

CHAPTER 12

Brakes

LIST OF CONTENTS

Para		Page
12.1	General.....	1
12.2	Adjustment.....	2
12.3	Bleeding the Hydraulic Brake System.....	4
12.4	Front Brake Master Cylinder Removal/Disassembly.....	5
12.5	Cleaning, Inspection and Repair.....	6
12.6	Assembly Installation.....	7
12.7	Brake Pad Replacement Removal.....	9
12.8	Front Brake Caliper Removal.....	10
12.9	Rear Brake Master Cylinder Removal/Disassembly.....	10
12.10	Cleaning, Inspection and Repair.....	10
12.11	Assembly/Installation.....	12
12.12	Front Brake Caliper Installation.....	12
12.13	Rear Brake Caliper Removal.....	12
12.14	Rear Brake Caliper Installation.....	12
12.15	Brake Caliper Disassembly (Front and Rear).....	12
12.16	Cleaning, Inspection and Repair.....	13
12.17	Brake Caliper Assembly.....	13

LIST OF ILLUSTRATIONS

Fig		Page
12.1	Front Brake Control Lever Free Play Adjustment.....	2
12.2	Rear Brake Pedal Height Adjustment.....	3
12.3	Free Play Adjustment.....	3
12.4	Bleeding Brakes (Typical).....	5
12.5	Front Master Cylinder.....	6
12.6	Front Brake Hand Lever and Reservoir.....	7
12.7	Master Cylinder/Reservoir Assembly.....	8
12.8	Rear Brake Control.....	9
12.9	Brake Caliper.....	11

12.1 GENERAL

The front and rear brakes are fully hydraulic disc brakes and require little maintenance. Every 5000 miles, check master cylinders for proper fluid levels and check brake pads and discs for wear. If brake pads' friction material is worn to $\frac{1}{16}$ in or less they should be replaced. Minimum brake disc thickness is stamped on the side of the disc. When filling master cylinders, use only DOT 3 Hydraulic Brake Fluid which is approved for use in hydraulic brake systems. When removing master cylinder/reservoir filler plug or cover, be sure that all dirt is removed from the area to prevent dirt getting into reservoir. Rear brake reservoir should be filled to the 'MAX' line. Front brake master cylinder should be filled to half way in reservoir sight glass with the reservoir in a level position.

The front brake master cylinder is an integral part of the brake hand lever assembly. The rear brake master cylinder is located on the right side of the motorcycle near the brake pedal.

WARNING

Because brake performance is a critical safety item, brake system servicing requires special tools, correct replacement parts and procedures. Whenever the brake system is serviced, it should be tested on dry, clean road at slow speeds before putting the motorcycle in regular service.

12.2 ADJUSTMENT

a. Front Brake Lever. The front brake lever can be adjusted to the rider.

- (1) Fig 12.1 refers. Loosen jam nut(1).
- (2) Turn adjusting screw (2) until lever is comfortable for rider.

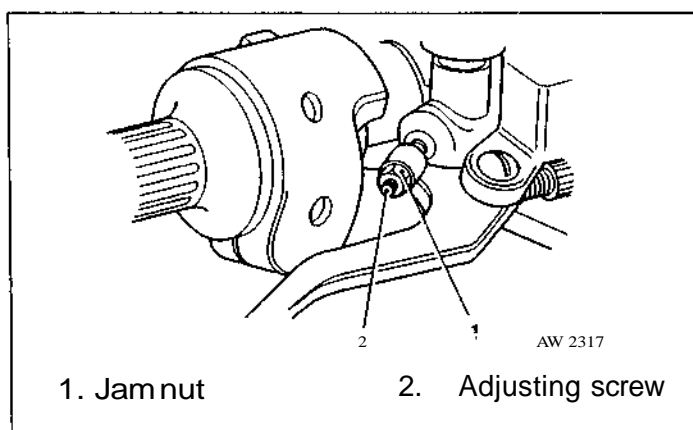


Fig 12.1 Front Brake Control Lever Free Play Adjustment

- (3) Hold adjusting screw (2) stationary and tighten lock nut (1).

b. Rear Brake Pedal

- (1) Fig 12.2 refers. Loosen lock nut (3) and adjust stop screw (1) until brake pedal (2) is at desired height. Tighten locknut (3).

