

2011 Mercury Mariner

2011 ENGINE Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)

2011 ENGINE**Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)****SPECIFICATIONS****MATERIAL****MATERIAL SPECIFICATIONS**

Item	Specification	Fill Capacity
High Temperature 4x4 Front Axle and Wheel Bearing Grease XG-11	WSS-M1C267-A1	-
Motorcraft® Metal Surface Prep ZC-31-A	-	-
Motorcraft® Premium Gold Engine Coolant VC-7-B (US); CVC-7-B (Canada)	WSS-M97B51-A1	-
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	5.0L (5.3 qt) includes filter change
Multi-Purpose Grease XG-4 and/or XL-5	ESB-M1C93-B	-
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A	-
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4	-
Motorcraft® Silicone Gasket Remover ZC-30	-	-
Thread Sealant with PTFE TA-24	WSK-M2G350-A2	-

GENERAL SPECIFICATIONS**GENERAL SPECIFICATIONS**

Item	Specification
Displacement	2.5L
No. of cylinders	4
Bore/stroke	89.0/100.0

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Firing order	1-3-4-2
Oil pressure (hot @ 2,000 rpm)	200-268 kPa (29-39 psi)
Compression ratio	9.7:1
Engine weight (without accessory drive components and flexplate or flywheel)	115.8 kg (255.3 lb)
Engine and transaxle assembly weight (without accessory drive components)	203.8 kg (449.3 lb)
Cylinder Block	
Cylinder bore diameter	89.0-89.03 mm (3.503-3.505 in)
Cylinder bore maximum out-of-round	0.008 mm (0.0003 in)
Main bearing bore diameter	57.018-57.040 mm (2.244-2.245 in)
Head gasket surface flatness	0.1 mm/general 0.05 mm/200 x 200 (0.004 in/general) (0.0019 in/7.87 x 7.87)
Piston	
Diameter (1)	88.965-88.975 mm (3.5025-3.5029 in)
Diameter (2)	88.975-88.985 mm (3.5029-3.5033 in)
Diameter (3)	88.985-88.995 mm (3.5033-3.5037 in)
Piston-to-bore clearance	0.025-0.045 mm (0.0009-0.0017 in)
Ring groove width - top	1.203-1.205 mm (0.0473-0.0474 in)
Ring groove width - 2nd	1.202-1.204 mm (0.0473-0.0474 in)
Ring groove width - oil	2.501-2.503 mm (0.0984-0.0985 in)
Piston skirt coating thickness	0.008-0.016 mm (0.0003-0.0006 in)
Piston Pin	
Diameter	19.995-20.0 mm (0.8265-0.8267 in)
Length	54.7-55.0 mm (2.1535-2.1653 in)
Cylinder Head	
Cylinder head flatness	0.08 (0.0031 in) maximum overall, a maximum of 0.05 mm (0.0019 in) within 150 mm (5.9 in)
Valve lift @ zero lash (exhaust)	7.7 mm (0.30 in)

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Valve lift @ zero lash (intake)	8.8 mm (0.35 in)
Valve guide diameter	5.509-5.539 mm (0.216-0.218 in)
Valve seat width - intake/exhaust	0.99-1.84 mm (0.038-0.072 in)
Valve seat angle	45 degrees
Valve seat runout	0.075 mm (0.0029 in)
Valve lash adjuster bore diameter	31.00-31.03 mm (1.220-1.221 in)
Cam bore diameter	25.015-25.040 mm (0.984-0.985 in)
Valve	
Valve head diameter - intake	34.85-35.15 mm (1.372-1.383 in)
Valve head diameter - exhaust	29.85-30.15 mm (1.175-1.187 in)
Valve stem diameter - intake	5.470-5.485 mm (0.2153-0.2159 in)
Valve stem diameter - exhaust	5.465-5.480 mm (0.2151-0.2157 in)
Valve stem-to-guide clearance - intake	0.0027 mm (0.00010 in)
Valve stem-to-guide clearance - exhaust	0.0029 mm (0.00011 in)
Valve face runout	0.05 mm (0.0019 in)
Valve face angle	45 degrees
Valve Spring - Compression Pressure	
Intake and exhaust (installed)	17.5 kg (38.667 lb)
Intake (valve open)	8.9 mm (0.35 in) of lift 44 kg (97.032 lb)
Exhaust (valve open)	7.4 mm (0.29 in) of lift 42 kg (93.338 lb)
Free length	44.92 mm (1.768 in)
Assembled height	37.9 mm (1.492 in)
Crankshaft	
Main bearing journal diameter	51.978-52.002 mm (2.046-2.047 in)
Production repair	51.730-51.750 mm (2.036-2.037 in)
Main bearing clearance	0.016-0.047 mm (0.0006-0.0015 in)
Connecting rod journal diameter	51.978-52.002 mm (2.046-2.047 in)
Production repair	51.730-51.750 mm (2.036-2.037 in)
End play	0.220-0.450 mm (0.008-0.018 in)

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Rings

Width - top	1.17-1.185 mm (0.0460-0.0466 in)
Width - 2nd	1.197-1.199 mm (0.0471-0.0472 in)
Width - oil	2.38-2.45 mm (0.093-0.096 in)
Ring gap (in bore) - top	0.16-0.31 mm (0.006-0.012 in)
Ring gap (in bore) - 2nd	0.31-0.46 mm (0.012-0.018 in)
Ring gap (in bore) - oil	0.2-0.7 mm (0.007-0.027 in)

Valve Tappet

Diameter	30.97-30.98 mm (1.2192-1.2196 in)
Tappet-to-valve clearance - intake	0.22- 0.28 mm (0.008-0.011 in)
Tappet-to-valve clearance - exhaust	0.27-0.33 mm (0.010-0.013 in)
Tappet-to-bore clearance	0.02-0.06 mm (0.0007-0.0023 in)

Camshaft

Lobe lift - intake	8.24999 mm (0.324 in)
Lobe lift - exhaust	7.80007 mm (0.307 in)
Runout (1) ⁽¹⁾	0.03 mm (0.001 in)
Thrust clearance	0.09-0.24 mm (0.003-0.009 in)
Journal diameter	24.96-24.98 mm (0.982-0.983 in)
Journal-to-bore clearance	0.035-0.080 mm (0.001-0.003 in)

Connecting Rod

Bearing clearance	0.027-0.052 mm (0.001-0.002 in)
Bearing thickness	1.496-1.520 mm (0.058-0.059 in)
Crank bore diameter	55.023-55.047 mm (2.166-2.167 in)
Pin bore diameter	20.965-20.985 mm (0.825-0.826 in)
Length (center-to-center)	151.8 mm (5.976 in)
Side clearance	1.95-3.05 mm (0.076-0.120 in)
Axial clearance	0.14-0.36 mm

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(0.005-0.014 in)

(1) No. 3 Journal - Supported by No. 1 and No. 5 journals.

TORQUE SPECIFICATIONS**TORQUE SPECIFICATIONS**

Description	Nm	lb-ft	lb-in
A/C compressor mounting bolts	25	18	-
Accessory drive belt idler pulley and bracket bolts	25	18	-
Accessory drive belt idler pulley bolt	25	18	-
Accessory drive belt tensioner bolts	25	18	-
Air Cleaner (ACL) outlet pipe-to-Throttle Body (TB) clamp	4	-	35
Balance shaft bolts ⁽¹⁾	-	-	-
Bellhousing-to-engine bolts	48	35	-
Blocker heater	40	30	-
Camshaft bearing cap bolts ⁽¹⁾	-	-	-
Camshaft sprocket bolts	72	53	-
Clutch hydraulic line	25	18	-
Clutch hydraulic line bracket-to-transaxle bolt	3	-	27
Coil-on-plug stud bolts	8	-	71
Connecting rod cap bolts ⁽¹⁾	-	-	-
Coolant outlet bolts	10	-	89
Coolant pump bolts	10	-	89
Coolant pump pulley bolts	20	-	177
Crankcase vent oil separator bolts	10	-	89
Crankshaft Position (CKP) sensor bolts ⁽¹⁾	-	-	-
Crankshaft pulley bolt ⁽¹⁾	-	-	-
Crankshaft rear oil seal retainer bolts ⁽¹⁾	-	-	-
Cylinder head bolts ⁽¹⁾	-	-	-
Cylinder Head Temperature (CHT) sensor	12	-	106

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Dampener bolts	40	30	-
Driveshaft bolts	37	27	-
EGR tube	55	41	-
EGR valve bolts	20	-	177
Engine front cover bolts ⁽¹⁾	-	-	-
Engine front cover-to-oil pan bolts ⁽¹⁾	-	-	-
Engine mount bolts	48	35	-
Engine mount bracket bolt	115	85	-
Engine mount bracket nuts	115	85	-
Engine Oil Pressure (EOP) switch	15	-	133
Engine plug bolt	20	-	177
Engine support crossmember bolts	90	66	-
Engine support crossmember nut	175	129	-
Engine-to-bellhousing bolts	48	35	-
Exhaust manifold heat shield bolts	10	-	89
Exhaust manifold nuts ⁽¹⁾	-	-	-
Exhaust manifold stud bolts	17	-	150
Flexplate bolts ⁽¹⁾	-	-	-
Flywheel bolts ⁽¹⁾	-	-	-
Front roll restrictor bolt	115	85	-
Fuel rail stud bolts	23	17	-
Generator electrical connection nut	6	-	53
Generator mounting bolt and nuts	47	35	-
Ground eyelet bolt	10	-	89
Ground strap bolt	10	-	89
Intake manifold bolts	18	-	159
Intermediate shaft bearing retainer nuts	27	20	-
Knock Sensor (KS) bolt	20	-	177
Lateral support crossmember bolts	115	85	-
LH splash shield bolts	9	-	80
LH transaxle mount bolt	103	76	-
Lower front cover timing hole plug	12	-	106

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Main bearing beam bolts ⁽¹⁾	-	-	-
Oil filter adapter bolts	25	18	-
Oil filter (spin-on filter type) ⁽²⁾	-	-	-
Oil pan-to-bellhousing bolts ⁽¹⁾	-	-	-
Oil pan bolts ⁽¹⁾	-	-	-
Oil pan drain plug	28	21	-
Oil pump drive chain tensioner bolt	10	-	89
Oil pump drive chain tensioner shoulder bolt	10	-	89
Oil pump bolts ⁽¹⁾	-	-	-
Oil pump screen and pickup tube bolts	10	-	89
Oil pump sprocket bolt	25	18	-
Oil squirters	4	-	35
Power Distribution Box (PDB) cable nut	12	-	106
Power Transfer Unit (PTU) bolts	70	52	-
PTU bracket bolts	45	33	-
PTU bracket-to-engine bolts	40	30	-
PTU heat shield bolts	11	-	97
PTU lower LH bolt	45	33	-
Pressure plate bolts	29	21	-
Radio capacitor bolt	20	-	177
Radio capacitor nut	10	-	89
Rear transaxle mount bolt	115	85	-
RH splash shield bolts	9	-	80
Shift cable bracket bolts	22	16	-
Spark plug	12	-	106
Starter motor bolts	35	26	-
Starter motor solenoid battery nut	12	-	106
Starter motor solenoid nut	5	-	44
Starter motor ground wire nut	25	18	-
Thermostat housing bolts	10	-	89
Timing chain guide bolts	10	-	89
Timing chain tensioner bolts	10	-	89
Torque converter nuts	35	26	-

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Transaxle-to-engine bolts	48	35	-
Transaxle-to-PTU bolt	48	35	-
Upper engine bracket-to-PTU bolts	45	33	-
Upper front cover timing hole plug	10	-	89
Valve cover bolts ⁽¹⁾	-	-	-
Variable Camshaft Timing (VCT) oil control solenoid bolt	10	-	89
VCT system oil filter plug	17	-	150

(1) Refer to the appropriate procedure for this specification.

(2) Lubricate the spin-on oil filter gasket with clean engine oil. Tighten the oil filter three-fourths turn after the oil filter gasket makes contact with the oil filter adapter.

DESCRIPTION AND OPERATION

ENGINE

The 2.5L (153 CID) 4-cylinder engine has the following features:

- Dual overhead camshaft
- Four valves per cylinder
- Sequential Multi-Port Fuel Injection (SFI)
- Aluminum cylinder head
- Aluminum cylinder block
- Electronic ignition system with coil-on-plug 4 ignition coils

The 2.5L engine is a 4 valve-per-cylinder, dual overhead camshaft engine. The engine uses a coil-on-plug ignition system. The cylinder block is made of aluminum and the bearing caps are integrated into the ladder assembly. An aluminum oil pan bolts to the bottom of the lower cylinder block and to the transmission to provide greater strength. The camshafts are mounted in the cylinder heads and act against valve tappets to open and close the valves. The camshafts are driven off the front of the cylinder head by one timing chain. The chain is driven by a sprocket that is located on the crankshaft. The piston assembly is an aluminum piston with a cast iron connecting rod. The oil pump is driven by the crankshaft via a dedicated chain that is driven by the same sprocket that drives the timing chain.

Engine Identification

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

and their applications.

Engine Code Information Label

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



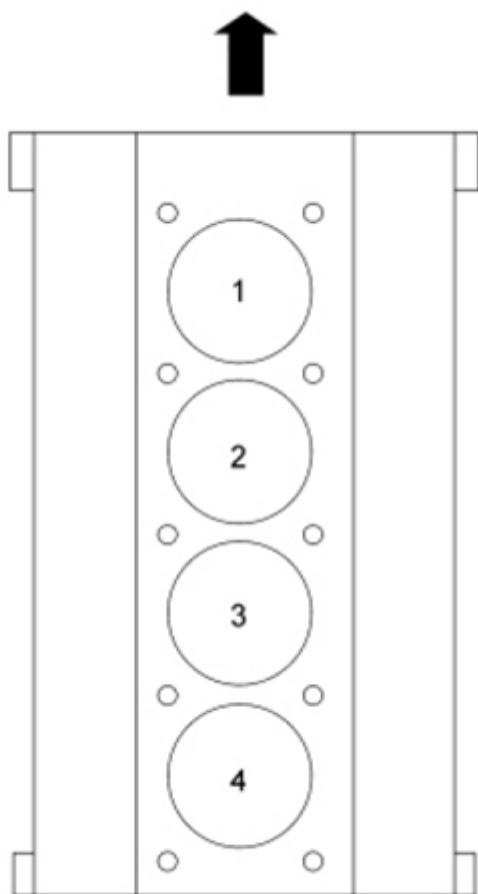
N0096817

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

ITEMS DESCRIPTION CHART

Item	Description
1	Engine part number
2	Chihuahua engine plant
3	Engine displacement
4	Bar code
5	Running number
6	Engine build date (DDMMYY)
7	Plant shift line
8	Bar code

Engine Cylinder Identification



N0070002

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

Exhaust Emission Control System

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

Induction System

The **SFI** provides the fuel/air mixture needed for combustion in the cylinders. The 4 solenoid-operated fuel injectors:

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

A constant fuel pressure is maintained across the fuel injectors by the fuel pressure sensor. The fuel pressure sensor is positioned upstream from the fuel injectors on the fuel injection supply manifold.

PCV System

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

Lubrication System

The engine lubrication system operates as follows:

- Oil is drawn into the oil pump through the oil pump screen cover and tube in the sump of the oil pan.
- Oil is pumped through the oil filter on the left front side of the cylinder block.
- Oil enters the main gallery where it is distributed to the crankshaft main journals and to the cylinder head.
- From the main journals, the oil is routed through cross-drilled passages in the crankshaft to lubricate the connecting rod bearings. Controlled leakage through the crankshaft main bearings and connecting rod bearings is slung radially outward to cool and lubricate the cylinder walls as well as the entire connecting rod, piston and piston ring assembly.

DIAGNOSIS AND TESTING

ENGINE

Refer to **ENGINE MECHANICAL SYSTEM - GENERAL INFORMATION** article for basic mechanical concerns or refer to the **INTRODUCTION** article for driveability concerns.

GENERAL PROCEDURES

VALVE CLEARANCE CHECK

1. Remove the valve cover. For additional information, refer to **VALVE COVER** in this service information.
2. Remove the 5 bolts, the pin-type retainer (not shown in illustration) and the RH splash shield.
 - To install, tighten to 9 Nm (80 lb-in).

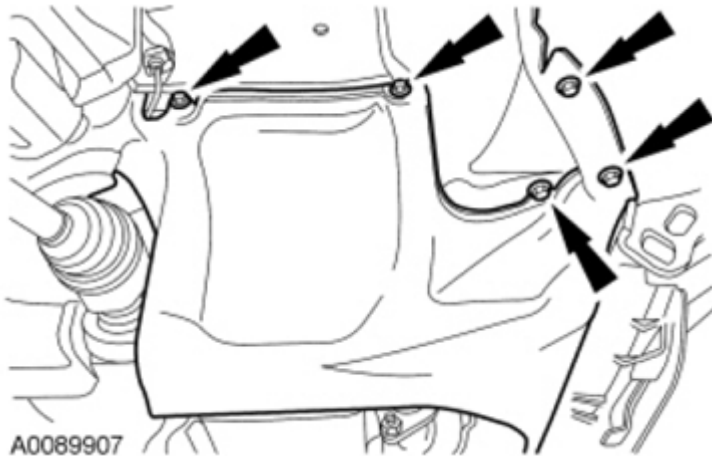


Fig. 3: Locating RH Splash Shield Bolts
Courtesy of FORD MOTOR CO.

NOTE: Turn the engine clockwise only, and only use the crankshaft bolt.

NOTE: Before removing the camshafts, measure the clearance of each valve at base circle, with the lobe pointed away from the tappet. Failure to measure all clearances prior to removing the camshafts will necessitate repeated removal and installation and wasted labor time.

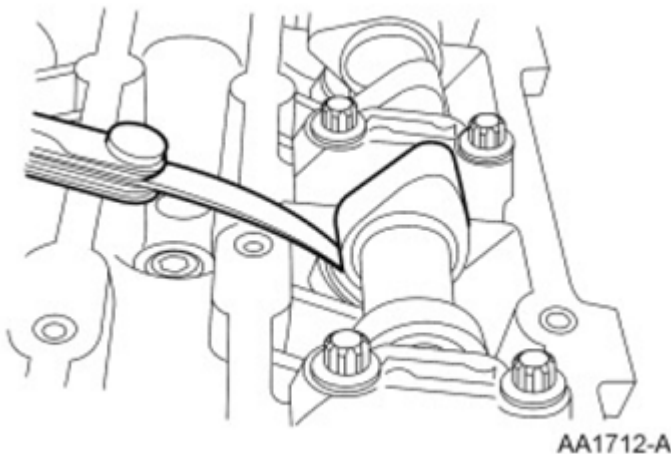


Fig. 4: Measuring Valve Clearance
Courtesy of FORD MOTOR CO.

3. Use a feeler gauge to measure the clearance of each valve and record its location.

NOTE: The number on the valve tappet only reflects the digits that follow the decimal. For example, a tappet with the number 0.650 has the thickness of 3.650 mm.

NOTE: The nominal clearance is:

- intake: 0.25 mm (0.0095 in).
- exhaust: 0.30 mm (0.0115 in).

4. The acceptable clearances after being fully installed are:

- intake: 0.22-0.28 mm (0.008-0.011 in).
- exhaust: 0.27-0.33 mm (0.010-0.013 in).

Select tappets using this formula: tappet thickness = measured clearance + the existing tappet thickness - nominal clearance.

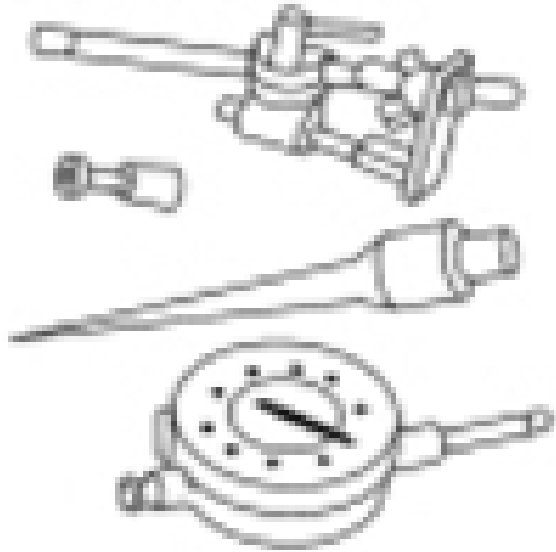
Select the closest tappet size to the ideal tappet thickness available and mark the installation location.

5. If any tappets do not measure within specifications, install new tappets in these locations. For additional information, refer to **VALVE TRAIN COMPONENTS - EXPLODED VIEW** and **Valve Tappets** in this service information.

BALANCE SHAFT BACKLASH

Special Tool(s)

SPECIAL TOOLS DESCRIPTION

 ST1214-A	Dial Indicator Gauge with Holding Fixture 100-002 (TOOL-4201-C)
	Timing Peg, Crankshaft TDC 303-507

**ST2638-A**

1. Install the Crankshaft **TDC** Timing Peg and rotate the crankshaft slowly clockwise until the crankshaft balance weight is up against the Crankshaft **TDC** Timing Peg. The engine is now at Top Dead Center (TDC).

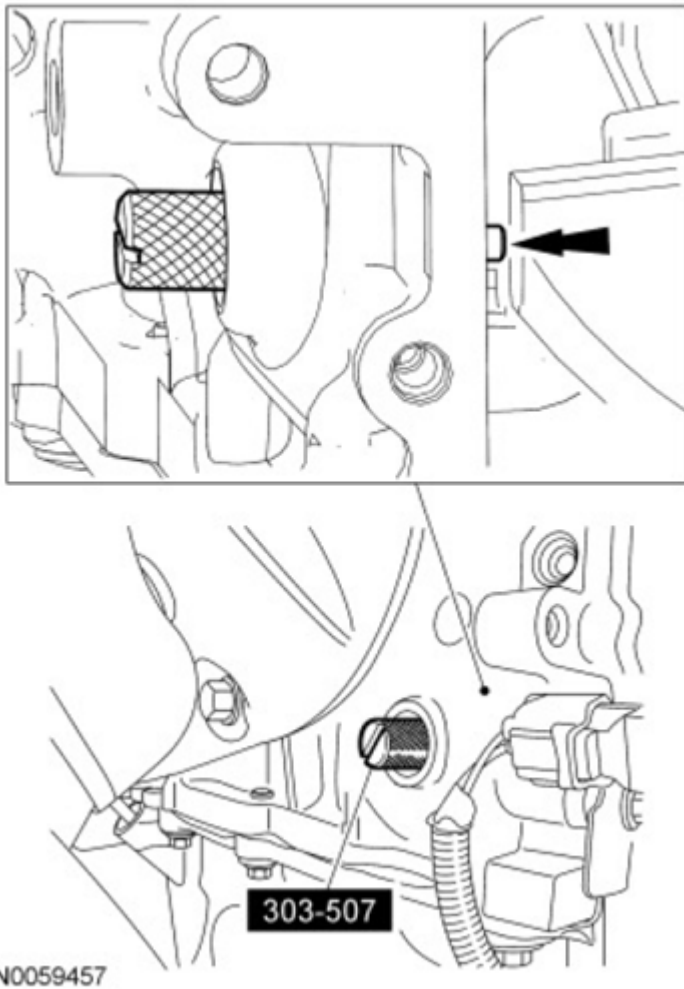


Fig. 5: View Of Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

2. Mark the balancer unit and shafts on the top for reference that the balancer unit is at **TDC** .

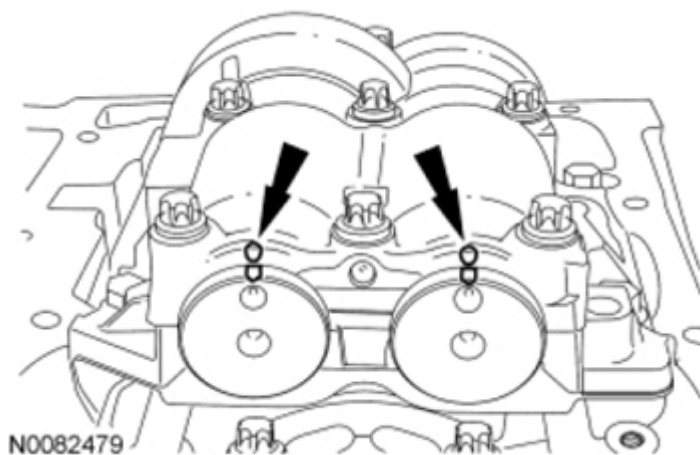
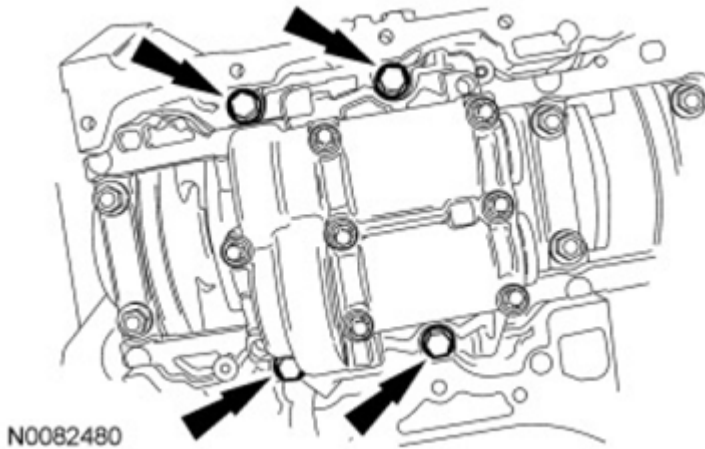


Fig. 6: Locating Balancer Unit Marks

Courtesy of FORD MOTOR CO.

NOTE: Due to the precision interior construction of the balancer unit, it should not be disassembled.

**Fig. 7: Locating Balancer Unit Bolts**

Courtesy of FORD MOTOR CO.

3. Remove the 4 bolts and the balancer unit.
4. Remove the adjustment shims from the seat faces of the balancer unit.

NOTE: Visually inspect the balancer unit gear for damage and verify that the shaft turns smoothly. If there is any damage or malfunction, replace the balancer unit.

5. Install the master adjustment shims (No. 50) on the seat faces of the balancer unit.
6. With the balancer unit shaft marks at the **TDC** position, slowly install the balancer unit to the cylinder block to avoid interference between the crankshaft drive gear and the balancer unit driven gear.

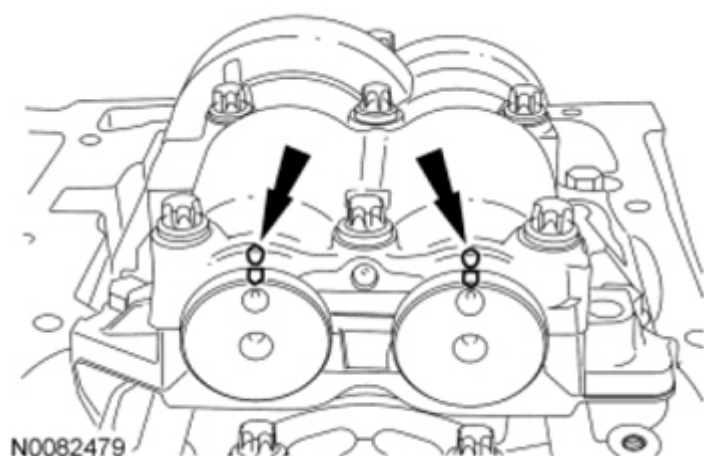


Fig. 8: Locating Balancer Unit Marks
Courtesy of FORD MOTOR CO.

7. Install the balancer unit bolts.
 - Tighten in the sequence shown in illustration in 2 stages.
 - Stage 1: Tighten to 25 Nm (18 lb-ft).
 - Stage 2: Tighten to 50 Nm (37 lb-ft).

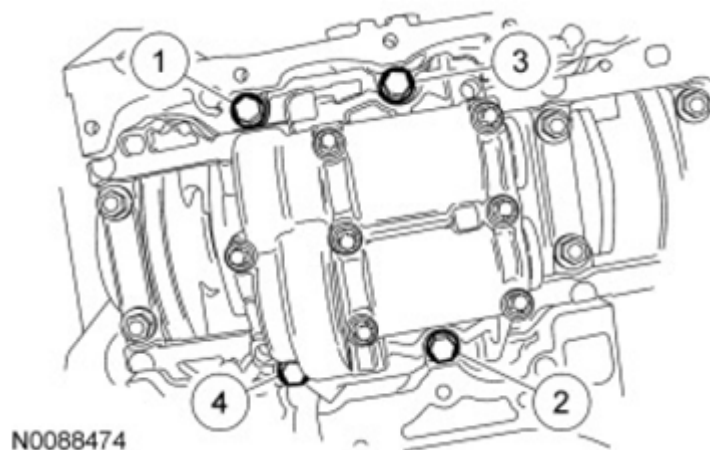


Fig. 9: Tightening Sequence Of Balancer Unit Bolts
Courtesy of FORD MOTOR CO.

8. Remove the Crankshaft TDC Timing Peg.
 - Rotate the crankshaft to confirm that there are no meshing problems between the balancer unit gear and the crankshaft gear.

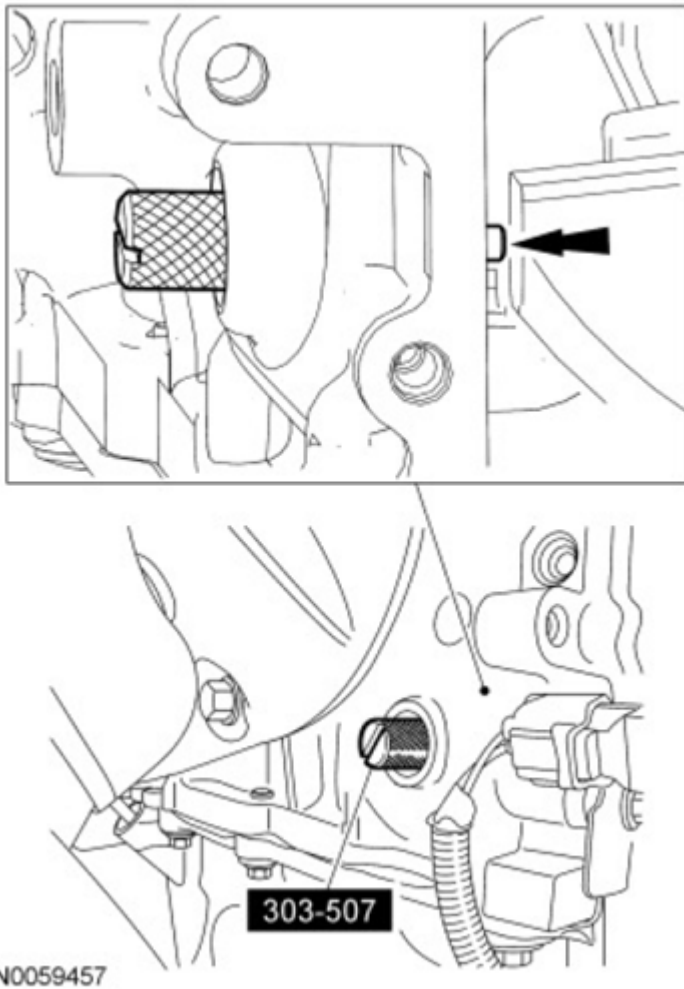


Fig. 10: View Of Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

9. Install the Crankshaft **TDC** Timing Peg and rotate the crankshaft slowly clockwise until the crankshaft balance weight is up against the Crankshaft **TDC** Timing Peg.
 - Remove the Crankshaft **TDC** Timing Peg.

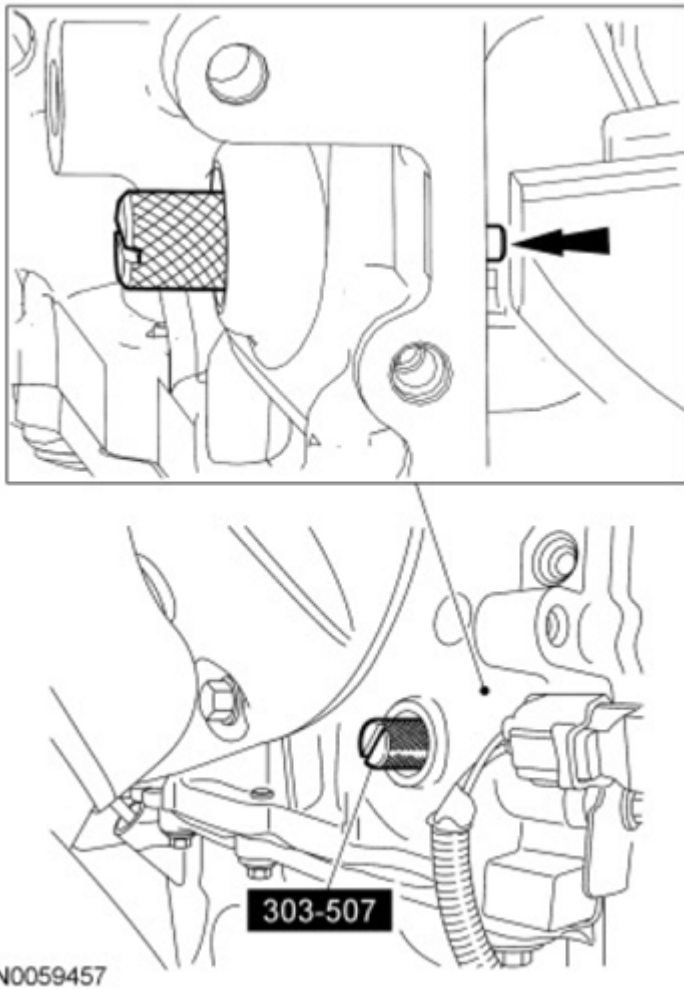


Fig. 11: View Of Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

- NOTE:** Measure the backlash and verify that it is within specified range at all of the following 6 positions: 10 degrees, 30 degrees, 100 degrees, 190 degrees, 210 degrees and 280 degrees. It will be necessary to reset the measuring equipment between measurements.
- NOTE:** The measurement must be taken with the Dial Indicator Gauge with Holding Fixture, a 5-mm Allen wrench and worm clamp set up as shown in illustration. Mark the Allen wrench with a file 80 mm (3.149 in) above the driven gear shaft center. Make sure the worm clamp and Allen wrench are not touching the balance shaft housing.
- NOTE:** For an accurate measurement while measuring the gear backlash, insert a screwdriver as shown in illustration into the crankshaft No. 1 crankweight area and set both the rotation and the thrust direction with the screwdriver, using a prying action as shown in illustration.

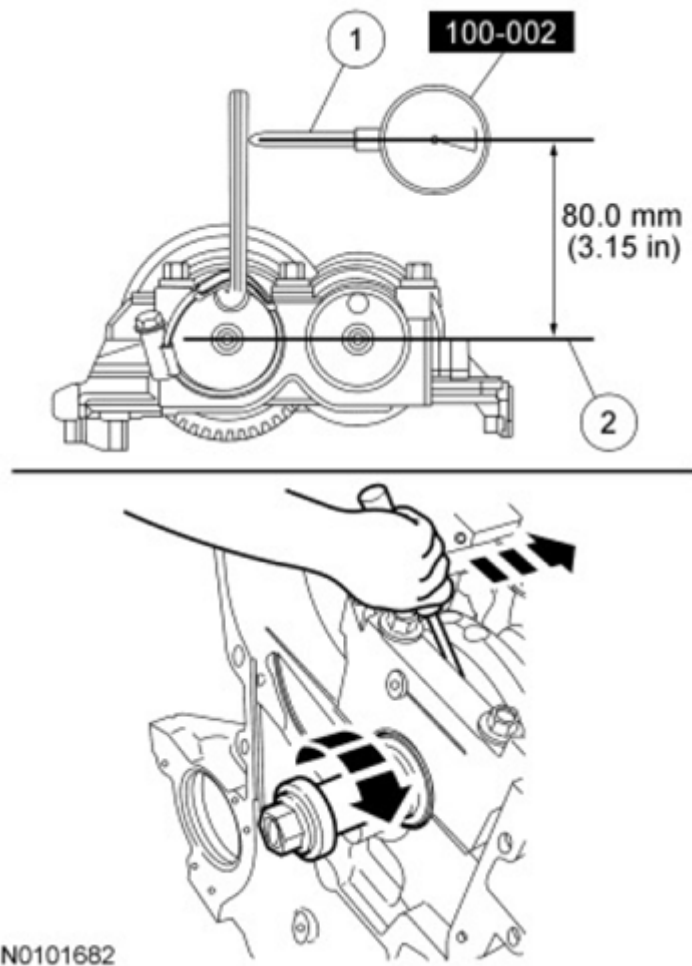


Fig. 12: Measuring Gear Backlash With Specifications
Courtesy of FORD MOTOR CO.

10. Position the Dial Indicator Gauge with Holding Fixture as shown in illustration. Measure the gear backlash.
 - Position the Dial Indicator Gauge with Holding Fixture (1) on the Allen wrench 80 mm (3.149 in) above the driven gear shaft center (2) on the balancer unit.
 - Rotate the crankshaft clockwise and measure the backlash at all of the following 6 positions: 10 degrees, 30 degrees, 100 degrees, 190 degrees, 210 degrees and 280 degrees.

NOTE: If maximum backlash exceeds 0.101 mm (0.003 in), install a new balancer unit.

ADJUSTMENT SHIM SELECTION TABLE

Backlash mm (in)	Selection shim (No.)	Shim thickness mm (in)	Backlash mm (in)	Selection shim (No.)	Shim thickness mm (in)
0.516-0.528 (0.0203-0.0207)	15	1.15 (0.0452)	0.245-0.257 (0.0096-0.0101)	35	1.35 (0.0531)
0.502-0.514 (0.0197-0.0202)	16	1.16 (0.0456)	0.232-0.243 (0.0091-0.0095)	36	1.36 (0.535)
0.489-0.500 (0.0192-0.0196)	17	1.17 (0.0460)	0.218-0.230 (0.0085-0.0090)	37	1.37 (0.539)
0.475-0.487 (0.0187-0.0191)	18	1.18 (0.0464)	0.205-0.216 (0.0080-0.0085)	38	1.38 (0.0543)
0.462-0.473 (0.0181-0.0186)	19	1.19 (0.0468)	0.191-0.203 (0.0075-0.0079)	39	1.39 (0.0547)
0.448-0.460 (0.0176-0.0181)	20	1.20 (0.0472)	0.178-0.189 (0.0070-0.0074)	40	1.40 (0.0551)
0.435-0.446 (0.0171-0.0175)	21	1.21 (0.0476)	0.164-0.176 (0.0064-0.0069)	41	1.41 (0.0555)
0.421-0.433 (0.0165-0.0170)	22	1.22 (0.0480)	0.151-0.162 (0.0059-0.0063)	42	1.42 (0.0559)
0.408-0.419 (0.0160-0.0164)	23	1.23 (0.0484)	0.137-0.149 (0.0053-0.0058)	43	1.43 (0.0562)
0.394-0.406 (0.0155-0.0159)	24	1.24 (0.0488)	0.124-0.135 (0.0048-0.0053)	44	1.44 (0.0566)
0.381-0.392 (0.0150-0.0154)	25	1.25 (0.492)	0.110-0.122 (0.0043-0.0048)	45	1.45 (0.0570)
0.367-0.379 (0.0144-0.0149)	26	1.26 (0.0496)	0.097-0.108 (0.0038-0.0042)	46	1.46 (0.0574)
0.354-0.365 (0.0139-0.0143)	27	1.27 (0.0499)	0.083-0.095 (0.0032-0.0037)	47	1.47 (0.0578)
0.340-0.352 (0.0133-0.0138)	28	1.28 (0.0503)	0.070-0.081 (0.0027-0.0031)	48	1.48 (0.0582)
0.327-0.338 (0.0128-0.0133)	29	1.29 (0.0507)	0.056-0.068 (0.0022-0.0026)	49	1.49 (0.0586)
0.313-0.325 (0.0123-0.0127)	30	1.30 (0.0511)	0.043-0.054 (0.0016-0.0021)	50 (master)	1.50 (0.0590)
0.300-0.311 (0.0118-0.0122)	31	1.31 (0.0515)	0.029-0.041 (0.0011-0.0016)	51	1.51 (0.0594)
0.286-0.298 (0.0112-0.0117)	32	1.32 (0.0519)	0.015-0.027 (0.0005-0.0010)	52	1.52 (0.0598)
0.272-0.284 (0.0107-0.0111)	33	1.33 (0.0523)	0.002-0.014 (0.00007-0.0005)	53	1.53 (0.0602)
0.259-0.271 (0.0101-0.0106)	34	1.34 (0.0527)	0.000-0.000 (0.0000-0.0000)	54	1.54 (0.0606)

N0101731

Fig. 13: Adjustment Shim Selection Chart
Courtesy of FORD MOTOR CO.

11. Using the backlash measurement, select the proper shims from the Adjustment Shim Selection Table.
 - Remove the balancer unit from the cylinder block.
 - Install the selected adjustment shims on the seat faces of the balancer unit.
12. Install the Crankshaft **TDC** Timing Peg and rotate the crankshaft slowly clockwise until the crankshaft balance weight is up against the Crankshaft **TDC** Timing Peg. The engine is now at **TDC**.

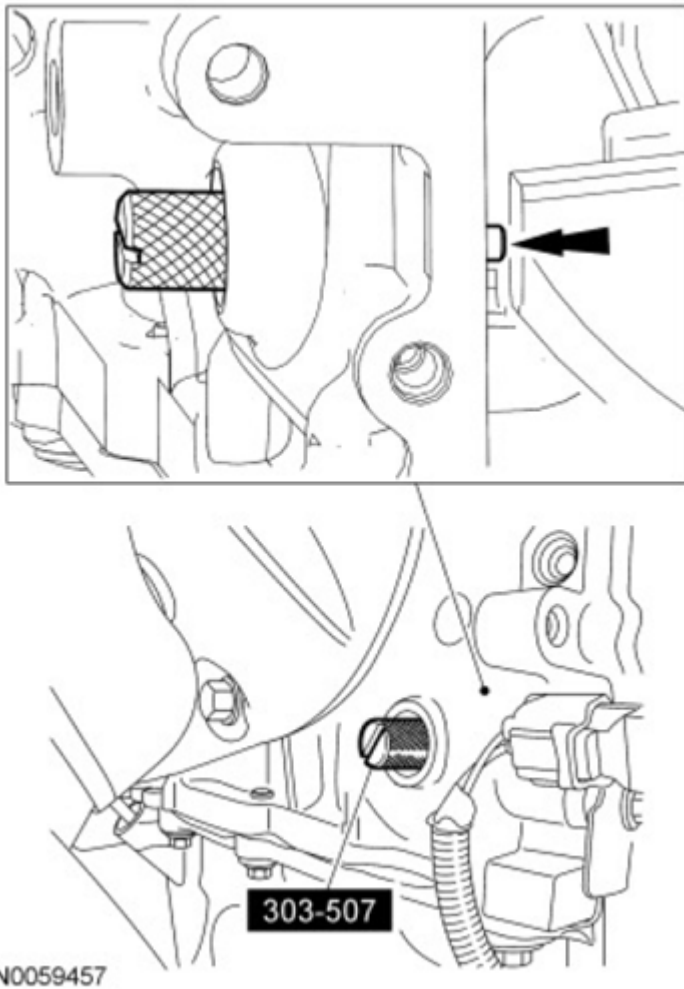


Fig. 14: View Of Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

13. With the balancer unit shaft marks in the **TDC** position, slowly install the balancer unit to the cylinder block to avoid interference between the crankshaft drive gear and the balancer unit driven gear.

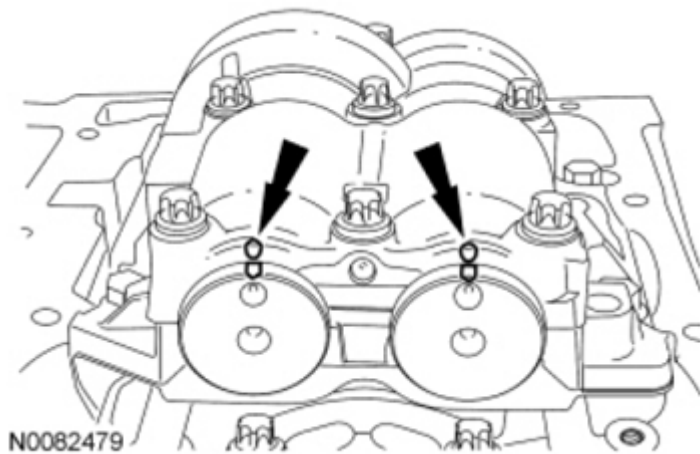


Fig. 15: Locating Balancer Unit Marks
Courtesy of FORD MOTOR CO.

14. Install the balancer unit bolts.
- Tighten in the sequence shown in illustration in 2 stages.
 - Stage 1: Tighten to 25 Nm (18 lb-ft).
 - Stage 2: Tighten to 50 Nm (37 lb-ft).

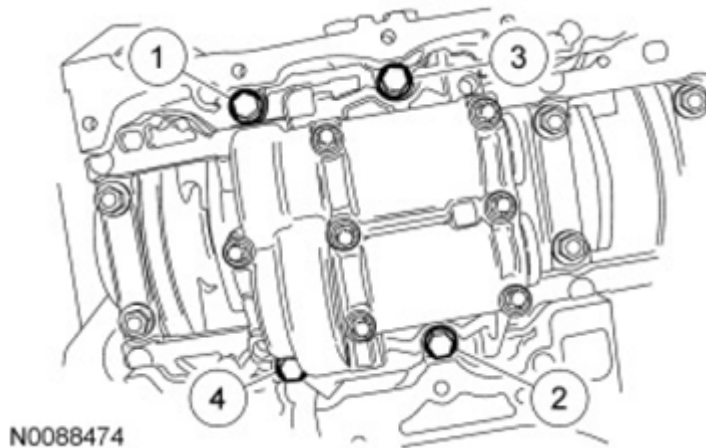


Fig. 16: Tightening Sequence Of Balancer Unit Bolts
Courtesy of FORD MOTOR CO.

NOTE: Remeasure the backlash and verify that it is within specified range at all of the following 6 positions: 10 degrees, 30 degrees, 100 degrees, 190 degrees, 210 degrees and 280 degrees. It will be necessary to reset the measuring equipment between measurements.

NOTE: The measurement must be taken with the Dial Indicator Gauge with Holding Fixture, a 5- mm Allen wrench and worm clamp set up as shown in

illustration. Mark the Allen wrench with a file 80 mm (3.149 in) above the driven gear shaft center. Make sure the worm clamp and Allen wrench are not touching the balance shaft housing.

NOTE: For an accurate measurement while measuring the gear backlash, insert a screwdriver as shown in illustration into the crankshaft No. 1 crankweight area and set both the rotation and the thrust direction with the screwdriver, using a prying action as shown in illustration.

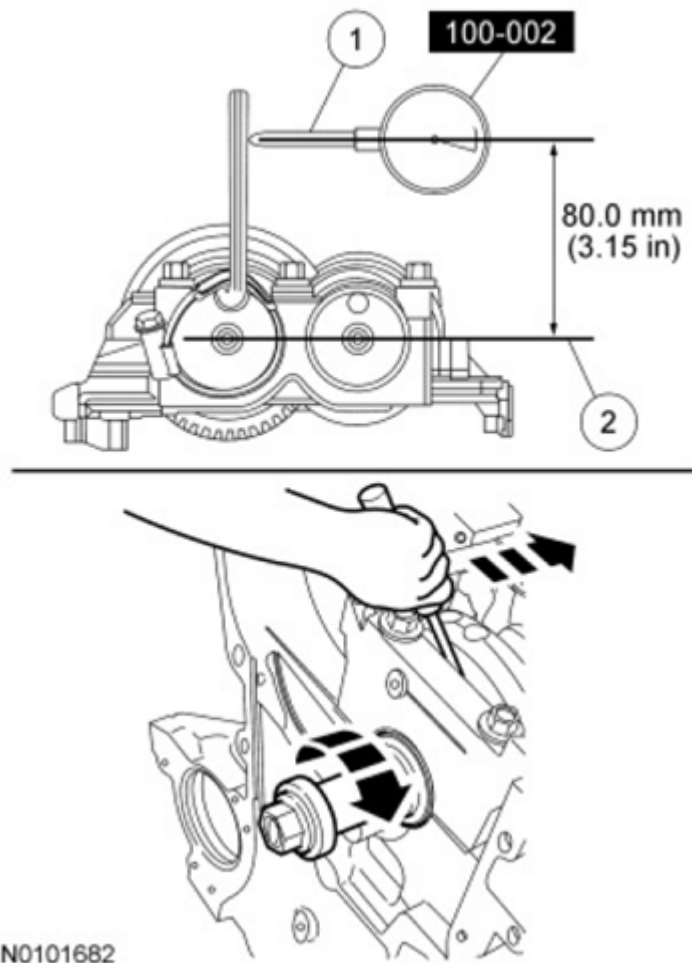


Fig. 17: Measuring Gear Backlash With Specifications
Courtesy of FORD MOTOR CO.

15. Position the Dial Indicator Gauge with Holding Fixture as shown in illustration. Measure the gear backlash.
 - Position the Dial Indicator Gauge with Holding Fixture (1) on the Allen wrench 80 mm (3.149 in) above the driven gear shaft center (2) on the balancer unit.
 - Rotate the crankshaft clockwise and measure the backlash at all of the following 6 positions: 10 degrees, 30 degrees, 100 degrees, 190 degrees, 210 degrees and 280 degrees.

- If the backlash exceeds the specified range of 0.005 to 0.101 mm (0.00019 to 0.0039 in), install a new balancer unit and repeat the procedure.

IN-VEHICLE REPAIR

INTAKE MANIFOLD

Intake Manifold (View 1 of 2)

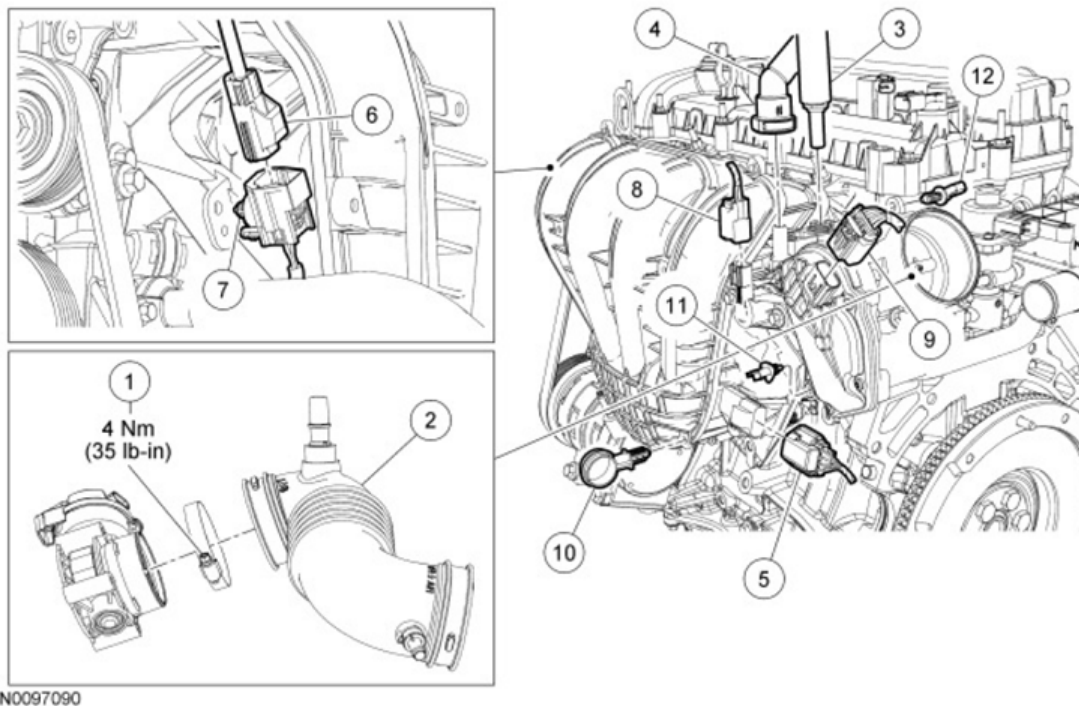


Fig. 18: Identifying Intake Manifold Components With Torque Specifications - (1 Of 2)
Courtesy of FORD MOTOR CO.

INTAKE MANIFOLD PARTS DESCRIPTION CHART

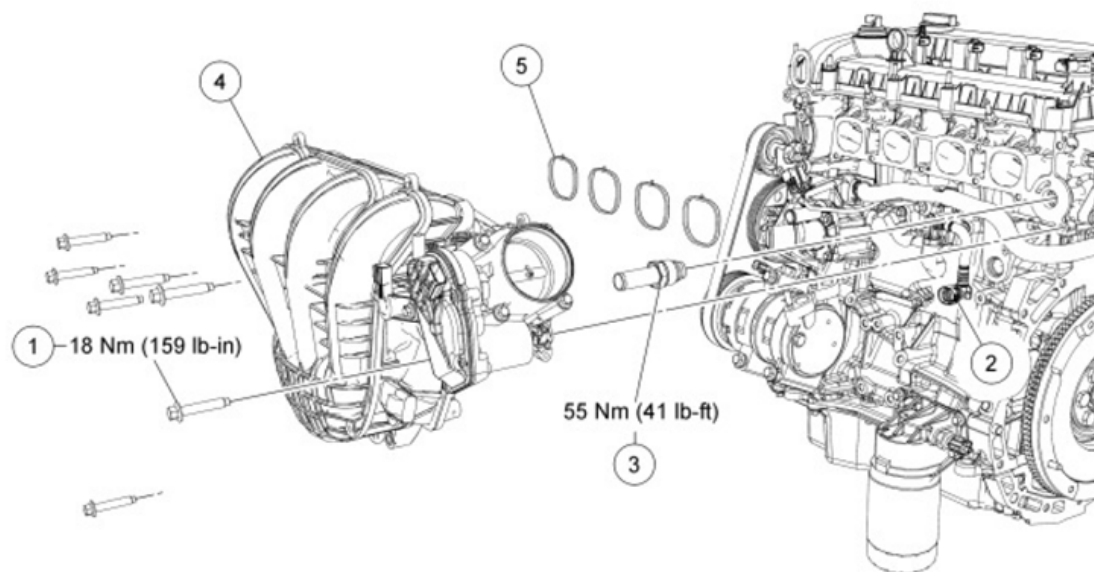
Item	Part Number	Description
1	9C632	Air Cleaner (ACL) outlet pipe-to-Throttle Body (TB) clamp
2	9B642	ACL outlet pipe
3	19D848	Vacuum supply hose
4	9D289	Fuel vapor return hose
5	14A464	Manifold Absolute Pressure (MAP) sensor electrical connector (part of 12C508)
6	14A464	Knock Sensor (KS) electrical connector (part of 12C508)
7	14A624	Wire harness pin-type retainer (part of 12C508)
8	14A464	Evaporative Emission (EVAP) canister purge valve electrical connector (part of 12C508)
9	14A464	Electronic throttle control electrical connector (part of

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		12C508)
10	18K580	Heater hose retainer
11	13A506	Wire harness pin-type retainer
12	14197	Wire harness pin-type retainer

Intake Manifold (View 2 of 2)



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Fig. 19: Identifying Intake Manifold Components With Torque Specifications - (2 Of 2)
Courtesy of FORD MOTOR CO.

INTAKE MANIFOLD PARTS DESCRIPTION CHART

Item	Part Number	Description
1	W500311	Intake manifold bolt (7 required)
2	6A785	Crankcase vent oil separator tube (part of 6A785)
3	9E470	EGR tube
4	9424	Intake manifold
5	9461	Intake manifold gasket

Removal and Installation

1. With vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** article.
2. Remove the fuel rail. For additional information, refer to **FUEL CHARGING AND CONTROLS - 2.5L** article.
3. Disconnect the vacuum supply hose.
 - Depress the quick release locking ring.

- Pull the vacuum hose out of the quick release fitting.

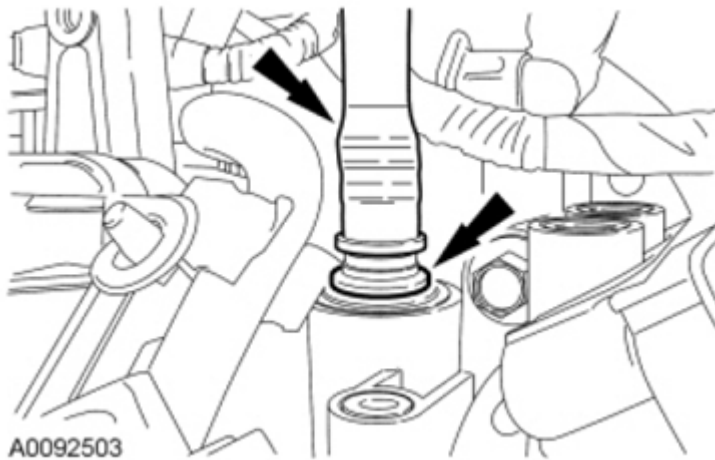


Fig. 20: Locating Vacuum Supply Hose
Courtesy of FORD MOTOR CO.

4. Disconnect the fuel vapor return hose from the intake manifold.
5. Disconnect the Manifold Absolute Pressure (MAP) electrical connector.
6. Disconnect the Evaporative Emission (EVAP) canister purge valve electrical connector.
7. Disconnect the electronic throttle control electrical connector.
8. Disconnect the Knock Sensor (KS) electrical connector.
 - Detach the wire harness pin-type retainer.
9. Detach the heater hose pin-type retainer.
10. Detach all wiring harness pin-type retainers from the intake manifold and position the wiring harness aside.
11. Loosen the clamp and disconnect Air Cleaner (ACL) outlet pipe from the Throttle Body (TB).
 - To install, tighten to 4 Nm (35 lb-in).
12. Remove the intake manifold lower bolt.
 - To install, tighten to 18 Nm (159 lb-in).

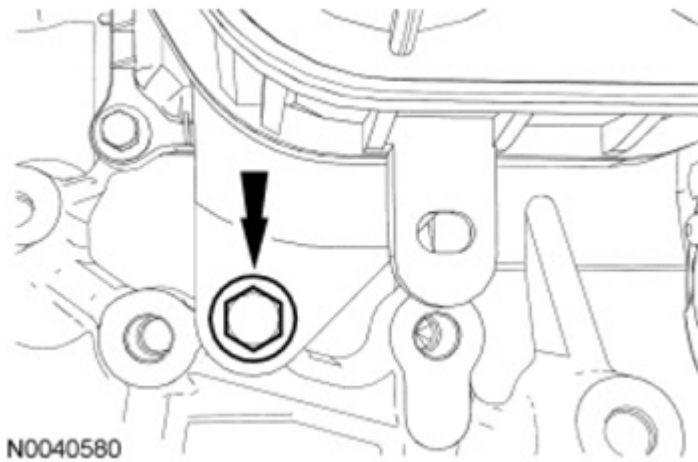


Fig. 21: Locating Intake Manifold Lower Bolt
Courtesy of FORD MOTOR CO.

13. Remove the 6 bolts and position the intake manifold aside to access the crankcase vent oil separator tube and the EGR tube.
 - To install, tighten to 18 Nm (159 lb-in).
14. Squeeze the 2 crankcase vent oil separator tube tabs and disconnect the tube from the intake manifold.
15. Remove the EGR tube.
 - To install, tighten to 55 Nm (41 lb-ft).
16. Remove the intake manifold and gaskets.

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.

17. To install, reverse the removal procedure.
 - Inspect and install new intake manifold gaskets if necessary.

VALVE COVER

Material

MATERIAL SPECIFICATIONS

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

Valve Cover (View 1 of 2)

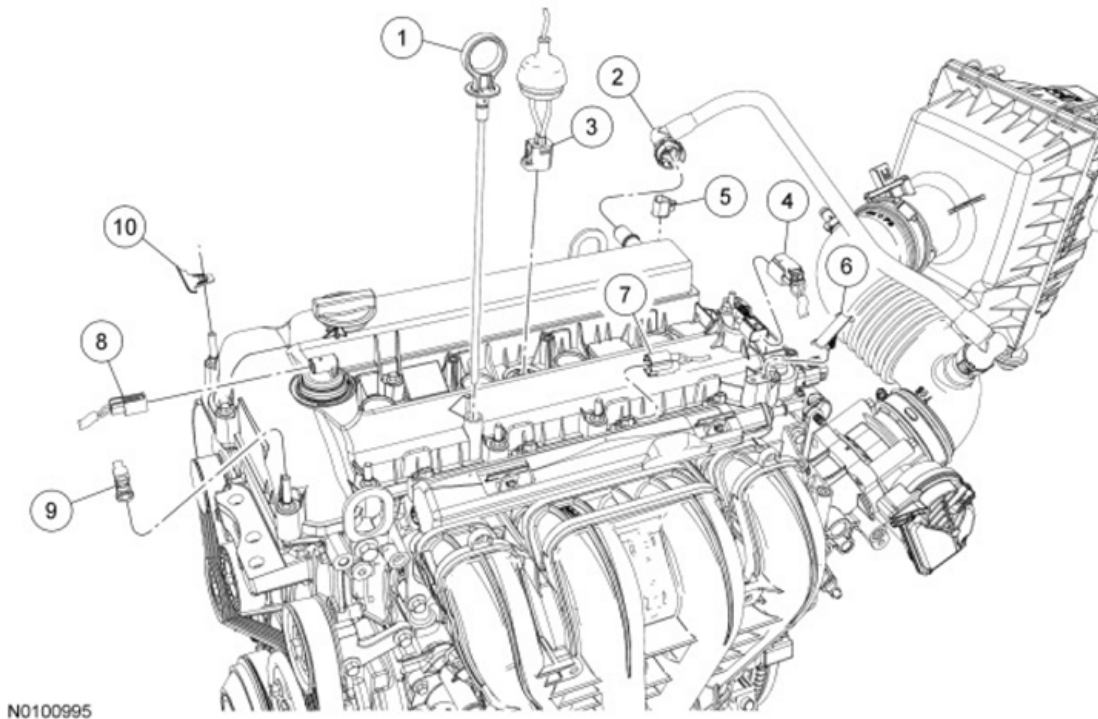
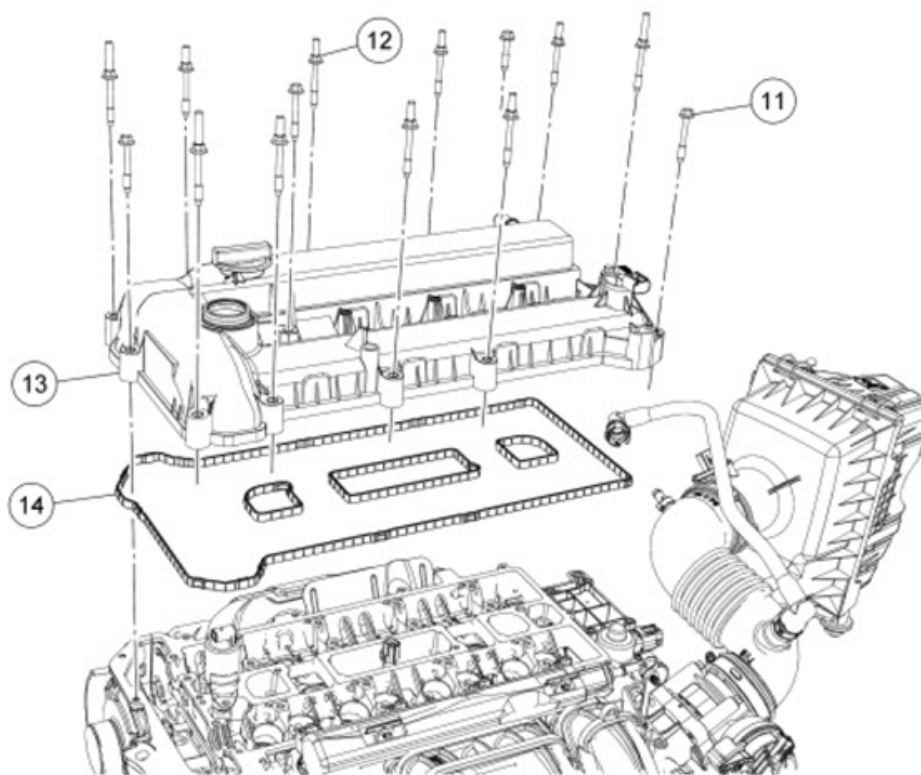


Fig. 22: Identifying Valve Cover Components - (1 Of 2)
Courtesy of FORD MOTOR CO.

VALVE COVER PARTS DESCRIPTION CHART

Item	Part Number	Description
1	6750	Oil level indicator
2	6853	Crankcase vent hose
3	14A464	Cylinder Head Temperature (CHT) sensor electrical connector (part of 12C508)
4	14A464	Camshaft Position (CMP) sensor electrical connector (part of 12C508)
5	14A464	Wire harness retainer (part of 12C508)
6	13A506	Wire harness retainer (part of 12C508)
7	14A464	Radio capacitor electrical connector (part of 12C508)
8	14A163	Variable Camshaft Timing (VCT) oil control solenoid electrical connector (part of 12C508)
9	14A163	Wire harness retainer (part of 14290)
10	14A464	Wire harness retainer (part of 12C508)

Valve Cover (2 of 2)



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Fig. 23: Identifying Valve Cover Components - (2 Of 2)

Courtesy of FORD MOTOR CO.

VALVE COVER PARTS DESCRIPTION CHART

Item	Part Number	Description
11	6C293	Valve cover retainer (10 required)
12	6C295	Valve cover retainer (4 required)
13	6582	Valve cover
14	6K260	Valve cover 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 can cause engine failure.

1. Remove the oil level indicator.
2. Remove the ignition coil-on-plugs. For additional information, refer to **ENGINE IGNITION - 2.5L** article.
3. Disconnect the crankcase vent hose.
4. Disconnect the Cylinder Head Temperature (CHT) sensor electrical connector.

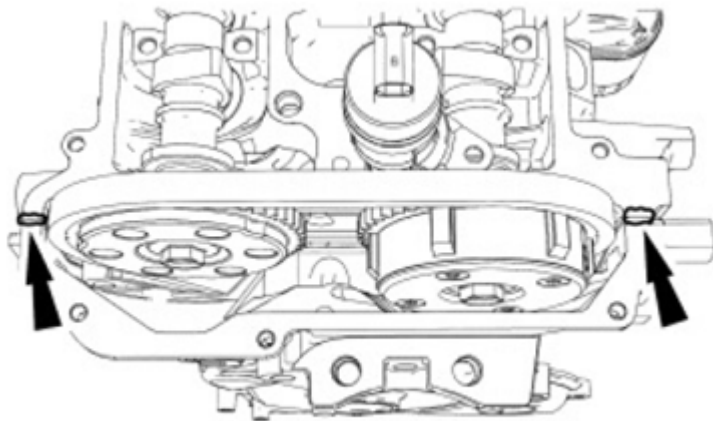
5. Disconnect the Camshaft Position (CMP) sensor electrical connector.
6. Disconnect the radio capacitor electrical connector.
7. Disconnect the Variable Camshaft Timing (VCT) solenoid electrical connector.
8. Detach all of the wiring harness retainers from the valve cover studs and position the harness aside.
9. Remove the 14 valve cover retainers, the valve cover and 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. Clean and inspect the sealing surfaces.

NOTE: The valve cover must be secured within 4 minutes of silicone gasket application. If the valve cover is not secured within 4 minutes, the sealant must be removed and the sealing area cleaned with metal surface prep.



N0045151

Fig. 24: Locating Silicone Gasket And Sealant Applying Locations
Courtesy of FORD MOTOR CO.

2. Apply silicone gasket and sealant to the locations shown in illustration.

NOTE: Clean and inspect the gasket. Install a new gasket, if necessary.

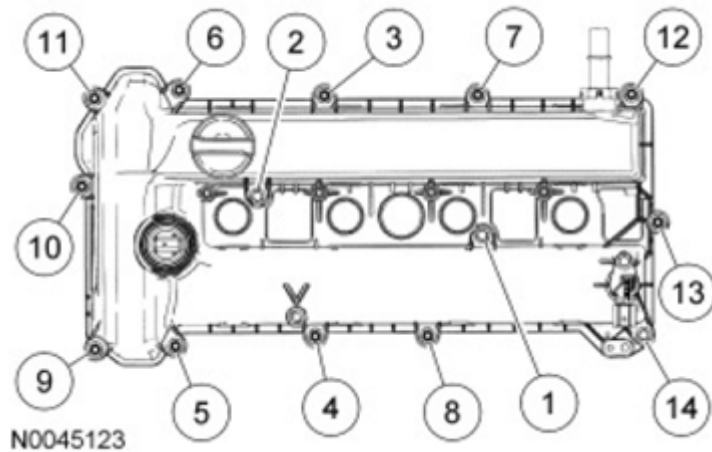


Fig. 25: Tightening Sequence Of Valve Cover Bolts
Courtesy of FORD MOTOR CO.

3. Install the valve cover, gasket and retainers.
 - Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).
4. Position the wiring harness and attach all of the wiring harness retainers to the valve cover studs.
5. Connect the **VCT** solenoid electrical connector.
6. Connect the radio capacitor electrical connector.
7. Connect the **CMP** sensor electrical connector.
8. Connect the **CHT** sensor electrical connector.
9. Connect the crankcase vent hose.
10. Install the ignition coil-on-plugs. For additional information, refer to **ENGINE IGNITION - 2.5L** article.
11. Install the oil level indicator.

LOWER END COMPONENTS - EXPLODED VIEW, CRANKSHAFT PULLEY AND CRANKSHAFT FRONT SEAL

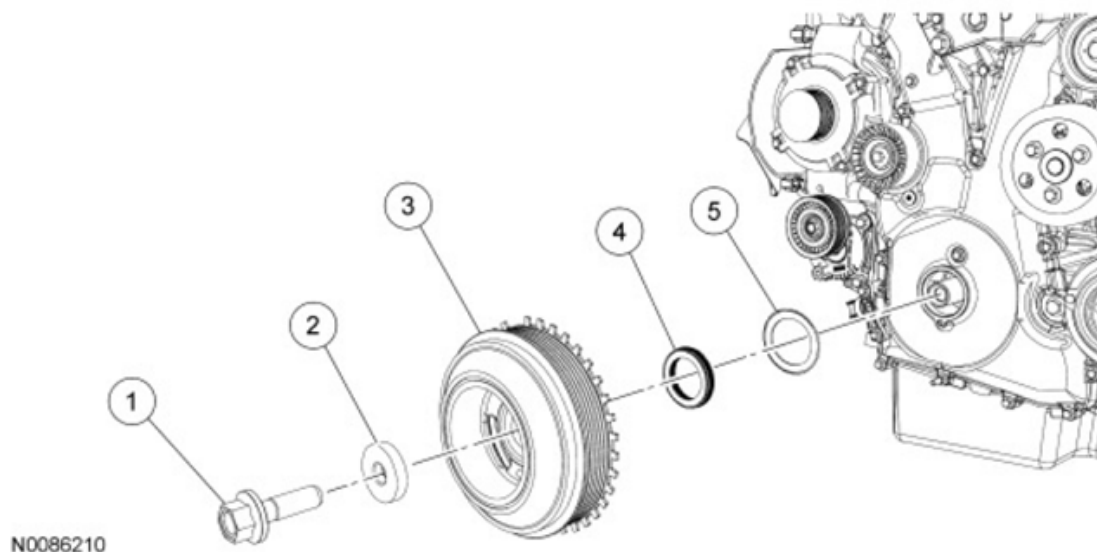


Fig. 26: Exploded View Of Lower End Components
Courtesy of FORD MOTOR CO.

PARTS DESCRIPTION CHART

Item	Part Number	Description
1	6K340	Crankshaft pulley bolt
2	-	Crankshaft pulley washer (part of 6K340)
3	6316	Crankshaft pulley
4	6700	Crankshaft front seal
5	6378	Diamond washer

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

CRANKSHAFT PULLEY

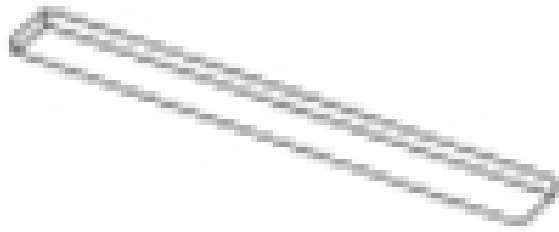
Special Tool(s)

SPECIAL TOOLS DESCRIPTION

	Alignment Plate, Camshaft 303-465 (T94P-6256-CH)
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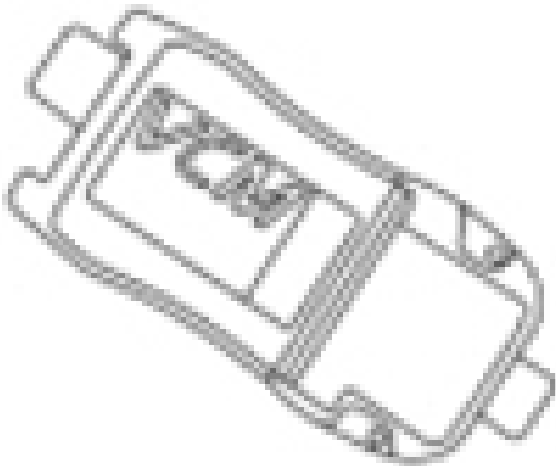
ST2645-A



ST3054-A

Holding Tool, Crankshaft Damper
303-1416

Timing Peg, Crankshaft TDC
303-507

 ST2638-A	
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

General Equipment

GENERAL EQUIPMENT REFERENCE CHART

6 mm x 18 mm bolt

Material

MATERIAL SPECIFICATIONS

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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: Do not loosen or remove the crankshaft pulley bolt without first installing the special tools as instructed in this procedure. The crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. The crankshaft, the crankshaft sprocket and the pulley are fitted together by friction, using diamond washers between the flange faces on each part. For that reason, the crankshaft sprocket is also unfastened if the pulley bolt is loosened. Before any repair requiring loosening or removal of the crankshaft pulley bolt, the crankshaft and camshafts must be locked in place by the special service tools, otherwise severe engine damage can occur.

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 front RH wheel and tire. For additional information, refer to **TIRES & WHEELS** article.
3. Remove the accessory drive belt. For additional information, refer to **ACCESSORY DRIVE - 2.5L** article.
4. Remove the valve cover. For additional information, refer to **VALVE COVER** in this service information.

NOTE: Failure to position the No. 1 piston at Top Dead Center (TDC) can result in damage to the engine. Turn the engine in the normal direction of rotation only.

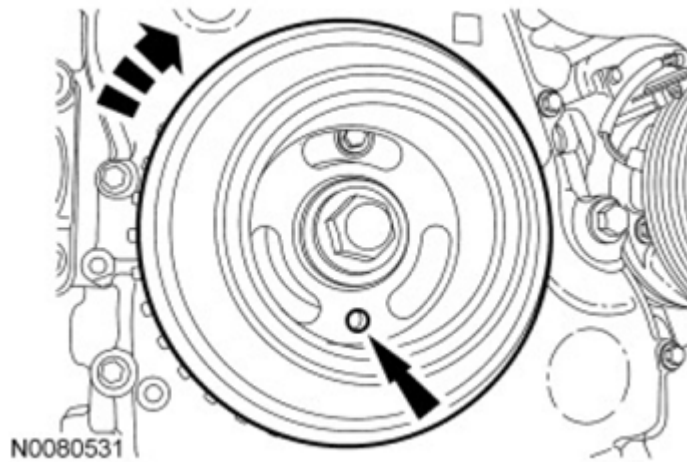


Fig. 27: Turning Crankshaft Pulley
Courtesy of FORD MOTOR CO.

5. Using the crankshaft pulley bolt, turn the crankshaft clockwise to position the No. 1 piston at Top Dead Center (TDC).
 - The hole in the crankshaft pulley should be in the 6 o'clock position.

NOTE: The Camshaft Alignment Plate is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

NOTE: The camshaft timing slots are offset. If the Camshaft Alignment Plate cannot be installed, rotate the crankshaft one complete revolution clockwise to correctly position the camshafts.

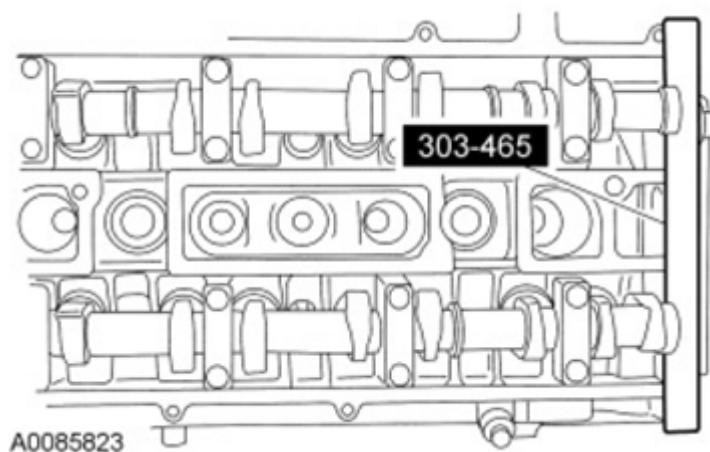


Fig. 28: View Of Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

6. Install the Camshaft Alignment Plate in the slots on the rear of both camshafts.

7. Remove the engine plug bolt.

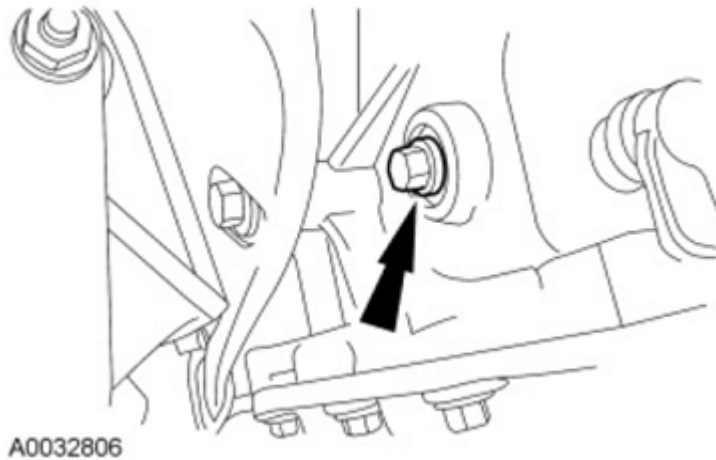


Fig. 29: Remove/Install Engine Plug Bolt
Courtesy of FORD MOTOR CO.

NOTE: The Crankshaft TDC Timing Peg will contact the crankshaft and prevent it from turning past TDC . However, the crankshaft can still be rotated in the counterclockwise direction. The crankshaft must remain at the TDC position during the crankshaft pulley removal and installation.

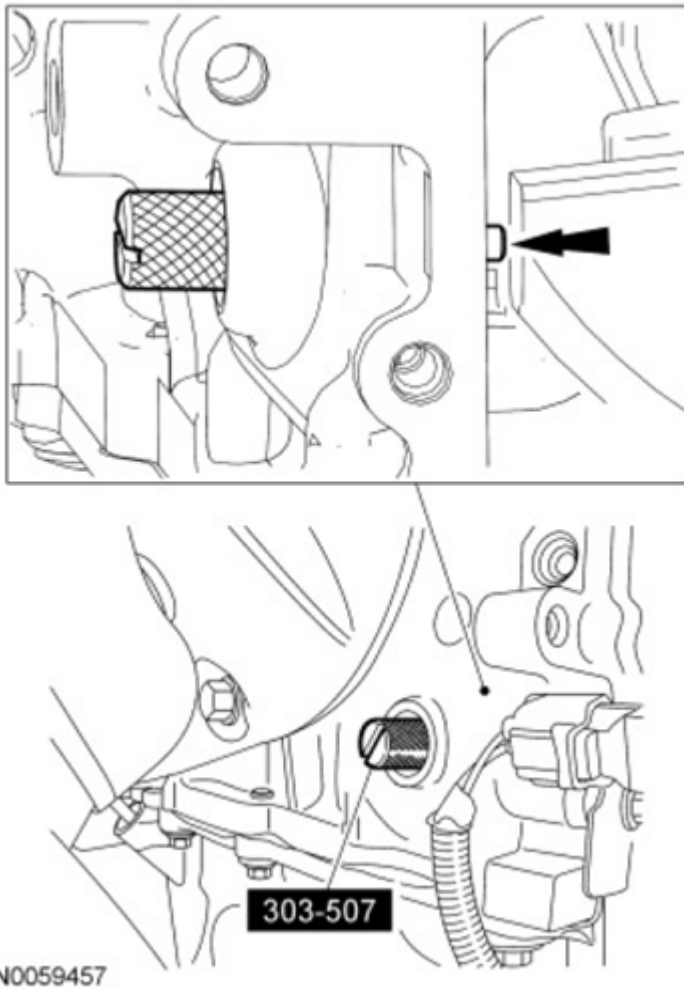


Fig. 30: View Of Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

8. Install the Crankshaft TDC Timing Peg.

NOTE: The crankshaft must remain in the Top Dead Center (TDC) position during removal of the pulley bolt or damage to the engine can occur. Therefore, the crankshaft pulley must be held in place with the Crankshaft Damper Holding Tool, and the bolt should be removed using an air impact wrench (1/2-in drive minimum).

NOTE: The crankshaft sprocket diamond washer may come off with the crankshaft pulley. The diamond washer must be replaced. Remove and discard the diamond washer. If the diamond washer is not installed, engine damage may occur.

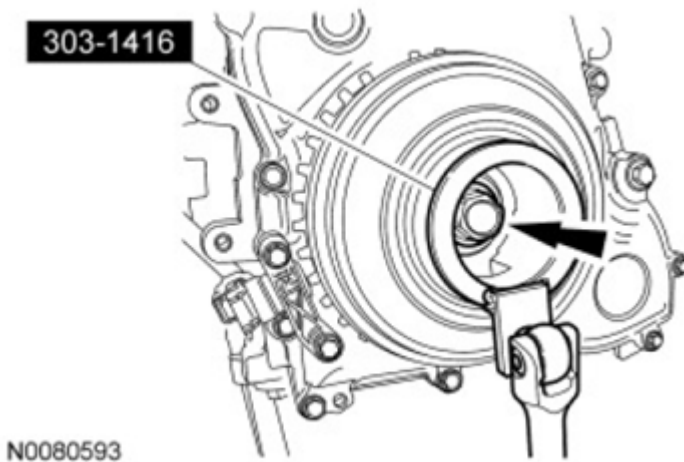


Fig. 31: Remove/Install Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

9. Use the Crankshaft Damper Holding Tool and a suitable 1/2-in drive hand tool to hold the crankshaft pulley. Use an air impact wrench to remove the crankshaft pulley bolt.
 - Remove and discard the crankshaft pulley bolt and washer.
 - Remove the crankshaft pulley.
 - Remove the diamond washer and discard.

Installation

1. Install a new diamond washer.

NOTE: Do not install the crankshaft pulley bolt at this time.

NOTE: Apply clean engine oil on the seal area before installing.

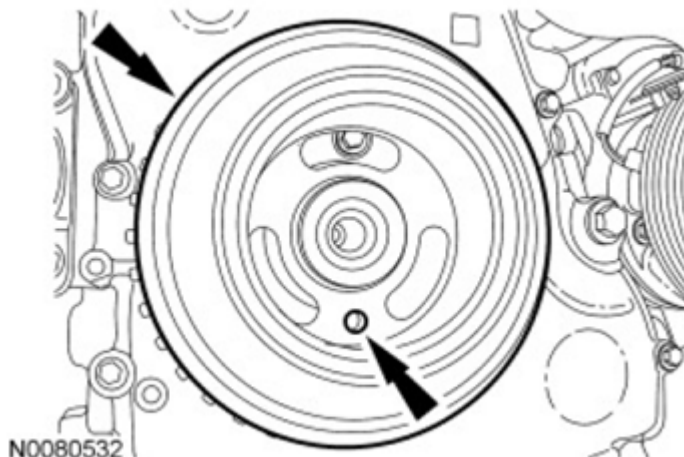


Fig. 32: Identifying Crankshaft Pulley And Hole
Courtesy of FORD MOTOR CO.

2. Position the crankshaft pulley onto the crankshaft with the hole in the pulley at the 6 o'clock position.

NOTE: Only hand-tighten the 6 mm x 18 mm bolt or damage to the front cover can occur.

NOTE: This step will correctly align the crankshaft pulley to the crankshaft.

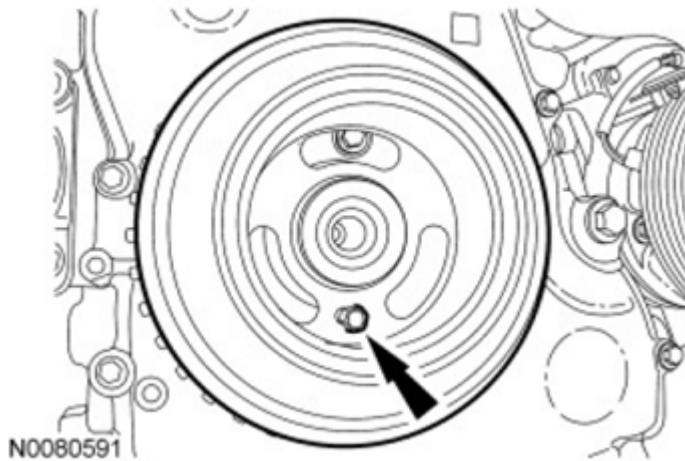


Fig. 33: View Of Crankshaft Pulley Alignment Bolt
Courtesy of FORD MOTOR CO.

3. Install a 6 mm x 18 mm bolt through the crankshaft pulley and thread it into the front cover.

NOTE: The crankshaft must remain in the Top Dead Center (TDC) position during installation of the pulley bolt or damage to the engine can occur. Therefore, the crankshaft pulley must be held in place with the Crankshaft Damper Holding Tool and the bolt should be installed using hand tools only.

NOTE: Do not reuse the crankshaft pulley bolt.

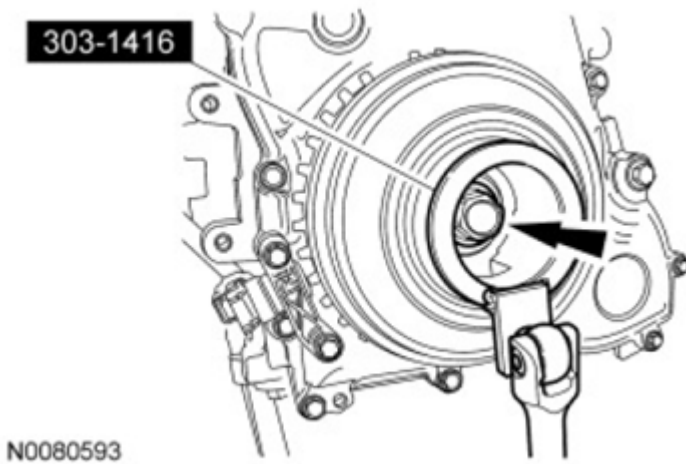


Fig. 34: Remove/Install Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

4. Install a new crankshaft pulley bolt. Use the Crankshaft Damper Holding Tool and a suitable 1/2- in drive hand tool to hold the crankshaft pulley, tighten the crankshaft pulley bolt in 2 stages:
 - Stage 1: Tighten to 100 Nm (74 lb-ft).
 - Stage 2: Tighten an additional 90 degrees.
5. Remove the 6 mm x 18 mm bolt.

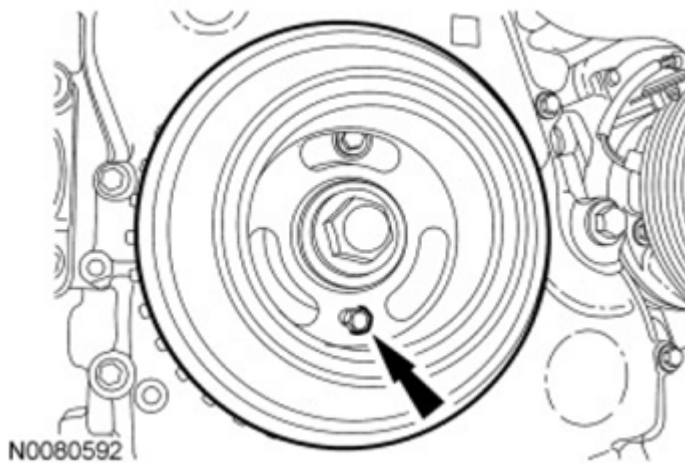


Fig. 35: View Of Crankshaft Pulley Alignment Bolt
Courtesy of FORD MOTOR CO.

6. Remove the Crankshaft TDC Timing Peg.

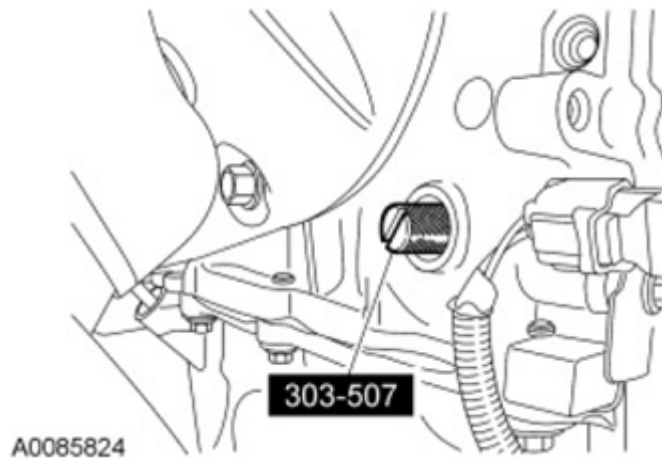


Fig. 36: View Of Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

7. Remove the Camshaft Alignment Plate.

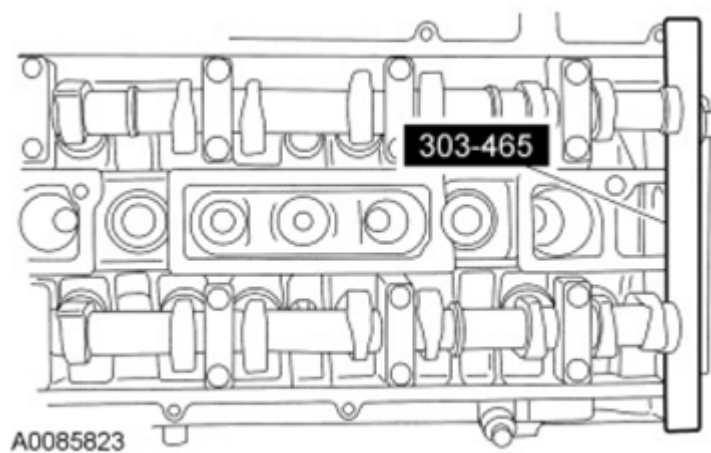


Fig. 37: View Of Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

NOTE: Only turn the engine in the normal direction of rotation.

8. Turn the crankshaft clockwise one and three-fourths turns.
9. Install the Crankshaft **TDC** Timing Peg.

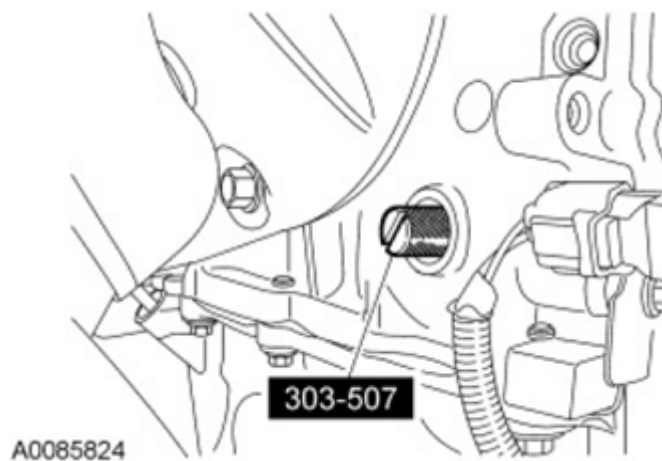


Fig. 38: View Of Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

NOTE: Only turn the engine in the normal direction of rotation.

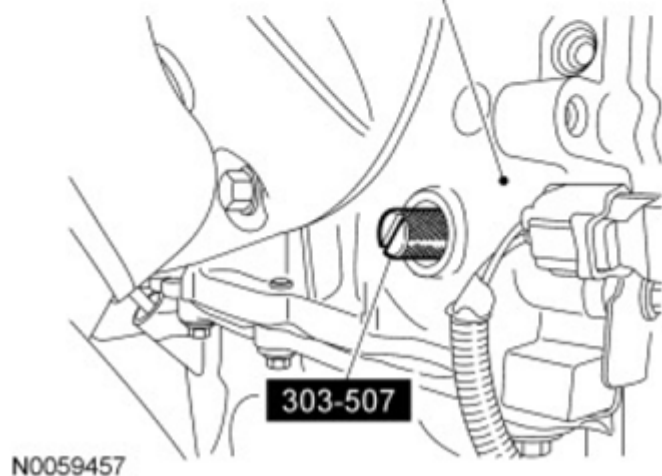
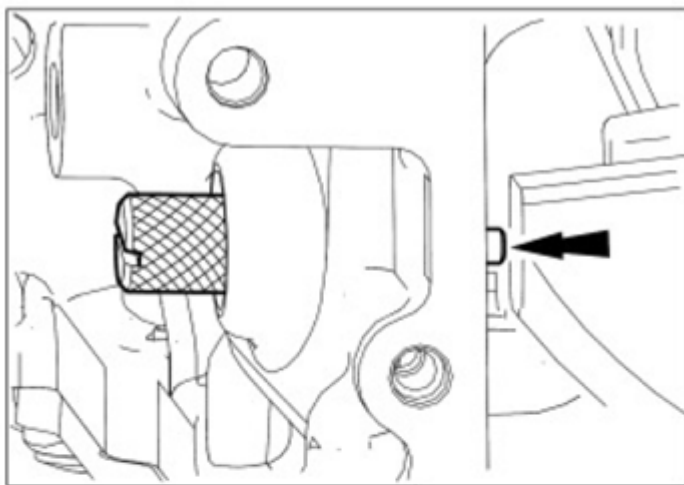


Fig. 39: View Of Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

10. Turn the crankshaft clockwise until the crankshaft contacts the Crankshaft TDC Timing Peg.

NOTE: Only hand-tighten the bolt or damage to the front cover can occur.

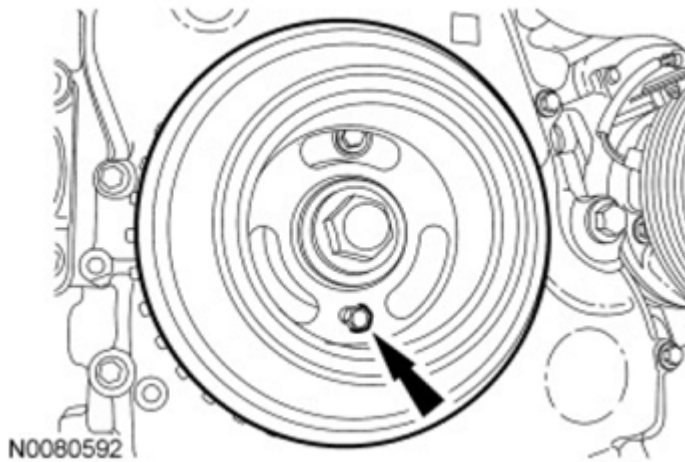


Fig. 40: View Of Crankshaft Pulley Alignment Bolt
Courtesy of FORD MOTOR CO.

11. Using the 6 mm x 18 mm bolt, check the position of the crankshaft pulley.
- If it is not possible to install the bolt, the engine valve timing must be corrected by repeating this procedure.
12. Install the Camshaft Alignment Plate to check the position of the camshafts.
- If it is not possible to install the Camshaft Alignment Plate, the engine valve timing must be corrected by repeating this procedure.

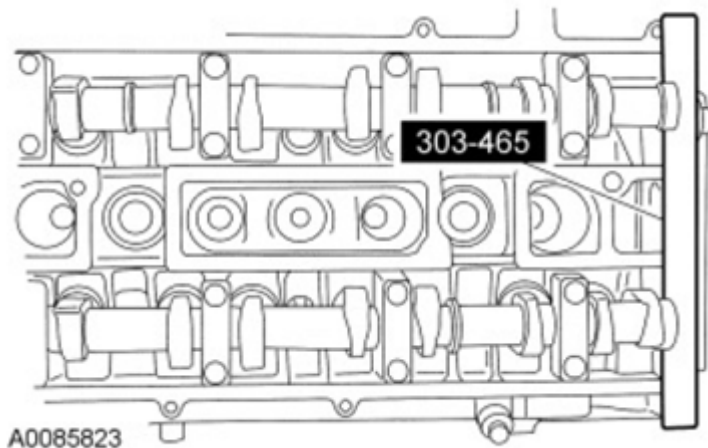


Fig. 41: View Of Camshaft Alignment Plate

Courtesy of FORD MOTOR CO.

13. Remove the Camshaft Alignment Plate.

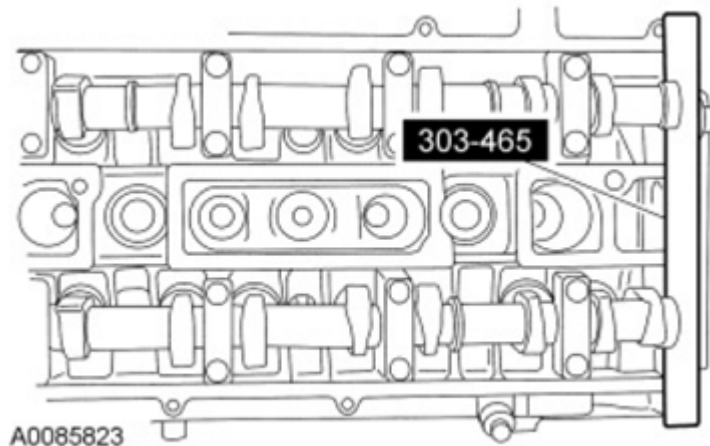


Fig. 42: View Of Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

14. Remove the 6 mm x 18 mm bolt.

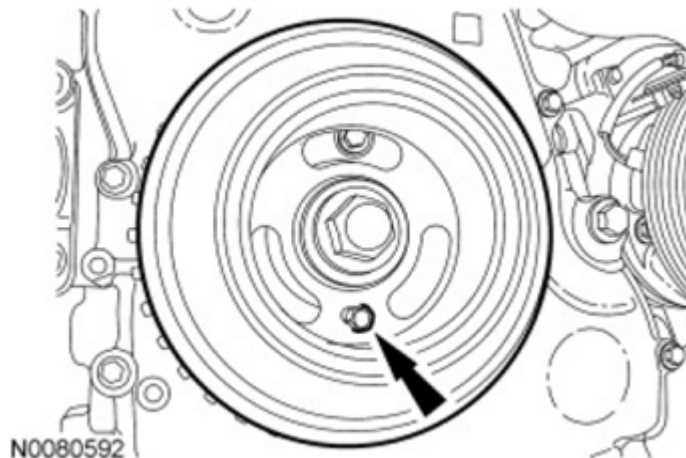


Fig. 43: View Of Crankshaft Pulley Alignment Bolt
Courtesy of FORD MOTOR CO.

15. Remove the Crankshaft TDC Timing Peg.

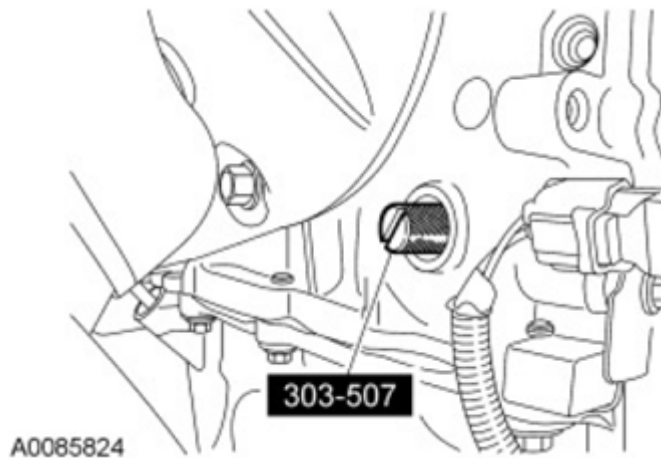


Fig. 44: View Of Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

16. Install the engine plug bolt.
 - Tighten to 20 Nm (177 lb-in).

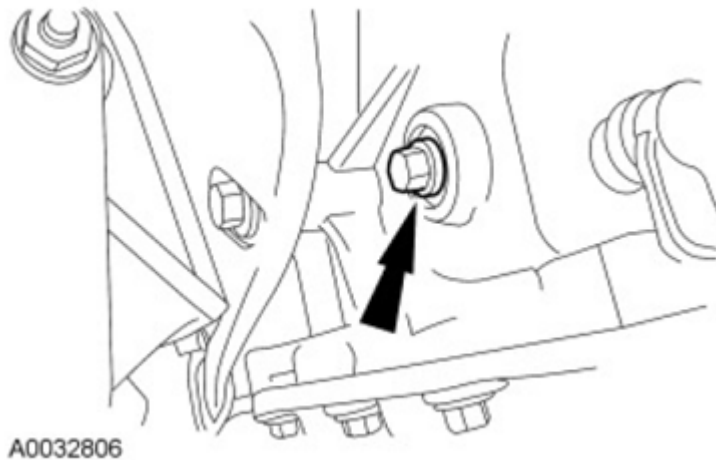


Fig. 45: Remove/Install Engine Plug Bolt
Courtesy of FORD MOTOR CO.

17. Install the accessory drive belt. For additional information, refer to **ACCESSORY DRIVE - 2.5L** article.
18. Install the front RH wheel and tire. For additional information, refer to **TIRES & WHEELS** article.
19. Install the valve cover. For additional information, refer to **VALVE COVER** in this service information.
20. Using the scan tool, perform the Misfire Monitor Neutral Profile Correction procedure, following the on-screen instructions.

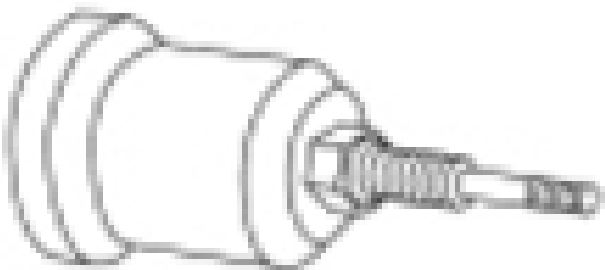
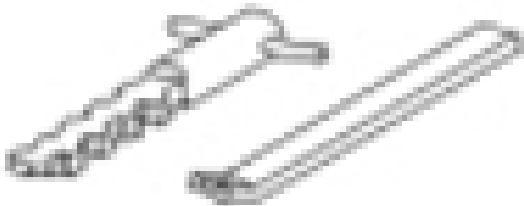
CRANKSHAFT FRONT SEAL

Special Tool(s)

2011 Mercury Mariner

2011 ENGINE Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)

SPECIAL TOOLS DESCRIPTION

 ST1917-A	Installer, Camshaft Front Oil Seal 303-096 (T74P-6150-A)
 ST1385-A	Remover, Oil Seal 303-409 (T92C-6700-CH)

Material

MATERIAL SPECIFICATIONS

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: Do not loosen or remove the crankshaft pulley bolt without first installing the

special tools as instructed in this procedure. The crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. The crankshaft, the crankshaft sprocket and the pulley are fitted together by friction, using diamond washers between the flange faces on each part. For that reason, the crankshaft sprocket is also unfastened if the pulley bolt is loosened. Before any repair requiring loosening or removal of the crankshaft pulley bolt, the crankshaft and camshafts must be locked in place by the special service tools, otherwise severe engine damage can occur.

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 crankshaft pulley. For additional information, refer to **LOWER END COMPONENTS - EXPLODED VIEW, CRANKSHAFT PULLEY AND CRANKSHAFT FRONT SEAL** and **CRANKSHAFT PULLEY** in this service information.

NOTE: Use care not to damage the engine front cover or the crankshaft when removing the seal.

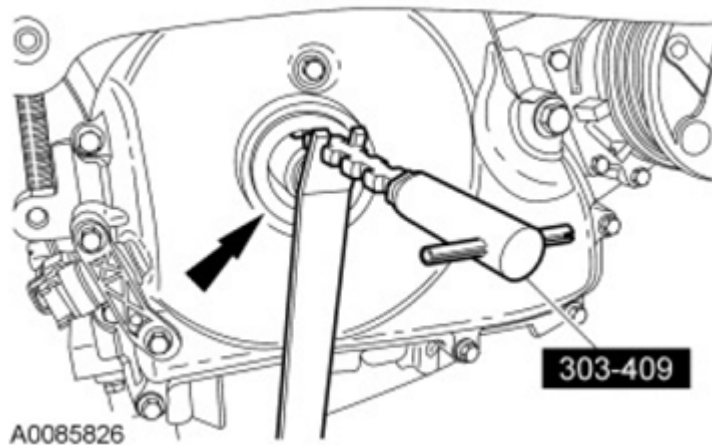


Fig. 46: Removing Crankshaft Front Oil Seal Using Oil Seal Remover
Courtesy of FORD MOTOR CO.

2. Using the Oil Seal Remover, remove the crankshaft front oil seal.

Installation

NOTE: Remove the through-bolt from the Camshaft Front Oil Seal Installer.

NOTE: Lubricate the oil seal with clean engine oil.

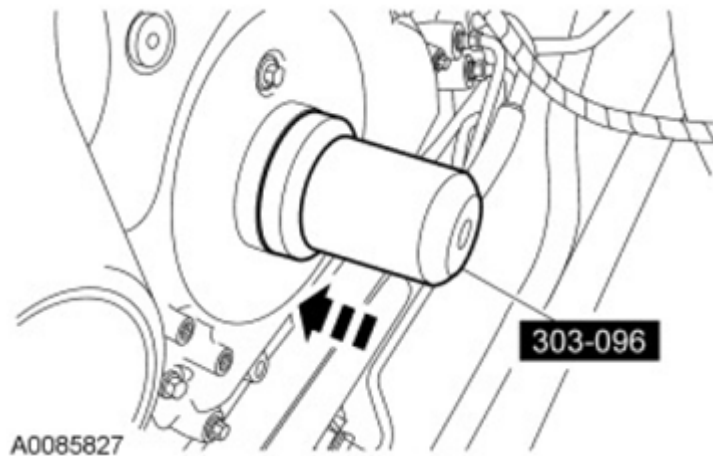


Fig. 47: Installing Crankshaft Front Oil Seal Using Camshaft Front Oil Seal Installer
Courtesy of FORD MOTOR CO.

1. Using the Camshaft Front Oil Seal Installer, install the crankshaft front oil seal.
2. Install the crankshaft pulley. For additional information, refer to **LOWER END COMPONENTS - EXPLODED VIEW, CRANKSHAFT PULLEY AND CRANKSHAFT FRONT SEAL** and **CRANKSHAFT PULLEY** in this service information.

LOWER END COMPONENTS - EXPLODED VIEW, FLEXPLATE, FLYWHEEL AND CRANKSHAFT REAR SEAL

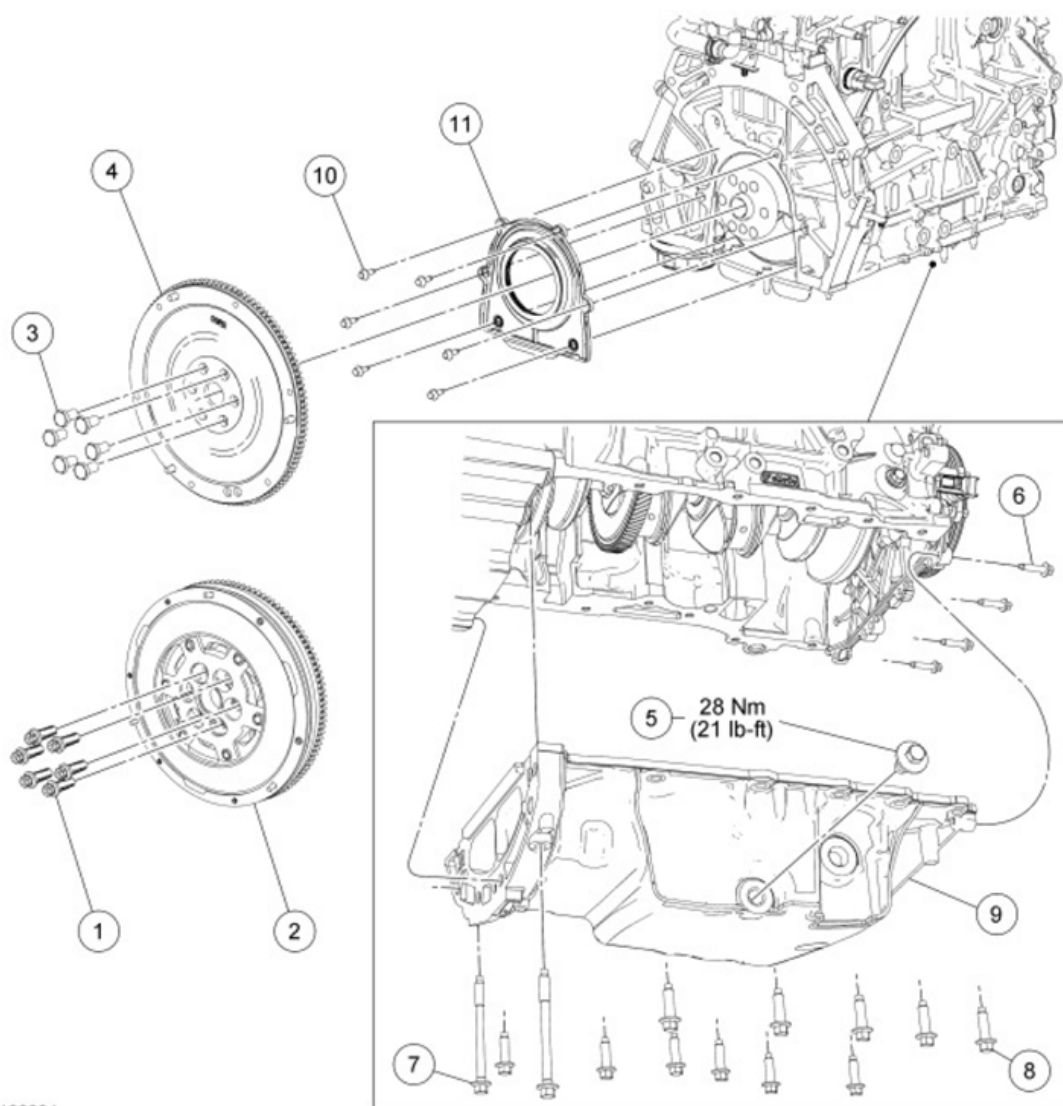


Fig. 48: Exploded View Of Lower End Components With Torque Specifications
Courtesy of FORD MOTOR CO.

PARTS DESCRIPTION CHART

Item	Part Number	Description
1	6379	Flywheel bolt (6 required)
2	6K390	Flywheel
3	6379	Flexplate bolt (6 required)
4	6K375	Flexplate
5	6730	Oil pan drain plug
6	W500215	Engine front cover bolt (4 required)
7	W706284	Oil pan bolt (2 required)
8	W500224	Oil pan bolt (11 required)
9	6675	Oil pan

10	W500212	Crankshaft rear oil seal with retainer plate bolt (6 required)
11	6K318	Crankshaft rear oil seal with retainer plate

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

FLEXPLATE

Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** article.
2. Remove the automatic transaxle. For additional information, refer to **AUTOMATIC TRANSAXLE/TRANSMISSION - 6F35** article.
3. Remove the 6 bolts and the flexplate.

