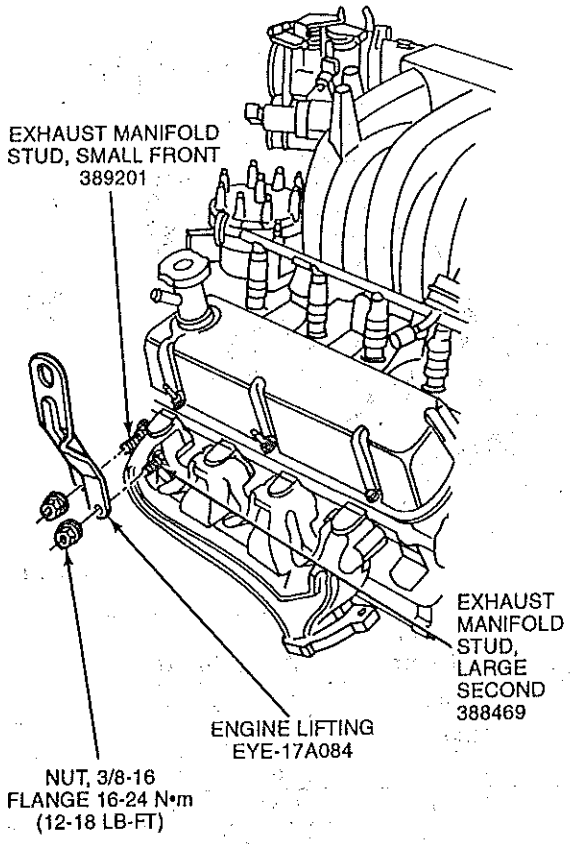
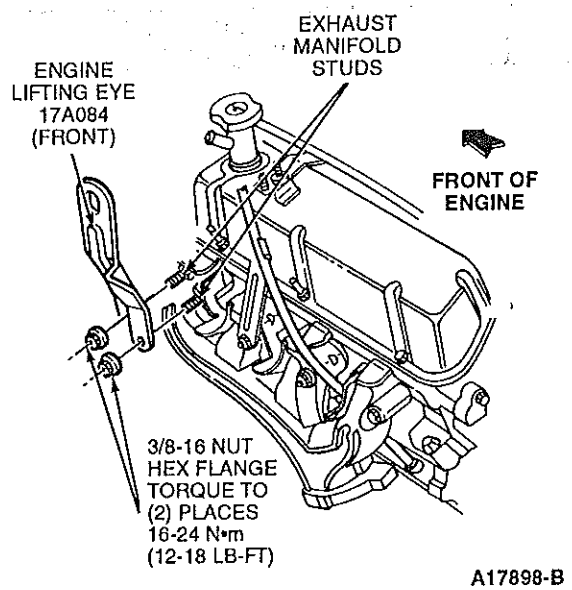
IN-VEHICLE SERVICE (Continued)

5.0L and 5.8L Front Lifting Eye



A15814-C

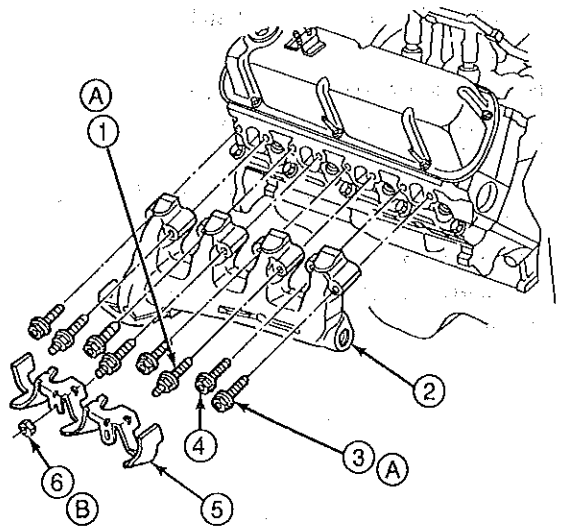


A17898-B

Installation, Right and Left

1. Clean mating surfaces of the exhaust manifold(s) and cylinder head (6049). Clean the exhaust pipe spherical seat on the manifold(s) and the exhaust pipe(s) sealing area.
2. Inspect exhaust manifold(s) for cracks and damaged gasket surfaces. Use a straightedge to check for warped exhaust manifold cylinder head port branches. Replace unserviceable manifold(s).
3. Install left exhaust manifold, studs and bolts. Working from center to ends, tighten to 35-43 N·m (26-32 lb-ft).
4. Install left spark plug heat shield and nuts. Torque heat shield nuts to 16-24 N·m (12-18 lb-ft).
5. Install front lifting eye and nuts. Tighten to 16-24 N·m (12-18 lb-ft).
6. Install right exhaust manifold, studs and bolts. Working from center to ends, tighten to 35-43 N·m (26-32 lb-ft).

Exhaust Manifold, 5.0L and 5.8L (5.8L Shown, 5.0L Similar)



A15810-D

Item	Part Number	Description
1	388469	Stud, 2.25-Inch
2	9430	Exhaust Manifold (Right)
3	381732	Bolt, 2.25-Inch
4	382951	Bolt, 1.12-Inch
5	12A406	Spark Plug Heat Shield
6	45358	Nut (3 Req'd)
A	—	Tighten to 35-43 N·m (26-32 Lb-Ft)
B	—	Tighten to 16-24 N·m (12-18 Lb-Ft)

IN-VEHICLE SERVICE (Continued)

7. Install right spark plug heat shield and tighten nuts to 16-24 N·m (12-18 lb-ft).
8. Inspect EGR tube and replace if rusted through or damaged. Install valve to upper intake manifold. Tighten EGR valve studs to 18-26 N·m (13-19 lb-ft). Tighten tube-to-intake manifold fitting nut to 27-34 N·m (20-25 lb-ft) for 5.0L engine. For 5.8L engine, tighten to 61-75 N·m (45-55 lb-ft).
9. Install coil bracket, transmission dipstick tube bracket and upper intake manifold support bracket. Tighten nuts to 16-24 N·m (12-18 lb-ft).
10. On models with C6 transmission, install secondary air injection manifold tube. Tighten tube nuts to 23-34 N·m (17-25 lb-ft).
11. Raise vehicle and install exhaust pipe(s) retaining nuts. Thread one nut half-way and tighten the other to 33-49 N·m (24-36 lb-ft), then tighten the first nut to 33-49 N·m (24-36 lb-ft).
12. Lower vehicle, operate and check for leaks.

Oil Pan/Oil Pump Screen Cover and Tube

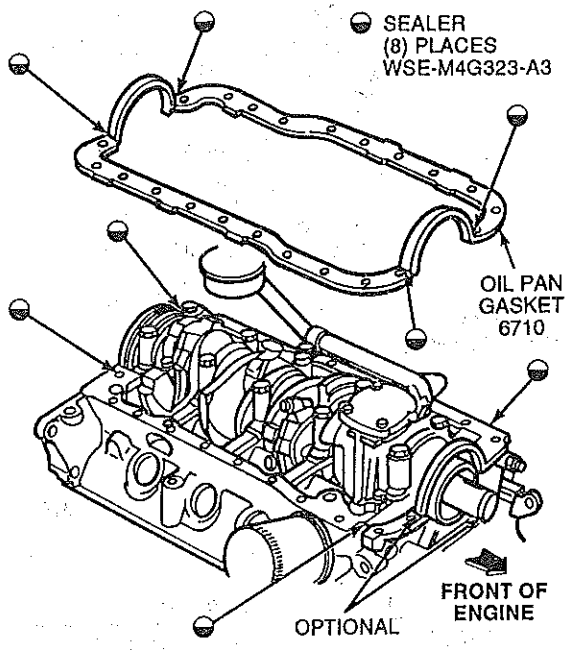
Removal

1. Remove the bolts attaching the fan shroud (8146) to the radiator (8005) and position the fan shroud over the fan assembly.
2. Remove the upper intake manifold (9424). Refer to Intake Manifold, Upper in the In-Vehicle Service portion of this section.
3. Raise vehicle.
4. Remove exhaust manifold-to-exhaust pipe. Refer to Section 09-00.
5. Disconnect the oil cooler line at the left side of the radiator if equipped with an automatic transmission (7003).
6. Remove the nuts and lockwashers attaching the engine support insulators to the chassis bracket.
7. Drain the crankcase.
8. Loosen transmission mounting nuts.
9. Raise the engine (6007) and place wood blocks securely under the engine supports.
10. Remove the oil pan attaching bolts and lower the oil pan (6675) onto the crossmember.
11. Remove the two bolts attaching the oil pump screen cover and tube (6622) to the oil pump (6600). Remove nut attaching oil pump screen cover and tube to the number 3 main bearing cap stud. Lower the oil pump screen cover and tube into the oil pan.
12. Remove the oil pan from the vehicle.

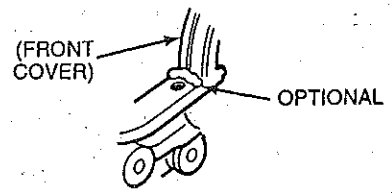
Installation

1. **CAUTION: Do not use solutions such as brake cleaner, carburetor cleaner, etc., as these solutions can leave a residue on the machined surfaces. Use only a cleaner which meets or exceeds Ford specification WSE-M5B392-A, such as Metal Surface Cleaner F4AZ-19A536-RA or equivalent.**

   Clean oil pan, oil pump screen cover and tube and gasket surfaces. Inspect the gasket sealing surface for damage and distortion due to overtightening of the bolts. Repair and straighten as required.
2. Position a new oil pan gasket to the cylinder block (6010). Apply Black Silicone Rubber F4AZ-19562-B or equivalent meeting Ford specification WSE-M4G323-A3 to gasket surfaces as indicated.



5.0L/5.8L OIL PAN SEALANT LOCATIONS

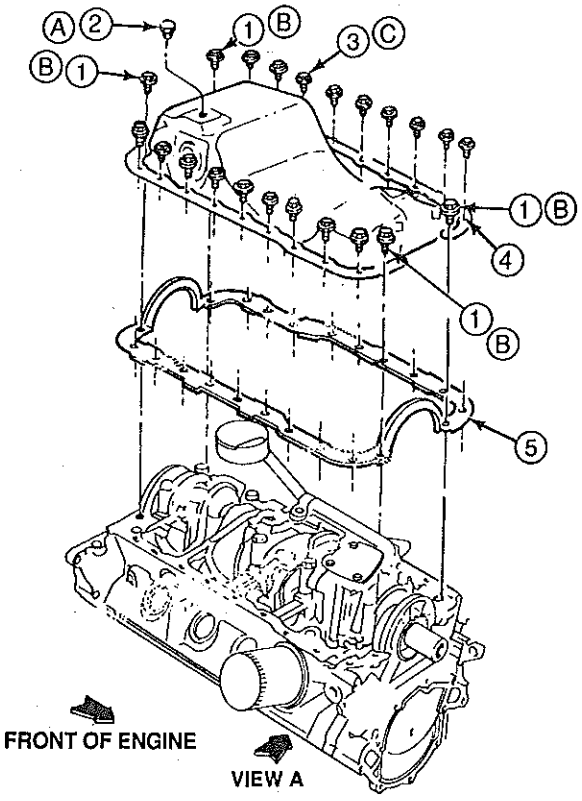


A24893-A

3. Place the oil pump screen cover and tube inside oil pan and position assembly in place.
4. Install nuts attaching oil pump screen cover and tube to number 3 main bearing cap stud and tighten to 30-43 N·m (22-32 lb-ft).
5. Install the upper pickup tube bolts. Tighten the pickup tube bolts to 16-24 N·m (12-18 lb-ft).

IN-VEHICLE SERVICE (Continued)

6. Install oil pan retaining bolts and alternately tighten all bolts (except for the four nearest the crankshaft) to 10-14 N·m (89-124 lb-in). Tighten four remaining bolts to 12-16 N·m (9-12 lb-ft). Refer to the following illustration.



A13396-G

Item	Part Number	Description
1	390657	Bolt, 5/16-18 x 1.12
2	6730	Oil Pan Drain Plug
3	390658	Bolt, 1/4-20 x .94
4	6675	Oil Pan
5	6710	Oil Pan Gasket
A	—	Tighten to 12-16 N·m (9-12 Lb-Ft)
B	—	Tighten to 12-16 N·m (9-12 Lb-Ft)

(Continued)

Item	Part Number	Description
C	—	Tighten to 10-14 N·m (89-144 Lb-In)

7. Install the transmission crossmember and remove jack stand.
8. Raise the engine and remove the wood blocks.
9. Lower the engine and install the insulator-to-chassis bracket nuts and washers. Tighten the nuts to 73-100 N·m (54-74 lb-ft).
10. Tighten transmission mounting nuts to proper specification. Refer to appropriate Group 07 section for specifications.
11. Install the exhaust manifold-to-exhaust pipe. Refer to Section 09-00.
12. If equipped with an automatic transmission, connect the oil cooler line at the radiator. Tighten to 24-31 N·m (18-23 lb-ft).
13. Lower vehicle.
14. Install the upper intake manifold as described in this section.
15. Install the fan shroud attaching bolts. Tighten to 7-10 N·m (62-89 lb-in).
16. **CAUTION: To prevent oil from entering the PCV system during air-powered oil fills, the closure hose should be disconnected from the oil fill pipe (6A868) and positioned away from the oil source. Cover the hose port with a shop towel to prevent oil from spilling onto the engine during oil fill. Reconnect the closure hose after the oil has been filled to the proper level.**

    Fill the crankcase with the proper grade and quantity of engine oil. Check oil level. Start the engine and operate it until it reaches normal operating temperature, then check for leaks.

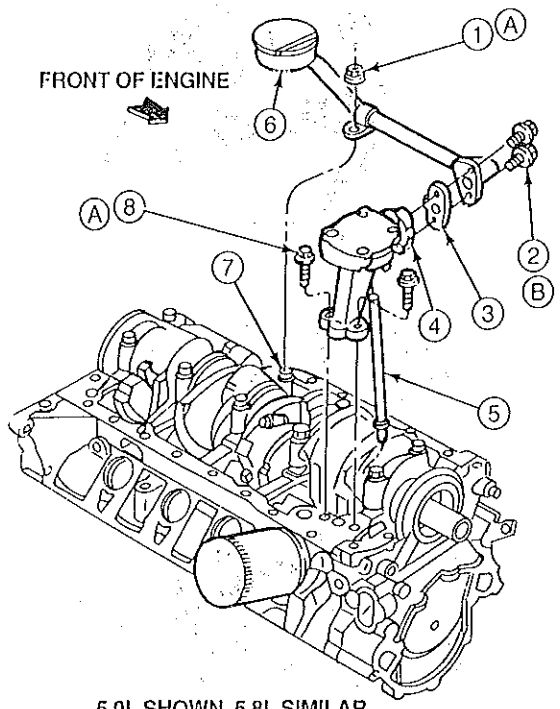
Oil Pump

Removal

1. Remove the oil pan (6675).
2. Remove the oil pump screen cover and tube (6622).

IN-VEHICLE SERVICE (Continued)

3. Remove the oil pump attaching bolts and oil pump intermediate shaft (6A618).



5.0L SHOWN, 5.8L SIMILAR A13397-D

Item	Part Number	Description
1	33771	Nut, 3/8-16
2	391378	Screw and Washer, 5/16-18 x 1.13
3	6626	Oil Pump Inlet Tube Gasket
4	6600	Oil Pump
5	6A618	Oil Pump Intermediate Shaft
6	6622	Oil Pump Screen Cover and Tube
7	—	Third Main (Reference Part of 6010)
8	57647	Bolt
A	—	Tighten to 30-43 N·m (22-32 Lb-Ft)
B	—	5.0L, Tighten to 16-24 N·m (12-18 Lb-Ft) 5.8L, Tighten to 14-20 N·m (10-15 lb-ft)

Installation

1. Prime the oil pump (6600) by filling the inlet port with engine oil. Rotate the oil pump intermediate shaft to distribute the oil within the pump body.
2. Position the oil pump intermediate shaft into the distributor socket. With the oil pump intermediate shaft firmly seated in the distributor socket, the stop on the oil pump intermediate shaft should touch the roof of the crankcase. Remove the oil pump intermediate shaft and position the stop as necessary.
3. NOTE: Do not attempt to force the oil pump into position if it will not seat readily. The oil pump intermediate shaft may be misaligned with the distributor shaft. To align, rotate the oil pump intermediate shaft into a new position.

   With the stop properly positioned, insert the oil pump intermediate shaft into the oil pump. Install the oil pump and oil pump intermediate shaft as an assembly. Tighten the oil pump attaching screws to 30-43 N·m (22-32 lb-ft).
4. Clean the oil pump screen cover and tube. Position assembly in place with a new gasket. Install attaching bolts and tighten 5.0L to 16-24 N·m (12-18 lb-ft) and tighten 5.8L to 14-20 N·m (10-15 lb-ft).
5. Install the oil pan.

Crankshaft Main Bearings

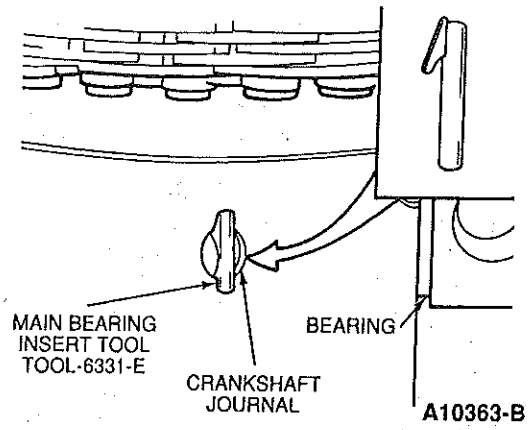
The main bearing inserts are selective fit. Refer to Section 03-00.

Removal

1. Drain the crankcase. Remove the oil level dipstick (6750). Remove the oil pan (6675)and related parts.
2. Remove the oil pump screen cover and tube (6622) and the oil pump (6600).
3. Replace one crankshaft main bearing (6333) at a time, leaving the other crankshaft main bearings securely fastened. Remove the main bearing cap to which new crankshaft main bearings are to be installed.
4. Insert Main Bearing Insert Tool TOOL-6331-E in the oil hole in the crankshaft (6303).
5. Rotate the crankshaft in the direction of engine rotation to force the crankshaft main bearing out of the cylinder block (6010).
6. Clean each crankshaft journal. Inspect the journals and thrust faces (thrust bearing) for nicks, burrs or bearing pickup that would cause premature crankshaft main bearing wear.

