Chapter 1
Routine maintenance and servicing

Contents

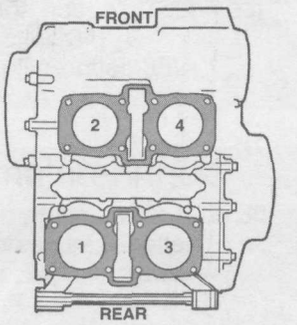
Degrees of difficulty

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

Engine

Cylinder numbering	Rear left – 1, front left – 2, rear right – 3, front right – 4
Spark plug type	
Type	NGK DPR8EA-9 or Nippondenso X24EPR-U9
Electrode gap	0.8 to 0.9 mm
Engine idle speed	
Europe and US models	1000 ± 50 rpm
California models	1100 ± 50 rpm
Carburettor synchronisation – minimum intake vacuum at idle	170 mmHg
Carburettor synchronisation – max. difference between carburettors	20 mmHg
Valve clearances (COLD engine)	
Intake valves	0.11 to 0.15 mm
Exhaust valves	0.26 to 0.30 mm
Cylinder compression at cranking speed	
Standard	142 psi (9.7 Bar)
Maximum	171 psi (11.8 Bar)
Minimum	128 psi (8.8 Bar)
Max. difference between cylinders	14.0 psi (0.96 Bar)
Engine oil pressure	3.6 psi (0.25 Bar) @ 1000 rpm, oil between 60 to 70°C



1•2 Specifications

Miscellaneous

Throttle cable freeplay	3 to 7 mm
Tyre pressures (cold)	see *Daily (pre-ride) checks*
Front brake lever freeplay	2 to 5 mm
Rear brake pedal height (see text)	20 mm

Recommended lubricants and fluids

Engine/transmission oil type	API grade SE, SF or SG motor oil
Engine/transmission oil viscosity	SAE 10W40 (but see *Daily (pre-ride) checks*)
Engine/transmission oil capacity	
Oil change	3.5 litres*
Oil and filter change	3.8 litres*
Following engine overhaul – dry engine, new filter	4.7 litres*
Final drive oil type	SAE 80 API GL-4 Hypoid gear oil
Final drive oil capacity	0.2 litre
Coolant type	50% distilled water, 50% corrosion inhibited ethylene glycol anti-freeze
Coolant capacity	
Radiator and engine	3.05 litres
Reservoir	0.2 litres
Brake fluid	DOT 4
Clutch fluid	DOT 4
Steering head bearings	Lithium-based multi-purpose grease
Swingarm pivot bolts	Lithium-based multi-purpose grease
Swingarm pivot bearings	Molybdenum disulphide grease
Swingarm pivot bearing seal lips	Molybdenum disulphide grease
Rear shock absorber pivots	Molybdenum disulphide grease
Wheel bearing seal lips	Lithium-based multi-purpose grease
Gearchange lever/rear brake pedal/footrest pivots and contact surfaces	Lithium-based multi-purpose grease
Front brake lever and clutch lever pivots and contact surfaces	Lithium-based multi-purpose grease
Sidestand and centrestand pivots	Lithium-based multi-purpose grease
Throttle twistgrip	Lithium-based multi-purpose grease or dry film lubricant
Front brake master cylinder piston tip	Silicone grease
Clutch lever master cylinder piston tip	Silicone grease
Cables	10W40 engine oil or cable lubricant

***Note:** *Oil capacities should be taken as an approximation only – always judge the amount by the level in the inspection window.*

Torque settings

Cooling system drain bolt (on water pump)	43 Nm
Engine oil drain bolt	43 Nm
Engine oil filter housing bolt – cartridge type filter	32 Nm
Engine oil filter – spin-on type filter	17 Nm
Final drive oil filler bolt	23 Nm
Final drive oil drain bolt	23 Nm
Main oil gallery bolt	12 Nm
Spark plugs	18 Nm
Steering head bearing adjuster nut	
Initial setting	50 Nm
Final setting	3 Nm
Steering stem nut	110 Nm
Top yoke fork clamp bolts	
1985 to 2000 models	20 Nm
2001 to 2003 models	23 Nm

Note: *The daily (pre-ride) checks outlined in the owner's manual cover those items which should be inspected on a daily basis. Always perform the pre-ride inspection at every maintenance interval (in addition to the procedures listed). The intervals listed below are the intervals recommended by the manufacturer for each particular operation during the model years covered in this manual. Your owner's manual may have different intervals for your model.*

Daily (pre-ride)

- ☐ See '*Daily (pre-ride) checks*' at the beginning of this manual.

After the initial 600 miles (1000 km)

Note: *This first service is performed by a Yamaha dealer after 600 miles (1000 km) from new. Thereafter, maintenance is carried out according to the following intervals of the schedule. If your motorcycle is still within its warranty period, check the warranty conditions before performing your own service work as you could invalidate it.*

Every 4000 miles (6000 km) or 6 months (whichever comes first)

- ☐ Check the spark plugs – (Section 1)
- ☐ Check and adjust the idle speed (Section 2)
- ☐ Check the fuel system and hoses (Section 3)
- ☐ Check/adjust the carburettor synchronisation (Section 4)
- ☐ Clean the air filter element (Section 5)
- ☐ Check the cooling system (Section 6)
- ☐ Check the brake pads (Section 7)
- ☐ Check the brake system and brake light switch operation (Section 8)
- ☐ Check the battery (Section 9)
- ☐ Change the engine oil (Section 10)

Every 6000 miles (10,000 km) or 10 months (whichever comes first)

- ☐ Check the final drive oil level (Section 11)
- ☐ Lubricate the clutch, gearchange and brake levers, brake pedal, sidestand and centrestand pivots, and the throttle cables (Section 12)
- ☐ Check and adjust the throttle cables (Section 13)
- ☐ Check and adjust the headlight aim (Section 14)
- ☐ Check the sidestand, centrestand and starter interlock circuit (Section 15)
- ☐ Check the suspension (Section 16)
- ☐ Check and adjust the steering head bearings (Section 17)
- ☐ Check the tightness of all nuts, bolts and fasteners (Section 18)
- ☐ Check the condition of the wheels and tyres (Section 19)
- ☐ Check the wheel bearings (Section 20)
- ☐ Check the clutch (Section 21)

Every 8000 miles (12,000 km) or 12 months (whichever comes first)

Carry out all the items under the 4000 mile (6000 km) check, plus the following

- ☐ Fit new spark plugs – (Section 22)
- ☐ Fit a new oil filter (Section 23)

Every 12,000 miles (20,000 km) or 20 months (whichever comes first)

Carry out all the items under the 4000 mile (6000 km) and the 6000 mile (10,000 km) checks, plus the following

- ☐ Fit a new air filter (Section 24)
- ☐ Change the final drive oil (Section 25)

Every 20,000 miles (30,000 km)

Carry out all the items under the 4000 mile (6000 km) check, plus the following

- ☐ Fit a new fuel filter (Section 26)
- ☐ Re-grease the steering head bearings (Section 27)
- ☐ Re-grease the swingarm bearings (Section 28)

Every 25,000 miles (40,000 km)

- ☐ Check and adjust the valve clearances (Section 29)

Every two years

- ☐ Change the coolant (Section 30)
- ☐ Change the brake and clutch fluid (Section 31)

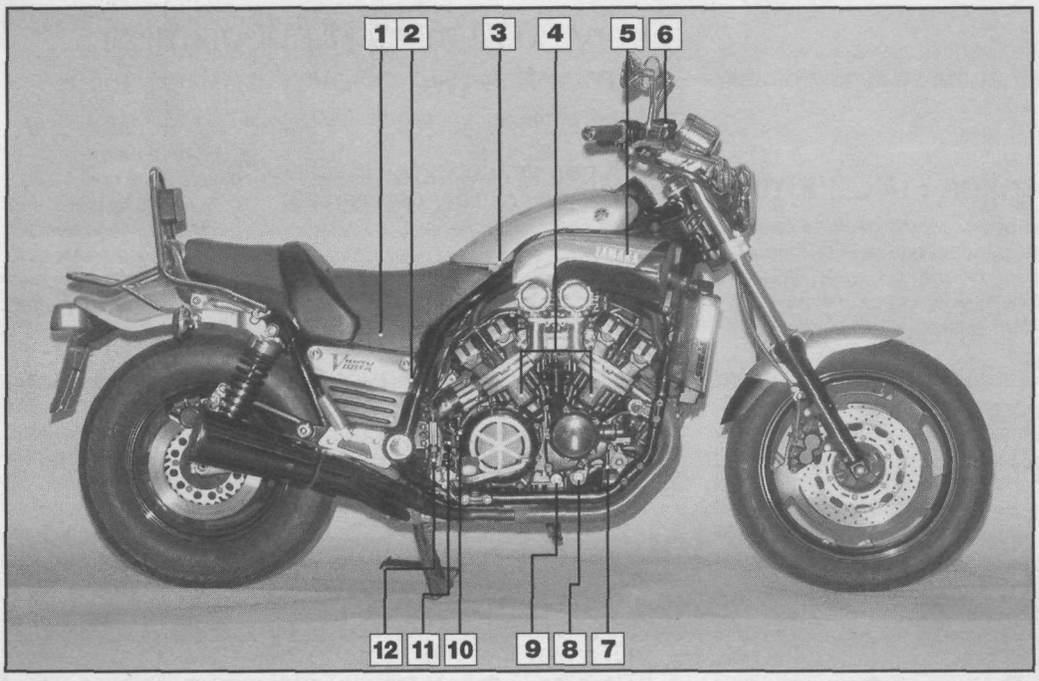
Every four years

- ☐ Fit new brake and clutch master cylinder and caliper/release cylinder seals (Section 32)
- ☐ Fit new brake and clutch hoses (Section 33)
- ☐ Fit new fuel hoses (Section 34)
- ☐ Change the front fork oil (Section 35)

Non-scheduled maintenance

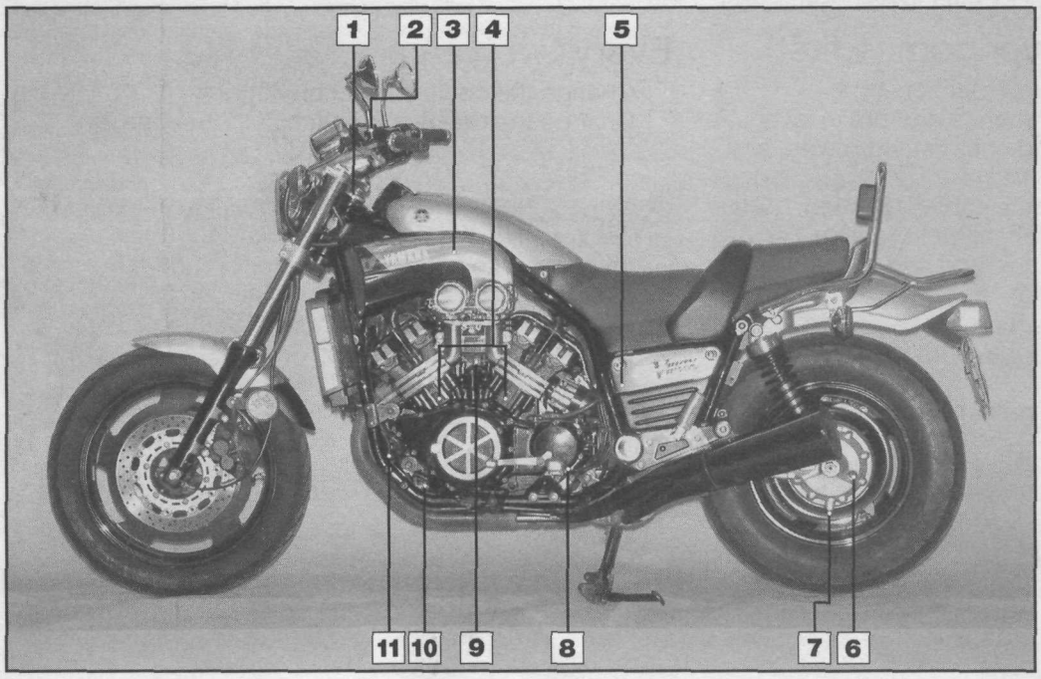
- ☐ Check the cylinder compression (Section 36)
- ☐ Check the engine oil pressure (Section 37)

Component locations on the right-hand side



1 *In-line fuel filter*
2 *Rear brake fluid reservoir*
3 *Coolant reservoir*
4 *Coolant drain plugs on cylinders*
5 *Cooling system pressure cap*
6 *Front brake fluid reservoir*
7 *Coolant drain bolt on wate pump*
8 *Engine oil level inspection window*
9 *Main oil gallery bolt for pressure check*
10 *Engine oil filler cap*
11 *Rear brake light switch*
12 *Rear brake pedal height adjuster*

Component locations on the left-hand side



1 *Steering head bearing adjuster*
2 *Clutch fluid reservoir*
3 *Air filter*
4 *Coolant drain plugs on cylinders*
5 *Battery*
6 *Final drive oil level/filler bolt*
7 *Final drive oil drain bolt*
8 *Gearchange pedal height adjuster*
9 *Idle speed adjuster*
10 *Engine oil drain bolt*
11 *Engine oil filter*

Introduction

1 This Chapter is designed to help the home mechanic maintain his/her motorcycle for safety, economy, long life and peak performance.

2 Deciding where to start or plug into the routine maintenance schedule depends on several factors. If your motorcycle has been maintained according to the warranty standards and has just come out of warranty, start routine maintenance as it coincides with the next mileage or calendar interval. If you have owned the machine for some time but have never performed any maintenance on it, start at the nearest interval and include some additional procedures to ensure that nothing important is overlooked. If you have just had a major engine overhaul, then start the maintenance routine from the beginning. If you have a used machine and have no knowledge of its history or maintenance record, combine all the checks into one large service initially and then settle into the specified maintenance schedule.

3 Before beginning any maintenance or repair, the machine should be cleaned thoroughly, especially around the oil filter, spark plugs, valve covers, body panels, carburettors, etc. Cleaning will help ensure that dirt does not contaminate the engine and will allow you to detect wear and damage that could otherwise easily go unnoticed.

4 Certain maintenance information is sometimes printed on labels attached to the motorcycle. If the information on the labels differs from that included here, use the information on the label.

Every 4000 miles (6000 km) or 6 months

1 Spark plug check

1 Make sure your spark plug socket is the correct size before attempting to remove the plugs – a suitable one is supplied in the motorcycle's tool kit which is stored under the seat.

2 Work on one plug at a time. When working on the rear cylinder spark plugs detach the plug cap cover from the heat shield, noting how it fits **(see illustration)**. Pull the cap off the spark plug **(see illustration)**. Using compressed air if available, clean the area around the base of the plug to prevent any dirt falling into the engine when the plug is removed.

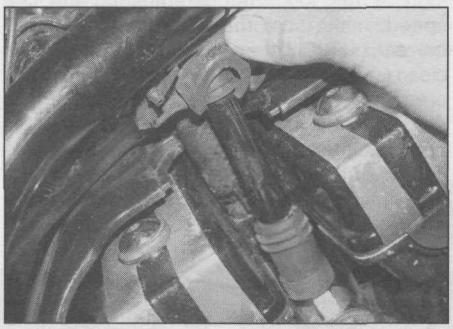
3 Using either the plug removing tool supplied in the bike's toolkit or a deep socket type wrench, unscrew the plug from the cylinder head **(see illustrations)**.

4 Inspect the electrodes for wear. Both the centre and side electrodes should have square edges and the side electrode should be of uniform thickness – if not, they are worn. Look for excessive deposits and evidence of a cracked or chipped insulator around the centre electrode. Check the colour of the plug then refer to the chart at the end of this manual to determine whether there are any carburation or ignition problems. Check the threads, the washer and the ceramic insulator body for cracks and other damage.

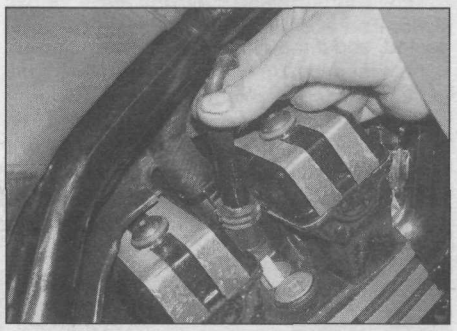
5 If the electrodes are not excessively worn, if no cracks or chips are visible in the insulator, and if the deposits can be easily removed with a wire brush, the plugs can be re-gapped and re-used. If in doubt concerning the condition of the plugs, replace them with new ones as the expense is minimal.

6 You can clean spark plugs by sandblasting them, provided you blow them out with compressed air and clean them with a high flash-point solvent afterwards.

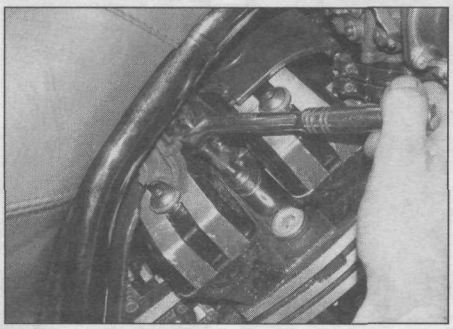
7 Before installing the plugs, make sure they



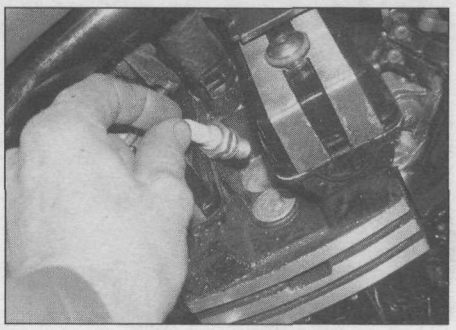
1.2a On the rear cylinders detach the cap cover from the heat shield



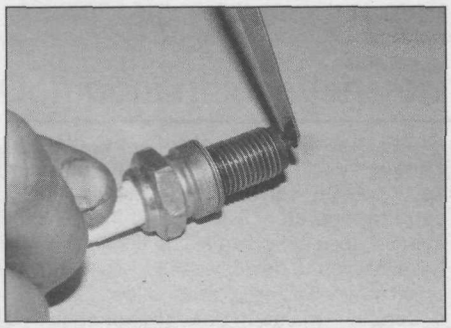
1.2b Pull the cap off the spark plug



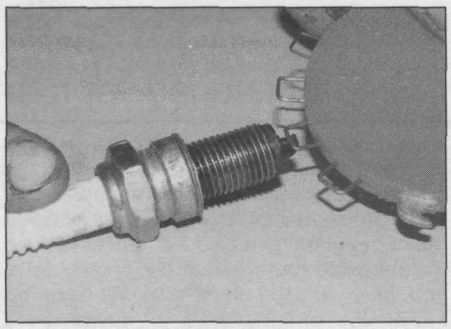
1.3a Unscrew the spark plug . . .



1.3b . . . and remove it



1.7a Using a feeler gauge to measure the spark plug electrode gap



1.7b Using a wire type gauge to measure the spark plug electrode gap

are the correct type and heat range and check the gap between the electrodes **(see illustrations)**. Compare the gap to that specified and adjust as necessary. If the gap must be adjusted, bend the side electrode *only and be very careful not to chip or crack* the insulator nose **(see illustration)**. Make sure the sealing washer is in place before installing each plug.

8 Fit the plug into the end of the tool, then use the tool to insert the plug. Since the cylinder heads are made of aluminium, which is soft and easily damaged, thread the plug as *far as possible into the head turning the tool* by hand. Once the plug is finger-tight, finish the job using a spanner on the tool supplied or a socket drive **(see illustration 1.3a)**. If a torque wrench is available, tighten the spark plug to the torque setting specified at the beginning of the Chapter. Otherwise, tighten it according to the instructions on the box – generally if new plugs are being used, tighten them by 1/2 a turn after the washer has seated, and if the old plugs are being reused, tighten them by 1/8 to 1/4 turn after they have seated. Do not over-tighten them.

9 *Spray the inside of the spark plug cap and* the joint between the lead and the cap with a water repelling and dispersing product such as WD40 as water can easily get in and cause misfires. Fit the cap back onto the spark plug **(see illustration 1.2b)**. When working on the rear cylinder spark plugs fit the plug cap cover onto the heat shield, making sure the pegs locate **(see illustration 1.2a)**.

HAYNES HINT ***Stripped plug threads in the cylinder head can be repaired with a Heli-Coil thread insert – see 'Tools and Workshop Tips' in the Reference section.***

2 Idle speed check

1 The idle speed should be checked and adjusted *before and after the carburettors are* synchronised (balanced), after checking the valve clearances, and when it is obviously too high or too low. Before adjusting the idle speed, make sure the spark plug gaps are correct (see Section 1), and the air filter is clean (see Section 5). If the valves are due for a clearance check, do that first (see Section 29). *Also, turn the handlebars from side-to-side* and check the idle speed does not change as you do. If it does, the throttle cables may not be adjusted or routed correctly, or may be worn out. This is a dangerous condition that can cause loss of control of the bike. Be sure to correct this problem before proceeding.

