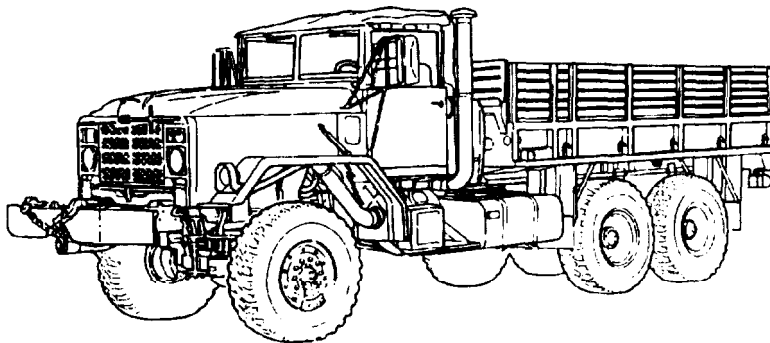


ARMY TM 9-2320-272-24-4 AIR FORCE TO 36A12- 1 C- 1155-2-4

This publication supersedes TM 9-2320-272-20- 1, October 1985, and changes 1 through 4; TM 9-2320-272-20-2, October 1985, and changes through 3; 9-2320-272-34-1, 1986, changes through TM 9-2320-272-34-2, June 1986, and changes 1 and 2; and TM 9-2320-358-24&P, October 1992.

TECHNICAL MANUAL VOLUME 4 OF 4 UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL FOR TRUCK, 5-TON, 6X6, M939, M939A1, M939A2 SERIES TRUCKS (DIESEL)



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TRUCK, CARGO: 5-TON, 6X6, DROPSIDE,

M923 (2320-01-050-2084) (EIC: BRY); M923A1 (2320-01-206-4087) (EIC: BSS); M923A2 (2320-01-230-0307) (EIC: B57); M925 (2320-01-047-8769) (EIC: BRT); M925A1 (2320-01-206-4088) (EIC: BST); M925A2 (2320-01-230-0308) (EIC: BS8);

TRUCK, CARGO: 5-TON, 6X6 XLWB,

M927 (2320-01-047-8771) (EIC: BRV); M927A1 (2320-01-206-4089) (EIC: BSW); M927A2 (2320-01-230-0309) (EIC: BS9); M928 (2320-01-047-8770) (UC: BRU); M928A1 (2320-01-206-4090) (EIC: BSX); M928A2 (2320-01-230-0310) (EIC: BTM);

TRUCK, DUMP: 5-TON, 6X6,

M929 (2320-01-047-8756) (EIC: BTH); M929A1 (2320-01-206-4079) (EIC: BSY); M929A2 (2320-01-230-0305) (EIC: BTN); M930 (2320-01-047-8755) (EIC: BTG); M930A1 (2320-01-206-4080) (EIC: BSZ); M930A2 (2320-01-230-0306) (EIC: BTO);

TRUCK, TRACTOR: 5-TON, 6X6,

M931 (2320-01-047-8753) (EIC: BTE); M931A1 (2320-01-206-4077) (EK: BS2); M931A2 (2320-01-230-0302) (EIC: BTP); M932 (2320-01-047-8752) (EIC: BTD); M932A1 (2320-01-205-2684) (EIC: 855); M932A2 (2320-01-230-0303) (EIC: BTQ);

TRUCK, VAN, EXPANSIBLE: 5-TON, 6X6,

M934 (2320-01-047-8750) (EIC: BTB); M934A1 (2320-01-205-2682) (EIC: BS4); M934A2 (2320-01-230-0300) (EIC: BTR);

TRUCK, MEDIUM WRECKER: 5-TON, 6X6,

M936 (2320-01-047-8754) (EIC: BTF); M936A1 (2320-01-206-4078) (EIC: BS6); M936A2 (2320-01-230-0304) (EIC: BTT).

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DEPARTMENTS OF THE ARMY AND THE AIR FORCE

JUNE 1998

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Washington, D.C., 30 JUNE 1998

TECHNICAL ORDER
NO. 36A12-1C-1155-2-4

TECHNICAL MANUAL
VOLUME 4 OF 4
UNIT, DIRECT SUPPORT, AND
GENERAL SUPPORT MAINTENANCE MANUAL
FOR

TRUCK, 5-TON, 6X6, M939, M939A1, M939A2 SERIES TRUCKS (DIESEL)

TRUCK	MODEL	EIC	NSN WITHOUT WINCH	NSN WITH WINCH
Cargo, Dropside	M923	BRY	2320-01-050-2084	
Cargo, Dropside	M923A1	BSS	2320-01-206-4087	
Cargo, Dropside	M923A2	BS7	2320-01-230-0307	
Cargo, Dropside	M925	BRT		2320-01-047-8769
Cargo, Dropside	M925A1	BST		2320-01-206-4088
Cargo, Dropside	M925A2	BS8		2320-01-230-0308
Cargo	M927	BRV	2320-01-047-8771	
Cargo	M927A1	BSW	2320-01-206-4089	
Cargo	M927A2	BS9	2320-01-230-0309	
Cargo	M928	BRU		2320-01-047-8770
Cargo	M928A1	BSX		2320-01-206-4090
Cargo	M92842	BTM		2320-01-230-0310
Dump	M929	BTH	2320-01-047-8756	
Dump	M929A1	BSY	2320-01-206-4079	
Dump	M929A2	BTN	2320-01-230-0305	
Dump	M930	BTG		2320-01-047-8755
Dump	M930A1	BSZ		2320-01-206-4080
Dump	M930A2	BTO		2320-01-230-0306
Tractor	M931	BTE	2320-01-047-8753	
Tractor	M931A1	BS2	2320-01-206-4077	
Tractor	M931A2	BTP	2320-01-230-0302	
Tractor	M932	BTD		2320-01-047-8752
Tractor	M932A1	BS5		2320-01-205-2684
Tractor	M932A2	BTQ		2320-01-230-0303
Van, Expansible	M934	BTB	2320-01-047-8750	
Van, Expansible	M934A1	BS4	2320-01-205-2682	
Van, Expansible	M934A2	BTR	2320-01-230-0300	
Medium Wrecker	M936	BTF		2320-01-047-8754
Medium Wrecker	M936A1	BS6		2320-01-206-4078
Medium Wrecker	M936A2	BTT		2320-01-230-0304

REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in back of this manual, directly to: Director, Armament and Chemical Acquisition and Logistics Activity, ATTN: AMSTA-AC-NML, Rock Island, IL 61299-7630. A reply will be furnished to you. You may also provide DA Form 2028-2 information via datafax or e-mail:

- E-mail: amsta-ac-nml. @ria-emh2.army.mil
- Fax: DSN 783-0726 or commercial (309) 782-0726

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This publication is published in four volumes. TM 9-2320-272-24-1 contains chapters 1,2, and 3 (through section IX). TM 9-2320-272-24-2 contains chapters 3 (sections X through XVI) and 4 (sections I through III). TM 9-2320-272-24-3 contains chapter 4 (sections IV through XVI). TM 9-2320-272-24-4 contains chapters 5 and 6 and appendices A through H. Volume 1 contains a table of contents for the entire manual. Volumes 1,2, and 3 contain an alphabetical index covering tasks found in their respective volume. Volume 4 contains an alphabetical index covering all tasks found in the entire manual.

