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DAYTONA 600

SERVICE MANUAL

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MANUALE DI MANUTENZIONE

モーターサイクル整備説明書

Daytona 600

Motorcycle Service Manual

Part Number 3850970 issue 1, 04.2003

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INTRODUCTION

This manual is designed primarily for use by trained technicians in a properly equipped workshop. However, it contains enough detail and basic information to make it useful to the owner who desires to perform his own basic maintenance and repair work. The work can only be carried out if the owner has the necessary hand and special service tools to complete the job.

A basic knowledge of mechanics, including the proper use of tools and workshop procedures is necessary in order to carry out maintenance and repair work. satisfactorily. Whenever the owner has insufficient experience or doubts his ability to do the work, all adjustments, maintenance, and repair work must be undertaken by an authorised Triumph Dealer.

In order to perform the work efficiently and to avoid costly mistakes, read the text and thoroughly familiarise yourself with procedures before starting work.

All work should be performed with great care and in a clean working area with adequate lighting.

Always use the correct special service tools or equipment specified. Under no circumstances use makeshift tools or equipment since the use of substitutes may adversely affect safe operation.

Where accurate measurements are required, they can only be made using calibrated, precision instruments.

For the duration of the warranty period, all repairs and scheduled maintenance must be performed by an authorised Triumph Dealer.

To maximise the life of your Motorcycle:

- Accurately follow the maintenance requirements of the periodic maintenance chart in the service manual.
- Do not allow problems to develop. Investigate unusual noises and changes in the riding characteristics of the motorcycle. Rectify all problems as soon as possible (immediately if safety related).
- Use only genuine Triumph parts as listed in the parts catalogue/parts microfiche.
- Follow the procedures in this manual carefully and completely. Do not take short cuts.
- Keep complete records of all maintenance and repairs with dates and any new parts installed.
- Use only approved lubricants, as specified in the owner's handbook, in the maintenance of the motorcycle.

How to use this manual

To assist in the use of this manual, the section title is given at the top.

Each major section starts with a contents page, listing the information contained in the section.

The individual steps comprising repair operations are to be followed in the sequence in which they appear.

Adjustment and repair operations include reference to service tool numbers and the associated illustration depicts the tool.

Where usage is not obvious the tool is shown in use.

Adjustment and repair operations also include reference to wear limits, relevant data, torque figures, specialist information and useful assembly details.

Warning, Caution and Note

Particularly important information is presented in the following form:

WARNING: This warning symbol identifies special instructions or procedures which, if not correctly followed, could result in personal injury, or loss of life.

CAUTION: This caution symbol identifies special instructions or procedures which, if not strictly observed, could result in damage to or destruction of equipment.

NOTE:

- **This note symbol indicates points of particular interest for more efficient and convenient operation.**

TAMPERING WITH NOISE CONTROL SYSTEM PROHIBITED

Owners are warned that the law may prohibit:

(a) The removal or rendering inoperative by any person other than for purposes of maintenance, repair or replacement, of any device or element of design incorporated into any new vehicle for the purpose of noise control prior to its sale or delivery to the ultimate purchaser or while it is in use; and

(b) the use of the vehicle after such device or element of design has been removed or rendered inoperative by any person.

REFERENCES

References

References to the left-hand or right-hand side given in this manual are made when viewing the motorcycle from the rear.

Operations covered in this manual do not always include reference to testing the motorcycle after repair. It is essential that work is inspected and tested after completion and if necessary a road test of the motorcycle is carried out particularly where safety related items are concerned.

Dimensions

The dimensions quoted are to design engineering specification with service limits where applicable.

During the period of running-in from new, certain adjustments may vary from the specification figures given in this manual. These will be reset by the dealer at the 500 mile/800 km service, and thereafter should be maintained at the figures specified in this manual.

REPAIRS AND REPLACEMENTS

Before removal and disassembly, thoroughly clean the motorcycle. Any dirt entering the engine or other parts will work as an abrasive and shorten the life of the motorcycle. Particular attention should be paid when installing a new part, that any dust or metal filings are cleared from the immediate area.

Force

Common sense should dictate how much force is necessary in assembly and disassembly. If a part seems especially difficult to remove or install, stop and examine what may be causing the problem. Never lever a component as this will cause damage both to the component itself and to the surface being levered against.

Whenever tapping to aid removal of an item is necessary, tap lightly using a hide or plastic faced mallet.

Edges

Watch for sharp edges, especially during engine disassembly and assembly. Protect the hands with industrial quality gloves when lifting the engine or turning it over.

When replacement parts are required, it is essential that only genuine Triumph parts are used.

Safety features and corrosion prevention treatments embodied in the motorcycle may be impaired if other than genuine Triumph parts are fitted. In certain territories, legislation prohibits the fitting of parts not to the manufacturer's specification.

Tightening procedure

Generally, when installing a part with several bolts, nuts or screws, they should all be started in their holes and tightened to a snug fit, evenly and in a cross pattern. This is to avoid distortion of the part and/or causing gas or oil leakage. Conversely, bolts, nuts, or screws, should all be loosened (in sequence if specified) by about a quarter of a turn and then removed.

Where there is a tightening sequence specified in this Service Manual, the bolts, nuts, or screws must be tightened in the order and by the method indicated.

Torque wrench setting figures given in this Manual must be observed. The torque tools used must be of accurate calibration.

Locking devices, where specified, must be fitted. If the efficiency of a locking device is impaired during removal it must be renewed. This applies particularly to micro-encapsulated fixings which must always be replaced if disturbed. Where necessary, the text in this manual will indicate where such a fixing is used.

GENERAL INFORMATION

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IGNITION SYSTEM SAFETY PRECAUTIONS

WARNING: The ignition system produces extremely high voltages. Do not touch any part of the ignition system or any cables while the engine is running.

An electric shock caused by contact with the ignition system may lead to illness, injury or death.

WARNING: Wearers of surgically implanted heart pacemaker devices should not be in close proximity to ignition circuits and or diagnostic equipment.

The ignition system and any diagnostic equipment may interrupt the normal operation of such devices causing illness or death.

DANGEROUS SUBSTANCES

WARNING: Many liquids and other substances used in motor vehicles are poisonous and should under no circumstances be consumed and should, as far as possible, be kept from contact with the skin. These substances among others include acid, anti-freeze, asbestos, brake fluid, fuel, lubricants, and various adhesives. Always pay close attention to the instructions printed on labels and obey the instructions contained within. These instructions are included for your safety and well being.
NEVER DISREGARD THESE INSTRUCTIONS!

Fluoroelastomers

WARNING: fluoroelastomer material is used in the manufacture of various seals in Triumph motorcycles.

In fire conditions involving temperatures greater than 315°C this material will decompose and can then be potentially hazardous. Highly toxic and corrosive decomposition products, including hydrogen fluoride, carbonyl fluoride, fluorinated olefins and carbon monoxide can be generated and will be present in fumes from fires.

In the presence of any water or humidity hydrogen fluoride may dissolve to form extremely corrosive liquid hydrofluoric acid.
If such conditions exist, do not touch the material and avoid all skin contact. Skin contact with liquid or decomposition residues can cause painful and penetrating burns leading to permanent, irreversible skin and tissue damage.

ENGINE OILS

WARNING: The oil may be hot to the touch. Contact with hot oil may cause the skin to be scalded or burned.

WARNING: Prolonged or repeated contact with engine oil can lead to skin dryness, irritation and dermatitis. In addition used engine oil contains potentially harmful contaminants which can cause cancer. Wear suitable clothing and avoid skin contact.

Health Protection Precautions

- Avoid prolonged and repeated contact with oils, particularly used engine oils.
- Wear protective clothing, including impervious gloves where practicable.
- Do not put oily rags in pockets.
- Overalls must be cleaned regularly. Discard heavily soiled clothing and oil impregnated footwear.
- First aid treatment should be obtained immediately for open cuts and wounds. Always be aware of who your nearest first aider is and where the medical facilities are kept.
- Use barrier creams, applying before each work period to protect the skin from the effects of oil and grease and to aid removal of the same after completing work.
- Wash with soap and water to ensure all oil is removed (skin cleansers and nail brushes will help). Preparations containing lanolin replace the natural skin oils which have been removed.
- Do not use petrol, kerosene, diesel fuel, gas oil, thinners or solvents for cleaning skin.
- If skin disorders develop, obtain medical advice without delay.
- Where practicable, de-grease components prior to handling.

WARNING: Any risk of eye injury must be avoided. Always wear eye protection when using a hammer, air line, cleaning agent or where there is ANY risk of flying debris or chemical splashing

ENVIRONMENTAL PROTECTION PRECAUTIONS

CAUTION: Do not pour oil on the ground, down sewers or drains, or into water courses. To prevent pollution of water courses etc., dispose of used oil sensibly. If in doubt contact your local authority.

Burning of used engine oil in small space heaters or boilers can be recommended only for units of approved design. If in doubt check with the appropriate local authority and/or manufacturer of the approved appliance.

Dispose of used oil and used filters through authorised waste disposal contractors, to licensed waste disposal sites, or to the waste oil reclamation trade. If in doubt, contact the Local Authority for advice on disposal facilities.

BRAKES

WARNING: Brake fluid is hygroscopic which means it will absorb moisture from the air. Any absorbed moisture will greatly reduce the boiling point of the brake fluid causing a reduction in braking efficiency.

Replace brake fluid in line with the routine maintenance schedule. A dangerous riding condition could result if this important maintenance item is neglected!

Do not spill brake fluid onto any area of the bodywork as this will damage any painted or plastic surface.

Always use new brake fluid from a sealed container and never use fluid from an unsealed container or from one which has been previously opened.

Do not mix different brands of fluid. Check for fluid leakage around brake fittings, seals and joints.

Check regularly for brake hose damage.

FAILURE TO OBSERVE ANY OF THE ABOVE WARNINGS MAY REDUCE BRAKING EFFICIENCY LEADING TO AN ACCIDENT.

WARNING: If there has been an appreciable drop in the level of the fluid in either brake fluid reservoir, consult your authorised Triumph Dealer for advice before riding.

If the brake lever or pedal feels soft when it is applied, or if the lever/pedal travel becomes excessive, there may be air in the brake lines or the brake may be defective.

It is dangerous to operate the motorcycle under such conditions and remedial action must be taken by your authorised Triumph Dealer before riding the motorcycle.

Failure to take remedial action may reduce braking efficiency leading to an accident.

WARNING: Use only D.O.T. 4 specification brake fluid as listed in the general information section of this manual. The use of brake fluids other than those D.O.T. 4 fluids listed in the general information section may reduce the efficiency of the braking system leading to an accident.

Failure to change the brake fluid at the interval specified in the routine maintenance schedule may reduce braking efficiency resulting in an accident.

WARNING: Never use mineral based grease in any part of the braking system or in any area where contact with the braking system is possible. Mineral based grease will damage the hydraulic seals in the calipers and master cylinders.

Damage caused by contact with mineral based grease may reduce braking efficiency resulting in an accident.

SAFETY INSTRUCTIONS

Jacking and lifting

WARNING: Always ensure that any lifting apparatus has adequate load and safety capacity for the weight to be lifted. Ensure the motorcycle is well supported to prevent any possibility of the machine falling prior to, and during lifting or jacking.

Never rely on a single means of support when working with the motorcycle. Use additional safety supports.

Do not leave tools, lifting equipment, spilt oil, etc. in a place where they could become a hazard to health. Always work in a clean, tidy area and put all tools away when the work is finished.

Precautions against damage

Avoid spilling brake fluid or battery acid on any part of the bodywork. Wash spillages off with water immediately.

Disconnect the battery earth lead before starting work, see **ELECTRICAL PRECAUTIONS**.

Always use the recommended service tool where specified.

Protect exposed bearing and sealing surfaces, and screw threads from damage.

Engine Coolant

WARNING: Coolant mixture which is blended with anti-freeze and corrosion inhibitors contains toxic chemicals which are harmful to the human body. Never swallow anti-freeze, corrosion inhibitors or any of the motorcycle coolant.

WARNING: Do not remove the radiator cap when the engine is hot. When the engine is hot, the coolant inside the radiator is hot and also under pressure. Contact with the pressurised coolant will cause scalds and skin damage.

CAUTION: The coolant anti-freeze contains a corrosion inhibitor which helps prevent damage to the metal surfaces inside the cooling system. Without this inhibitor, the coolant would 'attack' the metals and the resulting corrosion would cause blockages in the cooling system leading to engine overheating and damage. Always use the correct anti-freeze as specified in the Owner's Handbook. Never use a methanol based anti-freeze as this does not contain the required corrosion inhibition properties.

CAUTION: Distilled water must be used with the anti-freeze (see specification for anti-freeze) in the cooling system.

If hard water is used in the system, it causes scale accumulation in the water passages, and considerably reduces the efficiency of the cooling system. Reduced cooling system efficiency may lead to the engine overheating and suffering severe damage.

Cleaning components

A high flash-point solvent is recommended to reduce fire hazard.

Always follow container directions regarding the use of any solvent.

Always use the recommended cleaning agent or equivalent.

Do not use degreasing equipment for components containing items which could be damaged by the use of this process. Whenever possible, clean components and the area surrounding them before removal. Always observe scrupulous cleanliness when cleaning dismantled components.

Lubrication

Engine wear is generally at its maximum while the engine is warming up and before all the rubbing surfaces have an adequate lubricative film. During assembly, oil or grease (whichever is more suitable) should be applied to any rubbing surface which has lost its lubricative film. Old grease and dirty oil should be cleaned off. This is because used lubricants will have lost some lubricative qualities and may contain abrasive foreign particles.

Use recommended lubricants. Some oils and greases in particular should be used only in certain applications and may be harmful if used in an application for which they are not intended. This manual makes reference to molybdenum disulphide grease in the assembly of certain engine and chassis parts. Always check manufacturer recommendations before using such special lubricants.

Joints and joint faces

Assemble joints dry unless otherwise specified in this Manual.

If gaskets and/or jointing compound is recommended for use; remove all traces of old jointing material prior to reassembly. Do not use a tool which will damage the joint faces and smooth out any scratches or burrs on the joint faces using an oil stone. Do not allow dirt or jointing material to enter any tapped holes.

Gaskets, O-rings

Do not re-use a gasket or O-ring once it has been in service. The mating surfaces around the gasket should be free of foreign matter and perfectly smooth to avoid oil or compression leaks.

Liquid gasket, non-permanent locking agent

Follow manufacturer's directions for cleaning and preparing surfaces where these compounds will be used. Apply sparingly as excessive amounts of sealer may block engine oil passages and cause serious damage.

Prior to reassembly, blow through any pipes, channels or crevices with compressed air.

WARNING: To prevent injury, always use eye, face and ear protection when using compressed air. Always wear protective gloves if the compressed air is to be directed in proximity to the skin.

Screw threads

Metric threads to ISO standard are used.

Damaged nuts, bolts and screws must always be discarded.

Castellated nuts must not be slackened back to accept a split-pin, except in those recommended cases when this forms part of an adjustment.

Do not allow oil or grease to enter blind threaded holes. The hydraulic action on screwing in the bolt or stud could split the housing.

Always tighten a nut or bolt to the recommended torque figure. Damaged or corroded threads can affect the torque reading.

Unless specified, threaded fixings must always be fitted dry (no lubrication).

WARNING: Never lubricate a thread unless instructed to do so.

When a thread of a fixing is lubricated, the thread friction is reduced. When the fixing is tightened, reduced friction will cause overtightening and possible fixing failure.

A fixing which fails in service could cause component detachment leading to loss of control and an accident.

Locking devices

Always release locking tabs and fit new locking washers, do not re-use locking tabs.

Fitting a split pin

Always fit new split-pins of the correct size for the hole in the bolt or stud. Do not slacken back castle nuts when fitting split pin.

Always fit new roll pins of an interference fit in the hole.

Circlips, retaining rings

Replace any circlips and retaining rings that are removed. Removal weakens and deforms circlips causing looseness in the circlip groove. When installing circlips and retaining rings, take care to compress or expand them only enough to install them.

Always use the correct replacement circlip as recommended in the Triumph parts catalogue.

Self locking nuts

Self-locking nuts can be re-used, providing resistance can be felt when the locking portion passes over the thread of the bolt or stud.

DO NOT re-use self-locking nuts in critical locations, e.g. suspension components. Always use the correct replacement self-locking nut.

Encapsulated bolt

An encapsulated bolt can be identified by a coloured section of thread which is treated with a locking agent.

Unless a specified repair procedure states otherwise, encapsulated bolts cannot be reused and MUST be replaced if disturbed or removed.

WARNING: Failure to replace an encapsulated bolt could lead to a dangerous riding condition. Always replace encapsulated bolts.

Oil and grease seals

Replace any oil or grease seals that are removed. Removal will cause damage to an oil seal which, if re-used, would cause an oil leak.

Ensure the surface on which the new seal is to run is free of burrs or scratches. Renew the component if the original sealing surface cannot be completely restored.

Protect the seal from any surface which could cause damage over which it has to pass when being fitted. Use a protective sleeve or tape to cover the relevant surface and avoid touching the sealing lip.

Lubricate the sealing lips with a recommended lubricant. This will help to prevent damage in initial use. On dual lipped seals, smear the area between the lips with grease.

When pressing in a seal which has manufacturer's marks, press in with the marks facing out.

Seals must be pressed into place using a suitable driver. Use of improper tools will damage the seal.

Press

A part installed using a press or driver, such as a wheel bearing, should first be coated with oil on its outer or inner circumference so that it will locate smoothly.

Ball bearing

When installing a ball bearing, the bearing race which is an interference fit should be pushed by a suitable driver. This prevents severe stress or damage to the load carrying components. Press a ball bearing until it touches the shoulder in the bore or on the shaft.

Press or drift seals to the depth of its housing, with the sealing lip facing the lubricant to be retained if the housing is shouldered, or flush with the face of the housing where no shoulder is provided.

FUEL HANDLING PRECAUTIONS

General

The following information provides basic precautions which must be observed if petrol (gasoline) is to be handled safely. It also outlines other areas of risk which must not be ignored. This information is issued for basic guidance only and, if in doubt, appropriate enquiries should be made of your local Fire Officer.

Petrol - Gasoline

When petrol (gasoline) evaporates it produces 150 times its own volume in vapour which when diluted with air becomes a readily ignitable mixture. The vapour is heavier than air and will always fall to the lowest level. It can readily be distributed throughout a workshop by air currents, consequently, even a small spillage of petrol (gasoline) is potentially very dangerous.

WARNING: Petrol (gasoline) is highly flammable and can be explosive under certain conditions. When opening the fuel tank cap always observe all the following items;

Turn the motorcycle ignition switch OFF.

Do not smoke.

Always have a fire extinguisher containing FOAM, CO^2, HALON or POWDER close at hand when handling or draining fuel or fuel systems. Fire extinguishers must also be present in areas where fuel is stored.

Always disconnect the vehicle battery, negative (black) lead first, before carrying out dismantling or draining work on a fuel system.

Whenever petrol (gasoline) is being handled, drained or stored or when fuel systems are being dismantled, make sure the area is well ventilated. All potential forms of ignition must be extinguished or removed (this includes any appliance with a pilot light). Any lead-lamps must be flame-proof and kept clear of any fuel spillage.

Warning notices must be posted at a safe distance from the site of the work to warn others that petrol is being openly handled. The notice must instruct the reader of the precautions which must be taken.

Failure to observe any of the above warnings may lead to a fire hazard which could result in personal injury.

WARNING: No one should be permitted to repair components associated with petrol/gasoline without first having specialist training on the fire hazards which may be created by incorrect installation and repair of items associated with petrol/gasoline.
Repairs carried out by untrained personnel could bring about a safety hazard leading to a risk of personal injury.

WARNING: Draining or extraction of petrol/gasoline from a vehicle fuel tank must be carried out in a well ventilated area.

The receptacle used to contain the petrol/ gasoline must be more than adequate for the full amount of fuel to be extracted or drained. The receptacle should be clearly marked with its contents, and placed in a safe storage area which meets the requirements of local authority regulations.

When petrol/gasoline has been extracted or drained from a fuel tank, the precautions governing naked lights and ignition sources should be maintained.
Failure to observe any of the above warnings could bring about a safety hazard leading to a risk of personal injury.

Fuel tank removal

Fuel tanks should have a 'PETROL (GASOLINE) VAPOUR' warning label attached to them as soon as they are removed from the vehicle. In all cases, they must be stored in a secured, marked area.

Chassis repairs

WARNING: If the motorcycle is involved in an accident or collision it must be taken to an authorised Triumph dealer for repair or inspection. Any accident can cause damage to the motorcycle which, if not correctly repaired, may cause a second accident which may result in injury or death.

The frame must not be modified as any modification to the frame such as welding or drilling may weaken the frame resulting in an accident.

ELECTRICAL PRECAUTIONS

The following guidelines are intended to ensure the safety of the operator whilst preventing damage to the electrical and electronic components fitted to the motorcycle. Where necessary, specific precautions are detailed in the relevant sections of this manual which should be referred to prior to commencing repair operations.

Equipment - Prior to commencing any test procedure on the motorcycle ensure that the relevant test equipment is working correctly and any harness or connectors are in good condition, in particular mains leads and plugs.

WARNING: The ignition system produces extremely high voltages. Do not touch any part of the ignition system or any cables while the engine is running.

An electric shock caused by contact with the ignition system may lead to illness, injury or death.

WARNING: Wearers of surgically implanted heart pacemaker devices should not be in close proximity to ignition circuits and or diagnostic equipment.

The ignition system and any diagnostic equipment may interrupt the normal operation of such devices causing illness or death.

WARNING: The battery contains harmful materials. Always keep children away from the battery whether or not it is fitted in the motorcycle.
Do not jump start the battery, touch the battery cables together or reverse the polarity of the cables as any of these actions may cause a spark which would ignite battery gasses causing a risk of personal injury.

High Voltage Circuits - Whenever disconnecting live H.T. circuits always use insulated pliers. Exercise caution when measuring the voltage on the coil terminals while the engine is running, high voltage spikes can occur on these terminals.

Connectors and Harness - The engine of a motorcycle is a particularly hostile environment for electrical components and connectors. Always ensure these items are dry and oil free before disconnecting and connecting test equipment. Never force connectors apart either by using tools or by pulling on the wiring itself. Always ensure locking mechanisms are disengaged before removal and note the orientation to enable correct reconnection. Ensure that any protective covers and substances are replaced if disturbed.

Having confirmed a component to be faulty, switch off the ignition and disconnect the battery negative (black) lead first. Remove the component and support the disconnected harness. When replacing the component keep oily hands away from electrical connection areas and push connectors home until any locking mechanism becomes fully engaged.

Battery disconnecting

Before disconnecting the battery, switch off all electrical equipment.

WARNING: To prevent the risk of a battery exploding and to prevent damage to electrical components *ALWAYS* disconnect the battery negative (black) lead first. When reconnecting the battery, always connect the positive (red) lead first, then the negative (black) lead. Always disconnect the battery when working on any part of the electrical system.
Failure to observe the above warnings may lead to electrical damage and a fire hazard which could cause personal injury.

Always ensure that battery leads are routed correctly and are not close to any potential chafing points.

Disciplines

Switch off the ignition prior to making any connection or disconnection in the system. An electrical surge can be caused by disconnecting 'live' connections which can damage electronic components.

Ensure hands and work surfaces are clean and free of grease, swarf, etc. as grease collects dirt which can cause tracking or high-resistance contacts.

Prior to commencing any test, and periodically during any test, touch a good earth to discharge body static. This is because some electronic components are vulnerable to static electricity.

Electrical wires

All the electrical wires are either single-colour or two-colour and, with only a few exceptions, must be connected to wires of the same colour. On any of the two-colour wires there is a greater amount of one colour and a lesser amount of a second colour. A two-colour wire is identified by first the primary colour and then the secondary colour. For example, a yellow wire with thin red stripes is referred to as a 'yellow/red' wire; it would be a 'red/yellow' wire if the colours were reversed to make red the main colour.

Inspection

Disassembled parts should be visually inspected and replaced with new ones if there are any signs of the following:

Abrasions, cracks, hardening, warping, bending, dents, scratches, colour changes, deterioration, seizure or damage of any nature.

