

Chapter 7

Brakes, wheels and tyres

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Degrees of difficulty

Easy, suitable for novice with little experience	sg [^]	Fairly easy, suitable for beginner with some experience	jk JQ	Fairly difficult, suitable for competent DIY mechanic	^ gS	Difficult, suitable for experienced DIY mechanic	^k 3^ 2S	Very difficult, suitable for expert or professional	jk ^ ^
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Specifications

Brakes

Brake fluid type	DOT 4
Front caliper bore ID	
Upper bore.	30.20 mm
Lower bore.	27.00 mm
Front disc thickness	
YZF models	
Standard.	5.0 mm
Service limit	4.5 mm
FZS models	
Standard.	4.0 mm
Service limit	3.5 mm
Front disc maximum runout	0.2 mm
Front master cylinder bore ID.	14.00 mm
Rear caliper bore ID	
YZF models.	42.85 mm
FZS models.	38.10 mm
Rear disc minimum thickness	
Standard.	5.0 mm
Service limit	4.5 mm
Rear disc maximum runout	0.15 mm
Rear master cylinder bore ID	
YZF models.	14.00 mm
FZS models.	12.70 mm

Wheels

Rim size	
Front	
YZF models.	17 x MT3.50
FZS models.	17 x MT3.00
Rear.	17 x MT5.00
Wheel runout (max)	
Axial (side-to-side).	0.5 mm
Radial (out-of-round).	1.0 mm
Axle runout (max).	0.25 mm

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Tyres

Tyre pressures. see *Daily (pre-ride) checks*

Tyre sizes*

YZF models

Front. 120/60-ZR17

Rear. 160/60-ZR17

FZS models

Front. 110/70-ZR17

Rear. 160/60-ZR17

**Refer to the owners handbook or the tyre information label on the swingarm for approved tyre brands.*

Torque settings

Bleed valve. 6 Nm

Brake hose banjo bolts. 30 Nm

Front axle clamp bolt. 20 Nm

Front brake caliper mounting bolts. 40 Nm

Front brake disc bolts. 23 Nm

Front brake master cylinder clamp bolts

YZF models. 13 Nm

FZS models. 10 Nm

Front wheel axle

YZF models. 65 Nm

FZS models. 67 Nm

Rear brake caliper mounting bolts. 40 Nm

Rear brake disc bolts

YZF models. 20 Nm

FZS models. 23 Nm

Rear brake hose joint piece (YZF models). 40 Nm

Rear brake master cylinder mounting bolts. 23 Nm

Rear brake pad retaining pins (FZS models). 10 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, and the rear brake is a single-opposed piston caliper.

Caution: *Disc brake components rarely require disassembly except as part of the Routine maintenance schedule (see Chapter 1). Do not disassemble components unless absolutely necessary. If a 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.

health. Never blow it out with compressed air and don't inhale any of it. An approved filtering mask should be worn when working on the brakes.

1 Remove the retaining clips from each end of the pad retaining pin, then withdraw the pad pin, noting how it locates through the pad spring (see illustrations). Remove the pad spring, noting which way round it fits (see illustration).

2 Withdraw the pads from the top of the caliper, noting how they fit (see illustration). Where fitted, remove the shim from the back of each pad, noting how it fits (see illustration).

3 Inspect the surface of each pad for contamination and check that the friction material has not worn beyond its service limit (see Chapter 1, Section 8). If either pad is

2 Front brake pads - replacement

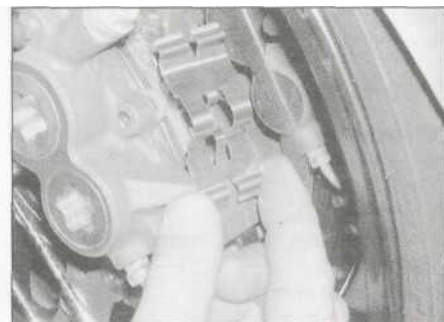
Warning: *The dust created by the brake system may contain asbestos, which is harmful to your*



2.1 a Remove the retaining clips



2.1 b ... then withdraw the pad pin ...



2.1 c ... and remove the pad spring



2.2a Lift the pads out of the caliper .. .



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

worn down to or beyond the service limit wear indicator, 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 not possible to 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. Any areas of glazing may be removed using emery cloth. Spray with a dedicated brake cleaner to remove any dust.

5 Check the condition of the brake disc (see Section 4).

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

7 Push the pistons as far back into the caliper as possible using hand pressure or a piece of wood as leverage. Due to the increased friction material thickness of new pads, it may be necessary to remove the master cylinder reservoir cover and diaphragm and siphon out some fluid. If access to the piston heads is too restricted with the calipers in place, displace

them (see Section 3). If the pistons are difficult to push back, 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. Take great care not to draw any air into the system. If in doubt, bleed the brakes afterwards (see Section 11).

8 Smear the backs of the pads and the shank of the pad pin with copper-based grease, making sure that none gets on the front or sides of the pads. Where fitted, fit the shim onto the back of each pad, making sure the arrow, where present, points in the direction of normal disc rotation (see illustration 2.2b).

9 Insert the pads into the caliper so that the friction material of each pad faces the disc (see illustration 2.2a). Fit the pad spring onto the pads, making sure the longer tangs point forward in the direction of normal disc rotation (see illustration 2.1 c). Insert the pad retaining pin through the hole in the outer pad, then press down on the pad spring so that the pin fits on top of the central leaf, then push the pin through the hole in the inner pad, and secure it with the retaining clips, using new ones if necessary (see illustrations 2.1 b and 2.1a).

10 Top up the master cylinder reservoir if necessary (see *Daily (pre-ride) checks*), and replace the reservoir cover and diaphragm.

11 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.

Front brake calipers - removal, overhaul and installation

Warning: If a caliper indicates the need for an overhaul (usually due to leaking fluid or sticky operation, or as part of the Routine maintenance schedule - see Chapter 1), all old brake fluid should be flushed from the system. Also, the dust created by the brake system may contain asbestos, which is harmful to your health. Never blow it out with compressed air and don't inhale any of it. An approved filtering mask should be worn when working on the brakes. Do not, under any circumstances, use petroleum-based solvents to clean brake parts. Use the specified clean brake fluid, dedicated brake cleaner or denatured alcohol only, as described.

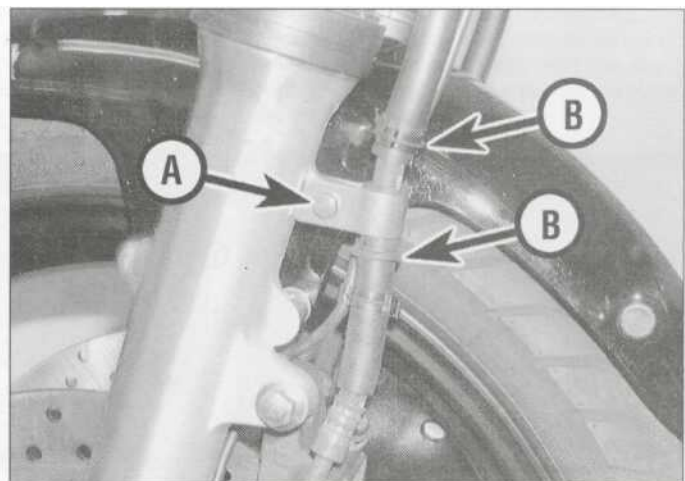
Removal

1 If the calipers are being overhauled, remove the brake pads (see Section 2). If the calipers are just being displaced or removed, the pads can be left in place. On YZF models, unscrew the nut and withdraw the bolt securing the brake hose to the mudguard (see illustration). On FZS models, unscrew the bolt securing the brake hose to the front mudguard, and when removing the left-hand caliper, free the speedometer sensor wire from its clips on the left-hand hose (see illustration).

2 If the calipers are just being displaced and not completely removed or overhauled, do not disconnect the brake hose. If the calipers are being overhauled, remove the brake hose



3.1 a On YZF models, unscrew the nut and withdraw the bolt to free the hose from its clamp



3.1 b On FZS models, unscrew the bolt (A) to free the hose, and release the clips (B) to free the wiring

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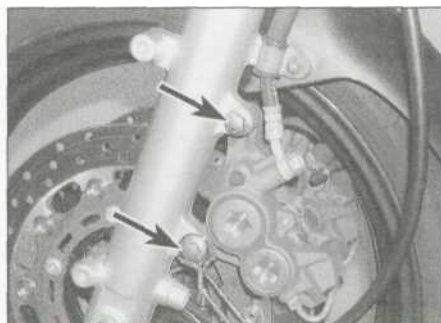
3.2 Unscrew the brake hose banjo bolt (arrowed), noting its alignment - YZF model

banjo bolt and detach the hose, noting its alignment with the caliper (see illustration). Plug the hose end or wrap a plastic bag tightly around to minimise fluid loss and prevent dirt entering the system. Discard the sealing washers as new ones must be used on installation. **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.*

3 Unscrew the caliper mounting bolts and slide the caliper off the disc, on YZF models, noting the speedometer cable guide secured by the lower bolt on the left-hand caliper (see illustrations).

Overhaul

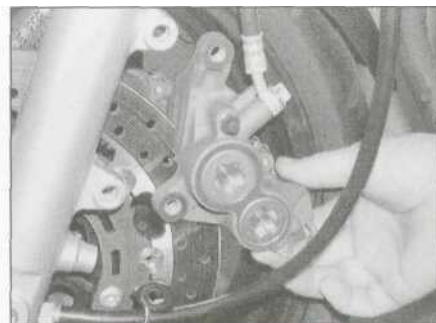
4 Clean the exterior of the caliper with denatured alcohol or brake system cleaner (see illustration).



3.3a Unscrew the caliper mounting bolts (arrowed)...

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.*

5 Using a flat piece of wood, block the pistons on one side of the caliper in their bores and displace the opposite pistons either by pumping them out by operating the front brake lever, or by forcing them out using compressed air. If the compressed air method is used, direct the air into the fluid inlet to force the pistons out of the body. Use only low pressure to ease the pistons out and make sure both pistons on the side being done are displaced at the same time. If the air pressure is too high and the pistons are forced out, the caliper and/or pistons may be damaged. Remove the seals from the bore of the displaced pistons (see below), then reinstall the pistons and block them using the wood. Now displace the pistons from the other side using the same method. Remove the wood and all the pistons. Mark each piston head and caliper body with a felt marker to ensure that



3.3b ... and slide the caliper off the disc

the pistons can be matched to their original bores on reassembly.

Caution: *Do not try to remove the pistons by levering them out, or by using pliers or any other grips. Do not attempt to remove the caliper bore plugs on the outside of the caliper, or the brake pipe linking the two sides of the caliper.*

6 Using a wooden or plastic tool, remove the dust seals from the caliper bores (see illustration). Discard them as new ones must be used on installation. If a metal tool is being used, take great care not to damage the caliper bores.

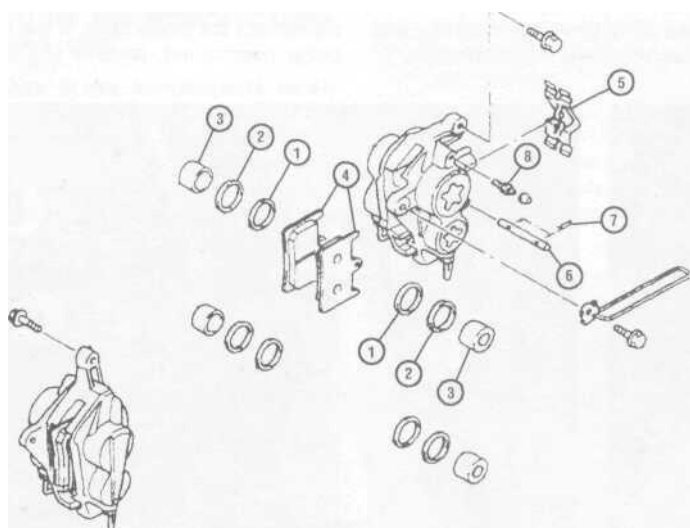
7 Remove and discard the piston seals in the same way.

