

REMOVAL

ENGINE

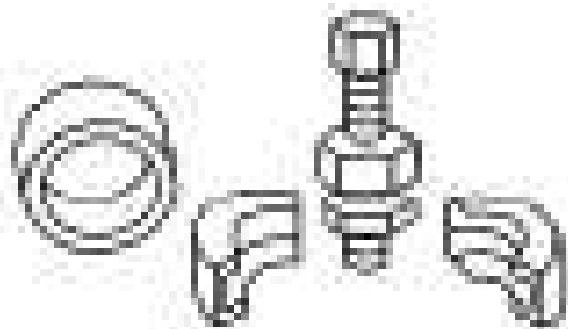
Special Tool(s)

SPECIAL TOOL DESCRIPTION CHART



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

ST1377-A



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

ST1290-B

Support Brackets, Engine 303-1507 or equivalent



ST3110-A

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING -- F150**.
2. **NOTE:** Index-mark the hood hinge location to aid in hood installation.

Remove the 4 bolts and the hood.

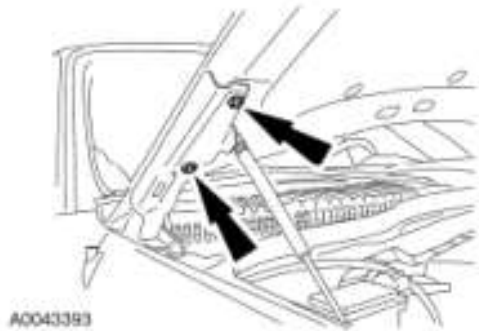


Fig. 214: Locating Hood Bolts

Courtesy of FORD MOTOR CO.

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

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

4. Remove the accessory drive belt.
5. Remove the cooling module. For additional information, refer to **ENGINE COOLING -- F150**.

6. Position the Power Distribution Box (PDB) and wiring harness forward.
7. Remove the starter. For additional information, refer to **STARTING SYSTEM -- F150** .
8. Remove the 2 bolts and the flexplate inspection cover.



Fig. 215: Locating Flexplate Inspection Cover Bolts
Courtesy of FORD MOTOR CO.

9. Remove the cylinder block opening cover.

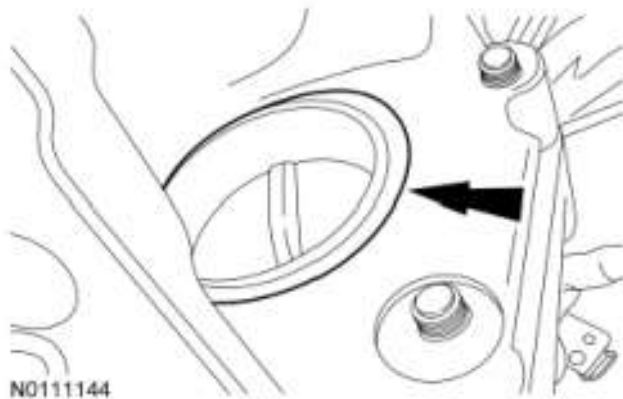


Fig. 216: Locating Cylinder Block Opening Cover
Courtesy of FORD MOTOR CO.

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

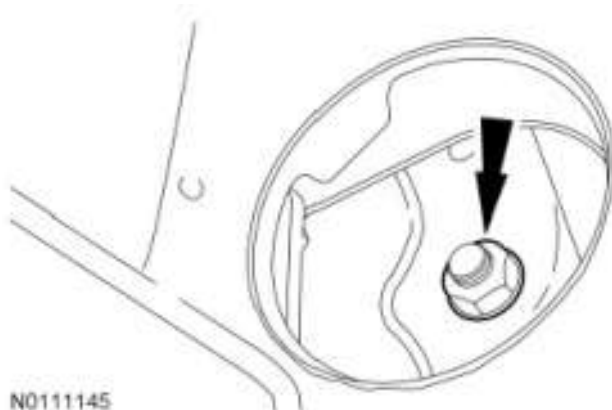


Fig. 217: Locating Torque Converter-To-Flexplate Nut

Courtesy of FORD MOTOR CO.

11. **NOTE:** The torque converter must be installed in its original orientation to the flexplate or engine damage may occur.

Rotate the flexplate so that the 2 slotted holes are shown at the 6 o'clock position and index mark the torque converter stud to the flexplate to maintain alignment during installation.

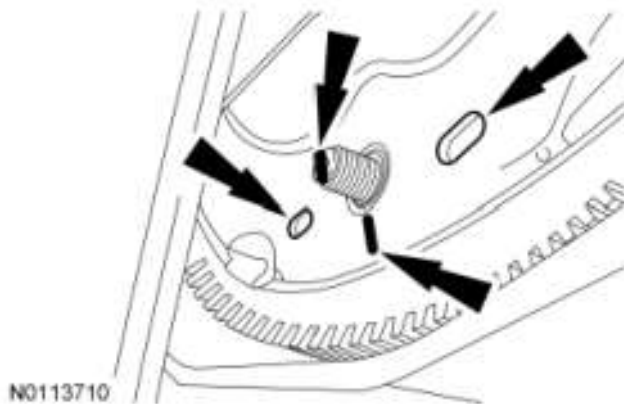


Fig. 218: Locating Slotted Holes And Index Mark Torque Converter Stud To Flexplate
Courtesy of FORD MOTOR CO.

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

Remove the lower 5 transmission-to-engine bolts.

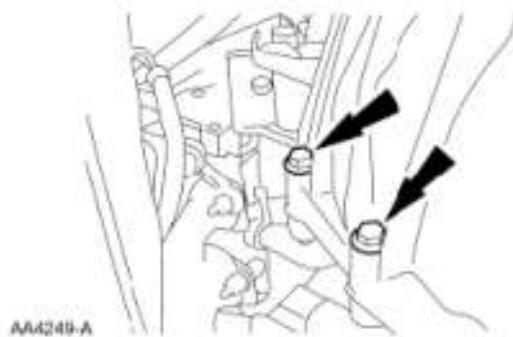


Fig. 219: Locating Transmission-To-Engine Bolts
Courtesy of FORD MOTOR CO.

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

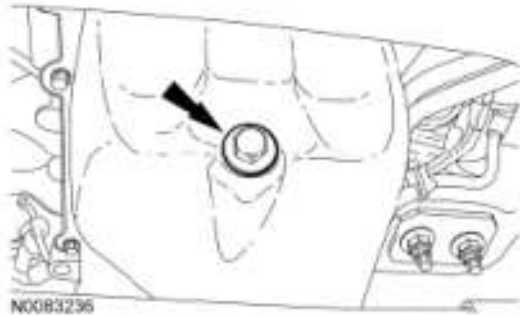


Fig. 220: Locating Drain Plug
Courtesy of FORD MOTOR CO.

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

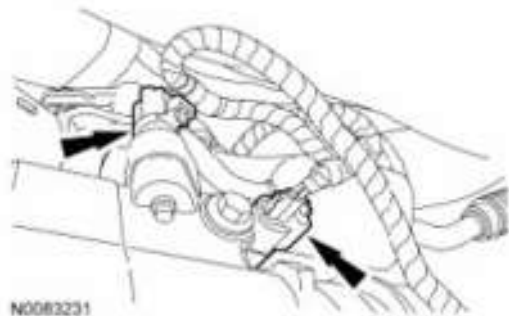


Fig. 221: Locating A/C Compressor Electrical Connector And Wiring Harness Retainer
Courtesy of FORD MOTOR CO.

15. Remove the 3 bolts and position the A/C compressor aside.

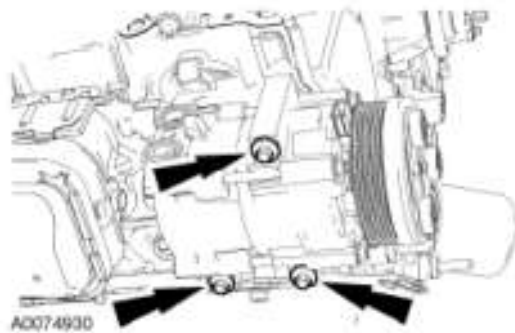


Fig. 222: Locating A/C Compressor Bolts
Courtesy of FORD MOTOR CO.

16. Remove the nut and the starter wiring harness retainer push pin and position aside the starter wiring harness and transmission cooler tube support bracket.

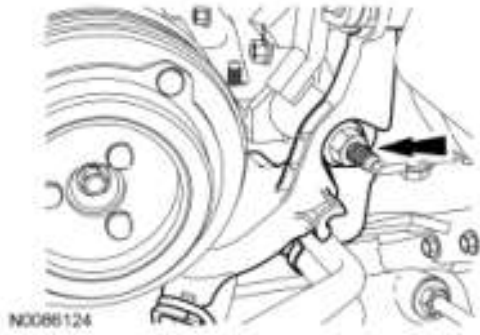


Fig. 223: Locating Transmission Fluid Cooler Tube Support Bracket And Nut
 Courtesy of FORD MOTOR CO.

