

# Chapter 7

## Brakes, wheels and tyres

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### Degrees of difficulty

<b>Easy</b> , suitable for novice with little experience 	<b>Fairly easy</b> , suitable for beginner with some experience 	<b>Fairly difficult</b> , suitable for competent DIY mechanic 	<b>Difficult</b> , suitable for experienced DIY mechanic 	<b>Very difficult</b> , suitable for expert DIY or professional 
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### Specifications

#### Brakes

Brake fluid type . . . . .	DOT 4
Brake pad friction material wear limit	
TDM and TRX models . . . . .	0.5 mm
XTZ models . . . . .	1.5 mm
Front caliper bore ID	
1991 to 1995 TDM models . . . . .	45.40 mm
1996-on TDM models	
Upper bore . . . . .	33.96 mm
Lower bore . . . . .	30.23 mm
TRX models . . . . .	32.10 mm
XTZ models . . . . .	27.00 mm
Front disc thickness	
Standard . . . . .	4.0 mm
Service limit . . . . .	3.5 mm
Front disc maximum runout . . . . .	0.2 mm
Front master cylinder bore ID	
TDM and TRX models . . . . .	15.8 mm
XTZ models . . . . .	14.0 mm
Rear caliper bore ID	
TDM and TRX models . . . . .	42.8 mm
XTZ models . . . . .	27.0 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 . . . . .	14.0 mm

**Wheels**

Wheel runout (max)	
Axial (side-to-side)	
TDM and XTZ models	0.5 mm
TRX models	2.0 mm
Radial (out-of-round)	
TDM and XTZ models	1.0 mm
TRX models	2.0 mm

**Tyres**

Tyre pressures	see <i>Daily (pre-ride) checks</i>
Tyre sizes*	
1991 to 1995 TDM models	
Front	110/80-18 58H, tubeless
Rear	150/70-17 69H, tubeless
1996-on TDM models	
Front	110/80-ZR18, tubeless
Rear	150/70-ZR17, tubeless
TRX models	
Front	120/60-ZR17, tubeless
Rear	160/60-ZR17, tubeless
XTZ models	
Front	90/90-21 54H, tubed
Rear	140/80-17 69H, tubed

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

**Torque settings**

Brake pad retaining pins – XTZ models	18 Nm
Brake caliper mounting bolts	
1991 to 1995 TDM models	35 Nm
1996-on TDM models and TRX models	40 Nm
XTZ models	35 Nm
Brake hose banjo bolts	
1991 to 1995 TDM models	26 Nm
1996-on TDM models and TRX models	30 Nm
XTZ models	25 Nm
Brake disc bolts	
TDM models and XTZ models	20 Nm
TRX models	23 Nm
Front brake master cylinder clamp bolts	
TDM models	9 Nm
TRX and XTZ models	10 Nm
Rear brake master cylinder bolts	
TDM and TRX models	23 Nm
XTZ models	20 Nm
Brake caliper bleed valves	6 Nm
Front wheel axle	
TDM models	58 Nm
TRX models	65 Nm
Front wheel axle clamp bolt	
TDM models	19 Nm
TRX models	20 Nm
Front wheel axle nut – XTZ models	110 Nm

**1 General information**

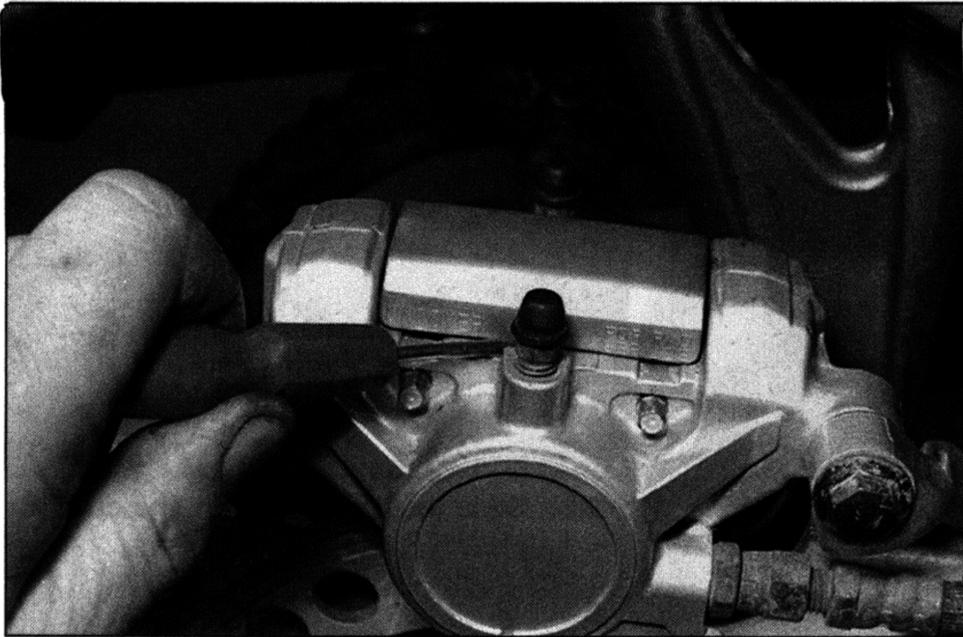
TDM and TRX models are fitted with cast alloy wheels designed for tubeless tyres only. XTZ models are fitted with spoked wheels designed for tubed tyres only. Both front and rear brakes are hydraulically operated disc brakes.

On TDM and TRX models, the front brakes are twin opposed-piston calipers, and the rear brake is a single opposed piston caliper. On XTZ models, both front and rear brakes are twin piston sliding calipers.



**Warning: Disc brake components rarely require disassembly. Do not disassemble components unless absolutely necessary. If a hydraulic brake**

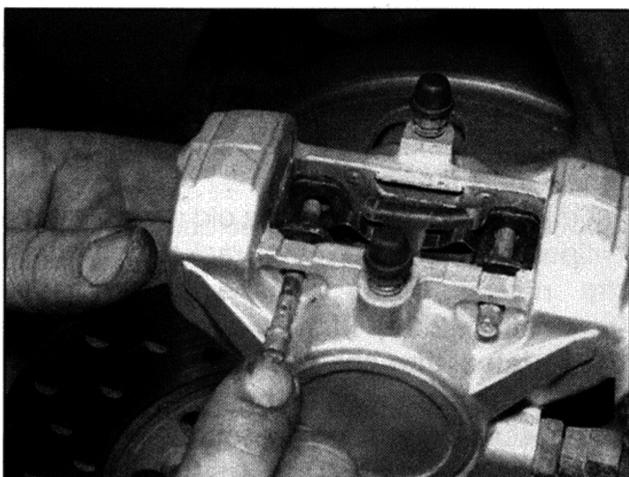
**line is loosened, the entire system must be disassembled, drained, cleaned and then properly filled and bled upon reassembly. Do not use solvents on internal brake components. Solvents will cause the seals to swell and distort. Use only clean brake fluid or denatured alcohol for cleaning. Use care when working with brake fluid as it can injure your eyes and it will damage painted surfaces and plastic parts.**



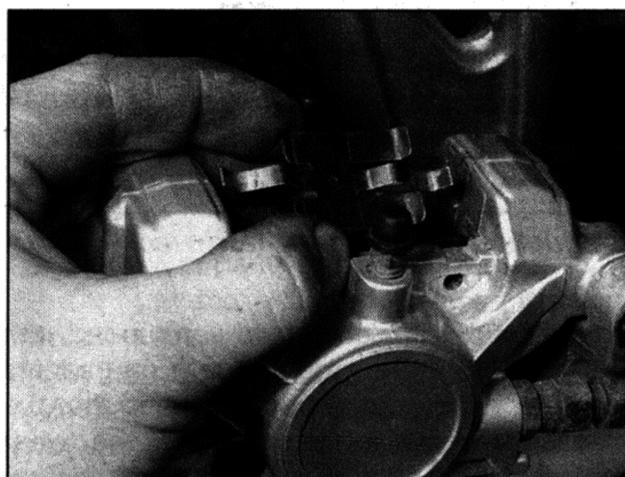
2.1a Remove the pad cover . . .



2.1b . . . then remove the retaining clips . . .



2.1c . . . and withdraw the pad pins



2.1d Remove the pad spring . . .



2.1e . . . and lift out the pads

**2 Brake pads – replacement**

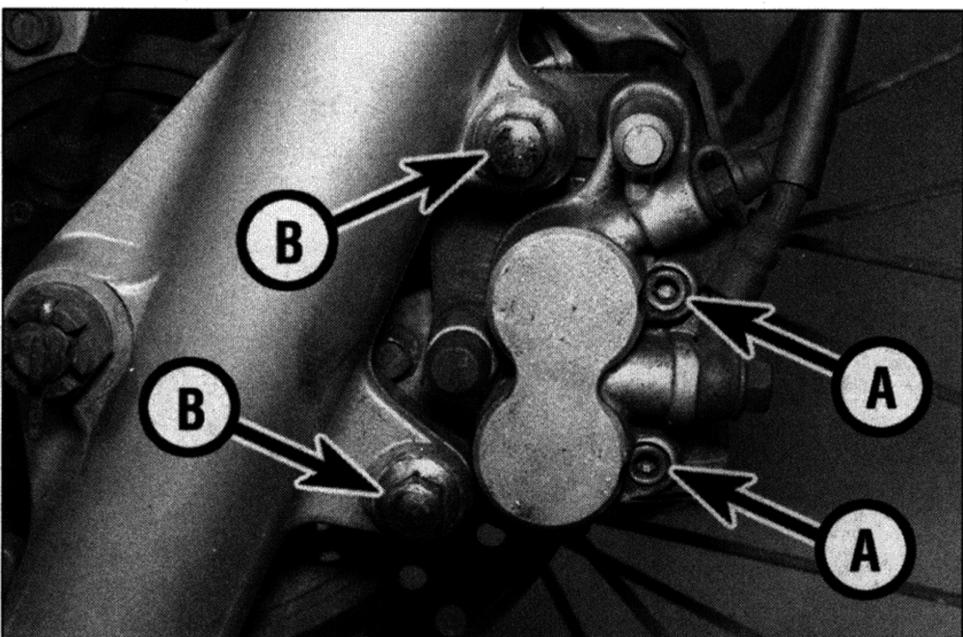
 **Warning: The dust created by the brake system may contain asbestos, which is harmful to**

**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.**

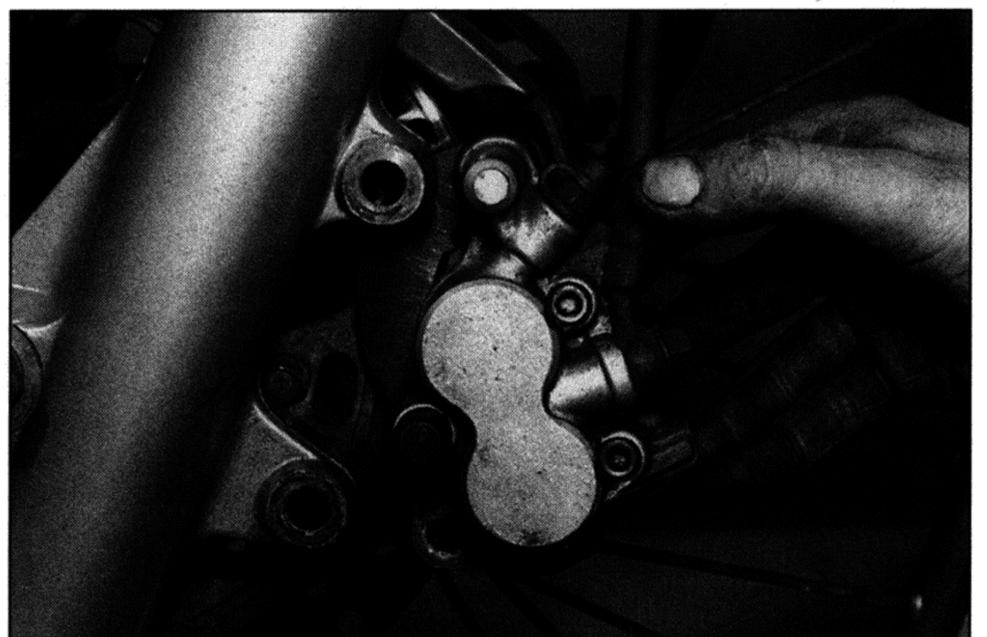
1 On TDM and TRX models, where fitted, remove the pad cover from the top of the caliper (see illustration). Remove the pad pin retaining clips, then withdraw the pad pins from the caliper, noting how they locate

against the pad spring (see illustrations). Remove the spring, noting how it fits, then lift out the pads (see illustrations). Where fitted, remove the shims from the back of the pads, noting how they fit.

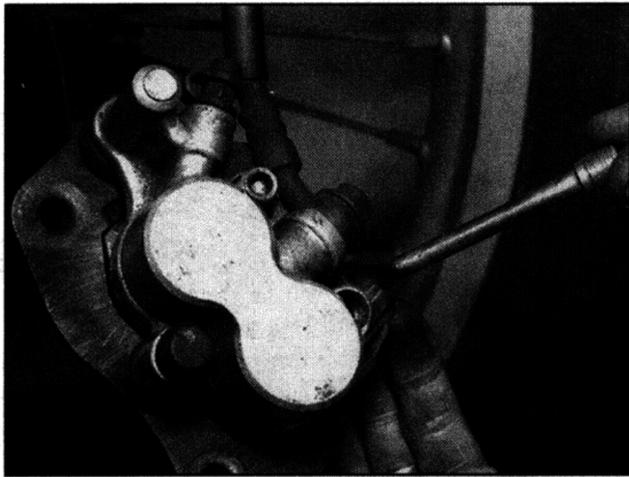
2 On XTZ models, slacken the pad retaining pins, then unscrew the caliper mounting bolts and slide the caliper off the disc (see illustrations). Unscrew the pad retaining pins



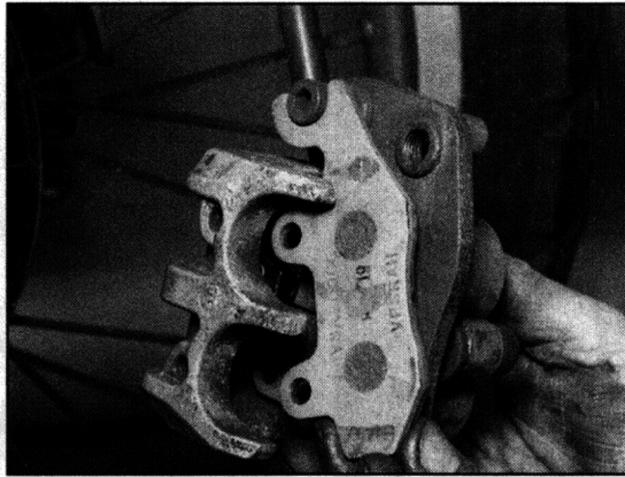
2.2a Slacken the pad retaining pins (A), then unscrew the caliper mounting bolts (B) . . .