2 The engine should be at normal operating temperature, which is usually reached after 10 to 15 minutes of stop-and-go riding. Place the motorcycle on its centrestand, and make sure the transmission is in neutral.

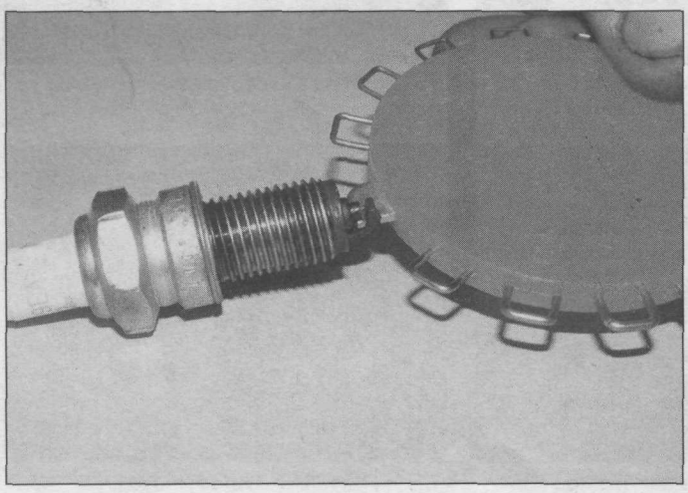
3 The idle speed adjuster is a knurled knob located on the left-hand side of the engine below the carburettors **(see illustration)**. With *the engine idling, adjust the speed by turning* the knob until the speed listed in this Chapter's Specifications is obtained. Turn the screw clockwise to increase idle speed, and anti-clockwise to decrease it.

4 Snap the throttle open and shut a few times, then recheck the idle speed. If necessary, repeat the adjustment procedure.

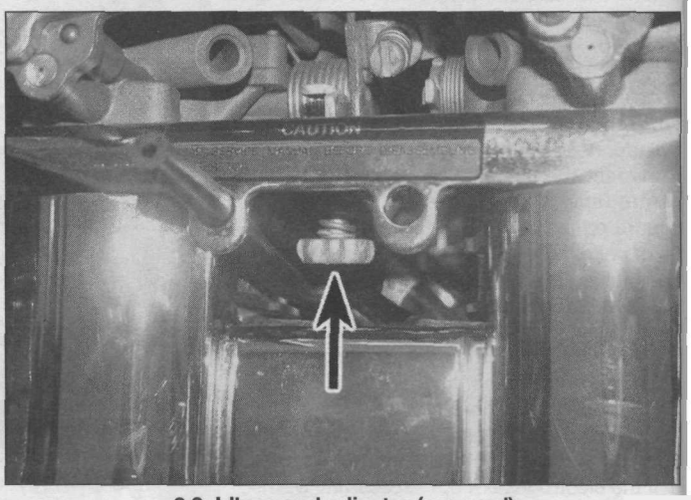
5 *If a smooth, steady idle can't be achieved* the air/fuel mixture may be incorrect (check the pilot screw settings – see Chapter 4) or the carburettors may need synchronising (see Section 4). Also check the intake duct rubbers for cracks which will cause an air leak, resulting in a weak mixture, and check the duct bolts and clamps are tight. (see Chapter 4).

3 Fuel system check

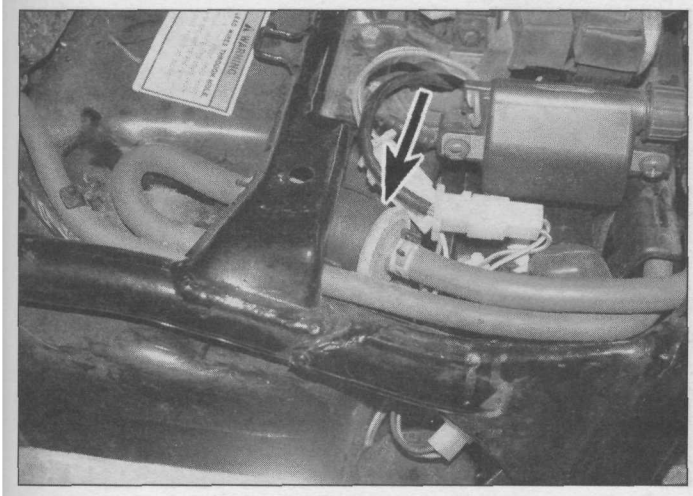
Warning: Petrol (gasoline) is extremely flammable, so take extra precautions when you work on any part of the fuel system. Don't smoke or allow open flames or bare light bulbs near the work area, and don't work in a garage where a natural gas-type appliance is present. If you spill any fuel on your skin, rinse it off immediately with soap and water. When you perform any kind of work on the fuel system, wear safety glasses and have a fire extinguisher suitable for a Class B type fire (flammable liquids) on hand.



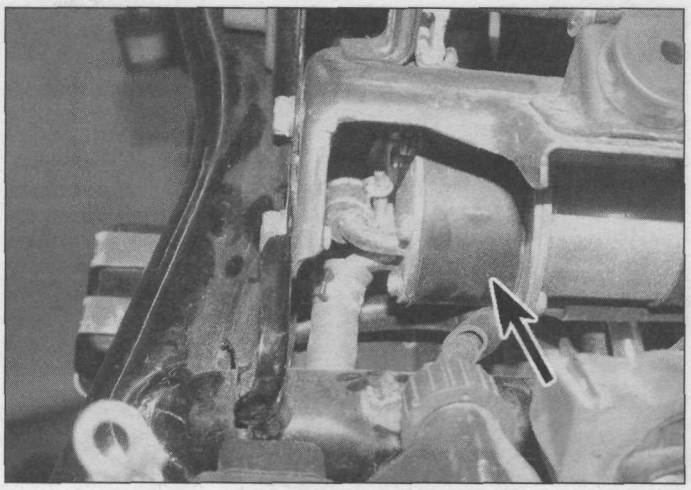
1.7c Adjust the electrode gap by bending the side electrode only



2.3 Idle speed adjuster (arrowed)



3.1a Fuel filter (arrowed) and hoses



3.1b Fuel pump (arrowed) and hoses

Fuel supply system

1 Remove the rider's seat (see Chapter 8) and the air filter housing (see Chapter 4) and check the fuel tank, the filter, the pump, the carburettors, and the fuel hoses between them, for signs of leakage, deterioration and damage **(see illustrations)**; check that each hose is fully pushed onto its union and secured by a clamp. Renew any hoses that are cracked or have deteriorated (see Section 34). Similarly check the drain hose from the filler cap drip tray and the breather hose from the tank.

2 Check for leakage from the level sensor in the base of the tank. If it is leaking, tighten the mounting screws **(see illustration)**. If leakage persists remove the sensor and replace its gasket with a new one (see Chapter 4).

3 If the carburettors are leaking, disassemble them and rebuild them using new seals (see Chapter 4).

4 An in-line filter is fitted in the fuel hose between the tank and the pump **(see illustration 3.1a)**. Check the filter for signs of contamination and dirt build-up. Renew the filter at the specified service interval, or if it is the suspected cause of fuel starvation (see Section 26).

5 Also check the vacuum hose between the No. 2 cylinder intake duct vacuum take-off union and the ignition advance unit for cracks, hardening and deterioration and replace it with a new one if necessary **(see illustration 4.5a)**. Any air leaks in the hose will prevent the ignition timing from advancing as it should and so cause poor performance. If you fit a new one, note that it comes in two separate sections with a one-way nozzle between them – the nozzle has a directional arrow which must point to the ignition advance unit **(see illustration)**.

Evaporative emission control (EVAP) system – check (California models)

6 Visually inspect all the system hoses between the fuel tank, the carburettors, and the canister for kinks and splits and any other damage or deterioration. Make sure that the hoses are securely connected with a clamp on each end. Replace any hoses that are damaged or deteriorated.

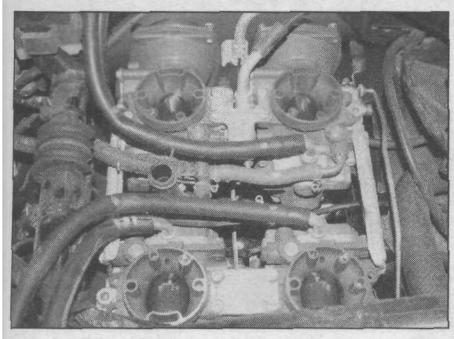
7 Check the EVAP canister for cracks or other damage.

4 Carburettor synchronisation

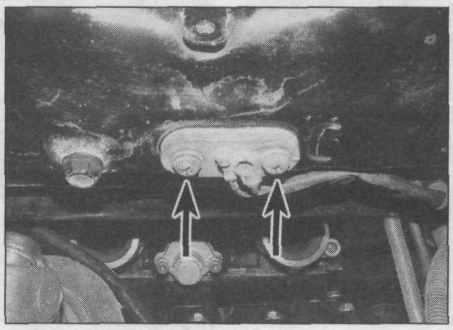
Warning: Petrol (gasoline) is extremely flammable, so take extra precautions when you work on any part of the fuel system. Don't smoke or allow open flames or bare light bulbs near the work area, and don't work in a garage where a natural gas-type appliance is present. If you spill any fuel on your skin, rinse it off immediately with soap and water. When you perform any kind of work on the fuel system, wear safety glasses and have a fire extinguisher suitable for a Class B type fire (flammable liquids) on hand.

Warning: Take great care not to burn your hand on the hot engine unit when accessing the gauge take-off points on the intake manifolds. Do not allow exhaust gases to build up in the work area; either perform the check outside or use an exhaust gas extraction system.

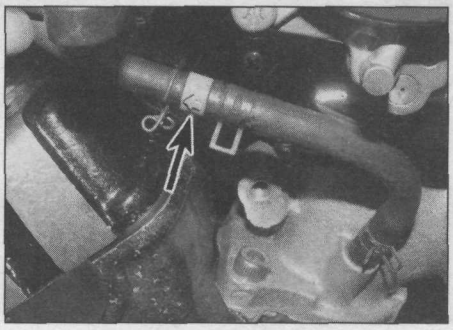
1 Synchronising or balancing the carburettors is simply the process of adjusting the throttle linkage settings so each carburettor passes the same amount of air/fuel mixture to each cylinder. This is done by measuring the vacuum produced in each intake duct. Carburettors that are out of synchronisation will result in increased fuel consumption, increased engine temperature, less than ideal throttle response and higher vibration levels. If you are also checking the valve clearances as part of a major service, do that before synchronising the



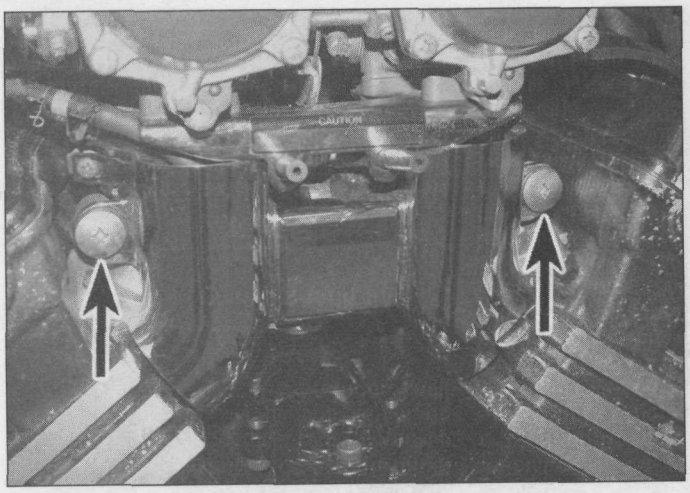
3.1c Carburettors and hoses



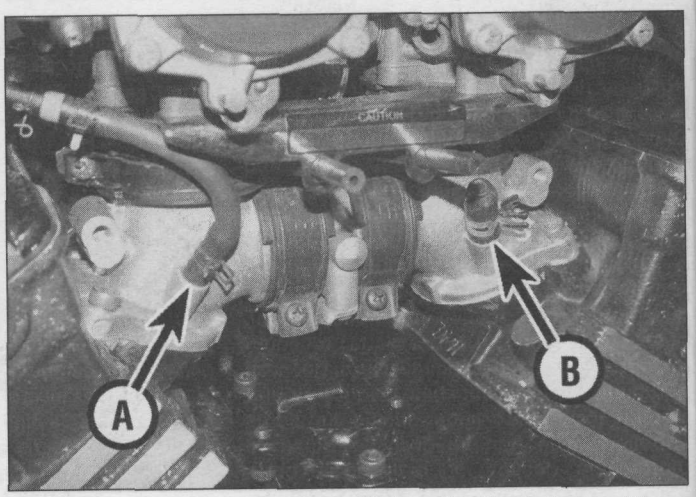
3.2 Fuel level sensor screws (arrowed)



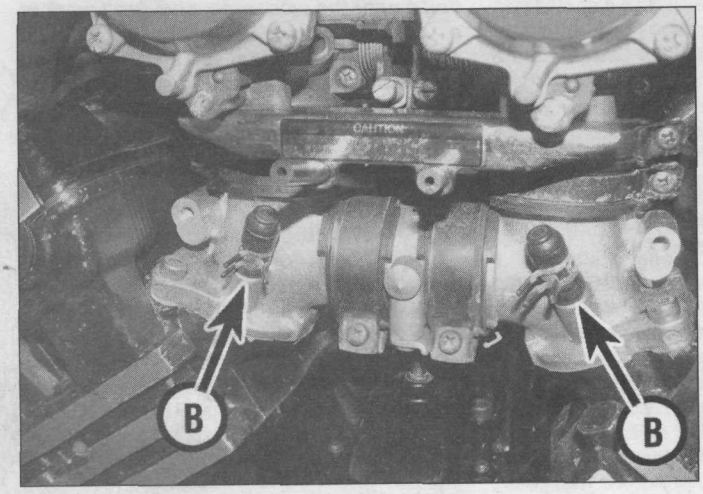
3.5 Note the nozzle (arrowed) with the directional arrow



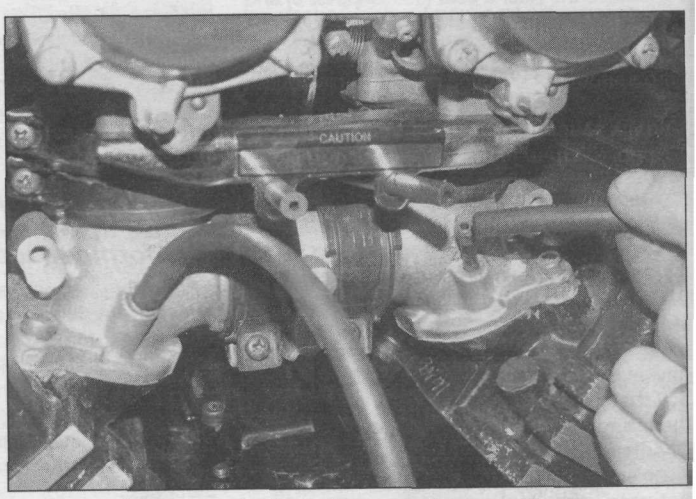
4.4 Undo the screws (arrowed) and remove the cover on each side



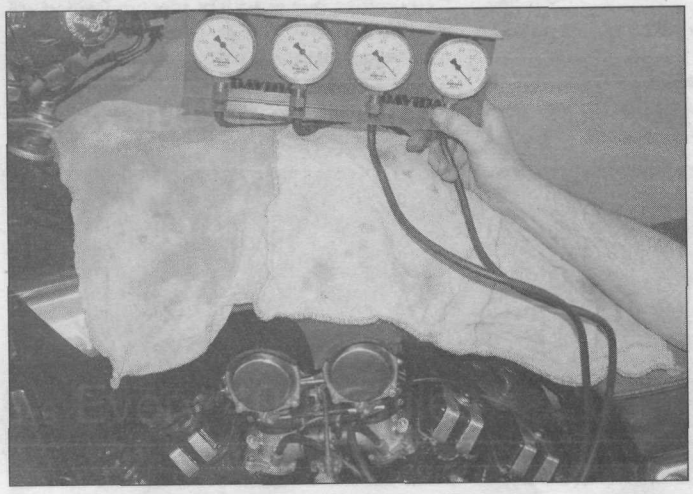
4.5a Remove the vacuum hose (A) from the No. 2 duct and the blanking caps (B) . . .



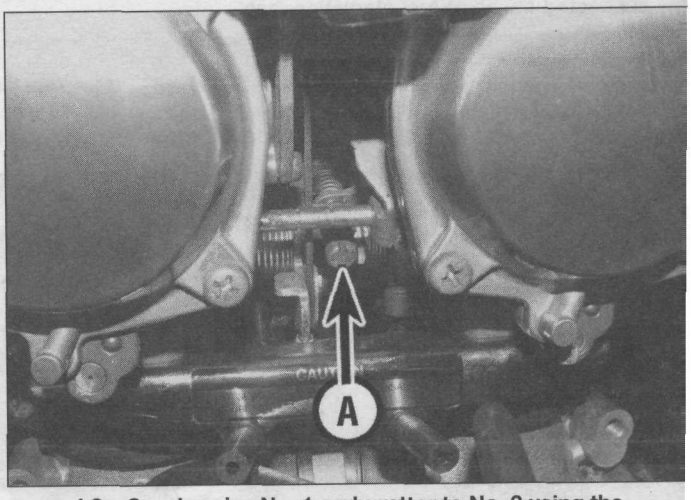
4.5b . . . from the others . . .



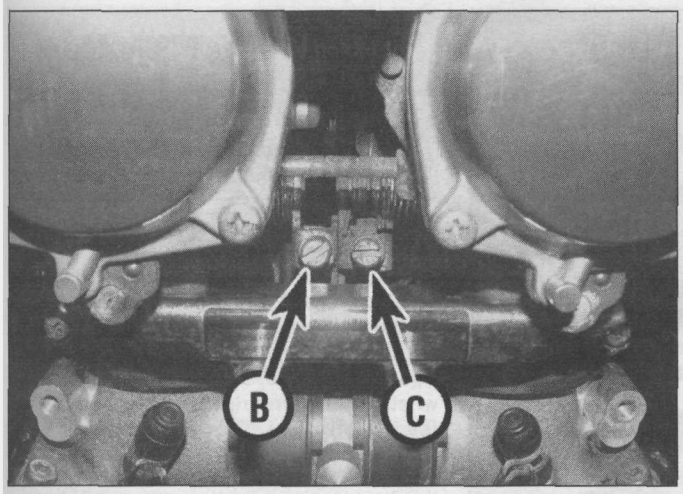
4.5c . . . and attach the gauge hoses to them



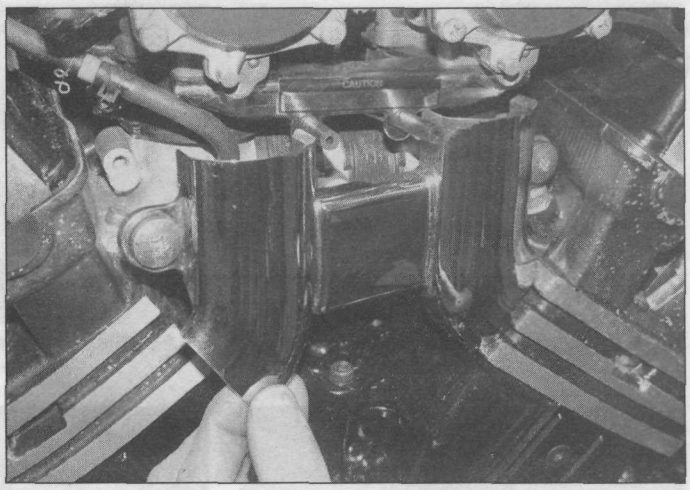
4.7 Carburettor synchronisation set-up



4.8a Synchronise No. 1 carburettor to No. 2 using the synchronising screw (A) . . .



4.8b . . . then synchronise No. 3 to No. 4 using screw (B), and finally synchronise Nos. 1 and 2 to Nos. 3 and 4 using screw (C)



4.10 On completion install the duct covers

carburettors (see Section 29). If the clearances have been checked recently, there should be no reason for them to need readjusting. Make sure the idle speed is correct (see Section 2).

