

0.6 Introduction

a world-shaking performance at the TT. Twenty-one year old Mike Hailwood won both 125 and 250 cc TTs and Hondas filled the top five positions in both races. Soichiro Honda's master plan was starting to come to fruition, Hailwood and Honda won the 1961 250 cc World Championship. Next year Honda won three titles. The other Japanese factories fought back and inspired Honda to produce some of the most fascinating racers ever seen: the awesome six-cylinder 250, the five-cylinder 125, and the 500 four with which the immortal Hailwood battled Agostini and the MV Agusta.

When Honda pulled out of racing in '67 they had won sixteen rider's titles, eighteen manufacturer's titles, and 137 GPs, including 18 TTs, and introduced the concept of the modern works team to motorcycle racing. Sales success followed racing victory as Soichiro Honda had predicted, but only because the products advanced as rapidly as the racing machinery. The Hondas that came to Britain in the early '60s were incredibly sophisticated. They had overhead

cams where the British bikes had pushrods, they had electric starters when the Brits relied on the kickstart, they had 12V electrics when even the biggest British bike used a 6V system. There seemed no end to the technical wizardry and when in 1968 the first four-cylinder



Carl Fogarty in action at the Suzuka 8 Hour on the RC45

An early CB750 Four



CB750 road bike arrived the world changed for ever. They even had to invent a new word for it: superbike. Honda raced again with the CB750 at Daytona and won the World Endurance title with a prototype DOHC version that became the CB900 roadster. There was the six-cylinder CBX, the first turbocharged production bike, they invented the full-dress tourer with the Goldwing and came back to GPs with the revolutionary oval-piston NR500 four-stroke, a much-misunderstood bike that was more rolling experiment than racer. It was true, though, that Mr Honda was not keen on two-strokes - early motocross engines had to be explained away to him as lawnmower motors! However, in 1982 Honda raced the NS500, an agile three-cylinder lightweight against the big four-cylinder opposition in 500 GPs. The bike won in the first year and in '83 took the world title for Freddie Spencer. In four-stroke racing the V4 layout took over from the straight four, dominating TT, F1 and Endurance championships and when Superbike arrived Honda were ready with the RC30. On the roads the VFR V4 became an instant classic while the CBR600 invented another new class of bike on its way to becoming a best-seller.

And then there was the NR750. This limited-edition technological tour-de-force embodied many of Soichiro Honda's ideals. It used the latest techniques and materials in every component, from the oval-piston, 32-valve V4 motor to the titanium coating on the windscreen, it was - as Mr Honda would have wanted - the best it could possibly be. A fitting memorial to the man who has shaped the motorcycle industry and motorcycles as we know them today.

The NC30 and NC35

They're methodical at Honda – not predictable but certainly methodical. Having built a world-beating 750 V4 they then miniaturised it and produce a 400 cc version. Come to think of it, even when their V4s weren't accepted as modern miracles of production engineering in the pre-VFR750 days, they still produced smaller versions.

The reason is simple: the Japanese licensing system. Until very recently, it was all but impossible to buy and run a big bike in Japan. Potential motorcyclists have to jump through an astonishing number of hoops to be licensed for lower capacity levels, but for a big bike there were tests with very low pass rates and such sneaky little extras as testing your ability to pick your bike up from lying on its side. The effective top capacity level that it was possible to qualify for without vast amounts of time, money and anabolic steroids was 400 cc. And so all four big manufacturers built scaled-down versions of the superbikes they made for their export markets.

Some of these bikes escaped from the home market, such as the VF400 of 1983, a scaled down middle-of-the-road motorcycle that got rave reviews but only lasted for a short time in the UK market mainly due to the fact is cost 25% more than a bike like Kawasaki's GPz305 workhorse. Even a bike like the VF500 that was made for export had a scaled down 400 cc version back home – and in typical Honda fashion it wasn't just a sleeved-down 500, both the bore and the stroke were different.

The British market got its first proper 400 when Honda UK took the brave step of importing the scaled-down version of the RC30 (or VFR750R) built for Superbike racing homologation, the 400 cc NC30 (or VFR400R). This wasn't the first VFR400, the VFR400R and VFR400Z (NC21 and NC24) models had been available in Japan since



The RVF400 NC35

1986. The NC30, though, was a real RC30 replica (are you following this?) a whole 18 kg lighter than the previous model and a dead ringer for the bigger bike. As you'd expect, it handled with ultimate precision and the motor was happiest at five-figure rotational speeds – max torque happened at 10,000 rpm and peak power at 12,500! Again everyone agreed that this was a gem of a motorcycle but the British market balked at the price tag of £5899 that was up to over £6500 by April 1991, 18 months after the bike's introduction. The recently revamped Honda CBR600FM cost under £5000 at the start of 1991, so despite the aluminium chassis, twin headlamp fairing, single-sided swingarm, gear-driven camshafts and drop-dead gorgeous looks, the bike was a sales failure.

The sales success came with the '90s phenomenon of the grey import, boatloads of second-hand Japanese home-market bikes

that were difficult to keep legal (that Japanese system again) and shipped to the UK where they were sold at attractive prices. Most grey importers will have derestricted the 59 bhp Japanese-spec bikes, a procedure that involves some electronic trickery.

The NC30 was introduced in 1989 on the Japanese market and was joined in 1994 by the RVF400 (NC35). The NC35 still had the gear-drive-camshaft 55 x 42 mm lump but now had upside-down front forks and 17-inch wheels front and back. And of course it looks just like its 750 cc big brother. Basically, Honda's 400 cc V4 is ten years old. Most motorcycles would be pensionable by now. The NC30 and its relatives manage the near-impossible trick of still being totally up to date and as trick as the day it was first launched. And why shouldn't it? An RC30 still looks the business, doesn't it?

Acknowledgements

Our thanks are due to Elliott Motorcycles of Swindon for supplying the VFR400R featured in the photographs and for providing technical support and encouragement for this manual. The RVF400R was supplied by Bike Direct of Bristol.

We would also like to thank NGK Spark Plugs (UK) Ltd for supplying the colour spark plug condition photos and the Avon Rubber Company for supplying information on tyre fitting.

The introduction, "The Birth of a Dream" was written by Julian Ryder. The cover photographs were taken by Paul Tanswell.

About this Manual

The aim of this manual is to help you get the best value from your motorcycle. It can do so in several ways. It can help you decide what work must be done, even if you choose to have it done by a dealer; it provides information and procedures for routine maintenance and servicing; and it offers diagnostic and repair procedures to follow when trouble occurs.

We hope you use the manual to tackle the work yourself. For many simpler jobs, doing it yourself may be quicker than arranging an appointment to get the motorcycle into a dealer and making the trips to leave it and pick it up. More importantly, a lot of money

can be saved by avoiding the expense the shop must pass on to you to cover its labour and overhead costs. An added benefit is the sense of satisfaction and accomplishment that you feel after doing the job yourself.

References to the left or right side of the motorcycle assume you are sitting on the seat, facing forward.

We take great pride in the accuracy of information given in this manual, but motorcycle manufacturers make alterations and design changes during the production run of a particular motorcycle of which they do not inform us. No liability can be accepted by the authors or publishers for loss, damage or injury caused by any errors in, or omissions from, the information given.

0.8 Identification numbers

Frame and engine numbers

The frame serial number is stamped into the right-hand side of the steering head. The engine number is stamped into the top of the crankcase on the right-hand side of the engine. Both of these numbers should be recorded and kept in a safe place so they can be furnished to law enforcement officials in

the event of a theft. There is also a carburettor identification number on the intake side of each carburettor body, and a colour code label on the top of the rear mudguard under the passenger seat.

The frame serial number, engine serial number, carburettor identification number and colour code should also be kept in a handy place (such as with your driver's licence) so

they are always available when purchasing or ordering parts for your machine.

The procedures in this manual identify the bikes by type (ie VFR or RVF), then if necessary by model code (eg K, meaning a 1989 production year model). The model code or production year is printed on the colour code label, which is located on the top of the rear mudguard under the passenger seat.

Model	Year	Code	Initial engine no.	Initial frame no.	Carb ID no.
NC30 – grey import	1989	K	NC13E-1200001	NC30-1000001	VDE3A A
NC30 – grey import	1990/91	L	NC13E-1300001	NC30-1050001	VDE3D A
NC30 – grey import	1992-on	N	NC13E-1400001	NC30-1100001	VDE3D B
NC35 – grey import	1994/95	R	NC13E-1500001	NC35-1000001	VP90A A
NC35 – grey import	1996-on	T	NC13E-1600001	NC35-1100001	VP90A A
NC30 – UK spec	1990/91	L	NC13E-2100007	NC30-2000006	VDE3B A
NC30 – UK spec	1991-93	M	NC13E-2200001	NC30-2100001	VDE3F A



The engine number is stamped into the top of the crankcase on the right-hand side of the engine



The frame number is stamped on the right-hand side of the steering head

0•10 Safety first!

Professional mechanics are trained in safe working procedures. However enthusiastic you may be about getting on with the job at hand, take the time to ensure that your safety is not put at risk. A moment's lack of attention can result in an accident, as can failure to observe simple precautions.

There will always be new ways of having accidents, and the following is not a comprehensive list of all dangers; it is intended rather to make you aware of the risks and to encourage a safe approach to all work you carry out on your bike.

Asbestos

● Certain friction, insulating, sealing and other products - such as brake pads, clutch linings, gaskets, etc. - contain asbestos. Extreme care must be taken to avoid inhalation of dust from such products since it is hazardous to health. If in doubt, assume that they do contain asbestos.

Fire

● Remember at all times that petrol is highly flammable. Never smoke or have any kind of naked flame around, when working on the vehicle. But the risk does not end there - a spark caused by an electrical short-circuit, by two metal surfaces contacting each other, by careless use of tools, or even by static electricity built up in your body under certain conditions, can ignite petrol vapour, which in a confined space is highly explosive. Never use petrol as a cleaning solvent. Use an approved safety solvent.

● Always disconnect the battery earth terminal before working on any part of the fuel or electrical system, and never risk spilling fuel on to a hot engine or exhaust.

● It is recommended that a fire extinguisher of a type suitable for fuel and electrical fires is kept handy in the garage or workplace at all times. Never try to extinguish a fuel or electrical fire with water.

Fumes

● Certain fumes are highly toxic and can quickly cause unconsciousness and even death if inhaled to any extent. Petrol vapour comes into this category, as do the vapours from certain solvents such as trichloroethylene. Any draining or pouring of such volatile fluids should be done in a well ventilated area.

● When using cleaning fluids and solvents, read the instructions carefully. Never use materials from unmarked containers - they may give off poisonous vapours.

● Never run the engine of a motor vehicle in an enclosed space such as a garage. Exhaust fumes contain carbon monoxide which is extremely poisonous; if you need to run the engine, always do so in the open air or at least have the rear of the vehicle outside the workplace.

The battery

● Never cause a spark, or allow a naked light near the vehicle's battery. It will normally be giving off a certain amount of hydrogen gas, which is highly explosive.

● Always disconnect the battery ground (earth) terminal before working on the fuel or electrical systems (except where noted).

● If possible, loosen the filler plugs or cover when charging the battery from an external source. Do not charge at an excessive rate or the battery may burst.

● Take care when topping up, cleaning or carrying the battery. The acid electrolyte, even when diluted, is very corrosive and should not be allowed to contact the eyes or skin. Always wear rubber gloves and goggles or a face shield. If you ever need to prepare electrolyte yourself, always add the acid slowly to the water; never add the water to the acid.

Electricity

● When using an electric power tool, inspection light etc., always ensure that the appliance is correctly connected to its plug and that, where necessary, it is properly grounded (earthed). Do not use such appliances in damp conditions and, again, beware of creating a spark or applying excessive heat in the vicinity of fuel or fuel vapour. Also ensure that the appliances meet national safety standards.

● A severe electric shock can result from touching certain parts of the electrical system, such as the spark plug wires (HT leads), when the engine is running or being cranked, particularly if components are damp or the insulation is defective. Where an electronic ignition system is used, the secondary (HT) voltage is much higher and could prove fatal.

Remember...

✗ **Don't** start the engine without first ascertaining that the transmission is in neutral.

✗ **Don't** suddenly remove the pressure cap from a hot cooling system - cover it with a cloth and release the pressure gradually first, or you may get scalded by escaping coolant.

✗ **Don't** attempt to drain oil until you are sure it has cooled sufficiently to avoid scalding you.

✗ **Don't** grasp any part of the engine or exhaust system without first ascertaining that it is cool enough not to burn you.

✗ **Don't** allow brake fluid or antifreeze to contact the machine's paintwork or plastic components.

✗ **Don't** siphon toxic liquids such as fuel, hydraulic fluid or antifreeze by mouth, or allow them to remain on your skin.

✗ **Don't** inhale dust - it may be injurious to health (see Asbestos heading).

✗ **Don't** allow any spilled oil or grease to remain on the floor - wipe it up right away, before someone slips on it.

✗ **Don't** use ill-fitting spanners or other tools which may slip and cause injury.

✗ **Don't** lift a heavy component which may be beyond your capability - get assistance.

✗ **Don't** rush to finish a job or take unverified short cuts.

✗ **Don't** allow children or animals in or around an unattended vehicle.

✗ **Don't** inflate a tyre above the recommended pressure. Apart from overstressing the carcass, in extreme cases the tyre may blow off forcibly.

✓ **Do** ensure that the machine is supported securely at all times. This is especially important when the machine is blocked up to aid wheel or fork removal.

✓ **Do** take care when attempting to loosen a stubborn nut or bolt. It is generally better to pull on a spanner, rather than push, so that if you slip, you fall away from the machine rather than onto it.

✓ **Do** wear eye protection when using power tools such as drill, sander, bench grinder etc.

✓ **Do** use a barrier cream on your hands prior to undertaking dirty jobs - it will protect your skin from infection as well as making the dirt easier to remove afterwards; but make sure your hands aren't left slippery. Note that long-term contact with used engine oil can be a health hazard.

✓ **Do** keep loose clothing (cuffs, ties etc. and long hair) well out of the way of moving mechanical parts.

✓ **Do** remove rings, wristwatch etc., before working on the vehicle - especially the electrical system.

✓ **Do** keep your work area tidy - it is only too easy to fall over articles left lying around.

✓ **Do** exercise caution when compressing springs for removal or installation. Ensure that the tension is applied and released in a controlled manner, using suitable tools which preclude the possibility of the spring escaping violently.

✓ **Do** ensure that any lifting tackle used has a safe working load rating adequate for the job.

✓ **Do** get someone to check periodically that all is well, when working alone on the vehicle.

✓ **Do** carry out work in a logical sequence and check that everything is correctly assembled and tightened afterwards.

✓ **Do** remember that your vehicle's safety affects that of yourself and others. If in doubt on any point, get professional advice.

● If in spite of following these precautions, you are unfortunate enough to injure yourself, seek medical attention as soon as possible.

The Birth of a Dream

by Julian Ryder

There is no better example of the Japanese post-War industrial miracle than Honda. Like other companies which have become household names, it started with one man's vision. In this case the man was the 40-year old Soichiro Honda who had sold his piston-ring manufacturing business to Toyota in 1945 and was happily spending the proceeds on prolonged parties for his friends. However, the difficulties of getting around in the chaos of post-War Japan irked Honda, so when he came across a job lot of generator engines he realised that here was a way of getting people mobile again at low cost.

A 12 by 18-foot shack in Hamamatsu became his first bike factory, fitting the

Honda C70 and C90 OHV-engined models

generator motors into pushbikes. Before long he'd used up all 500 generator motors and started manufacturing his own engine, known as the 'chimney', either because of the elongated cylinder head or the smoky exhaust or perhaps both. The chimney made all of half a horsepower from its 50 cc engine but it was a major success and became the Honda A-type. Less than two years after he'd set up in Hamamatsu, Soichiro Honda founded the Honda Motor Company in September 1948. By then, the A-type had been developed into the 90 cc B-type engine, which Mr Honda decided deserved its own chassis not a bicycle frame. Honda was about to become Japan's first post-War manufacturer of complete motorcycles. In August 1949 the first prototype was ready. With an output of three horsepower, the 98 cc D-type was still a

simple two-stroke but it had a two-speed transmission and most importantly a pressed steel frame with telescopic forks and hard tail rear end. The frame was almost triangular in profile with the top rail going in a straight line from the massively braced steering head to the rear axle. Legend has it that after the D-type's first tests the entire workforce went for a drink to celebrate and try and think of a name for the bike. One man broke one of those silences you get when people are thinking, exclaiming 'This is like a dream!' 'That's it!' shouted Honda, and so the Honda Dream was christened.

'This is like a dream!'
'That's it'
shouted Honda

Mr Honda was a brilliant, intuitive engineer and designer but he did not bother himself with the marketing side of his business. With hindsight, it is possible to see that employing Takeo Fujisawa who would both sort out the home market and plan the eventual expansion into overseas markets was a masterstroke. He arrived in October 1949 and in 1950 was made Sales Director. Another vital new name was Kiyoshi Kawashima, who along with Honda himself, designed the company's first four-stroke after Kawashima had told them that the four-stroke opposition to Honda's two-strokes sounded nicer and therefore sold better. The result of that statement was the overhead-valve 148 cc E-type which first ran in July 1951 just two months after the first drawings were made. Kawashima was made a director of the Honda Company at 34 years old.

The E-type was a massive success, over 32,000 were made in 1953 alone, but Honda's lifelong pursuit of technical innovation sometimes distracted him from commercial reality. Fujisawa pointed out that they were in danger of ignoring their core business, the motorised bicycles that still formed Japan's main means of transport. In May 1952 the F-type Cub appeared, another two-stroke despite the top men's reservations. You could buy a complete machine or just the motor to attach to your own bicycle. The result was certainly distinctive, a white fuel tank with a circular profile went just below and behind the saddle on the left of the bike, and the motor with its horizontal cylinder and bright red cover just below the rear axle on the same side of the bike. This was the machine that turned Honda into the biggest bike maker in Japan



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with 70% of the market for bolt-on bicycle motors, the F-type was also the first Honda to be exported. Next came the machine that would turn Honda into the biggest motorcycle manufacturer in the world.

The C100 Super Cub was a typically audacious piece of Honda engineering and marketing. For the first time, but not the last, Honda invented a completely new type of motorcycle, although the term 'scooterette' was coined to describe the new bike which had many of the characteristics of a scooter but the large wheels, and therefore stability, of a motorcycle. The first one was sold in August 1958, fifteen years later over nine-million of them were on the roads of the world. If ever a machine can be said to have brought mobility to the masses it is the Super Cub. If you add in the electric starter that was added for the C102 model of 1961, the design of the Super Cub has remained substantially unchanged ever since, testament to how right Honda got it first time. The Super Cub made Honda the world's biggest manufacturer after just two years of production.

Honda's export drive started in earnest in 1957 when Britain and Holland got their first bikes, America got just two bikes the next year. By 1962 Honda had half the American market with 65,000 sales. But Soichiro Honda had already travelled abroad to Europe and the USA, making a special point of going to the Isle of Man TT, then the most important race in the GP calendar. He realised that no matter how

advanced his products were, only racing success would convince overseas markets for whom 'Made in Japan' still meant cheap and nasty. It took five years from Soichiro Honda's first visit to the Island before his bikes were

handle anywhere near as well as the opposition. However, Honda had now signed up non-Japanese riders to lead their challenge. The first win didn't come until 1962 (Aussie Tom Phillis in the Spanish 125 GP) and was followed up with

ready for the TT. In 1959 the factory entered five riders in the 125. They did not have a massive impact on the event being benevolently regarded as a curiosity, but sixth, seventh and eighth were good enough for the team prize. The bikes were off the pace but they were well engineered and very reliable.

The TT was the only time the West saw the Hondas in '59, but they came back for more the following year with the first of a generation of bikes which shaped the future of motorcycling - the double-overhead-cam four-cylinder 250. It was fast and reliable - it revved to 14,000 rpm - but didn't

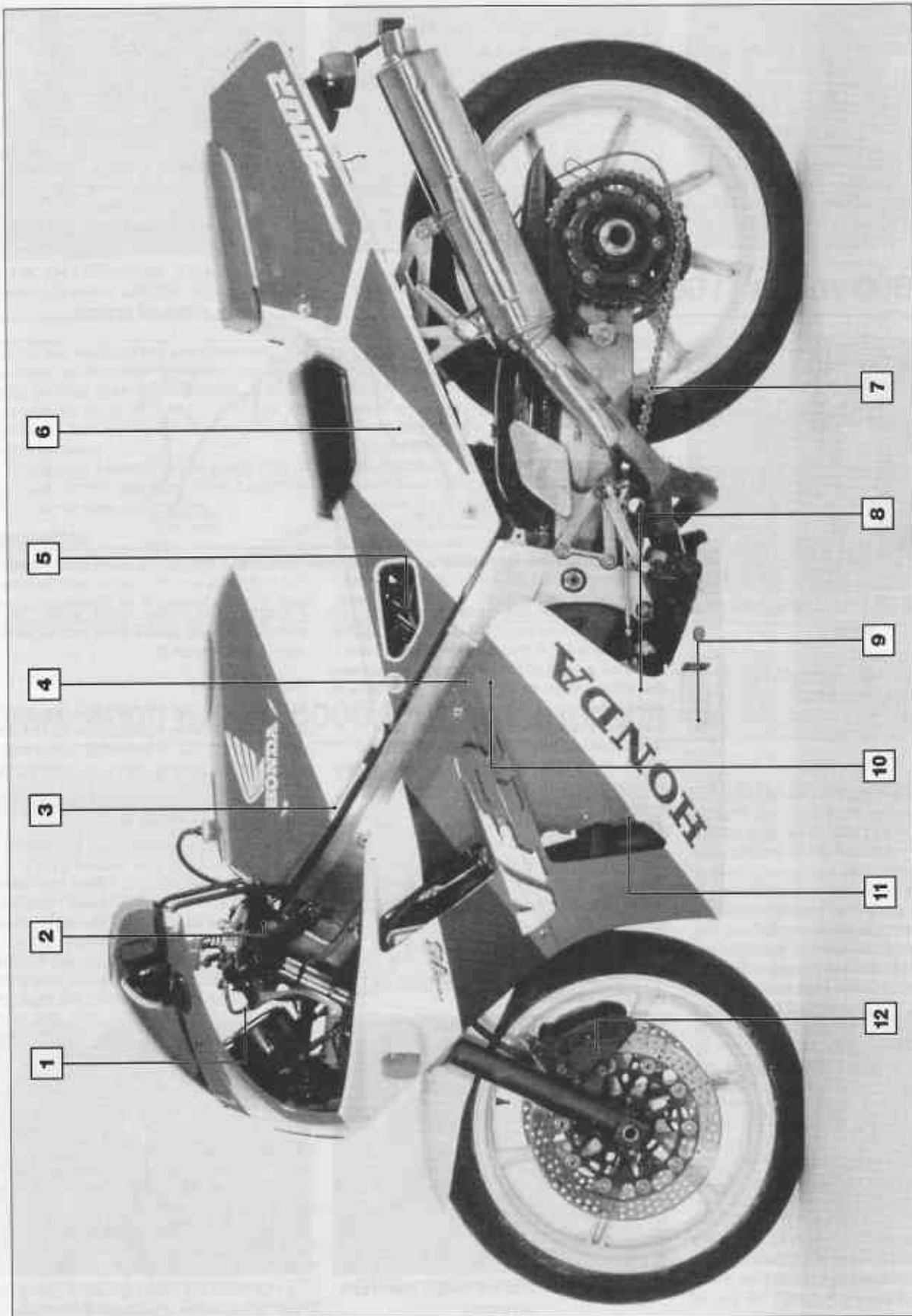
The GL1000 introduced in 1975, was the first in Honda's line of Goldwings





Component locations on right-hand side

- 1 Rear brake fluid reservoir
- 2 Coolant reservoir
- 3 Spark plug access for rear cylinder
- 4 Throttle cable upper adjuster
- 5 Front brake fluid reservoir
- 6 Brake lever span adjuster
- 7 Radiator pressure cap
- 8 Front brake pads
- 9 Front cylinder coolant drain plugs
- 10 Timing inspection cover
- 11 Engine/transmission oil filler plug/dipstick
- 12 Rear brake light switch
- 13 Rear brake pads



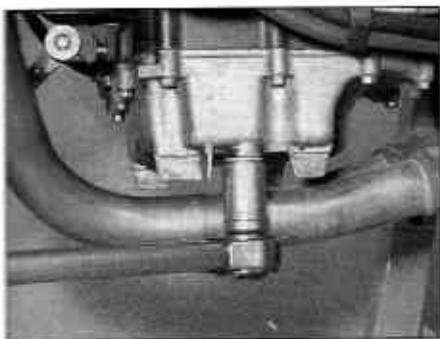
Component locations on left-hand side

- 1 Clutch cable upper adjuster
- 2 Steering head bearings
- 3 Air filter

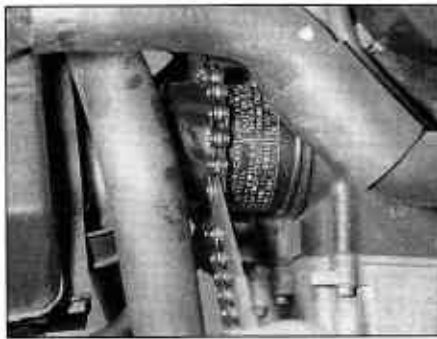
- 4 Idle speed adjuster
- 5 Spark plug access for rear cylinder
- 6 Battery

- 7 Drive chain
- 8 Coolant drain plug
- 9 Engine/transmission oil drain plug

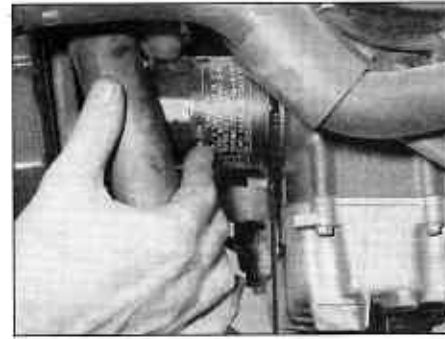
- 10 Clutch cable lower adjuster
- 11 Engine/transmission oil filter
- 12 Front brake pads



7.5 Tighten the drain plug to the specified torque setting



7.6a Unscrew the filter using a filter removing tool (chain type shown) . . .



7.6b . . . then allow the oil to drain . . .

Chapter (see illustration). Avoid overtightening, as damage to the sump will result.

6 Now place the drain tray below the oil filter. Remove the bolt securing the bottom of the lower radiator to its bracket and swing the radiator forward. Unscrew the oil filter using a filter removing strap- or chain-wrench and tip any residual oil into the drain tray (see illustrations). Remove the filter by manoeuvring it between the two front downpipes and the lower radiator.

7 Smear clean engine oil onto the rubber seal on the new filter, then manoeuvre it between the two front downpipes and the lower radiator and screw it onto the engine (see illustrations). Tighten it to the specified torque setting using a filter wrench, or if one is not available, tighten the filter as tight as possible by hand (see illustration). Install the radiator mounting bolt and tighten it securely.

8 Refill the engine to the proper level using the recommended type and amount of oil (see Daily (pre-ride) checks). With the motorcycle vertical, the oil level should lie between the upper and lower level lines on the dipstick (see Daily (pre-ride) checks). Install the filler cap (see illustration 7.3). Start the engine and let it run for two or three minutes (make sure that the oil pressure light extinguishes after a few seconds). Shut it off, wait a few minutes, then check the oil level. If necessary, add more oil to bring the level up to the upper

level line on the dipstick. Check around the drain plug and the oil filter for leaks.



Saving a little money on the difference between good and cheap oils won't pay off if the engine is damaged as a result.

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.



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.



7.6c . . . and remove the filter

8 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.



7.7a Smear clean oil onto the filter seal . . .



7.7b . . . then install the filter . . .



7.7c . . . and tighten it as described

11 Spark plugs – replacement

1 Remove the old spark plugs as described in Section 5 and install new ones.

12 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 Carburettor synchronisation is simply the process of adjusting the carburettors so they pass the same amount of fuel/air mixture to each cylinder. This is done by measuring the vacuum produced in each cylinder. Carburettors that are out of synchronisation will result in decreased fuel mileage, increased engine temperature, less than ideal throttle response and higher vibration levels. Before synchronising the carburettors, make sure the valve clearances are properly set.

2 To properly synchronise the carburettors,

you will need a set of vacuum gauges or calibrated tubes to indicate engine vacuum. The equipment used should 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, most owners leave the task to a Honda dealer. Also access to the synchronisation screws is very difficult as they are on the underside of the carburettors – a flexi-drive screwdriver helps.**



Warning: The engine and carburettors will be hot. With the restricted access to the screws, great care must be

taken not to burn yourself while synchronising the carburettors.

3 Remove the lower fairing (see Chapter 8).

4 Start the engine and let it run until it reaches normal operating temperature, then shut it off.

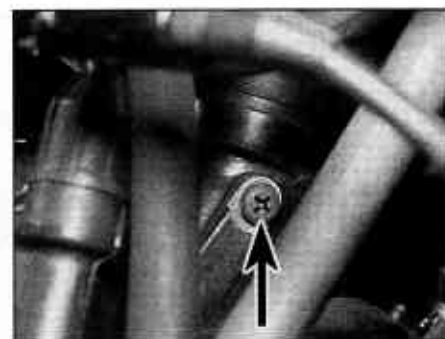
5 Disconnect the vacuum hose from the vacuum take-off stub on the no. 3 cylinder intake manifold. Apply a vacuum to the hose and seal it off using a clamp. This ensures the fuel tap is open and can supply fuel to the carburettors. Remove the blanking screws from the intake manifolds of the remaining carburettors (see illustration).

6 Connect the vacuum gauge adapters to the intake manifolds. Make sure they are a good fit because any air leaks will result in false readings.

7 Start the engine and adjust the idle speed (see Section 2). If using vacuum gauges 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.

9 The vacuum readings for all of the cylinders should be the same. If the vacuum readings vary, proceed as follows.

10 The carburettors are adjusted by turning the synchronising screws situated in-between the carburettors, in the throttle linkage. **Note: Do not press up on the screws whilst adjusting them, otherwise a false reading will be obtained.**

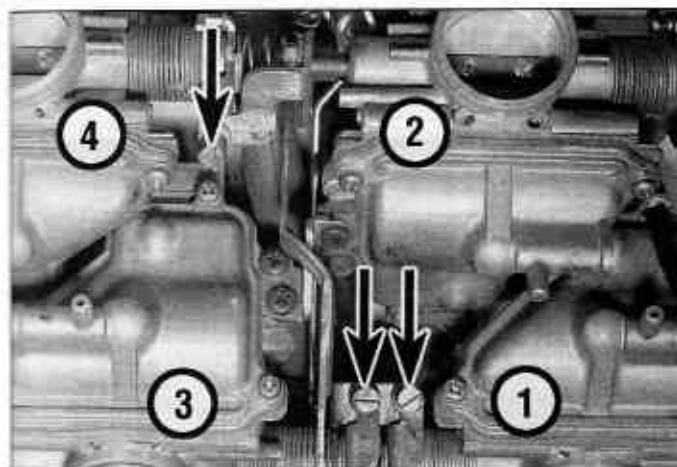


12.5 Intake manifold blanking plug (arrowed)

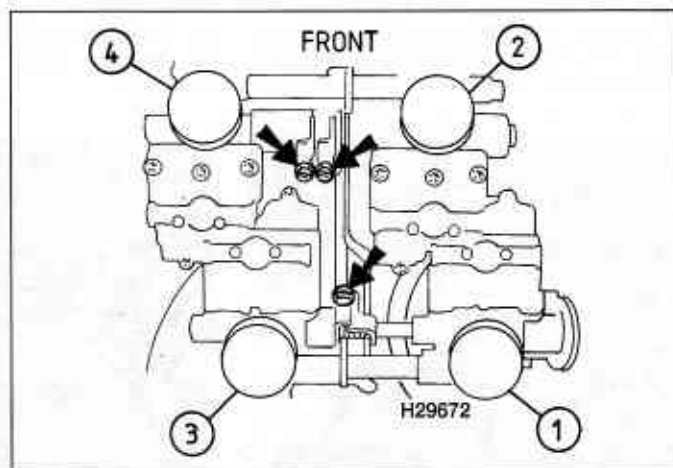
11 On VFR models, first synchronise no. 4 carburettor to no. 2 using the synchronising screw between the two front cylinder carburettors, until the readings are the same (see illustration). Then synchronise no. 1 carburettor to no. 3 using the left-hand synchronising screw (that next to no. 1 carburettor) between the two rear cylinder carburettors, and finally synchronise nos. 1 and 3 carburettors to nos. 2 and 4 carburettors using the right-hand synchronising screw (that next to no. 3 carburettor) between the two rear cylinder carburettors.

