

Section 16

5.0, 5.0 HO, 5.8 Litre Engines

Table of Contents

Core Plugs	
Installation	16-18
Removal	16-17
Crankshaft Rear Oil Seal	
Installation	16-12
Removal	16-12
Diagnosis and Testing	
Camshaft Lobe Lift	16-18
Compression Test	16-19
PCV System	16-20
Engine Specifications	16-26
Engine Torques	16-25
Exhaust Hose and	
Intermediate Pipe Replacement	16-24
Exhaust Manifold Replacement	
Installation	16-5
Removal	16-5
Front Engine Mounts	
Assembly	16-22
Disassembly	16-22
Height Adjustment	16-23
Removal	16-22
High-Rise Exhaust Elbow Replacement	16-23
Intake Manifold	
Installation	16-3
Removal	16-3
Oil Pan	
Installation	16-10
Removal	16-9
Oil Pump	
Assembly	16-11
Disassembly	16-10
Installation	16-12
Removal	16-10
Valve Clearance Check	16-15
Valve Lifter	
Installation	16-17
Removal	16-16
Valve Rocker Arm and Cover	
Installation	16-14
Removal	16-13
Water Pump Replacement	16-6
Installation	16-7
Removal	16-6

Tools Required:

T77L-9533-B Slide Hammer Tool
T71P-6513-A Hydraulic Lifter Compressor
T82L-6701-A Oil Seal Installer
T59L-100-B Pilot Bearing Puller
T58L-101-A Pilot Bearing Puller
T65P-6701-A Oil Seal Installer

Order from *Owatonna Tool Co.*, Owatonna, Minnesota. See inside of back cover for address.



Safety Warning

- **Before working on any part of the engine, read the section called Safety at the beginning of this manual.**
- **Unless instructed otherwise, always disconnect the battery cables from the battery before working on electrical system to prevent possible sparks or arcing in the engine compartment.**
- **Before starting engine after repair or maintenance procedures, always make sure engine compartment is free of fuel vapors.**

Intake Manifold

Removal

1. Drain cooling system. Remove flame arrestor cover, hose and flame arrestor.
2. Remove thermostat housing (A) on intake manifold.
2. Disconnect fuel line (B) at carburetor.
4. Disconnect spark plug wires at distributor cap and coil.
2. Remove distributor assembly (C).
2. Remove coil and bracket assembly (D).
7. Disconnect wiring harness at coil terminals, engine temperature sending unit, choke and other connections as necessary.
3. Disconnect throttle cable at carburetor and anchor block (E).
3. Remove shift bracket and solenoid assembly (F).
3. Disconnect PCV hose (G) at carburetor spacer.
11. Remove attaching bolts, and remove intake manifold and carburetor as an assembly.

Note If necessary to pry manifold away from cylinder heads, do not damage gasket sealing surfaces.

12. Remove and discard intake manifold gaskets and seals.

Cleaning

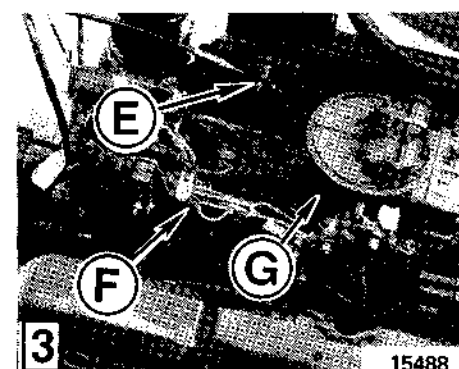
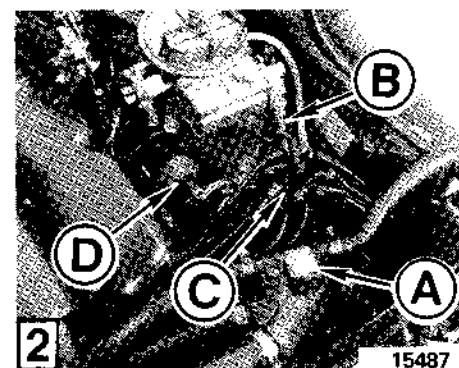
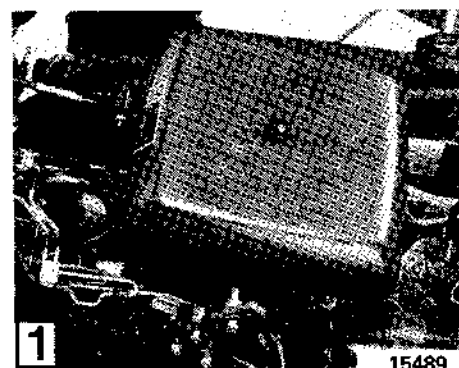
Remove all gasket material from the machined surfaces of the manifold. Clean the manifold in a suitable solvent and dry it with compressed air.

Inspection

Inspect the manifold for cracks, damaged gasket surfaces, or other defects that would make it unfit for further service. Replace all studs that are stripped or otherwise damaged. **Remove all filings and foreign matter that may have entered the manifold as a result of repairs.**

Installation

1. Clean mating surfaces of intake manifold, cylinder heads, and cylinder block. Use a solvent such as *Ford Spot Remover* (B7A-19521-A) or similar degreasing agent.



4 2. Apply a 1/8 in. diameter bead of silicone rubber sealer **(A)** (C3AZ-19562-A or B) in and along the joint, the full width of the cylinder block seal mounting surface (four corners) as shown.

4 3. Install the cylinder head to manifold gaskets, and the front and rear intake manifold to cylinder block seals **(B)**. Apply a 1/16 in. bead of sealer **(A)** at the outer end of each intake manifold seal for the full width of the seal.

Note This sealer sets up within 15 minutes after application, so assembly should proceed promptly.

4. Carefully lower intake manifold into position. When intake manifold is in place, run finger around seal area to be sure seals are in place. If seals have shifted, remove manifold and reposition seals.

5 5. Be sure intake manifold gaskets are properly aligned, then install attaching bolts. Tighten snugly to manifold, then tighten bolts in recommended sequence to proper torque. Repeat torque sequence, tightening bolts again to original torque value. See page 16-25.

2 6. Install thermostat housing and adaptor assembly on intake manifold.

2 7. Install distributor and hold down clamp.

3 8. Connect PCV hose to carburetor spacer.

2 9. Connect fuel line to carburetor.

2 10. Install coil and bracket assembly to intake manifold.