8 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.*

9 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.

10 Lubricate the new piston seals with clean brake fluid and install them in their grooves in

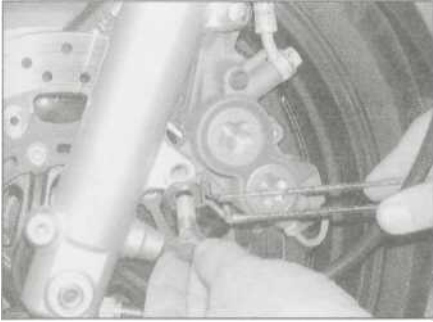


3.4 Front brake caliper components

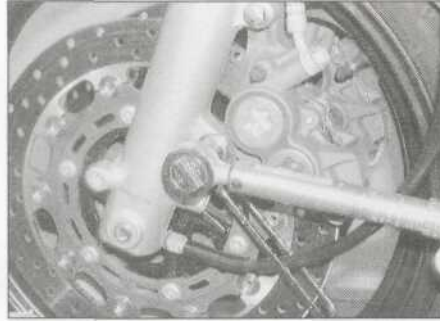
- | | | | |
|---------------|--------------|-----------|----------------------|
| 1 Dust seal | 3 Piston | 5 Spring | 7 Pin retaining clip |
| 2 Piston seal | 4 Brake pads | 6 Pad pin | 8 Bleed valve |

3.6 Use a plastic or wooden tool (such as a pencil) to remove the seals





3.14a Install the caliper mounting bolts . . .



3.14b ... and tighten them to the specified torque

the caliper bores. 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.

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

12 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

13 If necessary, push the pistons into the caliper using hand pressure or a piece of wood as leverage. **Note:** *It may be necessary to remove the master cylinder reservoir cap and diaphragm, and siphon out some fluid to allow this.* Slide the caliper onto the brake disc, making sure the pads sit squarely either side of the disc if they weren't removed (see illustration 3.3b).

14 Install the caliper mounting bolts, on YZF models not forgetting to secure the speedometer cable guide with the lower bolt on the left-hand caliper, and tighten them to the torque setting specified at the beginning of the Chapter (see illustrations).

15 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 3.2). 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 11.

16 If removed, install the brake pads (see Section 2). Secure the brake hose in its clamp on the mudguard, and on FZS models secure the speedometer sensor wire to the hose (see illustration 3.1 a or 3.1 b).

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

4 Front brake discs - inspection, removal and installation

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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 a new one fitted.

2 To check disc runout, position the bike on a suitable stand and support it so that the front wheel is raised off the ground. Mount a dial gauge to a fork leg, with the plunger on the gauge touching the surface of the disc about 10 mm (1/2 in) from the outer edge (see illustration). Rotate the wheel and watch the indicator 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, install new ones (see Section 16) and repeat this check.

3 If the disc runout is still excessive, a new one will have to be fitted, although machining by an engineer may be possible. 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. The thickness of the disc can be checked with a micrometer (see illustration). If the thickness of the disc is less than the service limit, a new one must be fitted.

Removal

4 Remove the wheel (see Section 14).

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 evenly and a little at a time in a criss-cross pattern to avoid distorting the disc, then remove the disc from the wheel (see illustration).

Installation

6 Mount the disc on the wheel with its marked side facing out, aligning the previously applied matchmarks (if you're reinstalling the original disc).

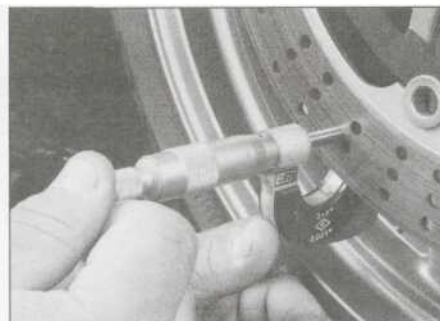
7 Clean the threads of the disc mounting bolts, then apply a suitable non-permanent thread locking compound. Install the bolts and tighten them evenly and a little at a time in a criss-cross pattern to the torque setting specified at the beginning of the Chapter. Clean off all grease from the brake disc using acetone or brake system cleaner. If a new brake disc has been installed, remove any protective coating from its working surfaces.

8 Install the front wheel (see Section 14).

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



4.2 Set up a dial indicator with the probe contacting the brake disc, then rotate the wheel to check for runout

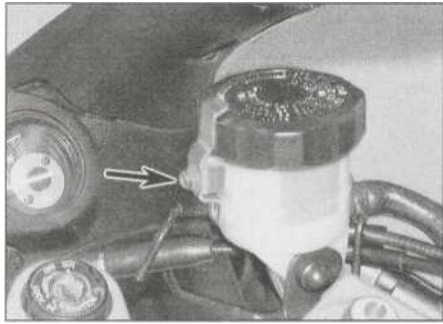


4.3 Using a micrometer to measure disc thickness



4.5 Unscrew the bolts (arrowed) and remove the disc

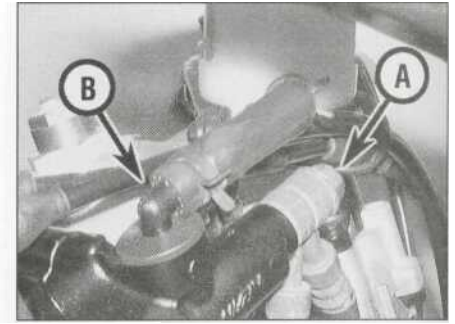
7*6 Brakes, wheels and tyres



5.3 On YZF models, remove the clamp (arrowed) and partially unscrew the cap



5.4 Brake switch wiring connectors (arrowed)



5.6a Brake hose banjo bolt (A), reservoir hose clamp and union (B) - YZF models

5 Front brake master cylinder - removal, overhaul and installation

1 If the master cylinder is leaking fluid, or if the lever does not produce a firm feel when the brake is applied, bleeding the brakes does not help (see Section 11), and the hydraulic hoses 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 fuel tank when working on the master cylinder.

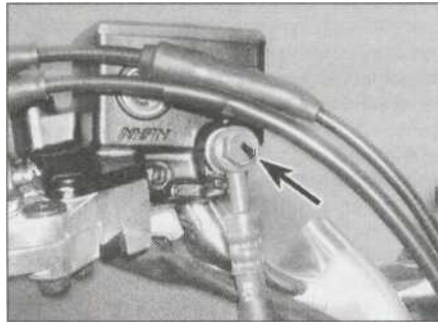
Caution: Disassembly, overhaul and reassembly of the brake master cylinder must be done in a spotlessly clean work area to avoid contamination and possible failure of the brake hydraulic system components.

Removal

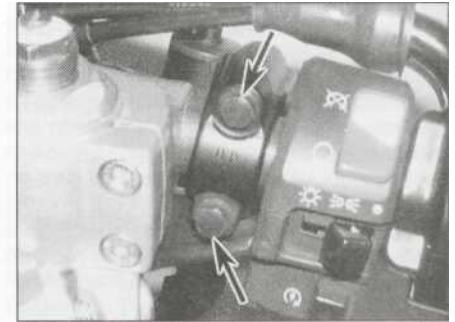
3 On YZF models, remove the reservoir cap clamp and partially unscrew the cap (see illustration). On FZS models, loosen, but do not remove, the screws holding the reservoir cover in place.

4 Disconnect the brake light switch wiring connectors (see illustration).

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



5.6b Brake hose banjo bolt (arrowed) - FZS models



5.8 Master cylinder clamp bolts (arrowed)

6 Unscrew the brake hose banjo bolt and separate the hose(s) from the master cylinder, noting the alignment (see illustrations). Discard the sealing washers as they must be replaced with new ones. Wrap the end(s) of the hose(s) in a clean rag and suspend in an upright position or bend down carefully and place the open end(s) in a clean container. The objective is to prevent excessive loss of brake fluid, fluid spills and system contamination.

7 On YZF models, unscrew the bolt securing the reservoir to its bracket, then release the clamp securing the reservoir hose to the union on the master cylinder (see illustration 5.6a). Remove the reservoir cap and lift off the diaphragm plate and the rubber diaphragm. Drain the brake fluid from the reservoir into a suitable container, then detach the reservoir hose from its union on the master cylinder.

Wipe any remaining fluid out of the reservoir with a clean rag.

8 Unscrew the master cylinder clamp bolts, then lift the master cylinder away from the handlebar (see illustration).

9 On FZS models, remove the reservoir cover retaining screws and lift off the cover, the diaphragm plate and the rubber diaphragm. Drain the brake fluid from the reservoir into a suitable container. Wipe any remaining fluid out of the reservoir with a clean rag.

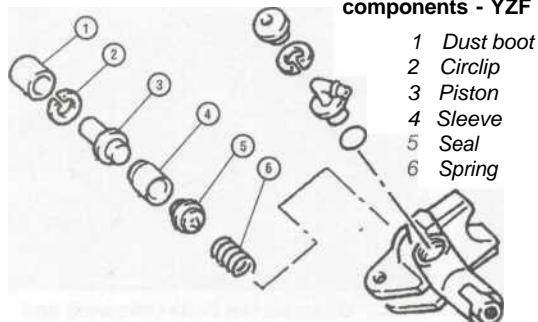
10 If required, remove the brake light switch (see Chapter 9).

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

Overhaul

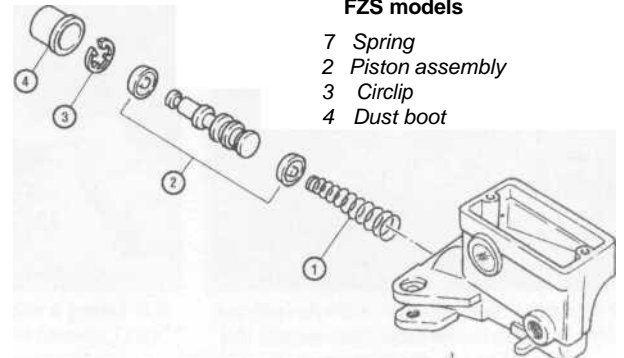
11 Carefully remove the dust boot from the master cylinder (see illustrations).

5.11a Front master cylinder components - YZF models

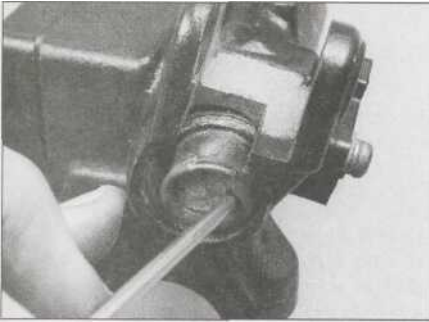


- 1 Dust boot
- 2 Circlip
- 3 Piston
- 4 Sleeve
- 5 Seal
- 6 Spring

5.11b Front master cylinder components - FZS models



- 7 Spring
- 2 Piston assembly
- 3 Circlip
- 4 Dust boot



5.11c Remove the rubber boot from the end of the master cylinder piston ...

12 Using circlip pliers, remove the circlip and slide out the piston assembly and the spring, noting how they fit (**see illustration**). Lay the parts out in the proper order to prevent confusion during reassembly (**see illustration**).

13 On YZF models, remove the fluid reservoir hose union rubber cap, then remove the circlip and detach the union from the master cylinder. Discard the O-ring as a new one must be used. Inspect the reservoir hose for cracks or splits and replace if necessary.

14 Clean all parts with clean brake fluid. 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.

15 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. Check that the fluid inlet and outlet ports in the master cylinder are clear.

16 The dust boot, circlip, piston assembly and spring are included in the rebuild kit. Use all of the new parts, regardless of the apparent condition of the old ones. If the seal and cup are not already on the piston, fit them according to the layout of the old piston assembly.