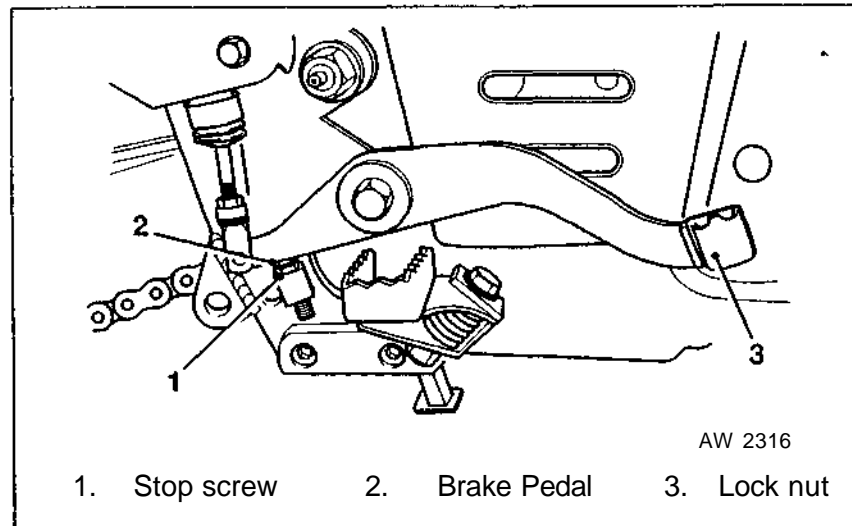


Fig 12.2 Rear Brake Pedal Height Adjustment

(2) Fig 12.3 refers. Depress brake pedal only as far as necessary for push rod (1) to contact master cylinder piston (a significant resistance can be felt). Hold pedal in this position while making adjustment in steps (3) to (7).

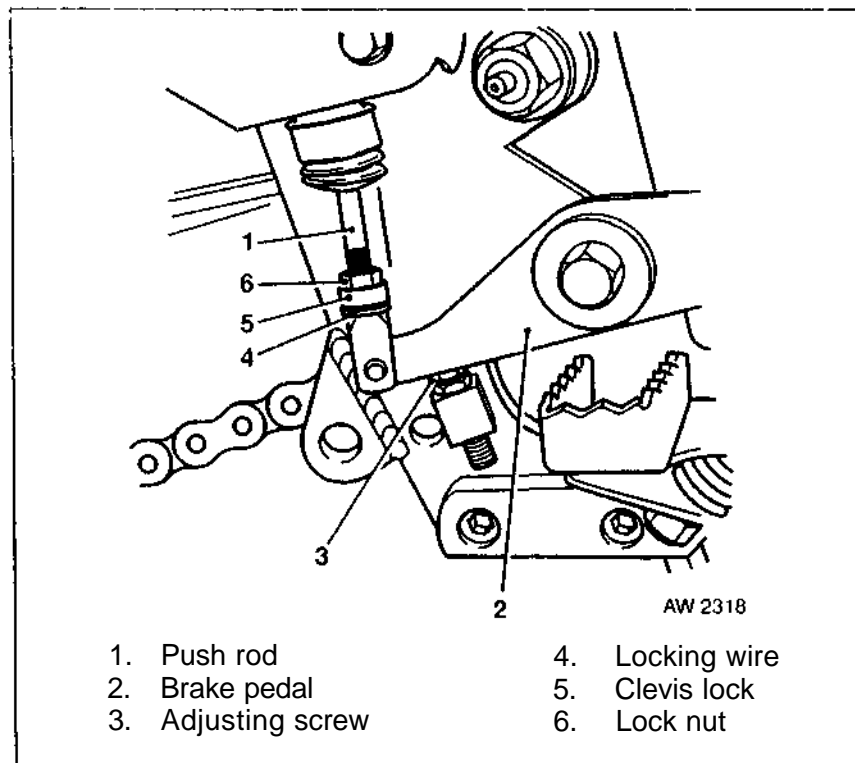


Fig 12.3 Free Play Adjustment

(3) Measure clearance between brake pedal (2) and adjusting screw (3). Clearance should be 1.6 mm ($\frac{1}{16}$ in).

(4) If clearance is not 1.6 mm ($\frac{1}{16}$ in) use long nose pliers and remove and discard locking wire (4).

- (5) Fig 12.3 refers. Remove lock wire, unsnap clevis lock (5) and swing out of way.
- (6) Loosen lock nut (6).
- (7) Lengthen or shorten push rod (1) by rotating it until clearance is 1-6 mm (A, in).
- (8) Tighten lock nut (6).
- (9) Snap clevis lock (5) over clevis.
- (10) Install new lock wire (4).

12.3 BLEEDING THE HYDRAULIC BRAKE SYSTEM

NOTE: Hydraulic brake fluid bladder type pressure equipment can be used to fill brake master cylinder through the bleeder fitting if master cylinder cover is removed so that system cannot pressurise. The ball check in the bleeder fitting must also be removed. Do not use pressure bleeding equipment when the hydraulic system is sealed with master cylinder cover and gasket in place.

- a. Fig 12.4 refers. Slip a length of appropriate size clear plastic tubing over wheel cylinder bleeder valve with other end in a clean container. Turn handlebars so that bleeder valve is nearly vertical.
- b. Depress brake pedal or lever once to build up pressure. Open bleeder valve by rotating counterclockwise about one-half turn.
- c. Keep master cylinder full of fluid at all times. Slowly depress brake pedal or lever once until fluid stops flowing from tubing. Close the bleeder valve. Allow pedal or lever to return slowly to release position.
- d. Repeat operation until brake system is free of air bubbles. Add fluid to master cylinder to bring to original level. Do not re-use fluid. Tighten brake bleeder nipple to 32-40 in/lbs torque.

NOTE: If, after bleeding the brake(s) it still feels spongy, remove the brake caliper. Lift the caliper and bleeder higher than the brake reservoir, purge the brake light switch, and resume normal bleeding operation. Install the caliper when finished. See para on Removal/Installation of Brake Caliper.

