GENERAL

Because straightening a badly bent frame requires special tools and fixtures for holding, bending and gauging, this service is only offered by some of the larger dealerships.

CAUTION — A frame that is badly bent or damaged should be replaced since it is questionable that it can be repaired economically.

Figure 2-29. Frame with Basic Dimensions (1970-72)
Figure 2-30. Frame with Basic Dimensions (1973 and Later)
FRONT FORK

ANCHING FORK OIL

The hydraulic fork is comprised of two sets of telescoping tubes that work against springs, with an oil filled (hydraulic) dampening mechanism to control the action. The unit is engineered to give long service with a minimum of repair. Oil change is not necessary on 1970-72 models unless oil has been contaminated or leakage has occurred. 1973 and later models require oil change initially at 500 miles and thereafter at 5000 mile intervals.

To drain fork sides, remove fork tube cap as described in "DISASSEMBLING FRONT FORK." Remove drain plug (29, Figure 2-31 or 15, Figure 2-36) from lower end of fork slider. Loosen tube end bolt (12, Figure 2-31 or 6, Figure 2-36) several turns. With a screwdriver move shock absorber up and down to loosen any sediment in bottom of fork slider, so oil will run free from drain.

After each fork side is drained and drain plugs have been installed, forks can be refilled by using an improvised filler can.

MAKING A FORK FILLER CAN

1. To make a filler can, see Figure 2-32 and proceed as follows. Drill a dozen 1/4 in. holes in the bottom of a one quart tin can (2), near the outside edge. Then, shape the bottom of the can with a light hammer so that it is dished upward to assure complete draining of oil through the holes.

   Select a tin funnel (3) with the funnel mouth about the same size as the bottom of can (2). Swage and shape the funnel spout, so that a piece of 1/4 in. metal tubing (4), about 2 in. long (a piece of fuel line is suitable), can be soldered into it. Solder (3) into the bottom of (2). Improvise and attach bail (1) to the filler can.

2. Make plug (7) from a rubber bottle stopper purchased from a drug store. Rubber stopper should be 1 in. to 1-3/8 in. long, and its largest diameter about 5/8 in.

3. Hold rubber stopper in vise and drill a 3/32 in. hole lengthwise through the center. Then enlarge the hole with a 1/4 in. drill. After hole is drilled in the stopper, insert a 1/4 in. rod (6) through the hole and grind the stopper to a 5/8 in. diameter at the large end, and slightly under 1/2 in. diameter at the small end, straight taper between ends to form the plug.

4. Slightly flare one end of a piece of 1/4 in. tubing (6), about 2 in. long, and insert into plug (7). Make an adapter (8) from an old fork tube cap. Break three stake locks securing breather valve and remove valve from cap. Drill a 1/2 in. hole through cap and plug the vent hole. Assemble adapter (8) to top of fork and insert rubber plug (7) into the adapter hole. Attach filler can to stopper with transparent flexible tubing (5) about 2 feet long.

FILLING FORK USING FORK FILLER CAN

suspend filler can above motorcycle so that when improvised fork tube cap is assembled in fork filler opening there will be ample slack in flexible tubing becoming taut (see Figure 2-33). Pour correct amount of fork oil into can. The difference in the amount of oil required between a (DRY) and a (WET) fork is due to oil cling. Do not use more oil than recommended because the excess oil will cause leakage from the top of the fork tubes.

<table>
<thead>
<tr>
<th>Year</th>
<th>Wet</th>
<th>Dry</th>
<th>Fork Oil</th>
</tr>
</thead>
<tbody>
<tr>
<td>1972 and</td>
<td>5-1/2 oz</td>
<td>6-1/2 oz</td>
<td>Harley-Davidson Type B</td>
</tr>
<tr>
<td>Earlier</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1973 and</td>
<td>5 oz.</td>
<td>6 oz.</td>
<td>Harley-Davidson Type B</td>
</tr>
<tr>
<td>Later</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Work the fork up and down. Air escaping through oil in filler can as fork is pushed downward will cause the oil to bubble violently, but because the bottom of the filler can serves as a baffle, no oil will be lost. As the fork moves up, oil will be sucked into the fork side. Usually working fork up and down 3 or 4 times is sufficient to empty filler can. After filler can appears to be empty, it is good practice to allow a few seconds for can to completely drain into hose, then work fork once more. This assures getting all oil into the fork side.

SERVICING

INSPECTION PROCEDURE (Figures 2-31 and 2-36)

If the hydraulic fork does not work properly or an appreciable amount of oil leakage should develop, inspect the fork as follows:

Check the oil level in each fork side by completely draining and refilling fork as described in "CHANGING FORK OIL." Insufficient oil in either fork side will result in faulty recoil action and excess oil will cause leakage from the top of fork tubes. When checking oil level in each fork side, also check for water in fork oil which will cause leakage from fork tube cap or oil to bypass fork slider bushings and seals. Oil will appear emulsified, aerated or light brown in color.

Oil leakage developing at upper fork tube taper may also be caused by imperfect fit in fork bracket taper. This can be remedied by applying Harley-Davidson Seal-All to fork tube cap threads.

Check slider oil seals for wear or damage to lip which could cause oil leakage.

On 1972 and earlier models, if the fork does not function correctly after eliminating the possibility of water contamination of fork oil and incorrect oil level in fork sides, inspect the fork tube breather valve (2) for defective condition. Remove fork tube cap (1), submerge in water and blow compressed air through cap vent hole. Breather valve should not leak below 15 lbs air pressure. If breather valve is faulty, renew valve as described in "REPLACING BREATHER VALVE."
Figure 2-31. Front Fork and Steering Head - Exploded View
If snubbing action of the front fork remains unsatisfactory, bottoms on compression, stops suddenly on recoil and does not operate smoothly after eliminating malfunctions previously covered, disassemble fork as described in "DISASSEMBLING FRONT FORK SHOCK ABSORBER." Inspect shock absorber giving particular attention to the following parts (see Figure 2-34 or 2-35): Check fit of damper piston in fork tube and fit on shock absorber tube. Check seating washer on upper and lower valve body faces. Replace worn or damaged parts.

NOTE
The front fork shock absorber parts for the 1975 and later fork are sealed in the bottom end of the fork tube and are non-serviceable.

See Figure 2-31. Examine fork tube (8) for scoring and badly worn sliding surface. Inspect fork slider bushings (11) in fork slider (10) for wear and scoring. Insert tube (8) in fork slider (10) and work up and down. If tube has appreciable play in slider, replace slider bushings. See "REMOVING FORK SLIDER BUSHINGS."

NOTE
1973 and later sliders do not have removable bushings. If slider is worn to excessive looseness on fork tube, slider must be replaced.

If the front fork has been damaged, check the fork alignment. Inspect fork tubes and the fork stem and bracket assembly (24) for bent or damaged condition. Tubes and fork stem and bracket assembly, that are badly damaged, must be replaced. If fork tube and fork stem and bracket assembly are only slightly damaged, they can be repaired as described in "STRAIGHTENING FORK TUBES," and "STRAIGHTENING FORK STEM AND BRACKET ASSEMBLY."

REPLACING 1972 AND EARLIER BREATHER VALVE (Figure 2-31)

Remove fork tube cap (1). Place in vise and break three stake locks securing breather valve (2). Free valve from cap. When reassembling, coat breather valve seat with a sealing agent. Seat rubber valve in cap and stake lock in three places.
REPLACING FORK BOOT PARTS (1970 ONLY)
(Figure 2-31)

To replace fork boot parts that are damaged or worn, or to remove boot parts for straightening or replacement of fork stem and bracket assembly (24), proceed as follows:

Stretch fork boot (5) from upper retainer (15). Free front fork sides from motorcycle as described in "DISASSEMBLING FRONT FORK." Remove fork boot plain screw and vent screw (14) and free retainer (15), gasket (16), and retaining disc (17). Lower retainer (18) is a light press fit in fork slider (10). Remove from slider by prying on retainer lip.

Assembly is the reverse order of disassembly. Start fork boot retainer by hand into the counterbore in upper end of fork slider. Insert the pilot end of Oil Seal Driver, Part No. 96310-55, through fork boot retainer and into the upper fork slider bushing. With a soft hammer, use very light blows to drive fork boot retainer to bottom against the end of fork slider.

NOTE
If fork tube slider bushings (11, Figure 2-31) are being replaced, install them before replacing lower fork boot retainer.

