Face
Courtesy of FORD MOTOR CO.

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.
2. Using the chart, 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

(C1)

	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
92	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2
91	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2
90	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2
89	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2
88	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2
87	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2
86	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2
85	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2
84	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2
83	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2
82	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2
81	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2
80	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2
79	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2
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69	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
68	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

CRANKSHAFT CODE

A0053883

Fig. 360: View Of Block And Crankshaft Code Chart
 Courtesy of FORD MOTOR CO.

NOTE: Before assembling the cylinder block, all sealing surfaces must be free of chips, dirt, paint and foreign material. Also, make sure the coolant and oil passages are clear.

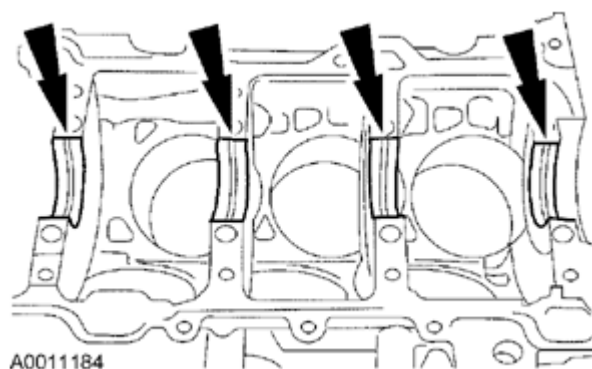


Fig. 361: Locating Crankshaft Main Bearings In Cylinder Block
 Courtesy of FORD MOTOR CO.

3. Lubricate the upper crankshaft main bearings with clean engine oil and install the 4 crankshaft main bearings in the cylinder block.

4. Lubricate the lower crankshaft main bearings with clean engine oil and install the 4 crankshaft main bearings in the lower cylinder block.

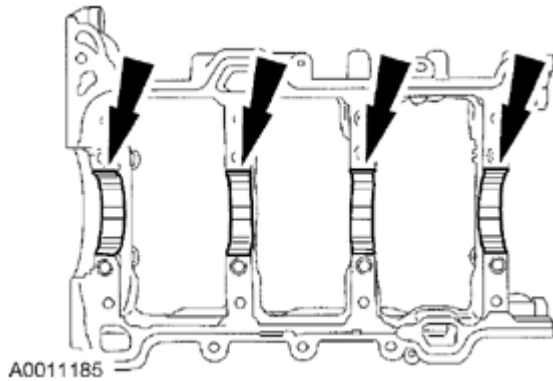


Fig. 362: Locating Main Bearings In Lower Cylinder Block
 Courtesy of FORD MOTOR CO.

5. Lubricate the crankshaft thrust bearing with clean engine oil and install in the cylinder block.

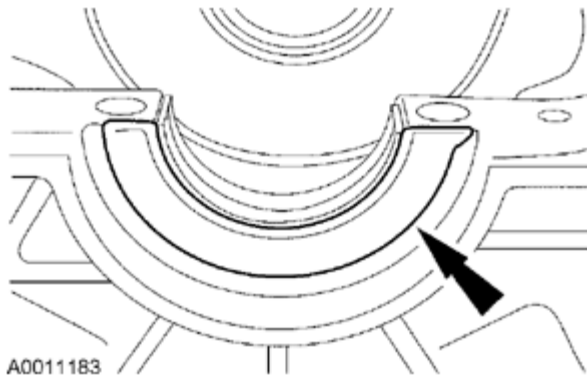


Fig. 363: Locating Crankshaft Thrust Bearing
 Courtesy of FORD MOTOR CO.

6. Install the crankshaft key.

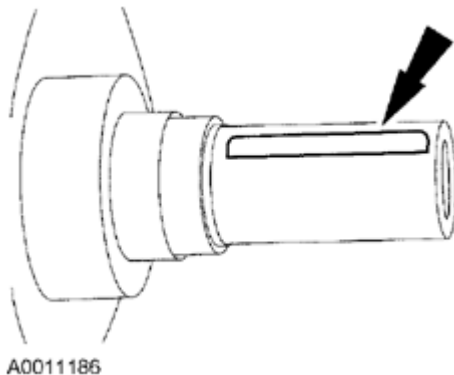


Fig. 364: Locating Crankshaft Key
Courtesy of FORD MOTOR CO.

7. Apply clean engine oil to the crankshaft main and rod bearing journals.
8. Position the crankshaft in the cylinder block.

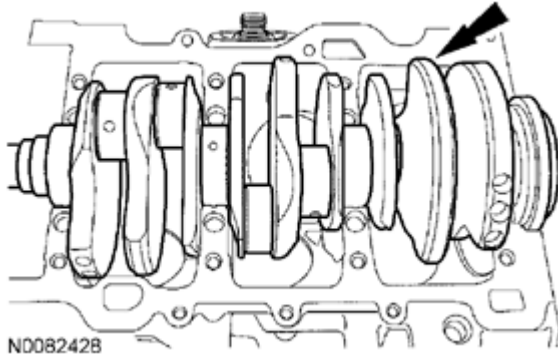
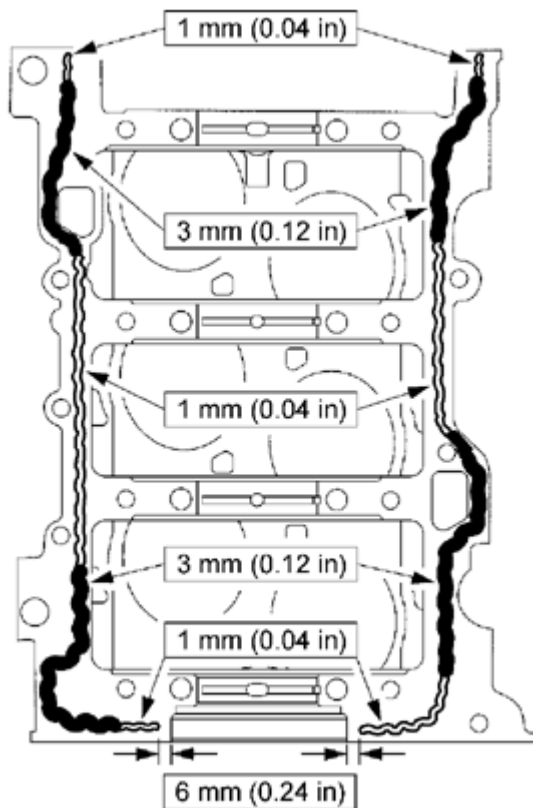


Fig. 365: Positioning Crankshaft In Cylinder Block
Courtesy of FORD MOTOR CO.

- 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. 366: Applying Gasket And Sealant To Cylinder Block With Specifications
 Courtesy of FORD MOTOR CO.

9. Apply gasket and sealant to the cylinder block as shown in the illustration.

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.

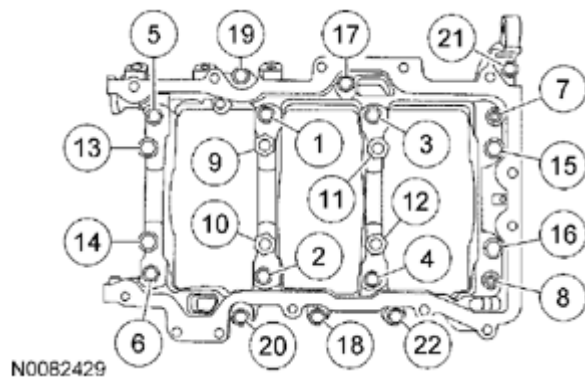


Fig. 367: Identifying Lower Cylinder Block Bolts And Studs Tightening Sequence
Courtesy of FORD MOTOR CO.

10. Position the lower cylinder block and install the new bolts and new studs.
 - Tighten the bolts and studs in the sequence shown in the illustration 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).
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.

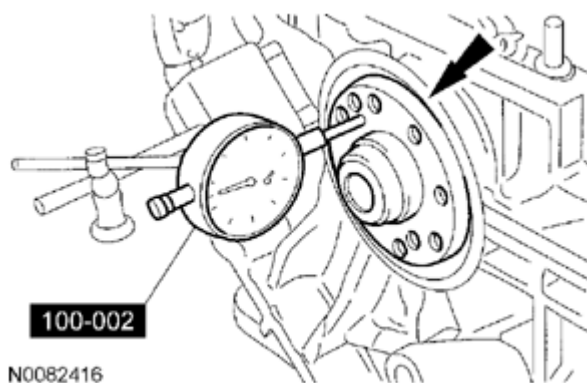


Fig. 368: Measuring Crankshaft End Play Using Dial Indicator Gauge With Holding Fixture
Courtesy of FORD MOTOR CO.

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

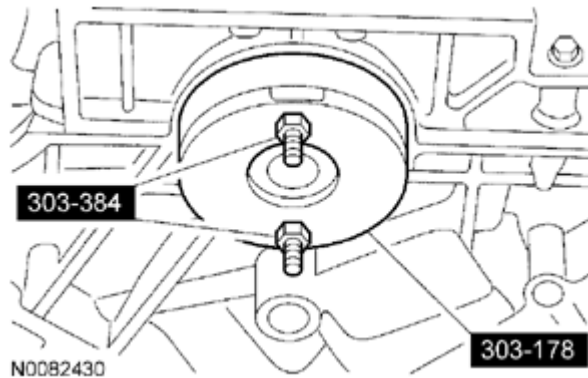


Fig. 369: Installing Rear Main Oil Seal Using Crankshaft Rear Main Oil Seal Installer And Crankshaft Rear Main Oil Seal Installer Bolts
Courtesy of FORD MOTOR CO.

13. Install the engine-to-transaxle separator plate.

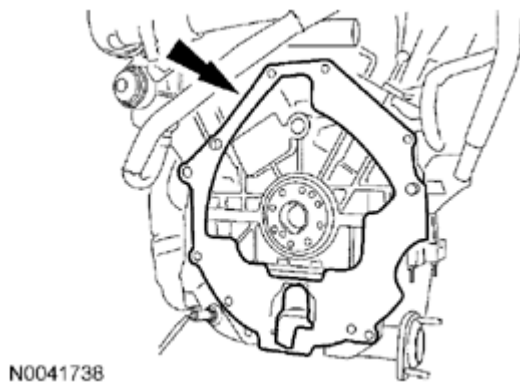


Fig. 370: Locating Engine-To-Transaxle Separator Plate
Courtesy of FORD MOTOR CO.

14. Position the flexplate and install the bolts.
 - Tighten to 80 Nm (59 lb-ft).

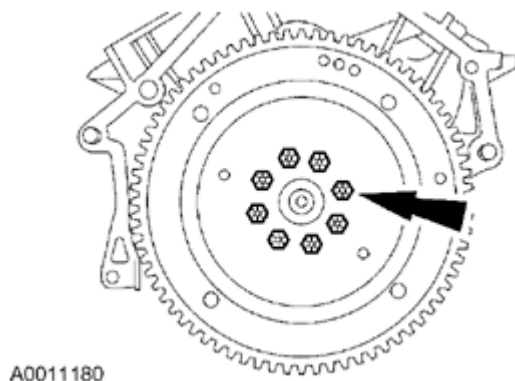


Fig. 371: Locating Flexplate Bolts

Courtesy of FORD MOTOR CO.

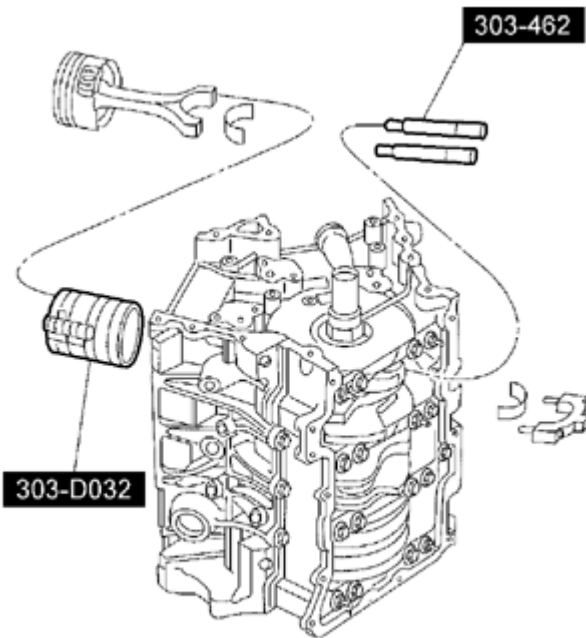
15. Mount the engine on an engine stand.
16. Using the chart, select the correct piston grade size for the cylinder bores.
 - Measure the cylinder block bore diameter.
 - Mark the outside of the block with the appropriate number(s) to identify bore grade size.
 - Choose the correct piston grade size 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. 372: View Of Cylinder Block Bore Diameter Chart
Courtesy of FORD MOTOR CO.

- 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 DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES - PISTON in this service information.
- 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. 373: Installing Piston And Connecting Rod Assemblies Using Piston Ring Compressor And Connecting Rod Installer
Courtesy of FORD MOTOR CO.

17. Using the Piston Ring Compressor and the Connecting Rod Installer, install the piston and connecting rod assemblies.

NOTE: The rod cap installation must keep the same orientation as marked during disassembly or engine damage may occur.

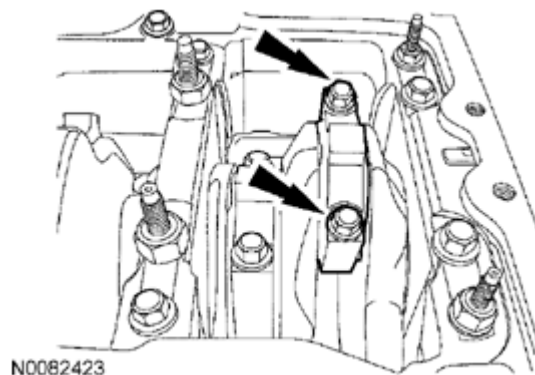


Fig. 374: Locating Connecting Rod Cap Bolts
Courtesy of FORD MOTOR CO.

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).
19. Install the oil separator cover, a new gasket and the bolts.
- Tighten to 10 Nm (89 lb-in).

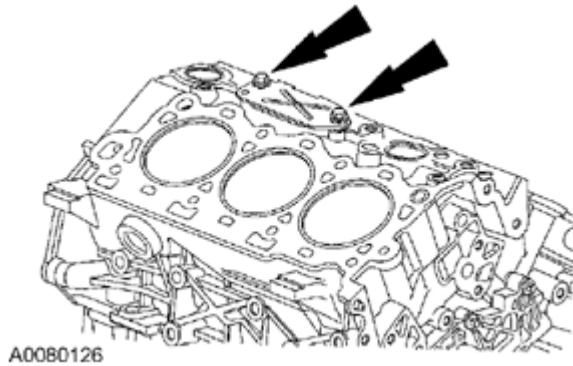


Fig. 375: Locating Oil Separator Cover Bolts
Courtesy of FORD MOTOR CO.

NOTE: LH shown in the illustration, RH similar.

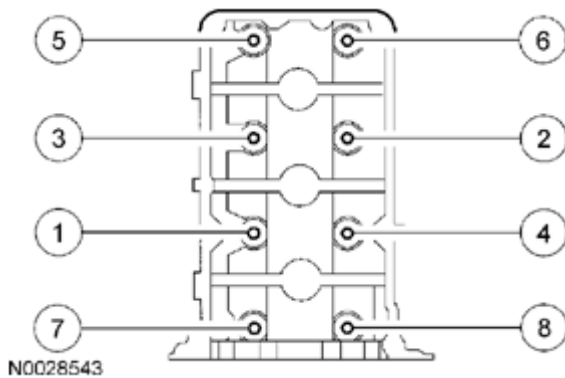


Fig. 376: Identifying LH And RH Cylinder Heads Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

20. Position the new LH and RH cylinder heads and gaskets. Install new bolts and tighten in the sequence shown in the illustration 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.
21. Install the crankshaft pulley bolt and rotate the crankshaft keyway to the 11 o'clock position to locate Top

Dead Center (TDC).

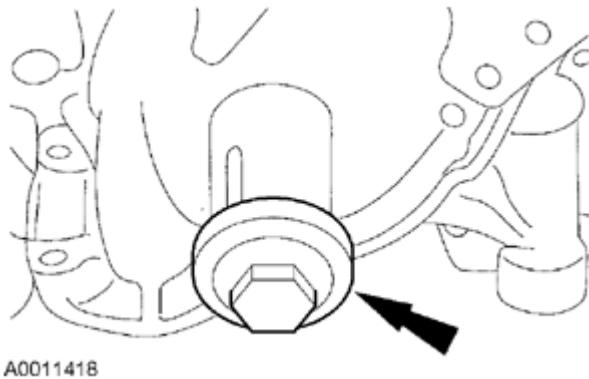


Fig. 377: Locating Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

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

22. Install the hydraulic lash adjusters.
 - Lubricate the hydraulic lash adjusters with clean engine oil.
23. Apply clean engine oil to 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 in the illustration, LH similar.

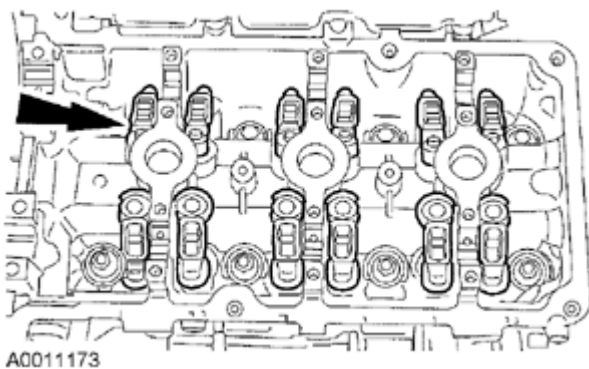


Fig. 378: Locating Camshaft Roller Followers
Courtesy of FORD MOTOR CO.

24. Install the LH and RH camshaft roller followers.

NOTE: LH shown in the illustration, RH similar.

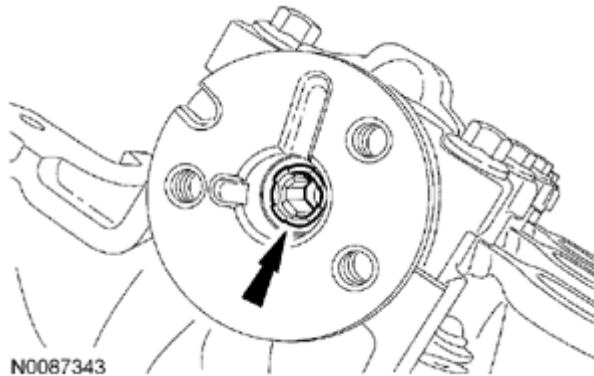


Fig. 379: Locating VCT System Oil Filter Screen
Courtesy of FORD MOTOR CO.

25. Install the new LH and RH oil filter screens in the intake camshafts.
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 in the illustration.

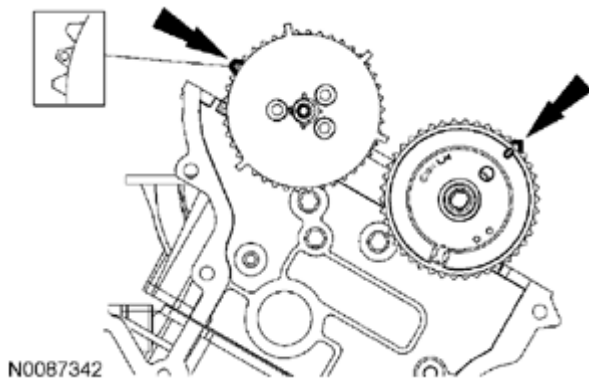
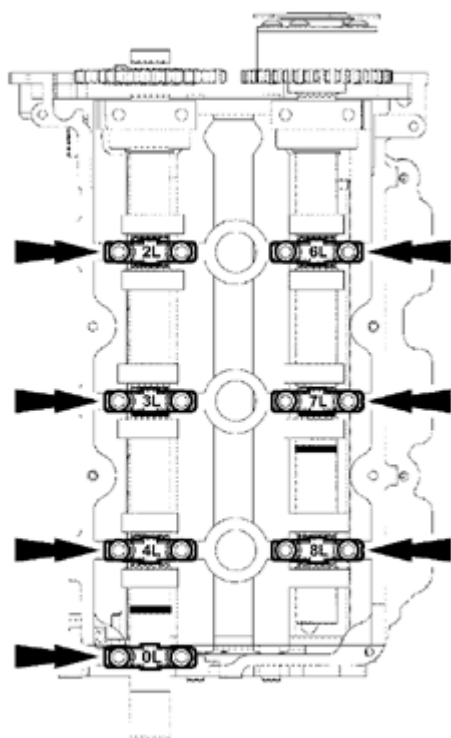


Fig. 380: Aligning LH Camshafts
Courtesy of FORD MOTOR CO.

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.

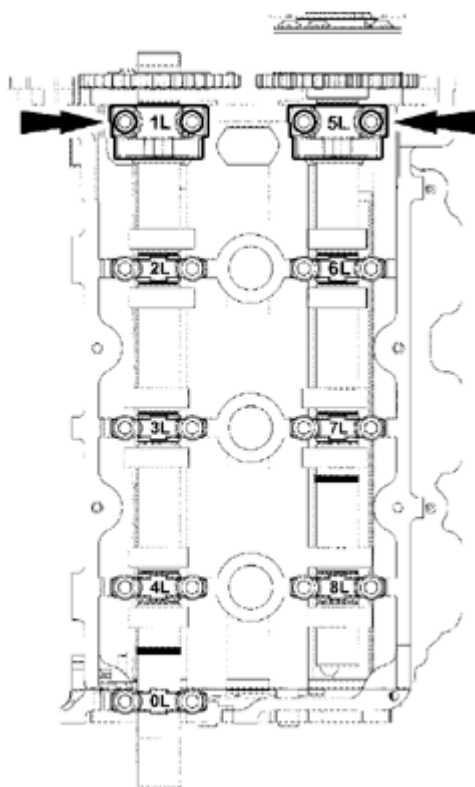
NOTE: Do not install the camshaft journal thrust caps until all of the camshaft bearing caps have been installed, or damage to the thrust caps can occur.



N0081819

Fig. 381: Locating LH Camshaft Bearing Caps
Courtesy of FORD MOTOR CO.

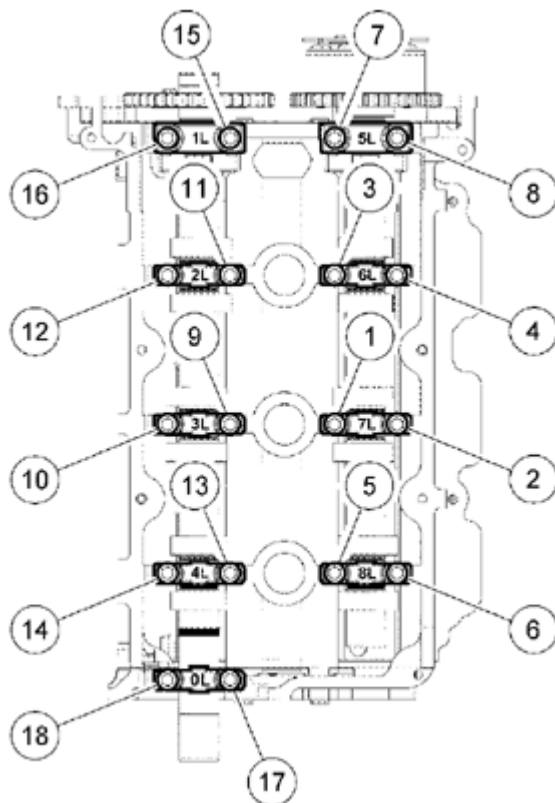
28. Lubricate the bearing surfaces of the LH camshaft bearing caps with clean engine oil and install the bearing caps.
 - Loosely install the bolts.
29. Lubricate the bearing surfaces of the LH camshaft bearing thrust caps with clean engine oil and install the bearing thrust caps.
 - Loosely install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



N0081820

Fig. 382: Locating LH Camshaft Bearing Thrust Caps
Courtesy of FORD MOTOR CO.

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



N0081821

Fig. 383: Identifying Camshaft Bearing Cap Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

30. Tighten the LH camshaft bearing cap bolts in the sequence shown in the illustration 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: 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.