IN-VEHICLE SERVICE (Continued)

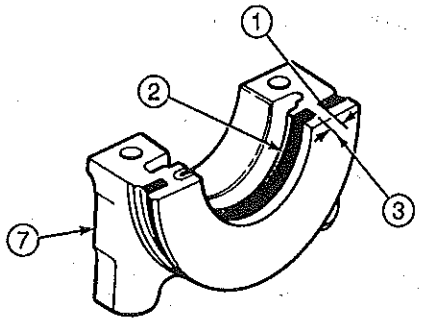
7. If the rear crankshaft main bearing is being replaced, remove and discard the crankshaft rear oil seal (6701).



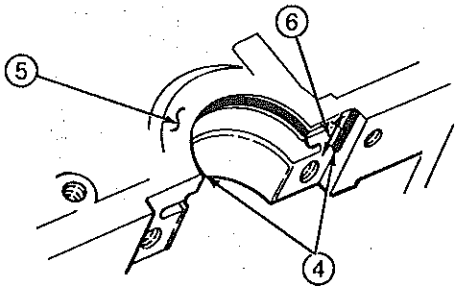
Installation

1. To install an upper crankshaft main bearing, place the plain end of the crankshaft main bearing over the shaft on the locking tang side of the block and partially install the crankshaft main bearing so that Main Bearing Insert Tool TOOL-6331-E can be inserted in the oil hole in the crankshaft. With Main Bearing Insert Tool TOOL-6331-E in the hole in the crankshaft, rotate the crankshaft in the opposite direction of engine rotation until the crankshaft main bearing seats itself. Remove the tool.
2. Install the bearing cap.
3. Select-fit the bearing for proper clearance. Refer to Section 03-00.
4. If the crankshaft main bearing is being replaced on journal number 1, 2 or 4, apply a coat of Motorcraft X0-10W30-QSP or -DSP engine oil or equivalent meeting Ford specification ESE-M2C153-E to the journal and crankshaft main bearings and install the bearing cap. Tighten the cap bolts. On 5.0L engines (6007), tighten cap bolts to 82-95 N·m (60-70 lb-ft); on 5.8L engines, tighten to 129-142 N·m (95-105 lb-ft).
5. NOTE: Join components within 15 minutes of applying specified bead size of silicone rubber.

   Before replacing rear main cap, apply a 1.58mm (1/16-inch) diameter bead of Silicone Rubber F4AZ-19562-B or equivalent meeting Ford specifications WSE-M4G323-A1 and ESE-M4G195-A in shaded area of cylinder block as shown.



SEALER APPLICATION SKETCH SPLIT LIP TYPE SEAL SHOWN BASIC APPLICATION AREAS FOR OTHER SEAL INSTALLATIONS ARE THE SAME



A3724-J

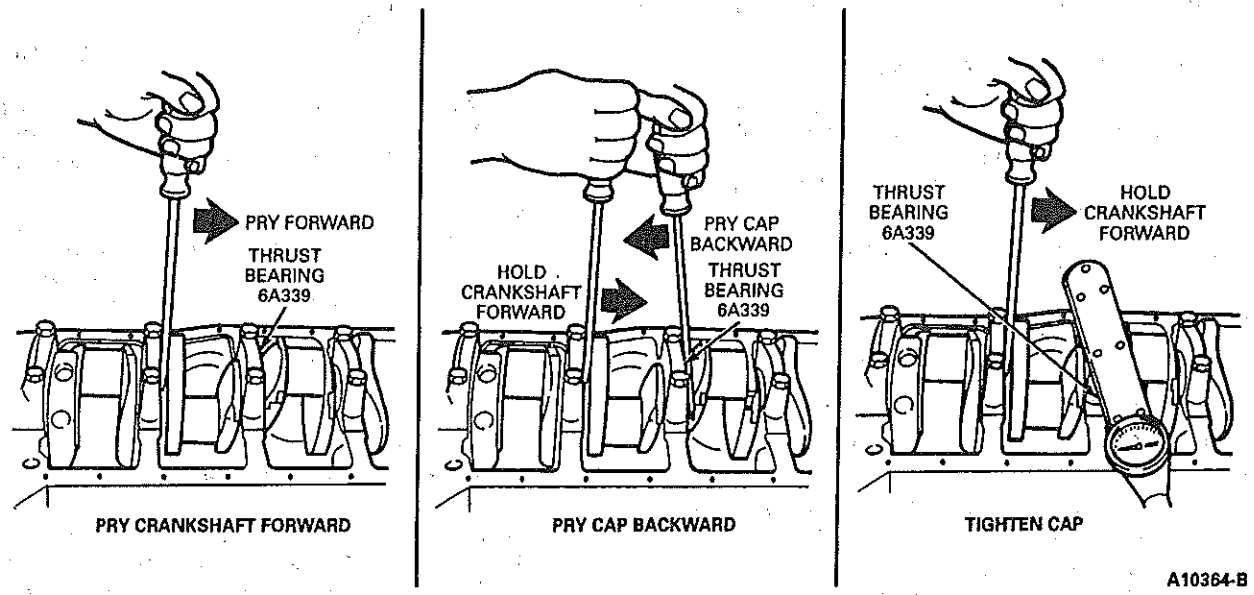
Item	Part Number	Description
1	—	Apply 1.58mm (1.16-In.) Dia. Bead of Silicone Rubber F4AZ-19562-B or WSE-M4G323-A1 and ESE-M4G195-A Sealer As Indicated on Bearing Cap (Both Sides)
2	—	Seal Groove
3	—	Leave 3.10mm (1/8-In.) Gap for Sealer Expansion
4	—	1.58mm (1/16-In.) Dia. Bead Silicone Rubber F4AZ-19562-B or WSE-M4G323-A1 and ESE-M4G195-A Sealer
5	6010	Cylinder Block
6	—	From Forward Face of Slinger Groove to Rear Face of Block
7	6333	Crankshaft Main Bearing

IN-VEHICLE SERVICE (Continued)

6. Lubricate the journal with Motorcraft XO-10W30 QSP or DSP engine oil or equivalent meeting Ford specification ESE-M2C153-E and install the rear main bearing cap. Tighten the cap bolts on 5.0L engines to 82-95 N·m (60-70 lb-ft); on 5.8L engines to 129-142 N·m (95-105 lb-ft).
7. If the thrust bearing cap (No. 3 main bearing) has been removed, install it as follows:

   Lubricate the journal with Motorcraft XO-10W30-QSP or DSP or equivalent meeting Ford specification ESE-M2C153-E engine oil and install the thrust bearing cap with the bolts finger-tight. Pry the crankshaft forward against the thrust surface of the upper half of the thrust bearing. Hold the crankshaft cap to the rear. This will align the thrust surfaces of both halves of the crankshaft thrust main bearing (6337). Retain the forward pressure on the crankshaft. Tighten the cap bolts on 5.0L engines to 82-95 N·m (60-70 lb-ft); on 5.8L engines to 129-142 N·m (95-105 lb-ft).
8. Install a new crankshaft rear oil seal.
9. Force crankshaft toward the rear of the engine.
10. Check crankshaft end play. Refer to Section 03-00.

Thrust Bearing Cap, Installation



11. Clean the oil pump screen cover and tube. Prime the oil pump by filling the inlet opening with oil and rotating the oil pump intermediate shaft (6A618) until oil emerges from the outlet opening. Install the oil pump and oil pump screen cover and tube.
12. Position the oil pan gaskets on the oil pan. Install the oil pan and related parts. Install the oil level dipstick.
13. **CAUTION: To prevent oil from entering the PCV system during air-powered oil fills, the closure hose should be disconnected from the oil fill pipe (6A868) and positioned away from the oil source. Cover the hose port with a shop towel to prevent oil from spilling onto the engine during oil fill. Reconnect the closure hose after the oil has been filled to the proper level.**

    Fill the crankcase with the proper grade and quality of engine oil. Start the engine and check for oil pressure. Operate the engine at fast idle and check for oil leaks.

IN-VEHICLE SERVICE (Continued)

Pistons and Connecting Rods

Removal

1. Drain the cooling system. Refer to Section 03-03. Drain the crankcase. Remove the intake manifold (9424), cylinder heads (6049), oil pan (6675) and oil pump (6600) as outlined.
2. Remove any ridges and/or deposits from the upper end of the cylinder bores as follows.

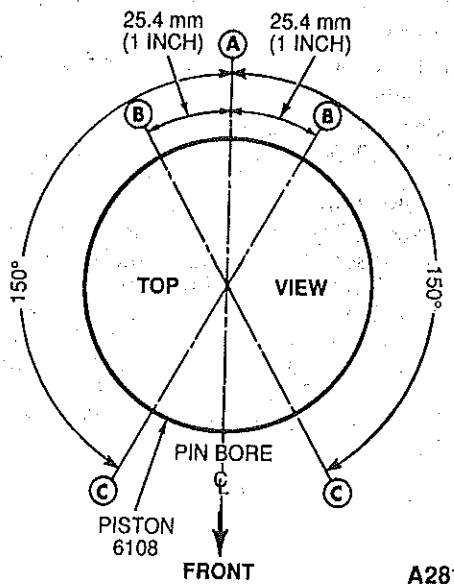
   Turn the crankshaft (6303) until the piston (6108) to be removed is at the bottom of its travel, then place a cloth on the piston head to collect the cuttings. Remove the cylinder ridge with a ridge cutter. Follow the instructions furnished by the tool manufacturers. Never cut into the ring travel area in excess of 0.794mm (1/32 inch) when removing ridges.
3. **CAUTION: Connecting rod caps must be installed in their original locations.**

   Make sure all connecting rod caps are marked so that they can be installed in their original positions.
4. Turn the crankshaft until the connecting rod being removed is down.
5. Remove the connecting rod nuts and cap.
6. Push the connecting rod and piston assembly out the top of the cylinder with the handle end of a hammer. Avoid damage to the crankshaft journal or the cylinder wall when removing the piston and rod assembly.
7. Remove the bearing inserts from the connecting rods and caps.

Installation

1. If new piston rings are to be installed, remove the cylinder wall glaze. Refer to Section 03-00. The small depression on the ring designates the top.
2. Install rings using a piston ring installation tool of the proper size.
3. NOTE: Be sure to install the pistons in the same cylinders from which they were fitted.

   Oil the piston rings, pistons and cylinder walls with recommended quality engine oil. The connecting rod and bearing caps are numbered from 1 to 4 in the right bank and from 5 to 8 in the left bank, beginning at the front of the engine (6007). The numbers on the connecting rod and bearing cap must be on the same side when installed in the cylinder bore. If a connecting rod is ever transferred from one cylinder block (6010) or cylinder to another, new connecting rod bearings (6211) should be fitted and the connecting rod should be numbered to correspond with the new cylinder number. When installing the piston and connecting rod assembly, the largest chamfer at the bearing end of the rod should be positioned toward the crank pin thrust face of the crankshaft.
4. Make sure the ring gaps (oil ring spacer-A, oil ring-B, compression ring-C) are properly spaced around the circumference of the piston.

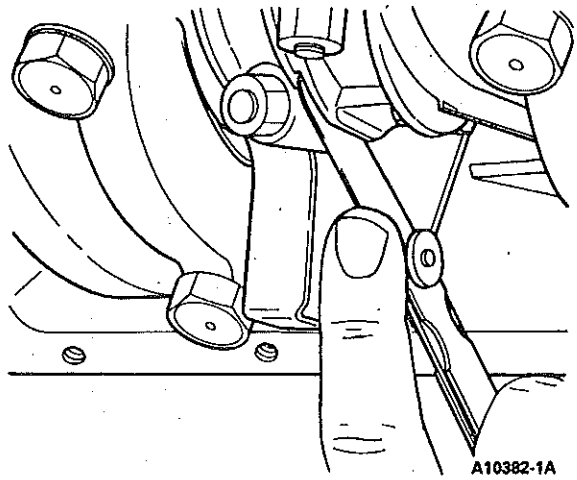


5. NOTE: Replacement pistons are slightly lighter in weight. Pistons must be replaced as a complete set to avoid the introduction of torsional vibration to the engine.

   Install Piston Ring Compressor D81L-6002-C or equivalent on the piston and push the piston in with a hammer handle until it is slightly below the top of the cylinder. Be sure to guide the connecting rods to avoid damaging the crankshaft journals. Install the piston with the indentation notch in the piston head toward the front of the engine.
6. Install connecting bearings and check the clearance of each connecting rod bearing. Refer to Section 03-00.
7. After the connecting rod bearings have been fitted, apply a light coat of recommended engine oil to the journals and connecting rod bearings.
8. Turn the crankshaft throw to the bottom of its stroke. Push the piston all the way down until the connecting rod bearing seats on the crankshaft journal.
9. Install the connecting rod cap. Tighten the nuts on 5.0L engines to 26-33 N·m (19-24 lb-ft); on 5.8L engines to 54-61 N·m (40-45 lb-ft).

IN-VEHICLE SERVICE (Continued)

10. After the piston and connecting rod assemblies have been installed, use a feeler gauge to check the side clearance between the connecting rods on each shaft journal.



11. Disassemble, clean, and assemble the oil pump. Clean the oil pump screen cover and tube (6622) and the oil pan and block gasket surfaces.
12. Prime the oil pump by filling the inlet port with engine oil of the quality recommended in the Owner Guide and rotating the oil pump intermediate shaft (6A618) to distribute the oil within the housing. Install the oil pump and the oil pan.
13. Install the cylinder heads following the steps under Cylinder Head in the In-Vehicle Service portion of this section.
14. Install accessory drive brackets with generator (GEN)(10300), secondary air injection pump (AIR pump)(9A486), air conditioning compressor, and power steering pump (3A674) and connect hoses and electrical connections.
15. Install the intake manifold.
16. **CAUTION: To prevent oil from entering the PCV system during air-powered oil fills, the closure hose should be disconnected from the oil fill pipe (6A868) and positioned away from the oil source. Cover the hose port with a shop towel to prevent oil from spilling onto the engine during oil fill. Reconnect the closure hose after the oil has been filled to the proper level.**

    Fill and bleed the cooling system. Refer to Section 03-03. Fill the crankcase with the proper quality and quantity of engine oil as recommended in the Owner Guide.
17. Start the engine, then check and adjust the ignition timing.
18. Operate the engine at fast idle and check for oil and coolant leaks. Operate the engine until engine temperatures have stabilized.
19. Install the engine air cleaner (ACL)(9600) and air cleaner outlet tube (9B659) assembly, including the crankcase ventilation tube (6758).

Connecting Rod Bearings

The connecting rod bearings (6211) are selective fit. Refer to Section 03-00.

Removal

1. Drain the crankcase. Remove the oil level dipstick (6750). Remove the oil pan (6675) and related parts.
2. Remove the oil pump screen cover and tube (6622) and the oil pump (6600).
3. Turn the crankshaft (6303) until the connecting rod to which new connecting rod bearings are to be fitted is down.

   Remove the connecting rod cap. Remove the bearing inserts from the rod and cap.

Installation

1. Be sure the bearing inserts and the bearing bore in the connecting rod and cap are clean. Foreign material under the inserts will distort the connecting rod bearing and cause a failure.
2. Clean the crankshaft journal.
3. Install the bearing inserts in the connecting rod and cap with the tangs fitting in the slots provided.
4. Pull the connecting rod assembly down firmly on the crankshaft journal.
5. Select fit the connecting rod bearing. Refer to Section 03-00.
6. Clean and apply a coat of Motorcraft XO-10W30-QSP or DSP engine oil or equivalent meeting Ford specification ESE-M2C153-E to the journal and connecting rod bearings. Install the connecting rod cap. Tighten the nuts on 5.0L engines (6007) to 26-33 N·m (19-24 lb-ft); on 5.8L engines to 54-61 N·m (40-45 lb-ft).
7. Repeat the procedure for the remaining connecting rods that require new connecting rod bearings.
8. Clean the oil pump screen cover and tube. Prime the oil pump by filling the inlet opening with oil and rotating the oil pump intermediate shaft (6A618) until oil emerges from the outlet opening. Install the oil pump and oil pump screen cover and tube.
9. Position the oil pan gasket on the cylinder block (6010). Install the oil pan and related parts. Install the oil level dipstick.

IN-VEHICLE SERVICE (Continued)

10. **CAUTION: To prevent oil from entering the PCV system during air-powered oil fills, the closure hose should be disconnected from the oil fill pipe (6A868) and positioned away from the oil source. Cover the hose port with a shop towel to prevent oil from spilling onto the engine during oil fill. Reconnect the closure hose after the oil has been filled to the proper level.**

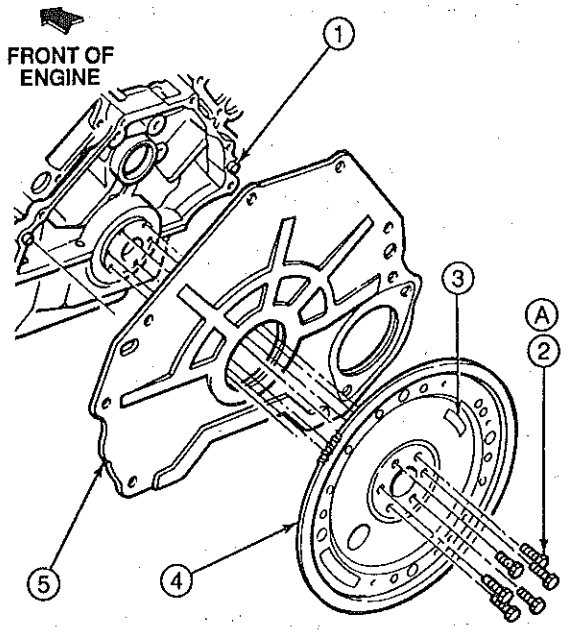
    Fill the crankcase with engine oil of the quality and quantity recommended in the Owner Guide. Start the engine and check for oil pressure. Operate the engine at fast idle and check for oil leaks.

Flywheel

Removal

1. On a vehicle with a manual transmission (7003), remove the transmission and flywheel housing, clutch pressure plate (7563) and clutch disc (7550). Refer to Group 08.

    On a vehicle with an automatic transmission, remove the transmission. Refer to Group 07.
2. To check flywheel face runout or to replace a flywheel ring gear for a manual transmission, refer to Section 03-00.
3. Remove the flywheel attaching bolts and remove the flywheel (6375).



A13399-D

Item	Part Number	Description
1	—	Dowel (2 Places) (Part of 6007)
2	—	Bolt (6 Places) (Apply Pipe Sealant with Teflon® D8AZ-19554-A or Equivalent Meeting Ford Specification WSK-M2G350-A2 or ESR-M18P7-A to Fasteners Prior to Assembly) (Part of 6375)
3	—	Automatic Transmission Usage Identification (Part of 6375)
4	6375	Flywheel
5	7007	Engine Rear Plate
A	—	Tighten to 102-115 N·m (75-85 Lb-Ft)

Installation

1. Coat the threads of the flywheel attaching bolts with oil-resistant Threadlock® and Sealer E0AZ-19554-AA or equivalent meeting Ford specifications ESE-M4G204-A2 and WSK-M2G315-A5. Position the flywheel on the crankshaft flange. Install and tighten the bolts in sequence across from each other to 102-115 N·m (75-85 lb-ft).

