

- | | | |
|---------------------|----------------------|-----------------|
| 1. Spring Assembly | 6. Capscrew | 11. Bushing |
| 2. Capscrew | 7. Self-Locking Nut | 12. Plate |
| 3. Self-locking Nut | 8. Shackle Assembly | 13. Spring Clip |
| 4. Bushing | 9. Capscrew | 14. Hex Nut |
| 5. Rear Bushing | 10. Self-Locking Nut | 15. Lockwasher |

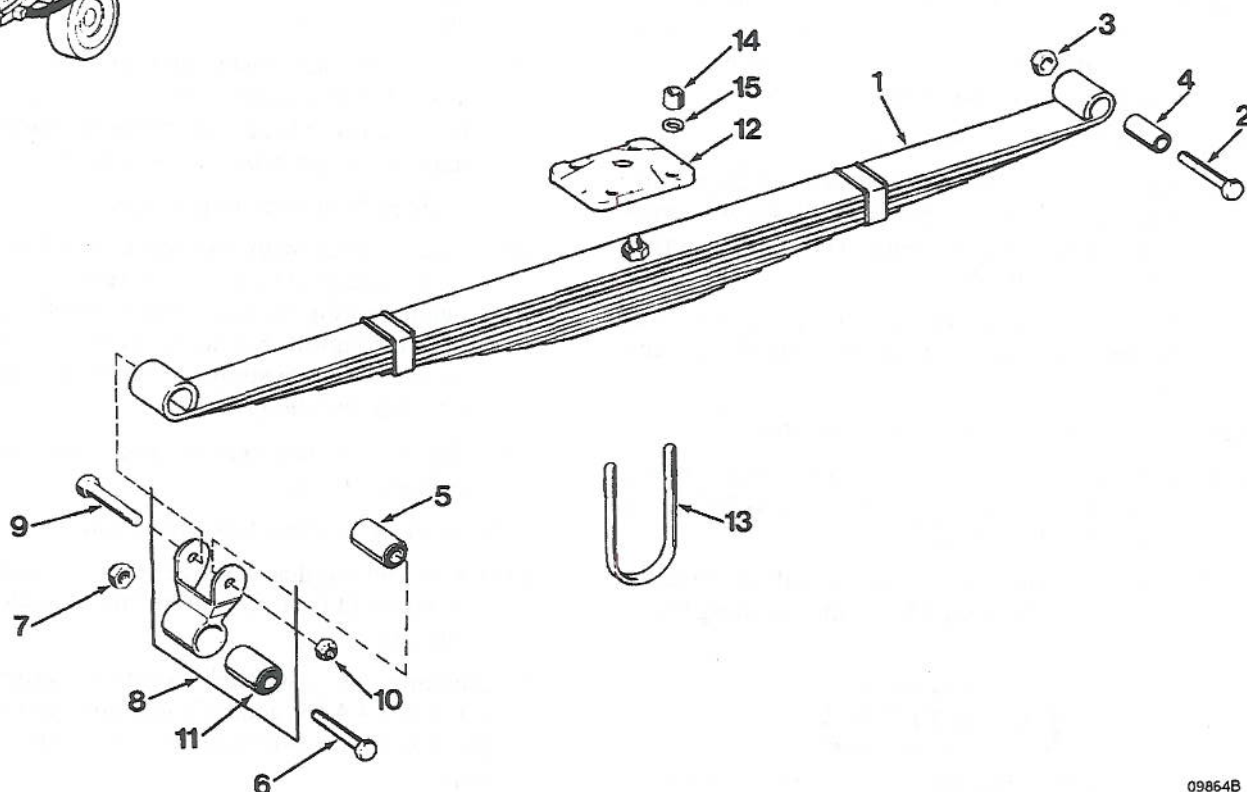


Figure 5-125. Rear Spring Group

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- (11) Refer to figure 5-126 to remove small bushing (4, figure 5-125) from rear spring as follows in steps (12) through (20).
- (12) Insert a 3/8 inch by 8 inch length of threaded rod through front bushing (4). Center bushing (4) on rod.

CAUTION

When removing bushing, press only on metal outer sleeve or damage to bushing may result.

- (13) Place a socket of diameter large enough to bear against metal outer sleeve of bushing (4), but small enough to pass through spring (1) eye, on one end of the threaded rod with the open end of the socket toward bushing (4). Socket will serve as bushing driver.
- (14) Install one flat washer and one hex nut on rod behind socket.

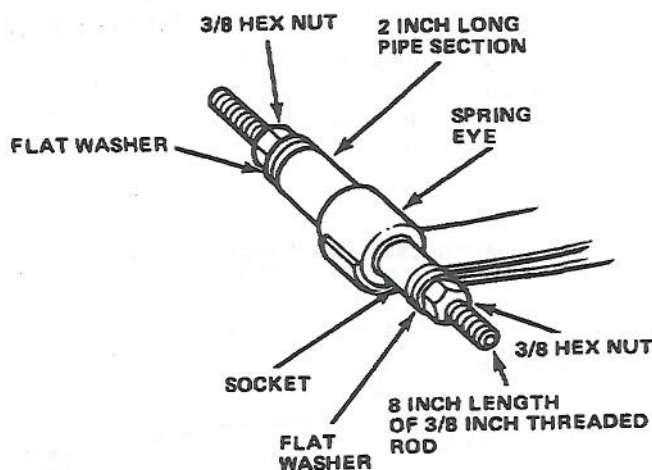


Figure 5-126. Bushing Replacement Tools-Small Bushing

- (15) Install 2 inch length of pipe with diameter large enough to accommodate bushing (4), but small enough to seat firmly against spring (1) eye, on opposite end of threaded rod. Pipe will serve as bushing receiver.
- (16) Install one flat washer and one hex nut on rod to hold pipe section in place. Flat washer must be of large enough diameter to support and maintain alignment of pipe section.
- (17) Tighten both hex nuts, finger tight.
- (18) Align socket with bushing (4) and align pipe with spring (1) eye. Socket will act as a press ram and press the bushing (4) out of the spring (1) eye and into the pipe.
- (19) Tighten nut at socket end of spring eye until bushing (4) is pressed out of spring (1) eye into pipe.
- (20) Remove bushing tools and bushing (4).
- (21) Refer to figure 5-127 and remove large bushing (5, figure 5-125) from rear spring as follows in steps (22) through (30).
- (22) Insert 1/2 inch by 11 inch length of threaded rod through bushing (5). Center bushing (5) on rod.

CAUTION

When removing bushing, press only on metal outer sleeve or damage to bushing may result.

- (23) Place deep socket of diameter large enough to bear against metal outer sleeve of bushing (5), but small enough to pass through spring (1) eye, on one end of threaded rod with open end of socket towards bushing (5). Socket will serve as bushing driver.

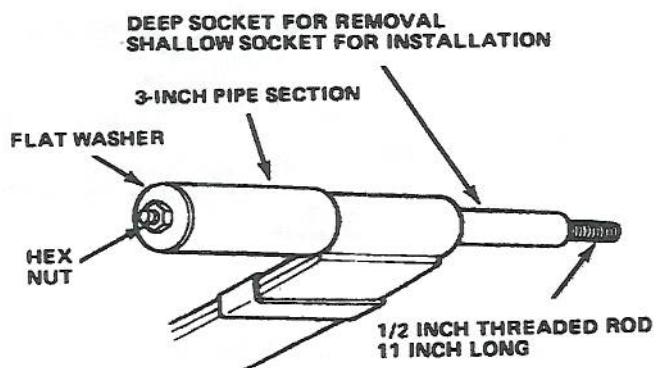


Figure 5-127. Bushing Replacement Tools
Large Bushing

- (24) Install one flat washer and one hex nut on rod behind socket.
- (25) Install a 3 inch length of pipe with diameter large enough to accommodate bushing (5), but small enough to seat firmly against spring (1) eye, on opposite end of threaded rod. Pipe will serve as bushing receiver.
- (26) Install one flat washer and one hex nut on rod to hold pipe section in place. Flat washer must be of large enough diameter to support and maintain alignment of pipe section.
- (27) Tighten both nuts, finger tight.
- (28) Align socket with bushing (5) and align pipe with spring (1) eye. Pipe section must butt against spring (1) eye surface so bushing (5) can pass through it. Socket will act as a press ram and press the bushing (5) out of the spring (1) eye and into the pipe.
- (29) Tighten nut at socket and press bushing (5) out of spring (1) eye.
- (30) Remove bushing tools and bushing (5).
- (31) Use method described in step (11) and remove bushing (11) from rear spring shackle assembly (8).

b. Cleaning and inspection. Refer to paragraphs 5-4.3 and 5-4.4 for general cleaning and inspection procedures. In addition, perform the following steps:

- (1) Inspect bushings (4), (5) and (11) for looseness in spring (1) eye or shackle assembly (8).
- (2) Inspect bushings (4), (5) and (11) for deterioration of bushing rubber.

c. Repair and replacement. Replace all worn or damaged parts.

d. Assembly and installation. Assembly of the rear spring group is accomplished during installation. Install the rear spring group as follows:

WARNING

Do not work under raised vehicle without first supporting vehicle with safety jack stands or injury to personnel may occur.

NOTE

Installation procedures for left and right spring groups are identical.

- (1) Refer to figure 5-127 and install large bushing (5, figure 5-125) as follows in steps (2) through (10).

- (2) Center bushing (5) on 1/2 inch by 11 inch length of threaded rod. Slide 3 inch length of pipe over bushing (5). Pipe must be of diameter that will seat firmly against the spring (1) eye.



When installing bushings, press only on metal outer sleeve or damage to bushing may occur.

- (3) Place shallow socket of diameter small enough to pass through the pipe section, but large enough to bear against metal outer sleeve of bushing (5), on one end of threaded rod with open end of socket toward bushing (5). Socket will serve as bushing driver.
- (4) Install one flat washer and one hex nut on rod behind socket.
- (5) Insert rod through spring (1) eye. Seat pipe section firmly against spring (1) eye.
- (6) Install one flat washer and one hex nut on end of rod against spring (1) eye. Diameter of flat washer must exceed diameter of spring (1) eye.
- (7) Align socket with bushing (5) and align bushing (5) with spring (1) eye. The pipe section must butt against the spring (1) eye surface so bushing (5) can pass through it. Socket will act as a press ram and press the bushing (5) out of the pipe into the spring (1) eye.
- (8) Tighten nut at socket and press bushing (5) into spring (1) eye.
- (9) Loosen tools and check bushing (5) position. Bushing (5) must be centered in spring (1) eye. Ends of bushing (5) must be flush with or slightly inset from ends of spring (1) eye.
- (10) If bushing (5) is not centered, tighten tools and correct bushing (5) position. If it is centered, remove tools.
- (11) Use method described in steps (2) through (10) and install bushing (11) in shackle assembly (8).
- (12) Refer to figure 5-126 and install small bushing (4, figure 5-125) as follows in steps (13) through (21).
- (13) Center bushing (4) on 3/8 inch by 8 inch length of threaded rod. Slide 2 inch length of pipe over bushing (4). Pipe must be of diameter to seat firmly against spring (1) eye.



When installing bushing, press only on metal outer sleeve or damage to bushing may result.