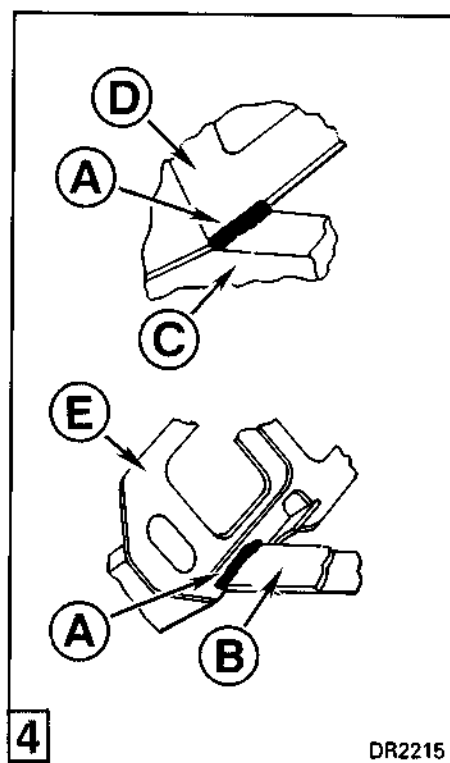
2 11. Connect engine harness wiring to coil, choke and temperature sender. Install shift bracket and solenoid assembly.

2 12. Attach throttle cable to carburetor and anchor block.

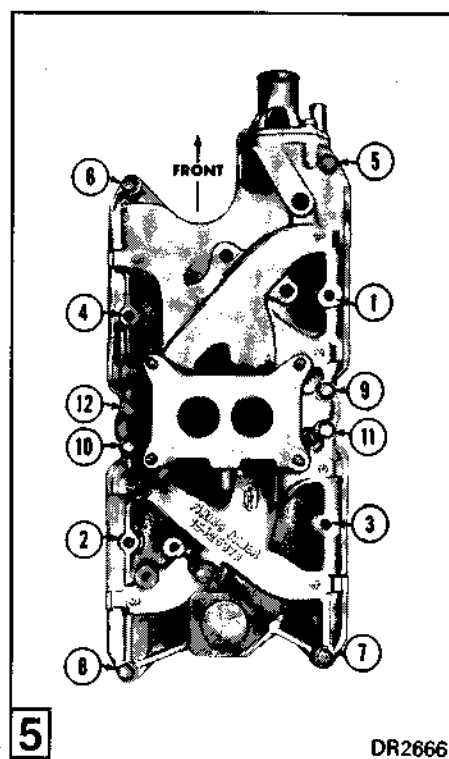
3 13. Connect spark plug wires to distributor cap, and high tension lead to coil. Be sure plug wires are replaced in proper order to ensure correct firing order. See **Section 3**.

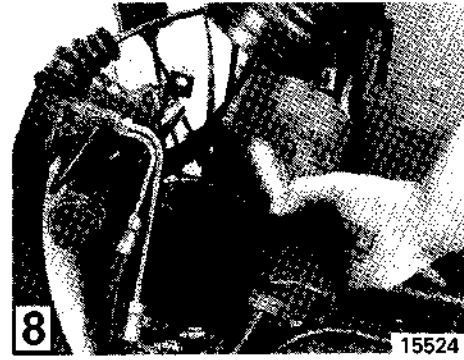
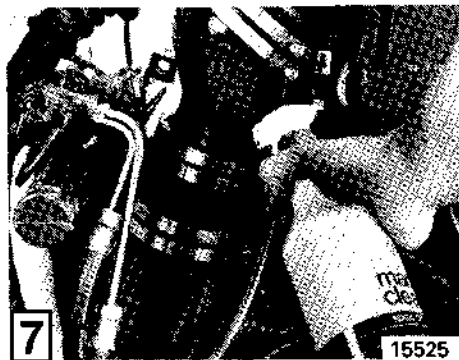
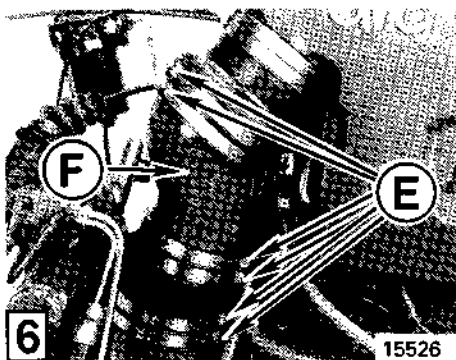
1  14. **Install flame arrestor.** Start engine, and check and adjust ignition timing. Check engine for cooling leaks.

5 15. After engine reaches normal operating temperature, re-tighten manifold bolts and nuts to proper torque in correct sequence.



- (A)** Sealer
- (B)** Seal
- (C)** Cylinder Block
- (D)** Cylinder Head
- (E)** Gasket





Exhaust Manifold Replacement

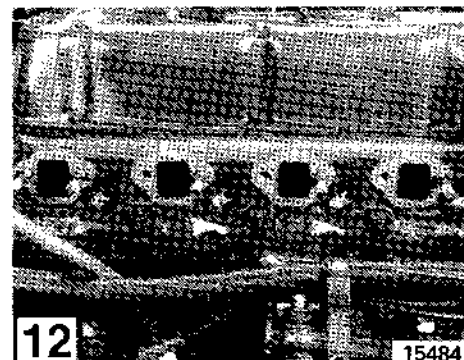
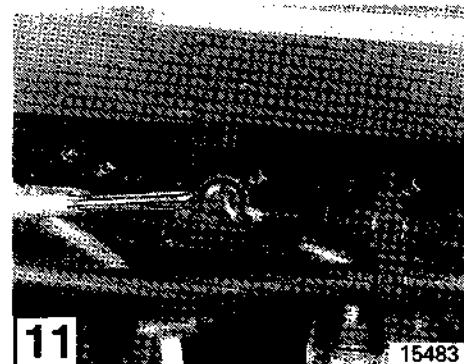
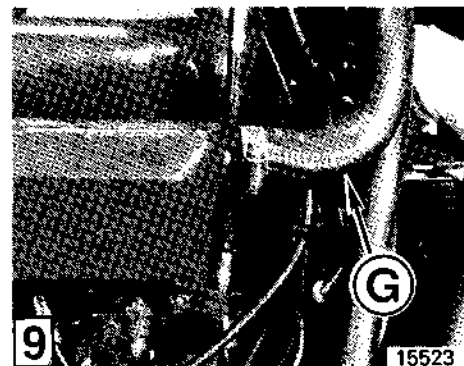
Removal

- 6** 1. Loosen six hose clamps **E** holding exhaust hoses to exhaust elbow **F**.
- 7** 2. Lubricate lower hose and exhaust pipe with a soapy water solution, and slide hose down onto pipe.
- 8** 3. Remove exhaust elbow from high-rise hose.
4. Remove high-rise elbow from manifold and discard gasket.
- 9** 5. Loosen clamp and pull water hose **G** off front of manifold.
- 10** 6. Pull spark plug leads off spark plugs. Mark plug wires to ensure correct firing order.
- 11** 7. Unscrew eight locknuts and lockwashers holding manifold to mounting studs, then pull manifold and high-rise assembly off studs. Remove clamps from water hose and dipstick tube.
8. Remove and discard exhaust manifold gasket.

Installation

- 12** 1. Install a new exhaust manifold gasket. Gasket ports must completely align with exhaust openings.