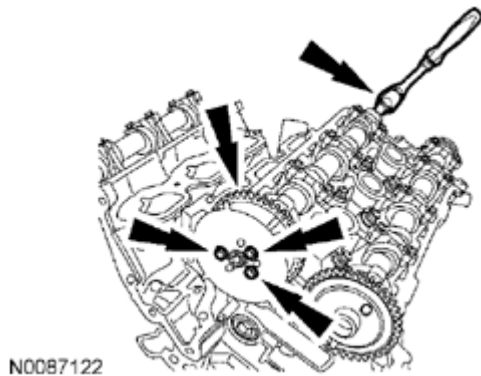


Fig. 384: Remove/Install LH Camshaft Phaser, Sprocket And Bolts
Courtesy of FORD MOTOR CO.

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

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

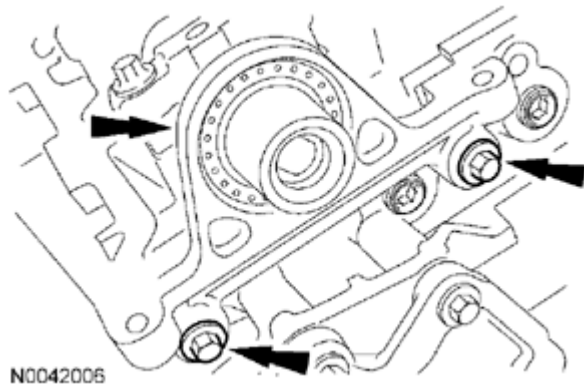


Fig. 385: Locating Camshaft Oil Seal Retainer And Bolts
Courtesy of FORD MOTOR CO.

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

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

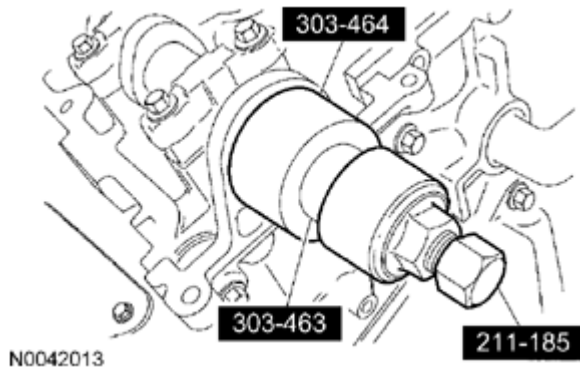


Fig. 386: Installing Camshaft Oil Seal Using Special Tools
Courtesy of FORD MOTOR CO.

33. Using the Power Steering Pump Pulley Installer, Camshaft Oil Seal Installer and the Camshaft Oil Seal Protector, install a new camshaft oil seal.
34. Lubricate the RH camshafts with clean engine oil and carefully position the camshafts onto the cylinder head.
 - Align the RH camshafts as shown in the illustration.

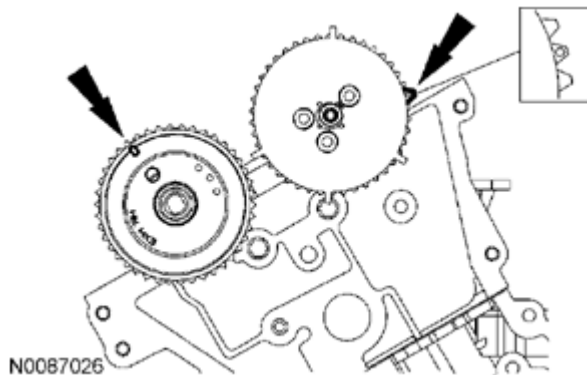
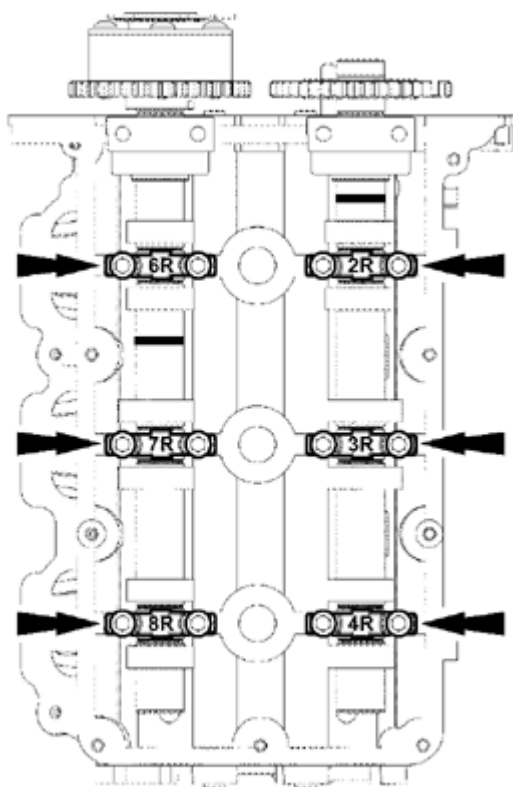


Fig. 387: Identifying RH Camshafts Are In Neutral Position
Courtesy of FORD MOTOR CO.

- 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.



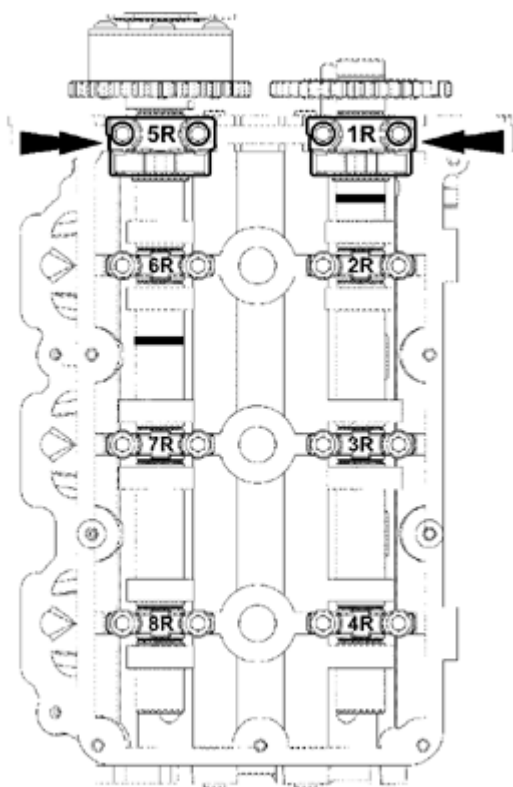
N0042369

Fig. 388: Locating Camshaft Bearing Caps
Courtesy of FORD MOTOR CO.

35. Install the camshaft bearing caps.

- Loosely install the bolts.

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

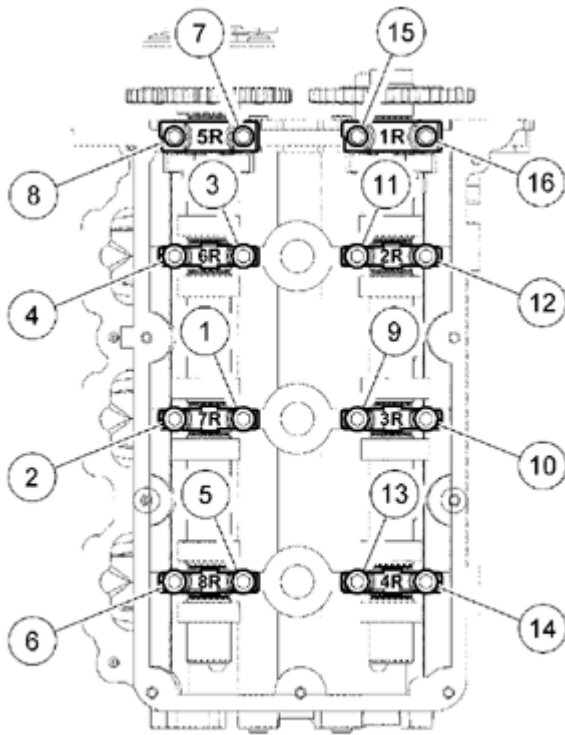


N0042453

Fig. 389: Locating Camshaft Bearing Thrust Caps
Courtesy of FORD MOTOR CO.

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

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



N0081822

Fig. 390: Identifying Camshaft Bearing Cap Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

37. Tighten the RH camshaft bearing cap bolts in the sequence shown in the illustration 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: 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.

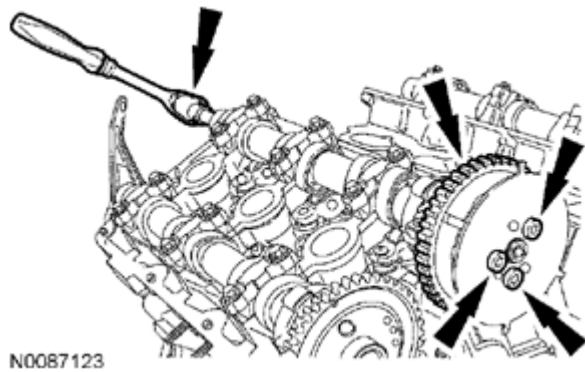


Fig. 391: Remove/Install RH Camshaft Phaser, Sprocket And Bolts
Courtesy of FORD MOTOR CO.

38. Tighten the 3 RH camshaft phaser and sprocket bolts to 18 Nm (159 lb-in).
39. Position the oil pump and install the bolts.
 - Tighten in the sequence shown in the illustration to 10 Nm (89 lb-in).

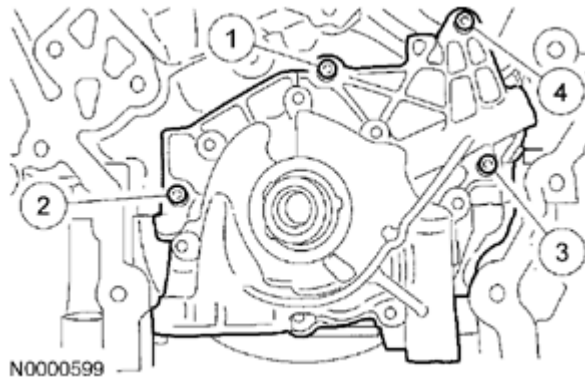


Fig. 392: Identifying Oil Pump Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

40. Remove the crankshaft pulley bolt.

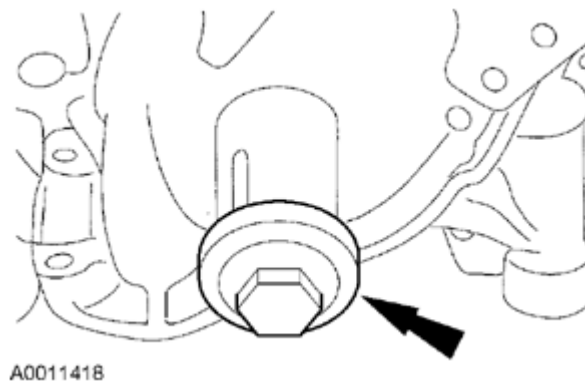


Fig. 393: Locating Crankshaft Pulley Bolt

Courtesy of FORD MOTOR CO.

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

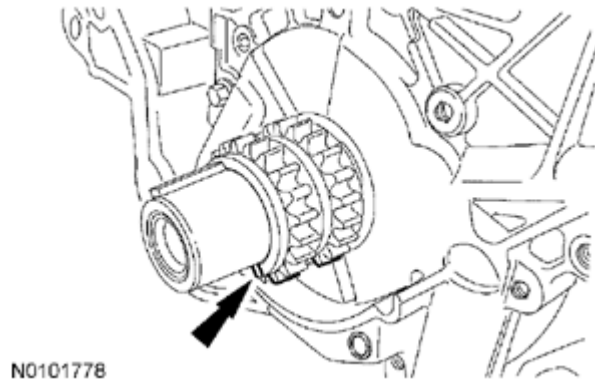


Fig. 394: Locating Crankshaft Sprocket With Timing Mark Facing Out
Courtesy of FORD MOTOR CO.

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: LH shown in the illustration, RH similar.

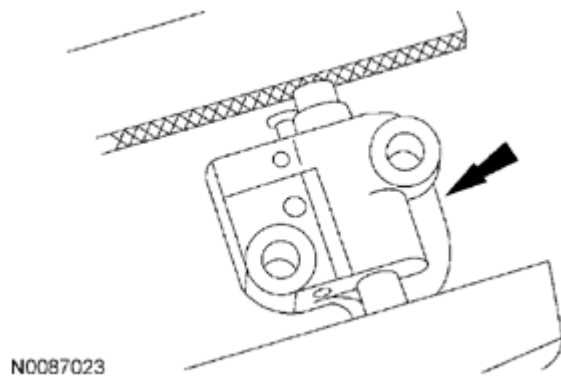


Fig. 395: Positioning Chain Tensioner In Soft-Jawed Vise
Courtesy of FORD MOTOR CO.

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

NOTE: LH shown in the illustration, RH similar.

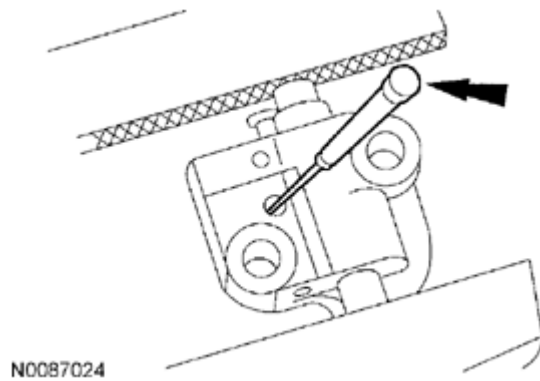


Fig. 396: Holding Chain Tensioner Ratchet Lock Mechanism Away From Ratchet Stem With Small Pick

Courtesy of FORD MOTOR CO.

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

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.

44. Slowly compress the timing chain tensioner.
45. Retain the tensioner piston with a 1.5 mm (0.06 in) diameter wire or paper clip.

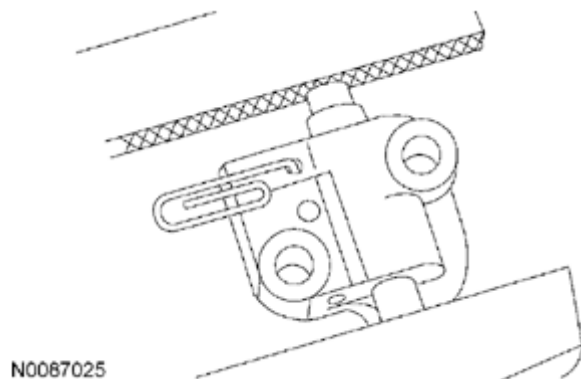


Fig. 397: Retaining Tensioner Piston With 1.5 mm (0.06 in) Diameter Wire Or Paper Clip

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.

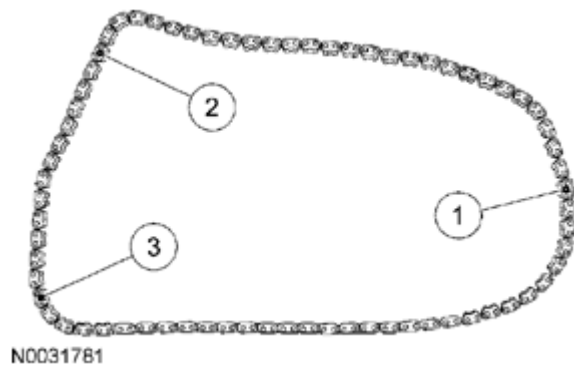


Fig. 398: Identifying Timing Marks On Timing Chain
Courtesy of FORD MOTOR CO.

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.

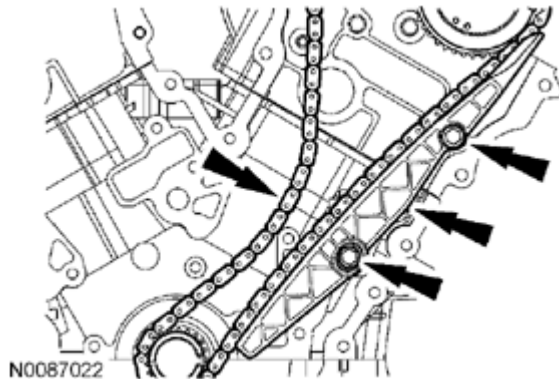


Fig. 399: Locating Bolts And LH Timing Chain Guide
Courtesy of FORD MOTOR CO.

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).

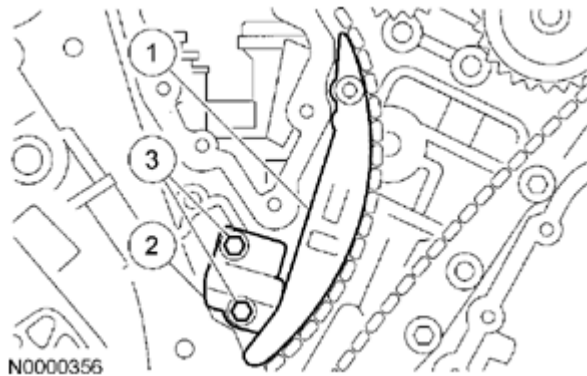


Fig. 400: Identifying LH Timing Chain Tensioner Arm And Bolts
Courtesy of FORD MOTOR CO.

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

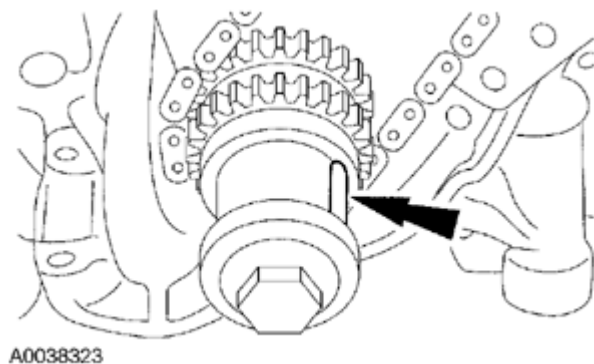


Fig. 401: Locating Crankshaft Keyway Is In 3 O'Clock Position
Courtesy of FORD MOTOR CO.

50. Verify that the RH camshafts are correctly positioned.

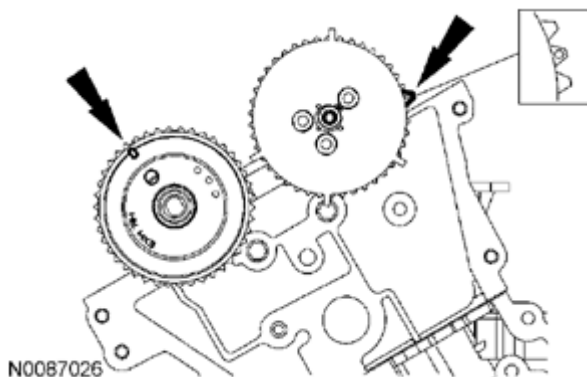


Fig. 402: Identifying RH Camshafts Are In Neutral Position
Courtesy of FORD MOTOR CO.

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.

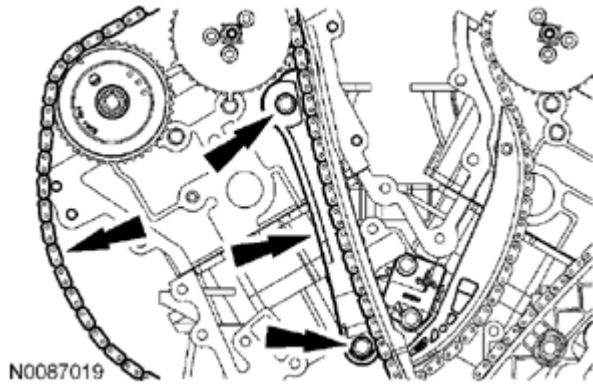


Fig. 403: Locating RH Timing Chain Guide And Bolts
Courtesy of FORD MOTOR CO.

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).

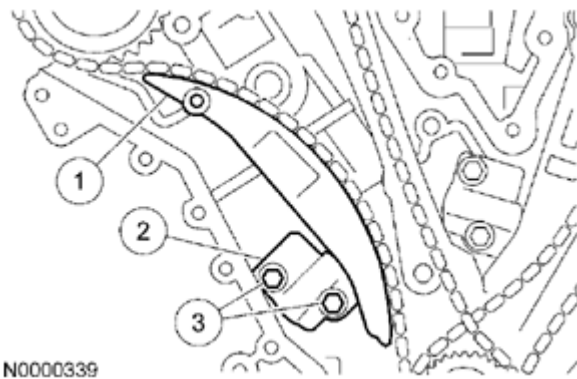
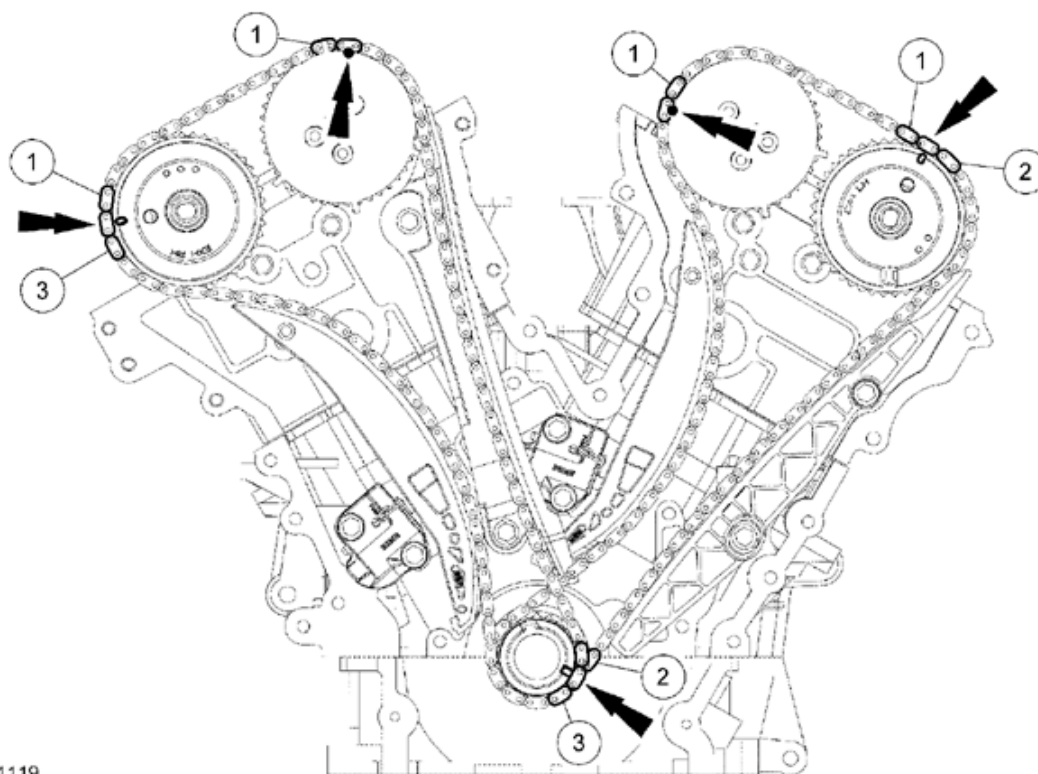


Fig. 404: Identifying RH Timing Chain Tensioner, Tensioner Arm And Bolts
Courtesy of FORD MOTOR CO.

53. Remove the LH and RH timing chain tensioner piston retaining wires.
54. Rotate the crankshaft counterclockwise 120 degrees to TDC.

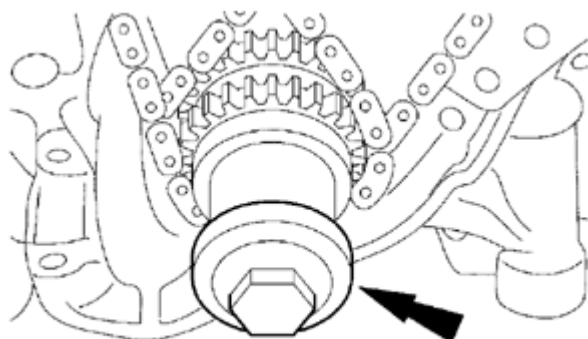
NOTE: Failure to verify correct timing drive component alignment will result in severe engine damage.



