Chapter 7
Brakes, wheels and tyres

Contents

Degrees of difficulty

Easy, suitable for novice with little experience	**Fairly easy,** suitable for beginner with some experience	**Fairly difficult,** suitable for competent DIY mechanic	**Difficult,** suitable for experienced DIY mechanic	**Very difficult,** suitable for expert DIY or professional

Specifications

Brakes

Brake fluid type	DOT 4
Front caliper bore ID	
1985 to 1992 models	45.4 mm
1993 to 2003 models	
Upper bore	33.96 mm
Lower bore	30.23 mm
Front disc thickness	
1985 to 1992 models	
Standard	7.5 mm
Service limit	7.0 mm
1993 to 2003 models	
Standard	5.0 mm
Service limit	4.5 mm
Front disc maximum runout	
1985 to 1992 models	0.15 mm
1993 to 2003 models	0.3 mm
Front master cylinder bore ID	
1985 to 1992 models	15.87 mm
1993 to 2003 models	14.0 mm
Rear caliper bore ID	42.85 mm
Rear disc thickness	
Standard	7.5 mm
Service limit	7.0 mm
Rear disc maximum runout	0.15 mm
Rear master cylinder bore ID	12.7 mm

Wheels

Rim size	
Front	18 x MT2.15
Rear	15 x MT3.50
Wheel runout (max)	
Axial (side-to-side)	0.5 mm
Radial (out-of-round)	1.0 mm

Tyres

Tyre pressures	see *Daily (pre-ride) checks*
Tyre sizes*	
Front	110/90V18 tubeless
Rear	150/90V15 tubeless

**Refer to the owners handbook, the tyre information label on the bike, or your dealer for approved tyre brands.*

Torque wrench settings

Bleed valves	6 Nm
Brake hose banjo bolts	
1985 to 1992 models	25 Nm
1993 to 2003 models	30 Nm
Brake torque arm nuts	22 Nm
Front brake caliper mounting bolts	
1985 to 1992 models	45 Nm
1993 to 2003 models	40 Nm
Front brake disc bolts	
1985 to 1992 models	20 Nm
1993 to 2003 models	23 Nm
Front brake master cylinder clamp bolts	9 Nm
Front axle clamp bolt	20 Nm
Front wheel axle	60 Nm
Rear axle nut	
Castellated nut with split pin	120 Nm
Plain nut	150 Nm
Rear axle clamp bolt	20 Nm
Rear brake disc bolts	
1985 to 1992 models	20 Nm
1993 to 2003 models	23 Nm
Rear brake caliper mounting bolts	
1985 to 1992 models	45 Nm
1993 to 2003 models	40 Nm
Rear brake master cylinder mounting bolts	23 Nm

1 General information

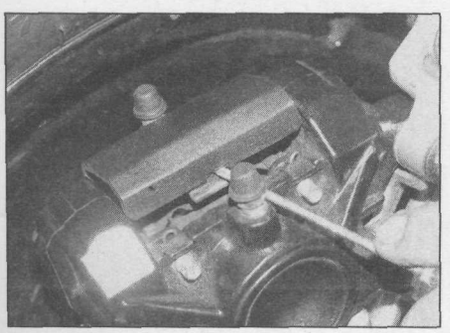
All models are fitted with cast alloy wheels designed for tubeless tyres only. Both front and rear brakes are hydraulically operated disc brakes.

The front brakes are twin opposed-piston calipers. The rear brake is a single opposed-piston caliper.

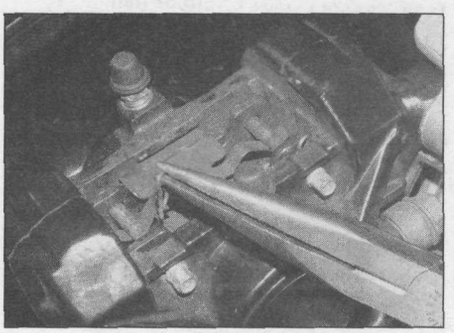
Caution: Disc brake components rarely require disassembly. Do not disassemble components unless absolutely necessary. If an hydraulic brake line is loosened, the entire system must be disassembled, drained, cleaned and then properly filled and bled upon reassembly. Do not use solvents on internal brake components. Solvents will cause the seals to swell and distort. Use only clean brake fluid or denatured 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 (front and rear) – renewal

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. Do not, under any circumstances, use petroleum-based solvents to clean brake parts. Use clean brake fluid, brake cleaner or denatured alcohol only.



2.2a Remove the pad cover . . .



2.2b . . . then remove the retaining clips . . .

Note: *If the pad pins have not been previously greased and have not been removed for a while, they could well be very difficult to withdraw. If this is the case, they will have to be driven out using a suitable drift or punch. To do this you will have to remove the caliper (see Section 4), as otherwise the shock could distort the disc. If you apply penetrating fluid this will help, but make sure none gets on the pads or discs.*

1 If required, displace the brake caliper (see Section 4) – if you are installing new pads you'll find it easier to push the pistons back into their bores with the caliper detached from the fork. There is no need to disconnect the brake hose. Note that Yamaha recommend using a new pad spring when new pads are installed.

2 Prise off the brake pad cover using a flat-bladed screwdriver **(see illustration)**. Pull the retaining clips out of the pad pins **(see illustration)**. Look into the caliper and note how the pad spring fits. Withdraw the pad pins using a suitable pair of pliers and remove the pad spring **(see illustration)**. Withdraw the

pads from the caliper body **(see illustration)**. Where fitted and if required, remove the anti-chatter shim from the back of each pad, noting how they fit **(see illustration)**.

3 Inspect the surface of each pad for contamination and check whether the friction material has worn beyond its service limit (see Chapter 1) **(see illustration)**. If either pad is worn to or beyond the service limit, is fouled with oil or grease, or is heavily scored or damaged by dirt and debris, both sets of pads must be renewed as a set. Note that it is extremely difficult to effectively degrease the friction material; if the pads are contaminated in any way new ones must be fitted.

4 If the pads are in good condition clean them carefully, using a fine wire brush which is completely free of oil and grease to remove all traces of road dirt and corrosion. Using a pointed instrument, clean out the grooves in the friction material and dig out any embedded particles of foreign matter **(see illustration 2.3)**. Any areas of glazing can be removed using a clean wire brush. Spray with a dedicated brake cleaner to remove any dust. It is also worth spraying the inside of the caliper to remove any dust there, and also to spray the discs.

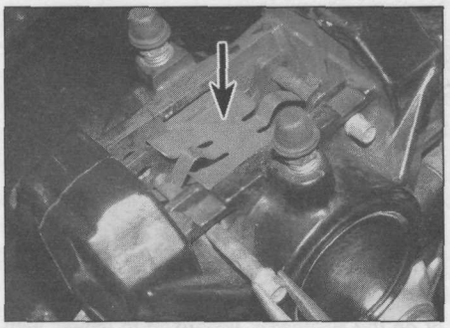
5 Check the condition of the brake disc(s) (see Section 3).

6 Remove all traces of corrosion from the pad pins. Check them for signs of damage and renew if necessary.

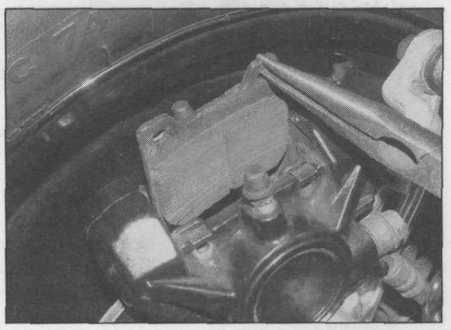
7 If new pads are being fitted, first clean around the exposed section of each piston to remove any dirt or debris stuck to them that could cause the seals to be damaged. Now push the pistons back into the caliper to create room – you can use your hands to do this, or use a piece of wood as leverage, or place the old pads back in the caliper and use a metal bar or a screwdriver inserted between them, or use grips and a piece of wood, rag or card to protect the caliper body **(see illustration)**. Alternatively obtain a proper piston-pushing tool from a good tool supplier **(see illustration)**. It may be necessary to remove the master cylinder reservoir cap and diaphragm and siphon out some fluid (see *Daily (pre-ride) checks*). If the pistons are difficult to push back, remove the bleed valve cap, then attach a length of clear hose to the bleed valve and place the open end in a suitable container, then open the valve and try again **(see illustration 9.5a or b and c)**. Take great care not to draw any air into the system. If in doubt, bleed the brakes afterwards (see Section 9). If any of the pistons are stuck or are difficult to push back, disassemble the caliper and overhaul it (see Section 4).

8 Smear the backs of the pads and shims (where fitted) and the shanks of the pad pins with copper-based grease, making sure that none gets on the front or sides of the pads.

9 Where fitted and if removed, fit the shim onto the back of each pad, making sure any arrow points in the normal direction of disc rotation **(see illustration 2.2e)**.

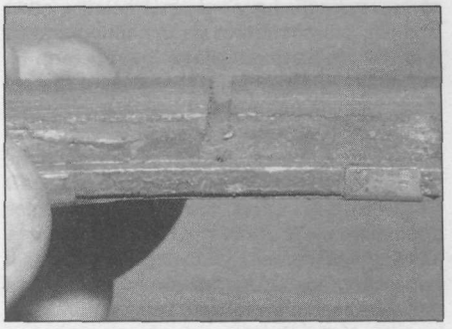


2.2c . . . withdraw the pad pins and remove the pad spring (arrowed) . . .



2.2d . . . and lift the pads out of the caliper . . .

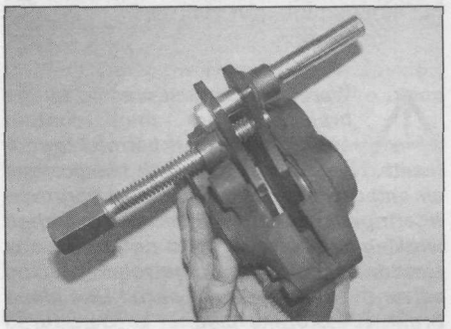
2.2e . . . and remove the shim, where fitted



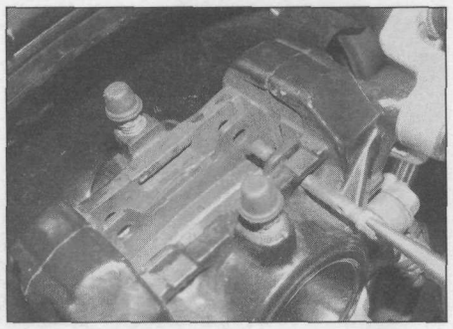
2.3 Check the pads as described

10 Insert the pads into the caliper so that the friction material of each pad faces the disc **(see illustration 2.2d)**. Insert one of the pad pins, making sure it passes through the hole in each pad **(see illustration)**. When fitting the pad spring, make sure the longer outer tangs on the spring, or on 1993 to 2003 models on the front caliper the directional arrow, point forward in the direction of normal disc rotation **(see illustration)**. Hook one end of the pad

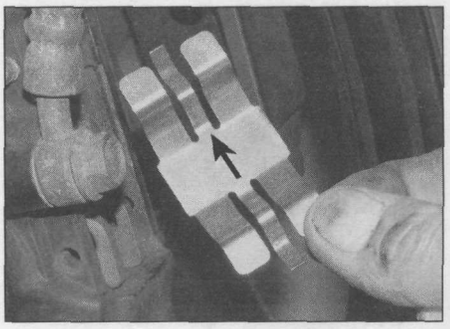
2.7a Push the pistons back into the caliper *using one of the methods described*



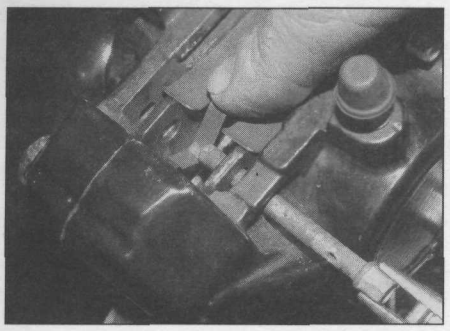
2.7b Here a commercially available special *tool is being used*



2.10a Insert one of the pins, then fit the spring . . .



2.10b . . . making sure it is the correct way round . . .



2.10c . . . then press down on it and insert the other pin

spring under the installed pin. Insert the other pad pin, pressing down on the spring end so that the pin fits over it **(see illustration)**. Fit the retaining clips, using new ones if the old ones are damaged or deformed – if necessary, rotate the pad pins to align their holes correctly **(see illustration 2.2b)**. Fit the caliper cover **(see illustration 2.2a)**.

11 If displaced install the brake caliper (see Section 4).

12 Top up the master cylinder reservoir if necessary (see *Daily (pre-ride) checks*), and refit the diaphragm, plate (rear reservoir only) and reservoir cover.

13 Operate the brake lever several times to bring the pads into contact with the disc. Check the operation of the brake before riding the motorcycle.

3 Brake discs (front and rear) – inspection, removal and installation

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. Do not, under any circumstances, use petroleum-based solvents to clean brake parts. Use clean brake fluid, brake cleaner or denatured alcohol only.

Inspection

1 Visually inspect the surface of the disc 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 a disc is badly grooved it must be machined or replaced with a new one.

2 To check disc runout, position the bike on its centrestand so that the wheel being checked is off the ground. Mount a dial gauge to a fork leg or on the swingarm, according to wheel, with the plunger on the gauge touching the surface of the disc about 10 mm (1/2 in) from the outer edge. Rotate the wheel and watch the gauge needle, comparing the reading with the limit listed in the Specifications at the beginning of the Chapter. If the runout is greater than the service limit, check the wheel bearings for play (see Chapter 1). If the bearings are worn, replace them with new ones (see Section 14) and repeat this check. It is also worth removing the disc (see below) and checking for a build-up of corrosion (see Step 6) as this will cause runout. If the runout is still excessive, the disc will have to be replaced with a new one, although machining by an engineer may be possible.

