Chapter 6
Steering and suspension

Refer to the beginning of Chapter 1 for model identification details

Contents

Degrees of difficulty

Easy, suitable for novice with little experience

Fairly easy, suitable for beginner with some experience

Fairly difficult, suitable for competent DIY mechanic

Difficult, suitable for experienced DIY mechanic

Very difficult, suitable for expert DIY or professional

Specifications

Front forks

Zip	
Fork oil type	20W fork oil
Fork oil capacity	
Zip, Zip 100 4T	30 cc each leg
Zip 50, Zip 50 4T, Zip 125	25 cc each leg
Liberty 50, Liberty 50 4T, Liberty 125, Fly 50, Fly 50 4T, Fly 125	
Fork oil type	20W fork oil
Fork oil capacity	30 cc each leg
X8 125	
Fork oil type	10W fork oil
Fork oil capacity	125 cc each leg
X9 125	
Fork oil type	20W fork oil
Fork oil capacity	90 cc each leg
X9 125 (Euro 3)	
Fork oil type	10W
Fork oil capacity	133 cc Kayaba fork, 145 cc Selenia fork
B125	
Fork oil type	7.5W fork oil
Fork oil capacity	102 cc each leg
Typhoon, Skipper (1998 to 2000 models), Skipper ST and all NRG models	
Grease type	Esso Beacon ET2 or Tradal Complex 2

Torque settings

Handlebar stem bolt nut	
Hexagon 125	38 Nm
Liberty 125	55 Nm
X8 125	43 to 47 Nm
All other models	50 to 55 Nm
Handlebar stem bolt (Zip models)	13 to 16 Nm
Steering head bearing adjuster nut	
Initial setting for all models with ball race bearings (see text)	8 to 10 Nm
Initial setting for all models with taper roller bearings (see text)	20 to 25 Nm
Final setting for all models with taper roller bearings (see text)	10 to 13 Nm
Steering head bearing locknut	
Models with taper roller bearings	30 to 33 Nm
Models with ball race bearings	40 Nm

Torque settings (continued)

Front monoshock mounting nuts	
Sfera, Hexagon, Skipper (1993 to 1997), Zip SP/RS, ET2, ET4, all LX, S and GT models	20 to 30 Nm
Front monoshock mounting bolts	
Sfera, Hexagon, Skipper (1993 to 1997), Zip SP/RS, ET2 and ET4	20 to 25 Nm
All LX, S and GT models	20 to 27 Nm
Front monoshock upper mounting	
Super Hexagon 125	30 Nm
Front monoshock lower mounting	
Super Hexagon 125	27 Nm
Upside-down telescopic forks	
Upper and lower fork assembly bolts	8 to 10 Nm
Motorcycle-type forks	
Top bolt	15 to 30 Nm
Fork leg clamp bolts	
X8 125	20 to 25 Nm
All Fly models	15 to 20 Nm
Damper bolt	
All Fly models	15 to 20 Nm
All other models	25 to 35 Nm
Rear shock absorber upper mounting	
Sfera 125 and ET4	20 to 27 Nm
B125, X9 125	41 Nm
All other models	20 to 25 Nm
Rear shock absorber lower mounting	
Sfera 125 and ET4	20 to 27 Nm
All other models	33 to 41 Nm
Swingarm pivot bolt	
Sfera 125 and ET4	20 to 27 Nm
Fly 50, Fly 50 4T, NRG Power DT and DD	64 to 72 Nm
All LX and S models	44 to 52 Nm
X9 125, B125, Fly 125, Liberty 125 (LEADER), X8 125, all GT models	64 to 72 Nm
All other models	33 to 41 Nm

1 General information

Front suspension is by conventional telescopic forks, upside-down telescopic forks, or by a single-sided trailing arm acting on a shock absorber (monoshock). The front suspension is not adjustable on any model. The model application of front suspension types is detailed in the model specifications in Chapter 1.

At the rear, single or twin oil-damped shock absorbers are mounted between the engine unit and the frame. The shock absorbers are adjustable for spring preload.