Installation

NOTE: Special bolts are used for installation. Do not use standard bolts.

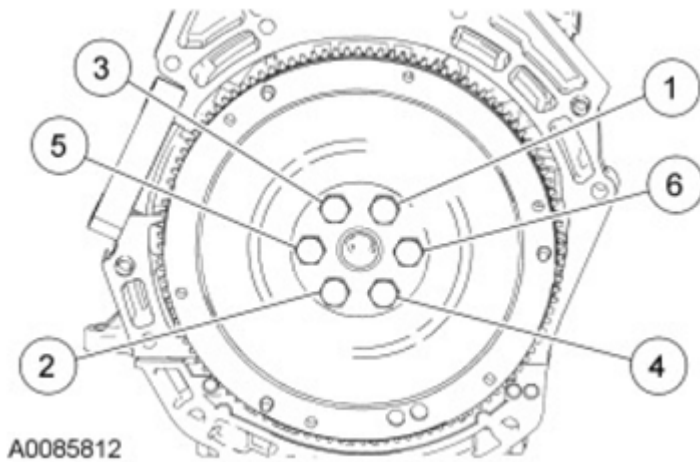


Fig. 49: Tightening Sequence Of Flexplate Bolts
Courtesy of FORD MOTOR CO.

1. Install the flexplate and tighten the bolts in the sequence shown in illustration in 3 stages.
 - Stage 1: Tighten to 50 Nm (37 lb-ft).
 - Stage 2: Tighten to 80 Nm (59 lb-ft).
 - Stage 3: Tighten to 112 Nm (83 lb-ft).
2. Install the automatic transaxle. For additional information, refer to **AUTOMATIC TRANSAXLE/TRANSMISSION - 6F35** article.

FLYWHEEL

Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** article.
2. Remove the manual transaxle and clutch. For additional information, refer to **CLUTCH** article and **MANUAL TRANSAXLE/TRANSMISSION** article.
3. Remove the 6 bolts and the flywheel.

Installation

NOTE: Special bolts are used for installation. Do not use standard bolts.

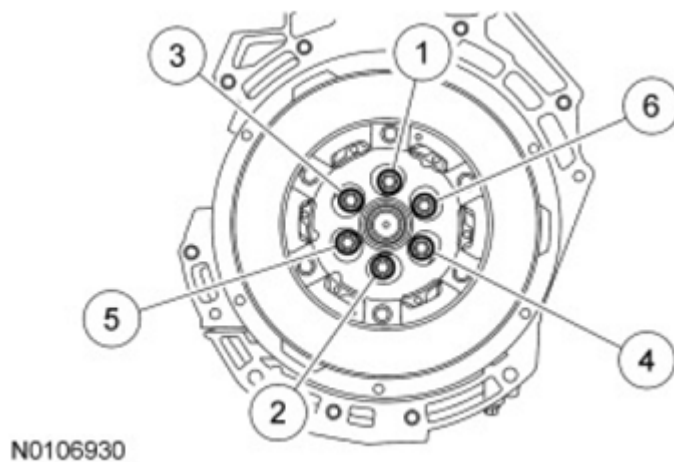
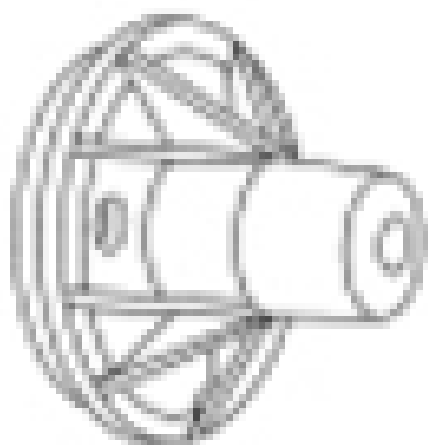


Fig. 50: Tightening Sequence Of Flywheel Bolts
Courtesy of FORD MOTOR CO.

1. Install the flywheel and tighten the bolts in the sequence shown in illustration in 3 stages.
 - Stage 1: Tighten to 50 Nm (37 lb-ft).
 - Stage 2: Tighten to 80 Nm (59 lb-ft).
 - Stage 3: Tighten to 112 Nm (83 lb-ft).
2. Install the clutch and manual transaxle. For additional information, refer to **CLUTCH** article and **MANUAL TRANSAXLE/TRANSMISSION** article.

CRANKSHAFT REAR SEAL**Special Tool(s)****SPECIAL TOOLS DESCRIPTION**

	Installer, Crankshaft Rear Main Oil Seal 303-328 (T88P-6701-B1)
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ST1506-A

Material**MATERIAL SPECIFICATIONS**

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 flexplate or flywheel. For additional information, refer to **FLEXPLATE** or **FLYWHEEL** in this service information.
3. Drain the engine oil.
 - Install the drain plug.
 - Tighten to 28 Nm (21 lb-ft).

NOTE: If the oil pan is not removed, damage to the rear oil seal retainer joint can occur.

4. Remove the 17 bolts and the oil pan.
5. Remove the 6 bolts and the crankshaft rear oil seal with retainer plate.

Installation

1. Using the Crankshaft Rear Main Oil Seal Installer, position the crankshaft rear oil seal with retainer plate onto the crankshaft.

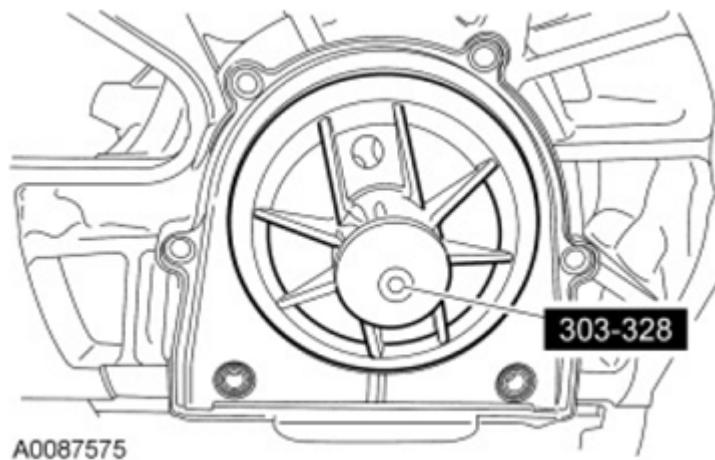


Fig. 51: Installing Crankshaft Rear Main Oil Seal
Courtesy of FORD MOTOR CO.

2. Install the crankshaft rear oil seal with retainer plate and bolts.
 - To install, tighten in the sequence shown in illustration to 10 Nm (89 lb-in).

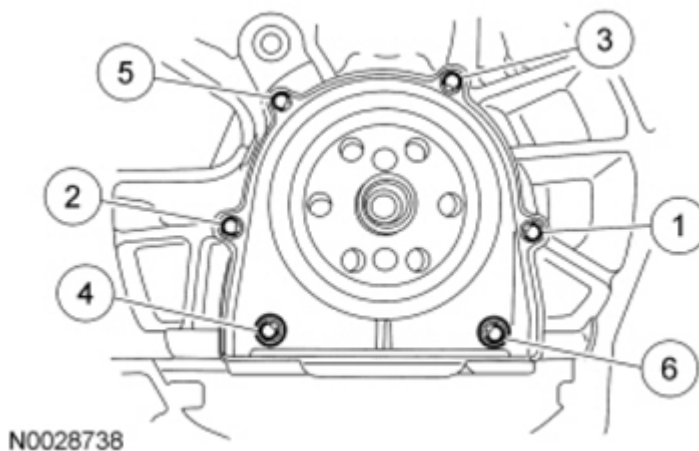


Fig. 52: Tightening Sequence Of Crankshaft Rear Oil Seal Bolts
Courtesy of FORD MOTOR CO.

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

3. Clean and inspect all the oil pan and cylinder block mating surfaces.

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



Fig. 53: Locating Oil Pan Bolts
Courtesy of FORD MOTOR CO.

4. Apply a 2.5 mm (0.09 in) bead of silicone gasket and sealant to the oil pan. Install the oil pan. Install the 2 oil pan bolts finger-tight.
5. Install the 4 bolts.
 - To install, tighten to 10 Nm (89 lb-in).

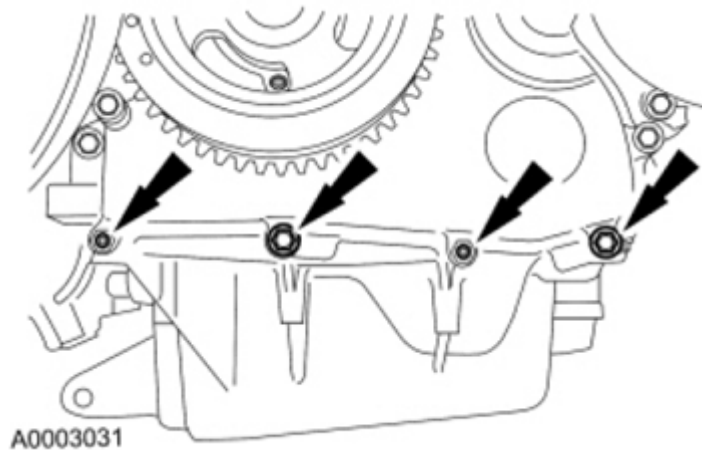


Fig. 54: Locating Oil Pan Bolts
Courtesy of FORD MOTOR CO.

6. Install the remaining oil pan bolts and tighten the oil pan bolts in the sequence shown in illustration to 25 Nm (18 lb-ft).

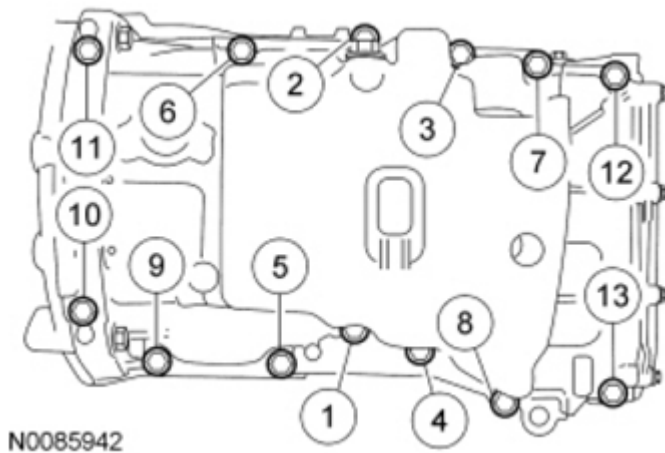


Fig. 55: Tightening Sequence Of Oil Pan Bolts
Courtesy of FORD MOTOR CO.

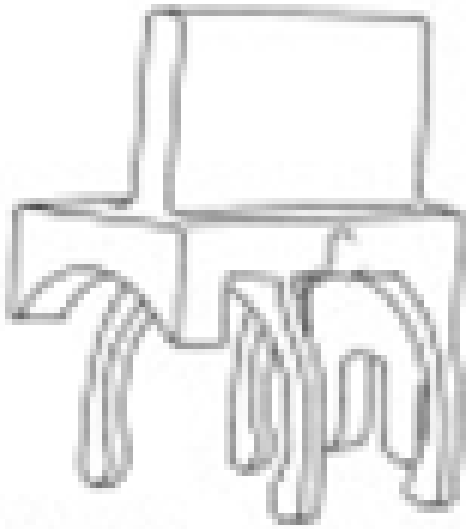
7. Install the flexplate or flywheel. For additional information, refer to **FLEXPLATE** or **FLYWHEEL** in this service information.
8. Fill the engine with clean engine oil.

ENGINE FRONT COVER

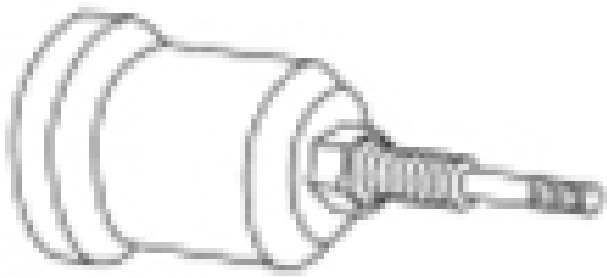
Special Tool(s)

SPECIAL TOOLS DESCRIPTION

Aligner, Crankshaft Sensor

**ST3055A**

303-1417

**ST1917-A**

Installer, Camshaft Front Oil Seal
303-096 (T74P-6150-A)

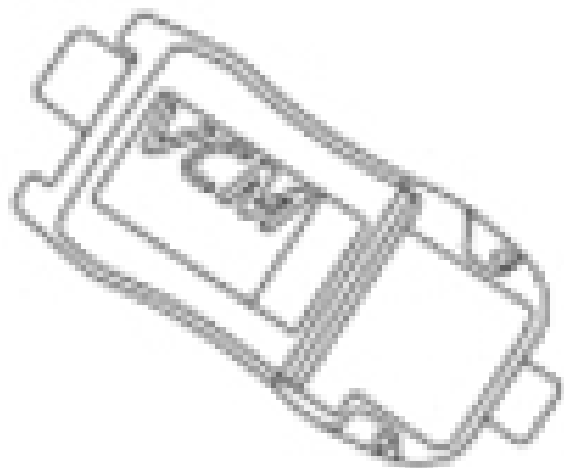
Remover, Oil Seal
303-409 (T92C-6700-CH)

2011 Mercury Mariner

2011 ENGINE Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)



ST1385-A



ST2834-A

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

General Equipment

GENERAL EQUIPMENT REFERENCE CHART

6 mm x 18 mm bolt

Material

MATERIAL SPECIFICATIONS

Item	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super	WSS-M2C945-A

Premium Motor Oil (Canada) XO-5W20-QSP (US);
CXO-5W20-LSP12 (Canada)

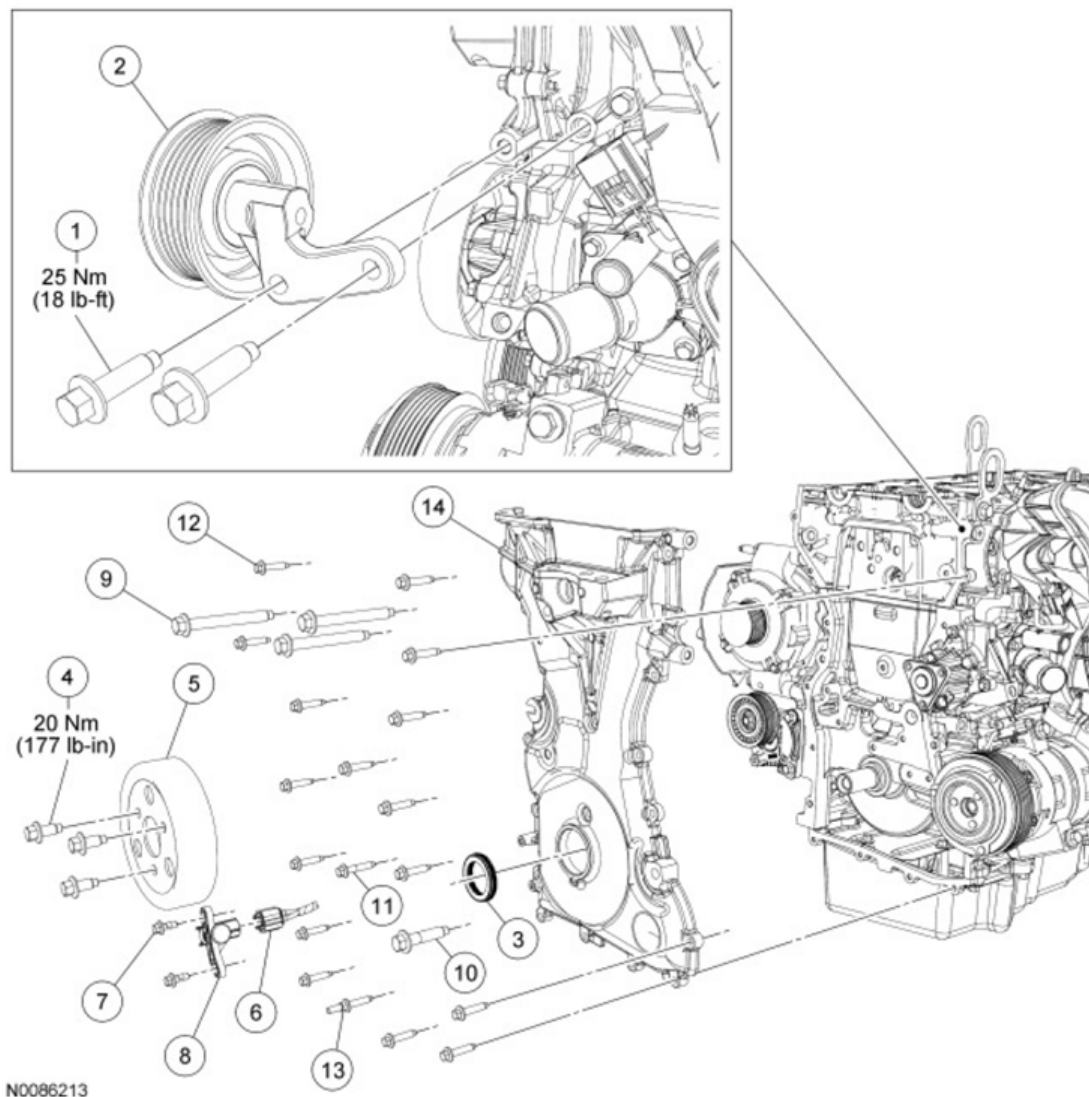


Fig. 56: Identifying Engine Front Cover Components With Torque Specifications
Courtesy of FORD MOTOR CO.

ENGINE FRONT COVER PARTS DESCRIPTION CHART

Item	Part Number	Description
1	W500224	Accessory drive belt idler pulley bolt (2 required)
2	19A216	Accessory drive belt idler pulley and bracket
3	6700	Crankshaft front seal
4	W500221	Coolant pump pulley bolt (3 required)
5	8509	Coolant pump pulley
6	14A464	Crankshaft Position (CKP) sensor electrical connector (part of

2011 Mercury Mariner

2011 ENGINE Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)

		12C508)
7	W701219	CKP sensor bolt (2 required)
8	6C315	CKP sensor
9	W500328	Engine front cover bolt (3 required)
10	W500320	Engine front cover bolt
11	W500300	Engine front cover bolt
12	W500215	Engine front cover bolt (16 required)
13	-	Engine front cover stud bolt
14	6019	Engine front cover

Removal

NOTE: Do not loosen or remove the crankshaft pulley bolt without first installing the special tools as instructed in this procedure. The crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. The crankshaft, the crankshaft sprocket and the pulley are fitted together by friction, using diamond washers between the flange faces on each part. For that reason, the crankshaft sprocket is also unfastened if the pulley bolt is loosened. Before any repair requiring loosening or removal of the crankshaft pulley bolt, the crankshaft and camshafts must be locked in place by the special service tools, otherwise severe engine damage can occur.

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 accessory drive belt and the smooth idler pulley. For additional information, refer to **ACCESSORY DRIVE - 2.5L** article.
3. Remove the crankshaft pulley. For additional information, refer to **CRANKSHAFT PULLEY** in this service information.
4. Remove the engine mount. For additional information, refer to **ENGINE MOUNT** in this service information.

NOTE: Use care not to damage the engine front cover or the crankshaft when removing the seal.

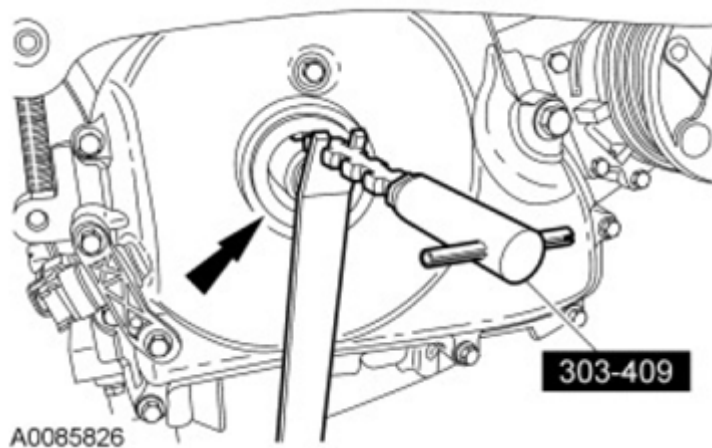
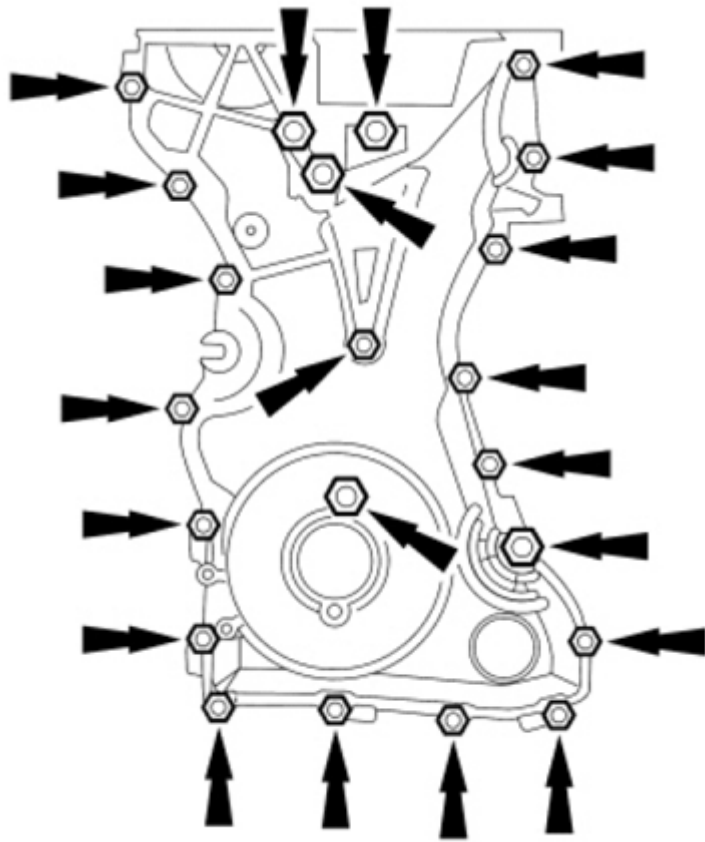


Fig. 57: Removing Crankshaft Front Oil Seal Using Oil Seal Remover
Courtesy of FORD MOTOR CO.

5. Using the Oil Seal Remover, remove the crankshaft front oil seal.
6. Remove the 3 bolts and the coolant pump pulley.
7. Remove the 2 bolts and the accessory drive belt idler pulley and bracket.
8. Disconnect the Crankshaft Position (CKP) sensor electrical connector.
9. Remove and the 2 bolts and the **CKP** sensor.
10. Remove the bolts, stud bolt and the engine front cover.



A0087412

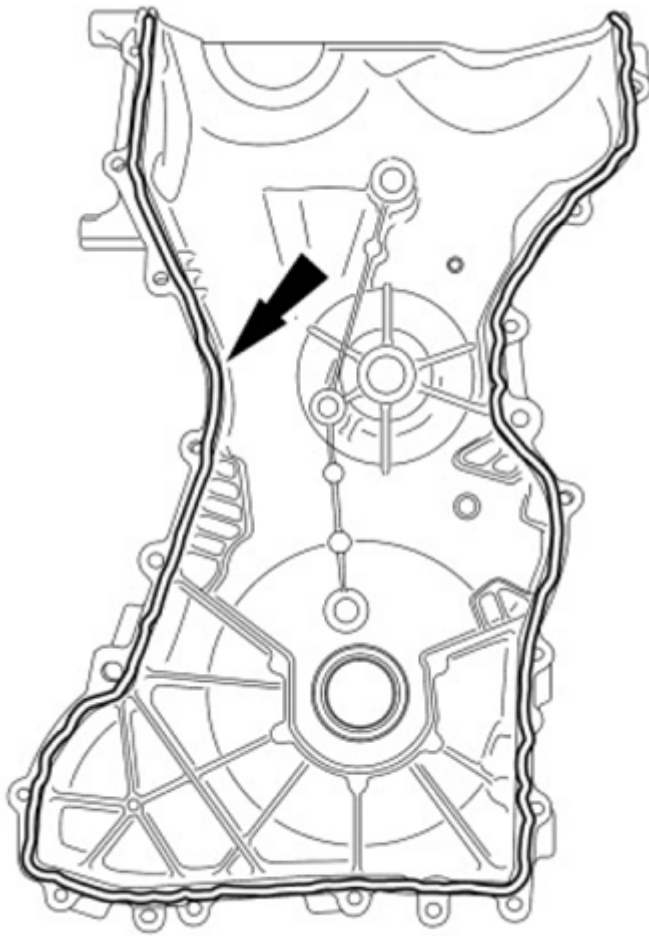
Fig. 58: Locating Engine Front Cover Bolts
Courtesy of FORD MOTOR CO.

Installation

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

1. Clean and inspect the mounting surfaces of the engine and the front cover.

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



A0032803

Fig. 59: Locating Silicone And Sealant Applying Areas Of Cylinder Head And Oil Pan Joint
Courtesy of FORD MOTOR CO.

2. Apply a 2.5 mm (0.09 in) bead of silicone gasket and sealant to the cylinder head and oil pan joint areas. Apply a 2.5 mm (0.09 in) bead of silicone gasket and sealant to the front cover.
3. Install the engine front cover. Tighten the bolts in the sequence shown in illustration, to the following specifications:
 - Tighten the 8-mm bolts and stud bolt to 10 Nm (89 lb-in).
 - Tighten the 13-mm bolts to 48 Nm (35 lb-ft).

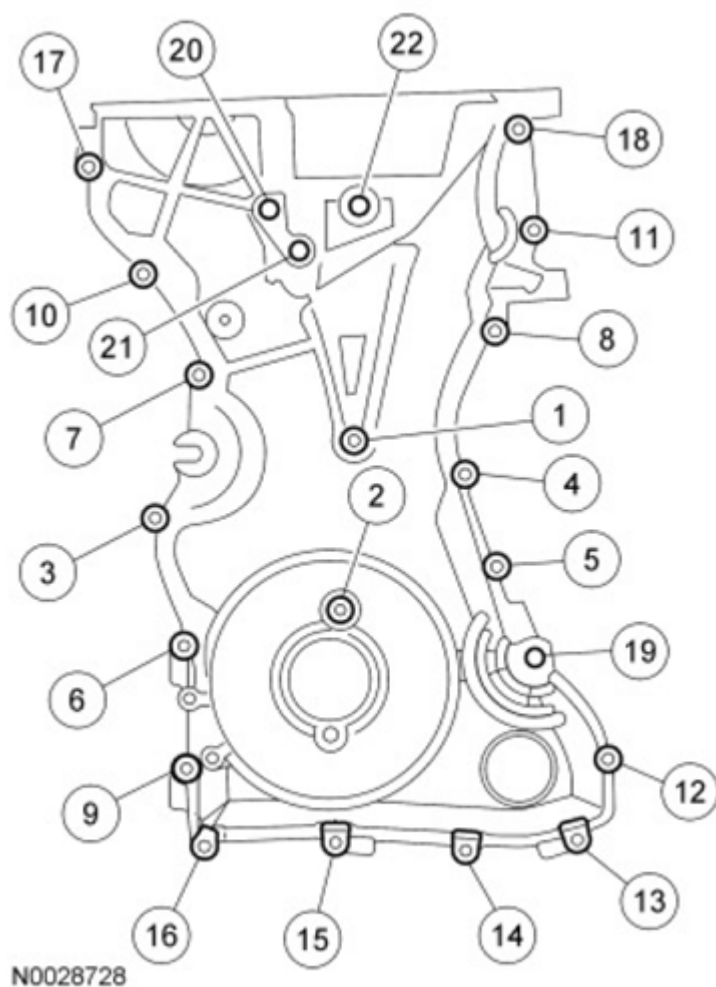


Fig. 60: Tightening Sequence Of Engine Front Cover Bolts
Courtesy of FORD MOTOR CO.

4. Install the accessory drive belt idler pulley and bracket and the 2 bolts.
 - Tighten to 25 Nm (18 lb-ft).
5. Install the coolant pump pulley and bolts.
 - Tighten to 20 Nm (177 lb-in).

NOTE: Remove the through bolt from the Camshaft Front Oil Seal Installer.

NOTE: Lubricate the oil seal with clean engine oil.

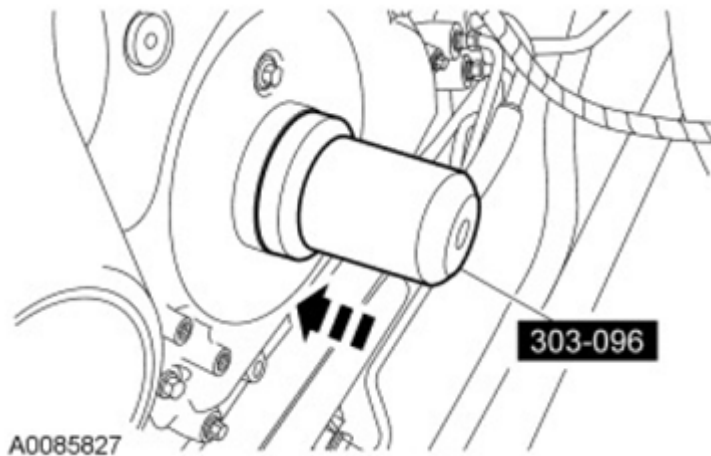


Fig. 61: Installing Crankshaft Front Oil Seal Using Camshaft Front Oil Seal Installer
Courtesy of FORD MOTOR CO.

6. Using the Camshaft Front Oil Seal Installer, install the crankshaft front oil seal.
7. Install the engine mount. For additional information, refer to **ENGINE MOUNT** in this service information.
8. Install the crankshaft pulley. For additional information, refer to **CRANKSHAFT PULLEY** in this service information.

NOTE: Only hand-tighten the bolt or damage to the front cover can occur.

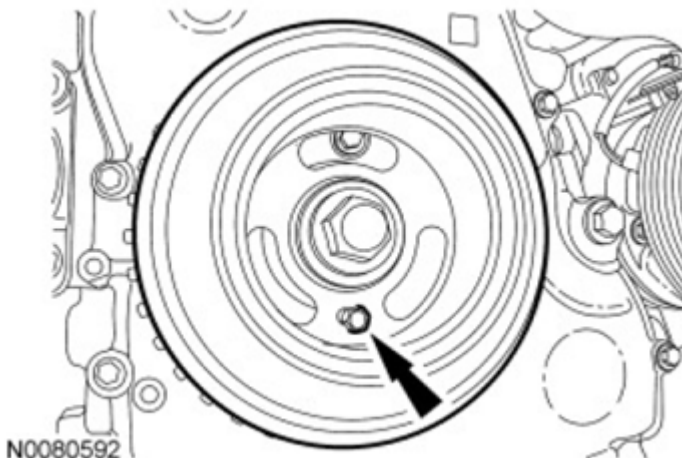


Fig. 62: View Of Crankshaft Pulley Alignment Bolt
Courtesy of FORD MOTOR CO.

9. Install a 6 mm x 18 mm bolt through the crankshaft pulley and thread it into the front cover.
10. Install the **CKP** sensor and the 2 bolts.
 - Do not tighten the bolts at this time.

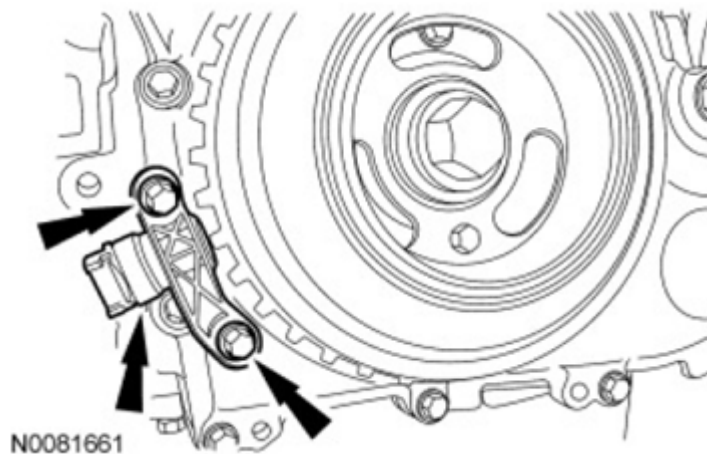


Fig. 63: Locating CKP Sensor Bolts
Courtesy of FORD MOTOR CO.

11. Using the Crankshaft Sensor Aligner, adjust the **CKP** sensor.
 - Tighten the 2 **CKP** bolts to 7 Nm (62 lb-in).

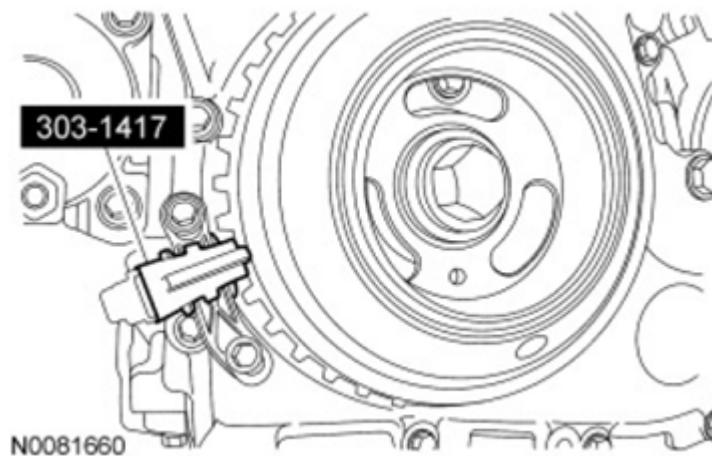


Fig. 64: Adjusting CKP Sensor Using Crankshaft Sensor Aligner
Courtesy of FORD MOTOR CO.

12. Connect the **CKP** sensor electrical connector.
13. Remove the 6 mm x 18 mm bolt.

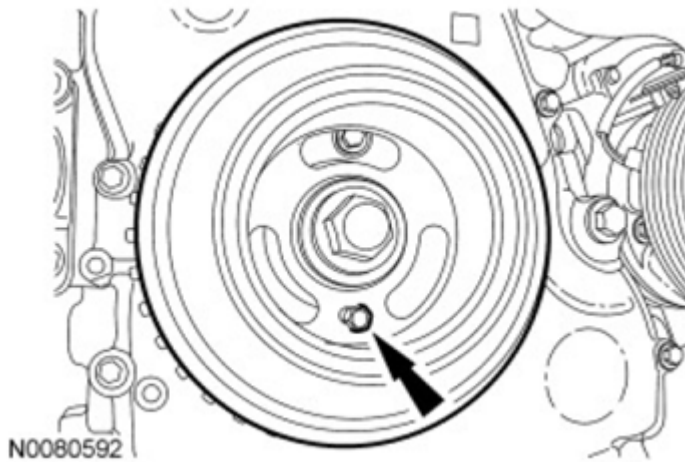


Fig. 65: View Of Crankshaft Pulley Alignment Bolt
Courtesy of FORD MOTOR CO.

14. Install the accessory drive belt and smooth idler pulley. For additional information, refer to **ACCESSORY DRIVE - 2.5L** article.
15. Using the scan tool, perform the Misfire Monitor Neutral Profile Correction procedure, following the on-screen instructions.

TIMING DRIVE COMPONENTS

Removal

NOTE: Do not loosen or remove the crankshaft pulley bolt without first installing the special tools as instructed in this procedure. The crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. The crankshaft, the crankshaft sprocket and the pulley are fitted together by friction, using diamond washers between the flange faces on each part. For that reason, the crankshaft sprocket is also unfastened if the pulley bolt is loosened. Before any repair requiring loosening or removal of the crankshaft pulley bolt, the crankshaft and camshafts must be locked in place by the special service tools, otherwise severe engine damage can occur.

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 engine front cover. For additional information, refer to **ENGINE FRONT COVER** in this service information.
3. Compress the timing chain tensioner in the following sequence.

1. Using a small pick, release and hold the ratchet mechanism.
2. While holding the ratchet mechanism in the released position, compress the tensioner by pushing the timing chain arm toward the tensioner.
3. Insert the paper clip into the hole to retain the tensioner.

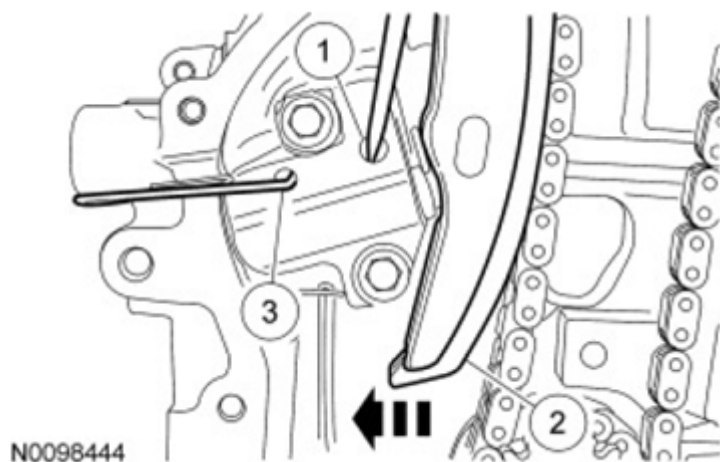


Fig. 66: Pushing Timing Chain Arm
Courtesy of FORD MOTOR CO.

4. Remove the 2 bolts and timing chain tensioner.

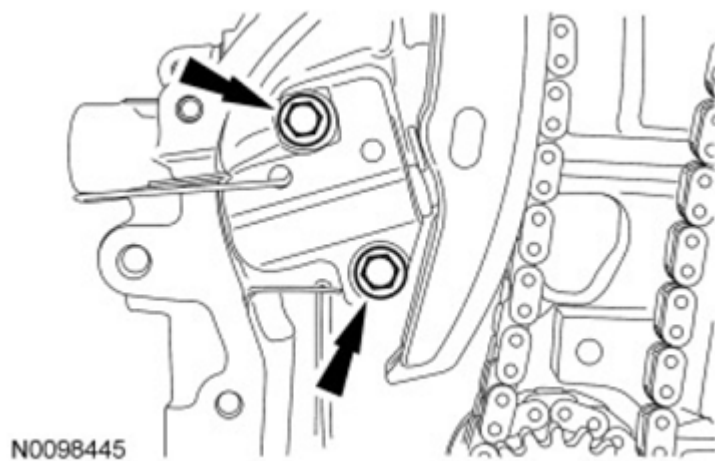


Fig. 67: Locating Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

5. Remove the timing chain tensioner arm.

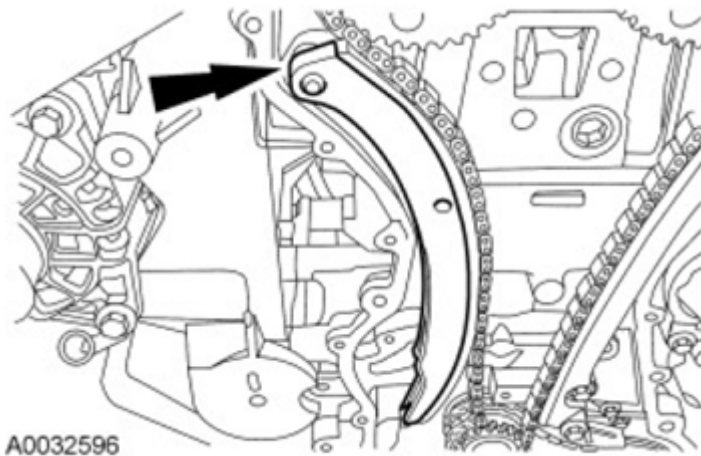


Fig. 68: Locating RH Timing Chain Guide
Courtesy of FORD MOTOR CO.

6. Remove the timing chain.

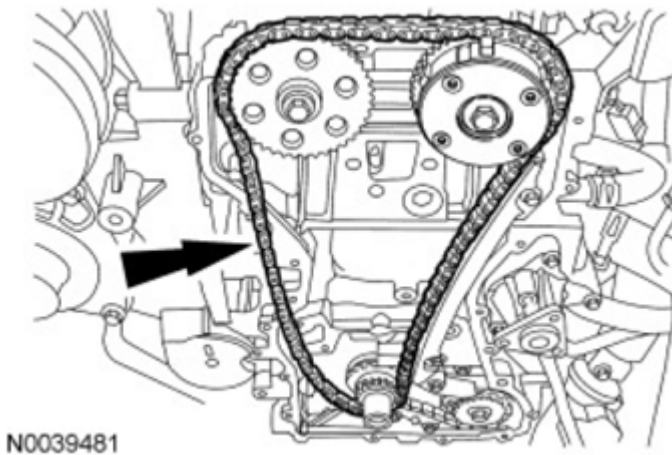


Fig. 69: View Of Timing Chain
Courtesy of FORD MOTOR CO.

7. Remove the 2 bolts and the timing chain guide.

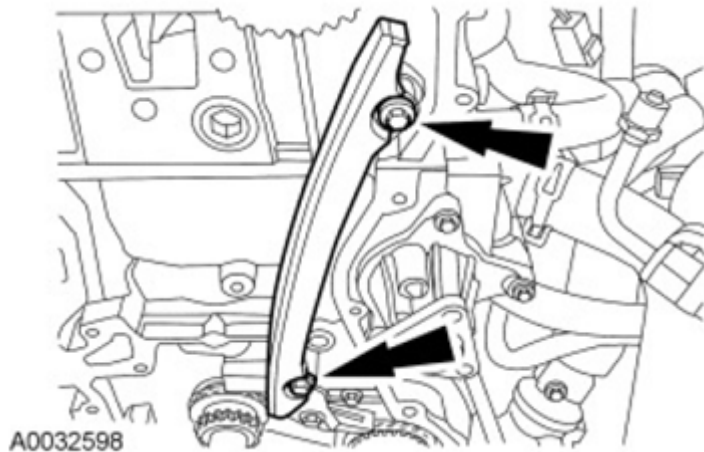


Fig. 70: Locating LH Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

NOTE: The Camshaft Alignment Plate is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

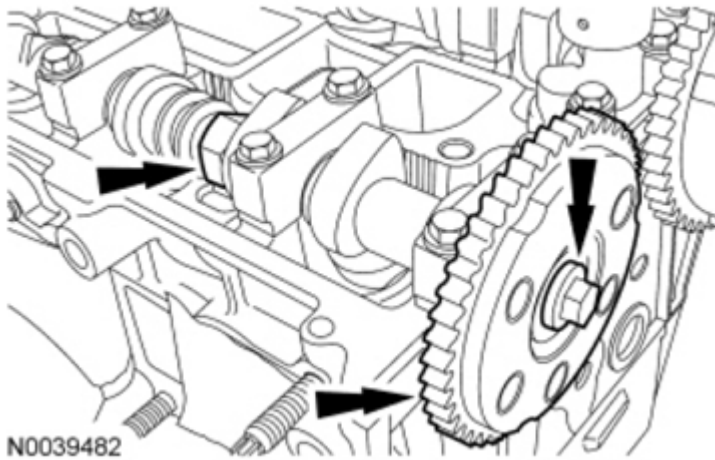


Fig. 71: View Of Exhaust Camshaft Sprocket With Bolt
Courtesy of FORD MOTOR CO.

8. Using the flats on the camshaft to prevent camshaft rotation, remove the bolt and the exhaust camshaft sprocket.

NOTE: The Camshaft Alignment Plate is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

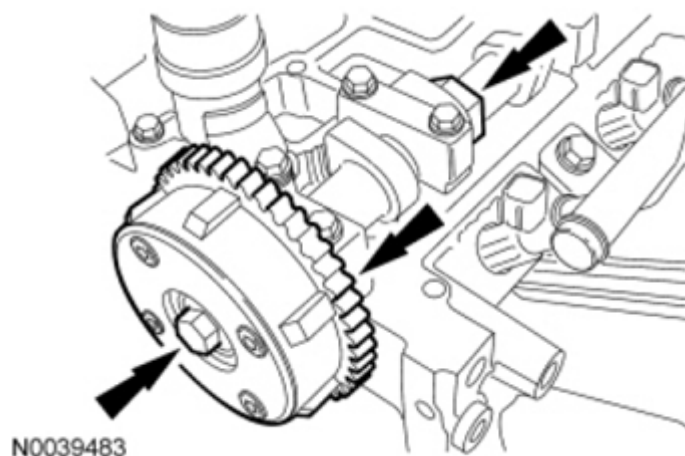


Fig. 72: View Of Camshaft Phaser, Sprocket With Bolts
Courtesy of FORD MOTOR CO.

9. Using the flats on the camshaft to prevent camshaft rotation, remove the bolt and the camshaft phaser and sprocket.

Installation

1. Install the camshaft sprockets and the bolts. Do not tighten the bolts at this time.

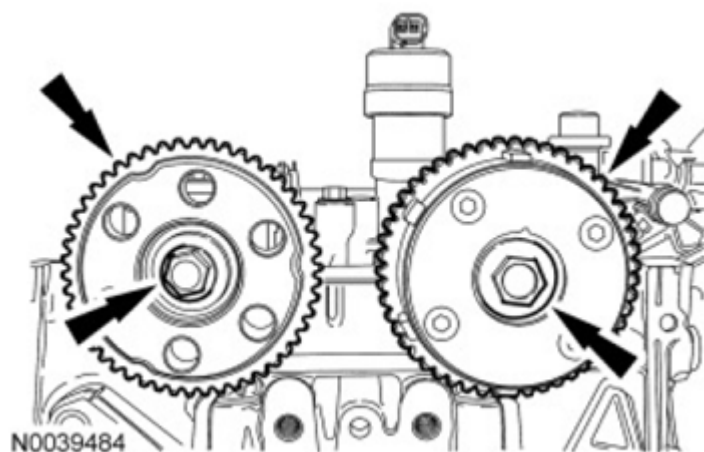


Fig. 73: View Of Camshaft Sprockets Bolts
Courtesy of FORD MOTOR CO.

2. Install the timing chain guide and the 2 bolts.
 - To install, tighten to 10 Nm (89 lb-in).

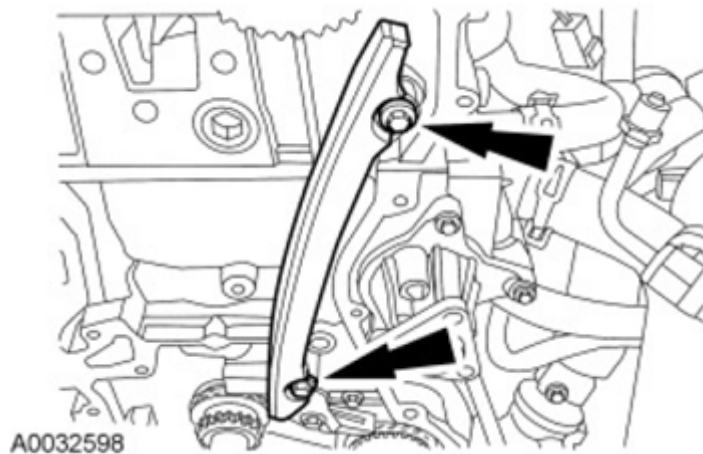


Fig. 74: Locating LH Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

3. Install the timing chain.

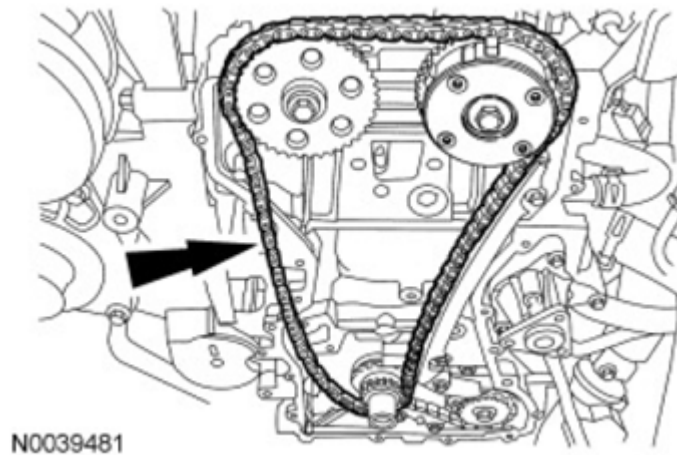


Fig. 75: View Of Timing Chain
Courtesy of FORD MOTOR CO.

4. Install the timing chain tensioner arm.

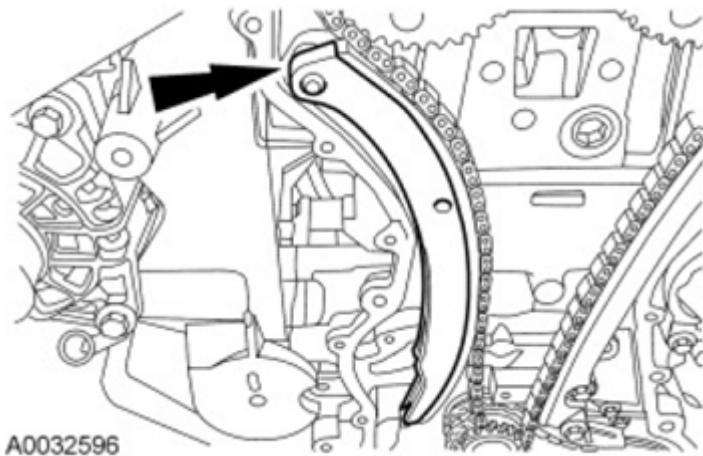


Fig. 76: Locating RH Timing Chain Guide
Courtesy of FORD MOTOR CO.

NOTE: If the timing chain plunger and ratchet assembly are not pinned in the compressed position, follow the next 4 steps.

NOTE: Do not compress the ratchet assembly. This will damage the ratchet assembly.

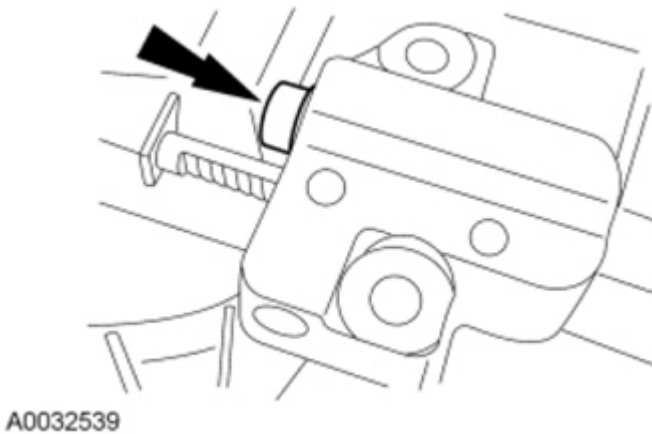


Fig. 77: Compressing Timing Chain Tensioner Plunger
Courtesy of FORD MOTOR CO.

5. Using the edge of a vise, compress the timing chain tensioner plunger.
6. Using a small pick, push back and hold the ratchet mechanism.

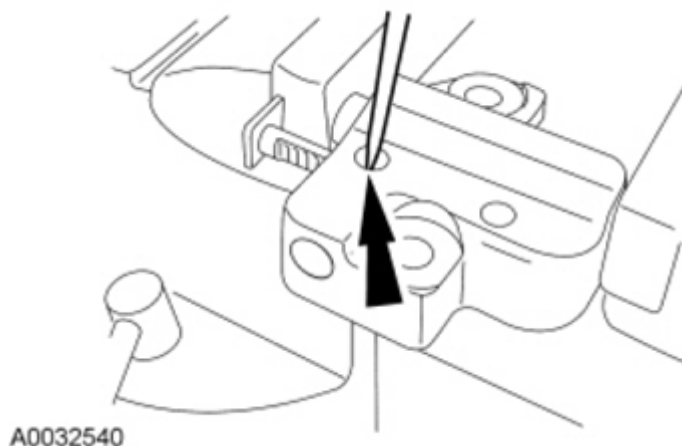


Fig. 78: Pushing Ratchet Mechanism
Courtesy of FORD MOTOR CO.

7. While holding the ratchet mechanism, push the ratchet arm back into the tensioner housing.

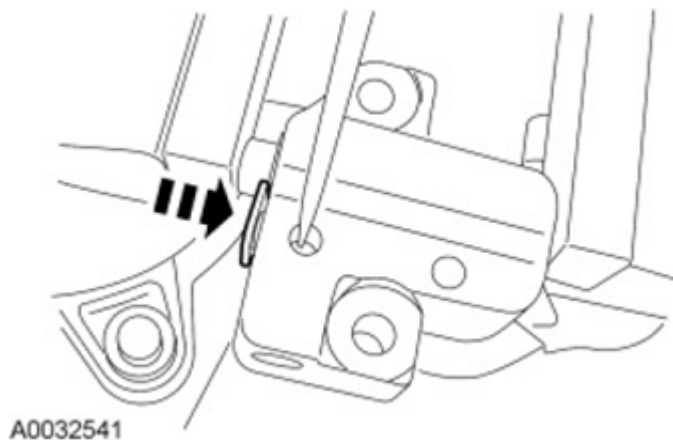


Fig. 79: Pushing Ratchet Arm
Courtesy of FORD MOTOR CO.

8. Install a paper clip into the hole in the tensioner housing to hold the ratchet assembly and the plunger in during installation.

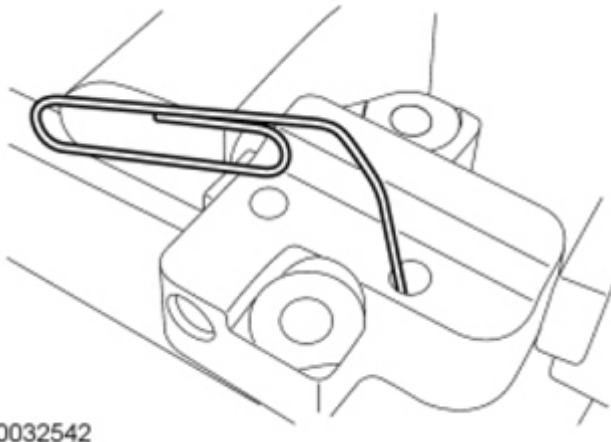


Fig. 80: Holding Ratchet Mechanism
Courtesy of FORD MOTOR CO.

9. Install the timing chain tensioner and the 2 bolts. Remove the paper clip to release the piston.
 - Tighten to 10 Nm (89 lb-in).

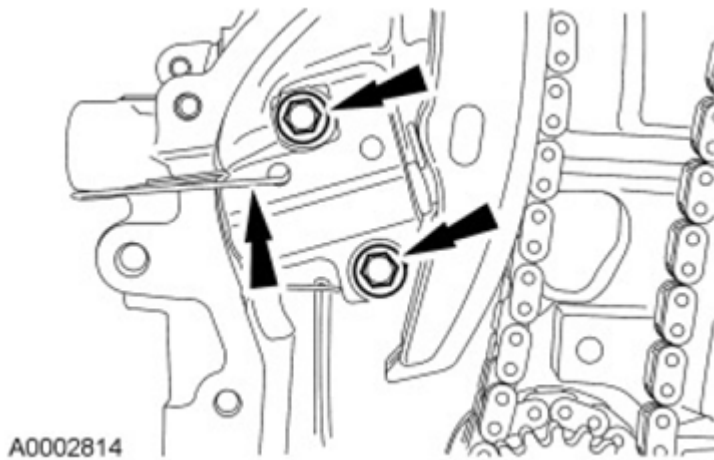


Fig. 81: Locating Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

NOTE: The Camshaft Alignment Plate is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

10. Using the flats on the camshafts to prevent camshaft rotation, tighten the bolts.
 - Tighten to 72 Nm (53 lb-ft).

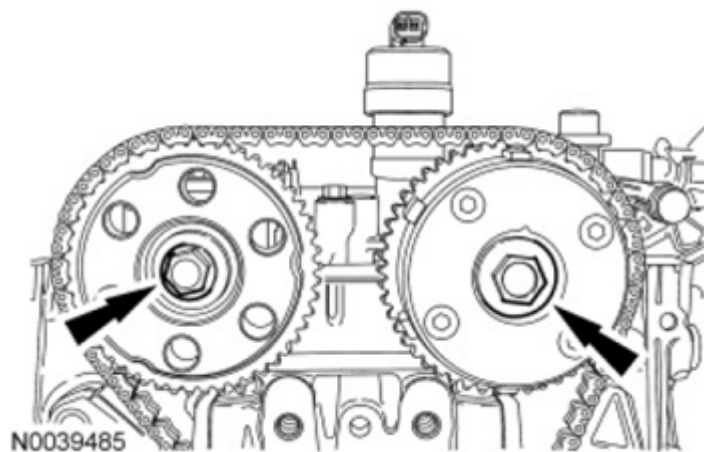


Fig. 82: View Of Camshaft Bolts
Courtesy of FORD MOTOR CO.

11. Install the engine front cover. For additional information, refer to **ENGINE FRONT COVER** in this service information.

VARIABLE CAMSHAFT TIMING (VCT) SYSTEM OIL FILTER

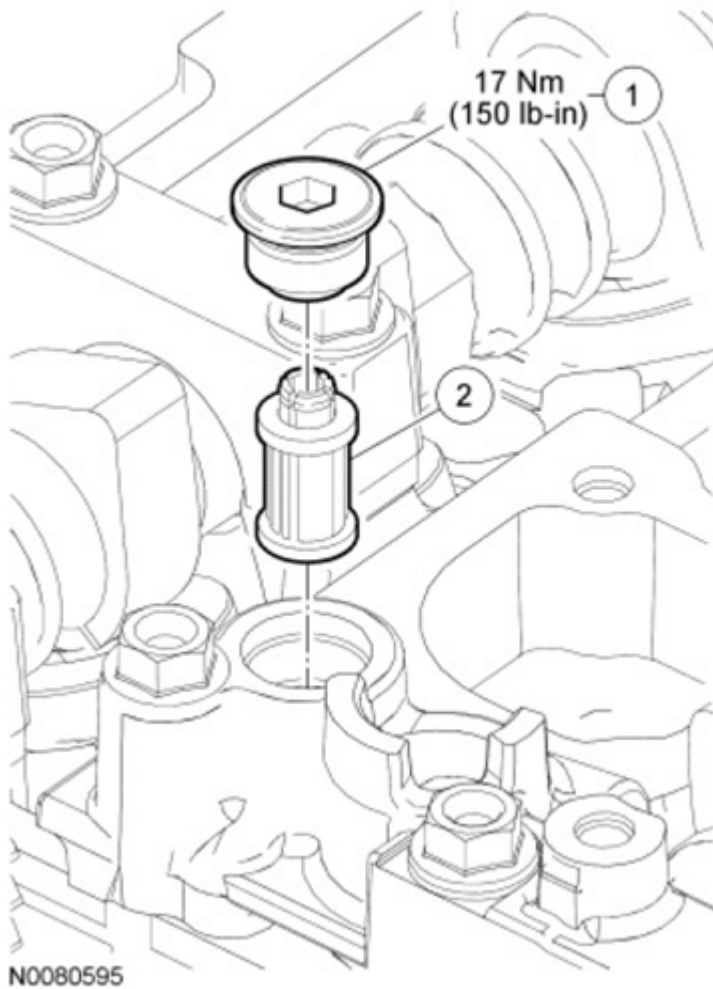


Fig. 83: Identifying Variable Camshaft Timing (VCT) System Oil Filter Components With Torque Specifications
Courtesy of FORD MOTOR CO.

VCT SYSTEM PARTS DESCRIPTION CHART

Item	Part Number	Description
1	W710451	Variable Camshaft Timing (VCT) system oil filter plug
2	6C683	VCT system oil filter

Removal and Installation

1. Remove the Variable Camshaft Timing (VCT) oil control solenoid. For additional information, refer to **ELECTRONIC ENGINE CONTROLS - 2.5L** article.
2. Remove the VCT system oil filter plug and the VCT system oil filter from the intake camshaft thrust cap.
 - To install, tighten to 17 Nm (150 lb-in).
3. To install, reverse the removal procedure.

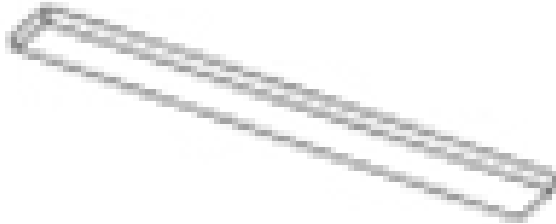
2011 Mercury Mariner

2011 ENGINE Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)

CAMSHAFTS

Special Tool(s)

SPECIAL TOOLS DESCRIPTION

 ST2645-A	Alignment Plate, Camshaft 303-465 (T94P-6256-CH)
 ST2638-A	Timing Peg, Crankshaft TDC 303-507

General Equipment

GENERAL EQUIPMENT REFERENCE CHART

6 mm x 18 mm bolt
M6 x 30 mm bolt

Material**MATERIAL SPECIFICATIONS**

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
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 can cause engine failure.

NOTE: Do not rotate the camshafts unless instructed to in this procedure. Rotating the camshafts or crankshaft with timing components loosened or removed can cause serious damage to the valves and pistons.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** article.
2. Remove the accessory drivebelt. For additional information, refer to **ACCESSORY DRIVE - 2.5L** article.
3. Remove the Variable Camshaft Timing (VCT) oil control solenoid. For additional information, refer to **ELECTRONIC ENGINE CONTROLS - 2.5L** article.
4. Remove the front RH wheel and tire. For additional information, refer to **TIRES & WHEELS** article.
5. Check the valve clearance. For additional information, refer to **VALVE CLEARANCE CHECK** in this service information.

NOTE: Failure to position the No. 1 piston at Top Dead Center (TDC) can result in damage to the engine. Turn the engine in the normal direction of rotation only.

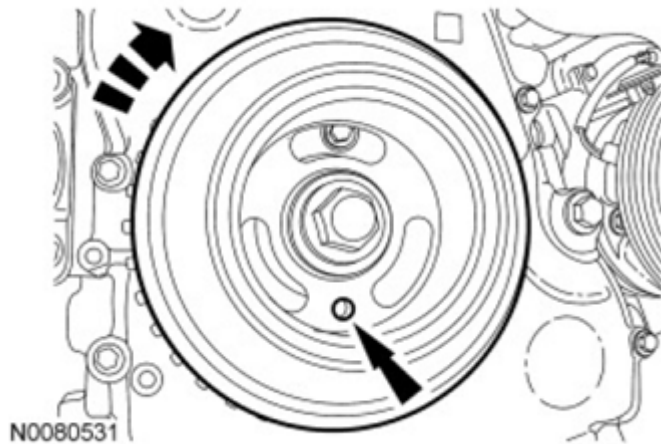


Fig. 84: Turning Crankshaft Pulley
Courtesy of FORD MOTOR CO.

6. Using the crankshaft pulley bolt, turn the crankshaft clockwise to position the No. 1 piston at Top Dead Center (TDC).
 - The hole in the crankshaft pulley should be in the 6 o'clock position.

NOTE: The Camshaft Alignment Plate is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

NOTE: The camshaft timing slots are offset. If the Camshaft Alignment Plate cannot be installed, rotate the crankshaft one complete revolution clockwise to correctly position the camshafts.

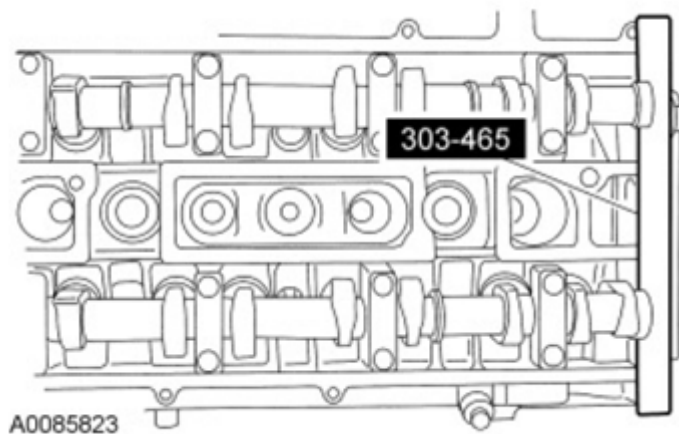


Fig. 85: View Of Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

7. Install the Camshaft Alignment Plate in the slots on the rear of both camshafts.
8. Remove the engine plug bolt.

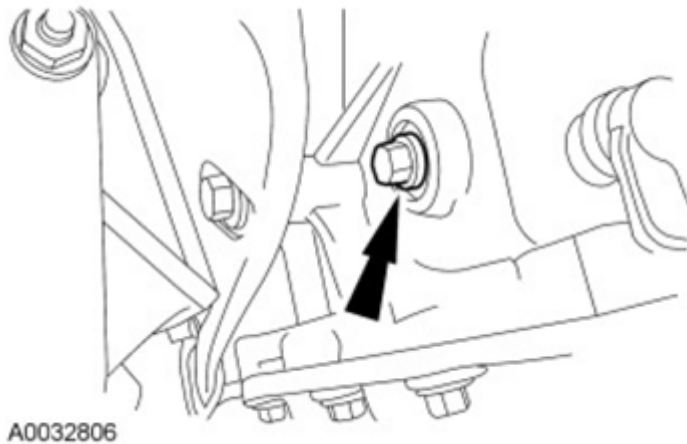


Fig. 86: Remove/Install Engine Plug Bolt
Courtesy of FORD MOTOR CO.

NOTE: The Crankshaft TDC Timing Peg will contact the crankshaft and prevent it from turning past TDC . However, the crankshaft can still be rotated in the counterclockwise direction. The crankshaft must remain at the TDC position during the camshaft removal and installation.

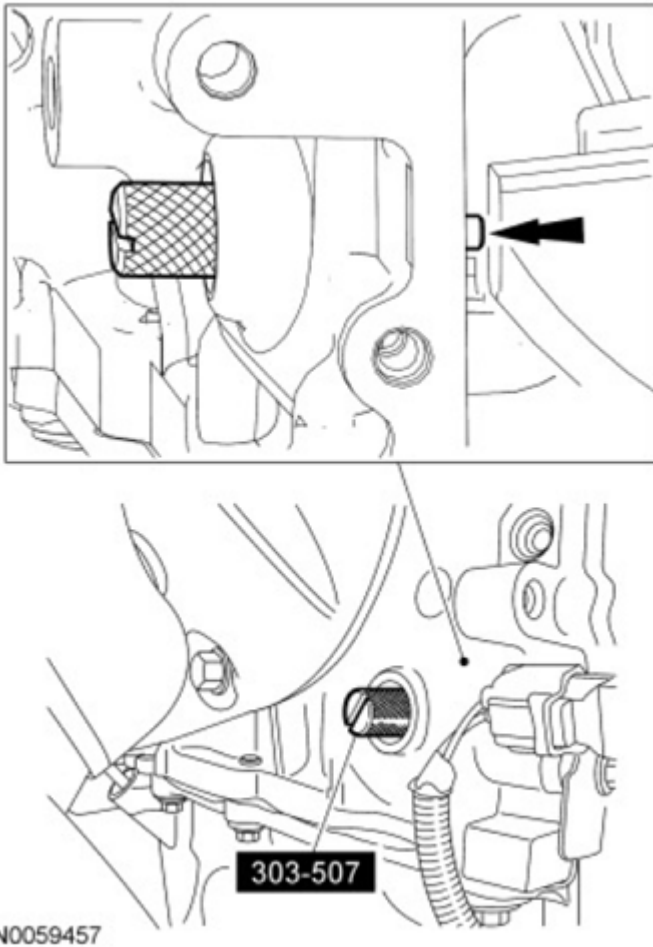


Fig. 87: View Of Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

9. Install the Crankshaft **TDC** Timing Peg.

NOTE: Only hand-tighten the bolt or damage to the front cover can occur.

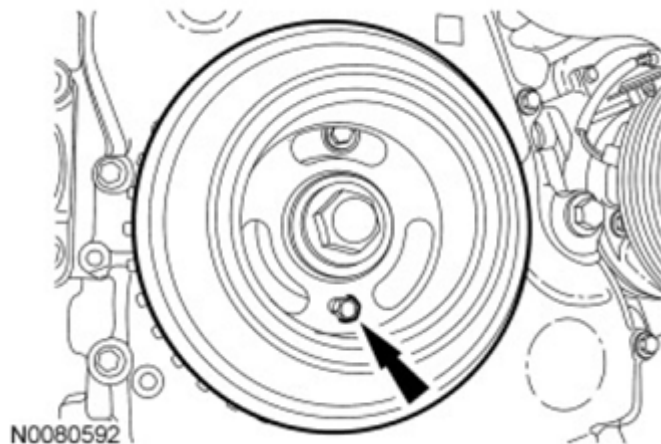


Fig. 88: View Of Crankshaft Pulley Alignment Bolt
Courtesy of FORD MOTOR CO.

10. Install a 6 mm x 18 mm bolt through the crankshaft pulley and thread it into the front cover.
11. Remove the lower front cover timing hole plug from the engine front cover.

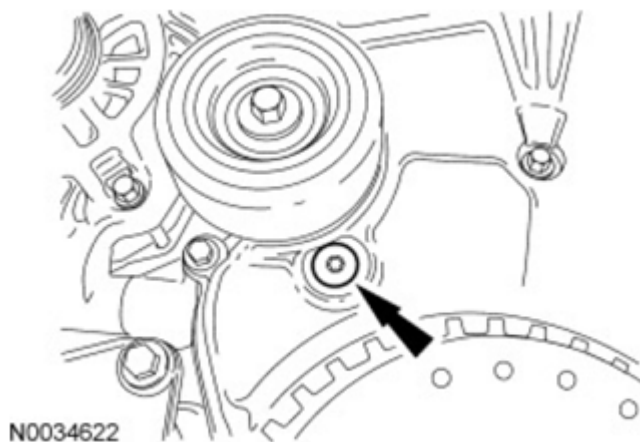


Fig. 89: Locating Lower Front Cover Timing Hole Plug
Courtesy of FORD MOTOR CO.

12. Remove the upper front cover timing hole plug from the engine front cover.

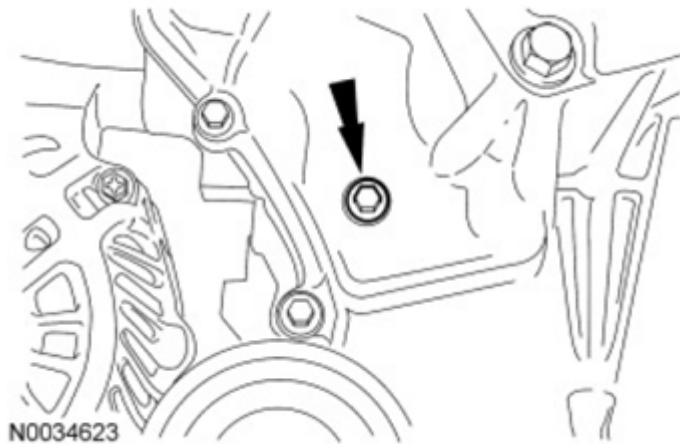


Fig. 90: Locating Upper Front Cover Timing Hole Plug
Courtesy of FORD MOTOR CO.

13. Reposition the Camshaft Alignment Plate to the slot on the rear of the intake camshaft only.

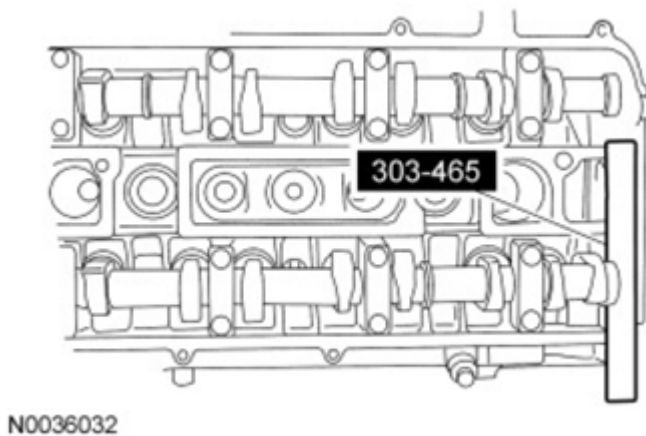


Fig. 91: View Of Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

NOTE: Releasing the ratcheting mechanism in the timing chain tensioner allows the plunger to collapse and create slack in the timing chain. Installing an M6 x 30 mm bolt into the upper front cover timing hole will hold the tensioner arm in a retracted position and allow enough slack in the timing chain for removal of the exhaust camshaft gear.

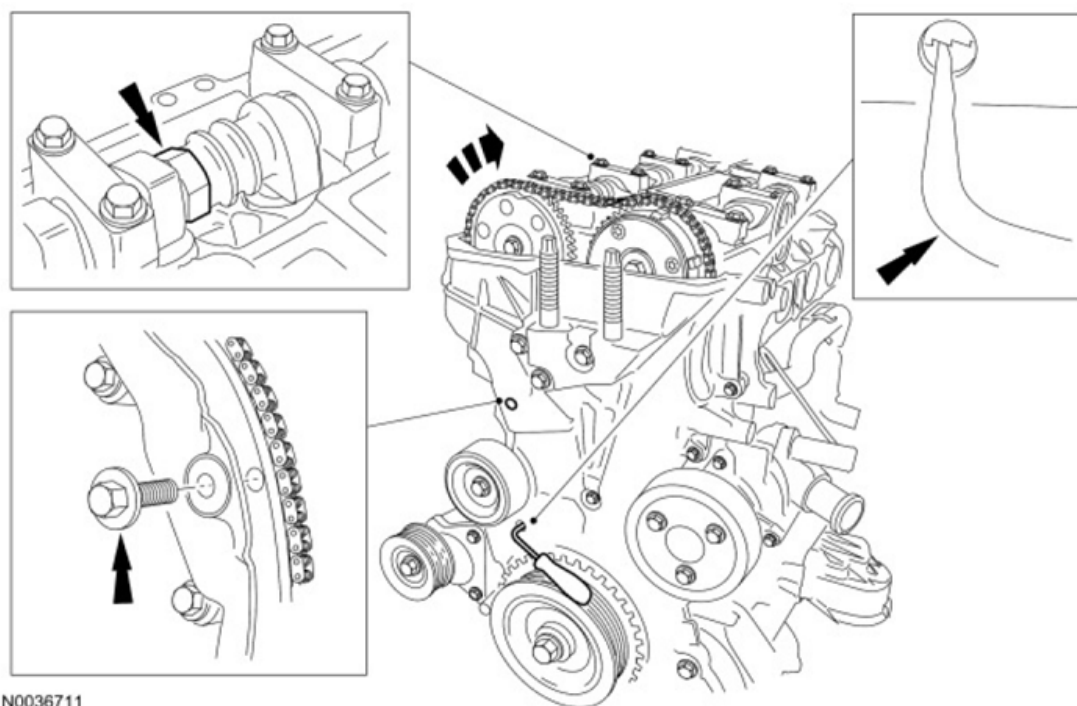
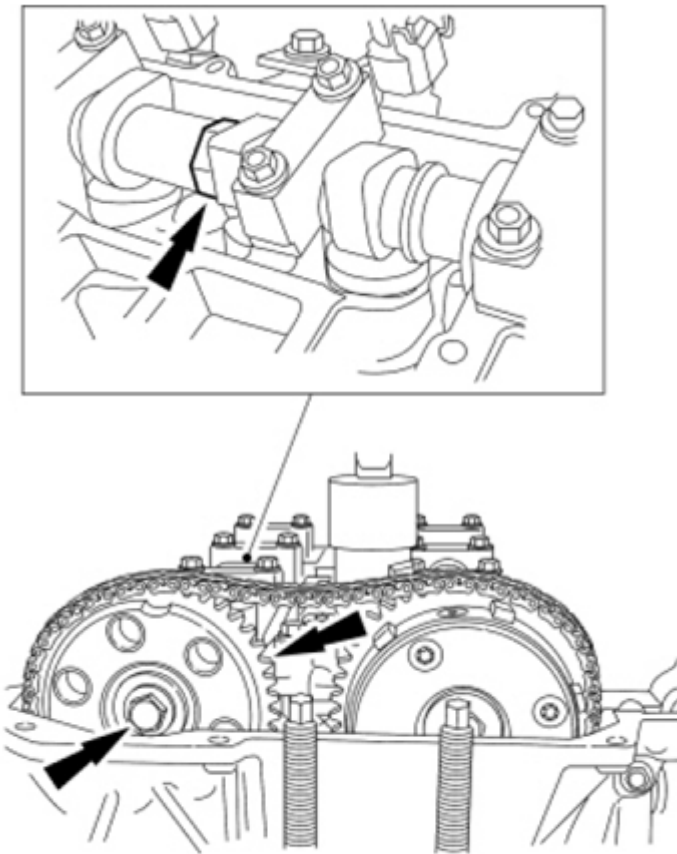


Fig. 92: Releasing Timing Chain Tensioner Ratchet
Courtesy of FORD MOTOR CO.

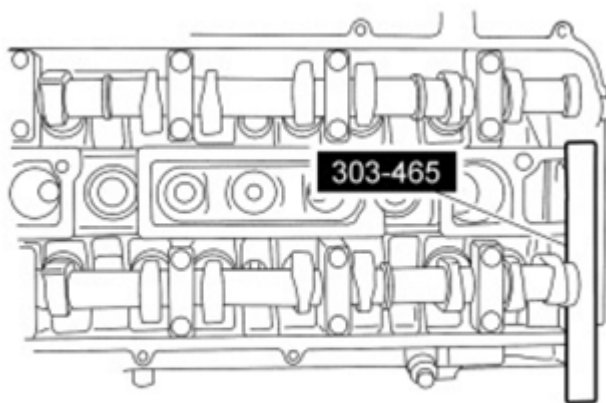
14. Using a small pick tool, unlock the chain tensioner ratchet through the lower front cover timing hole.
 - Using the flats of the camshaft, have an assistant rotate the exhaust camshaft clockwise to collapse the timing chain tensioner plunger.
 - Insert an M6 x 30 mm bolt into the upper front cover timing hole to hold the tensioner arm in the retracted position.
15. Using the flats on the camshaft to prevent camshaft rotation, remove the bolt and the exhaust camshaft drive gear.



N0035983

Fig. 93: Locating Exhaust Camshaft Drive Gear Bolt
Courtesy of FORD MOTOR CO.

16. Remove the Camshaft Alignment Plate.



N0036032

Fig. 94: View Of Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

17. Remove the timing chain from the intake camshaft drive gear.

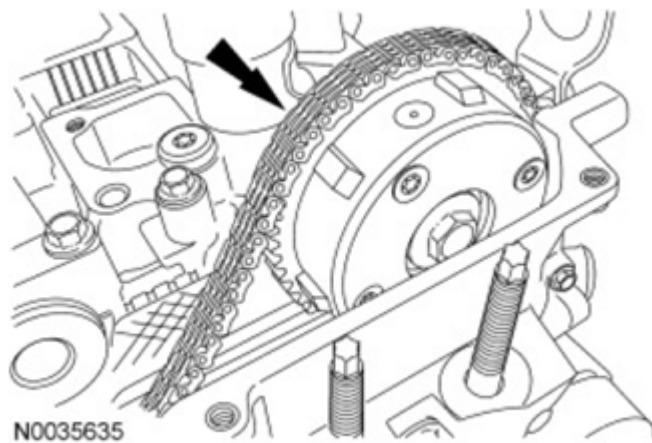


Fig. 95: Locating Timing Chain Of Intake Camshaft Drive Gear
Courtesy of FORD MOTOR CO.

18. Mark the position of the camshaft lobes on the No. 1 cylinder for installation reference.

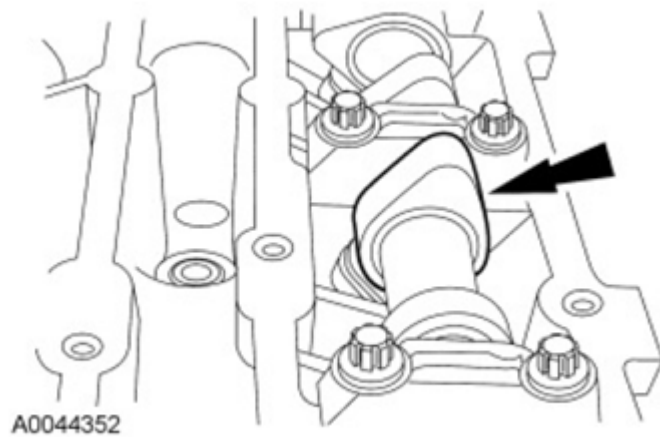


Fig. 96: View Of Camshaft Lobes Of No. 1 Cylinder
Courtesy of FORD MOTOR CO.

NOTE: Failure to follow the camshaft loosening procedure can result in damage to the camshafts.

NOTE: Mark the location and orientation of each camshaft bearing cap.

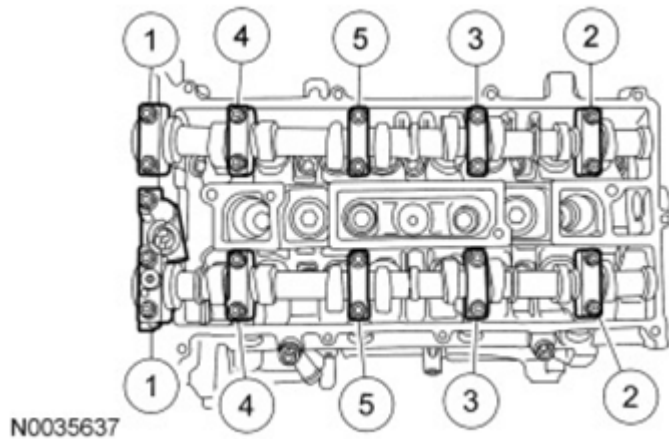


Fig. 97: Removing Sequence Of Camshaft Bearing Cap Bolts
Courtesy of FORD MOTOR CO.

19. Remove the camshafts from the engine.
 - Loosen the camshaft bearing cap bolts, in sequence, one turn at a time until all tension is released from the camshaft bearing caps.
 - Remove the bolts and the camshaft bearing caps.
 - Remove the camshafts.
20. If removal of the camshaft phaser and sprocket is necessary, mark the sprocket and camshaft for reference during installation.
 - If necessary, place the camshaft in a soft-jawed vise. Remove the bolt and the camshaft phaser and sprocket.

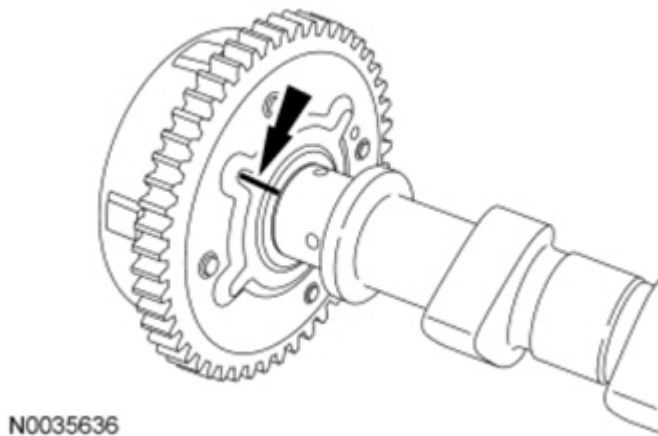
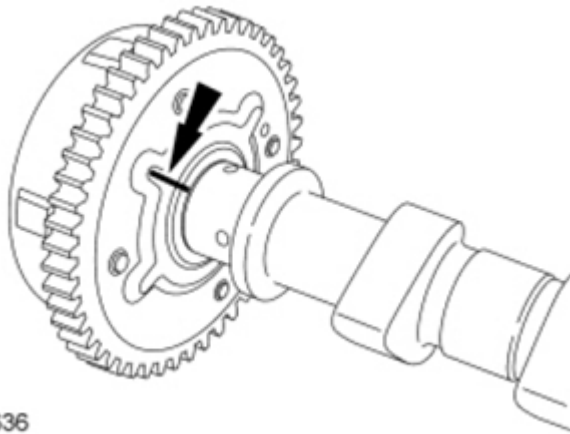


Fig. 98: View Of Sprocket And Camshaft Marking
Courtesy of FORD MOTOR CO.

Installation

NOTE: If new parts are installed, transfer the reference marks made during

disassembly to the new parts.



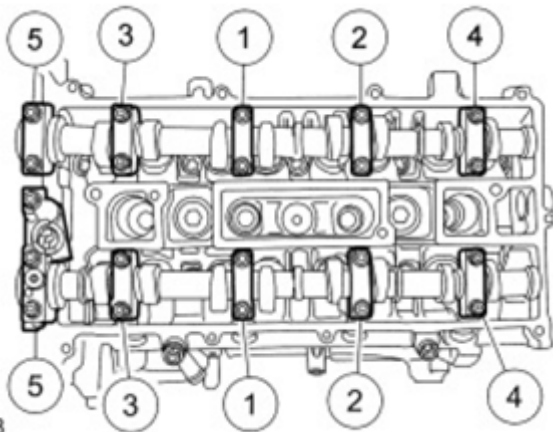
N0035636

Fig. 99: View Of Sprocket And Camshaft Marking
Courtesy of FORD MOTOR CO.

1. If necessary, position the camshaft in a soft-jawed vise and install the camshaft phaser and sprocket and the bolt.
 - Align the reference marks on the camshaft phaser and sprocket and the camshaft. Tighten the bolt to 72 Nm (53 lb-ft).

NOTE: Install the camshafts with the alignment slots in the camshafts lined up so the Camshaft Alignment Plate can be installed without rotating the camshafts. Make sure the lobes on the No. 1 cylinder are in the same position as noted in the removal procedure. Rotating the camshafts when the timing chain is removed, or installing the camshafts 180 degrees out of position can cause severe damage to the valves and pistons.

NOTE: Lubricate the camshaft journals and bearing caps with clean engine oil.



N0035638

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

2. Install the camshafts and bearing caps in their original location and orientation. Tighten the bearing caps in the sequence shown in illustration in 3 stages:
 - Stage 1: Tighten the camshaft bearing cap bolts one turn at a time, until finger-tight.
 - Stage 2: Tighten to 7 Nm (62 lb-in).
 - Stage 3: Tighten to 16 Nm (142 lb-in).
3. Install the Camshaft Alignment Plate.

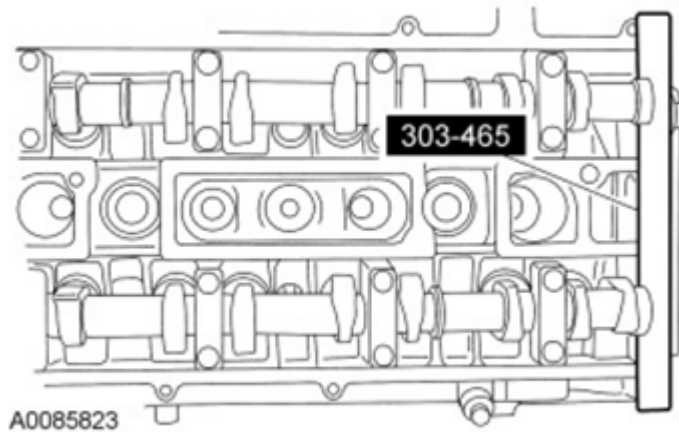


Fig. 101: View Of Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

4. Install the timing chain on the intake camshaft drive gear.

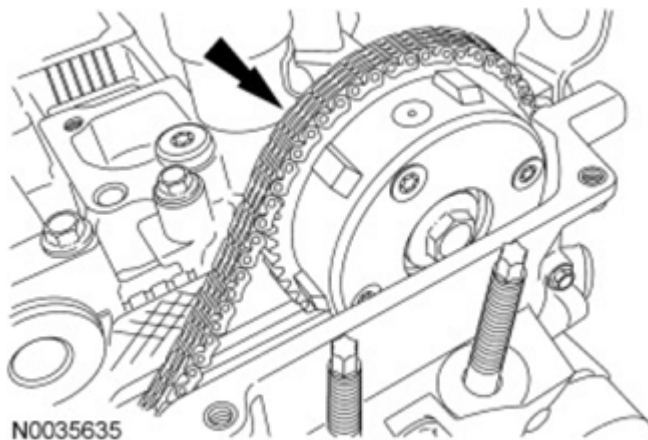


Fig. 102: Locating Timing Chain Of Intake Camshaft Drive Gear
Courtesy of FORD MOTOR CO.

NOTE: The timing chain must be correctly engaged on the teeth of the crankshaft

timing sprocket and the intake camshaft drive gear in order to install the exhaust camshaft drive gear onto the exhaust camshaft.

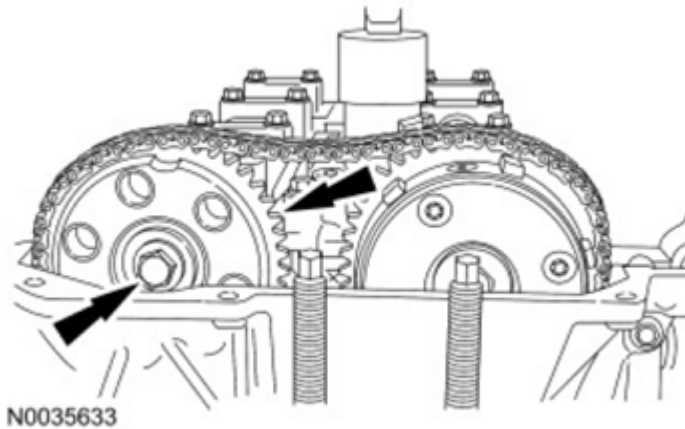


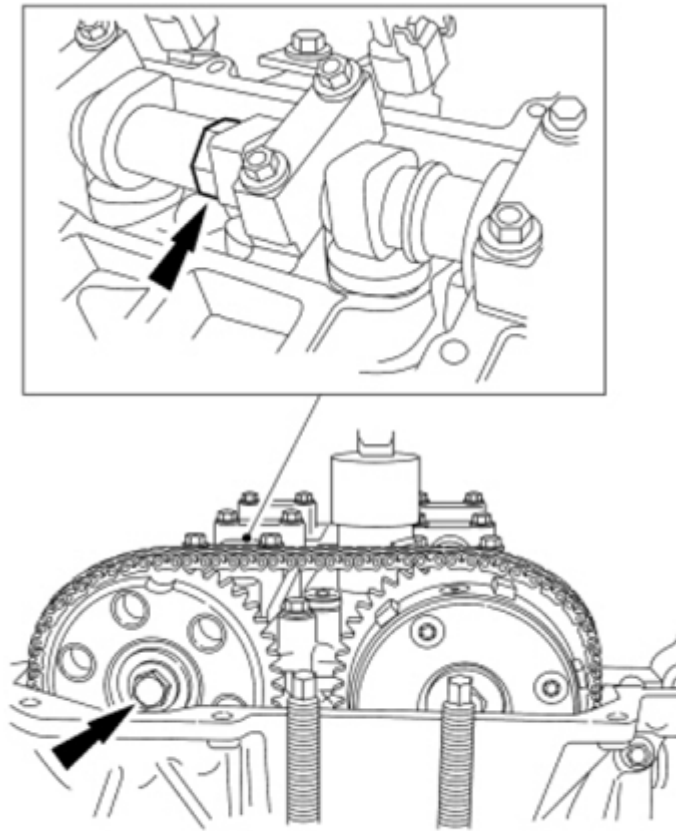
Fig. 103: Locating Exhaust Camshaft Bolt
Courtesy of FORD MOTOR CO.

5. Position the exhaust camshaft drive gear in the timing chain and install the gear and bolt on the exhaust camshaft.
 - Hand-tighten the bolt.

NOTE: Releasing the tensioner arm will remove the slack from the timing chain.

6. Remove the M6 x 30 mm bolt from the upper front cover timing hole to release the tensioner arm.

NOTE: The Camshaft Alignment Plate is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.



N0035634

Fig. 104: Locating Exhaust Camshaft Drive Gear Bolt
Courtesy of FORD MOTOR CO.

7. Using the flats on the camshafts to prevent camshaft rotation, tighten the bolts.
 - Tighten to 72 Nm (53 lb-ft).
8. Remove the Camshaft Alignment Plate.

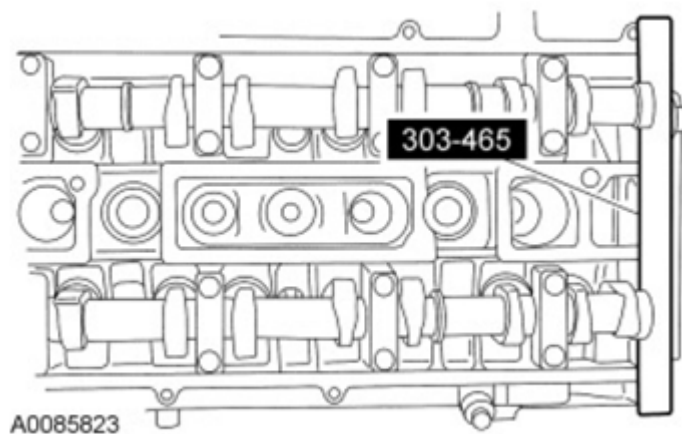


Fig. 105: View Of Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

9. Remove the 6 mm x 18 mm bolt.

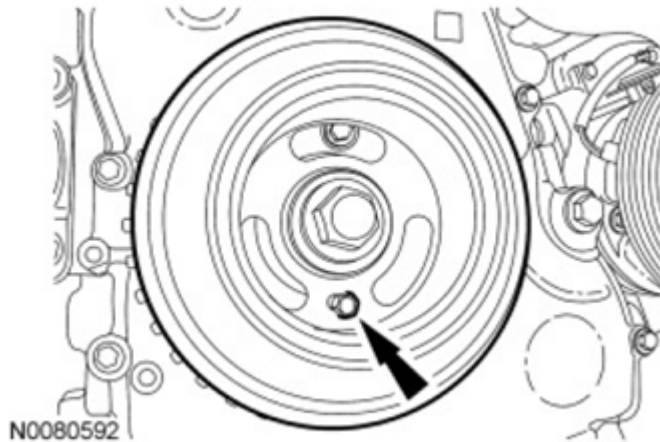


Fig. 106: View Of Crankshaft Pulley Alignment Bolt
Courtesy of FORD MOTOR CO.

10. Remove the Crankshaft TDC Timing Peg.

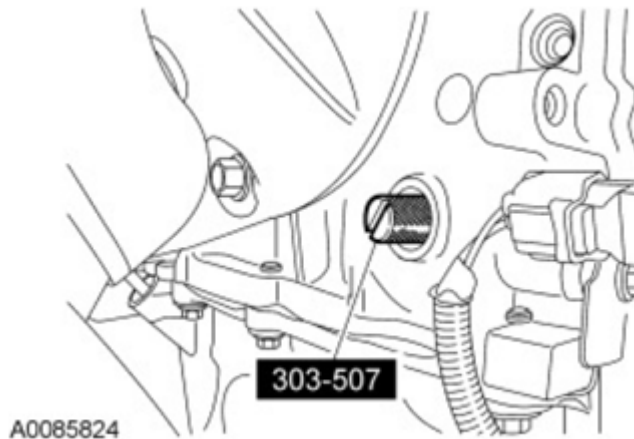


Fig. 107: View Of Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

11. Install the upper front cover timing hole plug.
- Tighten to 10 Nm (89 lb-in).

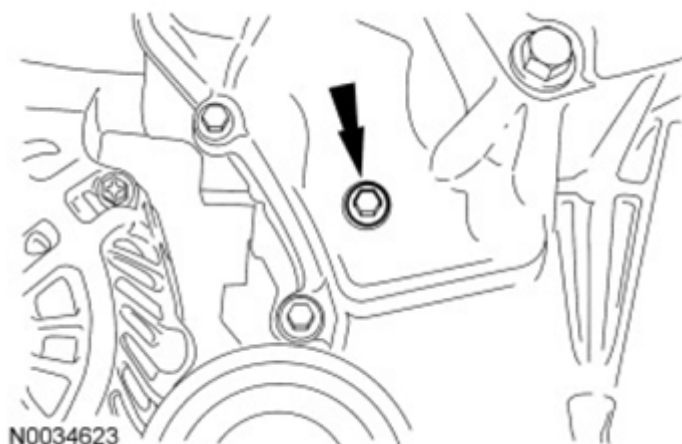


Fig. 108: Locating Upper Front Cover Timing Hole Plug
Courtesy of FORD MOTOR CO.

12. Apply silicone gasket and sealant to the threads of the lower front cover timing hole plug.
 - Install the plug and tighten to 12 Nm (106 lb-in).

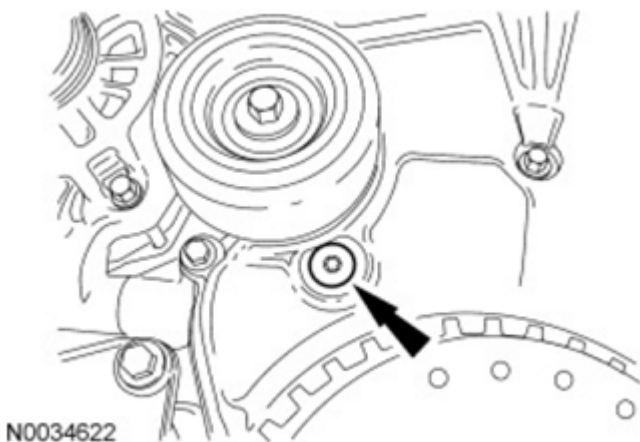


Fig. 109: Locating Lower Front Cover Timing Hole Plug
Courtesy of FORD MOTOR CO.

13. Install the engine plug bolt.
 - Tighten to 20 Nm (177 lb-in).

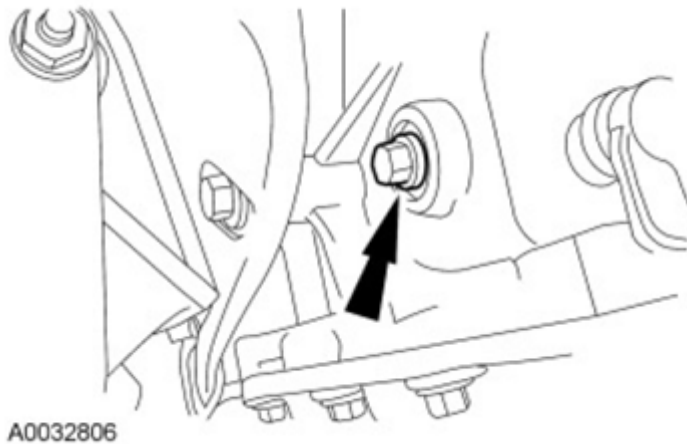


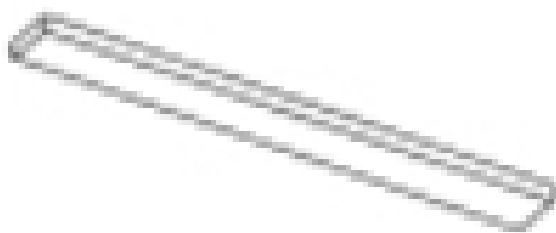
Fig. 110: Remove/Install Engine Plug Bolt
Courtesy of FORD MOTOR CO.

14. Install the accessory drivebelt. For additional information, refer to **ACCESSORY DRIVE - 2.5L** article.
15. Install the front RH wheel and tire. For additional information, refer to **TIRES & WHEELS** article.
16. Install the VCT oil control solenoid. For additional information, refer to **ELECTRONIC ENGINE CONTROLS - 2.5L** article.

CAMSHAFT PHASER AND SPROCKET

Special Tool(s)

SPECIAL TOOLS DESCRIPTION

 ST2645-A	Alignment Plate, Camshaft 303-465 (T94P-6256-CH)
	Timing Peg, Crankshaft TDC 303-507

2011 Mercury Mariner

2011 ENGINE Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)



General Equipment

GENERAL EQUIPMENT REFERENCE CHART

6 mm x 18 mm bolt

M6 x 30 mm bolt

Material

MATERIAL SPECIFICATIONS

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
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 can cause engine failure.

NOTE: Do not rotate the camshafts or crankshaft unless instructed to do so in this procedure. Rotating the camshafts or crankshaft with timing components

loosened or removed can cause serious damage to the valves or pistons.

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 - 2.5L** article.
3. Remove the Variable Camshaft Timing (VCT) oil control solenoid. For additional information, refer to **ELECTRONIC ENGINE CONTROLS - 2.5L** article.
4. Check the valve clearance. For additional information, refer to **VALVE CLEARANCE CHECK** in this service information.

NOTE: Failure to position the No. 1 piston at Top Dead Center (TDC) can result in damage to the engine. Turn the engine in the normal direction of rotation only.

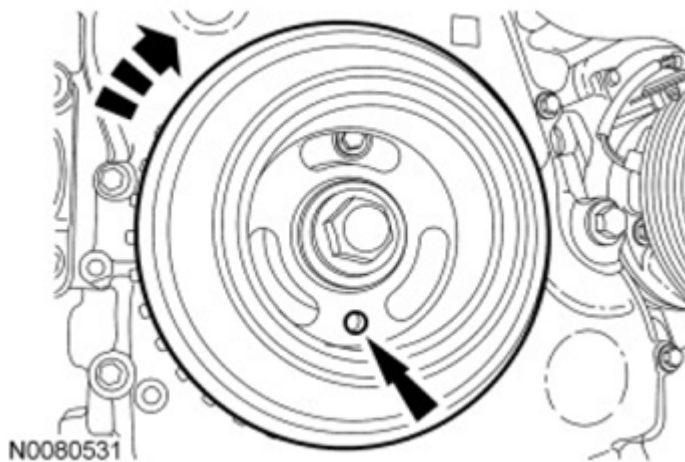


Fig. 111: Turning Crankshaft Pulley
Courtesy of FORD MOTOR CO.

5. Using the crankshaft pulley bolt, turn the crankshaft clockwise to position the No. 1 piston at Top Dead Center (TDC).
 - The hole in the crankshaft pulley should be in the 6 o'clock position.

NOTE: The Camshaft Alignment Plate is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

NOTE: The camshaft timing slots are offset. If the Camshaft Alignment Plate cannot be installed, rotate the crankshaft one complete revolution clockwise to correctly position the camshafts.

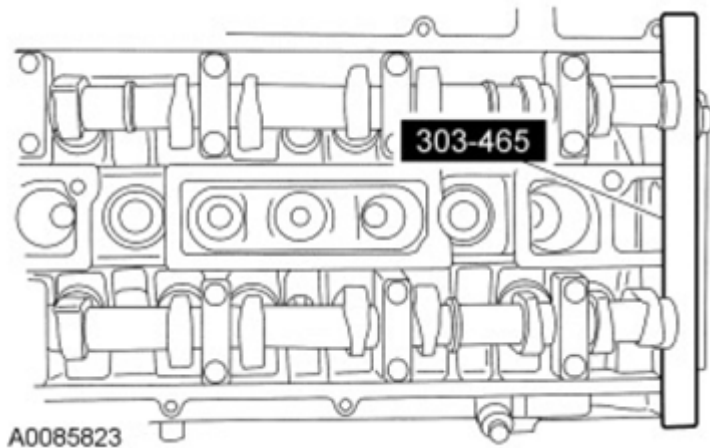


Fig. 112: View Of Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

6. Install the Camshaft Alignment Plate in the slots on the rear of both camshafts.
7. Remove the engine plug bolt.

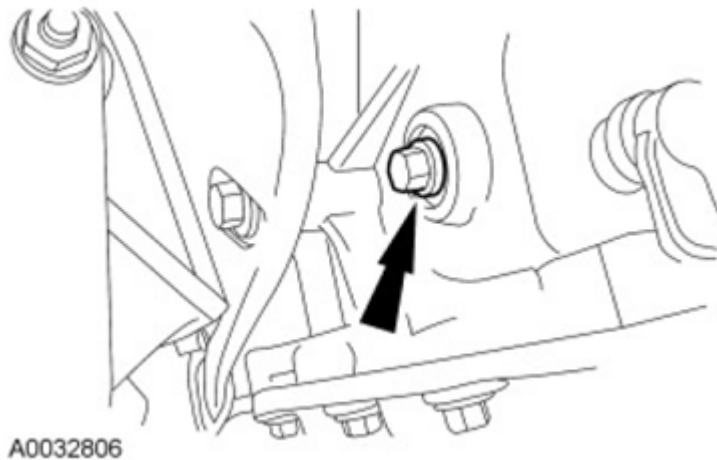


Fig. 113: Remove/Install Engine Plug Bolt
Courtesy of FORD MOTOR CO.

NOTE: The Crankshaft TDC Timing Peg will contact the crankshaft and prevent it from turning past TDC . However, the crankshaft can still be rotated in the counterclockwise direction. The crankshaft must remain at the TDC position during the camshaft removal and installation.

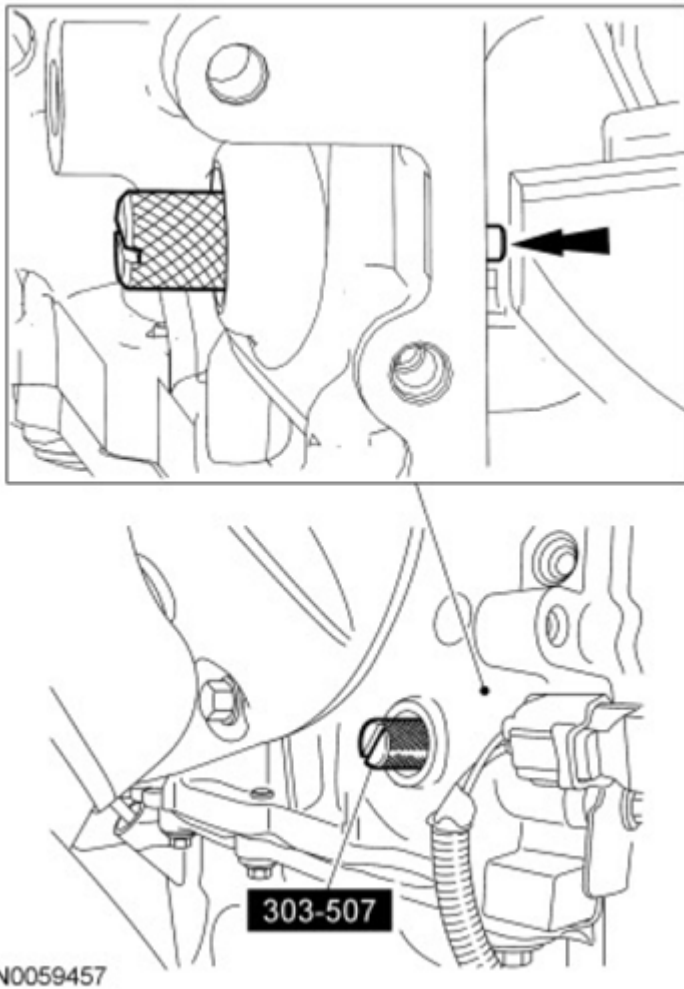


Fig. 114: View Of Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

8. Install the Crankshaft TDC Timing Peg.

NOTE: Only hand-tighten the bolt or damage to the front cover can occur.

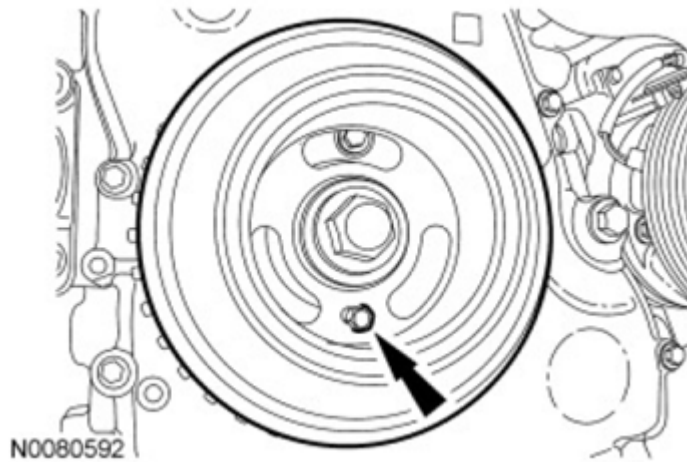


Fig. 115: View Of Crankshaft Pulley Alignment Bolt
Courtesy of FORD MOTOR CO.

9. Install a 6 mm x 18 mm bolt through the crankshaft pulley and thread it into the front cover.
10. Remove the lower timing hole plug from the engine front cover.

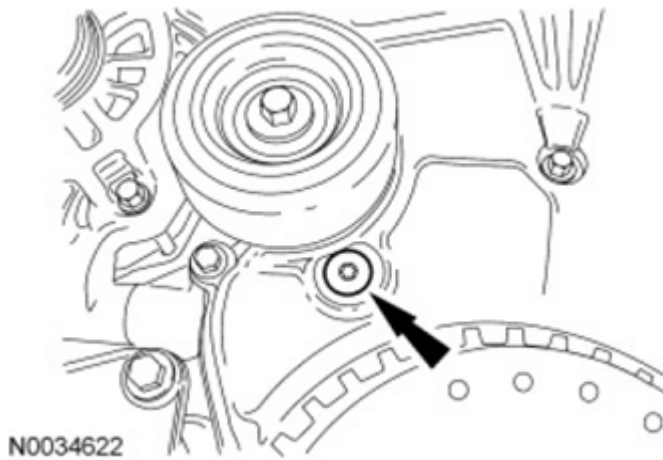


Fig. 116: Locating Lower Front Cover Timing Hole Plug
Courtesy of FORD MOTOR CO.

11. Remove the upper timing hole plug from the engine front cover.

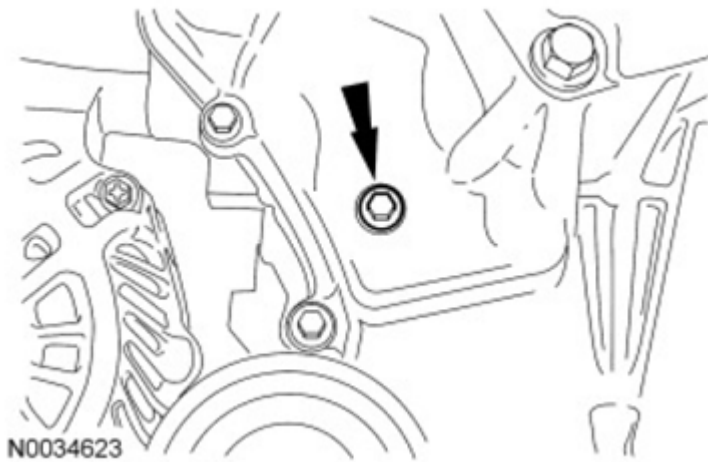


Fig. 117: Locating Upper Front Cover Timing Hole Plug
Courtesy of FORD MOTOR CO.

12. Reposition the Camshaft Alignment Plate to the slot on the rear of the intake camshaft only.

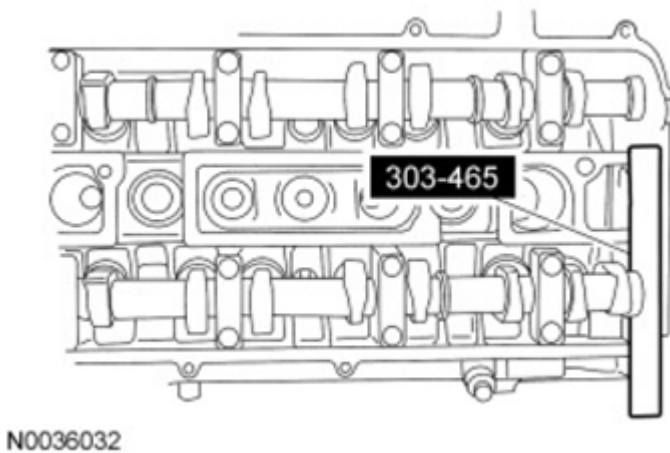


Fig. 118: View Of Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

NOTE: Releasing the ratcheting mechanism in the timing chain tensioner allows the plunger to collapse and create slack in the timing chain. Installing the M6 x 30 mm bolt into the upper front cover timing hole will lock the tensioner arm in a retracted position and allow enough slack in the timing chain for removal of the exhaust camshaft gear.