3 The disc must not be machined or allowed to wear down to a thickness less than the service limit as listed in this Chapter's Specifications and as sometimes marked on the disc itself. Check the thickness of the disc using a micrometer **(see illustration)**. If the thickness of the disc is less than the service limit, it must be replaced with a new one.

Removal

4 Remove the wheel (see Section 12 or 13).

Caution: Do not lay the wheel down and allow it to rest on the disc – the disc could become warped. Set the wheel on wood blocks so the disc doesn't support the weight of the wheel.

5 Mark the relationship of the disc to the wheel, so it can be installed in the same position. Unscrew the disc retaining bolts, loosening them a little at a time in a criss-cross pattern to avoid distorting the disc, then remove the disc from the wheel **(see illustrations)**.

Installation

6 Before installing the disc, make sure there is no dirt or corrosion where the disc seats on the hub, particularly right in the angle of the seat, as this will not allow the disc to sit flat when it is bolted down and it will appear to be warped when checked or when using the brake.

7 Install the disc on the wheel, making sure any directional arrow is on the outside and pointing in the direction of normal (i.e. forward) rotation. Also note any R or L marking on the front discs that denotes on which side of the wheel it must be mounted. Align the previously applied matchmarks (if you're reinstalling the original disc).

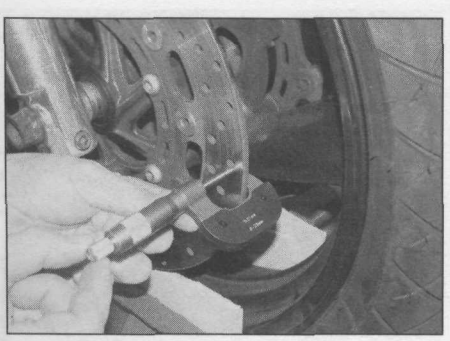
8 Apply a suitable non-permanent thread locking compound to the threads of the disc bolts, and tighten them evenly in a criss-cross pattern to the torque setting specified at the beginning of the Chapter **(see illustration 3.5a or b)**. Clean off all grease from the brake disc(s) using acetone or brake system cleaner. If a new brake disc has been installed, remove any protective coating from its working surfaces.

9 Install the wheel (see Section 12 or 13). Note that when installing a new disc you should also fit new brake pads (see Section 2).

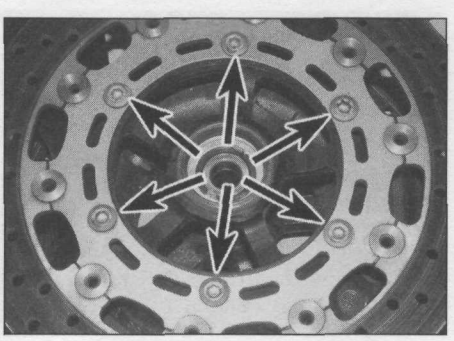
10 Operate the brake lever and pedal several times to bring the pads into contact with the disc. Check the operation of the brakes carefully before riding the bike.

4 Front brake calipers – removal, overhaul and installation

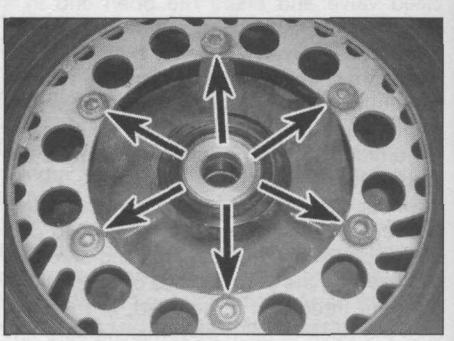
Warning: The dust created by the brake pads may contain asbestos, which is harmful to your health. Never blow it out with compressed air and don't inhale any of it. An approved filtering mask should be worn when working on the brakes. If a caliper indicates the need for an overhaul (usually due to leaking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



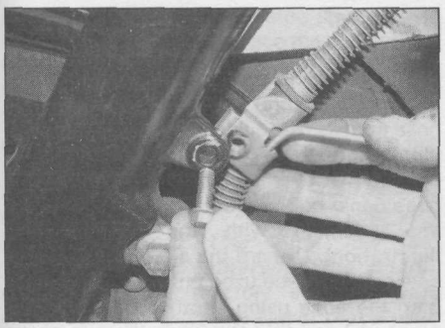
3.3 Checking disc thickness



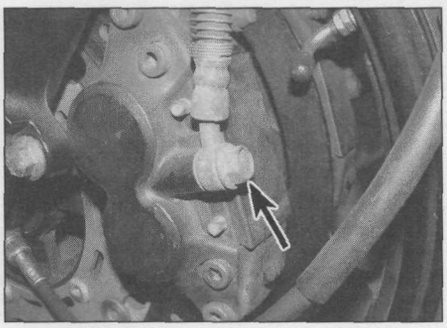
3.5a Front disc bolts (arrowed)



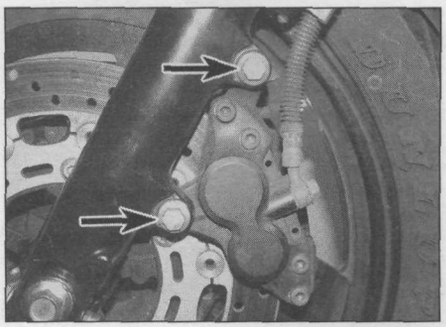
3.5b Rear disc bolts (arrowed)



4.3a Unscrew the brake hose holder bolt



4.3b Brake hose banjo bolt (arrowed)



4.4 Brake caliper mounting bolts (arrowed)

solvents to clean brake parts. Use clean brake fluid, brake cleaner or denatured alcohol only. Use care when working with brake fluid as it can injure your eyes and it will damage painted surfaces and plastic parts – cover these with rag. Disassembly, overhaul and reassembly of the caliper must be done in a spotlessly clean work area to avoid contamination and possible failure of the hydraulic system components.

Note: *If the entire front brake system is being overhauled (i.e. master cylinder as well as calipers), or if you intend to change the brake fluid as part of the caliper overhaul (which is advisable), drain the brake fluid completely from the system (see Section 9), as opposed to retaining the old fluid within it by blocking the hose as described (Step 3).*

1 If the caliper is leaking fluid, or if the brake pads are wearing unevenly, or the pistons do not move smoothly or are tight or stuck in their bores, then caliper overhaul is required.

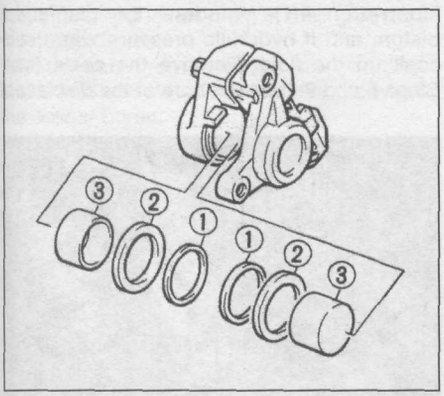
2 Before disassembling the caliper, read through the entire procedure and make sure that you have the correct seal kit. Also, you will need some new DOT 4 brake fluid, and some clean rags.

Removal

3 If the caliper is just being displaced and not completely removed or overhauled, do not disconnect the brake hose, but unscrew the bolt securing the brake hose holder to the front fork **(see illustration)**. If the caliper is being completely removed or overhauled, unscrew the brake hose banjo bolt and detach the hose, noting its alignment with the caliper **(see illustration)**. Discard the sealing washers as new ones must be used on installation. Either plug the hose using another suitable short piece of hose fitted through the eye of the banjo union (it must be a tight fit to seal it properly), block it using a suitable bolt with sealing washers and a capped (domed) nut, or wrap some clingfilm tightly around (a finger cut off a latex glove also works well), the object being to minimise fluid loss and prevent dirt entering the system. Whatever you do, also cover the end of the hose in rag, just in case. **Note:** *If you are planning to overhaul the caliper and don't have a source of compressed air to blow out the pistons, just loosen the banjo bolt at this stage and retighten it lightly. The bike's hydraulic system can then be used to force the pistons out of the body once the pads have been removed. Disconnect the hose once the pistons have been sufficiently displaced.*

4 Unscrew the caliper mounting bolts and slide the caliper off the disc **(see illustration)**.

5 If the caliper is being overhauled, remove the brake pads (see Section 2).



4.6 Front brake caliper components – single piston type shown

1 Dust seals
2 Piston seals
3 Pistons

Overhaul

6 Clean the exterior of the caliper with denatured alcohol or brake system cleaner **(see illustration)**.

7 Using a flat piece of wood, block the piston(s) on one side of the caliper in its/their bore(s) and displace the opposite piston(s) either by pumping it/them out by operating the front brake lever, or by forcing it/them out using compressed air **(see illustration)**. Withdraw the displaced piston(s) and if hydraulic pressure was used soak up the fluid. Remove the seals (see Steps 8 and 9) from the bore of the displaced piston(s), then reinstall the piston(s) and block it/them using the wood. Now displace the piston(s) from the other side using the same method, noting that it is essential to obtain a good seal between the wood and the caliper face. Mark each piston head and caliper body with a felt marker to ensure that the pistons can be matched to their original bores on reassembly.

Warning: Never place your fingers in front of the pistons in an attempt to catch or protect them when applying compressed air, as serious injury could result.

Caution: Do not try to remove the pistons by levering them out, or by using pliers or any other grips. On 1993 to 2003 models do not unscrew the caliper body joining bolts and separate the caliper halves.

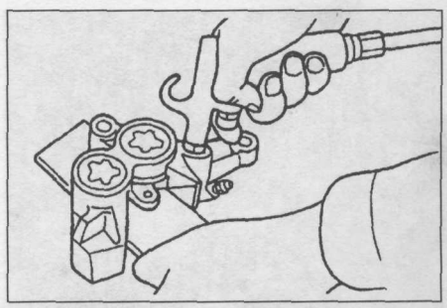
8 Remove the dust seal from each caliper bore using a wooden or plastic tool. Discard them as new ones must be used on installation. If a metal tool is being used, take great care not to damage the bores.

9 Remove and discard the piston seals in the same way.

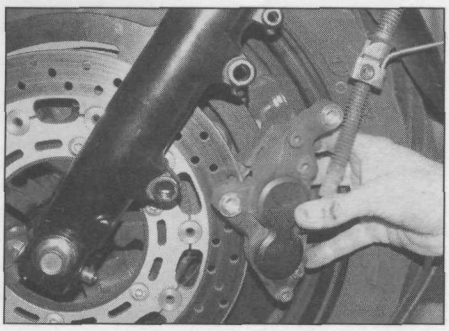
10 Clean the pistons and bores with clean brake fluid of the specified type. If compressed air is available, use it to dry the parts thoroughly (make sure it's filtered and unlubricated).

Caution: Do not, under any circumstances, use a petroleum-based solvent to clean brake parts.

11 Inspect the caliper bores and pistons for signs of corrosion, nicks and burrs and loss of plating. If surface defects are present, the caliper assembly must be renewed. If the necessary measuring equipment is available, compare the dimensions of the caliper bores to those specified at the beginning of the Chapter, and install a new caliper if necessary. If the caliper is in bad shape the master cylinder should also be checked.



4.7 Hold the wood firmly against the piston(s) on one side and apply compressed air to expel the piston(s) on the other side



4.16 Slide the caliper onto the disc and install the bolts

12 Lubricate the new piston seals with clean brake fluid and install them in their grooves in the caliper bores. On 1993 to 2003 models note that two sizes of bore and piston are used (see Specifications), and care must therefore be taken to ensure that the correct size seals are fitted to the correct bores. The same applies when fitting the new dust seals and pistons.

13 Lubricate the new dust seals with clean brake fluid and install them in their grooves in the caliper bores.

14 Lubricate the pistons with clean brake fluid and install them closed-end first into the caliper bores. Using your thumbs, push the pistons all the way in, making sure they enter the bore squarely.

Installation

15 If necessary, push the pistons a little way back into the caliper (see Section 2, Step 7). If removed, install the brake pads (see Section 2).

16 Slide the caliper onto the brake disc, making sure the pads sit squarely each side of the disc if they weren't removed **(see illustration)**. Install the caliper mounting bolts and tighten them to the torque setting specified at the beginning of the Chapter **(see illustration 4.4)**.

17 Fit the brake hose holder onto the front fork and tighten the bolt **(see illustration 4.3a)**.

18 If removed, connect the brake hose to the caliper, using new sealing washers on each side of the fitting. Align the hose as noted on removal **(see illustration 4.3b)**. Tighten the banjo bolt to the torque setting specified at the beginning of the Chapter. Top up the master cylinder reservoir with DOT 4 brake fluid (see *Daily (pre-ride) checks*) and bleed the hydraulic system as described in Section 9.

19 Check for leaks and thoroughly test the operation of the front brake before riding the motorcycle.

5 Rear brake caliper – removal, overhaul and installation

Warning: The dust created by the brake pads 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. If a caliper indicates the need for an overhaul (usually due to leaking fluid or sticky operation), all old brake fluid should be flushed from the system. Do not, under any circumstances, use petroleum-based solvents to clean brake parts. Use clean brake fluid, brake cleaner or denatured alcohol only. Use care when working with brake fluid as it can injure your eyes and it will damage painted surfaces and plastic parts – cover these with rag. Disassembly, overhaul and reassembly of the brake caliper must be done in a spotlessly clean work area to avoid contamination and possible failure of the hydraulic system components.

Note: *If the entire rear brake system is being overhauled (i.e. master cylinder as well as caliper), or if you intend to change the brake fluid as part of the caliper overhaul (which is advisable), drain the brake fluid completely from the system (see Section 9), as opposed to retaining the old fluid within it by blocking the hose as described (Step 3).*

1 If the caliper is leaking fluid, or if the brake pads are wearing unevenly, or the pistons do not move smoothly or are tight or stuck in their bores, then caliper overhaul is required.

2 Before disassembling the caliper, read through the entire procedure and make sure that you have the correct seal kit. Also, you will need some new DOT 4 brake fluid, and some clean rags.