DISASSEMBLY AND REPAIR

DISASSEMBLING FRONT FORK (Figure 2-31)

Remove front wheel and brake assembly as described in "WHEELS;" "REMOVING AND INSTALLING FRONT WHEEL."

Remove front fender and headlamp housing. Remove fork tube cap (1). Loosen fork tub pinch bolt (4). (On 1970 models, stretch rubber fork boot (5) from upper retainer (16) lip.) Remove fork side (6) complete. On 1972 and earlier models, use Wrench, Part No. 94694-52, and disassemble retainer (7) from top of fork tube (8). Remove spring (9) and drain hydraulic fork oil from fork tube. Turn assembly upside down and remove bolt and washer (12). It may be necessary to insert Tool, Part No. 95991-69 or a long screwdriver into 3/32 wide x 1/2 long slot C (Figure 2-34) in upper end of shock absorber tube to keep it from turning while removing bolt (12). On 1973-1974 models, use Socket, Part No. 94566-73 with extension on upper end of shock absorber tube C (Figure 2-35) to keep it from turning. Free slider (10) from tube (8).

DISASSEMBLING FRONT FORK SHOCK ABSORBER 1970
(Figure 2-34)
Shock absorber mechanism is part of fork tube (8). To disassemble, remove retaining ring (1) with Tru-arc Pliers, Part No. 96215-49, and remove lower valve body (2), washer (3) and upper valve body (4). Move shock absorber tube (7) and remove retaining ring and piston (6).

1971-1972 (Figure 2-34)

Remove parts as described for 1970 model including spring (4A) for 1971 model.

1973-1974 (Figure 2-35)

Remove retaining ring (1) from fork tube (13) with Tru-arc Pliers, Part No. 96215-49. Remove valve parts as follows: lower piston (2), lower stop (3), orifice washer (4), valve (5), spring washer (6), valve body (7), retaining ring (8) and upper piston (9). To disassemble upper piston (9), remove retaining ring (8) with Tru-arc pliers. To disassemble upper stop (11), remove roll pin (10) from shock absorber tube (12) and unscrew upper stop (11).

DISASSEMBLING, ASSEMBLING AND REPAIRING FRONT FORK - 1975 AND LATER (Figure 2-36)

Remove front wheel and brake assembly as described in "WHEEL" section of this manual. Remove front fender. Remove bracket that attaches headlamp to upper fork bracket and let hang loose by wiring harnesses.

NOTE

While Figure 2-31 applies to earlier models, parts (30, 32, 4 and 21) are similar and are referenced below.

Referring to Figure 2-31, remove two screws (30) so the cover (32) can be slid up out of the way, exposing the lower fork bracket. Loosen fork tube pinch bolts (4). Loosen screw (30) in upper fork bracket (21).

Remove the instrument (either the speedometer or tachometer) attached to tube cap (1), Figure 2-36, of the fork side being removed. Unscrew tube cap (1) from fork tube (2). Remove fork side completely by sliding down and out of both upper and lower fork brackets. Drain oil from fork.

Referring to Figure 2-36, disassemble the fork side as follows.

Remove O-ring (3) from inner groove in tube cap (1) and slide off washer (4). Pull spring (5) out of fork tube (2).

Using an Allen wrench, remove screw (6) along with washer (7) from bottom end of fork slider (8). This will free shock absorber tube (9) so that it can be removed from fork tube (2). Remove both fiber wear rings (10) from slots in shock absorber tube (9).

Separate fork tube (2) and fork slider (8) by pulling the two apart. Slip fork boot (11) off end of fork slider (8). Remove damper tube sleeve (12) from inside fork slider (8) by carefully pulling out past seal (14). Remove seal (14) only if it is to be replaced. Remove lock ring (13) and then pry out seal (14), discarding the damaged seal.

NOTE

To prevent damage to the lip of fork slider (8), the lip can be heated to expand the metal and thereby make seal removal easier.

Thoroughly clean and inspect each part. If inspection shows that any parts are bent, broken or damaged, those parts should be either repaired or replaced.

Inspect seal (14) for wear. If seal was removed, a new one must be installed. Inspect both wear rings (10) on damper tube (9) and replace if worn excessively or damaged.

Figure 2-36. Front Fork and Shock Absorber, Exploded View - 1975 and Later

2-25
Check boot (11) where it rubs on fork tube (2). The tube should show a bright, shining surface, free of scoring or abrasions and the boot should present a good, continuous seal and not show excessive wear.

Replace spring (5) if broken.

Inspect small hole in groove in lower end of fork tube (2) and see that it is not obstructed.

Make sure O-ring (3) is in good condition, without irregularities, and that it provides proper sealing when in place.

Check both washers (7 and 16) to see that they provide a good seal when used with their respective screws (6 and 15) to prevent oil leakage.

Repair bent or damaged fork tube (2) as outlined in paragraph "STRAIGHTENING FORK TUBES" below. Reassemble parts in reverse order of disassembly.

REMOVING FORK STEM AND BRACKET ASSEMBLY FROM STEERING HEAD (Figure 2-31)

Disconnect wires from panel. Remove front wheel and brake assembly as described in "REMOVING AND INSTALLING FRONT WHEEL". Remove front fender and headlamp housing. Remove fork tube cap (1). Loosen fork tube pinch bolt (4). (On 1970 models, loosen fork boot (5) from upper retainer (15) lip.) Remove fork side (6) complete. Remove handlebar clamp cover.

Remove headlamp and bracket as a unit.

Remove fork stem sleeve end (19) and loosen fork upper bracket pinch bolt (20). Lift handlebar assembly from steering head with fork upper bracket (21) attached. Carefully position assembly away from working area. Be careful not to bend control cables and wires more than necessary.

It is not necessary to disconnect clutch and brake hand levers from handlebar, wiring from ignition switch and wiring panel, or control cables, unless handlebar assembly is to be removed from motorcycle.

Remove washer (22) and fork stem sleeve (23). Free fork stem and bracket assembly (24) and at the same time carefully remove bearing cones (25 and 26 or 25A) and bearings (27 or 27A) from steering head. Inspect bearings, cones and cups for wear. If worn or pitted replace. If necessary to remove head cups (28 or 28A), insert a piece of bar stock through upper cup to drive against lower cup. Reverse operation to remove upper cup.

STRAIGHTENING FORK TUBES

Straightening fork tubes requires several special tools including a hydraulic or arbor press, dial indicator and straightening blocks (straightening blocks available for 1972 and earlier models only).

NOTE

Do not attempt to straighten a fork tube that has a sharp angle bend. These tubes should be scrapped because the metal is stretched.

Before beginning the straightening operation, clean the fork tube. Locate bends with a dial indicator as shown in Figure 2-37. (A fork tube is usually bent in two or three places - seldom one place.) Then, place fork tube or straightening blocks. Using an arbor or hydraulic press, straighten tube as much as possible as shown in Figure 2-38.

See Figure 2-37. With a dial indicator find the highest point out of round and mark with chalk. Press on high point of fork tube as shown in Figure 2-38. Repeat pressing operations until fork tube is within .003 to .004 in. of being straight. Always check with a dial indicator after each pressing operation.

Sometimes a fork tube is out of round, especially at the point it is clamped to the fork brackets. Place tube in straightening blocks as shown in Figure 2-39. Press until perfectly round and check with dial indicator or micrometer. Check fork tube by inserting into a new fork slider. Work tube up and down in slider, if it does not bind, it is straight.
Straightening Fork Stem and Bracket Assembly (Figure 2-40)

Straightening a fork stem and bracket assembly not only requires a great deal of practice to become proficient, but also several special tools and fixtures, including an arbor press, surface plate or suitable heavy metal plate that is perfectly smooth, bending bar, four straightening blocks (W), two improvised steel gauging bars or legs 1-5/16 in. diameter x 12 in. length (X, Figure 2-41), two steel support blocks (Y), and several steel press blocks (Z).

Do not attempt to repair fork stem and bracket assemblies that are badly bent or broken. These bracket assemblies should be scrapped.

Insert two steel gauging bars in the fork bracket and secure in place with two bracket pinch bolts as shown in Figure 2-40.

Sometimes the steel bars cannot be inserted into the bracket because the holes are distorted. In this case, press the bars into position using an arbor press. Then, press on the forward edge of bracket to correct "bow shaped" distortion (3) as shown in Figure 2-41. Repeat pressing operation until bar is loose in bracket. Secure in place with two pinch bolts.