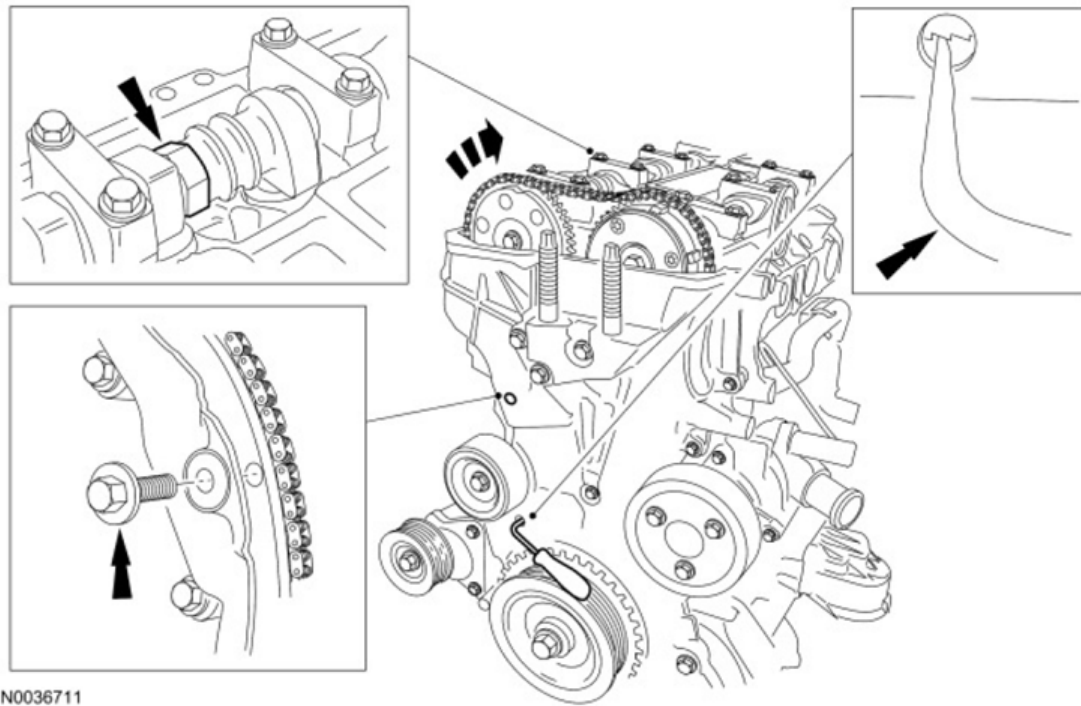
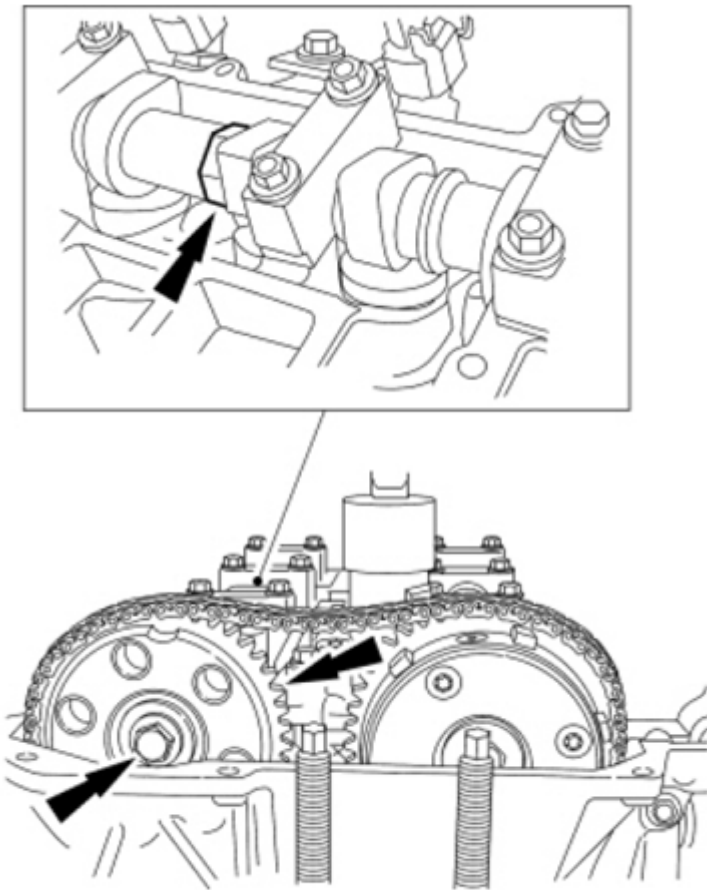


Fig. 119: Releasing Timing Chain Tensioner Ratchet
Courtesy of FORD MOTOR CO.

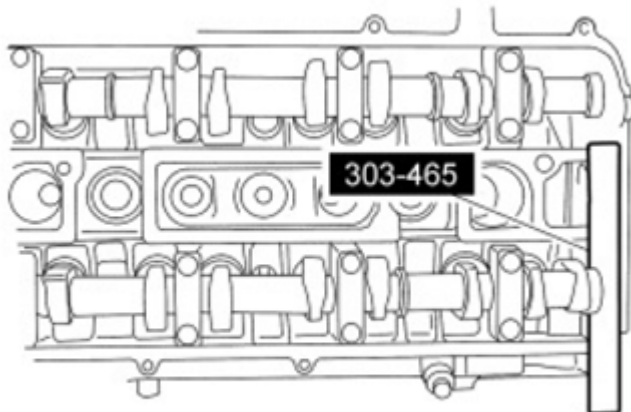
13. Using a small pick tool, release the timing chain tensioner ratchet through the lower front cover timing hole.
 - Have an assistant rotate (using the flats of the camshaft) the exhaust camshaft clockwise to collapse the timing chain tensioner plunger.
 - Insert the M6 x 30 mm bolt into the upper front cover timing hole to hold the tensioner arm in the retracted position.
14. Using the flats on the camshaft to prevent camshaft rotation, remove the bolt and the exhaust camshaft drive gear.



N0035983

Fig. 120: Locating Exhaust Camshaft Drive Gear Bolt
Courtesy of FORD MOTOR CO.

15. Remove the Camshaft Alignment Plate.



N0036032

Fig. 121: View Of Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

16. Remove the timing chain from the intake camshaft drive gear.

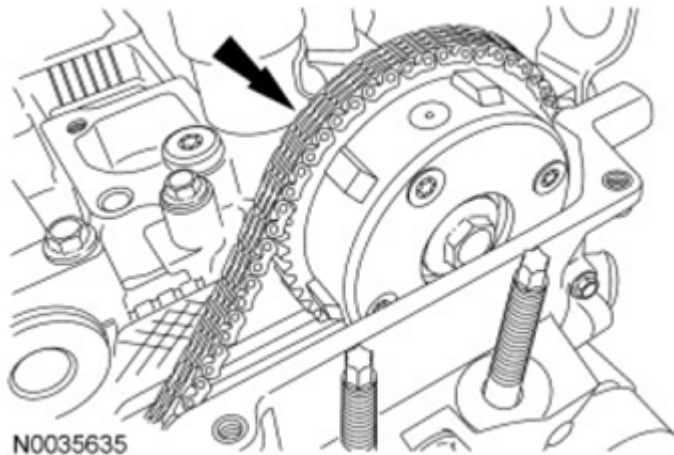


Fig. 122: Locating Timing Chain Of Intake Camshaft Drive Gear
Courtesy of FORD MOTOR CO.

17. Mark the position of the camshaft lobes on the No. 1 cylinder for installation reference.

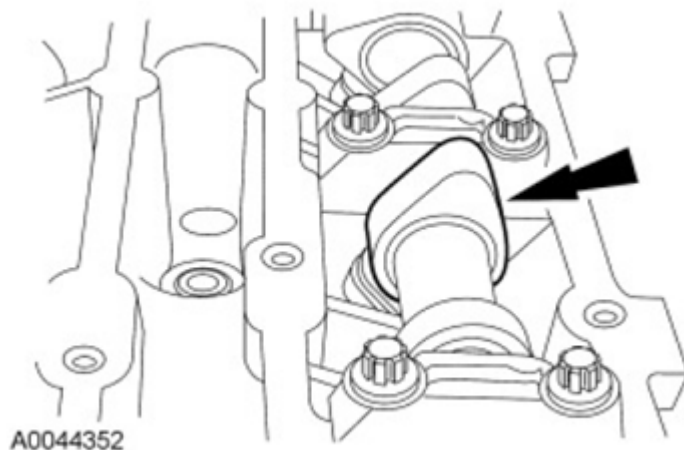


Fig. 123: View Of Camshaft Lobes Of No. 1 Cylinder
Courtesy of FORD MOTOR CO.

NOTE: Failure to follow the camshaft loosening procedure can result in damage to the intake camshaft.

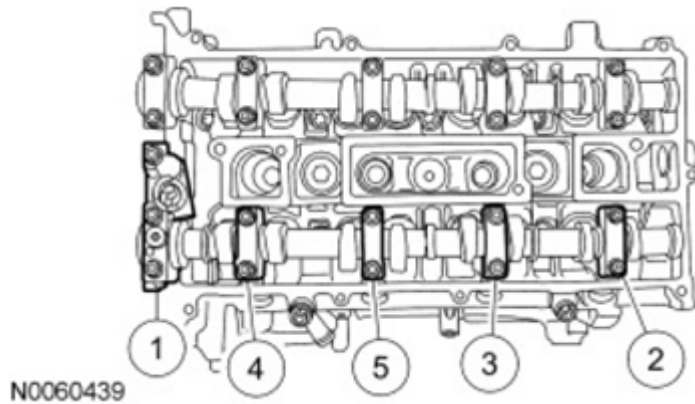


Fig. 124: Removing Order Of Intake Camshaft Bearing Cap Bolts
 Courtesy of FORD MOTOR CO.

18. Remove the intake camshaft from the engine.
 - Loosen the intake camshaft bearing cap bolts, in the sequence shown in illustration, one turn at a time until all tension is released from the camshaft bearing caps.
 - Remove the bolts and the camshaft bearing caps.
 - Remove the intake camshaft.
19. Mark the camshaft phaser and sprocket and the camshaft for reference during installation.

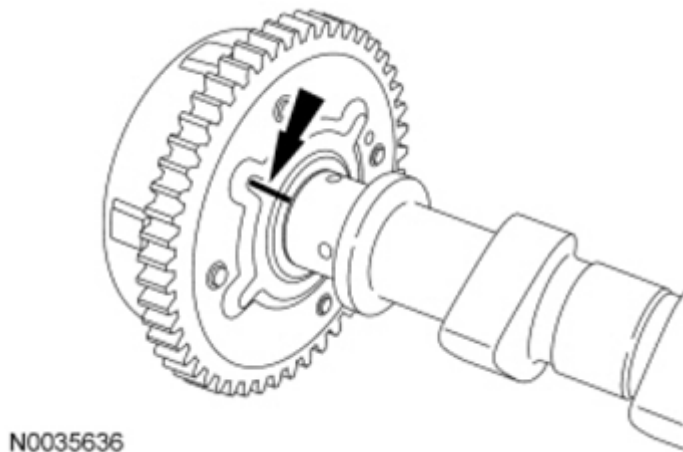


Fig. 125: View Of Sprocket And Camshaft Marking
 Courtesy of FORD MOTOR CO.

20. Place the camshaft in a soft-jawed vise. Remove the bolt and the camshaft phaser and sprocket.

Installation

NOTE: If new parts are installed, transfer the reference marks made during disassembly to the new parts.

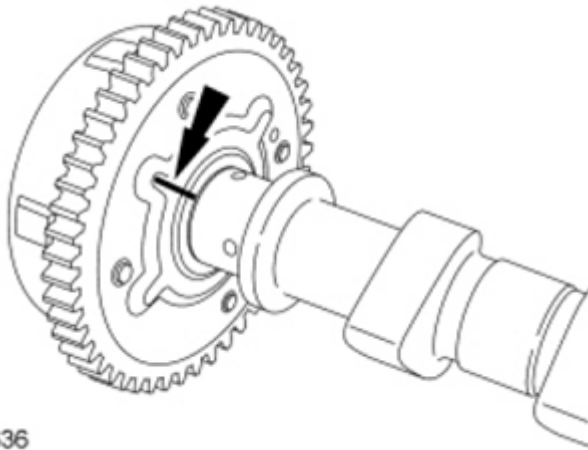


Fig. 126: View Of Sprocket And Camshaft Marking
Courtesy of FORD MOTOR CO.

1. Position the camshaft in a soft-jawed vise. Install the camshaft phaser and sprocket and the bolt.
 - Align the reference marks on the camshaft phaser and sprocket and the camshaft. Tighten the bolt to 72 Nm (53 lb-ft).

NOTE: Install the intake camshaft with the alignment slots in the camshafts lined up so the Camshaft Alignment Plate can be installed without rotating the camshafts. Make sure the lobes on the No. 1 cylinder are in the same position as noted in the removal procedure. Rotating the camshafts when the timing chain is removed, or installing the camshafts 180 degrees out of position can cause severe damage to the valves and pistons.

NOTE: Lubricate the intake camshaft journals and bearing caps with clean engine oil.

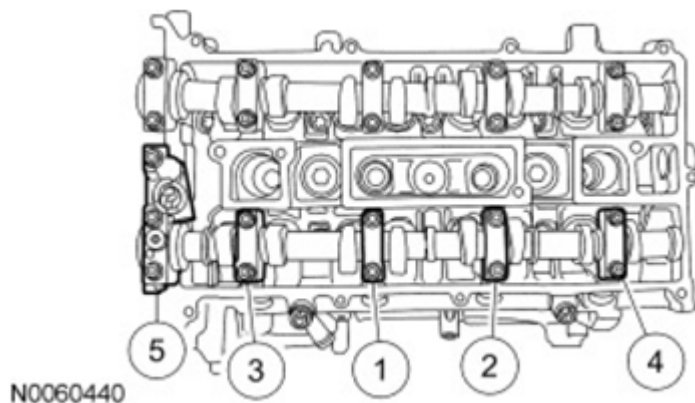


Fig. 127: Tightening Sequence Of Intake Camshaft Bearing Cap Bolts
Courtesy of FORD MOTOR CO.

2. Install the intake camshafts and bearing caps. Tighten the intake camshaft bearing caps in the sequence shown in illustration in 3 stages:
 - Stage 1: Tighten the intake camshaft bearing cap bolts until finger-tight.
 - Stage 2: Tighten to 7 Nm (62 lb-in).
 - Stage 3: Tighten to 16 Nm (142 lb-in).
3. Install the Camshaft Alignment Plate.

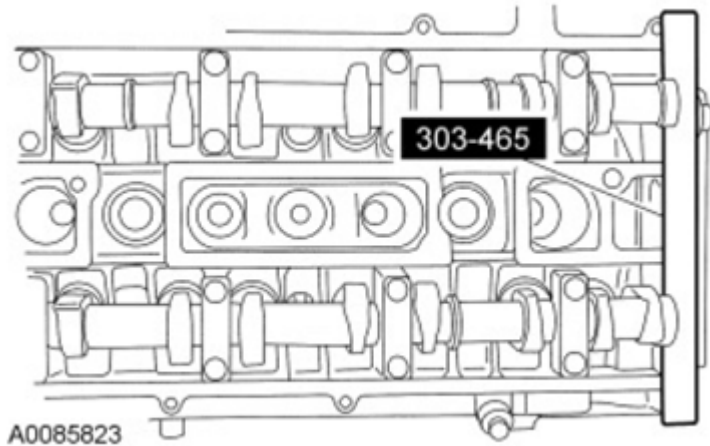


Fig. 128: View Of Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

4. Install the timing chain on the intake camshaft drive gear.

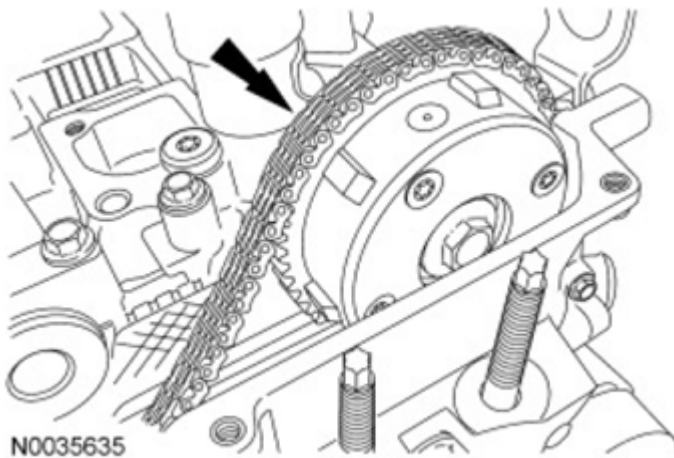


Fig. 129: Locating Timing Chain Of Intake Camshaft Drive Gear
Courtesy of FORD MOTOR CO.

NOTE: The timing chain must be correctly engaged on the teeth of the crankshaft timing sprocket and the intake camshaft drive gear in order to install the exhaust camshaft drive gear onto the exhaust camshaft.

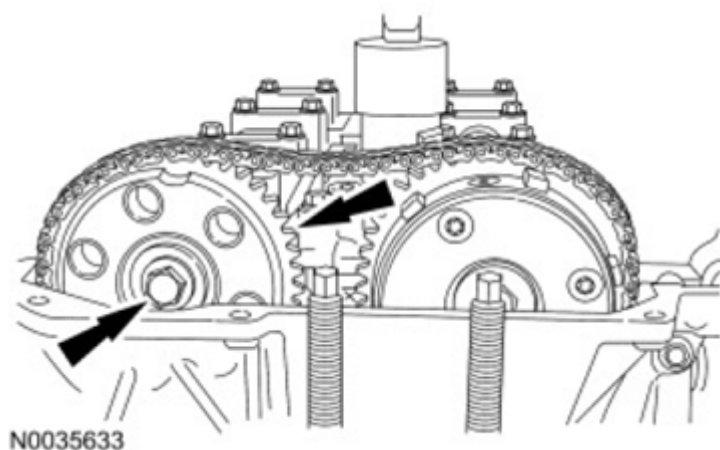


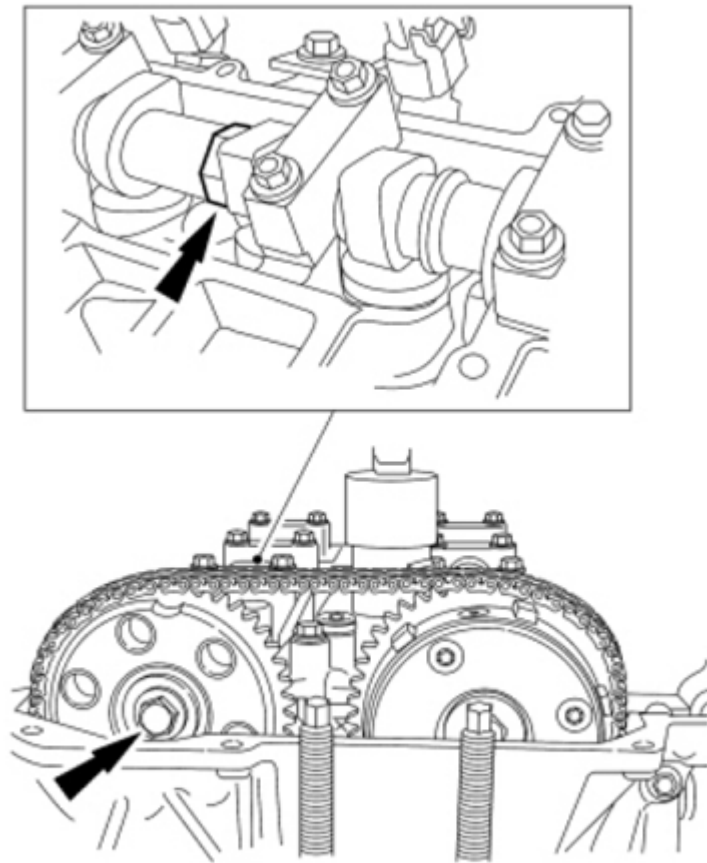
Fig. 130: Locating Exhaust Camshaft Bolt
Courtesy of FORD MOTOR CO.

5. Position the exhaust camshaft drive gear in the timing chain and install the gear and bolt on the exhaust camshaft.
 - Hand-tighten the bolt.

NOTE: Releasing the tensioner arm will remove the slack from the timing chain.

6. Remove the M6 x 30 mm bolt from the upper front cover timing hole to release the tensioner arm.

NOTE: The Camshaft Alignment Plate is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.



N0035634

Fig. 131: Locating Exhaust Camshaft Drive Gear Bolt
Courtesy of FORD MOTOR CO.

7. Using the flats on the camshaft to prevent camshaft rotation, tighten the exhaust camshaft drive gear bolt to 72 Nm (53 lb-ft).
8. Remove the Camshaft Alignment Plate.

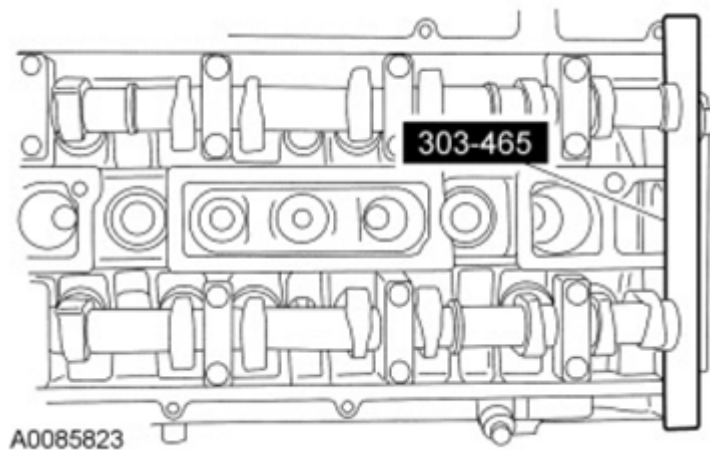


Fig. 132: View Of Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

9. Remove the 6 mm x 18 mm bolt.

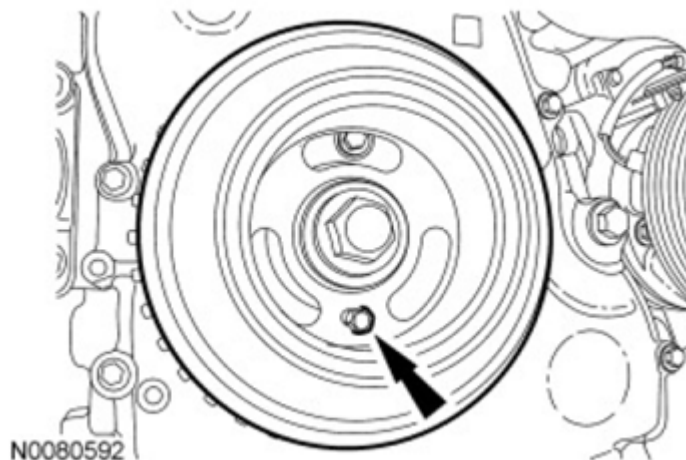


Fig. 133: View Of Crankshaft Pulley Alignment Bolt
Courtesy of FORD MOTOR CO.

10. Remove the Crankshaft TDC Timing Peg.



Fig. 134: View Of Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

11. Install the upper timing hole plug in the engine front cover.
 - Tighten to 10 Nm (89 lb-in).

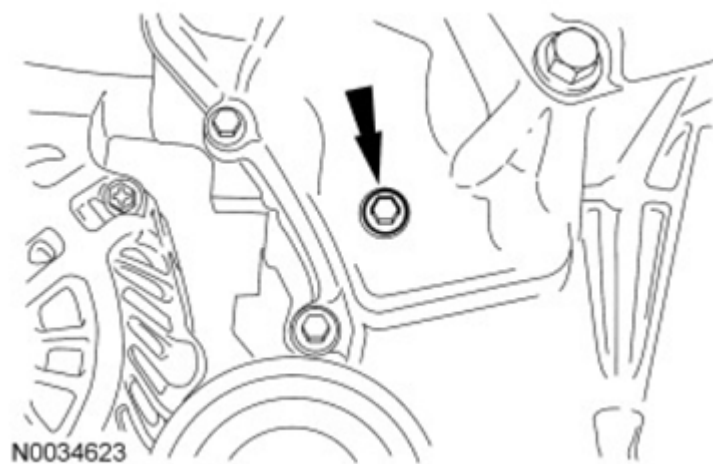


Fig. 135: Locating Upper Front Cover Timing Hole Plug
Courtesy of FORD MOTOR CO.

12. Apply silicone gasket and sealant to the threads of the lower timing hole plug.
 - Install the lower timing hole plug in the engine front cover.
 - Tighten to 12 Nm (106 lb-in).

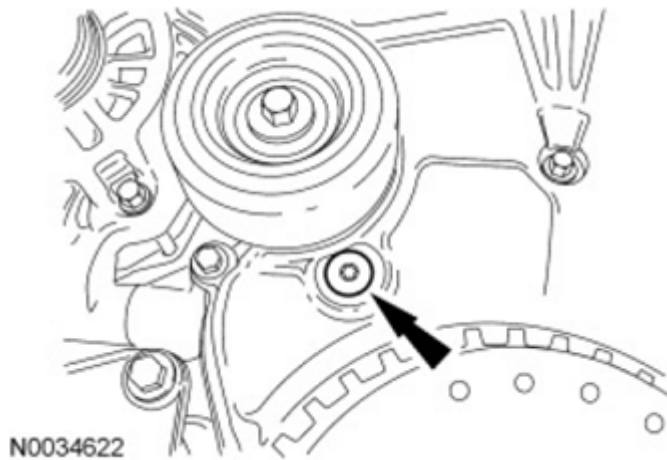


Fig. 136: Locating Lower Front Cover Timing Hole Plug
Courtesy of FORD MOTOR CO.

13. Install the engine plug bolt.
 - Tighten to 20 Nm (177 lb-in).

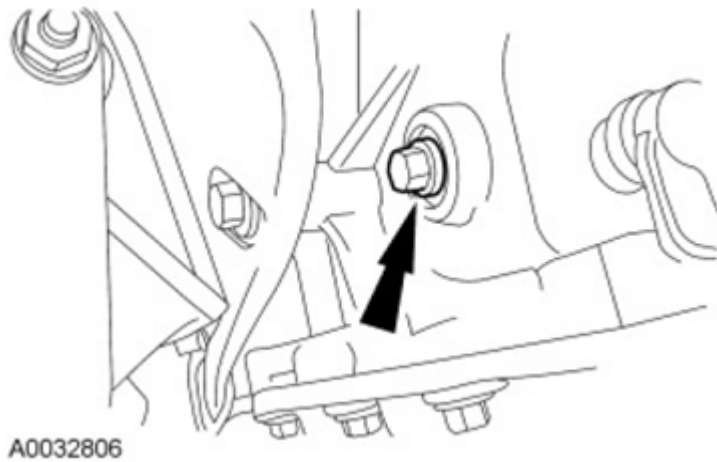
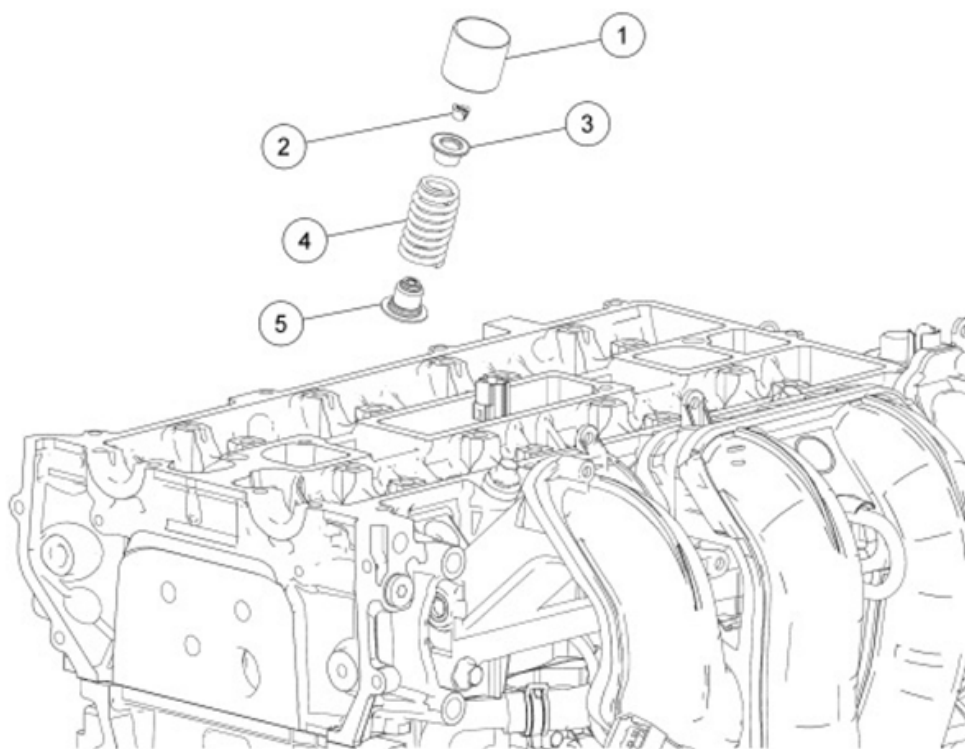


Fig. 137: Remove/Install Engine Plug Bolt
Courtesy of FORD MOTOR CO.

14. Install the accessory drive belt. For additional information, refer to **ACCESSORY DRIVE - 2.5L** article.
15. Install the VCT oil control solenoid. For additional information, refer to **ELECTRONIC ENGINE CONTROLS - 2.5L** article.

VALVE TRAIN COMPONENTS - EXPLODED VIEW



N0068038

Fig. 138: Exploded View Of Valve Train Components
Courtesy of FORD MOTOR CO.

PARTS DESCRIPTION CHART

Item	Part Number	Description
1	6500	Valve tappet (16 required)
2	6518	Valve collet (16 required)
3	6514	Valve spring retainer (16 required)
4	6513	Valve spring (16 required)
5	6517	Valve seal (16 required)

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

VALVE SPRINGS

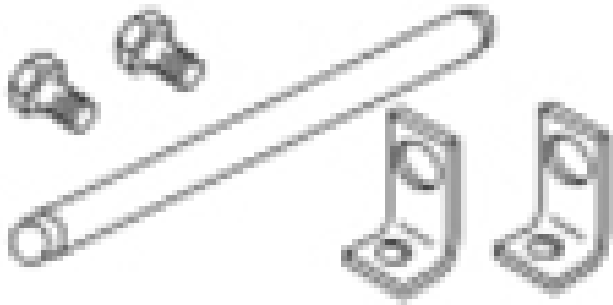
Special Tool(s)

SPECIAL TOOLS DESCRIPTION

	Compressor, Valve Spring 303-300 (T87C-6565-A)
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2011 Mercury Mariner

2011 ENGINE Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)



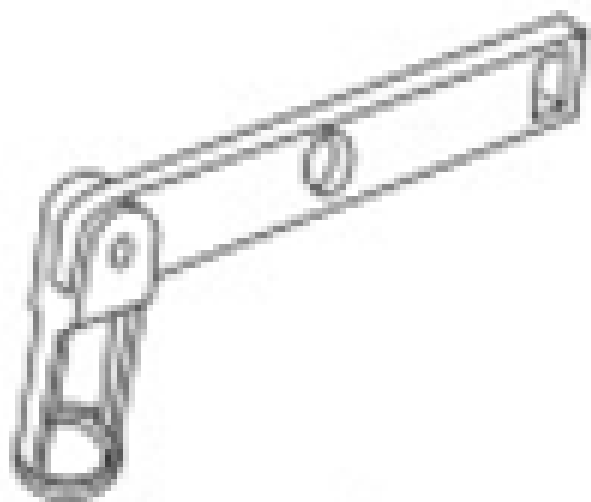
ST1981-A



ST1907-A

Compressor, Valve Spring
303-350 (T89P-6565-A)

Compressor, Valve Spring
303-472 (T94P-6565-AH)



ST1902-A

Material**MATERIAL SPECIFICATIONS**

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
Multi-Purpose Grease XG-4 and/or XL-5	ESB-M1C93-B

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. Remove the camshafts. For additional information, refer to **CAMSHAFTS** in this service information.

NOTE: If the camshafts and valve tappets are to be reused, mark the location of the valve tappets to make sure they are assembled in their original positions.

NOTE: The number on the valve tappets only reflects the digits that follow the decimal. For example, a tappet with the number 0.650 has the thickness of 3.650 mm.

3. Remove and inspect the valve tappets. For additional information, refer to ENGINE MECHANICAL SYSTEM - GENERAL INFORMATION article.
4. Remove the spark plugs. For additional information, refer to ENGINE IGNITION - 2.5L article.

NOTE: Use compressed air at 7 to 10 bars (100-150 psi). Do not disconnect the compressed air from the cylinder until the valve spring, valve spring retainer and valve collet is installed. Any loss of air pressure will allow the valve to fall into the cylinder.

5. Connect the compressed air supply to cylinder No. 1.

NOTE: Place all parts in order to one side.

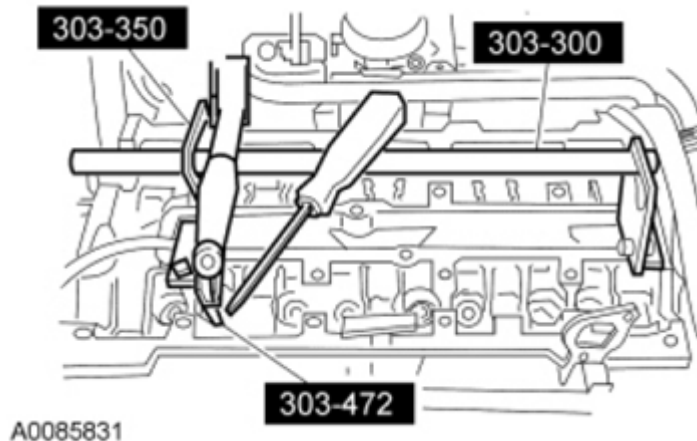


Fig. 139: Remove/Install Valve Spring Using Special Tools
Courtesy of FORD MOTOR CO.

6. Apply compressed air to the cylinder and remove the valve spring.
 - Using the Valve Spring Compressors, compress the valve spring and remove the valve collet, using some multi-purpose grease and a small screwdriver.
 - Remove the valve spring retainer and the valve spring.

Installation

NOTE: Check the seating of the valve collet.

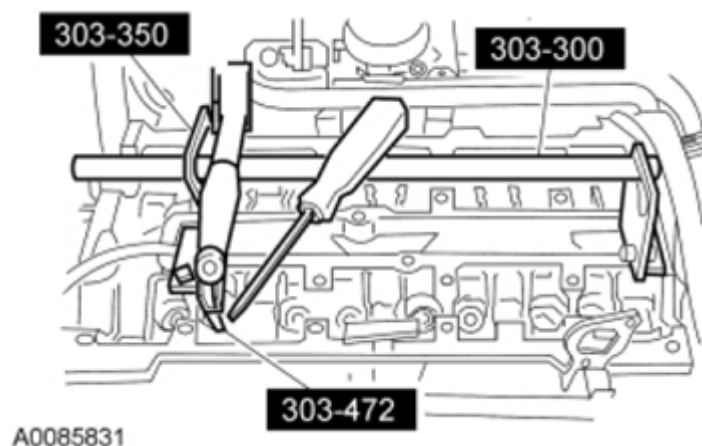


Fig. 140: Remove/Install Valve Spring Using Special Tools
 Courtesy of FORD MOTOR CO.

1. Using the Valve Spring Compressors, install the valve spring.
 - Insert the valve spring and the valve spring retainer.
 - Compress the valve spring and install the valve collet using some multi-purpose grease and a small screwdriver.
2. Disconnect the compressed air supply.
3. Repeat the appropriate removal and installation steps for all of the other cylinders.
4. Install the spark plugs. For additional information, refer to **ENGINE IGNITION - 2.5L** article.
5. Coat the valve tappets with clean engine oil and insert them.
6. Install the camshafts. For additional information, refer to **CAMSHAFTS** in this service information.

VALVE SEALS

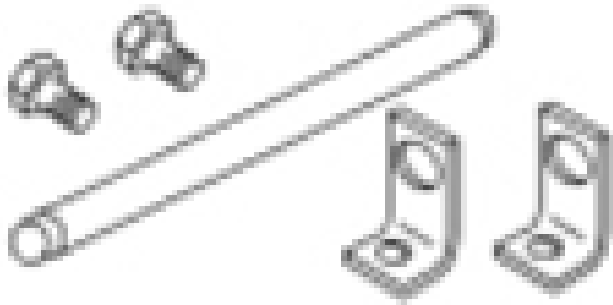
Special Tool(s)

SPECIAL TOOLS DESCRIPTION

Compressor, Valve Spring
 303-300 (T87C-6565-A)

2011 Mercury Mariner

2011 ENGINE Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)



ST1981-A



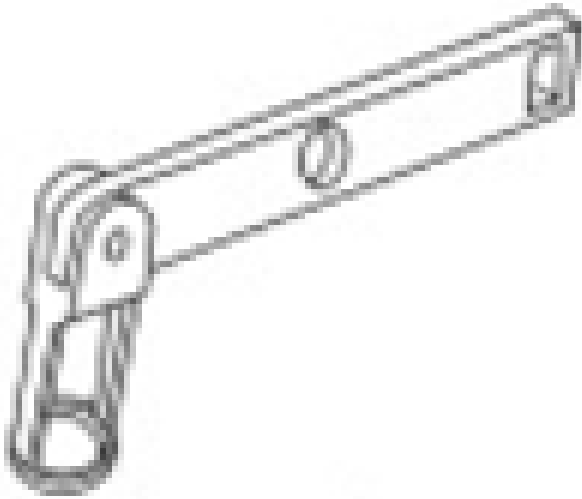
ST1907-A

Compressor, Valve Spring
303-350 (T89P-6565-A)

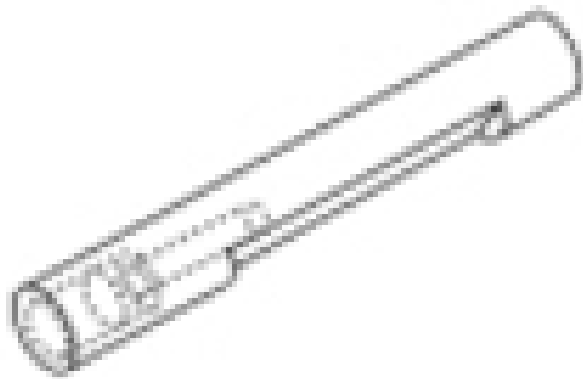
Compressor, Valve Spring
303-472 (T94P-6565-AH)

2011 Mercury Mariner

2011 ENGINE Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)



ST1902-A



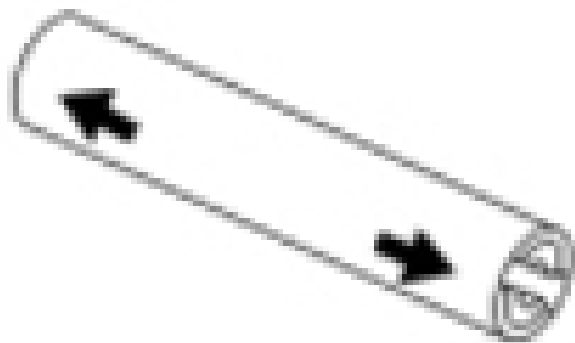
ST1906-A

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

Remover, Valve Stem Oil Seal
303-468 (T94P-6510-AH)

2011 Mercury Mariner

2011 ENGINE Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)



ST1904-A



ST1187-A

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

Material

MATERIAL SPECIFICATIONS

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
Multi-Purpose Grease XG-4 and/or XL-5	ESB-M1C93-B

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. Remove the camshafts. For additional information, refer to **CAMSHAFTS** in this service information.

NOTE: If the camshafts and valve tappets are to be reused, mark the location of the valve tappets to make sure they are assembled in their original positions.

NOTE: The number on the valve tappets only reflects the digits that follow the decimal. For example, a tappet with the number 0.650 has the thickness of 3.650 mm.

3. Remove and inspect the valve tappets. For additional information, refer to **ENGINE MECHANICAL SYSTEM - GENERAL INFORMATION** article.
4. Remove the spark plugs. For additional information, refer to **ENGINE IGNITION - 2.5L** article.

NOTE: Use compressed air at 7 to 10 bars (100-150 psi). Do not disconnect the compressed air from the cylinder until the valve spring, valve spring retainer and valve collet is installed. Any loss of air pressure will allow the valve to fall into the cylinder.

5. Connect the compressed air supply to cylinder No. 1.

NOTE: Place all parts in order to one side.

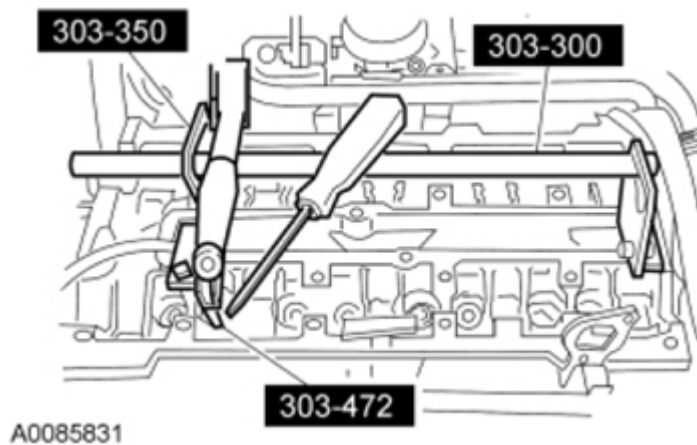


Fig. 141: Remove/Install Valve Spring Using Special Tools
Courtesy of FORD MOTOR CO.

6. Apply compressed air to the cylinder and remove the valve spring.
 - Using the Valve Spring Compressors, compress the valve spring and remove the valve collet, using some multi-purpose grease and a small screwdriver.
 - Remove the valve spring retainer and the valve spring.
7. Using the Valve Stem Oil Seal Remover and Slide Hammer, remove and discard the valve seal.

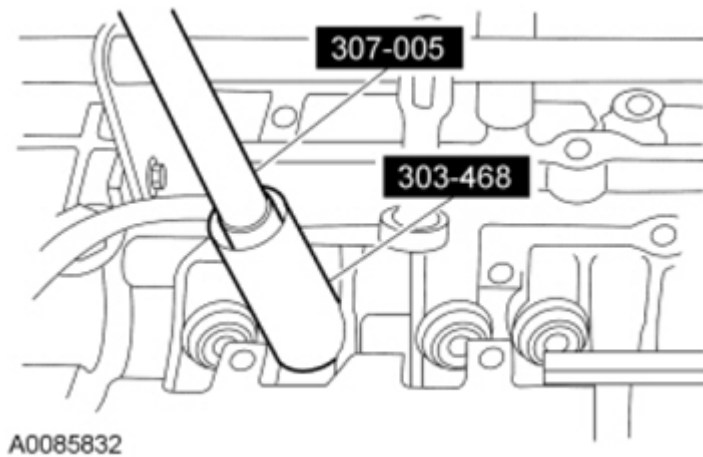


Fig. 142: Removing Valve Seal
Courtesy of FORD MOTOR CO.

Installation

1. Install the valve stem seal installation sleeve.

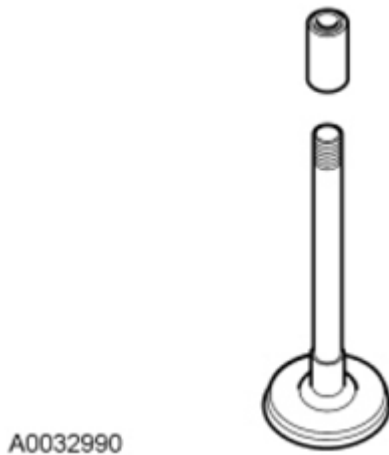


Fig. 143: Identifying Valve Stem Seal
Courtesy of FORD MOTOR CO.

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

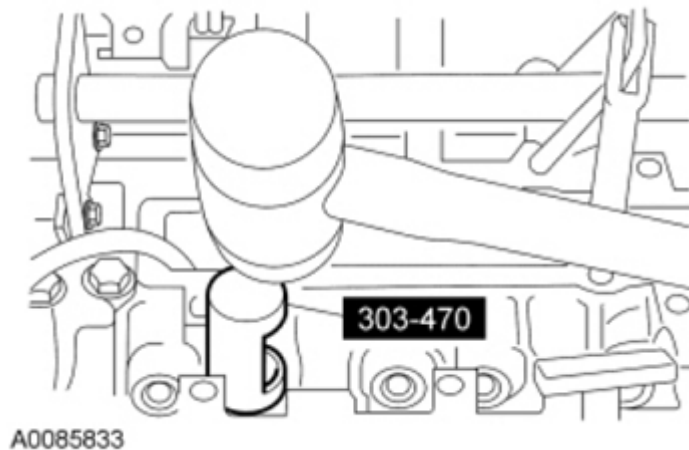


Fig. 144: Installing Valve Seal
Courtesy of FORD MOTOR CO.

NOTE: Check the seating of the valve collet.

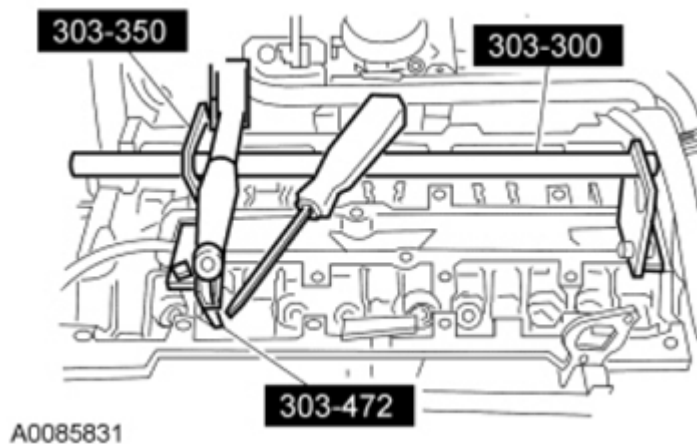


Fig. 145: Remove/Install Valve Spring Using Special Tools
Courtesy of FORD MOTOR CO.

3. Using the Valve Spring Compressors, install the valve spring.
 - Insert the valve spring and the valve spring retainer.
 - Compress the valve spring and install the valve collet using some multi-purpose grease and a small screwdriver.
4. Disconnect the compressed air supply.
5. Repeat the appropriate removal and installation steps for all of the other cylinders.
6. Install the spark plugs. For additional information, refer to **ENGINE IGNITION - 2.5L** article.
7. Coat the valve tappets with clean engine oil and insert them.
8. Install the camshafts. For additional information, refer to **CAMSHAFTS** in this service information.

VALVE TAPPETS**Material****MATERIAL SPECIFICATIONS**

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 camshafts. For additional information, refer to **CAMSHAFTS** in this service information.

NOTE: If the camshafts and valve tappets are to be reused, mark the location of the valve tappets to make sure they are assembled in their original positions.

NOTE: The number on the valve tappets only reflects the digits that follow the decimal. For example, a tappet with the number 0.650 has the thickness of 3.650 mm. Remove and inspect the valve tappets. For additional information, refer to **ENGINE MECHANICAL SYSTEM - GENERAL INFORMATION** article.

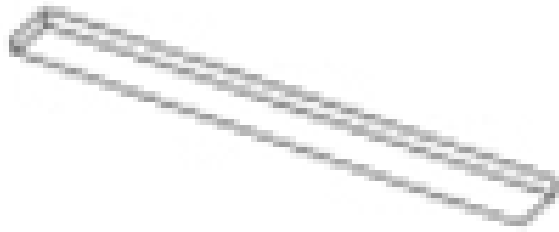
- 3.
4. To install, reverse the removal procedure.
 - Coat the valve tappets with clean engine oil prior to installation.

CYLINDER HEAD**Special Tool(s)****SPECIAL TOOLS DESCRIPTION**

	Alignment Plate, Camshaft 303-465 (T94P-6256-CH)
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2011 Mercury Mariner

2011 ENGINE Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)



ST2645-A

Material

MATERIAL SPECIFICATIONS

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
Motorcraft® Silicone Gasket Remover ZC-30	-

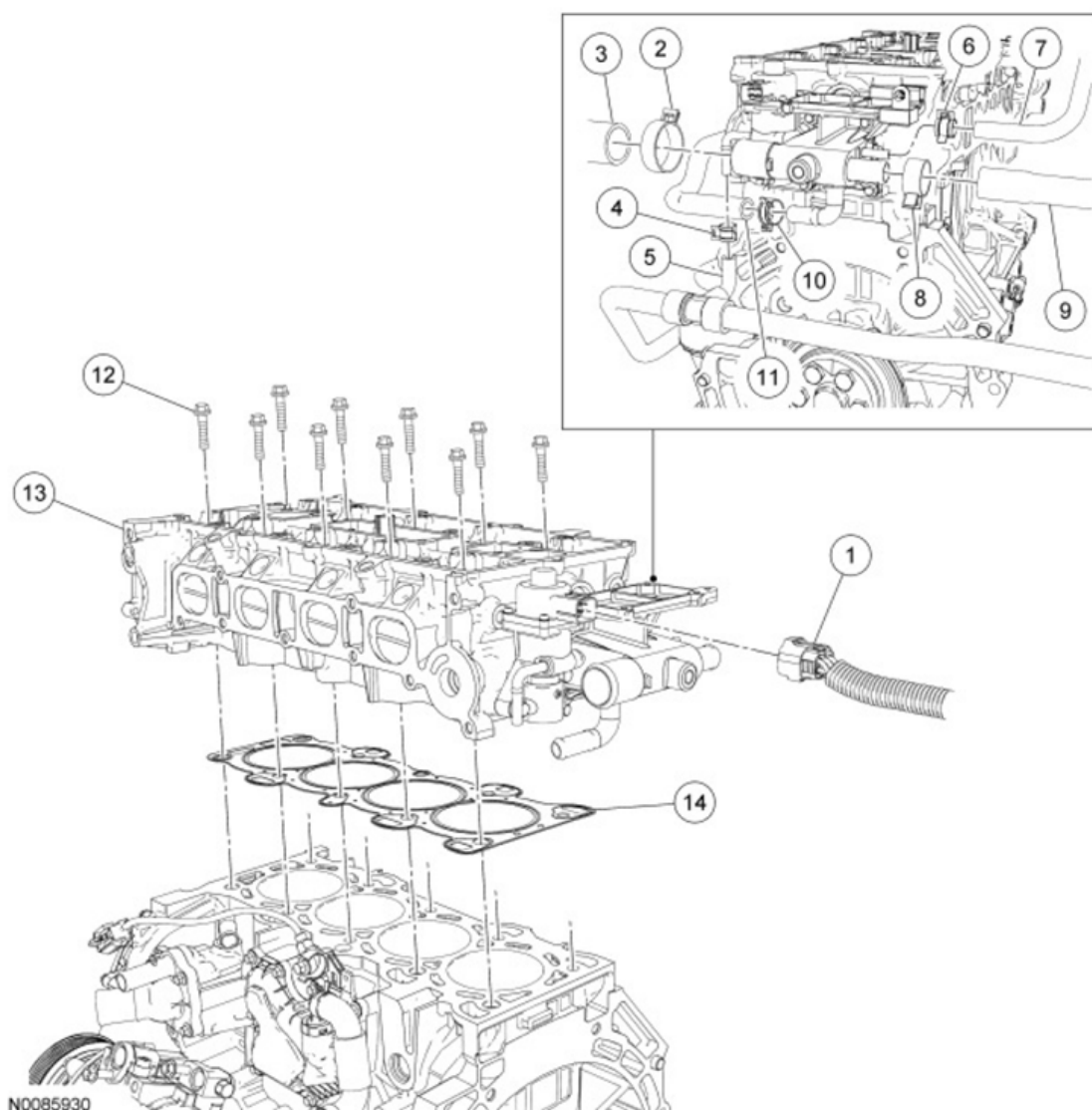


Fig. 146: Identifying Cylinder Head Components
Courtesy of FORD MOTOR CO.

CYLINDER HEAD PARTS DESCRIPTION CHART

Item	Part Number	Description
1	14A464	EGR valve electrical connector (part of 12B637)
2	8287	Upper radiator hose clamp
3	8260	Upper radiator hose
4	W52592	EGR coolant tube clamp
5	18K580	EGR coolant hose (part of heater hose)
6	-	Engine coolant vent hose clamp (part of 8W005)
7	8W005	Engine coolant vent hose
8	-	Heater hose clamp (part of 18K580)
9	18K580	Heater hose

2011 Mercury Mariner

2011 ENGINE Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)

10	W525958	Bypass hose clamp
11	8A582	Bypass hose
12	6065	Cylinder head bolt (10 required)
13	6049	Cylinder head
14	6051	Cylinder head gasket

Removal

NOTE: Do not loosen or remove the crankshaft pulley bolt without first installing the special tools as instructed in this procedure. The crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. The crankshaft, the crankshaft sprocket and the pulley are fitted together by friction, using diamond washers between the flange faces on each part. For that reason, the crankshaft sprocket is also unfastened if the pulley bolt is loosened. Before any repair requiring loosening or removal of the crankshaft pulley bolt, the crankshaft and camshafts must be locked in place by the special service tools, otherwise severe engine damage can occur.

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. Release the fuel system pressure. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** article.
3. Drain the engine cooling system. For additional information, refer to **ENGINE COOLING** article.
4. Remove the Variable Camshaft Timing (VCT) oil control solenoid. For additional information, refer to **ELECTRONIC ENGINE CONTROLS - 2.5L** article.
5. Remove the timing drive components. For additional information, refer to **TIMING DRIVE COMPONENTS** in this service information.
6. Remove the Camshaft Alignment Plate.

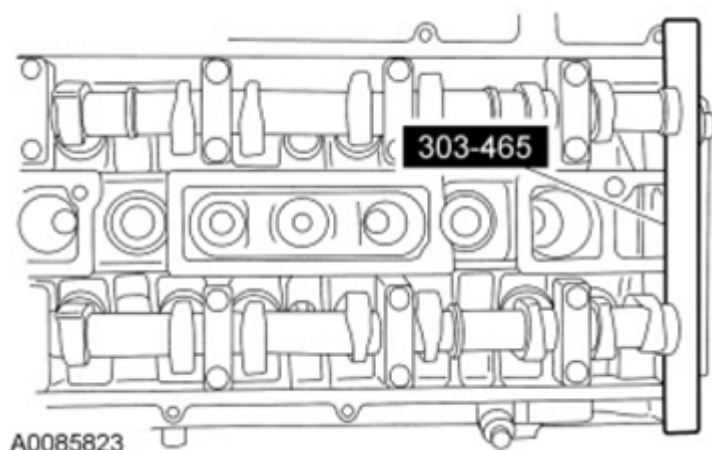


Fig. 147: View Of Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

7. Mark the position of the camshaft lobes on the No. 1 cylinder for installation reference.

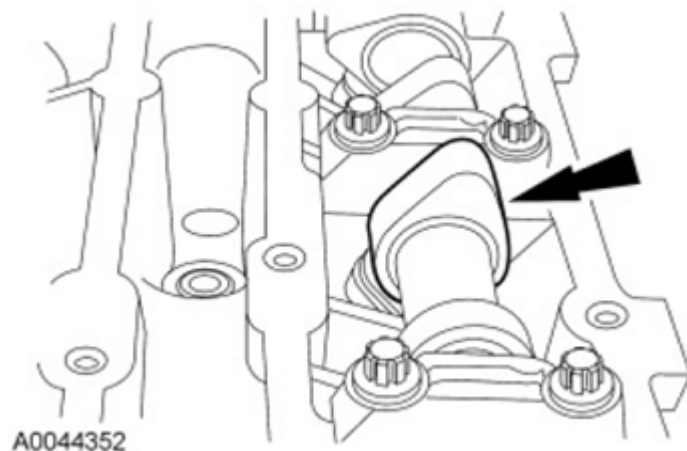


Fig. 148: View Of Camshaft Lobes Of No. 1 Cylinder
Courtesy of FORD MOTOR CO.

NOTE: Failure to follow the camshaft loosening procedure can result in damage to the camshafts.

NOTE: Mark the location and orientation of each camshaft bearing cap.

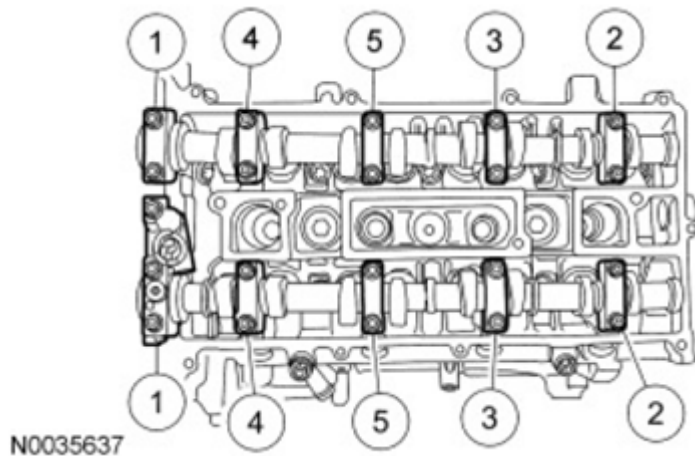


Fig. 149: Removing Sequence Of Camshaft Bearing Cap Bolts
Courtesy of FORD MOTOR CO.

8. Remove the camshafts from the engine.
 - Loosen the camshaft bearing cap bolts, in sequence, one turn at a time until all tension is released from the camshaft bearing caps.
 - Remove the bolts and the camshaft bearing caps.
 - Remove the camshafts.

NOTE: If the camshafts and valve tappets are to be reused, mark the location of the valve tappets to make sure they are assembled in their original positions.

9. Remove the valve tappets.

NOTE: The number on the valve tappets only reflects the digits that follow the decimal. For example, a tappet with the number 0.650 has the thickness of 3.650 mm.

10. Inspect the valve tappets. For additional information, refer to **ENGINE MECHANICAL SYSTEM - GENERAL INFORMATION** article.
11. Remove the intake manifold. For additional information, refer to **INTAKE MANIFOLD** in this service information.
12. Remove the generator. For additional information, refer to **CHARGING SYSTEM** article.
13. Remove the exhaust manifold. For additional information, refer to **EXHAUST MANIFOLD** in this service information.
14. Disconnect the EGR valve electrical connector.
15. Disconnect the EGR coolant hose from the EGR valve.
16. Disconnect the upper radiator hose, coolant bypass hose, heater hose and coolant vent hose from the engine coolant outlet.

17. Remove the 10 bolts and the cylinder head.

- Discard the bolts and the cylinder head 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 that make leak paths. Use a plastic scraping tool to remove all traces of the head gasket.

NOTE: Observe all warnings or cautions and follow all application directions contained on the packaging of the silicone gasket remover and the metal surface prep.

NOTE: If there is no residual gasket material present, metal surface prep can be used to clean and prepare the surfaces.

1. Clean the cylinder head-to-cylinder block mating surface of both the cylinder head and the cylinder block in the following sequence.
 1. Remove any large deposits of silicone or gasket material with a plastic scraper.
 2. Apply silicone gasket remover, following package directions, and allow to set for several minutes.
 3. Remove the silicone gasket remover with a plastic scraper. A second application of silicone gasket remover may be required if residual traces of silicone or gasket material remain.
 4. Apply metal surface prep, following package directions, to remove any traces of oil or coolant, and to prepare the surfaces to bond with the new gasket. Do not attempt to make the metal shiny. Some staining of the metal surfaces is normal.
2. 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 MECHANICAL SYSTEM - GENERAL INFORMATION** article.
3. Clean the cylinder head bolt holes in the cylinder block. Make sure all coolant, oil or other foreign material is removed.
4. Apply silicone gasket and sealant to the locations shown in illustration.

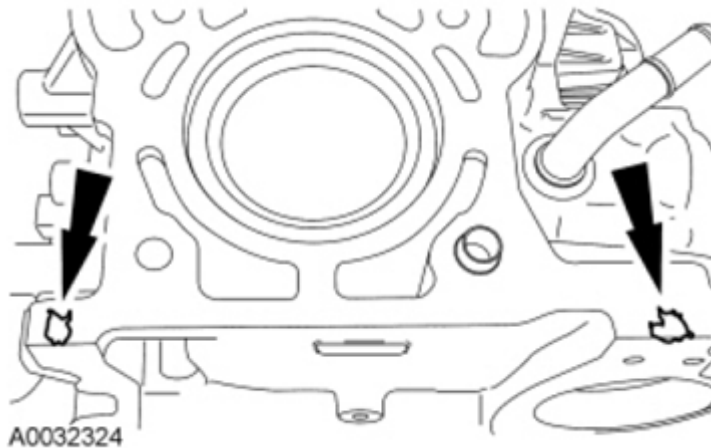


Fig. 150: Locating Silicone Gasket And Sealant Applying Areas Of Cylinder Block
Courtesy of FORD MOTOR CO.

5. Install a new head gasket.

NOTE: The cylinder head bolts are torque-to-yield and must not be reused. New cylinder head bolts must be installed.

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

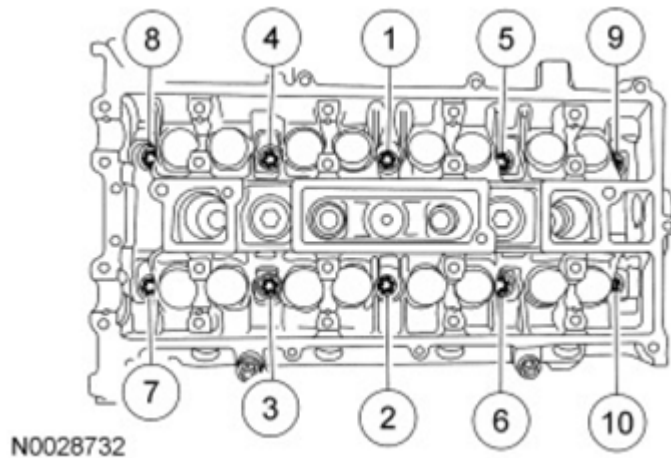


Fig. 151: Tightening Sequence Of Cylinder Head Bolts
Courtesy of FORD MOTOR CO.

6. Install the cylinder head and 10 new bolts. Tighten the bolts in the sequence shown in illustration in 5 stages:
 - Stage 1: Tighten to 5 Nm (44 lb-in).
 - Stage 2: Tighten to 15 Nm (133 lb-in).
 - Stage 3: Tighten to 45 Nm (33 lb-ft).

- Stage 4: Turn 90 degrees.
 - Stage 5: Turn an additional 90 degrees.
7. Connect the upper radiator hose, coolant bypass hose, heater hose and coolant vent hose to the engine coolant outlet.
 8. Connect the EGR coolant hose to the EGR valve.
 9. Connect the EGR valve electrical connector.
 10. Install the exhaust manifold. For additional information, refer to **EXHAUST MANIFOLD** in this service information.
 11. Install the generator. For additional information, refer to **CHARGING SYSTEM** article.
 12. Install the intake manifold. For additional information, refer to **INTAKE MANIFOLD** in this service information.

NOTE: Lubricate the valve tappets with clean engine oil.

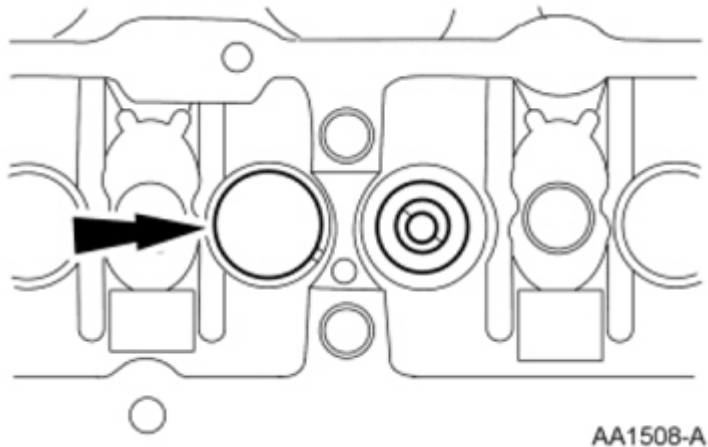


Fig. 152: Locating Valve Tappets
Courtesy of FORD MOTOR CO.

13. Install the valve tappets in their original positions.

NOTE: Install the camshafts with the alignment notches in the camshafts lined up so the camshaft alignment plate can be installed. Make sure the lobes on the No. 1 cylinder are in the same position as noted in the removal procedure. Failure to follow this procedure can cause severe damage to the valves and pistons.

NOTE: Lubricate the camshaft journals and bearing caps with clean engine oil.

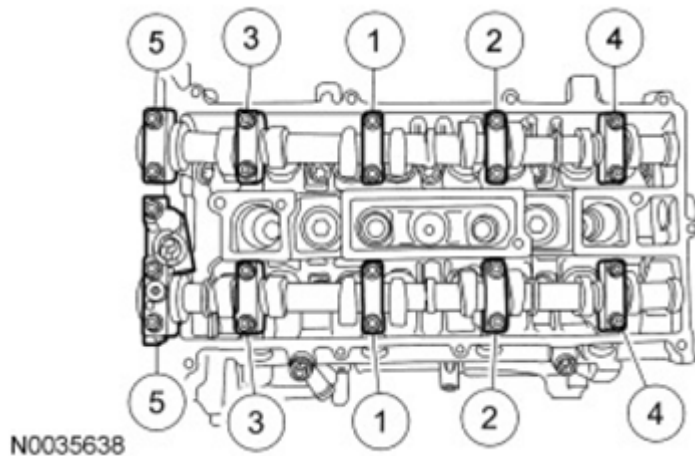


Fig. 153: Identifying Tightening Sequence Of Camshaft Bearing Cap Bolts
Courtesy of FORD MOTOR CO.

14. Install the camshafts and bearing caps in their original location and orientation. Tighten the bearing caps in the sequence shown in illustration in 3 stages:
 - Stage 1: Tighten the camshaft bearing cap bolts, one turn at a time, until finger-tight.
 - Stage 2: Tighten to 7 Nm (62 lb-in).
 - Stage 3: Tighten to 16 Nm (142 lb-in).
15. Install the Camshaft Alignment Plate.

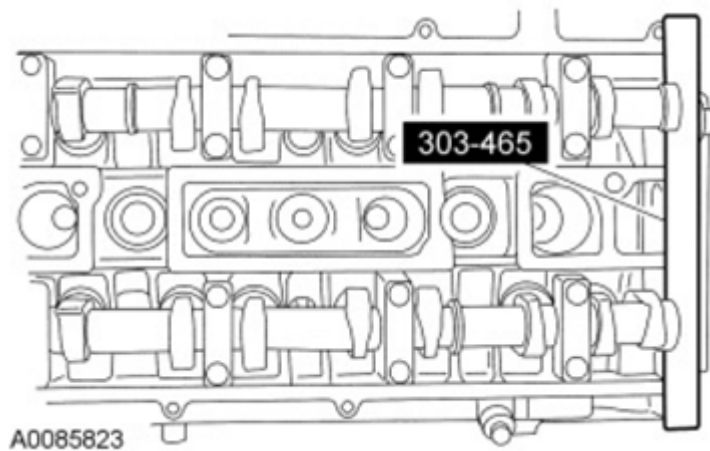


Fig. 154: View Of Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

16. Install the timing drive components. For additional information, refer to **TIMING DRIVE COMPONENTS** in this service information.
17. Install the VCT oil control solenoid. For additional information, refer to **ELECTRONIC ENGINE CONTROLS - 2.5L** article.
18. Fill and bleed the engine cooling system. For additional information, refer to **ENGINE COOLING**

article.

ENGINE LUBRICATION COMPONENTS - EXPLODED VIEW

Oil Filter Adapter, Spin-on Oil Filter and Engine Oil Pressure (EOP) Switch

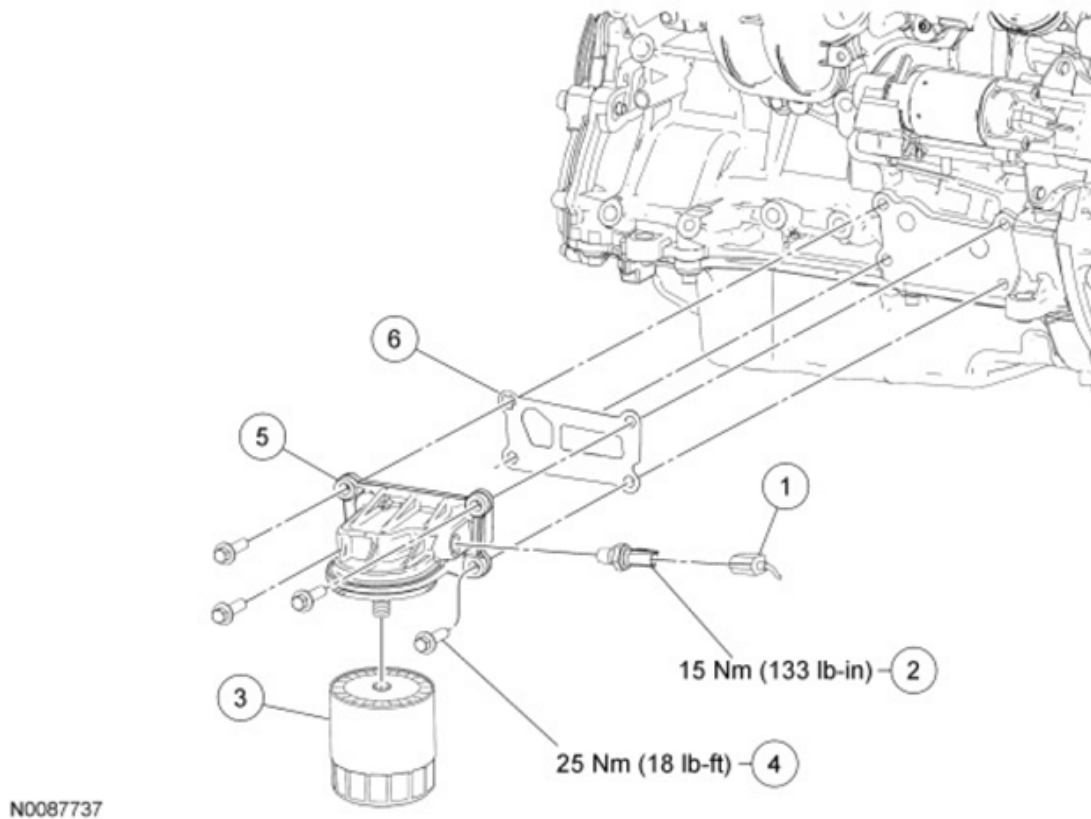


Fig. 155: Exploded View Of Engine Lubrication Components With Torque Specifications - (1 Of 5)
Courtesy of FORD MOTOR CO.

PARTS DESCRIPTION CHART

Item	Part Number	Description
1	14A464	Engine Oil Pressure (EOP) switch electrical connector (part of 12C508)
2	9278	EOP switch
3	6731	Spin-on oil filter
4	W500225	Oil filter adapter bolt (4 required)
5	6884	Oil filter adapter
6	6A636	Oil filter adapter gasket

Oil Pan, Oil Pump Screen and Pickup Tube, Front Wheel Drive (FWD) Vehicles

NOTE: Automatic transmission shown in illustration, manual transmission similar.

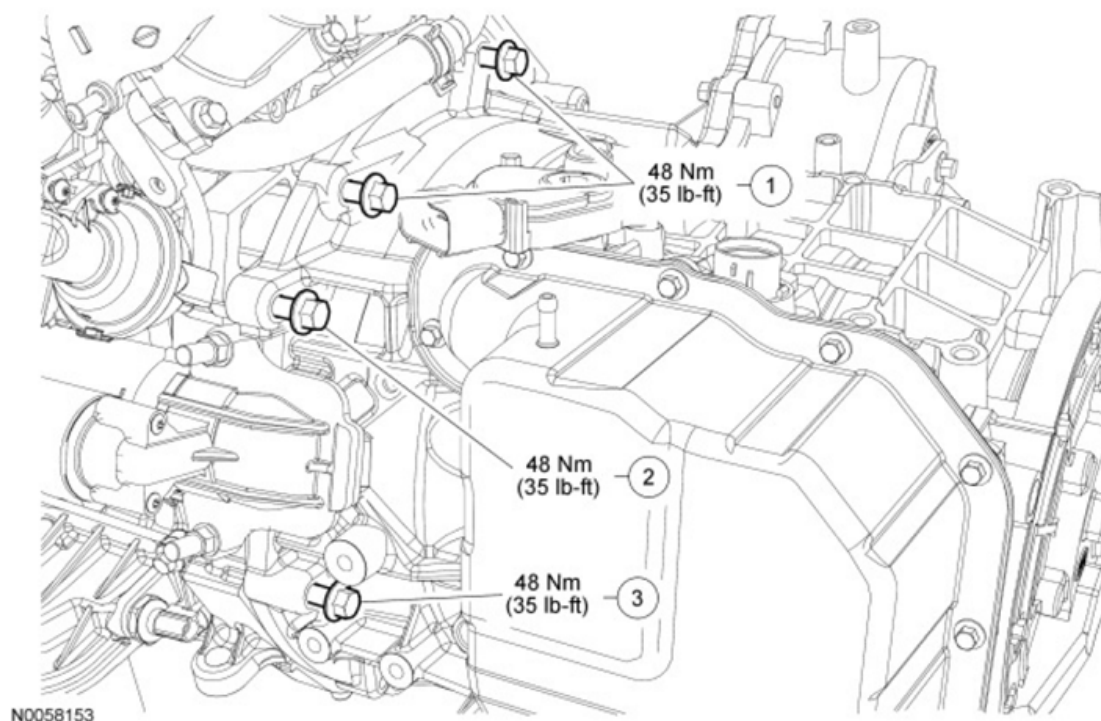


Fig. 156: Exploded View Of Engine Lubrication Components With Torque Specifications - (2 Of 5)
Courtesy of FORD MOTOR CO.

PARTS DESCRIPTION CHART

Item	Part Number	Description
1	W500121	Upper bellhousing-to-engine bolts
2	W500121	LH bellhousing-to-engine bolt
3	W500125	LH bellhousing-to-engine bolt

Oil Pan, Oil Pump Screen and Pickup Tube, All-Wheel Drive (AWD) Vehicles

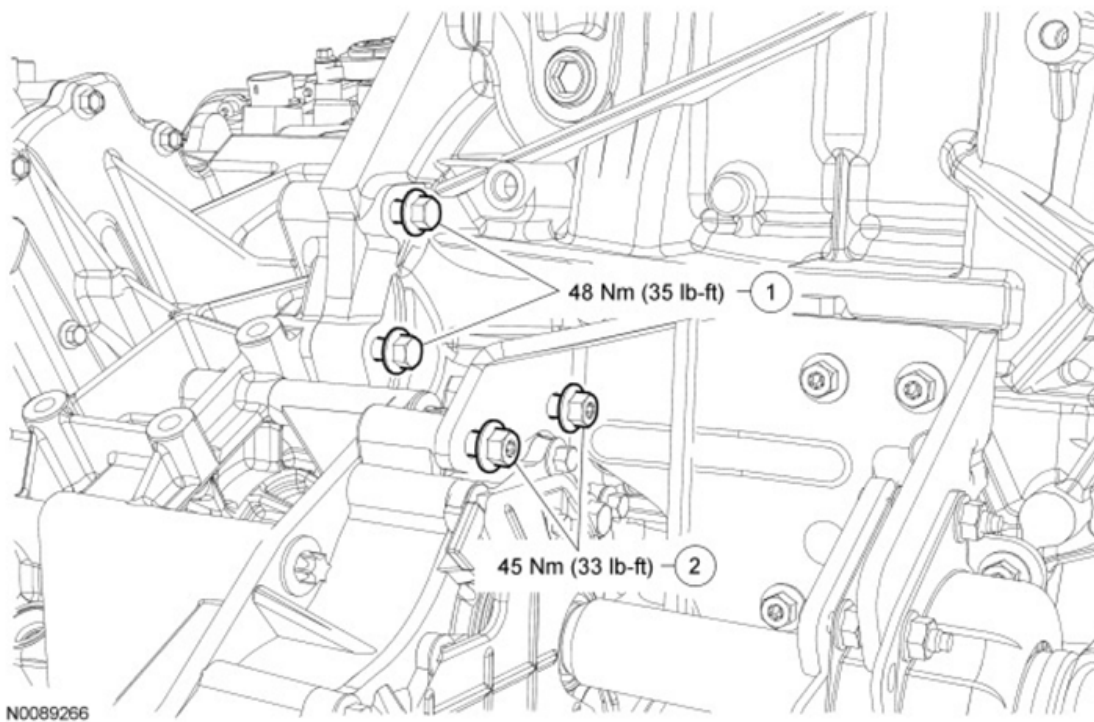
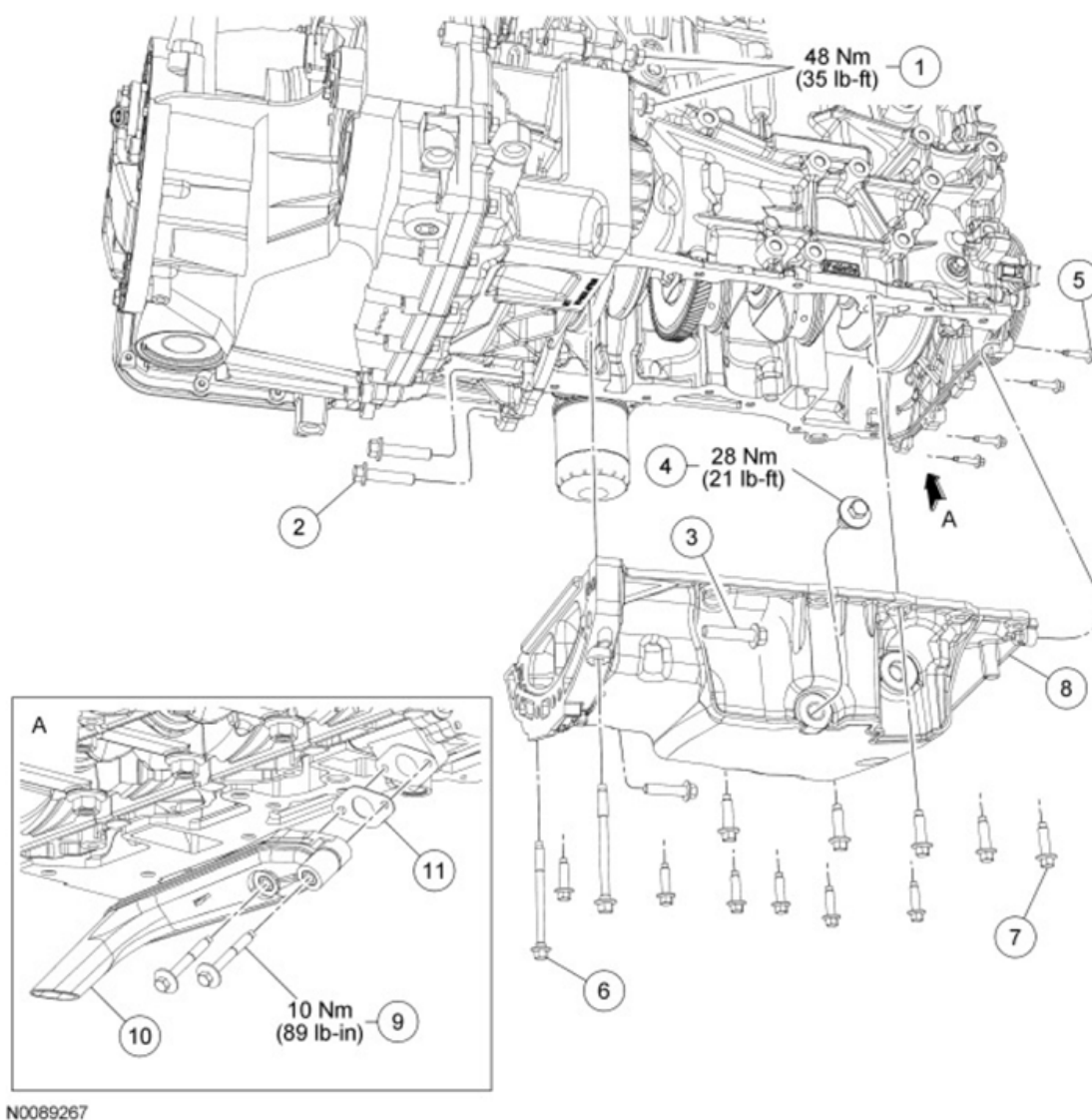


Fig. 157: Exploded View Of Engine Lubrication Components With Torque Specifications - (3 Of 5)
 Courtesy of FORD MOTOR CO.

PARTS DESCRIPTION CHART

Item	Part Number	Description
1	W500125	RH engine-to-bellhousing bolts (2 required for automatic transaxle) (1 required for manual transaxle)
2	W707386	RH engine bracket-to-Power Transfer Unit (PTU) bolts

Oil Pan, Oil Pump Screen and Pickup Tube



N0089267

Fig. 158: Exploded View Of Engine Lubrication Components With Torque Specifications - (4 Of 5)
Courtesy of FORD MOTOR CO.

PARTS DESCRIPTION CHART

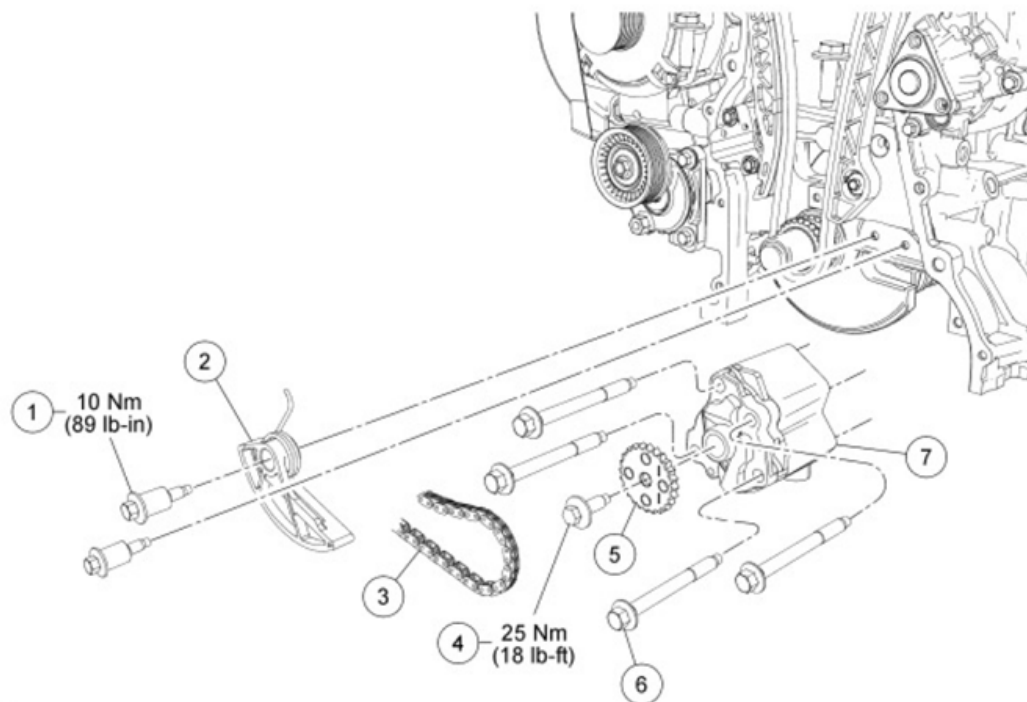
Item	Part Number	Description
1	W500120	RH engine-to-bellhousing bolts (Front Wheel Drive (FWD) vehicles)
2	W500121	Bellhousing-to-oil pan bolt (2 required)
3	W500121	Oil pan-to-bellhousing bolt (2 required)
4	6730	Oil pan drain plug
5	W500215	Engine front cover-to-oil pan bolt (4 required)
6	W706284	Oil pan bolt (2 required)
7	W500224	Oil pan bolt (11 required)
8	6675	Oil pan

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9	W706282	Oil pump screen and pickup tube bolt (2 required)
10	6622	Oil pump screen and pickup tube
11	6625	Oil pump screen and pickup tube gasket

Oil Pump



N0070733

Fig. 159: Exploded View Of Engine Lubrication Components With Torque Specifications - (5 Of 5)
Courtesy of FORD MOTOR CO.

PARTS DESCRIPTION CHART

Item	Part Number	Description
1	W703651	Oil pump drive chain tensioner shoulder bolt (2 required)
2	6C271	Oil pump drive chain tensioner
3	6A895	Oil pump drive chain
4	W704397	Oil pump sprocket bolt
5	6652	Oil pump sprocket
6	W703647	Oil pump bolt (4 required)
7	6600	Oil pump

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

OIL FILTER ADAPTER

Material

MATERIAL SPECIFICATIONS

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

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** article.
2. Remove the 5 bolts, the pin-type retainer (not shown in illustration) and the RH splash shield.
 - To install, tighten to 9 Nm (80 lb-in).



Fig. 160: Locating RH Splash Shield Bolts
Courtesy of FORD MOTOR CO.

3. Disconnect the Engine Oil Pressure (EOP) switch electrical connector.
4. Remove the spin-on oil filter.
 - To install, lubricate the spin-on oil filter gasket with clean engine oil and tighten the oil filter three-fourths turn after the oil filter gasket makes contact with the oil filter adapter.

NOTE: Discard the gasket.

5. Remove the 4 bolts and the oil filter adapter.
 - To install, tighten to 25 Nm (18 lb-ft).
6. To install, reverse the removal procedure.

ENGINE OIL PRESSURE (EOP) SWITCH

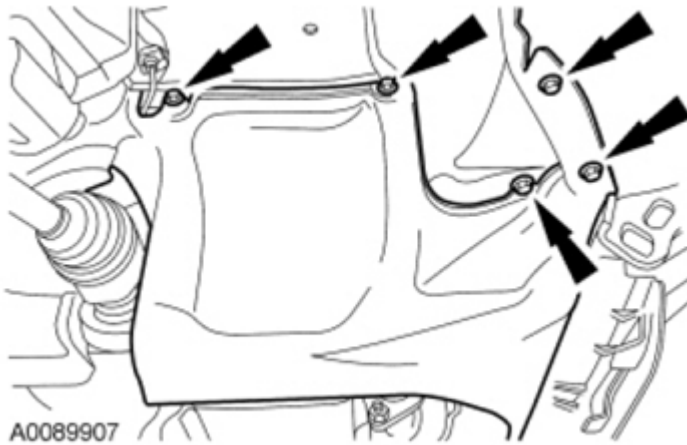
Material

MATERIAL SPECIFICATIONS

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

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 5 bolts, pin-type retainer (not shown in illustration) and the RH splash shield.
 - To install, tighten to 9 Nm (80 lb-in).

**Fig. 161: Locating RH Splash Shield Bolts**

Courtesy of FORD MOTOR CO.

3. Disconnect the Engine Oil Pressure (EOP) switch electrical connector.
4. Remove the **EOP** switch.
 - To install, tighten to 15 Nm (133 lb-in).
5. To install, reverse the removal procedure.
 - Apply thread sealant to the EOP switch threads.

OIL PAN**Material****MATERIAL SPECIFICATIONS**

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

Premium Motor Oil (Canada) XO-5W20-QSP (US); CXO-5W20-LSP12 (Canada)
Silicone Gasket and Sealant TA-30

WSE-M4G323-A4

Removal

All vehicles

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** article.
2. Remove the Air Cleaner (ACL) outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING - 2.5L** article.

NOTE: To prevent damage to the transmission, do not loosen the transmission-to-engine bolts more than 5 mm (0.19 in).

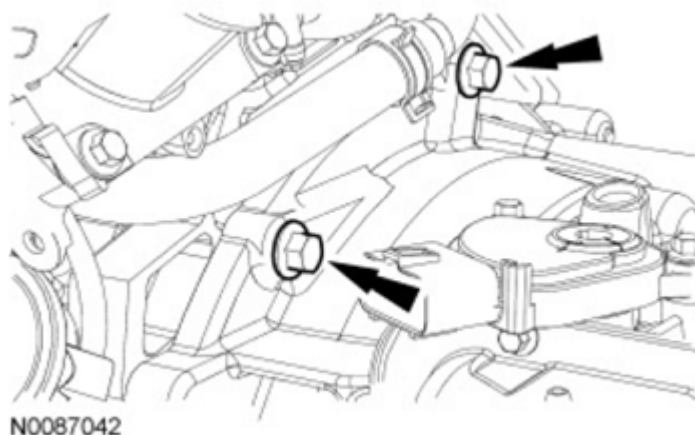


Fig. 162: Locating Upper Bellhousing-To-Engine Bolts
Courtesy of FORD MOTOR CO.

3. Loosen the 2 upper bellhousing-to-engine bolts 5 mm (0.19 in).

All-Wheel Drive (AWD) vehicles

4. Working from the top of the vehicle, loosen the 2 RH engine-to-bellhousing bolts 5 mm (0.19 in).

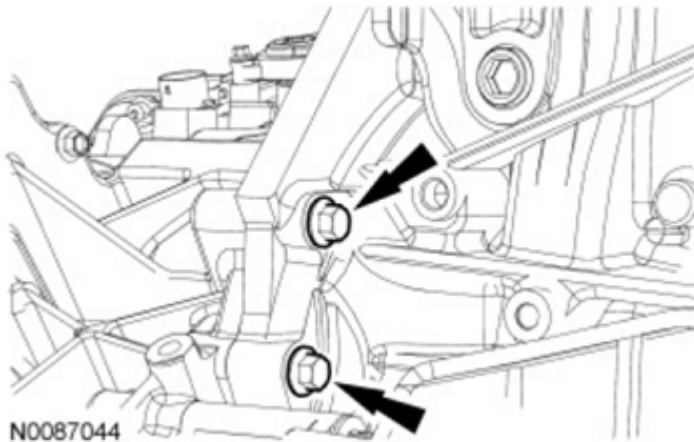


Fig. 163: Locating RH Engine-To-Bellhousing Bolts (All-Wheel Drive Vehicles)
Courtesy of FORD MOTOR CO.

5. Working from under the vehicle, loosen the 2 RH engine bracket-to-Power Transfer Unit (PTU) bolts 5 mm (0.19 in).

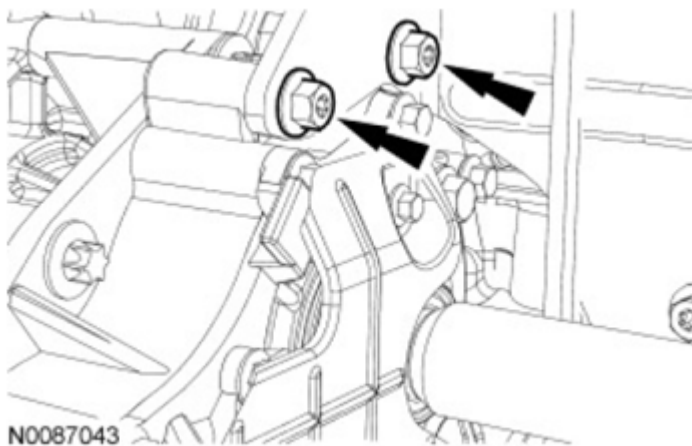


Fig. 164: Locating RH Engine Bracket-To-Power Transfer Unit (PTU) Bolts
Courtesy of FORD MOTOR CO.

All vehicles

6. Remove the 7 retainers (5 shown in illustration) and the LH splash shield.

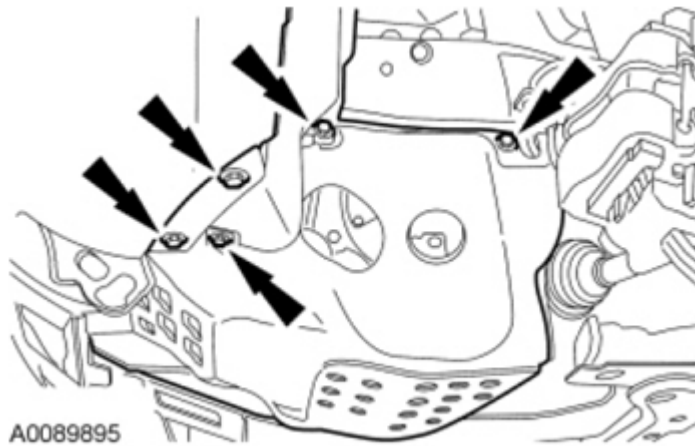


Fig. 165: Locating LH Splash Shield Retainers
Courtesy of FORD MOTOR CO.

7. Loosen the 2 LH bellhousing-to-engine bolts 5 mm (0.19 in).

Front Wheel Drive (FWD) vehicles

8. Loosen the 1 (manual transaxle) or 2 (automatic transaxle) RH engine-to-bellhousing bolt 5 mm (0.19 in).

All vehicles

9. Remove the 2 oil pan-to-bellhousing bolts.
10. Remove the 2 bellhousing-to-oil pan bolts.
11. Slide the transaxle rearward 5 mm (0.19 in).
12. Drain the engine oil.
 - Install the drain plug.
 - Tighten to 28 Nm (21 lb-ft).
13. Remove the 4 engine front cover-to-oil pan bolts.
14. Remove the 13 bolts and the oil pan.

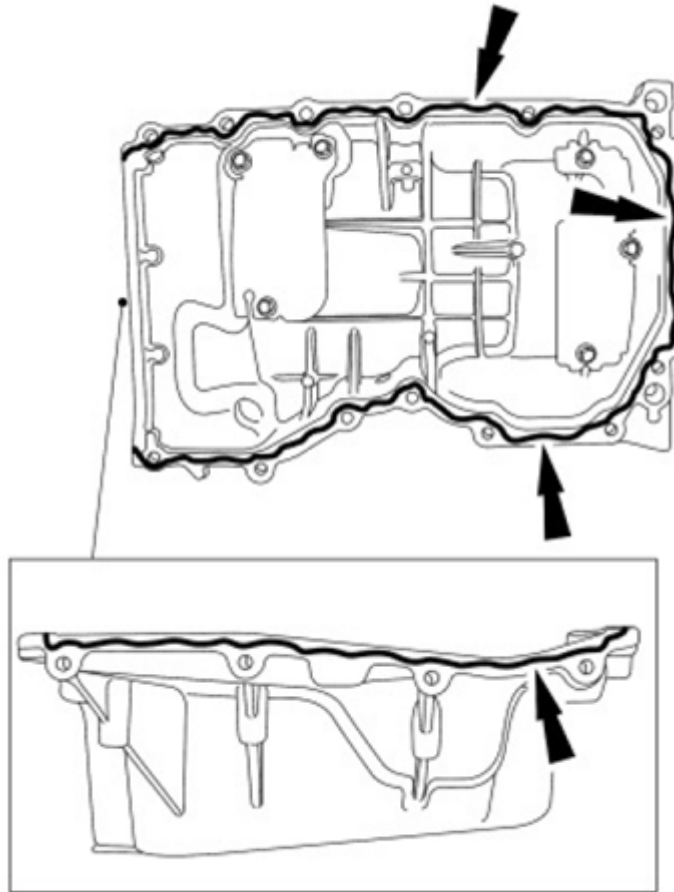
Installation

All vehicles

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

1. Clean and inspect all mating surfaces.

NOTE: If the oil pan is not secured within 10 minutes of sealant application, the sealant must be removed and the sealing area cleaned with metal surface prep. Allow to dry until there is no sign of wetness, or 10 minutes, whichever is longer. Failure to follow this procedure can cause future oil leakage.



N0085941

Fig. 166: Locating Gasket And Sealant Applying Area Of Oil Pan-To-Engine Block
Courtesy of FORD MOTOR CO.

2. Apply a 2.5 mm (0.09 in) bead of silicone gasket and sealant to the oil pan-to-engine block and to the oil pan-to-engine front cover mating surface.
3. Position the oil pan onto the engine and install the oil pan bolts finger-tight.

NOTE: The engine front cover-to-oil pan bolts must be tightened first to align the front surface of the oil pan flush with the front surface of the engine block.

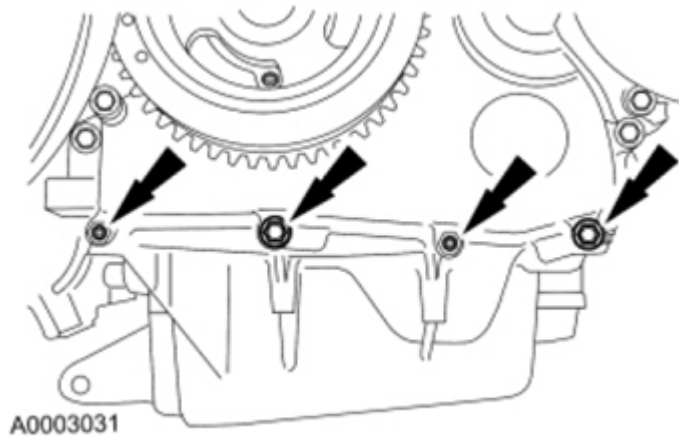


Fig. 167: Locating Oil Pan Bolts
Courtesy of FORD MOTOR CO.

4. Install the 4 engine front cover-to-oil pan bolts.
 - Tighten to 10 Nm (89 lb-in).
5. Tighten the oil pan bolts in the sequence shown in illustration.
 - Tighten to 25 Nm (18 lb-ft).

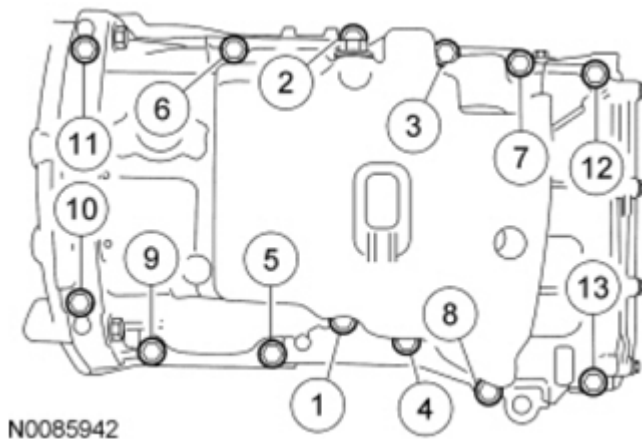


Fig. 168: Tightening Sequence Of Oil Pan Bolts
Courtesy of FORD MOTOR CO.

FWD vehicles

6. Alternate tightening the 1 LH bellhousing-to-engine and 1 RH engine-to-bellhousing bolts to slide the transaxle and engine together.
 - Tighten to 48 Nm (35 lb-ft).
7. Tighten the 1 remaining LH bellhousing-to-engine bolt.
 - Tighten to 48 Nm (35 lb-ft).

8. Tighten the 1 remaining RH engine-to-bellhousing bolt (automatic transaxle).
 - Tighten to 48 Nm (35 lb-ft).

AWD vehicles

9. Alternate tightening the 1 RH engine-to-**PTU** bracket bolt and 1 LH bellhousing-to-engine bolt to slide transaxle and engine together.
 - Tighten the **PTU** bracket bolt to 45 Nm (33 lb-ft).
 - Tighten the LH bellhousing bolt to 48 Nm (35 lb-ft).
10. Tighten the remaining RH engine-to-**PTU** bracket bolt.
 - Tighten to 45 Nm (33 lb-ft).
11. Tighten the 1 remaining LH lower bolt.
 - Tighten to 48 Nm (35 lb-ft).

All vehicles

12. Install the 2 bellhousing-to-oil pan bolts.
 - Tighten to 48 Nm (35 lb-ft).
13. Install the 2 oil pan-to-bellhousing bolts.
 - Tighten to 48 Nm (35 lb-ft).
14. Install the LH splash shield and the 7 retainers (5 shown in illustration).
 - Tighten to 9 Nm (80 lb-in).

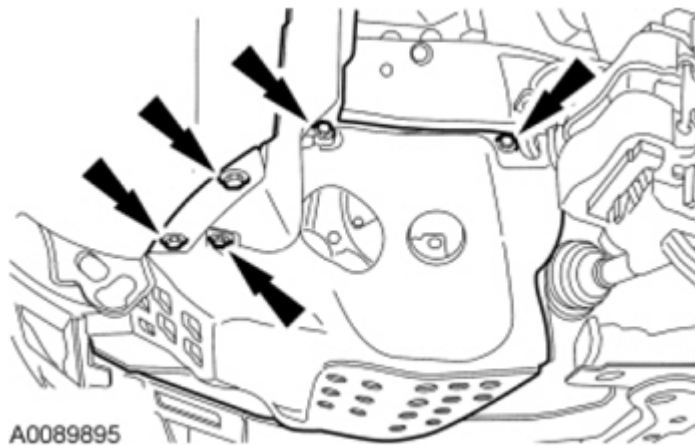


Fig. 169: Locating LH Splash Shield Retainers
 Courtesy of FORD MOTOR CO.

AWD vehicles

15. Working from the top of vehicle, tighten the 2 RH engine-to-bellhousing bolts.
 - Tighten to 48 Nm (35 lb-ft).

All vehicles

16. Tighten the 2 upper bellhousing-to-engine bolts.
 - Tighten to 48 Nm (35 lb-ft).
17. Install the **ACL** outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING - 2.5L** article.
18. Fill the engine with clean engine oil.

OIL PUMP SCREEN AND PICKUP TUBE**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 pan. For additional information, refer to **ENGINE LUBRICATION COMPONENTS - EXPLODED VIEW** and **Oil Pan** in this service information.

NOTE: Discard the gasket and clean and inspect the gasket mating surfaces.

3. Remove the 2 bolts and the oil pump screen and pickup tube.
 - To install, tighten to 10 Nm (89 lb-in).
4. To install, reverse the removal procedure.

OIL PUMP**Material****MATERIAL SPECIFICATIONS**

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 engine in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** article.
2. Remove the engine front cover. For additional information, refer to **ENGINE FRONT COVER** in this service information.
3. Drain the engine oil, then install the drain plug.

- To install, tighten to 28 Nm (21 lb-ft).
4. Remove the 4 oil pan-to-bellhousing bolts.
 5. Remove the 13 bolts and the oil pan.

NOTE: Discard the gasket and clean and inspect the gasket mating surfaces.

6. Remove the 2 bolts and the oil pump screen and pickup tube.
 - To install, tighten to 10 Nm (89 lb-in).
7. Remove the oil pump drive chain tensioner.
 1. Release the tension on the tensioner spring.
 2. Remove the 2 shoulder bolts and the tensioner.

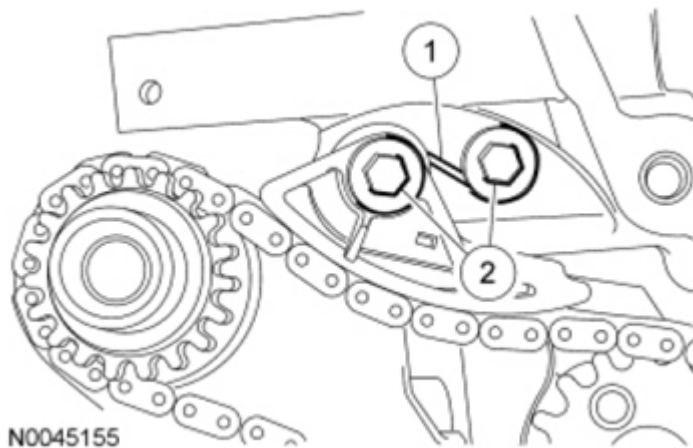


Fig. 170: Locating Oil Pump Drive Chain Tensioner And Shoulder Bolts
Courtesy of FORD MOTOR CO.

8. Remove the chain from the oil pump sprocket.
9. Remove the bolt and oil pump sprocket.
10. Remove the 4 bolts and the oil pump.

Installation

NOTE: Clean the oil pump and cylinder block mating surfaces with metal surface prep.

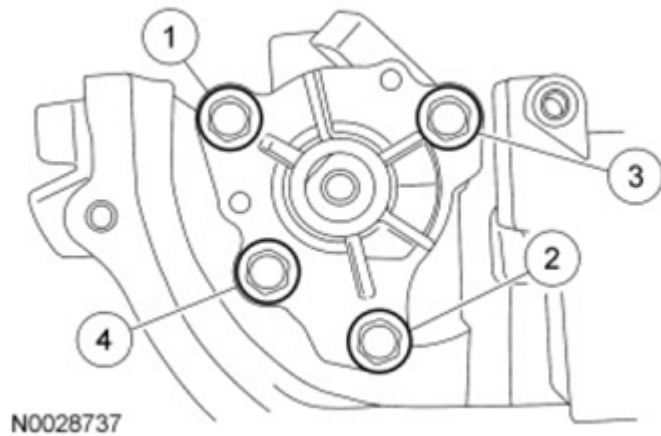


Fig. 171: Tightening Sequence Of Oil Pump Assembly Bolts
Courtesy of FORD MOTOR CO.

1. Install the oil pump assembly. Tighten the 4 bolts in the sequence shown in illustration in 2 stages:
 - Stage 1: Tighten to 10 Nm (89 lb-in).
 - Stage 2: Tighten to 20 Nm (177 lb-in).
2. Install the oil pump sprocket and bolt.
 - Tighten to 25 Nm (18 lb-ft).
3. Install the chain onto the oil pump sprocket.
4. Install the oil pump drive chain tensioner shoulder bolt.
 - Tighten to 10 Nm (89 lb-in).

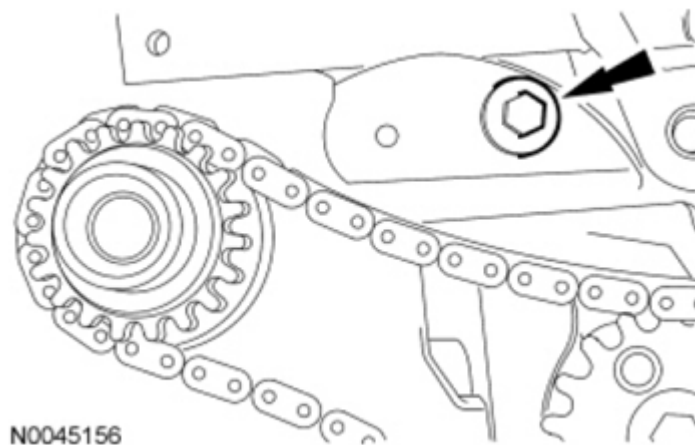


Fig. 172: Locating Oil Pump Drive Chain Tensioner Shoulder Bolt
Courtesy of FORD MOTOR CO.

5. Install the oil pump drive chain tensioner and bolt. Hook the tensioner spring around the shoulder bolt.
 - Tighten to 10 Nm (89 lb-in).

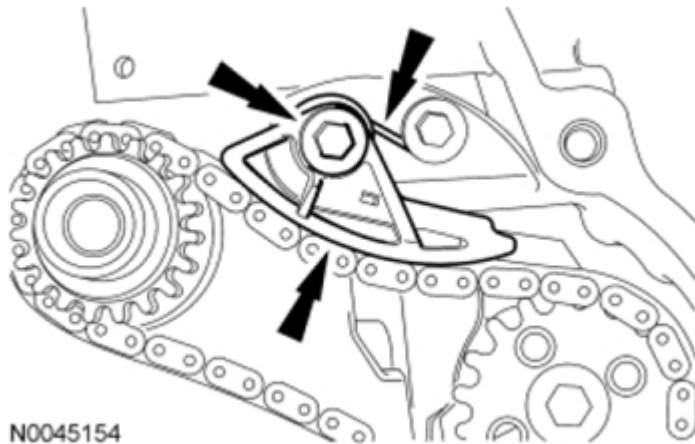


Fig. 173: Locating Oil Pump Drive Chain Tensioner And Shoulder Bolt
Courtesy of FORD MOTOR CO.

6. Install the oil pump screen and pickup tube and the 2 bolts.
 - Tighten to 10 Nm (89 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. Use a plastic scraping tool to remove traces of sealant.

7. Clean all mating surfaces with metal surface prep.

NOTE: If the oil pan is not secured within 10 minutes of sealant application, the sealant must be removed and the sealing area cleaned with metal surface prep. Allow to dry until there is no sign of wetness, or 10 minutes, whichever is longer. Failure to follow this procedure can cause future oil leakage.

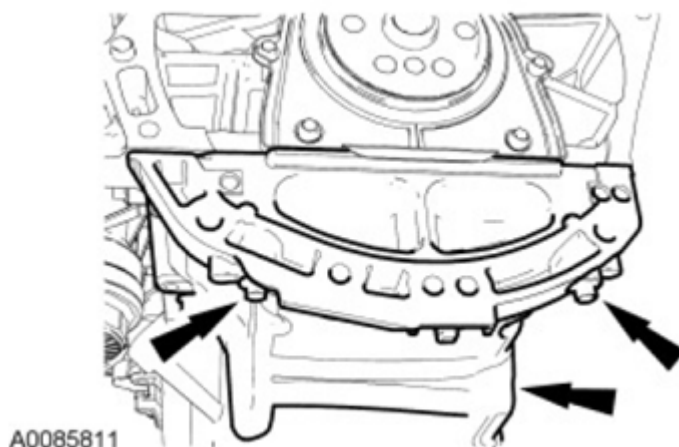
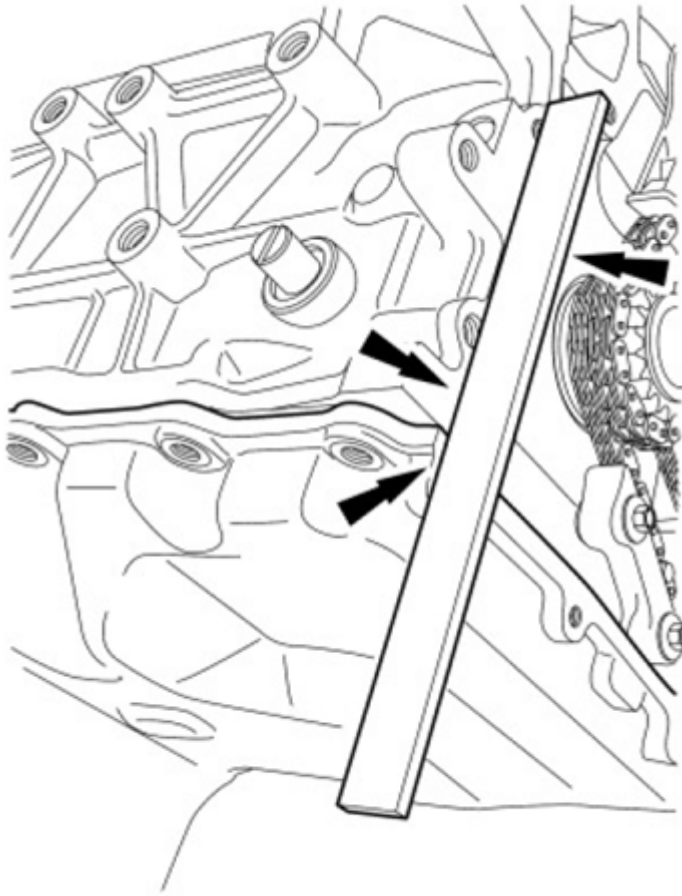


Fig. 174: Locating Oil Pan Bolts
Courtesy of FORD MOTOR CO.