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Section I. ENGINE (M939/A1) MAINTENANCE

5-1. GENERAL

5-2. ENGINE (M939/A1) MAINTENANCE INDEX

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5-3. CYLINDER HEAD REPAIR

THIS TASK COVERS:

- | | |
|--|---|
| <p>a. Disassembly</p> <p>b. Cleaning</p> | <p>c. Inspection</p> <p>d. Assembly</p> |
|--|---|

INITIAL SETUP:

APPLICABLE MODELS

M939/AI

SPECIAL TOOLS

Head holding fixture (Appendix E, Item 7)
 Cleaning brush (Appendix E, Item 28)
 Valve guide arbor (Appendix E, Item 153)
 Gauge block (Appendix E, Item 52)
 Crosshead guide puller (Appendix E, Item 106)
 Crosshead guide spacer (Appendix E, Item 33)

TOOLS

General mechanic's tool kit (Appendix E, Item 1)
 Outside micrometer (Appendix E, Item 80)
 Depth micrometer (Appendix E, Item 81)
 Torque wrench (Appendix D, Item 145)
 Soft-faced hammer

MATERIALS/PARTS

Six freeze plugs (Appendix D, Item 133)
 Sixteen half-keepers (Appendix D, Item 253)
 Two O-rings (Appendix D, Item 438)
 Two screw-assembled lockwashers (Appendix D, Item 578)
 Gasket (Appendix D, Item 94)
 Freeze plug (Appendix D, Item 132)
 Two freeze plugs (Appendix D, Item 134)
 Lubricating oil (Appendix C, Item 50)
 Prussian blue (Appendix C, Item 54)
 Sealing compound (Appendix C, Item 61)
 Antiseize tape (Appendix C, Item 72)
 Crocus cloth (Appendix C, Item 20)

PERSONNEL REQUIRED

TWO

REFERENCES (TM)

TM 9-2320-272-24P
 TM 9-247

EQUIPMENT CONDITION

Cylinder head removed (para. 4-12).

GENERAL SAFETY INSTRUCTIONS

When cleaning with compressed air, wear eyeshields and ensure source pressure does not exceed 30 psi (207 kPa).

a. Disassembly

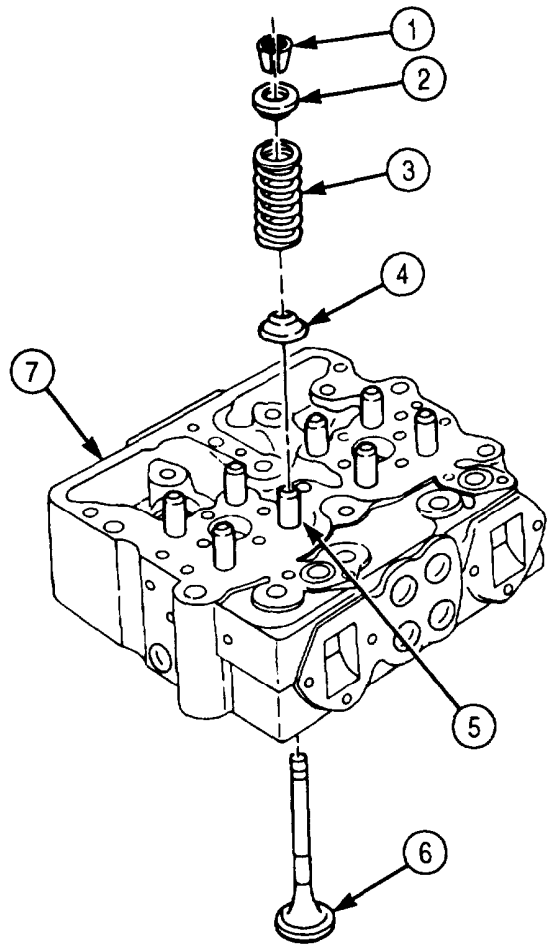
1. Remove sixteen half-keepers (1) from valve springs (3) and cylinder head (7). Discard sixteen half-keepers (1).

NOTE

Tag springs for installation

2. Remove eight upper spring guides (2), valve springs (3), and lower spring guides (4) from valve guide (5) and cylinder head (7).
3. Tap eight valve (6) stems down lightly to loosen and remove from cylinder head (7). Place on numbered valve board and hold for inspection.

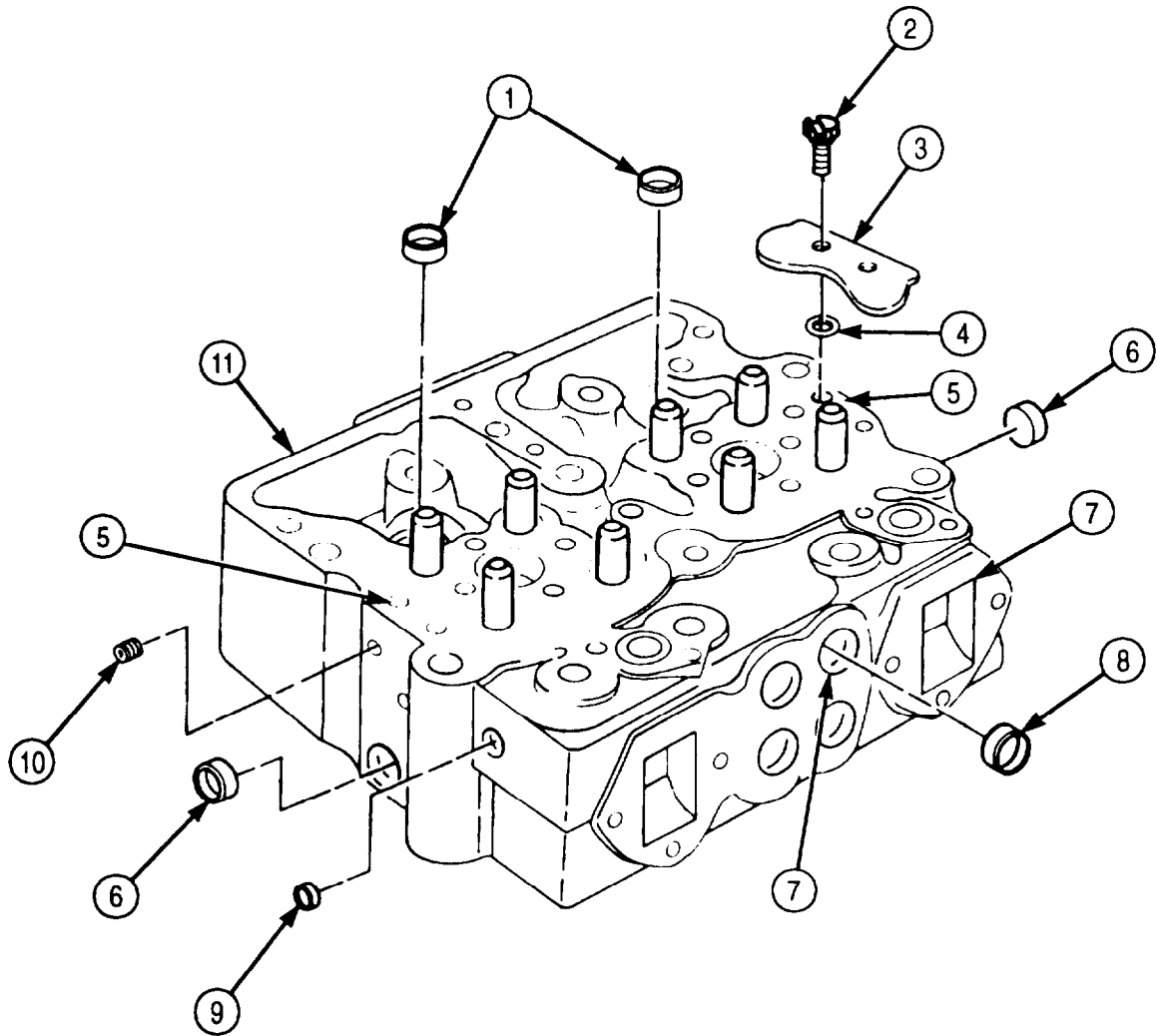
5-3. CYLINDER HEAD REPAIR (Contd)



5-3. CYLINDER HEAD REPAIR (Contd)

4. Remove two screw-assembled lockwashers (2), plate (3), and two O-rings (4) from cylinder head (11) and fuel crossover connection (5). Discard O-rings (4) and screw-assembled lockwashers (2).
5. Remove pipe plugs (10) from front and rear face of cylinder head (11). Hold pipe plugs (10) for installation.
6. Remove four freeze plugs (8) from exhaust ports (17) on cylinder head (11). Discard freeze plugs (8).
7. Remove two freeze plugs (6) from front and rear face of cylinder head (11). Discard freeze plugs (6).
8. Remove two freeze plugs (1) from cylinder head (11). Discard freeze plugs (1).
9. Remove freeze plug (9) from front of cylinder head (11). Discard freeze plug (9).