Note Gasket can be correctly installed in only one position. If improperly installed, gasket will block off part of each exhaust port and/or block access to spark plugs.



13 2. Slide manifold onto studs. Attach lockwashers and locknuts, and tighten locknuts to a torque of 20-26 ft. lbs. (27-35 N·m).

3. Coat a new gasket with *OMC Gasket Sealing Compound* and place it on manifold. Install high-rise elbow and hose assembly and tighten screws to 12-14 ft. lbs. (16-19 N·m).

9 4. Attach water hose to nipple at front of manifold and tighten clamp.

10 5. Attach spark plug wires to plugs. Make sure firing order is correct.

8 6. Lubricate upper (large diameter) outside surface of exhaust elbow with a soapy water solution, and push elbow into high-rise hose until it seats.

7 7. Lubricate lower end of exhaust elbow and slide lower hose up onto elbow. Position hose so that it equally covers elbow and exhaust pipe.

8. Install the six hose clamps and tighten them securely. Run engine and check for exhaust leaks.

Water Pump Replacement

Removal

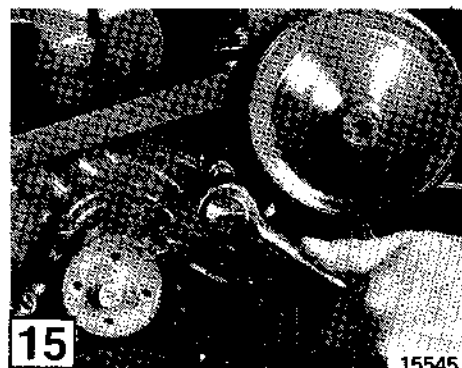
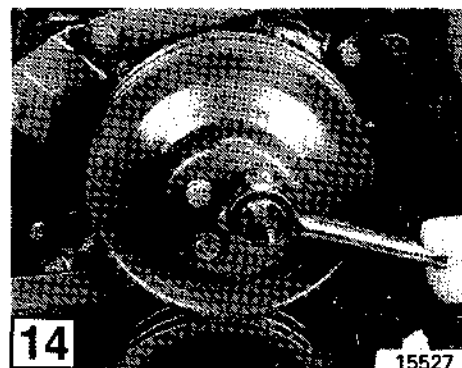
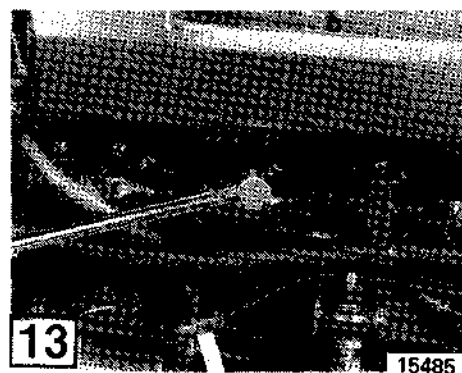
1. Drain all water from engine block.

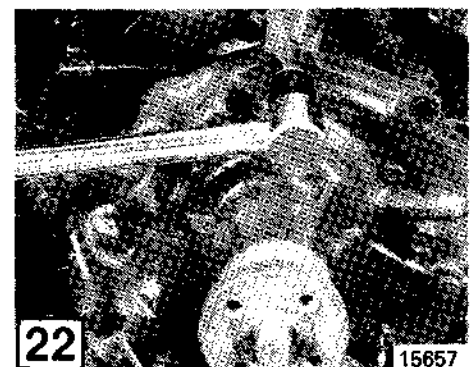
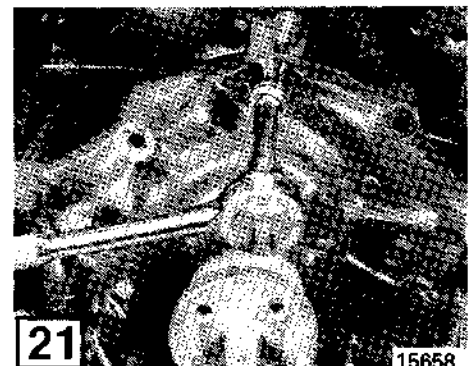
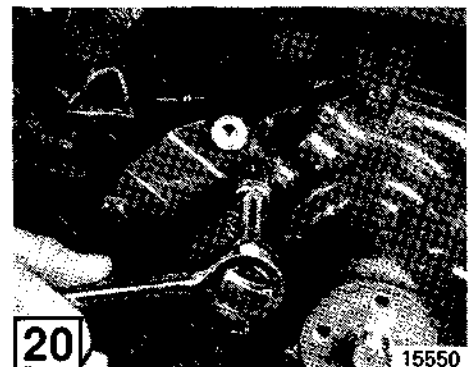
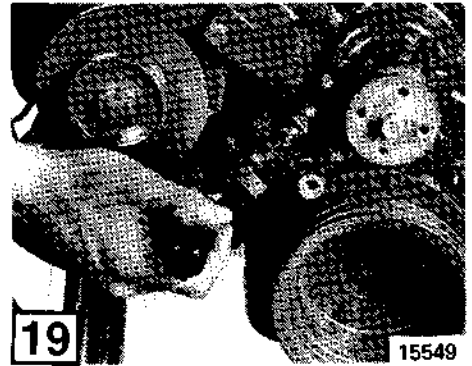
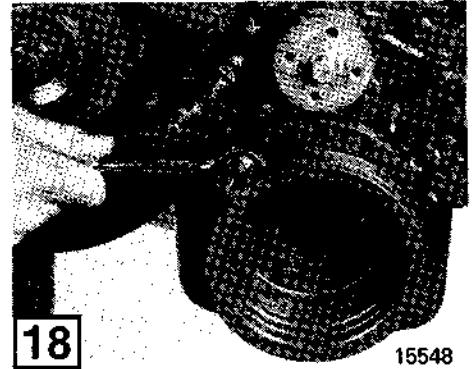
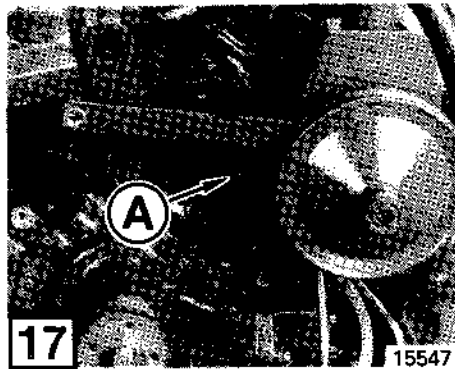
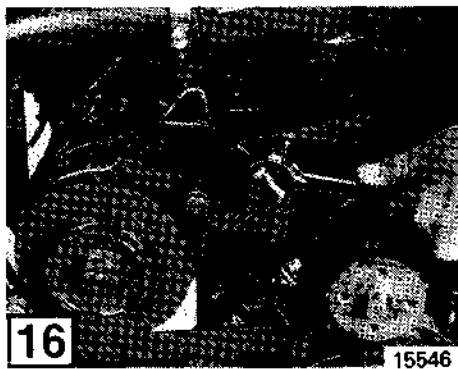
14 2. Loosen the water pump pulley bolts, but don't remove them at this time.

