Chapter 7

Brakes, wheels and tires

Contents

Section

Brake caliper - removal, overhaul and installation ....................................... 3
Brake check.......................................................................... See Chapter 1
Brake discs - inspection, removal and installation ........................................ 4
Brake hoses - inspection and replacement .................................................. 7
Brake Tight switches - check and adjustment ..................... See Chapter 1
Brake pads - replacement ............................................................................. 2
Brake system bleeding8 Front brake master cylinder - removal, overhaul and installation.. 5
Front wheel - removal, inspection and installation ......................................... 11

Section

General information1 Rear brake master cylinder - removal, overhaul and installation... 6
Rear wheel - removal, inspection and installation ...................................... 12
Tubeless tires - general information............................................................ 14
Wheel bearings - replacement ..................................................................... 13
Wheels - alignment ..................................................................................... 10
Wheels - inspection and repair ................................................................. 9
Wheels and tires - general check .............................................................. See Chapter 1

Specifications

Brakes
Brake lever free-play and pedal position See Chapter 1 Brake fluid type

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Standard</th>
<th>Minimum</th>
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<tr>
<td>Brake lever free-play</td>
<td>5.8 to 6.2 mm (0.23 to 0.24 inch)</td>
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<td>Brake fluid type</td>
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Rear brake disc thickness

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<td>7.3 to 7.7 mm (0.29 to 0.30 inch)</td>
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‘Refer to marks stamped into the disc (they supersede information printed here)

Disc runout limit: .......................................................... 0.3 mm (0.01 inch)

Pad friction material thickness

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Front caliper-to-bracket gap

Wheels and tires

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<td>Axle runout limit</td>
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<td>Tire pressures</td>
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<td>Tire sizes</td>
<td>See Chapter 1</td>
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<td>Tire pressures</td>
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**Torque specifications**

Front calipers

- Mounting bolts
  - Bracket bolt (with anti-dive)
  - Anti-dive piston bolt
  - Lower bracket bolt (without anti-dive)
  - Pad retaining pins
  - Pad retaining pin plugs
  - Caliper bleed valve

Rear caliper

- Pin bolt
- Mounting bolt
- Pad pin retainer bolt

Brake disc mounting bolts

Union (banjo fitting) bolts

- 1988 through 1990
- 1991-on

Metal line flare nuts

Master cylinder mounting bolts

- Front
- Rear

Front axle

- Axle bolt
- Axle pinch bolts
- Axle nut
- Axle pinch bolt
- Damper segment retainer plate bolts

Rear axle

- Axle nut
- Axle pinch bolt
- Damper segment retainer plate bolts

---

23 Nm (17 ft-lbs)
12 Nm (9 ft-lbs) 31 Nm (22 ft-lbs) 18 Nm (13 ft-lbs) 2.5 Nm (22 inch-lbs) 6 Nm (53 in-lbs)

28 Nm (20 ft-lbs) 23 Nm (17 ft-lbs) 11 Nm (8 ft-lbs) 40 Nm (29 ft-lbs)

30 Nm (22 ft-lbs) 35 Nm 25 ft-lbs) 17 Nm (12 ft-lbs)

12 Nm (9 ft-lbs) 12 Nm (9 ft-lbs)

90 Nm (65 ft-lbs) 22 Nm (16 ft-lbs)

110 Nm (80 ft-lbs) 32 Nm (23 ft-lbs) 20 Nm (14 ft-lbs)
1 General information

The models covered by this manual are equipped with hydraulic disc brakes on the front and rear. All models use a pair of four-piston calipers at the front and one dual-piston caliper at the rear. The rear brake and left front brake are operated by the brake pedal: the right front brake is operated by the brake lever on the left handlebar independently of the left front brake.

All models are equipped with cast aluminum wheels, which require very little maintenance and allow tubeless tires to be used.

Caution: Disc brake components rarely require disassembly. Do not disassemble components unless absolutely necessary. If any hydraulic brake line connection in the system is loosened, the entire system should be disassembled, drained, cleaned and then properly filled and bled upon reassembly. Do not use solvents on internal brake components. Solvents will cause seals to swell and distort. Use only clean brake fluid, brake cleaner or alcohol for cleaning. Use care when working with brake fluid as it can injure your eyes and it will damage painted surfaces and plastic parts.

2 Brake pads - replacement

Front calipers

Refer to illustrations 2.2a, 2.2b, 2.3a, 2.3b, 2.4a, 2.4b and 2.6

Warning: When replacing the front brake pads always replace the pads in BOTH calipers - never just on one side. Replace the anti-squeal shims and pad spring whenever the pads are replaced. Also, the dust created by the brake system may contain asbestos, which is harmful to your health. Never blow it out with compressed air and don't inhale any of it. An approved filtering mask should be worn when working on the brakes.

1 Place the bike on its centerstand. Refer to Chapter 8 and remove the brake disc covers.
2 Unscrew the pad pin plugs, then unscrew the pad pins (see Illustrations).
3 Unbolt the caliper bracket from the fork and pull the caliper off the bracket (see Illustrations).
4 Lift the pads out of the caliper (see illustrations).
2.2b Unscrew the pad pins with an Allen wrench
2.3a Unscrew the caliper bracket upper bolt (arrow) and the anti-dive piston bolt (or the lower bracket bolt on fork legs without anti-dive).