N0091119

Fig. 405: Identifying Camshaft And Crankshaft Timing Marks Location
Courtesy of FORD MOTOR CO.

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.
56. Remove the crankshaft pulley bolt and washer.



A0011064

Fig. 406: Locating Crankshaft Pulley Bolt And Washer
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).

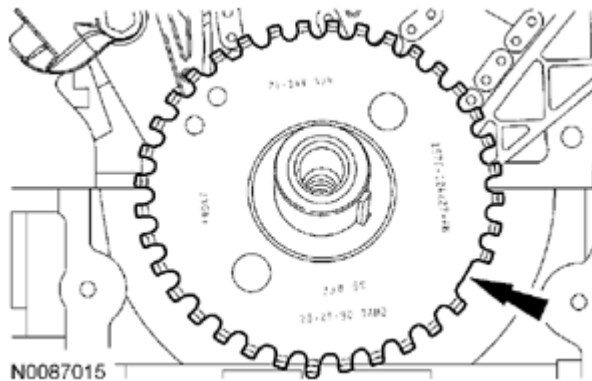


Fig. 407: Identifying Ignition Pulse Wheel
Courtesy of FORD MOTOR CO.

57. Install the ignition pulse wheel.

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

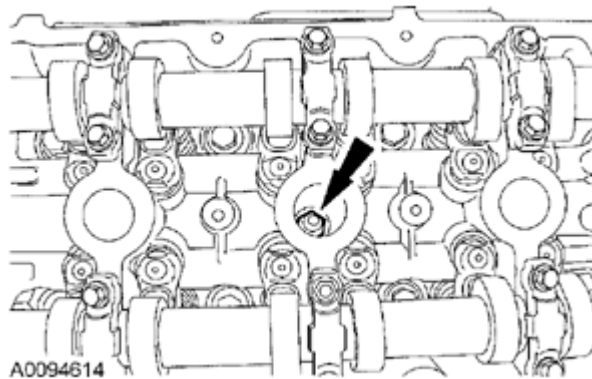


Fig. 408: Locating Spark Plugs
Courtesy of FORD MOTOR CO.

58. Install the LH and RH spark plugs.

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

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.

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: 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.

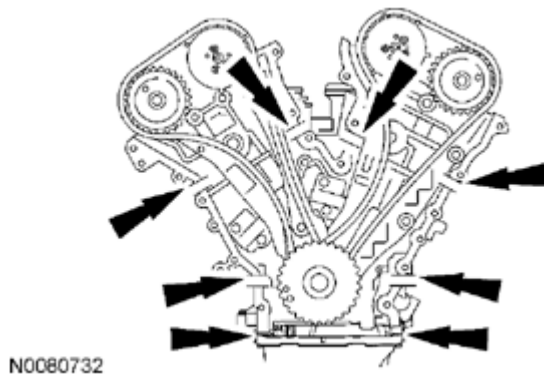
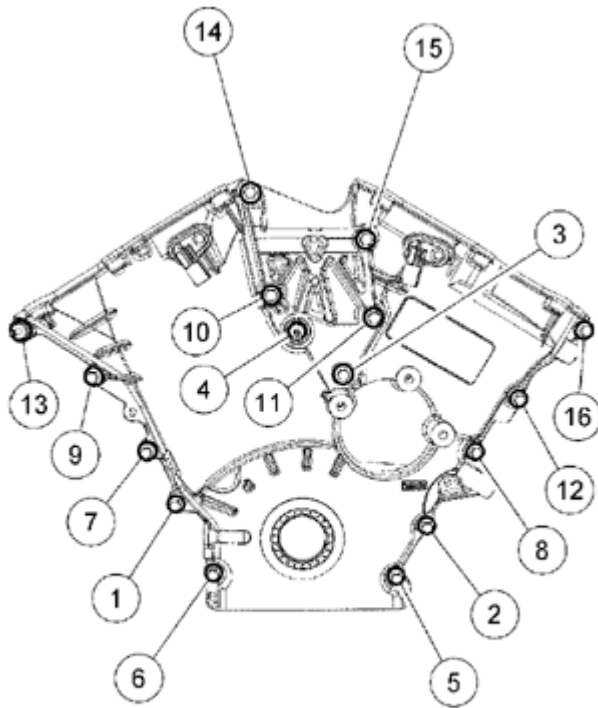


Fig. 409: Locating Sealant Applying Area At Cylinder Block And Cylinder Head Mating Surfaces
Courtesy of FORD MOTOR CO.

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: Fasteners 4 and 13 are stud bolts.

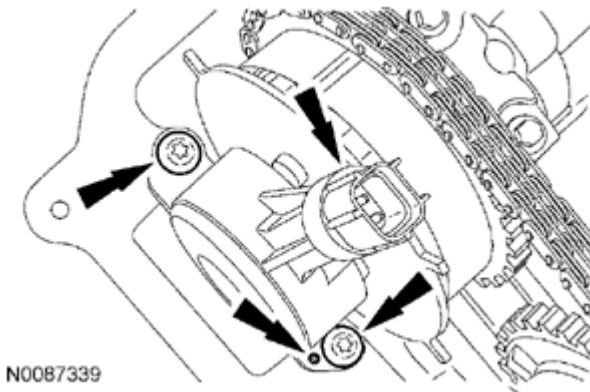


N0089880

Fig. 410: Identifying Engine Front Cover Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

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

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



N0087339

Fig. 411: Locating LH VCT Connector And 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.

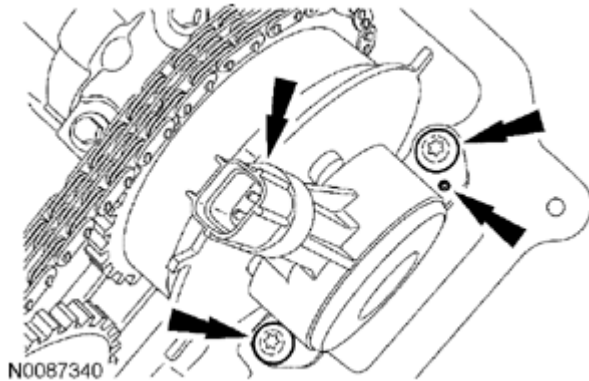


Fig. 412: Locating RH VCT Connector And Bolts
Courtesy of FORD MOTOR CO.

63. Install the 2 bolts and the RH VCT solenoid.
 - Tighten to 10 Nm (89 lb-in).

NOTE: Clean all sealing surfaces with metal surface prep.

64. Apply clean engine oil to the seal lip and seal bore before installing the seal.
65. Using the Front Cover Oil Seal Installer and the Crankshaft Vibration Damper Installer, install a new crankshaft front seal.

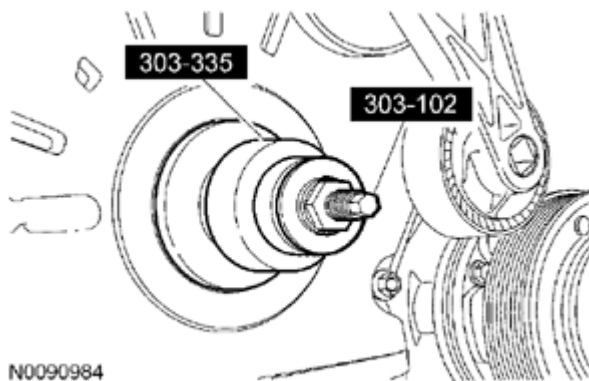
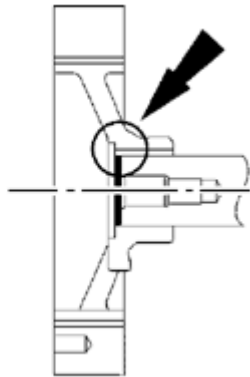


Fig. 413: Installing Crankshaft Front Seal Using Front Cover Oil Seal Installer And Crankshaft Vibration Damper Installer
Courtesy of FORD MOTOR CO.

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. 414: Locating Sealant At End Of Keyway Slot
Courtesy of FORD MOTOR CO.

66. Apply silicone gasket and sealant to the end of the crankshaft pulley keyway slot.

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

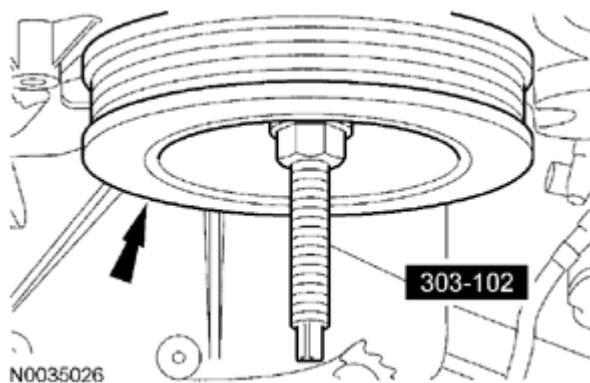


Fig. 415: Installing Crankshaft Pulley Using Crankshaft Vibration Damper Installer
Courtesy of FORD MOTOR CO.

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

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.

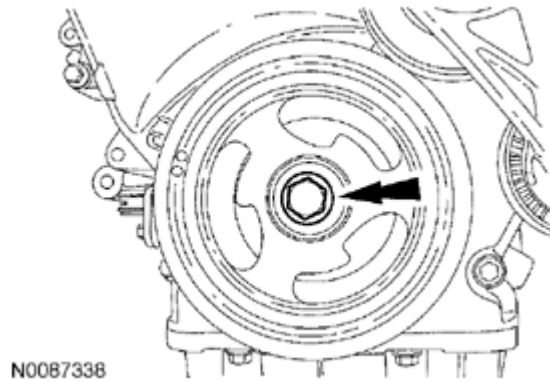


Fig. 416: Locating Crankshaft Pulley Bolt
 Courtesy of FORD MOTOR CO.

69. Install the belt tensioner and the 3 bolts.
- Tighten to 25 Nm (18 lb-ft).

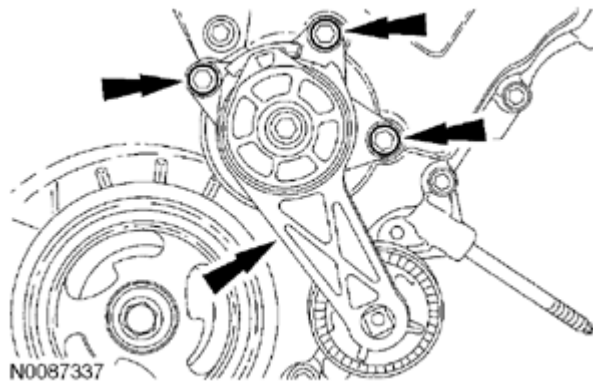


Fig. 417: Locating Accessory Drive Belt Tensioner And Bolts
 Courtesy of FORD MOTOR CO.

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.

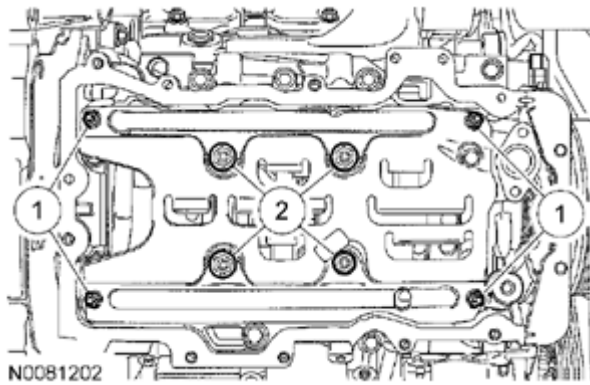


Fig. 418: Identifying M6 And M8 Oil Pan Baffle Nuts
Courtesy of FORD MOTOR CO.

71. Install a new O-ring seal on the oil pump screen and pickup tube.
 - Lubricate the O-ring seal with clean engine oil.

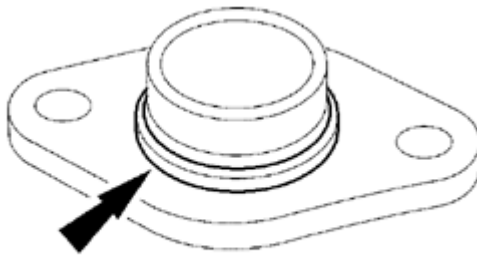


Fig. 419: Locating O-Ring Seal
Courtesy of FORD MOTOR CO.

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).

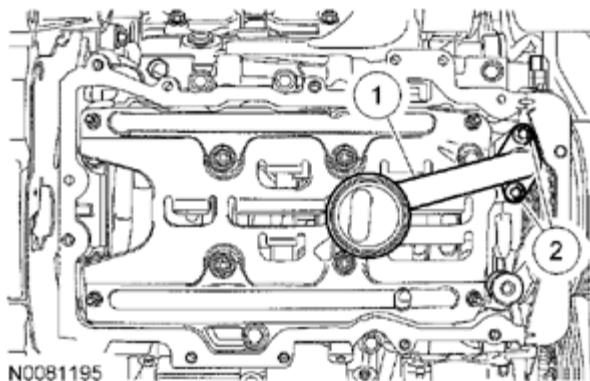
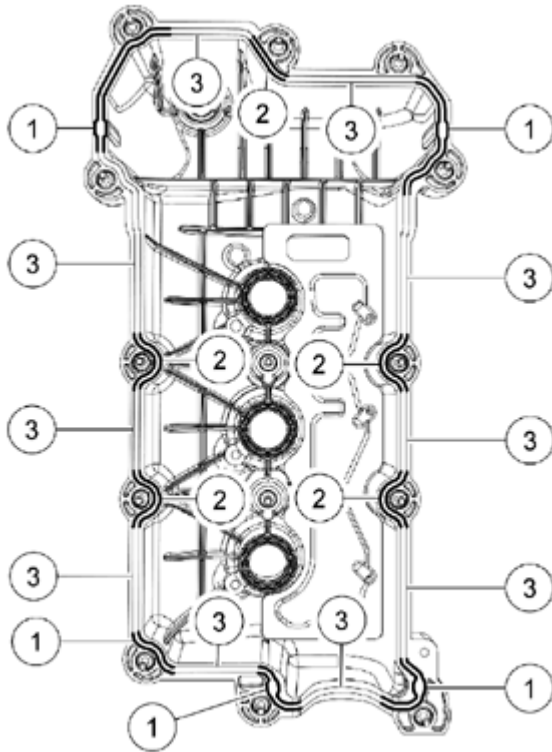


Fig. 420: Identifying Bolts, Oil Pump Screen And Pickup Tube

Courtesy of FORD MOTOR CO.

73. Install the new gasket in the LH valve cover in the following sequence.
1. Install the gasket at waffle pads and then the corners.
 2. Install the gasket around bolt holes.
 3. Install the remaining part of the gasket.



N0114294

Fig. 421: Identifying Valve Cover Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

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 and the cam seal retainer-to-cylinder head surface using metal surface prep before applying silicone gasket and sealant.

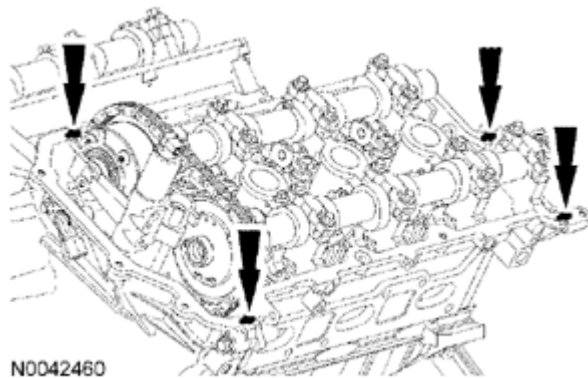


Fig. 422: Locating Sealant At Cylinder Block To Front Cover Mating Surface And Cam Seal Retainer-To-Cylinder Head Joints
 Courtesy of FORD MOTOR CO.

74. 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: Install a new valve cover gasket.

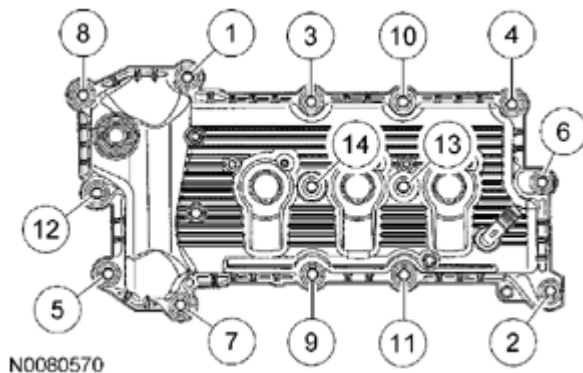
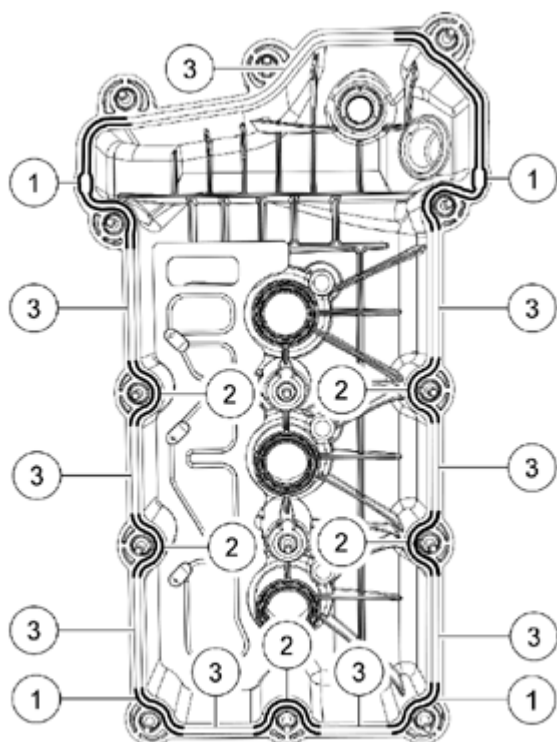


Fig. 423: Identifying Valve Cover Bolts Tightening Sequence
 Courtesy of FORD MOTOR CO.

75. Position the LH valve cover and install the bolts and stud bolts.
- Tighten in the sequence shown in the illustration to 10 Nm (89 lb-in).
76. Install the new gasket in the RH valve cover in the following sequence.
1. Install the gasket at waffle pads and then the corners.
 2. Install the gasket around bolt holes.
 3. Install the remaining part of the gasket.



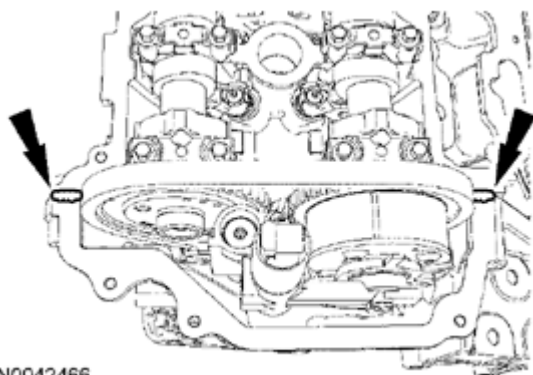
N0114295

Fig. 424: Identifying Valve Cover Bolts Tightening Sequence

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.

NOTE: Clean cylinder head and front cover surface using metal surface prep before applying silicone gasket and sealant.



N0042466

Fig. 425: Locating Silicone Gasket Sealant At Front Cover-To-Cylinder Head Joints

Courtesy of FORD MOTOR CO.

77. Apply an 8 mm (0.31 in) dot of silicone gasket sealant to the front cover-to-cylinder head joints.

NOTE: Install a new valve cover gasket.

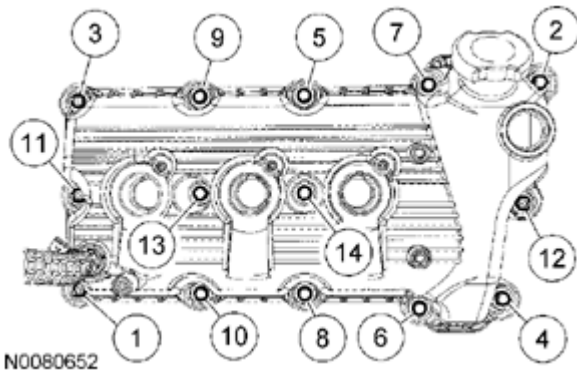


Fig. 426: Identifying Valve Cover Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

78. Position the RH valve cover and install the bolts and stud bolts.
- Tighten in the sequence shown in the illustration to 10 Nm (89 lb-in).
79. If equipped, install the block heater.
- Tighten to 21 Nm (15 lb-ft).

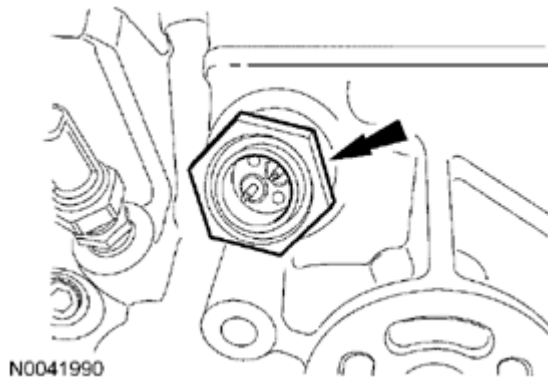


Fig. 427: Locating Block Heater
Courtesy of FORD MOTOR CO.

NOTE: Apply thread sealant with PTFE to the Engine Oil Pressure (EOP) switch threads.

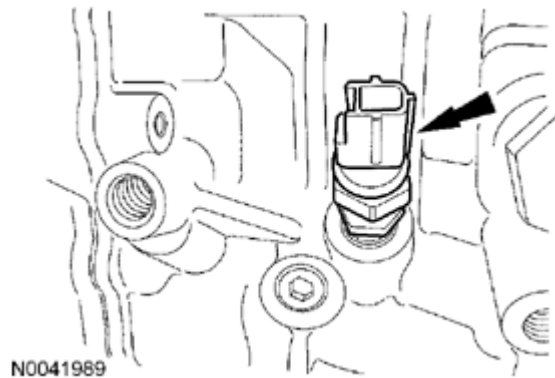


Fig. 428: Locating EOP Switch
Courtesy of FORD MOTOR CO.

80. Install the EOP switch.
 - Tighten to 14 Nm (124 lb-in).
81. Position the coolant pump housing and attach the coolant hose.
 - Tighten the clamp to 7 Nm (62 lb-in).

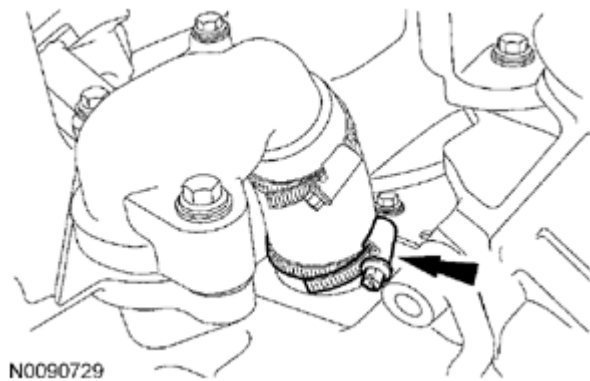


Fig. 429: Locating Coolant Hose Clamp
Courtesy of FORD MOTOR CO.

82. Install the 5 coolant pump housing bolts.
 - Tighten to 10 Nm (89 lb-in).

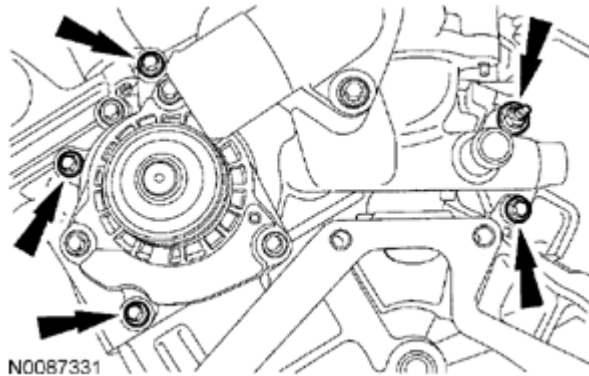


Fig. 430: Locating Coolant Pump Housing Bolts
Courtesy of FORD MOTOR CO.

