

SERVICE REPAIR

MANUAL

Hyster D024 (S135FT S155FT) Forklift Service
Repair Manual

HYSTER

GM 4.3L V-6 ENGINES

**S4.0-5.5FT, S5.5FTS (S80-120FT;
S80-100FTBCS; S120FTS; S120FTPRS)
[G004, H004];**

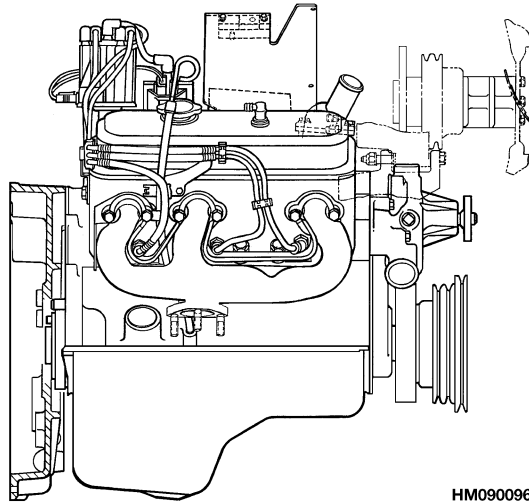
**H4.0FT5/FT6; H4.5FTS5, H4.5FT6; H5.0-5.5FT
(H80-120FT) [N005, P005, R005, S005, U005];**

H6.0-H7.0FT; (H135-155FT)

[H006, J006, K006, L006];

S6.0-7.0FT; (S135-155FT)

[D024, E024, F024, G024]



HM090096

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SAFETY PRECAUTIONS

MAINTENANCE AND REPAIR

- The Service Manuals are updated on a regular basis, but may not reflect recent design changes to the product. Updated technical service information may be available from your local authorized Hyster® dealer. Service Manuals provide general guidelines for maintenance and service and are intended for use by trained and experienced technicians. Failure to properly maintain equipment or to follow instructions contained in the Service Manual could result in damage to the products, personal injury, property damage or death.
- When lifting parts or assemblies, make sure all slings, chains, or cables are correctly fastened, and that the load being lifted is balanced. Make sure the crane, cables, and chains have the capacity to support the weight of the load.
- Do not lift heavy parts by hand, use a lifting mechanism.
- Wear safety glasses.
- DISCONNECT THE BATTERY CONNECTOR before doing any maintenance or repair on electric lift trucks. Disconnect the battery ground cable on internal combustion lift trucks.
- Always use correct blocks to prevent the unit from rolling or falling. See HOW TO PUT THE LIFT TRUCK ON BLOCKS in the **Operating Manual** or the **Periodic Maintenance** section.
- Keep the unit clean and the working area clean and orderly.
- Use the correct tools for the job.
- Keep the tools clean and in good condition.
- Always use **HYSTER APPROVED** parts when making repairs. Replacement parts must meet or exceed the specifications of the original equipment manufacturer.
- Make sure all nuts, bolts, snap rings, and other fastening devices are removed before using force to remove parts.
- Always fasten a DO NOT OPERATE tag to the controls of the unit when making repairs, or if the unit needs repairs.
- Be sure to follow the **WARNING** and **CAUTION** notes in the instructions.
- Gasoline, Liquid Petroleum Gas (LPG), Compressed Natural Gas (CNG), and Diesel fuel are flammable. Be sure to follow the necessary safety precautions when handling these fuels and when working on these fuel systems.
- Batteries generate flammable gas when they are being charged. Keep fire and sparks away from the area. Make sure the area is well ventilated.

NOTE: The following symbols and words indicate safety information in this manual:



WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury and property damage.

On the lift truck, the **WARNING** symbol and word are on orange background. The **CAUTION** symbol and word are on yellow background.

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This section is for the following models:

S4.0-5.5FT, S5.5FTS (S80-120FT; S80-100FTBCS; S120FTS; S120FTPRS) [G004, H004];

H4.0FT5/FT6; H4.5FTS5, H4.5FT6; H5.0-5.5FT (H80-120FT) [N005, P005, R005, S005, U005];

H6.0-H7.0FT; (H135-155FT) [H006, J006, K006, L006];

S6.0-7.0FT; (S135-155FT) [D024, E024, F024, G024]

**"THE
QUALITY
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**HYSTER
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General



CAUTION

Disconnect the battery cables before doing any disassembly and repair of the engine or parts of the electrical system.

The diodes and resistors in the electrical system can be damaged if the following cautions are not followed:

- **DO NOT** disconnect the battery when the engine is running. The voltage surge can damage the diodes and resistors.
- **DO NOT** disconnect an electric wire before the engine is stopped and the switches are OFF.

- **DO NOT** cause a short circuit by connection of the electric wires to the wrong terminals. Make sure a correct identification of the wire is made before it is connected.
- **Make sure a battery is the correct voltage and polarity before it is connected.**
- **DO NOT** check for current flow by making a spark because the electronic components can be damaged.

This SRM has repair instructions for GM 4.3 liter, V-6 engine. Checks and Adjustments and Specifications are also included.

Engine Removal and Installation

The Removal and Installation procedures for the engine are in the **Frame** section for each model of lift truck. If engine and transmission were removed from lift truck as a unit, see **Transmission** sections to separate transmission from engine.

The Removal and Installation procedures for the gasoline and LPG components of the engine are covered in the **Gasoline Fuel System and LPG Fuel System** sections for each model of lift truck.

Cylinder Head Repair

REMOVE AND DISASSEMBLE



WARNING

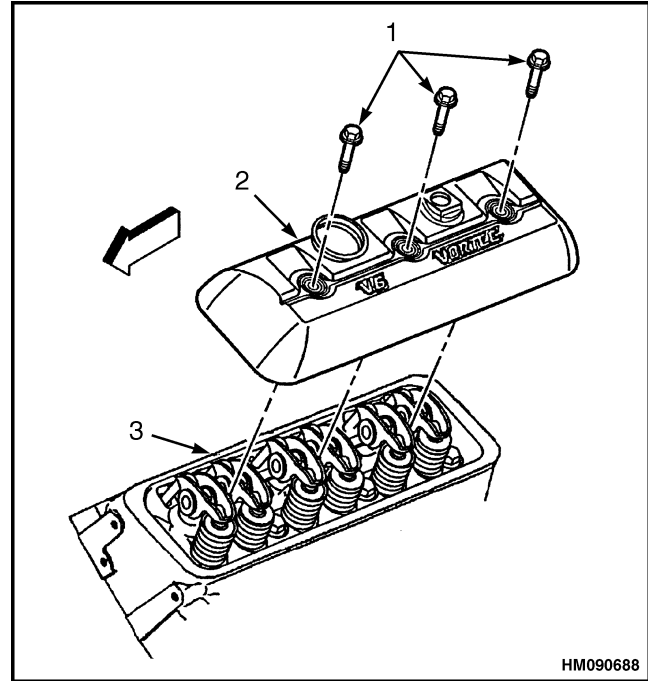
Disconnect the battery cables before making repairs to the engine.

1. Drain cooling system.
2. Loosen hose clamp and remove coolant hose from thermostat housing.

NOTE: Prior to removing distributor, mark location of distributor on distributor and engine to aid in proper installation. For more information regarding removal and installation of distributor, see **High Voltage Switch (HVS) Ignition; GM4.3L EPA Compliant Engines and GM5.7L LPG EPA Complicant Engine 2200SRM1097.**

3. Remove air cleaner, distributor, intake manifold, and exhaust manifolds. Remove drive belt(s) and remove brackets for drive belt tensioner and alternator.
4. Remove spark plugs and spark plug wire shields.
5. Remove valve rocker arm cover bolts and grommets. Discard grommets.
6. Remove rocker arm cover. See Figure 1.