Replacement Parts

WARNING: Only Triumph approved parts should be used to service, repair or convert Triumph motorcycles. To ensure that Triumph approved parts are used, always order parts, accessories and conversions from an authorised Triumph dealer. The fitting of non-approved parts, accessories or conversions may adversely affect the handling, stability or other aspects of the motorcycle operation which may result in an accident causing serious injury or death.

WARNING: Always have Triumph approved parts, accessories and conversions fitted by an authorised Triumph dealer. The fitment of parts, accessories and conversions by a dealer who is not an authorised Triumph dealer may affect the handling, stability or other aspects of the motorcycle operation which may result in an accident causing serious injury or death.

WARNING: Always have Triumph approved parts, accessories and conversions fitted by a trained technician. To ensure that a trained technician is used, have an authorised Triumph dealer fit the parts. The fitment of parts, accessories and conversions by personnel other than a trained technician at an authorised Triumph dealer may affect the handling, stability or other aspects of the motorcycle operation which may result in an accident causing serious injury or death.

Service data

The service data listed in this manual gives dimensions and specifications for brand new, original parts. Where it is permissible to allow a part to exceed these figures, then the service limit is given.

The terms of the motorcycle warranty will be invalidated by the fitting of other than genuine Triumph parts.

All genuine Triumph parts have the full backing of the motorcycle warranty. Triumph dealers are obliged to supply only genuine Triumph recommended parts.

Specification

Triumph are constantly seeking to improve the specification, design and production of their motorcycles and alterations take place accordingly.

While every effort has been made to ensure the accuracy of this Manual, it should not be regarded as an infallible guide to current specifications of any particular motorcycle.

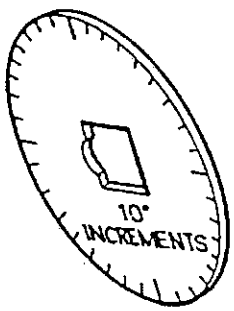
Authorised Triumph Dealers are not agents of Triumph and have no authority to bind the manufacturer by any expressed or implied undertaking or representation.

Service tools

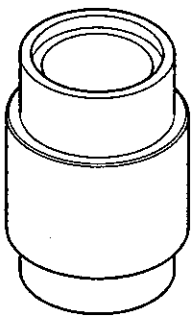
Special service tools have been developed to facilitate removal, dismantling and assembly of certain mechanical components in a practical manner without causing damage. Some operations in this service manual cannot be carried out without the aid of the relevant service tools. Where this is the case, the tools required will be described during the procedure.

Special service tools:-

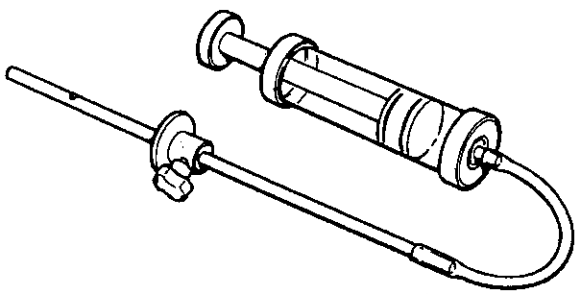
T3880105 - Angular Torque Gauge



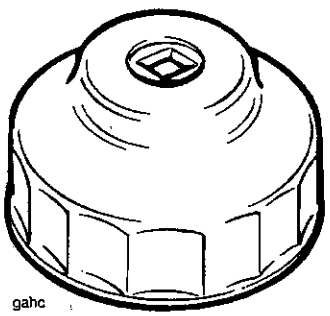
3880080-T0301 - Fork Seal/Bearing Drift



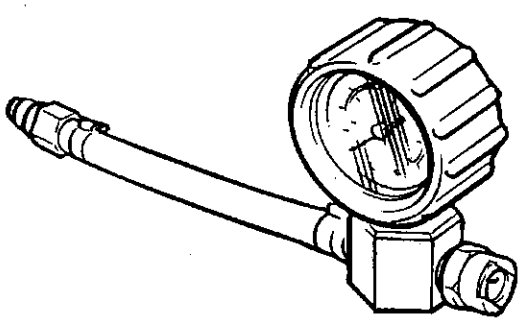
3880160-T0301 - Fork Filler/Evacuator



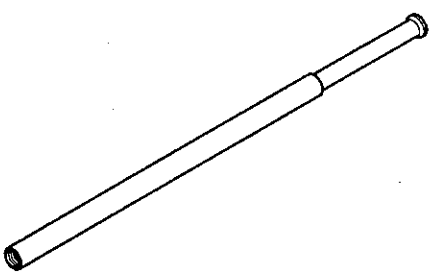
T3880311 - Oil Filter Wrench



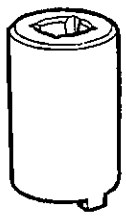
T3880048 - Fuel Pressure Gauge



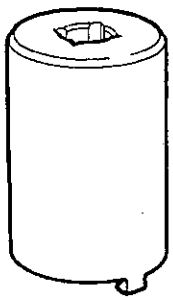
3880090-T0301 Damper Tube Rod



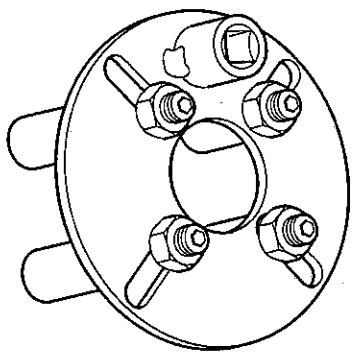
T3880350 - Wrench, Swing Arm Adjuster



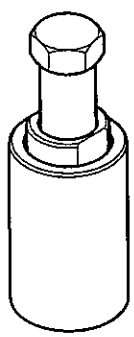
T3880355 - Wrench, Swing Arm Lockring



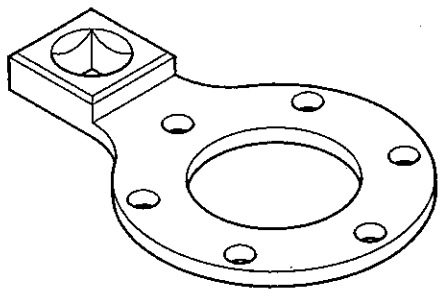
T3880360 - Holder, Clutch Assembly



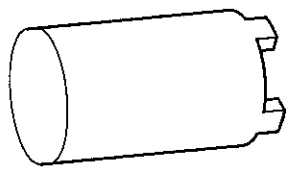
T3880365 - Puller, Alternator Rotor



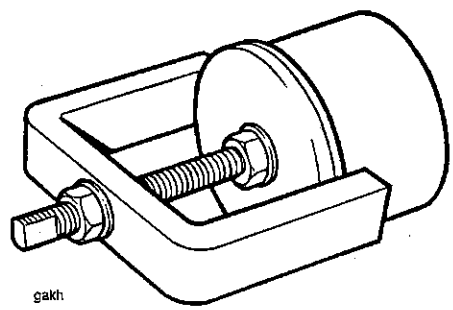
T3880370 - Restraint, Oil Pump Gear



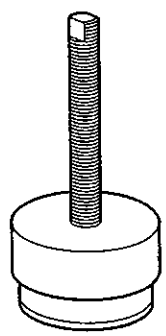
T3880380 - Wrench, Engine Mountings



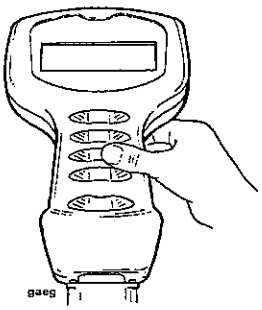
T3880315 - Extractor, Liners (use with adapter T3880316)



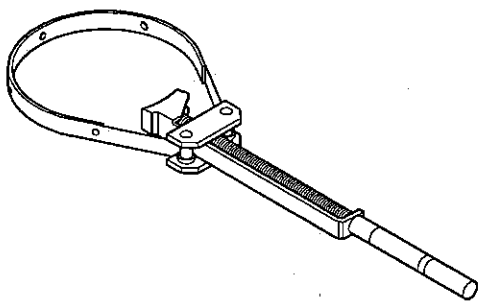
T3880316 - Adapter, Liner Puller



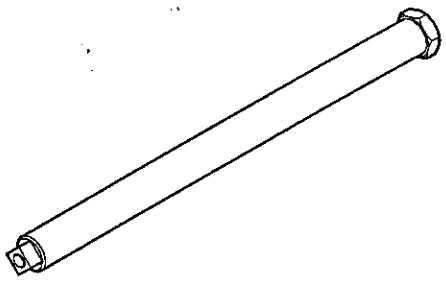
T3880250 - Engine Management Diagnostics



T3880375 - Alternator rotor holder



3880085-T0301 - Adapter, Fork Rod



Full Specification — Daytona 600

Engine		4 Cylinder 16 Valve DOHC
Arrangement		Transverse In-line
Displacement		599cc
Bore x Stroke		68mm X 41.3mm
Compression Ratio		12.75 : 1
Cylinder Numbering		Left to Right (No.1 adjacent to alternator)
Firing order		1-2-4-3
Max. Power (DIN 70020)		112PS @ 12750 RPM
Max. Torque		68Nm @ 11000 RPM
Cylinder Head		
Valve Head Dia.	In.	28.6 mm
	Ex.	22.8 mm
Valve Lift	In.	9.0-9.2 mm
	Ex.	8.0-8.2 mm
Valve Stem Dia.	In.	3.975 mm/ 3.990 mm (std) 3.960 (service limit)
	Ex.	3.975 mm/ 3.990 mm (std) 3.940 (service limit)
Valve Guide Bore Dia.		4.00 mm / 4.015 mm (std) 4.080 (service limit)
Valve Seat Width (in head)		0.9 mm/1.1 mm (std) 1.5 mm (service limit)
Valve Seat Width (valve)		0.9 mm/1.1 mm (std) 1.5 mm (service limit)
Valve Seat Angle		45°
Valve Spring Length	In (outer spring)	50.50 - 51.50 mm (std) 48.50 (service limit)
	In (inner spring)	42.50 - 43.50 mm (std) 40.50 (service limit)
	Ex	46.50 - 47.50 (std) 44.50 (service limit)
Valve Spring 'Load at Length'	In (outer spring)	158 N at 43.0 mm
	In (inner spring)	56 N at 39.5 mm
	Ex	200 N at 41.5 mm
Valve Clearance	In.	0.15 mm/ 0.25 mm
	Ex.	0.2 mm/0.3 mm
Valve Bucket Bore Dia.	In	28.515 mm/28.535 mm
	Ex	25.015 mm/25.035 mm
Valve Bucket Dia.	In	28.490 mm/28.476 mm
	Ex	24.990 mm/24.976 mm
Valve Timing	Inlet	Open 14° BTDC (@1.0mm lift) Close 46° ABDC (@1.0mm Lift) Duration 240°
	Exhaust	Open 39° BBDC (@1.0 mm Lift) Close 11° ATDC (@ 1.0 mm Lift) Duration 230°
Camshaft Journal Dia.		23.9 mm/23.93 mm (std) 22.87 (service limit)
Camshaft Journal Clearance		0.10 mm (std) 0.17 (service limit)
Camshaft Journal Bore Dia.		24.000 mm/24.021 mm
Camshaft Lobe Service Limit	In	34.98 mm
(nose to base circle)	Ex	33.85 mm
Camshaft End Float		0.030 mm /0.130 mm
Camshaft Run-out		0.015 mm max
Camchain Tensioner Spring Free Length		52.0mm

Full Specification — Daytona 600

Clutch/Primary Drive			
Primary Drive	Type		Gear
	Reduction Ratio		1.864:1 (82/44)
Clutch	Type		Wet
No. of Friction Plates			9
Plate Flatness Limit			0.15 mm
Friction Plate Thickness (new)			2.92 - 3.08 mm
Friction Plate Thickness (service limit)			2.72 mm
Clutch Actuation Method			Cable
Cable Free Play (at lever)			2-3 mm
Piston/Crankshaft			
Cylinder Liner Dia.			68.000 mm/68.015 mm
Service Limit			68.10 mm
Piston Diameter			67.990 +/- 0.005 mm (std)
			67.91 (service limit)
Piston Ring to Groove Clearance	Top		0.02 mm/ 0.03 mm (std)
			0.16 mm (service limit)
	Second		0.02 mm/0.06 mm (std)
			0.16 mm (service limit)
Piston Ring Groove Width	Top		0.81 mm/ 0.83 mm (std)
			0.91 mm (service limit)
	Second		0.81 mm/0.83 mm (std)
			0.91 mm (service limit)
	Oil		1.51 mm/ 1.53 mm
Piston Ring End Gap (new ring when fitted in bore)	Top		0.15 mm /0.30 mm (std)
			0.60 mm (service limit)
	Second		0.25 mm /0.40 mm (std)
			0.75 mm (service limit)
	Oil		0.20 mm/ 0.70 mm
Gudgeon Pin Bore Dia. In Piston			15.004 mm/15.012 mm (std)
			15.040 (service limit)
Gudgeon Pin Dia.			14.995 mm/15.000 mm (std)
			14.980 mm (service limit)
Connecting Rod Small End Dia.			15.034 mm/15.056 mm
Connecting Rod Big End Side Clearance			0.10 mm/0.30 mm (0.50 mm max)
Crankshaft Big End Journal Dia.			29.984 mm/30.000 mm(29.960 mm min.)
Crankshaft Big End Bearing Clearance			0.031 mm/0.059 mm (0.07 mm max)
Crankshaft Main Journal Dia.			29.984 mm/30.000 mm (29.960 mm min.)
Crankshaft Main Bearing Clearance			0.024 mm/0.048 mm (0.070 mm max)
Crankshaft End Float			0.05 mm/0.20 mm (0.40 mm max)
Crankshaft run-out			0.02 mm std (0.05 mm service limit)
Transmission			
Type			6 Speed Constant Mesh
Gear Ratios	1st		2.923 (38/13)
	2nd		2.063 (33/16)
	3rd		1.632 (31/19)
	4th		1.381 (29/21)
	5th		1.217 (28/23)
	6th		1.083 (26/24)
Gear Selector Fork Thickness			5.9 mm/6.0 mm (5.8 mm min.)
Gear Selector Groove Width			6.0 mm/6.15 mm (6.25 mm max)
Gear Selector Fork to Groove Clearance			0.25 mm max
Final Drive			Chain
Final Drive Ratio			2.812:1 (16/45)
Chain Type			DID 525 VM2
No. of Links			106 links
20 Link Length			317.5 mm/323.85mm
Drive Chain Slack			25-35 mm
Chain lubrication			Mobil chain spray

Full Specification — Daytona 600

Lubrication	
Oil Capacity (incl. filter, dry fill)	4.0 litres
Oil and filter change	3.8 litres
Oil change only	3.6 litres
Recommended Oil	Mobil 1 Racing 4T 15W/50 or 10W/40
Recommended Oil Approval Rating	API SH (or higher) and JASO MA
Oil Pressure (in main gallery)	4.6 Bar @6000 rpm (@ 80°C Oil Temp.)
Oil Pump Rotor Tip Clearance	0.15 mm, (0.20 mm max)
Oil Pump Body Clearance	0.15 mm/0.22 mm (0.35 mm max)
Oil Pump Rotor End Float	0.02 mm/0.07 mm (0.10 mm max)
Ignition System	
Type	Digital Inductive
Electronic Rev-Limiter	14000 rpm
Pick up Coil Air Gap	0.75 mm ±0.25 mm
Pick up Coil Resistance	0.56 KΩ ± 10% @ 20°C
Ignition Coil Type	Plug-top
Spark Plug Type	NGK CR9EK
Spark Plug Gap	0.7 mm
Fuel System	
Fuel Type	Unleaded, 95 RON (U.S. 89 CLC/AKI)
Fuel Tank Capacity	18 Litres
Low Level Warning Lamp	3 litres remaining
Fuel Pump Type	Submerged
Fuel Pressure (nominal)	3 Bar
Purge control system	Electronic via fuel system ECU
Fuel Injection System	
Type	Electronic,sequential
Idle Speed	Preset in engine management software
Injector Type	Keihin
Throttle	Twin cable, twist grip operated with electronic throttle potentiometer, idle speed control and second butterfly
Control Sensors	Barometric Pressure. Manifold Absolute Pressure, Throttle Position, Second Throttle Position, Coolant Temperature, Crankshaft Position, Induction air temperature and Road Speed Sensor & Lambda Sensor.
Cooling System	
Coolant Mixture	50/50 Distilled Water/Anti-Freeze
Anti-Freeze Type	Mobil Antifreeze
Freezing Point	-35°C
Cooling System Capacity	2.5 Litres
Radiator Cap Opening Pressure	1.1Bar
Thermostat Opening Temperature	84°C (nominal)
Cooling Fan Switch On Temperature	100°C
Temperature Gauge Sensor Resistance	3KΩ @ 15°C
Suspension	
Front Fork Travel	120 mm
Recommended Fork Oil Grade	SAE 10W
Oil Level (fork fully compressed)	112 mm
Oil Volume (dry fill)	465 cc
Front Fork Pull Through	3 mm above handlebar upper surface.
Fork spring rate	2102 N at 90mm deflection
Rear Wheel Travel	120 mm
Rear Suspension Bearing Grease	Mobil Grease HP 222

Full Specification — Daytona 600

Brakes

Front type	Two hydraulically actuated four piston calipers acting on twin discs
Caliper Piston Dia.	33.96 mm/30.23mm
Disc Dia.	308.6 mm
Disc Thickness	4 mm (3.5mm minimum)
Disc Run-out Max.	0.15 mm
Master Cylinder Diameter	14 mm
Recommended Fluid	Mobil Universal Brake and Clutch Fluid DOT4
Rear Type	Hydraulically actuated single piston caliper single disc
Caliper Piston Dia.	38 mm
Disc Dia.	220 mm
Disc Thickness	5 mm (4.5mm minimum)
Disc Run-out Max.	0.15 mm
Master Cylinder Diameter	14 mm
Recommended Fluid	Mobil Universal Brake and Clutch Fluid DOT4

Wheels and Tyres

Front Wheel Rim Axial Run-out	0.6 mm
Front Wheel Rim Radial Run-out	0.6 mm
Front Tyres	See owner's handbook
Front Tyre Pressure (cold)	2.4 Bar (34psi)
Front Tyre Tread Depth min.	2.0 mm
Rear Wheel Rim Axial Run-out	0.6 mm
Rear Wheel Rim Radial Run-out	0.6 mm
Rear Tyres	See owner's handbook
Rear Tyre Pressure (cold)	2.7 Bar (38psi)
Rear Tyre Tread Depth min.	2.0 mm–up to 80 mph (130 km/h) 3.0 mm–over 80 mph (130 km/h)

WARNING: Triumph motorcycles must not be operated above the legal road speed limit except in authorised closed course conditions.

Frame

Frame Type	Twin-spar aluminium
Overall Length	2050 mm
Overall Width	660 mm
Overall Height	1135 mm
Wheelbase	1390 mm
Seat Height	815 mm
Castor	24.6°
Trail	89.1 mm
Dry Weight	165 kg
Max. Payload (rider, passenger, luggage & accessories)	195 kg

Electrical Equipment

Battery Type		Sealed
Battery Rating		12V–10 Amp. hour
Alternator Rating		33.5A
Fuses	#1	20A
	#2	40A
	#3	10A
	#4	10A
	#5	10A
	#6	15A
	#7	15A
	#8	5A
	#9	15A
	#10	5A

Torque Wrench Settings

Cylinder Head Area

Application	Torque(Nm)	Notes
Cam cover to cylinder head	10	
Cam chain tensioner to crankcase	9	
Cam chain tensioner guide to crankcase	18	Encapsulated fixing
Camshaft bearing caps to head	See text	
Camshaft sprocket to camshaft	15	Encapsulated fixing
Cylinder head bolts	See text	
Spark plug	12	
Cylinder head sound suppression bolt	10	
Cylinder head to crankcase (cam chain-chest area)	12	
Cam chain tensioner centre nut	28	
Cam chain top pad	10	

Crankshaft

Application	Torque(Nm)	Notes
Connecting rod big ends	See text	Use new nuts and bolts
Centrifugal breather to crankshaft	30	Encapsulated fixing
Crankshaft position sensor wheel to alternator rotor	16	

Clutch

Application	Torque(Nm)	Notes
Clutch cover to crankcase	9	
Clutch cover sound suppression plate to cover	9	
Clutch centre nut	98	
Clutch push plate to centre	9	
Clutch lever pivot locknut	3.4	
Clutch lever clamp bolts	15	
Clutch cable upper adjuster locknut	1	

Engine Covers

Application	Torque(Nm)	Notes
Sprocket cover to crankcase	9	
Alternator cover	9	
Breather cover	9	
Water inlet elbow to crankcase	9	
Clutch cover	See clutch section	

Transmission

Application	Torque(Nm)	Notes
Output sprocket to output shaft	132	Apply Threebond 1374 to threads
Detent wheel to selector drum	12	Encapsulated fixing
Detent arm capscrew	12	Encapsulated fixing
Selector drum bearing retaining screw	12	Encapsulated fixing
Selector shaft retainer	12	Encapsulated fixing
Spring abutment bolt	28	
Gearbox oil restrictor plug	15	Encapsulated fixing
Input shaft bearing retainer	12	
Neutral indicator switch	10	

Lubrication System

Application	Torque(Nm)	Notes
Sump to crankcase	See section 7	
Sump drain plug	25	Use new washer
Low oil pressure warning light switch to crankcase	28	Use new washer
Heat exchanger to crankcase	65	
Oil filter to adapter	8-12	
Oil feed pipe to cylinder head	25	Use new washer
Oil pump to crankcase	13.7	
Oil pump gear to oil pump	15	Encapsulated fixing
Piston oil rail to crankcase	10	Encapsulated fixing
Gearbox selector shaft oil rail union bolt	8	
Gearbox selector shaft oil rail to crankcase	10	Encapsulated fixing

Wheels

Application	Torque(Nm)	Notes
Front wheel spindle/axle bolt	65	
Front fork pinch bolts	20	
Rear wheel nut	110	

Cooling System

Application	Torque(Nm)	Notes
Water pump to crankcase	9	
Radiator to frame	6	
Thermostat housing	9	
Cooling fan to radiator	2.5	
Coolant bleed screw	10	
Hose clips	4	
Coolant temperature sensor	14	

Final Drive

Application	Torque(Nm)	Notes
Rear sprocket to cush drive	55	
Chain guard to swinging arm	9	

Fuel System, Airbox and Exhaust

Application	Torque(Nm)	Notes
Fuel tank to frame (front)	8	
Fuel tank to bracket (rear)	5	
Fuel tank bracket to frame	9	
Fuel pump mounting plate to fuel tank	5	
Fuel pump clamp screw	4	
Throttle body transition piece to cylinder head	12	
Exhaust header to cylinder head	See text	
Exhaust mounting brackets to frame	15	
Exhaust silencer to header	22	
Air filter housing to airbox	5	
Fuel filler neck to tank	4	
Evaporative emissions cannister bracket to frame	12	
Solenoid valve bracket to frame	3	

Rear Suspension

Application	Torque(Nm)	Notes
Swinging arm spindle	110	
Rear suspension unit upper mounting	48	
Rear suspension unit lower mounting	48	
Drop link to drag link	48	
Drop link to swinging arm	48	
Drag link pivot at frame	48	
Chain tension adjuster locknut	27	
Swing arm spindle collar	15	
Swing arm spindle lock ring	30	

Front Suspension

Application	Torque(Nm)	Notes
Upper yoke pinch bolt	20	
Lower yoke pinch bolt	20	
Fork top cap to inner tube	23	
Upper yoke centre nut	90	
Damping cylinder bolt in base of fork	43	Use new washer
Handlebar clamp screw	27	

Front Suspension (cont'd)

Switch cubes/cable guides to handlebars	4	
Steering stem lock nut	40	
Fork shroud clamp bolt	2.5	

Brakes

Application	Torque(Nm)	Notes
Front brake caliper to fork	40	
Front brake hose to caliper	25	Use new washers
Front brake master cylinder reservoir to bracket	7	
Front brake hose to master cylinder	25	Use new washers
Front brake disc to wheel	22	Use new fixings
Front brake pad retaining pins	19	
Rear brake caliper to carrier - M8 bolt	25	
Rear brake caliper to carrier - M12 bolt	29	
Rear brake hose to caliper	25	Use new washers
Rear brake master cylinder to frame	27	
Rear brake master cylinder reservoir	5	
Rear brake hose to master cylinder	25	Use new washer
Rear brake disc to wheel	22	
Rear brake lever pivot bolt	22	Apply Threebond 1360 to threads
Rear brake pad retaining pin	19	
Rear brake pad retaining pin plug	2	
Bleed nipples	6	

Footrests, Control Plates and Engine Mountings

Application	Torque(Nm)	Notes
Upper crankcase to frame	70	
Lower crankcase to frame	70	
Cylinder head to frame	40	
Engine mounting bolt lockrings	48	
Control plate to frame	27	
Rear footrest hanger to frame	27	
Side stand mounting bracket	45	
Side stand pivot bolt	20	Apply Threebond 1360 to threads
Bank angle peg	9	Apply Threebond 1360 to threads
Gear change lever clamp bolt	9	

Electrical

Application	Torque(Nm)	Notes
Alternator to crankshaft	120	
Starter motor to crankcase	10	
Side stand switch to bracket	7	
Fall detection switch to frame	4	
Starter motor to lead	3	
Regulator fixing	7	
Crank position sensor to crankcase	10	Encapsulated fixing
Instruments to subframe	2	
Air temperature sensor	4	

Bodywork

Application	Torque(Nm)	Notes
Rear seat latch to frame	9	
Rear hugger to swing arm	5	
Mudguard extension bolts	3	
Rear light bracket to mudguard	3	
Rear mudguard to frame	6	
Rear seat lock barrel fixing	3	
Horn to frame	18	
Front mudguard to fork	3	
Cockpit to subframe	6	
Air intake chamber	2	
Belly panel to lower fairing	3	
Belly panel half to belly panel half	3	
Lower fairing to cockpit	3	
Rear panel to subframe	3	
Mirrors to cockpit subframe	9	

Lighting

Application	Torque(Nm)	Notes
Headlight to subframe	3.5	
Rear light to frame	3	
Number plate light to rear mudguard	5	
Indicator fixings	5	

MAINTENANCE

CONTENTS

INTRODUCTION

This maintenance schedule given overleaf describes the maintenance requirements for the Daytona 600 model.