2.2b . . . and slide the caliper off the disc



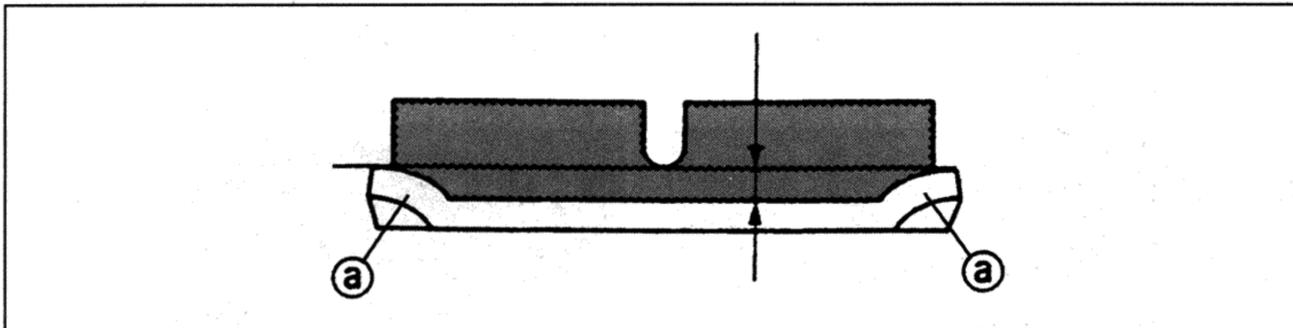
2.2c Remove the pad pins ...



2.2d ... and lift out the pads, noting how they fit



2.2e Slide the bracket out of the caliper



2.3a Pad wear indicator tangs (a) and minimum friction material limit (arrowed) – TDM and TRX

and withdraw them (see illustration). Remove the inner pad, noting how it locates against the guide pin on the caliper bracket, then remove the outer pad, noting how it sits in the caliper bracket (see illustration). Where fitted, remove the shims from the back of the pads, noting how they fit. Separate the bracket from the caliper, noting how it fits (see illustration). Remove the pad spring if required, noting how it fits (see illustration 2.11a).

3 Inspect the surface of each pad for contamination and check that the friction material has not worn level with or beyond the wear indicator tangs or groove (see Chapter 1) (see illustrations). Yamaha also specify a minimum friction material thickness (see

Specifications) which should correspond with the tang height or groove depth on genuine Yamaha pads. It is strongly advised that the pads are renewed well before the wear indicators or minimum amount of friction material is reached. The pads should also be renewed if they are fouled with oil or grease, or heavily scored or damaged by dirt and debris; it is not possible to degrease the friction material. Always renew both pads in the caliper and renew the pads in each front caliper at the same time.

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.

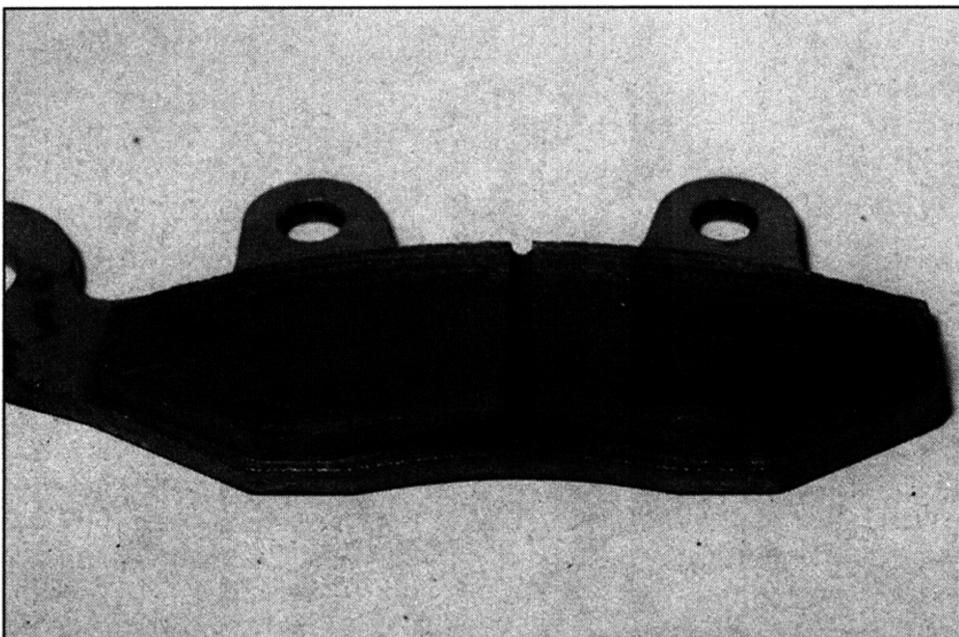
5 Check the condition of the brake disc(s) (see Section 4).

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

7 On XTZ models, clean the old grease off the caliper slider pins on the bracket and check the rubber boots in the caliper (see illustration 2.2e). If they are damaged or deteriorated, they should be renewed.

8 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.

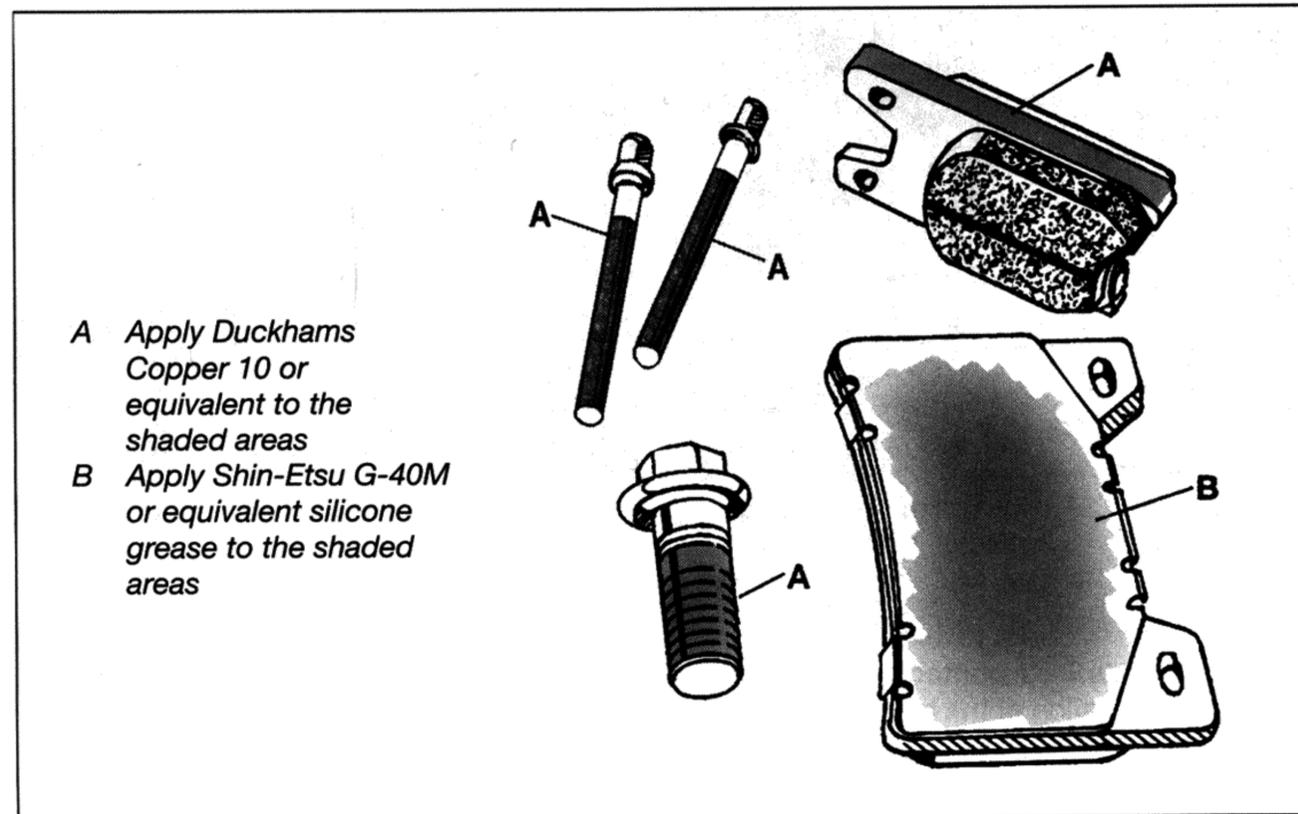
9 Where removed, fit the shims onto the back of the pads, making sure the arrow points in the direction of normal disc rotation (see illustration). The following step is necessary on UK models, and anywhere else where salt is used on the roads, to ensure that the pads move freely in the calipers. Apply a thin film of Duckhams Copper 10 or equivalent to the



2.3b Pad friction material showing wear limit groove – XTZ models



2.9a Fit the shim onto the back of the pad, making sure the arrow points in the direction of normal disc rotation



- A Apply Duckhams Copper 10 or equivalent to the shaded areas
- B Apply Shin-Etsu G-40M or equivalent silicone grease to the shaded areas

**2.9b** Special lubricants are required in the UK (and recommended anywhere salt is used on the roads) to prevent corrosion

following areas before installing the pads (see illustrations):

- a) To the edges of the metal backing on the brake pads.
- b) To the pad retaining pins.
- c) To the areas of the caliper where the pads rub.
- d) To the threads of the caliper mounting bolts.
- e) To the surfaces of the slider pins on XTZ models.

**Caution: Don't use too much Copper 10 and make sure it doesn't contact the brake discs or the pad friction surfaces.**

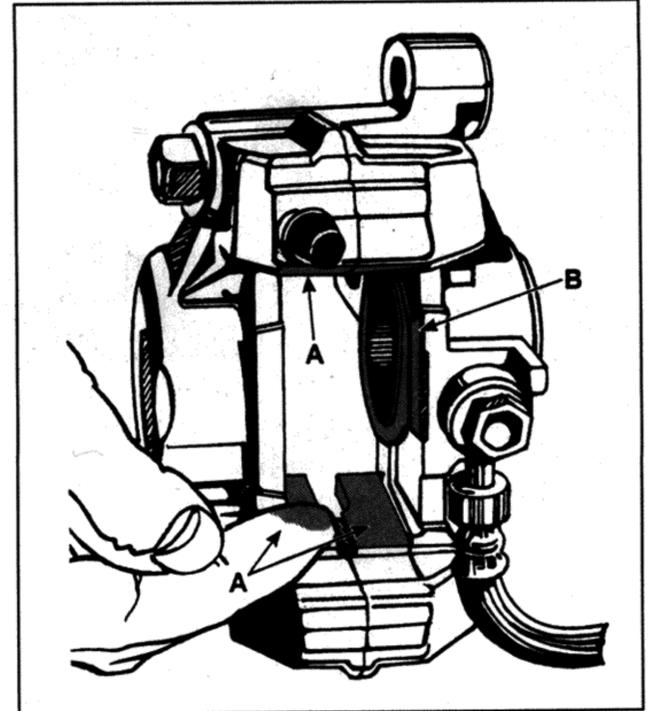
Apply a thin film of Shin-Etsu G-40M or equivalent silicone grease to the following:

- f) Exposed areas of the caliper pistons

g) The areas of the pad backing plates that contact the pistons.

**10** On TDM and TRX models, insert the pads into the caliper so that the friction material faces the disc (see illustration 2.1e). Fit the pad spring onto the pads, making sure the arrow (where present) or the longer outer tabs point in the direction of normal disc rotation (see illustration 2.1d). Install 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 2.1c and b). Where fitted, install the caliper cover (see illustration).

**11** On XTZ models, if removed, fit the pad spring into the caliper, making sure the larger tabs point to the outside of the caliper (see illustration). Apply the specified grease (see Step 9) to the slider pins on the bracket and slide the bracket into the caliper (see



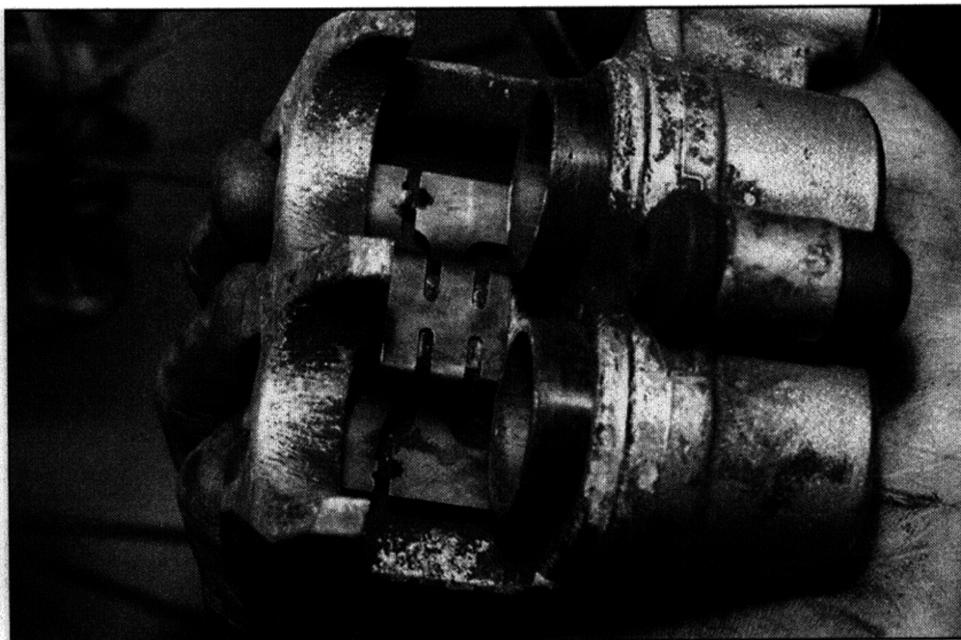
**2.9c** Apply the recommended lubricants to the pad friction areas inside the caliper and to the exposed portion of the caliper pistons

- A Duckhams Copper 10
- B Shin-Etsu G-40M or equivalent silicone grease



**2.10** Clip the cover onto the caliper, making sure it is secure

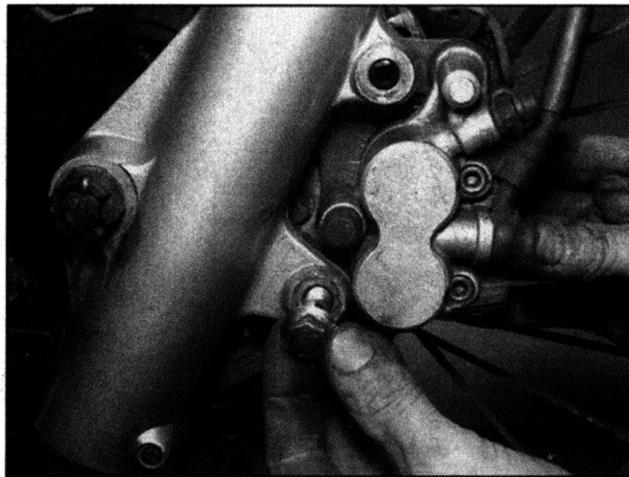
illustration 2.2e). Fit the outer pad, making sure it locates correctly (see illustration),



**2.11a** Install the pad spring as shown



**2.11b** Locate the outer pad into the caliper as shown



2.11c Slide the caliper onto the disc . . .