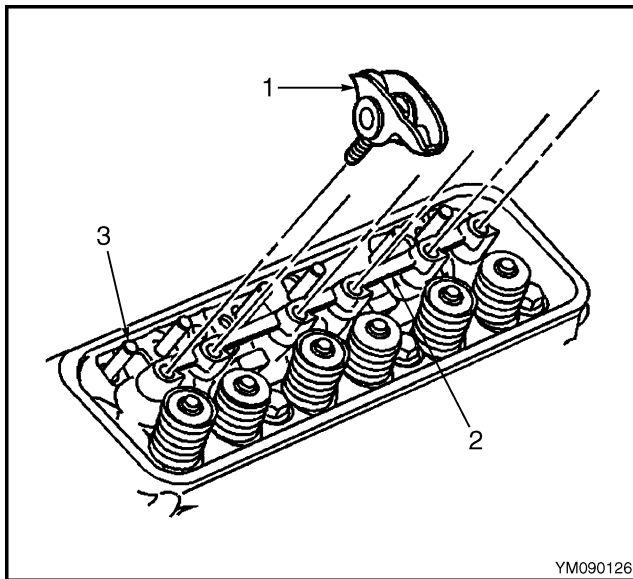
7. Remove valve rocker arms. Organize rocker arms so they can be installed in their original positions. See Figure 2.



1. ROCKER COVER BOLTS
2. ROCKER COVER
3. CYLINDER HEAD

Figure 1. Rocker Cover Removal

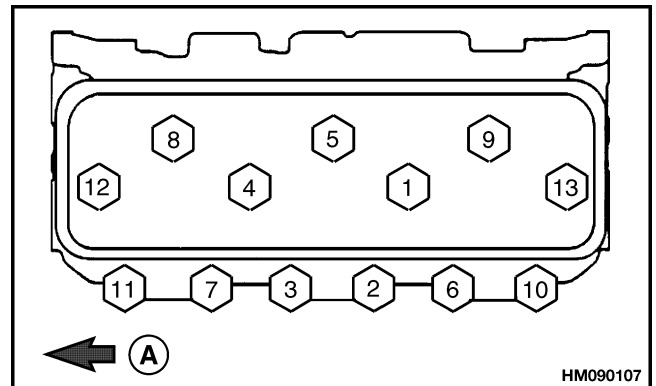
- 8. Remove valve rocker arm supports.
- 9. Remove valve push rods.



- 1. VALVE ROCKER ARM
- 2. VALVE ROCKER ARM SUPPORT
- 3. PUSH ROD

Figure 2. Remove Valve Rocker Arm and Push Rod

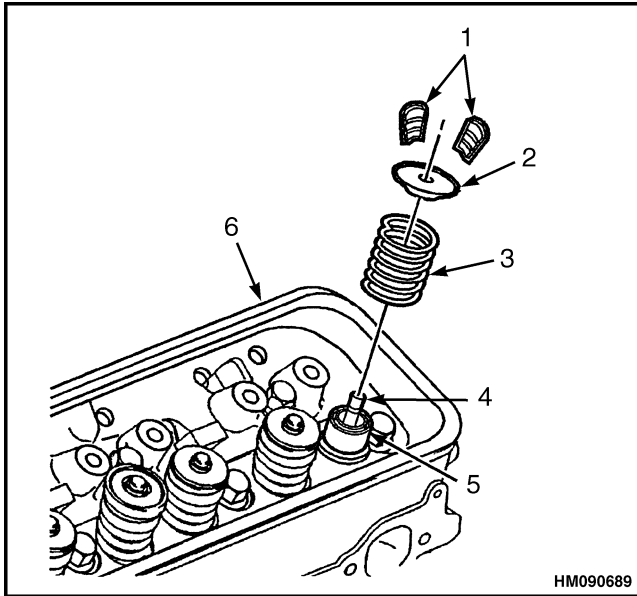
- 10. Remove capscrews that hold cylinder head to block in the sequence shown in Figure 3. Remove cylinder head and gasket. Discard cylinder head gasket.



- A. FAN END

Figure 3. Cylinder Head Capscrew Removal Sequence

- 11. Using a valve spring compressor, remove valve stem keys, caps, springs, and oil seals. Discard oil seals. Remove valves. Organize valves and springs so they can be installed in their original positions. See Figure 4.



1. VALVE STEM KEYS
2. VALVE SPRING CAP
3. VALVE SPRING
4. VALVE
5. VALVE STEM OIL SEAL
6. CYLINDER HEAD

Figure 4. Valve Removal

CLEAN AND INSPECT

1. Clean carbon from valve ports and combustion chambers in cylinder head. Use care not to scuff the combustion chambers.

WARNING

Cleaning solvents can be flammable and toxic and can cause skin irritation. When using cleaning solvents, always follow the solvent manufacturer's recommended safety procedures.

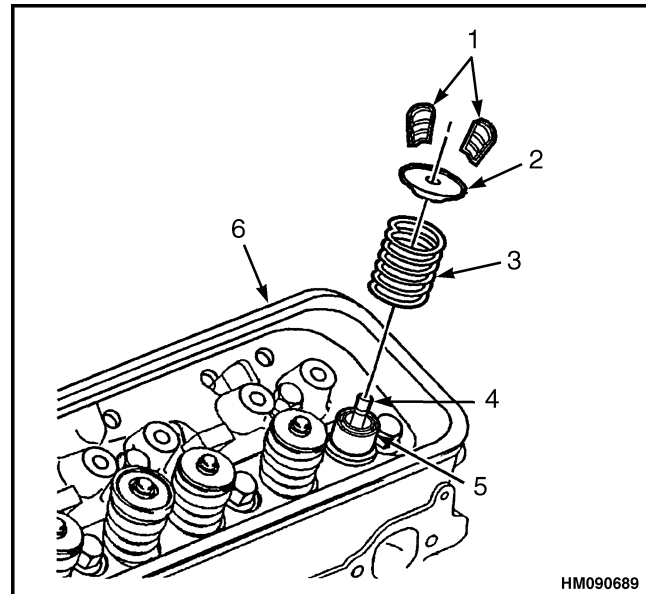
WARNING

Compressed air can move particles so they cause injury to the user or to other personnel. Make sure the path of the compressed air is away from all personnel. Wear protective goggles or a face shield to prevent injury to the eyes.

2. Using cleaning solvent, clean following items:

- Valve stem keys
- Valve spring cap
- Valve spring
- Valve
- Cylinder head

When cleaning is complete, dry components with compressed air. See Figure 5.



1. VALVE STEM KEYS
2. VALVE SPRING CAP
3. VALVE SPRING
4. VALVE
5. VALVE STEM OIL SEAL
6. CYLINDER HEAD

Figure 5. Valve Component Cleaning

3. Clean valve guides.



CAUTION

To prevent possible gouging of the cylinder head surfaces, use care when removing gasket material.

4. Remove all gasket material from surfaces of cylinder head.
5. Inspect cylinder head for following defects:
 - Damage to gasket surfaces
 - Damage to threaded bolt holes
 - Burnt or eroded areas in combustion chamber
 - Cracks in exhaust ports and combustion chambers
 - External cracks in water chamber
 - Restrictions in intake or exhaust passages
 - Restrictions in cooling system passages
 - Rusted, damaged, or leaking core plugs
6. Measure cylinder head for warpage with a straight edge and feeler gauge. See Figure 6.
 - A cylinder head block deck with warpage in excess of 0.10 mm (0.004 in.) within a 152.4 mm (6.0 in.) area must be repaired or replaced.
 - A cylinder head exhaust manifold mounting surface with a warpage in excess of 0.05 mm (0.002 in.) within a 152.4 mm (6.0 in.) area must be repaired or replaced.
 - A cylinder head intake manifold mounting surface with a warpage in excess of 0.10 mm (0.004 in.) within a 152.4 mm (6.0 in.) area must be repaired or replaced.

