6076
Engines

Serial Number (—499999)

Deere Power Systems Group
CTM6 (17MAR97)
LITHO IN U.S.A.
ENGLISH

Introduction

FOREWORD

This manual is written for an experienced technician. Essential tools required in performing certain service work are identified in this manual and are recommended for use.

Live with safety: Read the safety messages in the introduction of this manual and the cautions presented throughout the text of the manual.

This is the safety-alert symbol. When you see this symbol on the machine or in this manual, be alert to the potential for personal injury.

Use this component technical manual in conjunction with the machine technical manual. An application listing identifies product-model/component type-model relationship. See the machine technical manual for information on component removal and installation, and gaining access to the components.

This manual is divided in two parts: repair and diagnostics. Repair sections contain necessary instructions to repair the component. Diagnostic sections help you identify the majority of routine failures quickly.

Information is organized in groups for the various components requiring service instruction. At the beginning of each group are summary listings of all applicable essential tools, service equipment and tools, other materials needed to do the job, service parts kits, specifications, wear tolerances, and torques.

Binders, binder labels, and tab sets can be ordered by John Deere dealers direct from the John Deere Distribution Service Center.

This manual is part of a total product support program.

FOS MANUALS—REFERENCE

TECHNICAL MANUALS—MACHINE SERVICE

COMPONENT MANUALS—COMPONENT SERVICE

Fundamentals of Service (FOS) Manuals cover basic theory of operation, fundamentals of troubleshooting, general maintenance, and basic type of failures and their causes. FOS Manuals are for training new personnel and for reference by experienced technicians.

Technical Manuals are concise guides for specific machines. Technical manuals are on-the-job guides containing only the vital information needed for diagnosis, analysis, testing, and repair.

Component Technical Manuals are concise service guides for specific components. Component technical manuals are written as stand-alone manuals covering multiple machine applications.

MANUAL ORGANIZATION

Group 00—Introduction and Safety Information
Group 01—General Information
Group 02—Fuels, Lubricants and Coolant
Group 03—Engine Mounting
Group 04—Engine Rebuild Guide
Group 05—Cylinder Head and Valves
Group 10—Cylinder Block, Liners, Pistons and Rods
Group 15—Crankshaft, Main Bearings, and Flywheel
Group 16—Camshaft and Timing Gear Train
Group 20—Lubrication System
Group 25—Cooling System
Group 30—Air Intake and Exhaust System
Group 35—Fuel System
Group 100—Tune-Up
Group 105—Engine System Operation and Test
Group 110—Air Intake System Operation and Test
Group 115—Fuel System Operation and Tests
Group 199—Dealer Fabricated Tools

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All information, illustrations and specifications in this manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

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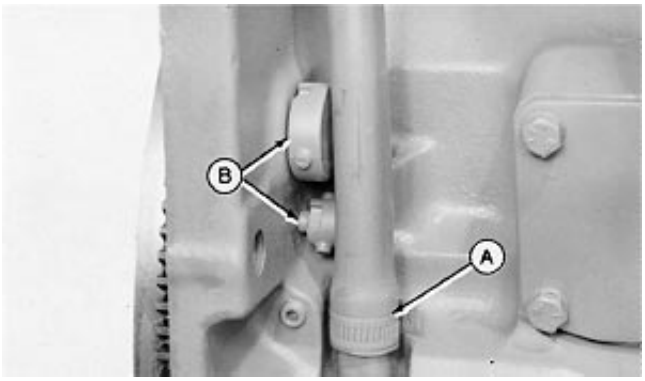
CHECK AND ADJUST VALVE CLEARANCE



Too little valve clearance throws valves out of time. Valves open too early and close too late. This causes the valves to overheat due to hot combustion gases rushing past valves when out of time. Overheating lengthens valve stems which prevents proper seating of valves. The valves seat so briefly or poorly that normal heat transfer into the cooling system does not have time to take place, causing burned valves and low power.

Too much valve clearance causes a lag in valve timing causing engine valve train imbalance. The fuel-air mixture enters the cylinders late during intake stroke. The exhaust valve closes early and prevents waste gases from being completely removed from cylinders. Also, the valves close with a great deal of impact, which may crack or break the valves and scuff the camshaft and followers.