2 Handlebars and levers – removal and installation

Handlebars

Removal

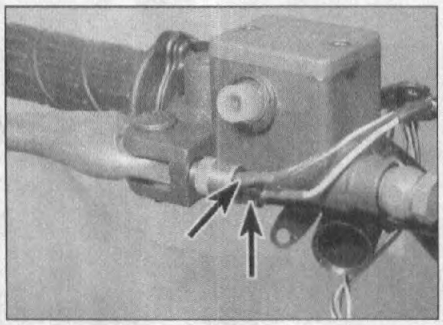
1 Remove the handlebar covers (see Chapter 7). If required, the handlebars can be displaced from the steering head for access to the bearings without having to detach any cables, or remove the brake lever brackets or brake master cylinder. If this is the case, ignore the Steps which do not apply.

2 Disconnect the wiring from each brake light switch **(see illustration)**.

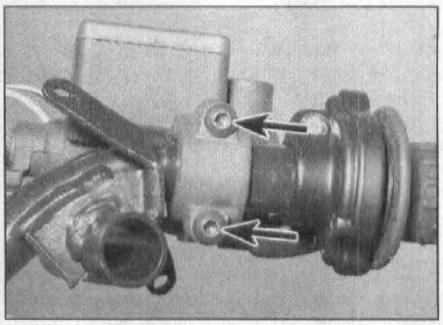
3 Detach the throttle cable from the twistgrip and slide the twistgrip off the end of the handlebar (see Chapter 4).

4 If either a front or rear disc brake is fitted with the hydraulic reservoir mounted on the handlebars, unscrew the master cylinder assembly clamp bolts and position the assembly clear of the handlebar, making sure no strain is placed on the hydraulic hose **(see illustration)**. Keep the hydraulic reservoir upright to prevent air entering the system.

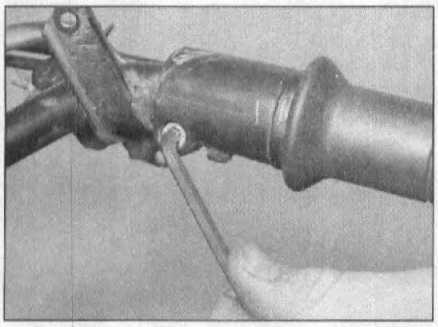
5 On models with a cable-operated front brake, detach the cable from the lever (see Chapter 8), then remove the bolt securing the



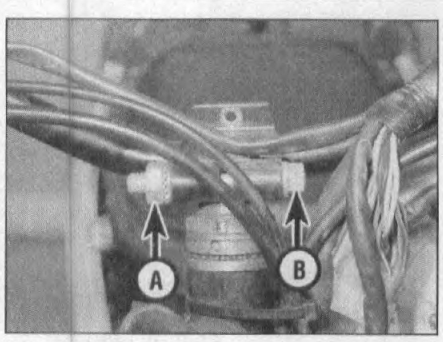
2.2 Disconnect the wiring connectors (arrowed) from each brake light switch



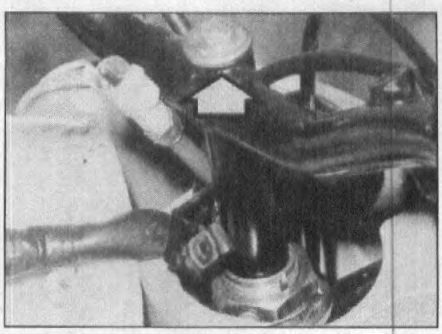
2.4 Disc brake master cylinder clamp bolts (arrowed)



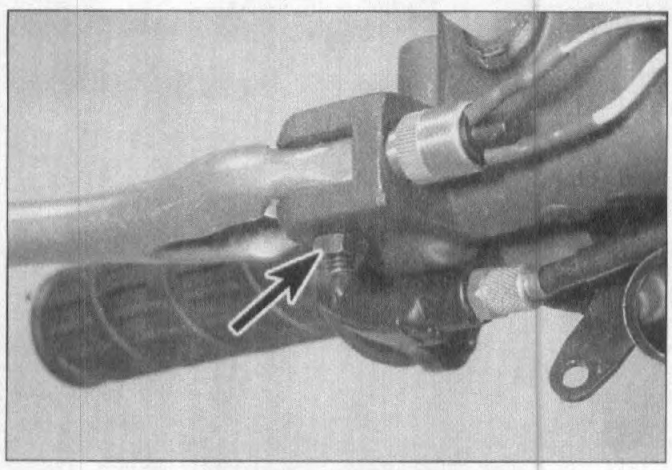
2.5 Unscrew the brake lever bracket bolt