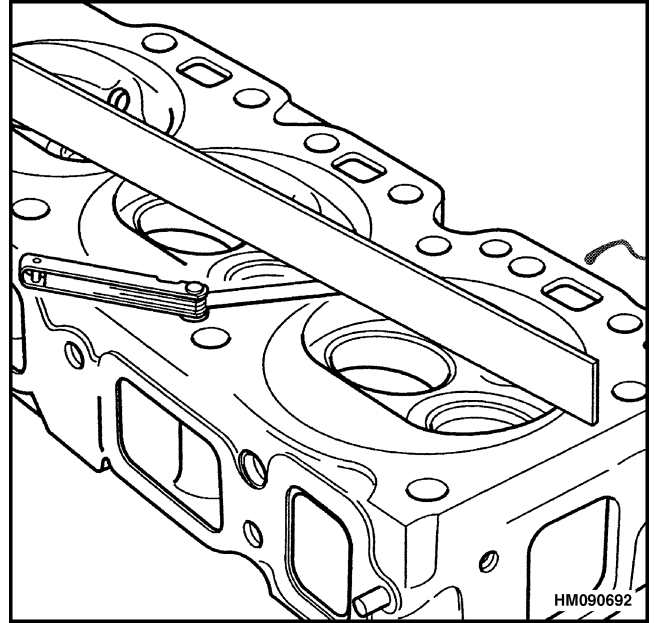
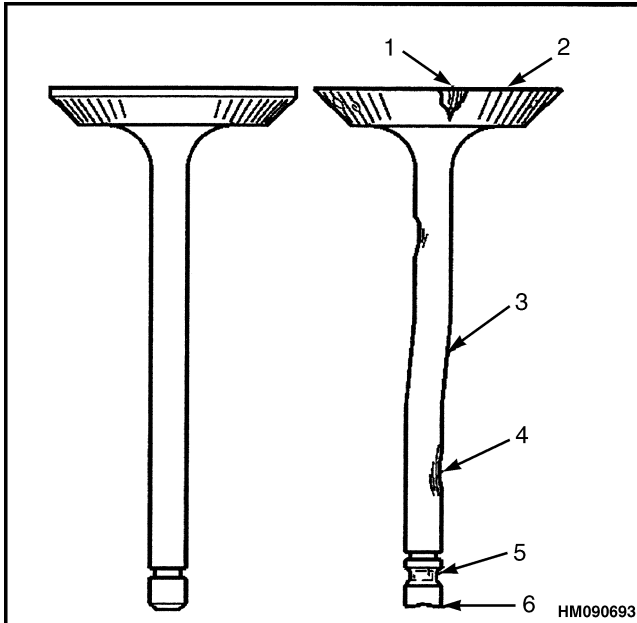


Figure 6. Cylinder Head Warpage Inspection

7. Inspect valves for:
 - Burnt or damaged areas
 - Undersized margin
 - Bent stem
 - Scoring or other damage to stem
 - Worn key groove
 - Worn stem tip

See Figure 7.



1. BURNT OR DAMAGED AREAS
2. UNDERSIZED MARGIN
3. BENT STEM
4. SCORING/DAMAGE TO THE STEM
5. WORN KEY GROOVE
6. WORN STEM TIP

Figure 7. Valve Inspection

Valve stems with excessive guide clearance must be repaired or replaced. Refer to Engine Specifications.

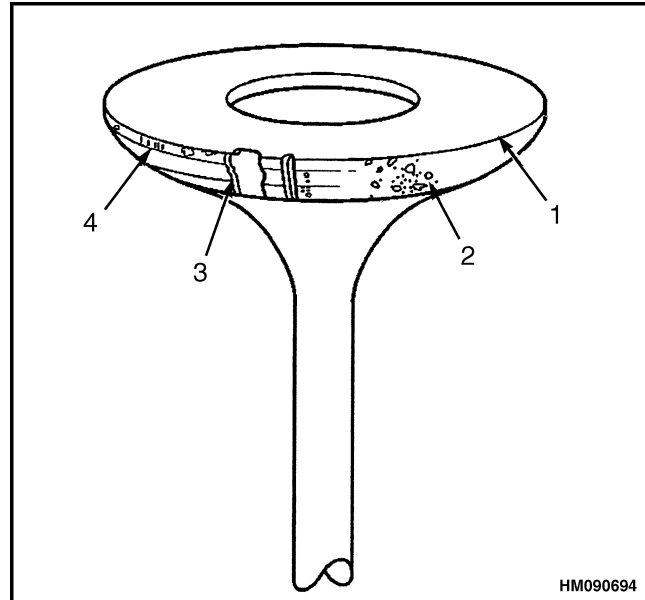
8. Inspect valve contact surface for the following:
 - Undersized margin
 - Pitted surface
 - Burnt or eroded areas
 - Acceptable edge margin

See Figure 8.

Valves with excessive damage must be replaced. Minor imperfections of valve or valve seat may be repaired. Refer to Valve Guides and Seats, Repairs or Valves, Repair.

VALVE OIL SEALS

The following procedure addresses replacement of valve oil seals. If **ONLY** valve oil seals are being replaced, it is not necessary to remove the cylinder head.



1. UNDERSIZED MARGIN
2. PITTED SURFACE
3. BURNT OR ERODED AREAS
4. ACCEPTABLE EDGE MARGIN

Figure 8. Valve Contact Surface Inspection

Remove and Disassemble

1. Remove spark plug wires from spark plugs and position spark plug wires out of way.
2. Remove each spark plug and spark plug wire shield.

NOTE: If spark plugs are not being replaced label each spark plug to its corresponding cylinder.

3. Remove rocker cover bolts and grommets. Discard grommets. Repeat for other rocker cover.
4. Remove rocker covers. Disconnect the Positive Crankcase Ventilation valve from the air inlet hose.
5. Perform cylinder leak down test for each cylinder. See Cylinder Leak Down Test.
6. Remove valve rocker arms. Organize rocker arms so they can be installed in their original positions. Repeat for other side.

- Using a valve spring compressor, remove valve stem keys, caps, springs, and oil seals. Discard oil seals. Organize springs so they can be installed in their original positions. Repeat for other each cylinder.

Cylinder Leak Down Test

NOTE: Rotate crankshaft to place piston in cylinder being tested at top dead center (TDC) of the compression stroke, with both valves closed. Lock crankshaft balancer in place to prevent piston movement.

- Install the J 35667-A Cylinder Head Leakdown Tester (Hyster P/N 4060759) tester in the spark plug port on cylinder to be tested.
- Apply shop air pressure to J 35667-A Cylinder Head Leakdown Tester (Hyster P/N 4060759) tester and adjust according to manufactures instructions.
- Record cylinder leakage value. Cylinder leakage exceeding 25 percent is considered excessive and may require component service.

Air leakage from intake or exhaust system may indicate a worn or burnt valve or a broken valve spring.

- Ensure that both valves are closed.
- Inspect cylinder head for a broken valve spring.
- Remove and inspect suspect cylinder head. See Cylinder Head Repair, Remove and Disassemble.

Air leakage from crankcase, oil level indicator, or oil fill tube may indicate worn piston rings, a damaged piston, a worn or scored cylinder bore, a damaged engine block or a damage cylinder head.

- Remove piston from the suspect cylinder. See Piston and Connecting Rod Assemblies, Remove.
- Inspect piston and connecting rod assembly. See Piston, Clean and Inspect.

- Inspect engine block. See Engine Block, Clean and Inspect.
- Inspect cylinder head. See Cylinder Head Repair, Clean and Inspect.

Air bubbles in cooling system may indicate a damaged cylinder head or a damaged cylinder head gasket.

- Remove both cylinder heads. See Cylinder Head Repair, Remove and Disassemble.
- Inspect engine block. See Engine Block, Clean and Inspect.
- Inspect cylinder head. See Cylinder Head Repair, Clean and Inspect.

Clean and Inspect



WARNING

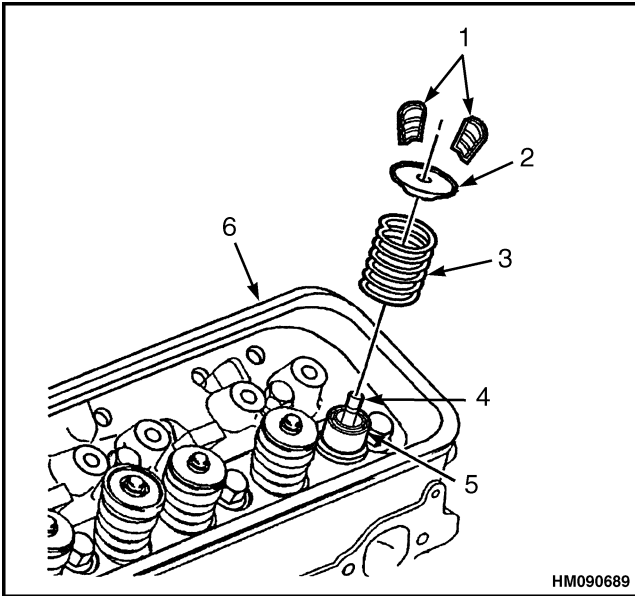
Cleaning solvents can be flammable and toxic and can cause skin irritation. When using cleaning solvents, always follow the solvent manufacturer's recommended safety procedures.



WARNING

Compressed air can move particles so they cause injury to the user or to other personnel. Make sure the path of the compressed air is away from all personnel. Wear protective goggles or a face shield to prevent injury to the eyes.