2.11d . . . and tighten the mounting bolts . . .



2.11e . . . and the pad pins to the specified torque

then fit the inner pad, locating the cutout against the guide (see illustration 2.2d). Install the pad pins, making sure they pass through the hole in each pad, and tighten them finger-tight (see illustration 2.2c). Install the brake caliper and tighten its bolts to the torque setting specified at the beginning of the Chapter, then tighten the pad retaining pins to the specified torque (see illustrations).

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

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 calipers – removal, overhaul and installation



**Warning:** 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. 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 clean brake fluid only on the internal parts. Brake cleaner or denatured alcohol can be used on external parts.

#### Removal

1 On XTZ models, if removing the rear brake caliper, unscrew the bolts securing the rear

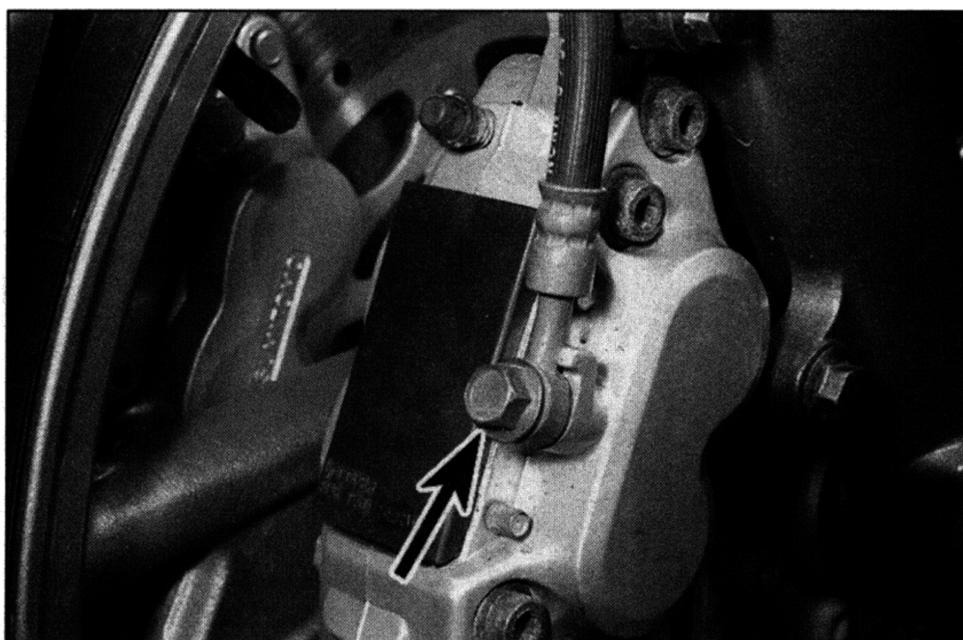
caliper shield and remove the shield (see illustration). If the brake pads are being removed from the calipers, slacken the pad retaining pins now (see illustration 2.2a).

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, unscrew the brake hose banjo bolt (see illustration). Note the alignment of the hose on the caliper and separate the hose from the caliper. On the rear caliper on TDM models, counter-hold the hose nut and unscrew the locknut and separate the hose from the hose joint in the caliper (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 banjo bolt 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.

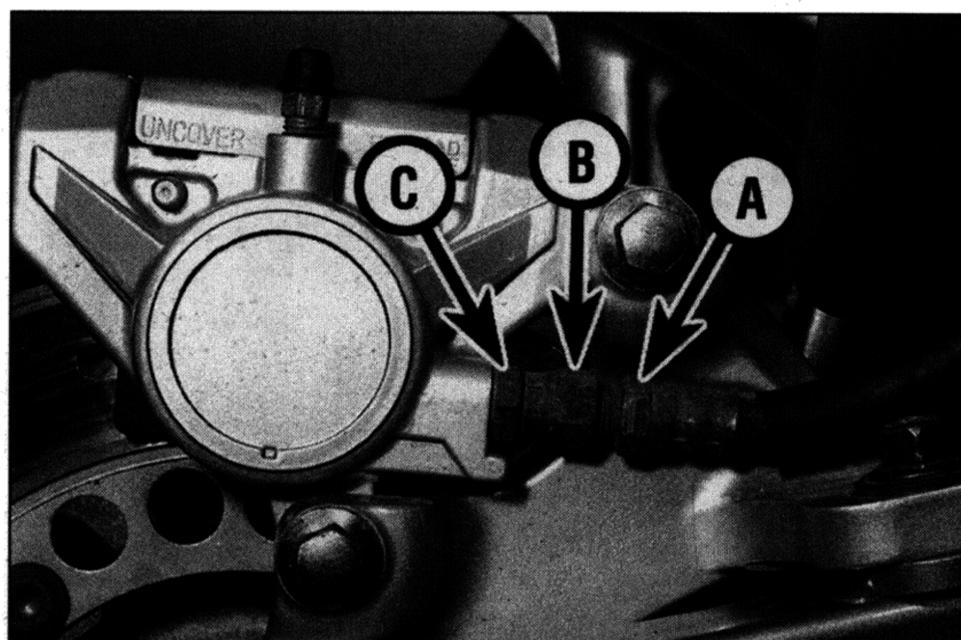
3 Unscrew the caliper mounting bolts, and



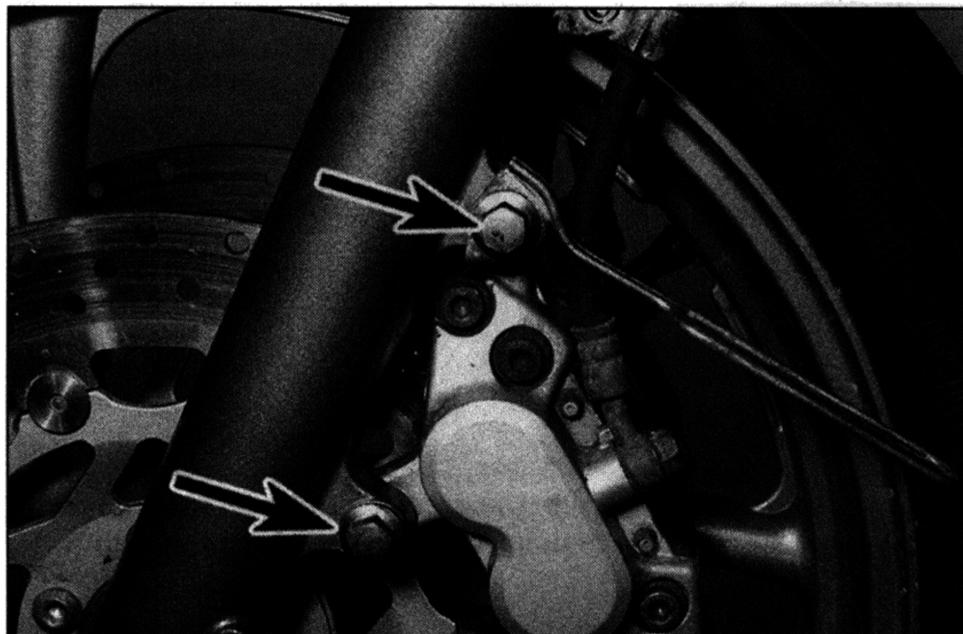
3.1 Unscrew the bolts (arrowed) and remove the shield



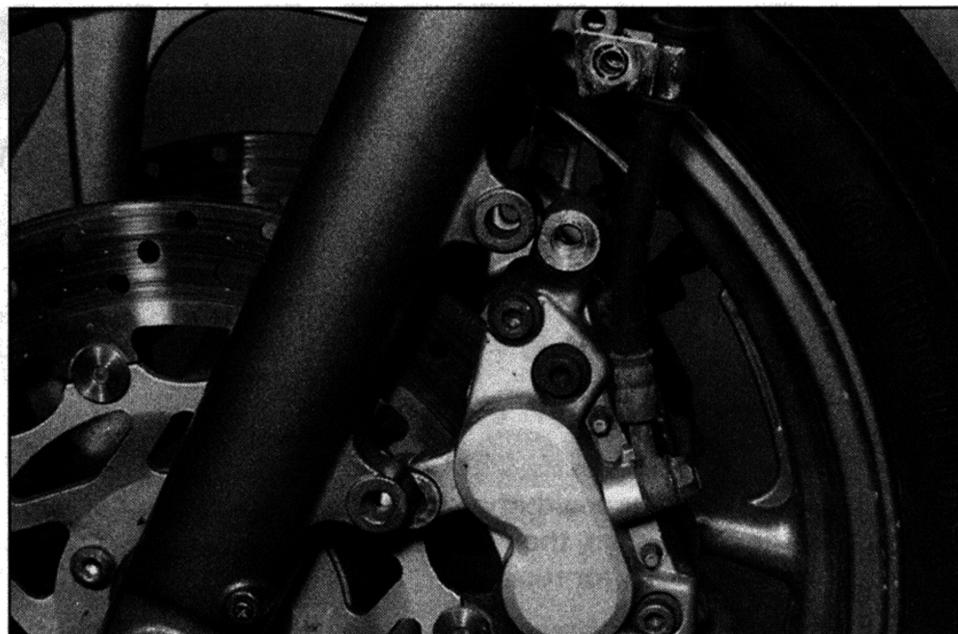
3.2a Unscrew the brake hose banjo bolt (arrowed), noting its alignment



3.2b Counter-hold the hose nut (A) and unscrew the locknut (B) from the hose joint (C)



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



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

slide the caliper off the disc (see illustrations).

4 If the calipers are being overhauled, remove the brake pads (see Section 2). If the calipers are just being displaced, the pads can be left in place.

### Overhaul

5 Clean the exterior of the caliper with brake system cleaner or denatured alcohol. On XTZ models, if not already done, separate the caliper bracket from the caliper, noting how it fits (see illustration 2.2e).

6 Displace the pistons as far as possible from the caliper body, either by pumping them out by operating the front brake lever or rear brake pedal (as applicable), or by forcing them out using compressed air. If the compressed air method is used, place a wad of rag between the pistons and the caliper to act as a cushion, then use compressed air directed into the fluid inlet to force the pistons out of the body. Use only low pressure to ease the pistons out and make sure the pistons 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. On opposed piston calipers there is not enough room to remove the pistons from both sides at the same time, so block one side in their

bore using a piece of wood and displace the opposite side first, then remove the seals (see below), reinstall the removed pistons and block them using the wood while removing the other side. Now remove the wood and the first pistons, which can now be easily removed. 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:** On TDM and TRX models, do not attempt to remove the caliper body bolts and separate the caliper halves.

7 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.

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

9 Clean the pistons and bores 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.

10 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 caliper is in bad shape the master cylinder should also be checked.

11 Lubricate the new piston seals with clean brake fluid and install them in their grooves in the caliper bores. Note that on some models different 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.

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

13 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

14 Install the brake pads (see Section 2).

15 Install the caliper on the brake disc making sure the pads sit squarely either side of the disc (see illustration 3.3b).

16 Install the caliper mounting bolts, and tighten them to the torque setting specified at the beginning of the Chapter (see illustration). On XTZ models, if the pads were removed, now tighten the pad retaining pins to the specified torque (see illustration 2.2a).

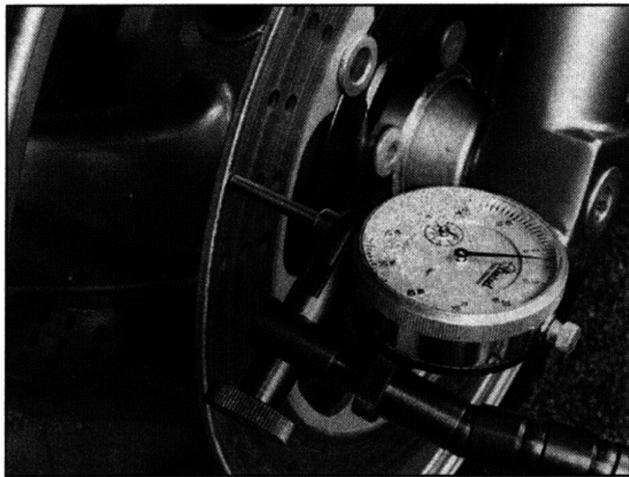
17 If removed, connect the brake hose to the caliper, using new sealing washers on each side of the banjo fittings (see illustration 7.4). Align the hose as noted on removal (see illustration 3.2a). Tighten the banjo bolt to the torque setting specified at the beginning of the Chapter. On the rear caliper on TDM models, fit the hose against the hose joint and tighten the locknut onto the hose, counter-



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



3.16 Tighten the caliper mounting bolts to the specified torque



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

holding the hose nut to prevent the hose twisting (see illustration 3.2b). Do not overtighten the locknut. 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 8.

**18** On XTZ models, install the rear brake caliper shield.

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

#### 4 Brake discs – inspection, removal and installation



##### 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 renewed.

**2** To check disc runout, position the bike on an auxiliary stand and support it so that the wheel is raised off the ground. On XTZ models, remove the front disc covers (see illustration 11.5). Mount a dial gauge on a fork slider or on the swingarm, 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 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, renew them (see Section 13) and repeat this check. If the disc runout is still excessive, it will have to be renewed, 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. The thickness of the disc can be checked with a micrometer (see



**4.3 Using a micrometer to measure disc thickness**

illustration). If the thickness of the disc is less than the service limit, it must be renewed.

##### Removal

**4** Remove the wheel (see Section 11 (front) or 12 (rear)).

**Caution: Do not lay the wheel down and allow it to rest on the disc or sprocket – they 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 illustration).

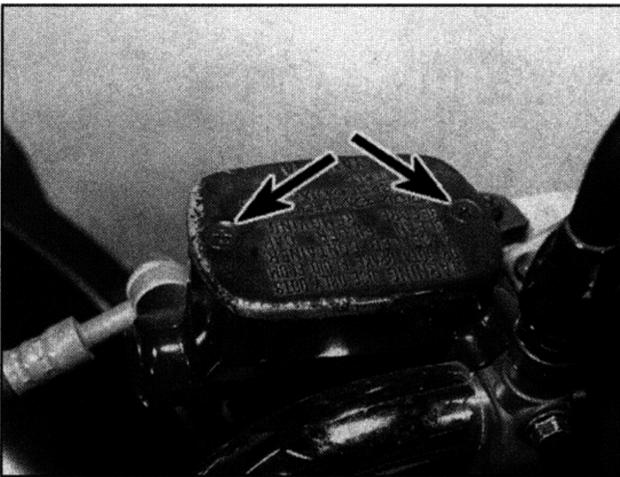
##### Installation

**6** Install the disc on the wheel, making sure the marked side is on the outside. Align the previously applied matchmarks (if you're reinstalling the original disc).