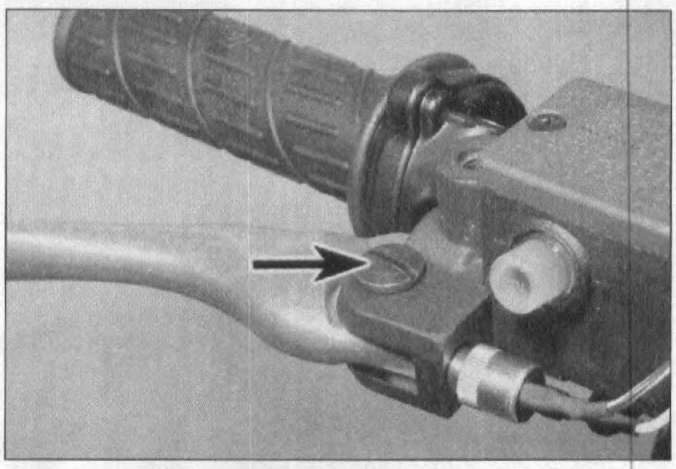
2.7a Unscrew the nut (A) and withdraw the pinch-bolt (B)



2.7b On Zip models remove the long stem bolt and washer (arrowed)



2.9a Unscrew the locknut (arrowed) . . .



2.9b . . . and remove the pivot bolt (arrowed)

brake lever bracket and slide that off the end of the handlebar **(see illustration)**.

6 On models with a cable-operated rear brake, remove the left-hand grip (peel the grip off the bar end, or if necessary cut it off), then detach the rear brake cable from the lever (see Chapter 8). Remove the bolt securing the rear brake lever bracket and slide it off the end of the handlebar.

7 On models with the handlebars secured by a clamp and pinch-bolt, remove the nut and withdraw the bolt, then lift the handlebars off the stem **(see illustration)**. On Zip models, loosen the bolt that passes down through the handlebar stem, then strike the bolt with a soft-faced mallet to free the cone inside the steering stem **(see illustration)**. Lift off the handlebars. If the handlebar components have been left attached, position the handlebars so that no strain is placed on any of the cables, hose or wiring. If you are removing the handlebars completely, make note of how the wiring is taped to the handlebar before freeing it.

Installation

8 Installation is the reverse of removal, noting the following.

a) Refer to the Specifications at the beginning of the Chapter and tighten the nut on the handlebar clamp bolt and on Zip models the stem bolt, to the specified torque setting.

b) Do not forget to reconnect the brake light switch wiring connectors.

c) Use a suitable adhesive between the left-hand grip and the handlebar.

Brake levers

Removal

9 Unscrew the lever pivot bolt locknut, then withdraw the pivot bolt and remove the lever **(see illustrations)**. If applicable, detach the brake cable from the lever as you remove it.

Installation

10 Installation is the reverse of removal. Apply grease to the pivot bolt shank and the contact areas between the lever and its bracket, and to the brake cable nipple (where applicable).

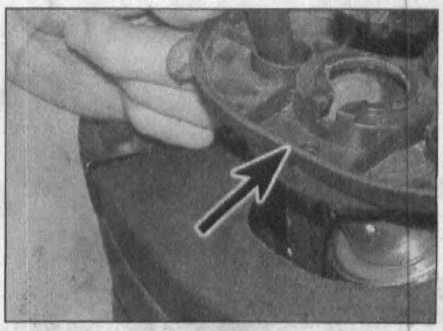
3 Steering stem – removal and installation

Removal

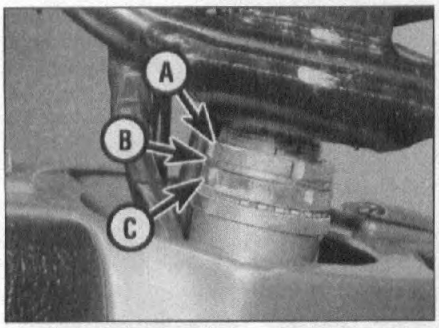
1 Remove the front wheel (see Chapter 8) and the handlebars (see Section 2). On drum brake models, detach the brake cable from the drum (see Chapter 8). On disc brake models, displace the brake caliper and secure it with a cable tie to avoid straining the hydraulic hose (see Chapter 8) – note that there is no need to disconnect the hydraulic hose. On all models, detach the speedometer cable from the wheel hub (see Chapter 9). Although not essential, it is advisable to remove the front body panel to avoid the possibility of damaging any paintwork (see Chapter 7).