2 To properly synchronise the carburettors you will need a set of vacuum gauges or a manometer. These instruments measure engine vacuum, and can be obtained from motorcycle dealers or mail order parts suppliers. The equipment used must be suitable for a four cylinder engine and come complete with the necessary adapters and hoses to fit the take-off points. **Note:** *Because of the nature of the synchronisation procedure and the need for special instruments, many owners leave the task to a Yamaha dealer.*

3 The engine should be at normal operating temperature, which is usually reached after 10 to 15 minutes of stop-and-go riding. Place the machine on its centrestand on level ground.

4 Undo the intake duct cover screws and remove the covers **(see illustration)**.

5 Release the clamps and detach the ignition advance unit vacuum hose from the No. 2 cylinder intake duct vacuum take-off union and the blanking caps from the unions on the other ducts **(see illustration)**. Attach the gauge or manometer hoses to the unions **(see illustration)**. Make sure the No. 1 (left-hand) gauge is attached to the No. 1 (rear left) cylinder union, and so on (see *Cylinder numbering* in the Specifications at the beginning of the Chapter).

6 Start the engine and check the idle speed (see Section 2). If the gauges are fitted with damping adjustment, set this so that the needle flutter is just eliminated but so that they can still respond to small changes in pressure.

7 The vacuum readings for all cylinders should be the same **(see illustration)**. If the vacuum readings differ, proceed as follows.

8 Identify the synchronising screws situated in-between the carburettors, in the throttle linkage, then obtain a suitable screwdriver with which to turn them **(see illustrations)**. **Note:** *Do not press on the screws whilst adjusting them, otherwise a false reading will be obtained.* First synchronise No. 1 carburettor to No. 2 using the synchronising screw on the left-hand side until the readings are the same. Flick the throttle a couple of times and recheck the reading. Now synchronise No. 3 carburettor to No. 4 using the rear synchronising screw on the right-hand side. Finally synchronise Nos. 1 and 2 carburettors to Nos. 3 and 4 using the front synchronising screw on the right-hand side. When all the carburettors are synchronised, open and close the throttle quickly to settle the linkage, and recheck the gauge readings, readjusting if necessary.

9 When the adjustment is complete, recheck the vacuum readings, then adjust the idle speed (see Section 2), and check the throttle cable freeplay (see Section 13). Remove the gauges and refit the blanking caps and hose – attach the vacuum hose to the No. 2 cylinder take-off union **(see illustration 4.5a)**. Fit the blanking caps to the other unions **(see illustration 4.5b)**. Make sure they are all secured by their clamps.

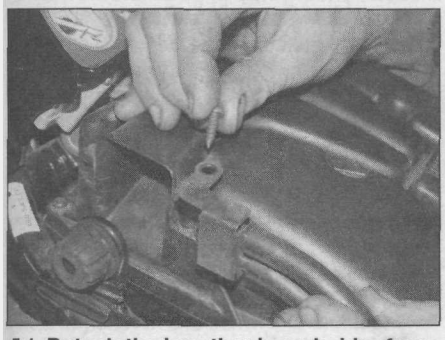
10 Install the intake duct covers **(see illustration)**.

5 Air filter cleaning

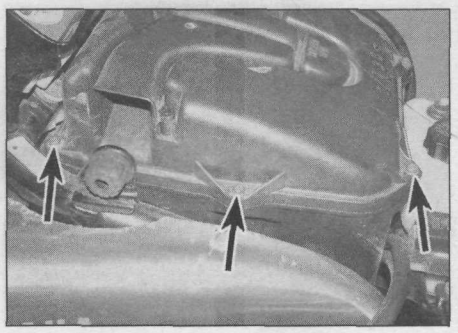
Note: *If the machine is continually ridden in dusty conditions, the filter should be cleaned more frequently.*

1 Remove the top cover (see Chapter 8). Undo the screw securing each carburettor breather hose holder and detach them **(see illustration)**.

2 Undo the screws securing the air filter cover to the filter housing, then remove the cover and withdraw the filter element from the housing **(see illustrations)**. Check the

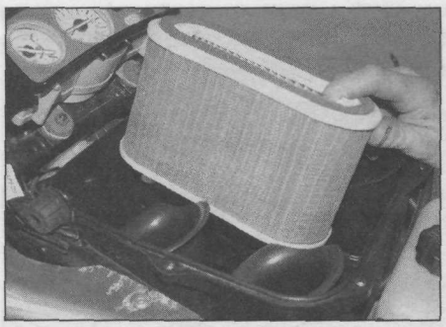


5.1 Detach the breather hose holder from each side

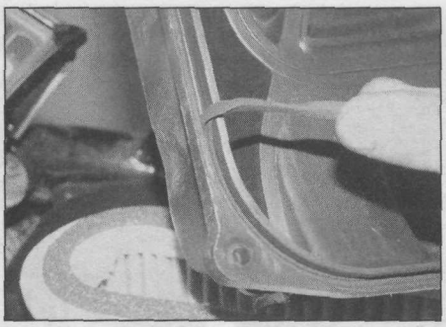


5.2a Undo the screws (arrowed) on each side . . .

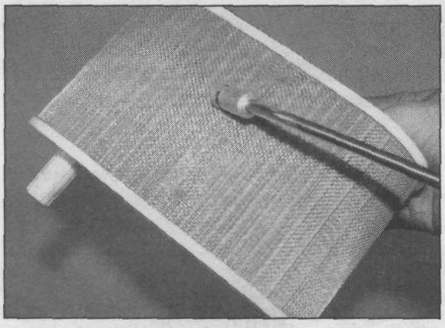
5.2b . . . then remove the cover . . .



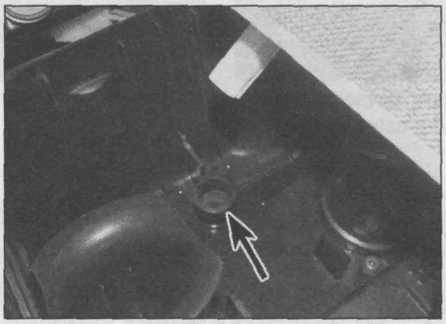
5.2c . . . and withdraw the element



5.2d Check the cover seal and fit a new one if necessary



5.3 Direct the air in the opposite direction to normal airflow



5.6 Make sure the peg locates in the drain hole (arrowed)

condition of the rubber seal in the cover and replace it with a new one it if it is damaged, deformed or deteriorated **(see illustration)**.

3 Tap the element on a hard surface to dislodge any large particles of dirt. If compressed air is available, use it to clean the element, directing the air in the opposite direction of normal airflow **(see illustration)**.

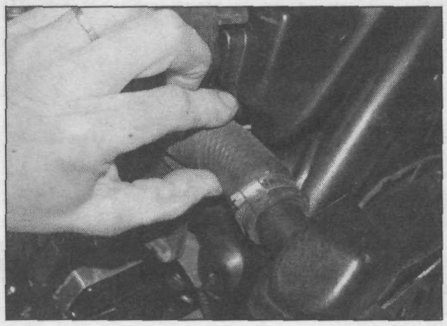
> **HAYNES HINT** ***If using compressed air to clean the element, place either your hand, a rag, or a piece of card on the inside of the element to prevent any dust and debris being blown from one side of the element into the other.***

4 Check the element for signs of damage. If the element is torn or cannot be cleaned, or is obviously beyond further use, replace it with a new one.

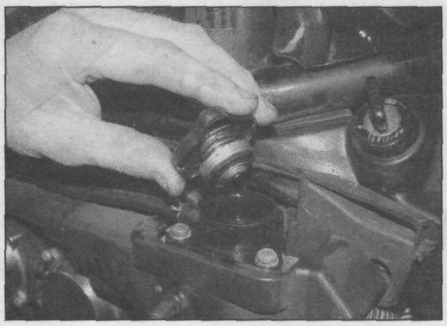
5 Check that the filter in the drain hole (which the peg on the bottom of the filter locates in) in the bottom of the housing has not become blocked, and clean it if necessary **(see illustration 5.6)**.

6 Install the filter element, making sure its peg locates correctly **(see illustration)**. Fit the air filter cover, making sure the rubber seal is in place in the rim and the cover seals properly **(see illustrations 5.2d and b)**.

7 Check the crankcase breather hose between the engine and the back of the air filter housing for loose connections, cracks and deterioration, and replace it with a new one if necessary – remove the air filter housing to access it (see Chapter 4). Every so often remove the breather housing cover and clean out any oil from the chamber (see Chapter 2, Section 26).



6.2 Check the coolant hoses as described



6.7 Remove the pressure cap from the filler neck as described

6 Cooling system check

Warning: The engine must be cool before beginning this procedure.

1 Check the coolant level in the reservoir (see *Daily (pre-ride) checks*).

2 Remove the top cover and the right-hand side cover (see Chapter 8). Examine each rubber coolant hose along its entire length. Look for cracks, abrasions and other damage. Squeeze each hose at various points to see whether they are dried out, cracked or hard **(see illustration)**. They should feel firm, yet pliable, and return to their original shape when released. If necessary, replace them with new ones (see Chapter 3).

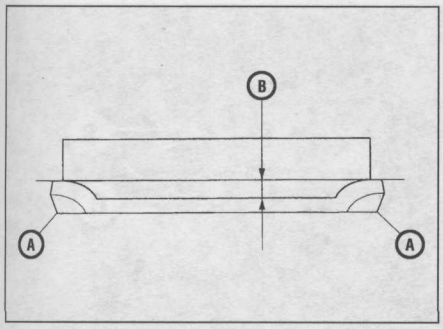
3 Check for evidence of leaks at each cooling system joint and around the pump on the right-hand side of the engine and the thermostat housing on the front next to the starter motor. Tighten any hose clips carefully to prevent future leaks. If the pump is leaking around the cover, check that the bolts are tight. If they are, remove the cover and replace the O-ring with a new one (see Chapter 3).

4 To prevent leakage of coolant from the cooling system to the lubrication system and vice versa, two seals are fitted on the pump shaft. The seal on the water pump side is of the mechanical type which bears on the inner face of the impeller. The second seal, which is mounted behind the mechanical seal, is of the normal feathered lip type. If on inspection of either the coolant or the engine oil there are signs of leakage between them (when oil and coolant mix they form a milky sludge), remove the pump and replace the seals with new ones (see Chapter 3).

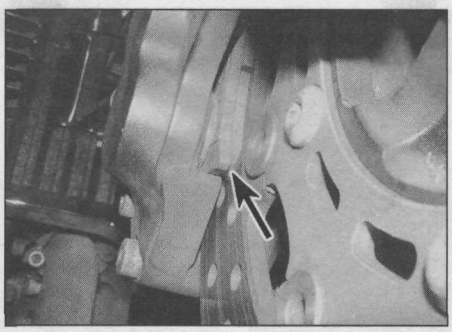
5 Check the radiator for leaks and other damage. Leaks in the radiator leave tell-tale scale deposits or coolant stains on the outside of the core below the leak. If leaks are noted, remove the radiator (see Chapter 3) and have it repaired or replace it with a new one – do not use a liquid leak stopping compound to try to repair leaks.

6 Check the radiator fins for mud, dirt and insects, which may impede the flow of air through the radiator. If the fins are dirty, remove the radiator (see Chapter 3) and clean it using water or low pressure compressed air directed through the fins from the inner side of the radiator. If the fins are bent or distorted, straighten them carefully with a screwdriver. If the air flow is restricted by bent or damaged fins over more than 20% of the radiator's surface area, replace the radiator with a new one.

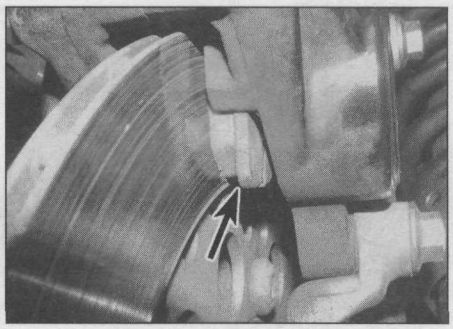
7 Remove the pressure cap from the radiator filler neck by holding it with a heavy cloth and turning it anti-clockwise until it reaches a stop **(see illustration)**. If you hear a hissing sound (indicating there is still pressure in the



7.2a Brake pad wear indicators (A) and minimum thickness (B)



7.2b Front brake pad wear indicator (arrowed)



7.2c Rear brake pad wear indicator (arrowed)

system), wait until it stops. Now press down on the cap and continue turning it until it can be removed. Check the condition of the coolant in the system. If it is rust-coloured or if accumulations of scale are visible, drain and flush the system and refill it with new coolant (See Section 30). Check the cap seal for cracks and other damage. If in doubt about the pressure cap's condition, have it tested by a Yamaha dealer or replace it with a new one.

8 Check the antifreeze content of the coolant with an antifreeze hydrometer. Sometimes coolant looks like it's in good condition, but might be too weak to offer adequate protection. If the hydrometer indicates a weak mixture, drain, flush and refill the system (see Section 30).

9 Install the cap by turning it clockwise until it reaches the first stop then push down on it and continue turning until it can turn no further. Start the engine and let it reach normal operating temperature, then check for leaks again. As the coolant temperature increases, the electric fan (mounted on the back of the radiator) should come on automatically and the temperature should begin to drop. If it does not, refer to Chapter 3 and check the fan, fan switch and fan circuit carefully.

10 If the coolant level is consistently low, and no evidence of leaks can be found, have the entire system pressure checked by a Yamaha dealer. Another cause of coolant loss, evident by the presence of steam in the exhaust gases and poor engine performance, is a leaking cylinder head gasket causing coolant to be burnt in the combustion chamber. This must be rectified immediately (see Chapter 2)

7 Brake pad wear check

1 Each brake pad has wear indicators that can be viewed without removing the pads from the caliper.

2 The turned in corners of the brake pad backing material form the wear indicators – when they are almost contacting the disc itself the pads must be replaced with new ones **(see illustration)**. The indicators are visible by looking at the exposed corner of the pads **(see illustrations)**. **Note:** *Some after-market pads may use different indicators (such as a groove cut into the friction material); the pad is worn when the groove is no longer visible.*

Caution: Do not allow the pads to wear to the extent that the indicators contact the disc itself as the disc will be damaged.

3 If the pads are dirty or if you are in doubt as to the amount of friction material remaining, remove them for inspection (see Chapter 7). If required, measure the amount of friction material remaining – the specified minimum is 0.5 mm, though it is not advisable not to allow them to wear down to this level or even down to 1 mm.

4 Refer to Chapter 7 for details of pad replacement.

8 Brake system check

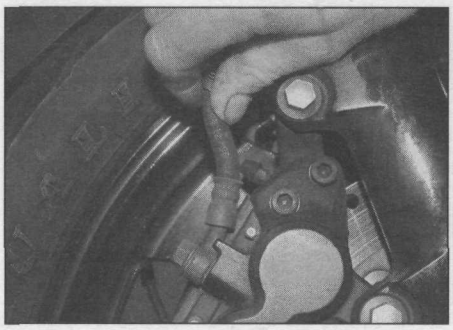
1 A routine general check of the brake system will ensure that any problems are discovered and remedied before the rider's safety is jeopardised.

2 Check the brake lever and pedal for looseness, improper or rough action, excessive play, bends, and other damage. Replace any damaged parts with new ones (see Chapter 7). Clean and lubricate the lever and pedal pivots if their action is stiff or rough (see Section 12).

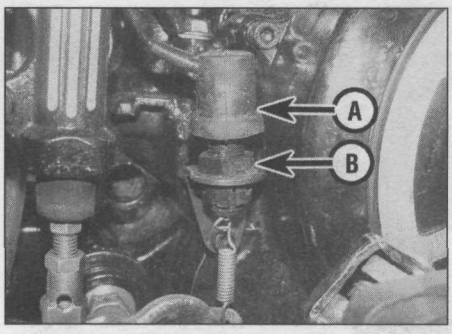
3 Make sure all brake component fasteners are tight. Check the brake pads for wear (see Section 7) and make sure the fluid level in the reservoirs is correct (see *Daily (pre-ride) checks*). Look for leaks at the hose connections and check for cracks in the hoses and unions **(see illustration)**. If the lever or pedal is spongy, bleed the brakes (see Chapter 7). The brake fluid should be changed every two years (see Section 31) and the hoses renewed if they deteriorate, or every four years irrespective of their condition (see Section 33). The master cylinder and caliper seals should be renewed if leakage from them is evident, or every four years when renewing the hoses, or sooner if their condition warrants it (see Section 32).

4 Make sure the brake light operates when the front brake lever is pulled in. The front brake light switch, mounted on the underside of the master cylinder, is not adjustable. If it fails to operate properly, check it (see Chapter 9).

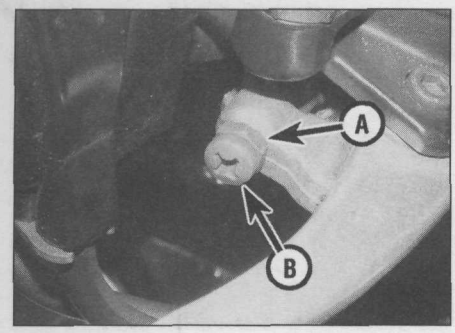
5 Make sure the brake light is activated just before the rear brake takes effect. If adjustment is necessary, hold the switch and turn the adjuster ring on the switch body until the brake light is activated when required **(see illustration)**. The switch is mounted ahead of the rear master cylinder. If the brake light comes on too late or not at all, turn the ring clockwise (when looked at from the top) so the switch threads out of the bracket. If the brake light comes on too soon or is permanently on, turn the ring anti-clockwise (when looked at from the top) so the switch threads into the bracket. If the switch doesn't operate the brake light, check it (see Chapter 9).



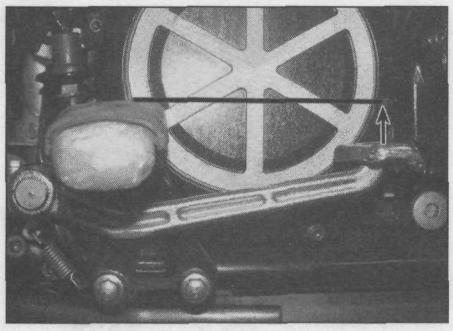
8.3 Flex the brake hoses and check for cracks, bulges and leaking fluid



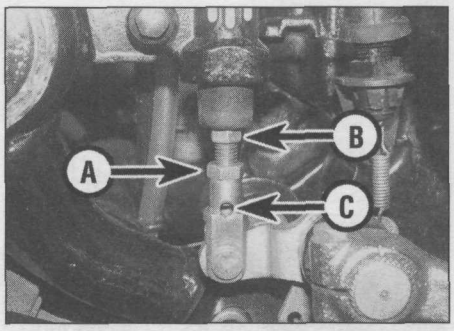
8.5 Hold the brake light switch (A) and turn the adjuster nut (B) as required



8.6 Slacken the locknut (A) and turn the screw (B) as required



8.7a Measure the distance between the top of the footrest and the top of the brake pedal as shown



8.7b Slacken the locknut (A) and turn the pushrod using the hex (B) making sure the rod end is still visible in the hole (C)

6 Check that the amount of freeplay at the front brake lever end (i.e. the amount of lever travel before the brake comes on) is within the specifications listed at the beginning of the Chapter. If adjustment is required, loosen the adjuster locknut, then turn the adjuster screw in or out until the specified amount of freeplay is obtained **(see illustration)**. To increase freeplay turn the screw anti-clockwise. To reduce freeplay turn the screw clockwise. Tighten the locknut on completion.

7 Check the position of the rear brake pedal. Yamaha recommend the distance between the top of the brake pedal and the top of the rider's footrest should be as specified at the beginning of the Chapter **(see illustration)**. If the pedal height is incorrect, or if the rider's preference is different, slacken the clevis locknut on the master cylinder pushrod, then turn the pushrod using a spanner on the hex at the top of the rod until the pedal is at the correct or desired height **(see illustration)**. To raise the pedal turn the adjuster anti-clockwise (as you look down at it). To reduce freeplay turn the adjuster clockwise (as you look down at it). After adjustment check that the pushrod end is still visible in the hole in the clevis. On completion tighten the locknut. Adjust the rear brake light switch after adjusting the pedal height (see Step 5).

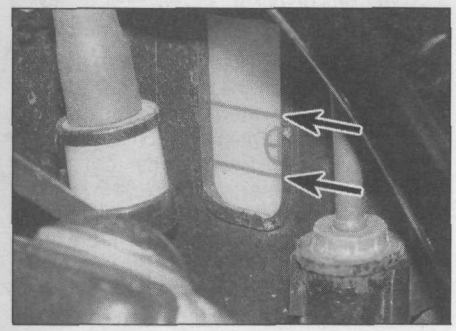
9 Battery check

Note: *A standard battery (not maintenance-free) is fitted to all models as original equipment.*

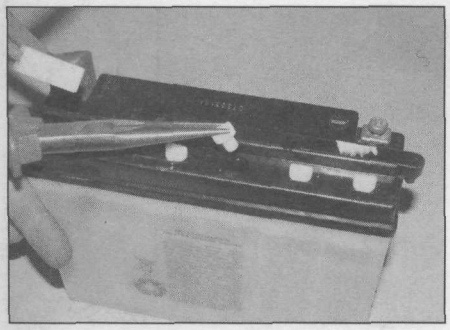
Warning: Be extremely careful when handling or working around the battery. The electrolyte is very caustic and an explosive gas (hydrogen) is given off when the battery is charging.