WARNING: The importance of good maintenance cannot be overestimated. The tasks described will help to ensure the safe and reliable operation of your Triumph motorcycle. Never attempt to cut costs by neglecting the maintenance requirements of your machine as this will result in the premature failure of the component(s) concerned and may lead to an unsafe riding condition and an accident.

Scheduled Maintenance Chart

Scheduled Maintenance Chart						
Operation Description	**Odometer Reading in Miles (Kms) or time period, whichever comes first.**					
	Every	500 (800) 1 month	4000 (6000) 1 year	8000 (12000) 2 years	12000 (18000) 3 years	16000 (24000) 4 years
Engine/oil cooler - check for leaks	Day	●	●	●	●	●
Engine oil - renew	-	●	●	●	●	●
Engine oil filter - renew	-	●	●	●	●	●
Valve clearances - check/adjust	-			●		●
Cam chain - wear check	-					●
Air cleaner - renew	-			●		●
Engine ECM - check for stored DTCs	-	●	●	●	●	●
Spark plugs - check	-		●	●		●
Spark plugs - renew	-				●	
Throttle bodies - balance	-			●		●
Throttle cable - check/adjust	Day	●	●	●	●	●
Cooling system - check for leaks	Day	●	●	●	●	●
Coolant level - check/adjust	Day	●	●	●	●	●
Coolant - renew	Every 2 Years					
Fuel system - check for leaks	Day	●	●	●	●	●
Lights, instruments & electrical systems - check	Day	●	●	●	●	●
Fuel filter - renew	-			●		●
Steering - check for free operation	Day	●	●	●	●	●
Headstock bearing - check/adjust	-			●		●
Headstock bearing - lubricate	-			●		●
Forks - check for leaks/smooth operation	Day	●	●	●	●	●
Fork oil - renew	-					●
Brake fluid levels - check	Day	●	●	●	●	●
Brake fluid - renew	Every 2 years					
Brake hoses - renew	Every 4 years					
Brake pads - check wear levels	Day	●	●	●	●	●
Brake master cylinder - renew seals	Every 4 years					
Brake calipers - renew seals	Every 4 years					
Drive chain - lubricate	Every 200 miles (300 kms)					
Drive chain - wear check	Every 500 miles (800 kms)					
Drive chain slack - check/adjust	Day	●	●	●	●	●
Drive chain rubbing strip - check	-		●	●		●
Drive chain rubbing strip - renew	-				●	
Rear suspension - lubricate	3 years/12,000 miles (18,000 kms)					
Fasteners - inspect visually for security	Day	●	●	●	●	●

Scheduled Maintenance Chart (continued)						
Operation Description	**Odometer Reading in Miles (Kms) or time period, whichever comes first.**					
	Every	500 (800) 1 month	4000 (6000) 1 year	8000 (12000) 2 years	12000 (18000) 3 years	16000 (24000) 4 years
Wheels - inspect for damage	Day	●	●	●	●	●
Tyre wear/tyre damage - check	Day	●	●	●	●	●
Tyre pressures - check/adjust	Day	●	●	●	●	●
Clutch cable - check/adjust	Day	●	●	●	●	●
Fuel/evaporative* hoses - renew	-	Every 4 years				
Secondary air injection system - clean and reset	-			●		●

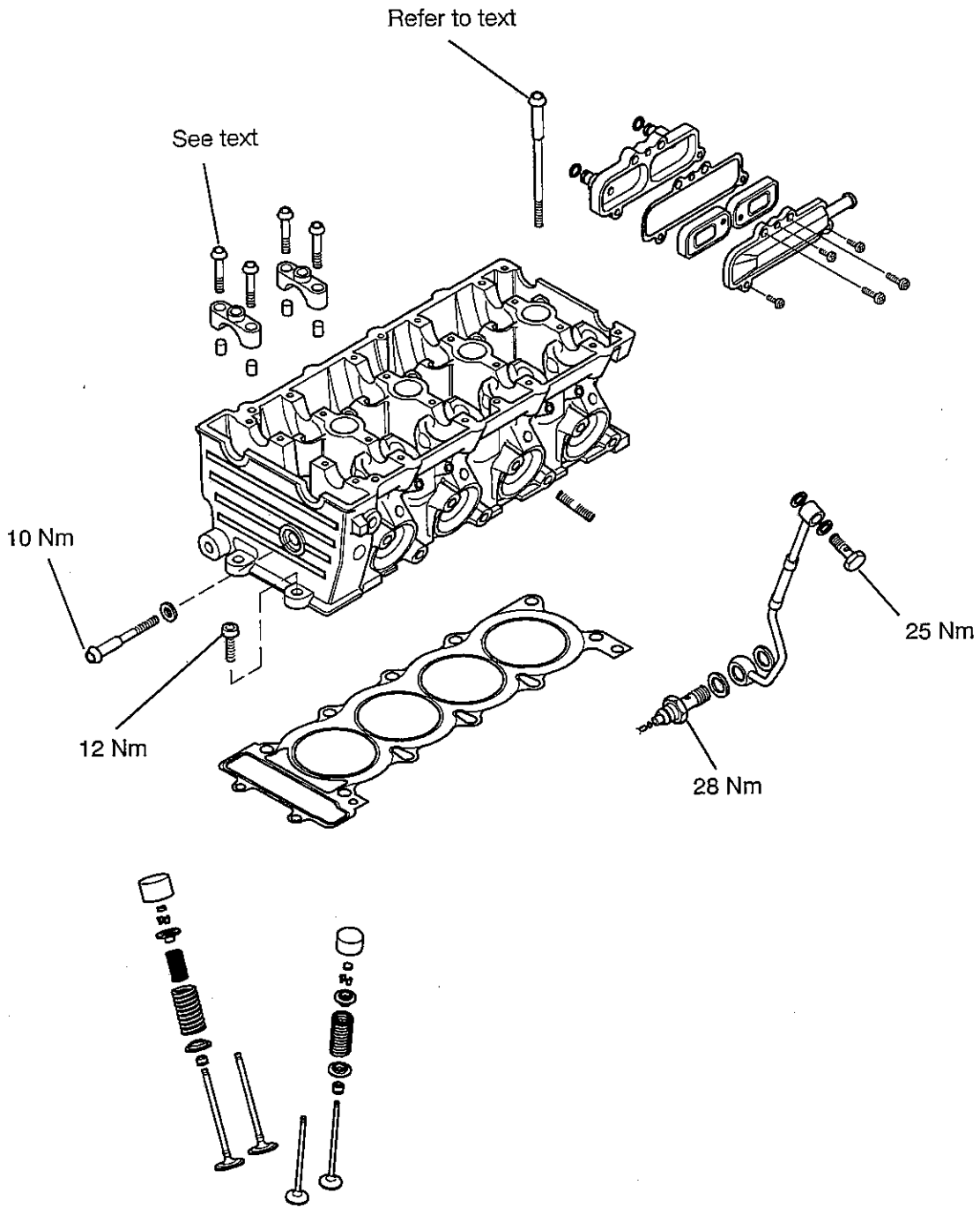
* Evaporative hoses on California models only

CYLINDER HEAD

CONTENTS

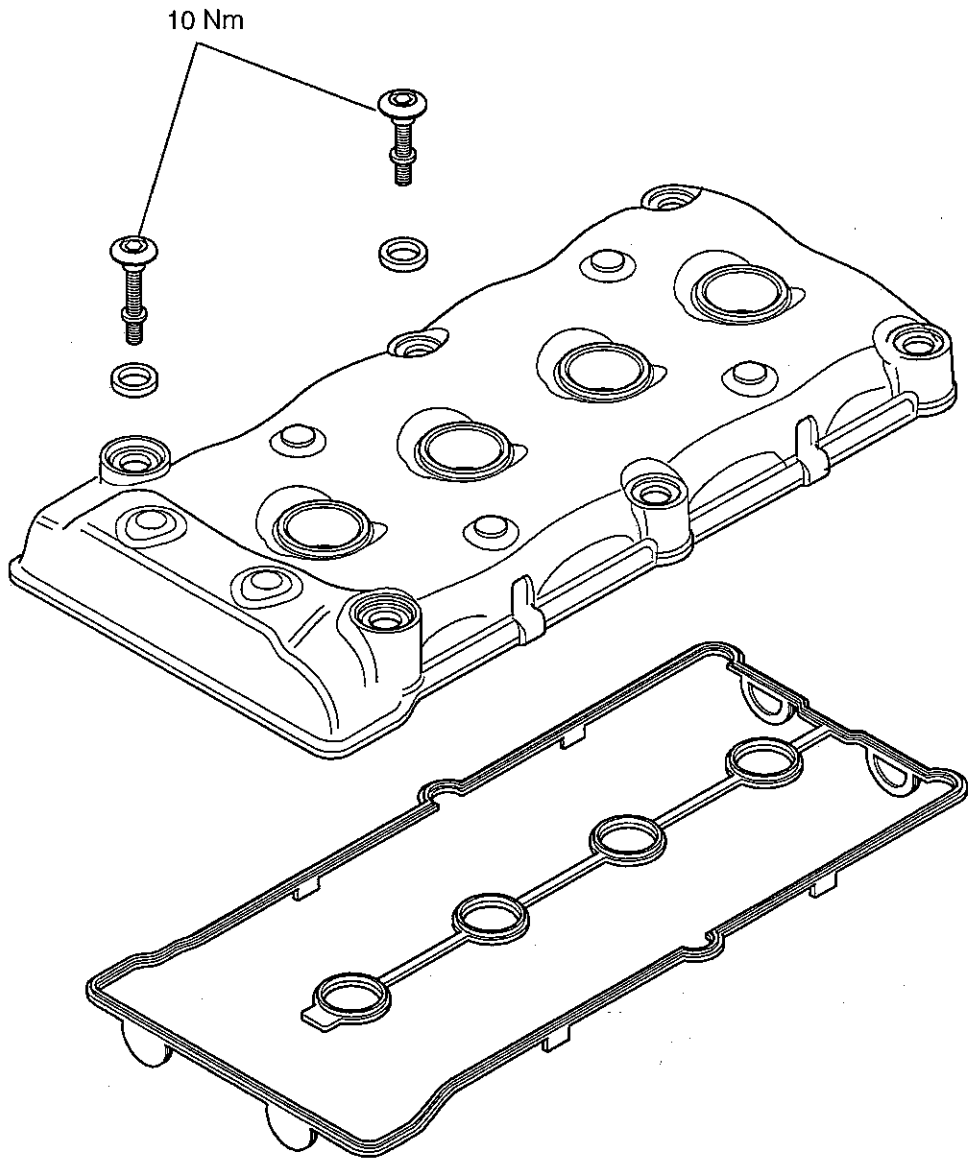
Exploded View

Cylinder Head and Valves



Exploded View

Cam Cover



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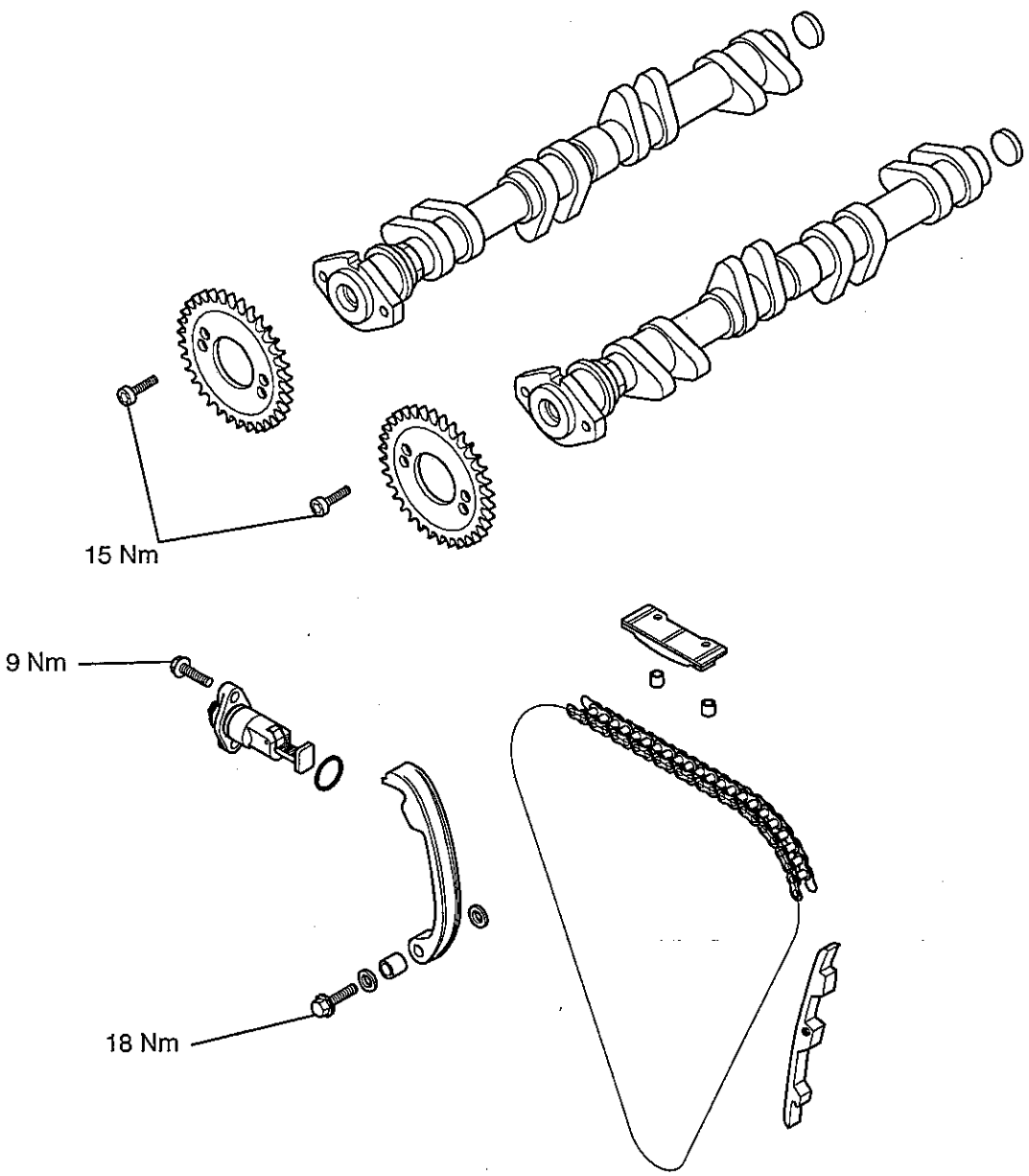
Exploded View

Camshaft and Camshaft Drive



CYLINDER HEAD DESCRIPTION

The engine is fitted with an aluminum alloy cylinder head which carries the camshaft, valves and spark plugs. The cylinder head is cast as a single entity and various components are permanently added after machining.

The camshafts run directly in the cylinder head without additional bearings. Valve clearances are adjusted by changing variable thickness shims which sit between the valve and valve tappet bucket. The camshafts are driven by a silent-type cam chain. The chain is tensioned by a spring loaded device fitted in the upper crankcase half, and is guided by two rubber blades.

Oil is supplied to the cylinder head by an external feed pipe. Once the oil is supplied to the cylinder head, the oil is distributed along internal drillings within the cylinder head casting and camshafts.

The inlet valves are fitted with dual valve springs, the exhaust with single springs. All valve springs have close wound coils at one end to help prevent irregular valve action. When assembling the cylinder head it is important that the close wound, colour coded ends of the springs are fitted facing downwards (towards the piston).

Both the tip and seating face of the valves are hardened to give a long service life. Due to methods used in assembly, the valve seats and valve guides cannot be replaced.

CAUTION: In any of the following procedures which necessitate the removal or disconnection of the camshaft chain, NEVER turn the engine without the camshaft chain and tensioner correctly fitted and adjusted. In the disassembled condition, the pistons will contact the valves if the crankshaft is turned, causing severe engine damage.

CAM COVER

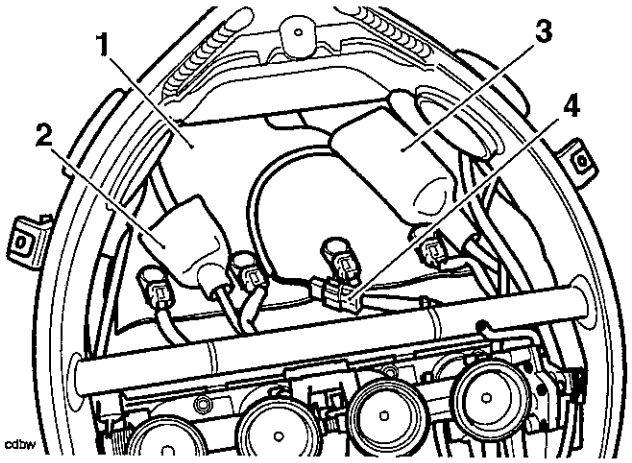
Removal

WARNING: Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

NOTE:

- **The cam cover may be detached after first removing the seats and disconnecting the battery negative (black) lead first. The fuel tank, airbox and lower fairings must also be removed. Refer to the relevant sections of this manual for removal procedures.**

1. Disconnect the electrical connections to the ignition coils and remove the coils from the cam cover by gently pulling upwards.
2. Disconnect the multiplugs leading to both switch cubes and the cooling fan.
3. Remove the air deflector.



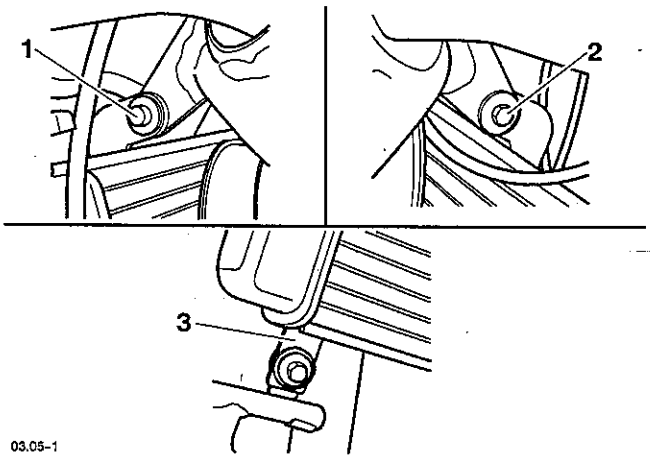
1. Air deflector

2. Left switch cube connection

3. Right switch cube connection

4. Fan connection

4. Release the radiator top and bottom mounting bolts and move the radiator off the left hand top mounting dowel, away from the engine.

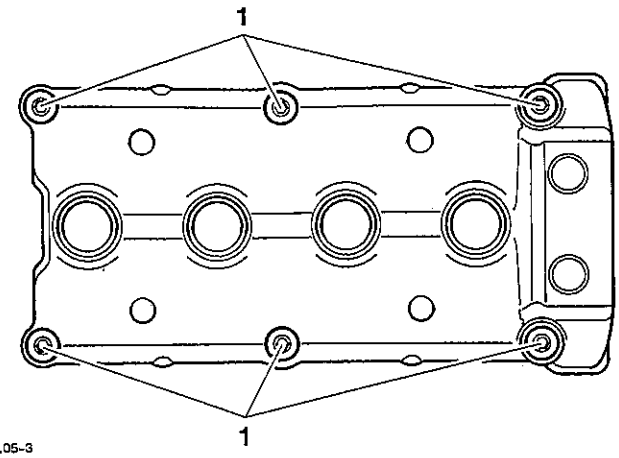


1. Radiator to frame locating dowel

2. Top mount bolt

3. Lower bracket (1 of 2)

5. Release the cam cover bolts.



03.05-3

1. Cam cover bolts

NOTE:

- **Two longer bolts are fitted at the right hand end of the cover, adjacent to the camshaft chain.**

CAUTION: Never use a lever to remove the cam cover from the cylinder head. Using a lever will cause damage to the cylinder head and cam cover which could lead to an oil leak.

6. Remove the cam cover bolts and cam cover.

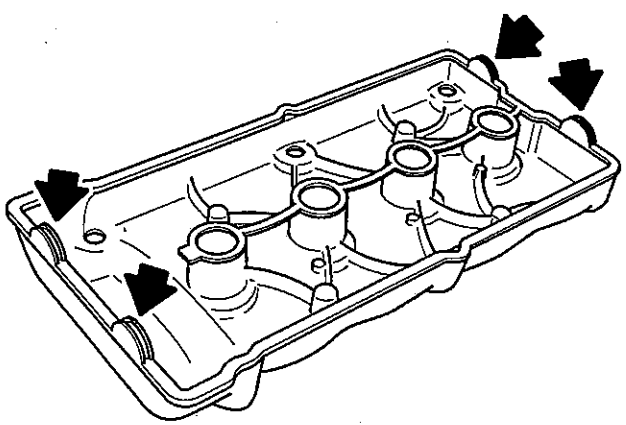
7. Remove the seal from the cover.

8. Remove any residual oil from the cylinder head using a syringe or a lint free cloth.

Installation

1. Check the condition of the cam cover seal and cam cover bolt seals. Replace or refit as necessary.

2. Apply silicone sealant to the four 'D' sections of the cam cover seal.



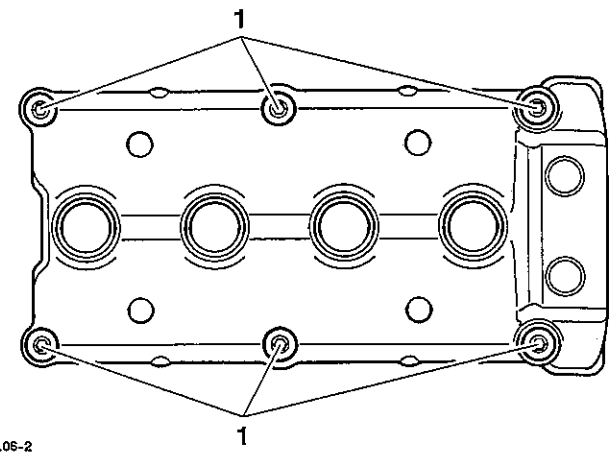
03.05-1

Arrowed: Silicone sealant areas

3. Fit the cam cover to the cylinder head. Ensure that the seal remains in position, paying particular attention to the spark plug tower areas.