- (14) Place socket of diameter small enough to pass through pipe, but large enough to bear against metal outer sleeve of bushing (4) on one end of threaded rod with open end of socket toward bushing (4). Socket will serve as bushing driver.
- (15) Install flat washer and hex nut on rod behind socket.
- (16) Insert rod through spring (1) eye. Seat pipe section firmly against spring (1) eye.
- (17) Install flat washer and hex nut on end of rod against spring (1) eye. Diameter of flat washer must exceed diameter of spring (1) eye.
- (18) Align socket with bushing (4) and align bushing (4) with spring (1) eye. The pipe section must butt against the spring (1) eye surface so bushing (4) can pass through it. Socket will act as a press ram and press the bushing (4) out of the pipe into the spring (1) eye.
- (19) Tighten nut at socket and press bushing (4) into spring (1) eye.
- (20) Loosen tools and check bushing (4) position. Bushing (4) must be centered in spring (1) eye. Ends of bushing (4) must be flush with, or slightly inset from, ends of spring (1) eye.
- (21) If bushing (4) is not centered in spring (1) eye, tighten tools and correct bushing (4) position. If bushing (4) is centered, remove tools.
- (22) Install shackle assembly (8), capscrew (9) and self-locking nut (10) to spring assembly (1). Do not tighten capscrew (9).
- (23) Install one end of spring assembly (1) with capscrew (6) and self-locking nut (7). Do not tighten capscrew (6).
- (24) Install the other end of spring assembly (1) with capscrew (2) and self-locking nut (3). Do not tighten capscrew (2).
- (25) Install plate (12).
- (26) Position axle on spring assembly (1) and install two spring clips (13), four lockwashers (15) and four hex nuts (14). Tighten hex nuts (14) to torque specified in table 6-2.

- (27) Connect shock absorber to axle.
- (28) Refer to paragraph 5-5.2 and install wheels.
- (29) Remove hydraulic jack from under axle.
- (30) Tighten capscrews (2), (6) and (9) to torque specified in table 6-2.
- (31) Remove safety stands from under frame rails.
- (32) Lower vehicle.

5-5.6.3 *Rear Axle Assembly and Rear Differential Group*. Refer to figure 5-128, and perform the following steps to overhaul the rear axle assembly and rear differential group.

- a. Removal and disassembly. Disassembly is accomplished during removal. Remove rear axle assembly and rear differential group as follows:

WARNING

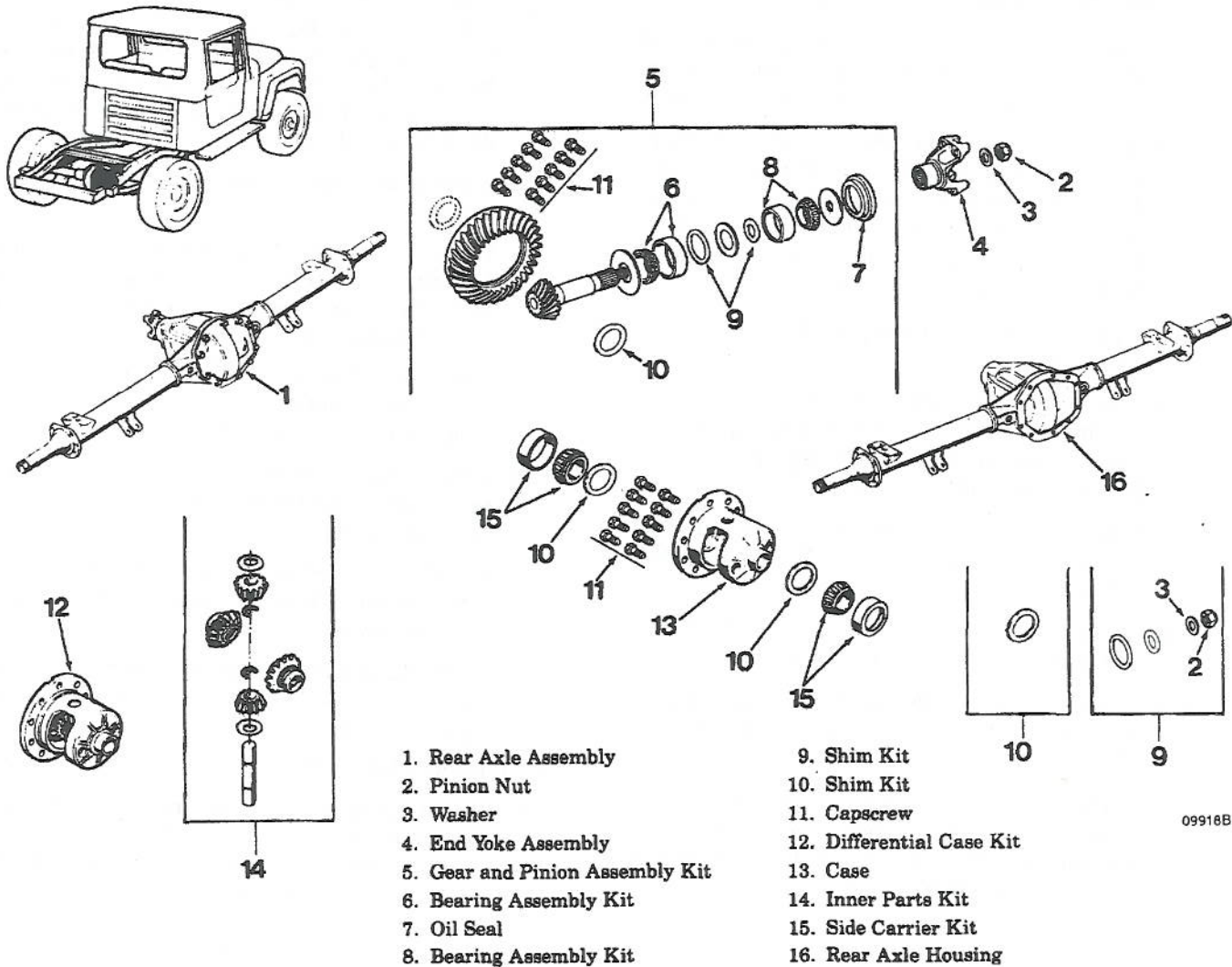
Do not work under raised vehicle without first supporting vehicle with safety jack stands or injury to personnel may occur.

- (1) Refer to paragraph 4-4.14 and drain rear axle fluid.
- (2) Refer to paragraph 5-5.6.5 and remove rear axle shafts.

NOTE

Lower left spring at front shackle so spreader tool can be installed.

- (3) Refer to paragraph 5-5.6.1 and remove rear shock absorbers at one end only.
- (4) Refer to paragraph 5-5.6.2 and remove U-bolts and tie plate.



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Figure 5-128. Rear Axle Assembly and Rear Differential Group

- (5) Loosen nuts attaching rear spring shackle to spring.
 - (6) Support axle housing with jack stand.
 - (7) Remove bolts attaching spring shackle to spring and lower spring.
 - (8) Remove axle housing cover from rear axle assembly (1).
 - (9) Mark carrier caps (2, figure 5-133) for assembly reference.
 - (10) Loosen, but do not remove, differential bearing cap bolts.
 - (11) Install spreader tool #J-24385-01 (figure 5-129). Be sure to install holddown clamps to keep spreader tool in position.
 - (12) Mount dial indicator on axle housing (16, figure 5-128). Zero indicator and be sure indicator stylus contacts one side of opening in housing (1).
 - (13) Spread housing no more than figure given in table 6-1. Remove dial indicator.
 - (14) Remove carrier caps. Tag caps for assembly reference.
 - (15) Remove differential case kit (12).
 - (16) Remove and discard capscrews (11).
 - (17) Remove ring gear from differential case (13).
 - (18) Remove inner parts kit (14).
 - (19) Remove side carrier kits (15) and shims (10).
 - (20) Mark propeller shaft and end yoke assembly (4) for assembly reference.
 - (21) Remove and discard pinion nut (2) using tool #J-8614-01 and washer (3).
 - (22) Remove end yoke assembly (4) using tools #J-8614-01, #J-8614-02, and #J-8614-03 (figure 5-130).
 - (23) Remove dust cap from pinion gear.
 - (24) Remove pinion gear.
 - (25) Remove shims (9, figure 128) and (10), bearing assembly kits (6) and (8) and oil seal (7).
- b. Cleaning and inspection. Refer to paragraphs 5-4.3 and 5-4.4 for general cleaning and inspection procedures. In addition, perform the following steps:

WARNING

P-D-680 Type II is toxic to the skin, eyes and respiratory tract. Avoid skin and eye contact. Good general ventilation is normally adequate.

Compressed air used for cleaning purposes can generate airborne particles which may enter the eyes. Pressure shall not exceed 30 psi and goggles must be worn.

- (1) Clean all parts with P-D-680 Type II (7, table 5-1). Allow bearings to air dry. Dry other parts with compressed air.

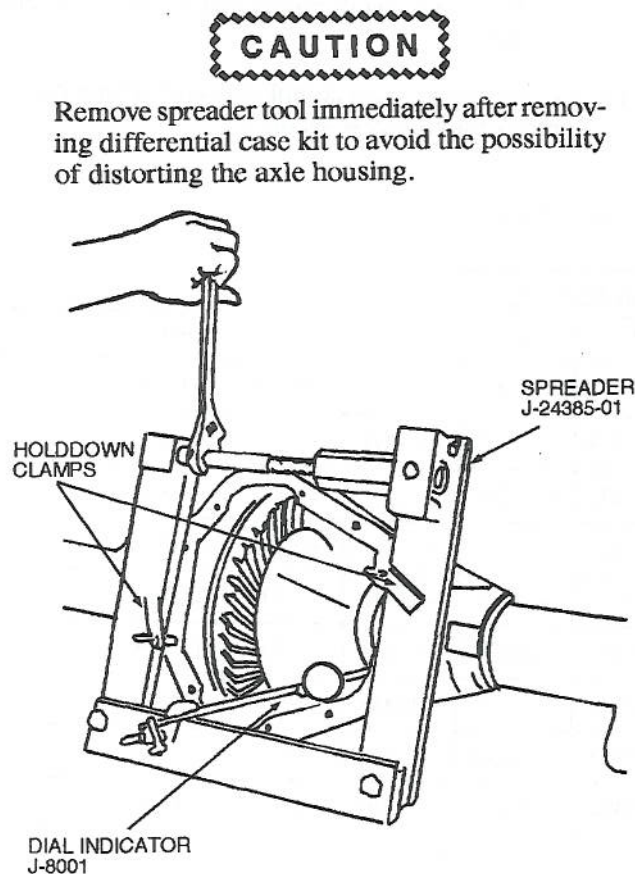


Figure 5-129. Spreading Axle Housing

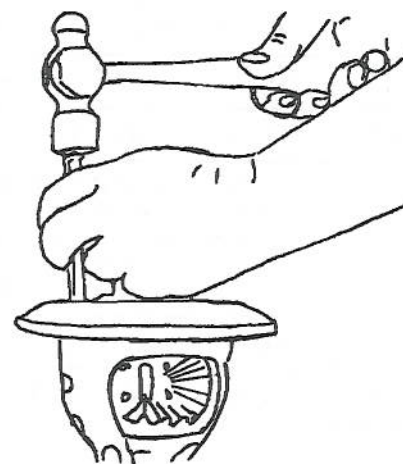


Figure 5-130. Pinion Yoke Removal

- c. Repair and replacement. Replace all worn or damaged parts.
- d. Assembly and installation. Assembly is accomplished during installation. Install rear axle assembly and rear differential group as follows:
 - (1) Measure thickness of shim kits (9) and (10) removed during disassembly.
 - (2) Note pinion depth variance numbers on old and new pinion gears.
 - (3) Refer to table 5-8, and determine amount to be added to or subtracted from original shim to arrive at starter shim thickness.
 - (4) Install pinion front bearing cup in housing bore, using driver handle #J-7079-02 and installer #J-25101.
 - (5) Install starter shim in rear bearing bore at rear axle housing (16). Be sure shim is centered in cup bore. If shim is chamfered, chamfer must face toward housing bore, not toward pinion head.
 - (6) Install pinion rear bearing cup in housing bore, using driver handle #J-25122 and installer #J-25157.
 - (7) Install bearing assembly (6) using installer sleeve #J-24433.
 - (8) Install pinion gear in rear axle housing (16).
 - (9) Install bearing assembly kit (8).