A bracket assembly is usually out of alignment from a horizontal centerline (1) with both legs bent or just one leg bent. (See Figure 2-41).

If both legs are twisted, place bracket assembly in position on arbor press as shown in Figure 2-40. Place two
If one leg is bent, place bracket assembly on three straightening blocks, two blocks under straight leg and one block under the low leg. Place press block diagonally across bracket assembly to high leg and press until high leg is forced down and into alignment with the other three legs.

Place the fork stem and bracket assembly on the four straightening blocks located on the surface plate. (Figure 2-42). If the legs rest squarely on straightening blocks, the bracket assembly is correctly trued.

If bracket is not true, press again, checking alignment after each operation.

**Figure 2-42. Checking Bracket Alignment**

Use a square and check to see if bracket assembly is bent or distorted (to either side) as shown in Figure 2-43. If so, place in vise and straighten, using Bending Bar, Part No. 96806-40, as shown in Figure 2-43.

Check to see if the fork stem is straight, true on a vertical centerline (2, Figure 2-41) by using a fork upper bracket as a gauge (Figure 2-44). If not, place in vise and use Bending Bar to bring into position.

**Figure 2-43. Bending Fork Stem and Bracket Assembly**

**Figure 2-44. Gauging Fork Stem**

**REMOVING FORK SLIDER BUSHINGS (1972 & EARLIER)**

**NOTE**

1973 and later forks do not have removable bushings. If slider is worn to excessive looseness on fork tube, slider must be replaced.

**Insert the fork slider bushing puller and cap (1, Figure 2-45) into the fork slider a sufficient distance to allow the claws to extend below lower end of the upper fork slider bushing (11, Figure 2-31). Place puller cap into oil seal counterbore. Apply oil to screw threads and steel thrust washer and turn nut down against puller cap to remove all slack from puller assembly. Use a Big Twin engine sprocket nut wrench and continue to turn nut against puller cap until bushing is removed (see Figure 2-46).**

To remove lower fork slider bushing, follow same procedure used in removing upper fork bushing.
oil. Fork bushing driver and guide (2, Figure 2-45) is used to install fork slider bushings as shown in Figure 2-47. Insert the bushing guide into the fork slider oil seal counterbore and insert the new lower fork slider bushing into the guide. The fork bushing driver has two grooves cut around its outside diameter which are used as depth gauges when driving in the bushings. The groove nearest the top of the driver is the depth gauge for the lower bushing, and the lower groove is the depth gauge for the upper bushing. The lower bushing is driven into the fork slider to the point where the upper groove on the bushing driver aligns with the top edge of the bushing guide.

**NOTE**

If the lower bushing is driven into the fork slider farther than specified, it will contact the bottom of the counterbore at lower end of fork bushing and bushing may be collapsed to the extent that it cannot be finish reamed.

When installing upper fork slider bushing, follow the same procedure used to install lower fork slider bushing. The upper fork slider bushing is driven into the fork slider the correct depth when the lower groove on the bushing driver is aligned with the top edge of the bushing guide.
REAMING FORK SLIDER BUSHINGS (1972 & EARLIER)

Figure 2-48 shows reamer with long pilot attached as required for reaming upper bushings to finish size. The long pilot is of correct size to fit into the unfinished lower bushing and guide the reamer through the upper bushing.

Figure 2-48. Reaming Fork Slider Bushing

CAUTION — Do not drop cutting edges of the reamer into bushing.

Slowly start cut, turning reamer clockwise. When removing reamer after bushing is reamed, continue turning clockwise and apply a slight upward pressure to remove reamer from the finished bushing. Install the short reamer pilot, shown under 3. Figure 2-45 on reamer to ream the lower bushing. The Allen wrench provided with the tool set is used to tighten or loosen reamer pilots on the reamer body.

ASSEMBLY

ASSEMBLING SLIDER

Clean chips from inside of slider by washing thoroughly in solvent. Install new seal (if required) with seal lip facing inward, and top of seal flush with top of slider. Install boot (5A, Figure 2-31).

ASSEMBLING FRONT FORK SHOCK ABSORBER
(Figure 2-34 or 2-35)

Assemble parts into shock absorber tube in reverse order of disassembly using Tru-arc retaining ring pliers to install rings in grooves. Be sure upper valve body (4) is installed with outer lip fitting over spring (4A).

ASSEMBLING FRONT FORK (Figure 2-31)

Assemble slider (10) on fork tube and shock absorber assembly (8) and check for free movement of slider on fork tube. Assemble bolt and washer (12) and new O-ring (13). Insert screwdriver or rod into upper end of fork tube to hold slotted end of tube (8) while tightening bolt and washer (12). Insert spring into fork side and pour specified amount of fork oil into each fork side. Using Wrench, Part No. 94694-52, install spring retainer (7) into fork tube. The top of the retainer should measure exactly 3/4 in. down from top of fork tube.

Install assembled fork side (6) into mounting brackets. Securely tighten fork tube cap (1) before tightening the fork tube pinch bolt. Secure fork boot in lip of retainer (15) (if used). Install front fender and headlamp housing. Install front wheel and brake assembly as described in "REMOVING AND INSTALLING FRONT WHEEL," Section 2.

INSTALLING STEM AND BRACKET ASSEMBLY, FORK SIDES AND ADJUSTING STEERING BEARINGS
(Figures 2-31)

Assembly of the fork stem and bracket assembly is essentially the reverse order of disassembly. Assemble the head cups (28 or 28A), bearings (27 or 27A) and bearing cones (25 and 26 or 25A). Apply a heavy coating of grease to the bearings when positioned in head cups. Install the fork stem (24) and tighten fork stem sleeve (23) on fork stem until all appreciable play is taken up and bearing action is smooth and free. Assemble spacer (22), handlebar assembly and upper fork bracket (21).

Install fork sides (6) after assembly into mounting brackets. Securely tighten fork tube cap (1) before tightening fork tube pinch bolts to 35 ft-lbs. Secure fork boot in lip of retainer (15) (if used). Install front fender. Install front wheel and brake assembly as described in "REMOVING AND INSTALLING FRONT WHEEL," Section 2.

With fork sides, wheel and fender reassembled, fork should have smooth free movement to either side. If there is any binding, slightly back off the fork stem sleeve (23) until it is correctly adjusted. Be sure not to back it off too much — as there should be no appreciable shake or sideways movement of the front fork. Install and securely tighten the sleeve end nut (19) and the upper bracket pinch bolt stem (20). Torque bolt (20) to 20-25 ft-lbs.
REAR SHOCK ABSORBER

DISASSEMBLING

Raise rear end of motorcycle with stand or suitable blocking underneath frame.

NOTE

If blocking is not available work on only one shock absorber at a time, the other shock absorber will hold the rear fork and frame in place.

(Figure 2-49): Remove top and bottom mounting stud nut (1), washer (2), stud cover (3), and washer (4). Slip shock absorber assembly off upper and lower studs. Push rubber bushings (5) from shock absorber mounting eyes. Place shock absorber in Rear Shock Absorber Tool, Part No. 97010-52A (see Figure 2-50) with split key (6) up. Compress absorber spring enough to remove each half of split key (6) from flange on shock eye. Release spring compression and remove absorber assembly from tool. Remaining items can be removed in order shown in Figure 2-49.

INSPECTING

Clean and inspect all parts for wear and damage, paying particular attention to the condition of the stud rubbers, the ride control adjustment cams, dirt seal, and spring. Examine absorber unit for traces of fluid leaking, especially at upper end. Unit should compress slightly easier than it extends. If possible, compare action with unused unit. Shock absorber cannot be repaired. Faulty units must be replaced.

ASSEMBLING

Assembly of the rear shock absorber is essentially the reverse order of disassembly.

(Figure 2-49): Apply a thin coat of grease to all surfaces of both cams. Note that cams (13) are identical and be sure to position cam lobes correctly as shown in Figure 2-49 inset. Place assembly in compressor tool and compress spring enough to install key halves (6).

Release spring compression. Keys will lock into place in inside diameter of covers 7 or 8.