2 Where fitted, lift the lower handlebar cover **(see illustration)**.

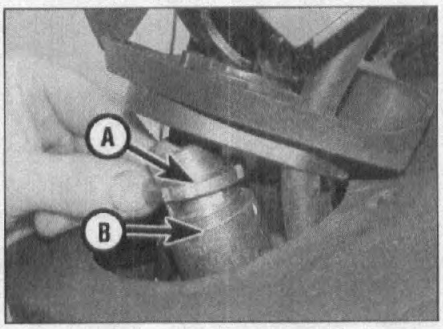
3 Unscrew and remove the bearing adjuster



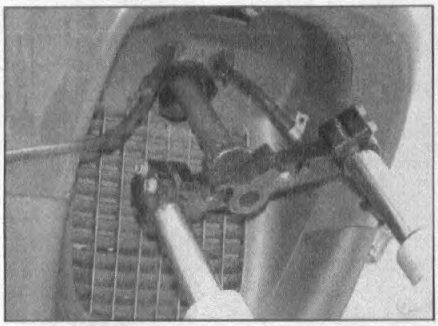
3.2 Lift the lower handlebar cover (arrowed)



3.3a Locknut (A), washer (B), bearing adjuster nut (C)



3.3b Remove the adjuster nut (A) and spacer (B)



3.4 Lower the steering stem out of the frame

locknut using either a suitable C-spanner, a peg-spanner or a drift located in one of the notches **(see illustration)**. Remove the washer, noting how it fits. Supporting the steering stem, unscrew the adjuster nut using either a C-spanner, a peg-spanner or a drift located in one of the notches. Remove the nut and the spacer where fitted **(see illustration)**.

4 Gently lower the steering stem out of the frame **(see illustration)**. On models with trailing arm monoshock suspension, the mudguard can be unbolted from the steering stem if required.

5 As applicable, remove the upper bearing balls from the top of the steering head – the lower bearing balls and inner race will be on the steering stem. **Note:** *On some later models, the upper bearing is a caged ball-bearing which is a press-fit in the steering head and the lower bearing is a taper roller bearing – see Section 4.* Remove all traces of old grease from the bearings and races and check them for wear or damage as described in Section 4. **Note:** *Do not attempt to remove the outer races from the frame or the lower bearing inner race from the steering stem unless they are to be renewed.*

Installation

6 Smear a liberal quantity of grease on the bearing outer races in the frame. Also grease both the upper and lower bearing assemblies. If removed, install the lower bearing assembly over its inner race.

7 Carefully lift the steering stem up through the frame. If removed, install the upper bearing assembly. If fitted, install the spacer, then thread the adjuster nut onto the steering stem. Tighten the adjuster nut to the initial torque setting specified at the beginning of the Chapter. On models with ball race bearings, now slacken the nut off approximately 90° and check the adjustment as described in Chapter 1 **(see illustration)**. On models with taper roller bearings, slacken the nut completely, retighten it to the final torque setting specified, then slacken it by 90°. To apply the torque setting, a service tool (Part No. 020055Y) or a suitable old socket fabricated into a peg spanner is required. If it is not possible to apply a torque wrench to the adjuster nut, tighten the nut and adjust the bearings as described in Chapter 1 after the installation procedure is complete.

Caution: Take great care not to apply excessive pressure because this will cause premature failure of the bearings.

8 When the bearings are correctly adjusted, install the washer, making sure the tab locates in the slot on the steering stem **(see illustration)**. Install the locknut and tighten it to the specified torque setting, using the same tool as above, if available.

9 Install the remaining components, then carry out a check of the steering head bearing freeplay as described in Chapter 1, and if necessary re-adjust.