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

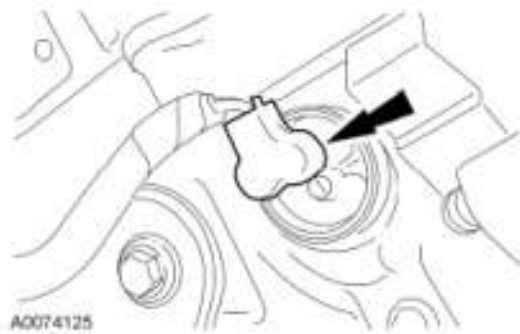


Fig. 224: Locating Block Heater Electrical Connector
 Courtesy of FORD MOTOR CO.

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

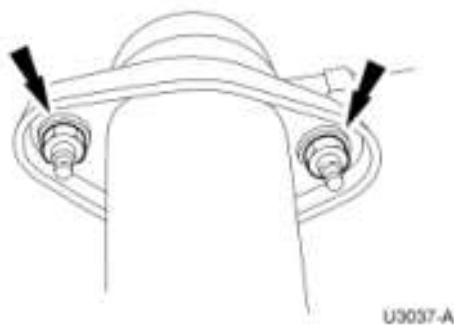


Fig. 225: Locating Exhaust Y-Pipe Flange Nuts
 Courtesy of FORD MOTOR CO.

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

Remove the 2 RH engine support insulator nuts.

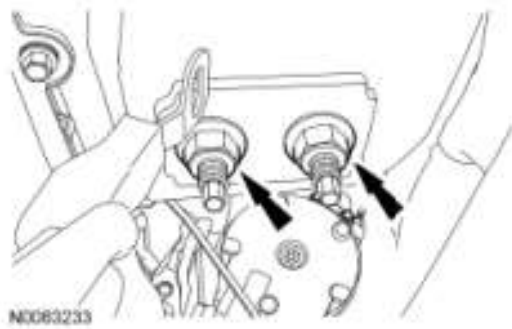


Fig. 226: Locating RH Engine Support Insulator Nuts
Courtesy of FORD MOTOR CO.

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

Remove the LH engine support insulator bolt.

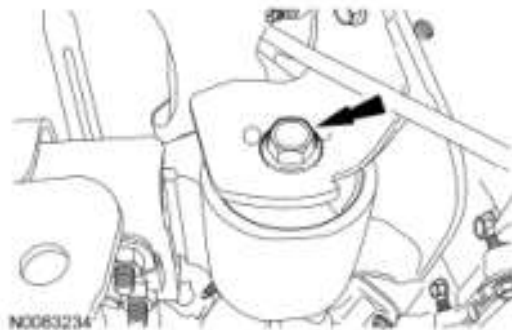


Fig. 227: Locating LH Engine Support Insulator Bolts
Courtesy of FORD MOTOR CO.

21. Loosen the 2 transmission mount nuts.

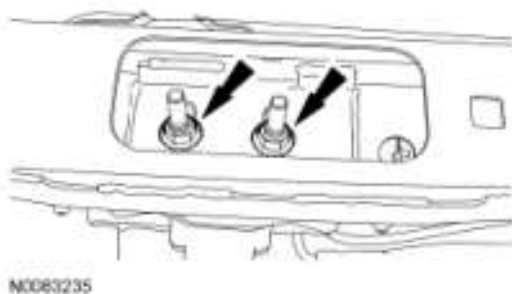


Fig. 228: Locating Transmission Mount Nuts
Courtesy of FORD MOTOR CO.

22. Remove and discard the oil filter.

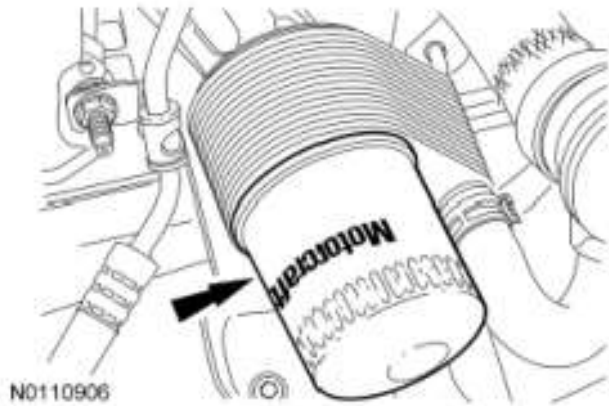


Fig. 229: Locating Oil Filter
Courtesy of FORD MOTOR CO.

23. Disconnect the lower radiator hose from the oil filter.

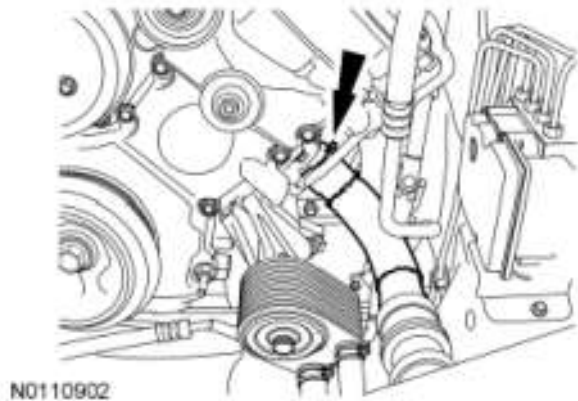


Fig. 230: Locating Lower Radiator Hose
Courtesy of FORD MOTOR CO.

24. Remove the oil cooler threaded shaft and position aside the oil cooler assembly.

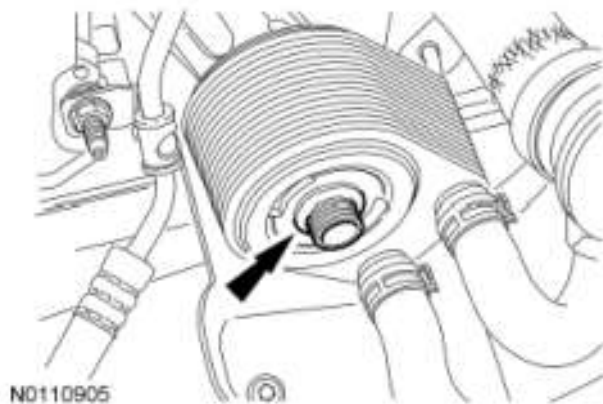


Fig. 231: Locating Oil Cooler Threaded Shaft
Courtesy of FORD MOTOR CO.

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

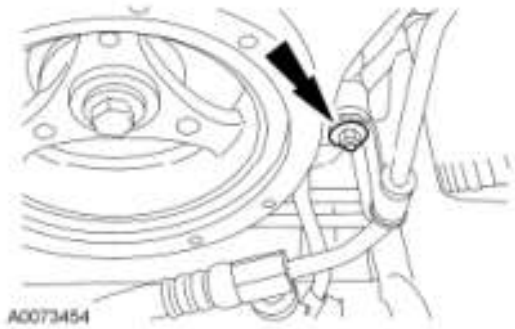


Fig. 232: Locating Power Steering Pressure Tube Support Bracket Nut
 Courtesy of FORD MOTOR CO.

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

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

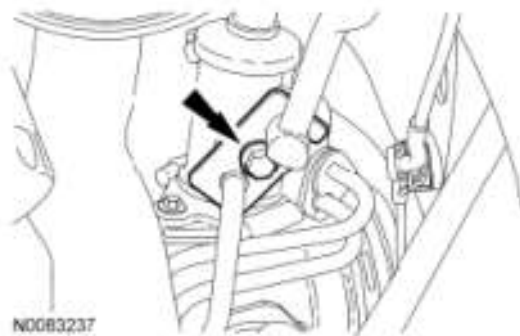


Fig. 233: Locating Power Steering Fluid Tubes And Bolt
 Courtesy of FORD MOTOR CO.

27. **NOTE:** Do not install a power steering pump pulley that has been removed and installed twice or pulley failure and/or pump damage may occur. Inspect the pulley for paint marks in the web area near the hub. If there are 2 paint marks, discard the pulley and install a new one. If there is 1 paint mark or no paint marks, use a paint pencil to mark the web area of the pulley near the hub.

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



Fig. 234: Removing Power Steering Pump Pulley Using Power Steering Pump Pulley Remover
Courtesy of FORD MOTOR CO.

28. Remove the 3 bolts and position aside the power steering pump.

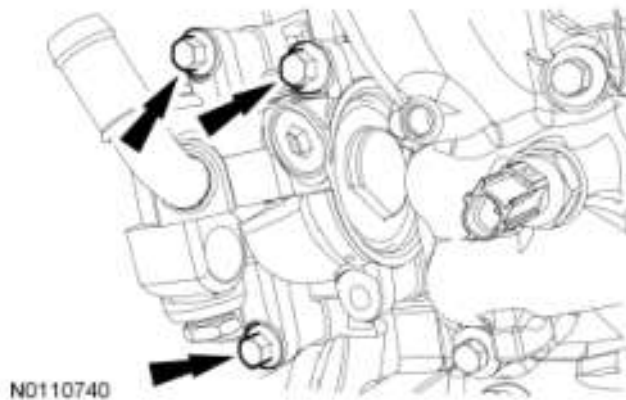


Fig. 235: Locating Power Steering Pump Bolts
Courtesy of FORD MOTOR CO.