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

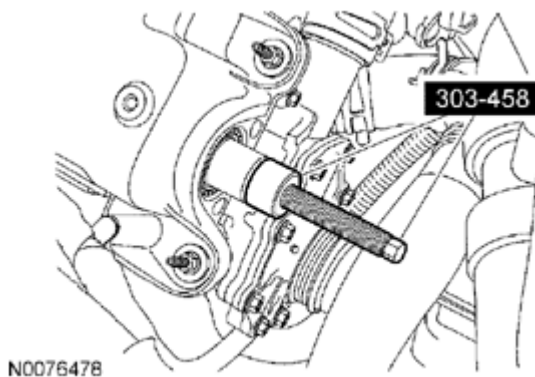


Fig. 431: Installing Camshaft Pulley Installer In Camshaft
Courtesy of FORD MOTOR CO.

83. Install the Camshaft Pulley Installer in the camshaft as shown in the illustration.
 - 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 in the illustration, 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).

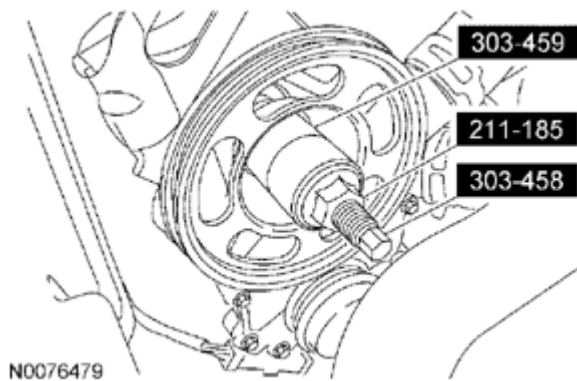


Fig. 432: Installing Special Tools Flush With End Of Camshaft
Courtesy of FORD MOTOR CO.

84. 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 in the illustration.
 - 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.
85. Install the coolant pump belt on the coolant pump pulley and position it on the camshaft pulley.

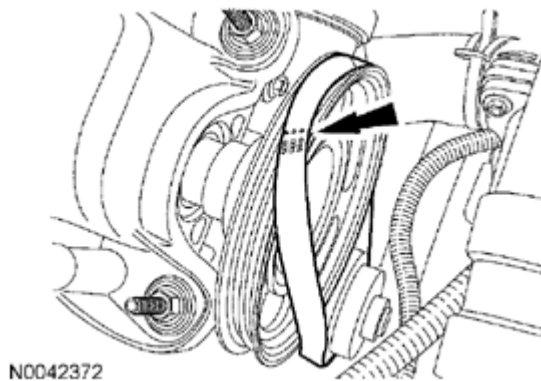
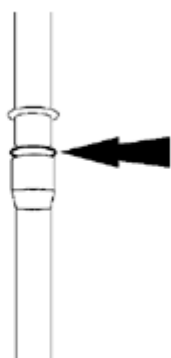


Fig. 433: Locating Coolant Pump Belt
Courtesy of FORD MOTOR CO.

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.

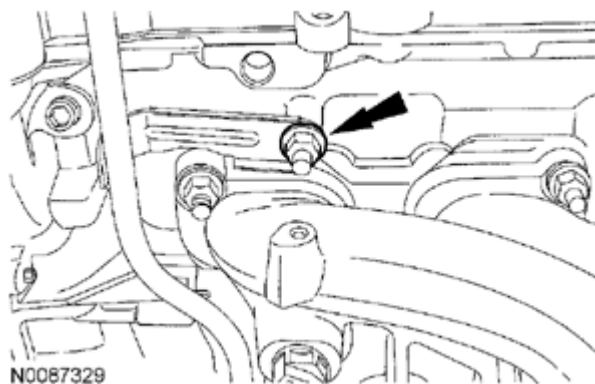
86. Rotate the crankshaft clockwise to seat the water pump belt on the camshaft pulley.
87. Install a new O-ring on the oil level indicator tube. Apply clean engine oil to the O-ring.



A0011038

Fig. 434: Locating O-Ring On Oil Level Indicator Tube
Courtesy of FORD MOTOR CO.

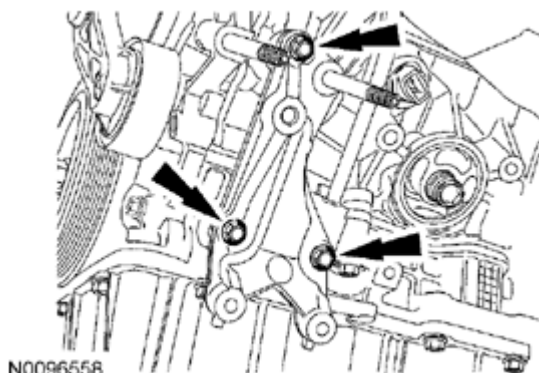
88. Position the oil level indicator and tube and install the stud bolt.
 - Tighten to 9 Nm (80 lb-in).



N0087329

Fig. 435: Locating Oil Level Indicator And Tube Stud Bolt
Courtesy of FORD MOTOR CO.

89. Install the 3 bolts and the A/C compressor bracket.
 - Tighten to 25 Nm (18 lb-ft).

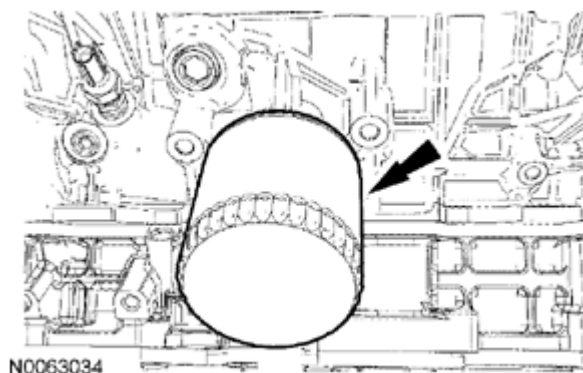


N0096558

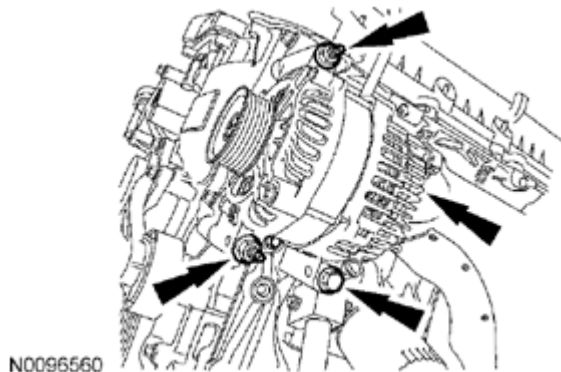
Fig. 436: Locating Bolts And A/C Compressor Bracket

Courtesy of FORD MOTOR CO.

90. 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. 437: Locating Oil Filter****Courtesy of FORD MOTOR CO.**

91. Position the generator and install the bolt and 2 nuts.
- Tighten to 47 Nm (35 lb-ft).

**Fig. 438: Locating Generator Bolt And Nuts****Courtesy of FORD MOTOR CO.**

92. Install the A/C compressor and the 3 bolts.
- Tighten to 25 Nm (18 lb-ft).

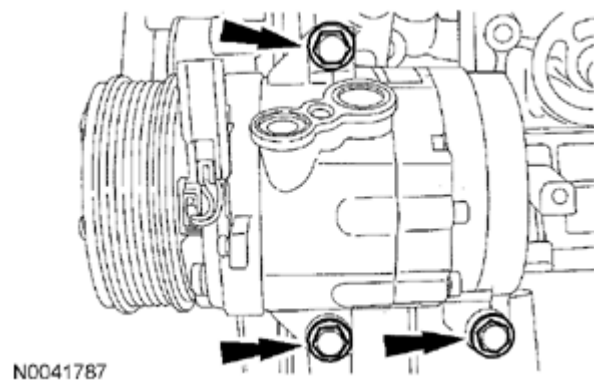


Fig. 439: Locating A/C Compressor Bolts
Courtesy of FORD MOTOR CO.

93. Rotate the accessory drive belt tensioner counterclockwise and install the accessory drive belt.

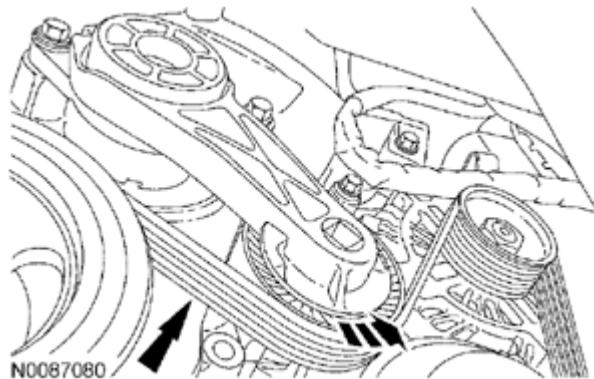


Fig. 440: Rotating Accessory Drive Belt Tensioner Counterclockwise
Courtesy of FORD MOTOR CO.

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

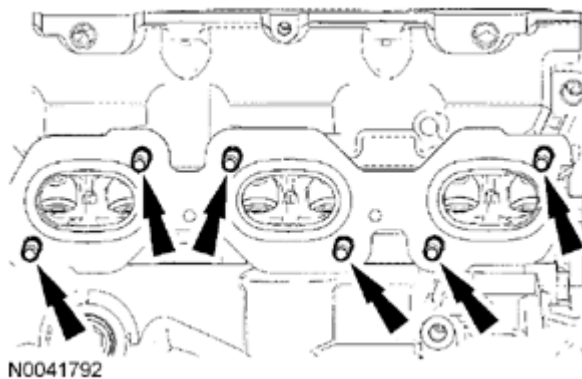


Fig. 441: Locating RH Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

95. Install a new gasket and the RH exhaust manifold and new nuts.
- Tighten the nuts in 2 stages in the sequence shown in the illustration.
 - Stage 1: Tighten to 20 Nm (177 lb-in).
 - Stage 2: Tighten to 20 Nm (177 lb-in).

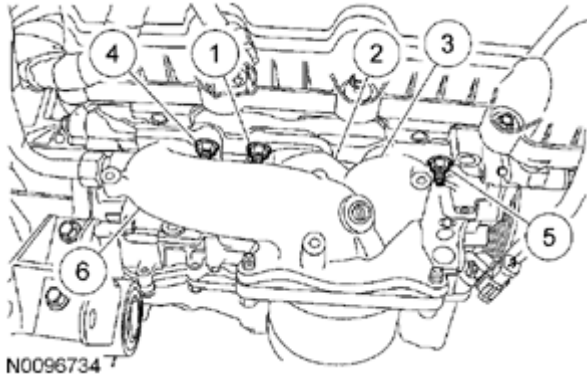


Fig. 442: Identifying RH Exhaust Manifold Nuts Tighten Sequence
 Courtesy of FORD MOTOR CO.

Front Wheel Drive (FWD)

96. Install a new gasket and the RH catalytic converter and the 3 new nuts.
- Tighten to 40 Nm (30 lb-ft).

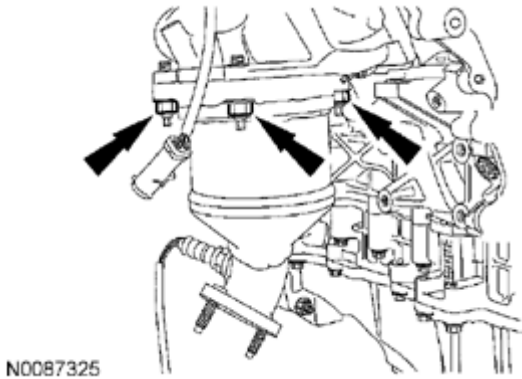


Fig. 443: Locating RH Catalytic Converter Nuts
 Courtesy of FORD MOTOR CO.

97. Install the 3 bolts and the RH heat shield.
- Tighten to 10 Nm (89 lb-in).

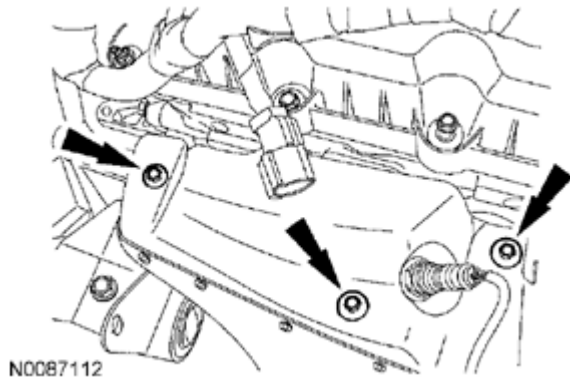


Fig. 444: Locating RH Heat Shield Bolts
Courtesy of FORD MOTOR CO.

All engines

NOTE: LH shown in the illustration, RH similar.

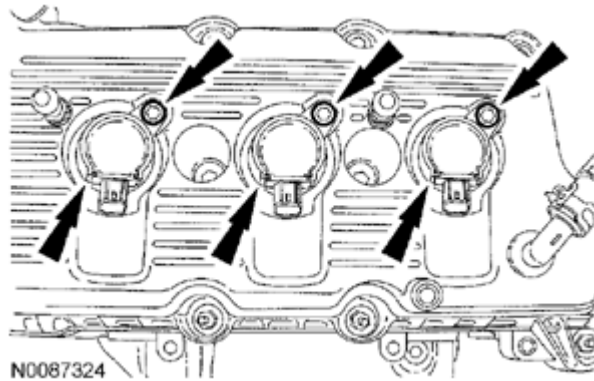


Fig. 445: Locating Coil-On-Plugs And Bolts
Courtesy of FORD MOTOR CO.

98. Apply a light film of silicone brake caliper grease and dielectric compound to the interior of the spark plug boot prior to installation.

Install the 6 coil-on-plugs and the bolts.

- Tighten to 6 Nm (53 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.

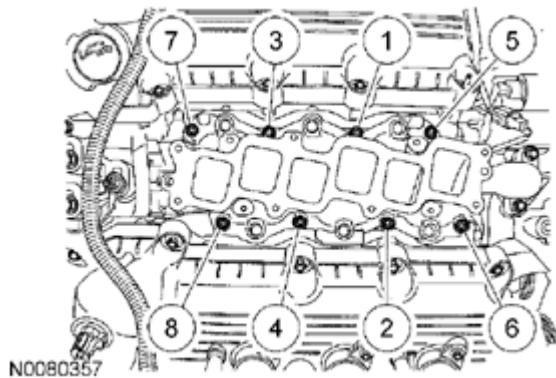
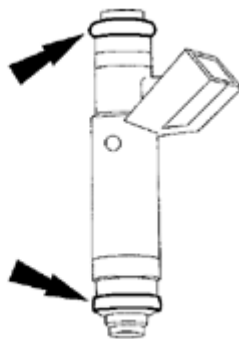


Fig. 446: Identifying Lower Intake Manifold Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

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

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. 447: Locating Fuel Injector O-Rings
Courtesy of FORD MOTOR CO.

100. 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.
101. Install the 4 bolts and the fuel rail and injectors assembly.
 - Tighten to 10 Nm (89 lb-in).

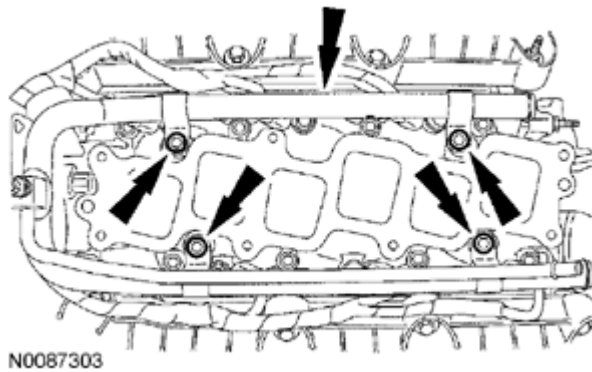


Fig. 448: Locating Fuel Rail And Injectors Assembly Bolts
 Courtesy of FORD MOTOR CO.

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

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

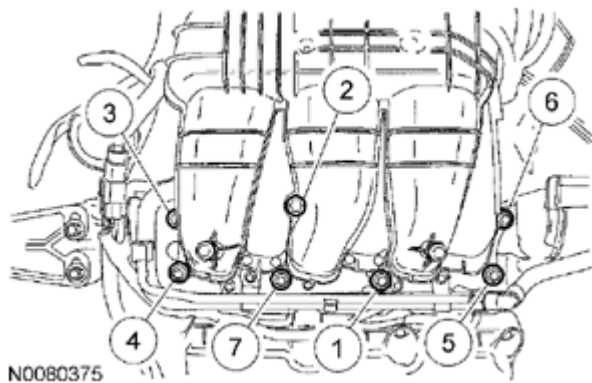


Fig. 449: Identifying Upper Intake Manifold Bolts Tightening Sequence
 Courtesy of FORD MOTOR CO.

102. Position the upper intake manifold and install the 7 bolts.
 - Tighten the bolts in 2 stages in the sequence shown in the illustration.
 - Stage 1: Tighten to 10 Nm (89 lb-in).
 - Stage 2: Tighten an additional 45 degrees.
103. Loosen the upper intake manifold bracket lower bolt. Install the upper bolts (1 shown in the illustration), then tighten all the bolts.
 - Tighten to 10 Nm (89 lb-in).

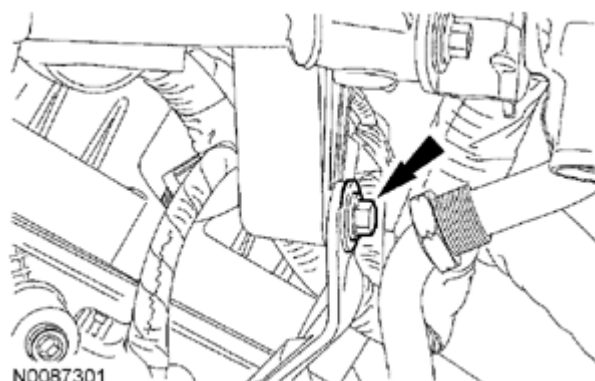


Fig. 450: Locating Upper Intake Manifold Bracket Lower Bolt
Courtesy of FORD MOTOR CO.

104. Connect the 3 LH coil-on-plug electrical connectors.
- Attach the 2 wiring harness retainers.

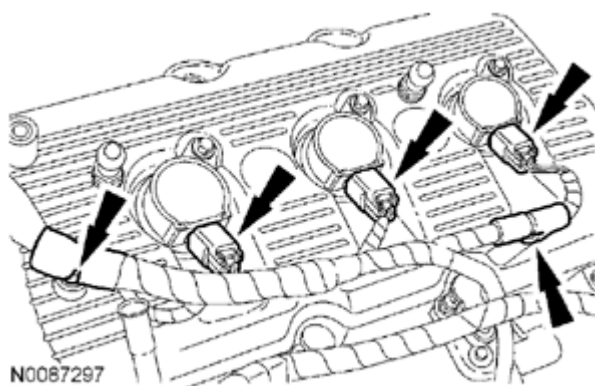


Fig. 451: Locating LH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

105. Connect the Engine Oil Pressure (EOP) switch electrical connector and attach the wiring retainer to the oil indicator tube.

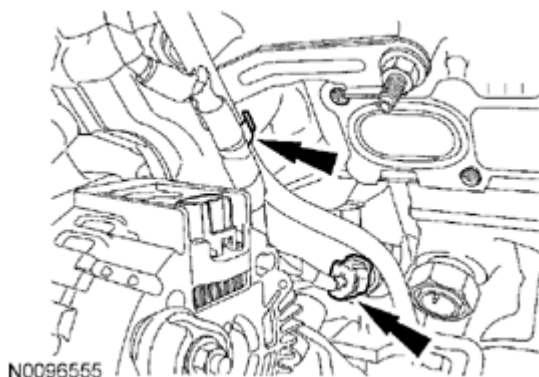


Fig. 452: Locating Engine Oil Pressure Switch Electrical Connector And Wiring Retainer Of Oil

Indicator Tube**Courtesy of FORD MOTOR CO.**

106. Install the radio interference capacitor and the nut.
- Tighten to 6 Nm (53 lb-in).

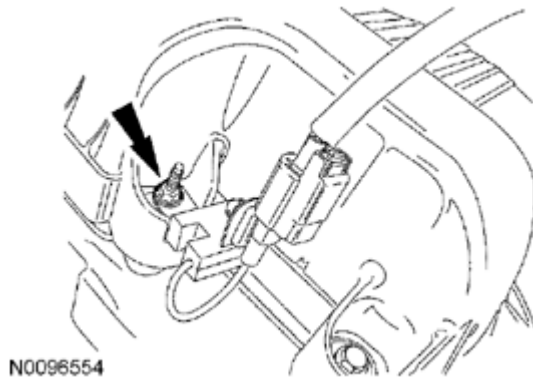


Fig. 453: Locating Radio Frequency Interference Capacitor Nut
Courtesy of FORD MOTOR CO.

107. Connect the LH VCT electrical connector.

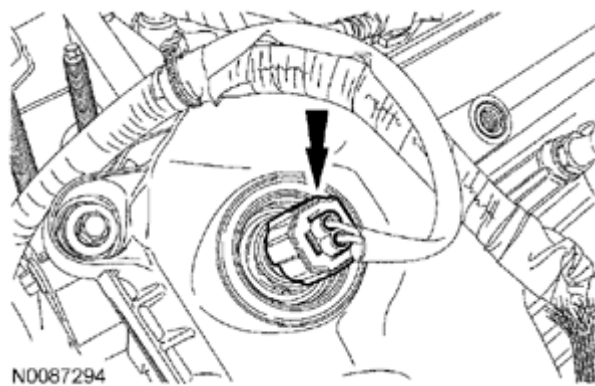


Fig. 454: Locating LH VCT Electrical Connector
Courtesy of FORD MOTOR CO.

108. Connect the fuel injector wiring harness electrical connector and attach the wiring harness retainer.

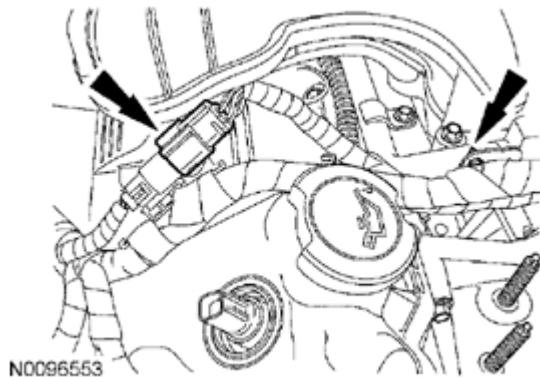


Fig. 455: Locating Fuel Injector Wiring Harness Electrical Connector And Wiring Harness Retainer

Courtesy of FORD MOTOR CO.

109. Connect the 2 Camshaft Position (CMP) sensor electrical connectors and attach the wiring harness retainer from the engine front cover stud bolt.

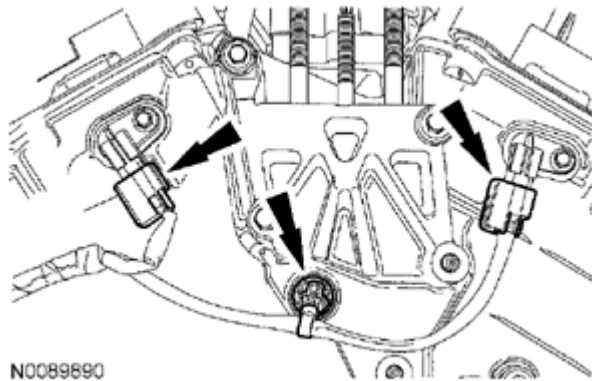


Fig. 456: Locating Camshaft Position Sensor Electrical Connectors, Wiring Harness Retainer And Engine Front Cover Stud Bolt

Courtesy of FORD MOTOR CO.