14 3. Release tension on the alternator and power steering pump belts, then remove them.

4. Unscrew the pulley bolts, and slide the pulley off the water pump hub.

15 5. Remove the two power steering bracket bolts and lockwashers.





16 6. Remove brace from alternator bracket to power steering pump.

17 7. Remove Torx head bolt **A** and spacer and remove pump.

18 8. Remove alternator brace from water pump by removing bolt and lockwasher.

19 9. Loosen hose clamp, and pull large hose off water pump.

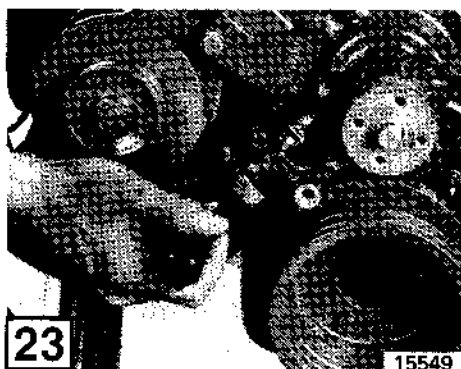
20 10. Take out alternator bracket bolts. Remove alternator and disconnect electrical leads at back of alternator. Set alternator aside.

21 11. Remove all pump mounting bolts. Lightly strike pump with a soft hammer to free it from the mounting gasket. Take off pump, then remove and discard gasket.

Installation

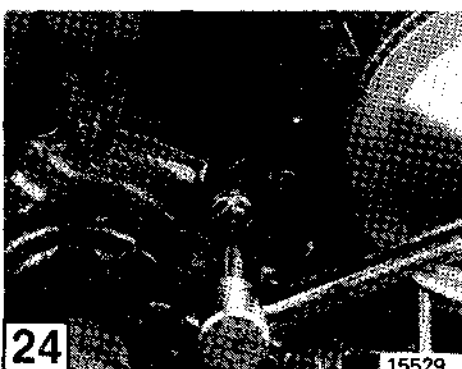
1. Thoroughly clean gasket surface on block. Coat both sides of a new gasket with *OMC Gasket Sealing Compound* and position it on block. Carefully align bolt holes and water passages.

22 2. Install water pump. Screw in all bolts except those that attach the alternator and power steering pump brackets. Tighten bolts to a torque of 12-15 ft. lbs. (16-20 N·m).



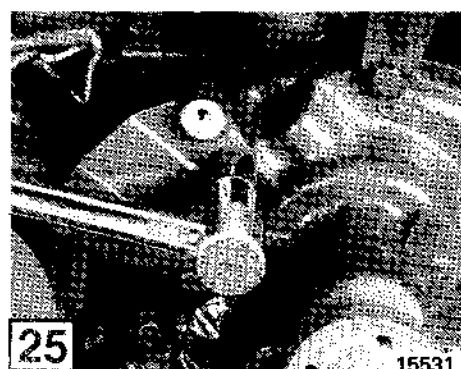
23

15549



24

15529



25

15531

23 3. Push large water hose onto pump inlet and tighten clamp securely.

24 4. Place spacer and Torx head bolt behind rear power steering pump bracket and secure to block. Attach two power steering pump bracket screws and lockwashers.

25 5. Attach the alternator bracket with screws, lockwashers and flat washers. Tighten the screws to a torque of 18-20 ft. lbs. (24-27 N-m).

26 6. Attach alternator brace to water pump cover. Do not tighten pivot bolt at this time.

7. Attach electrical leads to back of alternator.

27 8. Attach power steering pump brace to water pump bracket with screw and lockwasher.

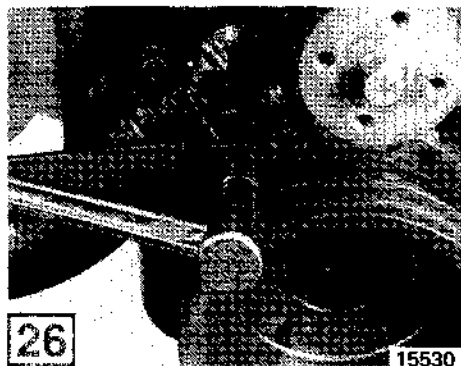
28 9. Align the pulley and pump hub screw holes, then slide the pulley onto the pump. Install the screws and lockwashers and tighten them securely.

10. Install the power steering pump belt and position it in the innermost pulley grooves. Install the alternator belt in the next outer groove.

Note The two belts are different lengths. The power steering pump belt is longer and goes on first.

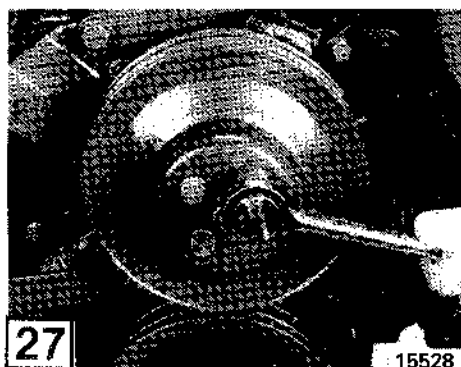
11. Tension both belts as recommended; see **Section 2, Service Information**. Tighten all power steering and alternator bracket bolts securely.

12. Run engine and check for water leaks.



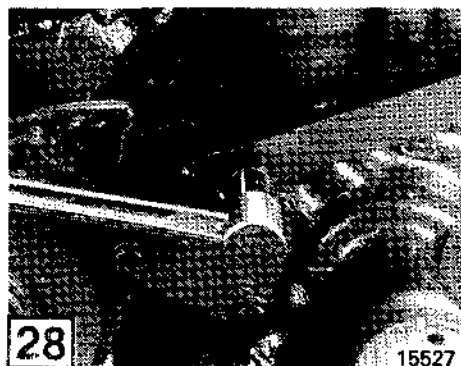
26

15530



27

15528



28

15527

Oil Pan

Removal

1. Disconnect the battery ground cable.
2. Drain the crankcase. Unscrew the dipstick tube.
3. Remove the oil pan attaching bolts and remove the pan braces and pan.
4. Refer to cleaning and inspection procedures. Check the gasket surface for damage caused by overtightened bolts. Straighten the surface as required to restore original flatness.

Cleaning

Scrape any dirt or metal particles from the inside of the pan. Scrape all old gasket material from the gasket surface. Wash the pan in a solvent and dry it thoroughly.

Inspection

Check the pan for cracks, holes, damaged drain plug threads, or a damaged gasket surface.

Inspect for damage (uneven surface) at the bolt holes caused by overtorquing the bolts. Straighten surfaces as required. Repair any damage, or replace the pan if repairs cannot be made satisfactorily.