4 Steering head bearings – inspection and renewal

Inspection

1 Remove the steering stem (see Section 3).

2 Remove all traces of old grease from the bearings and races and check them for wear or damage.

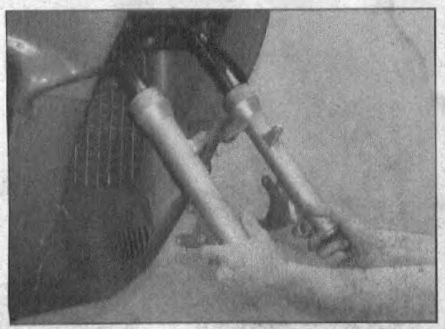
3 The outer races in the steering head should be polished and free from indentations. Inspect the ball or roller bearings for signs of wear, damage or discoloration, and examine the bearing retainer cage for signs of cracks or splits **(see illustration)**. Spin the bearing by hand. It should spin freely and smoothly. If there are any signs of wear on any of the above components both upper and lower bearing assemblies must be renewed as a set. Only remove the races if they need to be renewed – do not re-use them once they have been removed. **Note:** *If the upper bearing is a caged ball-bearing, turn it by hand to check for roughness and indentations in the race. The bearing is sealed and cannot be cleaned or regreased. Only remove the bearing if it is going to be renewed (see Steps 4, 5 and 6).*

Renewal

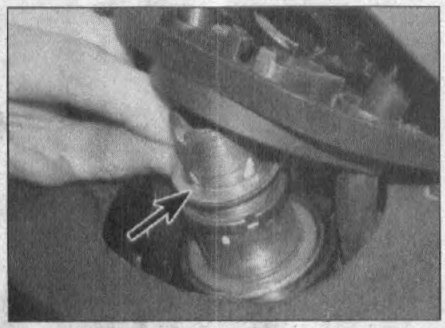
4 The outer races are an interference fit in the frame and can be tapped from position with a suitable drift **(see illustration)**. Tap firmly and evenly around each race to ensure that it is driven out squarely. It may prove advantageous to curve the end of the drift slightly to improve access.

5 Alternatively, the races can be pulled out using a slide-hammer with internal expanding extractor.

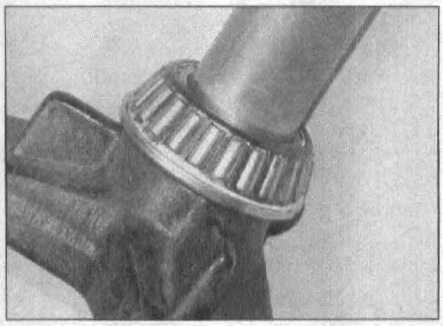
6 The new outer races can be pressed into the frame using a drawbolt arrangement **(see**



