

2013 Ford Fiesta S

2013 ENGINE Engine Mechanical - 1.6L - Fiesta

2013 ENGINE**Engine Mechanical - 1.6L - Fiesta****SPECIFICATIONS****MATERIAL SPECIFICATIONS**

Item	Specification	Fill Capacity
Gasket Maker TA-16	WSK- M2G348-A5	-
Motorcraft® Full Synthetic Manual Transmission Fluid XT-M5-QS	WSD- M2C200-C	-
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	4.05L (4.3 qt) includes filter change/3.75L (3.96 qt) without filter change
Motorcraft® Specialty Orange Engine Coolant VC-3-B (US); CVC-3-B (Canada)	WSS- M97B44-D	-
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	-
Thread Sealant with PTFE TA-24	WSK- M2G350-A2	-

GENERAL SPECIFICATIONS

Item	Specification
Engine	
Displacement	1.6L
No. of cylinders	4
Bore/stroke	79.0/81.4 mm (3.11/3.20 in)
Firing order	1-3-4-2
Oil pressure (hot @ 800 rpm)	100 kPa (14.5 psi)
Oil pressure (hot @ 2,000 rpm)	200 kPa (29.0 psi)
Compression ratio	11:1
Engine weight - (with flexplate)	81.0 kg (178.6 lb)
Engine and transaxle weight - automatic transaxle	157.2 kg (346.6 lb)

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Engine weight - (with flywheel)	90.5 kg (199.5 lb)
Engine and transaxle weight - manual transaxle	166.6 kg (367.5 lb)
Cylinder Block	
Cylinder bore diameter	79.005-79.025 mm (3.110-3.111 in)
Cylinder bore maximum out-of-round	0.008 mm (0.0003 in)
Main bearing bore diameter	54.000-54.018 mm (2.126-2.127 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	
Piston diameter (single grade)	78.977 - 78.991 mm (3.1093 - 3.1099 in)
Piston-to-cylinder bore clearance	0.0135 - 0.0485 mm (0.0005 - 0.0019 in)
Ring groove width - top	1.23-1.25 mm (0.048-0.049 in)
Ring groove width - 2nd	1.52-1.54 mm (0.059-0.060 in)
Ring groove width - oil	2.01-2.03 mm (0.079-0.080 in)
Piston skirt coating thickness	Tin Plating
Piston Pin	
Diameter	17.996-18.000 mm (0.7085-0.7086 in)
Length	51.0-51.3 mm (2.00-2.01 in)
Piston-to-pin clearance	0.012-0.020 mm (0.0005-0.0008 in)
Pin-to-rod clearance	Press fit
Cylinder Head	
Cylinder head flatness	0.1 mm (0.003 in) overall
Valve lift @ zero lash (exhaust)	8.6 mm (0.338 in)
Valve lift @ zero lash (intake)	8.7 mm (0.342 in)
Valve guide diameter	6.000-6.030 mm (0.242-0.244 in)
Valve seat width - intake/exhaust	1 mm 1 ± 0.15 mm (0.039 in ± 0.006 in)
Valve seat angle	45 degrees
Valve seat runout	0.029 mm (0.001 in)
Valve tappet bore diameter	28.8-29.2 mm (1.13-1.15 in)
Cam bore diameter	25.0-25.03 mm (0.98-.099 in)
Valve	
Valve head diameter - intake	30.1 mm ± 0.15 mm (1.18 in ± 0.006 in)
Valve head diameter - exhaust	24.1 mm ± 0.15 mm (0.95 in ± 0.006 in)
Valve stem diameter - intake	5.968 mm ± 0.0075 mm (0.235 in ± 0.0003 in)
Valve stem diameter - exhaust	5.958 mm ± 0.0075 mm (0.234 in ± 0.0003 in)
Valve stem-to-guide clearance - intake	0.0245-0.0695 mm (0.0010-0.0027 in)
Valve stem-to-guide clearance - exhaust	0.0295-0.0745 mm (0.0011-0.003 in)
Valve face runout	0.03 mm (0.001 in)
Valve face angle	44.5 degrees ± 0.15 mm (0.005 in)
Valve Spring - Compression Pressure	

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Intake and exhaust (installed)	180 N ± 11 N
Intake (valve open) 8.9 mm (0.35 in) of lift	320 N ± 20 N
Exhaust (valve open) 8.94 mm (0.351 in) of lift	320 N ± 20 N
Free length	48.7 mm ± 0.8 mm (1.92 in ± 0.031 in)
Assembled height	35.60 mm (1.401 in)
Crankshaft	
Main bearing journal diameter	47.980-48.000 mm (1.888-1.889 in)
Production repair	47.730-47.750 mm (1.878-1.879 in)
Main bearing clearance	0.024-0.044 mm (0.0009-0.0017 in)
Connecting rod journal diameter	43.980-44.000 mm (1.731-1.732 in)
Production repair	43.730-43.750 mm (1.721-1.722 in)
End play	0.2-0.43 mm (0.008-0.017 in)
Rings	
Width - top	1.19-1.23 mm (0.0468-0.0484 in)
Width - 2nd	1.495-1.53 mm (0.059-0.060 in)
Width - oil	2 mm (0.078 in)
Ring gap (in bore) - top	0.16-0.26 mm (0.0062-0.0102 in)
Ring gap (in bore) - 2nd	0.7-0.9 mm (0.0275-0.0295 in)
Ring gap (in bore) - oil	0.2-0.9 mm (0.0078-0.0295 in)
Valve Tappet	
Diameter	27.965-27.980 (1.100-1.101 in)
Tappet-to-valve clearance - intake	0.17-0.23 mm (0.007-0.009 in)
Tappet-to-valve clearance - exhaust	0.31-0.37 mm (0.012-0.015 in)
Tappet-to-bore clearance	0.020-0.065 mm (0.0008-0.0025 in)
Camshaft	
End play	0.07-0.20 mm (0.003-0.008 in)
Lobe lift - intake	8.9 mm (0.35 in)
Lobe lift - exhaust	8.94 mm (0.351 in)
Runout (1) ⁽¹⁾	0.02 mm (0.0008 in)
Thrust clearance	30.960-30.980 mm (1.21-1.22 in)
Journal diameter	24.97 mm ± 0.01 mm (0.98 in ± 0.0004 in)
Journal-to-bore clearance	0.020-0.070 mm (0.0008-0.0027 in)
Connecting Rod	
Running clearance	0.024-0.044 mm (0.0009-0.0017 in)
Bearing clearance	0.024-0.044 mm (0.0009-0.0017 in)
Bearing thickness (grade 1)	1.499-1.506 mm (0.0590-0.0592 in)
Bearing thickness (grade 2)	1.506-1.513 mm (0.0592-0.0595 in)
Bearing thickness (grade 3)	1.513-1.520 mm (0.0595-0.0598 in)
Bearing thickness (grade 4)	1.520-1.527 mm (0.0598-0.0601 in)

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Crank bore diameter	47.025-47.045 mm (1.851-1.852 in)
Pin bore diameter	17.965-17.985 mm (0.7072-0.7080 in)
Length (center to center)	137 mm (5.393 in)

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

TORQUE SPECIFICATIONS

Description	Nm	lb-ft	lb-in
Accessory drive belt idler pulley bracket bolts (without A/C only)	24	18	-
Accessory drive belt splash shield bolts	9	-	80
A/C compressor bolts and stud bolt	25	18	-
A/C line bracket nut	9	-	80
Battery tray bolts	10	-	89
Battery tray bracket nuts	10	-	89
Bellhousing-to-engine bolts	48	35	-
Block heater nut	3	-	27
Camshaft bearing caps ⁽¹⁾	-	-	-
Camshaft phaser and sprocket bolts - Exhaust ⁽¹⁾	-	-	-
Camshaft phaser and sprocket bolts - Intake ⁽¹⁾	-	-	-
Camshaft phaser and sprocket plugs	16	-	142
Camshaft Position (CMP) bolts	9	-	80
Camshaft trigger wheel bolts	21	15	-
Catalytic converter bracket-to-catalytic converter bolts	25	18	-
Catalytic converter bracket-to-engine bolts	50	37	-
Catalytic converter-to-cylinder head studs	17	-	150
Catalytic converter heat shield bolts	10	-	89
Catalytic converter nuts and bolt ⁽¹⁾	-	-	-
Catalytic converter-to-muffler bolts	48	35	-
Clutch pressure plate ⁽¹⁾	-	-	-
Connecting rod cap bolts ⁽¹⁾	-	-	-
Coolant outlet bolts	19	-	168
Coolant outlet bracket nut and bolt	6	-	53
Coolant pump bolts ⁽¹⁾	-	-	-
Coolant pump pulley bolts	20	-	177
Crankshaft rear seal bolts ⁽¹⁾	-	-	-
Crankshaft Position (CKP) sensor bolts	8	-	71
Crankshaft pulley bolt ⁽¹⁾	-	-	-
Crankcase vent oil separator bolts	9	-	80
Cylinder head bolts ⁽¹⁾	-	-	-
Engine ground wire bolt	10	-	89

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Engine lifting eye bolts - LH	19	-	168
Engine mount bolts	48	35	-
Engine mount bracket bolts ⁽¹⁾	-	-	-
Engine mount nuts ⁽¹⁾	-	-	-
Engine mount studs	8	-	71
Engine Oil Pressure (EOP) switch	18	-	159
Engine plug bolt	20	-	177
Engine-to-bellhousing bolts	48	35	-
Evaporative Emission (EVAP) canister purge valve bolt	9	-	80
Flexplate bolts ⁽¹⁾	-	-	-
Flexplate-to-clutch nuts ⁽¹⁾	-	-	-
Flywheel bolts ⁽¹⁾	-	-	-
Fuel rail bolts	11	-	97
Halfshaft bracket lower bolts	24	18	-
Halfshaft bracket upper bolt	48	35	-
Heated Oxygen Sensor (HO2S) electrical connector bracket nut	8	-	71
Ignition coil screws	6	-	53
Intake manifold bolts	18	-	159
Main bearing beam bolts ⁽¹⁾	-	-	-
Knock Sensor (KS)	20	-	177
Oil cooler bolt	56	41	-
Oil filter	15	-	133
Oil level indicator tube screw	4	-	35
Oil pan drain plug	28	21	-
Oil pan bolts ⁽¹⁾	-	-	-
Oil pan-to-bellhousing bolts	48	35	-
Oil pump bolts ⁽¹⁾	-	-	-
Oil pump screen and pickup tube bolts	9	-	80
PCM cover bolt	5.4	-	47.8
Positive battery cable nut	10	-	89
Selector lever cable bolt	10	-	89
Selector lever cable bracket bolts	25	18	-
Spark plugs	15	-	133
Starter motor bolts	48	35	-
Starter motor electrical terminals nuts	10	-	89
Thermostat housing bolts ⁽¹⁾	-	-	-
Timing belt cover backplate bolts	9	-	80
Timing belt cover bolts - Lower	9	-	80
Timing belt cover bolts - Upper	9	-	80

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Timing belt tensioner bolt	25	18	-
Transaxle fill plug	35	26	-
Transaxle support insulator bolts	90	66	-
Transaxle support insulator nuts	125	92	-
Transaxle roll-restrictor bolts	70	52	-
Valve cover retainers ⁽¹⁾	-	-	-
Variable Camshaft Timing (VCT) bridge bolts ⁽¹⁾	-	-	-
VCT solenoid bolts	8	-	71
Windage tray bolts	9	-	80
(1) Refer to the appropriate procedure in this service information.			

DESCRIPTION AND OPERATION

ENGINE

The 1.6L 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
- Twin independent Variable Camshaft Timing (VCT) system
-

The 1.6L engine is a 4 valve-per-cylinder, dual overhead camshaft engine. The engine uses an ignition coil and spark plug wires. 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 head 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 belt. The belt is driven by a sprocket that is located on the crankshaft. The piston assembly is an aluminum piston with a sinter forged carbon steel connecting rod. The oil pump is driven by the crankshaft.

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 the correct parts are obtained. These codes contain all the pertinent information relating to the dates, optional equipment and revisions.

Engine Code Information Label

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

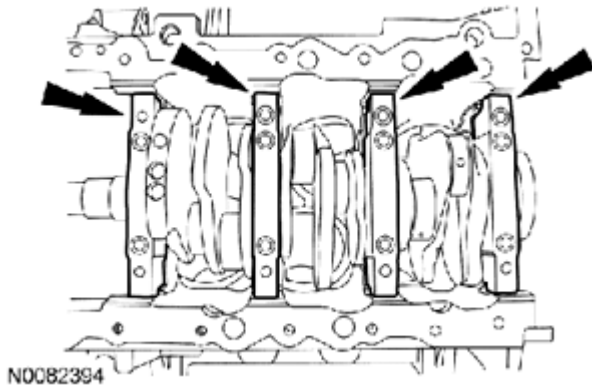


Fig. 1: Identifying Engine Code Information Label
Courtesy of FORD MOTOR CO.

Item	Description
1	Engine part number
2	Derivative of build
3	Bar code
4	Engine build date and time
5	Engine displacement
6	Engine build date (YYMMDD)
7	Bar code
8	Plant code (Taubate)

Engine Cylinder Identification

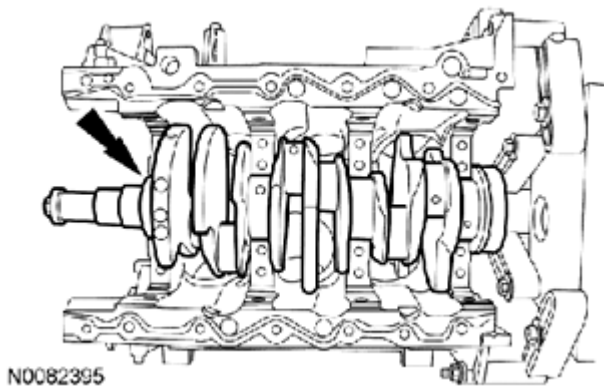


Fig. 2: Identifying Engine Cylinder Identification
Courtesy of FORD MOTOR CO.

Exhaust Emission Control System

Operation and necessary maintenance of the exhaust emission control devices used on this engine are covered in the **ENGINE CONTROLS - INTRODUCTION (EXCEPT DIESEL & HYBRID) (SECTION 0)** .

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

Twin Independent Variable Camshaft Timing (VCT) System

The twin independent VCT system allows variable control of intake valve closing which optimizes combustion at full load providing improved power and low speed torque (broadening the torque curve) which enables variable valve overlap which provides better fuel economy and emissions and provides optimized cold start operation with improved exhaust emissions.

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 and is cooled by an oil cooler.
- 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 SYSTEM - GENERAL INFORMATION** for basic mechanical concerns or refer to the **ENGINE CONTROLS - INTRODUCTION (EXCEPT DIESEL & HYBRID) (SECTION 0)** for driveability concerns.

GENERAL PROCEDURES

VALVE CLEARANCE CHECK

1. Remove the valve cover. For additional information, REFER to **Valve Cover**.
2. Remove the 4 spark plugs. For additional information, refer to **ENGINE IGNITION - 1.6L**.
3. Remove the 2 bolts and accessory drive belt splash shield.
 - To install, tighten to 9 Nm (80 lb-in).

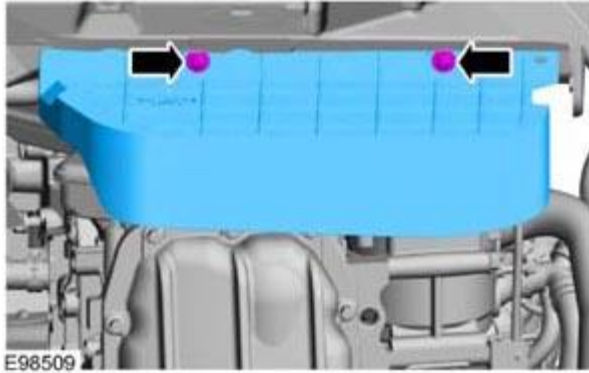


Fig. 3: Locating Bolts And Accessory Drive Belt Splash Shield
Courtesy of FORD MOTOR CO.

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

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

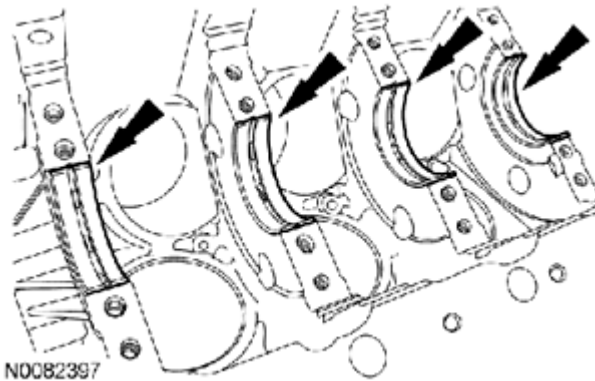


Fig. 4: Measuring Valve Clearance Using Feeler Gauge
Courtesy of FORD MOTOR CO.

4. Use a feeler gauge to measure each valve's clearance 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 0.20 mm (0.0079 in) for intake and 0.34 mm (0.0133 in) for exhaust.

NOTE: The acceptable clearances after being fully installed is 0.17-0.23 mm (0.007-0.009 in) for intake and 0.31-0.37 mm (0.012-0.015 in) for exhaust.

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

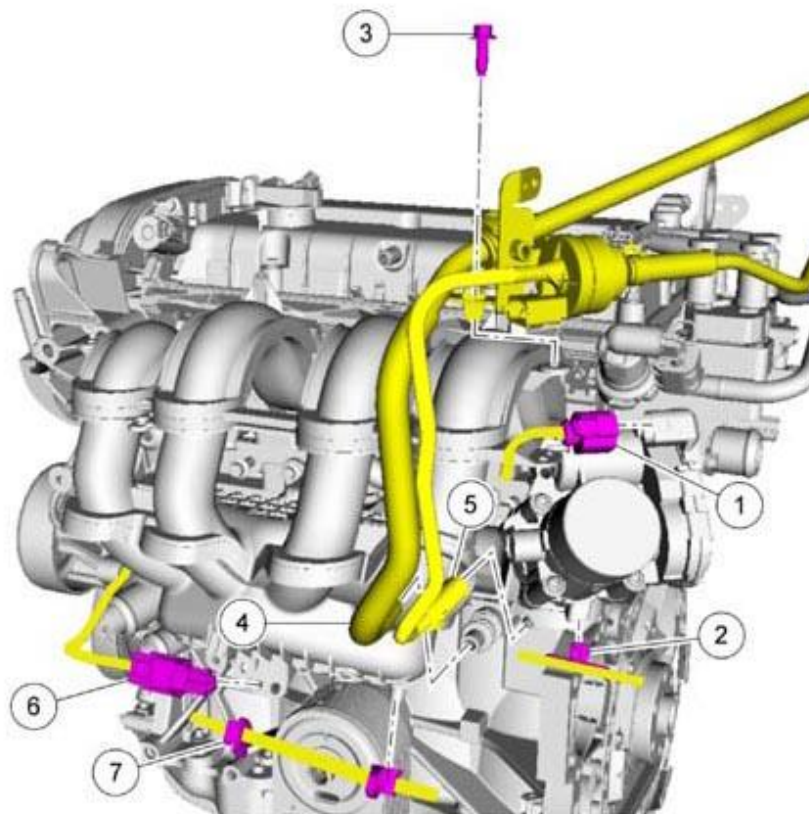
Select the closest tappet size to the ideal tappet thickness available and mark the installation location.

6. 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-VEHICLE REPAIR

INTAKE MANIFOLD

Intake Manifold (View 1 of 2)



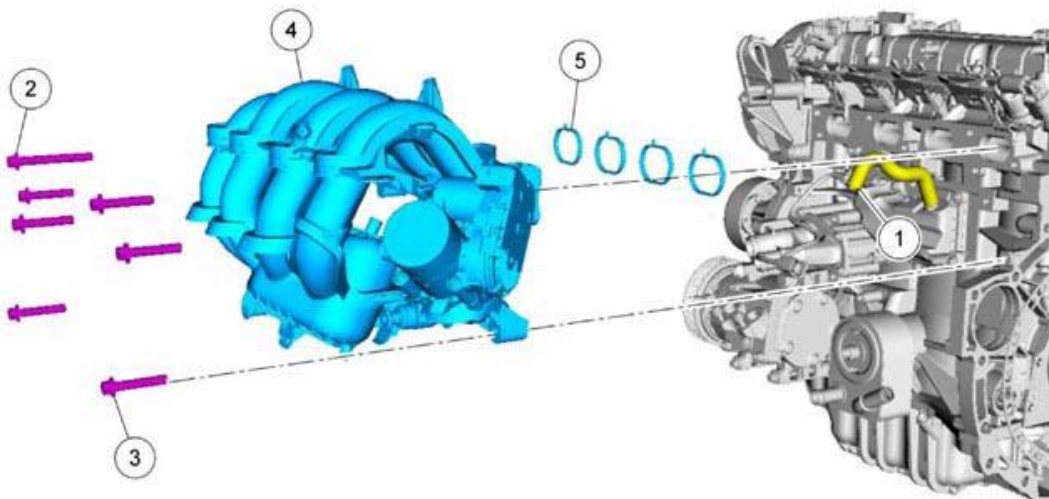
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Fig. 5: Exploded View Of Intake Manifold (1 Of 2)

Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	-	Throttle Body (TB) electrical connector (part of 12A581)
2	-	TB wiring harness retainer (part of 12A581)
3	W500213	Evaporative Emission (EVAP) canister purge valve bolt - 9 Nm (80 lb-in)
4	9C490	Brake booster vacuum tube
5	9C047	EVAP canister purge valve tube
6	-	Knock Sensor (KS) electrical connector (part of 12A581)
7	-	Wiring harness retainer (part of 12A581) (2 required)

Intake Manifold (View 2 of 2)



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Fig. 6: Exploded View Of Intake Manifold (2 Of 2)

Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6N664	PCV hose
2	W500117	Intake manifold bolt - 18 Nm (159 lb-in)
3	W500112	Intake manifold bolt (7 required) - 18 Nm (159 lb-in)
4	9424	Intake manifold
5	9439	Intake manifold gasket (4 required)

Removal

1. Remove the air cleaner outlet tube. For additional information, refer to **INTAKE AIR DISTRIBUTION**

& FILTERING .

2. Disconnect the crankcase vent tube from the valve cover.
 - Detach the 2 crankcase vent tube retainers.

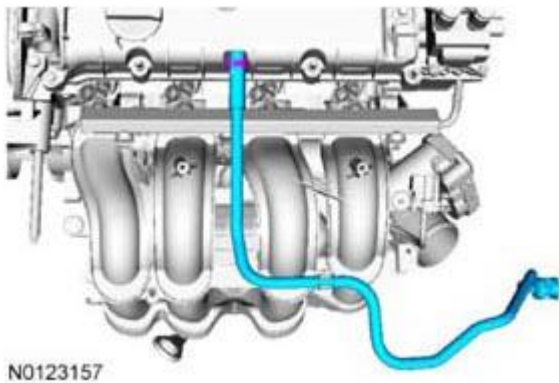


Fig. 7: Identifying Crankcase Vent Tube Retainers
Courtesy of FORD MOTOR CO.

3. Remove the fuel rail. For additional information, refer to **FUEL CHARGING AND CONTROLS - 1.6L .**
4. Remove the generator. For additional information, refer to **CHARGING SYSTEM .**
5. Remove the screw and the oil level indicator and tube.
 - Inspect and replace the O-ring seal, if necessary.

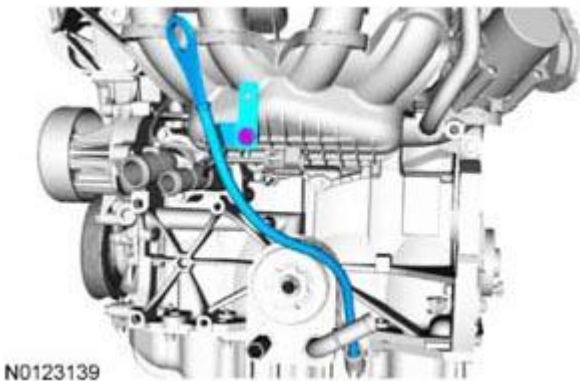


Fig. 8: Identifying Oil Level Indicator Tube And Screw
Courtesy of FORD MOTOR CO.

6. Disconnect the Throttle Body (TB) electrical connector.
 - Detach the wiring harness retainer from the TB.

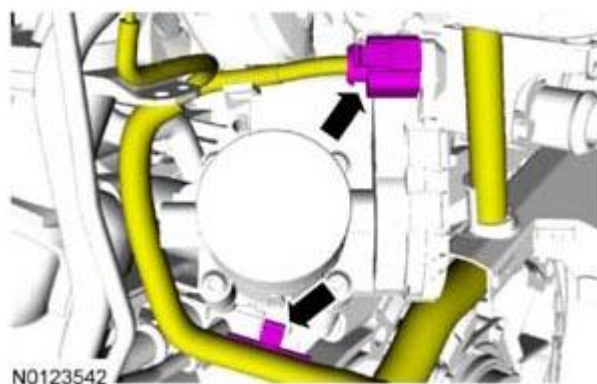


Fig. 9: Locating Throttle Body (TB) Electrical Connector
Courtesy of FORD MOTOR CO.

7. Disconnect the PCV hose from the intake manifold.

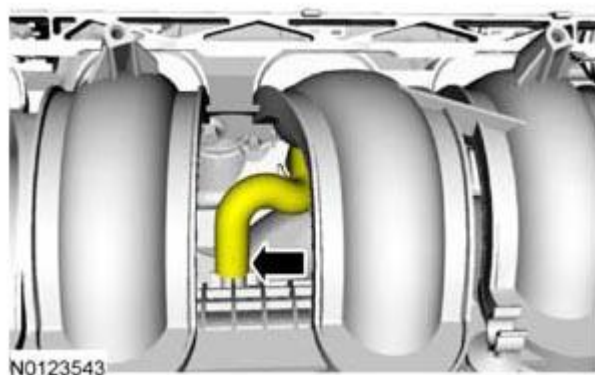


Fig. 10: Locating PCV Hose From Intake Manifold
Courtesy of FORD MOTOR CO.

8. Remove the bolt for the Evaporative Emission (EVAP) canister purge valve.

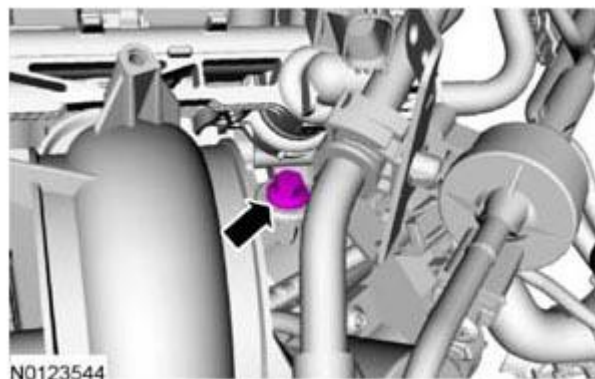


Fig. 11: Locating Evaporative Emission (EVAP) Canister Purge Valve Bolt
Courtesy of FORD MOTOR CO.

9. Disconnect the brake booster vacuum tube from the intake manifold.

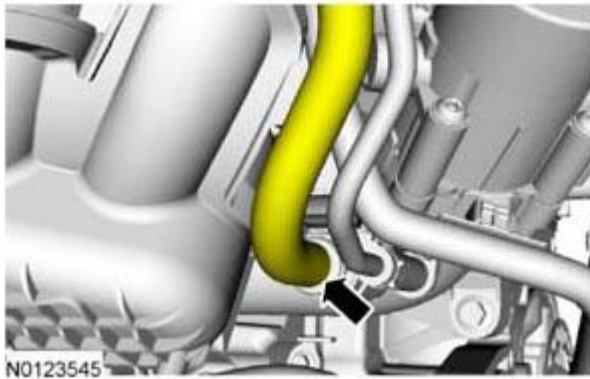


Fig. 12: Locating Brake Booster Vacuum Tube From Intake Manifold
Courtesy of FORD MOTOR CO.

10. Disconnect the EVAP canister purge valve tube from the intake manifold and position the EVAP canister purge valve aside.

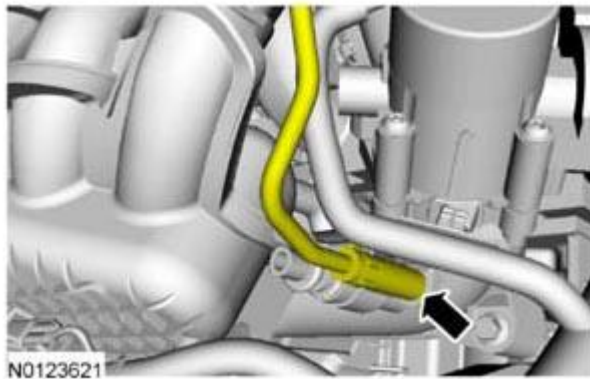


Fig. 13: Locating EVAP Canister Purge Valve Tube From Intake Manifold
Courtesy of FORD MOTOR CO.

11. Detach the Knock Sensor (KS) electrical connector from the bottom of the intake manifold.
 - Detach the 2 wiring harness retainers from the bottom of the intake manifold.

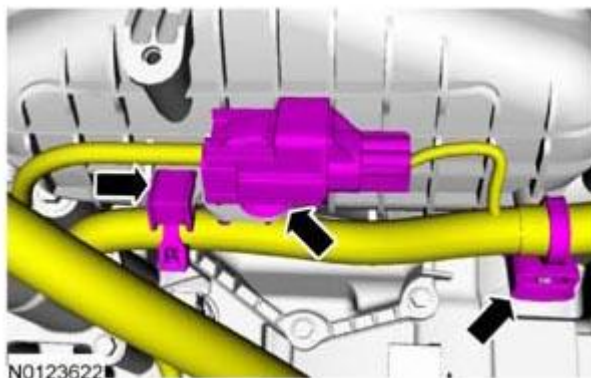


Fig. 14: Locating Knock Sensor (KS) Electrical Connector From Bottom Of Intake Manifold
Courtesy of FORD MOTOR CO.

12. Remove the 7 bolts for the intake manifold.

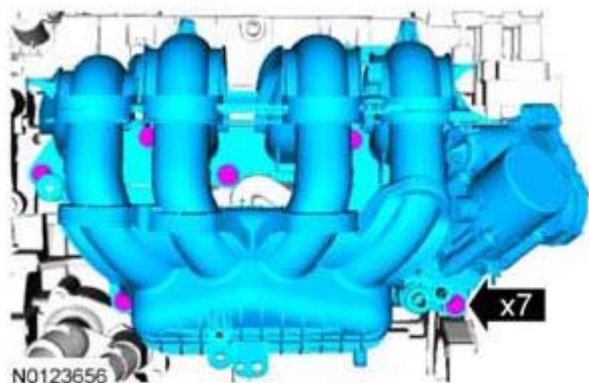
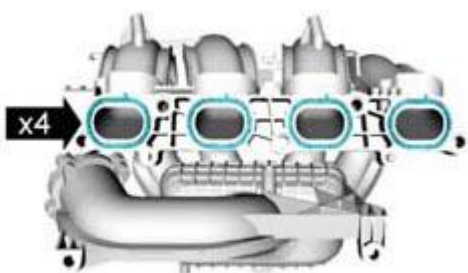


Fig. 15: Locating Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

Installation

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

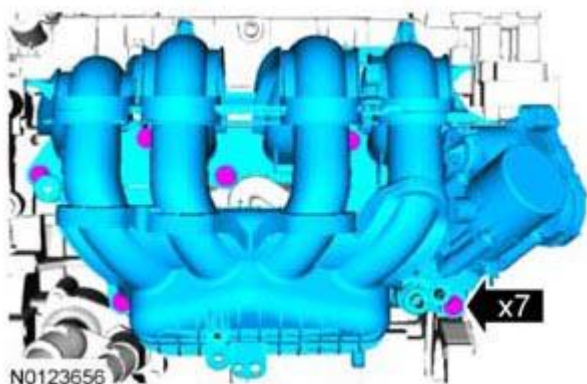
1. Inspect and install new intake manifold gaskets, if necessary.



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Fig. 16: Locating Intake Manifold Gaskets
Courtesy of FORD MOTOR CO.

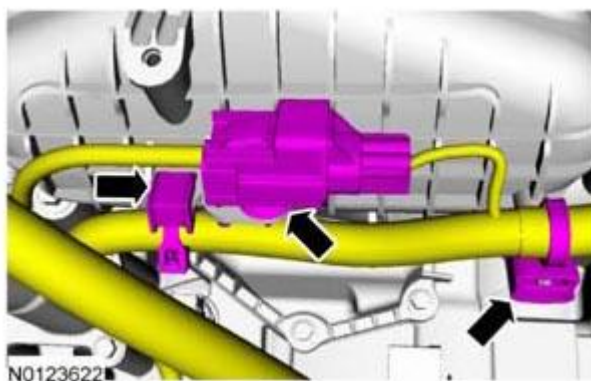
2. Install the intake manifold and the 7 bolts.
 - Tighten to 18 Nm (159 lb-in).



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Fig. 17: Locating Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

3. Attach the KS electrical connector to bottom of the intake manifold.
 - Attach the 2 wiring harness retainers to the bottom of the intake manifold.



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Fig. 18: Locating Knock Sensor (KS) Electrical Connector From Bottom Of Intake Manifold
Courtesy of FORD MOTOR CO.

4. Position and connect the EVAP canister purge valve tube to the intake manifold.

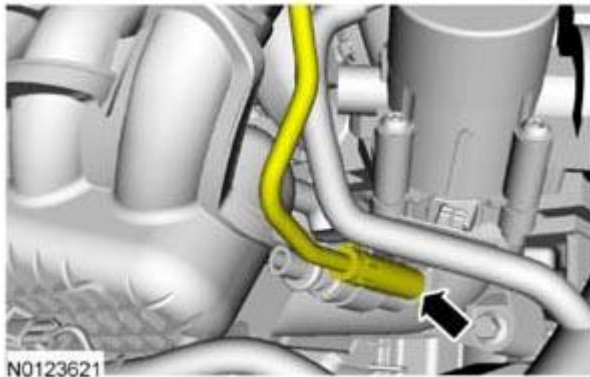


Fig. 19: Locating EVAP Canister Purge Valve Tube From Intake Manifold
Courtesy of FORD MOTOR CO.

5. Connect the brake booster vacuum tube to the intake manifold.

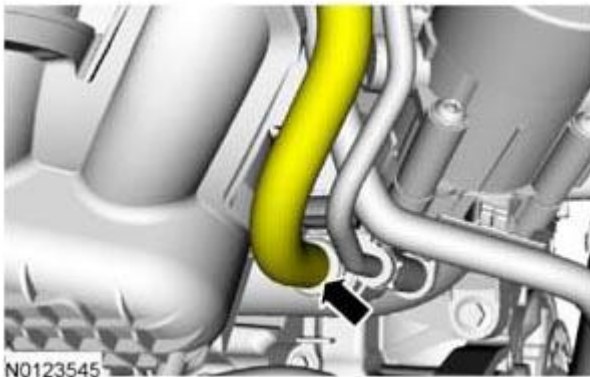


Fig. 20: Locating Brake Booster Vacuum Tube To Intake Manifold
Courtesy of FORD MOTOR CO.

6. Install the bolt for the EVAP canister purge valve.
 - Tighten to 9 Nm (80 lb-in).

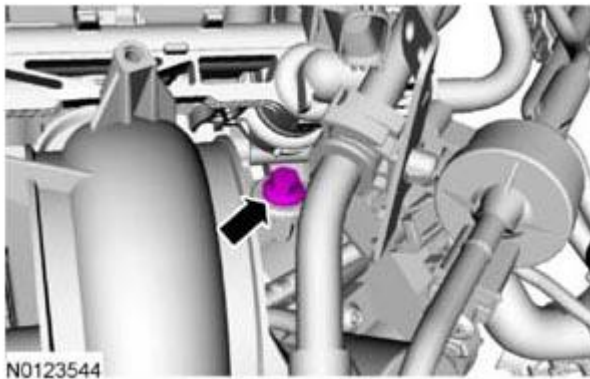


Fig. 21: Locating Evaporative Emission (EVAP) Canister Purge Valve Bolt
Courtesy of FORD MOTOR CO.

7. Connect the PCV hose to the intake manifold.

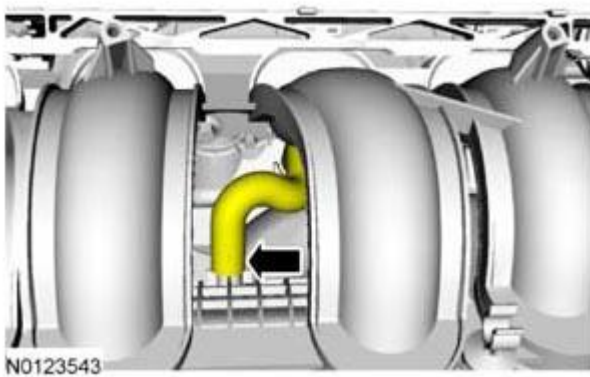


Fig. 22: Locating PCV Hose To Intake Manifold
Courtesy of FORD MOTOR CO.

8. Connect the TB electrical connector.
 - Attach the wiring harness retainer to the TB.

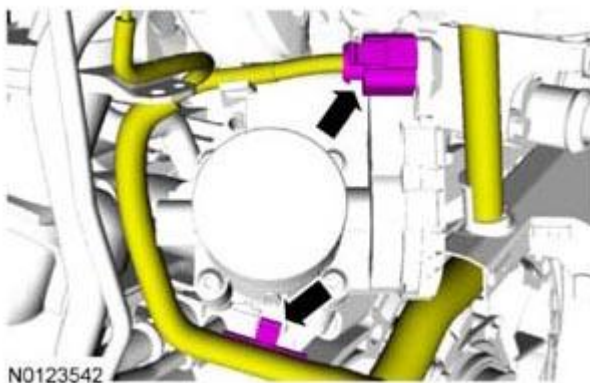


Fig. 23: Locating Throttle Body (TB) Electrical Connector

Courtesy of FORD MOTOR CO.

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

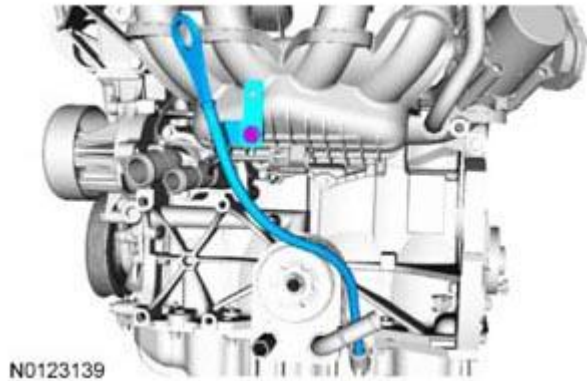


Fig. 24: Identifying Oil Level Indicator Tube And Screw
Courtesy of FORD MOTOR CO.

9. Install the oil level indicator and tube and the screw.
 - Tighten to 4 Nm (35 lb-in).
10. Install the generator. For additional information, refer to **CHARGING SYSTEM**.
11. Install the fuel rail. For additional information, refer to **FUEL CHARGING AND CONTROLS - 1.6L**.
12. Connect the crankcase vent tube to the valve cover.
 - Attach the 2 crankcase vent tube retainers.

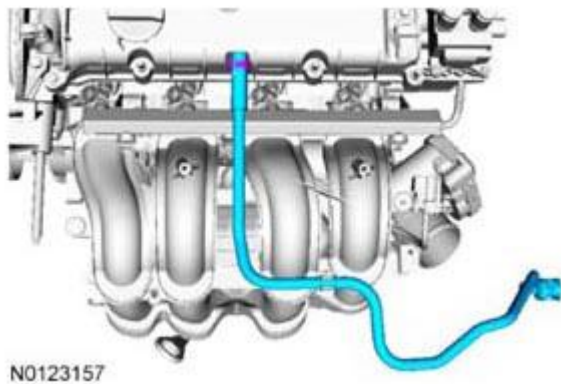
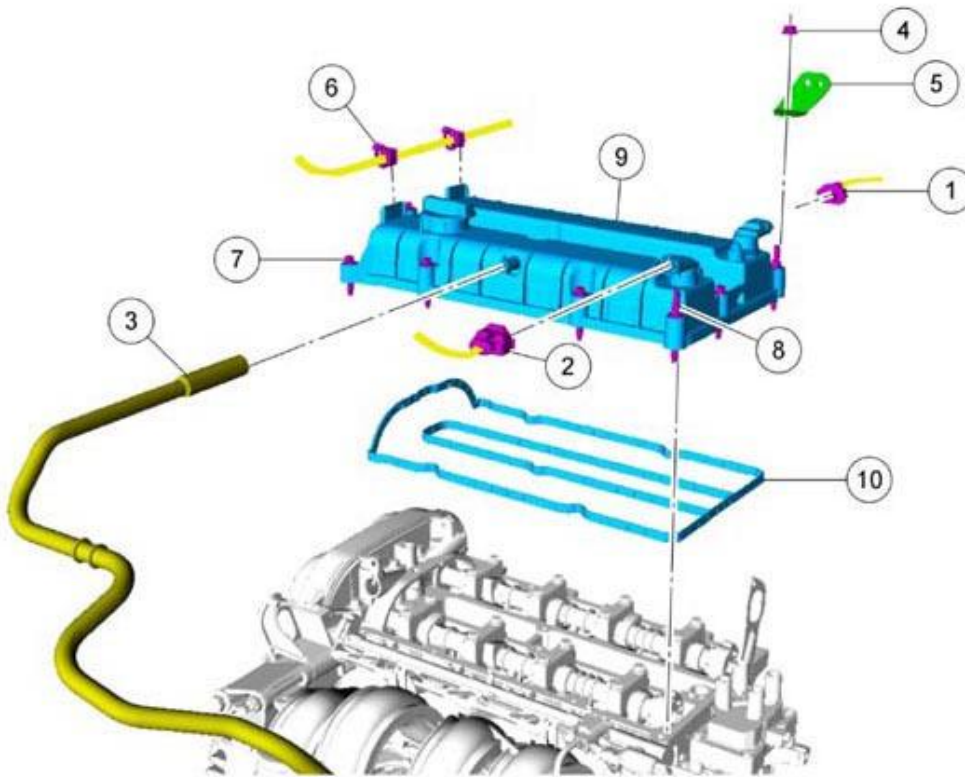


Fig. 25: Identifying Crankcase Vent Tube Retainers
Courtesy of FORD MOTOR CO.

13. Install the air cleaner outlet tube. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING**.

VALVE COVER



N0123263

Fig. 26: Exploded View Of Valve Cover
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	-	Exhaust Camshaft Position (CMP) sensor electrical connector (part of 12A581)
2	-	Intake CMP sensor electrical connector (part of 12A581)
3	6A664	Crankcase vent tube
4	W520412	Heated Oxygen Sensor (HO2S) connector bracket nut - 8 Nm (71 lb-in)
5	14A163	HO2S connector bracket
6	-	Wiring harness retainer (part of 12A581) (2 required)
7	-	Valve cover bolt (8 required) (part of 6M293) - 9 Nm (80 lb-in)
8	-	Valve cover stud bolt (4 required) (part of 6M293) - 9 Nm (80 lb-in)
9	6582	Valve cover
10	6584	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.

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. Remove the 2 Variable Camshaft Timing (VCT) oil control solenoids. For additional information, refer to **ELECTRONIC ENGINE CONTROLS**.
2. Disconnect the 2 Camshaft Position (CMP) sensor electrical connectors.
3. Remove the spark plug wires. For additional information, refer to **ENGINE IGNITION - 1.6L**.
4. Disconnect the crankcase vent tube from the valve cover.
5. Remove the nut and the Heated Oxygen Sensor (HO2S) electrical connector bracket.
6. Detach all the wiring harness retainers from the valve cover.
7. Loosen the 12 retainers and remove the valve cover.
 - Discard the gasket.

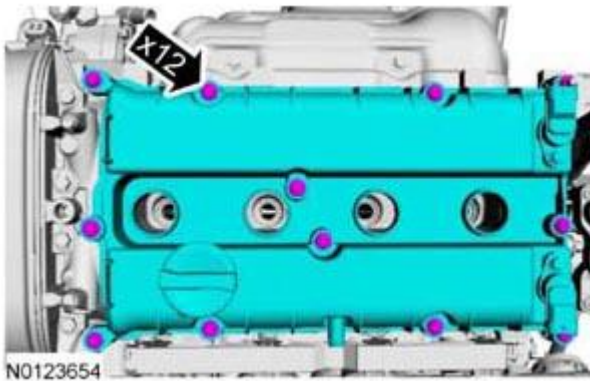


Fig. 27: Locating Retainers And Valve Cover
Courtesy of FORD MOTOR CO.

Installation

1. Using a new gasket, install the valve cover and tighten the retainers in sequence shown in illustration.
 - Tighten to 9 Nm (80 lb-in).

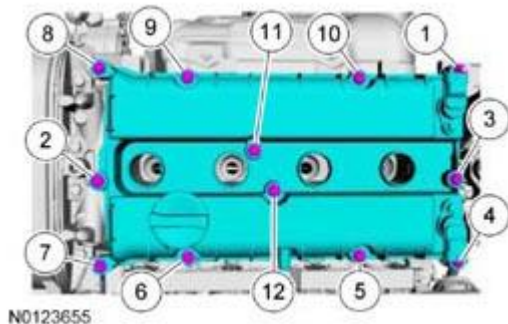
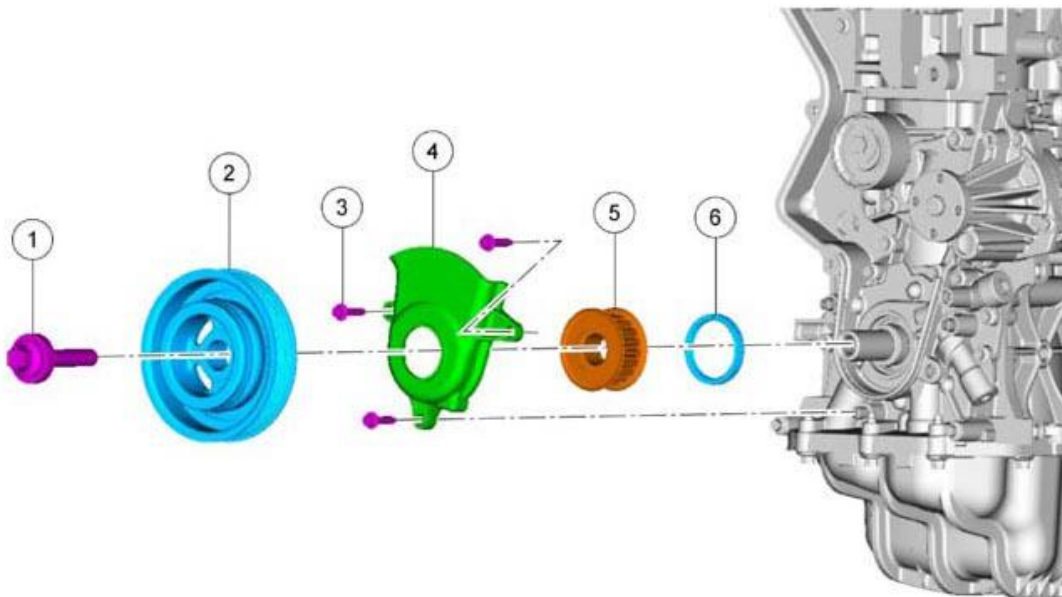


Fig. 28: Identifying Valve Cover And Retainers Tightening Sequence

Courtesy of FORD MOTOR CO.

2. Attach all the wiring harness retainers to the valve cover.
3. Install the Heated Oxygen Sensor (HO2S) electrical connector bracket and nut.
 - Tighten to 8 Nm (71 lb-in).
4. Connect the crankcase vent tube to the valve cover.
5. Install the spark plug wires. For additional information, refer to **ENGINE IGNITION - 1.6L**.
6. Connect the Camshaft Position (CMP) sensor electrical connectors.
7. Install the 2 Variable Camshaft Timing (VCT) oil control solenoids. For additional information, refer to **ELECTRONIC ENGINE CONTROLS**.

CRANKSHAFT PULLEY AND CRANKSHAFT FRONT SEAL - EXPLODED VIEW



N0123850

Fig. 29: Exploded View Of Crankshaft Pulley And Crankshaft Front Seal
Courtesy of FORD MOTOR CO.

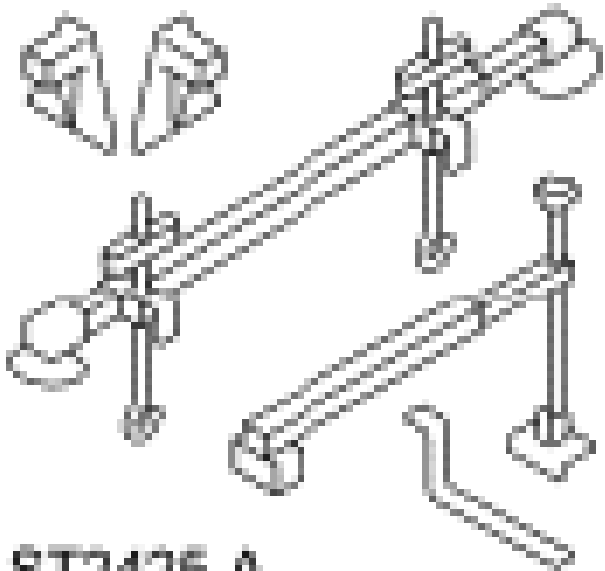
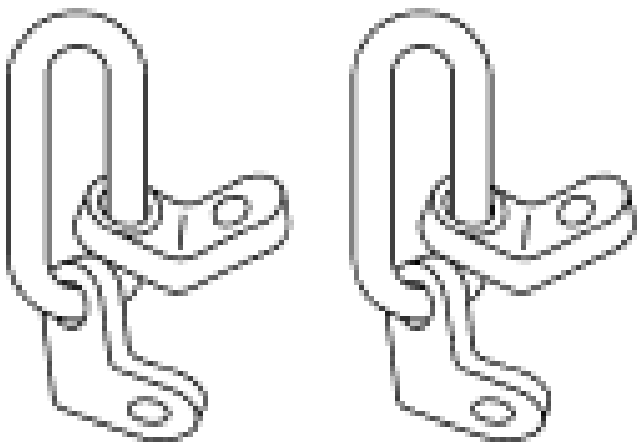
Item	Part Number	Description
1	6A340	Crankshaft pulley bolt
2	6312	Crankshaft pulley
3	W500215	Lower timing belt cover bolt (3 required)
4	6019	Lower timing belt cover
5	6306	Crankshaft sprocket gear
6	6700	Crankshaft front seal

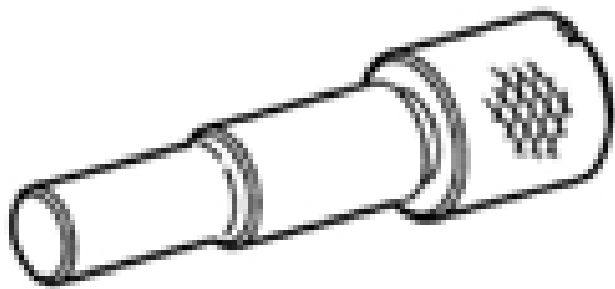
Removal and Installation

1. Refer to the appropriate procedures and/or exploded views in this service information for any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of removal.

CRANKSHAFT PULLEY

SPECIAL TOOLS

 <p>ST2425-A</p>	<p>Engine Support Bar 303-F072</p>
 <p>ST1595-A</p>	<p>Lifting Bracket, Engine 303-050 (T70P-6000)</p>



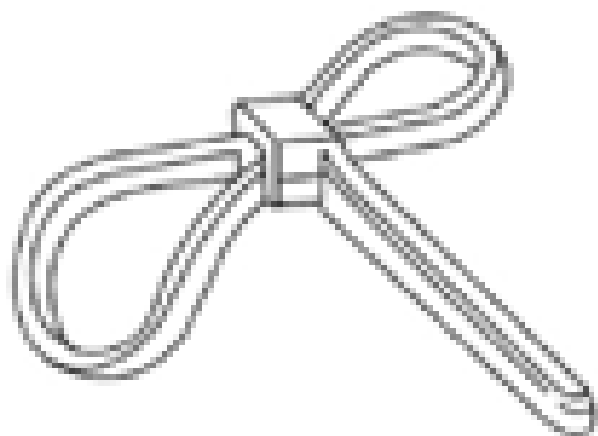
Pin, Crankshaft Top Dead Center (TDC)
303-748

ST3262-A



Tool, Variable Camshaft Timing (VCT)
Alignment
303-1097

ST3261-A



ST1438-A

Strap Wrench

303-D055 (D85L-6000-A) or equivalent**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. The crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. 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**.
2. Remove the upper and lower cowl panel grilles. For additional information, refer to **FRONT END BODY PANELS**.
3. Remove the RH front wheel and tire. For additional information, refer to **WHEELS AND TIRES**.

4. Remove the 2 bolts and accessory drive belt splash shield.

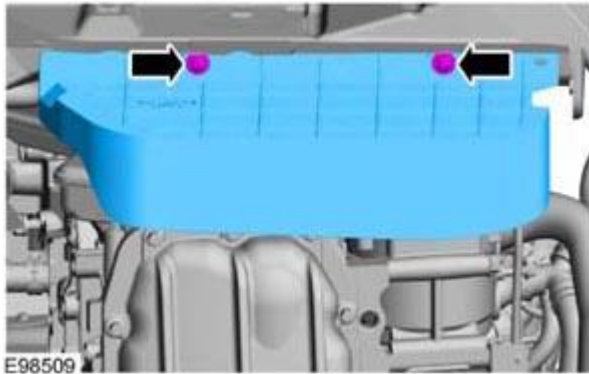


Fig. 30: Locating Bolts And Accessory Drive Belt Splash Shield
Courtesy of FORD MOTOR CO.

5. Loosen the 4 coolant pump bolts.

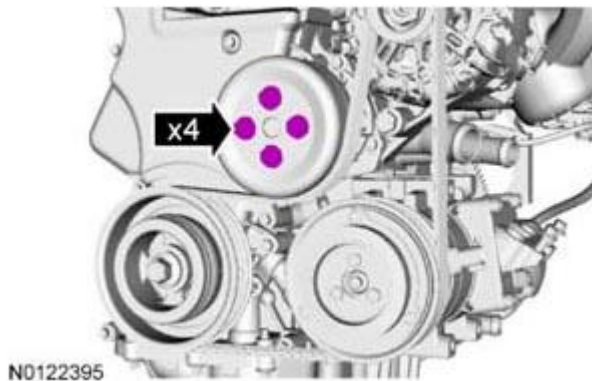


Fig. 31: Locating Coolant Pump Bolts
Courtesy of FORD MOTOR CO.

6. Remove the generator. For additional information, refer to **CHARGING SYSTEM**.
7. Release the 2 tabs and position the degas bottle aside.

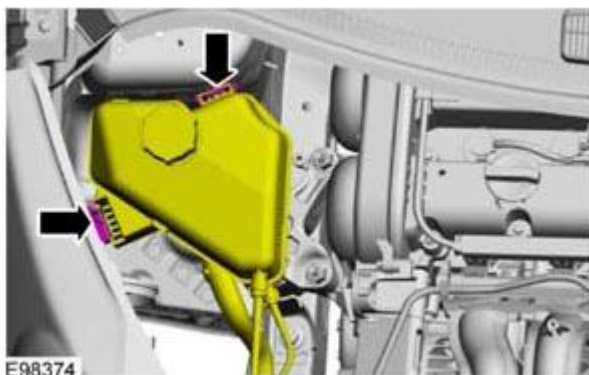


Fig. 32: Locating Tabs And Degas Bottle
Courtesy of FORD MOTOR CO.

8. Using a floor jack and a block of wood, support the engine.

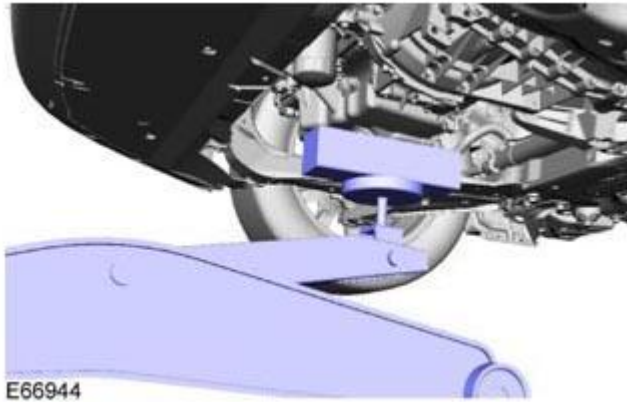


Fig. 33: Supporting Engine Using Floor Jack And Block Of Wood
Courtesy of FORD MOTOR CO.

NOTE: The engine mount studs must be held while removing the engine mount nuts or damage to the powertrain may occur.

NOTE: Do not loosen the engine mount center bolt or the engine may become improperly positioned.

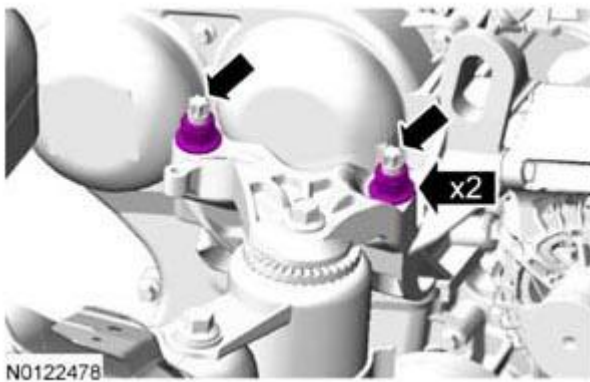


Fig. 34: Locating Engine Mount Nuts
Courtesy of FORD MOTOR CO.

9. Use the holding feature to prevent the engine mount studs from turning, remove the 2 engine mount nuts.
10. Remove the 3 bolts and the engine mount.

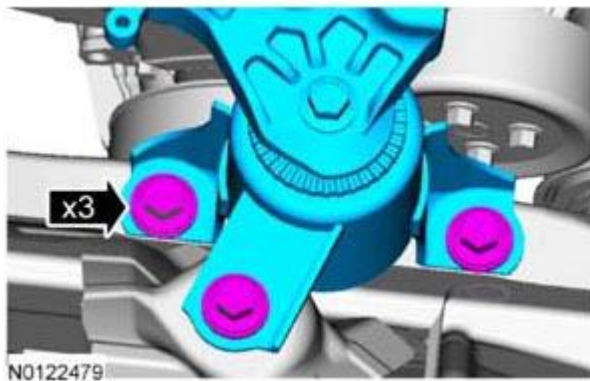


Fig. 35: Locating Bolts And Engine Mount
Courtesy of FORD MOTOR CO.

11. Remove the 4 bolts and coolant pump pulley.

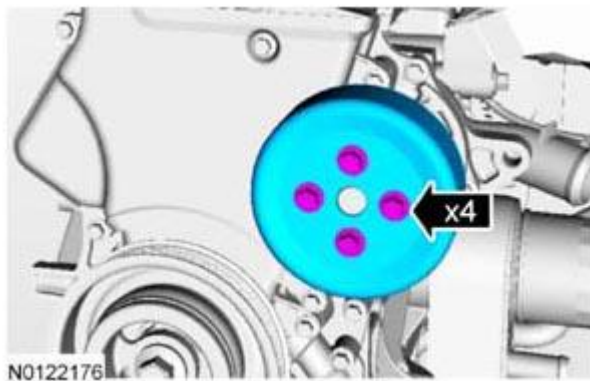


Fig. 36: Locating Bolts And Coolant Pump Pulley
Courtesy of FORD MOTOR CO.

12. Remove the 1 engine mount stud.

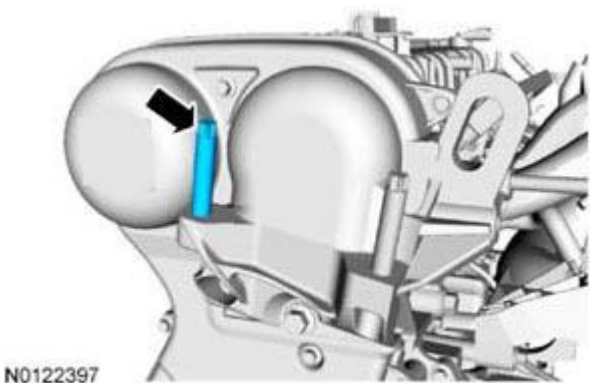


Fig. 37: Locating Engine Mount Stud
Courtesy of FORD MOTOR CO.

13. Remove the 9 bolts and the timing belt cover.

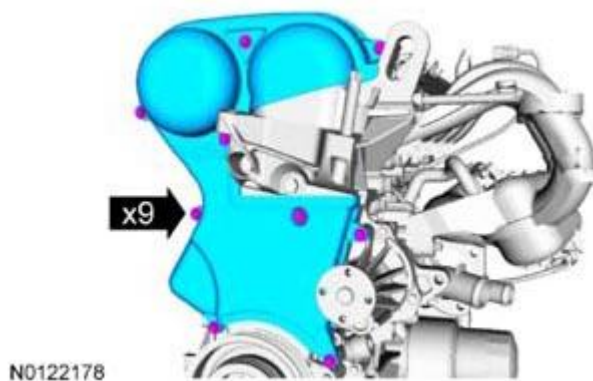


Fig. 38: Locating Bolts And Timing Belt Cover
Courtesy of FORD MOTOR CO.

14. Remove the 3 bolts and the engine mount bracket.

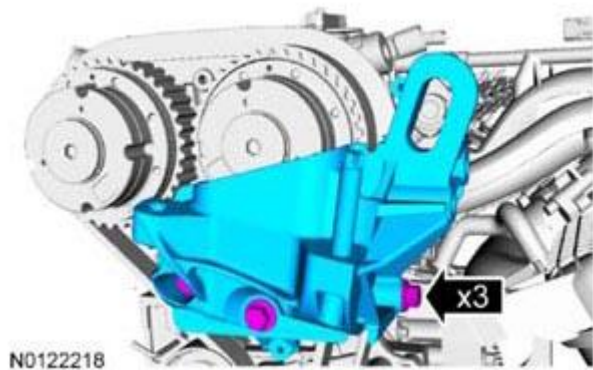


Fig. 39: Locating Bolts And Engine Mount Bracket
Courtesy of FORD MOTOR CO.

15. Using an engine mount bracket bolt, install the Engine Lifting Bracket.



Fig. 40: Installing Engine Lifting Bracket

Courtesy of FORD MOTOR CO.

16. Install the Engine Support Bar and support the engine.

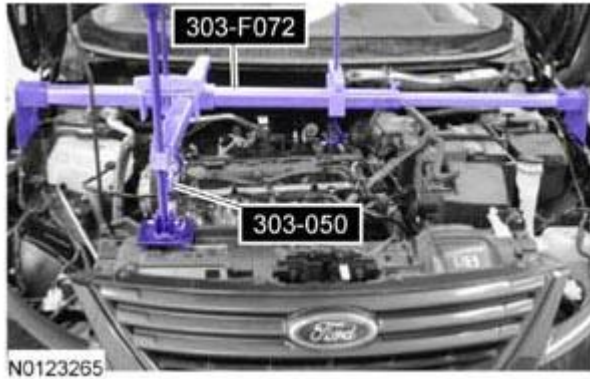


Fig. 41: Installing Engine Support Bar And Support Engine
Courtesy of FORD MOTOR CO.

17. Remove the floor jack and block of wood.

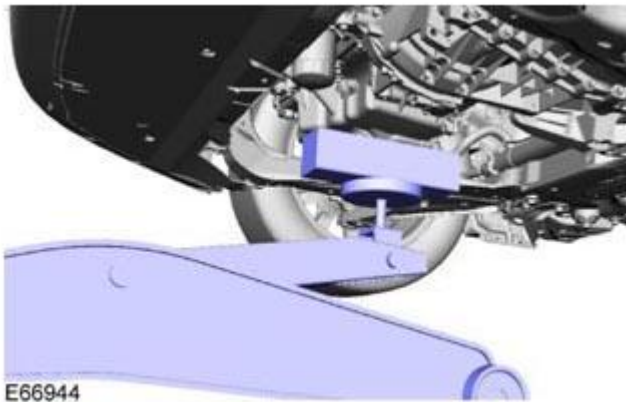


Fig. 42: Supporting Engine Using Floor Jack And Block Of Wood
Courtesy of FORD MOTOR CO.

NOTE: Only rotate the crankshaft in a clockwise direction.

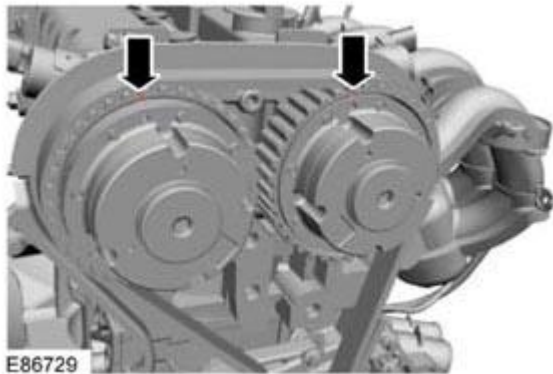


Fig. 43: Locating Markings On Camshaft Phaser And Sprockets
Courtesy of FORD MOTOR CO.

18. Using the crankshaft pulley bolt, turn the crankshaft clockwise until the markings on the camshaft phaser and sprockets are at the 11 o'clock position as shown in illustration.
19. Remove the engine plug bolt.

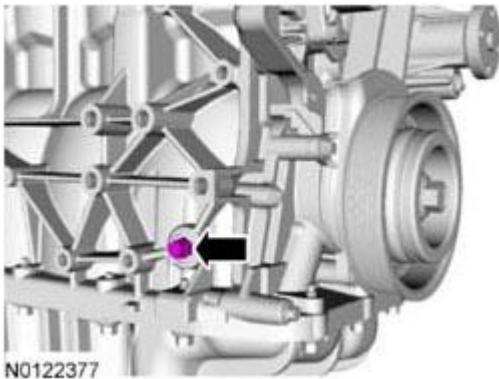


Fig. 44: Locating Engine Plug Bolt
Courtesy of FORD MOTOR CO.

NOTE: The Crankshaft Top Dead Center (TDC) Timing Pin 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.

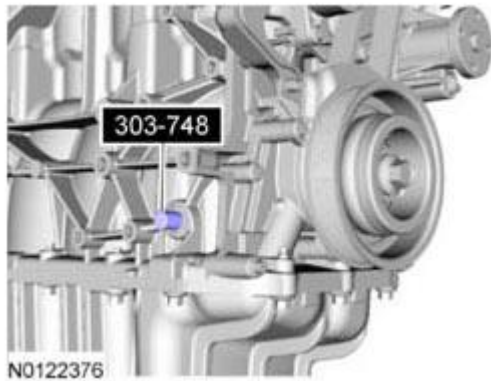


Fig. 45: Installing Crankshaft TDC Pin
Courtesy of FORD MOTOR CO.

20. Install the Crankshaft TDC Pin.

NOTE: Only rotate the crankshaft clockwise direction.



Fig. 46: Rotating Crankshaft
Courtesy of FORD MOTOR CO.

21. Rotate the crankshaft until it contacts Crankshaft TDC Pin.
22. Using the Strap Wrench, remove the crankshaft pulley bolt and the crankshaft pulley.
- Discard the crankshaft pulley bolt.

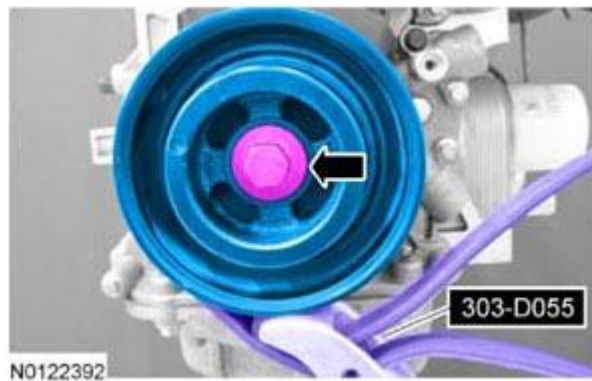


Fig. 47: Locating Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

23. Install the VCT Alignment Tool.

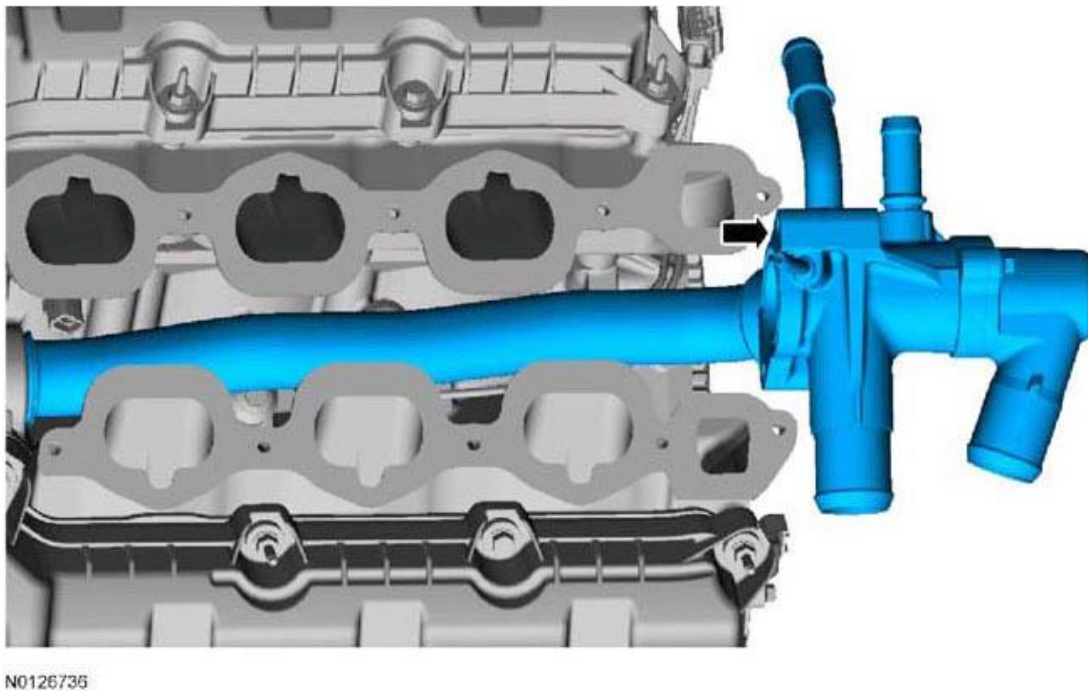
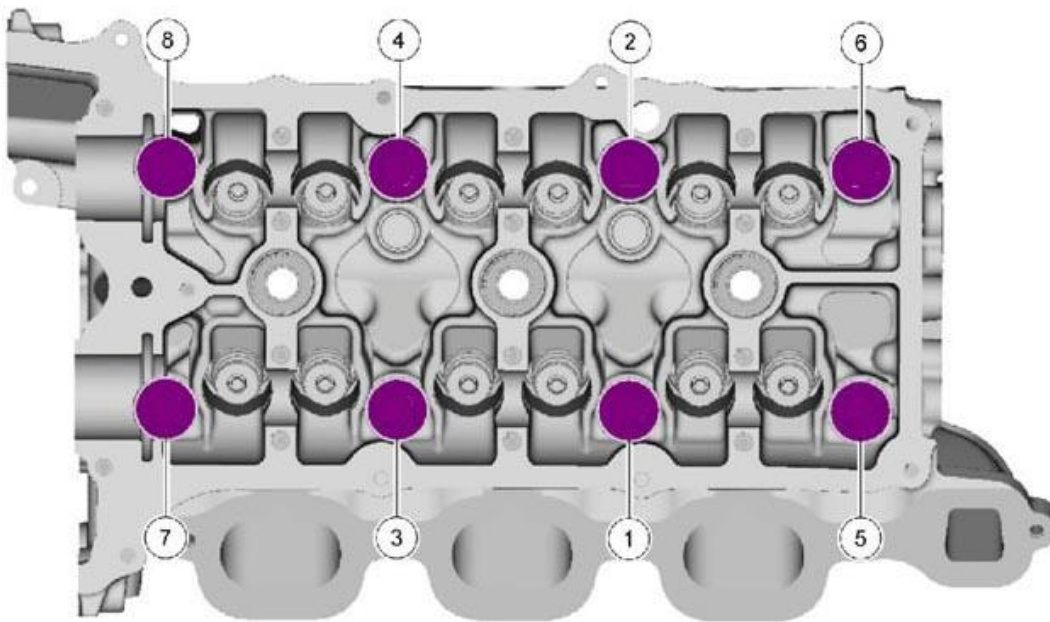


Fig. 48: Installing VCT Alignment Tool
Courtesy of FORD MOTOR CO.

Installation

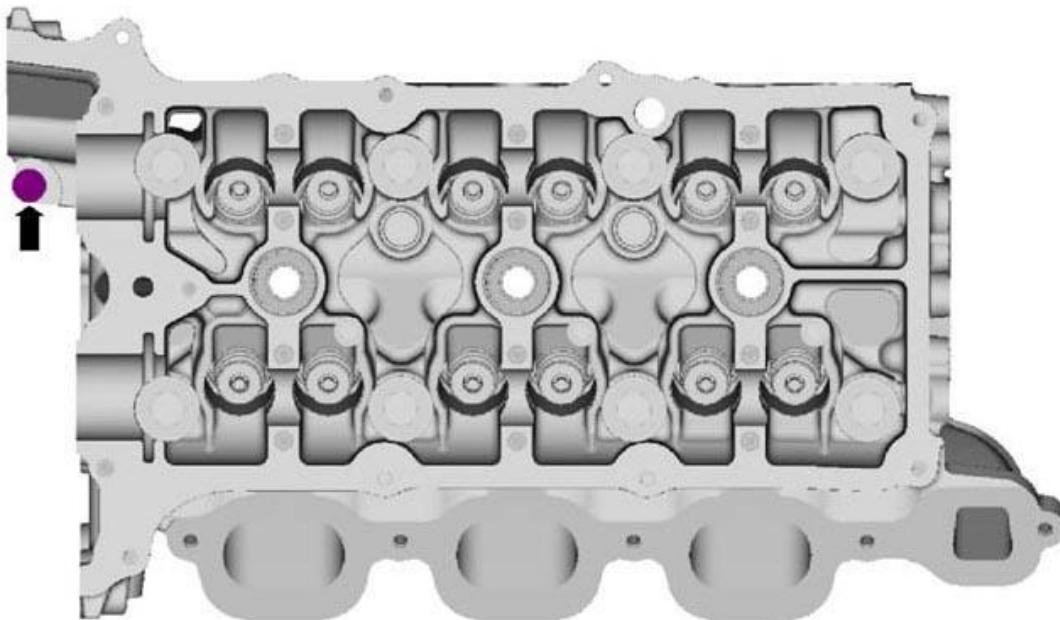
1. Install the crankshaft pulley and the new bolt.
 - Tighten to 100 Nm (74 lb-ft).
 - The final torque of the crankshaft will be completed in following steps.



N0127032

Fig. 49: Identifying Crankshaft Pulley And Bolt
Courtesy of FORD MOTOR CO.

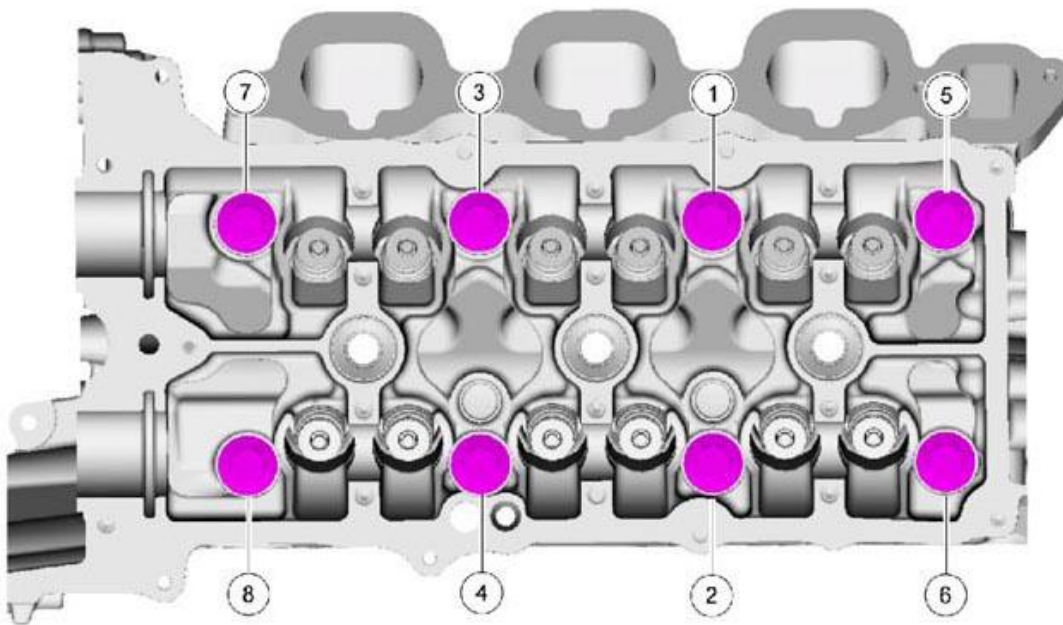
2. Remove the Crankshaft TDC Timing Pin.



N0127030

Fig. 50: Installing Crankshaft TDC Pin
Courtesy of FORD MOTOR CO.

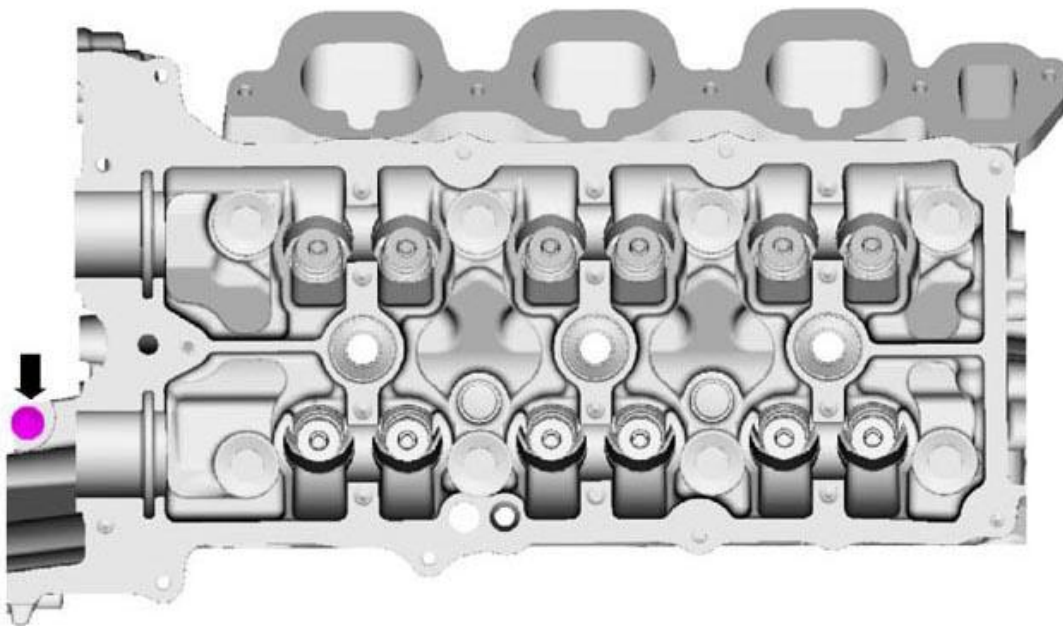
3. Remove the VCT Alignment Tool.



N0127035

Fig. 51: Removing VCT Alignment Tool
Courtesy of FORD MOTOR CO.

4. Tighten the crankshaft bolt in the following 3 stages.
 1. Stage 1: Using the Strap wrench, tighten an additional 90 degrees.
 2. Stage 2: Wait for 10 seconds.
 3. Stage 3: Using the Strap wrench, tighten an additional 15 degrees.



N0127033

Fig. 52: Locating Crankshaft Bolt
Courtesy of FORD MOTOR CO.

NOTE: Only rotate the crankshaft clockwise direction.



E93515

Fig. 53: Rotating Crankshaft
Courtesy of FORD MOTOR CO.

5. Rotate the crankshaft about 1 3/4 turns.
6. Install the Crankshaft TDC Timing Pin.

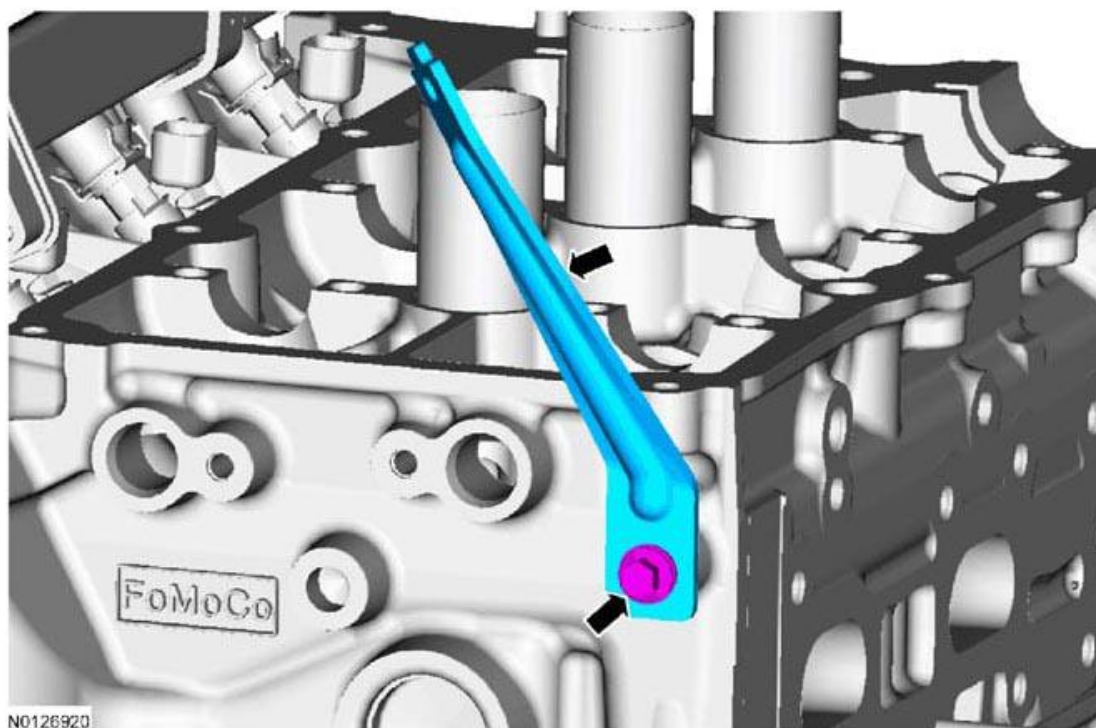


Fig. 54: Installing Crankshaft TDC Pin
Courtesy of FORD MOTOR CO.

NOTE: Only rotate the crankshaft clockwise direction.

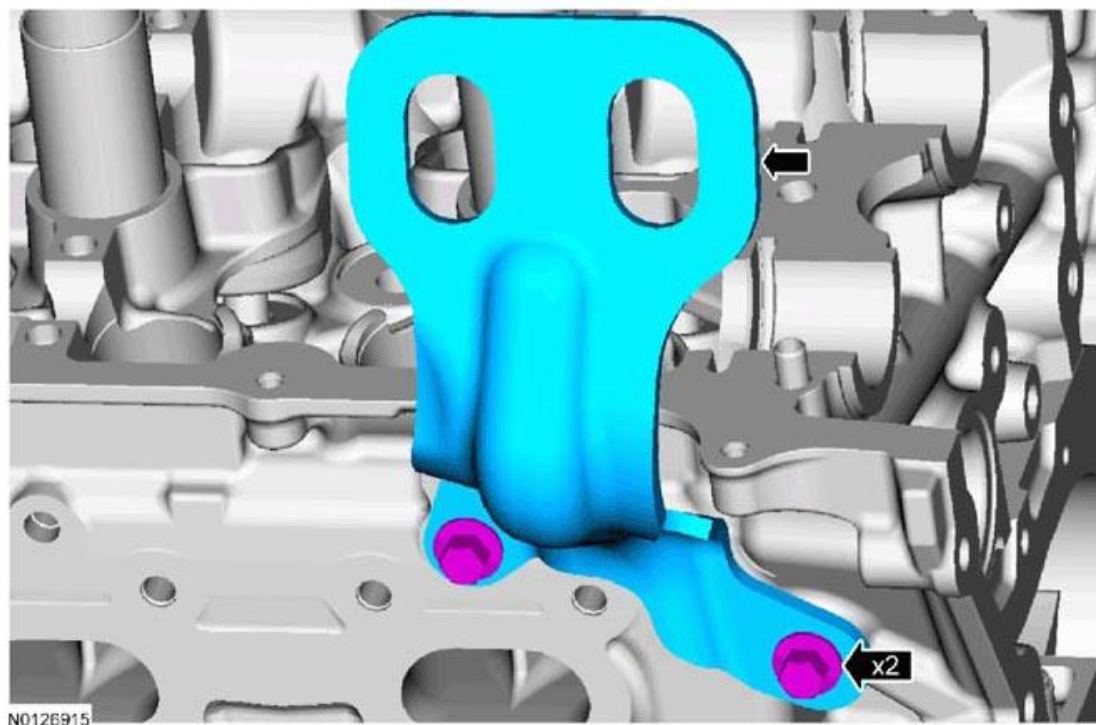


Fig. 55: Rotating Crankshaft

Courtesy of FORD MOTOR CO.

7. Rotate the crankshaft until it stops against the Crankshaft TDC Timing Pin.

NOTE: The special tool can only be installed if the valve timing is correct.

**Fig. 56: Installing VCT Alignment Tool**

Courtesy of FORD MOTOR CO.

8. Install the VCT Alignment Tool.
 - If the special tool cannot be installed, repeat the adjustment according to the preceding steps.
9. Remove the VCT Alignment Tool.

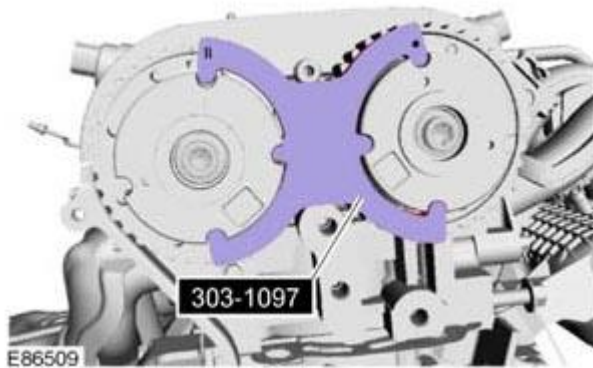


Fig. 57: Removing VCT Alignment Tool
Courtesy of FORD MOTOR CO.

10. Remove the Crankshaft TDC Timing Pin.

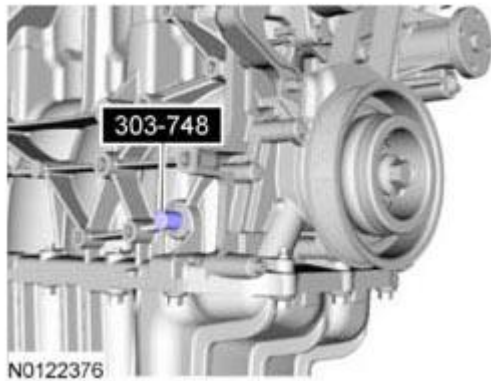


Fig. 58: Installing Crankshaft TDC Pin
Courtesy of FORD MOTOR CO.

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

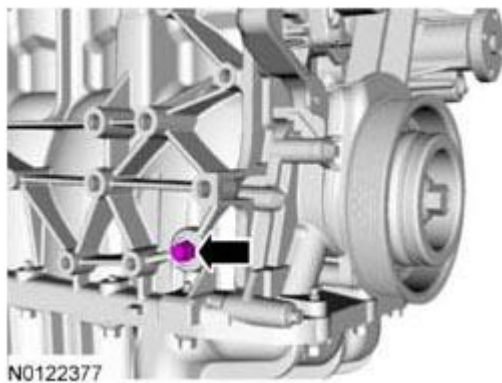


Fig. 59: Locating Engine Plug Bolt
Courtesy of FORD MOTOR CO.

12. Using a floor jack and a block of wood, support the engine.

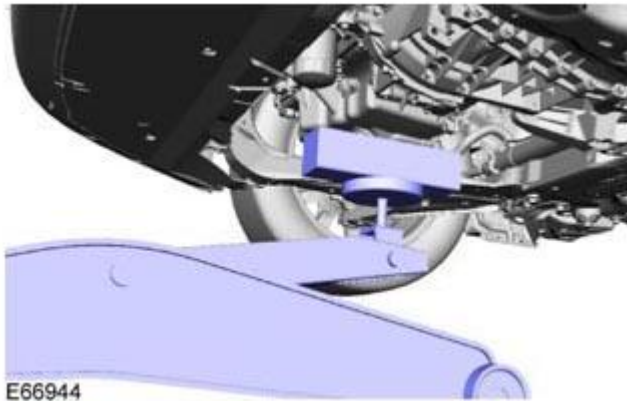


Fig. 60: Supporting Engine Using Floor Jack And Block Of Wood
Courtesy of FORD MOTOR CO.

13. Remove the Engine Support Bar.

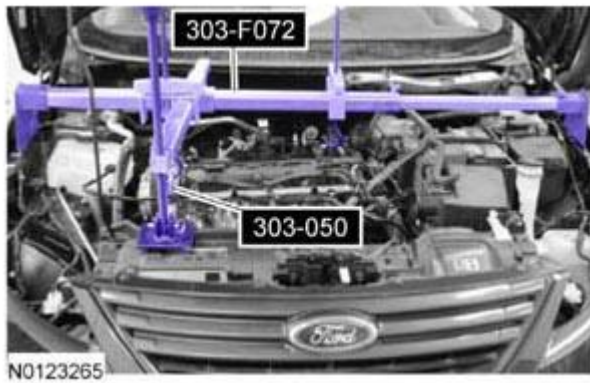


Fig. 61: Removing Engine Support Bar
Courtesy of FORD MOTOR CO.

14. Remove the bolt and the Engine Lifting Bracket.

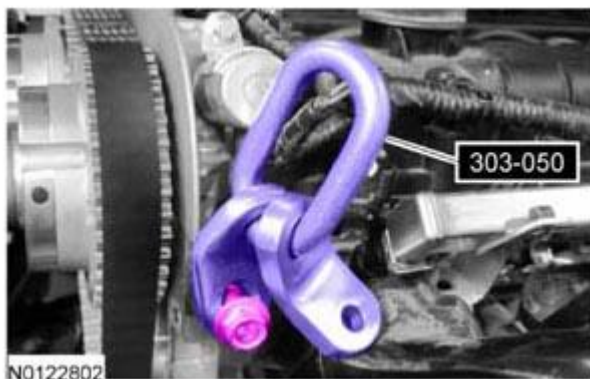


Fig. 62: Removing Engine Lifting Bracket
Courtesy of FORD MOTOR CO.

15. Install the engine mount bracket and the 3 bolts finger tight.
 1. Tighten the 2 bolts to 55 Nm (41 lb-ft).
 2. Tighten the bolt to 55 Nm (41 lb-ft).

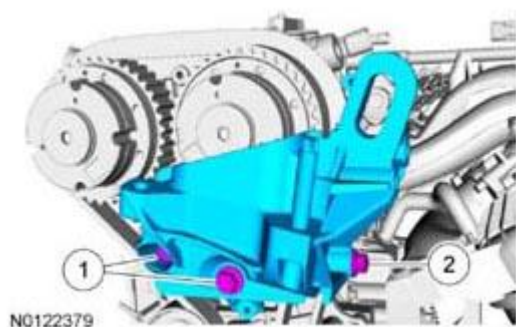


Fig. 63: Identifying Engine Mount Bracket And Bolts
Courtesy of FORD MOTOR CO.

16. Install the timing belt cover and the 9 bolts.
 - Tighten to 9 Nm (80 lb-in).

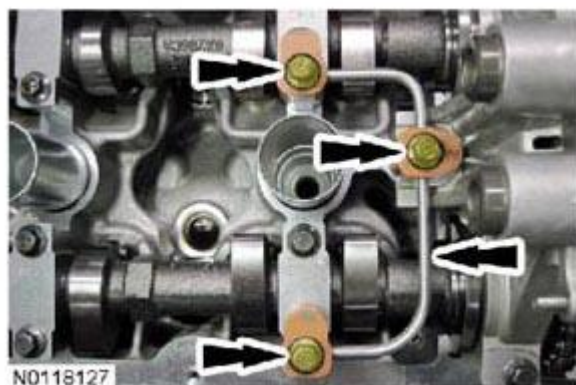


Fig. 64: Locating Bolts And Timing Belt Cover
Courtesy of FORD MOTOR CO.

17. Install the coolant pump pulley and the 4 bolts finger tight.



Fig. 65: Locating Bolts And Coolant Pump Pulley
Courtesy of FORD MOTOR CO.

18. Install the 1 engine mount stud finger tight.



Fig. 66: Locating Engine Mount Stud
Courtesy of FORD MOTOR CO.

NOTE: The 2 engine mount studs must be torqued or damage to the powertrain may occur.

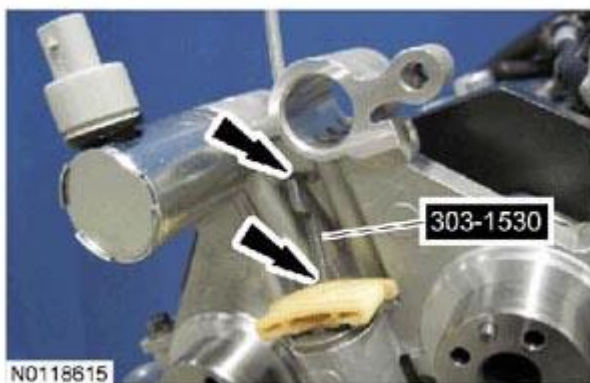


Fig. 67: Locating Engine Mount Studs

Courtesy of FORD MOTOR CO.

19. Torque the 2 engine mount studs before installing the engine mount nuts.
 - Tighten to 8 Nm (71 lb-in).

NOTE: Do not loosen the engine mount center bolt or the engine may become improperly positioned.

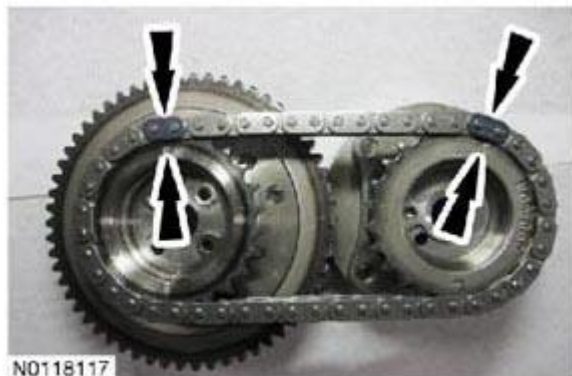


Fig. 68: Locating Engine Mount And Nuts
Courtesy of FORD MOTOR CO.

20. Install the engine mount and the 2 nuts.
 - Tighten the 2 nuts to 80 Nm (59 lb-ft).
21. Install the 3 engine mount bolts.
 - Tighten to 48 Nm (35 lb-ft).



Fig. 69: Locating Bolts And Engine Mount
Courtesy of FORD MOTOR CO.

22. Position the degas bottle on the 2 retainer tabs.

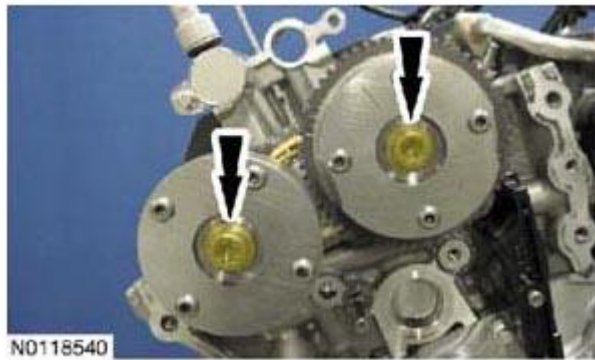


Fig. 70: Locating Tabs And Degas Bottle
Courtesy of FORD MOTOR CO.

23. Install the generator. For additional information, refer to **CHARGING SYSTEM**.
24. Tighten the 4 coolant pump bolts to 20 Nm (177 lb-in).

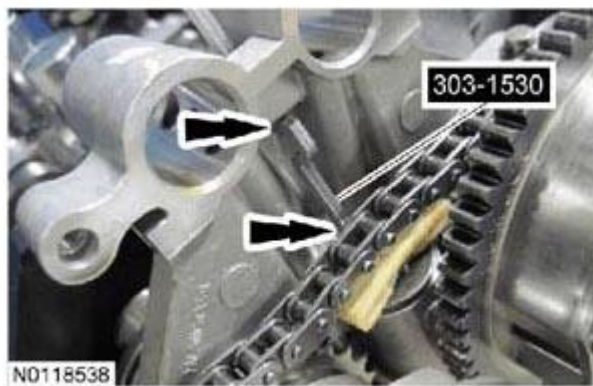


Fig. 71: Locating Coolant Pump Bolts
Courtesy of FORD MOTOR CO.

25. Install the accessory drive belt splash shield and the 2 bolts.
 - Tighten to 9 Nm (80 lb-in).

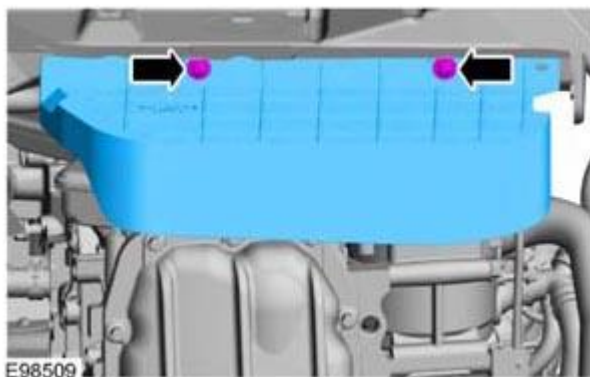
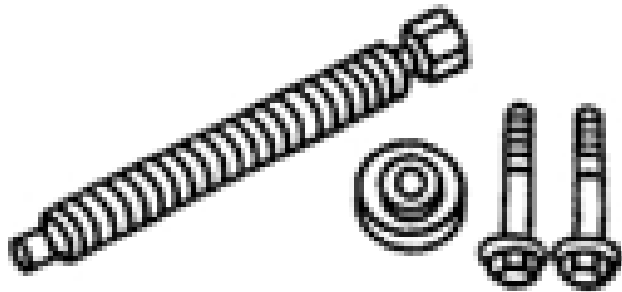


Fig. 72: Locating Bolts And Accessory Drive Belt Splash Shield
Courtesy of FORD MOTOR CO.

26. Install the RH front wheel and tire. For additional information, refer to **WHEELS AND TIRES**.
27. Install the upper and lower cowl panel grilles. For additional information, refer to **FRONT END BODY PANELS**.
28. Using the IDS, reset the KAM. For additional information, refer to Diagnostic Methods in the **ENGINE CONTROLS - INTRODUCTION (EXCEPT DIESEL & HYBRID) (SECTION 0)**.

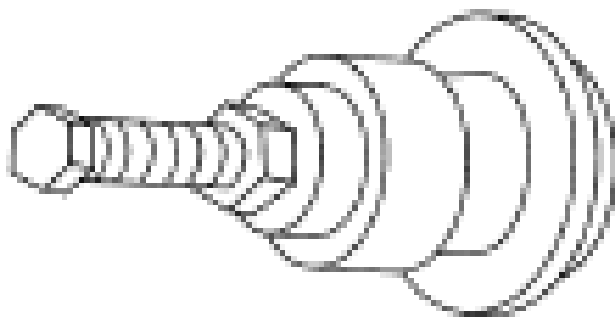
CRANKSHAFT FRONT SEAL

SPECIAL TOOLS



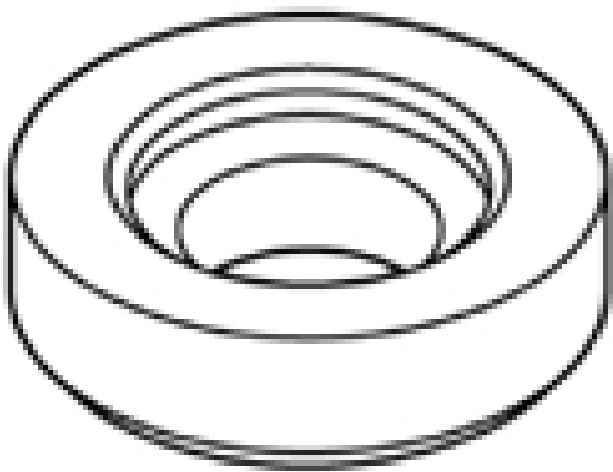
ST1378-A

Installer, Crankshaft Vibration Damper
303-175 (T82L-6316-B)



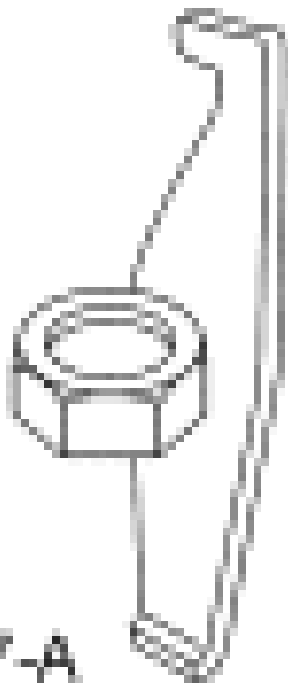
ST1328-A

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



ST3260-A

Replacer, Front Crankshaft Seal
303-420 (T92P-6701-BH)



ST2417-A

Remover, Input Shaft Oil Seal
308-375



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

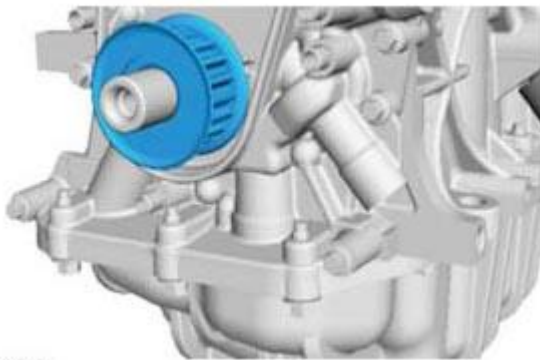
ST1185-A

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

1. Remove the timing belt. For additional information, REFER to **Timing Belt**.
2. Remove the crankshaft sprocket gear.



N0122215

Fig. 73: Identifying Crankshaft Sprocket Gear
Courtesy of FORD MOTOR CO.

3. Using the Input Shaft Oil Seal Remover and Slide Hammer, remove the crankshaft front oil seal.

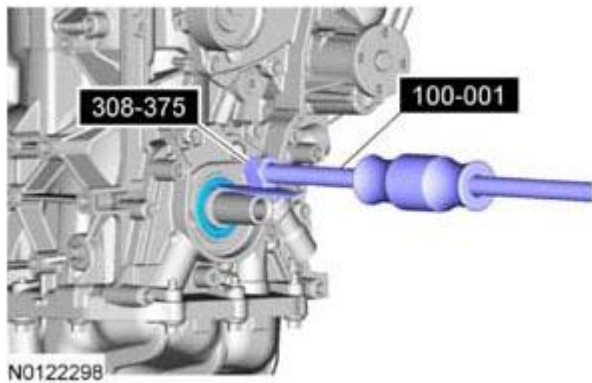


Fig. 74: Removing Crankshaft Front Oil Seal
Courtesy of FORD MOTOR CO.

Installation

NOTE: Lubricate the oil seal with clean engine oil.

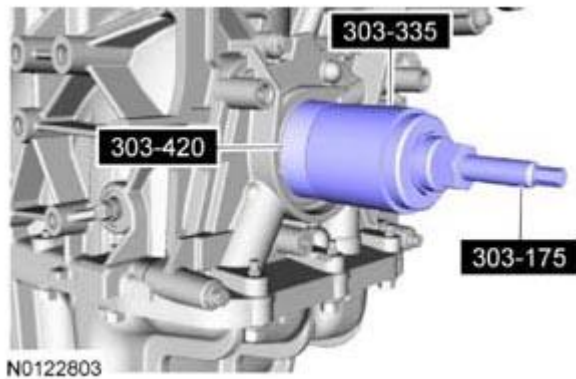
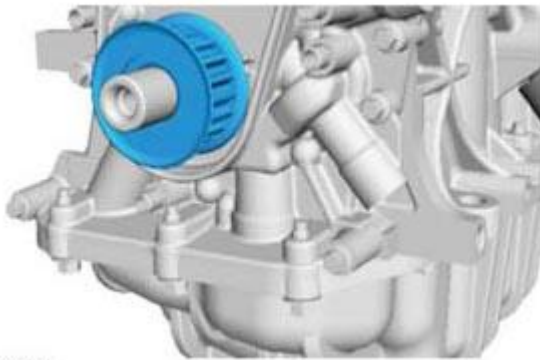


Fig. 75: Installing Crankshaft Front Oil Seal
Courtesy of FORD MOTOR CO.

1. Using the Crankshaft Vibration Damper Installer, Front Cover Oil Seal Installer and Front Crankshaft Seal Replacer, install the crankshaft front oil seal.
2. Install the crankshaft sprocket gear.

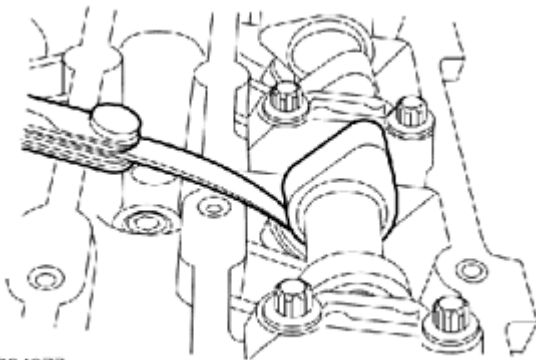


N0122215

Fig. 76: Identifying Crankshaft Sprocket Gear
Courtesy of FORD MOTOR CO.

3. Install the timing belt. For additional information, REFER to **Timing Belt**.

FLEXPLATE OR FLYWHEEL AND CRANKSHAFT REAR SEAL - EXPLODED VIEW



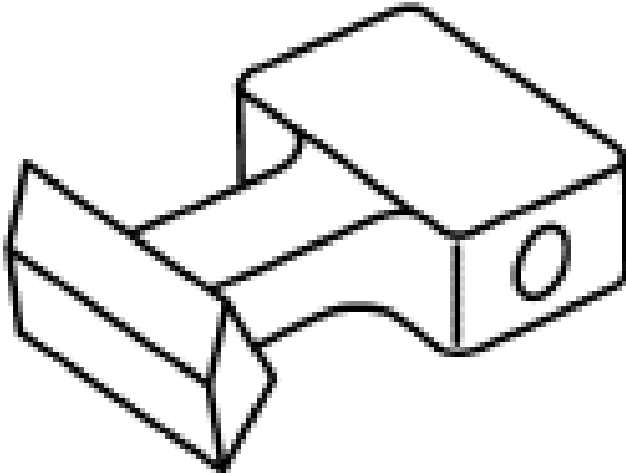
A0004277

Fig. 77: Exploded View Of Flexplate, Flywheel And Crankshaft Rear Seal
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6379	Flexplate bolt (6 required)
2	6375	Flexplate
3	6379	Flywheel bolt (6 required)
4	6375	Flywheel
5	W500213	Crankshaft rear oil seal with retainer plate bolt (6 required)
6	6K301	Crankshaft rear oil seal with retainer plate

Removal and Installation

1. Refer to the appropriate procedures and/or exploded views in this service information for any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of removal.

FLEXPLATE**SPECIAL TOOLS****ST1840-A**

Tool, Flywheel Holding
303-103

Removal

1. Remove the automatic transaxle. For additional information, refer to **AUTOMATIC DUAL CLUTCH TRANSAXLE (DCT) POWERSHIFT (DPS6) - EXTERNAL CONTROLS**.
2. Remove the 6 bolts and the flexplate.
 - Discard the bolts.

Installation

1. Align the flexplate and crankshaft using the dowel pin location hole and install the new bolts finger tight.

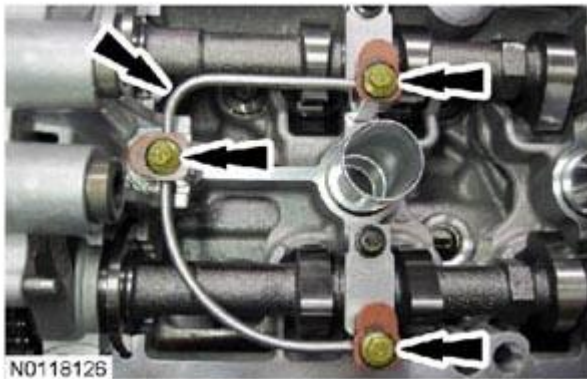


Fig. 78: Locating Flexplate Bolts
Courtesy of FORD MOTOR CO.

2. Install the Flywheel Holding Tool.



Fig. 79: Installing Flywheel Holding Tool
Courtesy of FORD MOTOR CO.

3. Tighten the bolts in the sequence shown in illustration in 2 stages:
 - Stage 1: Tighten to 30 Nm (22 lb-ft).
 - Stage 2: Tighten an additional 80 degrees.



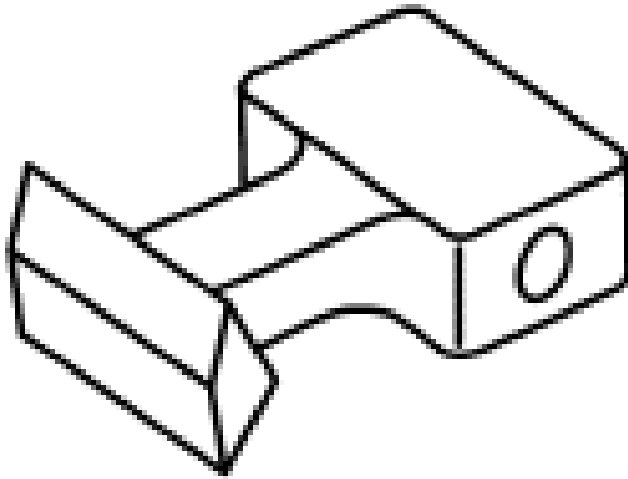
Fig. 80: Identifying Flexplate Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

4. Install the automatic transaxle. For additional information, refer to **AUTOMATIC DUAL CLUTCH TRANSAXLE (DCT) POWERSHIFT (DPS6) - EXTERNAL CONTROLS** .
5. Using the IDS, reset the KAM. For additional information, refer to Diagnostic Methods in the **ENGINE CONTROLS - INTRODUCTION (EXCEPT DIESEL & HYBRID) (SECTION 0)** .

FLYWHEEL

SPECIAL TOOLS

--	--



ST1840-A

Tool, Flywheel Holding
303-103**Removal**

1. Remove the clutch disc and pressure plate. For additional information, refer to **CLUTCH**.
2. Remove the 6 bolts and the flywheel.
 - Discard the bolts.

Installation

1. Align the flywheel and crankshaft using the dowel pin location hole and install the new bolts finger tight.

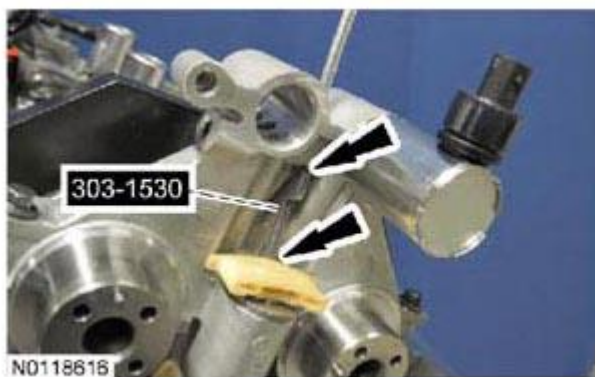


Fig. 81: Locating Flywheel Bolts
Courtesy of FORD MOTOR CO.

2. Install the Flywheel Holding Tool.



Fig. 82: Installing Flywheel Holding Tool
Courtesy of FORD MOTOR CO.

3. Tighten the bolts in the sequence shown in illustration in 2 stages:
 - Stage 1: Tighten to 30 Nm (22 lb-ft).
 - Stage 2: Tighten an additional 80 degrees.



Fig. 83: Identifying Flywheel Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

4. Install the clutch disc and pressure plate. For additional information, refer to **CLUTCH**.
5. Using the IDS, reset the KAM. For additional information, refer to Diagnostic Methods in the **ENGINE CONTROLS - INTRODUCTION (EXCEPT DIESEL & HYBRID) (SECTION 0)**.

CRANKSHAFT REAR SEAL

Removal

1. Remove the flexplate or flywheel. For additional information, REFER to **Flexplate** or **Flywheel**.
2. Remove the oil pan. For additional information, REFER to **Oil Pan**.
3. Remove the 6 bolts and the crankshaft rear seal.

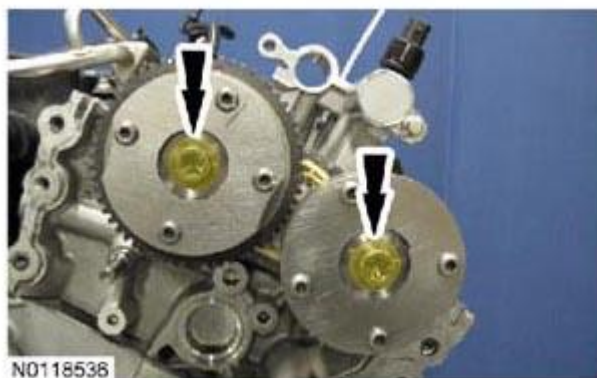


Fig. 84: Locating Bolts And Crankshaft Rear Seal
Courtesy of FORD MOTOR CO.

4. Clean the sealing surface of the crankshaft rear seal and crankshaft.

Installation

- NOTE:** New crankshaft rear seal is supplied with an alignment sleeve which must be removed after installation.
- NOTE:** Do not remove the alignment sleeve from the crankshaft rear seal prior to installation on the crankshaft.
- NOTE:** Do not lubricate the new crankshaft rear seal.



Fig. 85: Identifying Crankshaft Rear Seal Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

1. Align the crankshaft rear seal and alignment sleeve on the crankshaft and push the crankshaft rear seal off the alignment sleeve onto the crankshaft without stopping until the crankshaft rear seal meets the cylinder block.
 - Install the 6 bolts and tighten in sequence shown in illustration in 2 stages.
 - Stage 1: Tighten bolts 1 through 6 to 4 Nm (35 lb-in).

- Stage 2: Tighten bolts 1 through 6 to 9 Nm (80 lb-in).
- 2. Remove the alignment sleeve taking care not to touch the sealing lip.
- 3. Install the oil pan. For additional information, REFER to **Oil Pan**.
- 4. Install the flexplate or flywheel. For additional information, REFER to **Flexplate** or **Flywheel**.

TIMING BELT COVER

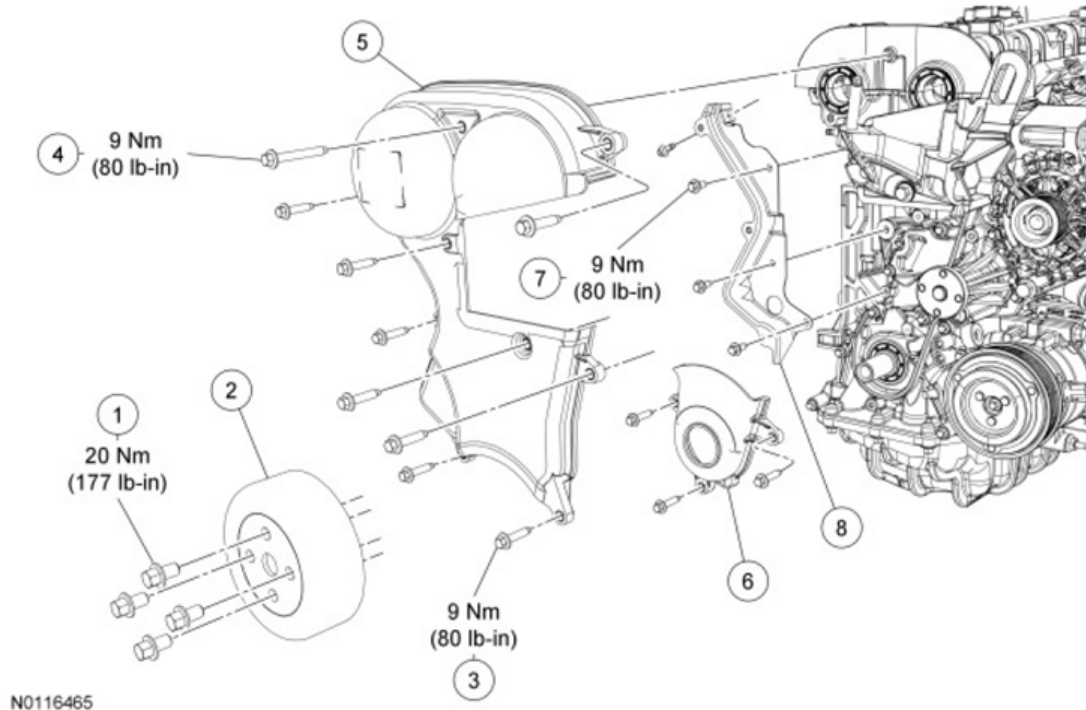


Fig. 86: Identifying Timing Belt Cover Components With Torque Specifications
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W714914	Coolant pump pulley bolt (3 required)
2	8509	Coolant pump pulley
3	W500215	Upper and lower timing belt cover bolt (12 required)
4	W500303	Upper timing belt cover bolt
5	6019	Upper timing belt cover
6	6019	Lower timing belt cover
7	W702251	Timing belt cover backplate bolt (4 required)
8	6019	Timing belt cover backplate

Removal

All timing belt covers

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

Upper timing belt cover

2. Loosen the 4 coolant pump pulley bolts.

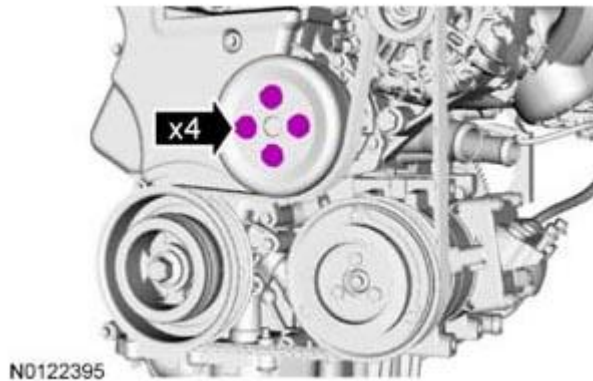


Fig. 87: Locating Coolant Pump Bolts
Courtesy of FORD MOTOR CO.