ADJUSTING SPRING

The rear shock absorber springs can be adjusted to three positions (five positions for 1975) for the weight of the motorcycle it is to carry. The average weight solo rider would use the extended spring position (off cam); when in low position (off cam), the cam lobes should be next to each other: that is, single lobes and double lobes matched. If necessary, rotate the cam to line them up properly. A heavy solo rider might require the position with springs slightly compressed (spring position second cam step).

To adjust the rear shock absorber springs, turn cushion spring adjusting cam to desired cam position with either Spanner Wrench, Part No. 94700-52B for 1974 and earlier or Spanner Wrench, Part No. 94820-75 for 1975 and later. Both cushion spring adjusting cams must be adjusted to the same position. Always back off cam in opposite direction when releasing spring tension to intermediate or solo position.

Figure 2-49. Rear Shock Absorber - Exploded View
NOTE
If shock cam is turned too far so that it falls off top position it will not be matched correctly with the other cam. To correct this condition, continue 180° in same direction until it falls off again and then adjust to desired position.

IMPORTANT
Install each shock absorber on motorcycle with slot in cam support (15, Figure 2-49) facing toward motorcycle wheel.

REAR FORK

DISASSEMBLING (Figure 2-51)
Remove the rear wheel as described in “REMOVING AND INSTALLING REAR WHEEL.” Free brake rod from operating lever and remove brake assembly from motorcycle. Remove exhaust pipe and muffler. Disconnect shock absorbers from rear fork.

See order of disassembly, Figure 2-51. Remove pivot bolt (1) and lockwasher (2) from rear fork (3). Rear fork can now be disassembled from frame. Remove the following parts: Bearing screw (4), bearing shakeproof washer (5), bearing lockwasher (6), bearing locknut – right (7) and bearing outer spacer (8). With a punch turn out bearing locknut – left (9) and remove pivot bolt nut (10). From inside of fork press or drive out bearing inner spacer (11) and bearing (12), by applying pressure against spacer (11). Press or drive out bearing shields (13) from fork inner side.

CLEANING AND INSPECTING
Before reassembling, clean and inspect all parts. Rough check the rear fork for correct alignment. Dimensions shown in Figure 2-52 will provide enough information to determine if fork is far enough out of alignment to require realigning or replacement. Straightening a badly bent rear fork requires special tools and fixtures for holding, bending and gauging.
Check the rear fork bearings. If the inner or outer bearing race is badly pitted, replace bearing assembly.

ASSEMBLING (Figure 2-51)

Assembly is essentially the reverse order of disassembly. Attention should also be given to the following instructions:

From outside of fork press or drive bearing shield (13) into position, flush with inner fork side. From outside of fork insert bearing spacer (11), shoulder facing in. Apply a heavy coating of grease to bearing (12).

NOTE

Pack the two rear fork pivot bearings with fresh grease at 10,000 mile intervals.

With wide side of bearing outer race facing out, tap bearing into fork until flush with inner fork side.

Insert bearing outer spacer (8), shoulder facing in. Assemble and tighten bearing locknut – right (7), and then back off one full turn. Insert pivot bolt nut (10). With a punch, tighten bearing locknut – left (9) until snug. Stake lock in three places. Position rear fork in place on motorcycle and at the same time position pivot bolt nut (10), shoulder in crankcase recess. With lockwasher (2) in place, coat pivot bolt (1) with grease. Insert in rear fork assembly and tighten securely.

Weigh the extreme rear end of fork by attaching spring scale and raising fork to horizontal position with centerline of frame. Take scale reading and tighten locknut – right (7) sufficient amount to provide from one to two pounds drag on the bearing. For example, if rear end of fork weighs three and one-half pounds with bearings free, bearings should be adjusted tight enough to increase weight of fork to four and one-half or five and one-half pounds as fork is lifted to horizontal position. Assemble screw (4), washer (5), and lockwasher (6).

Install shock absorbers, exhaust pipe and muffler. Install brake assembly and rear wheel. Insert brake rod in operating lever and adjust brake as described in “ADJUSTING REAR WHEEL BRAKE.”
BRAKES

GENERAL

The front wheel brake is operated by a hand lever on the right handlebar side, and the rear wheel brake is operated by a foot pedal. To keep mechanical brakes in proper operating condition, it is essential to check adjustment of brakes at regular service intervals of 5000 miles, or sooner, depending on wear of brake linings and drums. See adjustment of brakes and centering brake shoes. If brakes do not operate satisfactorily after adjustment of linkage and centering brake shoes in drums, disassemble and service brakes and connecting linkage. Hydraulic disc brake (1973 and later) is self-adjusting. Brake fluid level in master cylinder should be checked every 1000 miles.

On 1974 and later models rear brake lining can be inspected through view ports (8, Figure 2-54) to determine amount of lining wear.

DRUM BRAKES

ADJUSTING FRONT BRAKE (Figure 2-53)

When the front wheel brake is properly adjusted, the hand lever will move freely about one-quarter of its full movement before the brake starts to take effect. If adjusted too tight the brake may drag. To adjust brake, loosen locknut (1) on adjusting sleeve (2) and turn sleeve nut (3) in toward the cable support tube to decrease the free movement of hand lever and tighten the brake. Turn sleeve nut (3) away from the cable support tube to increase the free movement of hand lever and loosen the brake. When free movement of the hand lever is about one-quarter of its full movement, tighten locknut (1) against adjusting sleeve nut (3). Rotate the wheel to make sure brake is not too tight and dragging. If brake should drag with correct free movement in hand lever, recenter brake shoes in brake drum as follows:

Loosen, but do not remove, front brake shoe pivot stud (4) and axle nut (5). Spin front wheel. While wheel is turning apply brake and tighten pivot stud (4) and then axle nut (5). Recheck brake for correct adjustment as described above.

ADJUSTING REAR BRAKE (Figure 2-54)

To adjust rear wheel brake turn adjusting nut (1) to change the effective length of the brake rod (2) (1972 and earlier), or cable (1973 and later). The adjusting nut has a notch which fits against the clevis pin in the operating lever (3). Thus, it is locked in place on the rod, but may be turned down or backed off the rod by half turns as required. Set the adjusting nut so that the brake begins to take effect when the foot lever is pushed downward about 1-1/4 in.
Turn the nut onto the rod to tighten the brake; back it off to loosen the brake. Turn the wheel to be sure the brake is not too tight and dragging. If brake should drag with correct free movement in foot pedal, recenter brake shoes in brake drum as follows:

Loosen but do not remove rear brake pivot stud nut (4) or bolt (4A) and axle nut (5). Spin rear wheel. While wheel is turning apply brake and tighten pivot stud nut (4) or bolt (4A) and then the axle nut (5). Recheck brake for correct adjustment, as previously described.

REPLACING FRONT BRAKE CABLE (Figure 2-53)

If the front wheel brake cable (6) is not free in its housing, is frayed or broken, replace cable. Remove clevis clamp nut (7) and clamp (8). Free cable from clevis and pull from upper end of coil. Install new cable from upper end of housing as positioned on motorcycle, applying a light coat of grease as it is inserted into coil. When reassembling cable ferrule in hand lever anchor pin with side slot, be sure slot is toward inside as shown. Earlier type pin with slotted end should have open end facing downward.

To correctly adjust brake cable turn adjusting sleeve locknut (1) and adjusting sleeve nut (3) to the top of brake adjusting sleeve (2). Make sure brake cable end is correctly positioned in brake lever slot; control coil ferrule is correctly positioned in hand lever bracket slot, and the brake cable support tube (9) is positioned in the fork slider bracket. Take all slack out of brake cable by pulling at the lower end of cable. With front brake lever (10) in lowest position (brake released), loop cable (6) around clevis and secure in place with clevis clamp (8) and nut (7). Adjust brake as described in “ADJUSTING FRONT WHEEL BRAKE.”

DISASSEMBLING FRONT BRAKE (1972 AND EARLIER) (Figure 2-55)

Remove front wheel and brake assembly from motorcycle as described in “REMOVING AND INSTALLING FRONT WHEEL.” Remove operating shaft nut (2) and operating lever (3). Lightly tap operating shaft (4) to remove brake shoes (8), springs (9), operating shaft (4), washer (5) and pivot stud (6) as a unit from brake side plate (7). Remove shoes from operating shaft (4) and pivot stud (6).