4. Fit the cam cover bolts, complete with their seals (steel ring side facing upwards) and tighten to finger tight.

5. Progressively tighten the camshaft cover bolts to **10 Nm.**



03.05-2

1. Cam cover bolts

6. Refit the air deflector shield.

7. Refit and connect the ignition coils.

8. Remake the connections to the switch cubes and fan.

9. Locate the radiator to its mountings and tighten the fixings to **6 Nm.**

10. Refit the airbox and fuel tank as described in the fuel system section.

11. Refit all body panels as detailed in the body section.

12. Reconnect the battery positive (red) lead first.

13. Refit the seats.

CAM CHAIN TENSIONER

Removal

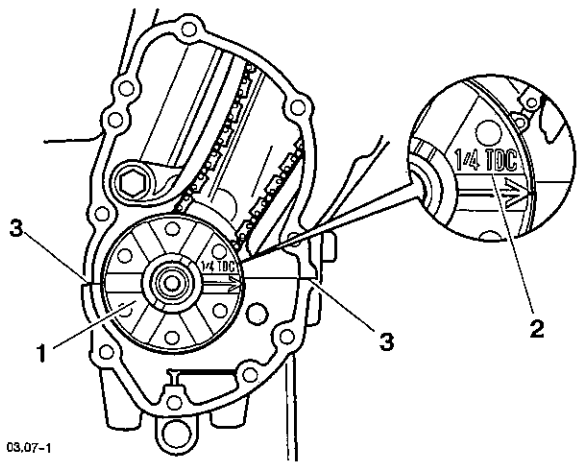
NOTE:

- **The cam chain tensioner may be removed after first removing the camshaft cover and breather cover. Refer to the relevant sections of this manual for removal procedure of each item.**

1. Rotate the crankshaft clockwise until No. 1 cylinder is at TDC.

NOTE:

- **No. 1 cylinder is at TDC when the arrow marked 1/4TDC on the centrifugal breather is horizontal, facing to the right and in line with the crankcase split line.**



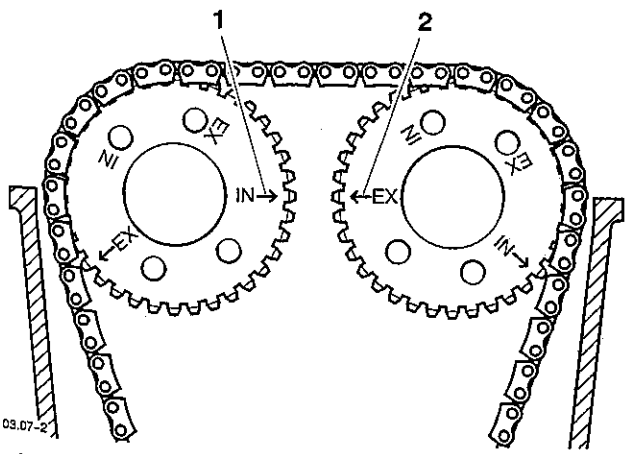
1. Centrifugal breather

2. 1/4 TDC mark

3. Crankcase split line

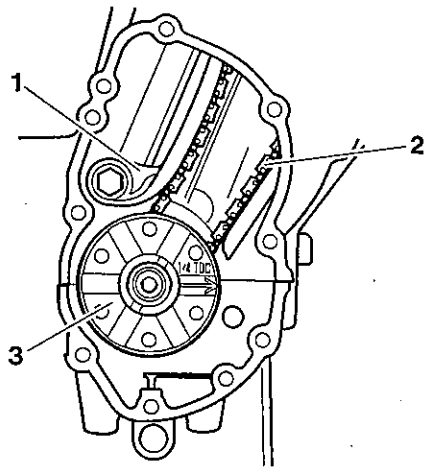
NOTE:

- **In addition, timing marks on the camshaft sprockets will point inwards at a point level with the cylinder head.**



1. Inlet timing mark

2. Exhaust timing mark



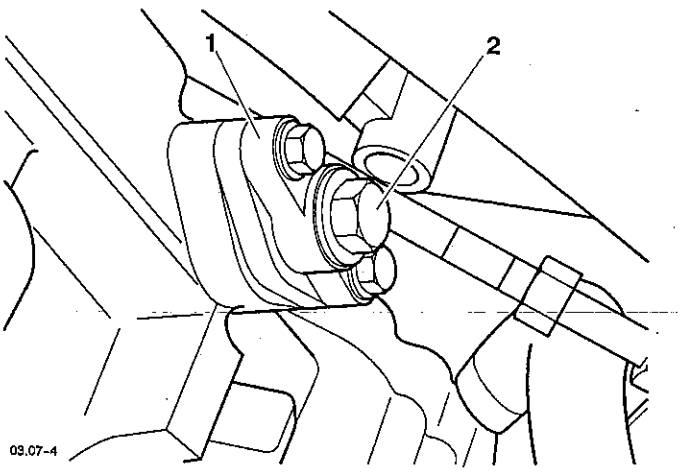
1. Cam chain tensioner blade

2. Cam chain

3. Centrifugal breather

WARNING: The cam chain tensioner center nut is under spring tension. Always wear hand, eye and face protection when withdrawing the center nut. Take great care to minimise the risk of personnel injury and loss of components.

2. Remove the center nut and washer from the cam chain tensioner and withdraw the cam chain tensioner spring and plunger.



1. Cam chain tensioner

2. Center nut

3. Remove the bolts securing the cam chain tensioner to the crankcase.

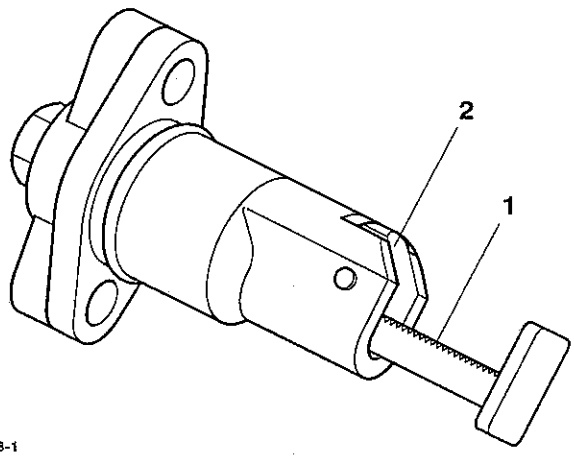
4. Remove the cam chain tensioner.

Installation

Before installation of the cam chain tensioner, check the following:

- No. 1 cylinder is still at TDC.
- The timing marks on the camshafts are still aligned.
- The cam chain tensioner 'O' ring is not worn or damaged. If worn or damaged, replace.

1. Set the cam chain tensioner plunger onto the first tooth of the ratchet (i.e. minimum extension) by manually lifting the cam chain tensioner pawl.



1. Cam chain tensioner ratchet

2. Pawl

2. Fit the 'O' ring to the tensioner body.
3. Fit the cam chain tensioner to the crankcase (ratchet facing upwards) and tighten the bolts to **9 Nm.**
4. Fit the spring and plunger into the cam chain tensioner and, using finger pressure only, push the tensioner into contact with the tensioner blade.

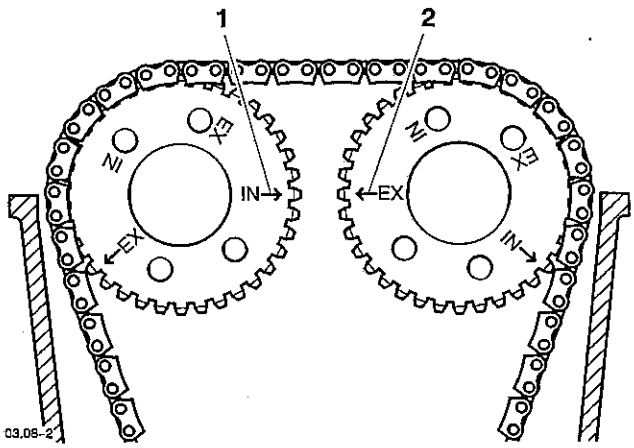
WARNING: The cam chain tensioner center nut is under spring tension. Always wear hand, eye and face protection when refitting the center nut. Take great care to minimise the risk of personnel injury and loss of components.

5. Fit the center nut and washer to the cam chain tensioner. Torque the nut to **23 Nm.**
6. Check that the cam chain tensioner is correctly seated in the middle of cam chain tensioner blade, when viewed from above.

NOTE:

- **No. 1 cylinder is at TDC when the arrow marked 1/4TDC on the centrifugal breather is horizontal, facing to the right and in line with the crankcase split line.**

7. Rotate the engine through 4 complete revolutions and reset number 1 cylinder to TDC.
8. Check that the camshaft timing marks point inwards at a point level with the cylinder head. Reset the cam positions if necessary.



1. Inlet timing mark

2. Exhaust timing mark

9. If the tensioner location and cam timing have both been checked and are correct, refit the cam cover and breather cover as described elsewhere in this manual.
10. Refit the airbox and fuel tank as described in the fuel section.
11. Refit all bodywork as described in the body section.
12. Reconnect the battery, positive (red) lead first.
13. Refit the seats.

CAMSHAFTS

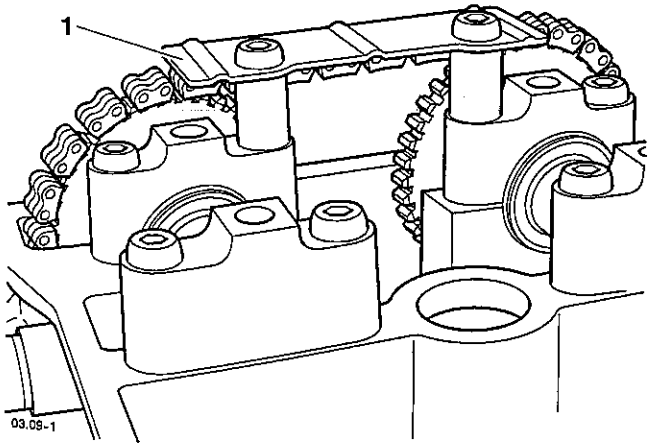
CAUTION: In following procedures, which necessitates the removal or disconnection of the camshaft chain, NEVER turn the engine without the camshaft chain and tensioner correctly fitted and adjusted. In the disassembled condition, the pistons will contact the valves if the crankshaft is turned, causing severe engine damage.

Removal

NOTE:

- **The camshafts can be removed from the cylinder head without the complete removal of the cam chain. However, the chain must first be detached from the camshafts. Refer to other parts of this section for details.**
- **The camshafts and sprockets are removed as an assembly with number 1 cylinder at TDC.**
- **No. 1 cylinder is at TDC when the arrow marked 1/4TDC on the centrifugal breather is horizontal, facing to the right and in line with the crankcase split line.**

1. Remove the cam cover as described earlier in this section.
2. Remove the cam chain tensioner as described earlier in this section.
3. Remove the cam chain top pad.

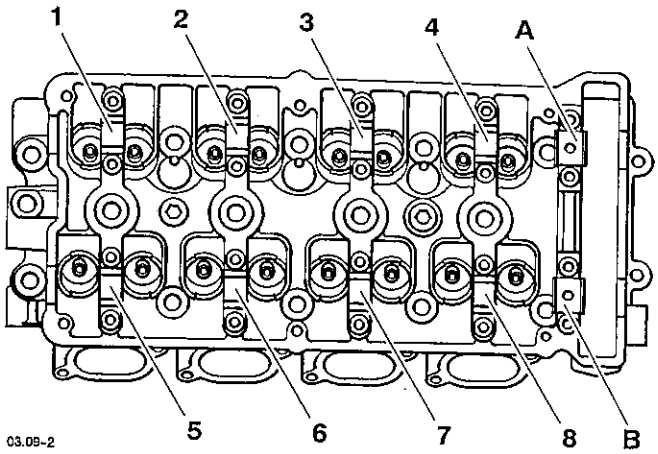


1. Top pad

NOTE:

- **The camshaft caps are numbered sequentially and must not be interchanged. The camshaft caps at the sprocket end of the camshafts are marked 'A' (Exhaust) and 'B' (Inlet).**

4. Mark the camshaft caps in relation to the cylinder head prior to removal.

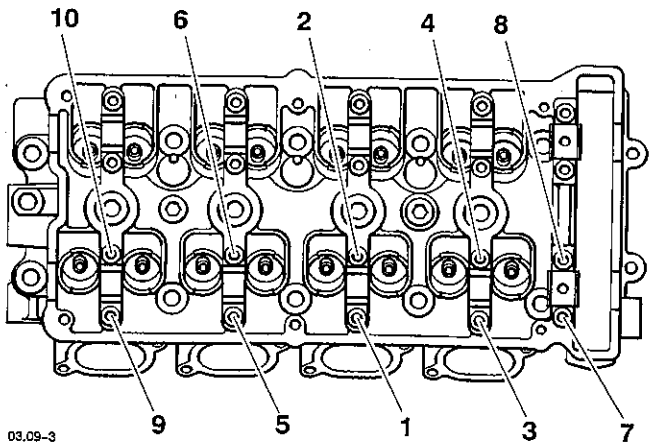


Camshaft cap numbering

CAUTION: Progressively release all the camshaft caps from ONE camshaft before removal. If both camshafts are progressively released at the same time, the valves may contact each other and cause damage to the cylinder head valve face areas and valve stems.

CAUTION: Never completely release one camshaft cap in isolation from the others. This could cause some of the camshaft caps to crack. Camshaft caps cannot be replaced!

5. Progressively release each of the bolts securing the camshaft caps of **ONE** camshaft, in the sequence shown below:



Cap bolt release sequence

6. Repeat for the second camshaft.

NOTE:

- **The camshaft caps are doweled. If they cannot be removed with hand pressure, GENTLY strike each one with a soft face mallet to release them.**

7. Once the tension on all the camshaft caps has been released, remove the bolts and the camshaft caps.

NOTE:

- **Secure the cam chain to ensure that it does not fall into the crankcase during the removal of the camshafts.**

8. Lift the cam chain from one camshaft and withdraw the camshaft from the cylinder head. Repeat for the second camshaft.

Inspection

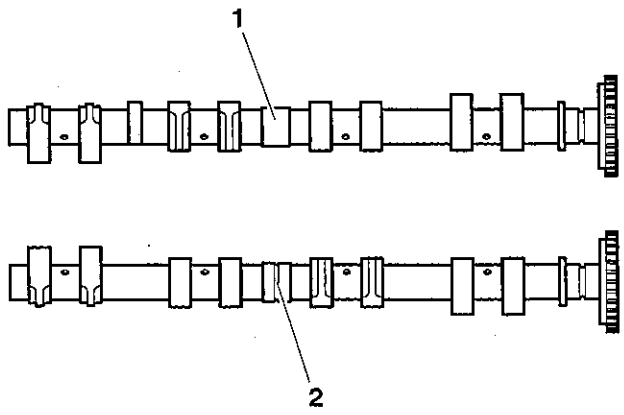
CAUTION: The same sprockets are used for both camshafts. To attach the sprocket to different camshafts, different bolt holes are used. Never fit a camshaft sprocket to a camshaft using incorrectly identified bolt holes. Severe engine damage will result from incorrect attachment.

NOTE:

- **The sprockets bolt holes are offset to ensure correct fitting to the camshaft.**

NOTE:

- **The inlet camshaft can be identified by a groove on a machined surface in its centre. The exhaust camshaft has a machine surface without a groove.**



03.11-2

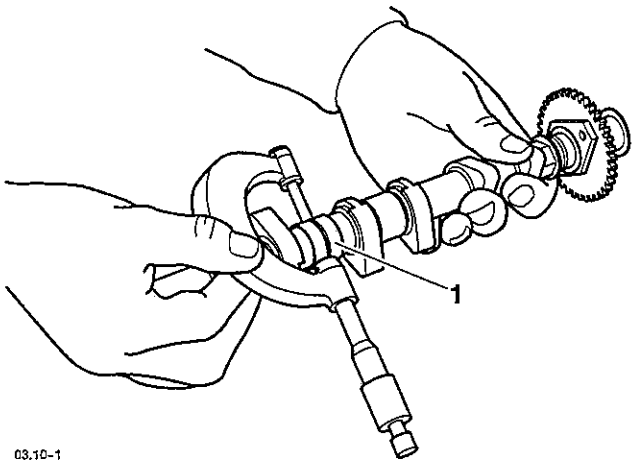
1. Exhaust camshaft (smooth)

2. Inlet camshaft (grooved)

1. Inspect the camshaft sprockets for damaged and/or worn teeth. Replace as necessary.

2. Check the diameter of the camshaft journals.

Standard	**23.90-23.93**
Service Limit	**22.87**



03.10-1

1. Journal diameter

- **If any journal is outside the service limit, replace the camshaft.**

3. Inspect the camshaft bearing surfaces in the cylinder head and the camshaft caps for wear and/or damage. If wear and/or damage is found replace the cylinder head and camshaft caps.

4. Check camshaft journal to camshaft cap clearance using Plastigage (Triumph part number 3880150-T0301) as follows:

a. Place a camshaft to the cylinder head (in it's correct location, i.e. inlet cam to inlet valves). Ensure that the camshaft sprocket timing marks are positioned as for removal.

CAUTION: Never completely tighten one camshaft cap in isolation from the other others. This could lead to cracking of the camshaft caps which will mean replacing the complete cylinder head.

b. Fit the camshaft caps and, in the sequence shown elsewhere in this section, torque the bolts to **10 Nm.**

c. Release and remove one camshaft cap. Wipe the exposed areas of the camshaft journal and cap.

d. Apply a thin smear of grease to the exposed part of the camshaft journal and a small quantity of silicone release agent to the camshaft cap.

e. Size a piece of Plastigage to fit across the exposed camshaft journal.

f. Fit the Plastigage to the exposed camshaft journal using the grease to hold it in place.

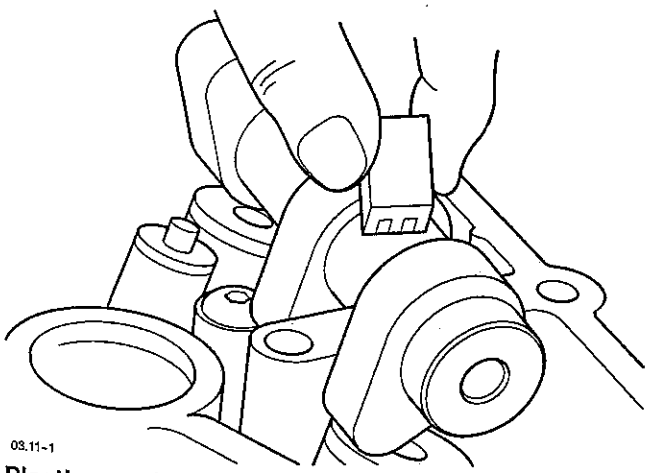
g. Refit the camshaft cap and progressively tighten to **10 Nm.**

h. Release and remove the camshaft cap.

j. Using the gauge provided with the Plastigage kit, measure the width of the now compressed Plastigage.

NOTE:

- **The camshaft caps are unique to each cylinder head and are not available individually. If a camshaft cap is worn or damaged, the complete cylinder head must be replaced.**



03.11-1

Plastigage check.

5. Calculate the camshaft journal clearance using the chart provided with the Plastigage kit.

6. If the camshaft journal to camshaft cap clearance is within the specified tolerances (see table below), remove the remaining camshaft caps (in the correct sequence) and clean off all traces of Plastigage, silicone release agent and grease.

Standard	0.10 mm
Service Limit	0.17 mm

NOTE:

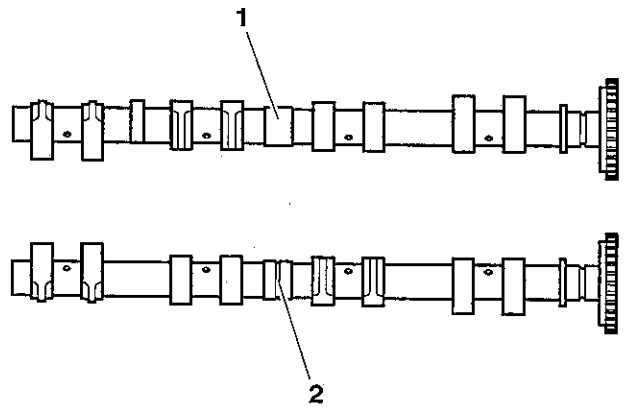
- **If any of the camshaft journal to camshaft cap clearances are outside the specified tolerances, and the camshaft journals are within their specified tolerances, the cylinder head must be replaced.**

Installation

1. Thoroughly clean the camshafts and lubricate the bearing and lobe areas with a 50/50 solution of engine oil and molybdenum disulphide grease.

NOTE:

- **The inlet camshaft can be identified by a groove on a machined surface in its centre. The exhaust camshaft has a machine surface without a groove.**



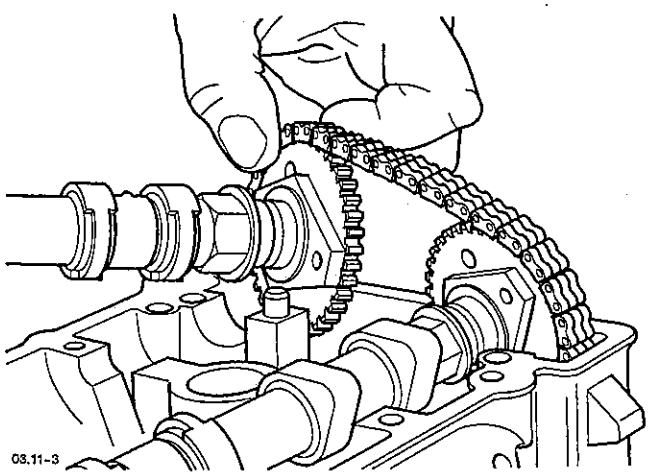
03.11-2

1. Exhaust camshaft (smooth)

2. Inlet camshaft (grooved)

2. Place the camshafts to the cylinder head. Ensure that they are correctly located over their respective valve banks.

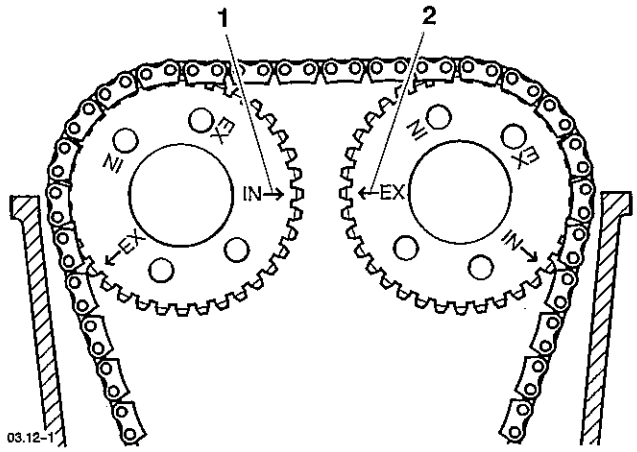
3. Working on one camshaft at a time, locate the cam chain over the camshaft sprockets.



03.11-3

Camshaft refitting

4. Position the timing mark on the camshaft sprockets in the position shown.



1. Inlet timing mark

2. Exhaust timing mark

CAUTION: Do not fit the camshaft caps without first aligning the timing marks on the camshaft sprockets and centrifugal breather. If the camshaft caps are fitted without aligning the timing marks, the inlet and exhaust valves may contact each other and cause damage to the valve head areas and valve stems.

CAUTION: Progressively tighten all the camshaft caps from ONE camshaft at a time. If both camshafts are progressively tightened at the same time the valves may contact each other and cause damage to the valve head areas and valve stems.