- (10) Install bearing assembly (8), end yoke assembly (4), washer (3) and pinion nut (2). Tighten nut (2) only enough to remove end play and provide 10 to 15 inch-pounds of drag torque when pinion is rotated.

- (11) Note pinion depth variance marked on pinion gear. If number is preceded by a plus (+) sign, add that amount to standard setting for rear axle assembly (1). If number is preceded by a minus (-) sign, subtract that amount from standard setting. Record this figure for future reference.

NOTE

If gear is marked 0 (zero), use the standard setting.

- (12) Assemble gauge arbor #J-5223-4 and discs #J-5223-25 (figure 5-131), and install in differential bearing cup bores. Be sure discs are firmly seated in bearing cup bores.
- (13) Install carrier caps over discs and tighten cap bolts securely.
- (14) Remove standard plunger from gauge block #J-5223-20 and install plunger #J-5223-27 (figure 5-132).
- (15) Compress plunger completely and tighten gauge block thumbscrew securely.

Table 5-8. Pinion Variance Chart

Old Pinion Marking	New Pinion Marking								
	-4	-3	-2	-1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0.000
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003
0	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004
-1	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005
-2	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006
-3	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006	-0.007
-4	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006	-0.007	-0.008

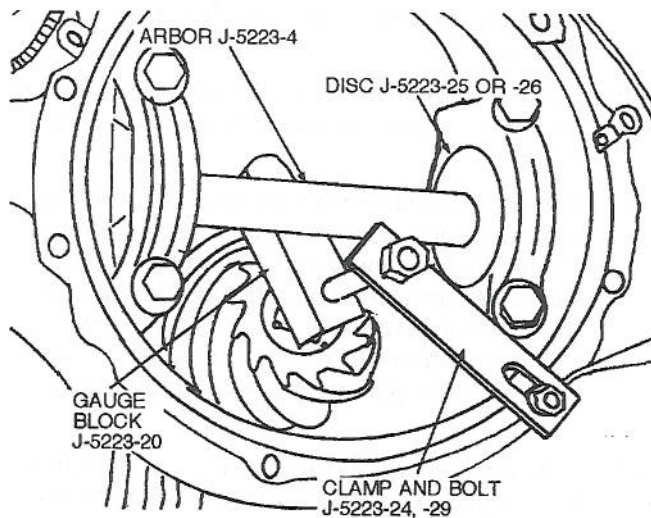


Figure 5-131. Installing Pinion Depth Gauge Tools

- (16) Install gauge block #J-5223-20. Position block so plunger is directly under gauge arbor #J-5223-4 (figure 5-131) and flat surface on anvil side of block.

CAUTION

To avoid false reading, do not allow the anvil to contact the pinion gear at any point.

- (17) Assemble bolt #J-5223-29 and clamp #J-5223-24 and mount tools on rear axle housing (16, figure 5-128). Use bolts to attach clamp to rear axle housing (16).
- (18) Extend clamp bolt until it presses against gauge block. Align gauge block plunger with center of gauge arbor and tighten clamp bolt until it presses against block with enough force to prevent block from moving.

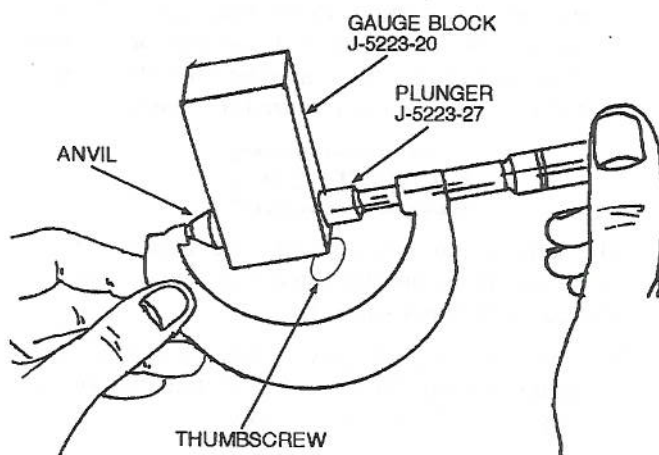


Figure 5-132. Measuring Gauge Block

- (19) Loosen gauge block thumbscrew and release plunger. When plunger contacts arbor tool, tighten thumbscrew to lock plunger in position. Do not disturb plunger position.
- (20) Remove clamp and bolt from rear axle housing (16).
- (21) Remove gauge block and measure distance from end of anvil to end of plunger using 3 inch micrometer (figure 5-132). This dimension represents measured pin depth. Record this measurement for assembly reference.

NOTE

If the measured pinion depth equals the desired pinion depth, the installed shim thickness is correct and further adjustment is not required.

- (22) Remove carrier caps and remove arbor tool and discs. If shim thickness and pinion depth are correct, proceed to step (25).
- (23) Remove pinion gear, rear bearing cup and depth shim from rear axle housing (16, figure 128).
- (24) Measure thickness of depth shim just removed from rear axle housing (16) and add this dimension to measured pinion depth obtained in previous step. From this total, subtract desired pinion depth. Result represents shim thickness required to adjust pinion depth.
- (25) To make pinion bearing preload adjustment, install previously used shims (9).
- (26) Reinstall pinion gear, bearing assembly kit (8), end yoke assembly (4), washer (3) and pinion nut (2). Tighten nut slowly to ensure that bearings are not over preloaded. If bearing preload is too great with less than torque given in table 6-2, the shim kit (8) is too thin.
- (27) Measure torque required to rotate pinion gear using 0-5 inch-pound torque wrench. Rotating torque should be between figures specified by table 6-2. Add shims to decrease preload. Subtract shims to increase preload.
- (28) Remove old pinion nut (2) and install new nut when pinion bearing preload is correctly adjusted.
- (29) Tighten pinion nut to torque specified by table 6-2.

- (30) To adjust differential bearing preload and ring gear backlash, remove all shims (10) from differential case kit (12) if not removed previously.
- (31) Install side carrier kits (15).
- (32) Install differential case kit (12) in axle housing.
- (33) Install carrier caps and tighten bolts securely, but not to torque specified by table 6-2.
- (34) Mount dial indicator #J-8001 to contact the ring gear carrier mating surface and accurately measure total carrier side movement.
- (35) To measure side movement, position a screwdriver behind one bearing cup and force carrier away from dial indicator as far as possible.
- (36) Zero dial indicator.
- (37) Position screwdriver behind opposite side bearing cup and force carrier as far as possible toward dial indicator. Repeat operation to ensure correct reading.
- (38) Record reading for later use.
- (39) Mount dial indicator on ring gear side of carrier flange and check flange runout with screwdriver held tightly against bearing cup.
- (40) Replace carrier if flange runout exceeds figure specified by table 6-2.
- (41) Remove case (13).
- (42) Install ring gear on case (13) using new capscrews (11) in ring gear 180 degrees apart. This will ensure proper hole alignment. Tighten capscrew (11) to torque specified by table 6-2.
- (43) Use feeler gauge to check that clearance between ring gear and carrier flange is figure specified by table 6-1. If clearance exceeds this figure, loosen capscrews and move ring gear away from flange. Use compressed air to remove dirt or metal particles lodged behind ring gear.
- (44) Retighten capscrews (11) and recheck clearance. If clearance is the figure specified in table 6-1, tighten capscrews to torque specified by table 6-1.
- (45) Install case (13) and bearing cups into housing and install carrier caps and screws.

Tighten capscrews tight enough to hold carrier caps straight.

- (46) Mount dial indicator #J-8001 on thrust side of carrier case flange so dial indicator will contact flange.
- (47) Position screwdriver behind thrust bearing cup; move ring gear teeth into pinion gear and hold. Ensure that dial indicator is in contact with carrier flange and zero dial indicator. Move screwdriver to opposite side behind carrier bearing cup (coast side) and move differential as far as possible from pinion gear. Record dial indicator reading.
- (48) Repeat procedure to ensure proper dial indicator reading. This measurement is thickness of shim kit to be placed on back side of thrust bearing between bearing and carrier. The balance of total distance of measurement is recorded in step (38).
- (49) Remove differential case kit (12) and remove bearing assemblies (15) using bearing removal tool #J-29721.
- (50) Measure and install correct shim pack thickness behind coast side bearing and install bearing.
- (51) Use feeler gauge to check that clearance between bearings and shim pack and carrier bearing wall is figure specified by table 6-1.
- (52) Remove front axle inner oil seals using splined end of axle shaft to pry out seals. Install new seals using installer #J-28648.
- (53) Install differential case kit. Tighten carrier capscrews to torque specified by table 6-2. Seal threads with RTV sealer (24, table 5-1).
- (54) Mount dial indicator #J-8001 and check backlash. Check backlash in three places, 120 degrees apart. If backlash is not within figures specified by table 6-1, remove differential case (13). Remove side carrier kit (15) and add or subtract shims (10) from differential bearing shim packs to move ring gear to required backlash.



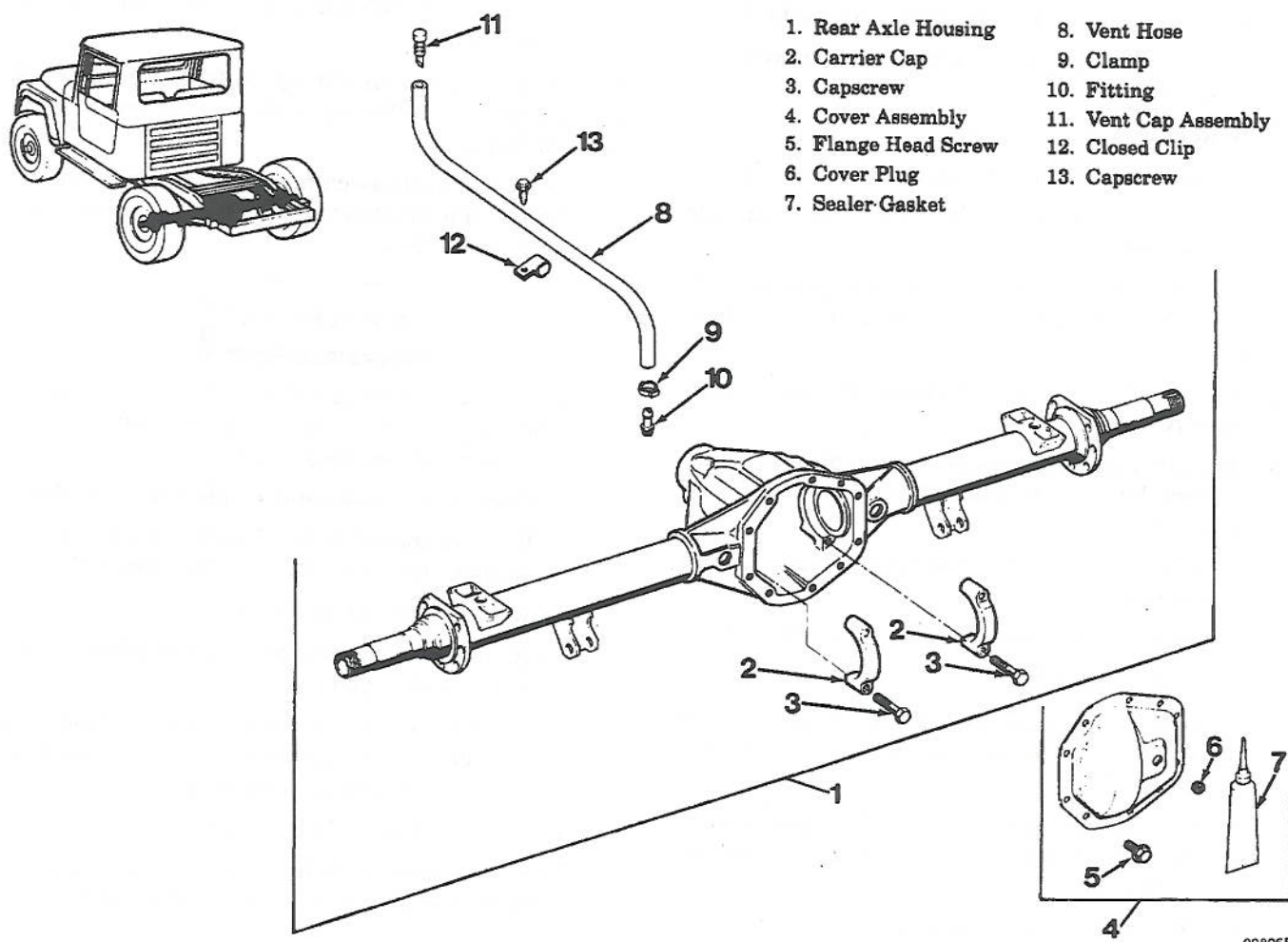
The same amount of shim thickness added or subtracted from one side must be added or subtracted on the opposite side.