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CAUTION: To prevent accidental starting of engine while performing valve adjustments, always disconnect (-) negative battery terminal.

NOTE: Valve clearance can be checked with engine cold or warm.

1. Remove rocker arm cover with ventilator tube (A).

2. Remove plastic plugs (B).

IMPORTANT: Visually inspect contact surfaces of valve tips or wear caps and rocker arm wear pads. Check all parts for excessive wear, breakage, or cracks. Replace parts that show visible damage.

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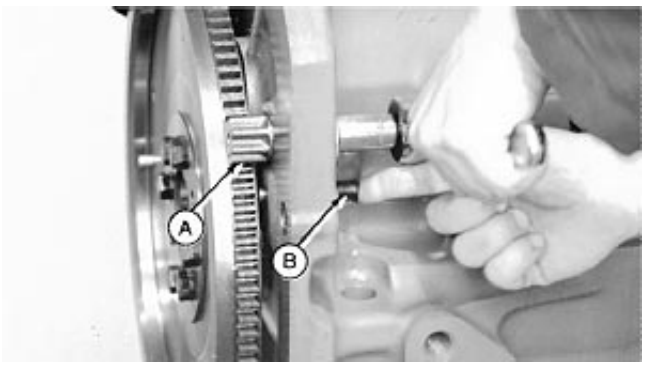
3. Rotate engine with the JDE81-1 Flywheel Turning Tool (A) until JDE81-4 Timing Pin (B) engages timing hole in flywheel.

If the rocker arms for No. 1 cylinder are loose, the engine is at No. 1 “TDC-Compression.” If the rocker arms for No. 6 cylinder are loose, the engine is at No. 6 “TDC-Compression.” Rotate the engine one full revolution to No. 1 “TDC-Compression.”



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4. With engine lock-pinned at “TDC” of No. 1 piston’s compression stroke, check and adjust (as needed) valve clearance on Nos. 1, 3 and 5 exhaust valves and Nos. 1, 2 and 4 intake valves.

VALVE CLEARANCE SPECIFICATIONS

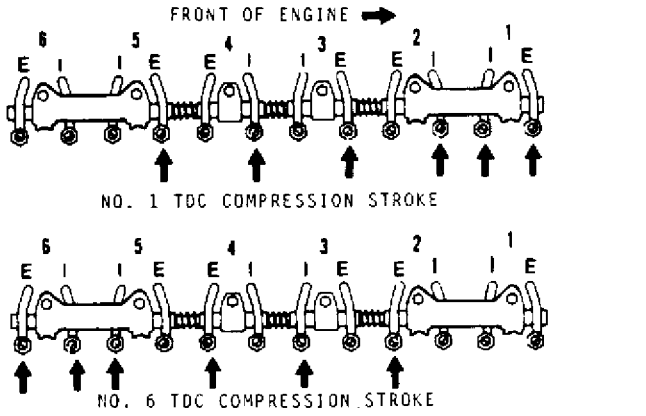
Intake Valves	0.38 mm (0.015 in.)
Exhaust Valves	0.51 mm (0.020 in.)

5. If valve clearance needs to be adjusted, loosen the locknut on rocker arm adjusting screw. Turn adjusting screw until feeler gauge slips with a slight drag. Hold the adjusting screw from turning with screwdriver and tighten locknut to 27 N·m (20 lb-ft). Recheck clearance again after tightening locknut. Readjust clearance as necessary.

6. Rotate flywheel 360˚ until No. 6 piston is at “TDC” of its compression stroke. Rocker arms for No. 6 piston should be loose.

7. Check and adjust (as needed) valve clearance to the same specifications on Nos. 2, 4 and 6 exhaust and Nos. 3, 5, and 6 intake valves. Tighten valve adjusting screw locknut to 27 N·m (20 lb-ft).

8. Recheck clearance on all valves again after locknut is tightened.



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CHECK VALVE LIFT

NOTE: Measuring valve lift can give an indication of wear on camshaft lobes and cam followers or bent push rods.