3. Remove the accessory drive belt. For additional information, refer to **ACCESSORY DRIVE**.
4. Remove the engine mount. For additional information, REFER to **Engine Mount**.
5. Remove the 4 bolts and coolant pump pulley.

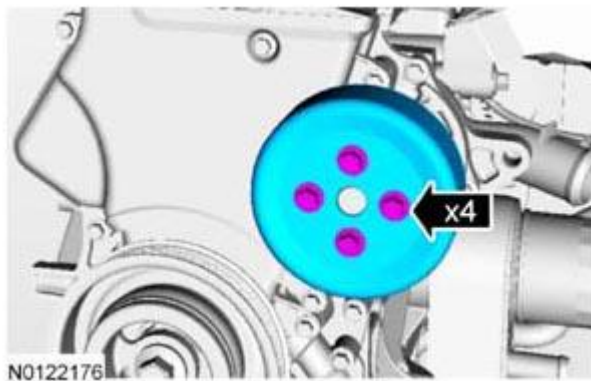


Fig. 88: Locating Bolts And Coolant Pump Pulley
Courtesy of FORD MOTOR CO.

6. Remove the 1 engine mount stud.

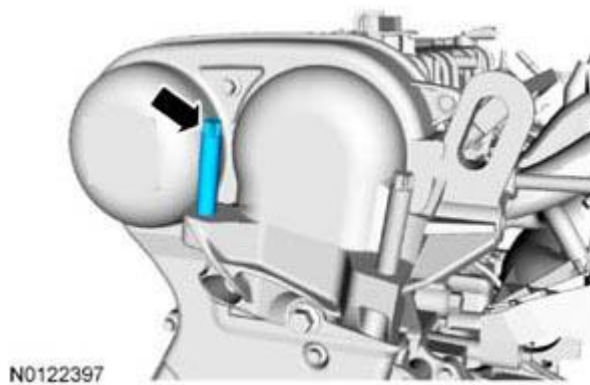


Fig. 89: Locating Engine Mount Stud
Courtesy of FORD MOTOR CO.

7. Remove the 9 bolts and the upper timing belt cover.

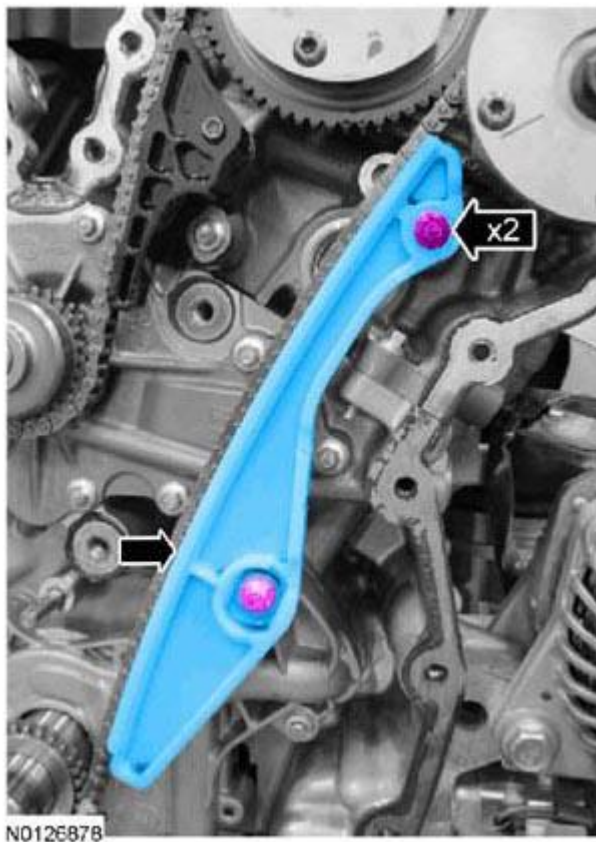


Fig. 90: Locating Bolts And Timing Belt Cover
Courtesy of FORD MOTOR CO.

Lower timing belt cover

8. Remove the crankshaft pulley. For additional information, REFER to **Crankshaft Pulley**.

9. Remove the 3 bolts and the lower timing belt cover.



Fig. 91: Locating Bolts And Lower Timing Belt Cover
Courtesy of FORD MOTOR CO.

Timing belt cover backplate

10. Loosen the 4 coolant pump pulley bolts.



Fig. 92: Locating Coolant Pump Bolts
Courtesy of FORD MOTOR CO.

11. Remove the accessory drive belt. For additional information, refer to **ACCESSORY DRIVE** .
12. Remove the engine mount. For additional information, REFER to **Engine Mount**.
13. Remove the 4 bolts and coolant pump pulley.

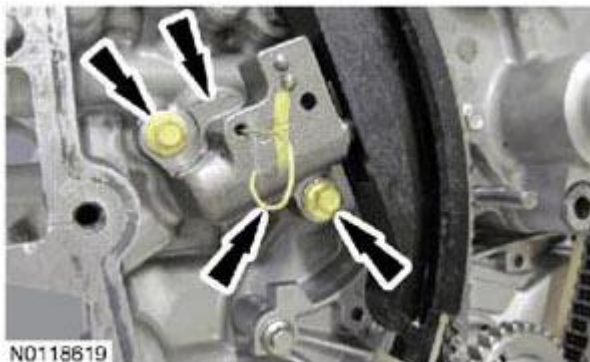


Fig. 93: Locating Bolts And Coolant Pump Pulley
Courtesy of FORD MOTOR CO.

14. Remove the 1 engine mount stud.



Fig. 94: Locating Engine Mount Stud
Courtesy of FORD MOTOR CO.

15. Remove the 9 bolts and the upper timing belt cover.



Fig. 95: Locating Bolts And Timing Belt Cover
Courtesy of FORD MOTOR CO.

16. Remove the 4 bolts and the timing belt cover backplate.



Fig. 96: Locating Bolts And Timing Belt Cover Backplate
Courtesy of FORD MOTOR CO.

Installation

Timing belt cover backplate

1. Install the timing belt cover backplate and the 4 bolts.
 - Tighten to 9 Nm (80 lb-in).



Fig. 97: Locating Bolts And Timing Belt Cover Backplate
Courtesy of FORD MOTOR CO.

2. Install the upper timing belt cover and the 9 bolts.
 - Tighten to 9 Nm (80 lb-in).

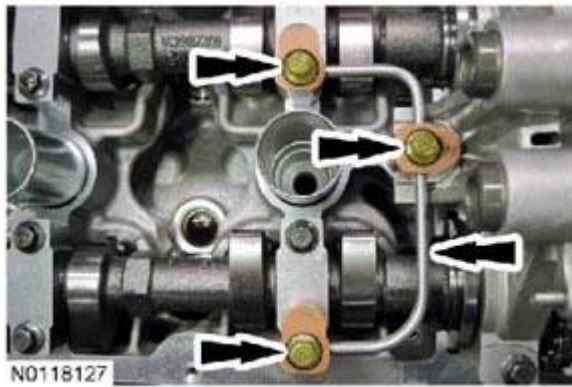


Fig. 98: Locating Bolts And Timing Belt Cover
Courtesy of FORD MOTOR CO.

3. Install the 1 engine mount stud finger tight.



Fig. 99: Locating Engine Mount Stud
Courtesy of FORD MOTOR CO.

NOTE: The 2 engine mount studs must be torqued or damage to the powertrain may occur.



Fig. 100: Locating Engine Mount Studs

Courtesy of FORD MOTOR CO.

4. Torque the 2 engine mount studs before installing the engine mount nuts.
 - Tighten to 8 Nm (71 lb-in).
5. Install the coolant pump pulley and the 4 bolts.
 - Do not torque at this time.



Fig. 101: Locating Bolts And Coolant Pump Pulley
Courtesy of FORD MOTOR CO.

6. Install the engine mount. For additional information, REFER to Engine Mount.
7. Install the accessory drive belt. For additional information, refer to ACCESSORY DRIVE.
8. Tighten the 4 coolant pump pulley bolts to 20 Nm (177 lb-in).

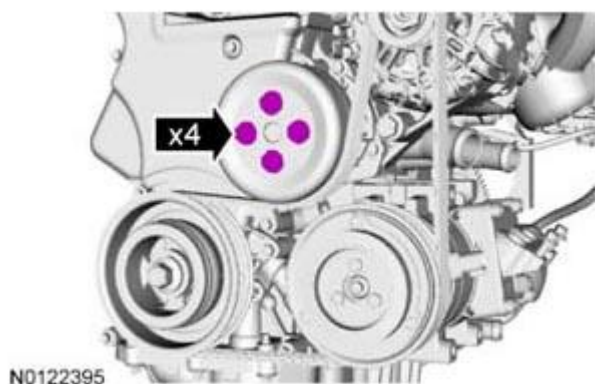
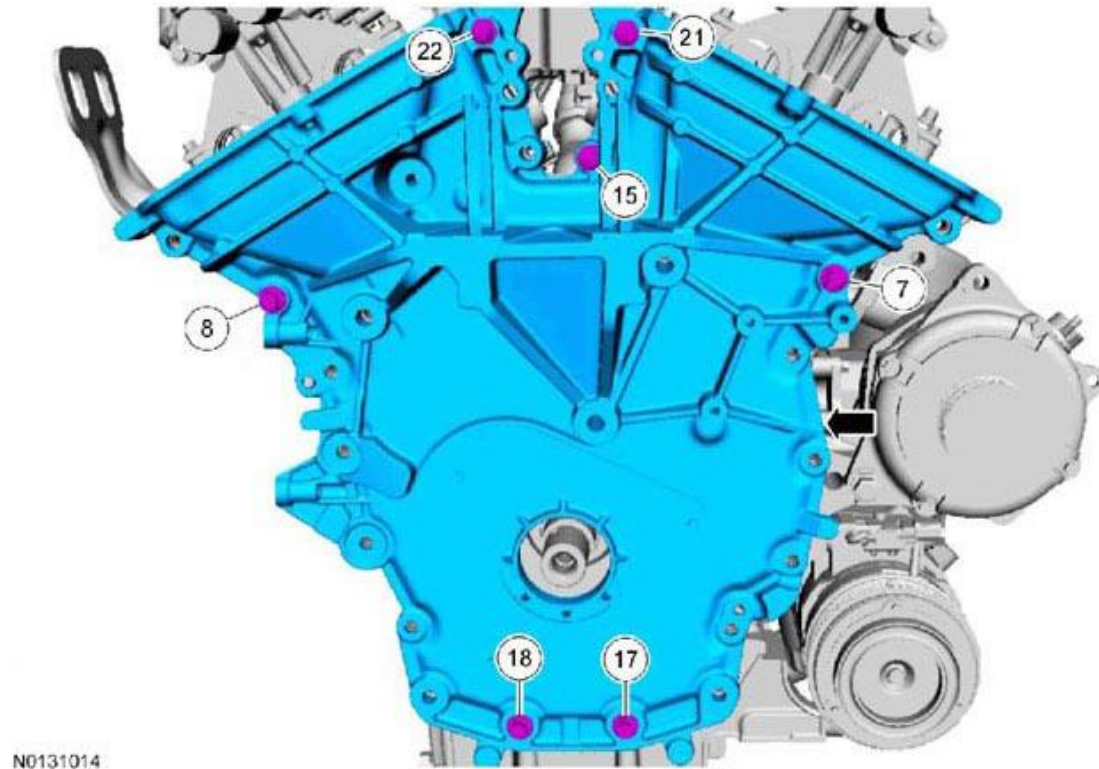


Fig. 102: Locating Coolant Pump Bolts

Courtesy of FORD MOTOR CO.

Lower timing belt cover

9. Install the lower timing belt cover and the 3 bolts.
 - Tighten to 9 Nm (80 lb-in).

**Fig. 103: Locating Bolts And Lower Timing Belt Cover**

Courtesy of FORD MOTOR CO.

10. Install the crankshaft pulley. For additional information, REFER to **Crankshaft Pulley**.

Upper timing belt cover

11. Install the upper timing belt cover and the 9 bolts.
 - Tighten to 9 Nm (80 lb-in).

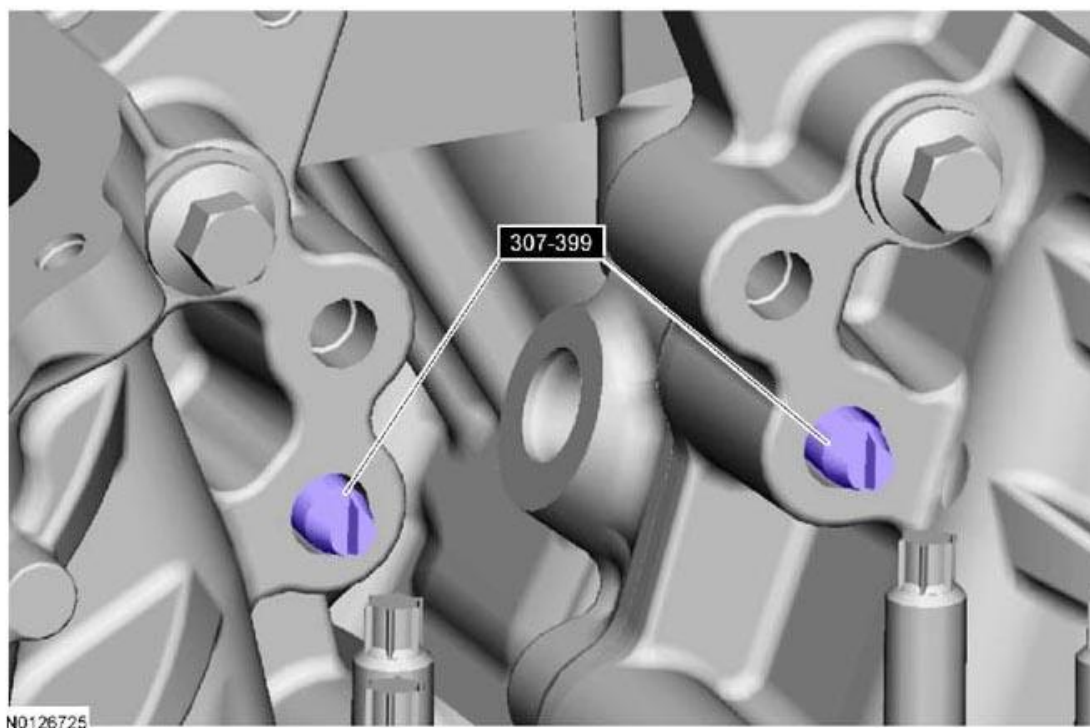


Fig. 104: Locating Bolts And Timing Belt Cover
Courtesy of FORD MOTOR CO.

12. Install the 1 engine mount stud finger tight.

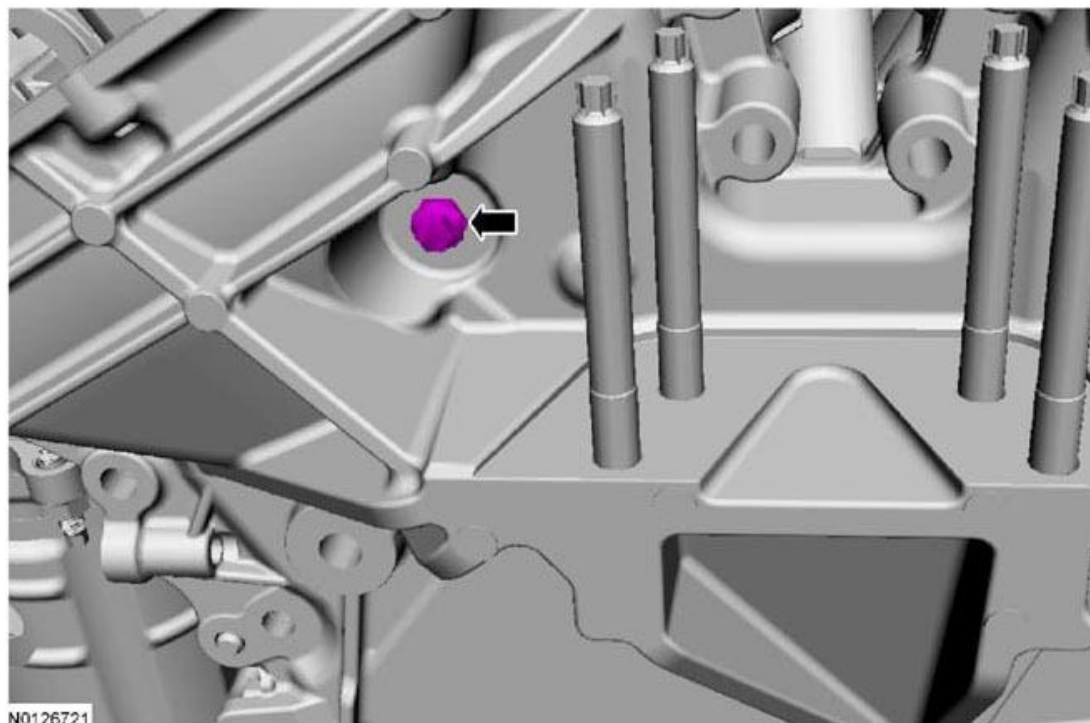
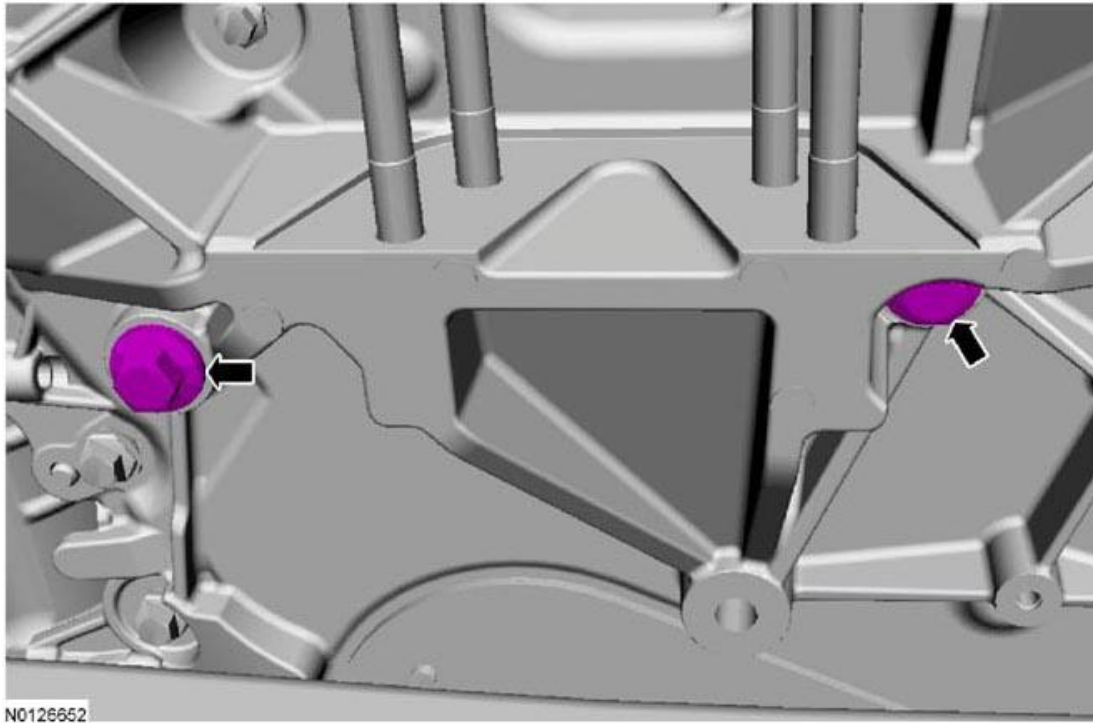


Fig. 105: Locating Engine Mount Stud

Courtesy of FORD MOTOR CO.

NOTE: The 2 engine mount studs must be torqued or damage to the powertrain may occur.

**Fig. 106: Locating Engine Mount Studs**

Courtesy of FORD MOTOR CO.

13. Torque the 2 engine mount studs before installing the engine mount nuts.
 - Tighten to 8 Nm (71 lb-in).
14. Install the coolant pump pulley and the 4 bolts.
 - Do not torque at this time.

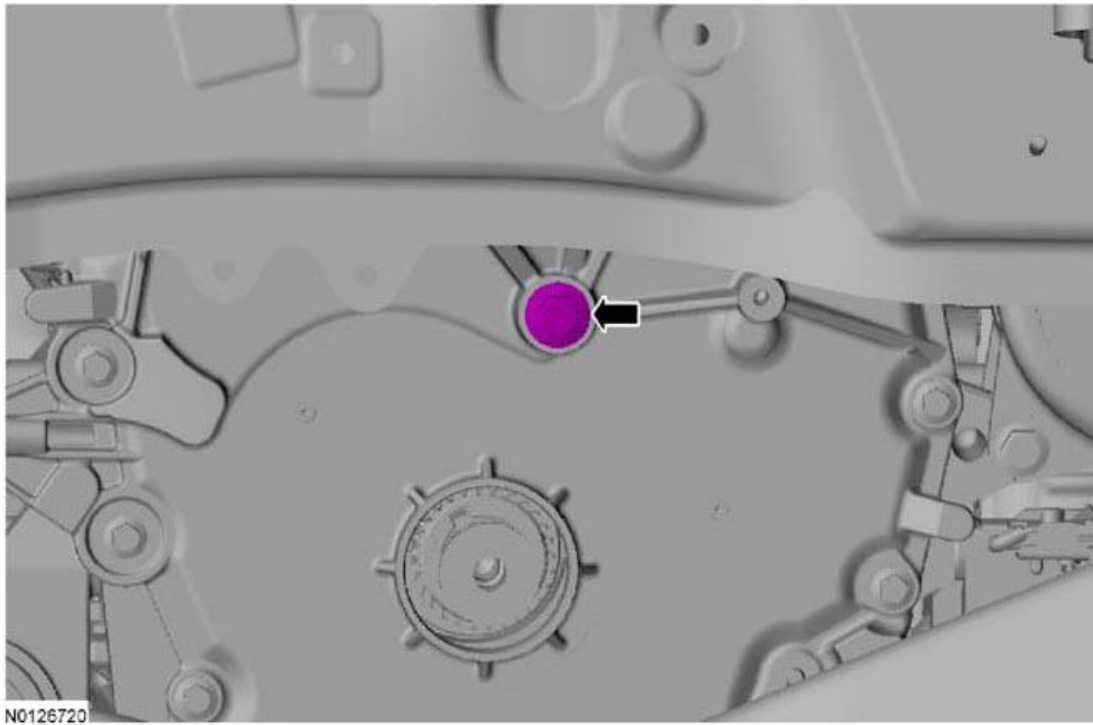


Fig. 107: Locating Bolts And Coolant Pump Pulley
Courtesy of FORD MOTOR CO.

15. Install the engine mount. For additional information, REFER to **Engine Mount**.
16. Install the accessory drive belt. For additional information, refer to **ACCESSORY DRIVE**.
17. Tighten the 4 coolant pump pulley bolts to 20 Nm (177 lb-in).

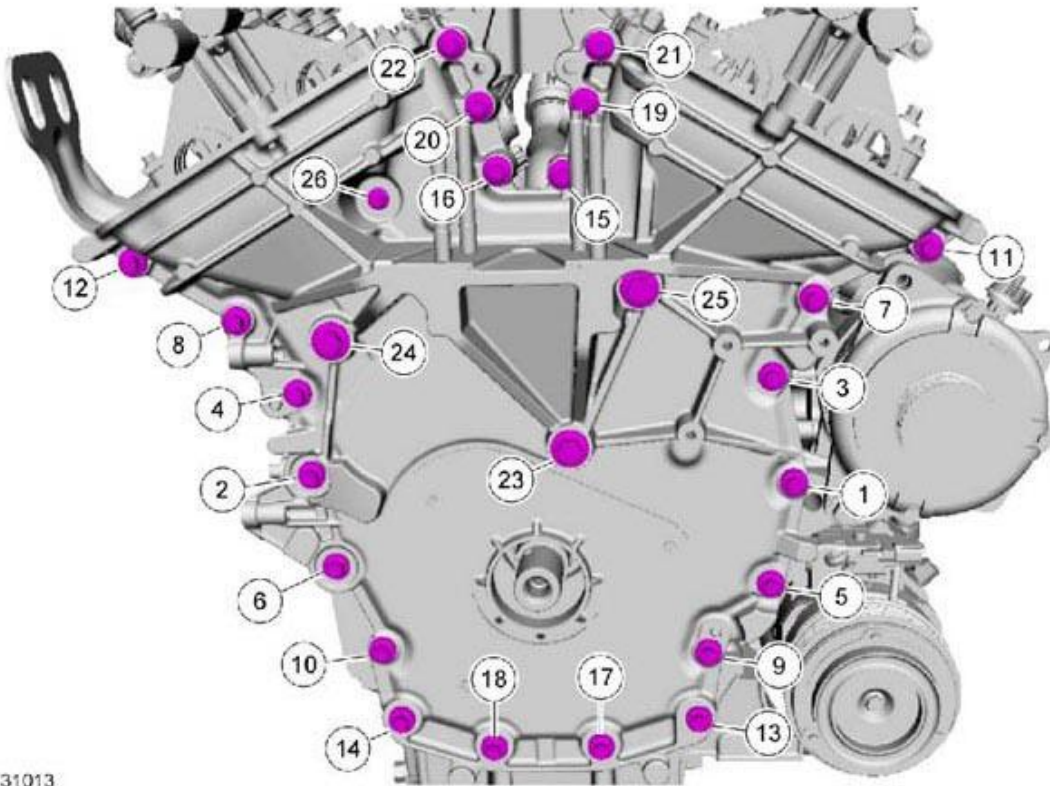


Fig. 108: Locating Coolant Pump Bolts
Courtesy of FORD MOTOR CO.

TIMING BELT

SPECIAL TOOLS

Tool, Variable Camshaft Timing (VCT)
Alignment
303-1097





Fig. 109: Exploded View Of Timing Belt
 Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W500215	Lower timing belt cover bolt (3 required)
2	6019	Lower timing belt cover
3	6268	Timing belt

Removal and Installation

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

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the crankshaft pulley. For additional information, REFER to **Crankshaft Pulley**.
3. Remove the 3 bolts and the lower timing belt cover.

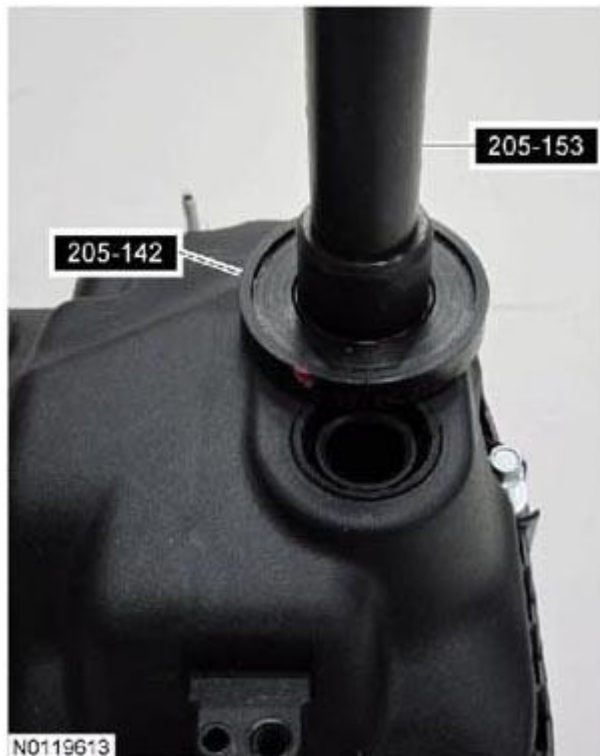


Fig. 110: Locating Bolts And Lower Timing Belt Cover
Courtesy of FORD MOTOR CO.

4. Install the VCT Alignment Tool.



Fig. 111: Installing VCT Alignment Tool
Courtesy of FORD MOTOR CO.

WARNING: The timing belt tensioner spring is under load. Extra care must be taken at all times when handling the tensioner. Failure to follow this instruction may result in personal injury.

5. Remove the timing belt.

1. Rotate the timing belt tensioner clockwise.
2. Align the 2 holes on the tensioner and install a small screwdriver or holding pin.
 - Remove the timing belt.

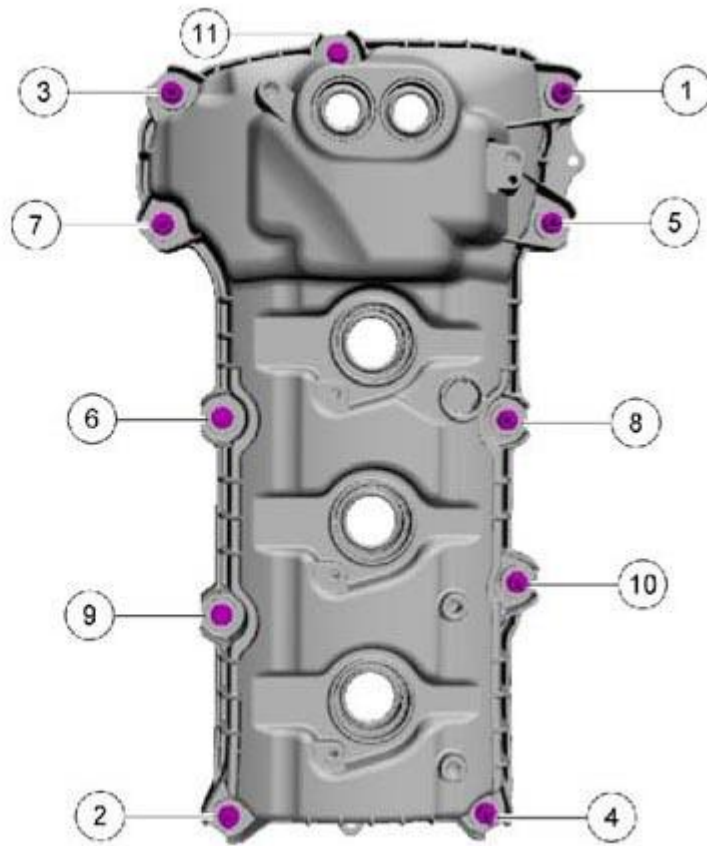


Fig. 112: Removing Timing Belt
Courtesy of FORD MOTOR CO.

Installation

1. Install the timing belt in the sequence shown in illustration.

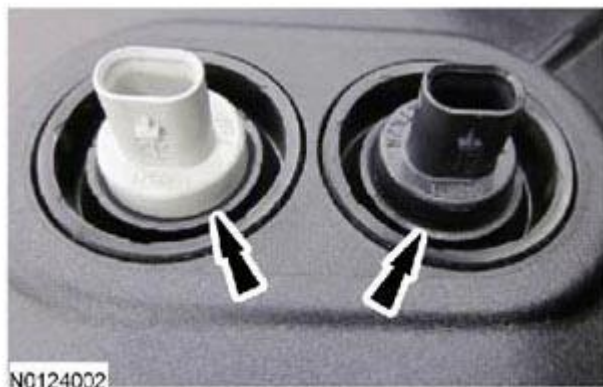


Fig. 113: Identifying Timing Belt In Sequence
Courtesy of FORD MOTOR CO.

WARNING: The timing belt tensioner spring is under load. Extra care must be taken at all times when handling the tensioner. Failure to follow this instruction may result in personal injury.

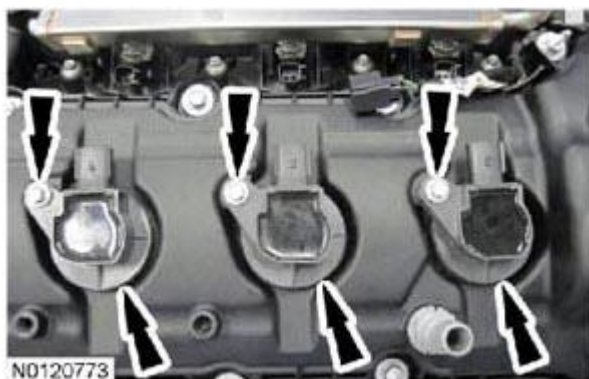


Fig. 114: Locating Timing Belt Tensioner Holding Tool
Courtesy of FORD MOTOR CO.

2. Remove the timing belt tensioner holding tool.
3. Install the lower timing belt cover and the 3 bolts.
 - Tighten to 9 Nm (80 lb-in).



Fig. 115: Locating Bolts And Lower Timing Belt Cover
Courtesy of FORD MOTOR CO.

4. Install the crankshaft pulley. For additional information, REFER to **Crankshaft Pulley**.

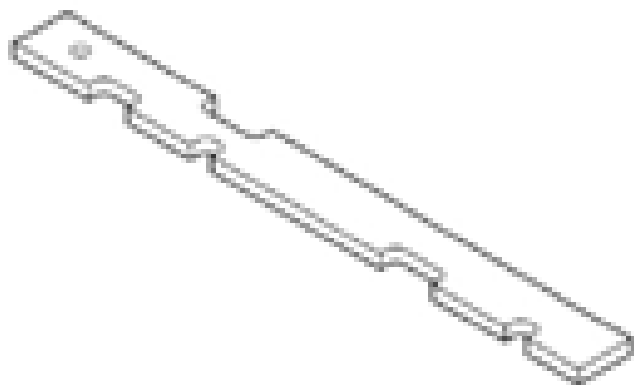
TIMING DRIVE COMPONENTS

SPECIAL TOOLS

	Tool, Variable Camshaft Timing (VCT) Alignment 303-1097
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ST3261-A



ST3259-A

Alignment Plate, Camshaft
303-376B



Fig. 116: Exploded View Of Timing Drive Components
 Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6268	Timing belt
2	6306	Crankshaft sprocket gear
3	6A340	Timing belt tensioner bolt
4	6K254	Timing belt tensioner
5	W710954	Intake camshaft phaser and sprocket plug and seal
6	6279	Intake camshaft phaser and sprocket bolt
7	6256	Intake camshaft phaser and sprocket
8	W710954	Exhaust camshaft phaser and sprocket plug and seal
9	6279	Exhaust camshaft phaser and sprocket bolt
10	6256	Exhaust camshaft phaser and sprocket

Removal

NOTE: Do not loosen or remove the crankshaft pulley bolt without first installing the special tools. The crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. 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.

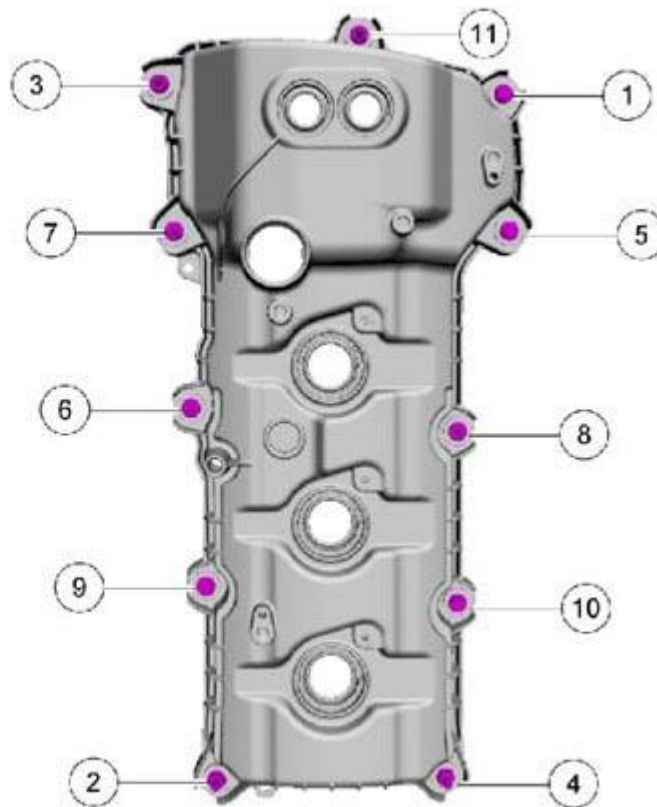
NOTE: During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning gasket surfaces, that enters the oil passages, coolant passages or the oil pan can cause engine failure.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the valve cover. For additional information, REFER to **Valve Cover**.
3. Remove the crankshaft pulley. For additional information, REFER to **Crankshaft Pulley**.
4. Remove the 3 bolts and the lower timing belt cover.



Fig. 117: Locating Bolts And Lower Timing Belt Cover
Courtesy of FORD MOTOR CO.

5. Install the VCT Alignment Tool.



N0125791

Fig. 118: Installing VCT Alignment Tool
Courtesy of FORD MOTOR CO.

WARNING: The timing belt tensioner spring is under load. Extra care must be taken at all times when handling the tensioner. Failure to follow this instruction may result in personal injury.



N0124002

Fig. 119: Removing Timing Belt
Courtesy of FORD MOTOR CO.

6. Remove the timing belt.

1. Rotate the timing belt tensioner clockwise.
2. Align the 2 holes on the tensioner and install a small screwdriver or holding pin.
 - Remove the timing belt.
7. Remove the crankshaft sprocket gear.

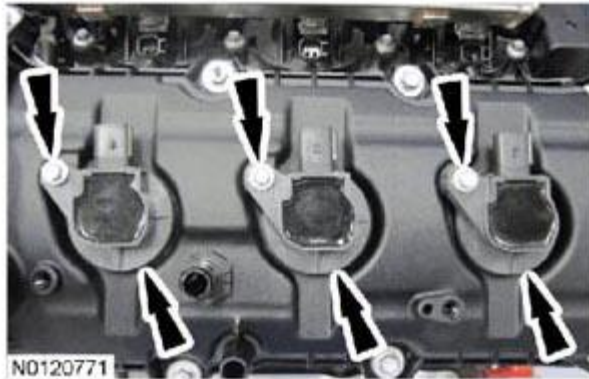


Fig. 120: Identifying Crankshaft Sprocket Gear
Courtesy of FORD MOTOR CO.

8. Remove the bolt and the timing belt tensioner.

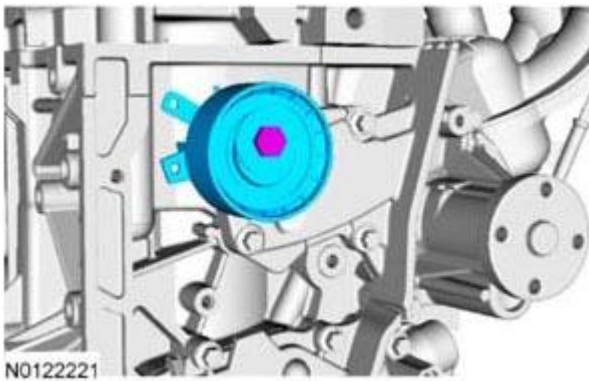


Fig. 121: Identifying Bolt And Timing Belt Tensioner
Courtesy of FORD MOTOR CO.

9. Remove the VCT Alignment Tool.

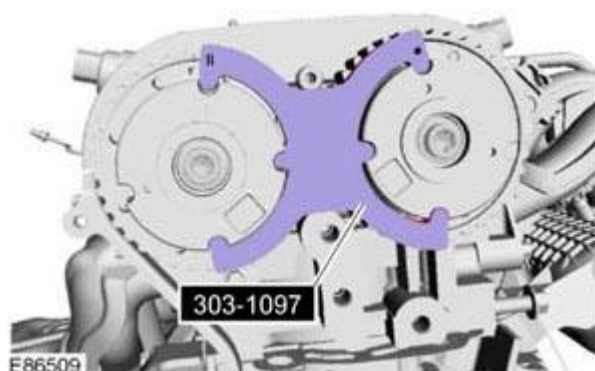


Fig. 122: Removing VCT Alignment Tool
Courtesy of FORD MOTOR CO.

NOTE: Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.

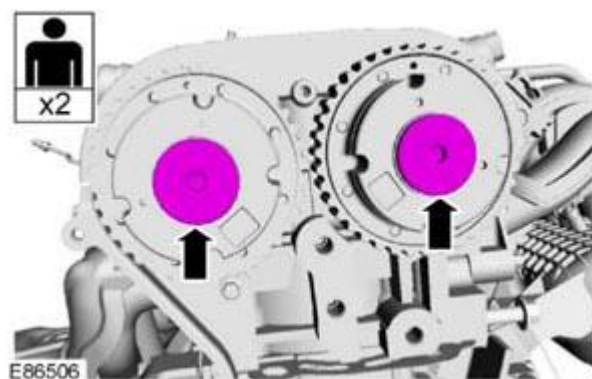


Fig. 123: Locating Camshaft Phaser And Sprocket Plugs
Courtesy of FORD MOTOR CO.

10. Remove the 2 camshaft phaser and sprocket plugs.

NOTE: Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.

11. Remove the 2 bolts and the camshaft phaser and sprockets.

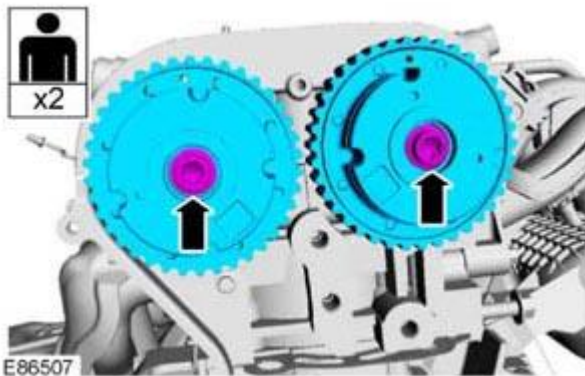


Fig. 124: Locating Bolts And Camshaft Phaser And Sprockets
Courtesy of FORD MOTOR CO.

Installation

1. Loosen the 2 bolts for the LH engine lift eye.

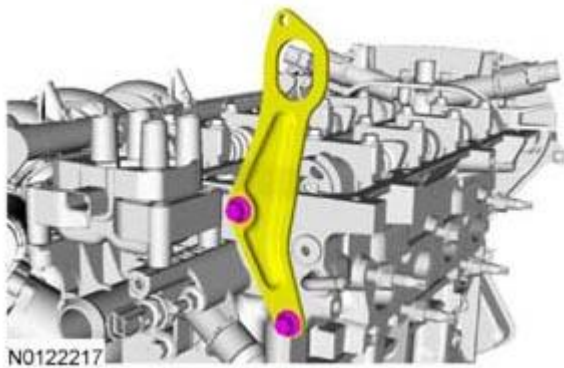
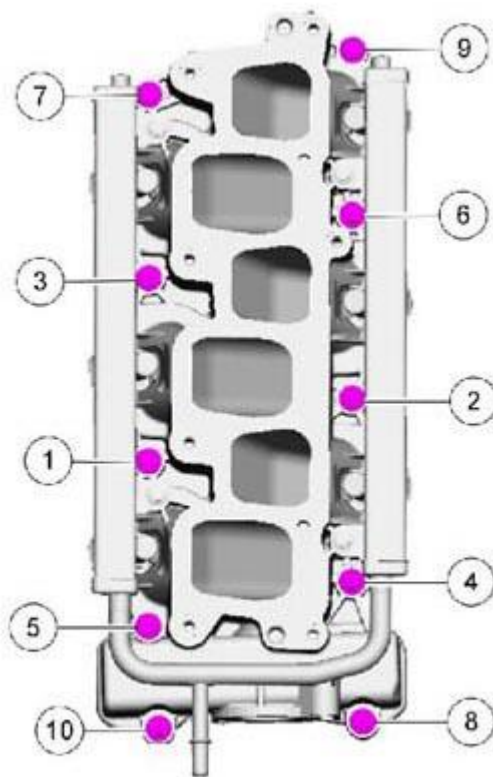


Fig. 125: Identifying LH Engine Lift Eye And Bolts
Courtesy of FORD MOTOR CO.

2. Install the Camshaft Alignment Plate into the end of the camshafts.



N0126297

Fig. 126: Installing Camshaft Alignment Plate Into End Of Camshafts
Courtesy of FORD MOTOR CO.

NOTE: Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.

NOTE: The timing marks of the camshaft phaser and sprocket must be at the 12 o'clock position.

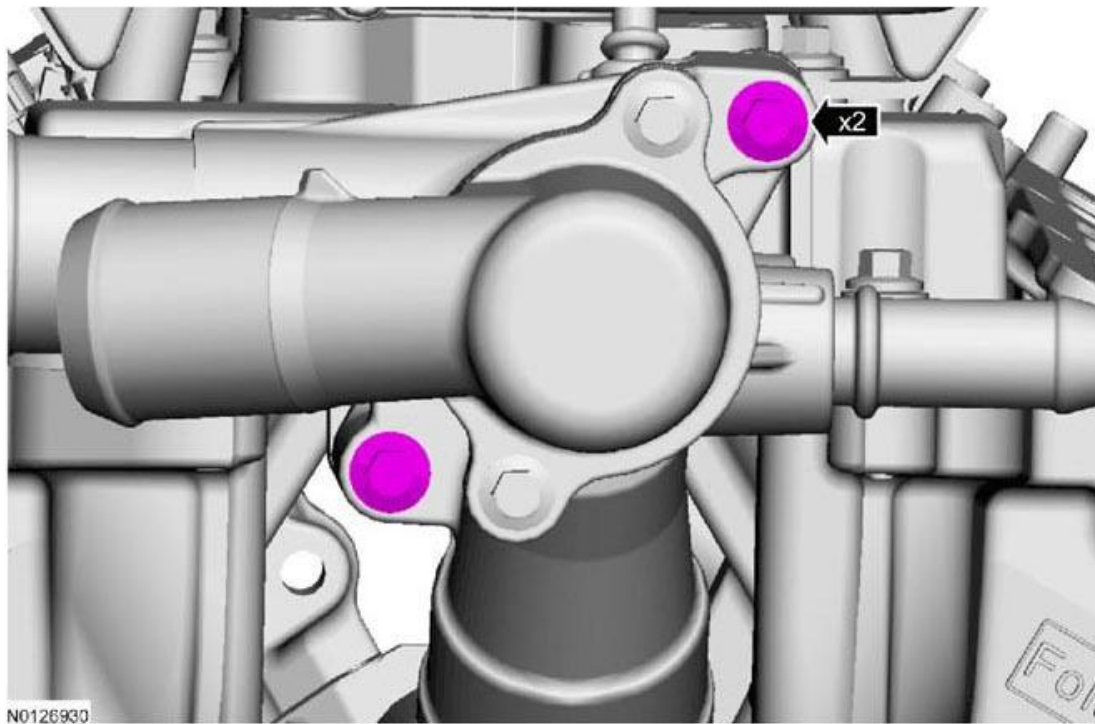


Fig. 127: Locating Camshaft Phaser And Sprockets Bolts
Courtesy of FORD MOTOR CO.

3. Install the 2 camshaft phaser and sprockets, bolts and the VCT Alignment Tool.
 - Tighten the 2 bolts to 25 Nm (18 lb-ft).
4. Remove the VCT Alignment Tool.



Fig. 128: Removing VCT Alignment Tool
Courtesy of FORD MOTOR CO.

5. Remove the Camshaft Alignment Plate.



Fig. 129: Removing Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

NOTE: Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.

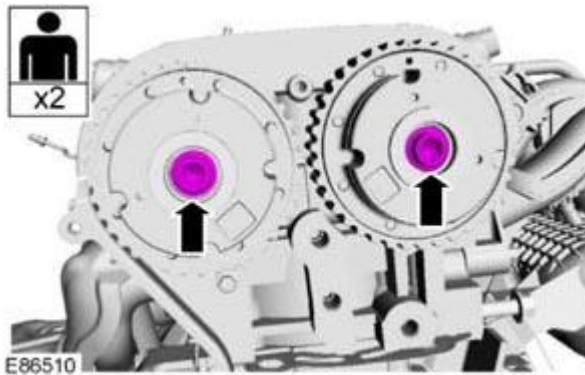


Fig. 130: Locating Camshaft Phaser And Sprocket Bolts
Courtesy of FORD MOTOR CO.

6. Tighten to 2 camshaft phaser and sprocket bolts an additional 75 degrees.

NOTE: The special tool can only be installed if the valve timing is correct.

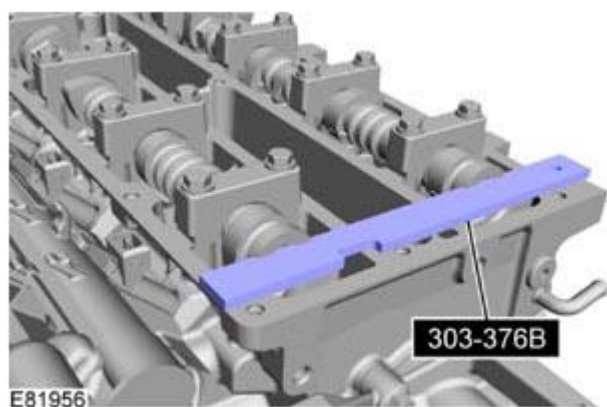


Fig. 131: Installing Camshaft Alignment Plate Into End Of Camshafts
Courtesy of FORD MOTOR CO.

7. Install the Camshaft Alignment Plate into the end of the camshafts.

NOTE: The special tool can only be installed if the valve timing is correct.

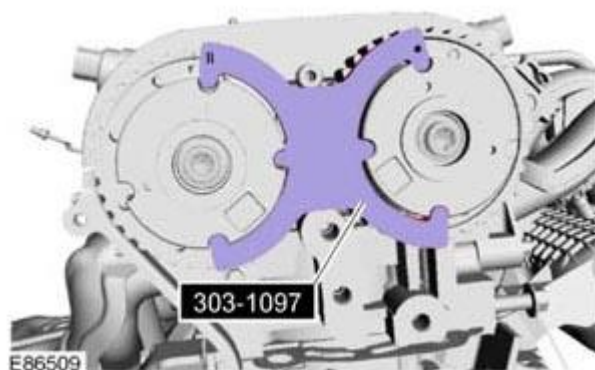


Fig. 132: Installing VCT Alignment Tool
Courtesy of FORD MOTOR CO.

8. Install the VCT Alignment Tool.
 - If the special tools cannot be installed, repeat the adjustment according to the preceding steps.
9. Remove the VCT Alignment Tool.

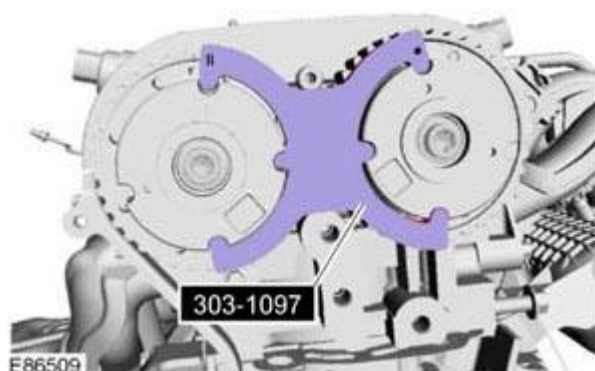


Fig. 133: Removing VCT Alignment Tool
Courtesy of FORD MOTOR CO.

10. Remove the Camshaft Alignment Plate.

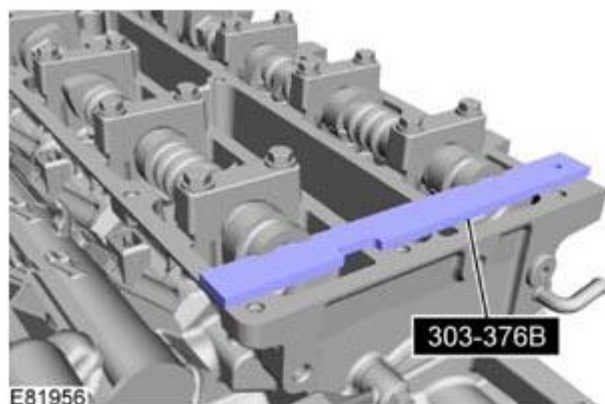


Fig. 134: Removing Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

NOTE: Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.

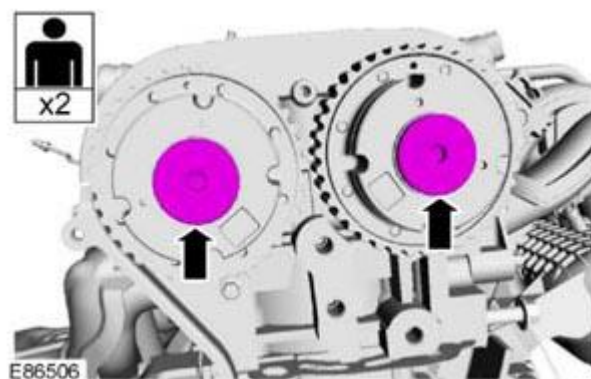


Fig. 135: Locating Camshaft Phaser And Sprocket Plugs

Courtesy of FORD MOTOR CO.

11. Install the 2 camshaft phaser and sprocket plugs.
 - Tighten to 16 Nm (142 lb-in).
12. Install the timing belt tensioner and the bolt.
 - Tighten to 25 Nm (18 lb-ft).
 - Rotate the timing belt tensioner clockwise and align the 2 holes on the tensioner and install a small screwdriver or holding pin.

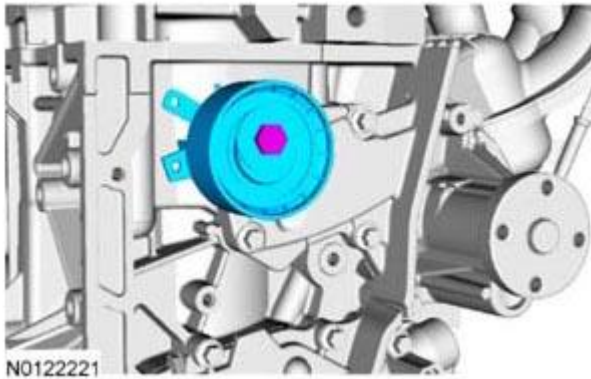


Fig. 136: Identifying Bolt And Timing Belt Tensioner
Courtesy of FORD MOTOR CO.

13. Install the crankshaft sprocket gear.

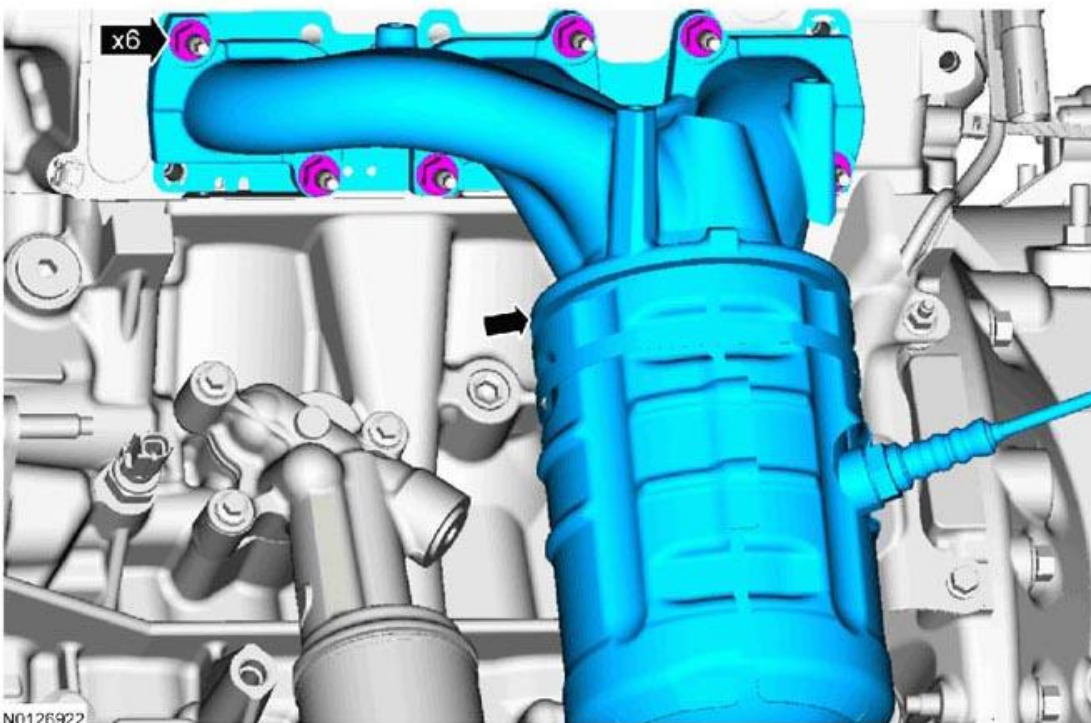
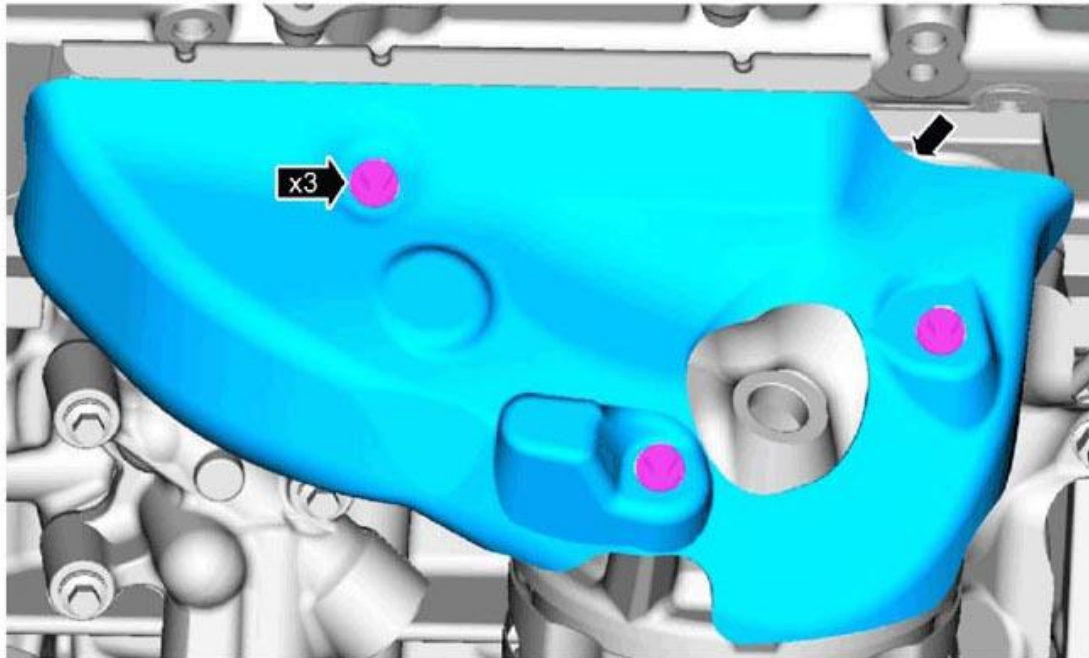


Fig. 137: Identifying Crankshaft Sprocket Gear
Courtesy of FORD MOTOR CO.

14. Install the VCT Alignment Tool.



N0126940

Fig. 138: Installing VCT Alignment Tool
Courtesy of FORD MOTOR CO.

15. Install the timing belt in the sequence shown in illustration.



Fig. 139: Identifying Timing Belt In Sequence
Courtesy of FORD MOTOR CO.

WARNING: The timing belt tensioner spring is under load. Extra care must be taken at all times when handling the tensioner. Failure to follow this instruction may result in personal injury.

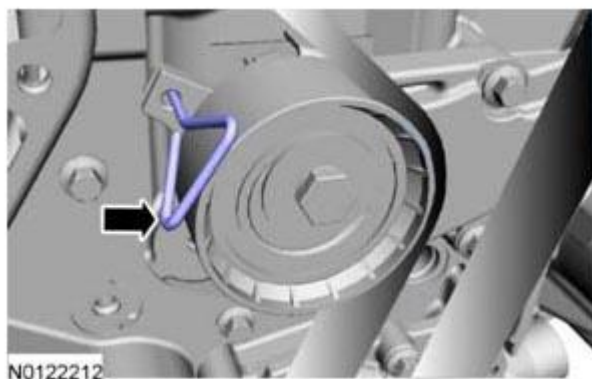
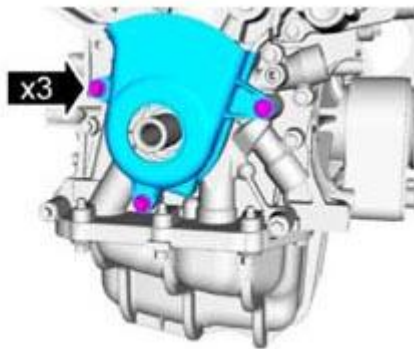


Fig. 140: Locating Timing Belt Tensioner Holding Tool
Courtesy of FORD MOTOR CO.

16. Remove the timing belt tensioner holding tool.
17. Install the lower timing belt cover and the 3 bolts.
 - Tighten to 9 Nm (80 lb-in).



N0122180

Fig. 141: Locating Bolts And Lower Timing Belt Cover
Courtesy of FORD MOTOR CO.

18. Install the crankshaft pulley. For additional information, REFER to Crankshaft Pulley.
19. Tighten the 2 bolts for the LH engine lift eye.
 - 19 Nm (168 lb-in).

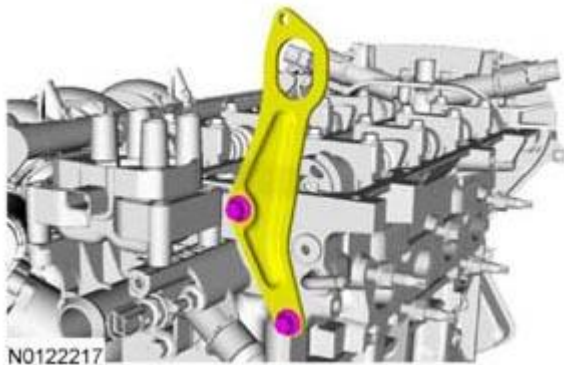


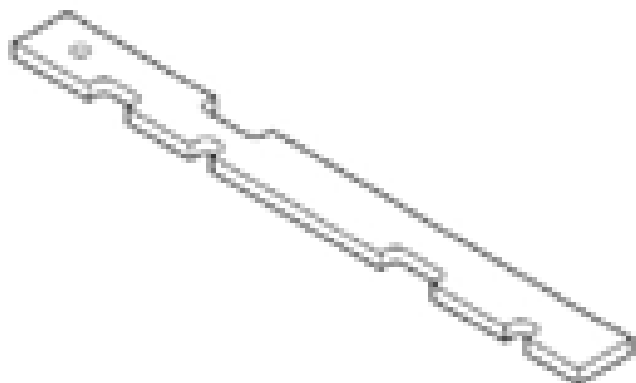
Fig. 142: Identifying LH Engine Lift Eye And Bolts
Courtesy of FORD MOTOR CO.

20. Install the valve cover. For additional information, REFER to Valve Cover.

CAMSHAFT PHASER AND SPROCKET

SPECIAL TOOLS

Alignment Plate, Camshaft



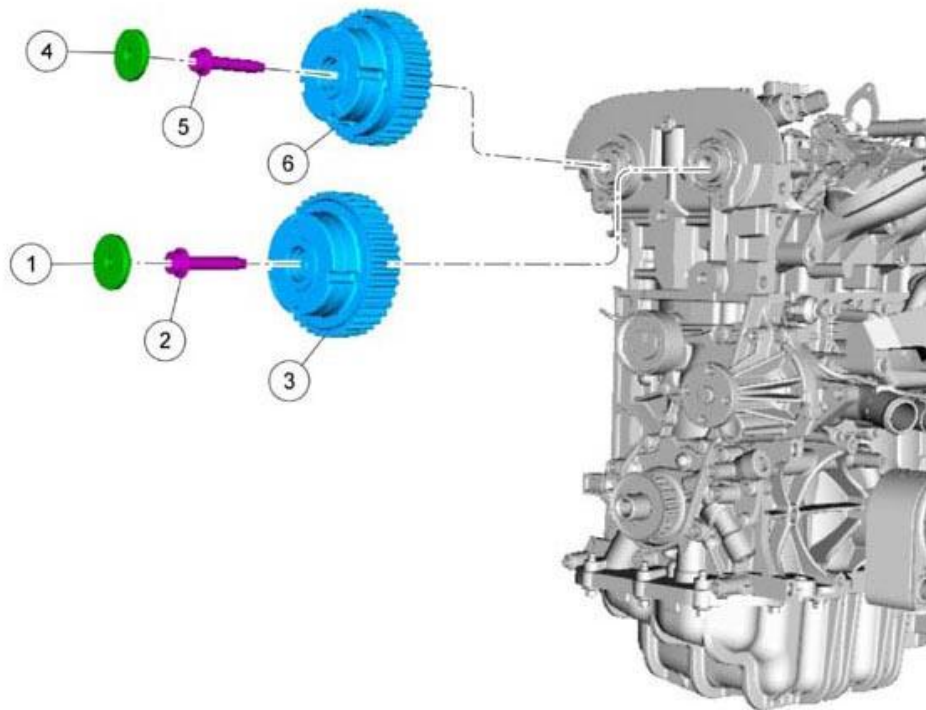
ST3259-A

303-376B



ST3261-A

Tool, Variable Camshaft Timing (VCT)
Alignment
303-1097



N0122222

Fig. 143: Exploded View Of Camshaft Phaser And Sprocket
 Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W710954	Intake camshaft phaser and sprocket plug and seal
2	6279	Intake camshaft phaser and sprocket bolt
3	6256	Intake camshaft phaser and sprocket
4	W710954	Exhaust camshaft phaser and sprocket plug and seal
5	6279	Exhaust camshaft phaser and sprocket bolt
6	6256	Exhaust camshaft phaser and sprocket

Removal

NOTE: Do not loosen or remove the crankshaft pulley bolt without first installing the special tools. The crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. 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 .

2. Remove the valve cover. For additional information, REFER to **Valve Cover**.
3. Remove the timing belt. For additional information, REFER to **Timing Belt**.
4. Remove the VCT Alignment Tool.

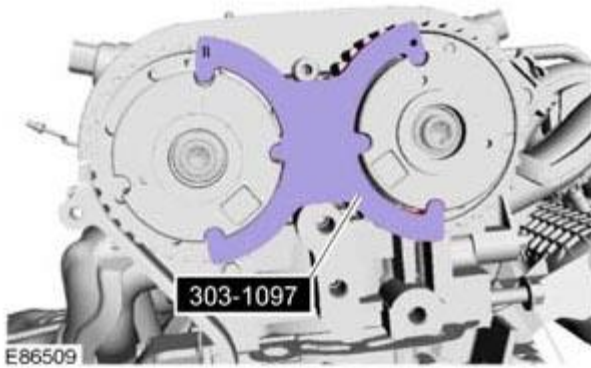


Fig. 144: Removing VCT Alignment Tool
Courtesy of FORD MOTOR CO.

NOTE: Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.

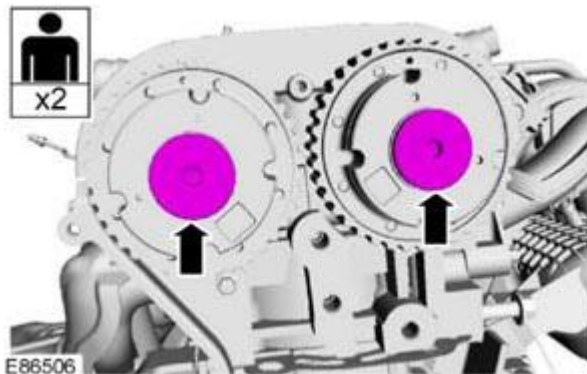


Fig. 145: Locating Camshaft Phaser And Sprocket Plugs
Courtesy of FORD MOTOR CO.

5. Remove the 2 camshaft phaser and sprocket plugs.

NOTE: Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.

6. Remove the 2 bolts and the camshaft phaser and sprockets.

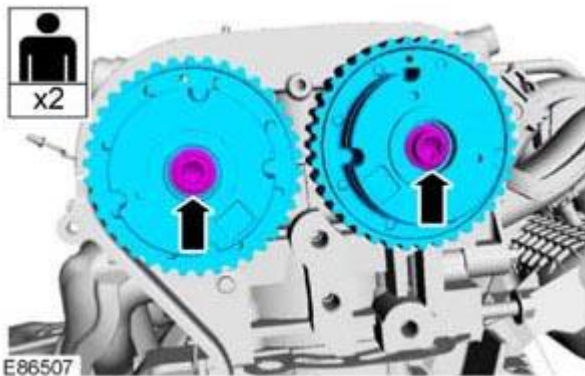


Fig. 146: Locating Bolts And Camshaft Phaser And Sprockets
Courtesy of FORD MOTOR CO.

Installation

1. Loosen the 2 bolts for the LH engine lift eye.

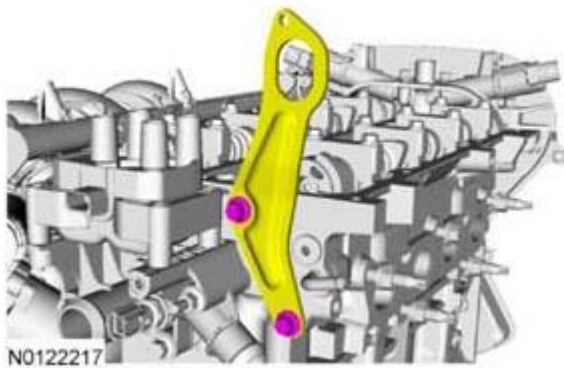


Fig. 147: Identifying LH Engine Lift Eye And Bolts
Courtesy of FORD MOTOR CO.

NOTE: It may be necessary to use an open-ended wrench to turn the camshafts by the hexagon to align the camshafts.

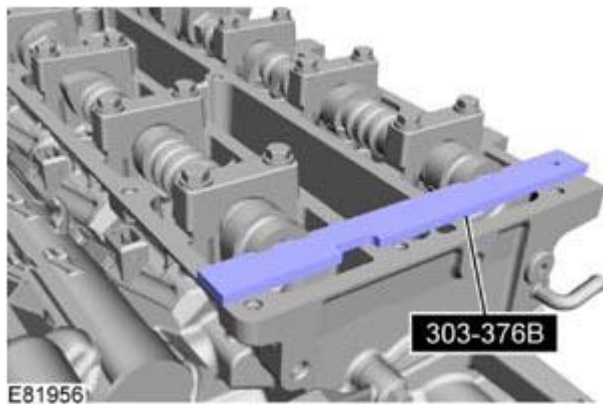


Fig. 148: Installing Camshaft Alignment Plate Into End Of Camshafts
Courtesy of FORD MOTOR CO.

2. Install the Camshaft Alignment Plate into the end of the camshafts.

NOTE: Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.

NOTE: The timing marks of the camshaft phaser and sprocket must be at the 12 o'clock position.

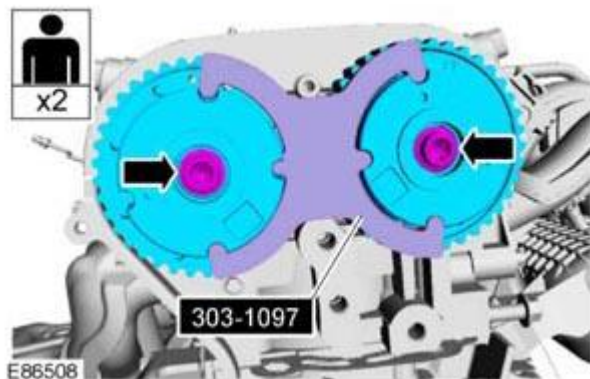


Fig. 149: Locating Camshaft Phaser And Sprockets Bolts
Courtesy of FORD MOTOR CO.

3. Install the 2 camshaft phaser and sprocket, bolts and the VCT Alignment Tool.
 - Tighten the 2 bolts to 25 Nm (18 lb-ft).
4. Remove the VCT Alignment Tool.

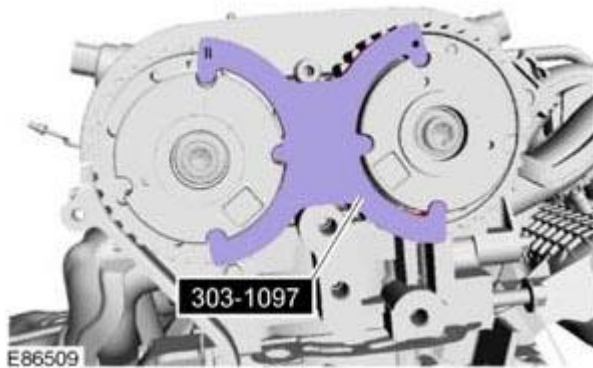


Fig. 150: Removing VCT Alignment Tool
Courtesy of FORD MOTOR CO.

5. Remove the Camshaft Alignment Plate.

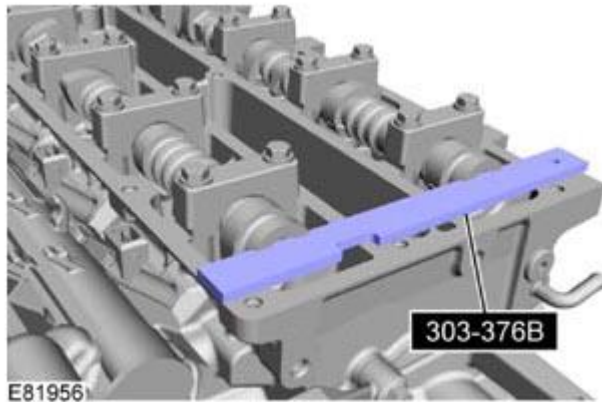


Fig. 151: Removing Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

NOTE: Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.

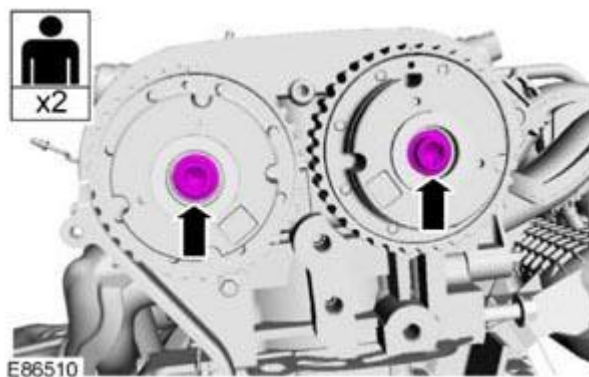


Fig. 152: Locating Camshaft Phaser And Sprocket Bolts

Courtesy of FORD MOTOR CO.

6. Tighten the 2 camshaft phaser and sprocket bolts an additional 75 degrees.

NOTE: The special tool can only be installed if the valve timing is correct.



Fig. 153: Installing Camshaft Alignment Plate Into End Of Camshafts
Courtesy of FORD MOTOR CO.

7. Install the Camshaft Alignment Plate into the end of the camshafts.

NOTE: The special tool can only be installed if the valve timing is correct.

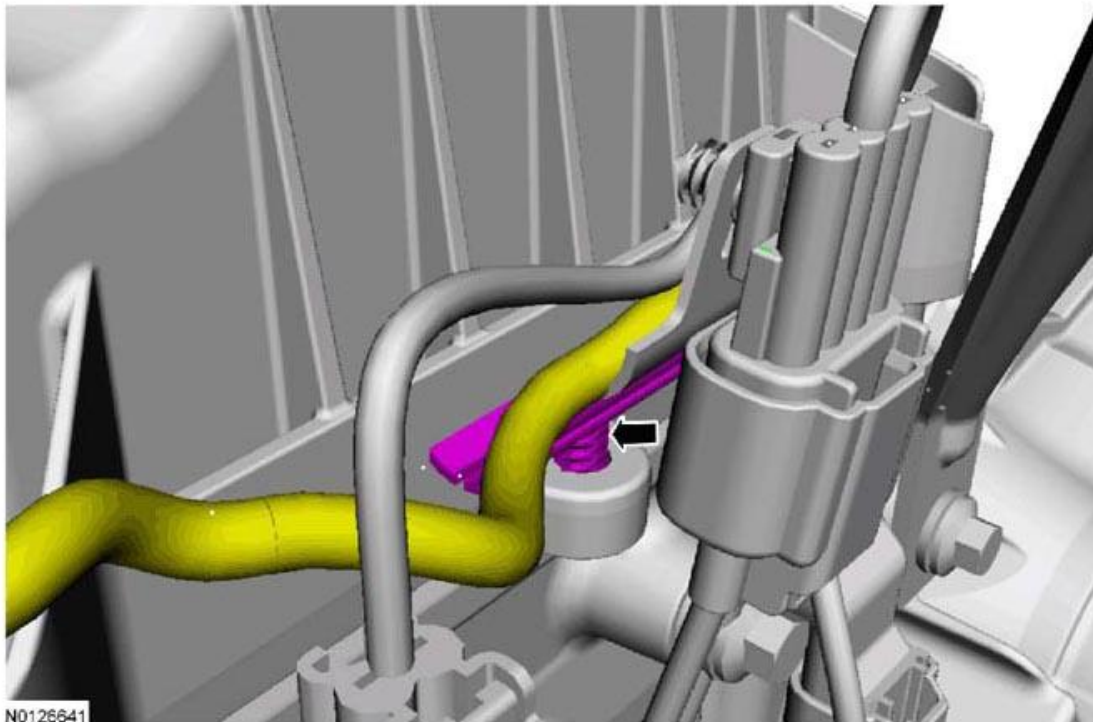


Fig. 154: Installing VCT Alignment Tool

Courtesy of FORD MOTOR CO.

8. Install the VCT Alignment Tool.
 - If the special tools cannot be installed, repeat the adjustment according to the preceding steps.
9. Remove the VCT Alignment Tool.

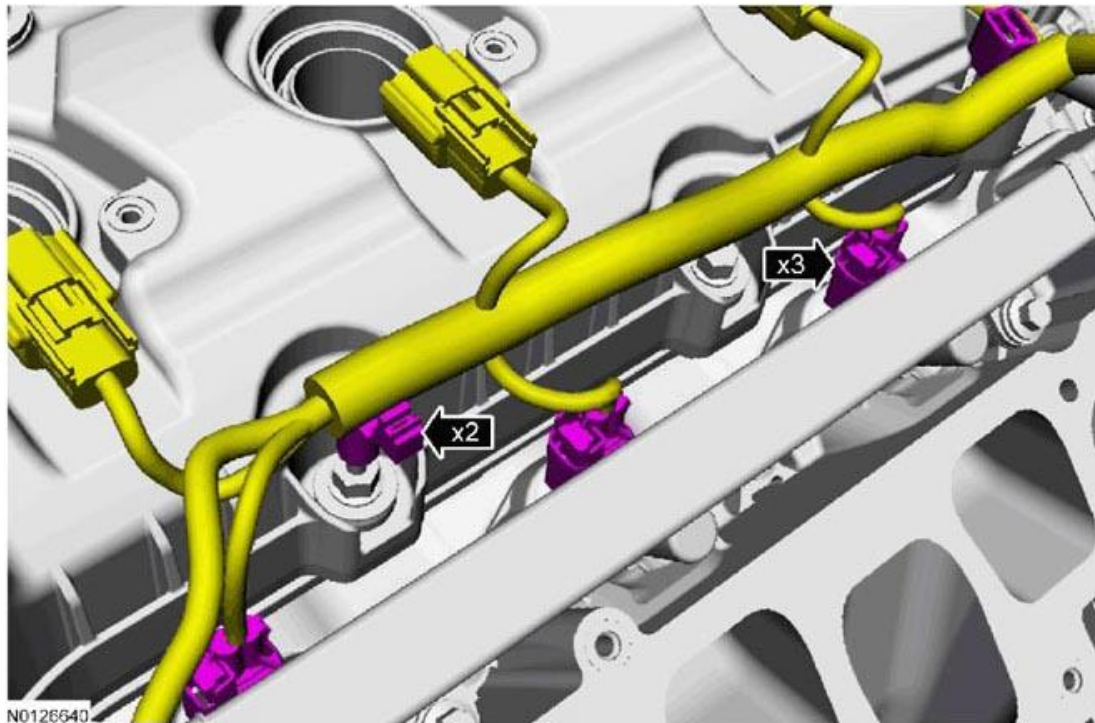


Fig. 155: Removing VCT Alignment Tool
Courtesy of FORD MOTOR CO.

10. Remove the Camshaft Alignment Plate.

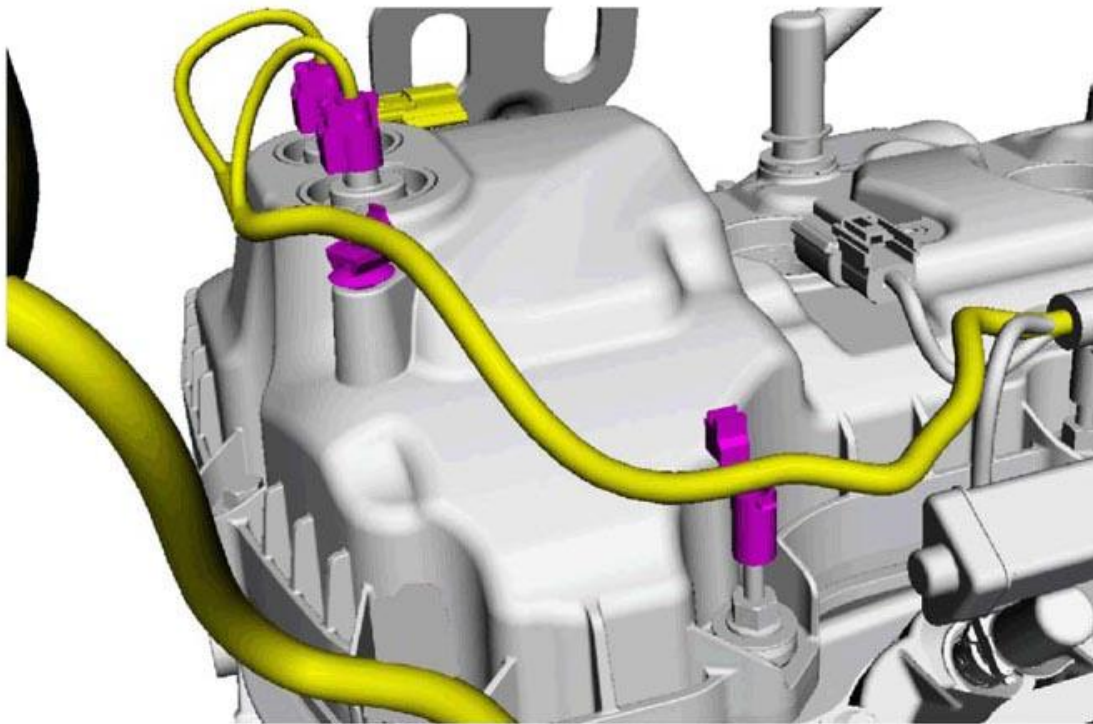


Fig. 156: Removing Camshaft Alignment Plate

Courtesy of FORD MOTOR CO.

NOTE: Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.

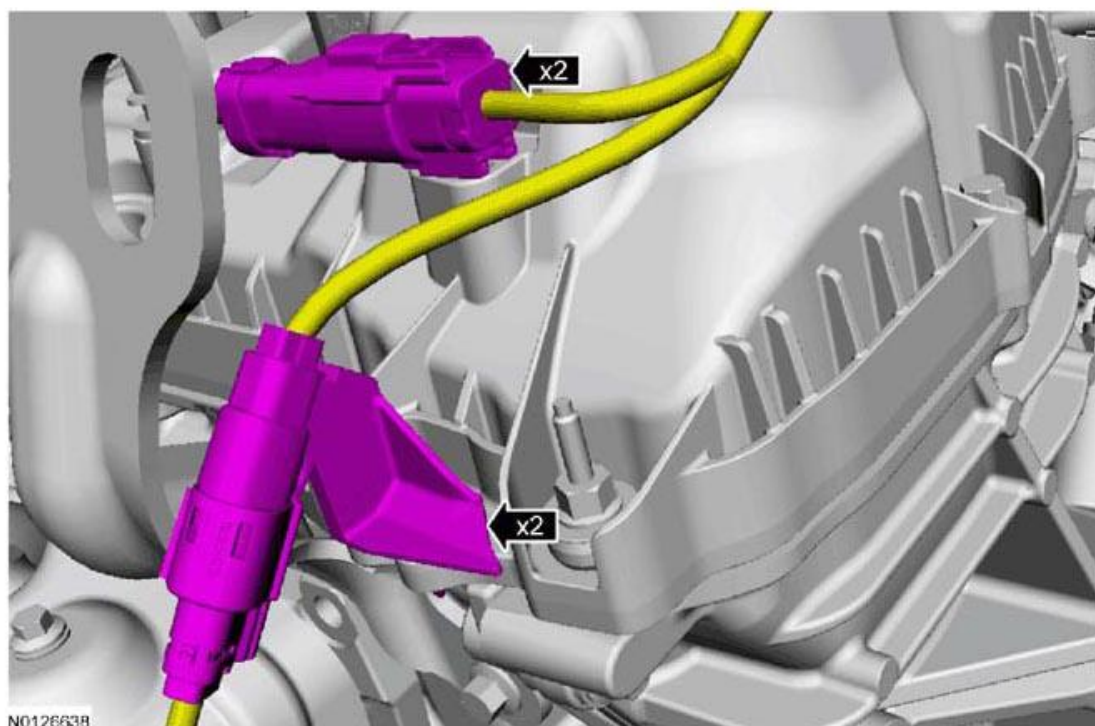


Fig. 157: Locating Camshaft Phaser And Sprocket Plugs
Courtesy of FORD MOTOR CO.

11. Install the 2 camshaft phaser and sprocket plugs.
 - Tighten to 16 Nm (142 lb-in).
12. Install the VCT Alignment Tool.

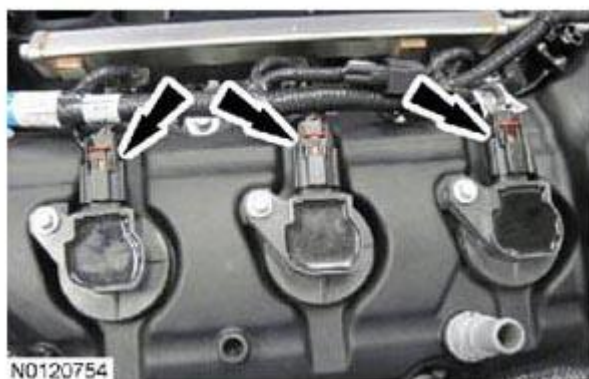
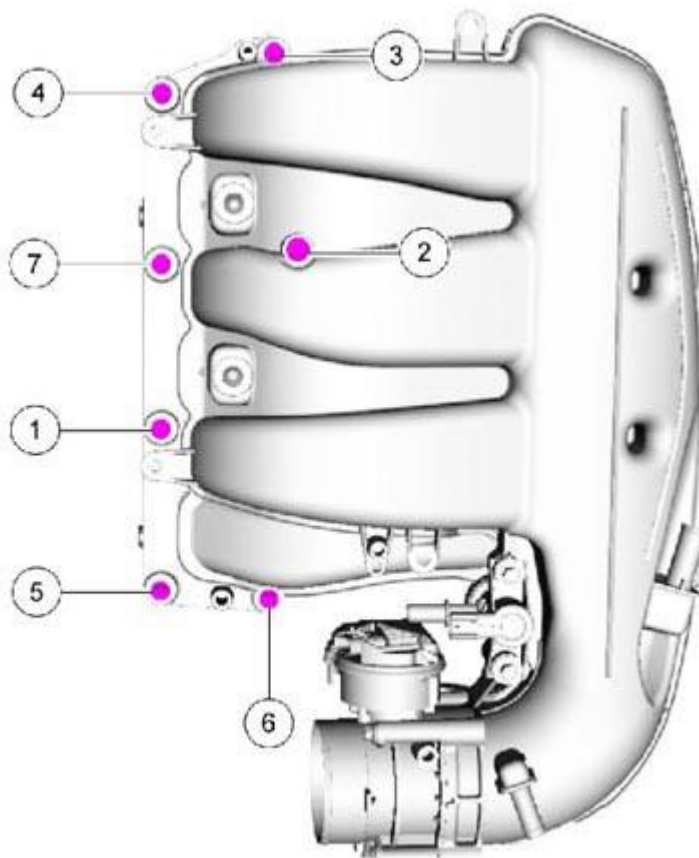


Fig. 158: Installing VCT Alignment Tool
Courtesy of FORD MOTOR CO.

13. Install the timing belt. For additional information, REFER to **Timing Belt**.
14. Tighten the 2 bolts for the LH engine lift eye.
 - Tighten to 19 Nm (168 lb-in).

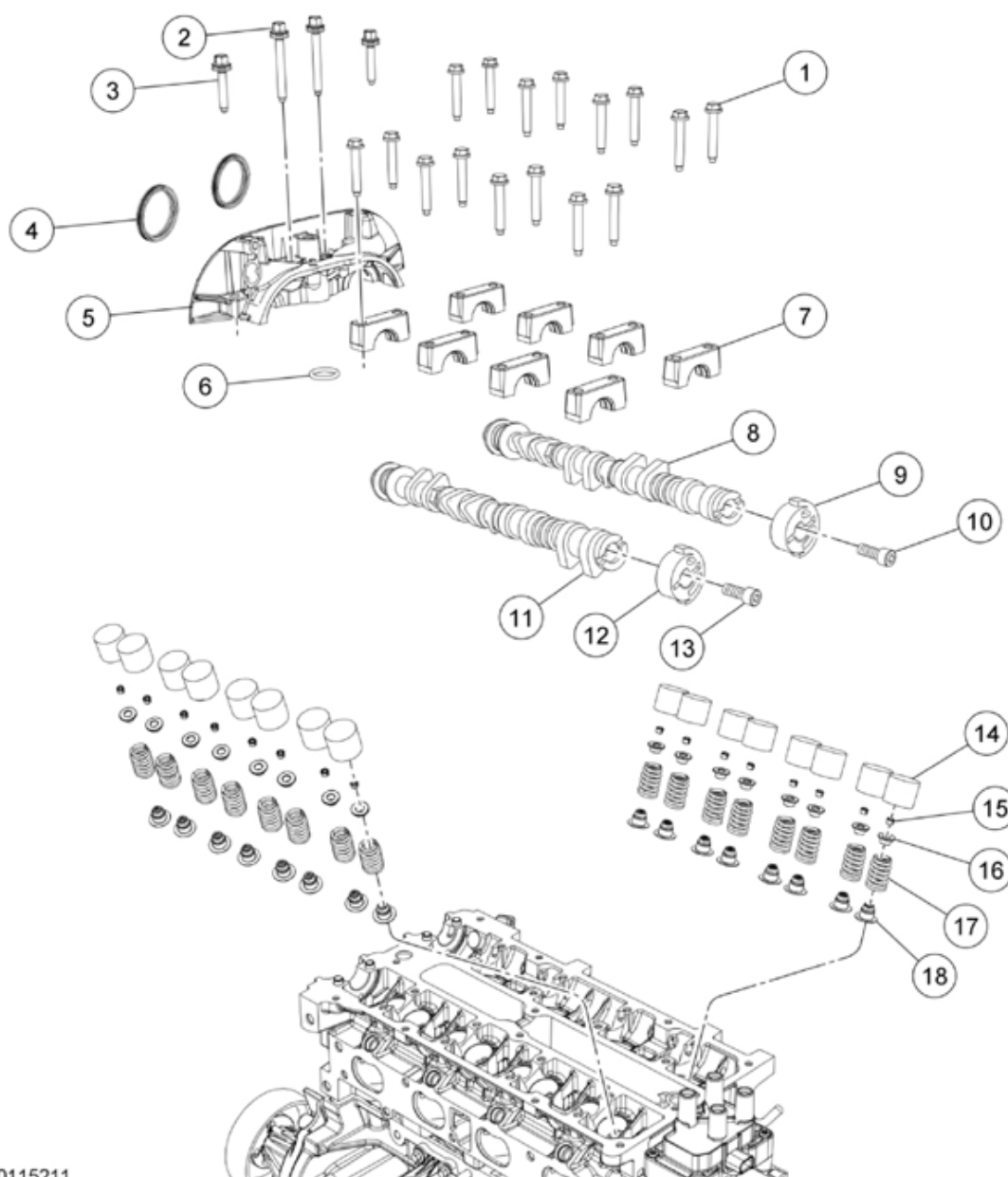


N0129729

Fig. 159: Identifying LH Engine Lift Eye And Bolts
 Courtesy of FORD MOTOR CO.

15. Install the valve cover. For additional information, REFER to Valve Cover.

VALVE TRAIN COMPONENTS - EXPLODED VIEW



N0115211

Fig. 160: Exploded View Of Valve Train Components
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W706225	Camshaft cap bolt (16 required)
2	W710294	Variable Camshaft Timing (VCT) bridge bolt (2 required)
3	W710295	VCT bridge bolt (2 required)
4	6K292	Camshaft oil seal (2 required)
5	-	VCT bridge (part of 6049)
6	W708317	VCT bridge O-ring seal
7	-	Camshaft cap (8 required) (part of 6049)

2013 Ford Fiesta S

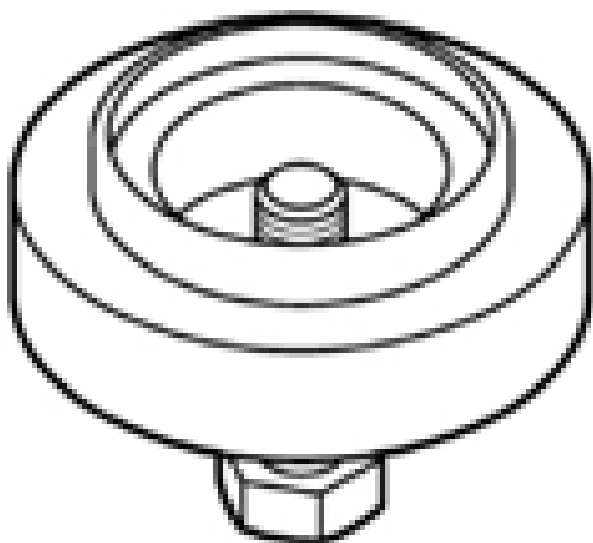
2013 ENGINE Engine Mechanical - 1.6L - Fiesta

8	6250	Exhaust camshaft
9	-	Exhaust camshaft trigger wheel (part of 6250)
10	-	Exhaust camshaft trigger wheel bolt (part of 6250)
11	6250	Intake camshaft
12	-	Intake camshaft trigger wheel (part of 6250)
13	-	Intake camshaft trigger wheel bolt (part of 6250)
14	6500	Valve tappet (16 required)
15	6518	Valve collet (16 required)
16	6514	Valve spring retainer (16 required)
17	6513	Valve spring (16 required)
18	6571	Valve seal (16 required)

1. Refer to the appropriate procedures and/or exploded views in this service information for any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of removal.

CAMSHAFTS

SPECIAL TOOLS

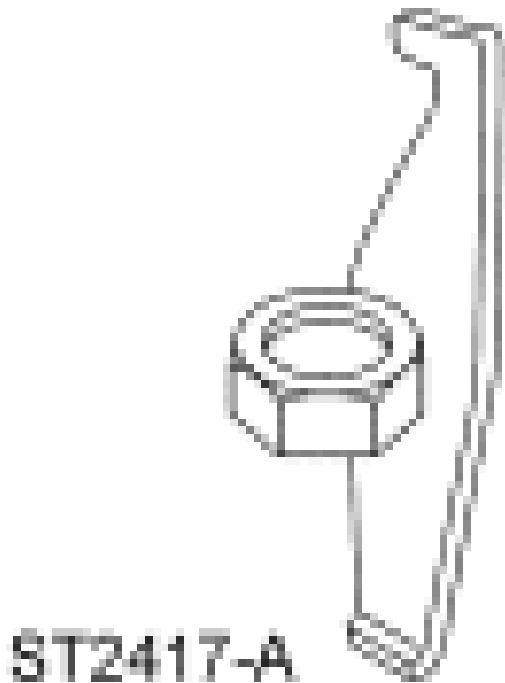


ST3263-A

Installer, Camshaft Seal
303-1532

2013 Ford Fiesta S

2013 ENGINE Engine Mechanical - 1.6L - Fiesta



Remover, Input Shaft Oil Seal
308-375



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

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

Gasket Maker
TA-16WSK-M2G348-
A5**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. Remove the camshaft phaser and sprockets. For additional information, REFER to **Camshaft Phaser and Sprocket**.
2. Using the Input Shaft Oil Seal Remover and Slide Hammer, remove the 2 camshaft oil seals.

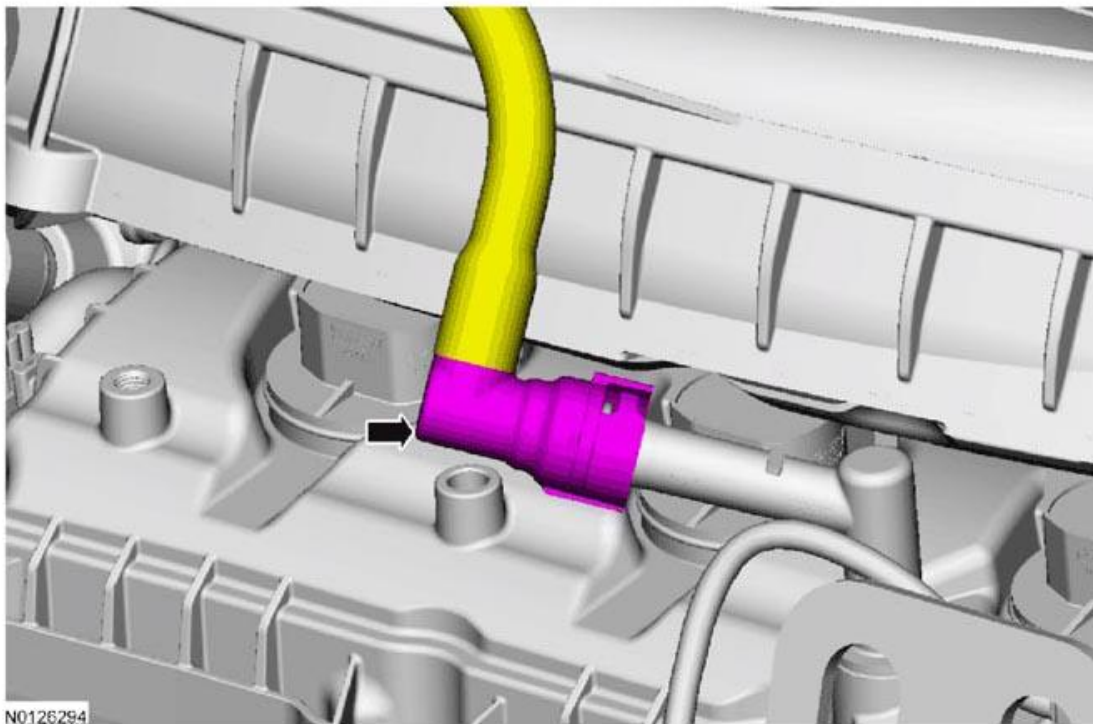


Fig. 161: Removing Camshaft Oil Seals
Courtesy of FORD MOTOR CO.

NOTE: Note the position of each component before removal.

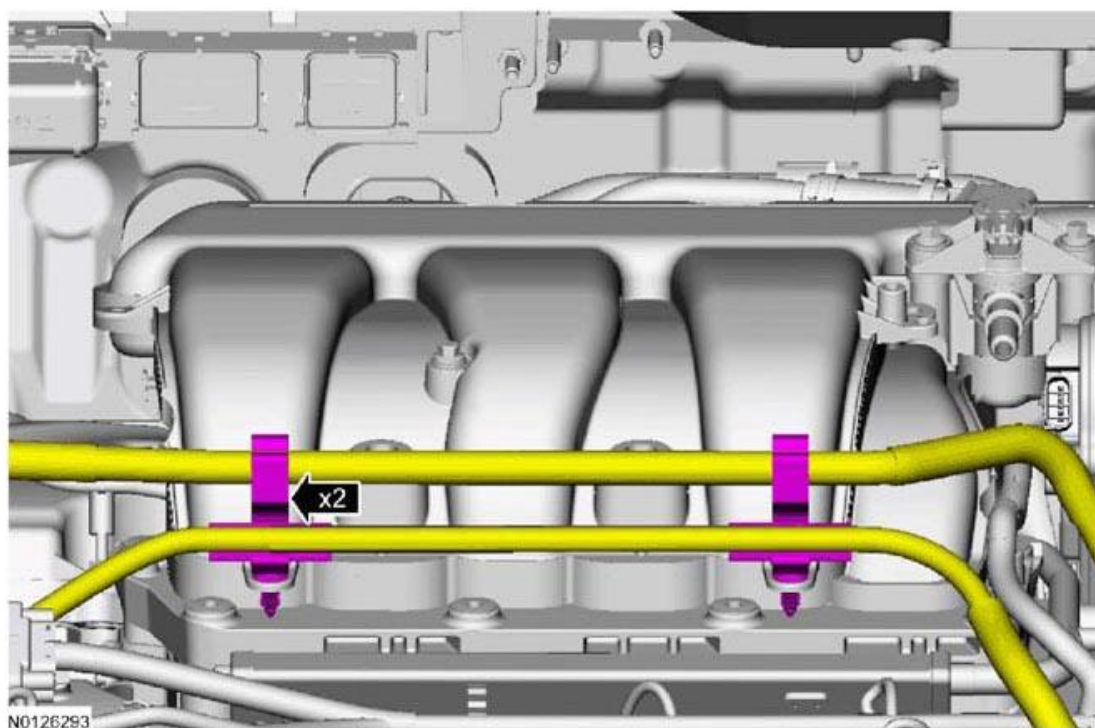


Fig. 162: Identifying Camshaft Bearing Caps And Variable Camshaft Timing (VCT) Bridge Bolts Tightening Sequence

Courtesy of FORD MOTOR CO.

3. Remove the bolts for the camshaft bearing caps and Variable Camshaft Timing (VCT) bridge in the sequence shown in illustration.
 - Inspect and replace the VCT bridge O-ring seal, if necessary.

NOTE: Do not pry on camshafts when removing or damage to the camshafts may occur.

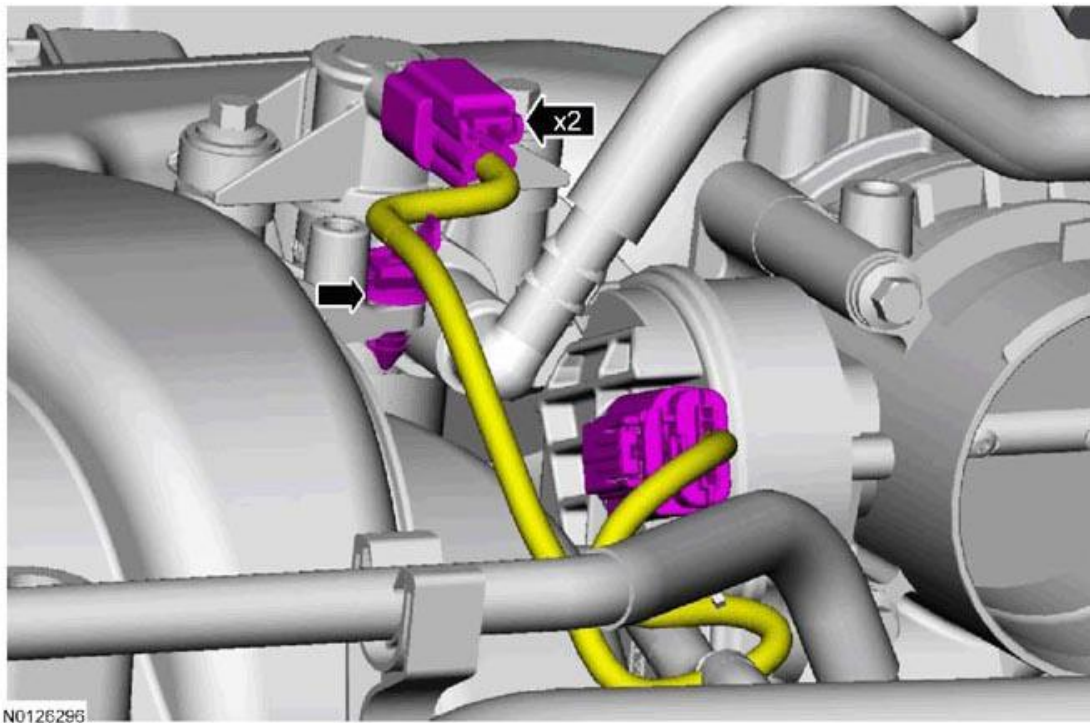


Fig. 163: Identifying Camshafts And Cylinder Head
Courtesy of FORD MOTOR CO.

4. Remove the 2 camshafts from the cylinder head.
5. If necessary, remove the 2 bolts and the camshaft trigger wheels.

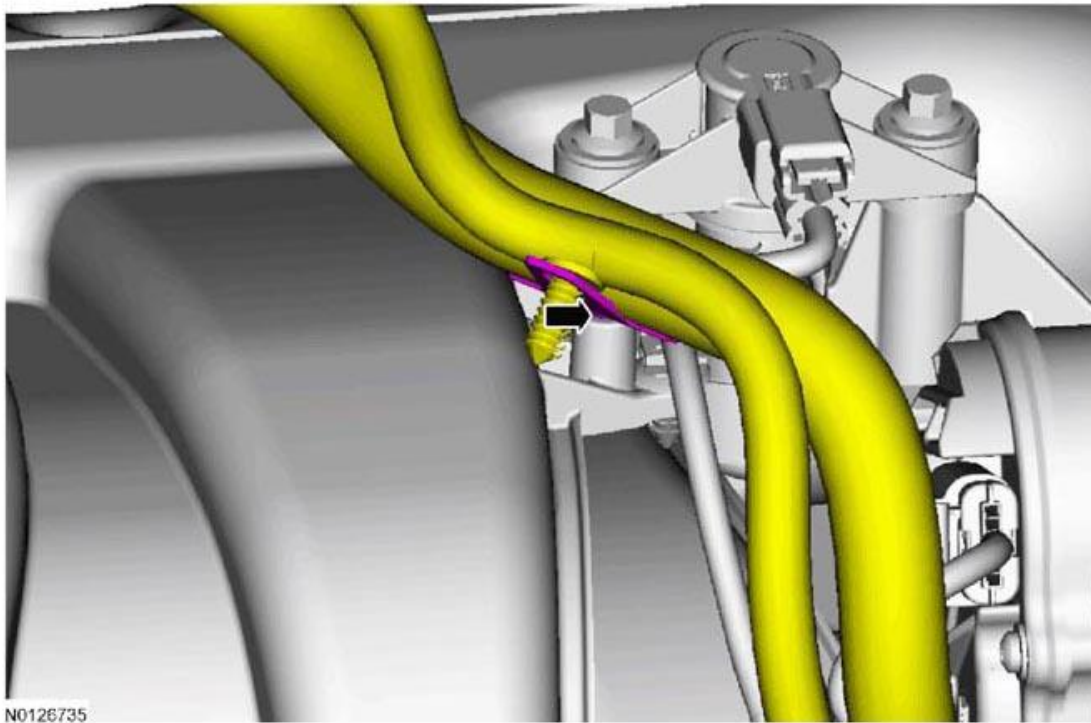


Fig. 164: Identifying Bolts And Camshaft Trigger Wheels
Courtesy of FORD MOTOR CO.

Installation

1. If removed, install the camshaft trigger wheels and the 2 bolts.
 - Tighten to 21 Nm (15 lb-ft).

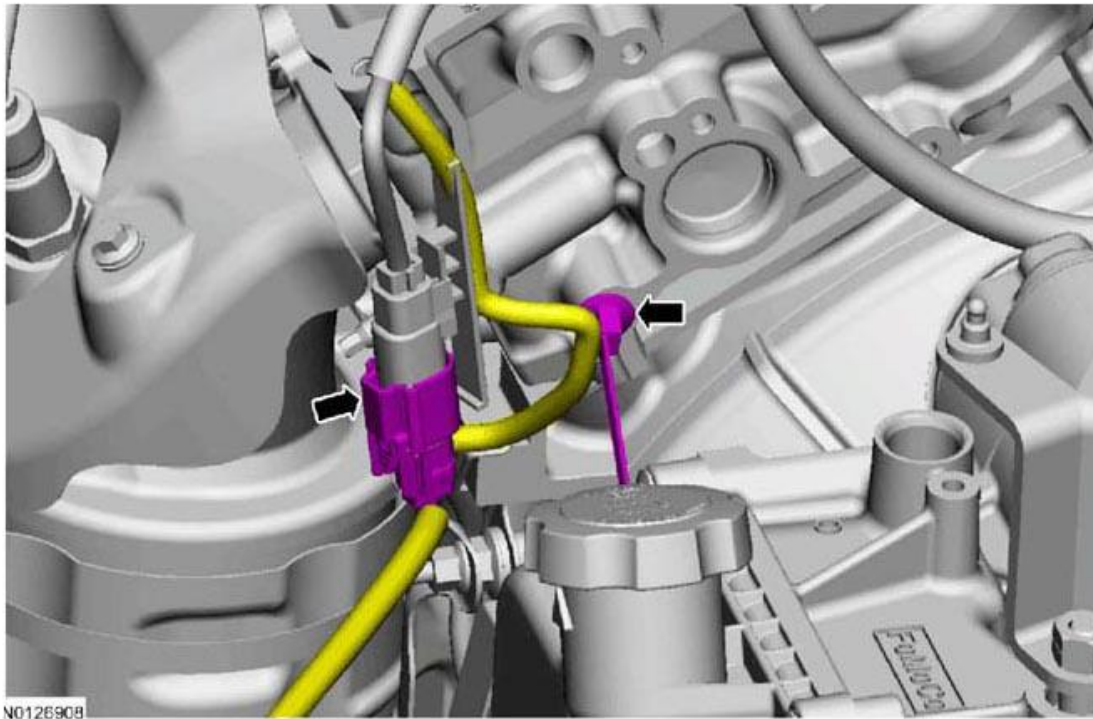


Fig. 165: Identifying Bolts And Camshaft Trigger Wheels
Courtesy of FORD MOTOR CO.

NOTE: Lubricate the camshafts with clean engine oil.



Fig. 166: Locating Camshafts
Courtesy of FORD MOTOR CO.

2. Install the camshafts as shown in illustration.
3. Install the VCT bridge O-ring seal.

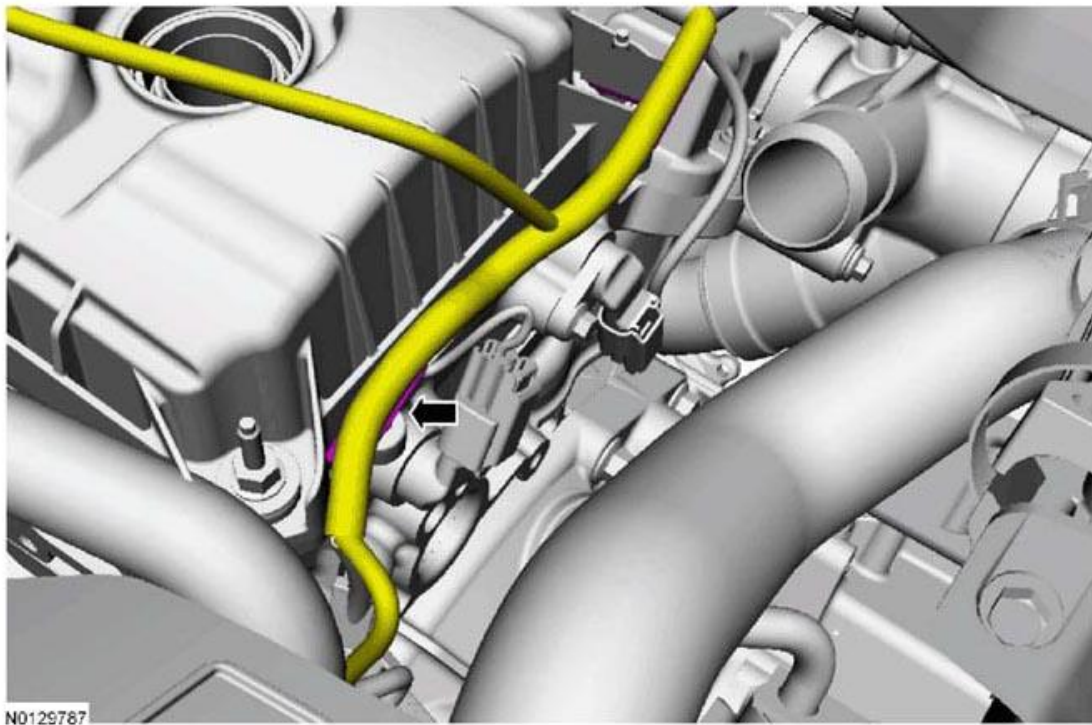


Fig. 167: Locating VCT Bridge O-Ring Seal
Courtesy of FORD MOTOR CO.

NOTE: The VCT bridge must be installed within 5 minutes of applying the gasket maker to the cylinder head.

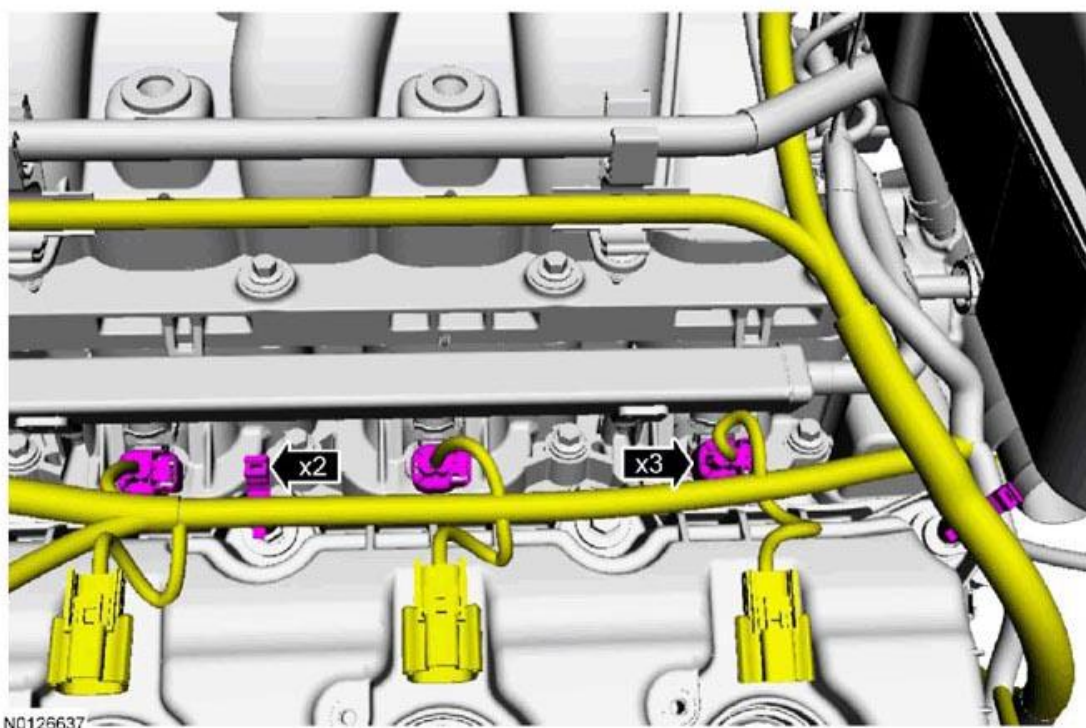


Fig. 168: Identifying Gasket Maker Applying Area To Cylinder Head
Courtesy of FORD MOTOR CO.