- (55) Lubricate all bearings with grease and gears with gear lubricant (26, table 5-1). Rotate pinion gear to prelube all moving components.

- (56) Install axle housing cover. Clean cover and housing mating surfaces and apply thin bead of silicone sealer (24, table 5-1) to housing and cover before installation.
- (57) Raise spring and install front spring shackles to spring attaching bolts.
- (58) Remove jack stand.
- (59) Refer to paragraph 5-5.6.2 and install tie plates and U-bolts. Tighten U-bolts to torque specified by table 6-2.
- (60) Tighten spring shackle to spring attaching bolts to torque specified in table 6-2.
- (61) Refer to paragraph 5-5.6.1 and install rear shock absorbers.
- (62) Refer to paragraph 5-5.6.5 and install rear axle shafts.

5-5.6.4 *Rear Axle Housing Group*. Refer to figure 5-133 and perform the following steps to overhaul the rear axle housing group.

- a. Removal and disassembly. Disassembly is accomplished during removal. Remove rear axle housing group as follows:
 - (1) Raise vehicle and position support stands under frame rails just forward of rear springs.
 - (2) Refer to paragraph 5-5.7.2 and remove rear wheels.
 - (3) Mark propeller shaft and axle for assembly alignment reference.
 - (4) Disconnect propeller shaft at rear axle yoke.



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Figure 5-133. Rear Axle Housing Group

- (5) Refer to paragraph 5-5.6.1 and disconnect shock absorbers at axle tubes.
- (6) Remove clamp (9) and vent hose (8) from fitting (10).
- (7) Remove fitting (10) from rear axle housing (1).
- (8) Remove capscrew (13) and remove closed clip (12) from vehicle.
- (9) Remove closed clip (12) and vent cap assembly (11) from vent hose (8).
- (10) Disconnect parking brake cable.

NOTE

Remove all braces, wires and tie wraps, as necessary, to remove rear axle housing.

- (11) Support rear axle housing (1) using hydraulic jack.
 - (12) Remove U-bolts.
 - (13) Slide rear axle housing from under vehicle.
 - (14) Remove flange head screws (5) and cover assembly (4).
 - (15) Remove cover plug (6).
 - (16) Remove capscrews (3) and carrier cap (2).
 - (17) Refer to paragraph 5-5.6.3 and remove rear axle assembly.
- b. Cleaning and inspection. Refer to paragraphs 5-4.3 and 5-4.4 for general cleaning and inspection procedures.
- c. Repair and replacement. Replace all worn or damaged parts.
- d. Assembly and installation. Assembly is accomplished during installation. Install rear axle housing group as follows:
- (1) Refer to paragraph 5-5.6.3 and install rear axle assembly.
 - (2) Install carrier caps (2) using capscrews (3).
 - (3) Install cover plug (6).
 - (4) Apply sealer gasket (7) to cover assembly (4) and install cover assembly (4) using flange head screws (5).
 - (5) Position rear axle housing (1) under vehicle, aligning springs with axle spring pads, and install U-bolts.
 - (6) Connect parking brake cable.
 - (7) Install closed clip (12) and vent cap assembly (11) on vent hose (8).

- (8) Install fitting (10) in rear axle housing (1).
- (9) Install clamp (9) on vent hose (8) and install vent hose (8) on fitting (10). Tighten clamp.
- (10) Install closed clip on vehicle using capscrews (13).

NOTE

Install all hoses, wires and tie wraps which were removed.

- (11) Refer to paragraph 5-5.6.1 and connect shock absorbers at axle tubes.
- (12) Install propeller shaft. Align reference marks made during removal.
- (13) Bleed and adjust rear brakes.
- (14) Refer to paragraph 5-5.7.2 and install rear wheels.
- (15) Remove supports and lower vehicle.
- (16) Check axle lubricant level. Add lubricant as necessary.

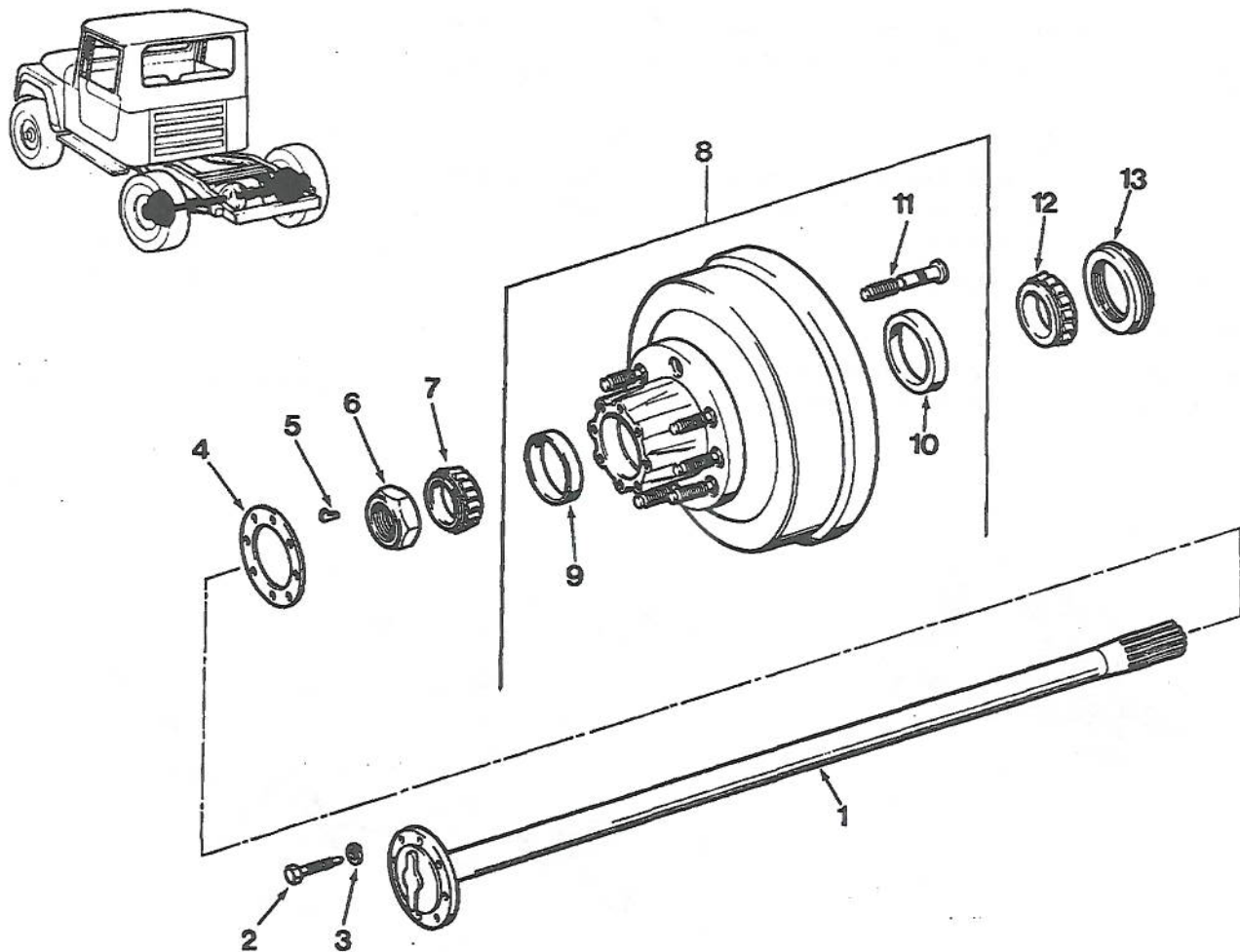
5-5.6.5 Rear Axle Shafts Group. Refer to figure 5-134, and perform the following steps to overhaul the rear axle shafts group.

- a. Removal and disassembly. Disassembly is accomplished during removal. Remove rear axle shafts group as follows:

WARNING

Do not work under raised vehicle without first supporting vehicle with safety jack stands or injury to personnel may occur.

- (1) Raise vehicle and remove right wheel and drum.
- (2) Remove special bolts (2) and lockwashers (3); remove right axle shaft (1) and gasket (4).
- (3) Remove locking wedge (5).
- (4) Remove hex nut (6), bearing assembly (7) and outer bearing cup (9).
- (5) Remove hub part of hub and drum assembly (8) and remove retainer assembly (13), bearing assembly (12) and inner bearing cup (10).
- (6) Remove studs (11) from hub.
- (7) Follow same procedure when removing left rear axle shaft group components from left side of vehicle.



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|---------------------|--------------------------|
| 1. Right Axle Shaft | 8. Hub and Drum Assembly |
| 2. Special Bolt | 9. Outer Bearing Cap |
| 3. Lockwasher | 10. Inner Bearing Cap |
| 4. Gasket | 11. Stud |
| 5. Locking Wedge | 12. Bearing Assembly |
| 6. Hex Nut | 13. Retainer Assembly |
| 7. Bearing Assembly | |

Figure 5-134. Rear Axle Shafts Group

- b. Cleaning and inspection. Refer to paragraphs 5-4.3 and 5-4.4 for general cleaning and inspection procedures.
- c. Repair and replacement. Replace all worn or damaged parts.
- d. Assembly and installation. Assembly is accomplished during installation. Install axle shaft

group as follows:

- (1) Install studs (11) in hub part of hub and drum assembly (8).
- (2) Install inner bearing cup (10), bearing assembly (12) and retainer assembly (13).
- (3) Install hub.

- (4) Install outer bearing cap (9), bearing assembly (7) and hex nut. Tighten hex nut to torque specified by table 6-2.
- (5) Install locking wedge (5).
- (6) Install gasket (4) and right axle shaft (1) using special bolts (2) and lockwashers (3). Tighten bolts (2) to torque specified by table 6-2.
- (7) Install drum and right wheel.
- (8) Lower vehicle.
- (9) Follow same procedure when installing left rear axle shaft group components on left side of vehicle.

5-5.7 Brakes and Wheels.