5-3. CYLINDER HEAD REPAIR (Contd)



5-3. CYLINDER HEAD REPAIR (Contd)

b. Cleaning

Clean all cylinder head (1) components (TM 9-247).

c. Inspection

1. Install four pipe plugs (11) in front and rear face of cylinder head (1).

NOTE

Apply sealing compound to outer diameter of freeze plugs before installation.

2. Install new freeze plug (10) in front face of cylinder head (1).
3. Install two new freeze plugs (2) in cylinder head (1).
4. Install two new freeze plugs (7) in front and rear face of cylinder head (1).
5. Install four new freeze plugs (9) in exhaust ports (8) on cylinder head (1).
6. Install two new O-rings (5), plate (4), and two new screw-assembled lockwashers (3) on fuel crossover connection (6) in cylinder head (1).

CAUTION

Do not use sander to polish cylinder heads. Serious damage to gasket sealing surfaces can result.

7. Clean cylinder head mating surfaces (12) lightly enough to remove all gasket remains and carbon deposits. Inspect in accordance with instructions in para. 5-25.

NOTE

Instructions for use of portable magnetic tester are included with the tester.

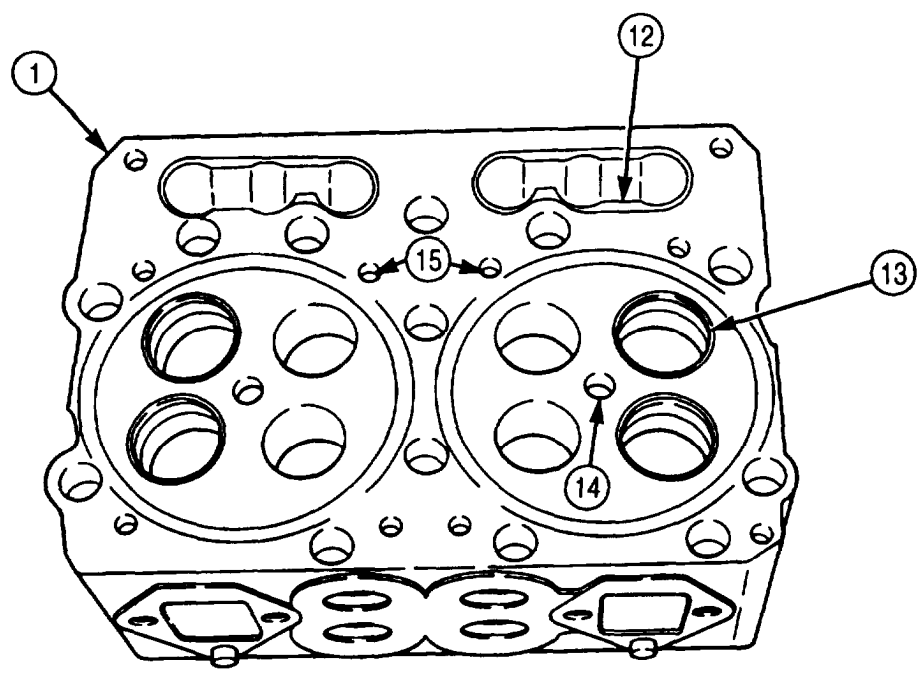
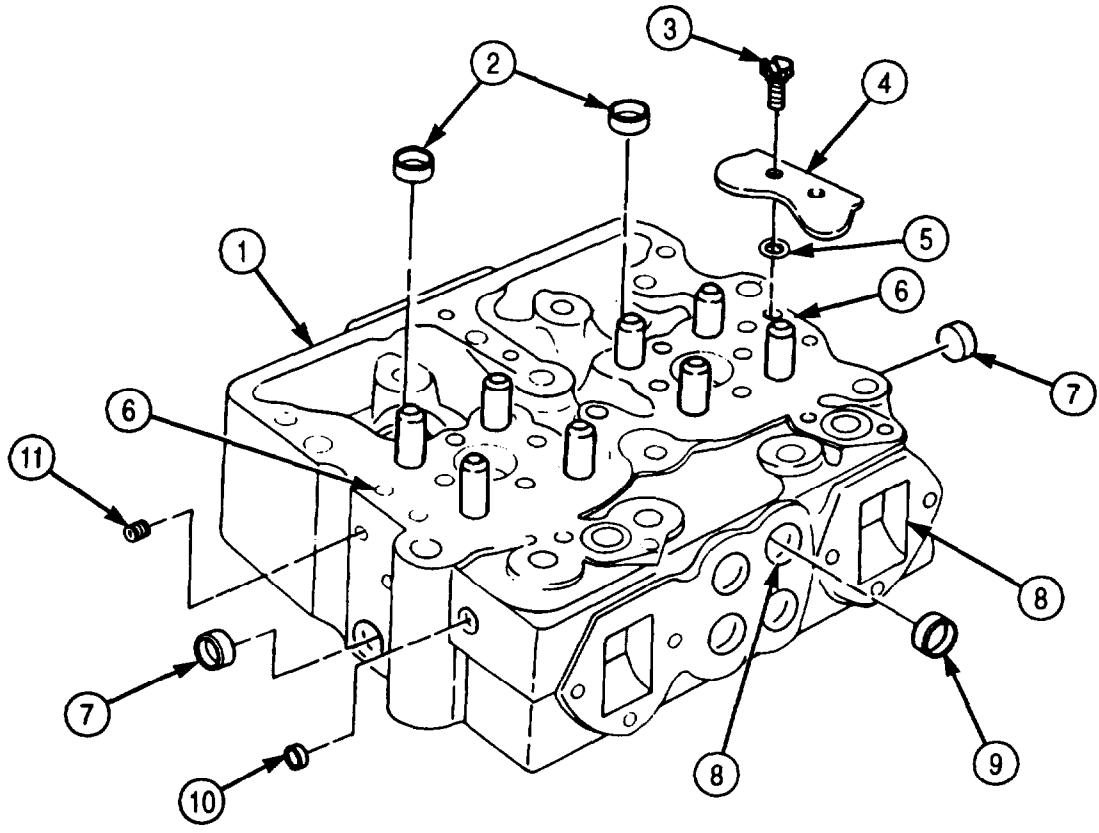
8. Inspect valve seats (13) and injector ports (14) on cylinder head (1) for cracks. If cracks are found, replace cylinder head (1).

NOTE

The following examples of cylinder head defects are provided to assist in determining causes of failures.

9. Check cylinder head valve seats (13) and injector ports (14) for hot spots and correct probable causes. If this condition exists, probable causes are overheating, loss of coolant, coolant flow stoppage, over-fueling, tight injector holddowns, incorrect injector sleeve installation, defective casting, hot shutdowns, and incorrect insert fittings. If hot spots are found, replace cylinder head (1).
10. Check cylinder head (1) and water passage holes (15) for pits and scratches. If pits and scratches are less than .003 in. (0.08 mm), remove with crocus cloth. If pits and scratches are more than 0.003 in. (0.08 mm) deep in the area 0.-625-0.156 in. (1.59-3.97 mm) from edge of water passage hole (15), replace cylinder head (1).
11. Check cylinder head surfaces (12) for warped surfaces. If warped surface exceeds 0.002 in. (0.05 mm), replace cylinder head (1).
12. Check cylinder head (1) for required thickness. Cylinder head (1) must measure 4.340 in. (110.24 mm) thick. If less than 4.340 in. (110.24 mm) thick, replace cylinder head (1).