DISASSEMBLING REAR BRAKE (Figure 2-56)

Remove rear wheel from motorcycle as described in “REMOVING AND INSTALLING REAR WHEEL.” Section 2. Remove rear brake rod adjusting nut (1) and free brake rod (2) from operating lever (3). Remove brake assembly from motorcycle. Remove operating shaft nut and washer (4), operating lever (3), pivot stud nut and lockwasher (5) or anchor bolt and washer (5A) and locating block (6) or spacer (6A). Lightly tap operating shaft (7) to remove brake shoes (8), springs (9), pivot stud (10 or 10A), operating shaft (7) and washer (11) as a unit from brake side plate (12). Remove shoes from operating shaft (7) and pivot stud (10).

INSPECTING AND REPAIRING BRAKES (Figures 2-55 and 2-56)

Clean and inspect brake shoes and linings (8) for wear, loose rivets, glazing, or imbedded particles. Brake shoes that are badly worn, cracked or damaged must be replaced. Linings (10 and 13) that are worn down to rivet heads, hard or glazed, impregnated with grease, cracked or damaged, must be replaced. Linings that are only slightly glazed and in apparent good condition may be reused after being roughened with a medium grade of sandpaper. Also, be sure to roughen braking surface of the brake drum.

If replacement of brake linings is necessary, new linings can be riveted to the old shoes, or, if riveting facilities are not available, brake shoes and linings can be renewed. To reline old shoes remove and discard old rivets and linings. Position new lining on brake shoe and head rivets, working from one end to the other to achieve a tight fit and avoid buckling. If a riveting machine is not available, set rivets with hand tools. After riveting linings to the brake shoes, bevel each end of brake lining as shown in Figure 2-57.

Figure 2-55. Front Brake (1972 and Earlier) - Exploded View

1. Pivot stud screw and washer
2. Operating shaft nut
3. Operating lever
4. Operating shaft
5. Operating shaft washer
6. Shoe pivot stud
7. Brake side plate
8. Brake shoe and lining (2)
9. Brake shoe spring (2)
10. Brake lining (2)
Clean all dirt from brake drums (not shown), and examine for scoring, grooving, or excessive wear. Inspect brake operating shaft (4 and 7), pivot stud (6 and 10 or 10A), and brake side plate (7 and 12) for excessive wear of shaft bearing surfaces. Recommended repair procedure is replacement of badly worn or damaged parts.

ASSEMBLING FRONT BRAKE (1972 AND EARLIER) (Figure 2-55)

Assembly is essentially the reverse order of disassembly. Assemble brake shoes (8) on operating shaft (4) and pivot stud (6) with one spring (9). Secure spring in groove that is nearest brake side plate. Position washer (5). Assemble unit to brake side plate (7). Make sure flat side of pivot stud (6) registers in recess of brake side plate. Install operating lever (3) and nut (2). Attach second spring in place with pliers. Install front wheel and brake assembly as described in "REMOVING AND INSTALLING FRONT WHEEL," Section 2. Adjust brakes and center brake shoes as described in "ADJUSTING FRONT WHEEL BRAKE."

ASSEMBLING REAR BRAKE (Figure 2-56)

Assembly is essentially the reverse order of disassembly. Assemble brake shoes (8) on operating shaft (7) and pivot stud (10 or 10A) with one spring (9). Secure spring in groove nearest brake side plate. Position washer (11) on shaft (7). Assemble unit on brake side plate (12). Install locating block (6) on spacer (6A), nut and lockwasher (5) or anchor bolt and washer (5A), operating lever (3) and nut and lockwasher (4). Attach second spring in place with pliers. Position brake assembly in rear wheel brake drum and install wheel assembly in frame as described in "REMOVING AND INSTALLING REAR WHEEL." Insert brake rod (2) through lever (3). Assemble adjusting nut (1) loosely on rod (2). Adjust brakes and center brake shoes as described in "ADJUSTING REAR WHEEL BRAKE."

DISASSEMBLING AND ASSEMBLING REAR BRAKE CROSS SHAFT (1974 & EARLIER) (Figure 2-56)

If it is necessary to remove the brake cross shaft (14) from the motorcycle, proceed as follows.

Disconnect rear chain and remove exhaust pipe and muffler from motorcycle. Free brake rod (2) clevis from cross shaft (14) lever arm, by removing washer and cotter pin (15) and clevis pin (16). Discard pin (15). Loosen pinch bolt (17), slip foot lever (18) and spring (19) from shaft (14). Remove shaft (14) from frame tube.

Examine cross shaft (14) and lever (18) splines for wear and damage. If lever slips on shaft splines when pinch bolt (17) is tight, renew worn parts. Fit clevis pin (16) in rod (2) clevis, and check for worn condition. Replace clevis pin (16) if badly worn.

Check cross shaft (14) bearing surface and compare with shaft non-bearing surface. If bearing surface is not worn, but has excessive play in frame tube, replace bronze bushings (20). Thread tap (3/4-16 tpi) into bushing and, from opposite side, drift bushing and tap from frame tube. Press new bushings (20) in place and install cross shaft (14). Rotate shaft to make sure it is free in bushings. If high spots develop when bushings are installed, ream to size.
back of center of the rear fork pivot bolt (3). Under no conditions should the top front of the cross shaft arm (2) be closer than 1-1/2 in. to the rear of the relieved portion of the transmission sprocket cover (4). Assemble brake pedal on cross shaft. If pedal does not position correctly (almost touching footrest), readjust cross shaft adjusting screw (1) so that cross shaft splines and brake pedal are correctly positioned. However, adjustment should be made so that cross shaft arm (2) is always moved to the rear, never closer to the transmission sprocket cover (4). After final adjustment tighten cross shaft bolt locknut (5).

LUBRICATING

Before operating motorcycle, lubricate brake system as indicated under "REGULAR SERVICE INTERVALS," Section 1.

REAR BRAKE FOOT PEDAL MECHANISM
(1975 AND 1976)

The rear brake foot mechanism is located on the right side of the motorcycle. It is mounted, along with the right foot peg, on a bracket which attaches directly to the frame. To remove the bracket, remove the front muffler, remove the attaching pinch screw and pull off the bracket. Figure 2-59 shows the bracket removed, with foot peg and brake parts attached. Disassemble as follows:

1. Detach brake cable (1) at rear brake operating lever and remove from slot in clevis pin (5).
2. Remove switch (3) from its mounting bracket by removing attaching hardware. Detach spring (4) at both ends and pull out clevis pin (5).
3. Remove foot pedal (6) by removing screw (7). Remove foot peg (8) by removing attaching hardware.

Clean all parts and inspect for wear or damage. Assemble in reverse order of disassembly. When fully assembled, adjust adjusting screw (10) to remove excessive play between brake cable and foot pedal. Tighten locking nut on screw after adjustments are completed. Inject a small amount of grease in fitting (11) using a hand grease gun.

REAR BRAKE FOOT PEDAL (1977 AND LATER)

The rear brake foot pedal and associated parts are located on the right side of the motorcycle.

Adjustment

The position of brake pedal can be changed to suit rider as follows. Refer to Figure 2-60.

1. Turn stop screw (5) in or out of bracket (1) to set 1/4 in. dimension shown in figure. Place brake pedal in position on splines of shaft (2) as desired. Note that the 1/4 in. dimension is easily set by backing screw (5) all the way down into bracket (1) then turning it back out six turns.
Figure 2-59. Rear Brake Foot Mechanism (1975 and 1976)

Make minor changes by readjusting stop screw (5). However, do not turn it more than three turns in either direction. A dimension close to 1/4 in. must be maintained for brake to work properly. Three turns of screw is about the same as changing pedal position one spline. So, if pedal is still not as desired, try repositioning on shaft splines rather than turning screw more than three turns.

After a new brake pedal position has been chosen, the position of stop light switch must be checked and repositioned as required. Loosen hardware securing switch and position along slot shown so switch plunger does not bottom out when pedal is fully released. Retighten switch mounting hardware.
FRONT DISC BRAKE
(1973 AND LATER)

OPERATION

NOTE

Two types of disc brakes are used. The following description applies to Figure 2-61 brake. Figure 2-62 brake operates in a similar manner.

The front brake master cylinder is an integral part of the brake hand lever assembly on the right handlebar. A hydraulic hose connects the master cylinder to the brake cylinder located in the outer caliper half on the left front fork slider. Brake pads in the caliper halves apply pressure to each side of disc mounted on the front wheel hub.