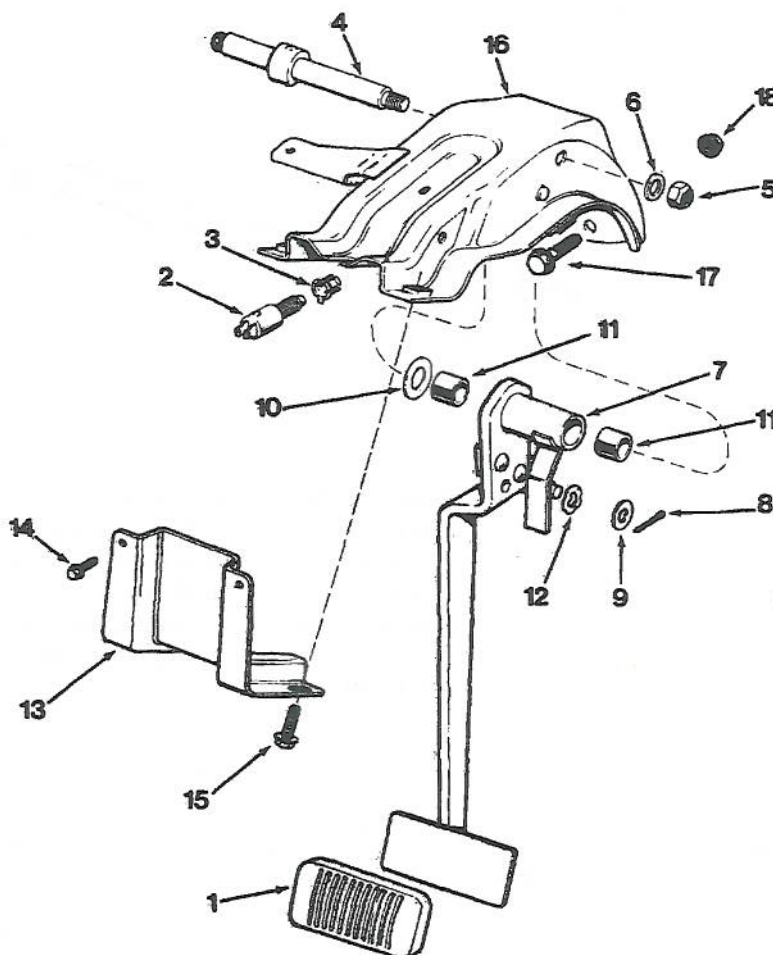
5-5.7.1 *Brake Pedal and Linkage Group*. Refer to figure 5-135, and perform the following steps to overhaul brake pedal and linkage group.

- a. Removal. Remove brake pedal and linkage group as follows:

- (1) Remove machine screws (15) and screws and washers (14); remove stabilizer bracket assembly (13).
- (2) Remove capscrews (17) and hex nuts (18); remove bracket (16) and brake pedal assembly (7).



1. Cover
2. Switch
3. Retainer
4. Brake Shaft Assembly
5. Self-Locking Hex Nut
6. Flat Washer
7. Brake Pedal Assembly
8. Cotter Pin
9. Flat Washer
10. Lockwasher
11. Pedal Bearing
12. Lockwasher
13. Stabilizer Bracket Assembly
14. Screw With Washer
15. Machine Screw
16. Bracket
17. Capscrew
18. Hex Nut



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Figure 5-135. Brake Pedal and Linkage Group

b. Disassembly. Disassemble brake pedal and linkage as follows:

- (1) Remove cotter pin (8), flat washer (9) and lockwasher (12).
- (2) Remove self-locking hex nut (5), flat washer (6) and brakeshaft assembly (4).
- (3) Remove brake pedal assembly (7).
- (4) Remove lockwasher (10) and pedal bearings (11).
- (5) Remove cover (1).
- (6) Remove switch (2) and retainer (3).

c. Cleaning and inspection. Refer to paragraphs 5-4.3 and 5-4.4 for general cleaning and inspection procedures.

d. Repair and replacement. Replace all worn or damaged parts.

e. Assembly. Assemble brake pedal and linkage as follows:

- (1) Install switch (2) and retainer (3).
- (2) Install cover (1).

(3) Install lockwasher (10) and pedal bearings (11).

(4) Install brake pedal assembly (7) on brake shaft assembly (4) and install brake shaft assembly (4) in bracket (16).

(5) Install flat washer (6) and self-locking nut (5).

(6) Install lockwasher (12), flat washer (9) and cotter pin (8).

f. Installation. Install brake pedal and linkage group as follows:

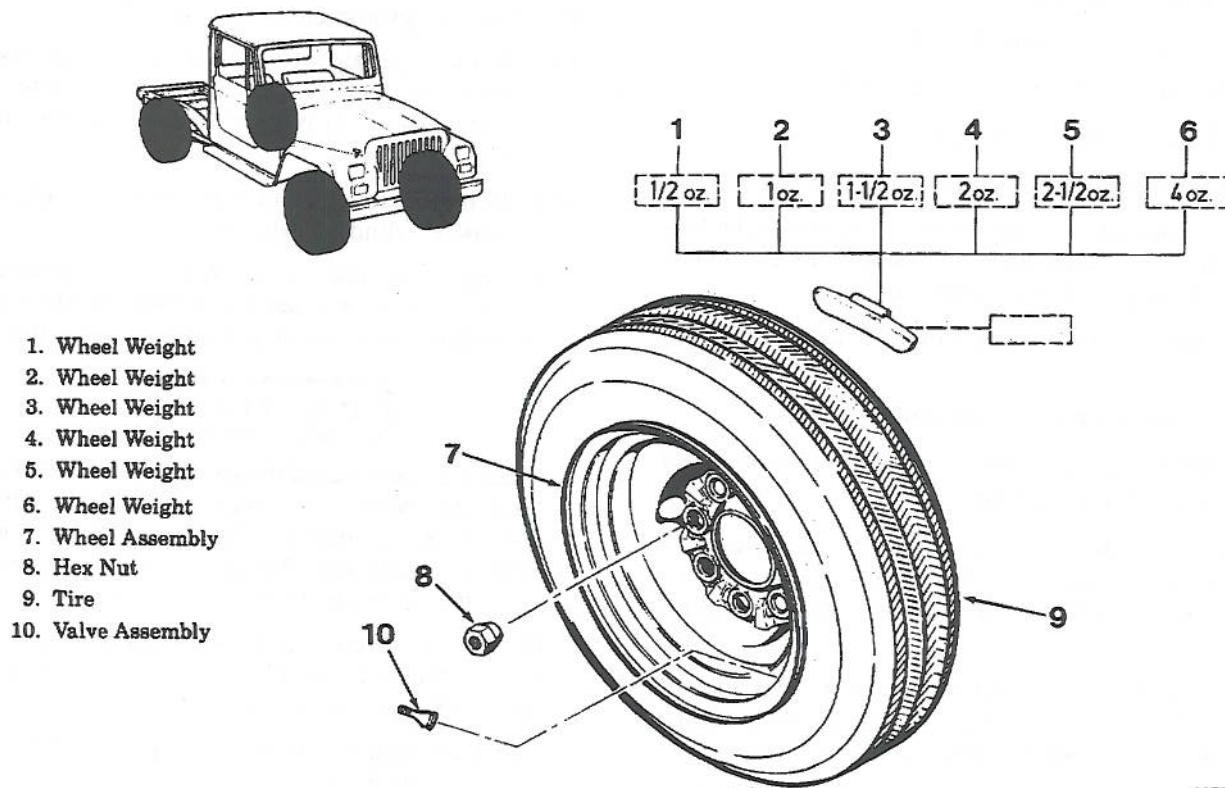
(1) Install bracket (16) using capscrew (17) and hex nut (18).

(2) Install stabilizer bracket (13) using screws and washers (14) and machine screw (15).

5-5.7.2 *Tire, Wheel and Weights Group*. Refer to figure 5-136, and perform the following steps to overhaul the tire, wheel and weights group.

a. Removal and disassembly. Disassembly is accomplished during removal. Remove tire, wheel and weights group as follows:

- (1) Remove hex nuts (8).



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Figure 5-136. Tire, Wheel and Weights Group

- (2) Remove wheel assemblies (7).
- (3) Remove any old weights (1-6).
- (4) Remove tires (9).
- (5) Remove valve assemblies (10).
- b. Cleaning and inspection. Refer to paragraphs 5-4.3 and 5-4.4 for general cleaning and inspection procedures. In addition, perform the following steps:

- (1) Inspect wheels for dents, cracks and broken welds. If wheel is found to be damaged, it must be replaced.



Never clean wheels with abrasives or caustic materials as damage to wheels may result.

- (2) Clean wheels with mild soap and water.
- c. Repair and replacement. Replace all worn or damaged parts.
- d. Assembly and installation. Assembly is accomplished during installation. Install tire, wheel and weights group as follows:
 - (1) Install valve assemblies (10).
 - (2) Install tires (9) on wheel assemblies (7).
 - (3) Install wheel (7) on hub.
 - (4) Install hex nut (8). Tighten to finger tightness.
 - (5) Tighten one hex nut (8) to torque prescribed by table 6-2, then tighten opposite hex nut (8) to torque prescribed by table 6-2.
 - (6) Tighten remaining hex nuts (8) in similar fashion.
 - (7) Install other wheels in similar fashion.
 - (8) Install wheel weights (1-6) as required by wheel balancing procedures.

5-5.7.3 Power Brake Booster And Master Cylinder Group. Refer to figure 5-137, and perform the following steps to the power brake booster and master cylinder group.

- a. Removal and disassembly. Disassembly is accomplished during removal. Remove power brake booster and master cylinder group as follows:

- (1) Disconnect power unit push rod at brake pedal. Discard screw and nut attaching rod to pedal.

- (2) Remove hex nuts (17) and (19) and remove booster spacer (18) and booster (16) from vehicle.
- (3) Remove retainer strap (15), loosen hose clamp (14) and remove hose (13) from valve assembly (11). Remove hose clamp (14) from hose (13).
- (4) Remove hex nuts (2) and remove booster (16) from master cylinder body (9). Set master cylinder body (9) aside.
- (5) Remove valve assembly (11) and grommet (12) from booster (16).
- (6) Remove studs (20) from booster (16).
- (7) Disconnect brake lines at master cylinder body (9). Block cylinder ports and open ends of brake lines to prevent entry of dirt.
- (8) Remove master cylinder assembly (1) from vehicle.
- (9) Remove cover (3) and diaphragm (4) and drain brake fluid out of reservoir.
- (10) Mount master cylinder body (9) in vise and remove reservoir and grommet kit (5) using pry bar.
- (11) Remove grommets from reservoir.
- (12) Remove repair kit (7) by first pushing inward on its primary piston and removing snap ring from groove in bore of master cylinder body (9).
- (13) Remove seat (8) and valve assembly (6) from master cylinder body (9).
- b. Cleaning and inspection. Refer to paragraphs 5-4.3 and 5-4.4 for general cleaning and inspection procedures. In addition, perform the following step:



Clean the master cylinder assembly with brake fluid only. Never use solvents containing mineral oil such as gasoline, kerosene, alcohol or carbon tetrachloride. Mineral oil is very harmful to the rubber piston cups and seals.

Do not use wire to open a clogged port in the master cylinder assembly as wire may create burrs in the port and cylinder bore.

- (1) Clean master cylinder assembly in brake fluid (27, table 5-1).
- (2) Blow out all passages with compressed air.