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



Fig. 236: Locating Engine Harness Electrical Connector
Courtesy of FORD MOTOR CO.

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

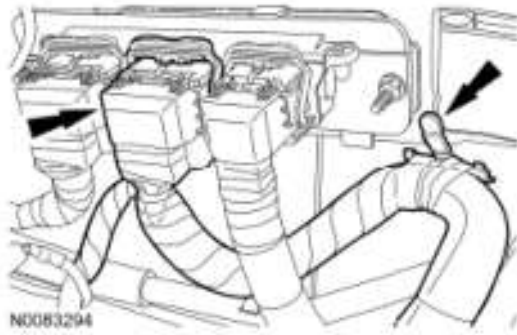


Fig. 237: Locating PCM Electrical Connector And Engine Wiring Harness Retainer
 Courtesy of FORD MOTOR CO.

31. Remove the ground strap bolt.



Fig. 238: Locating Ground Strap And Bolt
 Courtesy of FORD MOTOR CO.

32. Support the transmission.
33. Reposition the transfer case vent hose to access the bolts and remove the upper 2 transmission-to-engine bolts.

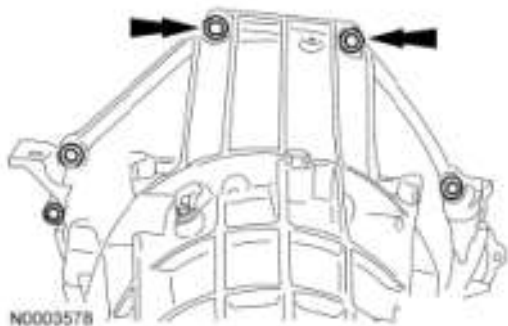


Fig. 239: Locating Upper Transmission-To-Engine Bolts
 Courtesy of FORD MOTOR CO.

34. Install the Engine Lifting Bracket and Engine Support Brackets.

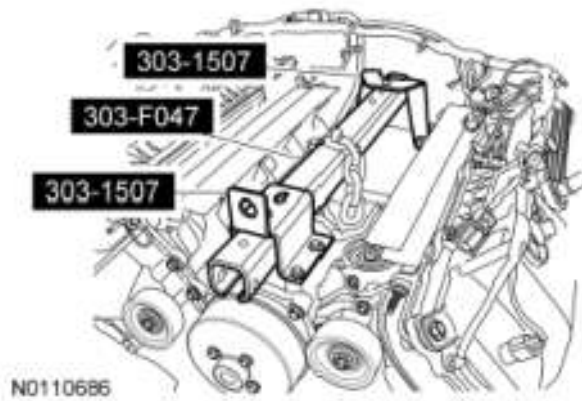


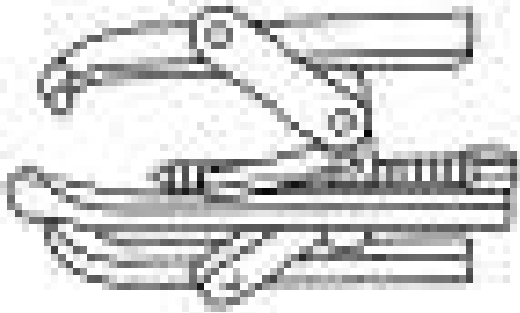
Fig. 240: Identifying Engine Lifting And Support Bracket
 Courtesy of FORD MOTOR CO.

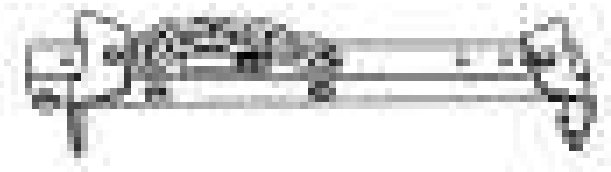
35. Using a floor crane, remove the engine assembly from the vehicle.

CYLINDER HEAD

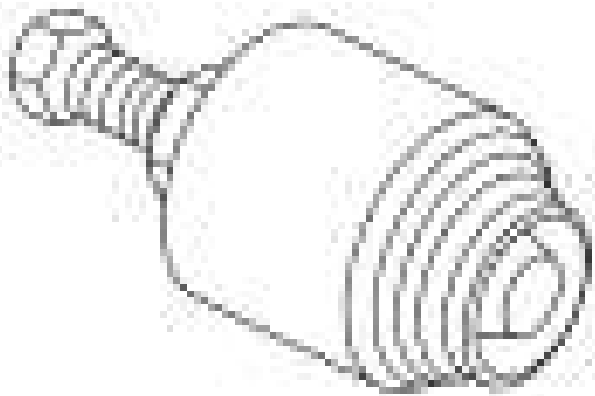
Special Tool(s)

SPECIAL TOOL DESCRIPTION CHART

 <p>ST1184-A</p>	<p>3 Jaw Puller 303-D121 or equivalent</p>
	<p>Lifting Bracket, Engine 303-F047 (014-00073) or equivalent</p>



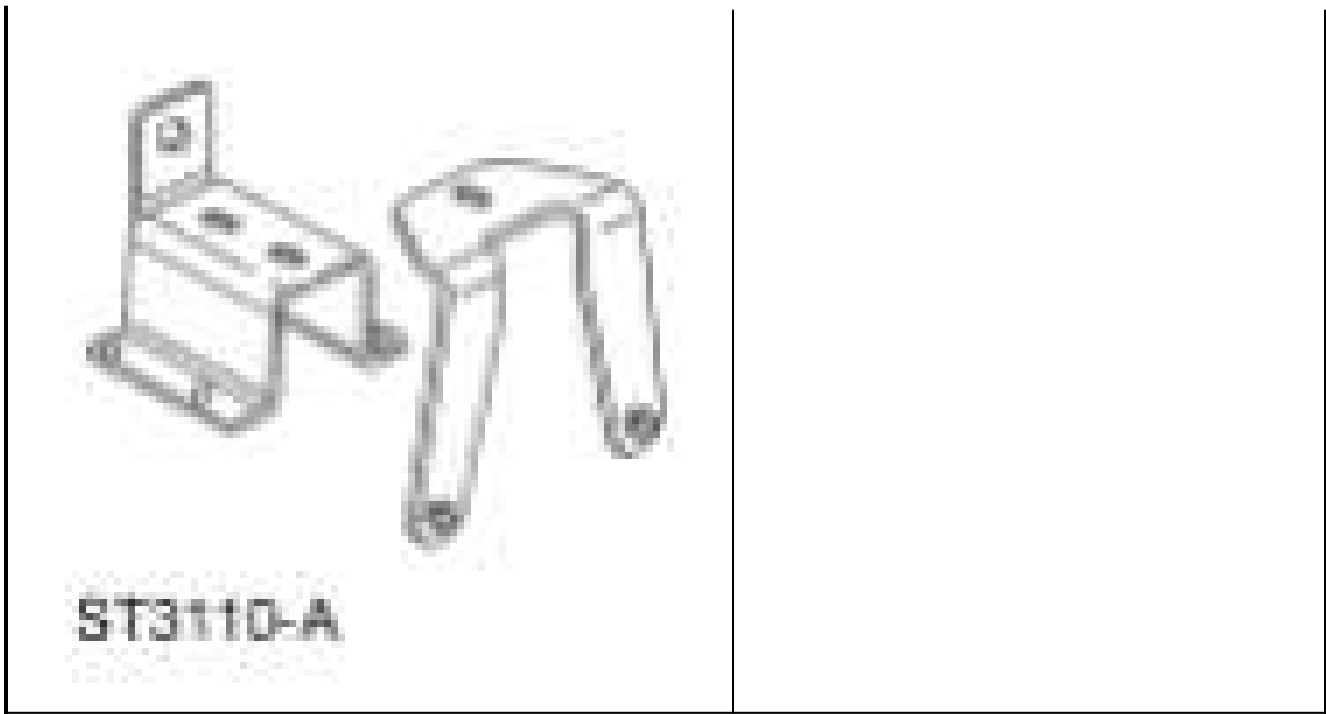
ST1377-A



ST1730-A

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

Support Brackets, Engine 303-1507 or
equivalent



Material

MATERIAL SPECIFICATIONS

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

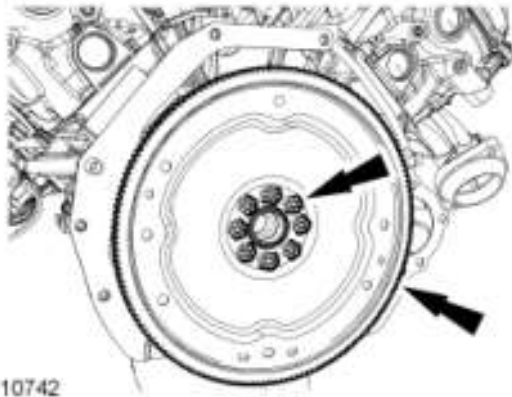
NOTE: During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning gasket surfaces that enters the oil passages, coolant passages or the oil pan, may cause engine failure.