- Using cleaning solvent, clean the following items:
 - Valve stem keys
 - Valve spring cap
 - Valve spring
- When cleaning is complete, dry components with compressed air. See Figure 9.



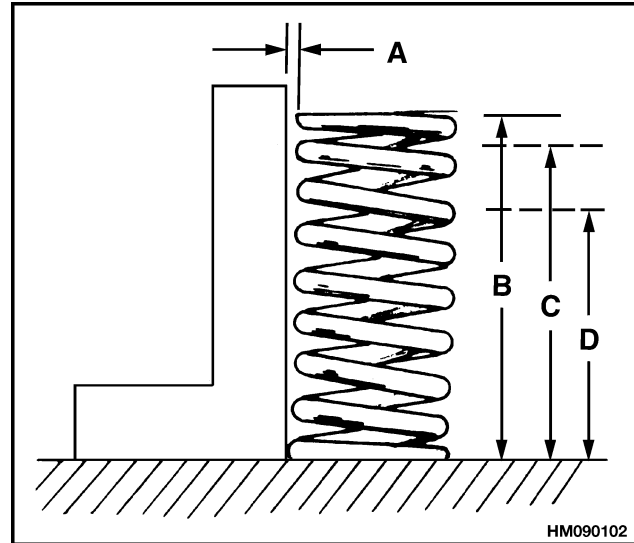
1. VALVE STEM KEYS
2. VALVE SPRING CAP
3. VALVE SPRING
4. VALVE
5. VALVE STEM OIL SEAL
6. CYLINDER HEAD

Figure 9. Valve Component Cleaning

3. Clean valve guides.

Assemble and Install

1. Using GM tool J-42073 (Hyster P/N 4622265), install oil seal in lower groove. Install shim, damper, spring, shield, and cap or rotator. Using a spring compressor, compress assembly and install retainers. Measure height of valve spring as shown in Figure 13. Measure from top of shim to top of retainer cap. Install shims to get correct height shown in Figure 10. The installed height of valve spring must not be less than minimum height.



NOTE: THIS LIST IS FOR 4.3L GASOLINE ENGINES.

- A. VARIATION FROM VERTICAL: LESS THAN 1.6 mm (0.063 in.)
- B. FREE LENGTH: 51.3 mm (2.02 in.)
- C. SPRING COMPRESSED TO 338 TO 374 N (76 TO 84 lbf) AT 43.2 mm (1.70 in.) CLOSED SPRING COMPRESSED TO 832 TO 903 N (187 TO 203 lbf) AT 32.3 mm (1.27 in.) OPEN
- D. INSTALLED HEIGHT INTAKE: 42.92 TO 43.43 mm (1.670 TO 1.700 in.) EXHAUST: 42.92 TO 43.43 mm (1.670 TO 1.700 in.)

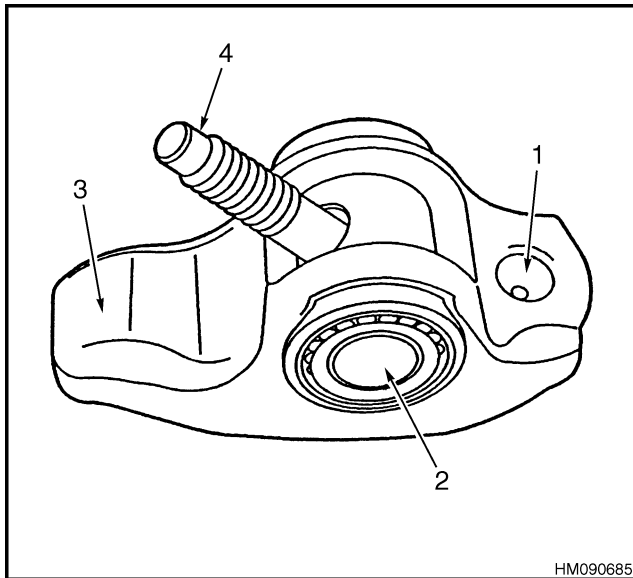
NOTE: THIS LIST IS FOR 4.3L LPG ENGINES.

- A. VARIATION FROM VERTICAL: LESS THAN 1.6 mm (0.063 in.)
- B. FREE LENGTH: 50 mm (2.0 in.)
- C. SPRING COMPRESSED TO 265 N (59.5 lbf) AT 43.2 mm (1.70 in.) CLOSED SPRING COMPRESSED TO 718 N (161.5 lbf) AT 32.3 mm (1.27 in.) OPEN
- D. INSTALLED HEIGHT INTAKE: 42.92 TO 43.43 mm (1.670 TO 1.700 in.) EXHAUST: 42.92 TO 43.43 mm (1.670 TO 1.700 in.)

Figure 10. Valve Spring Specifications

2. Apply a molybdenum grease or equivalent to following valve rocker arm contact surfaces:
 - Valve push rod socket
 - Roller pivot
 - Valve stem tip

See Figure 11.



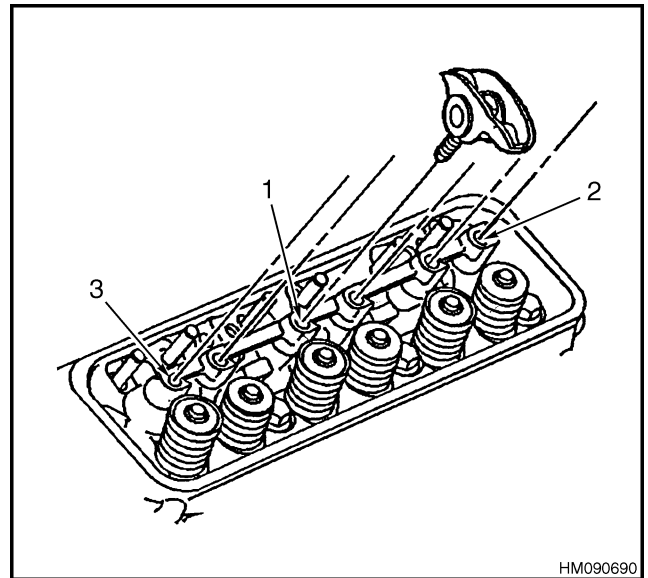
1. VALVE PUSH ROD SOCKET
2. ROLLER PIVOT
3. VALVE STEM TIP
4. ROCKER ARM BOLT

Figure 11. Lubricate Valve Rocker Arm Surfaces

3. Install valve rocker arm assemblies as follows:
 - a. Finger start rocker arm bolt at location 1 in Figure 12.
 - b. Finger start rocker arm bolt at location 2 in Figure 12.

- c. Finger start rocker arm bolt at location 3 in Figure 12.
- d. Finger start remaining three valve rocker arm bolts.

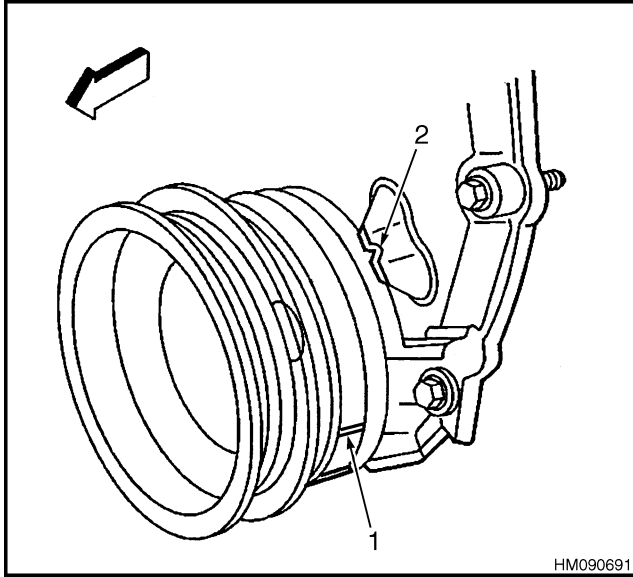
Repeat for other side.



1. BOLT AT LOCATION 1
2. BOLT AT LOCATION 2
3. BOLT AT LOCATION 3

Figure 12. Install Valve Rocker Arm Assemblies

4. Rotate crankshaft balancer to position crankshaft balancer alignment mark 57 to 63 degrees clockwise or counterclockwise from engine front cover alignment tab. See Figure 13.