Removal

3 If the caliper is just being displaced and not completely removed or overhauled, do not disconnect the brake hose, but free the brake hose from its rear guide on the swingarm **(see illustration)**. If the caliper is being completely removed or overhauled, unscrew the brake hose banjo bolt and detach the hose, noting its alignment with the caliper **(see illustration)**. Discard the sealing washers as new ones must be used on installation. Either plug the hose using another suitable short piece of hose fitted through the eye of the banjo union (it must be a tight fit to seal it properly), block it using a suitable bolt with sealing washers and a capped (domed) nut, or wrap some clingfilm tightly around (a finger cut off a latex glove also works well), the object being to minimise fluid loss and prevent dirt entering the system. Whatever you do, also cover the end of the hose in rag, just in case. **Note:** *If you are planning to overhaul the caliper and don't have a source of compressed air to blow out the pistons, just loosen the banjo bolt at this stage and retighten it lightly. The bike's hydraulic system can then be used to force the pistons out of the body once the pads have been removed. Disconnect the hose once the pistons have been sufficiently displaced.*

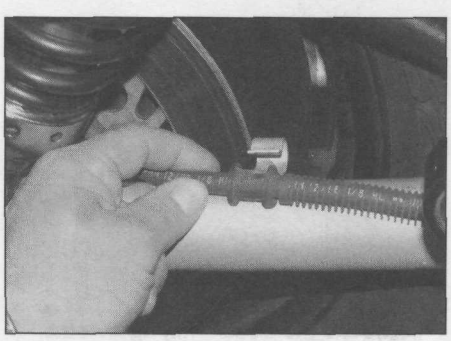
4 Unscrew the caliper mounting bolts and slide the caliper off the disc **(see illustration)**. If the caliper is just being displaced, lay it over the end of the swingarm between its bracket and rear shock.

5 If the caliper is being overhauled, remove the brake pads (see Section 2).

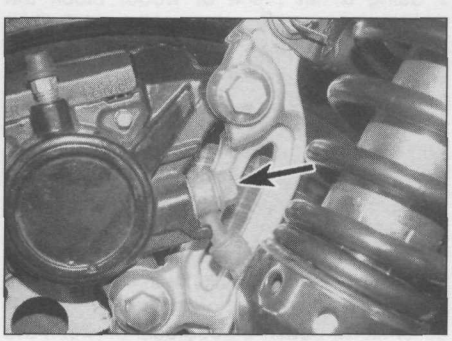
Overhaul

6 Clean the exterior of the caliper with denatured alcohol or brake system cleaner **(see illustration 4.6)**.

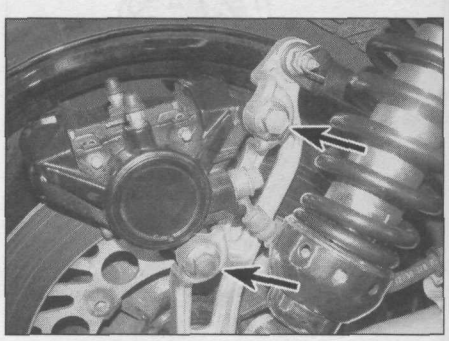
7 Using a flat piece of wood, block the piston on one side of the caliper in its bore and displace the opposite piston either by pumping it out by operating the brake pedal, or by forcing it out using compressed air **(see illustration 4.7)**. Withdraw the displaced piston, and if hydraulic pressure was used soak up the fluid. Remove the seals (see Steps 8 and 9) from the bore of the displaced



5.3a Release the brake hose from its guide



5.3b Brake hose banjo bolt (arrowed)



5.4 Brake caliper mounting bolts (arrowed)

piston, then reinstall the piston and block it using the wood. Now displace the piston from the other side using the same method, noting that it is essential to obtain a good seal between the wood and the caliper face. Mark each piston head and caliper body with a felt marker to ensure that the pistons can be matched to their original bores on reassembly.

⚠ ***Warning: Use only low air pressure, otherwise the piston may be forcibly expelled and cause damage or injury. Never place your fingers in front of the pistons in an attempt to catch or protect them when applying compressed air, as serious injury could result.***

Caution: Do not try to remove the pistons by levering them out, or by using pliers or any other grips. Do not unscrew the caliper body joining bolts and separate the caliper halves.

8 Remove the dust seal from each caliper bore using a wooden or plastic tool. Discard them as new ones must be used on installation. If a metal tool is being used, take great care not to damage the bores.

9 Remove and discard the piston seals in the same way.

10 Clean the pistons and bores with clean brake fluid of the specified type. If compressed air is available, use it to dry the parts thoroughly (make sure it's filtered and unlubricated).

Caution: Do not, under any circumstances, use a petroleum-based solvent to clean brake parts.

11 Inspect the caliper bores and pistons for signs of corrosion, nicks and burrs and loss of plating. If surface defects are present, the caliper assembly must be renewed. If the necessary measuring equipment is available, compare the dimensions of the caliper bores to those specified at the beginning of the Chapter, and install a new caliper if necessary. If the caliper is in bad shape the master cylinder should also be checked.

12 Lubricate the new piston seals with clean brake fluid and install them in their grooves in the caliper bores.

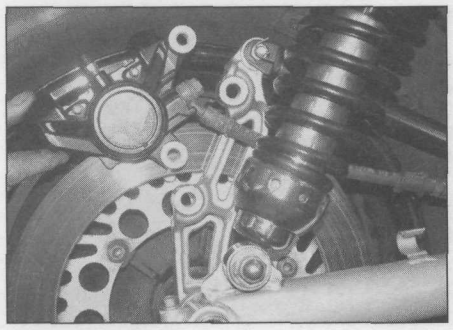
13 Lubricate the new dust seals with clean brake fluid and install them in their grooves in the caliper bores.

14 Lubricate the pistons with clean brake fluid and install them closed-end first into the caliper bores. Using your thumbs, push the pistons all the way in, making sure they enter the bore squarely.

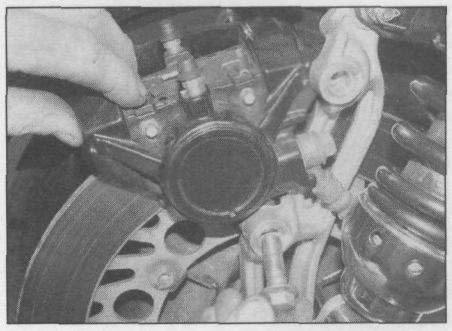
Installation

15 If necessary, push the pistons a little way back into the caliper (see Section 2, Step 7). If removed, install the brake pads (see Section 2).

16 Slide the caliper onto the brake disc, making sure the pads sit squarely each side of the disc if they weren't removed **(see illustration)**. Install the caliper mounting bolts and tighten them to the torque setting specified at the beginning of the Chapter **(see illustration)**.



5.16a Slide the caliper onto the disc . . .



5.16b . . . and install the bolts

17 Fit the brake hose into its guide **(see illustration 5.3a)**.

18 If removed, connect the brake hose to the caliper, using new sealing washers on each side of the fitting. Align the hose as noted on removal **(see illustration 5.3b)**. Tighten the banjo bolt to the torque setting specified at the beginning of the Chapter. Top up the master cylinder reservoir with DOT 4 brake fluid (see *Daily (pre-ride) checks*) and bleed the hydraulic system as described in Section 9.

19 Check for leaks and thoroughly test the operation of the rear brake before riding the motorcycle.

6 Front brake master cylinder – removal, overhaul and installation

⚠ ***Warning: Do not, under any circumstances, use petroleum-based solvents to clean brake parts. Use clean brake fluid, brake cleaner or denatured alcohol only. Use care when working with brake fluid as it can injure your eyes and it will damage painted surfaces and plastic parts – cover surrounding components with rag and wipe up any spills immediately and wash the area with soap and water. 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 hydraulic system components.***

Note: *If the entire front brake system is being overhauled (i.e. calipers as well as master cylinder), or if you intend to change the brake fluid as part of the master cylinder overhaul (which is advisable), drain the fluid completely from the system (see Section 9), as opposed to retaining the old fluid within it by blocking the hose as described (Step 7).*

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 (see Section 9), and the hydraulic hoses and unions are all in good condition, then master cylinder overhaul is recommended.

2 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 DOT 4 brake fluid, some clean rags and internal circlip pliers. **Note:** *To prevent damage to the paint from spilled brake fluid, always cover the body panels and instruments when working on the master cylinder.*

Removal

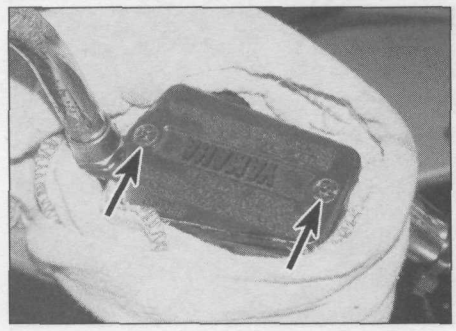
Note: *If the master cylinder is being displaced from the handlebar and not being removed completely or overhauled, follow Steps 6 and 8 only.*

3 Remove the rear view mirror (see Chapter 8).

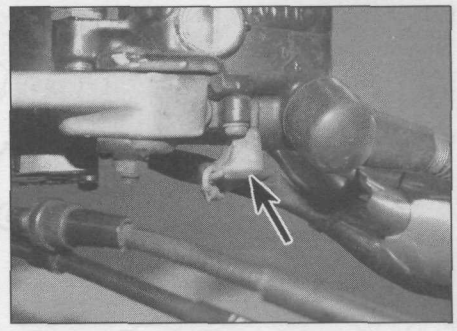
4 Loosen, but do not remove, the screws holding the reservoir cover in place **(see illustration)**.

5 Remove the front brake lever (see Chapter 6).

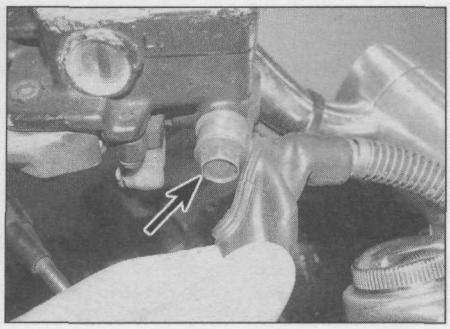
6 Disconnect the wiring connectors from the brake light switch **(see illustration)**.



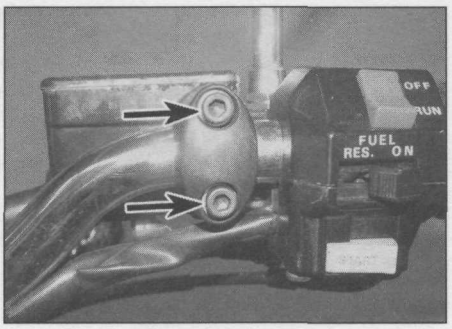
6.4 Slacken the reservoir cover screws (arrowed)



6.6 Disconnect the brake light switch wiring connectors (arrowed)



6.7 Brake hose banjo bolt (arrowed)



6.8 Master cylinder clamp bolts (arrowed)

7 If the master cylinder is being completely removed or overhauled, pull the rubber boot off the brake hose banjo bolt, then unscrew the banjo bolt and separate the hose from the master cylinder, noting the alignment **(see illustration)**. Discard the sealing washers as they must be replaced with new ones. Either plug the hose using another suitable short piece of hose fitted through the eye of the banjo union (it must be a tight fit to seal it properly), block it using a suitable bolt with sealing washers and a capped (domed) nut, or wrap some clingfilm tightly around (a finger cut off a latex glove also works well), the object being to minimise fluid loss and prevent dirt entering the system. Whatever you do, also cover the end of the hose in rag, just in case. If the master cylinder is just being displaced and not completely removed or overhauled, do not disconnect the hose.

8 Make an alignment mark between the front brake master cylinder assembly clamp mating surfaces and the handlebars so it easy to set them in the same position later. Unscrew the master cylinder clamp bolts, then lift the master cylinder and reservoir away from the handlebar **(see illustration)**.

Caution: Do not tip the master cylinder or brake fluid will run out.

9 Remove the reservoir cover and rubber diaphragm. If the system hasn't been drained, tip the brake fluid from the reservoir into a suitable container. Wipe any remaining fluid out of the reservoir with a clean rag.

10 If required undo the brake light switch screw and remove the switch, noting how it fits.

Overhaul

11 Carefully remove the short pushrod and dust boot from the end of the master cylinder and from around the piston, noting how they locate **(see illustration)**.

12 Push the piston in and, using circlip pliers, remove the circlip from its groove in the master cylinder and slide out the piston assembly and the spring, noting how they fit. Lay the parts out in order as you remove them to prevent confusion during reassembly.

13 Clean all parts with clean brake fluid or denatured alcohol. If compressed air is available, use it to dry the parts thoroughly (make sure it's filtered and unlubricated).

Caution: Do not, under any circumstances, use a petroleum-based solvent to clean brake parts.

14 Check the master cylinder bore for corrosion, scratches, nicks and score marks. If the necessary measuring equipment is available, compare the diameter of the bore to that given in the Specifications Section of this Chapter. If damage or wear 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. Check that the fluid inlet and outlet ports in the master cylinder are clear.

15 The dust boot, circlip, piston, seal, washer, cup, seat and spring are included in the rebuild kit. Use all of the new parts, regardless of the apparent condition of the old ones. Assemble and install them according to the layout of the old ones **(see illustration 6.11)**.

16 Lubricate the cup, seal and piston with clean brake fluid.

17 Fit the spring and piston assembly into the master cylinder, with the wide end of the spring going in first. Make sure the lips on the cup and seal do not turn inside out when they enter the bore. Depress the piston and install the new circlip, making sure that it locates in the groove in the master cylinder.