17 Fit the spring into the master cylinder, on FZS models so that its tapered end faces out.

18 Lubricate the piston assembly with clean brake fluid. Fit the assembly into the master cylinder, making sure it is the correct way round (**see illustration 5.12b**). Be sure the lips on the cup do not turn inside out when they are slipped into the bore. Depress the piston and install the new circlip, making sure that it locates in the groove (**see illustration 5.12a**).

19 Install the rubber dust boot, making sure the lip is seated correctly in the groove (**see illustration 5.11**).

20 On YZF models, fit a new O-ring onto the reservoir hose union, then press the union into the master cylinder and secure it with the circlip. Fit the rubber cap over the circlip.

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

Installation

22 If removed, install the brake light switch (see Chapter 9).

23 Attach the master cylinder to the handlebar and fit the clamp with its "UP" mark facing up, aligning the top mating surfaces of the clamp with the punchmark on the handlebar (**see illustration 5.8**). Tighten the upper bolt first, then the lower bolt to the torque setting specified at the beginning of the Chapter.

24 Connect the brake hose(s) to the master cylinder, using new sealing washers on each side of the union(s), and aligning the hose(s)

as noted on removal (**see illustrations 5.6a and 5.6b**). Tighten the banjo bolt to the torque setting specified at the beginning of this Chapter.

25 Install the brake lever (see Chapter 6, Section 5).

26 On YZF models, mount the reservoir and tighten the bolt securely. Connect the reservoir hose to the union and secure it with the clamp (**see illustration 5.6a**).

27 Connect the brake light switch wiring (**see illustration 5.4**).

28 Fill the fluid reservoir with new DOT 4 brake fluid as described in *Daily (pre-ride) checks*. Refer to Section 11 of this Chapter and bleed the air from the system.

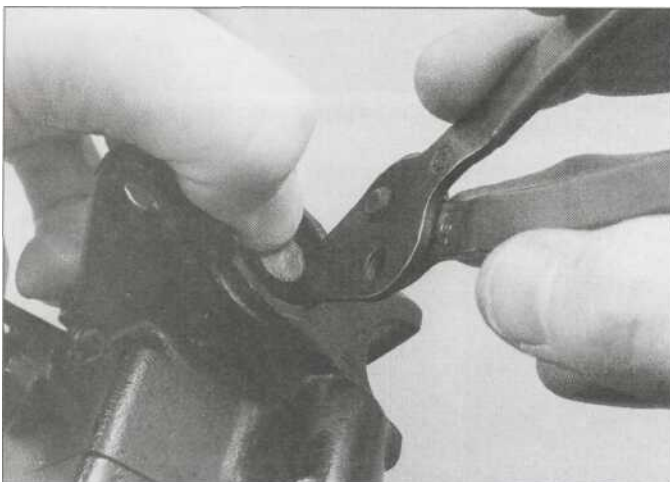
29 Fit the rubber diaphragm, making sure it is correctly seated, the diaphragm plate and the cover or cap onto the master cylinder reservoir. On YZF models, fit the cap clamp (**see illustration 5.3**).

30 Check the operation of the front brake before riding the motorcycle.

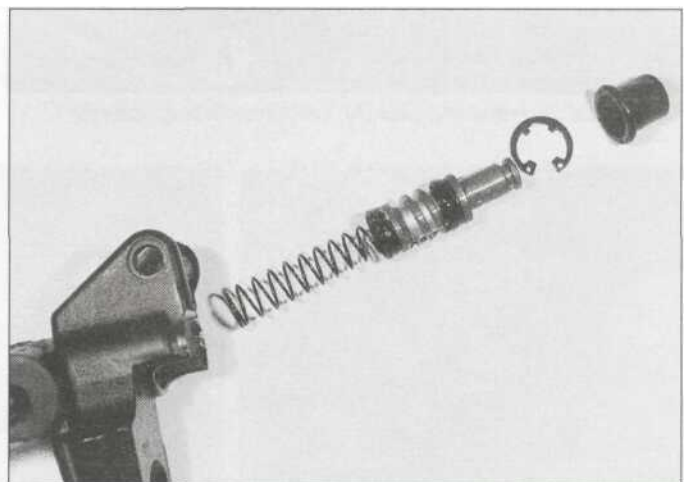
6 Rear brake pads - replacement

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.

1 On YZF models, press in the edges of the brake pad cover to release its clips and remove it - use a flat-bladed screwdriver if necessary (**see illustration**). Remove the pad pin retaining clips (**see illustration**). Withdraw the pad pins from the caliper using a suitable pair of pliers and remove the pad spring,

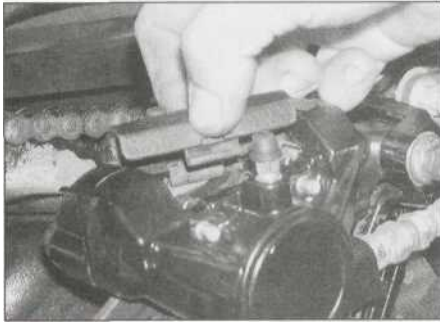


5.12a ... then depress the piston and remove the circlip using a pair of internal circlip pliers

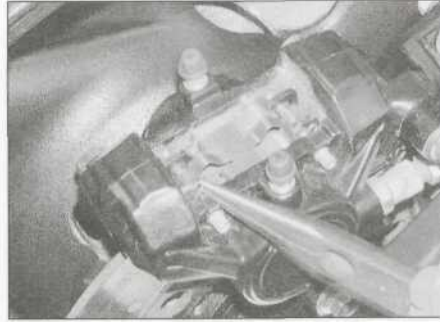


5.12b Lay out the internal parts, even if new parts are being used, to avoid confusion on reassembly

7*8 Brakes, wheels and tyres



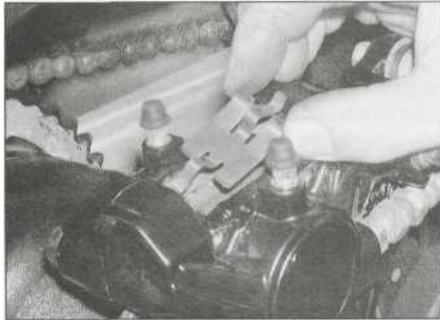
6.1a Remove the pad cover ...



6.1 b ... then remove the pad pin retaining clips



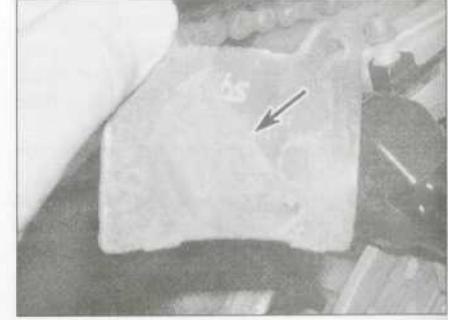
6.1 c Withdraw the pad pins .



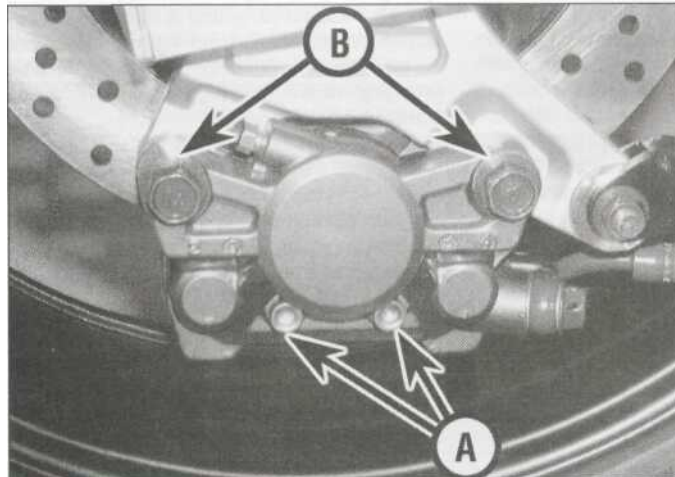
6.1 d ... and remove the pad spring



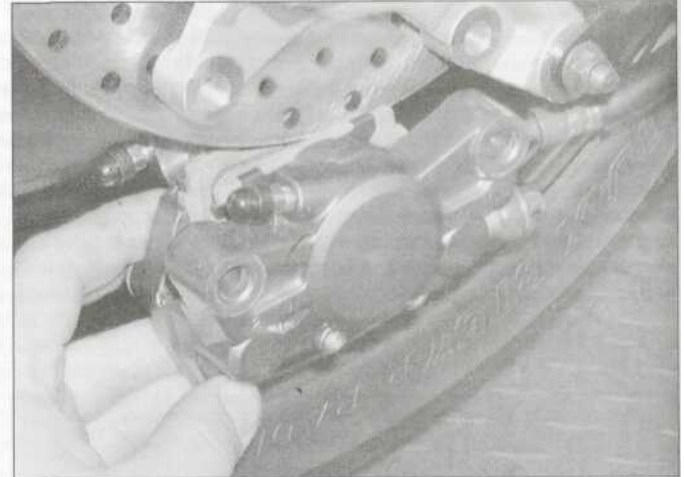
6.1e Lift out the pads ...



6.1f ... and remove the shim (arrowed), where fitted



6.2a Pad retaining pins (A), caliper mounting bolts (B)



6.2b Slide the caliper down off the disc



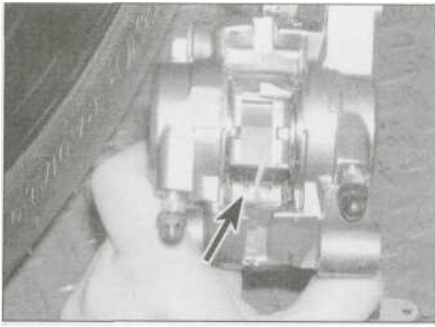
6.2c Remove the pad pins ...



6.2d ... and withdraw the pads



6.2e Remove the shim (arrowed) from the back of the pad, if one is fitted



6.2f Remove the pad spring (arrowed) if required, noting how it fits

noting how it fits (see illustrations). Withdraw the pads from the caliper body and remove the anti-chatter shim from the back of each pad, noting how it fits (see illustrations).

2 On FZS models, slacken the pad retaining pins, then unscrew the caliper mounting bolts and slide the caliper off the disc (see illustrations). Remove the pad retaining pins, then withdraw the pads from the caliper body (see illustrations). Remove the anti-chatter shim from the back of each pad, noting how it fits (see illustration). If required, remove the pad spring from inside the caliper body, noting how it fits (see illustration).

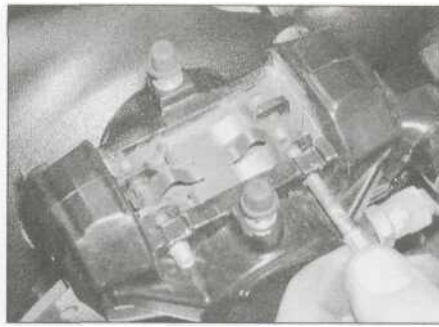
3 Inspect the surface of each pad for contamination and check that the friction material has not worn beyond its service limit (see Chapter 1, Section 8). If either pad is worn down to or beyond the service limit wear indicator, is fouled with oil or grease, or is heavily scored or damaged by dirt and debris, both pads must be renewed. Note that it is not possible to 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. Any areas of glazing may be removed using emery cloth. Spray with a dedicated brake cleaner to remove any dust.

5 Check the condition of the brake disc (see Section 8).

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

7 Push the pistons as far back into the caliper as possible using hand pressure or a piece of wood as leverage. Due to the increased friction material thickness of new pads, it may be necessary to remove the master cylinder reservoir cap and diaphragm and siphon out some fluid. On YZF models, if access to the piston heads is too restricted with the caliper in place, displace it (see Section 7). If the pistons are difficult to push back, attach a length of clear hose to the bleed valve and place the open end in a suitable container,



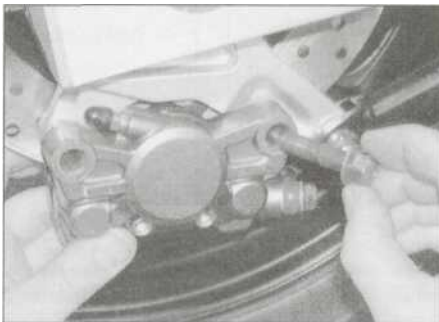
6.9a Install the pad pins, making sure they locate over and press down on the central tangs...

then open the valve and try again. Take great care not to draw any air into the system. If in doubt, bleed the brakes afterwards (see Section 11).