1. Remove rocker arm cover and loosen locknut on rocker arm. Set valve clearance at 0.00 mm (in.). Tighten locknut.

2. Put dial indicator tip on valve rotator. Be sure that valve is fully closed.

3. Check pre-set on dial indicator. Set dial indicator pointer at zero.

4. Manually turn engine in running direction, using the engine rotation tools previously mentioned for checking valve clearance.

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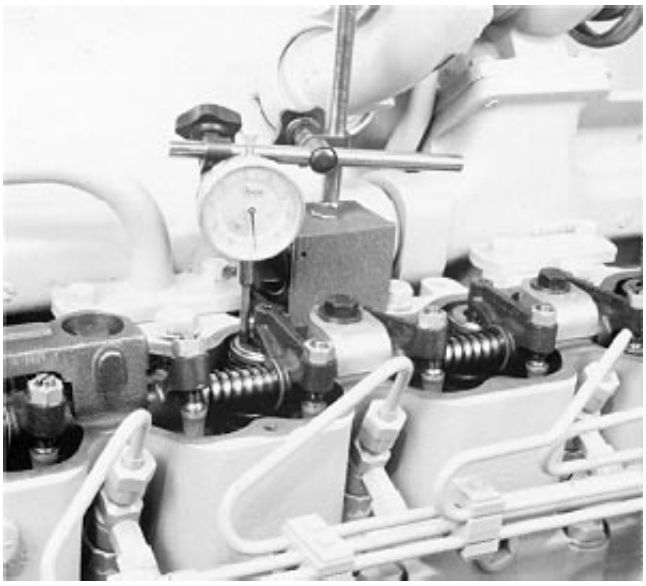
5. After rocker arm contacts valve wear cap, observe dial indicator reading as valve is moved to fully open position.



VALVE LIFT SPECIFICATION AT 0.00 MM (IN.) CLEARANCE

Engine Ser. No. (—121169)
Intake . . . . . 14.05—14.48 mm (0.553—0.570 in.)
Minimum Acceptable . . . . . 13.16 mm (0.518 in.)
Exhaust . . . . . 15.88—16.31 mm (0.625—0.642 in.)
Minimum Acceptable . . . . . 14.99 mm (0.590 in.)

Engine Ser. No. (121170—) and converted 644E Loaders
Intake . . . . . 13.39—13.84 mm (0.527—0.545 in.)
Minimum Acceptable . . . . . 12.50 mm (0.492 in.)
Exhaust . . . . . 14.38—14.84 mm (0.566—0.584 in.)
Minimum Acceptable . . . . . 13.49 mm (0.531 in.)

6. Adjust valve clearance to specification as outlined earlier in this group after measuring lift. (See CHECK AND ADJUST VALVE CLEARANCE.)

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DISCONNECT TURBOCHARGER OIL INLET LINE

1. Drain all engine oil and coolant, if not previously done.

IMPORTANT: When servicing 6076 Engines on a rollover stand, disconnect turbocharger oil inlet line (A) from oil filter housing or turbocharger before rolling engine over. Failure to do so may cause a hydraulic lock upon starting engine. Hydraulic lock may cause possible engine failure.

Hydraulic lock occurs when trapped oil in the oil filter housing drains through the turbocharger, the exhaust and intake manifolds, and then into the cylinder head.

After starting the engine, the trapped oil in the manifold and head is released into the cylinder(s) filling them with oil causing hydraulic lock and possible engine failure.

2. Disconnect turbocharger oil inlet line at oil filter housing or turbocharger.

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REMOVE CYLINDER HEAD

It is not necessary to remove engine from machine to service cylinder head on all applications. Refer to your Machine Technical Manual for engine removal procedure, if required.

CAUTION: After operating engine, allow exhaust system to cool before removal.

DO NOT drain coolant until the coolant temperature is below operating temperature. Always loosen drain valve slowly to relieve any excess pressure.