IN-VEHICLE SERVICE (Continued)

2. On a vehicle with a manual transmission, check the flywheel runout. Refer to Section 03-00. Install the clutch pressure plate, clutch disc and the transmission and flywheel housing. Refer to Group 08.

   On a vehicle with an automatic transmission, check the flywheel runout. Refer to Section 03-00. Install the transmission. Refer to Group 07.

Crankshaft Rear Oil Seal — 5.0L

SPECIAL SERVICE TOOL(S) REQUIRED

Description	Tool Number
Rear Crankshaft Seal Remover	T95P-6701-EH
Rear Crankshaft Seal Replacer	T95P-6701-BH
Rear Crankshaft Adapter	T96T-6701-A
Rear Crankshaft Seal Replacer Spacer	T96T-6701-B

Removal

1. Remove transmission (7003). If vehicle is equipped with a manual transmission, remove clutch assembly. Refer to either Group 07 or Group 08.
2. Remove flywheel (6375) from engine (6007).
3. **CAUTION: Use caution to avoid scratching or damaging the oil sealing surfaces during crankshaft rear oil seal (6701) removal.**

   Install the positioning bracket onto the crankshaft flange.
4. Thread Rear Crankshaft Seal Remover T95P-6701-EH over the rear crankshaft flange into the rear oil seal. Thread Impact Slide Hammer D80L-100-A or equivalent into the remover and remove the rear seal.

Installation

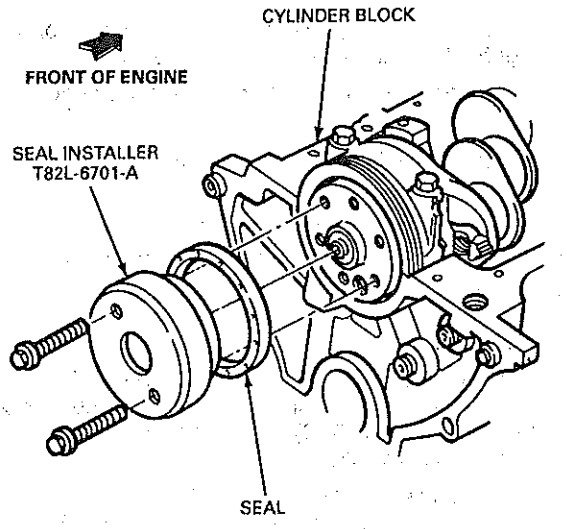
1. Lubricate the crankshaft rear oil seal and seal mating surfaces with clean engine oil.
2. Install Rear Crankshaft Adapter T96T-6701-A on end of crankshaft with two screws provided.
3. Slide Rear Crankshaft Seal Replacer Spacer T96T-6701-B onto Seal Replacer T95P-6701-BH. Position seal on Rear Crankshaft Seal Replacer T95P-6701-BH, and assemble to Rear Crankshaft Adapter T95P-6701-DH with center draw bolt and washer provided.
4. Draw seal into the crankcase bore until the Rear Crankshaft Seal Replacer T95P-6701-BH bottoms against the rear face of the seal carrier plate.
5. Install the positioning Rear Crankshaft Adapter T96T-6701-A onto the crankshaft flange. Position tool with crankshaft rear oil seal over the pilot diameter of the crankshaft (6303) and install bolts.
6. The crankshaft rear oil seal should be properly seated to within 0.127mm (.005 inch) of the rear face of the cylinder block (6010).
7. Install flywheel, clutch assembly (if equipped) and transmission. Refer to appropriate sections in Group 07 and Group 08.
8. **CAUTION: To prevent oil from entering the PCV system during air-powered oil fills, the closure hose should be disconnected from the oil fill pipe (6A868) and positioned away from the oil source. Cover the hose port with a shop towel to prevent oil from spilling onto the engine during oil fill. Reconnect the closure hose after the oil has been filled to the proper level.**

   Check engine oil level and correct as required.
9. Start engine and check for leaks.

Crankshaft Rear Oil Seal — 5.8L

SPECIAL SERVICE TOOL(S) REQUIRED

Description	Tool Number
Seal Replacer	T82L-6701-A



Removal

1. Remove the transmission (7003) as outlined in Group 07.
2. If equipped with manual transmission, remove clutch assembly as outlined in Section 08-01.
3. Remove flywheel attaching bolts and remove rear cap (main bearing) and flywheel (6375).

IN-VEHICLE SERVICE (Continued)

4. **CAUTION: Use caution throughout this procedure to avoid scratching or otherwise damaging the crankshaft oil seal surface.**

   Use an awl to punch two holes in the crankshaft rear oil seal (6701). Punch the holes on opposite sides of the crankshaft (6303) and just above the bearing cap-to-cylinder block split line. Install a sheet metal screw in each hole. Use two large screwdrivers or small pry bars and pry against both screws at the same time to remove the crankshaft rear oil seal. It may be necessary to place small blocks of wood against the cylinder block (6010) to provide a fulcrum point for the pry bars.
5. Clean the oil seal recess in the cylinder block and main bearing cap. Inspect and clean the oil seal contact surface on the crankshaft.

Installation

1. Coat the oil seal-to-cylinder block surface of the crankshaft rear oil seal with oil XO-5W30-QSP or DSP or equivalent meeting Ford specification ESE-M2C153-E. Coat the seal contact surface of the crankshaft rear oil seal and crankshaft with heavy SG engine oil. Remove pilot bearing. Place crankshaft rear oil seal on Seal Replacer T82L-6701-A and, using hammer, tap into place until tool contacts face of cylinder block or bearing cap.
2. Install flywheel. Tighten flywheel attaching bolts. Tighten bolts to 102-115 N·m (75-85 lb-ft).
3. If equipped, install clutch as outlined in Section 08-01.
4. Install transmission. Refer to appropriate Group 07 section.

Camshaft Rear Bearing Cover

Removal

1. On a vehicle with a manual transmission (7003) remove the transmission, flywheel housing, clutch pressure plate (7563) and clutch disc (7550). Refer to Group 08.

   On a vehicle with an automatic transmission, remove the transmission. Refer to Group 07.
2. Remove the flywheel attaching bolts and remove the flywheel (6375). Remove the engine rear plate (7007).
3. Replace the camshaft rear bearing cover (6266). Refer to Section 03-00.

Installation

1. Coat the flywheel attaching bolts with oil-resistant Threadlock and Sealer E0AZ-19554-AA or equivalent meeting Ford specification WSK-M2G315-A5 . Install engine rear plate. Install flywheel. Install and tighten the attaching bolts in sequence, across from each other to 102-115 N·m (75-85 lb-ft).
2. On a vehicle with a manual transmission, install the clutch pressure plate, clutch disc, transmission, and the flywheel housing. Refer to Group 08.
3. On a vehicle with an automatic transmission, install the transmission. Refer to Group 07.

Oil Filter/Adapter/Oil Cooler

Removal

1. Position a drip pan under the oil filter.
2. Unscrew the oil filter from the oil cooler mounting bolt insert (6L626) using an Oil Filter Wrench D79L-6731-A or B or equivalent and clean the oil cooler mounting bolt insert.

   Unscrew the oil filter from the oil cooler mounting bolt insert, turn it horizontal and let the excess oil drain off. Slide the oil filter toward the rear of the vehicle and remove. Some effort may be required to slide the oil filter between the engine crossmember and power steering hoses.
3. If it is necessary to remove the oil cooler, drain the cooling system. Refer to Section 03-03. Disconnect coolant lines from oil cooler adapter.
4. Remove oil filter mounting adapter bolt and O-ring.
5. Remove oil cooler mounting bolt insert and oil cooler.

Installation

1. **CAUTION: Make sure gasket from removed oil filter has not stuck to the oil cooler mounting bolt insert. Wipe oil cooler mounting bolt insert clean prior to installing new oil filter.**

   Coat the gasket on a new oil filter with recommended quality engine oil. Place the new oil filter in position on the oil cooler mounting bolt insert.
2. Hand-tighten the oil filter until the gasket makes contact and then advance it one-half turn.
3. NOTE: Be sure O-ring for oil filter adapter mounting bolt is positioned properly before bolt installation.

   If oil cooler was removed, reverse removal procedure to install. Fill and bleed cooling system. Refer to Section 03-03.
4. **CAUTION: To prevent oil from entering the PCV system during air-powered oil fills, the closure hose should be disconnected from the oil fill pipe (6A868) and positioned away from the oil source. Cover the hose port with a shop towel to prevent oil from spilling onto the engine during oil fill. Reconnect the closure hose after the oil has been filled to the proper level.**

   Check the oil level and fill the crankcase with engine oil of the quality recommended in the Owner Guide as necessary.

IN-VEHICLE SERVICE (Continued)

5. Operate the engine (6007) at fast idle and check for oil leaks. If oil leaks are evident, perform the necessary repairs to correct the leakage. Remove the drip pan.

Oil Level Indicator Tube, 5.0L

Removal

1. Drain the crankcase.
2. Remove the oil level dipstick (6750).
3. NOTE: Heat may be required to break sealant.

   Remove nut from oil level indicator tube bracket and remove oil level indicator tube (6754).

Installation

1. Apply a light film of 10W30 oil to the outer diameter of the end of the tube, prior to inserting the oil level indicator tube approximately 1/2 inch.
2. Apply Pipe Sealant with Teflon® D8AZ-19554-A or equivalent meeting Ford specifications WSK-M2G350-AZ and ESR-M18P7-A at oil level indicator tube joint. The oil level indicator tube must be bottomed out in the cylinder block (6010).
3. Install 3/8-16 nut on oil level indicator tube bracket. Tighten nut to cylinder head (6049) 16-24 N·m (12-18 lb-ft).
4. Install oil level dipstick.
5. **CAUTION: To prevent oil from entering the PCV system during air-powered oil fills, the closure hose should be disconnected from the oil fill pipe (6A868) and positioned away from the oil source. Cover the hose port with a shop towel to prevent oil from spilling onto the engine during oil fill. Reconnect the closure hose after the oil has been filled to the proper level.**

   Fill crankcase.

Oil Level Indicator Tube, 5.8L

Removal

1. Drain the crankcase.
2. Remove oil level dipstick (6750) from oil level indicator tube (6754).
3. Remove nut from oil level indicator tube bracket and exhaust manifold stud. Remove oil level indicator tube from cylinder block (6010).

Installation

1. Apply Pipe Sealant with Teflon® D8AZ-19554-A or equivalent meeting Ford specifications WSK-M2G350-AZ and ESR-M18P7-A around the periphery of the oil level indicator tube on the cylinder block installation.
2. Insert loose fit oil level indicator tube into the cylinder block with a rotational movement.
3. Install 3/8-16 nut on oil level indicator tube bracket to exhaust manifold stud.
4. Tighten nut to 16-24 N·m (12-18 lb-ft).
5. Install oil level dipstick in oil level indicator tube.
6. **CAUTION: To prevent oil from entering the PCV system during air-powered oil fills, the closure hose should be disconnected from the oil fill pipe (6A868) and positioned away from the oil source. Cover the hose port with a shop towel to prevent oil from spilling onto the engine during oil fill. Reconnect the closure hose after the oil has been filled to the proper level.**

   Fill crankcase.

Sensor, Oil Pressure Sender/Switch

Removal

1. Remove oil filter, oil cooler mounting bolt insert (6L626), oil cooler (6A642) and oil cooler adapter.
2. Remove oil pressure sensor (9278) from cylinder block (6010).

Installation

1. Install oil pressure sensor in cylinder block. Tighten to 11-24 N·m (8-18 lb-ft).
2. For 5.0L only, install oil cooler adapter to water pump (8501). Tighten to 2-5 N·m (20-40 lb-in).
3. NOTE: Surfactant meeting Ford specification ESE-M998144-A or equivalent may be used to facilitate assembly of the oil cooler adapter assembly hoses to the water pump and oil cooler assembly. The surfactant concentration can be 10 percent maximum (10 parts water to 1 part surfactant).

   Install oil cooler and oil cooler mounting bolt insert to cylinder block. Tighten to 54-61 N·m (40-45 lb-ft).
4. NOTE: Be sure to properly position the O-ring on the oil filter adapter mounting bolt. Apply a light film of petroleum jelly or SAE 50 oil to the O-ring to hold it in place and position in the groove on the oil cooler prior to tightening the mounting bolt.

   Install oil filter adapter to oil cooler. Tighten to 3-6 N·m (30-50 lb-in).
5. Prior to installation of oil filter, apply a light film of 5W30 motor oil on the oil filter gasket.
6. Install oil filter. Turn 1/2 turn after gasket contact. Tighten to (optional) 11-14 N·m (8-10 lb-ft).

REMOVAL AND INSTALLATION

Engine

Removal

1. Disconnect battery (10655).
2. Drain cooling system. Refer to Section 03-03.
3. Remove hood (16612). Refer to Section 01-02 in the Body, Chassis Manual.
4. Remove jack handle and air intake duct.
5. Remove radiator (8005). Refer to Section 03-03.
6. Remove fan fan shroud (8146).
7. Discharge A/C system. Refer to Section 12-00 in the Body, Chassis Manual.
8. Remove serpentine belt. Refer to Section 03-05.
9. Remove fan blade (8600).
10. Remove upper intake manifold (9424). Refer to Intake Manifold, Upper in In-Vehicle Service portion of this section.
11. Disconnect heater water hoses (18472) from water pump (8501).
12. Remove retaining bolt and water pump heater brackets from generator (GEN)(10300).
13. Disconnect electrical connectors from generator.
14. Disconnect two hoses from air pump.
15. Disconnect vacuum lines.
16. Relieve fuel pressure. Refer to Section 03-04B.
17. Remove retaining bolts for generator and air pump brackets.
18. Disconnect ground cables from engine block.
19. Disconnect electrical connectors from A/C.
20. Disconnect A/C manifold lines from A/C compressor (19703).
21. Disconnect power steering hoses from power steering pump (3A674).
22. Remove A/C and power steering bracket.
23. Disconnect electrical block from left fender.
24. Disconnect fuel lines.
25. Raise vehicle on hoist and remove starter motor (11001). Refer to Section 03-06A.
26. Remove exhaust manifold-to-exhaust pipe nuts.
27. For manual transmissions, remove clutch housing-to-engine bolts or for automatic transmissions, remove torque converter housing-to-engine bolts.
28. Remove motor mount nuts.
29. Lower vehicle.
30. Install lifting eyes.
31. Using suitable lifting device, remove engine (6007) from vehicle.
32. Mount engine on suitable bench or stand.

Installation

1. Follow removal procedure in reverse order. Tighten clutch housing-to-engine bolts for manual transmissions or torque converter housing-to-engine bolts for automatic transmissions to 55-67 N·m (40-50 lb-ft). Tighten fan shroud bolts to 7-10 N·m (62-89 lb-in). Tighten exhaust manifold-to-exhaust inlet pipe nuts to 35-45 N·m (26-36 lb-ft). Tighten engine mount nuts to 73-100 N·m (54-74 lb-ft). To install starter motor, refer to Section 03-06A.
2. Refill cooling system. Refer to Section 03-03.
3. NOTE: When the battery has been disconnected and reconnected, some abnormal drive symptoms may occur while the powertrain control module (PCM)(12A650) relearns its adaptive strategy. The vehicle may need to be driven 16 km (10 miles) or more to relearn the strategy.

   Reconnect battery.

Camshaft Bearings

NOTE: Camshaft bearings (6261) are available prefinished to size for standard and 0.38mm (0.015 inch) undersize journal diameters. The camshaft bearings are not interchangeable from one bore to another.

SPECIAL SERVICE TOOL(S) REQUIRED

Description	Tool Number
Camshaft Bearing Set	T65L-6250-A

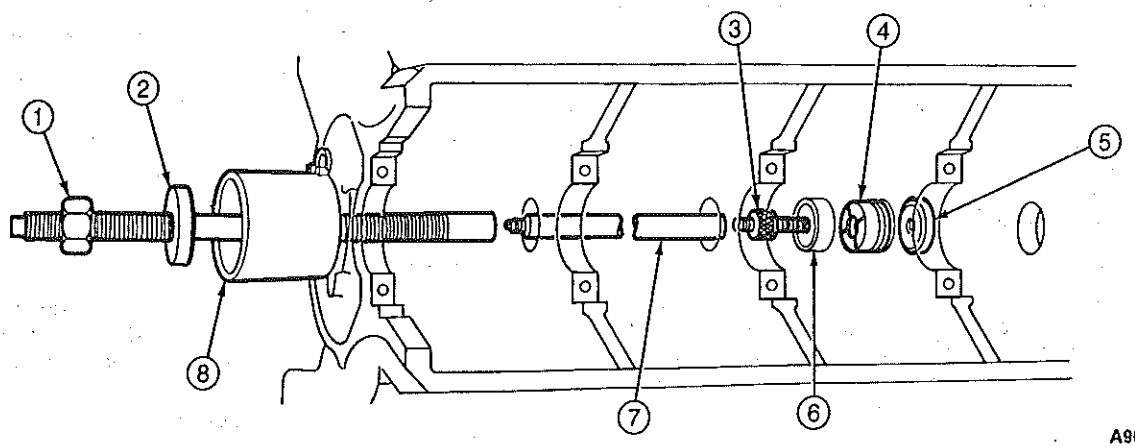
Removal

1. Remove engine (6007) from vehicle. Refer to Engine in Removal and Installation portion of this section.
2. Remove the camshaft (6250), flywheel (6375) and crankshaft (6303) as outlined. Push the pistons (6108) to the top of the cylinders.
3. Remove rear bearing bore plug.
4. Select the proper size expanding collet and backup nut and assemble on the expanding mandrel Camshaft Bearing Set T65L-6250-A.
5. With the expanding collet collapsed, install the collet assembly in the camshaft bearing, and tighten the backup nut on the expanding mandrel until the collet fits the camshaft bearing.
6. Assemble the puller screw and extension (if necessary) and install on the expanding mandrel. Wrap a cloth around the threads of the puller screw to protect the front bearing or journal. Tighten the pulling nut against the thrust bearing and pulling plate to remove the camshaft bearing. Be sure to hold a wrench on the end of the puller screw to prevent it from turning.

REMOVAL AND INSTALLATION (Continued)

7. Repeat the procedure for each camshaft bearing. To remove the front bearing, install the puller screw from the rear of the cylinder block (6010).