Installation

1. Clean the gasket surfaces of the block and oil pan. Coat the block surface and oil pan gasket surface with oil-resistant sealer. Position the oil pan gasket on the cylinder block.
2. Hold the oil pan in place against the block and place pan brace against pan; install a bolt finger tight on each side of the oil pan. Install the remaining bolts. Tighten the bolts from the center outward in each direction. Tighten 1/4-20 bolts to a torque of 84-108 in. lbs. (9,5-12,2 N·m). Tighten 5/16-18 bolts to 108-132 in. lbs. (12,2-14,9 N·m).
3. Attach the dipstick tube. Connect the battery ground cable.
4. Fill the crankcase. Start the engine and check for leaks.

Oil Pump

Removal

1. Remove the oil pan following the procedure under **Oil Pan Removal**.
2. Remove the oil pump mounting bolts and remove the pump from the cylinder block.

Disassembly

1. Remove the four screws and washers securing the oil pump cover to the oil pump.
2. Remove the oil pump outer rotor and rotor shaft assembly from the oil pump housing.
3. Remove the cotter pin that secures the relief valve plug in the oil pump housing. To remove the plug, drill a small hole and insert a self-tapping screw in the relief valve plug. Use pliers to remove plug from oil pump housing. Use care to prevent the loss of the relief valve spring.
4. Remove the spring and relief valve from the oil pump housing.

Cleaning

Wash all parts in a solvent and dry them thoroughly with compressed air. Use a brush to clean the inside of the pump housing and the pressure relief valve chamber. Be sure all dirt and metal particles are removed.

Inspection

1. Check the inside of the pump housing and the outer race and rotor for damage or excessive wear.

2. Check the mating surface of the pump cover for wear. If the cover mating surface is worn, scored or grooved, replace the cover.

29 3. Measure the outer race to housing clearance. Your feeler gauge reading must be 0.001-0.0013 in. (0,03-0,033 mm).

30 4. Check the clearance between the outer race and the rotor lobes. With the rotor assembly installed in the housing, place a straight edge over the rotor assembly and the housing. Measure the clearance (rotor end play) between the straight edge and the rotor and outer race. Your reading must be 0.001-0.004 in. (0,03-0,10 mm).

5. Check the drive shaft to housing bearing clearance by measuring the O.D. of the shaft and I.D. of the housing bearing. Correct clearance is 0.0015-0.0029 in. (0,04-0,07 mm).

6. If the pump fails either Step 3, 4, or 5, replace the oil pump assembly. The outer race, shaft and rotor are replaceable only as an assembly.

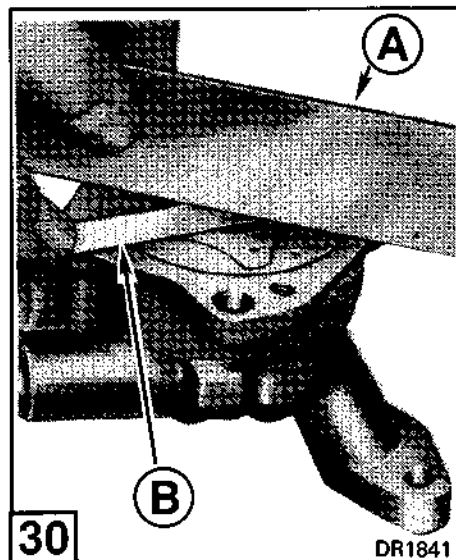
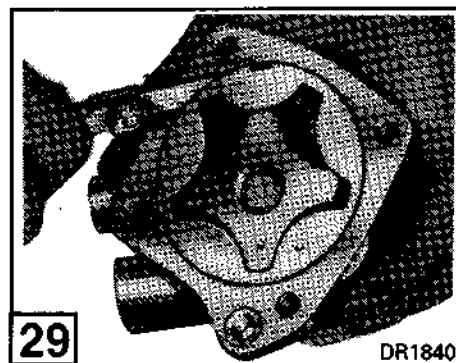
7. Inspect the relief valve spring for a collapsed or worn condition. Check the relief valve spring tension. If the spring tension is not within specifications 10.6-12.2 lbs. and 1.704 in. long (5.0, 5.0 L HO models) or 18.2-20.2 lbs. and 2.49 in. long (5.8 L models) and/or the spring is worn or damaged, replace the spring. Check the relief valve piston for scores and free operation in the bore.

Assembly

1. Install the relief valve, spring and the relief valve plug in the oil pump housing. Press the plug inward until it seats, then install the cotter pin.

2. Install the outer rotor and rotor shaft in the housing. Be sure that the identification mark on the outer rotor is on the same side as the identification mark on the inner rotor. These parts are matched sets and should only be replaced as an assembly. Fill the housing with engine oil for priming purposes.

3. Install the cover plate and tighten the four screws to 72-120 in. lbs. (8,1-13,6 N-m).



Ⓐ Straight Edge
Ⓑ Feeler Gauge

Crankshaft Rear Oil Seal

A one piece crankshaft rear oil seal is provided for servicing 5.0, 5.0 L HO and 5.8 L model engines. The complete seal is replaced without removing the crankshaft.

Removal

1. Remove starter.
2. Remove flywheel housing, coupling, flywheel and cover.
3. Using a sharp awl, punch one hole into the seal metal surface between the lip and engine block.
4. Screw in the threaded end of slide hammer tool T77L-9533-B or equivalent. Use the slide hammer to remove the seal. Use caution to avoid scratching or damaging the oil seal surface.

Installation

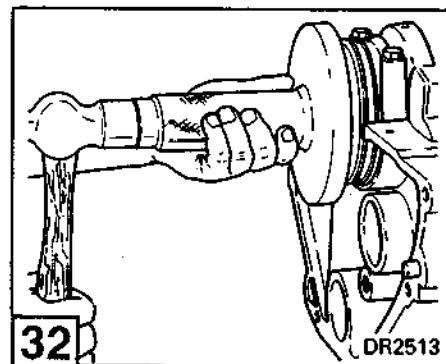
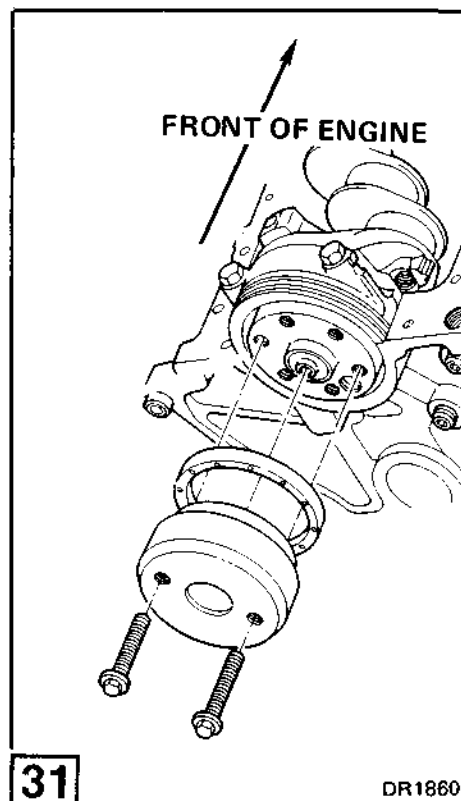
1. Lubricate new seal with engine oil.