5 Check the condition of the brake discs (see Section 4). If they are in need of machining or replacement, follow the procedure in that Section to remove them. If they are okay, deglaze them with sandpaper or emery cloth, using a swirling motion.

6 Check the rubber pin bushings in the caliper and bracket (see illustration 2.4b and the accompanying illustration). Replace them if they're deteriorated or damaged.

7 Remove the cap from the master cylinder reservoirs (front reservoir for the right caliper and rear reservoir for the left caliper) and siphon out some fluid. Push the pistons into the caliper as far as possible, while checking the master cylinder reservoirs to make sure they don't overflow. If you can't depress the pistons with thumb pressure, try using a pry bar or C-clamp. If the pistons stick, remove the caliper and overhaul it as described in Section 3.

8 Make sure the shim is in place on the outer pad and the steel shield is in place on the bracket (see illustration 2.6). Lubricate the pin bushings with silicone grease and install the caliper on the bracket.

9 Install the pad spring in the caliper, then install the pads (see illustrations 2.4b and 2.4a). Press the pads down against the spring and install the pad pins. Thread the pins partway in, but wait until the caliper is installed to torque them.

10 If the fork leg has an antidive unit, lubricate its needle bearing with multi-purpose grease. Install the bracket bolt and antidive unit bolt (or both bracket bolts if the fork leg doesn't have an antidive unit).

11 Tighten the bracket bolts to the torque listed in this Chapter's Specifications. Tighten the pad pins to the specified torque, then install.
2.3b Take the bracket off and slide the caliper off the bracket.

2.4a Pull the pads out of the caliper ...

the pad pin plugs and tighten them to their specified torque.
12 Refill the master cylinder reservoir (see Chapter 1) and install the diaphragm and cover. Operate the brake lever several times to bring the pads into contact with the disc. 13 Reinstall the disc brake covers (see Chapter 8).
14 Check the operation of the brakes carefully before riding the motorcycle.
2.6 Inspect the bracket's pin bushing (A); be sure the bracket shield (B) and pad shim (C) are in place.

2.4b ... remove the pad spring (arrow) and check the condition of the pin bushing (arrow).
2.16a Rear caliper mounting details

A  Pin bolt
B  Mounting bolt
C  Pad pin retainer bolt position
D  Brake hose union bolt
E  Bleed valve
Rear calipers
Refer to illustrations 2.16a, 2.16b, 2.17a, 2.17b, 2.20a, 2.20b and 2.20c Warning: The dust created by the brake system may contain asbestos, which is harmful to your health. Never blow it out with compressed air and don't inhale any of it. An approved filtering mask should be worn when working on the brakes. Replace the anti-squeal shims and pad spring whenever the pads are replaced.

15 Place the bike on its centerstand. Refer to Chapter 8 and remove the left saddlebag.
16 Undo the pad pin retainer bolt, then remove the mounting bolts and take the caliper off the bike (see illustrations). 17 Remove the pad pin retainer and pull out the pins, then take the pads out of the caliper (see illustrations).
18 Perform Step 7 above to inspect the disc and prepare the caliper for pad installation.
19 Make sure the pad spring is in position with its tabs toward the wheel side of the caliper, then install the pads (see illustration 2.17b). 20 Align the pin holes in the pads with the holes in the caliper, then install the pad pins. Slip the retainer over the ends of the pins so it engages the pin grooves, then bolt the retainer to the caliper (see illustrations). Tighten the retainer bolt slightly at this point.
21 Lubricate the caliper pin bolt with silicone grease, then position the caliper on the bracket and install the pin bolt and mounting bolt.

2.16b Lift the caliper **off and remove the** pad pin retainer **(arrow)**

2.17a Pull out the **pad pins** ...

Tighten the pin bolt, mounting bolt and pad pin retainer bolt to the torque listed in this Chapter's Specifications. 22 Refill the master cylinder reservoir (see Chapter 1). 23 Operate the brake pedal to bring the pads back into contact with the disc. Check the operation of the brakes carefully before riding the motorcycle.
24 Refer to Chapter 8 and install the left saddlebag.
2.17b ... lift out the pads and remove the pad spring (arrow)

2.20a Align the pin holes in the caliper and pad
3 Brake caliper - removal, overhaul and installation

Warning: If a front caliper indicates the need for an overhaul (usually due to leaking fluid or sticky operation), BOTH front callipers should be overhauled and all old brake fluid flushed from the system. Also, the dust created by the broke system may contain asbestos, which is harmful to your health. Never blow it out with compressed air and don't inhale any of it. An approved filtering mask should be worn when working on the brakes. Do not, under any circumstances, use petroleum-based solvents to clean brake parts. Use brake cleaner or denatured alcohol only!
Removal

1. Support the bike securely so it can't be knocked over during this procedure.
2. With a clean rag handy to catch spills, remove the brake hose banjo fitting bolt and separate the hose from the caliper (see illustrations 2.2a and 2.16a). Discard the sealing washers. Place the end of the hose in a container and operate the brake lever to pump out the fluid. Once this is done, wrap a clean shop rag tightly around the hose to soak up any drips and prevent contamination.
3. Unscrew the caliper mounting bolts (see Illustrations 2.3a and 2.16a).
4. Lift off the caliper and remove the brake pads (see Section 2).