5-3. CYLINDER HEAD REPAIR (Contd)



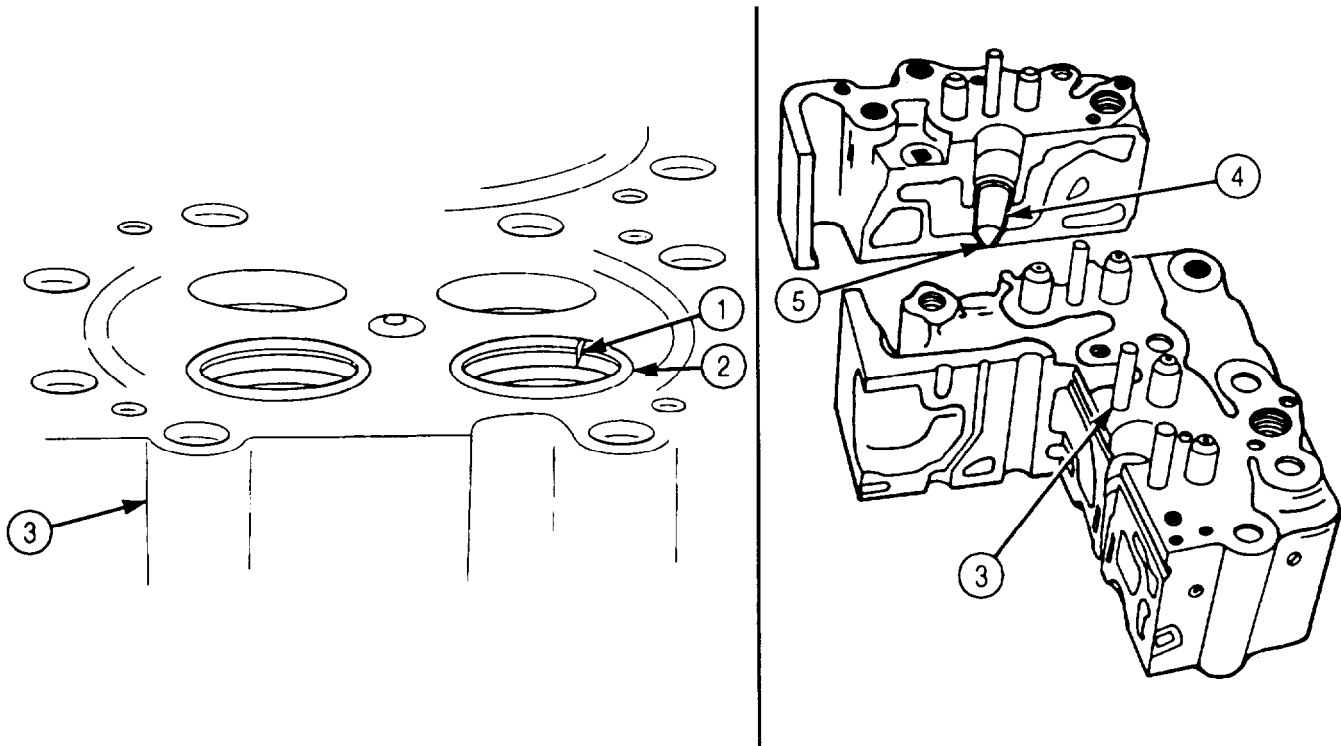
5-3. HEAD REPAIR (Contd)

- 13. Check valve seat insert (2) and cylinder head (3) for looseness by tapping surface around valve seat insert (2). Replace valve seat inserts (2) that bounce when tapped (para. 5-4).
- 14. Measure width (6) of valve seat insert (2). If width exceeds 0.125 in. (3.18 mm) at any one point and cannot be narrowed during regrinding, mark valve seat inserts (2) for replacement (para. 5-4).

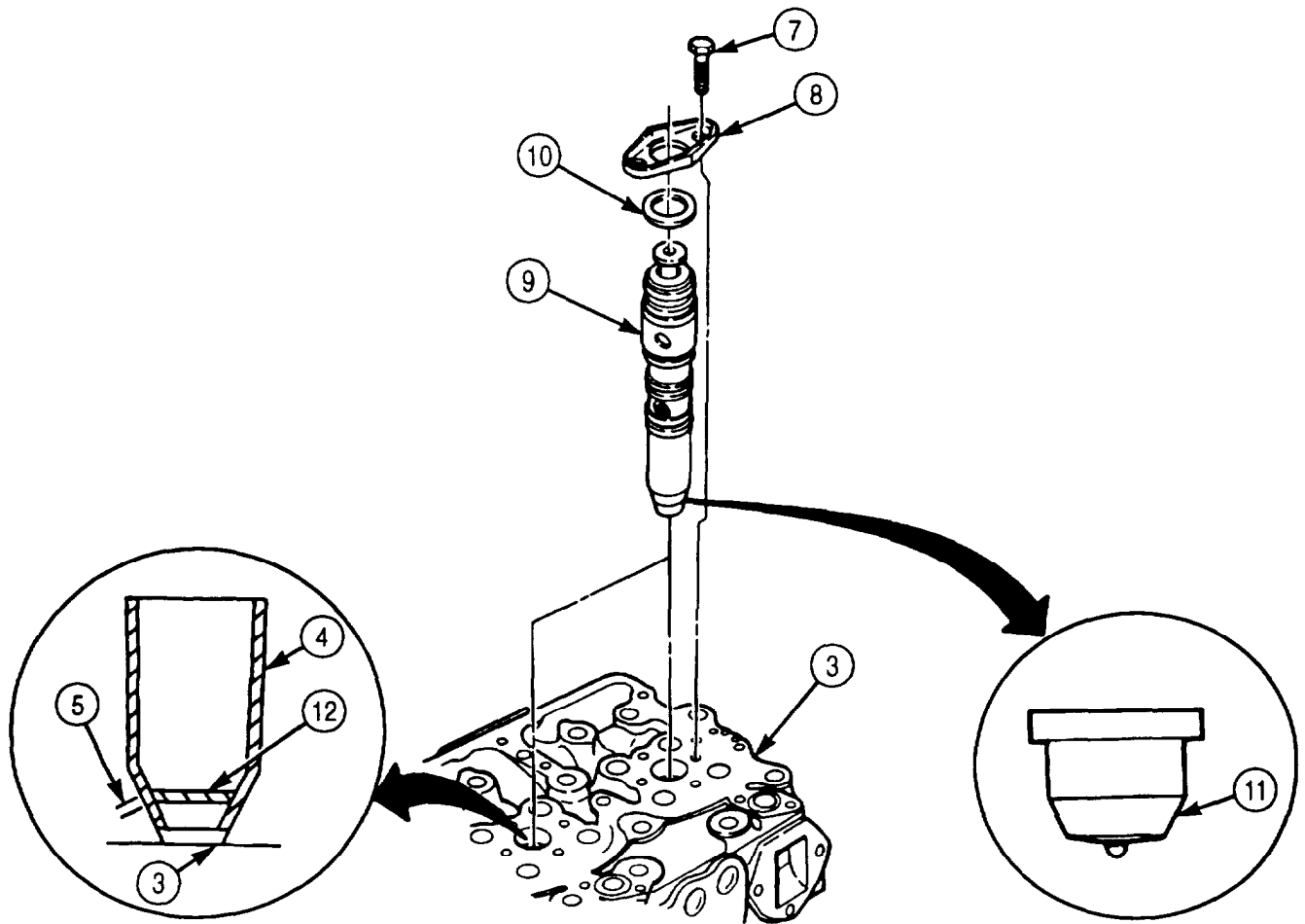
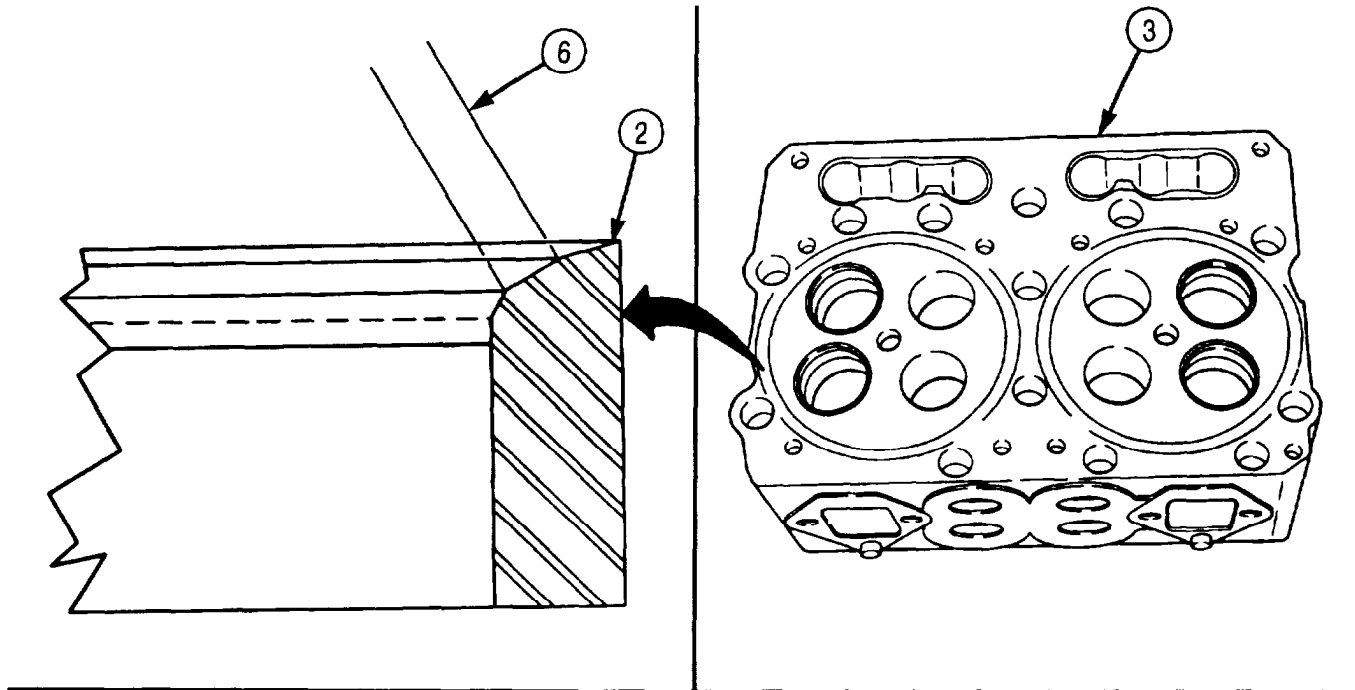
NOTE