NOTE: If rear brake continues to feel spongy:

1. See Fig 12.4. Clamp supply line.
2. Remove brake switch, turn over and fill with brake fluid. Install brake switch.

WARNING

Replace fluid reservoir covers before bleeding. DOT 3 brake fluid can cause eye irritation. In case of contact with eyes, flush with plenty of water and get medical attention. KEEP BRAKE FLUID OUT OF THE REACH OF CHILDREN.

CAUTION

Whenever a hydraulic brake line or fitting is opened the fitting should be flushed with brake fluid and the brake system must be bled. Do this to eliminate any air or contaminants from the brake system. Air in the fluid will cause the brake pedal to have a spongy feel. If a contaminant becomes lodged in the seat of a fitting, leakage of fluid could occur, and/or air could be drawn into the system.

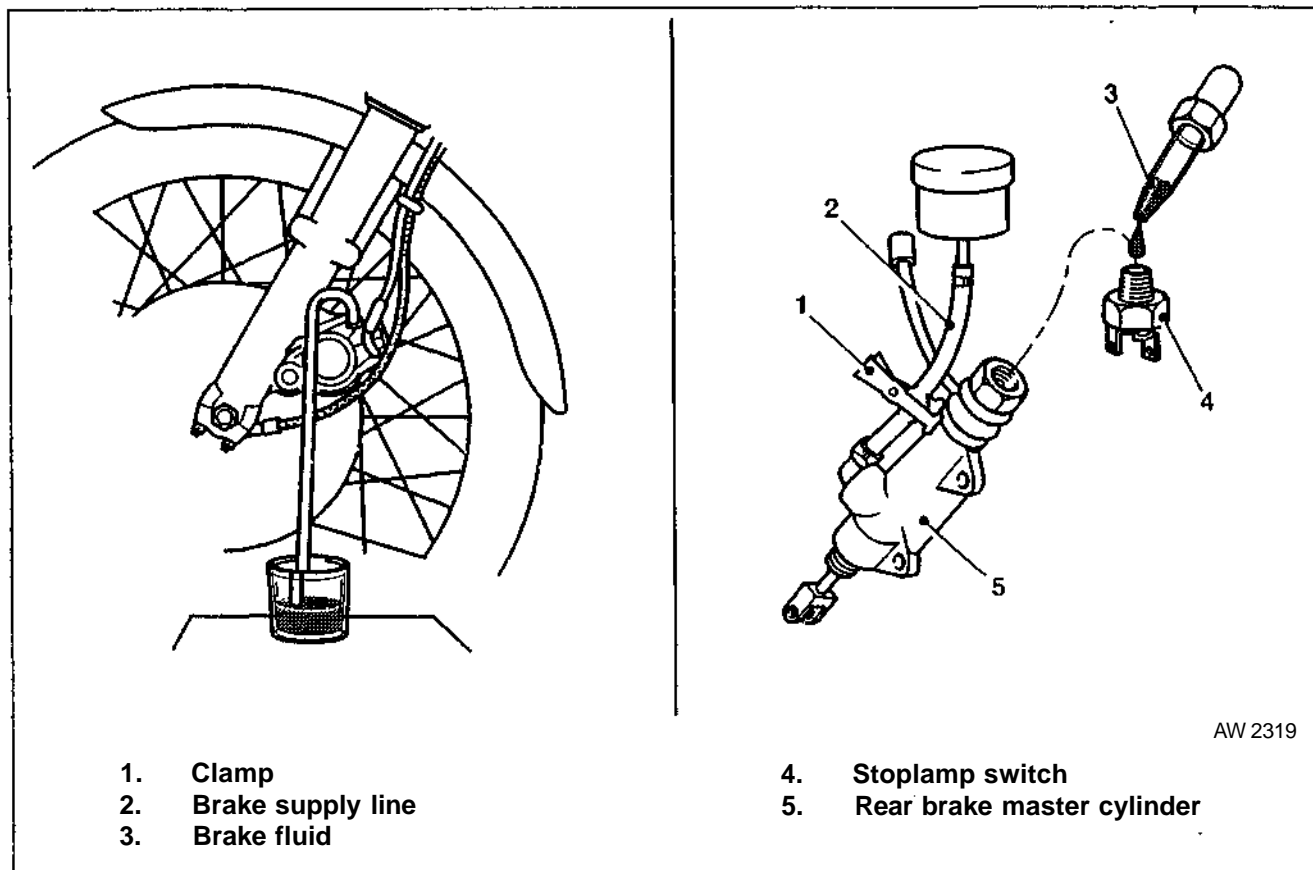


Fig 12.4 Bleeding Brakes (Typical)