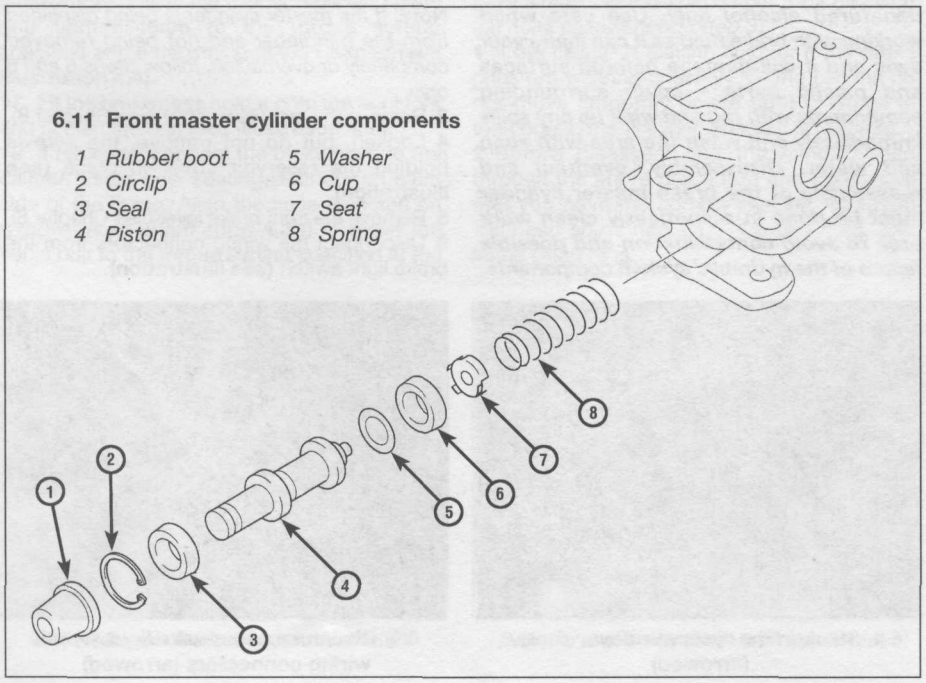
18 Apply some silicone grease to the inside of the rubber dust boot, then install it, making sure it is seated properly in the groove in the master cylinder and around the piston. Insert the short pushrod.

19 Inspect the reservoir rubber diaphragm and renew it if it is damaged or deteriorated.

Installation

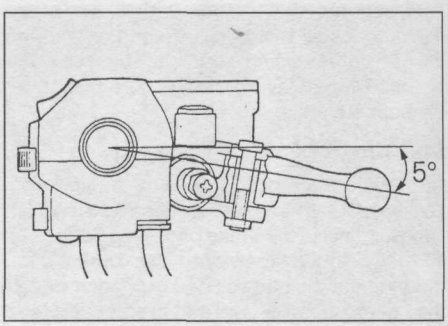
20 If removed, locate the brake light switch on the underside of the master cylinder and secure it with the screw.

21 Attach the master cylinder to the handlebar and fit the clamp, aligning the mating surfaces with the handlebar as noted on removal **(see illustration 6.8)**. Tighten the top bolt first, then the bottom bolt, to the torque setting specified at the beginning of the Chapter. If no alignment marks were made, and after installing the lever if removed, set the angle of the lever at 5° below the horizontal with the handlebar **(see illustration)**.



6.11 Front master cylinder components

1 Rubber boot
2 Circlip
3 Seal
4 Piston
5 Washer
6 Cup
7 Seat
8 Spring



6.21 Master cylinder and lever position

22 Connect the brake hose to the master cylinder, using new sealing washers on each side of the union, and aligning the hose as noted on removal **(see illustration 6.7)**. Tighten the banjo bolt to the torque setting specified at the beginning of the Chapter. Fit the rubber boot.

23 Install the brake lever (see Chapter 6). Connect the brake light switch wiring **(see illustration 6.6)**.

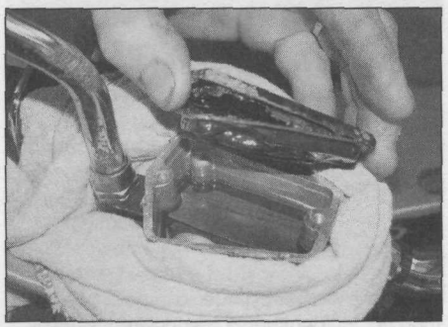
24 Fill the fluid reservoir with new DOT 4 brake fluid as described in *Daily (pre-ride) checks*. Refer to Section 9 of this Chapter and bleed the air from the system.

25 Fit the rubber diaphragm, making sure it is correctly seated, and the cover onto the reservoir **(see illustration)**.

26 Refer to Chapter 1, Section 8 and set the front brake lever freeplay.

27 Install the rear view mirror (see Chapter 8).

28 Check the operation of the front brake and brake light before riding the motorcycle.



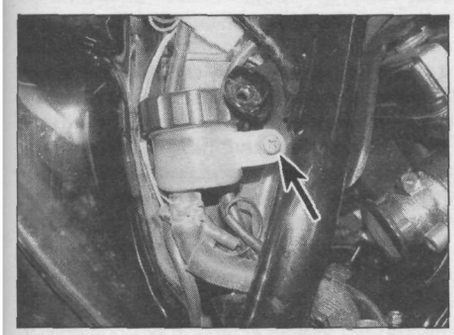
6.25 Make sure the diaphragm is correctly seated before fitting the cover

7 Rear brake master cylinder – removal, overhaul and installation

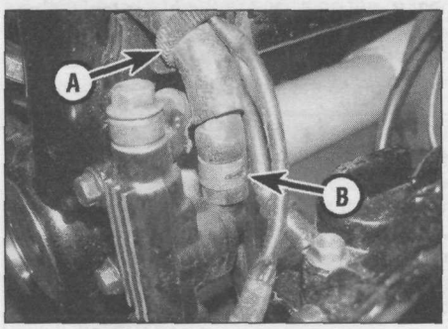
Warning: Do not, under any circumstances, use petroleum-based solvents to clean brake parts. Use clean brake fluid, brake cleaner or denatured alcohol only. Use care when working with brake fluid as it can injure your eyes and it will damage painted surfaces and plastic parts – cover surrounding components with rag. 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 hydraulic system components.

Note: *If the entire rear brake system is being overhauled (i.e. caliper as well as master cylinder), or if you intend to change the brake fluid as part of the master cylinder overhaul (which is advisable), drain the brake fluid completely from the system (see Section 9), as opposed to retaining the old fluid within it by blocking the hose as described (Step 5).*

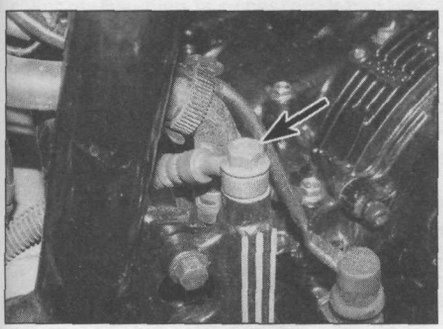
1 If the master cylinder is leaking fluid, or if the lever does not produce a firm feel when the brake is applied, and bleeding the brake does not help (see Section 9), and the hydraulic hoses and unions are all in good condition, then master cylinder overhaul is recommended.



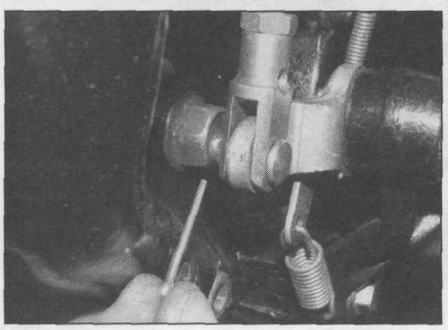
7.3 Reservoir mounting screw (arrowed)



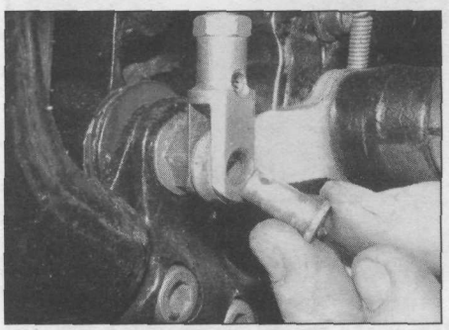
7.4 Release the cable tie (A), then release the clamp (B) and detach the hose



7.5 Brake hose banjo bolt (arrowed)



7.6a Remove the split pin and washer . . .



7.6b . . . then withdraw the clevis pin

2 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 DOT 4 brake fluid, some clean rags and internal circlip pliers. **Note:** *To prevent damage to the paint from spilled brake fluid, always cover the surrounding components when working on the master cylinder.*

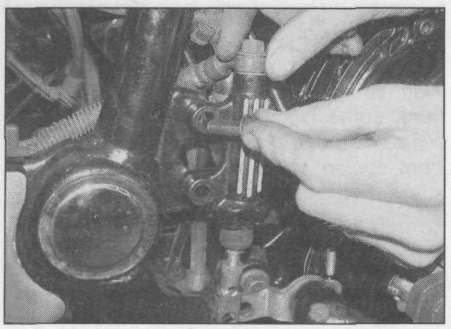
Removal

3 If the system hasn't been drained (see **Note** above), remove the right-hand side panel (see Chapter 8), and undo the reservoir mounting screw **(see illustration)**. Unscrew the cap and remove the diaphragm plate and diaphragm, then empty the reservoir into a suitable container. If the system has been drained, undo the reservoir mounting screw.

4 Release the tie securing the reservoir hose to the brake light switch wire **(see illustration)**. Release the clamp and detach the reservoir hose from its union on the master cylinder, being prepared with a rag to catch any residual fluid, and remove the reservoir. Wipe any remaining fluid out with a clean rag. Inspect the reservoir hose for cracks or splits and replace it with a new one if necessary.

5 If the master cylinder is being completely removed or overhauled, unscrew the brake hose banjo bolt and separate the hose from the master cylinder, noting its alignment **(see illustration)**. Discard the two sealing washers as they must be replaced with new ones. Either plug the hose using another suitable short piece of hose fitted through the eye of the banjo union (it must be a tight fit to seal it properly), block it using a suitable bolt with sealing washers and a capped (domed) nut, or wrap some clingfilm tightly around (a finger cut off a latex glove also works well), the object being to minimise fluid loss and prevent dirt entering the system. Whatever you do, also cover the end of the hose in rag, just in case. If the master cylinder is just being displaced and not completely removed or overhauled, do not disconnect the hose.

6 Remove the split pin and washer from the clevis pin securing the brake pedal to the master cylinder pushrod, then remove the clevis pin and separate the pedal from the pushrod **(see illustrations)**.

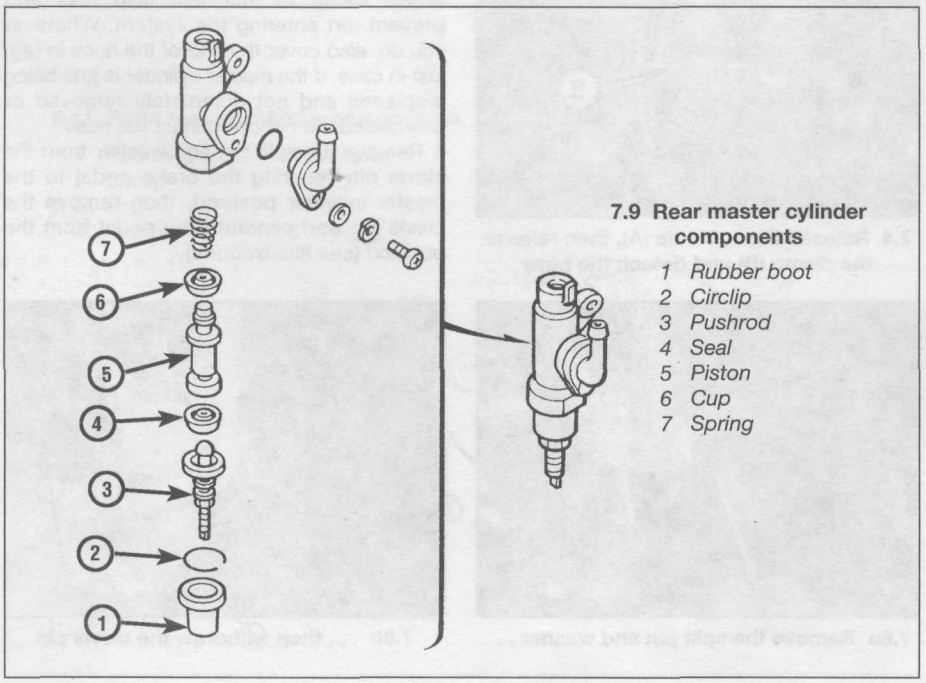


7.7 Unscrew the mounting bolts and remove the master cylinder

7 Unscrew the two bolts securing the master cylinder to the bracket and remove the master cylinder **(see illustration)**.

Overhaul

8 If required, mark the position of the clevis locknut on the pushrod, then slacken the locknut and thread the clevis off the pushrod.
9 Dislodge the rubber dust boot from the base of the master cylinder and from around the pushrod, noting how it locates, and slide it down the pushrod **(see illustration)**.
10 Push the pushrod in and, using circlip pliers, remove the circlip from its groove in the master cylinder and slide out the pushrod, piston assembly and the spring, noting how they fit. Lay the parts out in the proper order to prevent confusion during reassembly.
11 If required, undo the screw securing the fluid reservoir hose union and detach it from the master cylinder. Discard the O-ring as a new one must be used.
12 Clean all of the parts with clean brake fluid or denatured alcohol.
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).
13 Check the master cylinder bore for corrosion, scratches, nicks and score marks. If the necessary measuring equipment is available, compare the diameter of the bore to that given in the Specifications Section of this Chapter. If damage or wear 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.
14 The dust boot, pushrod, circlip, piston, seal, cup and spring are included in the rebuild kit. Use all of the new parts, regardless of the apparent condition of the old ones. Assemble and install them according to the layout of the old ones.
15 Lubricate the cup, seal and piston with clean brake fluid.
16 Fit the spring, wider end first, and the piston assembly into the master cylinder. Make sure the lips on the cup and seal do not turn inside out when they enter the bore.
17 Apply some silicone grease to the end of the pushrod and fit it into the master cylinder. Depress the pushrod, then install the new circlip, making sure it is properly seated in the groove.
18 Install the rubber dust boot, making sure it is seated properly in the groove in the master cylinder and around the pushrod.
19 If removed, fit a new O-ring onto the fluid reservoir hose union, then fit the union into the master cylinder and secure it with its screw.
20 If removed, thread the clevis locknut and the clevis onto the master cylinder pushrod end. Position the clevis as noted on removal, then tighten the locknut against the clevis.