4. Apply a 1.5 mm (0.059 in) bead of gasket maker to the cylinder head as shown in illustration.

NOTE: Make sure that the camshafts and camshaft bearing caps are installed in their original locations or damage to the engine may occur.

NOTE: Apply clean engine oil to the bearing surfaces of the camshaft bearing caps and the VCT bridge.

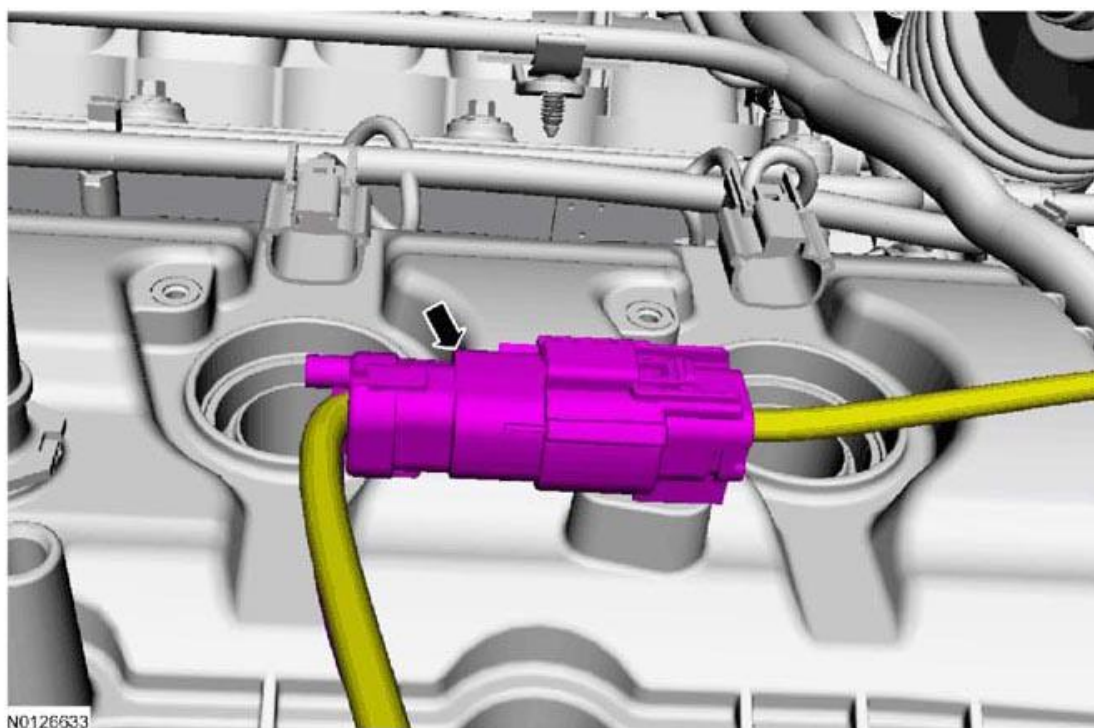


Fig. 169: Locating Camshaft Bearing Caps, VCT Bridge And Bolts
Courtesy of FORD MOTOR CO.

5. Install the camshaft bearing caps, VCT bridge and the bolts finger tight.
6. Tighten the bolts in the sequence shown in illustration in 6 stages.
 - Stage 1: Tighten the bolts evenly, half a turn at a time, until the camshaft bearing caps and the VCT bridge are seated against the cylinder head.
 - Stage 2: Tighten bolts 1 through 16 to 7 Nm (62 lb-in).
 - Stage 3: Tighten bolts 17 through 20 to 10 Nm (89 lb-in).
 - Stage 4: Tighten bolts 1 through 16 an additional 45 degrees.
 - Stage 5: Tighten bolts 17 and 19 an additional 70 degrees.
 - Stage 6: Tighten bolts 18 and 20 an additional 53 degrees.

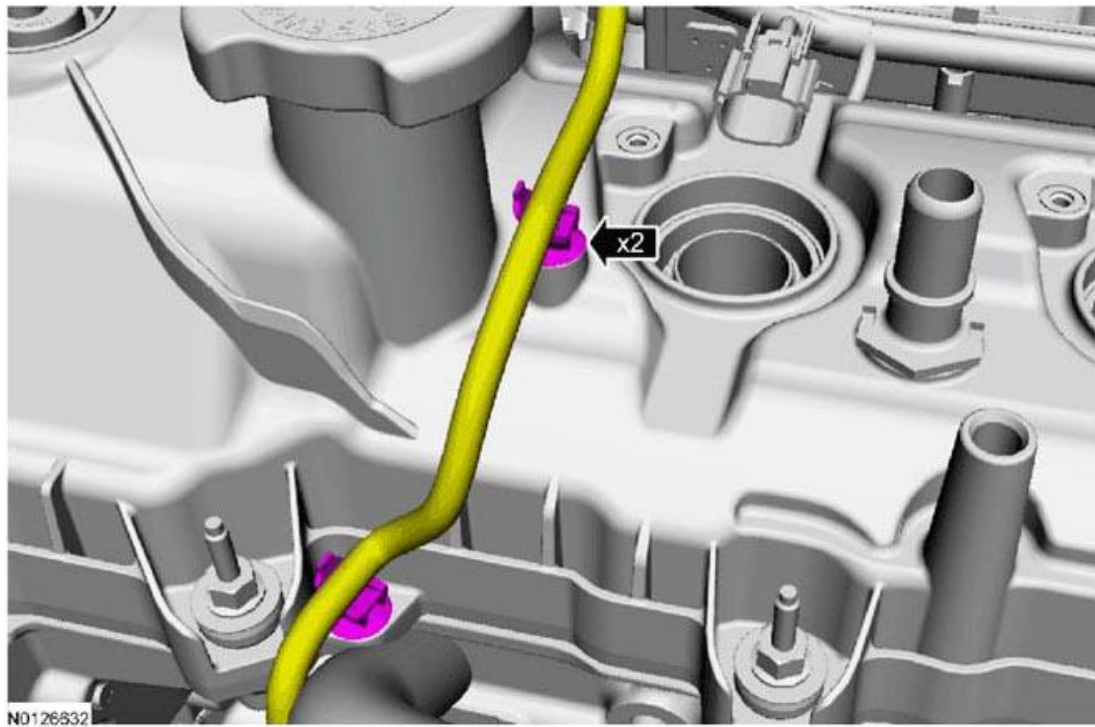


Fig. 170: Identifying Camshaft Bearing Caps And Variable Camshaft Timing (VCT) Bridge Bolts Tightening Sequence
 Courtesy of FORD MOTOR CO.

7. If the cylinder head, camshafts or valve tappets were replaced, check the valve clearance. For additional information, REFER to **Valve Clearance Check**.
8. Using the Camshaft Seal Installer, install the 2 camshaft oil seals.

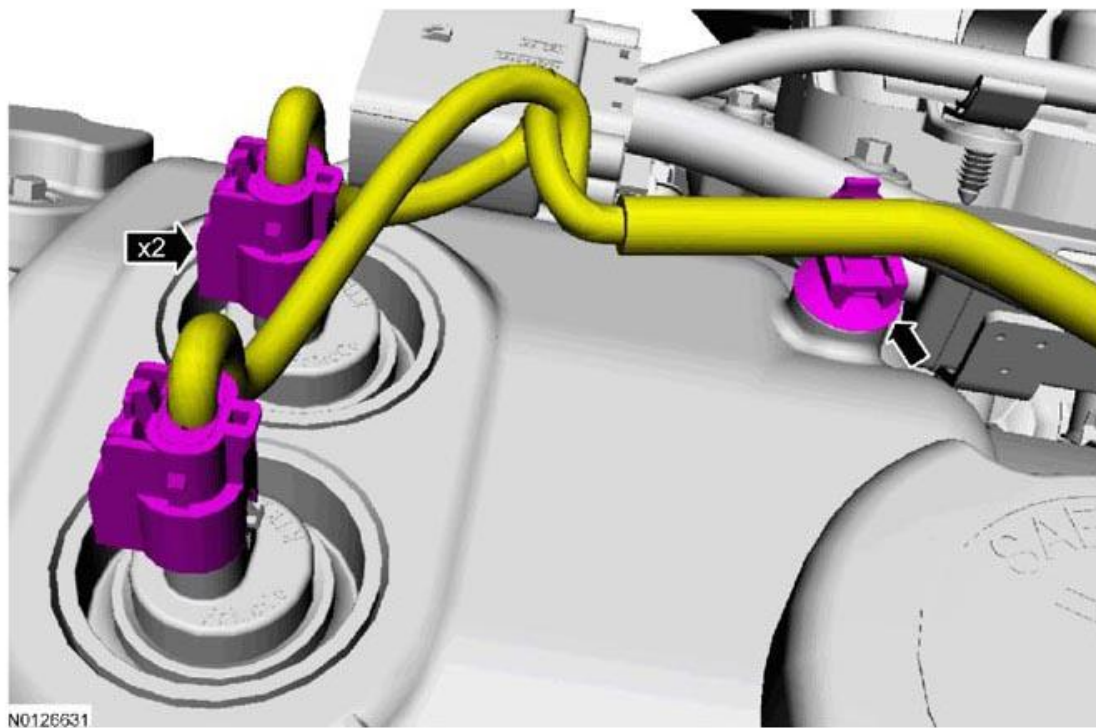
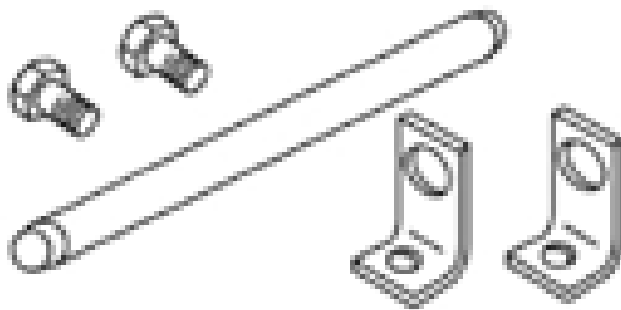


Fig. 171: Installing Camshaft Oil Seals
Courtesy of FORD MOTOR CO.

9. Install the camshaft phaser and sprocket. For additional information, REFER to **Camshaft Phaser and Sprocket**.

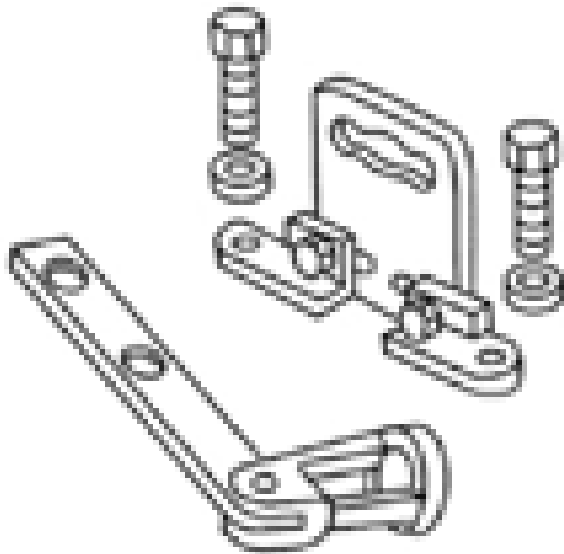
VALVE SPRINGS

SPECIAL TOOLS



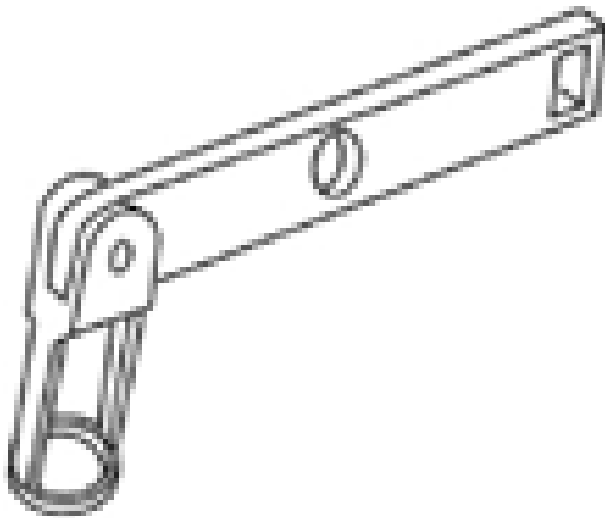
ST1981-A

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



ST1907-A

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



ST1902-A

Compressor, Valve Spring
303-1418

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
Motorcraft® XL-5 (aerosol) and/or CRC® SL3151

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**.
2. Remove the camshafts. For additional information, REFER to **Camshafts**.
3. Remove the ignition coil. For additional information, refer to **ENGINE IGNITION - 1.6L**.
4. Remove the 2 bolts and the LH engine lift eye.

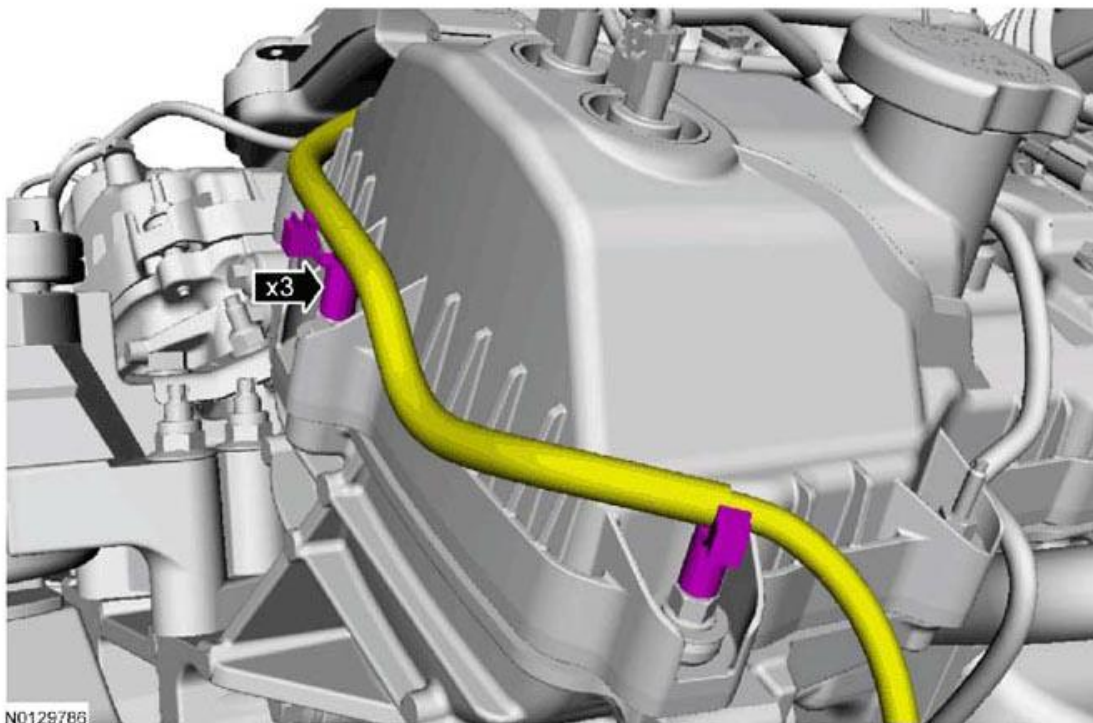


Fig. 172: Locating Bolts And LH Engine Lift Eye
Courtesy of FORD MOTOR CO.

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.

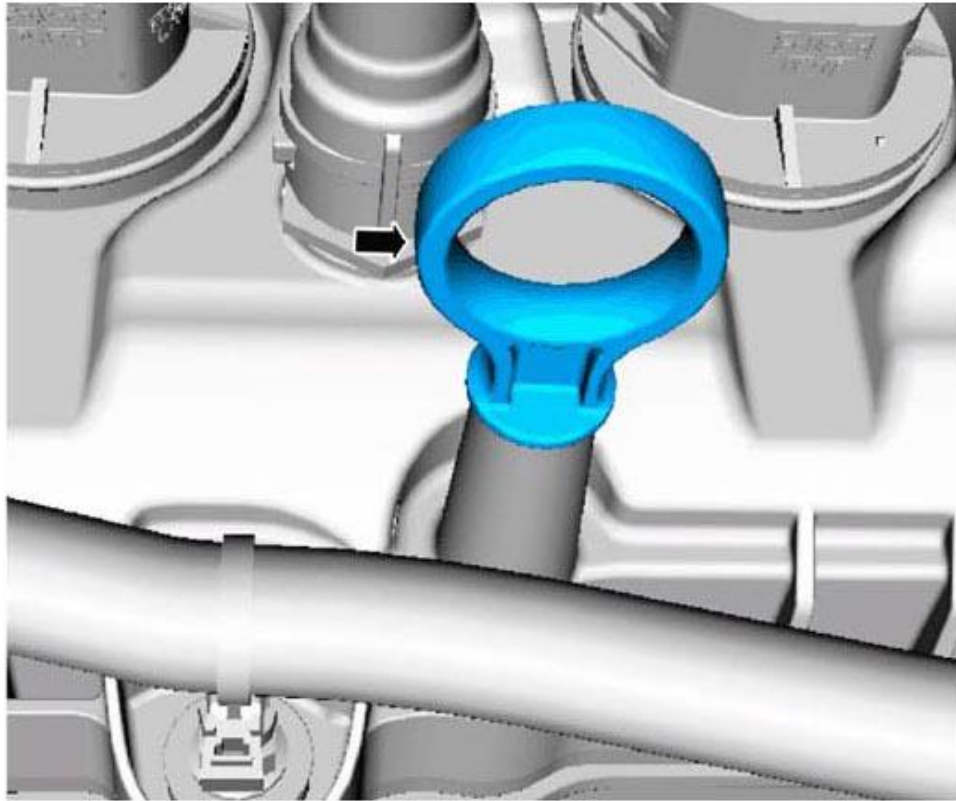


Fig. 173: Identifying Camshafts And Valve Tappets
Courtesy of FORD MOTOR CO.

5. Remove and inspect the valve tappets. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

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

NOTE: Use compressed air to remove any foreign material in the spark plug well before removing the spark plugs.

6. Remove the 4 spark plugs.

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.

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

NOTE: Place all parts in order to one side.



Fig. 174: Removing Valve Spring Retainer And Valve Spring
Courtesy of FORD MOTOR CO.

8. 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.
9. Repeat the appropriate removal steps for all of the other cylinders.

Installation

NOTE: Check the seating of the valve collet.

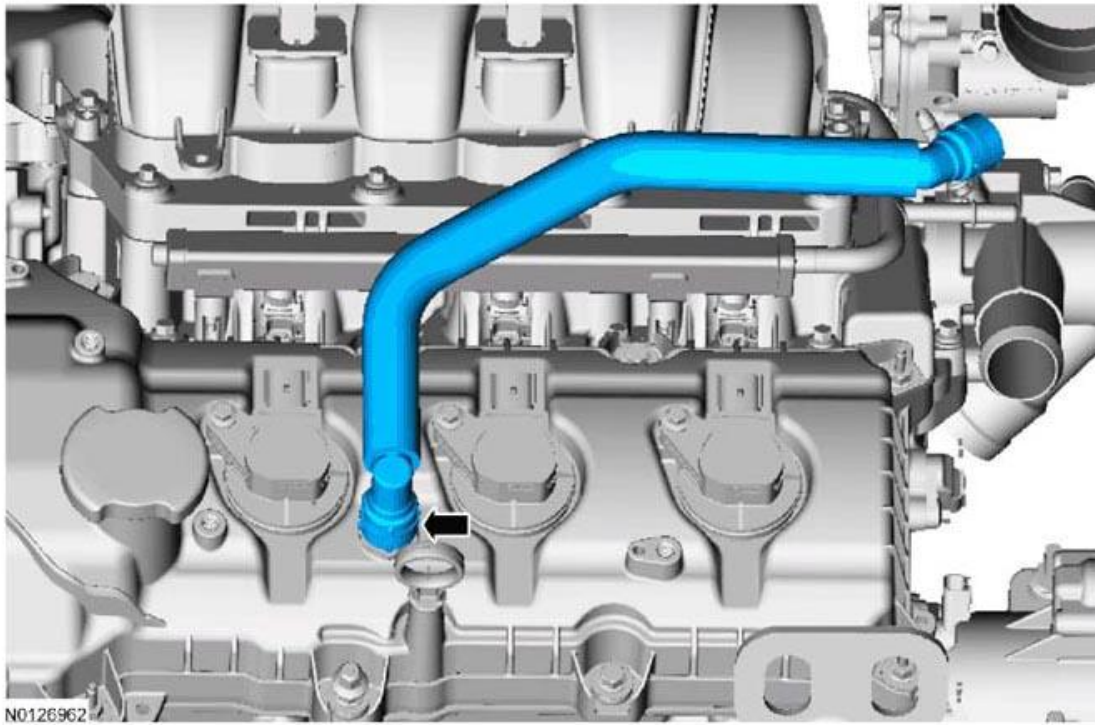


Fig. 175: Removing Valve Spring Retainer And Valve Spring
Courtesy of FORD MOTOR CO.

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 installation steps for all of the other cylinders.

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 4 spark plugs.
 - Tighten to 15 Nm (133 lb-in).
5. Coat the valve tappets with clean engine oil and install them in the cylinder head in their original position.

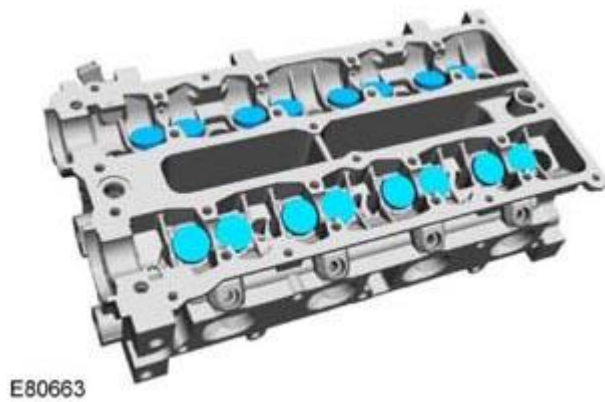


Fig. 176: Identifying Camshafts And Valve Tappets
Courtesy of FORD MOTOR CO.

6. Install the camshafts. For additional information, REFER to **Camshafts**.
7. Install the LH engine lift eye and the 2 bolts.
 - Tighten to 19 Nm (168 lb-in).

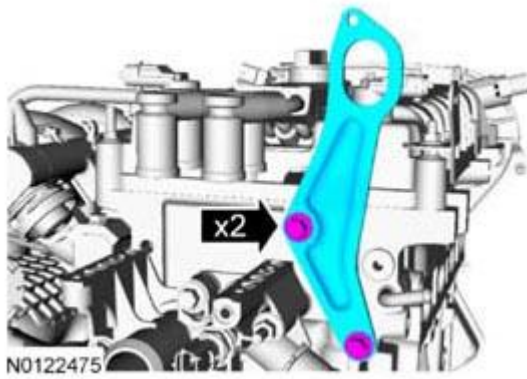


Fig. 177: Locating LH Engine Lift Eye And Bolts
Courtesy of FORD MOTOR CO.

8. Install the ignition coil. For additional information, refer to **ENGINE IGNITION - 1.6L** .

VALVE SEALS

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: 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 valve springs. For additional information, REFER to Valve Springs.

NOTE: Use valve stem seal pliers (such as Snap-on® YA-8230 or equivalent).

2. Using valve stem seal pliers, remove and discard the valve seals.



Fig. 178: Locating Valve Seals
Courtesy of FORD MOTOR CO.

Installation

1. Install the valve stem seal installation sleeve.

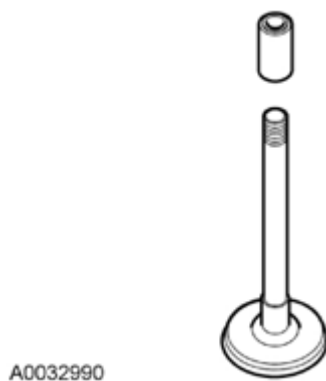


Fig. 179: Identifying Valve Stem Seal Installation Sleeve
Courtesy of FORD MOTOR CO.

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



Fig. 180: Locating Valve Seals
Courtesy of FORD MOTOR CO.

2. Using valve stem seal pliers, install the valve seals.
3. Install the valve springs. For additional information, REFER to **Valve Springs**.

VALVE TAPPETS

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**.
2. Remove the camshafts. For additional information, REFER to **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.

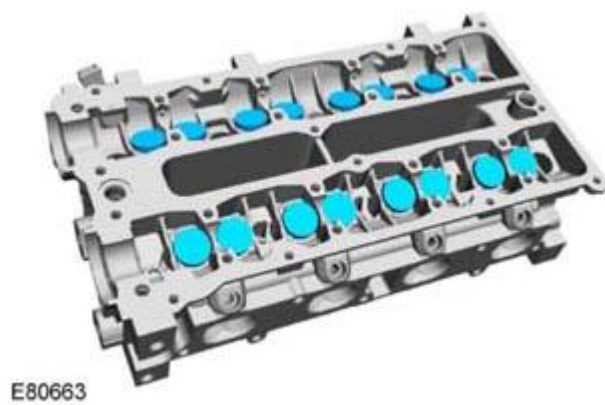
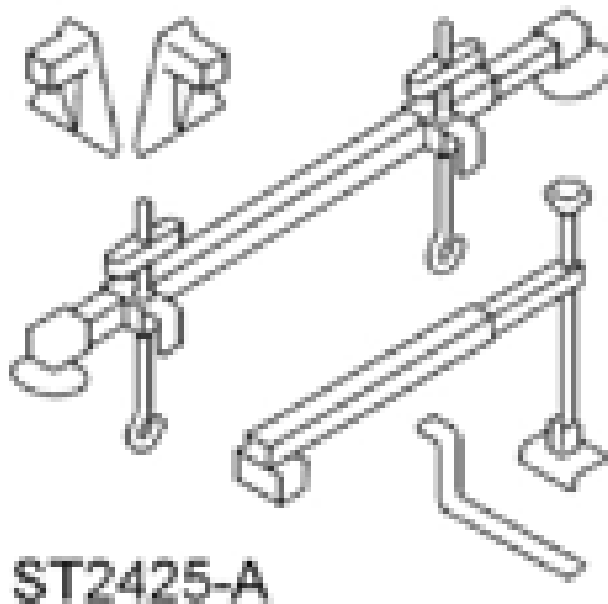


Fig. 181: Identifying Camshafts And Valve Tappets
Courtesy of FORD MOTOR CO.

3. Remove and inspect the valve tappets. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.
4. To install, reverse the removal procedure.
 - Coat the valve tappets with clean engine oil prior to installation.

CYLINDER HEAD

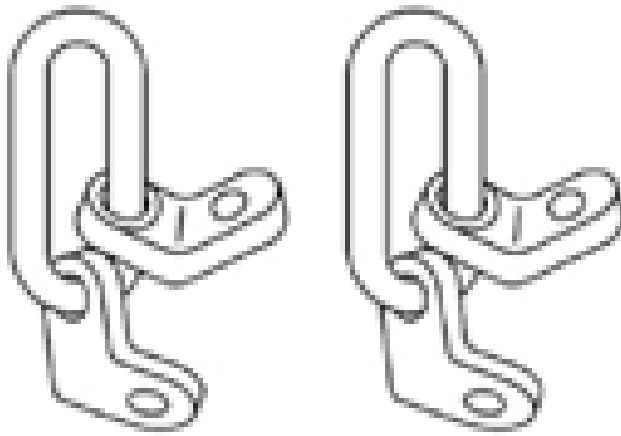
SPECIAL TOOLS



Engine Support Bar
303-F072

2013 Ford Fiesta S

2013 ENGINE Engine Mechanical - 1.6L - Fiesta

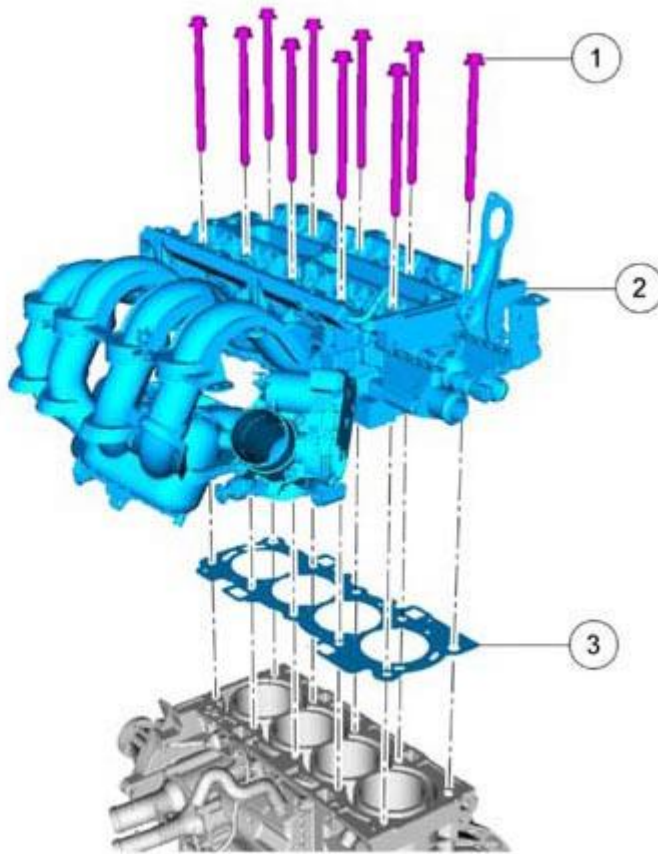


ST1595-A

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

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
Motorcraft® Metal Surface Prep ZC-31-A	-



N0123631

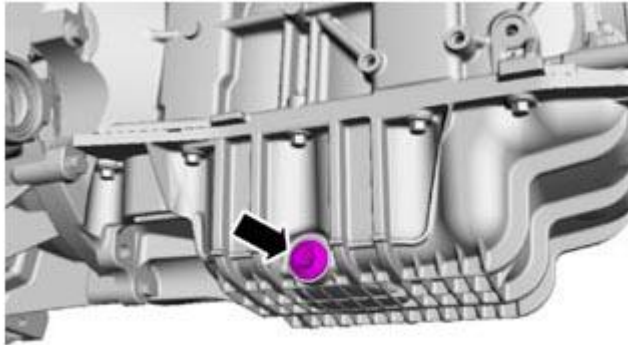
Fig. 182: Exploded View Of Cylinder Head
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6065	Cylinder head bolt (10 required)
2	6049	Cylinder head
3	6051	Cylinder head gasket

Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** .
2. Release the fuel system pressure. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** .
3. Disconnect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND CABLES** .
4. Remove the Air Cleaner (ACL) outlet tube. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING** .
5. Remove the Heated Oxygen Sensor (HO2S). For additional information, refer to **ELECTRONIC ENGINE CONTROLS** .
6. Drain the engine cooling system. For additional information, refer to **ENGINE COOLING SYSTEM** .

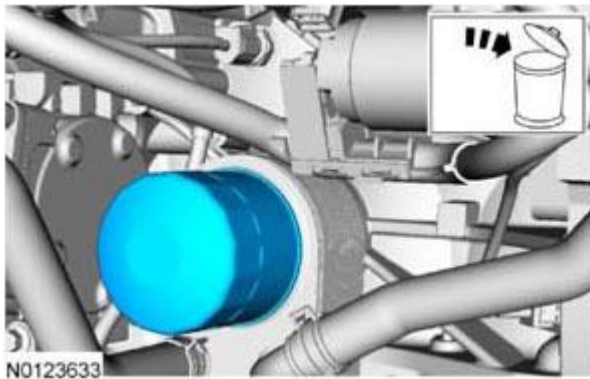
7. Drain the engine oil.
 - Install the drain plug.
 - Tighten to 28 Nm (21 lb-ft).



E79660

Fig. 183: Locating Drain Plug
Courtesy of FORD MOTOR CO.

8. Remove and discard the engine oil filter.



N0123633

Fig. 184: Removing Engine Oil Filter
Courtesy of FORD MOTOR CO.

9. Remove the Catalyst Monitor Sensor (CMS). For additional information, refer to **ELECTRONIC ENGINE CONTROLS**.
10. Remove the 2 catalytic converter-to-muffler nuts and separate the catalytic converter from the muffler.
 - Discard the gasket.

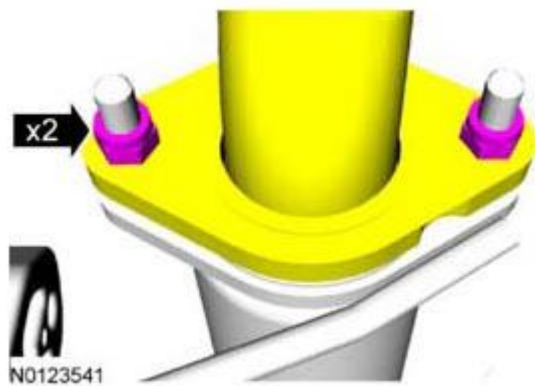


Fig. 185: Locating Catalytic Converter-To-Muffler Nuts
Courtesy of FORD MOTOR CO.

NOTE: Do not excessively bend or twist the exhaust flexible pipe. Failure to follow these instructions may cause damage to the flexible pipe.

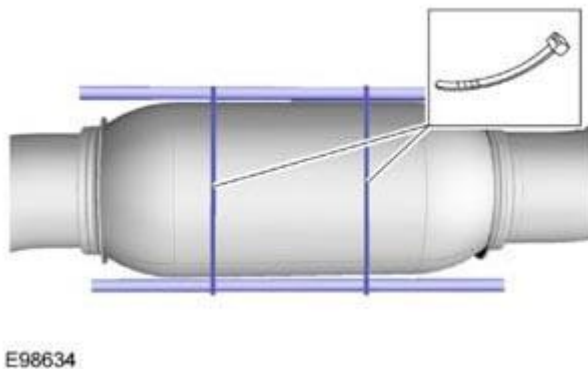


Fig. 186: Supporting Exhaust Flexible Pipe
Courtesy of FORD MOTOR CO.

11. Support the exhaust flexible pipe with a support wrap or suitable splint.
12. Remove the 4 bolts and the lower catalytic converter bracket.

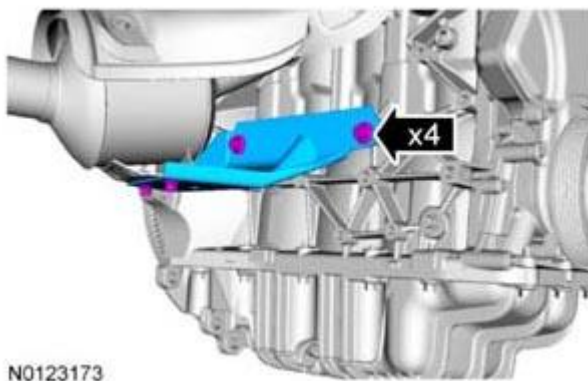


Fig. 187: Locating Bolts And Lower Catalytic Converter Bracket
Courtesy of FORD MOTOR CO.

13. Remove the 4 bolts and the catalytic converter heat shield.

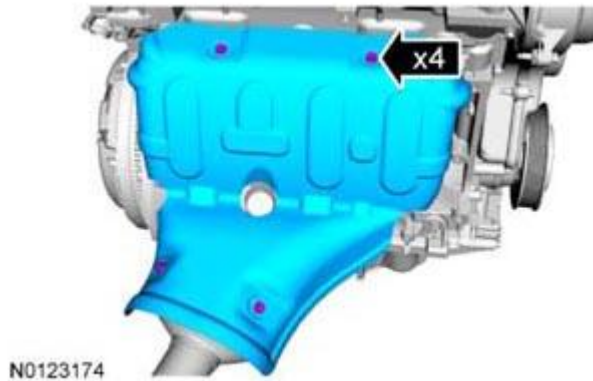


Fig. 188: Locating Bolts And Catalytic Converter Heat Shield
Courtesy of FORD MOTOR CO.

14. Remove the 4 catalytic converter nuts and bolt.
- Discard the 4 nuts and bolt.

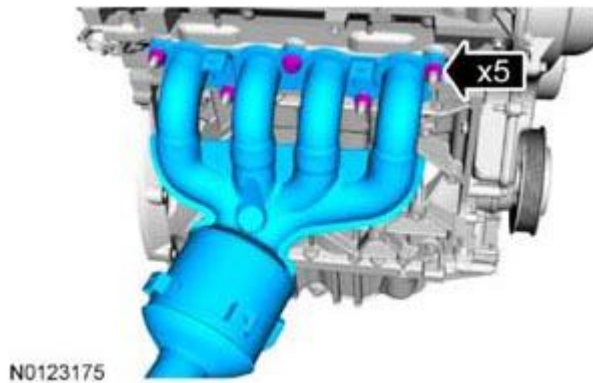


Fig. 189: Locating Catalytic Converter Nuts And Bolt
Courtesy of FORD MOTOR CO.

15. Position the catalytic converter back and secure with mechanic wire.
- Discard the catalytic converter gasket.
16. If equipped, disconnect the block heater electrical connector.
17. Remove the 4 catalytic converter studs and discard.

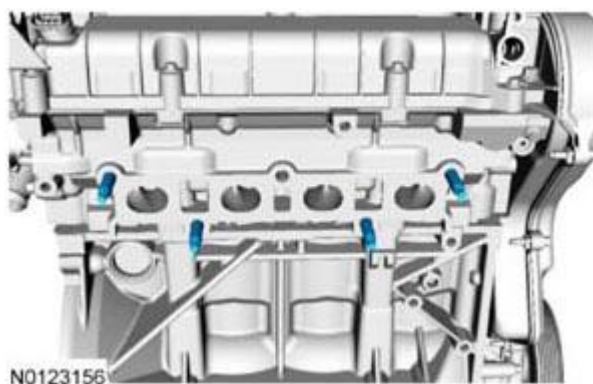


Fig. 190: Identifying Catalytic Converter Studs
Courtesy of FORD MOTOR CO.

18. Disconnect the fuel tube spring lock couplings from the fuel rail. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION**.

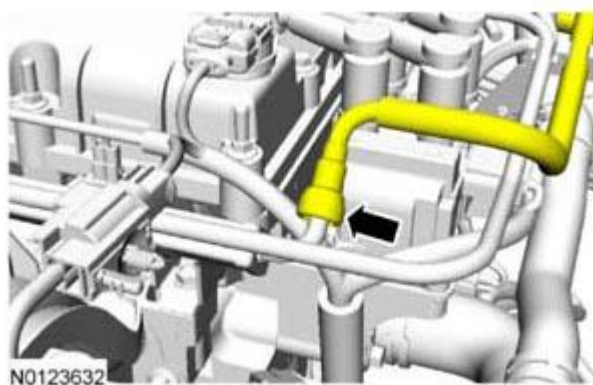


Fig. 191: Locating Fuel Tube Spring Lock Couplings From Fuel Rail
Courtesy of FORD MOTOR CO.

19. Disconnect the 4 fuel injector electrical connectors.

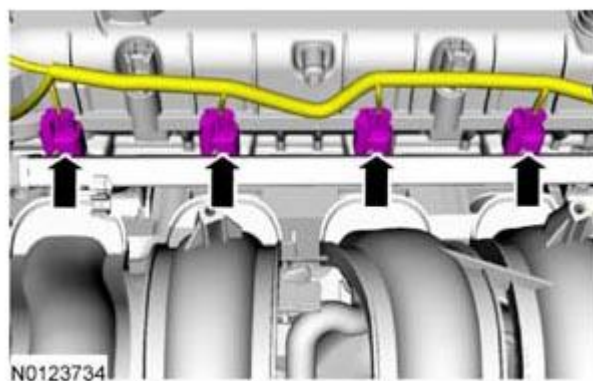


Fig. 192: Locating Fuel Injector Electrical Connectors
Courtesy of FORD MOTOR CO.

20. Disconnect the Throttle Body (TB) electrical connector.
- Detach the wiring harness retainer from the TB.

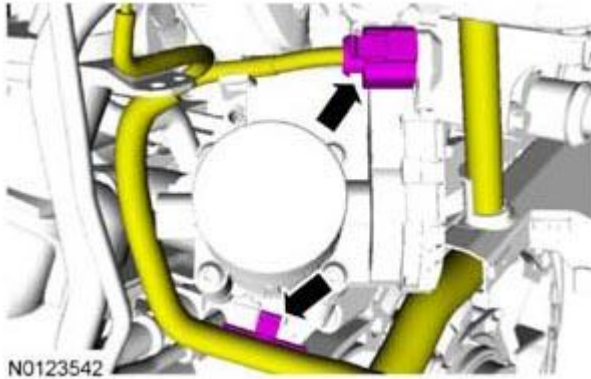


Fig. 193: Locating Throttle Body (TB) Electrical Connector
Courtesy of FORD MOTOR CO.

21. Remove the screw and the oil level indicator and tube.
- Inspect and replace the O-ring seal, if necessary.

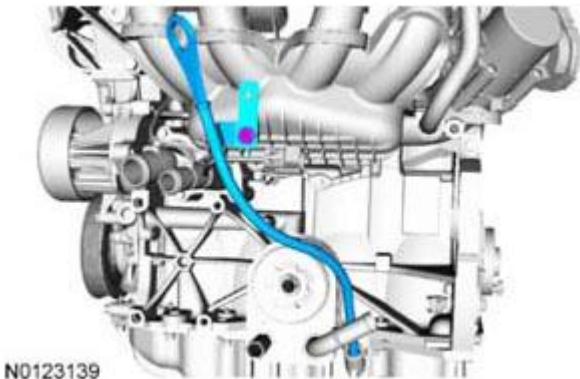


Fig. 194: Identifying Oil Level Indicator Tube And Screw
Courtesy of FORD MOTOR CO.

22. Disconnect the PCV hose from the intake manifold.

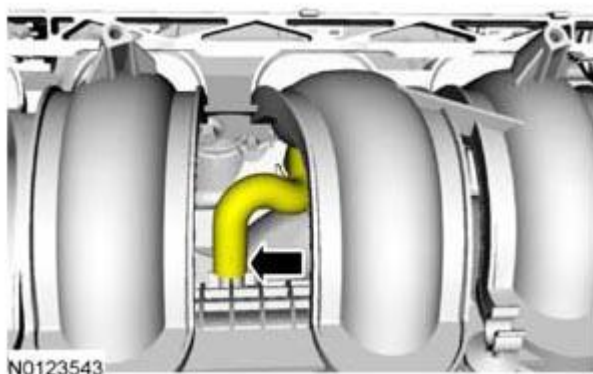


Fig. 195: Locating PCV Hose From Intake Manifold
Courtesy of FORD MOTOR CO.

23. Remove the bolt for the Evaporative Emission (EVAP) canister purge valve.

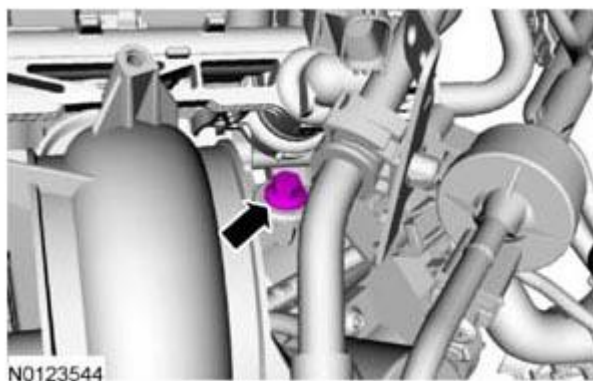


Fig. 196: Locating Evaporative Emission (EVAP) Canister Purge Valve Bolt
Courtesy of FORD MOTOR CO.

24. Disconnect the brake booster vacuum tube from the intake manifold.

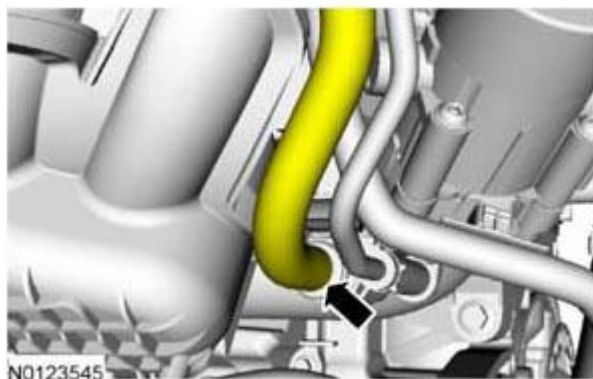


Fig. 197: Locating Brake Booster Vacuum Tube From Intake Manifold
Courtesy of FORD MOTOR CO.

25. Disconnect the EVAP canister purge valve tube from the intake manifold and position the EVAP canister purge valve aside.

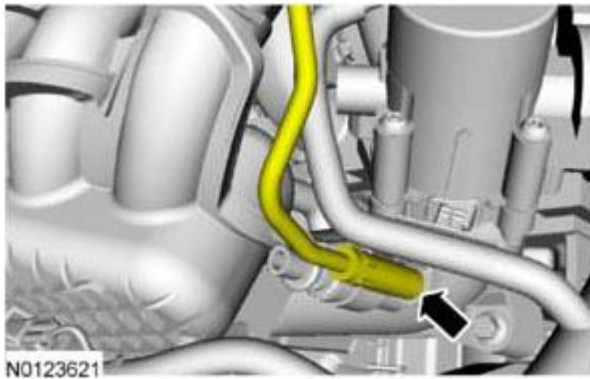


Fig. 198: Locating EVAP Canister Purge Valve Tube From Intake Manifold
Courtesy of FORD MOTOR CO.

26. Detach the Knock Sensor (KS) electrical connector from the bottom of the intake manifold.
- Detach the 2 wiring harness retainers from the bottom of the intake manifold.

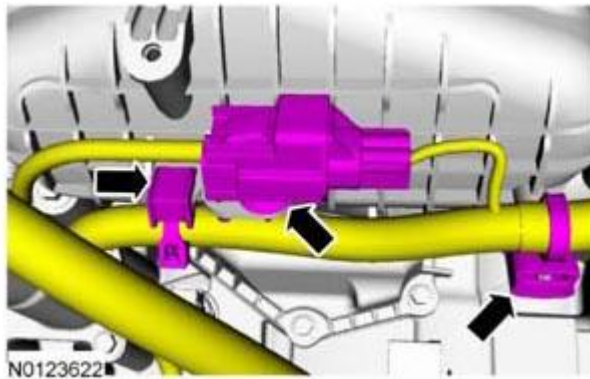


Fig. 199: Locating Knock Sensor (KS) Electrical Connector From Bottom Of Intake Manifold
Courtesy of FORD MOTOR CO.

27. Remove the valve tappets. For additional information, REFER to **Valve Tappets**.
28. Remove the 2 lower bolts for the intake manifold.

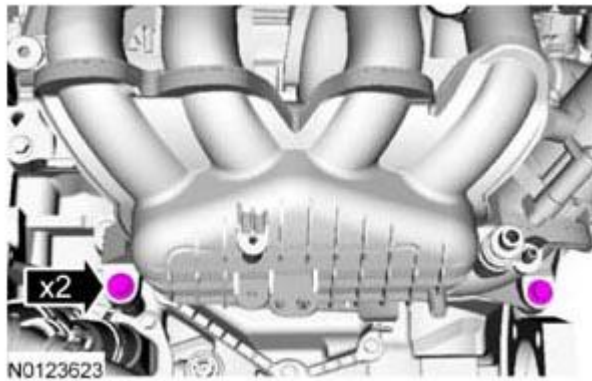


Fig. 200: Locating Intake Manifold And Lower Bolts
Courtesy of FORD MOTOR CO.

29. Remove the 4 bolts and the timing belt cover backplate.

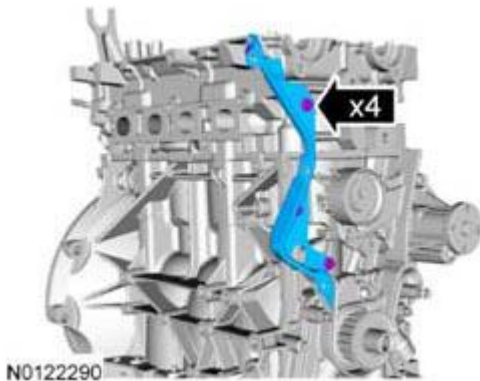


Fig. 201: Locating Timing Belt Cover Backplate And Bolts
Courtesy of FORD MOTOR CO.

30. Disconnect the ignition coil electrical connector and remove the 4 screws and the ignition coil.

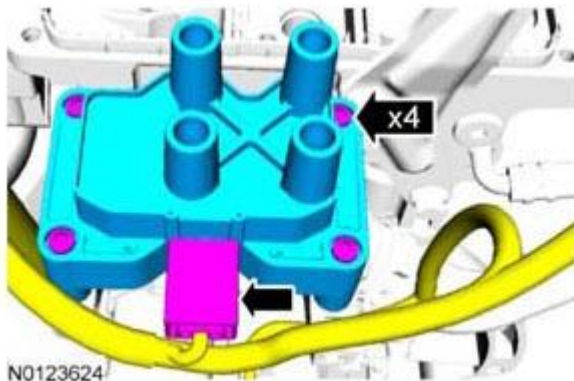


Fig. 202: Locating Ignition Coil Electrical Connector And Screws
Courtesy of FORD MOTOR CO.

31. Detach the fuel tube retainer from the coolant outlet bracket.
- Detach the 2 wiring harness retainers and the coolant hose retainer from the coolant outlet bracket.

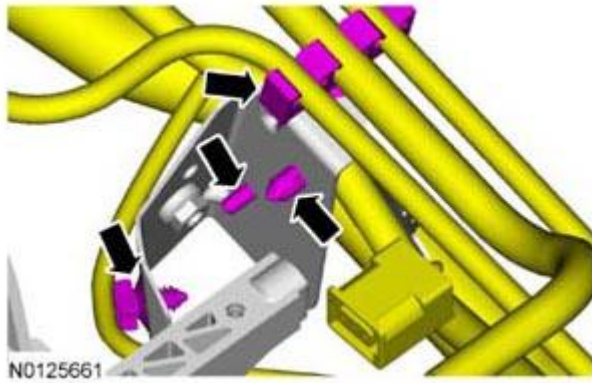


Fig. 203: Locating Wiring Harness Retainers And Coolant Hose Retainer From Coolant Outlet Bracket

Courtesy of FORD MOTOR CO.

32. If equipped with a manual transaxle, remove the transaxle shift cables from the clip.

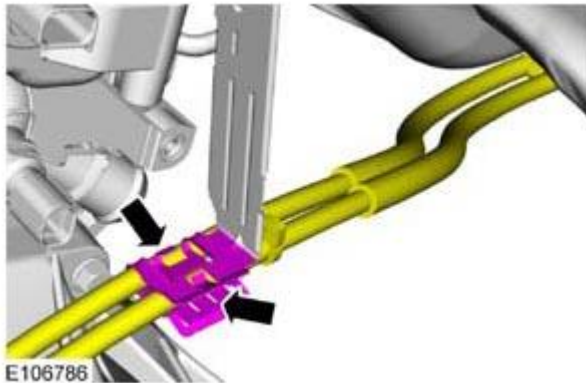


Fig. 204: Locating Transaxle Shift Cables From Clip

Courtesy of FORD MOTOR CO.

33. Remove the nut, bolt and the bracket from the coolant outlet.

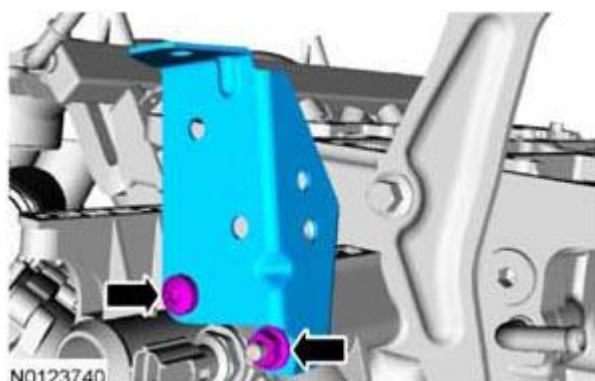


Fig. 205: Locating Coolant Outlet Bracket Nut And Bolt
Courtesy of FORD MOTOR CO.

34. Disconnect the Engine Coolant Temperature (ECT) sensor electrical connector.

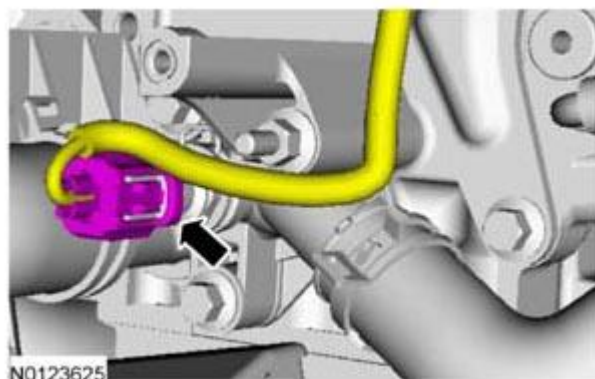


Fig. 206: Locating Engine Coolant Temperature (ECT) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

35. Disconnect the 2 coolant hoses from the coolant outlet.

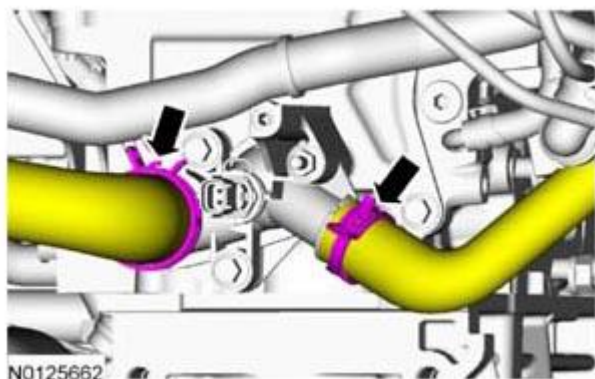


Fig. 207: Locating Coolant Hoses From Coolant Outlet
Courtesy of FORD MOTOR CO.

36. Disconnect the coolant return hose from the cylinder head.

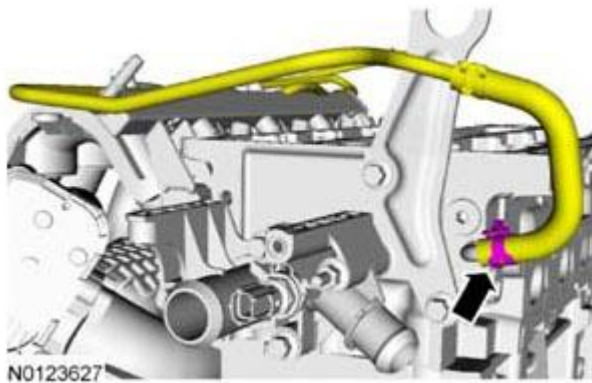


Fig. 208: Locating Coolant Return Hose From Cylinder Head
Courtesy of FORD MOTOR CO.

37. Using a floor jack and a block of wood, support the engine.

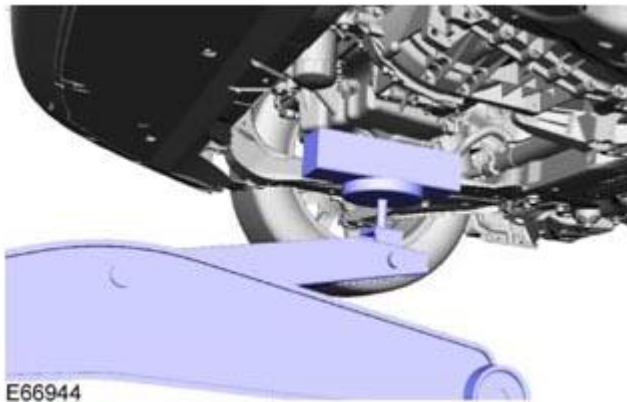


Fig. 209: Supporting Engine Using Floor Jack And Block Of Wood
Courtesy of FORD MOTOR CO.

38. Remove the Engine Support Bar.

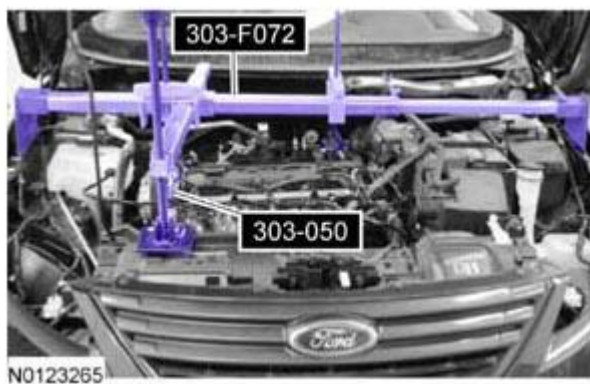


Fig. 210: Removing Engine Support Bar
Courtesy of FORD MOTOR CO.

39. Remove the bolt and the Engine Lifting Bracket.



Fig. 211: Removing Engine Lifting Bracket
Courtesy of FORD MOTOR CO.

NOTE: Make sure that the cylinder head is at ambient air temperature before removing the cylinder head bolts.

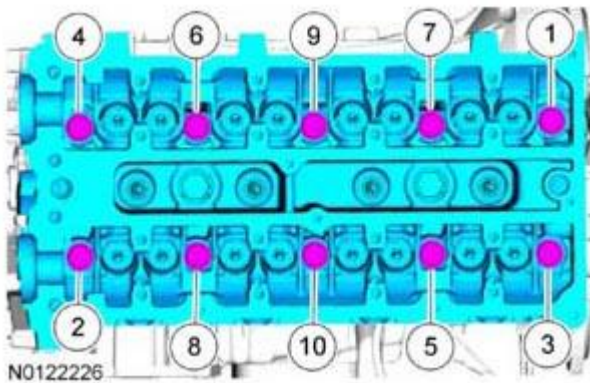


Fig. 212: Identifying Cylinder Head Bolts In Sequence
Courtesy of FORD MOTOR CO.

40. Remove the 10 cylinder head bolts in the sequence shown in illustration.
 - Remove the cylinder head.
 - Discard the cylinder head bolts and gasket.
41. Support the cylinder head on a bench with the head gasket side up. Check the cylinder head distortion and the cylinder block distortion. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

Installation

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

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 gasket material with a plastic scraper.
 2. 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.

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

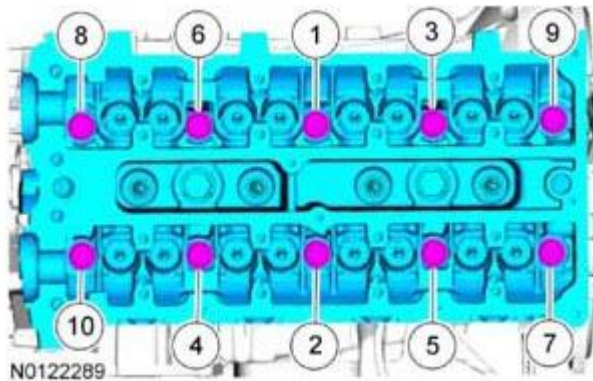


Fig. 213: Identifying Cylinder Head Gasket And Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

2. Install the cylinder head gasket, cylinder head and 10 new bolts. Tighten the bolts in the sequence shown in illustration in 4 stages:
 - Stage 1: Tighten to 5 Nm (44 lb-in).
 - Stage 2: Tighten to 15 Nm (133 lb-in).
 - Stage 3: Tighten to 35 Nm (26 lb-ft).
 - Stage 4: Tighten an additional 75 degrees.
3. Using a engine mount bracket bolt, install the Engine Lifting Bracket.



Fig. 214: Installing Engine Lifting Bracket
Courtesy of FORD MOTOR CO.

4. Install the Engine Support Bar and support the engine.

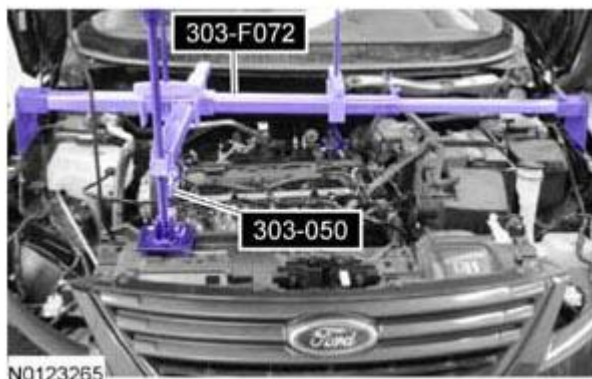


Fig. 215: Installing Engine Support Bar And Support Engine
Courtesy of FORD MOTOR CO.

5. Remove the floor jack and block of wood.

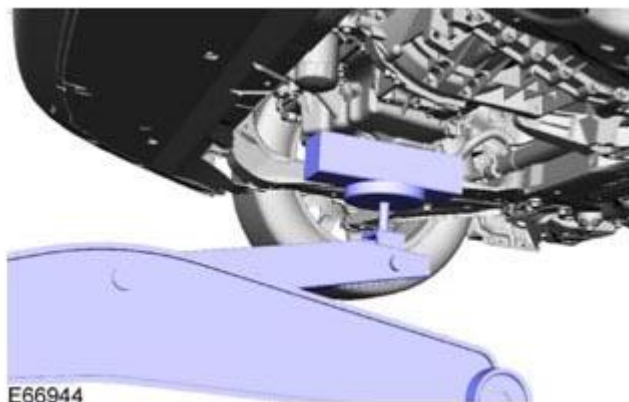


Fig. 216: Supporting Engine Using Floor Jack And Block Of Wood
Courtesy of FORD MOTOR CO.

6. Connect the coolant return hose to the cylinder head.

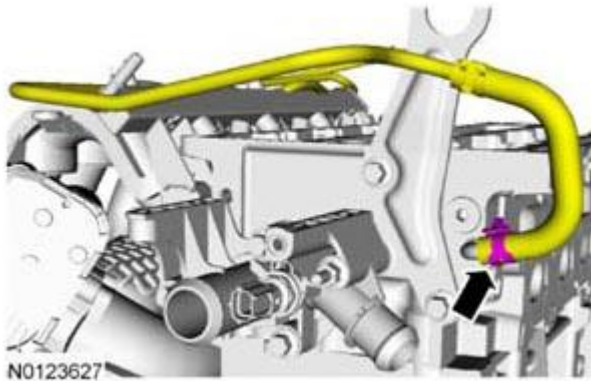


Fig. 217: Locating Coolant Return Hose To Cylinder Head
Courtesy of FORD MOTOR CO.

7. Connect the 2 coolant hoses to the coolant outlet.

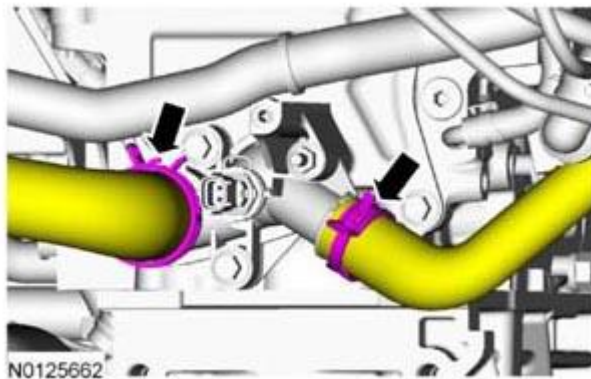


Fig. 218: Locating Coolant Hoses From Coolant Outlet
Courtesy of FORD MOTOR CO.

8. Connect the ECT sensor electrical connector.

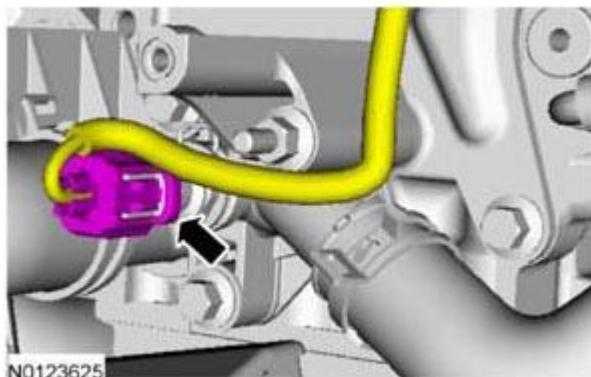


Fig. 219: Locating Engine Coolant Temperature (ECT) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

9. Install the coolant outlet bracket, nut and the bolt.
 - Tighten to 6 Nm (53 lb-in).

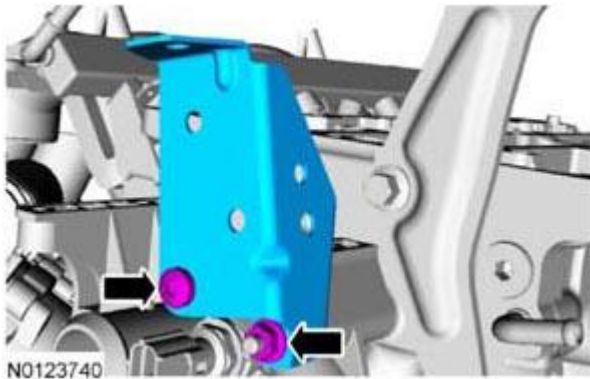


Fig. 220: Locating Coolant Outlet Bracket Nut And Bolt
Courtesy of FORD MOTOR CO.

10. If equipped with a manual transaxle, install the transaxle shift cables to the clip.

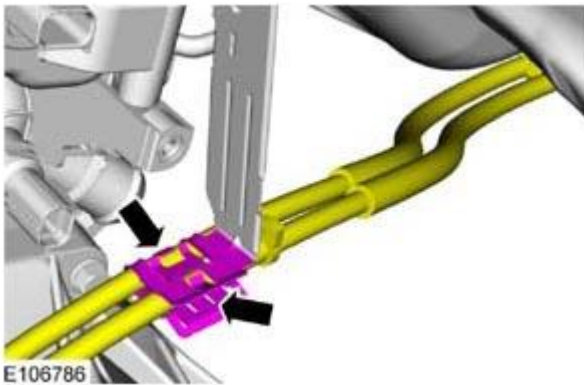


Fig. 221: Locating Transaxle Shift Cables From Clip
Courtesy of FORD MOTOR CO.

11. Attach the fuel tube retainer to the coolant outlet bracket.
 - Attach the 2 wiring harness and coolant hose retainers to the coolant outlet bracket.

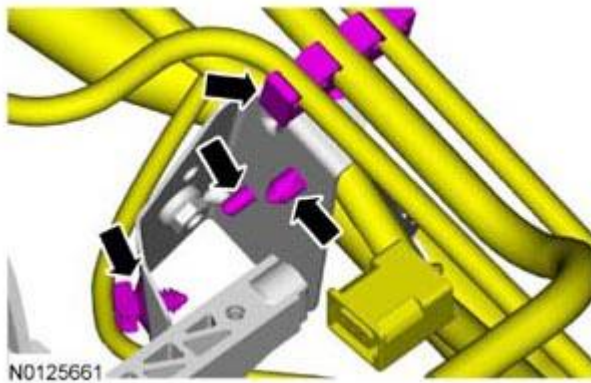


Fig. 222: Locating Wiring Harness Retainers And Coolant Hose Retainer From Coolant Outlet Bracket

Courtesy of FORD MOTOR CO.

12. Install the ignition coil, 4 screws and connect the ignition coil electrical connector.
 - Tighten to 6 Nm (53 lb-in).

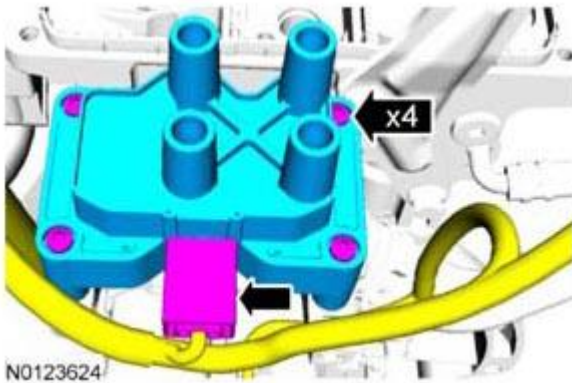


Fig. 223: Locating Ignition Coil Electrical Connector And Screws

Courtesy of FORD MOTOR CO.

13. Install the timing belt cover backplate and the 4 bolts.
 - Tighten to 9 Nm (80 lb-in).

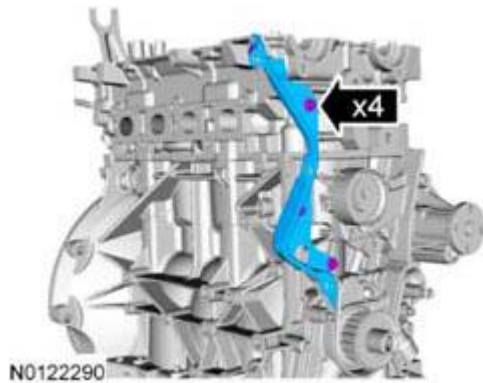


Fig. 224: Locating Timing Belt Cover Backplate And Bolts
Courtesy of FORD MOTOR CO.

14. Install the 2 lower bolts for the intake manifold.
 - Tighten to 18 Nm (159 lb-in).

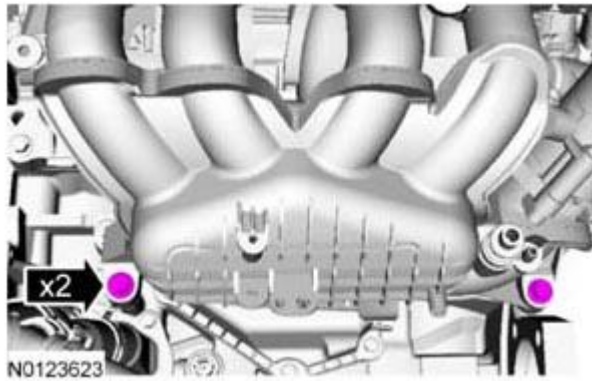


Fig. 225: Locating Intake Manifold And Lower Bolts
Courtesy of FORD MOTOR CO.

15. Install the valve tappets. For additional information, REFER to **Valve Tappets**.
16. Attach the KS electrical connector to bottom of the intake manifold.
 - Attach the 2 wiring harness retainers to the bottom of the intake manifold.

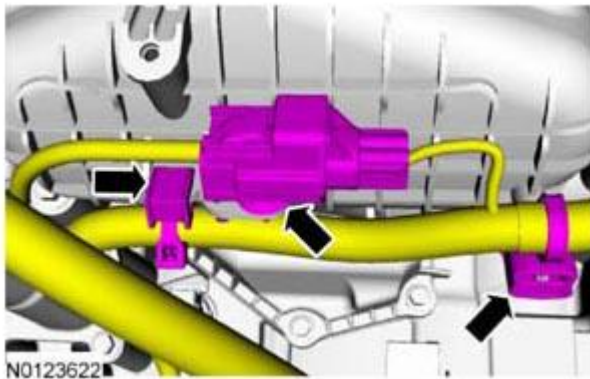


Fig. 226: Locating Knock Sensor (KS) Electrical Connector From Bottom Of Intake Manifold
 Courtesy of FORD MOTOR CO.

17. Position and connect the EVAP canister purge valve tube to the intake manifold.

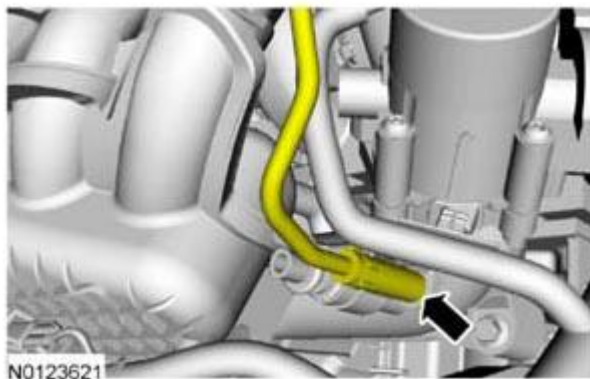


Fig. 227: Locating EVAP Canister Purge Valve Tube From Intake Manifold
 Courtesy of FORD MOTOR CO.

18. Connect the brake booster vacuum tube to the intake manifold.

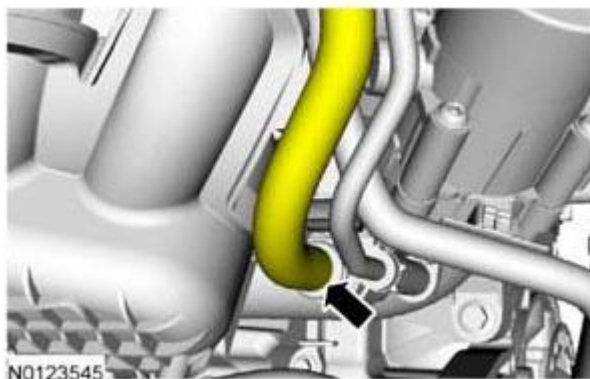


Fig. 228: Locating Brake Booster Vacuum Tube To Intake Manifold
 Courtesy of FORD MOTOR CO.

19. Install the bolt for the EVAP canister purge valve.
 - Tighten to 9 Nm (80 lb-in).

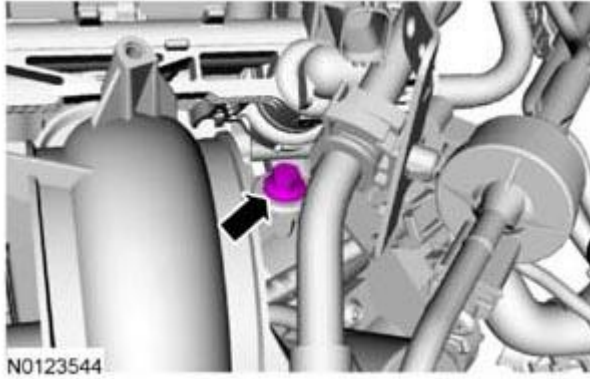


Fig. 229: Locating Evaporative Emission (EVAP) Canister Purge Valve Bolt
Courtesy of FORD MOTOR CO.

20. Connect the PCV hose to the intake manifold.

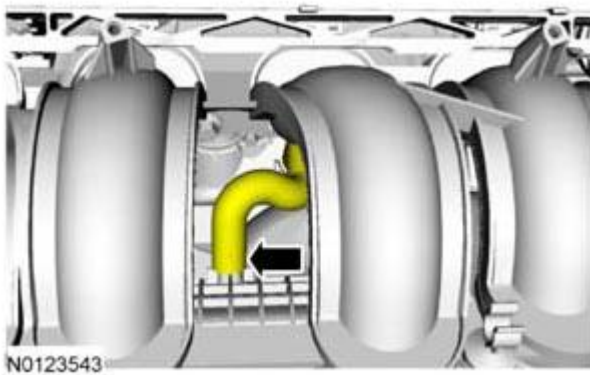


Fig. 230: Locating PCV Hose To Intake Manifold
Courtesy of FORD MOTOR CO.

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

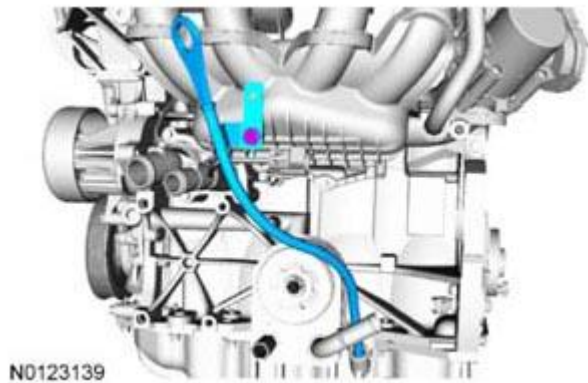


Fig. 231: Identifying Oil Level Indicator Tube And Screw
Courtesy of FORD MOTOR CO.

21. Install the oil level indicator and tube and the screw.
 - Tighten to 4 Nm (35 lb-in).
22. Connect the TB electrical connector.
 - Attach the wiring harness retainer to the TB.

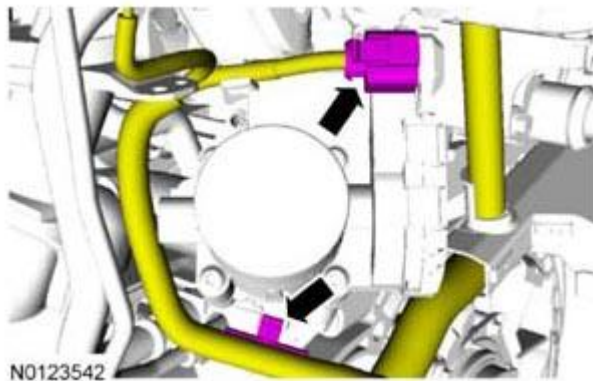


Fig. 232: Locating Throttle Body (TB) Electrical Connector
Courtesy of FORD MOTOR CO.

23. Connect the 4 fuel injector electrical connectors.

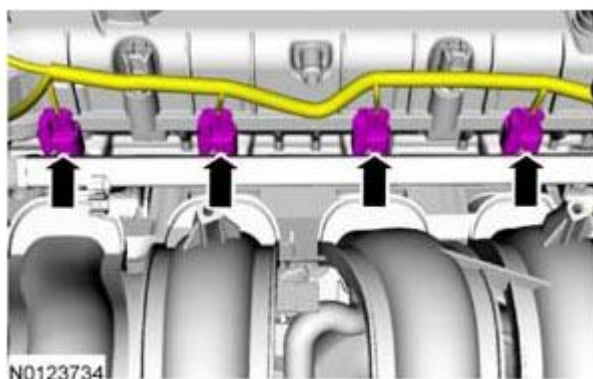


Fig. 233: Locating Fuel Injector Electrical Connectors
Courtesy of FORD MOTOR CO.

24. Connect the fuel tube spring lock couplings to the fuel rail. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION**.

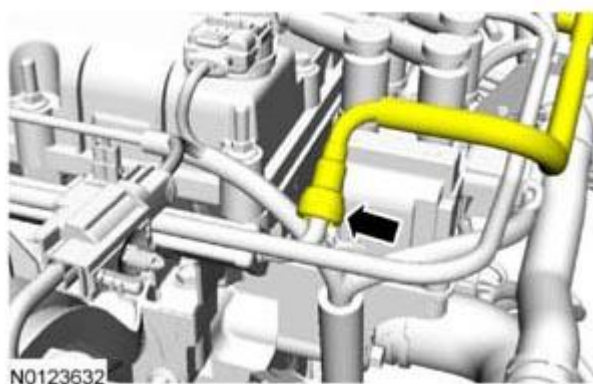


Fig. 234: Locating Fuel Tube Spring Lock Couplings From Fuel Rail
Courtesy of FORD MOTOR CO.

25. Install the 4 new catalytic converter studs.
- Tighten to 17 Nm (150 lb-in).

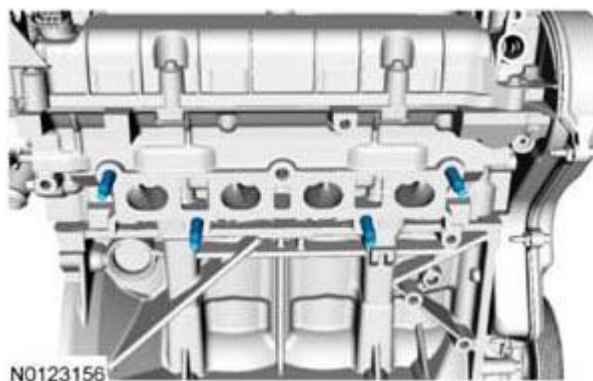


Fig. 235: Identifying Catalytic Converter Studs
Courtesy of FORD MOTOR CO.

26. If equipped, connect the block heater electrical connector.
27. Using a new gasket, position the catalytic converter and install the 4 new nuts and bolt finger tight.

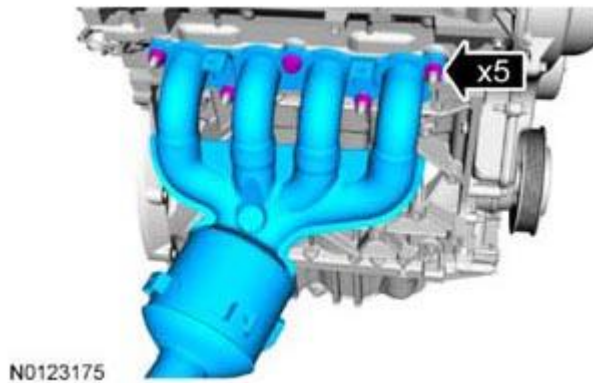


Fig. 236: Locating Catalytic Converter Nuts And Bolt
Courtesy of FORD MOTOR CO.

NOTE: Failure to tighten the catalytic converter manifold fasteners in 20 Nm increments until reaching final torque of 55 Nm will cause the converter to develop an exhaust leak.

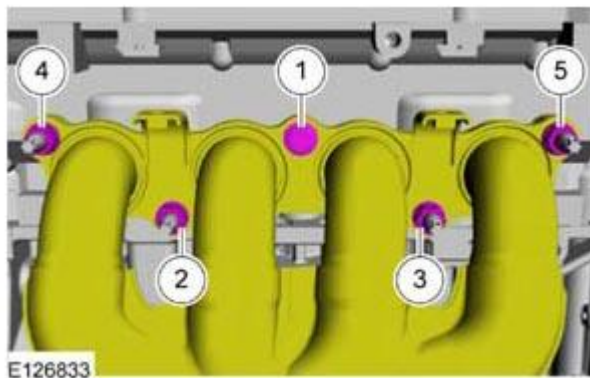


Fig. 237: Identifying Catalytic Converter Manifold Bolt And Nuts Tightening Sequence
Courtesy of FORD MOTOR CO.

28. Tighten the bolt and 4 nuts in the sequence shown in illustration, in 3 stages.
 - Stage 1: Tighten all fasteners in sequence to 20 Nm (177 lb-in).
 - Stage 2: Tighten all fasteners in sequence to 40 Nm (30 lb-ft).
 - Stage 3: Tighten all fasteners in sequence to 55 Nm (41 lb-ft).
29. Install the catalytic converter heat shield and the 4 bolts.
 - Tighten to 10 Nm (89 lb-in).

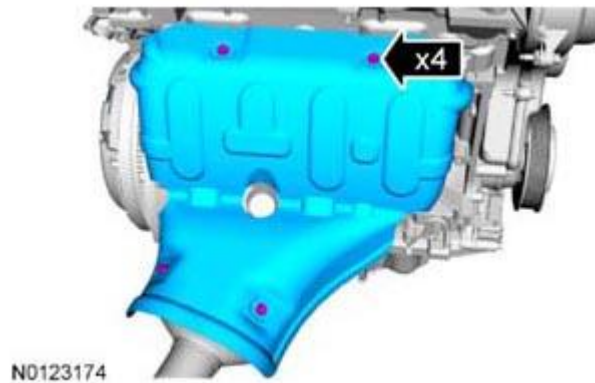


Fig. 238: Locating Bolts And Catalytic Converter Heat Shield
Courtesy of FORD MOTOR CO.

30. Install the lower catalytic converter bracket and the 4 bolts and tighten in sequence shown in illustration.
1. Tighten the catalytic converter bracket-to-engine block bolts to 50 Nm (37 lb-ft).
 2. Tighten the catalytic converter bracket-to-catalytic converter bolts to 25 Nm (18 lb-ft).

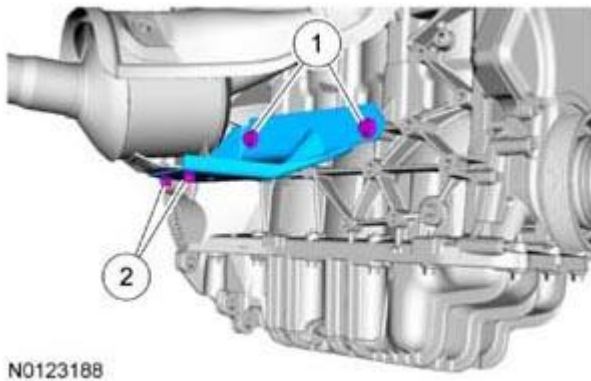
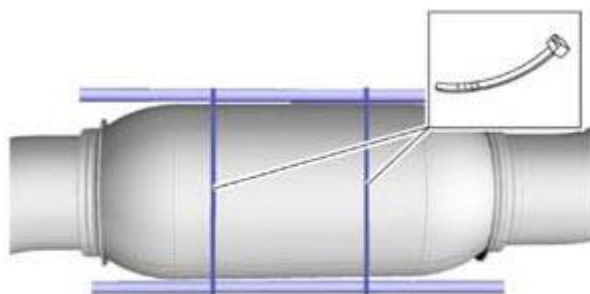


Fig. 239: Identifying Lower Catalytic Converter Bracket And Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

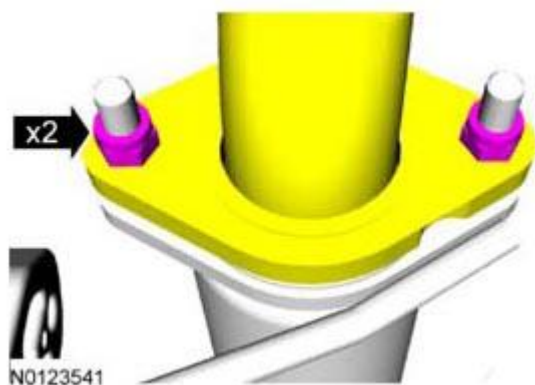
NOTE: Do not excessively bend or twist the exhaust flexible pipe. Failure to follow these instructions may cause damage to the flexible pipe.



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Fig. 240: Supporting Exhaust Flexible Pipe
Courtesy of FORD MOTOR CO.

31. Remove the support for the exhaust flexible pipe.
32. Using a new gasket, position the catalytic converter to the muffler and install the 2 catalytic converter nuts.
 - Tighten to 48 Nm (35 lb-ft).



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Fig. 241: Locating Catalytic Converter-To-Muffler Nuts
Courtesy of FORD MOTOR CO.

33. Install the CMS. For additional information, refer to **ELECTRONIC ENGINE CONTROLS**.

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

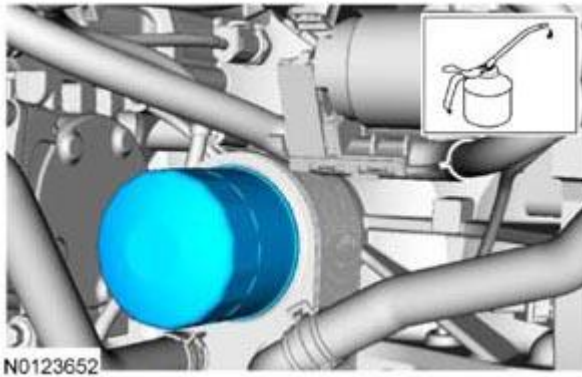


Fig. 242: Identifying Engine Oil Filter
Courtesy of FORD MOTOR CO.

34. Install a new engine oil filter.
 - Tighten to 15 Nm (133 lb-in).
35. Install the HO2S. For additional information, refer to **ELECTRONIC ENGINE CONTROLS** .
36. Install the ACL outlet tube. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING** .
37. Connect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND CABLES** .
38. Fill the engine with clean engine oil.
39. Fill the engine cooling system. For additional information, refer to **ENGINE COOLING SYSTEM** .

ENGINE LUBRICATION COMPONENTS - EXPLODED VIEW

Oil Filter, Oil Cooler and Engine Oil Pressure (EOP) Switch

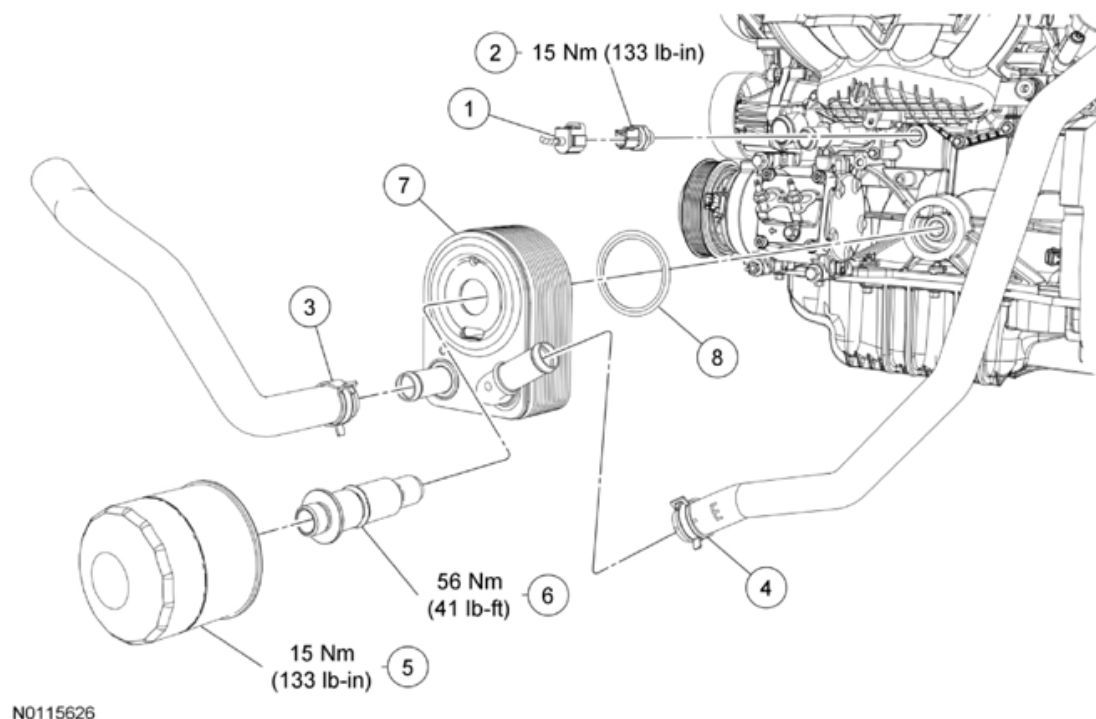


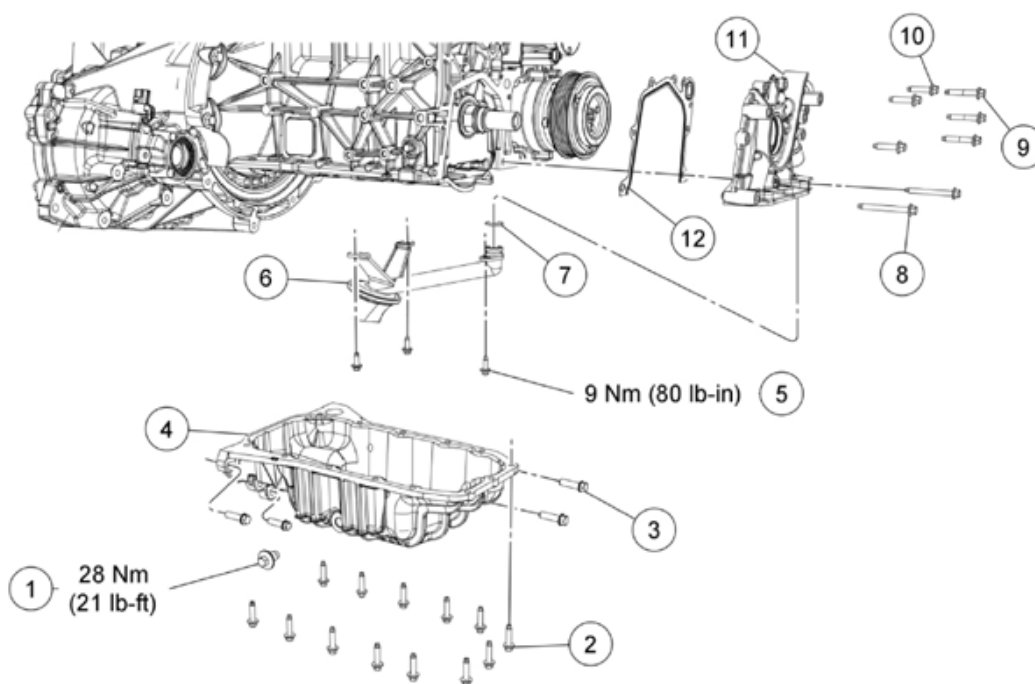
Fig. 243: Exploded View Of Oil Filter, Oil Cooler And Engine Oil Pressure (EOP) Switch With Torque Specifications

Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	-	Engine Oil Pressure (EOP) switch electrical connector (part of 12A522)
2	9278	EOP switch
3	8K276	Oil cooler coolant hose
4	18472	Oil cooler coolant hose
5	6731	Oil filter
6	6L626	Oil cooler mounting bolt
7	6A642	Oil cooler
8	6L621	Oil cooler gasket

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

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



N0115215

Fig. 244: Exploded View Of Oil Pan, Oil Pump And Oil Pump Screen And Pickup Tube With Torque Specifications
 Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6730	Oil pan drain plug
2	W500225	Oil pan bolt (13 required)
3	W701069	Oil pan bolt (4 required)
4	6675	Oil pan
5	W703311	Oil pump screen and pickup tube bolt (3 required)
6	6622	Oil pump screen and pickup tube
7	6626	Oil pump screen and pickup tube O-ring seal
8	W500300	Oil pump bolt (2 required)
9	W500301	Oil pump bolt (3 required)
10	W500215	Oil pump bolt (3 required)
11	6600	Oil pump
12	6659	Oil pump gasket

1. Refer to the appropriate procedures and/or exploded views in this service information for any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of removal.

OIL COOLER

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
Motorcraft® Orange Antifreeze/Coolant Concentrated VC-3-B (US); CVC-3-B2 (Canada)	WSS-M97B44-D

Removal and Installation

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

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

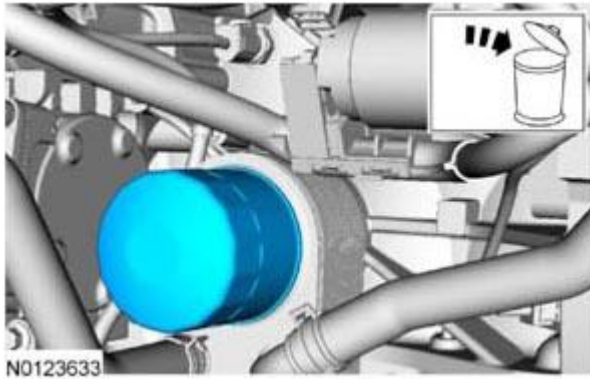


Fig. 245: Removing Engine Oil Filter
Courtesy of FORD MOTOR CO.

2. Remove the engine oil filter and discard.
 - To install, tighten to 15 Nm (133 lb-in).
3. Using hose clamp pliers, clamp the 2 oil cooler coolant hoses and remove the 2 coolant hoses from the oil cooler.



Fig. 246: Removing Coolant Hoses From Oil Cooler
Courtesy of FORD MOTOR CO.

NOTE: If metal or aluminum material is present in the oil cooler, mechanical concerns exist. Failure to correct these concerns may cause engine failure. To diagnose mechanical concerns, refer to ENGINE SYSTEM - GENERAL INFORMATION .

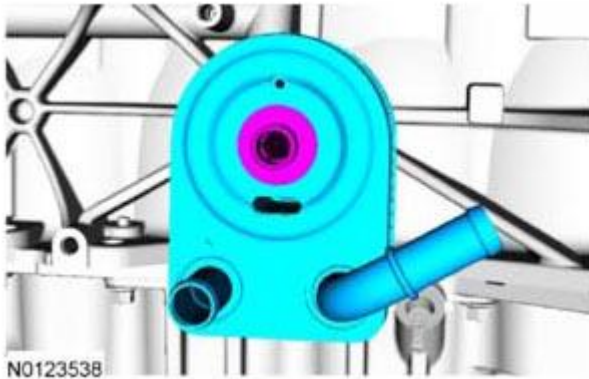


Fig. 247: Identifying Oil Cooler Mounting Bolt
Courtesy of FORD MOTOR CO.

4. Remove the oil cooler mounting bolt and the oil cooler.
 - Inspect the oil cooler gasket, replace if necessary.
 - To install, tighten to 56 Nm (41 lb-ft).
5. To install, reverse the removal procedure.
 - Inspect and adjust the coolant level in the degas bottle.

ENGINE OIL PRESSURE (EOP) SWITCH

MATERIAL SPECIFICATIONS

Item	Specification
Thread Sealant with PTFE	WSK-M2G350-A2

TA-24

Removal and Installation

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Disconnect the EOP switch electrical connector.

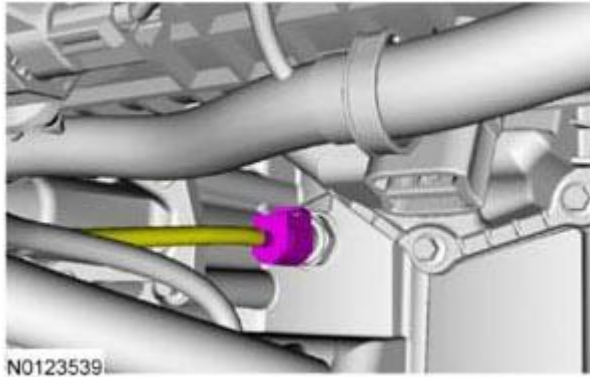


Fig. 248: Identifying EOP Switch Electrical Connector
Courtesy of FORD MOTOR CO.

3. Remove the EOP switch.
 - To install, tighten to 18 Nm (159 lb-in).

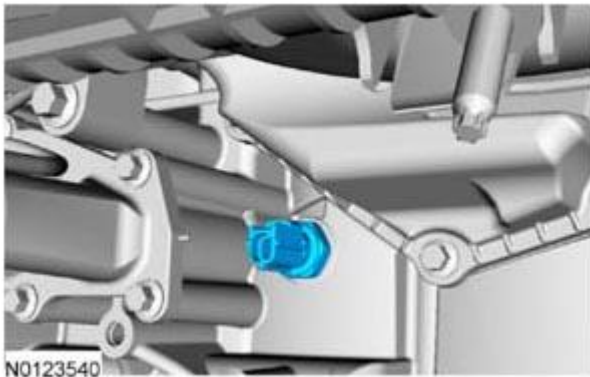


Fig. 249: Identifying EOP Switch
Courtesy of FORD MOTOR CO.

4. To install, reverse the removal procedure.
 - Apply thread sealant to the EOP switch threads.

OIL PAN**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**.
2. Remove the screw and the oil level indicator and tube.
 - Inspect and replace the O-ring seal, if necessary.

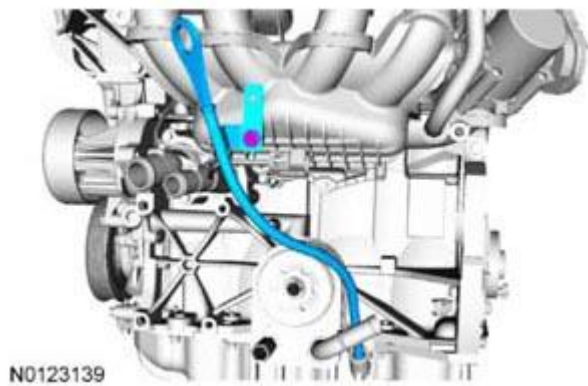
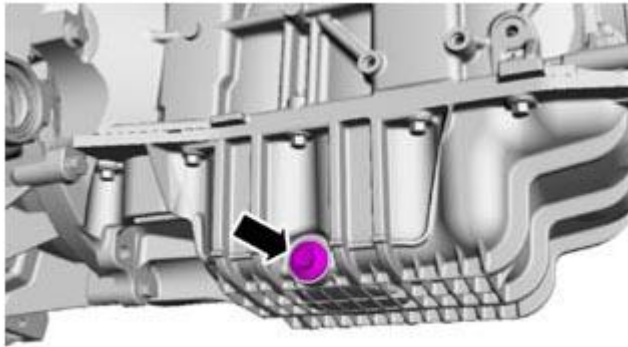


Fig. 250: Identifying Oil Level Indicator Tube And Screw
Courtesy of FORD MOTOR CO.

3. Drain the engine oil.
 - Install the drain plug.
 - Tighten to 28 Nm (21 lb-ft).



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Fig. 251: Locating Drain Plug
Courtesy of FORD MOTOR CO.

4. Remove and discard the engine oil filter.

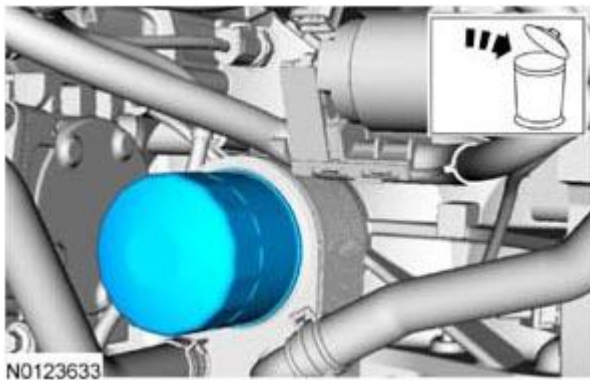


Fig. 252: Removing Engine Oil Filter
Courtesy of FORD MOTOR CO.

5. Remove the 17 bolts from the oil pan.

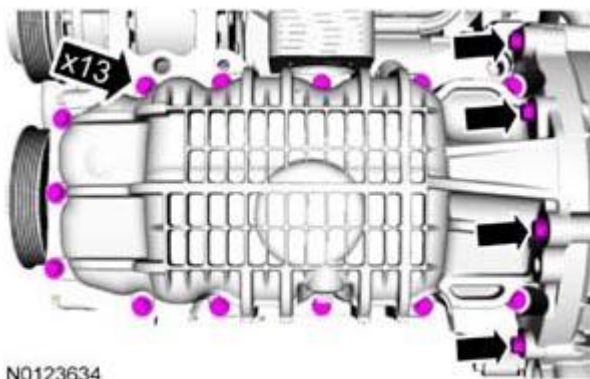
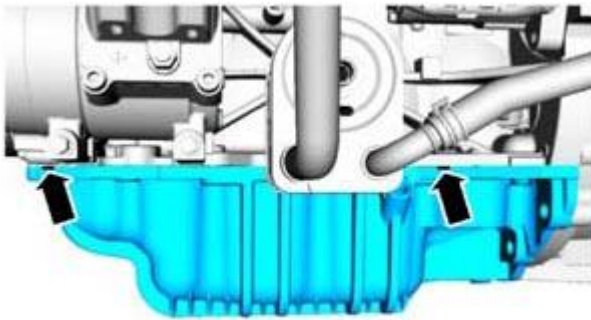


Fig. 253: Locating Oil Pan Bolts
Courtesy of FORD MOTOR CO.

6. Using the 3 pry pads (2 shown in illustration), remove the oil pan.



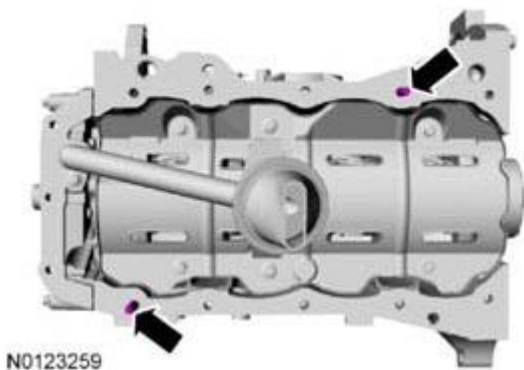
N0123635

Fig. 254: Locating Oil Pan
Courtesy of FORD MOTOR CO.

Installation

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

1. Clean and inspect all mating surfaces using silicone gasket remover.
2. Install 2 M8x20 studs for oil pan alignment.



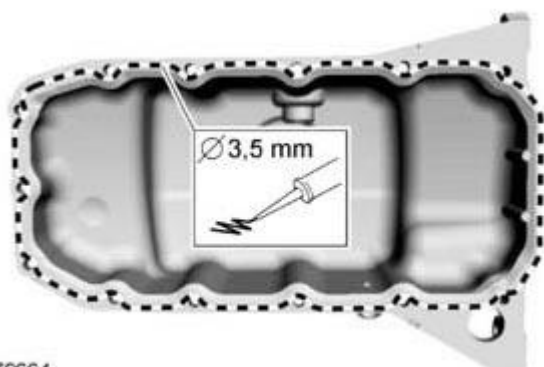
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Fig. 255: Locating Oil Pan Alignment And M8X20 Studs
Courtesy of FORD MOTOR CO.

NOTE: The oil pan must be installed within 5 minutes of applying the sealant.

NOTE: If the oil pan is not secured within 5 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 5 minutes,

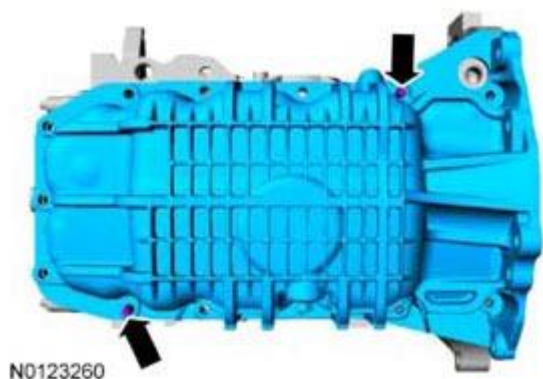
whichever is longer. Failure to follow this procedure can cause future oil leakage



E79664

Fig. 256: Applying Bead Of Sealant To Oil Pan
Courtesy of FORD MOTOR CO.

3. Apply a 3.5 mm (0.137 in) bead of sealant to the oil pan.
4. Install the oil pan using the 2 studs for alignment.



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Fig. 257: Locating Oil Pan Studs
Courtesy of FORD MOTOR CO.

5. Install 15 bolts finger tight and remove the 2 alignment studs and install the remaining 2 bolts finger tight.

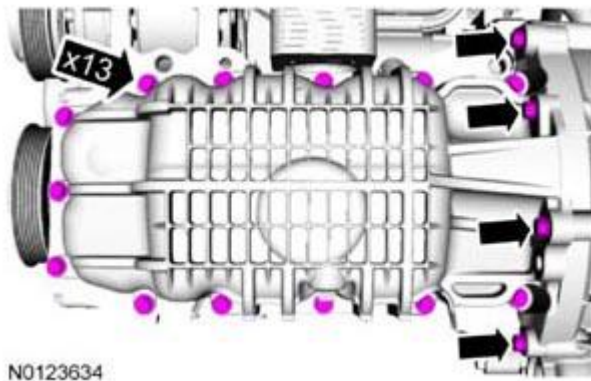


Fig. 258: Locating Oil Pan Bolts
Courtesy of FORD MOTOR CO.

6. Tighten the oil pan bolts in the following sequence in 3 stages.
 - Stage 1: Tighten bolts 1 through 4 to 48 Nm (35 lb-ft).
 - Stage 2: Tighten bolts 5 through 17 to 10 Nm (89 lb-in).
 - Stage 3: Tighten bolts 5 through 17 to 20 Nm (177 lb-in).

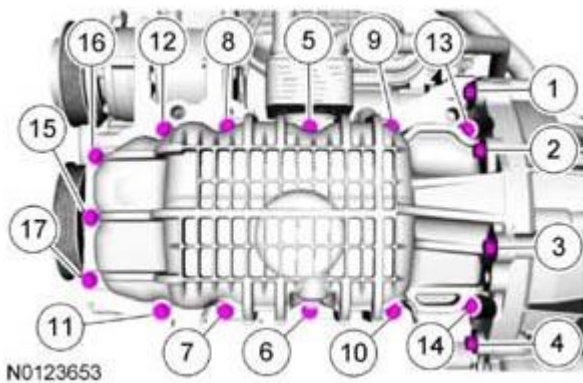


Fig. 259: Identifying Oil Pan Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

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

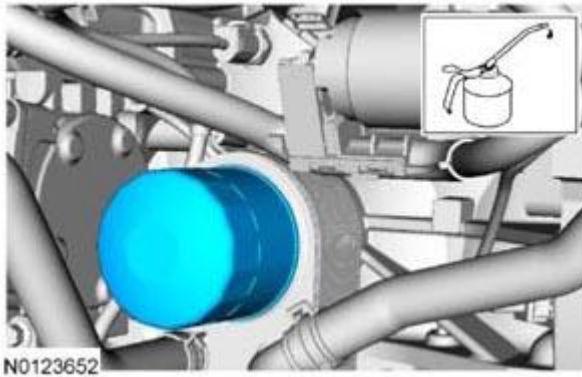


Fig. 260: Identifying Engine Oil Filter
Courtesy of FORD MOTOR CO.

7. Install a new engine oil filter.
 - Tighten to 15 Nm (133 lb-in).

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

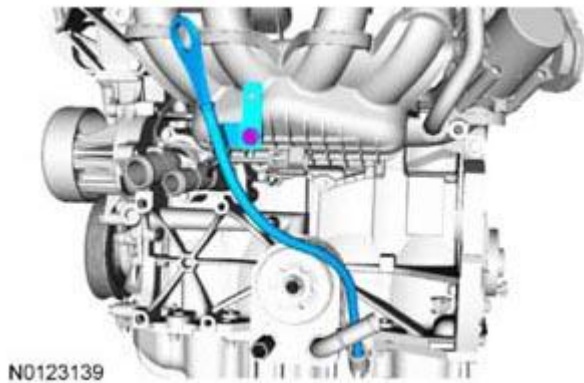


Fig. 261: Identifying Oil Level Indicator Tube And Screw
Courtesy of FORD MOTOR CO.

8. Install the oil level indicator and tube and the screw.
 - Tighten to 4 Nm (35 lb-in).
9. 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**.
2. Remove the engine oil pan. For additional information, REFER to **Oil Pan**.
3. Remove the 3 bolts and the oil pump screen and pickup tube.

- Inspect and replace the O-ring seal, if necessary.
- To install, tighten to 9 Nm (80 lb-in).

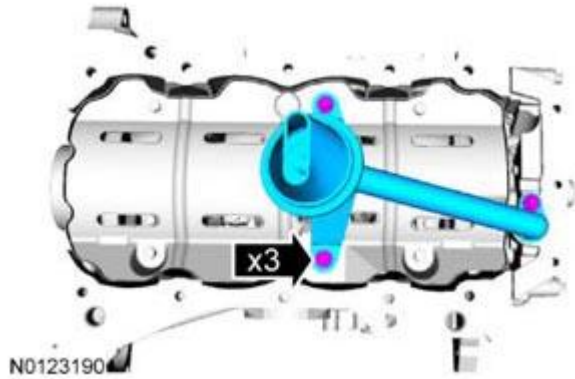


Fig. 262: Locating Oil Pump Screen And Pickup Tube Bolts
Courtesy of FORD MOTOR CO.

4. To install, reverse the removal procedure.

OIL PUMP

Removal

1. Remove the crankshaft front seal. For additional information, REFER to **Crankshaft Front Seal**.
2. Remove the oil pan. For additional information, REFER to **Oil Pan**.
3. Remove the 4 bolts and the timing belt cover backplate.

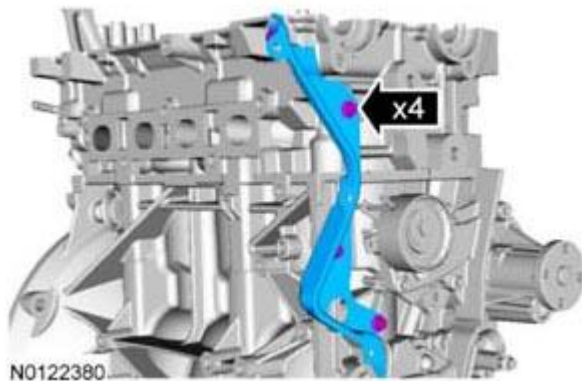


Fig. 263: Locating Bolts And Timing Belt Cover Backplate
Courtesy of FORD MOTOR CO.

4. Remove the 3 bolts and the oil pump screen and pickup tube.
 - Inspect and replace the oil pump screen and pickup tube O-ring seal, if necessary.

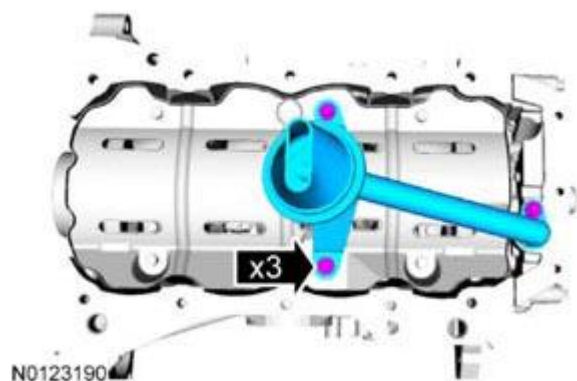


Fig. 264: Locating Oil Pump Screen And Pickup Tube Bolts
Courtesy of FORD MOTOR CO.

5. Remove the 8 bolts and the oil pump.
 - Remove and discard the oil pump gasket.

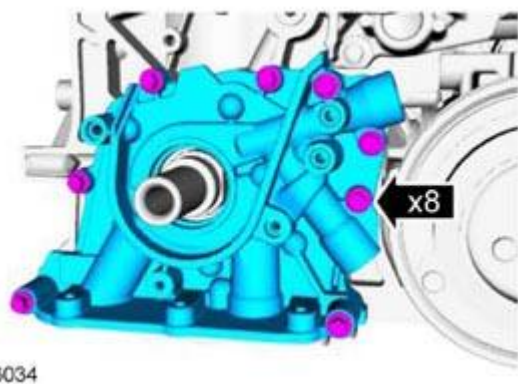


Fig. 265: Locating Bolts And Oil Pump
Courtesy of FORD MOTOR CO.

Installation

1. Install a new gasket, the oil pump and the 8 bolts in their original position and tighten in sequence shown in illustration in 2 stages.
 - Stage 1: Tighten to 6 Nm (53 lb-in).
 - Stage 2: Tighten to 9 Nm (80 lb-in).

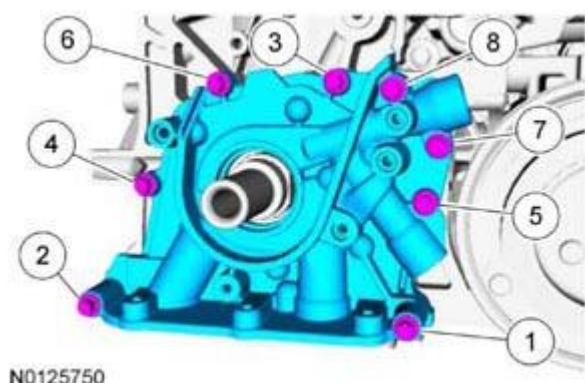


Fig. 266: Identifying Oil Pump And Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

2. Install the oil pump screen and pickup tube and 3 bolts.
 - Tighten to 9 Nm (80 lb-in).

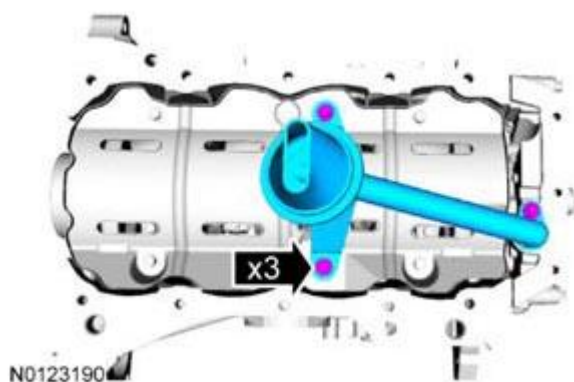


Fig. 267: Locating Oil Pump Screen And Pickup Tube Bolts
Courtesy of FORD MOTOR CO.

3. Install the timing belt cover backplate and the 4 bolts.
 - Tighten to 9 Nm (80 lb-in).

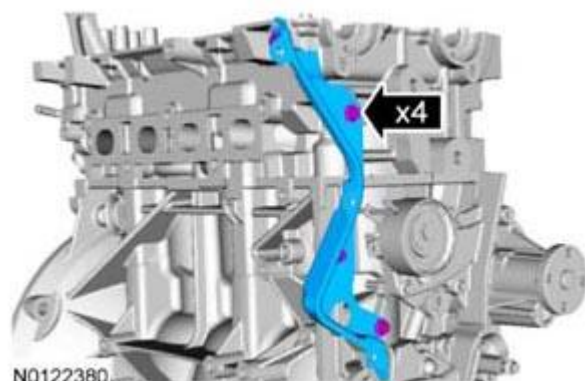


Fig. 268: Locating Bolts And Timing Belt Cover Backplate
Courtesy of FORD MOTOR CO.

4. Install the oil pan. For additional information, REFER to **Oil Pan**.
5. Install the crankshaft front seal. For additional information, REFER to **Crankshaft Front Seal**.