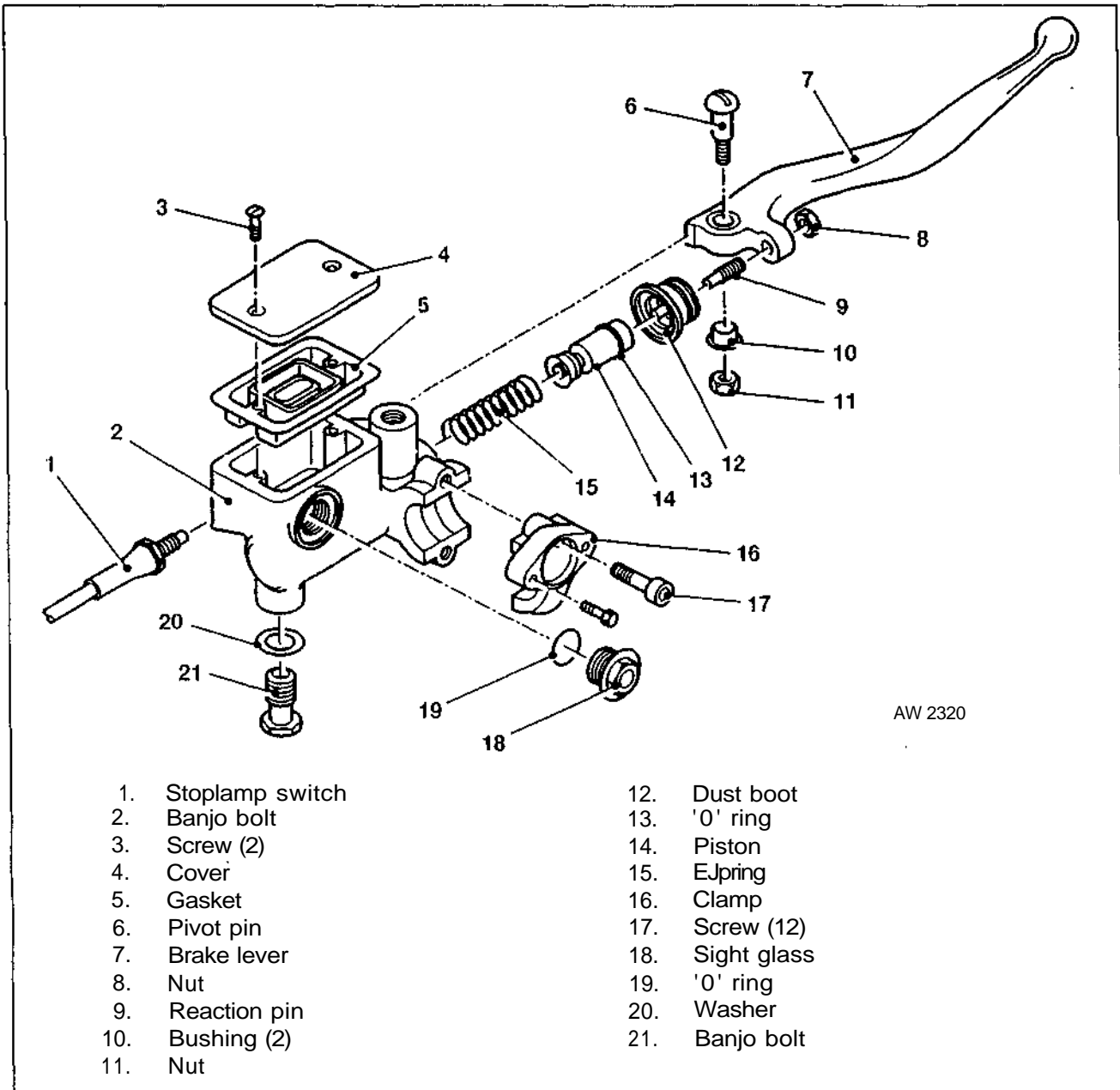
12.4 FRONT BRAKE MASTER CYLINDER REMOVAL/DISASSEMBLY

Fig 12.5 refers.

The master cylinder is located on the right side of the handlebar. Remove and disassemble as follows.

- a. Open the bleeder nipple on the front caliper and drain the brake fluid by pumping the handlever.
- b. Disconnect the hydraulic brake line from the master cylinder by removing banjo bolt (21) and washer (20).
- c. Remove the master cylinder screws (3), cover (4) and gasket (5). (Gasket includes plastic plate).
- d. Remove nut (11). Unscrew pivot pin (6) and remove bushings (10). Remove brake lever (7), nut (8) and reaction pin (9).

- e. Remove master cylinder from handlebar by removing screws (17) and clamp (16).
- f. Pull out the dust boot (12), piston (14), 'O' ring (13) and spring (15).
- g. If necessary, remove sight glass (18) and 'O' ring (19).



AW 2320

Fig 12.5 Front Master Cylinder

12.5 CLEANING, INSPECTION AND REPAIR

Fig 12.5 refers.

- a. Inspect piston (14), 'O' ring (13), dust boot (12) and pivot pin (6) for wear, softening or enlarging. Replace if necessary.

- b. Examine the cylinder walls for scratches and grooves. If damaged, replace master cylinder/reservoir (2).
- c. The gasket (5) should be replaced if torn or punctured.