7.9 Rear master cylinder components

1 *Rubber boot*
2 *Circlip*
3 *Pushrod*
4 *Seal*
5 *Piston*
6 *Cup*
7 *Spring*

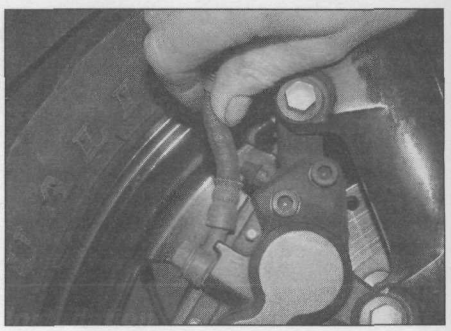
Installation

21 Fit the master cylinder onto the frame and tighten its mounting bolts to the torque setting specified at the beginning of the Chapter **(see illustration 7.7)**.
22 Align the brake pedal with the master cylinder pushrod clevis, then slide in the clevis pin, fit the washer and secure it using a new split pin **(see illustrations 7.6b and a)**.
23 Connect the brake hose to the master cylinder, using new sealing washers on each side of the union. Align the hose as noted on removal and tighten the banjo bolt to the specified torque setting **(see illustration 7.5)**.
24 Install the reservoir and tighten its screw **(see illustration 7.3)**. Connect the reservoir hose to the union on the master cylinder and secure it with the clip **(see illustration 7.4)**. Check that the hose is secure at the reservoir end as well. If the clips have weakened, use new ones. Secure the brake light switch wire to the hose with the cable tie.
25 Fill the fluid reservoir with new DOT 4 brake fluid (see *Daily (pre-ride) checks*) and bleed the system following the procedure in Section 9.
26 Refer to Chapter 1, Section 8 and set the height of the rear brake pedal.
27 Check the operation of the rear brake and brake light carefully before riding the motorcycle.

8 Brake hoses and unions – inspection and replacement

Inspection

1 Brake hose condition should be checked regularly and the hoses replaced at the specified interval (see Chapter 1).
2 Twist and flex the rubber hoses while looking for cracks, bulges and seeping fluid **(see illustration)**. 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 banjo union fittings connected to the brake hoses, and the hose splitter (bolted to the bottom yoke behind the Yamaha emblem – unscrew the emblem bolts



8.2 Check the hoses for cracks and signs of deterioration

and pivot it up for access) for the front brake system. If the fittings are rusted, scratched or cracked, replace them with new ones.

Replacement

4 The brake hoses have banjo union fittings on each end. Cover the surrounding area with plenty of rags and unscrew the banjo bolt at each end of the hose, noting its alignment **(see illustrations 4.3b, 5.3b, 6.7 and 7.5)**. Free the hoses from any clips or guides and remove them. Discard the sealing washers as new ones must be used.

5 Position the new hose, making sure it isn't twisted or otherwise strained, and abut the tab on the hose union with the lug on the component casting, where present. Otherwise align the hose as noted on removal. Install the hose banjo bolts using new sealing washers on both sides of the unions. Tighten the banjo bolts to the torque setting specified at the beginning of this Chapter.

6 Make sure the hoses are correctly aligned and routed clear of all moving components. Flush the old brake fluid from the system, refill with new DOT 4 brake fluid (see *Daily (pre-ride) checks*) and bleed the air from the system (see Section 9). Check the operation of the brakes carefully before riding the motorcycle.

9 Brake system bleeding and fluid change

Note: *If required use a commercially available vacuum-type brake bleeding tool* ***(see illustration)****. If bleeding the system using the conventional method does not work sufficiently well, it is advisable to obtain a bleeder and repeat the procedure detailed below, following the manufacturers instructions for using the tool.*

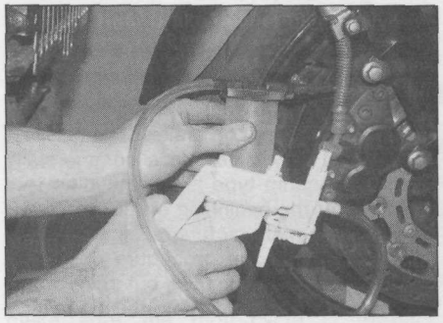
Warning: Use care when working with brake fluid as it can injure your eyes and it will damage painted surfaces and plastic parts.

Bleeding

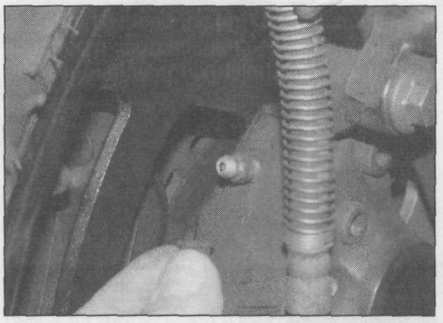
1 Bleeding the brakes is simply the process of removing all the air bubbles from the brake fluid reservoirs, the hoses and the brake calipers. Bleeding is necessary whenever a brake system hydraulic connection is loosened, when a component or hose is replaced, or when a master cylinder or caliper is 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.

2 To bleed the brakes, you will need some new DOT 4 brake fluid, a length of clear vinyl or plastic tubing, a small container partially filled with clean brake fluid, some rags and a ring spanner to fit the brake caliper bleed valves.

3 Cover the top and side covers, side panels, front mudguard and other painted components as required to prevent damage in the event that brake fluid is spilled.



Vacuum type brake bleeding tool in use



9.5a Front brake caliper bleed valve

4 Remove the reservoir cover or cap, diaphragm plate (rear reservoir), and diaphragm (see *Daily (pre-ride) checks*) and slowly pump the brake lever or pedal a few times, until no air bubbles can be seen floating up from the holes in the bottom of the reservoir. Doing this bleeds the air from the master cylinder end of the line. Loosely refit the reservoir cover or cap.

5 Pull the dust cap off the bleed valve on the caliper **(see illustrations)**. Attach one end of the clear vinyl or plastic tubing to the bleed valve and submerge the other end in the brake fluid in the container **(see illustration)**.

6 Check the fluid level in the reservoir – do not allow it 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 in (front brake) or down (rear brake) while opening the caliper bleed valve. When the valve is opened, brake fluid will flow into the clear tubing and the lever will move toward the handlebar or the pedal will move down.

8 Retighten the bleed 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. On completion, disconnect the bleeding equipment, then tighten the bleed valve to the torque setting specified at the beginning of the chapter and install the dust cap.

9 When bleeding the front brake, carry out the procedure on both calipers. When bleeding the rear brake on later models, carry out the procedure on the other bleed valve on the caliper body.

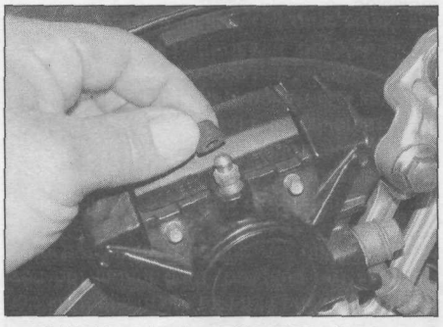
10 Install the diaphragm, plate (rear reservoir) and cover or cap. Wipe up any spilled brake fluid and check the entire system for leaks.

HAYNES HINT

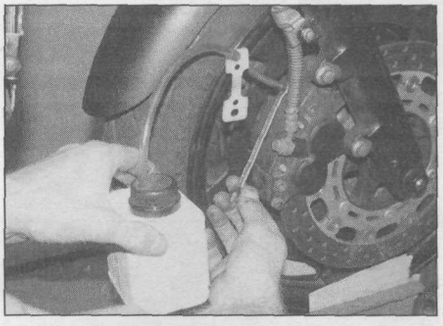
If it's not possible to produce a firm feel to the lever or pedal the fluid may be aerated. Let the brake fluid in the system stabilise for a few hours and then repeat the procedure when the tiny bubbles in the system have settled out. Also check to make sure that there are no 'high-spots' in the brake hose in which an air bubble can become trapped – this will occur most often in an incorrectly mounted hose union, but can also arise through bleeding the brakes while some of the brake system components are at such an angle to encourage this. Reversing the angle or displacing and moving the offending component around will normally dislodge any trapped air.

Changing the fluid

11 Changing the brake fluid is a similar process to bleeding the brakes and requires the same materials, plus a suitable tool for siphoning the fluid out of the hydraulic reservoir (such as a syringe, though if one isn't



9.5b Rear brake caliper bleed valve



9.5c To bleed the brakes, you need a spanner, a short section of clear tubing, and a clear container half-filled with brake fluid

available it is no problem to displace the reservoir and tip the fluid out as described in Section 6 or 7). Ensure that your container is large enough to take all the old fluid when it is flushed out of the system.

12 Follow Steps 3, 4 and 5, but after removing the reservoir cover or cap, diaphragm plate (rear reservoir), and diaphragm, siphon or tip the old fluid out of the reservoir (if you want to tip the contents out of the front reservoir displace it from the handlebars). Fill the reservoir with new brake fluid, then follow Step 7.

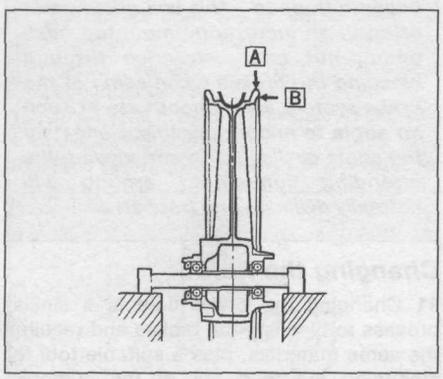
12 Retighten the bleed valve, then release the brake lever or pedal gradually. Keep the reservoir topped-up with new fluid to above the LOWER level at all times or air may enter the system and greatly increase the length of the task. Repeat the process until new fluid can be seen emerging from the bleed valve.

HAYNES HINT

Old brake fluid is invariably much darker in colour than new fluid, making it easy to see when all old fluid has been expelled from the system.

13 Disconnect the hose, then tighten the bleed valve to the specified torque setting and install the dust cap.

14 Top-up the reservoir, install the diaphragm, plate (rear reservoir), and cover or cap. Wipe up any spilled brake fluid and check the entire system for leaks.



10.2 Check the wheel for radial (out-of-round) runout (A) and axial (side-to-side) runout (B)

15 Check the operation of the brakes before riding the motorcycle.

Draining the system for overhaul

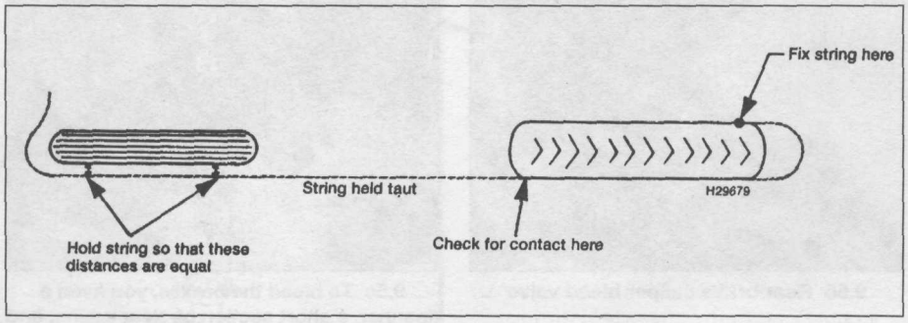
16 Draining the brake fluid is again a similar process to bleeding the brakes. The quickest and easiest way is to use a commercially available vacuum-type brake bleeding tool (see **Note** at the beginning of this section) – follow the manufacturer's instructions. Otherwise follow the procedure described above for changing the fluid, but quite simply do not put any new fluid into the reservoir – the system fills itself with air instead.

10 Wheels – inspection and repair

1 Position the motorcycle on its centrestand. When checking the front wheel, support the bike using a jack or auxiliary stand so that the wheel is raised off the ground – if you use a jack fit a block of wood between the head and the engine. 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 (see Chapter 1) and tyres (see *Daily (pre-ride) checks*).

2 To check axial (side-to-side) runout, attach a dial gauge to the fork slider or the swingarm and position its stem against the side of the rim **(see illustration)**. Spin the wheel slowly and check the amount of runout at the rim. To accurately check radial (out of round) runout with the dial gauge, remove the wheel from the machine, and the tyre from the wheel. With the axle clamped in a vice and the dial gauge positioned on the top of the rim, rotate the wheel and check the runout.

3 An easier, though slightly less accurate, method is to attach a stiff wire pointer to the fork slider or the swingarm and position the end a fraction of an inch from the wheel (where the wheel and tyre 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, check the wheel bearings and axle very carefully before replacing.*



11.5 Wheel alignment check using string

4 Visually inspect the wheels for cracks, flat spots on the rim, and other damage. Look very closely for dents in the area where the tyre bead contacts the rim. Dents in this area may prevent complete sealing of the tyre against the rim, which leads to deflation of the tyre over a period of time.

5 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 alloy wheel.

11 Wheels – alignment check

1 Misalignment of the wheels, which may be due to a bent frame or fork yokes, can cause strange and possibly serious handling problems. If the frame or yokes 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. A plumb bob or other suitable weight will also be required.

3 Place the bike on its centrestand on level ground, so the bike is upright. Measure the width of both tyres 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 tyres on both sides.

4 If a string is used, have your assistant hold one end of it about halfway between the floor and the rear axle, touching the rear sidewall of the tyre.

5 Run the other end of the string forward and pull it tight so that it is roughly parallel to the floor **(see illustration)**. Slowly bring the string into contact with the front sidewall of the rear tyre, then turn the front wheel until it is parallel with the string. Measure the distance from the front tyre sidewall to the string.