8. Apply a 2.5 mm (0.09 in) bead of sealant gasket and sealant to the oil pan.
 - Position the oil pan onto the engine and install the 2 rear oil pan bolts finger-tight.
9. Using a suitable straight edge, align the front surface of the oil pan flush with the front surface of the engine block.



N0039349

Fig. 175: Aligning Front Surface Of Oil Pan
Courtesy of FORD MOTOR CO.

10. Install the remaining oil pan bolts.
 - Tighten in the sequence shown in illustration to 25 Nm (18 lb-ft).

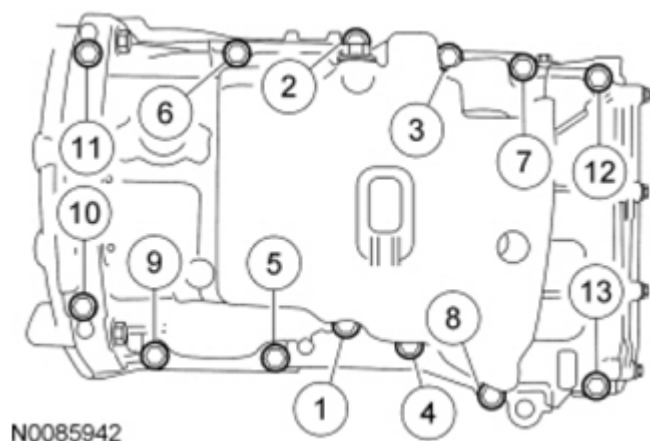


Fig. 176: Tightening Sequence Of Oil Pan Bolts
Courtesy of FORD MOTOR CO.

11. Install the 4 oil pan-to-bellhousing bolts.
 - Tighten to 48 Nm (35 lb-ft).
12. Install the engine front cover. For additional information, refer to **ENGINE FRONT COVER** in this service information.
13. Fill the engine with clean engine oil.

EXHAUST MANIFOLD

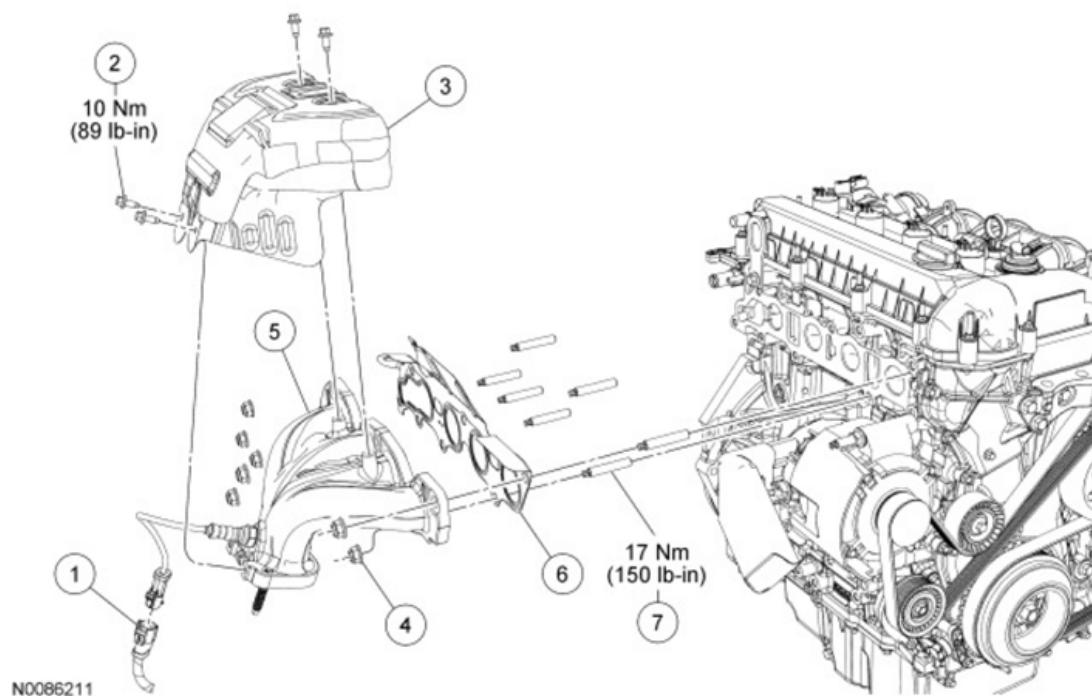


Fig. 177: Identifying Exhaust Manifold Components With Torque Specifications
Courtesy of FORD MOTOR CO.

EXHAUST MANIFOLD PARTS DESCRIPTION CHART

Item	Part Number	Description
1	14A464	Heated Oxygen Sensor (HO2S) electrical connector (part of 12C508)
2	W713299	Exhaust manifold heat shield bolt (4 required)
3	9N454	Exhaust manifold heat shield
4	W713652	Exhaust manifold nut (7 required)
5	9430	Exhaust manifold
6	9448	Exhaust manifold gasket
7	W704474	Exhaust manifold stud (7 required)

Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** article.
2. Remove the exhaust downpipe and exhaust intermediate pipe. For additional information, refer to **EXHAUST SYSTEM** article.
3. Disconnect the Heated Oxygen Sensor (HO2S) electrical connector.
4. Remove the 4 exhaust manifold heat shield bolts and the heat shield.
5. Remove and discard the 7 exhaust manifold nuts.
6. Remove the exhaust manifold and discard the exhaust manifold gasket.
7. Remove and discard the 7 exhaust manifold studs.
8. Clean and inspect the exhaust manifold. For additional information, refer to **ENGINE MECHANICAL SYSTEM - GENERAL INFORMATION** article.

Installation

1. Install the 7 new exhaust manifold studs.
 - Tighten to 17 Nm (150 lb-in).

NOTE: Failure to tighten the catalytic converter nuts to specification before installing the converter bracket bolts will cause the converter to develop an exhaust leak.

NOTE: Failure to tighten the catalytic converter nuts to specification a second time will cause the converter to develop an exhaust leak.

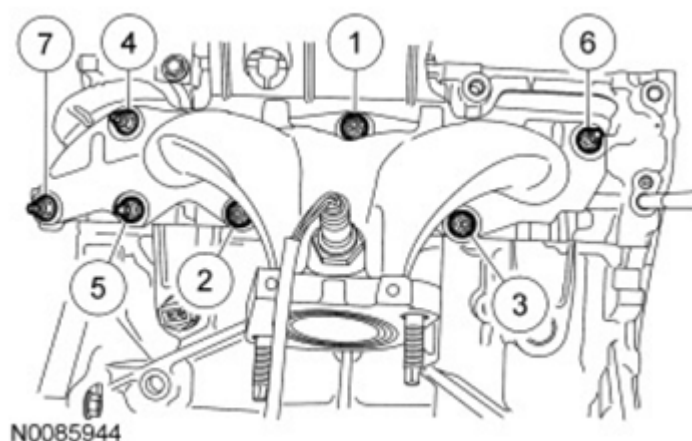


Fig. 178: Tightening Sequence Of Exhaust Manifold Gasket Nuts

Courtesy of FORD MOTOR CO.

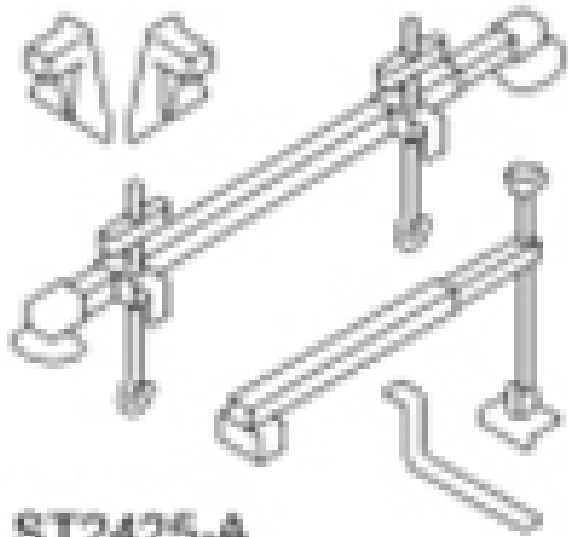
2. Install a new exhaust manifold gasket, the exhaust manifold and 7 new nuts in the sequence shown in illustration in 2 stages:
 - Stage 1: Tighten to 48 Nm (35 lb-ft).
 - Stage 2: Tighten to 48 Nm (35 lb-ft).
3. Install the exhaust manifold heat shield and the 4 bolts.
 - Tighten to 10 Nm (89 lb-in).
4. Connect the **HO2S** electrical connector.
5. Install the exhaust downpipe and exhaust intermediate pipe. For additional information, refer to **EXHAUST SYSTEM** article.

ENGINE MOUNT

Special Tool(s)

SPECIAL TOOLS DESCRIPTION

Support Bar, Engine
303-F072



ST2425-A

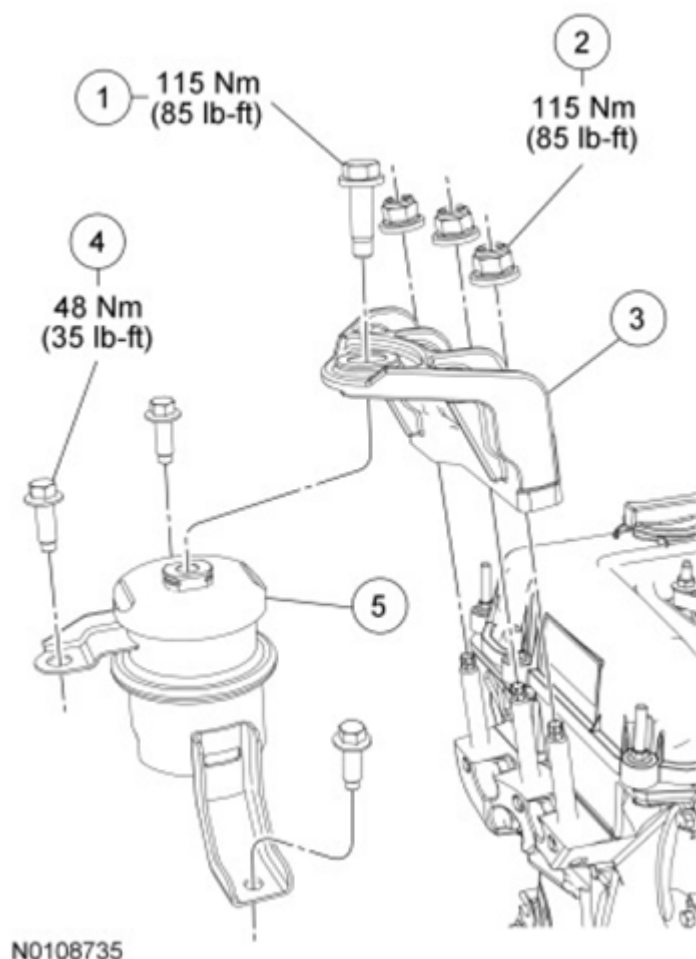


Fig. 179: Identifying Engine Mount With Torque Specifications
Courtesy of FORD MOTOR CO.

ENGINE MOUNT PARTS DESCRIPTION CHART

Item	Part Number	Description
1	W714723	Engine mount bracket bolt
2	N807144	Engine mount bracket nut (3 required)
3	6A094	Engine mount bracket
4	W500233	Engine mount bolt (3 required)
5	6068	Engine mount

Removal and Installation

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** article.
2. Install the Engine Support Bar.

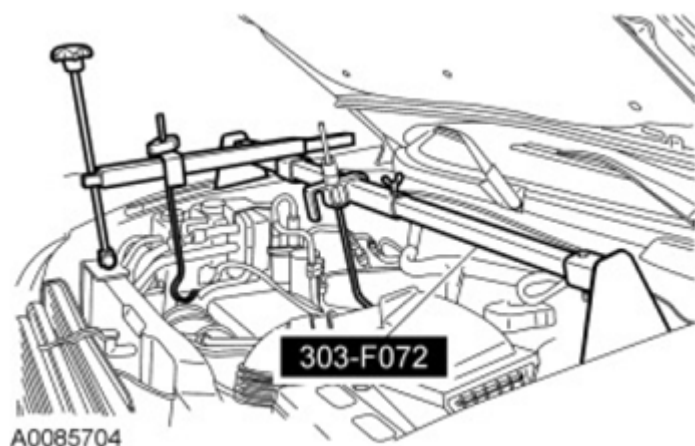


Fig. 180: Identifying Engine Support Bar
Courtesy of FORD MOTOR CO.

3. Remove the engine mount bracket bolt.
 - To install, tighten to 115 Nm (85 lb-ft).
4. Use the Engine Support Bar to raise the engine 25 mm (0.98 in).

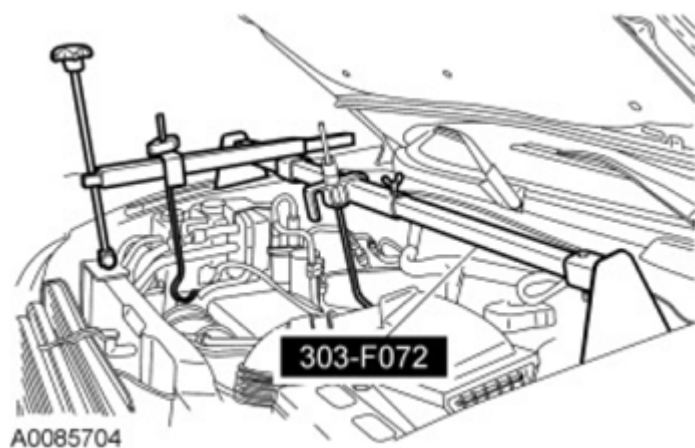
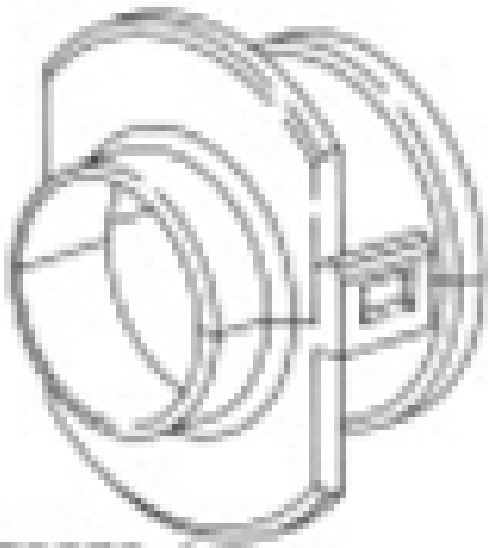
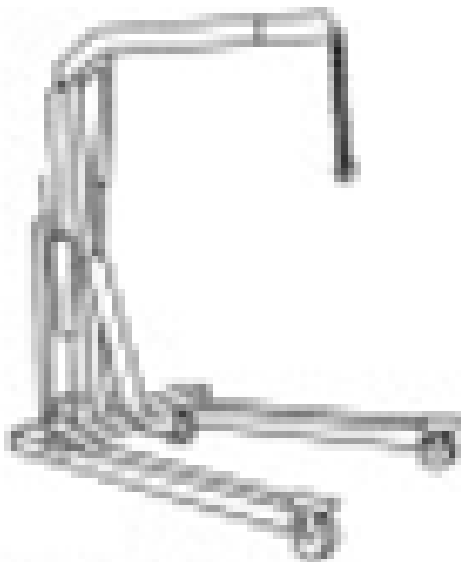


Fig. 181: Identifying Engine Support Bar
Courtesy of FORD MOTOR CO.

5. Remove the 3 nuts and the engine mount bracket.
 - To install, tighten to 115 Nm (85 lb-ft).
6. Remove the 3 bolts and the engine mount.
 - To install, tighten to 48 Nm (35 lb-ft).
7. To install, reverse the removal procedure.

REMOVAL

ENGINE - AUTOMATIC TRANSAXLE**Special Tool(s)****SPECIAL TOOLS DESCRIPTION****ST2870-A**Disconnect Tool, Transmission Cooler Line
307-569**ST1341-A**2,200# Floor Crane, Fold Away
300-OTC1819E or equivalent

2011 Mercury Mariner

2011 ENGINE Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)



Powertrain Lift
014-00765 or equivalent

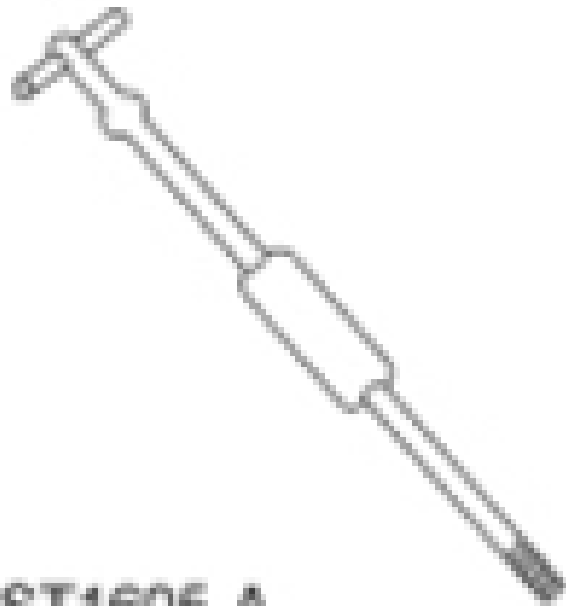


Remover, Halfshaft Oil Seal
308-428

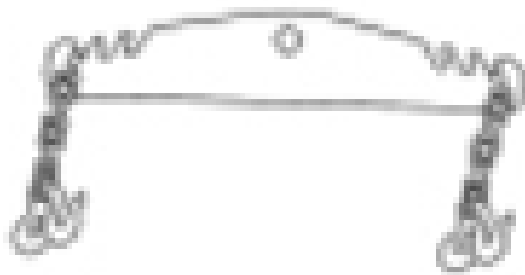
Slide Hammer
100-001 (T50T-100-A)

2011 Mercury Mariner

2011 ENGINE Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)



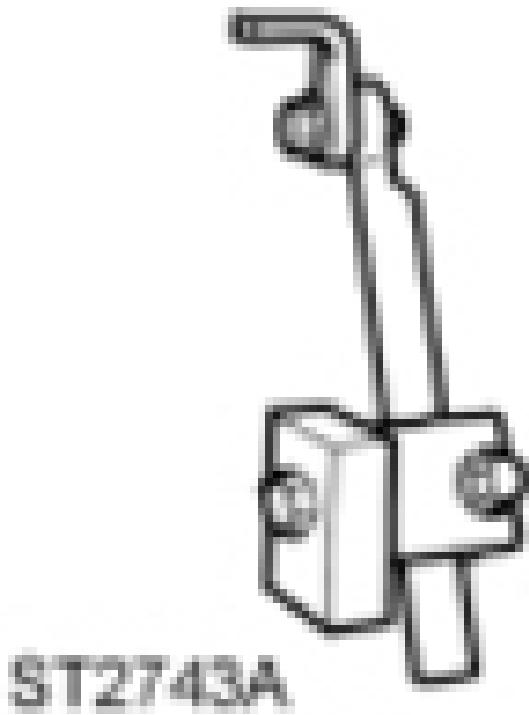
ST1605-A



ST1602-A

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

Adjustable Grip Arm, 1735A
014-00001 or equivalent

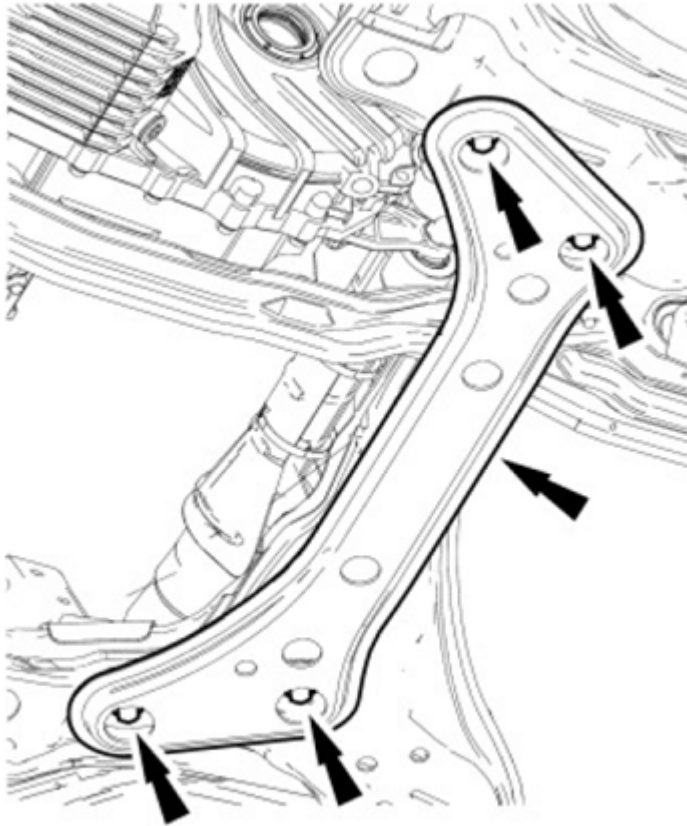


WARNING: Do not smoke, carry lighted tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

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** article.
3. Remove the engine Air Cleaner (ACL) and ACL outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING - 2.5L** article.
4. Remove the battery tray. For additional information, refer to **BATTERY, BATTERY MOUNTING SYSTEM & BATTERY CABLES** article.
5. Drain the engine oil.
 - Install the drain plug.
 - To install, tighten to 28 Nm (21 lb-ft).
6. Remove the RH and LH halfshafts. For additional information, refer to **FRONT DRIVE HALFSHAFTS** article.

7. Drain the cooling system. For additional information, refer to **ENGINE COOLING** article.
8. Remove the bolts and the lateral support crossmember.



A0087403

Fig. 182: Locating Lateral Support Crossmember Bolts
Courtesy of FORD MOTOR CO.

9. Remove the exhaust downpipe and exhaust intermediate pipe. For additional information, refer to **EXHAUST SYSTEM** article.
10. Remove the 2 intermediate shaft bearing retainer nuts.

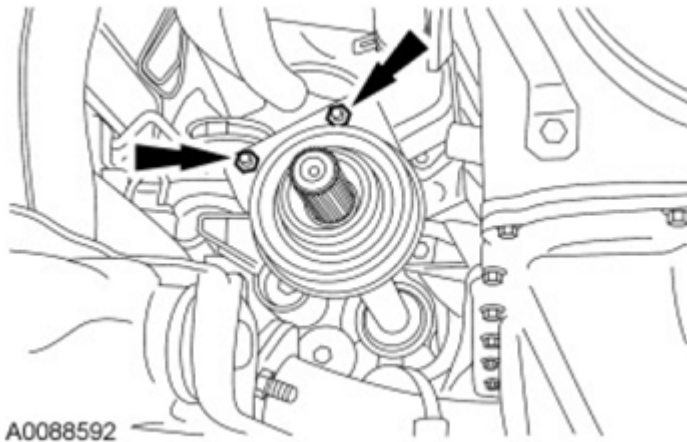


Fig. 183: Locating Intermediate Shaft Bearing Retainer Nuts
Courtesy of FORD MOTOR CO.

NOTE: On All-Wheel Drive (AWD) vehicles, the Power Transfer Unit (PTU) seal must be replaced every time the intermediate shaft is removed.

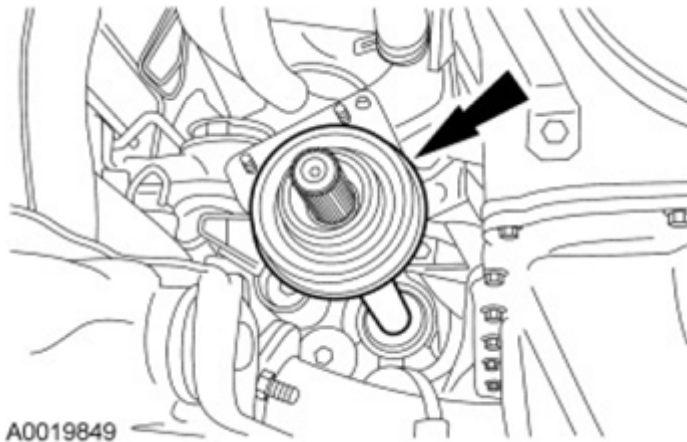


Fig. 184: Locating Intermediate Shaft
Courtesy of FORD MOTOR CO.

11. Remove the intermediate shaft.
12. Remove the accessory drive belt. For additional information, refer to **ACCESSORY DRIVE - 2.5L** article.
13. Press the locking tab to release the generator air duct and remove.

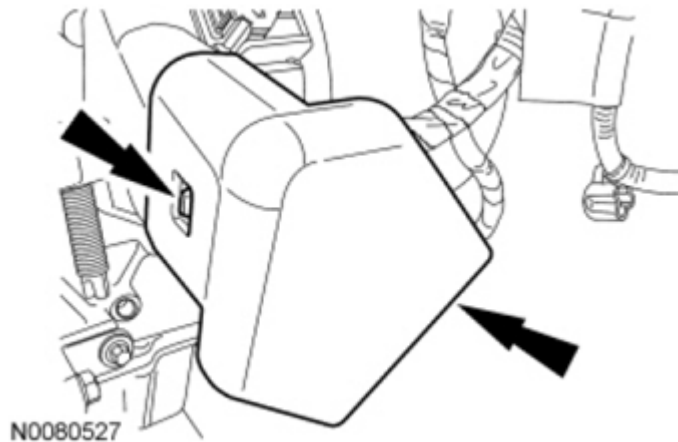


Fig. 185: Locating Locking Tab And Generator Air Duct
Courtesy of FORD MOTOR CO.

14. Remove the drain plug and drain the transmission fluid. For additional information, refer to **AUTOMATIC TRANSAXLE/TRANSMISSION - 6F35** article.

All-Wheel Drive (AWD) vehicles

15. Drain the **PTU** . For additional information, refer to **TRANSFER CASE - POWER TRANSFER UNIT (PTU)** article.
16. Index-mark the driveshaft to the yoke and remove the 6 bolts holding the driveshaft to the **PTU** and position aside with mechanic's wire.

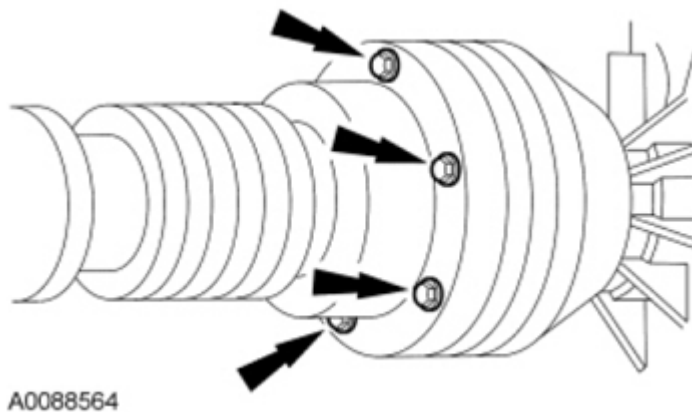


Fig. 186: Locating Driveshaft Bolts
Courtesy of FORD MOTOR CO.

All vehicles

17. If equipped, remove the bolt and ground eyelet.

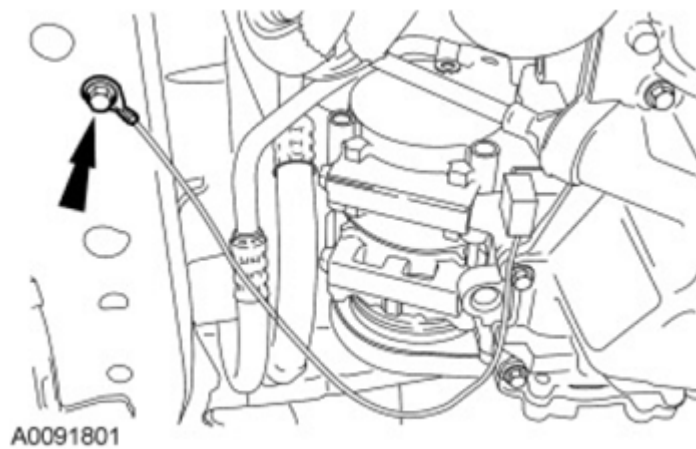


Fig. 187: Locating Ground Eyelet Bolts
Courtesy of FORD MOTOR CO.

18. Disconnect the transaxle electrical connector.

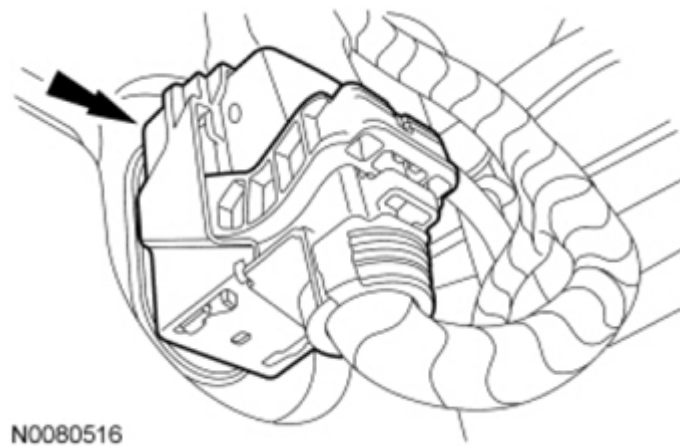


Fig. 188: Locating Transaxle Electrical Connector
Courtesy of FORD MOTOR CO.

19. Detach the wiring harness retainer from the transaxle stud bolt.

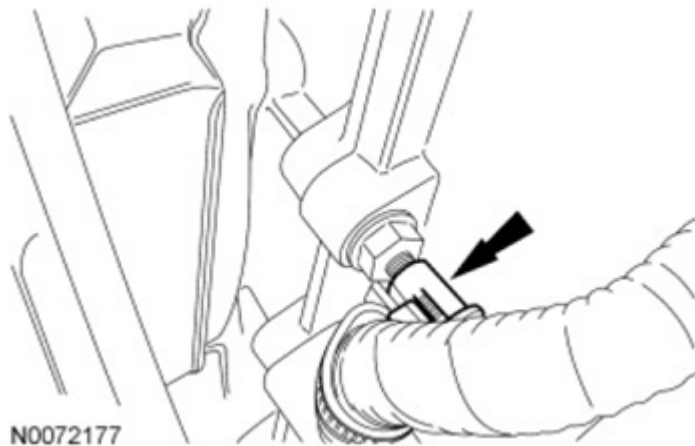


Fig. 189: Locating Wiring Harness Retainer Of Transaxle Stud Bolt
Courtesy of FORD MOTOR CO.

20. Disconnect the Turbine Shaft Speed (TSS) sensor electrical connector.

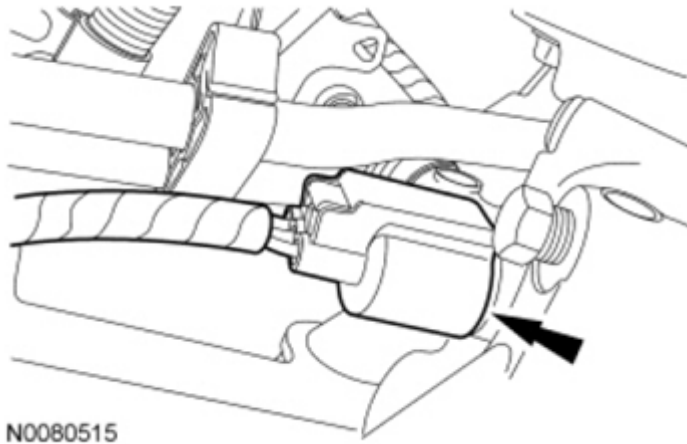


Fig. 190: Locating Turbine Shaft Speed (TSS) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

21. Remove the 2 secondary latches from the transaxle fluid cooler tubes.

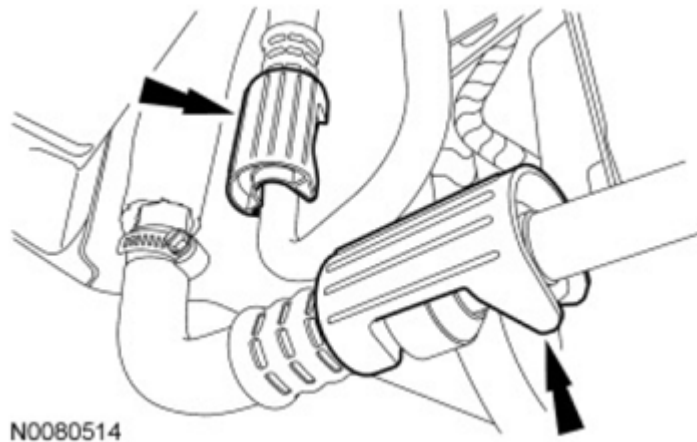


Fig. 191: Locating Secondary Latches Of Transaxle Fluid Cooler Tubes
 Courtesy of FORD MOTOR CO.

22. Using the Transmission Cooler Line Disconnect Tool, disconnect the 2 transaxle fluid cooler tubes (1 shown in illustration).

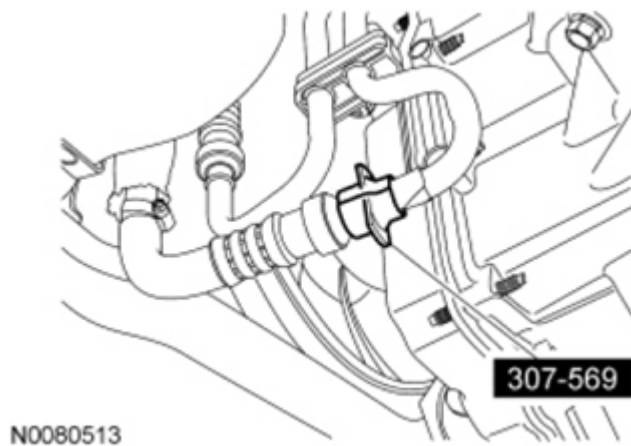


Fig. 192: Disconnecting Transaxle Fluid Cooler Tubes
 Courtesy of FORD MOTOR CO.

23. Remove the Power Distribution Box (PDB) cover.

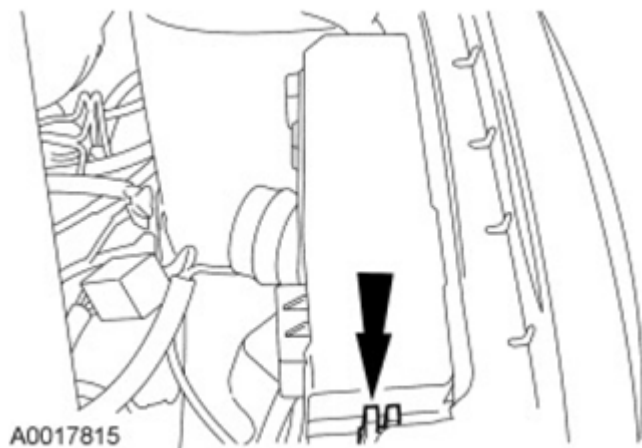


Fig. 193: Locating Power Distribution Box (PDB) Cover
Courtesy of FORD MOTOR CO.

24. Remove the nut and disconnect the cable from the **PDB** .

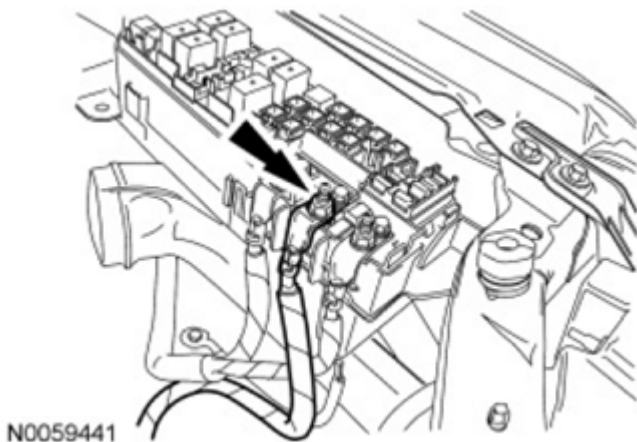


Fig. 194: Locating PDB Cable Nut
Courtesy of FORD MOTOR CO.

25. Disconnect the electrical connector from the **PDB** .

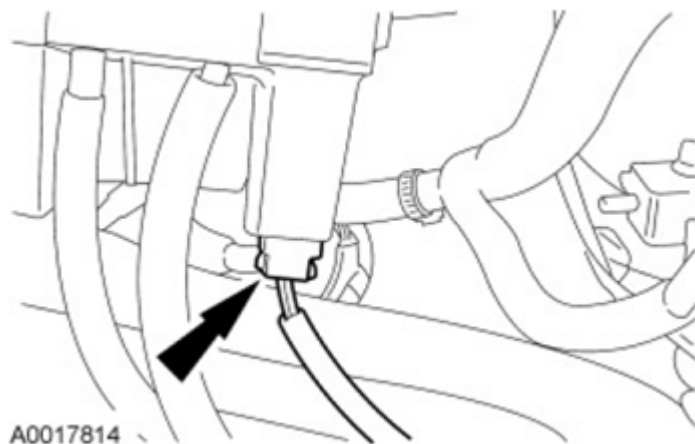


Fig. 195: Locating PDB Electrical Connector
Courtesy of FORD MOTOR CO.

26. Remove the bolt and the ground strap.

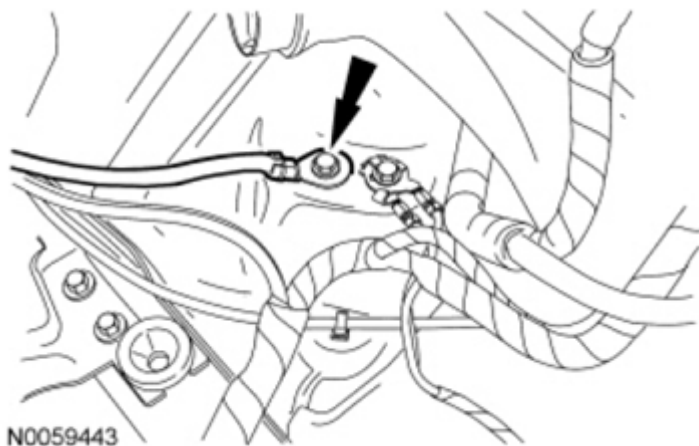


Fig. 196: Locating Ground Strap Bolt
Courtesy of FORD MOTOR CO.

27. Detach the 2 wiring harness retainers from the battery tray bracket and position the wiring harness aside.

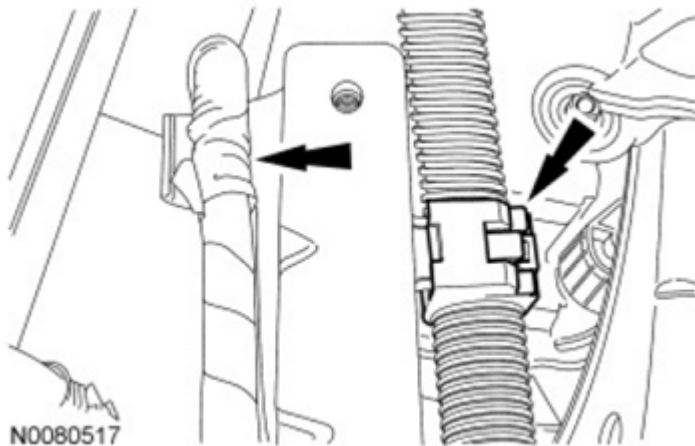


Fig. 197: Locating Battery Tray Bracket Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

28. Disconnect the shift cable from the transaxle manual lever.

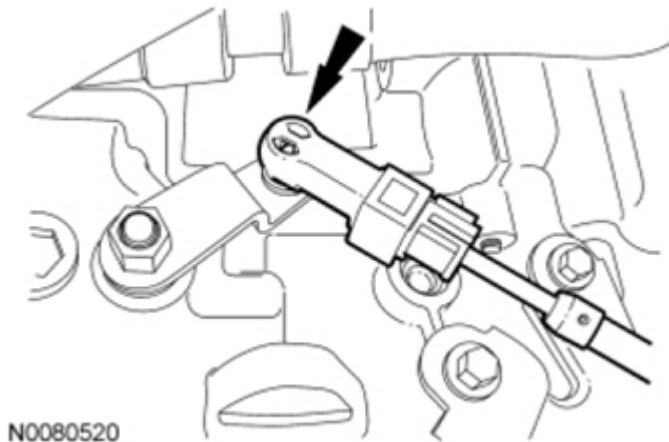


Fig. 198: View Of Shift Cable Of Transaxle Manual Lever
Courtesy of FORD MOTOR CO.

29. Pinch the 2 tabs and remove the transmission shift cable from the bracket.



Fig. 199: View Of Transmission Shift Cable Tabs
Courtesy of FORD MOTOR CO.

30. Detach the shift cable pin-type retainer and position the shift cable aside.

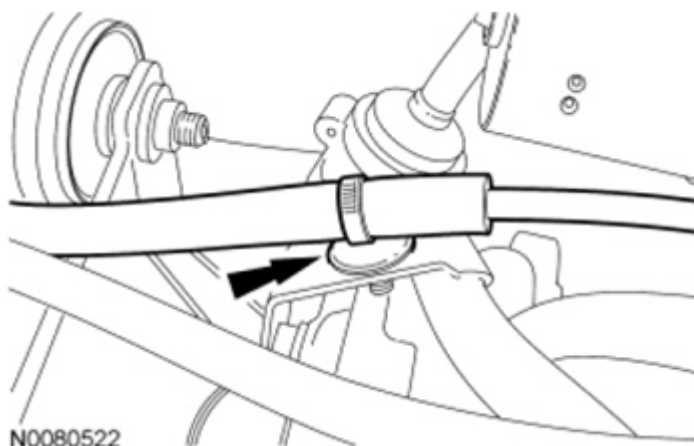


Fig. 200: Locating Shift Cable Pin-Type Retainer
Courtesy of FORD MOTOR CO.

31. If equipped, disconnect the block heater electrical connector. Detach all the block heater wiring harness retainers and position the wiring harness aside.

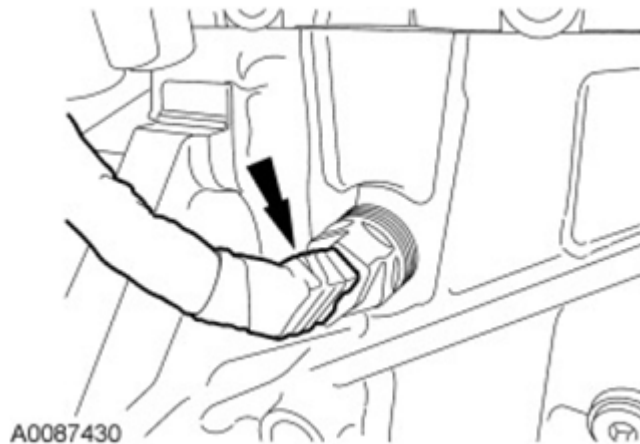


Fig. 201: Locating Block Heater Electrical Connector
Courtesy of FORD MOTOR CO.

32. Disconnect the upper radiator hose.

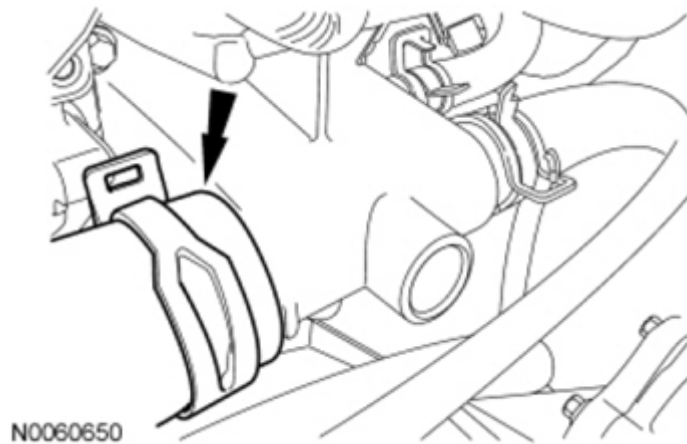


Fig. 202: Locating Upper Radiator Hose
Courtesy of FORD MOTOR CO.

33. Detach the heater hose support strap from the stud.

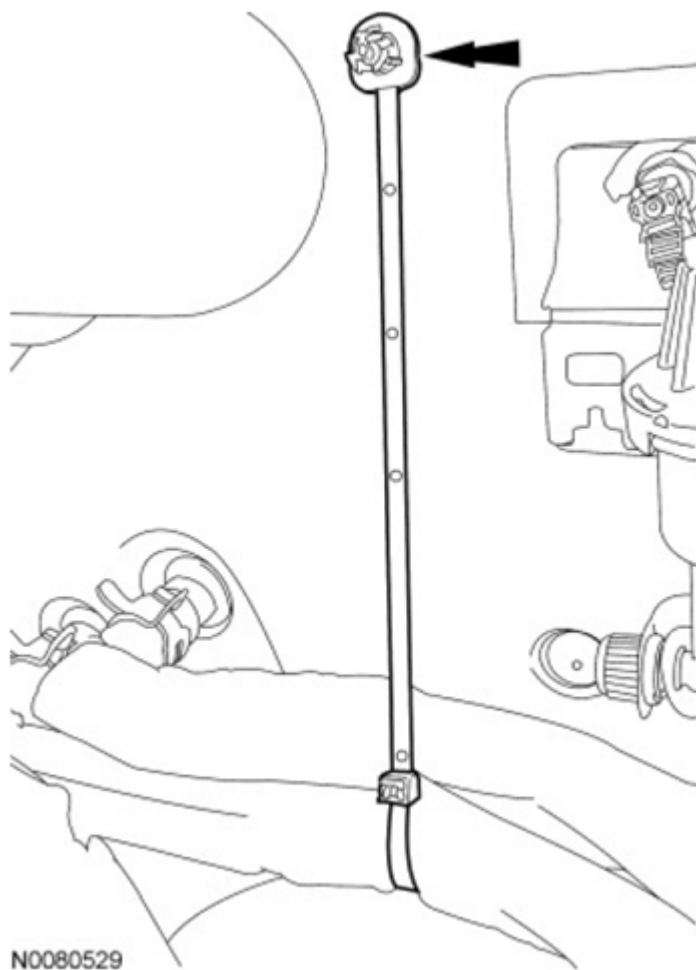


Fig. 203: Locating Heater Hose Support Strap Of Stud
Courtesy of FORD MOTOR CO.

34. Disconnect the heater hoses from the heater core.

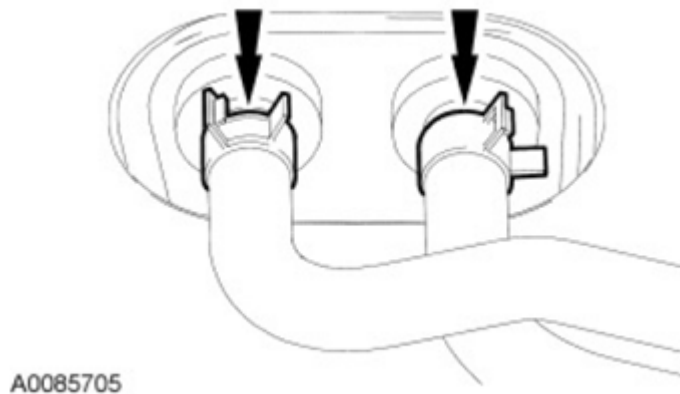


Fig. 204: Locating Heater Hoses Of Heater Core
Courtesy of FORD MOTOR CO.

35. Disconnect the vacuum supply tube and position aside.

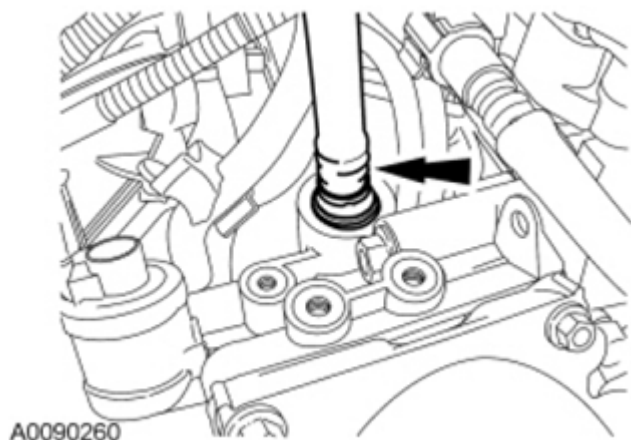


Fig. 205: Locating Vacuum Supply Tube
Courtesy of FORD MOTOR CO.

36. Disconnect the fuel vapor return tube.
- Detach the fuel vapor tube retainer from the wire harness.

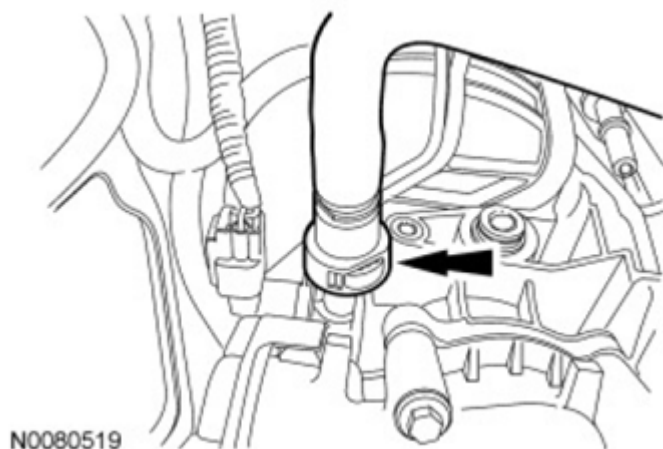


Fig. 206: Locating Fuel Vapor Return Tube
Courtesy of FORD MOTOR CO.

37. Disconnect the fuel supply tube quick connect coupling. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** article.

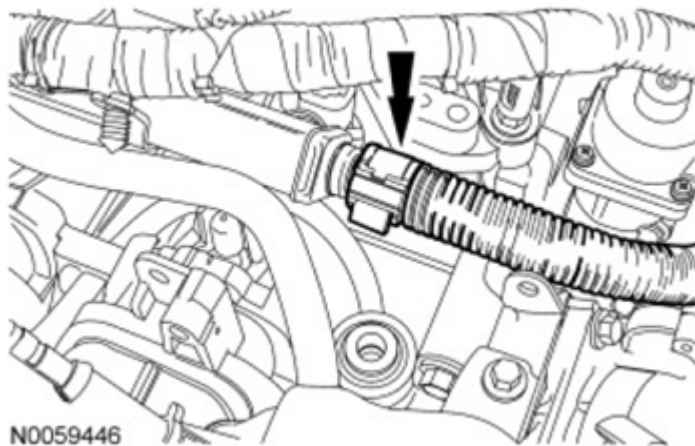


Fig. 207: Locating Fuel Supply Tube Quick Connect Coupling
Courtesy of FORD MOTOR CO.

38. Disconnect the PCM electrical connector and the wire harness retainer.

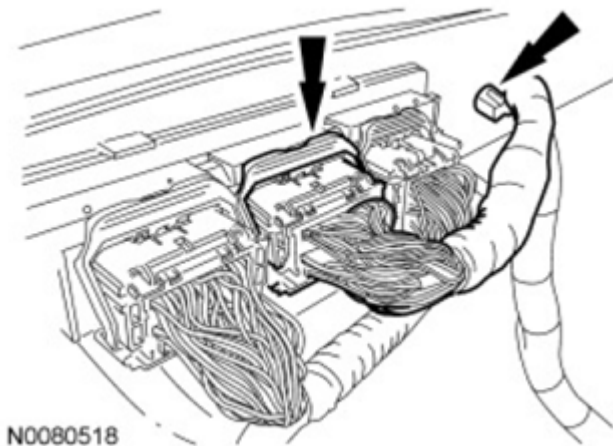


Fig. 208: Locating PCM Electrical Connector And Wire Harness Retainer
Courtesy of FORD MOTOR CO.

39. Disconnect the engine control harness electrical connector.

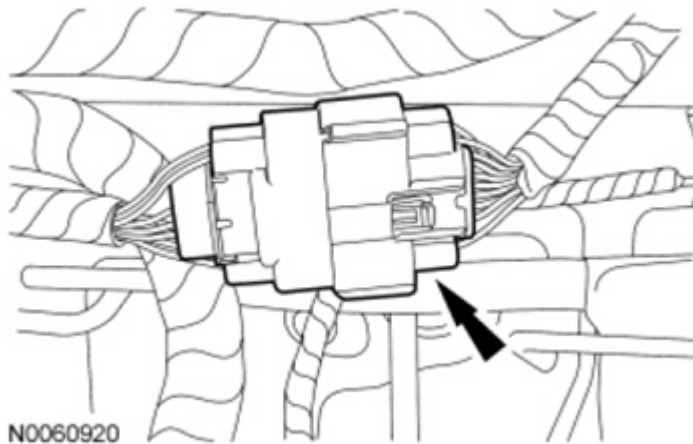


Fig. 209: Locating Engine Control Harness Electrical Connector
Courtesy of FORD MOTOR CO.

40. Disconnect the generator electrical connector and the 2 retainers.

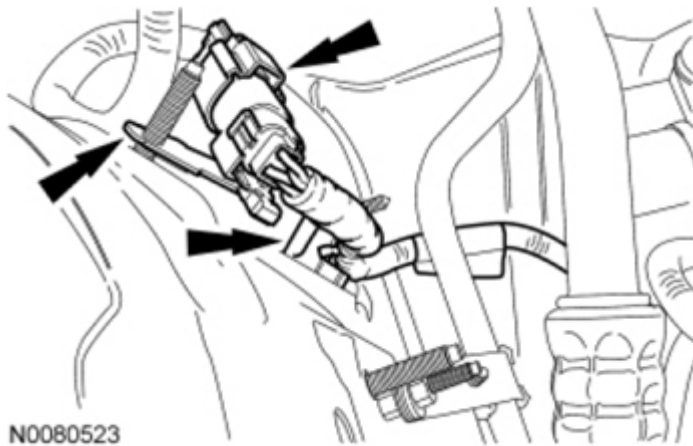


Fig. 210: Locating Generator Electrical Connector And Retainers
Courtesy of FORD MOTOR CO.

41. Disconnect the A/C compressor electrical connector and remove the 3 bolts. Position the A/C compressor aside and support the compressor with a length of mechanic's wire.
- Detach the wire harness retainer.

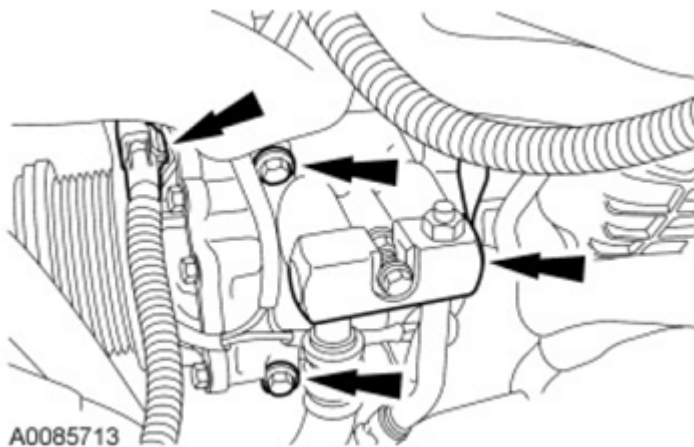


Fig. 211: Locating A/C Compressor Electrical Connector And Bolts
Courtesy of FORD MOTOR CO.

42. Disconnect the lower radiator hose from the radiator.

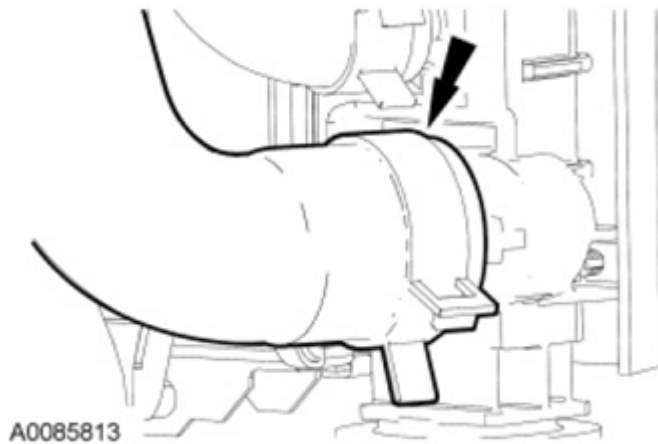


Fig. 212: Locating Lower Radiator Hose
Courtesy of FORD MOTOR CO.

43. Remove the front roll restrictor bolt and the 2 bolts for the engine support crossmember.

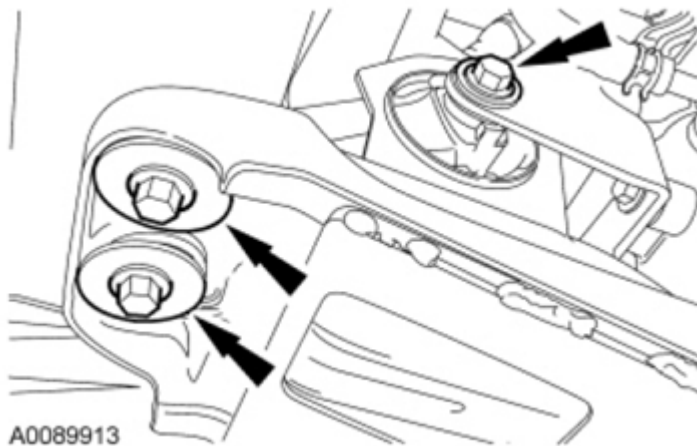


Fig. 213: Locating Front Roll Restrictor And Engine Support Crossmember Bolts
Courtesy of FORD MOTOR CO.

44. Remove the rear nut and the engine support crossmember.
- Discard the nut.

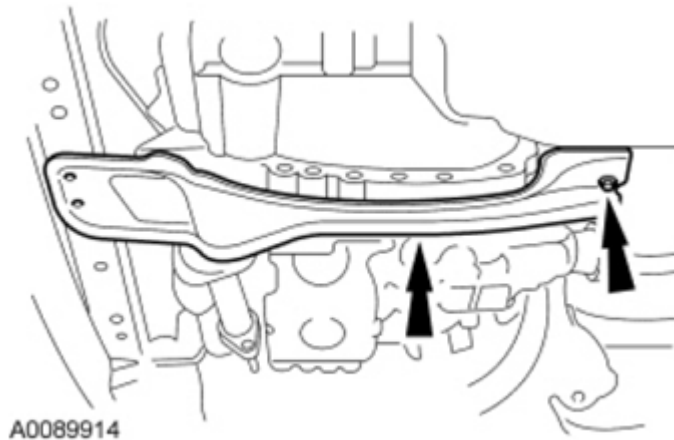
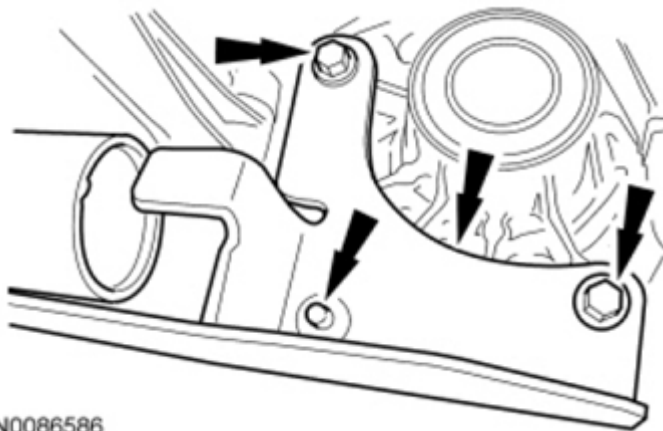


Fig. 214: Locating Engine Support Crossmember Rear Nut
Courtesy of FORD MOTOR CO.

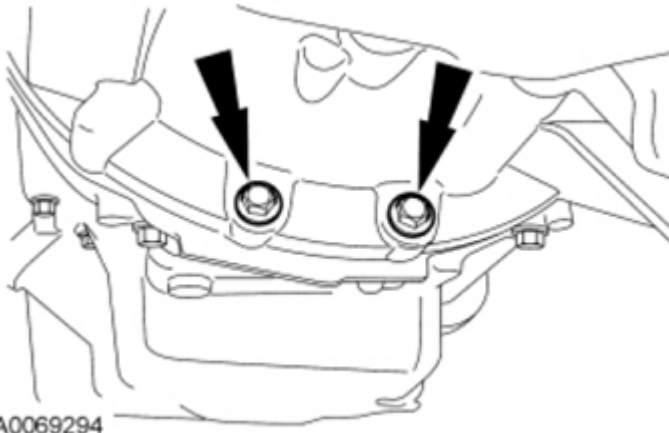
45. If equipped, remove the 3 bolts and the dampener.



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Fig. 215: Locating Dampener And Bolts
Courtesy of FORD MOTOR CO.

NOTE: The transaxle-to-engine bolts differ in length. Mark the bolts for correct installation.



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Fig. 216: Locating Transaxle-To-Engine Bolts
Courtesy of FORD MOTOR CO.

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

NOTE: The transaxle-to-engine bolts differ in length. Mark the bolts for correct installation.

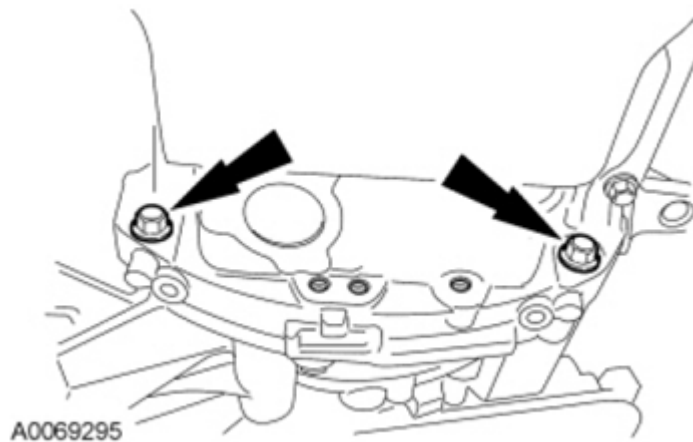


Fig. 217: Locating Transaxle-To-Engine Bolts
Courtesy of FORD MOTOR CO.

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

AWD vehicles

48. Remove the 4 **PTU** bracket-to-engine bolts.

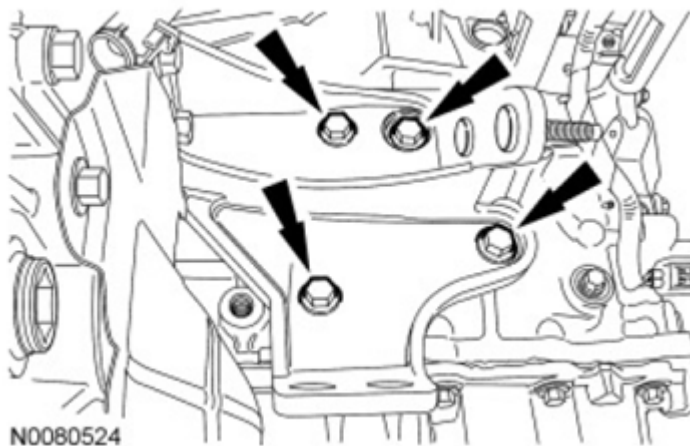


Fig. 218: Locating PTU Bracket-To-Engine Bolts
Courtesy of FORD MOTOR CO.

49. Remove the **PTU** bracket-to-engine bolt.

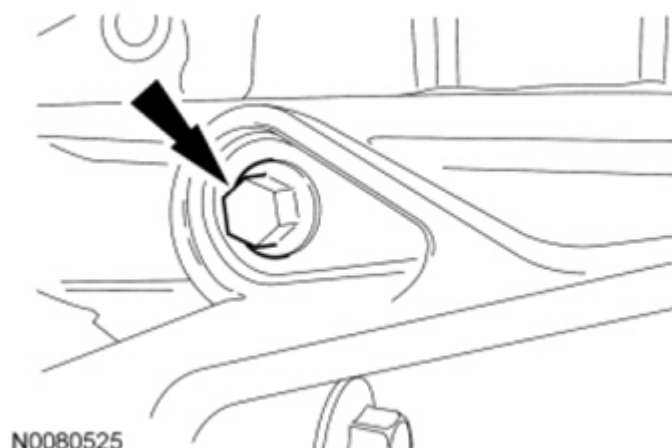


Fig. 219: Locating PTU Bracket-To-Engine Bolt
Courtesy of FORD MOTOR CO.

50. Remove the 2 PTU bracket-to-PTU bolts and remove the bracket.

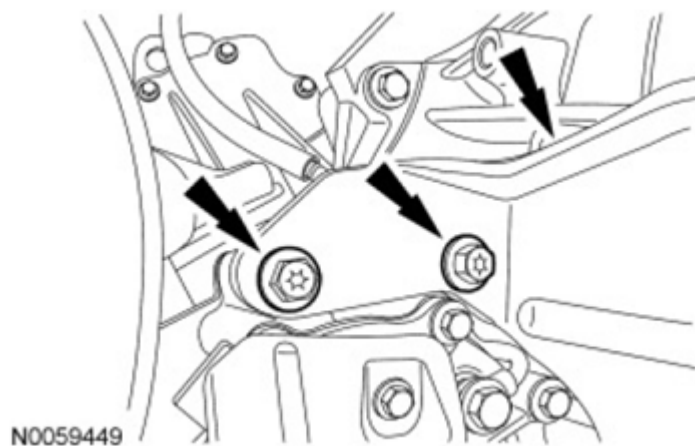


Fig. 220: Locating PTU Bracket-To-PTU Bolts And Bracket
Courtesy of FORD MOTOR CO.

All vehicles

51. Remove the spin-on engine oil filter.

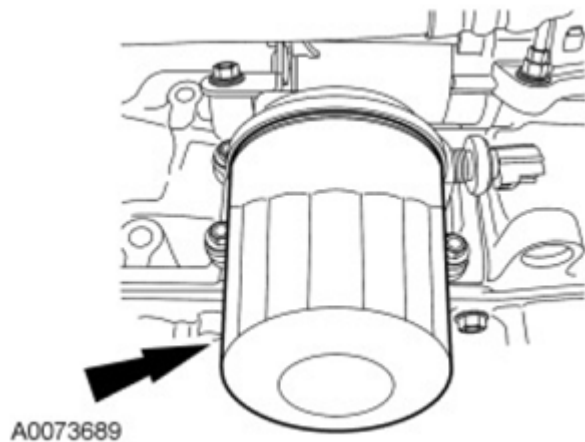


Fig. 221: Locating Engine Oil Filter
Courtesy of FORD MOTOR CO.

52. Using the Powertrain Lift and Adjustable Grip Arm, secure the engine to the lift table.

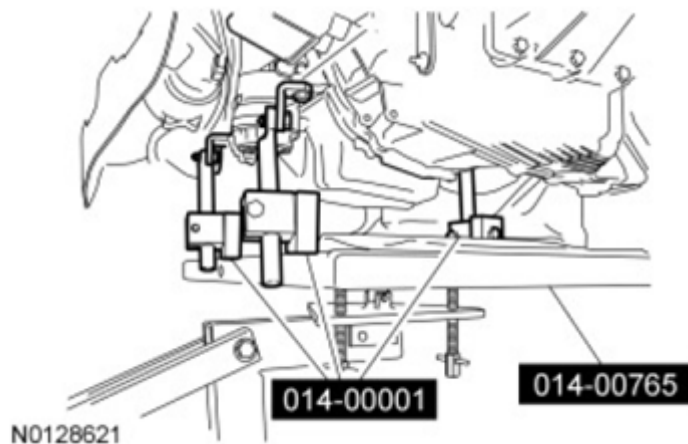


Fig. 222: Securing Engine And Transaxle Onto Powertrain Lift
Courtesy of FORD MOTOR CO.

53. Remove the engine mount bracket bolt.

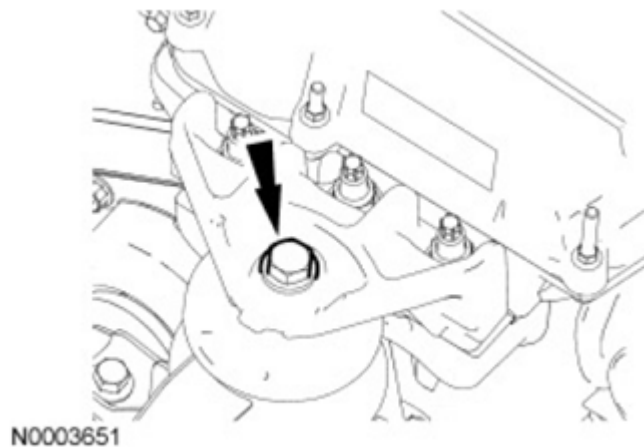


Fig. 223: Locating Engine Mount Bracket Bolt
Courtesy of FORD MOTOR CO.

54. Remove the 3 nuts and the engine mount bracket.

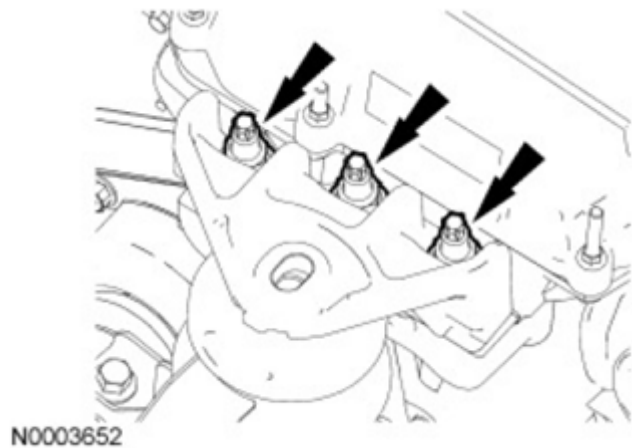


Fig. 224: Locating Engine Mount Bracket Nuts
Courtesy of FORD MOTOR CO.

NOTE: Late build AWD vehicle equipped with a mass damper shown in illustration, other vehicles similar.

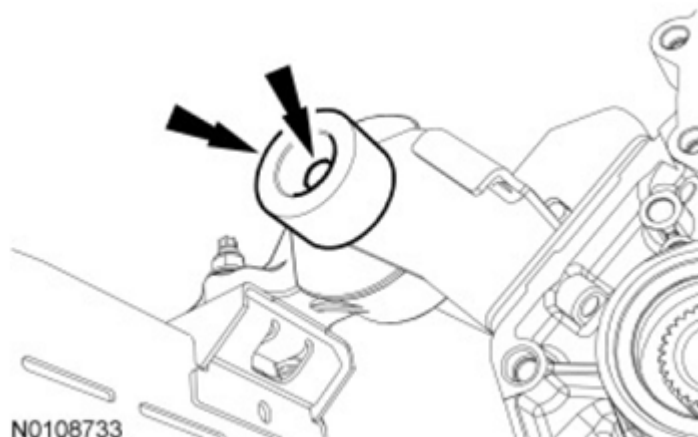


Fig. 225: View Of Transaxle Rear Mount Bolt
Courtesy of FORD MOTOR CO.

55. Remove the bolt from the transaxle rear mount and the mass damper (if equipped).
56. Remove the bolt from the LH transaxle mount.

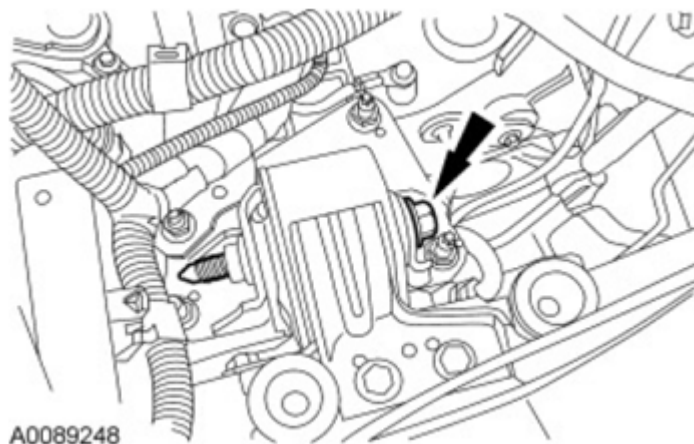


Fig. 226: Locating LH Transaxle Mount Bolt
Courtesy of FORD MOTOR CO.

57. Lower the engine and transaxle from the vehicle.
58. Disconnect the starter terminals.
 1. Remove the battery cable nut.
 2. Remove the starter solenoid terminal nut.

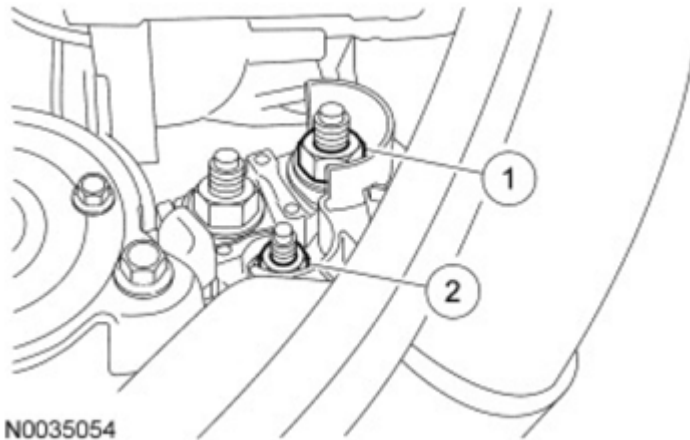


Fig. 227: Identifying Battery Cable And Starter Solenoid Terminal Nuts
Courtesy of FORD MOTOR CO.

59. Remove the nut and the ground wire.

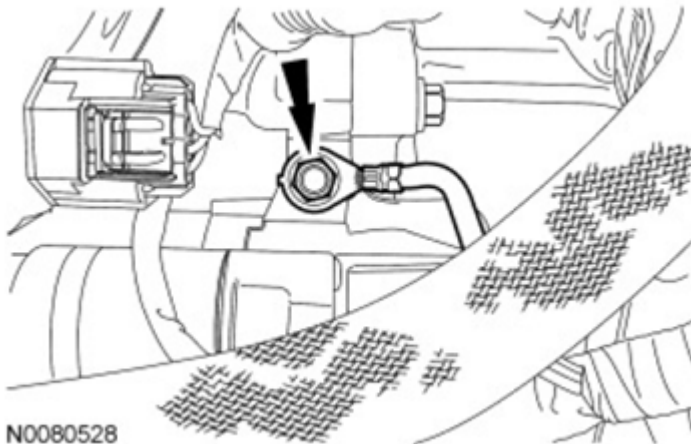


Fig. 228: Locating Ground Wire Nut
Courtesy of FORD MOTOR CO.

60. Remove the 2 stud bolts and remove the starter.

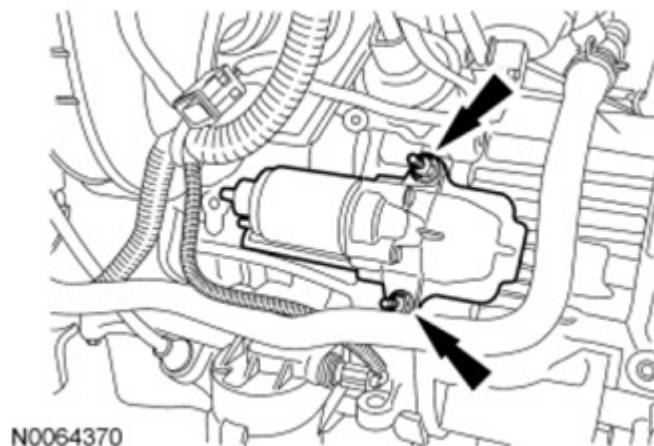


Fig. 229: Locating Starter Motor Stud Bolts
Courtesy of FORD MOTOR CO.

61. Remove the starter motor isolator.

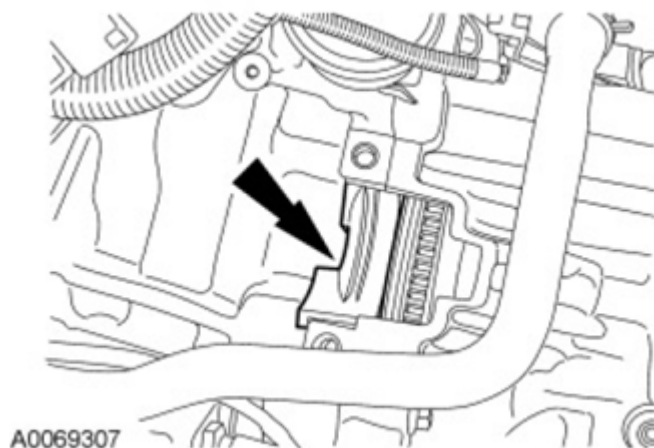


Fig. 230: Locating Starter Motor Isolator
Courtesy of FORD MOTOR CO.

AWD vehicles

62. Detach the PTU vent hose retainer.

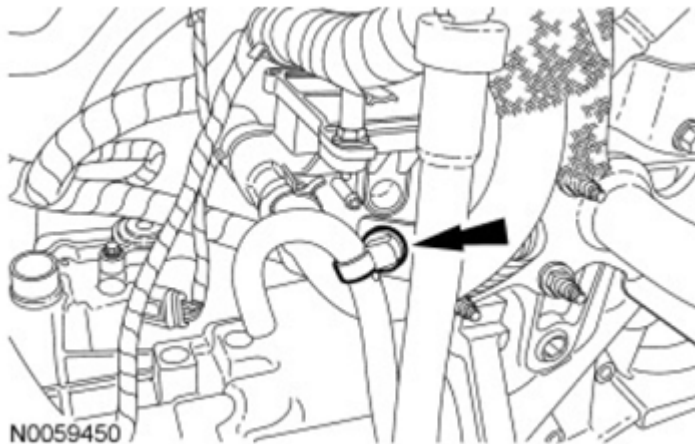


Fig. 231: Locating PTU Vent Hose Retainer
Courtesy of FORD MOTOR CO.

63. Remove the LH lower PTU bolt.

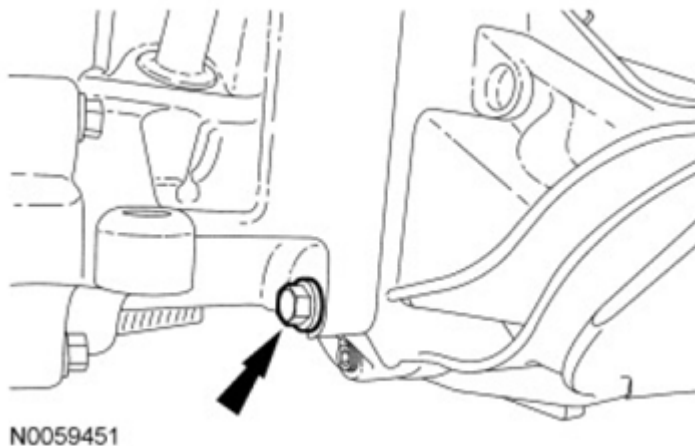


Fig. 232: Locating LH Lower PTU Bolt
Courtesy of FORD MOTOR CO.

64. Remove the 3 RH PTU bolts and the PTU .

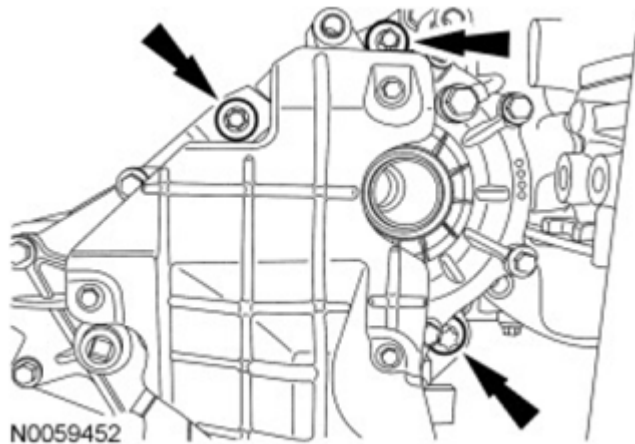


Fig. 233: Locating PTU And RH PTU Bolts
Courtesy of FORD MOTOR CO.

65. Remove the 3 bolts and the PTU heat shield.

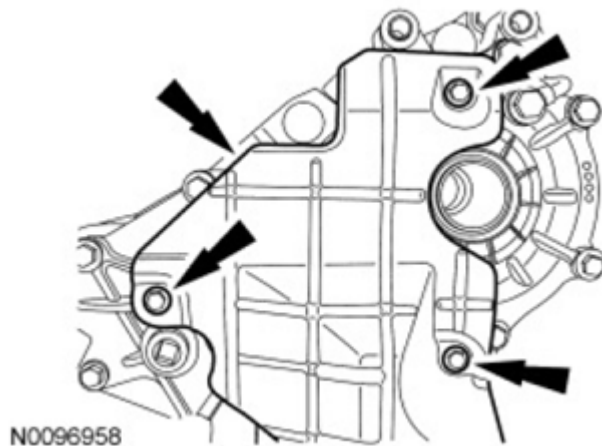


Fig. 234: Locating PTU Heat Shield Bolts
Courtesy of FORD MOTOR CO.

66. Using the Halfshaft Oil Seal Remover and Slide Hammer, remove the intermediate shaft seal.

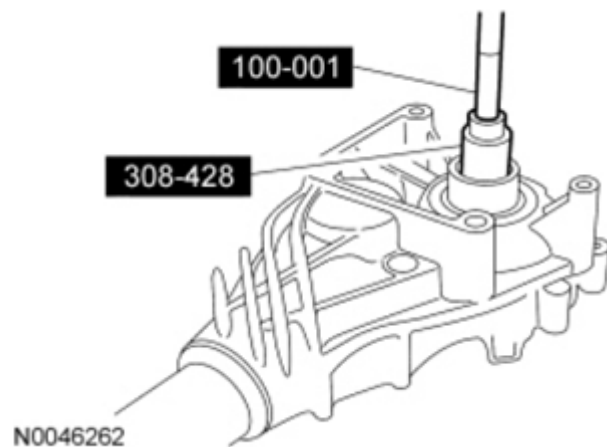


Fig. 235: Removing Intermediate Shaft Seal
Courtesy of FORD MOTOR CO.

All vehicles

67. Remove and discard the 4 torque converter nuts.

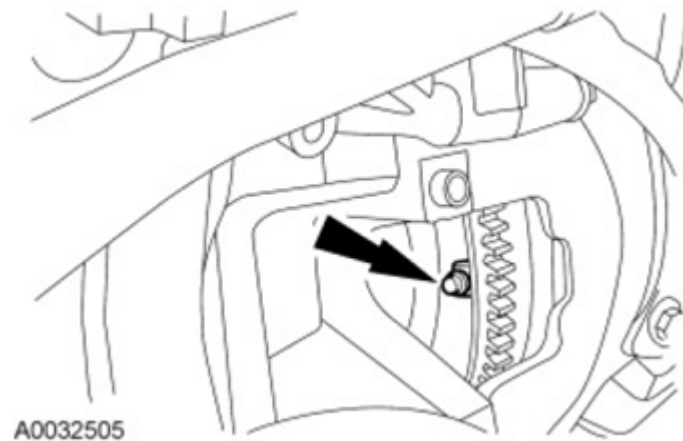


Fig. 236: Locating Torque Converter Nut
Courtesy of FORD MOTOR CO.

68. Using the Floor Crane and Spreader Bar, remove the engine and transaxle from the lift table.

NOTE: The transaxle-to-engine bolts differ in length. Mark the bolts for correct installation.

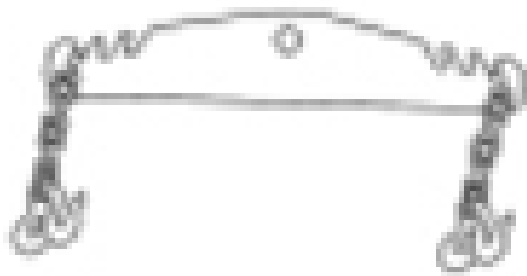
69. Remove the remaining 6 engine-to-transaxle bolts and separate the engine and transaxle.

ENGINE - MANUAL TRANSAXLE

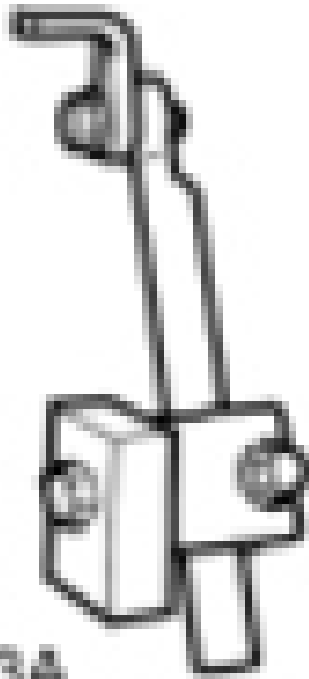
Special Tool(s)

SPECIAL TOOLS DESCRIPTION

 ST1341-A	2,200# Floor Crane, Fold Away 300-OTC1819E or equivalent
 ST1293-A	Powertrain Lift 014-00765 or equivalent
	Spreader Bar 303-D089 (D93P-6001-A3) or equivalent



ST1602-A

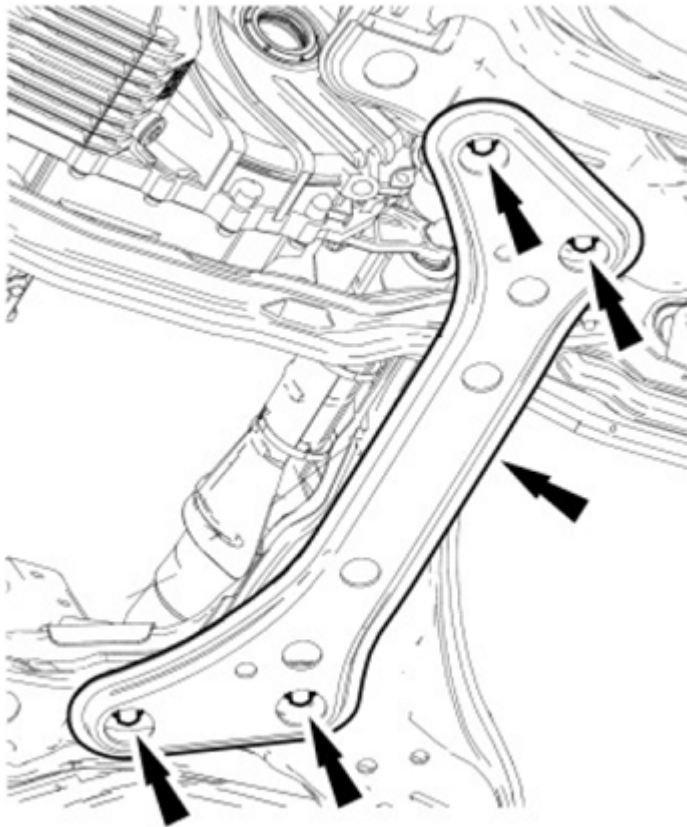


ST2743A

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.

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** article.
3. Remove the engine Air Cleaner (ACL) and ACL outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING - 2.5L** article.
4. Remove the battery tray. For additional information, refer to **BATTERY, BATTERY MOUNTING SYSTEM & BATTERY CABLES** article.
5. Drain the engine oil.
 - Install the drain plug.
 - Tighten to 28 Nm (21 lb-ft).
6. Remove the LH halfshaft and the intermediate shaft. For additional information, refer to **FRONT DRIVE HALFSHAFTS** article.
7. Drain the cooling system. For additional information, refer to **ENGINE COOLING** article.
8. Remove the 4 bolts and the lateral support crossmember.



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Fig. 237: Locating Lateral Support Crossmember Bolts
 Courtesy of FORD MOTOR CO.

9. Remove the exhaust downpipe and exhaust intermediate pipe. For additional information, refer to **EXHAUST SYSTEM** article.
10. Remove the accessory drive belt. For additional information, refer to **ACCESSORY DRIVE - 2.5L** article.
11. Press the locking tabs to release the generator air duct and remove.

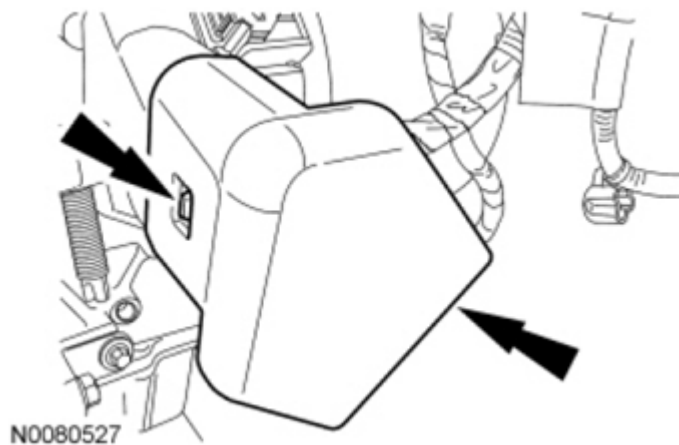


Fig. 238: Locating Locking Tab And Generator Air Duct
Courtesy of FORD MOTOR CO.

12. If equipped, remove the bolt and ground eyelet.

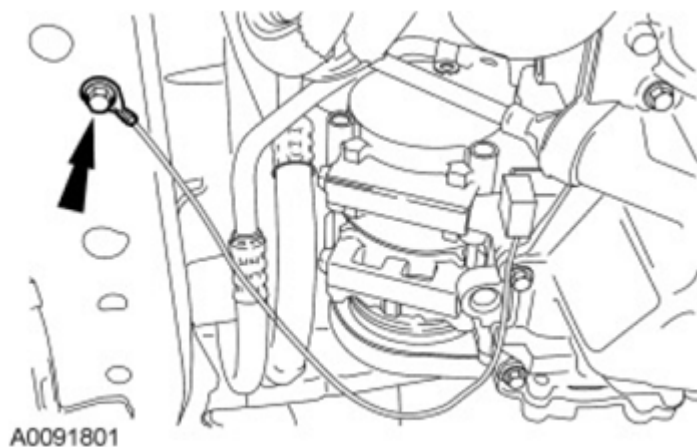


Fig. 239: Locating Ground Eyelet Bolts
Courtesy of FORD MOTOR CO.

13. Remove the Power Distribution Box (PDB) cover.

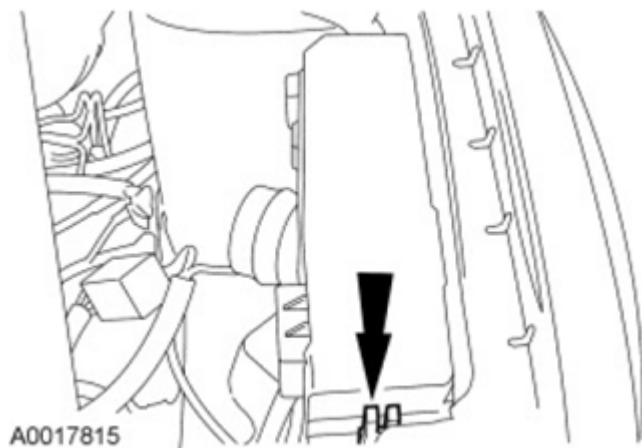


Fig. 240: Locating Power Distribution Box (PDB) Cover
Courtesy of FORD MOTOR CO.

14. Remove the nut and disconnect the cable from the **PDB** .

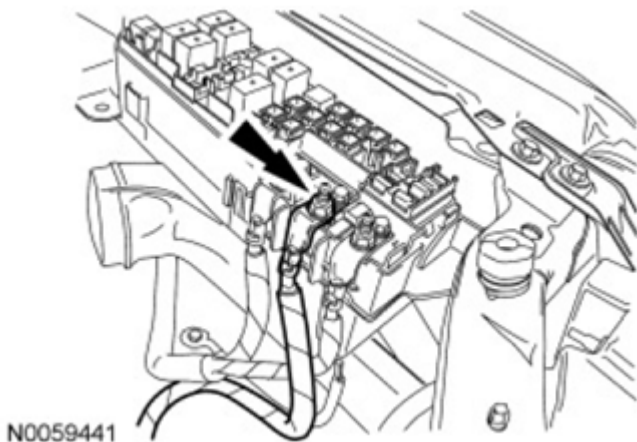


Fig. 241: Locating PDB Cable Nut
Courtesy of FORD MOTOR CO.

15. Disconnect the electrical connector from the **PDB** .

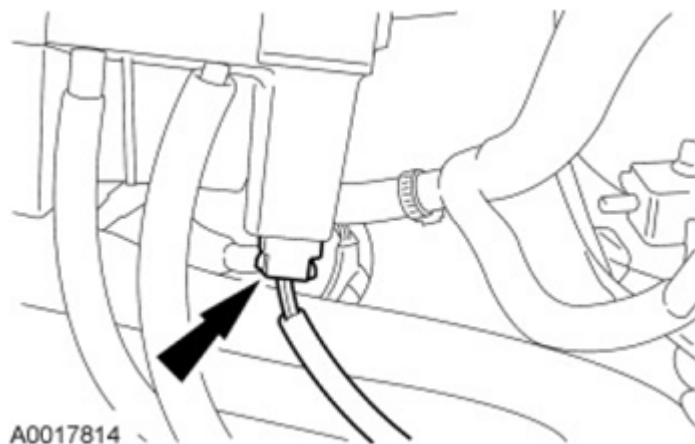


Fig. 242: Locating PDB Electrical Connector
Courtesy of FORD MOTOR CO.

16. Remove the bolt and the ground strap.

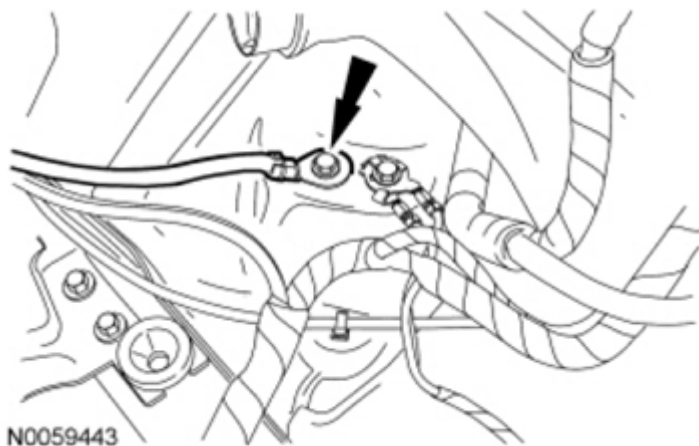


Fig. 243: Locating Ground Strap Bolt
Courtesy of FORD MOTOR CO.

17. Detach the 2 wiring harness retainers from the battery tray bracket and position the wiring harness aside.

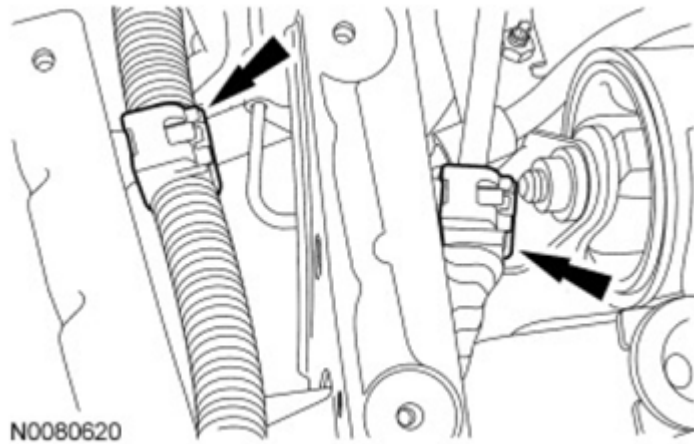


Fig. 244: Locating Wiring Harness Retainers Of Battery Tray Bracket
Courtesy of FORD MOTOR CO.

18. Position the clutch hydraulic line aside.
 1. Remove the clutch hydraulic line bracket-to-transaxle bolt.
 2. Disconnect the clutch hydraulic line from the clutch slave cylinder.
 - Plug the hydraulic line.
 3. Position the clutch hydraulic line aside.

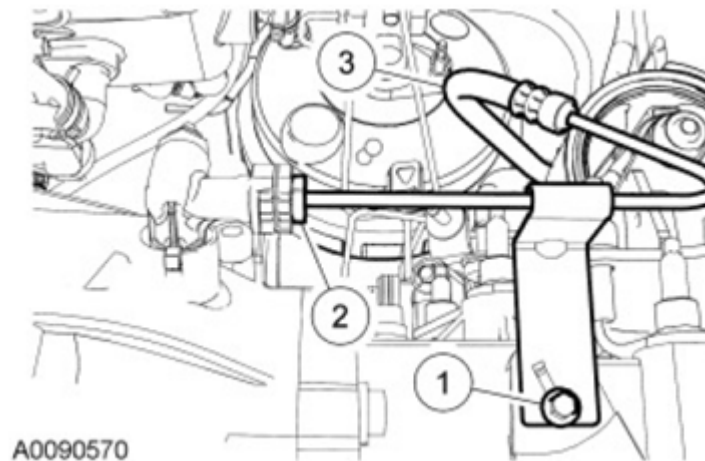


Fig. 245: Identifying Clutch Hydraulic Line And Bracket-To-Transaxle Bolt
Courtesy of FORD MOTOR CO.

19. Disconnect the Vehicle Speed Sensor (VSS) electrical connector and the 2 pin-type retainers.

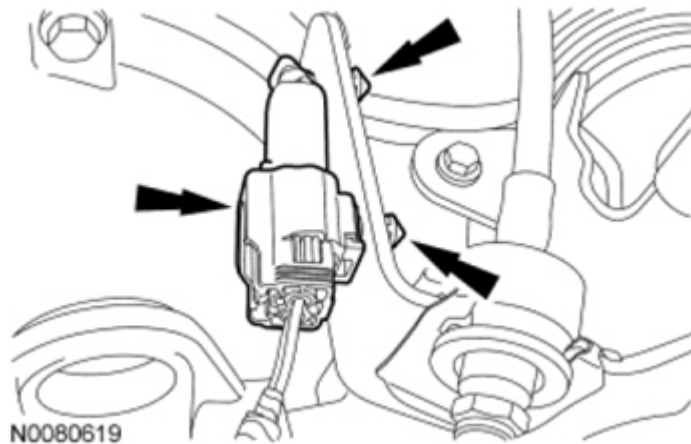


Fig. 246: Locating Vehicle Speed Sensor Electrical Connector And Pin-Type Retainers
Courtesy of FORD MOTOR CO.

20. Detach the 2 wiring harness retainers and disconnect the reversing lamp indicator switch electrical connector.

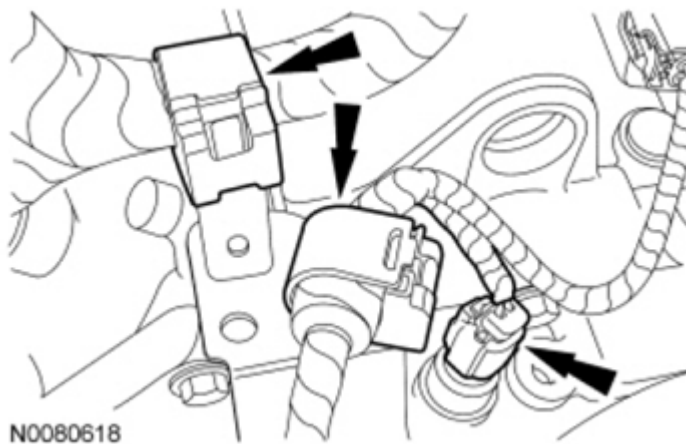


Fig. 247: Locating Reversing Lamp Indicator Switch Electrical Connector And Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

21. Disconnect the shift cables.

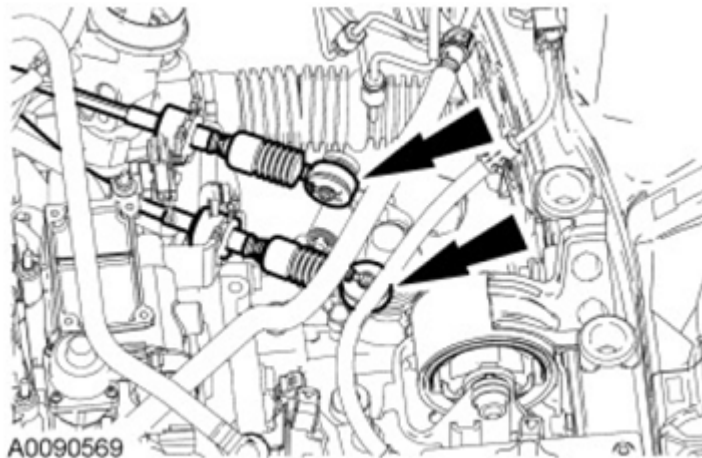


Fig. 248: Locating Shift Cables
Courtesy of FORD MOTOR CO.

22. Remove the 3 shift cable bracket bolts.
- Position the bracket aside.

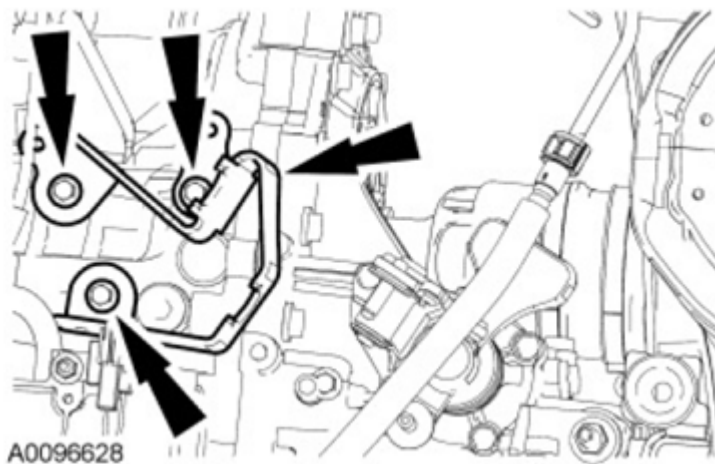


Fig. 249: Locating Shift Cable Bracket Bolts
Courtesy of FORD MOTOR CO.

23. If equipped, disconnect the block heater electrical connector.
- Detach all the block heater wiring harness retainers and position the wiring harness aside.

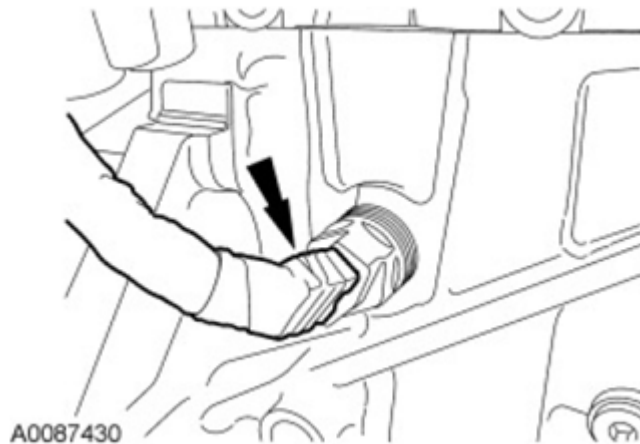


Fig. 250: Locating Block Heater Electrical Connector
Courtesy of FORD MOTOR CO.

24. Disconnect the upper radiator hose.

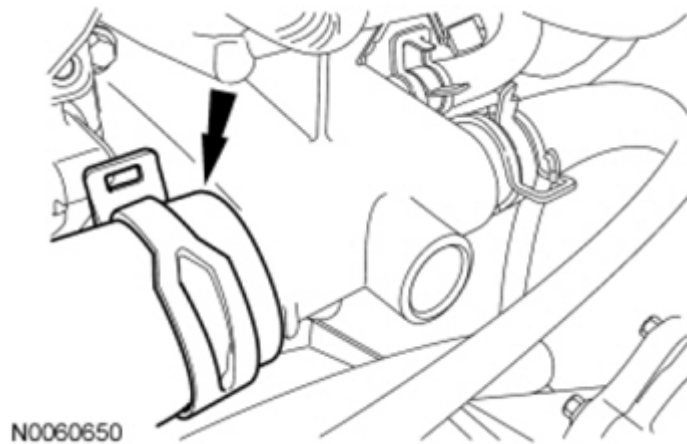


Fig. 251: Locating Upper Radiator Hose
Courtesy of FORD MOTOR CO.

25. Detach the heater hose support strap from the stud.

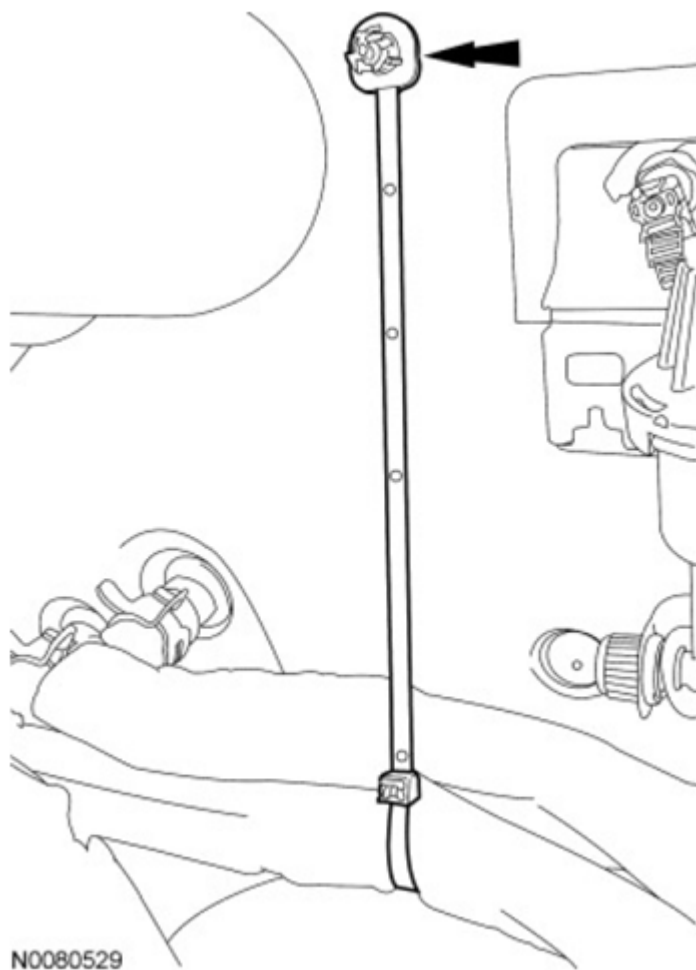


Fig. 252: Locating Heater Hose Support Strap Of Stud
Courtesy of FORD MOTOR CO.

26. Disconnect the heater hoses from the heater core.

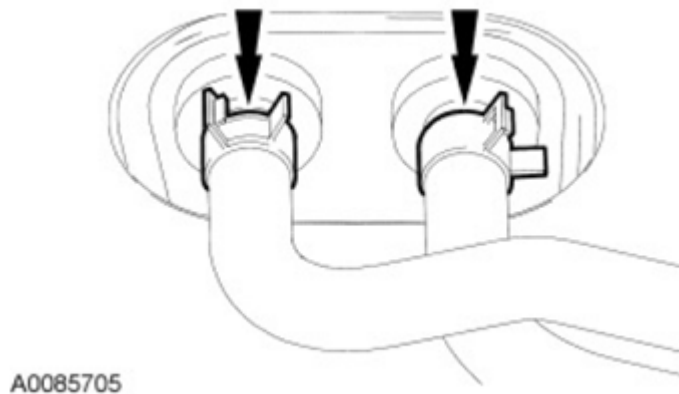


Fig. 253: Locating Heater Hoses Of Heater Core
Courtesy of FORD MOTOR CO.

27. Disconnect the vacuum supply tube and position aside.

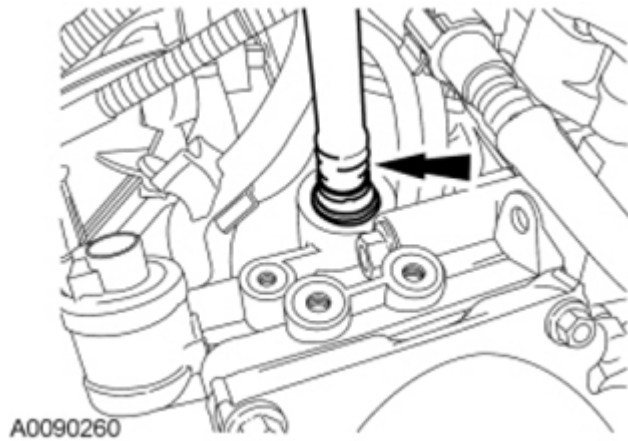


Fig. 254: Locating Vacuum Supply Tube
Courtesy of FORD MOTOR CO.

28. Disconnect the fuel vapor return tube.
- Detach the fuel vapor tube retainer from the wire harness.

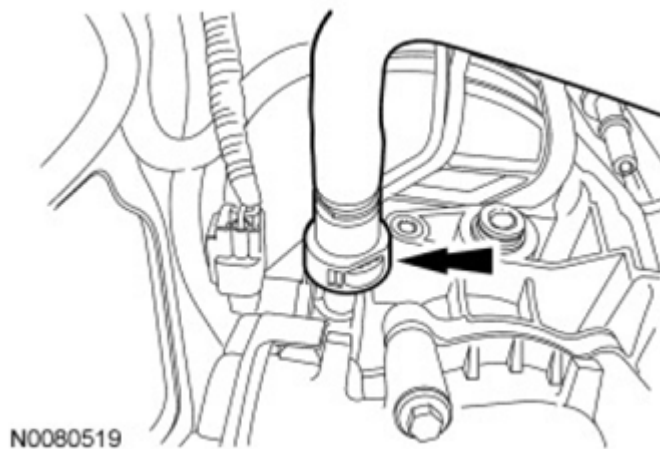


Fig. 255: Locating Fuel Vapor Tube Retainer
Courtesy of FORD MOTOR CO.

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

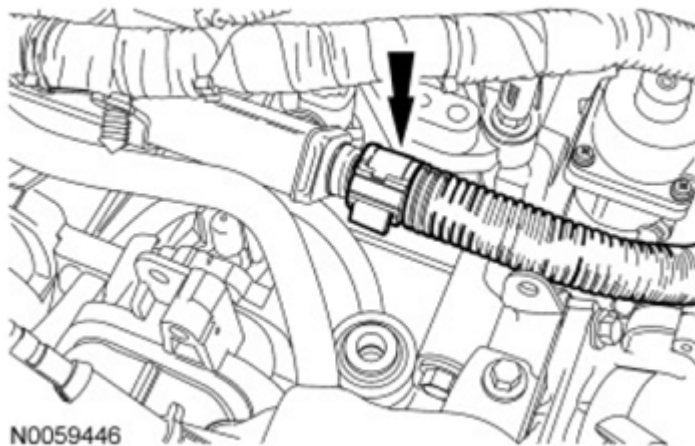


Fig. 256: Locating Fuel Supply Tube Quick Connect Coupling
Courtesy of FORD MOTOR CO.

30. Disconnect the PCM electrical connector and the wire harness retainer.

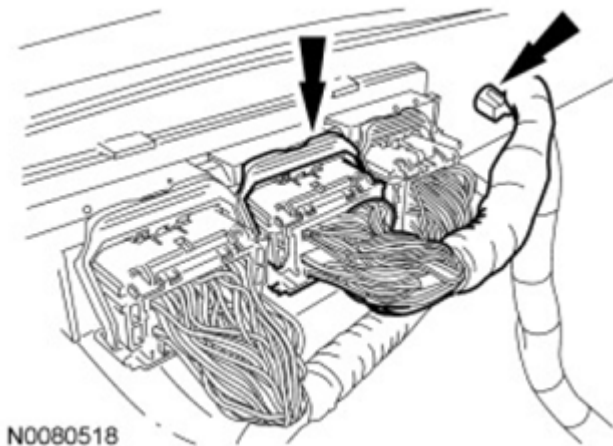


Fig. 257: Locating PCM Electrical Connector And Wire Harness Retainer
Courtesy of FORD MOTOR CO.