12.6 ASSEMBLY/INSTALLATION

- a. Dip all internal parts in DOT 3 hydraulic brake fluid.
- b. Fig 12.5 refers. Coat 'O' ring (19) with DOT 3 hydraulic brake fluid and install sight glass (18) and 'O' ring, if removed.
- c. Install spring (15). Assemble piston (14) with 'O' ring (13) and dust boot (12).
- d. Fig 12.6 refers. Lightly coat pivot pin (6) and bushings (10) with Loctite Anti-Seize. Assemble the brake lever (7) to the master cylinder/reservoir assembly (2) using pivot pin and bushings. Check front brake lever for proper operation. Wipe off excess Anti-Seize.

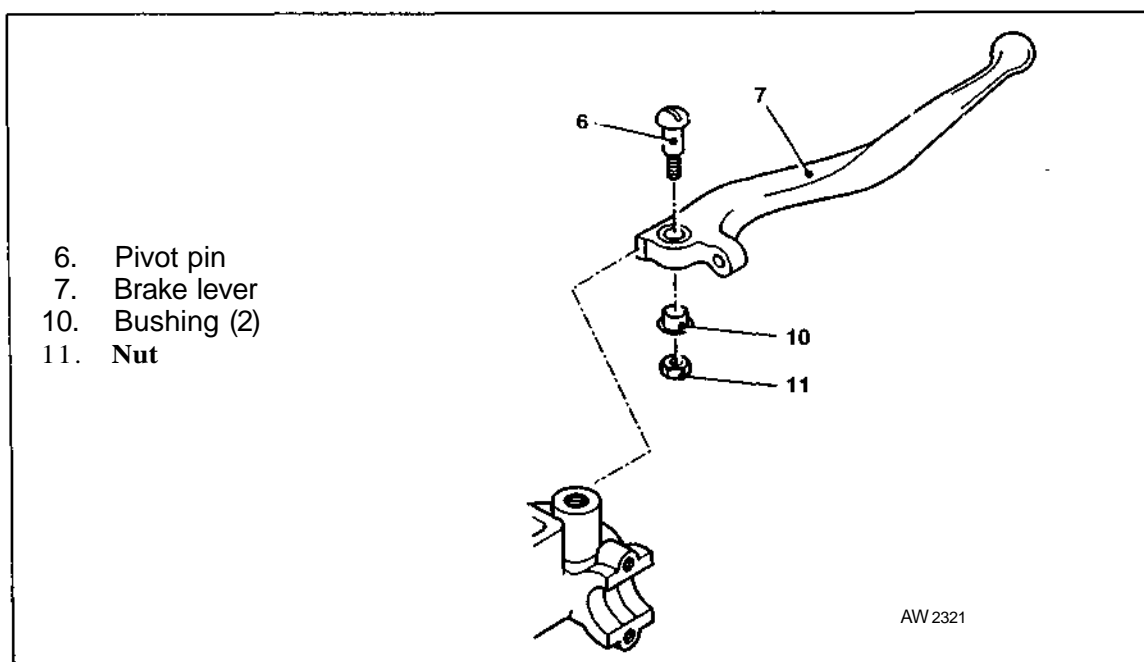


Fig 12.6 Front Brake Hand Lever and Reservoir

- e. Fig 12.5 refers. Install master cylinder to handlebar by installing clamp (16) and screws (17). Tighten screws to 70-80 in/lbs torque.

CAUTION

Fig 12.7 refers. Be sure washer (20), banjo bolt (21), hydraulic brake line and master cylinder bore are free of DOT 3 hydraulic brake fluid, dirt and metal chips before assembly to avoid leakage.

- f. Install banjo bolt (21), washer (20) and hydraulic brake line in master cylinder/reservoir.

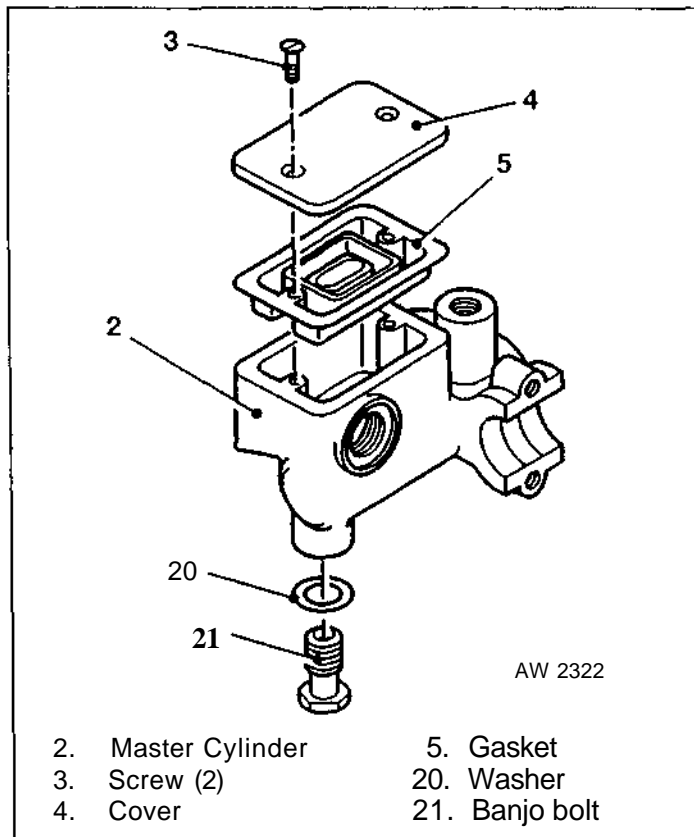


Fig 12.7 Master Cylinder/Reservoir Assembly

g. Fill the master cylinder with DOT 3 Hydraulic Brake Fluid. Bleed the brake system using the procedure outlined in Bleeding the Hydraulic Brake System.