31 2. **5.0, 5.0 L HO models** - Position the oil seal with seal lip facing forward on rear oil seal installer T82L-6701-A or equivalent. Position seal and tool on the rear of the engine. Alternate bolt tightening to properly seat the seal. Rear face of seal must be within 0.005 in. (0,127 mm) of the rear face of the block.

32 **5.8 L model** - Start the seal with the seal lip facing forward and install it with the rear oil seal replacer tool T65P-6701-A or equivalent. Keep the tool straight with the centerline of the crankshaft and install the seal until the tool contacts the cylinder block surface.

Note Remove the tool and inspect the seal to ensure it was not damaged during installation.

3. Install flywheel cover, flywheel, coupling and housing.
4. Install starter.



Valve Rocker Arm Cover and Rocker Arm

Removal

1. If a cylinder head rocker arm is to be removed, remove the crankcase ventilation hose or PCV valve from the valve rocker arm cover.
2. Disconnect the spark plug wires from the spark plugs by grasping, twisting and pulling the moulded cap only. Remove the wires from the clamp on the valve rocker arm cover(s) and position the wires out of the way.
3. Remove the exhaust manifold.
4. Remove the valve rocker arm cover(s).
- 33** 5. Remove the valve rocker arm bolt, fulcrum seat and rocker arm.

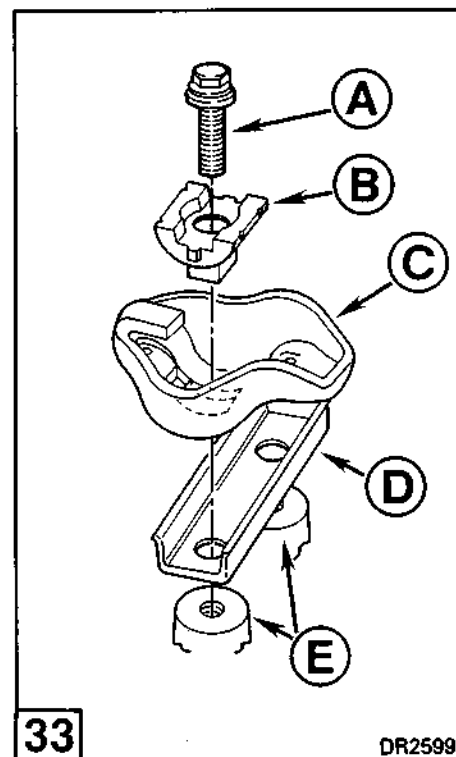
Inspection - Rocker Arm

If the pad at the valve end of the rocker arm has a grooved radius, replace the rocker arm. Do not attempt to true this surface by grinding.

Inspection - Push Rod

Check the ends of the push rods for nicks, grooves, roughness or excessive wear.

The push rods can be visually checked for straightness while they are installed in the engine by rotating them with the valve closed. They also can be checked with a dial indicator for a maximum runout of 0.015 in. (0,38 mm). If the push rod is visibly bent, it should be replaced.



- Ⓐ Fulcrum Bolt
- Ⓑ Fulcrum Seat
- Ⓒ Rocker
- Ⓓ Fulcrum Guide
- Ⓔ Threaded Pedestal

Installation

1. Apply *Lubriplate 777* or equivalent to the top of the valve stems, the rocker arm and fulcrum seats.

34 2. Position the No. 1 piston on TDC at the end of the compression stroke, Position **A**, and install the rocker arm, fulcrum seat, oil deflector and bolt on the following valves:

5.0, 5.0 L HO Models

5.8 L Model

No. 1 Intake, No. 1 Exhaust
No. 7 Intake, No. 5 Exhaust
No. 8 Intake, No. 4 Exhaust

No. 1 Intake, No. 1 Exhaust
No. 4 Intake, No. 3 Exhaust
No. 8 Intake, No. 7 Exhaust

34 3. Rotate the crankshaft to Position **B**, 180° from TDC **A**, and install the rocker arm, fulcrum seat, oil deflector and bolt on the following valves:

5.0, 5.0 L HO Models

5.8 L Model

No. 4 Intake, No. 6 Exhaust
No. 5 Intake, No. 2 Exhaust

No. 3 Intake, No. 2 Exhaust
No. 7 Intake, No. 6 Exhaust

34 4. Rotate the crankshaft to Position **C**, 270° from Position **B**, and install the rocker arm, fulcrum seat, oil deflector and bolt on the following valves:

5.0, 5.0 L HO Models

5.8 L Model

No. 2 Intake, No. 7 Exhaust
No. 3 Intake, No. 3 Exhaust
No. 6 Intake, No. 8 Exhaust

No. 2 Intake, No. 4 Exhaust
No. 5 Intake, No. 5 Exhaust
No. 6 Intake, No. 8 Exhaust

5. Be sure that the fulcrum seat base is inserted in its slot on the cylinder head before tightening the fulcrum bolts. Tighten the fulcrum bolt to 18-25 ft. lbs. (24-34 N·m). Check the valve clearance following the procedures under Valve Clearance Checking Procedure.

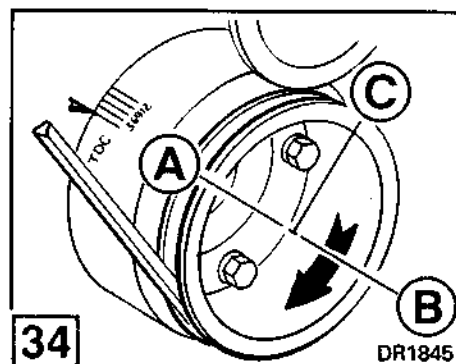
6. Clean the valve rocker arm cover(s) and the cylinder head gasket surface(s). Position the gasket in the cover, making sure that the gasket tangs are secured in the notches in the cover.

7. Position the cover(s) on the cylinder head(s). Make sure the gasket seats evenly all around the head. Install the bolts. The cover is tightened in two steps. Tighten the bolts to 60-72 in. lbs. (6.8-8.1 N·m). Two minutes later, tighten the bolts to the same specifications. If the starboard cover was removed, install PCV valve.

8. Install exhaust manifold.

9. Install the spark plug wires in the clamp on the valve rocker arm cover(s). Connect the spark plug wires.

10. Start the engine and check for leaks.



- A** TDC
- B** 180° from **A**
- C** 270° from **B**

Valve Clearance Check

The valve arrangement on the port bank is E-I-E-I-E-I-E-I and on the starboard bank is I-E-I-E-I-E-I-E.

A 0.060 in. shorter push rod or a 0.060 in. longer push rod are available for service to provide a means of compensating for dimensional changes in the valve mechanism.