12 On RVF models, first synchronise no. 3 carburettor to no. 1 using the synchronising screw between the two rear cylinder carburettors, until the readings are the same (see illustration). Then synchronise no. 2 carburettor to no. 4 using the right-hand synchronising screw (that next to no. 4 carburettor) between the two front cylinder carburettors, and finally synchronise nos. 1 and 3 carburettors to nos. 2 and 4 using the left-hand synchronising screw (that next to no. 2 carburettor) between the two front cylinder carburettors.

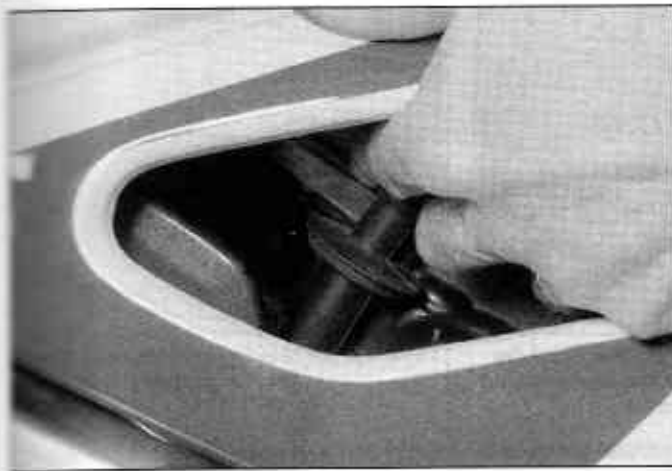
13 When all the carburettors are synchronised, open and close the throttle quickly to settle the linkage, and recheck the gauge readings, readjusting if necessary.



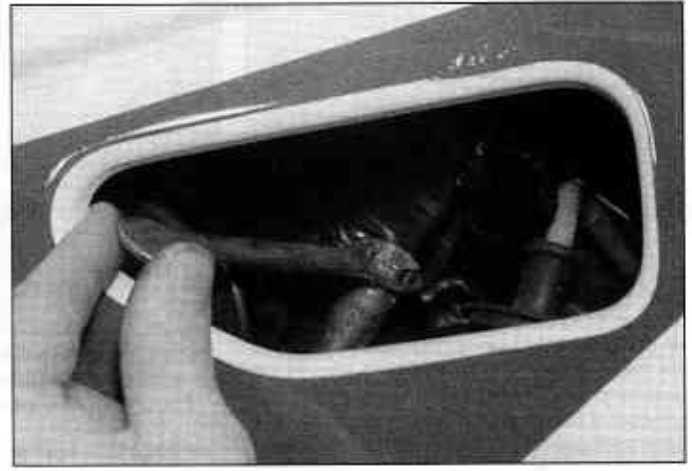
12.11 Synchronisation screws and carburettor identification – VFR model (arrowed)



12.12 Synchronisation screws and carburettor identification – RVF model (arrowed)



5.5a Remove the spark plug cap . . .



5.5b . . . then unscrew the spark plug

Remove each spark plug (see illustration). Clean the area around the base of the plugs to prevent any dirt falling into the engine. Using either the plug removing tool supplied in the bike's toolkit or a deep socket type wrench, unscrew the plugs from the cylinder head (see illustration). Lay each plug out in relation to its cylinder; if any plug shows up a problem it will then be easy to identify the troublesome cylinder.

Inspect the electrodes for wear. Both the centre and side electrodes should have square edges and the side electrodes should be of uniform thickness. Look for excessive deposits

and evidence of a cracked or chipped insulator around the centre electrode. Compare your spark plugs to the colour spark plug reading chart at the end of this manual. Check the threads, the washer and the ceramic insulator body for cracks and other damage.

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

8 Cleaning spark plugs by sandblasting is permitted, provided you clean the plugs with a high flash-point solvent afterwards.

9 Before installing the plugs, make sure they 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 electrodes only and be very careful not to chip or crack the insulator nose (see illustration). Make sure the washer is in place before installing each plug.

10 Since the cylinder head is made of aluminium, which is soft and easily damaged, thread the plugs into the heads turning the tool by hand (see illustration). Once the plugs are finger-tight, the job can be finished

with a spanner on the tool supplied or a socket drive (see illustration 1.5b). Tighten the spark plugs to the specified torque setting where possible – do not over-tighten them. If using the tool provided in the bike's toolkit to tighten the spark plugs, tighten them first by hand and then a further 120° for a new plug, or 30° for a used plug, using the tool handle.

HAYNES
HiNT

As the plugs are quite recessed, slip a short length of hose over the end of the plug to use as a tool to

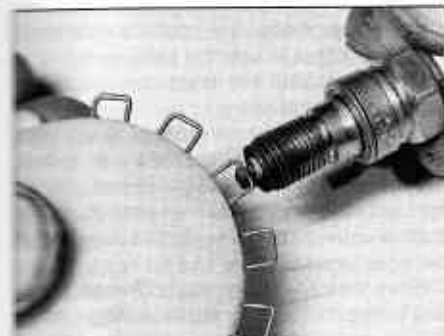
thread it into place. The hose will grip the plug well enough to turn it, but will start to slip if the plug begins to cross-thread in the hole – this will prevent damaged threads.

11 Reconnect the spark plug caps, making sure they are securely connected to the correct cylinder. Install all other components previously removed.

HAYNES
HiNT

Stripped plug threads in the cylinder head can be repaired with a Heli-Coil Insert – see 'Tools and

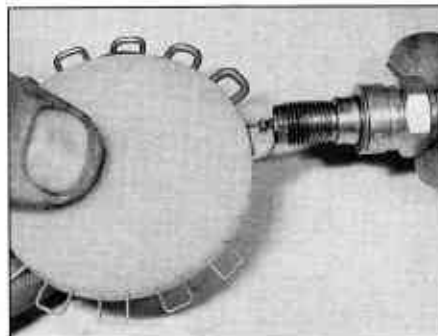
Workshop Tips' in the Reference section.



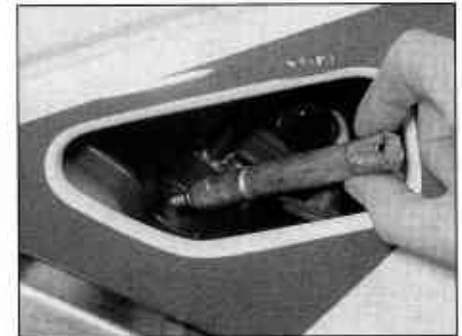
5.9a Using a wire type gauge to measure the spark plug electrode gap



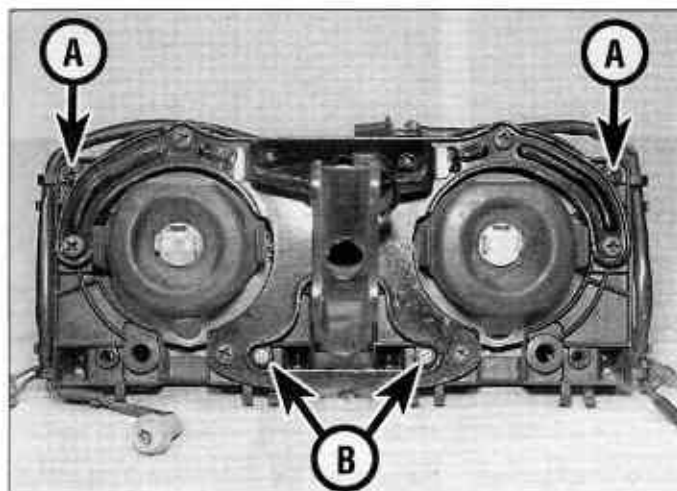
5.9b Using a feeler gauge to measure the spark plug electrode gap



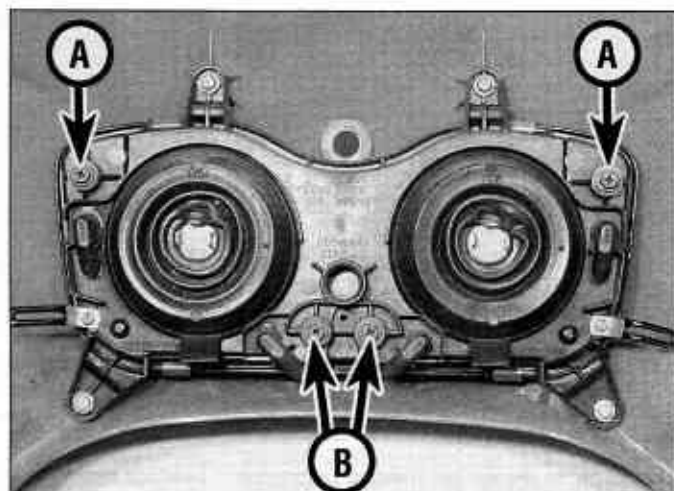
5.9c Adjust the electrode gap by bending the side electrode only



5.10 Thread in the plug as far as possible turning the tool by hand



15.2a Headlight beam vertical adjustment screws (A), horizontal adjustment screws (B) - VFR models



15.2b Headlight beam vertical adjustment screws (A), horizontal adjustment screws (B) - RVF models

1 The headlight beam can be 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 a second assistant to do this.

2 Vertical adjustment is made by turning the adjuster screw on the top outer corner of each headlight unit (see illustrations). Turn it clockwise to move the beam up, and anti-clockwise to move it down.

3 Horizontal adjustment is made by turning the adjuster screw on the bottom inner corner of each headlight unit (see illustrations 15.2a and b). Turn it clockwise to move the beam in, and anti-clockwise to move it out.

holding the stand retracted when the motorcycle is in use. If the spring is sagged or broken it must be replaced.

2 Lubricate the sidestand pivot regularly (see Section 6).

3 On VFR models, check the condition of the sidestand rubber. If it is worn down to or beyond the wear limit line, replace it with a new one (see illustration).

4 On RVF models, the sidestand switch prevents the motorcycle being started if the stand is extended. Check its operation by shifting the transmission into neutral, retracting the stand and starting the engine. Pull in the clutch lever and select a gear. Extend the sidestand. The engine should stop as the sidestand is extended. If the sidestand switch does not operate as described, check its circuit (see Chapter 9).

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 times. See if they move up-and-down smoothly without binding. If binding is felt, the forks should be disassembled and inspected (see Chapter 6).

3 Inspect the area around the dust seal for signs of oil leakage, then carefully lever up the dust seal using a flat-bladed screwdriver and inspect the area around the fork seal (see illustration). If leakage is evident, the seals must be replaced (see Chapter 6).

4 Check the tightness of all suspension nuts and bolts to be sure none have worked loose.

Rear suspension

5 Inspect the rear shock for fluid leakage and tightness of its mountings. If leakage is found, the shock should be replaced (see Chapter 6).

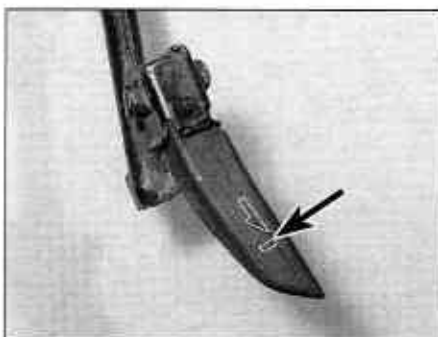
6 With the aid of an assistant to support the bike, compress the rear suspension several times. It should move up and down freely without binding. If any binding is felt, the worn or faulty component must be identified and replaced. The problem could be due to either the shock absorber, the suspension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

7 Support the motorcycle using an auxiliary stand so that the rear wheel is off the ground. Grab the swingarm and rock it from side to side – there should be no discernible movement at the rear (see illustration overleaf). 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 the Chapter, and re-check for movement. Next, grasp the top of the rear wheel and pull it upwards – there

16 Sidestand – check



1 The sidestand return spring must be capable of retracting the stand fully and



16.3 Replace the sidestand rubber if it is worn to or beyond the line (arrowed)

17 Suspension – check



1 The suspension components must be maintained in top operating condition to ensure rider safety. Loose, worn or damaged



17.3 Check above and below the dust seal for signs of oil leakage



18.8a Bend down the tabs securing the locknut ...



18.8b ... and remove the locknut



18.9a Adjust the bearings using either a C-spanner ...

notches in the locknut (see illustration). Unscrew the locknut using either a C-spanner or a suitable drift located in one of the notches (see illustration). Remove the lockwasher, bending up the remaining tabs to release it from the adjuster nut if necessary. Inspect the tabs for cracks or signs of fatigue. If there are any, discard the lockwasher and use a new one; otherwise the old one can be re-used.

9 Using either the C-spanner or drift, slacken the adjuster nut slightly until pressure is just released, then tighten it until all freeplay is removed, yet the steering is able to move freely (see illustrations). 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.

10 With the bearings correctly adjusted, install the lockwasher, using a new one if the tabs are weakened or cracked, onto the adjuster nut and fit two tabs into the slots in the adjuster nut (see illustration).

11 Hold the adjuster nut to prevent it from moving, then install the locknut and tighten it finger-tight (see illustration 18.8b). Tighten

the locknut further until its notches align with the remaining lockwasher tabs. Secure the locknut in position by bending up the lock washer tabs into its notches (see illustration).

12 Fit the top yoke to the steering stem (see illustration 18.7), then install the nut and tighten it and both the fork clamp bolts to the torque settings specified at the beginning of the Chapter (see illustration). Do not forget to secure the clutch cable guide with the left-hand fork clamp bolt (see illustration). Fit the cap over the stem nut.

13 Check the bearing adjustment as described above and re-adjust if necessary.



18.9b ... or a drift



18.10 Use a new lockwasher if the tabs on the old one are fatigued or cracked



18.11 Bend the tabs up into the notches in the locknut



18.12a Tighten the steering stem nut to the specified torque



18.12b Secure the clutch cable guide with the left-hand fork clamp bolt

16 Shims are available in 0.025 mm increments from 1.200 mm to 2.800 mm. Obtain and install the replacement shim in the recess in the top of the valve spring retainer (see illustration 23.12b), noting that the shim should be lubricated with molybdenum disulphide oil (a 50/50 mixture of molybdenum disulphide grease and engine oil).

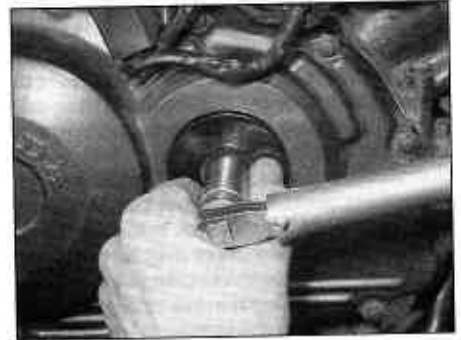
17 Make sure the shim is correctly seated, then slide the rocker arm onto the shim, making sure it doesn't catch the edge of the shim, and that it is centrally positioned. Repeat the process for any other valves until the clearances are correct.

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

19 Install all disturbed components in a reverse of the removal sequence. Use a new O-ring on the timing inspection cover and



23.19a Fit the cover using a new O-ring . . .



23.19b . . . and tighten it to the specified torque

smear it and the cover threads with molybdenum disulphide oil (a 50/50 mixture of molybdenum disulphide grease and engine

oil) (see illustration). Tighten the cover to the torque setting specified at the beginning of the Chapter (see illustration).

Every 24,000 miles (36,000 km) or two years

Carry out all the items under the 8000 mile (12,000 km) check, plus the following:

24 Cooling system – draining, flushing and refilling



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 lower fairing and the right-hand fairing side panel (see Chapter 8). Remove the pressure cap by turning it anti-clockwise until it reaches a stop (see illustration 13.6). 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 turning the cap until it can be removed.
- 2 Position a suitable container beneath the water pump. Remove the coolant drain plug and its sealing washer and allow the coolant to completely drain from the system (see illustrations). Retain the old sealing washer for use during flushing.
- 3 Position the container beneath the front cylinders, then remove the drain plugs and

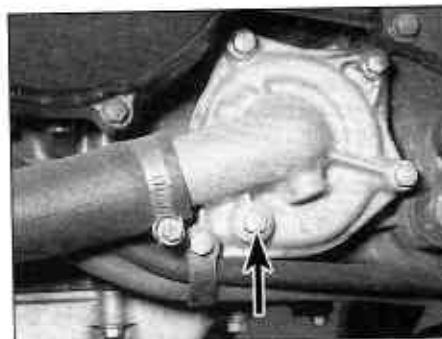
sealing washers and allow the coolant to completely drain from the engine (see illustrations). Retain the old sealing washers for use during flushing.

Flushing

- 4 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 cleanly out of the drain holes. If the radiator is extremely corroded, remove it (see Chapter 3) and have it cleaned by a specialist.

- 5 Clean the drain holes then install the drain plugs using the old sealing washers.
- 6 Fill the cooling system with clean water



24.2a Remove the drain plug from the water pump (arrowed) . . .



24.2b . . . and allow the coolant to drain



24.3a Remove the drain plug from each front cylinder (arrowed) . . .



24.3b . . . and allow the coolant to drain

Cylinder head

Warpage (max) 0.10 mm

Clutch

Friction plates 10

Plain plates 9

Friction plate thickness

Standard 2.92 to 3.08 mm

Service limit (min) 2.8 mm

Plain plate warpage (max) 0.3 mm

Spring free height (set of three together)

Standard 5.3 mm

Service limit (min) 4.8 mm

Clutch housing ID at guide bore

Standard 29.000 to 29.021 mm

Service limit (max) 29.06 mm

Clutch housing guide OD

Standard 28.967 to 28.980 mm

Service limit (min) 28.93 mm

Clutch housing guide ID

Standard 21.995 to 22.015 mm

Service limit (max) 22.05 mm

Lubrication system

Oil pressure see Chapter 1

Oil pump**VFR400**

Inner rotor tip-to-outer rotor clearance 0.15 mm

Outer rotor-to-body clearance 0.15 to 0.22 mm

Rotor endfloat 0.04 to 0.09 mm

RVF400

Inner rotor tip-to-outer rotor clearance

Standard 0.15 mm

Service limit (max) 0.20 mm

Outer rotor-to-body clearance

Standard 0.15 to 0.21 mm

Service limit (max) 0.35 mm

Rotor endfloat

Standard 0.02 to 0.09 mm

Service limit (max) 0.10 mm

Oil pump drive sprocket ID

Standard 29.025 to 29.075 mm

Service limit (max) 29.11 mm

Cylinder bores**Bore**

Standard 55.000 to 55.015 mm

Service limit (max) 55.07 mm

Warpage (max) 0.10 mm

Ovality (out-of-round) (max) 0.10 mm

Taper (max) 0.10 mm

Cylinder compression see Chapter 1

Connecting rods**Small-end internal diameter**

Standard 14.016 to 14.034 mm

Service limit (max) 14.05 mm

Small-end-to-piston pin clearance

Standard 0.016 to 0.040 mm

Service limit (max) 0.06 mm

Big-end side clearance

Standard 0.1 to 0.3 mm

Service limit (max) 0.4 mm

Big-end oil clearance

Standard 0.028 to 0.052 mm

Service limit (max) 0.07 mm

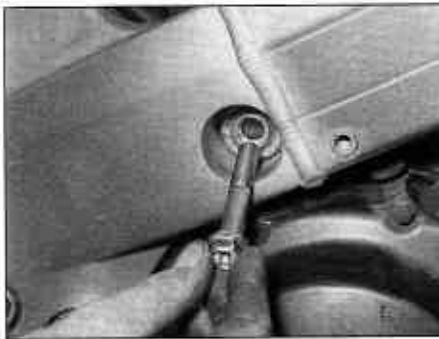
Input shaft 5th and 6th gears gear-to-bush clearance	
Standard	0.020 to 0.062 mm
Service limit (max)	0.10 mm
Input shaft 5th gear bush ID	
Standard	24.985 to 25.006 mm
Service limit (max)	25.03 mm
Input shaft OD at 5th gear bush point	
Standard	24.967 to 24.978 mm
Service limit (min)	24.96 mm
Input shaft-to-bush clearance at 5th gear bush point	
Standard	0.007 to 0.039 mm
Service limit (max)	0.06 mm
Output shaft 2nd, 3rd and 4th gears ID	
Standard	28.000 to 28.020 mm
Service limit (max)	28.04 mm
Output shaft 2nd, 3rd and 4th gears bush OD	
Standard	27.959 to 27.980 mm
Service limit (min)	27.94 mm
Output shaft 2nd, 3rd and 4th gears gear-to-bush clearance	
Standard	0.020 to 0.062 mm
Service limit (max)	0.10 mm
Output shaft 2nd gear bush ID	
Standard	24.985 to 25.006 mm
Service limit (max)	25.03 mm
Output shaft OD at 2nd gear bush point	
Standard	24.967 to 24.978 mm
Service limit (min)	24.96 mm
Output shaft-to-bushing clearance at 2nd gear bush point	
Standard	0.007 to 0.039 mm
Service limit (max)	0.06 mm

Selector drum and forks

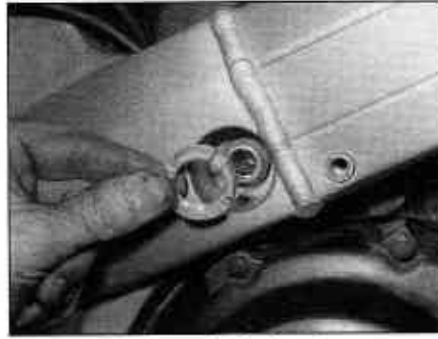
Selector fork end thickness	
Standard	5.93 to 6.00 mm
Service limit (min)	5.80 mm
Selector fork bore ID	
Standard	12.000 to 12.021 mm
Service limit (max)	12.04 mm
Selector fork shaft OD	
Standard	11.969 to 11.980 mm
Service limit (min)	11.95 mm

Torque settings – specific components

Engine mountings	
Adjuster bolts	11 Nm
Adjuster bolt locknuts	55 Nm
Lower rear mounting bolt nut	
VFR models	40 Nm
RVF models	65 Nm
Left-hand mounting bolts	40 Nm
Right-hand mounting bolts	40 Nm
Valve cover bolts	10 Nm
Camshaft holder bolts	12 Nm
Timing inspection cover	18 Nm
Rocker arm shaft plugs	8 Nm
Camshaft drive gear assemblies	
Mounting bolts	36 Nm
Crankcase bolt	12 Nm
Cylinder head 6 mm bolts	12 Nm
Cylinder head 8 mm bolts	36 Nm
Starter clutch cover bolts	28 Nm
Starter clutch bolt	85 Nm
Right-hand crankcase cover bolts	10 Nm
Oil pump driven sprocket bolt	15 Nm
Clutch nut	85 Nm
Oil pump cover bolts	12 Nm
Oil pump mounting bolts	12 Nm
Selector drum cam pin bolt	23 Nm



5.23a Remove the upper rear mounting bolt . . .



5.23b . . . the locknut . . .



5.23c . . . and the adjuster bolt

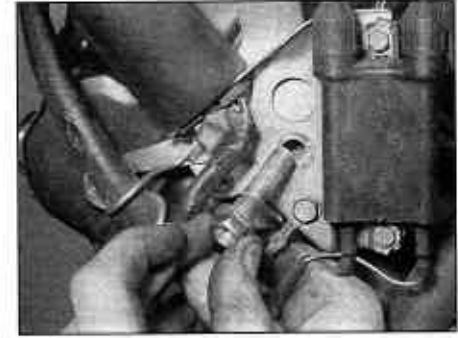
adjuster bolt using an Allen key (see illustrations).

24 Make sure the engine is properly supported on the jack, and have an assistant support it as well. On VFR models, remove the front, middle and upper rear mounting bolts on the left-hand side, noting the spacer fitted with the middle bolt, and that the front bolt also secures the radiator/front cylinder coil bracket (see illustrations). Now remove the front and middle bolts on the right-hand side, noting that each has a spacer (see illustrations). On RVF models, remove the upper and lower front mounting bolts on the left-hand side, noting the spacers, and the upper rear mounting bolt (see illustrations). Also remove the upper and lower front mounting bolts on the right-hand side, noting the spacer fitted with the lower bolt.

25 The engine can now be removed from the frame. Check that all wiring, cables and hoses are well clear, then carefully lower the engine and manoeuvre it out of the side of the frame (see **Caution** above). In our experience, the easiest way to manoeuvre the engine out is to have two people physically manhandle it rather than to lower and move it on the jack. Support the engine between you and remove the jack, then move the engine forward, lower it a bit, lift the front of the engine up, then lower the engine out of the frame (see illustration). In some cases, depending on what type of stand is being used to support



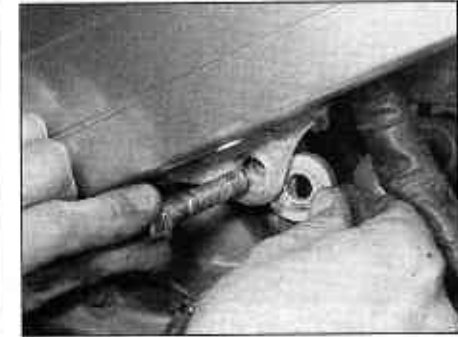
5.24a On VFR models note the spacer (arrowed) fitted with the middle bolt . . .



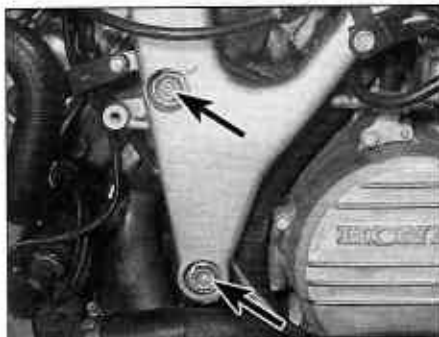
5.24b . . . and how the front bolt secures the bracket



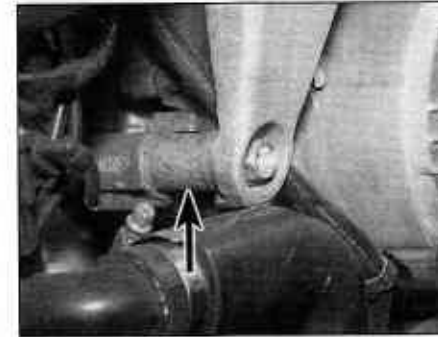
5.24c Remove the front bolt and its spacer . . .



5.24d . . . and the middle bolt and its spacer



5.24e On RVF models, remove the front mounting bolts on each side (arrowed) . . .



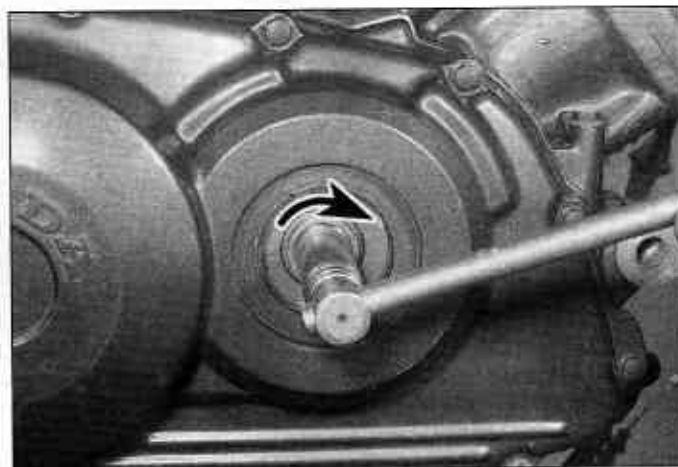
5.24f . . . noting the spacers where fitted



5.25 Manoeuvre the engine as described



9.2a Remove the timing inspection cover



9.2b Turn the engine clockwise using a 14 mm socket on the starter clutch bolt

9 Camshafts – removal, inspection and installation



Note: The camshafts can be removed with the engine in the frame. Place clean rags over the spark plug holes and the cam gear train holes to prevent any component from dropping into the engine on removal. To make installation and setting the timing easier, it is advised that the front and rear cylinders are worked on separately, ie the camshafts are not all removed at the same time.

Removal

1 Remove the valve covers (see Section 8).
2 Unscrew the timing inspection cover from the right-hand crankcase cover (see illustration). Discard the cover O-ring as a new one must be used. The engine can be turned using a 14 mm spanner or socket on the starter clutch bolt and turning it in a clockwise direction only (see illustration). Alternatively, place the motorcycle on an auxiliary stand so that the rear wheel is off the ground, select a high gear and rotate the rear wheel by hand in its normal direction of rotation.

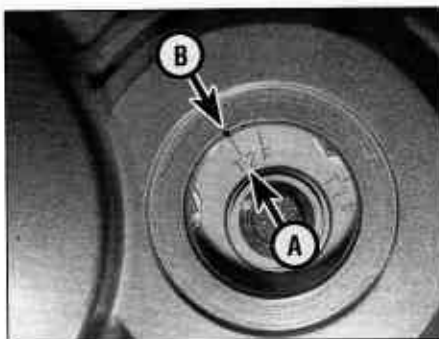
3 To remove the front cylinder head camshafts, turn the engine until the "T2" mark on the timing plate aligns with the static timing mark on the crankcase cover, and the index lines on the right-hand end of the camshafts are facing away from the head and aligning with the index mark on the camshaft holders (see illustrations). The no. 4 (front right) cylinder is at TDC on the compression stroke (all valves closed).

4 To remove the rear cylinder head camshafts, turn the engine until the "T1" mark on the timing plate aligns with the static timing mark on the crankcase cover, and the index lines on the right-hand end of the camshafts are facing away from the head and aligning

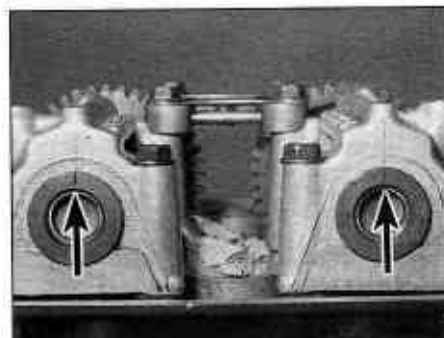
with the index mark on the camshaft holders (see illustration and 9.3b). The no. 1 (rear left) cylinder is at TDC on the compression stroke (all valves closed).