1 Remove the rider's seat (see Chapter 8). Check that the battery terminals are clean and tight and that the casing is not damaged or leaking.

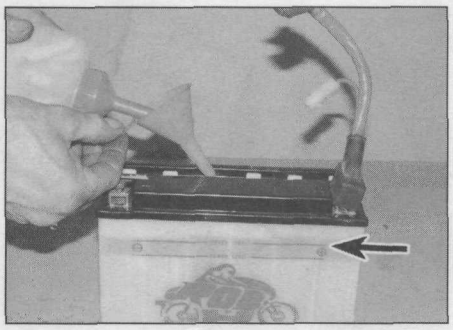
2 The electrolyte level is visible through the translucent battery case and can be seen by looking between the engine's rear valve cover and the frame on the right-hand side – it should be between the UPPER and LOWER level lines **(see illustration)**. If the level is difficult to see, remove the battery and clean the casing (see Chapter 9).



9.2 Check that the electrolyte level is between the lines (arrowed)



9.3a Remove the cell caps . . .



9.3b . . . and top the cells up to the upper level line (arrowed)

3 If the electrolyte is low, remove the battery (see Chapter 9), then remove the cell caps **(see illustration)**. Fill each cell to the upper level line with distilled water **(see illustration)**. Do not use tap water, and do not overfill. The cell holes are quite small, so it will help to use a small funnel or a clean plastic squeeze bottle with a small spout to add the water, though most dedicated distilled water bottles come with a flexible spout. Fit the battery cell caps, then install the battery (see Chapter 9).

4 See Chapter 9 for details on checking the specific gravity of the electrolyte and for details on charging the battery. If the machine is not in regular use, remove the battery and give it a refresher charge every month to six weeks (see Chapter 9).

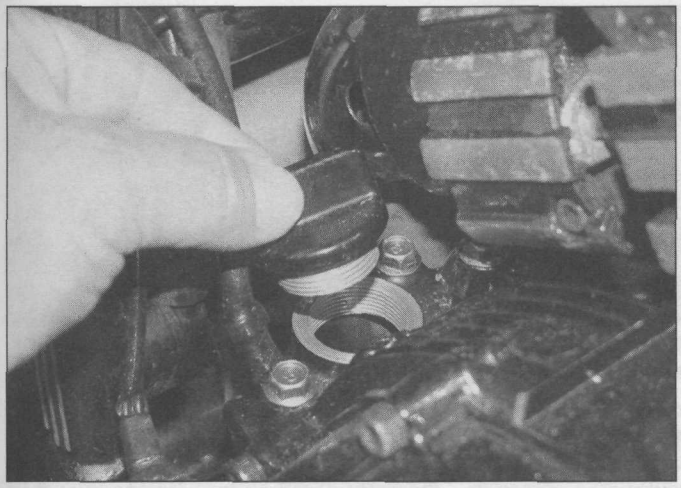
10 Engine oil change

Warning: Be careful when draining the oil, as the exhaust pipes, the engine, and the oil itself can cause severe burns.

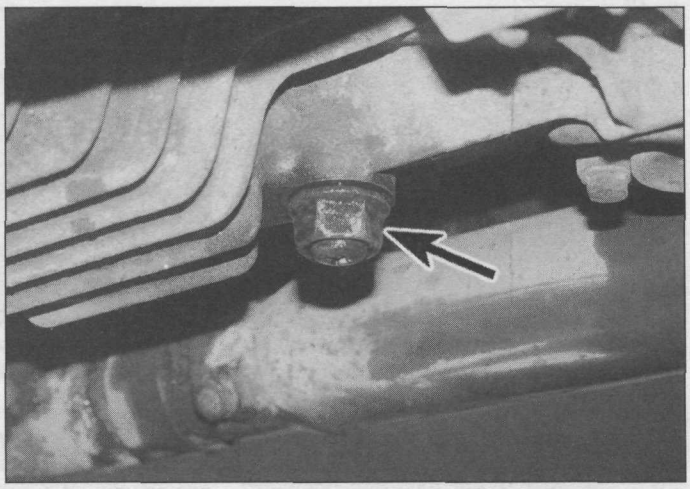
1 Consistent routine oil and filter changes are the single most important maintenance procedure you can perform on a motorcycle. The oil not only lubricates the internal parts of the engine, transmission and clutch, but it also acts as a coolant, a cleaner, a sealant, and a protector. Because of these demands, the oil takes a terrific amount of abuse and should be replaced often with new oil of the recommended grade and type. Saving a little money on the difference in cost between a good oil and a cheap oil won't pay off if the engine is damaged. The oil filter should be changed with every second oil change (though some owners prefer to fit a new one with every oil change) (see Section 23).

2 Before changing the oil, warm up the engine so the oil will drain easily. Make sure the bike is on level ground. Put the motorcycle on its centrestand.

3 Position a clean drain tray below the engine. Unscrew the oil filler cap (located on the right-hand side of the engine behind the



10.3 Remove the oil filler cap from the crankcase



10.4a Unscrew the engine oil drain plug (arrowed) . . .

clutch cover) to vent the crankcase and to act as a reminder that there is no oil in the engine **(see illustration)**.

4 Unscrew the oil drain bolt from the underside of the engine and allow the oil to flow into the drain tray **(see illustrations)**. Check the condition of the sealing washer on the drain plug and replace it with a new one if it is damaged or worn, but note that it is best to use a new one whatever the condition of the old one – you may have to cut the old one off using pliers **(see illustration)**.

5 When the oil has completely drained, fit the bolt into the sump, preferably using a new sealing washer, and tighten it to the torque setting specified at the beginning of the Chapter **(see illustration)**. Avoid overtightening, as it is quite easy to damage the threads in the sump.

6 Refill the engine to the proper level using the recommended type and amount of oil (see Specifications). With the motorcycle vertical, the oil level should lie between the maximum and minimum level lines on the inspection window (see *Daily (pre-ride) checks*). Install the filler cap **(see illustration 10.3)**. Start the engine and let it run for two or three minutes. Shut it off, wait a few minutes, then check the oil level. If necessary, add more oil to bring the level close to the maximum line, but do not go above it.

7 Check that there are no leaks around the drain plug. Also check for leaks around the filter housing (cartridge type) or filter base (spin-on type) on the front of the engine. A leak around the housing on models with a cartridge type filter either means the housing bolt is not tight enough or the O-ring is damaged or pinched. A leak around the base on models with a spin-on type filter probably means it is not tight enough, though the seal could be damaged.

8 Every so often, and especially as Yamaha do not fit an oil pressure switch and warning light (the system fitted uses an oil level sensor), it is advisable to perform an oil pressure check (see Section 37).

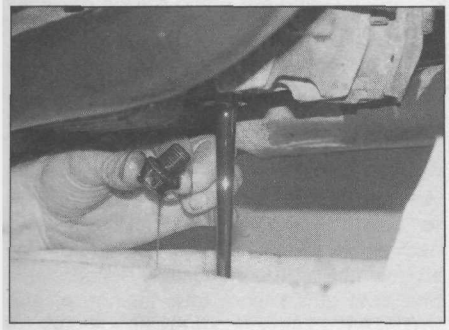
9 The old oil drained from the engine cannot be re-used and should be disposed of properly. Check with your local refuse disposal company, disposal facility or environmental agency to see whether they will accept the used oil for recycling. Don't pour used oil into drains or onto the ground.

HAYNES HiNT

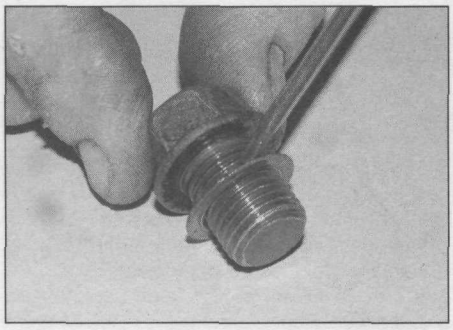
Check the old oil carefully – if it is very metallic coloured, then the engine is experiencing wear from break-in (new engine) or from insufficient lubrication. If there are flakes or chips of metal in the oil, then something is drastically wrong internally and the engine will have to be disassembled for inspection and repair. If there are pieces of fibre-like material in the oil, the clutch is experiencing excessive wear and should be checked.

OIL CARE
FOLLOW THE CODE
OIL BANK LINE
0800 66 33 66
www.oilbankline.org.uk

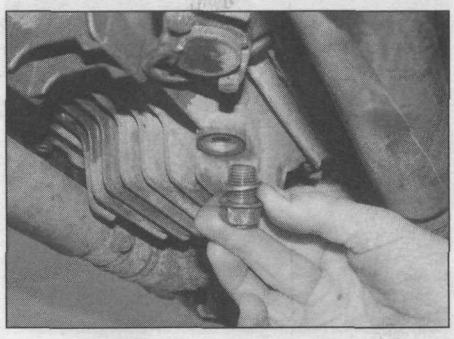
Note: It is antisocial and illegal to dump oil down the drain. To find the location of your local oil recycling bank, call this number free. In the US note that any oil supplier must accept used oil for recycling.



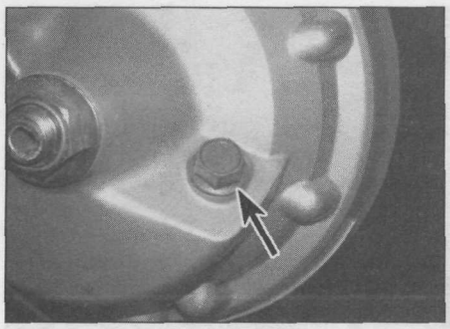
10.4b . . . and allow the oil to drain



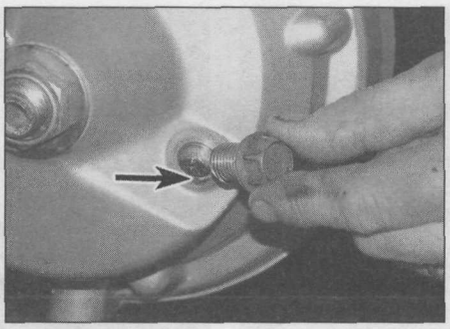
10.4c Remove the sealing washer and fit a new one



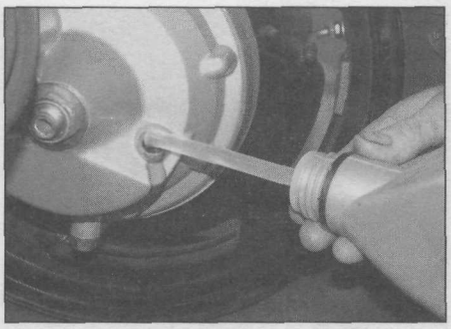
10.5 Install the drain plug using a new sealing washer



11.2a Unscrew the filler bolt (arrowed) . . .



11.2b . . . and check the level – it should be up to the rim of the bolt hole (arrowed)



11.3 Top the oil up to the rim of the hole if necessary – have a rag handy for spillage or in case you slightly overfill it

Every 6000 miles (10,000 km) or 10 months

11 Final drive oil level check

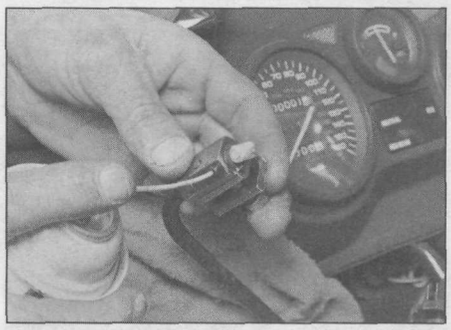
1 Place the motorcycle on its centrestand, making sure it is on level ground. The check should be made after the machine has been standing for a few hours.

2 Unscrew the oil filler bolt and check that the oil is up to the edge of the filler hole **(see illustrations)**. If the level is below this, look for signs of leakage, such as oil staining on the underside of the casing. If leakage is evident, the problem must be rectified to avoid the possibility of damage to the final drive and oil contaminating the rear tyre (see Chapter 6).

3 If necessary replenish the oil to the correct level using the type and grade specified at the beginning of the Chapter, using a suitable funnel if there is no filler spout on the oil container **(see illustration)**. Install the filler bolt, using a new sealing washer if necessary, and tighten it to the torque setting specified at the beginning of the Chapter.

12 Stand, lever pivot and cable lubrication

1 Since the controls, cables and various other components of a motorcycle are exposed to the elements, they should be lubricated periodically to ensure safe and trouble-free operation.



12.3a Lubricating a cable with a pressure lubricator. Make sure the tool seals around the inner cable

2 Lubricate the footrests, clutch and brake levers, brake pedal, gearchange lever and linkage, and sidestand and centrestand pivots. In order for the lubricant to be applied where it will do the most good, the component should be disassembled. The lubricant recommended by Yamaha for each application is listed at the beginning of the Chapter, though there are many dedicated alternatives available. If chain or cable lubricant is being used, it can be applied to the pivot joint gaps and will usually work its way into the areas where friction occurs, so less disassembly of the component is needed (however it is always better to do so and clean off all dirt and old lubricant first). If motor oil or light grease is being used, apply it sparingly as it may attract dirt (which could cause the controls to bind or wear at an accelerated rate). **Note:** *One of the best alternative lubricants for the control lever pivots is a dry-film lubricant (available from many sources by different names).*

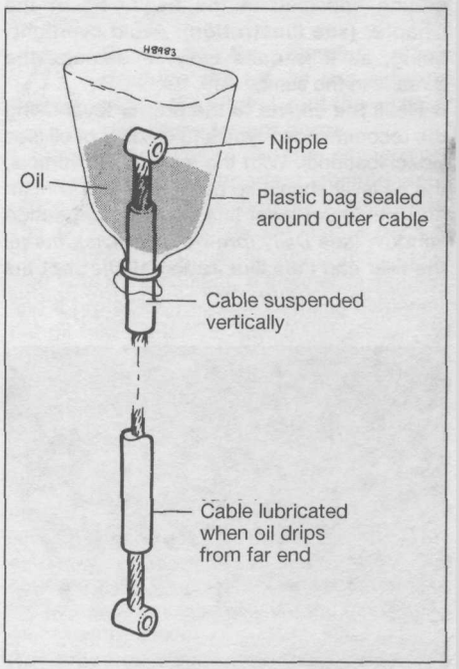
3 To lubricate the throttle cables, disconnect them from the throttle twistgrip (see Chapter 4), then lubricate them with a pressure adapter and aerosol lubricant, or if one is not available, using the set-up shown **(see illustrations)**. See Chapter 4 for the throttle cable removal procedures.

13 Throttle cable check

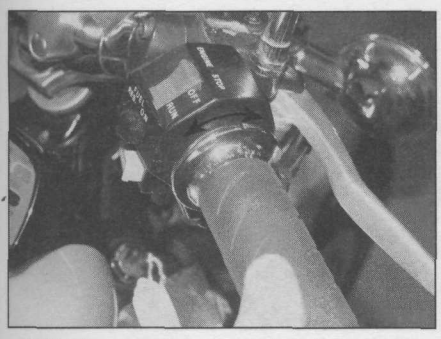
1 Make sure the throttle grip rotates smoothly and freely from fully closed to fully open with the front wheel turned at various angles. The grip should return automatically from fully open to fully closed when released.

2 If the throttle sticks, this is probably due to a cable fault. Remove the cables (see Chapter 4) and lubricate them (see Section 12). Check that the inner cables slide freely and easily in the outer cables. If not, replace the cables with new ones. With the cables removed, make sure the throttle twistgrip rotates freely on the handlebar. If necessary, remove the handlebar end-weight and slide the twistgrip off the handlebar. Clean any old grease from the bar and the inside of the tube. Smear some new grease of the specified type onto the bar, then refit the twistgrip. Install the cables, making sure they are correctly routed (see Chapter 4). If this fails to improve the operation of the throttle, the cables must be replaced with new ones. Note that the fault could lie in the cable splitter sliders, or in very rare cases in the carburettors themselves rather than the cables, necessitating their removal and inspection (see Chapter 4).

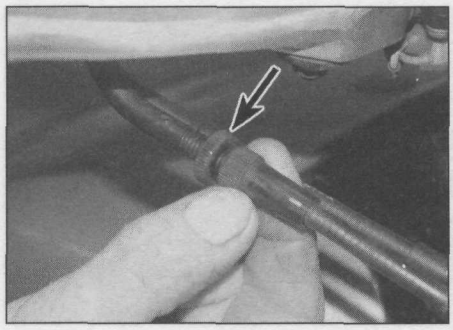
3 With the throttle operating smoothly, check for a small amount of freeplay in the cables, measured in terms of the amount of twistgrip



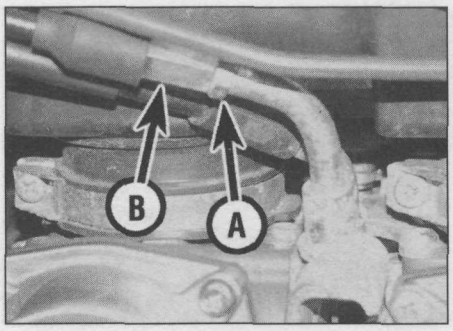
12.3b Lubricating a cable with a makeshift funnel and motor oil



13.3 Measure the amount of freeplay in the throttle as shown



13.4 Slacken the locknut (arrowed) and turn the adjuster as required



13.6 Throttle cable adjuster locknut (A) and adjuster (B) – carburettor end

rotation before the throttle opens, and compare the amount to that listed in this Chapter's Specifications **(see illustration)**. If it's incorrect, first make sure the idle speed is correctly set (see Section 2), then adjust the cables as follows.

4 Initially adjust freeplay using the adjuster in the throttle opening cable where it leaves the throttle/switch housing on the handlebar. Loosen the locknut and turn the adjuster in or out as required until the specified amount of freeplay is obtained (see this Chapter's Specifications), then retighten the locknut **(see illustration)**.

5 If the adjuster has reached its limit of adjustment, reset it to its start point by turning it fully in, so that freeplay is at a maximum, then remove the left-hand side cover (see Chapter 8), and adjust the cable at the carburettor end.

6 Slacken the adjuster locknut, then turn the adjuster in or out as required until the specified amount of freeplay is obtained, then tighten the locknut **(see illustration)**. Subsequent adjustments can be made at the throttle end when required. After adjustment check that the throttle twistgrip operates smoothly and snaps shut quickly when released.

7 If the cables cannot be adjusted, check them as described above and replace them with new ones if necessary.

Warning: Turn the handlebars all the way through their travel with the engine idling. Idle speed should not change. If it does, the cables may be routed incorrectly. Correct this condition before riding the bike.

14 Headlight aim check

Note: *An improperly adjusted headlight may cause problems for oncoming traffic or provide poor, unsafe illumination of the road ahead. Before adjusting the headlight aim, be sure to consult with local traffic laws and regulations – for UK models refer to MOT Test Checks in the Reference section.*

1 The headlight beam can adjusted both horizontally and vertically. Before making any adjustment, check that the tyre pressures are correct and the suspension is adjusted as required. Make any adjustments to the headlight aim with the machine on level ground, with the fuel tank half full and with an assistant sitting on the seat. If the bike is usually ridden with a passenger on the back, have an assistant to do this.

2 Vertical adjustment is made by turning the adjuster screw on the bottom right-hand side of the headlight unit using a screwdriver **(see illustration)**. Turn it clockwise to raise the beam and anti-clockwise to lower it.

3 Horizontal adjustment is made by turning the adjuster screw on the top left-hand side of the headlight **(see illustration)**. Turn it clockwise to move the beam to the right and anti-clockwise to move it to the left.

15 Sidestand, centrestand and starter interlock circuit check

1 Check the stand springs for damage and distortion. The springs must be capable of retracting the stands fully and holding them retracted when the motorcycle is in use. If a spring is sagged or broken it must be replaced with a new one.

2 Lubricate the stand pivots regularly (see Section 12).

3 Check the stands and their mounts for bends and cracks. Stands can often be repaired by welding. Check the pivot bolts and nuts are tight.

4 Check the operation of the starter interlock circuit as follows: Firstly, make sure the transmission is in neutral, then retract the sidestand and start the engine. Pull in the clutch lever and select a gear. Extend the sidestand. The engine should stop as the sidestand is extended. Secondly, make sure the engine is in neutral and the sidestand is down, then start the engine. Pull the clutch lever in and select a gear. The engine should cut out.