Overhaul

Refer to illustration 3.8

5. Clean the exterior of the caliper with denatured alcohol or brake system cleaner.
6. If the bike's hydraulic system is in reasonably good condition, it can be used to remove the pistons from the calipers. Leave the fluid hose connected and remove the caliper and pads. Place a drain pan under the caliper to catch the brake fluid that will run out. Caution: Place rags or plastic over nearby painted or plated parts to protect them from brake fluid splashes. Wash off any splashes immediately with soap and water to prevent damage to the surfaces. Pump the lever or pedal a few times to force the pistons out of the caliper. If one piston comes out faster than the other one, slip a piece of wood into the pad area to block that piston until the other one is forced out.
7. If the hydraulic system isn't in good enough condition to push the pistons out, you'll need to use compressed air. Disconnect the hose from the caliper. Place a few rags between the pistons and the caliper frame to act as a cushion, then use compressed air, directed into the fluid inlet, to remove the pistons. Use only enough air pressure to ease the pistons out of the bore. If a piston is blown out, even with the cushion in place, it may be damaged. Warning: Never place your fingers in front of the piston in an attempt to catch or protect it when applying compressed air, as serious injury could occur.

Installation

14. Refer to Section 2 and install the brake pads and caliper.
15. Connect the brake hose to the caliper, using new sealing washers on each side of the fitting. Align the banjo fitting with its tab and tighten the bolt to the torque listed in this Chapter's Specifications.
16. Fill the master cylinder with the recommended brake fluid (see Chapter 1) and bleed the system (see Section 8). Check for leaks.
17. Check the operation of the brakes carefully before riding the motorcycle.
3.8 Remove the pistons, then the dust seals (upper arrow) and piston seals (lower arrow)
4 Brake discs - inspection, removal and installation

**Inspection**

Refer to illustrations 4.3 and 4.4

1. Support the bike securely so it can't be knocked over during this procedure, with the wheel to be checked off the ground.
2. Visually inspect the surface of the disc(s) for score marks and other damage. Light scratches are normal after use and won't affect brake operation, but deep grooves and heavy score marks will reduce braking efficiency and accelerate pad wear. If the discs are badly grooved they must be machined or replaced.
3. To check disc runout, mount a dial indicator to a fork leg or the swingarm, with the plunger on the indicator touching the surface of the disc about 1/2-inch from the outer edge (see illustration). Slowly turn the wheel and watch the indicator needle, comparing your reading with the limit listed in this Chapter's Specifications. If the runout is greater than allowed, check the hub bearings for play (see Section 9). If the bearings are worn, replace them and repeat this check. If the disc runout is still excessive, it will have to be replaced.
4. The disc must not be machined or allowed to wear down to a thickness less than the minimum allowable thickness, stamped on the disc and listed in this Chapter's Specifications (see illustration). The thickness of the disc can be checked with a micrometer. If the thickness of the disc is less than the minimum allowable, it must be replaced.
Removal

Refer to illustration 4.6

5  Remove the wheel (see Section 11 for front wheel removal or Section 12 for rear wheel removal). Caution: Don't lay the wheel down and allow it to rest on one of the discs - the disc could become warped. Set the wheel on wood blocks so the disc doesn't support the weight of the wheel.

6  Mark the relationship of the disc to the wheel, so it can be installed in the same position. Look for L and R marks on the left and right front discs. If you don't see them, make your own. Remove the Allen head bolts that retain the disc to the wheel (see illustration). Loosen the bolts a little at a time, in a criss-cross pattern, to avoid distorting the disc. Once all the bolts are loose, take the disc off.

Installation

7  Position the disc on the wheel, aligning the previously applied matchmarks (if you're reinstalling the original disc). Make sure the FRONT OUT SIDE or REAR OUT SIDE mark on the disc faces away from the wheel (see illustration 4.6). If you're installing a front disc, make sure the disc with the L mark goes on the left side of the bike and the disc with the R mark goes on the right side.

8 Install the Allen bolts, tightening them a little at a time, in a crisscross pattern, until the torque listed in this Chapter's Specifications is reached. Thoroughly clean off all grease from the brake disc(s) using acetone or brake system cleaner.

9  Install the wheel.

10 Operate the brake lever or pedal several times to bring the pads into contact with the disc. Check the operation of the brakes carefully before riding the motorcycle.

5 Front brake master cylinder - removal, overhaul and installation

1 If the master cylinder is leaking fluid, or if the lever does not produce a firm feel when the brake is applied, and bleeding the brakes does not help, master cylinder overhaul is recommended. Before disassembling the master cylinder, read through the entire procedure and make sure that you have the correct rebuild kit. Also, you will need some new, clean brake fluid of the recommended type. some clean rags and internal snap-ring pliers. Note: To prevent damage to the paint from spilled brake fluid, always cover plastic or plated parts when working on the master cylinder.