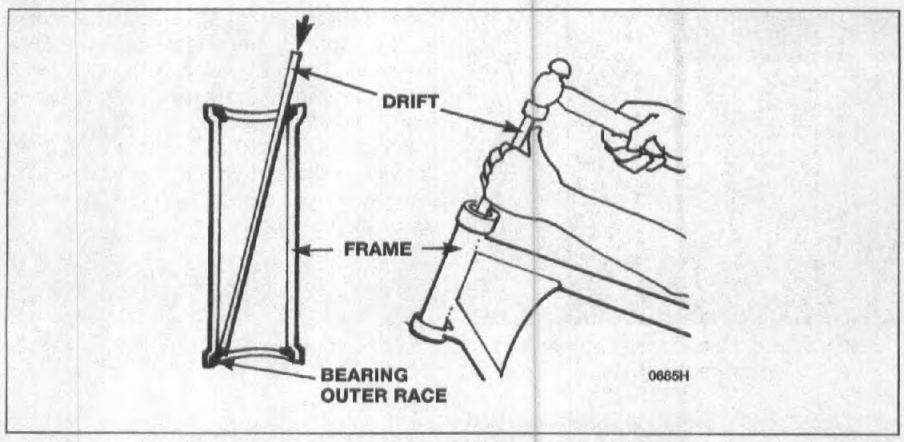
3.7 Check the bearings for freeplay



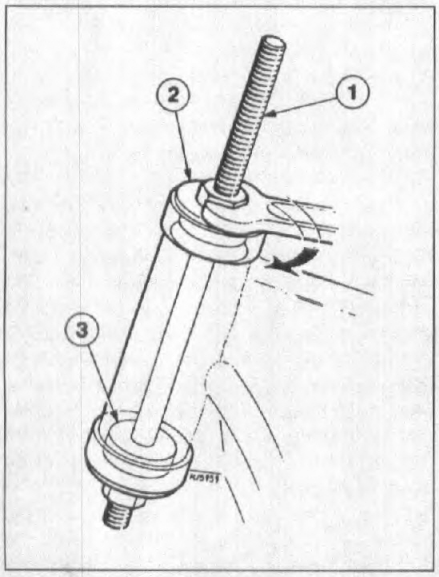
3.8 Ensure tab (arrowed) locates in the slot in the stem



4.3 Examine the bearings and the bearing cage – roller bearing

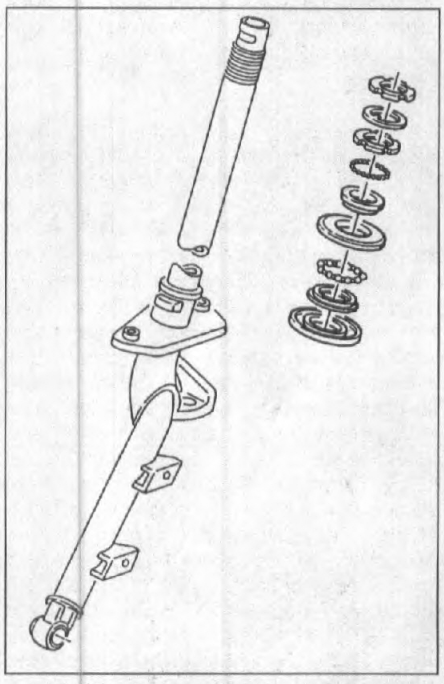


4.4 Drive the bearing outer races from the frame



4.6 Drawbolt arrangement for fitting steering head bearing outer races

1 Long bolt or threaded bar
2 Thick washer
3 Guide for lower outer race



4.8 Steering head bearing assembly

illustration), or by using a large diameter tubular drift which bears only on the outer edge of the race. Ensure that the drawbolt washer or drift (as applicable) bears only on the outer edge of the race and does not contact the working surface. Alternatively, have the races installed by a Piaggio dealer equipped with the bearing race installing tools.

> **HAYNES HiNT** ***Installation of new bearing outer races is made much easier if the races are left overnight in the freezer. This causes them to contract slightly making them a looser fit.***

7 To remove the lower bearing inner race from the steering stem, use two screwdrivers placed on opposite sides of the race to work it free. If the bearing is firmly in place it will be necessary to use a bearing puller, or drive a chisel between the underside of the race and the bearing seat. Take the steering stem to a Piaggio dealer if required. Check the condition of the dust seal that fits under the race and renew it if it is worn, damaged or deteriorated.

8 Fit the new lower inner race bearing onto the steering stem **(see illustration)**. A length of tubing with an internal diameter slightly larger than the steering stem will be needed to tap the new bearing into position. Ensure that the drift bears only on the inner edge of the race and does not contact its working surface.

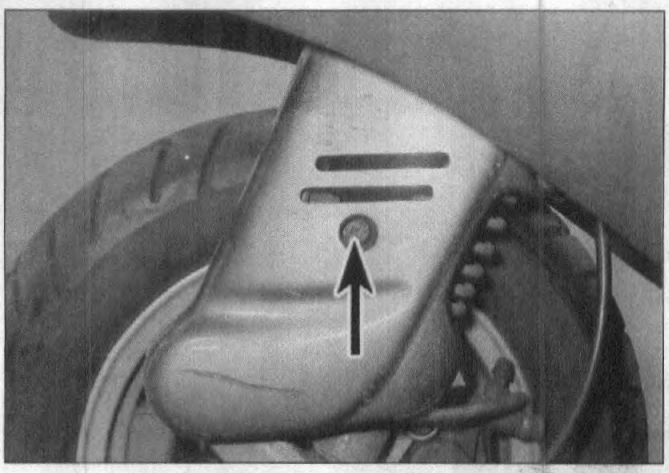
9 Install the steering stem (see Section 3).