WARNING

Be sure the reliefport in the cylinder is operating properly. After servicing the master cylinder, always check the operation of the internal components with the reservoir cover removed. Actuate the brake lever. A slight spurt of fluid will break through the fluid surface if all internal components are working properly. Improper operation of brake components can endanger the operator.

h. Install gasket (5), cover (4) and screws (3). Tighten screws (3) to 6-8 in/lbs torque.

j. Test ride motorcycle. If brakes feel spongy, repeat procedure outlined in Bleeding the Hydraulic Brake System.

NOTE: The front brake lever is designed to have no free play before moving the push rod. See Adjustment.

k. This master cylinder assembly is equipped with a sight glass to visually check fluid level without removing cover. With the correct amount of brake fluid, the sight glass is filled half way with reservoir as level as possible.

12.7 REAR BRAKE MASTER CYLINDER REMOVAL/DISASSEMBLY

Fig 12.8 refers.

- a. Loosen jamnut (18). Bend clevis pin (17) retainer and remove clevis pin from clevis (16). Remove clevis.
- b. Disconnect brake hose fitting (14) and washer (15) at master cylinder (13) bottom and drain fluid from reservoir. Disconnect brake hose elbow (3) from grommet (4). Remove grommet.
- c. Remove mounting screws (5), washers (6), spacers (11) and nuts (12). Master cylinder (13) may now be removed and disassembled on a clean work bench.
- d. Remove push rod (19) and dust cover (20).
- e. Remove retaining ring (7), piston (9), 'O' ring (8) and spring (10).