2 Caution: Disassembly, overhaul and reassembly of the brake master cylinder must be done in a spotlessly clean work area to avoid contamination and possible failure of the brake hydraulic system components.
5.5 Undo the union bolt at the master cylinder; on installation, use a new sealing washer on each side of the hose fitting.
Removal
Refer to illustrations 5.5 and 5.7
3 Loosen but do not remove the screws holding the reservoir cover in place.
4 Disconnect the electrical connectors from the brake light switch and the cruise cancel switch if equipped (see Chapter 9).
5 Remove the banjo fitting bolt (see illustration) and separate the brake hose from the master cylinder. Wrap the end of the hose in a clean rag and suspend the hose in an upright position or bend it down carefully and place the open end in a clean container. The objective is

5.7 Remove the Allen bolts to separate the clamp from the master cylinder; on installation, align the mark on the handlebar trim (arrow) with the split between the clamp and master cylinder to prevent excessive loss of brake fluid, fluid spills and system contamination.

6 Remove the locknut from the underside of the lever pivot bolt, then unscrew the bolt.
7 Remove the plastic cover from the master cylinder mounting bolts (if equipped). Remove the master cylinder mounting bolts (see illustration) and separate the master cylinder from the handlebar.

Overhaul
Refer to illustrations 5.9, 5.10a, 5.10b and 5.10c
8 Detach the cover and the rubber diaphragm, then drain the brake fluid into a suitable container. Remove the plate from the bottom of the reservoir (if equipped), then wipe any remaining fluid out of the reservoir with a clean rag.
9 Carefully remove the rubber dust boot from the end of the piston (see illustration).
10 Using snap-ring pliers, remove the snap-ring (see illustration) and slide out the piston assembly and the spring (see illustrations). Lay the parts out in the proper order to prevent confusion during reassembly.
11 Clean all of the parts with brake system cleaner (available at auto parts stores), isopropyl alcohol or clean brake fluid. Caution: Do not, under any circumstances, use a petroleum-based solvent to clean brake parts. If compressed air is available, use it to dry the parts thoroughly (make sure it's filtered and un lubricated). Check the master cylinder bore for corrosion, scratches, nicks and score marks. If damage is evident, the master cylinder must be replaced with a new one. If the master cylinder is in poor condition, then the calipers should be checked as well.
5.10a Remove the snap-ring from the cylinder bore ...

5.10b ... then pull out the piston assembly ...

5.10c ... and spring
The piston assembly and spring are included in the rebuild kit. Use all of the new parts, regardless of the apparent condition of the old ones. Before reassembling the master cylinder, soak the piston and the rubber cup seals in clean brake fluid for ten or fifteen minutes. Lubricate the master cylinder bore with clean brake fluid, then carefully insert the piston and related parts in the reverse order of disassembly. Make sure the lips on the cup seals do not turn inside out when they are slipped into the bore. Push the piston into the bore against the spring pressure, then install the snap-ring (make sure the snap-ring is properly seated in the groove). Install the rubber dust boot (make sure the lip is seated properly in the piston groove).

### Installation

15 Attach the master cylinder to the handlebar, aligning the split in the clamp with the pointer cast in the handlebar trim (see illustration 5.7) and tighten the bolts to the torque listed in this Chapter's Specifications. Connect the brake hose to the master cylinder, using new sealing washers. Tighten the banjo fitting bolt to the torque listed in this Chapter's Specifications. Refer to Section 8 and bleed the air from the system.

If the master cylinder is leaking fluid, or if the pedal does not produce a firm feel when the brake is applied, and bleeding the brakes does not help, master cylinder overhaul is recommended. Before disassembling the master cylinder, read through the entire procedure and make sure that you have the correct rebuild kit. Also, you will need some new, clean brake fluid of the recommended type, some clean rags and internal snap-ring pliers.

**Caution:** Disassembly, overhaul and reassembly of the brake master cylinder must be done in a spotlessly clean work area to avoid contamination and possible failure of the brake hydraulic system components.

### Removal

Refer to illustration 6.7

3 Support the bike securely so it can't be knocked over during this procedure.

4 Remove both mufflers, the exhaust chamber, the left exhaust pipe assembly and the right heat protector (see Chapter 4). Remove the battery and its tray (see Chapter 8).

6 If you're working on a bike with cruise control, follow the wiring harness from the switch at the rear master cylinder to the two-pin red electrical connector behind the engine control module, then unplug it.

7 Remove the cotter pin from the clevis pin on the master cylinder pushrod (see illustration). Remove the clevis pin.

8 Have a container and some rags ready to catch spilling brake fluid. Remove the union bolt and seals from the banjo fitting on the rear of the master cylinder. Direct the end of the hose into the container, unscrew the cap on the master cylinder reservoir and allow the fluid to drain.

9 Follow the metal line for the front caliper from the master cylinder to its flare nut on the frame, then undo the nut with a flare nut wrench. Remove the mounting bolts (see illustration 6.7). Lift the master cylinder out far enough for access to the reservoir hose clamp, then loosen the clamp and disconnect the reservoir hose from the master cylinder.