5 Front suspension – disassembly, inspection and reassembly

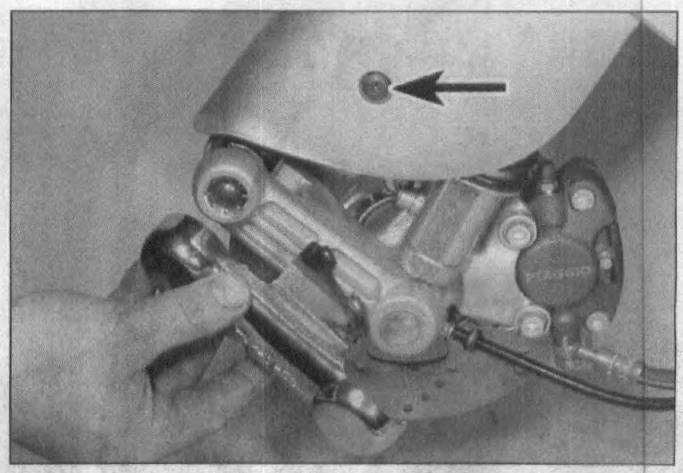
Single-side trailing arm monoshock

Disassembly

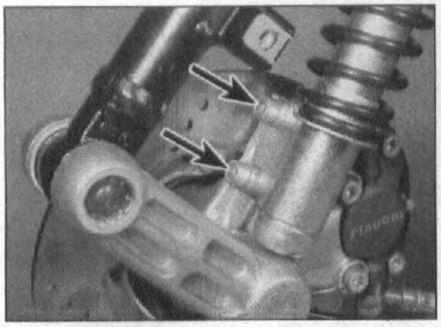
1 Remove the front wheel (see Chapter 8). Where applicable, remove the suspension cover and the trailing link trim **(see illustrations)**.



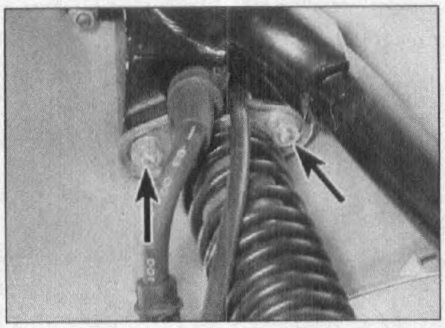
5.1a Suspension cover screw (arrowed) – Hexagon



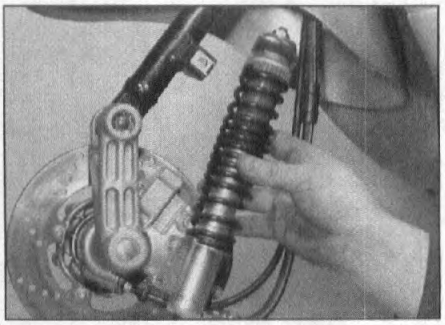
5.1b Suspension cover screw (arrowed) and trim – ET2 and ET4



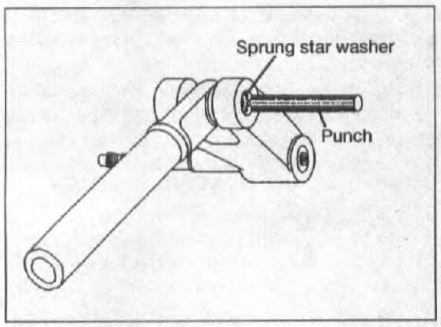
5.2a Remove the two bolts (arrowed) . . .



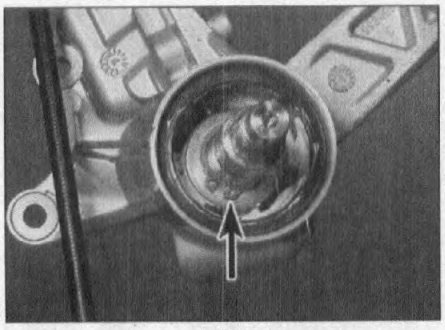
5.2b . . . and the two nuts (arrowed) . . .