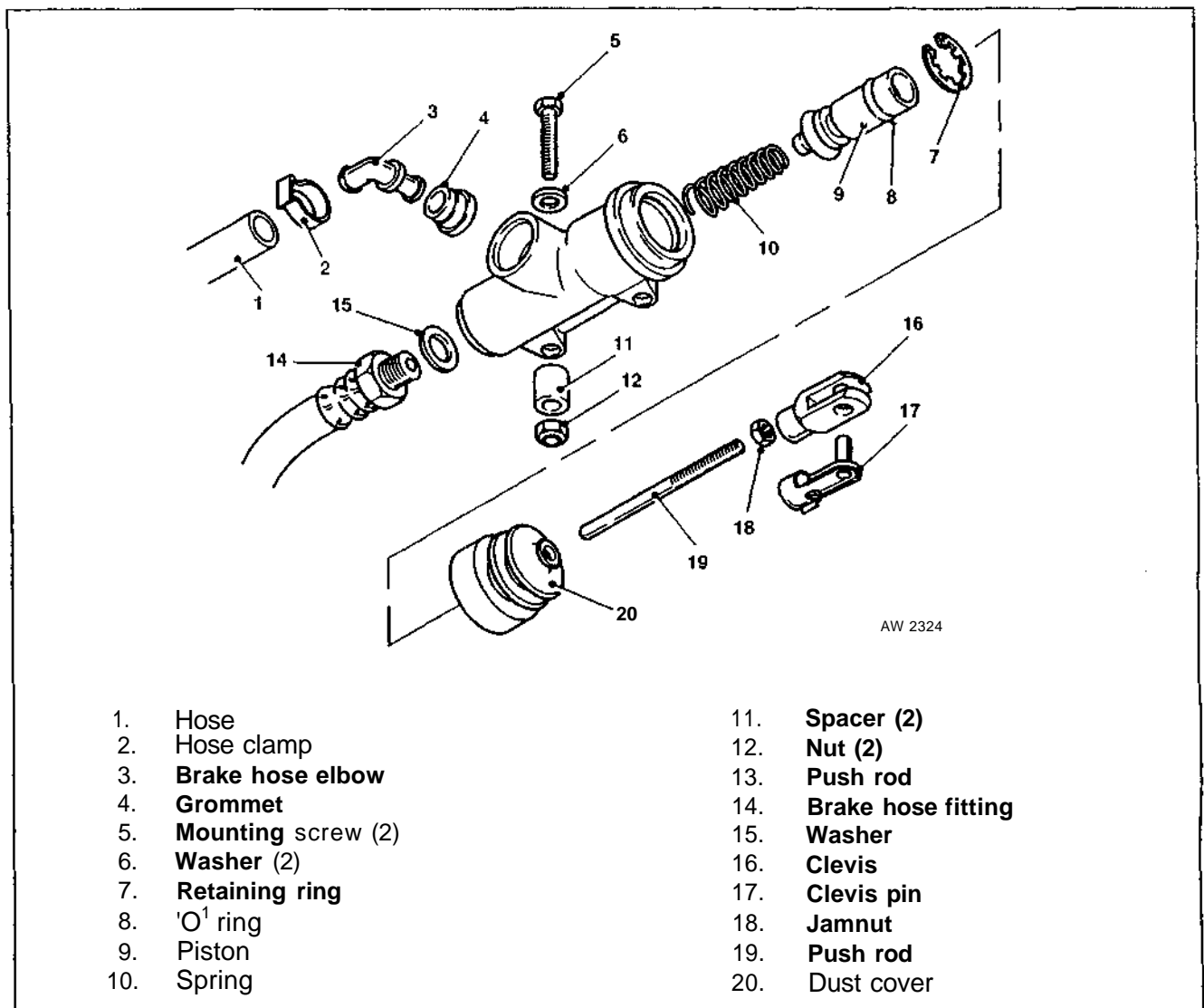


Fig 12.8 Rear Brake Control

12.8 CLEANING, INSPECTION AND REPAIR

Fig 12.9 refers.

WARNING

Clean brake system components in denatured alcohol or brake fluid DO NOT use mineral base cleaning solvents such as gasoline or paint thinner. Use of mineral base solvents causes deterioration of rubber parts that continues after assembly and can result in component failure.

- a. Inspect piston cup and piston (11) for softening, enlarging or wear. Replace piston if necessary.
- b. Inspect cylinder bore for scratches and grooves. Replace if necessary.
- c. Be sure push rod (11) and pedal assembly are not bent. Bent parts should be replaced.

12.9 ASSEMBLY/INSTALLATION

Fig 12.9 refers.

- a. Dip all master cylinder internal parts in DOT 3 HYDRAULIC BRAKE FLUID.
- b. Install 'O' ring (8) on piston (9). Install spring (10), and insert into master cylinder bore. Install retaining ring (7) and push rod (19).
- c. Install master cylinder on motorcycle using bolts (5), washers (6), spacers (11) and nuts (12).
- d. Install grommet (4) and brake hose elbow (3).
- e. Install brake line (14) and washer (15). Tighten fitting to 70-80 in/lbs torque. Install jamnut (18), clevis (16) and clevis pin (17).
- f. Fill reservoir with DOT 3 HYDRAULIC BRAKE FLUID and bleed system following the procedure outlined under **Bleeding the Hydraulic Brake System**.
- g. Check and adjust brake pedal height and push rod free play as described under ADJUSTMENT given earlier.

12.10 BRAKE PAD REPLACEMENT REMOVAL

Fig 12.9 refers.

NOTE: The brake calipers do not have to be removed to replace the brake pads. However, before replacing ONLY the pads, inspect the assembly and be sure the other components do not need replacement.

WARNING

Brake pads must be replaced only in sets for correct and safe brake operation.

- a. Use a screwdriver to remove dust cover (5) from caliper (13).
- b. Remove circlip (8) from pad locator pin (7).
- c. Remove spring tensioner (4).
- d. Slide pads (2) out of caliper halves.

e. **Installation.**

- (1) Slide pads into position in caliper.
- (2) Install spring tensioner.
- (3) Install pad locator pin (7). Be sure pin is ON TOP of the spring tensioner. Install washer and circlip on pin.
- (4) Snap dust cover into place on caliper.