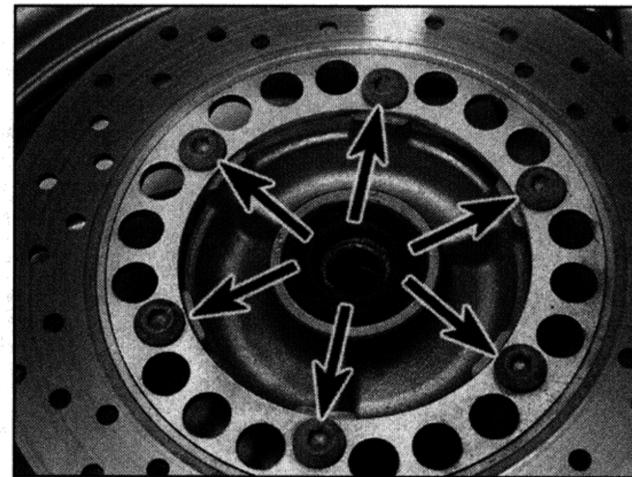
**7** Apply a suitable non-permanent thread locking compound to the disc bolts, then install the bolts and tighten them in a criss-cross pattern evenly and progressively to the torque setting specified at the beginning of the Chapter. Clean off all grease from the brake disc(s) using acetone or brake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

**8** Install the wheel (see Section 11 or 12).

**9** Operate the brake lever or pedal several times to bring the pads into contact with the



**5.3a On TDM and XTZ models, slacken the reservoir cover screws (arrowed)**



**4.5 Unscrew the bolts (arrowed) and remove the disc – TDM rear disc shown**

disc. Check the operation of the brakes carefully before riding the bike.

#### 5 Front brake master cylinder – removal, overhaul and installation



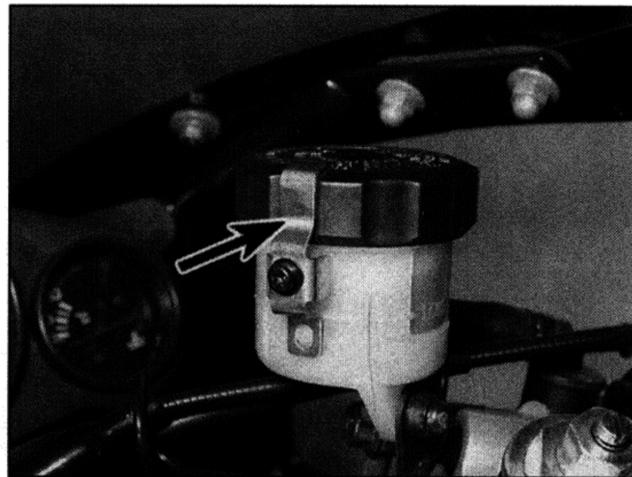
**1** If the master cylinder is leaking fluid, or if the lever does not produce a firm feel when the brake is applied, and bleeding the brakes does not help (see Section 8), and the hydraulic hoses are all in good condition, then master cylinder overhaul is recommended.

**2** Before disassembling the master cylinder, read through the entire procedure and make sure that you obtain a new piston/seal 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.**

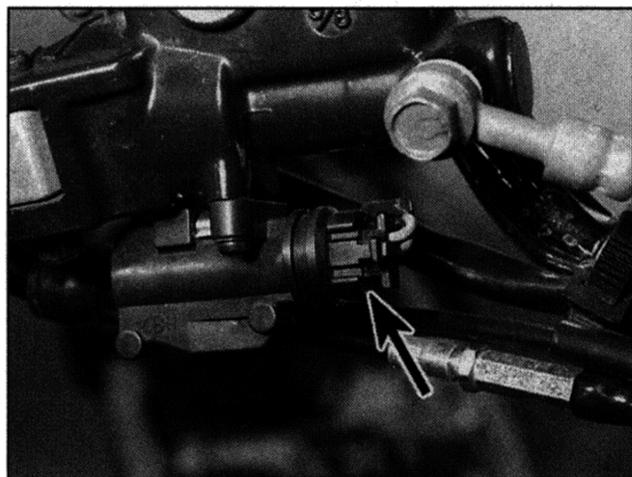
**Caution: Disassembly, overhaul and reassembly of the brake master cylinder must be done in a spotlessly clean work area to avoid contamination and possible failure of the brake hydraulic system components.**

##### Removal

**3** On XTZ models, remove the hand guard. On TDM and XTZ models, loosen, but do not remove, the screws holding the reservoir cover in place (see illustration). On TRX models, remove the reservoir cap clamp and partially unscrew the cap (see illustration).



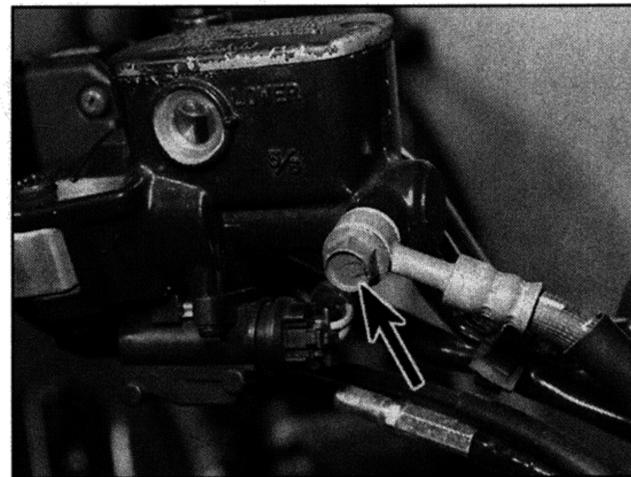
**5.3b On TRX models, remove the clamp (arrowed) and partially unscrew the cap**



5.4a Brake switch wiring connector (arrowed) – TDM models



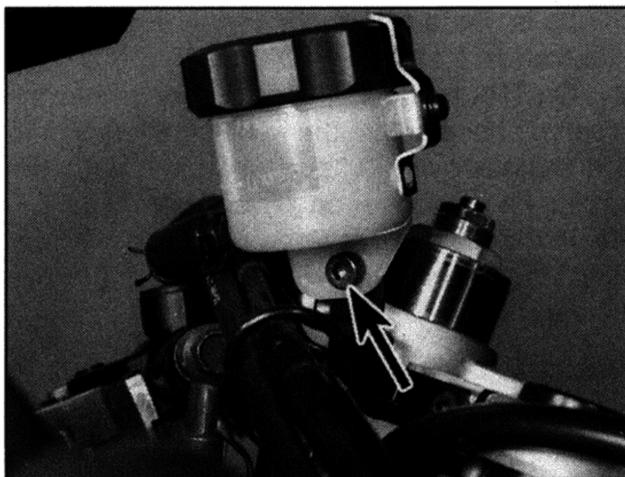
5.4b Brake switch wiring connectors (arrowed) – TRX models



5.6a Brake hose banjo bolt (arrowed) – TDM models



5.6b Brake hose banjo bolt (arrowed) – TRX models



5.7a Reservoir mounting bolt . . .



5.7b . . . and hose clamp – TRX models

4 On TDM and TRX models, disconnect the brake light switch wiring connector(s) (see illustrations). On XTZ models, remove the switch from the brake lever bracket.

5 Remove the front brake lever (see Chapter 6). On TDM and XTZ models, remove the rear view mirror.

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 renewed. 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 TRX models, unscrew the bolt securing the reservoir to the bracket, then release the clamp securing the reservoir hose to the union on the master cylinder (see illustrations). 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 illustrations).

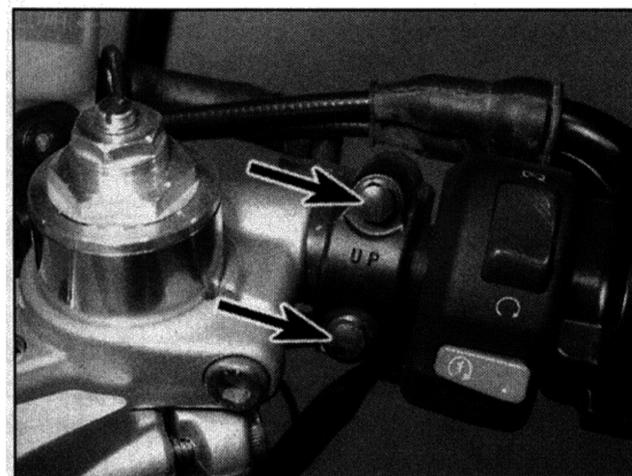
9 On TDM and XTZ models, remove the reservoir cover retaining screws and lift off the cover, the diaphragm plate and the rubber diaphragm. Drain the brake fluid from the reservoir into a suitable container. Wipe any remaining fluid out of the reservoir with a clean rag.

10 If required, on TDM and TRX models, remove the brake light switch (see Chapter 9).

### Overhaul

11 On TDM models, thread the adjuster off the pushrod and remove the spring (where fitted), the nut and the plate.

12 Carefully remove the dust boot from the master cylinder (see illustration).



5.8a Master cylinder clamp bolts (arrowed) – TRX models



5.8b Master cylinder clamp bolts (arrowed) – XTZ models



5.12 Remove the rubber boot from the end of the master cylinder piston . . .



**5.13a** . . . then depress the piston and remove the circlip using a pair of internal circlip pliers

**13** Using circlip pliers, remove the circlip and slide out the washer and pushrod (TDM models), 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**).

**14** On TRX 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 renew if necessary.

**15** 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.**

**16** Check the master cylinder bore for corrosion, scratches, nicks and score marks. If damage or wear is evident, the master cylinder must be renewed. 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.

**17** The dust boot, circlip, piston, seal, primary cup and spring are only available as a 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.

**18** Install the spring in the master cylinder. On TDM models the spring's tapered end faces in, and on TRX and XTZ models its tapered end faces out.

**19** Lubricate the piston, seal and cup with clean brake fluid. Install the assembly into the master cylinder, making sure it is the correct way round (**see illustration 5.13b**). Make sure the lips on the cup do not turn inside out when they are slipped into the bore. On TDM models slide in the pushrod with its washer. Depress the piston and install the new circlip, making sure that it locates in the master cylinder groove (**see illustration 5.13a**).

**20** Install the rubber dust boot, making sure



**5.13b** Lay out the internal parts as shown, even if new parts are being used, to avoid confusion on reassembly

the lip is seated correctly in the groove (**see illustration 5.12**).

**21** On TRX 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.

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

### Installation

**23** If removed, on TDM and TRX models, install the brake light switch (see Chapter 9).

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

**25** 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 b**). Tighten the banjo bolt to the torque setting specified at the beginning of this Chapter.

**26** Install the brake lever (see Chapter 6), and on TDM and XTZ models the rear view mirror.

**27** On TRX models, mount the reservoir onto its bracket and tighten the bolt securely (**see illustration 5.7a**). Connect the reservoir hose to the union and secure it with the clamp (**see illustration 5.7b**).

**28** On TDM and TRX models, connect the brake light switch wiring (**see illustrations 5.4a and b**). On XTZ models, fit the switch into the lever bracket.

**29** Fill the fluid reservoir with new DOT 4 brake fluid as described in *Daily (pre-ride) checks*. Refer to Section 8 of this Chapter and bleed the air from the system.

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

**31** Check the operation of the front brake before riding the motorcycle.



**5.24** Align the clamp mating surfaces with the punch mark on the handlebar (arrowed)

## 6 Rear brake master cylinder – removal, overhaul and installation

**1** If the master cylinder is leaking fluid, or if the lever does not produce a firm feel when the brake is applied, and bleeding the brakes does not help (see Section 8), and the hydraulic hoses are all in good condition, then master cylinder overhaul is recommended.

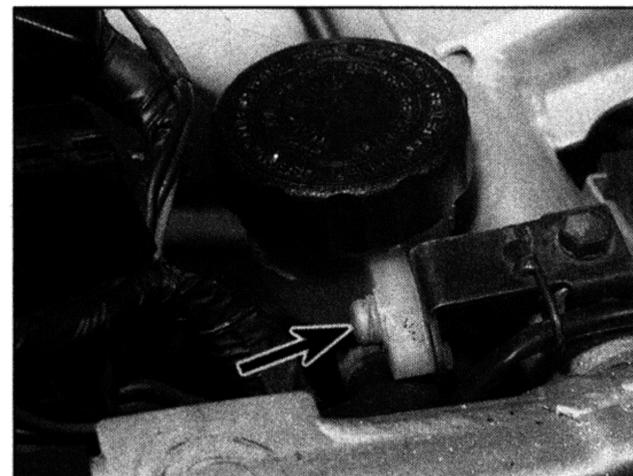
**2** Before disassembling the master cylinder, read through the entire procedure and make sure that you obtain a new piston/seal kit. Also, you will need some new DOT 4 brake fluid, some clean rags and internal circlip pliers. **Note:** To prevent damage to the paint from spilled brake fluid, always cover the surrounding components when working on the master cylinder.