5 Before disturbing the camshaft journal holders, check for identification markings. For the front cylinder head, the inlet camshaft holders are marked A (right-hand cylinder) and B (left-hand cylinder) and the exhaust camshaft holders marked C (left-hand cylinder) and D (right-hand cylinder). For the rear cylinder head, the inlet camshaft holders

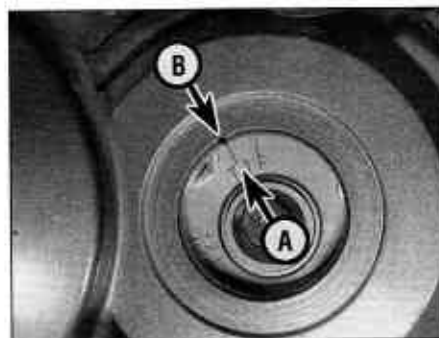
are marked A (left-hand cylinder) and B (right-hand cylinder) and the exhaust camshaft holders are marked C (right-hand cylinder) and D (left-hand cylinder). The letter corresponding to each holder is also stamped into the cylinder head. These markings ensure that the holders can be matched up to their original locations on installation. If no markings are visible, mark your own using a felt pen. If necessary, make a sketch of the layout as a further aid for installation (see illustration).



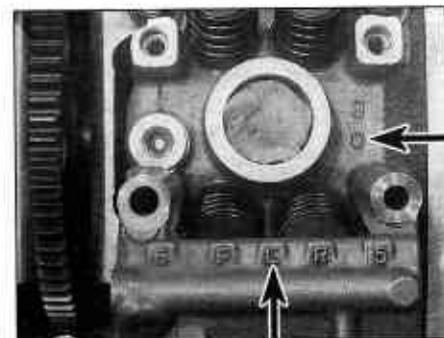
9.3a Turn the engine until the T2 mark (A) aligns with the static mark (B) . . .



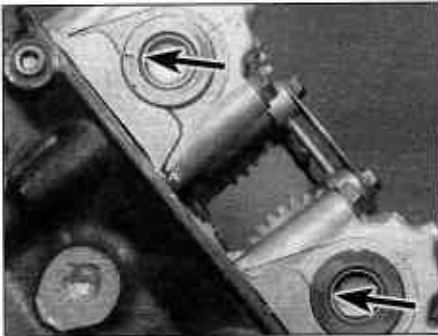
9.3b . . . and the index lines (arrowed) face away from the head



9.4 Align the T1 mark (A) with the static mark (B)



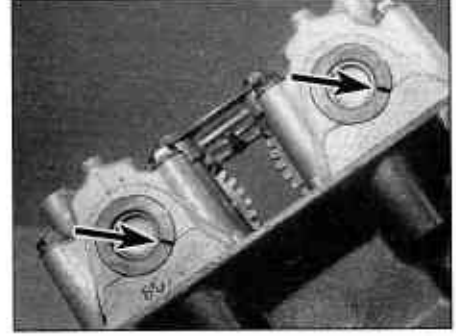
9.5 Note the letter marked in the middle of each holder and its corresponding letter on the cylinder head (arrows)



9.19h ... the front cylinder camshaft lines should face as shown (arrowed)



9.19i With the front cylinder camshaft lines facing the head (arrowed) ...



9.19j ... the rear cylinder camshaft lines should face as shown (arrows)

the head and the front cylinder camshaft lines should face back at about 3 o'clock (see illustrations). Now turn the engine 90° clockwise until the "T2" mark again aligns with the static mark (see illustration 9.19d). The front cylinder camshaft lines should now face the head and the rear cylinder camshaft lines should face forward between 3 and 4 o'clock (see illustrations).

Caution: If the marks are not aligned exactly as described, the valve timing will be incorrect and the valves may strike the pistons, causing extensive damage to the engine.

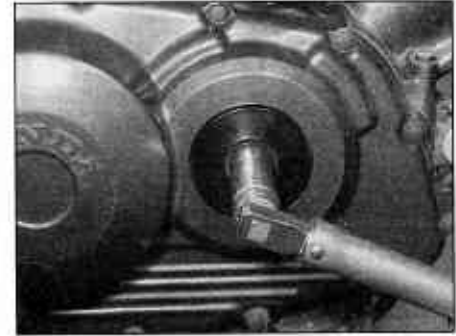
20 Check the valve clearances and adjust them if necessary (see Chapter 1).

21 Use a new O-ring on the timing inspection cover and smear it and the cover threads with molybdenum disulphide oil (a 50/50 mixture of molybdenum disulphide grease and engine oil) (see illustration). Tighten the cover to the torque setting specified at the beginning of the Chapter (see illustration).

22 Install the valve covers (see Section 8).



9.21a Smear the cover threads and new O-ring with molybdenum oil ...



9.21b ... and tighten it to the specified torque

component from dropping into the engine on removal.

Removal

1 Remove the camshafts (see Section 9).

2 Before proceeding, arrange to label and store the related components of the rocker assemblies in such a way that they can be returned to their original locations without getting mixed up. A good way to do this is to obtain a container which is divided into eight compartments, and to label each compartment with the identity of the rockers which will be stored in it (ie number of cylinder, inlet or exhaust side). Alternatively, labelled plastic bags will do just as well. A similar way of storing the shims is also required, though sixteen compartments are

needed, labelled according to cylinder number, inlet or exhaust side, inner or outer valve.

3 Lift up each rocker arm and remove each shim from the top of the valve assembly and store it in the container for safekeeping. Remove the shim using a magnet or put a dab of grease onto a small screwdriver – it will stick to the grease (see illustration).

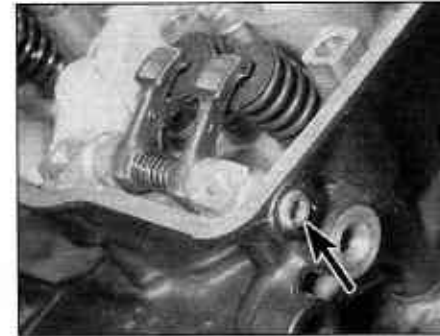
4 Unscrew the rocker arm shaft plug from the side of the cylinder head (see illustration). Discard the plug as it has special threads and new ones must be used if they are removed. Slide the rocker shaft out, removing the arms and spring as you do (see illustration). Slide the arms and spring back into their original positions on their shaft, and place them in the correct location in the container.

10 Rocker arms and shafts – removal, inspection and installation

Note: The rocker arms and shafts can be removed with the engine in the frame. Place clean rags over the spark plug holes and the cam gear train holes to prevent any



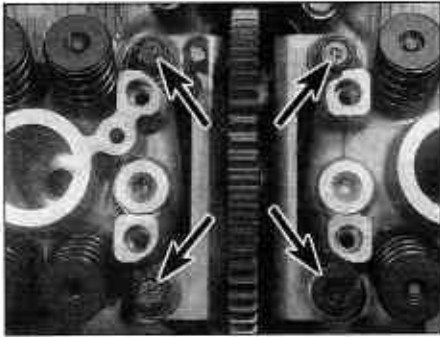
10.3 A dab of grease on the end of a screwdriver makes shim removal easy



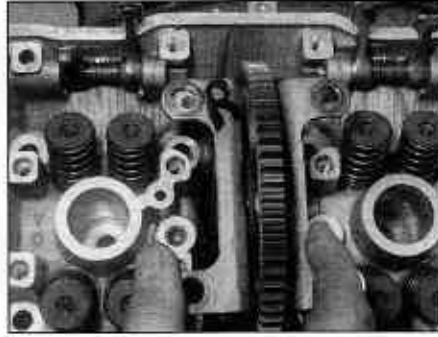
10.4a Remove the plug (arrowed) ...



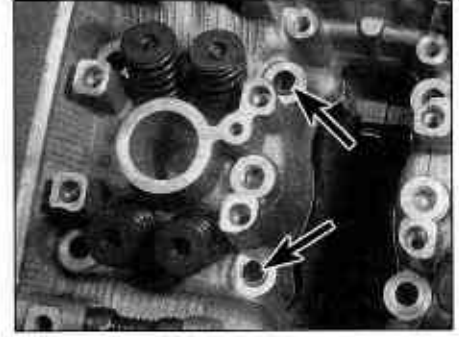
10.4b ... then withdraw the rocker shaft and remove the arms and spring



11.3a Remove the four bolts (arrowed) . . .



11.3b . . . and lift the assembly out of the head



11.3c Remove the dowels (arrowed) if loose

necessary, remove the water pipe (see Chapter 3). Check the condition of the sealing washer and replace it if necessary.

3 Each assembly is marked for identification. The front cylinder assembly is marked with an "F" and the rear with an "R". If the markings are no longer visible, make your own as the assemblies must be installed in their original position. Unscrew and remove the four bolts securing the assembly to the cylinder head (see illustration). Carefully lift the assembly out of the cylinder head, noting how it fits (see illustration). Remove the two dowels if they are loose (see illustration).

Inspection

4 Wash the assembly in clean solvent and dry it off.

5 Check the teeth on both gears for cracks and other damage and make sure the gears turn smoothly and freely. If the teeth are damaged or worn, the assembly must be replaced. If this is the case, the corresponding teeth on both the camshafts and the crankshaft should be inspected.

Installation

6 If removed, fit the two dowels into the cylinder head, making sure they are fully pressed home, otherwise the gear assemblies will not sit properly and the gears will not mesh (see illustration 11.3c).

7 Install the gear assembly, making sure it is fitted into its correct head (see Step 3) and with the bolt hole for the crankcase bolt facing

the inlet side of the cylinder. Press the assembly squarely down onto its dowels, making sure the lower gear teeth mesh correctly with those of the drive gear on the crankshaft. This can be done by turning the upper gear back and forth – the whole assembly should be felt to rise off the cylinder head slightly.

8 Install the four mounting bolts and the cylinder block bolt, using a new sealing washer if required, and tighten them all finger-tight (see illustration and 11.2). Tighten the two mounting bolts adjacent to the dowels first, followed by the other two bolts, and finally the crankcase bolt, to the torque settings specified at the beginning of the Chapter (see illustration).

9 Install the camshafts (see Section 9).

12 Cylinder heads – removal and installation

Caution: The engine must be completely cool before beginning this procedure or the cylinder head may become warped.

Note 1: The cylinder head can be removed with the engine in the frame. If the engine has been removed, ignore the steps which don't apply.

Note 2: If removing the rear cylinder head, a peg spanner is required to slacken and tighten the adjuster bolt locknut on the right-hand engine mounting bolt. If the Honda service

tool (Part no. 07HMA-MR70200) is not available, a suitable one will have to be fabricated out of a piece of steel tubing.

Removal

1 If removing the front cylinder head, remove the radiators and the cooling system thermostat (see Chapter 3).

2 If not already done (Step 1), drain the cooling system (see Chapter 1).

3 Remove the carburettors (see Chapter 4).

4 Remove the exhaust system (see Chapter 4).

5 Remove the camshafts (see Section 9), and if required the rocker arms and shafts (see Section 10). If they are not being removed, it is advisable to cable-tie each rocker arm to its valve to prevent the shim falling out should the cylinder head be moved or turned upside down. Alternatively, lift up each rocker arm and remove each shim from the top of each valve assembly and store it in a marked container (see Section 10, Step 2) for safekeeping. Remove the shim using a magnet or put a dab of grease onto a small screwdriver and remove the shim – it will stick to the grease (see illustration 10.3).

6 Unscrew the bolt securing the camshaft drive gear assembly to the inlet side of the crankcase. The bolt is situated centrally below the two inlet manifolds (see illustration 11.2). The rear cylinder bolt does not clear the water pipe, so leave it loosely in place or, if necessary, remove the water pipe (see Chapter 3). Check the condition of the sealing washer and replace it if necessary.

7 If removing the front cylinder head, on VFR models remove the engine front mounting bolts on each side of the frame, noting the spacer fitted with the right-hand bolt (see illustrations 5.24b and c). On RVF models, remove the engine upper front mounting bolts on each side of the frame, noting the spacer fitted with the left-hand bolt (see illustration 5.24e).

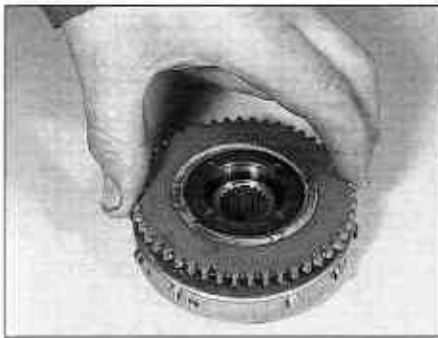
8 If removing the rear cylinder head, remove the upper rear engine mounting bolts on each side of the frame. When removing the right-hand bolt, unscrew the upper rear mounting bolt, then unscrew the adjusting bolt locknut using the peg spanner (see Note 2 above),



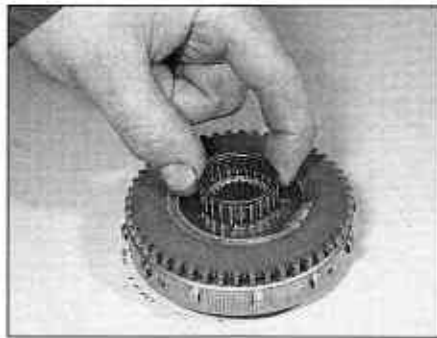
11.8a Install the bolts . . .



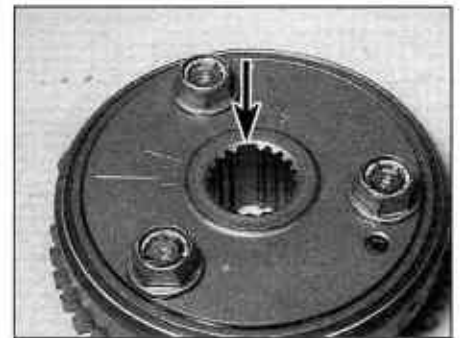
11.8b . . . and tighten them as described to the specified torque



15.17a Fit the driven gear into the starter clutch body . . .



15.17b . . . then fit the needle roller bearing



15.18a The wide spline (arrowed) in the starter clutch must align with that on the crankshaft . . .

clockwise as you do so to spread the rollers and allow the hub of the gear to enter (**see illustration**). Fit the needle roller bearing into the driven gear (**see illustration**).

18 Make sure the recessed section in the main clutch housing aligns with the starter clutch, then install the starter clutch assembly onto the end of the crankshaft, aligning the wider groove in the starter clutch with the wider spline on the shaft (**see illustrations**). Install the starter clutch bolt and its washer (**see illustration 15.8a**), and using the method employed on removal to stop the clutch from

turning, tighten the bolt to the torque setting specified at the beginning of the Chapter (**see illustration**).

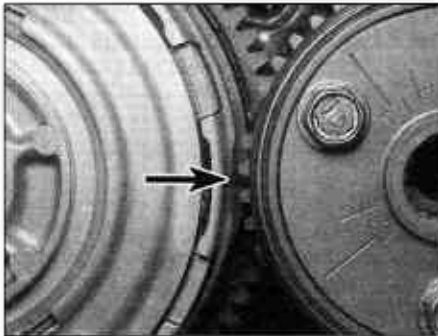
19 Lubricate the idle/reduction gear shaft with clean engine oil. Install the gear assembly, making sure the smaller pinion faces outwards and meshes correctly with the teeth of the starter driven gear, and the teeth of the larger pinion mesh correctly with the teeth of the starter motor shaft, then slide the shaft into the gear (**see illustration**).

20 Install the pulse generator coil assembly (**see Chapter 5**).

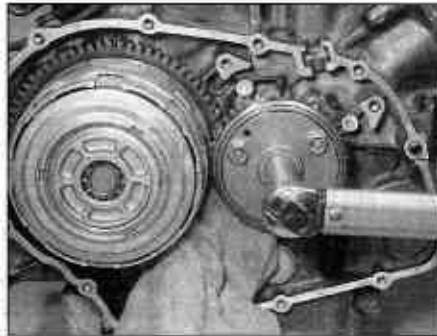
21 If removed, insert the dowels in the crankcase, then install the crankcase cover using a new gasket, making sure it locates correctly onto the dowels and the idle/reduction gear shaft (**see illustration**). Tighten the cover bolts evenly in a criss-cross sequence to the specified torque setting, making sure the wiring clips are correctly installed (**see illustration**).

22 Refill the engine with oil (**see Chapter 1**) and check the level (**see Daily (pre-ride) checks**).

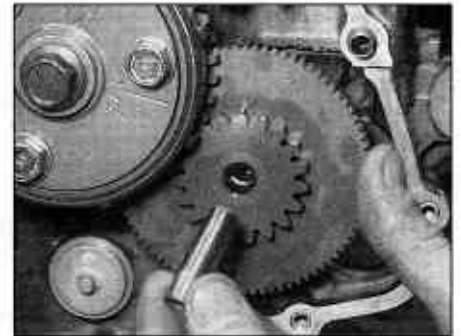
23 Install the lower fairing (**see Chapter 8**).



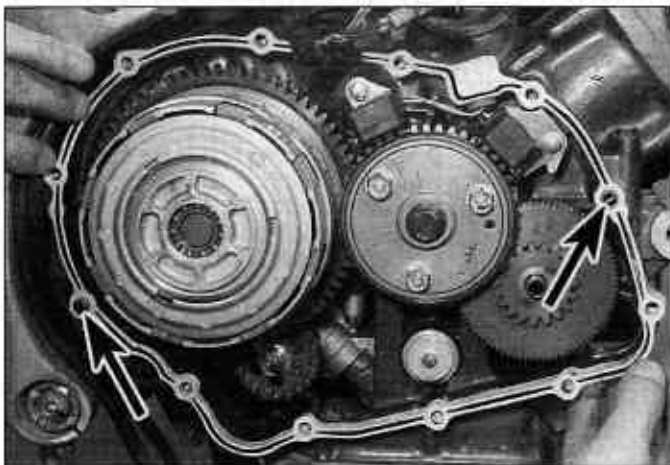
15.18b . . . and the cutout in the main clutch housing must be positioned to allow clearance for the starter driven gear



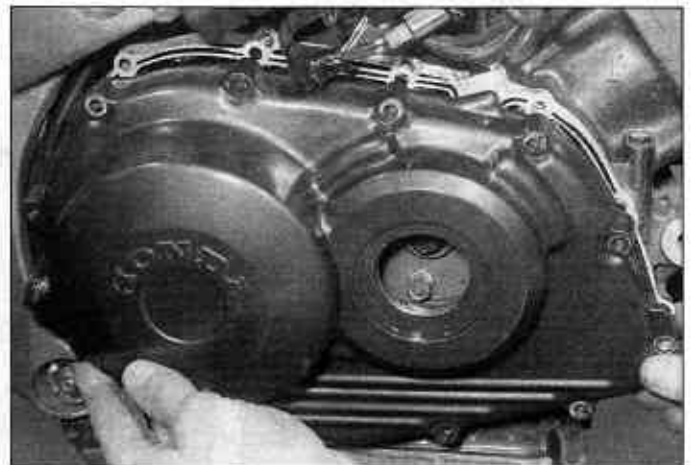
15.18c Tighten the starter clutch bolt to the specified torque



15.19 Install the idle/reduction gear as shown and slide the shaft into its bore



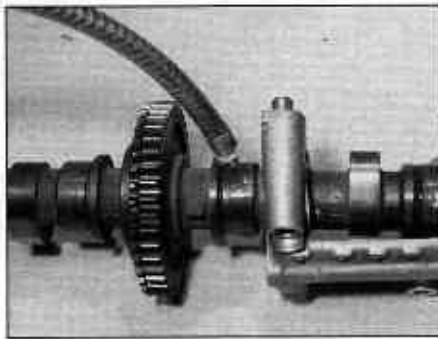
15.21a Position a new gasket onto the dowels (arrowed) . . .



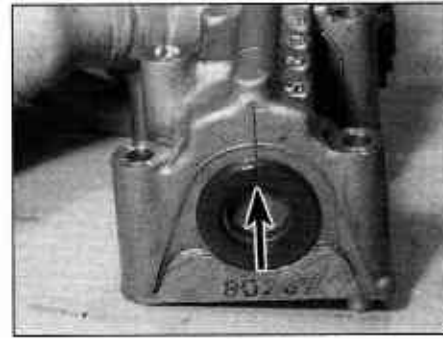
15.21b . . . then fit the cover



9.10 Measure the cam bearing journals with a micrometer



9.12 Apply molybdenum oil to the camshaft journals and holders



9.13 The index line on the right-hand end of each camshaft must face the top of the holder

10 Next, check the camshaft bearing oil clearances. Measure the diameter of the camshaft journal with a micrometer (**see illustration**). Measure the journal holder diameter with an internal micrometer or telescoping gauge. To determine the journal oil clearance, subtract the holder diameter from the journal diameter and compare the result to the clearance specified. If the clearance is greater than specified, compare the measurements of the camshaft journal and the holder to those specified and replace whichever component is beyond its limit.



Before replacing camshafts or the journal holders because of damage, check with local machine shops specialising in motorcycle engine work. In the case of the camshafts, it may be possible for cam lobes to be welded, reground and hardened, at a cost far lower than that of a new camshaft. If the bearing surfaces in the holders are damaged, it may be possible for them to be bored out to accept bearing inserts. Due to the cost of new components it is recommended that all options be explored before condemning them as trash!

11 Check the camshaft drive gear on the drive gear assembly and the driven gear on each camshaft for wear, cracks and other damage, replacing them if necessary. The driven gears are integral with the camshafts, whilst the drive gear assembly can be removed from the engine (**see Section 11**). If wear this severe is apparent, the entire engine should be disassembled for inspection.

Installation

12 Make sure the bearing surfaces on the camshafts and in the holders are clean, then apply molybdenum disulphide oil (a 50/50 mixture of molybdenum disulphide grease and engine oil) to each of them (**see illustration**). Also apply it to the camshaft lobes.

13 The camshafts and holders must be installed in their correct location according to their identification marks (**see Steps 5 and 6**). If separated, install each holder onto its correct side of the camshaft (**see illustration 9.6d**), with the index line on the end of each shaft on the right-hand side of the engine and facing up and in line with the index line on the holder (**see illustration**). Do not confuse the index line on the right-hand end of each shaft with the square cutout on the left-hand end of each shaft.

14 To install the front cylinder camshafts when the rear cylinder shafts are in place, first align the "T1" mark on the timing plate with the static mark on the cover, and check that the index line on the end of each rear cylinder shaft faces away from the head. Now turn the engine 90° (1/4 turn) clockwise until the "T2" mark aligns and the lines on the rear shafts face back at about 10 o'clock. Install the front cylinder camshafts with the index lines facing away from the head.

15 To install the rear cylinder camshafts when the front cylinder shafts are in place, first align the "T2" mark on the timing plate with the static mark on the cover, and check that the index line on the end of each front cylinder shaft faces away from the head. Now turn the engine 630° (1 3/4 turns) clockwise until the "T1" mark aligns and the lines on the front shafts face forward at about 3 o'clock. Install the rear cylinder camshafts with the

index lines facing away from the head.

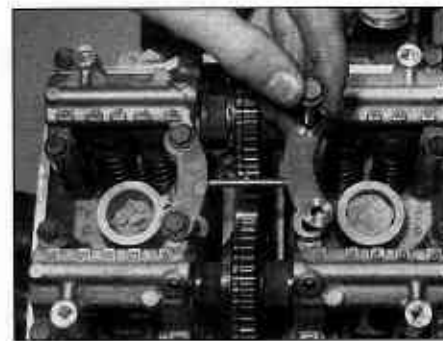
16 If the camshafts have been removed from both heads, install the rear ones first with the index lines facing away from the head and the "T1" mark aligned, then turn the engine 90° (1/4 turn) clockwise until the "T2" mark aligns and the lines on the rear shafts face back at about 10 o'clock, and install the front camshafts with the lines facing away from the head.

17 Make sure the camshaft holder dowels are installed, and that the cutout in each rocker arm shaft is aligned with the camshaft holder bolt hole in each corner of the cylinder head. Lay the camshafts and holders in place in the cylinder head (**see illustration 9.6c**), making sure the lines on the camshaft ends and holders remain aligned and the camshaft driven gear meshes correctly with the drive gear (**see illustration**). Take extra care at this stage as it is easy to be one tooth out on the timing without it appearing as a significant misalignment of the timing marks.

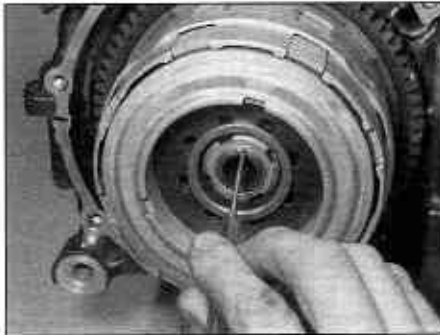
18 Install the holder bolts, not forgetting to fit the oil pipe assembly and plates, which must be installed with the crescents facing in (**see illustration**). Note that the bolts are all different lengths – make sure they are installed as shown (**see illustrations overleaf**). When tightening the camshaft holders, tighten the no. 2 (front left cylinder) holder before the no. 4 (front right cylinder) holder, and the no. 3 (rear right cylinder) holder before the no. 1 (rear left



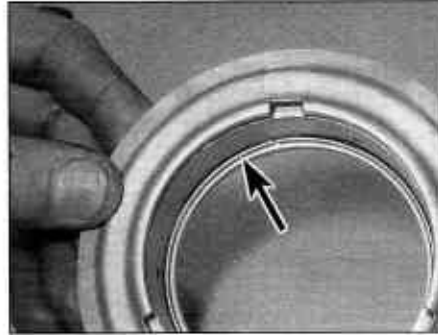
9.17 Make sure the holders locate onto the dowels and the teeth of the gears mesh correctly



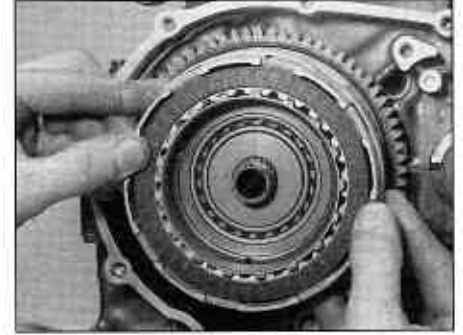
9.18a Fit the oil pipe plates with the crescents facing in



16.4 Unstake the clutch nut



16.6 Do not remove the spring seat (arrowed) unless a new one is being fitted



16.7 Remove the clutch plates as an assembly

punch, or a drill (see illustration). To remove the clutch nut, the input shaft must be locked. If the engine is in the frame, engage 6th gear and have an assistant hold the rear brake on hard with the rear tyre in firm contact with the ground. Alternatively, fit the primary drive gear back onto the end of the crankshaft (if removed) – the primary drive gear and the primary driven gear on the back of the main clutch housing can be locked together using the special tool (Part no. 00724-001010), or a stout piece of cloth, such as denim, can be jammed between them, without the risk of any damage should the bolt prove tight. Unscrew the nut using the peg spanner (see Note 2) (see illustration 16.32c) and remove the lockwasher from the input shaft, noting which way round it fits (see illustration 16.32a). Discard the nut, and if it is worn or damaged the lockwasher, as new ones must be used.

HAYNES HINT If the engine is being completely disassembled or the oil pump driven sprocket is being removed, also slacken the sprocket bolt while the input shaft is locked.

5 Draw the diaphragm spring holder off the shaft, noting how it fits (see illustration 16.31).

6 Remove the three diaphragm springs,

noting how they fit, followed by the pressure plate (see illustrations 16.30b and a). Do not remove the spring seat from the pressure plate unless it is being replaced (see illustration).

7 Remove the outer thrust washer (see illustration 16.29), then pull the clutch friction and plain plates off the input shaft as an assembly (see illustration).

8 Pull the outer clutch centre and one-way clutch out of the clutch as an assembly, then remove the inner thrust washer, the inner clutch centre and the clutch housing (see illustrations 16.27, 16.25b and a, and 16.24b).

9 Note the tabs on the oil pump drive sprocket behind the clutch housing which must locate in the slots in the back of the housing on reassembly. If required, unscrew the oil pump driven sprocket bolt and remove the drive and driven sprocket together with the drive chain (see illustrations). If the sprocket bolt was not previously slackened, lock the sprocket to prevent it from turning (see Tool Tip). Also remove the clutch housing guide from the input shaft (see illustration 16.22).

Inspection

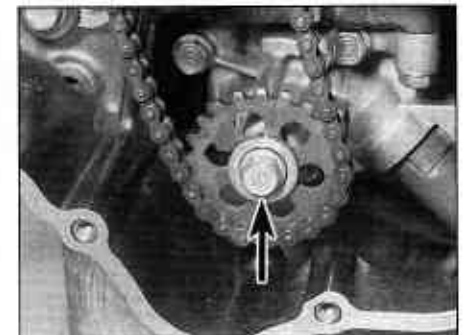
Clutch unit

10 After an extended period of service the clutch friction plates will wear and promote clutch slip. Measure the thickness of each

friction plate using a vernier caliper (see illustration). If any plate has worn to or beyond the service limits given in the Specifications at the beginning of the Chapter, the friction plates must be replaced as a set. Also, if any of the plates smell burnt or are glazed, they must be replaced as a set.

11 The plain plates should not show any signs of excess heating (bluing). Check for warpage using a flat surface and feeler gauges (see illustration). If any plate exceeds the maximum permissible amount of warpage, or shows signs of bluing, all plain plates must be replaced as a set.

12 Lay the diaphragm springs on top of each other on a flat surface (such as a piece of plate glass) and measure the height to the surface of the inner edge of the top spring



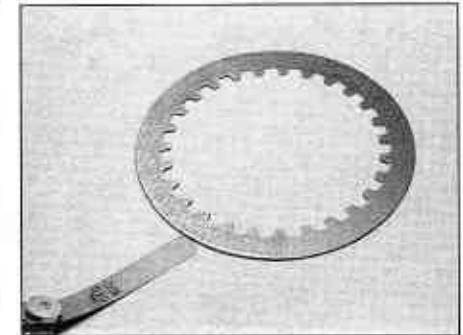
16.9a Remove the sprocket bolt...



16.9b ... and draw the chain and sprockets off the shafts



16.10 Measuring clutch friction plate thickness



16.11 Check the plain plates for warpage

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LIVING WITH YOUR HONDA VFR/RVF

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MAINTENANCE

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Buying spare parts

Once you have found all the identification numbers, record them for reference when buying parts. Since the manufacturers change specifications, parts and vendors (companies that manufacture various components on the machine), providing the ID numbers is the only way to be reasonably sure that you are buying the correct parts.

Whenever possible, take the worn part to the dealer so direct comparison with the new

component can be made. Along the trail from the manufacturer to the parts shelf, there are numerous places that the part can end up with the wrong number or be listed incorrectly.

Parts for unofficial (grey) import machines can be obtained from dealers specialising in imports or from certain Honda dealers. Note that many of the NC30 import parts will be the same as those fitted to the UK NC30 model. Certain items, such as spark plugs, lubricants,

chains, tyres, batteries and brake pads can be obtained from non-specialist dealers.

Used parts can be obtained for roughly half the price of new ones, but you can't always be sure of what you're getting. Once again, take your worn part to the breaker for direct comparison.

Whether buying new, used or rebuilt parts, the best course is to deal directly with someone who specialises in parts for your particular make.