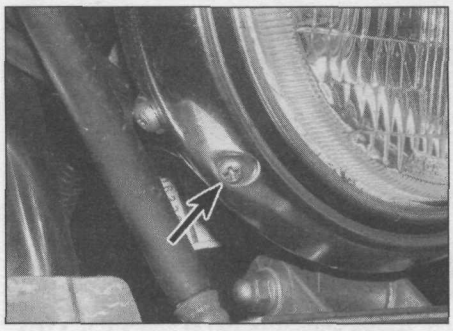
5 Also check that when the sidestand is down the engine can only be started if the transmission is in neutral, and when the sidestand is up and the transmission is in gear the engine can only be started if the clutch lever is pulled in. If the circuit does not operate as described, check the sidestand switch, neutral switch and the clutch switch, and the circuit between them (see Chapter 9).

16 Suspension check

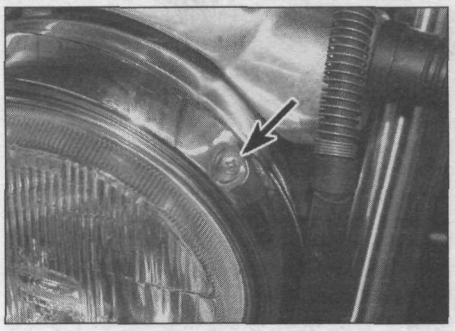
1 The suspension components must be maintained in top operating condition to ensure rider safety. Loose, worn or damaged suspension parts decrease the motorcycle's stability and control.

Front suspension

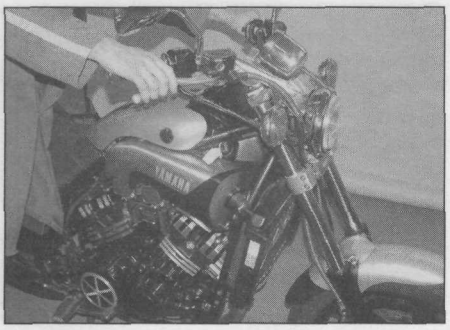
2 While standing alongside the motorcycle, apply the front brake and push on the handlebars to compress the forks several



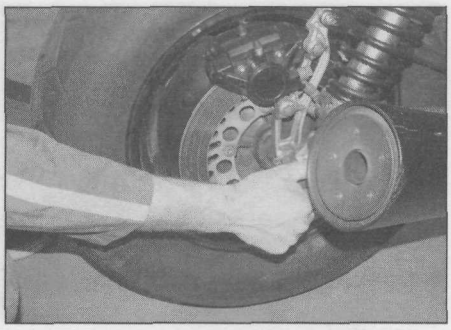
14.2 Vertical adjuster (arrowed)



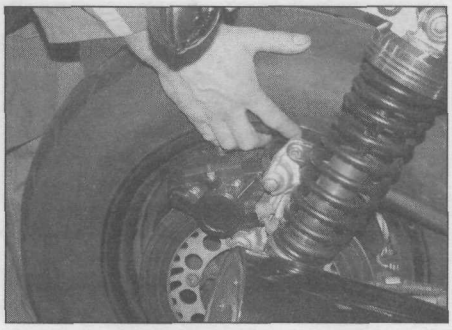
14.3 Horizontal adjuster (arrowed)



16.2 Bounce the front end to check the action of the forks



16.7a Checking for play in the swingarm bearings



16.7b Checking for play in the suspension mountings and swingarm bearings

times **(see illustration)**. See if they move up-and-down smoothly without binding. If binding is felt, disassemble and inspect the forks (see Chapter 6).

3 Inspect the area above and around each dust seal for signs of oil leakage, pitting and corrosion, then carefully lever the seals up using a flat-bladed screwdriver and inspect the area around the fork seal. If leakage is evident, the seals in each fork must be replaced with new ones (see Chapter 6). If there is pitting within the extent of fork travel, you should consider replacing the tubes with new ones as it will eventually cause the seals to fail. If there is evidence of corrosion between the seal retaining ring and its groove in the fork slider spray the area with a penetrative lubricant, otherwise the ring will be difficult to remove if needed. Press the dust seal back into the top of the fork slider on completion.

4 Check the tightness of all suspension nuts and bolts to be sure none have worked loose, applying the torque settings at the beginning of Chapter 6 if you have a torque wrench.

Rear suspension

5 Inspect the rear shock absorbers for fluid leakage and tightness of their mountings. If leakage is found, the shock absorbers must be replaced with new ones as a pair, never singly (see Chapter 6).

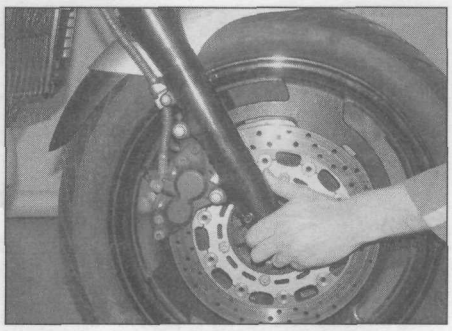
6 With the aid of an assistant to support the bike, compress the rear suspension several times. It should move up and down freely without binding. If any binding is felt, the worn or faulty component must be identified and renewed. The problem could be due to either the shock absorbers or the swingarm components.

7 Support the motorcycle on its centrestand. Grab the swingarm and rock it from side to side – there should be no discernible movement at the rear **(see illustration)**. If there's a little movement or a slight clicking can be heard, inspect the tightness of all the rear suspension mounting bolts and nuts, referring to the torque settings specified at the beginning of Chapter 6, and re-check for movement. Next, grasp the top of the rear wheel and pull it upwards – there should be no discernible freeplay before the shock absorbers begin to compress **(see illustration)**. Any freeplay felt in either check indicates worn bearings in the swingarm, or worn shock absorber mountings. The worn components must be renewed (see Chapter 6).

8 To make an accurate assessment of the swingarm bearings, remove the rear wheel (see Chapter 7) and the shock absorbers (see Chapter 6). Grasp the rear of the swingarm with one hand and place your other hand at the junction of the swingarm and the frame. Try to move the rear of the swingarm from side-to-side. Any wear (play) in the bearings will be felt as movement between the swingarm and the frame at the front. Next, move the swingarm up and down through its full travel. It should move freely, without any binding or rough spots. If any play in the swingarm is noted or if the swingarm does not move freely, the bearings must be removed for inspection or renewal (see Chapter 6).

17 Steering head bearings freeplay check

1 Steering head bearings which can become dented, rough or loose during normal use of the machine. In extreme cases, worn or loose steering head bearings can cause steering wobble – a condition that is potentially dangerous.



17.4 Checking for play in the steering head bearings

Check

2 Support the motorcycle on its centrestand, making sure it is on level ground. Raise the front wheel off the ground either by having an assistant push down on the rear, or by placing a support under the engine.

3 Point the front wheel straight-ahead and slowly move the handlebars from side-to-side. Any dents, notchiness or roughness in the bearings will be felt and the bars will not move smoothly and freely. Again point the wheel straight-ahead, and tap the front of the wheel to one side. The wheel should 'fall' under its own weight to the limit of its lock, indicating that the bearings are not too tight. Check for similar movement to the other side. If the steering doesn't perform as described, and it's not due to the resistance of cables or hoses, then the bearings should be adjusted as described below.

4 Next, grasp the bottom of the forks and gently pull and push them forward and backward **(see illustration)**. Any looseness or freeplay in the steering head bearings will be felt as front-to-rear movement of the forks. If play is felt, adjust the bearings as described below.

HAYNES HINT

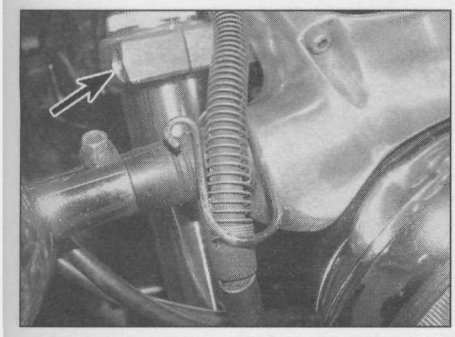
Make sure you are not mistaking any movement between the bike and stand, or between the stand and the ground, for freeplay in the bearings. Do not pull and push the forks too hard – a gentle movement is all that is needed. Freeplay between the fork slider and the fork tube due to worn bushes can also be misinterpreted as steering head bearing play – do not confuse the two.

Adjustment

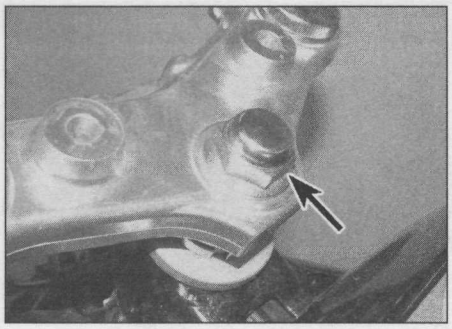
5 Displace the handlebar assembly from the top yoke and lay it on some rag behind the steering head (see Chapter 6).

6 Slacken the fork clamp bolts in the top yoke **(see illustration)**.

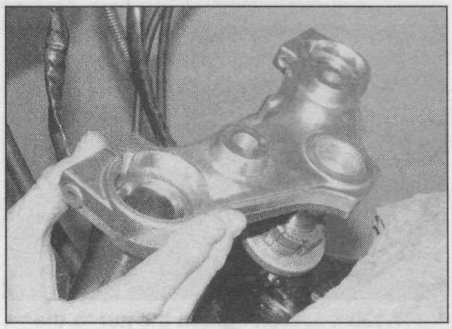
7 Unscrew the steering stem nut, and on 1999-on models remove the washer **(see illustration)**.



17.6 Slacken the fork clamp bolt (arrowed) on each side of the top yoke . . .

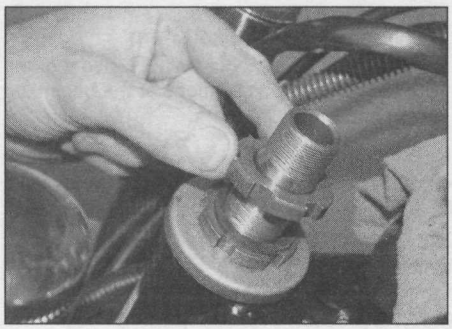


17.7 . . . then unscrew the steering stem nut (arrowed) . . .

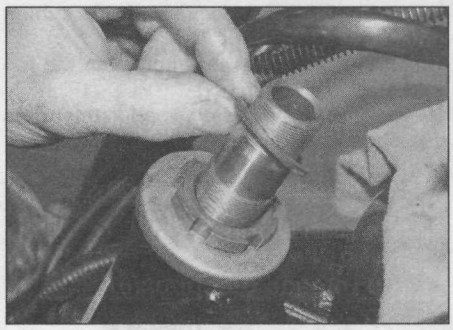


17.8 . . . and ease the top yoke up off the steering stem and forks

17.9a Remove the tabbed lockwasher . . .



17.9b . . . the locknut, which should only be finger-tight . . .



17.9c . . . and the rubber washer

8 Ease the top yoke up and off the steering stem and fork tubes and remove it **(see illustration)**.

9 Remove the tabbed lockwasher, noting how it fits, then unscrew and remove the locknut, if required using either a C-spanner, a peg spanner or a drift located in one of the notches, though it should only be finger-tight **(see illustrations)**. Remove the rubber washer **(see illustration)**.

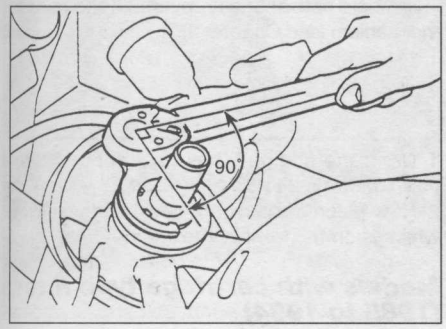
10 To adjust the bearings as specified by Yamaha, a special service tool (Pt. No. 90890-01403) and a torque wrench are required. If the tool is available, first slacken the adjuster nut, then tighten it to the initial torque setting specified at the beginning of the Chapter, making sure the torque wrench handle is at right-angles (90°) to the line between the adjuster nut and the wrench socket in the special tool **(see illustration)**. Now slacken the nut so that it is loose, then tighten it to the final torque setting specified. Check that the steering is still able to move freely from side to side, but that all freeplay is eliminated.

11 If the Yamaha tool is not available, using either a C-spanner, a peg spanner or a drift located in one of the notches, slacken the adjuster nut slightly until pressure is just released, then tighten it until all freeplay is removed, then tighten it a little more **(see illustration)**. This pre-loads the bearings. Now slacken the nut, then tighten it again, setting it so that all freeplay is just removed yet the steering is able to move freely from side to side. To do this tighten the nut only a little at a time, and after each tightening repeat the checks outlined above (Steps 2 to 4) until the bearings are correctly set. The object is to set the adjuster nut so that the bearings are under a very light loading, just enough to remove any freeplay.

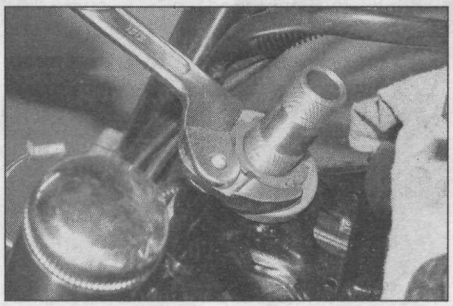
Caution: Take great care not to apply excessive pressure because this will cause premature failure of the bearings.

12 With the bearings correctly adjusted, install the rubber washer and the locknut **(see illustrations 17.9c and b)**. Make sure the tapered side of the locknut faces down. Hold the adjuster nut so that its setting cannot be disturbed, then tighten the locknut finger-tight, then tighten it further until its notches align with those in the adjuster nut; make sure it is not so tight that the rubber washer starts to be squeezed out the side. Install the tabbed lockwasher so that the tabs fit into the notches in both the locknut and adjuster nut **(see illustration 17.9a)**.

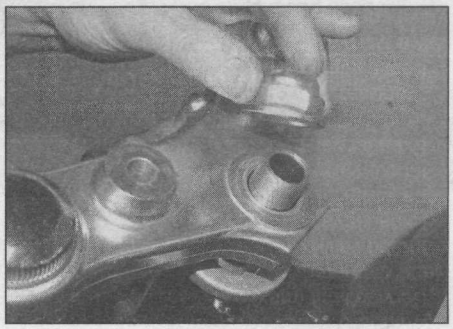
13 Fit the top yoke onto the steering stem **(see illustration 17.8)**, then install the washer (where fitted) and the steering stem nut and tighten the nut to the torque setting specified at the beginning of the Chapter **(see illustrations)**. Now tighten both the fork



17.10 Make sure the torque wrench arm is at right angles (90°) to the tool



17.11 If the tool is not available, adjust the bearings as described – here a C-spanner is being used



17.13a Install the nut, with its washer where fitted . . .

17.13b . . . then tighten the nut to the specified torque setting, followed by the clamp bolt (arrowed) on each side

clamp bolts to the specified torque setting **(see illustration 17.6)**.

14 Fit the handlebar assembly onto the top yoke (see Chapter 6).

15 Re-check the bearing adjustment as described above and re-adjust if necessary.

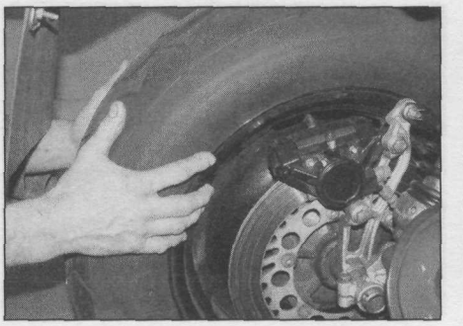
18 Nuts and bolts tightness check

1 Since vibration of the machine tends to loosen fasteners, all nuts, bolts, screws, etc. should be periodically checked for proper tightness.

2 Pay particular attention to the following:

Spark plugs
Engine and final drive oil drain bolts and coolant drain bolt, and final drive oil filler bolt
Final drive housing nuts
Engine mounting bolts
Removable frame section bolts
Lever and pedal bolts
Footrest bracket and holder nuts/bolts and stand nuts/bolts
Shock absorber bolts and swingarm pivot bolts
Handlebar clamp bolts and holder nuts
Front axle bolt and axle clamp bolt
Steering stem nut
Front fork clamp bolts (top and bottom yoke) and fork top bolts
Rear axle nut and clamp bolt
Brake caliper and master cylinder mounting bolts
Brake hose banjo bolts and caliper bleed valves
Brake disc bolts
Exhaust system bolts/nuts

3 If a torque wrench is available, use it along with the torque specifications at the beginning of this and other Chapters.



20.2 Checking for play in the wheel bearings

19 Wheels and tyres check

Tyres

1 Check the tyre condition and tread depth thoroughly – see *Daily (pre-ride) checks*.

Wheels

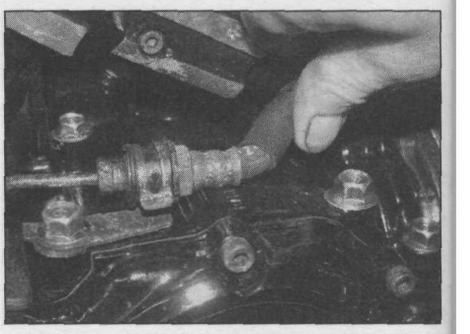
2 Cast wheels are virtually maintenance free, but they should be kept clean and checked periodically for cracks and other damage. Also check the wheel runout and alignment (see Chapter 7). Never attempt to repair damaged cast wheels; they must be replaced with new ones. Check the valve locknut is tight. Also, make sure the valve dust cap is in place and tight.

20 Wheel bearings check

1 Wheel bearings will wear over a period of time and result in handling problems.

2 Place the motorcycle on its centrestand. When checking the front wheel place a jack under the engine with a piece of wood between the jack head and the sump and raise it so that the wheel is off the ground. Check for any play in the bearings by pushing and pulling the wheel against the axle **(see illustration)**. Also spin the wheel and check that it rotates smoothly.

3 If any play is detected in the hub, or if the wheel does not rotate smoothly (and this is not due to brake or transmission drag), the wheel bearings must be removed and inspected for wear or damage (see Chapter 7).



21.3 Flex the clutch hose and check for cracks, bulges and leaking fluid

21 Clutch check

1 All models are fitted with an hydraulic clutch, for which there is no method of adjustment.

2 Check the fluid level in the reservoir (see *Daily (pre-ride) checks*).

3 Inspect the pipe and hose and its connections for signs of fluid leakage, cracking, deterioration and wear **(see illustration)** – remove the left-hand side cover to examine the pipe (see Chapter 8).

4 Change the clutch fluid every two years (see Section 31), and replace the hose and/or pipe with a new one either if damaged or deteriorated, or every four years irrespective of condition (see Section 33). The master and release cylinder seals should be changed every four years, or if leakage from them is evident (see Section 32).

5 Check the operation of the clutch. If there is evidence of air in the system (spongy feel to the lever, difficulty in engaging gear, drag when in gear), bleed the clutch (see Chapter 2). If the lever feels stiff or sticky, overhaul the release mechanism (see Chapter 2).

Every 8000 miles (12,000 km) or 12 months

Carry out all the items under the 4000 mile (6000 km) check, plus the following:

22 Spark plug renewal

1 Remove the old spark plugs as described in Section 1 and install new ones.

23 Engine oil and filter change

Warning: Be careful when draining the oil, as the exhaust pipes, the engine, and the oil itself can cause severe burns.