OIL LEVEL INDICATOR AND TUBE

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

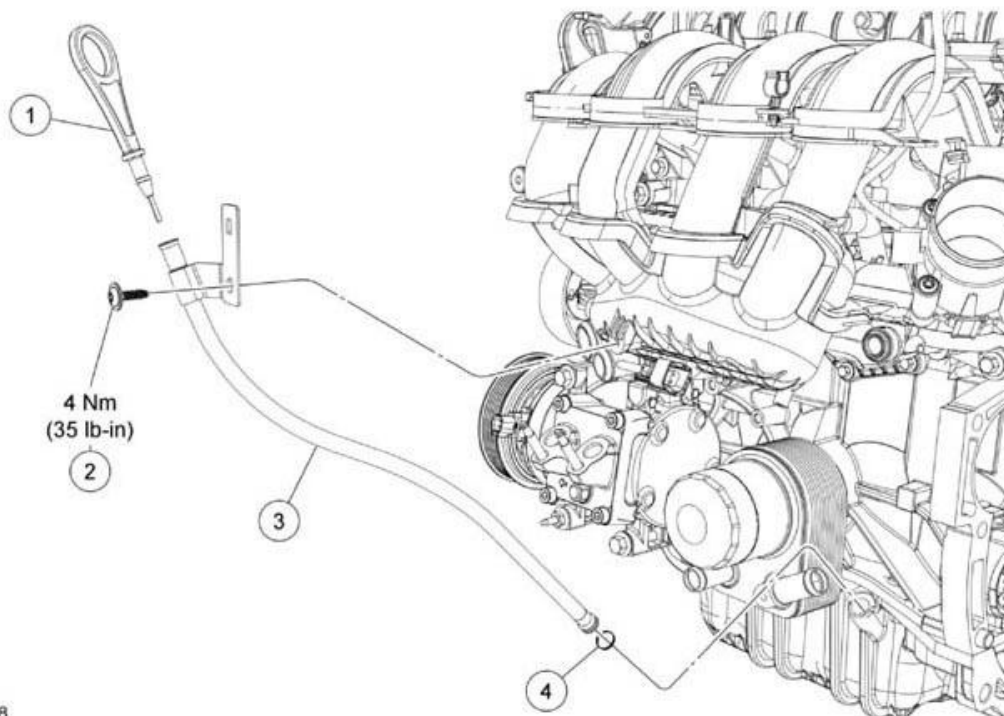


Fig. 269: Identifying Oil Level Indicator And Tube Components With Torque Specifications
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6750	Oil level indicator
2	W709843	Oil level indicator tube screw
3	6754	Oil level indicator tube
4	W701261	O-ring seal

Removal and Installation

1. Remove the oil level indicator.
2. Remove the oil level indicator tube screw.
 - To install, tighten to 4 Nm (35 lb-in).
3. Remove the oil level indicator tube.
 - Inspect and replace the O-ring seal, if necessary.
 - To install, lubricate the O-ring seal with clean engine oil.
4. To install, reverse the removal procedure.

ENGINE MOUNT

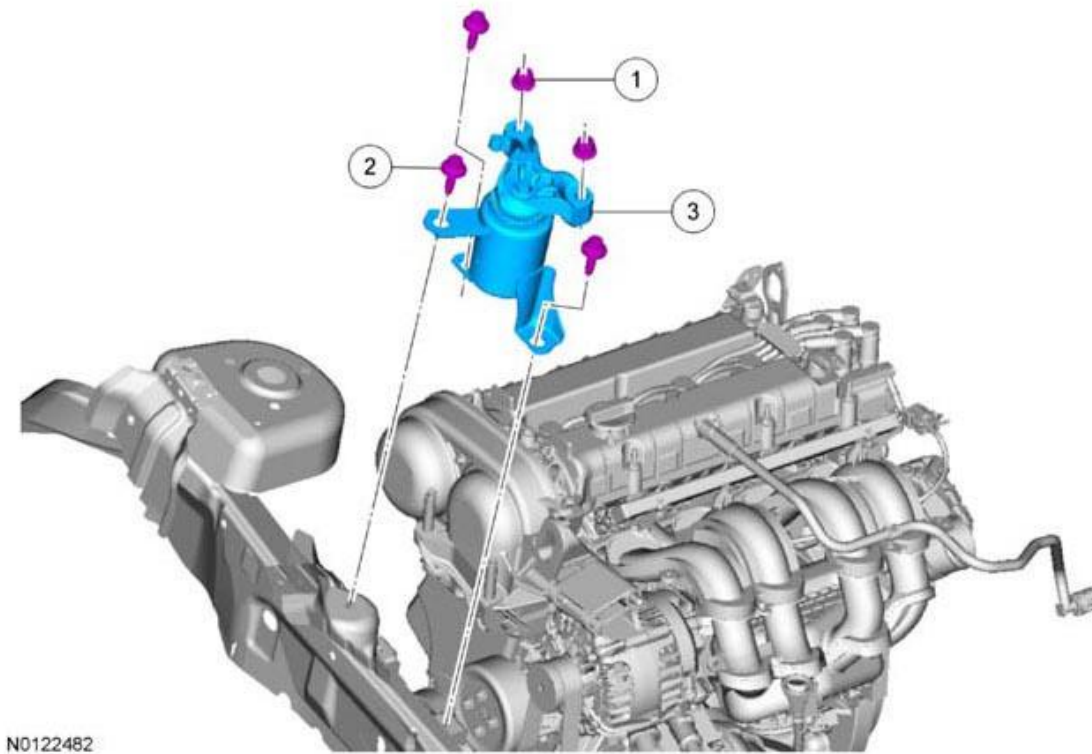


Fig. 270: Identifying Engine Mount Bolt And Nut
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W520214	Engine mount nut (2 required)
2	W706408	Engine mount bolt (3 required)
3	6038	Engine mount

Removal

1. Release the 2 tabs and position the degas bottle aside.

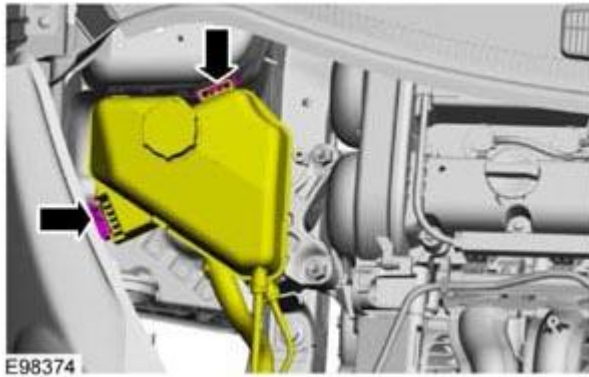


Fig. 271: Locating Tabs And Degas Bottle
Courtesy of FORD MOTOR CO.

2. Using a floor jack and a wooden block, support the engine.

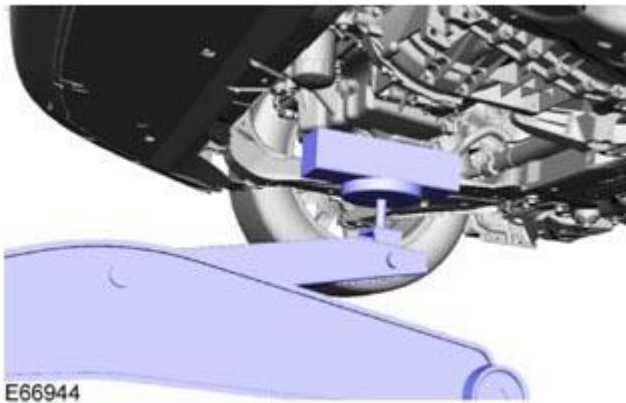


Fig. 272: Supporting Engine Using Floor Jack And Block Of Wood
Courtesy of FORD MOTOR CO.

- NOTE:** The engine mount studs must be held while removing the engine mount nuts or damage to the powertrain may occur.
- NOTE:** Do not loosen the engine mount center bolt or the engine may become improperly positioned.

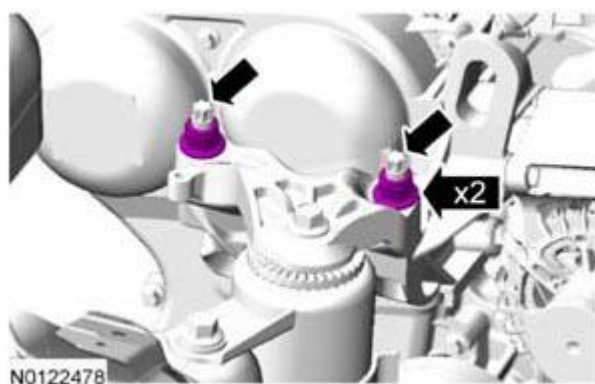


Fig. 273: Locating Engine Mount Nuts
Courtesy of FORD MOTOR CO.

3. Use the holding feature to prevent the engine mount studs from turning, remove the 2 engine mount nuts.
4. Remove the 3 bolts and the engine mount.

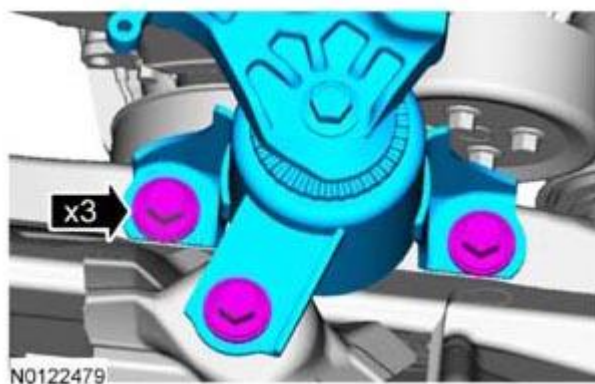


Fig. 274: Locating Bolts And Engine Mount
Courtesy of FORD MOTOR CO.

Installation

NOTE: The engine mount studs must be torqued or damage to the powertrain may occur.

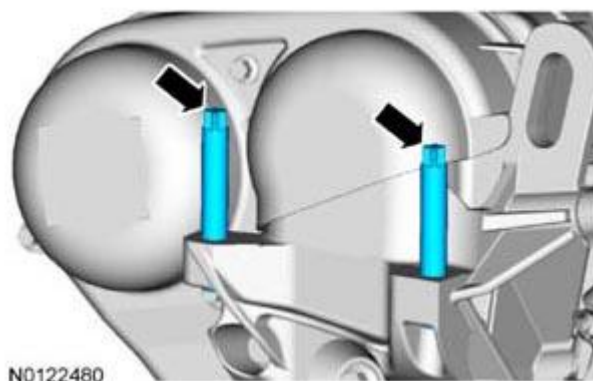


Fig. 275: Locating Engine Mount Studs
Courtesy of FORD MOTOR CO.

1. Torque the engine mount studs before installing the engine mount.
 - Tighten to 8 Nm (71 lb-in).

NOTE: Do not loosen the engine mount center bolt or the engine may become improperly positioned.

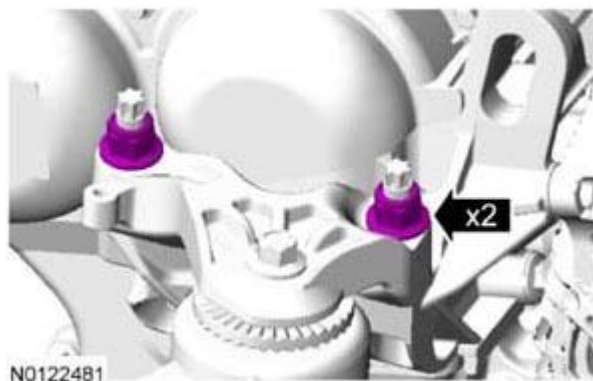


Fig. 276: Locating Engine Mount And Nuts
Courtesy of FORD MOTOR CO.

2. Install the engine mount and the 2 nuts.
 - Tighten the 2 nuts to 80 Nm (59 lb-ft).
3. Install the 3 engine mount bolts.
 - Tighten to 48 Nm (35 lb-ft).

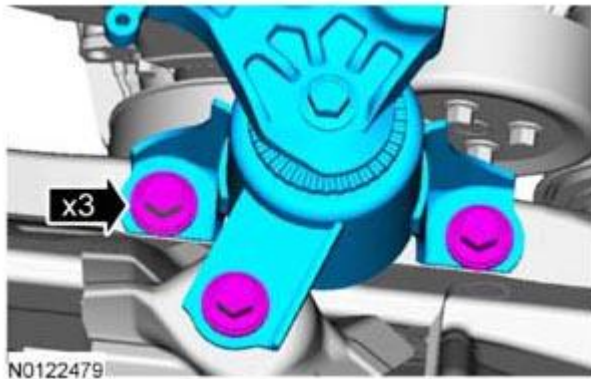


Fig. 277: Locating Bolts And Engine Mount
Courtesy of FORD MOTOR CO.

4. Position the degas bottle on the 2 retainer tabs.

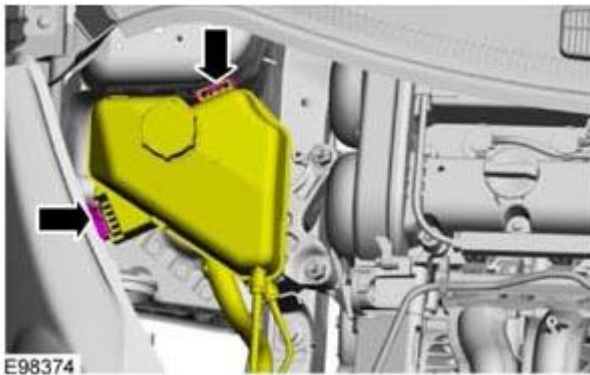


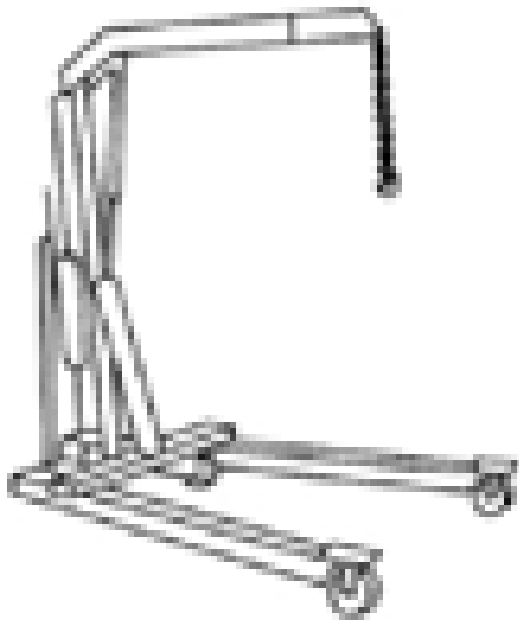
Fig. 278: Locating Tabs And Degas Bottle
Courtesy of FORD MOTOR CO.

REMOVAL

ENGINE - AUTOMATIC TRANSAXLE

SPECIAL TOOLS

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**ST1341-A**

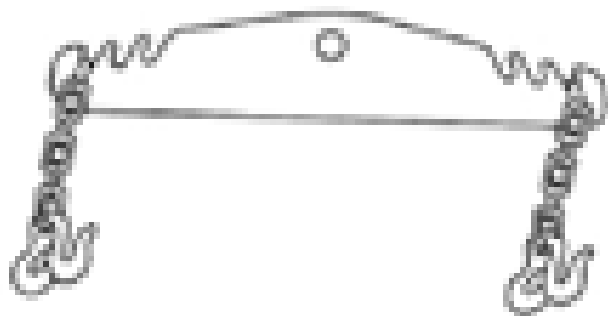
2, 200# Floor Crane, Fold Away
300-OTC1819E

**ST1682-A**

Powertrain Lift
300-OTC1585AE

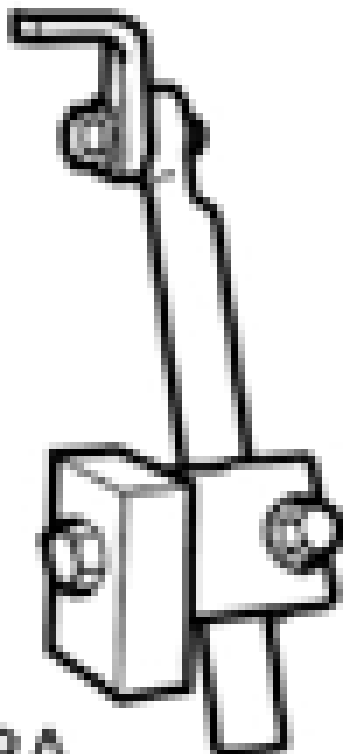
2013 Ford Fiesta S

2013 ENGINE Engine Mechanical - 1.6L - Fiesta



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

ST1602-A



Adjustable Grip Arm, 1735A
014-00001

ST2743A

All vehicles

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Release the fuel system pressure. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION**.
3. Remove the Air Cleaner (ACL) and ACL outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING**.
4. Disconnect the crankcase vent tube from the valve cover.
 - Detach the 2 crankcase vent tube retainers and remove the tube.

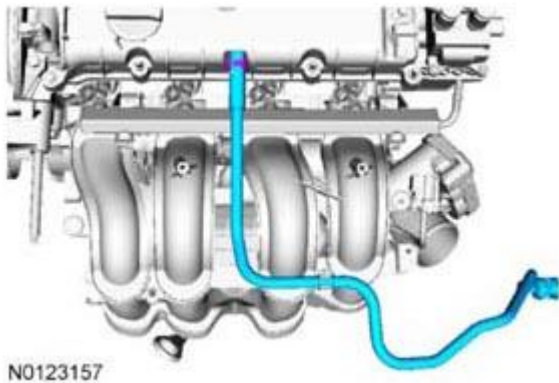


Fig. 279: Identifying Crankcase Vent Tube Retainers
Courtesy of FORD MOTOR CO.

5. Remove the positive battery cable cover.

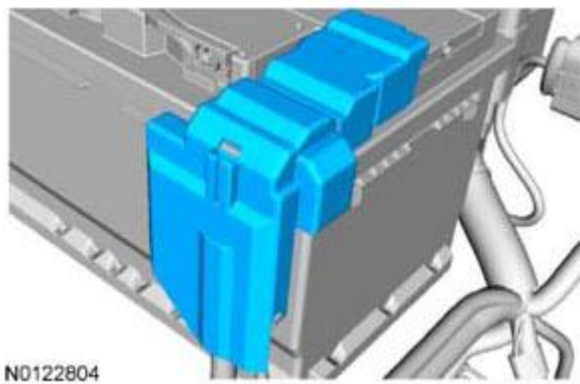


Fig. 280: Identifying Positive Battery Cable Cover
Courtesy of FORD MOTOR CO.

6. Remove the battery. For additional information, refer to **BATTERY, MOUNTING AND CABLES**.
7. Remove the nut and cable from the positive battery cable terminal.



Fig. 281: Locating Positive Battery Cable Terminal And Nut
Courtesy of FORD MOTOR CO.

8. Remove the bolt and the PCM cover.



Fig. 282: Locating Bolt And PCM Cover
Courtesy of FORD MOTOR CO.

9. Disconnect the 3 PCM electrical connectors.

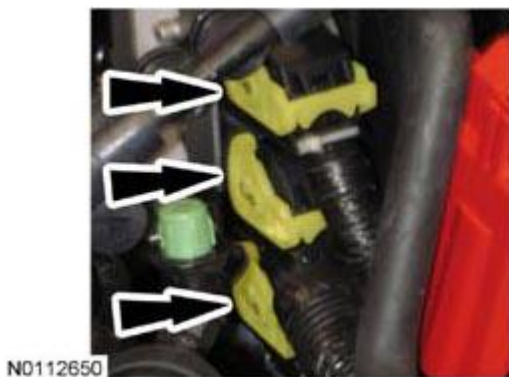


Fig. 283: Locating PCM Electrical Connectors
Courtesy of FORD MOTOR CO.

10. Remove the 3 bolts and the battery tray.

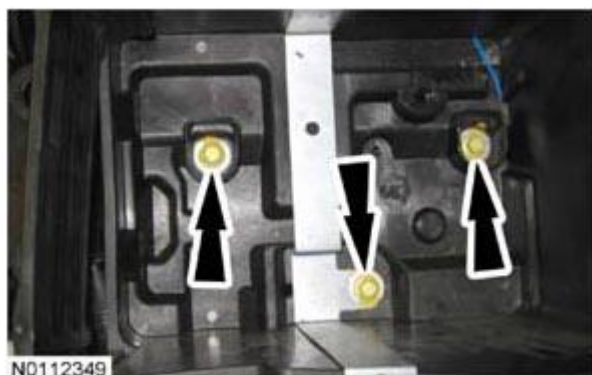


Fig. 284: Locating Bolts And Battery Tray
Courtesy of FORD MOTOR CO.

11. Detach the 2 positive battery cable wire harness retainers from battery tray bracket.



Fig. 285: Locating Positive Battery Cable Wire Harness Retainers From Battery Tray Bracket
Courtesy of FORD MOTOR CO.

12. Remove the selector lever cable bolt, 3 battery tray nuts and the battery tray bracket.
- Detach the 2 wiring harness retainers from the battery tray bracket.

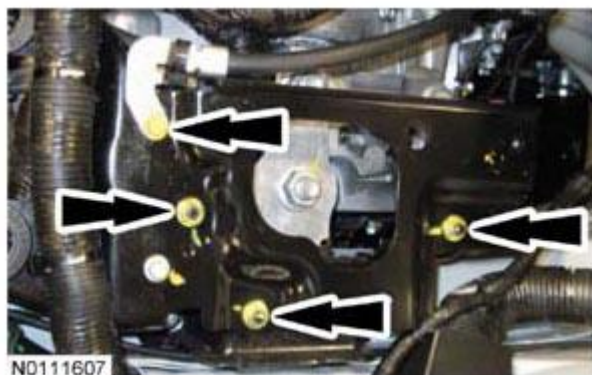


Fig. 286: Locating Wiring Harness Retainers From Battery Tray Bracket
Courtesy of FORD MOTOR CO.

13. Disconnect the engine harness electrical connector.



Fig. 287: Locating Engine Harness Electrical Connector
Courtesy of FORD MOTOR CO.

14. Disconnect the brake booster vacuum hose.



Fig. 288: Locating Brake Booster Vacuum Hose
Courtesy of FORD MOTOR CO.

15. Disconnect the fuel tube spring lock couplings from the fuel rail. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION**.



Fig. 289: Locating Fuel Tube Spring Lock Couplings From Fuel Rail
Courtesy of FORD MOTOR CO.

16. Detach the fuel tube from the coolant outlet bracket retainer.



Fig. 290: Locating Fuel Tube From Coolant Outlet Bracket Retainer
Courtesy of FORD MOTOR CO.

17. Remove the generator. For additional information, refer to **CHARGING SYSTEM** .
18. Drain the cooling system. For additional information, refer to **ENGINE COOLING SYSTEM** .
19. Remove the degas bottle. For additional information, refer to **ENGINE COOLING SYSTEM** .
20. Disconnect the selector lever cable from the control lever.

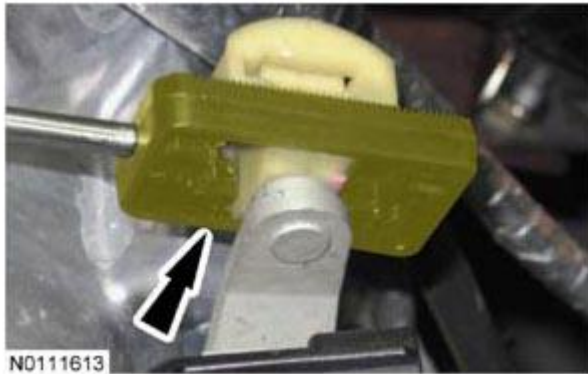


Fig. 291: Locating Selector Lever Cable From Control Lever
Courtesy of FORD MOTOR CO.

21. Detach the wiring harness retainer from the selector lever cable bracket.

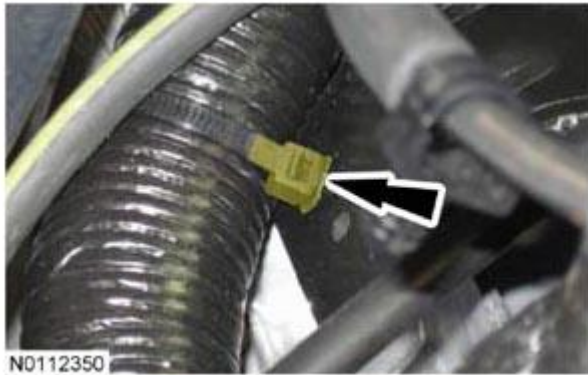


Fig. 292: Locating Wiring Harness Retainer From Selector Lever Cable Bracket
Courtesy of FORD MOTOR CO.

22. Remove the 2 selector lever cable bracket bolts from the transaxle and position the selector lever cable and bracket aside.

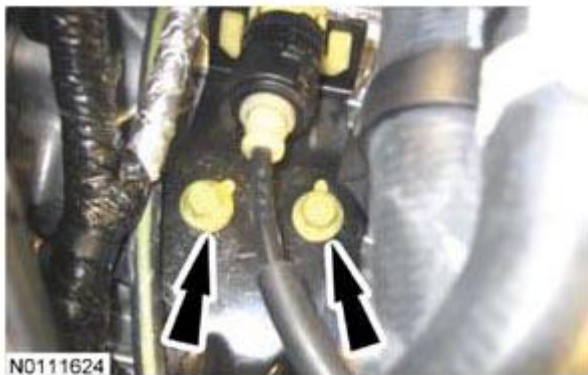


Fig. 293: Locating Selector Lever Cable Bracket Bolts
Courtesy of FORD MOTOR CO.

23. Remove the cooling fan motor and shroud. For additional information, refer to **ENGINE COOLING SYSTEM**.
24. Disconnect the 2 coolant hoses from the engine oil cooler.
 - Detach the oil cooler hose retainer from the upper radiator hose.



Fig. 294: Locating Coolant Hoses From Engine Oil Cooler
Courtesy of FORD MOTOR CO.

25. Remove the Heated Oxygen Sensor (HO2S). For additional information, refer to **ELECTRONIC ENGINE CONTROLS**.
26. Disconnect the lower heater hose from the heater core.



Fig. 295: Locating Lower Heater Hose From Heater Core
Courtesy of FORD MOTOR CO.

27. Detach the coolant hose retainer from the coolant outlet bracket.



Fig. 296: Locating Coolant Hose Retainer From Coolant Outlet Bracket
Courtesy of FORD MOTOR CO.

28. Disconnect the Evaporative Emission (EVAP) tube quick connect coupling near the bulk head. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** .

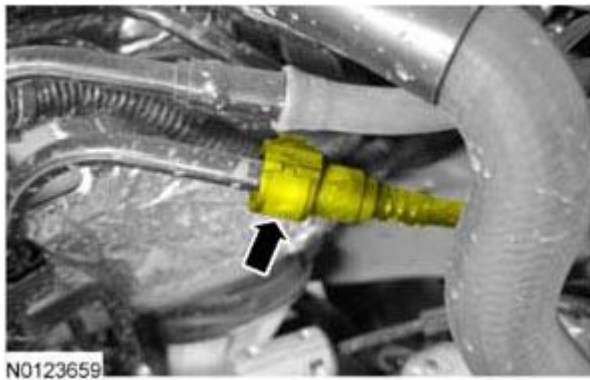


Fig. 297: Locating Evaporative Emission (EVAP) Tube Quick Connect Coupling Near Bulk Head
Courtesy of FORD MOTOR CO.

29. Disconnect the upper radiator hose from the engine.



Fig. 298: Locating Upper Radiator Hose From Engine
Courtesy of FORD MOTOR CO.

30. Disconnect the lower radiator hose and coolant hose from the thermostat housing.



Fig. 299: Locating Lower Radiator Hose And Coolant Hose From Thermostat Housing
Courtesy of FORD MOTOR CO.

31. Remove the bolt and position the engine ground wire aside.



Fig. 300: Locating Bolt And Engine Ground Wire
Courtesy of FORD MOTOR CO.

32. Drain the transmission. For additional information, refer to **AUTOMATIC DUAL CLUTCH TRANSAXLE (DCT) POWERSHIFT (DPS6) - EXTERNAL CONTROLS** .
33. Remove the RH and LH halfshafts. For additional information, refer to **FRONT DRIVE HALFSHAFTS** .
34. Remove the 3 bolts and the halfshaft bracket.

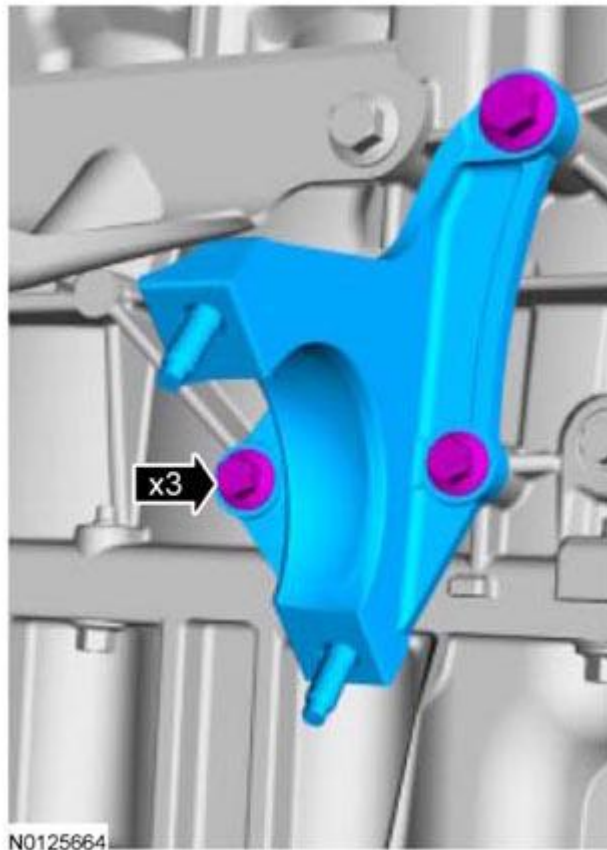


Fig. 301: Locating Bolts And Halfshaft Bracket
Courtesy of FORD MOTOR CO.

Vehicles with A/C

35. Disconnect the A/C compressor electrical connector.



Fig. 302: Locating A/C Compressor Electrical Connector
Courtesy of FORD MOTOR CO.

36. Remove the nut and position the A/C line bracket aside.

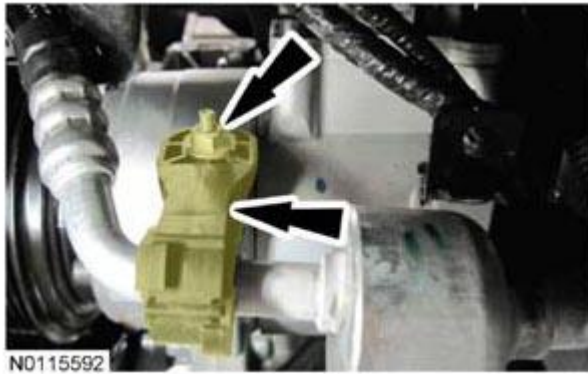


Fig. 303: Locating Nut And A/C Line Bracket
Courtesy of FORD MOTOR CO.

37. Disconnect the A/C pressure transducer electrical connector.
- Detach the wiring harness retainer.

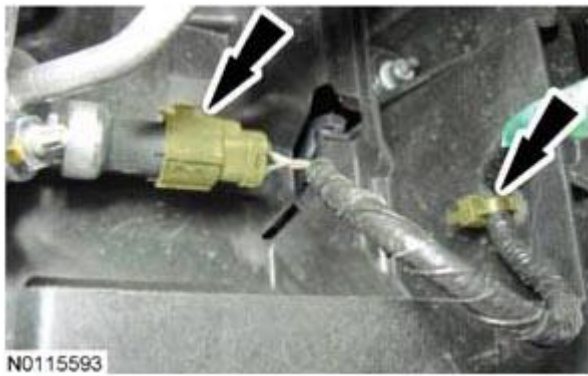


Fig. 304: Locating A/C Pressure Transducer Electrical Connector
Courtesy of FORD MOTOR CO.

38. Detach the wiring harness retainer from the lower A/C compressor bracket.



Fig. 305: Locating Wiring Harness Retainer From Lower A/C Compressor Bracket
Courtesy of FORD MOTOR CO.

39. Remove the 2 bolts, stud bolt and position the A/C compressor aside and support with a length of mechanic's wire.

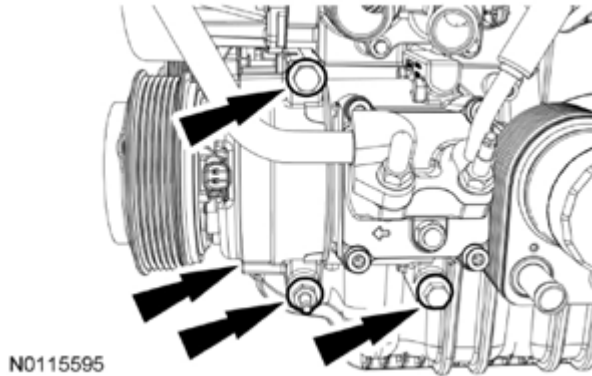


Fig. 306: Locating A/C Compressor Bolts And Stud Bolt
Courtesy of FORD MOTOR CO.

Vehicles without A/C

40. Remove the 3 bolts and the accessory drive belt idler pulley bracket.

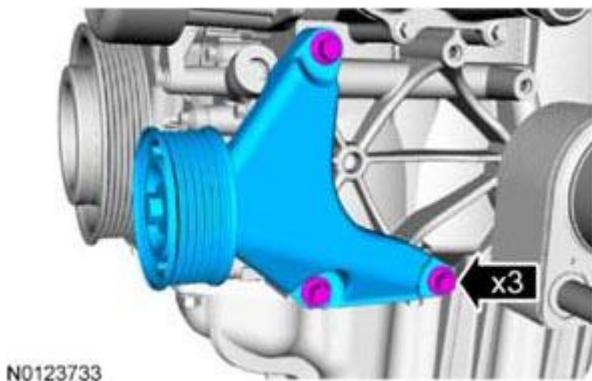


Fig. 307: Locating Bolts And Accessory Drive Belt Idler Pulley Bracket
Courtesy of FORD MOTOR CO.

All vehicles

41. Remove the Catalyst Monitor Sensor (CMS). For additional information, refer to **ELECTRONIC ENGINE CONTROLS**.
42. Remove the 2 catalytic converter-to-muffler nuts and separate.
- Discard the gasket.



Fig. 308: Locating Catalytic Converter-To-Muffler Nuts
Courtesy of FORD MOTOR CO.

NOTE: Do not excessively bend or twist the exhaust flexible pipe. Failure to follow these instructions may cause damage to the flexible pipe.

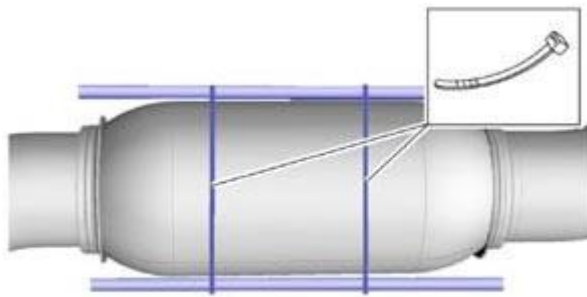


Fig. 309: Supporting Exhaust Flexible Pipe
Courtesy of FORD MOTOR CO.

43. Support the exhaust flexible pipe with a support wrap or suitable splint.
44. Remove the 4 bolts and the lower catalytic converter bracket.

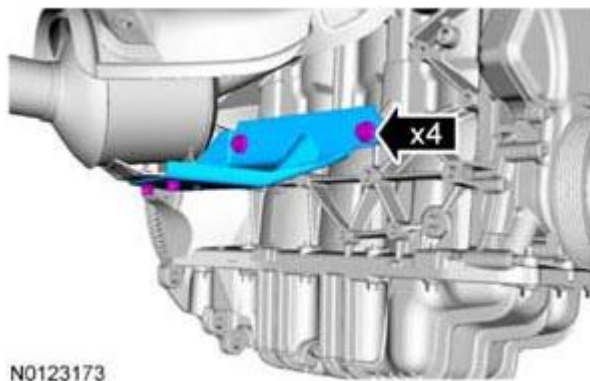


Fig. 310: Locating Bolts And Lower Catalytic Converter Bracket
Courtesy of FORD MOTOR CO.

45. Remove the 4 bolts and the catalytic converter heat shield.

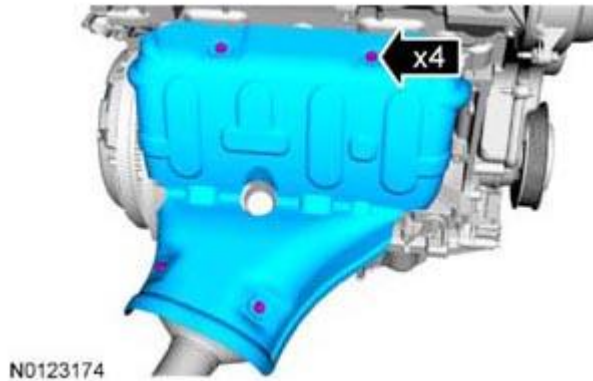


Fig. 311: Locating Bolts And Catalytic Converter Heat Shield
Courtesy of FORD MOTOR CO.

46. Remove the 4 catalytic converter nuts and bolt.
- Discard the bolt and 4 nuts.

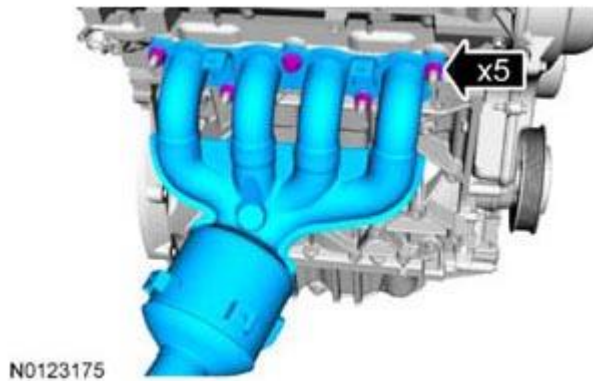


Fig. 312: Locating Catalytic Converter Nuts And Bolt
Courtesy of FORD MOTOR CO.

47. Position the catalytic converter back and secure with mechanic wire.
- Discard the catalytic converter gasket.
48. Clean and inspect the catalytic converter flange. For additional information, refer to exhaust manifold cleaning and inspection in **ENGINE SYSTEM - GENERAL INFORMATION** .
49. If equipped, disconnect the block heater electrical connector.
50. Drain the engine oil.
- Install the drain plug and tighten to 28 Nm (21 lb-ft).

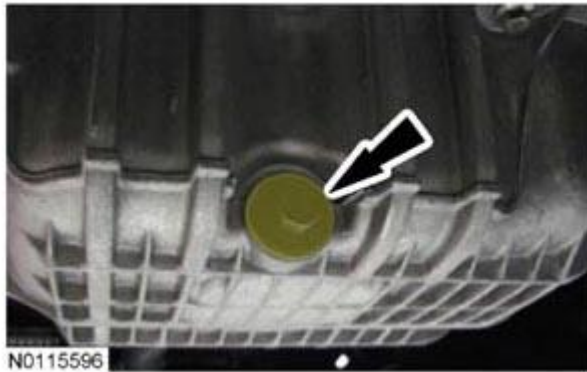


Fig. 313: Locating Drain Plug
Courtesy of FORD MOTOR CO.

51. Remove and discard the engine oil filter.

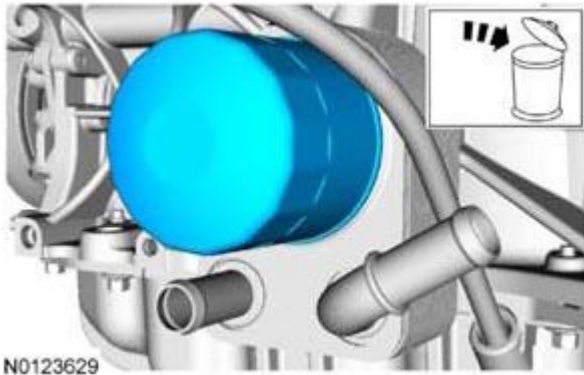


Fig. 314: Removing Engine Oil Filter
Courtesy of FORD MOTOR CO.

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

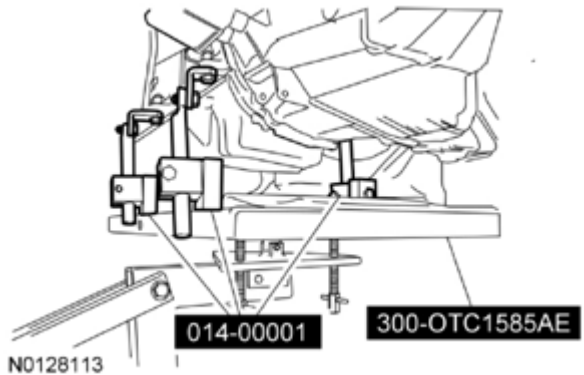


Fig. 315: Securing Engine To Lift Table
Courtesy of FORD MOTOR CO.

53. Remove the 2 bolts and the transaxle roll restrictor.



Fig. 316: Locating Bolts And Transaxle Roll Restrictor
Courtesy of FORD MOTOR CO.

NOTE: The engine mount studs must be held while removing the engine mount nuts or damage to the powertrain may occur.

NOTE: Do not loosen the engine mount center bolt or the engine may become improperly positioned.



Fig. 317: Locating Engine Mount Nuts
Courtesy of FORD MOTOR CO.

54. Use the holding feature to prevent the engine mount studs from turning, remove the 2 engine mount nuts.
55. Remove the 3 bolts and the engine mount.

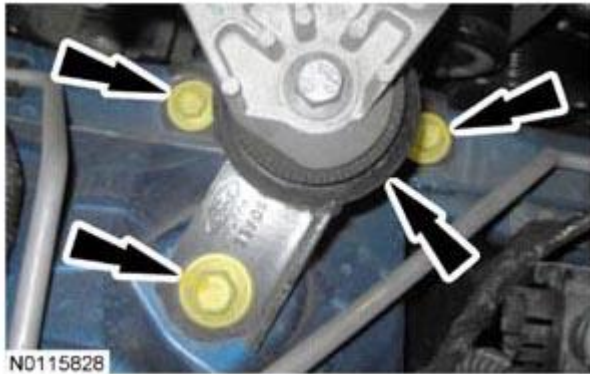


Fig. 318: Locating Bolts And Engine Mount
Courtesy of FORD MOTOR CO.

56. Remove the 2 bolt, 2 nuts and the transaxle support insulator.



Fig. 319: Locating Transaxle Support Insulator Bolt And Nuts
Courtesy of FORD MOTOR CO.

57. Lower the engine and transaxle assembly from the vehicle.
58. Remove the 4 catalytic converter studs and discard.

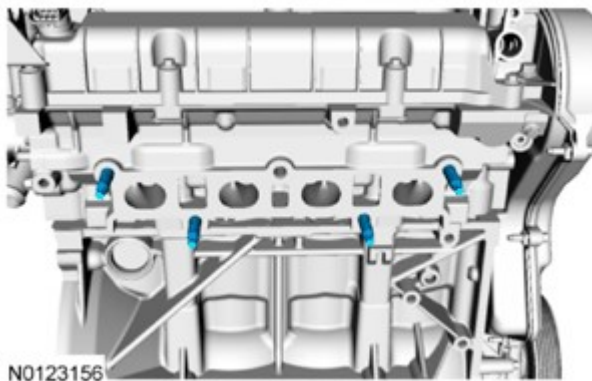


Fig. 320: Identifying Catalytic Converter Studs

Courtesy of FORD MOTOR CO.

59. Detach the 2 wiring harness retainers from the coolant outlet bracket.

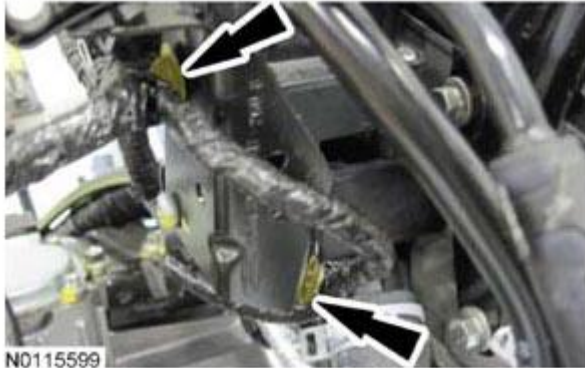


Fig. 321: Locating Wiring Harness Retainers From Coolant Outlet Bracket
Courtesy of FORD MOTOR CO.

60. Disconnect the ignition coil and Engine Coolant Temperature (ECT) sensor electrical connectors.

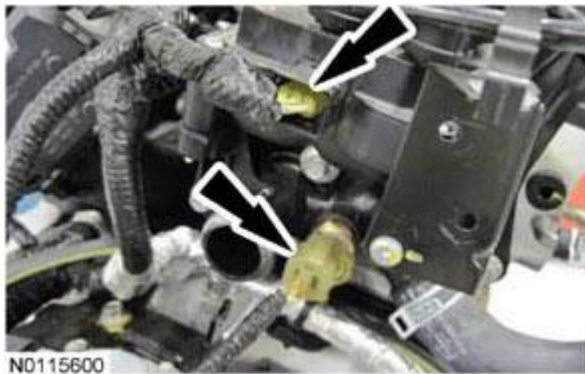


Fig. 322: Locating Ignition Coil And Engine Coolant Temperature (ECT) Sensor Electrical Connectors
Courtesy of FORD MOTOR CO.

61. Detach the HO2S sensor electrical connector pin-type retainer from the bracket.



Fig. 323: Locating HO2S Sensor Electrical Connector Pin-Type Retainer From Bracket
Courtesy of FORD MOTOR CO.

62. Disconnect the 2 Camshaft Position (CMP) sensor electrical connectors.



Fig. 324: Locating Camshaft Position (CMP) Sensor Electrical Connectors
Courtesy of FORD MOTOR CO.

63. Detach and disconnect the LH Knock Sensor (KS) electrical connector.



Fig. 325: Locating LH Knock Sensor (KS) Electrical Connector
Courtesy of FORD MOTOR CO.

64. Disconnect the Variable Camshaft Timing (VCT) oil control solenoid electrical connectors.
- Detach the 2 wiring harness retainers.

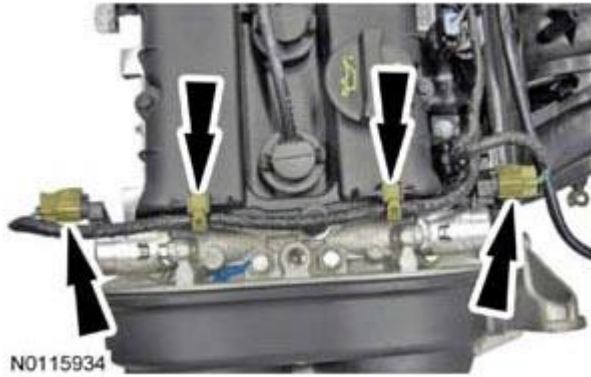


Fig. 326: Locating Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

65. Disconnect the 4 fuel injector electrical connectors.
- Detach the wiring harness retainers from the valve cover stud bolts.



Fig. 327: Locating Fuel Injector Electrical Connectors
Courtesy of FORD MOTOR CO.

66. Disconnect the EVAP canister purge valve electrical connector.

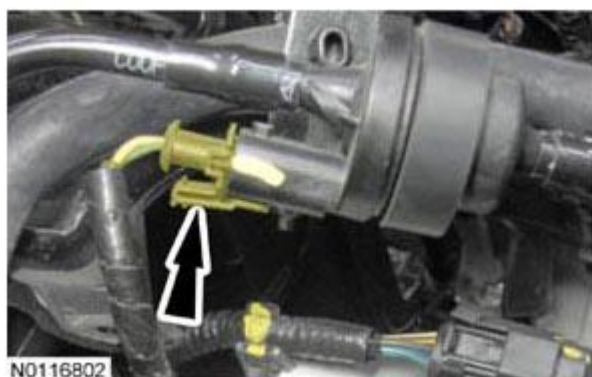


Fig. 328: Locating EVAP Canister Purge Valve Electrical Connector
Courtesy of FORD MOTOR CO.

67. Disconnect the Throttle Body (TB) electrical connector.
- Detach the 2 wiring harness retainers from the TB.



Fig. 329: Locating Throttle Body (TB) Electrical Connector
Courtesy of FORD MOTOR CO.

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



Fig. 330: Locating Crankshaft Position (CKP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

69. Disconnect the Engine Oil Pressure (EOP) switch electrical connector.
- Detach the wiring harness retainer from the engine block.



Fig. 331: Locating Engine Oil Pressure (EOP) Switch Electrical Connector
Courtesy of FORD MOTOR CO.

70. Disconnect the RH KS electrical connector.
- Detach the 2 wiring harness retainers from the intake manifold.



Fig. 332: Locating Wiring Harness Retainers From Intake Manifold
Courtesy of FORD MOTOR CO.

71. Remove the 2 nuts and disconnect the starter motor electrical terminals.



Fig. 333: Locating Nuts And Starter Motor Electrical Terminals
Courtesy of FORD MOTOR CO.

72. Remove the 3 bolts (2 shown in illustration) and the starter motor.

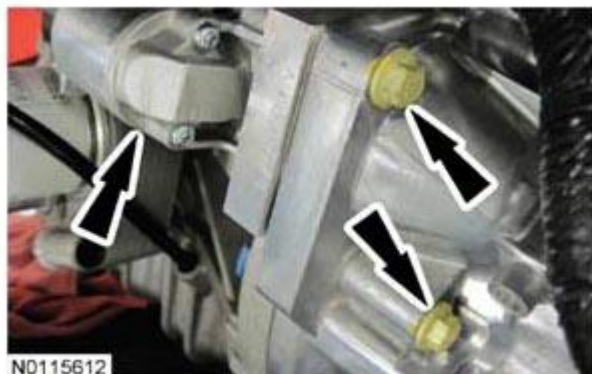


Fig. 334: Locating Bolts And Starter Motor
Courtesy of FORD MOTOR CO.

73. Detach the wiring harness pin-type retainer and remove the 2 upper bellhousing-to-engine bolts and bracket.



Fig. 335: Locating Upper Bellhousing-To-Engine Bolts
Courtesy of FORD MOTOR CO.

74. Remove the clutch nut access cover.



Fig. 336: Locating Clutch Nut Access Cover
Courtesy of FORD MOTOR CO.

NOTE: Rotate the engine in a clockwise direction only or engine damage may occur.

NOTE: Mark one stud and the flexplate for installation reference.



Fig. 337: Locating Flexplate-To-Clutch Nuts
Courtesy of FORD MOTOR CO.

75. Remove the 6 flexplate-to-clutch nuts and discard.

NOTE: Lower the engine to within a few inches of the floor.



Fig. 338: Lifting Engine And Transaxle Assembly Using Floor Crane And Spreader Bar
Courtesy of FORD MOTOR CO.

76. Using the Floor Crane and Spreader Bar, remove the engine and transaxle assembly from the lift table.
77. Remove the 6 clutch housing-to-engine bolts and separate the engine and transaxle.



N0113199

Fig. 339: Locating Clutch Housing-To-Engine Bolts
Courtesy of FORD MOTOR CO.

78. Remove and discard the engine-to-transaxle separator plate.

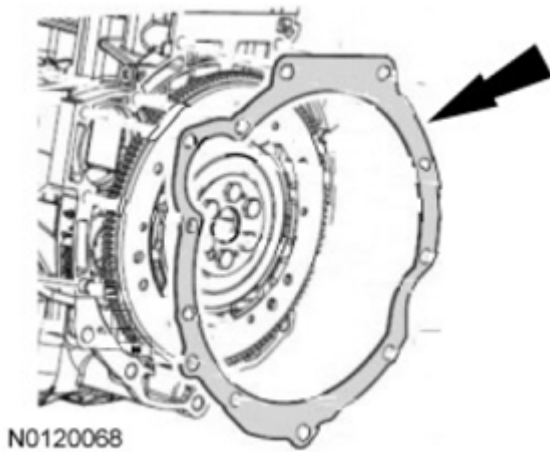
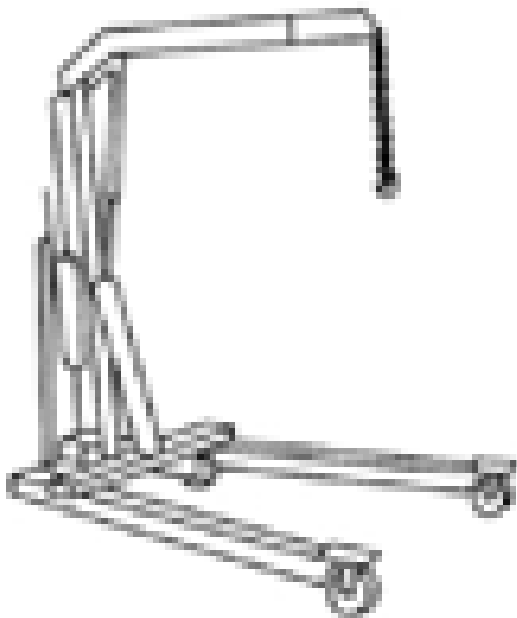


Fig. 340: Locating Engine-To-Transaxle Separator Plate
Courtesy of FORD MOTOR CO.

ENGINE - MANUAL TRANSAXLE

SPECIAL TOOLS

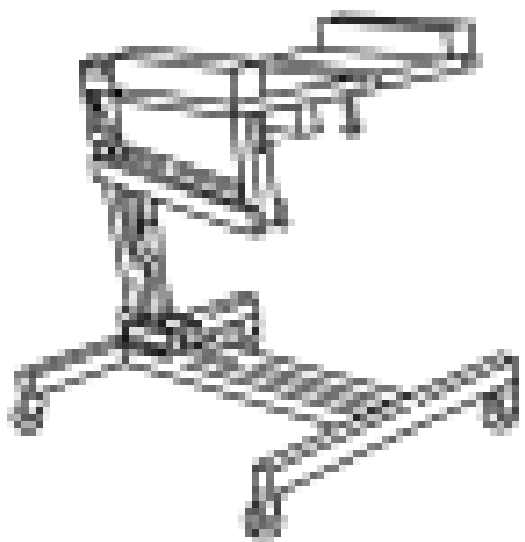


ST1341-A

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

2013 Ford Fiesta S

2013 ENGINE Engine Mechanical - 1.6L - Fiesta



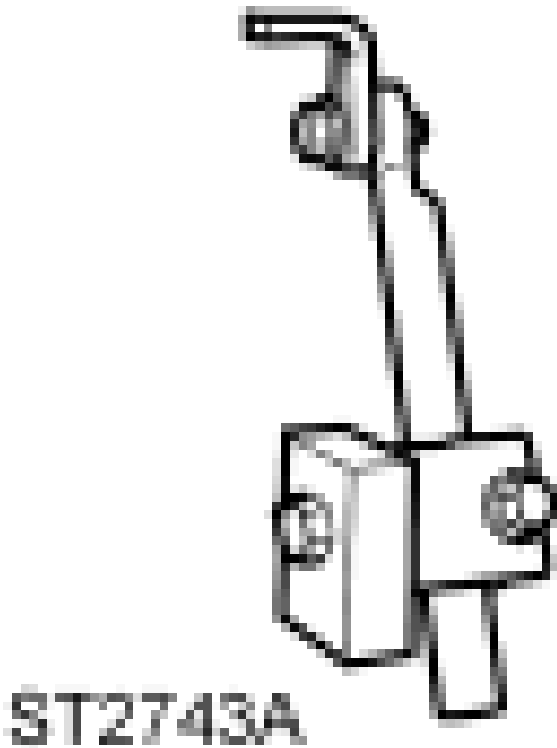
ST1652-A

Powertrain Lift
300-OTC1585AE



ST1602-A

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



Adjustable Grip Arm, 1735A
014-00001

All vehicles

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Release the fuel system pressure. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION**.
3. Remove the Air Cleaner (ACL) and ACL outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING**.
4. Disconnect the crankcase vent tube from the valve cover.
 - Detach the 2 crankcase vent tube retainers and remove the tube.

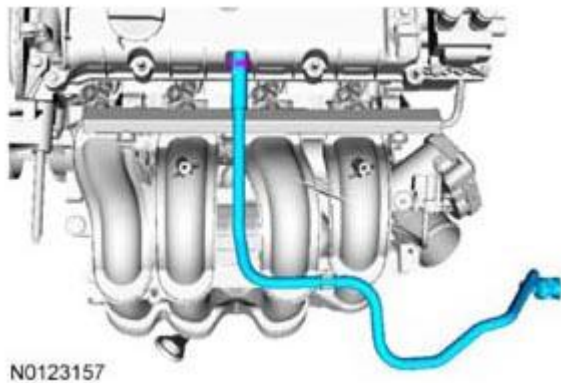


Fig. 341: Identifying Crankcase Vent Tube Retainers
Courtesy of FORD MOTOR CO.

5. Remove the positive battery cable cover.

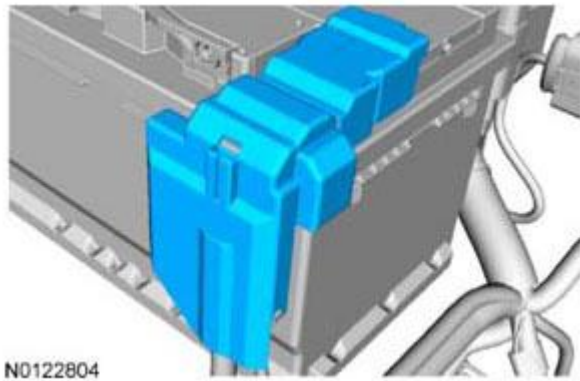


Fig. 342: Identifying Positive Battery Cable Cover
Courtesy of FORD MOTOR CO.

6. Remove the battery. For additional information, refer to **BATTERY, MOUNTING AND CABLES**.
7. Remove the nut and cable from the positive battery cable terminal.

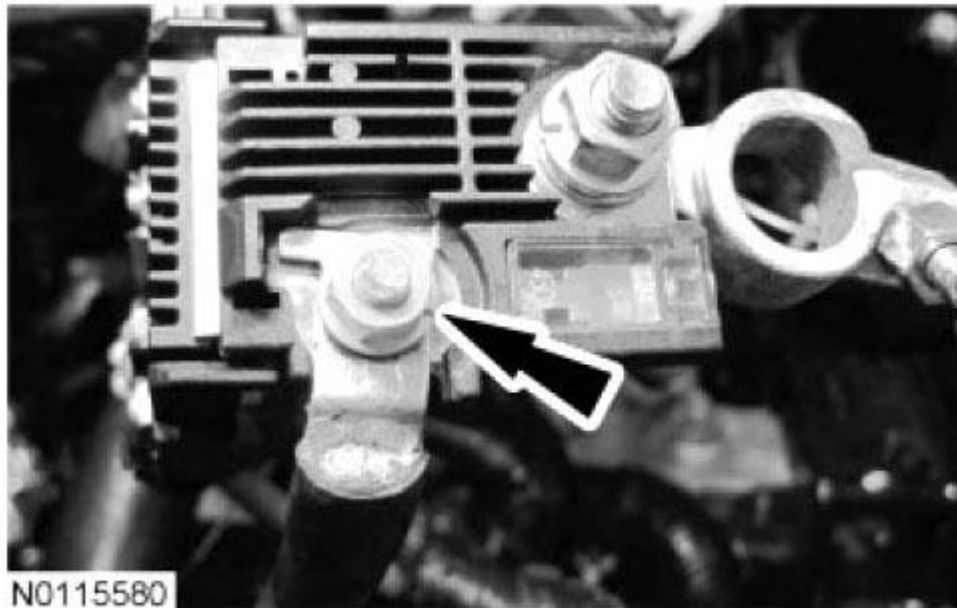


Fig. 343: Locating Positive Battery Cable Terminal And Nut
Courtesy of FORD MOTOR CO.

8. Remove the bolt and the PCM cover.

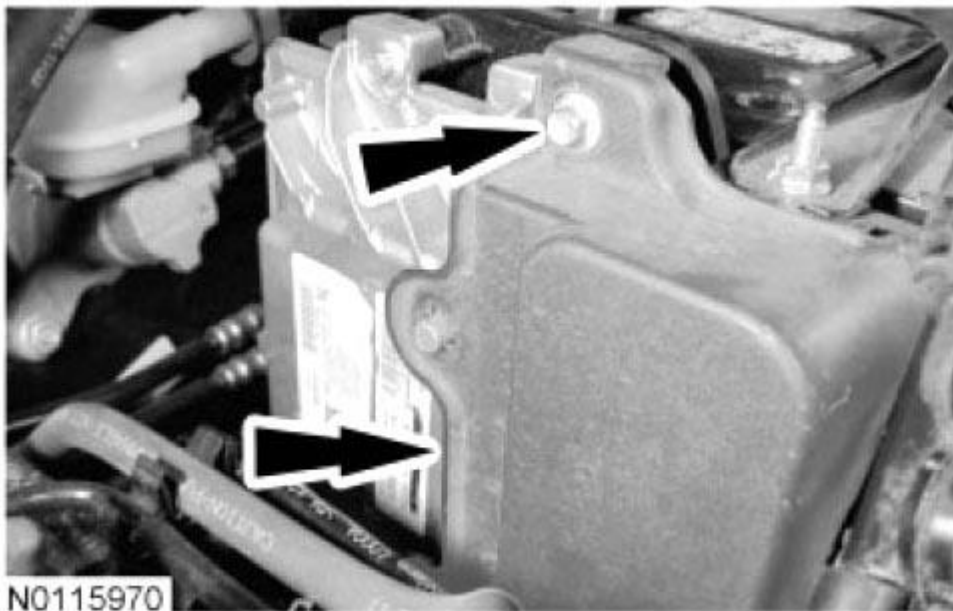


Fig. 344: Locating Bolt And PCM Cover
Courtesy of FORD MOTOR CO.

9. Disconnect the 3 PCM electrical connectors.

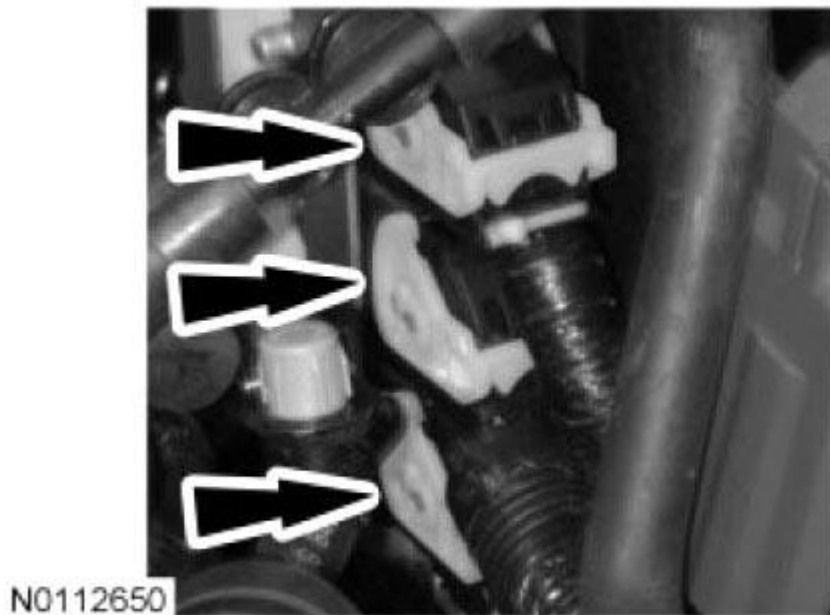


Fig. 345: Locating PCM Electrical Connectors
Courtesy of FORD MOTOR CO.

10. Remove the 3 bolts and the battery tray.

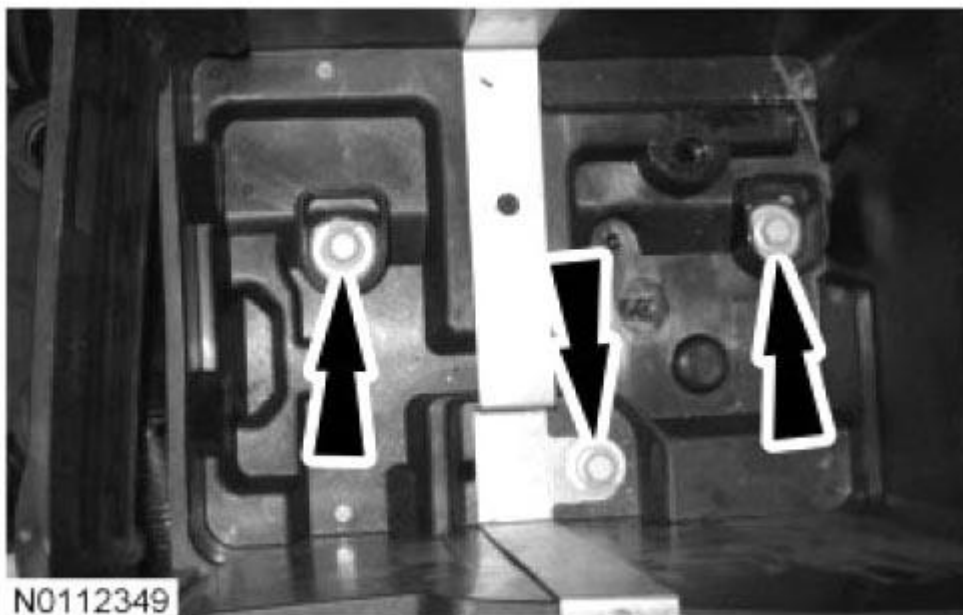


Fig. 346: Locating Bolts And Battery Tray
Courtesy of FORD MOTOR CO.

11. Detach the 2 positive battery cable wire harness retainers from battery tray bracket.

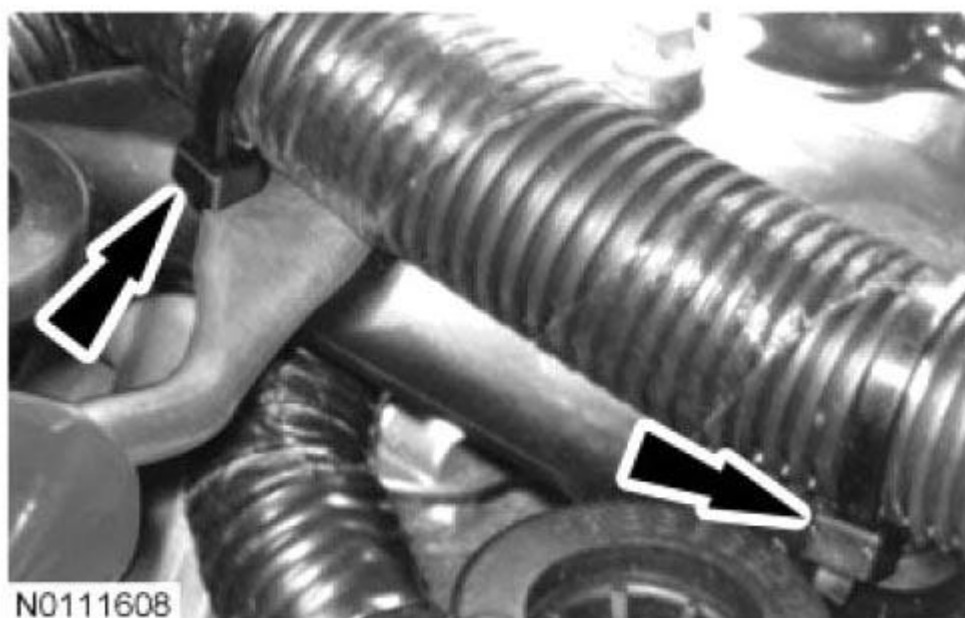


Fig. 347: Locating Positive Battery Cable Wire Harness Retainers From Battery Tray Bracket
Courtesy of FORD MOTOR CO.

12. Remove the 3 battery tray nuts and the battery tray bracket.
 - Detach the 2 wiring harness retainers from the battery tray bracket.

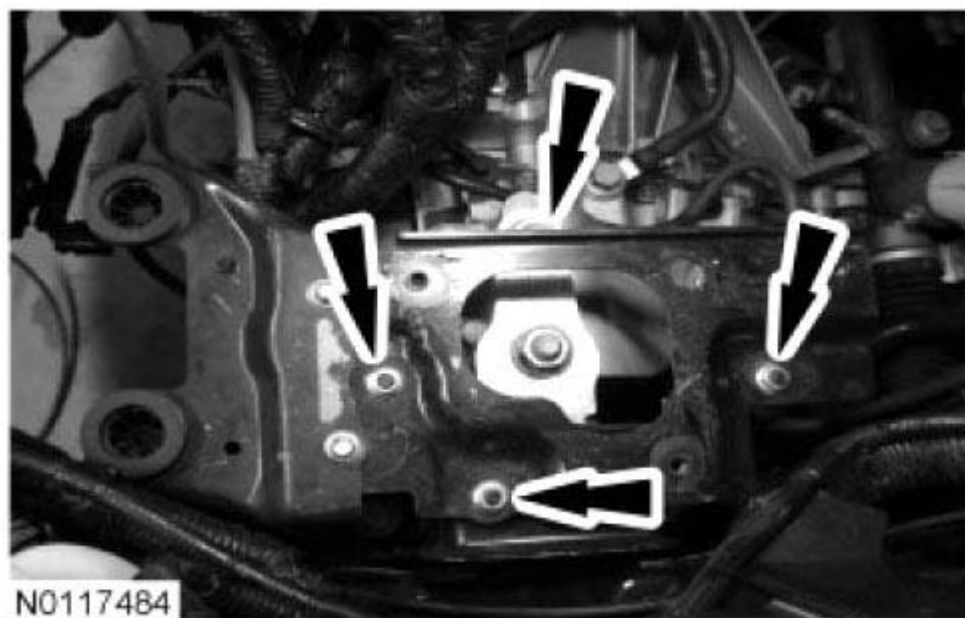


Fig. 348: Locating Battery Tray Nuts
Courtesy of FORD MOTOR CO.

13. Disconnect the engine harness electrical connector.



Fig. 349: Locating Engine Harness Electrical Connector
Courtesy of FORD MOTOR CO.

14. Disconnect the brake booster vacuum hose.

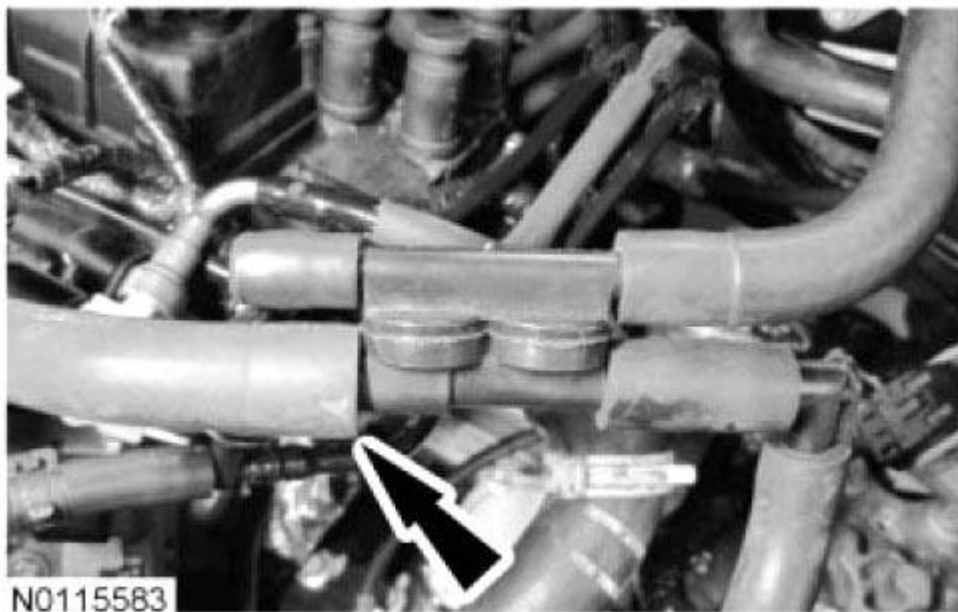


Fig. 350: Locating Brake Booster Vacuum Hose
Courtesy of FORD MOTOR CO.

15. Disconnect the fuel tube spring lock couplings from the fuel rail. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION**.



Fig. 351: Locating Fuel Tube Spring Lock Couplings From Fuel Rail
Courtesy of FORD MOTOR CO.

16. Detach the fuel tube from the coolant outlet bracket retainer.

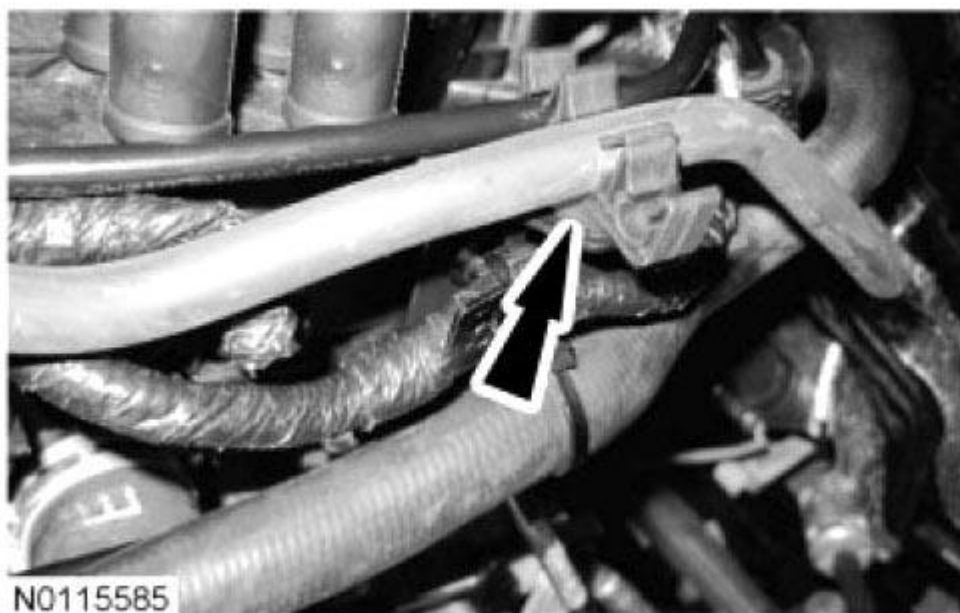


Fig. 352: Locating Fuel Tube From Coolant Outlet Bracket Retainer

Courtesy of FORD MOTOR CO.

17. Remove the generator. For additional information, refer to **CHARGING SYSTEM** .
18. Drain the cooling system. For additional information, refer to **ENGINE COOLING SYSTEM** .
19. Remove the degas bottle. For additional Information, refer to **ENGINE COOLING SYSTEM** .
20. Release the 7 retainers (2 shown in illustration) and remove the gearshift cable cover.



Fig. 353: Locating Retainers And Gearshift Cable Cover
Courtesy of FORD MOTOR CO.

21. Remove the gearshift cables.
 1. Using a suitable tool, lightly pry the gearshift cables off the transaxle shift control levers.
 2. Remove the gearshift cable by pulling the lower part of abutment down and removing from the brackets.

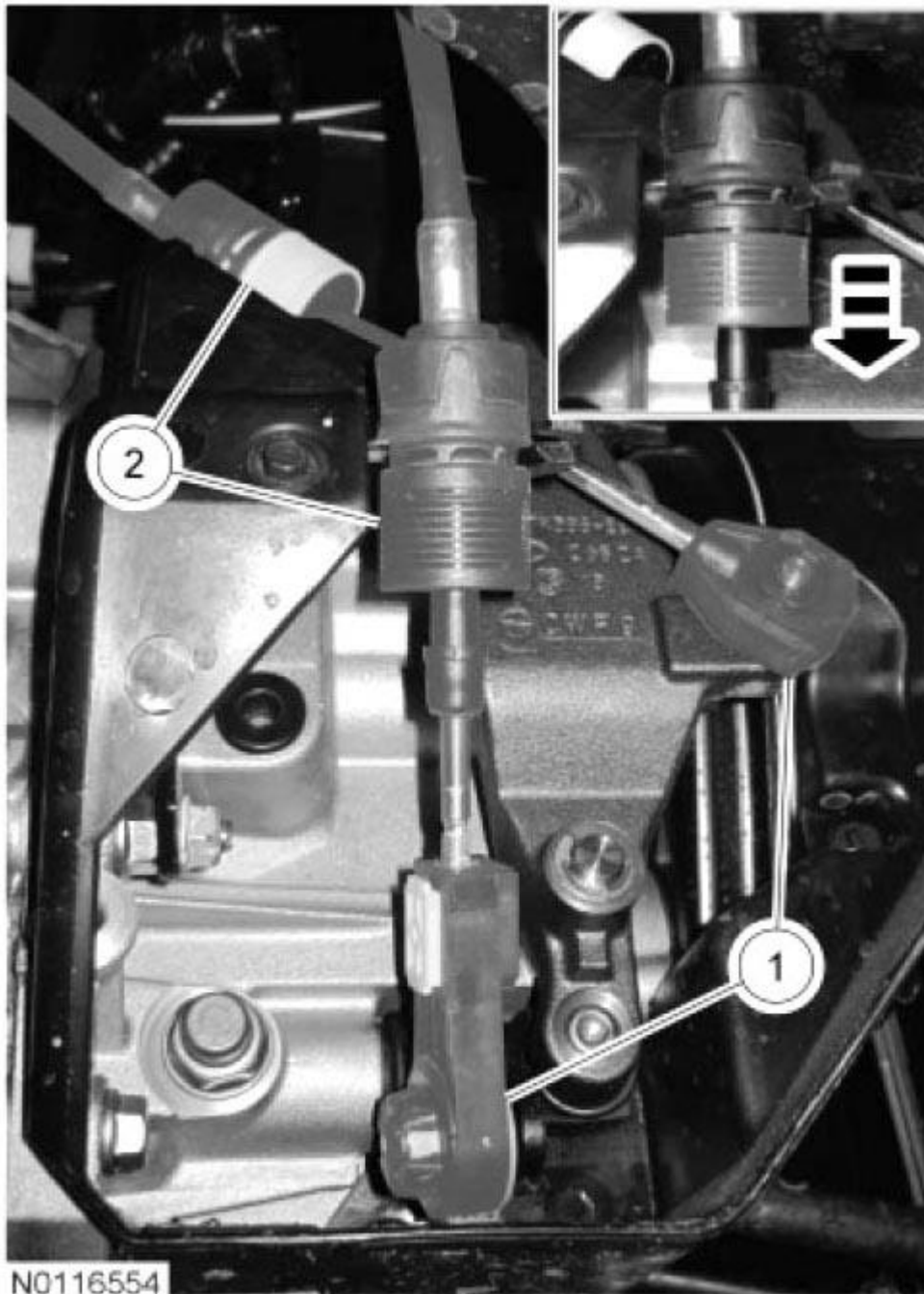


Fig. 354: Removing Gearshift Cable
Courtesy of FORD MOTOR CO.

22. Remove the cooling fan motor and shroud. For additional information, refer to **ENGINE COOLING SYSTEM**.
23. Disconnect the 2 coolant hoses from the engine oil cooler.
 - Detach the oil cooler hose retainer from the upper radiator hose.

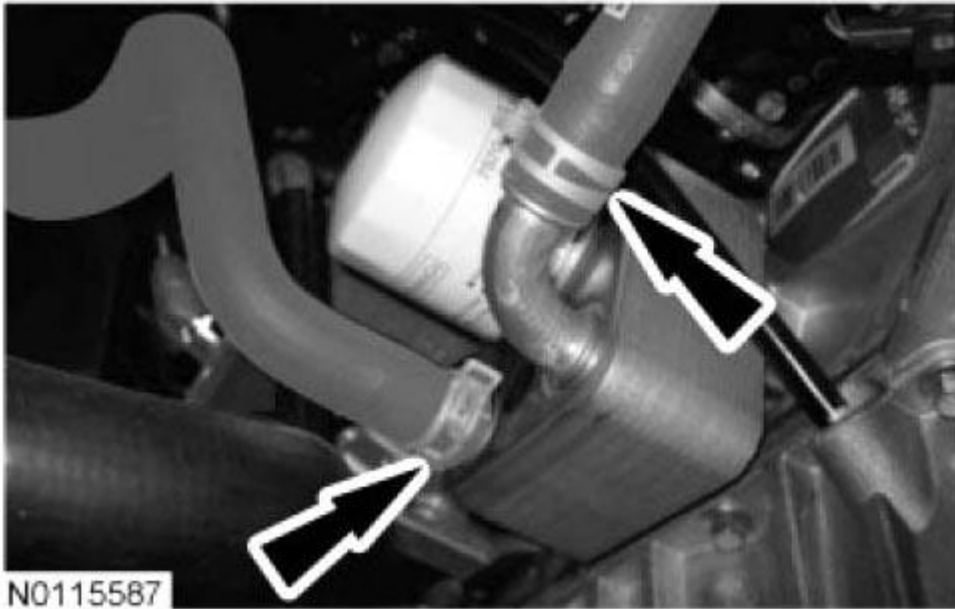


Fig. 355: Locating Coolant Hoses From Engine Oil Cooler
Courtesy of FORD MOTOR CO.

24. Remove the Heated Oxygen Sensor (HO2S). For additional information, refer to **ELECTRONIC ENGINE CONTROLS**.
25. Disconnect the lower heater hose from the heater core.

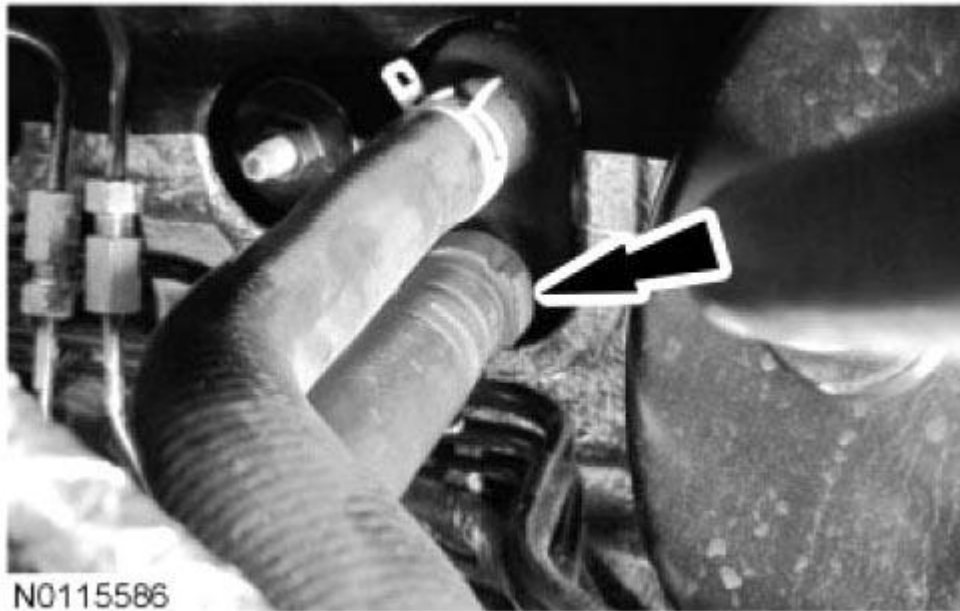


Fig. 356: Locating Lower Heater Hose From Heater Core
Courtesy of FORD MOTOR CO.

26. Detach the coolant hose retainer from the coolant outlet bracket.

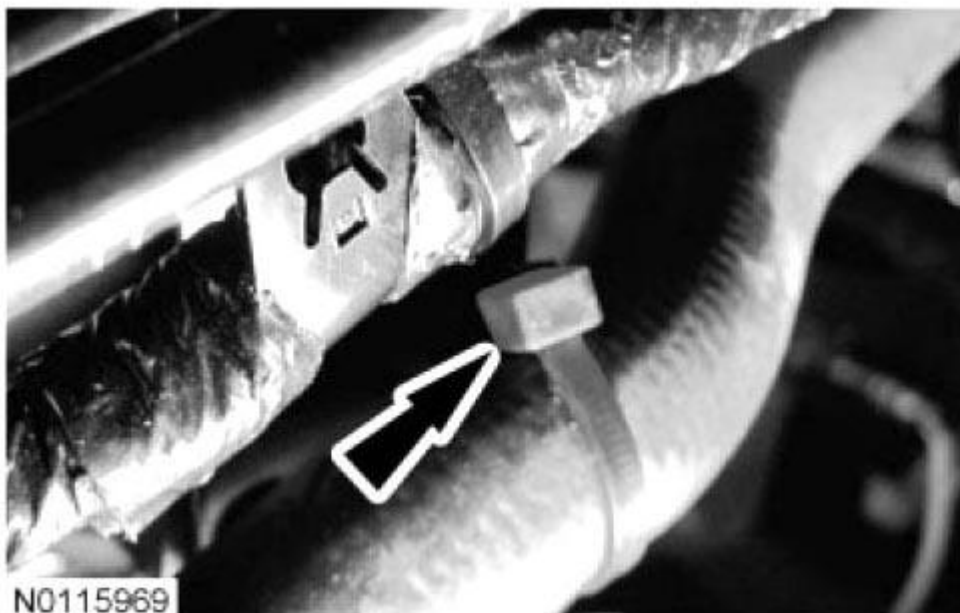


Fig. 357: Locating Coolant Hose Retainer From Coolant Outlet Bracket
Courtesy of FORD MOTOR CO.

27. Disconnect the Evaporative Emission (EVAP) tube quick connect coupling near the bulk head. For

additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** .

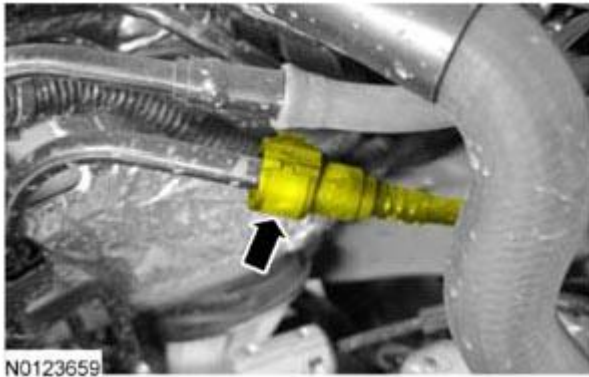


Fig. 358: Locating Evaporative Emission (EVAP) Tube Quick Connect Coupling Near Bulk Head
Courtesy of FORD MOTOR CO.

28. Disconnect the upper radiator hose from the engine.

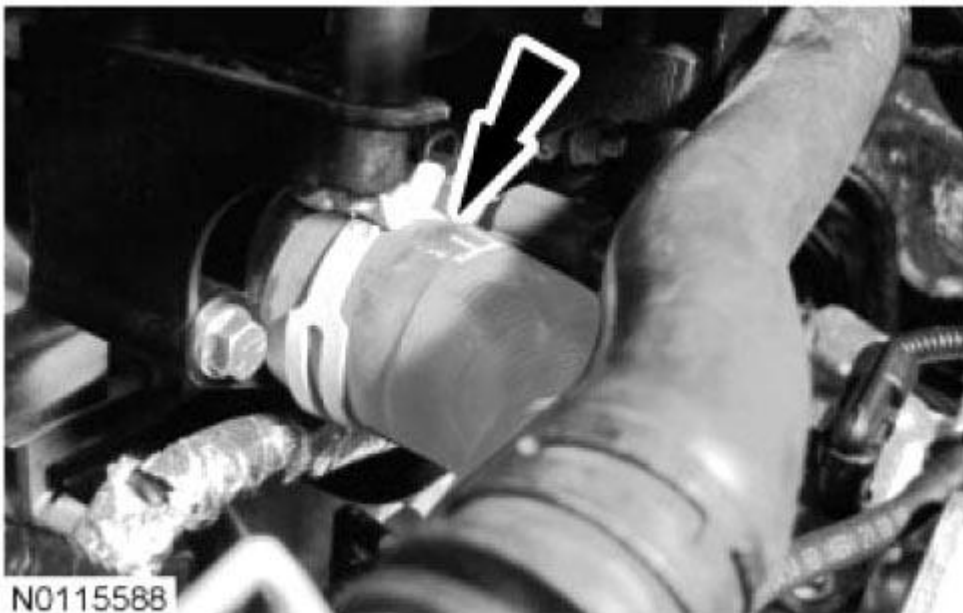


Fig. 359: Locating Upper Radiator Hose From Engine
Courtesy of FORD MOTOR CO.

29. Disconnect the lower radiator hose and coolant hose from the thermostat housing.

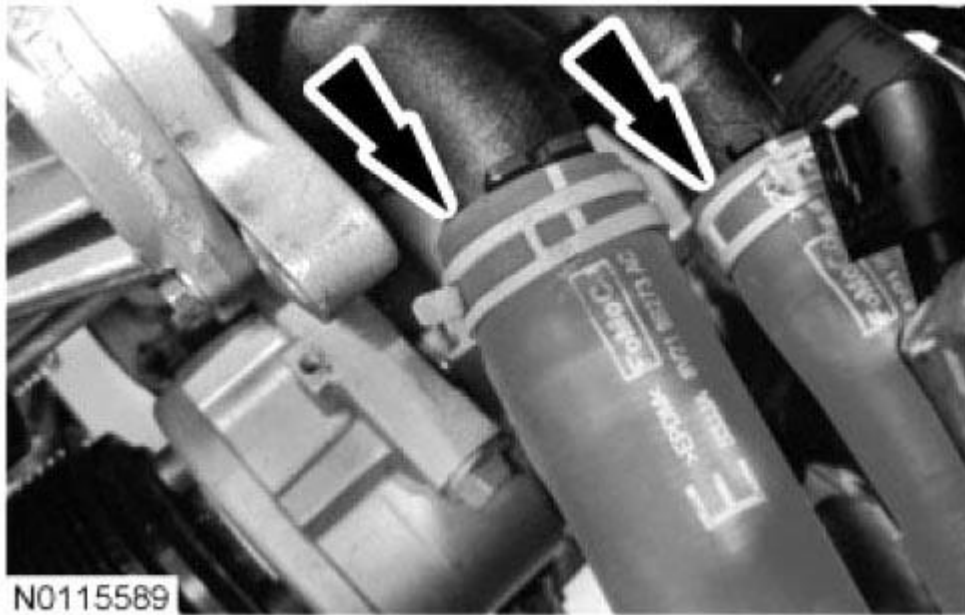


Fig. 360: Locating Lower Radiator Hose And Coolant Hose From Thermostat Housing
Courtesy of FORD MOTOR CO.

WARNING: Carefully read cautionary information on product label. For **EMERGENCY MEDICAL INFORMATION** seek medical advice. In the USA or Canada on Ford/Motorcraft products call: 1-800-959-3673. For additional information, consult the product Material Safety Data Sheet (MSDS) if available. Failure to follow these instructions may result in serious personal injury.

NOTE: Do not spill brake fluid on painted or plastic surfaces or damage to the surface may occur. If brake fluid is spilled onto a painted or plastic surface, immediately wash the surface with water.

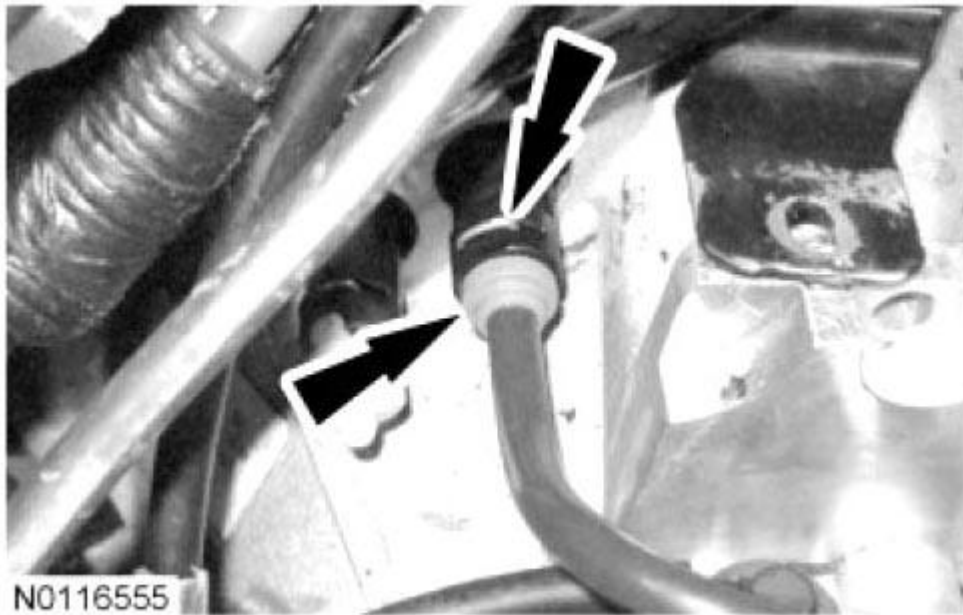


Fig. 361: Locating Clip And Clutch Hydraulic Hose
Courtesy of FORD MOTOR CO.

30. Remove the clip and disconnect the clutch hydraulic hose.
31. Detach the clutch hydraulic hose from the transaxle retainer.

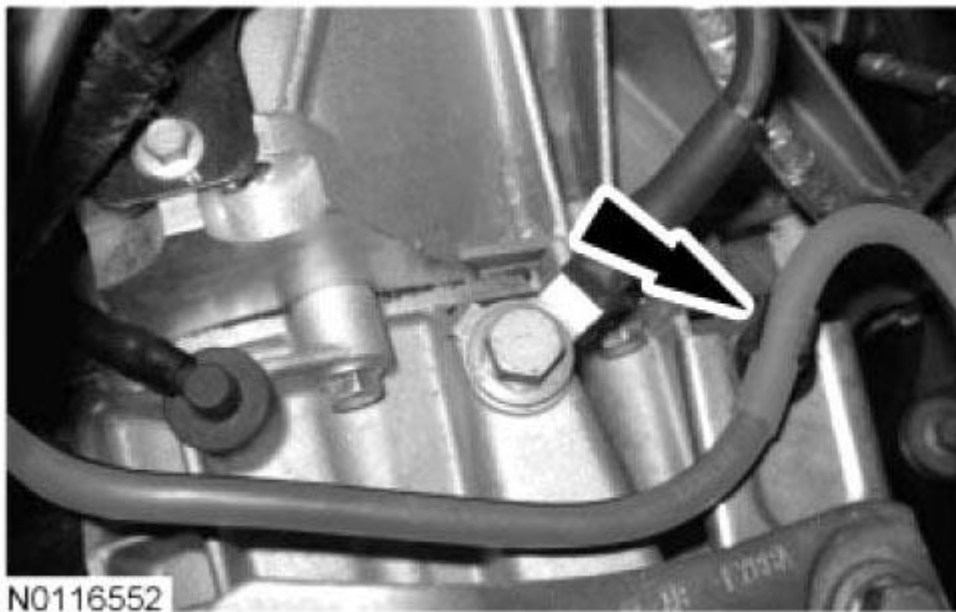


Fig. 362: Locating Clutch Hydraulic Hose From Transaxle Retainer
Courtesy of FORD MOTOR CO.

32. Remove the bolt and position the engine ground wire aside.

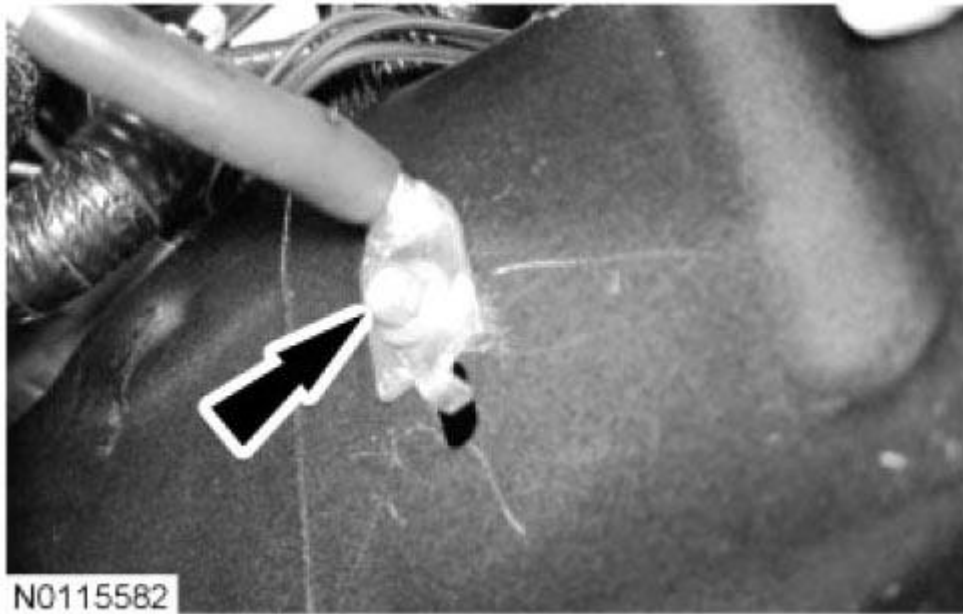


Fig. 363: Locating Bolt And Engine Ground Wire
Courtesy of FORD MOTOR CO.

33. Remove the RH and LH halfshafts. For additional information, refer to **FRONT DRIVE HALFSHAFTS** .
34. Remove the 3 bolts and the halfshaft bracket.

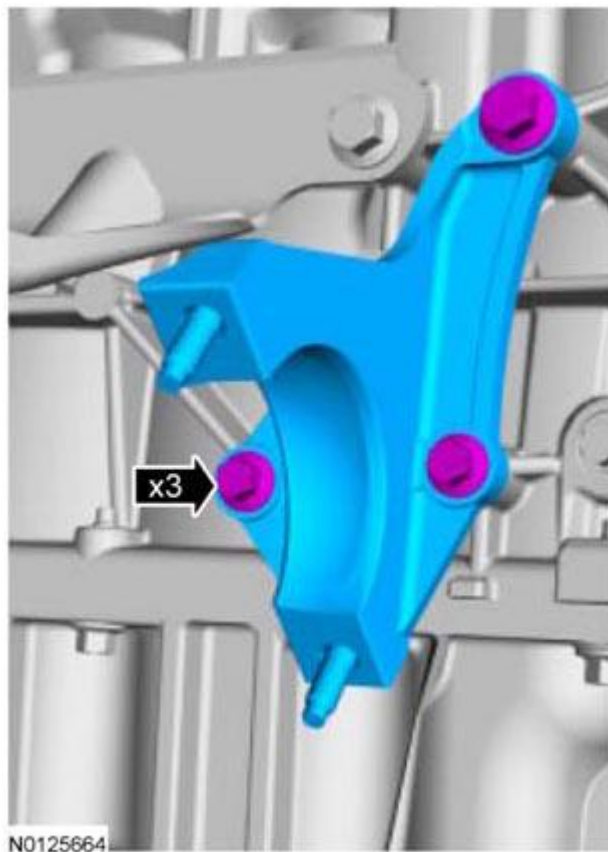


Fig. 364: Locating Bolts And Halfshaft Bracket
Courtesy of FORD MOTOR CO.

Vehicles with A/C

35. Disconnect the A/C compressor electrical connector.

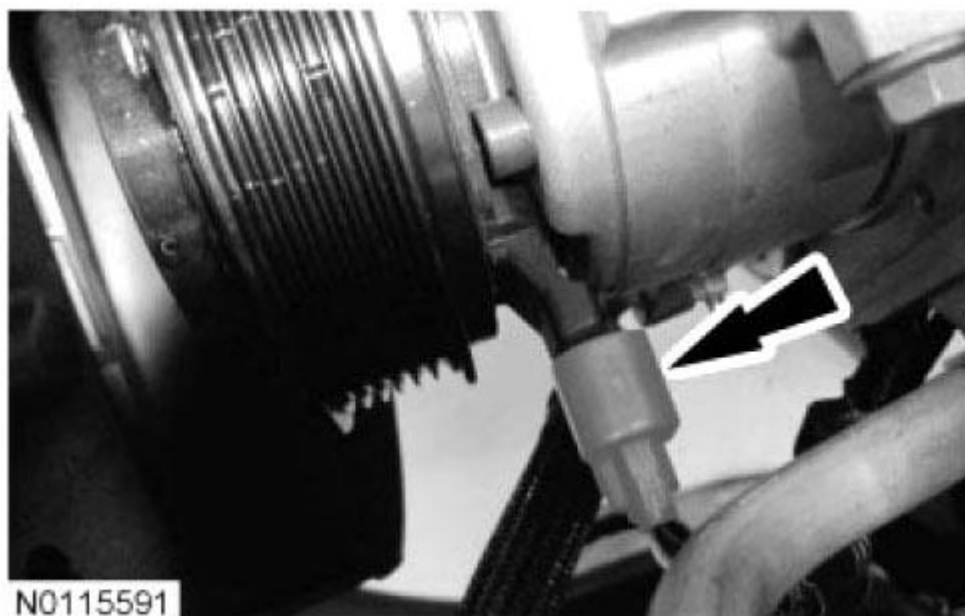


Fig. 365: Locating A/C Compressor Electrical Connector
Courtesy of FORD MOTOR CO.

36. Remove the nut and position the A/C line bracket aside.

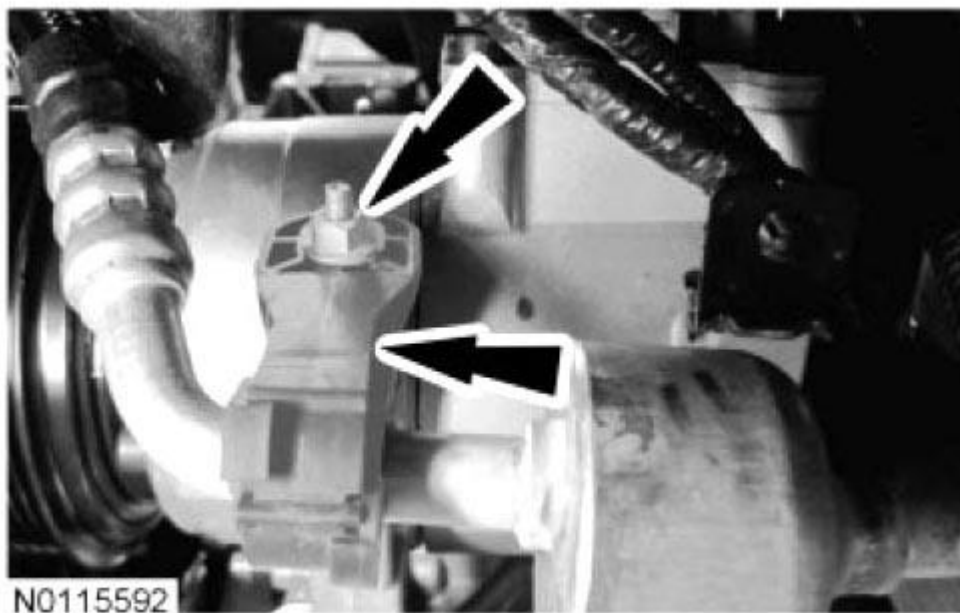


Fig. 366: Locating Nut And A/C Line Bracket
Courtesy of FORD MOTOR CO.

37. Disconnect the A/C pressure transducer electrical connector.

- Detach the wiring harness retainer.

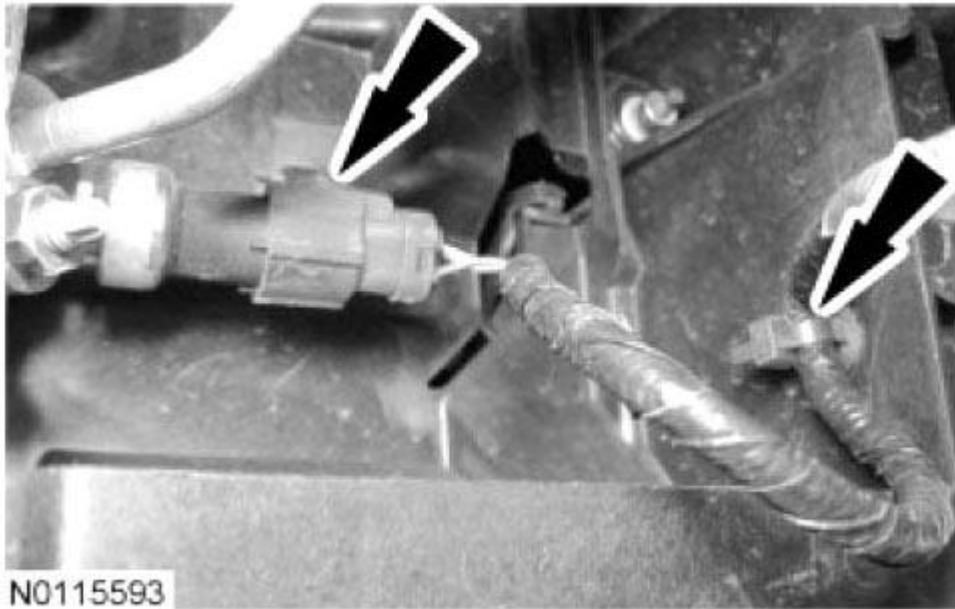


Fig. 367: Locating A/C Pressure Transducer Electrical Connector
Courtesy of FORD MOTOR CO.

38. Detach the wiring harness retainer from the lower A/C compressor bracket.

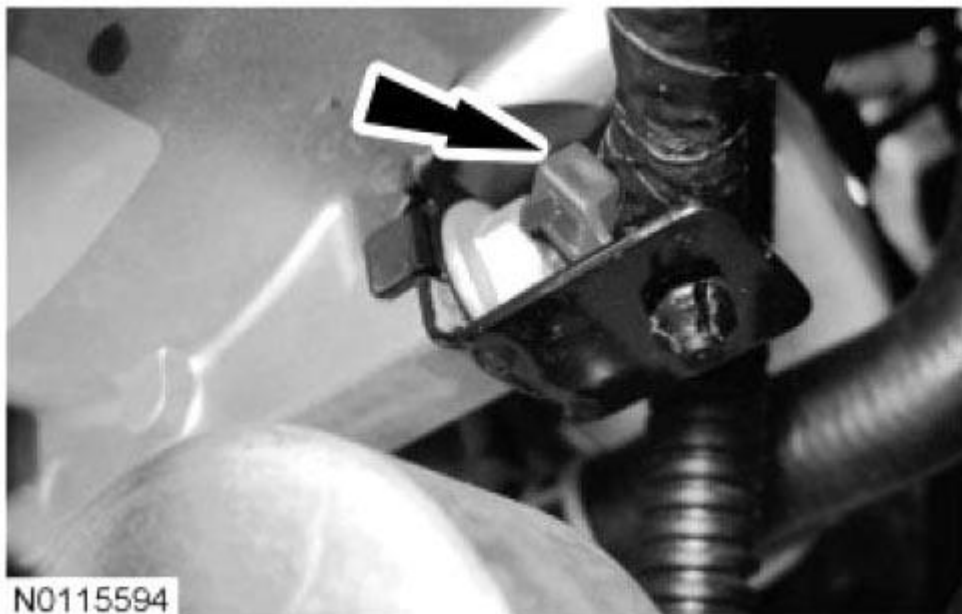


Fig. 368: Locating Wiring Harness Retainer From Lower A/C Compressor Bracket
Courtesy of FORD MOTOR CO.

39. Remove the 2 bolts, stud bolt and position the A/C compressor aside and support with a length of mechanic's wire.

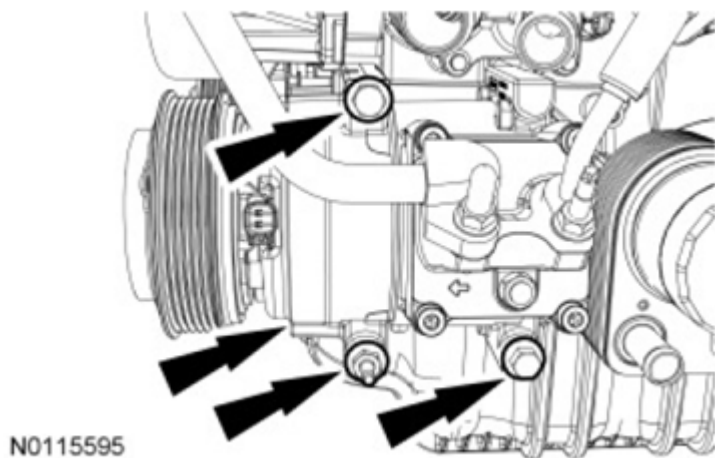


Fig. 369: Locating A/C Compressor Bolts And Stud Bolt
Courtesy of FORD MOTOR CO.

Vehicles without A/C

40. Remove the 3 bolts and the accessory drive belt idler pulley bracket.

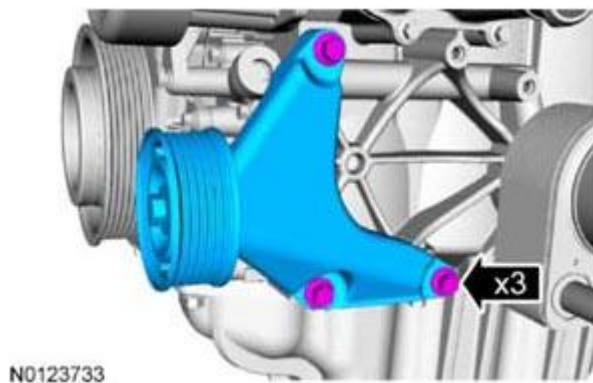


Fig. 370: Locating Bolts And Accessory Drive Belt Idler Pulley Bracket
Courtesy of FORD MOTOR CO.

All vehicles

41. Remove the Catalyst Monitor Sensor (CMS). For additional information, refer to **ELECTRONIC ENGINE CONTROLS**.
42. Remove the 2 catalytic converter-to-muffler nuts and separate.
 - Discard the gasket.

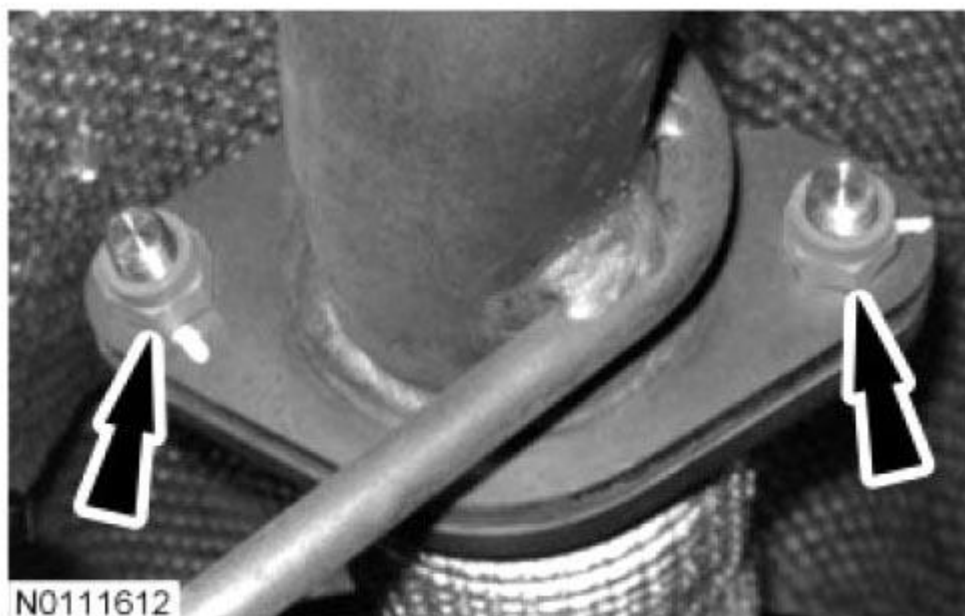
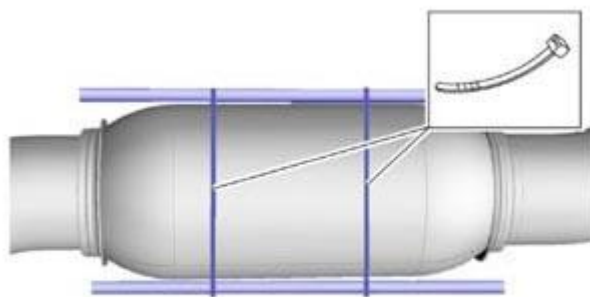


Fig. 371: Locating Catalytic Converter-To-Muffler Nuts
Courtesy of FORD MOTOR CO.

NOTE: Do not excessively bend or twist the exhaust flexible pipe. Failure to follow these instructions may cause damage to the flexible pipe.



E98634

Fig. 372: Supporting Exhaust Flexible Pipe
Courtesy of FORD MOTOR CO.

43. Support the exhaust flexible pipe with a support wrap or suitable splint.
44. Remove the 4 bolts and the lower catalytic converter bracket.

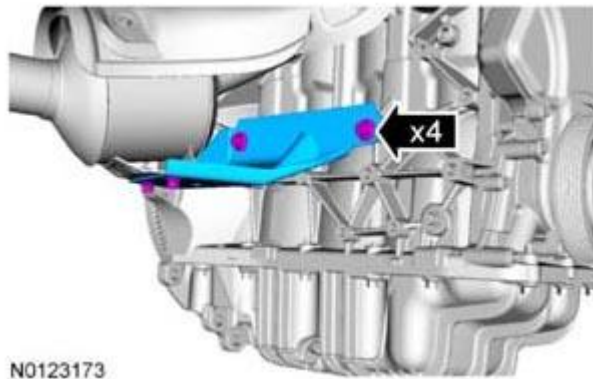


Fig. 373: Locating Bolts And Lower Catalytic Converter Bracket
Courtesy of FORD MOTOR CO.

45. Remove the 4 bolts and the catalytic converter heat shield.

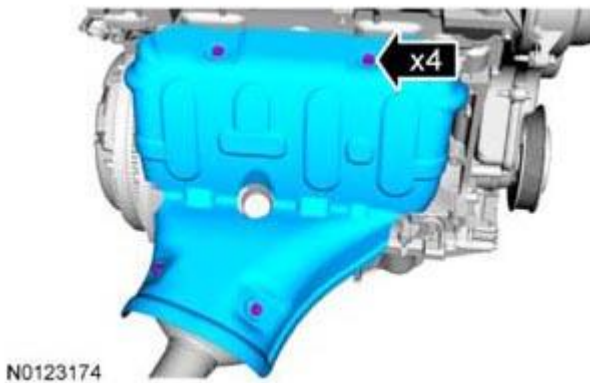


Fig. 374: Locating Bolts And Catalytic Converter Heat Shield
Courtesy of FORD MOTOR CO.

46. Remove the 4 catalytic converter nuts and bolt.
- Discard the bolt and 4 nuts.

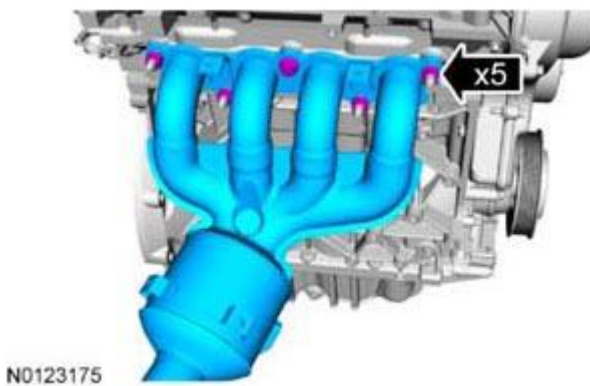


Fig. 375: Locating Catalytic Converter Nuts And Bolt

Courtesy of FORD MOTOR CO.

47. Position the catalytic converter back and secure with mechanic wire.
 - Discard the catalytic converter gasket.
48. Clean and inspect the catalytic converter flange. For additional information, refer to exhaust manifold cleaning and inspection in **ENGINE SYSTEM - GENERAL INFORMATION**.
49. If equipped, disconnect the block heater electrical connector.
50. Drain the engine oil.
 - Install the drain plug and tighten to 28 Nm (21 lb-ft).

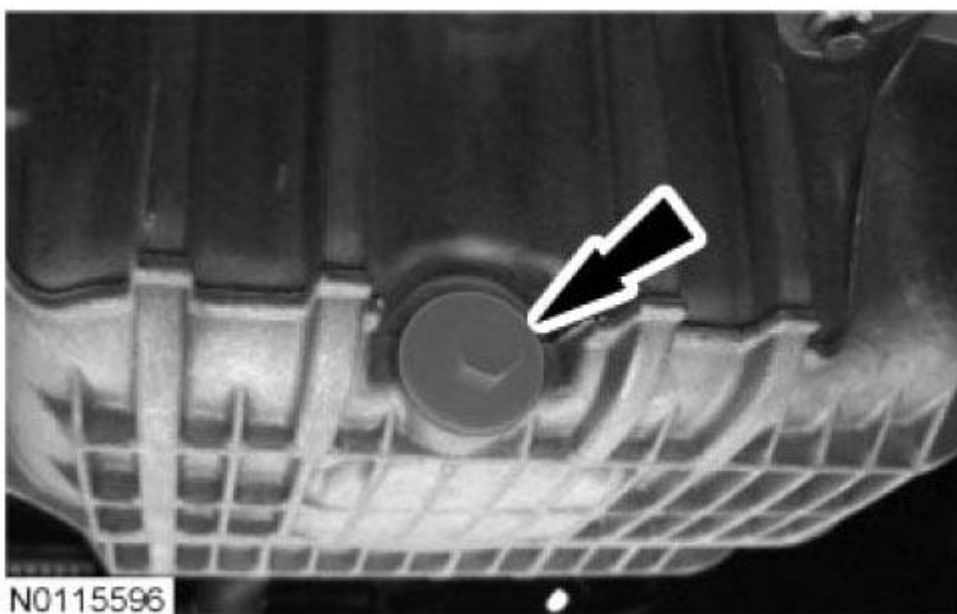


Fig. 376: Locating Drain Plug
Courtesy of FORD MOTOR CO.