NOTE: ONCE THE VALVE ROCKER ARM ASSEMBLIES ARE INSTALLED AND PROPERLY TORQUED, NO ADDITIONAL VALVE LASH ADJUSTMENT IS REQUIRED.

1. CRANKSHAFT BALANCER ALIGNMENT MARK
2. ENGINE FRONT COVER ALIGNMENT TAB

Figure 13. Rotate Crankshaft Balancer

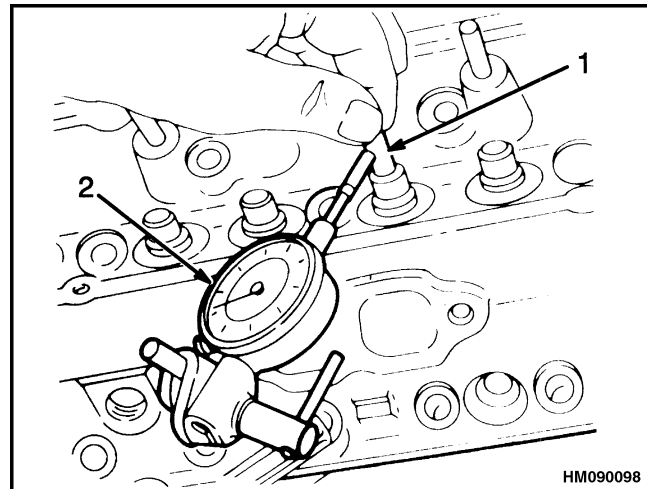
5. Tighten valve rocker arm bolts to 30 N•m (22 lbf ft). See Figure 19. Repeat for other side.
6. Use new gasket and install rocker covers. Install new grommets on capscrews and install capscrews into rocker covers. Tighten capscrews to 12 N•m (107 lbf in). See Figure 22. Repeat for other side.
7. Install air inlet hose on PCV valve. Tighten clamp.
8. Install each spark plug wire shield and spark plugs.
9. Install spark plug wires to their appropriate spark plugs.

VALVE GUIDES AND SEATS, REPAIRS

Measure clearance between valve stem and guide as follows:

1. Clamp a dial indicator on exhaust port side of the cylinder head. See Figure 14.
2. Position dial indicator so that movement of valve stem from side to side, crosswise to cylinder head, will cause a direct movement of dial indicator stem.
The dial indicator stem must contact side of valve stem just above valve guide.
3. Lower valve head about 1.6 mm (0.063 in.) below valve seat.
4. Using light pressure, move valve stem from side to side in order to obtain valve stem-to-guide clearance reading.

See Engine Specifications for maximum clearances. If clearance is more than maximum amount, over-size valves or new valve guides must be installed. Use a reamer of correct size when installing new valve guides. Use normal service procedures when grinding valve seats. See Engine Specifications for dimensions.



1. VALVE STEM
2. DIAL INDICATOR

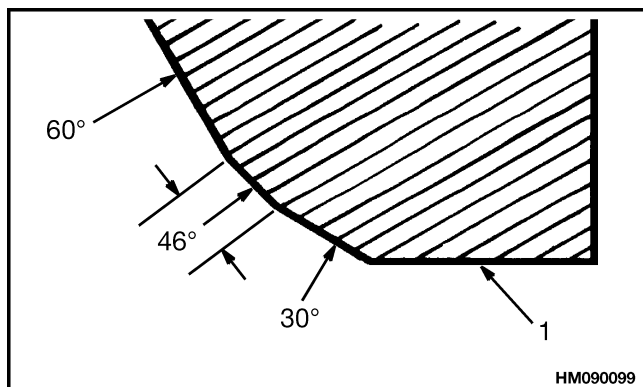
Figure 14. Valve Stem Clearance

VALVES, REPAIR

NOTE: Before any work is performed on valve faces and seats, make sure clearance of valve stems in their valve guides is within specifications.

A correction for minimum wear and damage to valve and seat can be done by a process called lapping. When the valve seats are lapped, keep valve faces and seats within the specifications. Make sure all of the lapping compound is removed from the valve and valve seat when the process is completed.

Valves with minor pits in valve faces can be machined to proper angle. There are many different types of equipment for repairing valve faces. Follow instructions of manufacturer of equipment that you are using. Valves must be machined to proper specifications. See Figure 15.



NOTE: SEAT WIDTH DIMENSION APPLIES TO THE 46° FACE ONLY.

1. CYLINDER HEAD

Figure 15. Valve Seat Specifications for Inlet and Exhaust Valves

Replace a valve if any of the following conditions are present:

- Valve stem is worn below specifications.
- Valve stem is bent.
- Valve face is warped.
- Any part of valve is cracked.
- Any wear or damage to valve face that cannot be removed by resurfacing and still meet specifications shown in Figure 16.

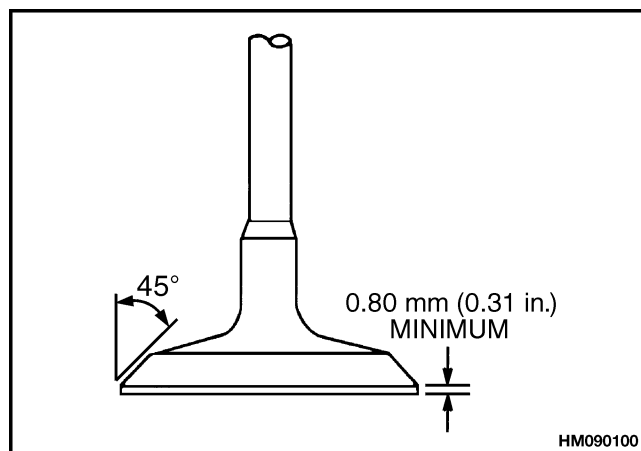


Figure 16. Valve Head Measurements

VALVE SEATS, REPAIR

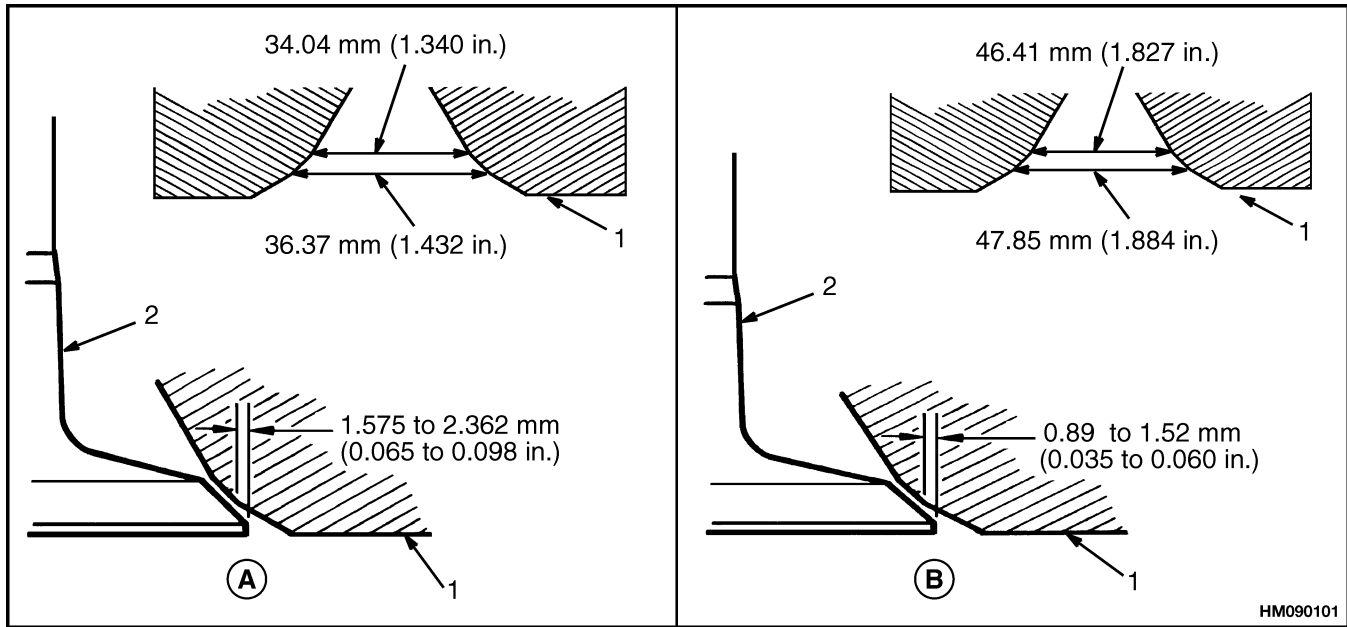
NOTE: Before any work is done on valve faces and seats, make sure clearance of valve stems in their valve guides is within specifications.