### Overhaul

11 Pull the boot away from the end of the master cylinder. Depress the pushrod and, using snap-ring pliers, remove the snap-ring. Slide out the piston assembly, separate cup and spring. Lay the parts out in the proper order to prevent confusion during reassembly. Clean all of the parts with brake system cleaner (available at auto parts stores), isopropyl alcohol or clean brake fluid.

**Caution:** Do not, under any circumstances, use a petroleum-based solvent to clean brake parts. If compressed air is available, use it to dry the parts thoroughly (make sure it's filtered and unlubricated). Check the master cylinder bore
6.7 Remove the clevis pin (A), brake hose union bolt (B) and mounting bolts (C); on installation, use a new sealing washer on each side of the hose fitting for corrosion, scratches, nicks and score marks. If damage is evident, the master cylinder must be replaced with a new one. If the master cylinder is in poor condition, then the caliper should be checked as well. A new piston, separate cup and spring are included in the rebuild kit. Use them regardless of the condition of the old ones. Before reassembling the master cylinder, soak the piston and the rubber cup seals in clean brake fluid for ten or fifteen minutes. Lubricate the master cylinder bore with clean brake fluid, then carefully insert the parts in the reverse order of disassembly. The flat side of the separate cup faces out of the bore (toward the piston). Make sure the lips on the cup seals do not turn inside out when they are slipped into the bore. Depress the pushrod, then install the snap-ring (make sure the snap-ring is properly seated in the groove). Install the rubber dust boot (make sure the lip is seated properly in the groove).

Installation

16 Connect the reservoir hose to the master cylinder.
17 Thread the flare nut on the front caliper line into its fitting with fingers, then tighten it with a flare nut wrench. Connect the banjo fitting to the end of the master cylinder, using a new sealing washer on each side of the fitting. Tighten the union bolt to the torque listed in this Chapter’s Specifications.
18 Connect the fluid feed hose to the inlet fitting and install the hose clamp.
19 Bolt the master cylinder to the frame and tighten its bolts to the torque listed in this Chapter’s Specifications. Connect the clevis to the brake pedal and secure the clevis pin with a new cotter pin.
20 Fill the fluid reservoir with the specified fluid (see Chapter 1) and bleed the system following the procedure in Section 8. Check the position of the brake pedal (see Chapter 1) and adjust it if necessary. Check the operation of the brakes carefully before riding the motorcycle.
21 The remainder of installation is the reverse of the removal steps.

7 Brake hoses - inspection and replacement

Inspection

Refer to illustrations 7.2a through 7.2e

1 Periodically check the condition of the brake hoses.
2 Twist and flex the rubber hoses (see illustrations 2.2a and the accompanying illustrations) while looking for cracks, bulges and seeping fluid. Check extra carefully around the areas where the hoses connect with the banjo fittings, as these are common areas for hose failure.
3 Inspect the metal banjo fittings connected to brake hoses. If the fittings are rusted, scratched or cracked, replace them.
Replacement

4 Most brake hoses have banjo fittings on each end of the hose. Cover the surrounding area with plenty of rags and unscrew the union bolts on either end of the hose. Detach the hose from any clips that may be present and remove the hose.

5 Position the new hose, making sure it isn’t twisted or otherwise strained, between the two components. Make sure the metal tube portion of the banjo fitting is positioned next to the stop on the component it’s connected to, if equipped (see illustrations 2.2a and 2.16a). On the front master cylinder, the hose should be inclined toward the front of the bike at a 30-degree angle from vertical. Install the union bolts, using new sealing washers on both sides of the fittings, and tighten them to the torque listed in this Chapter’s Specifications.

6 Flush the old brake fluid from the system, refill the system with the recommended fluid (see Chapter 1) and bleed the air from the system (see Section 8). Check the operation of the brakes carefully before riding the motorcycle.
Bleeding the brake is simply the process of removing all the air bubbles from the brake fluid reservoirs, the lines and the brake calipers. Bleeding is necessary whenever a brake system hydraulic connection is loosened, when a component or hose is replaced, or when the master cylinder or caliper is overhauled. Leaks in the system may also allow air to enter, but leaking brake fluid will reveal their presence and warn you of the need for repair.

To bleed the brakes, you will need some new, clean brake fluid of the recommended type (see Chapter 1), a length of clear vinyl or plastic tubing, a small container partially filled with clean brake fluid, some rags and a wrench to fit the brake caliper bleeder valves.

Cover the fuel tank and other painted components to prevent damage in the event that brake fluid is spilled.

Remove the reservoir cap or cover and slowly pump the brake.
8 Brake system bleeding

7.2e The retainers are labeled R and L for right and left sides of the bike.
7-10 Chapter 7 Brakes, wheels and tires

Dents in this area may prevent complete sealing of the tire against the rim, which leads to deflation of the tire over a period of time. If damage is evident, or if runout in either direction is excessive, the wheel will have to be replaced with a new one. Never attempt to repair a damaged cast aluminum wheel.

9.2 Check the wheel for
out-of-round (A) and
lateral movement (B)

10 Wheels - alignment check

1 Misalignment of the wheels, which may be due to a cocked rear lever or pedal a few times. until no air bubbles can be seen floating up from the holes at the bottom of the reservoir. Doing this bleeds the air from the master cylinder end of the line. Reinstall the reservoir cap or cover.