Unofficial (grey) imports

The majority of VFR400R (NC30) and all RVF400R (NC35) machines in the UK are unofficial (grey) imports. These second-hand machines are imported directly from the Japanese market and are allocated age-related licence plates for UK use; the licence plate letter reflects the production year in Japan.

Common changes made prior to sale in the UK are the disabling of the rev-limiter device (or more correctly 'speed-limiter' device), which is fitted to comply with Japanese

market regulations. The device is located in the speedometer head and is linked to the ignition control unit to cut the ignition when 180 kmh (112 mph) is reached. The importers have several methods of disabling the device, either fitting a plug-in unit at the speedometer head or ignition control unit, or by modifying the limiter mechanism.

Speedometers calibrated in kilometres (kmh) must have a miles per hour (mph) scale applied. This can be done simply by applying a suitable overlay to the speedometer lens or a more professional approach is to fit one of the replacement dial faces to the

speedometer itself. In each case it is important that the correct size overlay or dial face is used.

The ratings of certain bulbs (headlight, sidelight, brake/tail light and turn signal lights) differ from those normally used on UK market machines. Of these, the brake/tail light bulbs will most likely have been replaced with the regulation 21/5W UK fitment.

Note that restrictor kits can be fitted to the VFR and RVF engines to reduce their power output to 33 bhp (25 kW) to comply with the UK full standard category A licence. Kits can be obtained from and fitted by grey importers.

1 Engine/transmission oil level

Note: The daily (pre-ride) checks outlined in the owner's manual covers those items which should be inspected on a daily basis.

Before you start:

- ✓ Take the motorcycle on a short run to allow it to reach normal operating temperature.

Caution: Do not run the engine in an enclosed space such as a garage or workshop.

- ✓ Stop the engine and support the motorcycle in an upright position, using an auxiliary stand if required. Allow it to stand undisturbed for a few minutes to allow the oil level to stabilise. Make sure the motorcycle is on level ground.

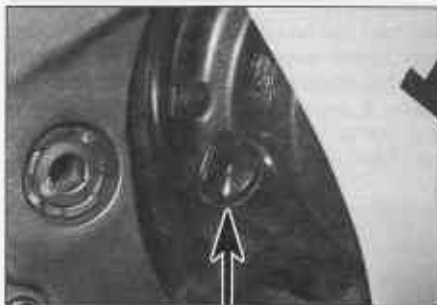
Bike care:

- If you have to add oil frequently, you should check whether you have any oil leaks. If there is no sign of oil leakage from the joints and gaskets the engine could be burning oil (see *Fault Finding*).

The correct oil

- Modern, high-revving engines place great demands on their oil. It is very important that the correct oil for your bike is used.
- Always top up with a good quality oil of the specified type and viscosity and do not overfill the engine.

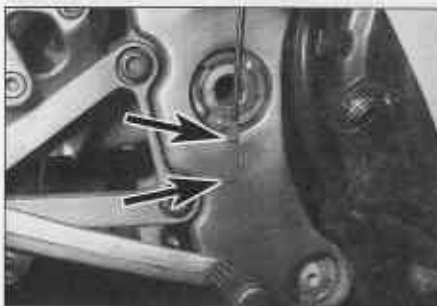
Oil type	API grade SE, SF or SG
Oil viscosity	SAE 10W40



- 1 Unscrew the oil filler cap (arrowed) from the right-hand crankcase cover. The dipstick is integral with the oil filler cap, and is used to check the engine oil level.



- 2 Using a clean rag or paper towel, wipe off all the oil from the dipstick. Insert the clean dipstick back into the engine, but **do not** screw it in.



- 3 Remove the dipstick and observe the level of the oil, which should be somewhere in between the upper and lower level lines (arrowed).



- 4 If the level is below the lower line, top the engine up with the recommended grade and type of oil, to bring the level up to the upper line on the dipstick. Do not overfill.

2 Legal and safety checks

Lighting and signalling:

- Take a minute to check that the headlight, tail light, brake light, instrument lights and turn signals all work correctly.
- Check that the horn sounds when the switch is operated.
- A working speedometer is a statutory requirement in the UK. If the speedometer is calibrated in kilometres, make sure that a suitable mph indicator is stuck to its face for the UK market.

Safety:

- Check that the throttle grip rotates smoothly and snaps shut when released, in all steering positions. Also check for the correct amount of freeplay (see Chapter 1).
- Check that the engine shuts off when the kill switch is operated.
- Check that sidestand return spring holds the stand securely up when retracted.

Fuel:

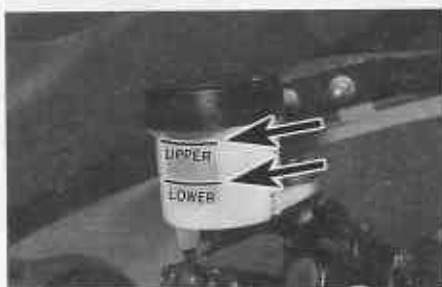
- This may seem obvious, but check that you have enough fuel to complete your journey. If you notice signs of fuel leakage – rectify the cause immediately.
- Ensure you use the correct grade unleaded or low-lead fuel – see Chapter 4 Specifications.

0•12 Daily (pre-ride) checks

3 Brake fluid level



Warning: Brake hydraulic fluid can harm your eyes and damage painted surfaces, so use extreme caution when handling and pouring it and cover surrounding surfaces with rag. Do not use fluid that has been standing open for some time, as it absorbs moisture from the air which can cause a dangerous loss of braking effectiveness.



- 1 The front brake fluid level is visible through the reservoir body – it must be between the UPPER and LOWER level lines (arrowed).



- 3 Top up with new DOT 4 hydraulic fluid until the level is above the lower mark. Take care to avoid spills (see **Warning** above).



- 6 If the level is below the LOWER level line, remove the seat cowl (see Chapter 8). Unscrew the reservoir cap and remove the diaphragm plate and diaphragm.

Before you start:

✓ Support the motorcycle in an upright position, using an auxiliary stand if required, and turn the handlebars until the top of the front brake master cylinder is as level as possible. If necessary, tilt the motorcycle to make it level. The rear master cylinder reservoir is located below the seat cowl on the right-hand side of the machine.



- 2 If the level is below the LOWER level line, remove the two reservoir cap screws and remove the cover, the diaphragm plate and the diaphragm. On RVF models, first remove the screw securing the cap clamp.



- 4 Ensure that the diaphragm is correctly seated before installing the plate and cover.



- 7 Top up with new clean hydraulic fluid of the recommended type, until the level is above the lower mark. Take care to avoid spills (see **Warning** above).

✓ Make sure you have the correct hydraulic fluid. DOT 4 is recommended.

✓ Wrap a rag around the reservoir being worked on to ensure that any spillage does not come into contact with painted surfaces.

✓ Access to the front reservoir cap screws is restricted by the windshield. A short or angled screwdriver is required to access the screws.

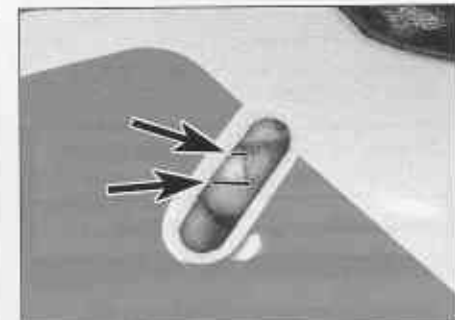
Bike care:

● The fluid in the front and rear brake master cylinder reservoirs will drop slightly as the brake pads wear down.

● If any fluid reservoir requires repeated topping-up this is an indication of an hydraulic leak somewhere in the system, which should be investigated immediately.

● Check for signs of fluid leakage from the hydraulic hoses and components – if found, rectify immediately.

● Check the operation of both brakes before taking the machine on the road; if there is evidence of air in the system (spongy feel to lever or pedal), it must be bled as described in Chapter 7.



- 5 The rear brake fluid level is visible through the reservoir body via the aperture in the right-hand side of the seat cowl – it must be between the UPPER and LOWER level lines (arrowed).



- 8 Ensure that the diaphragm is correctly seated before installing the plate and cap. Tighten the cap securely, then install the seat cowl (see Chapter 8).

0•14 Daily (pre-ride) checks

6 Tyre checks

Tyre care:

- Check the tyres carefully for cuts, tears, embedded nails or other sharp objects and excessive wear. Operation of the motorcycle with excessively worn tyres is extremely hazardous, as traction and handling are directly affected.

- Check the condition of the tyre valve and ensure the dust cap is in place.

- Pick out any stones or nails which may have become embedded in the tyre tread. If left, they will eventually penetrate through the casing and cause a puncture.

- If tyre damage is apparent, or unexplained loss of pressure is experienced, seek the advice of a tyre fitting specialist without delay.

Tyre tread depth:

- At the time of writing UK law requires that tread depth must be at least 1 mm over 3/4 of the tread breadth all the way around the tyre, with no bald patches. Many riders, however, consider 2 mm tread depth minimum to be a safer limit. Honda recommend a minimum of 1.5 mm on the front and 2 mm on the rear.

- Many tyres now incorporate wear indicators in the tread. Identify the location marking on the tyre sidewall to locate the indicator bar and replace the tyre if the tread has worn down to the bar.

The correct pressures:

- The tyres must be checked when **cold**, not immediately after riding. Note that low tyre pressures may cause the tyre to slip on the rim or come off. High tyre pressures will cause abnormal tread wear and unsafe handling.

- Use an accurate pressure gauge.

- Proper air pressure will increase tyre life and provide maximum stability and ride comfort.

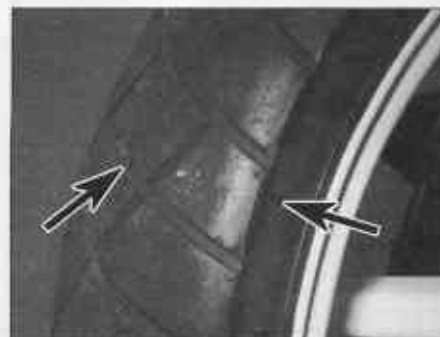
Loading	Front	Rear
Rider only	33 psi (2.25 Bar)	33 psi (2.25 Bar)
Rider and passenger	33 psi (2.25 Bar)	36 psi (2.50 Bar)



1 Check the tyre pressures when the tyres are **cold** and keep them properly inflated.



2 Measure tread depth at the centre of the tyre using a tread depth gauge.



3 Tyre tread wear indicator bar and its location marking (usually either an arrow, a triangle or the letters TWI) on the sidewall (arrowed).

4 Coolant level



Warning: DO NOT remove the radiator pressure cap to add coolant. Topping up is done via the coolant reservoir tank filler. DO NOT leave open containers of coolant about, as it is poisonous.

Before you start:

- ✓ Make sure you have a supply of coolant available (a mixture of 50% distilled water and 50% corrosion inhibited ethylene glycol anti-freeze is needed).
- ✓ Always check the coolant level when the engine is at normal working temperature.



1 The coolant reservoir is located under the seat cowl on the right-hand side. The coolant UPPER and LOWER level lines are visible by looking up from below the cowl.

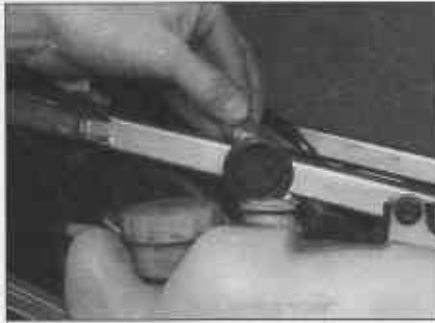
Take the motorcycle on a short run to allow it to reach normal temperature.

Caution: Do not run the engine in an enclosed space such as a garage or workshop.

- ✓ Support the motorcycle in an upright position, using an auxiliary stand if required, whilst checking the level. Make sure the motorcycle is on level ground.

Bike care:

- Use only the specified coolant mixture. It is important that anti-freeze is used in the

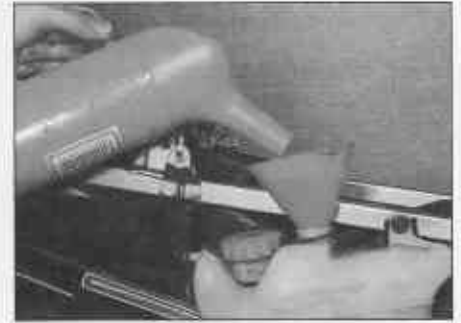


2 If the coolant level is not in between the UPPER and LOWER markings, remove the seat cowl (see Chapter 8), then remove the reservoir filler cap.

system all year round, and not just in the winter. Do not top the system up using only water, as the system will become too diluted.

- Do not overfill the reservoir tank. If the coolant is significantly above the UPPER level line at any time, the surplus should be siphoned or drained off to prevent the possibility of it being expelled out of the overflow hose.

- If the coolant level falls steadily, check the system for leaks (see Chapter 1). If no leaks are found and the level continues to fall, it is recommended that the machine is taken to a Honda dealer for a pressure test.



3 Top the coolant level up with the recommended coolant mixture. Fit the cap securely, then install the seat cowl (see Chapter 8).

5 Suspension, steering and drive chain

Suspension and steering:

- Check that the front and rear suspension operates smoothly without binding.
- Check that the suspension is adjusted as required.

- Check that the steering moves smoothly from lock-to-lock.

Drive chain:

- Check that the drive chain slack isn't excessive, and adjust if necessary (see Chapter 1).
- If the chain looks dry, lubricate it (see Chapter 1).

Chapter 1

Routine maintenance and servicing

Contents

Air filter – replacement	21	Front forks – oil change	33
Battery – charging	see Chapter 9	Fuel hoses – replacement	32
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Battery – removal, installation, inspection and maintenance	see Chapter 9	Headlight aim – check and adjustment	15
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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



1.2 Specifications

Engine

Cylinder numbering (as viewed from riding position)

Front right	no. 4
Front left	no. 2
Rear right	no. 3
Rear left	no. 1

↑
FRONT

2	4
---	---

1	3
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Spark plugs

Type

Standard

For extended high speed riding

Electrode gap

Engine idle speed

Carburettor synchronisation – max. difference between carburettors

Valve clearances (COLD engine)

Inlet valves

Exhaust valves

Cylinder compression

Oil pressure (with engine warm)

NGK ER9EH or Nippon denso Y27FER

NGK ER10EH or Nippon denso Y31FER

0.6 to 0.7 mm

1300 ± 100 rpm

40 mm Hg

0.12 to 0.18 mm

0.21 to 0.27 mm

157 to 213 psi (10.8 to 14.7 Bar)

71 to 85 psi (5.0 to 6.0 Bar) @ 5000 rpm, oil @ 80°C

Miscellaneous

Drive chain slack

Clutch cable freeplay

Throttle cable freeplay

Tyre pressures (cold)

Rider only

Rider and passenger

15 to 25 mm

10 to 20 mm

2 to 6 mm

Front

33 psi (2.25 Bar)

33 psi (2.25 Bar)

Rear

33 psi (2.25 Bar)

36 psi (2.50 Bar)

Torque settings – specific components

Spark plug	9 Nm
Engine/transmission oil drain plug	35 Nm
Engine/transmission oil filter	10 Nm
Timing inspection cover	18 Nm
Steering stem nut	140 Nm
Top yoke fork clamp bolts	11 Nm
Rear wheel bearing holder pinch bolt	55 Nm

Torque settings – non-specified components

Note: Where a specific setting is not given for a particular bolt/nut, these general settings apply. The dimension given applies to the diameter of the thread, not the head.

5 mm bolt/nut	5 Nm
6 mm bolt/nut	10 Nm
8 mm bolt/nut	22 Nm
10 mm bolt/nut	35 Nm
12 mm bolt/nut	55 Nm
6 mm flange bolt with 8 mm head	9 Nm
6 mm flange bolt/nut with 10 mm head	12 Nm
8 mm flange bolt/nut	27 Nm
10 mm flange bolt/nut	40 Nm

Recommended lubricants and fluids

Engine/transmission oil type	API grade SE, SF or SG motor oil
Engine/transmission oil viscosity	SAE 10W40
Engine/transmission oil capacity	
Oil change	2.4 litres
Oil and filter change	2.5 litres
Following engine overhaul – dry engine, new filter	3.0 litres
Coolant type	50% distilled water, 50% corrosion inhibited ethylene glycol anti-freeze
Coolant capacity	
Radiator and engine	2.1 litres
Reservoir	0.2 litre
Brake fluid	DOT 4
Drive chain	SAE 80 or 90 gear oil
Steering head bearings	Lithium-based multi-purpose grease
Swingarm pivot bearings	Molybdenum disulphide grease
Suspension linkage bearings	Molybdenum disulphide grease
Bearing seal lips	Lithium-based multi-purpose grease
Gearchange lever/clutch lever/rear brake pedal pivots	Molybdenum disulphide grease
Front brake lever pivot and piston tip	Molybdenum disulphide grease
Cables	10W40 motor oil
Sidestand pivot	Molybdenum disulphide grease
Throttle grip	Multi-purpose grease or dry film lubricant

1.6 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, you may want to pick up 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, then you may want to 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 you may want to start the maintenance routine from the beginning. If you have a used machine and have no knowledge of its history or maintenance record, you may desire to combine all the checks into one large service initially and then settle into the maintenance schedule prescribed.

3 Before beginning any maintenance or

repair, the machine should be cleaned thoroughly, especially around the oil filter, spark plugs, valve covers, body panels, carburetors, 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 decals attached to the motorcycle. If the information on the decals differs from that included here, use the information on the decal.

Every 600 miles (1000 km)



1.3 Push up on the chain and measure the slack

1 Drive chain and sprockets – check, adjustment and lubrication

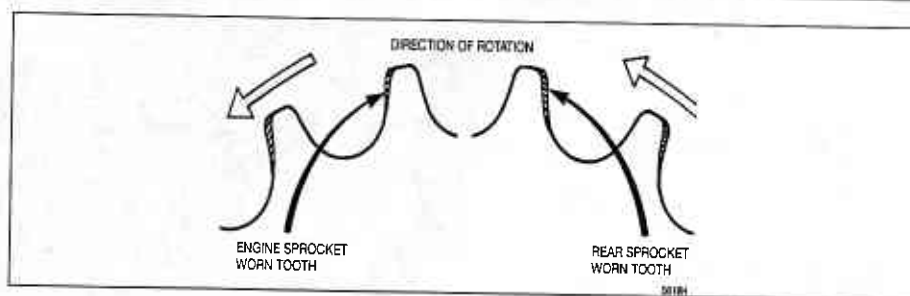
Check

1 A neglected drive chain won't last long and can quickly damage the sprockets. Routine chain adjustment and lubrication isn't difficult and will ensure maximum chain and sprocket life.

2 To check the chain, place the bike on its sidestand and shift the transmission into neutral. Make sure the ignition switch is OFF.

3 Push up on the bottom run of the chain and measure the slack midway between the two sprockets, then compare your measurement to that listed in this Chapter's Specifications (see illustration). As the chain stretches with wear, adjustment will periodically be necessary (see below). Since the chain will rarely wear evenly, roll the bike forwards so that another section of chain can be checked; do this several times to check the entire length of chain.

4 In some cases where lubrication has been neglected, corrosion and galling may cause the links to bind and kink, which effectively shortens the chain's length. Such links should be thoroughly cleaned and worked free. If the chain is tight between the sprockets, rusty or kinked, it's time to replace it with a new one. If you find a tight area, mark it with felt pen or



1.6 Check the sprockets in the areas indicated to see if they are worn excessively

paint, and repeat the measurement after the bike has been ridden. If the chain's still tight in the same area, it may be damaged or worn. Because a tight or kinked chain can damage the transmission bearings, it's a good idea to replace it.

Caution: If the machine is ridden with more than 40 mm of slack in the drive chain, the chain will contact the frame and swingarm, causing severe damage.

5 Check the entire length of the chain for damaged rollers, loose links and pins, and missing O-rings and replace it if damage is found. **Note:** Never install a new chain on old sprockets, and never use the old chain if you install new sprockets – replace the chain and sprockets as a set.

6 Remove the engine sprocket cover (see Chapter 6). Check the teeth on the engine sprocket and the rear wheel sprocket for wear (see illustration).



1.9 Slacken the bearing holder pinch bolt (arrowed)

7 Inspect the drive chain slider on the swingarm for excessive wear and replace it if worn (see Chapter 6).

Adjustment

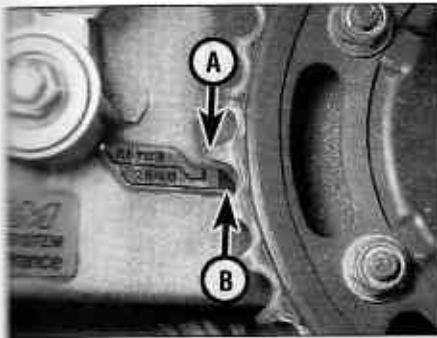
8 Rotate the rear wheel until the chain is positioned with the tightest point at the centre of its bottom run. If available, raise the rear wheel off the ground using an auxiliary stand or support.

9 Slacken the bearing holder pinch bolt (see illustration).

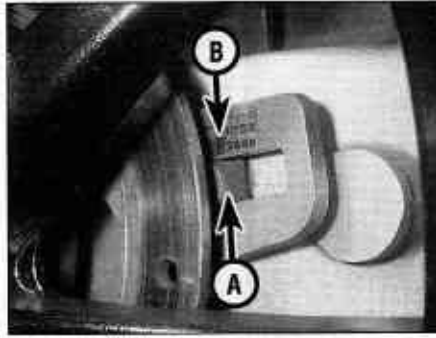
10 Using the pin spanner tool provided in the toolkit or a suitable drift located in one of the notches in the adjuster, turn the bearing holder until the proper chain tension is obtained (see illustration). Having completed the adjustment, on VFR models check the alignment of the tip of the sprocket tooth with the wear decal on the swingarm, and on RVF models check the alignment of the front of the



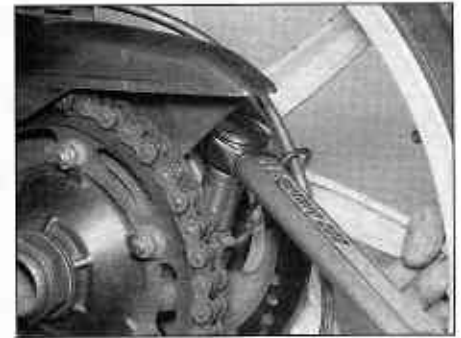
1.10a Turn the bearing holder using the tool provided or a suitable drift as shown



1.10b On VFR models, if the sprocket tooth (A) aligns with the red zone (B), replace the chain



1.10c On RVF models, if the front of the block (A) aligns with the red zone (B), replace the chain



1.11 Tighten the pinch bolt to the specified torque

block on the inside of the swingarm with the wear decal on the slider section of the brake caliper bracket (see illustrations). If either aligns with the red REPLACE CHAIN zone, the drive chain has stretched excessively and must be replaced.

11 Tighten the bearing holder pinch bolt to the torque setting specified at the beginning of the Chapter (see illustration).

Lubrication

12 If required, wash the chain in paraffin (kerosene), then wipe it off and allow it to dry, using compressed air if available. If the chain is excessively dirty it should be removed from

the machine and allowed to soak in the paraffin (see Chapter 6).

Caution: Don't use petrol (gasoline), solvent or other cleaning fluids which might damage the internal sealing properties of the chain. Don't use high-pressure water to clean the chain. The entire process shouldn't take longer than ten minutes, otherwise the O-rings could be damaged.

13 For routine lubrication, the best time to lubricate the chain is after the motorcycle has been ridden. When the chain is warm, the lubricant will penetrate the joints between the sideplates better than when cold. **Note:** Honda specifies SAE 80 to SAE 90 gear oil

only. If you use an aerosol chain lube make sure that it is suitable for O-ring or X-ring (sealed) chains; if it isn't, the solvents could damage the chain's sealing rings. Apply the oil to the area where the sideplates overlap – not the middle of the rollers.



Apply the oil to the top of the lower chain run, so centrifugal force will work the oil into the chain when the bike is moving. After applying the lubricant, let it soak in a few minutes before wiping off any excess.

Every 4000 miles (6000 km) or 6 months

2 Idle speed – check and adjustment



1 The idle speed should be checked and adjusted before and after the carburettors are synchronised (balanced) and when it is obviously too high or too low. Before adjusting the idle speed, make sure the valve clearances and spark plug gaps are correct. Also, turn the handlebars back-and-forth and see if the idle speed changes as this is done. 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 sidestand, and make sure the transmission is in neutral.

3 The idle speed adjuster is located in between the fairing side panel and the frame on the left-hand side (see illustration). With the engine idling, adjust the idle speed by

turning the adjuster screw until the idle 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 fuel/air mixture may be incorrect (see Chapter 4) or the carburettors may need synchronising (see Section 12).



2.3 Idle speed adjuster screw (arrowed)

3 Brake pads – wear check

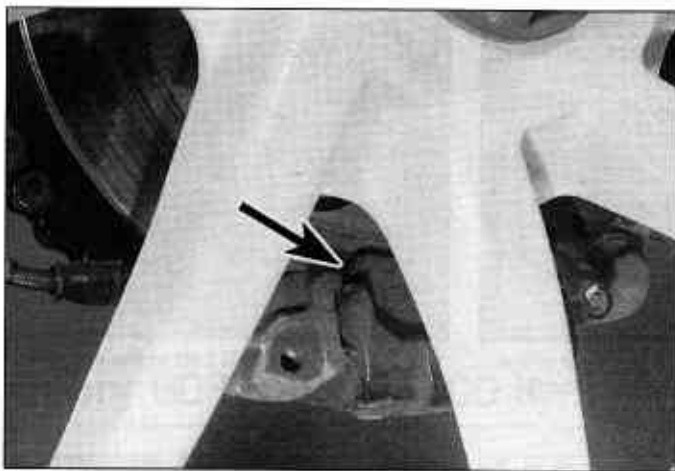


1 Each brake pad has wear indicators that can be viewed without removing the pads from the caliper. On the front brake caliper, the pad wear indicator grooves are visible by looking up at the lower edge of the pads (see illustration). On the rear brake caliper, the pad wear indicator cutouts are visible by

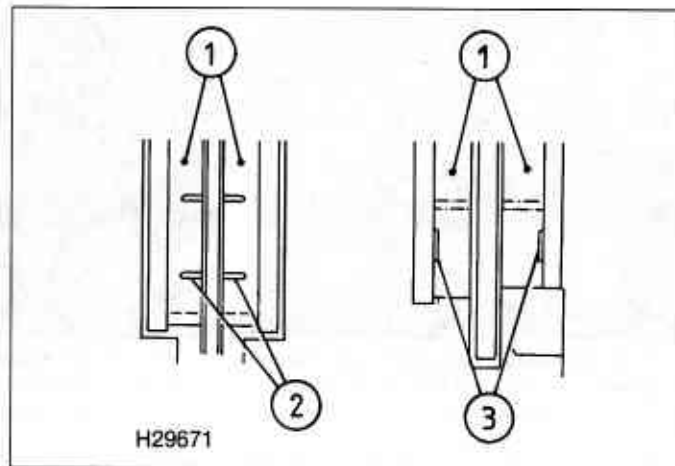


3.1a Front brake pad wear indicator groove

1.8 Every 4000 miles (6000 km) or 6 months



3.1b Rear brake pad wear cutout is located in the side of the pad



3.2 Pad wear indicators

1 Pad friction material 2 Front pad grooves 3 Rear pad cutouts

looking at the top edge of the pads (see illustration).

2 If the pads are worn to or beyond the bottom of the grooves (front pads) or to or beyond the beginning of the cutouts (rear pads), they must be replaced (see illustration). 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 6). **Note:** Some after-market pads may use different indicators to those on the original equipment as shown.

3 Refer to Chapter 7 for details of pad replacement.

4 Clutch – check and adjustment

1 Check that the clutch cable operates smoothly and easily.

2 If the clutch lever operation is heavy or stiff, remove the cable (see Chapter 2) and lubricate it (see Section 6). If the cable is still stiff, replace it. Install the lubricated or new cable (see Chapter 2).

3 With the cable operating smoothly, check

that the clutch lever is correctly adjusted. Periodic adjustment is necessary to compensate for wear in the clutch plates and stretch of the cable. Check that the amount of freeplay at the clutch lever end is within the specifications listed at the beginning of the Chapter (see illustration).

4 If adjustment is required, loosen the adjuster locking at the top of the cable and turn the adjuster in or out until the required amount of freeplay is obtained (see illustration). To increase freeplay, turn the adjuster clockwise. To reduce freeplay, turn the adjuster anti-clockwise. Tighten the locking ring securely.

5 If all the adjustment has been taken up at the lever, reset the adjuster to give the maximum amount of freeplay, then set the correct amount of freeplay using the adjuster on the lower end of cable. The lower adjuster is set in a bracket on the alternator cover on the left-hand side of the engine. Use the nuts on each end of the threaded section in the cable to adjust freeplay (see illustration). Remove the lower fairing to access the adjuster nuts (see Chapter 8). To increase freeplay, slacken the front nut and tighten the rear nut until the freeplay is as specified, then

tighten the front nut. To reduce freeplay, slacken the rear nut and tighten the front nut until the freeplay is as specified, then tighten the rear nut. Subsequent adjustments can now be made using the lever adjuster only.

5 Spark plug gaps – check and adjustment

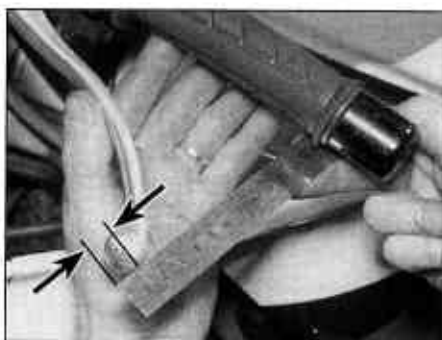
1 Make sure your spark plug socket is the correct size before attempting to remove the plugs – a suitable one is supplied in the motorcycle's tool kit which is stored under the seat.

2 To access the front cylinder spark plugs, remove the fairing side panels (see Chapter 8), then remove the upper radiator lower mounting bolts and swing the radiator forward.

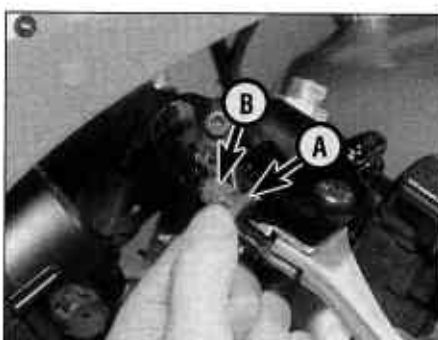
3 The rear cylinder spark plugs are accessed via the cutouts in the front of the seat cowl.

4 Clean the area around the plug caps to prevent any dirt falling into the spark plug channels.

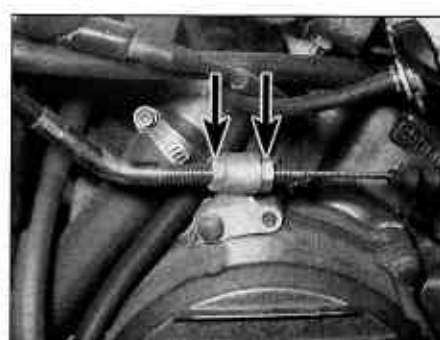
5 Check that the cylinder location is marked on each plug lead, then pull the spark plug



4.3 Measuring clutch cable freeplay



4.4 Slacken the locking (A) and turn the adjuster (B) in or out as required



4.5 Clutch cable lower adjuster nuts

1•10 Every 4000 miles (6000 km) or 6 months

6 Stand, lever pivots and cables – 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.

2 The footrests, clutch and brake levers, brake pedal, gearshift lever linkage and sidestand pivots should be lubricated frequently. In order for the lubricant to be applied where it will do the most good, the component should be disassembled. However, if chain and 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. 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 lubricants for the control lever pivots is a dry-film lubricant (available from many sources by different names).