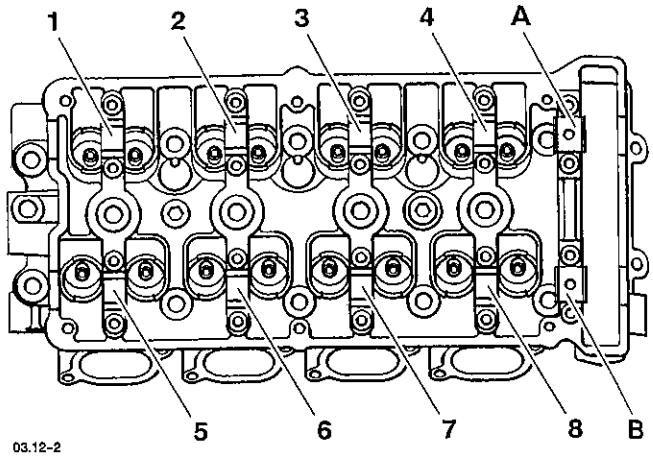
5. Lubricate the camshaft caps with a 50/50 solution of engine oil and and molybdenum disulphide grease.

6. Check that the camshaft and crankshaft timing marks remain correctly set (crank - 1/4TDC mark horizontal, arrow pointing forward and level with the crankcase split line, camshaft - arrows level with the head and pointing inwards).

NOTE:

- **The camshaft caps are numbered sequentially and must not be interchanged.**
- **The camshaft caps, at the sprocket end of the camshafts are marked, 'A' (Exhaust) and 'B' (Inlet) and also locate the cam chain top pad.**

7. Lubricate the cam cap bolt threads with clean engine oil.

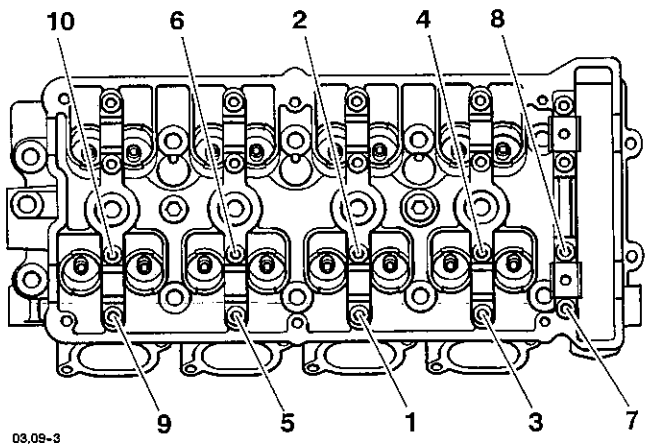


Camshaft cap numbering

8. Fit the camshaft caps and bolts, then finger-tighten the bolts. **Do not fully tighten the bolts yet.**

CAUTION: Never completely tighten one camshaft cap in isolation from the other others. This could cause the camshaft caps to crack.

9. In the order shown below, progressively tighten the bolts securing the camshaft caps of **ONE** camshaft until full thread engagement is achieved. Finally, again in the order shown below, torque to **10 Nm.**



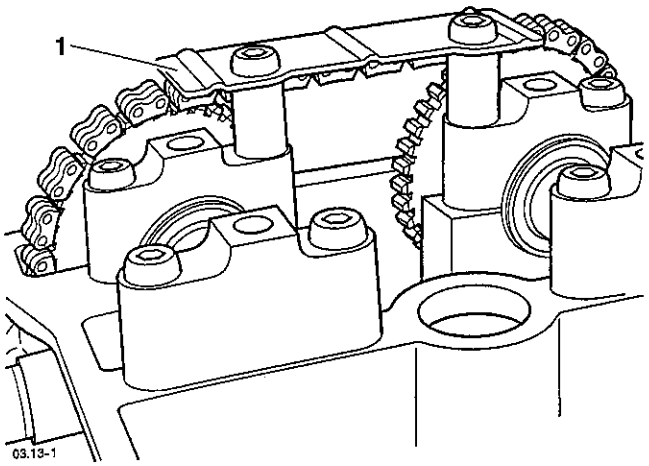
Cap tightening sequence

10. Repeat step 9 for the second camshaft.

CAUTION: Do not rotate the camshafts more than 5°. If the camshafts are rotated more than 5° the valves may contact the pistons and cause damage to the piston, valve head areas and valve stems.

11. Rotate the camshafts through 5° in each direction. Ensure free rotation.

12. Fit the top pad (rubber side to the cam chain) and tighten the bolts to **10 Nm.**



1. Top pad

13. Assemble the cam chain tensioner as described earlier in this section.

> **CAUTION: If any components have been renewed, the valve clearances must be checked and adjusted. Running with incorrectly adjusted valve clearances may cause excess engine noise, rough running and engine damage.**

14. Check valve clearances. Adjust as necessary.

15. If the tensioner location and cam timing have both been checked and are correct, refit the cam cover and breather cover as described elsewhere in this manual.

16. Refit the airbox and fuel tank as described in the fuel section.

17. Refit all bodywork as described in the body section.

18. Reconnect the battery, positive (red) lead first.

19. Refit the seats.

VALVE CLEARANCE MEASUREMENT

Valve Clearances

NOTE:

- **The correct valve clearances are in the range given in the table below:**

Inlet	**0.15 – 0.25 mm**
Exhaust	**0.20 – 0.30 mm**

Camshaft, valve, valve shim and valve seat wear affect the valve clearances. The effect of this wear is to change the clearance between the camshaft and the tappet bucket, causing engine noise and improper running. If the valve clearances become too small, permanent damage to the valve and valve seat will take place. If the valve clearance becomes too great, the engine will become noisy and will not run correctly.

NOTE:

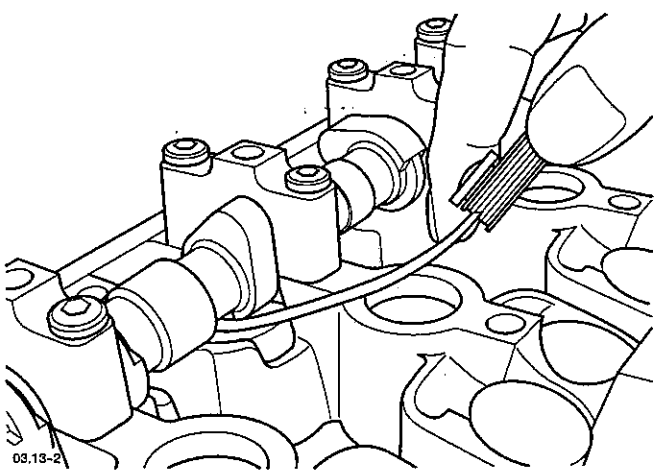
- **Valve clearance adjustment must be carried out with the engine cold.**

1. Remove the camshaft cover as previously described in this section.

2. Remove the spark plugs to reduce compression resistance when turning the engine.

3. Select a high gear and, using the rear wheel, turn the engine over until a pair of camshaft lobes are positioned pointing directly away from the valves.

4. Using feeler gauges, measure and record the clearances for this pair of valves only.



Measuring valve clearance

5. Repeat the process until the clearances for all valves have been checked.

NOTE:

- **If the measurements taken do not fall within the specified tolerances, shim adjustment must be made.**

> **CAUTION: If valve clearances are not checked and, if necessary, corrected, wear could cause some of the valves to remain partly open. This will lower performance, burn valves and valve seats and may cause severe engine damage.**

6. Record the measured valve clearance on a chart.

Valve clearance adjustment

NOTE:

- **To adjust the valve clearances the camshafts must be removed (exhaust valve adjustments - remove the exhaust camshaft, inlet valve adjustments - remove the inlet camshaft). Follow the camshaft removal procedure described earlier in this section.**

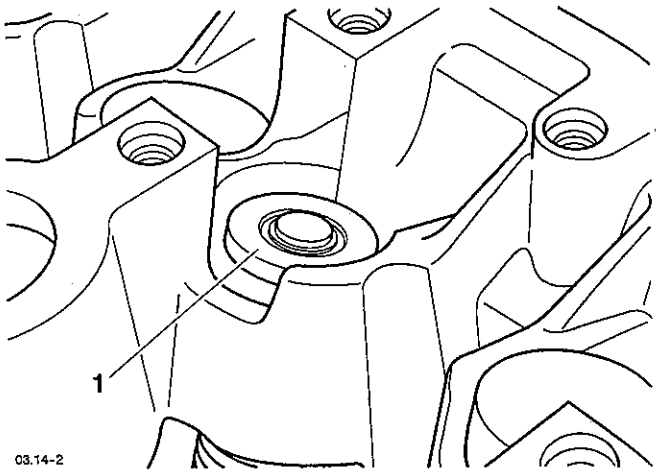
1. Remove the relevant camshaft, using the procedure described earlier in this section.
2. Remove the tappet bucket from the cylinder head.

1. Tappet bucket

NOTE:

- **The original shim may withdraw with the tappet bucket.**

3. Remove the existing shim from the valve head.



1. Shim

NOTE:

- **The correct valve clearances are in the range given in the table below:**

Inlet	**0.15 – 0.25 mm**
Exhaust	**0.20 – 0.30 mm**

4. Measure the original shim, using a micrometer or vernier and select the appropriate new shim as required.

Clearance too small:

- **If an exhaust valve clearance is less than 0.20 then fit a thinner shim.**

Clearance too large:

- **If an exhaust valve clearance is more than 0.30 then fit a thicker shim.**

NOTE:

- **Shims are available ranging from 1.70 mm to 3.00 mm in increments of 0.025 mm.**

5. Fit the new shim to the valve head.
6. Lubricate the tappet bucket(s) with a 50/50 solution of engine oil and molybdenum disulphide grease.
7. Refit the tappet bucket.
8. Refit the camshaft, as described earlier in this section.
9. Re-check all valve clearances.
10. Repeat the procedure if the valves require further adjustment.

CYLINDER HEAD

Removal

WARNING: Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

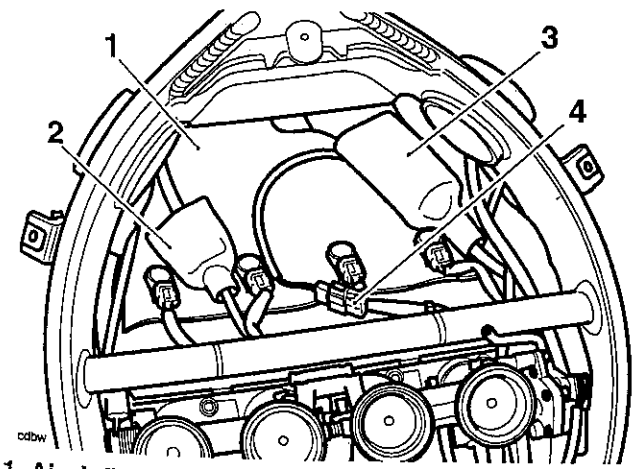
NOTE:

- **The cylinder head may be removed after first removing the seat and disconnecting the battery, negative (black) lead first. The fuel tank, airbox and both lower fairings must also be removed. Refer to the relevant sections for removal procedures.**

1. Drain the engine oil as described in the lubrication section.

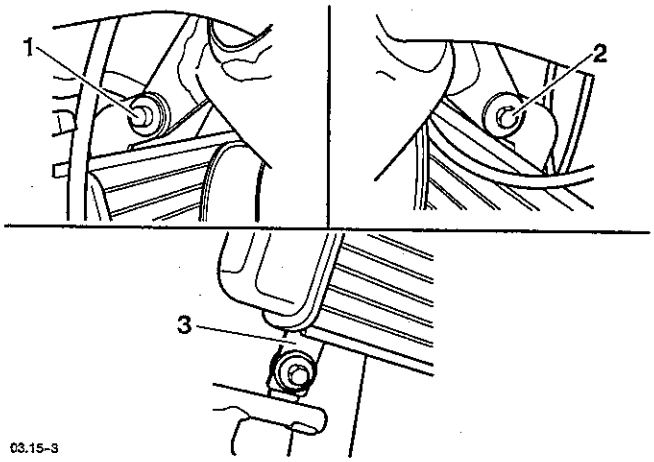
WARNING: Do not remove the coolant pressure cap when the engine is hot. When the engine is hot the cooling system is hot and also under pressure which can result in hot coolant being sprayed out on removal of the cap. Contact with the hot coolant will cause scalds and skin damage.

2. Drain the coolant, as described in the cooling section.
3. Disconnect the electrical connections to the ignition coils and remove the coils from the cam cover by gently pulling upwards.
4. Disconnect the multiplugs leading to both switch cubes and the cooling fan.



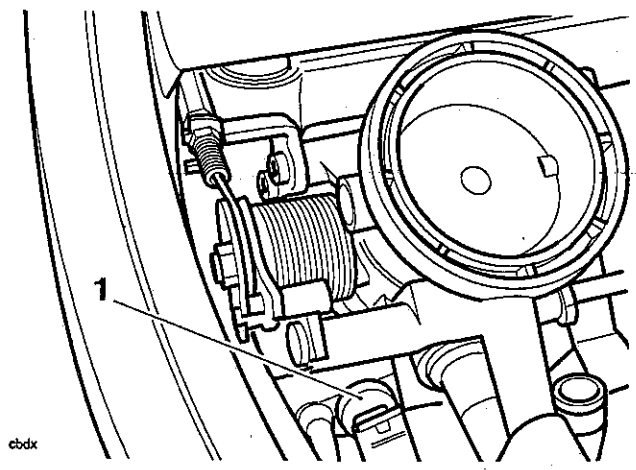
1. **Air deflector shield**
2. **Left switch cube connection**
3. **Right switch cube connection**
4. **Fan connection**

5. Remove the air deflector shield.
6. Disconnect the radiator top hose at the cylinder head.
7. Disconnect the bottom and heat exchanger hoses at the radiator
8. Undo the radiator top and bottom mounting bolts and move the radiator off the top mounting dowel.



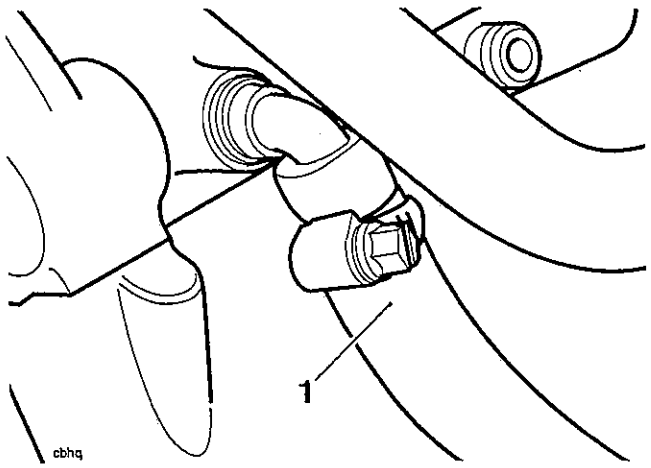
1. **Radiator to frame locating dowel**
2. **Top mount bolt**
3. **Lower mounting (1 of 2)**

9. Place the displaced radiator assembly in a safe place.
10. Disconnect the electrical connector from the coolant temperature sensor.



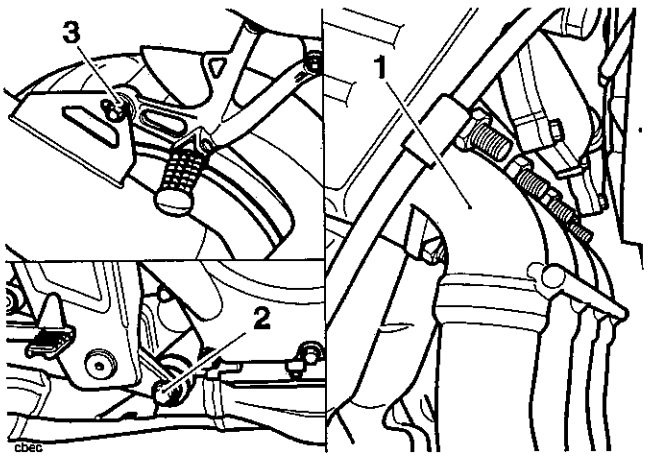
1. **Coolant temperature sensor**

11. Disconnect the by-pass hose from the head.



1. Bypass hose

12. Remove the exhaust system and silencer as described in the fuel system section.



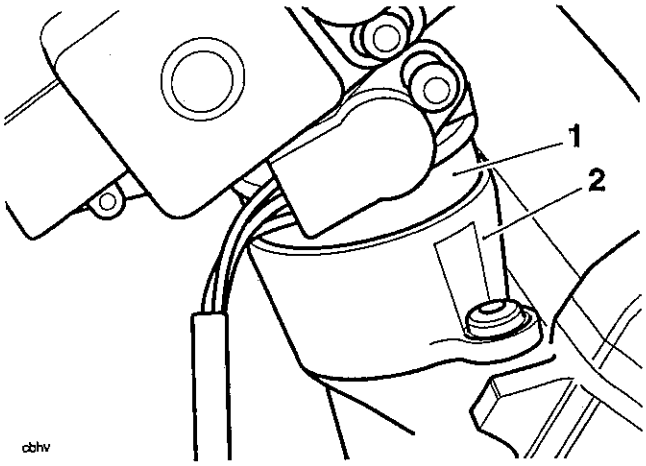
1. Exhaust header

2. Centre mounting

3. Rear mounting

13. Disconnect the multiplugs to the various sensors, injectors and actuators on the throttle body assembly.

14. Release the clips securing the throttle bodies to the transition pieces. Withdraw the throttle bodies and place on the crankcase.



1. Clip (1 of 4)

2. Transition piece

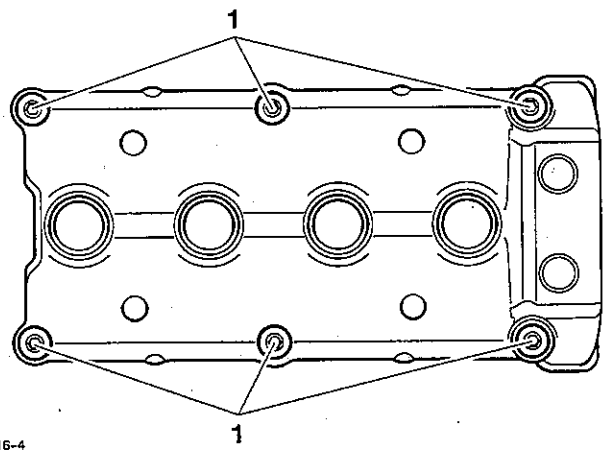
NOTE:

- **It is not necessary to disconnect the throttle cable from the throttle bodies when removing the cylinder head.**

15. Progressively release the cam cover bolts.

NOTE:

- **Two, longer bolts are fitted at the right hand end of the camshaft cover adjacent to the camshaft chain.**



1. Camshaft cover bolts

> **CAUTION: Never use a lever to remove the camshaft cover from the cylinder head. Using a lever will cause damage to the cylinder head and camshaft cover which could lead to an oil leak.**

16. Remove the bolts together with the cam cover.

17. Remove any residual oil from the front of the cylinder head using a syringe or a lint free cloth.

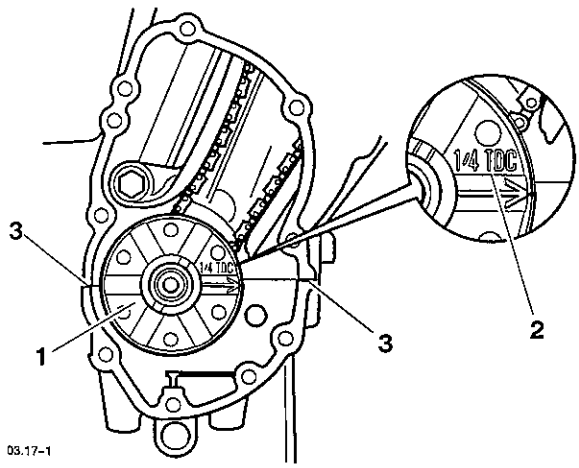
18. Remove the breather cover.

19. Check valve clearances as described earlier in this section. Note any incorrect clearances for adjustment on re-assembly.

20. Rotate the crankshaft clockwise until No. 1 cylinder is at TDC.

NOTE:

- **No. 1 cylinder is at TDC when the arrow marked 1/4TDC on the centrifugal breather is horizontal, facing to the right and in line with the upper and lower crankcase split line.**



03.17-1

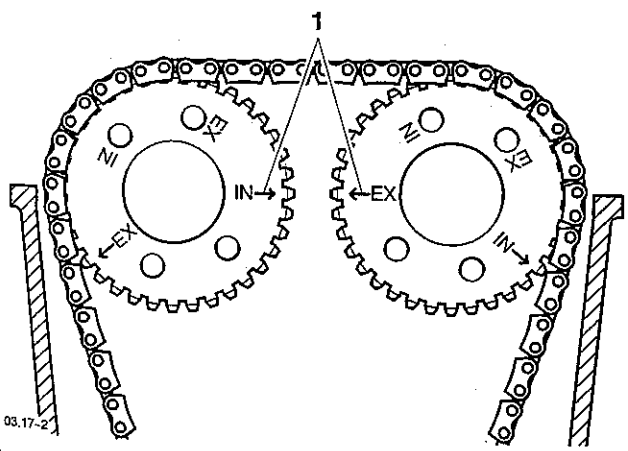
1. Centrifugal breather

2. Timing mark

3. Crankcase split

NOTE:

- **In addition timing marks on the camshaft sprockets will point inwards at a point level with the cylinder head.**

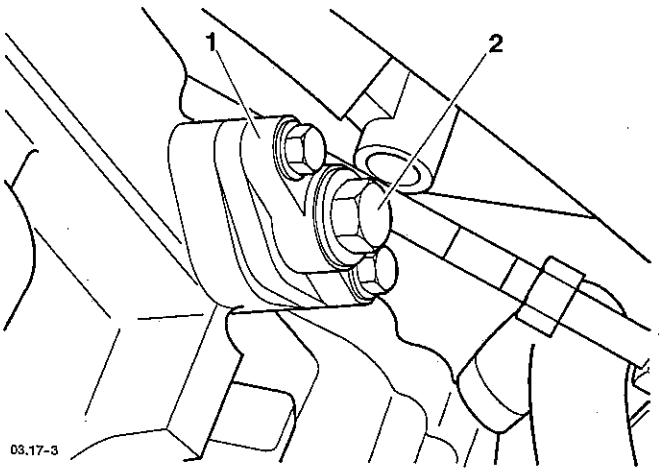


03.17-2

1. Camshaft timing marks

WARNING: The cam chain tensioner center nut is under spring tension. Always wear hand, eye and face protection when withdrawing the center nut. Take great care to minimise the risk of personnel injury and loss of components.

21. Remove the center nut and washer from the cam chain tensioner and withdraw the cam chain tensioner spring and plunger.



03.17-3

1. Cam chain tensioner

2. Center nut

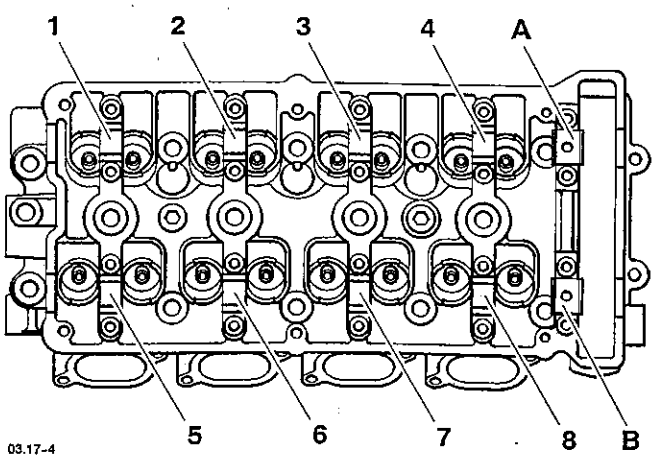
22. Remove the cam chain tensioner.