5 Pull back the rubber cover and slip a box wrench over the caliper bleed valve (see illustration 2.2a or 2.16a). Attach one end of the clear vinyl or plastic tubing to the bleeder valve and submerge the other end in the brake fluid in the container.

6 Remove the reservoir cap or cover and check the fluid level. Do not allow the fluid level to drop below the lower mark during the bleeding process.

7 Carefully pump the brake lever or pedal three or four times and hold it while opening the caliper bleeder valve. When the valve is opened, brake fluid will flow out of the caliper into the clear tubing and the lever will move toward the handlebar or the pedal will move down.

8 Retighten the bleeder valve, then release the brake lever or pedal gradually. Repeat the process until no air bubbles are visible in the brake fluid leaving the caliper and the lever or pedal is firm when applied. Note: The brake pedal operates two calipers, the rear and the left front. Bleed the left front caliper first, then the rear caliper. Remember to add fluid to the reservoir as the level drops. Use only new, clean brake fluid of the recommended type. Never reuse the fluid lost during bleeding.

9 Replace the reservoir cover, wipe up any spilled brake fluid and check the entire system for leaks. Note: If bleeding is difficult, it may be necessary to let the brake fluid in the system stabilize for a few hours (it may be aerated). Repeat the bleeding procedure when the tiny bubbles in the system have settled out.

9 Wheels - inspection and repair

Refer to illustration 9.2

1 Support the motorcycle securely upright, then clean the wheels thoroughly to remove mud and dirt that may interfere with the inspection procedure or mask defects. Make a general check of the wheels and tires as described in Chapter 1.

2 Raise the wheel to be checked off the ground, then attach a dial indicator to the fork slider or the swingarm and position the stem against the side of the rim. Spin the wheel slowly and check the sideto-side (axial) runout of the rim, then compare your readings with the value listed in this Chapter's Specifications (see illustration). In order to accurately check radial runout with the dial indicator, the wheel would have to be removed from the machine and the tire removed from the wheel. With the axle clamped in a vise, the wheel can be rotated to check the runout.

3 An easier, though slightly less accurate, method is to attach a stiff wire pointer to the fork or the swingarm and position the end a fraction of an inch from the wheel (where the wheel and tire join). If the wheel is true, the distance from the pointer to the rim will be constant as the wheel is rotated. Note: If wheel runout is excessive, refer to the appropriate Section in this Chapter and check the wheel bearings very carefully before replacing the wheel.

4 The wheels should also be visually inspected for cracks, flat spots on the rim and other damage. Since tubeless tires are involved, look very closely for dents in the area where the tire bead contacts the rim.

wheel or a bent frame or triple clamps, can cause strange and possibly serious handling problems. If the frame or triple clamps are at fault, repair by a frame specialist or replacement with new parts are the only alternatives.

2 To check the alignment you will need an assistant, a length of string or a perfectly straight piece of wood and a ruler graduated in
1/64 inch increments. A plumb bob or other suitable weight will also be required.
3 Support the motorcycle in a level position, then measure the width of both tires at their widest points. Subtract the smaller measurement from the larger measurement, then divide the difference by two. The result is the amount of offset that should exist between the front and rear tires on both sides.
4 If a string is used, have your assistant hold one end of it about half way between the floor and the rear axle, touching the rear sidewall of the tire.
5 Run the other end of the string forward and pull it tight so that it is roughly parallel to the floor. Slowly bring the string into contact with the front sidewall of the rear tire, then turn the front wheel until it is parallel with the string. Measure the distance from the front tire sidewall to the string.
6 Repeat the procedure on the other side of the motorcycle. The distance from the front tire sidewall to the string should be equal on both sides.
7 As was previously pointed out, a perfectly straight length of wood may be substituted for the string. The procedure is the same.
8 If the distance between the string and tire is greater on one side, or if the rear wheel appears to be cocked, refer to Chapter 6. Swingarm bearings - check, and make sure the swingarm is tight.
9 If the front-to-back alignment is correct, the wheels still may be out of alignment vertically.
10 Using the plumb bob, or other suitable weight, and a length of string, check the rear wheel to make sure it is vertical. To do this, hold the string against the tire upper sidewall and allow the weight to settle just off the floor. When the string touches both the upper and lower tire sidewalls and is perfectly straight, the wheel is vertical. If it is not, place thin spacers under one leg of the centerstand.
11 Once the rear wheel is vertical, check the front wheel in the same manner. If both wheels are not perfectly vertical, the frame and/or major suspension components are bent.