31. Disconnect the engine control harness electrical connector.

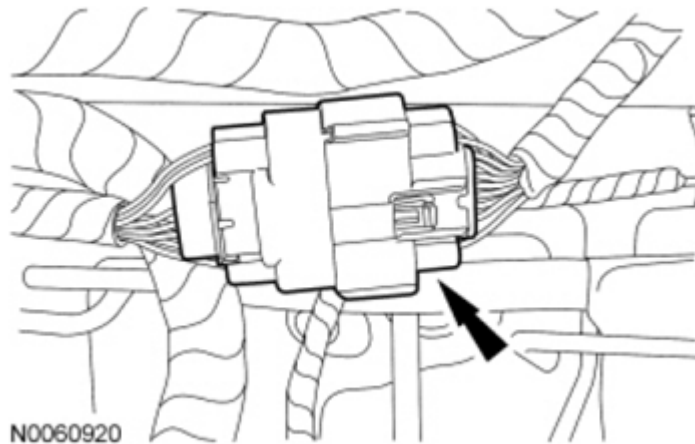


Fig. 258: Locating Engine Control Harness Electrical Connector
Courtesy of FORD MOTOR CO.

32. Disconnect the generator electrical connector and the 2 retainers.

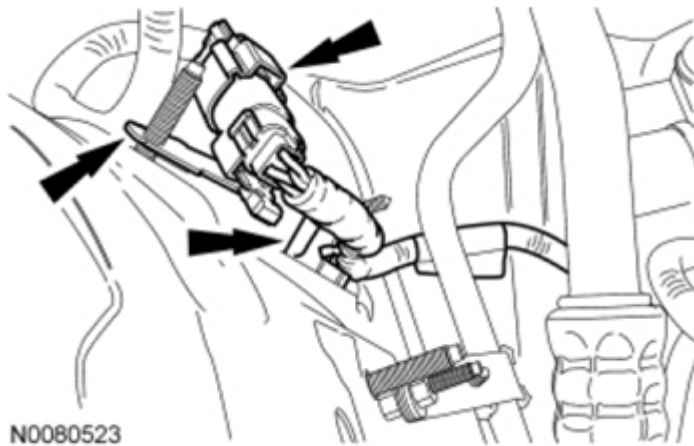


Fig. 259: Locating Generator Electrical Connector And Retainers
Courtesy of FORD MOTOR CO.

33. Disconnect the A/C compressor electrical connector and remove the 3 bolts. Position the A/C compressor aside and support the compressor with a length of mechanic's wire.

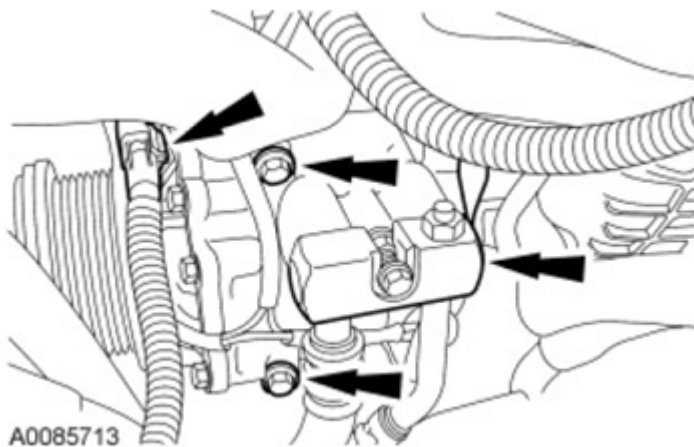


Fig. 260: Locating A/C Compressor Electrical Connector And Bolts
Courtesy of FORD MOTOR CO.

34. Disconnect the lower radiator hose from the radiator.

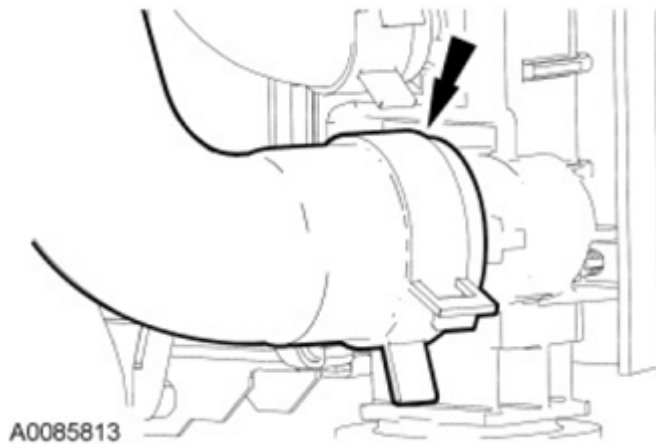


Fig. 261: Locating Lower Radiator Hose
Courtesy of FORD MOTOR CO.

35. Remove the front roll restrictor bolt and the 2 bolts for the engine support crossmember.

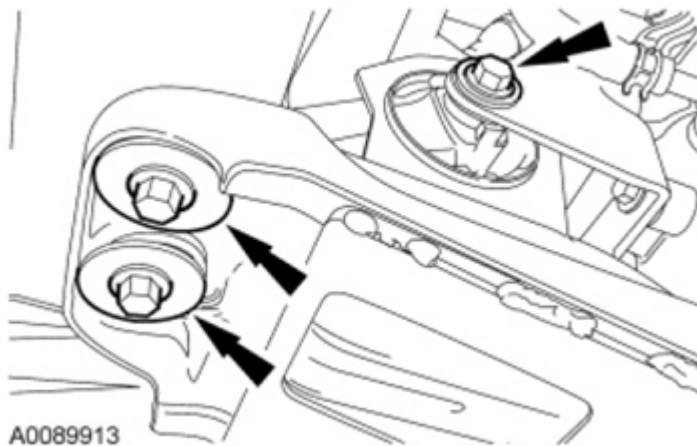


Fig. 262: Locating Front Roll Restrictor And Engine Support Crossmember Bolts
 Courtesy of FORD MOTOR CO.

36. Remove the rear nut and the engine support crossmember.
 - Discard the nut.

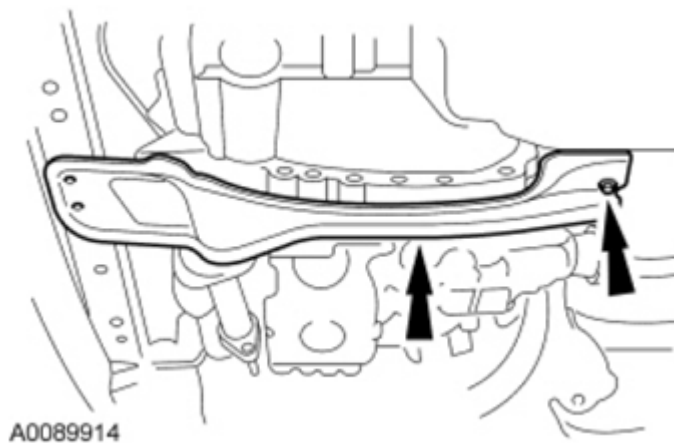


Fig. 263: Locating Engine Support Crossmember Rear Nut
 Courtesy of FORD MOTOR CO.

NOTE: The transaxle-to-engine bolts differ in length. Mark the bolts for correct installation.



Fig. 264: Locating Transaxle-To-Engine Bolts
Courtesy of FORD MOTOR CO.

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

NOTE: The transaxle-to-engine bolts differ in length. Mark the bolts for correct installation.

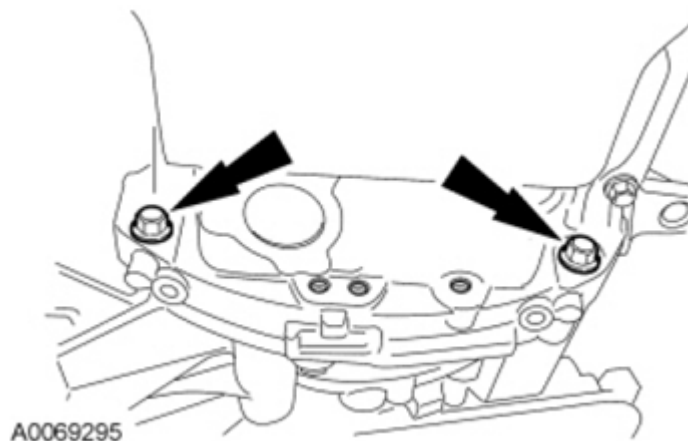


Fig. 265: Locating Transaxle-To-Engine Bolts
Courtesy of FORD MOTOR CO.

38. Remove the 2 engine-to-transaxle bolts.
39. Remove the spin-on engine oil filter.

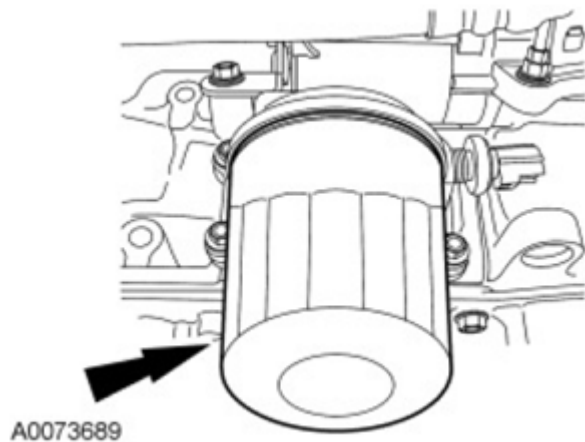


Fig. 266: Locating Engine Oil Filter
Courtesy of FORD MOTOR CO.

40. Using the Powertrain Lift and Adjustable Grip Arm, secure the engine to the lift table.

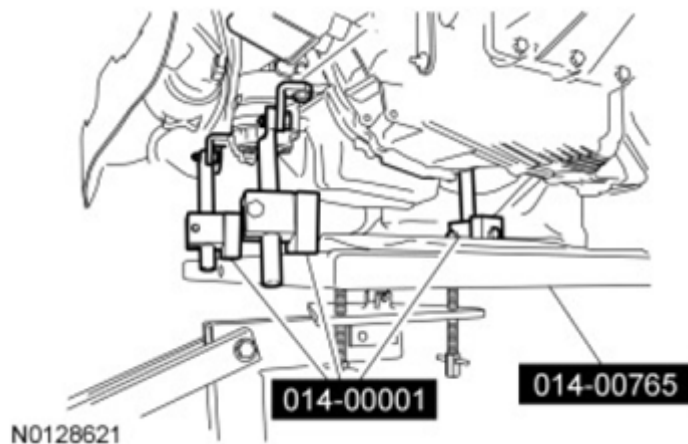


Fig. 267: Securing Engine And Transaxle Onto Powertrain Lift
Courtesy of FORD MOTOR CO.

41. Remove the engine mount bracket bolt.

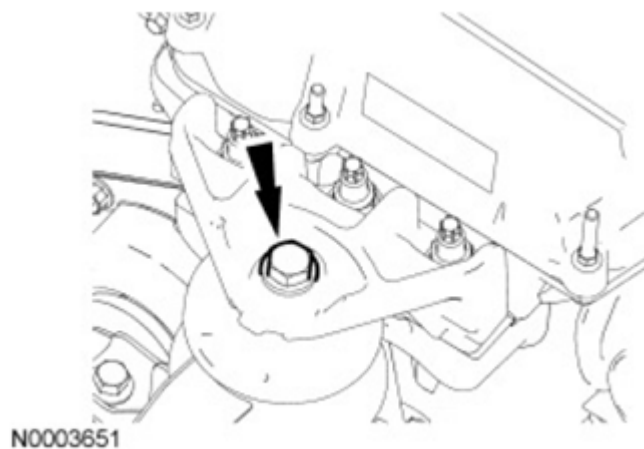


Fig. 268: Locating Engine Mount Bracket Bolt
Courtesy of FORD MOTOR CO.

42. Remove the nuts and the engine mount bracket.

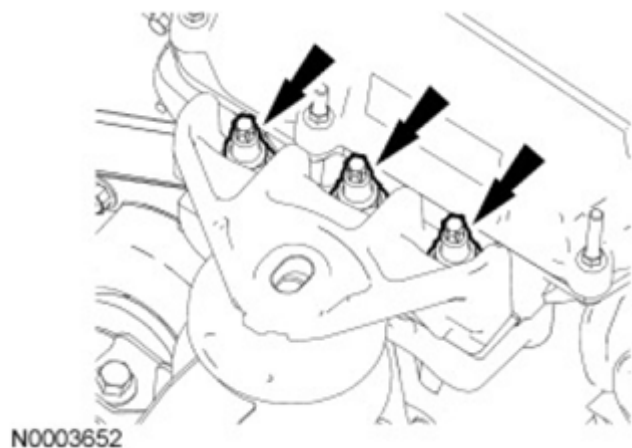


Fig. 269: Locating Engine Mount Bracket Nuts
Courtesy of FORD MOTOR CO.

43. Remove the bolt from the transaxle rear mount.

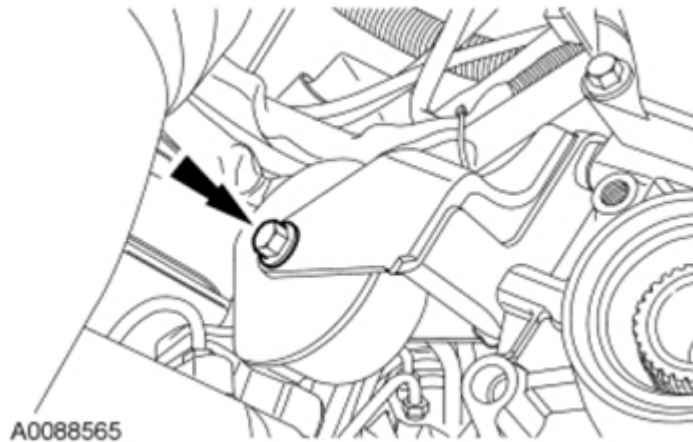


Fig. 270: Locating Transaxle Rear Mount Bolt
Courtesy of FORD MOTOR CO.

44. Remove bolt from the LH transaxle mount.

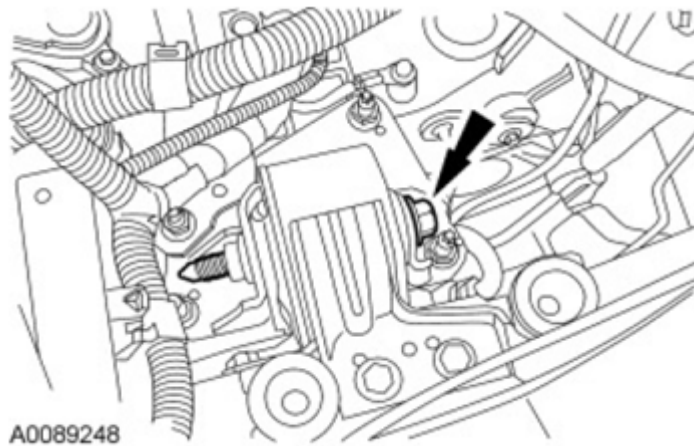


Fig. 271: Locating LH Transaxle Mount Bolt
Courtesy of FORD MOTOR CO.

45. Lower the engine and transaxle from the vehicle.
46. Disconnect the starter terminals.
1. Remove the battery cable nut.
 2. Remove the starter solenoid terminal nut.

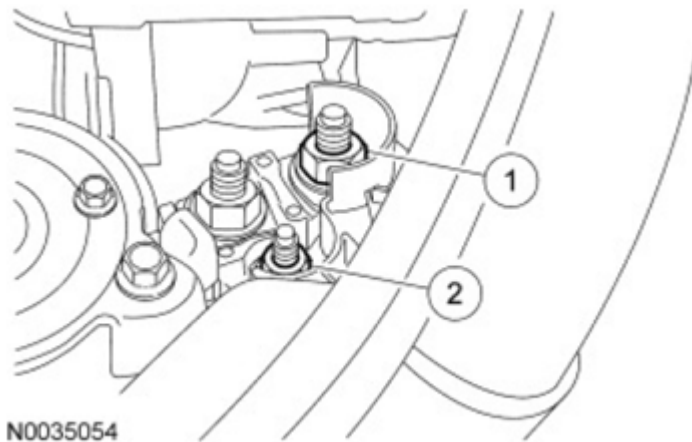


Fig. 272: Identifying Battery Cable And Starter Solenoid Terminal Nuts
Courtesy of FORD MOTOR CO.

47. Remove the nut and the ground wire.

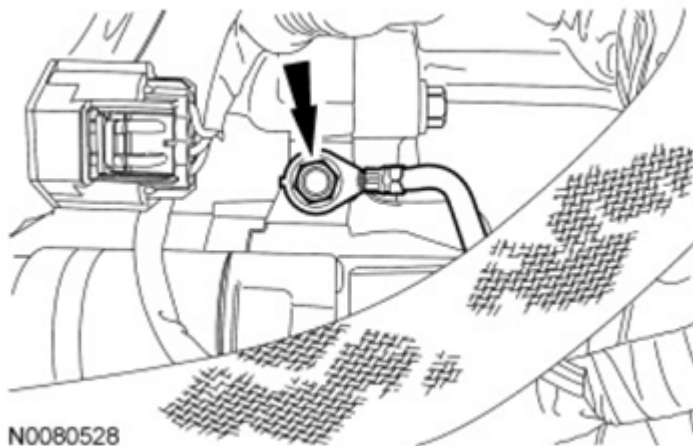


Fig. 273: Locating Ground Wire Nut
Courtesy of FORD MOTOR CO.

48. Remove the 2 stud bolts and remove the starter.

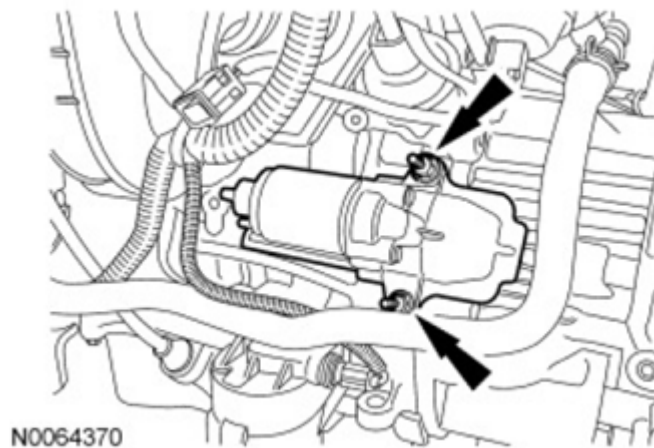


Fig. 274: Locating Starter Motor Stud Bolts
Courtesy of FORD MOTOR CO.

49. Remove the starter motor isolator.

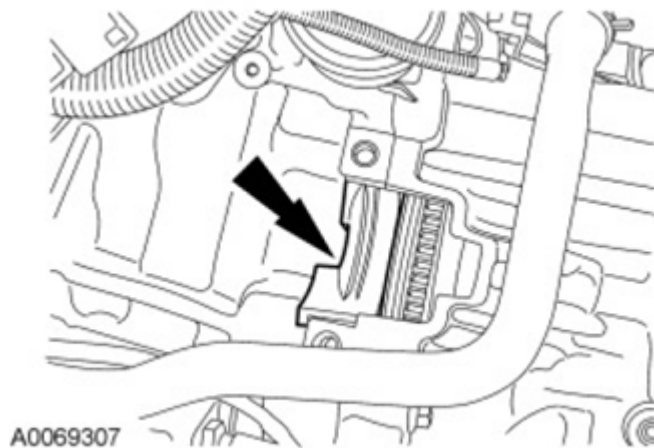


Fig. 275: Locating Starter Motor Isolator
Courtesy of FORD MOTOR CO.

50. Using the Floor Crane and Spreader Bar, remove the engine and transaxle from the lift table.

NOTE: The transaxle-to-engine bolts differ in length. Mark the bolts for correct installation.

51. Remove the remaining 5 engine-to-transaxle bolts and separate the engine and transaxle.

DISASSEMBLY

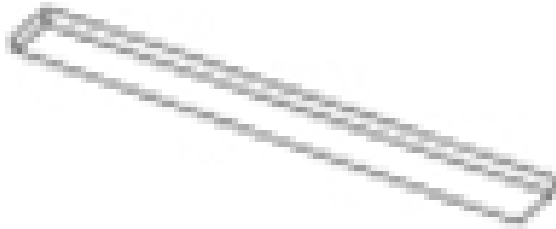
ENGINE

2011 Mercury Mariner

2011 ENGINE Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)

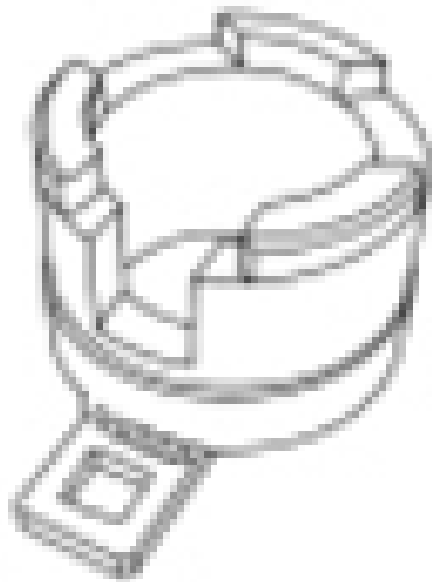
Special Tool(s)

SPECIAL TOOLS DESCRIPTION

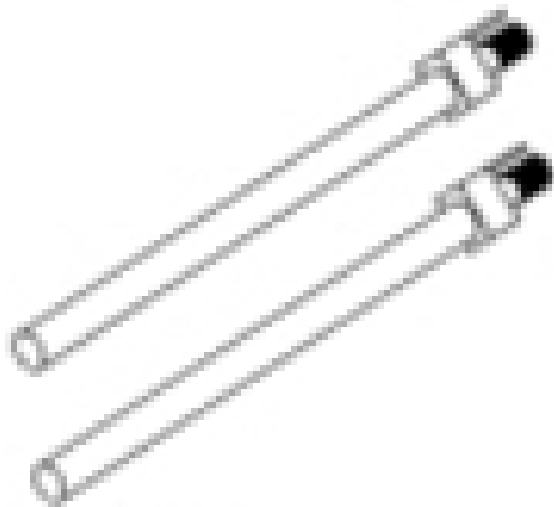
 ST2645-A	Alignment Plate, Camshaft 303-465 (T94P-6256-CH)
 ST1910-A	Engine Stand 014-00232 or equivalent
	Holding Tool, Crankshaft Damper 303-1416

2011 Mercury Mariner

2011 ENGINE Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)



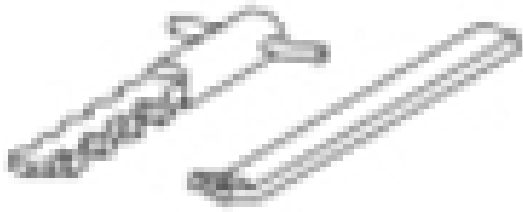
ST3054-A



ST1982-A

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

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



ST1385-A



ST2638-A

Timing Peg, Crankshaft TDC
303-507

NOTE: Do not loosen or remove the crankshaft pulley bolt without first installing the special tools as instructed in this procedure. The crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. The crankshaft, the crankshaft sprocket and the pulley are fitted together by friction, using diamond washers between the flange faces on each part. For that reason, the crankshaft sprocket is also unfastened if the pulley bolt is loosened. Before any repair requiring loosening or removal of the crankshaft pulley bolt, the crankshaft and camshafts must be locked in place by the special service tools, otherwise severe engine damage can occur.

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: Due to the precision fit and timing of the balancer shaft assembly, it cannot be removed from the engine block.

NOTE: For additional information, refer to the exploded views under the Engine **ASSEMBLY** procedure in this service information.

Vehicles with manual transaxle

WARNING: The clutch disc and clutch pressure plate are heavy and may fall if not held when the bolts are removed. Failure to follow this instruction may result in serious personal injury.

NOTE: Loosen the bolts evenly to prevent pressure plate damage.

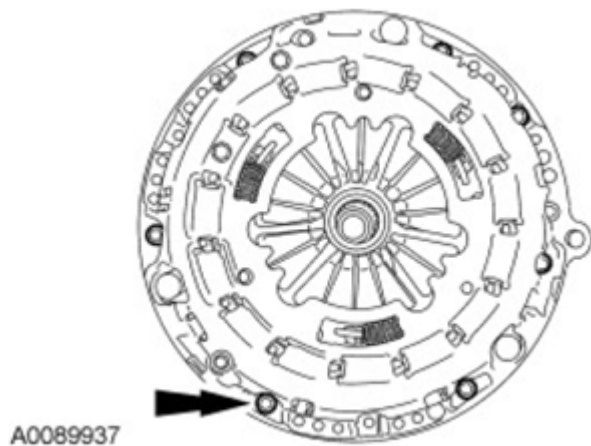
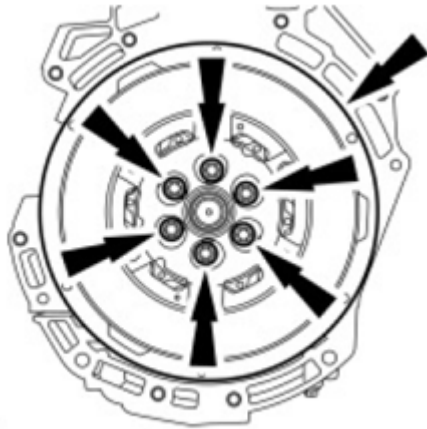


Fig. 276: Locating Clutch Pressure Plate Bolt
Courtesy of FORD MOTOR CO.

1. Remove the bolts, clutch pressure plate and clutch disc.
2. Remove the bolts and the flywheel.

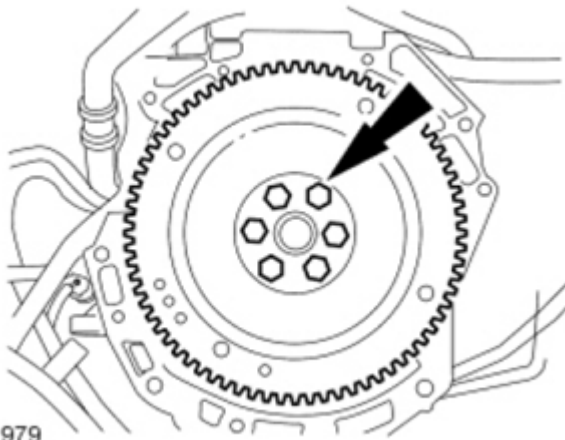


N0109827

Fig. 277: Locating Flywheel Bolts
Courtesy of FORD MOTOR CO.

Vehicles with automatic transaxle

3. Remove the bolts and the flexplate.



A0031979

Fig. 278: Locating Flexplate Bolt
Courtesy of FORD MOTOR CO.

All vehicles

4. Mount the engine on a suitable stand.
5. Disconnect the Crankshaft Position (CKP) sensor electrical connector.
 - Detach the wiring harness-to-engine retainer.

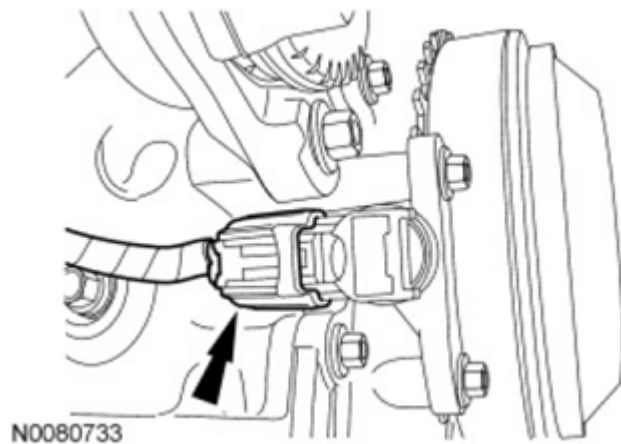


Fig. 279: Locating CKP Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

6. Disconnect the generator electrical connection and the 2 wiring harness retainers.

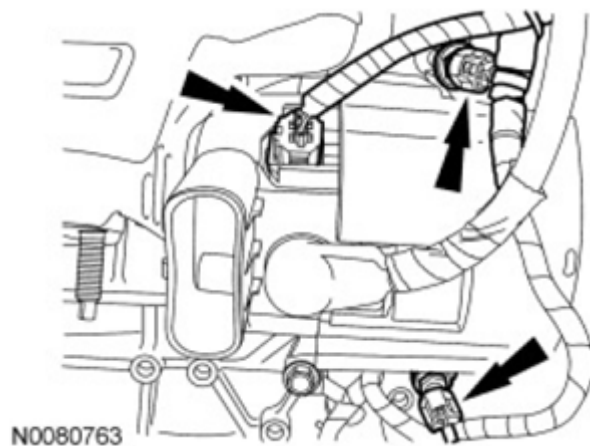


Fig. 280: Locating Generator Electrical Connection And Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

7. Remove the nut and the generator wiring harness.



Fig. 281: Locating Generator Wiring Harness And Nut
Courtesy of FORD MOTOR CO.

8. Remove the 2 nuts, 1 bolt and the generator.



Fig. 282: Locating Generator With Fasteners
Courtesy of FORD MOTOR CO.

9. Disconnect the Heated Oxygen Sensor (HO2S) electrical connector.

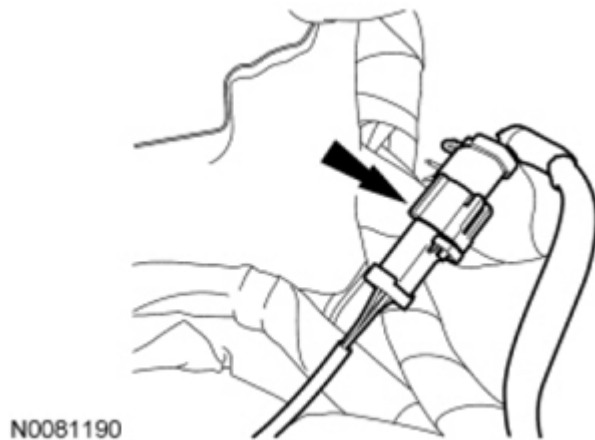


Fig. 283: Locating Heated Oxygen Sensor (HO2S) Electrical Connector
Courtesy of FORD MOTOR CO.

10. Remove the 4 exhaust manifold heat shield bolts and the heat shield.

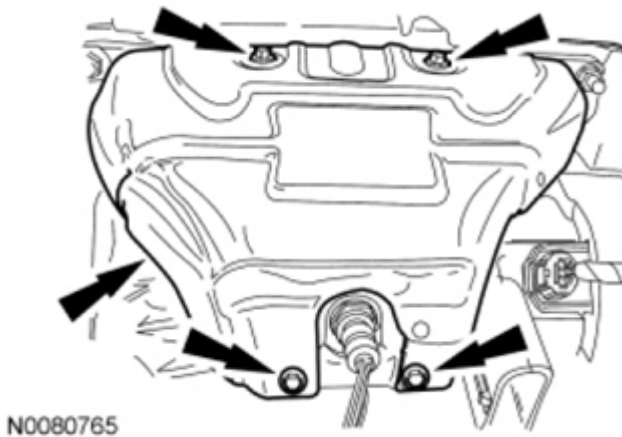


Fig. 284: Locating Exhaust Manifold Heat Shield With Bolts
Courtesy of FORD MOTOR CO.

11. Remove and discard the 7 exhaust manifold nuts.

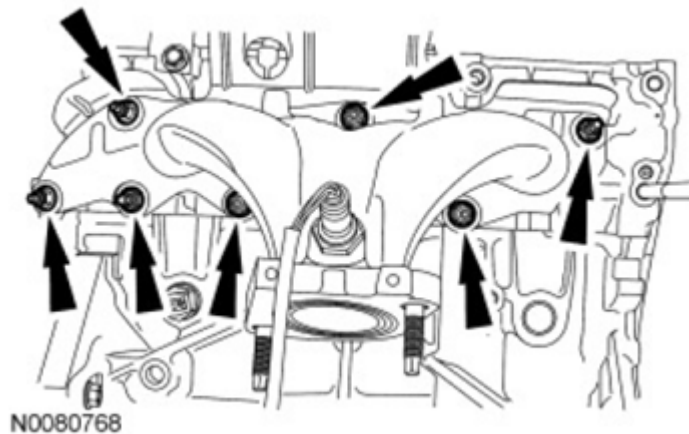


Fig. 285: Locating Exhaust Manifold Nuts
Courtesy of FORD MOTOR CO.

12. Remove the exhaust manifold and discard the exhaust manifold gasket.
13. Remove and discard the 7 exhaust manifold studs.

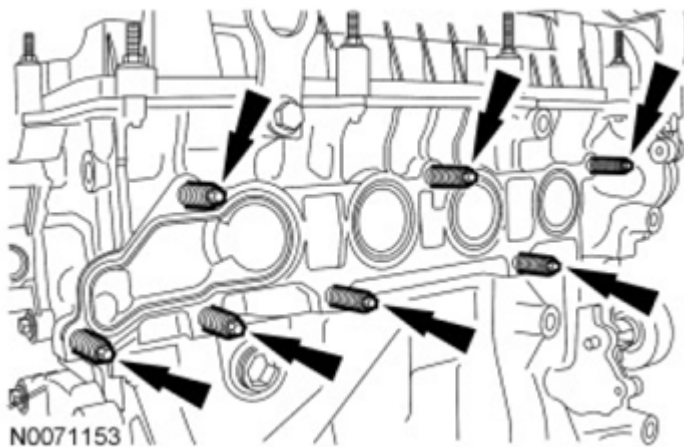


Fig. 286: View Of Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

14. Clean and inspect the exhaust manifold. For additional information, refer to **ENGINE MECHANICAL SYSTEM - GENERAL INFORMATION** article.
15. Remove the 2 bolts and the accessory drive belt tensioner.

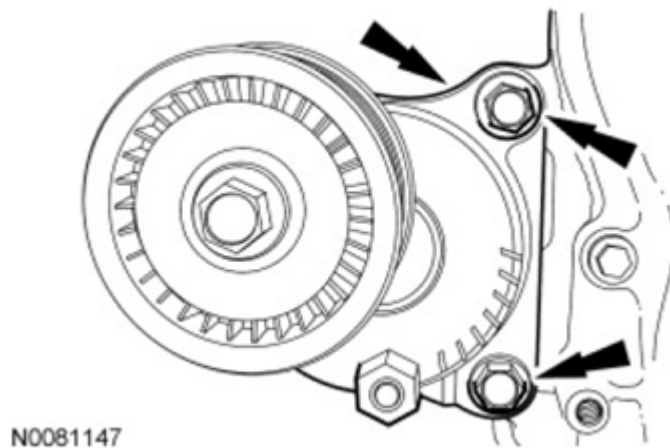


Fig. 287: Locating Accessory Drive Belt Tensioner And Bolts
Courtesy of FORD MOTOR CO.

16. Loosen the bolt and remove the accessory drive belt idler pulley.

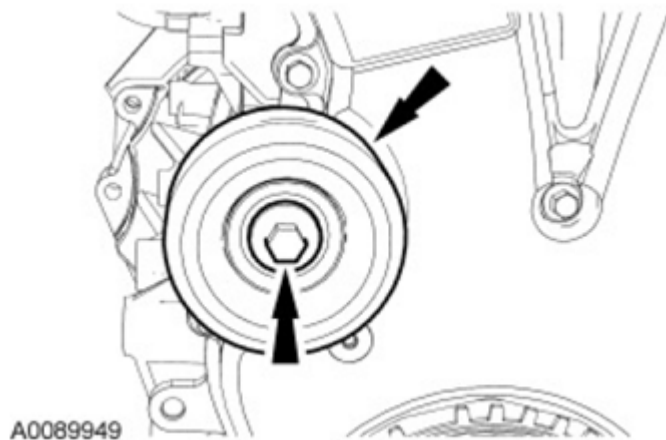


Fig. 288: Locating Accessory Drive Belt Idler Pulley And Bolt
Courtesy of FORD MOTOR CO.

17. Remove the 2 bolts and the accessory drive belt idler pulley and bracket.

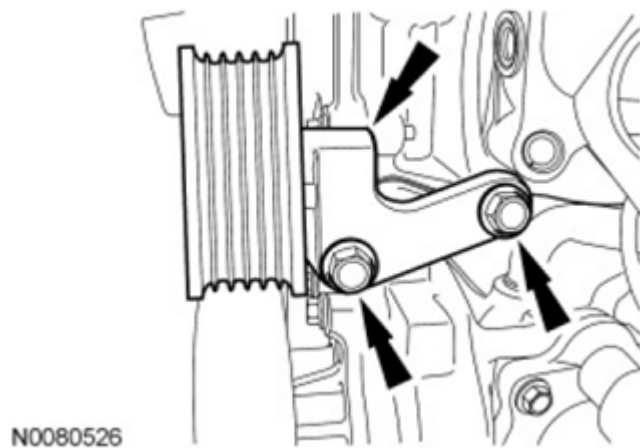


Fig. 289: Locating Accessory Drive Belt Idler Pulley And Bracket Bolts
Courtesy of FORD MOTOR CO.

18. Remove the 3 bolts and the coolant pump pulley.

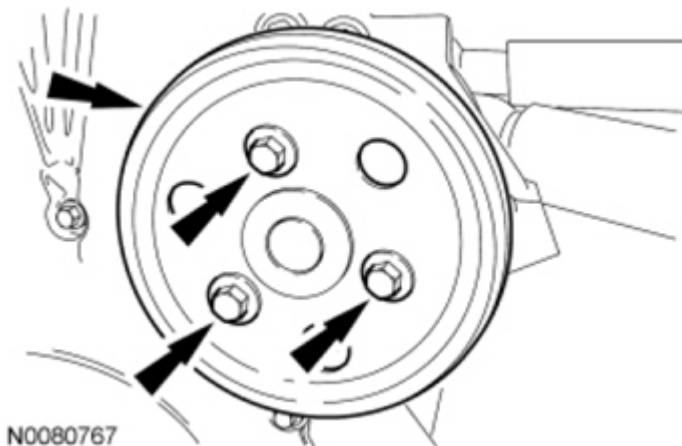


Fig. 290: Locating Coolant Pump Pulley And Bolts
Courtesy of FORD MOTOR CO.

19. Remove the bolts and the coolant pump.

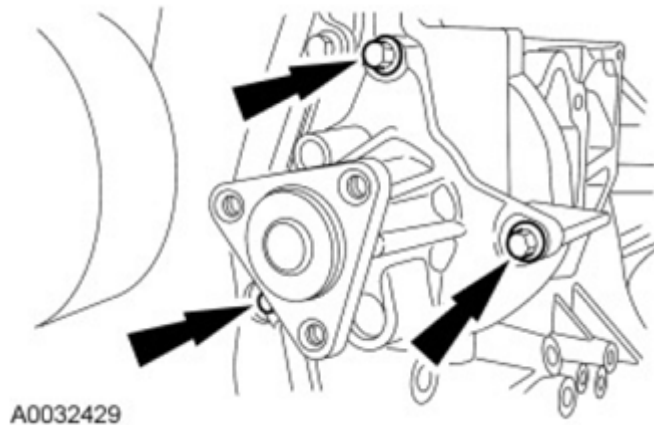


Fig. 291: Locating Coolant Pump Bolts
Courtesy of FORD MOTOR CO.

20. Remove the 3 bolts and the thermostat housing assembly.

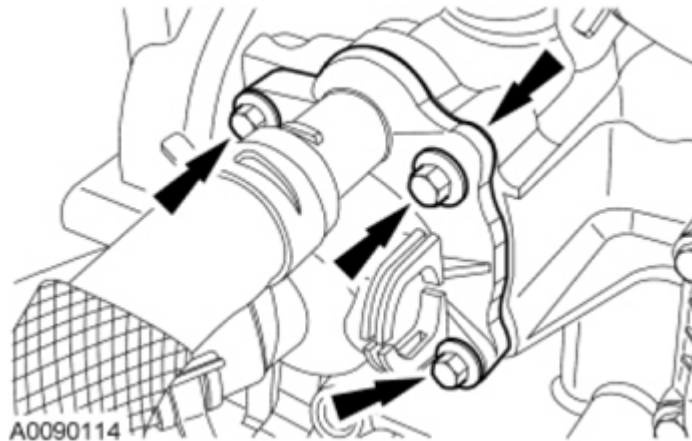


Fig. 292: Locating Thermostat Housing And Bolts
Courtesy of FORD MOTOR CO.

21. Remove the coolant tube retainer from the intake manifold.

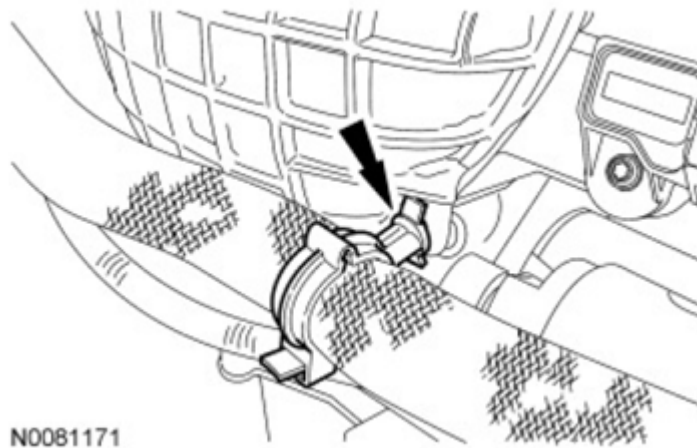


Fig. 293: Locating Coolant Tube Retainer Of Intake Manifold
Courtesy of FORD MOTOR CO.

22. Disconnect the Engine Oil Pressure (EOP) switch electrical connector.

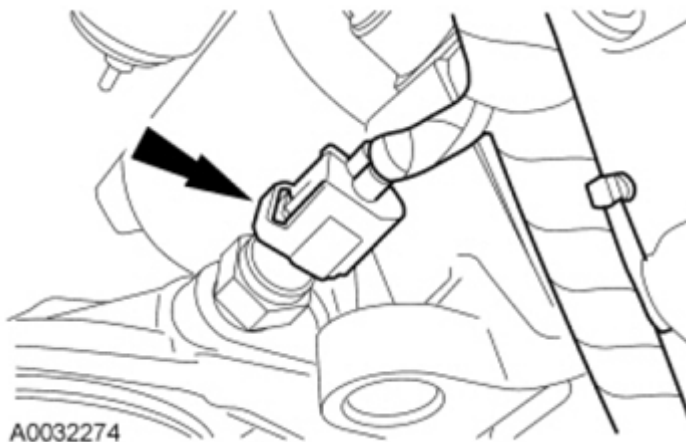


Fig. 294: Locating Engine Oil Pressure Switch Electrical Connector
Courtesy of FORD MOTOR CO.

23. Remove the 4 bolts and the oil filter adapter.
- Discard the gasket.

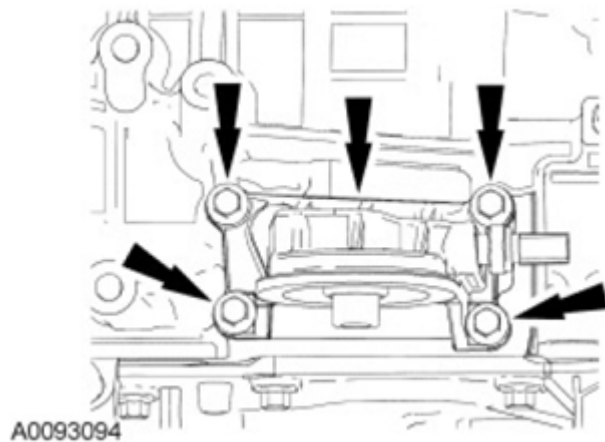


Fig. 295: Locating Oil Filter Adapter Bolts
Courtesy of FORD MOTOR CO.

24. If equipped, remove the bolt and capacitor.

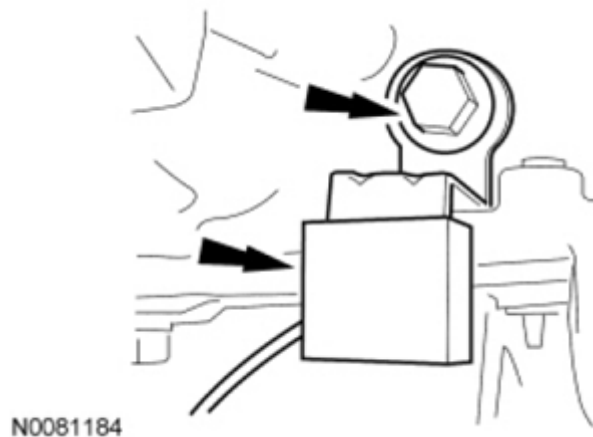


Fig. 296: Locating Capacitor And Bolt
Courtesy of FORD MOTOR CO.

25. Disconnect the Variable Camshaft Timing (VCT) electrical connector.

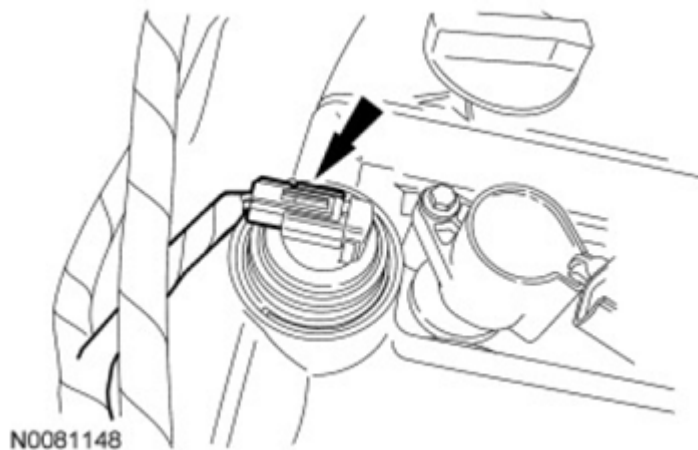


Fig. 297: Locating Variable Camshaft Timing (VCT) Electrical Connector
Courtesy of FORD MOTOR CO.

26. Detach the wiring harness retainers from the RH side valve cover stud bolts.

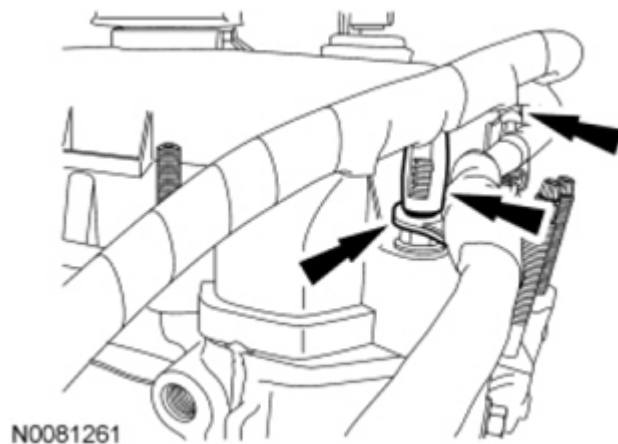


Fig. 298: Locating Wiring Harness Retainers Of RH Side Valve Cover Stud Bolt
Courtesy of FORD MOTOR CO.

27. Disconnect the crankcase vent hose from the valve cover.

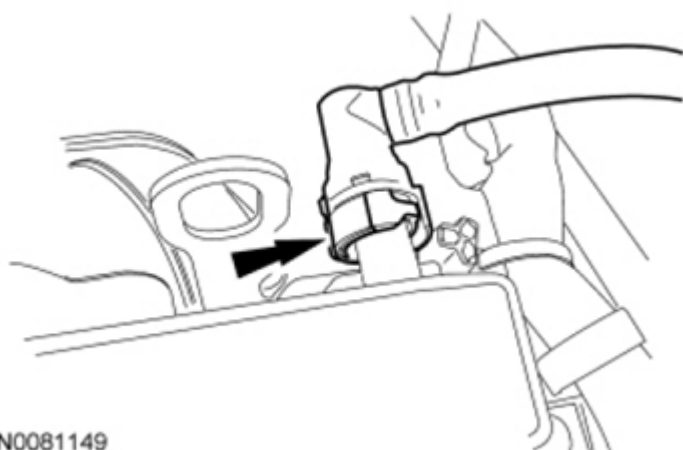


Fig. 299: Locating Crankcase Vent Hose Of Valve Cover
Courtesy of FORD MOTOR CO.

28. Detach the wiring harness retainers from the LH side valve cover stud bolts.

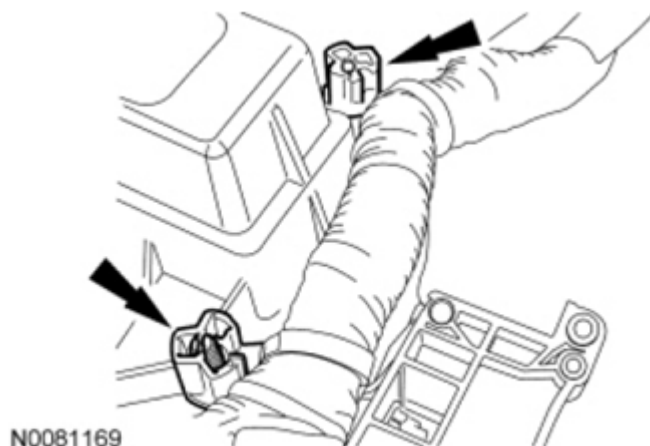


Fig. 300: Locating Wiring Harness Retainers Of LH Side Valve Cover Stud Bolts
Courtesy of FORD MOTOR CO.

29. Disconnect the Manifold Absolute Pressure (MAP) sensor electrical connector.

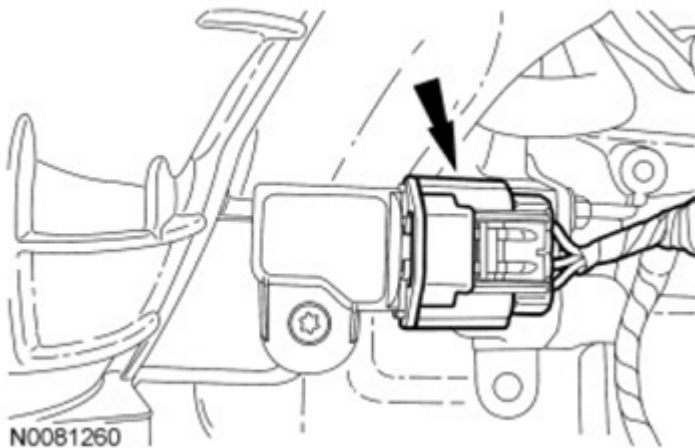


Fig. 301: Locating Manifold Absolute Pressure (MAP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

30. Disconnect the electronic throttle control and Evaporative Emission (EVAP) canister purge valve electrical connectors.

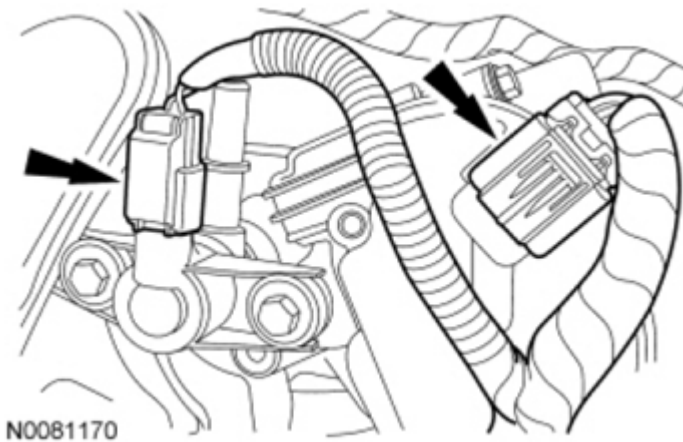


Fig. 302: Locating Evaporative Emission (EVAP) Canister Purge Valve Electrical Connectors
Courtesy of FORD MOTOR CO.

31. Disconnect the EGR valve electrical connector.

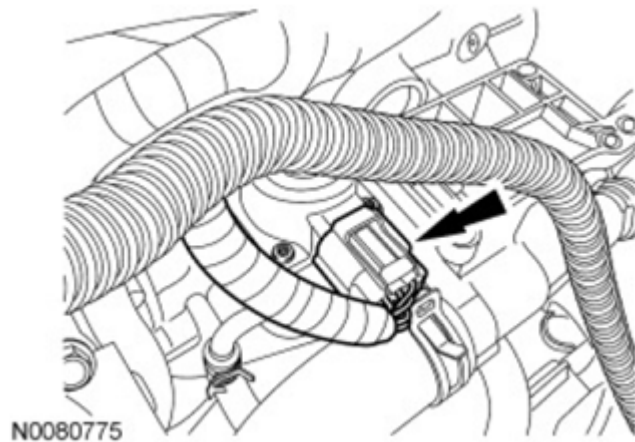


Fig. 303: Locating EGR Valve Electrical Connector
Courtesy of FORD MOTOR CO.

32. Disconnect the Knock Sensor (KS) and detach the 2 wiring harness retainers.

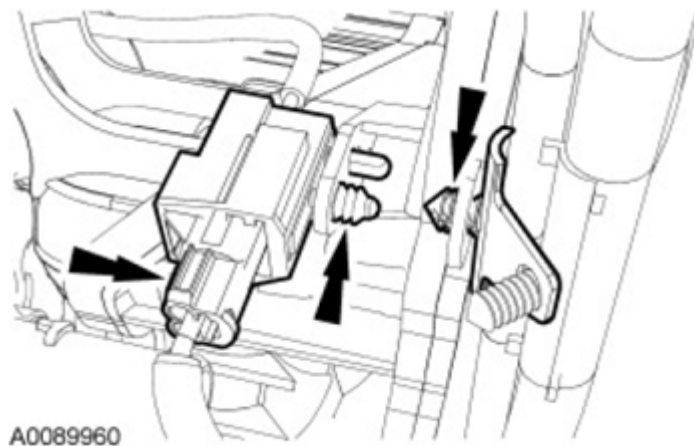


Fig. 304: Locating Knock Sensor And Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

33. Detach all the wiring harness retainers from the intake manifold.
34. Disconnect the 4 coil-on-plugs and Camshaft Position (CMP) sensor electrical connectors.

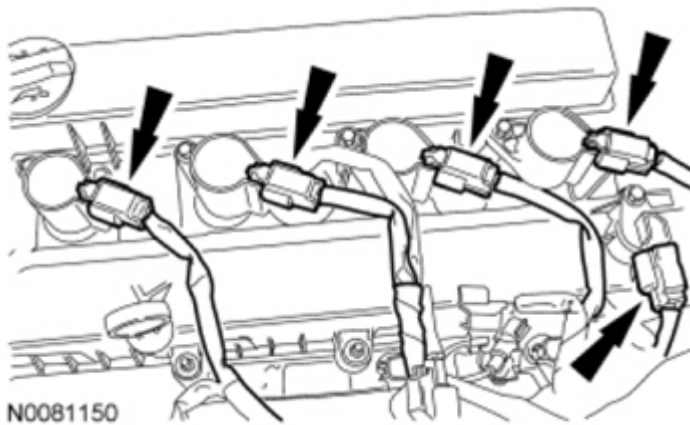


Fig. 305: View Of Coil-On-Plugs And Camshaft Position Sensor Electrical Connectors
Courtesy of FORD MOTOR CO.

35. Position the rubber boot aside and disconnect the Cylinder Head Temperature (CHT) sensor electrical connector.

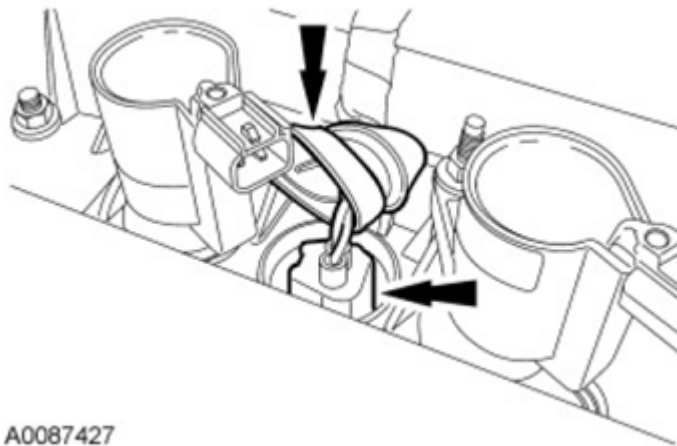


Fig. 306: Locating Cylinder Head Temperature Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

36. Disconnect the radio capacitor electrical connector.

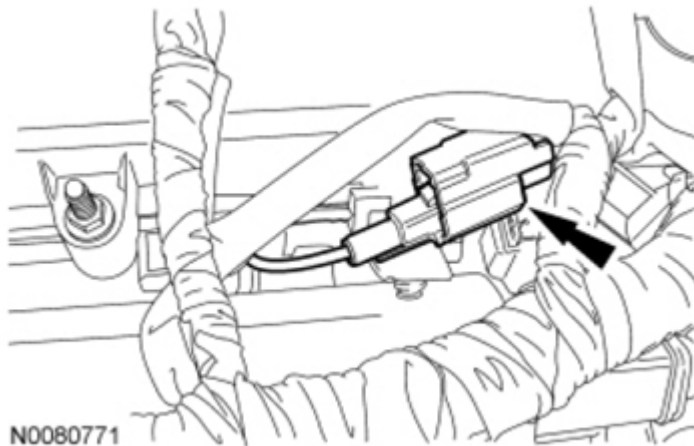


Fig. 307: Locating Radio Capacitor Electrical Connector
Courtesy of FORD MOTOR CO.

37. Disconnect the 4 fuel injector electrical connectors.
- Detach the 2 wiring harness retainers and remove the wiring harness assembly.

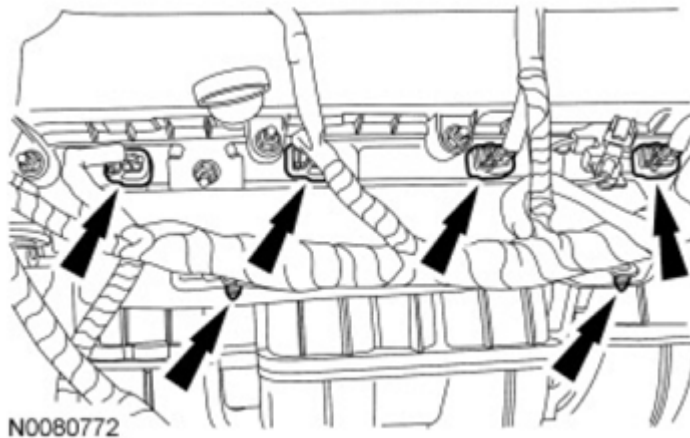


Fig. 308: Locating Fuel Injector Electrical Connectors And Retainers
Courtesy of FORD MOTOR CO.

38. Remove the fuel rail insulator.

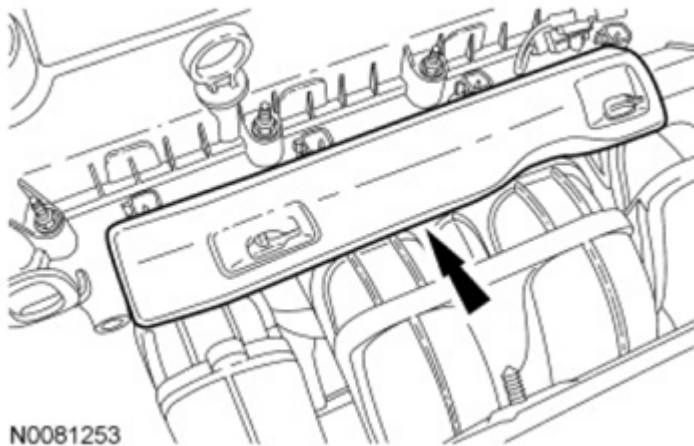


Fig. 309: Locating Fuel Rail Insulator
Courtesy of FORD MOTOR CO.

39. Remove the nut and the radio capacitor.

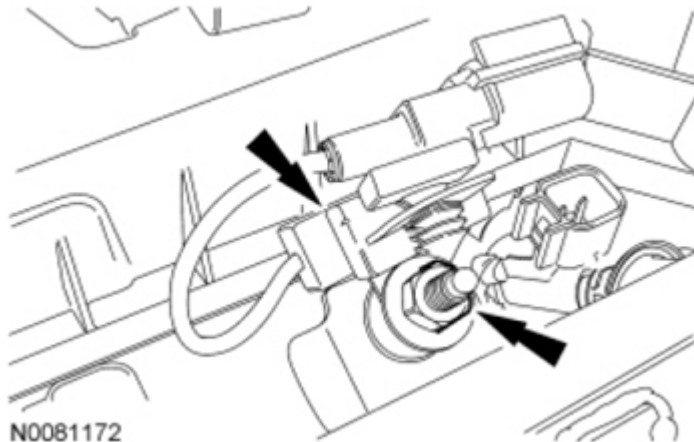


Fig. 310: Remove/Install Radio Capacitor And Nut
Courtesy of FORD MOTOR CO.

40. Remove the 2 stud bolts, fuel rail and fuel injectors as an assembly.

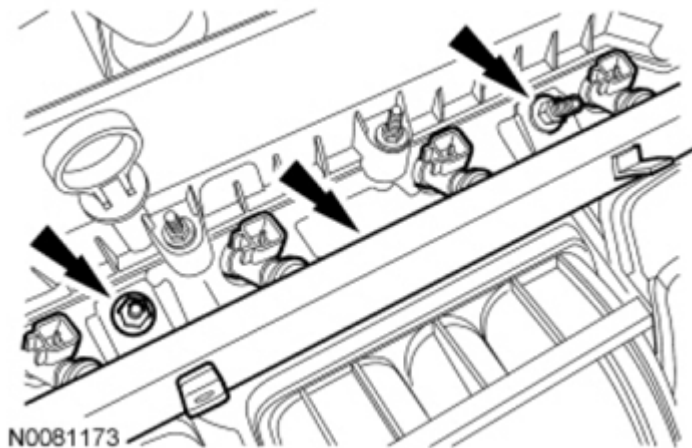


Fig. 311: Locating Fuel Injector With Stud Bolts
Courtesy of FORD MOTOR CO.

41. Remove the 8 bolts (3 shown in illustration) and position the intake manifold aside.

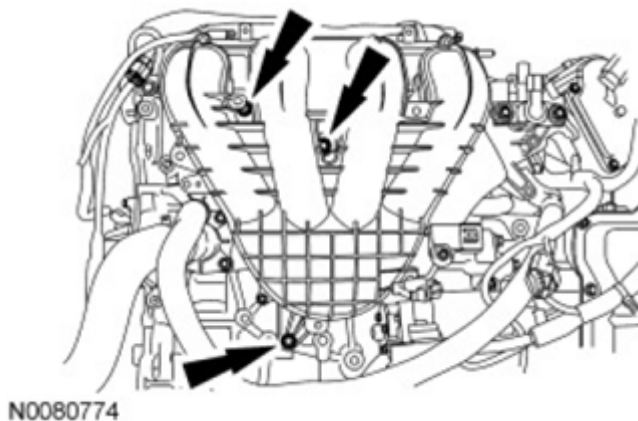


Fig. 312: Remove/Install Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

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.

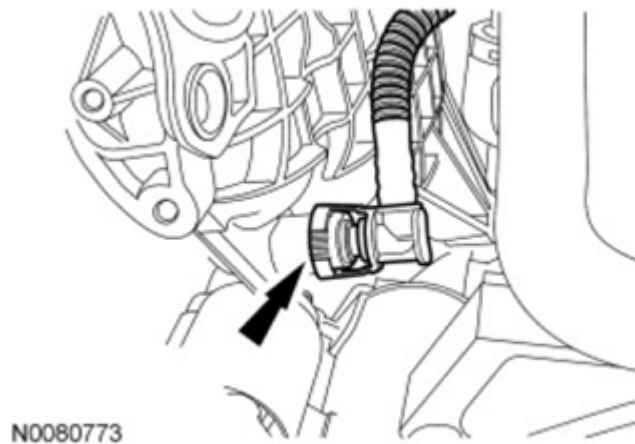


Fig. 313: Locating Crankcase Vent Oil Separator Tube Tab
Courtesy of FORD MOTOR CO.

42. Squeeze the 2 crankcase vent oil separator tube tabs and disconnect the tube from the intake manifold.
43. Remove the EGR tube.

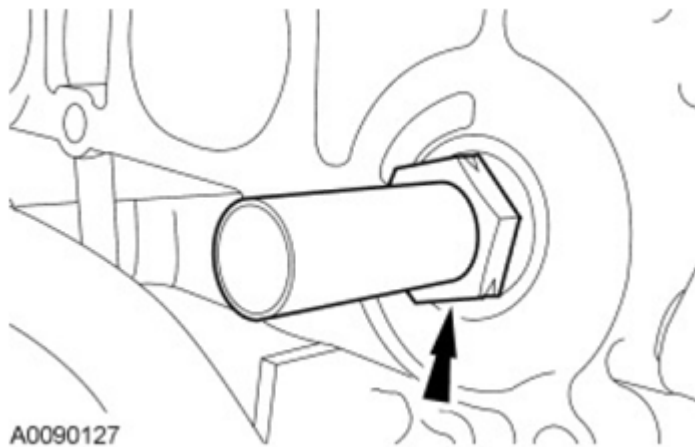


Fig. 314: View Of EGR Tube
Courtesy of FORD MOTOR CO.

44. Disconnect the coolant hose.

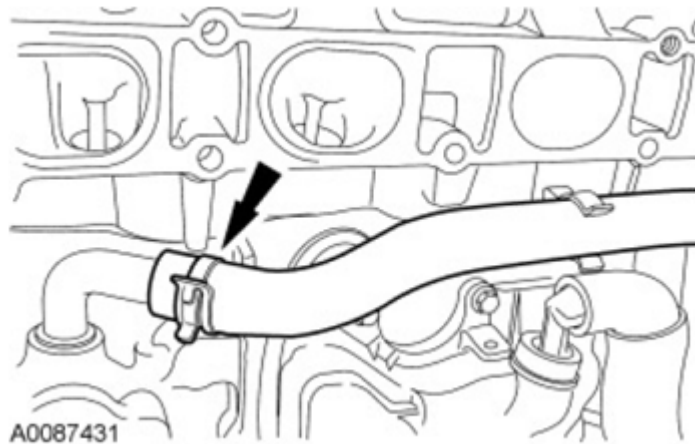


Fig. 315: Locating Coolant Hose
Courtesy of FORD MOTOR CO.

45. Disconnect and remove the coolant hose.

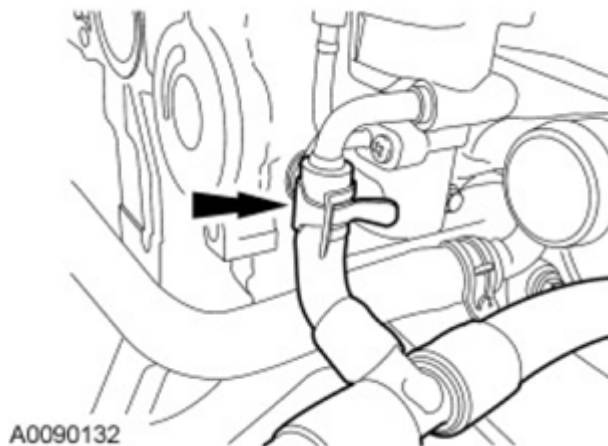


Fig. 316: Locating Coolant Hose
Courtesy of FORD MOTOR CO.

46. Disconnect and remove 2 the coolant hoses.

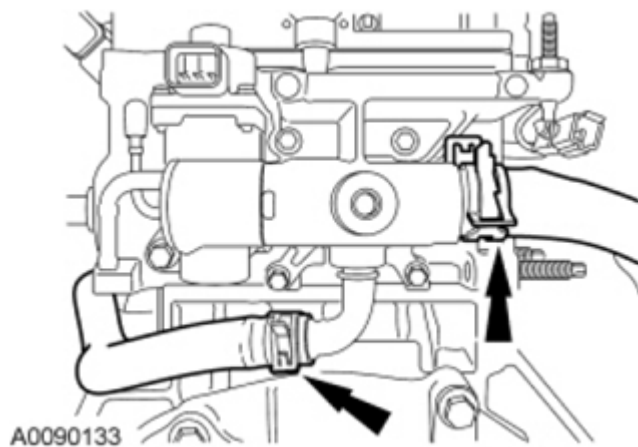


Fig. 317: Locating Coolant Hoses
Courtesy of FORD MOTOR CO.

47. Remove the bolt and the **KS** .

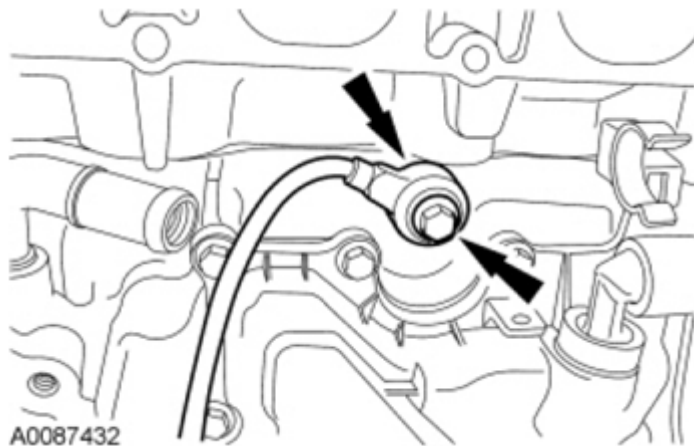


Fig. 318: Remove/Install KS With Bolt
Courtesy of FORD MOTOR CO.

48. Remove the 8 bolts and the crankcase vent oil separator.

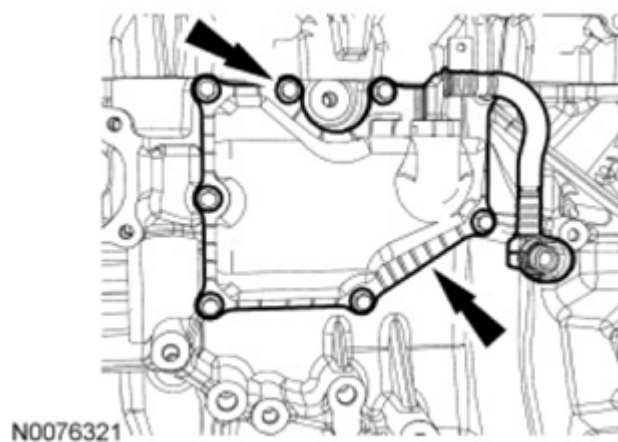


Fig. 319: Remove/Install Crankcase Vent Oil Separator Bolts
Courtesy of FORD MOTOR CO.

49. If equipped, remove the block heater.

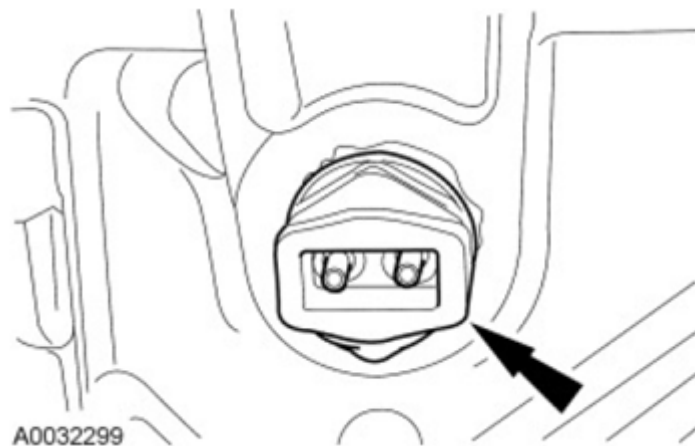


Fig. 320: View Of Block Heater
Courtesy of FORD MOTOR CO.

50. Remove the oil level indicator.

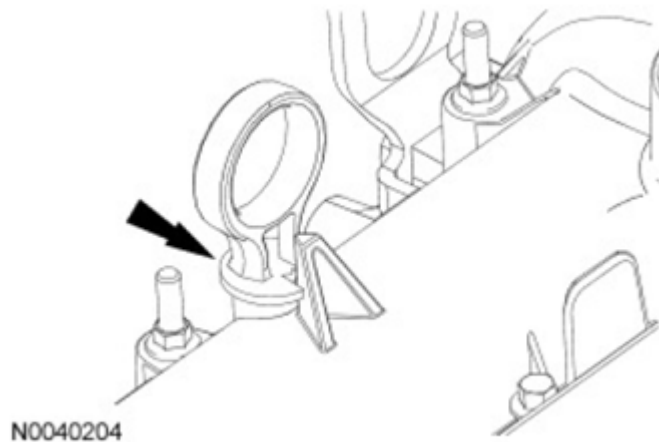


Fig. 321: Locating Oil Level Indicator
Courtesy of FORD MOTOR CO.

NOTE: When removing the ignition coil-on-plugs, a slight twisting motion will break the seal and ease removal.

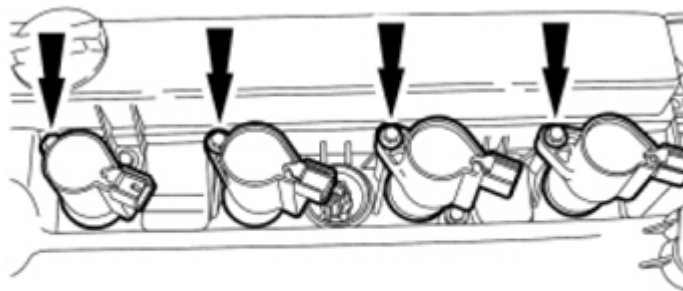


Fig. 322: Remove/Install Coil-On-Plug Bolts
Courtesy of FORD MOTOR CO.

51. Remove the 4 bolts and the 4 coil-on-plugs.
52. Remove the 12 retainers and the valve cover.

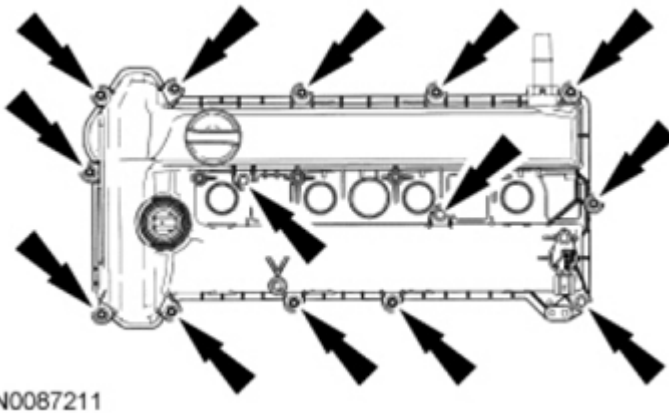


Fig. 323: Locating Valve Cover Retainers
Courtesy of FORD MOTOR CO.

53. Remove the bolts and the **CKP** sensor.

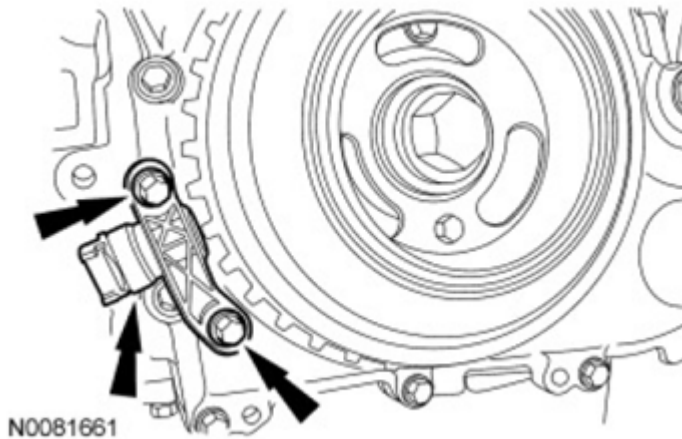


Fig. 324: Locating CKP Sensor With Bolts
Courtesy of FORD MOTOR CO.

NOTE: Failure to position the No. 1 piston at Top Dead Center (TDC) can result in damage to the engine. Turn the engine in the normal direction of rotation only.

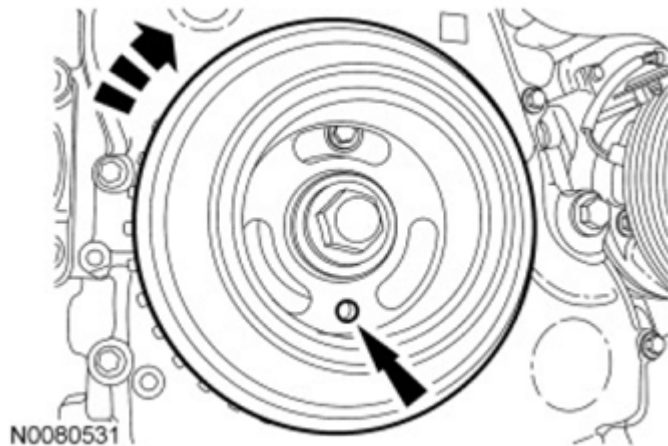


Fig. 325: Turning Crankshaft Pulley
Courtesy of FORD MOTOR CO.

54. Using the crankshaft pulley bolt, turn the crankshaft clockwise to position the No. 1 piston at Top Dead Center (TDC).
 - The hole in the crankshaft pulley should be in the 6 o'clock position.

NOTE: The Camshaft Alignment Plate is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

NOTE: The camshaft timing slots are offset. If the Camshaft Alignment Plate cannot be installed, rotate the crankshaft one complete revolution clockwise to correctly position the camshafts.

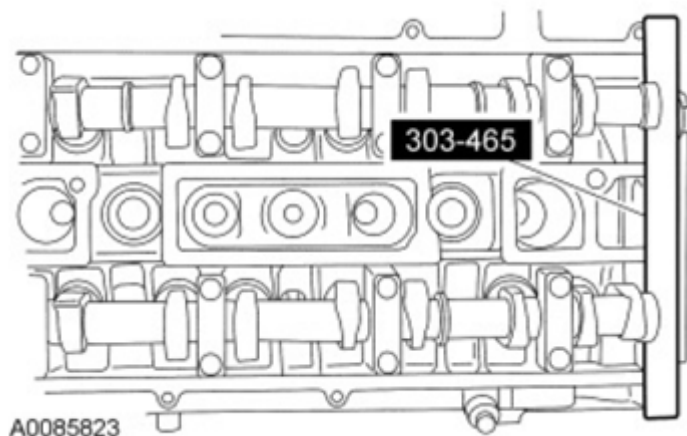


Fig. 326: View Of Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

55. Install the Camshaft Alignment Plate in the slots on the rear of both camshafts.
56. Remove the engine plug bolt.

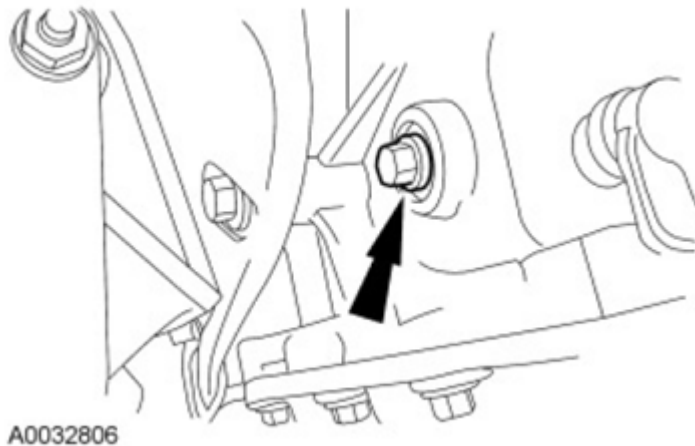


Fig. 327: Remove/Install Engine Plug Bolt
Courtesy of FORD MOTOR CO.

NOTE: The Crankshaft TDC Timing Peg will contact the crankshaft and prevent it from turning past TDC . However, the crankshaft can still be rotated in the counterclockwise direction. The crankshaft must remain at the TDC position during disassembly.

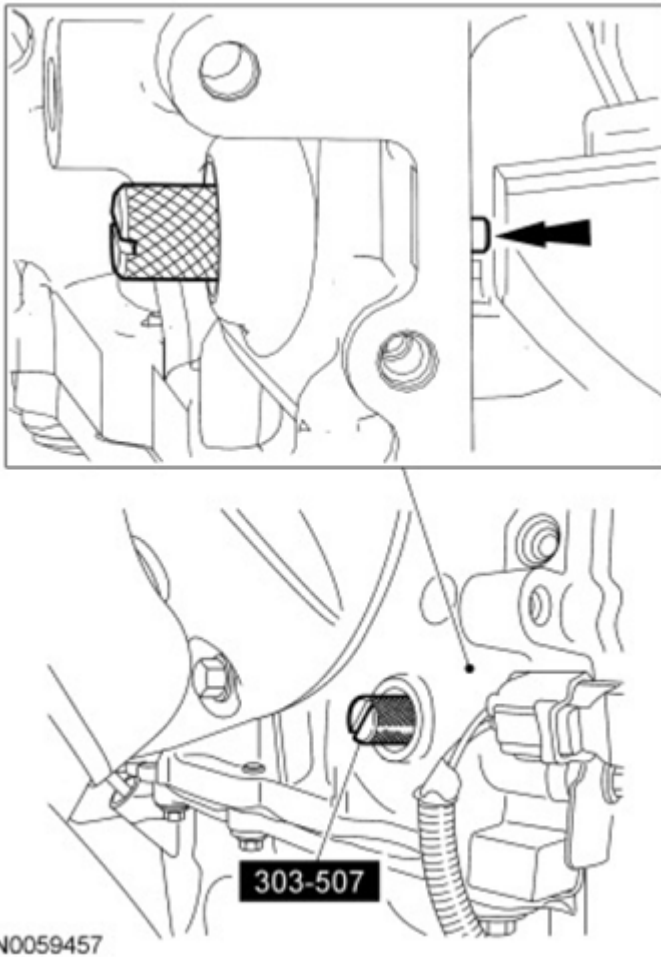


Fig. 328: View Of Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

57. Install the Crankshaft TDC Timing Peg.

NOTE: The crankshaft must remain in the Top Dead Center (TDC) position during removal of the pulley bolt or damage to the engine can occur. Therefore, the crankshaft pulley must be held in place with the Crankshaft Damper Holding Tool and the bolt should be removed using an air impact wrench (1/2-in drive minimum).

NOTE: The crankshaft sprocket diamond washer may come off with the crankshaft pulley. The diamond washer must be replaced. Remove and discard the diamond washer. If the diamond washer is not installed, engine damage may occur.

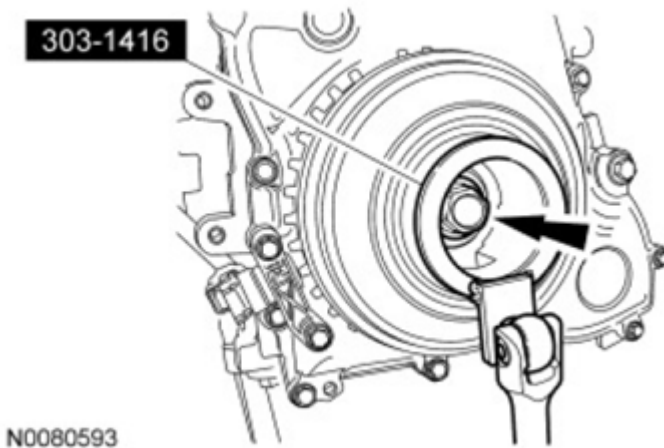


Fig. 329: Remove/Install Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

58. Use the Crankshaft Damper Holding Tool and a suitable 1/2-in drive hand tool to hold the crankshaft pulley. Use an air impact wrench to remove the crankshaft pulley bolt.
 - Remove and discard the crankshaft pulley bolt and washer.
 - Remove the crankshaft pulley.
 - Remove the diamond washer and discard.

NOTE: Use care not to damage the engine front cover or the crankshaft when removing the seal.

59. Using the Oil Seal Remover, remove the crankshaft front oil seal.

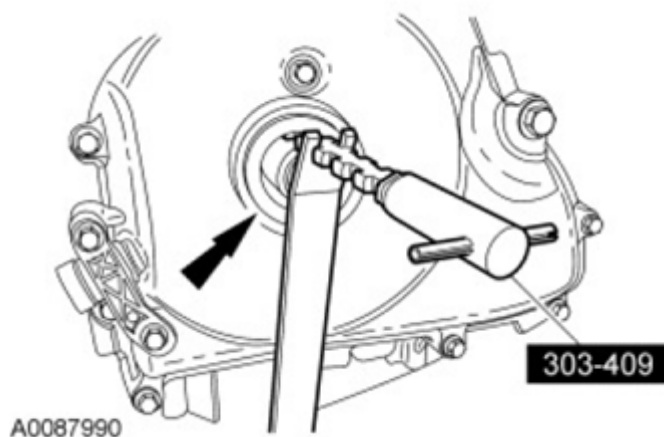
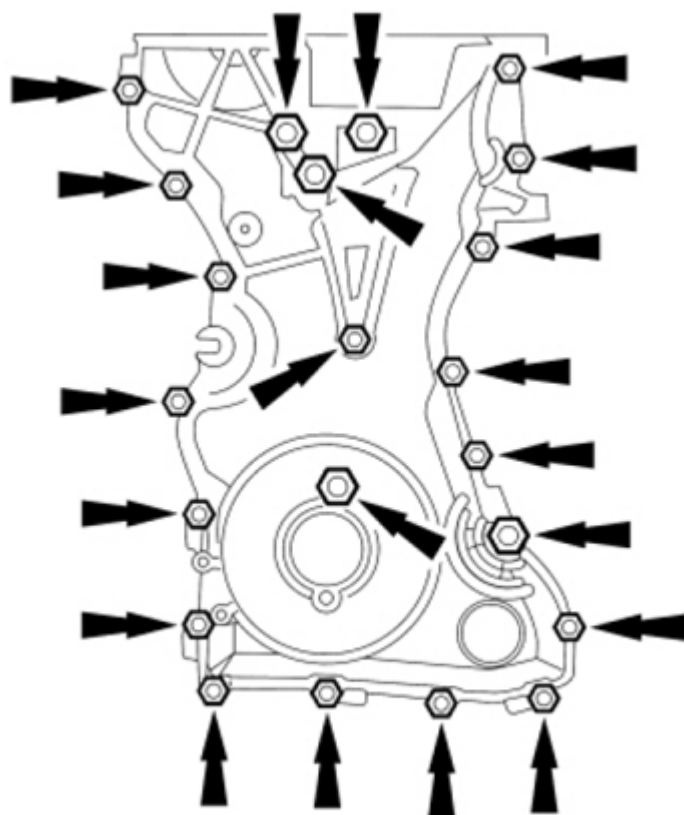


Fig. 330: Removing Crankshaft Front Oil Seal
Courtesy of FORD MOTOR CO.

60. Remove the 22 bolts and the engine front cover.



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Fig. 331: Locating Engine Front Cover Bolts
Courtesy of FORD MOTOR CO.

61. Compress the timing chain tensioner in the following sequence.
 1. Using a small pick, release the hold the ratchet mechanism.
 2. While holding the ratchet mechanism in the released position, compress the tensioner by pushing the timing chain arm toward the tensioner.
 3. Insert a paper clip into the hole to retain the tensioner.

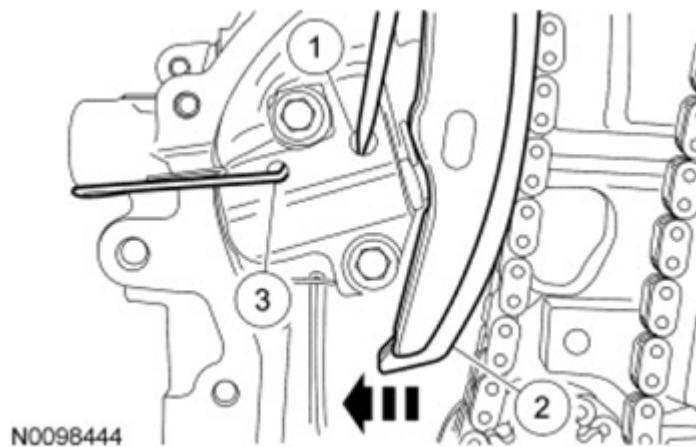


Fig. 332: Pushing Timing Chain Arm
Courtesy of FORD MOTOR CO.

62. Remove the 2 bolts and timing chain tensioner.

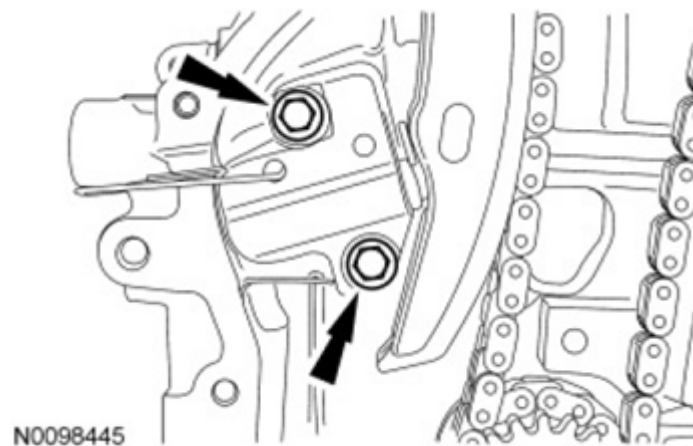


Fig. 333: Locating Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

63. Remove the RH timing chain guide.

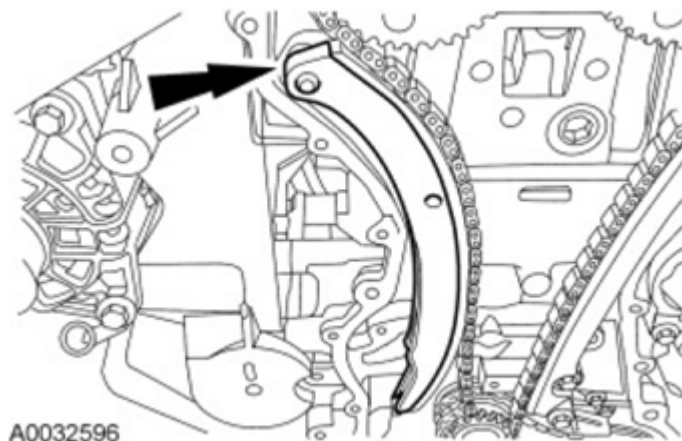


Fig. 334: Locating RH Timing Chain Guide
Courtesy of FORD MOTOR CO.

64. Remove the timing chain.

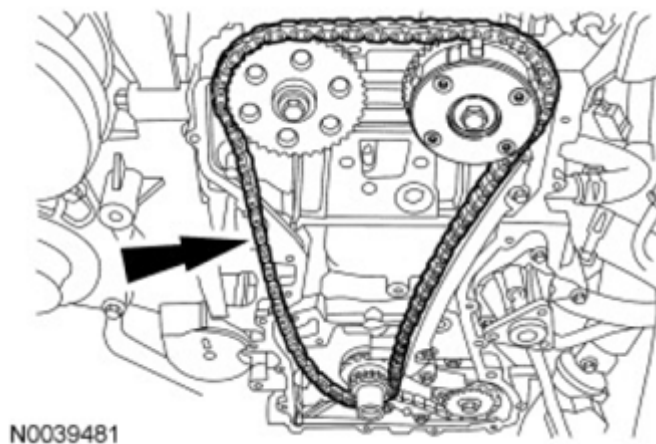


Fig. 335: View Of Timing Chain
Courtesy of FORD MOTOR CO.

65. Remove the bolts and the LH timing chain guide.

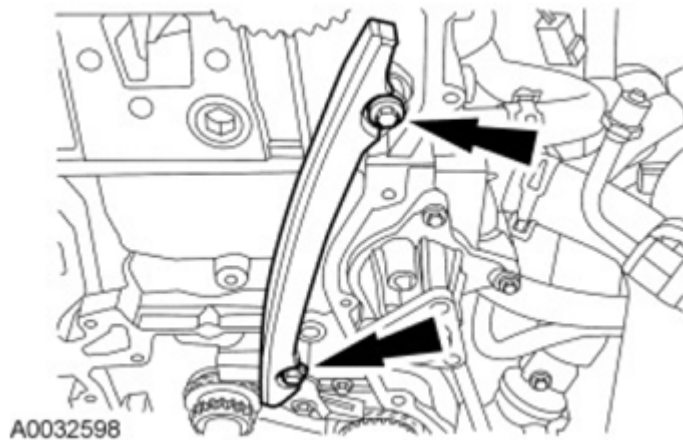


Fig. 336: Locating LH Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

NOTE: The Camshaft Alignment Plate is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

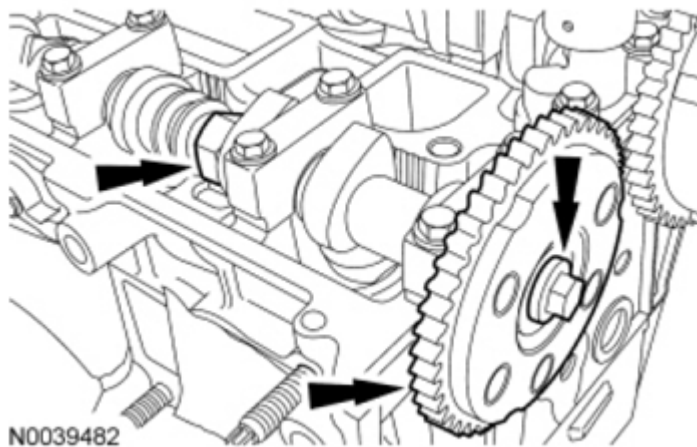


Fig. 337: View Of Exhaust Camshaft Sprocket With Bolt
Courtesy of FORD MOTOR CO.

66. Using the flats on the camshaft to prevent camshaft rotation, remove the bolt and the exhaust camshaft sprocket.

NOTE: The Camshaft Alignment Plate is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

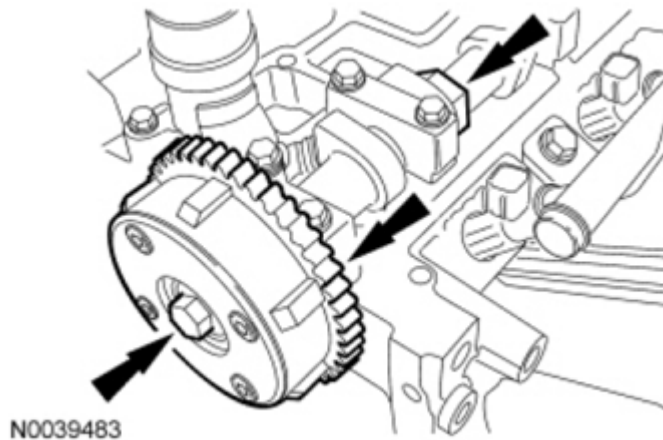


Fig. 338: View Of Camshaft Phaser And Sprocket Bolts
Courtesy of FORD MOTOR CO.

67. Using the flats on the camshaft to prevent camshaft rotation, remove the bolt and the camshaft phaser and sprocket.
68. Remove the oil pump drive chain tensioner.
 1. Release the tension on the tensioner spring.
 2. Remove the tensioner and the 2 shoulder bolts.

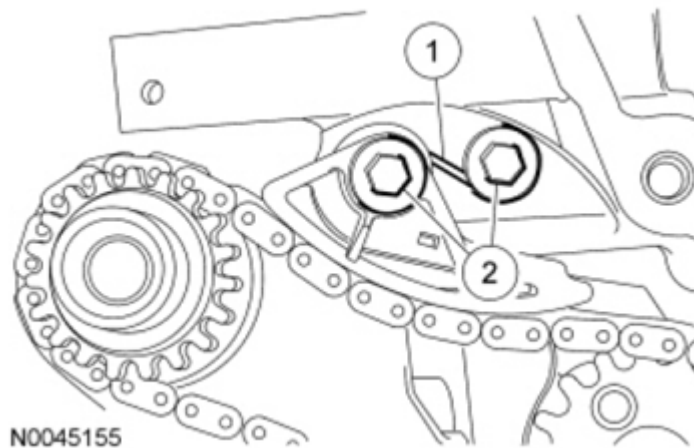


Fig. 339: Locating Oil Pump Drive Chain Tensioner And Shoulder Bolts
Courtesy of FORD MOTOR CO.

NOTE: Remove and discard the crankshaft sprocket diamond washer located behind the crankshaft sprocket.

NOTE: The oil pump chain sprocket must be held in place.

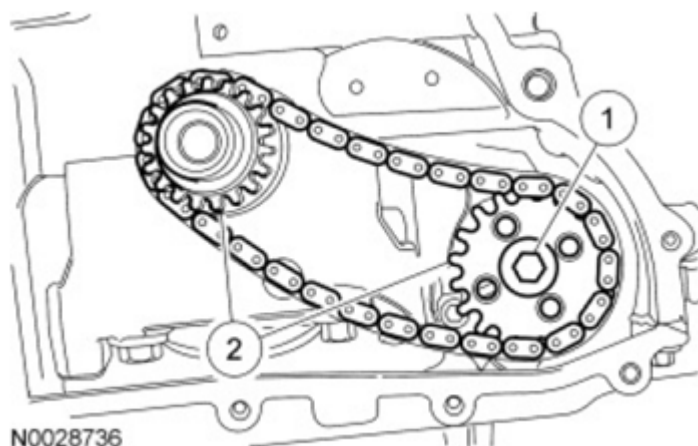


Fig. 340: Locating Oil Pump Chain And Sprockets
Courtesy of FORD MOTOR CO.

69. Remove the oil pump chain and sprockets.
 1. Remove the bolt.
 2. Remove the chain and sprockets.
70. Mark the position of the camshaft lobes on the No. 1 cylinder for assembly reference.

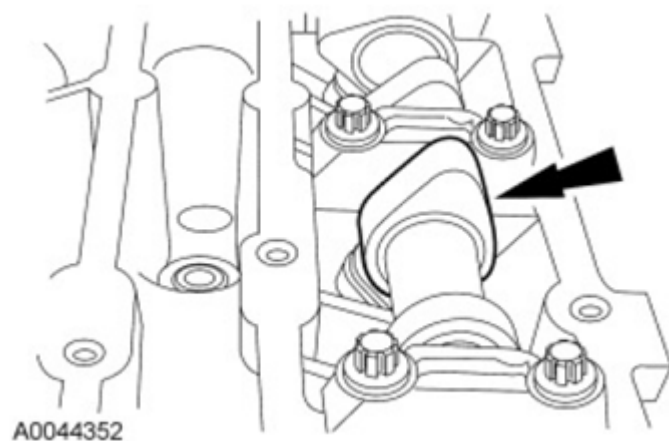


Fig. 341: View Of Camshaft Lobes Of No. 1 Cylinder
Courtesy of FORD MOTOR CO.

71. Remove the bolt and the VCT solenoid.

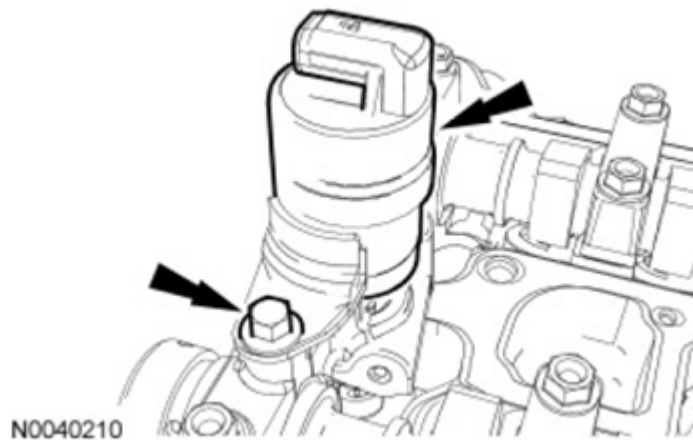


Fig. 342: Remove/Install VCT Solenoid And Bolt
Courtesy of FORD MOTOR CO.

72. Remove the plug and the VCT system oil filter from the intake camshaft thrust cap.

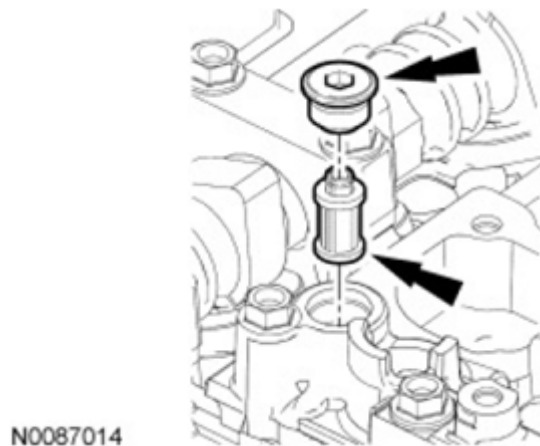


Fig. 343: View Of VCT System Oil Filter And Plug
Courtesy of FORD MOTOR CO.

NOTE: Failure to follow the camshaft loosening procedure can result in damage to the camshafts.

NOTE: Mark the location and orientation of each camshaft bearing cap.

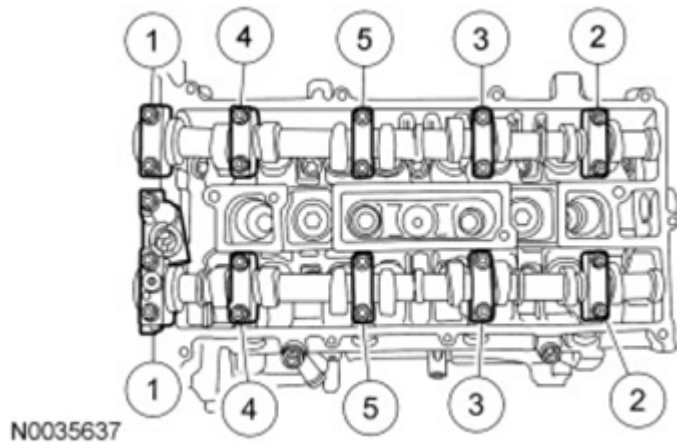


Fig. 344: Removing Sequence Of Camshaft Bearing Cap Bolts
Courtesy of FORD MOTOR CO.

73. Remove the camshafts from the engine.
- Loosen the camshaft bearing bolts in the sequence shown in illustration, one turn at a time. Repeat until all the tension is released.
 - Remove the camshaft bearing caps.
 - Remove the camshafts.

NOTE: If the camshafts and valve tappets are to be reused, mark the location of the valve tappets to make sure they are assembled in their original positions.

NOTE: The number on the valve tappets only reflects the digits that follow the decimal. For example, a tappet with the number 0.650 has the thickness of 3.650 mm.

74. Remove and inspect the valve tappets. For additional information, refer to [ENGINE MECHANICAL SYSTEM - GENERAL INFORMATION](#) article.
75. Remove the cylinder head.
- Remove and discard the cylinder head bolts.
 - Remove the cylinder head.
 - Remove and discard the cylinder head gasket.

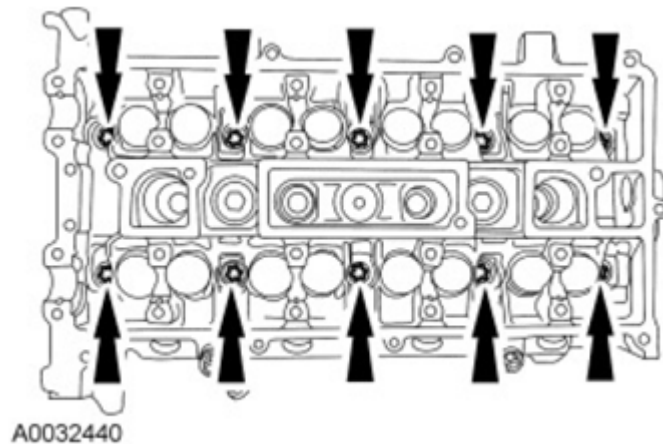


Fig. 345: Locating Cylinder Head Bolts
Courtesy of FORD MOTOR CO.

76. 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 MECHANICAL SYSTEM - GENERAL INFORMATION** article.
77. Remove the cylinder head alignment dowels.

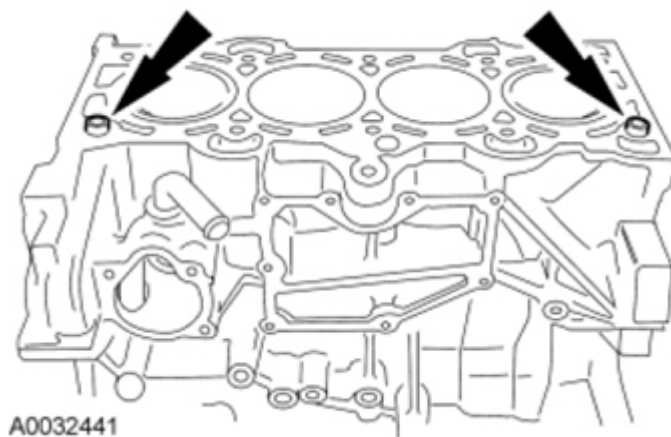
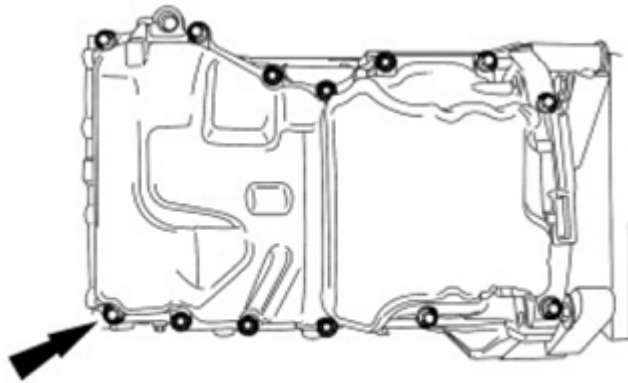


Fig. 346: Locating Cylinder Head Alignment Dowels
Courtesy of FORD MOTOR CO.

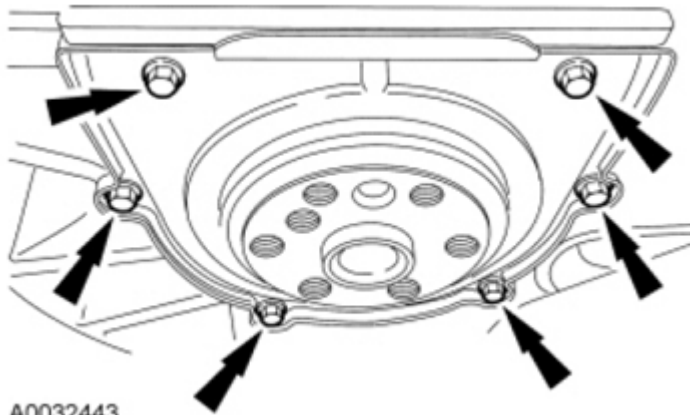
78. Remove the bolts and the oil pan.



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Fig. 347: Locating Oil Pan Bolt
Courtesy of FORD MOTOR CO.

79. Remove the bolts and the rear crankshaft seal.



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Fig. 348: Locating Rear Crankshaft Seal Bolts
Courtesy of FORD MOTOR CO.

80. Remove the bolts, oil pump pickup tube and gasket.
- Discard the gasket.

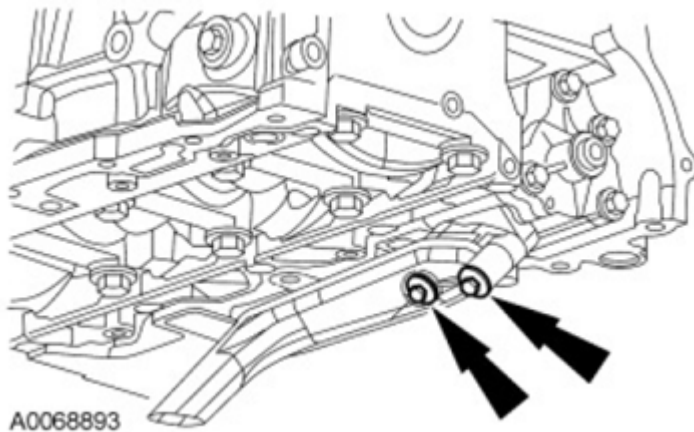


Fig. 349: Remove/Install Oil Pump Pickup Tube Bolts
Courtesy of FORD MOTOR CO.

81. Remove the bolts and the oil pump.

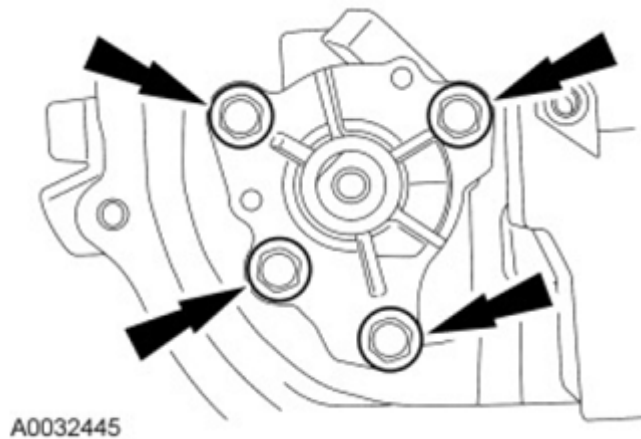


Fig. 350: Locating Oil Pump Bolts
Courtesy of FORD MOTOR CO.

82. Make sure the Crankshaft **TDC** Timing Peg is still installed and the engine is still at **TDC** .
 - Rotate the crankshaft slowly clockwise until the crankshaft balance weight is up against the Crankshaft **TDC** Timing Peg.

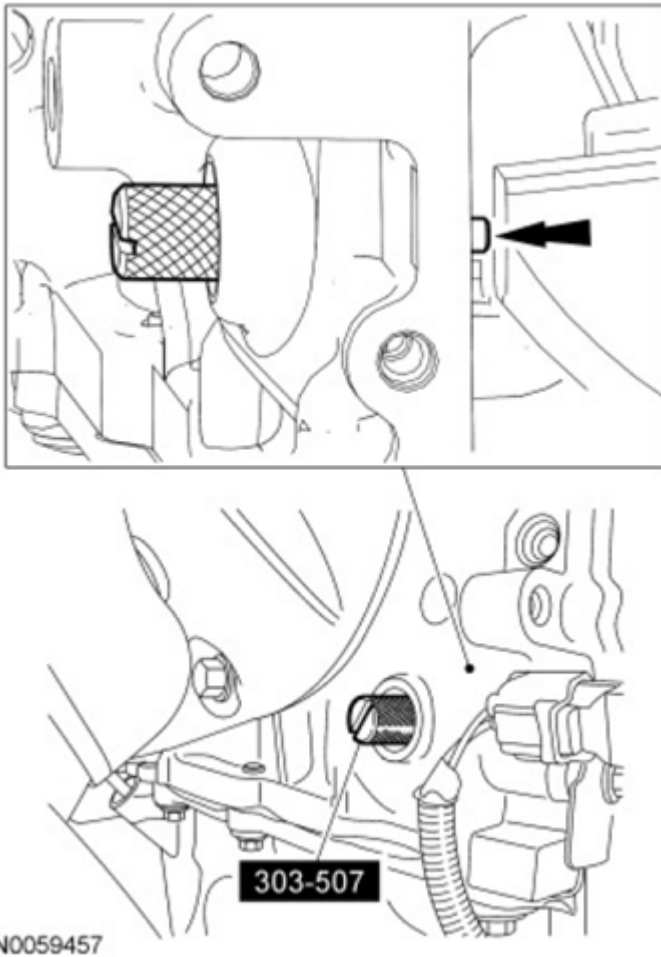


Fig. 351: View Of Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

83. Mark the balancer unit front shafts on the top for reference that the balancer unit is at **TDC** .

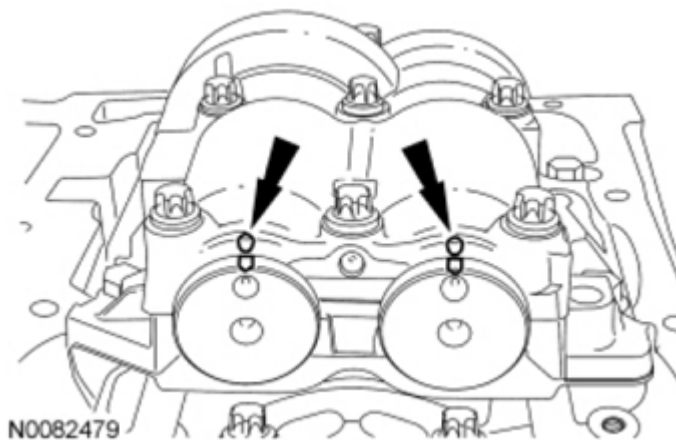


Fig. 352: Locating Balancer Unit Marks

Courtesy of FORD MOTOR CO.