6 Repeat the procedure on the other side of the motorcycle. The distance from the front tyre sidewall to the string should be equal on both sides.

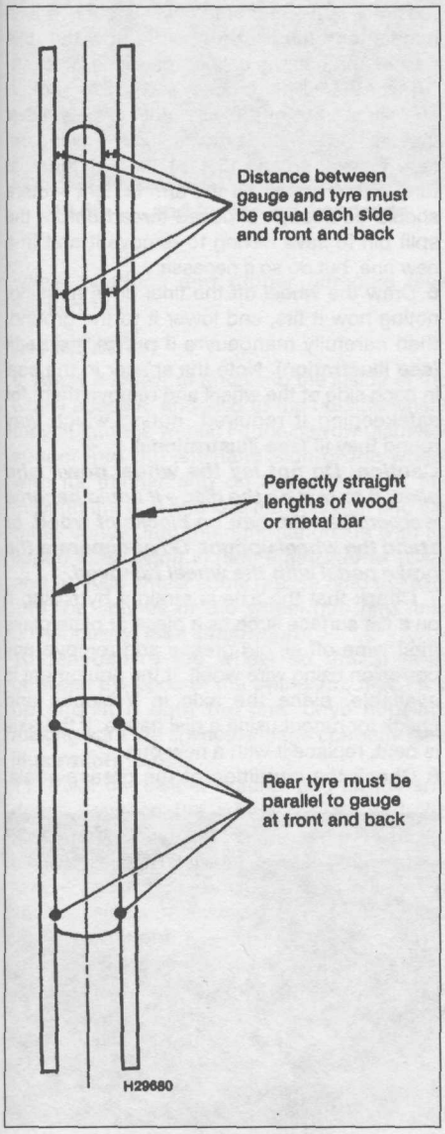
7 As previously mentioned, a perfectly straight length of wood or metal bar may be substituted for the string **(see illustration opposite)**. The procedure is the same.

8 If the front-to-back alignment is correct, the wheels still may be out of alignment vertically.

9 Using a 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 tyre upper sidewall and allow the weight to settle just off the floor. When the string touches both the upper and lower tyre sidewalls and is perfectly straight, the wheel is vertical. If it is not, place thin spacers under one leg of the stand until it is.

10 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.



11.7 Wheel alignment check using a straight-edge

12 Front wheel – removal and installation

Removal

1 Position the motorcycle on its centrestand. Support the bike using a jack or auxiliary stand so that the wheel is raised off the ground – if you use a jack fit a block of wood between the head and the engine. Always make sure the motorcycle is properly supported.

2 Displace the brake calipers (see Section 4). Support the calipers with a cable tie or a bungee cord so that no strain is placed on the hydraulic hoses. There is no need to disconnect the hoses from the calipers. **Note:** *Do not operate the front brake lever with the calipers removed.*

3 Unscrew the knurled ring securing the speedometer cable to the drive housing and detach it, noting how it locates **(see illustration)**.

4 Slacken the axle clamp bolt on the bottom of the left-hand fork, then unscrew the axle **(see illustration)**.

5 Support the wheel, then withdraw the axle from the left-hand side, using a drift to tap it out if necessary, and carefully lower the wheel **(see illustration)**.

6 Remove the speedometer drive housing from the left-hand side of the wheel, noting how it fits, and the spacer from the right-hand side, noting which way round it fits **(see illustrations)**.

Caution: Don't lay the wheel down and allow it to rest on a disc – the disc could become warped. Set the wheel on wood blocks so the disc doesn't support the weight of the wheel.

7 Check that the axle is straight by rolling it on a flat surface such as a piece of plate glass (first wipe off all old grease and remove any corrosion using wire wool). If the equipment is available, place the axle in V-blocks and check for runout using a dial gauge. If the axle is bent, replace it with a new one.

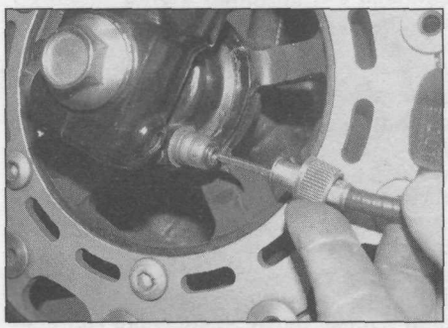
8 Check the condition of the grease seals and wheel bearings (see Section 14).

Installation

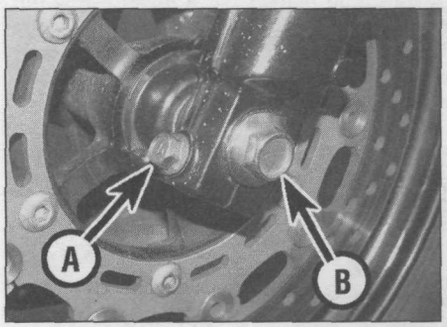
9 Apply a smear of grease to the inside of the speedometer drive housing and the wheel spacer, and also to the outside where they fit into the wheel. Also apply a thin coat of grease to the axle

10 Manoeuvre the wheel into position between the fork sliders. Fit the speedometer drive housing into the left-hand side of the wheel, locating the drive plate tabs into its cut-outs **(see illustration 12.6a)**. Fit the spacer into the right-hand side **(see illustration 12.6b)**.

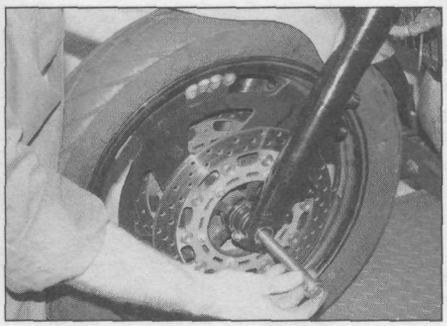
11 Lift the wheel into place, making sure the drive housing and spacer remain in position, and that the housing is positioned so that the lug on the bottom of the fork is between the stoppers on the housing **(see illustration)**.



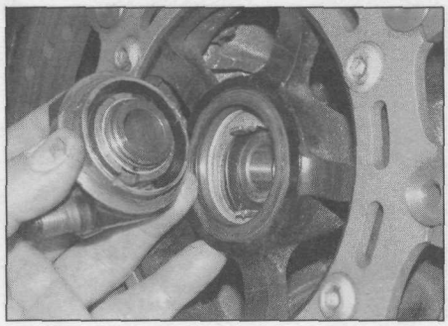
12.3 Unscrew the ring and detach the cable



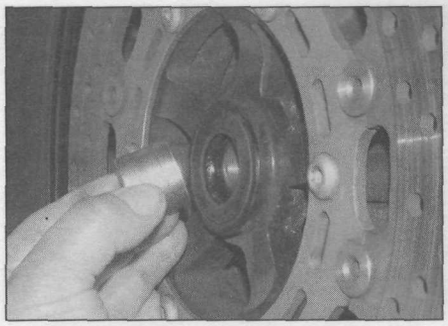
12.4 Slacken the axle clamp bolt (A), then unscrew the axle (B)



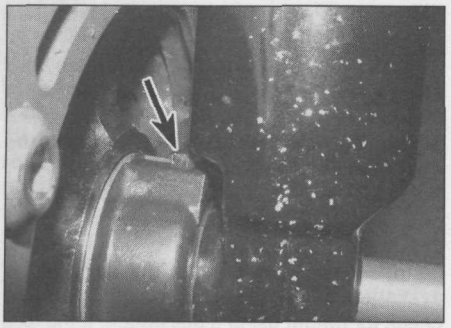
12.5 Withdraw the axle and remove the wheel



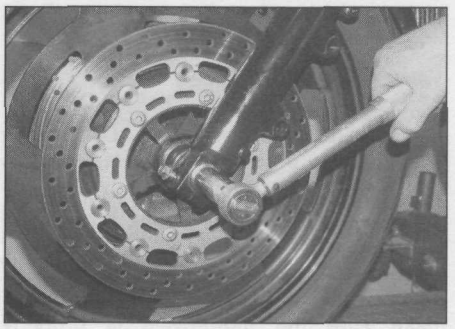
12.6a Remove the speedometer drive housing



12.6b . . . and the spacer



12.11a Make sure the lug (arrowed) locates between the stoppers on the drive housing



12.11b Tighten the axle to the specified torque

Slide the axle in from the left-hand side **(see illustration 12.5)** and tighten it to the torque setting specified at the beginning of the Chapter **(see illustration)**. Check that the wheel spins freely.

12 Lower the front wheel to the ground, then install the brake calipers (see Section 4).

13 Apply the front brake a few times to bring the pads back into contact with the discs. Move the motorcycle off its stand, apply the front brake and pump the front forks a few times to settle all components in position.

14 Now tighten the axle clamp bolt on the bottom of the right-hand fork to the specified torque setting **(see illustration 12.4)**.

15 Connect the speedometer cable to the drive housing, making sure it locates correctly, and tighten the knurled ring to secure it **(see illustration 12.3)**.

16 Check for correct operation of the front brake before riding the motorcycle.

13 Rear wheel – removal and installation

Removal

1 Position the motorcycle on its centrestand so that the wheel is off the ground – if possible position the stand on a block of wood to raise the rear higher than normal to provide more clearance, otherwise manoeuvring the wheel out can be tricky. It is advisable to place a block in front of the front wheel, or better still to tie the front brake lever to the handlebar so that the front wheel is locked. Remove the licence plate.

2 Displace the rear brake caliper (see Section 5).

3 Where fitted, remove the split pin from the left-hand end of the axle. Discard it as a new one must be used. Unscrew the axle nut and remove the washer **(see illustration)**.

4 Slacken the axle clamp bolt **(see illustration)**. Withdraw the axle from the right-hand side – slide a screwdriver or bar through the holes in the end of the axle and use it as a handle **(see illustration)**. Note how the axle passes through the caliper mounting bracket.

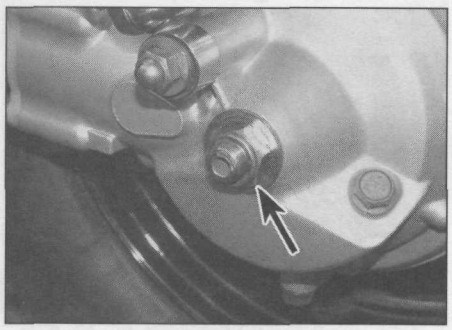
5 Pivot the caliper bracket and torque arm up so they are out of the way, noting the washer that fits between the bracket and the swingarm **(see illustration and 13.11b)**. Slacken the front torque arm bolt nut if the arm is tight – there should be enough exposed thread before the split pin to save having to remove it and fit a new one, but do so if necessary.

6 Draw the wheel off the final drive housing, noting how it fits, and lower it to the ground, then carefully manoeuvre it out of the back **(see illustration)**. Note the spacer in the seal in each side of the wheel and remove them for safekeeping if required, noting which way round they fit **(see illustrations)**.

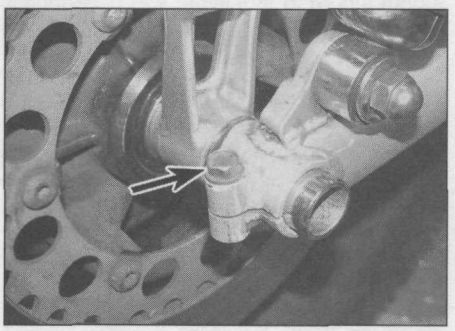
Caution: Do not lay the wheel down and allow it to rest on the disc – it could become warped. Lay the tyre on blocks of wood. or stand the wheel upright. Do not operate the brake pedal with the wheel removed.

7 Check that the axle is straight by rolling it on a flat surface such as a piece of plate glass (first wipe off all old grease and remove any corrosion using wire wool). If the equipment is available, place the axle in V-blocks and check for runout using a dial gauge. If the axle is bent, replace it with a new one.

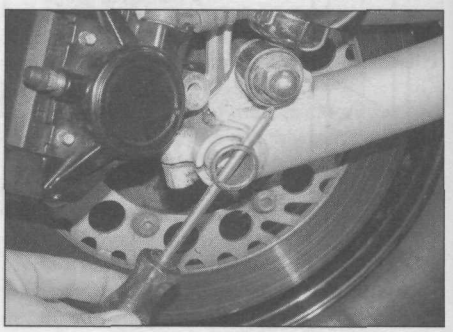
8 Check the condition of the grease seals,



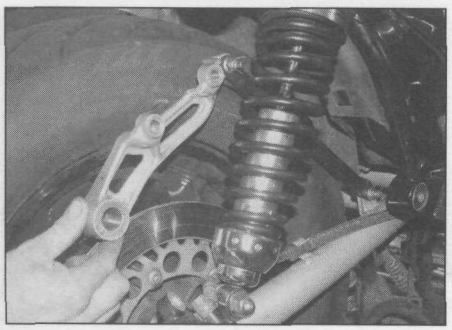
13.3 Unscrew the nut (arrowed) and remove the washer



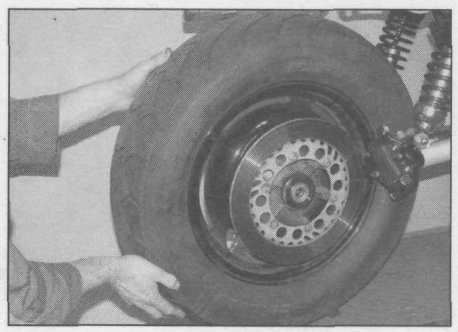
13.4a Slacken the clamp bolt (arrowed) . . .