**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.**

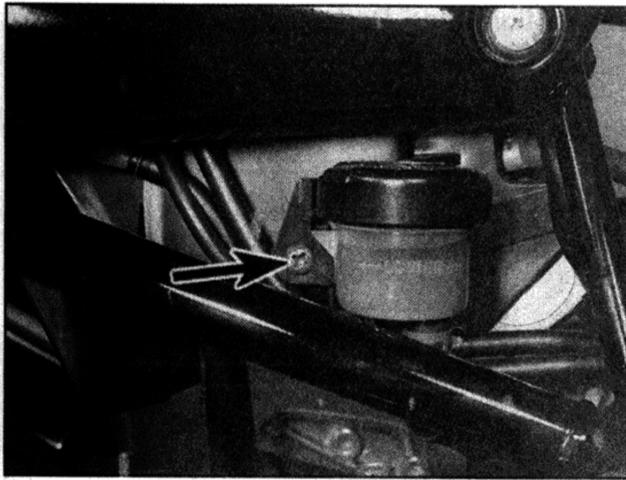
### Removal

**3** On TDM models, remove the seat, and on XTZ models remove the right-hand side cover (see Chapter 8).

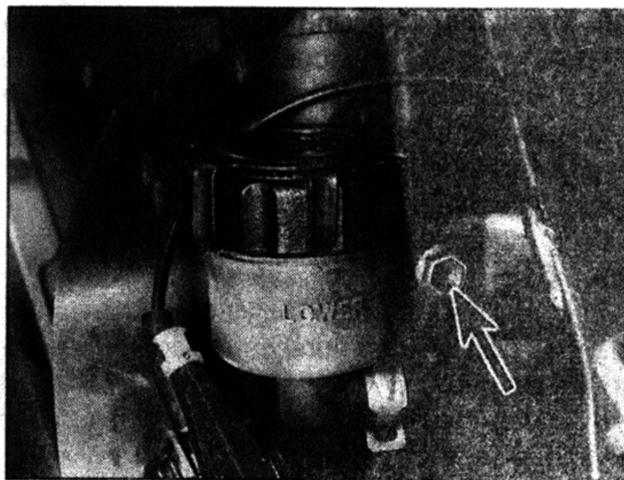
**4** Unscrew the bolt securing the master cylinder fluid reservoir to the frame, then remove the reservoir cap and pour the fluid into a container (**see illustrations**). Release



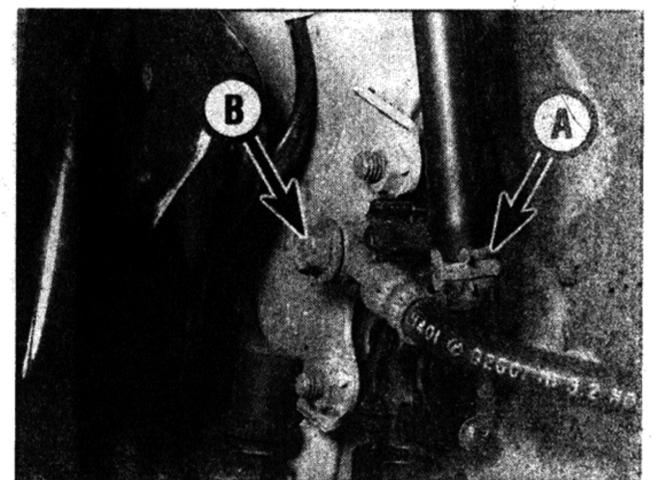
**6.4a** Master cylinder reservoir screw (arrowed) – TDM models



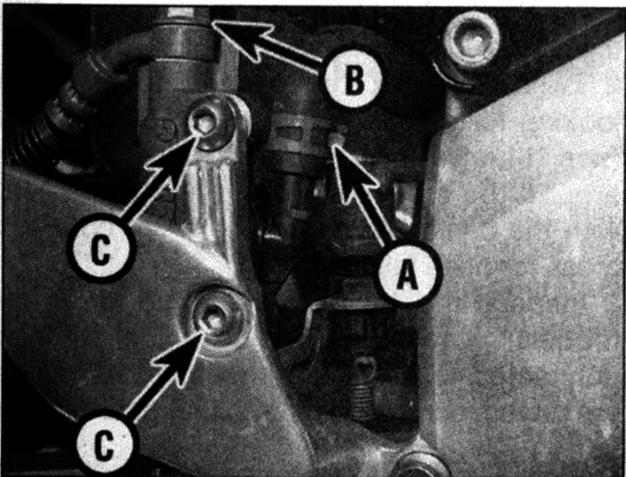
6.4b Master cylinder reservoir screw (arrowed) – TRX models



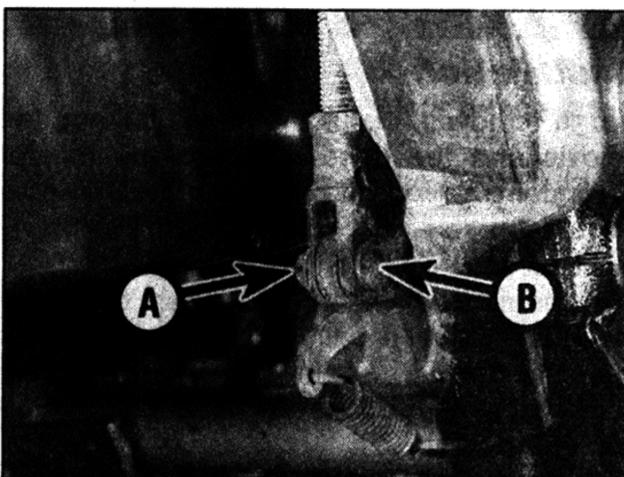
6.4c Master cylinder reservoir bolt (arrowed) – XTZ models



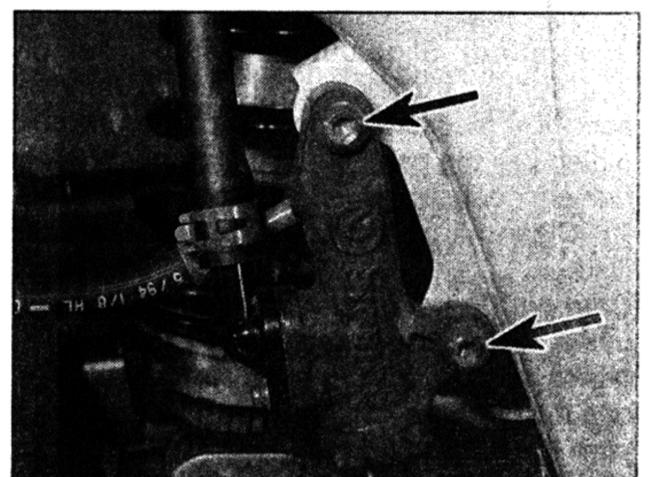
6.5a Reservoir hose clamp (A), brake hose banjo bolt (B) – TDM models



6.5b Reservoir hose clamp (A), brake hose banjo bolt (B), master cylinder mounting bolts (C) – TRX models



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



6.7 Master cylinder mounting bolts (arrowed) – TDM shown

the clamp securing the reservoir hose to the union on the master cylinder and detach the hose (see illustrations 6.5a and b).

5 Unscrew the brake hose banjo bolt and separate the brake hose from the master cylinder, noting its alignment (see illustrations). Discard the two sealing washers as they must be renewed. 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.

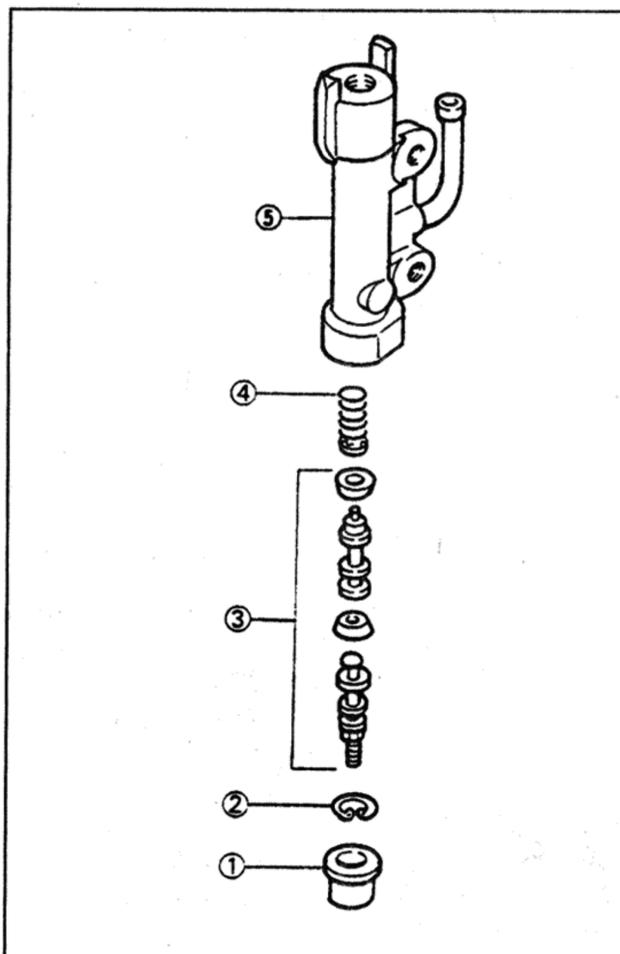
7 Unscrew the two bolts securing the master cylinder to the bracket and remove the master cylinder (see illustration and 6.5b).

### 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).

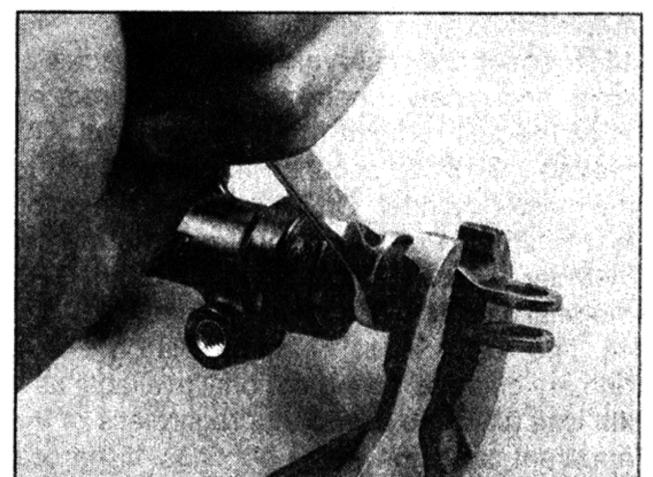
9 Dislodge the rubber dust boot from the base of the master cylinder to reveal the pushrod retaining circlip (see illustrations).

10 Depress the pushrod and, using

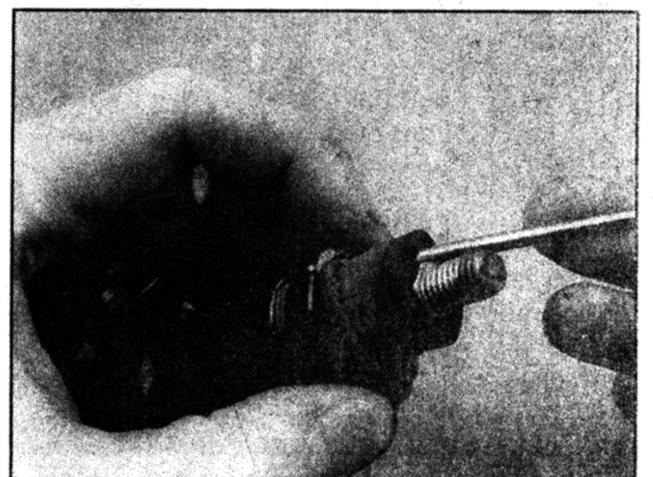


6.9a Master cylinder components

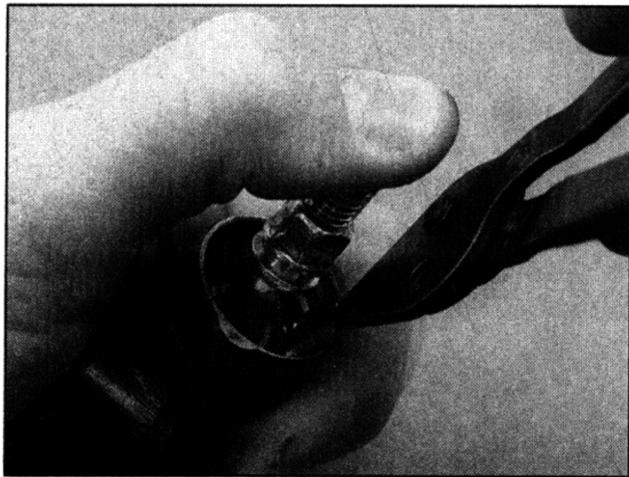
- 1 Rubber boot
- 2 Circlip
- 3 Piston/seal assembly
- 4 Spring
- 5 Master cylinder



6.8 Hold the clevis and slacken the locknut



6.9b Remove the dust boot from the pushrod



**6.10 Depress the piston and remove the circlip from the cylinder**

circlip pliers, remove the circlip (**see illustration**). Slide out the piston assembly and spring. 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.

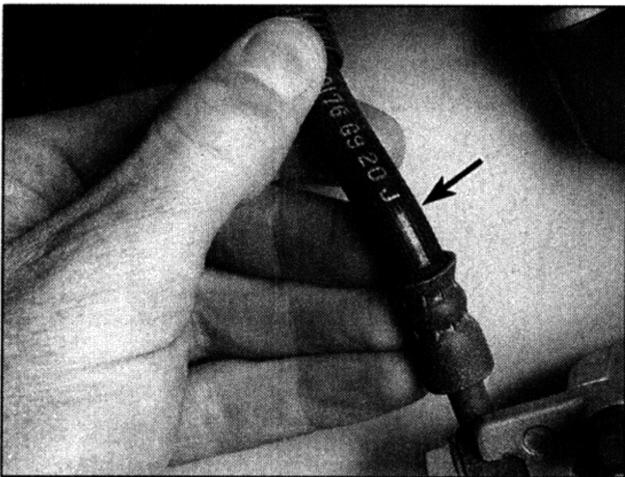
**11** Clean all of the parts with clean brake fluid.

**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 damage is evident, the master cylinder must be renewed. If the master cylinder is in poor condition, then the caliper should be checked as well.

**13** Inspect the reservoir hose for cracks or splits and renew if necessary. If required, on TDM models remove the screw and on XTZ models the circlip securing the hose union to the master cylinder. On TRX models the union is a push fit. Pull the union from the master cylinder. Discard the O-ring or bush (TRX models) as a new one must be used.

**14** The dust boot, circlip, piston, seal, primary cup and spring are only available as a 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.



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

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

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

**18** Install the rubber dust boot, making sure the lip is seated properly in the groove.

**19** If removed, fit a new O-ring or bush (TRX models) to the fluid reservoir hose union, then push the union into the master cylinder and on TDM and XTZ models secure it with its screw or circlip.

### Installation

**20** If removed, install the clevis locknut, the clevis and the base nut onto the master cylinder pushrod end. Position the clevis as noted on removal, then tighten the clevis locknut securely (**see illustration 6.8**).

**21** Install 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 6.5b and 6.7**).

**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 6.6**).

**23** Connect the brake hose banjo bolt to the 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 illustrations 6.5a and b**).

**24** Secure the fluid reservoir to the frame with its retaining bolt (**see illustrations 6.4a, b and c**). 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 6.5a and b**). 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



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

brake fluid (**see Daily (pre-ride) checks**) and bleed the system following the procedure in Section 8.

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

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

## 7 Brake hoses, pipes and unions – inspection and replacement



### Inspection

**1** Brake hose and pipe condition should be checked regularly and the hoses renewed 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 (1996-on models) and the banjo union fittings connected to the brake hoses. If the fittings are rusted, scratched or cracked, renew them.

### Replacement

**4** The brake hoses have banjo union fittings on each end, with the exception of the rear caliper hose on TDM models which has a joint piece. On 1996-on TDM models, the brake pipe splitting the front brake hose has flare nuts. Cover the surrounding area with plenty of rags and unscrew the banjo bolt or flare nut at each end of the hose or pipe, noting its alignment. On the rear caliper on TDM models, counter-hold the hose nut and unscrew the locknut and separate the hose from the hose joint in the caliper (**see illustration 3.2b**). If required, unscrew the joint from the caliper. Free the hose or pipe from any clips or guides and remove it. Discard the sealing washers on the hose unions (**see illustration**).

**5** Position the new hose or pipe, 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 or pipe 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 settings specified at the beginning of this Chapter. Do not overtighten the brake pipe flare nuts. On the rear caliper on TDM models, if removed, thread the joint piece into the caliper using a new sealing washer and tighten securely (**see illustration 3.2b**). 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 and pipes are correctly aligned and routed clear of all moving components.



8.6a Brake caliper bleed valve



8.6b To bleed the brakes, you need a spanner, a short section of clear tubing, and a clear container half-filled with brake fluid

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 8). Check the operation of the brakes carefully before riding the motorcycle.