110. Connect the Crankshaft Position (CKP) sensor electrical connector and attach the 2 wiring harness retainers.

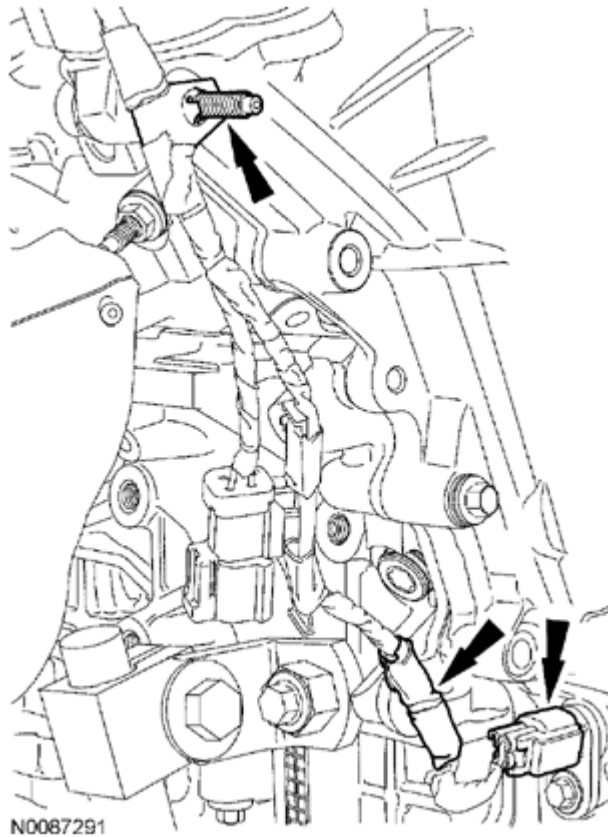


Fig. 457: Locating Crankshaft Position Sensor Electrical Connector And Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

111. Connect the RH VCT electrical connector and attach the wiring harness retainer to the valve cover stud bolt.

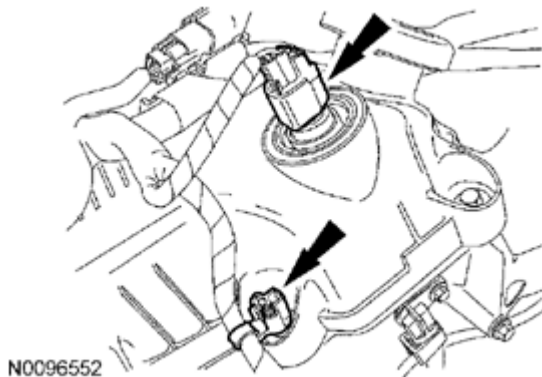


Fig. 458: Locating RH Variable Camshaft Timing Electrical Connector And Wiring Harness Retainer
Courtesy of FORD MOTOR CO.

112. Connect the RH coil-on-plug electrical connectors.
 - Attach the 2 wiring harness retainers.

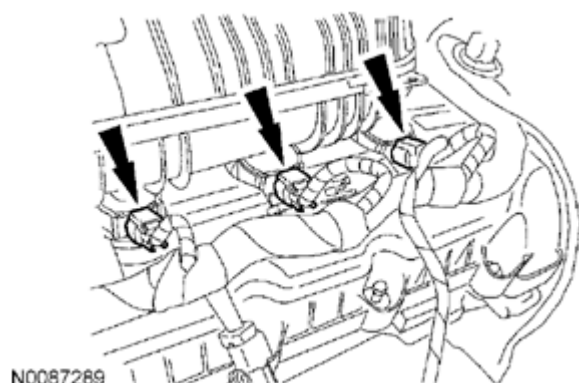


Fig. 459: Locating RH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

113. Connect the Manifold Absolute Pressure (MAP) electrical connector and attach the wiring retainer.

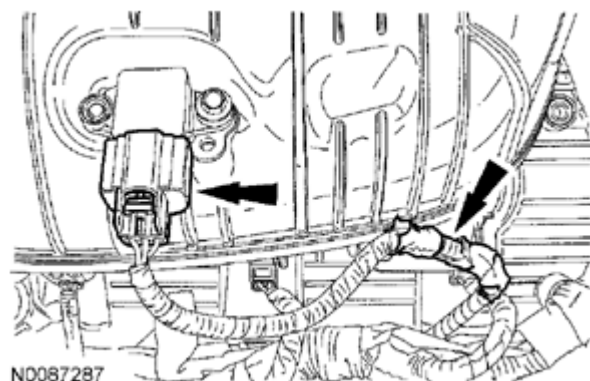


Fig. 460: Locating Manifold Absolute Pressure Electrical Connector And Wiring Retainer
Courtesy of FORD MOTOR CO.

114. Attach the wiring harness retainer to the upper intake manifold.

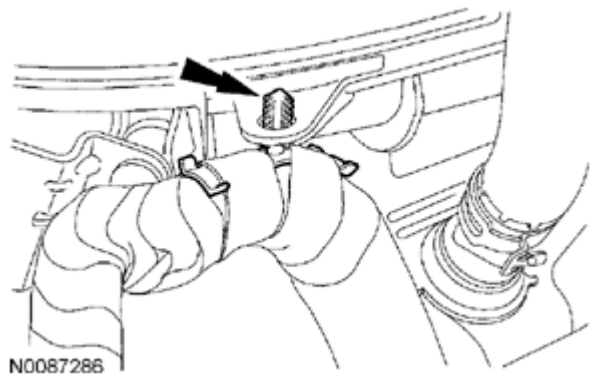


Fig. 461: Locating Wiring Harness Retainer Of Upper Intake Manifold
Courtesy of FORD MOTOR CO.

115. Connect the PCV valve electrical connector.

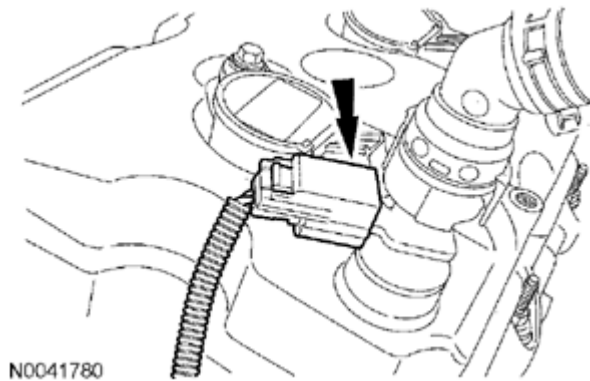


Fig. 462: Locating PCV Valve Electrical Connector
Courtesy of FORD MOTOR CO.

116. Connect the EGR regulator electrical connector and attach the wiring retainer.

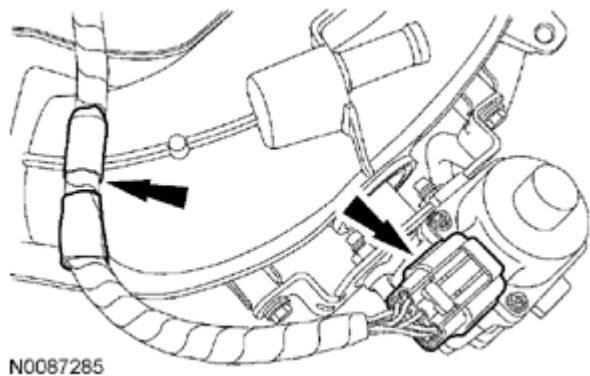


Fig. 463: Locating EGR Regulator Electrical Connector And Wiring Retainer
Courtesy of FORD MOTOR CO.

117. Connect the Evaporative Emission (EVAP) canister purge valve electrical connector.

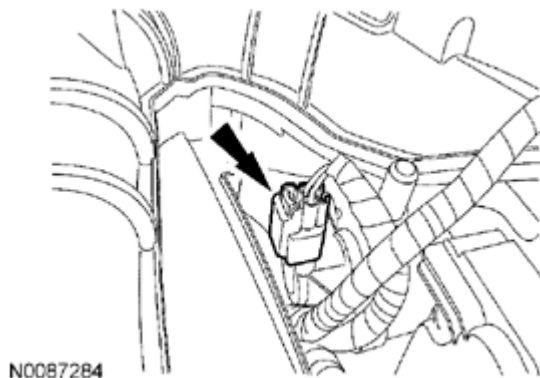


Fig. 464: Locating Evaporative Emission Canister Purge Valve Electrical Connector

Courtesy of FORD MOTOR CO.

118. Connect the electronic throttle control electrical connector.

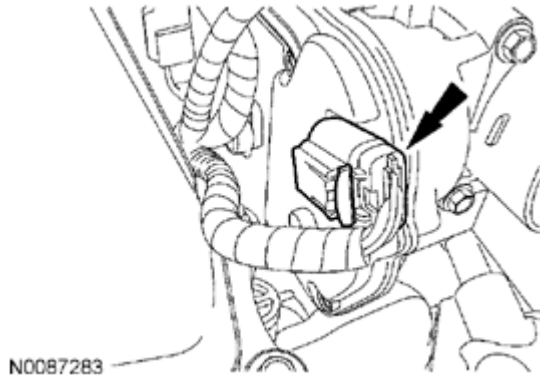


Fig. 465: Locating Electronic Throttle Control Electrical Connector
Courtesy of FORD MOTOR CO.

119. 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.

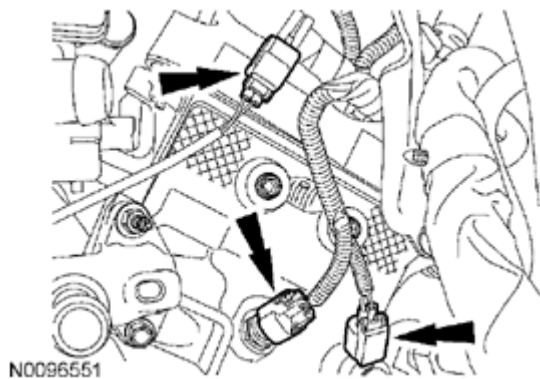


Fig. 466: Locating Engine Block Knock Sensor Electrical Connector And Cylinder Head KS Electrical Connector
Courtesy of FORD MOTOR CO.

120. Position the B+ wiring harness and attach the 2 harness retainers to the valve cover stud bolts.

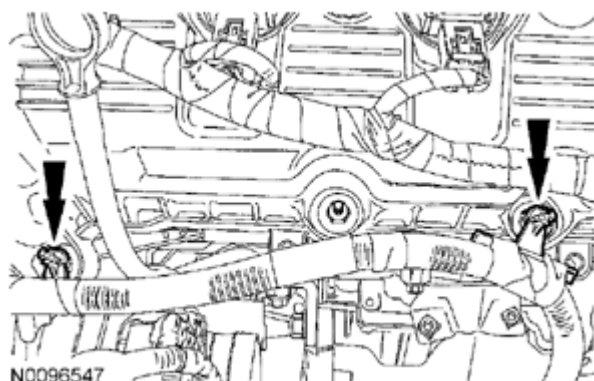


Fig. 467: Locating B+ Wiring Harness Retainers Of Valve Cover Stud Bolts
Courtesy of FORD MOTOR CO.

121. Install the B+ wire and nut on the generator.
 - Tighten to 8 Nm (71 lb-in).

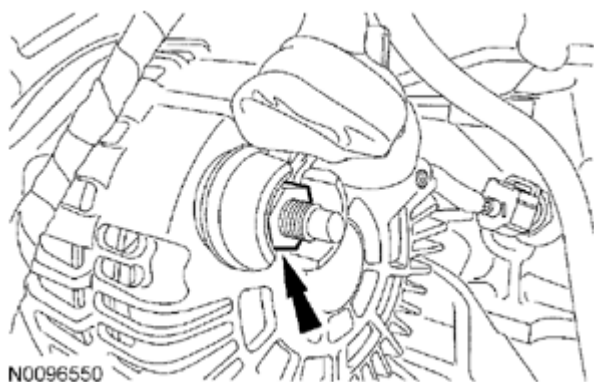


Fig. 468: Locating Generator B+ Wire Nut
Courtesy of FORD MOTOR CO.

122. Connect the generator electrical connector.

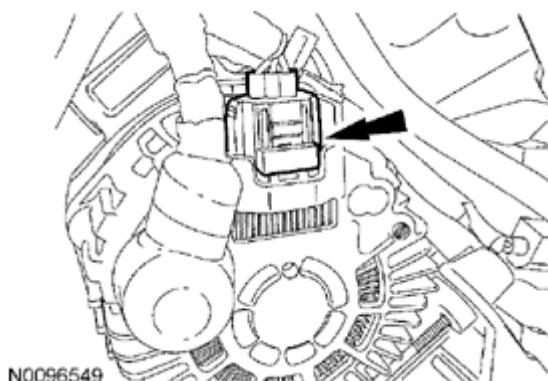


Fig. 469: Locating Generator Electrical Connector
Courtesy of FORD MOTOR CO.

123. Connect the A/C compressor clutch electrical connector.

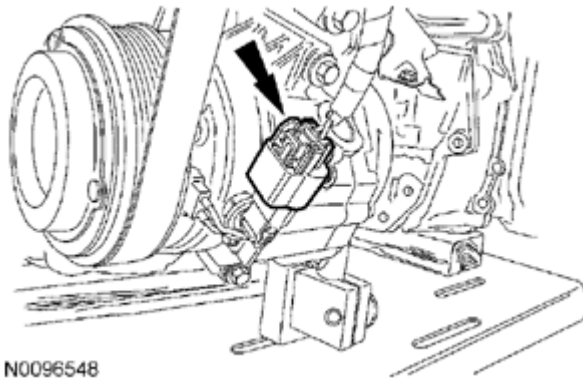


Fig. 470: Locating A/C Compressor Clutch Electrical Connector
Courtesy of FORD MOTOR CO.

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.

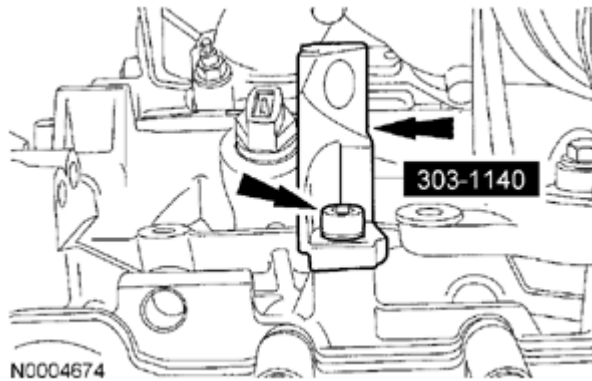


Fig. 471: Locating Lower Half Of Engine Lifting Bracket Set
Courtesy of FORD MOTOR CO.

124. Install the lower half of the Engine Lifting Bracket Set.
125. Install the upper half of the Engine Lifting Bracket Set.

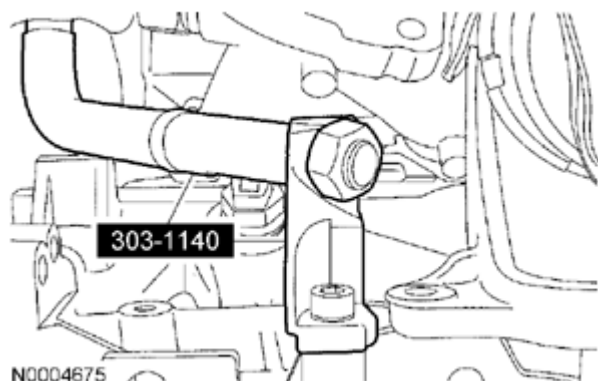


Fig. 472: Locating Upper Half Of Engine Lifting Bracket Set
Courtesy of FORD MOTOR CO.

126. Install the Engine Lifting Bracket.

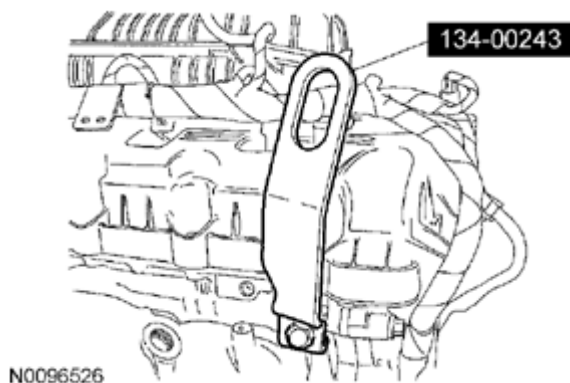


Fig. 473: Identifying Engine Lifting Bracket
Courtesy of FORD MOTOR CO.

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

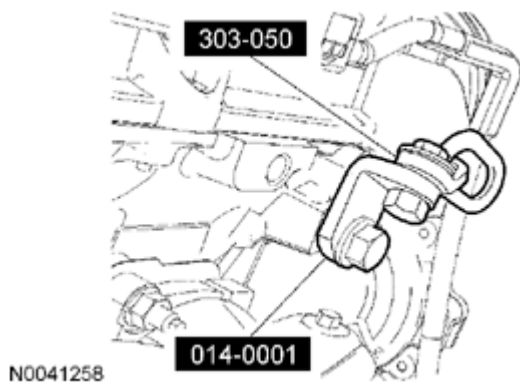


Fig. 474: Identifying Engine Lifting Bracket And Universal Adapter Bracket
Courtesy of FORD MOTOR CO.

128. Using the Spreader Bar, Engine Lifting Brackets, Engine Lifting Bracket Set and a suitable engine crane, remove the engine from the engine stand.

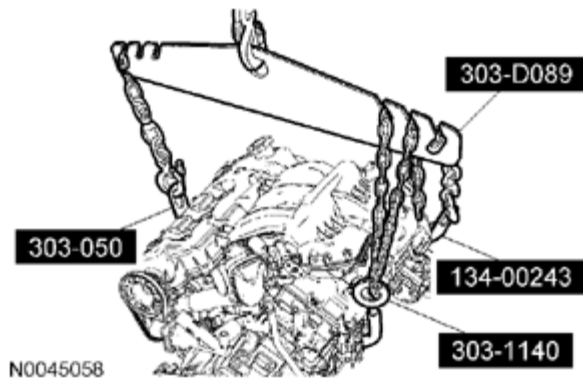


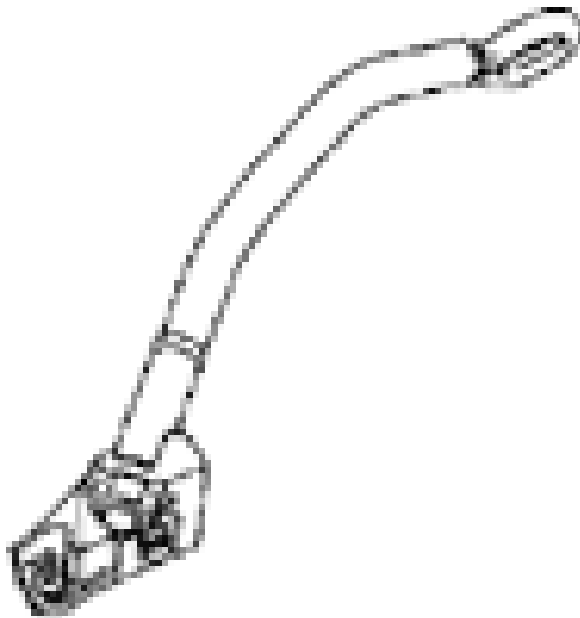
Fig. 475: Removing Engine From Engine Stand Using Special Tools
Courtesy of FORD MOTOR CO.

INSTALLATION

ENGINE

Special Tools

SPECIAL TOOL(S)

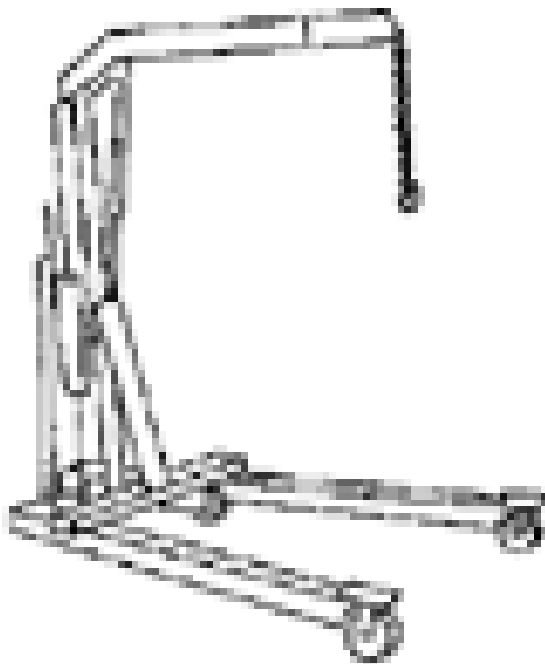


ST2873-A

Engine Lifting Bracket Set
303-1140

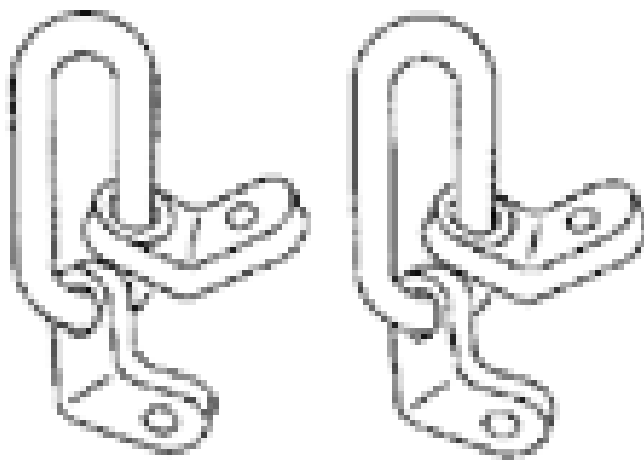
2011 Mercury Milan

2011 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan



ST1341-A

2,200# Floor Crane, Fold Away
300-OTC1819E or equivalent



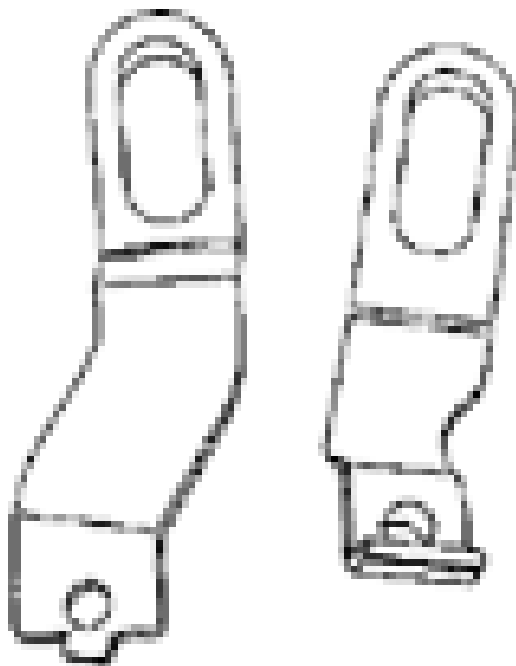
ST2793-A

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

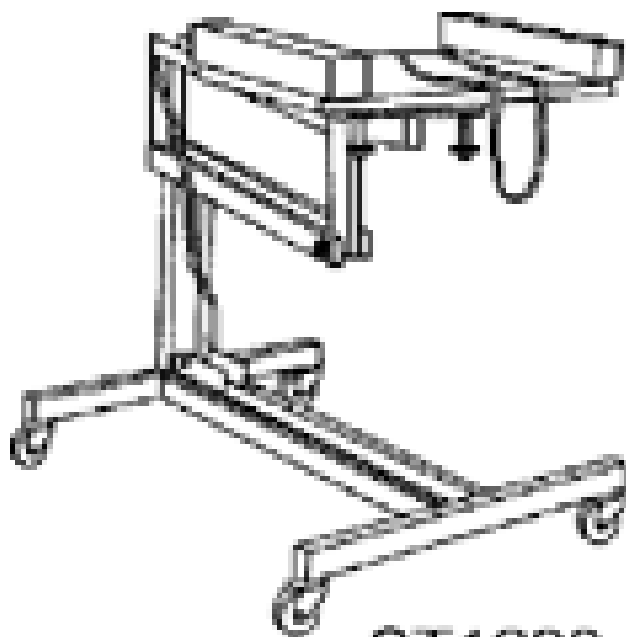
Lifting Brackets, Engine
134-00243 or equivalent

2011 Mercury Milan

2011 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan



ST2463-A



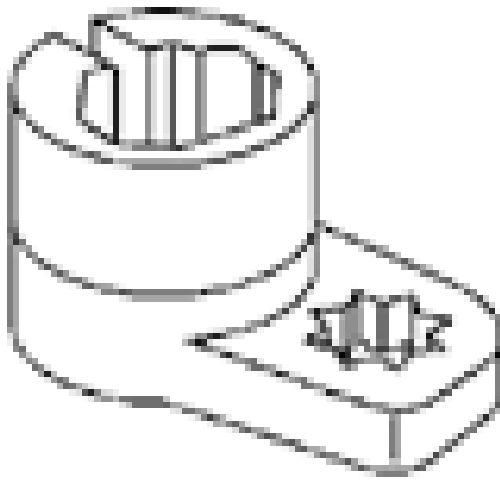
ST1293-A

Powertrain Lift
300-OTC1585AE or equivalent

Socket, Exhaust Gas Oxygen Sensor
303-476

2011 Mercury Milan

2011 ENGINE Engine Mechanical - 3.0L (4V) - Fusion & Milan



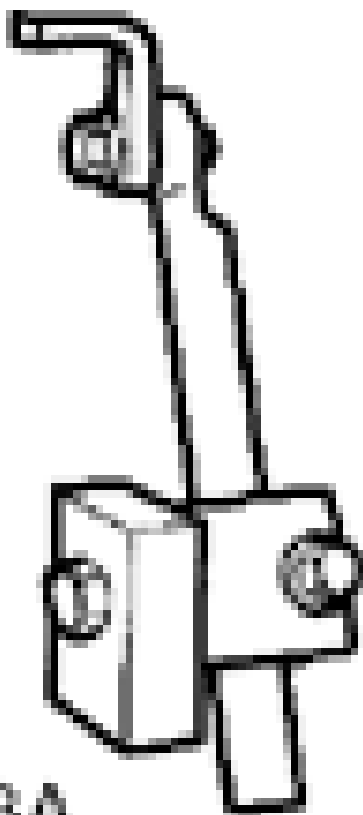
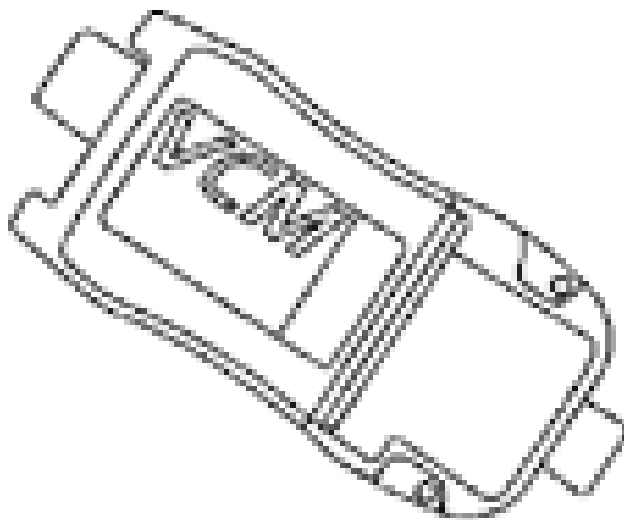
ST1447-A



ST1602-A

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

Adjustable Grip Arm, 1735A
014-00001 or equivalent

**ST2743A****ST2834-A**

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

Material Specifications**MATERIAL SPECIFICATIONS TABLE**

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada) XO-5W20-QSP (US); CXO-5W20-LSP12 (Canada)	WSS-M2C945-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.