1. Drain engine coolant.

2. Remove water manifold (A) and all coolant piping. (See Cooling System, Group 25.)

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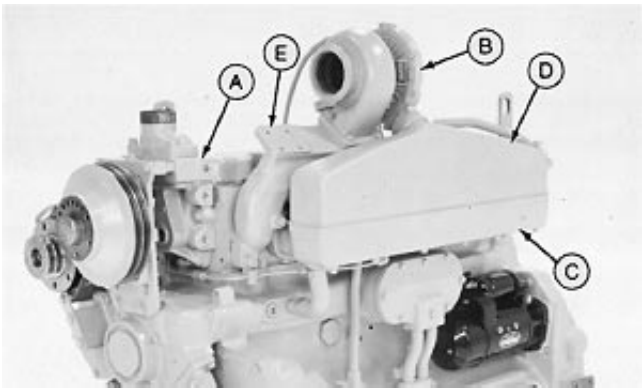
3. Remove turbocharger (B) and exhaust elbow. (See Air Intake and Exhaust System, Group 30.)

4. On 6076A Engines, remove aftercooler assembly (D). (Group 30.)

5. Remove air intake manifold (C). (Group 30.)

6. Remove exhaust manifold (E). (Group 30.)



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A—Water Manifold
B—Turbocharger
C—Intake Manifold
D—Aftercooler Assembly
E—Exhaust Manifold

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7. Remove fuel injection lines (A) and nozzles (B). (See Fuel System, Group 35.)

8. Remove rocker arm cover (C) and ventilator outlet hose assembly.

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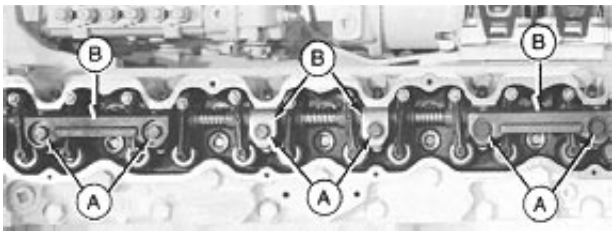
9. Remove six cap screws (A) and remove all four clamps (B). Lift rocker arm assembly up and remove.



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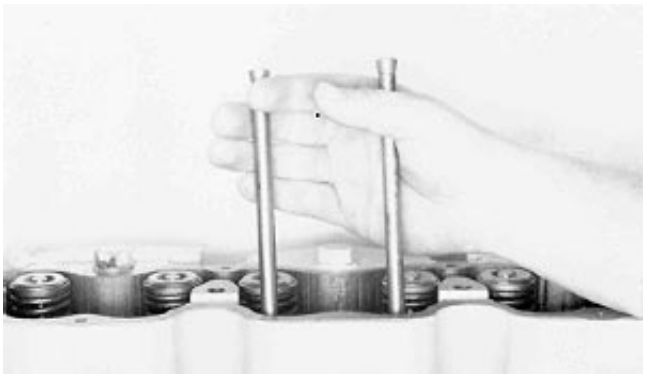
10. Remove all 12 push rods and identify for reassembly.

NOTE: Clean and inspect push rods as explained later in this group.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11. Remove all 26 cylinder head cap screws.

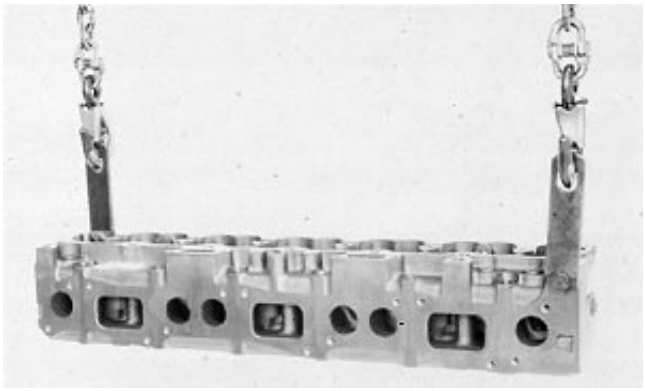
NOTE: If desired, check and record each cylinder head cap screw torque before removing.

IMPORTANT: DO NOT use screwdrivers or pry bars between cylinder block and cylinder head to loosen head-to-block gasket seal.