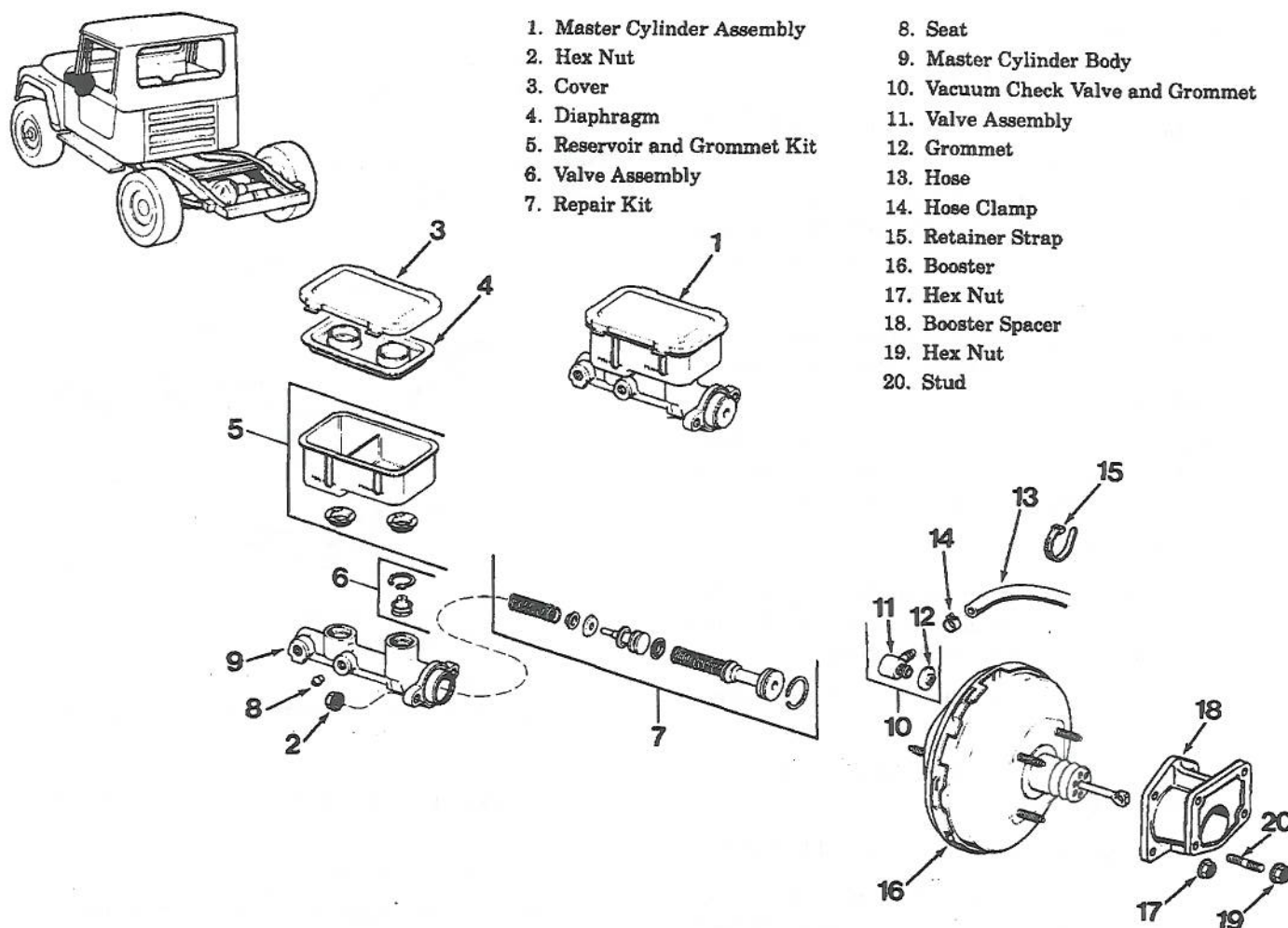


Figure 5-137. Power Brake Booster and Master Cylinder Group

WARNING

Compressed air used for cleaning can create airborne particles that may enter the eyes. Pressure shall not exceed 30 psi and goggles must be worn.

c. Repair and replacement. Replace all worn or damaged parts.

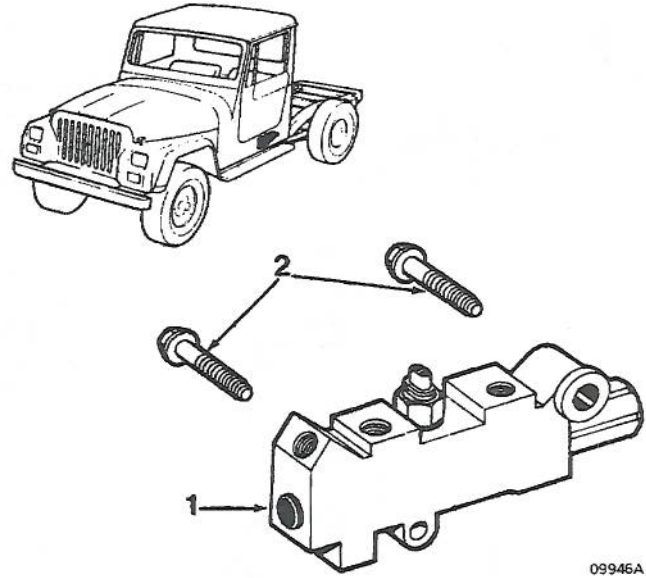
d. Assembly and installation. Assembly is accomplished during installation. Install power booster and master cylinder group as follows:

- (1) Install new seats (8) using spare tube fitting nuts to press them into place. Do not allow seats to become cocked during installation and be sure they are bottomed.
- (2) Assemble components of secondary piston of repair kit (7).

- (3) Lubricate bore of master cylinder body (9) with brake fluid and install secondary piston assembly.
- (4) Lubricate primary piston assembly of repair kit (7) with brake fluid and install in master cylinder body (9).
- (5) Push primary piston inward and install snap ring in groove of master cylinder bore.
- (6) Install new grommets from reservoir and grommet kit (5) in master cylinder body (9). Be sure grommets are properly seated.
- (7) Install valve assembly (6) in master cylinder body (9).
- (8) Lay reservoir from reservoir and grommet kit (5) or flat, hard surface. Press reservoir (5) into master cylinder body (9) using rocking motion.

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- (9) Install diaphragm (4) in cover (3).
- (10) Install studs (20) in booster (16).
- (11) Install grommet (12) and valve assembly (11) in booster (16).
- (12) Install booster (16) and booster spacer (18) on vehicle using hex nuts (17) and (19). Tighten hex nuts (17) and (19) to torque specified in table 6-2.
- (13) Install master cylinder assembly (1) on booster using hex nuts (2). Tighten hex nuts to torque specified in table 6-2.
- (14) Install hose clamp (14) on hose (13). Install hose (13) on valve assembly (11) and tighten hose clamp (14). Install retainer strap (15).
- (15) Connect brakelines.
- (16) Align power unit push rod and brake pedal; install replacement attaching screw and nut and tighten to torque specified in table 6-2.
- (17) Add brake fluid to master cylinder reservoir to bring fluid to proper level.
- (18) Install cover (3) and diaphragm (4) on master cylinder reservoir.
- (19) Refer to paragraph 4-4.5 and bleed brakelines.



1. Brake Proportioning Valve
2. Capcrew

Figure 5-138. Brake Proportioning Valve Group

5-5.7.4 *Brake Proportioning Valve Group*. Refer to figure 5-138, and perform the following steps to overhaul the brake proportioning valve group.

- a. Removal and disassembly. Disassembly is accomplished during removal. Remove the brake proportioning valve group as follows:
 - (1) Disconnect brake lines from brake proportioning valve (1). Tape brake lines off to prevent leakage of brake fluid and contamination.
 - (2) Disconnect wire from switch.
 - (3) Remove cap screws (2).
 - (4) Remove brake proportioning valve (1).
- b. Cleaning and inspection. Refer to paragraphs 5-4.3 and 5-4.4 for general cleaning and inspection procedures.
- c. Repair and replacement. Replace all worn or damaged parts.
- d. Assembly and installation. Assembly is accomplished during installation. Install brake proportions valve as follows:
 - (1) Install brake proportioning valve (1) using cap screws (2).

- (2) Connect brake lines to brake proportioning valve (1).
- (3) Connect wire to switch.
- (4) Refer to paragraph 4-4.5 and bleed brake lines and refill master cylinder.

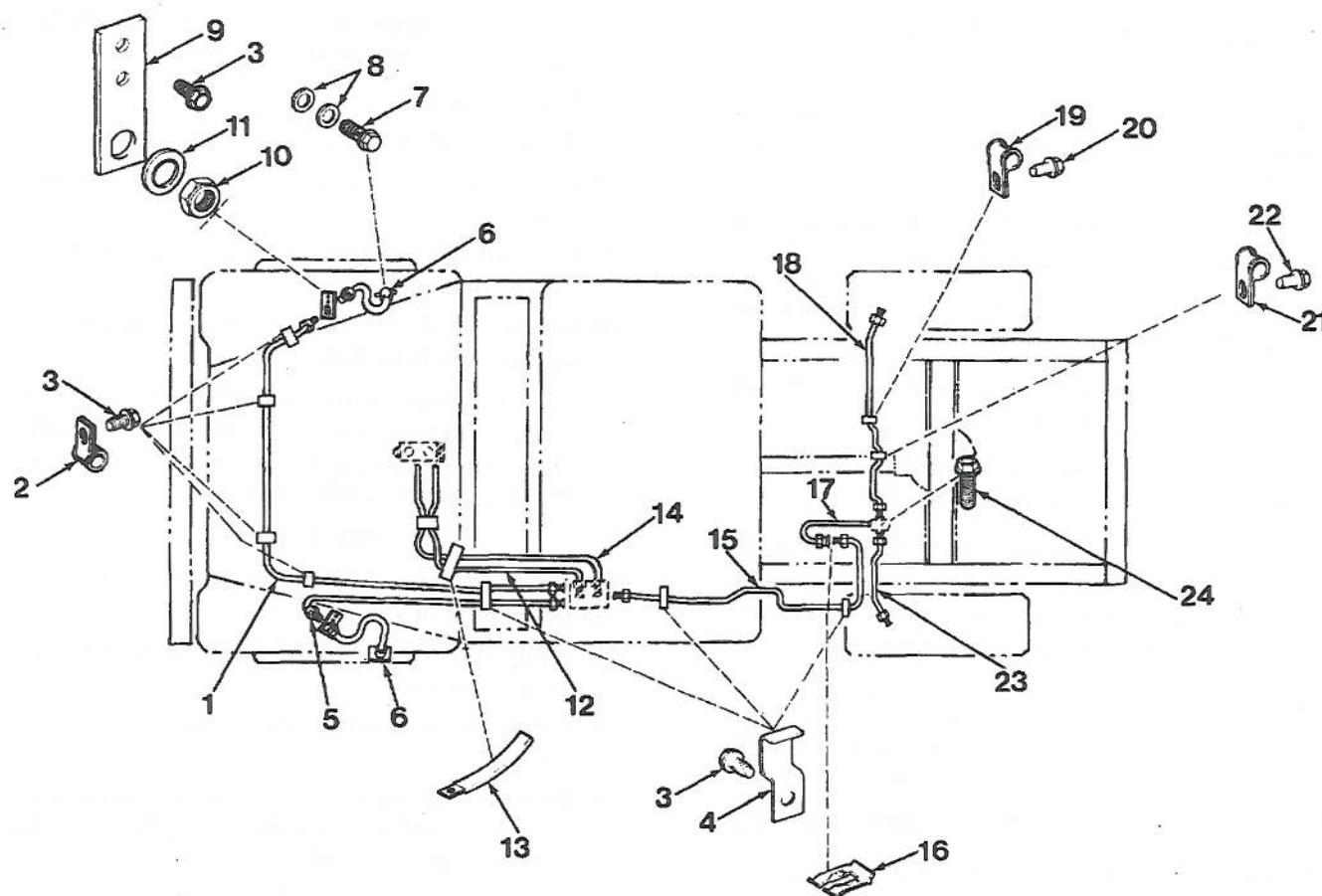
5-5.7.5 *Brake Lines Group*. Refer to figure 5-139, and perform the following steps to overhaul the brake lines group.