NOTE: Due to the precision interior construction of the balancer unit, it should not be disassembled.

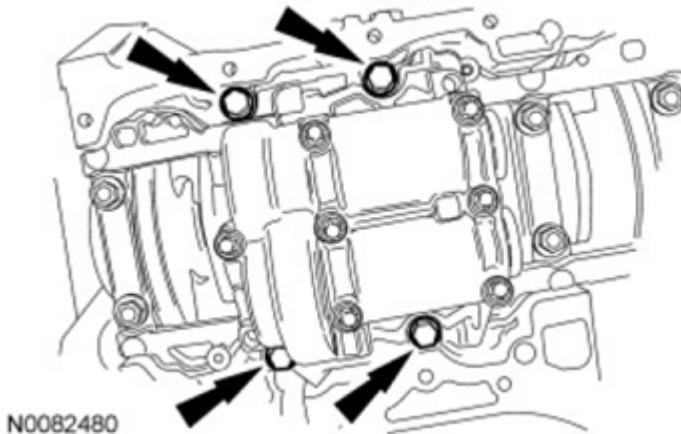


Fig. 353: Locating Balancer Unit Bolts
Courtesy of FORD MOTOR CO.

84. Remove the 4 bolts and the balancer unit.
85. Remove the Crankshaft **TDC** Timing Peg.

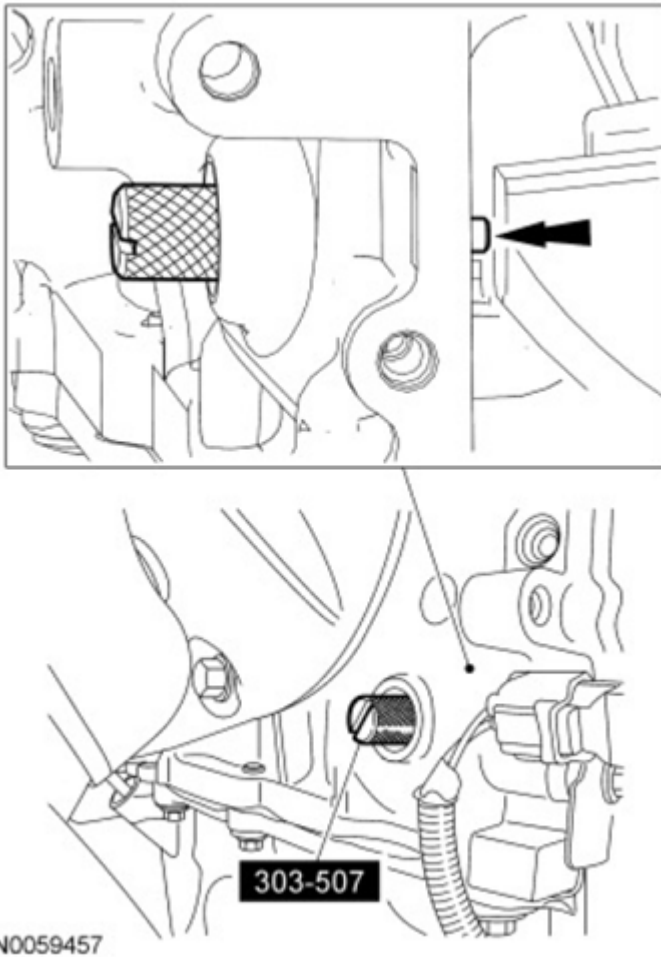


Fig. 354: View Of Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

86. 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 connecting rods, connecting rod caps and connecting rod bearings in numerical order for correct orientation for reassembly.

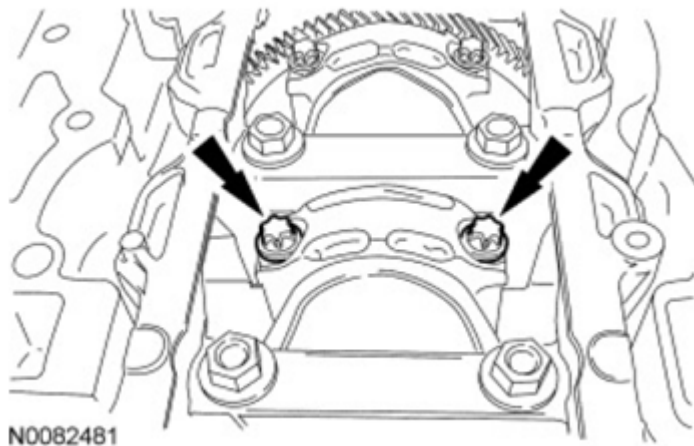


Fig. 355: Locating Connecting Rod Cap Bolts
Courtesy of FORD MOTOR CO.

87. Remove the connecting rod cap bolts and cap.

NOTE: Do not scratch the cylinder walls or crankshaft journals with the connecting rod.

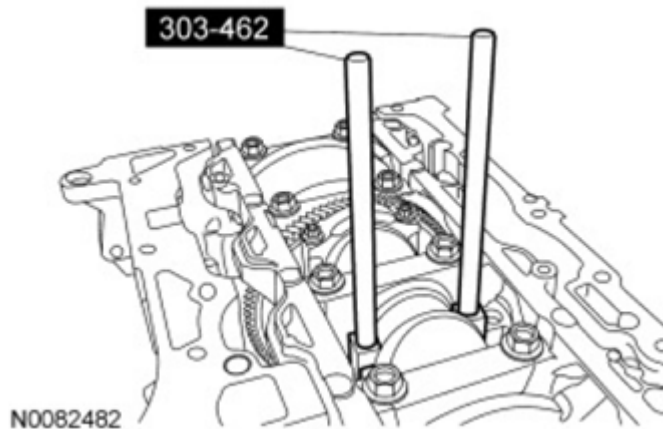


Fig. 356: Removing Piston/Rod Assembly Of Engine Block
Courtesy of FORD MOTOR CO.

88. Using the Connecting Rod Installer, remove the piston/rod assembly from the engine block.
89. Repeat the previous 2 steps until all the piston/rod assemblies are removed from the engine block.
90. Remove the bolts in the sequence shown in illustration.
 - Remove the main bearing beam.
 - Discard the bolts.

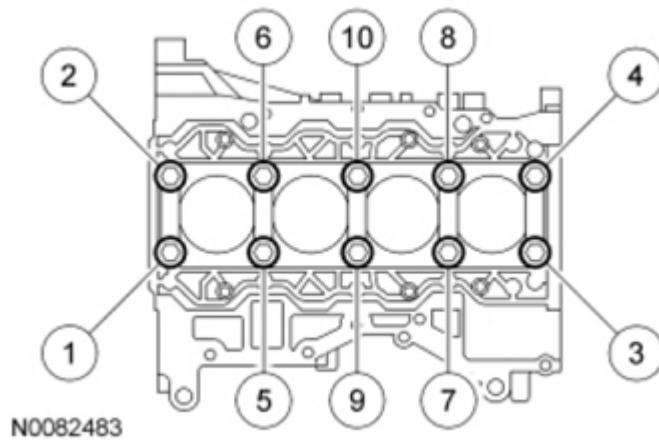


Fig. 357: Removing Order Of Main Bearing Beam Bolts
Courtesy of FORD MOTOR CO.

91. Remove the crankshaft from the engine block.

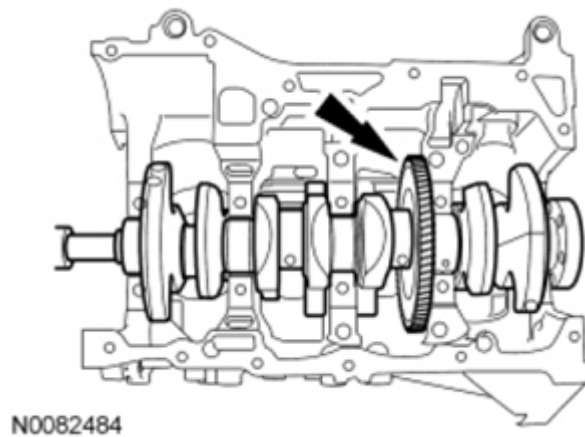
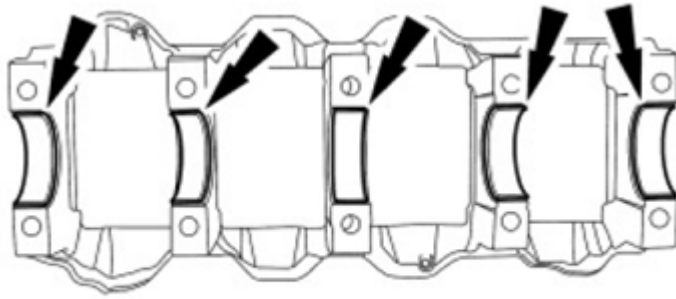


Fig. 358: View Of Crankshaft
Courtesy of FORD MOTOR CO.

NOTE: If the main bearings are being reused, mark them in order for correct orientation and reassembly.



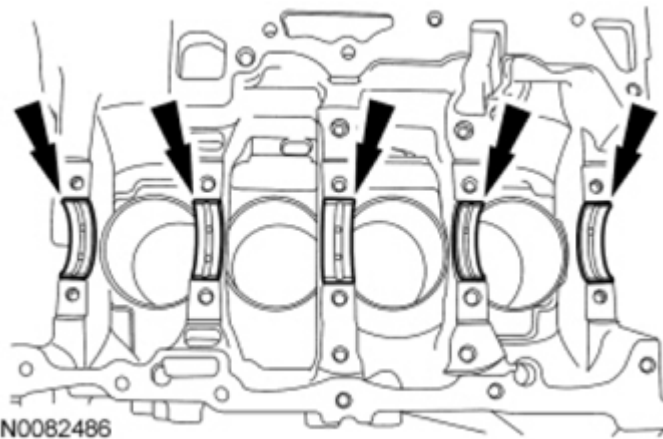
N0082485

Fig. 359: Locating Main Bearings Of Main Bearing Beam
Courtesy of FORD MOTOR CO.

92. Remove the main bearings from the main bearing beam.

NOTE: If the main bearings are being reused, mark them in order for correct orientation and reassembly.

NOTE: The center bulkhead has the thrust bearing.



N0082486

Fig. 360: View Of Main Bearings Of Cylinder Block
Courtesy of FORD MOTOR CO.

93. Remove the main bearings from the cylinder block.

NOTE: If the oil squirters are being reused, mark them in order for correct location during reassembly.

NOTE: The front bulkhead does not have an oil squirter.

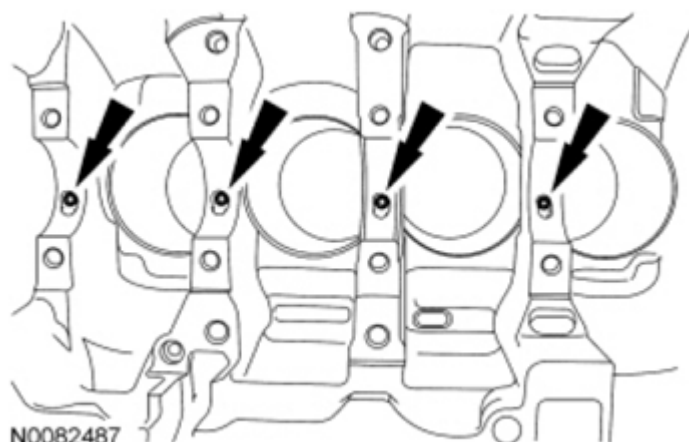


Fig. 361: Locating Oil Squirters
Courtesy of FORD MOTOR CO.

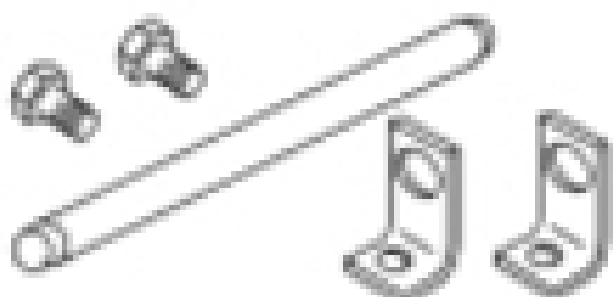
94. Remove the 4 oil squirters.
95. Inspect the cylinder block, main bearing beam, pistons and connecting rods. For additional information, refer to **ENGINE MECHANICAL SYSTEM - GENERAL INFORMATION** article.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

CYLINDER HEAD

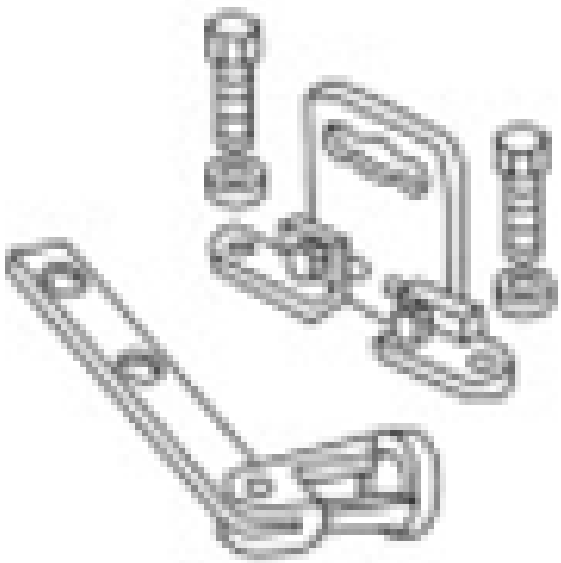
Special Tool(s)

SPECIAL TOOLS DESCRIPTION

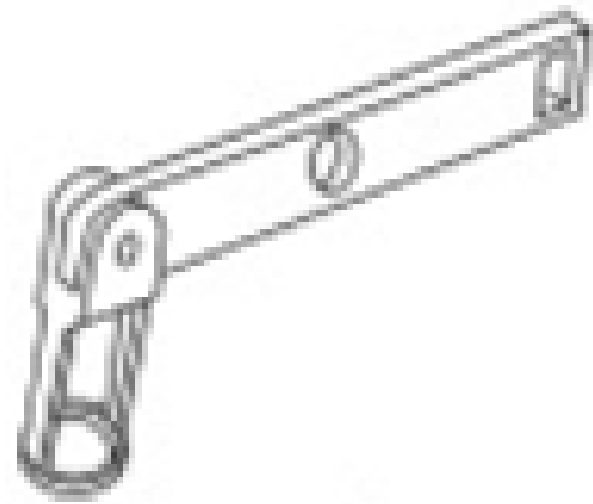
 ST1981-A	Compressor, Valve Spring 303-300 (T87C-6565-A)
	Compressor, Valve Spring 303-350 (T89P-6565-A)

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ST1907-A



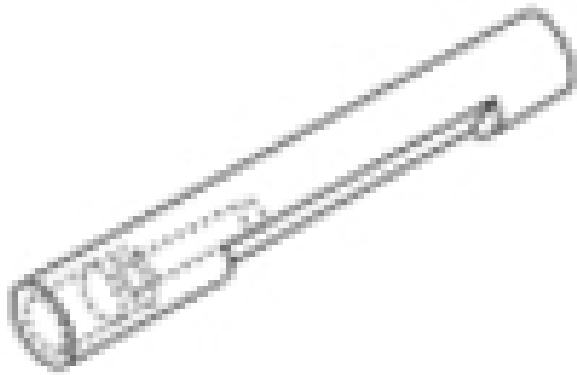
ST1902-A

Compressor, Valve Spring
303-472 (T94P-6565-AH)

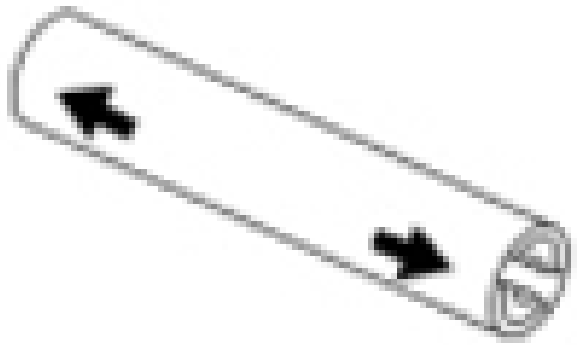
Installer, Valve Stem Oil Seal
303-470 (T94P-6510-CH)

2011 Mercury Mariner

2011 ENGINE Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)



ST1906-A



ST1904-A

Remover, Valve Stem Oil Seal
303-468 (T94P-6510-AH)

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

2011 Mercury Mariner

2011 ENGINE Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)

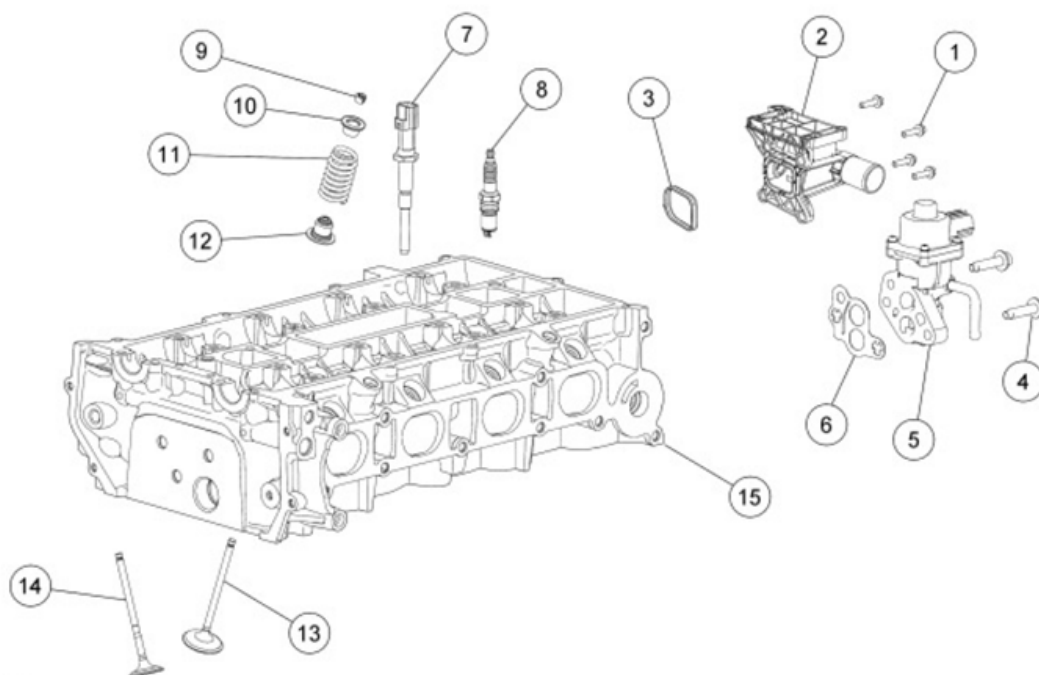


ST1187-A

Material

MATERIAL SPECIFICATIONS

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
Multi-Purpose Grease XG-4 and/or XL-5	ESB-M1C93-B



N0100885

Fig. 362: Exploded View Of Cylinder Head Components
 Courtesy of FORD MOTOR CO.

CYLINDER HEAD PARTS DESCRIPTION CHART

Item	Part Number	Description
1	W500015	Coolant outlet bolt (4 required)
2	8K556	Coolant outlet
3	-	Coolant outlet gasket (part of 8K556)
4	W500225	EGR valve bolt (2 required)
5	9D475	EGR valve
6	9D476	EGR valve gasket
7	6G004	Cylinder Head Temperature (CHT) sensor
8	12405	Spark plug (4 required)
9	6518	Valve collet (16 required)
10	6514	Valve spring retainer (16 required)
11	6513	Valve spring (16 required)
12	6517	Valve seal (16 required)
13	6505	Intake valve (8 required)
14	6507	Exhaust valve (8 required)
15	6049	Cylinder head

Disassembly

NOTE: If the components are to be reinstalled, they must be installed in the same positions. Mark the components removed for locations.

1. Remove the 4 bolts and the coolant outlet.
 - Discard the gasket.
2. Remove the 2 bolts and the EGR valve.
 - Discard the gasket.
3. Remove the Cylinder Head Temperature (CHT) sensor.

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

4. Remove the spark plugs.

NOTE: Use a small screwdriver and multi-purpose grease to remove the valve collets.

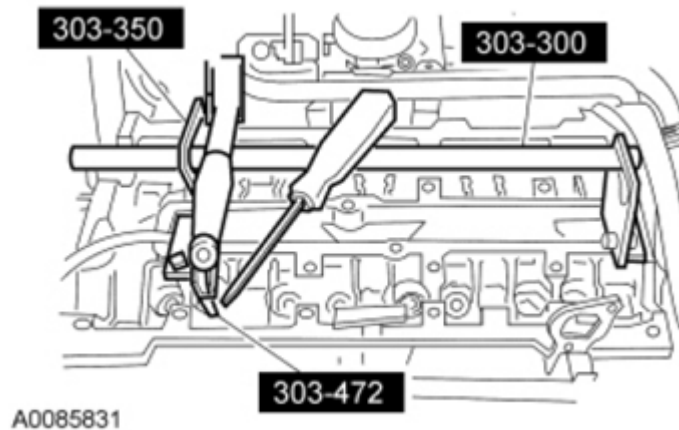


Fig. 363: Remove/Install Valve Spring Using Special Tools
Courtesy of FORD MOTOR CO.

5. Using the Valve Spring Compressors, compress the valve springs and remove the valve collets, valve spring retainers and the valve springs.
6. Inspect the components, if necessary. For additional information, refer to **ENGINE MECHANICAL SYSTEM - GENERAL INFORMATION** article.
7. Remove the valves.
8. Using the Valve Stem Oil Seal Remover and Slide Hammer, remove and discard the valve seals.

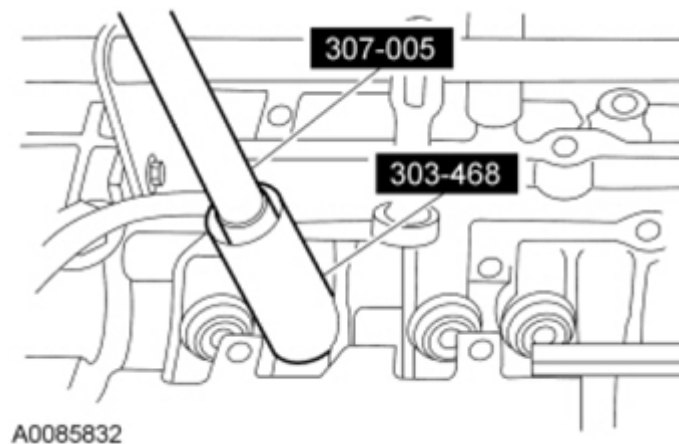


Fig. 364: Removing Valve Seal
Courtesy of FORD MOTOR CO.

9. Inspect the valves. For additional information, refer to **ENGINE MECHANICAL SYSTEM - GENERAL INFORMATION** article. Install new parts, as necessary.

Assembly

NOTE: Coat the valve stems with clean engine oil.

1. Install the valves.

NOTE: Use the protector provided with the replacement kit to prevent damage to the valve seals.

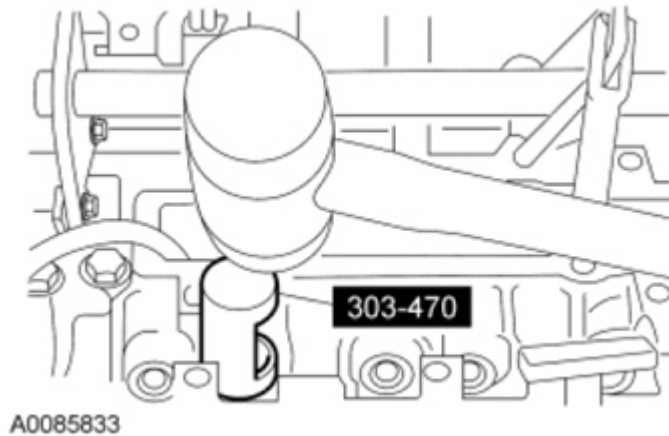


Fig. 365: Installing Valve Seal
Courtesy of FORD MOTOR CO.

2. Lubricate the valve stems and guides with clean engine oil.

Using the Valve Stem Oil Seal Installer, install the valve seals.

NOTE: Check the seating of the valve collets.

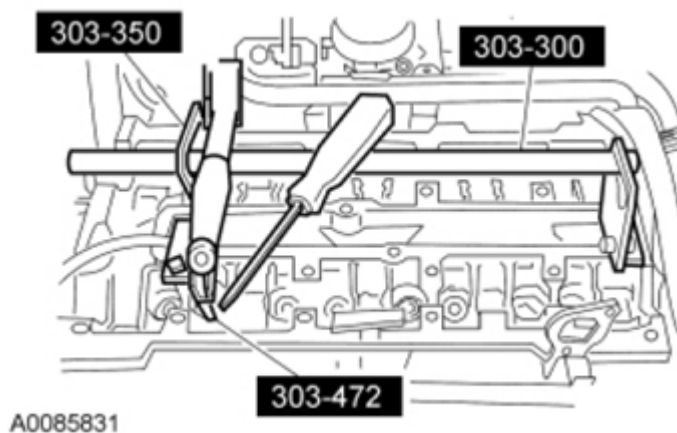


Fig. 366: Remove/Install Valve Spring Using Special Tools
Courtesy of FORD MOTOR CO.

3. Using the Valve Spring Compressors, install the valve springs.
 - Insert the valve springs and the valve spring retainers.

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- Compress the valve springs and install the valve collets, using multi-purpose grease and a small screwdriver.

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

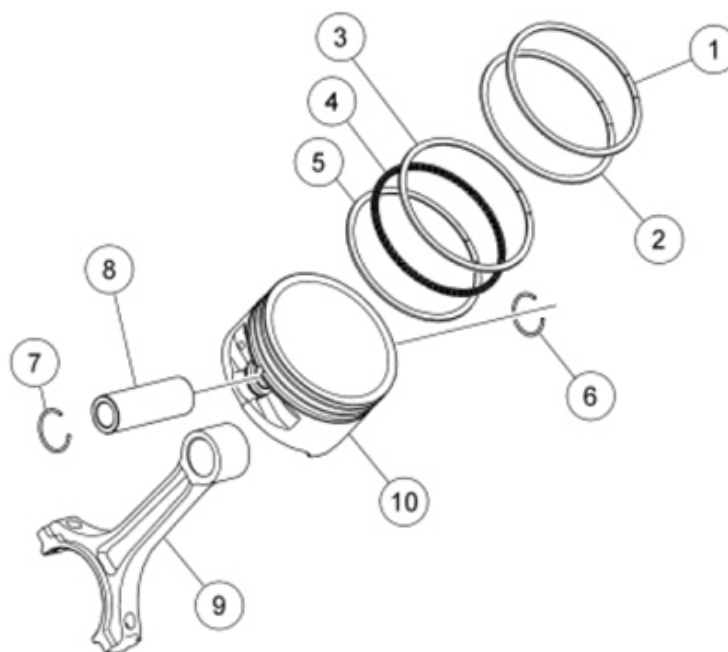
4. Install the spark plugs.
 - Tighten to 12 Nm (106 lb-in).
5. Install the **CHT** sensor.
 - Tighten to 12 Nm (106 lb-in).
6. Using a new gasket, install the EGR valve and 2 bolts
 - Tighten to 20 Nm (177 lb-in).
7. Using a new gasket, install the coolant outlet and 4 bolts.
 - Tighten to 10 Nm (89 lb-in).

PISTON

Material

MATERIAL SPECIFICATIONS

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. 367: Exploded View Of Piston Components
Courtesy of FORD MOTOR CO.

PISTON PARTS DESCRIPTION CHART

Item	Part Number	Description
1	6150	Piston compression upper ring
2	6152	Piston compression lower ring
3	6159	Piston oil control upper segment ring
4	6161	Piston oil control spacer
5	6159	Piston oil control lower segment ring
6	6140	Piston pin retainer
7	6140	Piston pin retainer
8	6135	Piston pin
9	6200	Connecting rod
10	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 MECHANICAL SYSTEM - GENERAL INFORMATION** article.

Assembly

NOTE: The arrow on the top of the piston points towards the front of the engine.

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 upper and lower ring should be installed with the paint mark on the outside diameter circumference of the ring to be positioned on the right side of the ring gap. The lower compression ring needs to be installed with the undercut side downward.

NOTE: The upper and lower compression ring gaps are not controlled for installation.

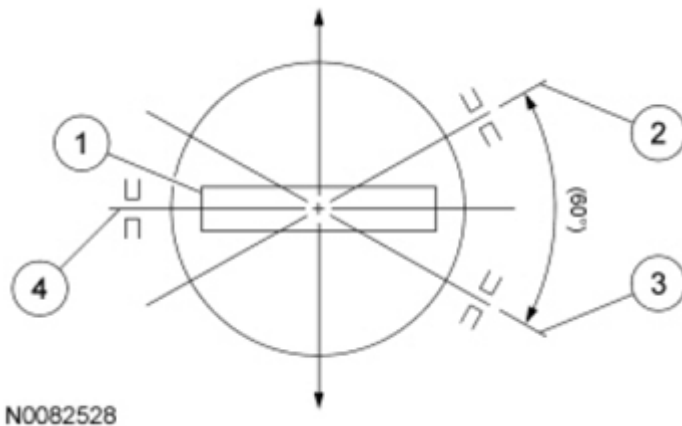


Fig. 368: Piston Rings Positioning Diagram
Courtesy of FORD MOTOR CO.

6. Install the piston rings onto the piston as shown in illustration.
 1. Piston pin

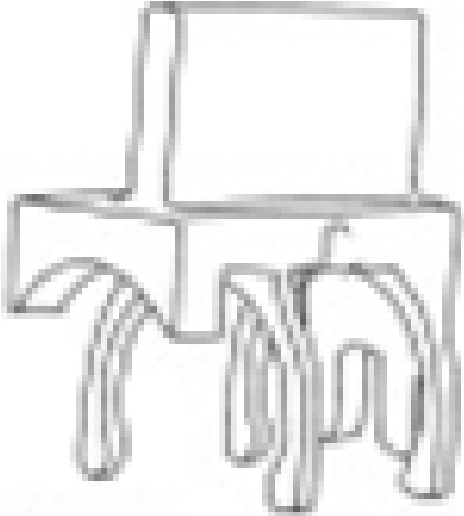
2. Upper oil control ring gap location
3. Lower oil control ring gap location
4. Center line of the piston pin bore and the expander gap

ASSEMBLY

ENGINE

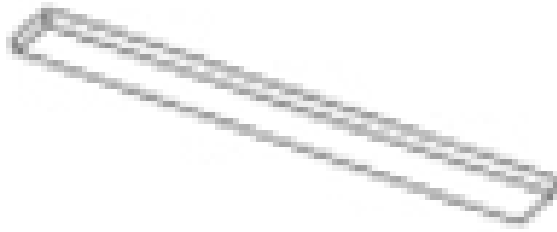
Special Tool(s)

SPECIAL TOOLS DESCRIPTION

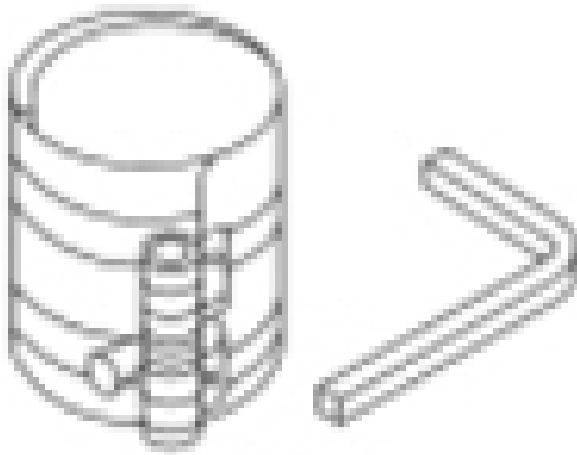
 ST3055A	Aligner, Crankshaft Sensor 303-1417
	Alignment Plate, Camshaft 303-465 (T94P-6256-CH)

2011 Mercury Mariner

2011 ENGINE Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)



ST2645-A



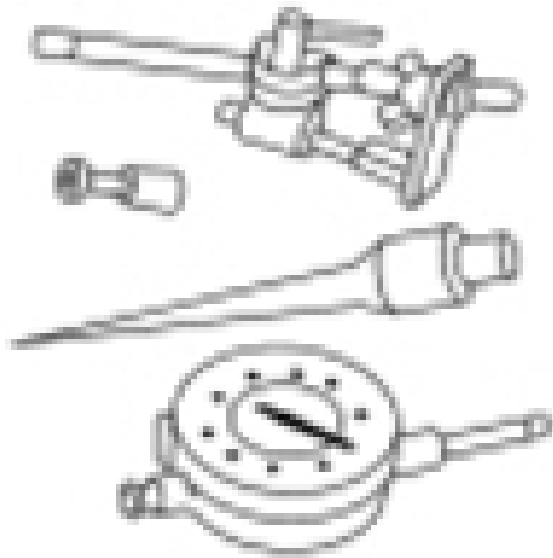
ST1378-A

Compressor, Piston Ring
303-D032 (D81L-6002-C)

Dial Indicator Gauge with Holding Fixture
100-002 (TOOL-4201-C)

2011 Mercury Mariner

2011 ENGINE Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)



ST1214-A



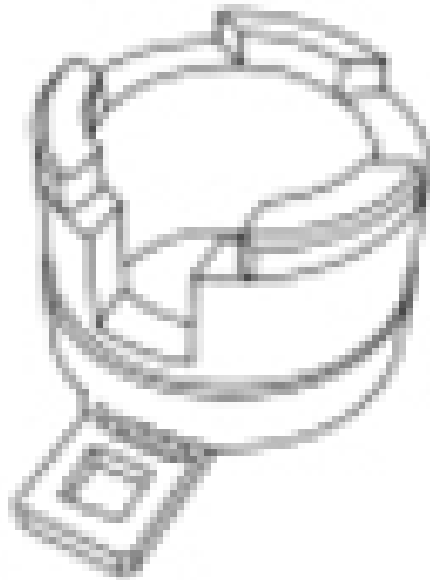
ST1341-A

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

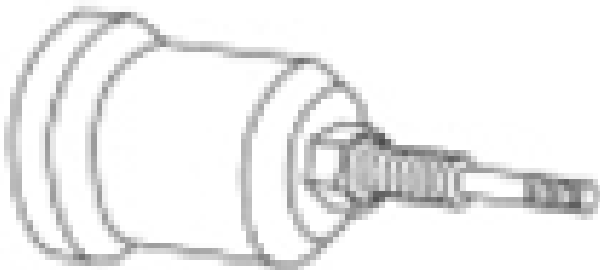
Holding Tool, Crankshaft Damper
303-1416

2011 Mercury Mariner

2011 ENGINE Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)



ST3054-A



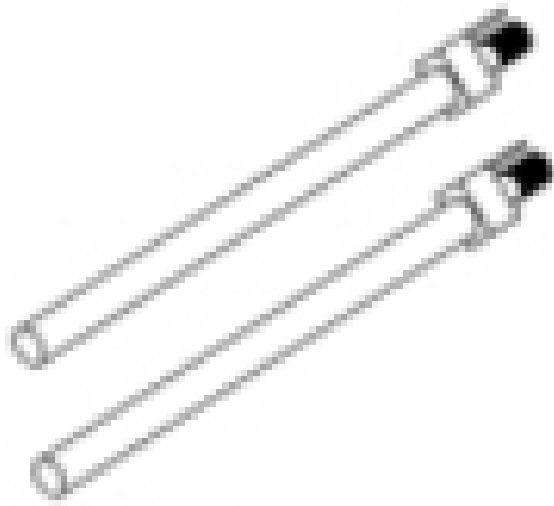
ST1917-A

Installer, Camshaft Front Oil Seal
303-096 (T74P-6150-A)

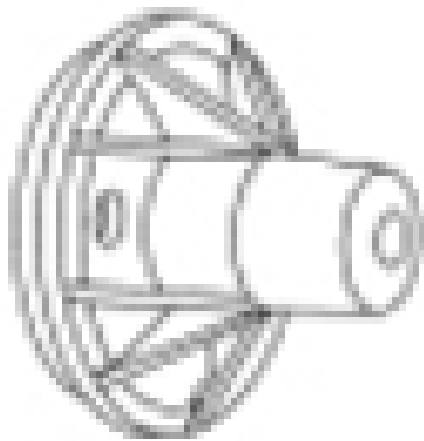
Installer, Connecting Rod
303-462 (T94P-6136-AH)

2011 Mercury Mariner

2011 ENGINE Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)



ST1982-A



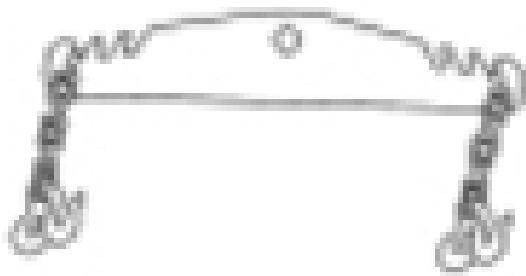
ST1506-A

Installer, Crankshaft Rear Main Oil Seal
303-328 (T88P-6701-B1)

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

2011 Mercury Mariner

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ST1602-A



ST2638-A

Timing Peg, Crankshaft TDC
303-507

General Equipment

GENERAL EQUIPMENT REFERENCE CHART

6 mm x 18 mm bolt

Material

MATERIAL SPECIFICATIONS

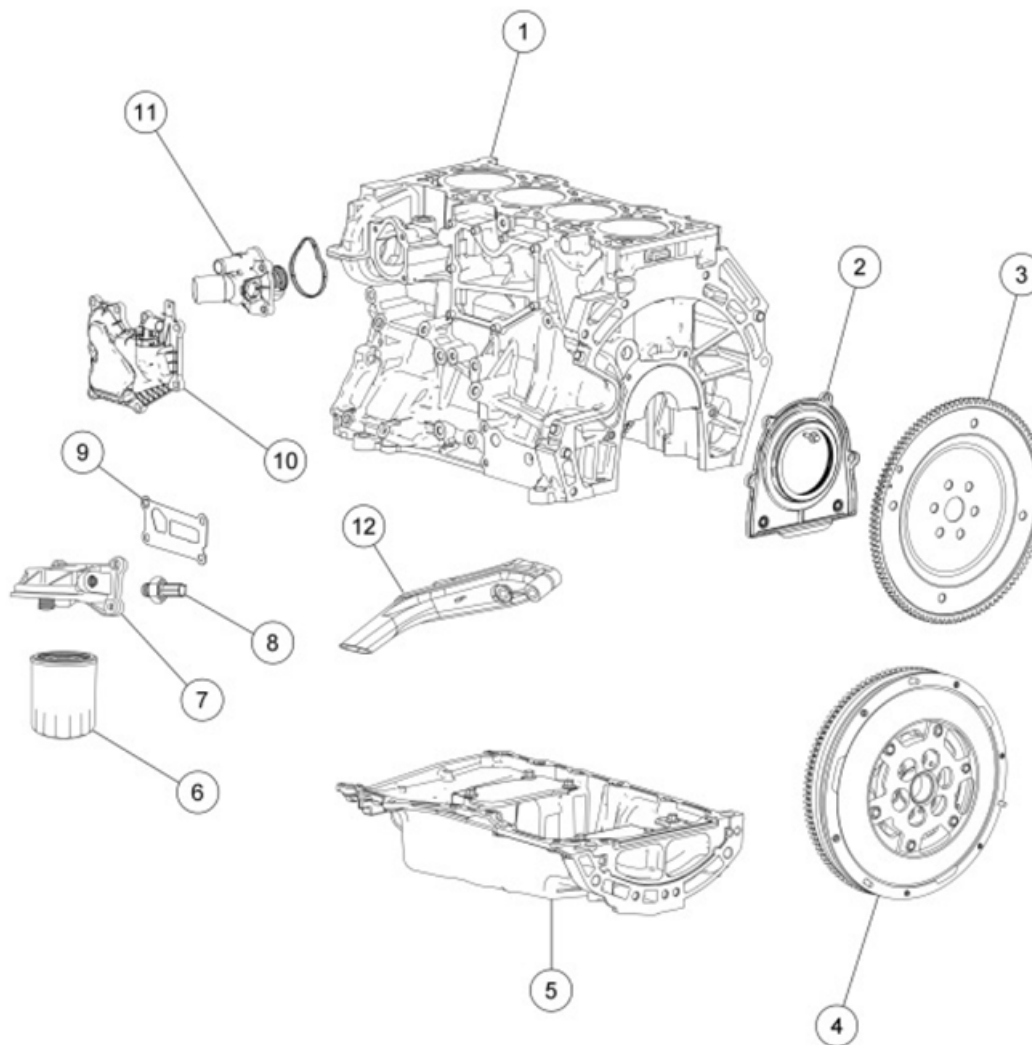
Item	Specification
High Temperature 4x4 Front Axle and Wheel	WSS-M1C267-A1

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Bearing Grease XG-11	
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® Premium Gold Engine Coolant VC-7-B (US); CVC-7-B (Canada)	WSS-M97B51-A1
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
Motorcraft® Silicone Gasket Remover ZC-30	-

Lower Engine Block (View 1)



N0109830

Fig. 369: Exploded View Of Lower Engine Block Components (View 1)
Courtesy of FORD MOTOR CO.

LOWER ENGINE BLOCK PARTS DESCRIPTION CHART

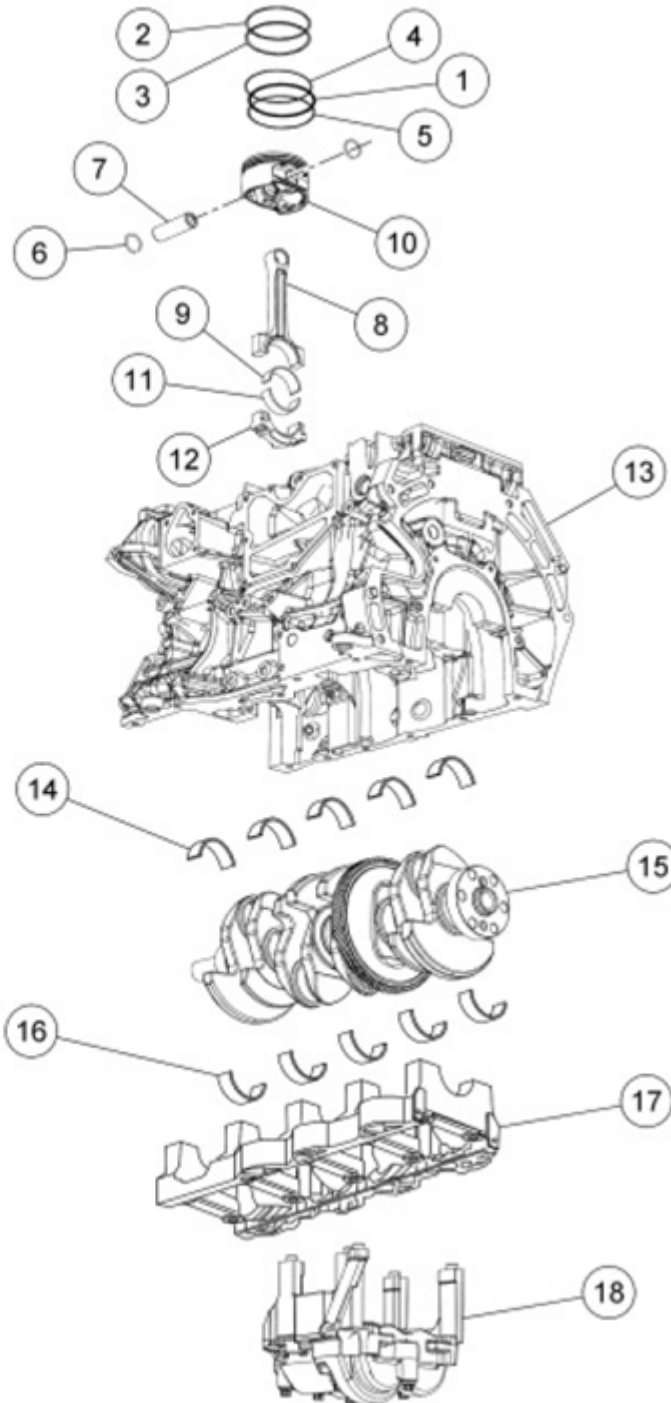
Item	Part Number	Description
1	6010	Cylinder block
2	6K318	Crankshaft rear oil seal and retainer
3	6K375	Flexplate
4	6K390	Flywheel
5	6675	Oil pan
6	6714	Oil filter
7	6884	Oil filter adapter
8	9278	Engine Oil Pressure (EOP) switch
9	6A636	Oil filter adapter gasket

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10	6A785	Crankcase vent oil separator
11	8575	Thermostat assembly
12	6622	Oil pump screen and pickup tube

Lower Engine Block (View 2)



N0105927

2011 Mercury Mariner

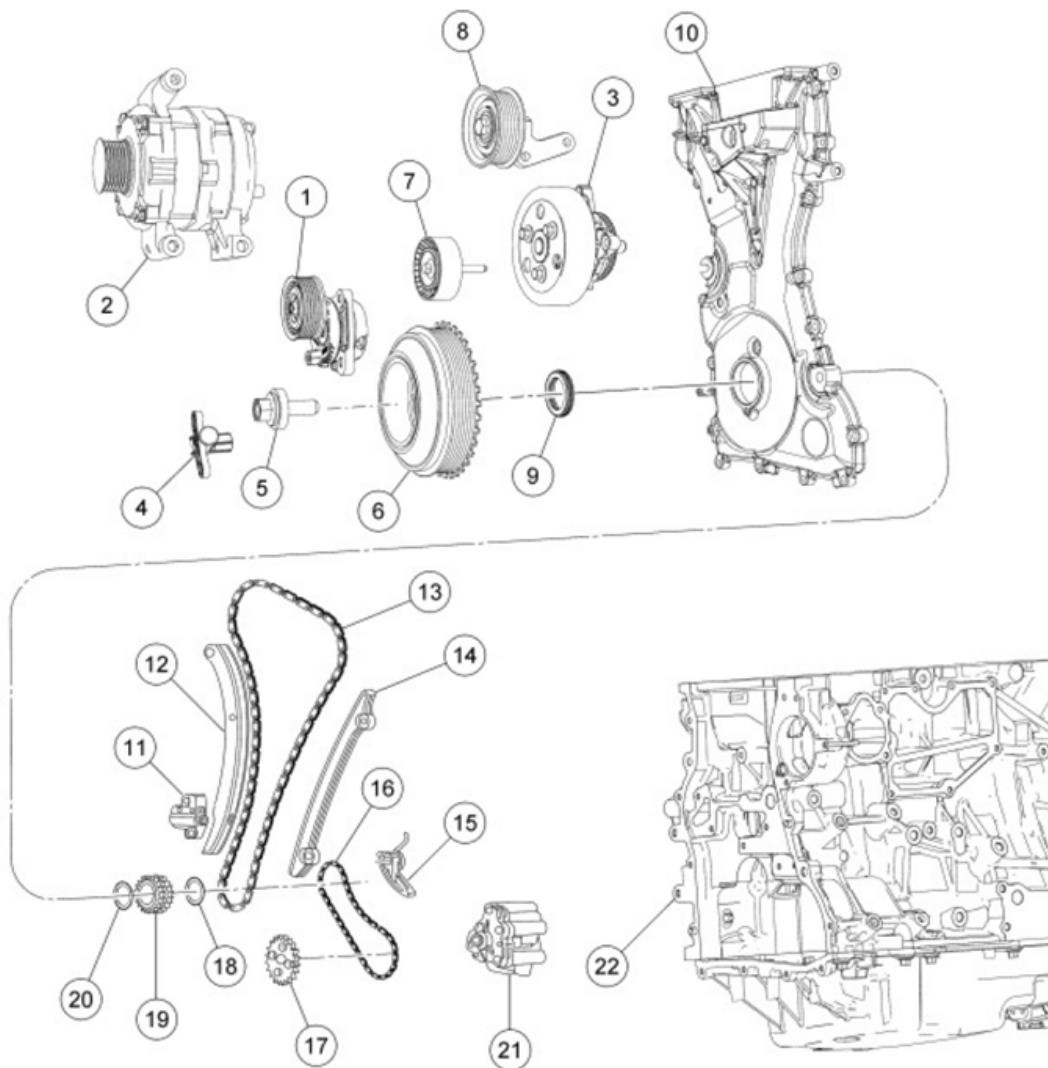
2011 ENGINE Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)

Fig. 370: Exploded View Of Lower Engine Block Components (View 2)
Courtesy of FORD MOTOR CO.

LOWER ENGINE BLOCK PARTS DESCRIPTION CHART

Item	Part Number	Description
1	6161	Piston oil control spacer (4 required)
2	6150	Piston compression upper ring (4 required)
3	6152	Piston compression lower ring (4 required)
4	6159	Piston oil control upper segment ring (4 required)
5	6159	Piston oil control lower segment ring (4 required)
6	6140	Piston pin retainer (8 required)
7	6135	Piston pin (4 required)
8	6200	Connecting rod (4 required)
9	6211	Connecting rod upper bearing (4 required)
10	6110	Piston (4 required)
11	6211	Connecting rod lower bearing (4 required)
12	6210	Connecting rod cap (4 required)
13	6010	Cylinder block
14	6333	Cylinder block crankshaft main bearing (5 required)
15	6303	Crankshaft
16	6333	Crankshaft main bearing beam bearing (5 required)
17	6F098	Main bearing beam
18	6K360	Balance shaft assembly

Front Engine Block



N0085945

Fig. 371: Exploded View Of Front Engine Block Components
Courtesy of FORD MOTOR CO.

FRONT ENGINE BLOCK PARTS DESCRIPTION CHART

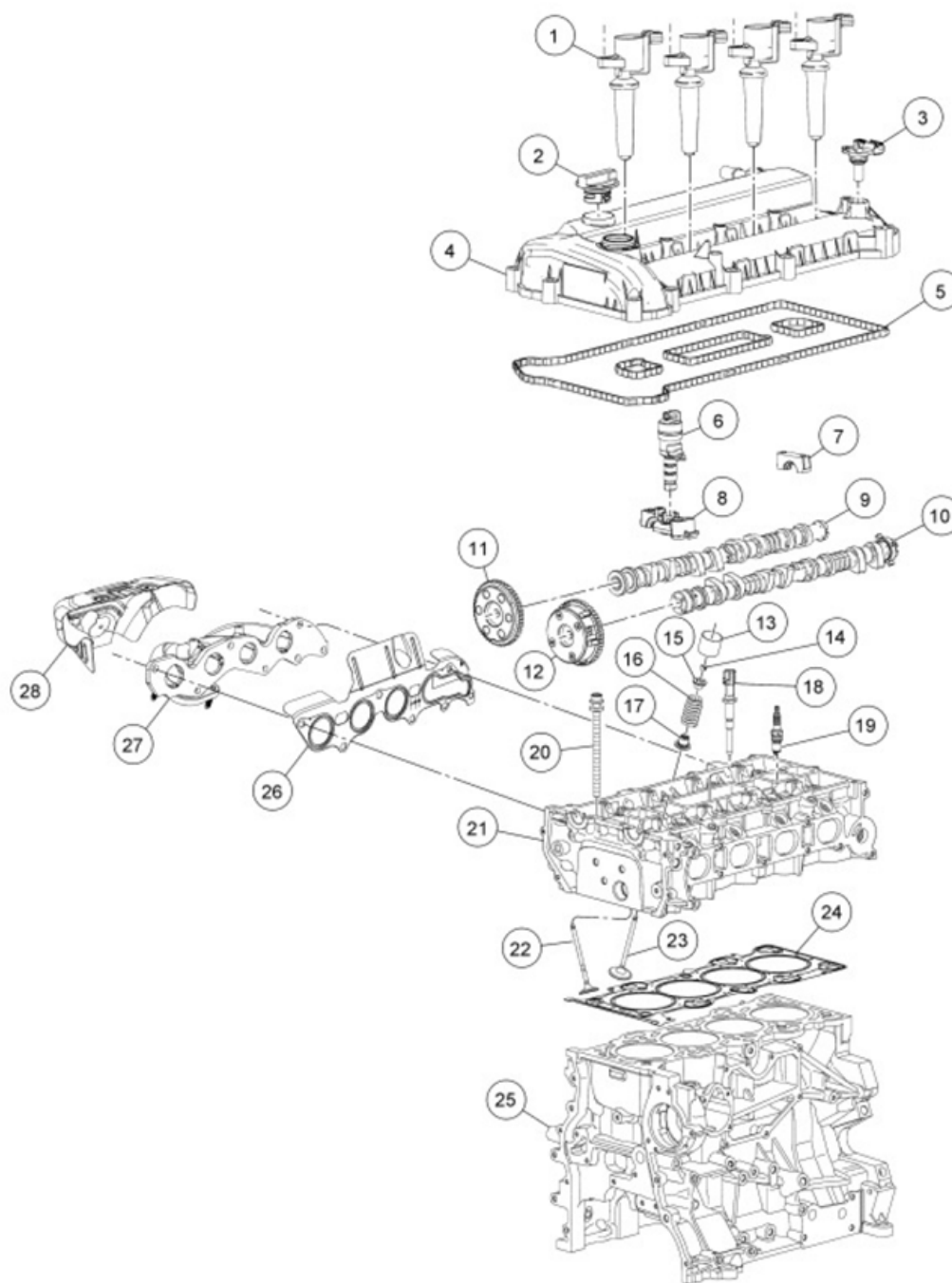
Item	Part Number	Description
1	6B209	Accessory drive belt tensioner
2	10300	Generator
3	8501	Coolant pump and pulley
4	6C315	Crankshaft Position (CKP) sensor
5	6K340	Crankshaft pulley bolt
6	6316	Crankshaft pulley
7	6C348	Smooth idler pulley
8	19A216	Idler pulley and bracket
9	6700	Crankshaft front seal
10	6019	Engine front cover

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11	6K254	Timing chain tensioner
12	6K255	Timing chain tensioner arm
13	6268	Timing chain
14	6K297	Timing chain guide
15	6C271	Oil pump chain tensioner
16	6A895	Oil pump chain
17	6652	Oil pump drive gear
18	6378	Diamond washer
19	6306	Crankshaft sprocket
20	6378	Diamond washer
21	6600	Oil pump
22	6010	Cylinder block

Cylinder Head



N0086212

Fig. 372: Exploded View Of Cylinder Head Components
Courtesy of FORD MOTOR CO.

CYLINDER HEAD PARTS DESCRIPTION CHART

Item	Part Number	Description
1	12A366	Coil-on-plug assembly (4 required)

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2	6766	Oil filler cap
3	12K073	Camshaft Position (CMP) sensor
4	6M293	Valve cover
5	6M293	Valve cover gasket
6	6M280	Variable Camshaft Timing (VCT) oil control solenoid
7	6A284	Camshaft bearing cap (9 required)
8	6A258	Camshaft bearing cap
9	6A272	Camshaft (exhaust)
10	6A271	Camshaft (intake)
11	6C251	Camshaft sprocket
12	6C525	VCT actuator
13	6500	Valve tappet (16 required)
14	6518	Valve collet (16 required)
15	6514	Valve spring retainer (16 required)
16	6513	Valve spring (16 required)
17	6A517	Valve stem seal (16 required)
18	6G004	Cylinder Head Temperature (CHT) sensor
19	12405	Spark plug (4 required)
20	6065	Cylinder head bolt (10 required)
21	6049	Cylinder head
22	6505	Exhaust valve (8 required)
23	6507	Intake valve (8 required)
24	6051	Head gasket
25	6010	Cylinder block
26	9448	Exhaust manifold gasket
27	9430	Exhaust manifold
28	9N454	Exhaust manifold heat shield

Intake Manifold

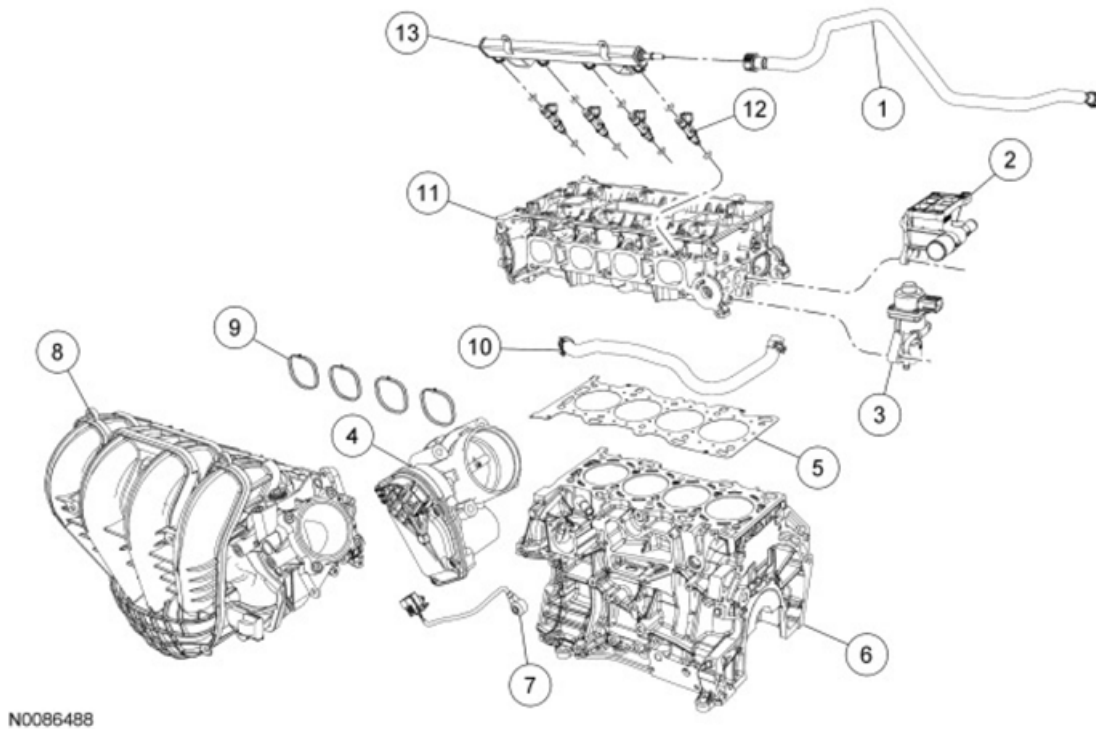


Fig. 373: Exploded View Of Intake Manifold Components
Courtesy of FORD MOTOR CO.

INTAKE MANIFOLD PARTS DESCRIPTION CHART

Item	Part Number	Description
1	9288	Fuel supply tube
2	8K556	Coolant outlet
3	9D475	EGR valve
4	9E926	Electronic throttle body
5	6051	Cylinder head gasket
6	6010	Cylinder block
7	12A699	Knock Sensor (KS)
8	9424	Intake manifold
9	9439	Intake manifold gasket
10	8A582	Coolant hose
11	6049	Cylinder head
12	9F593	Fuel injector (4 required)
13	9H487	Fuel rail

NOTE: Do not loosen or remove the crankshaft pulley bolt without first installing the special tools as instructed in this procedure. The crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. The crankshaft, the crankshaft sprocket and the pulley are fitted together by friction, using diamond

washers between the flange faces on each part. For that reason, the crankshaft sprocket is also unfastened if the pulley bolt is loosened. Before any repair requiring loosening or removal of the crankshaft pulley bolt, the crankshaft and camshafts must be locked in place by the special service tools, otherwise severe engine damage may occur.

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: 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 MECHANICAL SYSTEM - GENERAL INFORMATION article.

All vehicles

NOTE: If the oil squirters are being reused, they must be installed in the same location as marked during disassembly.

NOTE: The front bulkhead does not have an oil squirter.

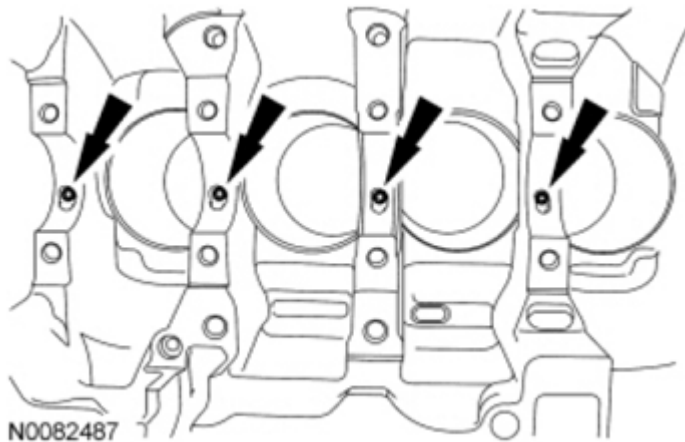


Fig. 374: Locating Oil Squirters
Courtesy of FORD MOTOR CO.

1. Install the 4 oil squirters.
 - Tighten to 4 Nm (35 lb-in).
2. Measure each of the crankshaft main bearing journal diameters in at least 2 directions and record the smallest diameter for each journal.

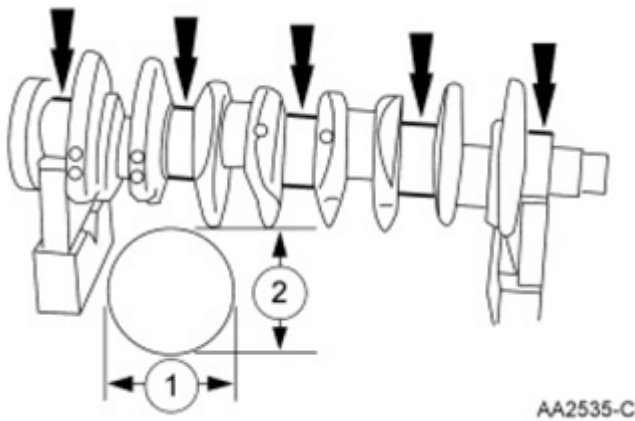


Fig. 375: Locating Crankshaft Main Bearing Journal
Courtesy of FORD MOTOR CO.

3. Position the main bearing beam in the engine block with the main bearing beam mounted flush with the rear face of the engine block.

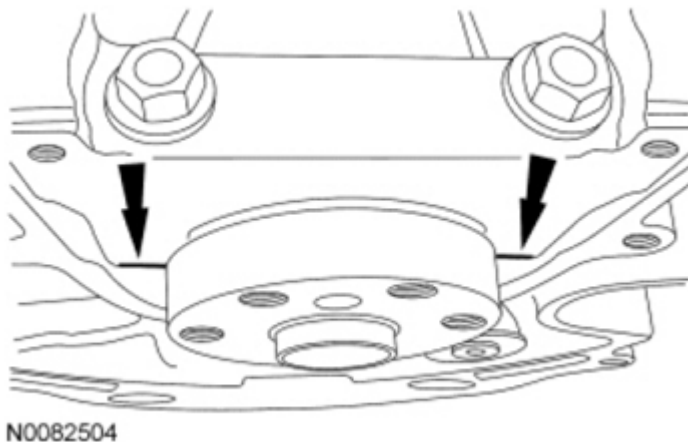


Fig. 376: Locating Main Bearing Beams
Courtesy of FORD MOTOR CO.

4. Using the original main bearing beam bolts, install and tighten the 10 main bearing beam bolts.
 - Tighten the bolts in the sequence shown in illustration in 3 stages.
 - Stage 1: Tighten to 5 Nm (44 lb-in).
 - Stage 2: Tighten to 25 Nm (18 lb-ft).
 - Stage 3: Tighten an additional 90 degrees.

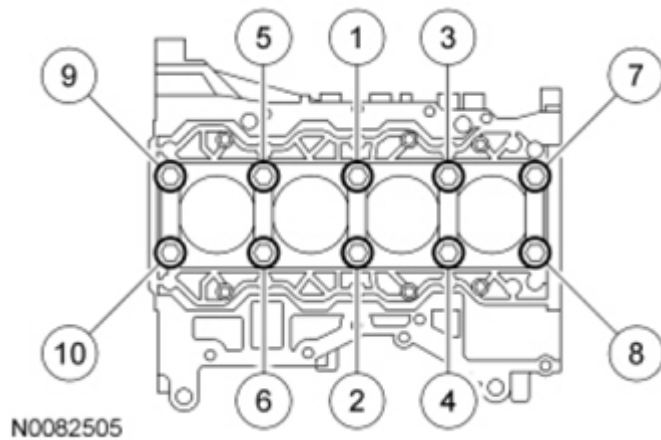


Fig. 377: Tightening Sequence Of Main Bearing Beam Bolts
Courtesy of FORD MOTOR CO.

5. Measure each crankshaft block main bearing bore diameter.
 - Remove the bolts and the main bearing beam.
 - Discard the main bearing beam bolts.

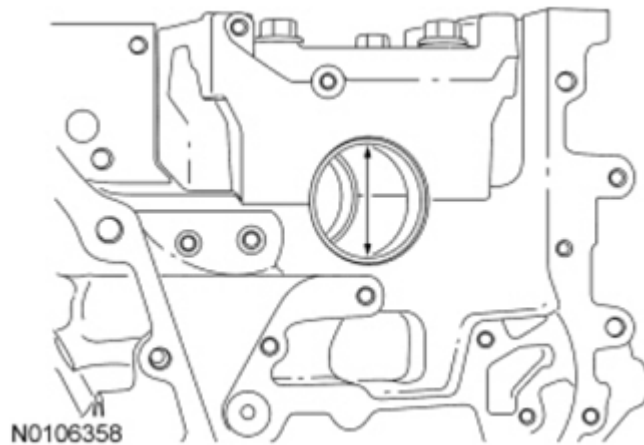


Fig. 378: Identifying Crankshaft Block Main Bearing Bore Diameter
Courtesy of FORD MOTOR CO.

6. Using the chart, select the crankshaft main bearings.

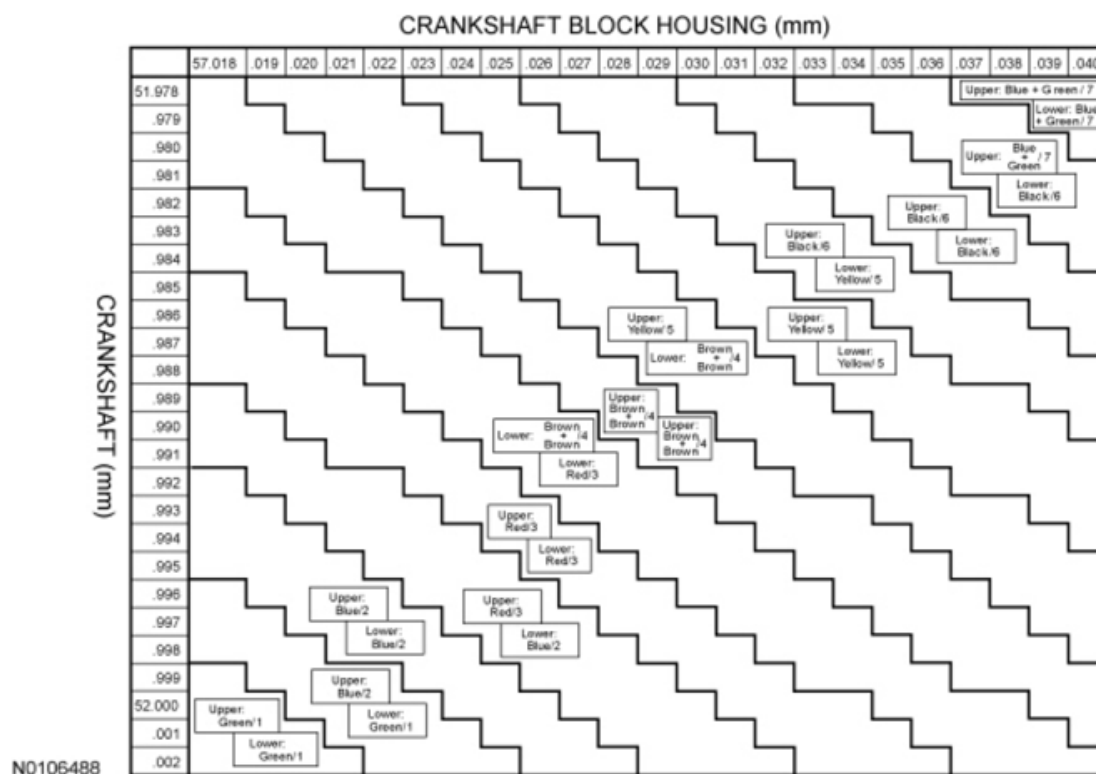
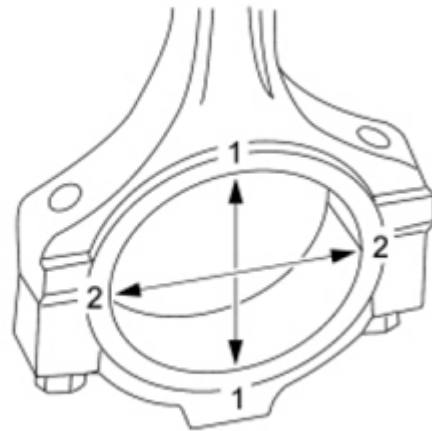


Fig. 379: Crankshaft Main Bearings Selection Chart
Courtesy of FORD MOTOR CO.

NOTE: The rod cap installation must keep the same orientation as marked during disassembly or engine damage may occur.

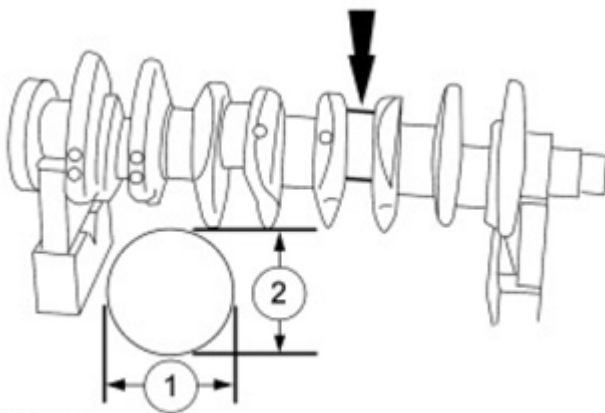
7. Using the original connecting rod cap bolts, install the connecting caps and bolts.
 - Tighten the bolts in 2 stages.
 - Stage 1: Tighten to 29 Nm (21 lb-ft).
 - Stage 2: Tighten an additional 90 degrees.
8. Measure the connecting rod large end bore in 2 directions. Record the smallest measurement for each connecting rod.
 - Remove the bolts and the connecting rod cap.
 - Discard the connecting rod cap bolts.



A0026938

Fig. 380: Identifying Connecting Rod Large End Bore Dimensions
Courtesy of FORD MOTOR CO.

9. Measure each of the crankshaft connecting rod bearing journal diameters in at least 2 directions. Record the smallest measurement for each connecting rod journal.



N0082805

Fig. 381: Identifying Crankshaft Connecting Rod Bearing Journal Diameters
Courtesy of FORD MOTOR CO.

10. Using the chart, select the correct connecting rod bearings for each crankshaft connecting rod journal.

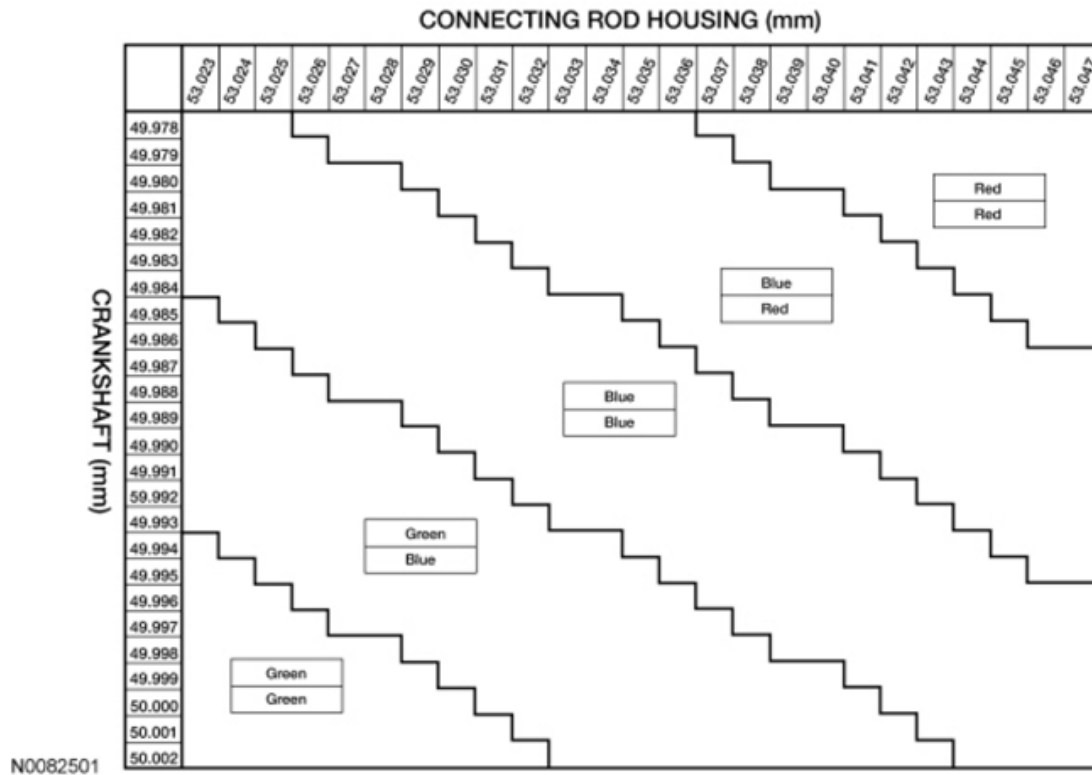


Fig. 382: Connecting Rod Bearings Selection Chart
Courtesy of FORD MOTOR CO.

- 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.
- NOTE:** If reusing the crankshaft main bearings, install them in their original positions and orientation as noted during disassembly.
- NOTE:** The center bulkhead is the thrust bearing.

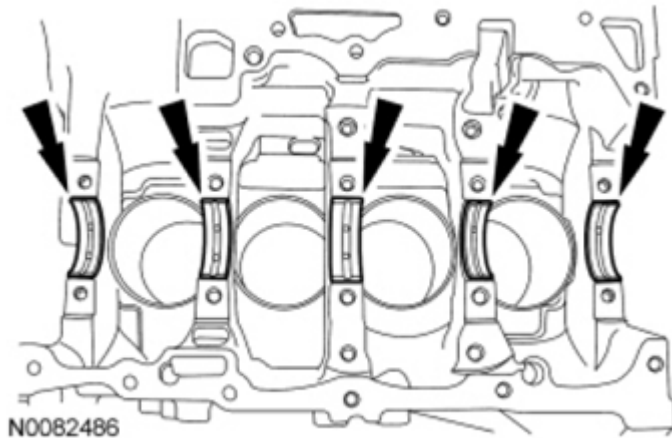


Fig. 383: View Of Main Bearings Of Cylinder Block
Courtesy of FORD MOTOR CO.

11. Lubricate the upper crankshaft main bearings with clean engine oil and install the 5 crankshaft main bearings in the cylinder block.

NOTE: If reusing the crankshaft main bearings, install them in their original positions and orientation as noted during disassembly.

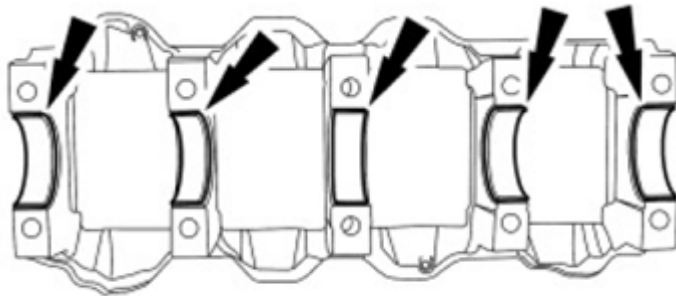


Fig. 384: Locating Main Bearings Of Main Bearing Beam
Courtesy of FORD MOTOR CO.

12. Lubricate the crankshaft main bearings with clean engine oil and install the 5 crankshaft main bearings in the main bearing beam.
13. Lubricate journals on the crankshaft with clean engine oil.
14. Position the crankshaft in the cylinder block.

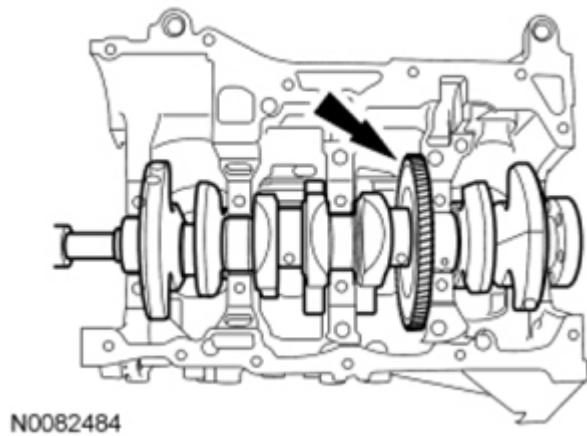


Fig. 385: View Of Crankshaft
Courtesy of FORD MOTOR CO.

15. Lubricate the 10 main bearing beam side fit surfaces (front 2 shown in illustration) with clean engine oil.

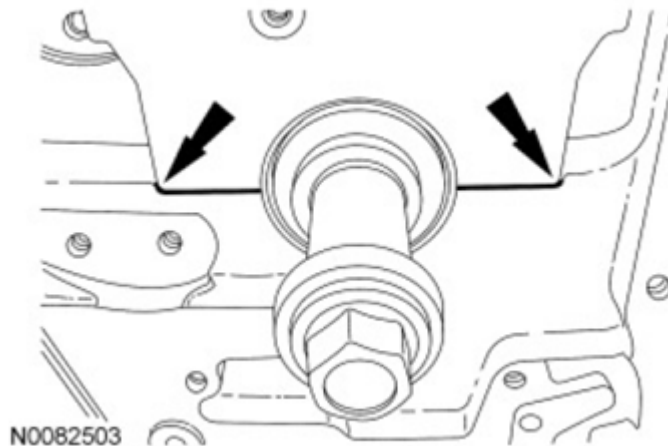


Fig. 386: Locating Main Bearing Beam Side Fit Surfaces
Courtesy of FORD MOTOR CO.

16. Lubricate the crankshaft bearing journals on the main bearing beam with clean engine oil. Then position the main bearing beam in the engine block with the main bearing beam mounted flush with the rear face of the engine block.

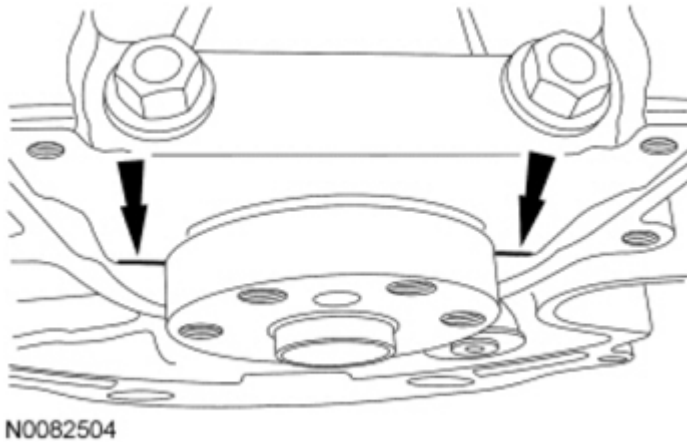


Fig. 387: Locating Main Bearing Beams
Courtesy of FORD MOTOR CO.

NOTE: Lubricate the main bearing beam bolts threads and under the bolt heads with clean engine oil.

NOTE: Position the crankshaft to the rear of the cylinder block, then position the crankshaft to the front of the cylinder block before tightening the main bearing beam bolts.

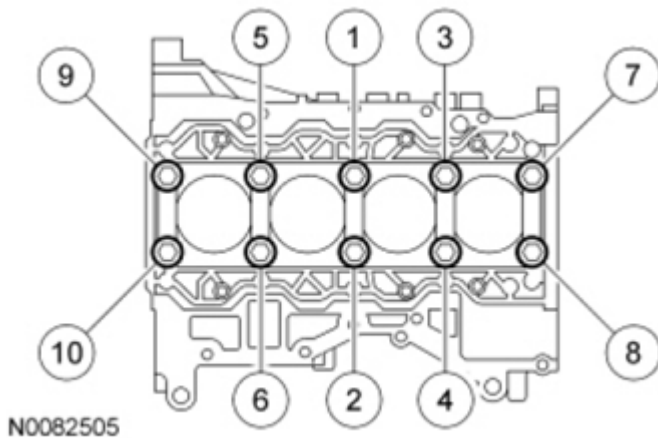


Fig. 388: Tightening Sequence Of Main Bearing Beam Bolts
Courtesy of FORD MOTOR CO.

17. Install and tighten the 10 new main bearing beam bolts.
 - Tighten the bolts in the sequence shown in illustration in 3 stages.
 - Stage 1: Tighten to 5 Nm (44 lb-in).
 - Stage 2: Tighten to 25 Nm (18 lb-ft).
 - Stage 3: Tighten an additional 90 degrees.

18. 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 0.22-0.43 mm (0.008-0.016 in). If the crankshaft end play exceeds the specified range, install new parts as necessary.

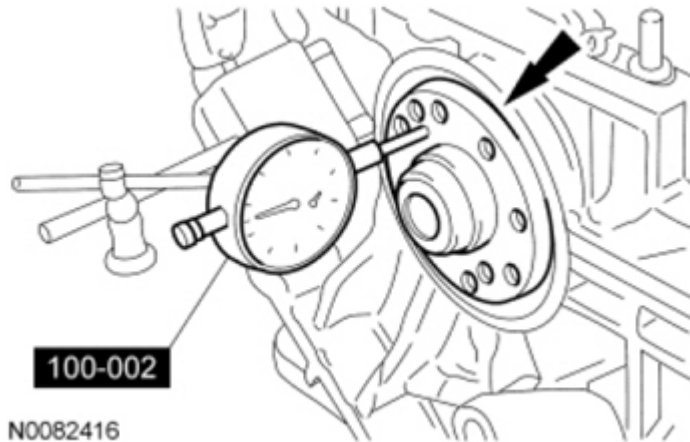
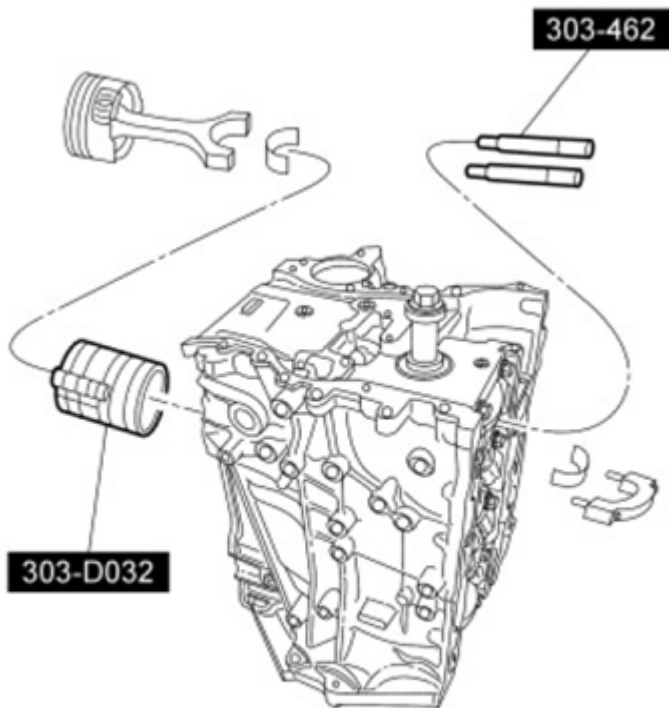


Fig. 389: Measuring Crankshaft End Play

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 arrow on top is facing toward the front of the engine.



N0082506

Fig. 390: Installing Piston And Connecting Rod Assemblies
Courtesy of FORD MOTOR CO.

19. Using the Piston Ring Compressor and the Connecting Rod Installer, install the piston and connecting rod assemblies.
 - When installing the pistons and connecting rod assemblies, the oil ring gaps must be positioned 60 degrees apart from each other and a minimum of 90 degrees from the expander gap.
 - The position of the upper and lower compression ring gaps are not controlled for installation.

NOTE: The rod cap installation must keep the same orientation as marked during disassembly or engine damage may occur.

NOTE: Install connecting rod caps and bolts on the connecting rods for cylinders 1 and 4 first and tighten. Then rotate crankshaft 180 degrees and install connecting rod caps and bolts on connecting rods for cylinders 2 and 3 and tighten.

NOTE: After installation of each connecting rod cap, rotate the crankshaft to verify smooth operation.

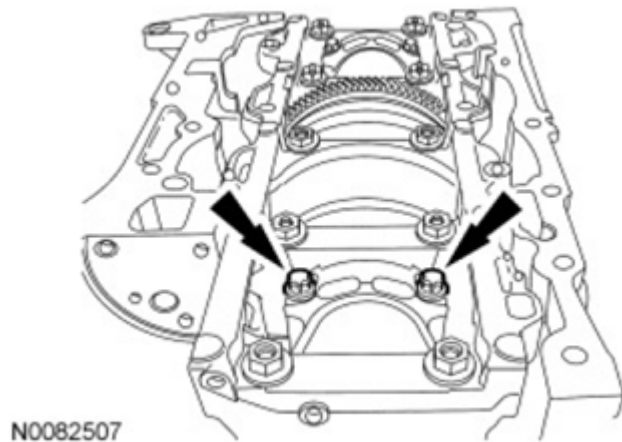


Fig. 391: Locating Connecting Rod Cap Bolts
Courtesy of FORD MOTOR CO.

20. Install the connecting rod caps and the new bolts.
 - Tighten the bolts in 2 stages.
 - Stage 1: Tighten to 29 Nm (21 lb-ft).
 - Stage 2: Tighten an additional 90 degrees.
21. Install the Crankshaft **TDC** Timing Peg and rotate the crankshaft slowly clockwise until the crankshaft balance weight is up against the Crankshaft **TDC** Timing Peg. The engine is now at Top Dead Center (TDC).

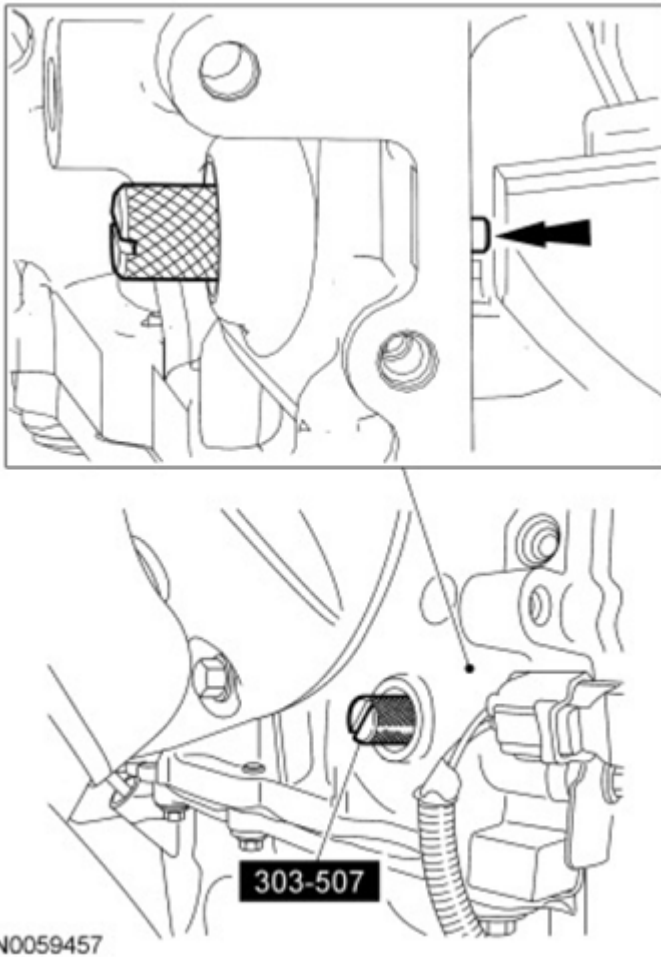


Fig. 392: View Of Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

- NOTE:** Due to the precision interior construction of the balancer unit, it should not be disassembled.
- NOTE:** The original adjustment shims must be installed in their original positions.
- NOTE:** Confirm by visual inspection that there is no damage to the balancer unit gear and verify that the shaft turns smoothly. If there is any damage or malfunction, replace the balancer unit.

22. Install the adjustment shims in their original positions on the seat faces of the balancer unit.
23. With the balancer unit shaft marks in the **TDC** position, slowly install the balancer unit to the cylinder block to avoid interference between the crankshaft drive gear and the balancer unit driven gear.

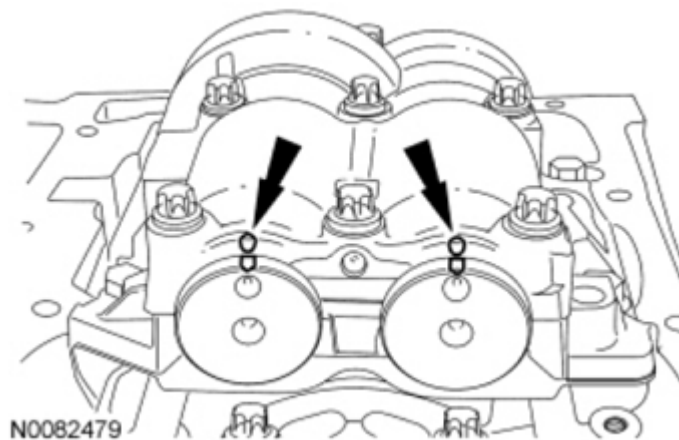


Fig. 393: Locating Balancer Unit Marks
Courtesy of FORD MOTOR CO.

24. Install the balancer unit bolts.
- Tighten in the sequence shown in illustration in 2 stages.
 - Stage 1: Tighten to 25 Nm (18 lb-ft).
 - Stage 2: Tighten to 50 Nm (37 lb-ft).

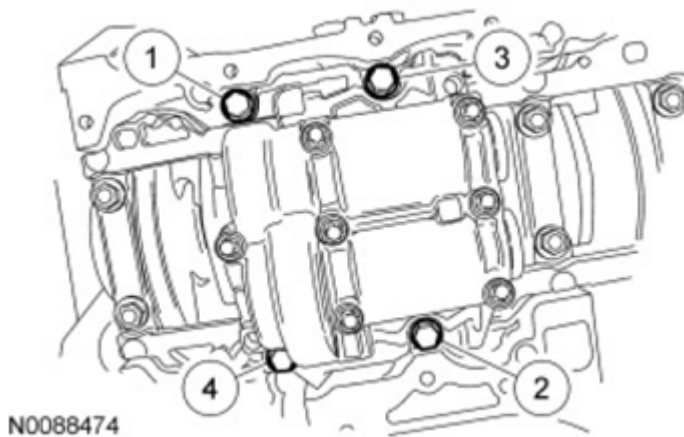


Fig. 394: Tightening Sequence Of Balancer Unit Bolts
Courtesy of FORD MOTOR CO.

25. Remove the Crankshaft TDC Timing Peg.

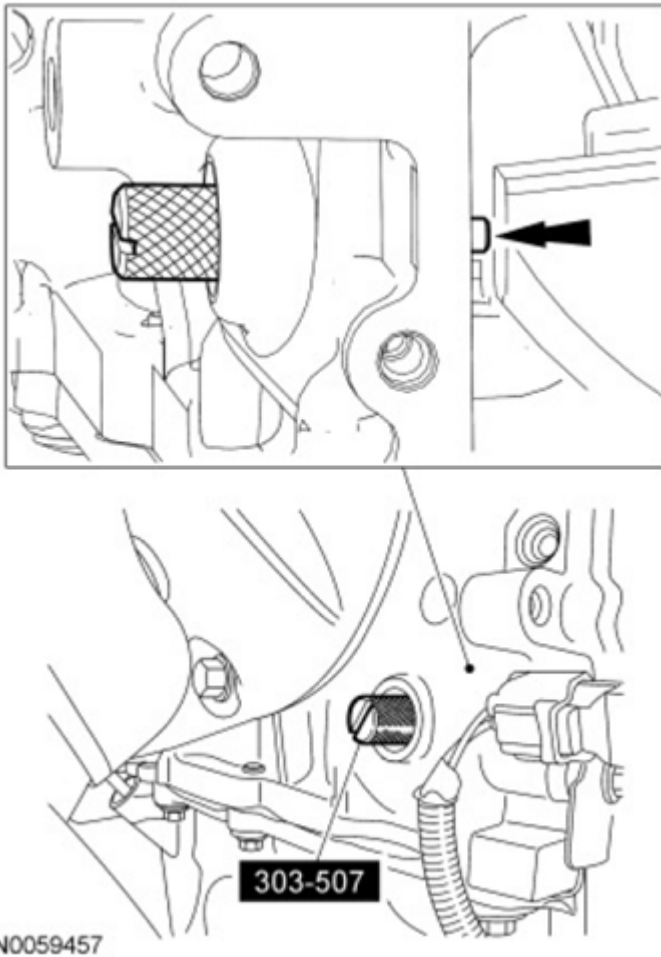


Fig. 395: View Of Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

26. Rotate the crankshaft to confirm that there are no meshing problems between the balancer unit gear and the crankshaft gear.
27. Install the Crankshaft **TDC** Timing Peg and rotate the crankshaft slowly clockwise until the crankshaft balance weight is up against the Crankshaft **TDC** Timing Peg.
 - Remove the Crankshaft **TDC** Timing Peg.

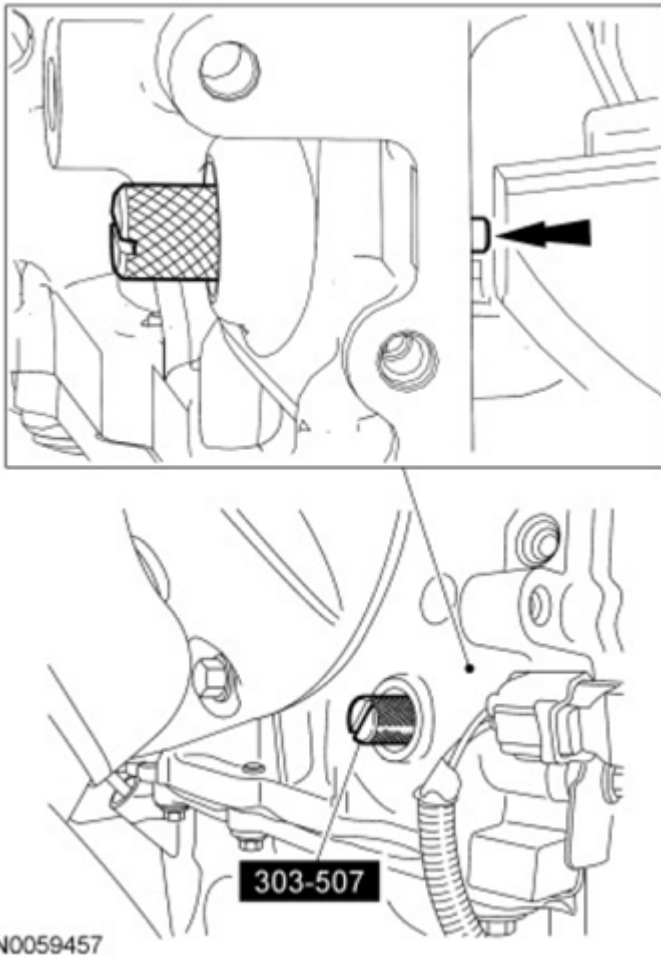


Fig. 396: View Of Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

- NOTE:** Measure the backlash and verify that it is within specified range at all of the following 6 positions: 10 degrees, 30 degrees, 100 degrees, 190 degrees, 210 degrees and 280 degrees. It will be necessary to reset the measuring equipment between measurements.
- NOTE:** The measurement must be taken with the Dial Indicator Gauge with Holding Fixture, a 5-mm Allen wrench and worm clamp set up as shown in illustration. Mark the Allen wrench with a file 80 mm (3.149 in) above the driven gear shaft center. Make sure the worm clamp and Allen wrench are not touching the balance shaft housing.
- NOTE:** For an accurate measurement while measuring the gear backlash, insert a screwdriver as shown in illustration into the crankshaft No. 1 crankweight area and set both the rotation and the thrust direction with the screwdriver, using a prying action as shown in illustration.

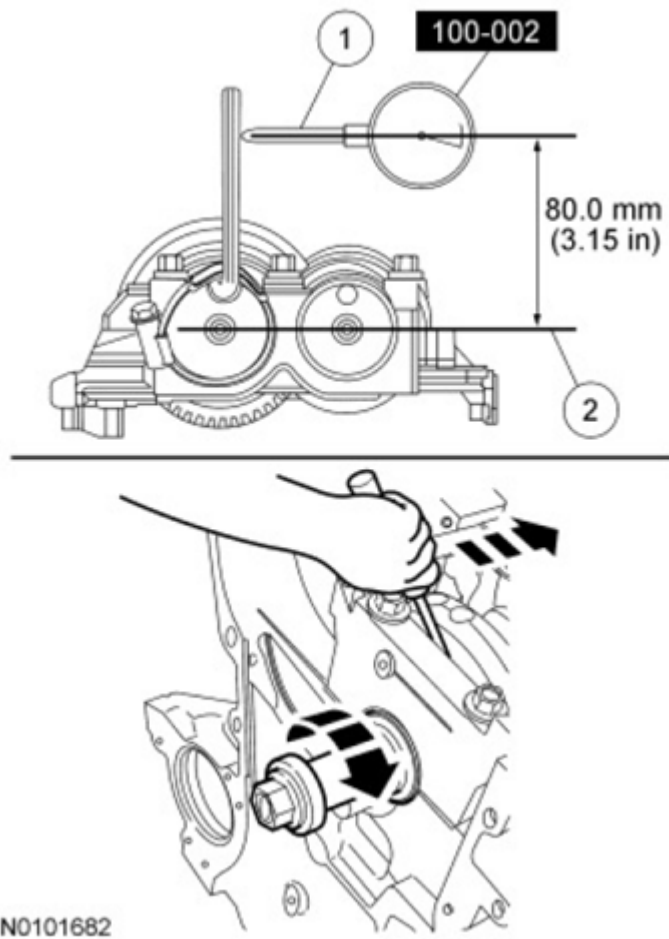


Fig. 397: Measuring Gear Backlash With Specifications
Courtesy of FORD MOTOR CO.

28. Position the Dial Indicator Gauge with Holding Fixture as shown in illustration. Measure the gear backlash.
 - Position the Dial Indicator Gauge with Holding Fixture (1) on the Allen wrench 80 mm (3.149 in) above the driven gear shaft center (2) on the balancer unit.
 - Rotate the crankshaft clockwise and measure the backlash at all of the following 6 positions: 10 degrees, 30 degrees, 100 degrees, 190 degrees, 210 degrees and 280 degrees.
 - Backlash specifications are 0.005 to 0.101 mm (0.00019 to 0.0039 in).
 - If the backlash exceeds the specified range, carry out the Balance Shaft Backlash procedure. For additional information, refer to **BALANCE SHAFT BACKLASH** in this service information.

NOTE: Failure to position the No. 1 piston at Top Dead Center (TDC) can result in damage to the engine. Turn the engine in the normal direction of rotation only.

29. Turn the crankshaft clockwise to position the No. 1 piston at Top Dead Center (TDC).

NOTE: The Crankshaft TDC Timing Peg will contact the crankshaft and prevent it from turning past TDC . However, the crankshaft can still be rotated in the counterclockwise direction. The crankshaft must remain at the TDC position until the timing drive components and crankshaft pulley are installed.

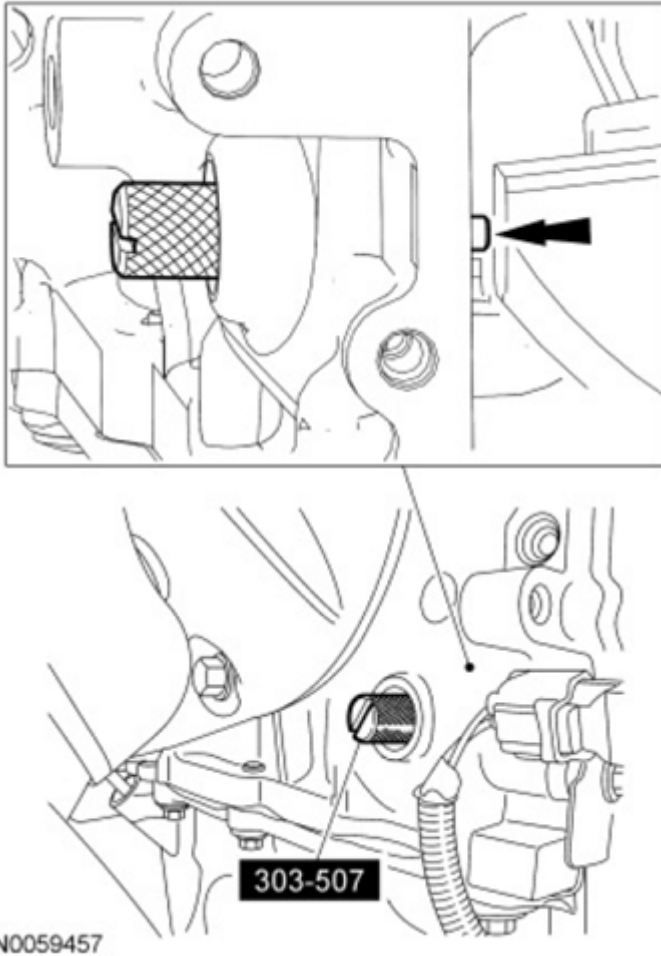


Fig. 398: View Of Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

30. Install the Crankshaft TDC Timing Peg.

NOTE: Clean the oil pump and cylinder block mating surfaces with metal surface prep.

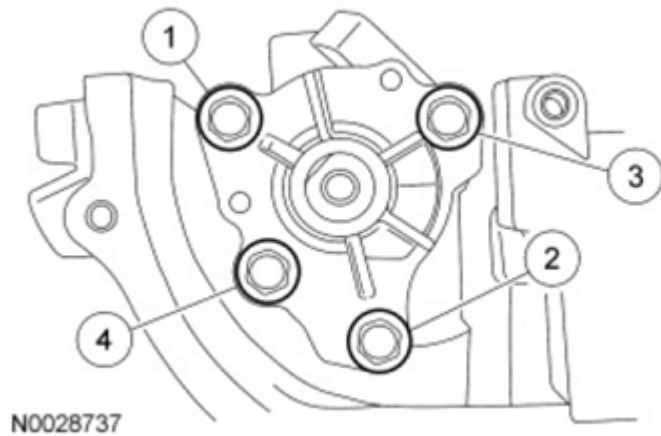


Fig. 399: Tightening Sequence Of Oil Pump Assembly Bolts
Courtesy of FORD MOTOR CO.

31. Install the oil pump assembly. Tighten the bolts in the sequence shown in illustration in 2 stages:
 - Stage 1: Tighten to 10 Nm (89 lb-in).
 - Stage 2: Tighten to 20 Nm (177 lb-in).
32. Install a new oil pump pickup tube gasket and the pickup tube.
 - Tighten to 10 Nm (89 lb-in).

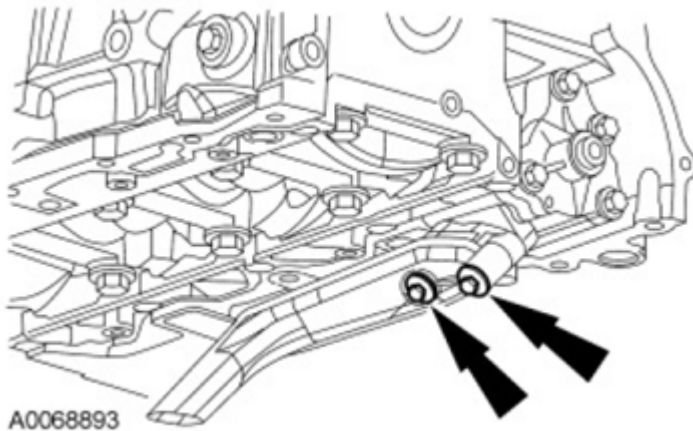


Fig. 400: Remove/Install Oil Pump Pickup Tube Bolts
Courtesy of FORD MOTOR CO.

33. Using the Crankshaft Rear Main Oil Seal Installer, install the crankshaft rear main oil seal.

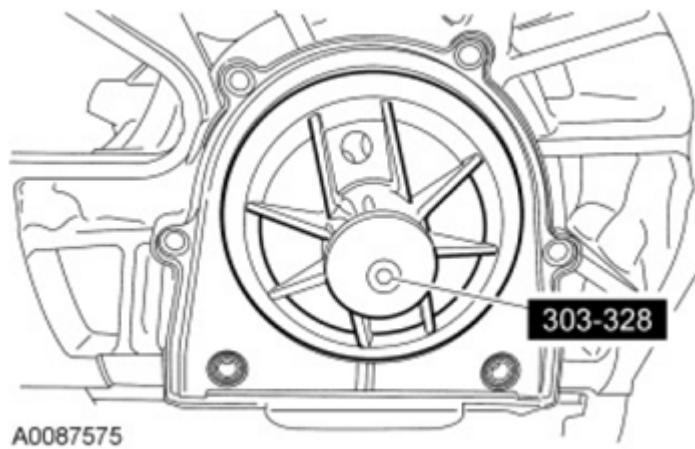


Fig. 401: Installing Crankshaft Rear Main Oil Seal
Courtesy of FORD MOTOR CO.

34. Tighten the crankshaft rear oil seal retainer bolts in the sequence shown in illustration.
- Tighten to 10 Nm (89 lb-in).

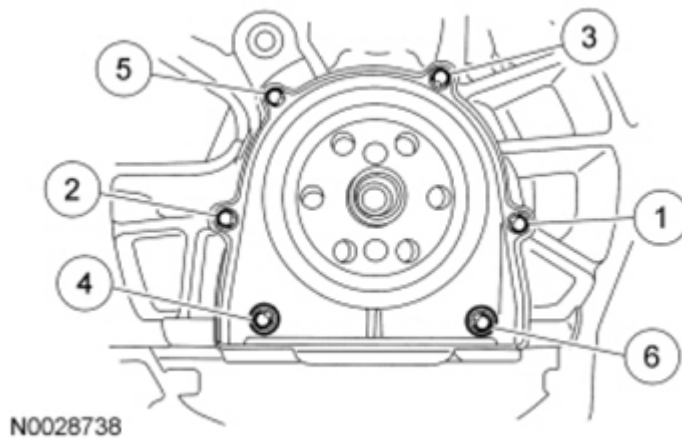


Fig. 402: Tightening Sequence Of Crankshaft Rear Oil Seal Bolts
Courtesy of FORD MOTOR CO.

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

35. Clean and inspect all mating surfaces.

NOTE: If the oil pan is not secured within 4 minutes of sealant application, the sealant must be removed and the sealing area cleaned with metal surface prep. Allow to dry until there is no sign of wetness, or 4 minutes,

whichever is longer. Failure to follow this procedure can cause future oil leakage.

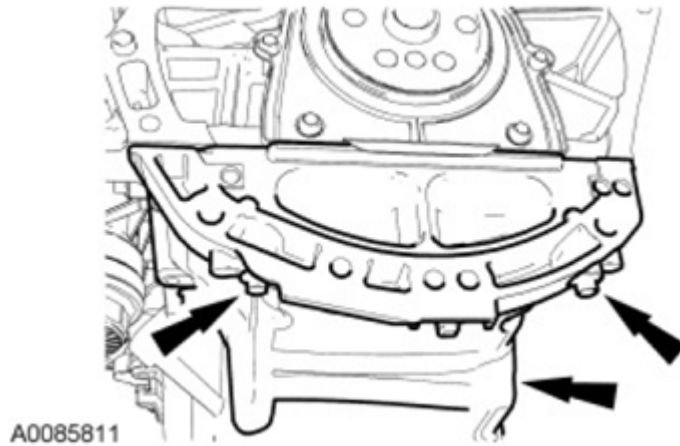
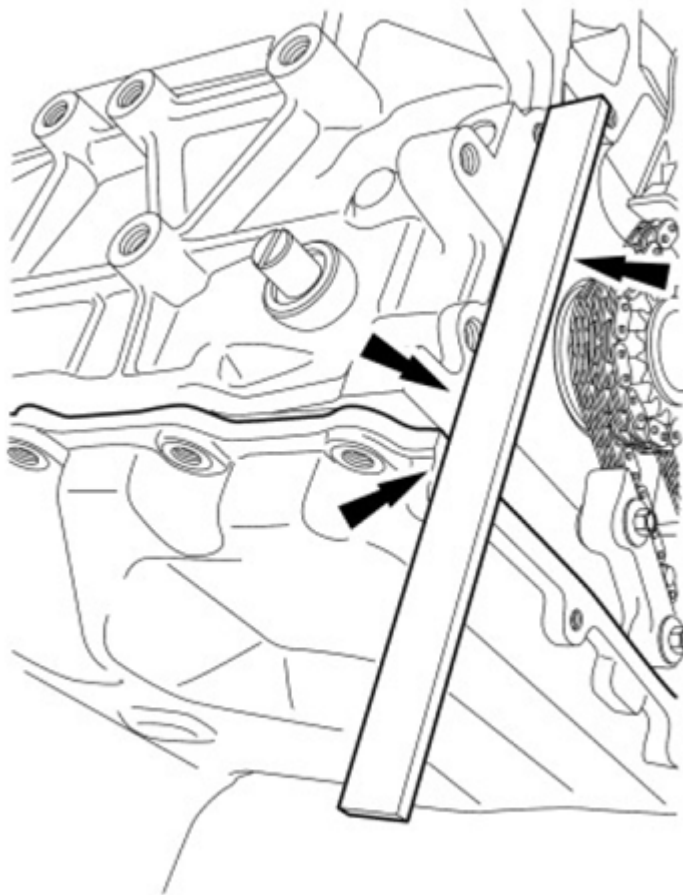


Fig. 403: Locating Oil Pan Bolts
Courtesy of FORD MOTOR CO.