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

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

1. Install an auxiliary starter switch. **Crank the engine with the ignition switch OFF until the No. 1 piston is on TDC after the compression stroke.**

35 2. With the crankshaft in the positions designated in Steps 3, 4 and 5, position the *Owatonna* Hydraulic Lifter Compressor Tool P/N T71P-6513-A (A) on the rocker arm. Slowly apply pressure to bleed down the hydraulic lifter until the plunger is completely bottomed. Hold the lifter in this position and check the available clearance between the rocker arm and the valve stem tip with a feeler gauge (B).

36 3. With the No. 1 piston on TDC at the end of the compression stroke as shown in Position (C), check the following valves:

5.0, 5.0 L HO Models

No. 1 Intake, No. 1 Exhaust
No. 7 Intake, No. 5 Exhaust
No. 8 Intake, No. 4 Exhaust

5.8 L Model

No. 1 Intake, No. 1 Exhaust
No. 4 Intake, No. 3 Exhaust
No. 8 Intake, No. 7 Exhaust

36 4. After checking the spacing on these valves, rotate the crankshaft to Position (D), 180° from TDC (C), then check the following valves:

5.0, 5.0 L HO Models

No. 4 Intake, No. 6 Exhaust
No. 5 Intake, No. 2 Exhaust

5.8 L Model

No. 3 Intake, No. 2 Exhaust
No. 7 Intake, No. 6 Exhaust

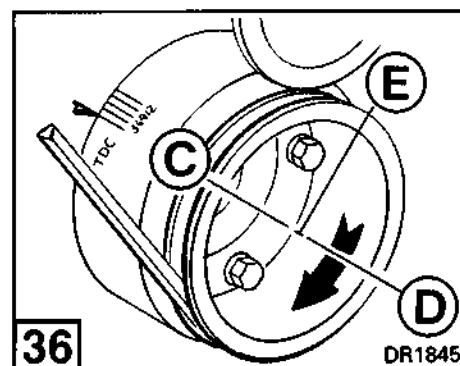
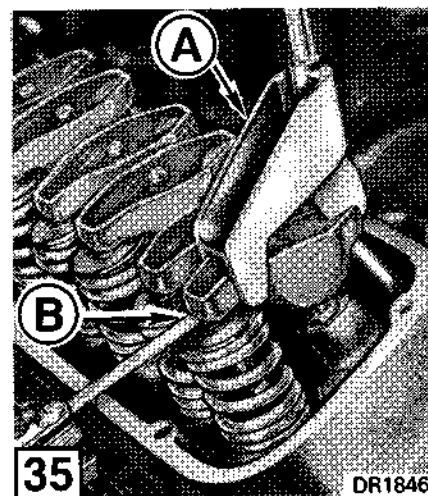
36 5. After checking the spacing on these valves, rotate the crankshaft to Position (E), 270° from Position (D), and check the following valves:

5.0, 5.0 L HO Models

No. 2 Intake, No. 7 Exhaust
No. 3 Intake, No. 3 Exhaust
No. 6 Intake, No. 8 Exhaust

5.8 L Model

No. 2 Intake, No. 4 Exhaust
No. 5 Intake, No. 5 Exhaust
No. 6 Intake, No. 8 Exhaust



(C) TDC
(D) 180° from (C)
(E) 270° from (D)

Clearance Specifications:

5.0, 5.0 L HO Models

Allowable: 0.071-0.193 in. (1,8-4,9 mm)

Desirable: 0.096-0.165 in. (2,4-4,2 mm)

5.8 L Model

Allowable: 0.098-0.198 in. (2,5-5,0 mm)

Desirable: 0.123-0.173 in. (3,1-4,4 mm)

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

Valve Lifter

The following procedure is applicable for removing one or all of the valve lifters. Before replacing a hydraulic valve lifter for noisy operation, be sure the noise is not caused by improper valve clearance or by worn rocker arms and/or push rods.

Dirt, deposits of gum and varnish and air bubbles in the lubricating oil can cause hydraulic valve lifter failure or malfunction.

Dirt, gum and varnish can keep a check valve from seating and cause a loss of hydraulic pressure. An open valve disc will cause the plunger to force oil back into the valve lifter reservoir during the time the push rod is being lifted to force the valve from its seat.

Air bubbles in the lubricating system can be caused by too much oil in the system or too low an oil level. Air may also be drawn into the lubricating system through an opening in a damaged oil pick-up tube. Air in the hydraulic system can cause a loss of hydraulic pressure.

Removal

1. Remove intake manifold and carburetor as an assembly, following instructions under **Intake Manifold**.
2. Remove the valve rocker arm covers. Loosen the rocker arm bolts and turn rocker arms to one side.
3. Remove the push rods in sequence.
4. Remove the valve lifters with a magnet. Place them in a rack in sequence. If the lifters are stuck in bores, rotate lifter back and forth to loosen them from gum or varnish deposits.

Cleaning

Thoroughly clean all the parts in cleaning solvent and wipe them with a clean, lint-free cloth.

Inspection

Inspect the parts and discard the entire lifter assembly if any part shows pitting, scoring, galling or evidence of nonrotation. Replace the entire assembly if the plunger is not free in the body.

Check for freeness of operation by pressing down on the push rod cup. The lifters can also be checked with a hydraulic tester to test the leak-down rate. Follow the instructions of the test unit manufacturer.

Installation

1. Clean the outside of valve lifters. Lifters and bores are to be lubricated with heavy oil SF before installation. Install the lifters in their original bores. Check any new lifter for free fit in bore to which it is to be installed.

2. Install push rods in original positions. Apply *Lubriplate 777* or equivalent to valve stem tips and push rod ends.

3. Position the rocker arms over the push rods and tighten the bolts following the procedure under **Valve Rocker Arm Installation**. Adjust valve clearance.

4. Install rocker arm covers following procedure under **Rocker Arm and Cover Installation**.

5. Install intake manifold and carburetor following the instructions under **Intake Manifold**.

Core Plugs

Removal

To remove a large core plug, drill a ½ in. hole in the center of the plug and remove with an *Owatonna* Clutch Pilot Bearing Puller Tool P/N T59L-100-B and T58L-101-A or pry it out with a large drift punch. On a small core plug, drill a ¼ in. hole in the center of the plug and pry it out with a small pin punch. Clean and inspect the plug bore.

Prior to installing a core plug the plug bore should be inspected for any damage that would interfere with the proper sealing of the plug. If the bore is damaged it will be necessary to true the surface by boring for the next specified oversize plug.

Oversize (OS) plugs are identified by the OS stamped in the flat located on the cup side of the plug.

Coat the plug and/or bore lightly with an oil-resistant (oil galley) or water-resistant (cooling jacket) sealer, and install it following the procedure for cup-type or expansion-type below:

Installation - Cup-Type

37 Cup-type core plugs **A** are installed with the flanged edge outward. The maximum diameter of this plug is located at the outer edge of the flange. The flange on cup-type plugs flares outward with the largest diameter at the outer (sealing) edge **B**.