- a. Removal and disassembly. Disassembly is accomplished during removal. Remove brake lines group as follows:

NOTE

Before removing any brake lines, bleed the system dry.

- (1) Remove cap screws (3), loosen connector, and remove hex nut (10), flat washer (11), and tube assembly (1).
- (2) Remove closed clips (2) and holddown clip (4) from tube assembly (1).
- (3) Remove special hex head bolts (7), special flat washers (8) and hose assembly (6).
- (4) Remove cap screws (3) and bracket (9).
- (5) Remove hex nuts (10) and flat washer (11), loosen connector and remove hose assembly (6).



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- | | | |
|--------------------------|-------------------|-------------------|
| 1. Tube Assembly | 9. Bracket | 17. Hose Assembly |
| 2. Closed Clip | 10. Hex Nut | 18. Tube Assembly |
| 3. Capscrew | 11. Flat Washer | 19. Closed Clip |
| 4. Holddown Clip | 12. Tube Assembly | 20. Capscrew |
| 5. Tube Assembly | 13. Strap Clip | 21. Closed Clip |
| 6. Hose Assembly | 14. Tube Assembly | 22. Capscrew |
| 7. Special Hex Head Bolt | 15. Tube Assembly | 23. Tube Assembly |
| 8. Special Flat Washer | 16. Retaining Cup | 24. Capscrew |

Figure 5-139. Brake Lines Group

- (6) Remove capscrews (3) and bracket (9).
 - (7) Loosen connector and remove tube assembly (5).
 - (8) Remove capscrew (3) and strap clip (13) and remove tube assemblies (12) and (14).
 - (9) Remove capscrews (3) and holddown clips (4); remove retaining clip (16), loosen connectors and remove tube assembly (15).
 - (10) Remove hose assembly (17).
 - (11) Loosen connectors, remove capscrew (20) and (22) and remove tube assembly (18).
 - (12) Remove closed clips (19) and (21) from tube assembly (18).
 - (13) Loosen connectors and remove capscrew (24); remove tube assembly (23) and T-fitting.
- b. Cleaning and inspection. Refer to paragraphs 5-4.3 and 5-4.4 for general cleaning and inspection procedures. In addition, perform the following step:
- (1) Inspect brake lines for swelling, distortion, kinks or cracks. Any brake line exhibiting these conditions must be replaced.

c. Repair and replacement. Replace all worn or damaged parts.

d. Assembly and installation. Assembly is accomplished during installation. Install brake lines group as follows:

- (1) Install tube assembly (23) and T-fitting; tighten connectors and install capscrew (24).
- (2) Install closed clips (19) and (21) on tube assembly (18).
- (3) Install tube assembly (18), tighten connectors and install capscrews (20) and (22).
- (4) Install hose assembly (17) and tighten connector connecting assembly (17) to T-fitting.
- (5) Connect tube assembly (15) to hose assembly (17), tighten connector and install retaining clip (16). Tighten opposite connector and install holddown clips (4) and capscrews.
- (6) Install bracket (9) using capscrews (3).
- (7) Install tube assemblies (12) and (14) using strap clip (13) and capscrew (3). Tighten connectors.
- (8) Install tube assembly (5) and tighten connector.
- (9) Install hose assembly (6) and tighten connector to brake.
- (10) Connect free connectors of hose assembly (6) and tube assembly (5) at bracket (9) using flat washers (11) and hex nuts (10).
- (11) Install closed clips (2) on tube assembly (1).
- (12) Install tube assembly (1), connect connector and holddown clips (4) and capscrews (3); fasten closed clips (2) to vehicle using capscrews (2).
- (13) Install bracket (9) using capscrews (3).
- (14) Connect hose assembly (6) using special flat washers (8) and special hex head bolt (7).
- (15) Connect free connectors of tube assembly (1) and hose assembly at bracket (9) using flat washer (11) and hex nut (10).
- (16) Refer to paragraph 4-4.5 and refill master cylinder and bleed brake lines.

5-5.7.6 *Front Brake Caliper Group*. Refer to figure 5-140, and perform the following steps to overhaul the front brake caliper group.

a. Removal and disassembly. Disassembly is accomplished during removal. Remove front brake caliper group as follows:

- (1) Remove two-thirds of brake fluid from master cylinder front reservoir.
- (2) Raise vehicle.
- (3) Remove wheel and tire.
- (4) Bottom piston (4) using pry bar or large C-clamp.
- (5) Remove bolt package (6) and components of hardware kit (8).
- (6) Remove brake lines. Tape off ends to prevent spillage of brake fluid.
- (7) Remove caliper assemblies (1) and (2) by lifting them upward and out of shield and support. Place caliper assemblies (1) and (2) on front spring or other suitable support.

NOTE

Do not allow brake hose to support weight of caliper assemblies.

- (8) Remove hardware kit (8), shoe spring package (9) and shoe set (7).
- (9) Clean caliper exterior with brake fluid (27, table 5-1).
- (10) Drain remaining fluid from caliper assemblies (1) and (2) and place caliper assemblies (1) and (2) on clean work surface.
- (11) Pad caliper interiors with clean shop cloths.
- (12) Insert air nozzle into caliper fluid inlet holes and slowly apply just enough air pressure to ease piston packages (4) out of bore.

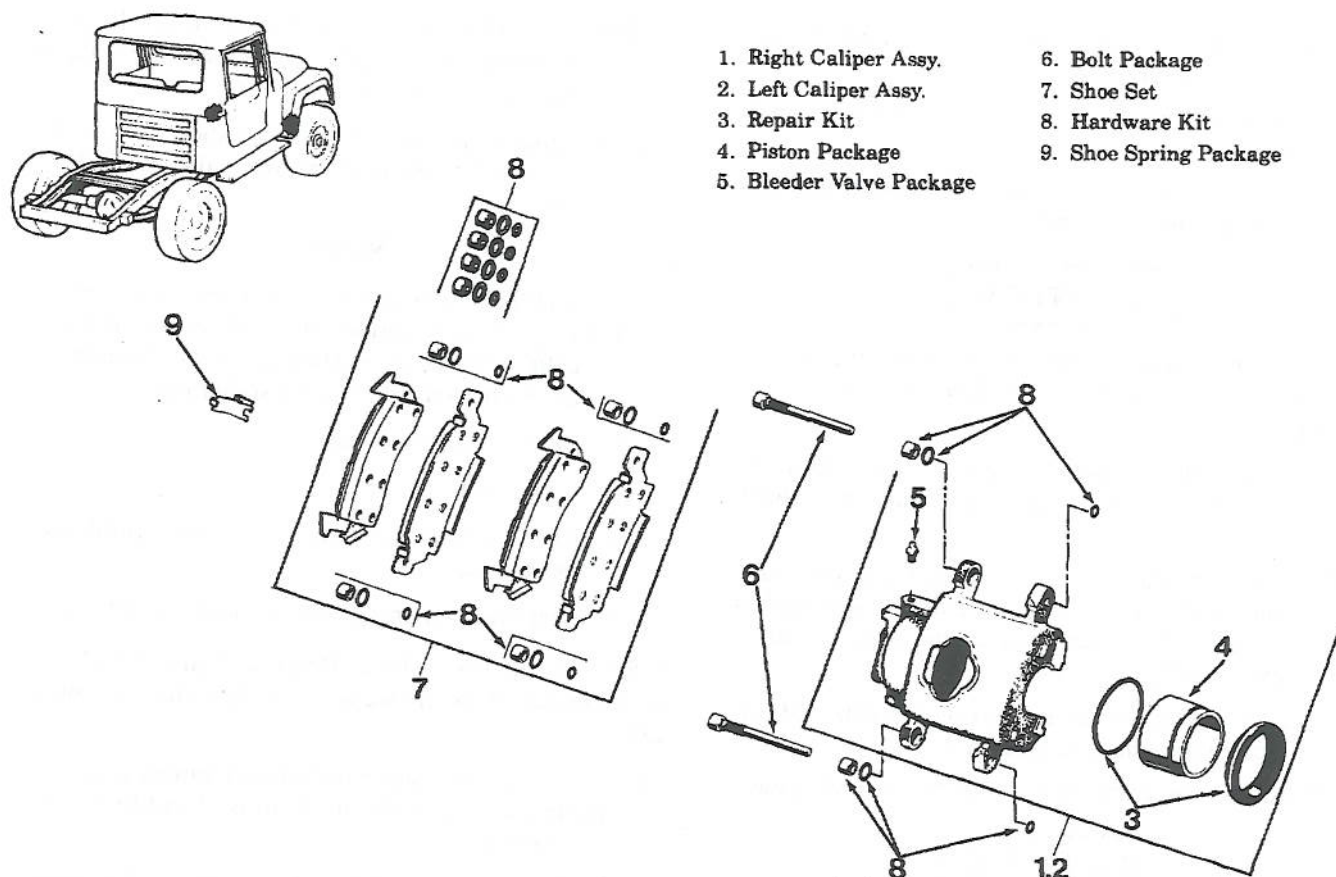
WARNING

Do not place fingers in front of the piston in an attempt to catch or protect it. Use only enough air pressure to ease the piston out of the bore. Excessive air pressure can eject the piston with enough force to cause damage or injury.

CAUTION

Remove repair kit seals using a wooden or plastic tool as a metal tool could score the piston bore.

- (13) Remove and discard repair kit (3) seals.
 - (14) Remove bleeder valve packages (5).
- b. Cleaning and inspection. Refer to paragraphs 5-4.3 and 5-4.4 for general cleaning and inspection procedures. In addition perform the following steps:
- (1) Clean all parts in clean brake fluid (27, table 5-1).



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Figure 5-140. Front Brake Caliper Group

WARNING

Compressed air used for cleaning can create airborne particles that may enter the eyes. Pressure must remain under 30 psi and goggles must be worn.

- (2) Replace mounting bolts if threads are corroded or damaged.

CAUTION

Do not attempt to clean or polish mounting bolts with abrasives as the protective plating will be removed.

- (3) Inspect piston for nicks, scratches or corrosion. If any of these conditions are present, piston must be replaced.
- (4) Inspect piston bore for nicks, scratches or corrosion. If any of the conditions are present, caliper must be replaced. Minor cor-

rosion and stains may be removed using a crocus cloth.

- c. Repair and replacement. Replace all worn or damaged parts.
- d. Assembly and installation. Assembly is accomplished during installation. Install front brake caliper group as follows:

- (1) Lubricate piston bores and repair kit (3) seals with brake fluid (27, table 5-1).
- (2) Install repair kit (3) seals in bore groove. Work seals into grooves using fingers only.
- (3) Lubricate piston packages (4) with brake fluid.
- (4) Install replacement dust boots on pistons. Slide metal retainer portions of boots over open end of pistons and pull boot rearward until rubber boot lips seat in piston grooves.
- (5) Push metal retainer portions of boots forward until retainers are flush with rings at open end of piston and boot folds snap into place.

- (6) Insert pistons into bores and into piston seals. Do not unseat seals.
- (7) Press piston to bottom of bore using hammer handle.
- (8) Set metal retainer portions of dust boots in counterbores using tool #J-22904.

CAUTION

The metal portions of the dust boots must be seated evenly and below the faces of the calipers.

- (9) Install bleeder screw. Tighten screw securely, but not to required torque until brakes have been bled.
- (10) Install replacement copper gaskets on brake lines and connect lines to calipers assemblies (1) and (2). Tighten brake line bolts to torque specified by table 6-2.
- (11) Lubricate hardware kit (8) components with silicone lubricant (28, table 5-1).
- (12) Install rubber bushings in caliper mounting ears.

CAUTION

Do not use the original old bushings on sleeves. Use replacement parts only.