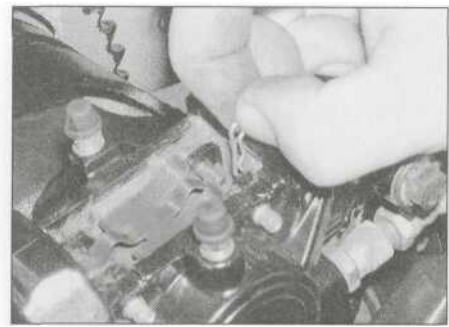
8 Smear the backs of the pads and the shank of each pad pin with copper-based grease, making sure that none gets on the front or sides of the pads. Fit the anti-chatter shim onto the back of each pad, making sure the arrow, where present, points in the direction of normal disc rotation (see illustration 6.1f or 6.2e).

9 On YZF models, insert the pads into the caliper so that the friction material of each pad is facing the disc (see illustration 6.1e). Locate the pad spring on the pads, making sure the longer outer tabs point in the direction of normal disc rotation (see illustration 6.1d). Insert the pad pins, making sure they pass through the hole in each pad and locate correctly onto the pad spring, then fit the retaining clips (see illustrations). Install the caliper cover (see illustration 6.1a).

10 On FZS models, if removed, fit the pad spring (see illustration 6.2f). Insert the pads into the caliper so that the friction material of each pad is facing the disc (see illustration 6.2d). Press the pads onto the pad spring until the pad pin holes align, then insert the pins, making sure they pass through the hole in each pad (see illustration 6.2c). Slide the caliper up onto the disc (see illustration 6.2b), then install the bolts and tighten them and the pad pins to the torque setting specified at the beginning of the Chapter (see illustrations).



6.10a Install the caliper bolts ...



6.9b ... then fit the retaining clips

11 Top up the master cylinder reservoir if necessary (see Daily (pre-ride) checks).

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

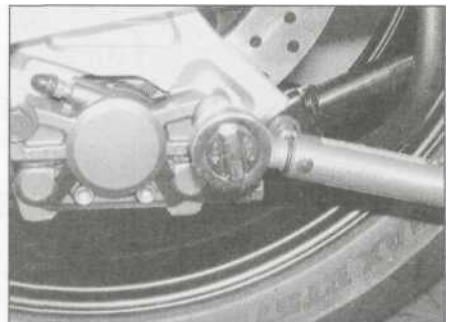
7 Rear brake caliper - removal, overhaul and installation

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Warning: If a caliper indicates the need for an overhaul (usually due to leaking fluid or sticky operation, or as part of the Routine maintenance schedule - see Chapter 1), all old brake fluid should be flushed from the system. Also, the dust created by the brake system may contain asbestos, which is harmful to your health. Never blow it out with compressed air and don't inhale any of it. An approved filtering mask should be worn when working on the brakes. Do not, under any circumstances, use petroleum-based solvents to clean brake parts. Use the specified clean brake fluid, dedicated brake cleaner or denatured alcohol only, as described.

Removal

1 On YZF models, if the calipers are being overhauled, remove the brake pads (see Section 6). If the calipers are just being displaced or removed, the pads can be left in place.

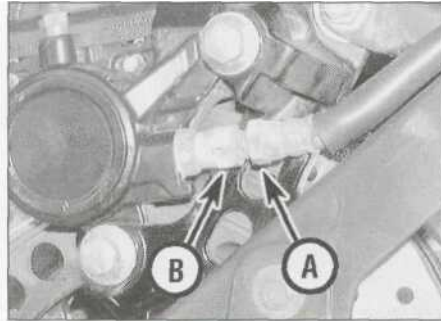


6.10b ... and tighten them and the pad pins to the specified torque

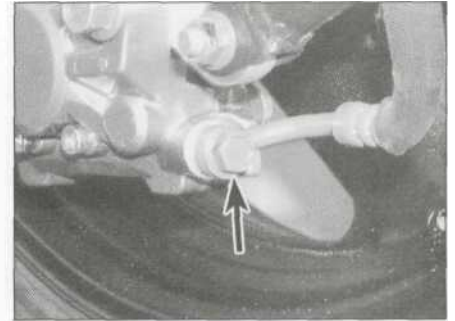
7*10 Brakes, wheels and tyres



7.2a On YZF models, unscrew the bolt (arrowed) and free the brake hose



7.2b Counter-hold the hose nut (A) and slacken the locknut (B)

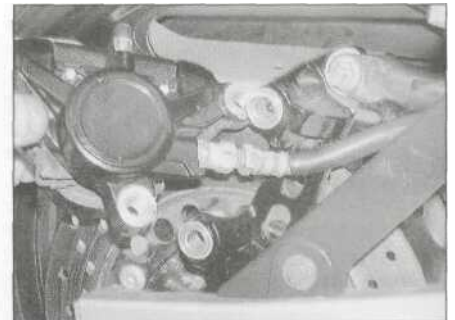


7.2c Brake hose banjo bolt (arrowed) - FZS models

2 If the calipers are just being displaced and not completely removed or overhauled, do not disconnect the brake hose. If this is the case, on YZF model, unscrew the bolt securing the brake hose clamp to the torque arm - this will provide a bit more slack in the hose (**see illustration**). If the calipers are being overhauled on YZF models, counter-hold the hose nut and unscrew the locknut and separate the hose from the hose joint in the caliper (**see illustration**). On FZS models, unscrew the brake hose banjo bolt and separate the brake hose from the master cylinder, noting its alignment (**see illustration**). Plug the hose end or wrap a plastic bag tightly around it to minimise fluid loss and prevent dirt entering the system. Discard the two sealing washers as they - must be replaced with new ones. **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*



7.3a Unscrew the bolts (arrowed)...



7.3b ... and slide the caliper off the disc

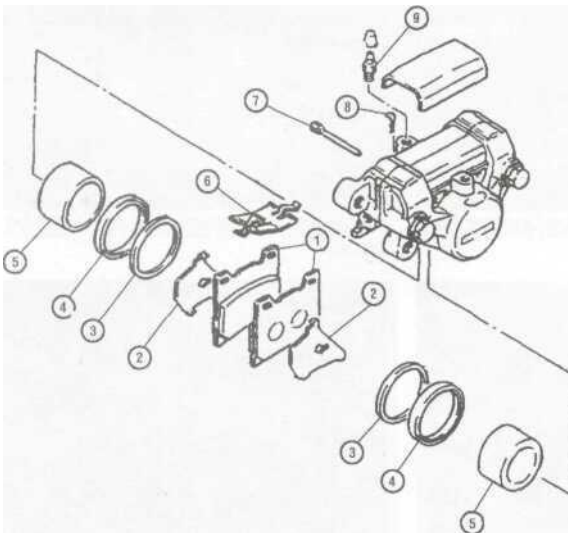
pads have been removed. Disconnect the hose once the pistons have been sufficiently displaced.

3 Unscrew the caliper mounting bolts, and slide the caliper off the disc (**see illustrations or illustrations 6.2a and 6.2b** for FZS models). On FZS models, if the calipers are being overhauled, remove the brake pads and the pad spring (see Section 6).

Overhaul

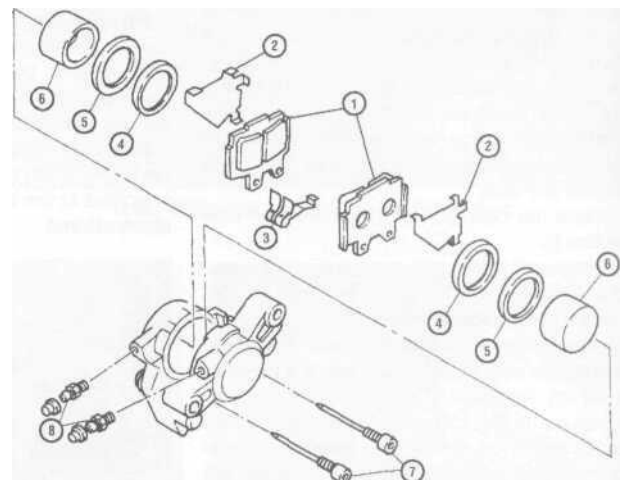
4 Clean the exterior of the caliper with denatured alcohol or brake system cleaner (**see illustrations**).

A **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.*



7.4a Rear brake caliper components - YZF models

- | | | |
|-------------|--------------------|----------------------|
| 1 Pads | 4 Piston seal | 7 Pad pin |
| 2 Shims | 5 Piston | 8 Pin retaining clip |
| 3 Dust seal | 6 Brake pad spring | 9 Bleed valve |



7.4b Rear brake caliper components - FZS models

- | | | |
|----------|---------------|---------------|
| 1 Pads | 4 Dust seal | 7 Pad pin |
| 2 Shims | 5 Piston seal | 8 Bleed valve |
| 3 Spring | 6 Piston | |

5 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 rear brake lever, or by forcing it out using compressed air. If the compressed air method is used, direct the air into the fluid inlet to force the pistons out of the body. Use only low pressure to ease the pistons out. If the air pressure is too high and the pistons are forced out, the caliper and/or pistons may be damaged. Remove the seal from the bore of the displaced piston (see below), then reinstall the piston and block it using the wood. Now displace the piston from the other side using the same method. Remove the wood and all the pistons. 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.

Caution: Do not try to remove the pistons by levering them out, or by using pliers or any other grips.

6 Using a wooden or plastic tool, remove the dust seals from the caliper bores (see illustration 3.6). Discard them as new ones must be used on installation. If a metal tool is being used, take great care not to damage the caliper bores.

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

8 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.

9 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.

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

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

12 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.

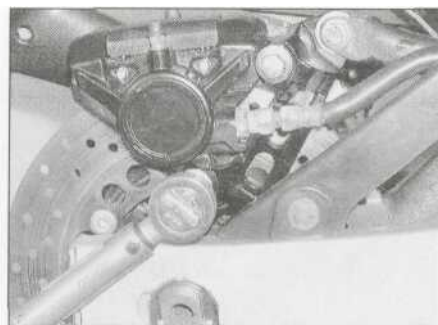
Installation

13 On FZS models, if removed, install the brake pads (see Section 2).

14 Push the pistons a little way back into the caliper using hand pressure or a piece of wood as leverage. **Note: It may be necessary to remove the master cylinder reservoir cap and diaphragm, and siphon out some fluid to**



7.15a Install the caliper bolts ...



7.15b ... and tighten them to the specified torque

allow this. Slide the caliper onto the brake disc, making sure the pads sit squarely either side of the disc if they weren't removed (see illustration 7.3b or 6.2b).

15 Install the caliper mounting bolts, and tighten them to the torque setting specified at the beginning of the Chapter (see illustrations or illustrations 6.1 Oa and 6.1 Ob for FZS models).

16 If removed, on YZF models fit the brake hose onto the hose joint and tighten the locknut onto the hose, counter-holding the hose nut to prevent the hose twisting (see illustration 7.2b). Do not overtighten the locknut. On FZS models, connect the brake hose to the caliper, using new sealing washers on each side of the union, and aligning the hose as noted on removal (see illustration 7.2c). 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 11.

17 On YZF models, if removed, install the brake pads (see Section 2). Also fit the hose clamp and tighten the bolt (see illustration 7.2a).

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

8 Rear brake disc - inspection, removal and installation

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Inspection

1 Refer to Section 4 of this Chapter, noting that the dial gauge should be attached to the swingarm.

Removal

2 Remove the rear wheel (see Section 15).
3 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 evenly and a little at a time in a criss-cross pattern to avoid distorting the disc, and remove the disc (see illustration).