Lift cylinder head from block. If cylinder head sticks, use a soft hammer to tap the cylinder head.

12. Remove cylinder head gasket. Inspect possible oil, coolant, or combustion chamber leaks. Also, check for evidence of incorrect or defective head gasket being used.

NOTE: Do not rotate crankshaft with cylinder head removed unless all cylinder liners are secured with cap screws and large flat washers as described later in this group.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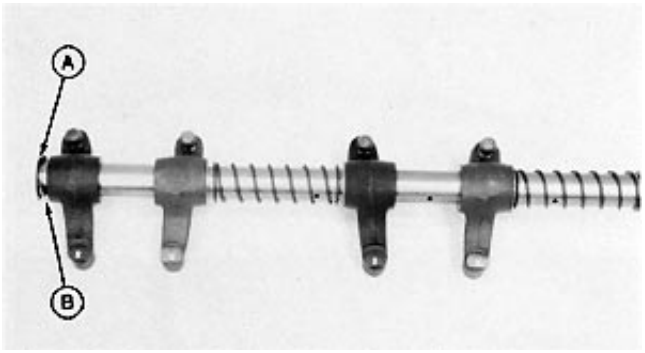
DISASSEMBLE AND INSPECT ROCKER ARM SHAFT ASSEMBLY

NOTE: Make preliminary inspection during disassembly. Look for:
—Worn or scored rocker arms, shaft, and shaft support.
—Weak or broken springs
—Lube oil restriction

1. Remove plugs (A) and washers (B) from ends of rocker arm shaft.

2. Slide springs, rocker arms, and rocker arm supports off rocker arm shaft identifying their parts for reassembly in the same sequence they were in before disassembly.



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3. Inspect rocker arm shaft (A) for severe scratching, scoring, or excessive wear at points of rocker arm contact. Measure rocker arm and shaft. Compare with specifications given below.

NOTE: Wear could indicate weak valve springs, bent push rods, or loose rocker arm shaft clamps.

ROCKER ARM ASSEMBLY SPECIFICATIONS

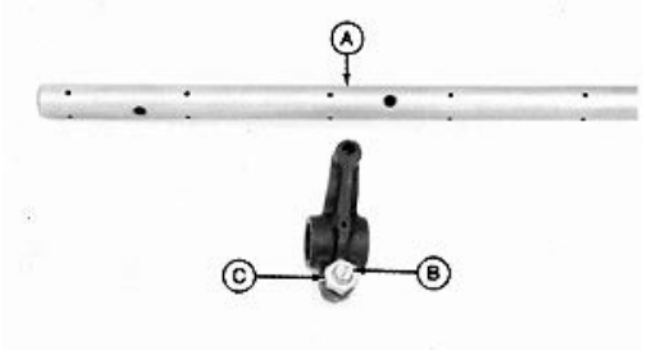
Rocker Arm I.D. . . . . 19.07—19.10 mm (0.7507—0.7520 in.)

Rocker Arm Shaft O.D . . . . . 19.01—19.05 mm (0.7484—0.7500 in.)

4. Check rocker arm adjusting nut (C) and screw (B) for damage. Visually inspect rocker arm for hairline cracks. Replace if necessary.

NOTE: Be sure all oil holes in rocker arm shaft are clean and open.

5. Clean all rocker arm parts with clean solvent. Dry with compressed air.



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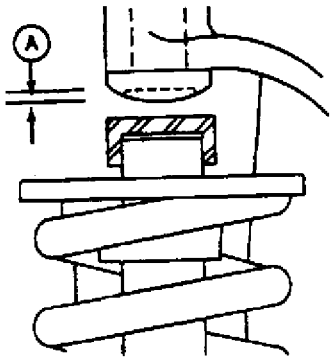
6. Check for cups or concave wear (A) on ends of rocker arms where they contact wear caps.

7. Examine spacer springs on shaft between rocker arms. Be sure they are strong enough to exert a positive pressure on rocker arms.

NOTE: If the rocker arm has been damaged by a valve failure, replace it and the push rods when replacing valves.