- (13) Install sleeves in inboard mounting ears of caliper. Position sleeves with sleeve ends facing shoes and linings flush with machined surfaces of mounting ears.
- (14) Install shoe spring packages (9) on inboard shoes of shoe set (7). Place single tang ends of springs over notches in shoes.
- (15) Install inboard shoes in caliper assemblies (1) and (2). Be sure shoes are flush against pistons and that springs (9) are fully seated in pistons.
- (16) Install outboard shoes of shoe set (7). Shoe ears should rest on upper surfaces of caliper mounting ears and lower shoe tabs should fit into cut-out in caliper assemblies (1) and (2). Be sure shoes are fully seated.
- (17) Position caliper assemblies (1) and (2) over rotors and in support shields and brackets.
- (18) Install bolt package (6) bolts. Be sure bolts pass under inboard shoe retaining ears and insert bolts until they enter bores in outboard shoe and caliper mounting ears. Thread bolts into support brackets and tighten to torque specified by table 6-2.

- (19) Fill master cylinder with brake fluid. Refer to paragraph 4-4.5 and bleed brake lines. Pump brake pedal to seat shoes.
- (20) Clinch upper ears of outboard shoes until radial clearance between shoes and calipers is eliminated.

NOTE

Outboard shoes with formed ears are designed for original installation only and are fitted to the caliper. These shoes should never be relined or reconditioned for future installation.

- (21) Install wheel and tire.
- (22) Lower vehicle.
- (23) Check and correct master cylinder fluid level as necessary.
- (24) Test brake operation before moving vehicle.

5-5.7.7 *Front Brake Disc*. Refer to figure 5-141, and perform the following steps to overhaul the front brake disc.

- a. Removal and disassembly. Disassembly is accomplished during removal. Remove front brake disc as follows:
 - (1) Remove two-thirds of brake fluid from master cylinder front reservoir.
 - (2) Raise vehicle.
 - (3) Remove wheels and tires. Refer to paragraph 5-5.7.6 and remove calipers.
 - (4) Remove grease caps (1).
 - (5) Remove bearing lockrings (2), using tool #J-6893, and lockwashers (3).
 - (6) Remove locknut and pin assembly (4), using tool #J-6893.
 - (7) Remove cone and rollers (5).
 - (8) Remove outer bearing caps (11).
 - (9) Remove hub and disc assemblies (8).
 - (10) Remove wheel bolts (9) from hub and disc assemblies (8).
 - (11) Remove inner bearing caps (10).
 - (12) Remove bearing assemblies (7).
 - (13) Remove hub seals (6).
- b. Cleaning and inspection. Refer to paragraphs 5-4.3 and 5-4.4 for general cleaning and inspection procedures. In addition, perform the following steps:

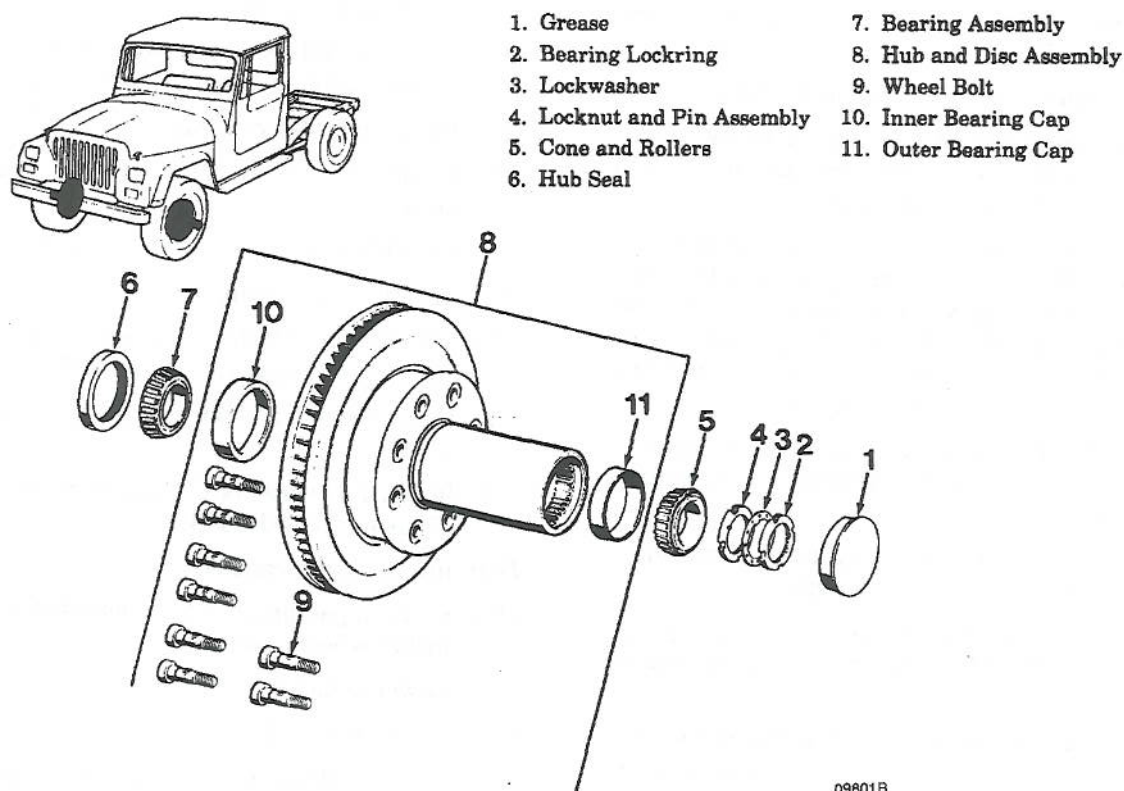


Figure 5-141. Front Brake Disc

- (1) Clean all parts in clean brake fluid (27, table 5-1) only.
- (2) Inspect wheel bolts for corrosion or thread damage. If corroded or damaged, wheel bolts must be replaced.

CAUTION

Do not attempt to clean or polish wheel bolts with abrasives as the protective plating may be removed.

- (3) Inspect disc for rust or scoring. If rust or scoring is present, disc must be cleaned with flat sanding discs while turning on lathe.
- (4) Check rotor thickness at center of lining contact area. If thickness is below figure prescribed by table 6-1 rotor must be replaced.
- (5) Measure disc lateral runout (figure 5-142) as follows in steps (6) through (8):
- (6) Mount dial indicator stylus on support stand or steering spindle.
- (7) Position indicator stylus so it contacts center of disc lining contact area and zero indicator.

- (8) Turn disc 360 degrees and note indicator reading. If runout exceeds figure stated in table 6-1, disc must be refinished. If runout exceeds replacement limit as stated in table 6-1, disc must be replaced.

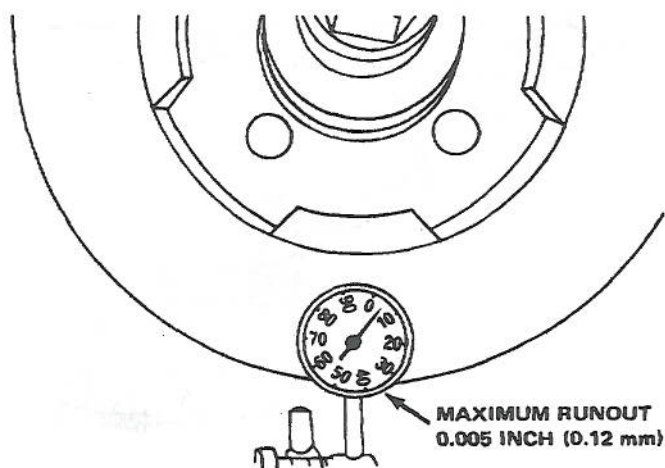


Figure 5-142. Checking Lateral Runout

- (9) Measure thickness variation of the disc (figure 5-143) as follows:
 - (10) Use micrometer or two dial indicators.
 - (11) Take readings at four or more equally spaced points around disc circumference and 1 inch inward from outer edge of disc.
 - (12) Thickness variation must not vary from point-to-point by more than the figure stated in table 6-1. If thickness variation exceeds limit, disc must be refinished. If refinishing would cause disc thickness to fall below figure prescribed by table 6-1, disc must be replaced.
- c. Repair and replacement. Replace all worn or damaged parts. In addition, perform the following steps:
- (1) Clean rust or scoring off disc using flat sanding discs while turning disc on lathe.
 - (2) If disc has lateral runout not exceeding figure prescribed by table 6-1, refinish disc on lathe.
 - (3) If disc has thickness variation exceeding figure prescribed by table 6-1, refinish disc on lathe.
- d. Assembly and installation. Assembly is accomplished during installation. Install front brake disc as follows:

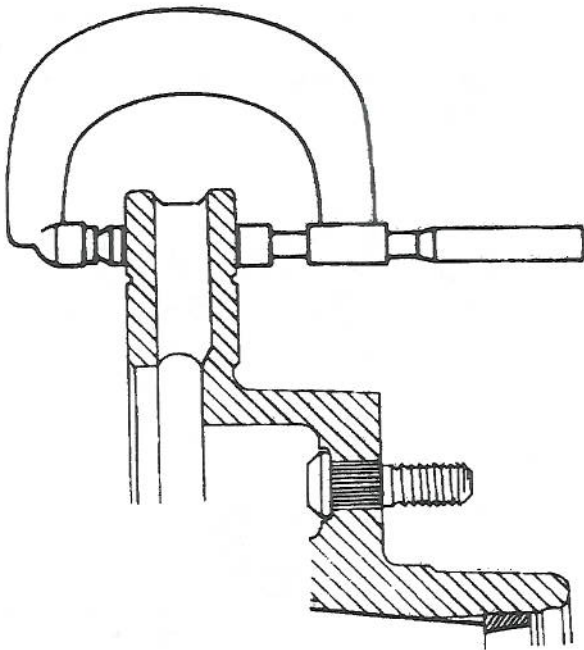


Figure 5-143. Checking Disc Thickness Variation

- (1) Install hub seals (6).
- (2) Lubricate and install bearing assemblies (7) with wheel bearing grease (29, table 5-1).
- (3) Install inner bearing caps (10).
- (4) Install wheel bolts (9) in hub and disc assemblies (8).
- (5) Install hub and disc assemblies (8).
- (6) Install outer bearing caps (11).
- (7) Lubricate and install cone and rollers (5) with wheel bearing grease (29, table 5-1).
- (8) Install locknut and pin assemblies (4) using tool #J-6893.
- (9) Install lockwashers (3) and bearing lockrings (2) using tool #J-6893.
- (10) Install grease caps (1).
- (11) Refer to paragraph 5-5.7.6 and install calipers. Install wheels and tires.
- (12) Lower vehicle.
- (13) Add brake fluid.

5-5.7.8 *Parking Brake Group*. Refer to figure 5-144, and perform the following steps to overhaul the parking brake group.

- a. Removal and disassembly. Disassembly is accomplished during removal. Remove parking brake group as follows:
- (1) Raise vehicle.
 - (2) Remove hex nuts (13) and flat washer (14).
 - (3) Remove front control assembly (8) from rear cable equalizer (15).
 - (4) Remove cotter pins (16) and rear cable equalizer (15).
 - (5) Remove rear cable assemblies, left (18) and right (19), from retaining clips (17) and remove retaining clips (17).
 - (6) Refer to paragraph 5-5.7.9 and disassemble rear drum brakes as far as necessary to remove left and right rear cable assemblies (18) and (19).
 - (7) Remove cable bracket (21).
 - (8) Remove capscrews (20) and clip (11).
 - (9) Remove front control assembly (8) from retaining clips (9) and remove retaining clip (9).
 - (10) Remove front control and assembly (8) from cable bracket (12).
 - (11) Remove clip (11).