The following examples of valve seat defects are provided to assist in determining causes of failure.

- 15. Inspect valve seat insert (2) and cylinder (3) for cracks (1) and correct probable causes. If cracks exist, probable causes are improperly machined insert bore, improper fitting of insert in bore, foreign particle under insert, faulty installation, and overheating.
- 16. Inspect valve seat insert (2) and cylinder head (3) for bums and correct probable causes. If burned, probable causes are carbon or foreign matter that prevents proper seating of valve. If burned, resurface or replace (para. 5-4).
- 17. Inspect injector sleeves (4) and cylinder head (3) in accordance with instructions in para. 5-6. Check injector sleeves (4) for scratches with bright light. If scratched, mark injector sleeve (4) for replacement (para. 5-6).
- 18. Check injector cup seating area (5).
 - a. Lightly coat injector cup (11) with Prussian blue.
 - b. Install injector (9) into sleeve (4) with washer (10), clamp (8), and two screws (7). Tighten alternately in 4 lb-ft (5.4 N.m) steps to 10-12 lb-ft (14-16 N-m).
 - c. Remove two screws (7), clamp (8), washer (10), and injector (9).
 - d. Check seat pattern in bottom of sleeve (4) and sleeve seating area (5).
 - e. Blued band (12) on sleeve (4) in sleeve seating area (5) must be 0.060 in. (1.52 mm) minimum width and be located approximately 0.469 in. (11.91 mm) from bottom of cylinder head (3) surface.



5-3. CYLINDER HEAD REPAIR (Contd)



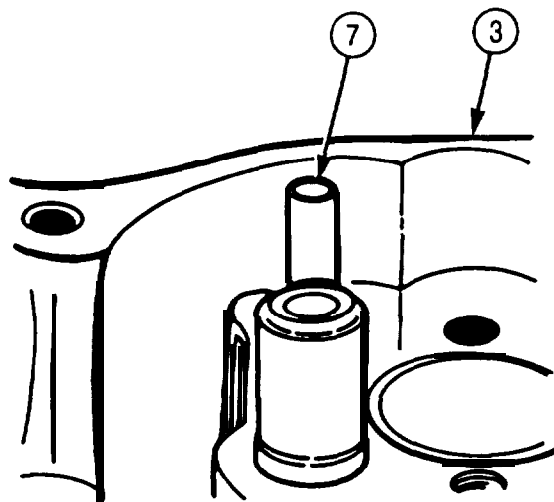
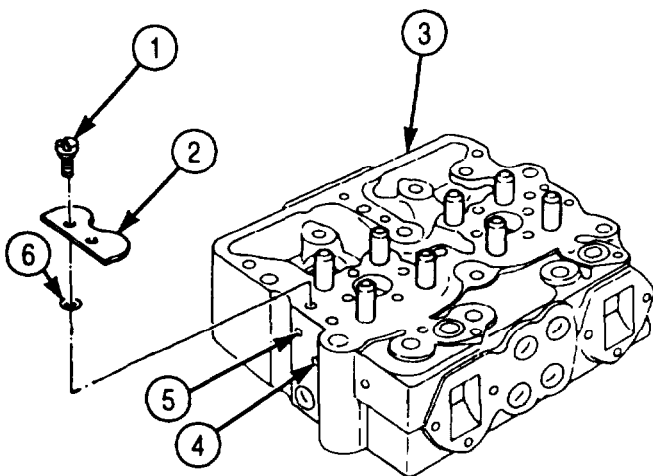
5-3. CYLINDER HEAD REPAIR (Contd)

19. Install injector (18) in cylinder head (3) with washer (19), clamp (10), and two screws (11). Tighten alternately in 4 lb-ft (5.4 N-m) steps to 10-12 lb-ft (14-16 N-m).
20. Measure protrusion of injector tip (8) with gauge block. Protrusion should be 0.060-0.070 in. (1.52-1.78 mm). If not, mark sleeve (9) for replacement (para. 5-6).
21. Air-test fuel inlet passage (4) and fuel outlet passage (5) for leakage and cracks.
 - a. Install two O-rings (6), plate (2), and two screw-assembled lockwashers (1).
 - b. Install pipe adapter (151, pipe extension (16), and air pressure gauge (17) into fuel outlet passage (5).
 - c. Install air hose adapter (121, air pressure control valve (13), and air hose (14) into fuel inlet passage (4).
 - d. Open air pressure control valve (13) and apply air pressure until air pressure gauge (17) reads 80-100 psi (550-690 pKa), then close valve (13).
 - e. Observe air pressure gauge (17). If pressure drops before fifteen seconds, replace cylinder head (3).
 - f. If air pressure holds for fifteen seconds, cylinder head (3) is serviceable.