NOTE: The flexplate and spacer plate must be removed before mounting the engine on the engine stand.

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

All cylinder heads

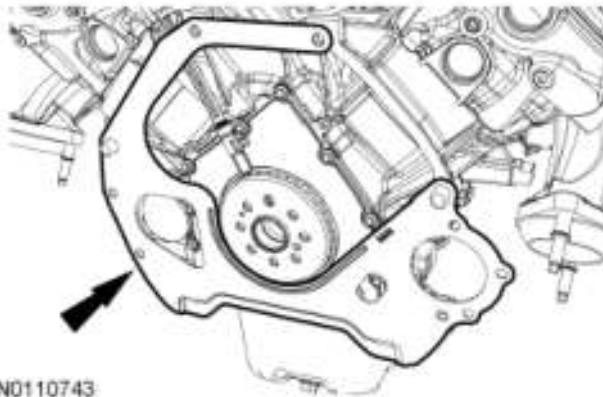
1. Remove the engine. For additional information, refer to ENGINE.
2. Remove the 8 bolts and the flexplate.
 - Discard the 8 flexplate bolts.



N0110742

Fig. 241: Locating Flexplate Bolts
Courtesy of FORD MOTOR CO.

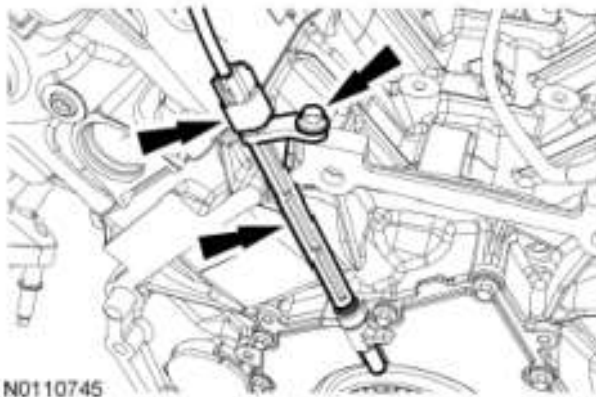
3. Remove the spacer plate.



N0110743

Fig. 242: Locating Spacer Plate
Courtesy of FORD MOTOR CO.

4. Disconnect the electrical connector and remove the bolt and the Crankshaft Position (CKP) sensor.



N0110745

Fig. 243: Locating Electrical Connector, Bolt And Crankshaft Position (CKP) Sensor
Courtesy of FORD MOTOR CO.

5. Mount the engine on a work stand.
6. Remove the Engine Lifting Brackets.

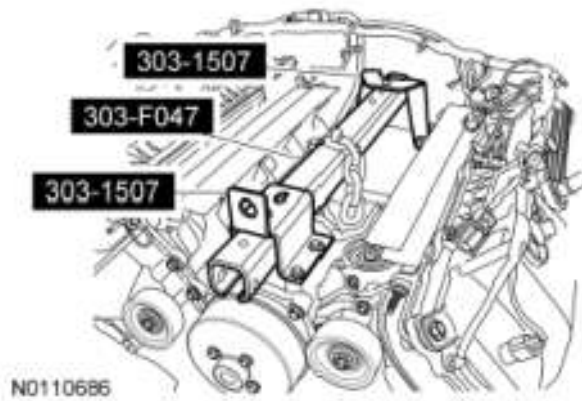


Fig. 244: Identifying Engine Lifting And Support Bracket
 Courtesy of FORD MOTOR CO.

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

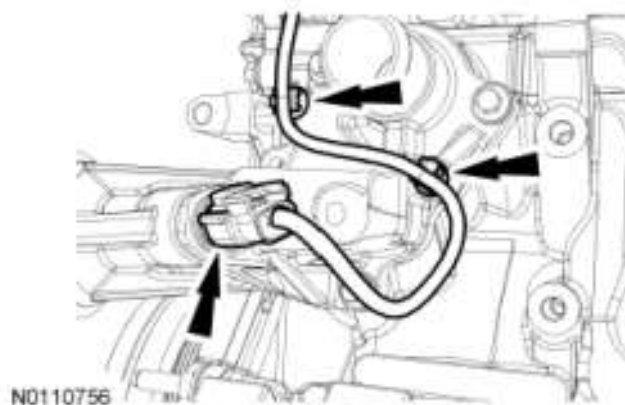


Fig. 245: Locating Engine Oil Pressure (EOP) Switch Electrical Connector
 Courtesy of FORD MOTOR CO.

8. Disconnect the LH Variable Camshaft Timing (VCT) system oil control solenoid electrical connector and the 2 wiring harness retainers.

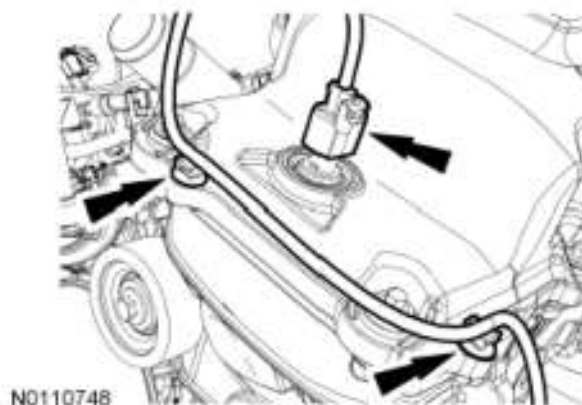


Fig. 246: Locating LH Variable Camshaft Timing (VCT) System Oil Control Solenoid Electrical Connector And Wiring Harness Retainers
 Courtesy of FORD MOTOR CO.

9. Disconnect the 3 engine wiring harness position retainers from the LH valve cover.

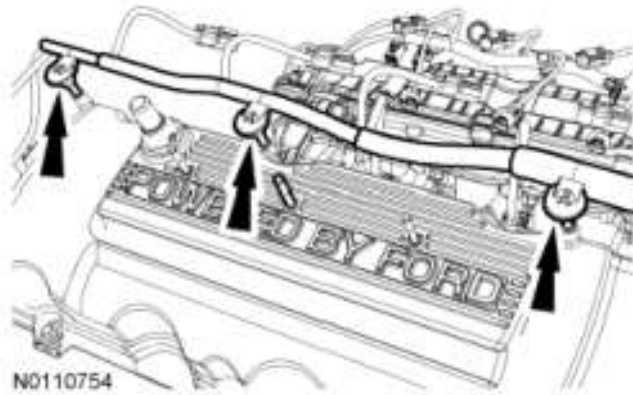


Fig. 247: Locating Engine Wiring Harness Position Retainers
Courtesy of FORD MOTOR CO.

10. Disconnect the wiring harness retainer, the Knock Sensor (KS) and Cylinder Head Temperature (CHT) sensor electrical connector.

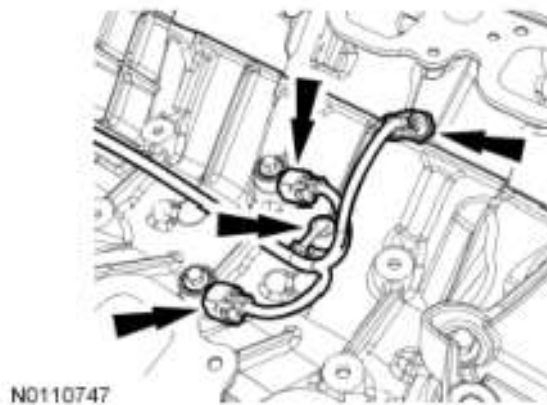


Fig. 248: Locating Wiring Harness Retainer, Knock Sensor (KS) And Cylinder Head Temperature (CHT) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

11. Disconnect the LH and RH Camshaft Position (CMP) sensor electrical connectors.

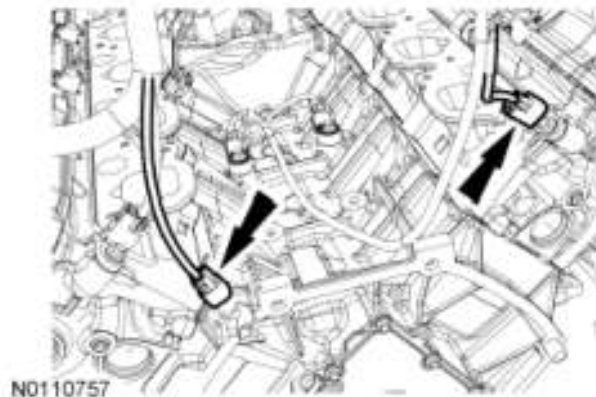


Fig. 249: Locating LH And RH Camshaft Position (CMP) Sensor Electrical Connectors

Courtesy of FORD MOTOR CO.