11 Front wheel - removal, inspection and installation

Removal

Refer to illustrations 11.5a, 11.5b, 11.6, 11.7, 11.8a and 11.8b
1 Place the bike on its centerstand. Raise the front wheel off the ground by placing a floor jack, with a wood block on the jack head, under the engine. Don't place the jack under the oil filter.
2 Remove the brake disc covers (see Chapter 8).
3 Disconnect the speedometer cable from the drive unit (see Chapter 9).
4 Unbolt the caliper bracket on either side of the bike (it isn't necessary to remove both calipers) and remove the caliper, leaving the brake hose connected. Tie the caliper to a support such as the handlebars with a piece of wire so it doesn't hang by the brake hose. Note: Slip a piece of wood between the pads of the removed caliper so the pads won't be squeezed together if the brake lever is accidentally pulled.
5 Loosen the axle bolt, then remove the axle pinch bolts and the brake disc cover brackets (see illustrations).
11.5a Loosen the axle bolt (arrow), undo the pinch bolts and remove the brake disc cover bracket
11.6 Remove the axle bolt

6 Unscrew the axle bolt (see illustration).
7 Support the wheel, then pull out the axle (see illustration) and carefully lower the wheel away from the forks.
8 Remove the collar from the right side and the speedometer drive

11.5b Remove the left side disc cover bracket; it also secures the speedometer cable (note the L and R marks on the disc cover brackets)

11.7 Slip a rod into the axle hole and pull the axle out assembly from the left side (see illustrations). Set the wheel aside. Caution: Don't lay the wheel down and allow it to rest on one of the discs - the disc could become warped. Set the wheel on wood blocks so the disc doesn't support the weight of the wheel. Note: Don't operate the front brake lever with the wheel removed.
11.8a Remove the spacer from the right side of the wheel...

11.8b ... and the speedometer gearbox from the left side
11.9 Check the axle for runout using a dial indicator and V-blocks (divide the reading by two to obtain the actual runout)

**Inspection**

*Refer to illustration 11.9*
9 Set the axle in a pair of V-blocks, rotate it and check run out with a dial indicator (see illustration). If the axle is corroded, remove the corrosion with fine emery cloth.
10 Check the condition of the wheel bearings (see Section 13).

**Installation**

*Refer to illustrations 11.1a and 11.1b*
11 Apply a thin coat of grease to the seal lip, then slide the axle into the hub. Slide the wheel into place. Make sure the lugs in the speedometer drive clutch line up with the notches in the speedometer drive gear (see illustration). Make sure the cast boss on the speedometer gear housing rests against the back of the tab on the left fork leg (see illustration).
12 Install the front axle bolt and tighten it loosely.
13 Reinstall the disc cover brackets, making sure to place the bracket marked R on the right side and the bracket marked L on the left. Tighten the axle pinch bolts to the torque listed in this Chapter's Specifications, then tighten the axle bolt to the specified torque. 14 Install the brake caliper (see Section 3). Once the caliper is installed, measure the gap between the left brake disc (both sides) and the caliper bracket. If the gap is less then listed in this Chapter's Specifications, loosen the axle pinch bolts and reposition the fork leg until the gap is as specified. Tighten the axle pinch bolts to the specified torque, then spin the wheel, apply the left front brake several times and recheck the clearance between the brake disc and bracket. Don't operate the motorcycle until the gap is correct or the brake disc may be damaged.
15 Reconnect the speedometer cable (see Chapter 9).
16 Apply the front brake, pump the forks up and down several times and check for binding and proper brake operation. 17 Once the brakes work properly, refer to Chapter 8 and install the disc covers.

**12 Rear wheel - removal, inspection and installation**

**Removal**

*Refer to illustrations 12.3, 12.5, 12.6a, 12.6b, 12.7 and 12.8*
1 Place the bike on its centerstand and support it with the rear wheel off the ground. The support must be stable, so the bike can't be knocked over, and located so it won't interfere with removal of the wheel.
2 Remove the trunk and saddlebags (see Chapter 8).
3 Remove the axle nut (see illustration).
4 Remove the left shock absorber's lower mounting bolt (see Chapter 6).
5 Loosen the axle pinch bolt (see illustration).
6 Support the wheel. Slip a screwdriver or punch into the axle hole. pull the axle part way out and remove the washer (see illustrations).
7 Lift the brake caliper and bracket out of the way and tie them up so the caliper doesn't hang by the brake hose (see illustration). 
Note: Slip a piece of wood between the pads of the removed caliper so the
11.11a On installation, make sure the speedometer drive lugs (arrows) engage the notches in the gear box

11.11b Place the speedometer drive gear’s boss (arrow) against the rear side of the tab on the fork leg; this keeps the drive gearbox from spinning with the wheel

*pads won't be squeezed together if the brake lever is accidentally pulled.*

8 Remove the spacer from the left side of the wheel (see illustration).
9 Lower the wheel and remove it from the swingarm. Caution: *Don't lay the wheel down and allow it to rest on the disc or the sprocket*
12.3 Unscrew the axle nut
12.5 Loosen the axle pinch bolt ...
- they could become warped. Set the wheel on wood blocks so the disc or the sprocket doesn't support the weight of the wheel. Do not operate the brake pedal with the wheel removed.

**Inspection**

10 Refer to Section 11 and inspect the axle.

12 Pull the coupling out of the wheel (see Chapter 6). Unbolt the retainer plate that secures the rubber dampers in the wheel and turn it clockwise so the arrows on the plate and wheel are aligned. Lift the plate off and pull the rubber damper segments out of the wheel. Check the segments for damage and for wear where the coupling pins pass through them. Replace the segments as a set if problems are found. Install the new ones (or the old ones, if they're being reinstalled) with the OUTSIDE mark facing away from the wheel. Install the retainer plate with its arrow marks aligned, turn it counterclockwise and install the bolts. Tighten them to the torque listed in this Chapter's Specifications.