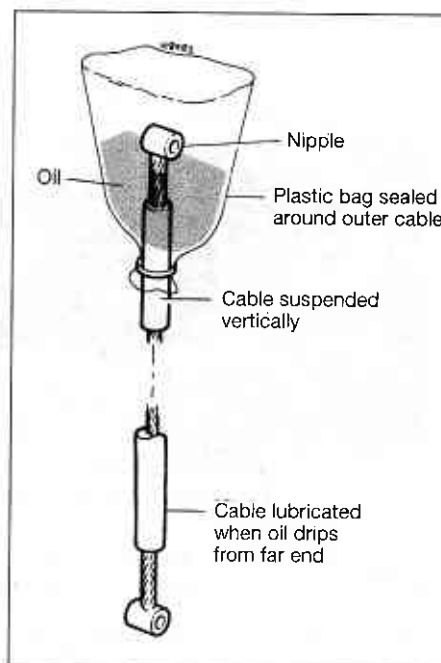
3 To lubricate the cables, disconnect the relevant cable at its upper end, then lubricate



6.3a Lubricating a cable with a pressure lubricator. Make sure the tool seals around the inner cable

the cable with a pressure adapter and aerosol lubricant, or if one is not available, using motor oil via the set-up shown (see illustrations). See Chapter 4 for the choke and throttle cable removal procedures.

4 The speedometer cable should be removed (see Chapter 9) and the inner cable withdrawn from the outer cable and lubricated with motor oil or cable lubricant. Do not lubricate the upper few inches of the cable as the lubricant may travel up into the instrument head.



6.3b Lubricating a cable with a makeshift funnel and motor oil

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

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

7 Engine oil and oil filter 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 protectant. 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 oil change.

2 Before changing the oil, warm up the engine so the oil will drain easily. Remove the lower fairing (see Chapter 8).

3 Put the motorcycle on its sidestand, and position a clean drain tray below the engine.

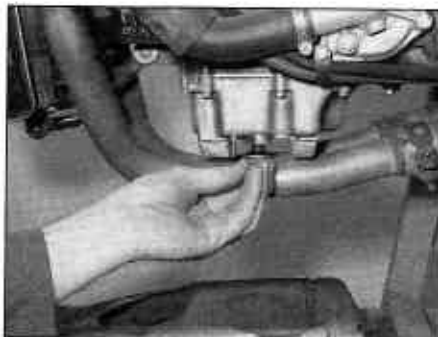
Unscrew the oil filler cap from the right-hand crankcase cover to vent the crankcase and to act as a reminder that there is no oil in the engine (see illustration).

4 Next, unscrew the oil drain plug from the bottom 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 damaged or worn.

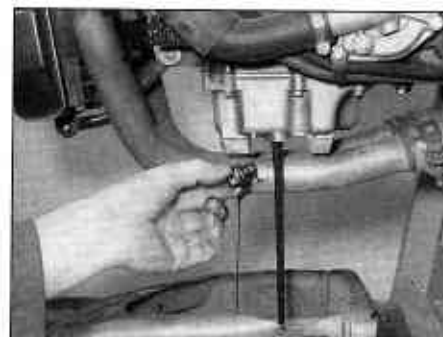
5 When the oil has completely drained, fit the plug to the sump, using a new sealing washer if necessary, and tighten it to the torque setting specified at the beginning of the



7.3 Unscrew the oil filler cap ...



7.4a ... and the oil drain plug ...



7.4b ... and allow the oil to completely drain

1•12 Every 8000 miles (12,000 km) or 12 months

Check

1 Remove the fuel tank (see Chapter 4) and check the tank, the fuel tap and the fuel and vacuum hoses for signs of leakage, deterioration or damage; in particular check that there is no leakage from the fuel hoses. Replace any hoses which are cracked or deteriorated.

2 If the fuel tap is leaking, tighten the assembly screws (see Chapter 4). If leakage persists unscrew the screws and disassemble the tap, noting how the components fit. Inspect all components and replace any that are worn or damaged. Some components are available individually, though it may be necessary to replace the whole tap.

3 If the carburettor gaskets are leaking, the carburettors should be disassembled and rebuilt using new gaskets and seals (see Chapter 4).

Filter cleaning

4 Cleaning or replacement of the fuel filter is advised after a particularly high mileage has been covered. It is also necessary if fuel starvation is suspected.

5 The fuel filter is mounted in the tank and is integral with the fuel tap. Remove the fuel tank and the fuel tap (see Chapter 4). Clean the gauze filter to remove all traces of dirt and fuel sediment. Check the gauze for holes. If any are found, a new filter should be fitted (check for availability – it may be necessary to replace the whole tap). Check the condition of the O-ring and replace it if it is in any way damaged or deteriorated.

9 Battery – check

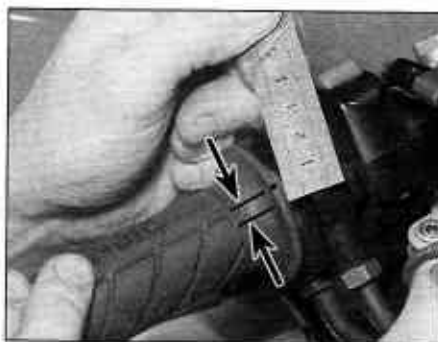
1 All models covered in this manual are fitted with a sealed battery, and therefore require no maintenance. **Note:** Do not attempt to remove the battery caps to check the electrolyte level or battery specific gravity. Removal will damage the caps, resulting in electrolyte leakage and battery damage. All that should be done is to check that its terminals are clean and tight and that the casing is not damaged or leaking. See Chapter 9 for further details.

2 If the machine is not in regular use, disconnect the battery and give it a refresher charge every month to six weeks, as described in Chapter 9.

10 Throttle and choke cables – check

Throttle cables

1 Make sure the throttle grip rotates easily 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.



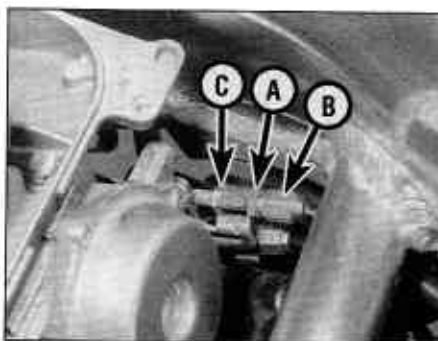
10.3 Throttle cable freeplay is measured in terms of twistgrip rotation

2 If the throttle sticks, this is probably due to a cable fault. Remove the cables (see Chapter 4) and lubricate them (see Section 6). Install the cables, making sure they are correctly routed. If this fails to improve the operation of the throttle, the cables must be replaced. Note that in very rare cases the fault could lie in the carburettors rather than the cables, necessitating the removal of the carburettors and inspection of the throttle linkage (see Chapter 4).

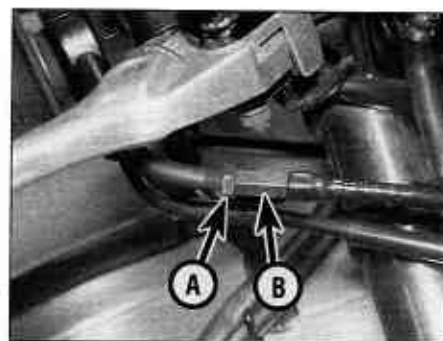
3 With the throttle operating smoothly, check for a small amount of freeplay in the cables, measured in terms of the amount of twistgrip rotation before the throttle opens, and compare the amount to that listed in this Chapter's Specifications (see illustration). If it's incorrect, adjust the cables to correct it.

4 Freeplay adjustments can be made at the throttle end of the cable. Loosen the locknut on the accelerator cable where it leaves the handlebar (see illustration). Turn the adjuster until the specified amount of freeplay is obtained (see this Chapter's Specifications), then retighten the locknut.

5 If the adjuster has reached its limit of adjustment, reset it so that the freeplay is at a maximum, then remove the fuel tank and air filter housing (see Chapter 4) and adjust the cable at the carburettor end. On VFR models, the adjuster is on the upper cable in the bracket, and on RVF models, the adjuster is on the lower cable. Slacken the adjuster locknut, then screw the adjuster out, making sure the lower nut remains captive in the bracket, thereby threading itself down the



10.5 Throttle cable adjuster locknut (A), adjuster (B) and lower nut (C) – carburettor end (VFR model shown)



10.4 Throttle cable adjuster locknut (A) and adjuster (B) – throttle end

adjuster as you turn it, until the specified amount of freeplay is obtained, then tighten the locknut (see illustration). Further adjustments can now be made at the throttle end. If the cable cannot be adjusted as specified, replace the cable (see Chapter 4).



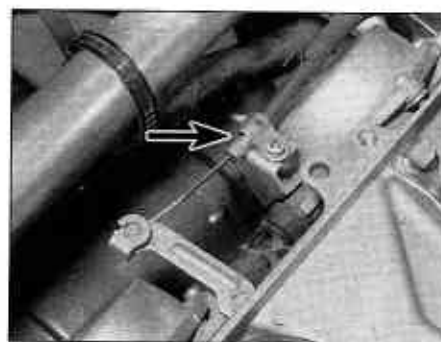
Warning: Turn the handlebars all the way through their travel with the engine idling. Idle speed should not change. If it does, the cables may be routed incorrectly. Correct this condition before riding the bike.

6 Check that the throttle twistgrip operates smoothly and snaps shut quickly when released.

Choke cable

7 If the choke does not operate smoothly this is probably due to a cable fault. Remove the cable (see Chapter 4) and lubricate it (see Section 6). Install the cable, routing it so it takes the smoothest route possible.

8 If this fails to improve the operation of the choke, the cable must be replaced. Note that in very rare cases the fault could lie in the carburettors rather than the cable, necessitating the removal of the carburettors and inspection of the choke plungers (see Chapter 4). Make sure there is a small amount of freeplay in the cable before the plungers move. If there isn't, check that the cable is seating correctly at both the lever and the carburettor ends. If it is, then slacken the choke outer cable bracket screw on the carburettor and slide the cable further into the bracket, creating some freeplay (see illustration). Otherwise, replace the cable.



10.8 Slide the outer cable end (arrowed) further into the bracket to create some freeplay

1•14 Every 8000 miles (12,000 km) or 12 months

14 When the adjustment is complete, recheck the vacuum readings, then adjust the idle speed by turning the throttle stop screw (see Section 2) until the idle speed listed in this Chapter's Specifications is obtained. Stop the engine.

15 Remove the vacuum gauges. Release the clamp on the fuel tap vacuum hose and connect it to the take-off stub on the no. 3 cylinder intake manifold. Fit the blanking screws into the remaining intake manifolds, making sure that their sealing washers are in place.

16 Install the lower fairing (see Chapter 8).

13 Cooling system check



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

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

2 Remove the lower fairing (see Chapter 8). The entire cooling system should be checked for evidence of leakage. Examine each rubber coolant hose along its entire length. Look for cracks, abrasions and other damage. Squeeze each hose at various points. They should feel firm, yet pliable, and return to their original shape when released. If they are dried out or hard, replace them with new ones.

3 Check for evidence of leaks at each cooling system joint. Tighten the hose clips carefully to prevent future leaks.

4 Check the radiators for leaks and other damage. Leaks in the radiators 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.

Caution: Do not use a liquid leak stopping compound to try to repair leaks.

5 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 radiators (see Chapter 3) and clean them using water or low pressure compressed air directed through the fins from

the rear 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 30% of the radiator's surface area, replace the radiator.

6 Remove the pressure cap from the upper radiator filler neck by turning it anti-clockwise until it reaches a stop (see illustration). 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 turning the cap 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, flush and refill the system with new coolant (See Section 24). Check the cap seal for cracks and other damage. If in doubt about the pressure cap's condition, have it tested by a Honda dealer or replace it with a new one. Install the cap by turning it clockwise until it reaches the first stop then push down on the cap and continue turning until it can turn no further.

7 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 24).

8 Start the engine and let it reach normal operating temperature, then check for leaks again. As the coolant temperature increases, the fan should come on automatically and the temperature should begin to drop. If it does not, refer to Chapter 3 and check the fan and fan circuit carefully.

9 If the coolant level is consistently low, and no evidence of leaks can be found, have the entire system pressure checked by a Honda dealer.

14 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 loose connections, improper or rough action, excessive play, bends, and other damage. Replace any damaged parts with new ones (see Chapter 7).

3 Make sure all brake fasteners are tight. Check the brake pads for wear (see Section 3) 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. If the lever or pedal is spongy, bleed the brakes (see Chapter 7).

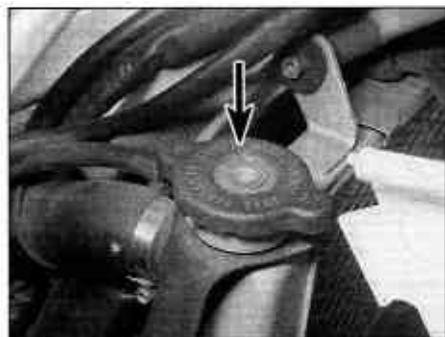
4 Make sure the brake light operates when the front brake lever is pulled in. The front brake light switch, mounted on the underside of the master cylinder, is not adjustable. If it fails to operate properly, check it (see Chapter 9).

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 on the inside of the rider's right-hand footrest bracket, just ahead of the master cylinder. If the brake light comes on too late, turn the ring clockwise. If the brake light comes on too soon or is permanently on, turn the ring anti-clockwise. If the switch doesn't operate the brake light, check it (see Chapter 9).

6 The front brake lever has a span adjuster which alters the distance of the lever from the handlebar (see illustration). Each setting is identified by a notch in the adjuster which aligns with the arrow on the lever. Pull the lever away from the handlebar and turn the adjuster ring until the setting which best suits the rider is obtained. There are two settings.

15 Headlight aim – check and adjustment

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.



13.6 Cooling system pressure cap (arrowed)



14.5 Rear brake light switch adjuster ring (arrowed)



14.6 Front brake lever span adjuster ring (arrowed)

1•16 Every 8000 miles (12,000 km) or 12 months



17.7a Checking for play in the swingarm bearings



17.7b Checking for play in the rear shock mountings and suspension linkage bearings



18.4 Checking for play in the steering head bearings

should be no discernible freeplay before the shock absorber begins to compress (see illustration). Any freeplay felt in either check indicates worn bearings in the suspension linkage or swingarm, or worn shock absorber mountings. The worn components must be replaced (see Chapter 6).

8 To make an accurate assessment of the swingarm bearings, remove the rear wheel (see Chapter 7) and the bolt securing the suspension linkage assembly to the swingarm (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 should be felt as movement between the swingarm and the frame at the front. If there is any play the swingarm will be felt to move forward and backward at the front (not from side-to-side). 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 replacement (see Chapter 5).

slowly move the handlebars from side-to-side. Any dents or roughness in the bearing races will be felt and the bars will not move smoothly and freely.

4 Next, grasp the forks and try to move them forward and backward (see illustration). Any looseness in the steering head bearings will be felt as front-to-rear movement of the forks. If play is felt in the bearings, adjust the steering head as follows.

18 Steering head bearings - freeplay check and adjustment

HAYNES
HINT

Freeplay in the fork due to worn fork bushes can be misinterpreted for steering head bearing play - do not confuse the two.



18.5 Slacken the right-hand bolt (A) and the left-hand bolt (B)

1 This motorcycle is equipped with caged ball 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.

Check

2 Support the motorcycle in an upright position using an auxiliary stand. 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

Adjustment

5 Slacken the right-hand fork clamp bolt in the top yoke and remove the left-hand clamp bolt, noting the clutch cable guide secured by the bolt (see illustration). The handlebar clamp bolts can remain in place.

6 Prise the cap off the steering stem nut and remove the nut using a 41 mm socket or spanner (see illustrations).

7 Gently ease the top yoke upwards off the fork tubes and position it clear of the head bearings, using a rag to protect the tank or other components (see illustration).

8 Prise the lockwasher tabs out of the



18.6a Prise off the nut cap ...



18.6b ... then unscrew the nut ...



18.7 ... and ease the yoke up off the forks

1•18 Every 8000 miles (12,000 km) or 12 months

19 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 oil drain plug
- Gearshift pedal bolt
- Footrest and stand bolts
- Engine mounting bolts
- Shock absorber and suspension linkage bolts and swingarm pivot bolts
- Handlebar clamp bolts
- Front axle bolt and axle clamp bolts
- Front fork clamp bolts (top and bottom yoke)
- Rear wheel nut and bearing holder pinch bolt



19.3 Torque wrenches are available in various ranges

- Brake caliper 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 (**see illustration**).

20 Wheels and tyres – general 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 rubber for signs of damage or deterioration and have it replaced if necessary. Also, make sure the valve stem cap is in place and tight.

Every 12,000 miles (18,000 km) or 18 months

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

21 Air filter – replacement



Caution: If the machine is continually ridden in wet or dusty conditions, the filter should be replaced more frequently.

- 1 Remove the fuel tank (*see Chapter 4*).
- 2 Release the clamp securing each sub air cleaner hose to the union on the back of the housing and detach the hoses (**see illustration**).
- 3 On VFR models, release the clamp securing the drain hose to the left-hand side of the housing and detach the hose (**see illustration**).

4 Remove the seven screws securing the air filter cover to the filter housing and remove the cover (**see illustrations**). Remove the filter element from the housing and discard it (**see illustration**). Check the condition of the sub air cleaner element, and clean or replace it as required (**see illustration**).



21.2 Detach the sub-air cleaner hoses (arrowed) ...



21.3 ... and on VFR models, the drain hose



21.4a Remove the cover screws ...



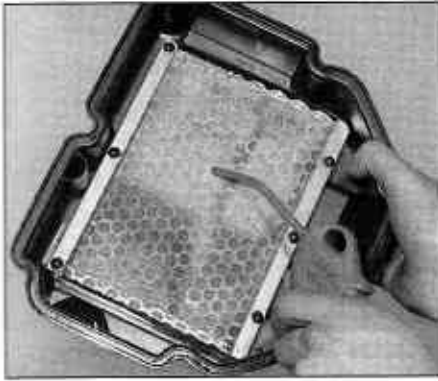
21.4b ... then lift off the cover ...



21.4c ... and remove the air filter



21.4d Check the condition of the sub air cleaner element



21.6 The filter can be cleaned between intervals using compressed air

5 Install the new filter by reversing the removal procedure. Make sure the filter is properly seated, then install the cover and attach the sub air cleaner hoses and drain hose (VFR models only), securing them with the clamps. Install the fuel tank (see Chapter 4).

6 To clean the filter in between replacement service intervals, tap the filter on a hard surface to dislodge any dirt and use compressed air to clear the element, directing the air from the inside (see illustration).



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.

22 Brakes – fluid change



1 The brake fluid should be replaced at the prescribed interval or whenever a master cylinder or caliper overhaul is carried out. Refer to the brake bleeding section in Chapter 7, noting that all old fluid must be pumped from the fluid reservoir and hydraulic line before filling with new fluid.

Every 16,000 miles (24,000 km) or two years

Carry out all the items under the 8000 mile (12,000 km) check, plus the following:

23 Valve clearances – check and adjustment



1 The engine must be completely cool for this maintenance procedure, so let the machine sit overnight before beginning.

2 Remove the spark plugs (see Section 5).

3 Remove the lower fairing (see Chapter 8) and the valve covers (see Chapter 2). Each cylinder is referred to by a number (see Specifications).

4 Make a chart or sketch of all valve positions so that a note of each clearance can be made against the relevant valve.

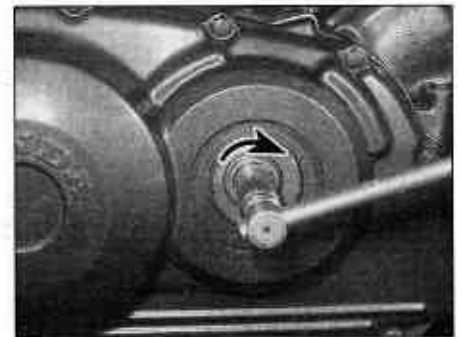
5 Unscrew the timing inspection cover from the right-hand crankcase cover (see illustration). Discard the cover O-ring as a new one must be used. The engine can be turned using a 14 mm spanner or socket on the starter clutch bolt and turning it in a clockwise direction only (see illustration). Alternatively, place the motorcycle on an auxiliary stand so that the rear wheel is off the ground, select a high gear and rotate the rear wheel by hand in its normal direction of rotation.

6 Turn the engine until the “T1” mark on the timing plate aligns with the static timing mark on the crankcase cover, and the index lines on the right-hand end of the camshafts on the rear cylinder head are facing away from the head (see illustrations). If they are facing towards the head, rotate the engine clockwise one full turn until the “T1” mark again aligns with the static timing mark. The camshaft index lines will now be facing away and the no. 1 cylinder is at TDC on the compression stroke.

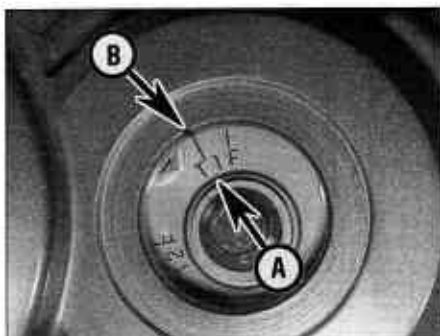
7 With no. 1 cylinder at TDC on the compression stroke, check the clearances on the no.1 cylinder inlet and exhaust valves. Insert a feeler gauge of the same thickness as the correct valve clearance (see Specifications) between the rocker arm and shim of each valve and check that it is a firm sliding 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.



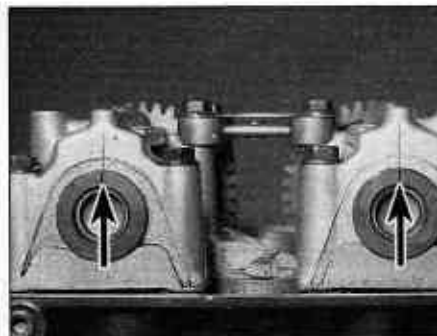
23.5a Remove the timing inspection cover



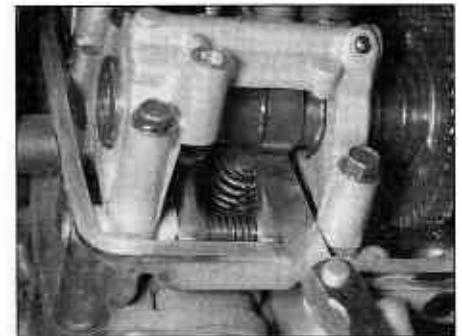
23.5b Turn the engine clockwise using a 14 mm socket on the starter clutch bolt



23.6a Turn the engine until the T1 mark (A) aligns with the static mark (B) . . .

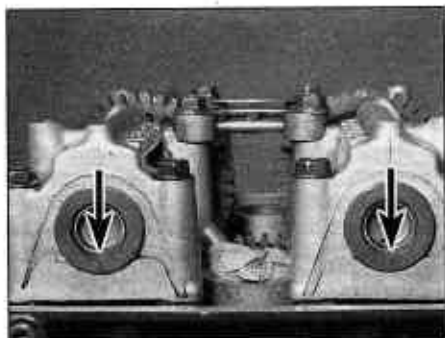


23.6b . . . and the camshaft index lines (arrowed) face away from the head

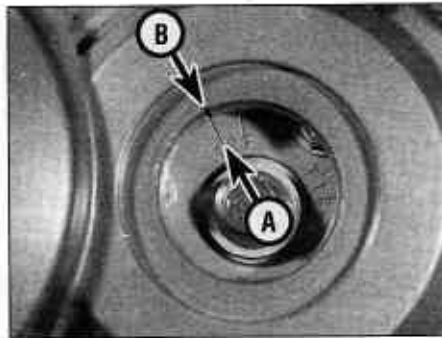


23.7 Measure the valve clearance using a feeler gauge as shown

1•20 Every 16,000 miles (24,000 km) or two years



23.8 Camshafts shown with the index lines (arrowed) facing towards the head



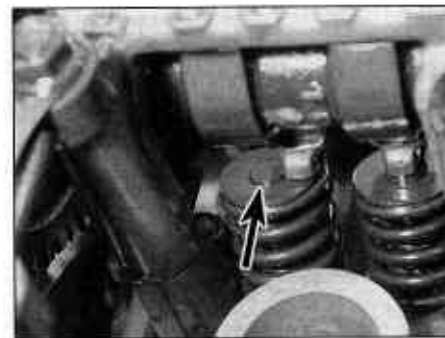
23.9 Align the T2 mark (A) with the static mark (B)



23.12a Slide the rocker arm across . . .

8 Now rotate the engine clockwise until the "T1" mark on the timing plate again aligns with the static timing mark on the crankcase cover, and the index lines on the right-hand end of the camshafts on the rear cylinder head are facing towards the head (see illustration). The no. 3 cylinder is now at TDC on the compression stroke. Measure the valve clearance of the no. 3 cylinder valves using the method described in Step 7.

9 Rotate the engine clockwise until the "T2" mark on the timing plate aligns with the static timing mark on the crankcase cover (see illustration), and the index lines on the right-hand end of the camshafts on the front cylinder head are facing away from the head (see illustration 23.6b). The no. 4 cylinder is now at TDC on the compression stroke.



23.12b . . . to access the shim

Measure the valve clearance of the no. 4 cylinder valves using the method described in Step 7.

10 Rotate the engine clockwise until the "T2" mark on the timing plate again aligns with the static timing mark on the crankcase cover, and the index lines on the right-hand end of the camshafts on the front cylinder head are facing towards the head (see illustration 23.8). The no. 2 cylinder is now at TDC on the compression stroke. Measure the valve clearance of the no. 2 cylinder valves using the method described in Step 7.

11 When all clearances have been measured and charted, identify whether the clearance on any valve falls outside the specified range. If any do, the shim between the rocker arm and the valve must be replaced with one of a thickness which will restore the correct clearance.

12 Make sure the cylinder being worked on is at TDC on the compression stroke before removing the shim. Place rags over the spark plug holes and the cam gear train holes to prevent a shim from dropping into the engine on removal. To access the shim being replaced, slide the rocker arm above that shim along its shaft and against the pressure of the spring, until the shim is accessible (see illustrations).

Caution: If the valve clearance is tight, it is possible that the shim may pop out when the rocker arm is slid across.

13 If available, use a magnet to remove the

shim (see illustration). Otherwise, put a dab of grease onto a small screwdriver and remove the shim – it will stick to the grease (see illustration). Do not allow the shim to fall into the engine.

14 Measure the shim using a micrometer to determine its size (see illustration).

15 Calculate the required replacement shim by using the formula $a = b - c + d$, where a is the required shim size, b is the measured valve clearance, c is the specified valve clearance, and d is the existing shim thickness. For example:

The measured clearance of a no. 1 cylinder inlet valve is 0.20 mm, so $b = 0.20$.

The specified clearance range for an inlet valve is 0.12 to 0.18 mm, the mid-point being 0.15 mm, so $c = 0.15$.

The thickness of the existing shim is 2.200 mm, so $d = 2.2$.

*Therefore, the required replacement shim $a = 0.20 - 0.15 + 2.2$
($a = 2.25$ mm)*

Note: If the required replacement shim is greater than 2.800 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).



23.13a Remove the shim using a magnet . . .



23.13b . . . or a screwdriver with a dab of grease



23.14 Measure the shim using a micrometer

1•22 Every 24,000 miles (36,000 km) or two years

mixed with a flushing compound. Make sure the flushing compound is compatible with aluminium components, and follow the manufacturer's instructions carefully.

7 Start the engine and allow it to reach normal operating temperature. Let it run for about ten minutes.

8 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.

9 Drain the system once again.

10 Fill the system with clean water and repeat the procedure in Steps 7 to 9.

Refilling

11 Fit a new sealing washer to each drain plug and tighten them securely.

12 Fill the system 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.

13 When the system is full (all the way up to the base of the upper radiator filler neck), 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.

14 If necessary, top up the coolant level to the base of the upper radiator filler neck and install the pressure cap (see illustration). Also top up the coolant reservoir to the UPPER level mark (see *Daily (pre-ride) checks*).

15 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 1. 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.

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



24.14 Make sure the pressure cap locates properly under the rim of the filler neck

17 Check the system for leaks.

18 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.

Non-scheduled maintenance

25 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 an 8 mm threaded adapter for the spark plug hole will be required. 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 23) and that the cylinder head bolts 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.

26 Engine – oil pressure check

1 The oil pressure warning light should come on when the ignition (main) switch is turned ON and extinguish a few seconds after the engine is started – this serves as a check that the warning light bulb is sound. If the oil

pressure light comes on whilst the engine is running, low oil pressure is indicated – stop the engine immediately and carry out an oil level check (see *Daily (pre-ride) checks*).

2 An oil pressure check must be carried out if the warning light comes on when the engine is running yet the oil level is good (Step 1). It can also provide useful information about the condition of the engine's lubrication system.

3 To check the oil pressure, a suitable gauge (which screws into the crankcase) will be needed. Honda provide a tool (part no. 07501-4220100) for this purpose.

4 Warm the engine up to normal operating temperature then stop it.

5 Remove the oil pressure switch (see Chapter 9) and swiftly screw the adapter into the crankcase threads. Connect the oil pressure gauge to the adapter.

6 Start the engine and briefly increase the engine speed to 5000 rpm whilst watching the gauge reading. The oil pressure should be similar to that given in the Specifications at the start of this Chapter.

7 If the pressure is significantly lower than the standard, either the pressure regulator is stuck open, the oil pump is faulty, the oil strainer or filter is blocked, or there is other engine damage. Begin diagnosis by checking the oil filter, strainer and regulator, 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.

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

9 Stop the engine and unscrew the gauge and adapter from the crankcase.

10 Install the oil pressure switch (see Chapter 9). Check the oil level (see *Daily (pre-ride) checks*).

27 Wheel bearings – check

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

2 Support the motorcycle upright using an auxiliary stand so that the wheel being checked is off the ground. Check for any play in the bearings by pushing and pulling the wheel against the axle (see illustration). Also rotate 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).



27.2 Checking for play in the wheel bearings

Chapter 2

Engine, clutch and transmission

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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

General

Type	Four-stroke 90° V-four
Capacity	399 cc
Bore	55.0 mm
Stroke	42.0 mm
Compression ratio	11.3 to 1
Firing order	1-4-3-2
Cylinder numbering	
Rear left	1
Front left	2
Rear right	3
Front right	4
Cooling system	Liquid cooled
Clutch	Wet multi-plate
Transmission	Six-speed constant mesh
Final drive	Chain

↑
FRONT

2	4
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1	3
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28 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.

29 Swingarm and suspension linkage bearings – re-greasing



1 Over a period of time the grease will harden or dirt will penetrate the bearings due to failed dust seals.

2 The swingarm is not equipped with grease nipples. Remove the swingarm and suspension linkage as described in Chapter 6 for greasing of the bearings.