1 Drain the engine oil as described in Section 10, Steps 2 to 5.

2 Now place the drain tray below the oil filter, which is on the front of the engine.

Models with cartridge type filter (1985 to 1994)

3 Unscrew the large bolt in the centre of the filter housing and remove the housing and

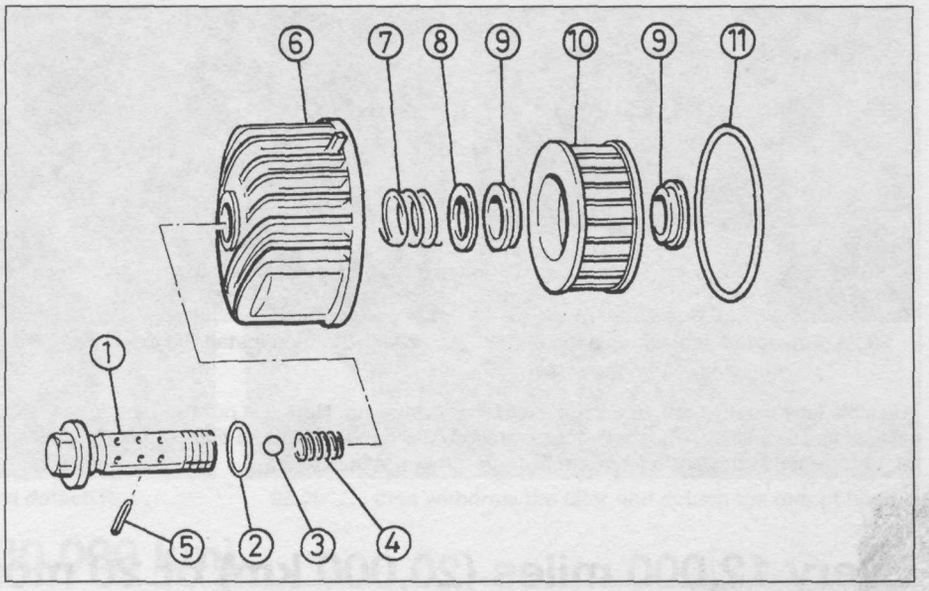
filter assembly **(see illustration)**. Withdraw the filter from the housing, noting the washer and spring, and tip any residue oil into the drain tray. If the washer is not in the housing it will be stuck to the end of the filter. Withdraw the bolt from the housing and discard its O-ring. Wipe any oil out of the housing and clean it. Discard the O-ring as a new one must be used.

4 Check the action of the bypass valve in the bolt by levering the ball against the spring with a screwdriver. If it doesn't move, replace the bolt with a new one – the individual valve components are not available separately.

5 Fit a new O-ring smeared with grease onto the bolt. Fit the bolt into the housing, then fit the spring, washer and new filter over the bolt – make sure the rubber seals in the filter do not become dislodged.

6 Fit a new O-ring smeared with grease into the groove in the housing **(see illustration)**, then install the housing and filter assembly, with the cooling fins vertical and the triangular projections at the top so they fit into the indents on the crankcase. Tighten the bolt to the torque setting specified at the beginning of the Chapter.

7 Refill the engine to the proper level as described in Section 10, Steps 6 and 7.



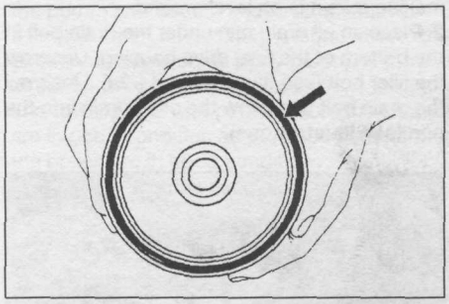
23.3 Oil filter assembly – 1985 to 1994 models

1 Centre bolt	*4 Bypass valve spring*	*8 Washer*
2 O-ring	*5 Roll pin*	*9 Filter seals*
3 Bypass valve ball	*6 Filter housing*	*10 Filter*
	7 Spring	*11 Housing O-ring*

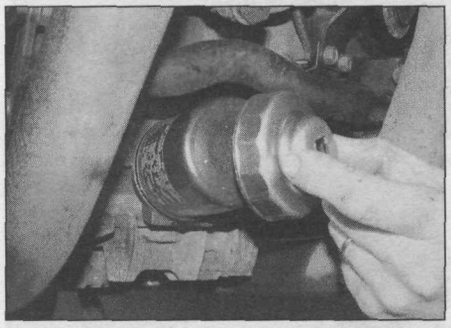
Models with spin-on filter (1995 to 2003)

8 Unscrew the oil filter using a filter socket (commercially available from good accessory dealers), a filter removing strap or a chain-wrench, and tip any residual oil into the drain tray **(see illustrations)**. The filter socket is preferable because it allows a means of tightening the new filter to the correct torque.

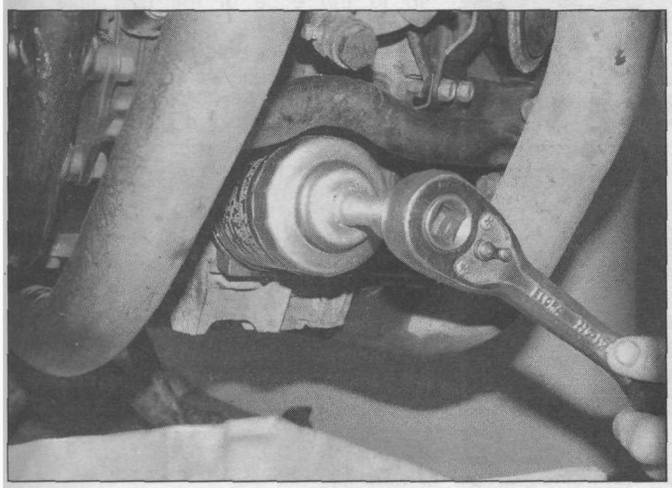
9 Smear clean engine oil onto the rubber seal on the new filter and thread it onto the engine **(see illustrations)**. Tighten it to the specified torque setting using the filter socket if



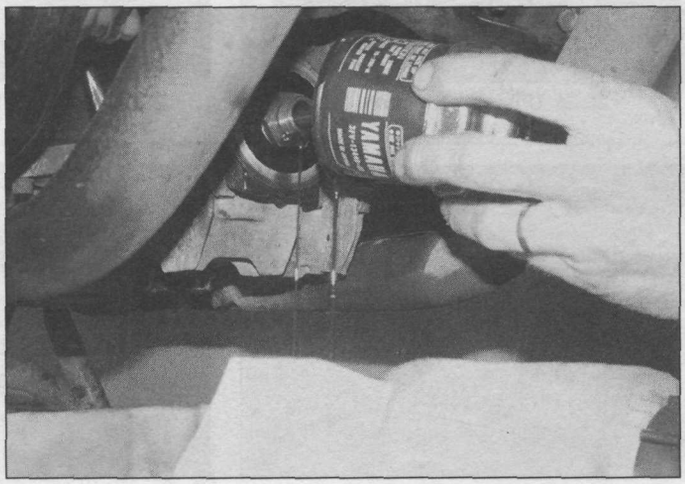
23.6 Make sure the O-ring (arrowed) is properly seated in its groove in the housing



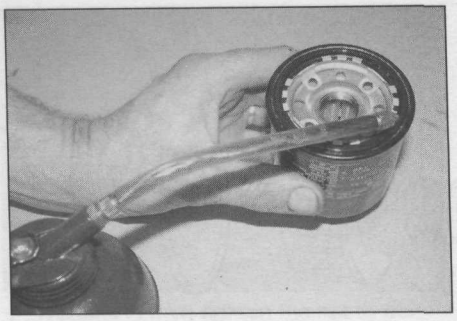
23.8a Fit the filter adapter over the head of the filter



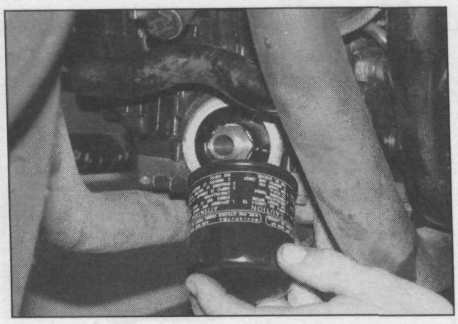
23.8b Unscrew the filter . . .



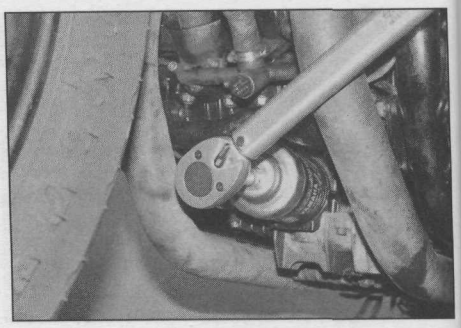
23.8c . . . and tip the oil into the tray



23.9a Smear the seal with clean oil . . .



23.9b . . . then install the new filter . . .



23.9c . . . and tighten it to the specified torque or as specified

available **(see illustration)**, or tighten the filter as tight as possible by hand, or by the number of turns specified on the filter itself or its packaging. **Note:** *Do not use a strap or chain filter removing tool to tighten the filter as you will damage it.*

10 Refill the engine to the proper level as described in Section 10, Steps 6 and 7.

Every 12,000 miles (20,000 km) or 20 months

Carry out all the items under the 4000 mile (6000 km) and 6000 mile (10,000 km) checks, plus the following:

24 Air filter renewal

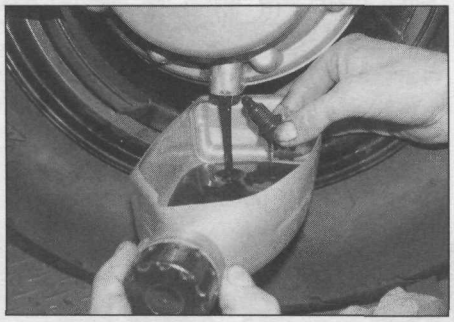
1 Remove the old filter as described in Section 5 and install a new one.

25 Final drive oil change

1 Place the motorcycle on its centrestand, making sure it is on level ground.

2 Place an oil drain pan under the drain bolt in the bottom of the final drive housing. Unscrew the filler bolt **(see illustration 11.2a)**. Unscrew the drain bolt and allow the oil to drain into the pan **(see illustrations)**.

25.2a Unscrew the drain bolt (arrowed) . . . .



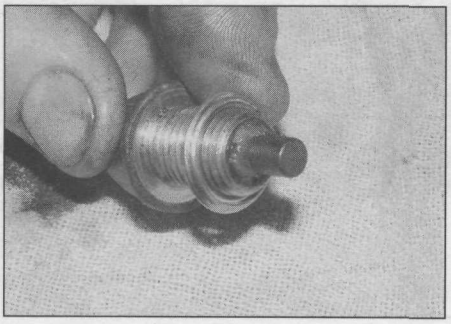
25.2b . . . and allow the oil to drain

3 Remove the drain bolt sealing washer and replace it with a new one – you will probably need to lever the old one off using a small screwdriver, or even to cut it off **(see illustration)**. Check the magnetic tip on the drain bolt for debris and clean it off – a small amount of sludge can be expected, but the presence of any larger metallic bits could indicate wear or damage within the drive housing, or incorrect bevel gear backlash. The problem should be investigated, especially if there is any abnormal noise (rumbling, whining or clunking) during normal use, or if roughness, stiffness or notchiness is felt when the rear wheel is turned by hand.

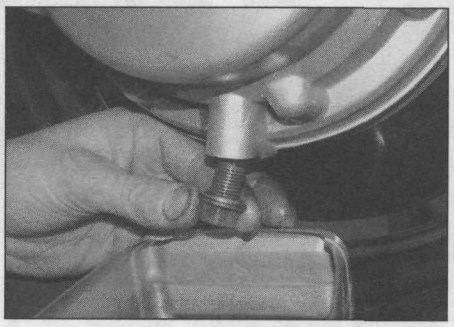
4 Install the bolt with a new sealing washer and tighten it to the torque setting specified at the beginning of the Chapter **(see illustrations)**.

5 Fill the housing using the amount and type of oil specified at the beginning of the Chapter **(see illustration 11.3)**. The oil should come up to the edge of the filler hole **(see illustration 11.2b)**.

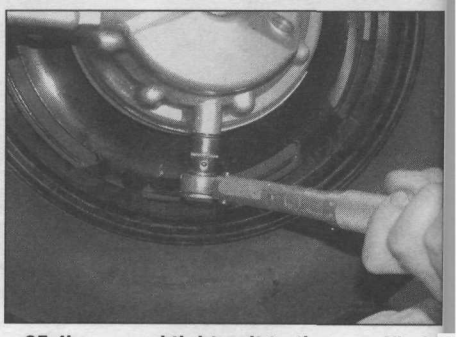
6 Install the filler bolt, using a new sealing washer if necessary, and tighten it to the specified torque setting.



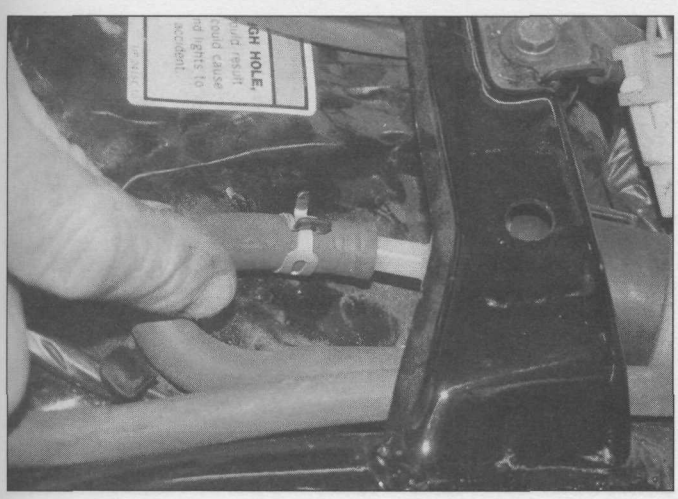
25.3 Replace the sealing washer with a new one, and check the magnetic tip for debris



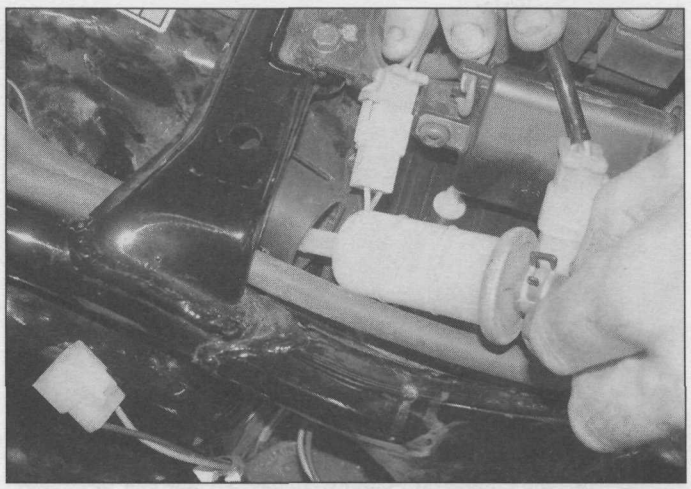
25.4a Install the drain bolt using a new sealing washer . . .



25.4b . . . and tighten it to the specified torque setting



26.2a Release the input hose clamp and detach it . . .



26.2b . . . then withdraw the filter and detach the output hose

Every 20,000 miles (30,000 km)

Carry out all the items under the 4000 mile (6000 km) check, plus the following:

26 Fuel filter renewal

Warning: Petrol (gasoline) is extremely flammable, so take extra precautions when you work on any part of the fuel system. Don't smoke or allow open flames or bare light bulbs near the work area, and don't work in a garage where a natural gas-type appliance is present. If you spill any fuel on your skin, rinse it off immediately with soap and water. When you perform any kind of work on the fuel system, wear safety glasses and have a fire extinguisher suitable for a Class B type fire (flammable liquids) on hand.

1 Remove the rider's seat (see Chapter 8).
2 Release the clamp securing the input hose (from the tank) to the back of the filter and detach it, being prepared to catch any residual fuel with a rag **(see illustration)**. Draw the filter forwards out of its sleeve, then release the clamp securing the output hose (to the pump) and detach it **(see illustration)**.
3 Install the new filter, noting that the directional arrow on its body must point in the direction of fuel flow, i.e. away from the tank and towards the pump. Make sure the clamps are in good condition and are secure, and that the hoses are in good condition.
4 Install the rider's seat (see Chapter 8).

27 Steering head bearings re-greasing

1 Over a period of time the grease will harden or may be washed out of the bearings by incorrect use of jet washes.
2 Disassemble the steering head for re-greasing of the bearings. Refer to Chapter 6 for details.

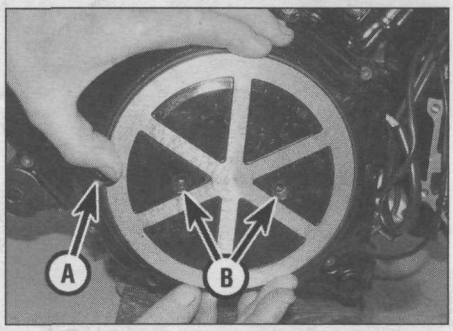
28 Swingarm bearings re-greasing

1 Over a period of time the grease will harden or dirt or water will penetrate the bearings due to failed seals.
2 The suspension is not equipped with grease nipples. Remove the swingarm as described in Chapter 6 for greasing of the bearings.

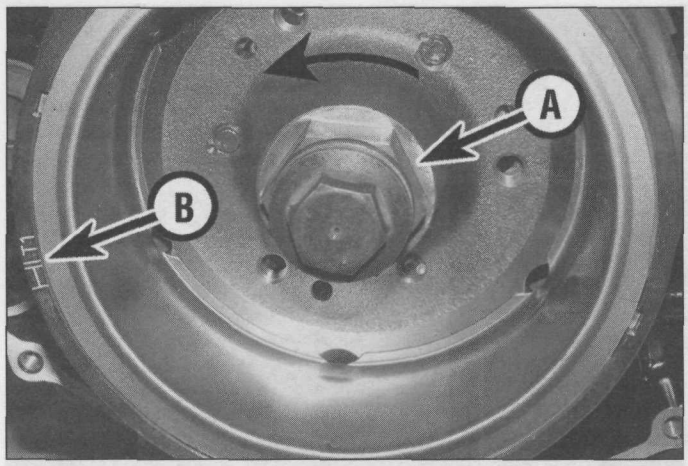
Every 25,000 miles (40,000 km)

29 Valve clearances check

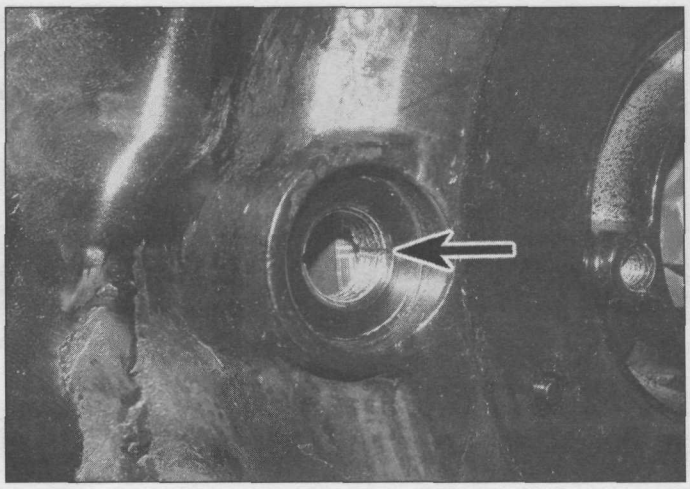
1 The engine must be completely cool for this maintenance procedure, so let the machine sit overnight before beginning.
2 Remove the valve covers (see Chapter 2), and the spark plugs (see Section 1). Each cylinder is referred to by a number – the rear left is number 1, the front left is number 2, the rear right is number 3, and the front right is number 4.
3 Make a chart or sketch of all valve positions so that a note of each clearance can be made against the relevant valve.
4 Unscrew the timing mark inspection plug from the alternator cover on the left-hand side of the engine, then undo the screws securing the crankshaft end cap and remove it **(see illustration)**. Discard the inspection plug O-ring and the end cap rubber gasket and O-ring as new ones must be used, and remove the collared washer from the centre of the cover. Note that the timing marks are difficult to see – you will need a torch, and you have to look in at an angle from the front as the marks are not directly visible from the side. This makes the triangular pointer (static timing mark) redundant,



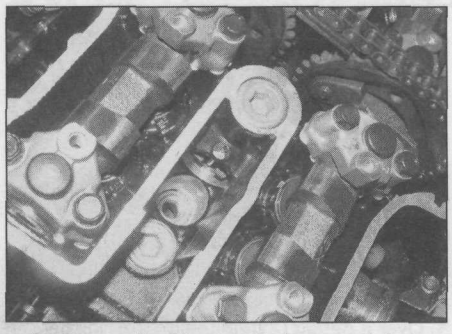
29.4 Unscrew the timing plug (A), then undo the screws (B) and remove the cap



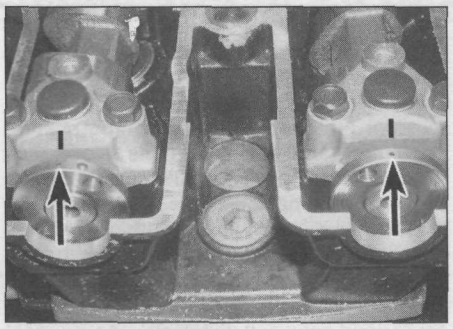
29.5a Turn the engine anti-clockwise using a spanner or socket on the large hex (A), *not the bolt in the centre (alternator cover* removed for clarity). Note the line nearest to the T1 mark (B) on the rotor rim – this is the TDC mark for the No. 1 cylinder



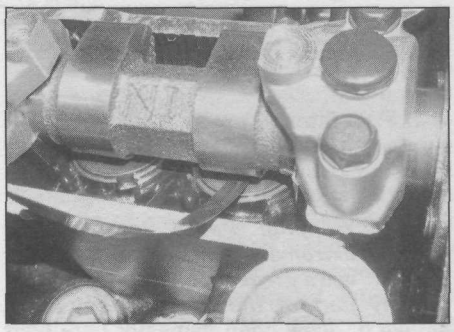
29.5b Turn the engine until the line next to the T1 mark (the top line) aligns with the notch (arrowed) . . .