Installation

4 Install the disc on the wheel with its marked side facing out, aligning the previously applied matchmarks (if you're reinstalling the original disc).

5 Clean the threads of the disc mounting bolts, then apply a suitable non-permanent thread locking compound. Install the bolts and tighten them evenly and a little at a time in a criss-cross pattern to the torque setting specified at the beginning of the Chapter. Clean off all grease from the brake disc using acetone or brake system cleaner. If a new brake disc has been installed, remove any protective coating from its working surfaces.

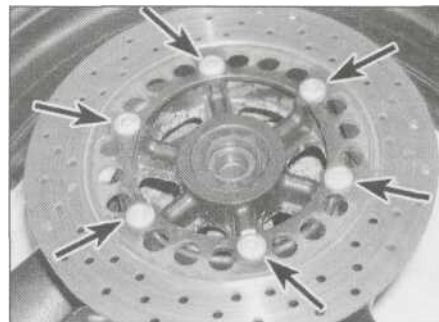
6 Install the rear wheel (see Section 15).

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

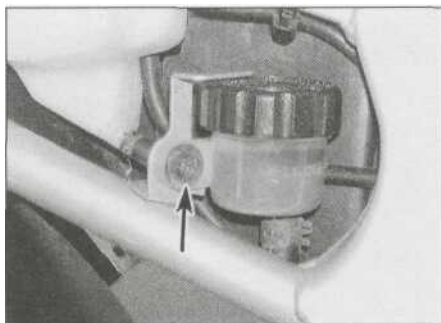
Rear brake master cylinder - removal, overhaul and installation 55

1 If the master cylinder is leaking fluid, or if the lever does not produce a firm feel when the brake is applied, bleeding the brakes does not help (see Section 11), and the hydraulic hoses are all in good condition, then master cylinder overhaul is recommended.

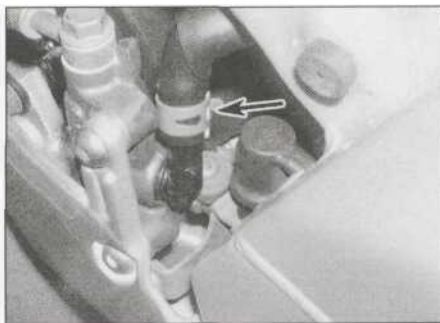
2 Before disassembling the master cylinder, read through the entire procedure and make sure that you have the correct rebuild kit.



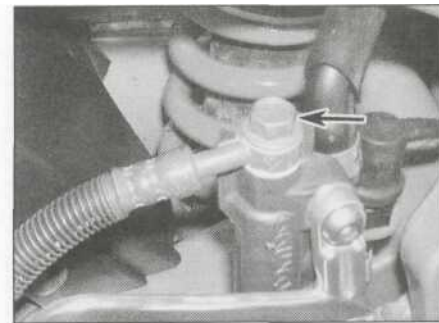
8.3 Rear brake disc bolts (arrowed)



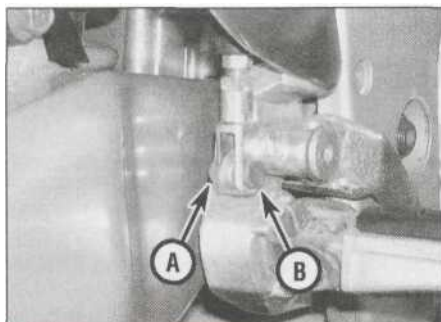
9.4a Remove the screw (arrowed) and drain the reservoir ...



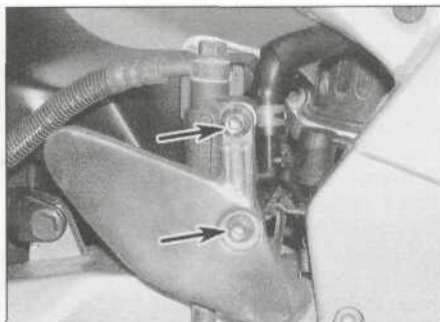
9.4b ... and detach the hose (arrowed) from the master cylinder



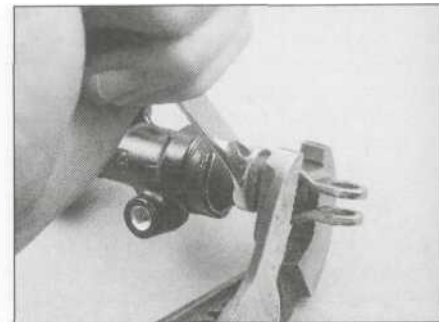
9.5 Brake hose banjo bolt (arrowed)



9.6 Remove the split pin (A) and withdraw the clevis pin (B)



9.7 Master cylinder mounting bolts (arrowed) - YZF model



9.8 Hold the clevis and slacken the locknut

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.

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

Removal

3 On YZF models, remove the seat and the right-hand side cover (see Chapter 8). On FZS models, remove the right-hand side cover (see Chapter 8).

4 Remove the screw securing the master cylinder fluid reservoir to the frame, then

remove the reservoir cap and diaphragm and pour the fluid into a container (see illustration). Release the clamp securing the reservoir hose to the union on the master cylinder and detach the hose, being prepared to catch any residue fluid (see illustration).

5 Unscrew the brake hose banjo bolt and separate the brake hose from the master cylinder, noting its alignment (see illustration). Discard the two sealing washers as they must be replaced with new ones. Wrap the end of the hose in a clean rag and suspend the hose in an upright position or bend it down carefully and place the open end in a clean container. The objective is to prevent excessive loss of brake fluid, fluid spills and system contamination.

6 Remove the split pin and washer from the clevis pin securing the brake pedal to the master cylinder pushrod (see illustration).

Withdraw the clevis pin and separate the pedal from the pushrod. Discard the split pin as a new one must be used.

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 and its base nut off the pushrod (see illustration).

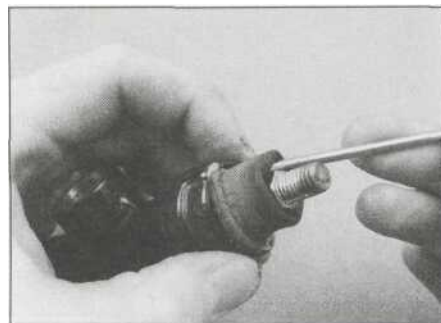
9 Dislodge the rubber dust boot from the base of the master cylinder to reveal the pushrod retaining circlip (see illustration).

10 Depress the pushrod and, using circlip pliers, remove the circlip (see illustration). Slide out the piston assembly and spring (see illustrations opposite). If they are difficult to remove, apply low pressure compressed air to the fluid outlet. Lay the parts out in the proper order to prevent confusion during reassembly.

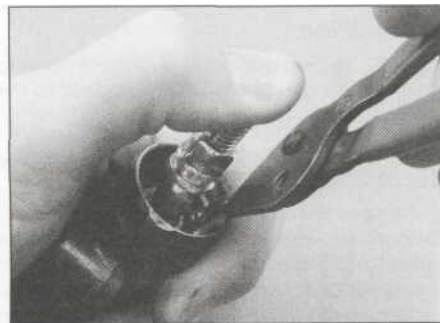
11 Clean all of the parts with clean brake fluid.

Caution: Do not, under any circumstances, use a petroleum-based solvent to clean brake parts. If compressed air is available, use it to dry the parts thoroughly (make sure it's filtered and unlubricated).

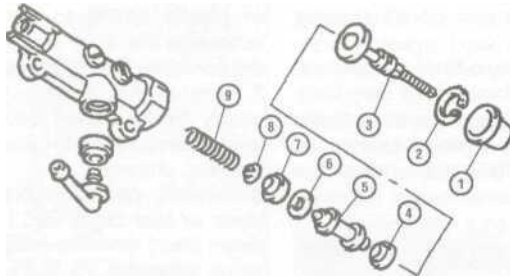
12 Check the master cylinder bore for corrosion, scratches, nicks and score marks. If the necessary measuring equipment is available, compare the diameter of the bore to that given in the Specifications Section of this Chapter. If damage is evident, the master cylinder must be replaced with a new one.



9.9 Remove the dust boot from the pushrod



9.10a Depress the piston and remove the circlip from the cylinder



9.10b Master cylinder components - YZF models

- | | | |
|-------------|----------|---------------|
| 1 Dust boot | 4 Seal | 7 Seal |
| 2 Circlip | 5 Piston | 8 Spring seat |
| 3 Pushrod | 6 Washer | 9 Spring |

13 Inspect the reservoir hose for cracks or splits and replace it with a new one if necessary. If required, pull the union from the master cylinder. Discard the bush as a new one must be used.

14 The dust boot, circlip, piston assembly and spring are included in the rebuild kit. Use all of the new parts, regardless of the apparent condition of the old ones. If the seal and cup are not already on the piston, fit them according to the layout of the old piston assembly.

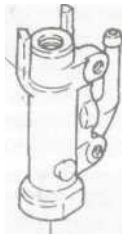
15 Fit the spring in the master cylinder so that its tapered end faces the piston.

16 Lubricate the piston assembly with clean brake fluid. Fit the assembly into the master cylinder, making sure it is the correct way round. Make sure the lips on the cup do not turn inside out when they are slipped into the bore.

17 Install and depress the pushrod, then fit a new circlip, making sure it is properly seated in the groove (see illustration 9.10a).

18 Install the rubber dust boot, making sure the lip is seated properly in the groove (see illustration 9.9).

19 If removed, fit a new reservoir hose union bush, then push the union into the master cylinder.



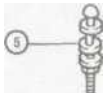
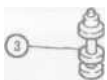
Installation

20 If removed, thread the clevis locknut, the clevis and its base nut onto the master cylinder pushrod end. Position the clevis as noted on removal, then tighten the clevis locknut securely (see illustration 9.8).

21 Fit the master cylinder onto the footrest bracket and tighten its mounting bolts to the torque setting specified at the beginning of the Chapter (see illustration 9.7).

22 Align the brake pedal with the master cylinder pushrod clevis, then slide in the clevis pin and secure it using a new split pin, not forgetting the washer (see illustration 9.6).

23 Connect the brake hose banjo bolt to the



9.10c Master cylinder components • FZS models

- | | |
|----------|-------------|
| 7 Spring | 5 Pushrod |
| 2 Seal | 6 Circlip |
| 3 Piston | 7 Dust boot |
| 4 Seal | |

master cylinder, using a new sealing washer on each side of the banjo union. Ensure that the hose is positioned so that it butts against the lug and tighten the banjo bolt to the specified torque setting (see illustration 9.5).

24 On FZS models, install the fluid reservoir and tighten its screw. On YZF models, locate the reservoir in position but do not fix it to the bracket, as it also acts as a cap clamp. Ensure that the hose is correctly routed, then connect it to the union on the master cylinder and secure it with the clamp (see illustration 9.4b). Check that the hose is secure and clamped at the reservoir end as well. If the clamps have weakened, use new ones.

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 11. On YZF models, on completion install the reservoir and tighten its screw (see illustration 9.4a).

26 On YZF models, install the seat, and on all models install the right-hand side cover (see Chapter 8).

27 Check the operation of the brake carefully before riding the motorcycle.

10 Brake hoses, pipes and unions - inspection and replacement j:k
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Inspection

1 Brake hose and pipe 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 metal brake pipe on each front caliper and the banjo union fittings connected to the brake hoses (see illustration). If the pipe is damaged or rusted or cracked, a new caliper must be installed as the pipe is not available separately (though it would be worth checking with a brake or hydraulic hose/pipe specialist). If the union fittings are rusted, scratched or cracked, fit new hoses.