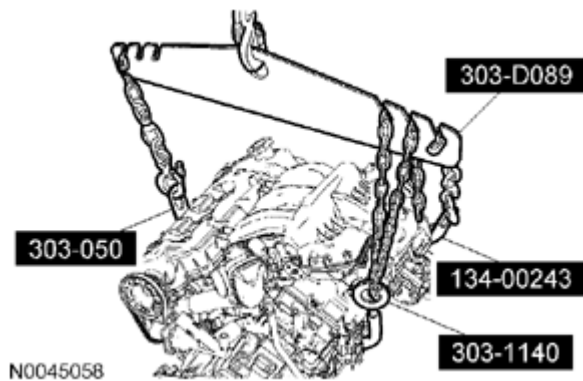


Fig. 476: Aligning Transaxle To Engine Using Special Tools
Courtesy of FORD MOTOR CO.

2. Install the 4 transaxle-to-engine bolts.
 - Tighten to 48 Nm (35 lb-ft).

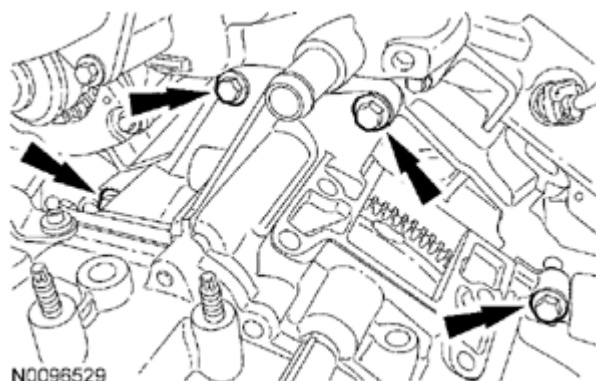


Fig. 477: Locating Transaxle-To-Engine Bolts
Courtesy of FORD MOTOR CO.

3. Install the transaxle-to-engine bolt.
 - Tighten to 48 Nm (35 lb-ft).

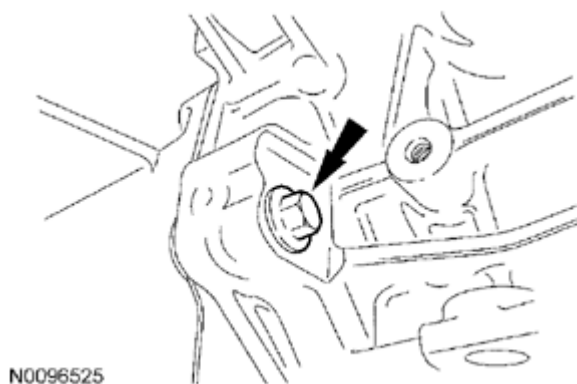


Fig. 478: Locating Transaxle-To-Engine Bolt
Courtesy of FORD MOTOR CO.

4. Connect the 2 transmission electrical connectors and attach the wiring harness retainer to the stud bolt.

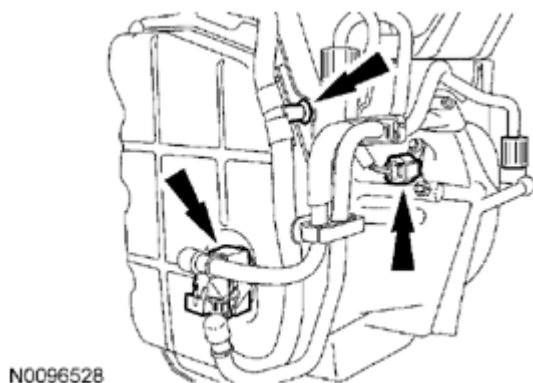


Fig. 479: Locating Transmission Electrical Connectors, Wiring Retainer And Stud Bolt
Courtesy of FORD MOTOR CO.

5. Attach the wiring harness retainer to the transmission indicator tube.

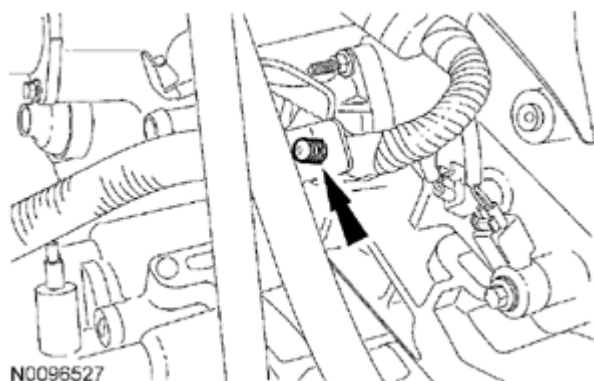


Fig. 480: Locating Wiring Harness Retainer Of Transmission Indicator Tube
Courtesy of FORD MOTOR CO.

6. Install the starter and the 2 stud bolts.
 - Tighten to 27 Nm (20 lb-ft).

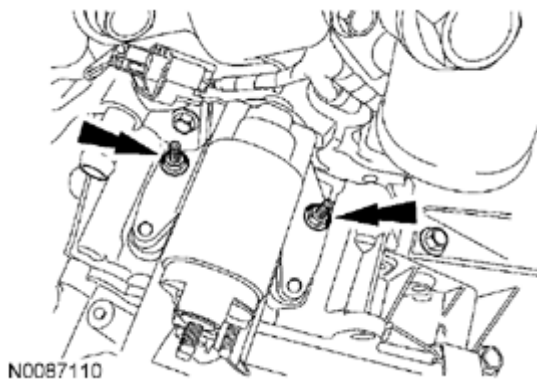


Fig. 481: Locating Starter Stud Bolts
Courtesy of FORD MOTOR CO.

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).

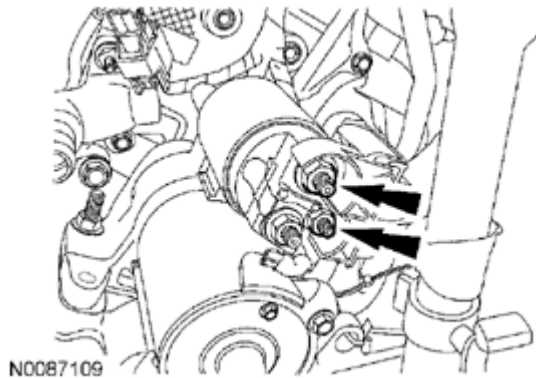


Fig. 482: Locating Starter Wiring Nuts
Courtesy of FORD MOTOR CO.

NOTE: Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges which make leak paths.

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.
9. Install the starter wiring ground wire and nut.
 - Tighten to 18 Nm (159 lb-in).

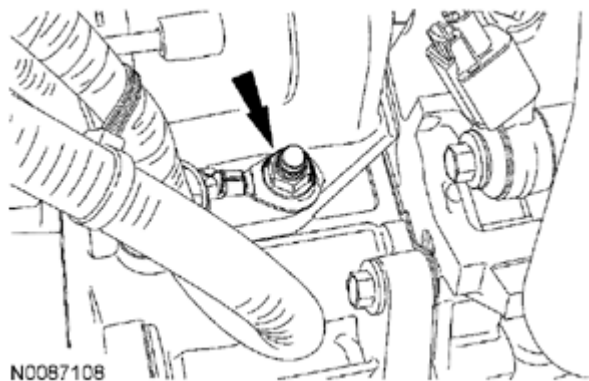


Fig. 483: Locating Starter Wiring Ground Nut
Courtesy of FORD MOTOR CO.

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.

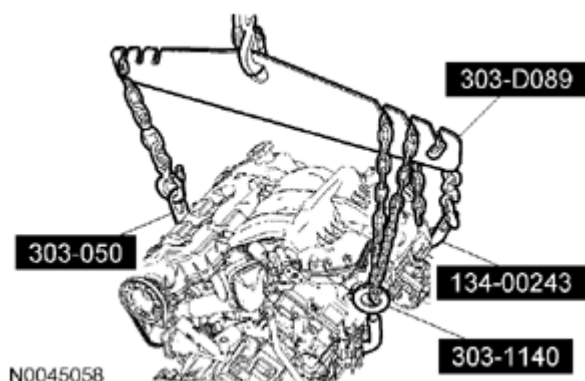


Fig. 484: Positioning Engine And Transaxle Onto Lift Table Using Special Tools
Courtesy of FORD MOTOR CO.

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

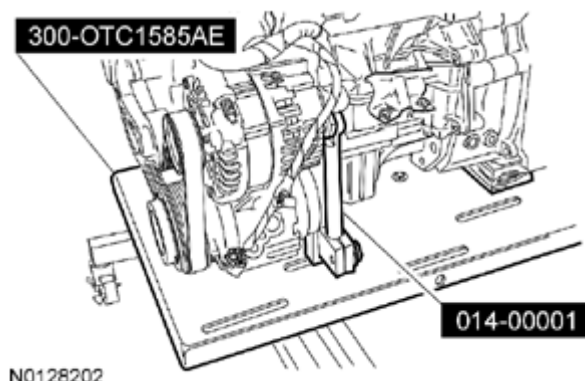


Fig. 485: Installing Powertrain Lift And Adjustable Grip Arm Onto Engine
Courtesy of FORD MOTOR CO.

11. Install the Adjustable Grip Arm and the Powertrain Lift to the engine.
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).

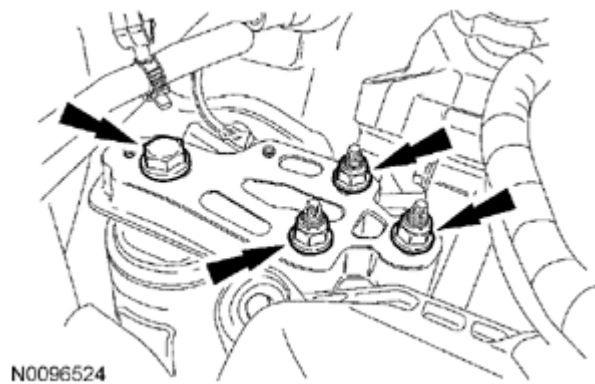


Fig. 486: Locating Bolt, Nuts And Engine Mount Bracket
Courtesy of FORD MOTOR CO.

14. Install the damper and bolt.
 - Tighten to 23 Nm (17 lb-ft).

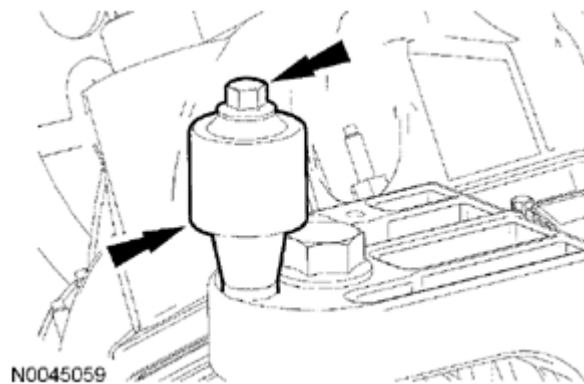


Fig. 487: Locating Bolt And Damper
Courtesy of FORD MOTOR CO.

15. Install the ground strap and bolt on the engine mount bracket.
 - Tighten to 10 Nm (89 lb-in).

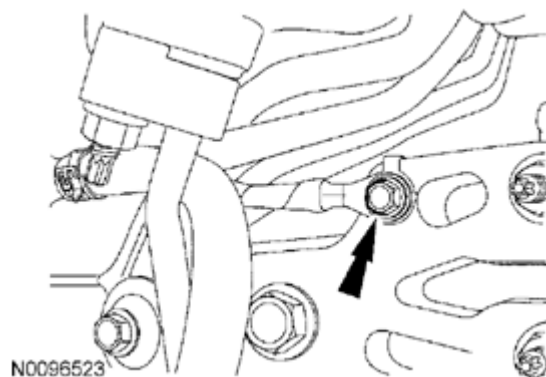


Fig. 488: Locating Bolt And Ground Strap On Engine Mount Bracket
Courtesy of FORD MOTOR CO.

16. Install the rear transaxle support through bolt.
 - Tighten to 103 Nm (76 lb-ft).

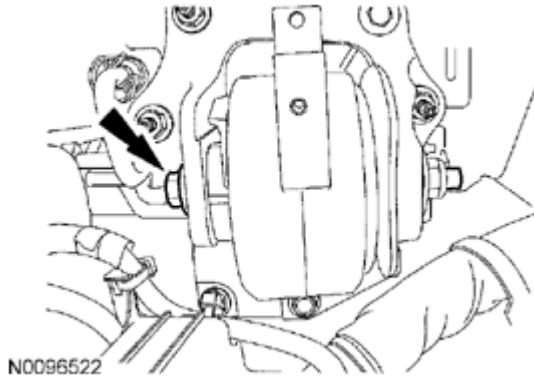


Fig. 489: Locating Rear Transaxle Support Through Bolt
Courtesy of FORD MOTOR CO.

17. Install the transaxle-to-engine stud and 2 nuts.
 - Tighten to 48 Nm (35 lb-ft).

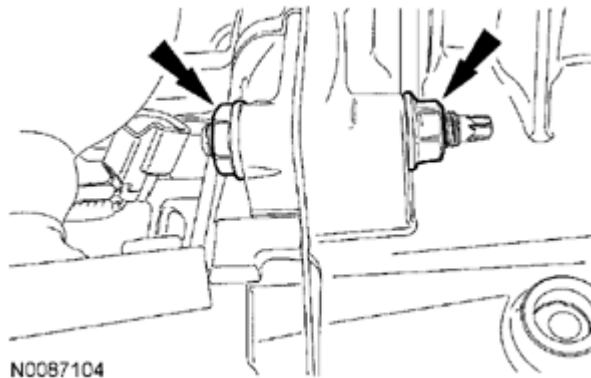


Fig. 490: Locating Nuts And Transaxle-To-Engine Stud
Courtesy of FORD MOTOR CO.

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.

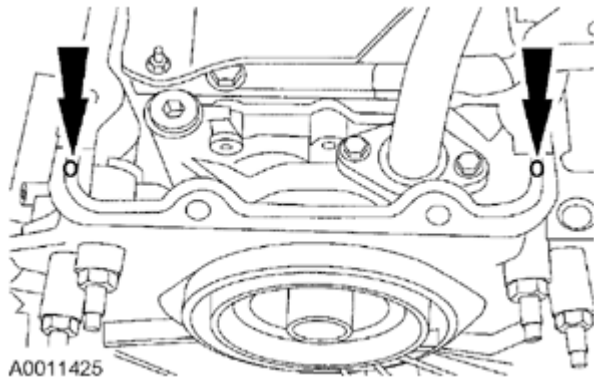


Fig. 491: Locating Sealant On Front Cover-To-Cylinder Block Sealing Surface
 Courtesy of FORD MOTOR CO.

18. Apply a 10 mm (0.39 in) dot of silicone gasket and sealant to the front cover-to-cylinder block sealing surface.

NOTE: Install a new oil pan gasket.

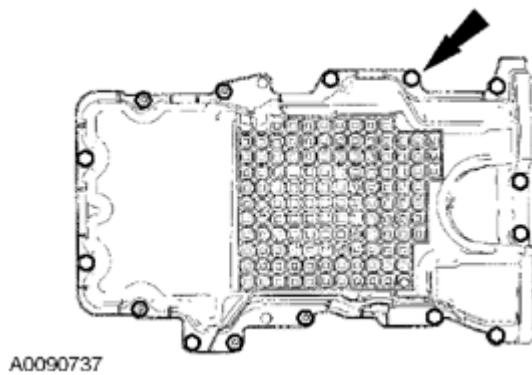


Fig. 492: Locating Oil Pan Bolts And Stud Bolts
 Courtesy of FORD MOTOR CO.

19. Position the oil pan and gasket and loosely install the bolts and stud bolts.
20. Install the 2 oil pan-to-transaxle bolts.
 - Tighten to 40 Nm (30 lb-ft).



Fig. 493: Locating Oil Pan-To-Transaxle Bolts
Courtesy of FORD MOTOR CO.

21. Tighten the oil pan bolts in the sequence shown in the illustration to 25 Nm (18 lb-ft).

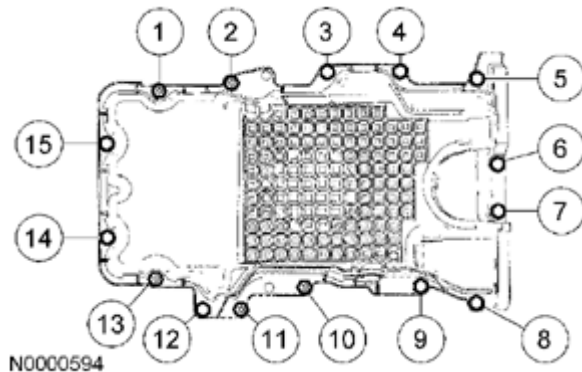


Fig. 494: Identifying Oil Pan Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

22. Install the 4 torque converter nuts.
- Tighten to 40 Nm (30 lb-ft).

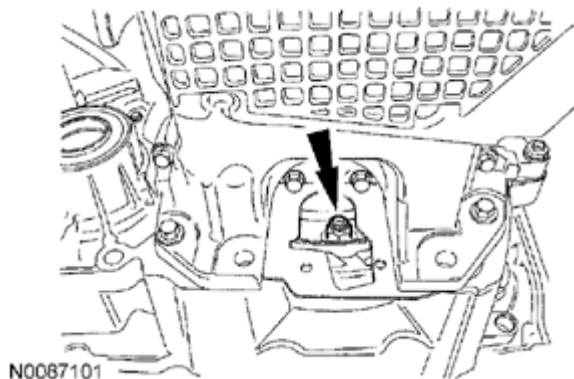


Fig. 495: Locating Torque Converter Nuts
Courtesy of FORD MOTOR CO.

23. Install the access cover.

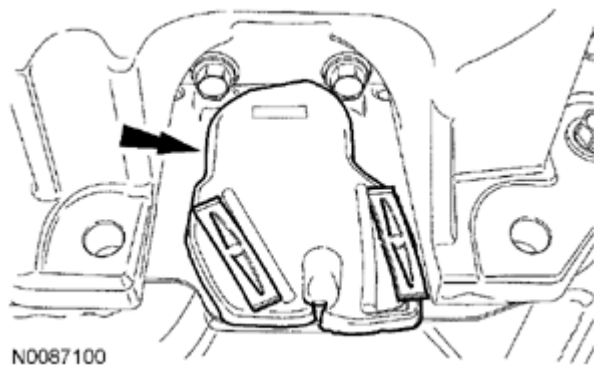


Fig. 496: Locating Access Cover
Courtesy of FORD MOTOR CO.

All-Wheel Drive (AWD) vehicles

24. Install the Power Transfer Unit (PTU) and the 5 bolts.
 - Tighten to 90 Nm (66 lb-ft).

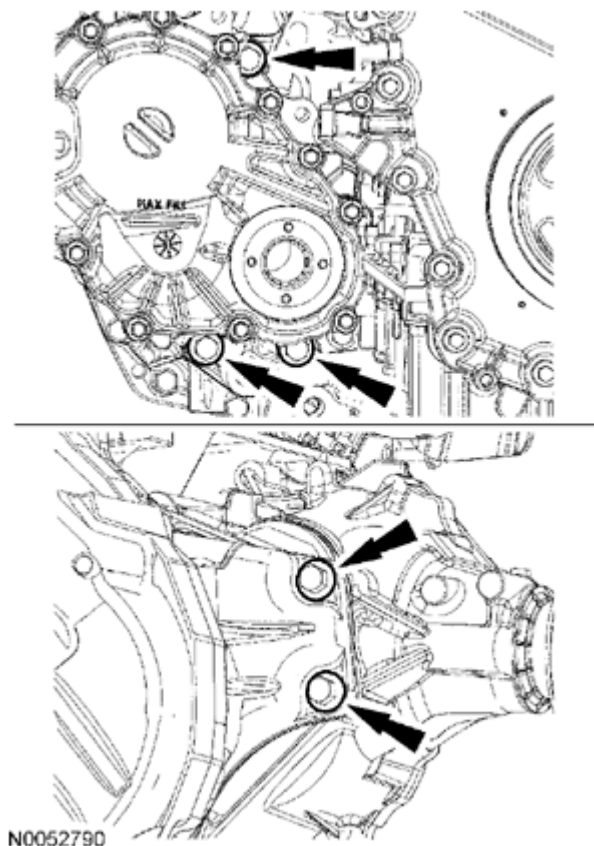
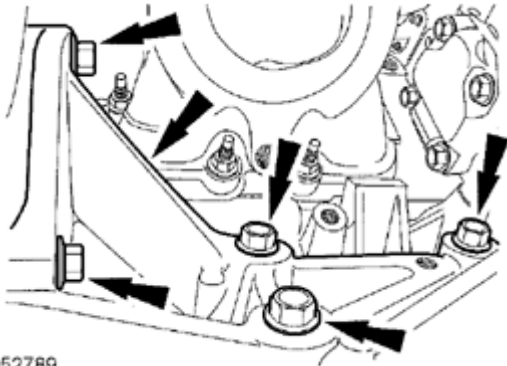


Fig. 497: Locating Bolts And Power Transfer Unit (PTU)

Courtesy of FORD MOTOR CO.