8. Roll rocker arm shaft and push rods on a flat surface to check for bends or distortion. Replace parts as necessary.



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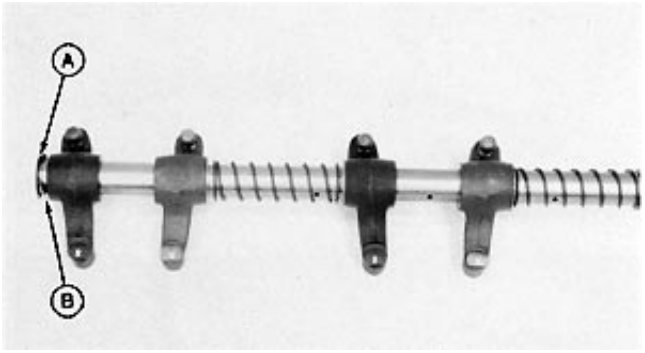
9. Assemble parts on rocker arm shaft opposite removal procedure.

Make sure rocker arm shaft end plugs (A) are firmly seated against end of shaft, and washers (B) are installed on shaft.



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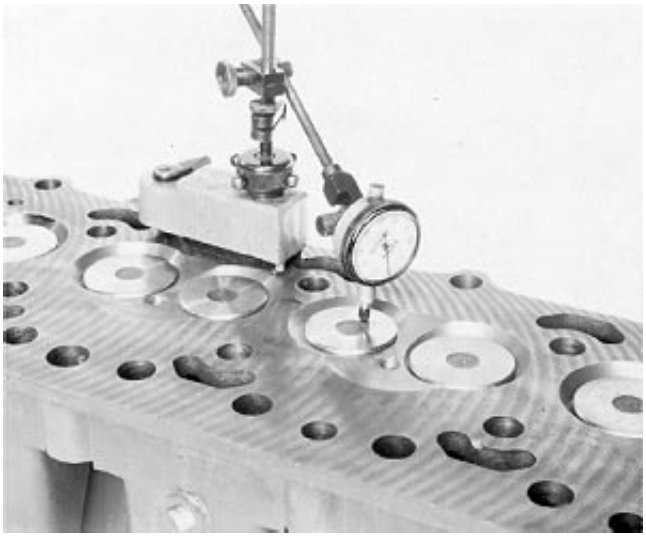
MEASURE VALVE RECESS

1. Measure and record valve recess dimensions for all valves using a magnetic base dial indicator.

VALVE RECESS SPECIFICATIONS

Valve Recess Below Cylinder Head:	
Exhaust	1.19—1.70 mm (0.047—0.067 in.)
—Maximum Recess	2.46 mm (0.097 in.)
Intake	3.35—3.86 mm (0.132—0.152 in.)
—Maximum Recess	4.62 mm (0.182 in.)

NOTE: If measurement does not meet specifications, install either new valves or inserts, or both to obtain proper valve height. (See REPLACE VALVE SEAT INSERTS, later in this group.)



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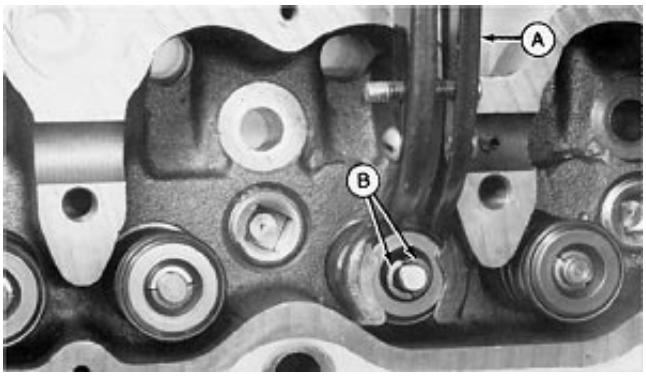
REMOVE VALVE ASSEMBLY

NOTE: Refer to DIAGNOSING MALFUNCTIONS, earlier in this group.