23. Remove the cam chain top pad.

NOTE:

- **The camshaft caps are numbered sequentially and must not be interchanged. The camshaft caps at the sprocket end of the camshafts are marked 'A' (Exhaust) and 'B' (Inlet).**

24. Identify the camshaft caps in relation to the cylinder head prior to removal.



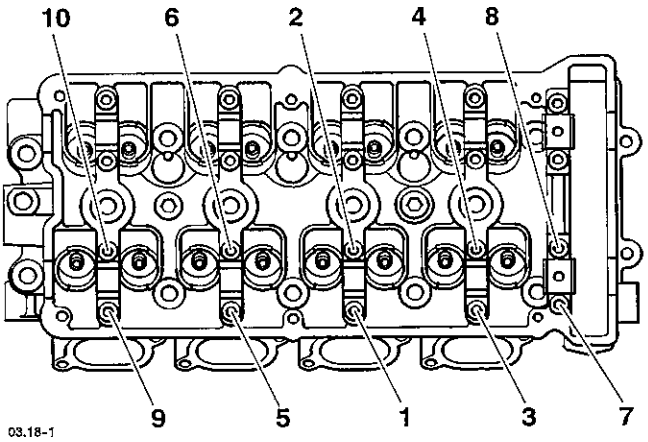
03.17-4

Camshaft Cap Numbering

CAUTION: Progressively release all the camshaft caps from ONE camshaft before removal. If both camshafts are progressively released at the same time the valves may contact each other and cause damage to the valve head areas and valve stems.

CAUTION: Never completely release one camshaft cap in isolation from the others. This could cause some of the camshaft caps to crack.

25. Progressively release, but do not yet remove each of the bolts securing the camshaft caps of **ONE** camshaft at a time, in the sequence shown below.



Cap release sequence

NOTE:

- **The camshaft caps are doweled. If they cannot be removed with hand pressure, gently strike each one with a soft face mallet to release them.**

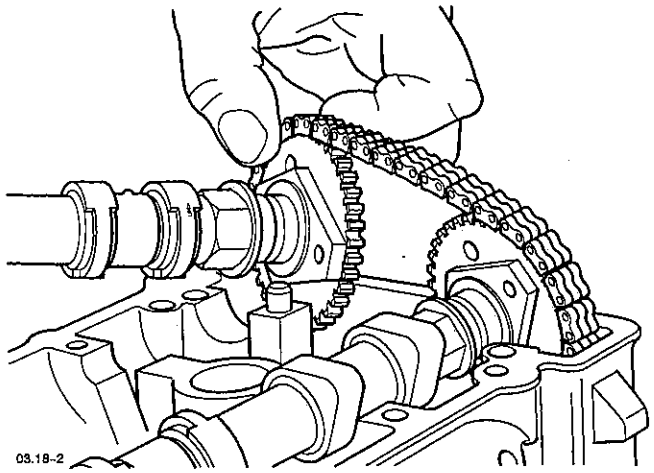
26. Once the tension on all the camshaft caps has been released, remove the bolts and camshaft caps.

27. Repeat for the second camshaft.

NOTE:

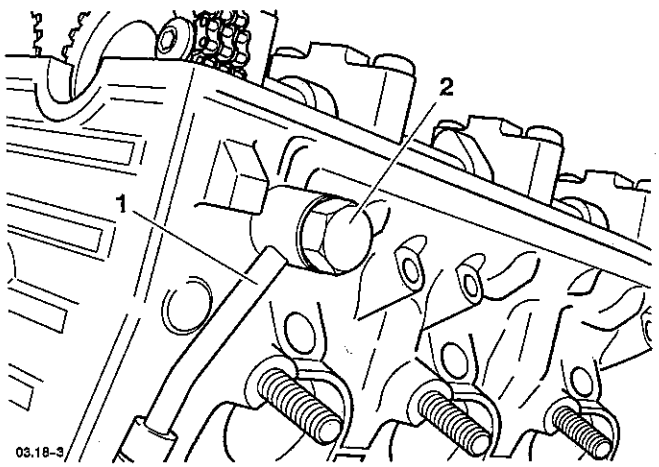
- **Secure the cam chain to ensure that it does not fall into the crankcase during the removal of the camshafts.**

28. Lift the cam chain from one camshaft and withdraw the camshaft from the cylinder head. Repeat for the second camshaft.



1. Removing a camshaft

29. Remove the banjo bolt securing the oil feed pipe to the cylinder head. Discard the copper washers.

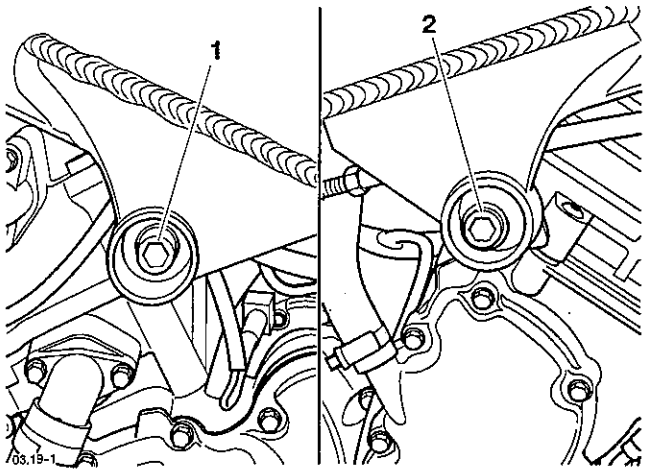


1. Oil feed pipe

2. Banjo bolt

30. Place a support beneath the engine and ensure that the frame is adequately and securely supported.

31. Release and remove the frame to cylinder head mounting bolts on both sides.



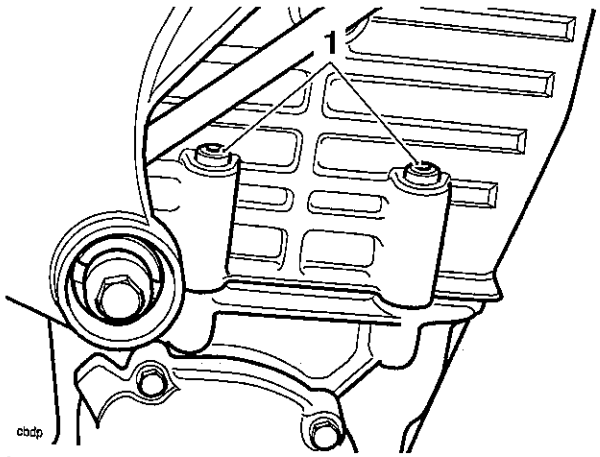
1. Left hand mounting bolt

2. Right hand mounting bolt

32. Release the frame to cylinder head adjuster lockring, on the right hand side of the engine, using service tool T3880380.

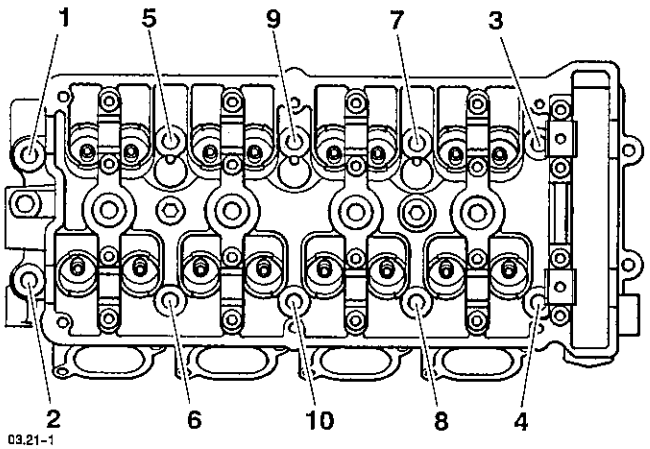
33. Release the frame to cylinder head adjuster.

34. Release the bolts securing the outside of the cylinder head to the upper crankcase.



1. Cylinder head to crankcase bolts

35. Progressively release the cylinder head bolts in the order shown below:



1. Bolt release sequence

36. Remove the cylinder head bolts and lightly strike the cylinder head with a rubber mallet to break the seal of the gasket.

37. Remove the cylinder head.

38. Remove the cylinder head gasket. Discard the gasket.

39. Remove the cylinder liners as described in the crankshaft, rods and pistons section.

NOTE:

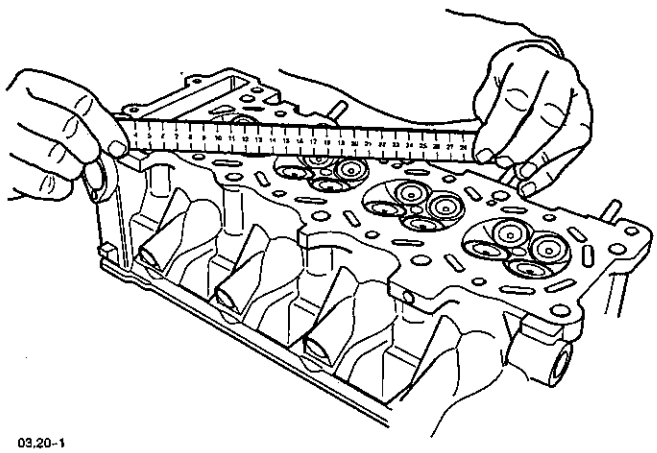
- **The cylinder liners must be removed and resealed after removing the head as the silcone sealer may leak otherwise.**

Inspection

1. Thoroughly clean the surface of the cylinder head and check for damage and/or pitting of the combustion chambers.

2. Using a straight edge, check the cylinder head gasket face for warp which could lead to gasket failure. Replace the cylinder head if warped beyond the flatness limit.

Cylinder head flatness tolerance	**0.03 mm max warp**



03.20-1

Cylinder head level check

3. Check the cam chain rubbing blade. Renew if worn or damaged.

4. Check the 'O' rings on the throttle bodies and fuel injectors for damage. Replace as necessary.

CAUTION: Ensure all trace of fluids are removed from the threaded holes in the crankcase. Should any fluid remain in any of the threaded holes, severe crankcase damage could result from hydraulic locking of head bolts etc., on assembly of the engine.

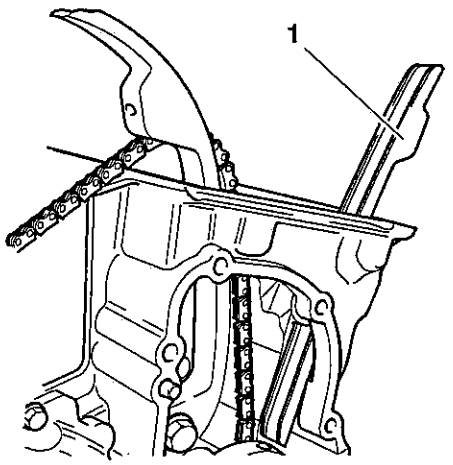
Installation

1. Fit the cylinder liners as described in the crankshaft, rods and piston section.

2. Position the cam chain rubbing blade to the right hand side of the upper crankcase.

NOTE:

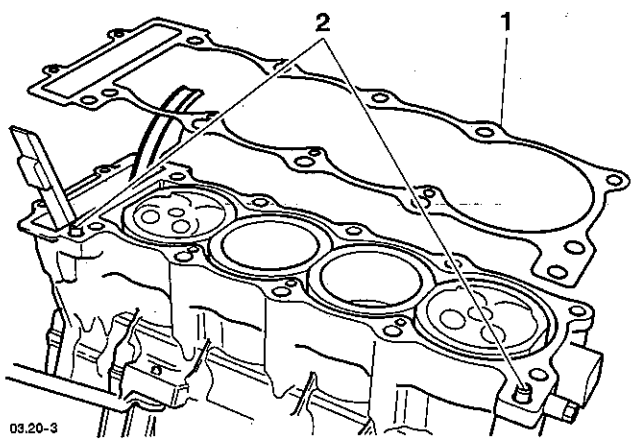
- **When correctly fitted, the blade locates in the crankcase on a web. The upper section will then fit into the recess in the top of the crankcase.**



03.20-2

1. Cam chain rubbing blade

3. Thoroughly clean the upper faces of the crankcase taking care not to damage the mating surfaces. Fit a new cylinder head gasket ensuring that the location dowels are correctly in place.



03.20-3

1. Cylinder head gasket

2. Dowels

4. Ensure that the cylinder head is completely clean.

5. Carefully lower the cylinder head over the rubbing blade and locate onto the crankcase dowels.

CAUTION: Use the correct procedure to fit and tighten the cylinder head bolts. This will ensure the long term reliability of the cylinder head gasket

Clean each bolt, paying particular attention to the threads and under-bolt-head areas. If any of the threads or bolt-head areas are damaged, replace the bolts.

Tighten the bolts in the two-stage procedure given below.

Failure to observe these important items may lead to engine damage .

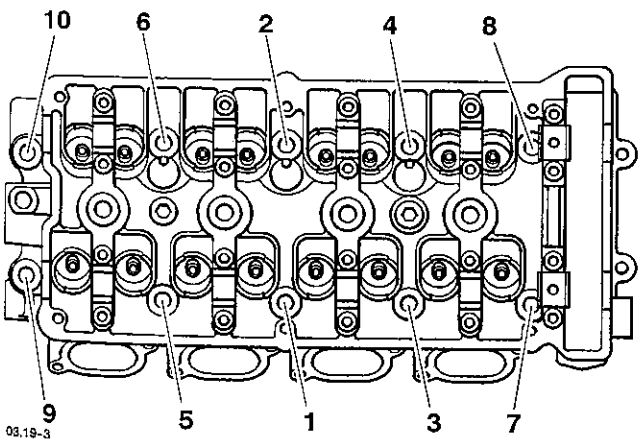
6. Fit the cylinder head bolts and tighten until finger tight. The cylinder head bolts are finally tightened in two stages. This is to ensure that the cylinder head gasket seals correctly to the cylinder head and crankcase. The two stages are as follows:

NOTE:

- **In both stages, a torque wrench of known and accurate calibration must be used.**

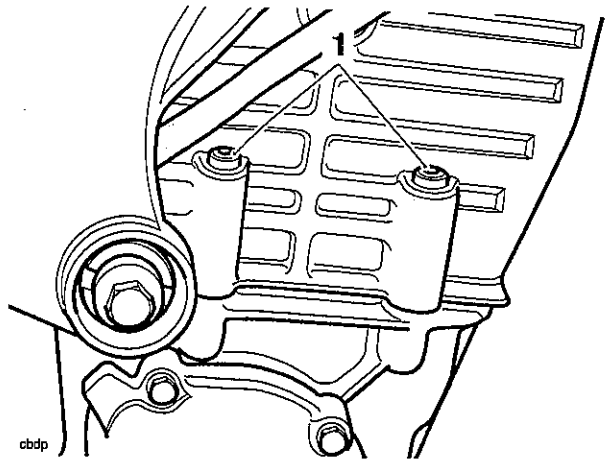
A Tighten the cylinder head bolts, in the sequence shown below, to **20 Nm.**

B Tighten the cylinder head bolts, in the sequence shown below, to torque **50 Nm.**



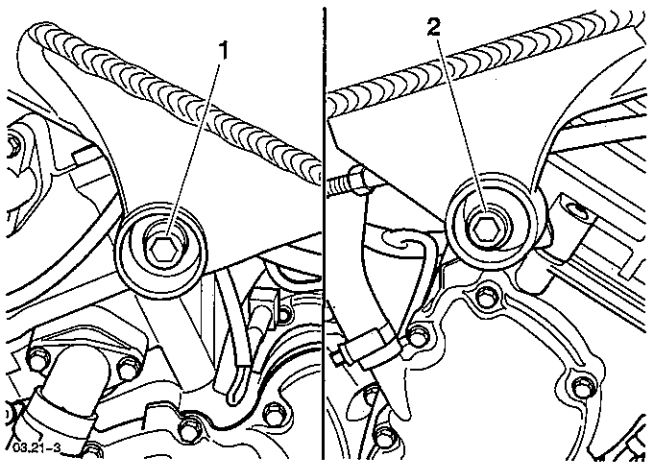
Bolt tightening sequence

7. Fit the bolts securing the outside of the cylinder head to the crankcase and tighten to **12 Nm.**



1. Cylinder head to crankcase bolts

8. Fit the left hand frame-to-cylinder head mounting bolt (hand tight).



1. Left hand mounting bolt

2. Right hand mounting bolt

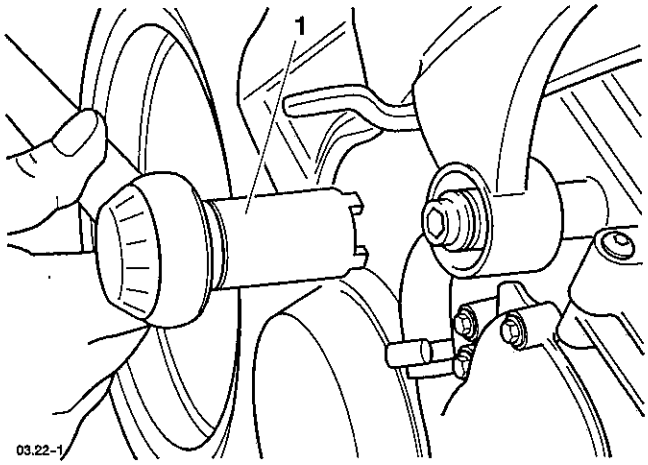
9. Tighten the left hand frame-to-cylinder head mounting bolt to **40 Nm.**

10. Tighten the right hand frame-to-cylinder head adjuster lockring to **5 Nm.**

11. Fit the right hand frame-to-cylinder head mounting bolt (hand tight).

12. Tighten the right hand frame-to-cylinder head mounting bolt to **40 Nm.**

13. Fit the frame adjuster lockring and tighten to **48 Nm** using service tool T3880380.



1. Service tool T3880380

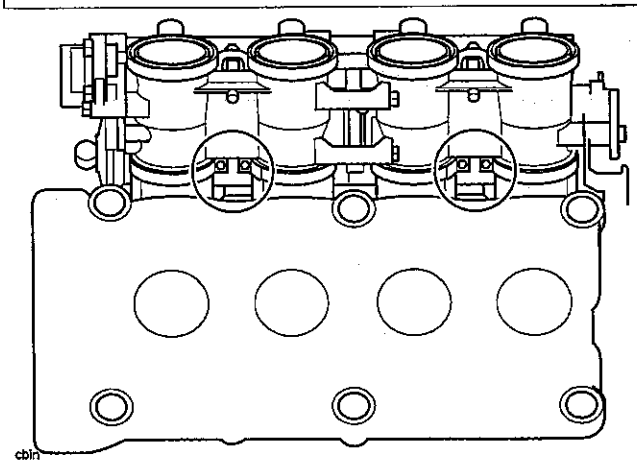
14. Remove the support from beneath the engine.

15. Fit the throttle body transition pieces to the cylinder head, incorporating new 'O' rings if required. Tighten the bolts to **12 Nm.**

16. Fit the throttle bodies to the transition pieces. Tighten the throttle body clips, with the screw heads positioned as shown circled in the diagram below, to **1.5 Nm.**

WARNING: Failure to orientate the clips as shown in the diagram could result in a sticking throttle. Always orientate the throttle body clips as shown in the diagram below.

A sticking or stuck throttle will lead to loss of motorcycle control and an accident.



Circled - Clip screw-heads

NOTE:

- **Ensure the throttles seat correctly in the transition pieces and seal each throttle through 360 degrees.**

WARNING: Operation of the motorcycle with an incorrectly adjusted, incorrectly routed or damaged throttle cable could interfere with the operation of the brakes, clutch or the throttle itself. Any of these conditions could result in loss of control of the motorcycle and cause an accident.

Move the handlebars to the left and right full lock, and check that cables and harnesses do not bind. A cable or harness which binds will restrict the steering and could result in loss of control of the motorcycle and cause an accident.

17. Check that there is 2-3 mm of free play at the throttle twist grip. Adjust as described in the fuel system section.

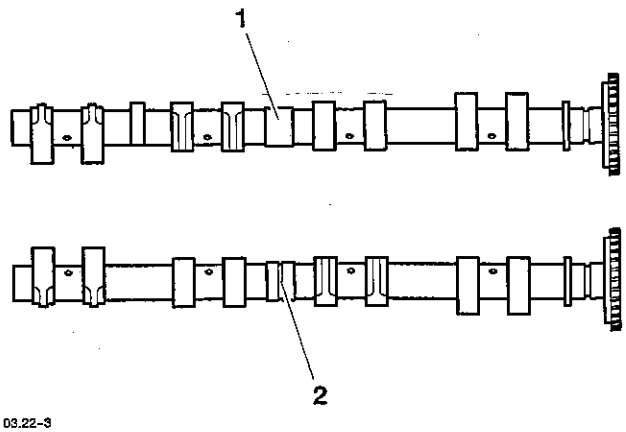
18. Fit the oil feed pipe to the cylinder head incorporating new copper washers to the union. Tighten the banjo bolt to **25 Nm.** Ensure that the oil feed pipe is not distorted during the tightening.

19. Adjust any incorrect valve clearances found on removal as described in the valve clearances section.

20. Thoroughly clean the camshafts and lubricate the bearing and lobe areas with a 50/50 solution of engine oil and molybdenum disulphide grease.

NOTE:

- **The inlet camshaft can be identified from the exhaust camshaft by a groove on a machined surface. The exhaust camshaft has a machined surface with no groove.**



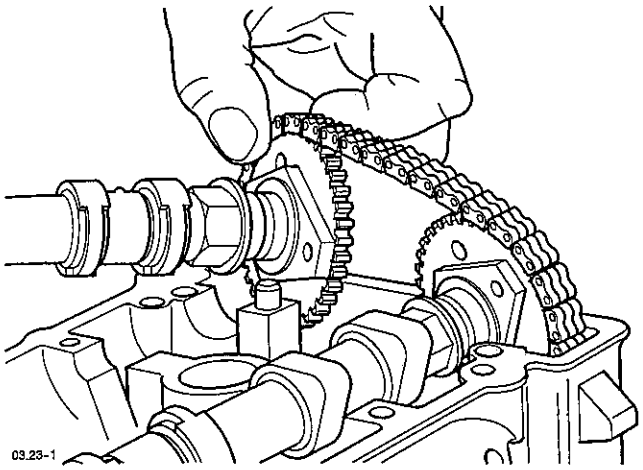
1. Exhaust camshaft (smooth)

2. Inlet camshaft (grooved)

21. Place the camshafts to the cylinder head. Ensure that they are correctly located over their respective valve banks.

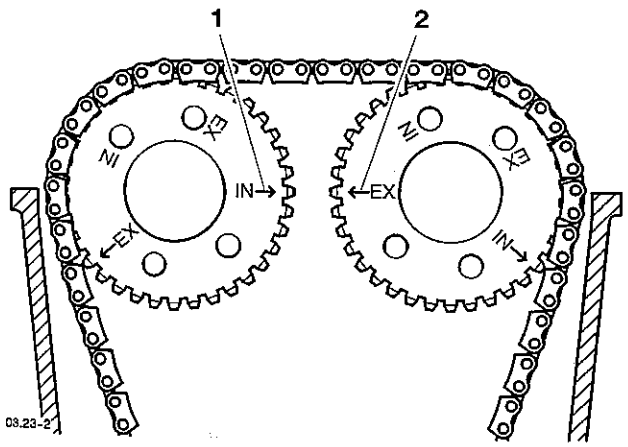
22. If necessary, rotate the crankshaft until No. 1 cylinder is at TDC (1/4TDC mark horizontal, arrow pointing forward and level with the crankcase split line).

23. Working on one camshaft at a time, locate the cam chain over the camshaft sprockets.



1. Camshaft replacement

24. Position the timing marks on the camshaft sprockets in the position shown below:



1. Inlet timing mark

2. Exhaust timing mark

CAUTION: Do not fit the camshaft caps without first correctly aligning the timing marks on the camshaft sprockets and centrifugal breather. If the camshaft caps are fitted without aligning the timing marks, the inlet and exhaust valves may contact each other, or the pistons, and cause damage to the pistons, valve head areas and valve stems.

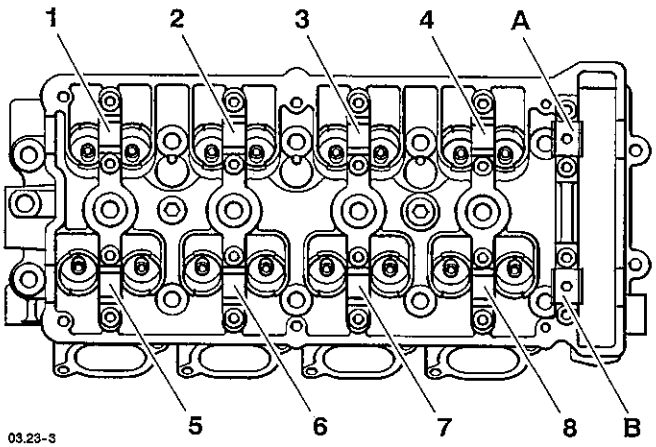
Progressively tighten all the camshaft caps from ONE camshaft before moving onto the second. If both camshafts are progressively tightened at the same time, the valves may contact each other and cause damage to the valve head areas and valve stems.