51. Remove and discard the engine oil filter.

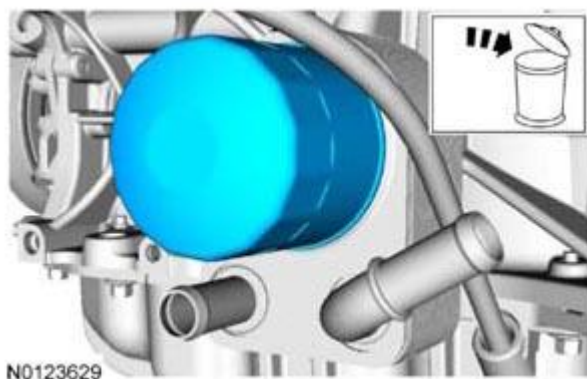


Fig. 377: Removing Engine Oil Filter
Courtesy of FORD MOTOR CO.

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

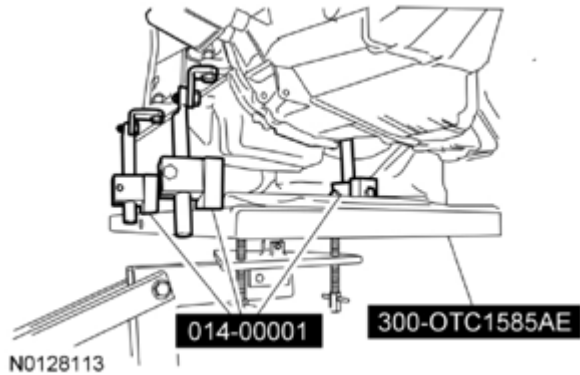


Fig. 378: Securing Engine To Lift Table
Courtesy of FORD MOTOR CO.

53. Remove the bolt for the transaxle roll restrictor.

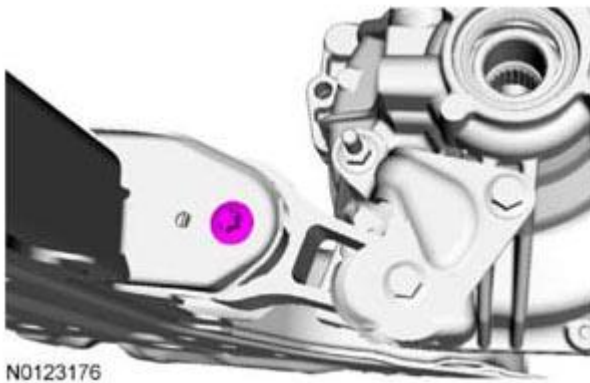


Fig. 379: Identifying Transaxle Roll Restrictor Bolt
Courtesy of FORD MOTOR CO.

- NOTE:** The engine mount studs must be held while removing the engine mount nuts or damage to the powertrain may occur.
- NOTE:** Do not loosen the engine mount center bolt or the engine may become improperly positioned.

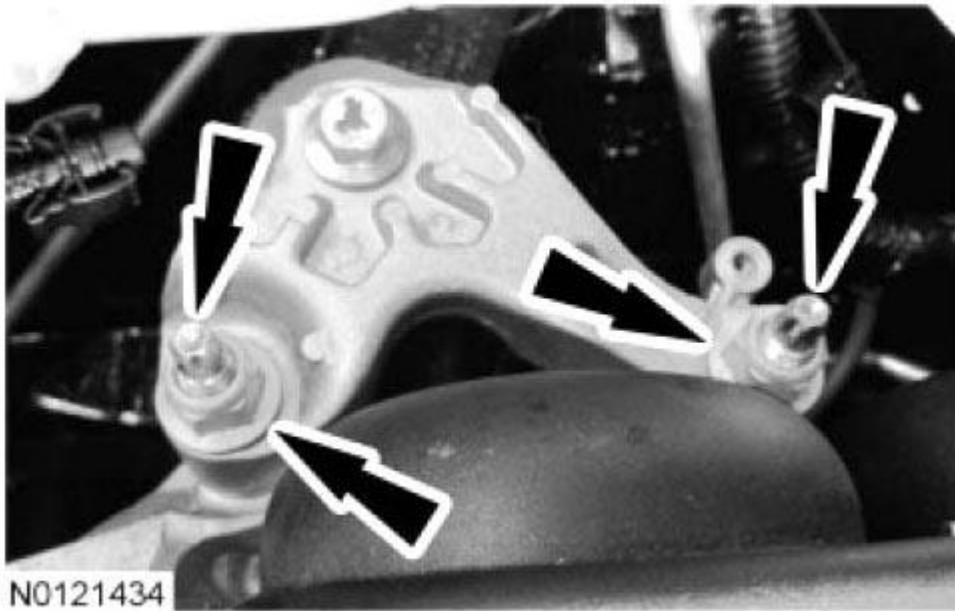


Fig. 380: Locating Engine Mount Nuts
Courtesy of FORD MOTOR CO.

54. Use the holding feature to prevent the engine mount studs from turning, remove the 2 engine mount nuts.
55. Remove the 3 bolts and the engine mount.

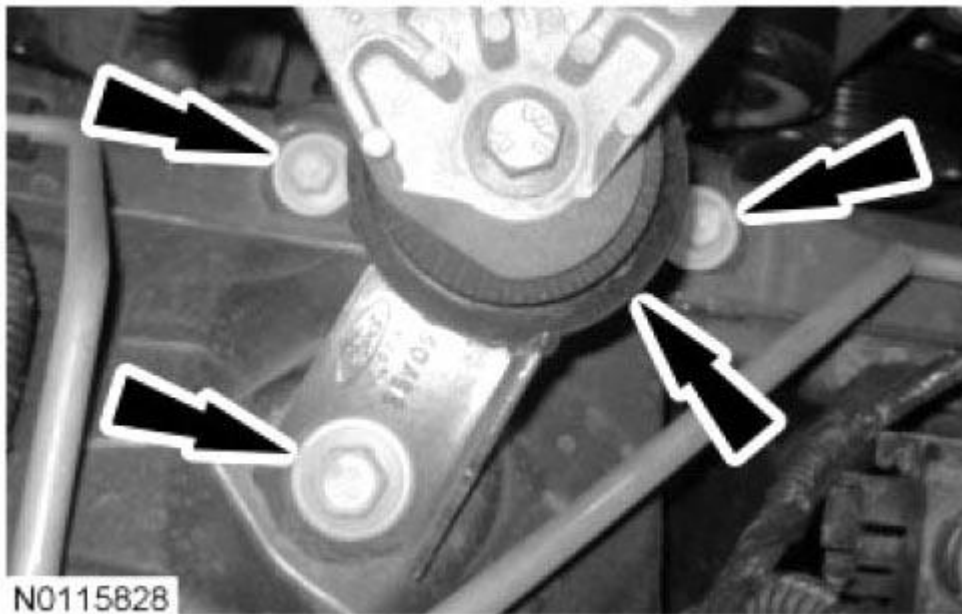


Fig. 381: Locating Bolts And Engine Mount
Courtesy of FORD MOTOR CO.

56. Remove the 2 bolt, 2 nuts and the transaxle support insulator.

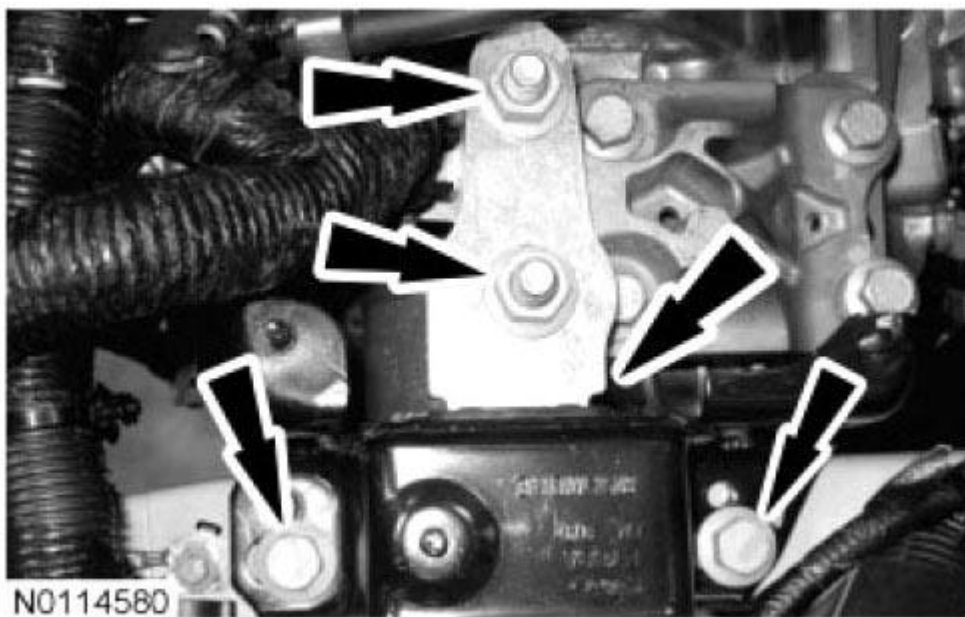


Fig. 382: Locating Transaxle Support Insulator Bolt And Nuts
Courtesy of FORD MOTOR CO.

57. Lower the engine and transaxle assembly from the vehicle.
58. Remove the 4 catalytic converter studs and discard.

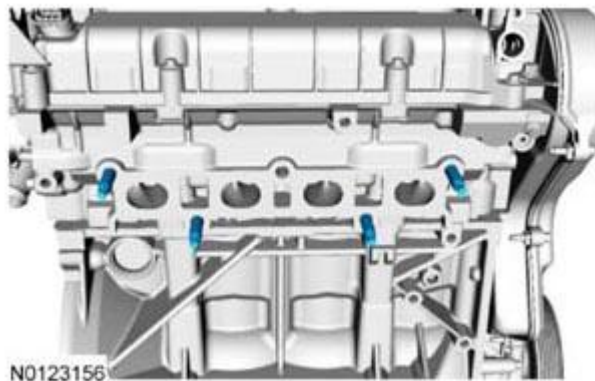


Fig. 383: Identifying Catalytic Converter Studs
Courtesy of FORD MOTOR CO.

59. Detach the 2 wiring harness retainers from the coolant outlet bracket.

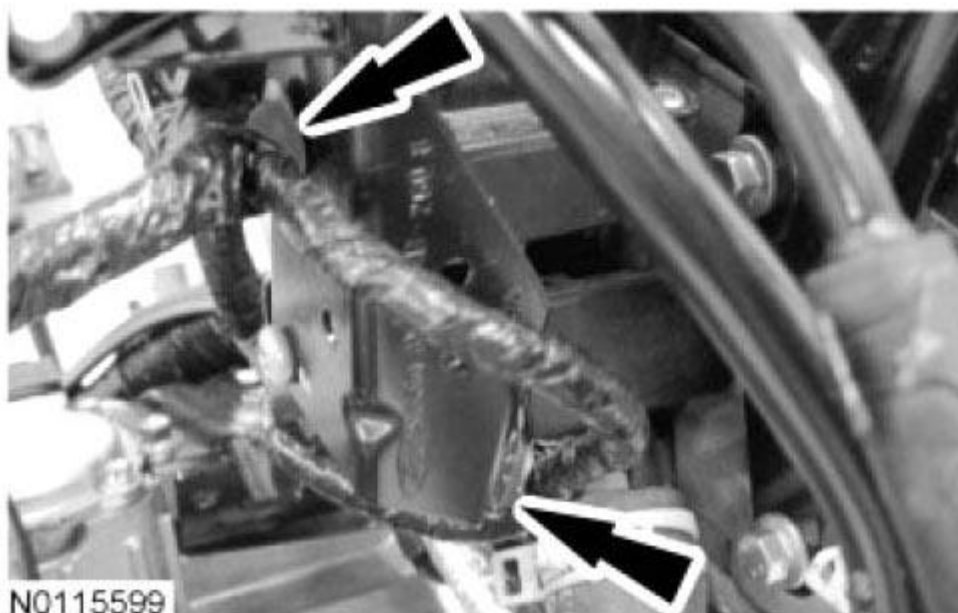


Fig. 384: Locating Wiring Harness Retainers From Coolant Outlet Bracket
Courtesy of FORD MOTOR CO.

60. Disconnect the ignition coil and Engine Coolant Temperature (ECT) sensor electrical connectors.

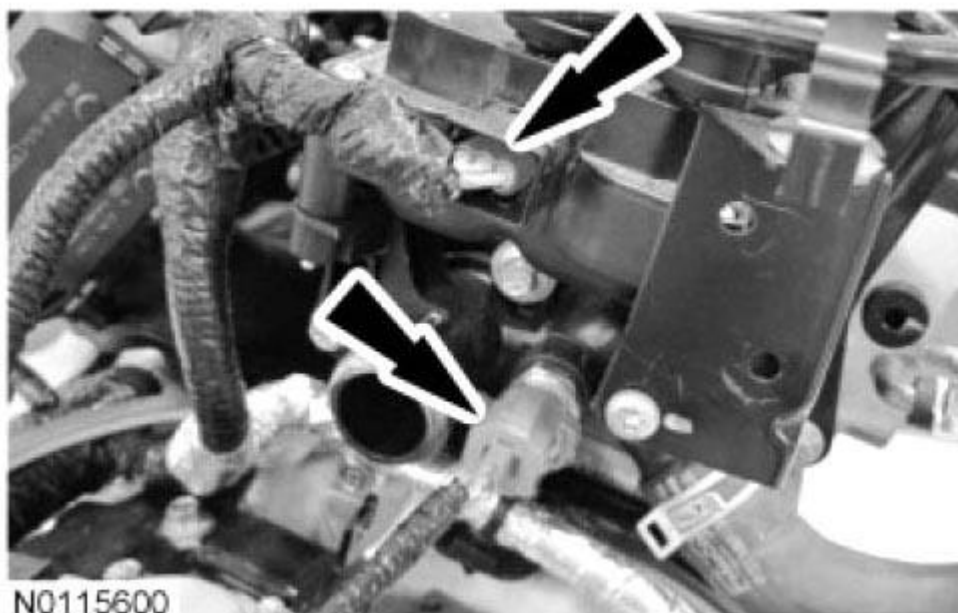


Fig. 385: Locating Ignition Coil And Engine Coolant Temperature (ECT) Sensor Electrical Connectors
Courtesy of FORD MOTOR CO.

61. Detach the HO2S sensor electrical connector pin-type retainer from the bracket.

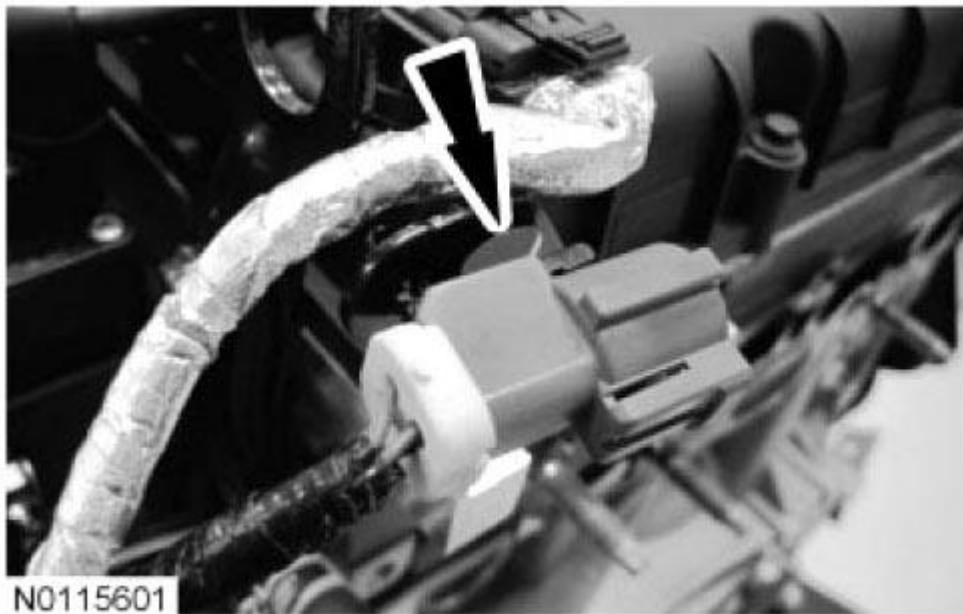


Fig. 386: Locating HO2S Sensor Electrical Connector Pin-Type Retainer From Bracket
Courtesy of FORD MOTOR CO.

62. Disconnect the 2 Camshaft Position (CMP) sensor electrical connectors.

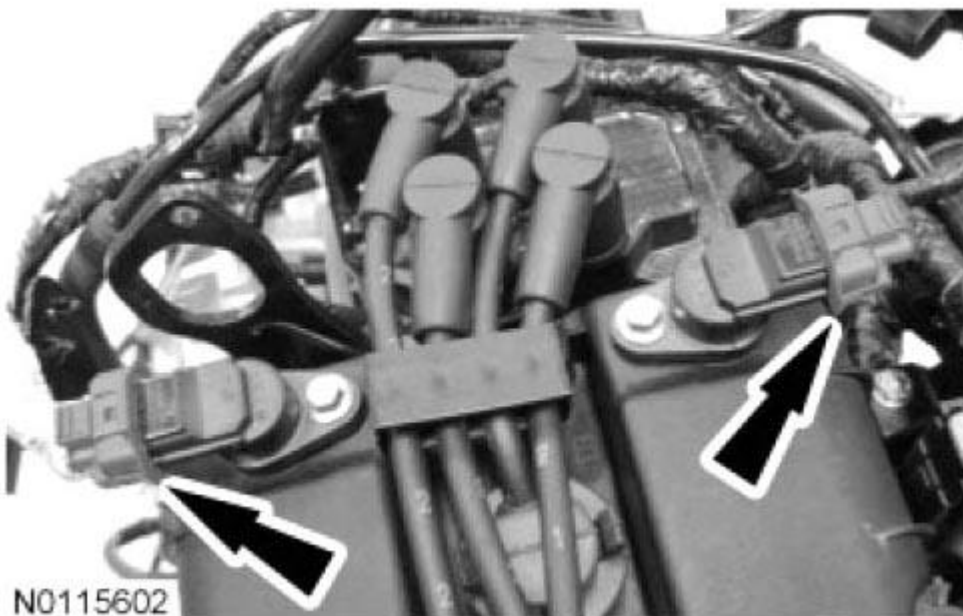


Fig. 387: Locating Camshaft Position (CMP) Sensor Electrical Connectors
Courtesy of FORD MOTOR CO.

63. Detach and disconnect the LH Knock Sensor (KS) electrical connector.



Fig. 388: Locating LH Knock Sensor (KS) Electrical Connector
Courtesy of FORD MOTOR CO.

64. Disconnect the Variable Camshaft Timing (VCT) oil control solenoid electrical connectors.
- Detach the 2 wiring harness retainers.

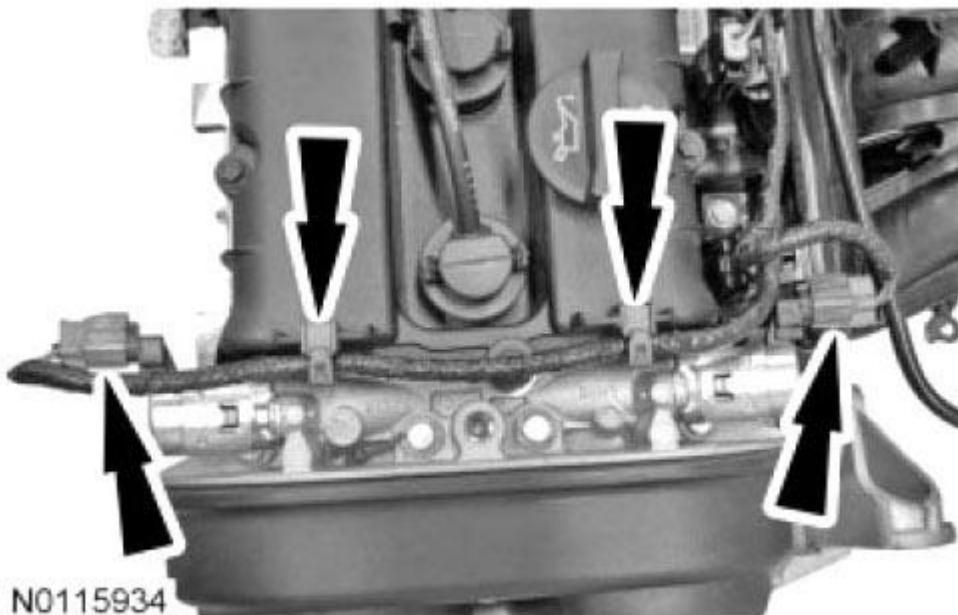


Fig. 389: Locating Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

65. Disconnect the 4 fuel injector electrical connectors.
- Detach the wiring harness retainers from the valve cover stud bolts.



Fig. 390: Locating Fuel Injector Electrical Connectors
Courtesy of FORD MOTOR CO.

66. Disconnect the EVAP canister purge valve electrical connector.

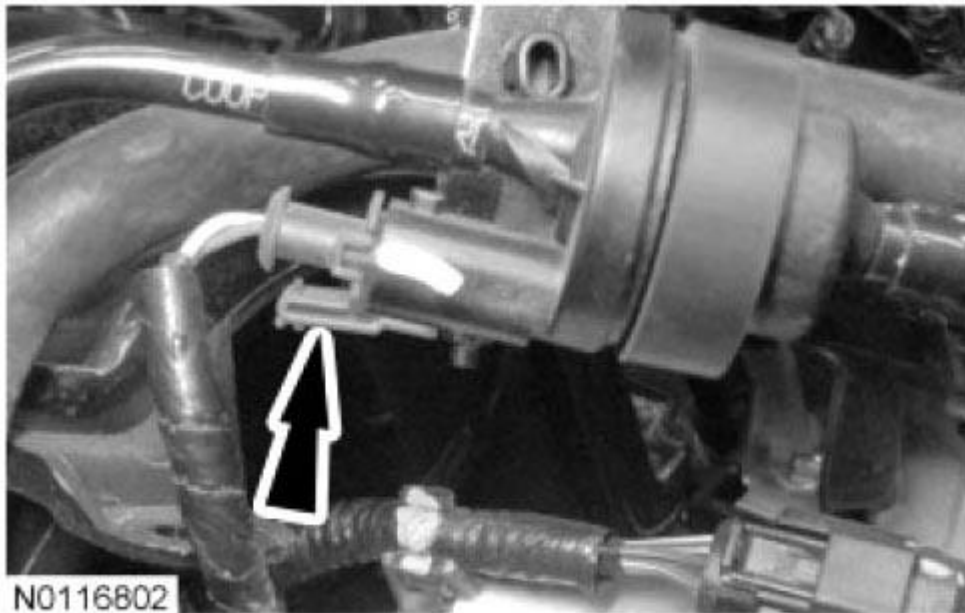


Fig. 391: Locating EVAP Canister Purge Valve Electrical Connector
Courtesy of FORD MOTOR CO.

67. Disconnect the Throttle Body (TB) electrical connector.
- Detach the 2 wiring harness retainers from the TB.

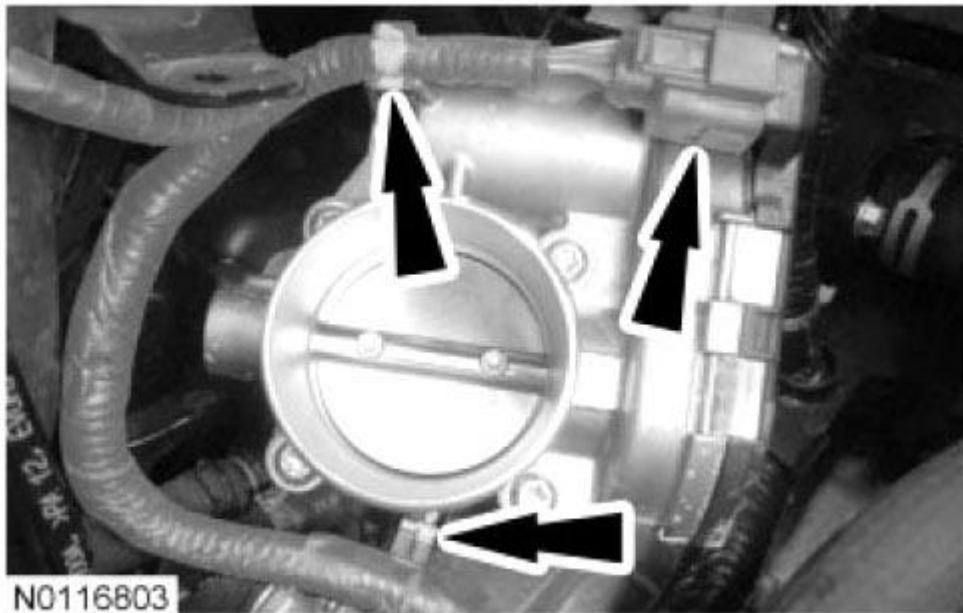


Fig. 392: Locating Throttle Body (TB) Electrical Connector
Courtesy of FORD MOTOR CO.

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

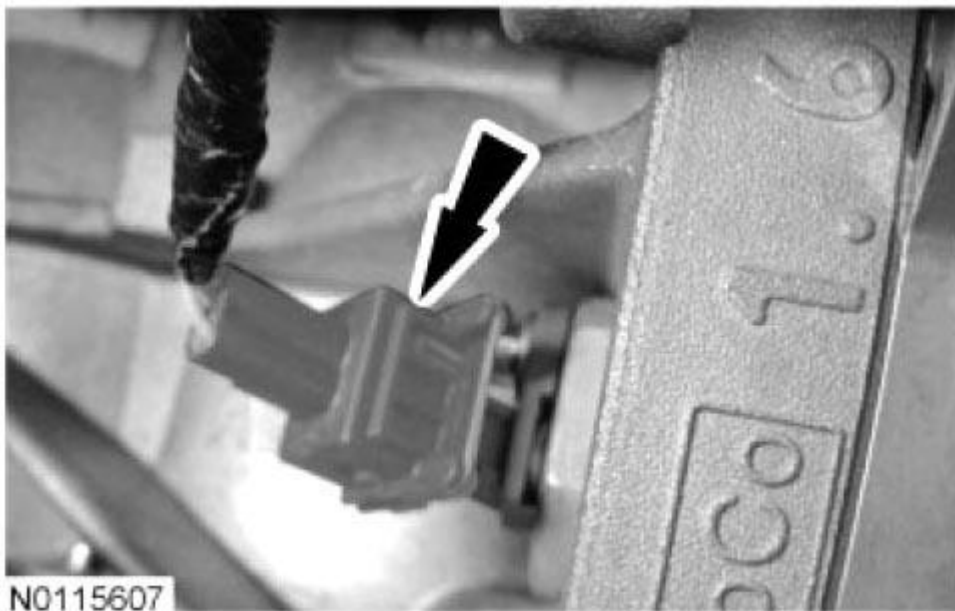


Fig. 393: Locating Crankshaft Position (CKP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

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

- Detach the wiring harness retainer from the engine block.

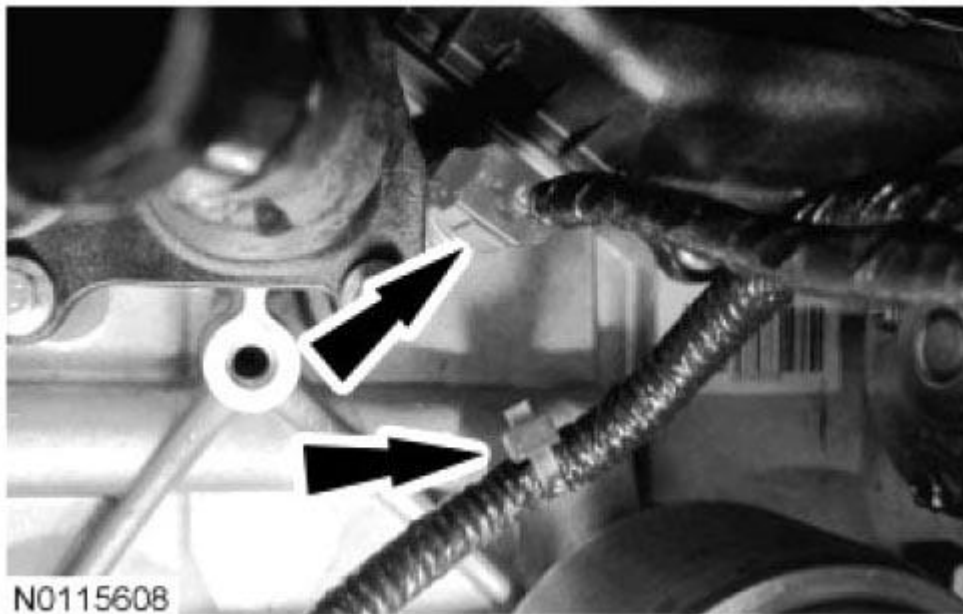


Fig. 394: Locating Engine Oil Pressure (EOP) Switch Electrical Connector
Courtesy of FORD MOTOR CO.

70. Disconnect the RH KS electrical connector.
- Detach the 2 wiring harness retainers from the intake manifold.

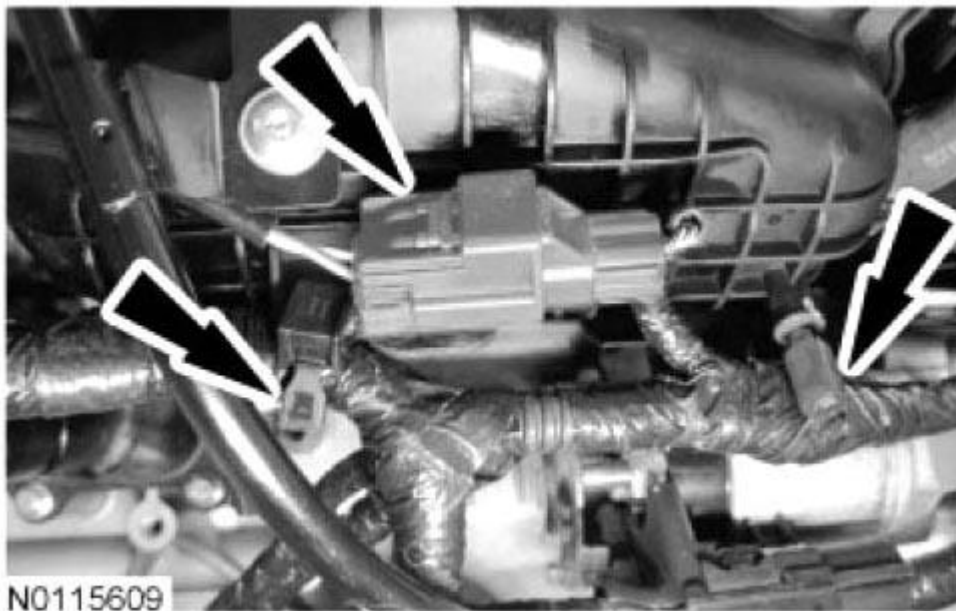


Fig. 395: Locating Wiring Harness Retainers From Intake Manifold
Courtesy of FORD MOTOR CO.

71. Remove the 2 nuts and disconnect the starter motor electrical terminals.

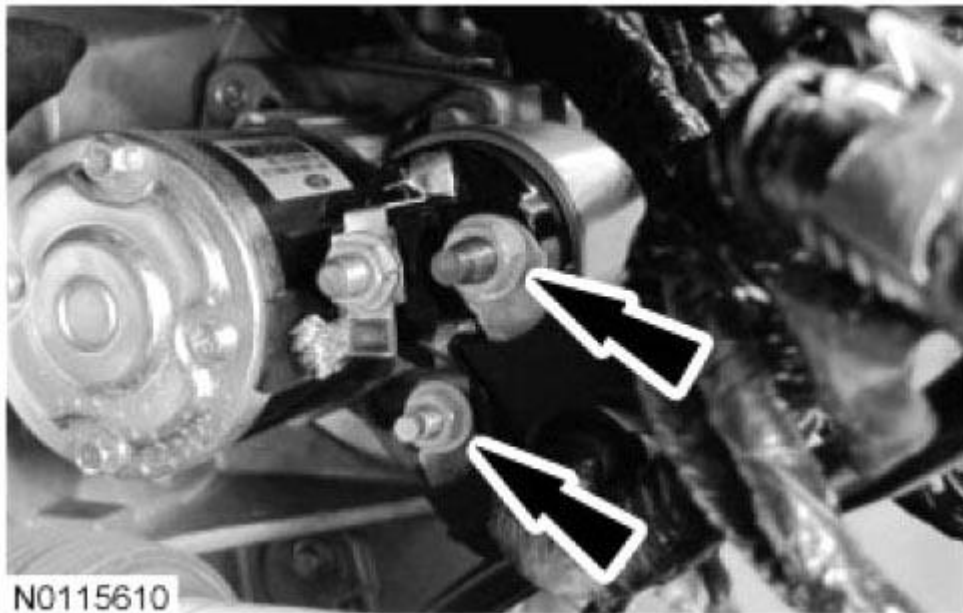


Fig. 396: Locating Nuts And Starter Motor Electrical Terminals
Courtesy of FORD MOTOR CO.

72. Remove the 3 bolts (2 shown in illustration) and the starter motor.

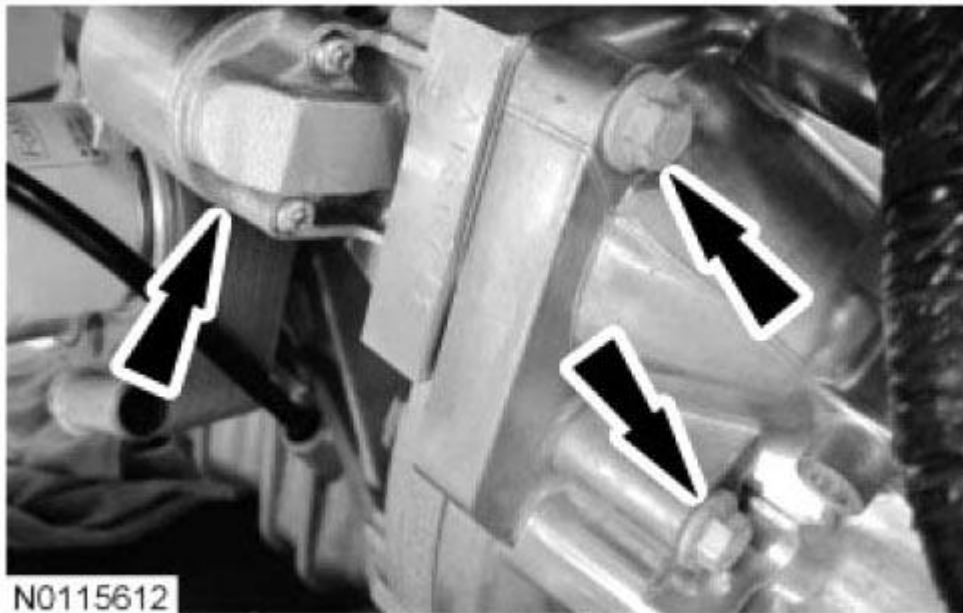


Fig. 397: Locating Bolts And Starter Motor
Courtesy of FORD MOTOR CO.

73. Detach the wiring harness pin-type retainer and remove the 2 upper bellhousing-to-engine bolts and bracket.



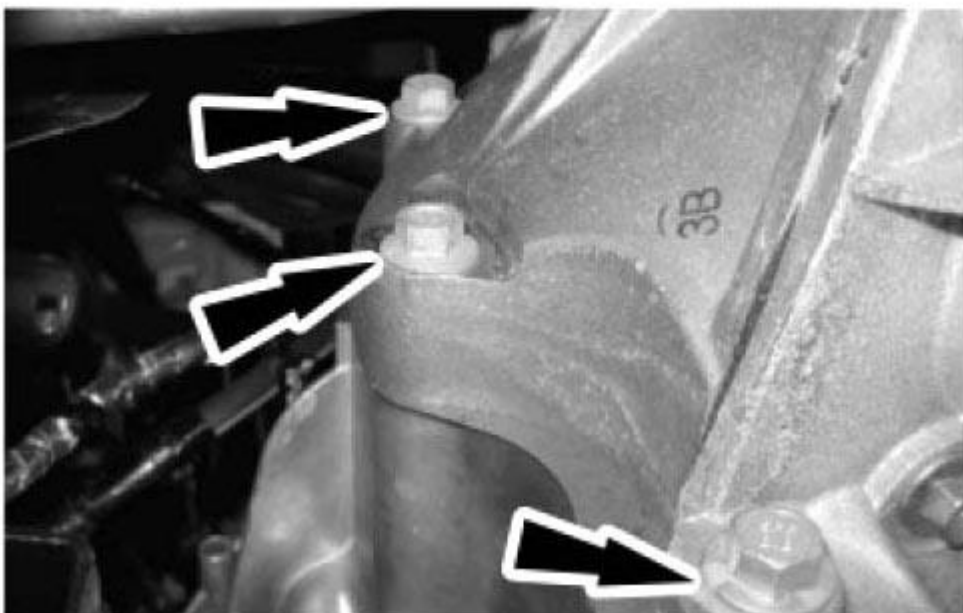
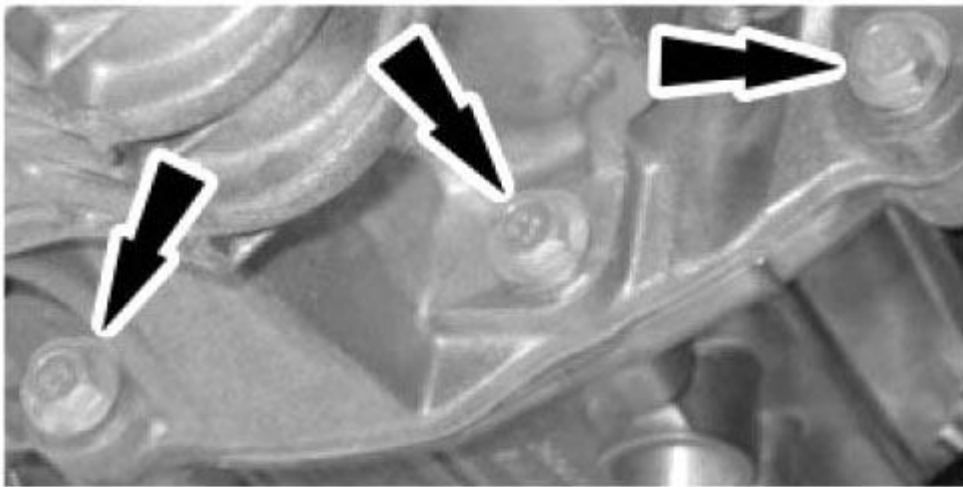
Fig. 398: Locating Upper Bellhousing-To-Engine Bolts
Courtesy of FORD MOTOR CO.

NOTE: Lower the engine to within a few inches of the floor.



Fig. 399: Lifting Engine And Transaxle Assembly Using Floor Crane And Spreader Bar
Courtesy of FORD MOTOR CO.

74. Using the Floor Crane and Spreader Bar, remove the engine and transaxle assembly from the lift table.
75. Remove the 6 clutch housing-to-engine bolts and separate the engine and transaxle.



N0113199

Fig. 400: Locating Clutch Housing-To-Engine Bolts
 Courtesy of FORD MOTOR CO.

DISASSEMBLY

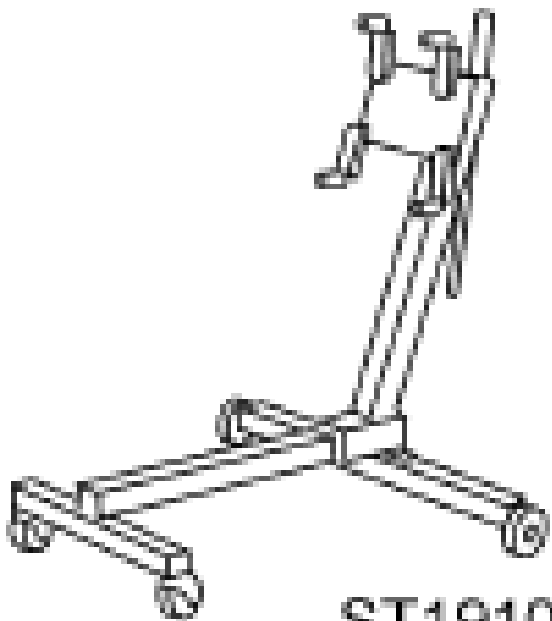
ENGINE

SPECIAL TOOLS

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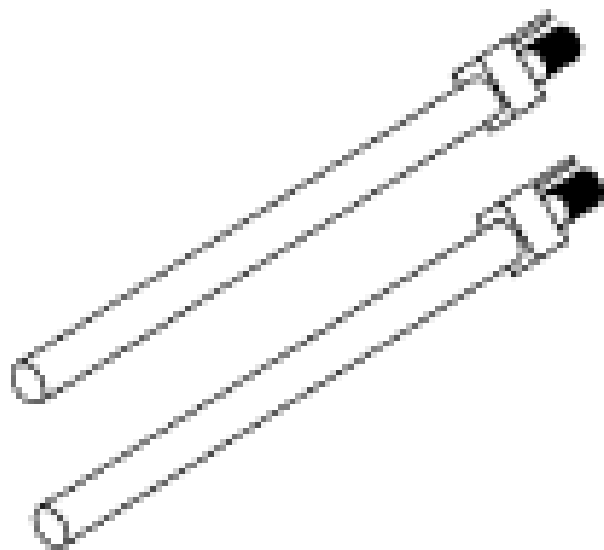
2013 Ford Fiesta S

2013 ENGINE Engine Mechanical - 1.6L - Fiesta



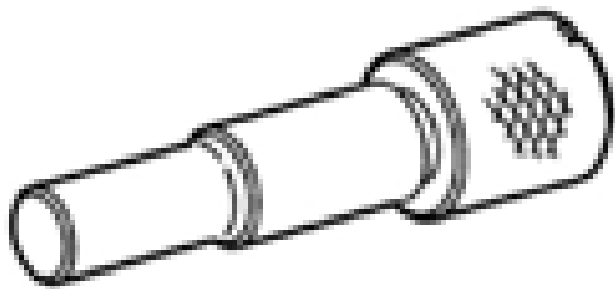
ST1910-A

Engine Stand
014-00232 or equivalent



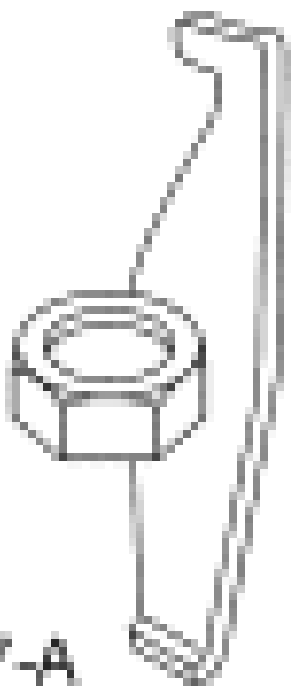
ST1982-A

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



Pin, Crankshaft Top Dead Center (TDC)
303-748

ST3262-A



Remover, Input Shaft Oil Seal
308-375

ST2417-A

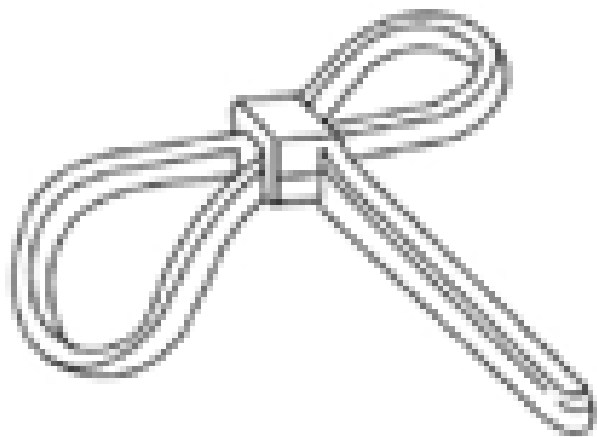
2013 Ford Fiesta S

2013 ENGINE Engine Mechanical - 1.6L - Fiesta



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

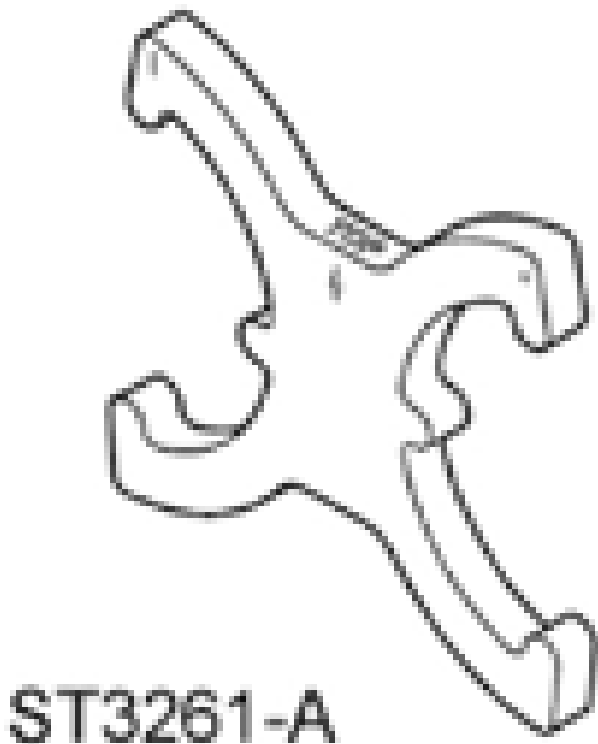
ST1185-A



Strap Wrench
303-D055 (D85L-6000-A) or equivalent

ST1438-A

Tool, Variable Camshaft Timing (VCT)



Alignment
303-1097

WARNING: Do not breathe dust or use compressed air to blow dust from storage containers or friction components. Remove dust using government-approved techniques. Friction component dust may be a cancer and lung disease hazard. Exposure to potentially hazardous components may occur if dusts are created during repair of friction components, such as brake pads and clutch discs. Exposure may also cause irritation to skin, eyes and respiratory tract, and may cause allergic reactions and/or may lead to other chronic health effects. If irritation persists, seek medical attention or advice. Failure to follow these instructions may result in serious personal injury.

NOTE: Do not loosen or remove the crankshaft pulley bolt without first installing the special tools. The crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. 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: For additional information, refer to the exploded view under the ASSEMBLY procedure.

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 clutch pressure plate retaining bolts evenly, by two turns at a time.

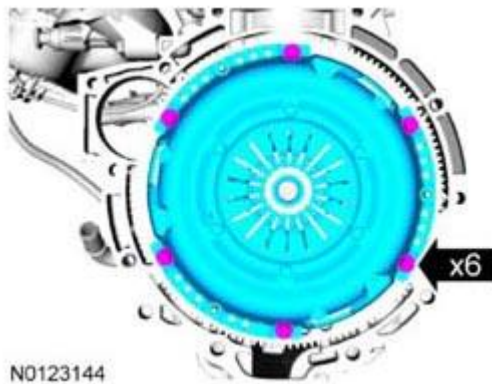


Fig. 401: Locating Clutch Pressure Plate Retaining Bolts
Courtesy of FORD MOTOR CO.

1. Remove and discard the 6 clutch pressure plate retaining bolts, remove the clutch disc and pressure plate.
2. Remove the bolts and the flywheel.
 - Discard the bolts.



Fig. 402: Locating Bolts And Flywheel
Courtesy of FORD MOTOR CO.

Vehicles with automatic transaxle

3. Remove the bolts and the flexplate.
 - Discard the bolts.



Fig. 403: Locating Bolts And Flexplate
Courtesy of FORD MOTOR CO.

All vehicles

4. Mount the engine on a Engine Stand.

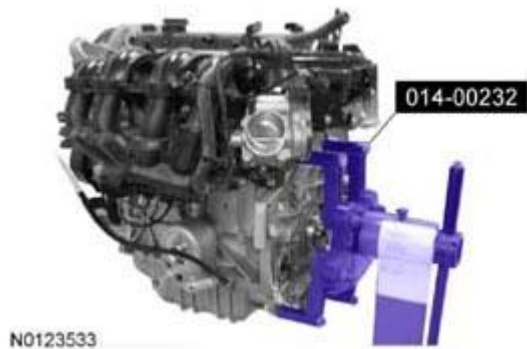


Fig. 404: Mounting Engine On Engine Stand
Courtesy of FORD MOTOR CO.

5. Disconnect the Evaporative Emission (EVAP) canister purge valve tube from the intake manifold.

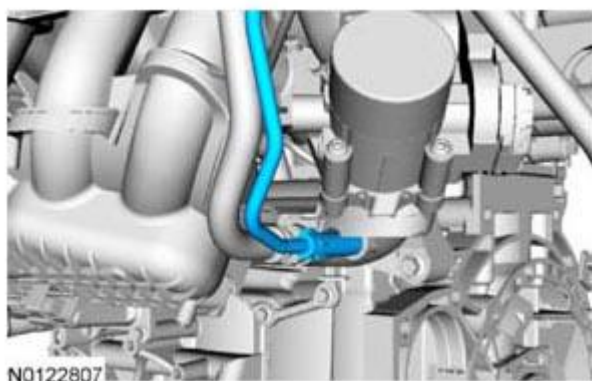


Fig. 405: Identifying Evaporative Emission (EVAP) Canister Purge Valve Tube And Intake Manifold

Courtesy of FORD MOTOR CO.

6. Disconnect the brake booster vacuum tube from the intake manifold.

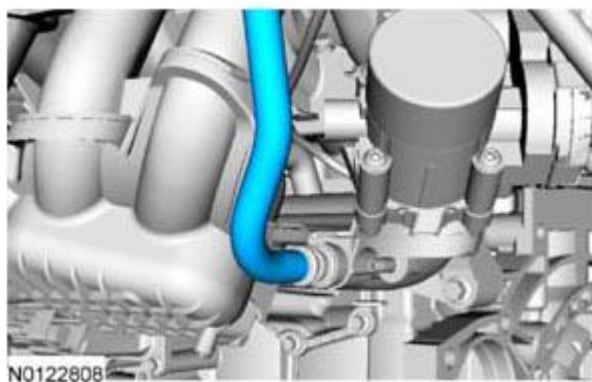


Fig. 406: Identifying Brake Booster Vacuum Tube And Intake Manifold

Courtesy of FORD MOTOR CO.

7. Detach the EVAP tube and coolant tube from the coolant outlet bracket retainer.

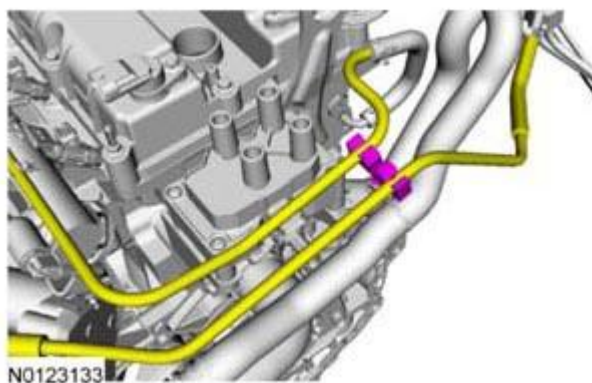


Fig. 407: Identifying EVAP Tube And Coolant Tube From Coolant Outlet Bracket Retainer

Courtesy of FORD MOTOR CO.

8. Remove the bolt for the EVAP canister purge valve and remove the brake booster vacuum tube and EVAP canister purge valve as an assembly.

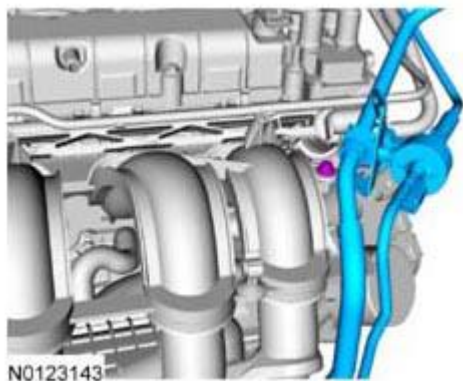


Fig. 408: Identifying EVAP Canister Purge Valve Bolt
Courtesy of FORD MOTOR CO.

9. Remove the 4 spark plug wires.

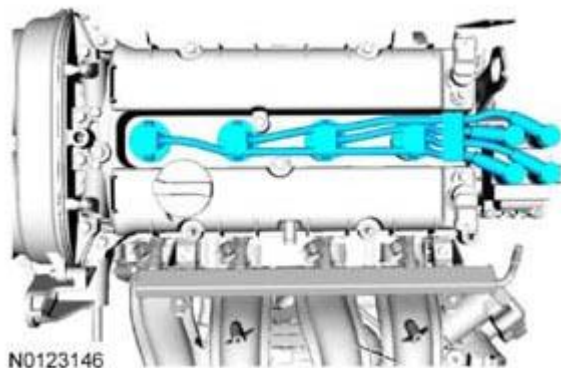


Fig. 409: Identifying Spark Plug Wires
Courtesy of FORD MOTOR CO.

10. Disconnect the coolant hose from the coolant outlet.

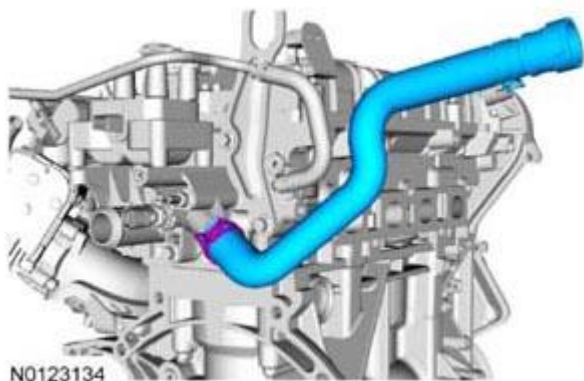


Fig. 410: Identifying Coolant Hose And Coolant Outlet
Courtesy of FORD MOTOR CO.

11. Disconnect the coolant return hose from the cylinder head.
 - Detach the coolant tube from the fuel rail retainers.

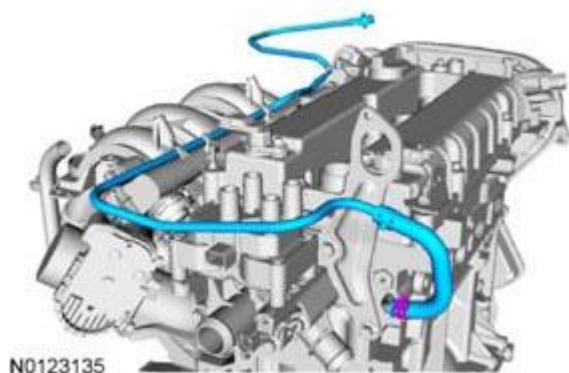


Fig. 411: Identifying Coolant Tube And Fuel Rail Retainers
Courtesy of FORD MOTOR CO.

12. Remove the nut, bolt and the bracket from the coolant outlet.

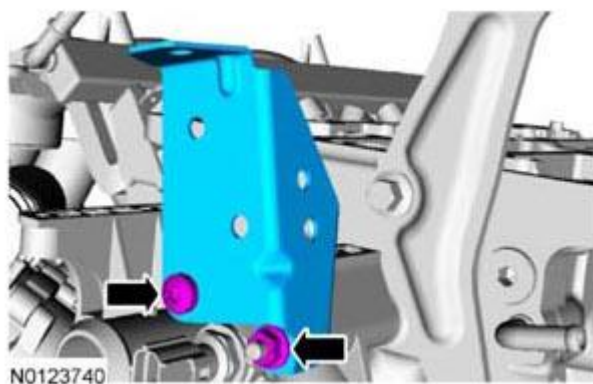


Fig. 412: Locating Coolant Outlet Bracket Nut And Bolt
Courtesy of FORD MOTOR CO.

13. Remove the 4 bolts and the coolant outlet and ignition coil assembly.
 - Inspect and replace the gasket, if necessary.

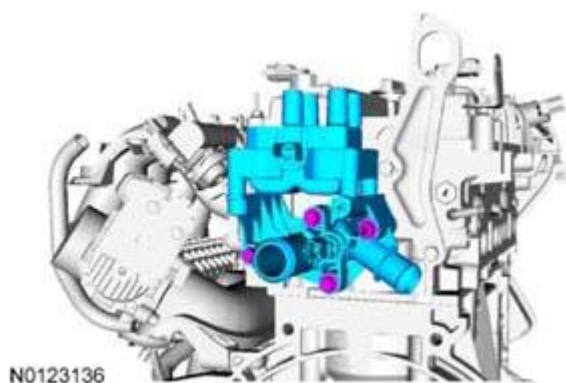


Fig. 413: Identifying Coolant Outlet And Ignition Coil Assembly Bolts
Courtesy of FORD MOTOR CO.

14. Remove the 2 bolts and the engine lift eye.

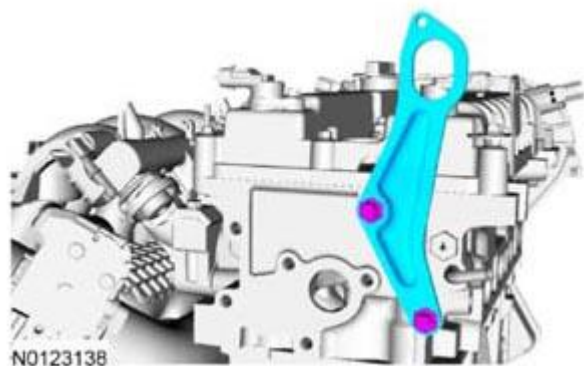


Fig. 414: Identifying Bolts And Engine Lift Eye
Courtesy of FORD MOTOR CO.

15. Remove the screw and the oil level indicator and tube.
- Inspect and replace the O-ring seal, if necessary.

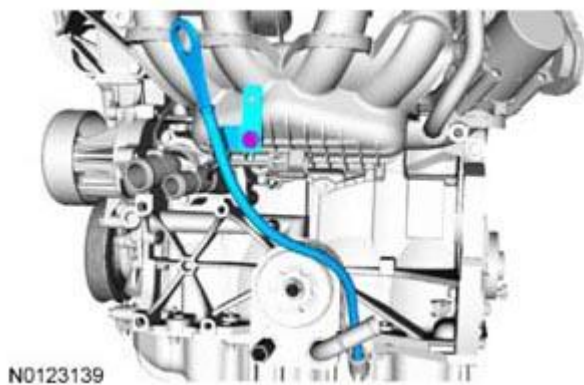


Fig. 415: Identifying Oil Level Indicator Tube And Screw
Courtesy of FORD MOTOR CO.

16. If equipped, remove the engine block heater.

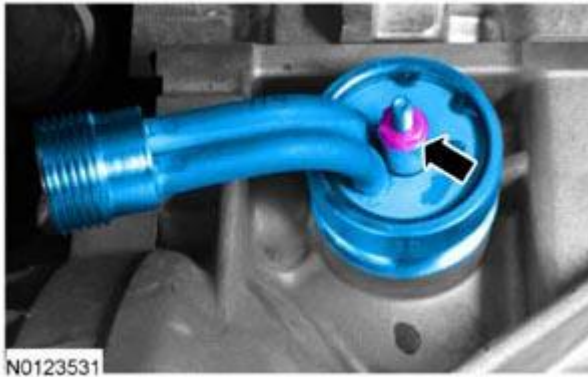


Fig. 416: Locating Engine Block Heater
Courtesy of FORD MOTOR CO.

17. Remove the 2 bolts and the fuel rail assembly.

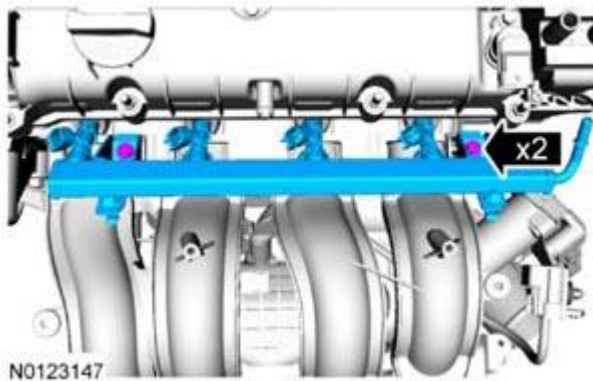


Fig. 417: Identifying Fuel Rail Assembly And Bolts
Courtesy of FORD MOTOR CO.

18. Remove the 4 fuel injector clips and the 4 fuel injectors.

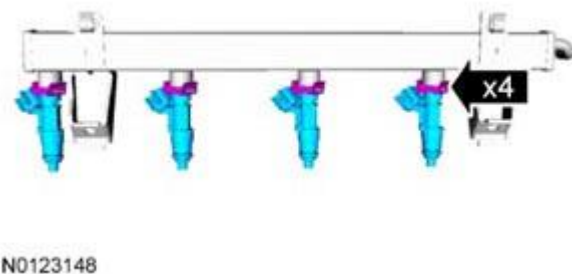


Fig. 418: Identifying Fuel Injector Clips And Fuel Injectors
Courtesy of FORD MOTOR CO.

19. Remove and discard the 8 fuel injector O-ring seals.



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Fig. 419: Identifying Fuel Injector O-Ring Seals
 Courtesy of FORD MOTOR CO.

20. Detach the Knock Sensor (KS) from the bottom of the intake manifold.

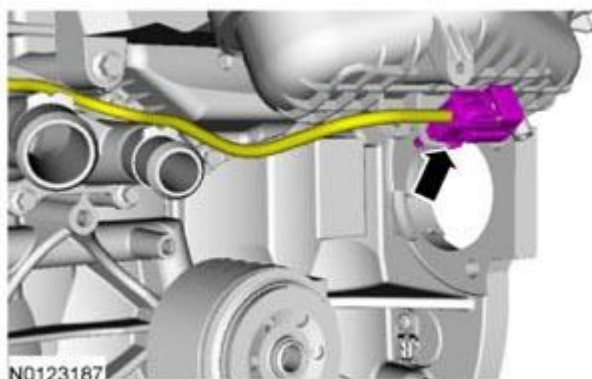


Fig. 420: Locating Knock Sensor Electrical Connector
 Courtesy of FORD MOTOR CO.

21. Remove the 7 bolts and the intake manifold.
 - Disconnect the PCV hose from the intake manifold.

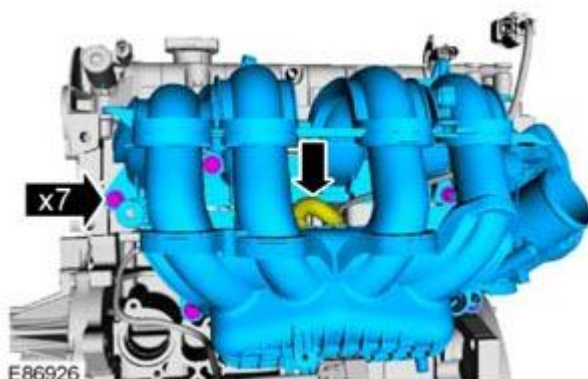


Fig. 421: Locating Bolts And Intake Manifold
 Courtesy of FORD MOTOR CO.

NOTE: A new oil cooler must be installed or severe damage to the engine can occur.

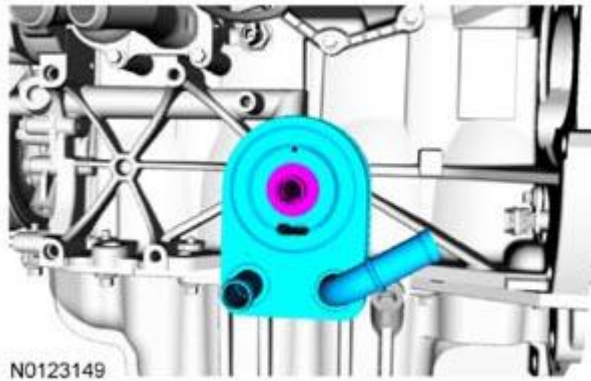


Fig. 422: Identifying Bolt And Oil Cooler
Courtesy of FORD MOTOR CO.

22. Remove the bolt and the oil cooler.
 - Discard the oil cooler.
23. Remove the 4 bolts and the thermostat housing
 - Inspect and replace the gasket, if necessary.

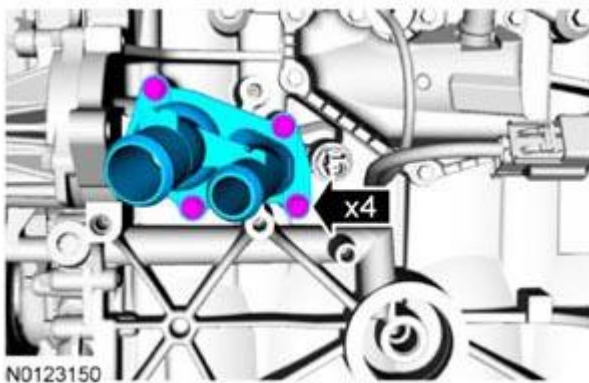


Fig. 423: Locating Bolts And Thermostat Housing
Courtesy of FORD MOTOR CO.

24. Remove the thermostat from the engine block.
 - Inspect the thermostat seal and replace, if necessary.

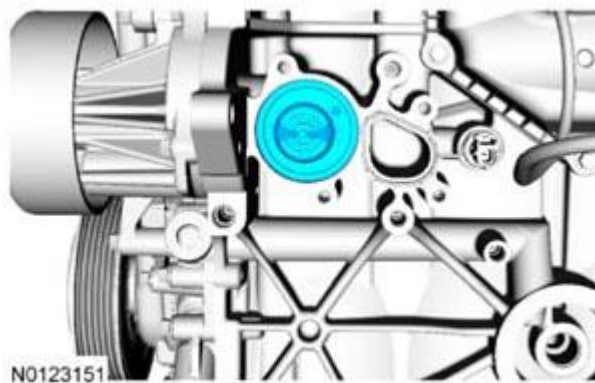


Fig. 424: Identifying Thermostat And Engine Block
Courtesy of FORD MOTOR CO.

NOTE: Mark the location of the 2 KS for installation.

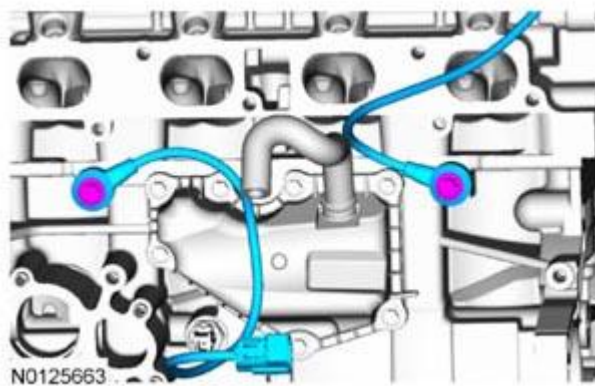


Fig. 425: Identifying KS Bolts
Courtesy of FORD MOTOR CO.

25. Remove the 2 bolts and the 2 KS.
26. Remove the bolts and the crankcase vent oil separator.
 - Inspect and replace the gasket, if necessary.

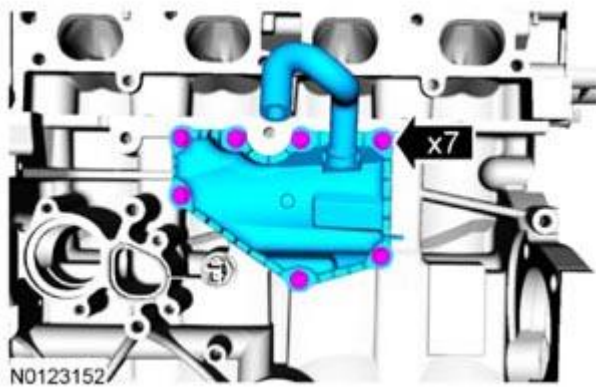


Fig. 426: Locating Bolts And Crankcase Vent Oil Separator
Courtesy of FORD MOTOR CO.

27. Remove the Engine Oil Pressure (EOP) switch.

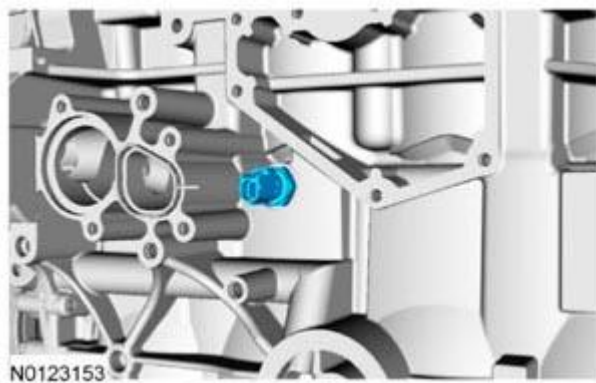


Fig. 427: Identifying Engine Oil Pressure (EOP) Switch
Courtesy of FORD MOTOR CO.

28. Remove the bolt and the Crankshaft Position (CKP) sensor.



Fig. 428: Identifying Crankshaft Position (CKP) Sensor And Bolt
Courtesy of FORD MOTOR CO.

29. Remove the 2 bolts and the Variable Camshaft Timing (VCT) oil control solenoids.

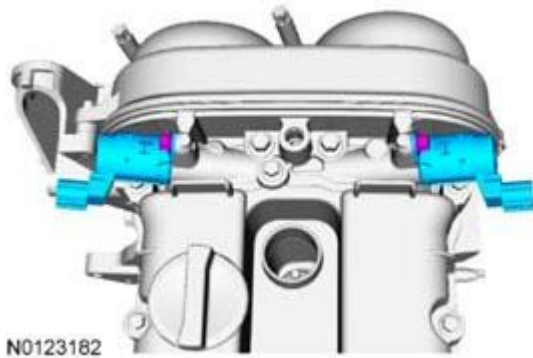


Fig. 429: Identifying Variable Camshaft Timing (VCT) Oil Control Solenoids And Bolts
Courtesy of FORD MOTOR CO.

30. Remove the nut and the Heated Oxygen Sensor (HO2S) electrical connector bracket.

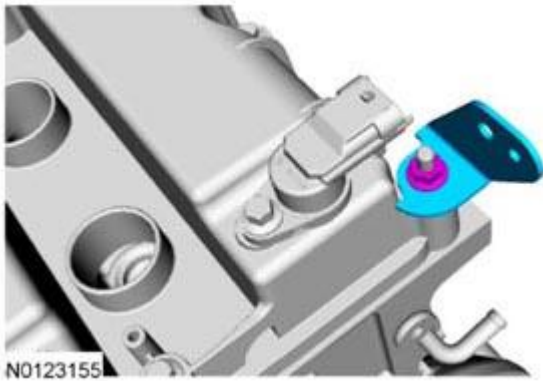


Fig. 430: Identifying Heated Oxygen Sensor (HO2S) Electrical Connector Bracket And Nut
Courtesy of FORD MOTOR CO.

31. Loosen the 12 retainers and remove the valve cover.
- Discard the gasket.

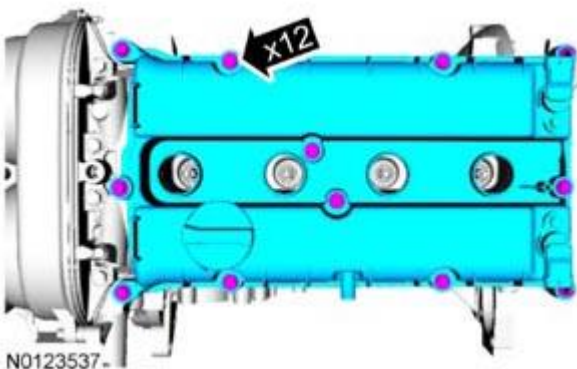


Fig. 431: Locating Retainers And Valve Cover
Courtesy of FORD MOTOR CO.

32. Remove the 1 engine mount stud.

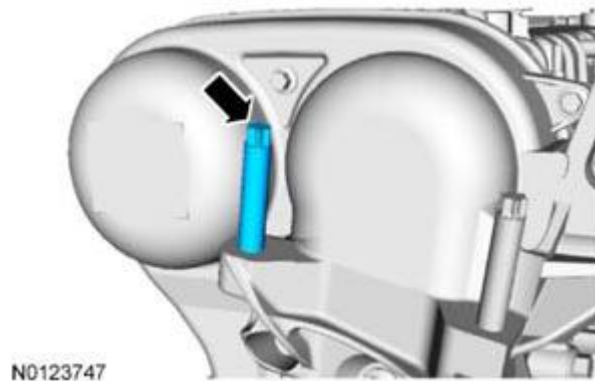


Fig. 432: Locating Engine Mount Stud
Courtesy of FORD MOTOR CO.

33. Remove the 4 bolts and coolant pump pulley.

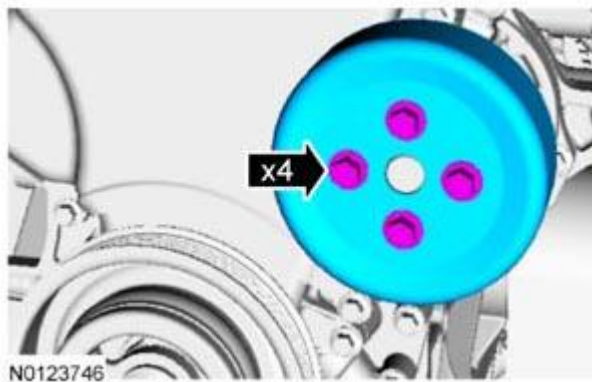


Fig. 433: Locating Bolts And Coolant Pump Pulley
Courtesy of FORD MOTOR CO.

34. Remove the 9 bolts and the timing belt cover.

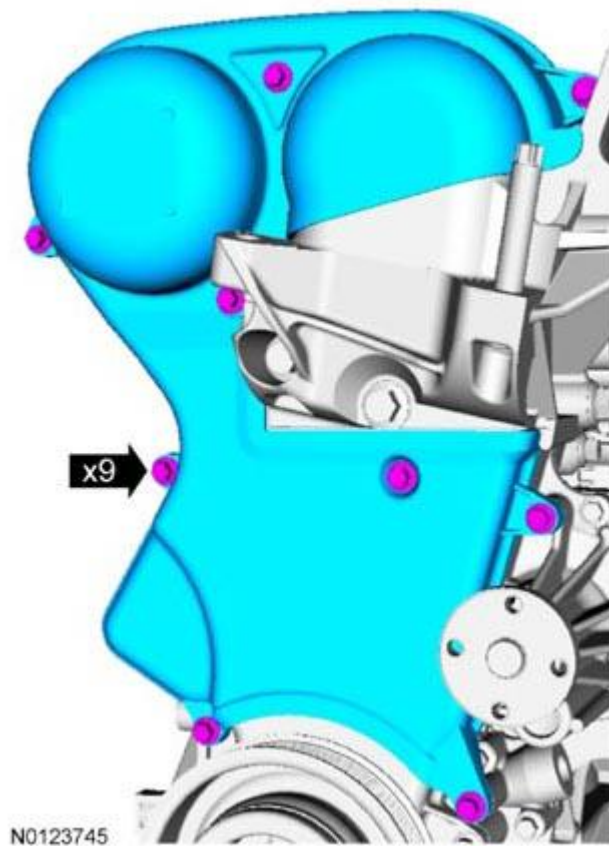


Fig. 434: Locating Bolts And Timing Belt Cover
Courtesy of FORD MOTOR CO.

35. Remove the 3 bolts and the engine mount bracket.

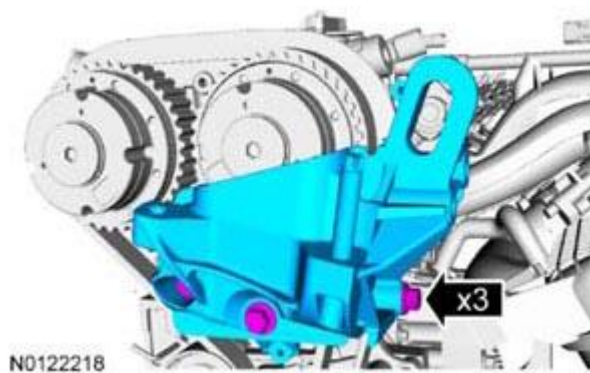


Fig. 435: Locating Bolts And Engine Mount Bracket
Courtesy of FORD MOTOR CO.

NOTE: Only rotate the crankshaft in a clockwise direction.

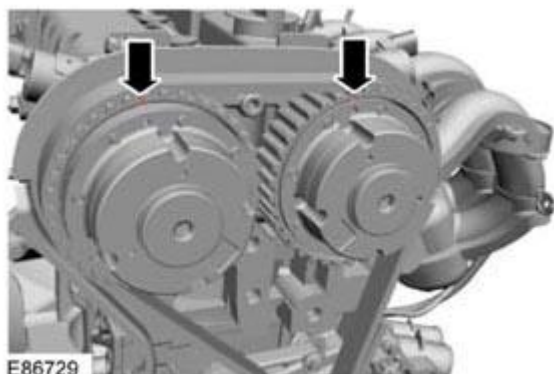


Fig. 436: Locating Markings On Camshaft Phaser And Sprockets
Courtesy of FORD MOTOR CO.

36. Using the crankshaft pulley bolt, turn the crankshaft clockwise until the markings on the camshaft phaser and sprockets are at the 11 o'clock position as shown in illustration.
37. Remove the engine plug bolt.

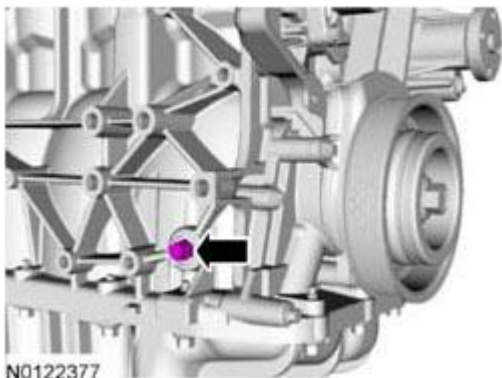


Fig. 437: Locating Engine Plug Bolt
Courtesy of FORD MOTOR CO.

NOTE: The Crankshaft Top Dead Center (TDC) Timing Pin 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.

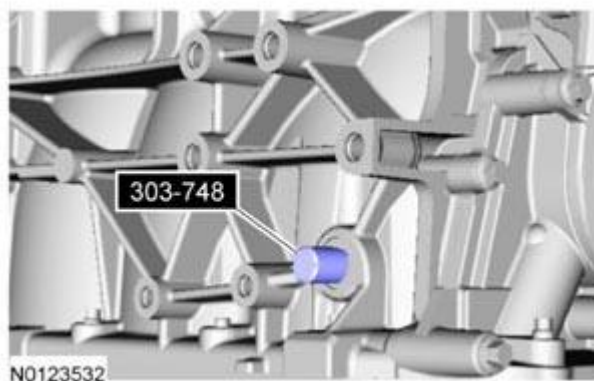


Fig. 438: Installing Crankshaft TDC Pin
Courtesy of FORD MOTOR CO.

38. Install the Crankshaft TDC Pin.

NOTE: Only rotate the crankshaft clockwise direction.



Fig. 439: Rotating Crankshaft Clockwise
Courtesy of FORD MOTOR CO.

39. Rotate the crankshaft until it contacts the Crankshaft TDC Pin.
40. Using the Strap Wrench, remove the crankshaft pulley bolt and the crankshaft pulley.
- Discard the crankshaft pulley bolt.

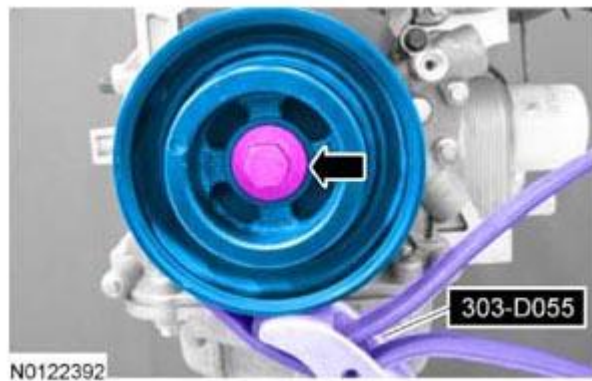


Fig. 440: Locating Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

41. Remove the 3 bolts and the lower timing belt cover.

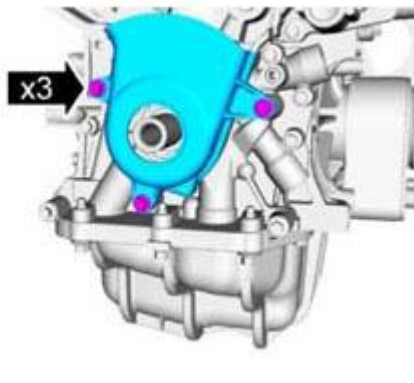


Fig. 441: Locating Bolts And Lower Timing Belt Cover
Courtesy of FORD MOTOR CO.

42. Install the VCT Alignment Tool.

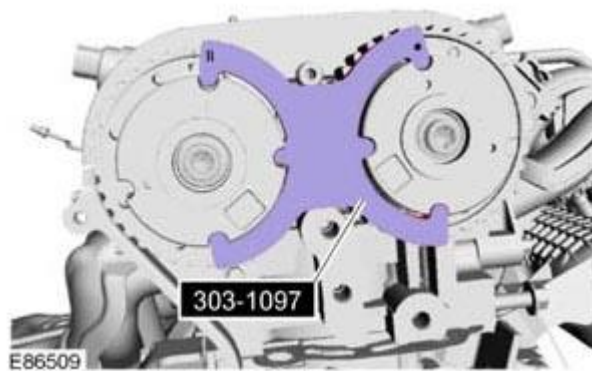


Fig. 442: Installing VCT Alignment Tool
Courtesy of FORD MOTOR CO.

WARNING: The timing belt tensioner spring is under load. Extra care must be taken at all times when handling the tensioner. Failure to follow this instruction may result in personal injury.

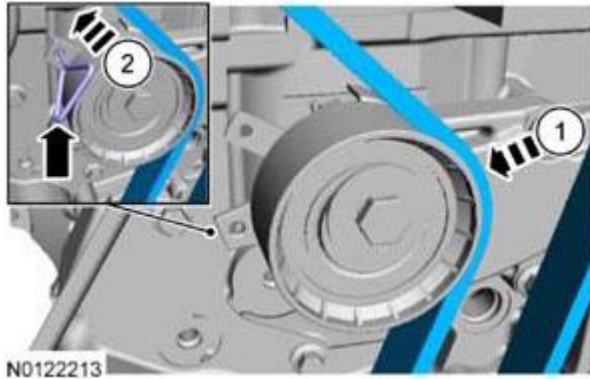


Fig. 443: Removing Timing Belt
Courtesy of FORD MOTOR CO.

43. Remove the timing belt.
 1. Rotate the timing belt tensioner clockwise.
 2. Align the 2 holes on the tensioner and install a small screwdriver or holding pin.
 - Remove the timing belt.
44. Remove the 4 bolts and the timing belt cover backplate.

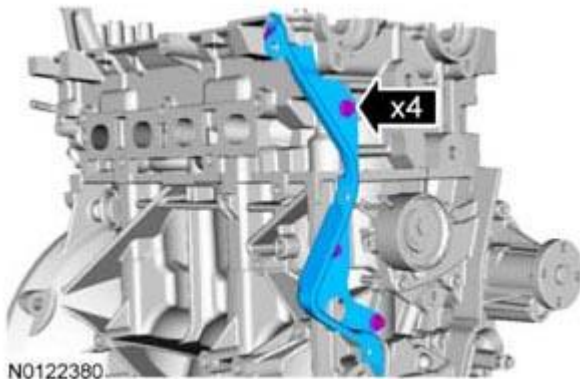
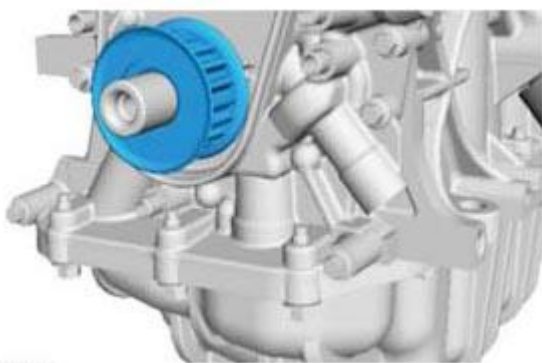


Fig. 444: Locating Bolts And Timing Belt Cover Backplate
Courtesy of FORD MOTOR CO.

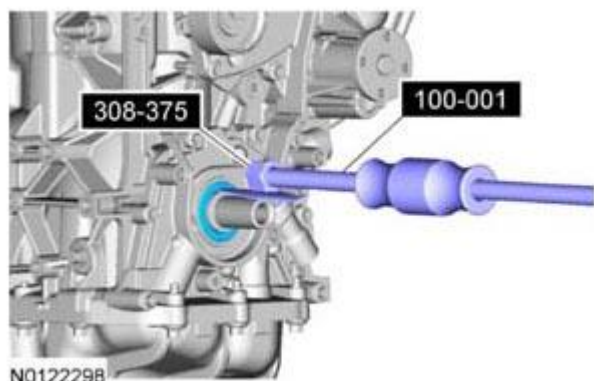
45. Remove the crankshaft sprocket gear.



N0122215

Fig. 445: Identifying Crankshaft Sprocket Gear
Courtesy of FORD MOTOR CO.

46. Using the Input Shaft Oil Seal Remover and Slide Hammer, remove the crankshaft front oil seal.



N0122298

Fig. 446: Removing Crankshaft Front Oil Seal
Courtesy of FORD MOTOR CO.

47. Remove the bolt and the timing belt tensioner.



N0122221

Fig. 447: Identifying Bolt And Timing Belt Tensioner
Courtesy of FORD MOTOR CO.

48. Remove the 6 bolts and the coolant pump.
- Discard the gasket.

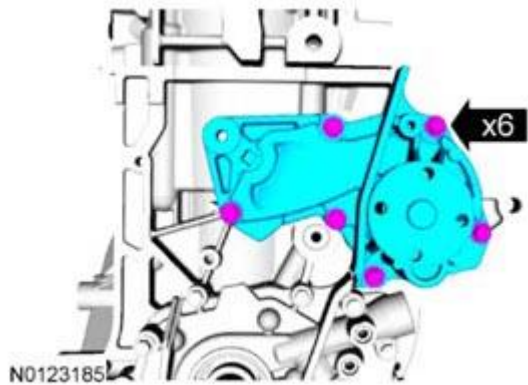


Fig. 448: Locating Bolts And Coolant Pump
Courtesy of FORD MOTOR CO.

49. Remove the 4 spark plugs.

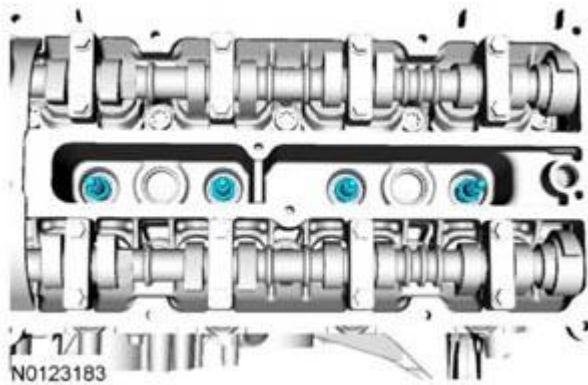


Fig. 449: Identifying Spark Plugs
Courtesy of FORD MOTOR CO.

50. Remove the VCT Alignment Tool.

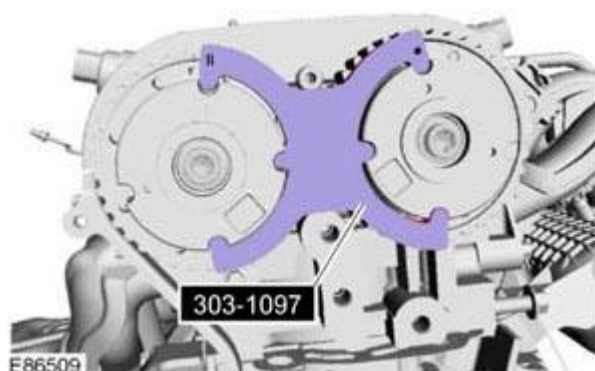


Fig. 450: Removing VCT Alignment Tool
Courtesy of FORD MOTOR CO.

NOTE: Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.

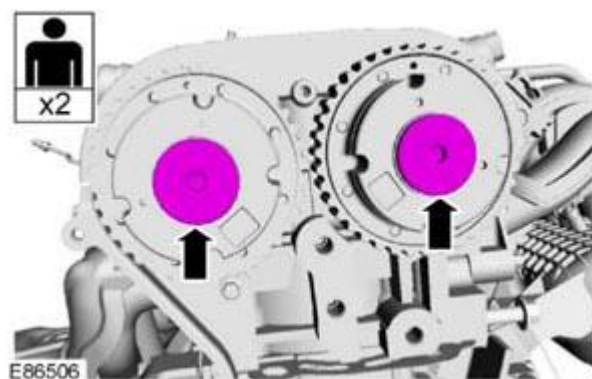


Fig. 451: Locating Camshaft Phaser And Sprocket Plugs
Courtesy of FORD MOTOR CO.

51. Remove the 2 camshaft phaser and sprocket plugs.

NOTE: Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.

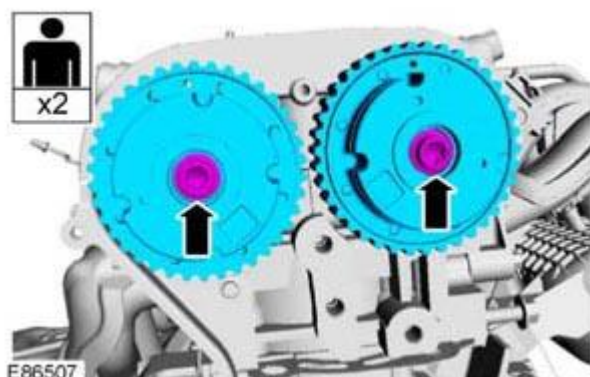


Fig. 452: Locating Bolts And Camshaft Phaser And Sprockets
Courtesy of FORD MOTOR CO.

52. Remove the 2 bolts and the camshaft phaser and sprockets.
53. Using the Input Shaft Oil Seal Remover and Slide Hammer, remove the 2 camshaft oil seals.

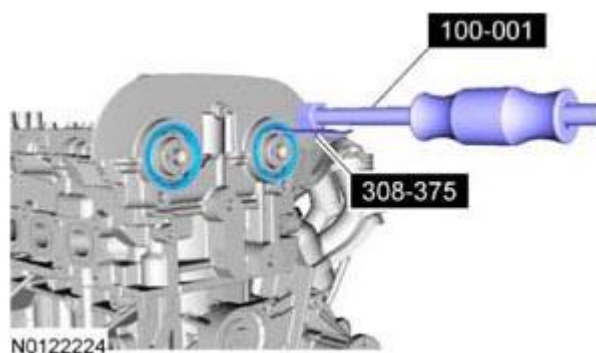


Fig. 453: Removing Camshaft Oil Seals
Courtesy of FORD MOTOR CO.

NOTE: Note the position of each component before removal.

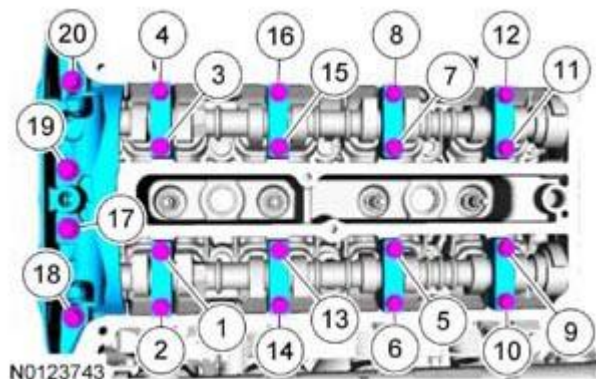


Fig. 454: Identifying Camshaft Bearing Caps And Variable Camshaft Timing (VCT) Bridge Bolts Tightening Sequence

Courtesy of FORD MOTOR CO.

54. Remove the bolts for the camshaft bearing caps and VCT bridge in the sequence shown in illustration.
55. Remove the VCT bridge O-ring seal.
 - Inspect and replace the VCT bridge O-ring seal, if necessary.

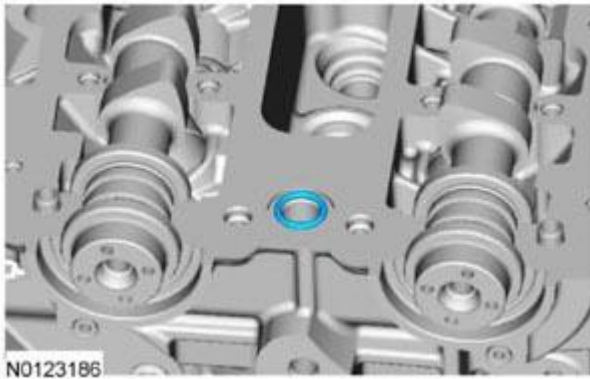


Fig. 455: Identifying VCT Bridge O-Ring Seal
Courtesy of FORD MOTOR CO.

NOTE: Do not pry on camshafts when removing or damage to the camshafts may occur.

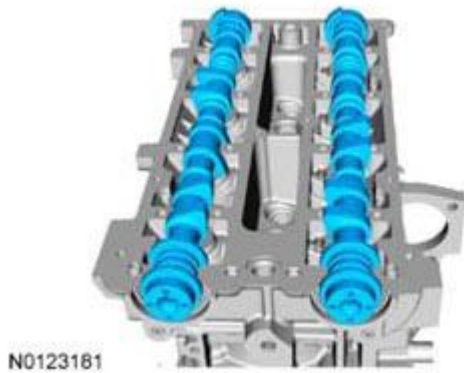
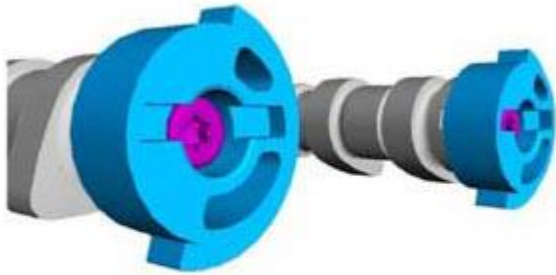


Fig. 456: Identifying Camshafts And Cylinder Head
Courtesy of FORD MOTOR CO.

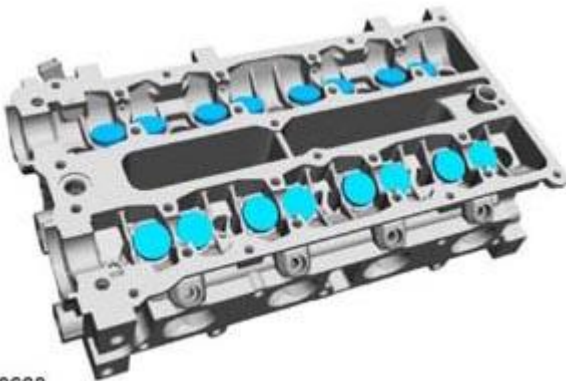
56. Remove the 2 camshafts from the cylinder head.
57. If necessary, remove the 2 bolts and the camshaft trigger wheels.



E86662

Fig. 457: Identifying Bolts And Camshaft Trigger Wheels
Courtesy of FORD MOTOR CO.

- 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.



E80663

Fig. 458: Identifying Camshafts And Valve Tappets
Courtesy of FORD MOTOR CO.

58. Remove and inspect the valve tappets. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.
59. Remove the Crankshaft TDC Pin.

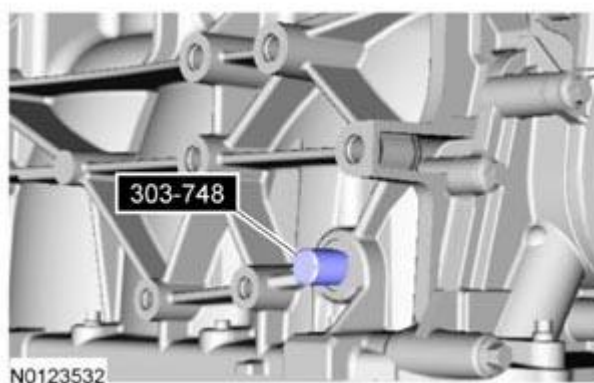


Fig. 459: Removing Crankshaft TDC Pin

Courtesy of FORD MOTOR CO.

NOTE: Make sure that the cylinder head is at ambient air temperature before removing the cylinder head bolts.

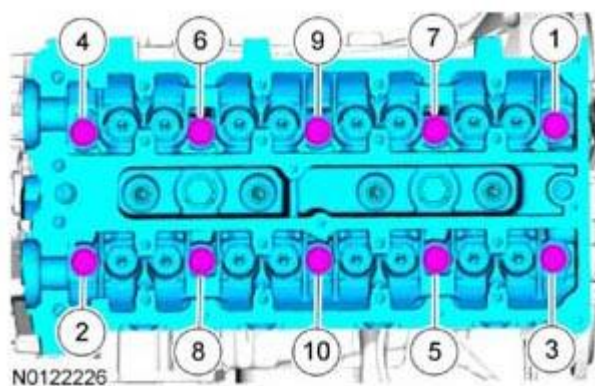


Fig. 460: Identifying Cylinder Head Bolts In Sequence

Courtesy of FORD MOTOR CO.

60. Remove the 10 cylinder head bolts in the sequence shown in illustration.
 - Remove the cylinder head.
 - Discard the cylinder head bolts and gasket.
61. Support the cylinder head on a bench with the head gasket side up. Check the cylinder head distortion and the cylinder block distortion. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.
62. Remove the cylinder head alignment dowels.

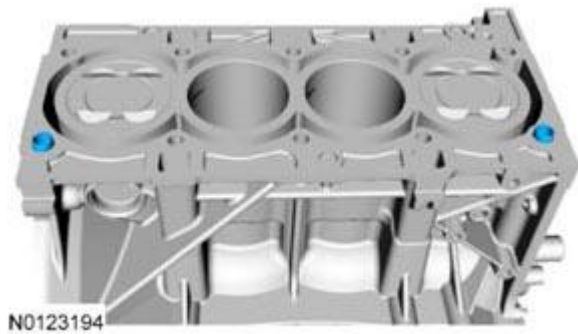


Fig. 461: Identifying Cylinder Head Alignment Dowels
 Courtesy of FORD MOTOR CO.

63. Remove the 13 bolts from the oil pan.

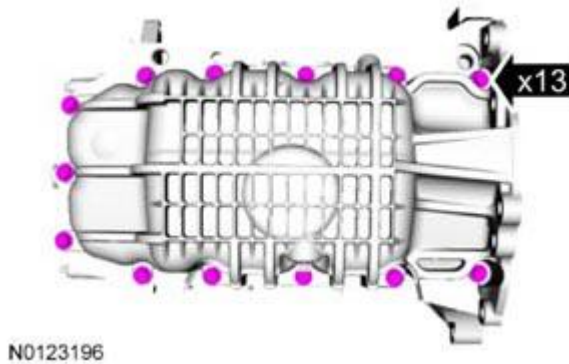


Fig. 462: Locating Oil Pan Bolts
 Courtesy of FORD MOTOR CO.

64. Using the pry pads, remove the oil pan.

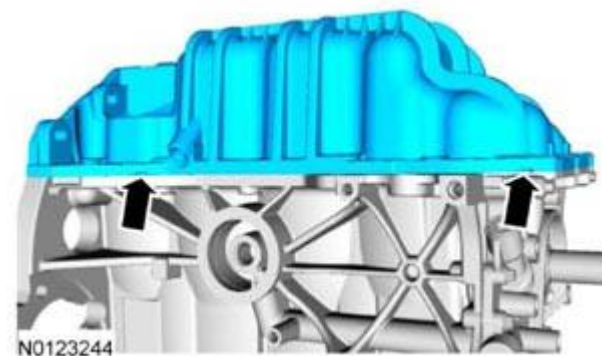


Fig. 463: Locating Oil Pan
 Courtesy of FORD MOTOR CO.

65. Remove the 6 bolts and the crankshaft rear seal.



Fig. 464: Locating Bolts And Crankshaft Rear Seal
Courtesy of FORD MOTOR CO.

66. Remove the 3 bolts and the oil pump screen and pickup tube.
- Inspect and replace the O-ring seal, if necessary.

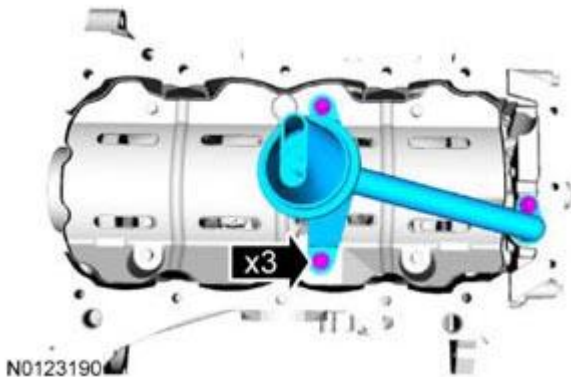


Fig. 465: Locating Oil Pump Screen And Pickup Tube Bolts
Courtesy of FORD MOTOR CO.

67. Remove the 4 bolts and the windage tray.

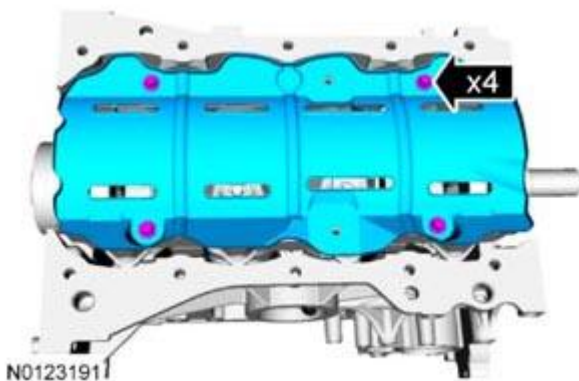


Fig. 466: Locating Bolts And Windage Tray

Courtesy of FORD MOTOR CO.

NOTE: Mark the location of the 3 different length bolts.

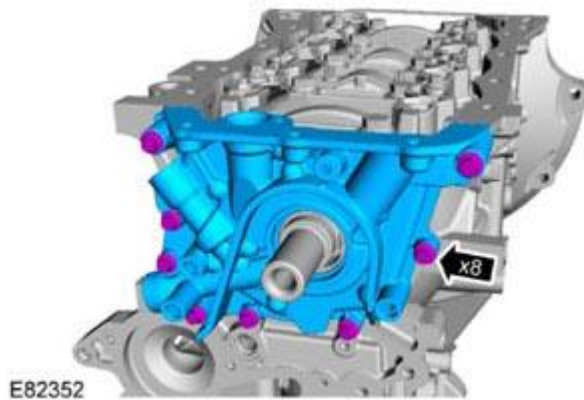


Fig. 467: Locating Oil Pump Bolts
Courtesy of FORD MOTOR CO.

68. Remove the 8 bolts and the oil pump.
 - Discard the gasket.
69. 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.

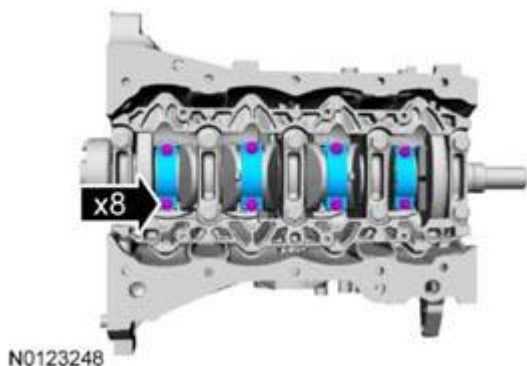


Fig. 468: Locating Bolts And Connecting Rod Cap
Courtesy of FORD MOTOR CO.

70. Remove the bolts and the connecting rod cap.

NOTE: Do not scratch the cylinder walls or crankshaft journals with the

connecting rod.

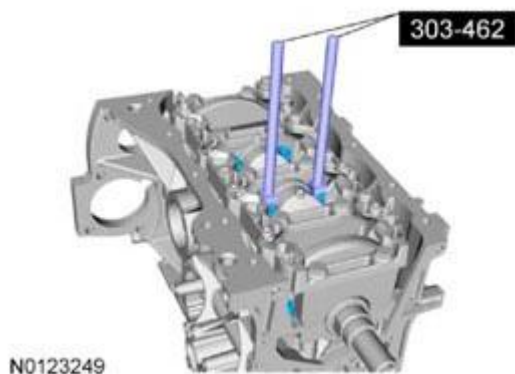


Fig. 469: Removing Piston/Rod Assembly From Engine Block
Courtesy of FORD MOTOR CO.

71. Using the Connecting Rod Installer, remove the piston/rod assembly from the engine block.
72. Repeat the previous 2 steps until all the piston/rod assemblies are removed from the engine block.

NOTE: Mark the position of the parts, so they can be installed in their original positions.

73. Remove the connecting rod bearings from the connecting rod and cap.

NOTE: The main bearing beam has 2 arrows pointing towards the front of engine for correct orientation for reassembly.

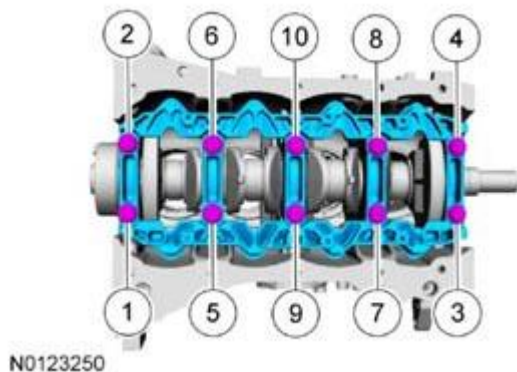
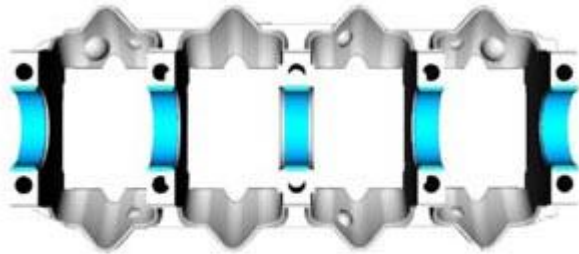


Fig. 470: Identifying Main Bearing Beam Bolts In Sequence
Courtesy of FORD MOTOR CO.

74. Remove the 10 bolts in the sequence shown in illustration and the main bearing beam.

NOTE: If the main bearings are being reused, mark them in order for correct orientation and reassembly.



N0123241

Fig. 471: Identifying Main Bearings And Main Bearing Beam
Courtesy of FORD MOTOR CO.

75. Remove the main bearings from the main bearing beam.
76. Remove the crankshaft from the engine block.



N0123242

Fig. 472: Identifying Crankshaft And Engine Block
Courtesy of FORD MOTOR CO.

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.



N0123243

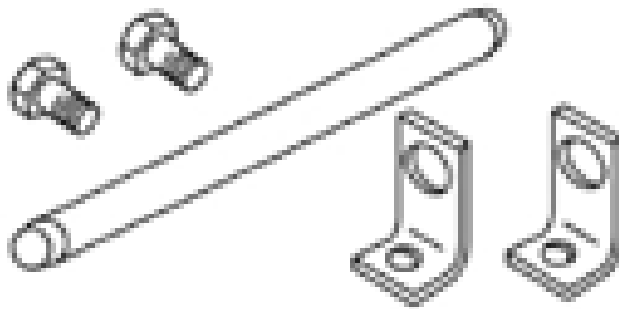
Fig. 473: Identifying Main Bearings And Cylinder Block
Courtesy of FORD MOTOR CO.

77. Remove the main bearings from the cylinder block.
78. Inspect the cylinder block and main bearing beam.
79. Inspect the pistons and connecting rods. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

CYLINDER HEAD

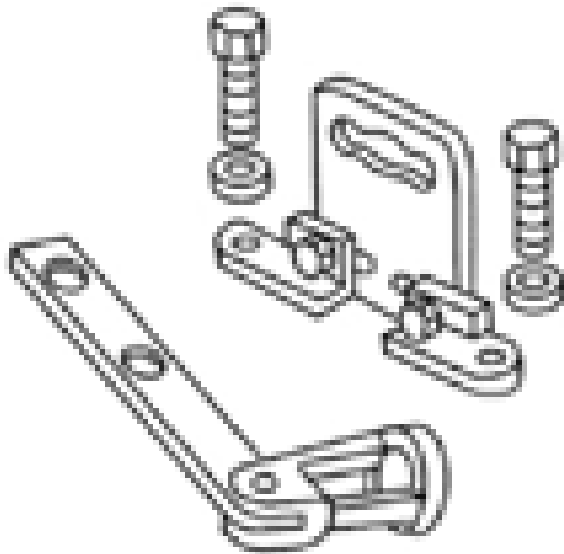
SPECIAL TOOLS



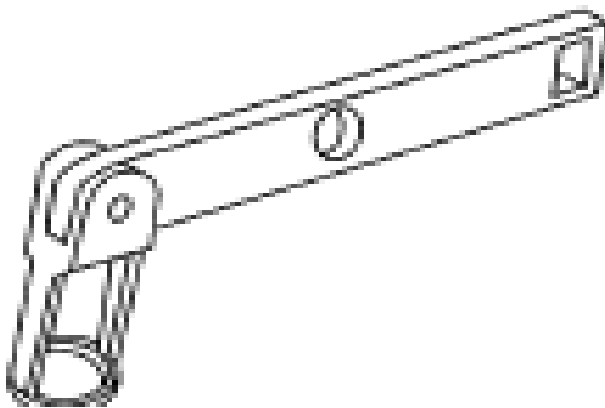
ST1981-A

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

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



ST1907-A

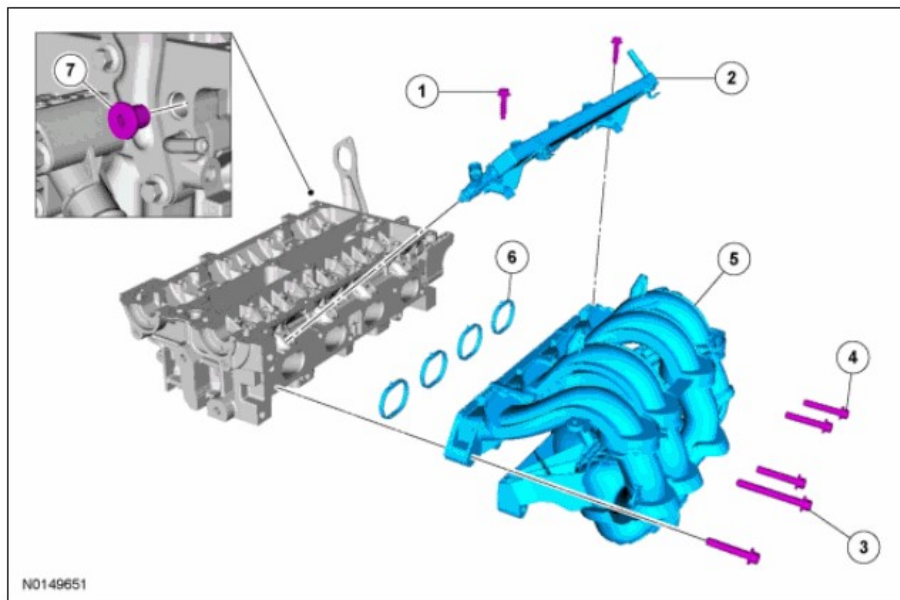


Compressor, Valve Spring
303-1418

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 Motorcraft® XL-5 (aerosol) and/or CRC® SL3151	ESB-M1C93-B

Cylinder Head (View 1 of 2)

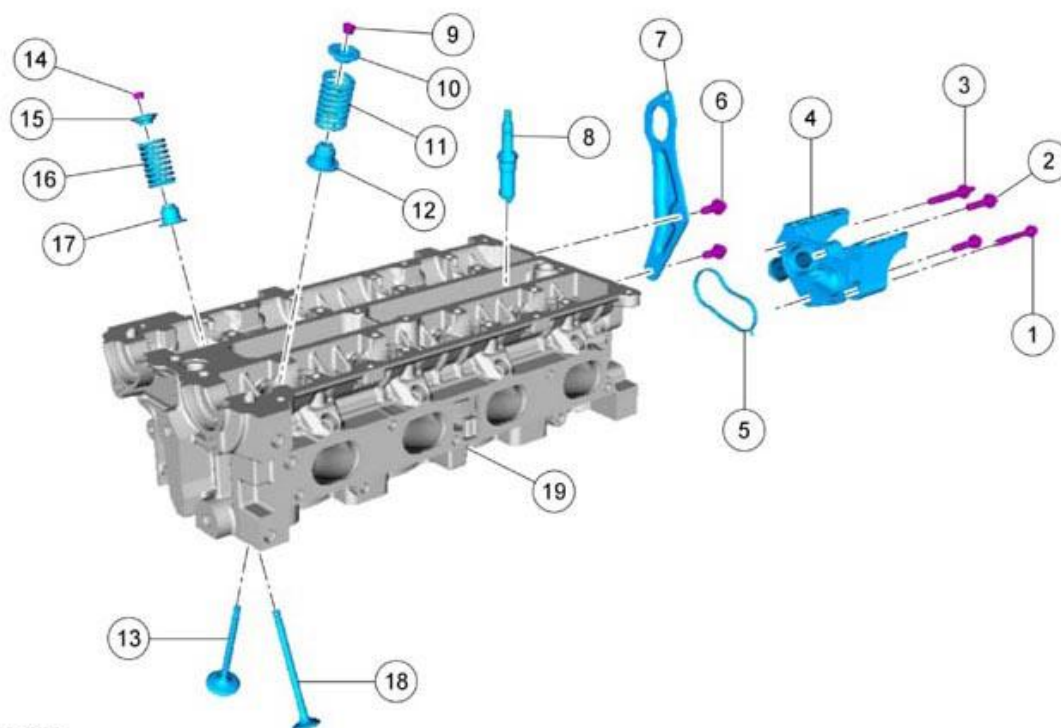


Item	Part Number	Description
1	W704043	Fuel rail bolt (2 required) - 11 Nm (97 lb-in)
2	9D280	Fuel rail assembly
3	W500117	Intake manifold bolt - 18 Nm (159 lb-in)
4	W500112	Intake manifold bolt (4 required) - 18 Nm (159 lb-in)
5	9424	Intake manifold
6	9439	Intake manifold gasket (4 required)
7	W715533	Oil gallery plug

Fig. 474: Exploded View Of Cylinder Head (1 Of 2)

Courtesy of FORD MOTOR CO.

Cylinder Head (View 2 of 2)



N0123739

Fig. 475: Exploded View Of Cylinder Head (2 Of 2)
Courtesy of FORD MOTOR CO.

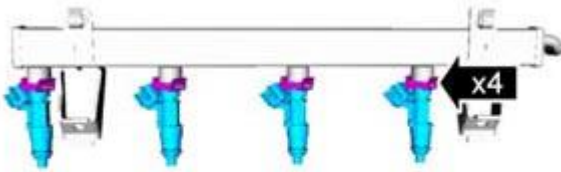
Item	Part Number	Description
1	W714169	Coolant outlet bolt - 19 Nm (168 lb-in)
2	-	Coolant outlet bolt (part of 8K556) (2 required) - 19 Nm (168 lb-in)
3	W713019	Coolant outlet stud bolt - 19 Nm (168 lb-in)
4	8K556	Coolant outlet
5	-	Coolant outlet gasket (part of 8K556)
6	W500223	Lift eye bolt (2 required) - 19 Nm (168 lb-in)
7	-	Lift eye bracket
8	12405	Spark plug (4 required)
9	6518	Intake valve collet (16 required)
10	6514	Intake valve spring retainer (8 required)
11	6513	Intake valve spring (8 required)
12	6571	Intake valve seal (8 required)
13	6507	Intake valve (8 required)
14	6518	Exhaust valve collet (16 required)
15	6514	Exhaust valve spring retainer (8 required)
16	6513	Exhaust valve spring (8 required)
17	6571	Exhaust valve seal (8 required)
18	6505	Exhaust valve (8 required)
19	6049	Cylinder head

Disassembly

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: If the components are to be reinstalled, mark the location of the components removed, they must be installed in the same location.

1. Remove the 2 bolts and the fuel rail and injectors as an assembly.
2. Remove the 4 fuel injector clips and the 4 fuel injectors.



N0123148

Fig. 476: Identifying Fuel Injector Clips And Fuel Injectors
Courtesy of FORD MOTOR CO.

3. Remove and discard the 8 fuel injector O-ring seals.



N0123137

Fig. 477: Identifying Fuel Injector O-Ring Seals
Courtesy of FORD MOTOR CO.