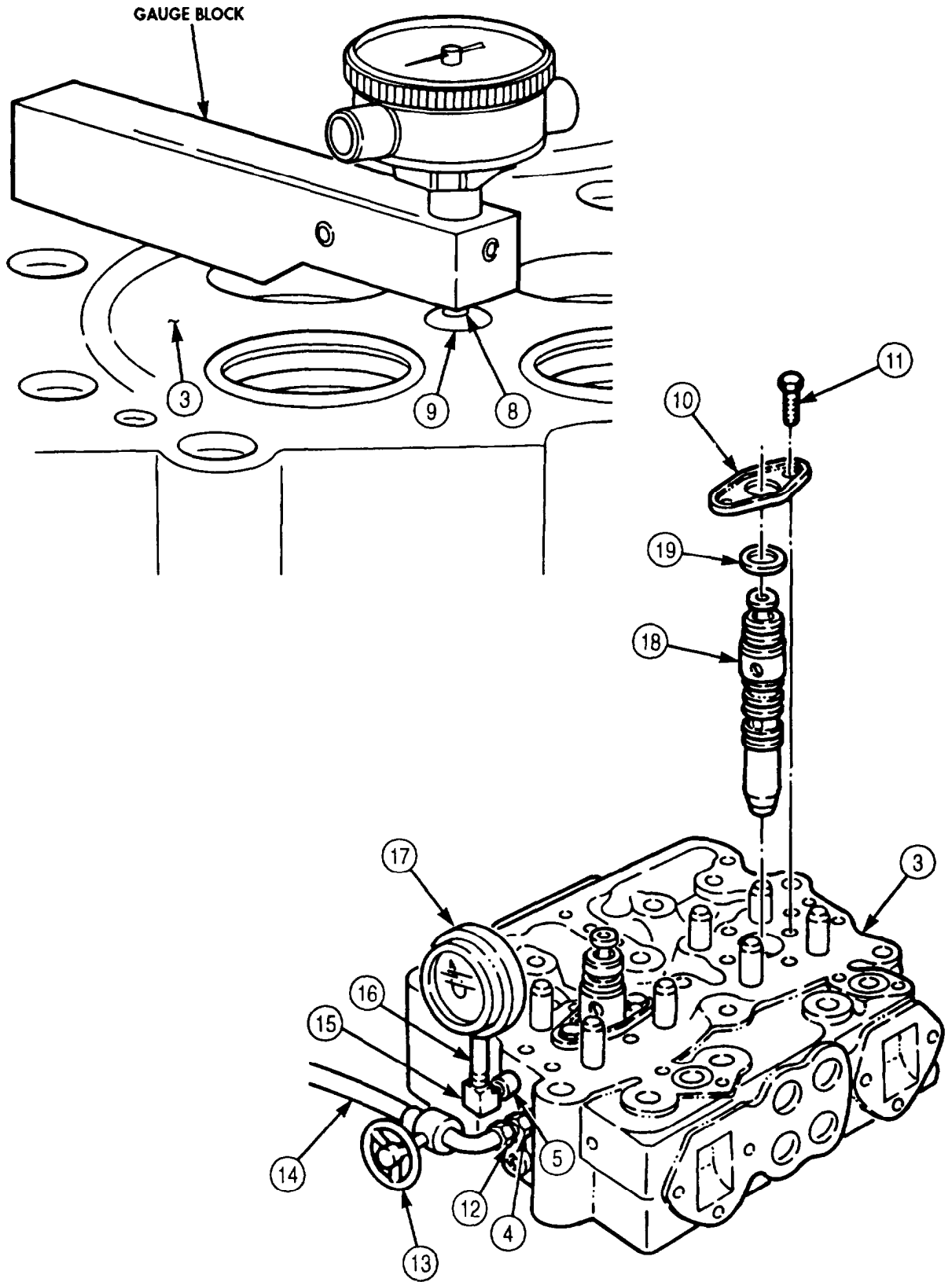
NOTE

Replace pipe plugs in fuel passages of cylinder head after removal of test adapters.

22. Remove air pressure gauge (17), pipe extension (16), and pipe adapter (15).
23. Remove air hose adapter (12), air pressure control valve (13), and air hose (14) from fuel inlet passage (4)
24. Inspect four crosshead guides (7) in accordance with instructions in para. 2-15.
25. Check outside diameter of four crosshead guides (7) using micrometer or dial gauge. If outside diameter is less than 0.432 in. (10.97 mm), mark guide (7) for replacement.
26. Check four crosshead guides (7) for correct height. If height is not 1.860-1.880 in. (47.24-47.75 mm), mark guide (7) for replacement.
27. Check four crosshead guides (7) for straightness. If guide (7) is not straight, replace guide (7) (subtask d, step 1).



5-3. CYLINDER HEAD REPAIR (Contd)



5-3. CYLINDER HEAD REPAIR (Contd)