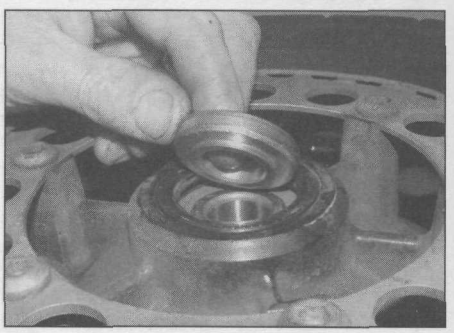
13.4b . . . then withdraw the axle, using a handle as shown



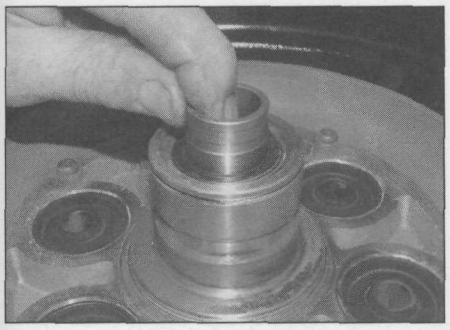
13.5 Pivot the caliper bracket up out of the way, retrieving the washer as you do



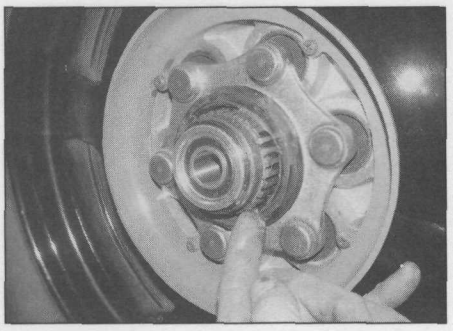
13.6a Draw the wheel off the final drive and manoeuvre it out the back



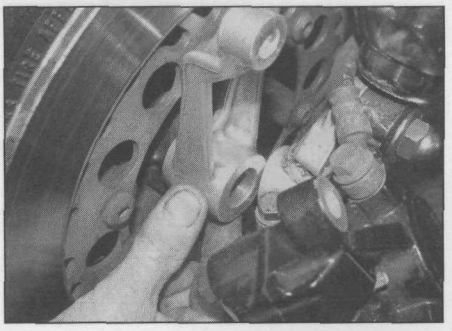
13.6b Note the spacer for the right-hand side . . .



13.6c . . . and for the left-hand side



13.9 Grease the splines before installing the wheel



13.11a Pivot the caliper bracket down . . .

wheel bearings and rubber dampers (see Section 14).

Installation

9 Apply a smear of grease to the inside of the wheel spacers, and also to the outside where they fit into the wheel. Fit the narrow diameter spacer into the left-hand side of the wheel with its thinner end on the outside (it fits through the seal and into the bearing), and the wider spacer into the right-hand side with its lipped side facing in **(see illustrations 13.6c and b)**. Also smear some grease onto the axle and the splines of the wheel hub and final drive housing **(see illustration)**.

10 Manoeuvre the wheel so that it is in between the ends of the swingarm, then lift it up and fit it onto the final drive housing, making sure the splines engage correctly **(see illustration 13.6a)**.

11 Pivot the caliper bracket and torque arm down between the wheel spacer and the swingarm, aligning the holes **(see illustration)**. Fit the washer between the bracket and the arm – you may need to lever the arm out slightly using a screwdriver to accommodate it **(see illustration)**.

12 Slide the axle through from the right hand side, making sure that it passes through the washer, the caliper bracket and the spacer **(see illustration)**.

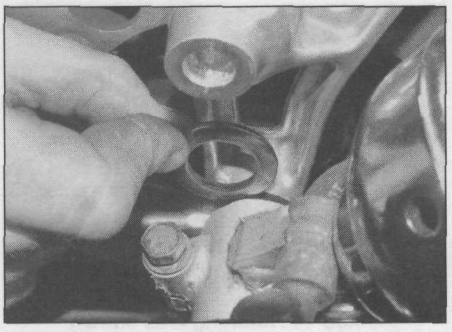
13 Install the washer and axle nut and tighten the nut to the torque setting specified at the beginning of the Chapter, noting the different settings for the different type nuts **(see illustrations)**. Where a split pin was fitted, install a new one and bend its ends securely to hold the nut in place.

14 Tighten the axle clamp bolt to the specified torque setting **(see illustration 13.4a)**. Tighten the front torque arm bolt nut to the torque setting specified at the beginning of the Chapter if slackened. Where a castellated type axle nut is fitted, fit a new split pin through the hole in the shaft and bend its ends securely around the nut.

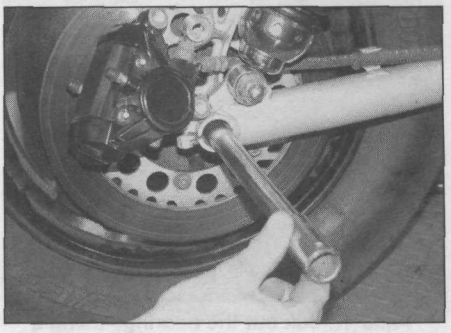
15 Install the brake caliper (see Section 5).

16 Apply the rear brake a few times to bring the pads back into contact with the disc. Move the motorcycle off its stand.

17 Check for correct operation of the rear brake before riding the motorcycle.



13.11b . . . then fit the washer between it and the swingarm



13.12 Slide the axle through . . .

14 Wheel bearings – removal, inspection and installation

Caution: Before removing the bearings (but having removed the seals etc as required to access the bearings), refer to 'Tools and Workshop Tips' in the Reference Section and check them to see if new ones are needed – however good their apparent condition, once the bearings have been driven out of the wheel they should be replaced with new ones rather than being reused, as the impact on the inner race when driving them out could damage them. Always replace the wheel bearings in sets. Never replace the bearings individually. Avoid using a high pressure cleaner on the wheel bearing area.

Front wheel bearings

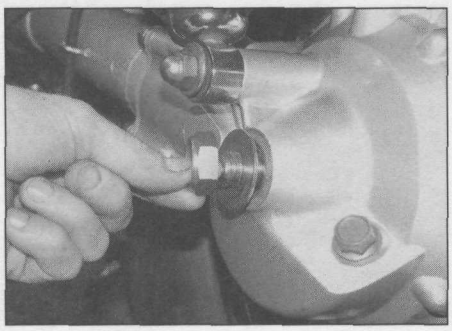
1 Remove the wheel (see Section 12).

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

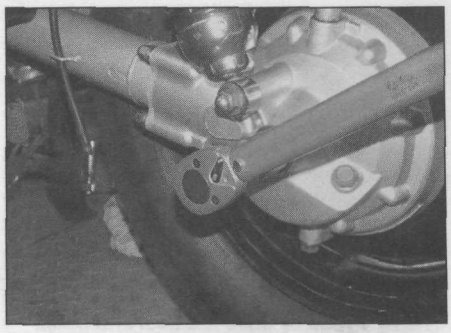
3 Lever out the grease seal on each side of the wheel using a flat-bladed screwdriver, taking care not to damage the rim of the hub **(see illustration)**. Discard the seals. Lever out the retainer plate on the left-hand side of the wheel and remove the speedometer drive plate, noting how it fits **(see illustrations)**. Refer to 'Tools and Workshop Tips' in the *Reference* section and check the bearings.

HAYNES HiNT

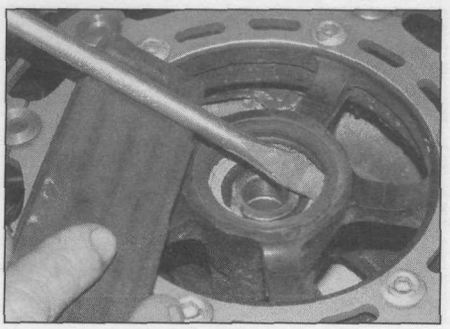
Position a piece of wood against the wheel to prevent the screwdriver shaft damaging it when levering the grease seal out.



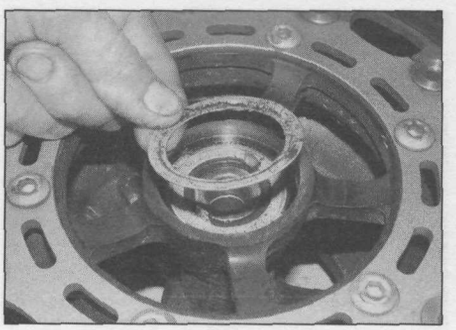
13.13a . . . then fit the washer and nut . . .



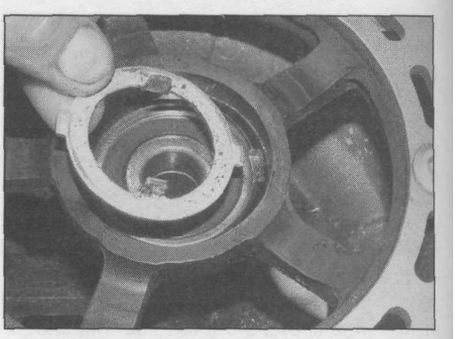
13.13b . . . and tighten the nut to the specified torque



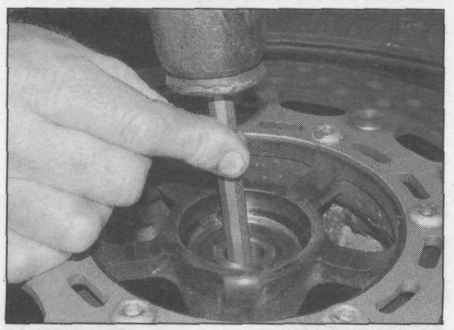
14.3a Lever out the grease seals . . .



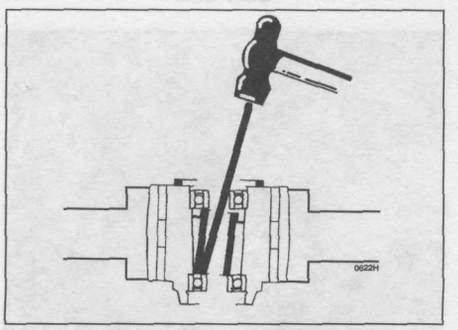
14.3b . . . and the retainer plate . . .



14.3c . . . and remove the drive plate



14.5a Knock out the bearings using a drift . . .



14.5b . . . locating it as shown

14.7 A socket can be used to drive in the bearing

4 If the bearings are good and are not being removed, and they are of the unsealed type or are only sealed on one side, clean them with a high flash-point solvent (one which won't leave any residue) and blow them dry with compressed air (don't let the bearings spin as you dry them). Pack the bearing with grease and spin the bearing to distribute it. **Note:** *If the bearing is sealed on both sides don't attempt to clean it.*

5 To remove the bearings, insert a metal rod (preferably a brass drift punch) through the centre of the upper bearing, tap evenly around the inner race of the lower bearing to drive it from the hub **(see illustrations)**. The bearing spacer will also come out.

6 Lay the wheel on its other side so that the remaining bearing faces down. Drive the bearing out of the wheel using the same technique as above.

7 Thoroughly clean the hub area of the wheel. Install the new left-hand bearing into the recess in the hub, with the marked or sealed side facing outwards. Using the old bearing, 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)**.

8 Turn the wheel over and install the bearing spacer. Drive the other bearing into place as described above.

9 Fit the speedometer drive plate into the left-hand side of the wheel, with the drive tabs facing out and aligning the flat tabs with the cut-outs in the hub **(see illustration 14.3c)**. Press the retainer plate onto the drive plate **(see illustration 14.3b)**.

10 Apply a smear of lithium based grease to the lips of the seals, then press them into the wheel, using a seal or bearing driver or a suitable socket to drive it into place if necessary **(see illustration)**. As the seals sit flush with the top surface of their housing, using a piece of wood as shown will automatically set them flush without the risk of setting them too deep and having to lever them out again. When the wheel is installed the speedometer drive housing will automatically set its seal deeper if necessary.

11 Clean off any grease from the brake discs using acetone or brake system cleaner then install the wheel (see Section 12).

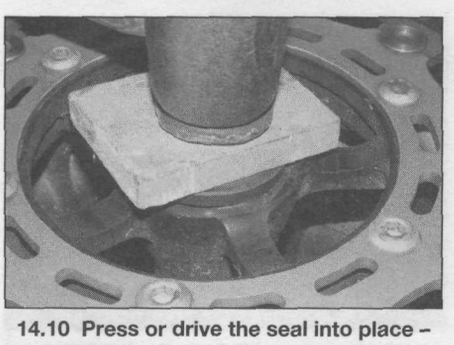
Rear wheel bearings

12 Remove the rear wheel (see Section 13). If not already done remove the spacer from each side of the wheel, noting which way round they fit **(see illustrations 13.6b and c)**.

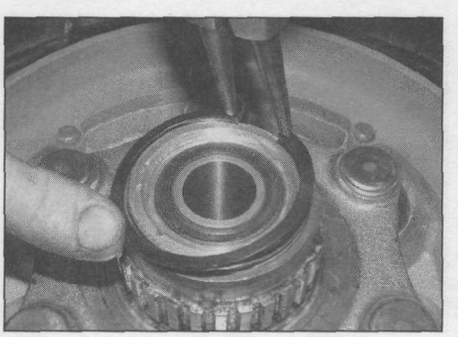
13 Set the wheel on blocks so as not to allow the weight of the wheel to rest on the brake disc.

14 Remove the circlip, then lift the final drive coupling out of the wheel leaving the rubber dampers in position – lever the coupling up using a screwdriver if required **(see illustrations)**.

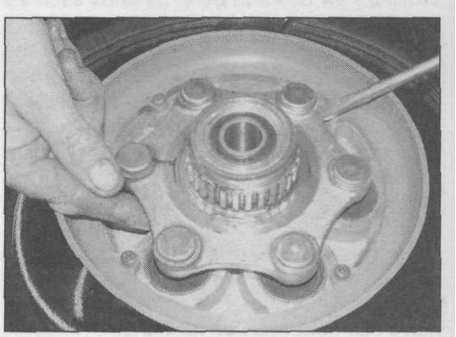
15 Using a flat-bladed screwdriver, prise out



14.10 Press or drive the seal into place – using a piece of wood as shown automatically sets the seal flush



14.14a Remove the circlip . . .



14.14b . . . then lift the coupling out of the dampers

the grease seal from each side of the wheel **(see illustrations)**. Discard the seals. Refer to 'Tools and Workshop Tips' in the *Reference* section and check the bearings. A needle bearing is fitted in the left-hand side of the wheel, and a caged ball bearing in the right-hand side.