Camshaft Bearings



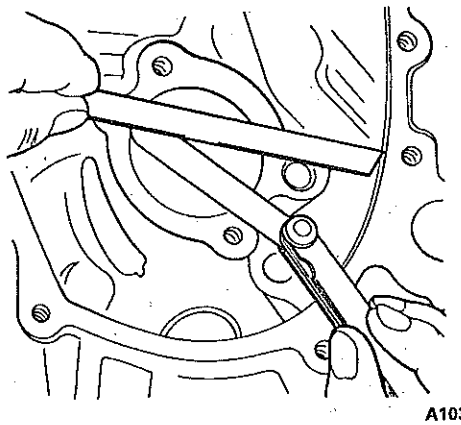
A9045-D

Item	Part Number	Description
1	—	Pulling Screw
2	—	Pulling Plate
3	—	Expanding Mandrel
4	—	Expanding Collet
5	—	Backup Nut
6	—	Bearing, Camshaft (Part Number Given Is for Reference Only)
7	—	Puller Screw Extension
8	—	Front Spacer NOTE: All Items Except No. 6 (Bearing) Are Included in Camshaft Bearing Set T65L-6250-A

(Continued)

Installation

1. Position the new camshaft bearing at the bearing bores with the oil holes aligned and press them in place with the Camshaft Bearing Set T65L-6250-A. Be sure to center the pulling plate and puller screw to avoid damage to the camshaft bearing. Failure to use the correct expanding collet can cause severe camshaft bearing damage. Make sure the front camshaft bearing is installed 0.127-0.508mm (0.005-0.020 inches) below the front face of the cylinder block.



A10385-B

2. Install a new rear bearing bore plug.
3. Install the camshaft, crankshaft, flywheel and related parts as outlined. Do not check connecting rod and main bearing clearances as a part of camshaft bearing replacement. Install the engine in the vehicle.

REMOVAL AND INSTALLATION (Continued)

Crankshaft

SPECIAL SERVICE TOOL(S) REQUIRED

Description	Tool Number
Spark Plug Wire Remover	T74P-6666-A
Clutch Housing Alignment Tool	T75P-6392-A

Removal

1. With the engine (6007) removed from the vehicle and placed in a workstand, disconnect the distributor to spark plug wires (12286) at the spark plugs (12405) and remove the wires and bracket assembly from the attaching stud on the valve covers (6582) using Spark Plug Wire Remover T74P-6666-A. Disconnect the ignition coil to distributor high tension wiring (12298) at the ignition coil (12029). Remove the distributor cap (12106) and distributor to spark plug wires as an assembly. Remove the spark plugs to allow easy rotation of the crankshaft (6303).
2. Drain the crankcase.
3. Remove the oil filter. Slide the water pump bypass hose clamp toward the water pump (8501). Remove the generator (GEN)(10300) and mounting brackets.
4. Remove the crankshaft pulley (6312) from the crankshaft vibration damper / pulse ring. Remove the capscrew and washer from the end of the crankshaft. Install Gear and Pulley Puller D80L-522-A or equivalent on the crankshaft vibration damper / pulse ring and remove the crankshaft vibration damper / pulse ring.
5. Remove the engine front cover (6019) and water pump as an assembly.
6. Check the timing chain deflection. Then, remove the timing chain / belt (6268) and sprockets. Refer to Timing Chains and Sprockets in the In-Vehicle Service portion of this section.
7. Invert the engine on the workstand. Remove the clutch pressure plate (7563) and clutch disc (7550) (manual shift transmission). Remove the flywheel (6375) and engine rear plate (7007). Remove the oil pan (6675) and gasket. Remove the oil pump (6600).
8. NOTE: Make sure all bearing caps (main and connecting rod) are marked so that they can be installed in their original locations.

   Turn the crankshaft until the connecting rod from which the cap is being removed is down, and remove the bearing cap. Push the connecting rod and piston assembly up into the cylinder. Repeat this procedure until all the connecting rod bearing caps are removed.
9. Remove the main bearing caps.
10. **CAUTION: Handle the crankshaft with care to avoid possible fracture or damage to the finished surfaces.**

    Carefully lift the crankshaft out of the cylinder block (6010) so that the thrust bearing surfaces are not damaged.
11. Remove rear journal oil seal from the crankshaft.
12. Remove the main bearing inserts from the cylinder block and bearing caps.
13. Remove the connecting rod bearing (6211) from the connecting rods and caps.

    To refinish journals and dress minor imperfections, refer to Section 03-00.

Installation

1. If the crankshaft main bearing journals have been refinished to a definite undersize, install the correct undersize crankshaft main bearings (6333).
2. **CAUTION: Be sure the bearing inserts and bearing bores are clean. Foreign material under the inserts will distort the crankshaft main bearing and cause a failure.**

   Place the upper crankshaft main bearing inserts in position in bores with the tang fitting in the slot provided.
3. Install the lower crankshaft main bearing inserts in the bearing caps.
4. NOTE: Be careful not to damage the bearing surfaces.

   Carefully lower the crankshaft into place.
5. Check the clearance of each crankshaft main bearing. Refer to Section 03-00.
6. Apply engine oil of the quality recommended in the Owner Guide to the journals and crankshaft main bearings.
7. NOTE: Apply Black Silicone Rubber F4AZ-19562-B or equivalent meeting Ford specifications WSE-M4G323-A1 and ESE-M4G195-A in a 1.59mm (1/16-inch) bead in each corner of rear main bearing cap saddle, the full length of the saddle.

   NOTE: Be sure that the main bearing caps are installed in their original locations.

   Install all the crankshaft main bearing caps, except the thrust bearing cap (No. 3 bearing). Tighten the bearing cap bolts on 5.0L engines to 82-95 N·m (60-70 lb-ft); on 5.8L SFI engines to 129-142 N·m (95-105 lb-ft).
8. Install the thrust bearing cap with the bolts finger-tight.
9. Pry the crankshaft forward against the thrust surface on the upper half of the crankshaft main bearing.
10. Hold the crankshaft forward and pry the thrust bearing cap to the rear. This will align the thrust surfaces of both halves of the crankshaft thrust main bearing (6337).

REMOVAL AND INSTALLATION (Continued)

11. Retain the forward pressure on the crankshaft. Tighten the cap bolts on 5.0L engines to 82-95 N·m (60-70 lb-ft); on 5.8L engines to 129-142 N·m (95-105 lb-ft).
12. Force the crankshaft toward the rear of the engine.
13. Check the crankshaft end play. Refer to Section 03-00.
14. Install new bearing inserts in the connecting rods and caps. Check the clearance of each bearing. Refer to Section 03-00.
15. Apply a light coat of recommended quality engine oil to the journals and connecting rod bearings after the connecting rod bearings have been fitted.
16. Turn the crankshaft throw to the bottom of its stroke. Push the piston (6108) all the way down until the connecting rod bearing seats on the crankshaft journal.
17. Install the connecting rod cap. Tighten the nuts on 5.0L engines to 26-33 N·m (19-24 lb-ft); on 5.8L to 54-61 N·m (40-45 lb-ft).
18. Using a feeler gauge to check the side clearance between the connecting rods on each connecting rod crankshaft journal after the piston and connecting rod assemblies have been installed. Refer to Specifications at the end of this section.
19. Install a new crankshaft rear oil seal (6701).
20. Install the timing chain/belt, the sprockets, engine front cover, crankshaft vibration damper/pulse ring and crankshaft pulley.
21. Coat the threads of the flywheel attaching bolts with oil-resistant Threadlock and Sealer E0AZ-19554-AA or equivalent meeting Ford specification WSK-M2G315-A5. Position the flywheel on the crankshaft flange. Install and tighten the bolts to 102-115 N·m (75-85 lb-ft).

    On a flywheel for manual shift transmission (7003), use Clutch Housing Alignment Tool T75L-6392-A to locate the clutch disc. Install the clutch pressure plate. Tighten the attaching bolts to 27-39 N·m (20-29 lb-ft).
22. Clean the oil pan, oil pump and oil pump screen cover and tube (6622). Prime the oil pump by filling the inlet port with engine oil and rotating the oil pump intermediate shaft (6A618) to distribute oil within the housing. Install the oil pump and oil pan.
23. Install generator and mounting bracket.
24. Install the oil filter.
25. Install the spark plugs, distributor cap and distributor to spark plug wires. Connect the distributor to spark plug wires and ignition coil to distributor high tension wiring.
26. Install the engine in the vehicle.
27. **CAUTION: To prevent oil from entering the PCV system during air-powered oil fills, the closure hose should be disconnected from the oil fill pipe (6A868) and positioned away from the oil source. Cover the hose port with a shop towel to prevent oil from spilling onto the engine during oil fill. Reconnect the closure hose after the oil has been filled to the proper level.**

    Fill crankcase.

DISASSEMBLY AND ASSEMBLY

Engine

SPECIAL SERVICE TOOL(S) REQUIRED

Description	Tool Number
Cylinder Ridge Reamer	T64L-6011-EA

Disassembly

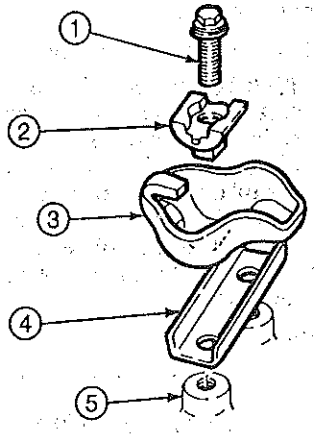
1. NOTE: Before starting disassembly, remove all wiring harnesses, emission control system, fuel system, ignition system, flywheel (6375), engine rear plate (7007) and components front end accessory drive components. For more detailed information on a particular system, refer to the specific section in the appropriate repair group.

   NOTE: All valve train components should be identified to make sure they are installed in their original positions during assembly.

   With the engine (6007) mounted on a workstand: Remove the left and right valve covers (6582) and discard the gaskets.
2. Remove the upper and lower intake manifold (9424) assemblies.
3. Remove the oil level dipstick (6750) and oil level indicator tube (6754) assembly and remove the oil filter.

DISASSEMBLY AND ASSEMBLY (Continued)

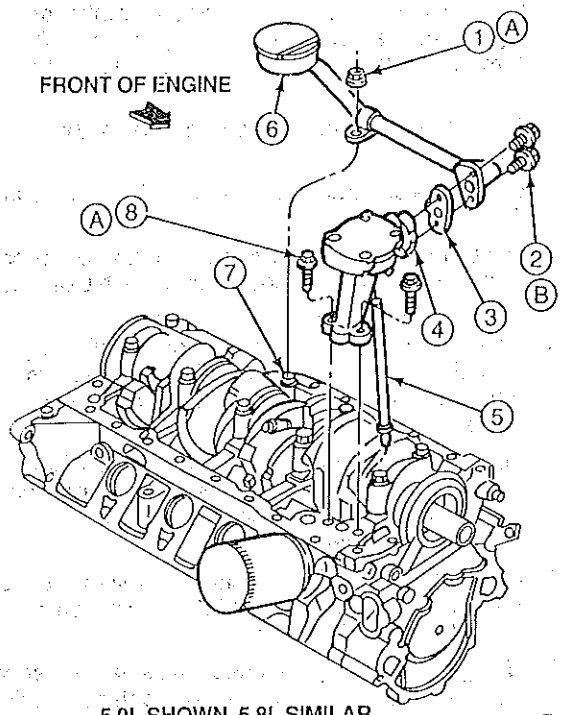
4. Remove the rocker arms (6564), rocker arm seats (6A528), push rods (6565), rocker arm fulcrum guides (6A588) and valve tappets (6500) and remove the cylinder heads (6049).



A4870-C

Item	Part Number	Description
1	390385	Attaching Bolt
2	6A528	Rocker Arm Seat
3	6564	Rocker Arm
4	6A588	Rocker Arm Fulcrum Guide
5	—	Threaded Pedestal (Part of 6049)

5. Remove the crankshaft pulley (6312) and crankshaft vibration damper/pulse ring.
6. Remove the water pump (8501) and engine front cover (6019) as an assembly. Discard the gasket and seal.
7. Remove the oil pan (6675) and discard the gasket.
8. Remove the oil pump (6600), oil pump screen cover and tube (6622) assembly and oil pump intermediate shaft (6A618).



5.0L SHOWN, 5.8L SIMILAR A13397-D

Item	Part Number	Description
1	33771	Nut, 3/8-16
2	391378	Screw and Washer, 5/16-18 x 1.13
3	6626	Oil Pump Inlet Tube Gasket
4	6600	Oil Pump
5	6A618	Oil Pump Intermediate Shaft
6	6622	Oil Pump Screen Cover and Tube (Typical)
7	—	Third Main (Part of 6010)
8	57647	Bolt
A	—	Tighten to 30-43 N·m (22-32 Lb-Ft)
B	—	Tighten to 16-24 N·m (12-18 Lb-Ft)

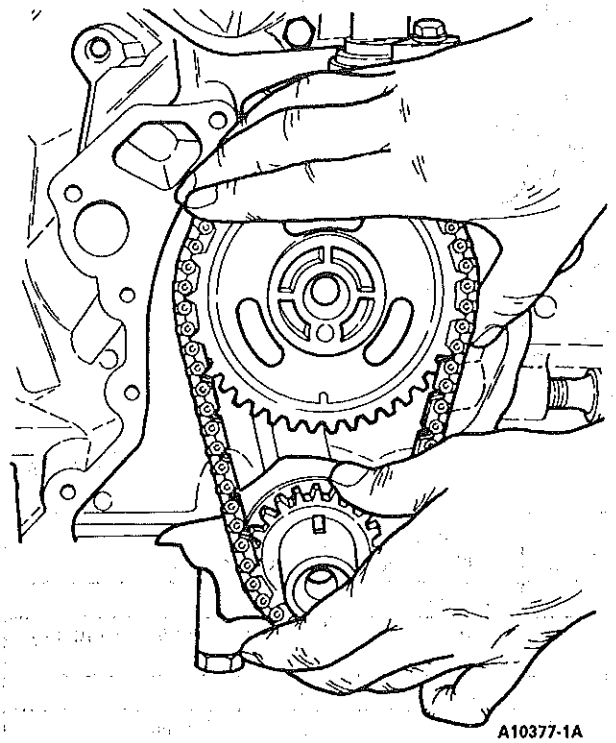
9. Remove the crankshaft rear oil seal (6701) as described in the Crankshaft Rear Oil Seal Removal procedure in the In-Vehicle Service portion of this section.
10. Remove the camshaft sprocket, capscrew, washer and eccentric or timing flag. Slide the sprocket and timing chain/belt (6268) forward and remove the timing chain/belt and sprocket as an assembly.
11. Remove the camshaft thrust plate (6269) and remove the camshaft (6250).

DISASSEMBLY AND ASSEMBLY (Continued)

12. NOTE: Pistons (6108), connecting rods and bearings should be numbered to make sure they are assembled in their original positions.

    NOTE: Before removing pistons inspect the top of the cylinder bores. If necessary, remove the ridge and/or carbon deposits from each cylinder using Cylinder Ridge Reamer T64L-6011-EA.

    Remove the connecting rod caps and remove the piston.


A10377-1A

13. **CAUTION: When removing the crankshaft (6303), take care not to damage any of the bearing surfaces on the crankshaft.**

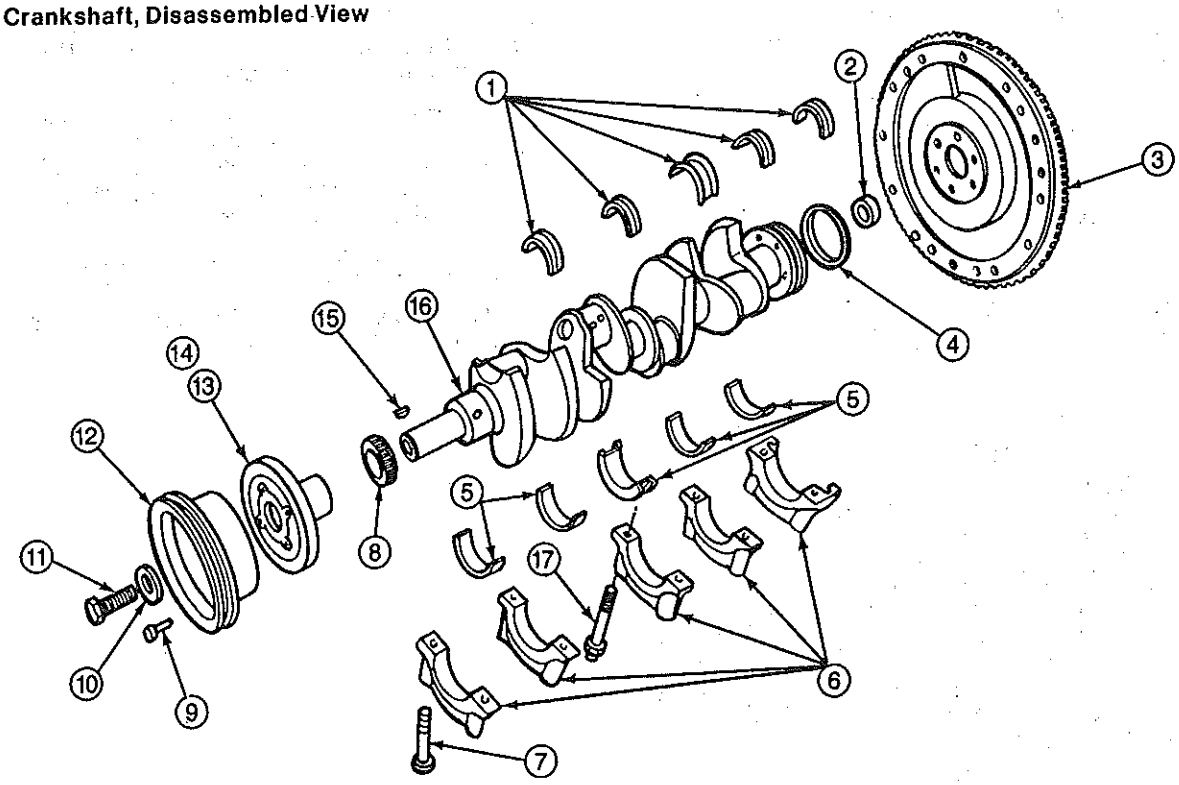
    NOTE: The location of the main bearing caps and the main bearing inserts should be identified. When the engine is assembled, crankshaft main bearings (6333) which are to be reused should be installed in their original positions.

    Remove the crankshaft main bearing caps, crankshaft main bearings and crankshaft.