29.5c . . . the No. 1 cylinder cam lobes face up and slightly towards each other . . .



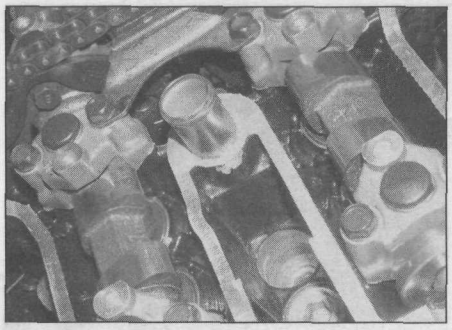
29.5d . . . and the small punch marks (arrowed) are at the top and aligning with the index lines (highlighted)



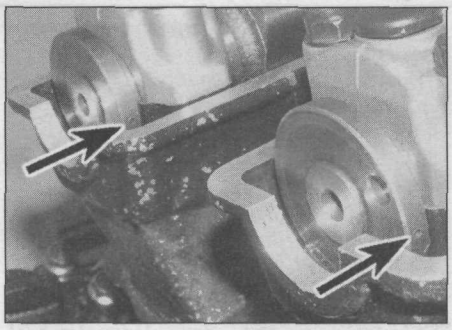
29.6 Insert the feeler gauge between the cam and the shim and measure the clearance

and so you must use the notch in the rear side of the inspection hole as the static mark.

5 Turn the engine using an offset 32 mm ring spanner or socket on the hex on the alternator rotor boss (do not turn the engine using the *rotor bolt itself), turning it in an anti-clockwise* direction only **(see illustration)**. Turn the engine until the line nearest to the 'T1' mark on the alternator rotor aligns with the static timing mark (the notch in the inspection hole), and the camshaft lobes for the No. 1 (rear left) cylinder face up and slightly towards each other, and the **small** punch mark on the right-hand end of each rear cylinder camshaft points up and aligns with the index line on the adjacent camshaft holder **(see illustrations)**. If the cam lobes are facing down and the *punch marks are not visible, turn the engine* anti-clockwise 360° (one full turn) so that line nearest the 'T1' mark again aligns with the static timing mark. The camshaft lobes will now be facing up and slightly towards each other, meaning the No. 1 cylinder is at TDC (top dead centre) on the compression stroke.



29.7a Turn the engine so the No. 3 cylinder cam lobes face up and slightly towards each other . . .

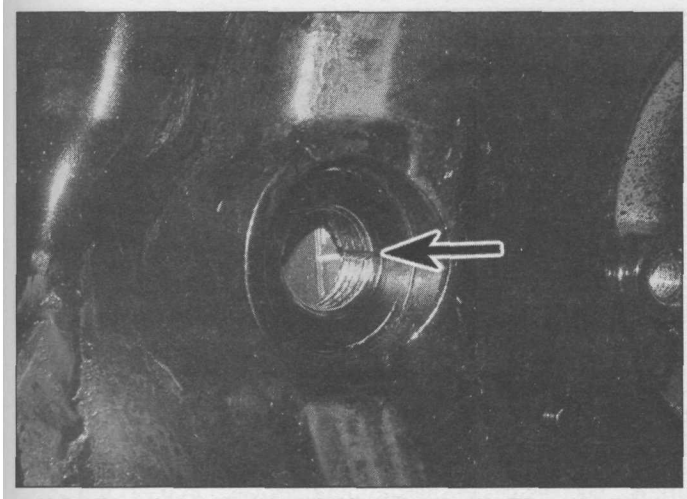


29.7b . . . and the small punch marks (arrowed) point to the front and align with the cylinder head surface

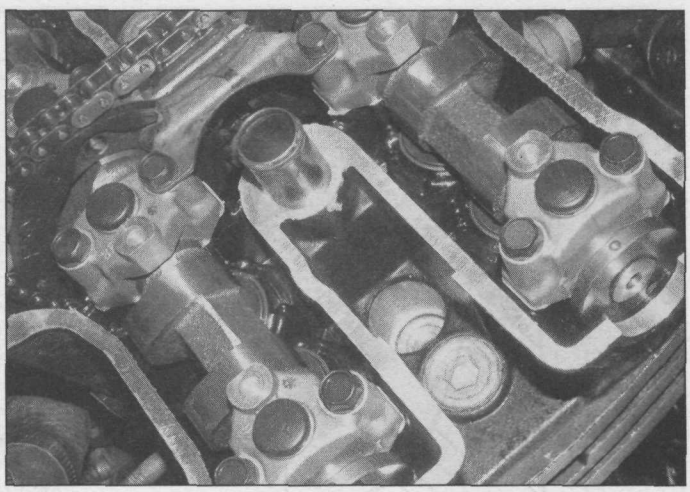
6 With No. 1 cylinder at TDC on the compression stroke, check the clearances on the No. 1 cylinder intake and exhaust valves. Insert a feeler gauge of the same thickness as the correct valve clearance (see Specifications) between the base of the camshaft lobe and the shim on the top of each valve and check that it is a firm sliding fit – you should feel a slight drag when the you pull the gauge out **(see illustration)**. If not, use the feeler gauges to obtain the exact clearance. Record the measured clearance on the chart.

7 Now turn the engine anti-clockwise 180° *(half a turn) so that the camshaft lobes for the* No. 3 cylinder are facing up and slightly towards each other, and the **small** punch marks are pointing forwards and in line with the cylinder head mating surface **(see illustrations)**. The No. 3 cylinder is now at TDC on the compression stroke. Measure the *clearances of the No. 3 cylinder valves using* the method described in Step 6.

8 Now turn the engine anti-clockwise 250° so that the line next to the 'T2' mark on the alternator rotor aligns with the static timing mark, the camshaft lobes for the No. 2 cylinder are facing away from each other, and the **large** punch mark on the left-hand end of each camshaft points up and aligns with the



29.8a Turn the engine until the line next to the T2 mark aligns with the notch (arrowed) . . .



29.8b . . . the No. 2 cylinder cam lobes face away from each other . . .

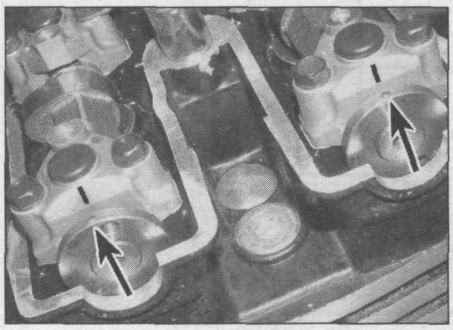
index line on the camshaft holder **(see illustrations)**. The No. 2 cylinder is now at TDC on the compression stroke. Measure the clearances of the No. 2 cylinder valves using the method described in Step 6.

9 Now turn the engine anti-clockwise 180° (half a turn) so that the camshaft lobes for the No. 4 cylinder are facing away from each other and the **large** punch marks are pointing forwards and in line with the cylinder head mating surface **(see illustrations)**. The No. 4 cylinder is now at TDC on the compression stroke. Measure the clearances of the No. 4 cylinder valves using the method described in Step 6.

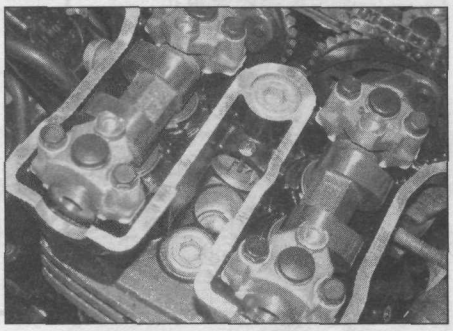
10 When all clearances have been measured and charted, identify whether the clearance on any valve falls outside that specified. If it does, the shim in the top of the cam follower must be replaced with one of a thickness which will restore the correct clearance.

11 Shim replacement requires the use of a Yamaha special tool, part no.90890-04105. This is readily available from dealers and should not be expensive. It may also be possible to obtain an after-market tool from a good accessory shop or mail-order parts specialist, but make sure you get the correct one as many are available.

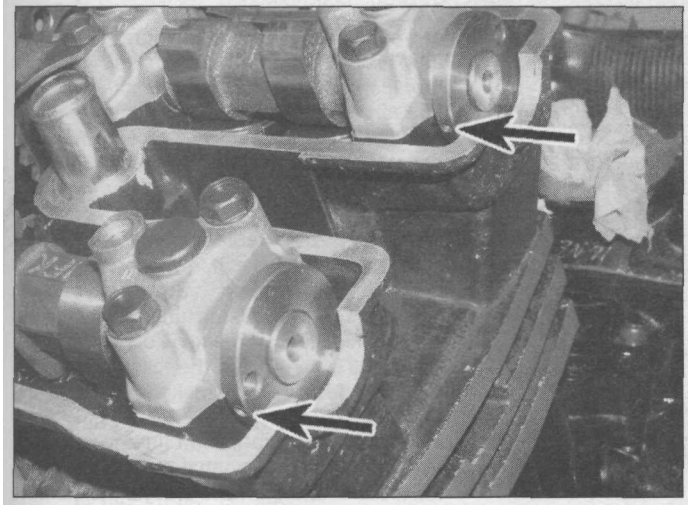
12 Turn the crankshaft as required so the cylinder of the valve being worked on is at TDC on its compression stroke (see above). Position the cam follower of the valve in question so that its shim removal slot faces backwards (front cylinder exhaust valves and rear cylinder intake valves) or forwards (front cylinder inlet valves and rear cylinder exhaust valves) **(see illustration)**.



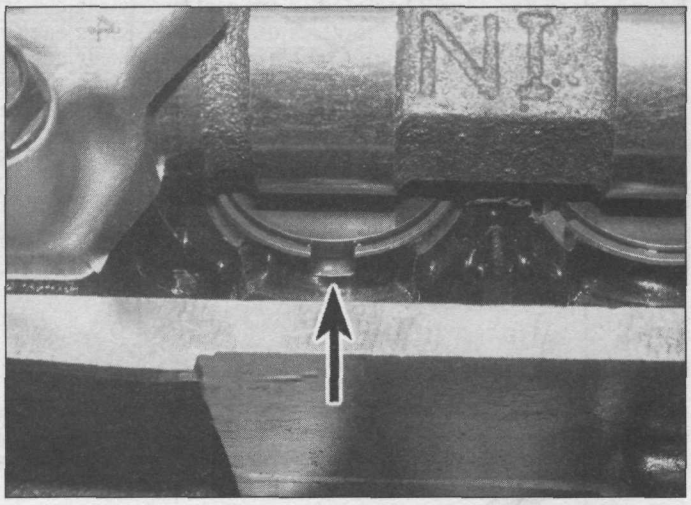
29.8c . . . and the large punch marks (arrowed) are at the top and aligning with the index lines (highlighted)



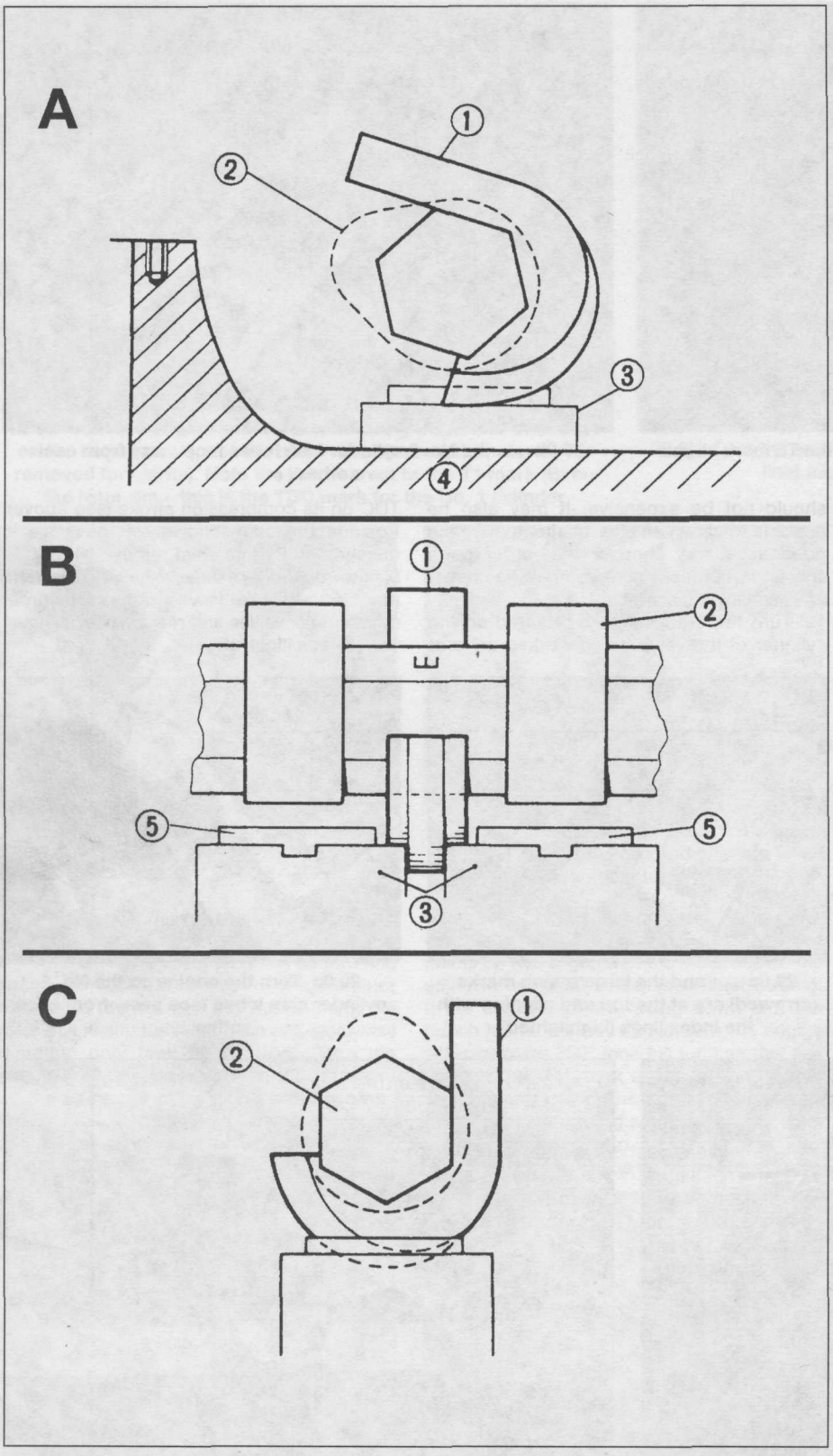
29.9a Turn the engine so the No. 4 cylinder cam lobes face away from each other . . .



29.9b . . . and the large punch marks (arrowed) point to the front and align with the cylinder head surface

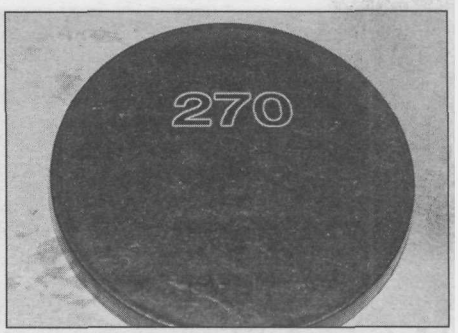


29.12 Position the slot (arrowed) as described



29.13 Fit the tool as shown (frames A and B), then, rotate the camshaft so the tool depresses the followers (frame C)

1 Tool *3 Follower* *5 Shim*
2 Camshaft *4 Cylinder head*



29.16 Each shim should have its size marked on it

13 Fit the special tool onto the hexagonal section between the cam lobes as shown, making sure it is central **(see illustration)**.

14 Rotate the crankshaft as required so that the lobes on the tool move onto the followers and depress them, making sure the camshaft lobes themselves are pointing away from the shims so they do not restrict removal **(see illustration 29.13)**.

15 Prise the shim out of the follower using a small screwdriver inserted in the shim removing slot, and remove it using a pair of pliers or a magnet **(see illustration 29.12)**.

16 A size mark should be stamped on one face of the shim **(see illustration)**. A shim size of 250 denotes a thickness of 2.5 mm, 245 is 2.45 mm. If the mark is not visible the shim thickness will have to be measured. It is recommended that the shim is measured anyway to check that it has not worn.

17 Using the appropriate shim selection chart, find where the measured valve clearance and existing shim thickness values intersect and read off the shim size required **(see illustration opposite)**. **Note:** *If the existing shim is marked with a number not ending in 0 or 5, round it up or down as appropriate to the nearest number ending in 0 or 5 so that the chart can be used.* Shims are available in 0.05 mm increments from 2.00 to 3.20 mm. **Note:** *If the required replacement shim is greater than 3.20 mm (the largest available), the valve is probably not seating correctly due to a build-up of carbon deposits and should be checked and cleaned or resurfaced as required (see Chapter 2).*

18 Obtain the replacement shim, then measure it to ensure its marking is correct. Lubricate the shim with molybdenum disulphide oil (a 50/50 mixture of molybdenum disulphide grease and engine oil) and fit it into its recess in the top of the follower, with the size mark facing down. Make sure the shim is correctly seated.

19 Rotate the crankshaft in the opposite direction to Step 14 so that the tool moves off the follower and the valve closes, then remove the tool.