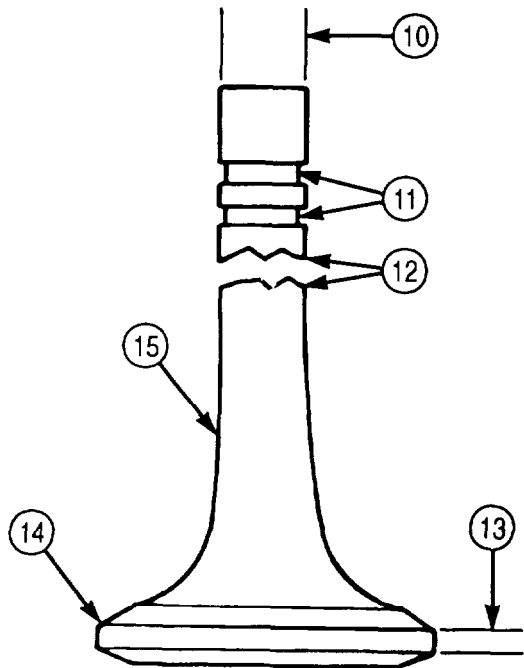
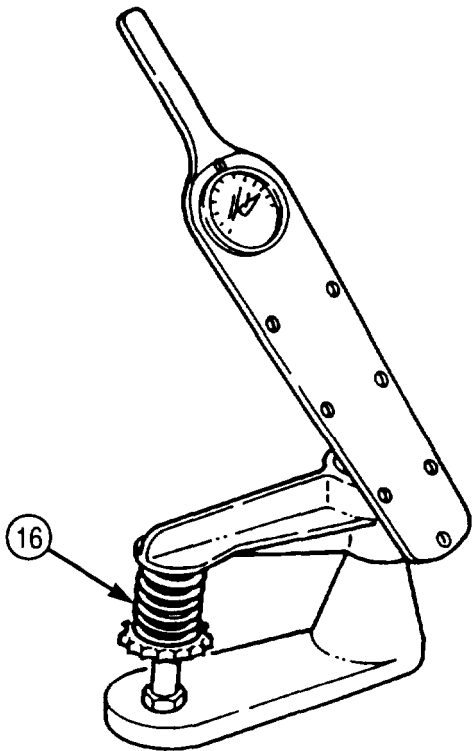
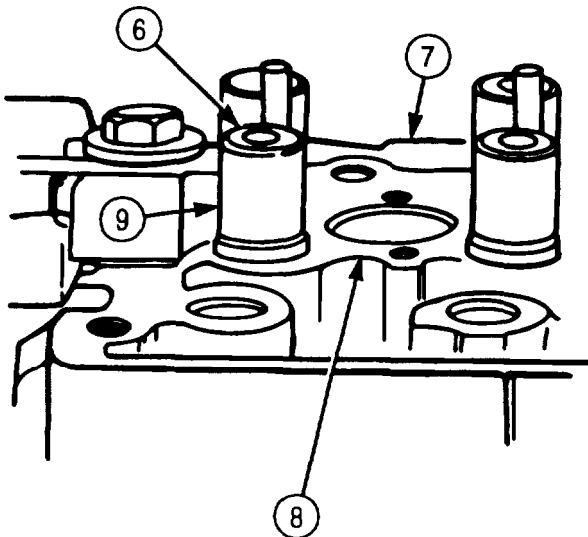
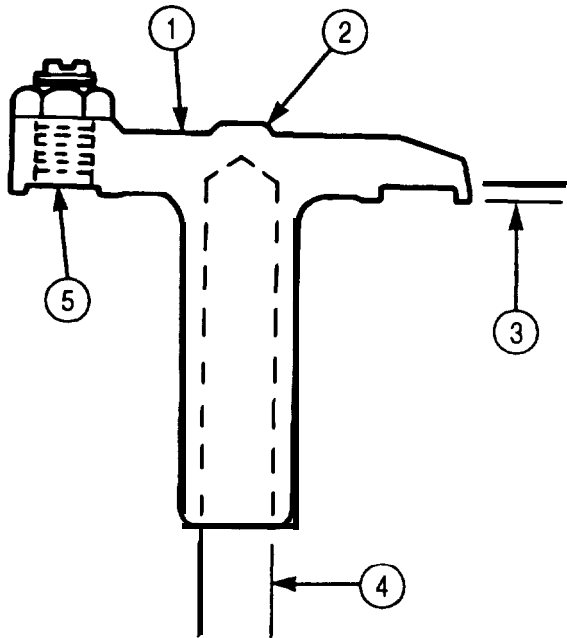
28. Inspect valve crossheads (1) in accordance with instructions in para. 2-15. Discard crossheads (1) if defective.
 - a. Check valve crossheads (1) for damaged adjusting screw threads (5) and excessive wear on rocker lever contact area (2).
 - b. Using micrometer, set small bore gauge at 0.4402 in. (11.181 mm).
 - c. Attempt to insert gauge into bore (4). Discard valve crosshead (1) if bore gauge goes into bore (4).
 - d. Check for out-of-round bore (4) by gauging at several points 90° apart. Discard valve crosshead (1) if bore (4) is out of round.
 - e. Check valve stem counterbore depth (3). Discard crosshead (1) if depth (3) is not 0.1200-0.1400 in. (3.048-3.556 mm).
29. Inspect eight valve guides (9) in accordance with instructions in para. 2-15. If defective, mark valve guides (9) for replacement.
 - a. Check eight valve guides (9) for chips, cracks, burrs, or broken out sections. If chipped, cracked, broken, or burrs are found, mark for replacement.
 - b. Check valve guide (9) for protrusion (7). If protrusion (7) is not 1.270-1.280 in. (32.26-32.51 mm) above cylinder head surface (8), mark valve guide (9) for replacement.
 - c. Set small bore gauge at 0.4552 in. (11.562 mm) and attempt to insert gauge into guide bore (6). If gauge goes into bore (6), mark guide (9) for replacement.
30. Check valve head (14) and intake and exhaust valves (15) for cracks, warping, pits, burns, or cupping. Discard valve(s) (15) if cracked or warped, pitted, burned, or cupped.
 - a. Check rim thickness (13) on intake and exhaust valves (15). Discard valve (15) if rim thickness (13) is less than 0.105 in. (2.67 mm).
 - b. Check intake and exhaust valve keeper grooves (11) for wear. Use new keeper to check grooves (11). Discard valve(s) (15) if new keepers fit loosely in grooves (11).
 - c. Check valve stem (12) for cracks, scoring, and galling. If cracked, scored, or galled, discard valve (15).
 - d. Measure valve stem (10) outside diameter with micrometer. If stem (10) outside diameter is less than 0.449 in. (11.41 mm), discard valve (15).

CAUTION

Use care when selecting replacement valve springs. Intermixing of old and new valve guides in any one cylinder head is permissible only if a specific crosshead has two of the same type or equivalent guides and springs installed under it.

31. Inspect valve springs (16) in accordance with instructions in para. 2-15. Discard valve springs (16) if defective.
 - a. Check valve springs (16) for distortions, cracked, or collapsed coils. Discard valve spring (16) if distorted, or if coils are cracked or collapsed.
 - b. Check valve spring (16) free length. No. 1 valve spring is 2.29 in. (58 mm) in length. No 2. valve spring is 2.69 in. (68 mm) in length.
 - c. Using spring tester, inspect for serviceability by checking load when spring is compressed. Discard spring No. 1 if spring does not give load of at least 150 lb (667 N) when compressed to 1.77 in (45 mm). Discard spring No. 2 if spring does not give load of at least 143 lb (636 N) when compressed to 1.72 in. (44 mm).

5-3. CYLINDER HEAD REPAIR (Contd)



5-3. CYLINDER HEAD REPAIR (Contd)

d. Assembly

NOTE

Use repaired and inspection-approved cylinder heads only.

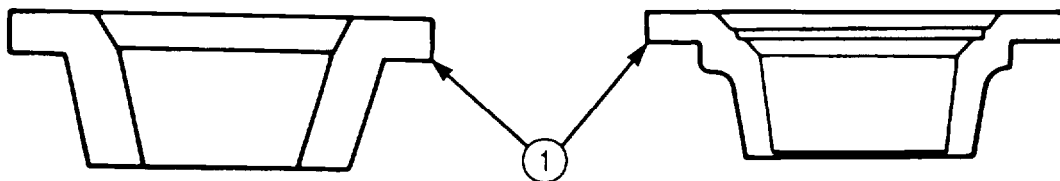
1. Replace worn valve guides (3). Drive valve guides (3) from underside of cylinder head (2) with hammer and punch.
2. Using arbor press, mandrel, and valve guide arbor, install new valve guides (3).
3. Using crosshead guide puller, remove defective crosshead guides (6) from cylinder head (2).
4. Thoroughly clean crosshead guide (9) holes.
5. Check crosshead guide (6) height. Assembled height must be 1.860-1.880 in. (47.24-47.75 mm).