14. For cleaning purposes, the oil gallery and coolant drain plugs can be removed.

DISASSEMBLY AND ASSEMBLY (Continued)

Crankshaft, Disassembled View



A10383-D

Item	Part Number	Description
1	6333	Crankshaft Main Bearing
2	7118	Transmission Input Shaft Pilot Bearing
3	6375	Flywheel
4	6701	Crankshaft Rear Oil Seal
5	6333	Crankshaft Main Bearing
6	6325	Main Bearing Caps
7	384664	Bolt
8	6306	Crankshaft Sprocket

(Continued)

Item	Part Number	Description
9	391264-S	Bolt
10	6378	Crankshaft Pulley Retaining Washer
11	388813	Bolt
12	6312	Crankshaft Pulley
13	1616	Damper
14	6A329	Damper
15	372890-S	Key
16	6303	Crankshaft
17	391546	Stud

Assembly

Before assembling cylinder block (6010), all sealing surfaces must be clean and free of chips, dirt, paint, and foreign material. Also make sure coolant and oil passages are clear.

If new piston rings are to be installed and no visible crosshatch marks remain on the cylinder wall, remove cylinder wall glaze using a spring-type tool. Follow instructions of tool manufacturer.

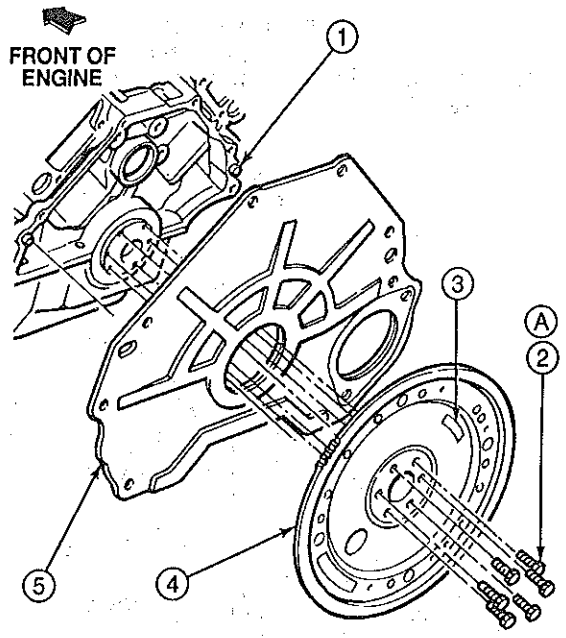
1. NOTE: Lightly oil all attaching bolt and stud threads with SAE 50 engine oil meeting Ford specification WSE-M2C908-A or equivalent before installation, except those specifying special sealant.

   Place crankshaft upper main bearings in position in the bores with the tang fitting in the slot provided. Lubricate bearings with SAE 50 weight oil meeting Ford specification WSE-M2C908-A or equivalent for 5.0L engine and for 5.8L engines.
2. Install the lower crankshaft main bearings in the bearing caps.
3. Carefully lower crankshaft into place. Use care to prevent damage to bearing surfaces.

DISASSEMBLY AND ASSEMBLY (Continued)

4. Check clearance of each crankshaft main bearing. Refer to Section 03-00.
5. Apply a light coat of SAE 50 engine oil meeting Ford specification WSE-M2C908-A or equivalent for the 5.0L engine and 5.8L engine to the journals and crankshaft main bearings after crankshaft main bearings have been fitted.
6. NOTE: Make sure main bearing caps are installed in their original positions.

   Install all bearings and caps except thrust bearing cap (No. 3 bearing). Refer to Crankshaft Main Bearings in the In-Vehicle Service portion of this section for installation of thrust bearing cap. Tighten bearing caps to 129-142 N·m (95-105 lb-ft) for 5.8L engine and 82-95 N·m (60-70 lb-ft) for 5.0L engine.
7. Install crankshaft rear oil seal as described in this section. Install engine rear plate and flywheel and tighten bolts to specification.

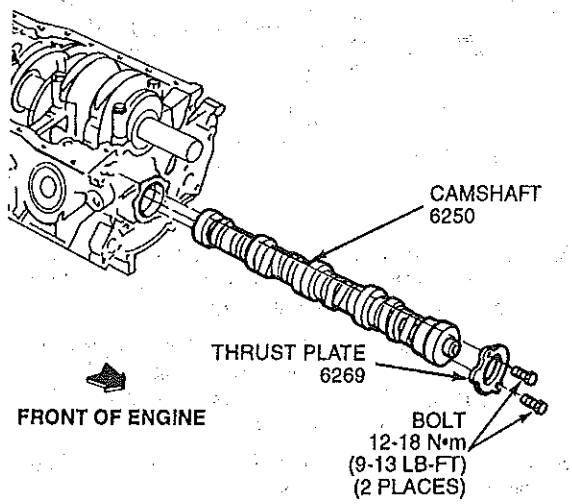


A13399-D

Item	Part Number	Description
1	—	Dowel (2 Places)
2	391275	Bolt, 7/16-20 x .72 (6 Places) (Apply Pipe Sealant with Teflon® D8AZ-19554-A or Equivalent Meeting Ford Specification WSK-M2G350-A2 or ESR-M18P7-A to Fasteners Prior to Assembly)
3	—	Automatic Transmission Usage Identification
4	6375	Flywheel
5	7007	Engine Rear Plate
A	—	Tighten to 102-115 N·m (75-85 Lb-Ft)

(Continued)

8. Coat all camshaft bearings (6261), camshaft lobes and camshaft sprocket spacer (6265) with SAE 50 engine oil meeting Ford specification WSE-M2C908-A or equivalent for 5.0L engine and for 5.8L engine.
9. Carefully slide camshaft through camshaft bearings. Install camshaft thrust plates with groove toward cylinder block. Tighten thrust plate retaining bolts. Tighten to 12-18 N·m (9-13 lb-ft).

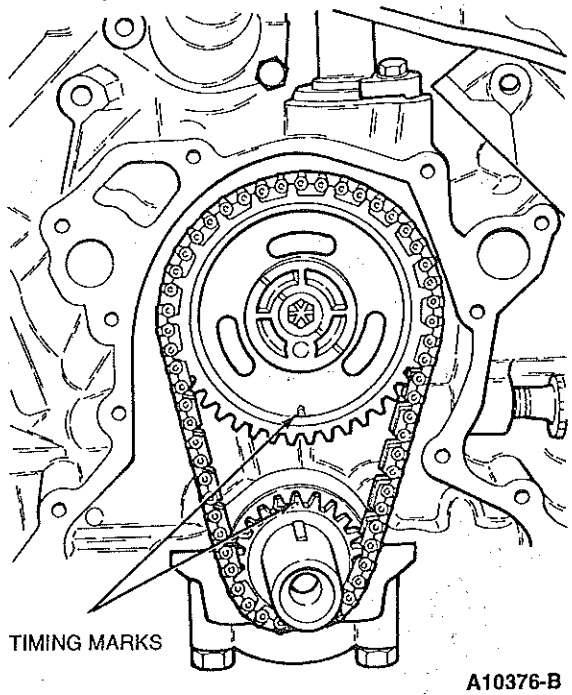


A13400-C

10. Check camshaft end play. Refer to Section 03-00. If not within specification, replace camshaft thrust plate.
11. Install camshaft sprocket (6256) and timing chain/belt. Position camshaft sprocket and timing chain/belt on camshaft and crankshaft sprocket simultaneously. Make sure timing marks on the sprockets are aligned.

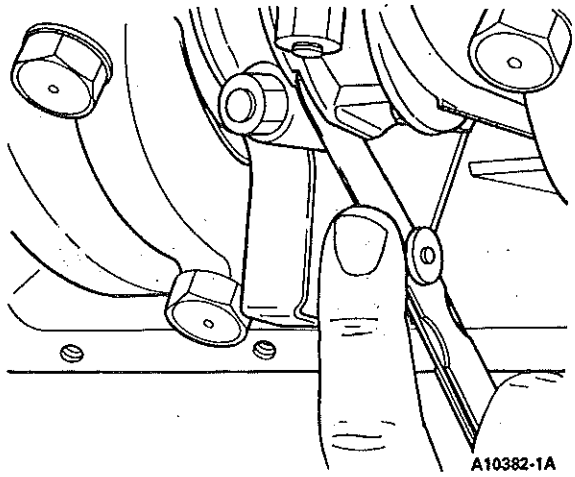
DISASSEMBLY AND ASSEMBLY (Continued)

12. Install eccentric or timing flag, washers, and camshaft capscrew. Tighten camshaft capscrew to 54-61 N·m (40-45 lb-ft).

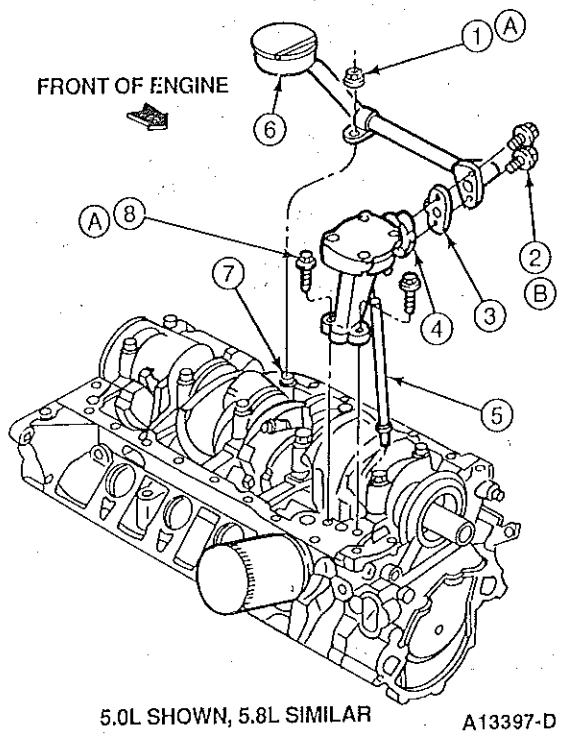


13. Oil the piston rings, pistons and cylinder walls. Be sure to install the pistons in the same cylinders from which they were removed.
14. Make sure the ring gaps are properly spaced around the circumference of the piston. (Refer to Pistons and Connecting Rods in the In-Vehicle Service portion of this section.)
15. NOTE: Install piston with indentation notch in the piston head toward front of engine.

    Install a piston ring compressor on the piston and push piston in with a hammer handle or an appropriate piston hammer until it is slightly below top of cylinder. Be sure to guide connecting rods to avoid damaging crankshaft journals (cover studs).
16. Check clearance of each connecting rod bearing (6211). Refer to procedure in Section 03-00.
17. After connecting rod bearings have been fitted, apply a light coat of engine oil to the crankshaft connecting rod journals and connecting rod bearings.
18. Turn the crankshaft throw to the bottom of its stroke. Push piston all the way down until connecting rod bearing seats on the crankshaft journal.
19. Install connecting rod cap. Install nuts and tighten to 26-33 N·m (19-24 lb-ft) for 5.0L engines, or to 54-61 N·m (40-45 lb-ft) for 5.8L engines.
20. Check side clearance between connecting rods on each crankshaft journal after piston and connecting rod assemblies have been installed.



21. Prime the oil pump and install oil pump, oil pump intermediate shaft, and oil pump screen cover and tube assembly. Tighten oil pump bolts to 30-43 N·m (22-32 lb-ft).



Item	Part Number	Description
1	33771	Nut, 3/8-16
2	391378	Screw and Washer, 5/16-18 x 1.13
3	6626	Oil Pump Inlet Tube Gasket

(Continued)

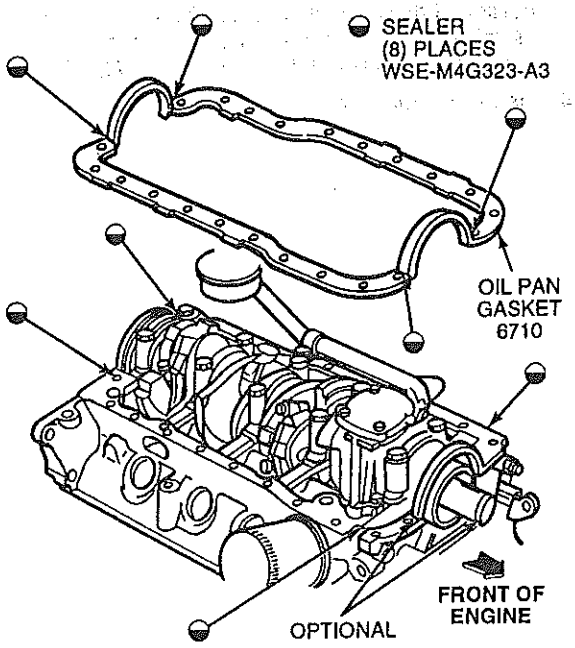
DISASSEMBLY AND ASSEMBLY (Continued)

Item	Part Number	Description
4	6600	Oil Pump
5	6A618	Oil Pump Intermediate Shaft
6	6622	Oil Pump Screen Cover and Tube
7	—	Third Main (Part of 6010)
8	57647	Bolt
A	—	Tighten to 30-43 N·m (22-32 Lb-Ft)
B	—	Tighten to 16-24 N·m (12-18 Lb-Ft)

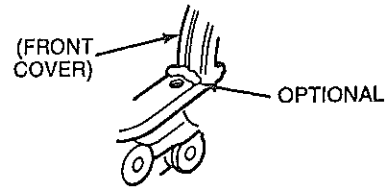
22. Install crankshaft front seal (6700) in engine front cover.
23. Install crankshaft front seal, gasket, timing pointer / misfire sensor assembly and engine front cover. Tighten cover bolts to specification. Refer to Engine Front Cover in the In-Vehicle Service portion of this section. Also, install crankshaft vibration damper / pulse ring and crankshaft pulley and torque bolt to 95-122 N·m (70-90 lb-ft).
24. Install new oil filter.

DISASSEMBLY AND ASSEMBLY (Continued)

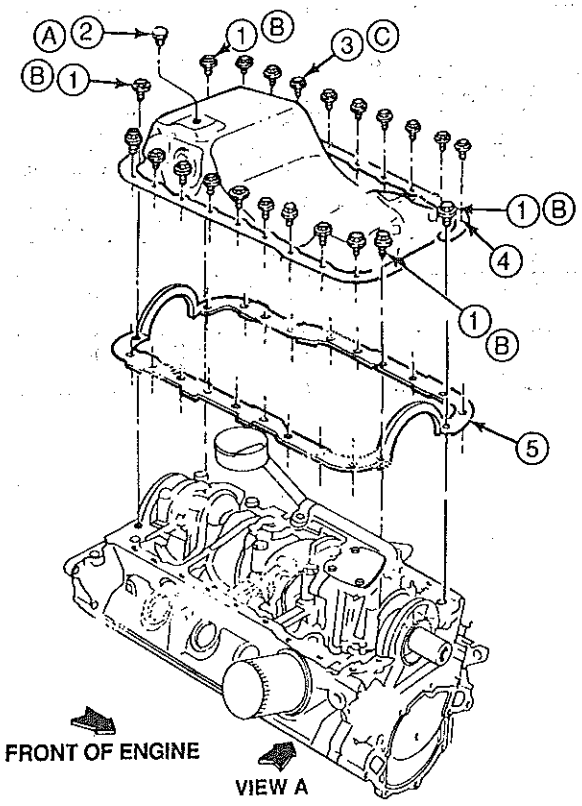
25. Install oil pan gasket and seal assembly. Install oil pan. Tighten oil pan bolts to specification. Tighten the four 5/16-18 x 1.12 oil pan bolts to 12-16 N·m (9-12 lb-ft) and the remaining 1/4-20 x .94 oil pan bolts to 10-14 N·m (89-124 lb-in).



5.0L/5.8L OIL PAN SEALANT LOCATIONS



A24893-A



A13396-G

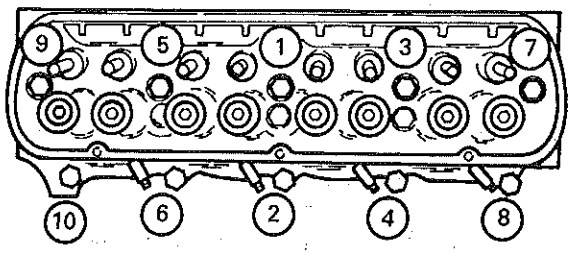
Item	Part Number	Description
1	390657	Bolt, 5/16-18 x 1.12
2	6730	Oil Pan Drain Plug
3	390658	Bolt, 1/4-20 x .94
4	6675	Oil Pan Assembly
5	6710	Gasket, Oil Pan
A	—	Tighten to 12-16 N·m (9-12 Lb-Ft)
B	—	Tighten to 12-16 N·m (9-12 Lb-Ft)
C	—	Tighten to 10-14 N·m (89-124 Lb-In)

26. Install valve tappets in their original bores.
27. Install tappet guide plate (roller tappet engines only) and tighten screws and washers to specification.
28. NOTE: If cylinder heads were completely disassembled, refer to Cylinder Head in the Disassembly and Assembly portion of this section.

    Position head gaskets (6051) on cylinder block. Install cylinder head locating dowels. Install cylinder heads.

DISASSEMBLY AND ASSEMBLY (Continued)

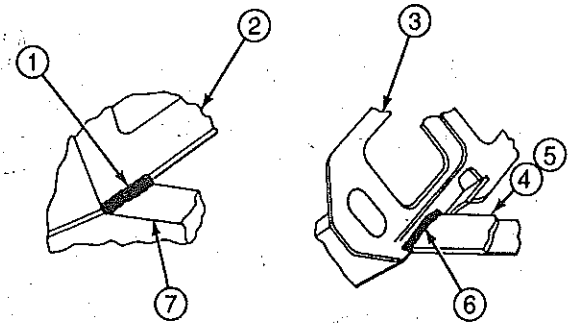
29. Tighten cylinder head bolts to specification, in the sequence shown.



A10374-1A

30. Install push rods, rocker arms, rocker arm seats, rocker arm fulcrum guides, and tighten fulcrum bolts to 24-34 N·m (18-25 lb-ft).
31. NOTE: This sealer sets up within 15 minutes after application. To assure effective sealing, assembly should proceed promptly.

    Apply 1.6mm (1/16-inch) bead of Black Silicone Rubber F4AZ-19562-B or equivalent meeting Ford specification WSE-M4G323-A1 or equivalent sealer to the end seals (junction).