Damaged valve seats can be resurfaced with a tool that is designed to repair valve seats. There are many different types of equipment for repairing valve seats. Follow the instructions of the manufacturer of the equipment that you are using.

The valve seats are ground at three different angles: 30°, 46°, and 60°. This method makes a valve seat that is proper width and produces the correct contact line between the valve and valve seat. The specifications for valve seats are shown in the Engine Specifications section and in Figure 15.

- If contact line is too high, it can be made lower by using a 30° stone.
- If contact line is too low, it can be raised using the 46° stone.
- If seat is too narrow, it can be made wider using a 46° stone.
- If seat is too wide, it can be made narrower using a 60° stone.

The correct dimensions for the valve seat widths and valve/valve seat overlap are shown in Figure 17. The valve seat widths are the dimensions of 46° face only. The valve/valve seat overlap is distance from the edge of the seat to outside edge of valve.



A. EXHAUST VALVE

B. INTAKE VALVE

1. CYLINDER HEAD

2. VALVE

Figure 17. Valve Seat Widths and Valve/Valve Seat Overlap

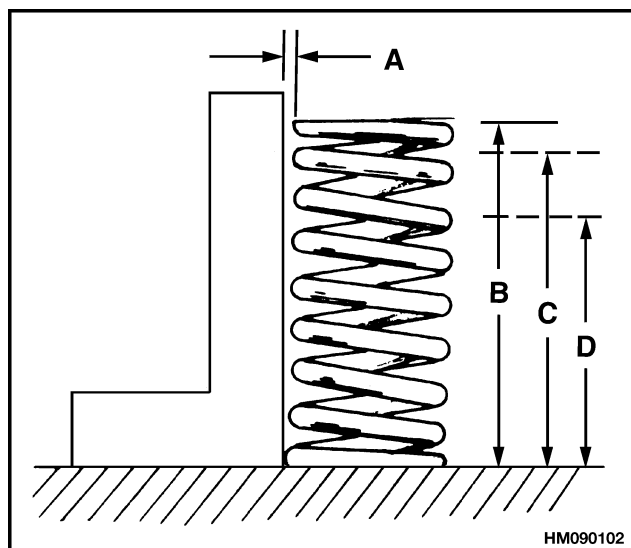
VALVE SPRINGS

Measure length of valve springs. The correct length is 51.6 mm (2.03 in.).

Use a special tool to check tension of valve springs. Compress the spring to correct height and check tension. For correct specifications, see Figure 18. Replace valve springs that are not within specifications.

⚠ WARNING

Be careful when testing the valve springs. These springs can come loose with enough force to cause an injury. Always use equipment that was designed to test springs. Always wear eye and face protection while testing valve springs.



NOTE: THIS LIST IS FOR 4.3L GASOLINE ENGINES.

- A. VARIATION FROM VERTICAL: LESS THAN 1.6 mm (0.063 in.)
- B. FREE LENGTH: 51.3 mm (2.02 in.)
- C. SPRING COMPRESSED TO 338 TO 374 N (76 TO 84 lbf) AT 43.2 mm (1.70 in.) CLOSED SPRING COMPRESSED TO 832 TO 903 N (187 TO 203 lbf) AT 32.3 mm (1.27 in.) OPEN
- D. INSTALLED HEIGHT INTAKE: 42.92 TO 43.43 mm (1.670 TO 1.700 in.) EXHAUST: 42.92 TO 43.43 mm (1.670 TO 1.700 in.)

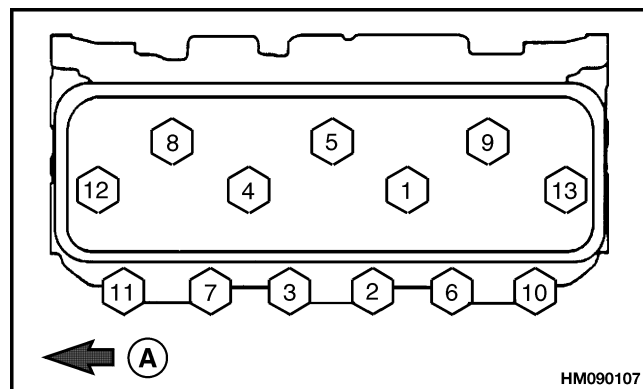
NOTE: THIS LIST IS FOR 4.3L LPG ENGINES.

- A. VARIATION FROM VERTICAL: LESS THAN 1.6 mm (0.063 in.)
- B. FREE LENGTH: 50 mm (2.0 in.)
- C. SPRING COMPRESSED TO 265 N (59.5 lbf) AT 43.2 mm (1.70 in.) CLOSED SPRING COMPRESSED TO 718 N (161.5 lbf) AT 32.3 mm (1.27 in.) OPEN
- D. INSTALLED HEIGHT INTAKE: 42.92 TO 43.43 mm (1.670 TO 1.700 in.) EXHAUST: 42.92 TO 43.43 mm (1.670 TO 1.700 in.)

Figure 18. Valve Spring Specifications

ASSEMBLE AND INSTALL

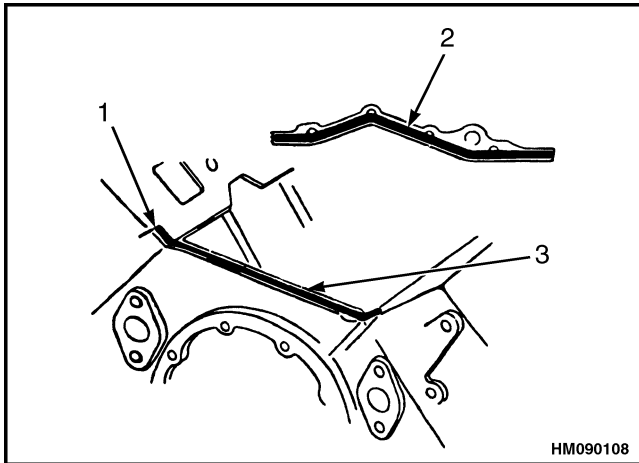
1. Install each valve in correct port. Install oil seal in lower groove. Install shim, damper, spring, shield, and cap or rotator. Using a spring compressor, compress assembly and install retainers. Measure height of valve spring as shown in Figure 18. Measure from top of shim to top of retainer cap. Install shims to get correct height shown in Figure 18. The installed height of valve spring must not be less than minimum height.
2. Clean surface of cylinder head and top of cylinder block. Make sure threads in block are clean. If threads are not clean, use a thread chaser to clean threads.
3. Install cylinder head gasket and cylinder head. Make sure cylinder head is aligned with pins in block.
4. Use sealant Hyster P/N 1451215 on threads of capscrews for cylinder head. Install capscrews as follows:
 - a. Tighten all capscrews to 30 N•m (22 lbf ft). Use sequence shown in Figure 19.
 - b. Tighten capscrews 11, 7, 3, 2, 6, 10 an additional 55 degrees. Tighten capscrews 12 and 13 an additional 65 degrees. Tighten capscrews 1, 4, 8, 5, 9 an additional 75 degrees.



A. FAN END

Figure 19. Cylinder Head Tightening Sequence

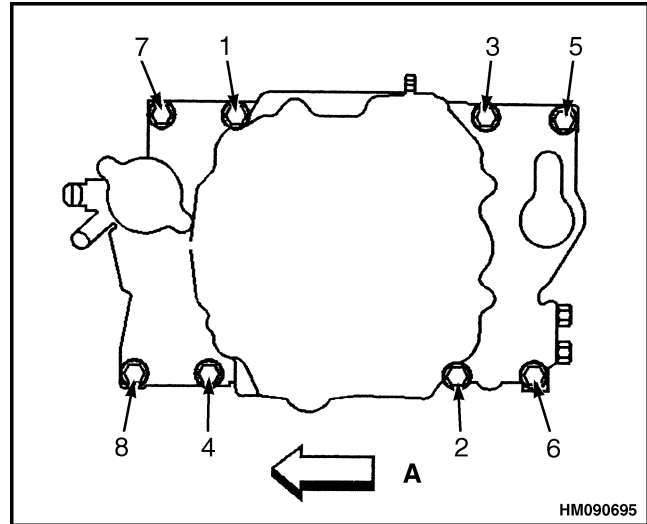
5. Apply RTV sealant (Hyster P/N 280472) to front and rear surfaces between intake manifold and engine block. See Figure 20. The bead of sealant must be 5 mm (0.2 in.) thick and extend up sides of heads 13 mm (0.5 in.) to seal and retain gaskets.