30 Brake caliper and master cylinder seals – replacement



1 Brake seals will deteriorate over a period of

time and lose their effectiveness, leading to sticking operation or fluid loss, or allowing the ingress of air and dirt. Refer to Chapter 7 and dismantle the components for seal replacement.

31 Brake hoses – replacement



1 The hoses will in time deteriorate with age and should be replaced regardless of their apparent condition.

2 Refer to Chapter 7 and disconnect the brake hoses from the master cylinders and calipers. Always replace the banjo union sealing washers with new ones.

32 Fuel hoses – replacement



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 delivery and vacuum hoses should be replaced regardless of their condition.

2 Remove the fuel tank (see Chapter 4). Disconnect the fuel hoses from the fuel tap and from the carburetors, noting the routing of each hose and where it connects (see Chapter 4 if required). It is advisable to make a sketch of the various hoses before removing them to ensure they are correctly installed.

3 Secure each new hose to its unions using new clamps. Run the engine and check for leaks before taking the machine out on the road.

33 Front forks – oil change



1 Fork oil degrades over a period of time and loses its damping qualities. Refer to Chapter 6 for front fork removal, oil draining and refilling, following the relevant steps. The forks do not need to be completely disassembled.

2•2 Engine, clutch and transmission

Camshafts

Inlet lobe height	
Standard	32.717 to 32.957 mm
Service limit (min)	32.670 mm
Exhaust lobe height	
Standard	32.428 to 32.668 mm
Service limit (min)	32.38 mm
Journal diameter	
VFR400	
Standard	27.939 to 27.960 mm
Service limit (min)	27.93 mm
RVF400	
Standard	27.959 to 27.980 mm
Service limit (min)	27.93 mm
Journal holder diameter	
Standard	28.000 to 28.021 mm
Service limit (min)	28.03 mm
Journal oil clearance	
VFR400	
Standard	0.040 to 0.082 mm
Service limit (max)	0.092 mm
RVF400	
Standard	0.020 to 0.062 mm
Service limit (max)	0.072 mm
Runout (max)	0.03 mm

Rockers

Rocker arm bore diameter	
Standard	8.500 to 8.515 mm
Service limit (max)	8.53 mm
Rocker arm shaft diameter	
Standard	8.466 to 8.484 mm
Service limit (min)	8.46 mm

Valves, guides and springs

Valve clearances	See Chapter 1
Inlet valve	
Stem diameter	
Standard	4.475 to 4.490 mm
Service limit (min)	4.47 mm
Guide bore diameter	
Standard	4.500 to 4.512 mm
Service limit (max)	4.56 mm
Stem-to-guide clearance	
Standard	0.010 to 0.037 mm
Service limit (max)	0.09 mm
Seat width	1.70 to 2.30 mm
Valve guide height above cylinder head	10.0 mm
Exhaust valve	
Stem diameter	
VFR400	
Standard	4.465 to 4.480 mm
Service limit (min)	4.46 mm
RVF400	
Standard	4.475 to 4.485 mm
Service limit (min)	4.46 mm
Guide bore diameter	
Standard	4.500 to 4.512 mm
Service limit (max)	4.56 mm
Stem-to-guide clearance	
Standard	0.020 to 0.047 mm
Service limit (max)	0.12 mm
Seat width	1.70 to 2.30 mm
Valve guide height above cylinder head	10.0 mm
Valve springs free length (inlet and exhaust)	
Inner spring	
Standard	31.4 mm
Service limit (min)	30.2 mm
Outer spring	
Standard	34.4 mm
Service limit (min)	33.2 mm

2•4 Engine, clutch and transmission

Pistons

Piston diameter (measured 10 mm up from skirt, at 90° to piston pin axis)	
Standard	54.970 to 54.990 mm
Service limit (min)	54.92 mm
Piston-to-bore clearance	
Standard	0.010 to 0.045 mm
Service limit (max)	0.10 mm
Piston pin diameter	
Standard	13.994 to 14.000 mm
Service limit (min)	13.98 mm
Piston pin bore diameter in piston	
Standard	14.002 to 14.008 mm
Service limit (max)	14.02 mm
Piston pin-to-piston pin bore clearance	
Standard	0.002 to 0.014 mm
Service limit (max)	0.04 mm

Piston rings

Ring end gap (installed)	
Top and second rings	
Standard	0.18 to 0.33 mm
Service limit (max)	0.65 mm
Oil ring side-rail	
Standard	0.20 to 0.80 mm
Service limit (max)	0.95 mm
Ring-to-groove clearance	
Top ring	
Standard	0.015 to 0.050 mm
Service limit (max)	0.10 mm
2nd ring	
Standard	0.015 to 0.045 mm
Service limit (max)	0.10 mm
Ring identification	
Top ring	'R' (facing up)
2nd ring	'•' mark or 'RN' (facing up)

Crankshaft and bearings

Main bearing oil clearance	
Standard	0.025 to 0.049 mm
Service limit (max)	0.07 mm
Runout (max)	0.03 mm

Transmission

Gear ratios (no. of teeth)	
VFR400	
Primary reduction	2.117 to 1 (72/34T)
Final reduction	2.666 to 1 (40/15T)
1st gear	2.928 to 1 (41/14T)
2nd gear	2.166 to 1 (39/18T)
3rd gear	1.800 to 1 (36/20T)
4th gear	1.591 to 1 (35/22T)
5th gear	1.435 to 1 (33/23T)
6th gear	1.318 to 1 (29/22T)
RVF400	
Primary reduction	2.117 to 1 (72/34T)
Final reduction	2.533 to 1 (38/15T)
1st gear	3.307 to 1 (43/13T)
2nd gear	2.352 to 1 (40/17T)
3rd gear	1.875 to 1 (30/16T)
4th gear	1.591 to 1 (35/22T)
5th gear	1.435 to 1 (33/23T)
6th gear	1.318 to 1 (29/22T)
Input shaft 5th and 6th gears ID	
Standard	28.000 to 28.020 mm
Service limit (max)	28.04 mm
Input shaft 5th and 6th gears bush OD	
Standard	27.959 to 27.980 mm
Service limit (min)	27.94 mm

2•6 Engine, clutch and transmission

Torque settings – specific components (continued)

Gearchange shaft centralising spring locating pin	23 Nm
Selector drum guide plate bolts	12 Nm
Crankcase 6 mm bolts	12 Nm
Crankcase 8 mm bolts	23 Nm
Crankcase 10 mm bolt	40 Nm
Connecting rod cap nuts	24 Nm
Selector fork shaft bolt	12 Nm

Torque settings – non-specified components

Note: Where a specific setting is not given for a particular bolt/nut, these general settings apply. The dimension given applies to the diameter of the thread, not the head.

5 mm bolt/nut	5 Nm
6 mm bolt/nut	10 Nm
8 mm bolt/nut	22 Nm
10 mm bolt/nut	35 Nm
12 mm bolt/nut	55 Nm
6 mm flange bolt with 8 mm head	9 Nm
6 mm flange bolt/nut with 10 mm head	12 Nm
8 mm flange bolt/nut	27 Nm
10 mm flange bolt/nut	40 Nm

1 General information

The engine/transmission unit is a liquid-cooled 90°V-four. The sixteen valves are operated by double overhead camshafts which are gear driven off the crankshaft. The engine/transmission assembly is constructed from aluminium alloy. The crankcase is divided horizontally.

The crankcase incorporates a wet sump, pressure-fed lubrication system which uses a chain-driven oil pump, an oil filter and by-pass valve assembly, a relief valve and an oil pressure switch. On UK VFR L and M models, the lubrication system includes a cooling circuit fed by a second rotor in the oil pump.

The alternator is on the left-hand end of the crankshaft and the starter clutch is on the right-hand end. The oil pump is chain driven off the crankshaft, and the water pump is driven by the oil pump.

Power from the crankshaft is routed to the transmission via the clutch. The clutch is of the wet, multi-plate type and is gear-driven off the crankshaft. The transmission is a six-speed constant-mesh unit. Final drive to the rear wheel is by chain and sprockets.

2 Operations possible with the engine in the frame

The components and assemblies listed below can be removed without having to remove the engine/transmission assembly from the frame. If however, a number of areas require attention at the same time, removal of the engine is recommended.

Valve cover
Camshafts and rockers
Camshaft drive gears
Cylinder heads
Ignition rotor and pulse generator coil assembly
Clutch
Gearchange mechanism (external components)
Alternator
Oil filter and oil cooler (where fitted)
Oil sump, oil pump, oil strainer and oil pressure relief valve
Starter motor
Starter clutch
Water pump

3 Operations requiring engine removal

It is necessary to remove the engine/transmission assembly from the frame to gain access to the following components.

Pistons, piston rings and cylinder bores
Transmission shafts
Selector drum and forks
Crankshaft and bearings
Connecting rods and bearings

4 Major engine repair – general note

1 It is not always easy to determine when or if an engine should be completely overhauled, as a number of factors must be considered.
2 High mileage is not necessarily an indication that an overhaul is needed, while low mileage, on the other hand, does not

preclude the need for an overhaul. Frequency of servicing is probably the single most important consideration. An engine that has regular and frequent oil and filter changes, as well as other required maintenance, will most likely give many miles of reliable service. Conversely, a neglected engine, or one which has not been run in properly, may require an overhaul very early in its life.

3 Exhaust smoke and excessive oil consumption are both indications that piston rings and/or valve guides are in need of attention, although make sure that the fault is not due to oil leakage.

4 If the engine is making obvious knocking or rumbling noises, the connecting rod and/or main bearings are probably at fault.

5 Loss of power, rough running, excessive valve train noise and high fuel consumption rates may also point to the need for an overhaul, especially if they are all present at the same time. If a complete tune-up does not remedy the situation, major mechanical work is the only solution.

6 An engine overhaul generally involves restoring the internal parts to the specifications of a new engine. The piston rings and main and connecting rod bearings are usually replaced and the cylinder walls honed during a major overhaul. Generally the valve seats are re-ground, since they are usually in less than perfect condition at this point. The end result should be a like new engine that will give as many trouble-free miles as the original.

7 Before beginning the engine overhaul, read through the related procedures to familiarise yourself with the scope and requirements of the job. Overhauling an engine is not all that difficult, but it is time consuming. Plan on the motorcycle being tied up for a minimum of two weeks. Check on the availability of parts

2•8 Engine, clutch and transmission



5.13 Remove the bolt (arrowed) securing the bracket and position it clear



5.14 Pull all four HT leads off the spark plugs



5.15 Pull back the cover and remove the nut securing the starter motor lead

securing the connector bracket to the underside of the frame and position the bracket clear of the engine (see illustration). The remaining connectors and headlight relay (where fitted) can be left in the bracket or disconnected as required.

14 Disconnect all the HT leads from the spark plugs and secure them clear of the engine (see illustration). If the HT leads don't have their cylinder number marked on them, label each lead to ensure correct reconnection.

15 Pull back the rubber cover on the starter motor terminal, then unscrew the nut and disconnect the lead (see illustration).

16 Note the alignment punch marks between the gearchange linkage arm and the shaft so that they can be correctly aligned on installation. Unscrew the linkage arm pinch bolt and slide the arm off the shaft (see illustration).

17 Unscrew the bolt securing the clutch cable bracket to the alternator cover, then detach the bracket and slip the cable end out of the release lever on the engine sprocket cover (see illustration).

18 Remove the front sprocket (see Chapter 6).

19 On VFR models, remove the rubber heat guard from between the top of the engine and

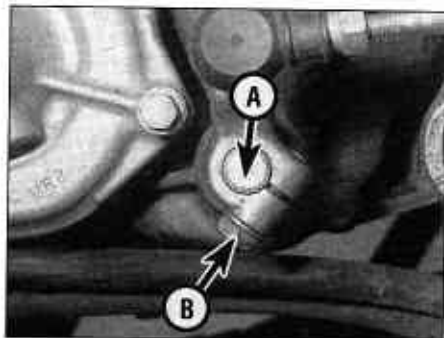
the front of the frame, noting carefully how it fits.

20 On UK VFR L and M models, unscrew the two bolts securing each oil cooler pipe union to the crankcase. Also unscrew the pipe bracket bolts, then detach the pipes from the engine. If preferred, remove the entire oil cooler with its pipes (see Section 7).

21 At this point, position an hydraulic or mechanical jack under the engine with a block of wood between the jack head and sump. Make sure the jack is centrally positioned so the engine will not topple in any direction when the last mounting bolt is removed. Take the weight of the engine on the jack.

22 Unscrew the nut on the left-hand end of the lower rear engine mounting bolt (see illustration). Unscrew the adjusting bolt locknut on the right-hand end of the bolt using a suitable peg spanner (see Note above), then unscrew the adjusting bolt and the mounting bolt together using an Allen key in the mounting bolt head, which engages with the adjuster bolt (see illustrations). Withdraw the mounting bolt with the adjuster bolt from the right-hand side. Note the spacer between the engine and the frame, and retrieve it after the engine has been moved forward (see illustration 5.26a).

23 Unscrew the upper rear mounting bolt, then unscrew the adjusting bolt locknut using the peg spanner. Unscrew the



5.16 Note the alignment of the punch marks (A), then remove the bolt (B) and slide the arm off the shaft



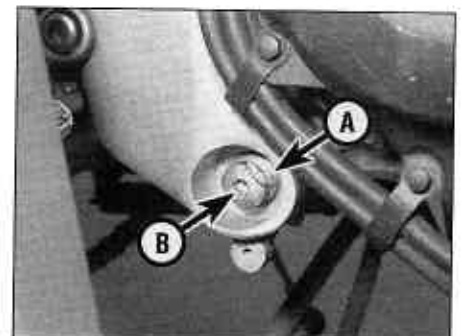
5.17 Unscrew the bolt (A) and detach the cable end (B) from the lever



5.22a Remove the nut from the left-hand end of the bolt . . .



5.22b . . . then remove the locknut . . .



5.22c . . . and unscrew the adjuster bolt (A) and the mounting bolt (B) together

2•10 Engine, clutch and transmission



5.26a Do not forget to install the spacer



5.26b Grease the mounting bolt . . .



5.26c . . . then engage the adjuster bolt with the mounting bolt head . . .



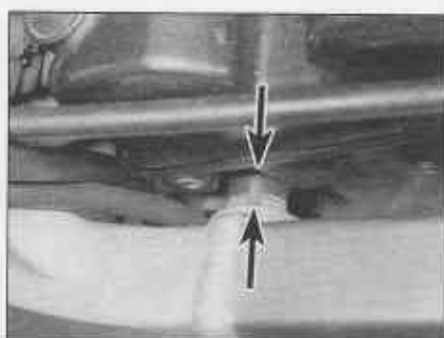
5.26d . . . and thread the adjuster bolt finger-tight into the frame



5.26e Tighten the upper . . .



5.26f . . . and lower adjuster bolts to the specified torque



5.26g Make a reference mark between the upper adjuster bolt and the frame (arrows) . . .



5.26h . . . and tighten the locknut to the specified torque



5.26i Now make a reference mark between the lower adjuster bolt and the frame (arrows) . . .



5.26j . . . and tighten the locknut to the specified torque

the bike, it may be easier, or necessary, to lift the bike frame up off the supported engine.

Installation

26 Installation is the reverse of removal, noting the following points:

- Make sure no wires, cables or hoses become trapped between the engine and the frame when installing the engine.
- Many of the engine mounting bolts are of different size and length. Make sure the correct bolt is installed in its correct location. Do not forget to install the spacer between the engine and frame on the lower rear mounting on the right-hand side (see illustration 5.26a).
- Apply a thin coat of grease to the lower rear mounting bolt, then slide the adjuster bolt onto the mounting bolt and engage them (see illustrations 5.26b and c). Slide the mounting bolt with the adjuster bolt fully into the frame from the right-hand side, making sure the spacer remains in place and the bolt passes through it - tighten it finger-tight (see illustration 5.26d).
- Next install the adjuster bolt into the upper rear right-hand mounting and tighten it finger-tight (see illustration 5.23c).
- Install the three left-hand side mounting bolts. On VFR models, make sure the 15 mm spacer is fitted with the middle bolt and that the front bolt secures the

radiator/front cylinder coil bracket, and tighten them finger-tight (see illustrations 5.24a and b). On RVF models, make sure the spacers are fitted with the front bolts (see illustrations 5.24e and f).

- f) Install the two right-hand side mounting bolts. On VFR models, make sure the 9 mm spacer is fitted with the middle bolt and that the 3.5 mm spacer is fitted with the front bolt, and tighten them finger-tight (see illustrations 5.24c and d). On RVF models, make sure the spacer is fitted with the lower bolt.
- g) Tighten the upper adjuster bolt using an Allen key, and the lower adjuster bolt using the head of its mounting bolt, to the torque setting specified at the beginning of the Chapter (see illustrations 5.26e and f). Make a reference mark between each adjuster bolt and the frame as a check against the adjuster bolt turning while the locknut is being tightened, then fit the locknuts and tighten them to the specified torque setting using the peg spanner (see illustrations 5.26g, h, i and j). Check that the reference marks still align – if they don't, repeat the installation and tightening procedure. Now fit the bolt into the upper adjuster bolt, and the nut onto the left-hand end of the lower mounting bolt (see illustrations 5.23a and 5.22b) and tighten them to the specified torque setting.
- h) Tighten the remaining mounting bolts, three on the left-hand side and two on the right-hand side to the specified torque setting.
- i) Use new gaskets on the exhaust pipe connections.
- j) Align the punch marks on the gearchange lever linkage arm and shaft when installing the arm onto the shaft, and tighten the pinch bolt securely (see illustration 5.16).
- k) Make sure all wires, cables and hoses are correctly routed and connected, and secured by any clips or ties.
- l) Refill the engine with oil and coolant (see Chapter 1).
- m) Adjust the throttle and clutch cable freeplay and idle speed (see Chapter 1).
- n) Adjust the drive chain (see Chapter 1).
- o) Start the engine and check that there are no oil or coolant leaks before installing the fairing panels.

6 Engine disassembly and reassembly – general information

Disassembly

1 Before disassembling the engine, the external surfaces of the unit should be thoroughly cleaned and degreased. This will prevent contamination of the engine internals,

and will also make working a lot easier and cleaner. A high flash-point solvent, such as paraffin (kerosene) can be used, or better still, a proprietary engine degreaser. Use old paintbrushes and toothbrushes to work the solvent into the various recesses of the engine casings. Take care to exclude solvent or water from the electrical components and inlet and exhaust ports.



Warning: The use of petrol (gasoline) as a cleaning agent should be avoided because of the risk of fire.

2 When clean and dry, arrange the unit on the workbench, leaving suitable clear area for working. Gather a selection of small containers and plastic bags so that parts can be grouped together in an easily identifiable manner. Some paper and a pen should be on hand to permit notes to be made and labels attached where necessary. A supply of clean rag is also required.

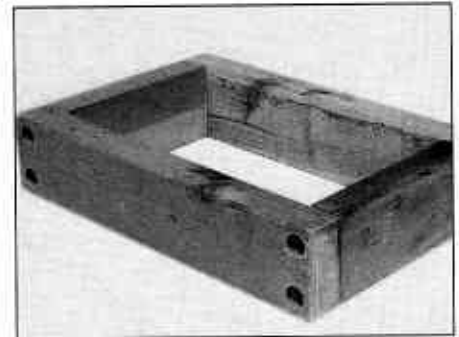
3 Before commencing work, read through the appropriate section so that some idea of the necessary procedure can be gained. When removing components it should be noted that great force is seldom required, unless specified. In many cases, a component's reluctance to be removed is indicative of an incorrect approach or removal method – if in any doubt, re-check with the text.

4 An engine support stand made from short lengths of 2 x 4 inch wood bolted together into a rectangle will help support the engine (see illustration). The perimeter of the mount should be just big enough to accommodate the sump within it so that the engine rests on its crankcase.

5 When disassembling the engine, keep 'mated' parts together (including gears, cylinder bores, pistons, connecting rods, valves, etc. that have been in contact with each other during engine operation). These 'mated' parts must be reused or replaced as an assembly.

6 A complete engine/transmission disassembly should be done in the following general order with reference to the appropriate Sections.

Remove the valve covers
Remove the camshafts and rockers
Remove the cylinder heads
Remove the starter clutch
Remove the clutch
Remove the alternator (see Chapter 9)
Remove the starter motor (see Chapter 9)
Remove the water pump (see Chapter 3)
Remove the pulse generator coil assembly (see Chapter 4)
Remove the gearchange mechanism external components
Remove the oil sump
Remove the oil pump
Separate the crankcase halves
Remove the connecting rods and pistons
Remove the crankshaft
Remove the transmission shafts
Remove the selector drum and forks



6.4 An engine support made from pieces of 2 x 4 inch wood

Reassembly

7 Reassembly is accomplished by reversing the general disassembly sequence.

7 Oil cooler and pipes (UK VFR L and M models) – removal and installation

Note: The oil cooler can be removed with the engine in the frame. If the engine has been removed, ignore the steps which do not apply.

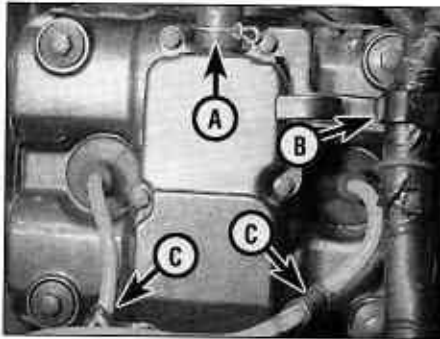
Removal

- 1 Remove the lower fairing panel (see Chapter 8).
- 2 Drain the engine oil (see Chapter 1).
- 3 To remove the cooler without its feed and return pipes, unscrew the bolts securing the cooler to the pipe unions and detach the pipes. Now unscrew the cooler mounting bolt and remove the cooler. Discard the union O-rings as new ones must be removed.
- 4 To remove the cooler with its feed and return pipes, unscrew the two bolts securing each pipe union to the crankcase. Also unscrew the pipe bracket bolts, then detach the pipes from the engine. Now unscrew the cooler mounting bolt and remove the cooler and pipes. Discard the union O-rings as new ones must be used.
- 5 To remove the pipes but leave the cooler in place, unscrew the bolts securing the pipe unions to the cooler, then unscrew the two bolts securing each pipe union to the crankcase. Also unscrew the pipe bracket bolts, then detach the pipes from the engine and cooler and remove them. Discard the union O-rings as new ones must be used.

Installation

6 Installation is the reverse of removal, noting the following:

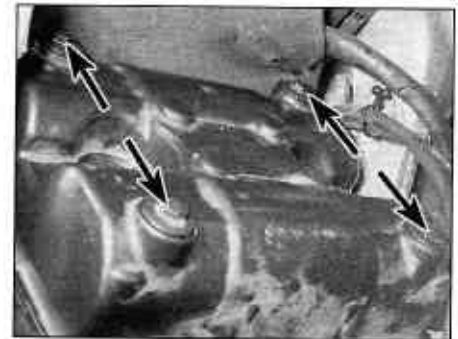
- a) Always use new O-rings on the pipe unions.
- b) Check the condition of the cooler mounting grommet and replace it if it is damaged or deteriorated.
- c) Fill the engine with oil (see Chapter 1).



8.3 Detach the breather hose (A) from its union, and the wiring loom (B) and HT leads (C) from their clips



8.4 Pull the caps off the spark plugs



8.5 The valve covers are secured by four bolts (arrowed)

8 Valve covers – removal and installation

Note: The valve covers can be removed with the engine in the frame. If the engine has been removed, ignore the steps which do not apply.

Removal

- 1 Remove the lower fairing (see Chapter 8).
- 2 To access the front cylinders valve cover, remove the radiators (see Chapter 3).
- 3 To access the rear cylinders valve cover, remove the fuel tank (see Chapter 4). Release the clamp securing the breather hose to the

breather and detach the hose. Also release any cables, leads and hoses from their clips (see illustration).

- 4 Disconnect the spark plug caps from the plugs and secure them clear of the engine, noting which fits where (see illustration).

- 5 Unscrew the four bolts securing the valve cover then lift the cover off the cylinder head (see illustration). If it is stuck, do not try to lever it off with a screwdriver. Tap it gently around the sides with a rubber hammer or block of wood to dislodge it. Also remove the gasket. Note the rubber washers fitted in the cover and remove them if they are loose.

Installation

- 6 Examine the valve cover gasket and the rubber washers for signs of damage or deterioration and replace them if necessary.

- 7 Clean the mating surfaces of the cylinder head and the valve cover with lacquer thinner, acetone or brake system cleaner.

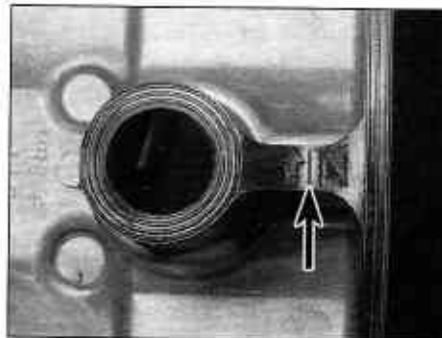
- 8 Apply a smear of a suitable sealant into the grooves in the valve cover. Install the gasket onto the valve cover, making sure it fits correctly into the groove, and that the arrow next to the "IN" mark points to the same side as the "IN" mark on the top of the front cylinder valve cover or the breather hose union on the top of the rear cylinder cover (see illustrations).

- 9 The front cylinders valve cover must be installed with the "IN" mark to the rear, facing the inlet side. The rear cylinder valve cover must be installed with the breather hose union pointing to the front. Position the valve cover on the cylinder head, making sure the gasket stays in place (see illustration). If removed, fit the rubber washers into the cover, using new ones if required, and making sure they are installed with the "UP" mark facing up (see illustration). Install the cover bolts and tighten them to the torque setting specified at the beginning of the Chapter (see illustration).

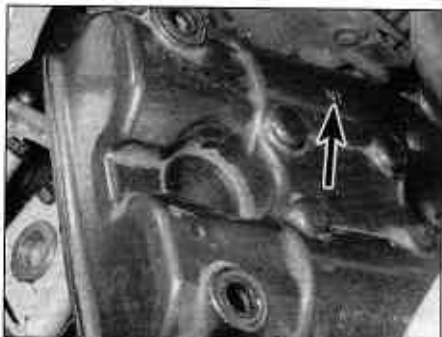
- 10 Install the remaining components in the reverse order of removal.



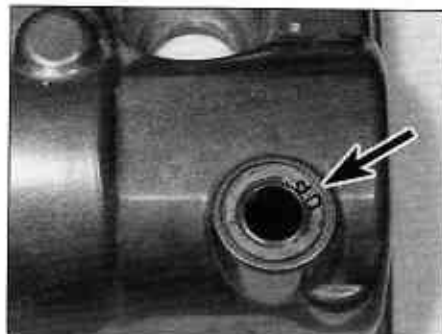
8.8a Make sure the gasket locates in the groove . . .



8.8b . . . and the arrow next to the IN mark faces the inlet side of the cover as described



8.9a Install the valve cover, noting the IN mark (arrowed) on the front cover

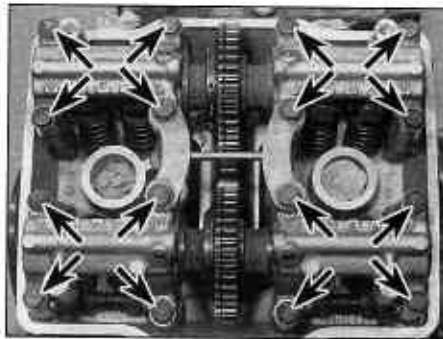


8.9b Make sure the UP mark faces up . . .



8.9c . . . then install the bolts and tighten them to the specified torque

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9.6a Camshaft holder and oil pipe assembly bolts (arrowed)



9.6b Remove the oil pipe assembly . . .



9.6c . . . then lift off the camshaft and holders together

6 Unscrew the camshaft holder bolts for the camshaft being worked on and all the bolts securing the central oil pipe and plate assembly, evenly and a little at a time in a criss-cross pattern, until they are all loose (**see illustration**). Remove the bolts, noting their different sizes, and the oil pipe plates and the oil pipes, then lift off the camshaft holders and camshaft together, noting how they fit (**see illustrations**). To separate the camshaft from the holders, align the cam lobe with the lobe-shaped hole in the holder, then remove the camshaft, noting how it fits (**see illustration**). Retrieve the dowels from either the holder or the cylinder head if they are

loose. The camshafts are marked for identification. For the front cylinder head, the inlet camshaft is marked FR IN and the exhaust camshaft is marked FR EX. For the rear cylinder head the inlet camshaft is marked RR IN and the exhaust camshaft is marked RR EX (**see illustration**). **Note:** To avoid the possibility of confusing related camshafts and holders, do not separate them unless required for inspection. If they are separated, make sure that all front cylinder components are stored separately from the rear cylinder components.

Caution: If the bearing cap bolts aren't loosened evenly, the camshaft may bind.

Inspection

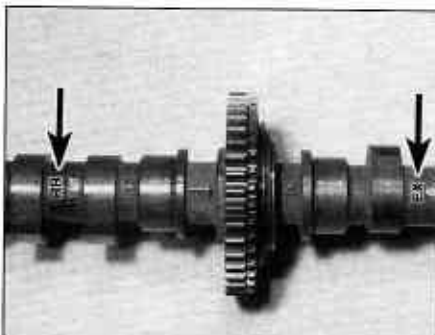
7 Inspect the bearing surfaces of the camshaft holders and the corresponding journals on the camshaft. Look for score marks, deep scratches and evidence of spalling (a pitted appearance) (**see illustration**).

8 Check the camshaft lobes for heat discoloration (blue appearance), score marks, chipped areas, flat spots and spalling (**see illustration**). Measure the height of each lobe with a micrometer (**see illustration**) and compare the results to the minimum lobe height listed in this Chapter's Specifications. If damage is noted or wear is excessive, the camshaft must be replaced. Also, be sure to check the condition of the rockers (see Section 10).

9 Check the amount of camshaft runout by supporting each end of the camshaft on V-blocks, and measuring any runout using a dial gauge. If the runout exceeds the specified limit the camshaft must be replaced.



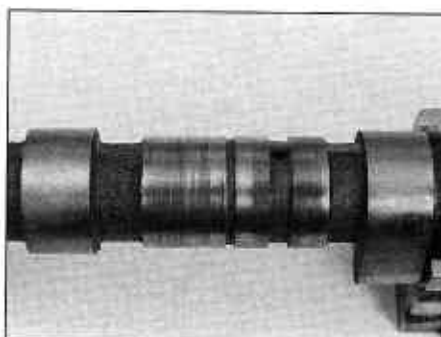
9.6d Separate the camshaft from the holders if required



9.6e Each camshaft is marked according to its location (arrows)



Refer to Tools and Workshop Tips in the Reference section for details of how to read a micrometer and dial gauge.