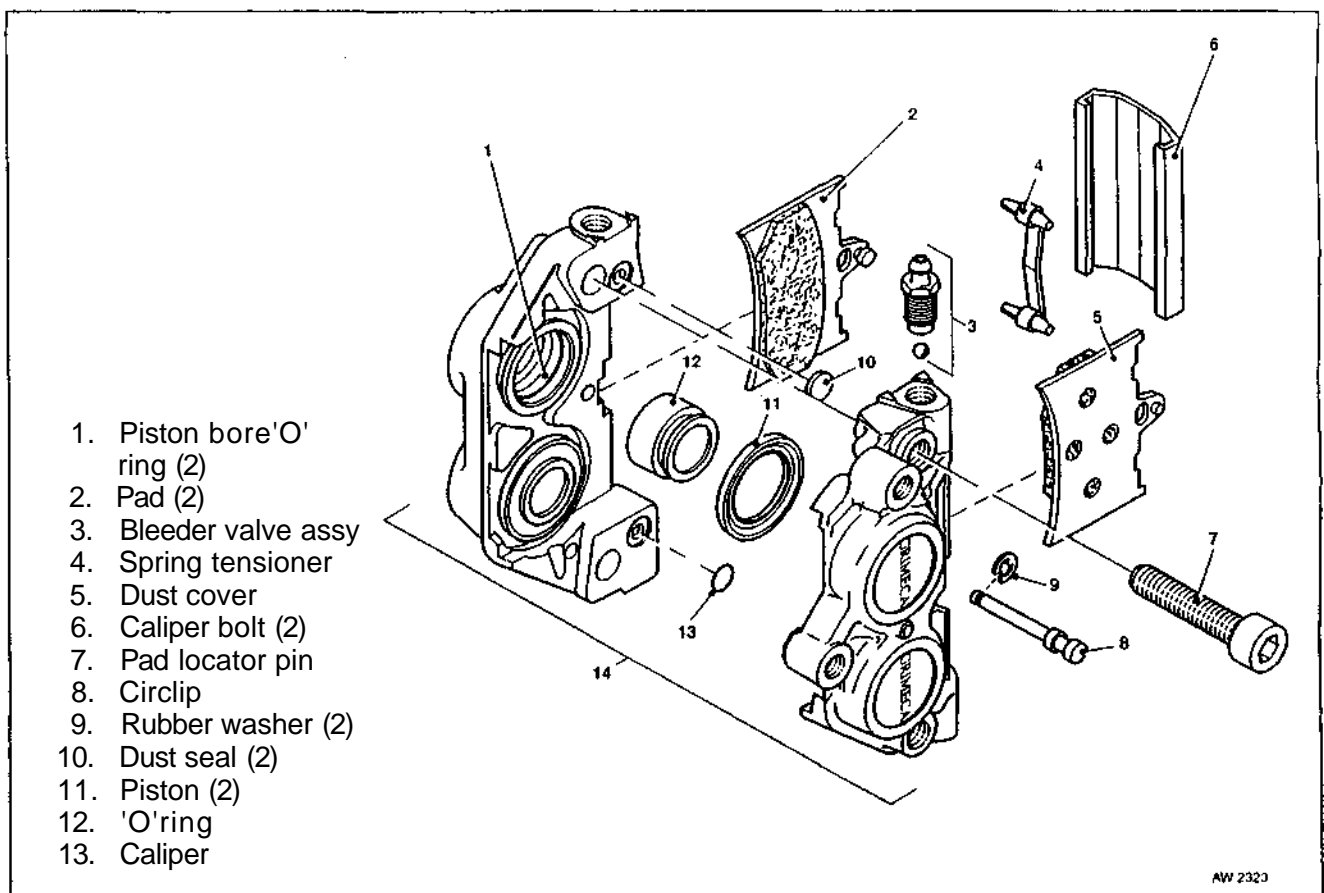


Fig 12.9 Brake Caliper

12.11 FRONT BRAKE CALIPER REMOVAL

- a. Disconnect brake line fitting and drain brake fluid.
- b. Remove retaining bolts and washers.
3. Remove caliper.

12.12 FRONT BRAKE CALIPER INSTALLATION

- a. Place caliper in position on fork leg and install retaining bolts and washers. Tighten to 28 ft/lbs torque.
- b. Install brake line fitting.
- c. Fill with DOT 3 Brake fluid and bleed the brake line. See BLEEDING THE HYDRAULIC BRAKE SYSTEM.

12.13 REAR BRAKE CALIPER REMOVAL

- a. Disconnect brake line banjo bolt and drain brake fluid. If necessary, remove brake line clamp screw.
- b. Remove retaining bolts, washers, and locknuts.
- c. Remove caliper.

12.14 REAR BRAKE CALIPER INSTALLATION

- a. Place caliper in position on brake torque arm and install retaining bolts, washers and locknuts. Tighten to 28 ft/lbs torque.
- b. Install brake line banjo bolt.
- c. Fill with DOT 3 brake fluid and bleed the brake line. See BLEEDING THE HYDRAULIC BRAKE SYSTEM.

12.15 BRAKE CALIPER DISASSEMBLY (FRONT AND REAR)

Fig 12.9 refers.

- a. Remove caliper. See CALIPER REMOVAL.
- b. Remove caliper bolts (6) and separate the caliper halves. Use a catch basin to catch remaining brake fluid.
- c. Remove 'O' rings (12) and rubber washer (9).
- d. Remove dust seal(s) (10).
- e. Use internal expanding pliers and remove the pistons (11).

- f. Remove piston bore 'O' rings (1).

12.16 CLEANING, INSPECTION AND REPAIR

- a. If the brake pad friction material is worn to $\frac{1}{16}$ in or less, replace the pads as a set.
- b. Replace any parts that appear worn or damaged. Always replace dust seal if piston is removed.

WARNING

Always use alcohol for cleaning metal parts. DO NOT use gasoline or other flammable substances.

- c. Clean all metal parts with alcohol and blow dry with compressed air.

WARNING

Always clean brake system rubber parts by washing in denatured alcohol or DOT 3 Hydraulic Brake Fluid. DO NOT use mineral base cleaning solvents such as gasoline or paint thinner. Use of mineral base solvents will cause deterioration of the parts. Parts would continue to deteriorate after assembly which could result in component failure.

- d. Clean all rubber parts in denatured alcohol or brake fluid.

12.17 BRAKE CALIPER ASSEMBLY

CAUTION

Lubricate all parts in DOT 3 Hydraulic Brake Fluid before assembly. This will ease assembly and help ensure parts are not damaged during assembly.

- a. Install piston bore 'O' ring(s). Be sure they are seated in their grooves.
- b. Install pistons.
- c. Install dust seals.
- d. Install 'O' rings and rubber washer.
- e. Install caliper bolts. Tighten front caliper bolts to 35 ft/lbs torque. Tighten rear caliper bolts to 25 Mbs torque.
- f. Install caliper. See FRONT or REAR BRAKE CALIPER INSTALLATION.

WARNING

If machine is used for Cross Country use —front and rear disc pads must be checked for wear every 250 miles.