25. Lubricate the camshaft caps with a 50/50 solution of engine oil and molybdenum disulphide grease.

26. Lubricate the threads of the cam cap bolts with engine oil.

NOTE:

- **The camshaft caps are numbered sequentially and must not be interchanged.**
- **The camshaft caps, at the sprocket end of the camshafts are marked, 'A' (Exhaust) and 'B' (Inlet).**

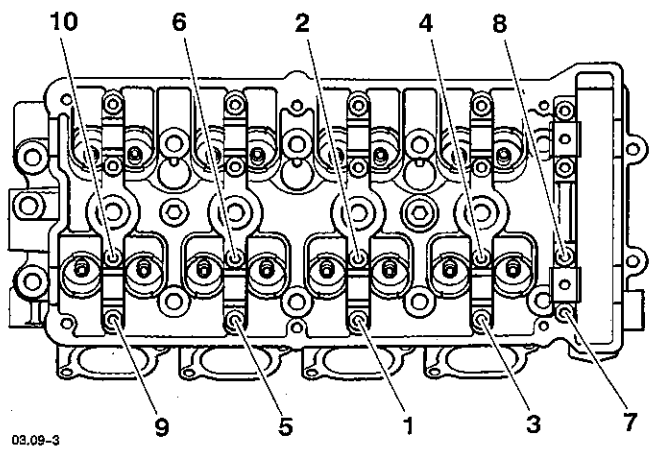


Camshaft cap numbering

27. Fit the camshaft caps and bolts. Do not tighten the bolts.

CAUTION: Never completely tighten one camshaft cap in isolation from the other others. This could cause the camshaft caps to crack.

28. In the order shown, progressively tighten the bolts securing the camshaft caps of **ONE** camshaft, until full thread engagement is achieved. Finally, again in the order shown below, torque to **10 Nm.**



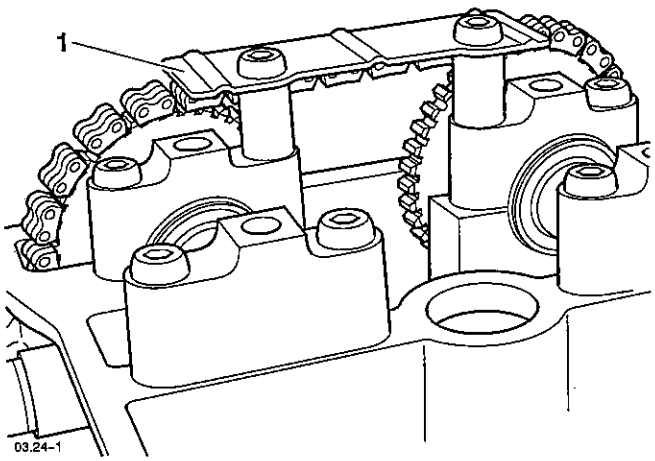
Cap tightening sequence

29. Repeat for the second camshaft.

CAUTION: Do not rotate the camshafts more than 5°. If the camshafts are rotated more than 5° the valves may contact the pistons and cause damage to the piston, valve head areas and valve stems.

30. Rotate the camshafts through 5° in each direction. Ensure free rotation.

31. Fit the top pad (rubber side to the cam chain) and tighten the bolts to **10 Nm.**

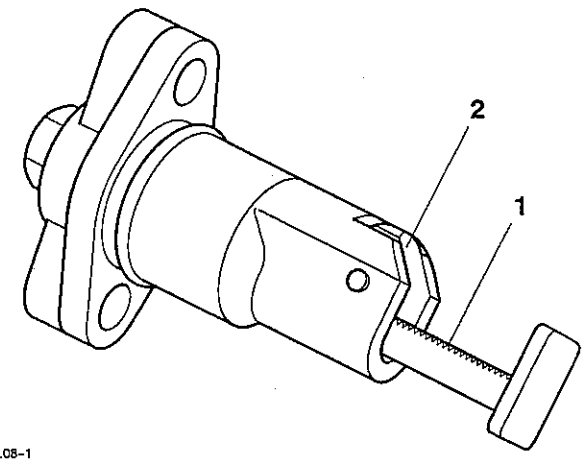


1. Top pad

NOTE:

- **The 1/4TDC arrow mark on the centrifugal breather should be positioned just before TDC to allow for cam chain tensioning.**
- **Ensure the timing marks on the camshafts are still in the correct position.**
- **Before installation of the cam chain tensioner check that the cam chain tensioner 'O' ring is not worn or damaged. Replace as necessary.**

32. Set the cam chain tensioner plunger onto the first tooth of the ratchet (i.e. minimum extension) by manually lifting the cam chain tensioner pawl.



1. Cam chain tensioner ratchet

2. Pawl

33. Fit the cam chain tensioner to the crankcase (ratchet facing upwards) and tighten the bolts to **9 Nm.**

34. Fit the spring and plunger into the cam chain tensioner and, using finger pressure only, push the ratchet into contact with the cam chain tensioner blade.

WARNING: The cam chain tensioner center nut is under spring tension. Always wear hand, eye and face protection when withdrawing the center nut. Take great care to minimise the risk of personnel injury and loss of components.

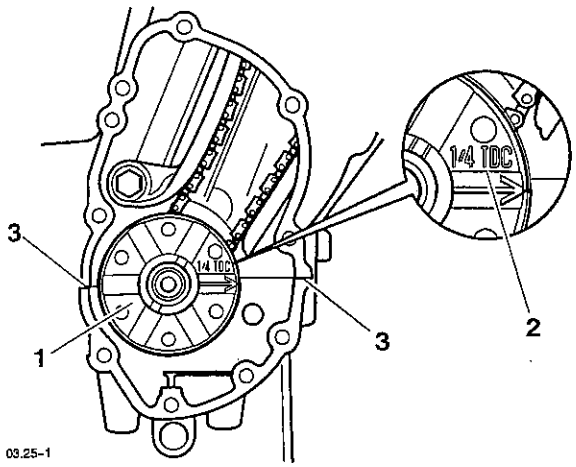
35. Fit the center nut and washer to the cam chain tensioner. Torque the nut to **23 Nm.**

36. Check that the cam chain tensioner is correctly seated in the middle of cam chain tensioner blade, when viewed from above.

37. Rotate the engine through 4 complete revolutions and reset number 1 cylinder to TDC.

NOTE:

- **No. 1 cylinder is at TDC when the arrow marked 1/4TDC on the centrifugal breather is horizontal, facing to the right and in line with the upper and lower crankcase split line.**



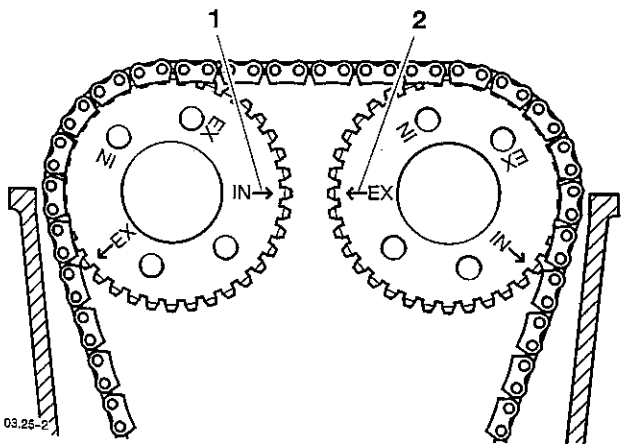
03.25-1

1. Centrifugal breather

2. 1/4TDC mark

3. Crankcase split

38. Ensure that the camshaft timing marks point inwards at a point level with the cylinder head.



03.25-2

1. Inlet timing mark

2. Exhaust timing mark

39. Correct the cam timing if necessary.

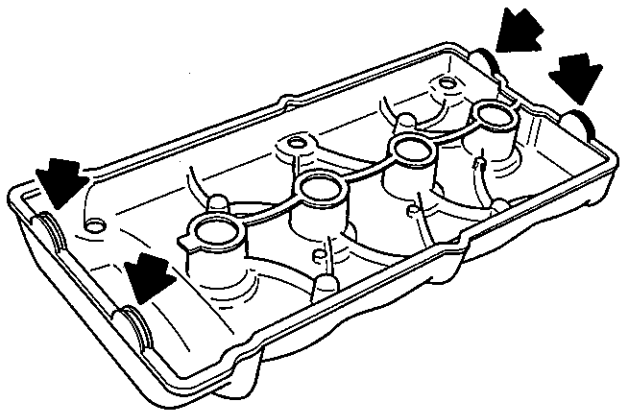
> **CAUTION: If any components have been renewed, the valve clearances must be checked and adjusted. Running with incorrectly adjusted valve clearances may cause excess engine noise, rough running and engine damage.**

40. Re-check the valve clearances and adjust as necessary.

41. Check the condition of the cam cover seal and cam cover bolt seals. Replace or refit as necessary.

42. If removed, fit the cam cover seal to the camshaft cover.

43. Apply silicone sealant to the four 'D' sections



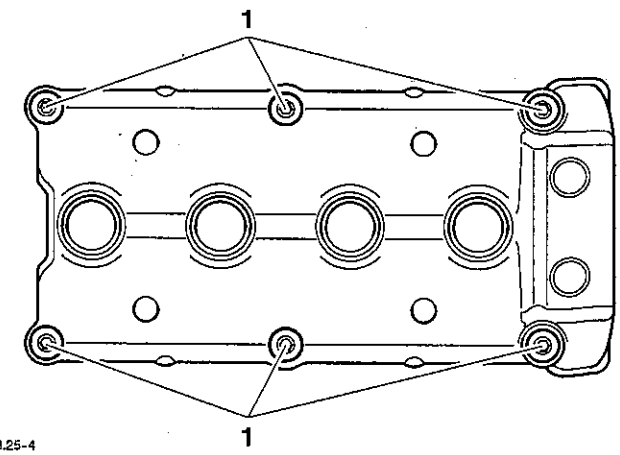
03.06-1

Arrowed: Silcone sealant areas

44. Fit the cam cover to the cylinder head. Ensure that the seal remains in position paying particular attention to the spark plug tower areas.

45. Fit the cam cover bolts, complete with their seals (steel ring side facing upwards) and tighten to finger tight.

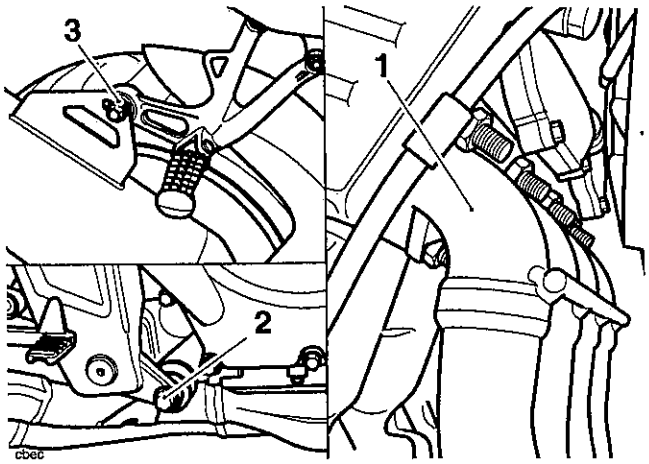
46. Progressively tighten the camshaft cover bolts to **10 Nm.**



03.25-4

1. Cam cover bolts

47. Fit the exhaust system as described in the fuel section.



1. Exhaust header

2. Centre mounting bracket

3. Rear mount bracket

48. Fit the radiator as described in the cooling system.

49. Inspect the coolant hoses. If serviceable refit the hoses in their original position and tighten all clips.

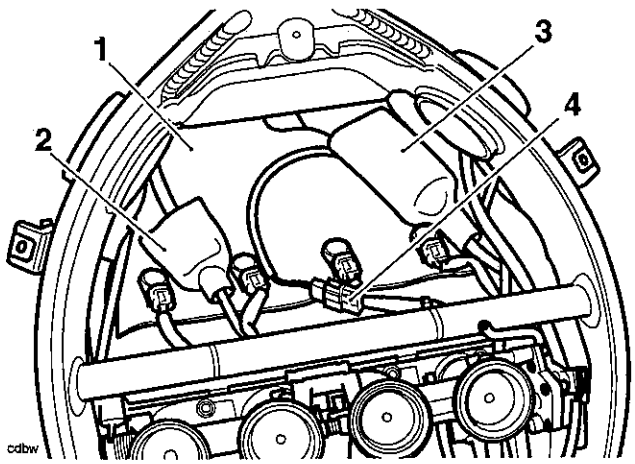
50. Connect the coolant temperature sensor.

51. Connect the injectors and throttle body multiplugs.

52. Refit the air deflector shield.

53. Refit and connect the ignition coils.

54. Remake the connections to the switch cubes and fan.



1. Air deflector

2. Left switch cube connection

3. Right switch cube connection

4. Fan connection

55. Fit the coolant drain plug and tighten to **13 Nm.**

56. Fit the air box and fuel tank as described in the fuel system section.

57. Fill the cooling system as described in the cooling system section.

58. Fit both lower fairings as described in the body section.

59. Connect the battery, positive (red lead) first.

60. Fit a new sealing washer to the sump plug and fit the plug. Tighten to **25 Nm.**

61. Fill the engine with the correct grade and type of engine oil (refer to lubrication section).

62. Start the engine and check for oil, fuel and/or water leaks.

VALVES AND VALVE STEM SEALS

Removal from the cylinder head

1. Remove each valve from the head using a valve spring compressor. The compressor must act on the top cup to allow removal of the valve collets.

2. Once the collets are released, remove the following items:
   - collets
   - valve spring cap
   - valve spring(s)
   - valve stem seal
   - thrust washer
   - valve (de-burr before removal)

Installation

1. Apply a thin coat of molybdenum disulphide grease to the valve stem.

2. Install the valve into the valve guide and refit the thrust washer to the valve spring recess (if removed).

3. Fit the valve stem seal over the valve stem and, using a suitable tool, press down fully until the seal is correctly seated over the valve guide.

NOTE:

- **During fitment of the valve stem seal, two distinctly different degrees of resistance will be noted when the seal is correctly fitted.**

- **Firstly, press the seal down the valve stem until the lower side of the seal comes into contact with the valve guide. Greater resistance is felt at this contact point and further gentle pressure is then required to locate the seal over the top end of the valve guide.**

- **On application of this pressure, the seal can be felt to positively locate over the top face of the valve guide. Once correctly positioned, the seal cannot be pushed down any further.**

CAUTION: Incorrect fitment of the valve stem oil seals could lead to high oil consumption and blue smoke emissions from the exhaust system. Do not use excessive force in fitting the seal as this may break the seal ring.

4. Install the valve spring(s) over the valve stem ensuring that the close wound coil end faces towards the cylinder head.

5. Compress the valve spring ensuring that the spring is compressed squarely to prevent damage to the valve stem and cylinder head.

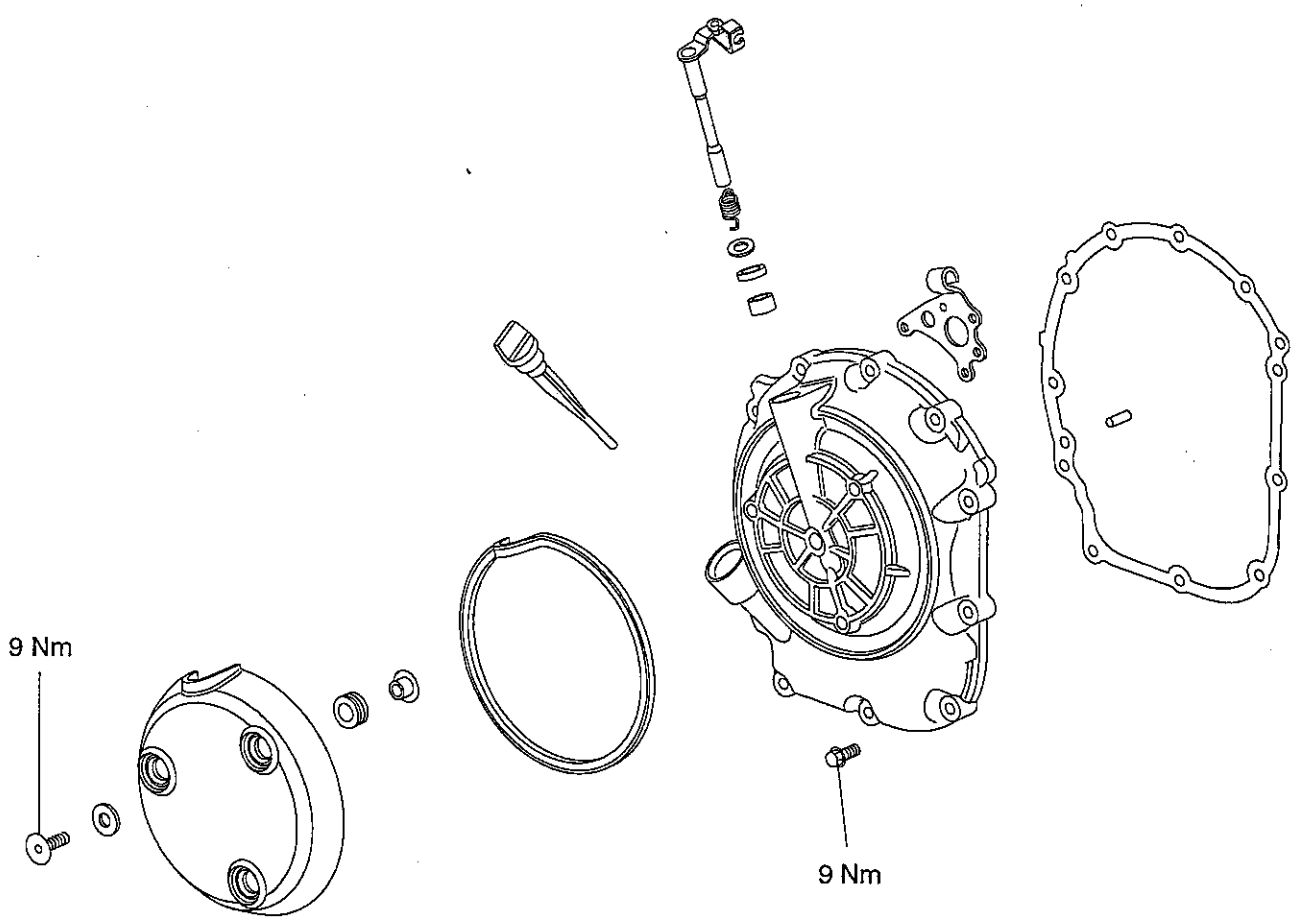
6. Fit the valve collets ensuring correct collet location in the spring cap and valve as the spring compressor is released.

CAUTION: Always check for correct location of the valve collets during and after assembly. If not fitted correctly, the collets may become dislodged when the engine is running allowing the valves to contact the pistons. Any such valve to piston contact will cause severe engine damage.