4. Remove the 5 bolts and the intake manifold.
5. Remove the 2 bolts and the LH engine lift eye.
6. Remove the oil gallery plug.
 - Discard the oil gallery plug

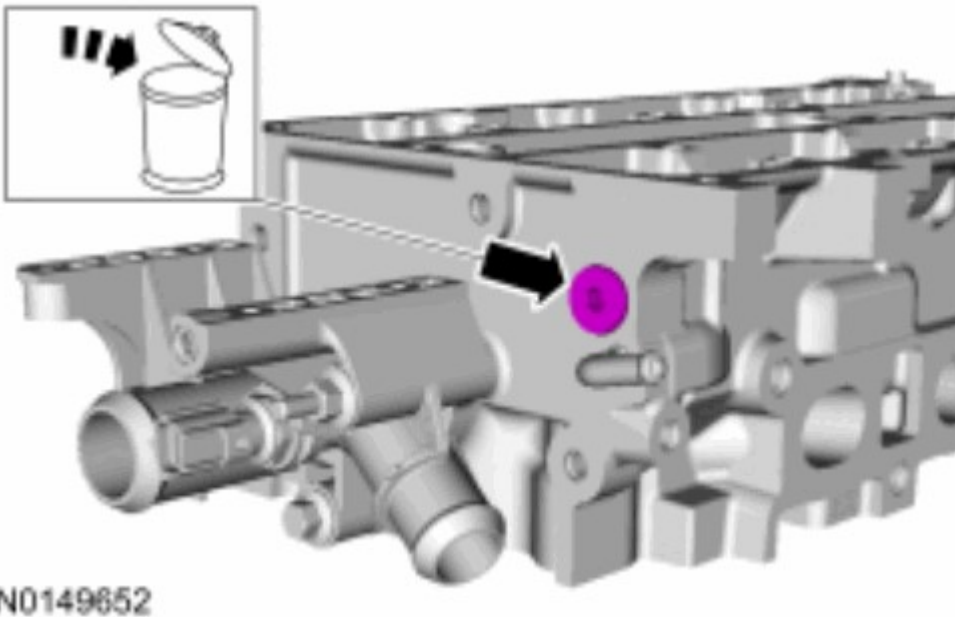


Fig. 478: Identifying Oil Gallery Plug
Courtesy of FORD MOTOR CO.

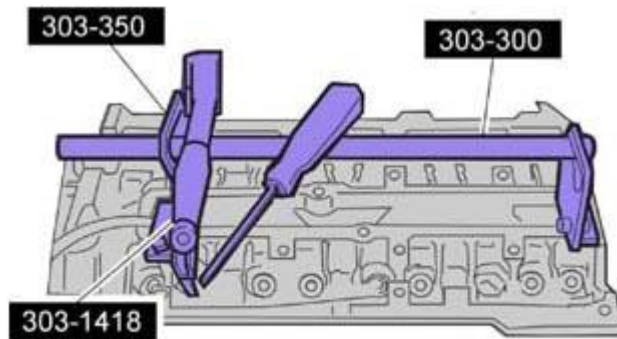
7. Remove the 3 bolts, stud bolt and the coolant outlet.
 - Discard the gasket.

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

NOTE: Use compressed air to remove any foreign material in the spark plug well before removing the spark plugs.

8. Remove the 4 spark plugs.

NOTE: Use a small screwdriver and multi-purpose grease to remove the valve collets.



N0122400

Fig. 479: Removing Valve Spring Retainer And Valve Spring
Courtesy of FORD MOTOR CO.

9. Using the Valve Spring Compressors, compress the valve spring and remove the valve spring collets, the valve spring retainers and the valve springs.
10. Inspect the valve springs. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

NOTE: Note the location of the valves if they are to be reused

11. Remove the valves.
12. Inspect the valves. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**. Install new parts, as necessary.

NOTE: Use a valve stem seal pliers (such as Snap-on® YA-8230 or equivalent).

13. Using valve stem seal pliers, remove and discard the valve seals.

Assembly

NOTE: If installing the original valves, make sure the valves are installed in the same position from which they were removed. Coat the valve stems with clean engine oil.

1. Install the valves.
2. Install the valve stem seal installation sleeve.



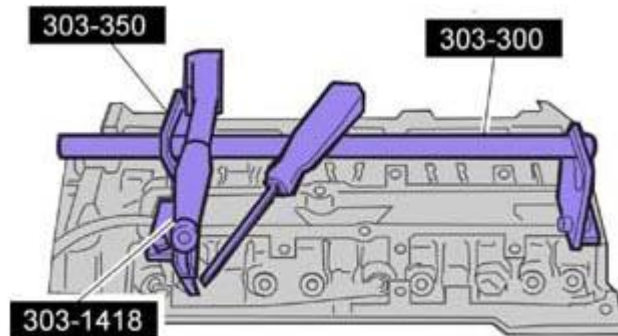
A0032990

Fig. 480: Identifying Valve Stem Seal Installation Sleeve
Courtesy of FORD MOTOR CO.

NOTE: Lubricate the valve stem, guides and valve stem seals with clean engine oil prior to installation.

3. Using valve stem seal pliers, install the valve seals.

NOTE: Check the seating of the valve collet.



N0122400

Fig. 481: Removing Valve Spring Retainer And Valve Spring
Courtesy of FORD MOTOR CO.

4. 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.

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

5. Install the 4 spark plugs.
 - Tighten to 15 Nm (133 lb-in).
6. Using a new gasket, install the coolant outlet, 3 bolts and the stud bolt.
 - Tighten to 19 Nm (168 lb-in).
7. Install the new oil gallery plug.
 - Tighten to 29 Nm (21 lb-ft).

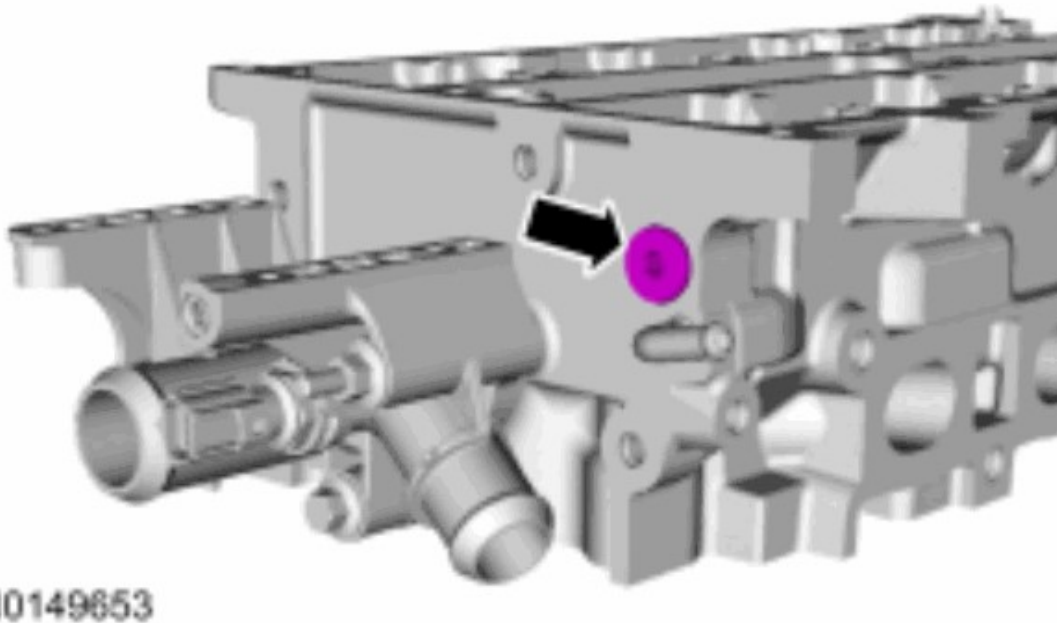


Fig. 482: Identifying Oil Gallery Plug
Courtesy of FORD MOTOR CO.

8. Install the LH engine lift eye and the 2 bolts.
 - Tighten to 19 Nm (168 lb-in).
9. Inspect and install new intake manifold gaskets if necessary.

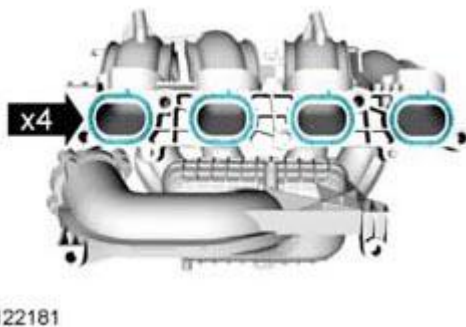


Fig. 483: Locating Intake Manifold Gaskets
Courtesy of FORD MOTOR CO.

10. Install the intake manifold and the 5 bolts.

- Tighten to 18 Nm (159 lb-in).

NOTE: Use O-ring seals that are made of special fuel-resistant material. The use of ordinary O-rings may cause the fuel system to leak. Do not reuse the O-ring seals.

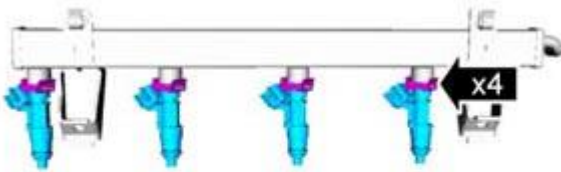


N0123137

Fig. 484: Identifying Fuel Injector O-Ring Seals
Courtesy of FORD MOTOR CO.

11. Install the new O-ring seals onto the fuel injectors and lubricate them with clean engine oil.

12. Install the 4 fuel injectors and the 4 fuel injector clips into the fuel rail.



N0123148

Fig. 485: Identifying Fuel Injector Clips And Fuel Injectors
Courtesy of FORD MOTOR CO.

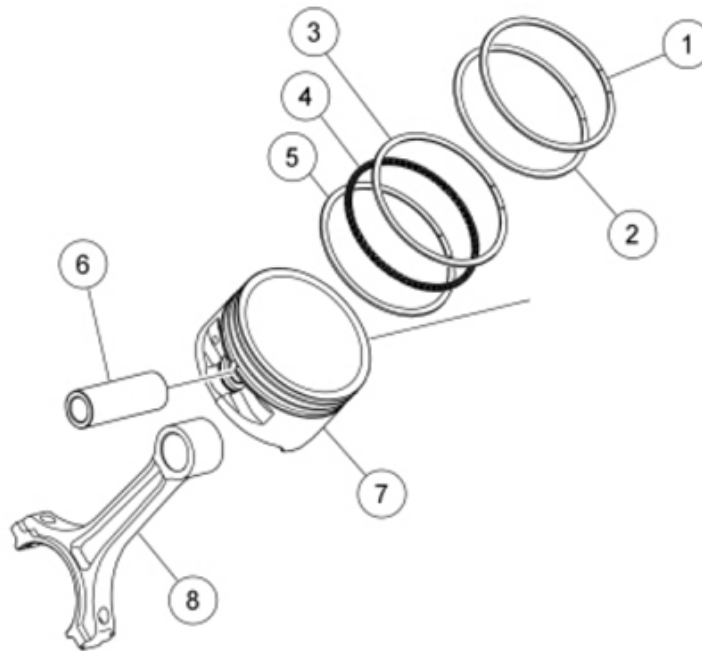
13. Install the fuel rail and fuel injectors as an assembly and install the 2 bolts.

- Tighten to 11 Nm (97 lb-in).

PISTON

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



N0115932

Fig. 486: Exploded View Of Piston
 Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	-	Piston compression upper ring (part of 6148)
2	-	Piston compression lower ring (part of 6148)
3	-	Piston oil control upper segment ring (part of 6148)
4	-	Piston oil control spacer (part of 6148)
5	-	Piston oil control lower segment ring (part of 6148)
6	6135	Piston pin
7	6108	Piston
8	6200	Connecting rod

Disassembly

1. Remove the connecting rod bearings from the connecting rod and cap.
2. Remove the piston rings from the piston.
 - Discard the piston rings.

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.

NOTE: Use a portable multipurpose press (such as OTC® 5180 or equivalent).

3. Using the portable multipurpose press, press the piston pin out of the connecting rod and piston assembly.
4. Separate the piston from the connecting rod.
5. Clean and inspect the piston and connecting rod. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

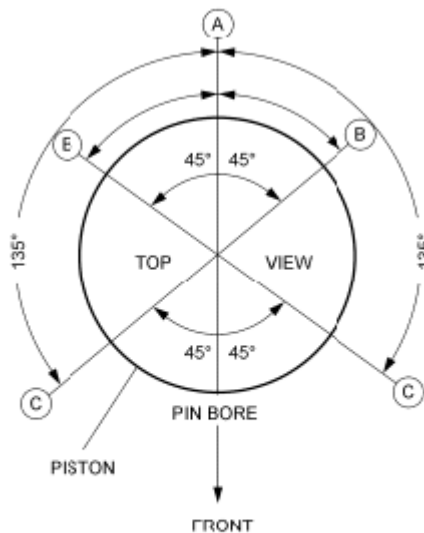
Assembly

NOTE: Lubricate all parts with clean engine oil.

1. Gradually heat the pin bore side of the connecting rod to approximately 300°C (572°F).
2. Align the piston-to-connecting rod orientation marks, and immediately install the piston pin.
3. Using the portable multipurpose press, press the piston pin into the piston and connecting rod assembly.

NOTE: The upper and lower compression rings are to be fitted with the identification marks on the upper side.

4. Install the piston rings.
5. Make sure the ring gaps (oil spacer - A, oil ring - B, compression ring - C) are correctly spaced around the circumference of the piston.



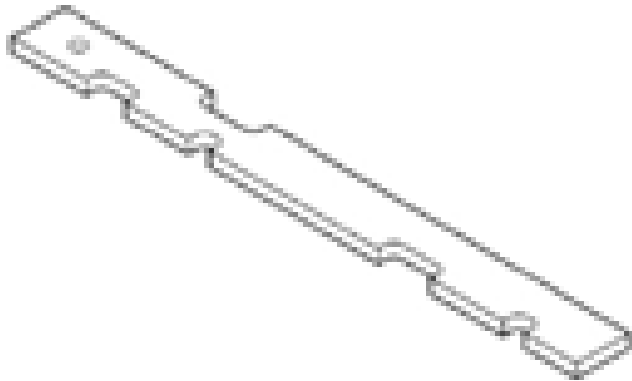
N0029312

Fig. 487: Identifying Piston Ring Gaps Dimensions
Courtesy of FORD MOTOR CO.

ASSEMBLY

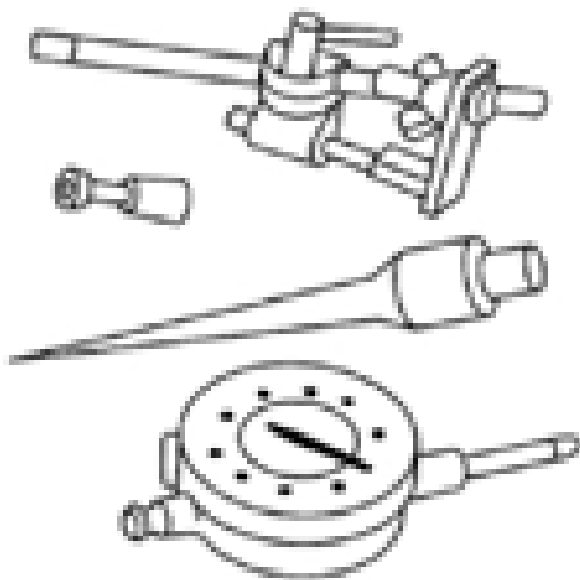
ENGINE

SPECIAL TOOLS



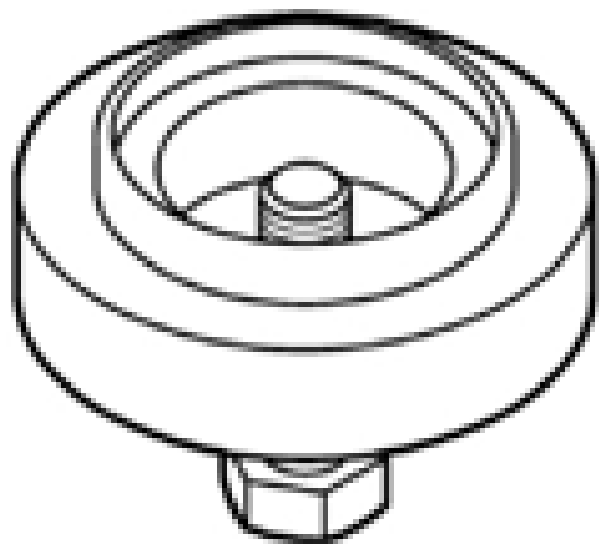
ST3259-A

Alignment Plate, Camshaft
303-376B



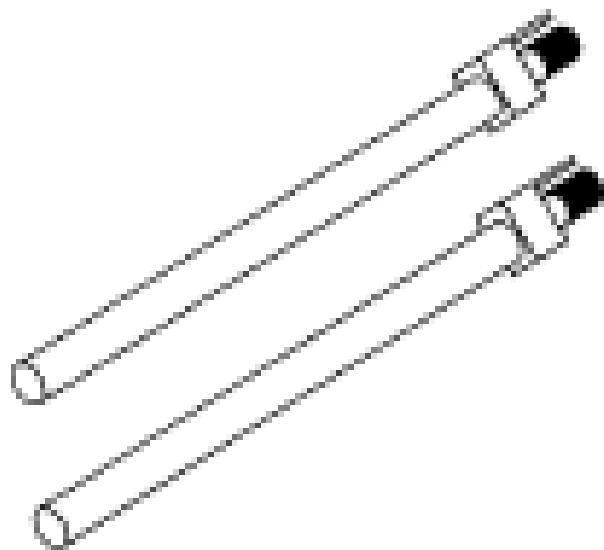
ST1214-A

Dial Indicator Gauge with Holding Fixture
100-002 (TOOL-4201-C)



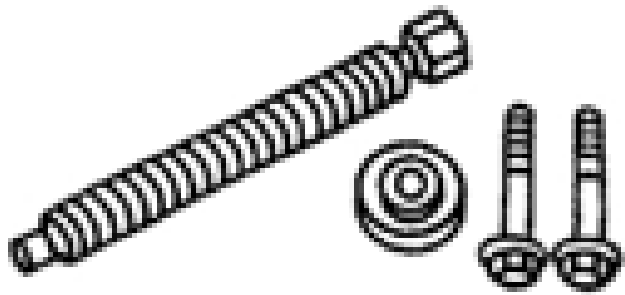
ST3263-A

Installer, Camshaft Seal
303-1532

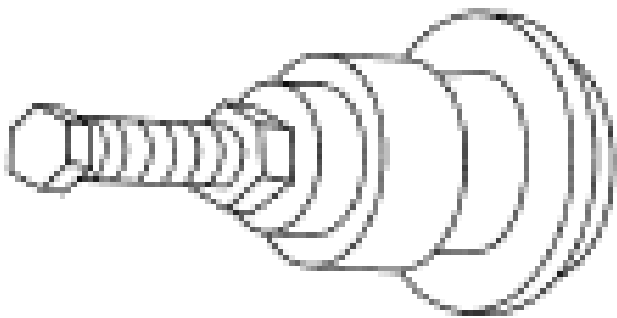


ST1982-A

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

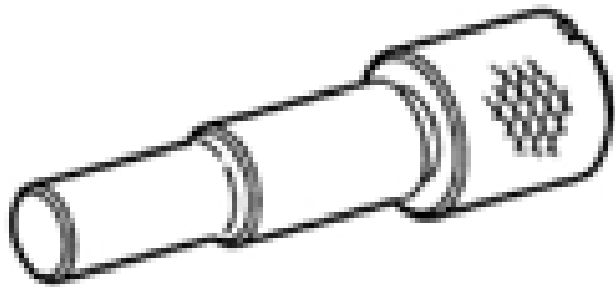
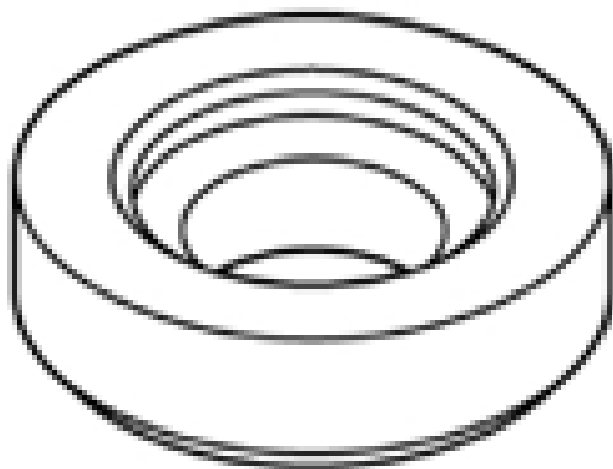
**ST1378-A**

Installer, Crankshaft Vibration Damper
303-175 (T82L-6316-B)

**ST1328-A**

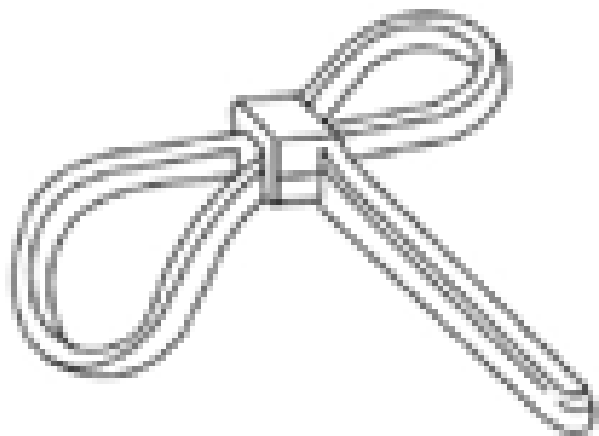
Installer, Front Cover Oil Seal
303-335 (T88T-6701-A)

Pin, Crankshaft Top Dead Center (TDC)
303-748

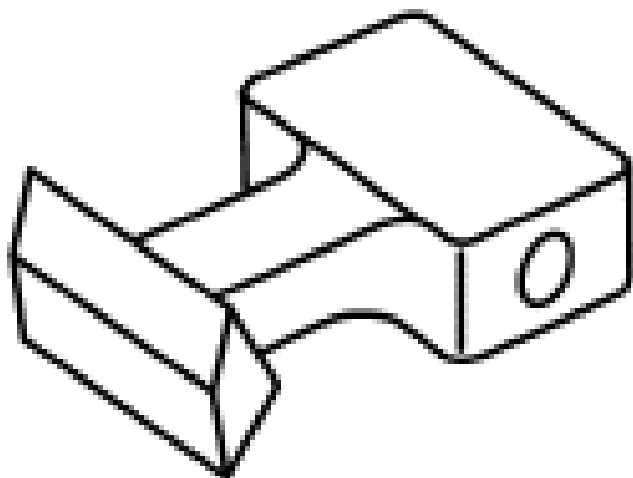
**ST3262-A****ST3260-A**

Replacer, Front Crankshaft Seal
303-420 (T92P-6701-BH)

Strap Wrench
303-D055 (D85L-6000-A) or equivalent



ST1438-A



ST1840-A

Tool, Flywheel Holding
303-103

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Tool, Variable Camshaft Timing (VCT)
Alignment
303-1097

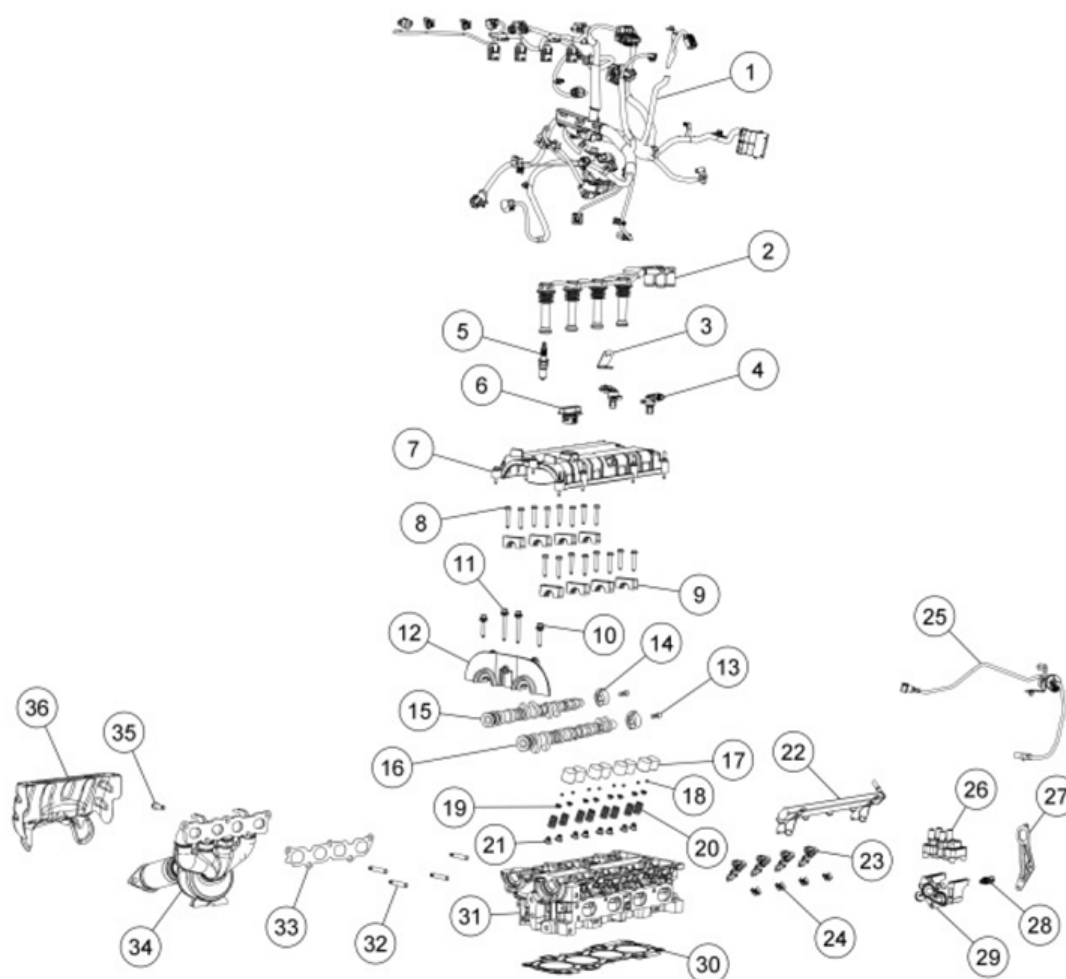
MATERIAL SPECIFICATIONS

Item	Specification
Gasket Maker TA-16	WSK-M2G348-A5
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada) XO-5W20-QSP (US); CXO-5W20-LSP12 (Canada)	WSS-M2C945-A
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
Thread Sealant with PTFE TA-24	WSK-M2G350-A2

Upper Engine

2013 Ford Fiesta S

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N0116187

Fig. 488: Exploded View Of Upper Engine
Courtesy of FORD MOTOR CO.

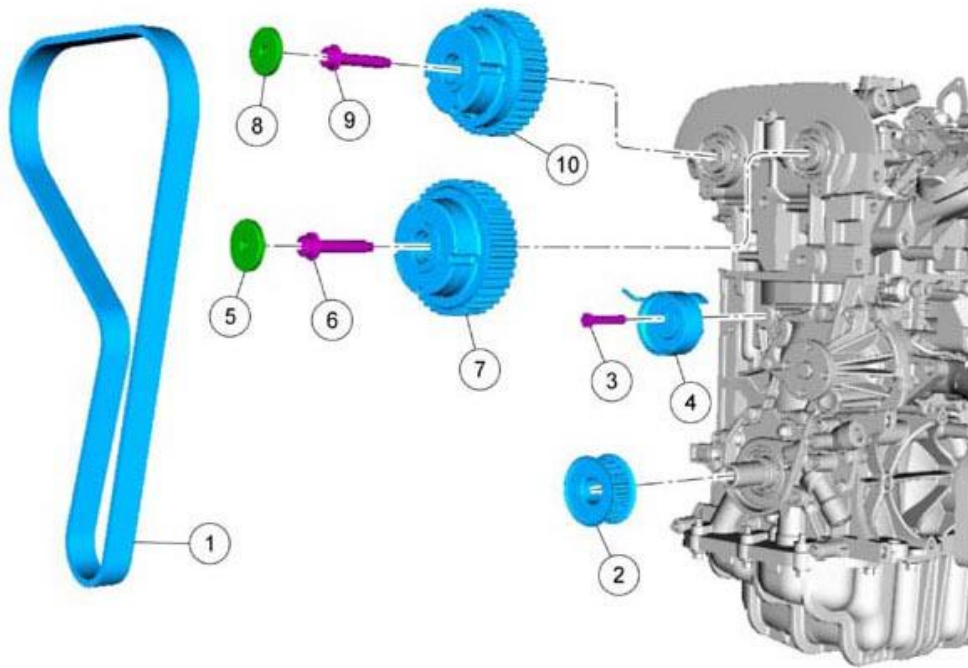
Item	Part Number	Description
1	12A581	Engine wiring harness
2	12259	Spark plug wire (4 required)
3	14A163	Heated Oxygen Sensor (HO2S) connector bracket
4	6B288	Camshaft Position (CMP) sensor (2 required)
5	12405	Spark plug (4 required)
6	6766	Oil fill cap
7	6582	Valve cover
8	W706225	Camshaft cap bolt (16 required)
9	-	Camshaft cap (8 required) (part of 6049)
10	-	Variable Camshaft Timing (VCT) bridge bolt (2 required) (part of 6049)
11	-	VCT bridge bolt (2 required) (part of 6049)

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12	-	VCT bridge (part of 6049)
13	W700279	Camshaft trigger wheel bolt (2 required) (part of 6250)
14	6M265	Camshaft trigger wheel (2 required) (part of 6250)
15	6250	Exhaust camshaft
16	6250	Intake camshaft
17	6500	Valve tappet (16 required)
18	6518	Valve collet (16 required)
19	6514	Valve spring retainer (16 required)
20	6513	Valve spring (16 required)
21	6571	Valve seal (16 required)
22	9D280	Fuel rail
23	9F593	Fuel injector (4 required)
24	9C995	Fuel injector clip (4 required)
25	9C047	Evaporative Emission (EVAP) tube
26	12029	Ignition coil
27	-	Lift eye bracket
28	12A648	Engine Coolant Temperature (ECT) sensor
29	8K556	Coolant outlet
30	6051	Cylinder head gasket
31	6049	Cylinder head
32	W703540	Catalytic converter stud bolt (4 required)
33	9448	Catalytic converter gasket
34	5G232	Catalytic converter
35	W500634	Catalytic converter bolt
36	9N454	Catalytic converter heat shield

Timing Drive

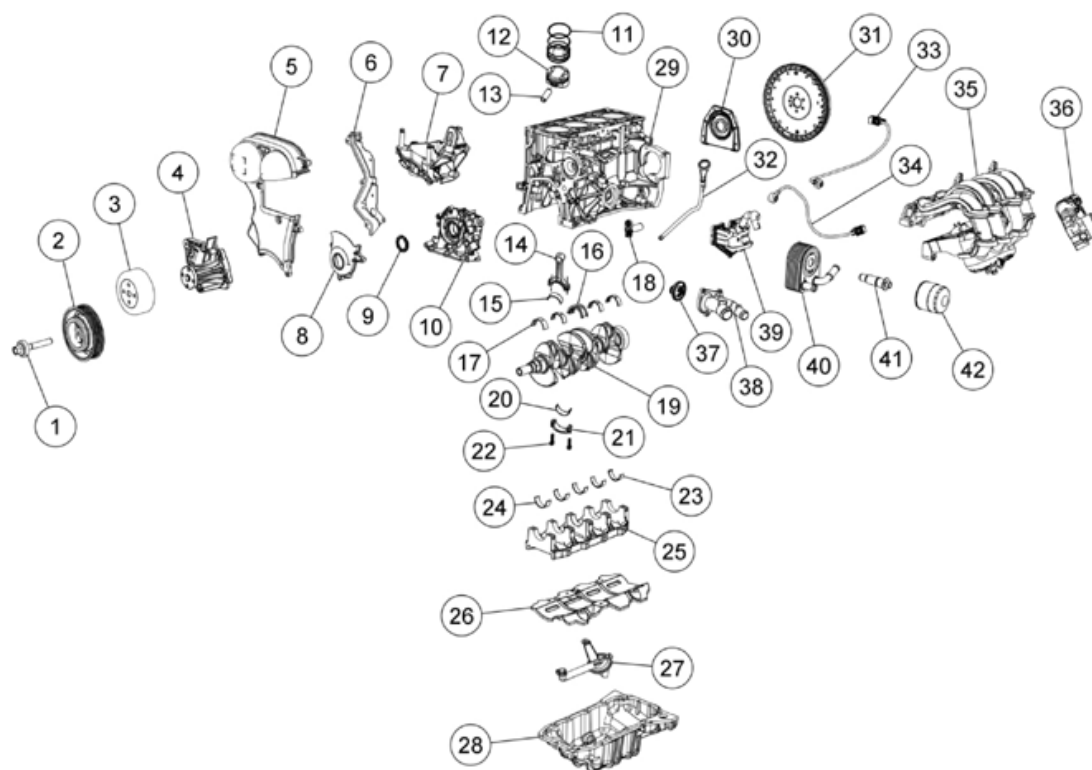


N0122220

Fig. 489: Exploded View Of Timing Drive
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6268	Timing belt
2	6306	Crankshaft sprocket gear
3	00812	Timing belt tensioner bolt
4	6K254	Timing belt tensioner
5	W710954	Intake camshaft phaser and sprocket plug and seal
6	6279	Intake camshaft phaser and sprocket bolt
7	6256	Intake camshaft phaser and sprocket
8	W710954	Exhaust camshaft phaser and sprocket plug and seal
9	6279	Exhaust camshaft phaser and sprocket bolt
10	6256	Exhaust camshaft phaser and sprocket

Lower Engine



N0115214

Fig. 490: Exploded View Of Lower Engine
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6A340	Crankshaft pulley bolt
2	6312	Crankshaft pulley
3	8509	Coolant pump pulley
4	8501	Coolant pump
5	6019	Upper timing belt cover
6	6019	Timing belt cover backplate
7	6038	Engine mount bracket
8	6019	Lower timing belt cover
9	6700	Crankshaft front seal
10	6600	Oil pump
11	6148	Piston ring (5 required)
12	6108	Piston (4 required)
13	6135	Piston pin (4 required)
14	6200	Connecting rod (4 required)

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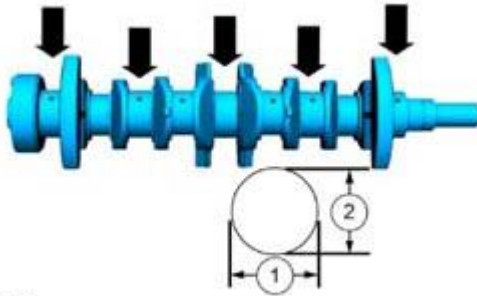
15	6211	Upper connecting rod bearing (4 required)
16	6337	Upper main bearing
17	6333	Upper main bearing (4 required)
18	6C315	Crankshaft Position (CKP) sensor
19	6303	Crankshaft
20	6211	Lower connecting rod bearing (4 required)
21	6200	Connecting rod cap (4 required)
22	6200	Connecting rod cap bolt (8 required)
23	6333	Lower main bearing (4 required)
24	6333	Wider lower main bearing
25	-	Lower crankshaft main bearing beam (part of 6010)
26	6687	Windage tray
27	6622	Oil pump screen and pickup tube
28	6675	Oil pan
29	6010	Engine block
30	6K301	Crankshaft rear oil seal with retainer plate
31	6375	Flexplate/Flywheel
32	6754	Oil level indicator tube
33	12A699	LH Knock Sensor (KS)
34	12A699	RH KS
35	9424	Intake manifold
36	9E926	Throttle Body (TB)
37	8575	Thermostat
38	8592	Thermostat housing
39	6A785	Crankcase vent oil separator
40	6A642	Oil cooler
41	6L626	Oil cooler mounting bolt
42	6731	Oil filter

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 SYSTEM - GENERAL INFORMATION** .

All vehicles

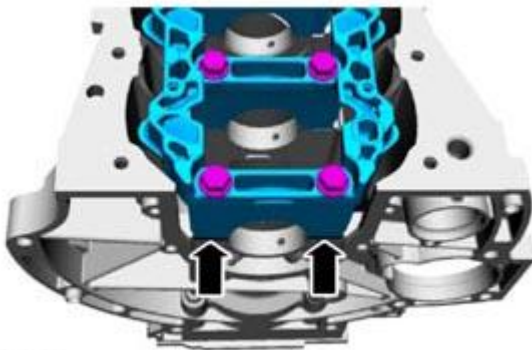
1. Measure each of the crankshaft main bearing journal diameters in at least 2 directions and record the smallest diameter for each journal.



N0123255

Fig. 491: Measuring Crankshaft Main Bearing Journal Diameters In Directions
Courtesy of FORD MOTOR CO.

2. Position the main bearing beam in the engine block with the main bearing beam mounted flush with the rear face of the engine block and install the original main bearing beam bolts finger tight.



N0123251

Fig. 492: Locating Original Main Bearing Beam Bolts
Courtesy of FORD MOTOR CO.

3. Tighten the 10 original main bearing beam bolts in the sequence shown in illustration in 2 stages.
 - Stage 1: Tighten to 19 Nm (168 lb-in).
 - Stage 2: Tighten an additional 60 degrees.

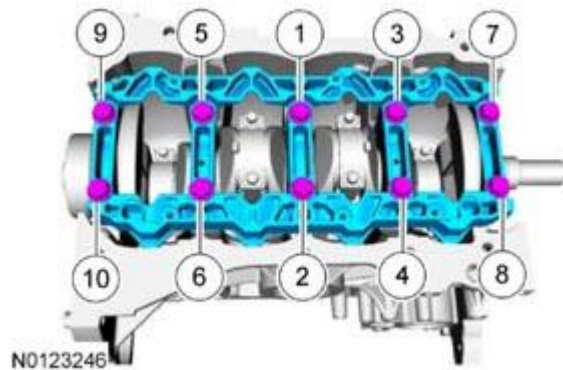


Fig. 493: Identifying Original Main Bearing Beam Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

4. Measure each crankshaft block main bearing bore diameter.

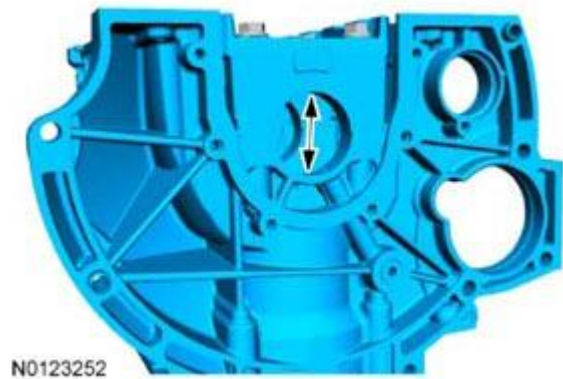
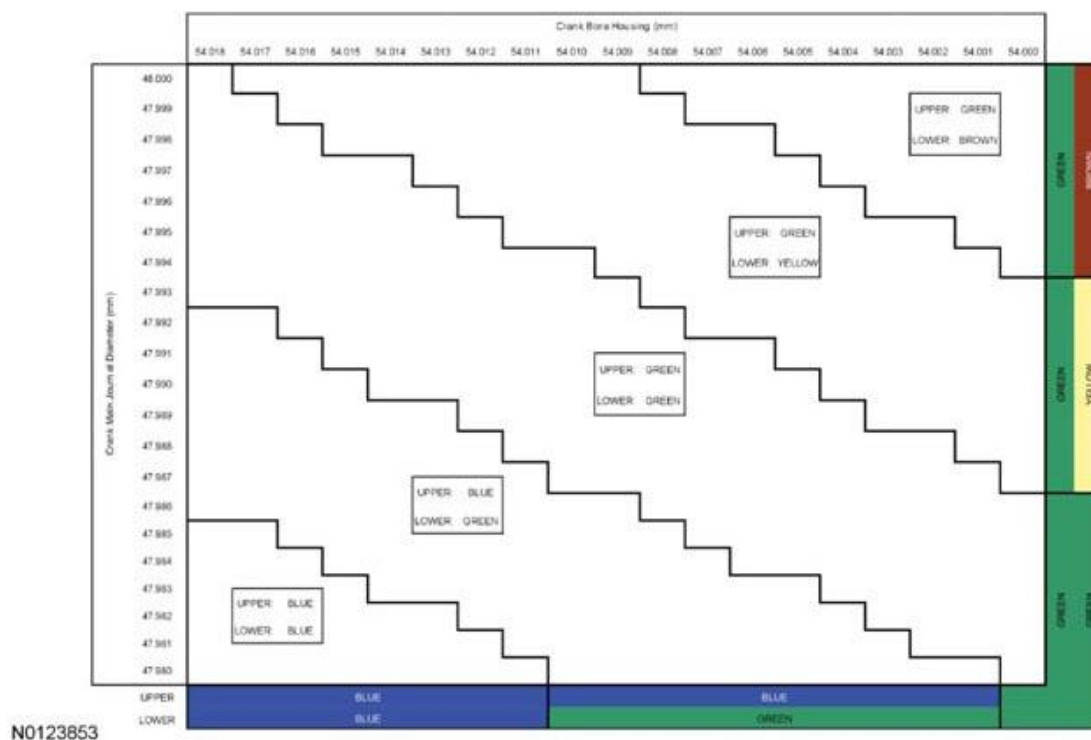
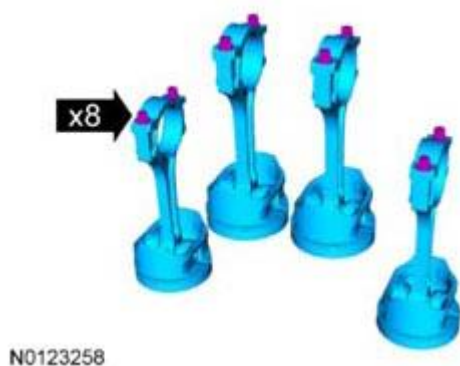


Fig. 494: Measuring Crankshaft Block Main Bearing Bore Diameter
Courtesy of FORD MOTOR CO.

5. Using the chart, select the crankshaft main bearings.

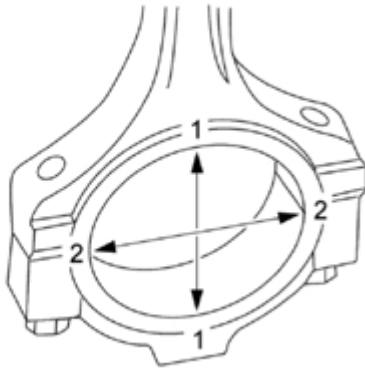


6. Using the original connecting rod cap bolts, install the connecting caps and bolts and tighten the bolts in 2 stages.
 - Stage 1: Tighten to 29 Nm (21 lb-ft).
 - Stage 2: Tighten an additional 90 degrees.



7. 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.

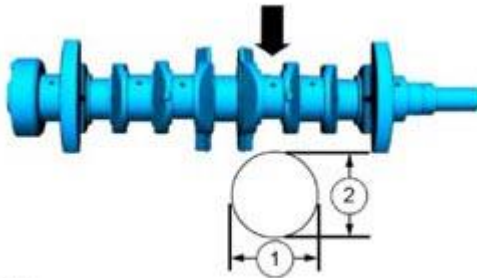
- Discard the connecting rod cap bolts.



A0026938

Fig. 497: Identifying Connecting Rod Large End Bore Measuring Directions
Courtesy of FORD MOTOR CO.

8. Measure each of the crankshaft connecting rod bearing journal diameters in at least 2 directions. Record the smallest measurement for each connecting rod journal.



N0123253

Fig. 498: Locating Crankshaft Connecting Rod Bearing Journal Diameters In Measuring Directions
Courtesy of FORD MOTOR CO.

9. Using the chart, select the correct connecting rod bearings for each crankshaft connecting rod journal.

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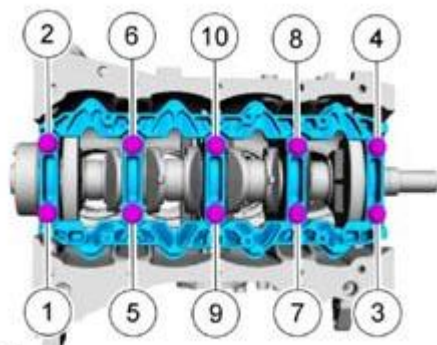
Crank Pin Diameter (mm)	Con. Rod Bore Diameter (mm)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
	43.045	43.044	43.043	43.042	43.041	43.040	43.039	43.038	43.037	43.036	43.035	43.034	43.033	43.032	43.031	43.030	43.029	43.028	43.027	43.026	43.025																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
40.000	3.025	3.024	3.023	3.022	3.021	3.020	3.019	3.018	3.017	3.016	3.015	3.014	3.013	3.012	3.011	3.010	3.009	3.008	3.007	3.006	3.005							YELLOW	YELLOW																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
39.999	3.026	3.025	3.024	3.023	3.022	3.021	3.020	3.019	3.018	3.017	3.016	3.015	3.014	3.013	3.012	3.011	3.010	3.009	3.008	3.007	3.006																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
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39.990	3.035	3.034	3.033	3.032	3.031	3.030	3.029	3.028	3.027	3.026	3.025	3.024	3.023	3.022	3.021	3.020	3.019	3.018	3.017	3.016	3.015	3.014	3.013	3.012	3.011	3.010	3.009	3.008	3.007																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
39.989	3.036	3.035	3.034	3.033	3.032	3.031	3.030	3.029	3.028	3.027	3.026	3.025	3.024	3.023	3.022	3.021	3.020	3.019	3.018	3.017	3.016	3.015	3.014	3.013	3.012	3.011	3.010	3.009	3.008	3.007																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
39.988	3.037	3.036	3.035	3.034	3.033	3.032	3.031	3.030	3.029	3.028	3.027	3.026	3.025	3.024	3.023	3.022	3.021	3.020	3.019	3.018	3.017	3.016	3.015	3.014	3.013	3.012	3.011	3.010	3.009	3.008	3.007																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
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39.985	3.040	3.039	3.038	3.037	3.036	3.035	3.034	3.033	3.032	3.031	3.030	3.029	3.028	3.027	3.026	3.025	3.024	3.023	3.022	3.021	3.020	3.019	3.018	3.017	3.016	3.015	3.014	3.013	3.012	3.011	3.010	3.009	3.008	3.007																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
39.984	3.041	3.040	3.039	3.038	3.037	3.036	3.035	3.034	3.033	3.032	3.031	3.030	3.029	3.028	3.027	3.026	3.025	3.024	3.023	3.022	3.021	3.020	3.019	3.018	3.017	3.016	3.015	3.014	3.013	3.012	3.011	3.010	3.009	3.008	3.007																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
39.983	3.042	3.041	3.040	3.039	3.038	3.037	3.036	3.035	3.034	3.033	3.032	3.031	3.030	3.029	3.028	3.027	3.026	3.025	3.024	3.023	3.022	3.021	3.020	3.019	3.018	3.017	3.016	3.015	3.014	3.013	3.012	3.011	3.010	3.009	3.008	3.007																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
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Fig. 499: Crankshaft Connecting Rod Journal And Correct Connecting Rod Bearings Selection Chart

Courtesy of FORD MOTOR CO.

NOTE: The main bearing beam has 2 arrows pointing towards the front of engine for correct orientation for reassembly.



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Fig. 500: Identifying Main Bearing Beam Bolts In Sequence

Courtesy of FORD MOTOR CO.

10. Remove the 10 bolts in the sequence shown in illustration and the main bearing beam.
 - Discard the main bearing beam bolts.

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.

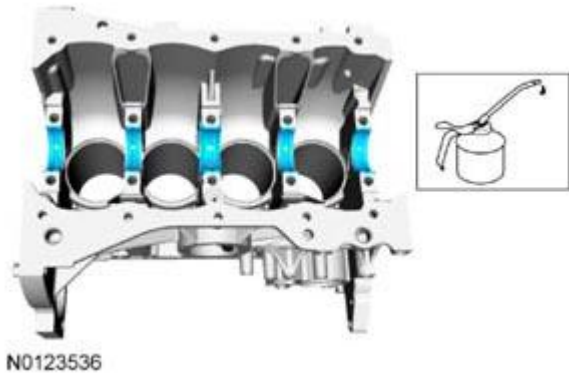


Fig. 501: Lubricating Upper Crankshaft Main Bearings
Courtesy of FORD MOTOR CO.

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.

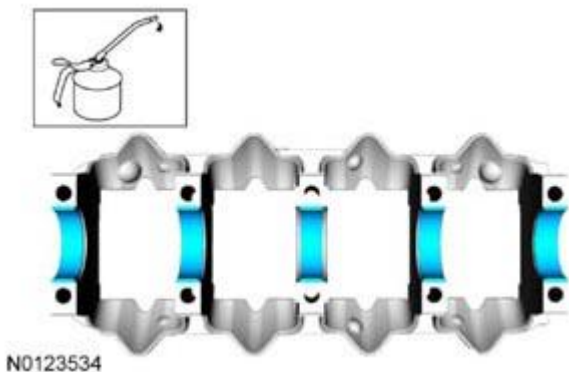


Fig. 502: Lubricating Crankshaft Main Bearings
Courtesy of FORD MOTOR CO.

12. Lubricate the crankshaft main bearings with clean engine oil and install the 5 crankshaft main bearings in the main bearing beam.

NOTE: Lubricate journals on the crankshaft with clean engine oil.

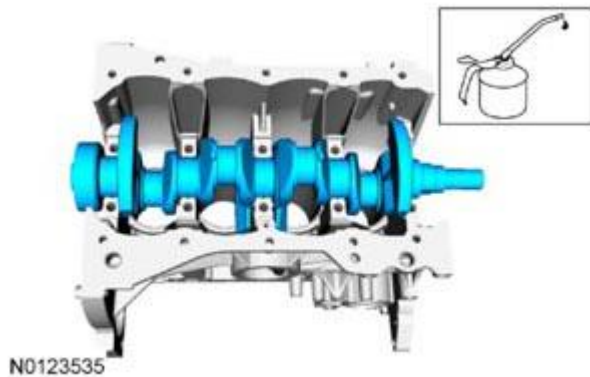


Fig. 503: Lubricating Journals On Crankshaft
Courtesy of FORD MOTOR CO.

13. Position the crankshaft in the cylinder block.
14. Lubricate the 10 main bearing beam side fit surfaces and the 5 main bearing beam bearings with clean engine oil.

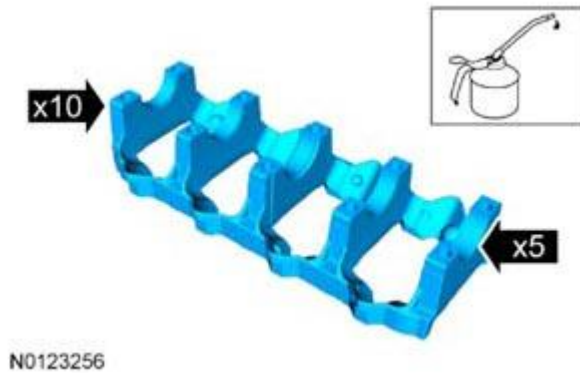


Fig. 504: Lubricating Main Bearing Beam Side Fit Surfaces And Main Bearing Beam Bearings
Courtesy of FORD MOTOR CO.

15. Position the main bearing beam in the engine block with the main bearing beam mounted flush with the rear face of the engine block.

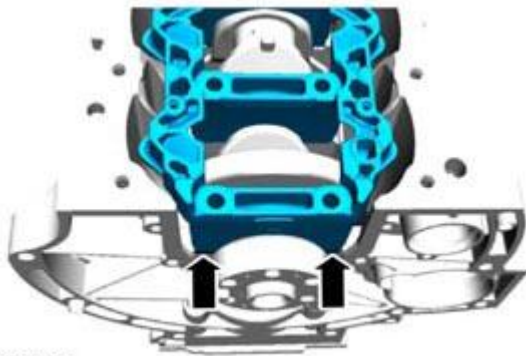


Fig. 505: Locating Main Bearing Beam In Engine Block
Courtesy of FORD MOTOR CO.

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.

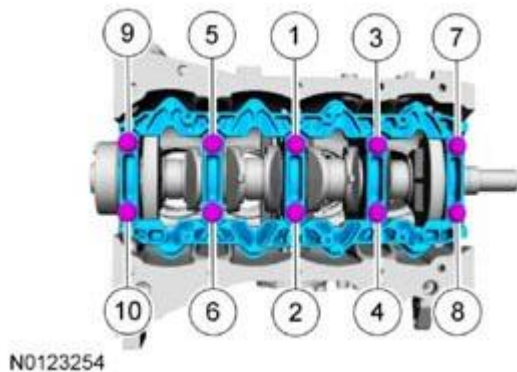


Fig. 506: Identifying Main Bearing Beam Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

16. Install and tighten the 10 new main bearing beam bolts.
 - Tighten the bolts in the sequence shown in illustration in 2 stages.
 - Stage 1: Tighten to 19 Nm (168 lb-in).
 - Stage 2: Tighten an additional 60 degrees.
17. 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 0.2-0.43 mm (0.008-0.017 in). If the crankshaft end play exceeds the specified range, install new parts as necessary.

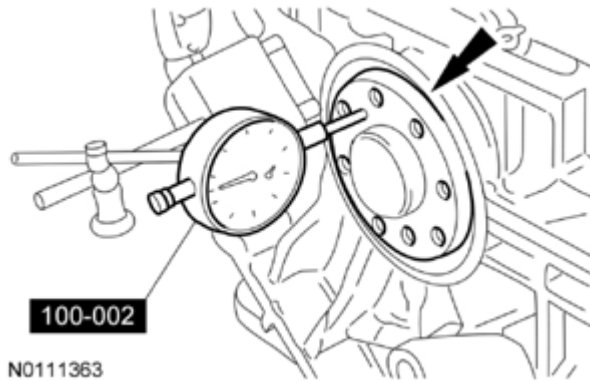


Fig. 507: Measuring Crankshaft End Play
Courtesy of FORD MOTOR CO.

18. Make sure the dimple in the piston faces the front of the engine.

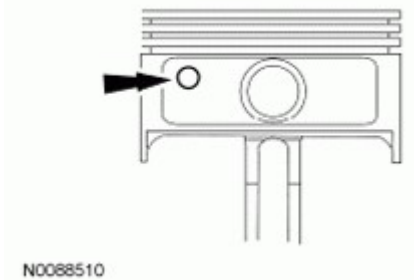
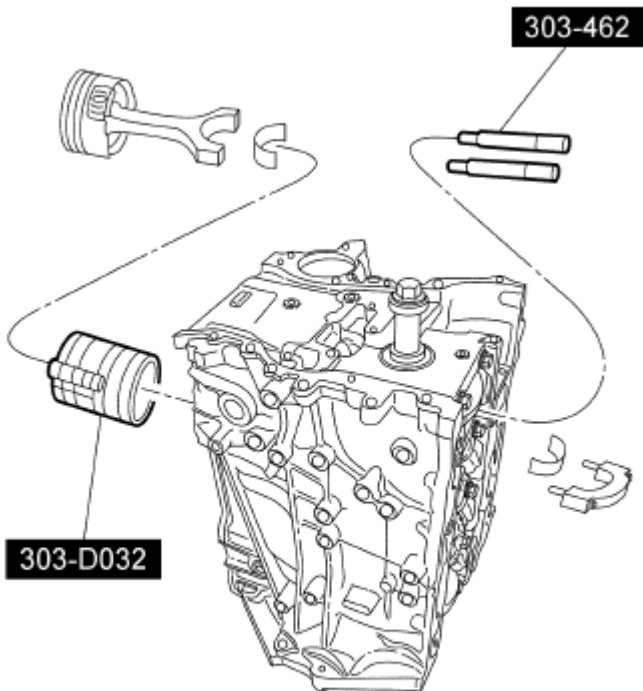


Fig. 508: Locating Dimple In Piston Faces
Courtesy of FORD MOTOR CO.

- 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.



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Fig. 509: Identifying Piston Ring Compressor And Connecting Rod Installer
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.

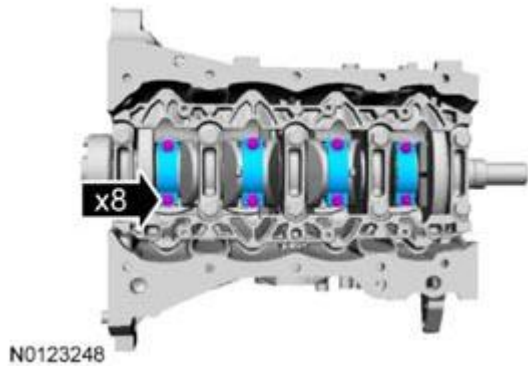


Fig. 510: Locating Bolts And Connecting Rod Cap
Courtesy of FORD MOTOR CO.

20. Install the connecting rod caps and the new bolts and tighten the bolts in 3 stages.
 - Stage 1: Tighten to 18 Nm (159 lb-in).
 - Stage 2: Wait 2 seconds.
 - Stage 3: Tighten an additional 35 degrees.
21. Install the Crankshaft Top Dead Center (TDC) Timing Pin and rotate the crankshaft slowly clockwise until the crankshaft balance weight is up against the Crankshaft TDC Timing Pin. The engine is now at TDC.

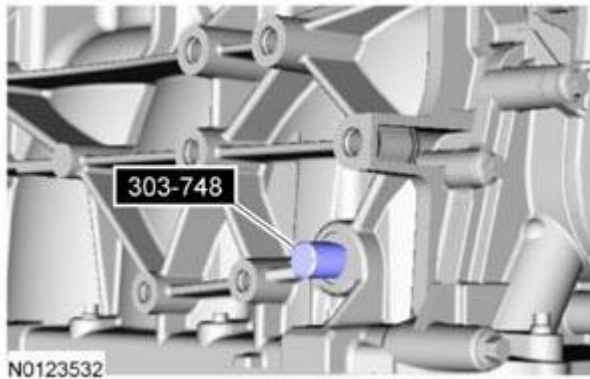


Fig. 511: Installing Crankshaft TDC Pin
Courtesy of FORD MOTOR CO.

22. Install a new gasket, the oil pump and the 8 bolts in their original position and tighten in sequence shown in illustration in 2 stages.
 - Stage 1: Tighten to 6 Nm (53 lb-in).
 - Stage 2: Tighten to 9 Nm (80 lb-in).

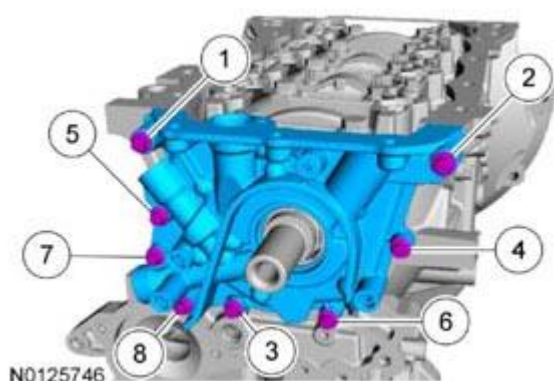


Fig. 512: Identifying Oil Pump And Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

23. Install the windage tray and the 4 bolts.
 - Tighten to 9 Nm (80 lb-in).

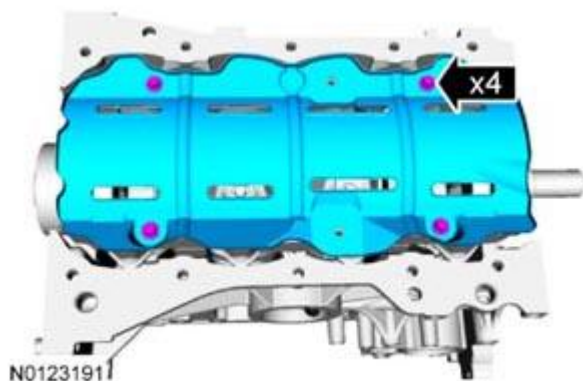


Fig. 513: Locating Bolts And Windage Tray
Courtesy of FORD MOTOR CO.

24. Install the oil pump screen and pickup tube and 3 bolts.
 - Tighten to 9 Nm (80 lb-in).

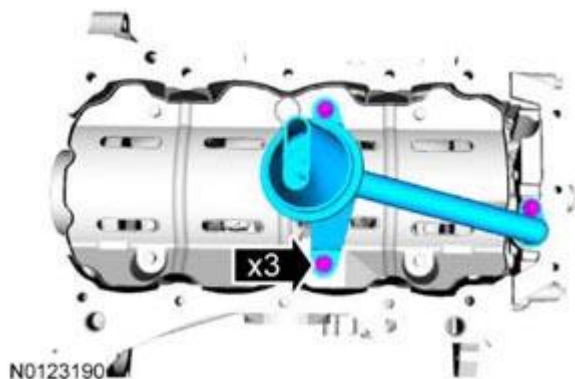


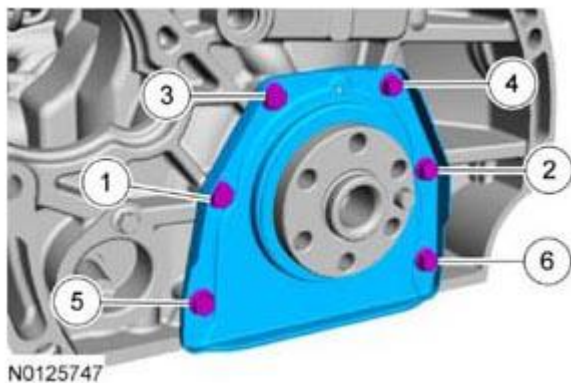
Fig. 514: Locating Oil Pump Screen And Pickup Tube Bolts

Courtesy of FORD MOTOR CO.

NOTE: New crankshaft rear seal is supplied with an alignment sleeve which must be removed after installation.

NOTE: Do not remove the alignment sleeve from the crankshaft rear seal prior to installation on the crankshaft.

NOTE: Do not lubricate the new crankshaft rear seal.

**Fig. 515: Identifying Crankshaft Rear Seal Bolts Tightening Sequence**

Courtesy of FORD MOTOR CO.

25. Align the crankshaft rear seal and alignment sleeve on the crankshaft and push the crankshaft rear seal off the alignment sleeve onto the crankshaft without stopping until the crankshaft rear seal meets the cylinder block.
 - Install the 6 bolts and tighten in sequence shown in illustration in 2 stages.
 - Stage 1: Tighten bolts 1 through 6 to 4 Nm (35 lb-in).
 - Stage 2: Tighten bolts 1 through 6 to 9 Nm (80 lb-in).
26. Remove the alignment sleeve taking care not to touch the sealing lip.

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.

27. Clean and inspect all oil pan mating surfaces.
28. Install 2 M8x20 studs for oil pan alignment.

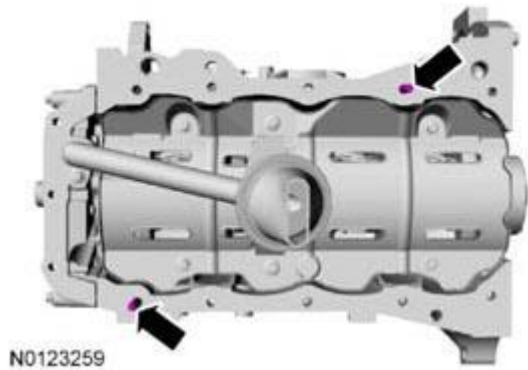


Fig. 516: Locating Oil Pan Alignment And M8X20 Studs
Courtesy of FORD MOTOR CO.

NOTE: The oil pan must be installed within 5 minutes of applying the sealant.

NOTE: If the oil pan is not secured within 5 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 5 minutes, whichever is longer. Failure to follow this procedure can cause future oil leakage.

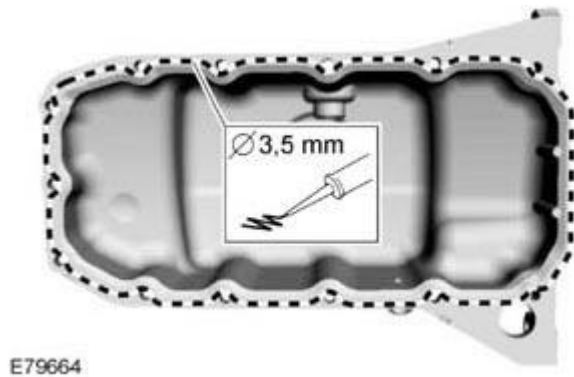


Fig. 517: Applying Bead Of Sealant To Oil Pan
Courtesy of FORD MOTOR CO.

29. Apply a 3.5 mm (0.137 in) bead of sealant to the oil pan.
30. Install the oil pan using the 2 studs for alignment.



Fig. 518: Locating Oil Pan Studs
Courtesy of FORD MOTOR CO.

31. Install 11 bolts finger tight and remove the 2 alignment studs and install the remaining 2 bolts finger tight.

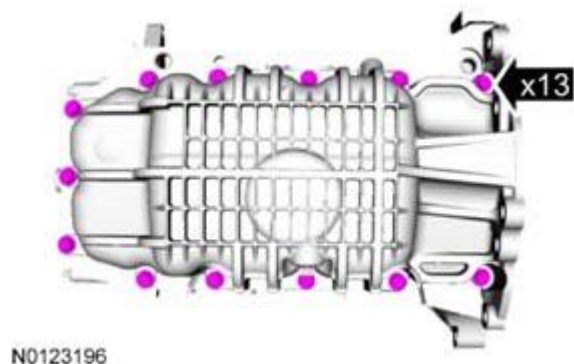


Fig. 519: Locating Oil Pan Bolts
Courtesy of FORD MOTOR CO.

32. Tighten the oil pan bolts in the following sequence in 2 stages.
- Stage 1: Tighten bolts 1 through 13 to 10 Nm (89 lb-in).
 - Stage 2: Tighten bolts 1 through 13 to 20 Nm (177 lb-in).

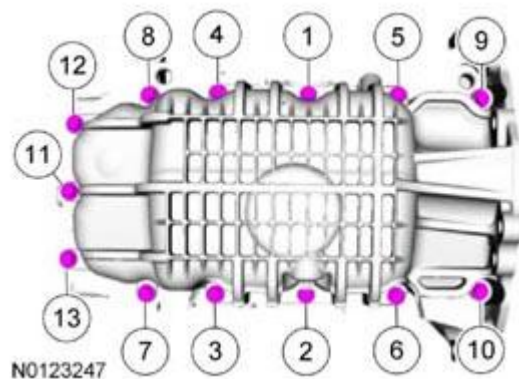


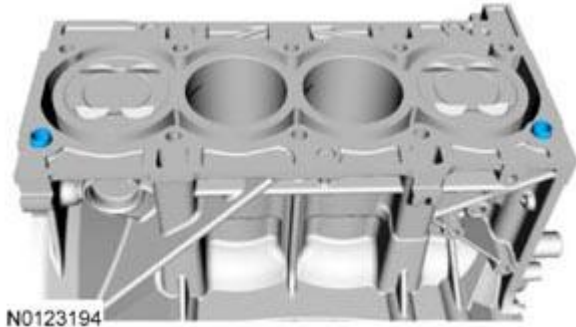
Fig. 520: Identifying Oil Pan Bolts Tightening Sequence

Courtesy of FORD MOTOR CO.

NOTE: Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean 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: If there is no residual gasket material present, metal surface prep can be used to clean and prepare the surfaces.

33. Clean the cylinder head-to-cylinder block mating surface of both the cylinder head and the cylinder block in the following sequence.
 1. 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. Clean the cylinder head bolt holes in the cylinder block. Make sure all coolant, oil or other foreign material is removed.
34. Install the cylinder head alignment dowels.
 - Dowels must be fully seated in the cylinder block.

**Fig. 521: Identifying Cylinder Head Alignment Dowels**

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.

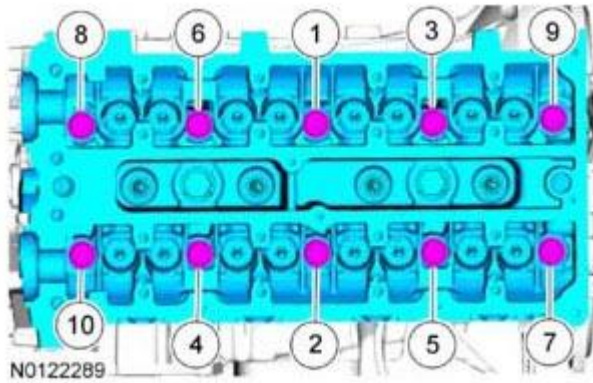


Fig. 522: Identifying Cylinder Head Gasket And Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

35. Install the cylinder head gasket, cylinder head and 10 new bolts. Tighten the bolts in the sequence shown in illustration in 4 stages:
 - Stage 1: Tighten to 5 Nm (44 lb-in).
 - Stage 2: Tighten to 15 Nm (133 lb-in).
 - Stage 3: Tighten to 35 Nm (26 lb-ft).
 - Stage 4: Turn 75 degrees.

NOTE: Coat the valve tappets with clean engine oil prior to installation.

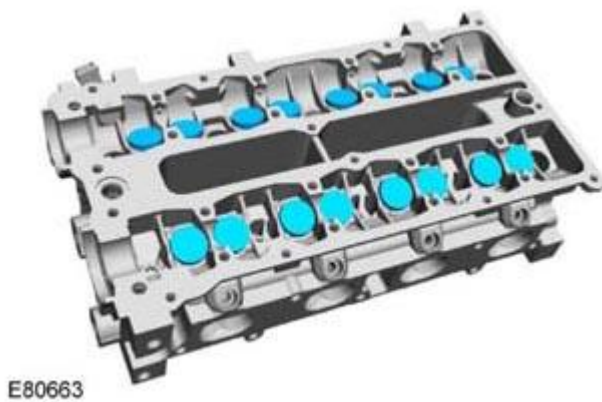
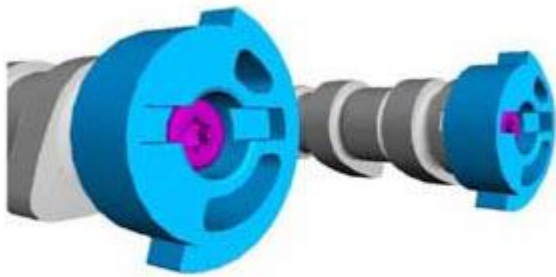


Fig. 523: Identifying Camshafts And Valve Tappets
Courtesy of FORD MOTOR CO.

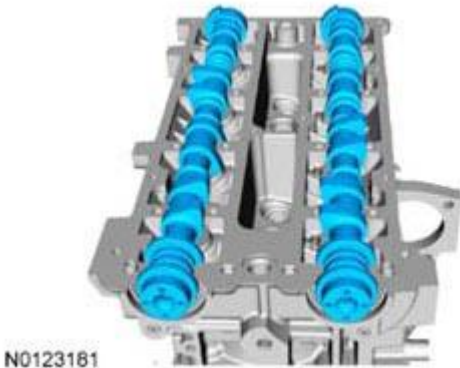
36. Install the valve tappets.
37. If removed, install the camshaft trigger wheels and the 2 bolts.
 - Tighten to 21 Nm (15 lb-ft).



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Fig. 524: Identifying Bolts And Camshaft Trigger Wheels
Courtesy of FORD MOTOR CO.

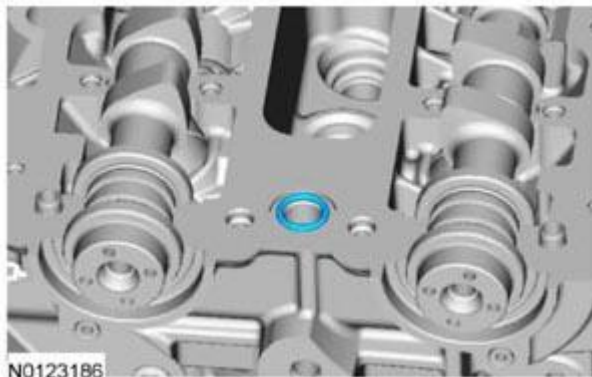
NOTE: Lubricate the camshafts with clean engine oil.



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Fig. 525: Identifying Camshafts
Courtesy of FORD MOTOR CO.

38. Install the camshafts as shown in illustration.
39. Install the Variable Camshaft Timing (VCT) bridge O-ring seal.



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Fig. 526: Identifying VCT Bridge O-Ring Seal
Courtesy of FORD MOTOR CO.

NOTE: The VCT bridge must be installed within 5 minutes of applying the gasket maker to the cylinder head.

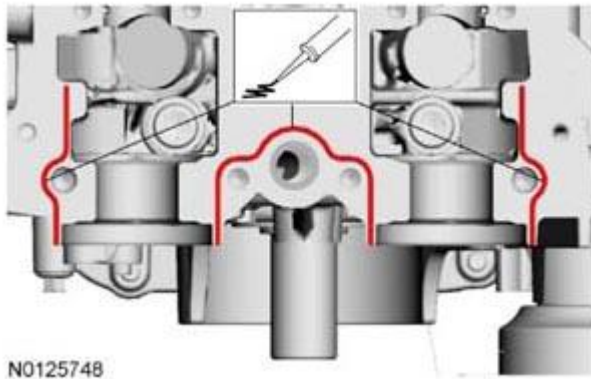


Fig. 527: Identifying Gasket Maker Applying Area To Cylinder Head
Courtesy of FORD MOTOR CO.

40. Apply a 1.5 mm (0.059 in) bead of gasket maker to the cylinder head as shown in illustration.

NOTE: Make sure that the camshafts and camshaft bearing caps are installed in their original locations or damage to the engine may occur.

NOTE: Apply clean engine oil to the bearing surfaces of the camshaft bearing caps and the VCT bridge.

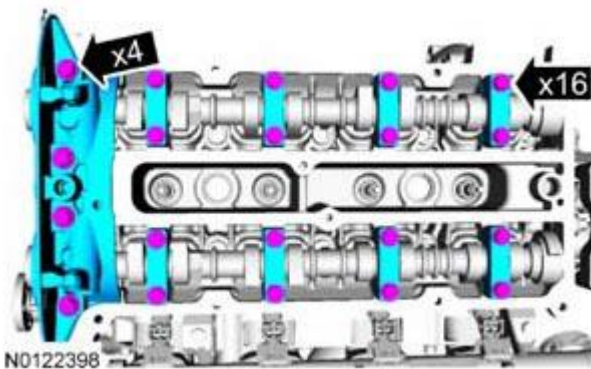


Fig. 528: Locating Camshaft Bearing Caps, VCT Bridge And Bolts
Courtesy of FORD MOTOR CO.

41. Install the camshaft bearing caps, VCT bridge and the bolts finger tight.
42. Tighten the bolts in the sequence shown in illustration in 6 stages.
- Stage 1: Tighten the bolts evenly, half a turn at a time, until the camshaft bearing caps and the VCT bridge are seated against the cylinder head.
 - Stage 2: Tighten bolts 1 through 16 to 7 Nm (62 lb-in).
 - Stage 3: Tighten bolts 17 through 20 to 10 Nm (89 lb-in).

- Stage 4: Tighten bolts 1 through 16 an additional 45 degrees.
- Stage 5: Tighten bolts 17 and 19 an additional 70 degrees.
- Stage 6: Tighten bolts 18 and 20 an additional 53 degrees.

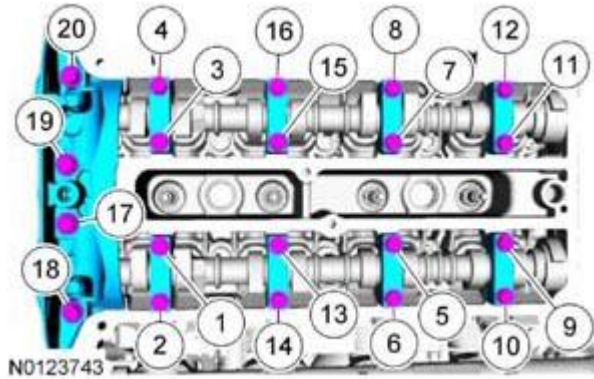


Fig. 529: Identifying Camshaft Bearing Caps And Variable Camshaft Timing (VCT) Bridge Bolts Tightening Sequence

Courtesy of FORD MOTOR CO.

43. If the cylinder head, camshafts or valve tappets were replaced, check the valve clearance. For additional information, REFER to **Valve Clearance Check**.
44. Using the Camshaft Seal Installer, install the 2 camshaft oil seals.

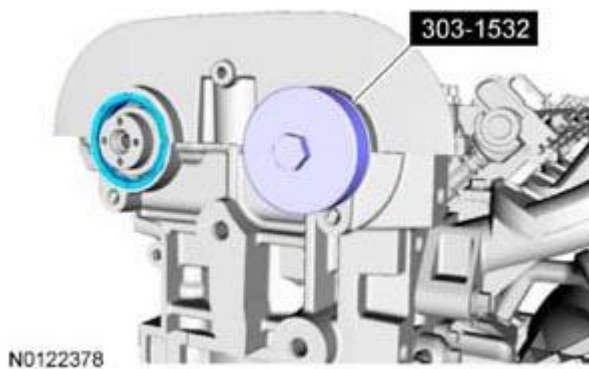


Fig. 530: Installing Camshaft Oil Seals

Courtesy of FORD MOTOR CO.

NOTE: It may be necessary to use an open-ended wrench to turn the camshafts by the hexagon to align the camshafts.

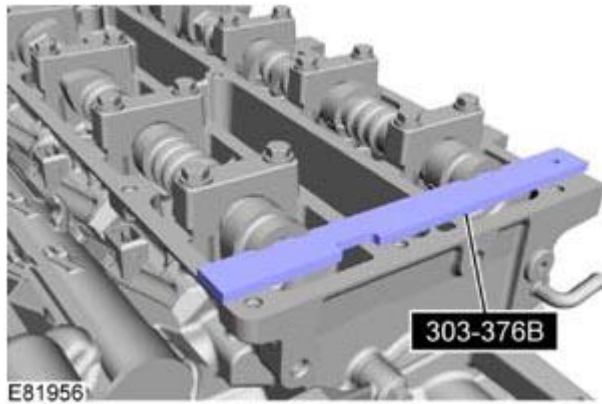


Fig. 531: Installing Camshaft Alignment Plate Into End Of Camshafts
Courtesy of FORD MOTOR CO.

45. Install the Camshaft Alignment Plate into the end of the camshafts.

NOTE: Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.

NOTE: The timing marks of the camshaft phaser and sprocket must be at the 12 o'clock position.

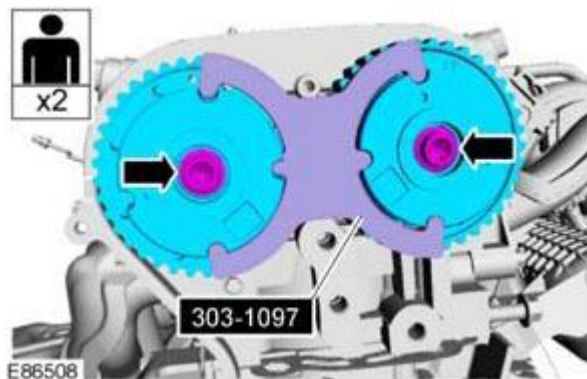


Fig. 532: Locating Camshaft Phaser And Sprockets Bolts
Courtesy of FORD MOTOR CO.

46. Install the 2 camshaft phaser and sprocket, bolts and the VCT Alignment Tool.
 - Tighten the 2 bolts to 25 Nm (18 lb-ft).
47. Remove the VCT Alignment Tool.

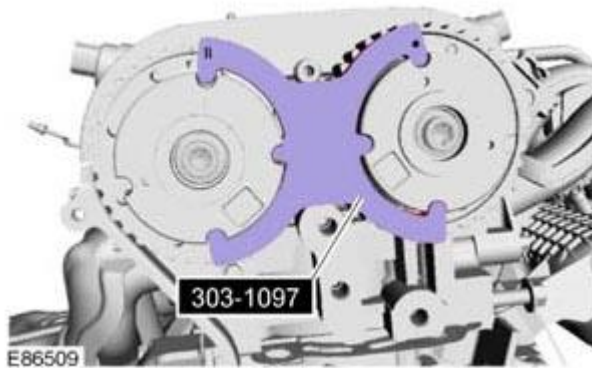


Fig. 533: Removing VCT Alignment Tool
Courtesy of FORD MOTOR CO.

48. Remove the Camshaft Alignment Plate.

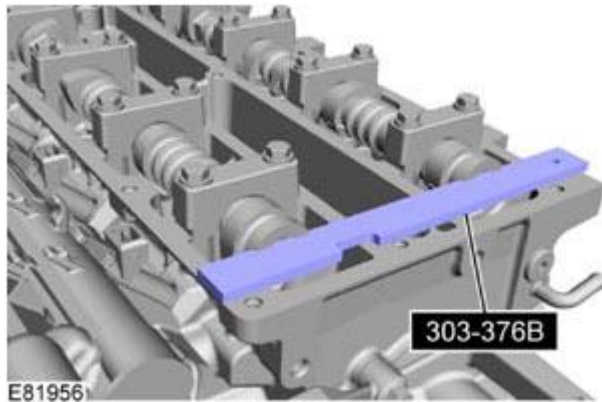


Fig. 534: Removing Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

NOTE: Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.

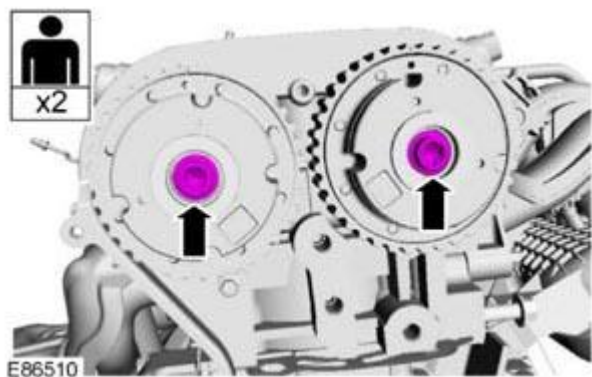


Fig. 535: Locating Camshaft Phaser And Sprocket Bolts

Courtesy of FORD MOTOR CO.

49. Tighten to 2 camshaft phaser and sprocket bolts an additional 75 degrees.

NOTE: The special tool can only be installed if the valve timing is correct.

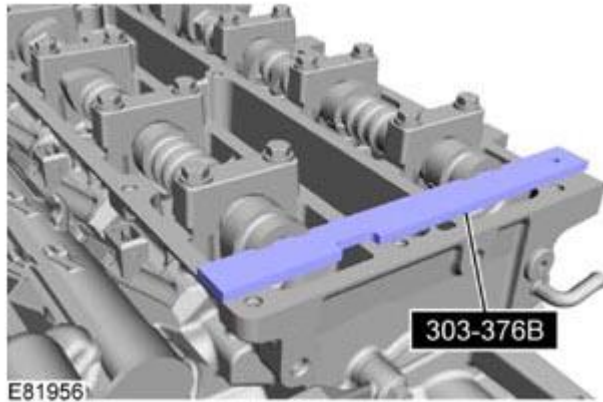


Fig. 536: Installing Camshaft Alignment Plate Into End Of Camshafts
Courtesy of FORD MOTOR CO.

50. Install the Camshaft Alignment Plate into the end of the camshafts.

NOTE: The special tool can only be installed if the valve timing is correct.

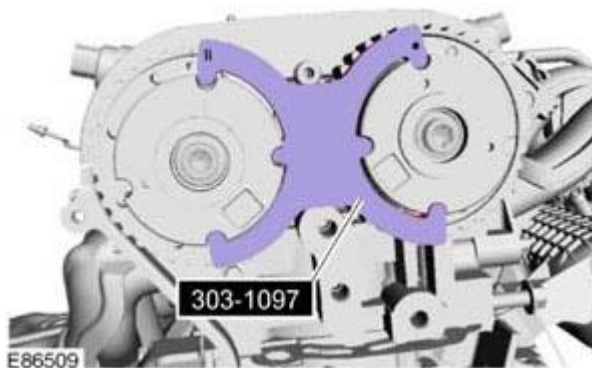


Fig. 537: Installing VCT Alignment Tool
Courtesy of FORD MOTOR CO.

51. Install the VCT Alignment Tool.
- If the special tools cannot be installed, repeat the adjustment according to the preceding steps.
52. Remove the VCT Alignment Tool.

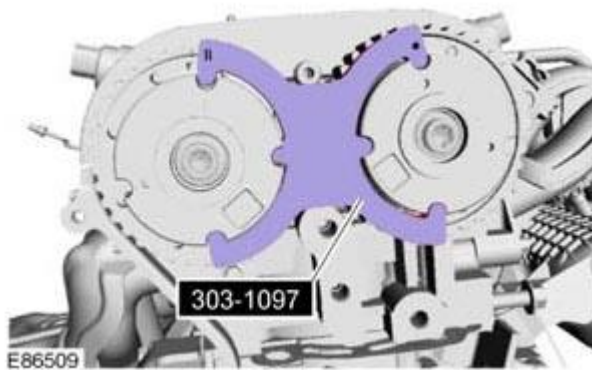


Fig. 538: Removing VCT Alignment Tool
Courtesy of FORD MOTOR CO.

53. Remove the Camshaft Alignment Plate.

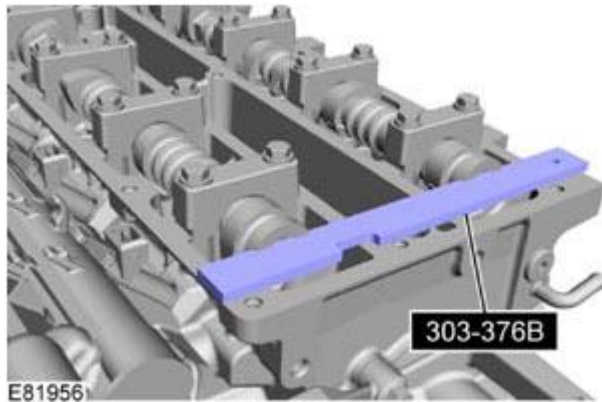


Fig. 539: Removing Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

NOTE: Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.

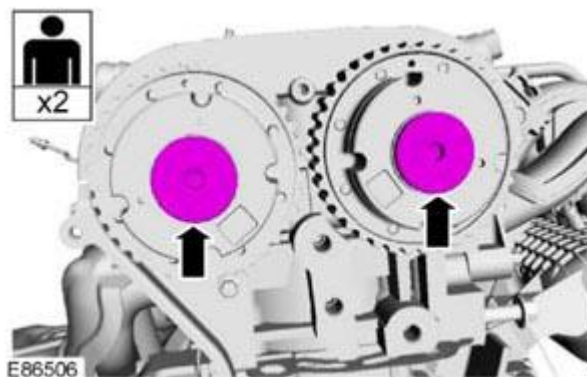


Fig. 540: Locating Camshaft Phaser And Sprocket Plugs

Courtesy of FORD MOTOR CO.

54. Install the 2 camshaft phaser and sprocket plugs.
 - Tighten to 16 Nm (142 lb-in).
55. Install the VCT Alignment Tool.

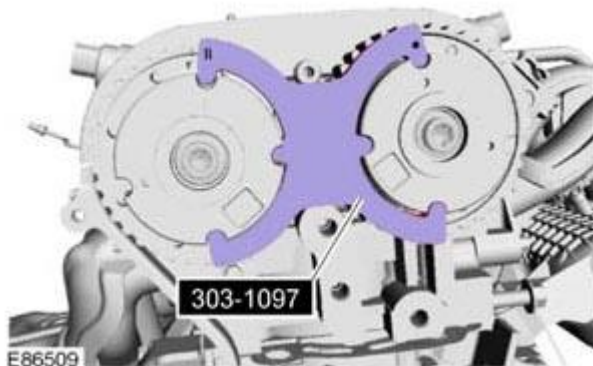


Fig. 541: Installing VCT Alignment Tool
Courtesy of FORD MOTOR CO.

56. Install the 4 spark plugs.
 - Tighten to 15 Nm (133 lb-in).

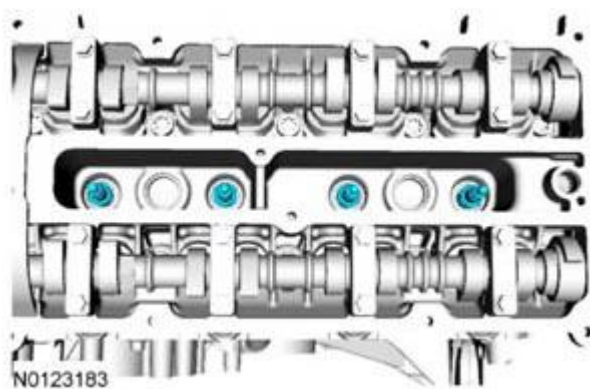


Fig. 542: Identifying Spark Plugs
Courtesy of FORD MOTOR CO.

57. Using a new gasket, install the coolant pump, 6 bolts and tighten in sequence shown in illustration in 2 stages.
 - Stage 1: Tighten to 6 Nm (53 lb-in).
 - Stage 2: Tighten to 10 Nm (89 lb-in).

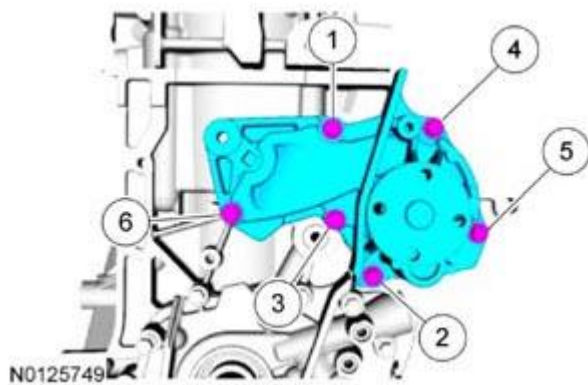


Fig. 543: Identifying Coolant Pump Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

58. Install the timing belt tensioner and the bolt.

- Tighten to 25 Nm (18 lb-ft).
- Rotate the timing belt tensioner clockwise and align the 2 holes on the tensioner and install a small screwdriver or holding pin.

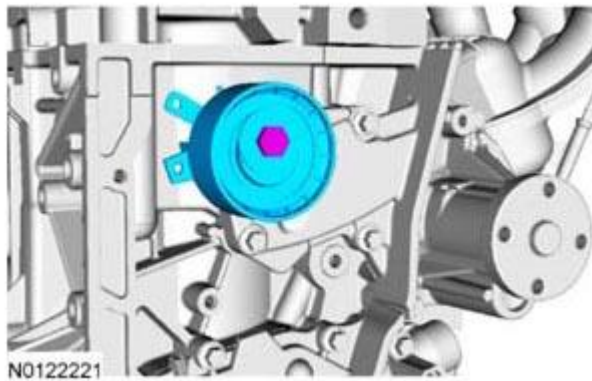


Fig. 544: Identifying Bolt And Timing Belt Tensioner
Courtesy of FORD MOTOR CO.

NOTE: Lubricate the oil seal with clean engine oil.

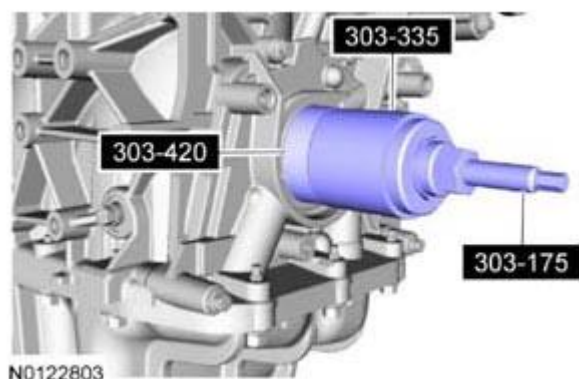


Fig. 545: Installing Crankshaft Front Oil Seal
Courtesy of FORD MOTOR CO.

59. Using the Crankshaft Vibration Damper Installer, Front Cover Oil Seal Installer and Front Crankshaft Seal Replacer, install the crankshaft front oil seal.
60. Install the crankshaft sprocket gear.

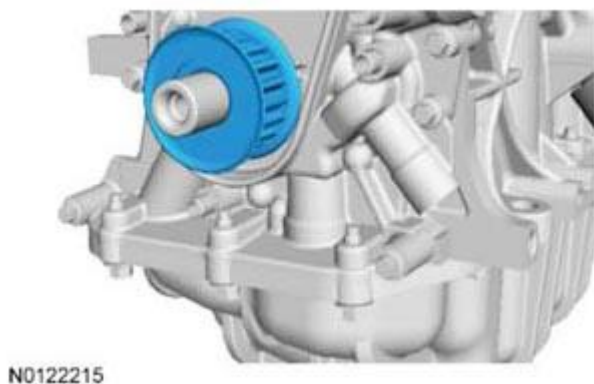


Fig. 546: Identifying Crankshaft Sprocket Gear
Courtesy of FORD MOTOR CO.

61. Install the timing belt cover backplate and the 4 bolts.
 - Tighten to 9 Nm (80 lb-in).

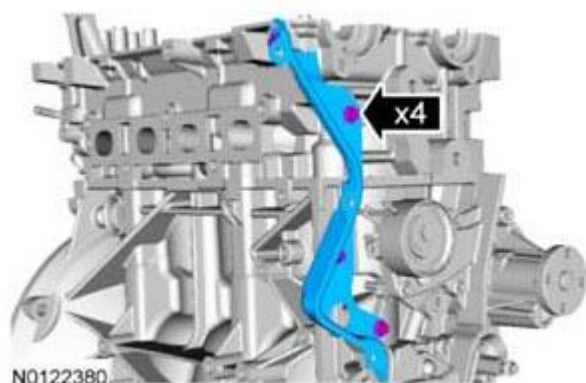


Fig. 547: Locating Bolts And Timing Belt Cover Backplate
Courtesy of FORD MOTOR CO.

62. Install the timing belt in the sequence shown in illustration.

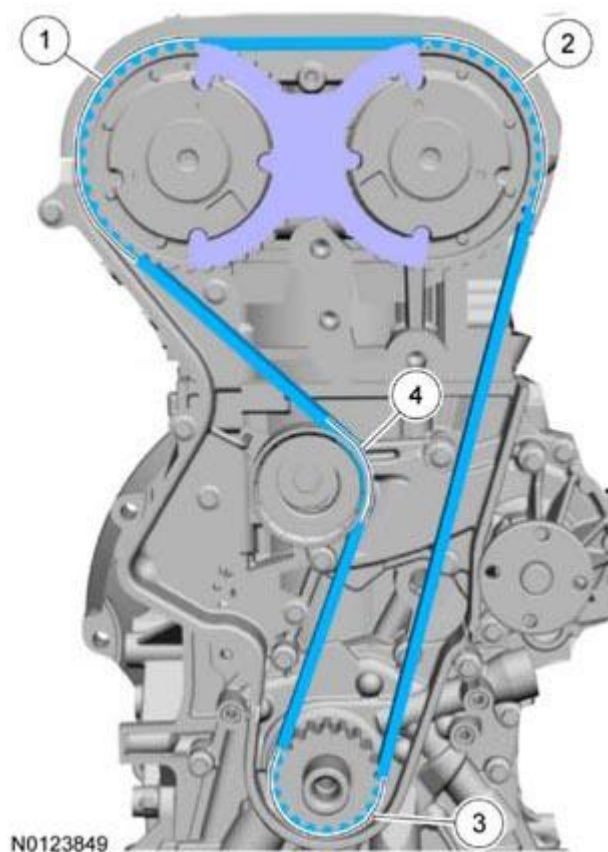


Fig. 548: Identifying Timing Belt In Sequence
Courtesy of FORD MOTOR CO.

WARNING: The timing belt tensioner spring is under load. Extra care must be taken at all times when handling the tensioner. Failure to follow this instruction may result in personal injury.

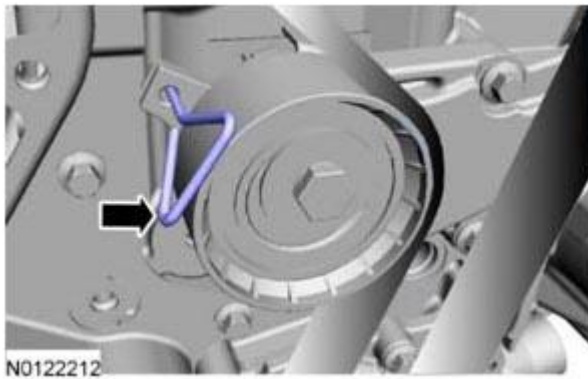


Fig. 549: Locating Timing Belt Tensioner Holding Tool
Courtesy of FORD MOTOR CO.

63. Remove the timing belt tensioner holding tool.
64. Install the lower timing belt cover and the 3 bolts.
 - Tighten to 9 Nm (80 lb-in).

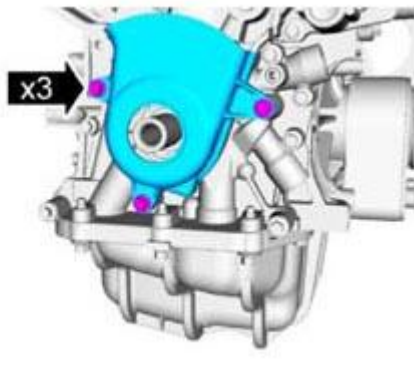


Fig. 550: Locating Bolts And Lower Timing Belt Cover
Courtesy of FORD MOTOR CO.

65. Install the crankshaft pulley and the new bolt.
 - Tighten to 100 Nm (74 lb-ft).
 - The final torque of the crankshaft will be completed in following steps.

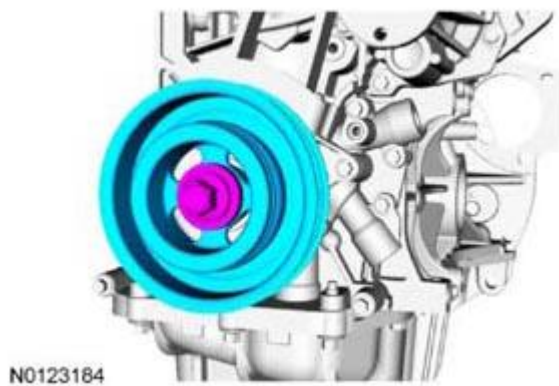


Fig. 551: Identifying Crankshaft Pulley And Bolt
Courtesy of FORD MOTOR CO.

66. Remove the Crankshaft TDC Timing Pin.

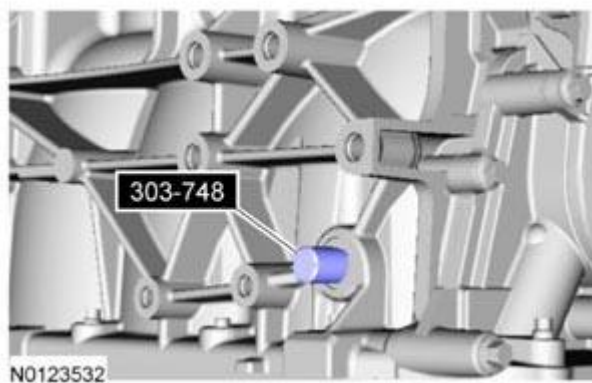


Fig. 552: Removing Crankshaft TDC Pin
Courtesy of FORD MOTOR CO.

67. Remove the VCT Alignment Tool.

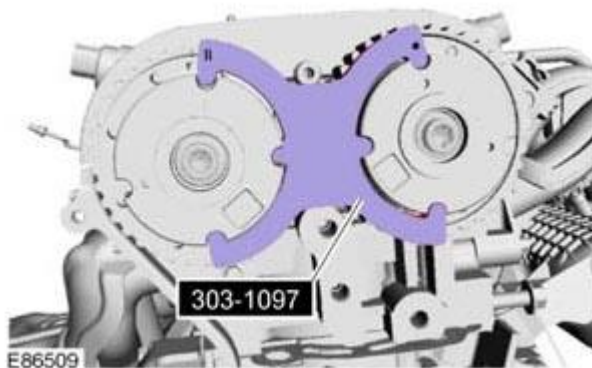


Fig. 553: Removing VCT Alignment Tool
Courtesy of FORD MOTOR CO.

68. Tighten the crankshaft bolt in the following 3 stages.
1. Stage 1: Using the Strap wrench, tighten an additional 90 degrees.
 2. Stage 2: Wait for 10 seconds.
 3. Stage 3: Using the Strap wrench, tighten an additional 15 degrees.



Fig. 554: Locating Crankshaft Bolt
Courtesy of FORD MOTOR CO.

NOTE: Only rotate the crankshaft clockwise direction.



Fig. 555: Rotating Crankshaft Clockwise
Courtesy of FORD MOTOR CO.

69. Rotate the crankshaft about 1 3/4 turns.
70. Install the Crankshaft TDC Timing Pin.

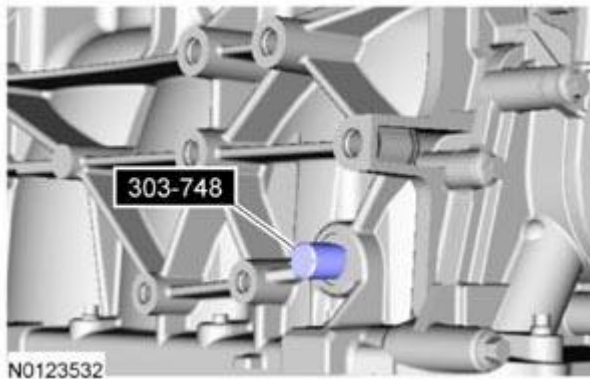


Fig. 556: Installing Crankshaft TDC Pin
Courtesy of FORD MOTOR CO.

NOTE: Only rotate the crankshaft clockwise direction.



Fig. 557: Rotating Crankshaft Clockwise
Courtesy of FORD MOTOR CO.

71. Rotate the crankshaft until it stops against the Crankshaft TDC Timing Pin.

NOTE: The special tool can only be installed if the valve timing is correct.

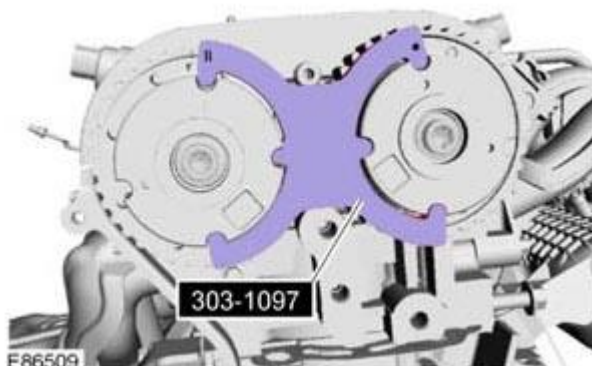


Fig. 558: Installing VCT Alignment Tool
Courtesy of FORD MOTOR CO.

72. Install the VCT Alignment Tool.
 - If the special tool cannot be installed, repeat the adjustment according to the preceding steps.
73. Remove the VCT Alignment Tool.

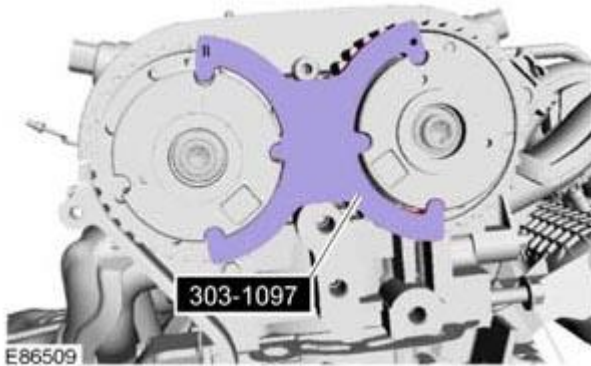


Fig. 559: Removing VCT Alignment Tool
Courtesy of FORD MOTOR CO.

74. Remove the Crankshaft TDC Timing Pin.

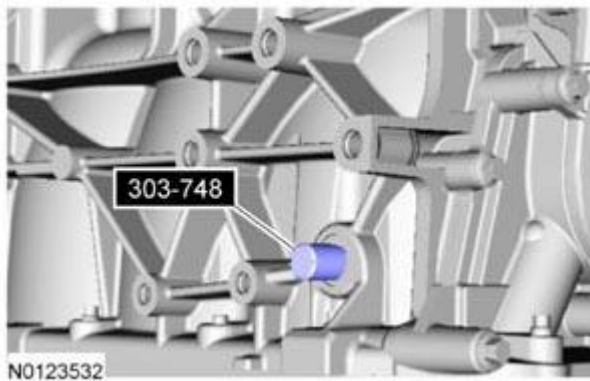


Fig. 560: Removing Crankshaft TDC Pin
Courtesy of FORD MOTOR CO.

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

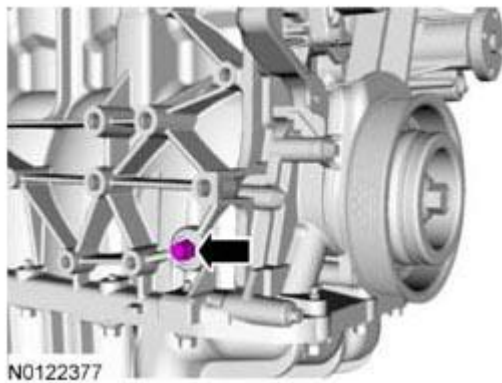


Fig. 561: Locating Engine Plug Bolt
Courtesy of FORD MOTOR CO.

76. Install the engine mount bracket and the 3 bolts finger tight.
 1. Tighten the 2 bolts to 55 Nm (41 lb-ft).
 2. Tighten the bolt to 55 Nm (41 lb-ft).

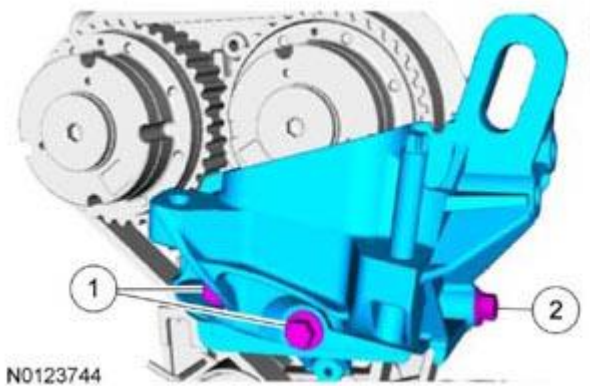


Fig. 562: Identifying Engine Mount Bracket And Bolts
Courtesy of FORD MOTOR CO.

77. Install the timing belt cover and the 9 bolts.
 - Tighten to 9 Nm (80 lb-in).

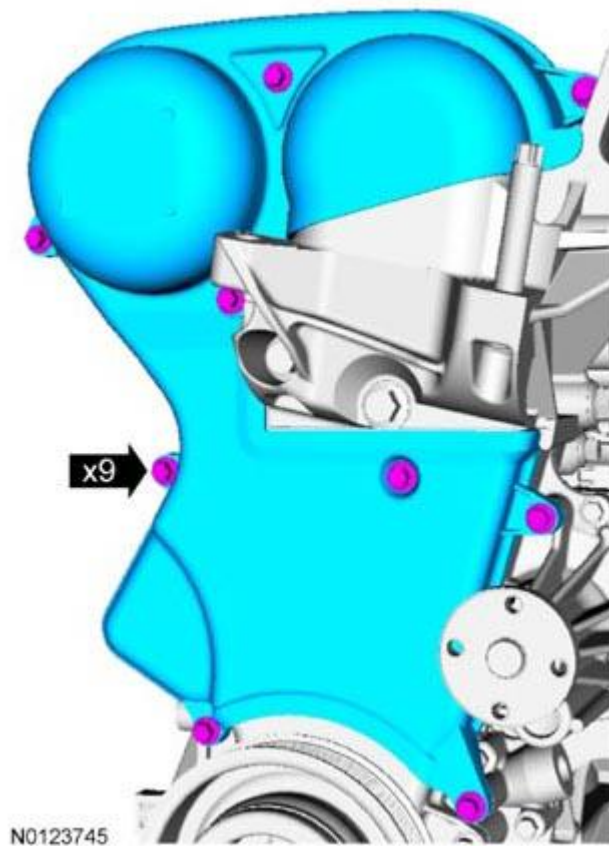


Fig. 563: Locating Bolts And Timing Belt Cover
Courtesy of FORD MOTOR CO.

78. Install the coolant pump pulley and the 4 bolts.
 - Tighten to 20 Nm (177 lb-in).

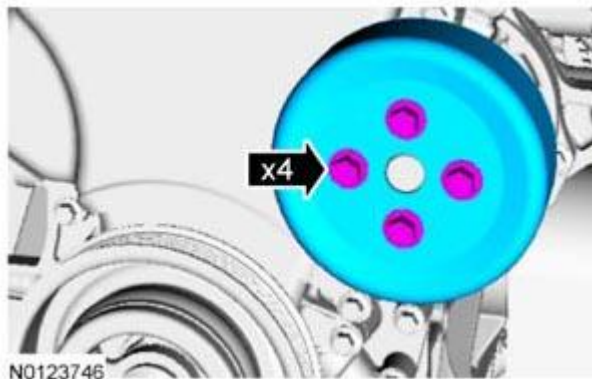


Fig. 564: Locating Bolts And Coolant Pump Pulley
Courtesy of FORD MOTOR CO.

79. Install the 1 engine mount stud finger tight.

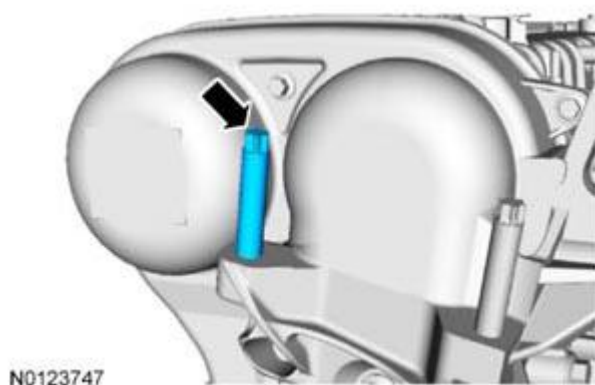


Fig. 565: Locating Engine Mount Stud
Courtesy of FORD MOTOR CO.

NOTE: The 2 engine mount studs must be torqued or damage to the powertrain may occur.

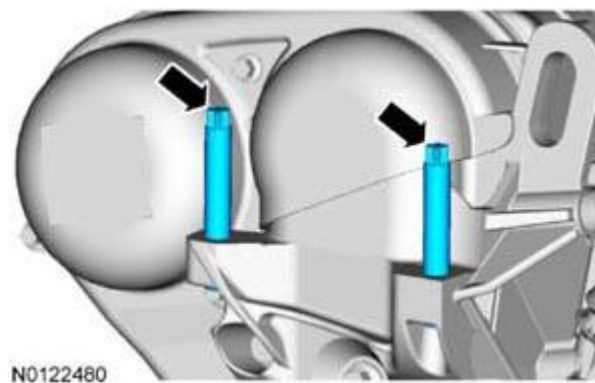


Fig. 566: Locating Engine Mount Studs
Courtesy of FORD MOTOR CO.

80. Torque the 2 engine mount studs before installing the engine mount nuts.
 - Tighten to 8 Nm (71 lb-in).
81. Using a new gasket, install the valve cover and tighten the retainers in sequence shown in illustration.
 - Tighten to 9 Nm (80 lb-in).

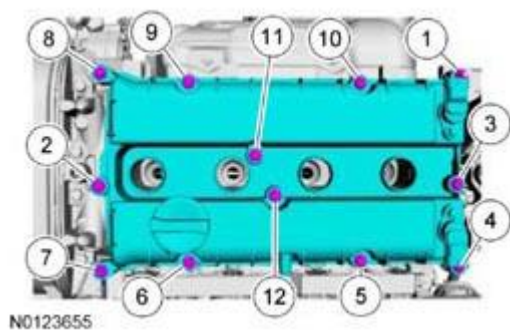


Fig. 567: Identifying Valve Cover And Retainers Tightening Sequence
Courtesy of FORD MOTOR CO.

82. Install the Heated Oxygen Sensor (HO2S) electrical connector bracket and the nut.
 - Tighten to 8 Nm (71 lb-in).

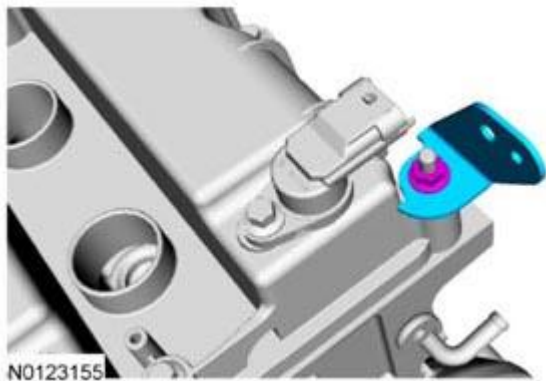


Fig. 568: Identifying Heated Oxygen Sensor (HO2S) Electrical Connector Bracket And Nut
Courtesy of FORD MOTOR CO.

NOTE: Lubricate the O-ring seals with clean engine oil.

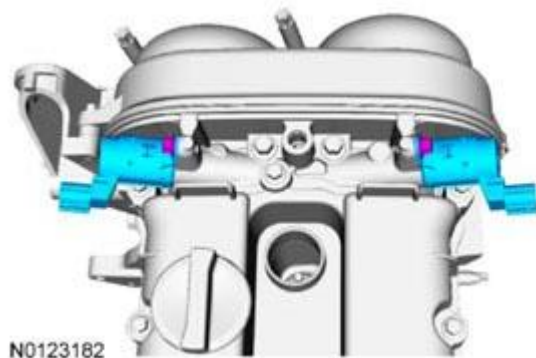


Fig. 569: Identifying Variable Camshaft Timing (VCT) Oil Control Solenoids And Bolts
Courtesy of FORD MOTOR CO.

83. Install the VCT oil control solenoids and the 2 bolts.
 - Tighten to 8 Nm (71 lb-in).
84. Install the Crankshaft Position (CKP) sensor and the bolt.
 - Tighten to 8 Nm (71 lb-in).



Fig. 570: Identifying Crankshaft Position (CKP) Sensor And Bolt
Courtesy of FORD MOTOR CO.

NOTE: Apply thread sealant to the Engine Oil Pressure (EOP) switch threads.

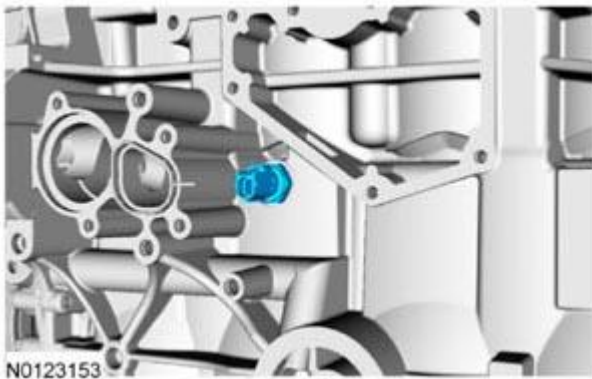


Fig. 571: Identifying Engine Oil Pressure (EOP) Switch
Courtesy of FORD MOTOR CO.

85. Install the EOP switch.
 - Tighten to 18 Nm (159 lb-in).
86. Install the crankcase vent oil separator and the bolts.
 - Tighten to 9 Nm (80 lb-in).

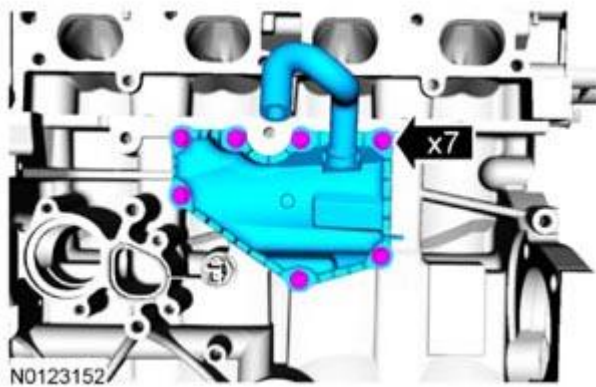


Fig. 572: Locating Bolts And Crankcase Vent Oil Separator
 Courtesy of FORD MOTOR CO.

87. Install the RH Knock Sensor (KS) at the 2 o'clock position and the LH KS at the 11 o'clock position and install the bolts.
 - Tighten to 20 Nm (177 lb-in).

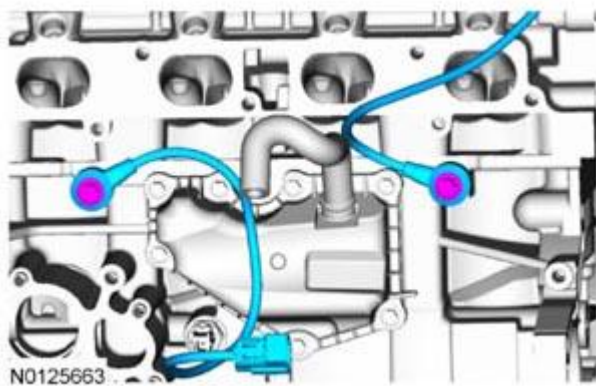


Fig. 573: Identifying KS Bolts
 Courtesy of FORD MOTOR CO.

88. Install the thermostat and seal in the engine block.

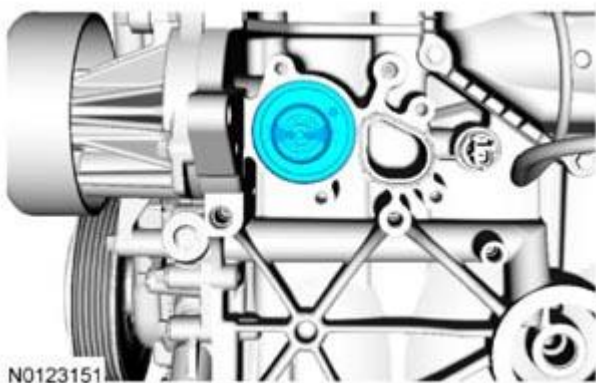


Fig. 574: Identifying Thermostat And Engine Block
Courtesy of FORD MOTOR CO.