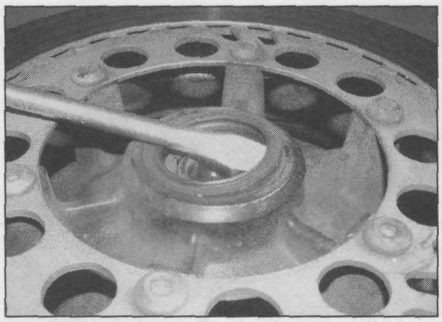
16 If the bearings are good and are not being removed, and they are of the unsealed type or are only sealed on one side, clean them with a high flash-point solvent (one which won't leave any residue) and blow them dry with compressed air (don't let the bearings spin as you dry them). Pack the bearing with grease and spin the bearing to distribute it. **Note:** *If the bearing is sealed on both sides don't attempt to clean it.*

17 Remove the circlip securing the caged ball bearing **(see illustration)**. To remove the ball bearing, use an 18 mm socket inserted into the needle bearing so that it bears on the central spacer, and tap it with a hammer to drive the ball bearing out from the other side **(see illustration)**. Turn the wheel over. If the spacer came out with the bearing, fit it back into the wheel. Now fit the socket onto the spacer and drive out the needle bearing.

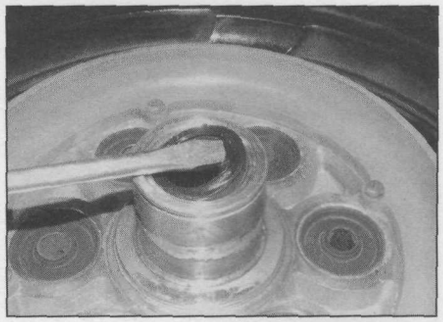
18 Drive the new ball bearing in until it seats using a 38 mm socket **(see illustration)**. Secure it with the circlip, making sure it locates in its groove **(see illustration 14.17a)**. Turn the wheel over and fit the spacer. Carefully drive the needle bearing in until it seats using a 25 mm socket **(see illustration)**.

19 Apply a smear of lithium grease to the lips of the grease seals. Press the wide seal into the right-hand side of the wheel **(see illustration)**. As the seal sits flush with the hub, it is best to knock it into place using a flat piece of wood **(see illustration)**. Press the narrow seal into the left-hand side of the wheel and use a 27 mm socket to set it in **(see illustrations)**.

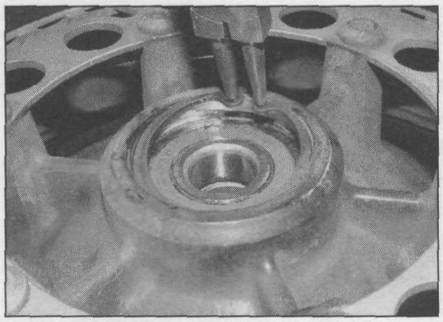
20 Inspect the coupling O-ring and the rubber dampers for signs of wear or damage and replace them with new ones if necessary



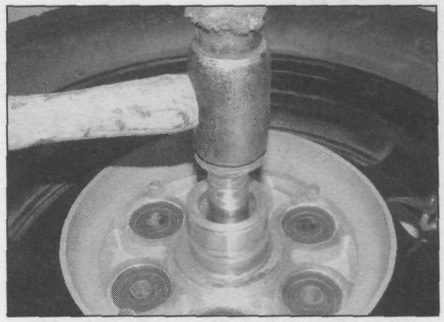
14.15a Lever out the grease seal from the right-hand side of the wheel . . .



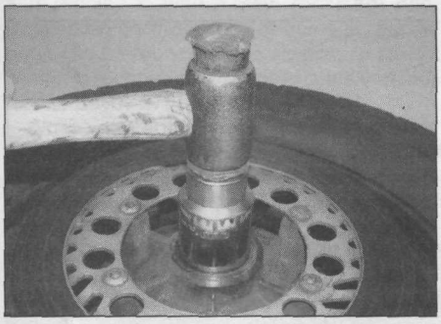
14.15b . . . and from the left-hand side



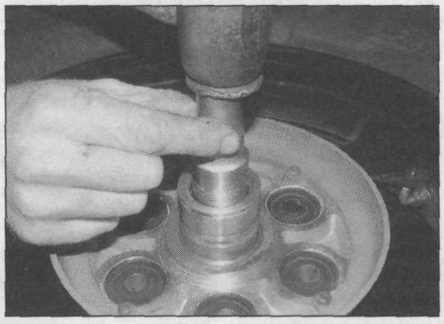
14.17a Remove the circlip . . .



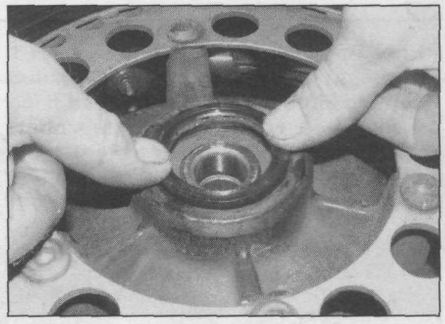
14.17b . . . then drive the bearings out as described



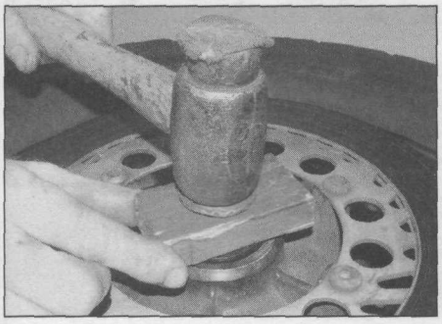
14.18a Drive the ball bearing in using a 38 mm socket . . .



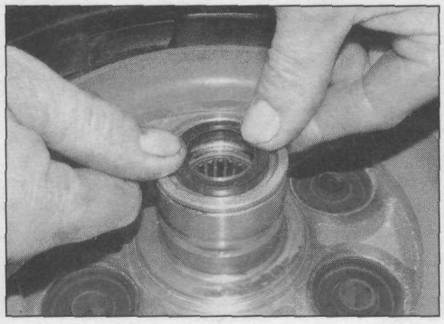
14.18b . . . and the needle bearing using a 25 mm socket



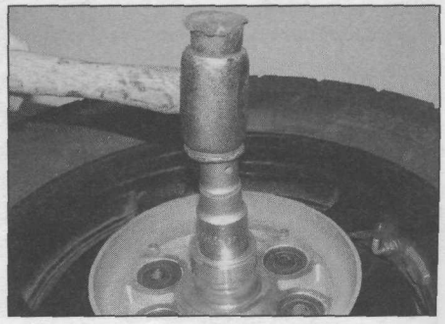
14.19a Fit the right-hand seal . . .



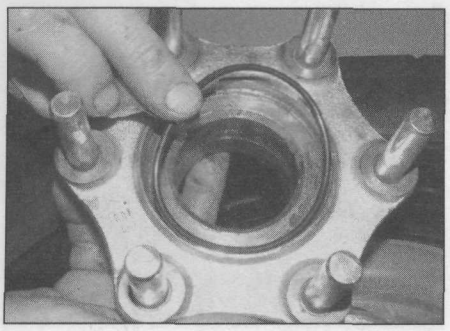
14.19b . . . and set it flush using a piece of wood



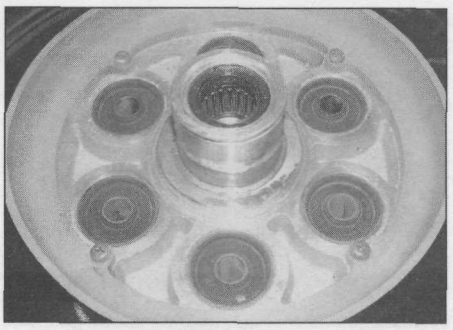
14.19c Press the left-hand seal in . . .



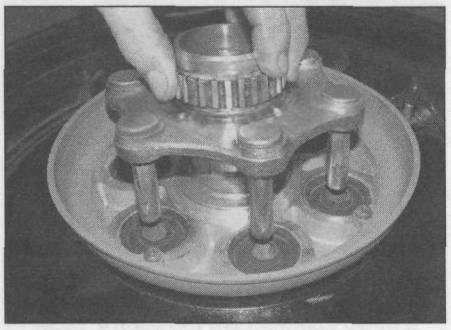
14.19d . . . and set it using a 27 mm socket



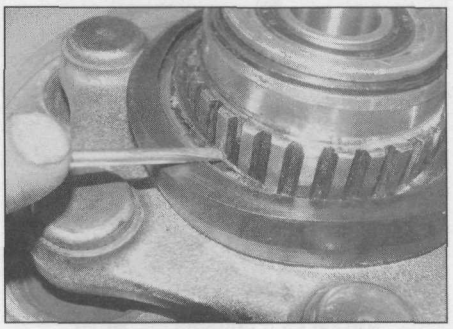
14.20a Check the inner O-ring . . .



14.20b . . . and the rubber dampers, renewing them if necessary



14.20c Fit the coupling into the dampers and press on it to seat it



14.20d Check the dust seal, making sure it is correctly seated on its rim

(see illustrations). Apply a smear of grease to the O-ring and fit the coupling onto the wheel, making sure all the damper rubbers are in place **(see illustration)**. Press the coupling down to seat the O-ring, then secure it with its circlip **(see illustration 14.14a)**. Make sure the dust seal is in good condition and correctly seated **(see illustration)**. Replace it with a new one if necessary.

21 Clean off any grease from the brake disc using acetone or brake system cleaner then install the wheel (see Section 13).

15 Tyres – general information and fitting

General information

1 The wheels fitted to all models are designed to take tubeless tyres only. Tyre sizes are given in the Specifications at the beginning of this chapter.

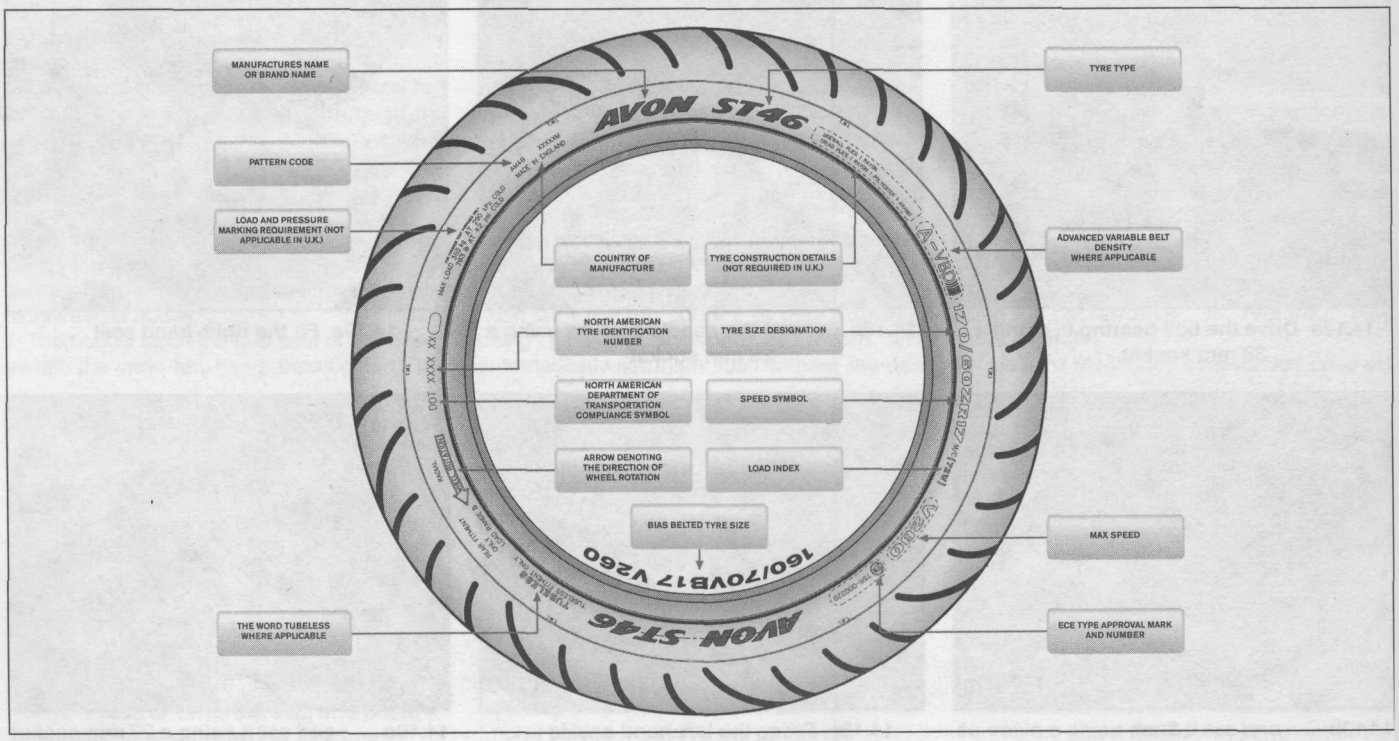
2 Refer to the *Daily (pre-ride) checks* listed at the beginning of this manual for tyre maintenance.

Fitting new tyres

3 When selecting new tyres, refer to the tyre information label on the swingarm and the tyre options listed in the owners handbook. Ensure that front and rear tyre types are compatible, the correct size and correct speed rating; if necessary seek advice from a Yamaha dealer or tyre fitting specialist **(see illustration)**.

4 It is recommended that tyres are fitted by a motorcycle tyre specialist rather than attempted in the home workshop. This is particularly relevant in the case of tubeless tyres because the force required to break the seal between the wheel rim and tyre bead is substantial, and is usually beyond the capabilities of an individual working with normal tyre levers. Additionally, the specialist will be able to balance the wheels after tyre fitting.

5 Note that punctured tubeless tyres can in some cases be repaired. Consult a Yamaha dealer or motorcycle tyre fitting specialist for advice.



15.3 Typical tyre sidewall markings