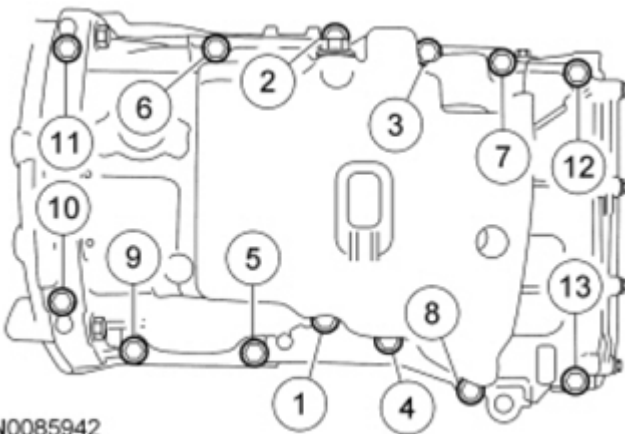
36. Apply a 2.5 mm (0.09 in) bead of silicone gasket and sealant to the oil pan. Install the oil pan. Install the 2 oil pan bolts finger-tight.
37. Using a suitable straight edge, align the front surface of the oil pan flush with the front surface of the engine block.



N0039349

Fig. 404: Aligning Front Surface Of Oil Pan
Courtesy of FORD MOTOR CO.

38. Install the remaining oil pan bolts and tighten the oil pan bolts in the sequence shown in illustration.
- Tighten to 25 Nm (18 lb-ft).



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Fig. 405: Tightening Sequence Of Oil Pan Bolts
Courtesy of FORD MOTOR CO.

39. Install the cylinder head alignment dowels.
- Dowels must be fully seated in the cylinder block.

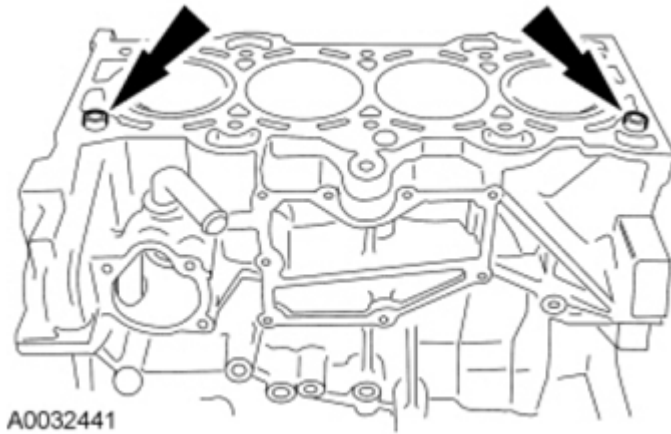


Fig. 406: Locating Cylinder Head Alignment Dowels
Courtesy of FORD MOTOR CO.

- NOTE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges that make leak paths. Use a plastic scraping tool to remove all traces of the head gasket.
- NOTE:** Observe all warnings and cautions and follow all application directions contained on the packaging of the silicone gasket remover and the metal surface prep.
- NOTE:** If there is no residual gasket material present, metal surface prep can be used to clean and prepare the surfaces.

40. Clean the cylinder head-to-cylinder block mating surface of both the cylinder head and the cylinder block in the following sequence.
1. Remove any large deposits of silicone or gasket material with a plastic scraper.
 2. Apply silicone gasket remover, following package directions, and allow to set for several minutes.
 3. Remove the silicone gasket remover with a plastic scraper. A second application of silicone gasket remover may be required if residual traces of silicone or gasket material remain.
 4. Apply metal surface prep, following package directions, to remove any traces of oil or coolant, and to prepare the surfaces to bond with the new gasket. Do not attempt to make the metal shiny. Some staining of the metal surfaces is normal.
41. Apply silicone gasket and sealant to the locations shown in illustration.

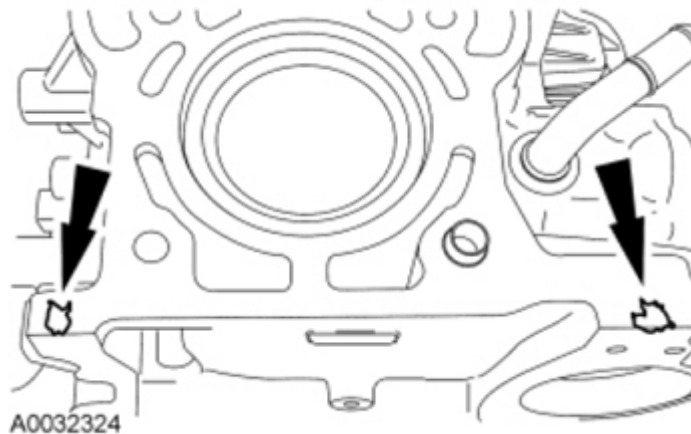


Fig. 407: Locating Silicone Gasket And Sealant Applying Areas Of Cylinder Block
Courtesy of FORD MOTOR CO.

42. Install a new head gasket.

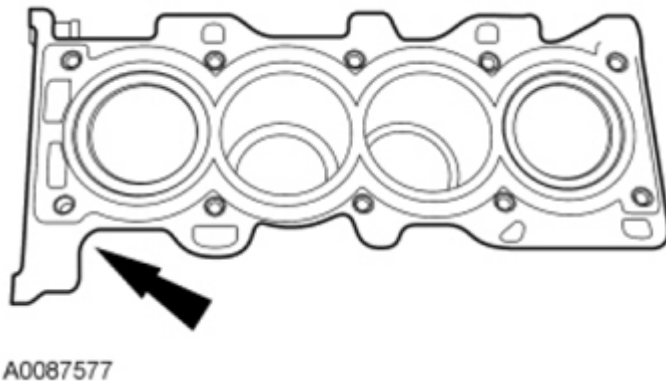


Fig. 408: View Of Head Gasket
Courtesy of FORD MOTOR CO.

NOTE: The cylinder head bolts are torque-to-yield and must not be reused. New cylinder head bolts must be installed.

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

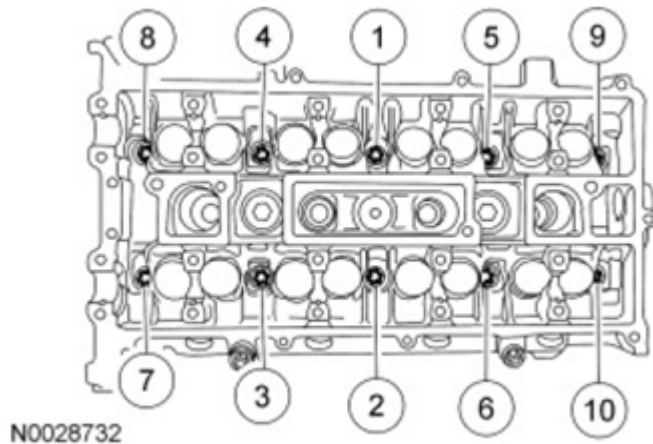


Fig. 409: Tightening Sequence Of Cylinder Head Bolts
Courtesy of FORD MOTOR CO.

43. Install the cylinder head and 10 new bolts. Tighten the bolts in the sequence shown in illustration in 5 stages:
- Stage 1: Tighten to 5 Nm (44 lb-in).
 - Stage 2: Tighten to 15 Nm (133 lb-in).
 - Stage 3: Tighten to 45 Nm (33 lb-ft).
 - Stage 4: Turn 90 degrees.
 - Stage 5: Turn an additional 90 degrees.

NOTE: Coat the valve tappets with clean engine oil prior to installation.

44. Install the valve tappets.

NOTE: Install the camshafts with the alignment slots in the camshafts lined up so the Camshaft Alignment Plate can be installed without rotating the camshafts. Make sure the lobes on the No. 1 cylinder are in the same position as noted in the disassembly procedure. Rotating the camshafts when the timing chain is removed, or installing the camshafts 180 degrees out of position, can cause severe damage to the valves and pistons.

NOTE: Lubricate the camshaft journals and bearing caps with clean engine oil.

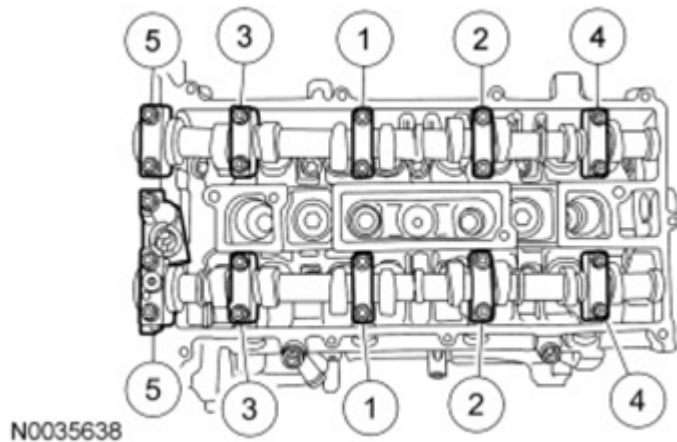


Fig. 410: Identifying Tightening Sequence Of Camshaft Bearing Cap Bolts
Courtesy of FORD MOTOR CO.

45. Install the camshafts and bearing caps in their original locations and orientation. Tighten the bearing caps in the sequence shown in illustration in 3 stages:
 - Stage 1: Tighten the camshaft bearing cap bolts one at a time until finger-tight.
 - Stage 2: Tighten to 7 Nm (62 lb-in).
 - Stage 3: Tighten to 16 Nm (142 lb-in).
46. Install the Variable Camshaft Timing (VCT) system oil filter and the plug in the intake camshaft thrust cap.
 - Tighten to 17 Nm (150 lb-in).

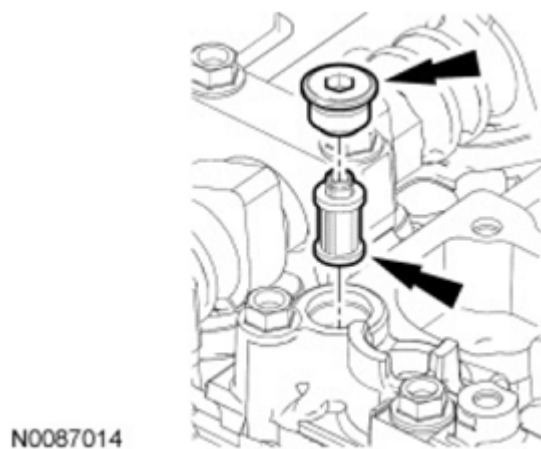


Fig. 411: View Of VCT System Oil Filter And Plug
Courtesy of FORD MOTOR CO.

47. Install the VCT solenoid and the bolt.
 - Tighten to 10 Nm (89 lb-in).

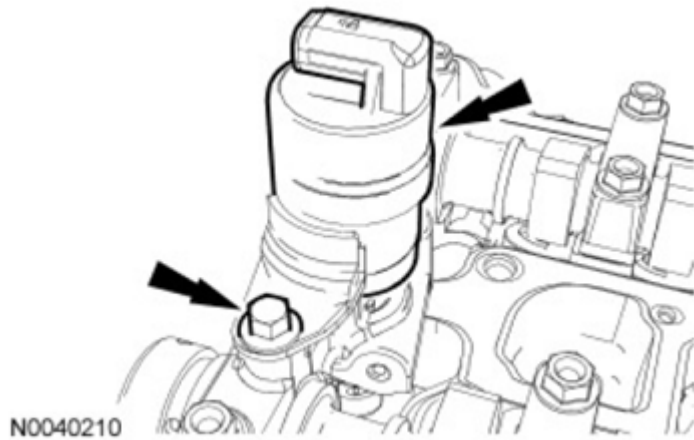


Fig. 412: Remove/Install VCT Solenoid And Bolt
Courtesy of FORD MOTOR CO.

NOTE: Install a new crankshaft sprocket diamond washer on both sides of the crankshaft sprocket.

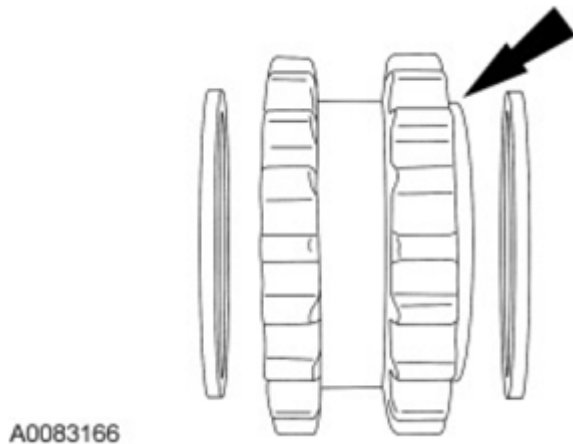


Fig. 413: View Of Crankshaft Sprocket
Courtesy of FORD MOTOR CO.

48. Install the crankshaft sprocket, new crankshaft sprocket diamond washers, oil pump chain and oil pump sprocket.
 - The crankshaft sprocket flange must be facing away from the engine block.
49. Install the oil pump chain, sprocket and bolt.
 - Tighten to 25 Nm (18 lb-ft).

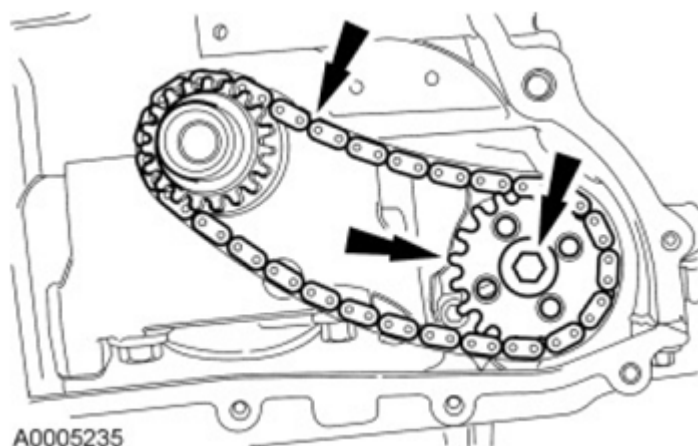


Fig. 414: Identifying Oil Pump Chain, Sprocket And Bolt
 Courtesy of FORD MOTOR CO.

50. Install the oil pump chain tensioner shoulder bolt.
 - Tighten to 10 Nm (89 lb-in).

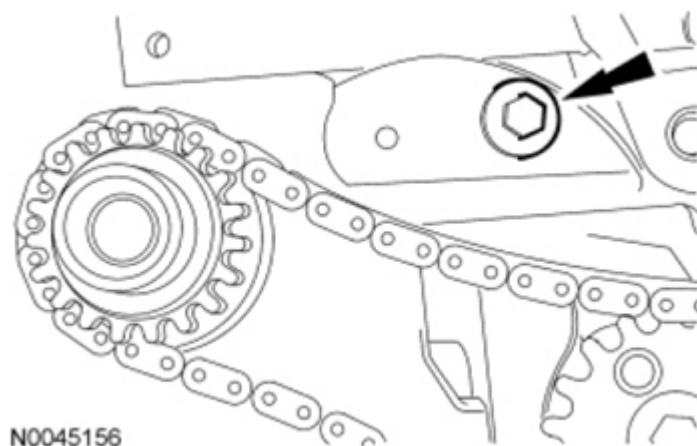


Fig. 415: Locating Oil Pump Drive Chain Tensioner Shoulder Bolt
 Courtesy of FORD MOTOR CO.

51. Install the oil pump chain tensioner. Hook the tensioner spring around the shoulder bolt.
 - Tighten to 10 Nm (89 lb-in).

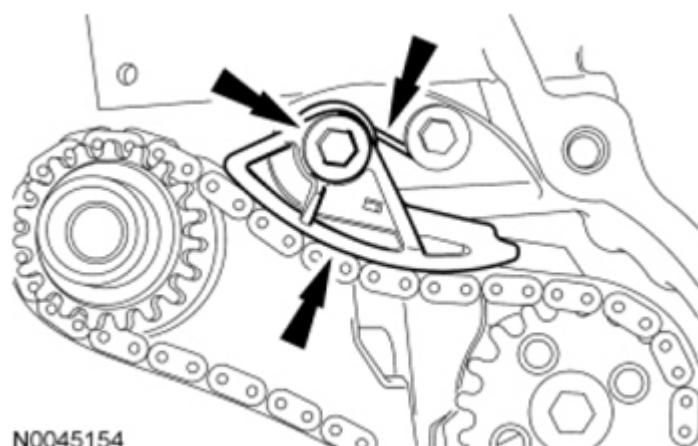


Fig. 416: Locating Oil Pump Drive Chain Tensioner And Shoulder Bolt
 Courtesy of FORD MOTOR CO.

NOTE: The Camshaft Alignment Plate is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

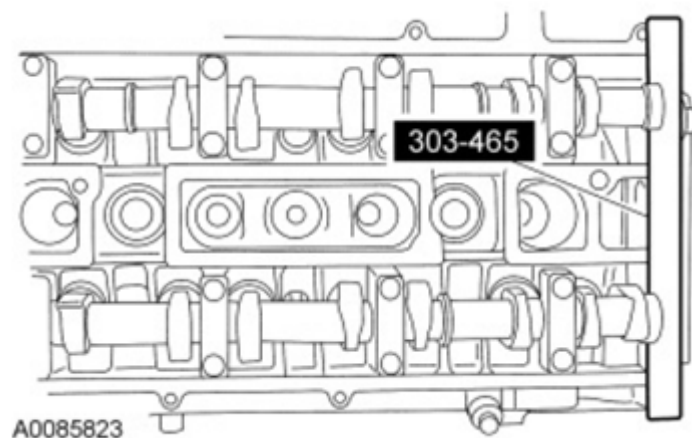


Fig. 417: View Of Camshaft Alignment Plate
 Courtesy of FORD MOTOR CO.

52. Install the Camshaft Alignment Plate in the slots on the rear of both camshafts.
53. Install the camshaft sprockets and the bolts. Do not tighten the bolts at this time.

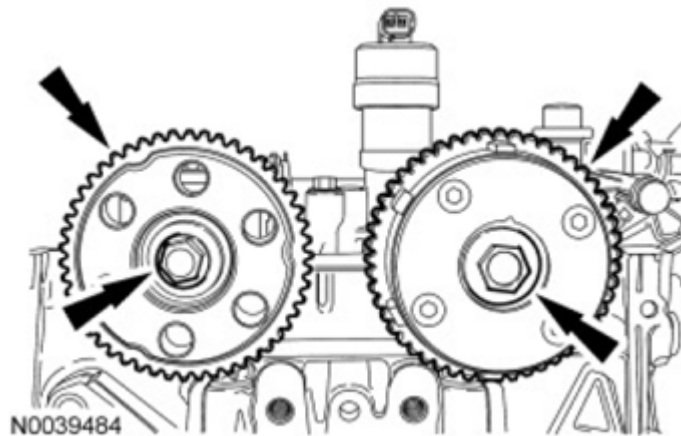


Fig. 418: View Of Camshaft Sprockets Bolts
Courtesy of FORD MOTOR CO.

54. Install the LH timing chain guide and the bolts.
- Tighten to 10 Nm (89 lb-in).

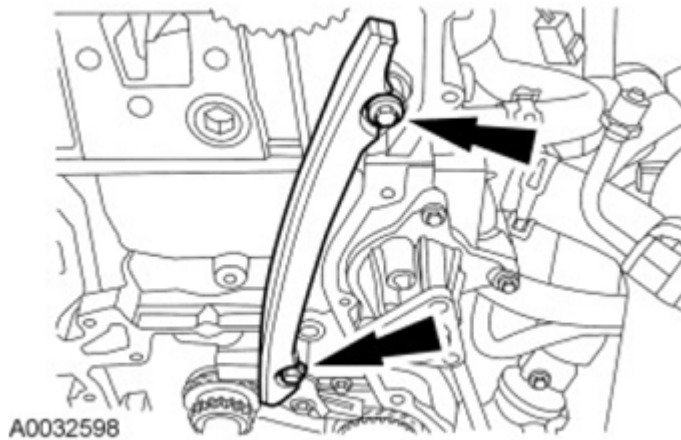


Fig. 419: Locating LH Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

55. Install the timing chain.

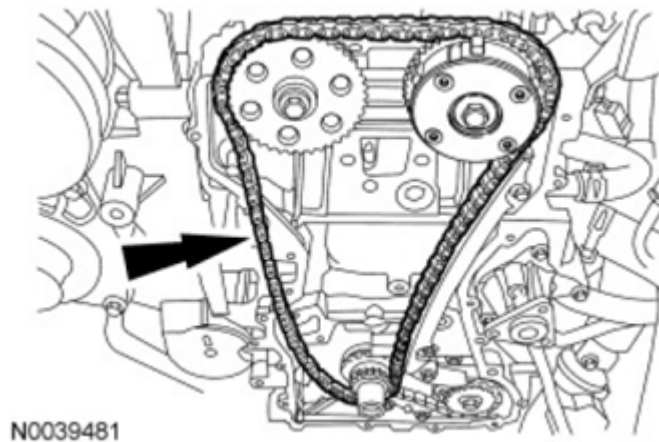


Fig. 420: View Of Timing Chain
Courtesy of FORD MOTOR CO.

56. Install the RH timing chain guide.

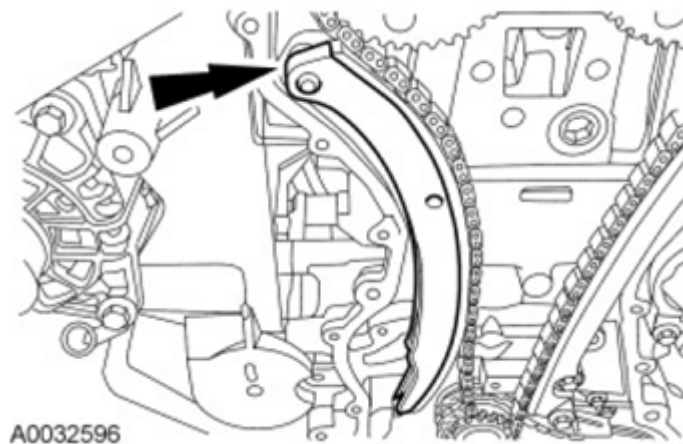
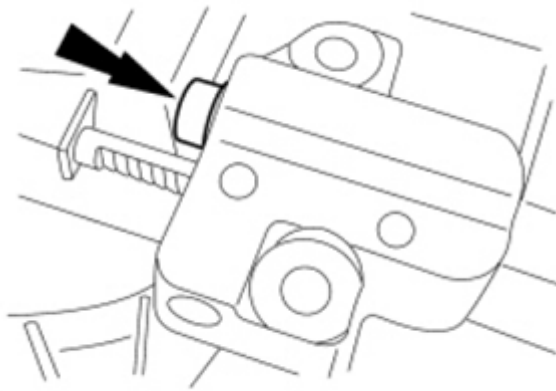


Fig. 421: Locating RH Timing Chain Guide
Courtesy of FORD MOTOR CO.

NOTE: If the timing chain tensioner plunger and ratchet assembly are not pinned in the compressed position, follow the next 4 steps.

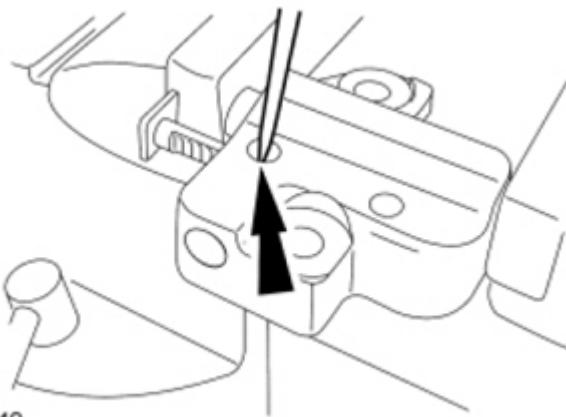
NOTE: Do not compress the ratchet assembly. This will damage the ratchet assembly.



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Fig. 422: Compressing Timing Chain Tensioner Plunger
Courtesy of FORD MOTOR CO.

57. Using the edge of a vise, compress the timing chain tensioner plunger.
58. Using a small pick, push back and hold the ratchet mechanism.



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Fig. 423: Pushing Ratchet Mechanism
Courtesy of FORD MOTOR CO.

59. While holding the ratchet mechanism, push the ratchet arm back into the tensioner housing.

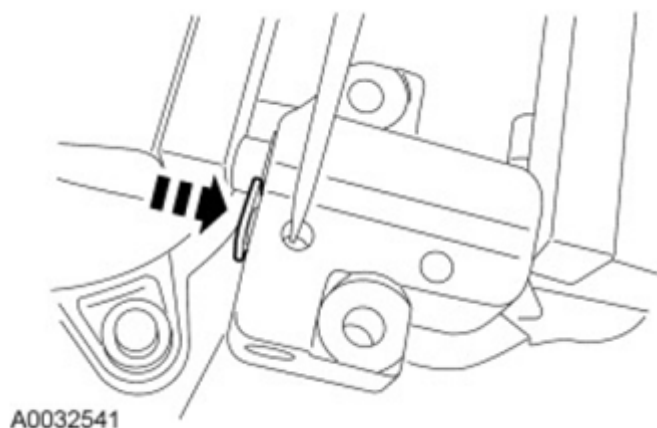


Fig. 424: Pushing Ratchet Arm
Courtesy of FORD MOTOR CO.

60. Install a paper clip into the hole in the tensioner housing to hold the ratchet assembly and the plunger in during installation.

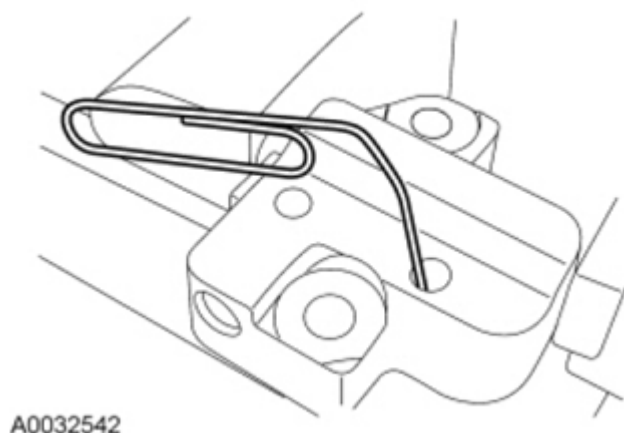


Fig. 425: Holding Ratchet Assembly Using Paper Clip
Courtesy of FORD MOTOR CO.

61. Install the timing chain tensioner and the bolts. Remove the paper clip to release the piston.
 - Tighten to 10 Nm (89 lb-in).

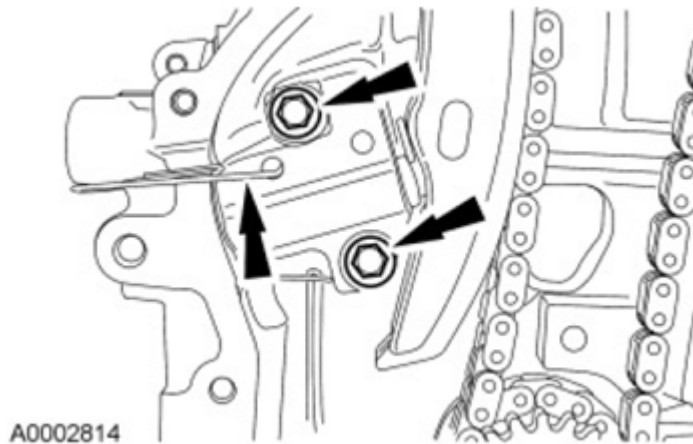


Fig. 426: Locating Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

NOTE: The Camshaft Alignment Plate is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

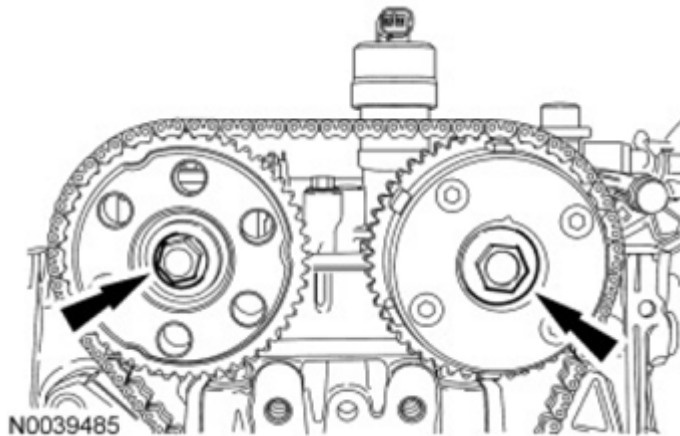


Fig. 427: View Of Camshaft Bolts
Courtesy of FORD MOTOR CO.

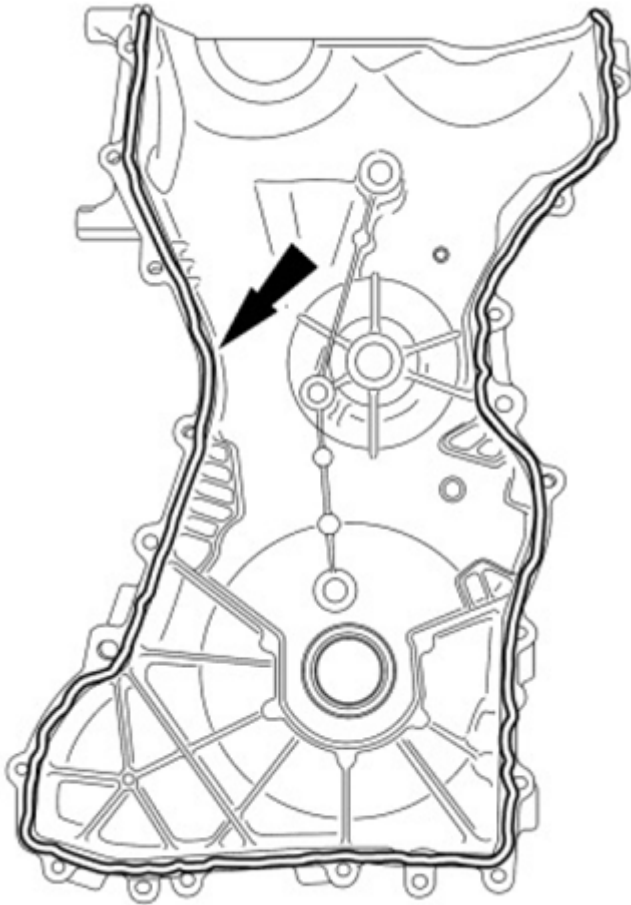
62. Using the flats on the camshafts to prevent camshaft rotation, tighten the bolts.
 - Tighten to 72 Nm (53 lb-ft).

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

63. Clean and inspect the mounting surfaces of the engine and the front cover.

NOTE: The engine front cover must be installed and the bolts tightened within 4

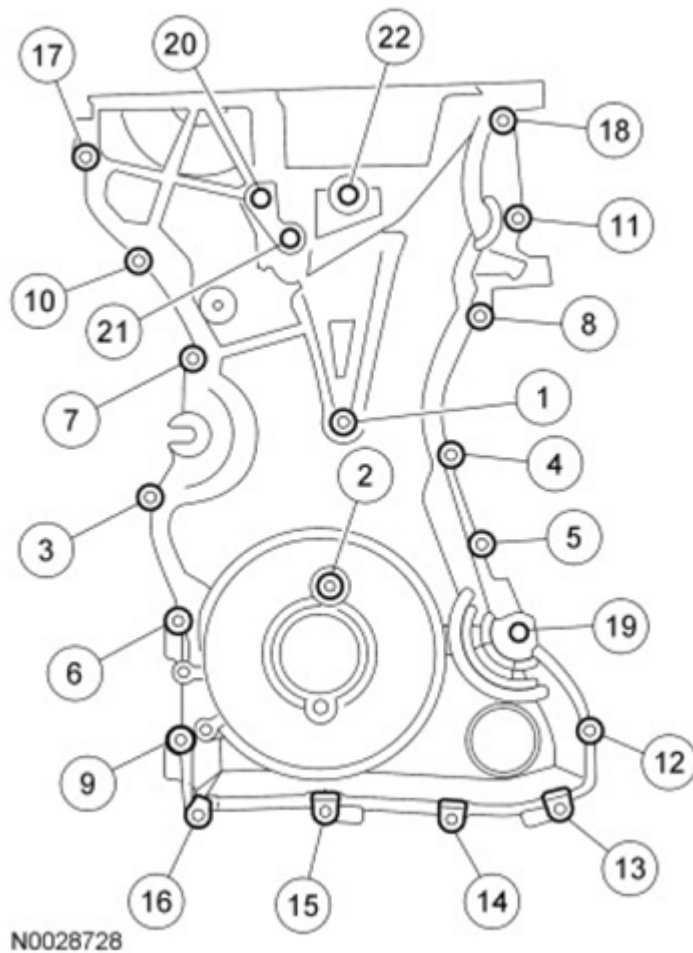
minutes of applying the silicone gasket and sealant.



A0032803

Fig. 428: Locating Silicone And Sealant Applying Areas Of Cylinder Head And Oil Pan Joint
Courtesy of FORD MOTOR CO.

64. Apply a 2.5 mm (0.09 in) bead of silicone gasket and sealant to the cylinder head and oil pan joint areas. Apply a 2.5 mm (0.09 in) bead of silicone gasket and sealant to the front cover.
65. Install the engine front cover. Tighten the bolts in the sequence shown in illustration, to the following specifications:
 - Tighten the 8-mm bolts to 10 Nm (89 lb-in).
 - Tighten the 13-mm bolts to 48 Nm (35 lb-ft).



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Fig. 429: Tightening Sequence Of Engine Front Cover Bolts
 Courtesy of FORD MOTOR CO.

NOTE: Remove the through-bolt from the Camshaft Front Oil Seal Installer.

NOTE: Lubricate the oil seal with clean engine oil.

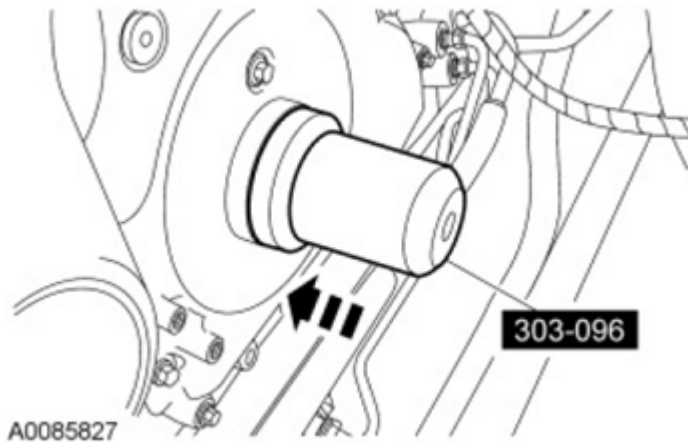


Fig. 430: Installing Crankshaft Front Oil Seal Using Camshaft Front Oil Seal Installer
Courtesy of FORD MOTOR CO.

66. Using the Camshaft Front Oil Seal Installer, install a new crankshaft front oil seal.

NOTE: Do not install the crankshaft pulley bolt at this time.

NOTE: Apply clean engine oil on the seal area before installing.

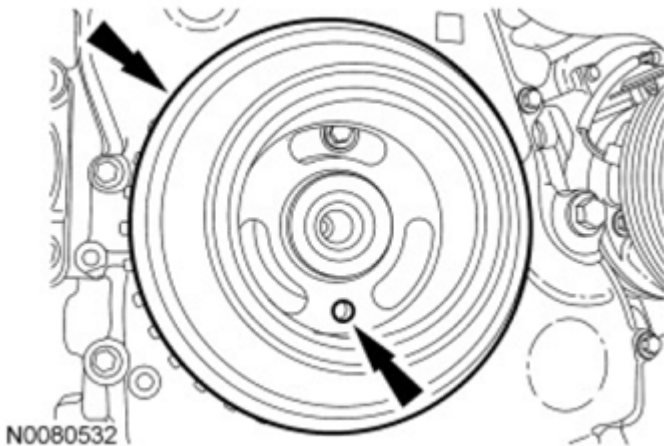


Fig. 431: Identifying Crankshaft Pulley And Hole
Courtesy of FORD MOTOR CO.

67. Position the crankshaft pulley onto the crankshaft with the hole in the pulley at the 6 o'clock position.

NOTE: Only hand-tighten the 6 mm x 18 mm bolt or damage to the front cover can occur.

NOTE: This step will correctly align the crankshaft pulley to the crankshaft.

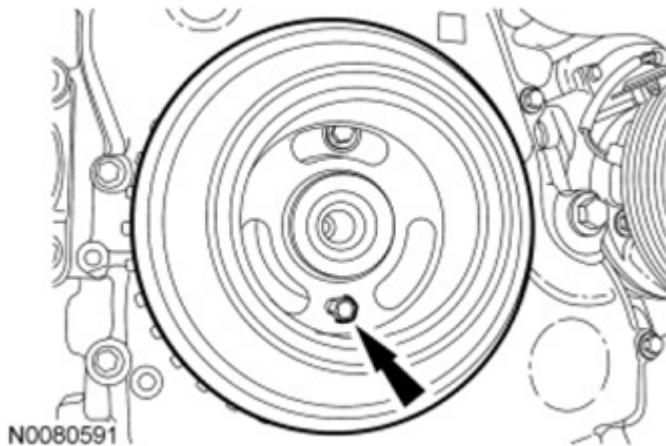


Fig. 432: View Of Crankshaft Pulley Alignment Bolt
Courtesy of FORD MOTOR CO.

68. Install a 6 mm x 18 mm bolt through the crankshaft pulley and thread it into the front cover.

NOTE: The crankshaft must remain in the Top Dead Center (TDC) position during installation of the pulley bolt or damage to the engine can occur. Therefore, the crankshaft pulley must be held in place with the Crankshaft Damper Holding Tool and the bolt should be installed using hand tools only.

NOTE: Do not reuse the crankshaft pulley bolt.

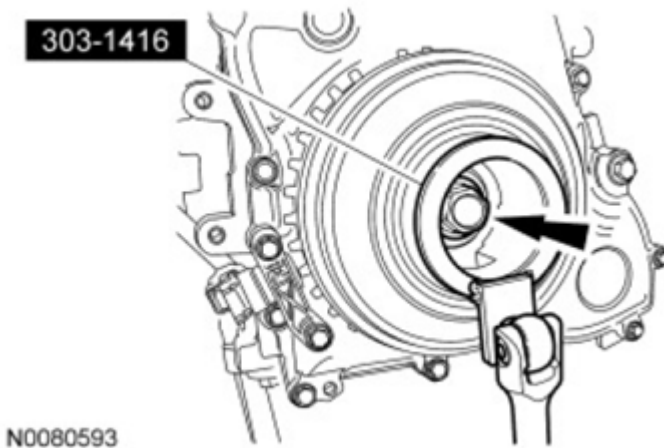


Fig. 433: Remove/Install Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

69. Install a new crankshaft pulley bolt. Using the Crankshaft Damper Holding Tool to hold the crankshaft pulley in place, tighten the crankshaft pulley bolt in 2 stages:

- Stage 1: Tighten to 100 Nm (74 lb-ft).
- Stage 2: Tighten an additional 90 degrees (1/4 turn).

70. Remove the 6 mm x 18 mm bolt.

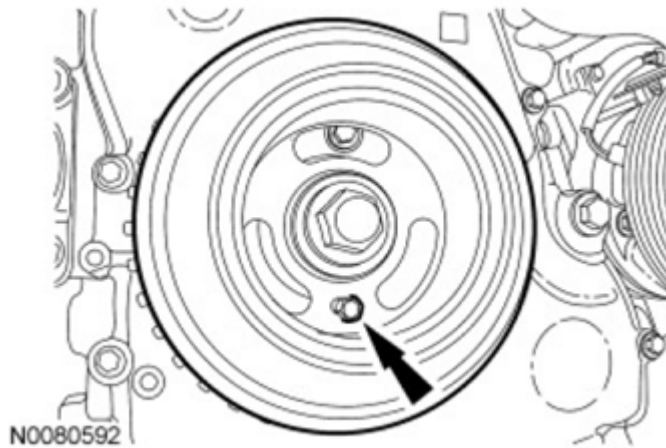


Fig. 434: View Of Crankshaft Pulley Alignment Bolt
Courtesy of FORD MOTOR CO.

71. Remove the Crankshaft TDC Timing Peg.



Fig. 435: View Of Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

72. Remove the Camshaft Alignment Plate.

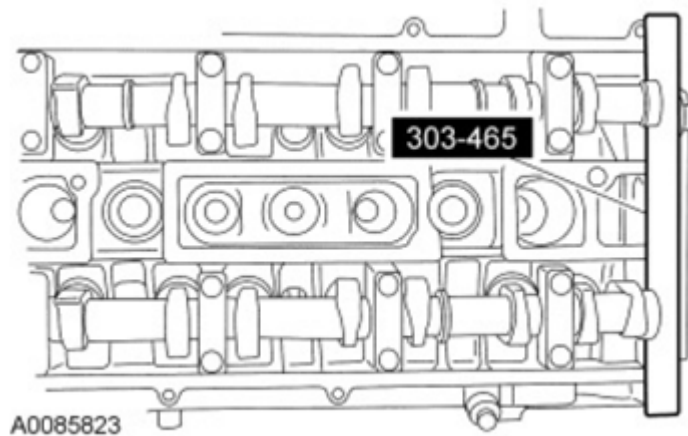


Fig. 436: View Of Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

NOTE: Only turn the engine in the normal direction of rotation.

73. Turn the crankshaft clockwise one and three-fourths turns.
74. Install the Crankshaft **TDC** Timing Peg.

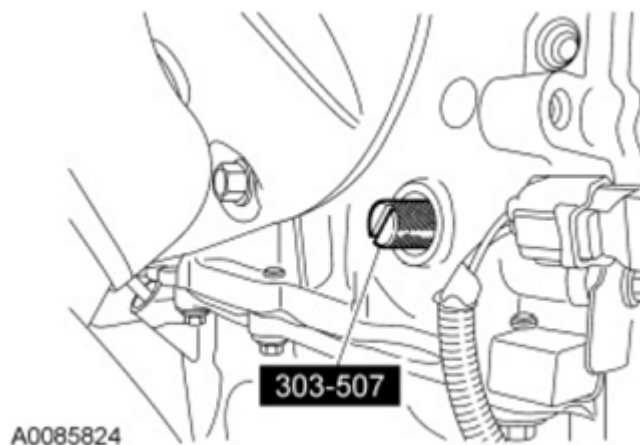
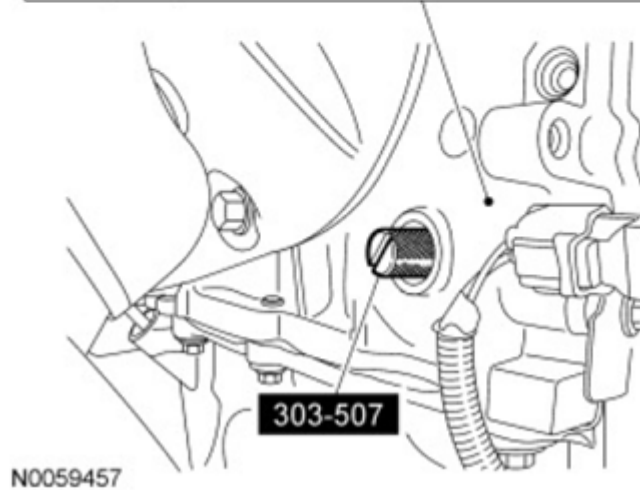
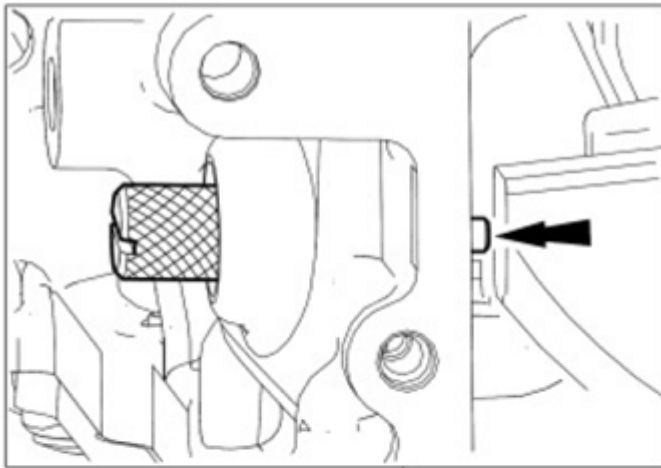


Fig. 437: View Of Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

NOTE: Only turn the engine in the normal direction of rotation.



N0059457

Fig. 438: View Of Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

75. Turn the crankshaft clockwise until the crankshaft contacts the Crankshaft **TDC** Timing Peg.

NOTE: Only hand-tighten the bolt or damage to the front cover can occur.

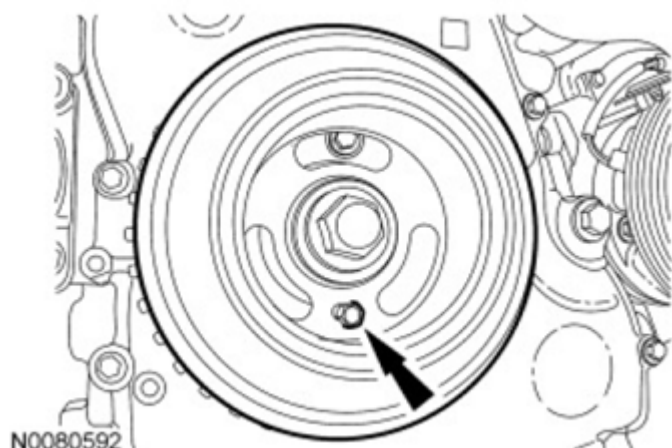


Fig. 439: View Of Crankshaft Pulley Alignment Bolt
 Courtesy of FORD MOTOR CO.

76. Using the 6 mm x 18 mm bolt, check the position of the crankshaft pulley.
 - If it is not possible to install the bolt, the engine valve timing must be corrected.
77. Install the Camshaft Alignment Plate to check the position of the camshafts.
 - If it is not possible to install the Camshaft Alignment Plate, the engine valve timing must be corrected.

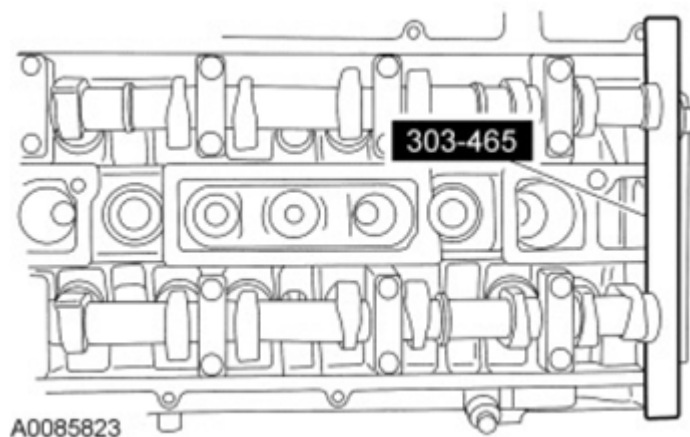


Fig. 440: View Of Camshaft Alignment Plate
 Courtesy of FORD MOTOR CO.

78. Remove the Camshaft Alignment Plate.

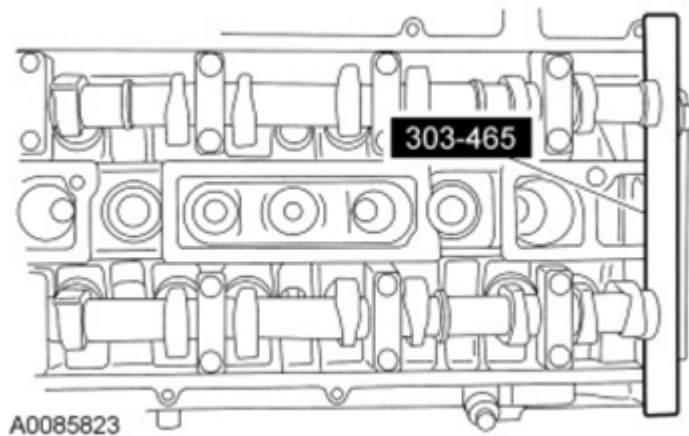


Fig. 441: View Of Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

79. Install the Crankshaft Position (CKP) sensor and the 2 bolts.
- Do not tighten the bolts at this time.

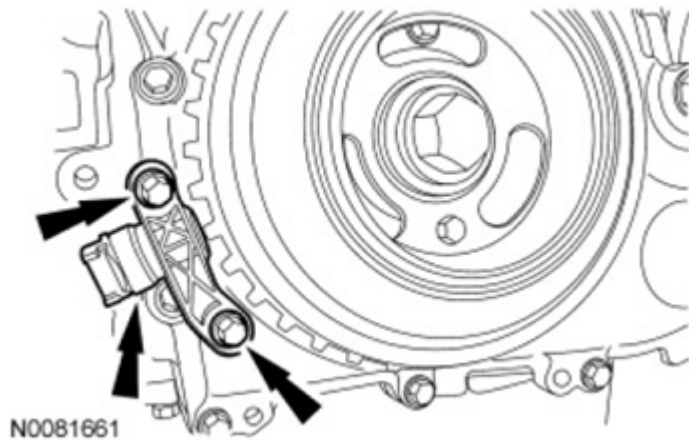


Fig. 442: Locating Crankshaft Position (CKP) Sensor And Bolts
Courtesy of FORD MOTOR CO.

80. Using the Crankshaft Sensor Aligner, adjust the **CKP** sensor.
- Tighten the 2 **CKP** sensor bolts to 7 Nm (62 lb-in).

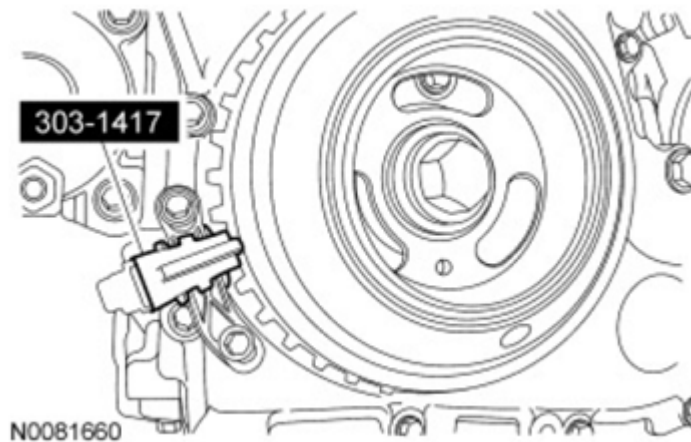


Fig. 443: Adjusting CKP Sensor Using Crankshaft Sensor Aligner
Courtesy of FORD MOTOR CO.

81. Remove the 6 mm x 18 mm bolt.

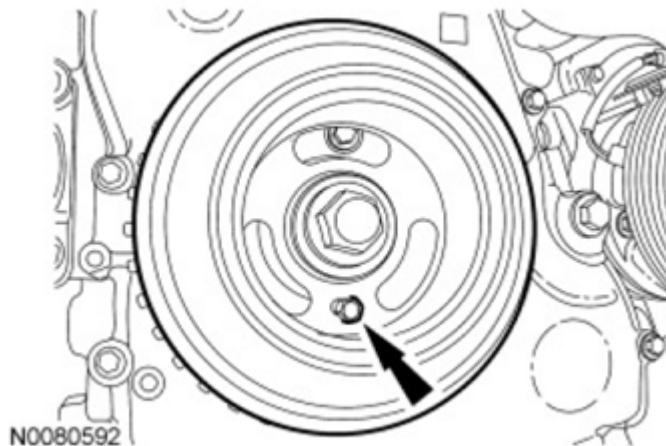


Fig. 444: View Of Crankshaft Pulley Alignment Bolt
Courtesy of FORD MOTOR CO.

82. Remove the Crankshaft TDC Timing Peg.



Fig. 445: View Of Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

83. Install the engine plug bolt.
- Tighten to 20 Nm (177 lb-in).

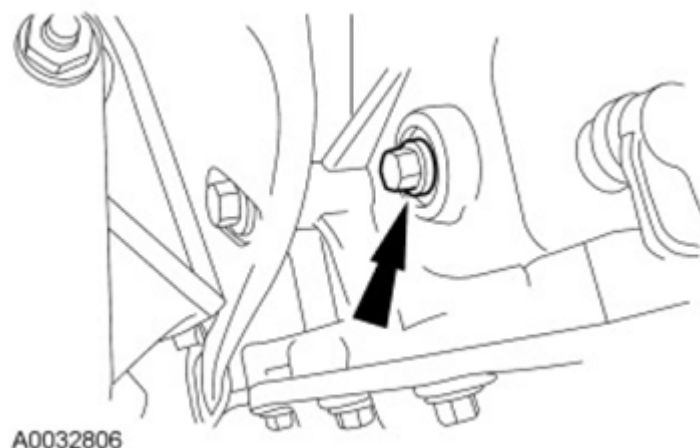
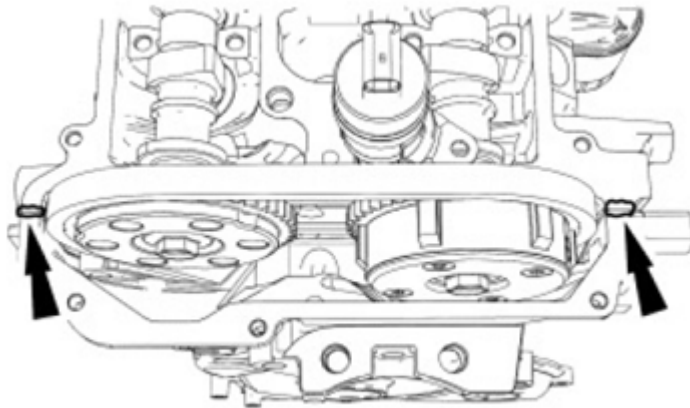


Fig. 446: Remove/Install Engine Plug Bolt
Courtesy of FORD MOTOR CO.

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

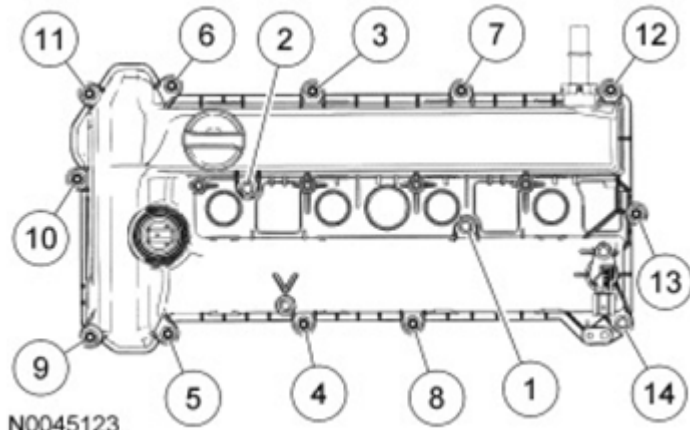
84. Clean the valve cover gasket surface with metal surface cleaner.
85. Apply silicone gasket and sealant to the locations shown in illustration.



N0045151

Fig. 447: Locating Silicone Gasket And Sealant Applying Locations
Courtesy of FORD MOTOR CO.

NOTE: The valve cover must be secured within 4 minutes of silicone gasket application. If the valve cover is not secured within 4 minutes, the sealant must be removed and the sealing area cleaned with metal surface cleaner.

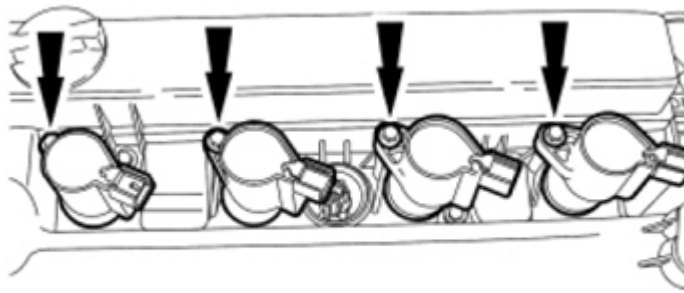


N0045123

Fig. 448: Tightening Sequence Of Valve Cover Bolts
Courtesy of FORD MOTOR CO.

86. Install the valve cover.
 - Tighten the bolts in the sequence shown in illustration to 10 Nm (89 lb-in).

NOTE: Apply dielectric compound to the inside of the coil-on-plug boots.

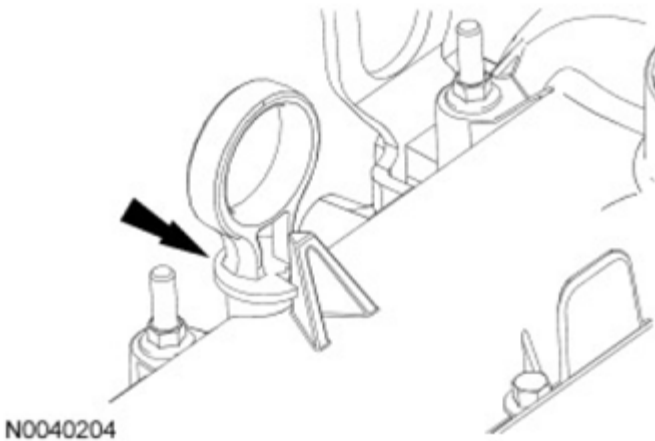


N0081185

Fig. 449: Remove/Install Coil-On-Plug Bolts
Courtesy of FORD MOTOR CO.

87. Install the 4 coil-on-plugs and the 4 bolts.
 - Tighten to 8 Nm (71 lb-in).

NOTE: Make sure the notch on the oil level indicator is aligned with the V-shaped boss on the valve cover and fully engaged into the valve cover.



N0040204

Fig. 450: Locating Oil Level Indicator
Courtesy of FORD MOTOR CO.

88. Install the oil level indicator.
89. If equipped, install the block heater.
 - Tighten to 40 Nm (30 lb-ft).

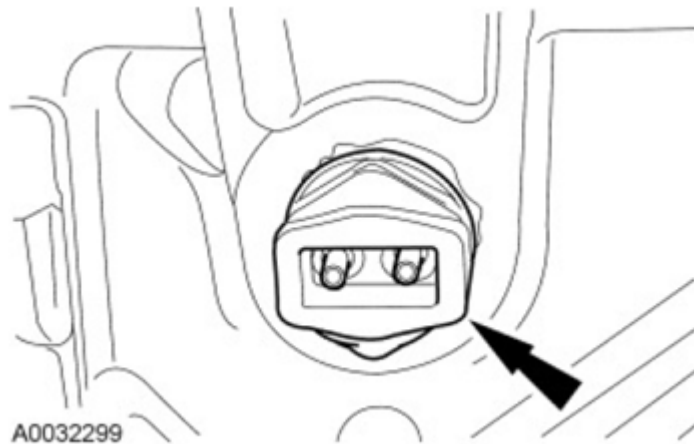


Fig. 451: View Of Block Heater
Courtesy of FORD MOTOR CO.

90. Install the crankcase vent oil separator and the 8 bolts.
 - Tighten to 10 Nm (89 lb-in).

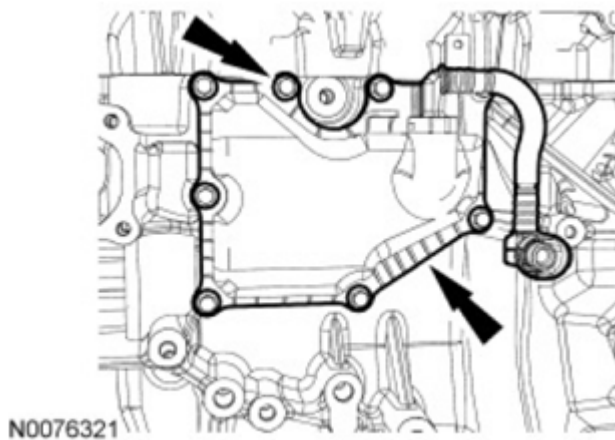


Fig. 452: Remove/Install Crankcase Vent Oil Separator Bolts
Courtesy of FORD MOTOR CO.

NOTE: The Knock Sensor (KS) must not touch the crankcase vent oil separator.

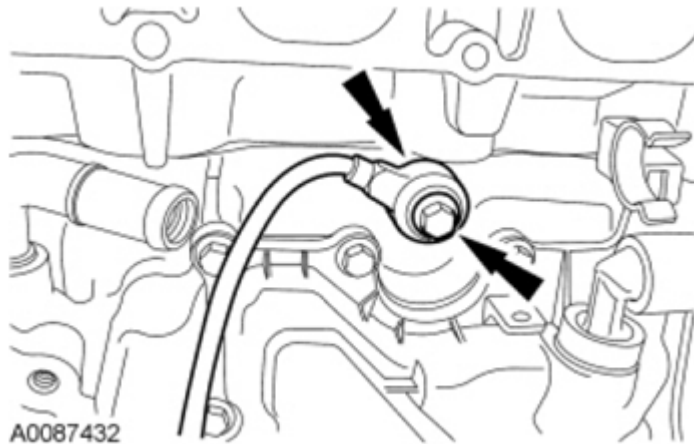


Fig. 453: Remove/Install KS With Bolt
Courtesy of FORD MOTOR CO.

91. Install the **KS** and the bolt.
 - Tighten to 20 Nm (177 lb-in).
92. Install the 2 coolant hoses.

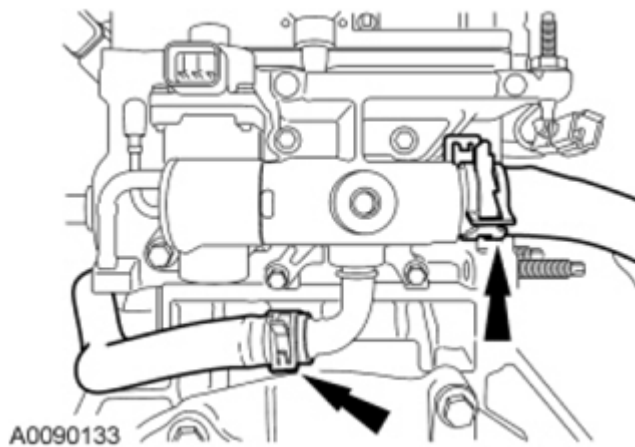


Fig. 454: Locating Coolant Hoses
Courtesy of FORD MOTOR CO.

93. Install the coolant hose.

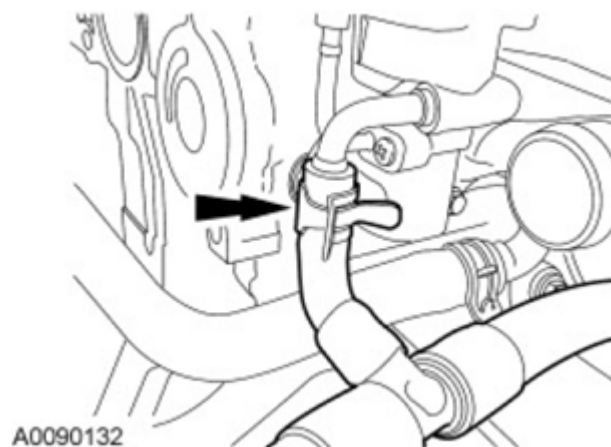


Fig. 455: Locating Coolant Hose
Courtesy of FORD MOTOR CO.

94. Install the coolant hose.

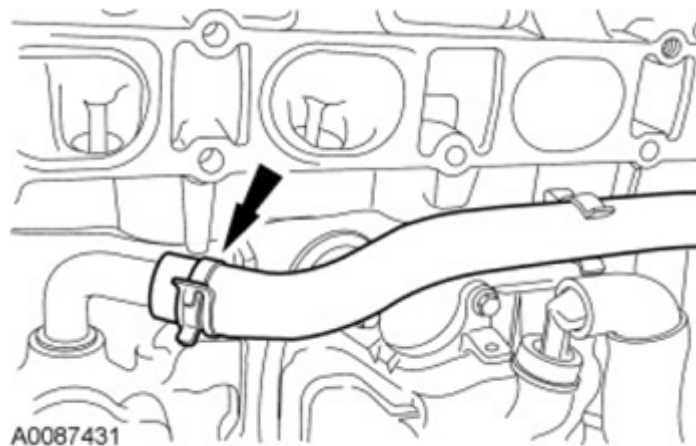


Fig. 456: Locating Coolant Hose
Courtesy of FORD MOTOR CO.

95. Install the EGR tube.
- Tighten to 55 Nm (41 lb-ft).

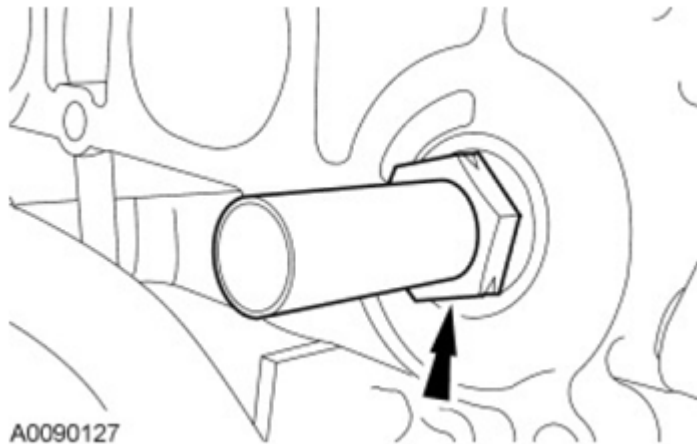


Fig. 457: View Of EGR Tube

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.

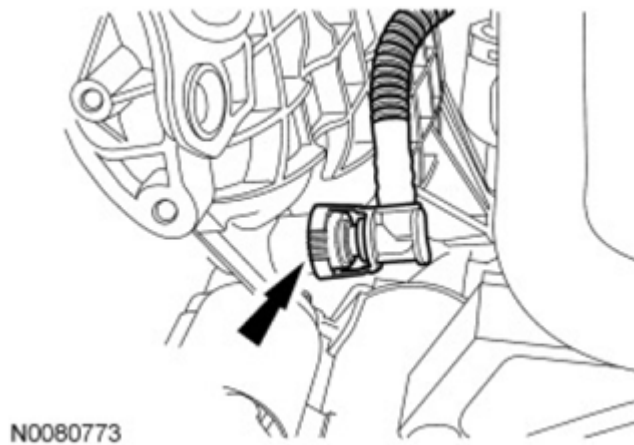


Fig. 458: Locating Crankcase Vent Oil Separator Tube Tab

Courtesy of FORD MOTOR CO.

96. Position the intake manifold and connect the crankcase vent oil separator tube.

NOTE: Inspect and install new intake manifold gaskets, if necessary.

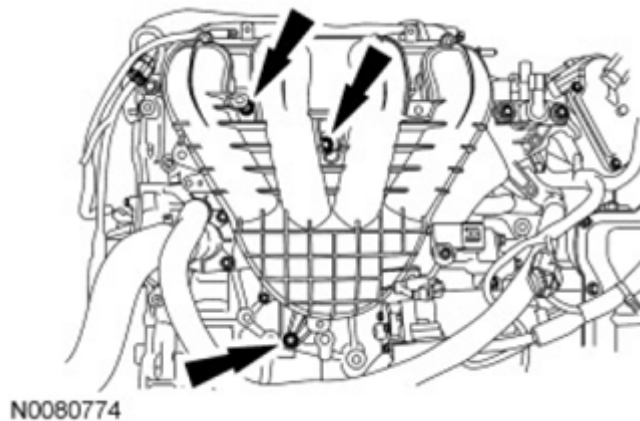


Fig. 459: Remove/Install Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

97. Install the intake manifold gaskets, intake manifold and the 8 bolts.
 - Tighten to 18 Nm (159 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.

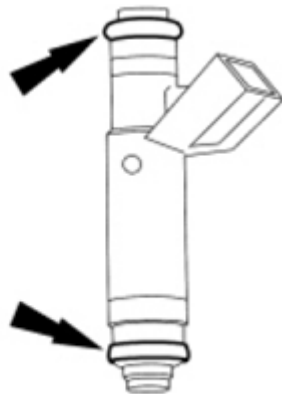


Fig. 460: Identifying Fuel Injector O-Rings
Courtesy of FORD MOTOR CO.

98. Install new fuel injector O-rings.
 - Separate the fuel injectors from the fuel rail.
 - Remove and discard the fuel injector O-rings.
 - Install new O-rings and lubricate with clean engine oil.
 - Install the fuel injectors onto the fuel rail.
99. Install the fuel rail with the fuel injectors as an assembly and the 2 stud bolts.

- Tighten to 23 Nm (17 lb-ft).

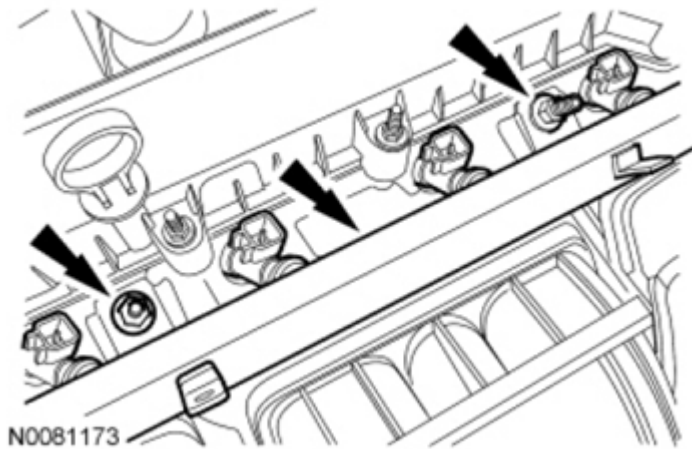


Fig. 461: Locating Fuel Injector Assembly
Courtesy of FORD MOTOR CO.

100. Install the radio capacitor and nut.
 - Tighten to 10 Nm (89 lb-in).

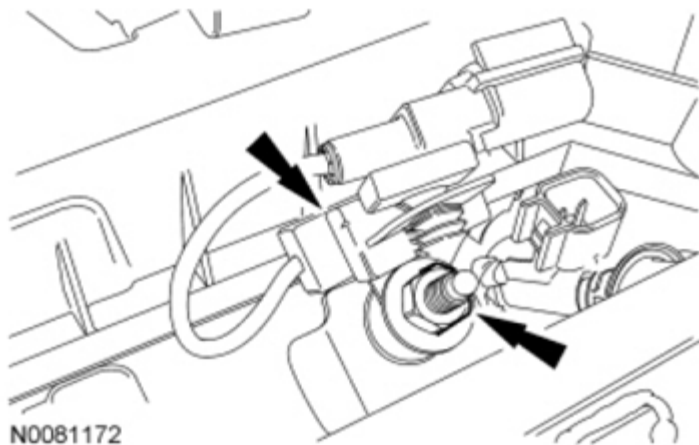


Fig. 462: Remove/Install Radio Capacitor And Nut
Courtesy of FORD MOTOR CO.

101. Install the fuel rail insulator.

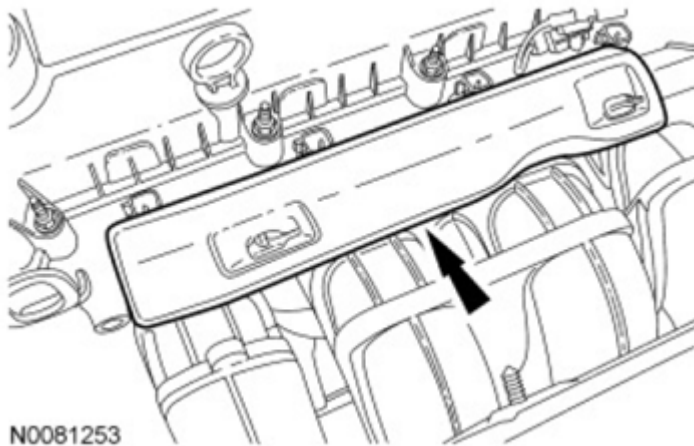


Fig. 463: Locating Fuel Rail Insulator
Courtesy of FORD MOTOR CO.

102. Connect the 4 fuel injector electrical connectors. Attach the 2 wiring harness retainers.

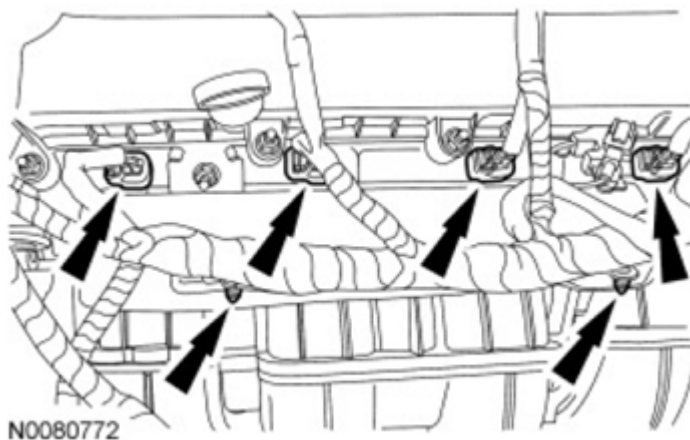


Fig. 464: Locating Fuel Injector Electrical Connectors And Retainers
Courtesy of FORD MOTOR CO.

103. Connect the radio capacitor electrical connector.



Fig. 465: Locating Radio Capacitor Electrical Connector
Courtesy of FORD MOTOR CO.

104. Position the engine control wiring harness on the engine and connect the **CHT** sensor and install the rubber boot.

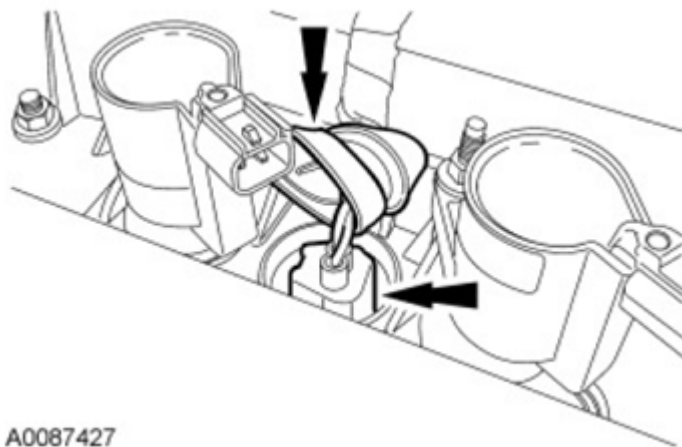


Fig. 466: Locating Cylinder Head Temperature Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

105. Connect the 4 coil-on-plugs and Camshaft Position (CMP) sensor electrical connectors.

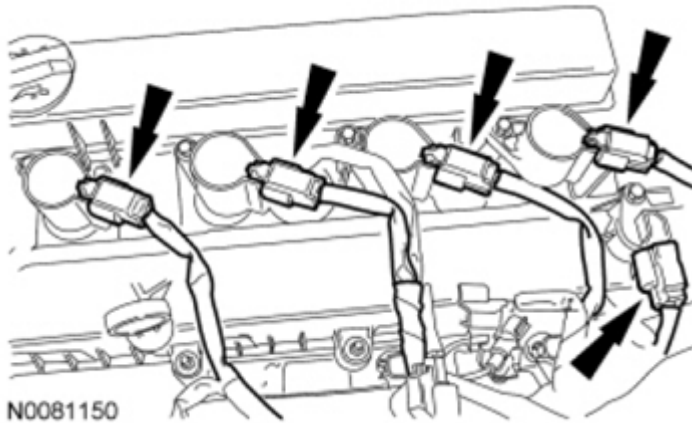


Fig. 467: View Of Coil-On-Plugs And Camshaft Position Sensor Electrical Connectors
Courtesy of FORD MOTOR CO.

106. Attach all wiring harness retainers to the intake manifold.
107. Connect the **KS** and attach the 2 wiring harness retainers.

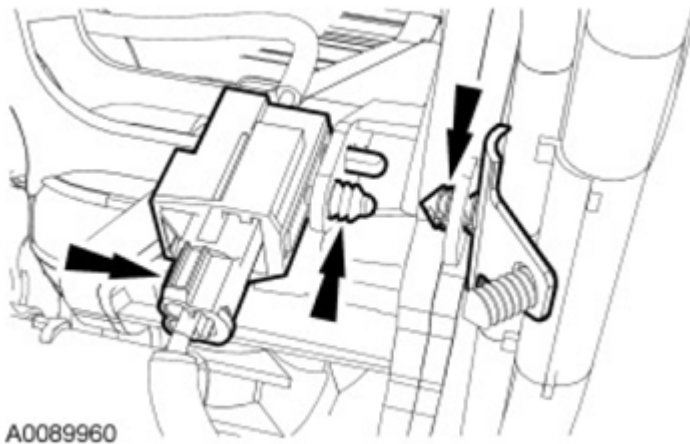


Fig. 468: Locating Knock Sensor And Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

108. Connect the EGR valve electrical connector.

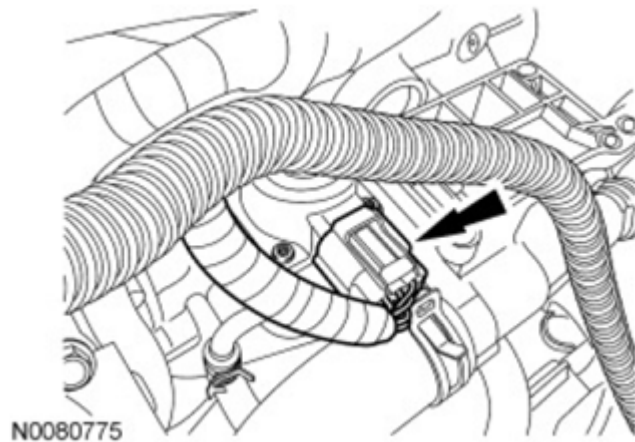


Fig. 469: Locating EGR Valve Electrical Connector
Courtesy of FORD MOTOR CO.

109. Connect the electronic throttle control and Evaporative Emission (EVAP) canister purge valve electrical connectors.

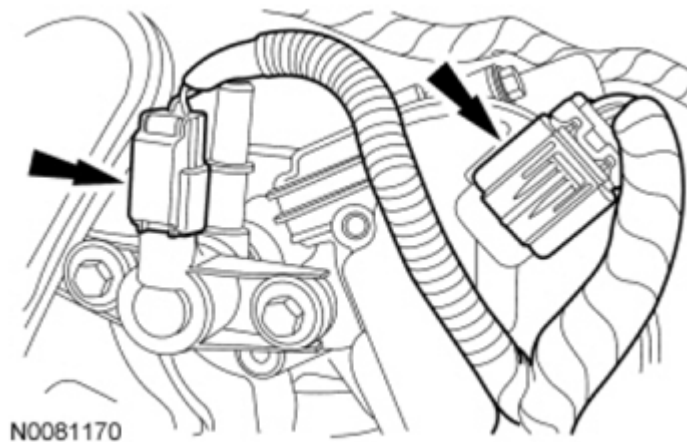


Fig. 470: Locating Evaporative Emission (EVAP) Canister Purge Valve Electrical Connectors
Courtesy of FORD MOTOR CO.

110. Connect the Manifold Absolute Pressure (MAP) sensor electrical connector.

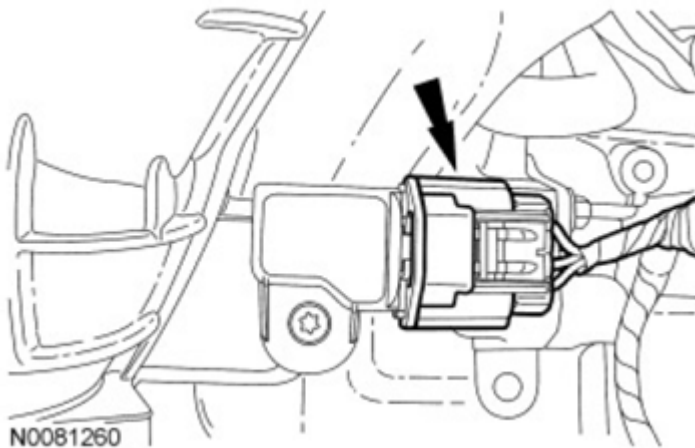


Fig. 471: Locating Manifold Absolute Pressure (MAP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

111. Attach the wiring harness retainers to the LH side valve cover stud bolts.

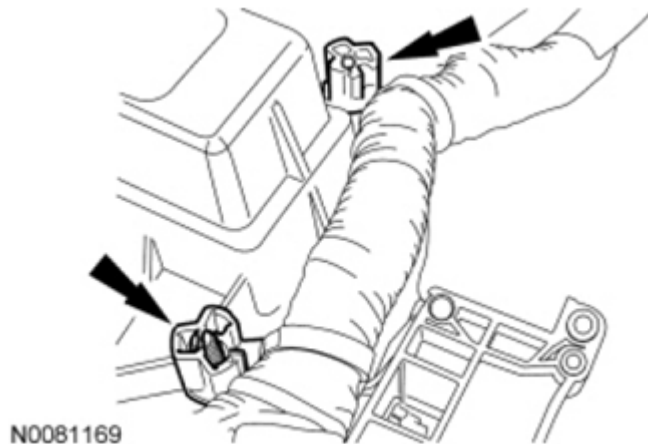


Fig. 472: Locating Wiring Harness Retainers Of LH Side Valve Cover Stud Bolts
Courtesy of FORD MOTOR CO.

112. Connect the crankcase vent hose to the valve cover.

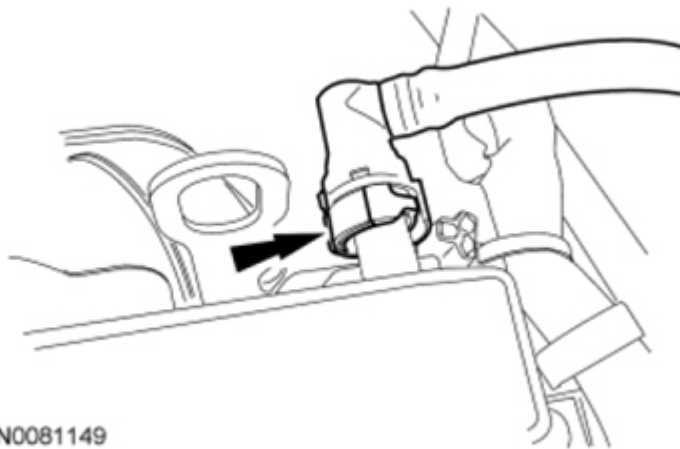


Fig. 473: Locating Crankcase Vent Hose Of Valve Cover
Courtesy of FORD MOTOR CO.

113. Attach the wiring harness retainers to the RH side valve cover stud bolts.

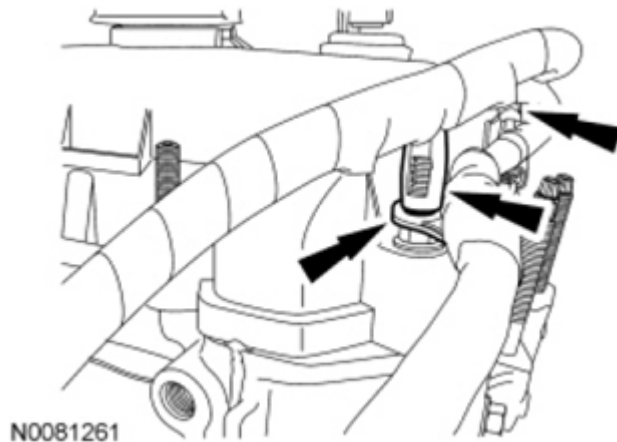


Fig. 474: Locating Wiring Harness Retainers Of RH Side Valve Cover Stud Bolt
Courtesy of FORD MOTOR CO.

114. Connect the VCT electrical connector.

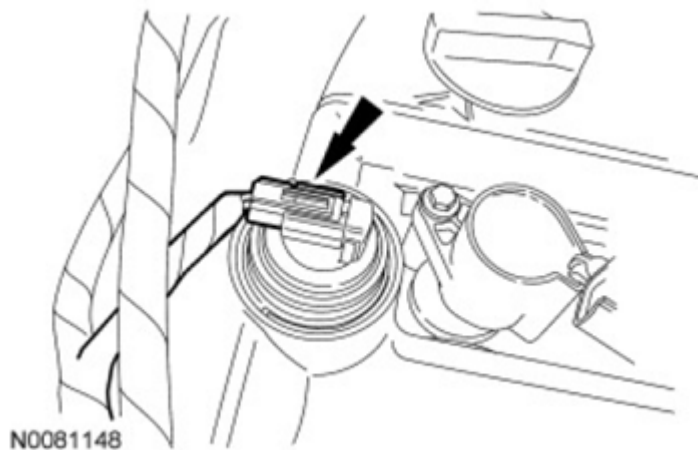


Fig. 475: Locating Variable Camshaft Timing (VCT) Electrical Connector
Courtesy of FORD MOTOR CO.

115. If removed, install the capacitor and bolt.
- Tighten to 20 Nm (177 lb-in).

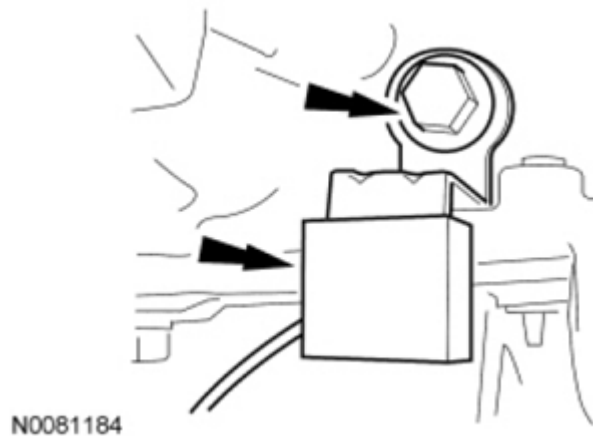


Fig. 476: Locating Capacitor And Bolt
Courtesy of FORD MOTOR CO.

NOTE: Clean the gasket mating surfaces with metal surface prep.

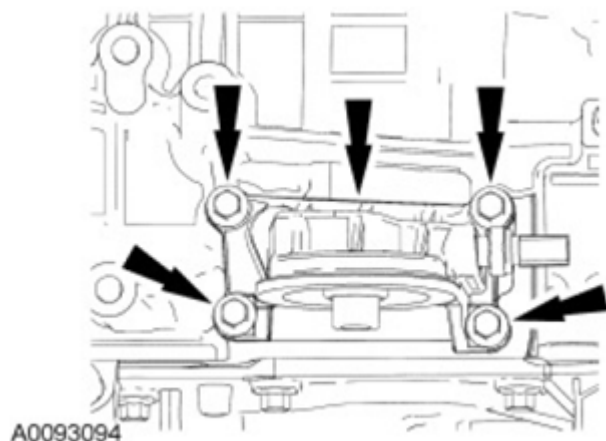


Fig. 477: Locating Oil Filter Adapter Bolts
Courtesy of FORD MOTOR CO.

116. Install the oil filter adapter with a new gasket.
 - Tighten to 25 Nm (18 lb-ft).
117. Connect the Engine Oil Pressure (EOP) switch electrical connector.

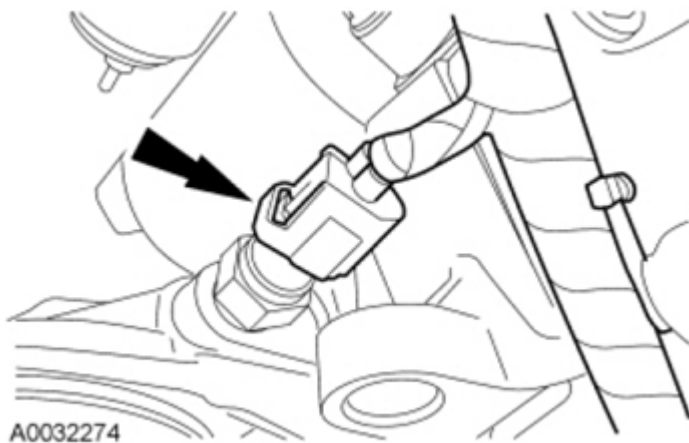


Fig. 478: Locating Engine Oil Pressure Switch Electrical Connector
Courtesy of FORD MOTOR CO.

118. Install the coolant tube retainer to the intake manifold.

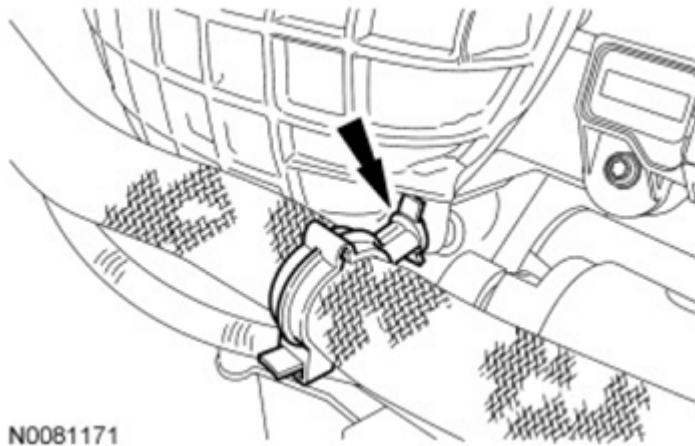


Fig. 479: Locating Coolant Tube Retainer Of Intake Manifold
Courtesy of FORD MOTOR CO.

NOTE: Clean and inspect the thermostat housing gasket. Install a new gasket, if necessary.

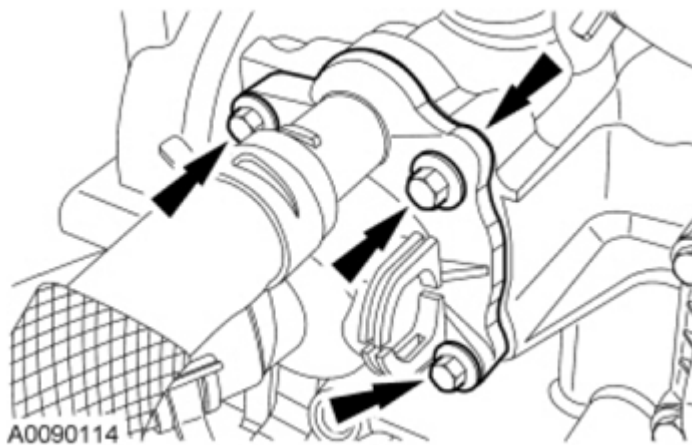


Fig. 480: Locating Thermostat Housing And Bolts
Courtesy of FORD MOTOR CO.

119. Install the thermostat housing and bolts.
 - Tighten to 10 Nm (89 lb-in).

NOTE: Clean the coolant pump mating surface with metal surface prep.

NOTE: Lubricate the coolant pump O-ring with clean engine coolant.

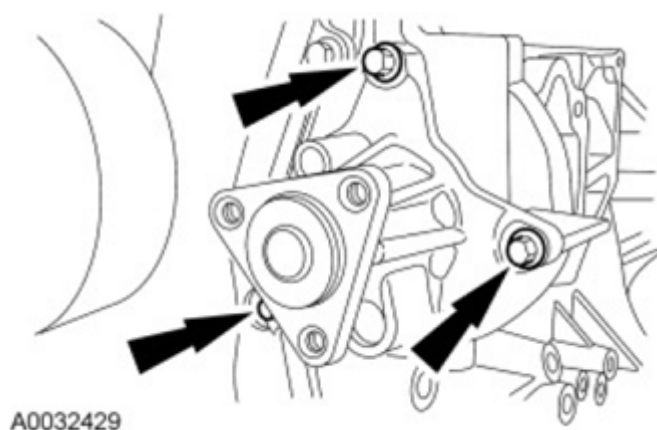


Fig. 481: Locating Coolant Pump Bolts
Courtesy of FORD MOTOR CO.

120. Install the coolant pump and bolts.
 - Tighten to 10 Nm (89 lb-in).
121. Install the 3 coolant pump pulley and bolts.
 - Tighten to 20 Nm (177 lb-in).

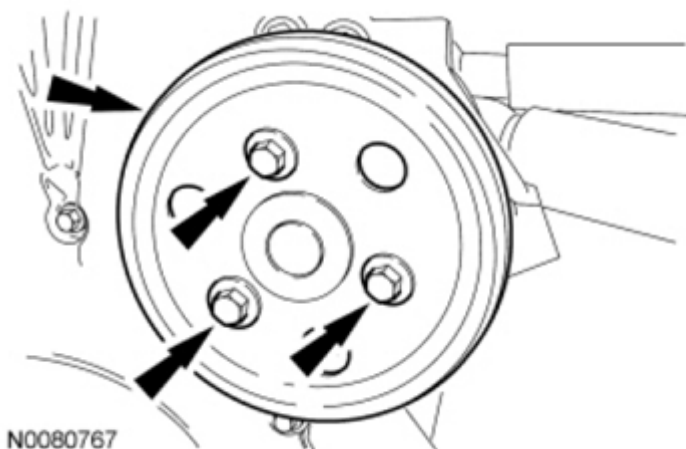


Fig. 482: Locating Coolant Pump Pulley And Bolts
Courtesy of FORD MOTOR CO.

122. Install the accessory drive belt idler pulley and bracket and the 2 bolts.
 - Tighten to 25 Nm (18 lb-ft).

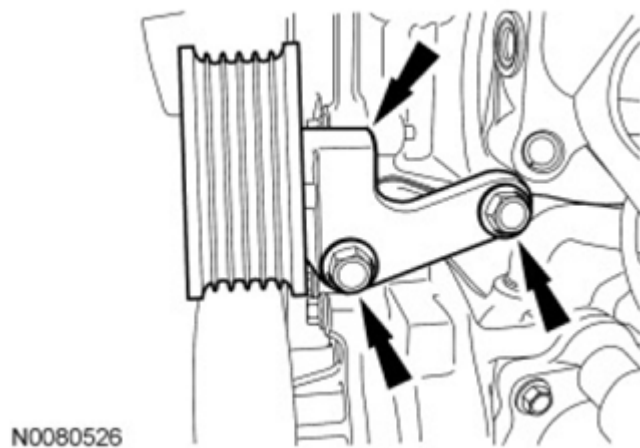


Fig. 483: Locating Accessory Drive Belt Idler Pulley And Bracket Bolts
Courtesy of FORD MOTOR CO.

123. Install the accessory drive belt idler pulley.
 - Tighten to 25 Nm (18 lb-ft).

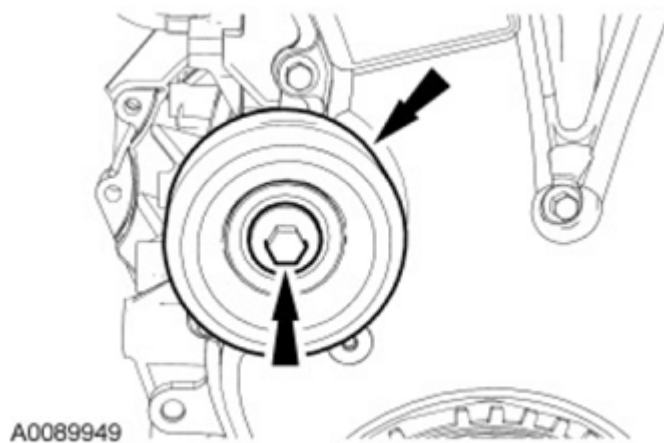


Fig. 484: Locating Accessory Drive Belt Idler Pulley And Bolt
Courtesy of FORD MOTOR CO.

124. Install the accessory drive belt tensioner and the 2 bolts.
 - Tighten to 25 Nm (18 lb-ft).

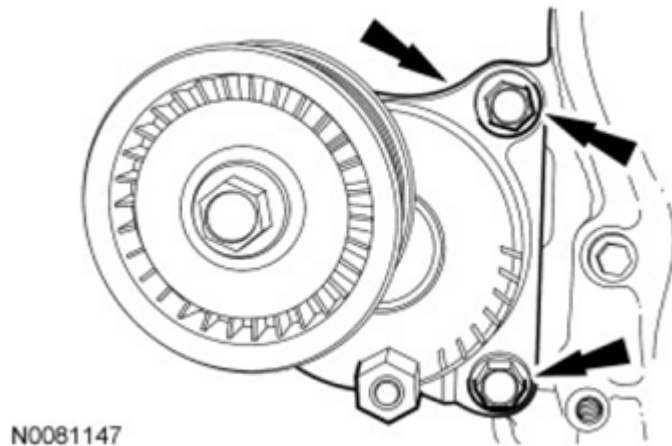


Fig. 485: Locating Accessory Drive Belt Tensioner And Bolts
Courtesy of FORD MOTOR CO.

125. Install 7 new exhaust manifold studs in the cylinder head.
 - Tighten to 17 Nm (150 lb-in).

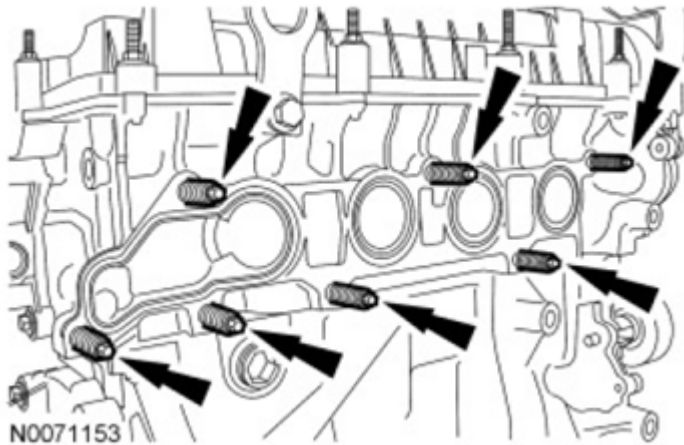


Fig. 486: View Of Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

126. Install the new exhaust manifold gasket on the engine.

NOTE: Failure to tighten the exhaust manifold nuts to specification a second time will cause the exhaust manifold to develop an exhaust leak.

NOTE: Make sure to tighten the nuts in the sequence shown in illustration in 2 stages.

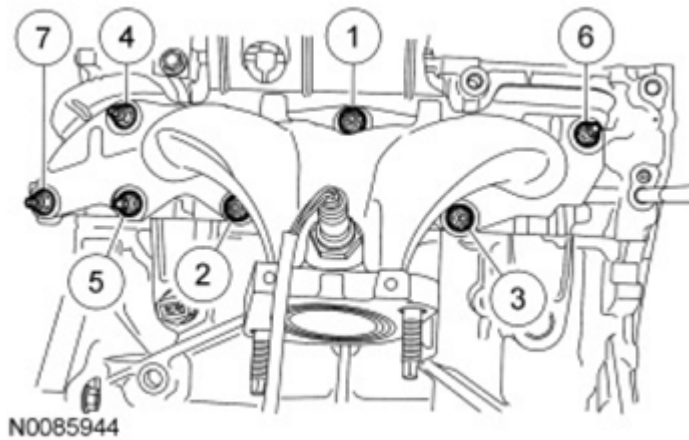


Fig. 487: Tightening Sequence Of Exhaust Manifold Gasket Nuts
Courtesy of FORD MOTOR CO.

127. Position the exhaust manifold and tighten the 7 new exhaust manifold nuts in the sequence shown in illustration in 2 stages:
 - Stage 1: Tighten to 48 Nm (35 lb-ft).
 - Stage 2: Tighten to 48 Nm (35 lb-ft).
128. Install the exhaust manifold heat shield and the 4 bolts.
 - Tighten to 10 Nm (89 lb-in).

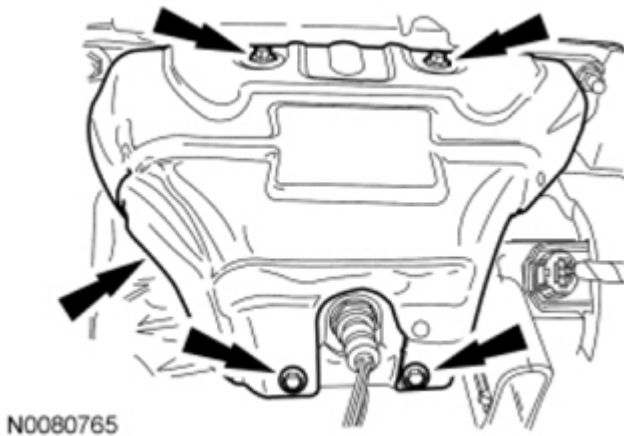


Fig. 488: Locating Exhaust Manifold Heat Shield With Bolts
Courtesy of FORD MOTOR CO.

129. Connect the Heated Oxygen Sensor (HO2S) electrical connector.

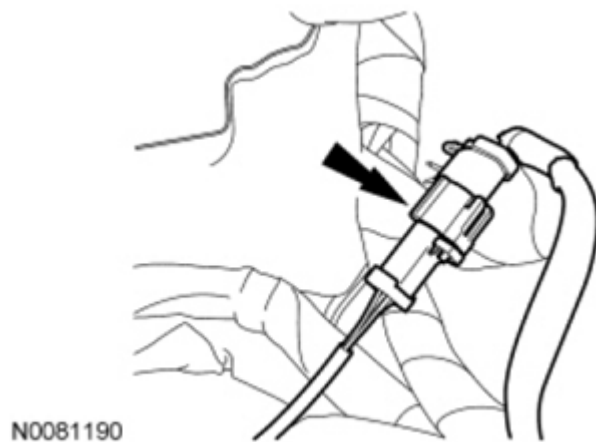


Fig. 489: Locating Heated Oxygen Sensor (HO2S) Electrical Connector
Courtesy of FORD MOTOR CO.

130. Install the generator, 2 nuts and 1 bolt.
- Tighten to 47 Nm (35 lb-ft).



Fig. 490: Locating Generator With Fasteners
Courtesy of FORD MOTOR CO.

131. Connect the generator electrical connection and install the nut.
- Tighten to 6 Nm (53 lb-in).



Fig. 491: Locating Generator Wiring Harness And Nut
Courtesy of FORD MOTOR CO.

132. Connect the generator electrical connection and attach the 2 wiring harness retainers.

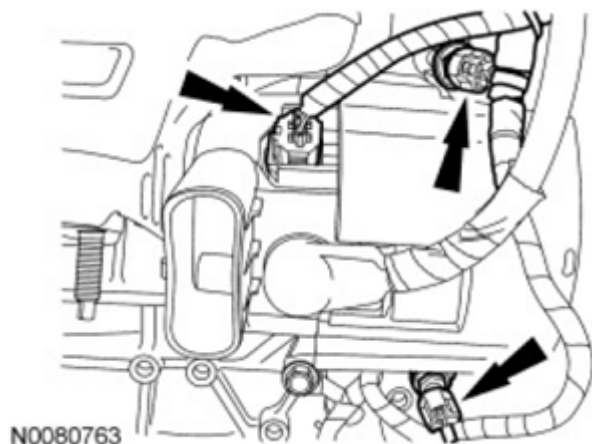


Fig. 492: Locating Generator Electrical Connection And Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

133. Connect the **CKP** sensor electrical connector.
- Attach the wiring harness-to-engine retainer.

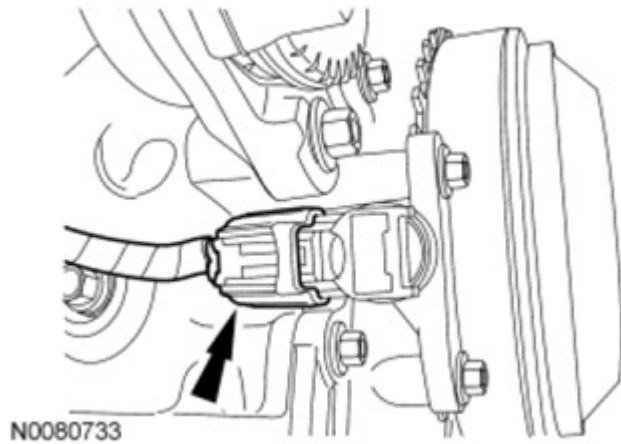


Fig. 493: Locating CKP Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

134. Using the Floor Crane and Spreader Bar, remove the engine from the engine stand.

Vehicles with automatic transaxle

135. Install the flexplate and the bolts. Tighten the bolts in the sequence shown in illustration in 3 stages:
- Stage 1: Tighten to 50 Nm (37 lb-ft).
 - Stage 2: Tighten to 80 Nm (59 lb-ft).
 - Stage 3: Tighten to 112 Nm (83 lb-ft).

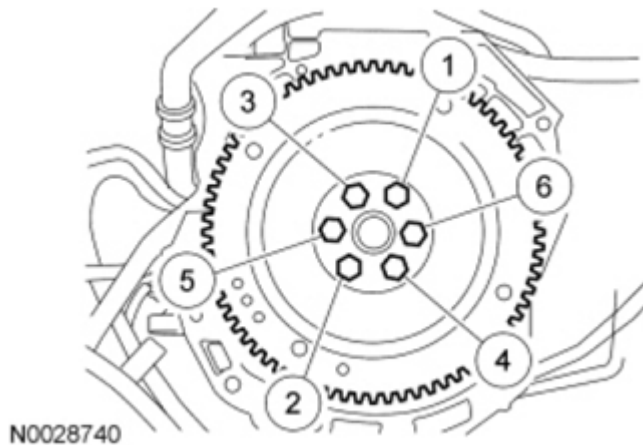


Fig. 494: Tightening Sequence Of Flexplate Bolts
Courtesy of FORD MOTOR CO.

Vehicles with manual transaxle

136. Install the flywheel and the bolts. Tighten the bolts in the sequence shown in illustration in 3 stages:
- Stage 1: Tighten to 50 Nm (37 lb-ft).

- Stage 2: Tighten to 80 Nm (59 lb-ft).
- Stage 3: Tighten to 112 Nm (83 lb-ft).

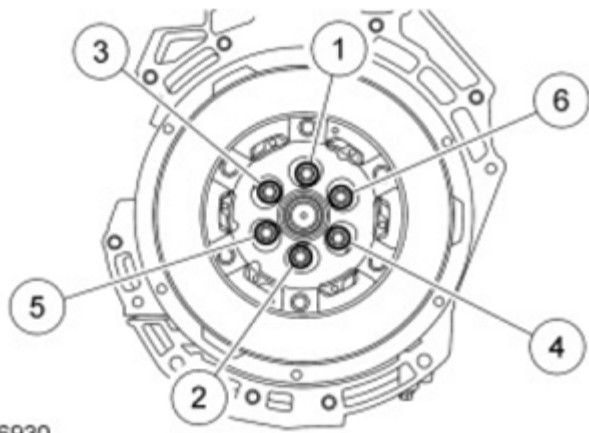


Fig. 495: Tightening Sequence Of Flywheel Bolts
Courtesy of FORD MOTOR CO.

137. Lubricate the transaxle input shaft pilot bearing with front axle grease.

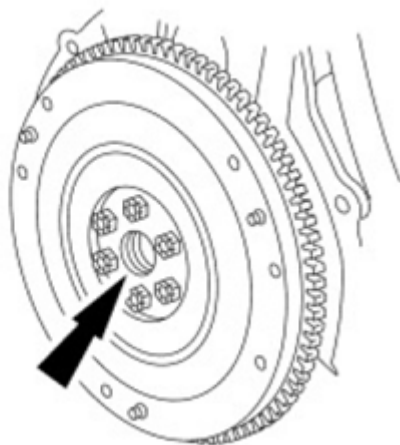
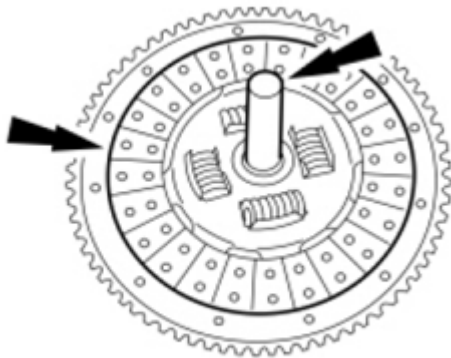


Fig. 496: Locating Transaxle Input Shaft Pilot Bearing
Courtesy of FORD MOTOR CO.

NOTE: Use a clutch disc aligner (such as OTC® Clutch Alignment Tool Set 4528 or equivalent).



N0109831

Fig. 497: Positioning Clutch Disc On Flywheel
Courtesy of FORD MOTOR CO.

138. Using a suitable clutch disc aligner, position the clutch disc on the flywheel.

NOTE: If reusing the clutch pressure plate and flywheel, align the marks made during removal.

139. Position the clutch pressure plate and install the bolts.

- Tighten to 29 Nm (21 lb-ft) in a star pattern sequence.

INSTALLATION

ENGINE - AUTOMATIC TRANSAXLE

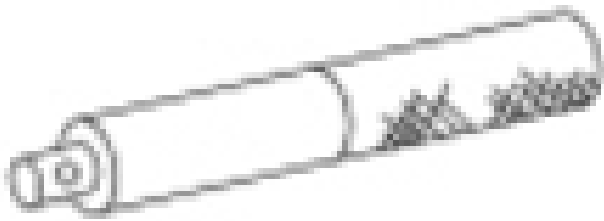
Special Tool(s)

SPECIAL TOOLS DESCRIPTION

	Handle 205-153 (T80T-4000-W)
--	---------------------------------

2011 Mercury Mariner

2011 ENGINE Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)



ST1653-A



ST1341-A

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

Installer, PTO Driven Gear Oil Seal
308-429

2011 Mercury Mariner

2011 ENGINE Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)



ST2570-A



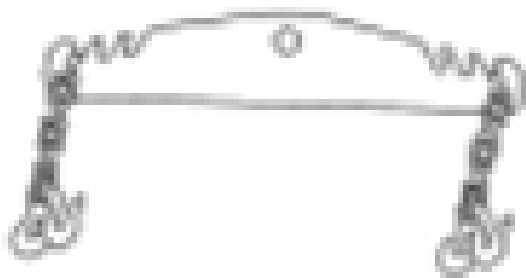
ST1293-A

Powertrain Lift
014-00765 or equivalent

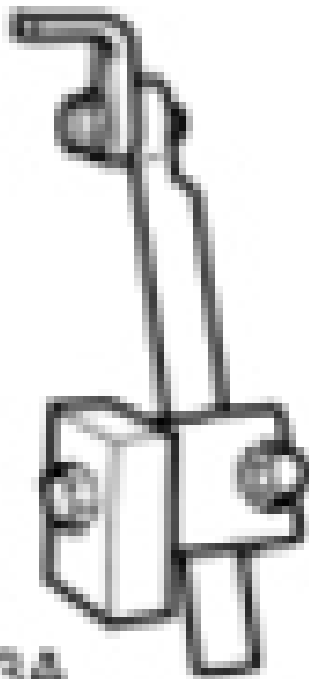
Spreader Bar
303-D089 (D93P-6001-A3) or equivalent

2011 Mercury Mariner

2011 ENGINE Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)



ST1602-A



ST2743A

Adjustable Grip Arm, 1735A
014-00001 or equivalent

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



ST2834-A

Material**MATERIAL SPECIFICATIONS**

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

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

- Using the Floor Crane and Spreader Bar, position the engine and transaxle together. Install the 6 transaxle-to-engine bolts.
 - Tighten to 48 Nm (35 lb-ft).

NOTE: Only rotate the engine in a clockwise direction only or engine damage will occur.

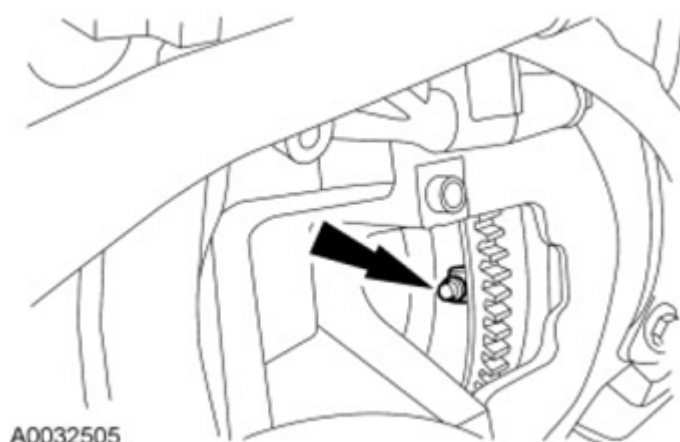


Fig. 498: Locating Torque Converter Nut
Courtesy of FORD MOTOR CO.