CAUTION

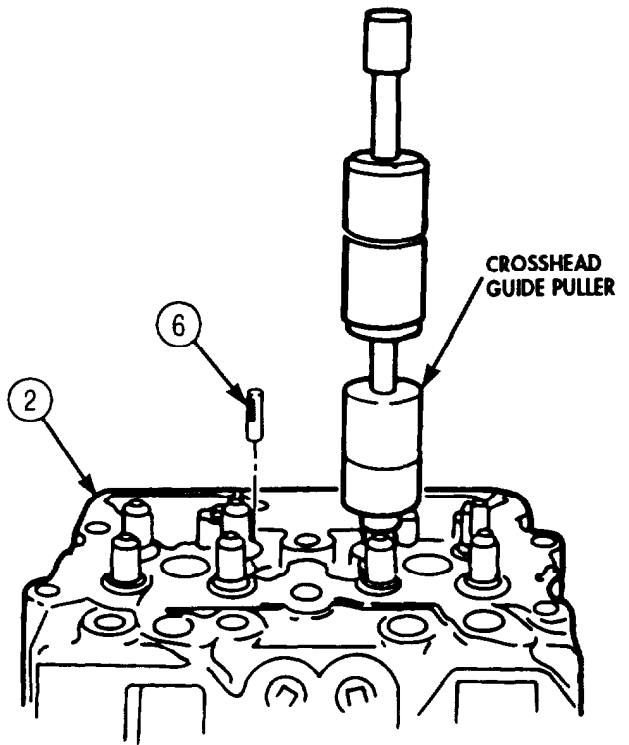
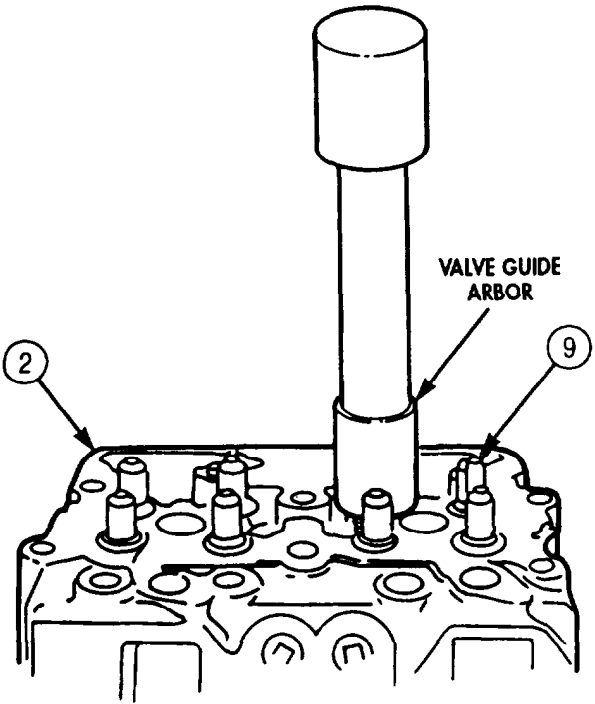
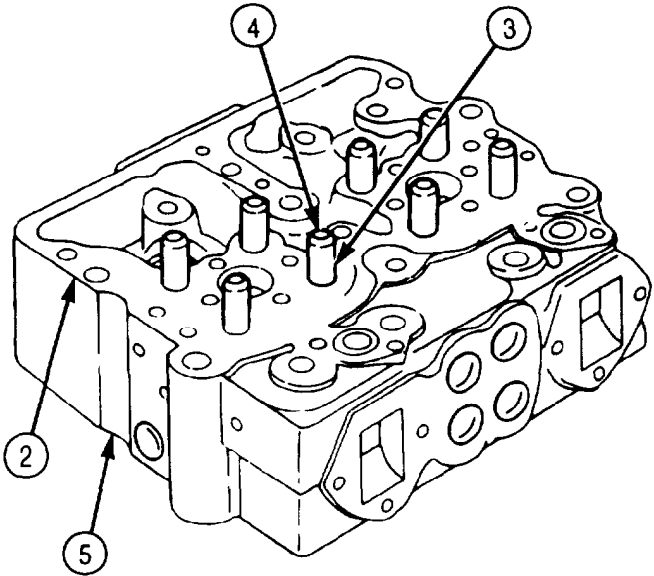
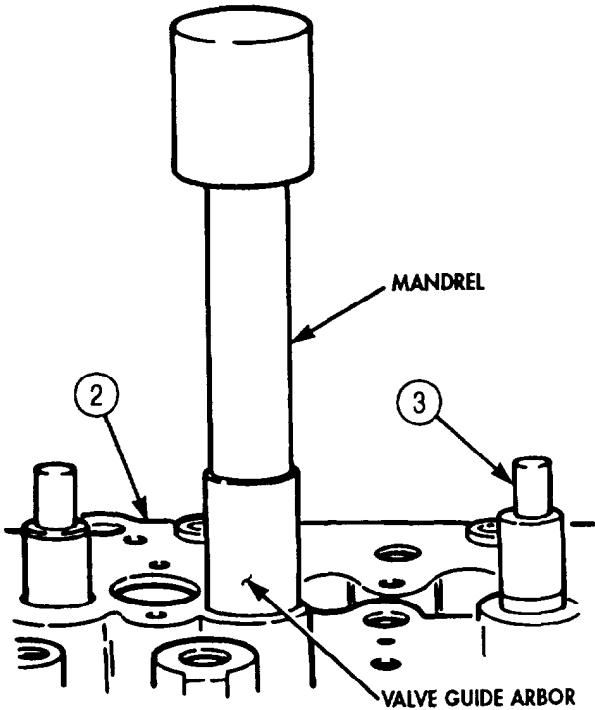
- To install intake and exhaust valves, position cylinder head on intake port face. Use wooden surface, workbench, or protective surface to prevent damage. Bench must be clean.
 - Be sure to install valves in original locations as numbered in step 3.
 - Ensure cylinder head is clean
6. Dip valve stem (4) in clean engine oil.
 7. Install valve stems (4) through valve guides (3) from face side (5) of cylinder head (2). Ensure valve heads are correctly seated on valve seats (1).
 8. Carefully position cylinder head (2) face down on workbench after all valves are installed so valve springs can be installed.

CAUTION

- Two differently-designed valve spring guides have been used in NHC-250 series engines. Part number 128879 spring guide cannot be used with 211999 valve spring. Number 170296 spring guide can be used with either valve spring.
- Reground valve heads seat deeper in cylinder head, causing valve stem to protrude farther above valve guide. This allows valve spring to extend beyond length limits of 2.250 in. (57.150 mm), and causes weak spring action. Use spacers up to 0.0625 in. (15.875 mm) to reduce valve spring to proper height.



5-3. CYLINDER HEAD REPAIR (Contd)



5-3. CYLINDER HEAD REPAIR (Contd)

NOTE

A maximum of two 0.03125 in. (0.794 mm) spacers may be used under lower spring guide when cylinder head has been resurfaced and valve seat insert has been refaced. Do not use spacers to compensate for weak springs.

9. Place eight lower spring guides (18) over valve guides (16) and seat to cylinder head (1).

NOTE

Do not mix intake and exhaust springs. Intake springs are taller.

10. Place eight valve springs (15) on lower spring guides (18).
11. Place eight upper spring guides (14) on top of springs (15) and over stem end of valve (8). Compress spring compressor until keeper grooves (12) on valve (8) are exposed.
12. Install new keepers (13) into valve grooves (12) and slowly release spring compressor. Repeat this step until all valves (8) are locked by keepers (13).
13. Using vacuum tester, test intake and exhaust valves (8) for proper seating.

NOTE

- Valves and valve seats must be dry.
 - Grease can be applied to O-ring on vacuum cup for better seal.
- a. Select correct size vacuum cup (9) for size valves (8) being tested.
 - b. Hold vacuum cup (9) over head of valve (8) and seat flat on cylinder head surface (2) surrounding valve (8).
 - c. Turn tester shutoff valve (6) to open position and hold pushbutton (7) down to operate vacuum pump (4).
 - d. Operate tester shutoff valve (6) until indicator hand (5) on vacuum gauge (4) stops climbing between 18-25 in. (457-635 mm) of mercury. Close tester shutoff valve (7) and release pushbutton (8).
 - e. Begin timing as soon as hand (5) reaches 18 in. of mercury on gauge (4).
 - f. Stop timing as soon as indicator hand (5) reaches 8 in. (20.32 cm) of mercury. If time is less than ten seconds, valve (8) seating is not satisfactory
 - g. Tap valve stem end with soft-faced hammer and retest by repeating steps a through f.
 - h. If valve seating is unsatisfactory, proceed to step i.
 - i. Check for loose connections on tester.
 - j. Operate vacuum pump (3) with suction cup (9) against a clear glass window.
 - k. Check indicator hand (5) for movement. If indicator hand (5) moves, there is leakage in the tester.
 - l. Tighten connections and retest valves (8).
 - m. Repeat steps b through l.
 - n. If test fails, regrind valves before retesting (para. 5-4).