89. Install the gasket, thermostat housing and the 4 bolts finger tight. Tighten the bolts in sequence shown in illustration in 2 stages.
- Stage 1: Tighten to 2 Nm (18 lb-in).
 - Stage 2: Tighten to 10 Nm (89 lb-in).

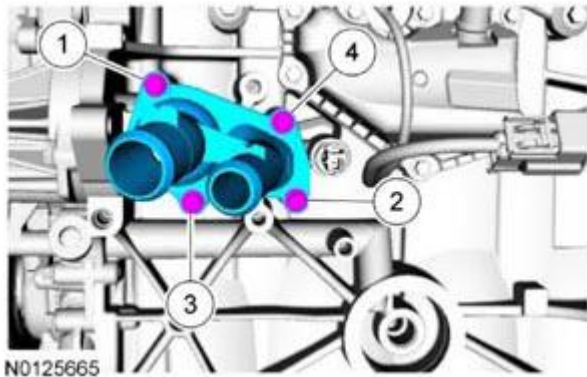


Fig. 575: Identifying Thermostat Housing And Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

NOTE: A new oil cooler must be installed or severe damage to the engine can occur.

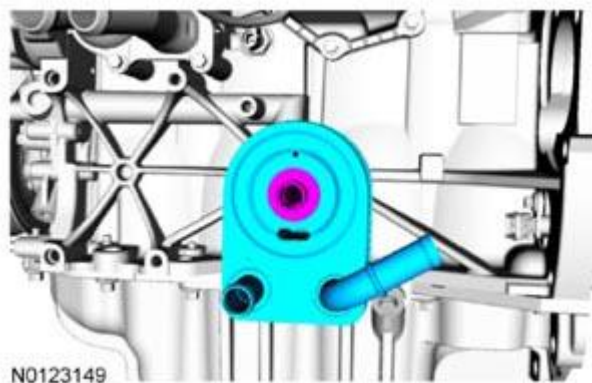
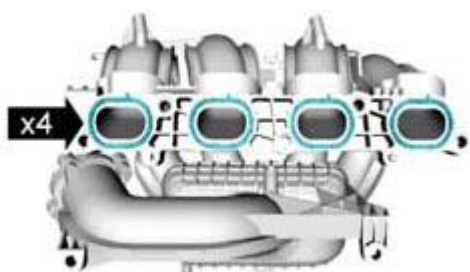


Fig. 576: Identifying Bolt And Oil Cooler
Courtesy of FORD MOTOR CO.

90. Install the new oil cooler and the bolt.
- Tighten to 56 Nm (41 lb-ft).

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.



N0122181

Fig. 577: Locating Intake Manifold Gaskets
Courtesy of FORD MOTOR CO.

91. Inspect and install new intake manifold gaskets if necessary.
92. Install the intake manifold and the 7 bolts.
 - Connect the PCV hose to the intake manifold.
 - Tighten to 18 Nm (159 lb-in).

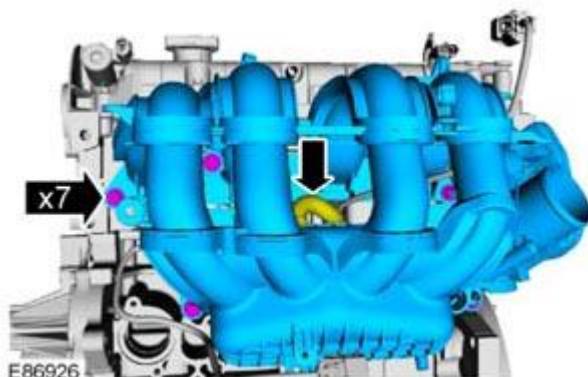


Fig. 578: Locating Bolts And Intake Manifold
Courtesy of FORD MOTOR CO.

93. Attach the KS electrical connector to the intake manifold.

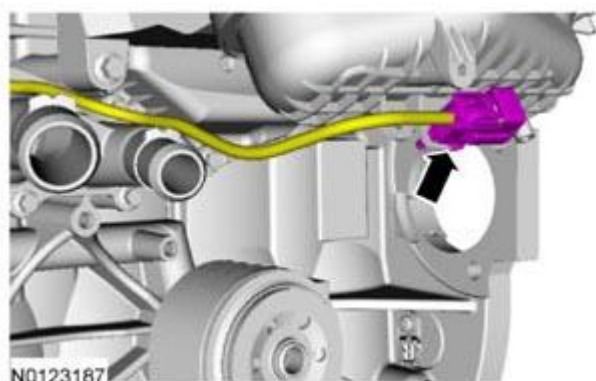


Fig. 579: Locating Knock Sensor Electrical Connector

Courtesy of FORD MOTOR CO.

NOTE: Use O-ring seals that are made of special fuel-resistant material. The use of ordinary O-rings may cause the fuel system to leak. Do not reuse the O-ring seals.

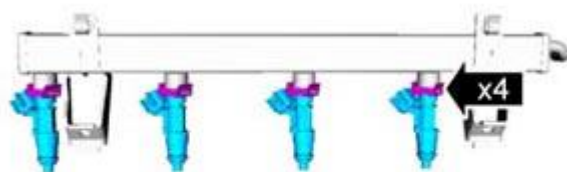


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Fig. 580: Identifying Fuel Injector O-Ring Seals

Courtesy of FORD MOTOR CO.

94. Install the new O-ring seals onto the fuel injectors and lubricate them with clean engine oil.
95. Install the 4 fuel injectors and the 4 fuel injector clips into the fuel rail.



N0123148

Fig. 581: Identifying Fuel Injector Clips And Fuel Injectors

Courtesy of FORD MOTOR CO.

96. Install the fuel rail and fuel injectors as an assembly and install the 2 bolts.

- Tighten to 11 Nm (97 lb-in).

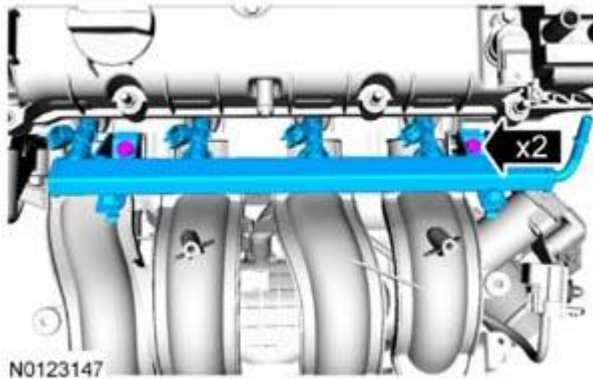


Fig. 582: Identifying Fuel Rail Assembly And Bolts
Courtesy of FORD MOTOR CO.

97. If equipped, position the block heater and finger-tighten the nut, making sure the block heater electrical connector points to the 8 o'clock position.
- Tighten the nut to 3 Nm (27 lb-in).

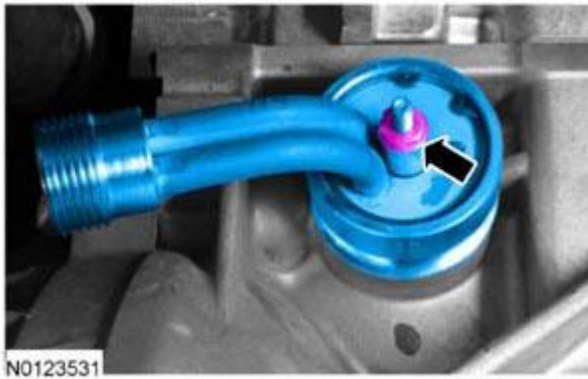


Fig. 583: Locating Engine Block Heater
Courtesy of FORD MOTOR CO.

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

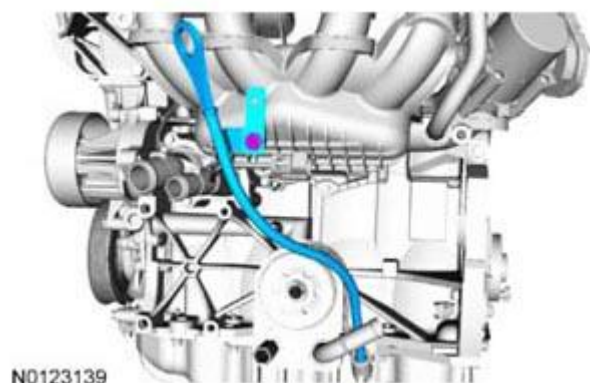


Fig. 584: Identifying Oil Level Indicator Tube And Screw
Courtesy of FORD MOTOR CO.

98. Install the oil level indicator and tube and the screw.
 - Tighten to 4 Nm (35 lb-in).
99. Install the LH engine lift eye and the 2 bolts.
 - Tighten to 19 Nm (168 lb-in).

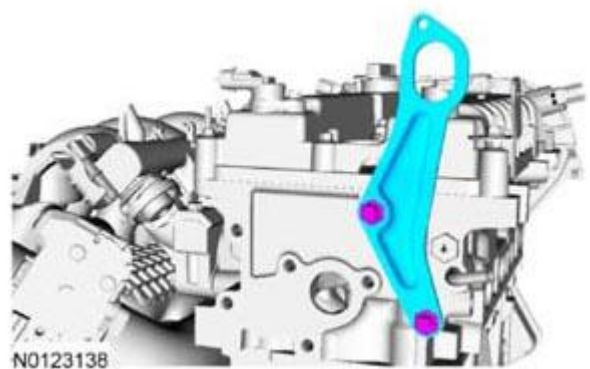


Fig. 585: Identifying Bolts And Engine Lift Eye
Courtesy of FORD MOTOR CO.

100. Install the ignition coil and coolant outlet assembly and the 4 bolts.
 - Tighten to 19 Nm (168 lb-in).

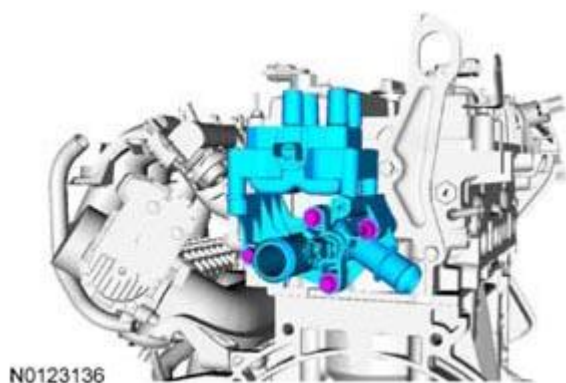


Fig. 586: Identifying Coolant Outlet And Ignition Coil Assembly Bolts
Courtesy of FORD MOTOR CO.

101. Install the coolant outlet bracket, nut and the bolt.
 - Tighten to 6 Nm (53 lb-in).

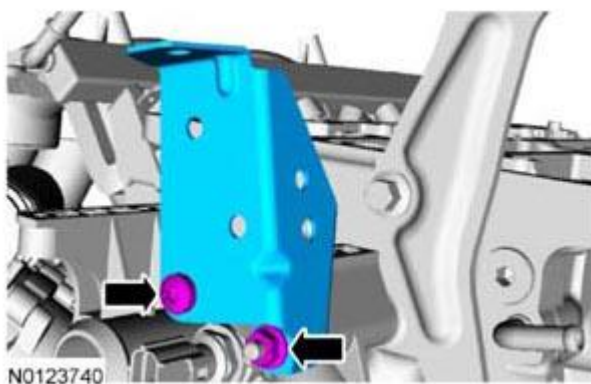


Fig. 587: Locating Coolant Outlet Bracket Nut And Bolt
Courtesy of FORD MOTOR CO.

102. Connect the coolant return hose to the cylinder head.
 - Attach the coolant tube to the fuel rail retainers.

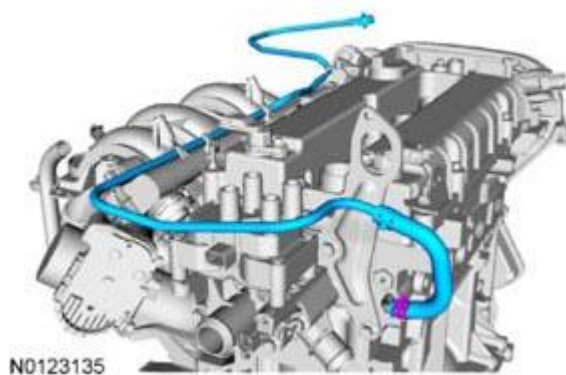


Fig. 588: Identifying Coolant Tube To Fuel Rail Retainers
Courtesy of FORD MOTOR CO.

103. Connect the coolant hose to the coolant outlet.

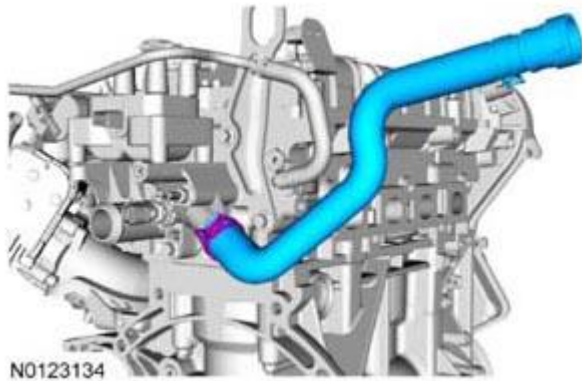


Fig. 589: Identifying Coolant Hose To Coolant Outlet
Courtesy of FORD MOTOR CO.

NOTE: Apply silicone dielectric compound to the inside of the spark plug wire boots.

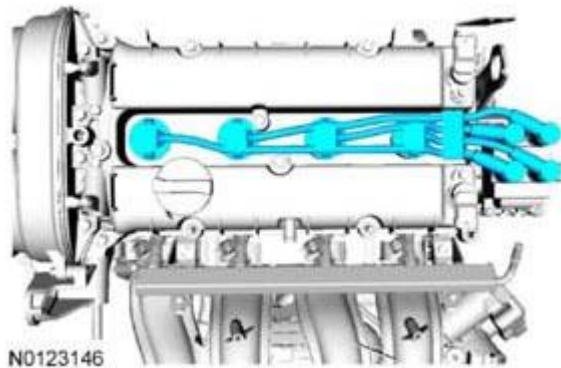


Fig. 590: Identifying Spark Plug Wires
Courtesy of FORD MOTOR CO.

104. Install the 4 spark plug wires.
105. Install the Evaporative Emission (EVAP) canister purge valve and the bolt.
- Tighten to 9 Nm (80 lb-in).

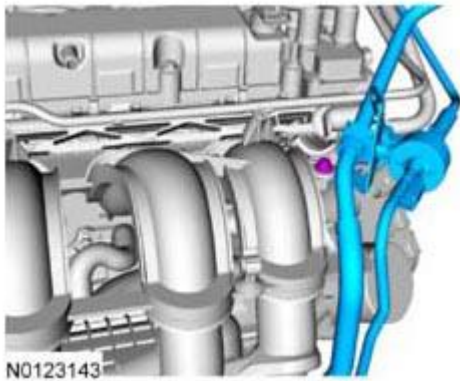


Fig. 591: Identifying EVAP Canister Purge Valve Bolt
Courtesy of FORD MOTOR CO.

106. Attach the EVAP tube and coolant tube to the coolant outlet bracket retainer.

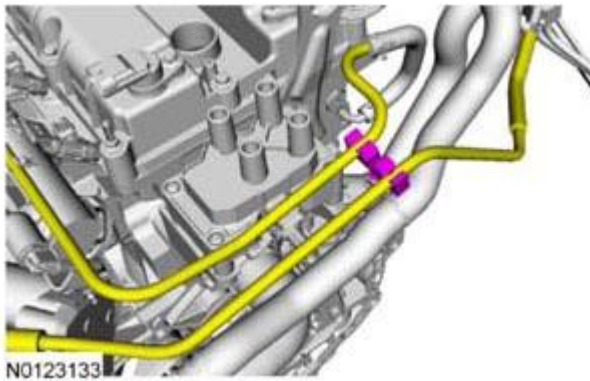


Fig. 592: Identifying EVAP Tube And Coolant Tube To Coolant Outlet Bracket Retainer
Courtesy of FORD MOTOR CO.

107. Connect the brake booster vacuum tube to the intake manifold.

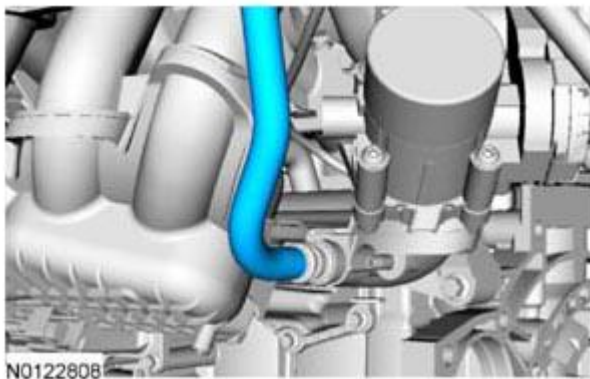


Fig. 593: Identifying Brake Booster Vacuum Tube To Intake Manifold
Courtesy of FORD MOTOR CO.

108. Connect the EVAP canister purge valve tube to the intake manifold.

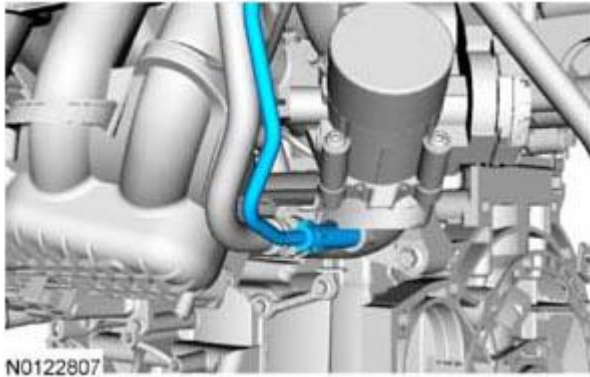


Fig. 594: Identifying Evaporative Emission (EVAP) Canister Purge Valve Tube To Intake Manifold
Courtesy of FORD MOTOR CO.

109. Using the Heavy Duty Floor Crane and Spreader Bar, remove the engine from the engine stand.

Vehicles with automatic transaxle

110. Align the flexplate and crankshaft using the dowel pin location hole and install the new bolts finger tight.

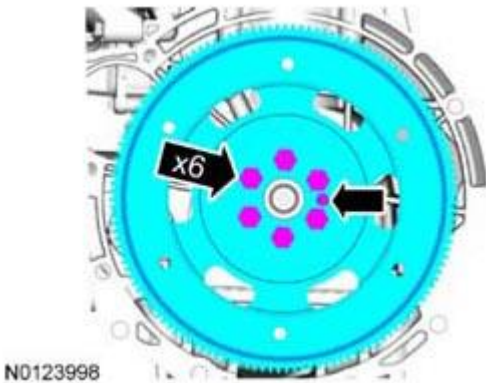


Fig. 595: Locating Flexplate Bolts
Courtesy of FORD MOTOR CO.

111. Install the Flywheel Holding Tool.

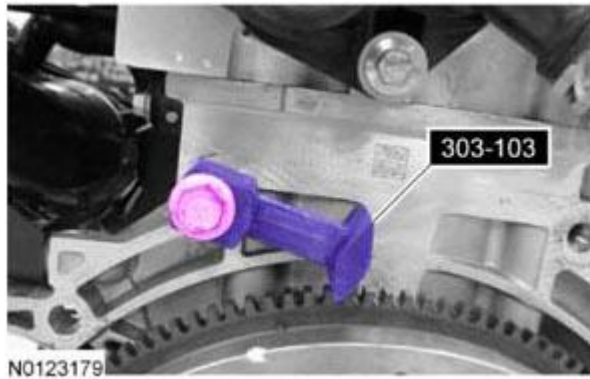


Fig. 596: Installing Flywheel Holding Tool
Courtesy of FORD MOTOR CO.

112. Tighten the bolts in the sequence shown in illustration in 2 stages:
- Stage 1: Tighten to 30 Nm (22 lb-ft).
 - Stage 2: Tighten an additional 80 degrees.



Fig. 597: Identifying Flexplate Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

Vehicles with manual transaxle

113. Align the flywheel and crankshaft using the dowel pin location hole and install the new bolts finger tight.

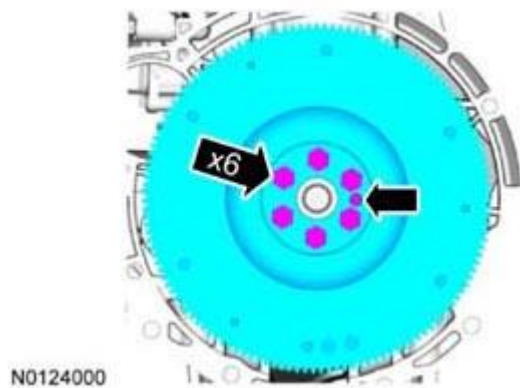


Fig. 598: Locating Flywheel Bolts
Courtesy of FORD MOTOR CO.

114. Install the Flywheel Holding Tool.

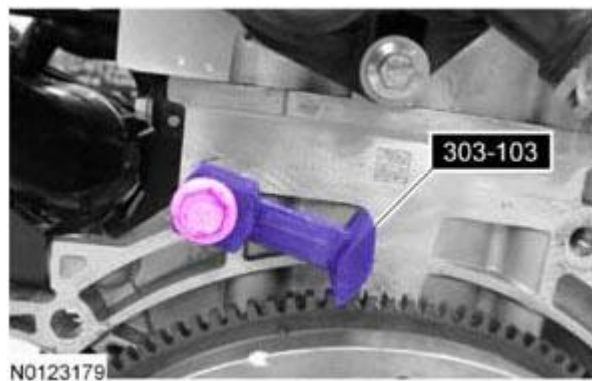


Fig. 599: Installing Flywheel Holding Tool
Courtesy of FORD MOTOR CO.

115. Tighten the bolts in the sequence shown in illustration in 2 stages:

- Stage 1: Tighten to 30 Nm (22 lb-ft).
- Stage 2: Tighten an additional 80 degrees.

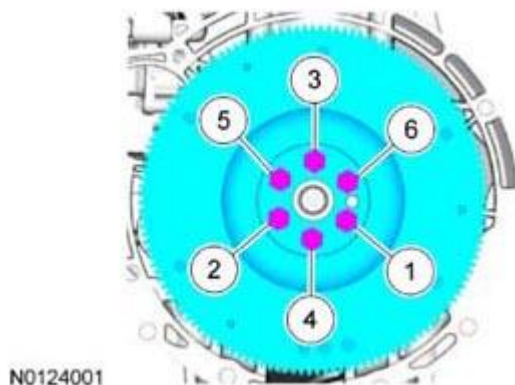
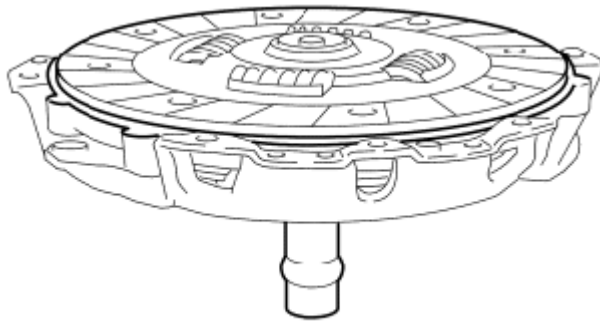


Fig. 600: Identifying Flywheel Bolts Tightening Sequence

Courtesy of FORD MOTOR CO.

NOTE: Be sure the clutch is installed correctly in the pressure plate. The side of the clutch marked gearbox side faces the pressure plate fingers. Failure to install the clutch plate will damage the clutch assembly during installation on the flywheel.

NOTE: Do not use cleaners with a petroleum base and do not immerse the clutch pressure plate in solvent or damage may occur.



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Fig. 601: Identifying Clutch Disc On Clutch Pressure Plate

Courtesy of FORD MOTOR CO.

116. Position the clutch disc on the clutch pressure plate with the side of the clutch marked gearbox side facing the pressure plate fingers. Using a suitable clutch aligner, centralize the clutch disc to the clutch pressure plate.

NOTE: Use a clutch disc aligner (such as OTC® Clutch Alignment Tool Set 4528 or equivalent).

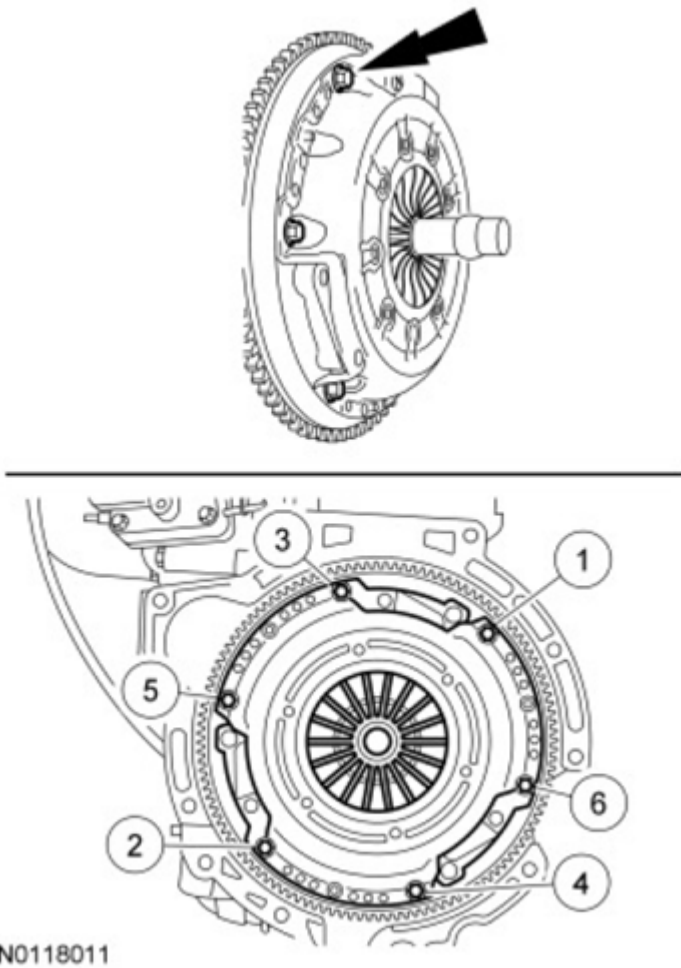


Fig. 602: Locating Clutch Pressure Plate-To-Flywheel Bolts
Courtesy of FORD MOTOR CO.

117. Using a clutch disc aligner, position the clutch disc and clutch pressure plate on the flywheel. Install the 6 new clutch pressure plate-to-flywheel bolts.
- Tighten the bolts evenly two turns at a time in the pattern shown in illustration.
 - Tighten to 29 Nm (21 lb-ft).

INSTALLATION

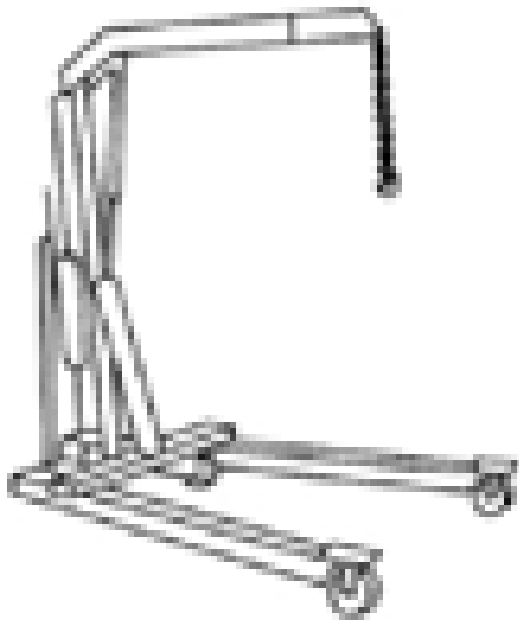
ENGINE - AUTOMATIC TRANSAXLE

SPECIAL TOOLS

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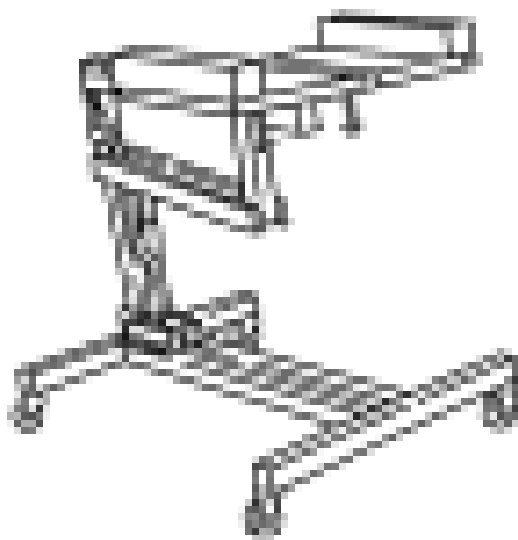
2013 Ford Fiesta S

2013 ENGINE Engine Mechanical - 1.6L - Fiesta



ST1341-A

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



ST1652-A

Powertrain Lift
300-OTC1585AE

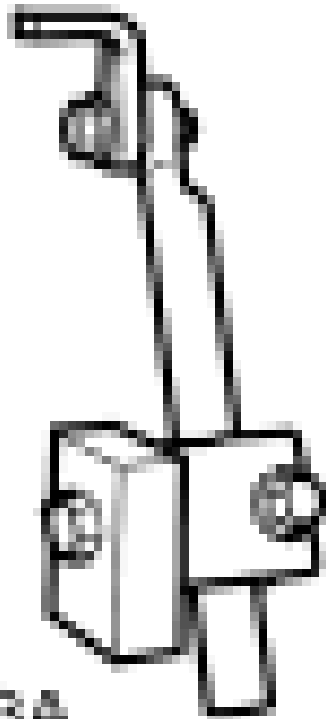
2013 Ford Fiesta S

2013 ENGINE Engine Mechanical - 1.6L - Fiesta



ST1602-A

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



ST2743A

Adjustable Grip Arm, 1735A
014-00001

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

All vehicles

NOTE: Use caution not to damage the engine-to-transaxle separator plate or damage can occur.

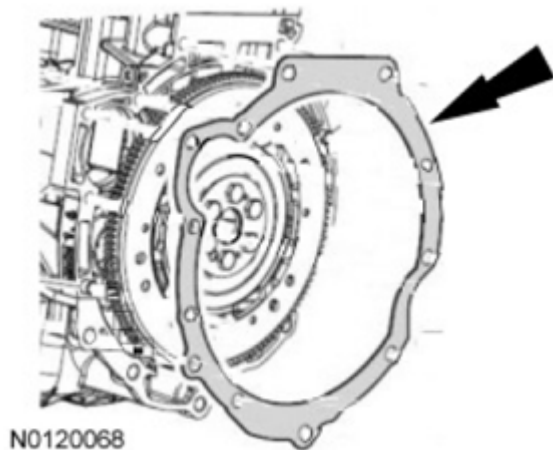
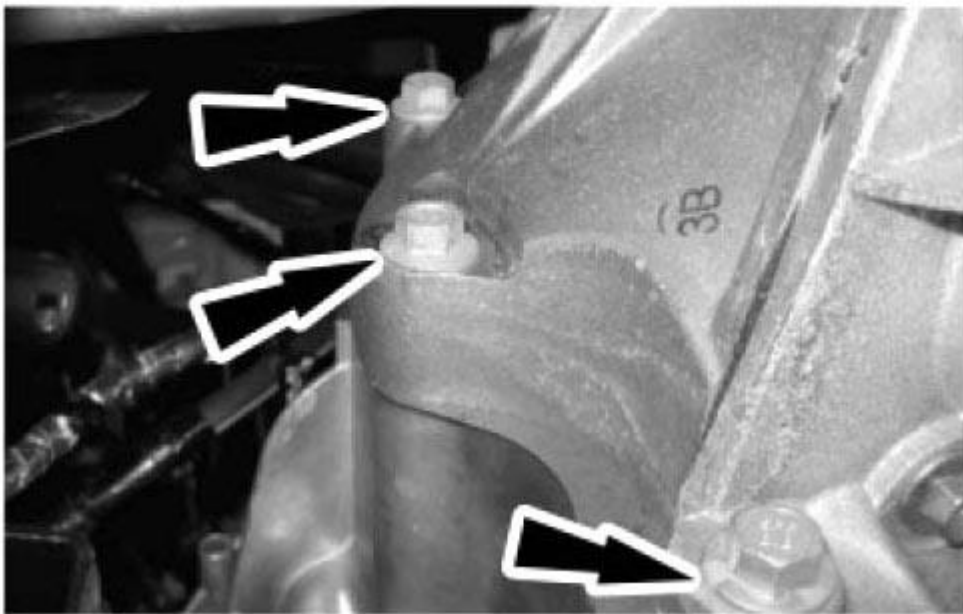
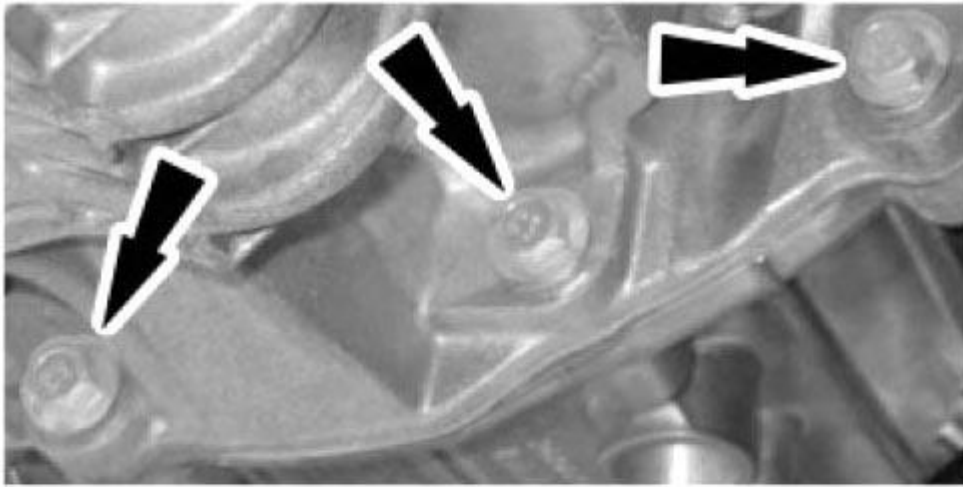


Fig. 603: Locating Engine-To-Transaxle Separator Plate
Courtesy of FORD MOTOR CO.

1. Install the new engine-to-transaxle separator plate.
2. Using the Heavy Duty Floor Crane and Spreader Bar, position the engine and transaxle together. Install the 6 engine-to-bellhousing bolts.
 - Tighten to 48 Nm (35 lb-ft).



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Fig. 604: Locating Clutch Housing-To-Engine Bolts
Courtesy of FORD MOTOR CO.

3. Using the Floor Crane and Spreader Bar, raise the engine and transaxle assembly onto the lift table.



Fig. 605: Lifting Engine And Transaxle Assembly Using Floor Crane And Spreader Bar
Courtesy of FORD MOTOR CO.

4. Using the Powertrain Lift and Adjustable Grip Arms, secure the engine and transaxle assembly to the lift table.

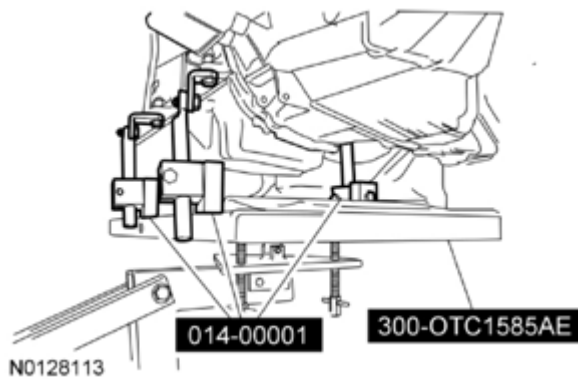


Fig. 606: Securing Engine To Lift Table
Courtesy of FORD MOTOR CO.

- NOTE:** Rotate the engine in a clockwise direction only or engine damage will occur.
- NOTE:** Tighten the flexplate-to-clutch nuts in a star pattern or transaxle damage can occur.
- NOTE:** Using a magnetic socket will help ensure ease of installation. If the nuts are dropped in the clutch housing, the transaxle will have to be removed to retrieve them.

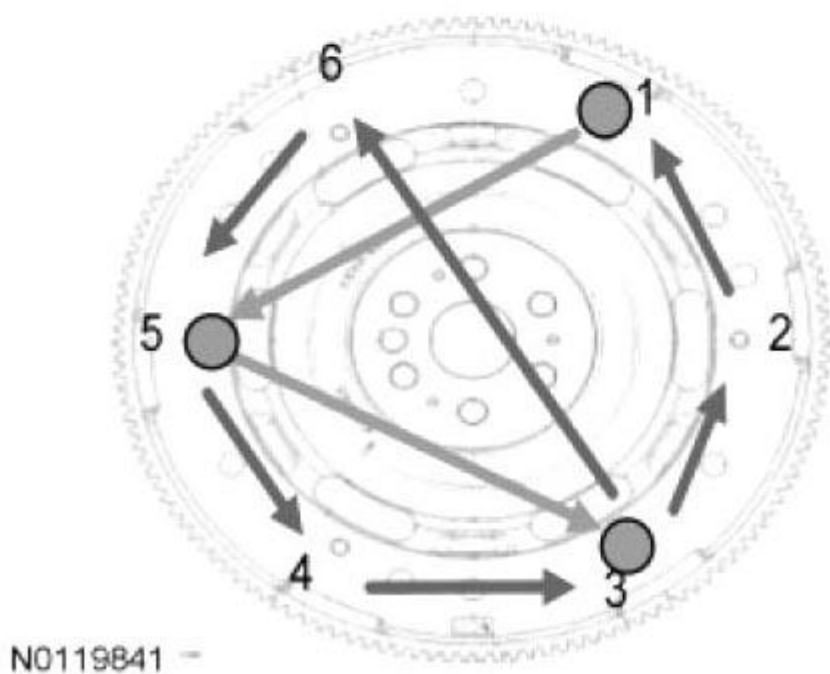
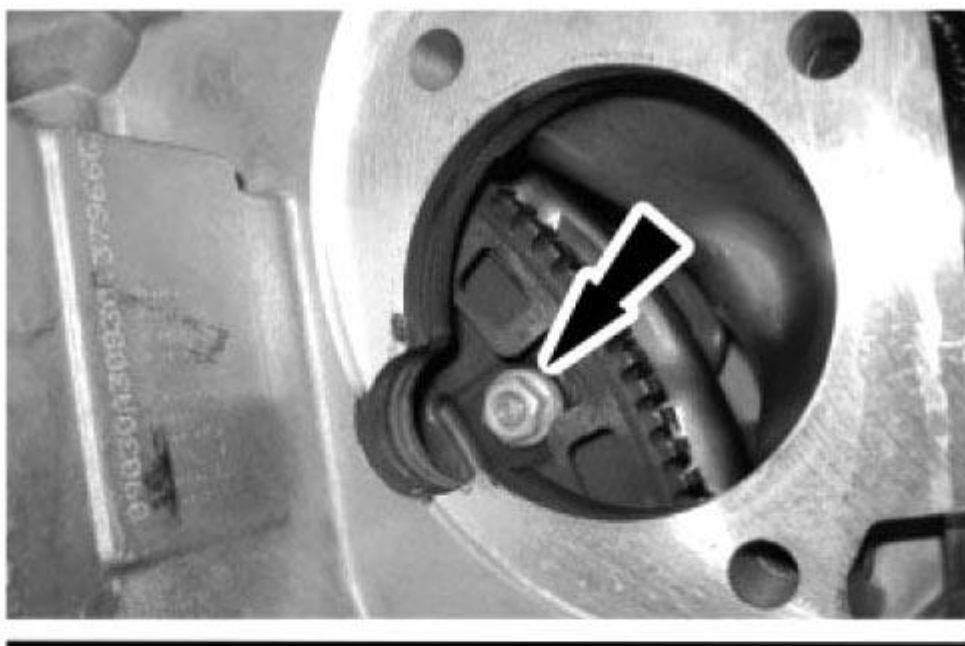


Fig. 607: Locating Flexplate-To-Clutch Nuts
Courtesy of FORD MOTOR CO.

5. Install the 6 new flexplate-to-clutch nuts. Tighten the nuts in a star pattern in 2 stages.
 - Stage 1: Tighten nuts 1, 5 and 3 to 12 Nm (106 lb-in).
 - Stage 2: Tighten all nuts to 25 Nm (18 lb-ft).
6. Install the flexplate-to-clutch nut access cover.

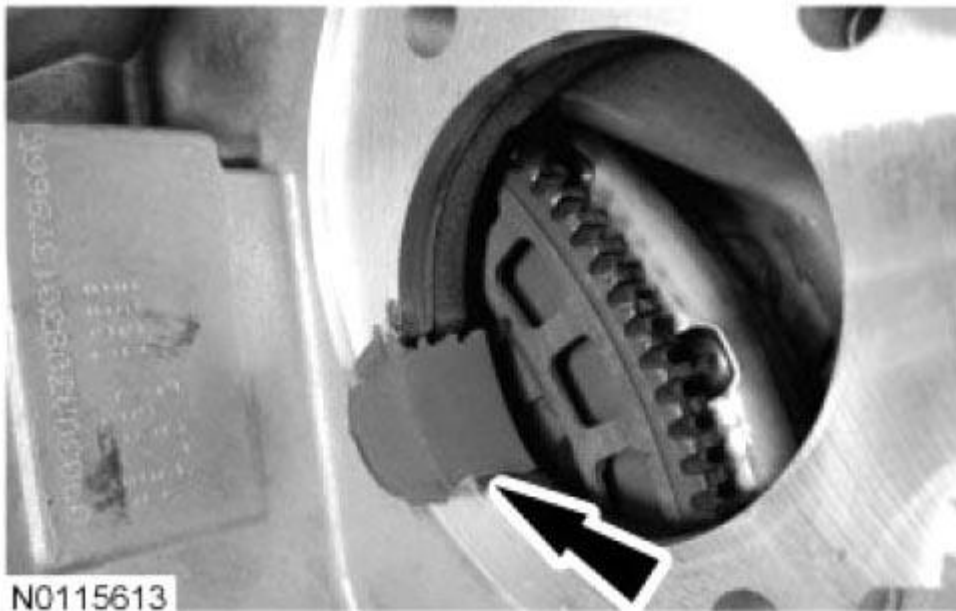


Fig. 608: Locating Clutch Nut Access Cover
Courtesy of FORD MOTOR CO.

7. Install the 2 upper bellhousing-to-engine bolts and bracket.
 - Tighten to 48 Nm (35 lb-ft).
 - Attach the wiring harness pin-type retainer to the bracket.



Fig. 609: Locating Upper Bellhousing-To-Engine Bolts

Courtesy of FORD MOTOR CO.

8. Install the starter motor and the 3 bolts (2 shown in illustration).
 - Install the 3 bolts finger-tight.
 - Tighten the 2 upper bolts to 48 Nm (35 lb-ft).
 - Tighten the lower bolt to 48 Nm (35 lb-ft).

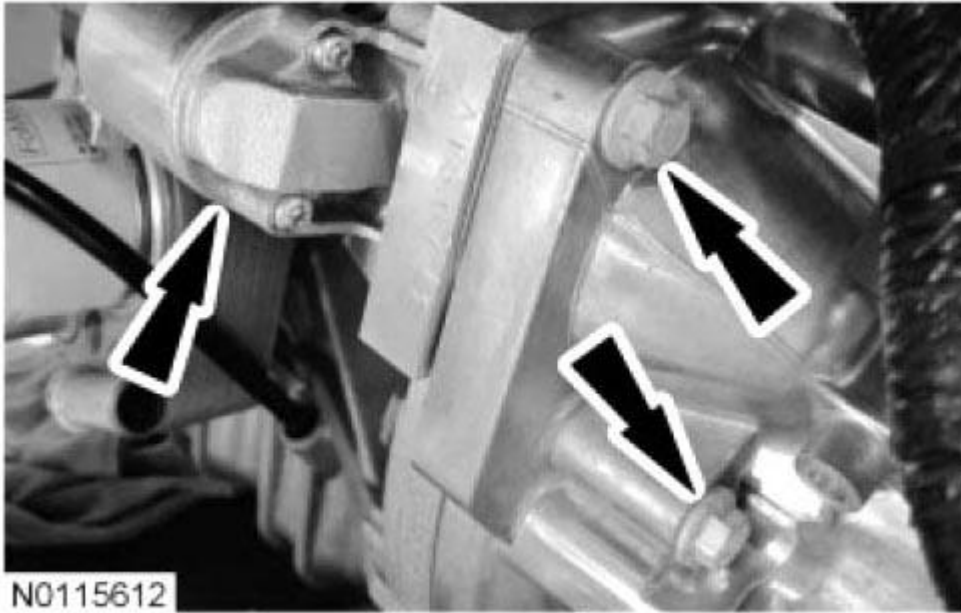


Fig. 610: Locating Bolts And Starter Motor
Courtesy of FORD MOTOR CO.

9. Connect the starter motor electrical terminals and install the 2 nuts.
 - Tighten to 10 Nm (89 lb-in).

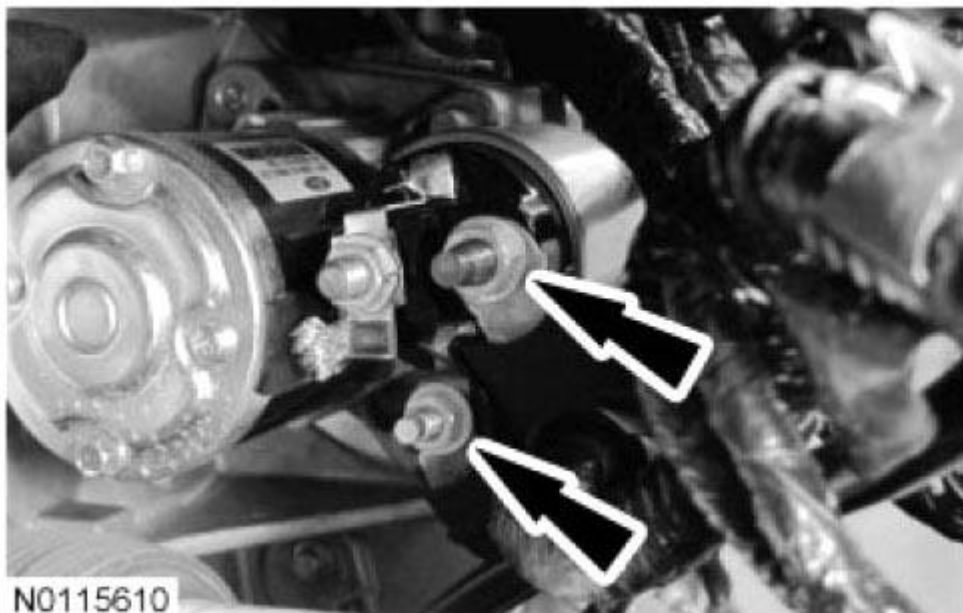


Fig. 611: Locating Nuts And Starter Motor Electrical Terminals
Courtesy of FORD MOTOR CO.

10. Connect the RH Knock Sensor (KS) electrical connector.
 - Attach the 2 wiring harness retainers to the intake manifold.

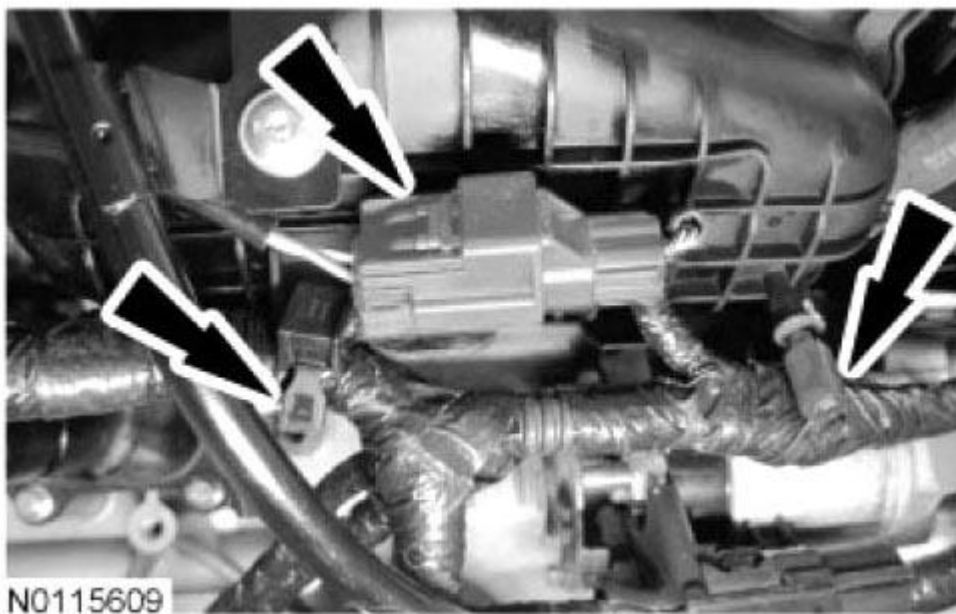


Fig. 612: Locating Wiring Harness Retainers From Intake Manifold
Courtesy of FORD MOTOR CO.

11. Connect the Engine Oil Pressure (EOP) switch electrical connector.
 - Attach the wiring harness retainer to the engine block.

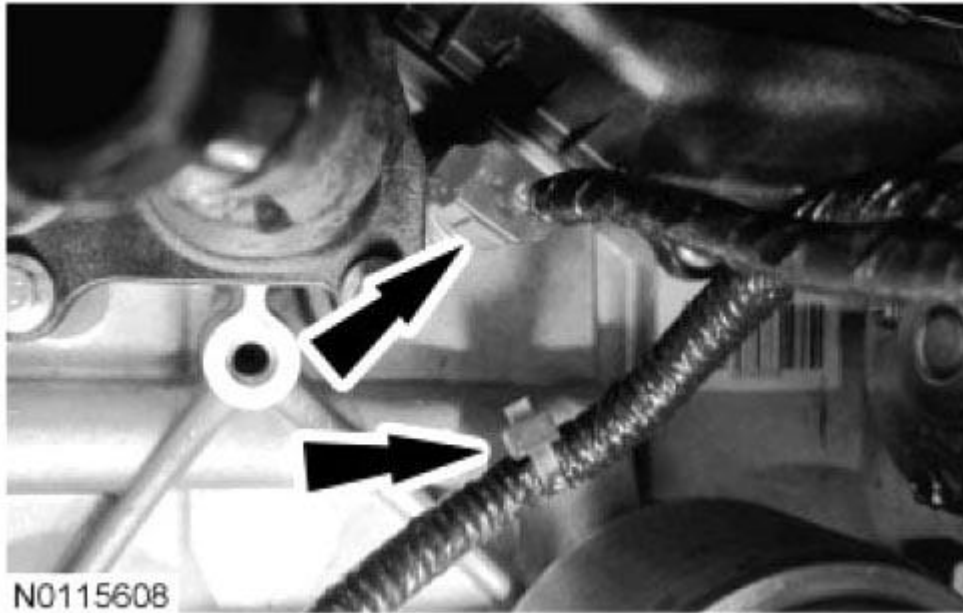


Fig. 613: Locating Engine Oil Pressure (EOP) Switch Electrical Connector
Courtesy of FORD MOTOR CO.

12. Connect the Crankshaft Position (CKP) sensor electrical connector.

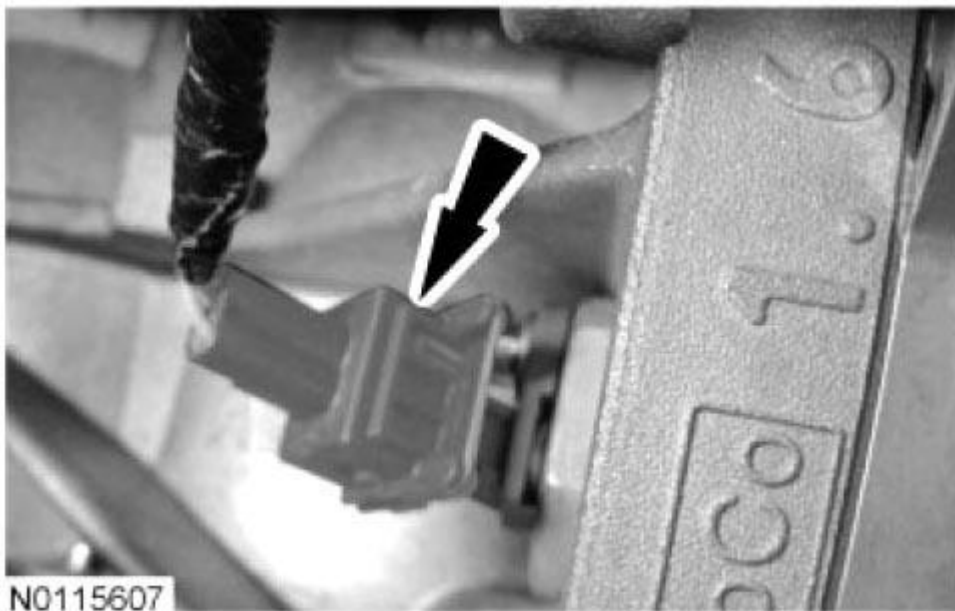


Fig. 614: Locating Crankshaft Position (CKP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

13. Connect the Throttle Body (TB) electrical connector.
 - Attach the 2 wiring harness retainers to the TB.

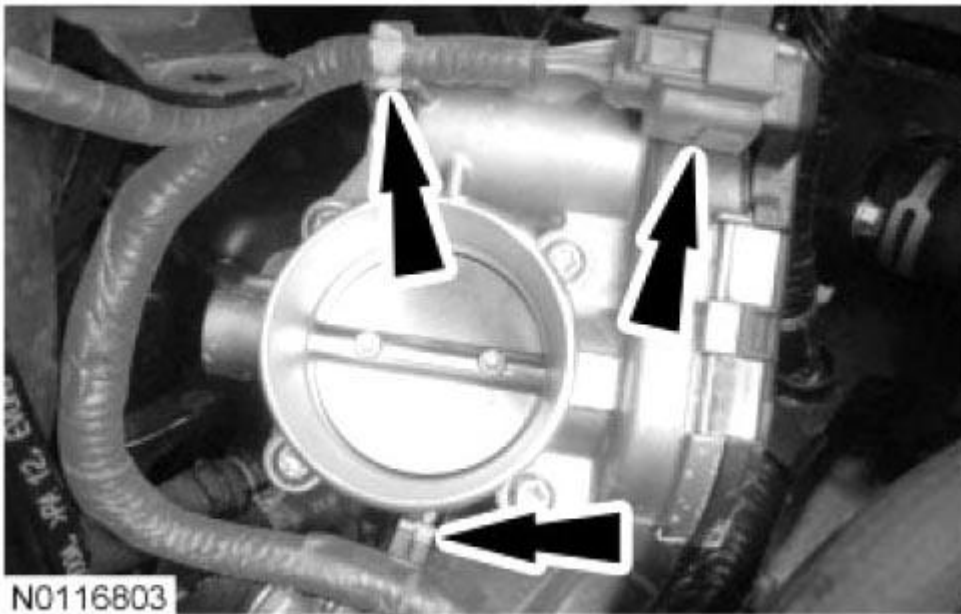


Fig. 615: Locating Throttle Body (TB) Electrical Connector
Courtesy of FORD MOTOR CO.

14. Connect the Evaporative Emission (EVAP) canister purge valve electrical connector.

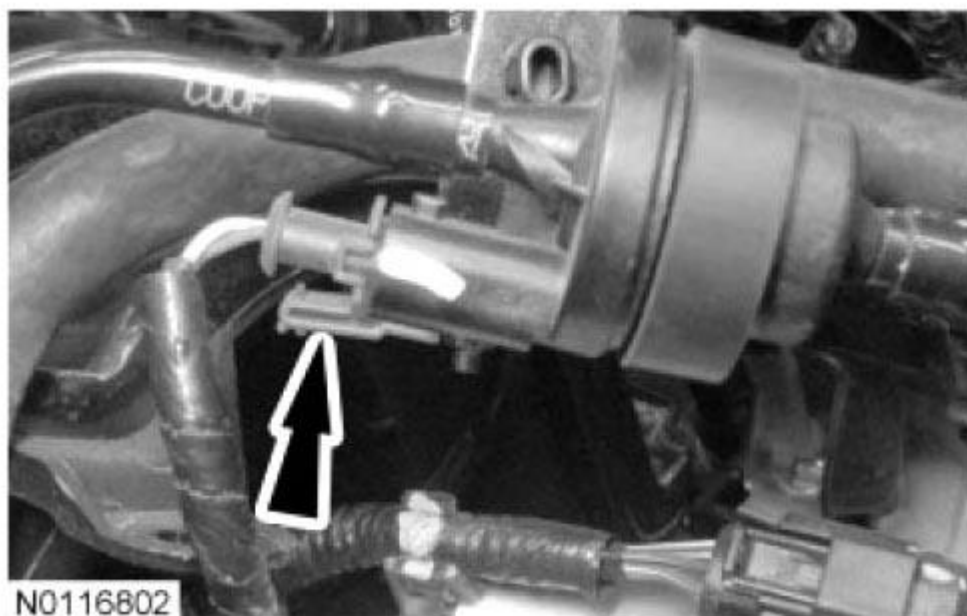


Fig. 616: Locating EVAP Canister Purge Valve Electrical Connector
Courtesy of FORD MOTOR CO.

15. Connect the 4 fuel injector electrical connectors.
 - Attach the 2 wiring harness retainers to the valve cover stud bolts.



Fig. 617: Locating Fuel Injector Electrical Connectors
Courtesy of FORD MOTOR CO.

16. Connect the 2 Variable Camshaft Timing (VCT) oil control solenoid electrical connectors.
 - Attach the 2 wiring harness retainers.

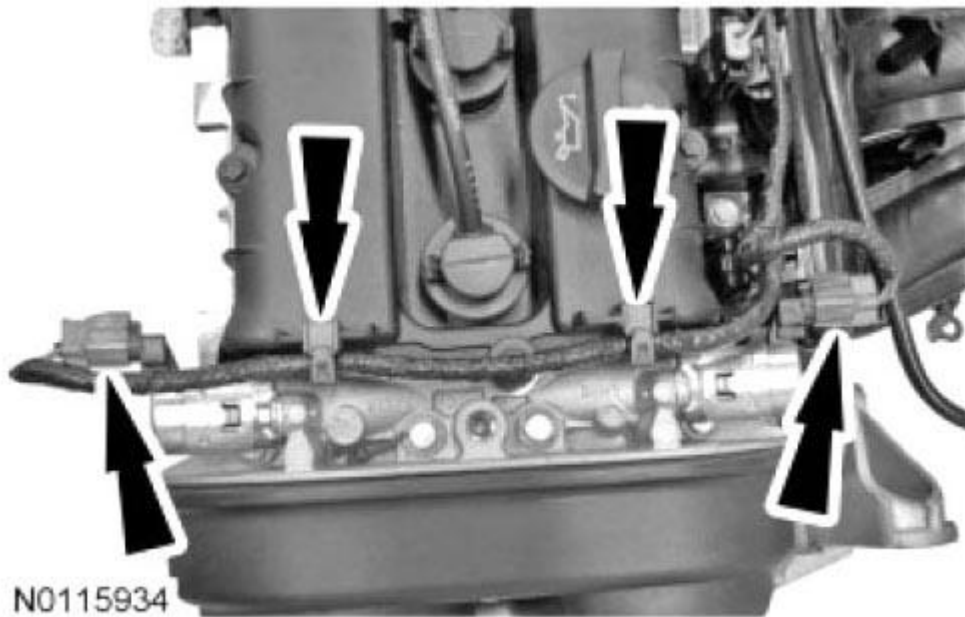


Fig. 618: Locating Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

17. Connect and attach the LH KS electrical connector.



Fig. 619: Locating LH Knock Sensor (KS) Electrical Connector
Courtesy of FORD MOTOR CO.

18. Connect the 2 Camshaft Position (CMP) sensor electrical connectors.

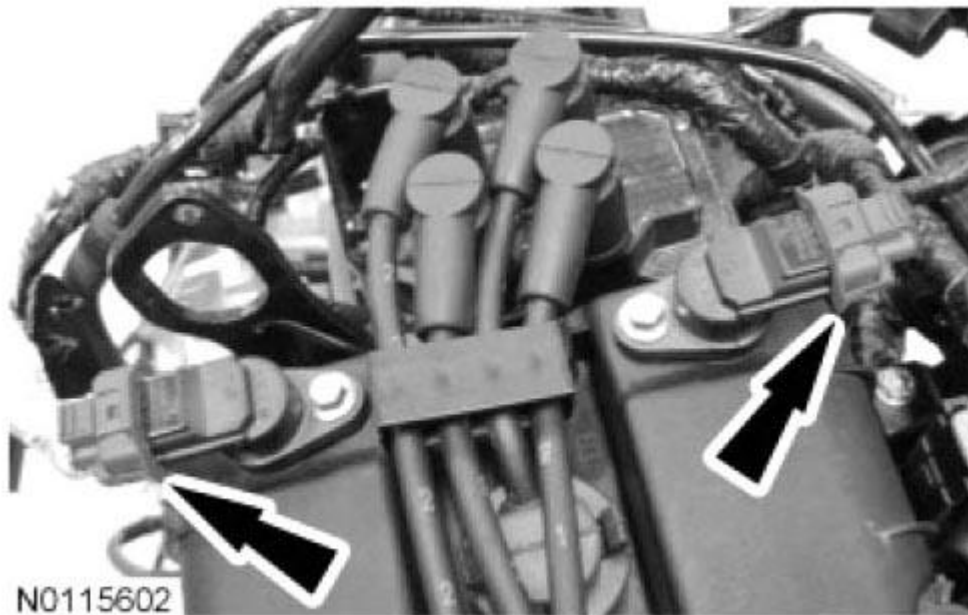


Fig. 620: Locating Camshaft Position (CMP) Sensor Electrical Connectors
Courtesy of FORD MOTOR CO.

19. Attach the Heated Oxygen Sensor (HO2S) sensor electrical connector pin-type retainer to the bracket.

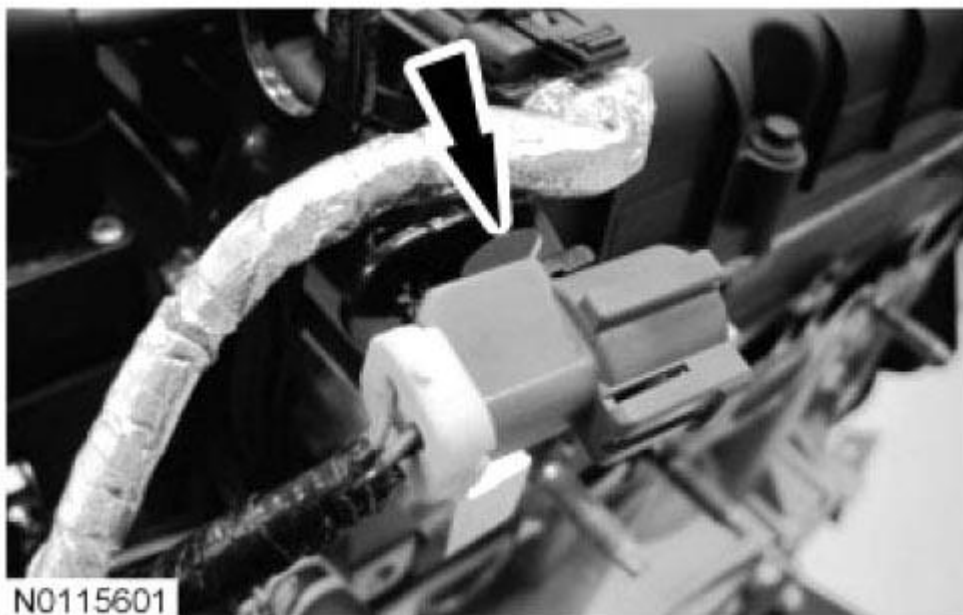


Fig. 621: Locating HO2S Sensor Electrical Connector Pin-Type Retainer To Bracket
Courtesy of FORD MOTOR CO.

20. Connect the ignition coil and Engine Coolant Temperature (ECT) sensor electrical connectors.

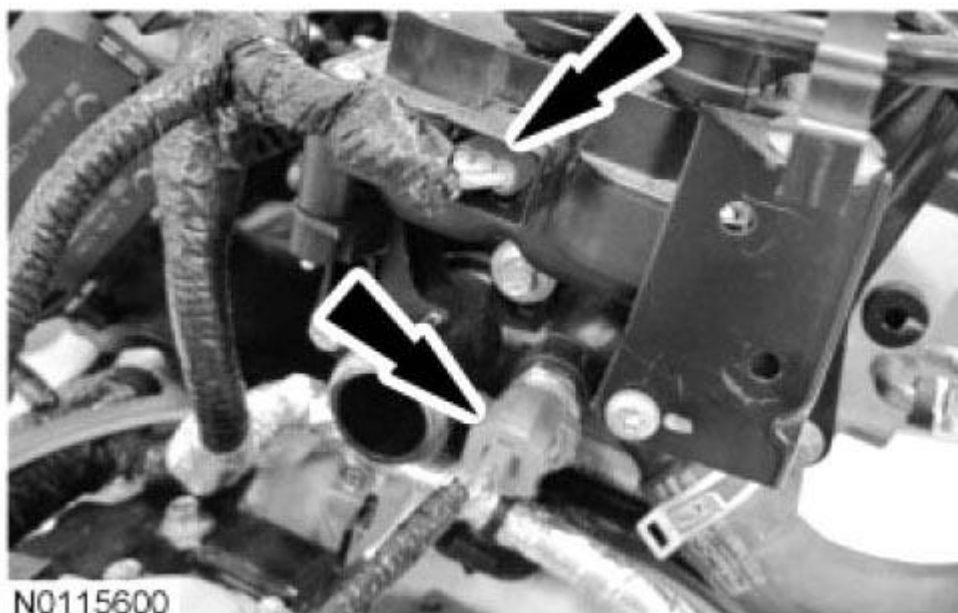


Fig. 622: Locating Ignition Coil And Engine Coolant Temperature (ECT) Sensor Electrical Connectors

Courtesy of FORD MOTOR CO.

21. Attach the 2 wiring harness retainers to the coolant outlet bracket.

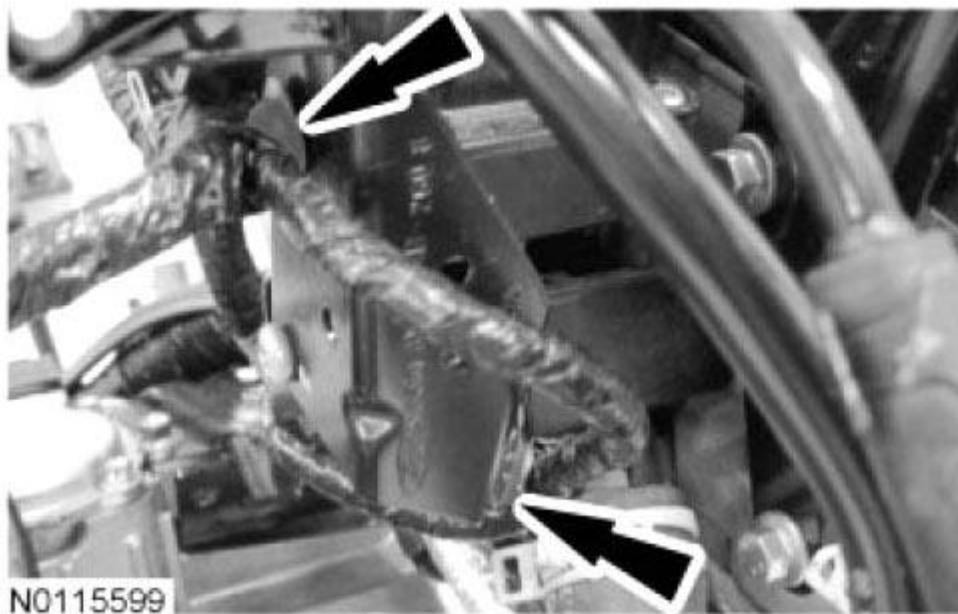


Fig. 623: Locating Wiring Harness Retainers From Coolant Outlet Bracket

Courtesy of FORD MOTOR CO.

22. Install the 4 new catalytic converter studs.

- Tighten to 17 Nm (150 lb-in).

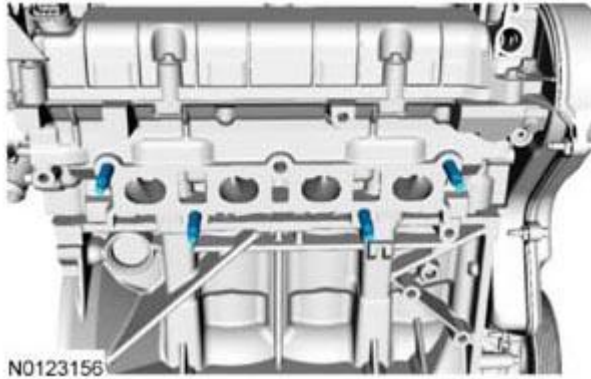


Fig. 624: Identifying Catalytic Converter Studs
Courtesy of FORD MOTOR CO.

NOTE: The engine mount studs must be torqued or damage to the powertrain may occur.

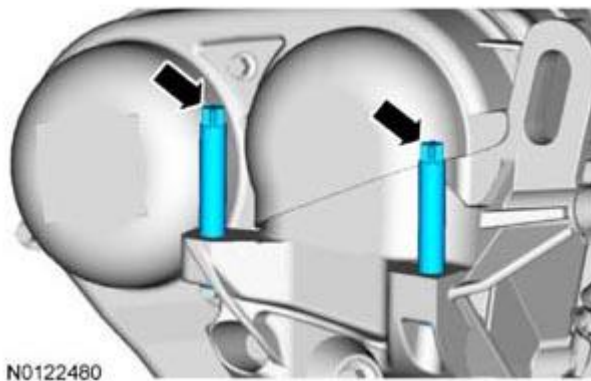


Fig. 625: Locating Engine Mount Studs
Courtesy of FORD MOTOR CO.

23. Torque the engine mount studs before installing the engine mount nuts.

- Tighten to 8 Nm (71 lb-in).

24. Using the lift table, position the engine and transaxle assembly in the vehicle.

25. Align the transaxle support insulator, install and tighten the 2 nuts and 2 bolts.

- Tighten the 2 nuts to 125 Nm (92 lb-ft).
- Tighten the 2 bolts to 90 Nm (66 lb-ft).

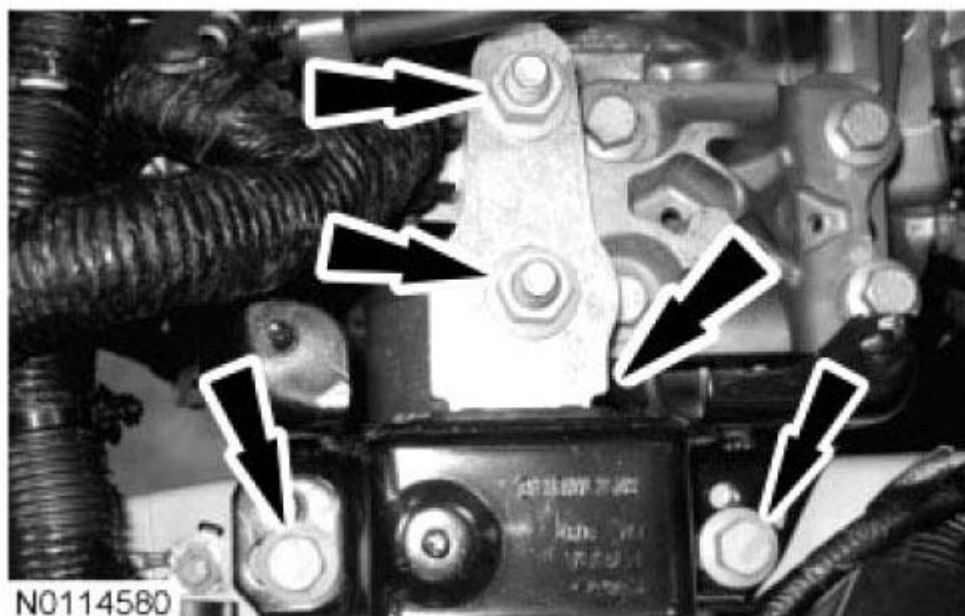


Fig. 626: Locating Transaxle Support Insulator Bolt And Nuts
Courtesy of FORD MOTOR CO.

NOTE: Do not loosen the engine mount center bolt or the engine may become improperly positioned.



Fig. 627: Locating Engine Mount And Nuts
Courtesy of FORD MOTOR CO.

26. Install the engine mount and the 2 nuts.
 - Tighten the 2 nuts to 80 Nm (59 lb-ft).
27. Lower the powertrain to the installed position.
28. Install the 3 engine mount bolts.
 - Tighten to 48 Nm (35 lb-ft).

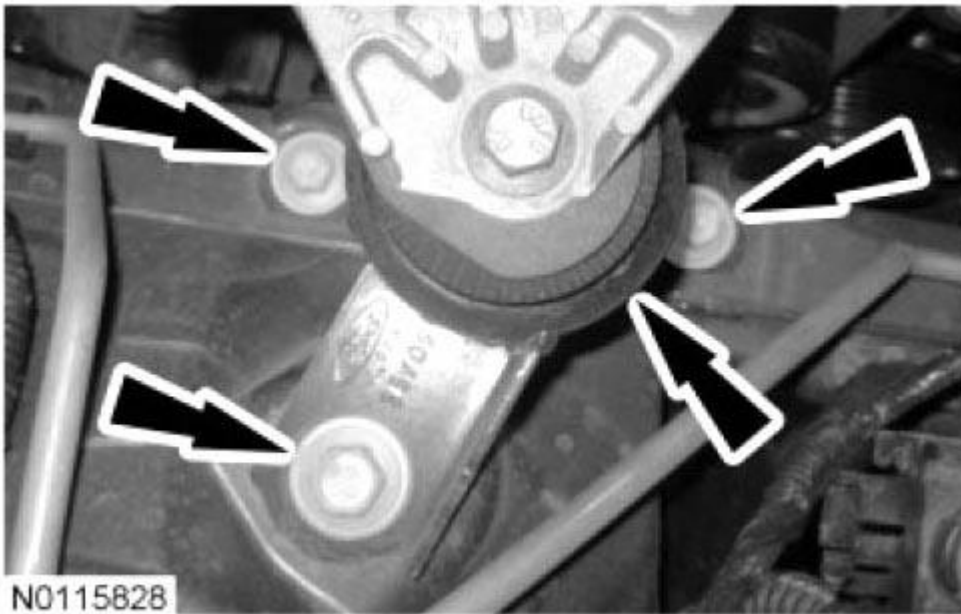


Fig. 628: Locating Bolts And Engine Mount
Courtesy of FORD MOTOR CO.

29. Install the transaxle roll restrictor and the 2 bolts.
 - Tighten to 70 Nm (52 lb-ft).

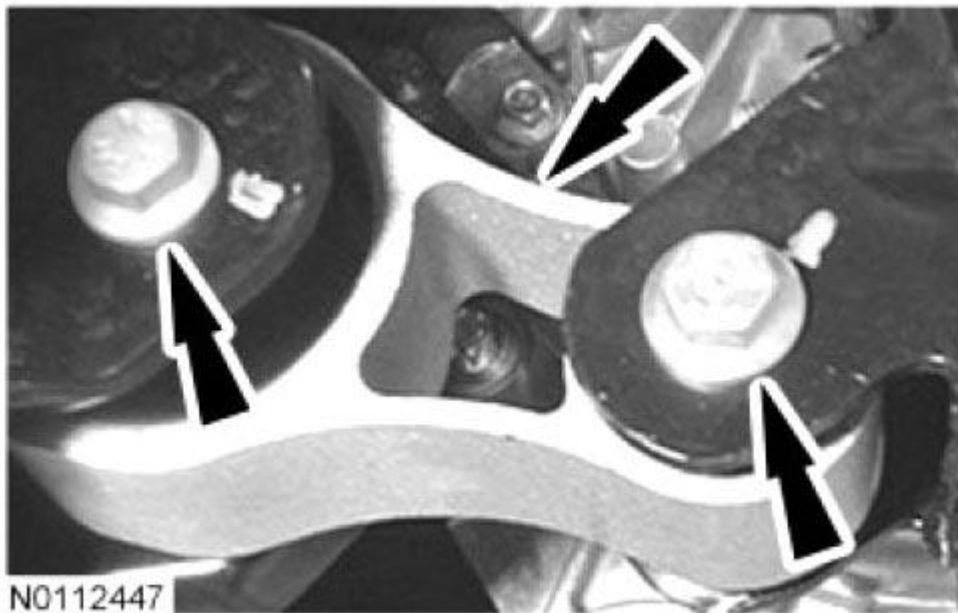


Fig. 629: Locating Bolts And Transaxle Roll Restrictor
Courtesy of FORD MOTOR CO.

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

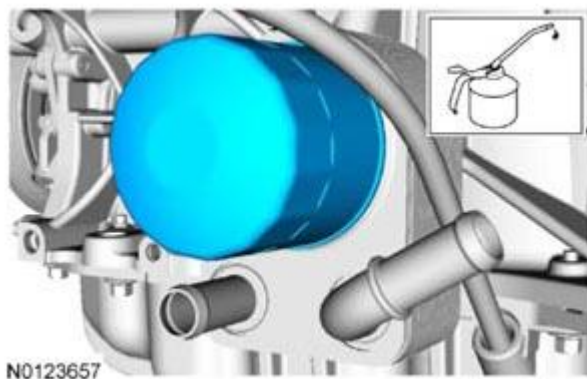


Fig. 630: Identifying Engine Oil Filter
Courtesy of FORD MOTOR CO.

30. Install a new engine oil filter.
 - Tighten to 15 Nm (133 lb-in).
31. If equipped, connect the block heater electrical connector.

NOTE: Failure to tighten the catalytic converter manifold fasteners in 20 Nm increments until reaching final torque of 55 Nm will cause the converter to

develop an exhaust leak.

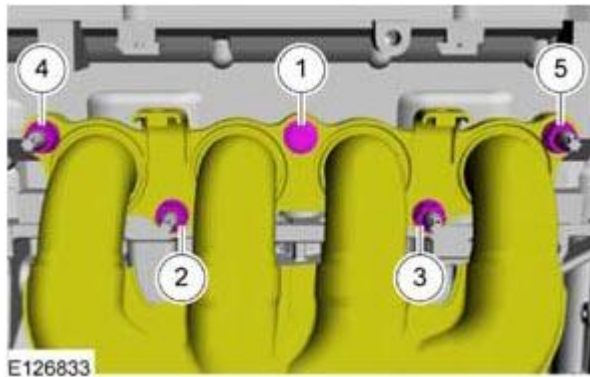


Fig. 631: Identifying Catalytic Converter Manifold Bolt And Nuts Tightening Sequence
Courtesy of FORD MOTOR CO.

32. Tighten the bolt and 4 nuts in the sequence shown in illustration, in 3 stages.
 - Stage 1: Tighten all fasteners in sequence to 20 Nm (177 lb-in).
 - Stage 2: Tighten all fasteners in sequence to 40 Nm (30 lb-ft).
 - Stage 3: Tighten all fasteners in sequence to 55 Nm (41 lb-ft).
33. Position the catalytic converter heat shield and install the 4 bolts.
 - Tighten to 10 Nm (89 lb-in).

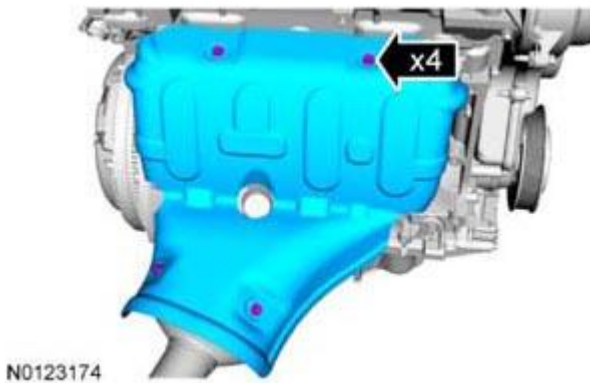
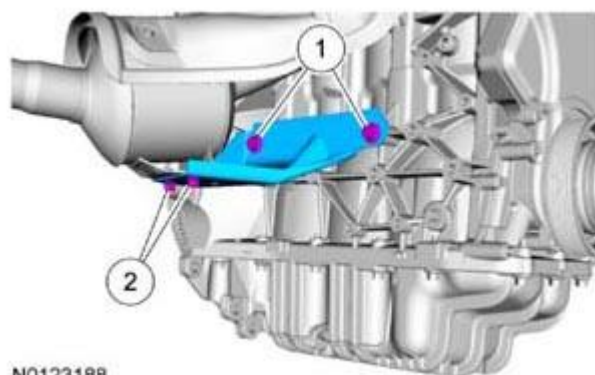


Fig. 632: Locating Bolts And Catalytic Converter Heat Shield
Courtesy of FORD MOTOR CO.

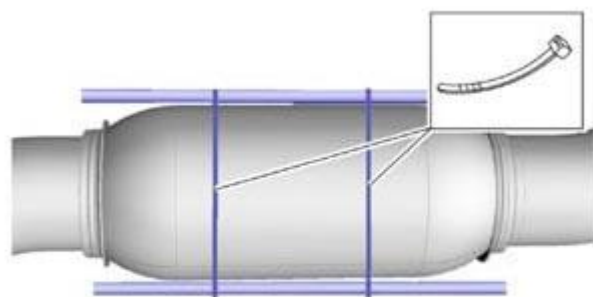
34. Install the lower catalytic converter bracket and the 4 bolts and tighten in sequence shown in illustration.
 1. Tighten the catalytic converter bracket-to-engine block bolts to 50 Nm (37 lb-ft).
 2. Tighten the catalytic converter bracket-to-catalytic converter bolts to 25 Nm (18 lb-ft).



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Fig. 633: Identifying Lower Catalytic Converter Bracket And Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

NOTE: Do not excessively bend or twist the exhaust flexible pipe. Failure to follow these instructions may cause damage to the flexible pipe.



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Fig. 634: Supporting Exhaust Flexible Pipe
Courtesy of FORD MOTOR CO.

35. Remove the support for the exhaust flexible pipe.
36. Using a new gasket, position the catalytic converter to the muffler and install the 2 catalytic converter nuts.
 - Tighten to 48 Nm (35 lb-ft).

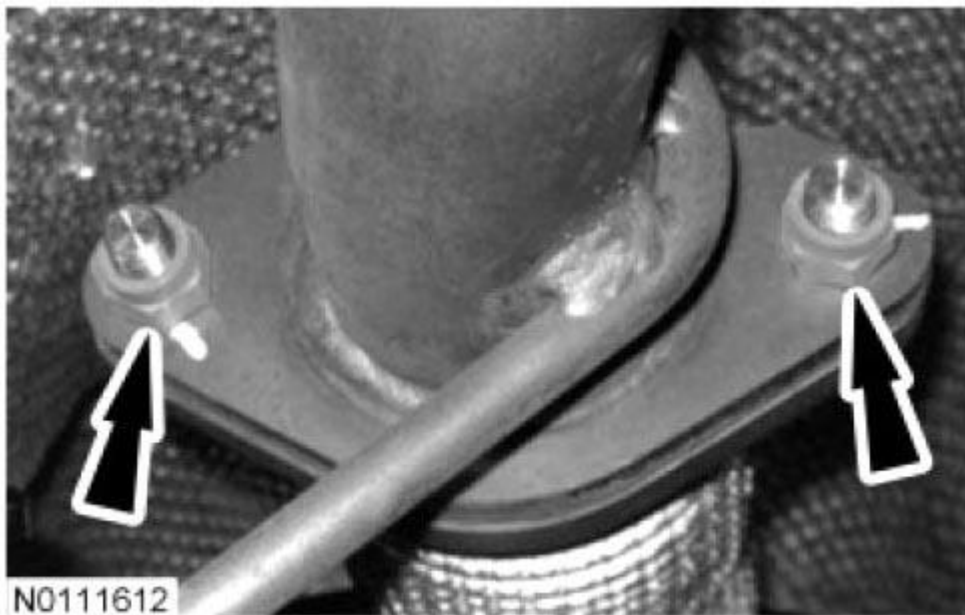


Fig. 635: Locating Catalytic Converter-To-Muffler Nuts
Courtesy of FORD MOTOR CO.

37. Install the Catalyst Monitor Sensor (CMS). For additional information, refer to **ELECTRONIC ENGINE CONTROLS**.

Vehicles without A/C

38. Install the accessory drive belt idler pulley bracket and the 3 bolts.
 - Tighten to 24 Nm (18 lb-ft).

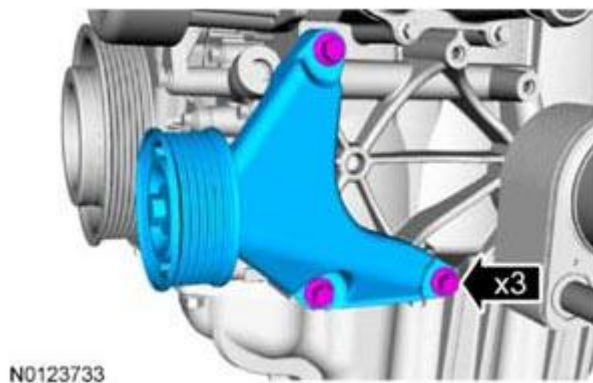


Fig. 636: Locating Bolts And Accessory Drive Belt Idler Pulley Bracket
Courtesy of FORD MOTOR CO.

Vehicles with A/C

39. Position the A/C compressor and install the 2 bolts and stud bolt.
- Tighten to 25 Nm (18 lb-ft).

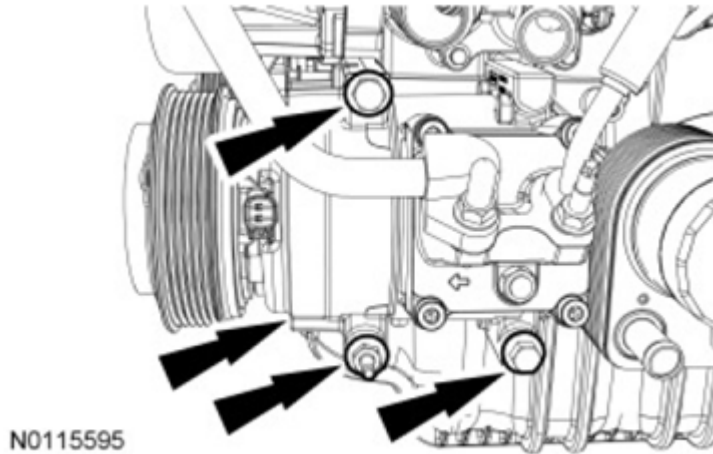


Fig. 637: Locating A/C Compressor Bolts And Stud Bolt
Courtesy of FORD MOTOR CO.

40. Attach the wiring harness retainer to the lower A/C compressor bracket.

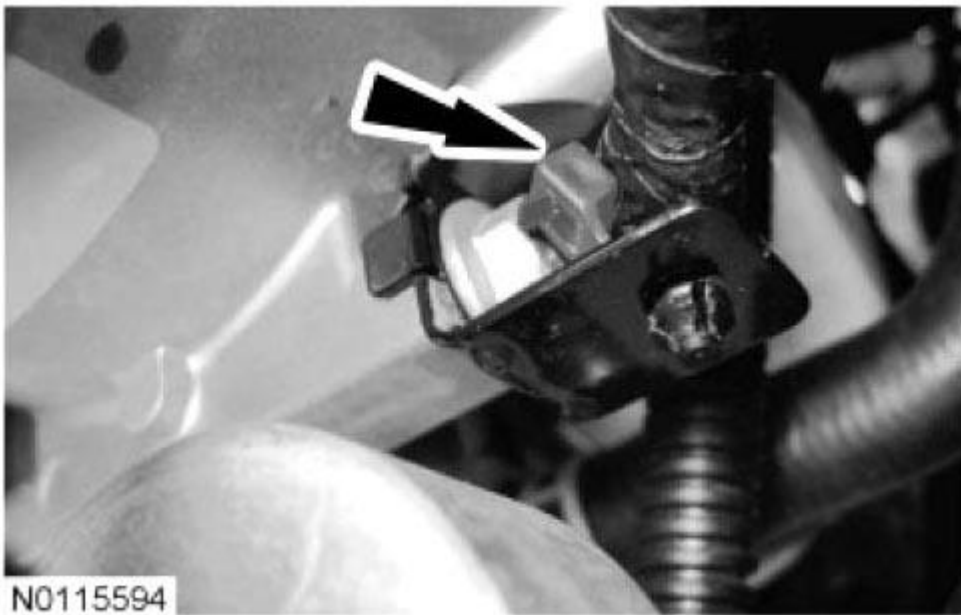


Fig. 638: Locating Wiring Harness Retainer To Lower A/C Compressor Bracket
Courtesy of FORD MOTOR CO.

41. Connect the A/C pressure transducer electrical connector.
- Attach the wiring harness retainer.

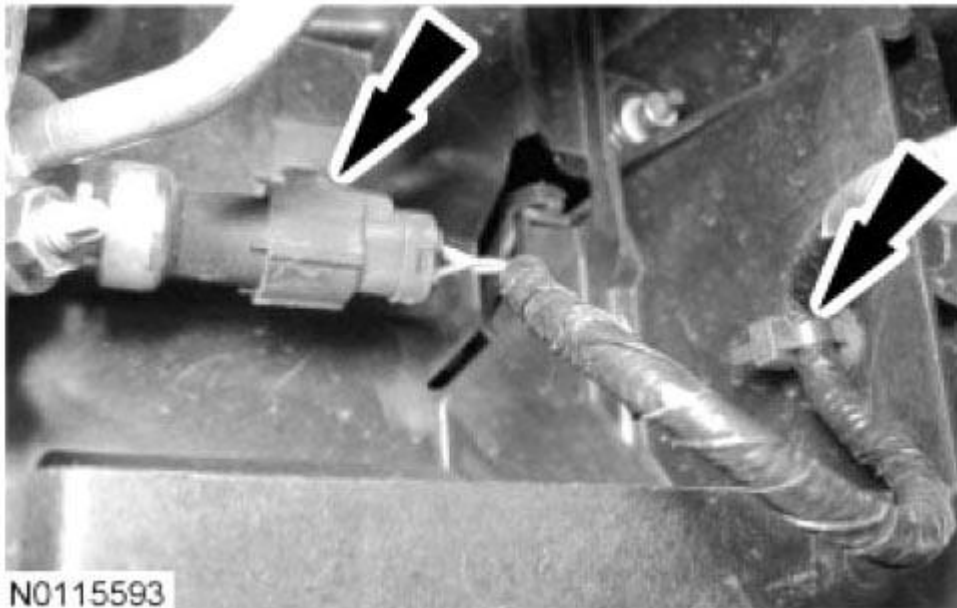


Fig. 639: Locating A/C Pressure Transducer Electrical Connector
Courtesy of FORD MOTOR CO.

42. Position the A/C line bracket and install the nut.
- Tighten to 9 Nm (80 lb-in).

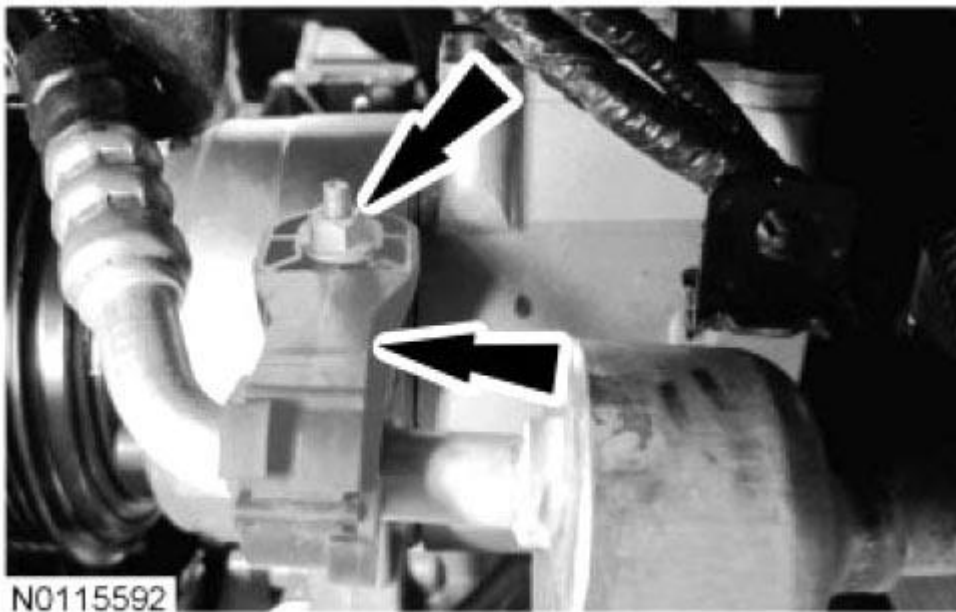


Fig. 640: Locating Nut And A/C Line Bracket
Courtesy of FORD MOTOR CO.

43. Connect the A/C compressor electrical connector.

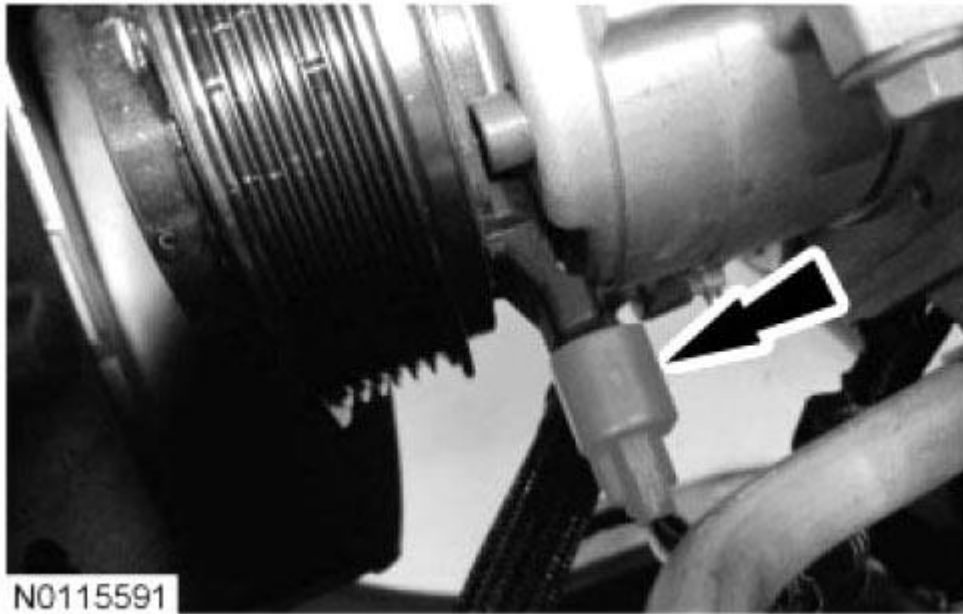


Fig. 641: Locating A/C Compressor Electrical Connector
Courtesy of FORD MOTOR CO.

All vehicles

44. Install the halfshaft bracket and the 3 bolts and tighten in sequence shown in illustration.
1. Tighten the top bolt to 48 Nm (35 lb-ft).
 2. Tighten the 2 bottom bolts to 24 Nm (18 lb-ft).

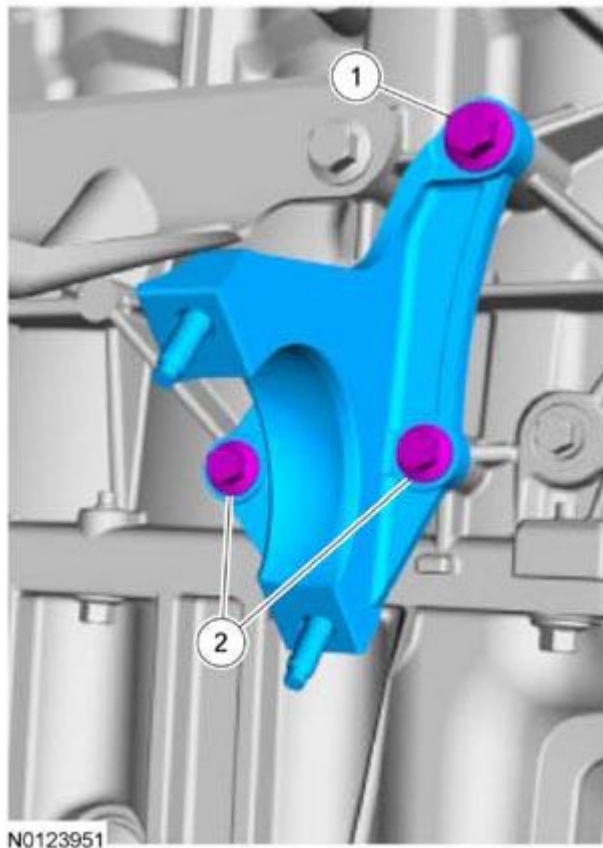


Fig. 642: Identifying Halfshaft Bracket And Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

45. Install the RH and LH halfshafts. For additional information, refer to **FRONT DRIVE HALFSHAFTS**.
46. Position the engine ground wire and install the bolt.
 - Tighten to 10 Nm (89 lb-in).



Fig. 643: Locating Bolt And Engine Ground Wire
Courtesy of FORD MOTOR CO.

47. Connect the lower radiator hose and coolant hose to the thermostat housing.



Fig. 644: Locating Lower Radiator Hose And Coolant Hose To Thermostat Housing
Courtesy of FORD MOTOR CO.

48. Connect the upper radiator hose to the engine.

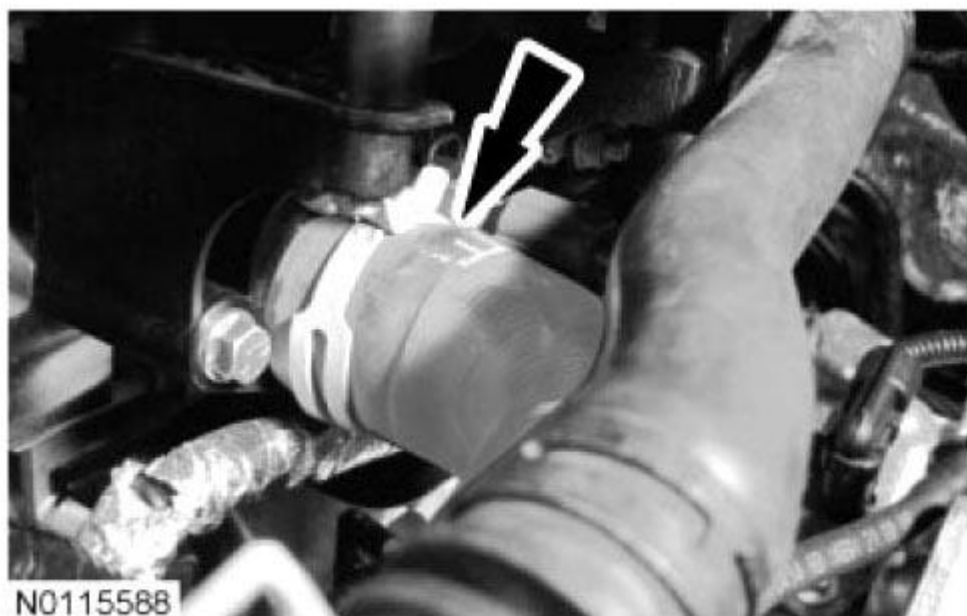


Fig. 645: Locating Upper Radiator Hose To Engine
Courtesy of FORD MOTOR CO.

49. Connect the EVAP tube quick connect coupling near the bulk head. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** .

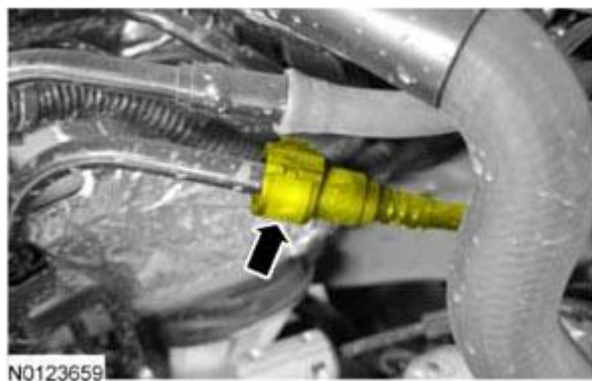


Fig. 646: Locating Evaporative Emission (EVAP) Tube Quick Connect Coupling Near Bulk Head
Courtesy of FORD MOTOR CO.

50. Attach the coolant hose retainer to the coolant outlet bracket.

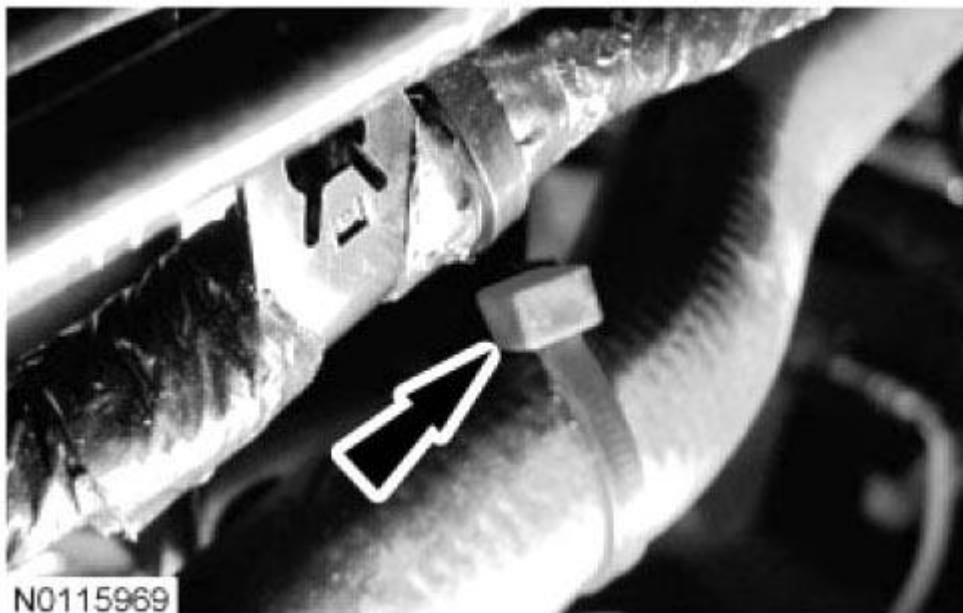


Fig. 647: Locating Coolant Hose Retainer To Coolant Outlet Bracket
Courtesy of FORD MOTOR CO.

51. Connect the lower heater hose to the heater core.



Fig. 648: Locating Lower Heater Hose To Heater Core
Courtesy of FORD MOTOR CO.

52. Install the HO2S. For additional information, refer to **ELECTRONIC ENGINE CONTROLS**.

53. Position the selector lever cable and bracket and install the 2 bolts.
- Tighten to 25 Nm (18 lb-ft).

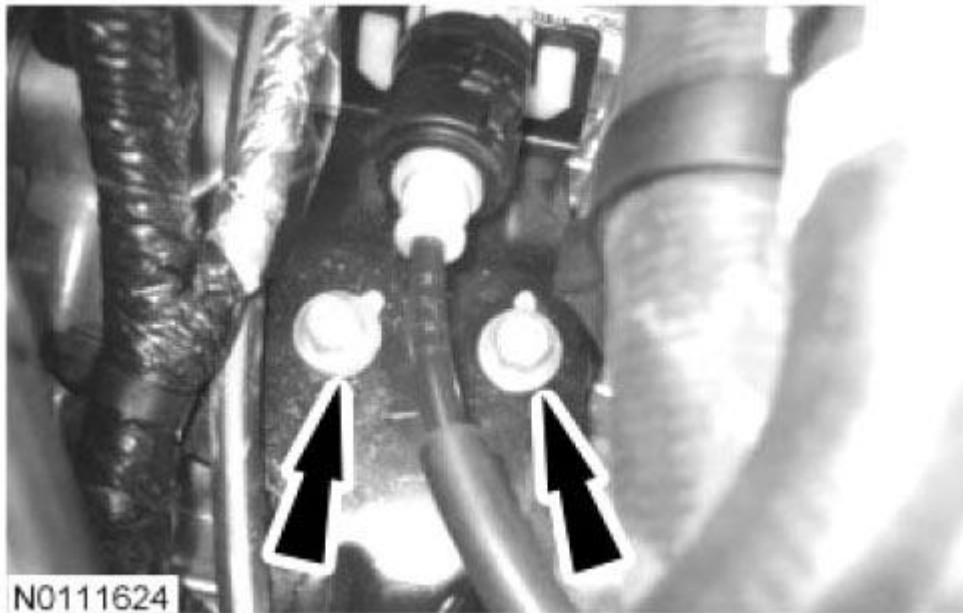


Fig. 649: Locating Selector Lever Cable Bracket Bolts
Courtesy of FORD MOTOR CO.

54. Attach the wiring harness retainer to the selector lever cable bracket.

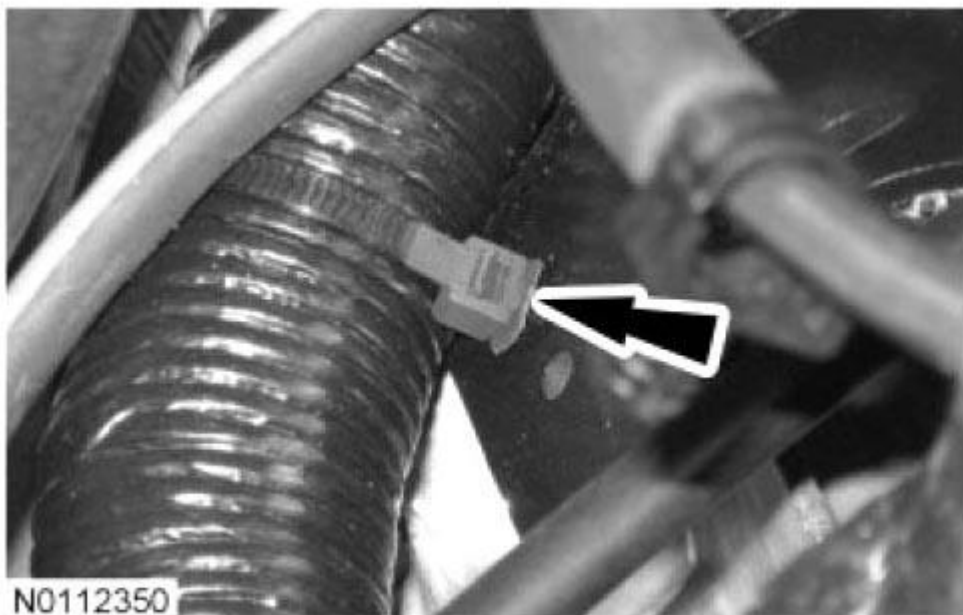


Fig. 650: Locating Wiring Harness Retainer To Selector Lever Cable Bracket
Courtesy of FORD MOTOR CO.

55. Connect the selector lever cable to the control lever.

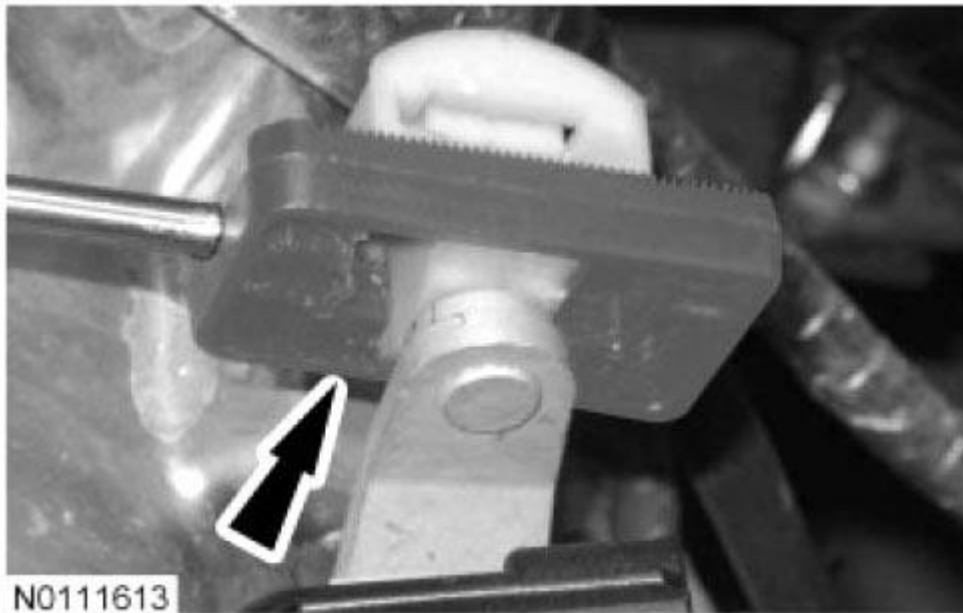


Fig. 651: Locating Selector Lever Cable To Control Lever
Courtesy of FORD MOTOR CO.

56. Connect the 2 coolant hoses to the engine oil cooler.
- Attach the oil cooler hose retainer to the upper radiator hose.

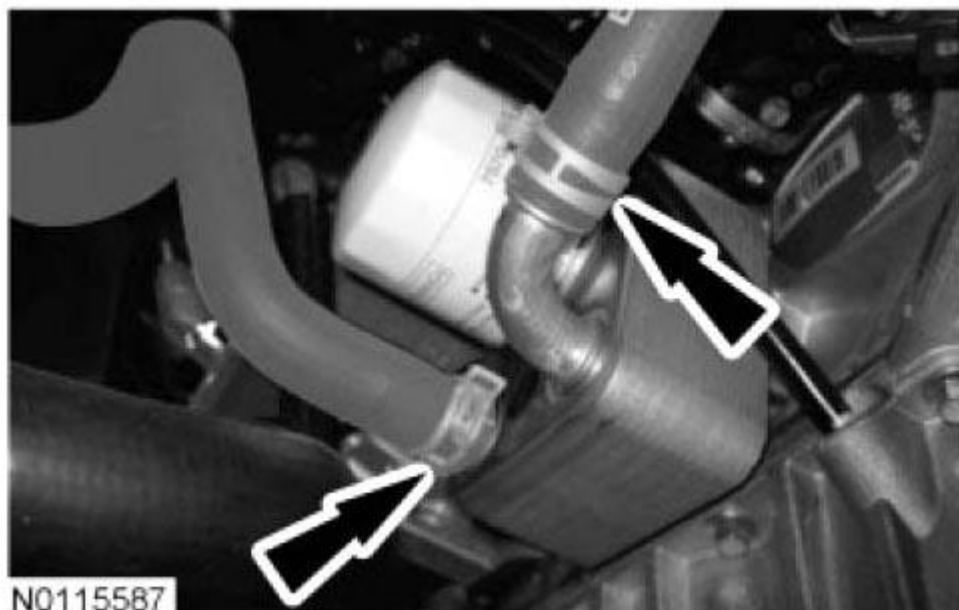


Fig. 652: Locating Coolant Hoses To Engine Oil Cooler
Courtesy of FORD MOTOR CO.

57. Install the cooling fan motor and shroud. For additional information, refer to **ENGINE COOLING SYSTEM** .
58. Install the generator. For additional information, refer to **CHARGING SYSTEM** .
59. Attach the fuel tube to the coolant outlet bracket retainer.

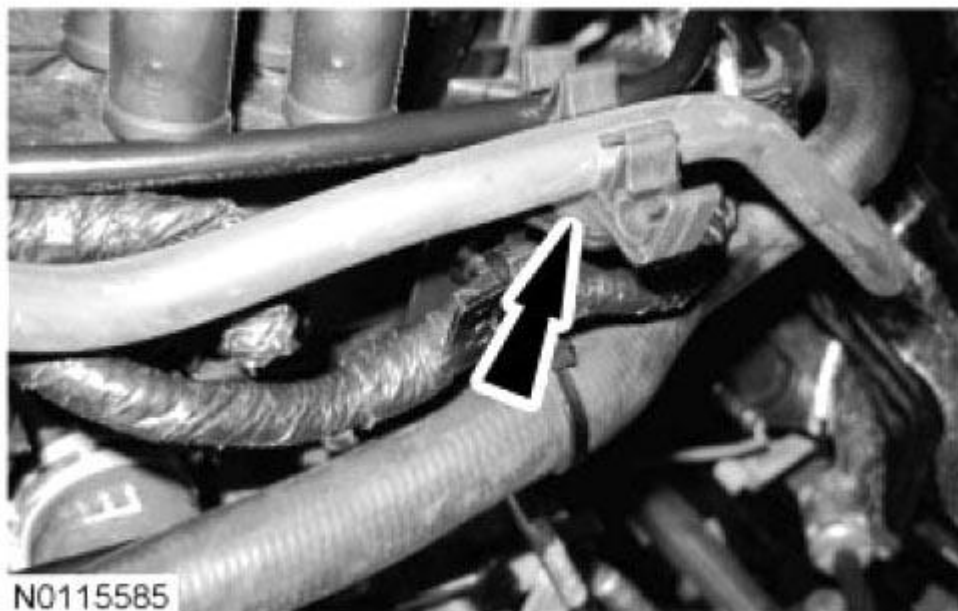


Fig. 653: Locating Fuel Tube To Coolant Outlet Bracket Retainer
Courtesy of FORD MOTOR CO.

60. Connect the fuel tube spring lock couplings to the fuel rail. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** .

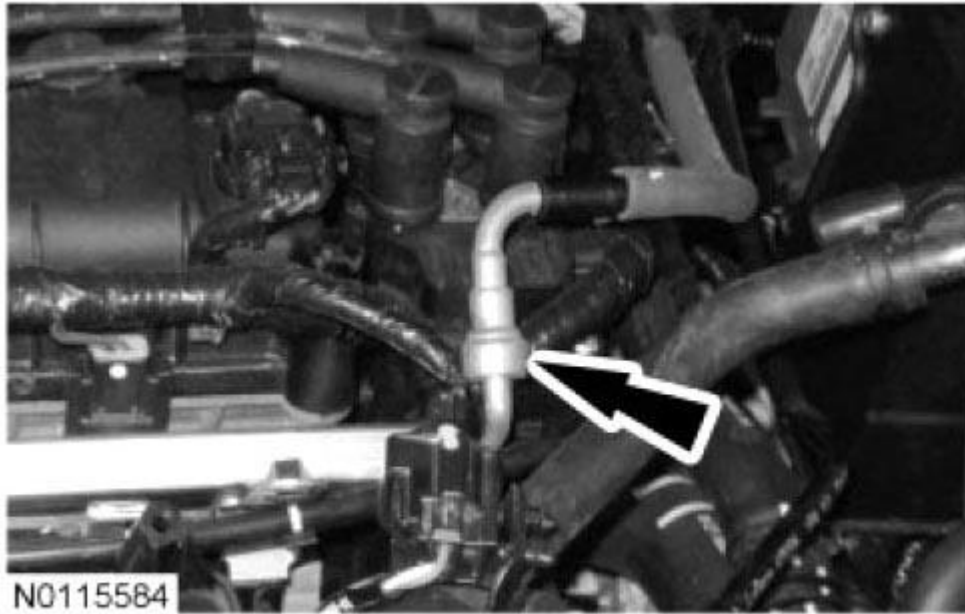


Fig. 654: Locating Fuel Tube Spring Lock Couplings From Fuel Rail
Courtesy of FORD MOTOR CO.

61. Connect the brake booster vacuum hose.

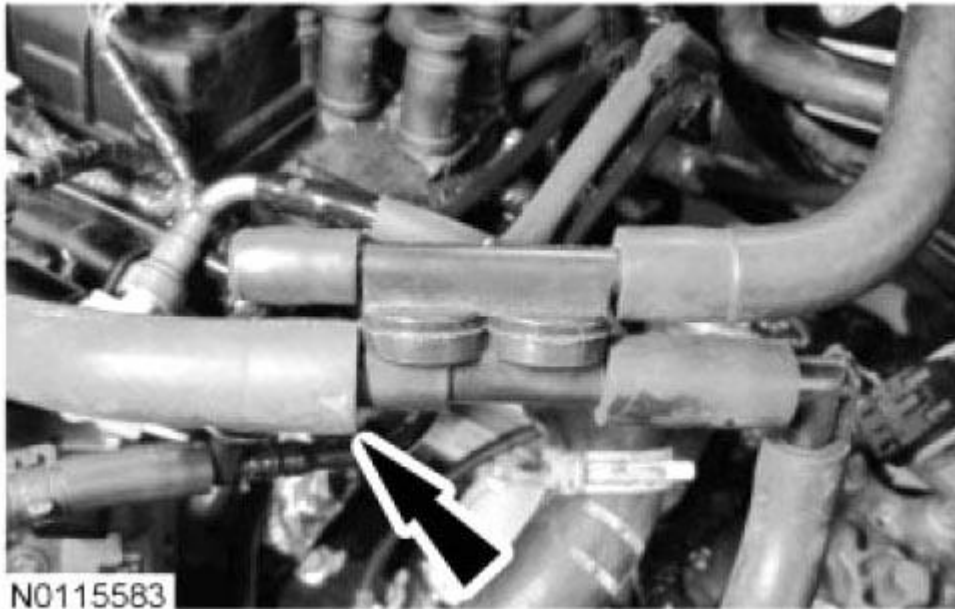


Fig. 655: Locating Brake Booster Vacuum Hose
Courtesy of FORD MOTOR CO.