When the brake hand lever is operated, the hydraulic fluid forces the piston against the brake pads which contact the disc. The wave spring is compressed between the backing plate and the adjusting ring. The adjusting ring is a press-fit in the cylinder and moves, as necessary, to take up excess clearance as friction material wears away. The press-fit adjusting ring takes up a new position in the cylinder and is now located correctly to maintain running clearance when brake is released, and makes brake self-adjusting. The action of the wave spring pulls the brake piston away from the disc to create a small pad-to-disc running clearance.
CHECK LIST

When the brake is not operating properly use the following list for possible causes.

1. Excessive lever travel or spongy feel.
   Air in system – bleed brake.
   Master cylinder low on fluid – fill master cylinder with approved brake fluid.

2. Chattering sound when brake is applied.
   Worn or defective pads – replace brake pads.
   Loose mounting bolts – tighten bolts.
   Warped disc – replace disc.

3. Ineffective brake – lever travels to the limit.
   Low fluid level – fill master cylinder with approved brake fluid.
   Piston seal defective – replace O-ring in brake piston.

4. Ineffective brake – lever travel normal.
   Distorted disc – replace brake disc.
   Distorted or contaminated brake pads – replace brake pads.

5. Brake pads drag on disc – will not retract.
   Adjusting ring not tight enough in caliper bore – replace adjusting ring.
   Piston binding in adjusting ring – replace.
   Piston in master cylinder not uncovering relief port – check master cylinder.

Figure 2-61. Front Disc Brake (1973) - Exploded View
DISASSEMBLING AND ASSEMBLING DISC BRAKE CALIPER – 1973 (Figure 2-61)

If only the caliper assembly is to be removed, it is not necessary to remove the wheel. To remove the caliper assembly proceed as follows: Remove hose clamp. Remove 4 bolts (1) and washers (2). Remove outer caliper half (3) and damper spring (4). Remove mounting pin (5) and inner caliper half (6). Remove brake pad mounting pins (7) and brake pads (8). Check the friction pads for wear, damage, and looseness. Remove both pads if thickness of friction material is less than 1/16 in. Check to see that the metal backing plate is flat. If it is at all bowed replace the brake pad.

NOTE
Brake pads should only be replaced as a set.

With hydraulic system connected to outer caliper half assembly (3), use a dial indicator to check piston retraction. Mount dial indicator on back of outer caliper with indicator plunger on the piston face. Apply hand brake. Set dial indicator to zero. Release hand brake. Piston should retract .020 to .025 in. If it does not, replace piston assembly (9A). Do not remove piston assembly unless there are signs of hydraulic fluid leakage or if piston is not operating properly.

To remove piston (9 or 9A), pump brake hand lever until piston will move no farther. Remove hydraulic line (10). Push piston boot (11) back from groove in piston and pull piston the rest of the way out.
DISASSEMBLING AND ASSEMBLING DISC BRAKE CALIPER (1974 TO 1977) (Figure 2-62)

If only the caliper assembly is to be removed, it is not necessary to remove the wheel. To remove caliper assembly, proceed as follows: remove socket head screw (1), locknuts (2), and washers (3). Pull outer caliper half (4) and inner caliper half (5) apart. Remove pressure plate (6) with brake pad (7) attached. Check brake pads for wear, damage and looseness.

Replace pads if worn down to indicator groove on bottom of pad. If pads need replacing, drill out rivets (8) with a 9/64 in. drill. Replace pads as a set only. Check to see that pressure plate (8) is flat. If it is at all bowed, replace it. Rivet new pads in place using a hollow rivet set. Before reassembling caliper halves push piston all the way into caliper bore. Also make sure that bushings in torque arm (9) are free of dirt and corrosion.

Do not remove piston from outer caliper half unless there are signs of hydraulic fluid leakage, or if piston is not operating properly.

To remove piston (10) disconnect and plug hydraulic hose (11). Pull off rubber boot (12). Using two screwdrivers, carefully pry piston (10) from caliper bore. If friction ring (13) is damaged remove it from piston and replace it. Remove O-ring (14) from caliper bore. Remove bleeder valve cap (15) and bleeder valve (16). Clean all parts in solvent and inspect. Replace all parts that are worn or damaged. Inspect cylinder bore. If it is badly scored, replace outer caliper half. At this time check brake disc (17) for wear and damage. Replace brake disc if it is worn to .188 in. or less or if it is badly scored or warped. See "FRONT WHEEL HUB."

Reassembly is basically the reverse of disassembly with the following exceptions. Make sure all parts are clean and in good condition before assembly. Lubricate piston, friction ring, and O-ring with brake fluid. When assembling piston and friction ring assembly to caliper half and O-ring assembly, make sure piston is square with the bore. Tap it in place with a soft hammer while rotating it so that O-ring is not damaged. When assembling boot make sure both lips engage their respective grooves.

Make sure bosses on torque arm are clean and free from corrosion before mounting caliper. When mounting caliper halves, tighten socket head bolts to 130 in-lbs torque. Make sure caliper floats freely on torque arm.

Connect hydraulic line (11) to caliper. Fill front brake master cylinder with approved hydraulic fluid. Check system for leaks and seal with Harley-Davidson "Pipe Sealant with Teflon," Part No. 99630-77, if necessary. Bleed brake to purging system of air. See "BLEEDING HYDRAULIC SYSTEM."

DISASSEMBLING AND ASSEMBLING DISC BRAKE CALIPER – 1978 (Figure 2-63)

If the brake disc must be replaced, it will be necessary to remove the wheel. See "WHEEL" section. To remove and disassemble one caliper assembly, use the following procedure.

Loosen bolt (11) but do not remove.

NOTE

Piston assembly must be pressed all the way into the bore when new brake pads have been installed to assure proper clearance when calipers are reassembled to motorcycle.

Install bleeder valve (17). Apply Harley-Davidson "Anti-Seize," Part No. 99632-77 to 4 bolts (1) before assembly. Assemble caliper unit to motorcycle. Tighten 4 bolts (1) to 35 ft-lbs torque. Connect hydraulic line (10). Assemble hose clamp. Fill master cylinder reservoir with hydraulic brake fluid. Use only hydraulic brake fluid which is approved for use in hydraulic brake systems. On front brake master cylinder fill to gasket surface.

CAUTION — When filling brake system or assembling parts be careful not to spill brake fluid on brake switches. Fluid will cause corrosion and possible switch failure.

NOTE

Turn handlebar to the left so that top of reservoir is level. Check for leaks. If leaks persist at hydraulic fittings, coat surfaces with Harley-Davidson "Pipe Sealant with Teflon," Part No. 99630-77. Use only Harley-Davidson "Pipe Sealant with Teflon" to avoid contamination of hydraulic system. Bleed brake to purging system of air. See "BLEEDING HYDRAULIC SYSTEM."

If after a short period of operation brake feels spongy, repeat bleeding procedure.

Install wheel on motorcycle as described under "REMOVING AND INSTALLING FRONT WHEEL."
Figure 2-63. Front Brake Caliper (Left) (1978)

Remove the two mounting screws (1) and nuts (2) to release caliper assembly from front fork. Turn handlebar until top of master cylinder is nearly level. Remove cover and gasket. Disconnect hydraulic fitting at brake caliper and hose line. Be careful brake hose seat (3) is not lost.

Remove bolt (4) and washer (5) to disassemble caliper halves. Remove seal (6), piston boot (7) and piston (8). Remove outer plate (9), brake pad set (10) and inner plate (11) from pins (12) and remove pins from inner caliper (13).

INSPECTION AND CLEANING

If brake pads are worn to 1/16 in. or less, replace set (10). Clean all metal parts in a non-flammable cleaning solvent. Blow dry with compressed air. Rubber parts must be cleaned in denatured alcohol or brake fluid.

WARNING — Use a non-flammable cleaning solvent for cleaning component parts. DO NOT use gasoline or other flammable substances.

CAUTION — Always clean brake system rubber parts by washing in denatured alcohol or 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 part and would continue to deteriorate after assembly which could result in component failure.

Inspect all components carefully for excessive wear or damage. Discard old seal (6) and replace with a new one.

Inspect brake discs bolted to wheel assembly and replace if warped or badly scored. See "WHEELS" for disassembly procedure.

WARNING — The front brake and the rear brake pads must be replaced in pairs only for correct and safe brake operation.

Place the two pins (12) in the inner caliper (13). Slide the inner plate (11), brake pad set (10) and outer plate (9) onto the pins.