9.7 Check the journal surfaces of the camshaft for scratches or wear

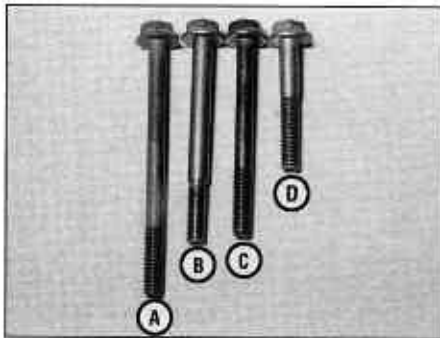


9.8a Check the lobes of the camshaft for wear - here's an example of damage requiring camshaft repair or renewal

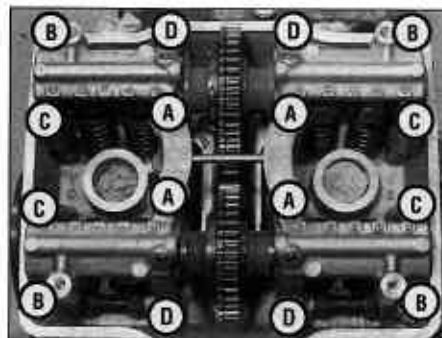


9.8b Measure the height of the camshaft lobes with a micrometer

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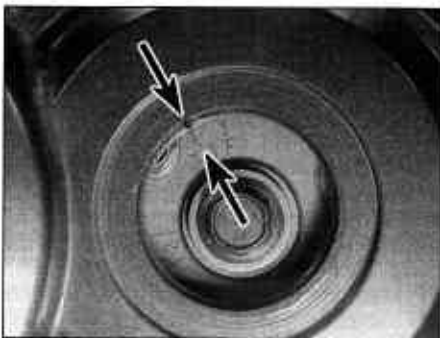
9.18b Install each bolt . . .



9.18c . . . in its correct location as shown



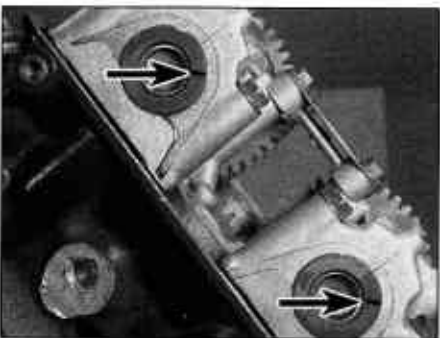
9.18d Tighten all the bolts as described to the specified torque



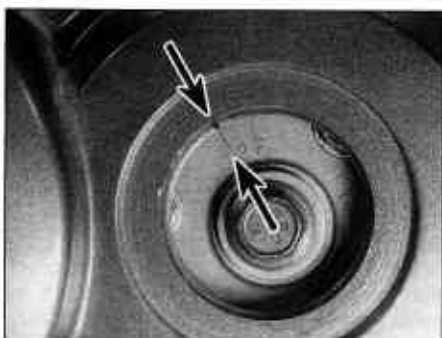
9.19a With the T1 mark aligned with the static mark (arrowed) . . .



9.19b . . . and the rear cylinder camshaft lines facing away from the head . . .



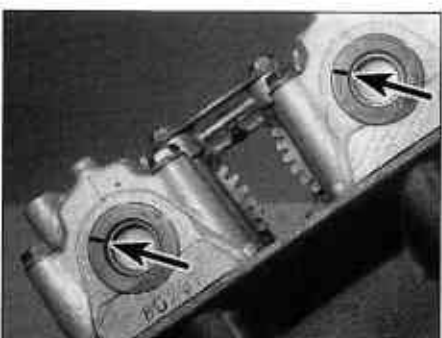
9.19c . . . the front cylinder camshaft lines should face as shown (arrowed)



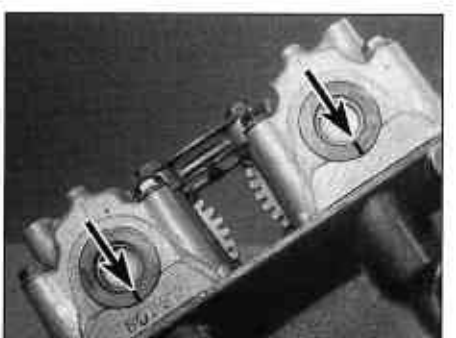
9.19d With the T2 mark aligned with the static mark (arrowed) . . .



9.19e . . . the front cylinder camshaft lines should face away from the head (arrowed) . . .



9.19f . . . and the rear cylinder camshaft lines should face as shown (arrowed)

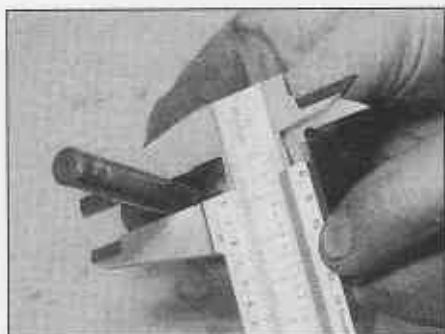


9.19g With the rear cylinder camshaft lines facing the head (arrowed) . . .

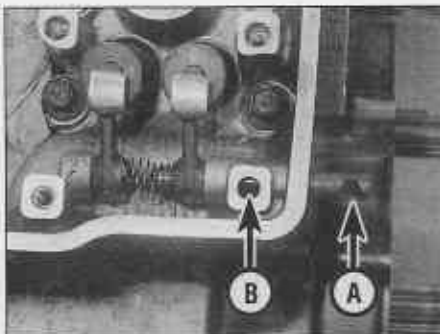
cylinder) holder. This is to compress the valves on those cylinders not at TDC on the compression stroke without placing undue strain on the camshafts. Tighten the bolts evenly and a little at a time in a criss-cross pattern, to the torque setting specified at the beginning of the Chapter (see illustration). Whilst tightening the bolts, make sure the holders are being pulled squarely down and are not binding on the dowels. Check that each camshaft is not pinched by turning the engine a few degrees in each direction.

Caution: The holders are likely to break if they are not tightened down evenly and squarely.

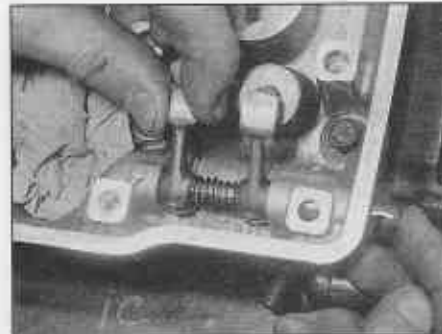
19 With all holders tightened down, check that the valve timing marks align as follows. Start with the "T1" mark aligned with the static mark and the index lines on the rear cylinder camshafts facing away from the head (see illustrations). The front cylinder camshaft lines should face forwards at 3 o'clock (see illustration). Now turn the engine 90° clockwise until the "T2" mark aligns with the static mark (see illustration). The front cylinder camshaft lines should now face away from the head and the rear cylinder camshaft lines should face back at about 10 o'clock (see illustrations). Now turn the engine 270° clockwise until the "T1" mark again aligns with the static mark (see illustration 9.19a). The rear cylinder camshaft lines should now face



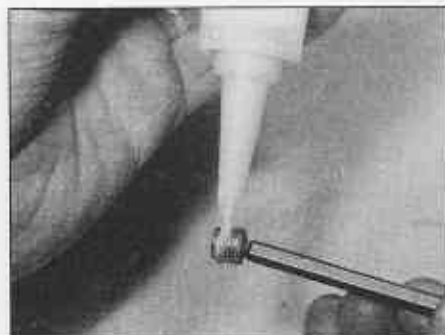
10.6 Measure the diameter of the rocker shaft



10.7a Align the cutout (A) in the shaft with the bolt hole (B) . . .



10.7b . . . and slide the shaft home



10.7c Apply a sealant to the plug threads . . .



10.7d . . . and install it in the head

8 Lubricate each shim with molybdenum disulphide oil (a 50/50 mixture of molybdenum disulphide grease and engine oil) and install it in the recess in the top of the valve spring retainer, making sure it is returned to its original position (*see illustration*). **Note:** It is most important that the shims are returned to their original valves otherwise the valve clearances will be inaccurate. Swing the rocker arm down onto the valve (*see illustration*).

9 Check that each arm moves freely on its shaft, then install the camshafts (*see Section 9*).

Inspection

5 Clean all components with solvent and dry them off. Blow through any oil passages with compressed air, if available. Inspect the rocker arm faces for pits, spalling, score marks and rough spots. Check the rocker arm-to-shaft contact areas. Look for cracks in each rocker arm. If the faces of the rocker arms are damaged, the rocker arms and the camshafts should be replaced as a set.

6 Measure the diameter of the rocker arm shafts, in the area where the rocker arms ride, and compare the results with this Chapter's Specifications (*see illustration*). Also measure the inside diameter of the rocker arms and compare the results with this Chapter's Specifications. If either the shaft or the rocker arms are worn beyond

the specified limits, replace them as a set.

Installation

7 Lubricate each shaft with molybdenum disulphide oil (a 50/50 mixture of molybdenum disulphide grease and engine oil). Position the rocker arms onto their correct valves. Slide the rocker shaft into place, noting that the cutout in each shaft must be on the outside, and should be aligned with the camshaft holder corner bolt hole (*see illustration*). Slide the shaft through each arm and the spring, with the spring between the arms (*see illustration*). Apply a suitable sealant to the threads of the **new** rocker shaft plug and tighten it to the torque setting specified at the beginning of the Chapter (*see illustrations*).

11 Camshaft drive gear assemblies – removal, inspection and installation

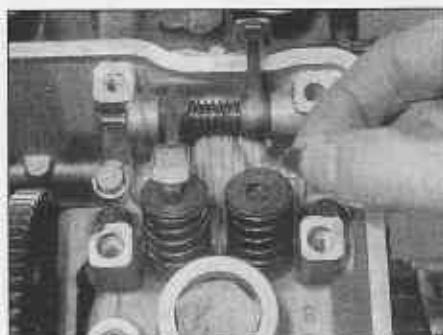


Note: The camshaft drive gear assemblies can be removed with the engine in the frame. Place clean rags over the spark plug holes and the cam gear train holes to prevent any component from dropping into the engine on removal.

Removal

1 Remove the camshafts (*see Section 9*).

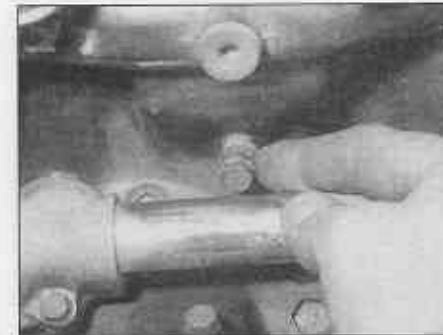
2 Unscrew the bolt securing the camshaft drive gear assembly to the inlet side of the crankcase. The bolt is situated centrally below the two inlet manifolds (*see illustration*). The rear cylinder bolt does not clear the water pipe, so leave it loosely in place or, if



10.8a Fit each shim into its recess . . .

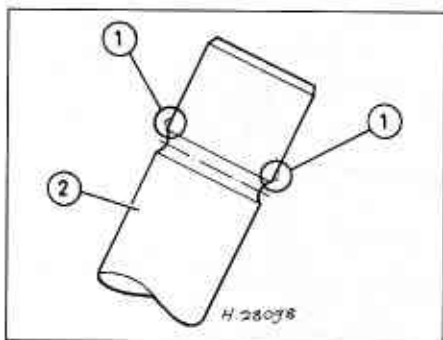


10.8b . . . and position the rocker arm on its valve



11.2 Unscrew the bolt securing the assembly to the crankcase

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14.6c If the valve stem (2) won't pull through the guide, deburr the area above the collet groove (1)

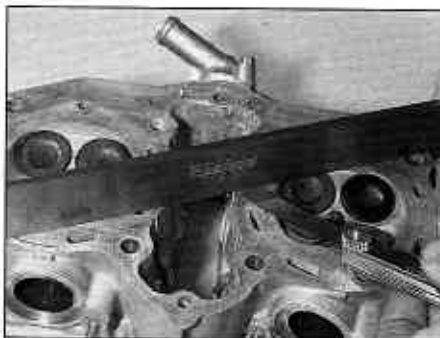
deburr the area around the collet groove with a very fine file or whetstone (**see illustration**).

7 Repeat the procedure for the remaining valves. Remember to keep the parts for each valve together and in order so they can be reinstalled in the same location.

8 Once the valves have been removed and labelled, pull the valve stem seals off the top of the valve guides with pliers and discard them (the old seals should never be reused).

9 Next, clean the cylinder head with solvent and dry it thoroughly. Compressed air will speed the drying process and ensure that all holes and recessed areas are clean.

10 Clean all of the valve springs, collets, retainers and spring seats with solvent and dry them thoroughly. Do the parts from one



14.13 Checking the cylinder head gasket face for distortion

valve at a time so that no mixing of parts between valves occurs.

11 Scrape off any deposits that may have formed on the valve, then use a motorised wire brush to remove deposits from the valve heads and stems. Again, make sure the valves do not get mixed up.

Inspection

12 Inspect the head very carefully for cracks and other damage. If cracks are found, a new head will be required. Check the cam bearing surfaces for wear and evidence of seizure. Check the camshafts for wear as well (**see Section 9**).

13 Using a precision straight-edge and a feeler gauge set to the warpage limit listed in the specifications at the beginning of the Chapter, check the head gasket mating surface for warpage. Refer to *Tools and Workshop Tips* in the Reference section for details of how to use the straight-edge.

14 Examine the valve seats in the combustion chamber. If they are pitted, cracked or burned, the head will require work beyond the scope of the home mechanic. Measure the valve seat width and compare it to this Chapter's Specifications (**see illustration**). If it exceeds the service limit, or if it varies around its circumference, valve overhaul is required. If available, use Prussian blue to determine the extent of valve seat wear. Uniformly coat the seat with the

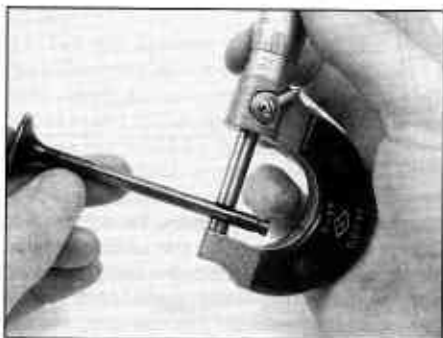


14.14 Measure the valve seat width with a ruler (or for greater precision use a vernier caliper)

Prussian blue, then install the valve and rotate it back and forth using a lapping tool. Remove the valve and check whether the ring of blue on the valve is uniform and continuous around the valve, and of the correct width as specified.

15 Measure the valve stem diameter (**see illustration**). Clean the valve guides to remove any carbon build-up, then measure the inside diameters of the guides (at both ends and the centre of the guide) with a small hole gauge and micrometer (**see illustrations**). The guides are measured at the ends and at the centre to determine if they are worn in a bell-mouth pattern (more wear at the ends). Subtract the stem diameter from the valve guide diameter to obtain the valve stem-to-guide clearance. If the stem-to-guide clearance is greater than listed in this Chapter's Specifications, the guides and valves will have to be replaced with new ones. If the valve stem or guide is worn beyond its limit, or if the guide is worn unevenly, it must be replaced.

16 Carefully inspect each valve face for cracks, pits and burned spots. Check the valve stem and the collet groove area for cracks (**see illustration**). Rotate the valve and check for any obvious indication that it is bent. Check the end of the stem for pitting and excessive wear. The presence of any of the above conditions indicates the need for



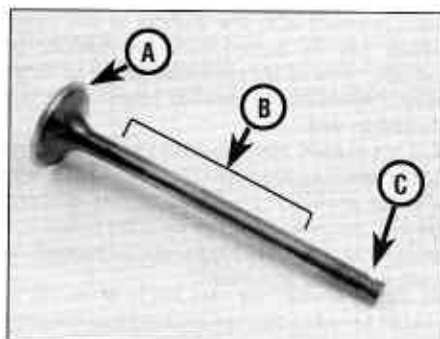
14.15a Measure the valve stem diameter with a micrometer



14.15b Insert a small hole gauge into the valve guide and expand it so there's a slight drag when it's pulled out



14.15c Measure the small hole gauge with a micrometer



14.16 Check the valve face (A), stem (B) and collet groove (C) for signs of wear and damage

check the components for wear and assess the extent of the work needed, and, unless a valve service is required, grind in the valves (see Section 14).

3 The dealer or engineering works will remove the valves and springs, replace the valves and guides, recut the valve seats, check and replace the valve springs, spring retainers and collets (as necessary) and reassemble the valve components.

4 After the valve service has been performed, the head will be in like-new condition. When the head is returned, be sure to clean it again very thoroughly before installation on the engine to remove any metal particles or abrasive grit that may still be present from the valve service operations. Use compressed air, if available, to blow out all the holes and passages.

14 Cylinder head and valves – disassembly, inspection and reassembly

1 As mentioned in the previous section, valve servicing, valve seat re-cutting and valve guide replacement should be left to a Honda dealer or engineering works. However, disassembly, cleaning and inspection of the valves and related components can be done (if the necessary special tools are available) by the home mechanic. This way no expense is incurred if the inspection reveals that overhaul is not required at this time.

2 To disassemble the valve components without the risk of damaging them, a valve spring compressor is absolutely necessary.

Disassembly

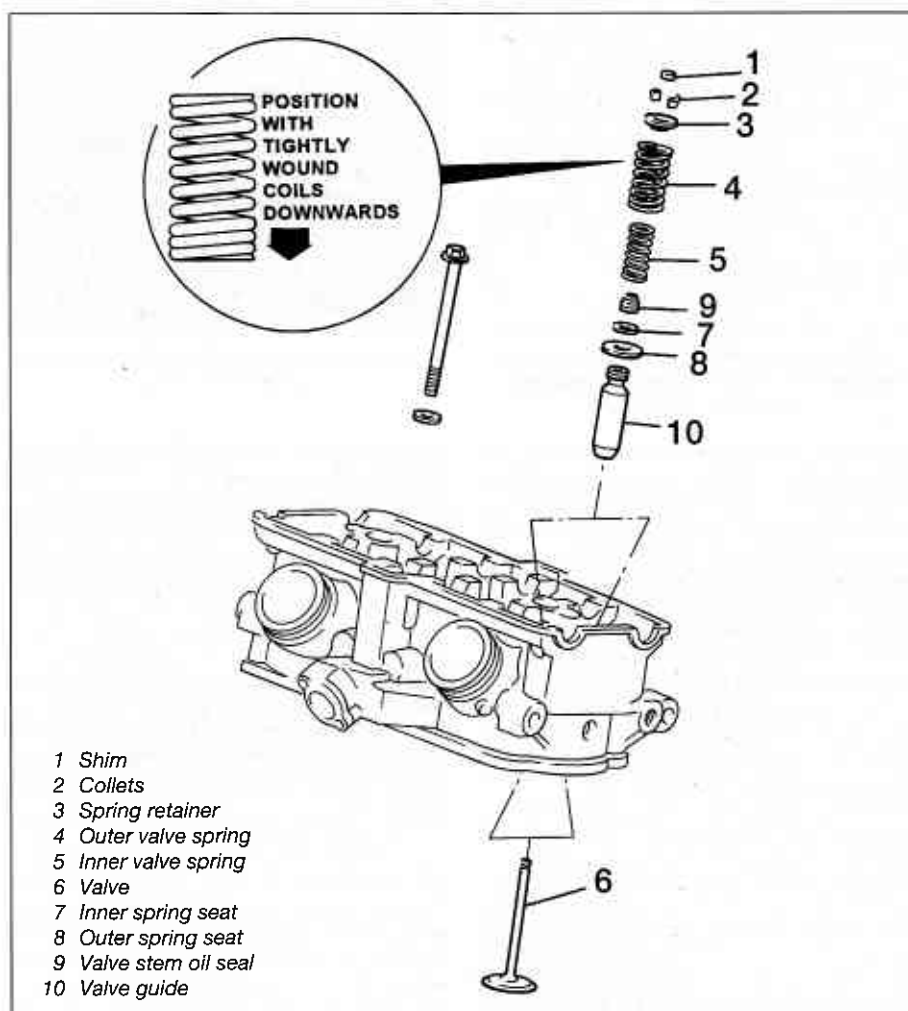
3 Before proceeding, arrange to label and store the valves along with their related components in such a way that they can be returned to their original locations without getting mixed up (see illustration). A good way to do this is to use the same container as the shims are stored in (see Section 10), or to obtain a separate container which is divided into sixteen compartments, and to label each compartment with the identity of the valve which will be stored in it (ie number of cylinder, inlet or exhaust side, inner or outer valve). Alternatively, labelled plastic bags will do just as well.

4 If not already done, remove the rocker arms and shafts (see Section 10).

5 If not already done, clean all traces of old gasket material from the cylinder head. If a scraper is used, take care not to scratch or gouge the soft aluminium.



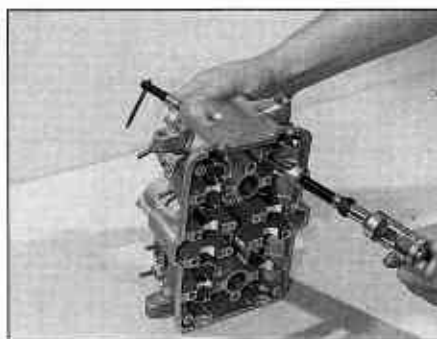
Refer to Tools and Workshop Tips for details of gasket removal methods.



14.3 Valve components

6 Compress the valve spring on the first valve with a spring compressor, making sure it is correctly located onto each end of the valve assembly (see illustration). Do not compress the springs any more than is absolutely necessary. Remove the collets, using either needle-nose pliers, tweezers, a magnet or a screwdriver with a dab of grease on it (see

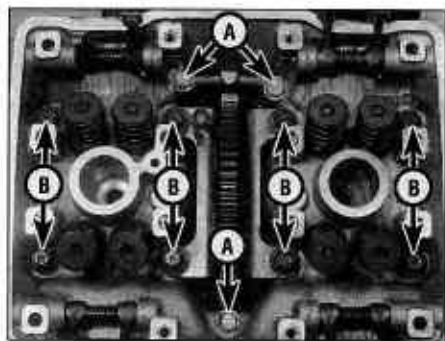
illustration). Carefully release the valve spring compressor and remove the spring retainer, noting which way up it fits, the inner and outer springs, the spring seats (one for each spring, the inner one fits inside the outer one), and the valve from the head (see illustration 14.3). If the valve binds in the guide (won't pull through), push it back into the head and



14.6a Compressing the valve springs using a valve spring compressor



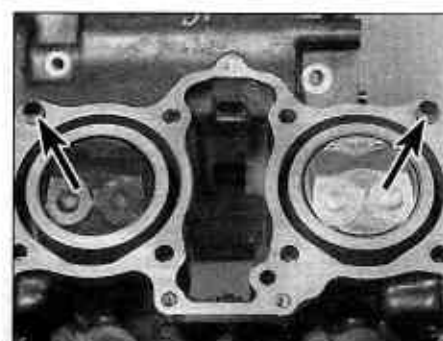
14.6b Remove the collets with needle-nose pliers, tweezers, a magnet or a screwdriver with a dab of grease on it



12.9 Cylinder head 6 mm bolts (A) and 8 mm bolts (B)



12.11 Lift the head up off the block



12.12 Remove the dowels (arrowed) if loose

then unscrew the adjuster bolt using an Allen key (see illustrations 5.23a, b and c).

9 Each cylinder head is secured by eight 8 mm bolts and three 6 mm bolts (see illustration). First slacken the 6 mm bolts evenly and a little at a time until they are all slack, then remove the bolts and their washers. Now slacken and remove the 8 mm bolts evenly and a little at a time in a criss-cross pattern until they are all slack, then remove the bolts and their washers.

10 Each camshaft drive gear assembly is marked for identification. The front cylinder assembly is marked with an "F" and the rear with an "R". If the markings are no longer visible, make your own as the assemblies must be installed in their original position. Lift the assembly out of the head (see illustration 11.3b).

11 Pull the cylinder head up off the block (see illustration). If it is stuck, tap around the joint faces of the cylinder head with a soft-faced mallet to free the head. Do not attempt to free the head by inserting a screwdriver between the head and cylinder block – you'll damage the sealing surfaces. Remove the old cylinder head gasket and discard it as a new one must be used.

12 If they are loose, remove the dowels from the cylinder block (see illustration). If they appear to be missing they are probably stuck in the underside of the cylinder head.

13 Check the cylinder head gasket and the mating surfaces on the cylinder head and

crankcase for signs of leakage, which could indicate warpage. Refer to Section 14 and check the flatness of the cylinder head.

14 Clean all traces of old gasket material from the cylinder head and crankcase. If a scraper is used, take care not to scratch or gouge the soft aluminium. Be careful not to let any of the gasket material fall into the crankcase, the cylinder bores or the oil passages.

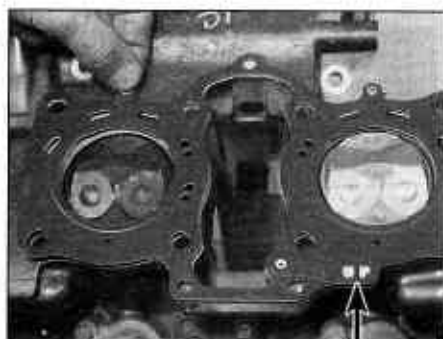
Installation

15 If removed, install the dowels onto the cylinder block (see illustration 12.12). Lubricate the cylinder bores with engine oil.

16 Ensure both cylinder head and crankcase mating surfaces are clean, then lay the new head gasket in place on the cylinder block, making sure all the holes are correctly aligned and the UP mark faces up (see illustration). Never re-use the old gasket.

17 Carefully fit the cylinder head onto the block, making sure it locates correctly onto the dowels (see illustration 12.11).

18 Install the camshaft drive gear assembly, making sure it is fitted into its correct head (see Step 11) and with the bolt hole for the crankcase bolt facing the inlet side of the engine. Press the assembly squarely down onto its dowels, making sure the lower gear teeth mesh correctly with those of the drive gear on the crankshaft. This can be done by turning the upper gear back and forth – the whole assembly should be felt to rise off the cylinder head slightly.



12.16 Make sure the gasket is the correct way round with all holes aligned and the UP mark (arrowed) facing up



12.19 Tighten the cylinder head bolts as described to the specified torque

19 Install the eight 8 mm bolts with their washers and the three 6 mm bolts and tighten them all finger-tight (see illustration 12.9). Now tighten the 8 mm bolts evenly and a little at a time in a criss-cross pattern to the torque setting specified at the beginning of the Chapter, then tighten the 6 mm bolts in the same way (see illustration).

20 If the front cylinder head was removed, install the front engine mounting bolts, making sure the spacer is fitted with the right-hand bolt on VFR models, and the left-hand bolt on RVF models, and tighten them to the specified torque setting.

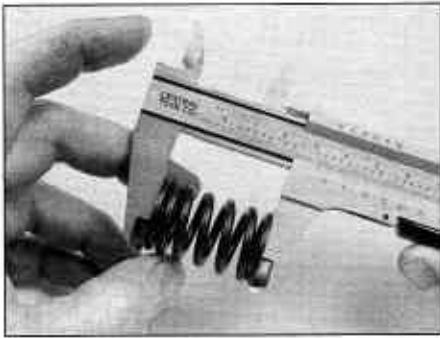
21 If the rear cylinder head was removed, install the adjuster bolt into the upper rear right-hand mounting and tighten it finger-tight (see illustration 5.23c). Also fit the left-hand engine bolt finger-tight. On the right-hand side, tighten the adjuster bolt using an Allen key, to the torque setting specified at the beginning of the Chapter (see illustration 5.26e). Make a reference mark between the adjuster bolt and the frame as a check against the adjuster bolt turning while the locknut is being tightened, then fit the locknut and tighten it to the specified torque setting using the peg spanner (see illustrations 5.26g, 5.23b and 5.26h). Check that the reference marks still align – if they don't, repeat the installation and tightening procedure. Now fit the mounting bolt into the adjuster bolt (see illustration 5.23a) and tighten it to the specified torque setting. Now tighten the left-hand bolt to the specified torque.

22 Install the remaining components in a reverse of their removal sequence, referring to the relevant Sections or Chapters (see Steps 1 to 5).

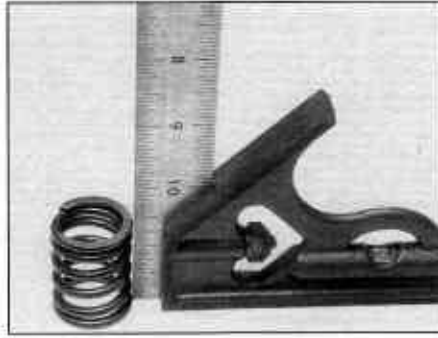
13 Valves/valve seats/valve guides – servicing



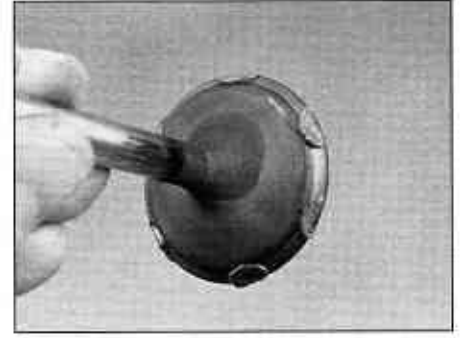
1 Because of the complex nature of this job and the special tools and equipment required, most owners leave servicing of the valves, valve seats and valve guides to a professional.
2 The home mechanic can, however, remove the valves from the cylinder head, clean and



14.17a Measure the free length of the valve springs



14.17b Check the valve springs for squareness



14.21 Apply the grinding compound very sparingly, in small dabs, to the valve face only

valve servicing. The stem end can be ground down, provided that the amount of stem above the collet groove after grinding is sufficient.

17 Check the end of each valve spring for wear and pitting. Measure the spring free length and compare it to that listed in the specifications (**see illustration**). If any spring is shorter than specified it has sagged and must be replaced. Also place the spring upright on a flat surface and check it for bend by placing a ruler against it (**see illustration**). If the bend in any spring is excessive, it must be replaced.

18 Check the spring retainers and collets for obvious wear and cracks. Any questionable parts should not be reused, as extensive damage will occur in the event of failure during engine operation.

19 If the inspection indicates that no overhaul work is required, the valve components can be reinstalled in the head.

Reassembly

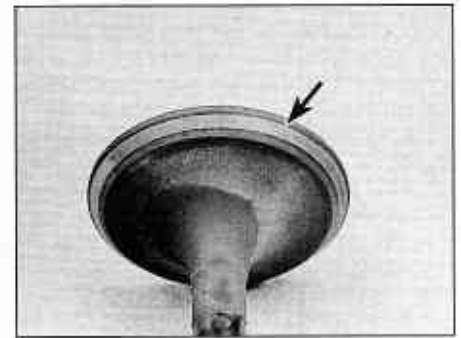
20 Unless a valve service has been performed, before installing the valves in the head they should be ground in (lapped) to ensure a positive seal between the valves and seats. This procedure requires coarse and fine valve grinding compound and a valve grinding tool. If a grinding tool is not available, a piece of rubber or plastic hose can be slipped over the valve stem (after the valve has been installed in the guide) and used to turn the valve.



14.22a Rotate the valve grinding tool back and forth between the palms of your hands

21 Apply a small amount of coarse grinding compound to the valve face, then slip the valve into the guide (**see illustration**). **Note:** Make sure each valve is installed in its correct guide and be careful not to get any grinding compound on the valve stem.