A3715-P

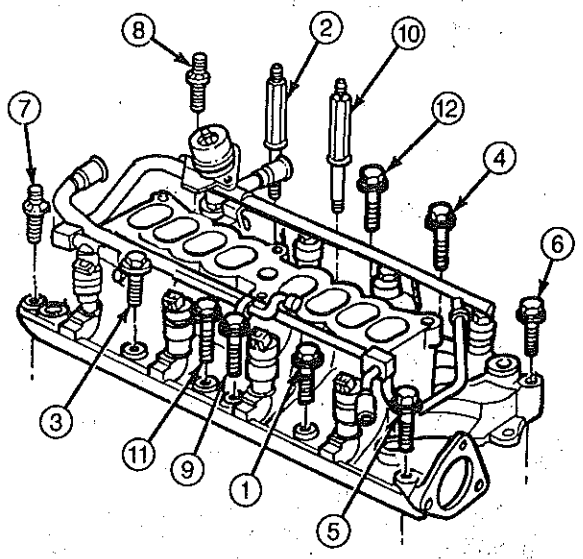
Item	Part Number	Description
1	F4AZ-19562-B	Sealer (4 Joints)
2	6049	Cylinder Head
3	9439	Intake Manifold Gasket
4	9A424	Intake Manifold Seal (LH)
5	9A425	Intake Manifold Seal (RH)
6	F4AZ-19562-B	Sealer (4 Seal Ends)
7	—	Seal Mounting Surface of Cylinder Block (Part of 6010)

32. Install lower and upper intake manifolds. Use guide pins to ease installation of intake manifolds onto cylinder heads.
33. Tighten intake manifold bolts in two steps using the sequence shown.

    Step 1 — 16 N·m (12 lb-ft)

    Step 2 — 31-34 N·m (23-25 lb-ft)

Tightening Sequence, 5.0L and 5.8L Shown



A10698-C

34. Install oil level indicator tube and oil level dipstick assembly.
35. Position valve cover gasket (6584) in each valve cover and install valve covers.

    Refer to Valve Cover and Gasket in the In-Vehicle Service portion of this section.
36. Install wiring harnesses, emission control system, fuel system, ignition system and front end accessory drive components, by referring to procedure in appropriate section.

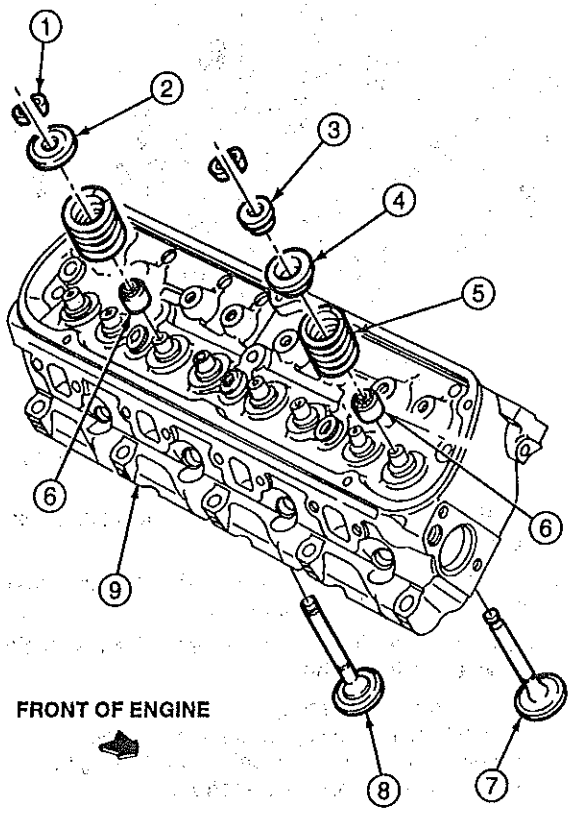
Cylinder Head

Disassembly

1. Remove the exhaust manifolds and the spark plugs (12405).
2. Clean the carbon out of the cylinder head combustion chambers before removing the valves.
3. Carefully compress the valve spring (6513) using a suitable valve spring compressor. Remove the valve spring retainer key (6518) and release the valve spring.
4. Remove the sleeve, spring retainer or retainer/rotator, valve spring, guide mounted stem seal and valve. Discard the valve stem seal (6571). Identify all valve parts.

DISASSEMBLY AND ASSEMBLY (Continued)

5. Clean, inspect and repair the cylinder head as required, or transfer all usable parts to a new cylinder head.



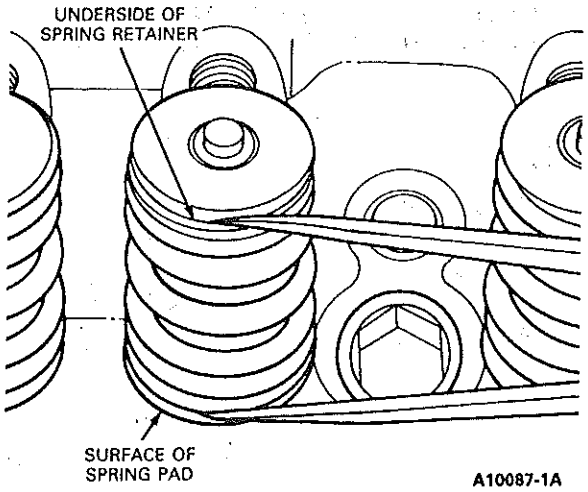
A17841-B

Item	Part Number	Description
1	6518	Valve Spring Retainer Key
2	6514	Valve Spring Retainer (Exhaust Only)
3	6517	Valve Spring Retainer Sleeve (Intake Only)
4	6514	Valve Spring Retainer (Intake Only)
5	6513	Valve Spring
6	6571	Valve Stem Seal (White, Intake Only)
7	6507	Intake Valve
8	6505	Exhaust Valve
9	6049	Cylinder Head

Assembly

1. Install each valve in the port from which it was removed or to which it was fitted. Install a new valve stem seal on the intake valve guide and exhaust valve guide.
2. Install the valve spring over the valve, and then install the spring retainer and sleeve. Compress the valve spring using a suitable valve spring compressor and install the valve spring retainer keys.
3. **CAUTION: Do not install the spacers unless necessary. Use of spacers in excess of recommendations will result in overstressing the valve springs and overloading the camshaft lobes which could lead to valve spring breakage and worn camshaft lobes.**

   Measure the assembled height of the valve spring from the surface of the cylinder head spring pad to the underside of the spring retainer with dividers. Check the dividers against a scale. The spring assembled heights should measure 1.78 inch for intake and 1.60 inch for exhaust. If the assembled height is greater than specifications, install the necessary 0.762mm (0.030-inch) thick spacer(s) between the cylinder head spring pad and the appropriate valve spring to bring the assembled height to the recommended height.



A10087-1A

4. Install the exhaust manifolds and the spark plug.

Pistons, Piston Pins and Rings

SPECIAL SERVICE TOOL(S) REQUIRED

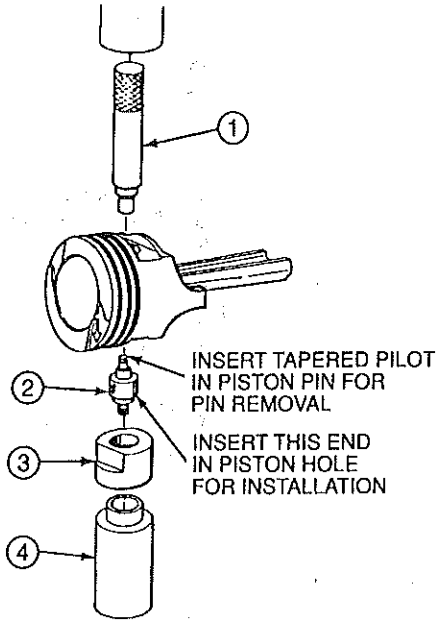
Description	Tool Number
Piston Pin Remover/Replacer	T68P-6135-A

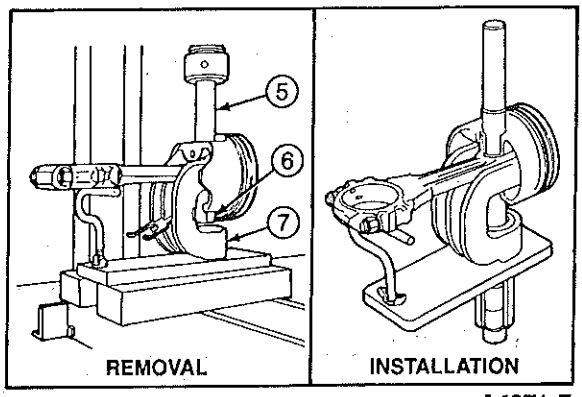
Disassembly

1. Remove the bearing inserts from the connecting rod and cap.
2. Mark the pistons to make sure they are assembled with the same rod and installed in the same cylinders from which they were removed.
3. Using an arbor press and the Piston Pin Remover/Replacer T68P-6135-A, press the piston pin from the piston and connecting rod. Remove the piston rings if they are to be replaced.

DISASSEMBLY AND ASSEMBLY (Continued)

Piston Pin, Removal and Installation





A4871-F

Item	Part Number	Description
1	—	Driver (Part of T68P-6135-A)
2	—	Locator (Part of T68P-6135-A)

(Continued)

Item	Part Number	Description
3	—	Adapter (Part of T68P-6135-A)
4	—	Cup (Part of T68P-6135-A)
5	—	Pin Pusher (Part of T68P-6135-A)
6	6135	Piston Pin
7	—	Receiving Tube (Part of T68P-6135-A)

Assembly

The piston, connecting rod and related parts are shown. Check the fit of a new piston in the cylinder bore before assembling the piston and piston pin to the connecting rod.

The piston pin bore of a connecting rod and the diameter of the piston pin must be within specifications. Refer to Specifications in this section.

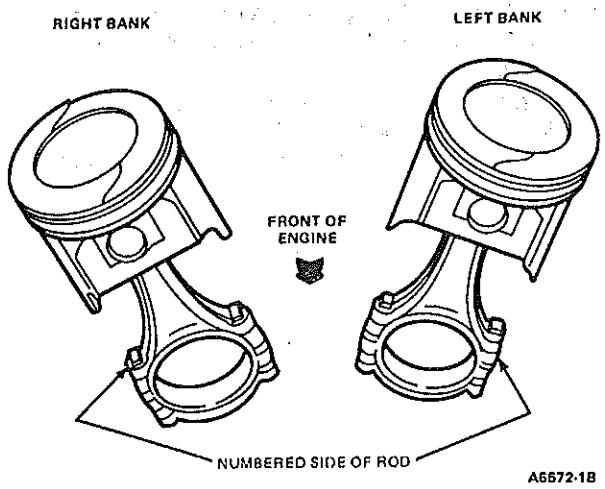
DISASSEMBLY AND ASSEMBLY (Continued)

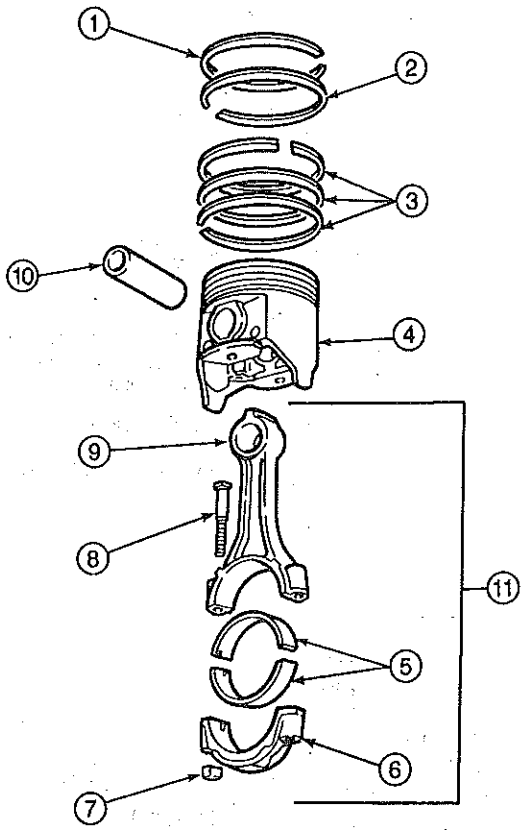
NOTE: Replacement pistons are slightly lighter in weight. Pistons must be replaced as a complete set to avoid the introduction of torsional vibration to the engine.

1. NOTE: Assemble the piston to the connecting rod with the indentation in the piston positioned as shown.

   Apply a light coat of recommended quality engine oil to all parts.

   On replacement connecting rods, install the large-chamfered side of the connecting rod bearing bore toward the crankshaft cheek; facing toward front of engine on the right bank rods, and facing toward rear of engine on left bank rods.





Item	Part Number	Description
1	6148	Partial Piston Ring Set (Upper)
2	6148	Partial Piston Ring Set (Lower)
3	—	Oil Ring (Part of 6148)
4	6102	Piston, Pin and Ring
5	6211	Connecting Rod Bearing
6	6210	Cap — Connecting Rod
7	6212	Connecting Rod Nut
8	6214	Connecting Rod Bolt
9	6200	Connecting Rod
10	6135/6108	Piston Pin/Piston and Pin Assembly
11	—	Connecting Rod and Rod Bearings (Part of 6200)

2. Start the piston pin in the piston and connecting rod (this may require a very light tap with a mallet). Using an arbor press and Piston Pin Remover/Replacer T68P-6135-A, press the piston pin through the piston and connecting rod until the pin is centered in the piston.

DISASSEMBLY AND ASSEMBLY (Continued)

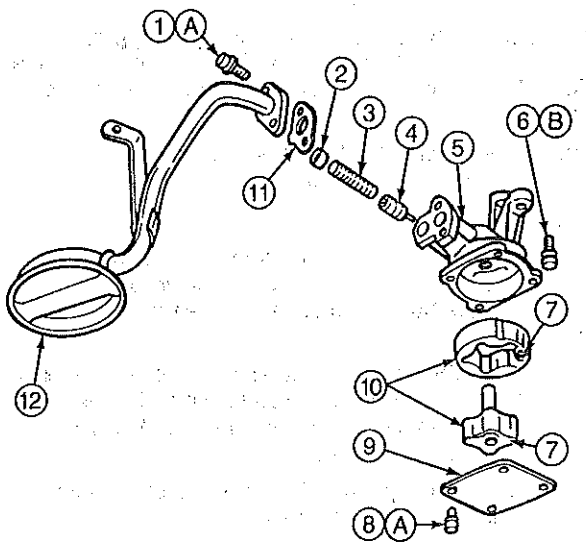
3. Check the end gap of all piston rings. Refer to Section 03-00. It must be within specifications. Follow the instructions contained on the piston ring package and install the piston rings using a piston ring installation tool of the proper size.
4. NOTE: If the lower lands have high steps, the piston should be replaced.

   Check the ring side clearance of the compression rings with a feeler gauge inserted between the ring and its lower land. Refer to Section 03-00. The gauge should slide freely around the entire ring circumference without binding. Any wear that occurs will form a step at the inner portion of the lower land.
5. Make sure the bearing inserts and the bearing bore in the connecting rod and cap are clean. Foreign material under the inserts will distort the connecting rod bearing and cause a failure. Install the connecting rod bearing inserts in the connecting rod and cap with the tangs fitting in the slots provided.

Oil Pump

Disassembly

1. Remove the oil pump screen cover and tube from the oil pump and remove the gaskets.
2. Remove the cover attaching bolts, then remove the cover. Remove the inner rotor and shaft assembly. Then remove the outer race.
3. Drill a small hole and insert a self-threading sheet metal screw of the proper diameter into the oil pressure relief valve chamber cap and pull the cap out of the chamber. Remove the spring and plunger.



A2535-F

Item	Part Number	Description
1	—	Bolt (Part of 6600)
2	6666	Oil Pump Relief Valve Plug
3	6670	Oil Pump Relief Valve Spring
4	6614	Oil Pump Relief Valve Repair Kit
5	6600	Oil Pump
6	—	Bolt (Part of 6600)
7	—	Identification Mark
8	—	Bolt (Part of 6600)
9	6616	Oil Pump Body Plate
10	6608	Oil Pump Drive Rotor and Shaft
11	6626	Oil Pump Inlet Tube Gasket
12	6622	Oil Pump Screen Cover and Tube
A	—	5.8L, Tighten to 14-20 N·m (10-15 Lb-Ft) 5.0L, Tighten to 12-18 N·m (9-13 Lb-Ft)
B	—	Tighten to 30-43 N·m (22-32 Lb-Ft)

Assembly

1. Clean, inspect and oil all parts thoroughly.
2. Install the oil pressure relief valve plunger, spring and a new cap.
3. NOTE: Be sure the dimple (identification mark) on the outer race is facing the same side as the identification mark on the rotor.

   Install the outer race and the inner rotor and shaft assembly.
4. Replace gasket and install the cover and tighten the cover attaching bolts to 30-43 N·m (22-32 lb-ft).

DISASSEMBLY AND ASSEMBLY (Continued)

Valve Tappet, Hydraulic

The internal parts of each hydraulic tappet assembly are matched sets. Do not mix the parts. Keep the assemblies intact until they are to be cleaned.

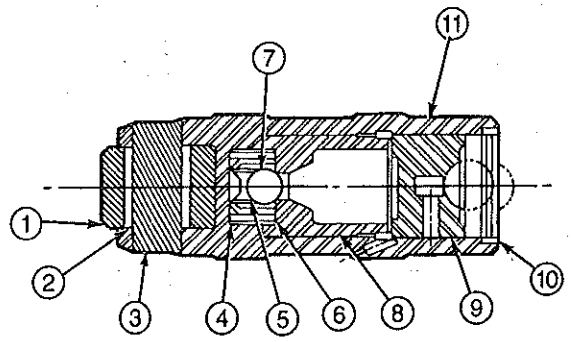
Valve tappets should always be tested after assembly. Refer to Section 03-00.

Disassembly

Disassemble and assemble each valve tappet separately. Keep the valve tappets in proper sequence so that they can be installed in their original bores.

1. Grasp the plunger retainer with needlenose pliers to release it from the groove. It may be necessary to depress the leakdown plunger to fully release the plunger retainer.
2. Remove the push rod socket, metering valve (disc), plunger and spring.
3. Carefully remove the plunger spring, the check valve retainer socket, the check valve spring and valve from the plunger.

Roller Tappet, 5.0L/5.8L Engines



A16238-A

Item	Part Number	Description
1	—	Cam Roller (Part of 6500)
2	—	Needles (Part of 6500)
3	—	Axle (Part of 6500)
4	—	Plunger Spring (Part of 6500)
5	—	Check Ball Spring (Part of 6500)
6	—	Ball Retainer (Part of 6500)
7	—	Check Ball (Part of 6500)
8	—	Leak-Down Plunger (Part of 6500)
9	—	Plunger Retainer (Part of 6500)
10	—	Plunger Retainer (Part of 6500)
11	—	Body (Part of 6500)

Assembly

1. Place the plunger upside down on a clean workbench.
2. Place the check valve (disc or check ball) in position over the oil hole on the bottom of the plunger. Set the check valve spring on top of the check valve (disc or check ball).
3. Position the check valve retainer over the check valve and spring and push the retainer down into place on the plunger.
4. Place the plunger spring, and then the plunger (open end up) into the valve tappet body.
5. Position the metering valve (disc) in the plunger and then place the push rod socket in the plunger.
6. Depress the plunger, and position the closed end of the plunger retainer in the groove of the valve tappet body. With the plunger still depressed, position the open ends of the plunger retainer in the groove. Release the plunger, and then depress it again to fully seat the plunger retainer.
7. Use the Tappet Leakdown Tester TOOL-6500-E to fill the valve tappets with test fluid. Refer to Section 03-00.