12. Remove the nut and the wiring harness ground cable.

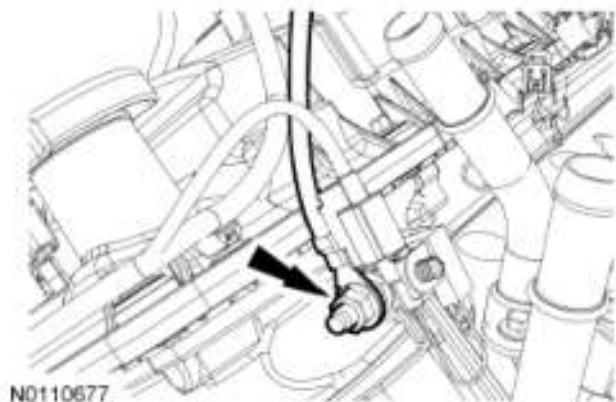


Fig. 250: Locating Ground Cable And Nut
Courtesy of FORD MOTOR CO.

13. Remove the nut and the radio interference capacitor.

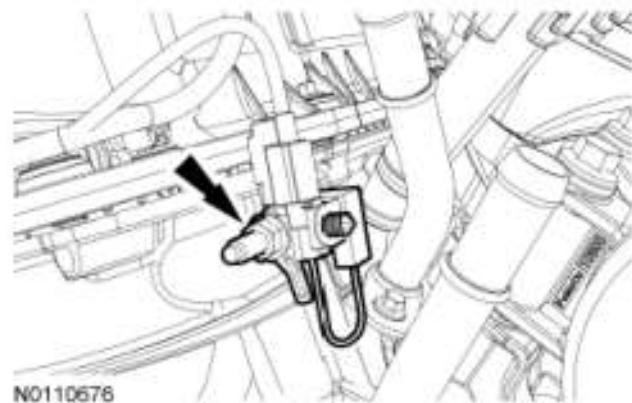


Fig. 251: Locating Radio Ignition Interference Capacitor
Courtesy of FORD MOTOR CO.

14. Disconnect the RH Variable Camshaft Timing (VCT) system oil control solenoid electrical connector and the 2 wiring harness retainers.

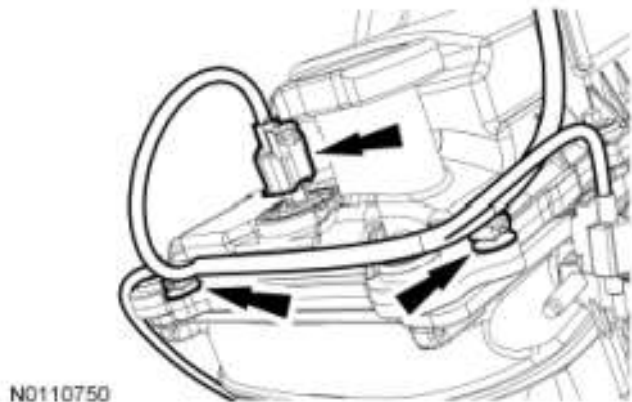


Fig. 252: Locating RH Variable Camshaft Timing (VCT) System Oil Control Solenoid Electrical Connector And Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

15. Disconnect the 3 engine wiring harness position retainers from the RH valve cover and remove the engine wiring harness.

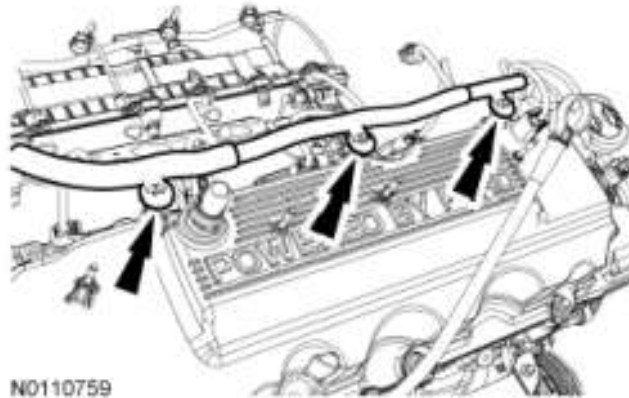


Fig. 253: Locating Engine Wiring Harness Position Retainers
Courtesy of FORD MOTOR CO.

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

Disconnect the 8 ignition wires from the valve cover retainers and the lower spark plugs.

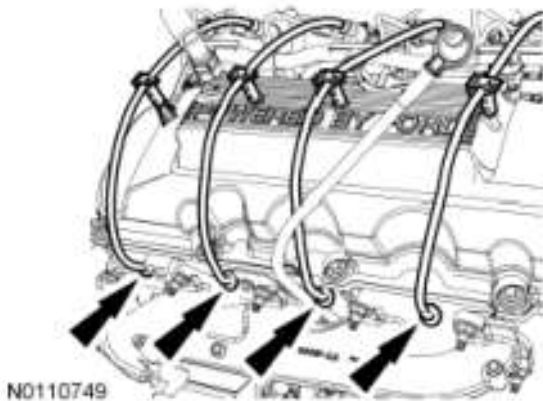


Fig. 254: Locating Ignition Wires
Courtesy of FORD MOTOR CO.

17. Remove the 2 bolts and the LH and RH CMP sensors.

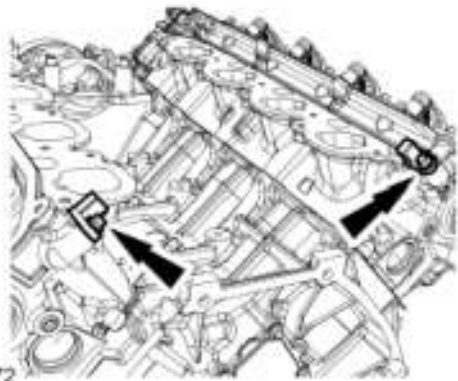


Fig. 255: Locating CMP Sensor Mounting Bolts
 Courtesy of FORD MOTOR CO.

18. Remove the bolt and the oil level indicator tube.
 - Discard the O-ring seal.

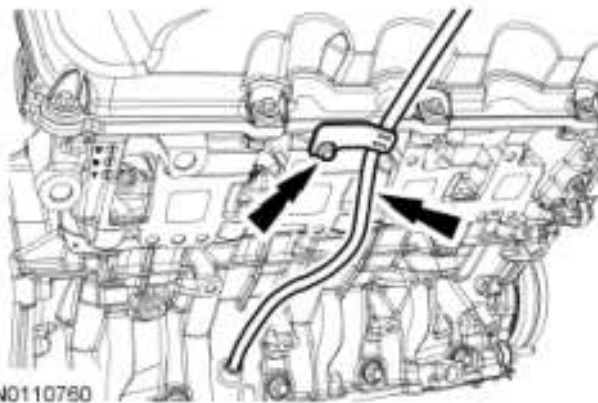


Fig. 256: Locating Bolt And Oil Level Indicator Tube
 Courtesy of FORD MOTOR CO.

19.

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

NOTE: Remove the valve cover carefully, or the Variable Camshaft Timing (VCT) solenoid may be damaged.

NOTE: The bolts are part of the valve cover and should not be removed.

Loosen the 10 bolts and remove the LH valve cover.

- Clean the valve cover mating surface of the cylinder head with silicone gasket remover and metal surface prep. Follow the directions on the packaging.
- Inspect the valve cover gasket. If the gasket is damaged, remove and discard the gasket. Clean the valve cover gasket groove with soap and water or a suitable solvent.

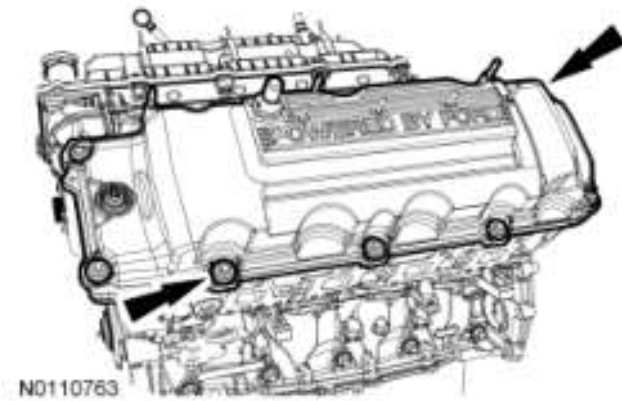


Fig. 257: Locating Valve Cover Gasket
 Courtesy of FORD MOTOR CO.

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

NOTE: Remove the valve cover carefully, or the Variable Camshaft Timing (VCT) solenoid may be damaged.

NOTE: The bolts are part of the valve cover and should not be removed.

Loosen the 10 bolts and remove the RH valve cover.