5.2c . . . and remove the shock absorber



5.4 Removing the trailing link arm sprung star washers with a 20 mm diameter punch



5.6 Remove the circlip (arrowed) and draw the bracket off the trailing link arm

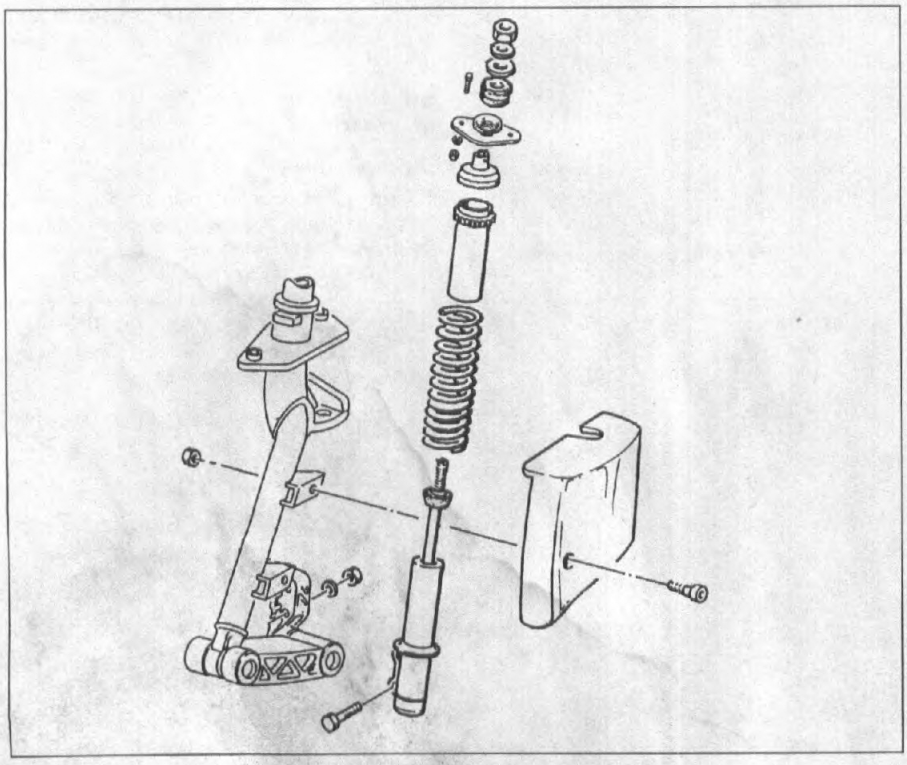
2 Remove the two bolts securing the bottom of the shock absorber to the bracket, noting the washers, and the two nuts securing the top to the steering stem **(see illustrations)**. Manoeuvre the shock absorber away from the scooter **(see illustration)**.

3 Before separating the trailing link arm from the steering stem, check the condition of the bearings by moving the arm laterally against the steering stem. If any play is felt between the arm and the stem, the bearings and spacer pin must be renewed. Also move the arm up and down. If any roughness is felt or the arm does not move smoothly and freely, the bearings and spacer pin must be renewed. If the bearings and pin are good, there is no need to separate the trailing link arm from the steering stem, unless required for other purposes.

4 To remove the trailing link arm, first remove the wheel hub assembly (see Chapter 8). To separate the arm from the steering stem, remove the sprung star washer from each side of the arm. The washers can be removed either by hitting them centrally with a suitable punch or drift, which should be wide enough to cover the raised inner section of the washer **(see illustration)**, or be levering up the outer tangs of the washer with a suitable screwdriver. Discard the washers, as new ones must be used.

5 Drive or press out the bearing spacer pin from the middle of the arm and separate the arm from the stem. Remove the O-rings and dust seals.

6 Check for any play in the two needle roller bearings between the trailing link arm and the brake caliper/shock absorber mounting bracket as described in Step 3. If required, remove the circlip and slide the bracket off the trailing link arm, using a soft-faced mallet to tap the end of the wheel axle through if necessary **(see illustration)**.



5.11 Front shock absorber components

Inspection

7 Thoroughly clean all components, removing all traces of dirt, corrosion and grease. Inspect all components closely, looking for obvious signs of wear such as heavy scoring, or for damage such as cracks or distortion.

8 Inspect the shock absorber for obvious physical damage and the coil spring for looseness, cracks or signs of fatigue.

9 Inspect the damper rod for signs of bending, pitting and oil leakage.

10 Inspect the mountings at the top and bottom of the shock for wear or damage.

11 If required, the shock absorber can be disassembled and individual components renewed **(see illustration)**. Compress the