25. Install the PTU support bracket and the 5 bolts.
 - Tighten to 55 Nm (41 lb-ft).

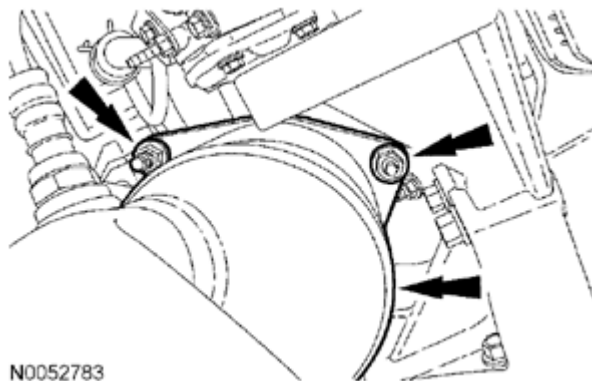


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Fig. 498: Locating Bolts And PTU Support Bracket
Courtesy of FORD MOTOR CO.

NOTE: A new PTU seal must be installed whenever the intermediate shaft is removed.

26. Install a new PTU seal. For additional information, refer to **TRANSFER CASE - POWER TRANSFER UNIT (PTU) -- FUSION & MILAN** article.
27. Using a new gasket, install the RH catalytic converter and 3 new nuts.
 - Tighten to 40 Nm (30 lb-ft).



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Fig. 499: Locating Nuts And RH Catalytic Converter
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).

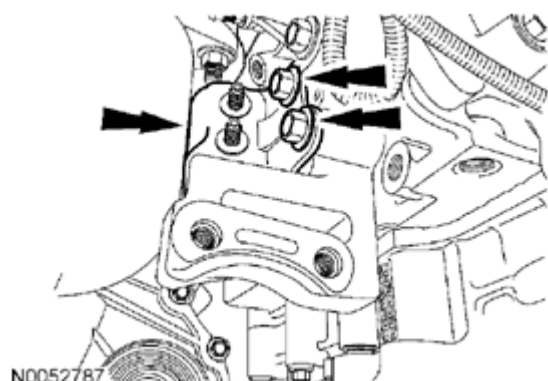


Fig. 500: Locating Bolts And RH Exhaust Heat Shield Bracket (Inboard Half)
Courtesy of FORD MOTOR CO.

29. Install the RH exhaust heat shield bracket (outboard half) and the 3 nuts.
- Tighten to 20 Nm (177 lb-in).

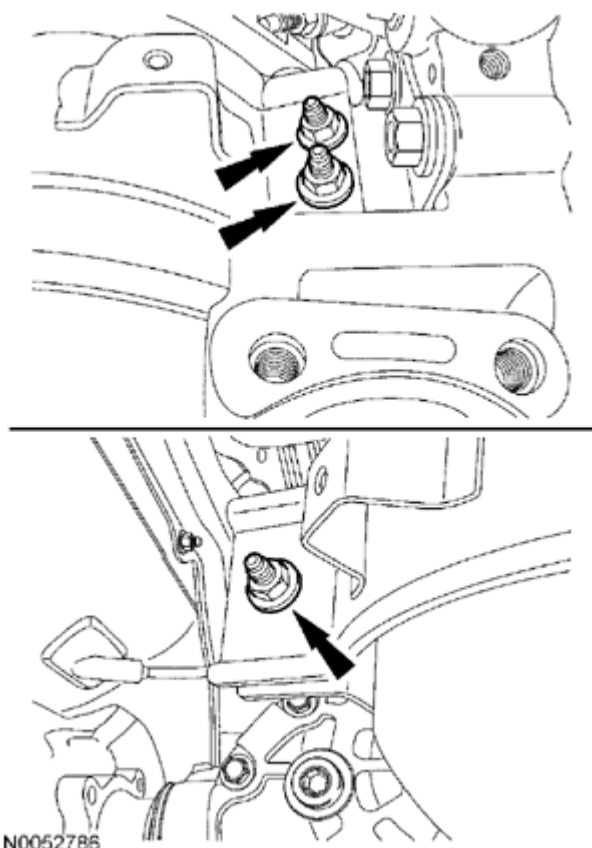


Fig. 501: Locating Nuts And RH Exhaust Heat Shield Bracket (Outboard Half)
Courtesy of FORD MOTOR CO.

30. Install the RH exhaust heat shield and the 6 bolts.
- Tighten to 10 Nm (89 lb-in).

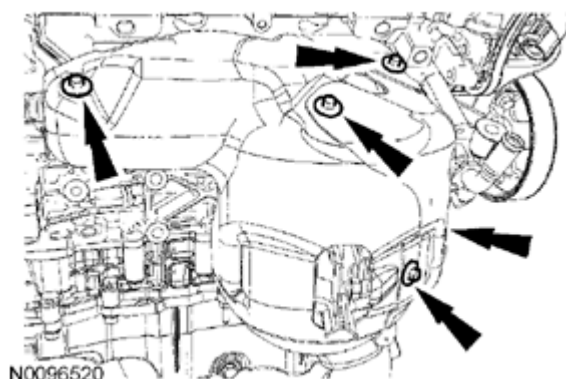
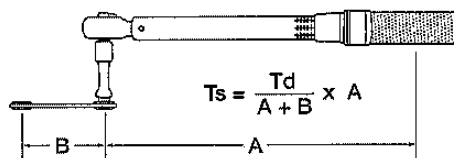
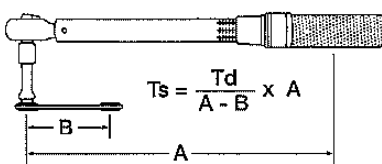
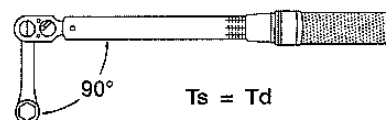
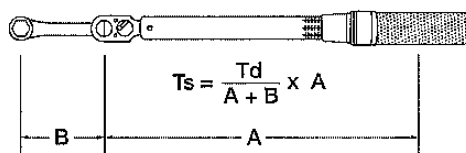
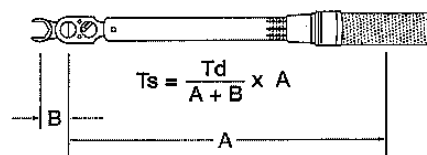
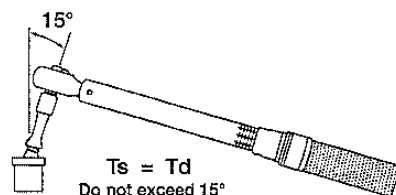
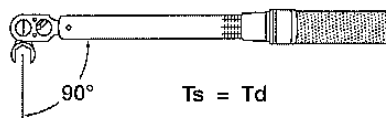
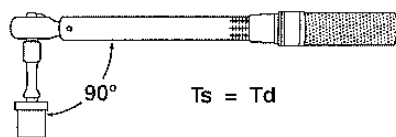


Fig. 502: Locating Bolts And RH Exhaust Heat Shield
Courtesy of FORD MOTOR CO.

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 in the illustration 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

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Fig. 503: Identifying Torque Wrench Adapter Formulas
 Courtesy of FORD MOTOR CO.

- To install, tighten to 48 Nm (35 lb-ft).

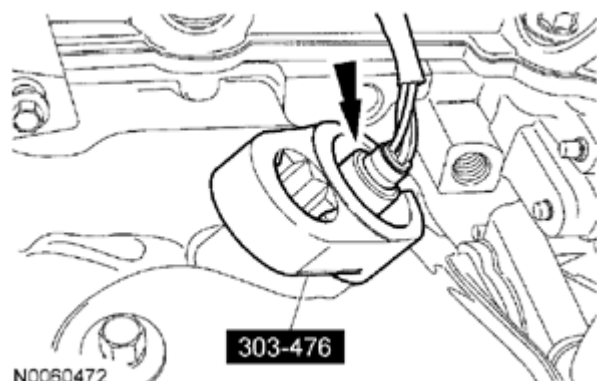


Fig. 504: Installing RH Heated Oxygen Sensor Using Exhaust Gas Oxygen Sensor Socket
 Courtesy of FORD MOTOR CO.

32. Connect the RH HO2S electrical connector.

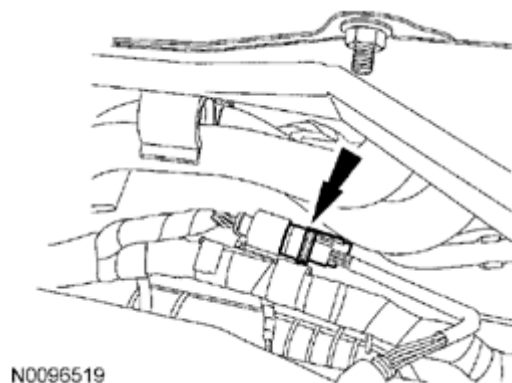


Fig. 505: Locating RH Heated Oxygen Sensor Electrical Connector
 Courtesy of FORD MOTOR CO.

33. Connect the RH Catalyst Monitor Sensor (CMS) electrical connector.

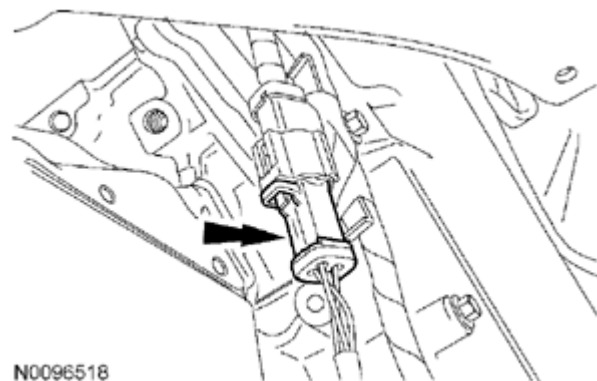


Fig. 506: Locating RH Catalyst Monitor Sensor (CMS) Electrical Connector
 Courtesy of FORD MOTOR CO.

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).

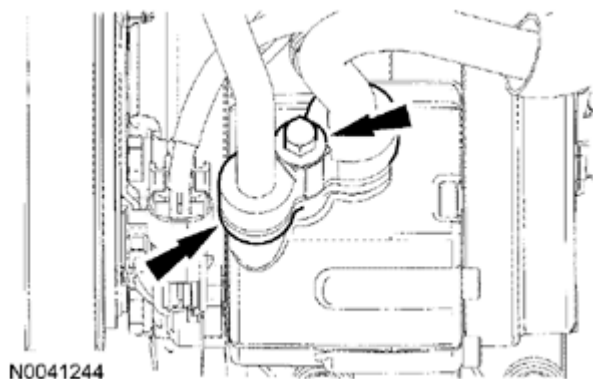


Fig. 507: Locating Bolt And A/C Manifold
Courtesy of FORD MOTOR CO.

35. Install 6 new LH catalytic converter studs.

- Tighten to 12 Nm (106 lb-in).

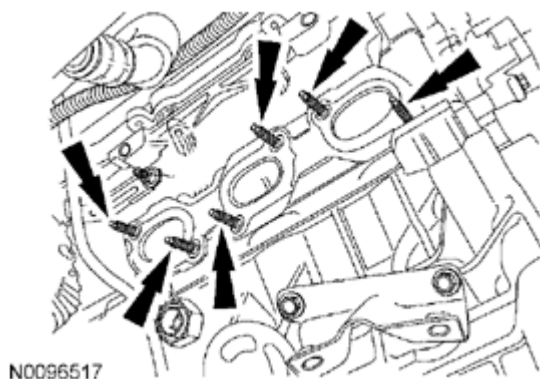


Fig. 508: Locating LH Catalytic Converter Manifold Studs
Courtesy of FORD MOTOR CO.

36. Install a new gasket, the LH catalytic converter and 6 new nuts.

- Tighten to 20 Nm (177 lb-in) in the sequence shown in the illustration.

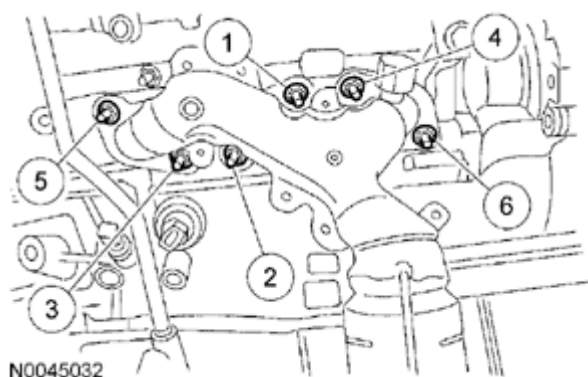


Fig. 509: Locating LH Catalytic Converter And Nuts
Courtesy of FORD MOTOR CO.

37. Install the heat shield and the 4 bolts (3 shown in the illustration).
 - Tighten to 10 Nm (89 lb-in).

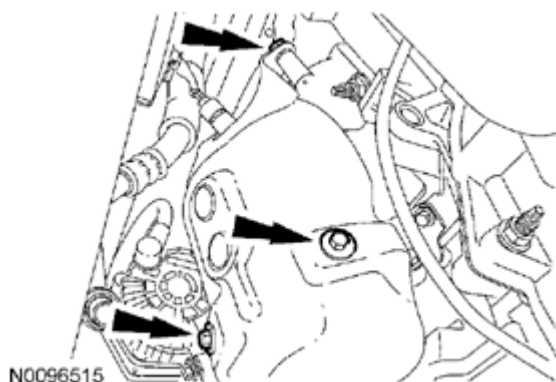


Fig. 510: Locating Bolts And LH Catalytic Converter Heat Shield
Courtesy of FORD MOTOR CO.

38. Connect the LH CMS electrical connector.

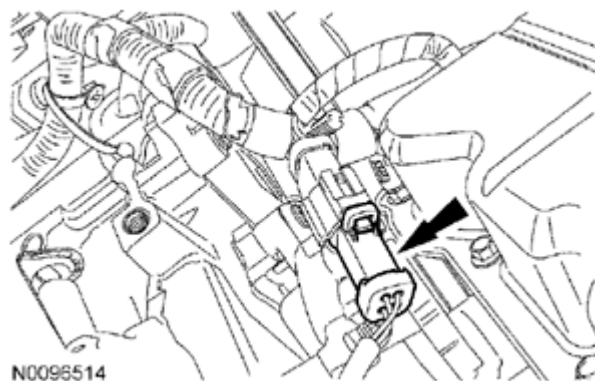


Fig. 511: Locating LH Catalyst Monitor Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

39. Connect the A/C tube and install the nut.

- Install a new gasket.
- Tighten to 8 Nm (71 lb-in).

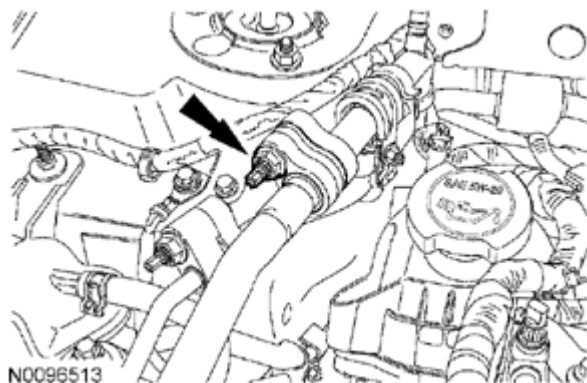


Fig. 512: Locating A/C Tube Nut
Courtesy of FORD MOTOR CO.

40. Install the A/C tube/windshield washer bottle bracket bolt.

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

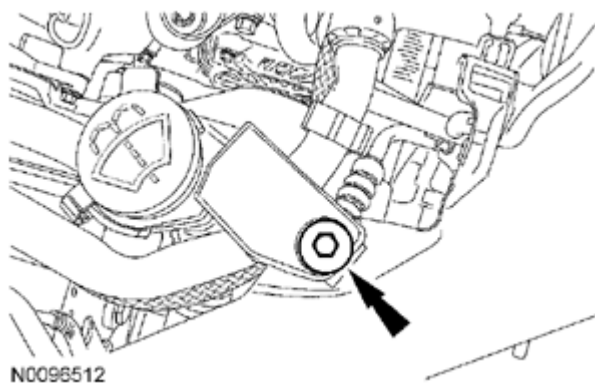
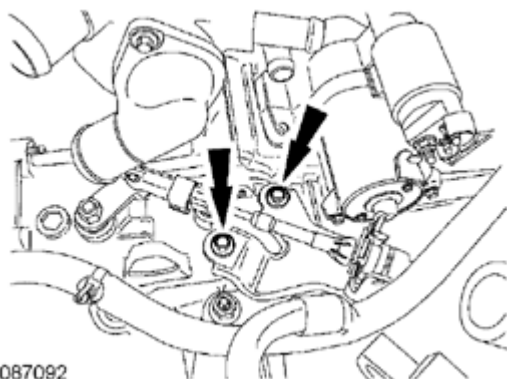


Fig. 513: Locating A/C Tube/Windshield Washer Bottle Bracket Bolt
Courtesy of FORD MOTOR CO.

41. Position the transaxle control cable bracket in place, install the 2 bolts.

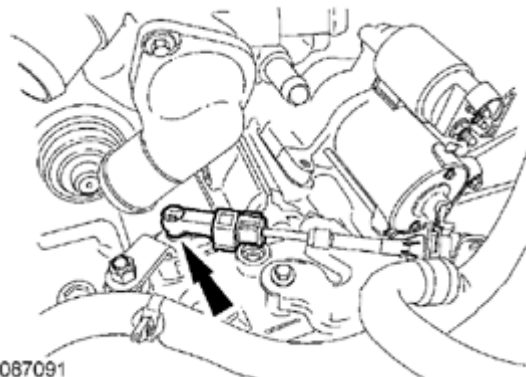
- Tighten to 23 Nm (17 lb-ft).



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Fig. 514: Locating Shift Cable Bracket Bolts
Courtesy of FORD MOTOR CO.

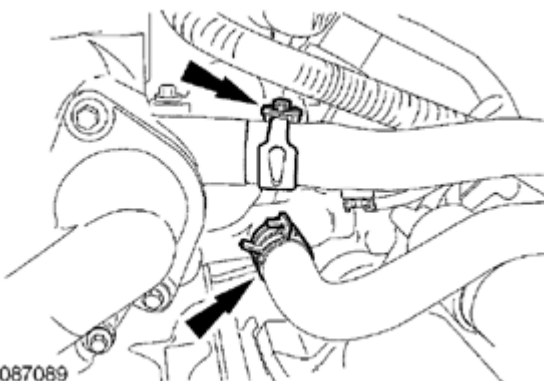
42. Connect the gearshift cable to the transaxle.



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Fig. 515: Locating Gearshift Cable
Courtesy of FORD MOTOR CO.

43. Connect the 2 heater hoses.



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Fig. 516: Locating Heater Hoses
Courtesy of FORD MOTOR CO.

44. Connect the upper and lower radiator hoses.

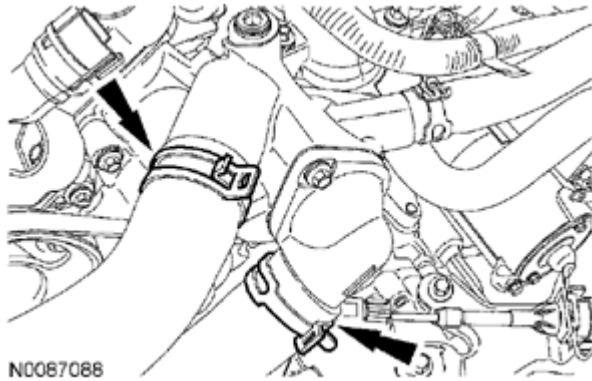


Fig. 517: Locating Upper And Lower Radiator Hoses
Courtesy of FORD MOTOR CO.

45. Connect the LH HO2S electrical connector.

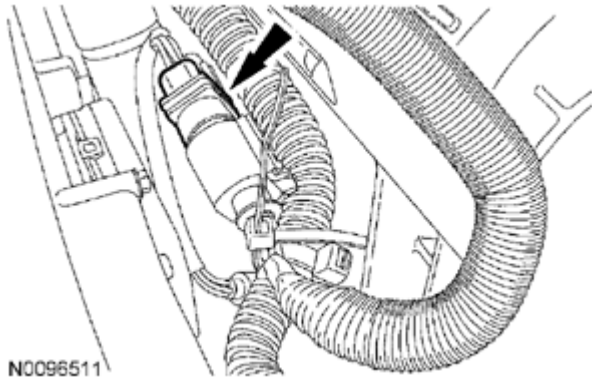


Fig. 518: Locating LH Heated Oxygen Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

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.

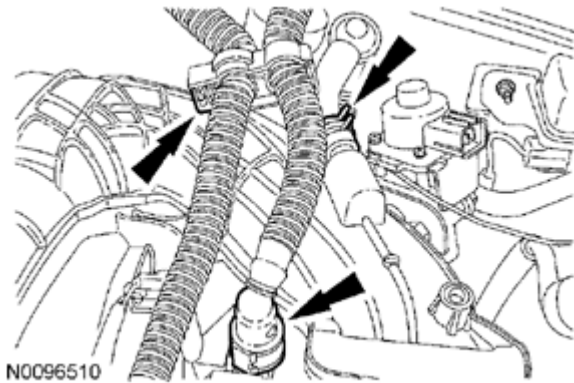


Fig. 519: Locating EVAP Tube-To-EVAP Canister Purge Valve Quick Connect Coupling And Brake Booster Vacuum Tube
 Courtesy of FORD MOTOR CO.

47. Connect the fuel supply tube to the fuel rail. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION - FUSION, MILAN & MKZ** article.
48. Connect the 3 PCM electrical connectors.



Fig. 520: 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).

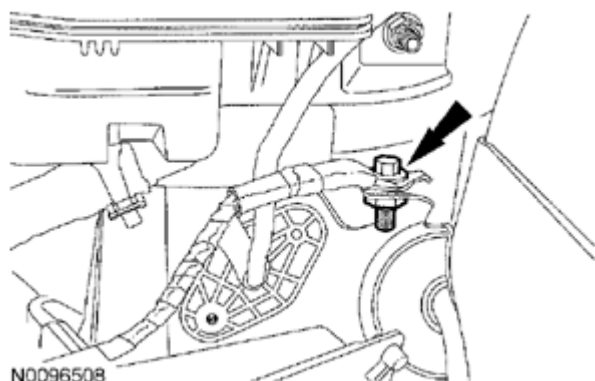


Fig. 521: Locating PCM Ground Bolt
Courtesy of FORD MOTOR CO.

50. Attach the 2 wiring harness retainers to the battery tray bracket and transaxle mount.

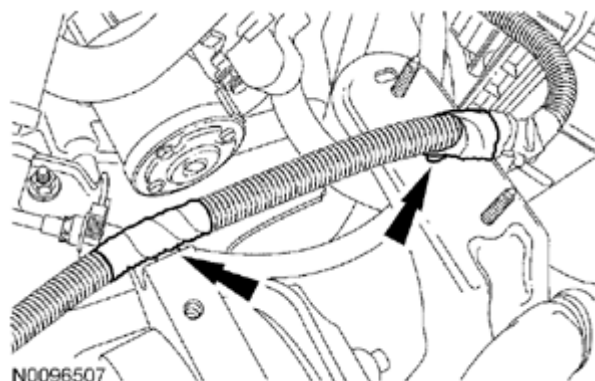


Fig. 522: Locating Wiring Harness Retainers Of Battery Tray Bracket And Transaxle Mount
Courtesy of FORD MOTOR CO.

51. Install the ground wire-to-inner fender and bolt.
 - Tighten to 10 Nm (89 lb-in).

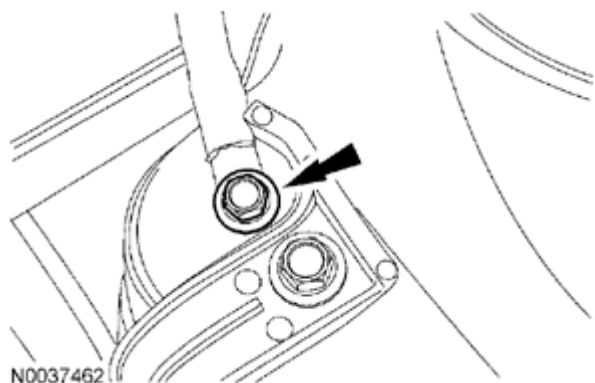


Fig. 523: Locating Bolt And Ground Wire
Courtesy of FORD MOTOR CO.