## 8 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 renewed, 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 TDM models, remove the seat, and on XTZ models remove the right-hand side cover (see Chapter 8) for access to the fluid reservoir.

5 Remove the reservoir cover or cap, diaphragm plate (where fitted) 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 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).

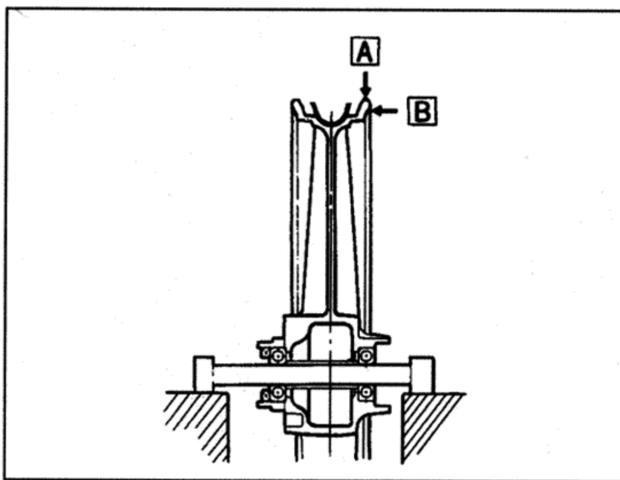
7 Remove the reservoir cover and check the fluid level. Do not allow the fluid level to drop below the lower mark during the bleeding process.

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 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.

10 On TDM and TRX models front brakes, go on to bleed air from the other brake caliper. On the rear brake of TDM and TRX models, go on to bleed air from the other side of the caliper (two bleed valves are fitted).

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



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

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*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.*

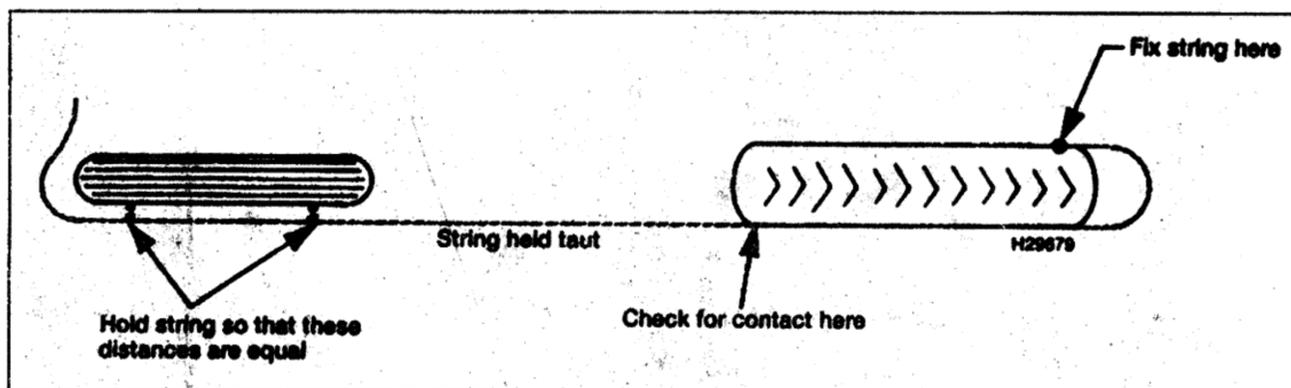
## 9 Wheels – inspection and repair



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 an auxiliary 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. 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 (see illustration).

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.



10.5 Wheel alignment check using string

4 The wheels should also be visually inspected for cracks, flat spots on the rim and other damage. On cast alloy wheels, 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 renewed. Never attempt to repair a damaged cast alloy wheel.

5 On XTZ models, check for loose or broken spokes. Tapping the spokes with a screwdriver is the best guide to their tension. A loose spoke will make a dull flat note compared to a tight one. Loose spokes must be tightened by turning the nipple at the spoke end in an anti-clockwise direction. Always check for runout after altering the tension in any of the spokes. Small irregularities can be corrected by adjusting the spokes in the affected area, although a certain amount of practice is necessary to prevent over-correction. If the wheel runout continues to be excessive, take the wheel to a professional wheel builder for inspection and adjustment.

### 10 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 an auxiliary 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. 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 (see illustration).

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 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 auxiliary stand.

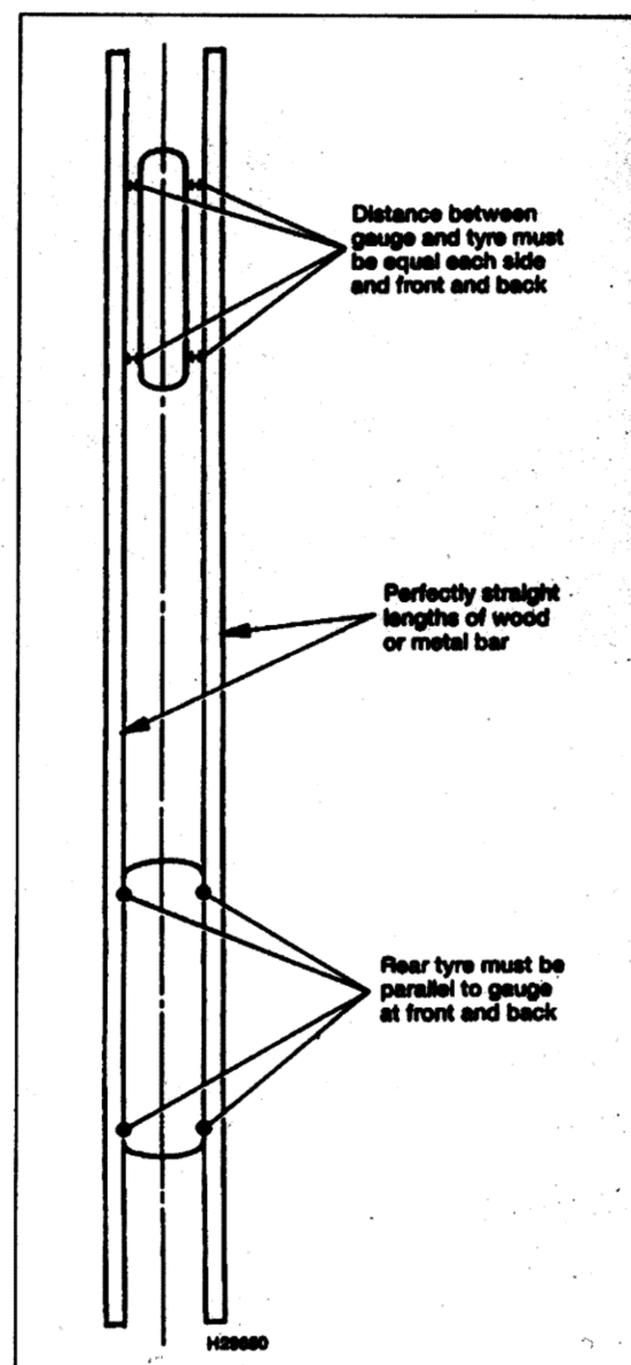
11 Once the rear wheel is vertical, check the front wheel in the same manner. If both wheels are not perfectly vertical, the frame and/or major suspension components are bent.

### 11 Front wheel - removal and installation

#### Removal

1 Position the motorcycle on an auxiliary stand and support it under the crankcase so that the front wheel is off the ground. Always make sure the motorcycle is properly supported.

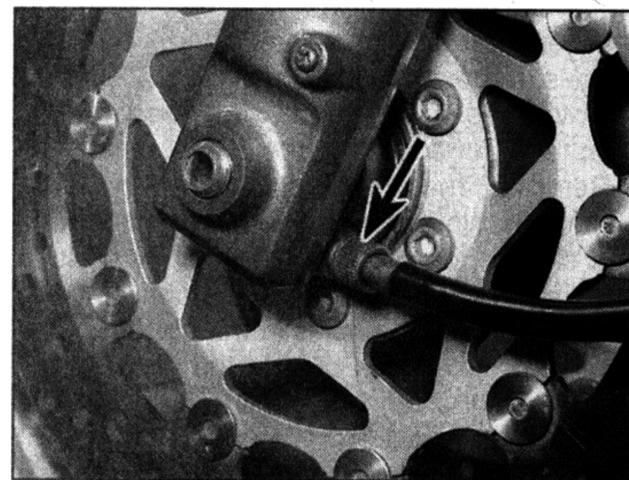
2 Remove the brake caliper mounting bolts



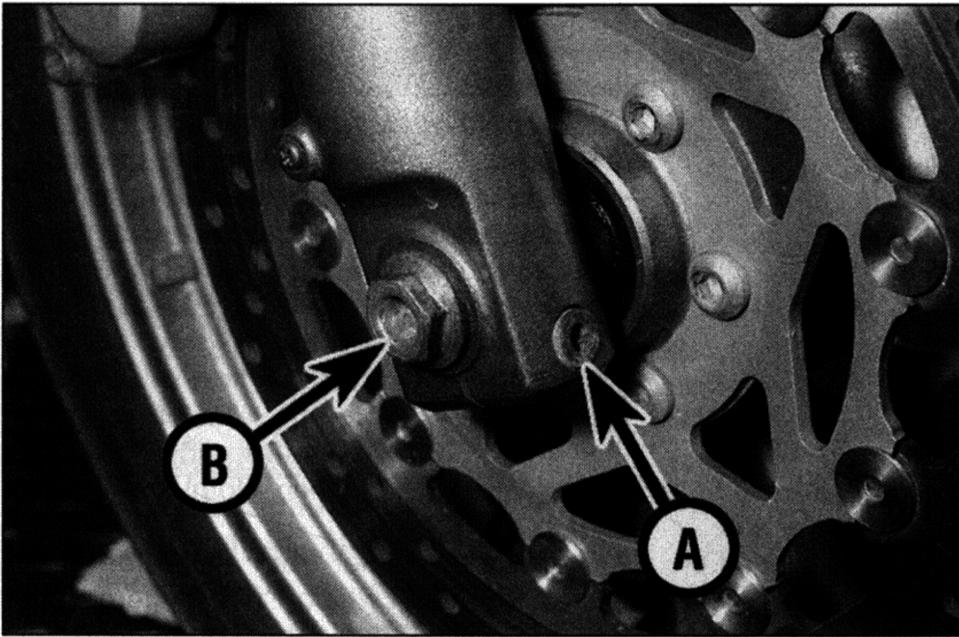
10.7 Wheel alignment check using a straight-edge

and slide the calipers off the discs (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.

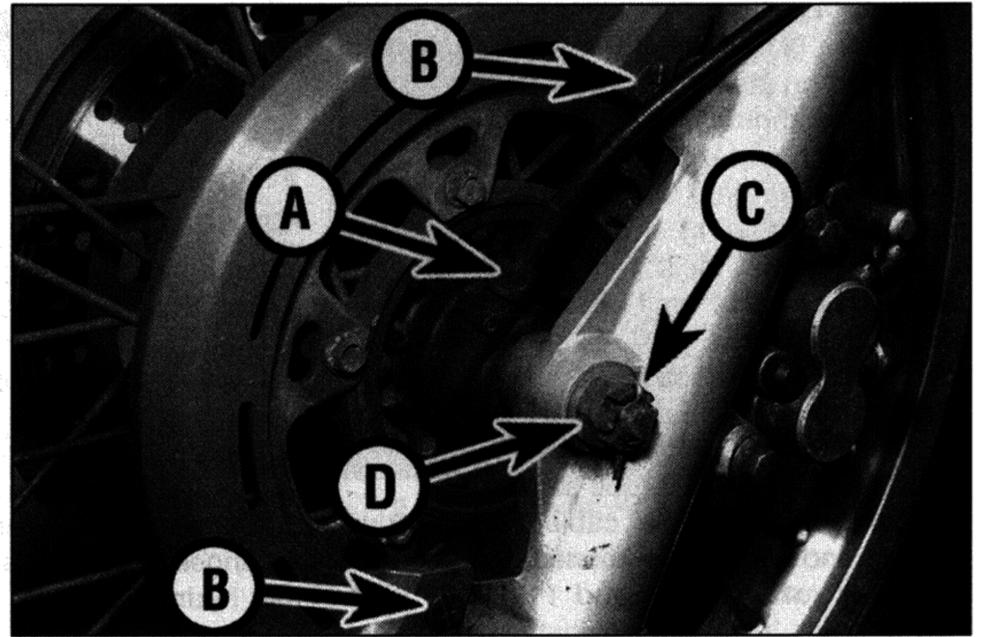
3 On TRX, XTZ and 1991 to 1998 TDM models, unscrew the knurled ring securing the speedometer cable to the drive gear and detach the cable (see illustration and 11.5).



11.3 Unscrew the ring (arrowed) and detach the cable



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



11.5 Speedometer cable (A), disc cover screws (B), split pin (C), axle nut (D)

On 1999 TDM models, trace the wiring from the speedometer drive gear up to its 3-pin connector and disconnect it, then free the wiring from the clips which retain it to the brake hose; alternatively, leave the wiring attached so that as the wheel is removed the drive gear is left joined to its lead.

4 On TDM and TRX models, slacken the axle clamp bolt on the bottom of the right-hand fork, then unscrew the axle (see illustration).

5 On XTZ models, first remove the screws securing the disc covers and remove the covers (see illustration). Remove the split pin from the end of the axle, then unscrew the axle nut and remove the washer. Counterhold the axle head to prevent it turning if necessary. Discard the split pin as a new one should be used.

6 Support the wheel, then withdraw the axle from the right-hand side and carefully lower the wheel. Use a drift to drive out the axle if required.

7 Remove the spacer from the right-hand side of the wheel and the speedometer drive gear 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 blocks so the disc doesn't support the weight of the wheel, or keep it upright.

8 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 axle is bent, renew it.

9 Check the condition of the wheel bearings (see Section 13).

### Installation

10 Apply lithium-based grease to the wheel spacer, the lips of the grease seals and to the speedometer drive gear. Fit the spacer into the right-hand side of the wheel and the drive gear into the left-hand side, making sure

the tabs locate in the slots (see illustrations 11.7a and b).

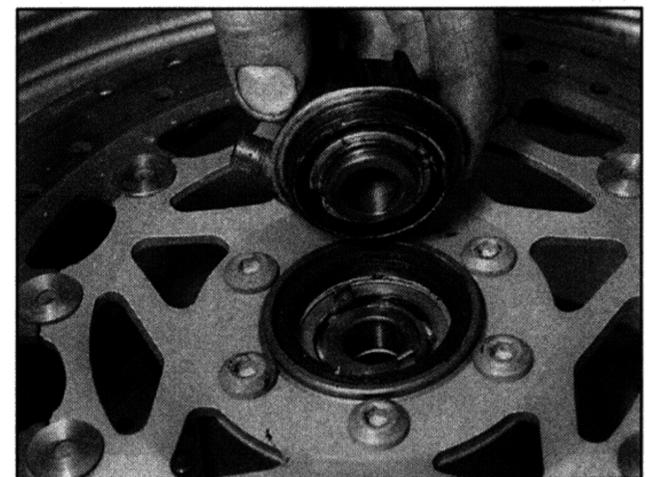
11 Manoeuvre the wheel into position. Apply a thin coat of grease to the axle.