Dip the seal (6), piston boot (7) and piston (8) into brake fluid before assembly. Use silicone base D.O.T. 5 type fluid.

Place the seal, boot and piston into the outer caliper (14).

NOTE

Piston assembly must be pressed all the way into the bore when new brake pads have been installed to assure proper clearance when calipers are reassembled to motorcycle.

Position the outer caliper on the pins (12) and secure to inner caliper assembly with washer (5) and bolt (4). Tighten to 45 to 50 ft-lbs torque.
Install bleed fitting (15), if removed, and brake hose seat (3) into outer caliper. Connect brake hose to caliper. Install front wheel, if removed. See "WHEELS."

Mount the caliper assembly to the front fork with two mounting screws (1) and locknuts (2). Torque screws to 115 to 120 in-lbs. Tighten bolt (4, Figure 2-63) to 45 to 50 ft-lbs torque.

NOTE
New locknuts should be used as this type of nut tends to lose its holding power when reused. If new locknuts are not available, Harley-Davidson Lock and Seal, Part No. 99625-77, should be used on threads.

Turn handlebar until top of master cylinder is nearly level. Slowly fill reservoir with DOT 5 type hydraulic brake fluid, to gasket level. Reservoir may be filled with pressurized equipment, see "BLEEDING HYDRAULIC SYSTEM."

NOTE
Check for leaks. If leaks persist at hydraulic fittings, coat surfaces with Harley-Davidson "Pipe Sealant with Teflon," Part No. 99630-77. Use only this sealant to avoid contamination of hydraulic system. Bleed brake to purge system of air.

FRONT BRAKE MASTER CYLINDER

DISASSEMBLING AND ASSEMBLING FRONT DISC BRAKE MASTER CYLINDER (Figure 2-64)

The master cylinder (1) is located on the right handlebar. Disassemble as follows: Remove master cylinder cover (2) and gasket (3) by removing 2 screws (4). Disconnect hydraulic line (5) from master cylinder. Remove handlebar switch assembly and disconnect stoplamp wires. Remove retaining ring (6) and pivot pin (7). Pull out brake lever (8), pin (9), plunger (10), spring (11), 2 washers (12), and dust wiper (13). Remove retaining ring (14) with Retaining Ring Pliers, Harley-Davidson Part No. 96215-49. Pull out piston (15) and O-ring (16) assembly, piston cup (17), spring cup (18), and piston return spring (19).

Inspect piston cup (17), and O-ring (16) for wear, softening, or enlarging. Examine cylinder walls for scratches and grooves. Gasket (3) should have no tears, punctures or breaks which would allow leakage. Replace if necessary.

Make sure vent hole in master cylinder cover is open.

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Figure 2-64. Front Disc Brake Master Cylinder (1973 and Later) - Exploded View

1. Master cylinder
2. Master cylinder cover
3. Gasket
4. Screw (2)
5. Hydraulic line
6. Retaining ring
7. Pivot pin
8. Brake lever
9. Pin
10. Plunger
11. Spring
12. Washer
13. Dust wiper
14. Retaining ring
15. Piston
16. O-ring
17. Piston cup
18. Spring cup
19. Spring
20. Fitting (1/8 N.P.T.)
Assemble master cylinder in reverse order or disassembly. If repair kit is installed, use all new parts, not just those that look worn. Dip all internal parts in brake fluid before assembly. Lightly grease pivot pin (7) and pin (9) before assembly. Turn handlebars to the left and fill system with D.O.T. 5 grade hydraulic brake fluid and bleed brake system. When filling brake system or assembling parts be careful not to spill brake fluid on brake switches. Fluid will cause corrosion and possible switch failure. See "BLEEDING HYDRAULIC SYSTEM." Install gasket (3) with flat side down. Install cover (2).

NOTE
Before adding hydraulic fluid, check to see that relief port in master cylinder is uncovered when brake lever is released.

Bleed system carefully to purge all air. Test ride motorcycle. If brake feels spongy, repeat bleeding procedure.

BLEEDING HYDRAULIC SYSTEM (Figure 2-65)

After servicing hydraulic brake system where any hydraulic line or cylinder is opened, it is necessary to bleed the system to expel all air.

Slip a length of appropriate size plastic tubing over wheel cylinder bleeder valve with other end in a clean container.

Turn handlebars to the right so that bleeder valve is nearly vertical. Open bleeder valve by rotating counterclockwise about one-half turn. With 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. Repeat operation until brake system is free of air bubbles. Add fluid to master cylinder to bring to original level. Do not reuse fluid unless it is clear and free from sediment and bubbles.

Figure 2-65. Bleeding Front Brake
(1973 Model Shown)
FIBERGLASS

BODY CARE

GENERAL

Parts are made of molded fiberglass. There are 3 types of fiberglass material finishes:

1. Gel Coat finish: This finish is made of a special pigment and blended polyester resin several thousandths of an inch thick.
2. Molded-in-Color finish: This finish is molded into the fiberglass material which is the same color throughout its thickness.
3. Painted finish: This finish is painted on the natural color fiberglass material using standard painting procedure.

CARE OF FINISHES

The Gel Coat and molded-in-color finishes require minimum care and can be kept new looking by following these easy maintenance rules:

- Clean, buff and wax the exterior periodically to renew finish.
- An automotive wax type cleaner containing fine rubbing compound is suitable for removing minor scratches and scuffs. Scratches which are not removed by the rubbing compound can be removed by wet sanding with 400 grit sandpaper. Then wet sand with 800 grit sandpaper, rebuff and apply wax polish.

Care should be taken not to cut through the gel coat surface when buffing. A power buffer may be used with care or the surface may be buffed by hand, using a rubbing compound.

REPAIR

GENERAL

Patch and fill in deep scratches, scars and small breaks.

Repair any major breaks as soon as possible, to avoid any additional damage.

For damage to the gel coat finish, a can of Gel Coat of the same color and a small amount of catalyst is needed. For damage to the molded-in-color surface, a can of Filler Coat of the same color and a small amount of catalyst is needed. For deeper holes, breaks, or gouges, some fiberglass mat and pre-accelerated polyester resin will also be required. Gel Coat and Filler Coat with catalyst are available in kit form from the Harley-Davidson Motor Co. The other materials including fiberglass mat, and pre-accelerated polyester resin are supplied in fiberglass repair kits which are available at most marine or automotive supply stores.

Damage to the painted type finish can be repaired by sanding, priming and painting using regular painting procedure.

SURFACE FINISHING

This type of damage may be classified as damage to the gel coat only, or a hole or gouge that is deep enough to slightly penetrate fiberglass material. Repair as follows:

1. To be sure that the area to be patched is dry, clean and free of any wax or oil, wash with lacquer thinner.
2. Roughen the bottom and sides of the damaged area, using a power drill with a burr attachment. Feather the edge surrounding the scratch or gouge, being careful not to undercut this edge. See Figure 2-66.

![Figure 2-66. Roughing Damaged Area](image)

3. A small amount of gel coat, the same color as the finish should be placed in a small can lid or on a piece of cardboard. Use just enough to fill the damaged area. If damage has penetrated through to fiberglass material, an equal amount of fibers, which can be taken from glass mat and shredded into small fibers, should be mixed with the gel coat – using a putty knife or flat stick. Add three drops of catalyst per teaspoon of gel coat using an eye dropper. Be sure to mix the catalyst thoroughly for maximum working time. Maximum working time (pot life) will be about 15 to 20 minutes at which time it begins to “gel.” See Figure 2-67.

4. Fill the scratch or hole above the surrounding undamaged area about 1/16 in., working the material into the damaged area with the sharp point of a knife. Be careful to puncture and eliminate any air bubbles which may occur. See Figure 2-68.

NOTE

If fiberglass fibers have not been used in mixture, skip steps 5 through 7 and proceed with step 8.

5. When the patch feels rubbery to touch (10-15 minutes), trim the patch flush with the surface, and then allow to cure completely (30-60 minutes). Patch will shrink slightly as it cures, making a depression. See Figure 2-69.

6. Carefully roughen up the bottom and edges of the depression, using the electric drill with burr attachment, as in Step 2. Feather into surrounding gel coat: do not undercut.

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7. Again mix a small amount of gel coat with catalyst – do not use glass fibers. Using your finger or putty knife, fill the depression with gel coat 1/16 in. above the surrounding surface.