- Clean the valve cover mating surface of the cylinder head with silicone gasket remover and metal surface prep. Follow the directions on the packaging.
- Inspect the valve cover gasket. If the gasket is damaged, remove and discard the gasket. Clean the valve cover gasket groove with soap and water or a suitable solvent.

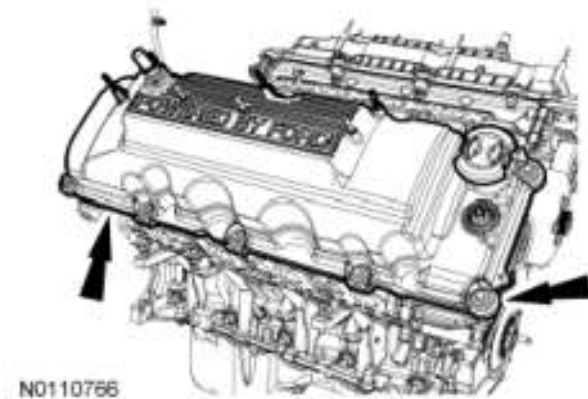


Fig. 258: Locating Valve Cover Gasket
 Courtesy of FORD MOTOR CO.

21. Remove the 6 bolts, the coolant pump pulley and the 2 accessory drive belt idler pulleys.

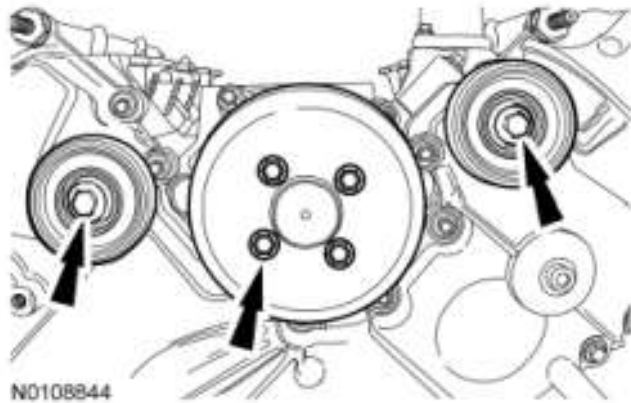


Fig. 259: Locating Coolant Pump Pulley, Accessory Drive Belt Idler Pulleys With Mounting Bolts
 Courtesy of FORD MOTOR CO.

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

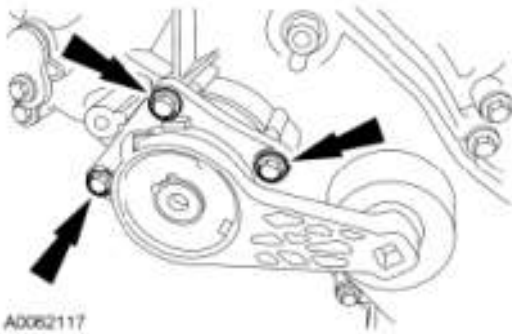


Fig. 260: Locating Accessory Drive Belt Tensioner Bolts
 Courtesy of FORD MOTOR CO.

23. Remove and discard the crankshaft pulley bolt. Using the 3 Jaw Puller, remove the crankshaft pulley.



Fig. 261: Identifying Jaw Puller On Crankshaft Pulley
 Courtesy of FORD MOTOR CO.

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

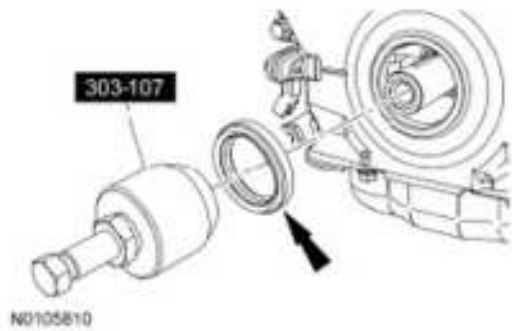


Fig. 262: Locating Crankshaft Front Seal And Crankshaft Front Oil Seal Remover
 Courtesy of FORD MOTOR CO.

25. Remove the front 4 oil pan bolts.

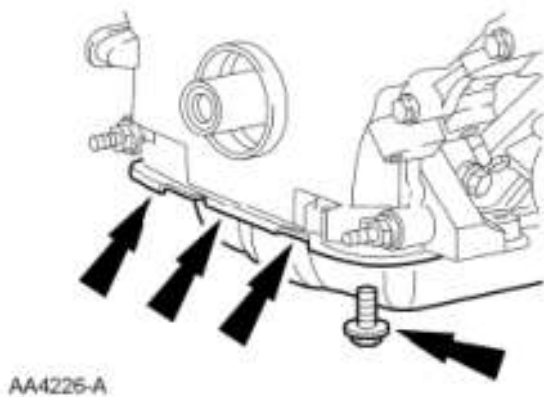


Fig. 263: Locating Front Oil Pan Bolts
 Courtesy of FORD MOTOR CO.

NOTE: Correct fastener location is essential for the assembly procedure.
 Record fastener location.

26.

Remove the 17 bolts and the 3 studs.

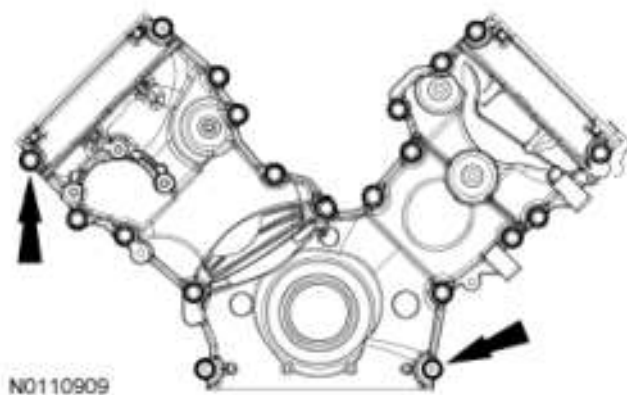


Fig. 264: Locating Bolts And Studs
 Courtesy of FORD MOTOR CO.

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

- Remove and discard the engine front cover gaskets.

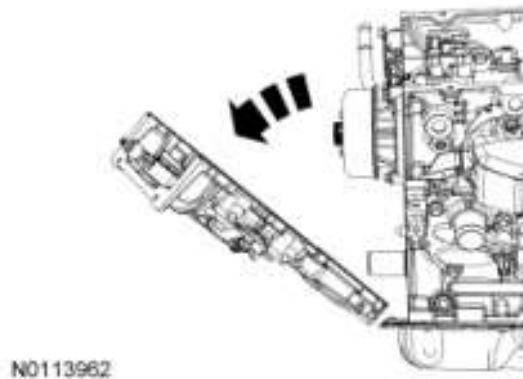


Fig. 265: Removing Engine Front Cover
Courtesy of FORD MOTOR CO.

28. Rotate the engine clockwise until the No. 1 intake valve is open.
29. Remove the 10 bolts and the LH intake rocker arm shaft assembly.

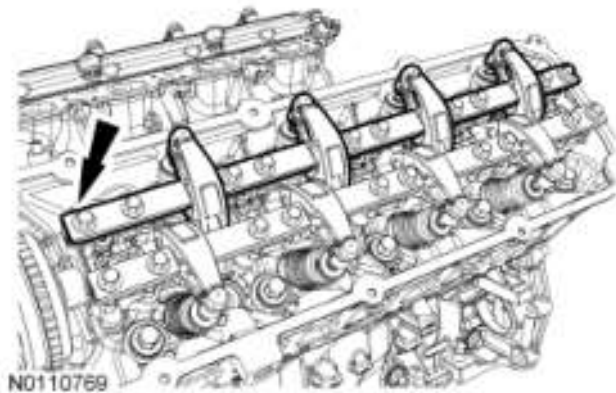


Fig. 266: Locating LH Intake Rocker Arm Shaft Assembly
Courtesy of FORD MOTOR CO.

30. Rotate the engine clockwise until the No. 1 exhaust valve is open.
31. Remove the 10 bolts and the LH exhaust rocker arm shaft assembly.

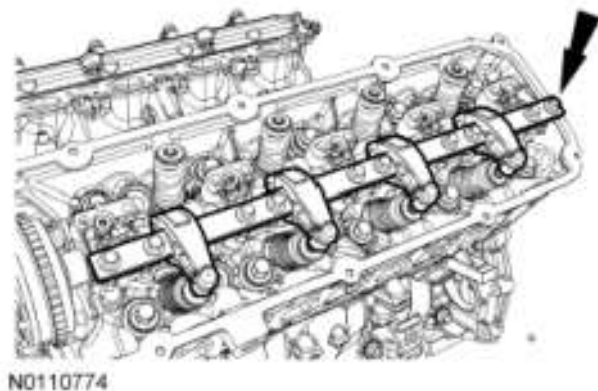


Fig. 267: Locating LH Exhaust Rocker Arm Shaft Assembly

Courtesy of FORD MOTOR CO.