1. Compress valve spring compressor (A) over valve.
2. Remove retaining locks (B).
3. Remove valve spring compressor.



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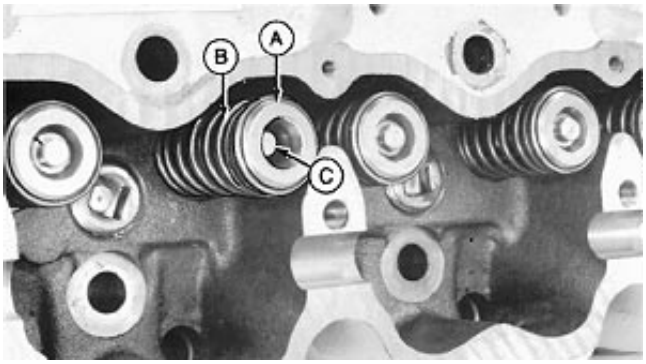
IMPORTANT: Permanently mark top or bottom of valve springs to assure correct reassembly. Early valve springs have a top and bottom, and must be installed in correct manner. Valve springs after Engine Serial No. (129679—) may be installed either way. Do not mix valve spring within a given engine.

4. Remove valve rotators (A) and valve springs (B).
5. Remove exhaust valve stem shields, if equipped.
6. Remove valves (C) from cylinder head.

NOTE: Identify all parts for correct reassembly.



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INSPECT AND MEASURE VALVE SPRINGS


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1. Inspect valve springs for alignment, wear and damage.

2. Put springs on a flat surface to see that they are square and parallel.

3. Check valve spring tension using D01168AA Spring Compression Tester.


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NOTE: Free spring length of 65 mm (2.56 in.) springs differ slightly, but compressed height must be within specification.

VALVE SPRING SPECIFICATIONS

Compression	**Height**
Engine Serial No. (—129678)	
Intake:	
Open: 719—789 N (162—177 lb-force)	38.1 mm (1.50 in.)
Closed: 353—407 N (79—91 lb-force)	52.5 mm (2.07 in.
Exhaust:	
Open: 709—779 N (159—175 lb-force)	38.5 mm (1.52 in.)
Closed: 301—355 N (68—80 lb-force)	54.5 mm (2.15 in.)
Engine Serial No. (129679—)	
Intake:	
Open: 815—880 N (183—198 lb-force)	38.1 mm (1.50 in.)
Closed: 345—399 N (78—90 lb-force)	52.5 mm (2.07 in.)
Exhaust:	
Open: 797—867 N (179—195 lb-force)	38.5 mm (1.52 in.)
Closed: 284—338 N (64—76 lb-force)	54.5 mm (2.15 in.)

IMPORTANT: Do not mix early production springs with current production springs within a given engine.

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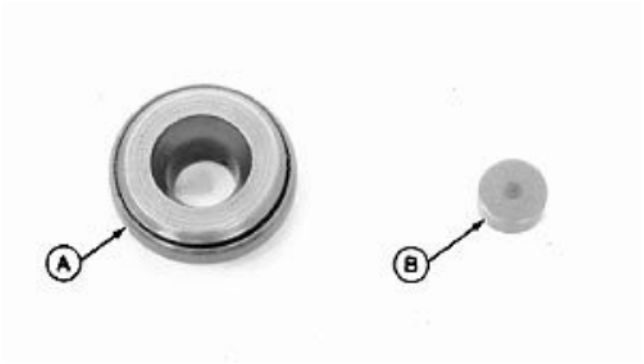
INSPECT VALVE ROTATORS AND WEAR CAPS



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1. Insure that valve rotators (A), if equipped, will turn freely. Replace if defective.

2. Replace valve wear caps (B) if pitted or worn.

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CLEAN VALVES

1. Hold each valve firmly against a soft wire wheel on a bench grinder.

2. Make sure all carbon is removed from valve head, face and unplated portion of stem.

IMPORTANT: Any carbon left on the stem will affect alignment in valve refacer if valves need to be refaced. Do not use wire wheel on plated portion of valve stem.