62. Connect the engine harness electrical connector.



Fig. 656: Locating Engine Harness Electrical Connector
Courtesy of FORD MOTOR CO.

63. Install the battery tray bracket, 3 battery tray nuts and the selector lever cable bolt.

- Attach the 2 wiring harness retainers to the bottom of the battery tray bracket.
- Tighten nuts and bolt to 10 Nm (89 lb-in).

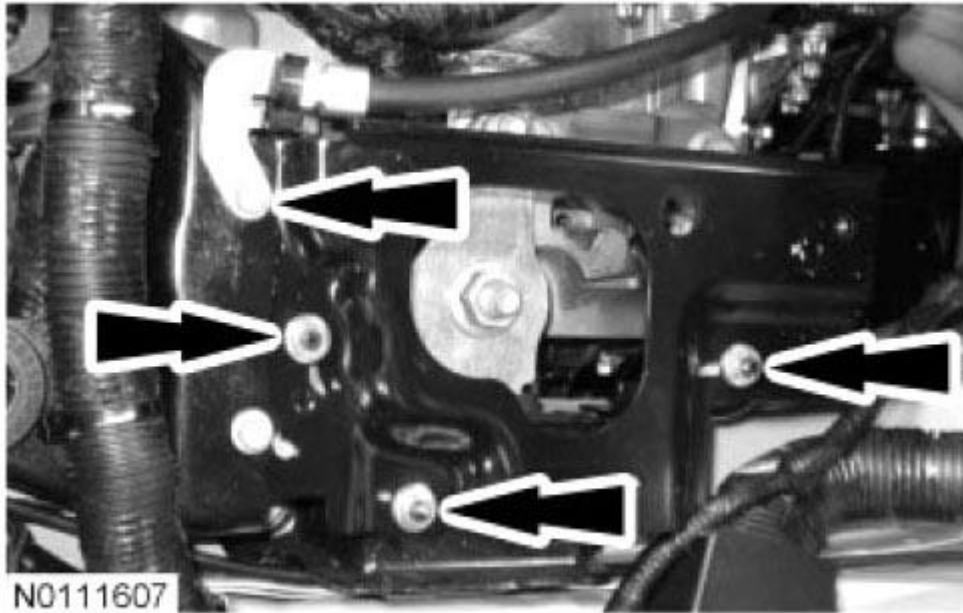


Fig. 657: Locating Wiring Harness Retainers From Battery Tray Bracket
Courtesy of FORD MOTOR CO.

64. Attach the 2 positive battery cable wire harness retainers to battery tray bracket.

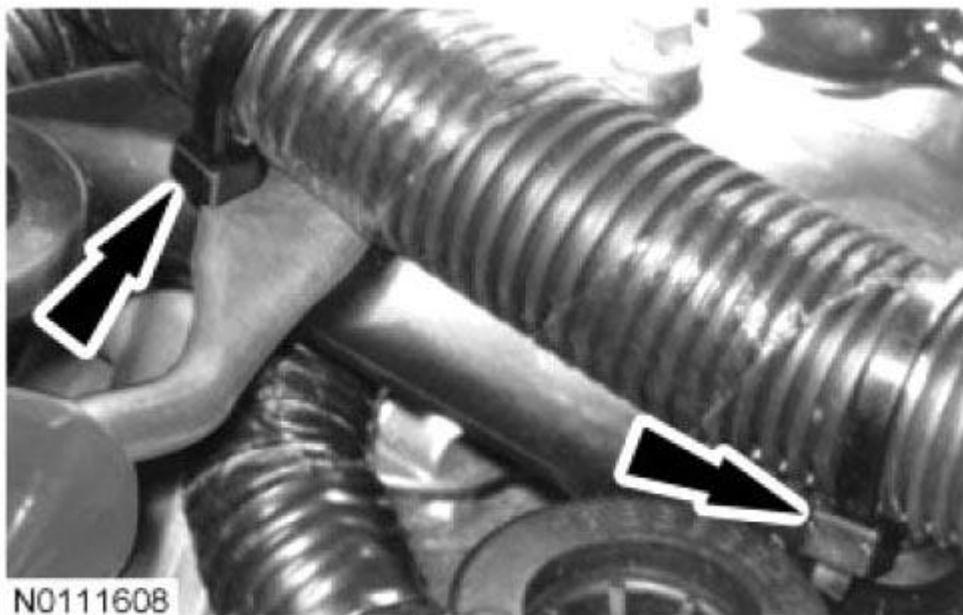


Fig. 658: Locating Positive Battery Cable Wire Harness Retainers From Battery Tray Bracket
Courtesy of FORD MOTOR CO.

65. Install the battery tray and the 3 bolts.
- Tighten to 10 Nm (89 lb-in).

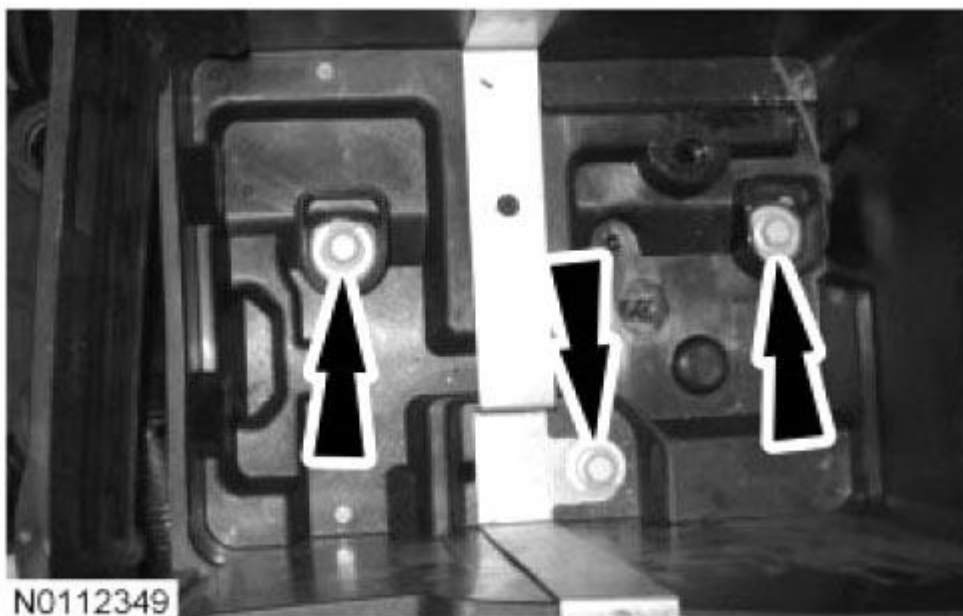


Fig. 659: Locating Bolts And Battery Tray
Courtesy of FORD MOTOR CO.

66. Connect the 3 PCM electrical connectors.

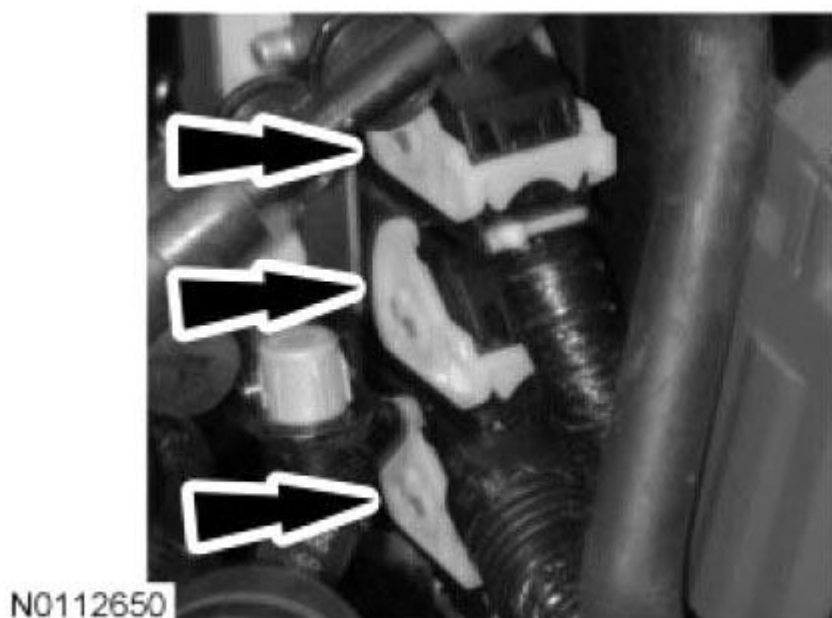


Fig. 660: Locating PCM Electrical Connectors
Courtesy of FORD MOTOR CO.

67. Install the PCM cover and the bolt.
 - Tighten to 5.4 Nm (47.8 lb-in).

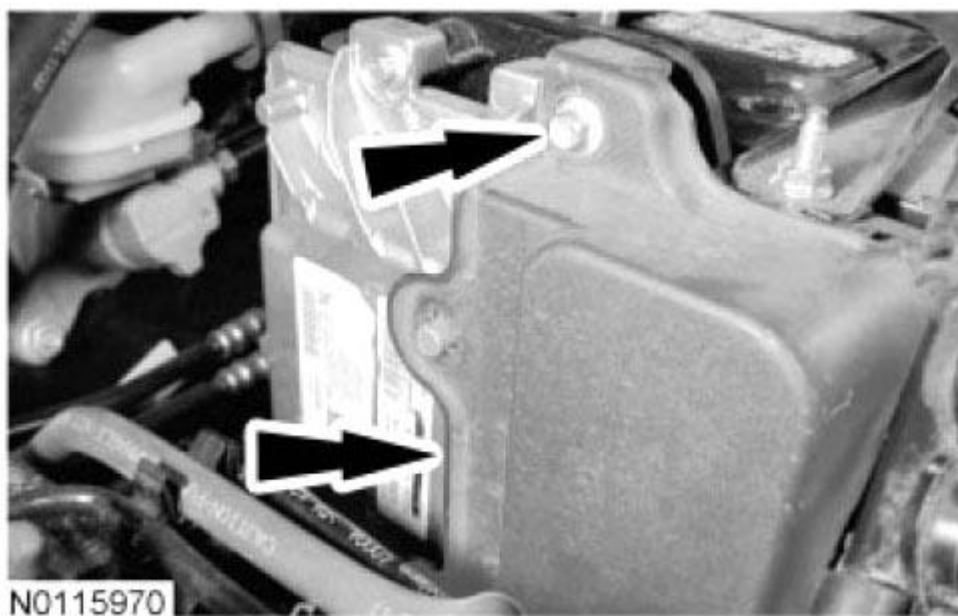


Fig. 661: Locating Bolt And PCM Cover
Courtesy of FORD MOTOR CO.

68. Connect the cable and nut to the positive battery cable terminal.
- Tighten to 10 Nm (89 lb-in).

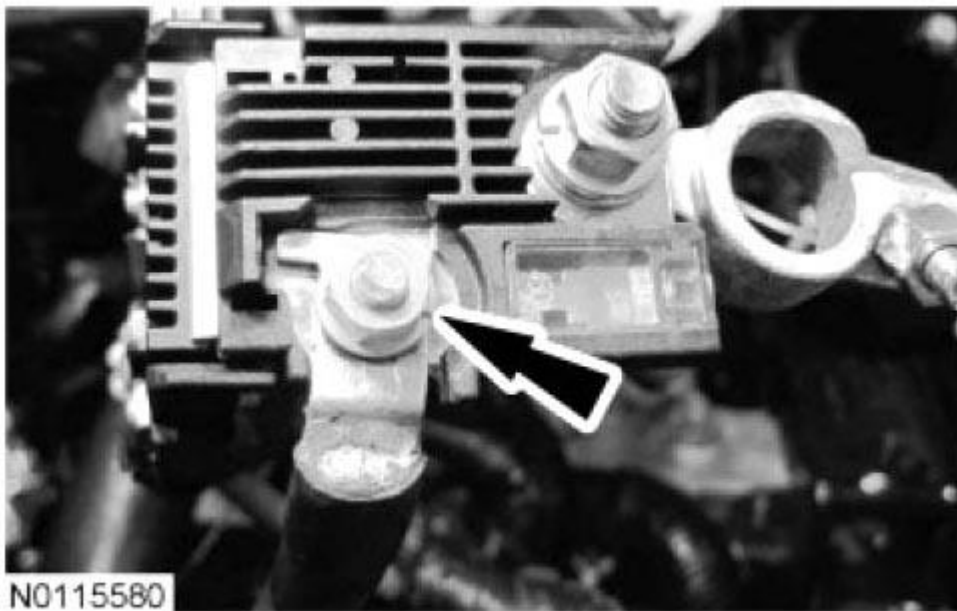


Fig. 662: Locating Positive Battery Cable Terminal And Nut
Courtesy of FORD MOTOR CO.

69. Install the battery. For additional information, refer to **BATTERY, MOUNTING AND CABLES** .
70. Install the positive battery cable cover.

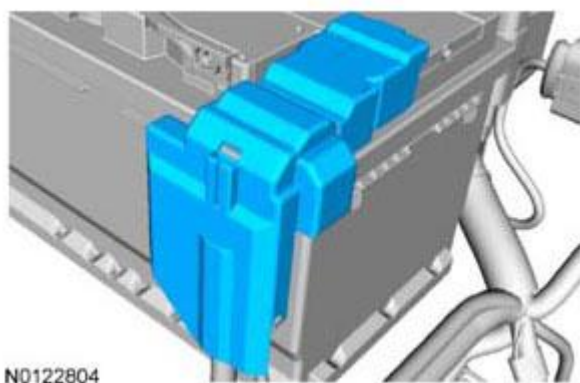


Fig. 663: Identifying Positive Battery Cable Cover
Courtesy of FORD MOTOR CO.

71. Connect the crankcase vent tube to the valve cover.
- Attach the crankcase vent tube to the 2 retainers.

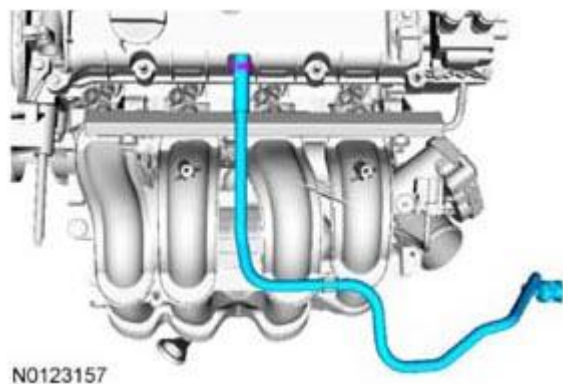


Fig. 664: Identifying Crankcase Vent Tube Retainers
Courtesy of FORD MOTOR CO.

72. Install the Air Cleaner (ACL) and ACL outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING**.
73. Fill the engine with clean engine oil.
74. Install the degas bottle. For additional information, refer to **ENGINE COOLING SYSTEM**.
75. Fill the and bleed cooling system. For additional information, refer to **ENGINE COOLING SYSTEM**.
76. Fill the transaxle with transmission fluid. For additional information, refer to **AUTOMATIC DUAL CLUTCH TRANSAXLE (DCT) POWERSHIFT (DPS6) - EXTERNAL CONTROLS**.
77. Adjust the selector lever cable. For additional information, refer to **AUTOMATIC TRANSAXLE/TRANSMISSION EXTERNAL CONTROLS**.

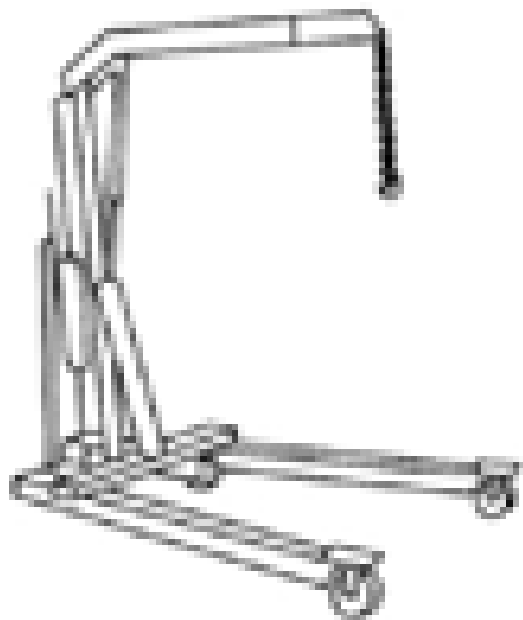
ENGINE - MANUAL TRANSAXLE

SPECIAL TOOLS

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

2013 Ford Fiesta S

2013 ENGINE Engine Mechanical - 1.6L - Fiesta



ST1341-A

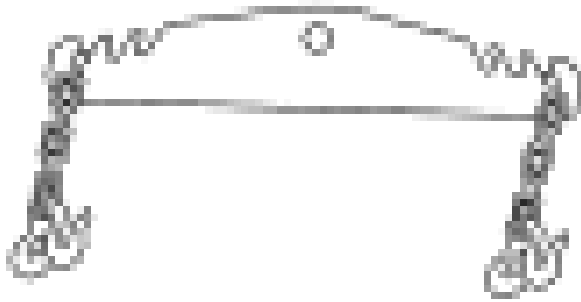


ST1652-A

Powertrain Lift
300-OTC1585AE

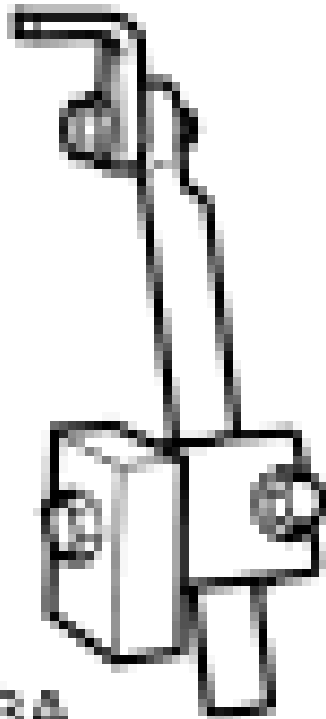
2013 Ford Fiesta S

2013 ENGINE Engine Mechanical - 1.6L - Fiesta



ST1602-A

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



ST2743A

Adjustable Grip Arm, 1735A
014-00001

MATERIAL SPECIFICATIONS

Item	Specification

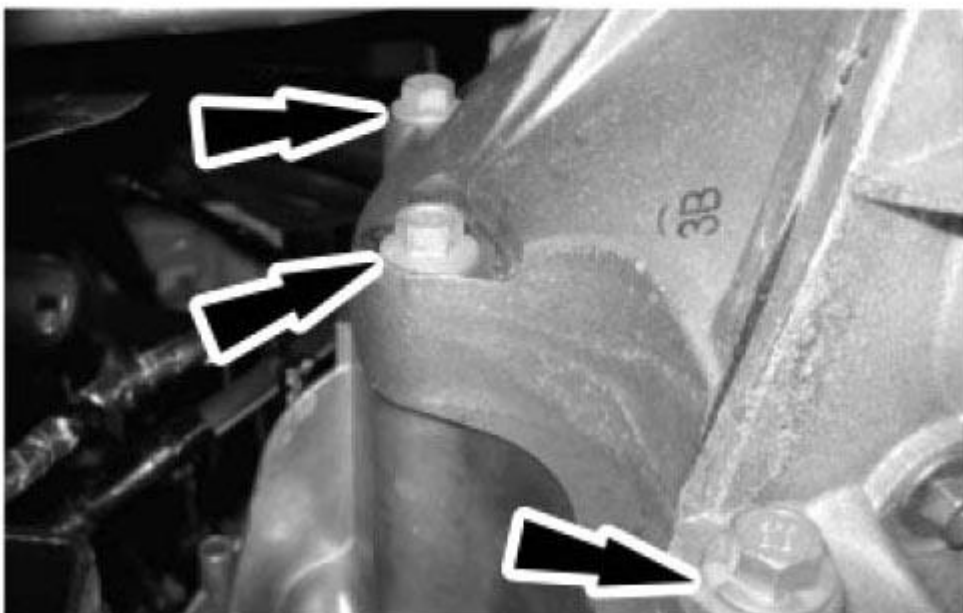
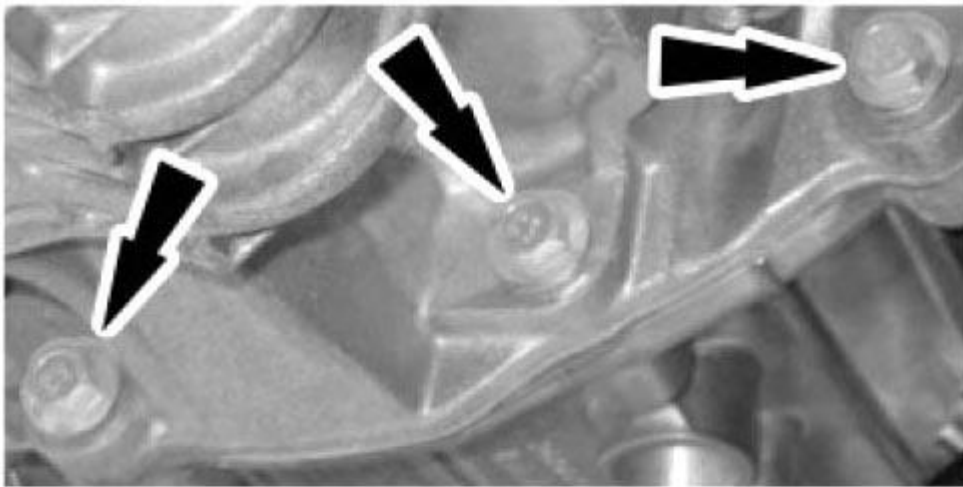
2013 Ford Fiesta S

2013 ENGINE Engine Mechanical - 1.6L - Fiesta

Motorcraft® Full Synthetic Manual Transmission Fluid XT-M5-QS	WSD-M2C200- C
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

All vehicles

1. Using the Heavy Duty Floor Crane and Spreader Bar, position the engine and transaxle together. Install the 6 engine-to-bellhousing bolts.
 - Tighten to 48 Nm (35 lb-ft).



N0113199

Fig. 665: Locating Clutch Housing-To-Engine Bolts
Courtesy of FORD MOTOR CO.

2. Using the Floor Crane and Spreader Bar, raise the engine and transaxle assembly onto the lift table.



Fig. 666: Lifting Engine And Transaxle Assembly Using Floor Crane And Spreader Bar
Courtesy of FORD MOTOR CO.

3. Using the Powertrain Lift and Adjustable Grip Arms, secure the engine and transaxle assembly to the lift table.

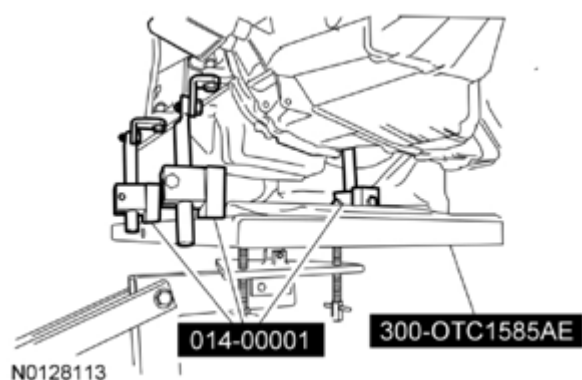


Fig. 667: Securing Engine To Lift Table
Courtesy of FORD MOTOR CO.

4. Install the 2 upper bellhousing-to-engine bolts and bracket.
 - Tighten to 48 Nm (35 lb-ft).
 - Attach the wiring harness pin-type retainer to the bracket.



Fig. 668: Locating Upper Bellhousing-To-Engine Bolts
Courtesy of FORD MOTOR CO.

5. Install the starter motor and the 3 bolts (2 shown in illustration).
- Install the 3 bolts finger-tight.
 - Tighten the 2 upper bolts to 48 Nm (35 lb-ft).
 - Tighten the lower bolt to 48 Nm (35 lb-ft).

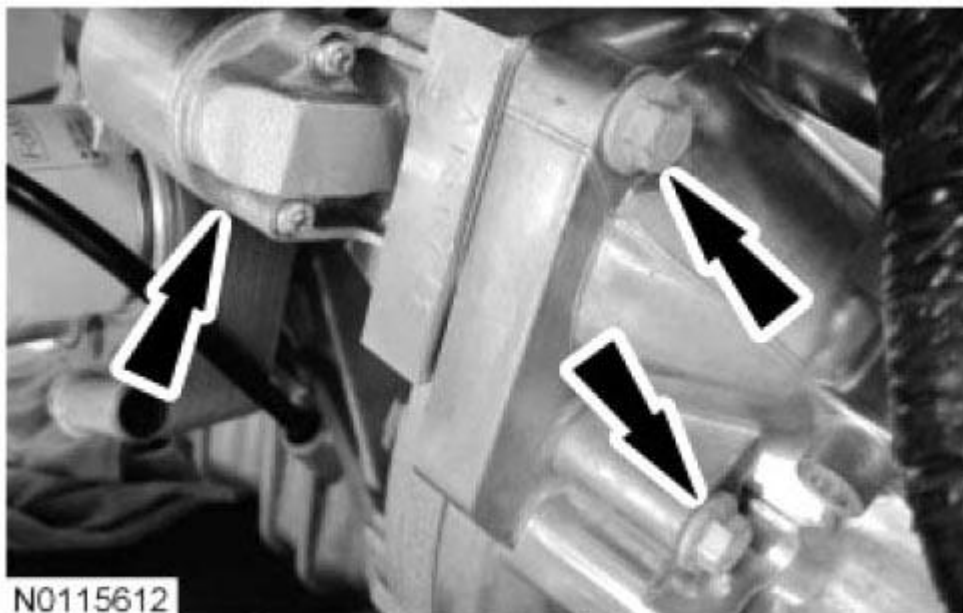


Fig. 669: Locating Bolts And Starter Motor
Courtesy of FORD MOTOR CO.

6. Connect the starter motor electrical terminals and install the 2 nuts.
 - Tighten to 10 Nm (89 lb-in).

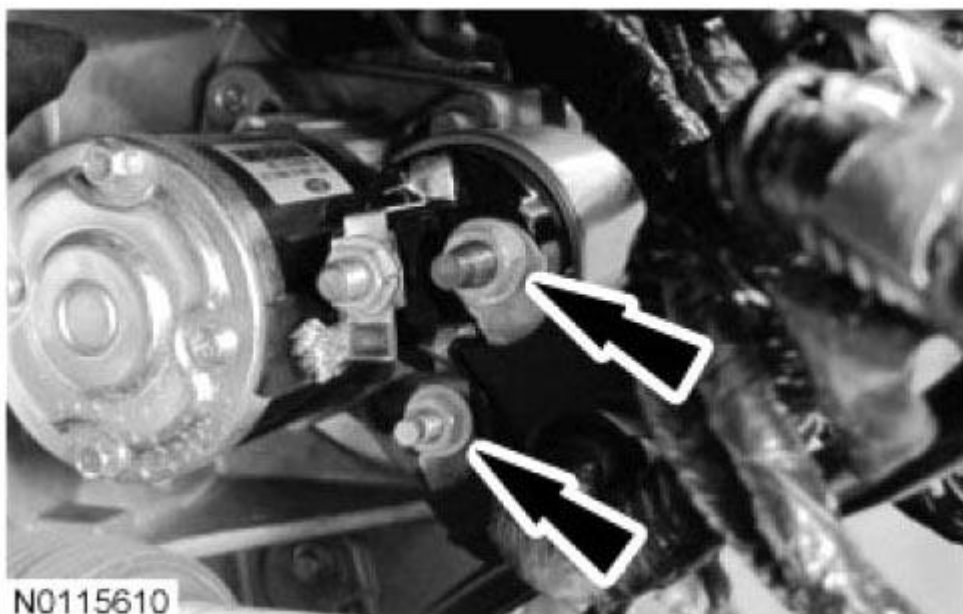


Fig. 670: Locating Nuts And Starter Motor Electrical Terminals
Courtesy of FORD MOTOR CO.

7. Connect the RH Knock Sensor (KS) electrical connector.
 - Attach the 2 wiring harness retainers to the intake manifold.

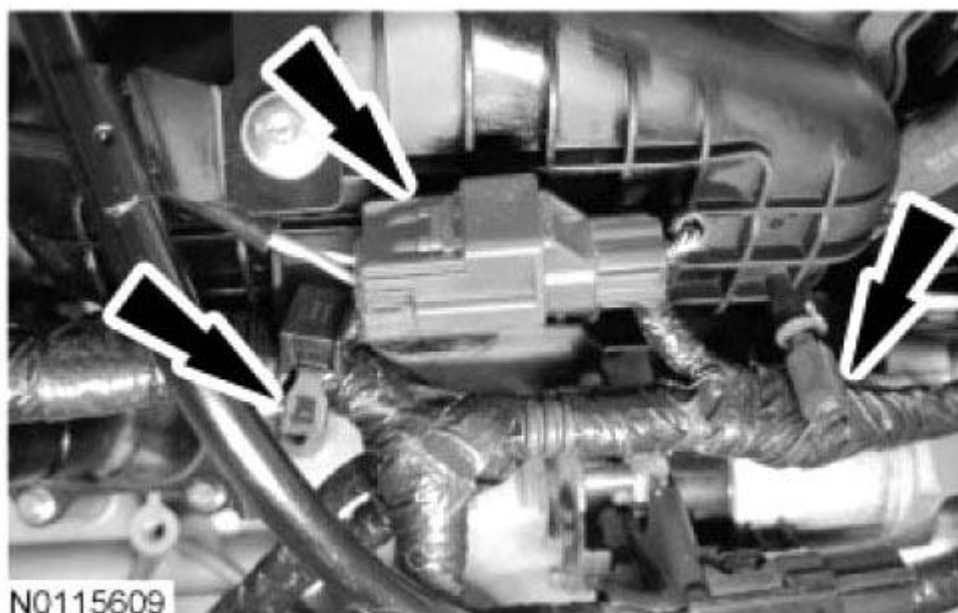


Fig. 671: Locating Wiring Harness Retainers From Intake Manifold
Courtesy of FORD MOTOR CO.

8. Connect the Engine Oil Pressure (EOP) switch electrical connector.
 - Attach the wiring harness retainer to the engine block.

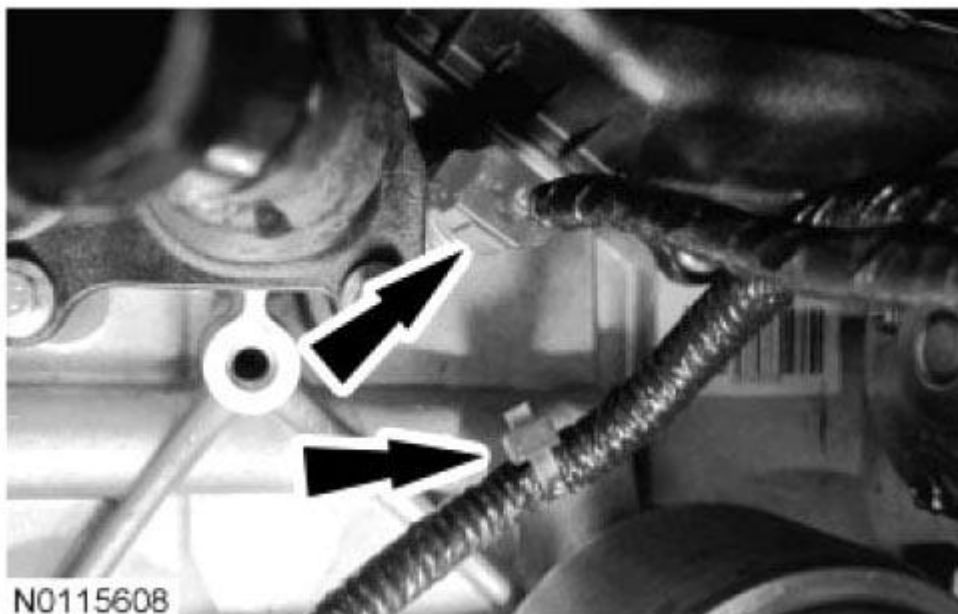


Fig. 672: Locating Engine Oil Pressure (EOP) Switch Electrical Connector
Courtesy of FORD MOTOR CO.

9. Connect the Crankshaft Position (CKP) sensor electrical connector.

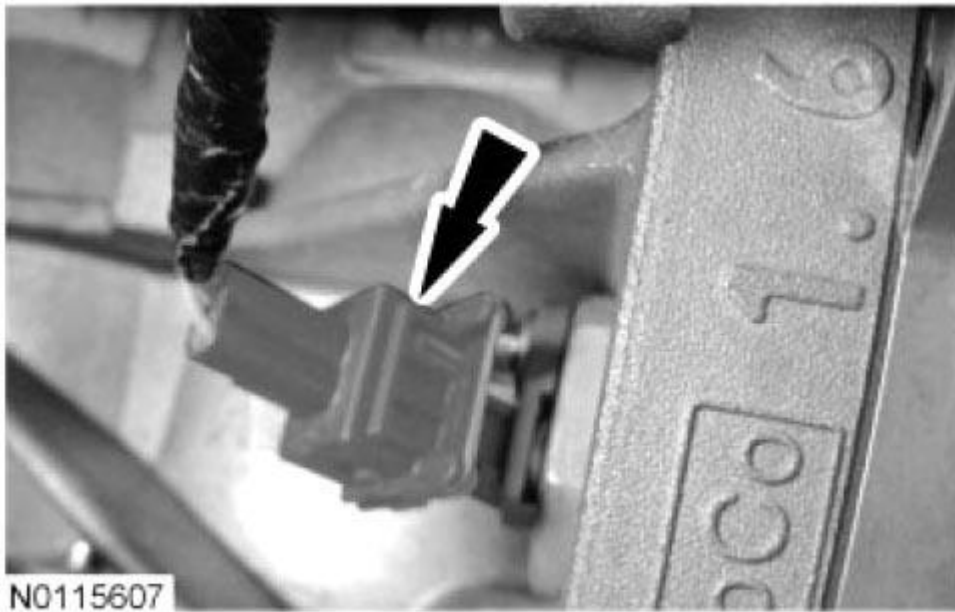


Fig. 673: Locating Crankshaft Position (CKP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

10. Connect the Throttle Body (TB) electrical connector.
- Attach the 2 wiring harness retainers to the TB.

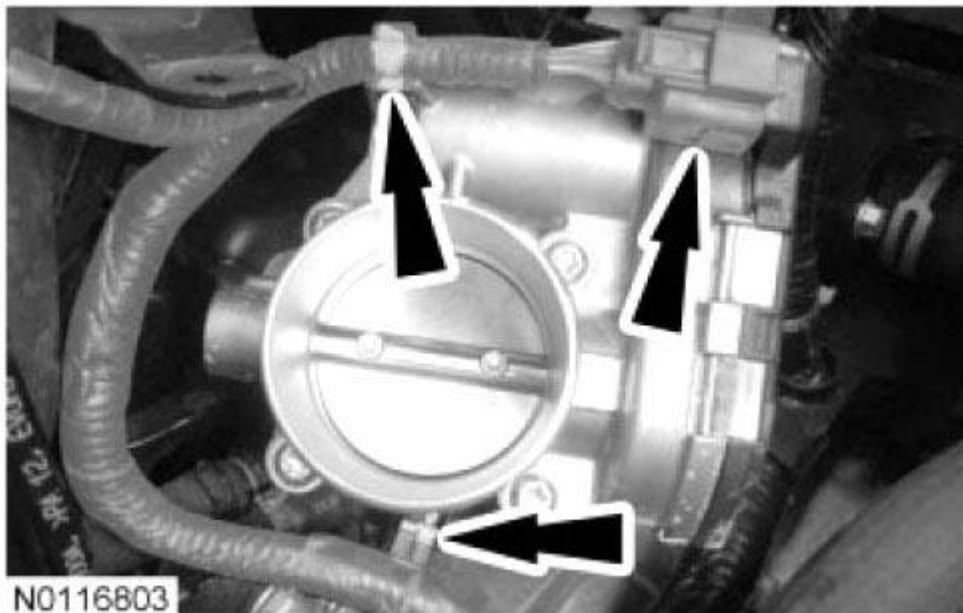


Fig. 674: Locating Throttle Body (TB) Electrical Connector
Courtesy of FORD MOTOR CO.

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

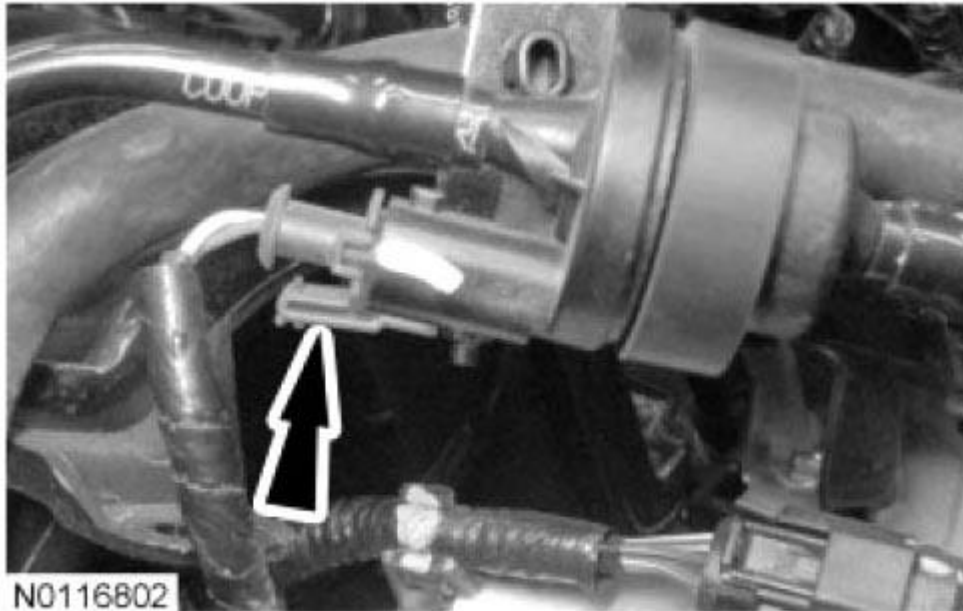


Fig. 675: Locating EVAP Canister Purge Valve Electrical Connector
Courtesy of FORD MOTOR CO.

12. Connect the 4 fuel injector electrical connectors.
 - Attach the wiring harness retainers to the valve cover stud bolts.



Fig. 676: Locating Fuel Injector Electrical Connectors
Courtesy of FORD MOTOR CO.

13. Connect the 2 Variable Camshaft Timing (VCT) oil control solenoid electrical connectors.
 - Attach the 2 wiring harness retainers.

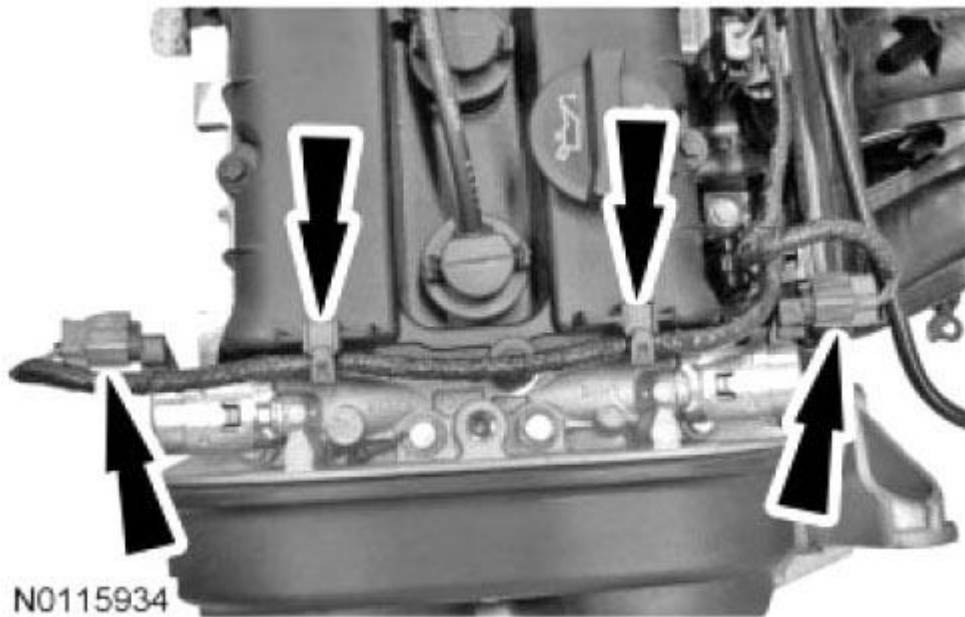


Fig. 677: Locating Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

14. Connect and attach the LH KS electrical connector.



Fig. 678: Locating LH Knock Sensor (KS) Electrical Connector
Courtesy of FORD MOTOR CO.

15. Connect the 2 Camshaft Position (CMP) sensor electrical connectors.

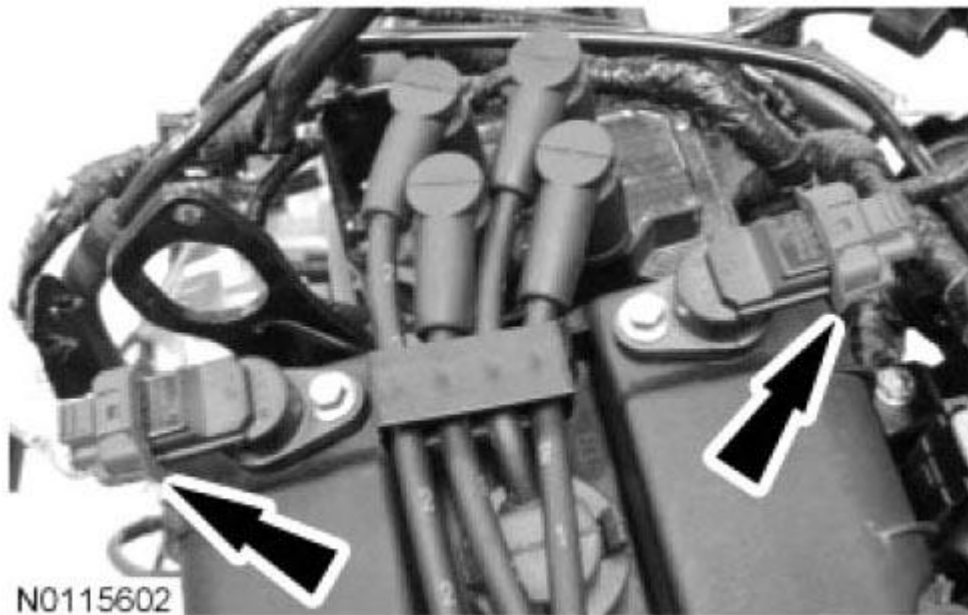


Fig. 679: Locating Camshaft Position (CMP) Sensor Electrical Connectors
Courtesy of FORD MOTOR CO.

16. Attach the Heated Oxygen Sensor (HO2S) sensor electrical connector pin-type retainer to the bracket.

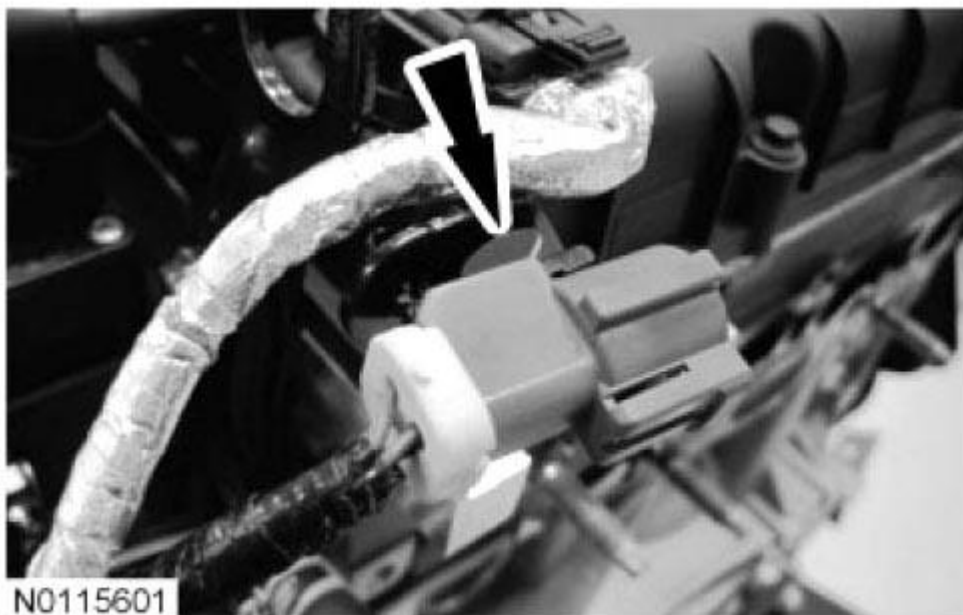


Fig. 680: Locating HO2S Sensor Electrical Connector Pin-Type Retainer To Bracket
Courtesy of FORD MOTOR CO.

17. Connect the ignition coil and Engine Coolant Temperature (ECT) sensor electrical connectors.

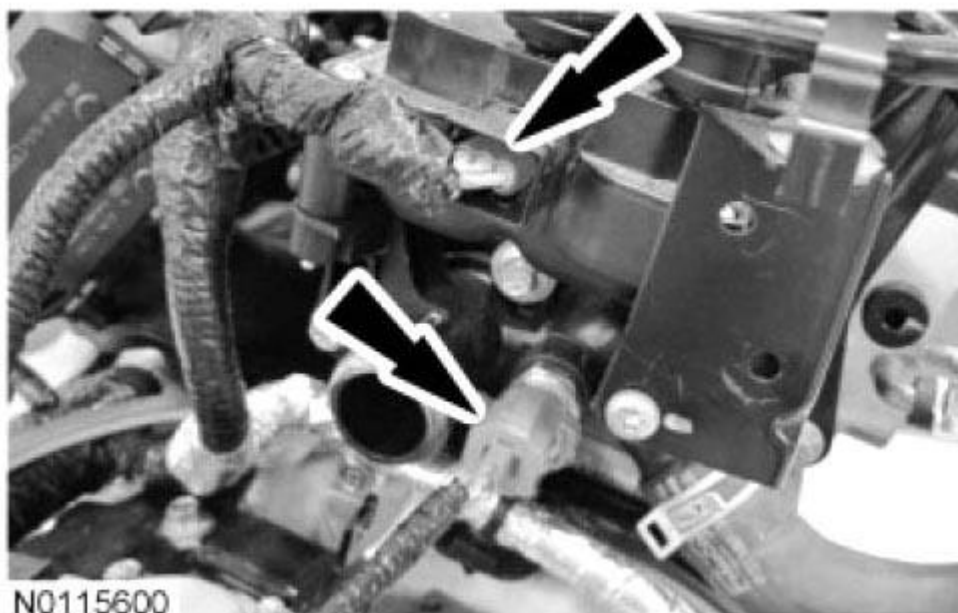


Fig. 681: Locating Ignition Coil And Engine Coolant Temperature (ECT) Sensor Electrical Connectors

Courtesy of FORD MOTOR CO.

18. Attach the 2 wiring harness retainers to the coolant outlet bracket.

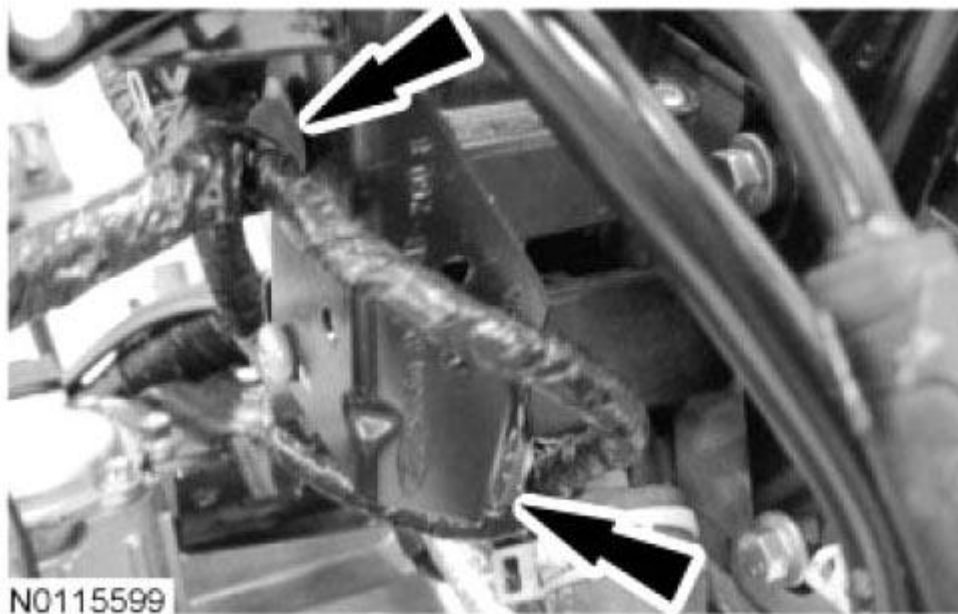


Fig. 682: Locating Wiring Harness Retainers From Coolant Outlet Bracket

Courtesy of FORD MOTOR CO.

19. Install the 4 new catalytic converter studs.

- Tighten to 17 Nm (150 lb-in).

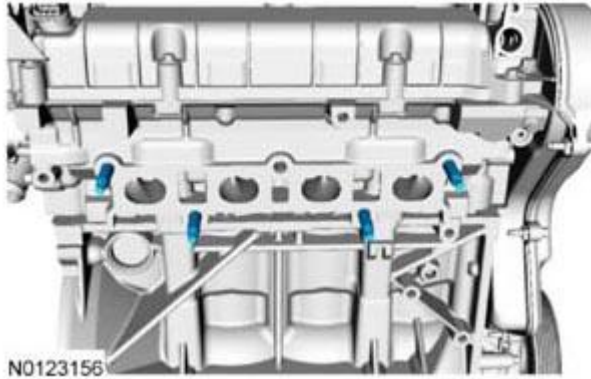


Fig. 683: Identifying Catalytic Converter Studs
Courtesy of FORD MOTOR CO.

NOTE: The engine mount studs must be torqued or damage to the powertrain may occur.

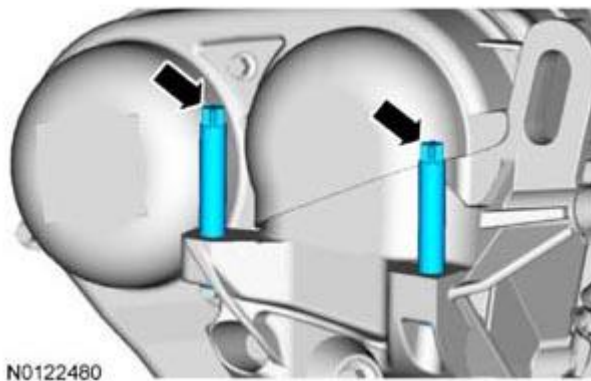


Fig. 684: Locating Engine Mount Studs
Courtesy of FORD MOTOR CO.

20. Torque the engine mount studs before installing the engine mount nuts.
 - Tighten to 8 Nm (71 lb-in).
21. Using the lift table, position the engine and transaxle assembly in the vehicle.
22. Align the transaxle support insulator, install and tighten the 2 nuts and 2 bolts.
 - Tighten the 2 nuts to 125 Nm (92 lb-ft).
 - Tighten the 2 bolts to 90 Nm (66 lb-ft).

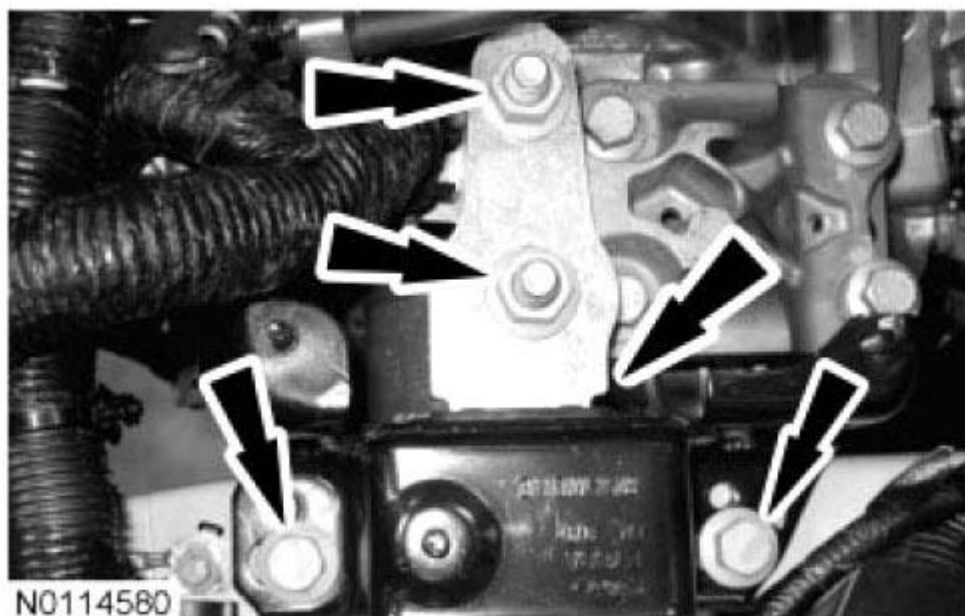


Fig. 685: Locating Transaxle Support Insulator Bolt And Nuts
Courtesy of FORD MOTOR CO.

NOTE: Do not loosen the engine mount center bolt or the engine may become improperly positioned.



Fig. 686: Locating Engine Mount And Nuts
Courtesy of FORD MOTOR CO.

23. Install the engine mount and the 2 nuts.
 - Tighten the 2 nuts to 80 Nm (59 lb-ft).
24. Lower the powertrain to the installed position.
25. Install the 3 engine mount bolts.
 - Tighten to 48 Nm (35 lb-ft).

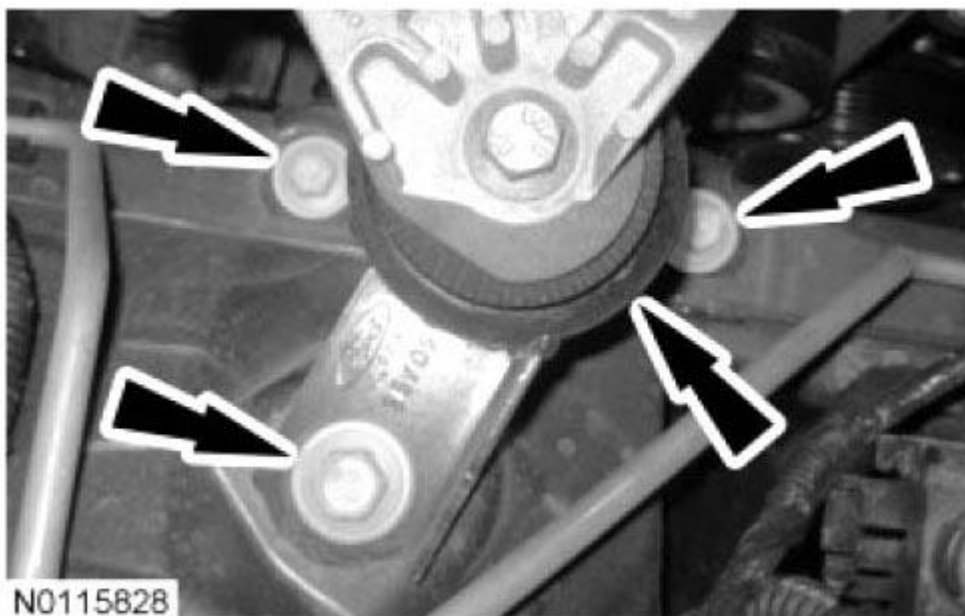


Fig. 687: Locating Bolts And Engine Mount
Courtesy of FORD MOTOR CO.

26. Install the transaxle roll restrictor bolt.
 - Tighten to 70 Nm (52 lb-ft).

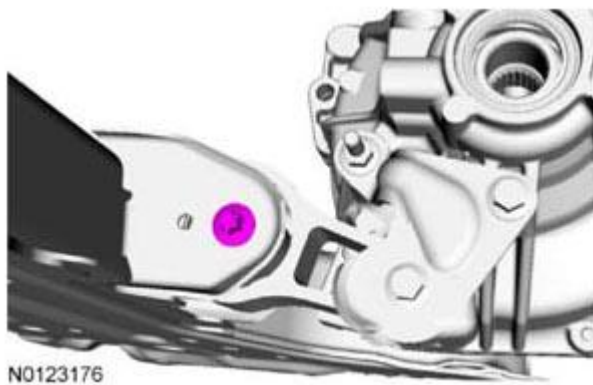


Fig. 688: Identifying Transaxle Roll Restrictor Bolt
Courtesy of FORD MOTOR CO.

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

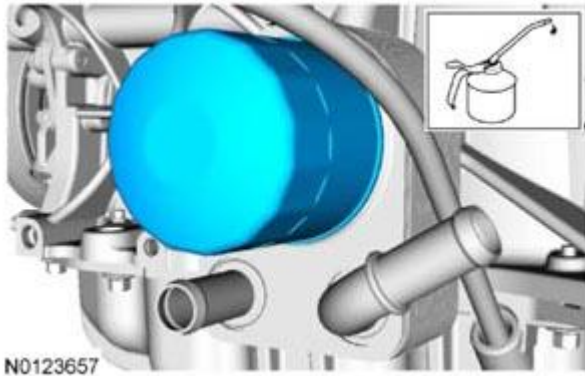


Fig. 689: Identifying Engine Oil Filter
Courtesy of FORD MOTOR CO.

27. Install a new engine oil filter.
 - Tighten to 15 Nm (133 lb-in).
28. If equipped, connect the block heater electrical connector.

NOTE: Failure to tighten the catalytic converter manifold fasteners in 20 Nm increments until reaching final torque of 55 Nm will cause the converter to develop an exhaust leak.

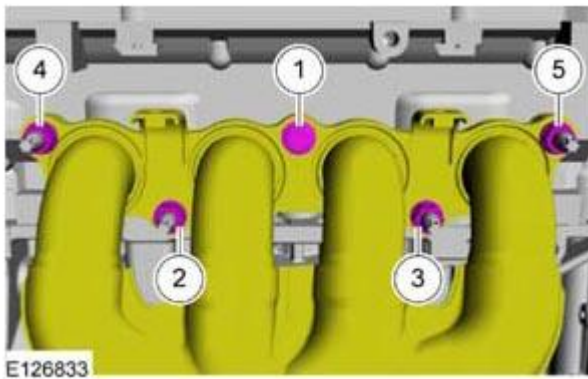


Fig. 690: Identifying Catalytic Converter Manifold Bolt And Nuts Tightening Sequence
Courtesy of FORD MOTOR CO.

29. Tighten the bolt and 4 nuts in the sequence shown in illustration, in 3 stages.
 - Stage 1: Tighten all fasteners in sequence to 20 Nm (177 lb-in).
 - Stage 2: Tighten all fasteners in sequence to 40 Nm (30 lb-ft).
 - Stage 3: Tighten all fasteners in sequence to 55 Nm (41 lb-ft).
30. Position the catalytic converter heat shield and install the 4 bolts.

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

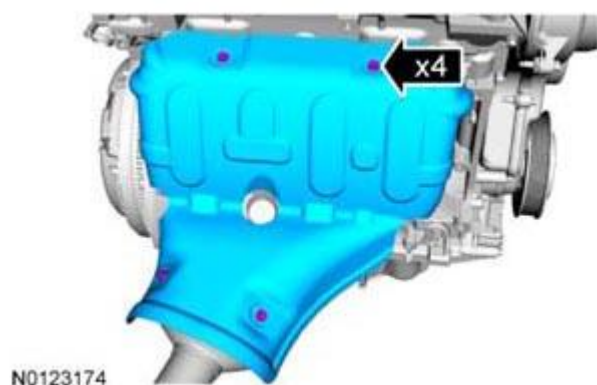


Fig. 691: Locating Bolts And Catalytic Converter Heat Shield
Courtesy of FORD MOTOR CO.

31. Install the lower catalytic converter bracket and the 4 bolts and tighten in sequence shown in illustration.
 1. Tighten the catalytic converter bracket-to-engine block bolts to 50 Nm (37 lb-ft).
 2. Tighten the catalytic converter bracket-to-catalytic converter bolts to 25 Nm (18 lb-ft).

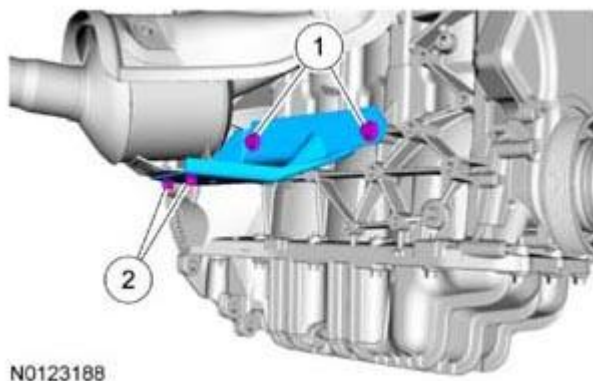
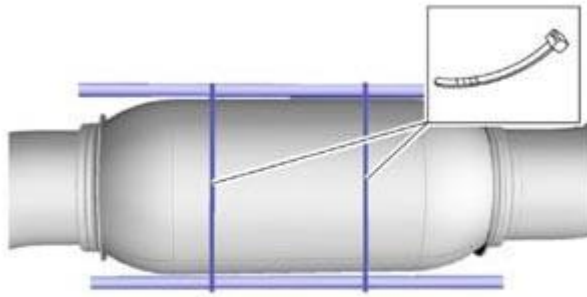


Fig. 692: Identifying Lower Catalytic Converter Bracket And Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

NOTE: Do not excessively bend or twist the exhaust flexible pipe. Failure to follow these instructions may cause damage to the flexible pipe.



E98634

Fig. 693: Supporting Exhaust Flexible Pipe
Courtesy of FORD MOTOR CO.

32. Remove the support for the exhaust flexible pipe.
33. Using a new gasket, position the catalytic converter to the muffler and install the 2 catalytic converter nuts.
 - Tighten to 48 Nm (35 lb-ft).

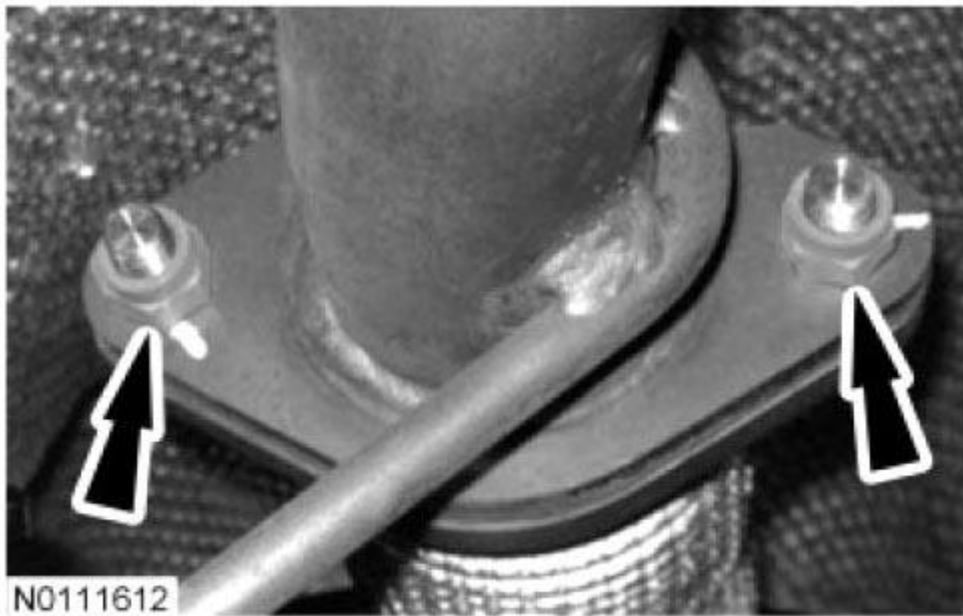


Fig. 694: Locating Catalytic Converter-To-Muffler Nuts
Courtesy of FORD MOTOR CO.

34. Install the Catalyst Monitor Sensor (CMS). For additional information, refer to **ELECTRONIC ENGINE CONTROLS**.

Vehicles without A/C

35. Install the accessory drive belt idler pulley bracket and the 3 bolts.
- Tighten to 24 Nm (18 lb-ft).

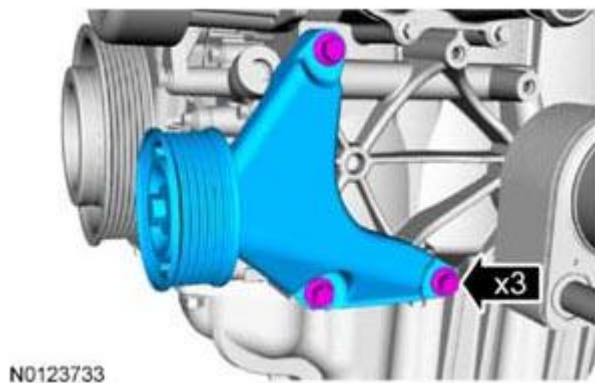


Fig. 695: Locating Bolts And Accessory Drive Belt Idler Pulley Bracket
Courtesy of FORD MOTOR CO.

Vehicles with A/C

36. Position the A/C compressor and install the 2 bolts and stud bolt.
- Tighten to 25 Nm (18 lb-ft).

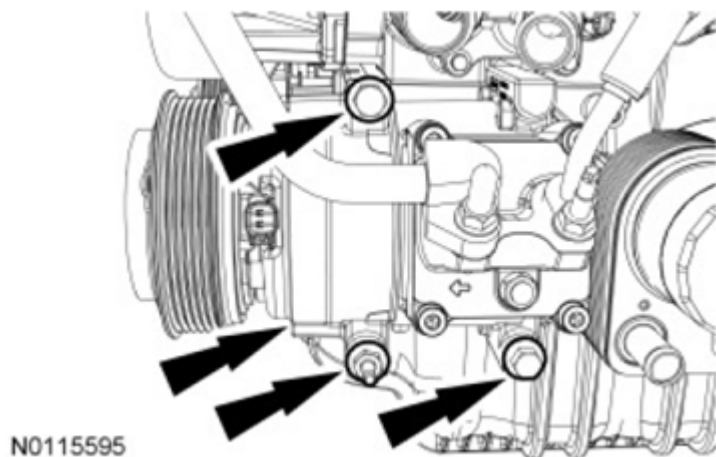


Fig. 696: Locating A/C Compressor Bolts And Stud Bolt
Courtesy of FORD MOTOR CO.

37. Attach the wiring harness retainer to the lower A/C compressor bracket.

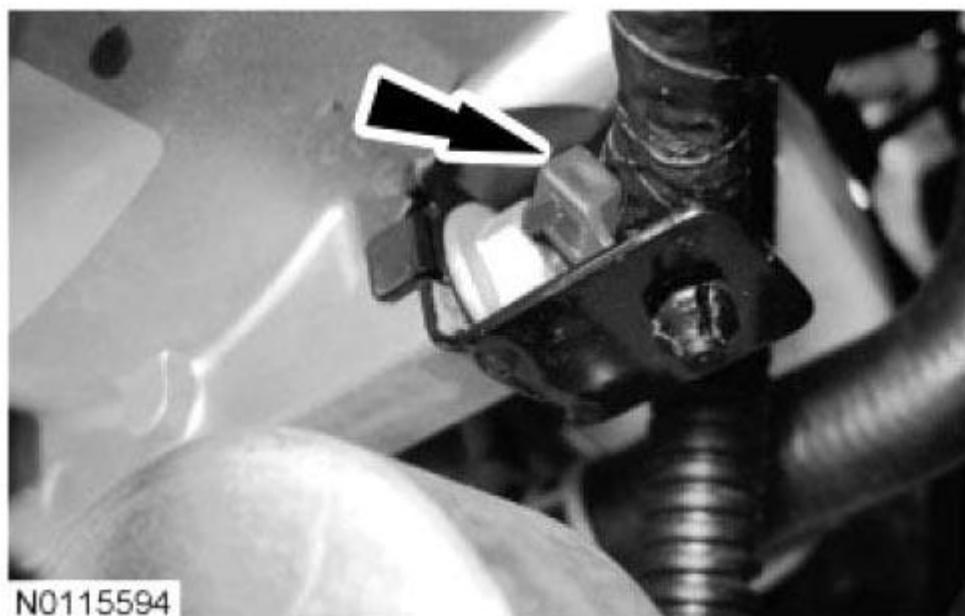


Fig. 697: Locating Wiring Harness Retainer To Lower A/C Compressor Bracket
Courtesy of FORD MOTOR CO.

38. Connect the A/C pressure transducer electrical connector.
- Attach the wiring harness retainer.



Fig. 698: Locating A/C Pressure Transducer Electrical Connector
Courtesy of FORD MOTOR CO.

39. Position the A/C line bracket and install the nut.

- Tighten to 9 Nm (80 lb-in).

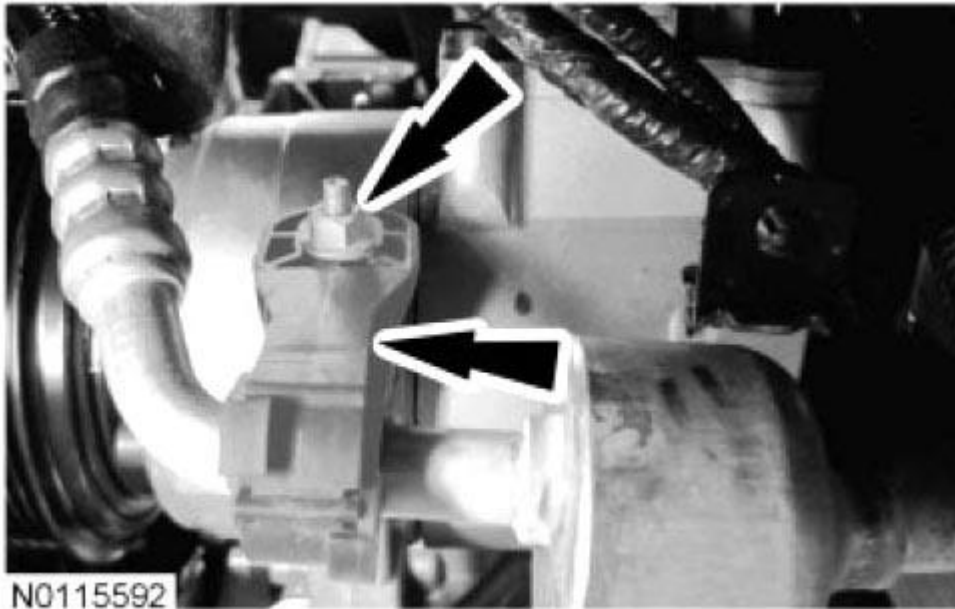


Fig. 699: Locating Nut And A/C Line Bracket
Courtesy of FORD MOTOR CO.

40. Connect the A/C compressor electrical connector.



Fig. 700: Locating A/C Compressor Electrical Connector
Courtesy of FORD MOTOR CO.

All vehicles

41. Install the halfshaft bracket and the 3 bolts and tighten in sequence shown in illustration.
 1. Tighten the top bolt to 48 Nm (35 lb-ft).
 2. Tighten the 2 bottom bolts to 24 Nm (18 lb-ft).

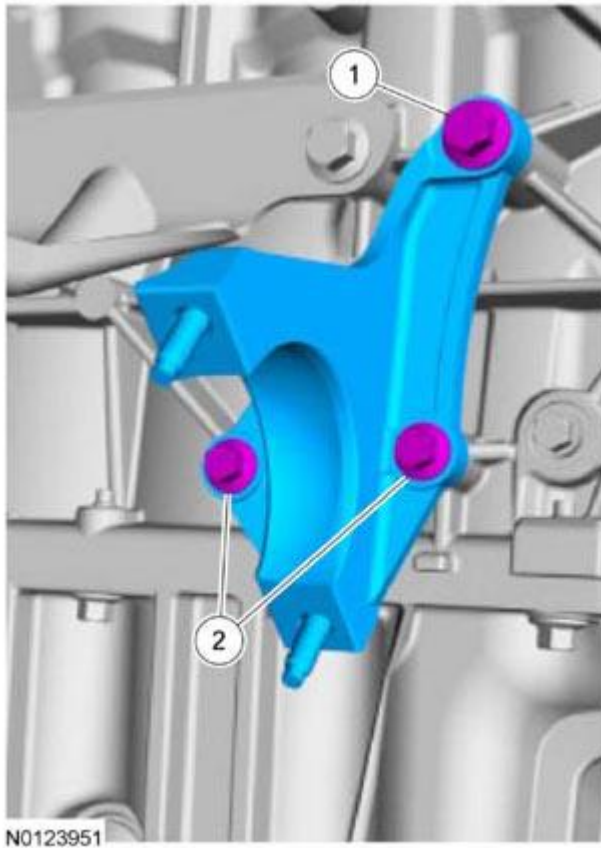


Fig. 701: Identifying Halfshaft Bracket And Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

42. Install the RH and LH halfshafts. For additional information, refer to **FRONT DRIVE HALFSHAFTS**.
43. Position the engine ground wire and install the bolt.
 - Tighten to 10 Nm (89 lb-in).



Fig. 702: Locating Bolt And Engine Ground Wire
Courtesy of FORD MOTOR CO.

44. Attach the clutch hydraulic hose to the transaxle retainer.

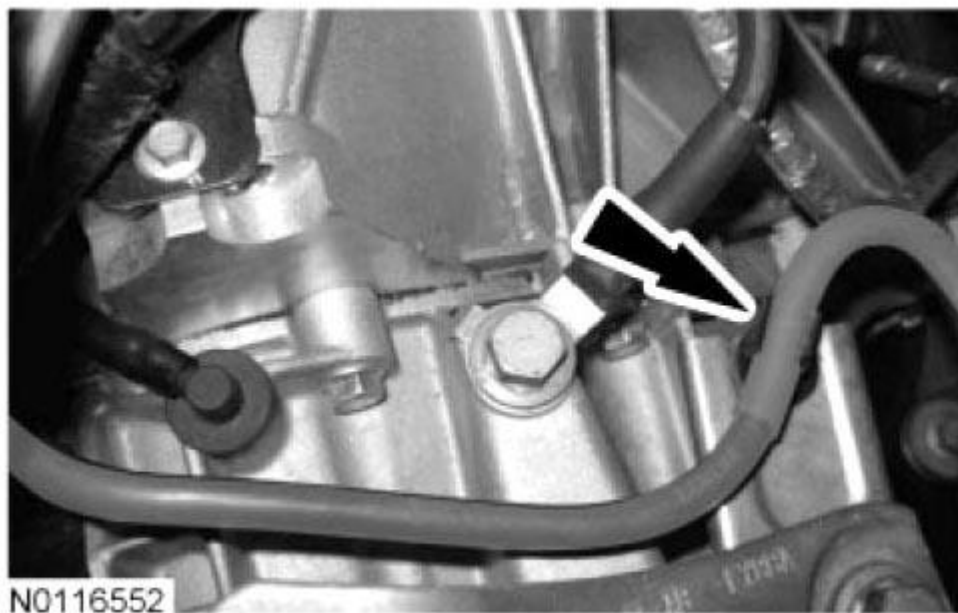


Fig. 703: Locating Clutch Hydraulic Hose To Transaxle Retainer
Courtesy of FORD MOTOR CO.

WARNING: Carefully read cautionary information on product label. For

EMERGENCY MEDICAL INFORMATION seek medical advice. In the USA or Canada on Ford/Motorcraft products call: 1-800-959-3673. For additional information, consult the product Material Safety Data Sheet (MSDS) if available. Failure to follow these instructions may result in serious personal injury.

NOTE: Do not spill brake fluid on painted or plastic surfaces or damage to the surface may occur. If brake fluid is spilled onto a painted or plastic surface, immediately wash the surface with water.

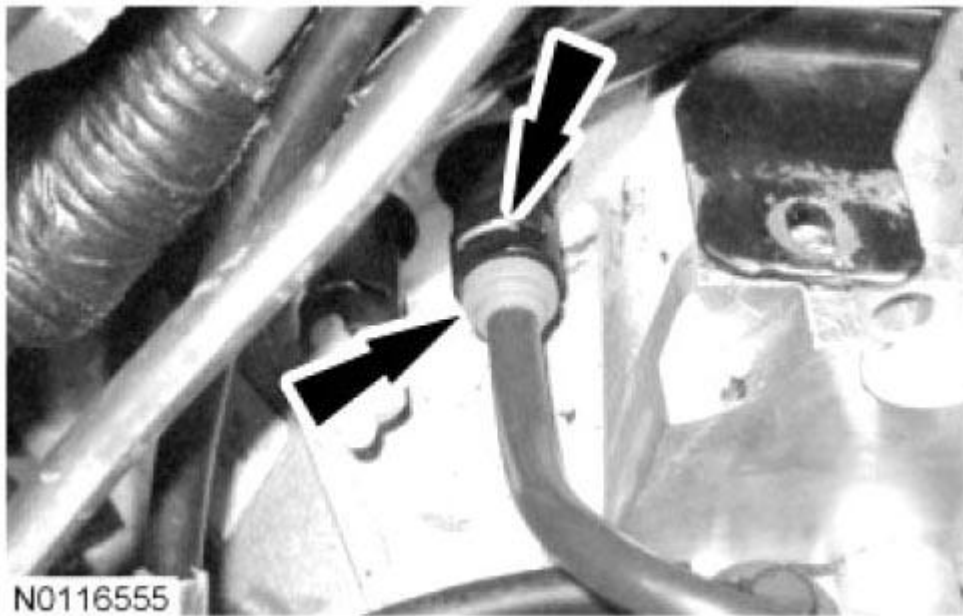


Fig. 704: Locating Clip And Clutch Hydraulic Hose
Courtesy of FORD MOTOR CO.

45. Connect the clutch hydraulic hose and install the clip.
46. Connect the lower radiator hose and coolant hose to the thermostat housing.

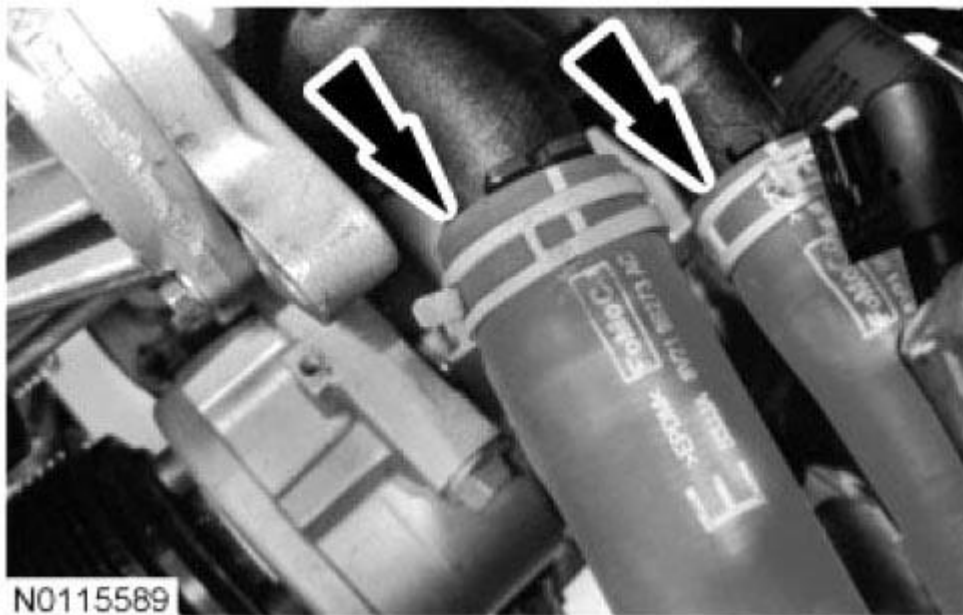


Fig. 705: Locating Lower Radiator Hose And Coolant Hose To Thermostat Housing
Courtesy of FORD MOTOR CO.

47. Connect the upper radiator hose to the engine.

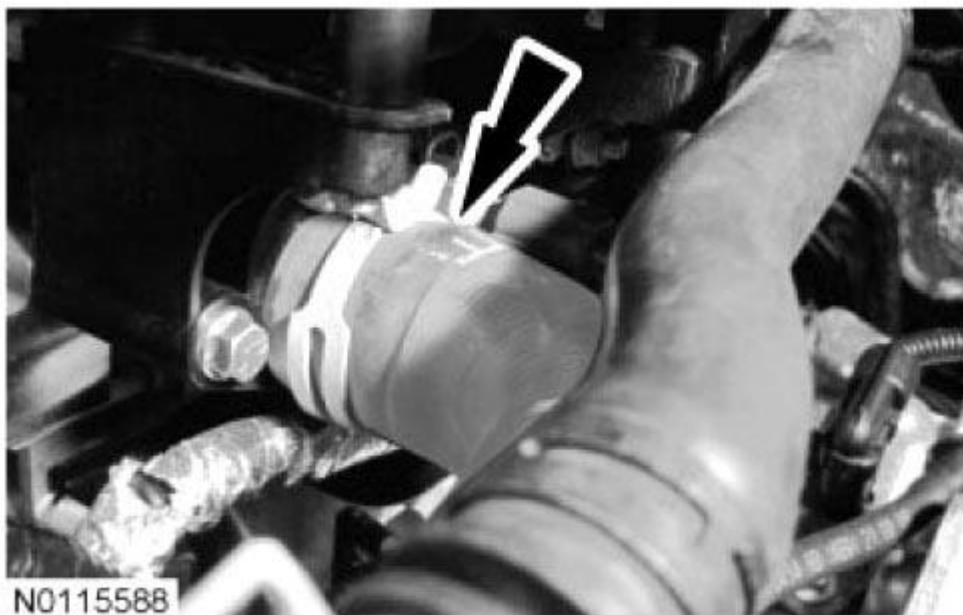


Fig. 706: Locating Upper Radiator Hose To Engine
Courtesy of FORD MOTOR CO.

48. Connect the EVAP tube quick connect coupling near the bulk head. For additional information, refer to

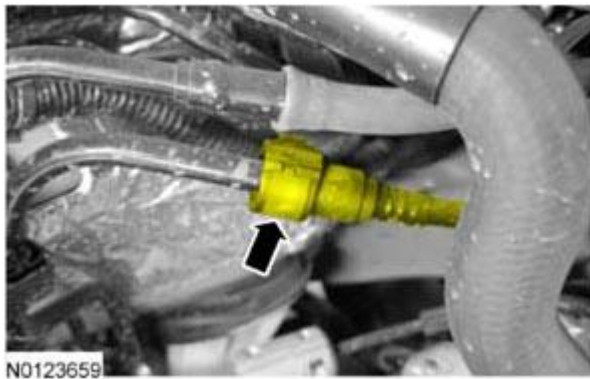
FUEL SYSTEM - GENERAL INFORMATION .

Fig. 707: Locating Evaporative Emission (EVAP) Tube Quick Connect Coupling Near Bulk Head
Courtesy of FORD MOTOR CO.

49. Attach the coolant hose retainer to the coolant outlet bracket.

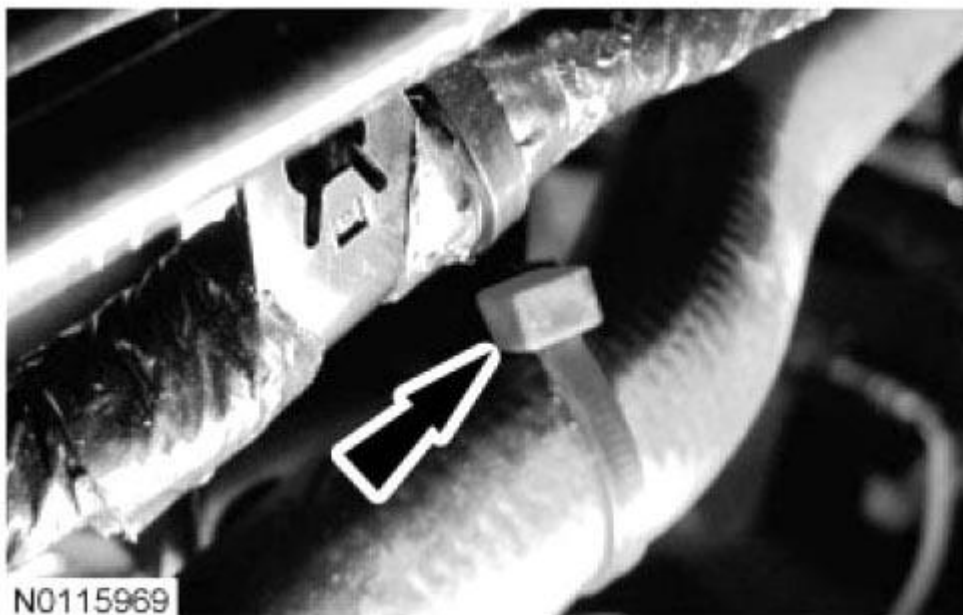


Fig. 708: Locating Coolant Hose Retainer To Coolant Outlet Bracket
Courtesy of FORD MOTOR CO.

50. Connect the lower heater hose to the heater core.



Fig. 709: Locating Lower Heater Hose To Heater Core
Courtesy of FORD MOTOR CO.

51. Install the HO2S. For additional information, refer to **ELECTRONIC ENGINE CONTROLS**.
52. Connect the 2 coolant hoses to the engine oil cooler.
 - Attach the oil cooler hose retainer to the upper radiator hose.

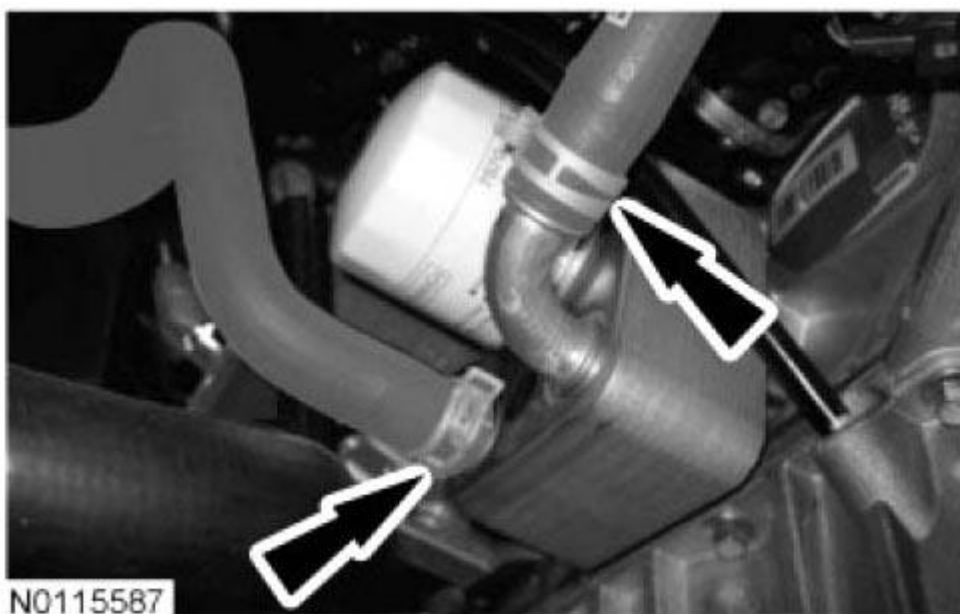


Fig. 710: Locating Coolant Hoses To Engine Oil Cooler

Courtesy of FORD MOTOR CO.

53. Install the cooling fan motor and shroud. For additional information, refer to **ENGINE COOLING SYSTEM**.
54. Install the gearshift cables.
 1. Attach the gearshift cables to the transaxle gearshift control levers.
 2. Install the gearshift cable by pulling the lower part of abutment down and installing them in the brackets.

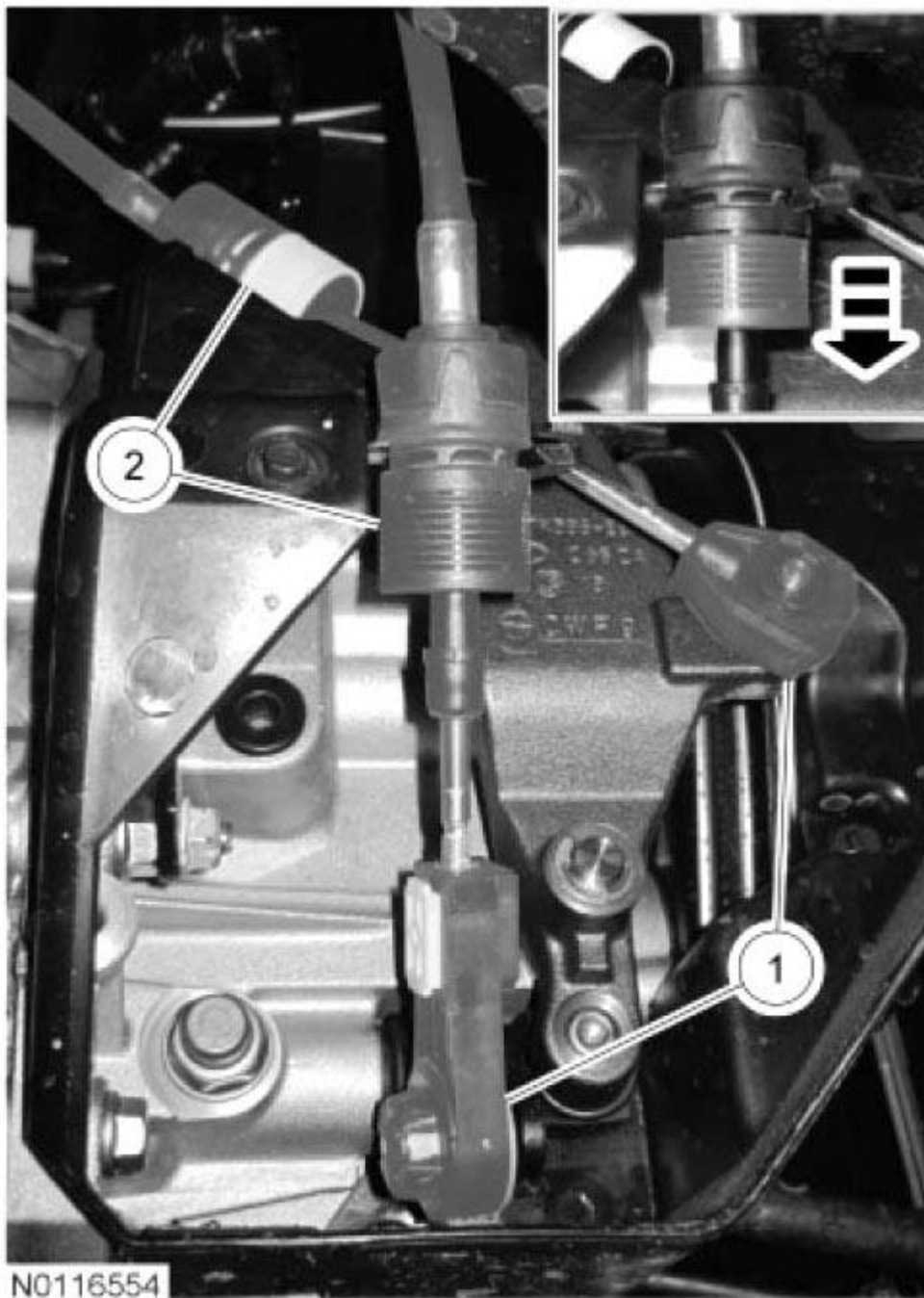


Fig. 711: Removing Gearshift Cable
Courtesy of FORD MOTOR CO.

55. Install the generator. For additional information, refer to **CHARGING SYSTEM**.
56. Attach the fuel tube to the coolant outlet bracket retainer.

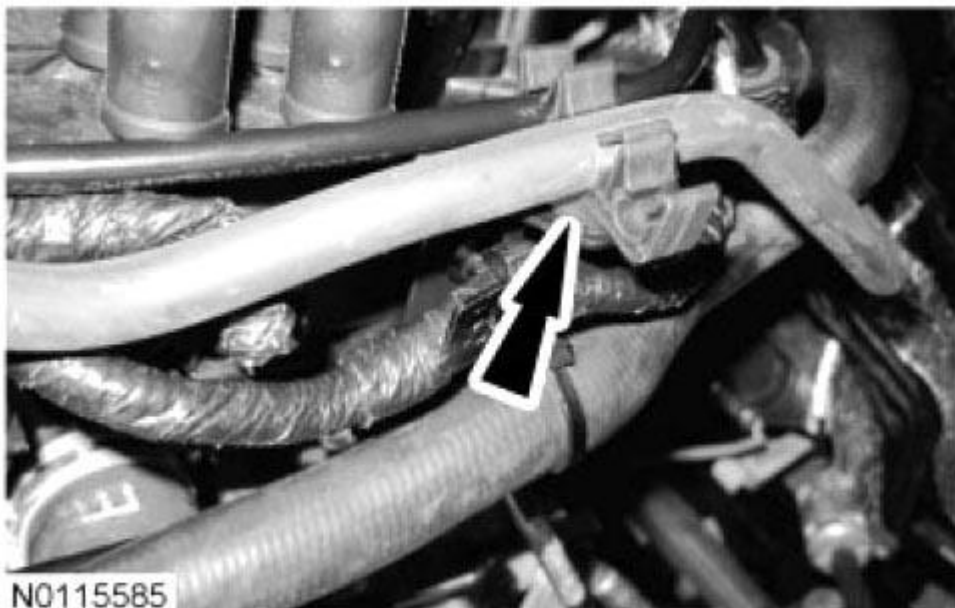


Fig. 712: Locating Fuel Tube To Coolant Outlet Bracket Retainer
Courtesy of FORD MOTOR CO.

57. Connect the fuel tube spring lock couplings to the fuel rail. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** .

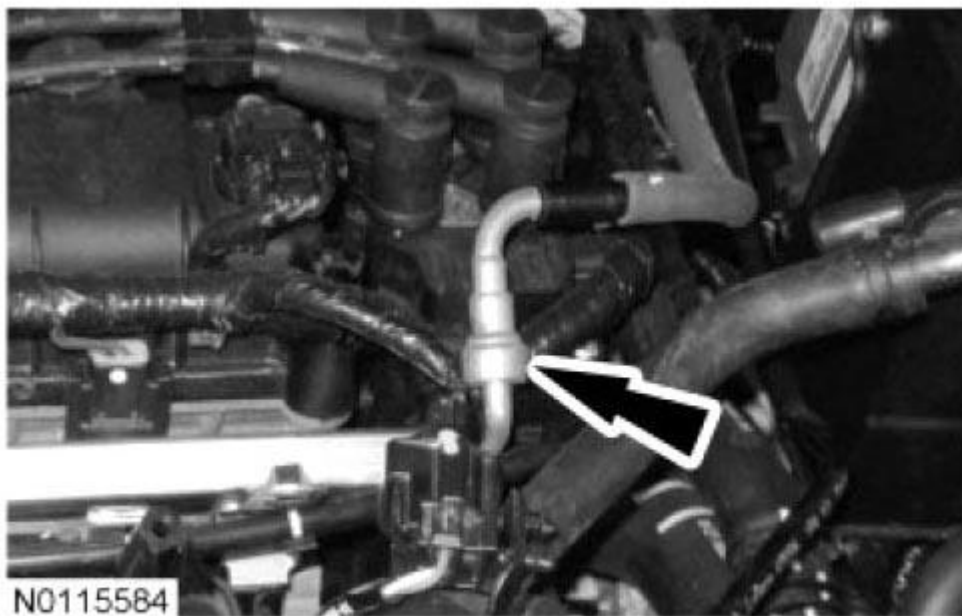


Fig. 713: Locating Fuel Tube Spring Lock Couplings From Fuel Rail
Courtesy of FORD MOTOR CO.

58. Connect the brake booster vacuum hose.

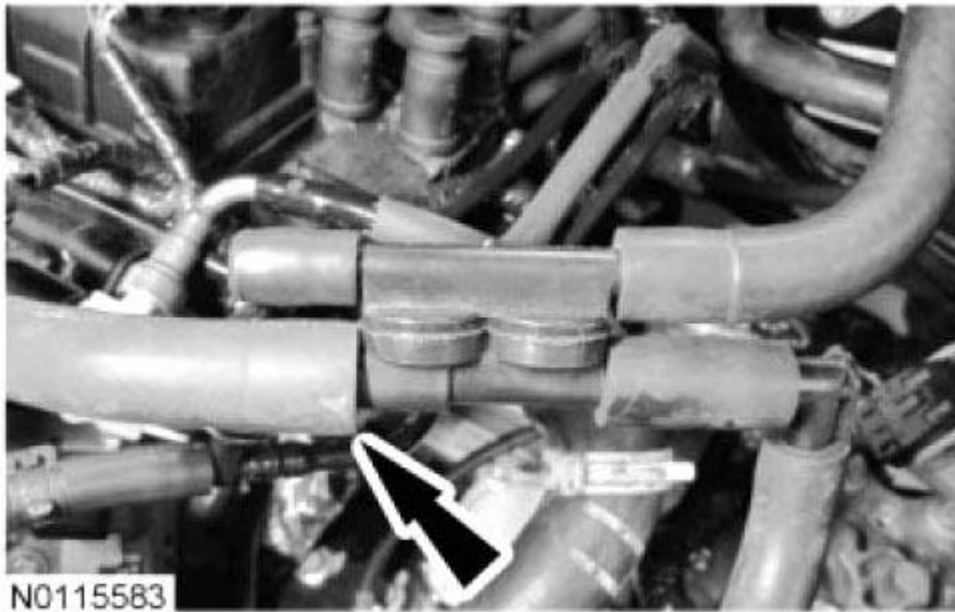


Fig. 714: Locating Brake Booster Vacuum Hose
Courtesy of FORD MOTOR CO.

59. Connect the engine harness electrical connector.



Fig. 715: Locating Engine Harness Electrical Connector
Courtesy of FORD MOTOR CO.

60. Install the battery tray bracket and the 3 battery tray nuts.
- Attach the 2 wiring harness retainers to the bottom of the battery tray bracket.
 - Tighten nuts and bolt to 10 Nm (89 lb-in).

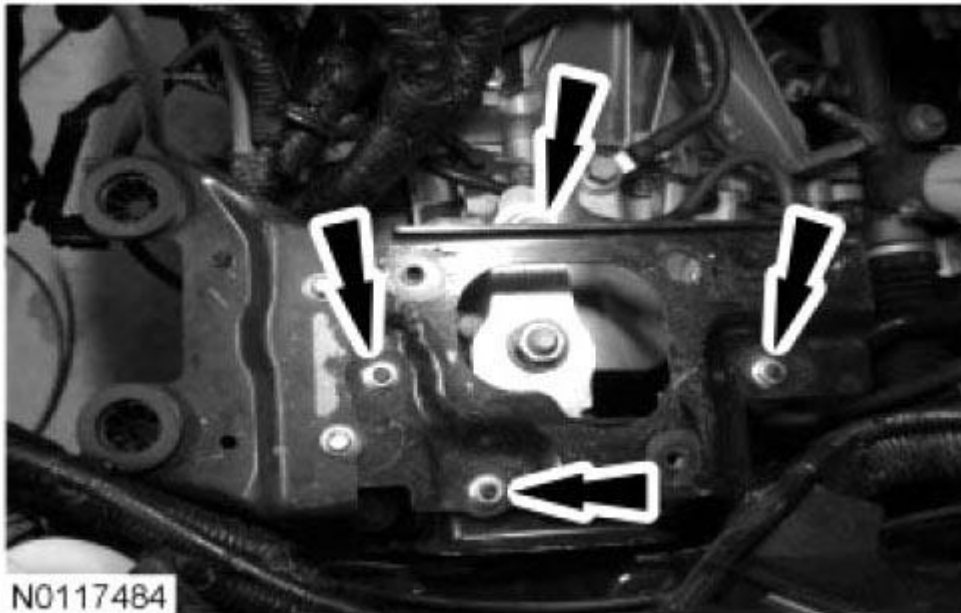


Fig. 716: Locating Battery Tray Nuts
Courtesy of FORD MOTOR CO.

61. Attach the 2 positive battery cable wire harness retainers to battery tray bracket.

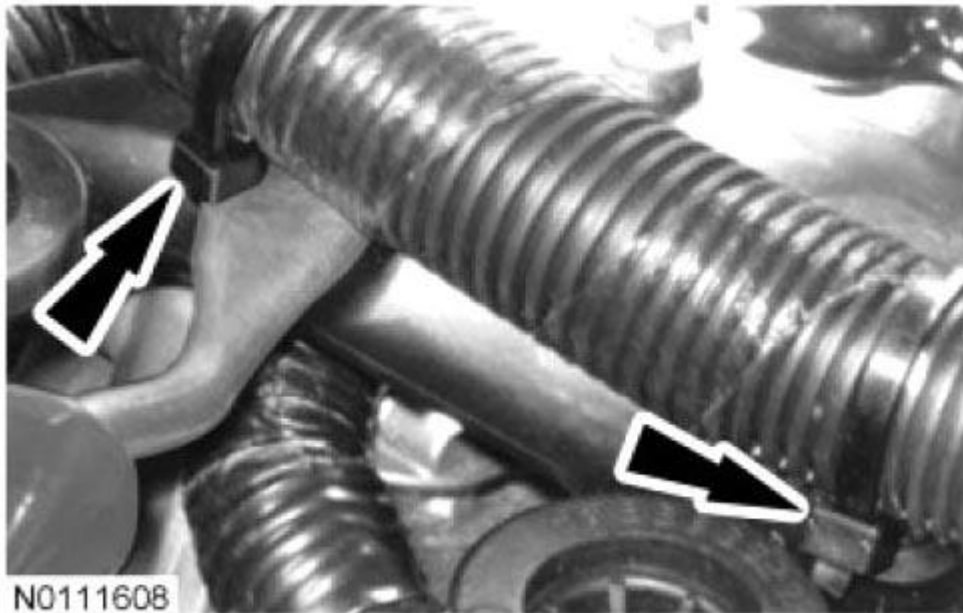


Fig. 717: Locating Positive Battery Cable Wire Harness Retainers From Battery Tray Bracket
Courtesy of FORD MOTOR CO.

62. Install the battery tray and the 3 bolts.
- Tighten to 10 Nm (89 lb-in).

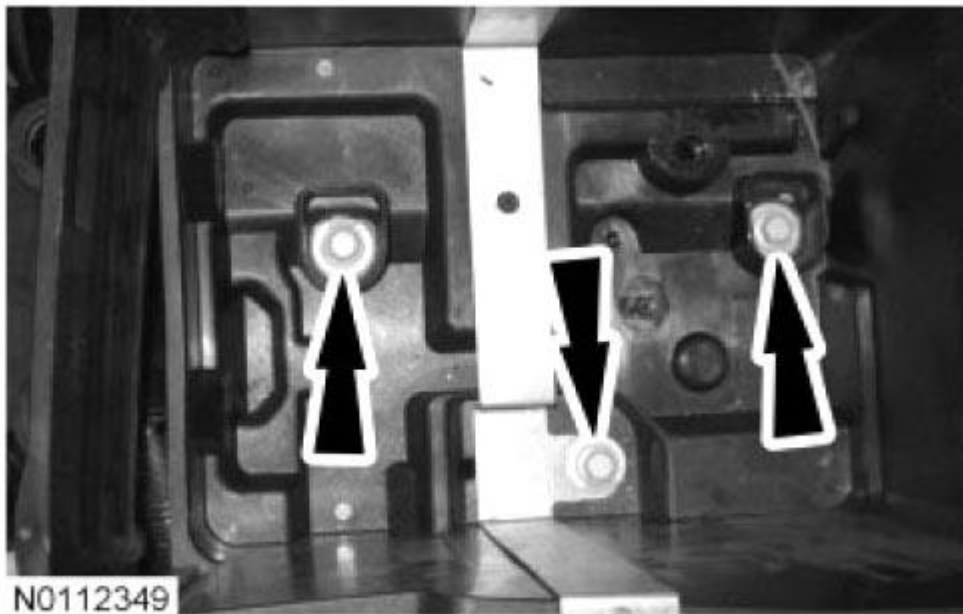


Fig. 718: Locating Bolts And Battery Tray
Courtesy of FORD MOTOR CO.

63. Connect the 3 PCM electrical connectors.

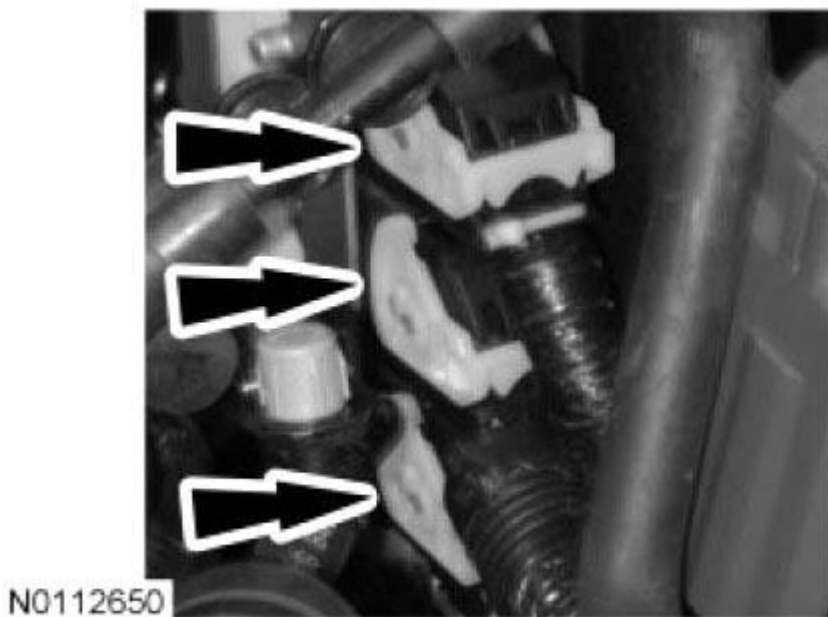


Fig. 719: Locating PCM Electrical Connectors
Courtesy of FORD MOTOR CO.

64. Install the PCM cover and the bolt.
- Tighten to 5.4 Nm (47.8 lb-in).

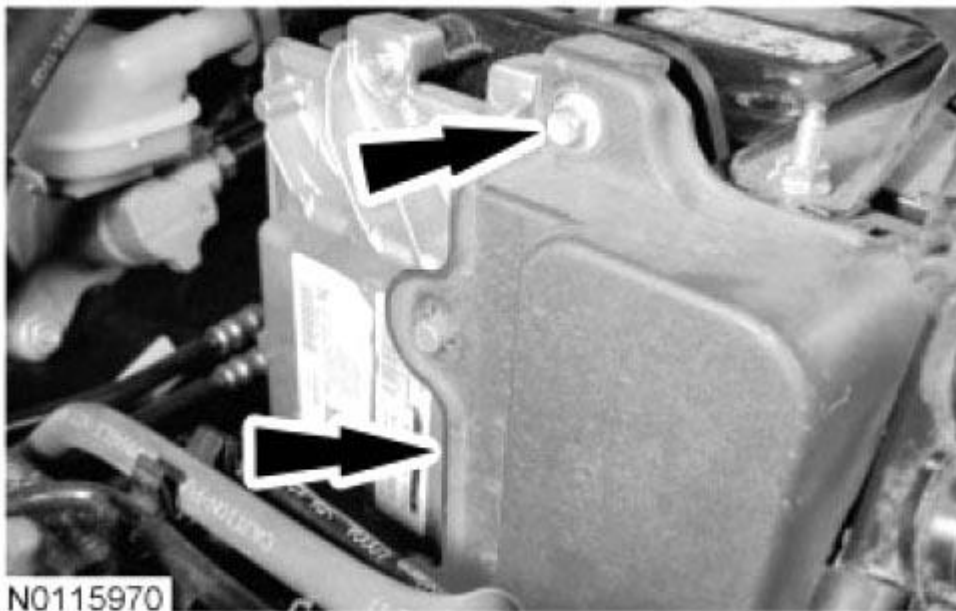


Fig. 720: Locating Bolt And PCM Cover
Courtesy of FORD MOTOR CO.

65. Install the cable and nut to the positive battery cable terminal.
 - Tighten to 10 Nm (89 lb-in).

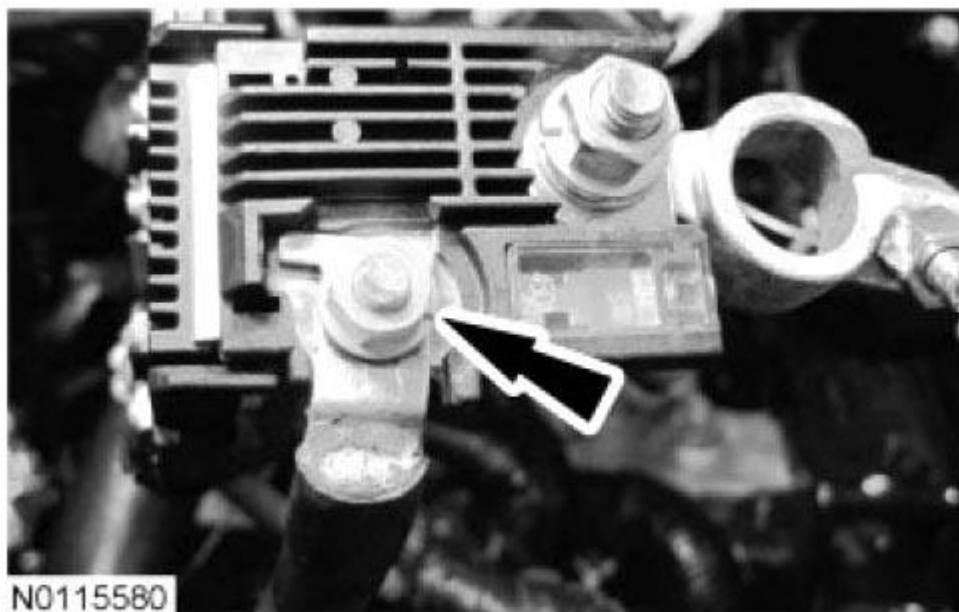


Fig. 721: Locating Positive Battery Cable Terminal And Nut
Courtesy of FORD MOTOR CO.

66. Install the battery. For additional information, refer to **BATTERY, MOUNTING AND CABLES**.
67. Install the positive battery cable cover.

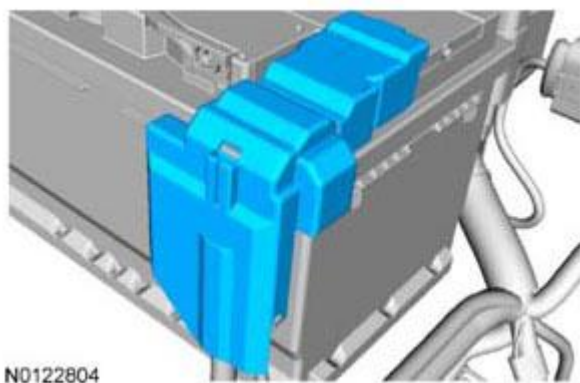


Fig. 722: Identifying Positive Battery Cable Cover
Courtesy of FORD MOTOR CO.

68. Connect the crankcase vent tube to the valve cover.

- Attach the crankcase vent tube to the 2 retainers.

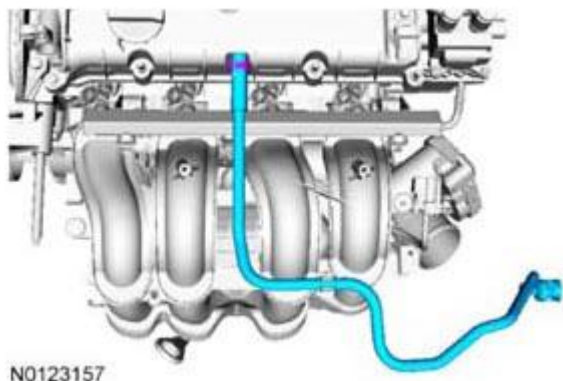


Fig. 723: Identifying Crankcase Vent Tube Retainers
Courtesy of FORD MOTOR CO.

69. Install the Air Cleaner (ACL) and ACL outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING**.
70. Fill the engine with clean engine oil.
71. Install the degas bottle. For additional information, refer to **ENGINE COOLING SYSTEM**.
72. Fill the and bleed cooling system. For additional information, refer to **ENGINE COOLING SYSTEM**.

NOTE: Before removing, clean the area around the fill plug.

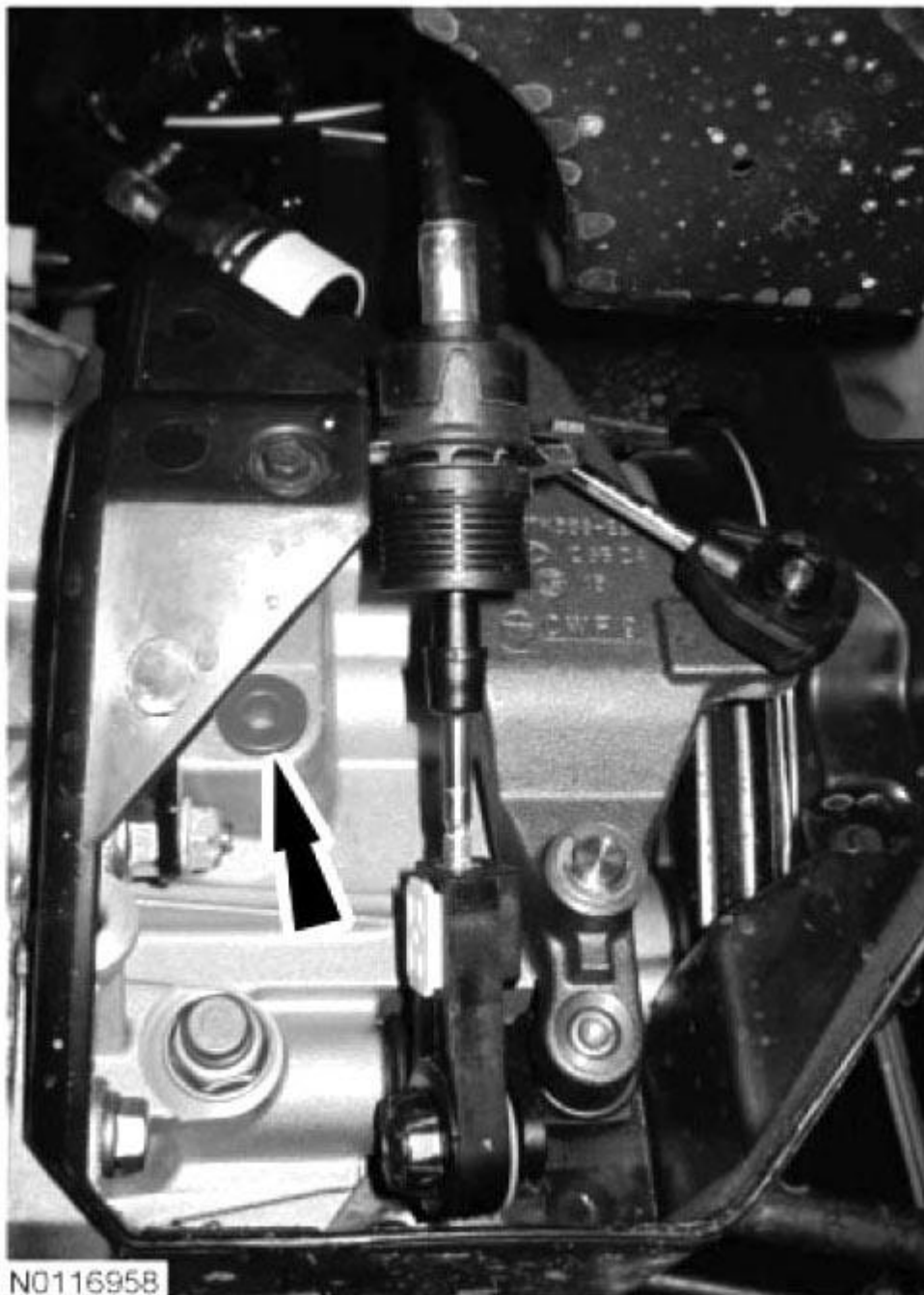


Fig. 724: Locating Fill Plug
Courtesy of FORD MOTOR CO.

73. Remove the fill plug and using a fluid suction gun, fill the transaxle with manual transmission fluid until fluid level is 0.0-5.0 mm (0.0-0.2 in) below the lower edge of the fill hole.
 - Install the fill plug and tighten to 35 Nm (26 lb-ft).
74. Bleed the clutch hydraulic system. For additional information, refer to **MANUAL**

TRANSAXLE/TRANSMISSION AND CLUTCH - GENERAL INFORMATION .

75. Adjust the gearshift cables. For additional information, refer to **MANUAL TRANSAXLE/TRANSMISSION AND CLUTCH - GENERAL INFORMATION .**
76. Install the gearshift cable cover and attach the 7 retainers (2 shown in illustration).



Fig. 725: Locating Retainers And Gearshift Cable Cover
Courtesy of FORD MOTOR CO.