32. Rotate the engine clockwise until the No. 1 intake valve is closed.
33. Remove the 10 bolts and the RH intake rocker arm shaft assembly.

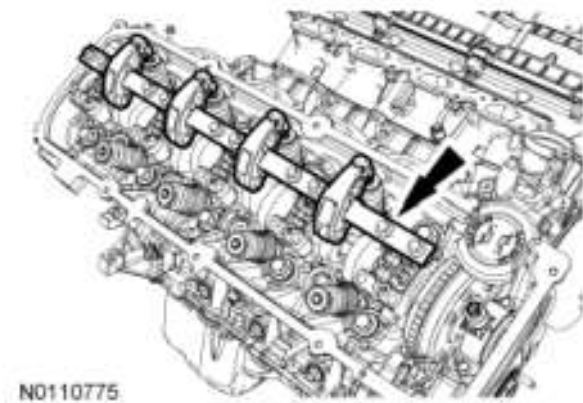


Fig. 268: Locating RH Intake Rocker Arm Shaft Assembly
Courtesy of FORD MOTOR CO.

34. Rotate the engine clockwise until the No. 1 exhaust valve is closed.
35. Remove the 10 bolts and the RH exhaust rocker arm shaft assembly.

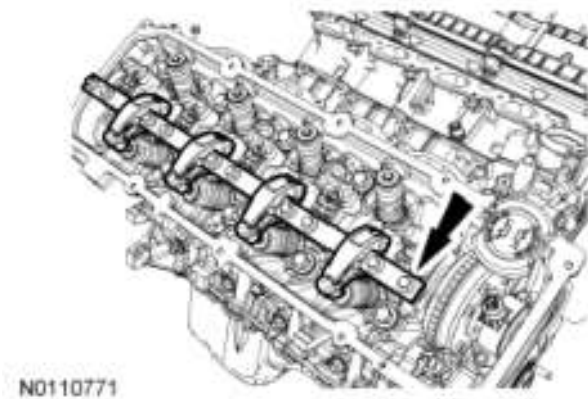


Fig. 269: Locating RH Exhaust Rocker Arm Shaft Assembly
Courtesy of FORD MOTOR CO.

36. Position the crankshaft keyway at the 11 o'clock position.

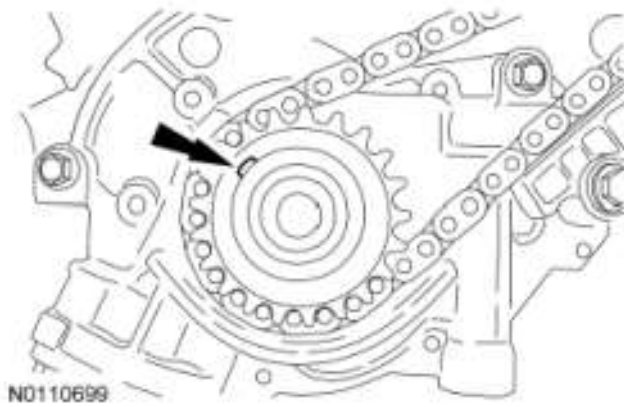


Fig. 270: Locating Crankshaft Key
Courtesy of FORD MOTOR CO.

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

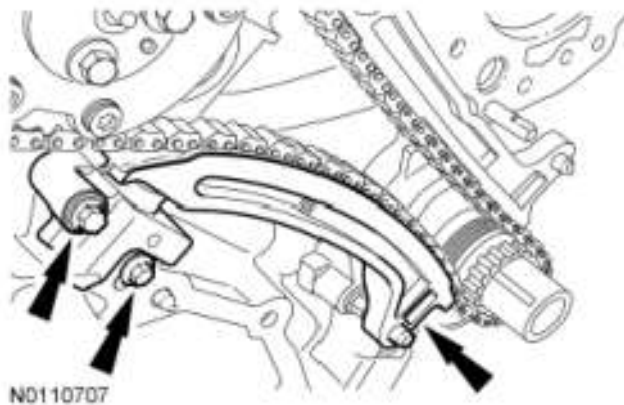


Fig. 271: Locating RH Timing Chain Tensioner And Tensioner Arm
Courtesy of FORD MOTOR CO.

38. Remove the bolt and the RH timing chain guide.

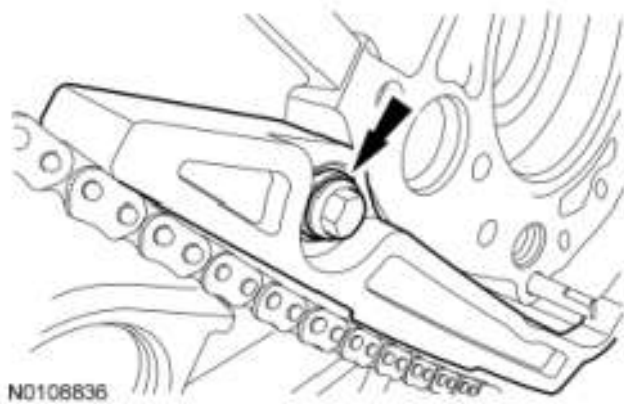
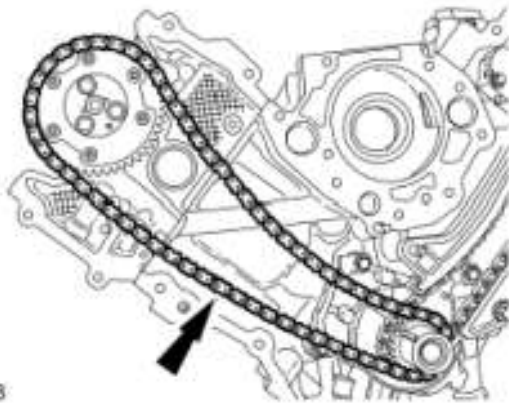


Fig. 272: Locating RH Timing Chain Guide Bolt
Courtesy of FORD MOTOR CO.

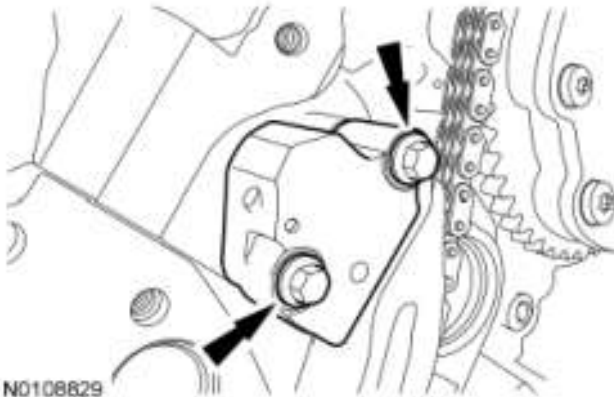
39. Remove the RH timing chain.



N0108833

Fig. 273: Locating RH Timing Chain
Courtesy of FORD MOTOR CO.

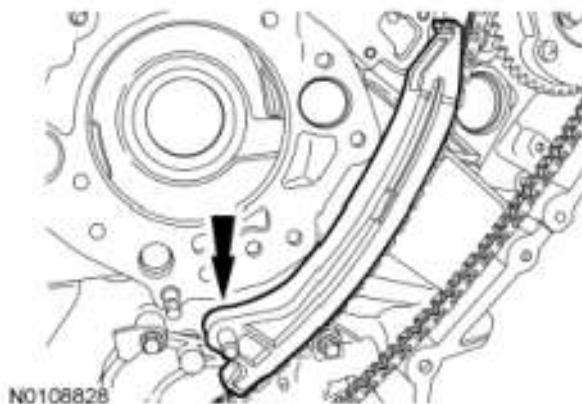
40. Remove the 2 bolts and the LH timing chain tensioner.



N0108829

Fig. 274: Locating LH Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

41. Remove the LH timing chain tensioner arm.



N0108828

Fig. 275: Locating LH Timing Chain Tensioner Arm
Courtesy of FORD MOTOR CO.

42. Remove the bolt and the LH timing chain guide.



Fig. 276: Locating LH Timing Chain Guide And Mounting Bolt
Courtesy of FORD MOTOR CO.

43. Remove the LH timing chain.

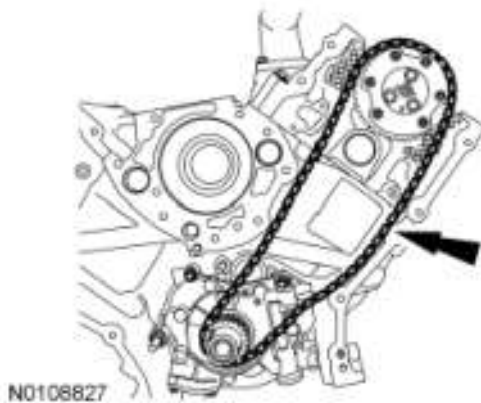


Fig. 277: Locating LH Timing Chain
Courtesy of FORD MOTOR CO.