**Installation**

13 If you're working on a 1988 or 1989 model, lubricate the coupling pins with Pro Honda Moly 60 grease or equivalent. If you're working on a 1990 or later bike, don't lubricate the pins; they ride in aluminum collars and grease will cause increased wear.

14 Make sure the coupling O-rings are in place (one on each side of the coupling), then push the coupling pins into the rubber segments. Lubricate the splines with Pro Honda Moly 60 grease or equivalent.

15 The remainder of installation is the reverse of the removal steps. Tighten all fasteners to the torques listed in this Chapter's Specifications and the Chapter 6 Specifications.

16 Check the operation of the brakes carefully before riding the motorcycle.
12.7 Lift the caliper and bracket away from the bike and support the caliper so it doesn't hang by the brake hose

12.8 Remove the spacer from the left side of the wheel
Wheel hub
13.3a Pry out the grease seal ...

13.3b ... and remove the speedometer drive

13.5a If there's enough room to tilt a metal rod so it will catch the bearing inner races, drive the bearings from the hub with a metal rod and hammer.

13 Wheel bearings - replacement

Refer to illustrations 13.3a, 13.3b, 13.5a, 13.5b, 13.5c, 13.5d and 13.8

1 Support the bike securely so it can't be knocked over during this procedure and remove the wheel (see Section 11 (front wheel) or 12 (rear wheel).

2 Set the wheel on blocks so as not to allow the weight of the wheel rest on the brake disc.

3 If you're working on a front wheel, pry the grease seal out of the left side and remove the speedometer drive (see illustrations). Turn the wheel over and pry the grease seal out of the other side.

4 If you're working on a rear wheel, pry the grease seal out of the left side.

5 A common method of removing wheel bearings is to insert a metal rod (preferably a brass drift punch) inserted through the center of one hub bearing and tap evenly around the inner race of the opposite bearing to drive it from the hub (see illustration). The bearing spacer will also come out. On these motorcycles, it's generally not possible to tilt the rod enough to catch the opposite bearing's inner race. In this case, use a bearing remover tool consisting of a shaft and remover head (see illustration). The head fits inside the bearing (see illustration). Then the wedge end of the shaft is tapped into the groove in the head to expand the head and lock it inside the bearing. Tapping on the shaft from this point will force the bearing out of the hub.
13.5c The tool can be used for front or rear bearings - place the split portion in the bearing like this ...
13.5b If you can't position a metal rod against the bearings, this tool can be used instead - place the split portion inside the bearing and pass the wedged rod through the hub in the split; tapping on the end of the rod will spread the split portion, locking it to the bearing, so the split portion and bearing can be driven out together

13.5d ... and pass the wedge end of the rod through the hub into the split portion
Deflate tire. After releasing beads, push tire bead into well of rim at point opposite valve. Insert lever adjacent to valve and work bead over edge of rim.

Use two levers to work bead over edge of rim. Note use of rim protectors.
Before fitting, ensure that tire is suitable for wheel. Take note of any sidewall markings such as direction of rotation arrows.

When first bead is clear, remove tire as shown.
Work first bead over the rim flange.

Use a tire lever to work the second bead over rim flange.
Chapter 7 Brakes, wheels and tires

6 Lay the wheel on its other side and remove the remaining bearing using the same technique. **Note:** The bearings must be replaced with new ones whenever they’re removed, as they're almost certain to be damaged during removal.
7 If you're installing bearings that aren't sealed on both sides, pack the new bearings with grease from the open side. Rotate the bearing to work the grease in between the bearing balls.
8 Thoroughly clean the hub area of the wheel. Install the bearing into the recess in the hub, with the sealed side facing out. Using a bearing driver or a socket large enough to contact the outer race of the bearing, drive it in until it's completely seated (see illustration). **Note:** The right rear wheel bearing is a dual type; the left rear wheel bearings is a single type.
9 Turn the wheel over and install the bearing spacer and bearing, driving the bearing into place as described in Step 8. Install the speedometer drive on the left side of the front wheel (see illustration 13.3a).
10 Coat new grease seals with grease, then install them (on both sides of the front wheel and on the left side of the rear wheel). It should be possible to push the seals in with even finger pressure, but if necessary use a seal driver, large socket or a flat piece of wood to drive the seals into place.
11 Clean off all grease from the brake disc(s) using acetone or brake system cleaner.
12 Refer to Section 11 or 12 and install the wheel.

14 Tubeless tires - general information

1 Tubeless tires are used as standard equipment on this motorcycle. They are generally safer than tube-type tires but if problems do occur they require special repair techniques.
2 The force required to break the seal between the rim and the bead of the tire is substantial, and is usually beyond the capabilities of an individual working with normal tire irons. **Also,** repair of the punctured tire and replacement on the wheel rim requires special tools, skills and experience that the average do-it-yourselfer lacks.
3 For these reasons, if a puncture or flat occurs with a tubeless tire, the wheel should be removed from the motorcycle and taken to a dealer service department or a motorcycle repair shop for repair or replacement of the tire. The accompanying illustrations can be used to replace a tubeless tire in an emergency.