22 Attach the grinding tool (or hose) to the valve and rotate the tool between the palms of your hands. Use a back-and-forth motion (as though rubbing your hands together) rather than a circular motion (ie so that the valve rotates alternately clockwise and anti-clockwise rather than in one direction only) (**see illustration**). Lift the valve off the seat and turn it at regular intervals to distribute the grinding compound properly. Continue the grinding procedure until the



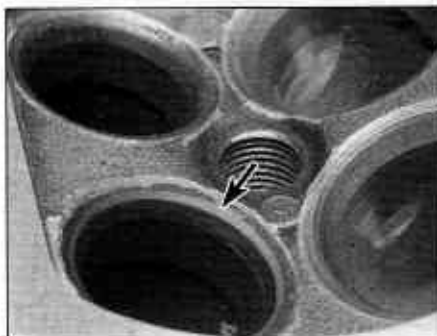
14.22b The valve face and seat should show a uniform unbroken ring . . .

valve face and seat contact area is of uniform width and unbroken around the entire circumference of the valve face and seat (**see illustrations**).

23 Carefully remove the valve from the guide and wipe off all traces of grinding compound. Use solvent to clean the valve and wipe the seat area thoroughly with a solvent soaked cloth.

24 Repeat the procedure with fine valve grinding compound, then repeat the entire procedure for the remaining valves.

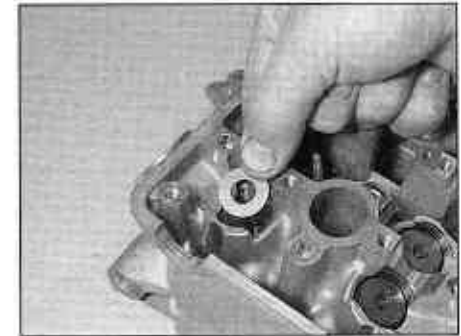
25 Lay the spring seats for all the valves in place in the cylinder head, making sure the inner seat fits flush inside the outer seat, then install new valve stem seals on each of the guides (**see illustrations**). Use an appropriate



14.22c . . . and the seat (arrowed) should be the specified width all the way round



14.25a Fit the inner spring seat . . .



14.25b . . . followed by the outer spring seat . . .

2•24 Engine, clutch and transmission



14.25c ... then press the valve stem seal into position using a suitable deep socket



14.26a Lubricate the stem and slide the valve into its correct location



14.26b Fit the inner valve spring ...

size deep socket to push the seals over the end of the valve guide until they are felt to clip into place. Don't twist or cock them, or they will not seal properly against the valve stems. Also, don't remove them again or they will be damaged.

26 Coat the valve stems with molybdenum disulphide grease, then install one of them into its guide, rotating it slowly to avoid damaging the seal (see illustration). Check that the valve moves up and down freely in the guide. Next, install the inner and outer springs, with their closer-wound coils facing down into the cylinder head, followed by the spring retainer, with its shouldered side facing down so that it fits into the top of the springs (see illustrations).

27 Apply a small amount of grease to the collets to help hold them in place as the pressure is released from the springs (see illustration). Compress the springs with the valve spring compressor and install the collets (see illustration). When compressing the springs, depress them only as far as is absolutely necessary to slip the collets into place. Make certain that the collets are securely locked in their retaining grooves.

28 Support the cylinder head on blocks so the valves can't contact the workbench top, then very gently tap each of the valve stems with a soft-faced hammer. This will help seat the collets in their grooves.



14.26c ... and the outer valve spring, with their closer-wound coils facing down ...



14.26d ... then fit the spring retainer



Check for proper sealing of the valves by pouring a small amount of solvent into each of the valve ports. If the solvent leaks past any valve into the combustion chamber area the valve grinding operation on that valve should be repeated.

15 Starter clutch and primary drive gear – removal, inspection and installation



1 Remove the lower fairing (see Chapter 8).

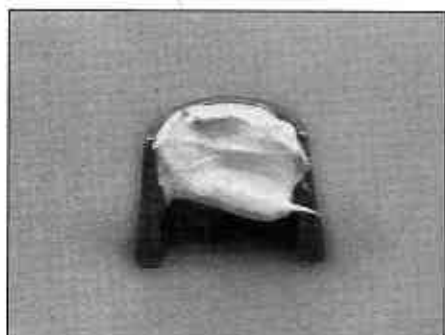
2 Drain the engine oil (see Chapter 1).

3 Unscrew the twelve bolts securing the right-hand crankcase cover and remove the cover, being prepared to catch any residue oil, and noting the positions of the wiring clips (see illustration). Discard the gasket as a new one must be used. Remove the dowels from either the cover or the crankcase if they are loose.

4 Remove the pulse generator coil assembly (see Chapter 5).

5 Withdraw the starter idle/reduction gear shaft from the centre of the gear, then remove the gear, noting how it fits (see illustration).

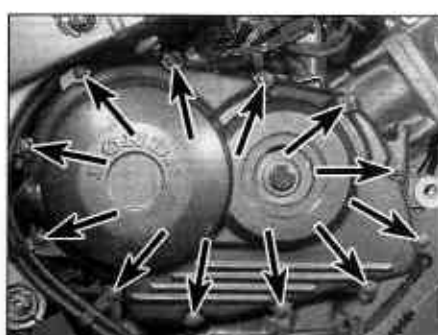
6 Turn the starter clutch in a clockwise



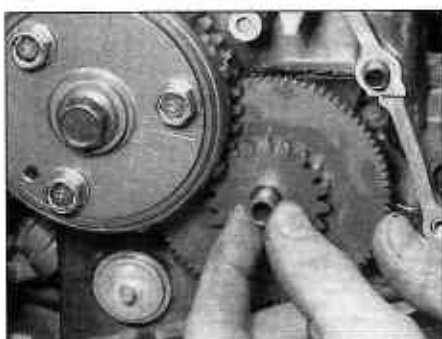
14.27a A small dab of grease will help to keep the collets in place on the valve while the spring is released



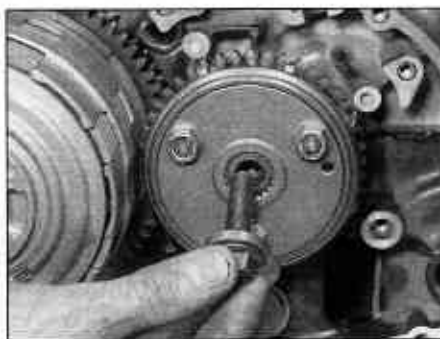
14.27b Compress the springs and install the collets, making sure they locate in the groove



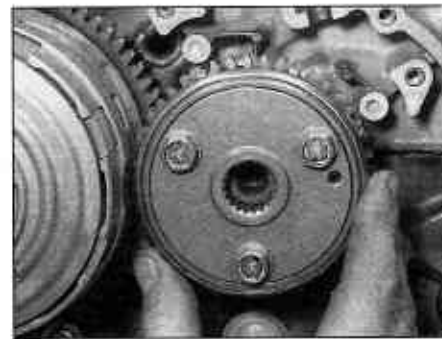
15.3 The cover is secured by twelve bolts (arrowed)



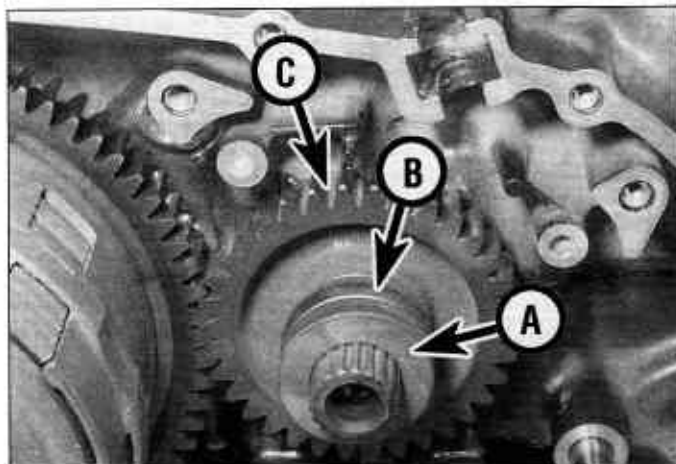
15.5 Withdraw the shaft and remove the idle/reduction gear



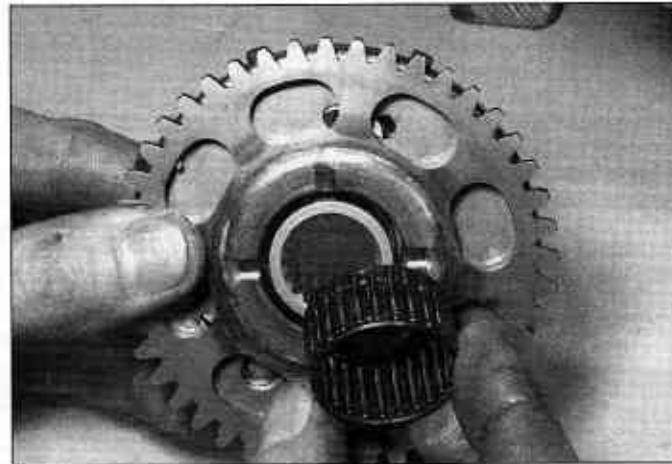
15.8a Remove the bolt ...



15.8b ... and draw the starter clutch off the shaft



15.9 Remove the thrust washer (A), the spacer (B) and the primary drive gear (C) if required



15.11 Withdraw the needle bearing and drive gear from the starter clutch

direction using a 14 mm spanner or socket on the bolt, until the recessed section in the main clutch housing aligns with the starter clutch (see illustration 15.18b). This provides clearance for the starter clutch to be removed.

7 To remove the starter clutch bolt, the primary drive gear on the back of the starter clutch and the primary driven gear on the back of the main clutch housing must be locked together. If the engine is in the frame, engage 6th gear and have an assistant hold the rear brake on hard with the rear tyre in firm contact with the ground. Alternatively, Honda provide a special tool (Part no. 00724-001010) which locks the gears, or a stout piece of cloth, such as denim, can be jammed between them, without the risk of any damage should the bolt prove tight.

8 Slacken and remove the bolt and its washer, then draw the starter clutch off the end of the crankshaft (see illustrations). Note how the wider groove in the starter clutch fits over the wider spline on the shaft.

9 If required, draw the thrust washer, spacer and primary drive gear off the end of the crankshaft, noting which way round they fit (see illustration).

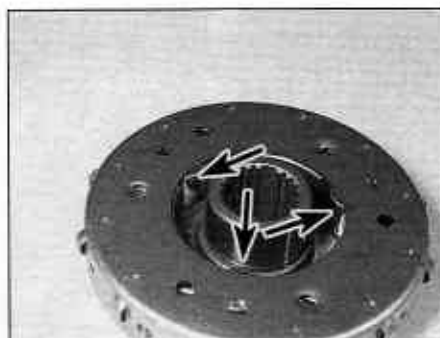
Inspection

10 With the starter clutch face down on a workbench, check that the starter driven gear rotates freely in a clockwise direction and locks against the rotor in an anti-clockwise direction. If it doesn't, the starter clutch should be dismantled for further investigation.

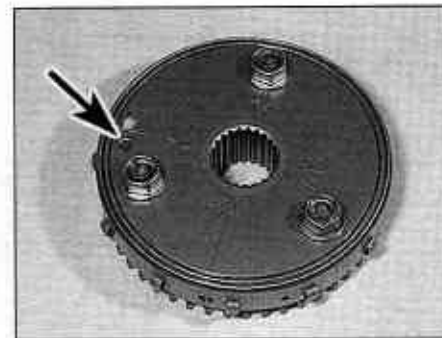
11 Withdraw the needle roller bearing and starter driven gear from the starter clutch (see

illustration). If the gear appears stuck, rotate it clockwise as you withdraw it to free it from the starter clutch.

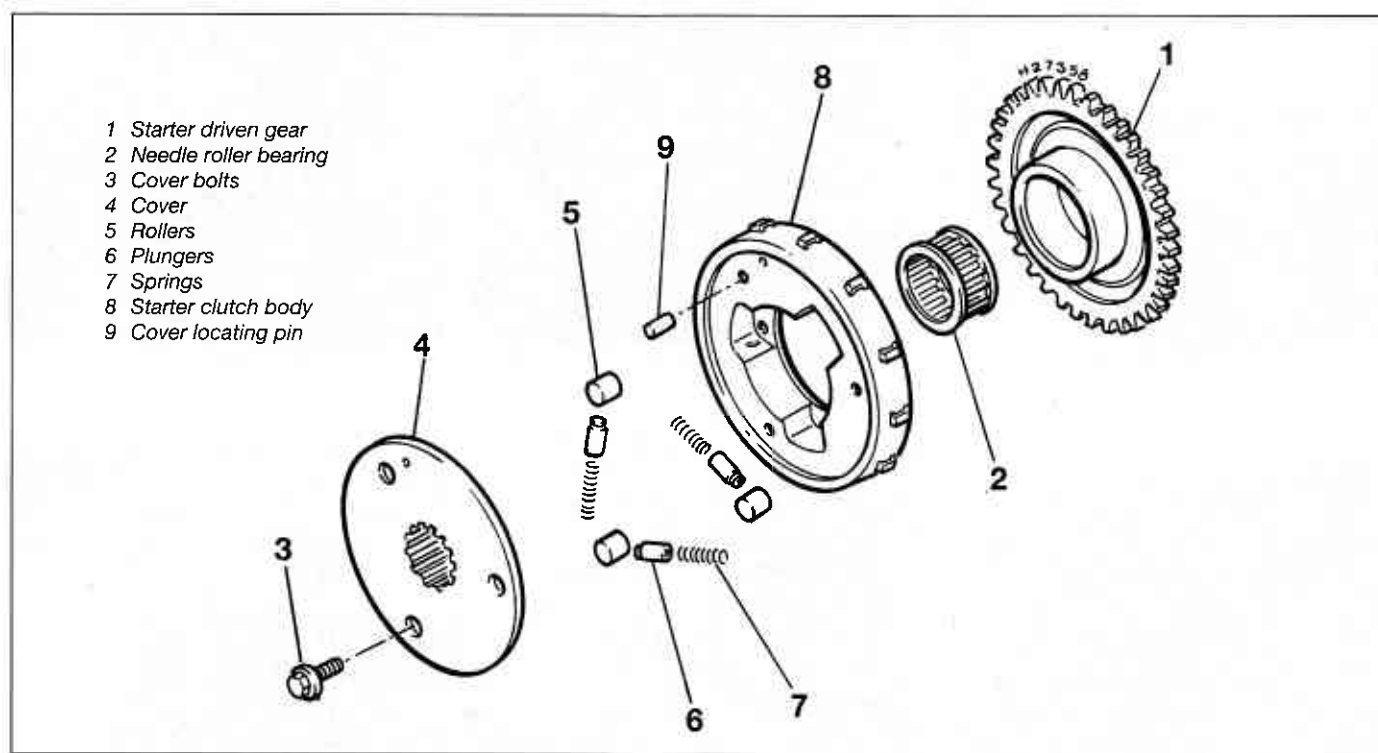
12 Check the condition of the rollers inside the clutch body (see illustration). If they are damaged, marked or flattened at any point, they should be replaced. Unscrew the three cover bolts and remove the cover, noting how the small hole locates over the pin (see illustration). Remove the rollers, plungers and



15.12a Check the rollers (arrowed) for signs of wear



15.12b Unscrew the three bolts and remove the cover, noting the hole (arrowed) for the locating pin



15.12c Starter clutch components

springs, noting how they fit (**see illustration**). Install the new components in a reverse sequence. Make sure the small hole in the



15.13 Inspect the starter clutch driven gear contact surface

cover locates over the pin. Apply a suitable non-permanent thread locking compound to the bolts and tighten them to the torque setting specified at the beginning of the Chapter.

13 Check the bearing surface of the starter driven gear hub and the needle roller bearing (**see illustration**). If the bearing surface shows signs of excessive wear or the bearing itself is worn or damaged, they should be replaced.

14 Check the teeth of the starter idle/reduction gear and the corresponding teeth of the starter driven gear and starter motor drive shaft. Replace the gears and/or starter motor if worn or chipped teeth are discovered on related gears. Also check the idle/reduction gear shaft for damage, and check that the gear is not a

loose fit on the shaft. Replace the shaft if necessary.

15 Check the teeth of the primary drive gear and the corresponding teeth of the primary driven gear on the back of the main clutch housing. Replace the gear and/or clutch housing if worn or chipped teeth are discovered.

Installation

16 If removed, slide the primary drive gear, spacer and thrust washer onto the crankshaft, making sure the teeth of the gear mesh correctly with those of the primary driven gear on the back of the main clutch housing (**see illustrations**).

17 Lubricate the hub of the starter driven gear with clean engine oil, then install the starter driven gear into the clutch, rotating it



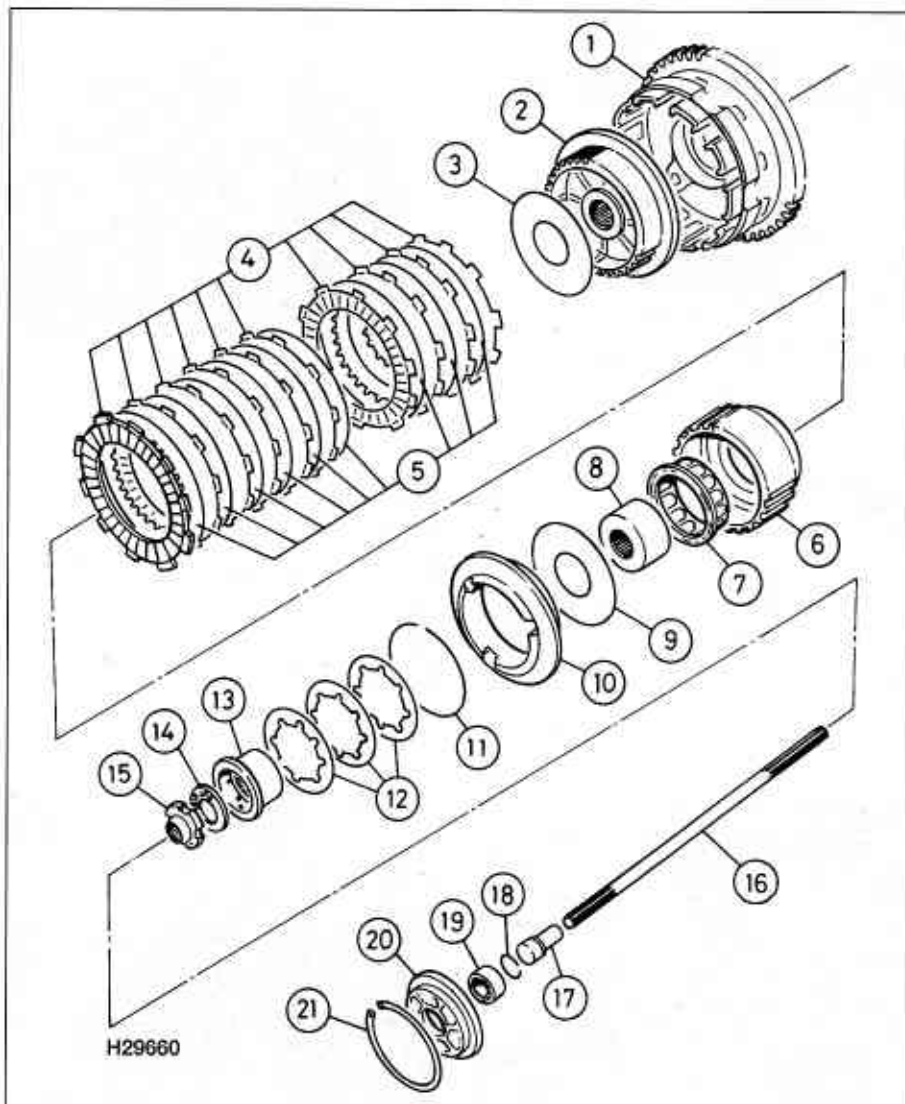
15.16a Slide the primary drive gear ...



15.16b ... the spacer ...



15.16c ... and the thrust washer onto the shaft



16.2a Clutch components

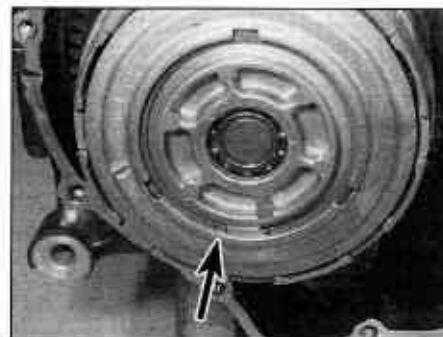
- | | | |
|------------------------|----------------------------|--------------------------|
| 1 Clutch housing | 8 One-way clutch hub | 15 Clutch nut |
| 2 Inner clutch centre | 9 Outer thrust washer | 16 Pushrod |
| 3 Inner thrust washer | 10 Pressure plate | 17 Pushrod end-piece |
| 4 Friction plates | 11 Spring seat | 18 Circlip |
| 5 Plain plates | 12 Diaphragm springs | 19 Bearing |
| 6 Outer clutch centre | 13 Diaphragm spring holder | 20 Pressure plate lifter |
| 7 One-way clutch sprag | 14 Lockwasher | 21 Circlip |



16.3a Remove the end-piece ...



16.3b ... and withdraw the pushrod



16.2b Remove the circlip (arrowed) ...



16.2c ... and withdraw the pressure plate lifter

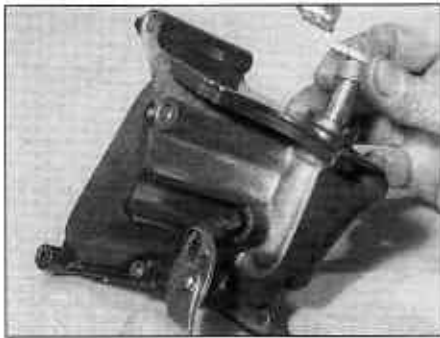
16 Clutch – removal, inspection and installation

Note 1: The clutch can be removed with the engine in the frame. If the engine has been removed, ignore the steps which don't apply.

Note 2: A peg spanner is required to slacken and tighten the clutch nut. If the Honda service tool (Part no. 07716-0020203) is not available, a suitable one will have to be fabricated out of a piece of steel tubing with an ID of 27 mm and an OD of 30 mm, or an old socket.

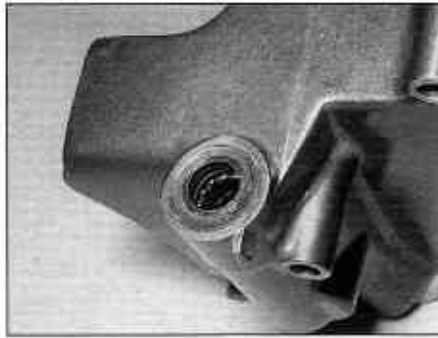
Removal

- 1 Remove the starter clutch (see Section 15).
- 2 Remove the circlip securing the pressure plate lifter inside the pressure plate and remove the lifter (see illustrations).
- 3 Remove the pushrod end piece from either the back of the pressure plate lifter or the end of the input shaft (see illustration). Withdraw the clutch pushrod from the input shaft, noting which way round it fits – it may have to be poked through from the other side, requiring removal of the engine sprocket cover, or the engine will have to be tipped on its side (see illustration).
- 4 The clutch nut is staked against the input shaft. Unstake the nut using a screwdriver, a



16.20e Remove and clean the release mechanism components, noting how they fit

Note the positions of the bolts as they are all different lengths. Remove the dowels if they are loose. Check the clutch release actuating mechanism for smooth operation and any signs of wear or damage. Remove the components, noting how the return spring ends locate, and clean and grease them if required (see illustrations). On assembly, align the shaft so that the release rod fits into its recess in the shaft. Check the pushrod oil seal in the crankcase joint for signs of leakage and replace it if necessary (see illustration 21.11); this seal is accessed by separating the crankcase halves, but if care is exercised it may be possible to lever the seal out and press a new one in without separating the crankcases (main pushrod removed). Refit the cover and the speedometer drive gear,



16.20f Check the oil seal and needle bearing in the cover

making sure the cover bolts are in their correct location and the drive gear tab locates correctly onto the slot in the engine sprocket bolt cap (see illustrations).

Installation

21 Remove all traces of old gasket from the crankcase and cover surfaces.

22 Smear the inside and outside of the clutch housing guide with molybdenum disulphide oil (a 50/50 mixture of molybdenum disulphide grease and engine oil), then install the guide onto the input shaft (see illustration).

23 Install the oil pump drive chain onto its drive and driven sprockets, then install the sprockets and chain as an assembly onto the clutch housing guide and oil pump; ensure that the scribed lines on the driven sprocket



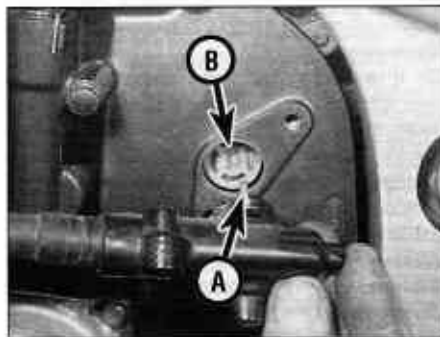
16.20g Note the locations of the different bolts...

face the engine and that the tabs on the drive sprocket face out (see illustration). Apply a suitable non-permanent thread locking compound to the sprocket bolt and tighten it to the torque setting specified at the beginning of the chapter (see **Tool Tip**), not forgetting its washer (see illustration). Alternatively, tighten the bolt when tightening the clutch nut (see Step 29).



TOOL TIP
Insert a screwdriver through one of the holes in the sprocket and lock it against the crankcase to prevent the sprocket from turning whilst tightening the bolt.

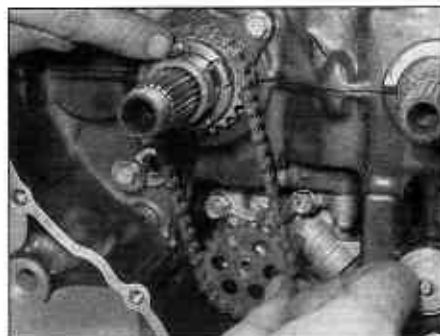
24 Install the clutch housing over the housing guide on the mainshaft, making sure that the tabs on the oil pump drive sprocket engage with the slots in the rear of the housing (see illustrations).



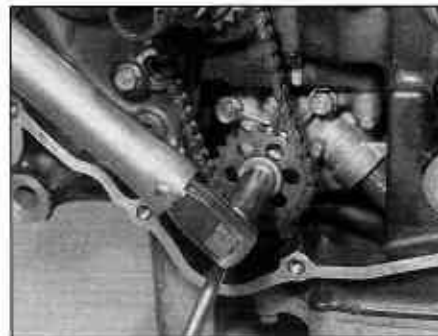
16.20h ... and align the drive tab (A) with the slot (B)



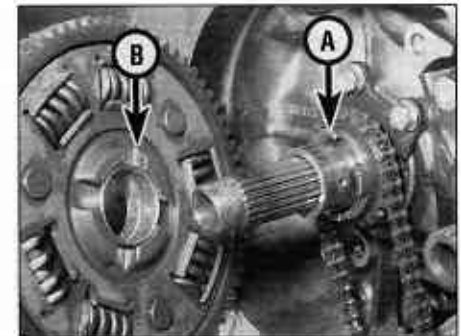
16.22 Slide the guide onto the input shaft...



16.23a ... then fit the oil pump chain and sprockets...



16.23b ... and tighten the bolt to the specified torque



16.24a Align the tabs (A) with the slots (B)...

2•30 Engine, clutch and transmission

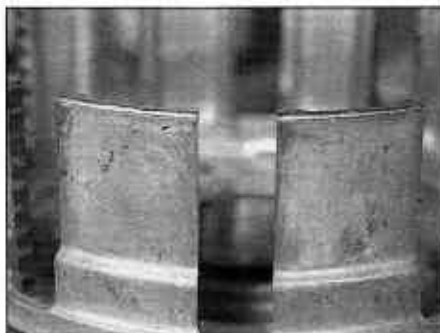


16.12 Measure the height of all three diaphragm springs as shown

(see illustration). Replace the springs if the height measured is less than the limit specified at the beginning of the Chapter.

13 Inspect the clutch assembly for burrs and indentations on the edges of the protruding tangs of the friction plates and/or slots in the edge of the housing with which they engage (see illustration). Similarly check for wear between the inner tongues of the plain plates and the slots in the clutch centre. Wear of this nature will cause clutch drag and slow disengagement during gear changes, since the plates will snag when the pressure plate is lifted. With care, a small amount of wear can be corrected by dressing with a fine file, but if this is excessive the worn components should be replaced.

14 Check the pressure plate lifter, bearing and pushrod end-piece for signs of roughness,

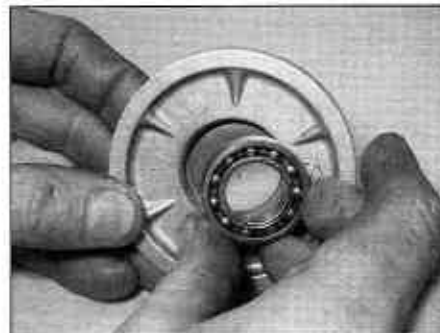


16.13 Inspect the clutch housing edges for indentations

wear or damage, and replace any parts as necessary. Check that the bearing outer race is a tight fit in the centre of the lifter, and that the inner race rotates freely without any rough spots. Replace the bearing if necessary (see illustration). Check that the pushrod is straight by rolling it on a flat surface.

15 Using a vernier caliper, measure the internal and external diameter of the clutch housing guide, and the internal diameter of the clutch housing and the oil pump drive sprocket. Compare the measurements to the specifications at the beginning of the Chapter and replace any components that are worn beyond their service limit. Also check all the above components for signs of damage or scoring, and replace if necessary.

16 Check the teeth of the primary driven gear on the back of the clutch housing and the



16.14 Replace the bearing if required

corresponding teeth of the primary drive gear on the back of the starter clutch. Replace the clutch housing and/or gear if worn or chipped teeth are discovered.

17 Check the pressure plate and thrust washer for signs of roughness, wear or damage, and replace any parts as necessary.

18 Check the diaphragm spring seat for distortion, wear or damage, and replace it if necessary (see illustration 16.6).

19 With the one-way clutch face up on a workbench, check that the hub rotates freely in an anti-clockwise direction and locks against the sprags in a clockwise direction. If it doesn't, replace the one-way clutch. Check the condition of the sprags inside the clutch body (see illustration). If they are damaged, marked or flattened at any point, they should be replaced. Check the bearing surface of the hub. If the hub surface shows signs of excessive wear or has flat spots, it should be replaced.

Release mechanism

20 Unscrew the bolt securing the clutch cable holder to the alternator cover, then detach the bracket and slip the cable end out of the release lever on the engine sprocket cover (see illustrations). Unscrew the two bolts securing the speedometer drive box to the engine sprocket cover and detach the box, noting how the drive tab locates in the slot in the sprocket bolt cap (see illustration). Unscrew the bolts securing the engine sprocket cover to the crankcase and draw the cover away from the engine (see illustration).



16.19 Check the one-way clutch as described



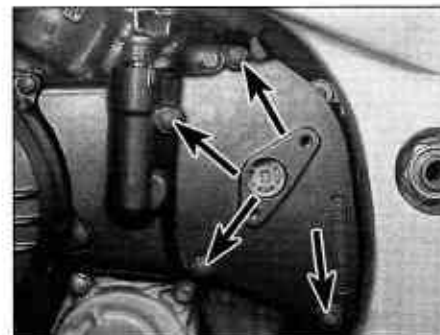
16.20a Remove the clutch cable bracket bolt ...



16.20b ... and detach the cable end from the lever



16.20c Remove the two bolts and detach the speedometer drive box from the cover



16.20d The sprocket cover is secured by four bolts (arrowed)