10.2 Flex the brake hoses and check for cracks, bulges and leaking fluid



10.3 Check the condition of the metal pipe on each front caliper



10.4 Remove the banjo bolt and separate the hose from the caliper; there is a sealing washer on each side of the fitting

Replacement

4 The brake hoses have banjo union fittings on each end, with the exception of the rear caliper hose on YZF models which has a joint piece (see illustration 7.2b). Cover the surrounding area with plenty of rags and unscrew the banjo bolt at each end of the hose or pipe, noting its alignment (see illustration). On the rear caliper on YZF models, counter-hold the hose nut and unscrew the locknut and separate the hose from the joint in the caliper (see illustration 7.2b). If required, unscrew the joint from the caliper. Free the hose from any clips or guides and remove it. Discard the sealing washers on the hose unions.

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. On the rear caliper on YZF models, if removed, thread the joint piece into the caliper using a new sealing washer and tighten it to the torque setting specified at the beginning of the Chapter (see illustration 7.2b). Fit the hose against the hose joint and tighten the locknut onto the hose, counter-holding the hose nut to prevent the hose twisting. Do not overtighten the

locknut. Make sure the hoses are correctly aligned and routed clear of all moving components.

6 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 11). Check the operation of the brakes carefully before riding the motorcycle.

11 Brake system 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 the master cylinder or caliper is overhauled. Leaks in the system may also allow air to enter, but leaking brake fluid will reveal their presence and warn you of the need for repair.

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 spanner to fit the brake caliper bleed valves.

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

4 When bleeding the rear brake on YZF models, remove the seat and the right-hand side cover, and on FZS models remove the right-hand side cover (see Chapter 8) for access to the fluid reservoir.

5 Remove the reservoir cap or cover, diaphragm plate and diaphragm 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 cap or cover.

6 Pull the dust cap off the bleed valve (see

illustration). 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).

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

8 Carefully pump the brake lever or pedal three or four times and hold it in (front) or down (rear) while opening the caliper bleed valve. When the valve is opened, brake fluid will flow out of the caliper into the clear tubing and the lever will move toward the handlebar or the pedal will move down.

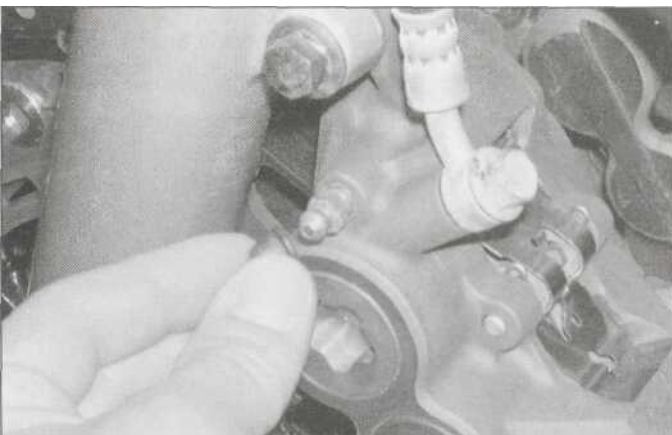
9 Retighten the bleed valve, then release the brake lever or pedal gradually. Repeat the process until no air bubbles are visible in the brake fluid leaving the caliper or, if the fluid is being changed, until new fluid is coming out, and the lever or pedal is firm when applied. When bleeding the front brake, go on to bleed the other caliper, or in the case of the rear brake also bleed air from the other bleed valve on the caliper. 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.



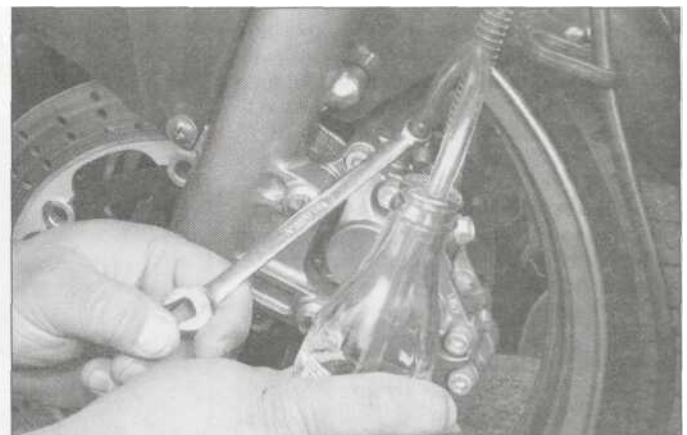
Old brake fluid is invariably much darker in colour than new fluid, making it easy to see when all old fluid has been expelled from the system.

10 Install the diaphragm and cap or cover assembly, wipe up any spilled brake fluid and check the entire system for leaks.

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.

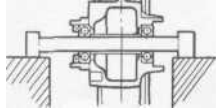


11.6a Brake caliper bleed valve



11.6b To bleed the brakes, you need a spanner, a short section of clear tubing, and a clear container half-filled with brake fluid

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

12 Wheels - inspection and repair

1 In order to carry out a proper inspection of the wheels, it is necessary to support the bike upright so that the wheel being inspected is raised off the ground. Position the motorcycle on a suitable stand. 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 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 axial (side-to-side) runout of the rim. In order to accurately check radial (out of round) runout with the dial gauge, the wheel would have to be removed 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, the wheel can be rotated to check the runout.

3 An easier, though slightly less accurate, method is to attach a stiff wire pointer to the fork 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 or hub bearings very carefully before replacing the wheel.*

4 The wheels should also be visually inspected for cracks, flat spots on the rim and other damage. 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. 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.

13 Wheels - alignment check

1 Misalignment of the wheels, which may be due to a cocked rear wheel or 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 In order to make a proper check of the wheels it is necessary to support the bike in an upright position, using a suitable stand. 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 was previously pointed out, a perfectly straight length of wood or metal bar may be substituted for the string (see illustration). The procedure is the same.

8 If the distance between the string and tyre is greater on one side, or if the rear wheel appears to be cocked, refer to Chapter 1, Section 1, and check that the chain adjuster markings coincide on each side of the swingarm.

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

10 Using the plumb bob, or other suitable weight, and a length of string, check the rear wheel to make sure it is vertical. To do this, hold the string against the 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.

11 Once the rear wheel is vertical, check the front wheel in the same manner. If both wheels are not perfectly vertical, the frame and/or major suspension components are bent.



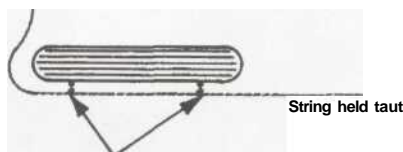
Distance between gauge and tyre must be equal each side and front and back

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Perfectly straight lengths of wood or metal bar

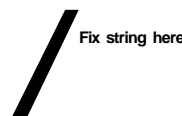


Rear tyre must be parallel to gauge at front and back



Hold string so that these distances are equal

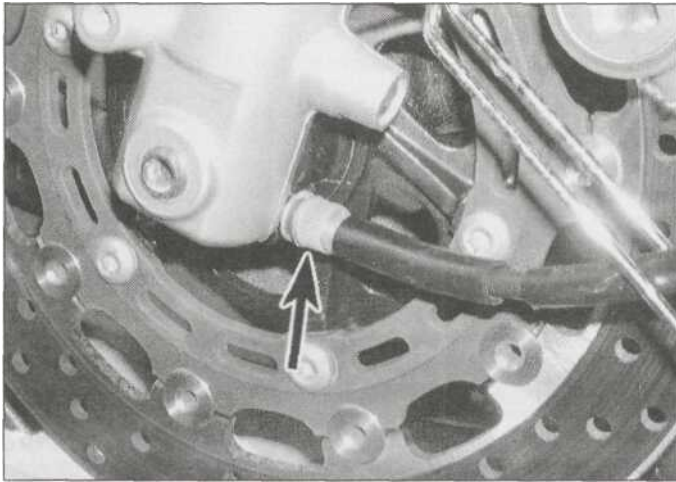
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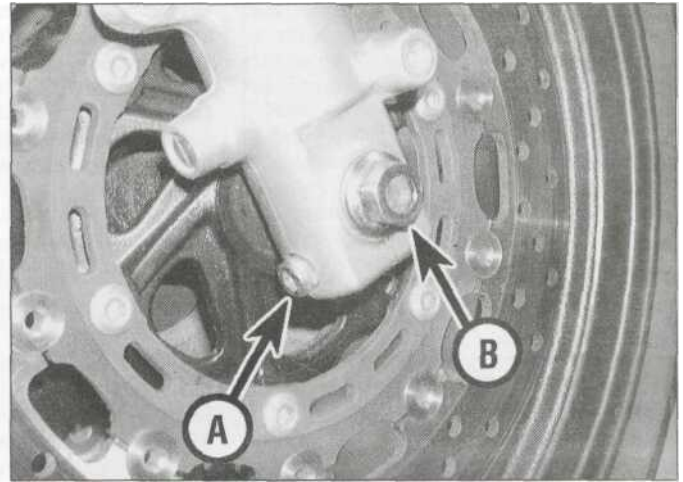
Fix string here

13.5 Wheel alignment check using string

13.7 Wheel alignment check using a straight-edge



14.3 Unscrew the ring (arrowed) and detach the cable



14.4 Slacken the clamp bolt (A) and unscrew the axle (B)

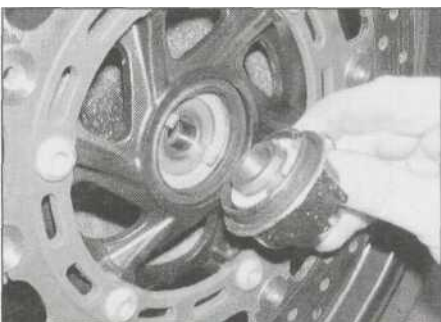
14 Front wheel - removal and installation

Removal

1 On YZF models, remove the fairing side panels (see Chapter 8), then put the motorcycle on an auxiliary stand and support it under the crankcase so that the front wheel is off the ground. On FZS models, put the motorcycle on the centrestand and support it under the crankcase so that the front wheel is off the ground. Always make sure the motorcycle is properly supported.



14.6a Remove the spacer ...



14.6b ... and the speedometer drive gear housing - YZF models

2 Displace the front brake calipers (see Section 3). Support the calipers with a piece of wire 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.

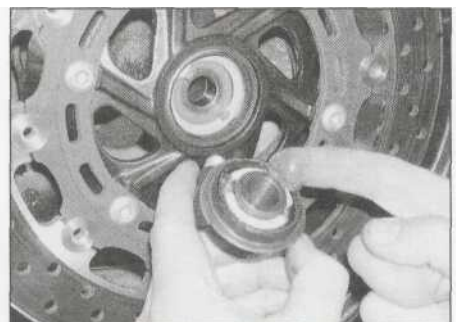
3 On YZF models, unscrew the knurled ring securing the speedometer cable to the drive gear and detach the cable (see illustration).

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

5 Support the wheel, then withdraw the axle from the right-hand side (see illustration 14.11b). Carefully lower the wheel from between the forks, noting how the speedometer drive gear or sensor locates against the fork. On FZS models, move the wheel backwards so that no strain is placed on the sensor wiring. Use a drift to drive out the axle if required.

6 Remove the spacer from the right-hand side of the wheel and the speedometer drive gear (YZF models) or sensor (FZS models) from the left-hand side, noting how they fit (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



14.9 Lubricate the various components

blocks so the disc doesn't support the weight of the wheel, or keep it upright.

7 Check the axle for straightness 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 fine emery cloth). If the equipment is available, place the axle in V-blocks and measure the runout using a dial gauge. If the axle is bent or the runout exceeds the limit specified, replace it with a new one.

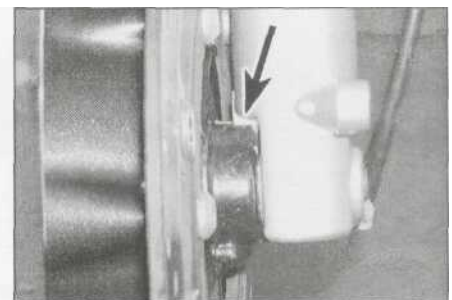
8 Check the condition of the wheel bearings (see Section 16).