52. Connect the 2 engine wiring harness electrical connectors.

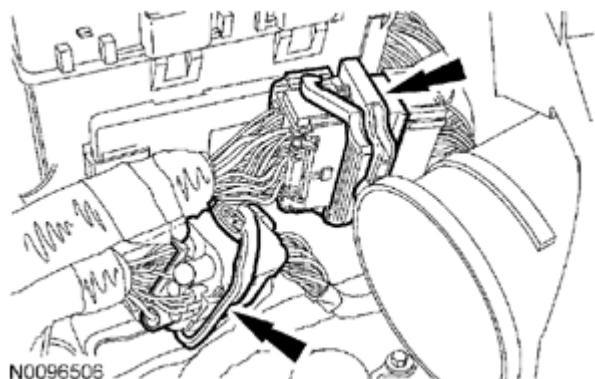


Fig. 524: Locating Engine Wiring Harness Electrical Connectors
Courtesy of FORD MOTOR CO.

53. Connect the engine wiring harness electrical connector.

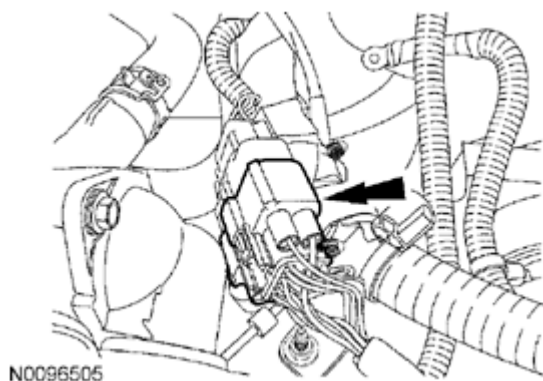


Fig. 525: Locating Engine Wiring Harness Electrical Connector
Courtesy of FORD MOTOR CO.

54. Connect the power feed wires to the battery terminal and install the 2 nuts.
- Tighten to 6 Nm (53 lb-in).

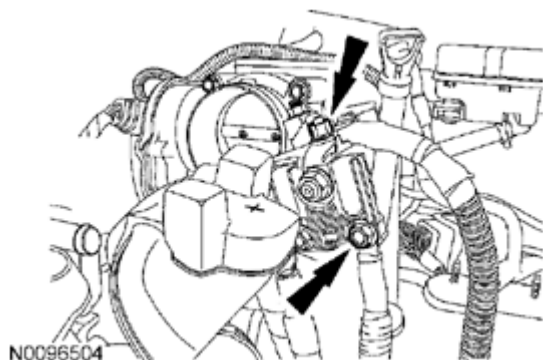


Fig. 526: Locating Nuts And Power Feed Wires
Courtesy of FORD MOTOR CO.

55. Install the battery tray. For additional information, refer to **BATTERY, MOUNTING & CABLES -- FUSION, MILAN & MKZ** article.
56. Install the engine Air Cleaner (ACL) and ACL outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING - 3.0L (4V) -- FUSION & MILAN** article.
57. Install a new engine oil filter.
 - Tighten to 5 Nm (44 lb-in) and then rotate an additional 180 degrees.

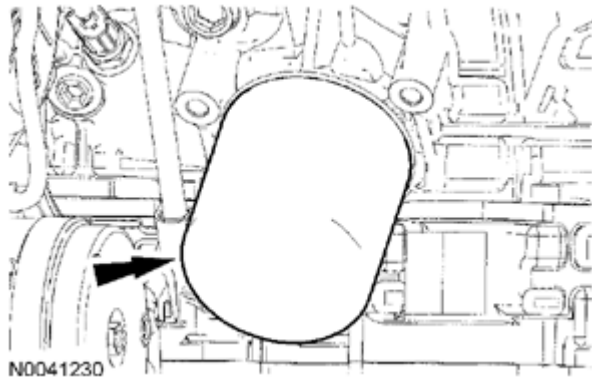


Fig. 527: Locating Engine Oil Filter
Courtesy of FORD MOTOR CO.

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.

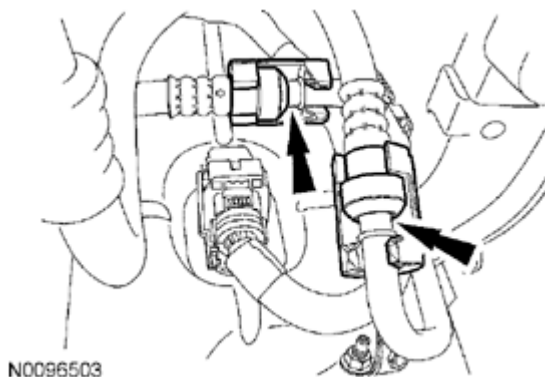


Fig. 528: Locating Transmission Fluid Cooler Tubes
Courtesy of FORD MOTOR CO.

59. Place the subframe assembly on the Powertrain Lift and raise the subframe into the installed position.

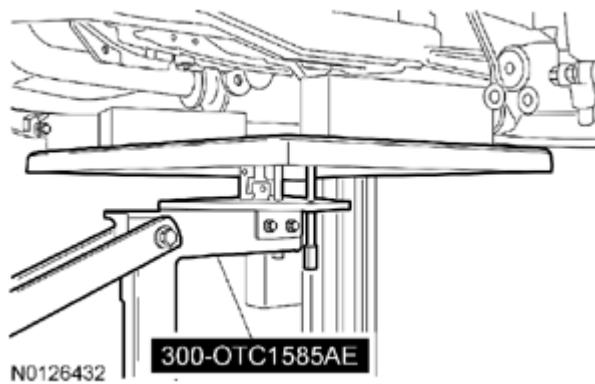


Fig. 529: Positioning Powertrain Lift Under Subframe Assembly
Courtesy of FORD MOTOR CO.

NOTE: LH shown in the illustration, RH similar.

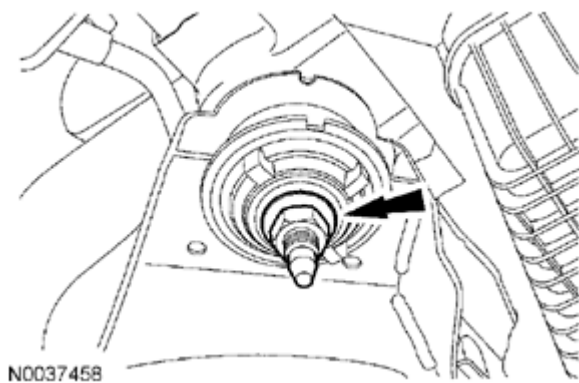


Fig. 530: Locating Front Subframe Nuts
Courtesy of FORD MOTOR CO.

60. Install the front subframe nuts.
 - Tighten to 150 Nm (111 lb-ft).

NOTE: LH shown in the illustration, RH similar.

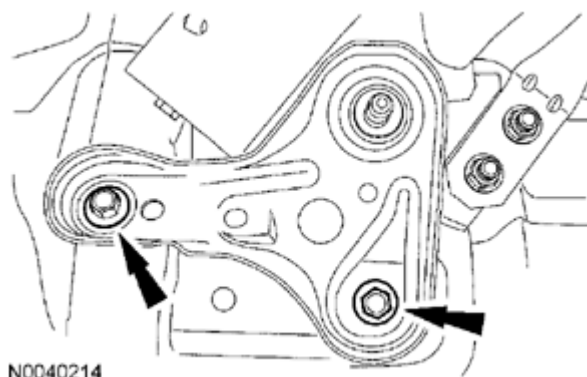


Fig. 531: Locating Subframe Brackets And Bolts
Courtesy of FORD MOTOR CO.

61. Position the subframe brackets and install the bolts finger-tight.

NOTE: LH shown in the illustration, RH similar.

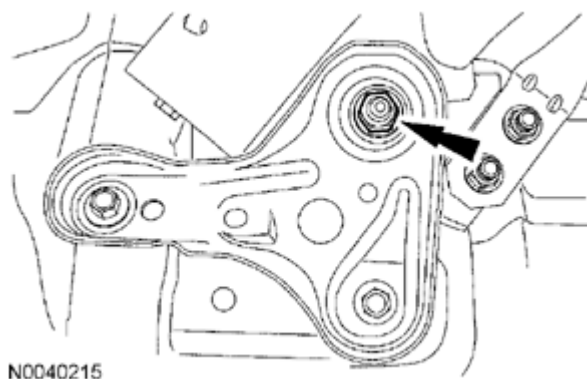


Fig. 532: Locating Subframe Nuts
Courtesy of FORD MOTOR CO.

62. Install the subframe nuts.
- Tighten to 150 Nm (111 lb-ft).

NOTE: LH shown in the illustration, RH similar.

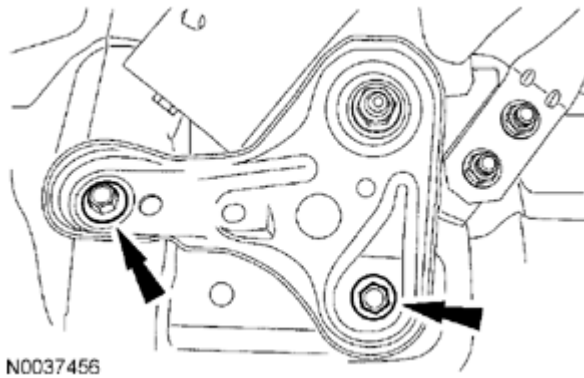


Fig. 533: Locating Subframe Bracket-To-Body Bolts
Courtesy of FORD MOTOR CO.

63. Tighten the subframe bracket-to-body bolts to 103 Nm (76 lb-ft).
64. Attach the 3 wiring harness retainers to the LH front of the subframe.

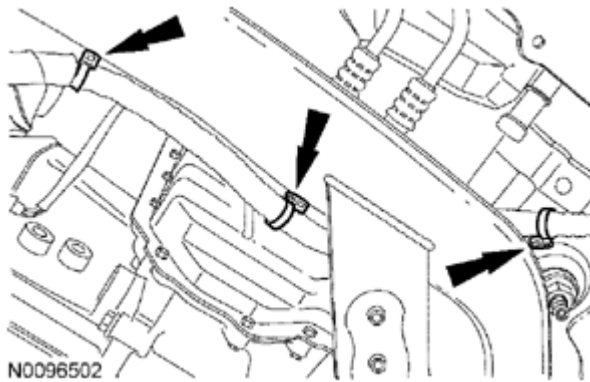


Fig. 534: Locating Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

65. Connect the 2 Electronic Power Assist Steering (EPAS) electrical connector on the front of the subframe.

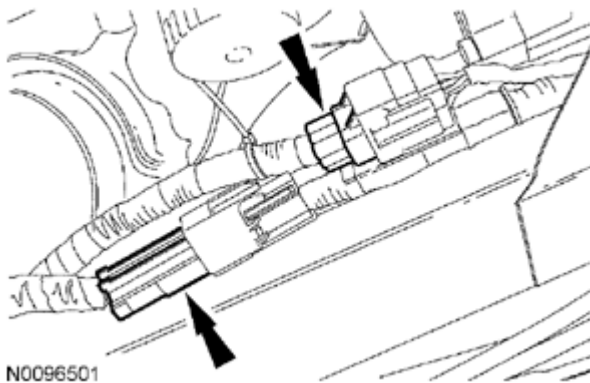


Fig. 535: Locating Electronic Power Assist Steering (EPAS) Electrical Connectors
Courtesy of FORD MOTOR CO.

66. Install the intermediate shaft and the LH halfshaft. For additional information, refer to **FRONT DRIVE HALFSHAFTS**.

NOTE: LH shown in the illustration, RH similar.

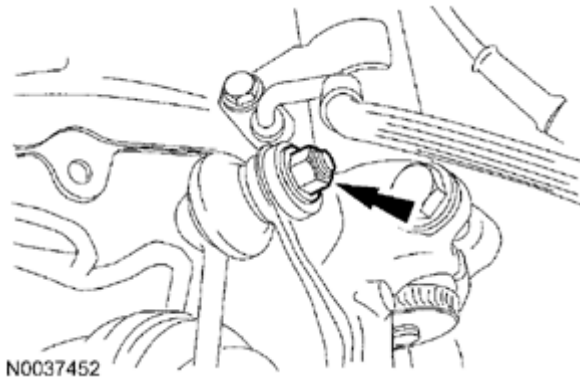


Fig. 536: Locating Stabilizer Bar Links Nut
Courtesy of FORD MOTOR CO.

67. Install the stabilizer bar links and nuts to the struts.
- Tighten to 40 Nm (30 lb-ft).

NOTE: LH shown in the illustration, RH similar.

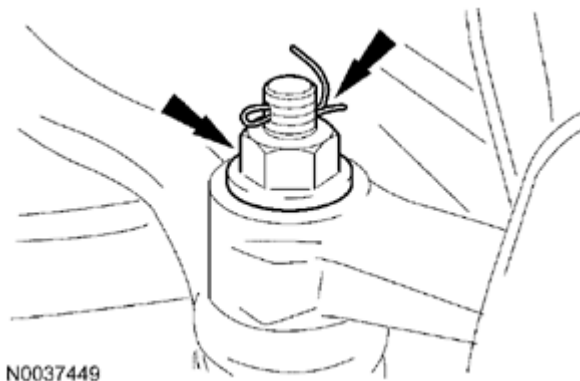


Fig. 537: Locating Tie-Rod Ends Cotter Pins And Nuts
Courtesy of FORD MOTOR CO.

68. Install the tie-rod ends and nuts.
- Tighten to 48 Nm (35 lb-ft).
 - Install the cotter pin.
69. Install the engine roll restrictor and the 2 bolts.
- Tighten to 90 Nm (66 lb-ft).

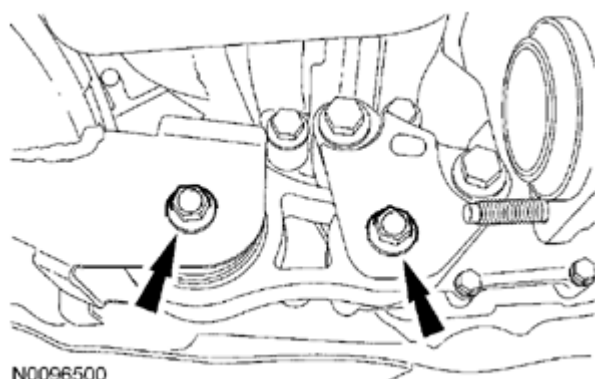


Fig. 538: Locating Bolts And Engine Roll Restrictor
Courtesy of FORD MOTOR CO.

70. If equipped, install the heat shield and the 2 bolts.

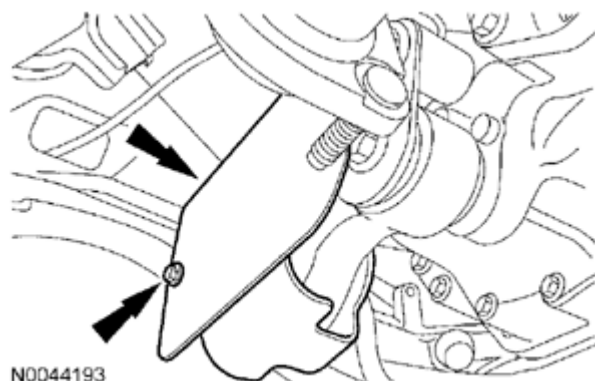


Fig. 539: Locating Bolts And Heat Shield
Courtesy of FORD MOTOR CO.

71. Slide the steering gear-to-dash seal onto the steering gear and engage the 4 retaining clips (2 shown in the illustration) 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.

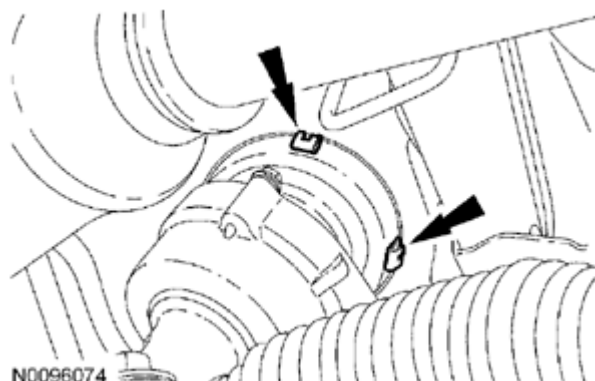


Fig. 540: Locating Clips And Steering Gear-To-Dash Seal
Courtesy of FORD MOTOR CO.

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 in the illustration).
 - Tighten to 70 Nm (52 lb-ft).

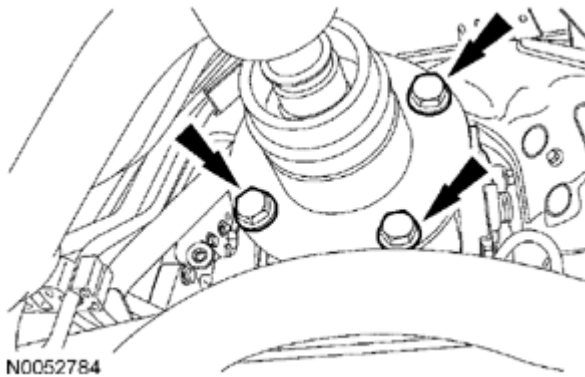


Fig. 541: Locating Driveshaft Bolts
Courtesy of FORD MOTOR CO.

All vehicles

73. Install the exhaust flexible pipe. For additional information, refer to **EXHAUST SYSTEM -- FUSION, MILAN & MKZ** article.
74. Install the LH splash shield and the 6 pin-type retainers (4 shown in the illustration).

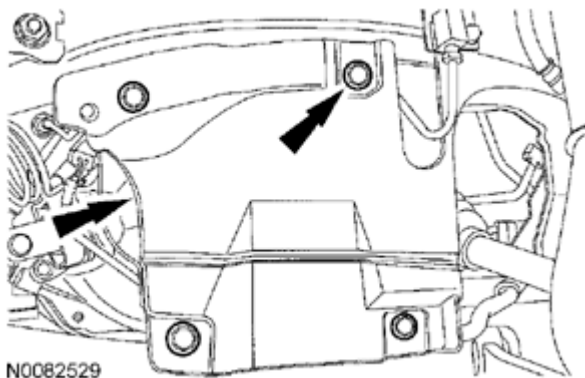


Fig. 542: Locating Pin-Type Retainers And LH Splash Shield
Courtesy of FORD MOTOR CO.

75. Position the LH fender splash shield and install the 4 screws.

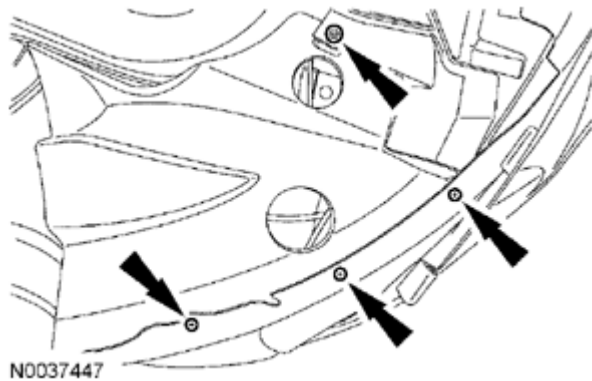


Fig. 543: Locating Screws And LH Fender Splash Shield
Courtesy of FORD MOTOR CO.

76. Install the EPAS ground wire and bolt in the RH front wheel well.
 - Tighten to 10 Nm (89 lb-in).

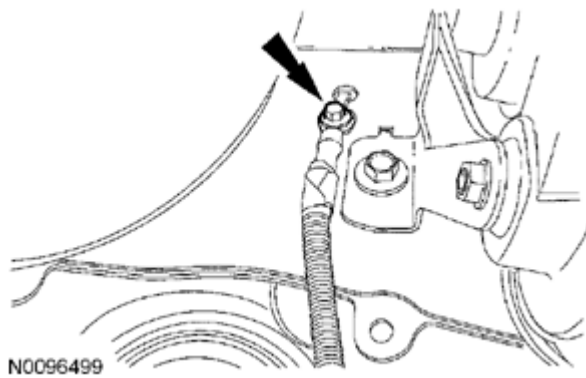


Fig. 544: Locating Electronic Power Assist Steering Wiring Ground Wire Bolt
Courtesy of FORD MOTOR CO.

77. Install the RH splash shield and the 6 pin-type retainers (4 shown in the illustration).

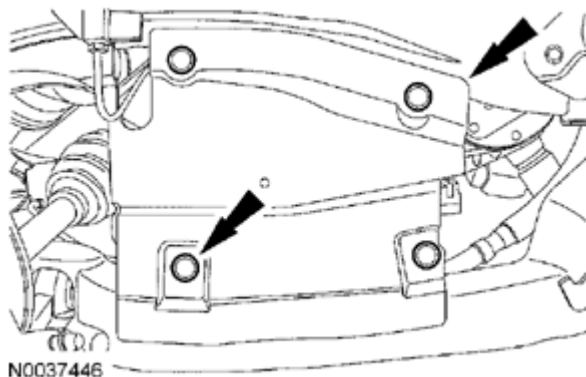


Fig. 545: Locating Pin-Type Retainers And RH Splash Shield
Courtesy of FORD MOTOR CO.

78. Position the RH fender splash shield and install the 4 screws.

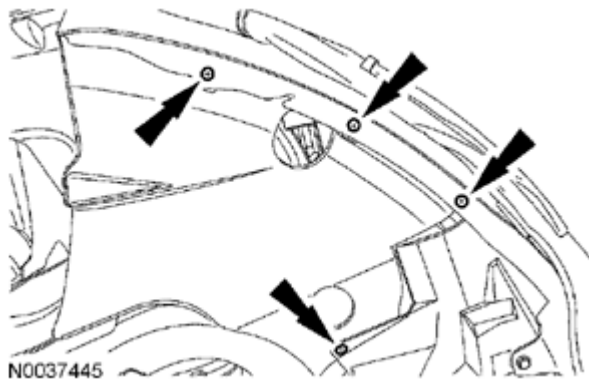


Fig. 546: Locating RH Fender Splash Shield Screws
Courtesy of FORD MOTOR CO.

79. Install the steering intermediate shaft onto the steering gear and install the bolt.
- Tighten to 20 Nm (177 lb-in).



Fig. 547: Locating Steering Column Shaft Bolt
Courtesy of FORD MOTOR CO.

80. Install the steering joint cover and the 2 nuts.

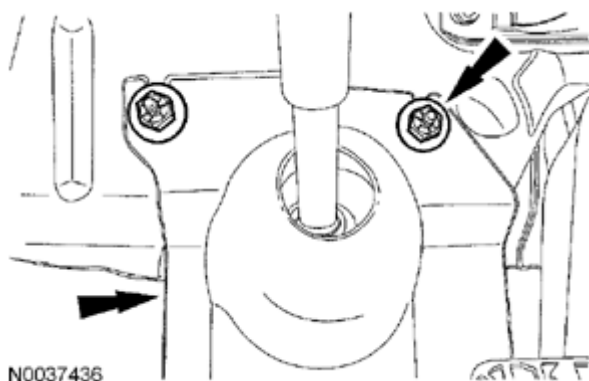


Fig. 548: Locating Nuts And Steering Joint Cover
Courtesy of FORD MOTOR CO.

81. Fill the engine with clean engine oil.
82. Connect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING & CABLES -- FUSION, MILAN & MKZ** article.
83. Fill and bleed the cooling system. For additional information, refer to **ENGINE COOLING SYSTEM (EXCEPT HYBRID)** article.
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 -- FUSION & MKZ** article.
85. Recharge the A/C system. For additional information, refer to **CLIMATE CONTROL SYSTEM - GENERAL INFORMATION & DIAGNOSTICS -- FUSION, MILAN & MKZ (EXCEPT HYBRID)** article.
86. After completing the repairs, use the scan tool to perform the Misfire Monitor Neutral Profile Correction procedure following the on-screen instructions.