Cylinder Block Assembly

Disassembly

1. Mount the engine in a workstand and remove all parts not furnished with the new cylinder block assembly following engine components removal and installation procedures in this section.
2. Remove the cylinder block assembly from the workstand.

Assembly

1. **CAUTION: Do not use solutions such as brake cleaner, carburetor cleaner, etc., as these solutions can leave a residue on the machined surfaces. Use only a cleaner which meets or exceeds Ford specification WSE-M5B392-A, such as Metal Surface Cleaner F4AZ-19A536-RA or equivalent.**

   Clean the gasket and seal surfaces of all serviceable parts and assemblies.
2. Position the new cylinder block assembly in a workstand.
3. Transfer all serviceable parts removed from the old cylinder block assembly following removal and installation procedures in this section.
4. Check all assembly clearances following Specifications listed at the end of this section, and correct as necessary.

Cylinder Block, Bare

Before replacing a cylinder block, determine if it is repairable. If so, make the necessary repairs. Refer to Section 03-00.

DISASSEMBLY AND ASSEMBLY (Continued)

Disassembly

1. Completely disassemble the engine. Refer to Engine in the Disassembly and Assembly portion of this section.
2. Ridge-ream the cylinder bores before removing piston assemblies.

Assembly

1. Clean the gasket and seal surfaces of all serviceable parts and assemblies.
2. Position the new cylinder block in a workstand.
3. Transfer all serviceable parts removed from the old cylinder block following appropriate removal and installation procedures in this section.
4. Check all assembly clearances. Refer to Specifications and correct as necessary.

ADJUSTMENTS

Valve Clearance, 5.0L (302 CID) MFI V-8 Engine

SPECIAL SERVICE TOOL(S) REQUIRED

Description	Tool Number
Tappet Bleed Down Wrench	T71P-6513-B

The valve arrangement of the left bank is E-I-E-I-E-I-E-I and on the right bank is I-E-I-E-I-E-I-E.

A 1.52mm (0.060 inch) shorter push rod (6565) or a 1.52mm (0.060 inch) longer push rod is available for service to provide a means of compensating for dimensional changes in the valve mechanism. Refer to the Master Parts List for the appropriate color code.

Valve stem-to-valve rocker arm clearance should be within specifications with the hydraulic valve tappet (6500) completely collapsed. Repeated valve reconditioning operations (valve and/or valve seat refacing) will decrease the clearance to the point that if it is not compensated for, the hydraulic valve tappet will cease to function and the valve will be held open.

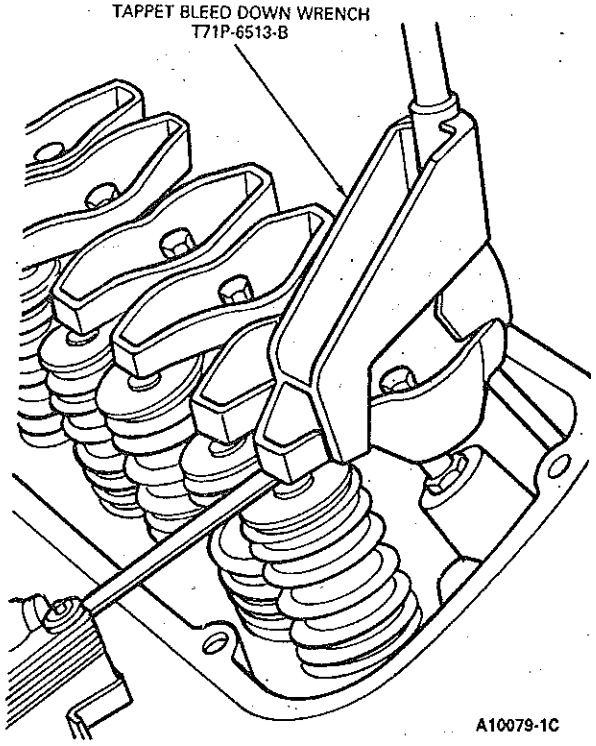
The positive stop rocker arm bolts eliminate the necessity to adjust the valve clearance. However, to obtain the specified valve clearance, it is important that all valve components be in a serviceable condition and installed and tightened properly.

To determine whether a shorter or a longer push rod is necessary, make the following check.

1. Disconnect the brown lead (I terminal) and the red and blue lead (S terminal) at the starter relay.
2. Install an auxiliary starter switch between the battery and S terminal of the starter relay. Crank the engine (6007) with the ignition switch in off position until the No. 1 piston (6108) is on TDC after the compression stroke.
3. Position the tappet compressor tool, Tappet Bleed Down Wrench T71P-6513-B on the rocker arm (6564) with the crankshaft (6303) in the positions designated in Steps 4, 5 and 6.

   Slowly apply pressure to bleed down the valve tappet until the plunger is completely bottomed. Hold the valve tappet in this position and check the available clearance between the rocker arm and the valve stem tip with a feeler gauge.

   If the clearance is less than specifications, install a shorter push rod. If the clearance is greater than specifications, install a longer push rod.



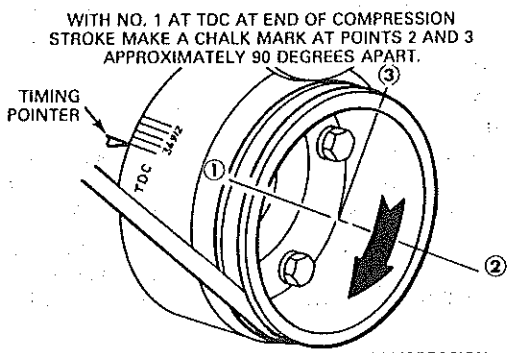
ADJUSTMENTS (Continued)

4. With the No. 1 piston on TDC at the end of the compression stroke, POSITION 1, check the following valves:

   No. 1 Intake No. 1 Exhaust

   No. 4 Intake No. 3 Exhaust

   No. 8 Intake No. 7 Exhaust



POSITION 1 — NO. 1 AT TDC AT END OF COMPRESSION STROKE.
POSITION 2 — ROTATE THE CRANKSHAFT 180 DEGREES (1/2 REVOLUTION) CLOCKWISE FROM POSITION 1.
POSITION 3 — ROTATE THE CRANKSHAFT 270 DEGREES (3/4 REVOLUTION) CLOCKWISE FROM POSITION 2.

A3234-H

5. Rotate the crankshaft to POSITION 2 and check the following valves:

   No. 3 Intake No. 2 Exhaust

   No. 7 Intake No. 6 Exhaust

6. Rotate the crankshaft to POSITION 3 and check the following valves:

   No. 2 Intake No. 4 Exhaust

   No. 5 Intake No. 5 Exhaust

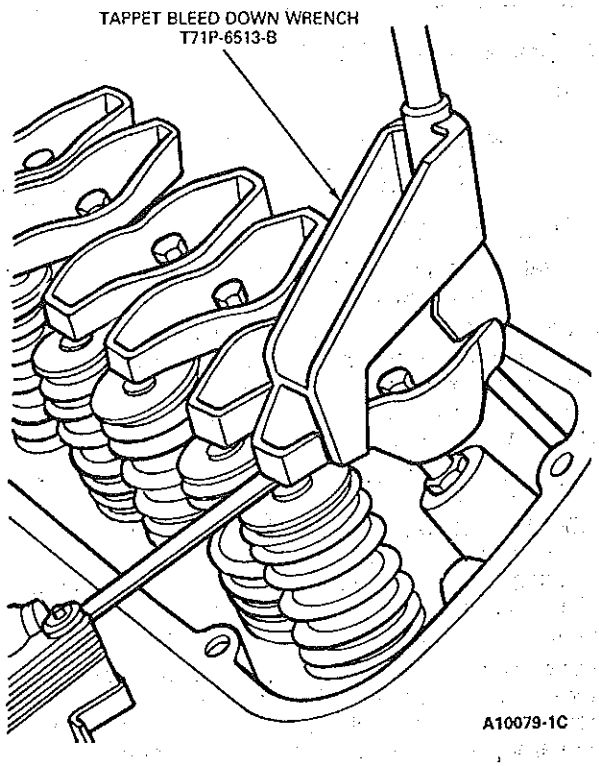
   No. 6 Intake No. 8 Exhaust

Valve Clearance, 5.8L (351 CID) MFI W-V-8 Engine

1. Disconnect the red and blue leads (S terminal) at the starter relay.
2. Install an auxiliary starter switch between the battery and S terminals of the starter relay. Crank the engine (6007) with the ignition switch in off position until the No. 1 piston (6108) is on TDC on the compression stroke.
3. With the crankshaft (6303) in the positions designated in steps 4, 5 and 6, position the tappet compressor tool on the rocker arm (6564).

   Slowly apply pressure to bleed down the valve tappet (6500) until the plunger is completely bottomed. Hold the valve tappet in this position and check the available clearance between the rocker arm and the valve stem tip with a feeler gauge.

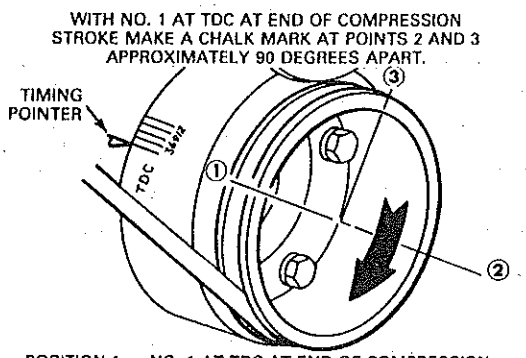
   If the clearance is less than specifications, install a shorter push rod (6565). If the clearance is greater than specifications, install a longer push rod.



A10079-1C

ADJUSTMENTS (Continued)

4. With the No. 1 piston on TDC at the end of the compression stroke, POSITION 1, check the following valves:
   No. 1 Intake No. 1 Exhaust
   No. 4 Intake No. 3 Exhaust
   No. 8 Intake No. 7 Exhaust



POSITION 1 — NO. 1 AT TDC AT END OF COMPRESSION STROKE.
POSITION 2 — ROTATE THE CRANKSHAFT 180 DEGREES (1/2 REVOLUTION) CLOCKWISE FROM POSITION 1.
POSITION 3 — ROTATE THE CRANKSHAFT 270 DEGREES (3/4 REVOLUTION) CLOCKWISE FROM POSITION 2.

A3234-H

5. Rotate the crankshaft to POSITION 2 and check the following valves:
   No. 3 Intake No. 2 Exhaust
   No. 7 Intake No. 6 Exhaust
6. Rotate the crankshaft to POSITION 3 and check the following valves:
   No. 2 Intake No. 4 Exhaust
   No. 5 Intake No. 5 Exhaust
   No. 6 Intake No. 8 Exhaust

SPECIFICATIONS

ENGINE SPECIFICATIONS

Engine	Bore and Stroke	Firing Order	Oil Pressure Hot @ 2000 rpm		Engine Type and Number of Cylinders
			kPa	(psi)	
5.0L (302 CID) MFI V-8	4.00 x 3.00	13726548	275-413	(40-60)	O.H.V. V-8
5.8L (351 CID) MFI W-V-8	4.00 x 3.50	13726548	275-448	(40-65)	O.H.V. V-8

SPECIFICATIONS (Continued)

General Specifications

CYLINDER HEAD AND VALVE TRAIN

Engine	Combustion Chamber Volume C.C.[b]	Valve Guide Bore Diameter		Valve Seat Width[a]		Valve Seat Runout TIR Maximum	Valve Arrangement Front to Rear	Gasket Surface Flatness[c]
		Intake	Exhaust	Intake	Exhaust			
5.0L (302 CID) MFI V-8	61.3-64.4	0.3433-0.3443	0.3433-0.3443	0.060-0.080	0.060-0.080	0.002	RT I-E-I-E-I-E-I-E LT E-I-E-I-E-I-E-I	0.003 in Any 6 Inches 0.006 Overall
5.8L (351 CID) MFI W-V-8	60.6-63.6	0.3433-0.3443	0.3433-0.3443	0.060-0.080	0.060-0.080	0.002	RT I-E-I-E-I-E-I-E LT E-I-E-I-E-I-E-I	0.003 in Any 6 Inches 0.006 Overall

a Valve seat angle — 45°.
b Compression pressure (psi) of the lowest cylinder must be at least 75% of the highest to be within specification.
c Gasket surface finish — rms 60-150.

VALVE ROCKER ARM SHAFT, PUSH RODS AND TAPPETS

Engine	Rocker Arm Lift Ratio to 1	Push Rod Runout TIR Maximum	Valve Tappet or Lifter			Collapsed Tapped Gap (Clearance)	
			Standard Diameter	Clearance to Bore[a]	Hydraulic Lifter Leakdown Rate[b]	Allowable	Desired
5.0L (302 CID) MFI V-8	1.59	0.015	0.8740-0.8745	0.0007-0.0027	10 to 50 Seconds for 1/16 Travel	0.071-0.171	0.091-0.151
5.8L (351 CID) MFI W-V-8	1.59	0.015	0.8740-0.8745	0.0007-0.0027	10 to 50 Seconds for 1/16 Travel	0.071-0.171	0.091-0.151

a Service limit — 0.005.
b Time required for plunger to leak down 0.0625 inch under load of 50 lbs. using leakdown fluid in tappet.

VALVE SPRINGS

Engine	Valve Spring Compression Pressure (Lbs.) @ Specified Height		Valve Spring Free Length (Approximate)		Valve Spring Assembled Height		Valve Spring Out of Square
	Intake[a]	Exhaust	Intake	Exhaust	Intake	Exhaust	
5.0L (302 CID) MFI V-8	74-82@ 1.78 196-212@ 1.36	76-84@ 1.60 190-210@ 1.20	2.06	1.88	1.75-1.81	1.58-1.64	5/64 (0.078)
5.8L (351 CID) MFI W-V-8	74-82@ 1.78 190-210@ 1.20	76-84@ 1.60 190-210@ 1.20	2.06	1.88	1.75-1.81	1.58-1.64	5/64 (0.078)

a Service limit — 10% loss pressure.

VALVES

Engine	Valve Stem to Guide Clearance[a]		Valve Head Diameter[b]		Valve Face Runout Maximum
	Intake	Exhaust	Intake	Exhaust	
5.0L (302 CID) MFI V-8	0.0010-0.0027	0.0015-0.0032	1.690-1.694	1.439-1.463	0.002
5.8L (351 CID) MFI W-V-8	0.0010-0.0027	0.0015-0.0032	1.770-1.794	1.453-1.468	0.002

a Service clearance — 0.0055.
b Valve face angle — 44°.

SPECIFICATIONS (Continued)

VALVE STEM DIAMETER

Engine	Standard		0.015 Oversize		0.030 Oversize	
	Intake	Exhaust	Intake	Exhaust	Intake	Exhaust
5.0L (302 CID) MFI V-8	0.3415-0.3423	0.3410-0.3418	0.3565-0.3573	0.3561-0.3568	0.3715-0.3723	0.3711-0.3718
5.8L (351 CID) MFI W-V-8	0.3415-0.3423	0.3410-0.3418	0.3565-0.3573	0.3561-0.3568	0.3715-0.3723	0.3711-0.3718

CAMSHAFT

Engine	Lobe Lift[a]		Camshaft End Play		Camshaft Journal to Bearing Clearance[b]
	Intake	Exhaust	End Play	Wear Limit	
5.0L (302 CID) MFI V-8	0.2637	0.2801	0.001-0.007	0.009	0.001-0.003
5.8L (351 CID) MFI W-V-8	0.2637	0.2801	0.001-0.007	0.009	0.001-0.003

a Maximum allowable lift loss — 0.005.
b Service limit — 0.006 maximum.

CAMSHAFT DRIVE

Engine	Camshaft Journal Diameter — Standard[a]					Camshaft Bearing Inside Diameter					Camshaft Front Bearing Location[b]
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 1	No. 2	No. 3	No. 4	No. 5	
5.0L (302 CID) MFI V-8	2.0815	2.0655	2.0515	2.0365	2.0215	2.0835	2.0685	2.0535	2.0385	2.0235	0.005-0.020
5.8L (351 CID) MFI W-V-8	2.0815	2.0665	2.0515	2.0365	2.0215	2.0835	2.0685	2.0535	2.0385	2.0235	0.005-0.020

a Camshaft journal runout — 0.005 TIR maximum.
b Distance in inches that front edge of bearing is installed below the front face of the cylinder block.

NOTE: Timing chain deflection — 12.70mm (0.50 inch) maximum.

CYLINDER BLOCK

Engine	Cylinder Bore Diameter[a]	Main Bearing Bore Diameter[b]	Distributor Shaft Bearing Bore Diameter	Head Gasket Surface Flatness	Head Gasket Surface Finish	Tappet Bore Diameter
5.0L (302 CID) MFI V-8	4.0000-4.0012	2.4412-2.4420	0.4525-0.4541	0.003 in any 6 in. 0.006 overall	RMS 60-150	0.8752-0.8767
5.8L (351 CID) MFI W-V-8	4.0000-4.0048	3.1922-3.1930	0.5155-0.5170	0.003 in any 6 in. 0.006 overall	RMS 60-150	0.8752-0.8767

a Maximum out-of-round — 0.0015, service limit — 0.005, maximum taper service limit — 0.010, cylinder bore surface finish — rms 18-38, Bore tapes service limit — 0.010.
b Crankshaft to rear face of block runout. TIR maximum 0.005.

BEARING JOURNALS

Engine	Main Bearing Journal Diameter[a]	Main Bearing Journal Runout TIR Maximum[b]	Main Bearing Thrust Face Runout TIR Maximum	Main Bearing Journal Taper Maximum Per Inch	Thrust Bearing Journal Length	Main and Rod Bearing Journal Finish rms Maximum	Main Bearing Thrust Face Finish rms Maximum
5.0L (302 CID) MFI V-8	2.2482-2.2490	0.002	0.001	0.0005	1.137-1.139	12	25 Front — 20 Rear
5.0L (351 CID) MFI W-V-8	2.9994-3.0002	0.002	0.001	0.0005	1.137-1.139	12	25 Front — 20 Rear

a Maximum out-of-round — 0.0006.
b Service limit — 0.005.

SPECIFICATIONS (Continued)

CRANKSHAFT AND FLYWHEEL

Engine Assembled	Connecting Rod Journal Diameter[a]	Connecting Rod Journal Taper Per Inch Maximum	Crankshaft Free End Play[b]	Flywheel Clutch Face Runout
5.0L (302 CID) MFI V-8	2.1228-2.1236	0.0006	0.004-0.008	0.010
5.8L (351 CID) MFI W-V-8	2.3103-2.3111	0.0006	0.004-0.008	0.010

a Maximum out-of-round — 0.0006.
b Service limit — 0.012.