Installation

9 Apply lithium based grease to the wheel spacer, the lips of the grease seals, and to the speedometer drive gear or sensor (see illustration). Fit the spacer into the right-hand side of the wheel and the drive gear or sensor into the left-hand side, making sure the tabs locate in the slots (see illustrations 14.6a and 14.6b).

10 Manoeuvre the wheel into position. Apply a thin coat of grease to the axle.

11 Lift the wheel into place between the fork sliders, making sure the spacer and drive gear or sensor remain in position, and that the slot in the drive gear or sensor locates over the tab on the inside of the fork (see illustration).



14.11 a Locate the tab on the inside of the fork in the slot in the top of the housing (arrowed)



14.11b ... and insert the axle

Slide the axle in from the right-hand side and tighten it to the torque setting specified at the beginning of the Chapter (see illustrations). Now tighten the axle clamp bolt on the bottom of the right-hand fork to the specified torque setting.

12 Install the brake calipers, making sure the pads sit squarely on either side of the discs

(see Section 3). Tighten the caliper mounting bolts to the specified torque setting.

13 On YZF models, fit the speedometer cable into the drive housing and tighten the knurled ring securely (see illustration). Install the fairing side panels (see Chapter 8).

14 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.

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

15 Rear wheel-removal and installation

Removal

1 Support the motorcycle securely in an upright position using an auxiliary stand (YZF models) or the centrestand (FZS models).

2 On FZS models, displace the rear brake caliper (see Section 7). Make sure no strain is placed on the hydraulic hose. There is no need to disconnect the hose from the caliper.

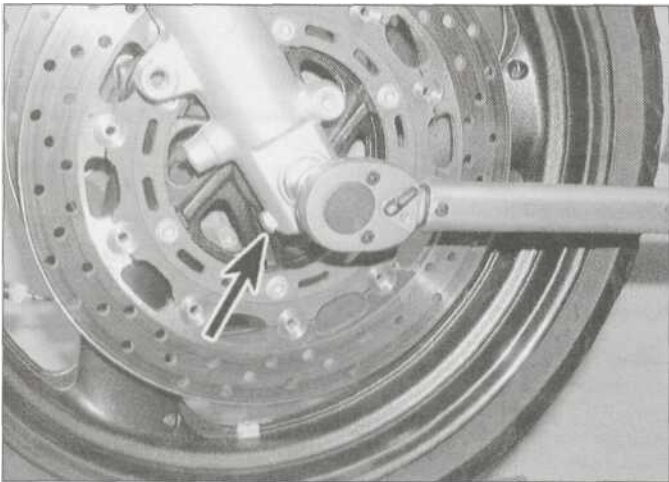
Note: Do not operate the brake pedal with the calipers removed.

3 Unscrew the axle nut and remove the adjustment position marker (see illustration). Slacken the adjuster locknut on each side of the swingarm, then turn the adjusters out to provide some slack in the chain.

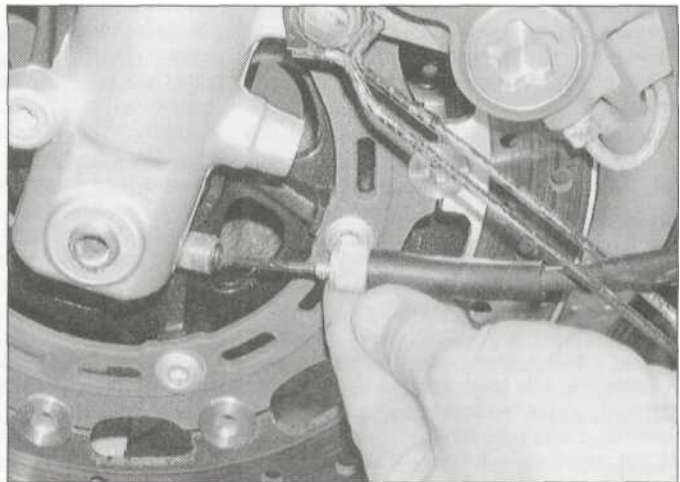
4 Support the wheel then withdraw the axle along with the other adjustment position marker and lower the wheel to the ground (see illustration). Note how the caliper bracket locates between the wheel and the swingarm.

5 Disengage the chain from the sprocket and remove the wheel from the between the swingarm ends (see illustration 15.10). Do not operate the brake pedal with the wheel removed.

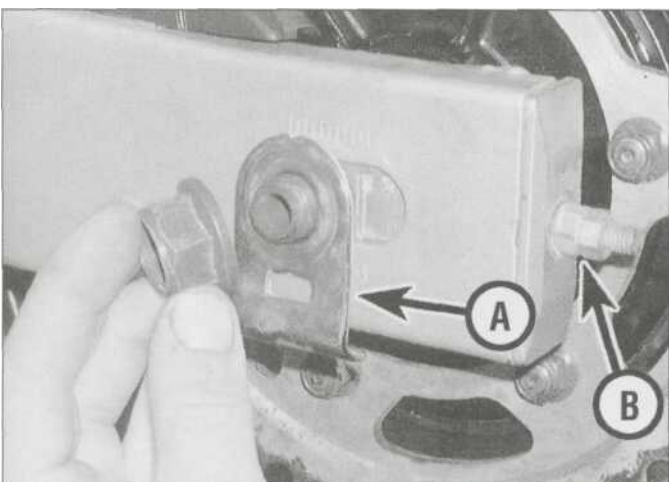
Caution: Do not lay the wheel down and allow it to rest on the disc or the sprocket -



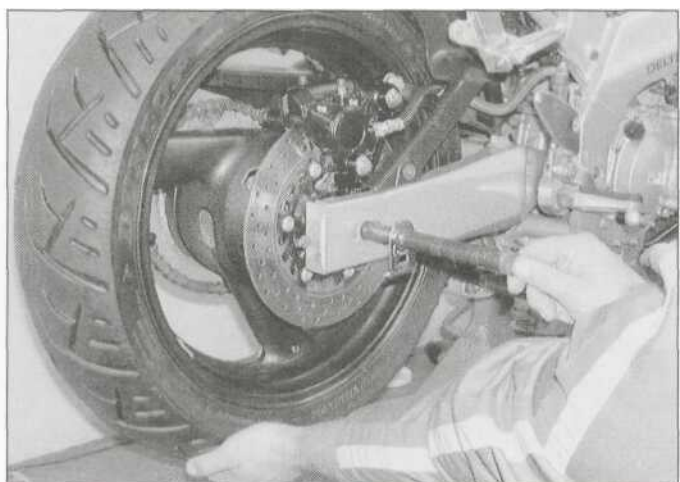
14.11c Tighten the axle to the specified torque, then tighten the clamp bolt (arrowed)



14.13 Install the cable and tighten the ring securely



15.3 Unscrew the axle nut and remove the position marker (A). Turn each chain adjuster (B) out to create some slack



15.4 Withdraw the axle and remove the wheel



15.7a Remove the plain collar from the left-hand side ..



15.7b ... and the shouldered collar from the right-hand side



15.10 Manoeuvre the wheel into position and fit the chain onto the sprocket

they could become warped. Set the wheel on wood blocks so the disc or the sprocket doesn't support the weight of the wheel.

6 Check the axle for straightness 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 fine emery cloth). If the equipment is available, place the axle in V-blocks and measure the runout using a dial gauge. If the axle is bent or the runout exceeds the limit specified, replace it with a new one.

7 Remove the collar from each side of the wheel, noting which fits where (see illustrations). Check the condition of the grease seals and wheel bearings (see Section 16).

Installation

8 Apply a thin coat of lithium based grease to the lips of each grease seal, and also to the collars and the axle. Slide the right-hand adjustment position marker onto the axle, making sure it is the correct way round.

9 Install the plain collar into the left-hand side of the wheel and the shouldered collar into the right-hand side (see illustrations 15.7a and 15.7b). Manoeuvre the wheel so that it is in between the ends of the swingarm. Align the brake caliper bracket.

10 Engage the drive chain with the sprocket and lift the wheel into position, on YZF models, making sure the disc fits correctly between the brake pads (see illustration). Make sure the collars and caliper bracket remain correctly in place.

11 Slide the axle, with the adjustment marker, through from the right-hand side (see illustration 15.4). Make sure it passes through the chain adjusters and the caliper bracket. On YZF models, align the flats on the axle head between the raised sections on the adjustment marker (see illustration). Check that everything is correctly aligned, then fit the left-hand adjustment position marker and the axle nut (see illustration 15.3).

12 Adjust the chain slack as described in Chapter 1, then tighten the axle nut to the torque setting specified at the beginning of the Chapter, on FZS models counter-holding the axle head on the other side of the wheel if necessary.

13 On FZS models, install the brake caliper, making sure the pads sit squarely on either side of the disc (see Section 7).

14 Operate the brake pedal several times to bring the pads into contact with the disc. Check the operation of the rear brake carefully before riding the bike.

16 Wheel bearings- removal, inspection and installation

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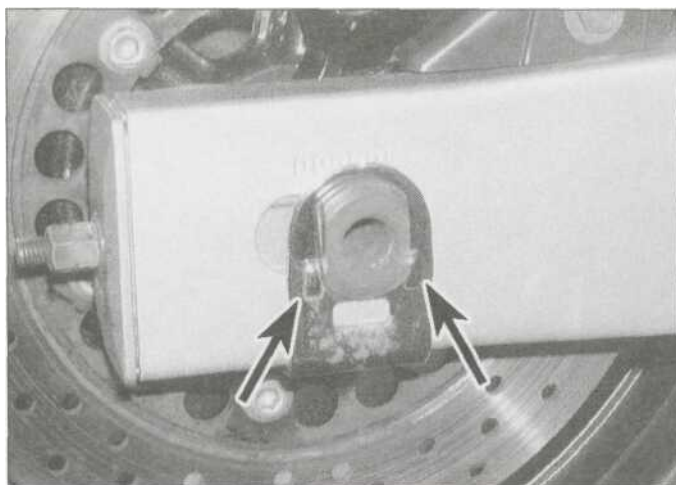
Front wheel bearings

Note: Always replace the wheel bearings in pairs. Never replace the bearings individually. Avoid using a high pressure cleaner on the wheel bearing area.

- 1 Remove the wheel (see Section 14).
- 2 Set the wheel on blocks so as not to allow the weight of the wheel to rest on the brake disc.
- 3 Lever out the grease seal on right-hand side of the wheel using a flat-bladed screwdriver, taking care not to damage the rim (see illustration). Discard the seal if it is damaged or deteriorated.



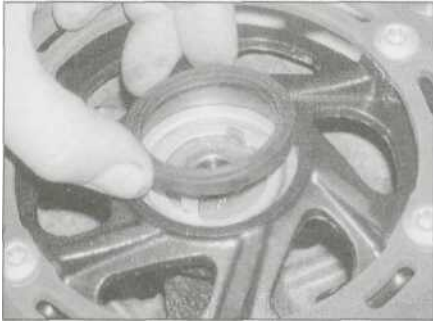
Position a piece of wood against the wheel to prevent the screwdriver shaft damaging it when levering the grease seal out.



15.11 On YZF, locate the flats on the axle head between the raised sections (arrowed) on the position marker



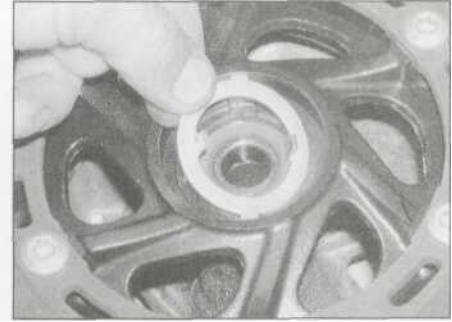
16.3 Lever out the grease seal



16.4a OnYZF models, lever out the grease seal...



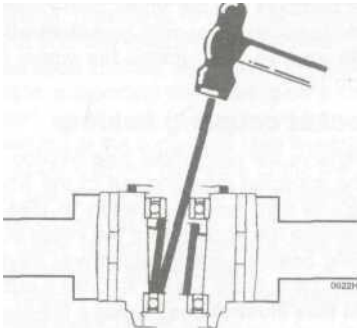
16.4b ... then lever out the retainer plate...