8. Spread the gel coat level with the surrounding area and allow to cure (30-60 minutes). See Figure 2-70. Gel coat can be covered with cellophane, if desired, to aid in spreading evenly. Remove cellophane after gel coat has cured.

9. Sand the patched area, using a sanding block with 600-grit wet sandpaper. Finish by buffing with fine rubbing compound such as DuPont #606 and waxing. Weathering will aid to blend touch-up if a slight color difference can be observed. See Figure 2-71.

**NOTE**

Where surface color of part has changed due to weathering, color match of patch may not be satisfactory. In this case, entire panel must be sprayed.

Thin Gel coat with acetone (1 to 1 ratio) and spray panel, blending sprayed area into a radius or corner on the part. Use a touch-up spray gun such as the Binks Model 15. After Gel coat is hard, buff and polish sprayed area.

**MOLDED-IN-COLOR SURFACE REPAIRS**

This type of damage consists of a scratch, hole or gouge that is deep enough to slightly penetrate fiberglass material.

Repair as follows:

1. To be sure that the area to be patched is dry, clean and free of any wax or oil, wash with lacquer thinner.

2. Roughen the bottom and sides of the damaged area, using a power drill with a burr attachment. Feather the edge surrounding the scratch or gouge, being careful not to undercut this edge. See Figure 2-66.
3. A small amount of Filler coat, the same color as the finish should be placed in a small can lid or on a piece of cardboard. Use just enough to fill the damaged area. Add three drops of catalyst per teaspoon of Filler coat using an eye dropper. Be sure to mix the catalyst thoroughly for maximum working time. Maximum working time (pot life) will be about 15 to 20 minutes at which time it begins to "gel."

4. Fill the scratch or hole slightly above the surrounding undamaged area, working the Filler coat into the damaged area with a putty knife. Be careful to puncture and eliminate any air bubbles which may occur. Patch can be covered with cellophane to aid in spreading evenly (see Figure 2-70). Allow to cure completely before removing cellophane.

5. Sand smooth with 220-grit sandpaper; then use 600-grit for finish sanding. Blend into surrounding area using 800-grit sandpaper. Buff with polishing compound such as DuPont #600 and finish with paste wax.

NOTE
Where surface color of part has changed due to weathering, color match of patch may not be satisfactory. In this case, entire panel must be sprayed.

Thin Gel Coat with acetone (1 to 1 ratio) and spray panel, blending sprayed area into a radius or corner on the part. Use a touch-up spray gun such as the Binks Model 15. After Gel Coat is hard, buff and polish sprayed area.

PATCHING OF HOLES, PUNCTURES AND BREAKS

If possible, work in shaded spot or in a building where the temperature is between 70° and 80°F.

1. Be sure surface is clean and dry where repair is to be made. Remove all wax and dirt from the damaged area.

2. Prepare injured area by cutting back fractured material to the sound part of the material. A keyhole or electric saber saw can be used to cut out the ragged edges. See Figure 2-72.

3. Rough sand the inside surface, using 80-grit dry sandpaper, feathering back about two inches all around the hole in the area the patch will touch. See Figure 2-73.

![Figure 2-73. Rough Sanding Inside Surface](image)

4. Cover a piece of cardboard or aluminum with cellophane and tape it to the outside surface with the cellophane facing toward the hole. Aluminum is used as backing where contour is present. The aluminum should be shaped the same as the contour. See Figure 2-74.

5. Cut glass mat to shape of hole, about 2 in. larger than hole.

![Figure 2-74. Taping on Backing](image)

6. Mix small amount of pre-accelerated resin and catalyst and daub resin on mat, thoroughly wetting it out. This may be done on a piece of cellophane or wax paper. See Figure 2-75.

NOTE
Mix resin 100 parts to 1 part catalyst for an approximate 30 minutes working time. Only mix enough resin for a given patch.

7. Lay patch over hole, cover with cellophane and squeegee out air bubbles. Allow one to two hours to cure, then remove cellophane. See Figure 2-76.
8. After the patch is cured, remove the cardboard from the outside of the hole and rough sand outside surface, feathering the edge of the hole. See Figure 2-77.

9. Mask area with tape and paper to protect the surrounding surface; then repeat steps 5, 6, 7 and 8, applying patches to outside surface until enough material has been laminated to re-establish the original thickness of the section.

10. Allow the patch to cure overnight; then sand with dry 80-grit paper on power sander. Smooth the patch and blend it with surrounding surface. If air pockets are present, puncture and fill with catalyzed resin. Let cure and resand. See Figure 2-78.

11. Mix gel coat or filler coat with catalyst. Work Gel Coat into patch with fingers. See Figure 2-79. Filler Coat should be filled into patch with a putty knife.
12. Cover with cellophane and squeegee smooth. Allow to cure completely before removing cellophane.

13. Sand the patch with 220-grit wet sandpaper; then use 600-grit for finish sanding. On painted type surface, paint can be applied at this time. Buff with polishing compound and wax.

NOTE

On Gel Coat finish, it may be necessary to repeat Steps 12 and 13 to insure a smooth, even gel coat surface. See Figure 2-80.

For large areas the gel coat can also be sprayed.

Where surface color of part has changed due to weathering, color match of patch may not be satisfactory. In this case, entire panel must be sprayed.

Thin Gel Coat with acetone (1 to 1 ratio) and spray panel, blending sprayed area into a radius or corner on the part. Use a touch-up spray gun such as the Binks Model 15. After Gel Coat is hard, buff and polish sprayed area.

Figure 2-80 Buffing Finish

Heat lamps may be used if working conditions are cold.

CAUTION — Do not place lamp bulb closer than 14 inches to surface or the resin may blister.
TOOLS

Fits slotted type locknuts.

Part No. 94630-67 Wheel Hub Bearing Locknut Wrench

Used to remove fork piston rod retainer from fork tube.

Part No. 94694-52 Fork Piston Rod Retainer Wrench

For small wheel spoke nipples (.205” across flats).

Part No. 94678-18 Spoke Nipple Wrench

Used to adjust rear shock absorber units for more or less spring compression (1974 and earlier).

Part No. 94700-65 Rear Shock Spanner Wrench (1974 and Earlier)

For large wheel spoke nipples (.234” across flats).

Part No. 94681-39 Spoke Nipple Wrench

Used to adjust rear shock absorber units for more or less spring compression (1975 and later)

Part No. 94820-75 Rear Shock Spanner Wrench (1975 and Later)

Used to remove fork piston rod bushing from fork damper tube.

Part No. 94691-52 Fork Piston Rod Bushing Spanner Wrench

Used to install press-fit connecting link sideplate supplied with replacement chains.

Part No. 95020-66 Rear Chain Connecting Link Press Tool
Removes press fit roller pins from all chains.

Part No. 95021-29 Chain Disassembly Tool

Used to rivet rear sprocket to brake shell. Set consists of riveting block, rivet punch, rivet set, adapter and support flange.

Part No. 95600-33B Sprocket Riveting Set

Adjustable stand for truing spoked wheels. Includes arbor. 95515-30A Arbor for wheels. (Can be used to convert old stand 95500-29.)

Part No. 95500-29A Wheel Truing Stand

When inserted into top end of fork tube, blade enters slot of damper tube to keep it from turning while removing or installing bottom nut on fork.

Part No. 95991-69 Fork Damper Holding Tool, 1968 to 1972

When inserted into top end of fork tube, socket fits over flats on damper tube to keep it from turning while removing or installing bottom screw on fork.

Part No. 94556-73 Fork Damper Holding Tool (1973-1974)

Special pliers for removing and replacing retaining rings.

96215-49 Small.
96216-49 Large.

Internal Lock Ring Pliers
Three recommended for use to support fork tubes while straightening on an arbor press.

Part No. 96247-54 Fork Tube Straightening Block (1972 & Earlier)

Complete set of tools consists of Fork Slider Bushing Puller (1), Bushing Driver (2) and Bushing Reamer (3) with long and short pilots. Tools used to remove worn fork slider bushings, install new parts and ream to size.

Part No. 96254-54 Bushing Tools for Front Fork (1972 and Earlier)

Used for straightening handlebar, forks and frames. Hooks on tubes for applying bending leverage.

Part No. 96806-40 Bending Bar

Simplifies shock absorber disassembly or assembly. Holds spring in compression while disassembling parts.

Part No. 97019-52A – Block

Part No. 97010-52A Shock Absorber Tool