1. EXTEND BEAD 13 mm (0.5 in.) UP HEADS (FRONT AND REAR).
2. REAR
3. FRONT

Figure 20. Intake Manifold Sealant Locations

6. Install gaskets and intake manifold. Tighten capscrews in sequence shown in Figure 21. Tighten capscrews on first pass to 3 N•m (27 lbf in). Tighten capscrews on second pass to 12 N•m (106 lbf in). Tighten capscrews on final pass to 15 N•m (133 lbf in).



A. FAN END

Figure 21. Intake Manifold Tightening Sequence

7. Install valve push rods. See Figure 22.

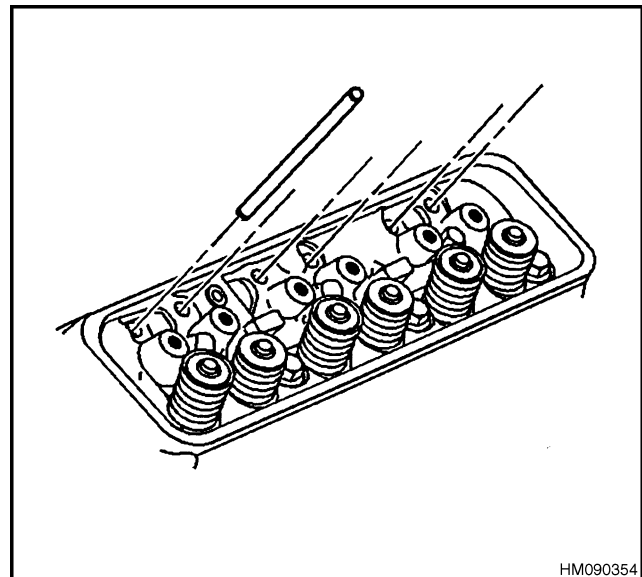


Figure 22. Install Valve Push Rod

**CAUTION**

Be sure that the arrow on the valve rocker arm support is in the up position. See Figure 23.

8. Install valve rocker arm supports.

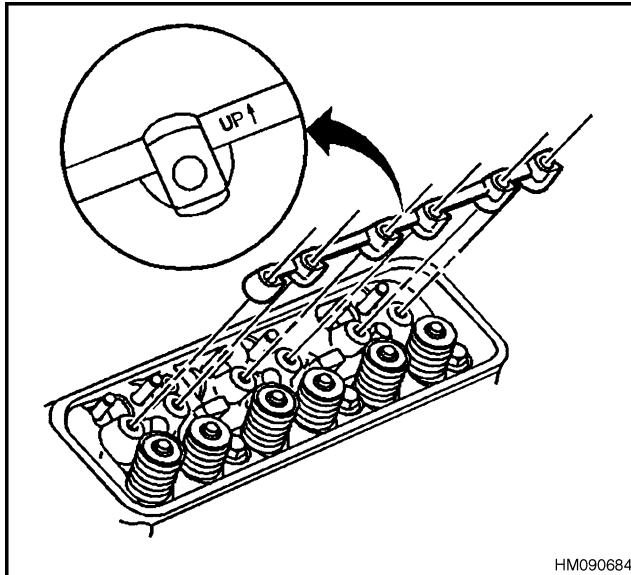
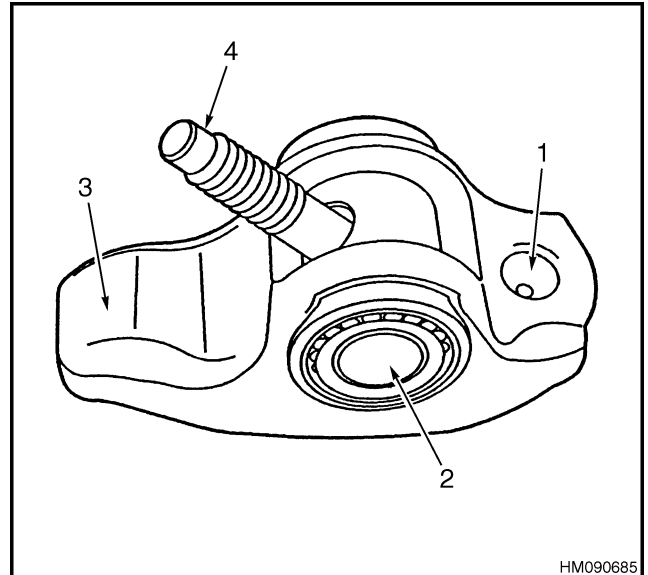


Figure 23. Install Valve Rocker Arm Supports

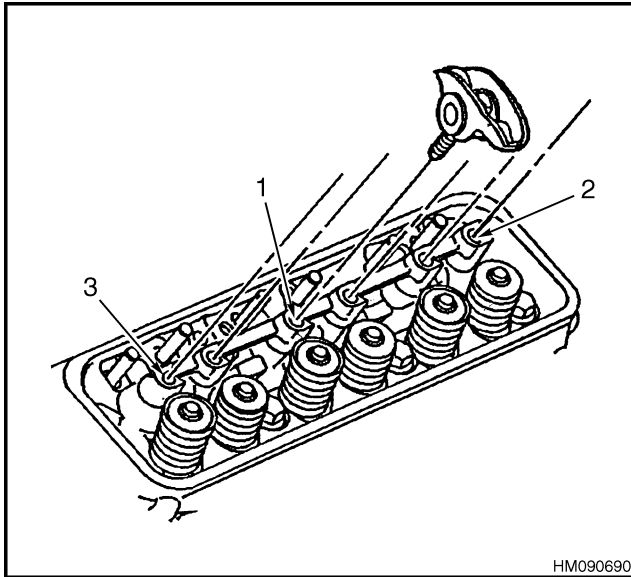
9. Apply a molybdenum grease or equivalent to following valve rocker arm contact surfaces: See Figure 24.
- Valve push rod socket
 - Roller pivot
 - Valve stem tip



1. VALVE PUSH ROD SOCKET
2. ROLLER PIVOT
3. VALVE STEM TIP
4. ROCKER ARM BOLT

Figure 24. Lubricate Valve Rocker Arm Surfaces

10. See Figure 25. Install valve rocker arm assemblies as follows:
- a. Finger start rocker arm bolt at location 1 in Figure 25.
 - b. Finger start rocker arm bolt at location 2 in Figure 25.
 - c. Finger start rocker arm bolt at location 3 in Figure 25.
 - d. Finger start remaining three valve rocker arm bolts.

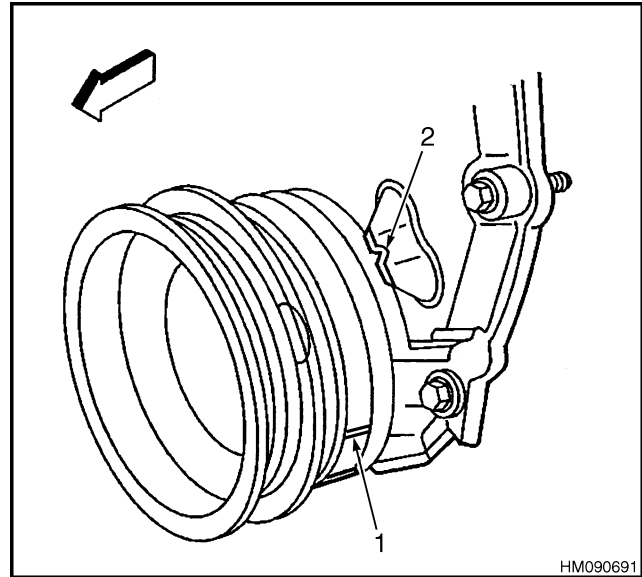


1. BOLT AT LOCATION 1
2. BOLT AT LOCATION 2
3. BOLT AT LOCATION 3

Figure 25. Install Valve Rocker Arm Assemblies

11. Rotate crankshaft balancer to position crankshaft balancer alignment mark 57 to 63 degrees clockwise or counterclockwise from engine front cover alignment tab. See Figure 26.