12 Lift the wheel into place between the fork sliders, making sure the spacer and drive gear remain in position, and that the slot in the drive gear locates over the tab on the inside of the fork (see illustration). Slide the axle in from the right-hand side (see illustration).

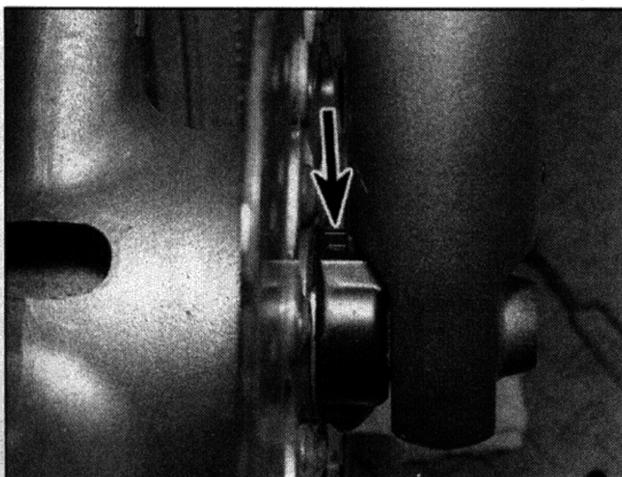
13 On TDM and TRX models, tighten the axle to the torque setting specified at the beginning of the Chapter (see illustration).



11.7a Remove the spacer ...



11.7b ... and the speedometer drive gear housing



11.12a Locate the tab on the inside of the fork in the slot in the top of the housing ...



11.12b ... and insert the axle



11.13 Tighten the axle to the specified torque

Now tighten the axle clamp bolt on the bottom of the right-hand fork to the specified torque setting (see illustration 11.4).

**14** On XTZ models, fit the washer and axle nut, then counter-hold the head of the axle and tighten the nut to the torque setting specified at the beginning of the Chapter. Fit a new split through the end of the axle (see illustration 11.5). Install the disc covers.

**15** 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.

**16** Fit the speedometer cable into the drive housing and tighten the knurled ring securely (see illustrations 11.3 and 11.5). On 1991 TDM models if the speedometer wiring was disconnected, remake the 3-pin connector and secure the wiring to the brake hose and the guide provided on the brake caliper lower mounting bolt; use the proper clips to the secure the wire to the brake hose and don't fasten them too tight otherwise the hose will be distorted.

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

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

## 12 Rear wheel – removal and installation



### Removal

**1** Position the motorcycle on an auxiliary stand so that the wheel is off the ground. On XTZ models, unscrew the bolts securing the rear brake caliper shield and remove the cover (see illustration 3.1).

**2** Remove the brake caliper mounting bolts and slide the caliper off the disc (see Section 3). Support the caliper with a piece of wire or a bungee cord so that 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. On TDM models, slacken the caliper bracket bolt on the swingarm (see illustration).

**3** Where fitted, remove the split pin from the axle nut on the end of the axle (see illustration). Unscrew the axle nut and remove the washer, and on TRX models the adjuster position marker (see illustration).

**4** Support the wheel then withdraw the axle and lower the wheel to the ground (see illustration). On TRX models, retrieve the adjustment position marker. 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 swingarm (see illustration 12.10).

**Caution:** Do not lay the wheel down and allow it to rest on the disc or 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. Do not operate the brake pedal with the wheel removed.

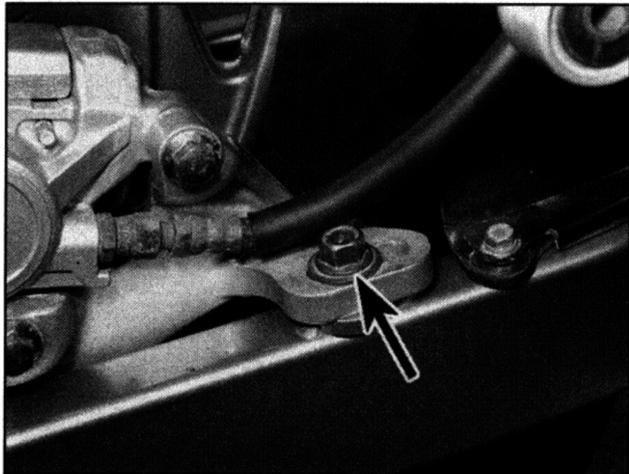
**6** Check the axle for straightness by rolling it on a flat surface such as a piece of plate glass (first wipe off all old grease and remove any corrosion using fine emery cloth). If the axle is bent, renew it.

**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 13).

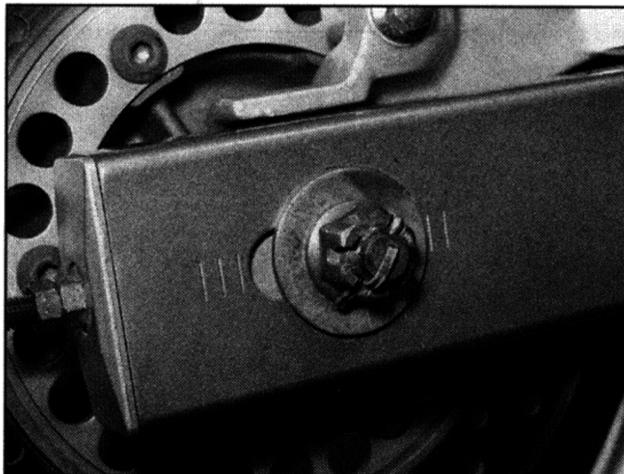
### Installation

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

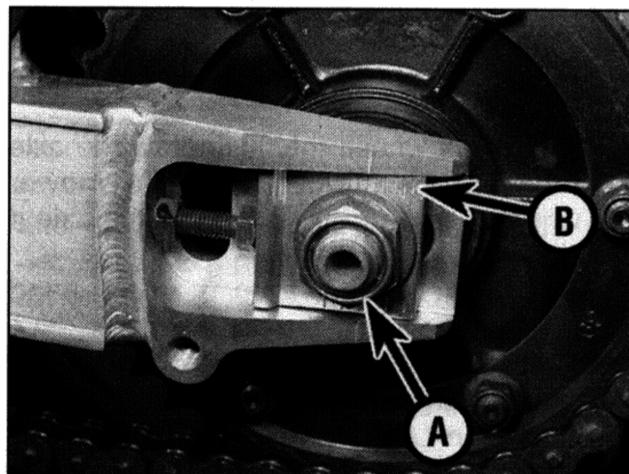
**9** Install the short collar into the left-hand side of the wheel and the long shouldered collar into the right-hand side (see illustrations 12.7b and a). Manoeuvre the wheel so that it is in between the ends of the swingarm. Align



12.2 On TDM models, slacken the caliper bracket bolt (arrowed)



12.3a Rear axle nut and split pin – 1991 to 1995 TDM models



12.3b Rear axle nut (A) and position marker (B) – TRX models



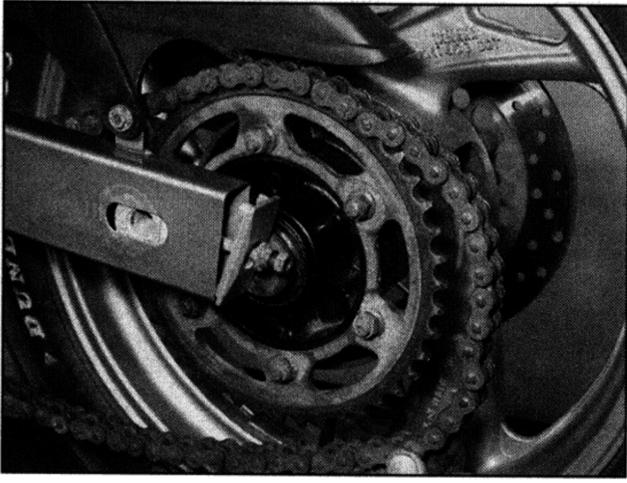
12.4 Withdraw the axle and remove the wheel



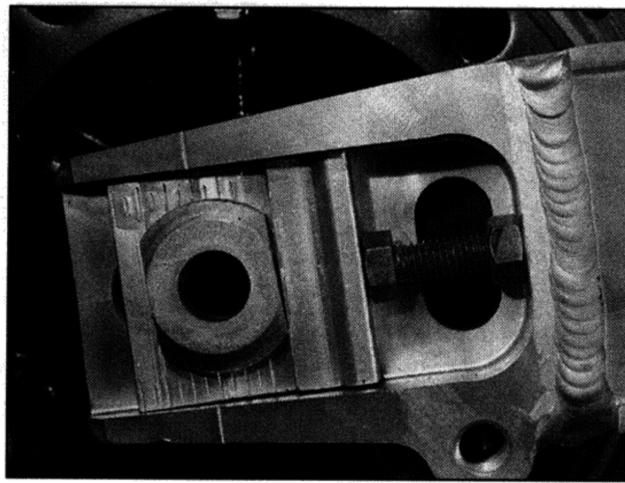
12.7a Remove the collar from each side . . .



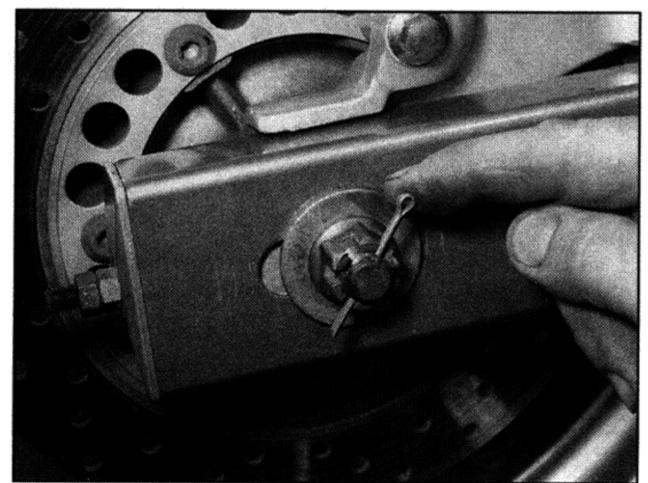
12.7b . . . noting which way round they fit



**12.10** Manoeuvre the wheel into position and fit the chain onto the sprocket



**12.11** On TRX models, make sure the axle head locates correctly in the adjustment marker



**12.12** Where fitted, use a new split pin

the brake caliper bracket, on XTZ models locating it against the swingarm so that the lug on the swingarm fits into the slot in the bracket.

**10** Engage the drive chain with the sprocket and lift the wheel into position (see illustration). Make sure the collars and caliper bracket remain correctly in place.

**11** Install the axle with its washer, or on TRX models with the adjustment marker (see illustration 12.4). On 1991 to 1995 TDM models, the axle goes in from the left, while on all other models it goes in from the right. Make sure it passes through the chain adjusters and the caliper bracket. On TRX models, align the flats on the axle head with the adjustment marker (see illustration). Check that

everything is correctly aligned, then fit the left-hand adjustment position marker (TRX models), the washer and the axle nut (see illustration 12.3b). Tighten the nut lightly at this stage, on TDM and XTZ models counter-holding the axle head on the other side of the wheel.

**12** Adjust the chain slack as described in Chapter 1. Now tighten the axle nut to the specified torque setting. On 1991 to 1995 TDM models and XTZ models, secure the nut using a new split pin (see illustration). On TDM models, tighten the caliper bracket bolt to the specified torque setting (see illustration 12.2).

**13** Install the brake caliper, making sure the pads sit squarely on either side of the disc

(see Section 3). Tighten the caliper mounting bolts to the specified torque setting. On XTZ models, install the caliper shield (see illustration 3.1).

**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.

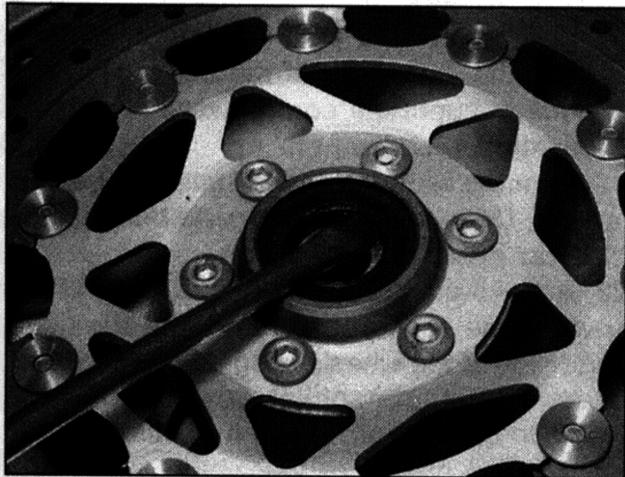
### 13 Wheel bearings – removal, inspection and installation



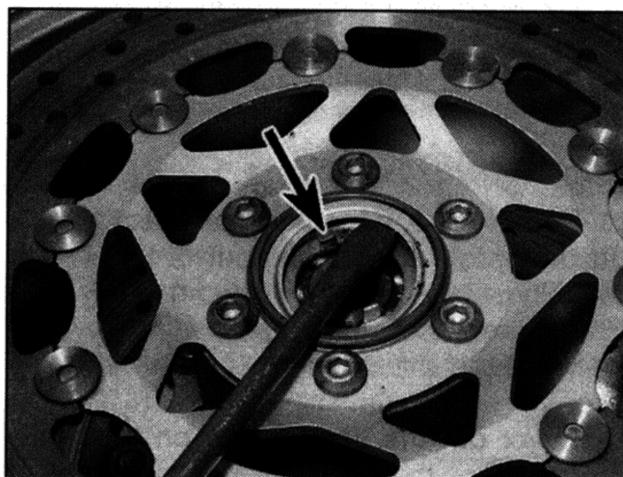
#### Front wheel bearings

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

- 1** Remove the wheel (see Section 11).
- 2** Set the wheel on blocks so as not to allow the weight of the wheel to rest on the brake disc.
- 3** On 1991 to 1998 TDM and all TRX models, 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 if they are damaged or deteriorated. 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).



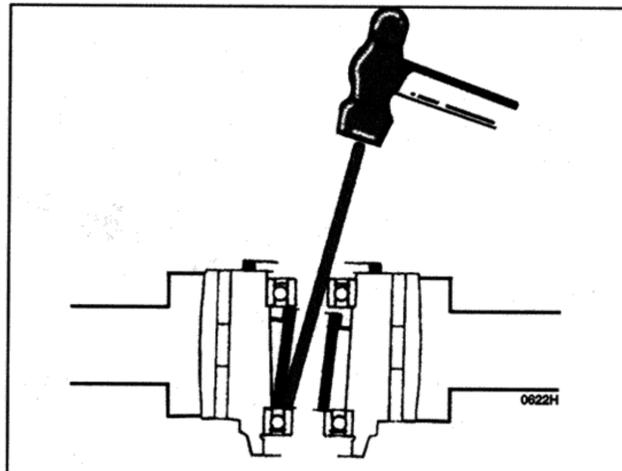
**13.3a** Lever out the grease seal . . .