LH cylinder head

44. Remove the 2 bolts and the LH exhaust manifold heat shield.

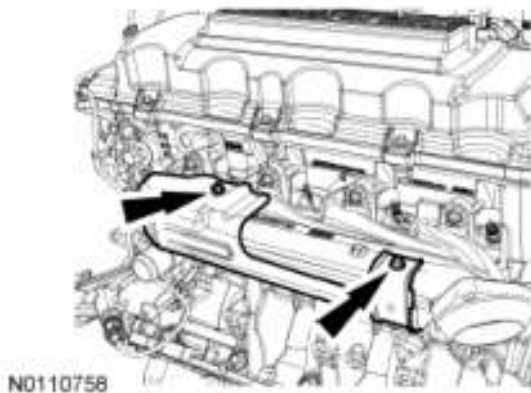


Fig. 278: Locating Exhaust Manifold Heat Shield With Mounting Bolts
Courtesy of FORD MOTOR CO.

45. Remove the 8 nuts, the 8 studs, the LH exhaust manifold and gaskets.
- Discard the 8 nuts and the 8 studs.
 - Discard the 2 gasket.
 - Inspect the exhaust manifold. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION -- F150** .

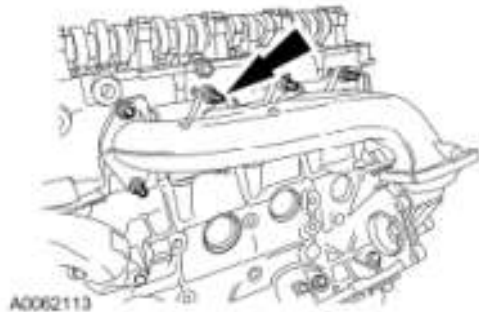


Fig. 279: Locating Exhaust Manifold Nuts And Studs
Courtesy of FORD MOTOR CO.

- 46.
- NOTE:** The cylinder head must be cool before removing it from the engine. Cylinder head warpage may result if a warm or hot cylinder head is removed.
- NOTE:** Place clean shop towels over exposed engine cavities. Carefully remove the towels so foreign material is not dropped into the engine.
- NOTE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges that make leak paths. Use a plastic scraping tool to remove all traces of the head gasket.
- NOTE:** Aluminum surfaces are soft and can be scratched easily. Never place the cylinder head gasket surface, unprotected, on a bench surface, or the cylinder head may be damaged.
- NOTE:** The cylinder head bolts must be discarded and new bolts must be installed. They are a tighten-to-yield design and cannot be reused.

Remove the 11 bolts and the LH cylinder head.

- Discard the cylinder head gasket.
- Discard the 11 cylinder head bolts.

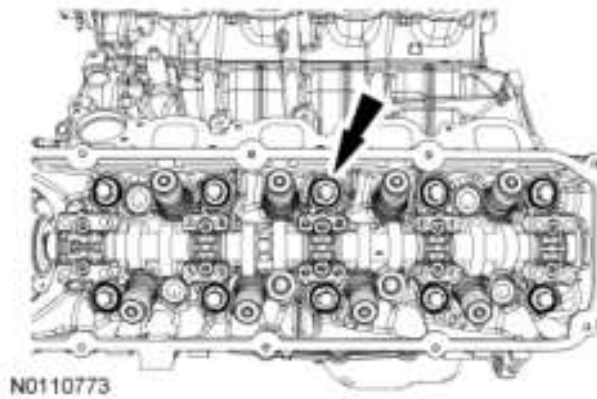


Fig. 280: Locating Cylinder Head Bolts
 Courtesy of FORD MOTOR CO.

RH cylinder head

47. Remove the 2 bolts and the RH exhaust manifold heat shield.

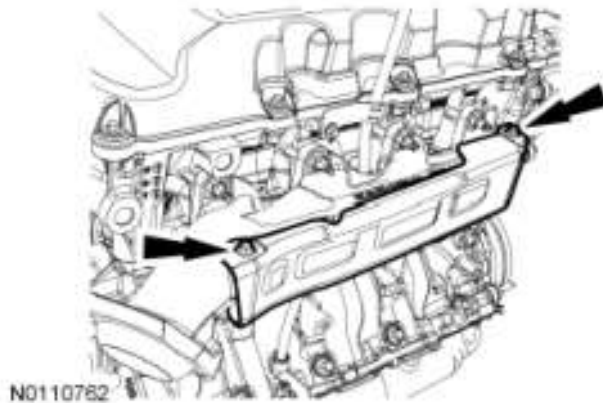


Fig. 281: Locating RH Exhaust Manifold Heat Shield Bolts
 Courtesy of FORD MOTOR CO.

48. Remove the 8 nuts, the 8 studs, the RH exhaust manifold and gaskets.
- Discard the 8 nuts and the 8 studs.
 - Discard the 2 gasket.
 - Inspect the exhaust manifold. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION -- F150** .

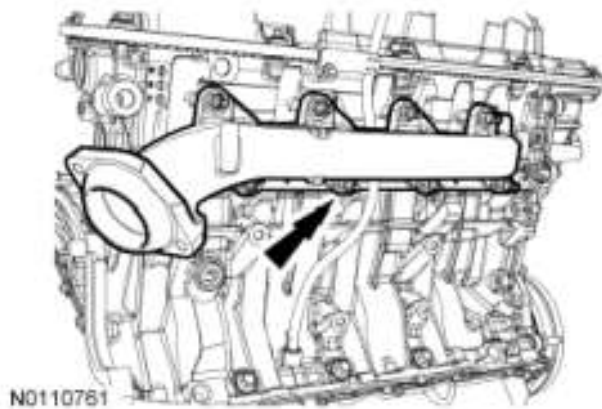


Fig. 282: Locating RH Exhaust Manifold Nuts And Studs
 Courtesy of FORD MOTOR CO.

49. Remove the nut and the ground strap.

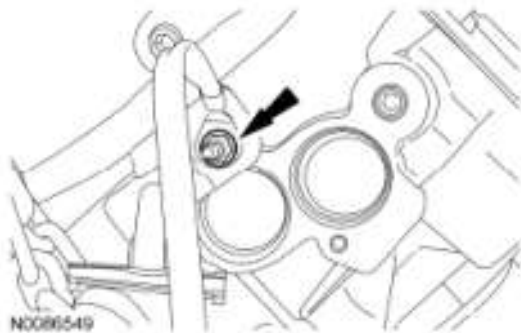


Fig. 283: Locating Nut And Ground Strap
 Courtesy of FORD MOTOR CO.

50. **NOTE:** The cylinder head must be cool before removing it from the engine. Cylinder head warpage may result if a warm or hot cylinder head is removed.

NOTE: Place clean shop towels over exposed engine cavities. Carefully remove the towels so foreign material is not dropped into the engine.

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

NOTE: Aluminum surfaces are soft and can be scratched easily. Never place the cylinder head gasket surface, unprotected, on a bench surface, or the cylinder head may be damaged.

NOTE: The cylinder head bolts must be discarded and new bolts must be installed. They are a tighten-to-yield design and cannot be reused.

Remove the 10 bolts and the RH cylinder head.

- Discard the cylinder head gasket.
- Discard the 11 cylinder head bolts.

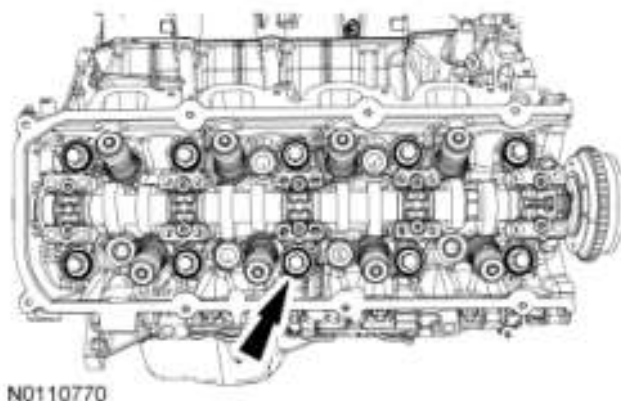


Fig. 284: Locating RH Cylinder Head Bolts
Courtesy of FORD MOTOR CO.

All cylinder heads

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

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

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

Clean the cylinder head-to-cylinder block mating surfaces of both the cylinder head and the cylinder block in the following sequence.

1. Remove any large deposits of silicone or gasket material with a plastic scraper.
 2. Apply silicone gasket remover, following package directions and allow to set for several minutes.
 3. Remove the silicone gasket remover with a plastic scraper. A second application of silicone gasket remover may be required if residual traces of silicone or gasket material remain.
 4. Apply metal surface prep, following package directions, to remove any remaining traces of oil or coolant and to prepare the surfaces to bond with the new gasket. Do not attempt to make the metal shiny. Some staining of the metal surfaces is normal.
52. Support the cylinder heads on a bench with the head gasket side up. Check the cylinder head distortion and the cylinder block distortion, paying particular attention to the oil pressure feed area.

For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION -- F150** .