2. Install the 4 new torque converter nuts.
 - Tighten to 35 Nm (26 lb-ft).
3. Using the Powertrain Lift and Adjustable Grip Arm, position the engine and transaxle onto the Powertrain Lift.

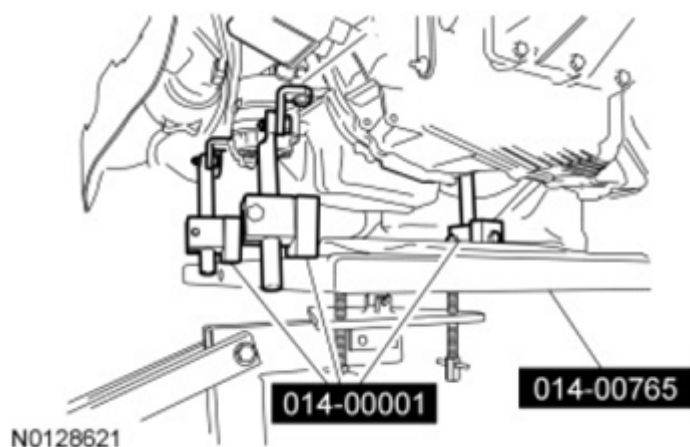


Fig. 499: Securing Engine And Transaxle Onto Powertrain Lift
Courtesy of FORD MOTOR CO.

All-Wheel Drive (AWD) vehicles

4. Using the Handle and PTO Driven Gear Oil Seal Installer, install the intermediate shaft seal.

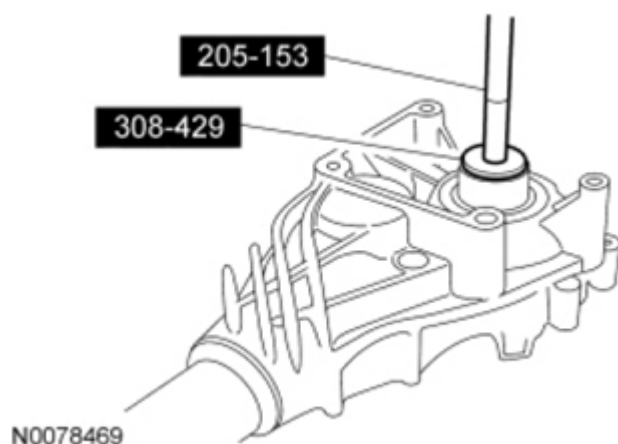


Fig. 500: Installing Intermediate Shaft Seal
Courtesy of FORD MOTOR CO.

5. Install the Power Transfer Unit (PTU) heat shield and the 3 bolts.
 - Tighten to 11 Nm (97 lb-in).

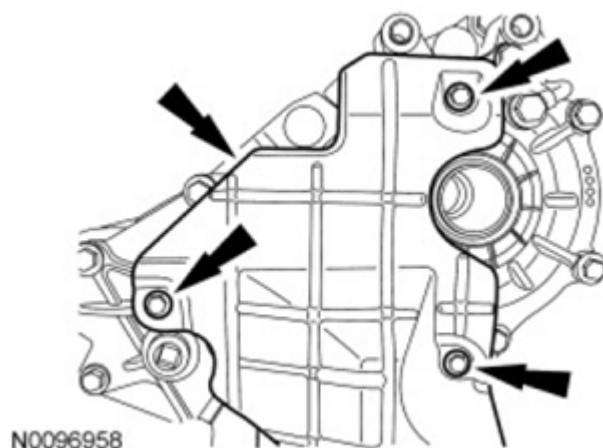


Fig. 501: Locating PTU Heat Shield Bolts
Courtesy of FORD MOTOR CO.

6. Install the PTU and the 3 RH PTU bolts.
 - Tighten to 70 Nm (52 lb-ft).

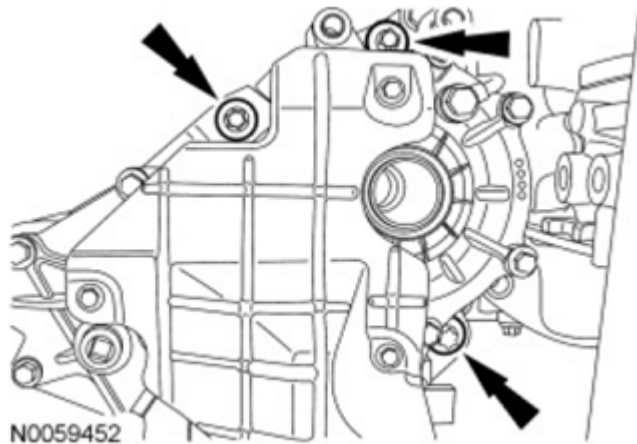


Fig. 502: Locating PTU And RH PTU Bolts
Courtesy of FORD MOTOR CO.

7. Install the LH lower **PTU** bolt.
 - Tighten to 48 Nm (35 lb-ft).

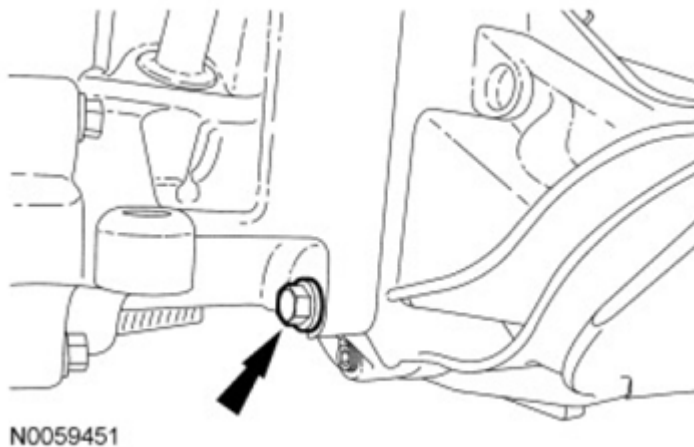


Fig. 503: Locating LH Lower PTU Bolt
Courtesy of FORD MOTOR CO.

8. Attach the **PTU** vent hose.

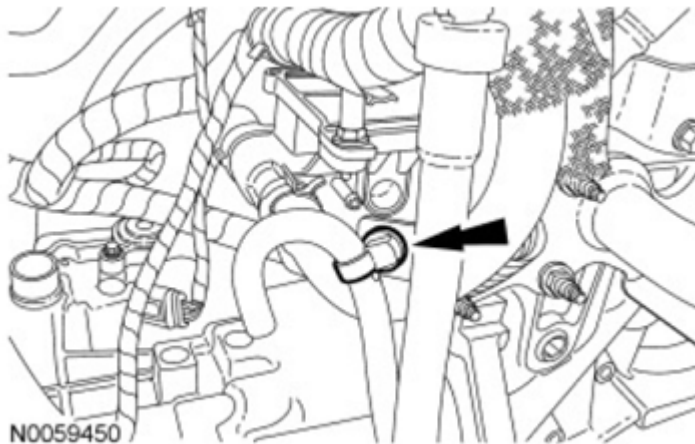


Fig. 504: Locating PTU Vent Hose Retainer
Courtesy of FORD MOTOR CO.

All vehicles

9. Install the starter motor isolator.

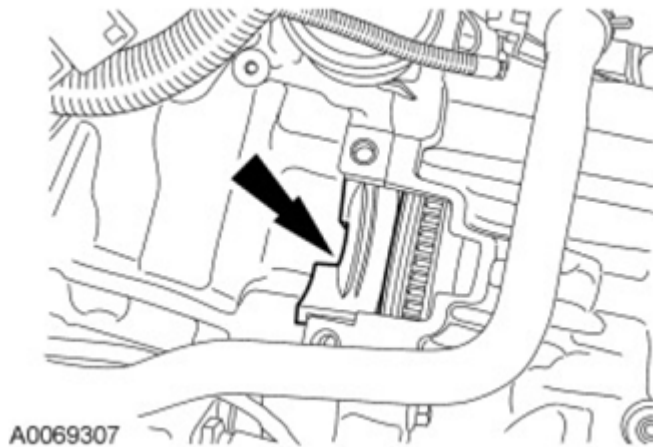


Fig. 505: Locating Starter Motor Isolator
Courtesy of FORD MOTOR CO.

10. Install the starter motor and the 2 stud bolts.
 - Tighten to 35 Nm (26 lb-ft).

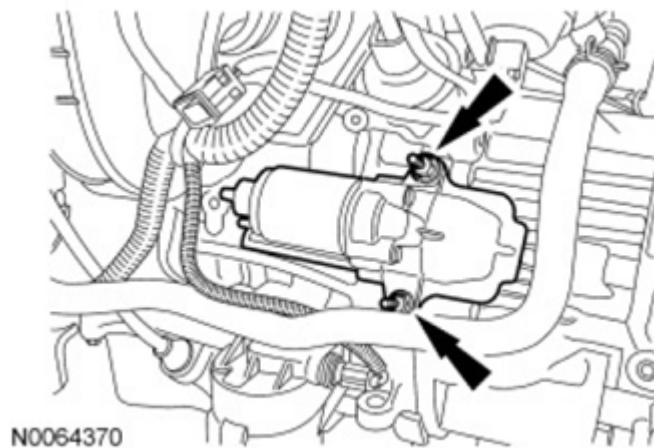


Fig. 506: Locating Starter Motor Stud Bolts
Courtesy of FORD MOTOR CO.

11. Install the ground wire and the nut.
 - Tighten to 25 Nm (18 lb-ft).

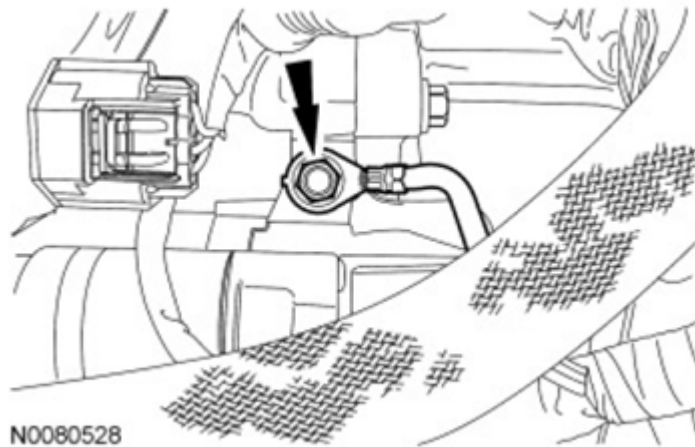


Fig. 507: Locating Ground Wire Nut
Courtesy of FORD MOTOR CO.

12. Install the starter motor harness connectors.
 1. Install the starter motor solenoid battery nut.
 - Tighten to 12 Nm (106 lb-in).
 2. Install the starter motor solenoid nut.
 - Tighten to 5 Nm (44 lb-in).

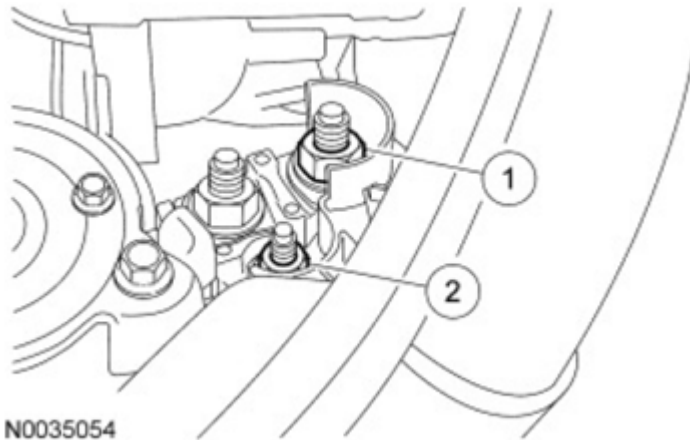


Fig. 508: Identifying Battery Cable And Starter Solenoid Terminal Nuts
Courtesy of FORD MOTOR CO.

13. Raise the engine and transaxle into the vehicle.
14. Install the bolt in the LH transaxle mount.
 - Tighten to 103 Nm (76 lb-ft).

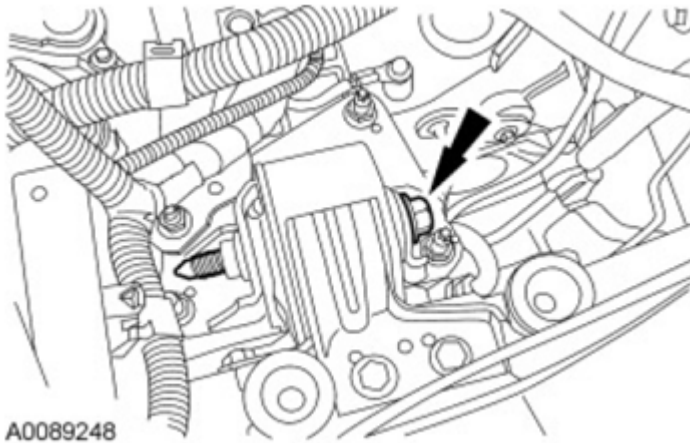


Fig. 509: Locating LH Transaxle Mount Bolt
Courtesy of FORD MOTOR CO.

NOTE: Late build AWD vehicle equipped with a mass damper shown in illustration, other vehicles similar.

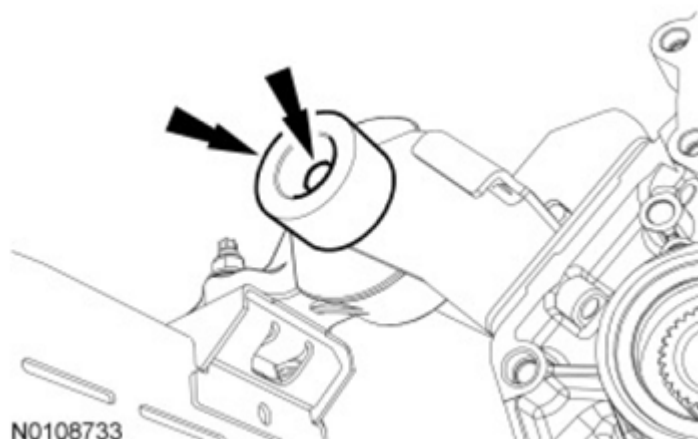


Fig. 510: View Of Transaxle Rear Mount Bolt
Courtesy of FORD MOTOR CO.

15. Install the bolt in the rear transaxle mount and mass damper (if equipped).
 - Tighten to 115 Nm (85 lb-ft).
16. Install the engine mount bracket and nuts.
 - Tighten to 115 Nm (85 lb-ft).

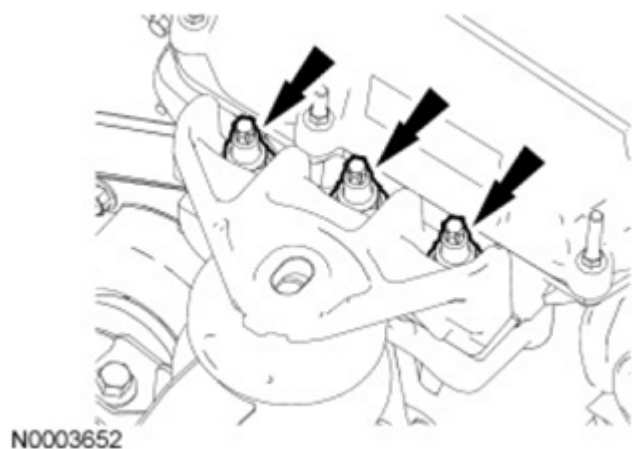


Fig. 511: Locating Engine Mount Bracket Nuts
Courtesy of FORD MOTOR CO.

17. Install the engine mount bracket bolt.
 - Tighten to 115 Nm (85 lb-ft).

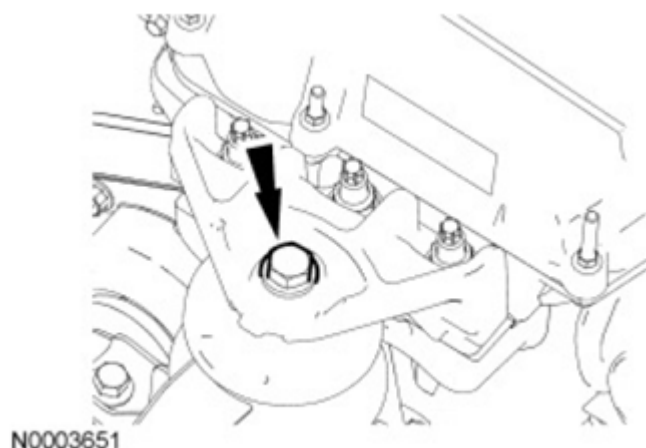


Fig. 512: Locating Engine Mount Bracket Bolt
Courtesy of FORD MOTOR CO.

18. Install a new spin-on engine oil filter.
 - Lubricate the spin-on oil filter gasket with clean engine oil and tighten the oil filter three-fourths turn after the oil filter gasket makes contact with the oil filter adapter.

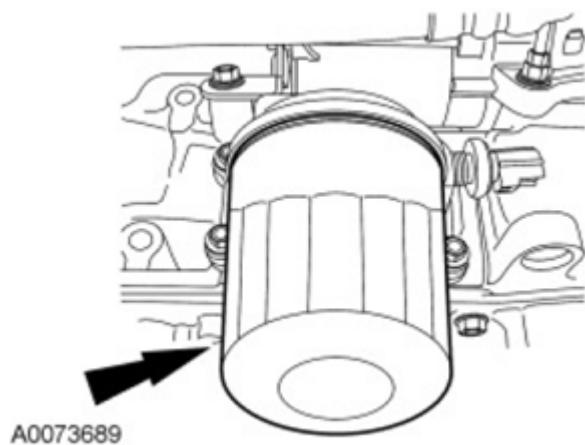


Fig. 513: Locating Engine Oil Filter
Courtesy of FORD MOTOR CO.

AWD vehicles

19. Install the **PTU** bracket and the 2 **PTU** bracket-to-**PTU** bolts.
 - Tighten to 45 Nm (33 lb-ft).

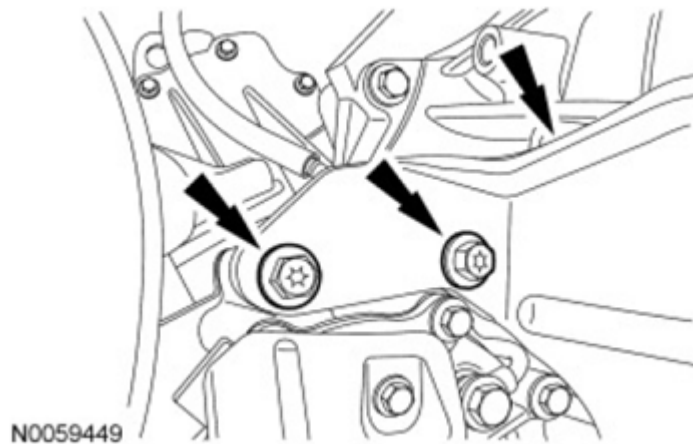


Fig. 514: Locating PTU Bracket-To-PTU Bolts And Bracket
Courtesy of FORD MOTOR CO.

20. Install the **PTU** bracket-to-engine bolt.
 - Tighten to 40 Nm (30 lb-ft).

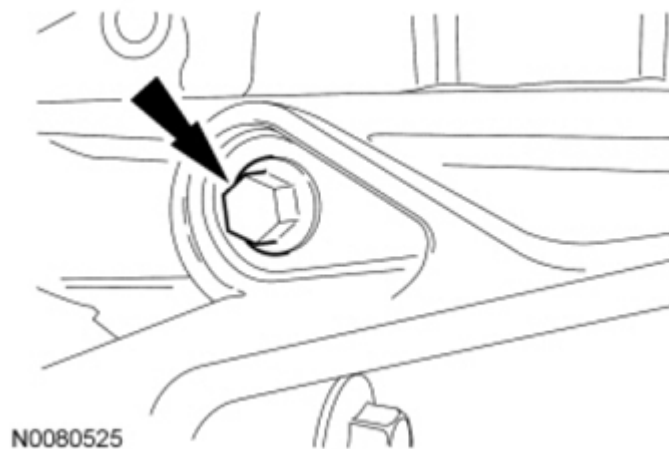


Fig. 515: Locating PTU Bracket-To-Engine Bolt
Courtesy of FORD MOTOR CO.

21. Install the 4 **PTU** bracket-to-engine bolts.
 - Tighten to 40 Nm (30 lb-ft).

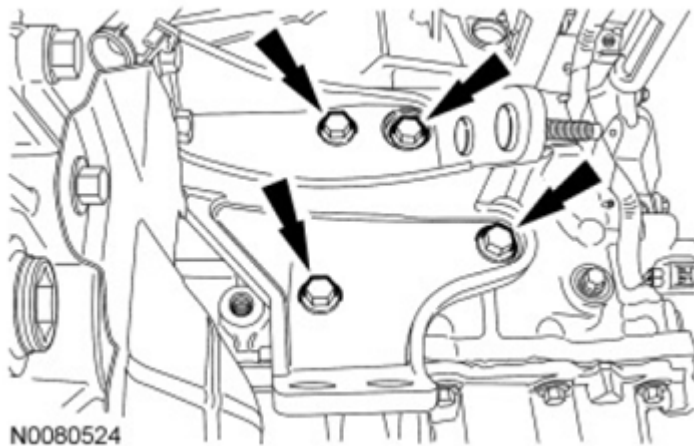


Fig. 516: Locating PTU Bracket-To-Engine Bolts
Courtesy of FORD MOTOR CO.

NOTE: A new Power Transfer Unit (PTU) intermediate shaft seal must be installed whenever the intermediate shaft or PTU is removed from the vehicle.

22. Install a new intermediate shaft seal and deflector. For additional information, refer to **TRANSFER CASE - POWER TRANSFER UNIT (PTU)** article.
23. If equipped, install the dampener and the 3 bolts.
 - Tighten to 40 Nm (30 lb-ft).

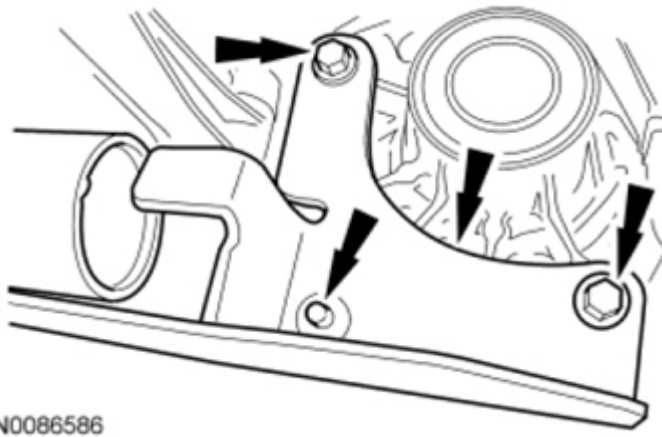


Fig. 517: Locating Dampener With Mounting Bolts
Courtesy of FORD MOTOR CO.

24. Install the 2 transaxle-to-engine bolts.
 - Tighten to 48 Nm (35 lb-ft).

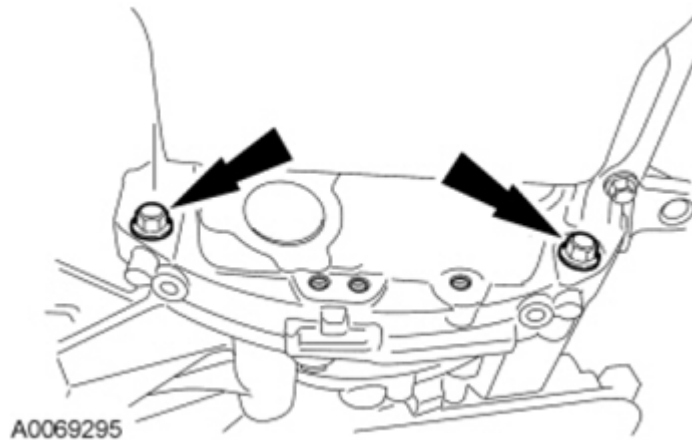


Fig. 518: Locating Transaxle-To-Engine Bolts
Courtesy of FORD MOTOR CO.

25. Install the 2 transaxle-to-engine bolts.
- Tighten to 48 Nm (35 lb-ft).



Fig. 519: Locating Transaxle-To-Engine Bolts
Courtesy of FORD MOTOR CO.

26. Install the engine support crossmember and new nut.
- Tighten to 175 Nm (129 lb-ft).

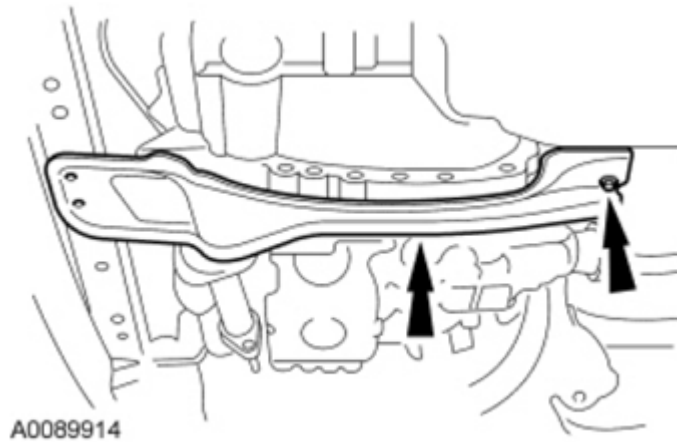


Fig. 520: Locating Engine Support Crossmember Rear Nut
 Courtesy of FORD MOTOR CO.

27. Install the 2 bolts for the engine support crossmember and the front roll restrictor bolt.
 - Tighten the engine support crossmember bolts to 90 Nm (66 lb-ft).
 - Tighten the front roll restrictor bolt to 115 Nm (85 lb-ft).

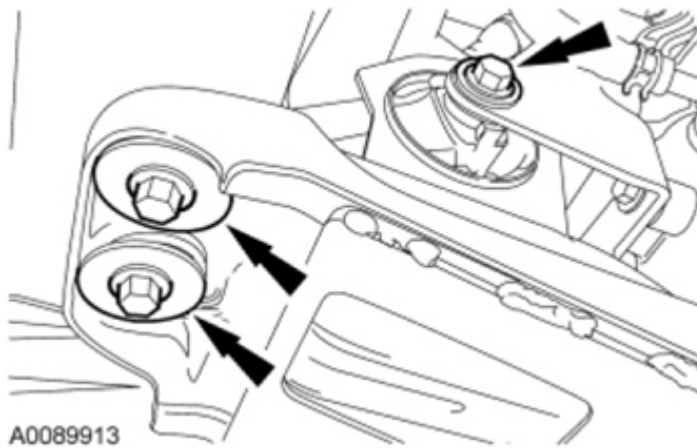


Fig. 521: Locating Front Roll Restrictor And Engine Support Crossmember Bolts
 Courtesy of FORD MOTOR CO.

28. Connect the lower radiator hose to the radiator.

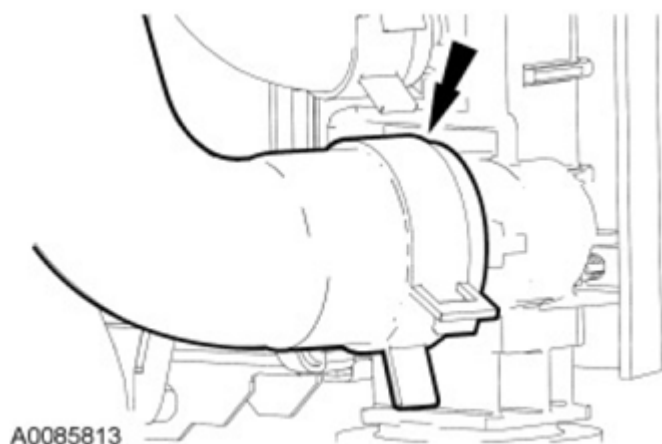


Fig. 522: Locating Lower Radiator Hose
Courtesy of FORD MOTOR CO.

29. Install the A/C compressor and connect the A/C compressor electrical connector.
 - Attach the wire harness retainer.
 - Tighten the bolts to 25 Nm (18 lb-ft).

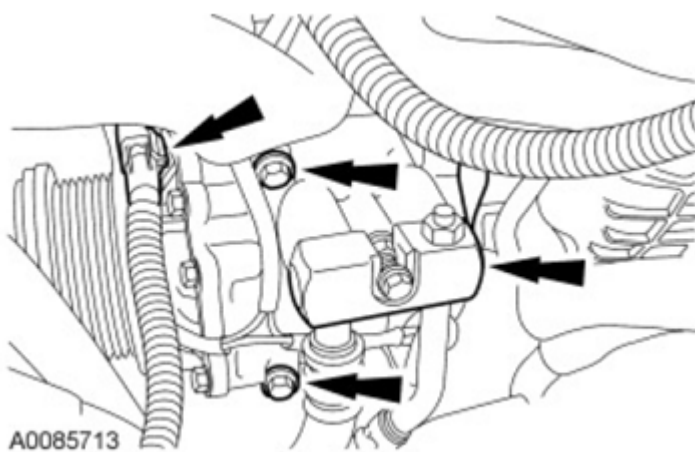


Fig. 523: Locating A/C Compressor Electrical Connector And Bolts
Courtesy of FORD MOTOR CO.

30. Attach the 2 retainers and connect the generator electrical connector.

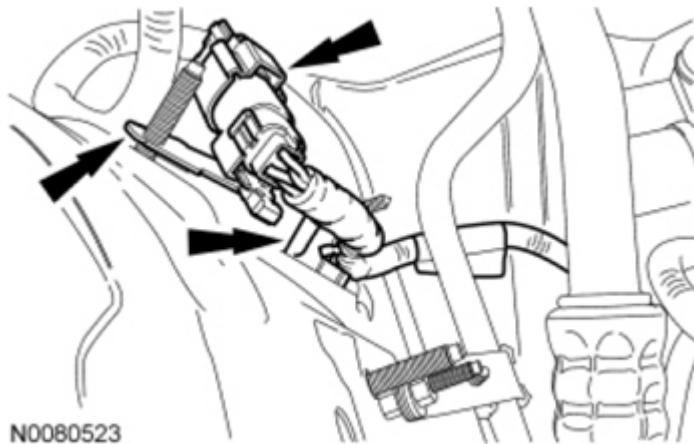


Fig. 524: Locating Generator Electrical Connector And Retainers
Courtesy of FORD MOTOR CO.

31. Connect the engine control harness electrical connector.

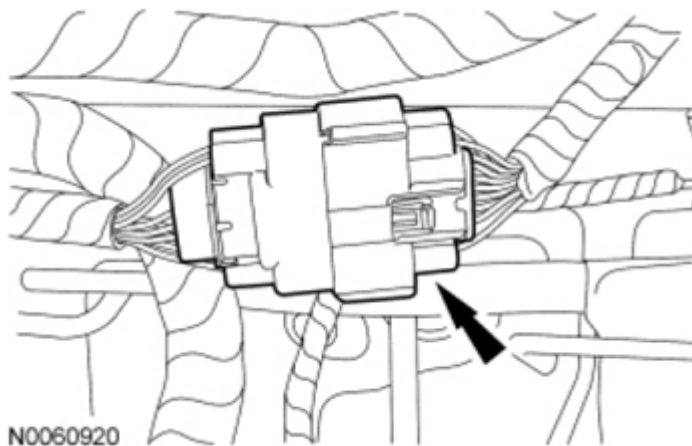


Fig. 525: Locating Engine Control Harness Electrical Connector
Courtesy of FORD MOTOR CO.

32. Connect the PCM electrical connector and attach the wire harness retainer.

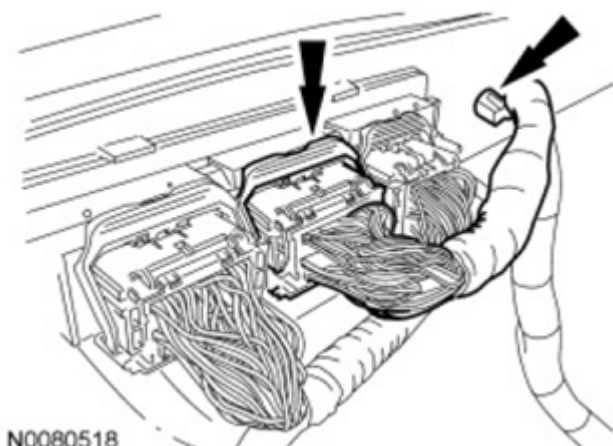


Fig. 526: Locating PCM Electrical Connector And Wire Harness Retainer
Courtesy of FORD MOTOR CO.

33. Connect the fuel supply tube quick connect coupling. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** article.

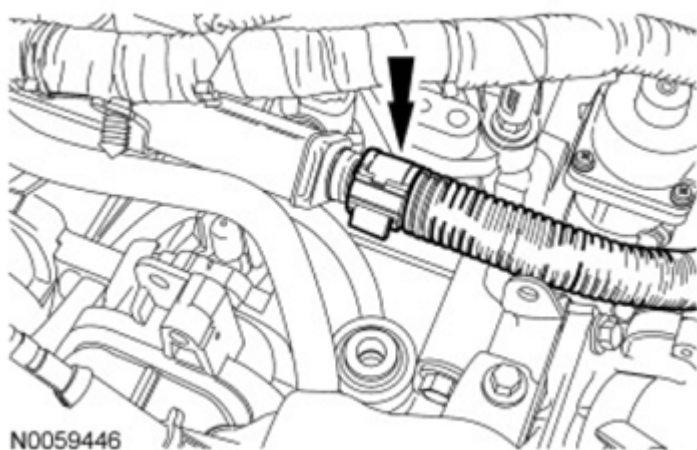


Fig. 527: Locating Fuel Supply Tube Quick Connect Coupling
Courtesy of FORD MOTOR CO.

34. Connect the fuel vapor return tube.
- Attach the fuel vapor tube retainer to the wire harness.

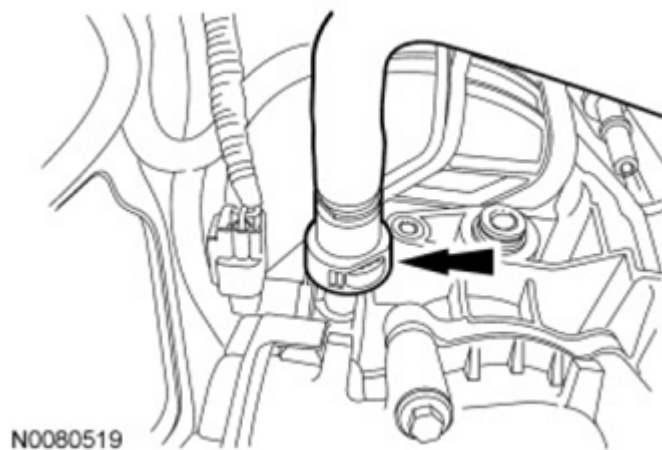


Fig. 528: Locating Fuel Vapor Tube Retainer
Courtesy of FORD MOTOR CO.

35. Connect the vacuum supply tube.

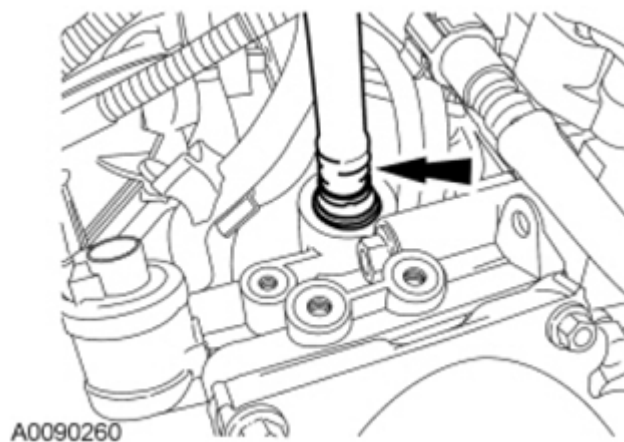
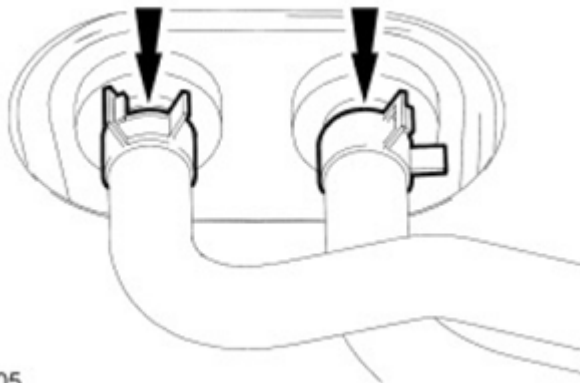


Fig. 529: Locating Vacuum Supply Tube
Courtesy of FORD MOTOR CO.

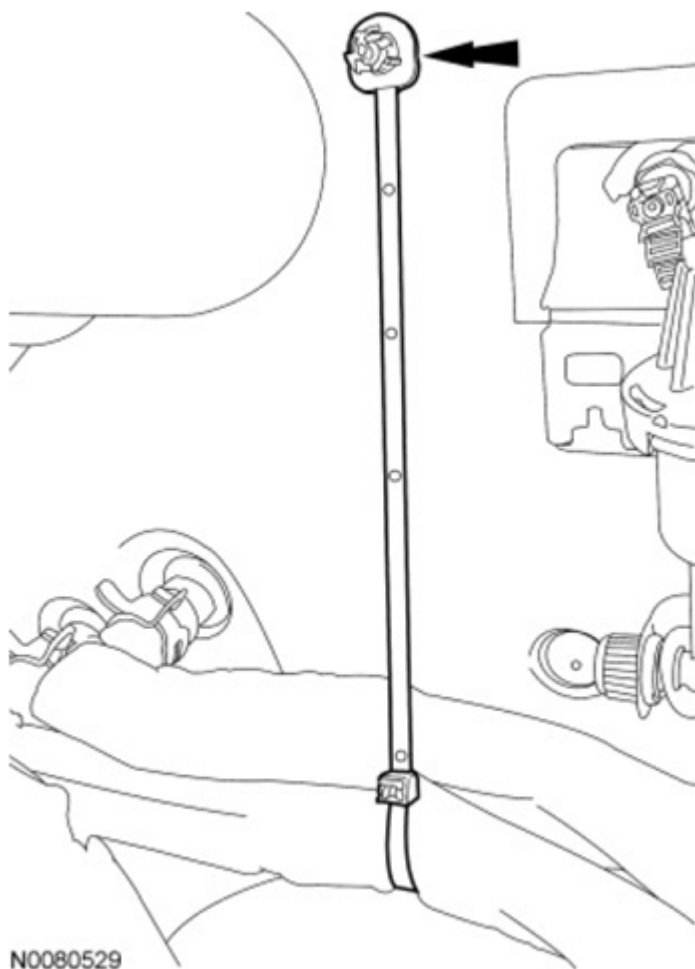
36. Connect the heater hoses to the heater core.



A0085705

Fig. 530: Locating Heater Hoses Of Heater Core
Courtesy of FORD MOTOR CO.

37. Attach the heater hose support strap to the stud.



N0080529

Fig. 531: Locating Heater Hose Support Strap Of Stud
Courtesy of FORD MOTOR CO.

38. Connect the upper radiator hose.

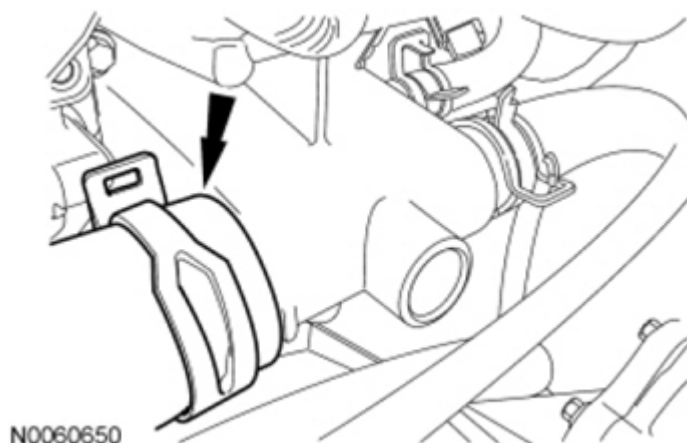


Fig. 532: Locating Upper Radiator Hose
Courtesy of FORD MOTOR CO.

39. If equipped, route the block heater wiring harness and attach all retainers. Connect the block heater electrical connector.



Fig. 533: Locating Block Heater Electrical Connector
Courtesy of FORD MOTOR CO.

40. Attach the shift cable pin-type retainer.

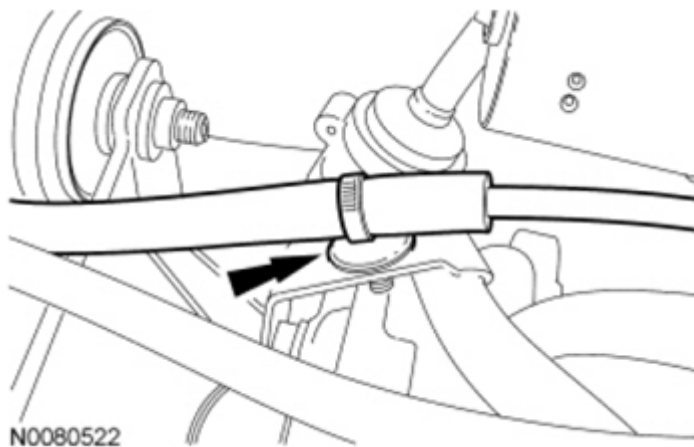


Fig. 534: Locating Shift Cable Pin-Type Retainer
Courtesy of FORD MOTOR CO.

41. Attach the shift cable to the shift cable bracket.

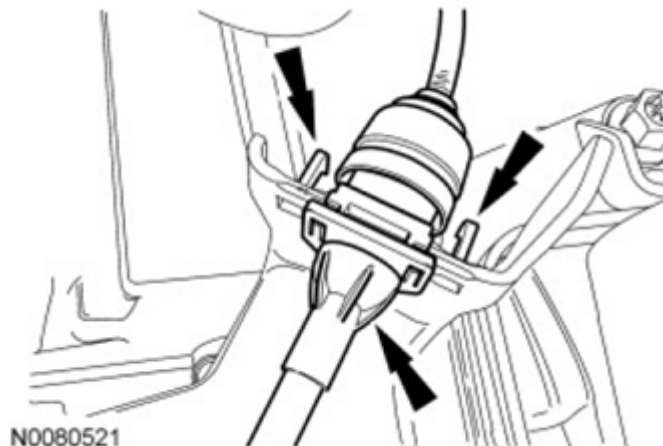


Fig. 535: View Of Transmission Shift Cable Tabs
Courtesy of FORD MOTOR CO.

42. Connect the shift cable to the transaxle manual lever.

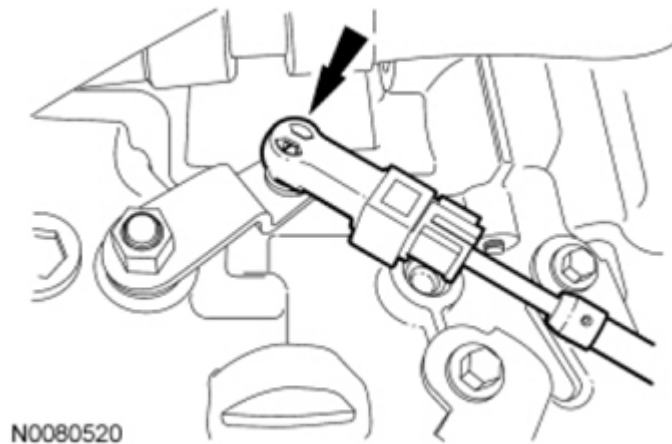


Fig. 536: View Of Shift Cable Of Transaxle Manual Lever
Courtesy of FORD MOTOR CO.

43. Attach the 2 wiring harness retainers to the battery tray bracket.

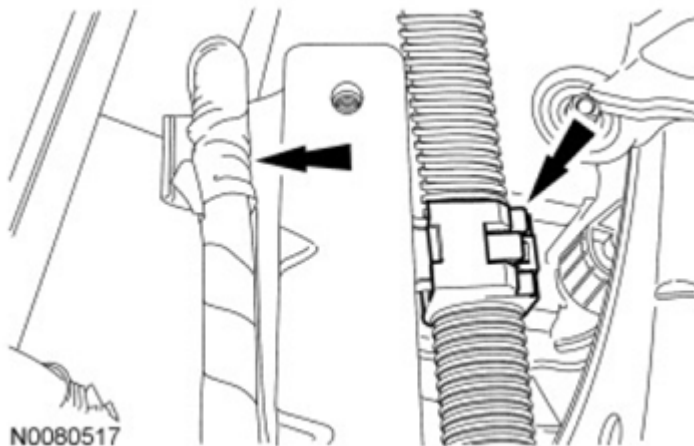


Fig. 537: Locating Battery Tray Bracket Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

44. Install the ground strap and bolt.
 - Tighten to 10 Nm (89 lb-in).

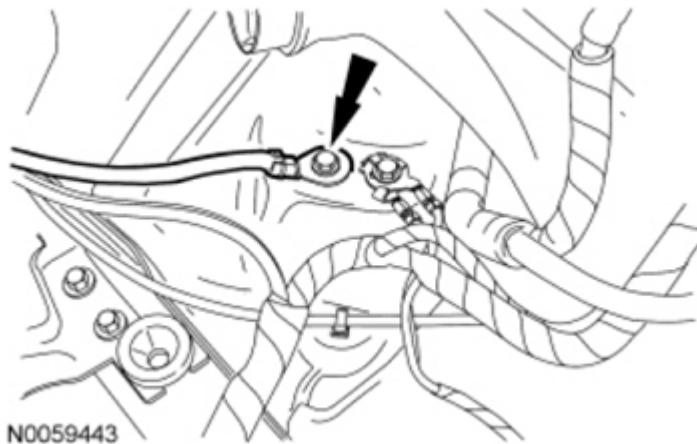


Fig. 538: Locating Ground Strap Bolt
Courtesy of FORD MOTOR CO.

45. Connect the electrical connector to the Power Distribution Box (PDB).

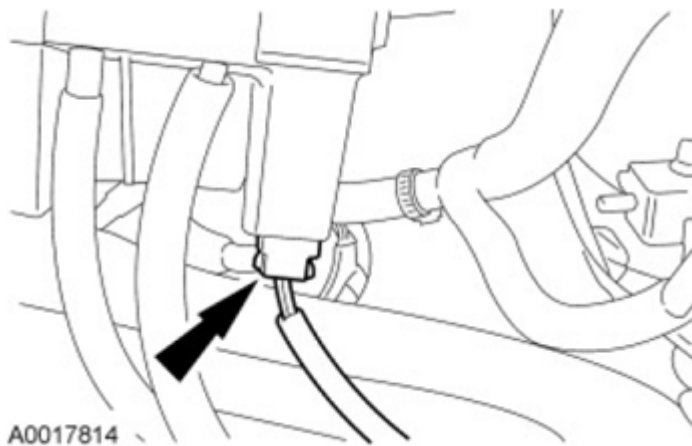


Fig. 539: Locating PDB Electrical Connector
Courtesy of FORD MOTOR CO.

46. Connect the cable to the **PDB** and install the nut.
- Tighten to 12 Nm (106 lb-in).

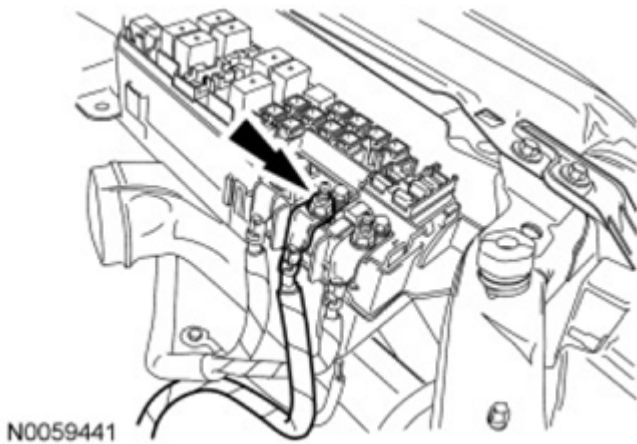


Fig. 540: Locating PDB Cable Nut
Courtesy of FORD MOTOR CO.

47. Install the **PDB** cover.

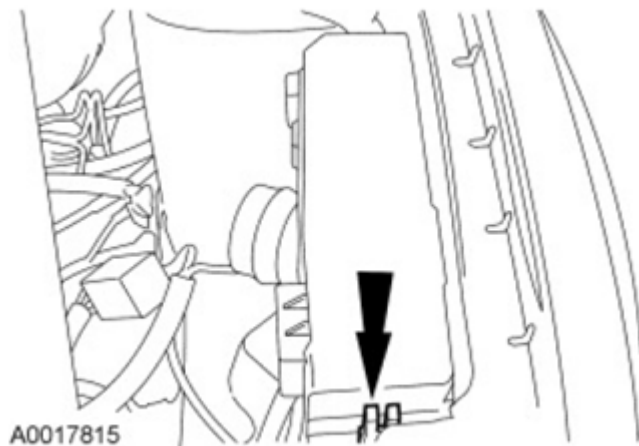


Fig. 541: Locating Power Distribution Box (PDB) Cover
Courtesy of FORD MOTOR CO.

48. Connect the 2 transaxle fluid cooler tubes.

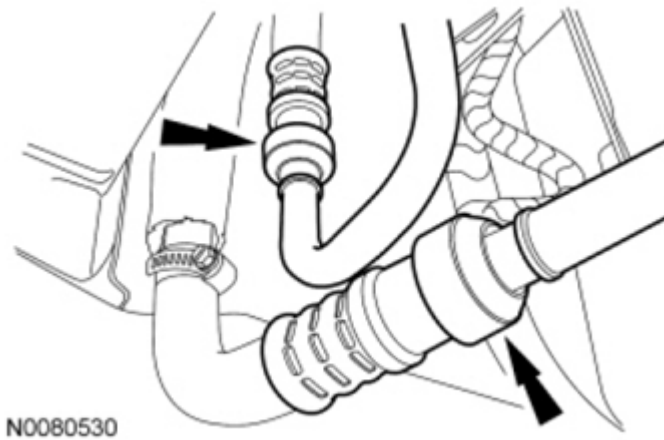


Fig. 542: Locating Transaxle Fluid Cooler Tubes
Courtesy of FORD MOTOR CO.

49. Install the 2 secondary latches to the transaxle fluid cooler tubes.

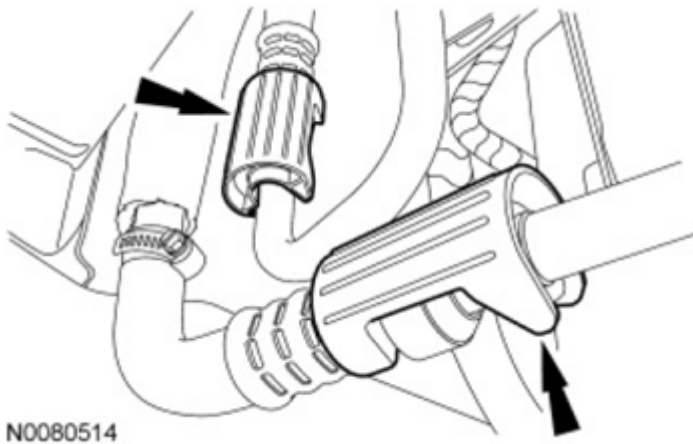


Fig. 543: Locating Secondary Latches Of Transaxle Fluid Cooler Tubes
Courtesy of FORD MOTOR CO.

50. Connect the Turbine Shaft Speed (TSS) sensor electrical connector.

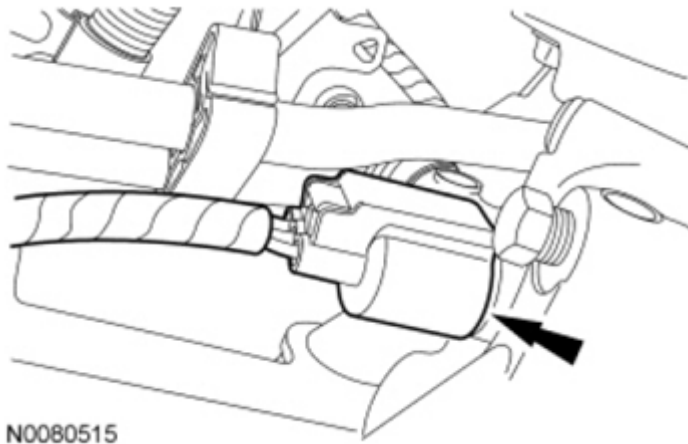


Fig. 544: Locating Turbine Shaft Speed (TSS) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

51. Attach the wiring harness retainer to the transaxle stud bolt.

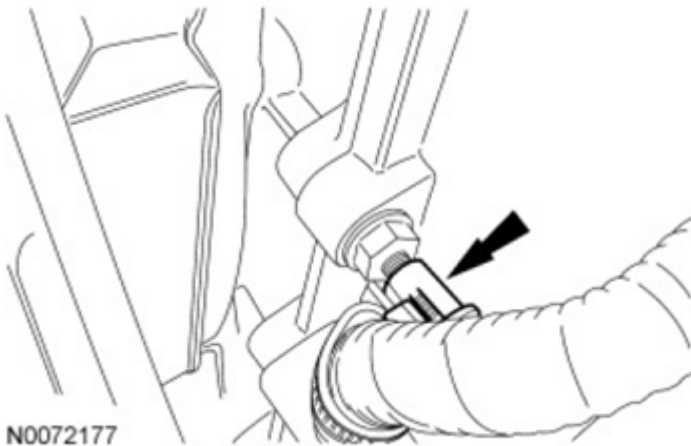


Fig. 545: Locating Wiring Harness Retainer Of Transaxle Stud Bolt
Courtesy of FORD MOTOR CO.

52. Connect the transaxle electrical connector.

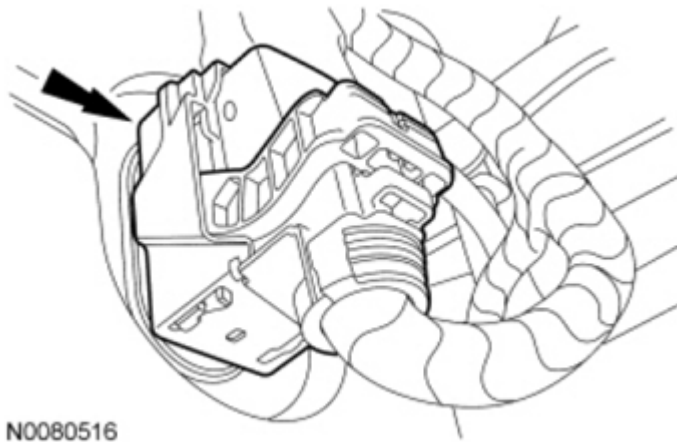


Fig. 546: Locating Transaxle Electrical Connector
Courtesy of FORD MOTOR CO.

53. If equipped, install the ground eyelet and bolt.
 - Tighten to 10 Nm (89 lb-in).

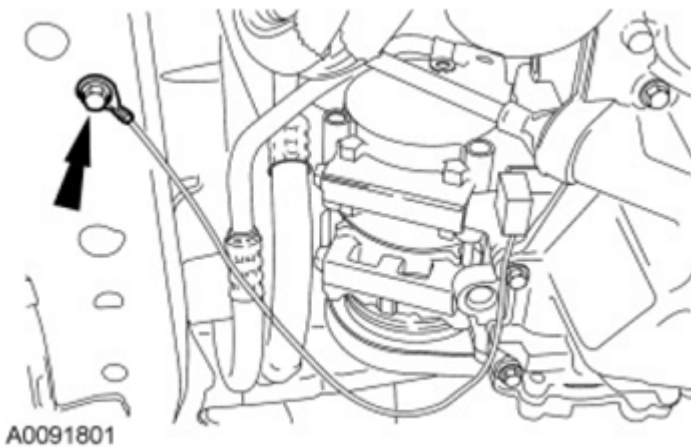


Fig. 547: Locating Ground Eyelet Bolts
Courtesy of FORD MOTOR CO.

AWD vehicles

54. Position the driveshaft to the **PTU** and install the 6 bolts.
 - Tighten to 37 Nm (27 lb-ft).

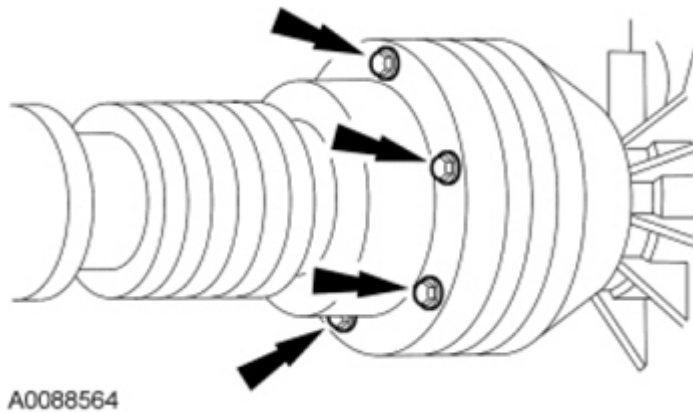


Fig. 548: Locating Driveshaft Bolts
Courtesy of FORD MOTOR CO.

All vehicles

55. Install the generator air duct and make sure the tab is latched.

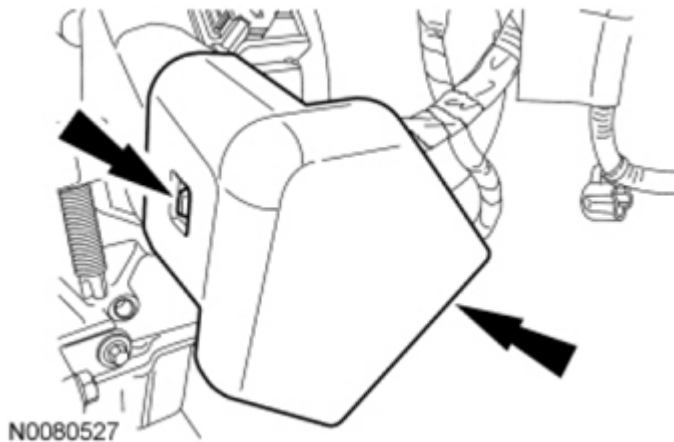


Fig. 549: Locating Locking Tab And Generator Air Duct
Courtesy of FORD MOTOR CO.

56. Install the accessory drive belt. For additional information, refer to **ACCESSORY DRIVE - 2.5L** article.
57. Install the intermediate shaft.

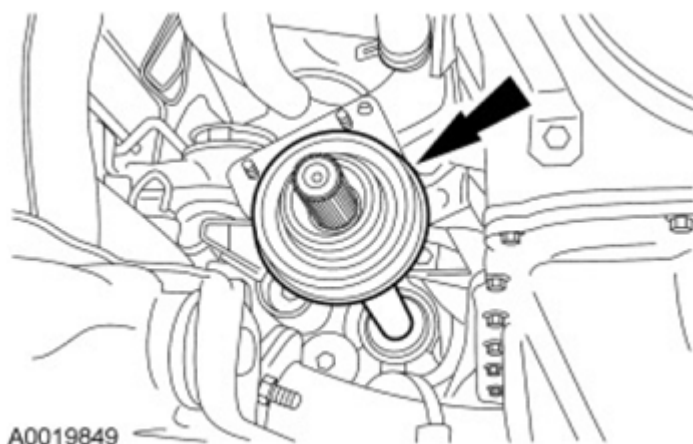


Fig. 550: Locating Intermediate Shaft
Courtesy of FORD MOTOR CO.

58. Install the 2 intermediate shaft bearing retainer nuts.
 - Tighten to 27 Nm (20 lb-ft).

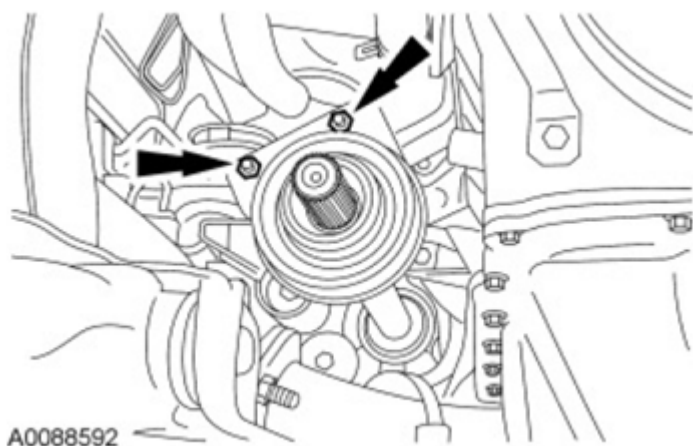
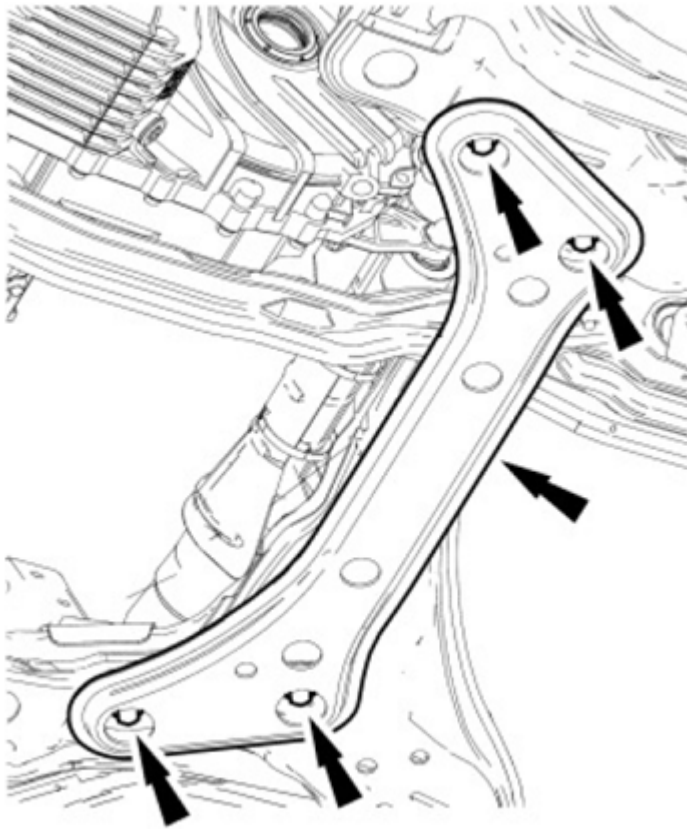


Fig. 551: Locating Intermediate Shaft Bearing Retainer Nuts
Courtesy of FORD MOTOR CO.

59. Install the exhaust downpipe and exhaust intermediate pipe. For additional information, refer to **EXHAUST SYSTEM** article.
60. Install the lateral support crossmember and bolts.
 - Tighten to 115 Nm (85 lb-ft).



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Fig. 552: Locating Lateral Support Crossmember Bolts
Courtesy of FORD MOTOR CO.

61. Install the RH and LH halfshafts. For additional information, refer to **FRONT DRIVE HALFSHAFTS** article.
62. Install the battery tray. For additional information, refer to **BATTERY, BATTERY MOUNTING SYSTEM & BATTERY CABLES** article.
63. Install the engine Air Cleaner (ACL) and ACL outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING - 2.5L** article.
64. Fill the engine with clean engine oil.
65. Fill and bleed the cooling system. For additional information, refer to **ENGINE COOLING** article.
66. Check and fill the transmission fluid as necessary. For additional information, refer to **AUTOMATIC TRANSAXLE/TRANSMISSION - 6F35** article.

AWD vehicles

67. Check and fill the **PTU** fluid as necessary. For additional information, refer to **TRANSFER CASE - POWER TRANSFER UNIT (PTU)** article.
68. If the engine was disassembled, use the scan tool to perform the Misfire Monitor Neutral Profile Correction procedure following the on-screen instructions.

ENGINE - MANUAL TRANSAXLE

Special Tool(s)

SPECIAL TOOLS DESCRIPTION



ST1341-A

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



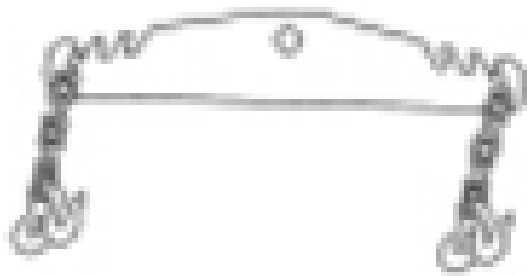
ST1293-A

Powertrain Lift
014-00765 or equivalent

Spreader Bar

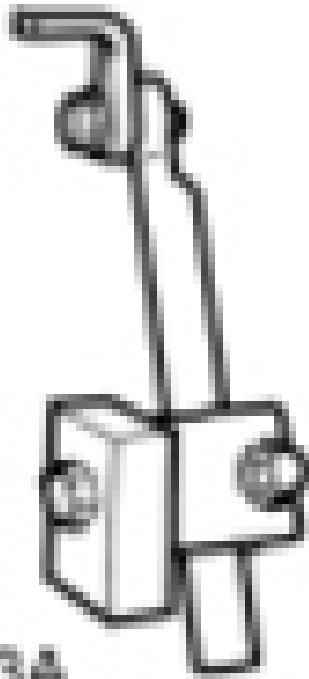
2011 Mercury Mariner

2011 ENGINE Engine Mechanical - 2.5L - Escape & Mariner (Except Hybrid)



ST1602-A

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



ST2743A

Adjustable Grip Arm, 1735A
014-00001 or equivalent

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



ST2834-A

Material**MATERIAL SPECIFICATIONS**

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

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.

1. Using the Floor Crane and Spreader Bar, position the engine and transaxle together. Install the 5 transaxle-to-engine bolts.
2. Using the Floor Crane and Spreader Bar, position the engine and transaxle onto the lift table.
3. Using the Powertrain Lift and Adjustable Grip Arm, secure the engine to the lift table.

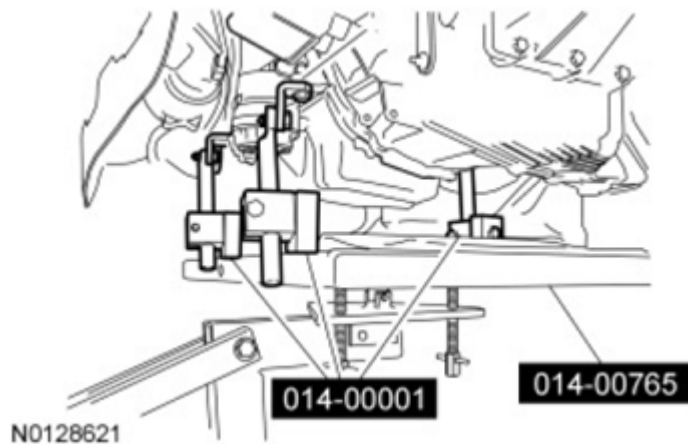


Fig. 553: Securing Engine And Transaxle Onto Powertrain Lift
Courtesy of FORD MOTOR CO.

4. Install the starter motor isolator.

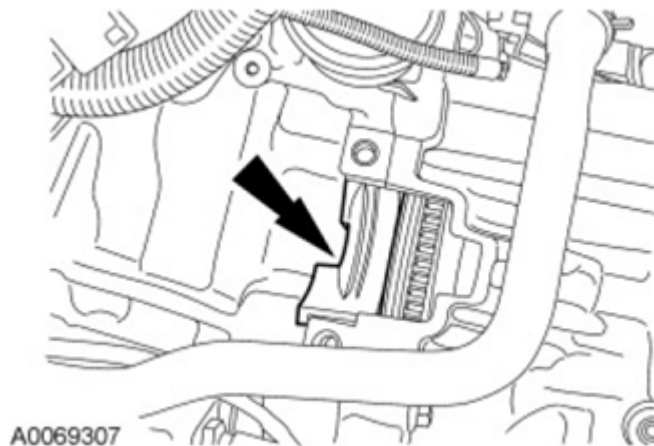


Fig. 554: Locating Starter Motor Isolator
Courtesy of FORD MOTOR CO.

5. Install the starter motor and the 2 stud bolts.
 - Tighten to 35 Nm (26 lb-ft).

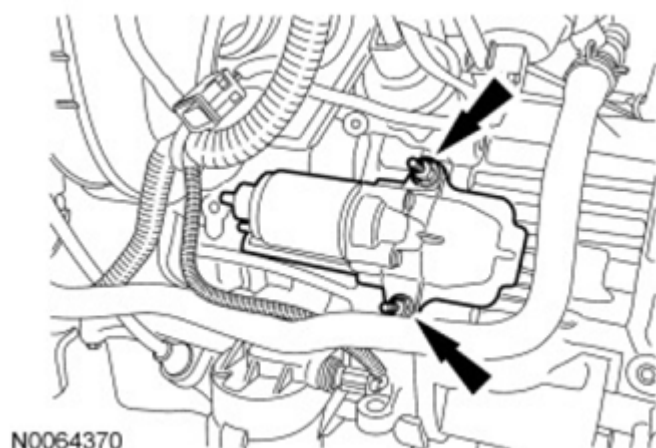


Fig. 555: Locating Starter Motor Stud Bolts
Courtesy of FORD MOTOR CO.

6. Install the ground wire and the nut.
 - Tighten to 25 Nm (18 lb-ft).

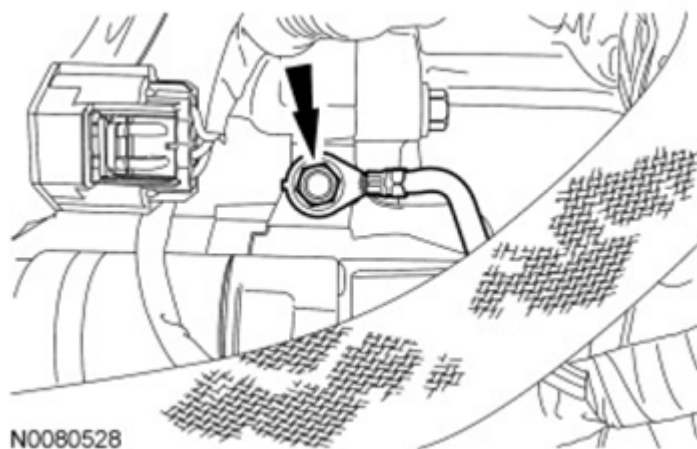


Fig. 556: Locating Ground Wire Nut
Courtesy of FORD MOTOR CO.

7. Install the starter motor harness connector.
 1. Install the starter motor solenoid battery nut.
 - Tighten to 12 Nm (106 lb-in).
 2. Install the starter motor solenoid nut.
 - Tighten to 5 Nm (44 lb-in).

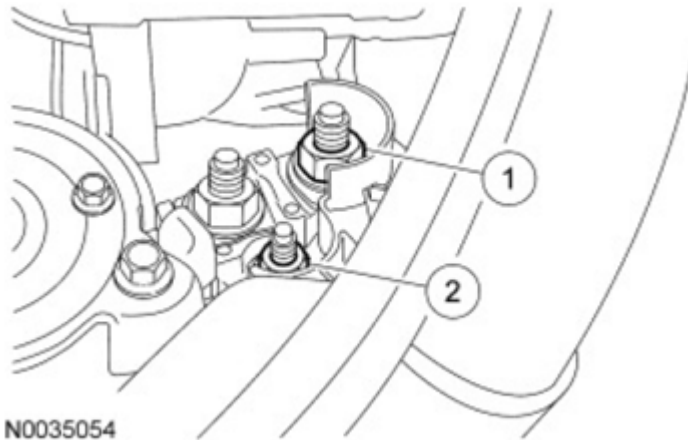


Fig. 557: Identifying Battery Cable And Starter Solenoid Terminal Nuts
Courtesy of FORD MOTOR CO.

8. Raise the engine and transaxle into the vehicle.
9. Install the bolt in the LH transaxle mount.
 - Tighten to 103 Nm (76 lb-ft).

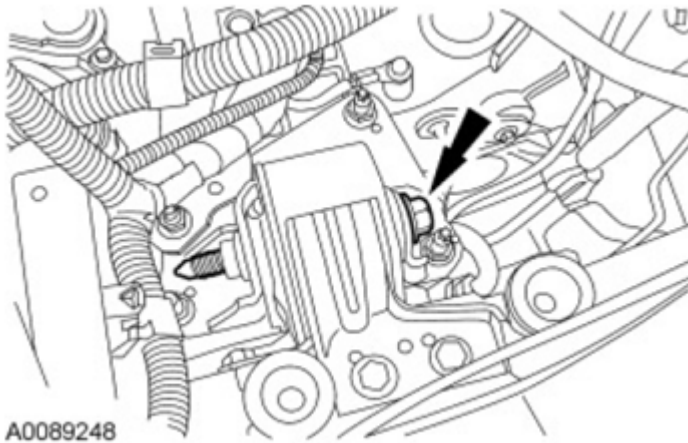


Fig. 558: Locating LH Transaxle Mount Bolt
Courtesy of FORD MOTOR CO.

10. Install the bolt in the rear transaxle mount.
 - Tighten 115 Nm (85 lb-ft).

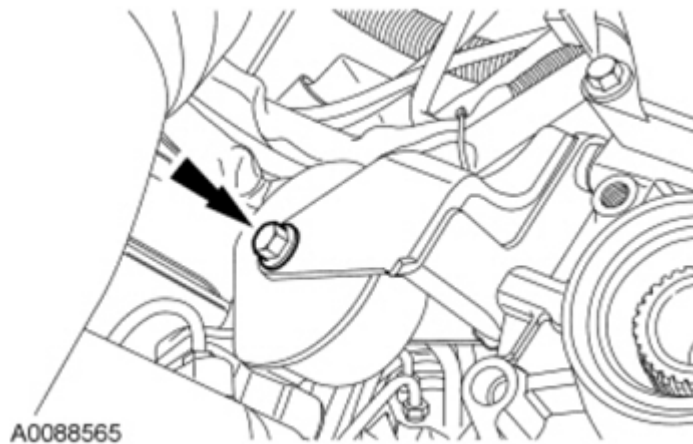


Fig. 559: Locating Transaxle Rear Mount Bolt
Courtesy of FORD MOTOR CO.

11. Install the engine mount bracket and nuts.
 - Tighten 115 Nm (85 lb-ft).



Fig. 560: Locating Engine Mount Bracket Nuts
Courtesy of FORD MOTOR CO.

12. Install the engine mount bracket bolt.
 - Tighten to 115 Nm (85 lb-ft).

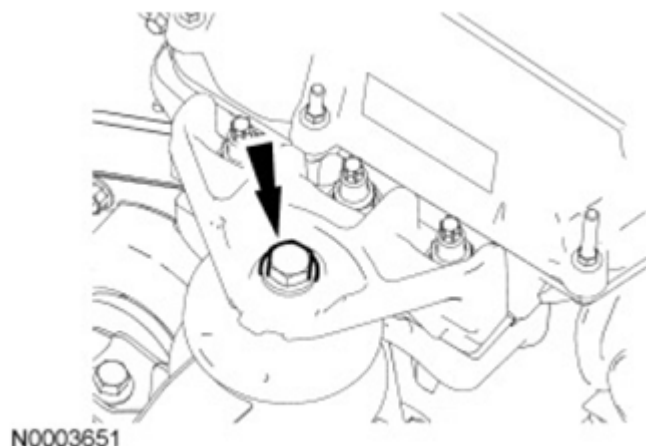


Fig. 561: Locating Engine Mount Bracket Bolt
Courtesy of FORD MOTOR CO.

13. Install a new spin-on engine oil filter.
 - Lubricate the spin-on oil filter gasket with clean engine oil and tighten the oil filter three-fourths turn after the oil filter gasket makes contact with the oil filter adapter.

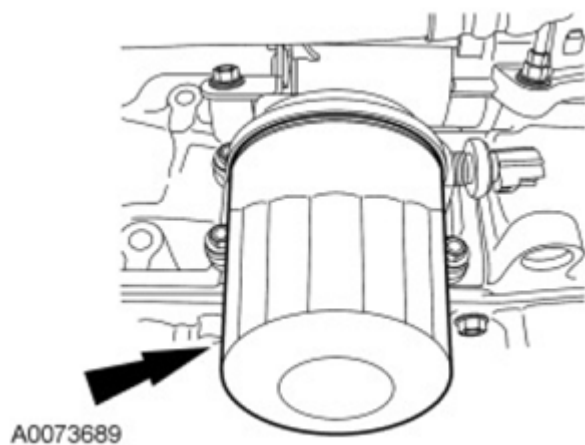


Fig. 562: Locating Engine Oil Filter
Courtesy of FORD MOTOR CO.

14. Install the 2 engine-to-transaxle bolts.
 - Tighten to 48 Nm (35 lb-ft).

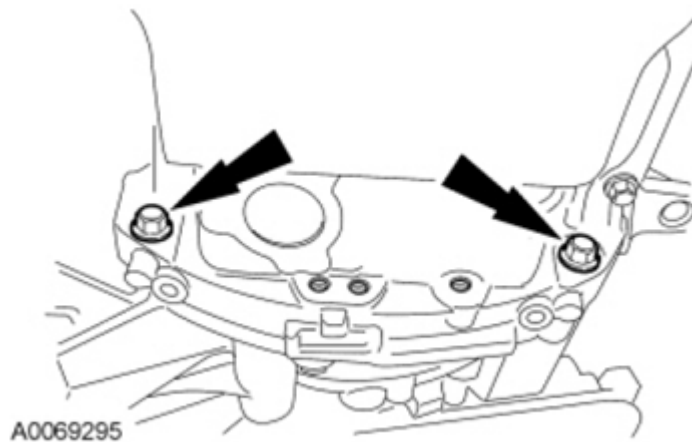


Fig. 563: Locating Transaxle-To-Engine Bolts
Courtesy of FORD MOTOR CO.

15. Install the 2 transaxle-to-engine bolts.
 - Tighten to 48 Nm (35 lb-ft).



Fig. 564: Locating Transaxle-To-Engine Bolts
Courtesy of FORD MOTOR CO.

16. Install the engine support crossmember and new nut.
 - Tighten to 175 Nm (129 lb-ft).

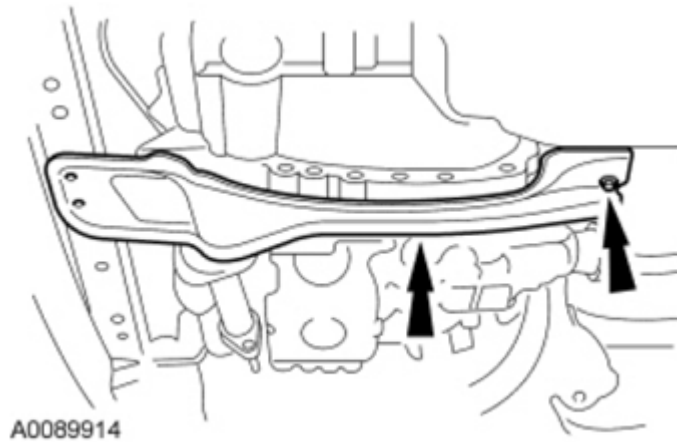


Fig. 565: Locating Engine Support Crossmember Rear Nut
 Courtesy of FORD MOTOR CO.

17. Install the 2 bolts for the engine support crossmember and the front roll restrictor bolt.
 - Tighten the engine support crossmember bolts to 90 Nm (66 lb-ft).
 - Tighten the front roll restrictor bolt to 115 Nm (85 lb-ft).

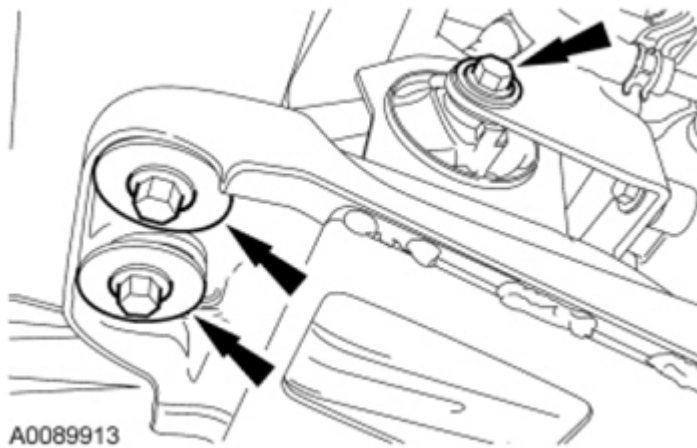


Fig. 566: Locating Front Roll Restrictor And Engine Support Crossmember Bolts
 Courtesy of FORD MOTOR CO.

18. Connect the lower radiator hose to the radiator.

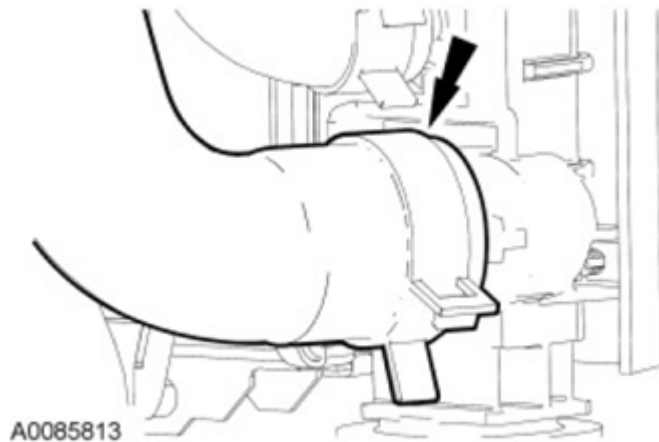


Fig. 567: Locating Lower Radiator Hose
Courtesy of FORD MOTOR CO.

19. Position the A/C compressor and install the 3 bolts.
- Tighten the bolts to 25 Nm (18 lb-ft).
 - Connect the A/C compressor electrical connector. Attach the wire harness retainer.

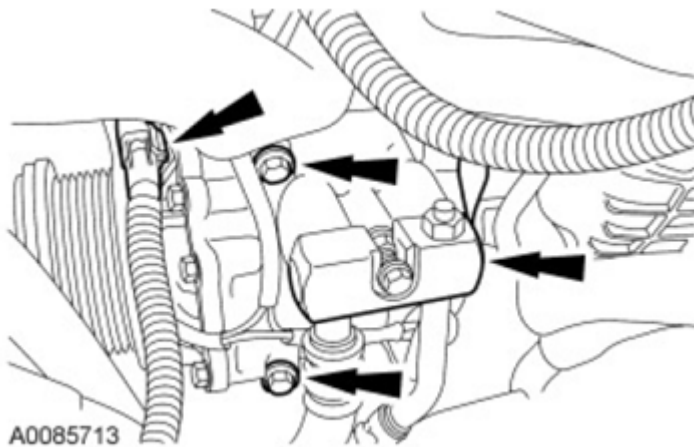


Fig. 568: Locating A/C Compressor Electrical Connector And Bolts
Courtesy of FORD MOTOR CO.

20. Connect the generator electrical connector and attach the 2 retainers.

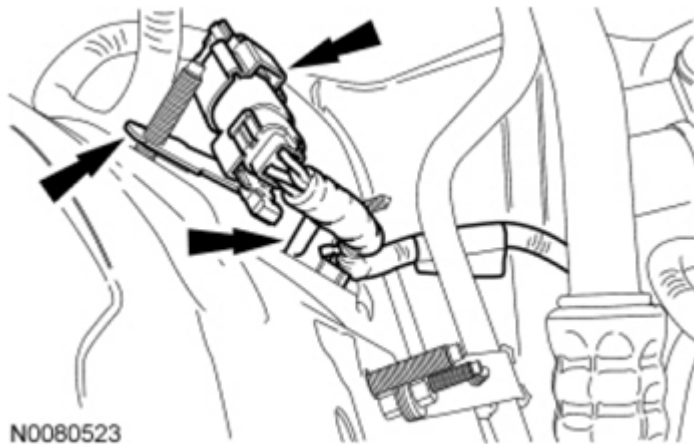


Fig. 569: Locating Generator Electrical Connector And Retainers
Courtesy of FORD MOTOR CO.

21. Connect the engine control harness electrical connector.

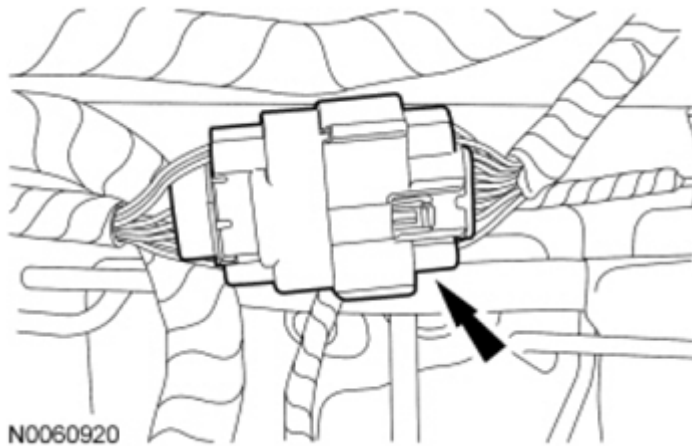


Fig. 570: Locating Engine Control Harness Electrical Connector
Courtesy of FORD MOTOR CO.

22. Connect the PCM electrical connector and attach the wire harness retainer.

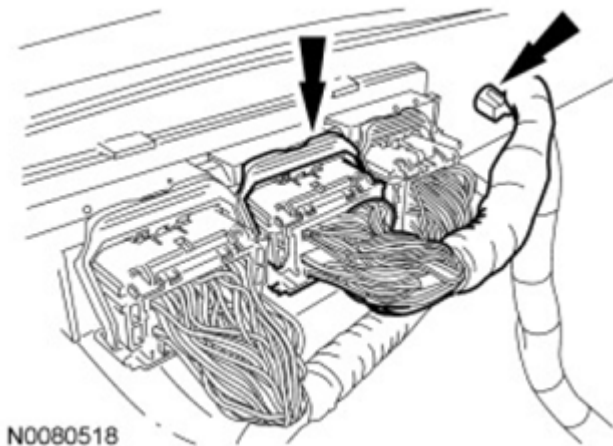


Fig. 571: Locating PCM Electrical Connector And Wire Harness Retainer
Courtesy of FORD MOTOR CO.

23. Connect the fuel supply tube quick connect coupling. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** article.

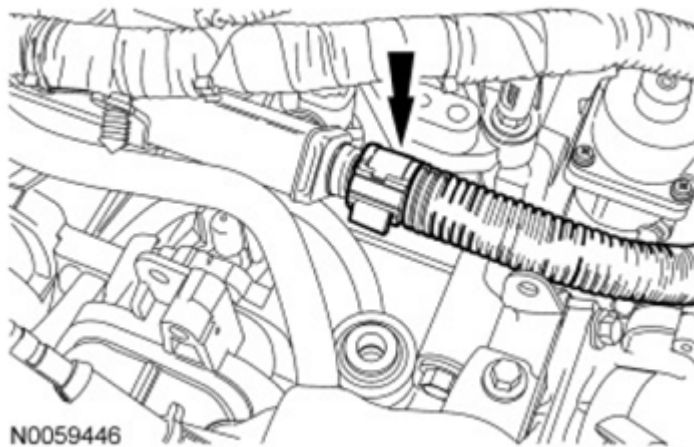


Fig. 572: Locating Fuel Supply Tube Quick Connect Coupling
Courtesy of FORD MOTOR CO.

24. Connect the fuel vapor return tube and retainer.
 - Attach the fuel vapor tube retainer to the wire harness.

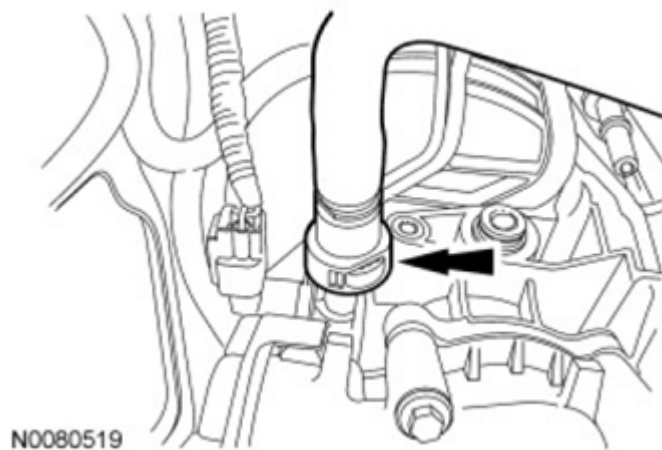


Fig. 573: Locating Fuel Vapor Tube Retainer
Courtesy of FORD MOTOR CO.

25. Connect the vacuum supply tube.

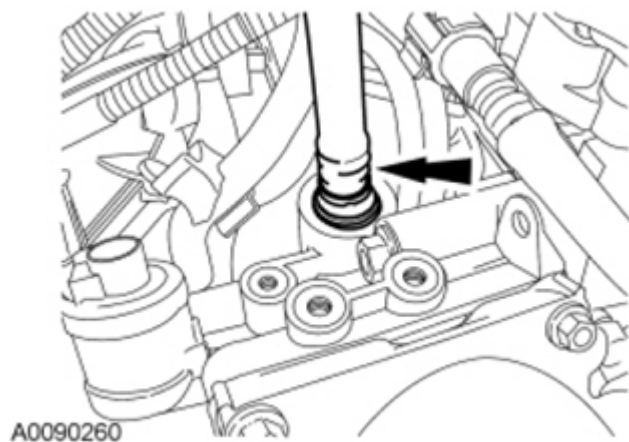


Fig. 574: Locating Vacuum Supply Tube
Courtesy of FORD MOTOR CO.

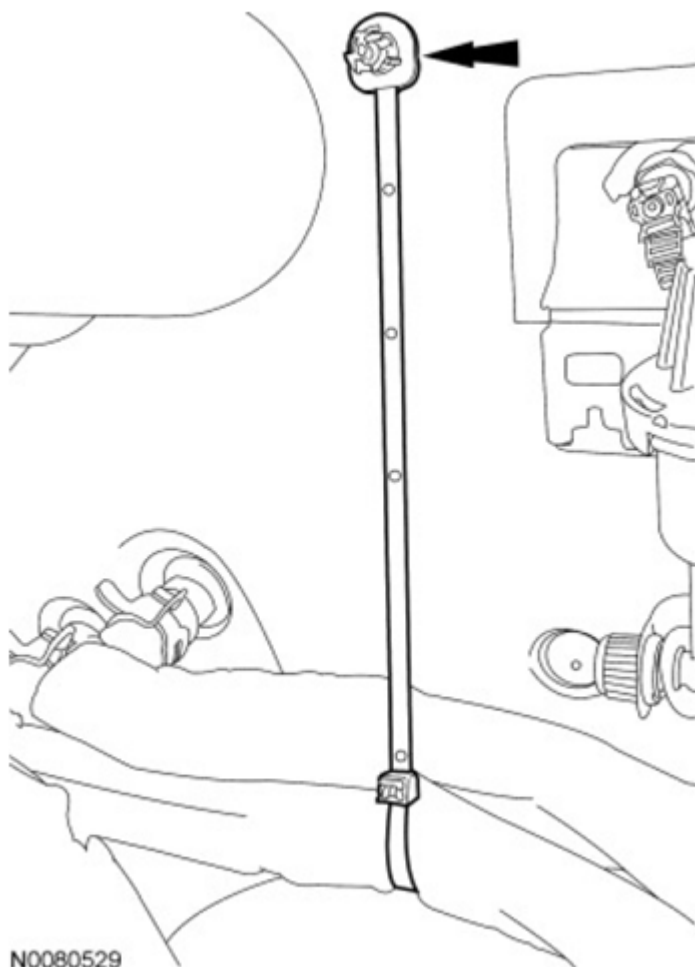
26. Connect the heater hoses to the heater core.



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Fig. 575: Locating Heater Hoses Of Heater Core
Courtesy of FORD MOTOR CO.

27. Attach the heater hose support strap to the stud.



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Fig. 576: Locating Heater Hose Support Strap Of Stud
Courtesy of FORD MOTOR CO.

28. Connect the upper radiator hose.

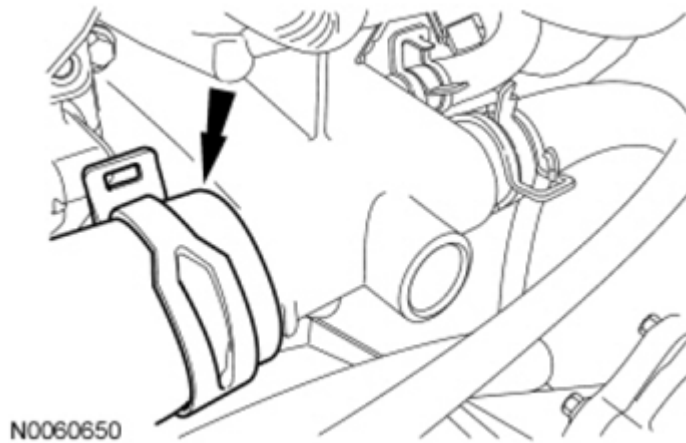


Fig. 577: Locating Upper Radiator Hose
Courtesy of FORD MOTOR CO.

29. If equipped, route the block heater wiring harness and attach all retainers.
- Connect the block heater electrical connector.

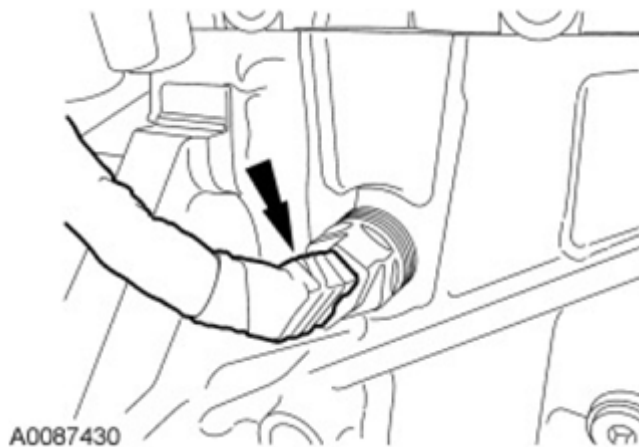


Fig. 578: Locating Block Heater Electrical Connector
Courtesy of FORD MOTOR CO.

30. Install the shift cable bracket.
1. Position the shift cable bracket.
 2. Install the 3 bolts.
 - Tighten to 22 Nm (16 lb-ft).

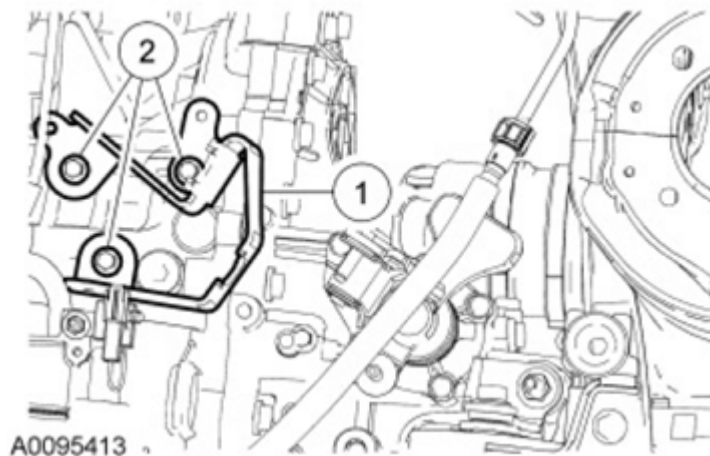


Fig. 579: Identifying Shift Cable Bracket And Bolts
Courtesy of FORD MOTOR CO.

31. Connect the shift cables.

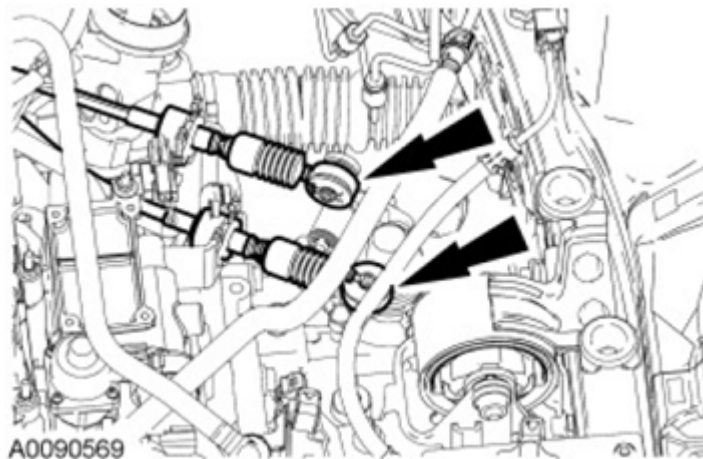


Fig. 580: Locating Shift Cables
Courtesy of FORD MOTOR CO.

32. Connect the reversing lamp indicator switch electrical connector and attach the 2 wiring harness retainers.

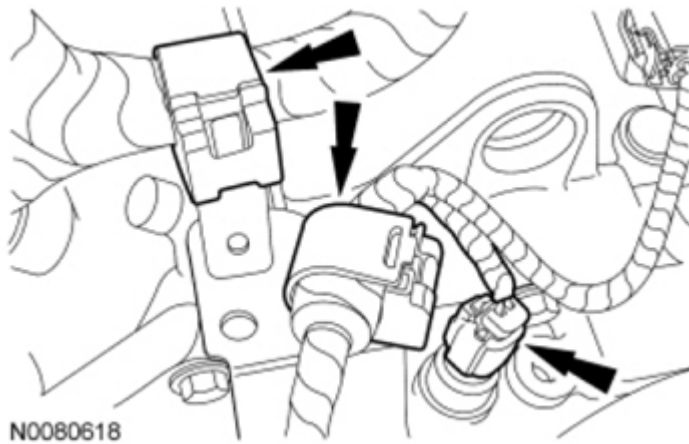


Fig. 581: Locating Reversing Lamp Indicator Switch Electrical Connector And Wiring Harness Retainers

Courtesy of FORD MOTOR CO.

33. Connect the Vehicle Speed Sensor (VSS) electrical connector and attach the 2 pin-type retainers.

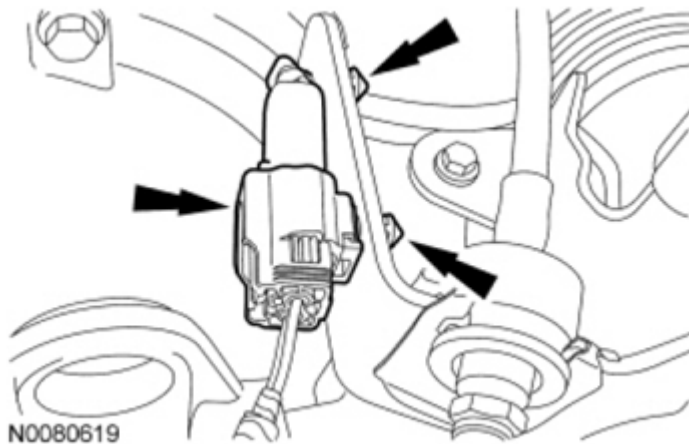


Fig. 582: Locating Vehicle Speed Sensor Electrical Connector And Pin-Type Retainers

Courtesy of FORD MOTOR CO.

34. Connect the clutch hydraulic line.
 1. Position the clutch hydraulic line.
 2. Connect the clutch hydraulic line to the clutch slave cylinder.
 - Tighten to 25 Nm (18 lb-ft).
 3. Install the clutch hydraulic line bracket-to-transaxle bolt.
 - Tighten to 3 Nm (27 lb-in).

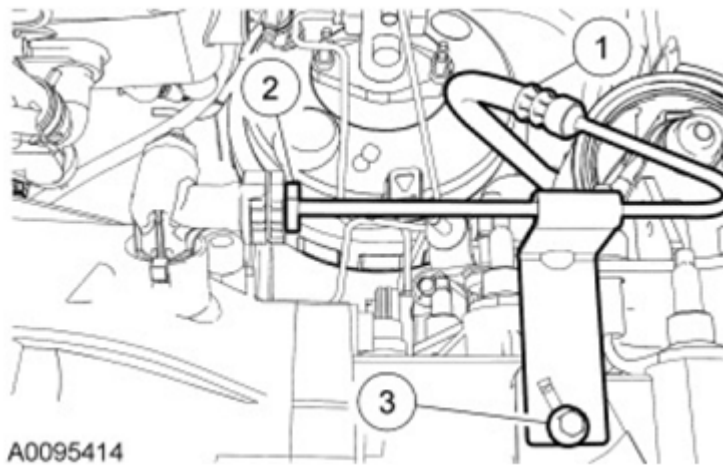


Fig. 583: Identifying Clutch Hydraulic Line And Bracket-To-Transaxle Bolt
Courtesy of FORD MOTOR CO.

35. Position the wiring harness and attach the 2 wiring harness retainers to the battery tray bracket.

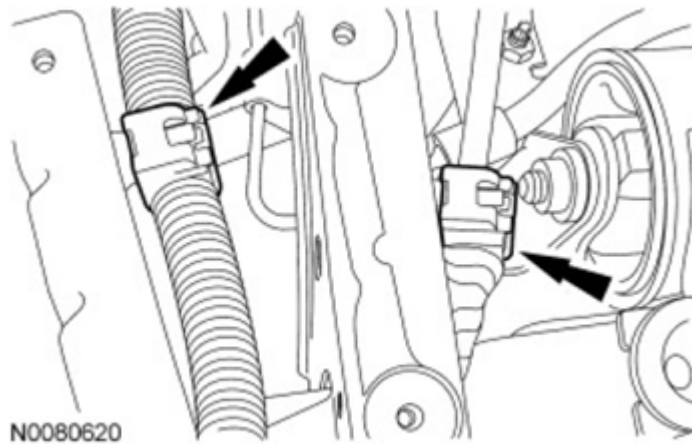


Fig. 584: Locating Wiring Harness Retainers Of Battery Tray Bracket
Courtesy of FORD MOTOR CO.

36. Install the ground strap and bolt.
 - Tighten to 10 Nm (89 lb-in).

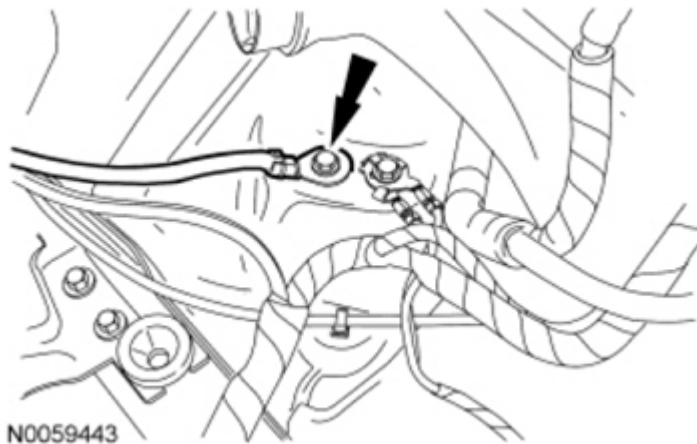


Fig. 585: Locating Ground Strap Bolt
Courtesy of FORD MOTOR CO.

37. Connect the electrical connector to the Power Distribution Box (PDB).

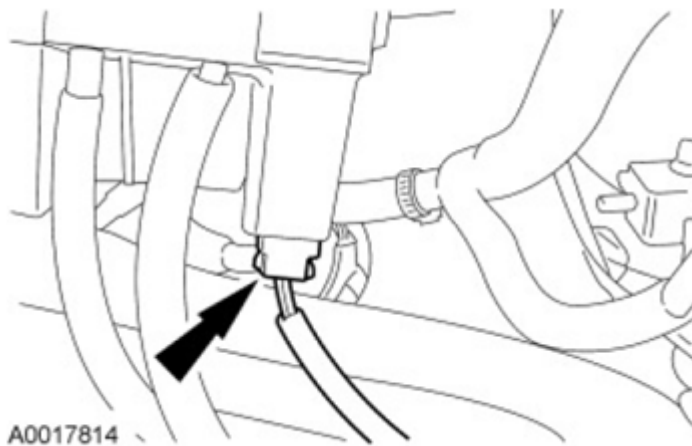


Fig. 586: Locating PDB Electrical Connector
Courtesy of FORD MOTOR CO.

38. Connect the cable to the **PDB** and install the nut.
- Tighten to 12 Nm (106 lb-in).

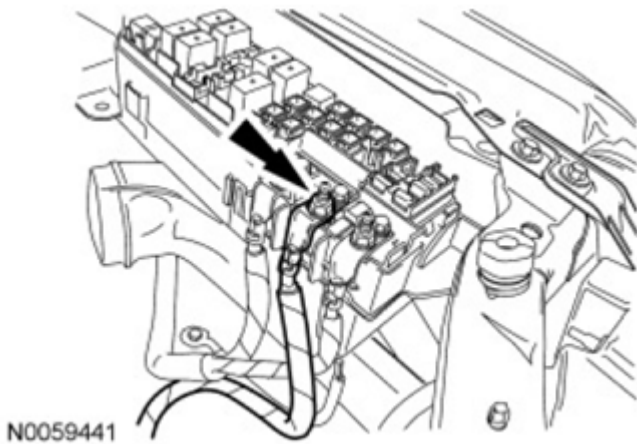


Fig. 587: Locating PDB Cable Nut
Courtesy of FORD MOTOR CO.

39. Install the **PDB** cover.

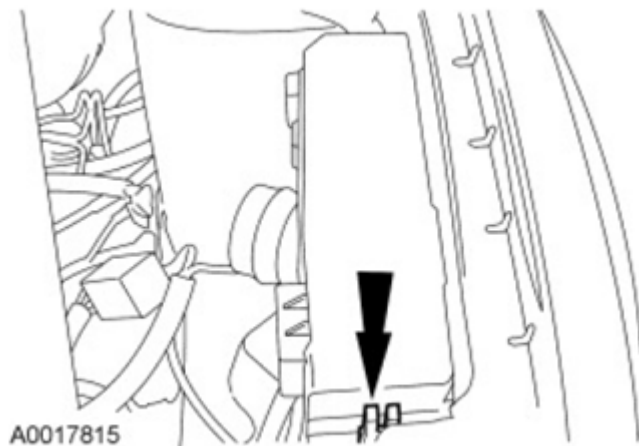


Fig. 588: Locating Power Distribution Box (PDB) Cover
Courtesy of FORD MOTOR CO.

40. If equipped, install the ground eyelet and bolt.
- Tighten to 10 Nm (89 lb-in).

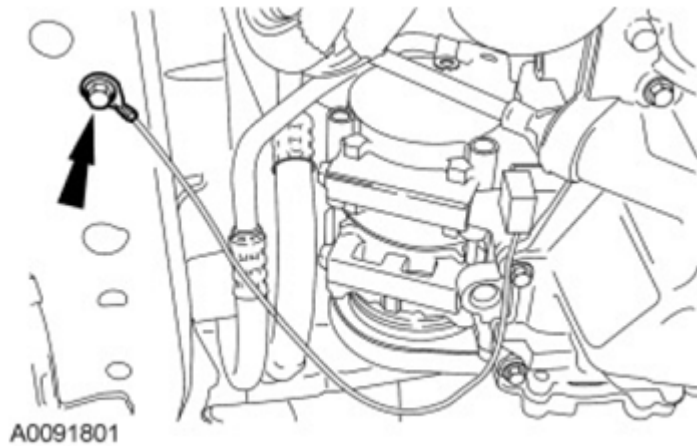


Fig. 589: Locating Ground Eyelet Bolts
Courtesy of FORD MOTOR CO.

41. Install the generator air duct and make sure the tab is latched.

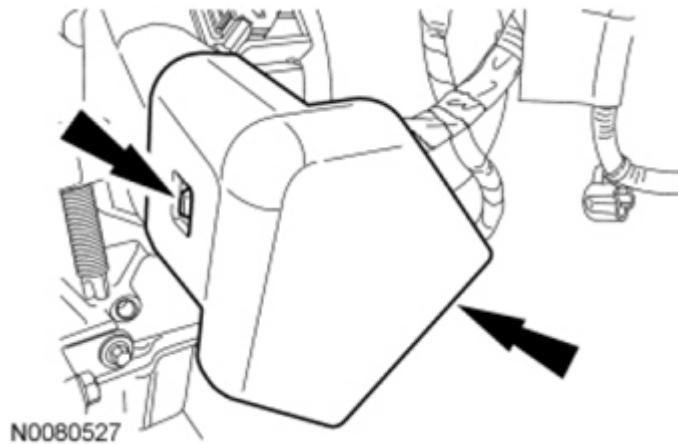
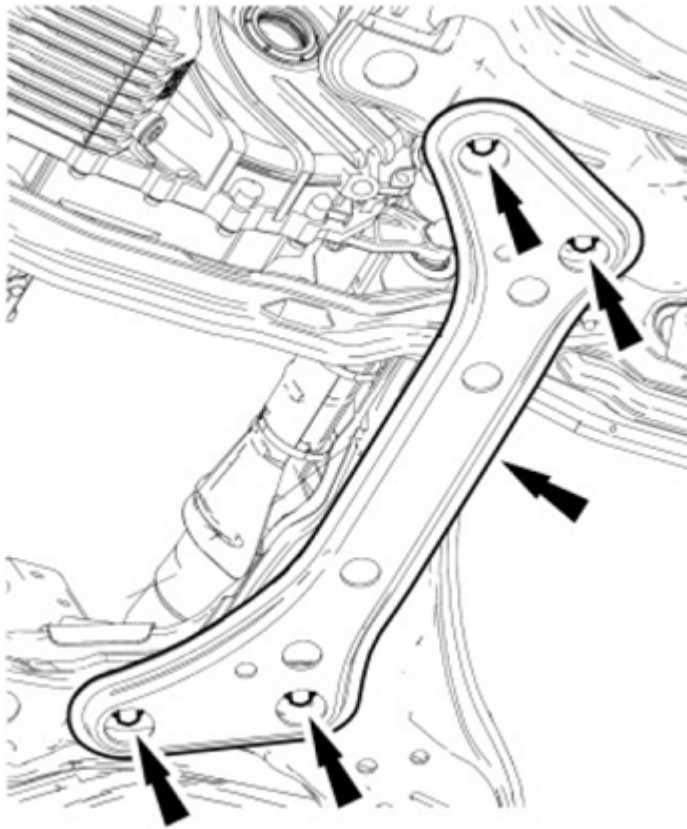


Fig. 590: Locating Locking Tab And Generator Air Duct
Courtesy of FORD MOTOR CO.

42. Install the accessory drive belt tensioner. For additional information, refer to **ACCESSORY DRIVE - 2.5L** article.
43. Install the exhaust downpipe and exhaust intermediate pipe. For additional information, refer to **EXHAUST SYSTEM** article.
44. Install the lateral support crossmember and bolts.
 - Tighten to 115 Nm (85 lb-ft).



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Fig. 591: Locating Lateral Support Crossmember Bolts
Courtesy of FORD MOTOR CO.

45. Install the LH halfshaft and the intermediate shaft. For additional information, refer to **FRONT DRIVE HALFSHAFTS** article.
46. Install the battery tray. For additional information, refer to **BATTERY, BATTERY MOUNTING SYSTEM & BATTERY CABLES** article.
47. Install the engine Air Cleaner (ACL) and ACL outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING - 2.5L** article.
48. Fill the engine with clean engine oil.
49. Fill and bleed the cooling system. For additional information, refer to **ENGINE COOLING** article.
50. Bleed the clutch system. For additional information, refer to **MANUAL TRANSAXLE/TRANSMISSION AND CLUTCH - GENERAL INFORMATION** article.
51. If the engine was disassembled, use the scan tool to perform the Misfire Monitor Neutral Profile Correction procedure following the on-screen instructions.