**13.3b** . . . then lever out the retainer plate and remove the drive plate (arrowed)



**13.5a** Knock out the bearings using a drift . . .



**13.5b** . . . locating it as shown

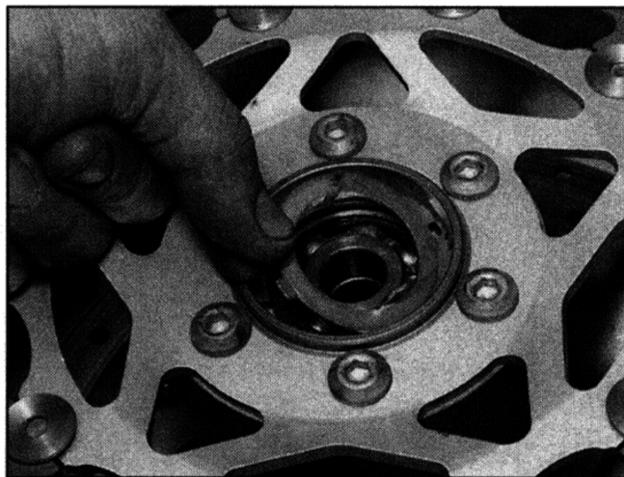


**Position a piece of wood against the wheel to prevent the screwdriver shaft damaging it when levering the grease seals out.**

- 4** On XTZ models, 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 (see illustration 13.3).
- 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.



13.10 A socket can be used to drive in the bearing



13.12a Fit the drive plate as described . . .



13.12b . . . then fit the retainer plate

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.*

**HAYNES** *Refer to Tools and Workshop Tips (Section 5)*  
**HiNT** *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, renew it.

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 1991 to 1998 TDM and all TRX 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**).

13 Apply a smear of lithium-based grease to the lips of the seal(s), 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**).

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

### Rear wheel bearings

15 Remove the rear wheel (see Section 12). Lift the sprocket coupling out of the wheel, noting how it fits (**see illustration**).

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 illustration**). Discard the seal as a new one should be used.

18 Using a metal rod (preferably a brass drift punch) inserted through the centre of one bearing, tap evenly around the inner race of the other bearing to drive it from the hub (**see illustrations 13.5a and b**). The bearing spacer will also come out.

19 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.

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

21 Thoroughly clean the hub area of the wheel. First 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 squarely until it's completely seated (**see illustration 13.10**).

22 Turn the wheel over and install the bearing spacer. Drive the left-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 (**see illustration**).

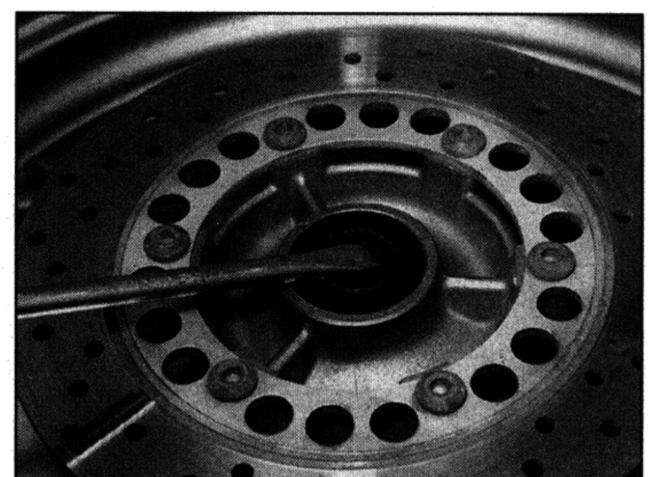
24 Clean off all grease from the brake disc



13.13 Press the grease seal into place



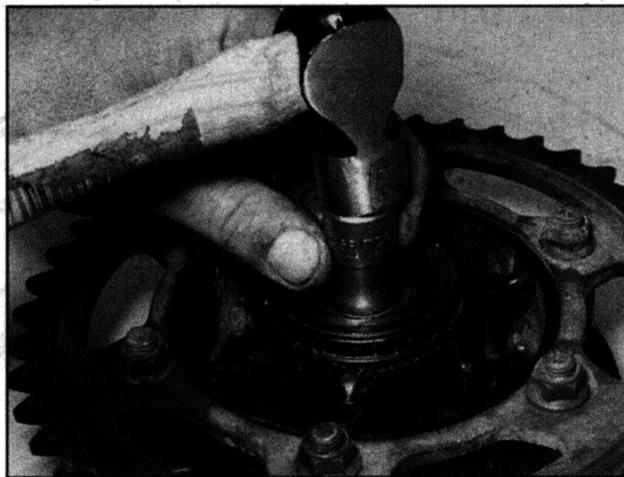
13.15 Lift the sprocket coupling out of the wheel



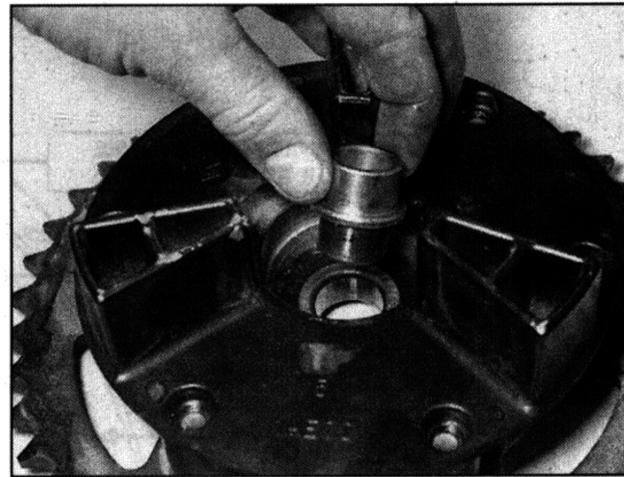
13.17 Lever out the grease seal



**13.23** Where the seal sits flush with the rim, a piece of wood can be used as shown



**13.26a** Use a socket to drive out the spacer . . .



**13.26b** . . . noting how it fits

using acetone or brake system cleaner. Install the sprocket coupling assembly onto the wheel, then install the wheel (see Section 12).

**Sprocket coupling bearing**

**25** Remove the rear wheel (see Section 12). Lift the sprocket coupling out of the wheel, noting how it fits (see illustration 13.15).

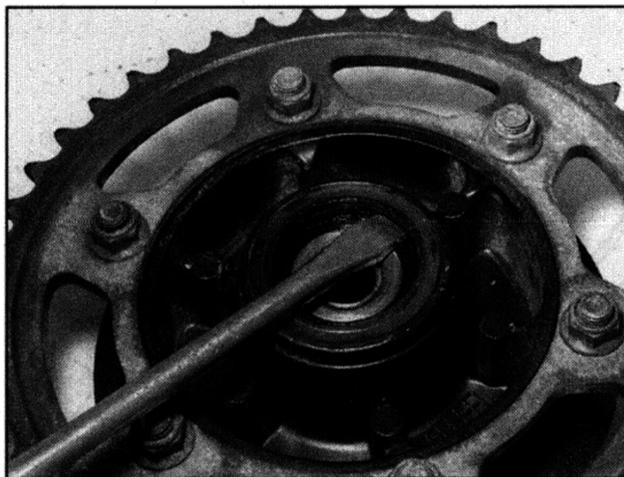
**26** Remove the spacer from the inside of the coupling bearing, using a suitable socket to drive it out if it is tight, noting which way round it fits (see illustrations). Using a flat-bladed screwdriver, lever out the grease seal from the outside of the coupling (see illustration).

**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.

**29** Thoroughly clean the bearing recess then install the bearing into the recess in 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 (see illustration 13.10).

**30** Apply a smear of grease to the lips of the new seal, and press it into the coupling, using



**13.26c** Lever out the grease seal



**13.27** Drive the bearing out from the inside

a seal or bearing driver, a suitable socket or a flat piece of wood to drive it into place if necessary (see illustration). Install the spacer into the inside of the coupling, making sure it is the correct way round (see illustration 13.26b), and drive it into place if it is tight (see illustration).

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

**32** Clean off all grease from the brake disc using acetone or brake system cleaner. Fit the sprocket coupling into the wheel (see illustration 13.15), then install the wheel (see Section 12).

**14 Tyres – general information and fitting**

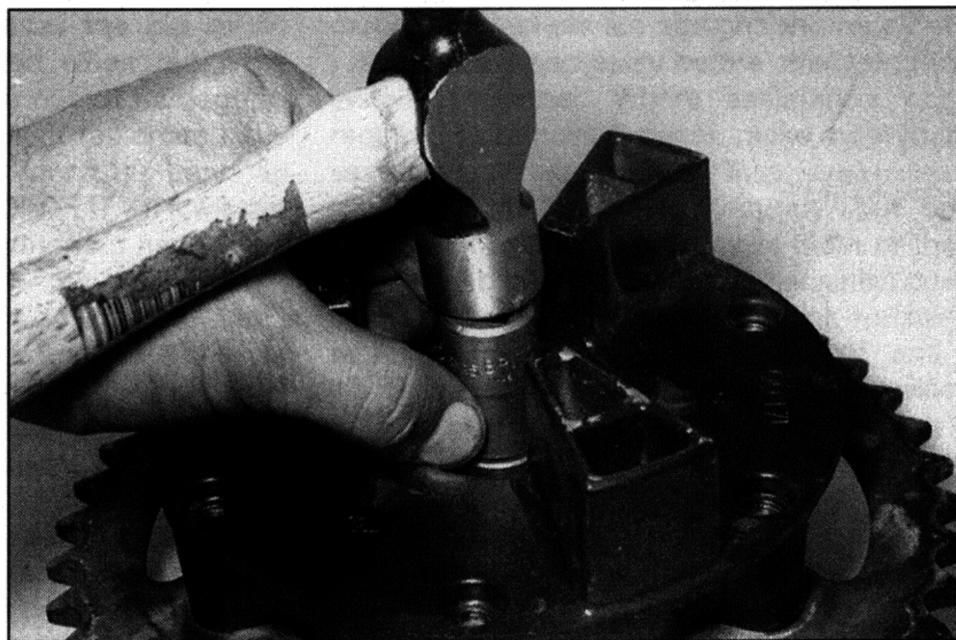
**General information**

**1** The wheels fitted on TDM and TRX models are designed to take tubeless tyres only. The wheels fitted on XTZ models are designed to take tubed tyres only. Tyre sizes are given in the Specifications at the beginning of this chapter.

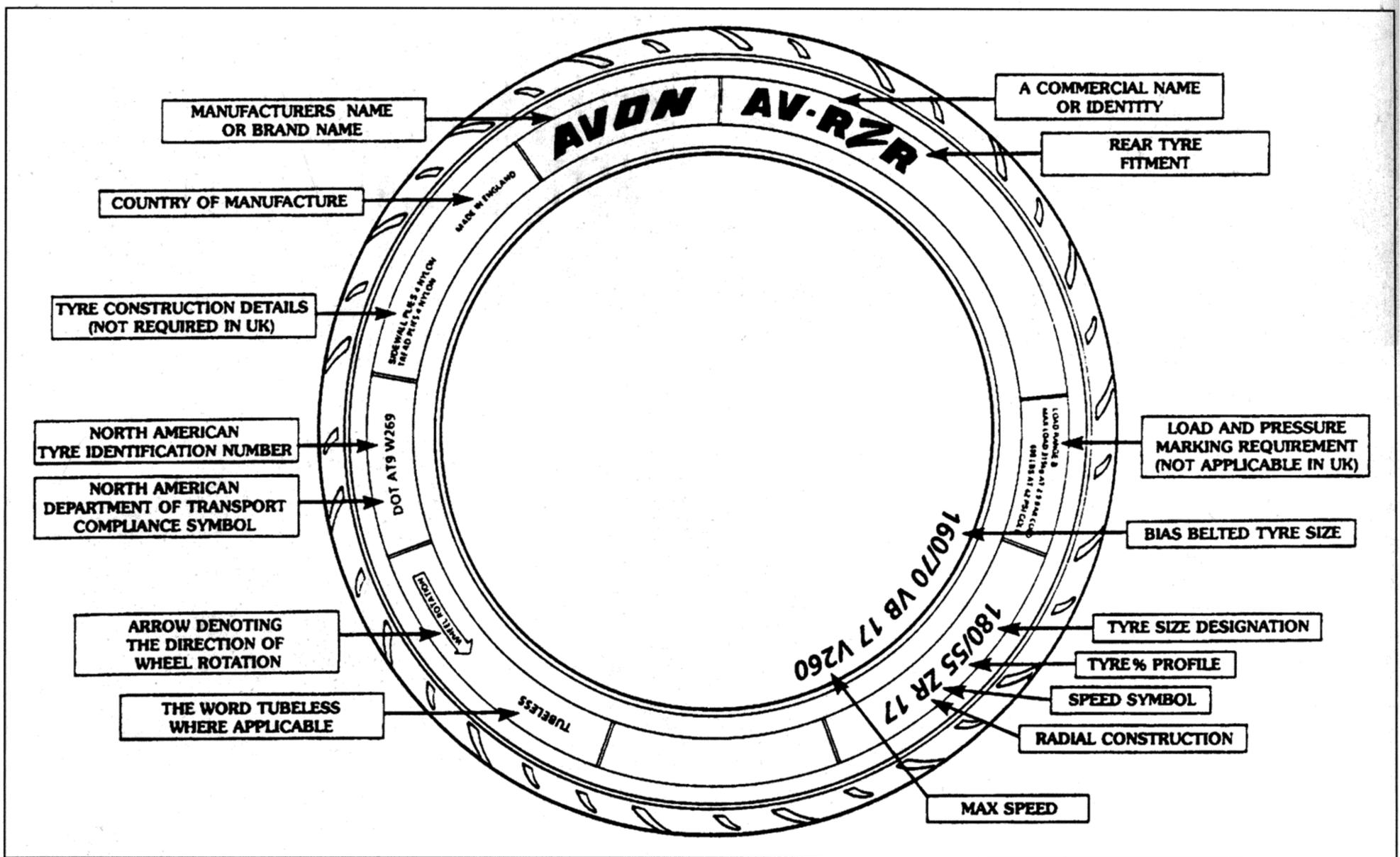
**2** Refer to the Daily (pre-ride) checks listed at



**13.30a** Fit the grease seal . . .



**13.30b** . . . and the spacer



14.3 Common tyre sidewall markings

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. Any such repairs must be carried out professionally by a motorcycle tyre fitting specialist and advice sought on reduced speed limits for repaired tyres.

**6** A punctured tubed tyre is best repaired by fitting a new inner tube and of course removing the item which caused the puncture from the tyre tread. Inner tubes can be repaired using a kit, but the safest option is to renew the inner tube.