CRANKSHAFT BEARINGS

Engine	Connecting Rod Bearing To Crankshaft Clearance Selective Fit			Main Bearing to Crankshaft Clearance Selective Fit[a]		
	Desired	Allowable	Bearing Wall Thickness Std.[a]	Desired	Allowable	Bearing Wall Thickness Std.[a]
5.0L (302 CID) MFI V-8	0.0008-0.0015	0.0007-0.0024	0.0572-0.0577	0.0005-0.0015[b]	0.0005-0.0024[c]	0.0957-0.0960[d]
5.8L (351 CID) MFI W-V-8	0.0008-0.0015	0.0008-0.0025	0.0572-0.0577	0.0008-0.0015	0.0008-0.0026	0.0957-0.0960

a For .002 undersize add .001 to standard wall thickness.
b No. 1 Bearing — .0001-.0015; all others — .0005-.0015.
c No. 1 Bearing — .0001-.0020; all others — .0005-.0024.
d No. 1 Upper only — .0961 — .0966; all others — .0957-.0962.

CONNECTING ROD, PISTON AND RINGS

Engine	Piston Pin Bore or Bushing I.D.	Rod Bearing Bore I.D.[a]	Rod Length Center to Center	Connecting Rod Alignment Maximum Total Difference		Rod to Crankshaft Assembled Side Clearance[b]
				Twist[b]	Bend[c]	
5.0L (302 CID) MFI V-8	0.9096-0.9112	2.2390-2.2398	5.0885-5.0915	0.015	0.012	0.010-0.020
5.8L (351 CID) MFI W-V-8	0.9097-0.9112	2.4265-2.4273	5.9545-5.9575	0.024	0.012	0.010-0.020

a Connecting rod bearing bore maximum out-of-round — .0004.
b Service limit — .023.
c Pin bushing and crankshaft bore must be parallel and in same vertical plane with specified total difference when measured at the ends of an 8-inch long bar, 4 inches on each side of rod centerline.

PISTON

	Diameter[a]			Piston to Bore Clearance Selective Fit	Piston Pin Bore Diameter	Ring Groove Width Compression		
	Coded Red	Coded Blue	.003 Oversize Coded Yellow			Top	Bottom	Oil
5.0L (302 CID) MFI V-8	3.9987-3.9993	3.9999-4.0005	4.0011-4.0017	0.0012-0.0020	0.9126-0.9128	0.060-0.061	0.060-0.061	0.1587-0.1597
5.8L (351 CID) MFI W-V-8	3.9978-3.9984	—	—	0.0015-0.0023	0.9123-0.9126	0.060-0.061	0.060-0.061	0.1587-0.1597

a Measured at the piston pin bore centerline at 90° to the pin.

SPECIFICATIONS (Continued)

PISTON PIN

Engine	Length	Diameter — Standard	To Piston Pin Bore Clearance[a]	To Connecting Rod Bushing Clearance
5.0L (302 CID) MFI V-8	3.010-3.040	0.9121-0.9122	0.0004-0.0007	Interference Fit
5.8L (351 CID) MFI W-V-8	3.010-3.040	0.9121-0.9122	0.0003-0.0005	Interference Fit

a Selective fit.

PISTON RINGS

Engine	Ring Width		Side Clearance[a]			Ring Gap		
	Top Compression	Bottom Compression	Top Compression	Bottom Compression	Oil	Top Compression	Bottom Compression	Oil[b]
5.0L (302 CID) MFI V-8	0.0577-0.0587	0.0577-0.0587	0.0013-0.0033	0.0013-0.0033	Snug	0.010-0.020	0.018-0.028	0.010-0.040
5.8L (351 CID) MFI W-V-8	0.0577-0.0587	0.0577-0.0587	0.0013-0.0033	0.0013-0.0033	Snug	0.010-0.020	0.018-0.028	0.010-0.040

a Service limit — 0.002 maximum increase in clearance.
b Steel rail.

OIL PUMP AND OIL CAPACITY

Engine	Relief Valve Spring Pressure Lbs. @ Specified Length	Driveshaft to Housing Clearance	Relief Valve to Housing Clearance	Rotor Assembly End Clearance	Outer Race to Housing Clearance	Engine Oil Capacity[a]		
						U.S. Quarts	Imperial Quarts	Liters
5.0L (302 CID) MFI V-8	10.6-12.2 @ 1.74	0.0015-0.0030	0.0015-0.0030	0.004 Maximum	0.001-0.013	5	4.2	4.7
5.8L (351 CID) MFI W-V-8	18.2-20.2 @ 2.49	0.0015-0.0030	0.0015-0.0030	0.004 Maximum	0.001-0.003	5	4.2	4.7

a Add 1 U.S. quart (or equivalent in imperial quarts or liters) when replacing filter.

TORQUE LIMITS — 5.0L (302 CID) MFI V-8 W-V-8

1/4-20	5/16-18	5/16-24	3/8-16	3/8-24	7/16-14	7/16-20	1/2-13	9/16-18
8-12 (6-9)	17-24 (12-18)	19-27 (14-20)	30-43 (22-32)	37-51 (27-38)	54-75 (45-57)	55-81 (40-60)	75-108 (55-80)	116-162 (85-120)

NOTE: All values in N·m (lb-ft), unless otherwise noted. Oil threads with engine oil unless the threads require oil or water-resistant sealer. The standard torque limits listed above are applicable for all functions not listed in the special torque chart.

PIPE THREADS

1/8-27	1/4-18	3/8-18	1/2-14
7-11 (5-8)	11-16 (8-12)	16-24 (12-18)	16-24 (12-18)

TORQUE SPECIFICATIONS

Description	N·m	Lb-Ft	Lb-In
Camshaft Sprocket — Gear to Camshaft	54-61	40-45	—
Camshaft Thrust Plate to Cylinder Block	12-16	9-12	—
Connecting Rod Nut — 5.0L	26-33	19-24	—

(Continued)

TORQUE SPECIFICATIONS (Cont'd)

Description	N·m	Lb-Ft	Lb-In
Connecting Rod Nut — 5.8L	54-61	40-45	—
Engine Front Cover	20-28	15-21	—
Cylinder Head Bolts	SEE NOTE		
Damper to Crankshaft	95-122	70-90	—
EGR Valve to Throttle Body	18-26	13-19	—
Flywheel to Crankshaft	102-115	75-85	—
Main Bearing Cap Bolts — 5.0L (302 CID) V-8	82-95	60-70	—

(Continued)

SPECIFICATIONS (Continued)

TORQUE SPECIFICATIONS (Cont'd)

Description	N·m	Lb-Ft	Lb-In
Main Bearing Cap Bolts — 5.8L (351 CID) W-V-8	129-142	95-105	—
Manifold to Cylinder Head — Intake	SEE NOTE		
Upper to Lower Intake Manifold	17-24	12-18	—
Manifold to Cylinder Head — Exhaust	35-43	26-32	—
Intake Manifold Vacuum Fittings — Aluminum	8-13	—	71-115
Intake Manifold Pipe Fittings — Aluminum	17-24	12-18	—
Oil Pump Screen Cover and Tube to Main Bearing Cap	30-43	22-32	—
Thermactor Pump Bracket to Cylinder Block	44-67	30-45	—
Distributor Clamp-Down	24-32	18-24	—
Oil Filter Insert to Cylinder Block/Adaptor	28-40	20-30	—
Oil Filter to Adapter or Cylinder Block	1/2 Turn After Gasket Contacts Sealing Surface — Oiled Gasket		
Oil Inlet Tube to Pump			
5.0L	9-13	12-18	—
5.8L	14-20	10-15	—
Oil Pan Drain Plug	20-34	15-25	—
Oil Pan to Cylinder Block (18 Places)	9-13	—	84-120
Oil Pan to Cylinder Block (4 Places)	12-16	9-12	—
Oil Pump to Cylinder Block	30-43	22-32	—
Oil Filter	11-14	8-10	—
Damper Bolt	54-71	40-52	—
Rocker Arm Stud/Bolt to Cylinder Head	24-34	18-25	—
Spark Plug to Cylinder Head	14-20	10-15	—
Valve Cover	16-20	12-15	—
Water Outlet Housing	13-16	9-12	—
Water Pump to Block/Front Cover	20-28	15-21	—
Thermactor Pump and Alternator Bracket to Cylinder Head — Bolt 3/8-16	41-54	30-40	—
EGR Transducer — Bolt (5.0L)	12-16	9-12	—
EGR Transducer — Nut (5.8L)	17-24	12-18	—
Accelerator Cable Bracket-to-Upper Intake Manifold	11-13	—	97-115
Intake Manifold Vacuum Outlet Fitting and Cap	8-13	—	71-115
Coil and Solenoid Bracket to Exhaust Manifold Stud	6-7	53-62	—
Heater Outlet Hose to Intake Manifold	3-4	—	27-35
Radiator Hose Clamps	3-4	—	27-35

(Continued)

TORQUE SPECIFICATIONS (Cont'd)

Description	N·m	Lb-Ft	Lb-In
Front Engine Cover Bolts — 5.8L (Holes 3, 4, 6, 10, 12, 13 and 14), 5.0L (Holes 14 and 15)	8-13.5	—	70-120
Remaining Holes	16-24	12-18	—
Timing Pointer/Misfire Sensor	8-12	—	70-105
Fuel Charging Wiring Harness Retaining Nut	16-24	12-18	—
Oil Pan-to-Cover Attaching Screws	16-24	12-18	—
Engine Cover-to-Cylinder Block Attaching Screws	20-28	15-21	—
Rocker Arm Bolts	24-34	18-25	—
Engine Lifting Eyes	16-24	12-18	—
Engine Mount Nuts	96-127	71-94	—
Wire Harness Bracket	16-24	12-18	—
Upper Pickup Tube Bolts	16-24	12-18	—
Clutch Housing-to-Engine Bolts	55-67	40-50	—
Torque Converter Housing-to-Engine Bolts	55-67	40-50	—
Insulator-to-Chassis Bracket Nuts	73-100	54-74	—
Fan Shroud Attaching Bolts	7-10	—	62-89
Oil Pump Screen Cover and Tube Attaching Bolts, 5.0L	16-24	12-18	—
Oil Pump Screen Cover and Tube Attaching Bolts, 5.8L	14-20	10-15	—
Oil Pressure Sensor to Cylinder Block	11-24	8-18	—
Oil Cooler Adapter-to-Water Pump	2-5	—	20-40
Oil Cooler Mounting Bolt Insert to Cylinder Block	54-61	40-45	—
Oil Cooler Adapter-to-Oil Cooler	3-6	—	30-50
Oil Cooler Line to Radiator	24-31	18-23	—
Flywheel Housing-to-Engine Bolts	68-88	50-65	—
Fan Shroud	17-24	—	62-89
Clutch Pressure Plate	27-39	20-29	—
Thrust Plate Retaining Bolts	12-16	9-12	—
Air Conditioning Compressor to Bracket	24-31	18-22	—
Power Steering Pump to Bracket	41-54	30-40	—
Thermactor Pump Holding Bolt	41-54	30-40	—
Alternator Attaching Bolt	41-54	30-40	—
Thermactor Pump and Alternator Bracket to Cylinder Head 3/8-16 Bolt	41-54	30-40	—
Air Conditioning Compressor and Power Steering Pump Bracket to Head	54-71	40-50	—
Thermactor Pump Pivot Bolt	30-40	22-30	—

(Continued)

SPECIFICATIONS (Continued)

TORQUE SPECIFICATIONS (Cont'd)

Description	N·m	Lb-Ft	Lb-In
Thermactor Pump Pulley to Pump Hub	9-12	—	6.5-9
Exhaust Manifold-to-Exhaust Pipe	33-49	24-36	—
Heat Shield, Spark Plug	16-24	12-18	—
Clutch-to-Fan Bolts	16-24	12-18	—
Fan and Clutch Assembly-to-Pulley	16-24	12-18	—
Dipstick Tube Bracket	16-24	12-18	—
EGR Valve Studs	18-26	13-19	—
Exhaust Manifold Fitting Nut — 5.8L	61-75	45-55	—
Intake Manifold Fitting Nut — 5.0L	27-34	20-25	—
Upper Intake Manifold Support Bracket	16-24	12-18	—

(Continued)

TORQUE SPECIFICATIONS (Cont'd)

Description	N·m	Lb-Ft	Lb-In
Secondary Air Injection Manifold Tube — C6 Transmission	23-34	17-25	—
Vacuum Harness Bracket and Nut	17-24	13-18	—
EGR Tube Flange Nuts			
5.8L	41-54	30-40	—
5.0L Valve	34-47	23-35	—
5.0L Intake	27-34	20-25	—
5.0L Oil Level Indicator Tube to Cylinder Block	16-23	12-17	—
5.8L Oil Level Indicator Tube to Exhaust Manifold Stud	16-24	12-18	—

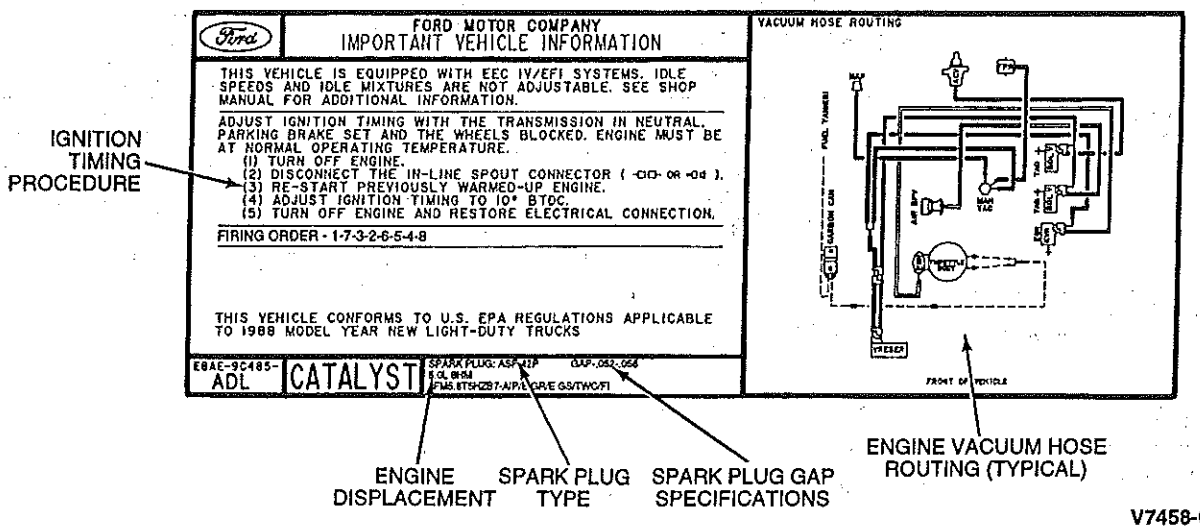
NOTE: 5.0L — Tighten in steps: first to 34-37 N·m (25-35 lb-ft), then to 61-75 N·m (45-55 lb-ft).

5.8L — Tighten in steps: first to 129-142 N·m (95-105 lb-ft), then to 143-151 N·m (105-112 lb-ft).

GREASES, LUBRICANTS, SEALERS AND ADHESIVES

Description	Part No.	Specified Ford Equivalent
Multi-Purpose Grease	D0AZ-19584-AA	ESB-M1C93-B and ESR-M1C159-A
Lubricant	SAE 50WT	ESE-M2C39-F
Silicone Rubber	F4AZ-19562-B	WSE-M4G323-A1
Threadlock Sealer	E0AZ-19554-AA	ESE-M4G204-A5
Perfect Seal Sealing Compound	F2AZ-19554-AA	ESR-M18P2-A and ESE-M4G115-A
Pipe Sealant with Teflon®	D8AZ-19554-A	WSK-M2G350-A2

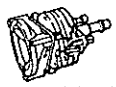
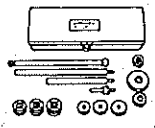
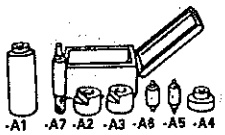
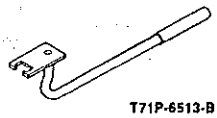
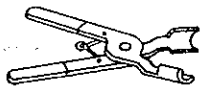
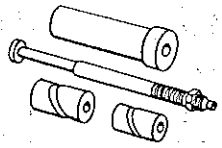
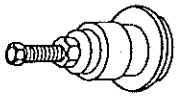
Vehicle Emission Control Information (VECI) Decal



V7458-C

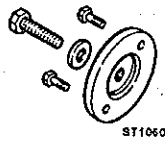
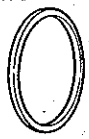
SPECIAL SERVICE TOOLS/EQUIPMENT

SPECIAL SERVICE TOOLS REQUIRED

Tool Number/ Description	Illustration
T64L-6011-EA Cylinder Ridge Reamer	 T64L-6011-EA
T65L-6250-A Camshaft Bearing Set	 T65L-6250-A
T68P-6135-A Piston Pin Remover/Replacer	 -A1 -A7 -A2 -A3 -A6 -A5 -A4 T68P-6135-A
T70P-6000 Engine Lifting Brackets	 T70P-6000
T71P-6513-B Tappet Bleed Down Wrench	 T71P-6513-B
T74P-6666-A Spark Plug Wire Remover	 T74P-6666-A
T75L-6392-A Clutch Housing Alignment Tool	 T75L-6392-A
T82L-6701-A Rear Main Seal Replacer	 T82L-6701-A
T88T-6701-A Crankshaft Seal Replacer/Cover Aligner	 T88T-6701-A

(Continued)

SPECIAL SERVICE TOOLS REQUIRED (Cont'd)

Tool Number/ Description	Illustration
T95P-6701-BH Rear Crankshaft Seal Replacer	T95P-6701-BH  ST1059-A
T95P-6701-EH Rear Crankshaft Seal Remover	T95P-6701-EH  ST1061-A
T96T-6701-A Rear Crankshaft Seal Adapter	T95P-6701-DH  ST1060-A
T96T-6701-B Rear Crankshaft Seal Replacer Spacer	T96T-6701-B  ST1058-A

SPECIAL SERVICE TOOLS DESIRED

Tool Number	Description
D79L-6731-A	Oil Filter Wrench
D79L-6731-B	Oil Filter Wrench
D80L-100-A	Impact Slide Hammer
D80L-522-A	Gear and Pulley Puller
D81L-6002-C	Piston Ring Compressor
D87L-9280-A	Disconnect Tool (3/8-Inch)
D87L-9280-B	Disconnect Tool (1/2-Inch)
TOOL-4201-C	Dial Indicator with Bracketry
TOOL-6331-E	Main Bearing Insert Tool
TOOL-6500-E	Tappet Leakdown Tester