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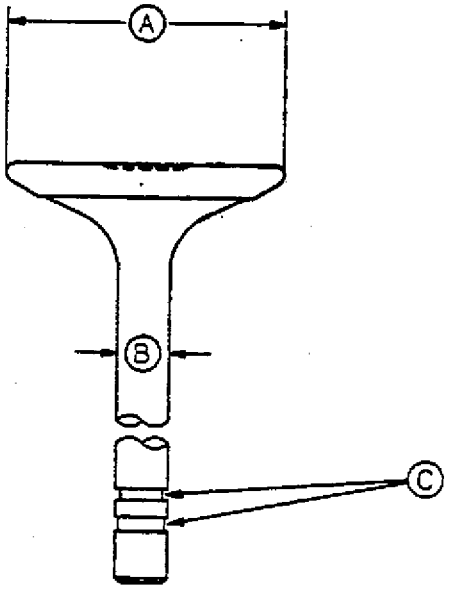
INSPECT AND MEASURE VALVES



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1. Thoroughly clean and inspect valves to help determine if they can be restored to a serviceable condition. Replace valves that are burned, cracked, eroded, or chipped.

NOTE: Early intake valve shown. All exhaust valves and intake valves after Engine Serial No. (106215—) have only one retainer lock groove (C).

2. Inspect valve retainer lock grooves on valve stem for damage. Also inspect stems for signs of scuffing, which may indicate insufficient valve guide-to-valve stem clearance. Replace if defects are evident.

3. Measure valve head OD (A). Compare valve stem OD (B) with guide ID to determine clearance as outlined later in this group.

A—Valve Head OD:
Exhaust . . . . . 46.87—47.13 mm (1.845—1.856 in.)
Intake . . . . . 50.87—51.13 mm (2.003—2.013 in.)

B—Valve Stem OD:
Exhaust . . . . . 9.44—9.46 mm (0.3717—0.3724 in.)
Intake . . . . . 9.46—9.49 mm (0.3724—0.3736 in.)

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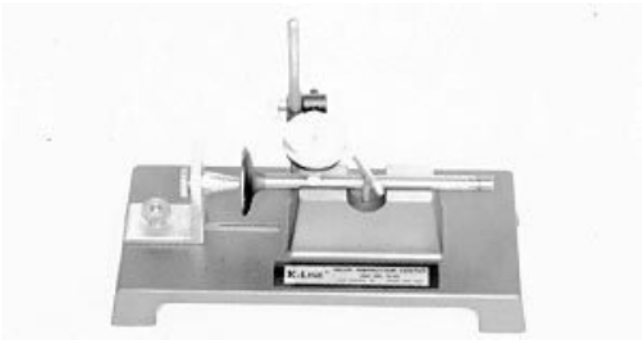
4. Use D05058ST Valve Inspection Center to determine if valve stem or face are out-of-round, bent, or warped.

Maximum permissible runout of
valve face . . . . . 0.05 mm (0.002 in.)



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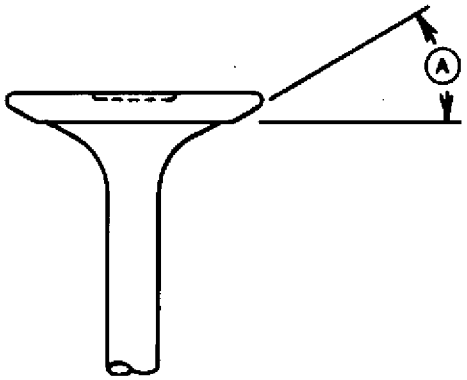
GRIND VALVES

If necessary to resurface, grind valve face to a 29.25° ± 0.25° angle (A).

IMPORTANT: When valve faces are ground, it is important not to nick valve head-to-stem radius with facing stone. A nick could cause the valve to break.

Break all sharp edges after grinding.



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INSPECT AND CLEAN CYLINDER HEAD

Inspect all cylinder head passages for restrictions. Heads with restricted or clogged passages can be cleaned by soaking them in a tank of hot caustic solution.

Scrape all old gasket material from head. Use a powered wire brush to clean sealing surfaces.

If cylinder head is not put in a chemical hot tank for cleaning, clean with solvent and a brush. Dry with compressed air and be sure to blow out all passages.

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