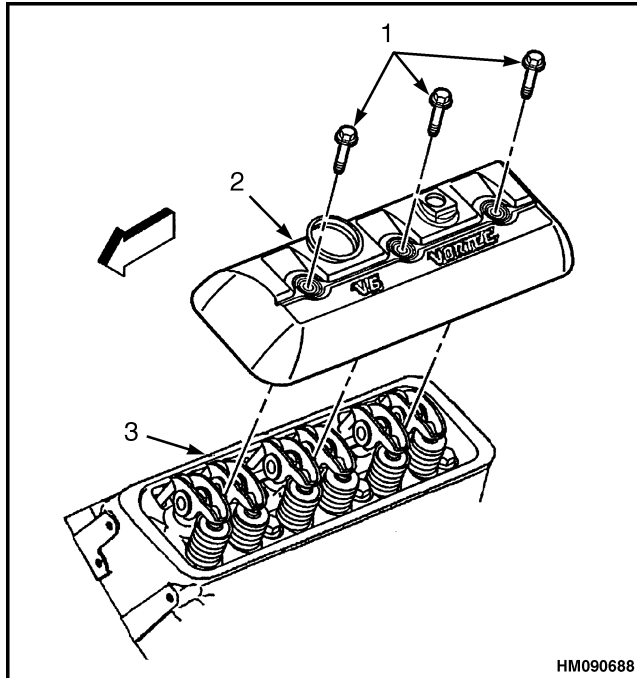
NOTE: Once valve rocker arm assemblies are installed and properly torqued, no additional valve lash adjustment is required.



1. CRANKSHAFT BALANCER ALIGNMENT MARK
2. ENGINE FRONT COVER ALIGNMENT TAB

Figure 26. Rotate Crankshaft Balancer

12. Tighten valve rocker arm bolts to 30 N·m (22 lbf ft). See Figure 24.
13. Use new gasket and install valve covers. Install new grommets on capscrews and install capscrews into valve covers. Tighten capscrews to 12 N·m (107 lbf in). See Figure 27.



- | | |
|-----------------|------------------|
| 1. CAPSCREW | 3. CYLINDER HEAD |
| 2. ROCKER COVER | |

Figure 27. Valve Cover Installation

14. Install spark plugs.
15. Install throttle body, air cleaner, and distributor. Install brackets for drive belt tensioner and alternator. Install drive belt(s).
16. Install exhaust manifolds. Tighten capscrews in two steps; first to 15 N•m (133 lbf in), then to 31 N•m (274 lbf in). If used, bend lock tabs against heads of capscrews.
17. Install coolant hose to housing for thermostat and tighten hose clamp. Fill coolant system with coolant. See **Periodic Maintenance** for your lift truck.

Engine Block Cleaning and Inspection

CLEAN AND INSPECT



CAUTION

To prevent possible gouging of the engine block surfaces, use care when removing gasket and sealing material.

1. Clean all remaining sealing or gasket material from sealing surfaces.



WARNING

Cleaning solvents can be flammable and toxic and can cause skin irritation. When using cleaning solvents, always follow the solvent manufacturer's recommended safety procedures.

2. Clean engine block with solvent.
3. Flush engine block with water or steam.



CAUTION

Clean all, debris and coolant from the engine block cylinder head bolt holes. Failure to do so may result in damaged threads, improperly tightened fasteners or damage to components.

4. Clean following engine block components:
 - Cylinder bores
 - Oil galleries and oil passages
 - Scale and deposits from coolant passages
 - Engine block cylinder head bolt holes.

5. After cleaning engine block, spray or wipe cylinder bores and machined surfaces with clean engine oil.

6. Inspect following areas, see Figure 28:

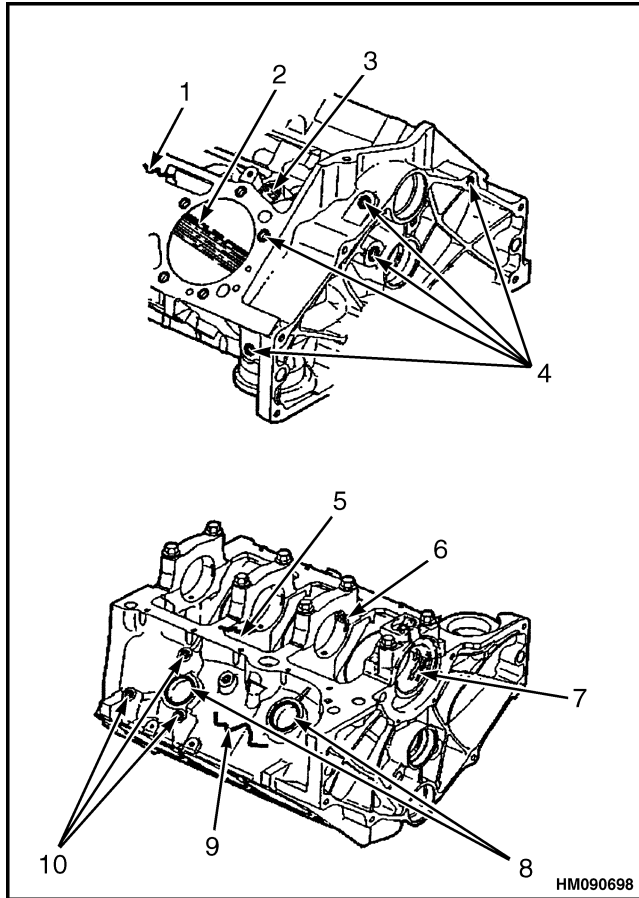
- Coolant jackets for cracks.
- Cylinder bores for scratches or gouging.
- Valve lifter bores for excessive scoring or wear.
- Threaded holes for damage
- Crankshaft bearing webs for cracks
- Crankshaft bearing caps and bores for damage

Crankshaft bearing bores should be round and uniform when measuring inside diameter (ID).

The surface where crankshaft bearings contact crankshaft bearing bore should be smooth.

If a crankshaft bearing cap is damaged and requires replacement, replace bearing cap first, then rebore engine block crankshaft bearing bores and check for proper alignment. Finally, check crankshaft for proper clearances.

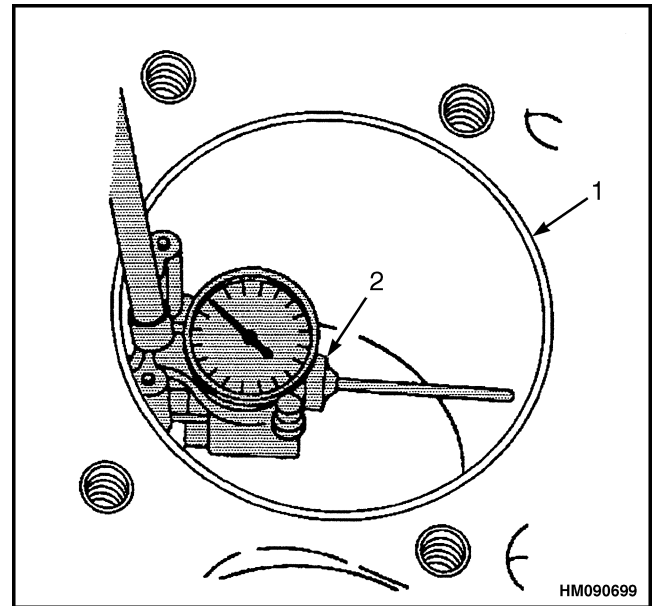
- Engine block core hole plug for damage
- Engine block for cracks for damage
- Engine mount bosses for damage



- 1. COOLANT JACKET
- 2. CYLINDER BORE
- 3. VALVE LIFTER BORES
- 4. THREADED HOLES
- 5. CRANKSHAFT BEARING WEBS
- 6. CRANKSHAFT BEARING CAPS
- 7. CRANKSHAFT BEARING BORES
- 8. ENGINE BLOCK HOLE PLUG BORE
- 9. ENGINE BLOCK
- 10. ENGINE MOUNT BOSSES

Figure 28. Engine Block Inspection

- 7. Measure cylinder bores for taper and out-of-round. See Figure 29.



- 1. PISTON CYLINDER BORE
- 2. BORE MEASURING DEVICE

Figure 29. Cylinder Bore Taper and Out-of-Round Inspection

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Want to get more information,
Please click here, Then get the complete
manual**

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