It is imperative to push the plug into the machined bore by using a properly designed tool. Under no circumstances is the plug to be driven into the bore using a tool that contacts the flange. This method will damage the sealing edge and will result in leakage and/or plug blow out.

The flanged (trailing) edge must be below the chamfered edge of the bore to effectively seal the plugged bore.

If the core plug replacing tool has a depth seating surface, do not seat the tool against a nonmachined (casting) surface.

Installation - Expansion-Type

38 Expansion-type core plugs **C** are installed with the flanged edge inward. The maximum diameter of this plug is located at the base of the flange with the flange flaring inward **D**.

It is imperative to push or drive the plug into the machined bore using a properly designed tool. Under no circumstances is the plug to be driven using a tool that contacts the crowned portion of the plug. This method will expand the plug prior to installation and may damage the plug and/or plug bore.

When installed the trailing (maximum) diameter must be below the chamfered edge of the bore to effectively seal the plugged bore.

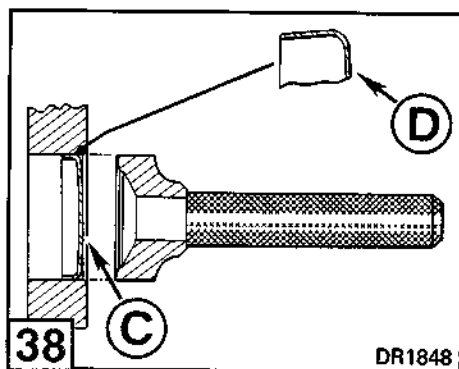
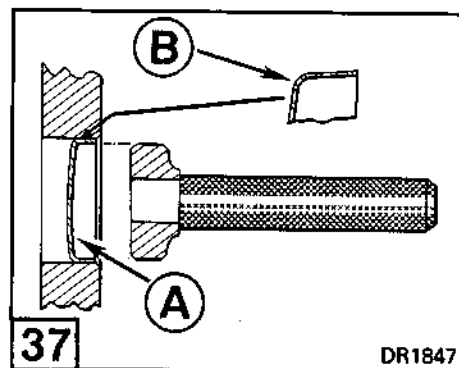
If the core replacing tool has a depth seating surface, do not seat the tool against a nonmachined (casting) surface.

Diagnosis and Testing

Camshaft Lobe Lift

Check the lift of each lobe in consecutive order, and make a note of the readings.

1. Remove valve rocker arm cover.
2. Remove the valve rocker arm. Install a solid, tappet-type push rod in the push rod bore of the camshaft lobe to be checked, or use the adapter for ball end push rods.



39 3. Make sure the push rod is in the valve lifter socket. Install a dial indicator so that the actuating point of the indicator is in the push rod socket (or the indicator ball socket adapter is on the end of the push rod) and in the same plane as the push rod movement.

4. Connect an auxiliary starter switch in the starting circuit. Crank the engine with the ignition switch OFF. Bump the crankshaft over until the tappet or lifter is on the base circle of the camshaft lobe. At this point, the push rod will be in its lowest position.

5. Zero the dial indicator. Continue to rotate the crankshaft slowly until the push rod is in the fully raised position.

6. Compare the total lift recorded on the indicator with specifications:

5.0 L Model

Intake: 0.230 in. (5,8 mm)
Exhaust: 0.238 in. (6,0 mm)

5.0 L HO Model

Intake: 0.260 in. (6,6 mm)
Exhaust: 0.278 in. (7,1 mm)

5.8 L Model

Intake: 0.278 in. (7,1 mm)
Exhaust: 0.283 in. (7,2 mm)

Maximum Allowable Loss: 0.005 in. (0,13 mm)

7. To check the accuracy of the original indicator reading, continue to rotate the crankshaft until the indicator reads ZERO. If the lift on any lobe is below specified wear limits, the camshaft and the valve lifters operating on the worn lobe(s) must be replaced.

8. Remove the dial indicator and auxiliary starter switch. Install the rocker arm.

9. Install the valve rocker arm cover.

Compression Test

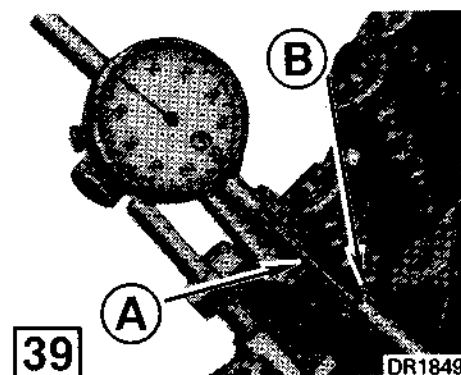
Compression Gauge Check

 1. Be sure the crankcase oil is at the proper level and of the correct viscosity. Make sure that the battery is properly charged. Operate the engine for a minimum of 30 minutes at 1200 RPM, or until the engine is at normal operating temperature. Turn the ignition switch off; **disconnect the B+ lead at the coil positive (+) terminal**, then remove all the spark plugs.

2. Set the carburetor choke and throttle plates in the **wide-open position**.

3. Install a compression gauge in No. 1 cylinder.

 4. Install an auxiliary starter switch in the starting circuit. Using the auxiliary starter switch, crank the engine (**with the ignition switch OFF**) at least five compression strokes and record the highest reading. Note the approximate number of compression strokes required to obtain the highest reading.



(A) Dial Indicator
(B) Push Rod

5. Repeat the test on each cylinder. Crank engine the same number of compression strokes as was required to obtain the highest reading on the No. 1 cylinder.

Test Conclusion

The indicated compression pressures are considered normal if the lowest reading cylinder is within 75% of the highest. Refer to the following example:

Highest Reading: 140 PSI
75%: 105 PSI

In this example, any cylinder reading less than 105 PSI indicates an improperly seated valve, or worn or broken piston rings.

If one or more cylinders read low, squirt approximately one tablespoon of engine oil on top of the pistons in the low reading cylinders. Repeat compression pressure check on these cylinders.

1. If compression improves considerably, the piston rings are at fault.
2. If compression does not improve, valves are sticking or seating poorly.
3. If two adjacent cylinders indicate low compression pressures and squirting oil on the pistons does not increase the compression, the cause may be a cylinder head gasket leak between the cylinders. Engine oil and/or coolant in the cylinders could result from this problem.

Positive Closed-Type Ventilation System

A malfunctioning closed crankcase ventilation system may be indicated by loping or rough engine idle. Do not attempt to compensate for this idle condition by disconnecting the crankcase ventilation system and making carburetor adjustments. **The removal of the crankcase ventilation system from the engine will adversely affect the fuel economy and engine ventilation with resultant shortening of engine life.** To determine whether the loping or rough idle condition is caused by a malfunctioning crankcase ventilation system, perform the following test.