20 Rotate the crankshaft anti-clockwise

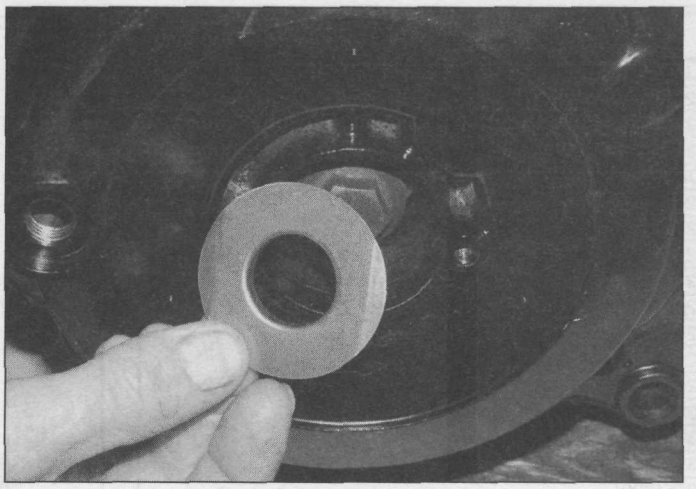
INTAKE

MEASURED CLEARANCE	INSTALLED PAD NUMBER																								
	200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320
0.00 ~ 0.05			200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310
0.06 ~ 0.10		200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315
0.11 ~ 0.15	STANDARD CLEARANCE																								
0.16 ~ 0.20	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320	
0.21 ~ 0.25	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320		
0.26 ~ 0.30	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320			
0.31 ~ 0.35	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320				
0.36 ~ 0.40	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320					
0.41 ~ 0.45	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320						
0.46 ~ 0.50	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320							
0.51 ~ 0.55	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320								
0.56 ~ 0.60	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320									
0.61 ~ 0.65	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320										
0.66 ~ 0.70	255	260	265	270	275	280	285	290	295	300	305	310	315	320											
0.71 ~ 0.75	260	265	270	275	280	285	290	295	300	305	310	315	320												
0.76 ~ 0.80	265	270	275	280	285	290	295	300	305	310	315	320													
0.81 ~ 0.85	270	275	280	285	290	295	300	305	310	315	320														
0.86 ~ 0.90	275	280	285	290	295	300	305	310	315	320															
0.91 ~ 0.95	280	285	290	295	300	305	310	315	320																
0.96 ~ 1.00	285	290	295	300	305	310	315	320																	
1.01 ~ 1.05	290	295	300	305	310	315	320																		
1.06 ~ 1.10	295	300	305	310	315	320																			
1.11 ~ 1.15	300	305	310	315	320																				
1.16 ~ 1.20	305	310	315	320																					
1.21 ~ 1.25	310	315	320																						
1.26 ~ 1.30	315	320																							
1.31 ~ 1.35	320																								

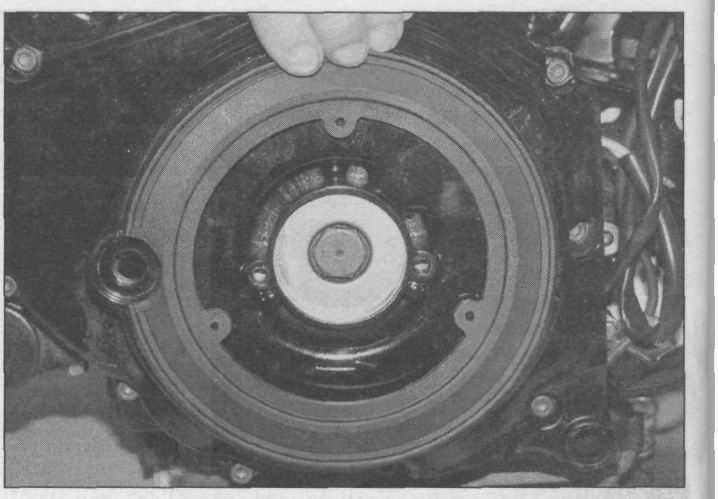
29.17 Shim selection charts

EXHAUST

MEASURED CLEARANCE	INSTALLED PAD NUMBER																								
	200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320
0.00 ~ 0.05						200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295
0.06 ~ 0.10					200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300
0.11 ~ 0.15				200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305
0.16 ~ 0.20			200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310
0.21 ~ 0.25		200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315
0.26 ~ 0.30	STANDARD CLEARANCE																								
0.31 ~ 0.35	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320	
0.36 ~ 0.40	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320		
0.41 ~ 0.45	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320			
0.46 ~ 0.50	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320				
0.51 ~ 0.55	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320					
0.56 ~ 0.60	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320						
0.61 ~ 0.65	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320							
0.66 ~ 0.70	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320								
0.71 ~ 0.75	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320									
0.76 ~ 0.80	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320										
0.81 ~ 0.85	255	260	265	270	275	280	285	290	295	300	305	310	315	320											
0.86 ~ 0.90	260	265	270	275	280	285	290	295	300	305	310	315	320												
0.91 ~ 0.95	265	270	275	280	285	290	295	300	305	310	315	320													
0.96 ~ 1.00	270	275	280	285	290	295	300	305	310	315	320														
1.01 ~ 1.05	275	280	285	290	295	300	305	310	315	320															
1.06 ~ 1.10	280	285	290	295	300	305	310	315	320																
1.11 ~ 1.15	285	290	295	300	305	310	315	320																	
1.16 ~ 1.20	290	295	300	305	310	315	320																		
1.21 ~ 1.25	295	300	305	310	315	320																			
1.26 ~ 1.30	300	305	310	315	320																				
1.31 ~ 1.35	305	310	315	320																					
1.36 ~ 1.40	310	315	320																						
1.41 ~ 1.45	315	320																							
1.46 ~ 1.50	320																								



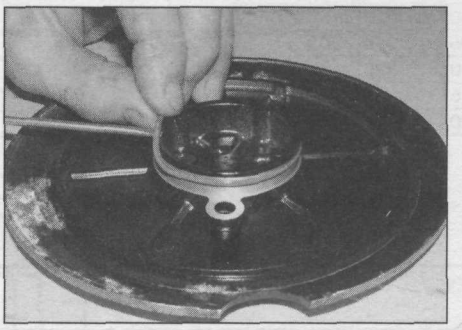
29.21a Fit the washer . . .



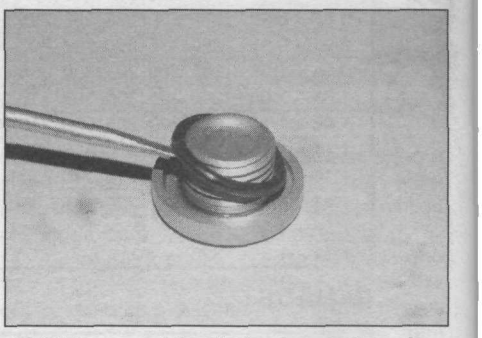
29.21b . . . then locate the rubber gasket onto the pegs

several turns to seat the new shim(s), then check the clearances again.

21 Install the valve covers (see Chapter 2), and the spark plugs (see Section 1). Install the crankshaft end cap collared washer, with the collared section facing in, and the cap, using a new gasket and O-ring – the rubber gasket has three holes which locate over the small pins on the alternator cover **(see illustrations)**. Smear the O-ring with oil and push the cover on until the O-ring is felt to locate. Install the timing inspection plug using a new O-ring **(see illustration)**.



29.21c Fit a new O-ring onto the cap . . .



29.21d . . . and the timing inspection plug

Every two years

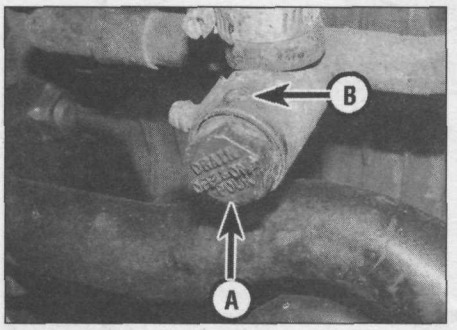
30 Coolant change

Warning: Allow the engine to cool completely before performing this maintenance operation. Also, don't allow antifreeze to come into contact with your skin or the painted surfaces of the motorcycle. Rinse off spills immediately with plenty of water. Antifreeze is highly toxic if ingested. Never leave antifreeze lying around in an open container or in puddles on the floor; children and pets are attracted by its sweet smell and may drink it. Check with local authorities (councils) about disposing of antifreeze. Many communities have collection centres which will see that antifreeze is disposed of safely. Antifreeze is also combustible, so don't store it near open flames.

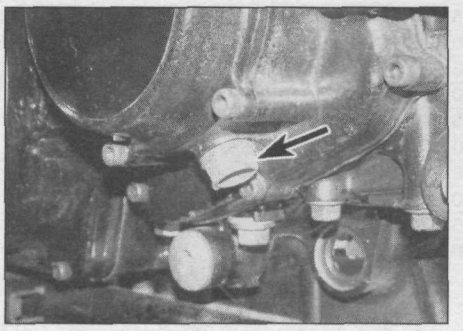
Draining

1 Remove the top cover and the right-hand side cover (see Chapter 8).

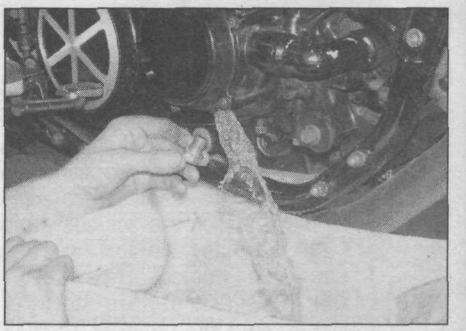
2 Remove the pressure cap from the top of the radiator filler neck by covering it with a heavy cloth and turning it anti-clockwise until it reaches a stop **(see illustration 6.7)**. If you hear a hissing sound (indicating there is still pressure in the system), wait until it stops. Now press down on the cap and continue



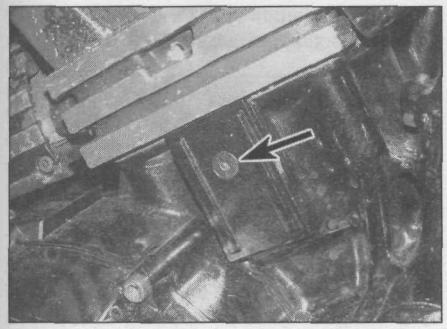
30.3a Turn the valve (A) so that the ON mark is at 2 o'clock and the ball locates in the hole (B)



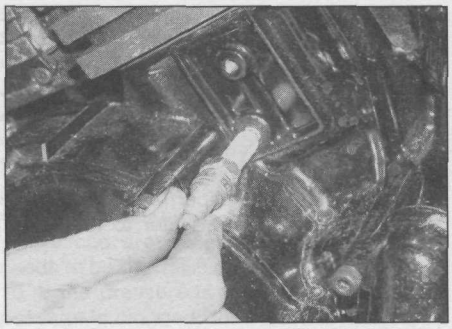
30.3b Unscrew the drain bolt (arrowed) . . .



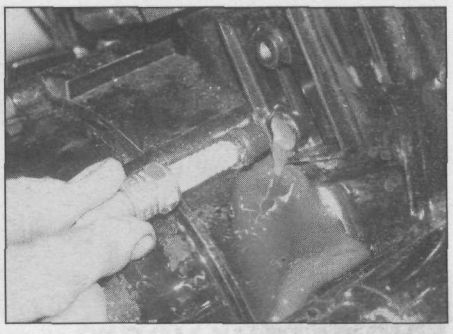
30.3c . . . and allow the coolant to drain



30.4a Undo the screw (arrowed) and remove the cover



30.4b Thread a spark plug top into the plug . . .



30.4c . . . then withdraw the plug and allow the coolant to drain

turning the cap until it can be removed. Also remove the coolant reservoir cap.

3 Turn the cooling system drain valve on the front of the engine to the ON position – set the ON mark at about 2 o'clock, and make sure the sprung ball locates in the hole in the top of the valve housing **(see illustration)**. Place a suitable container for catching the coolant beneath the water pump on the right-hand side of the engine. Unscrew the drain bolt and allow the coolant to completely drain from the system **(see illustrations)**. Retain the old sealing washer for use during flushing.

4 Undo the screw securing the cylinder jacket drain plug cover on each cylinder **(see illustration)**. Position the container beneath each cylinder in turn, then thread a spark plug top into the drain plug and use it as a handle to withdraw the plug, and allow the coolant to completely drain from the jacket **(see illustrations)**. Retain the old plug for use during flushing.

5 Release the clamps securing the radiator and reservoir overflow hoses and detach them from their unions on the reservoir, noting which fits where **(see illustration)**. Lift the reservoir up out of its holder, then unscrew the filler cap and drain the reservoir into the container **(see illustration)**.

Flushing

6 Flush the system with clean tap water by inserting a garden hose in the radiator filler neck. Allow the water to run through the system until it is clear and flows out cleanly. If the radiator is extremely corroded, remove it (see Chapter 3) and have it cleaned by a specialist. Also flush the reservoir.

7 Clean the drain holes in the water pump and cylinder bocks then install the drain plugs and bolt, using the old sealing washer. Tighten the bolt to the torque setting specified at the beginning of the Chapter

8 Fill the cooling system with clean water mixed with a flushing compound. Make sure the flushing compound is compatible with aluminium components, and follow the manufacturer's instructions carefully. Fit the radiator cap.

9 Turn the cooling system drain valve on the front of the engine to the OFF position – set the OFF mark at about 2 o'clock, and make sure the sprung ball locates in the hole in the bottom of the valve housing. Start the engine and allow it to reach normal operating temperature. Let it run for about ten minutes.

10 Stop the engine. Let it cool for a while, then cover the pressure cap with a heavy rag and turn it anti-clockwise to the first stop, releasing any pressure that may be present in the system. Once the hissing stops, push down on the cap and remove it completely.

11 Drain the system once again (see above).

12 Fill the system with clean water and repeat the procedure in Steps 6 to 11.

Refilling

13 Install the drain bolt using a new sealing washer and tighten it to the torque setting specified at the beginning of the Chapter **(see illustration)**. Fit the drain plug into each cylinder jacket, using new ones if the old ones are damaged, deformed or deteriorated, though it is best to use new ones whatever the condition of the old ones. Install the reservoir and connect the hoses to their unions **(see illustration 30.5a)**.

14 Fill the system via the radiator filler neck up to its base with the proper coolant mixture (see this Chapter's Specifications). **Note:** *Pour the coolant in slowly to minimise the amount of air entering the system.* Fill the reservoir to the UPPER level line (see *Daily (pre-ride) checks*).

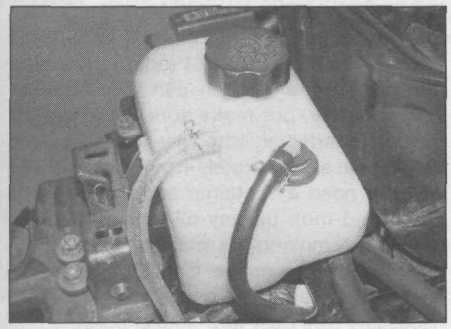
15 Turn the cooling system drain valve on the front of the engine to the OFF position – set the OFF mark at about 2 o'clock, and make sure the sprung ball locates in the hole in the bottom of the valve housing.

16 Start the engine and allow it to idle for 2 to 3 minutes. Flick the throttle twistgrip part open 3 or 4 times, so that the engine speed rises to approximately 4000 – 5000 rpm, then stop the engine. This process will bleed any trapped air bubbles from the system.

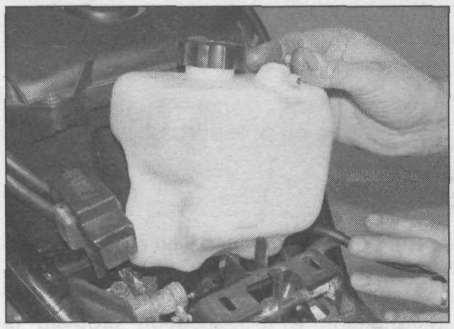
17 If necessary, top up the coolant level to the base of the radiator filler neck, then install the pressure cap. Similarly top up the coolant reservoir to the UPPER level line.

18 Start the engine and allow it to reach normal operating temperature, then shut it off. Let the engine cool then remove the pressure cap as described in Step 2. Check that the coolant level is still up to the base of the upper radiator filler neck. If it's low, add the specified mixture until it reaches the base of the filler neck. Refit the cap.

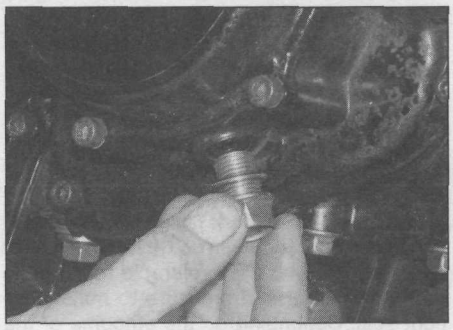
19 Check the coolant level in the reservoir and top up if necessary.



30.5a Detach the hoses from the reservoir . . .



30.5b . . . then remove the reservoir and empty it



30.13 Install the drain bolt using a new sealing washer

20 Check the system for leaks. Install the top and side covers (see Chapter 8).
21 Do not dispose of the old coolant by pouring it down the drain. Instead pour it into a heavy plastic container, cap it tightly and take it into an authorised disposal site or service station – see ***Warning*** at the beginning of this Section.

31 Brake and clutch fluid change

1 The brake and clutch fluid should be replaced every two years or whenever a master cylinder or caliper/release cylinder overhaul is carried out. Refer to the brake bleeding section in Chapter 7 and the clutch bleeding section in Chapter 2.

HAYNES HiNT

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

Every four years

32 Brake and clutch master cylinder and caliper/release cylinder seals renewal

1 The seals will deteriorate over a period of time and lose their effectiveness, leading to sticky operation or fluid loss, or allowing the ingress of air and dirt. Refer to Chapter 7 for the brake master cylinders and calipers and Chapter 2 for the clutch master and release cylinders, and dismantle the components for seal renewal every four years.
2 Note that certain Yamaha brake calipers suffer badly in adverse conditions, so it is worth keeping an eye on them, especially on earlier models, and changing the seals sooner than specified if necessary.

33 Brake and clutch hoses renewal

1 The hoses will deteriorate with age and should be replaced with new ones every four years regardless of their apparent condition.
2 Refer to Chapter 7 (brakes) and Chapter 2 (clutch) and disconnect the hoses from the master cylinders and calipers or release cylinder. Always replace the banjo union sealing washers with new ones, and tighten the bolts to the torque setting specified at the beginning of the relevant Chapter.

34 Fuel hoses renewal

Warning: Petrol (gasoline) is extremely flammable, so take extra precautions when you work on any part of the fuel system. Don't smoke or allow open flames or bare light bulbs near the work area, and don't work in a garage where a natural gas-type appliance is present. If you spill any fuel on your skin, rinse it off immediately with soap and water. When you perform any kind of work on the fuel system, wear safety glasses and have a fire extinguisher suitable for a Class B type fire (flammable liquids) on hand.

1 The fuel system hoses should be renewed at the first signs of cracking or hardening, or at the specified interval regardless of their condition. This includes all the vent and drain hoses, and the vacuum hose.
2 Remove the rider's seat (see Chapter 8) and the air filter housing (see Chapter 4). Disconnect the fuel hoses from the tank, filter, pump and carburettors, noting their routing and which length hose fits where **(see illustrations 3.1a, b and c)**. It is advisable to make a sketch to ensure correct installation.
3 Fit the new hoses to their unions and secure them using new clamps. Run the engine and check for leaks before taking the machine out on the road.

35 Front forks oil change

1 Fork oil degrades over a period of time and loses its damping qualities. Refer to the fork oil change procedure in Chapter 6. The forks do not need to be completely disassembled.

Non-scheduled maintenance

36 Cylinder compression check

1 Among other things, poor engine performance may be caused by leaking valves, incorrect valve clearances, a leaking head gasket, or worn pistons, rings and/or cylinder walls. A cylinder compression check will help pinpoint these conditions and can also indicate the presence of excessive carbon deposits in the cylinder heads.
2 The only tools required are a compression gauge and a spark plug wrench. A compression gauge with a threaded end for the spark plug hole is preferable to the type which requires hand pressure to maintain a tight seal. Depending on the outcome of the initial test, a squirt-type oil can may also be needed.
3 Make sure the valve clearances are correctly set (see Section 29) and that the cylinder head nuts are tightened to the correct torque setting (see Chapter 2).
4 Refer to *Fault Finding Equipment* in the Reference section for details of the compression test. Refer to the specifications at the beginning of the Chapter for compression figures.

37 Engine oil pressure check

1 The V-Max is not fitted with an oil pressure switch and warning light, only an oil level sensor and light (see Chapter 9 for further information). If a lubrication problem is suspected, first check the oil level (see *Daily (pre-ride) checks*).
2 If the oil level is correct, an oil pressure check must be carried out. The check provides useful information about the condition of the engine's lubrication system.
3 To check the oil pressure, a suitable gauge and adapter (which screws into the crankcase) will be needed. Yamaha provide the components (pt nos. 90890-03153 (gauge) and 90890-03124 (adapter)) for this purpose, or a gauge can be obtained commercially, but make sure it comes with the correct adapter, otherwise this will have to be purchased separately from Yamaha. You will also need a container and some rags to catch and mop up any oil that gets lost in between removing the main oil gallery plug and installing the gauge. Check the engine oil level after installing the gauge and replenish if necessary (see *Daily (pre-ride) checks*).
4 Unscrew the main oil gallery bolt, located on the right-hand side of the engine to the

rear of the oil level inspection window, and swiftly screw the gauge assembly in its place **(see illustration)**.

5 Warm the engine up to normal operating temperature.

6 With the engine speed at 1000 rpm the oil pressure should be similar to that given in the Specifications at the start of this Chapter. Stop the engine.

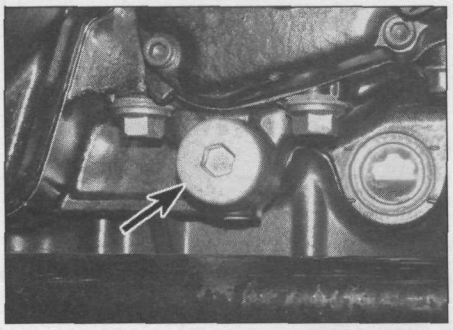
7 Fit a new O-ring onto the main oil gallery bolt. Unscrew the gauge assembly and immediately install the bolt, tightening it to the torque setting specified at the beginning of the Chapter.

8 Check the oil level (see *Daily (pre-ride) checks*) and replenish if necessary.

9 If the pressure is significantly lower than the standard, either the pressure relief valve is stuck open, on models with a cartridge type oil filter the bypass valve is stuck open (see Section 23), the oil pump or its drive mechanism is faulty, the oil strainer or filter is blocked, or there is other engine damage. Also make sure the correct grade oil is being used. Begin diagnosis by checking the oil filter, strainer and relief valve, then the oil pump (see Chapter 2). If those items check out okay, chances are the bearing oil clearances are excessive and the engine needs to be overhauled.

10 If the pressure is too high, either an oil passage is clogged, the relief valve is stuck closed or the wrong grade of oil is being used.

11 If the oil pressure and oil level are both good, then the oil level sensor or its warning light may be faulty. Check them and the circuit (see Chapter 9).



37.4 Main oil gallery plug (arrowed)