16.4c ... and remove the drive plate...



16.5a Knock out the bearings using a drift...



16.5b ... locating the drift as shown

4 On YZF models, lever out the grease seal and retainer plate on the left-hand side of the wheel and remove the speedometer drive plate, noting how it fits (**see illustrations**).

5 Using a metal rod (preferably a brass drift punch) inserted through the centre of the one bearing, tap evenly around the inner race of the other 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 If the bearings 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). Apply a few drops of oil to the bearing. **Note:** *If the bearing is sealed on both sides don't attempt to clean it.*

Refer to 'Tools and Workshop Tips' in Reference (Section 5) for more information about bearings.

8 Hold the outer race of the bearing and rotate the inner race - if the bearing doesn't

turn smoothly, has rough spots or is noisy, replace it with a new one.

9 If the bearing is good and can be re-used, wash it in solvent once again and dry it, then pack the bearing with lithium based grease.

10 Thoroughly clean the hub area of the wheel. Install the right-hand bearing into its recess in the hub, with the marked or sealed side facing outwards. Using the old bearing (if new ones are being fitted), 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**).

11 Turn the wheel over and install the bearing spacer. Drive the left-hand bearing into place as described above.

12 On YZF models, 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 cutouts in the hub (**see illustration**). Press the retainer plate onto the drive plate (**see illustration 16.4b**). Apply a smear of lithium based grease to the lips of the seal, then press it into the wheel, using a seal or bearing driver or a suitable socket to drive it into place if necessary (**see illustration 16.4a**).

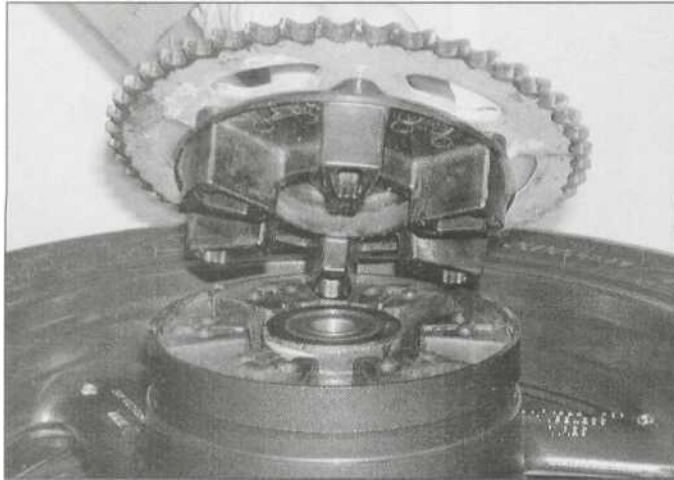
13 Apply a smear of lithium based grease to the lips of the seal, then press it into the right-hand side of the wheel, using a seal or bearing



16.10 A socket can be used to drive in the bearing



16.12 Fit the drive plate



16.15a Lift the sprocket coupling out of the wheel. ..



16.15b ... and remove the rubber damper segments

driver or a suitable socket to drive it into place if necessary (see illustration 16.10).

14 Clean off all grease from the brake discs using acetone or brake system cleaner then install the wheel (see Section 14).

Rear wheel bearings

15 Remove the rear wheel (see Section 15). Lift the sprocket coupling out of the wheel, noting how it fits, and remove the rubber dampers (see illustrations).



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

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

17 Lever out the grease seal on the right-hand side of the wheel using a flat-bladed screwdriver, taking care not to damage the rim of the hub (see Haynes Hint). Discard the seal if it is damaged or deteriorated.

18 Using a metal rod (preferably a brass drift punch) inserted through the centre of the right-hand bearing, tap evenly around the inner race of the left-hand bearing to drive it from the hub (see illustrations 16.5a and 16.5b). The bearing spacer will also come out.

19 Lay the wheel on its other side so that the right-hand bearing faces down. Drive the bearing out of the wheel using the same technique as above.

20 Refer to Steps 7 to 9 above and check the bearings.

21 Thoroughly clean the hub area of the wheel. First install the left-hand bearing into its recess in the hub, with the marked or sealed side facing outwards. Using the old bearing (if new ones are being fitted), a bearing driver or a socket large enough to contact the outer race of the bearing, drive it in squarely until it's completely seated (see illustration 16.10).

22 Turn the wheel over and install the bearing

spacer. Drive the right-hand side bearing into place as described above.

23 Apply a smear of grease to the lips of the new grease seal, and press it into the right-hand side of the wheel, using a seal or bearing driver, a suitable socket or a flat piece of wood to drive it into place if necessary.

24 Clean off all grease from the brake disc using acetone or brake system cleaner. Fit the rubber dampers into the wheel, then install the sprocket coupling assembly (see illustrations 16.15b and 16.15a). Install the wheel (see Section 15).

Sprocket coupling bearing

25 Remove the rear wheel (see Section 15). Lift the sprocket coupling out of the wheel, noting how it fits (see illustration 16.15a).

26 Remove the spacer from the inside of the coupling bearing, noting which way round it fits, using a suitable socket to drive it out if it is tight (see illustrations). Using a flat-bladed screwdriver, lever out the grease seal from the outside of the coupling (see illustration).

27 Support the coupling on blocks of wood and drive the bearing out from the inside using a bearing driver or socket (see illustration).

28 Refer to Steps 7 to 9 above and check the bearings.



16.26a Use a socket to drive out the spacer...



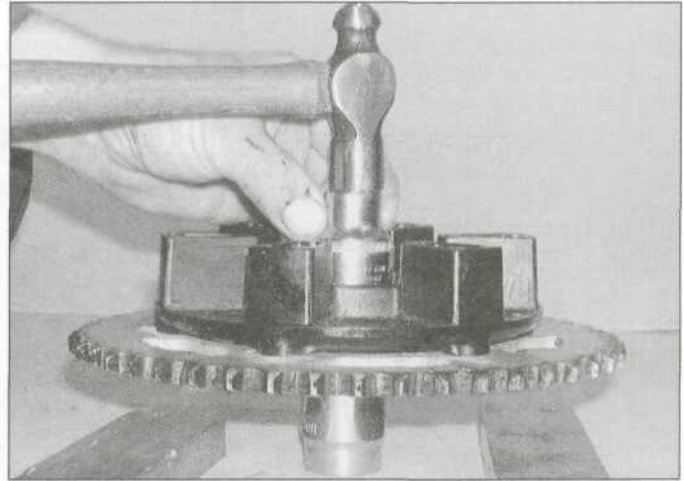
16.26b ... and remove it from the inside, noting how it fits



16.26c Lever out the grease seal



16.27 Drive the bearing out from the inside



16.30 Support the bearing when driving in the spacer

29 Thoroughly clean the bearing recess in the coupling then fit the bearing into the outside of the coupling, with the marked or sealed side facing out. Using the old bearing (if new ones are being fitted), a bearing driver or a socket large enough to contact the outer race of the bearing, drive it in until it is completely seated.

30 Fit the spacer into the inside of the coupling, making sure it is the correct way round and fits squarely into the bearing (**see illustration 16.26b**), and drive it into place if it is tight, supporting the bearing on a suitable socket as you do to prevent it from being driven out at the same time (**see illustration**).

31 Apply a smear of grease to the lips of the new seal, and press it into the coupling, using a seal or bearing driver, a suitable socket or a flat piece of wood to drive it into place if necessary (**see illustration**).

32 Check the sprocket coupling/rubber damper (see Chapter 6).

33 Clean off all grease from the brake disc using acetone or brake system cleaner. Fit the sprocket coupling into the wheel (**see illustration 16.15a**), then install the wheel (see Section 15).

17 Tyres- general information and fitting

General information

1 The wheels fitted on 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 overleaf**).

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

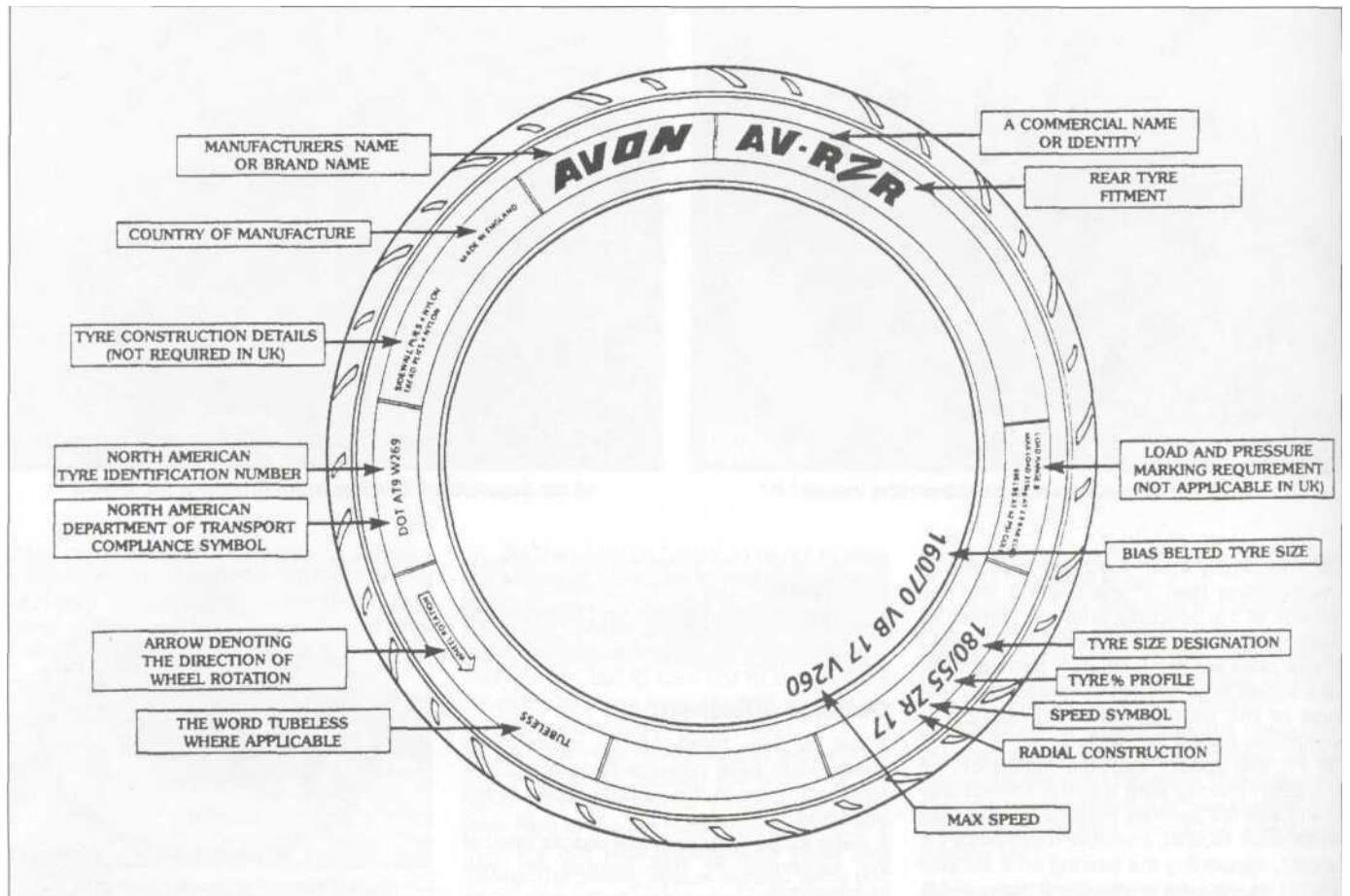


16.31 Press or drive the seal into the coupling - using a piece of wood as shown sets the seal flush with the rim

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. Yamaha recommend that such repairs are carried out only by an authorised dealer.

7*22 Brakes, wheels and tyres



17.3 Common tyre sidewall markings