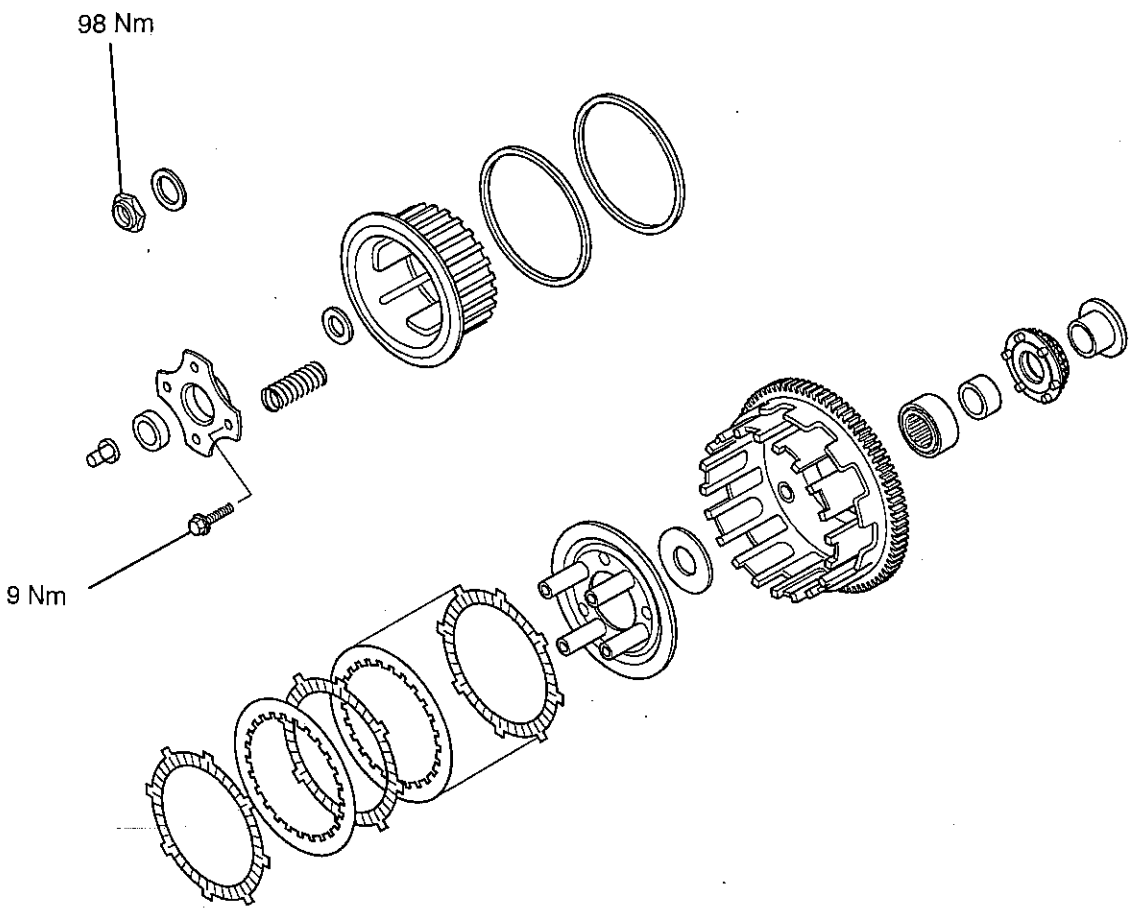
CLUTCH

CONTENTS

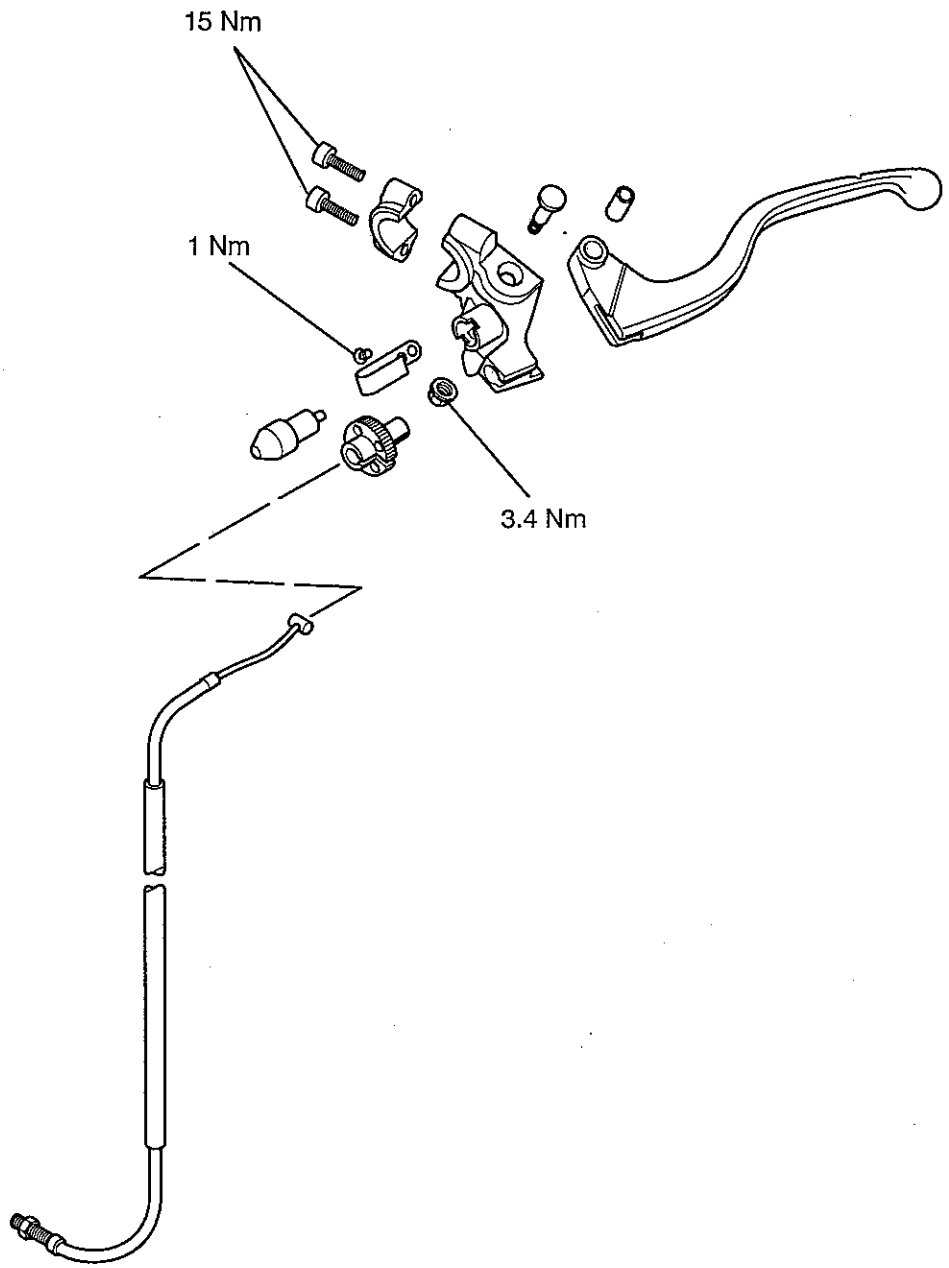
Exploded View - Clutch Cover



Exploded View - Clutch Assembly



Exploded View - Clutch Controls

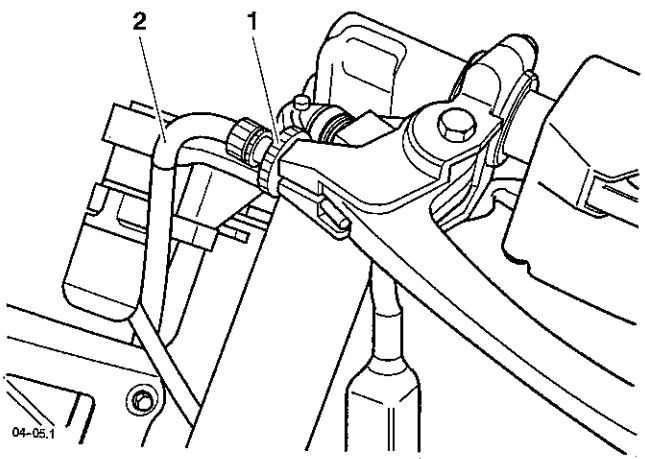


CLUTCH CABLE

Removal

WARNING: Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

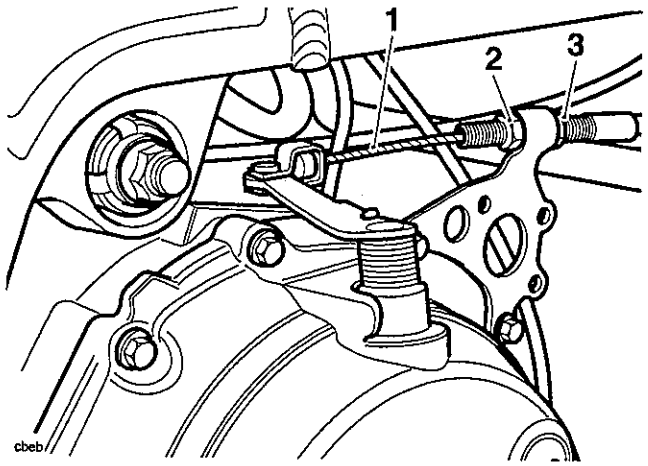
1. Position the motorcycle on a paddock stand.
2. Remove the seats and disconnect the battery negative (black) lead first.
3. Remove the right hand lower fairing panel as described in the body section.
4. Slacken the clutch cable locknut at the handlebars and screw the adjuster fully in.



1. Locknut

2. Clutch cable

5. At the clutch cover, slacken the clutch cable locknut to give maximum free play in the cable.

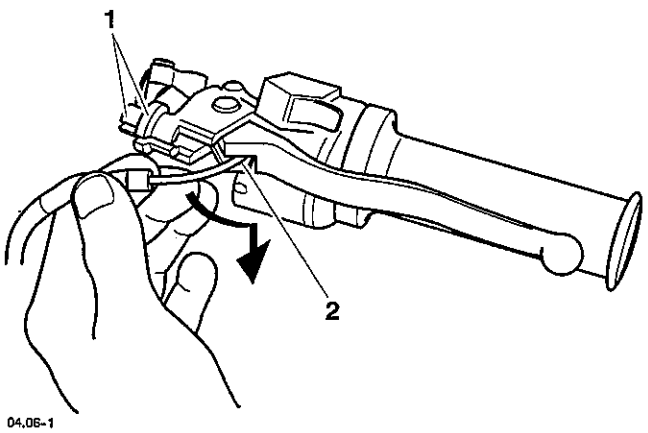


1. Clutch inner cable

2. Lock nut

3. Adjusting nut

6. Release the clutch cable from the actuating arm by pushing the inner cable nipple through the arm and sliding the cable out of the slot.
7. Withdraw the cable through the slot in the underside of the reaction bracket.
8. At the handlebars, turn the inner cable anti-clockwise through the slots in the adjuster and locknut, until the cable can be detached from the lever.



1. Nut/locknut slots

2. Cable release point

NOTE:

- **Before final removal of the cable, note the routing through the frame, engine etc.**

9. Remove the cable from the motorcycle.

Examination

1. Check the inner cable for free movement through the outer cable.
2. Examine the inner cable for damage, fraying etc.
3. Examine the two inner cable nipples for signs of looseness and damage. Replace the cable if necessary.

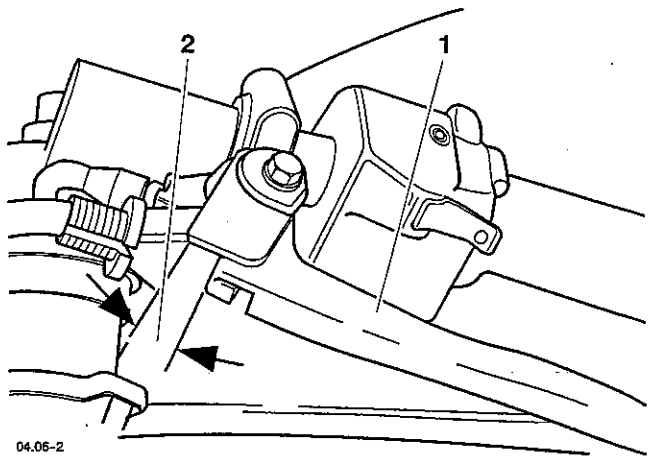
Assembly

1. Position the cable to the motorcycle using the same routing as noted during removal.
2. At the engine end of the cable, attach the inner cable to the reaction bracket and actuating arm using a reversal of the removal process.

NOTE:

- **Ensure that the two adjuster nuts are equally spaced, one either side of the reaction bracket.**

3. Set the lever adjuster to a point where an equal adjustment is possible in both directions.
4. Set the adjuster at the engine end to give a preliminary setting of 2-3 mm of free play, measured at the lever.
5. Operate the clutch lever several times and recheck the amount of free-play present.
6. Set the final adjustment of the cable to give 2-3 mm of free-play at the lever by turning the adjuster nut and locknut at the lever end. Secure the setting with the knurled locknut.



1. Clutch lever

2. Correct setting, 2-3 mm

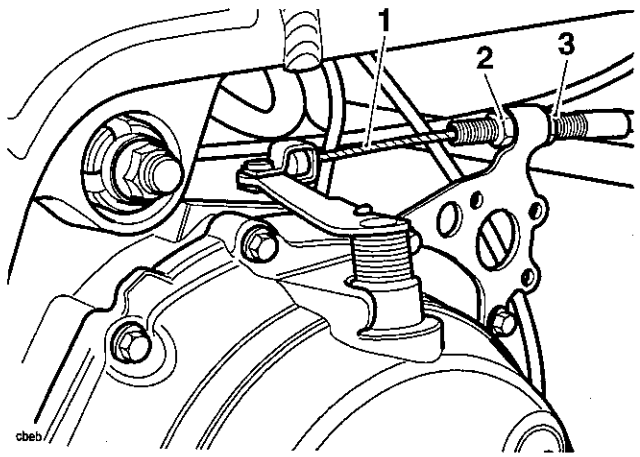
7. Refit the lower fairing, as described in the body section.
8. Reconnect the battery positive (red) lead first.
9. Refit the seats.
10. Remove the paddock stand and place the motorcycle on its side stand.

CLUTCH

Disassembly

WARNING: Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Remove the seats and disconnect the battery, negative (black) lead first.
2. Remove the right hand lower fairing as described in the body section.
3. Drain the engine oil, as described in the lubrication section.
4. Slacken the cable lock nut and release the adjuster at the clutch cover end, to give maximum play in the cable.

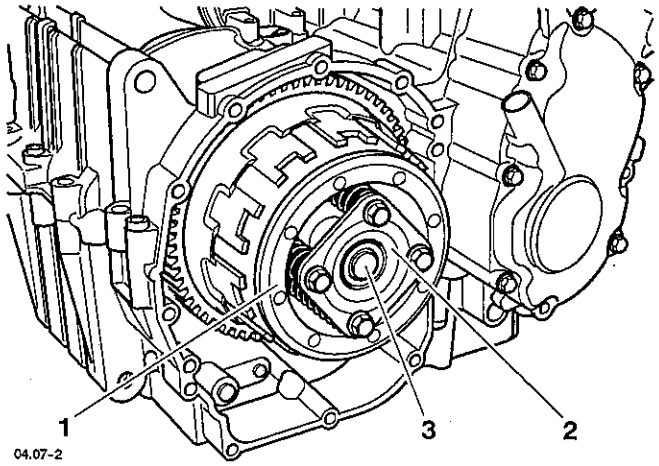


1. Clutch inner cable

2. Lock nut

3. Adjusting nut

5. Loosen the clutch cover bolts and remove the clutch cable reaction bracket complete with the clutch cable.
6. Release the clutch cable from the clutch actuating arm (push the inner cable nipple through the actuating arm and slide the cable out of the slot).
7. Remove the clutch cover and clutch cover gasket. Discard the clutch cover gasket.
8. Evenly loosen (but do not remove) the four bolts securing the push plate.
9. Remove the four bolts, push plate (complete with the lifter piece) and four springs.

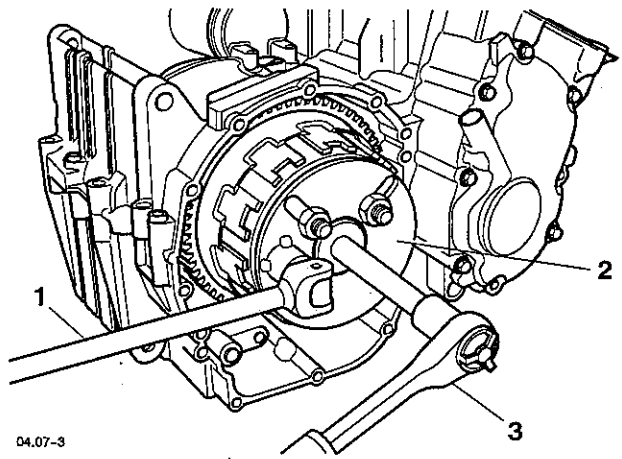


1. Inner plate

2. Push plate

3. Lifter piece

10. Fit service tool part number T3880360 to the inner drum and inner plate assembly. **Do not overtighten the screws securing the tool to the drum.**



1. Holding tool

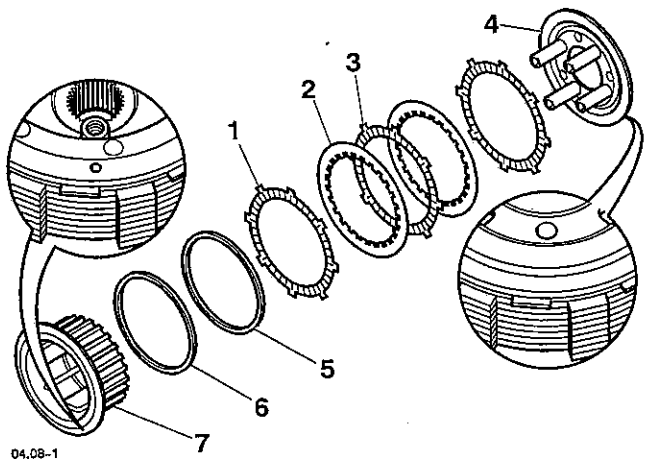
2. Service tool T3880360

3. Nut release tools

11. Hold the tool to prevent clutch rotation and remove the nut, Belleville washer and flat washer from the input shaft.
12. Withdraw the inner drum and inner plate assembly, complete with the service tool.

13. Remove the service tool from the inner drum and inner plate assembly, invert the assembly and withdraw the inner plate from the inner drum.

14. Noting their orientation remove the judder spring seat, judder spring, the outermost friction disc, steel plates and all other friction discs.



04.08-1

1. Outer friction disc

2. Steel plate

3. Friction disc

4. Inner plate

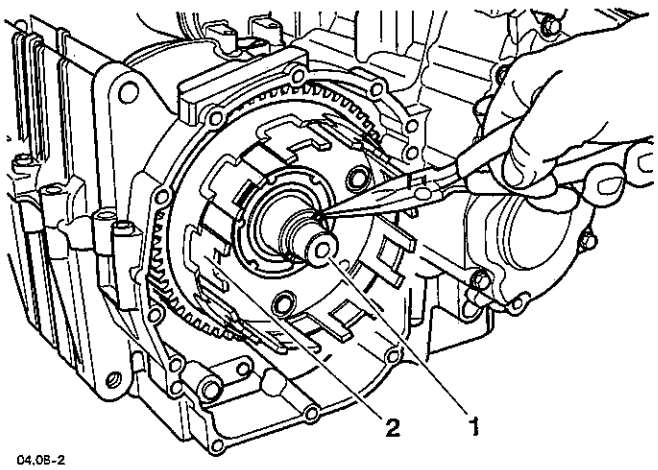
5. Anti-judder spring

6. Anti-judder spring seat

7. Inner drum

Inset - Alignment markings, drum to plate

15. Remove the washer from the gearbox input shaft and, using suitable pliers, withdraw the clutch bush.



04.08-2

1. Input shaft

2. Outer drum

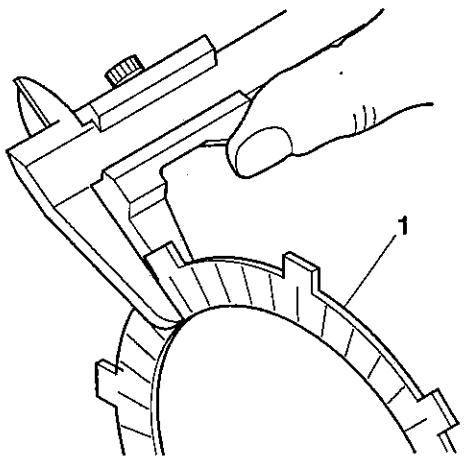
16. Withdraw the outer drum, titling slightly towards the crankshaft drive gear to aid removal.

Inspection

Inspect all friction discs and clutch plates for signs of wear, damage or distortion before re-use.

If any friction disc or clutch plate has signs of wear, damage or distortion, replace the friction discs or clutch plates as a set.

1. Check the thickness of all clutch friction discs.



04.08-3

1. Clutch friction disc

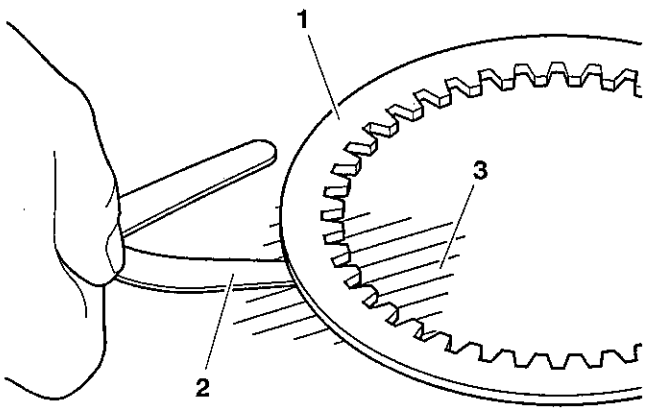
NOTE:

- **Friction disc thickness**

Standard	**2.92 - 3.08 mm**
Service limit	**2.72 mm**

Check all friction plates and clutch plates for bend and warp as follows:

1. Place the disc/plate being checked on a clean surface plate and try to pass a feeler gauge of the maximum thickness between the disc and surface plate, at several points around the clutch plate. If a feeler gauge greater than 0.15mm can be passed beneath the disc at any point, renew the clutch discs as a set.



04.09-1

1. Friction plate

2. Feeler gauge

3. Surface plate

NOTE:

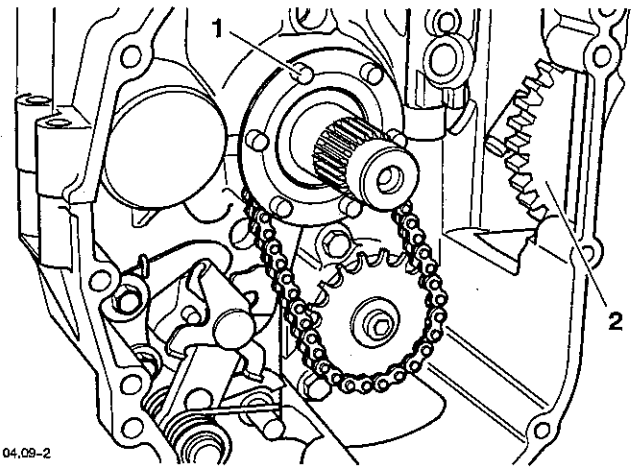
- Clutch plate bend/warp

Service limit	0.15 mm

Assembly

NOTE:

- After assembly, ensure that the clutch gear on the outer drum meshes with the crankshaft drive gear.
- After assembly, ensure that the outer drum fully locates on the oil pump drive pegs.



04.09-2

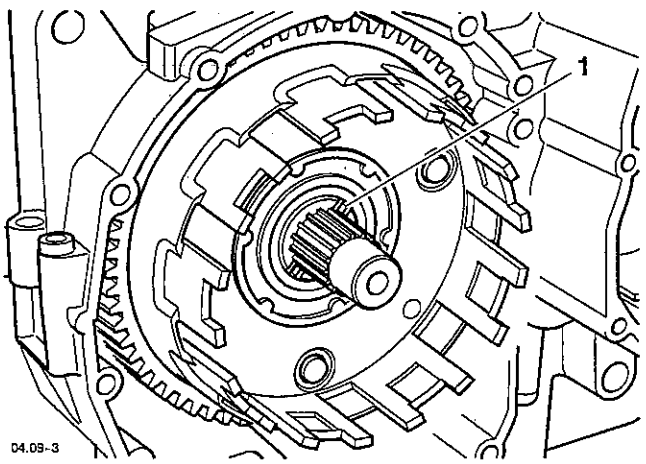
1. Oil pump drive pegs

2. Crankshaft drive gear

1. Fit the outer drum, tilting slightly towards the crankshaft drive gear to aid assembly.

2. Lubricate the clutch bush with a 50/50 solution of engine oil and molybdenum disulphide grease.

3. Fit the clutch bush (grooves outermost) and the washer.



04.09-3

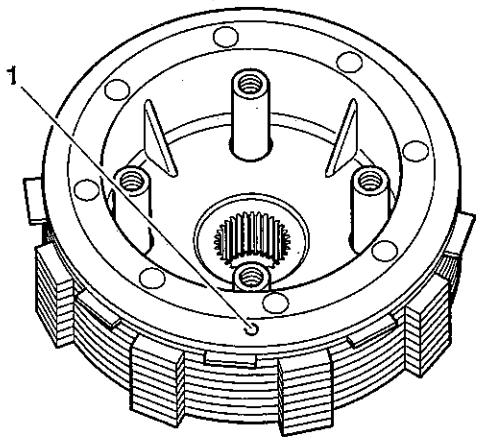
1. Clutch bush grooves

NOTE:

- **The outermost friction disc differs from all other friction discs and must not be fitted in any other position.**
- **Coat all friction discs in clean engine oil before refitting.**

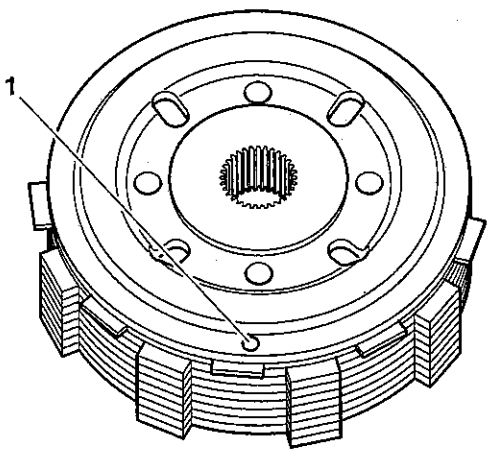
4. Retaining the same orientation from disassembly, fit the judder spring seat, judder spring, the outermost friction disc, clutch plates and friction discs to the inner drum.

CAUTION: The inner drum and inner plate are marked. They must be fitted with the marks in alignment. Incorrect replacement will cause clutch damage.



04.10-1

1. Inner drum alignment marking

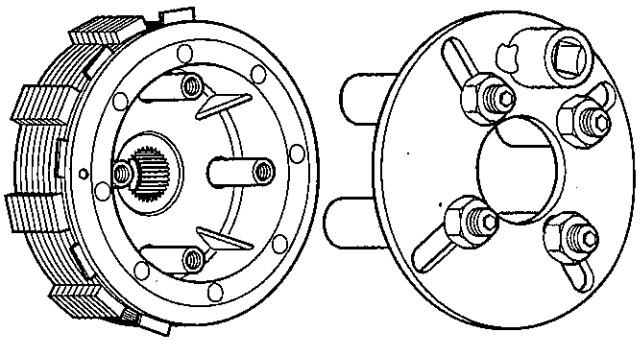


04.10-2

1. Inner plate alignment marking

5. Fit the inner plate to the inner drum taking care to realign the marks.

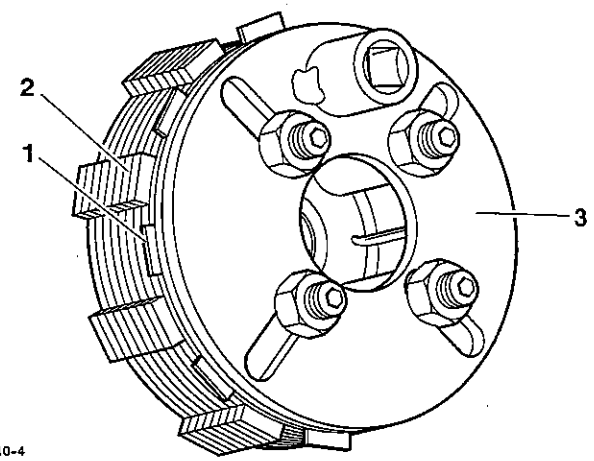
6. Invert the inner plate and inner drum assembly. Fit service tool part number T3880360 (hand tight) and align the friction disc teeth.



04.10-3

NOTE:

- **The teeth on the outermost friction disc are fitted offset to the others.**



04.10-4

1. Outermost friction disc location teeth

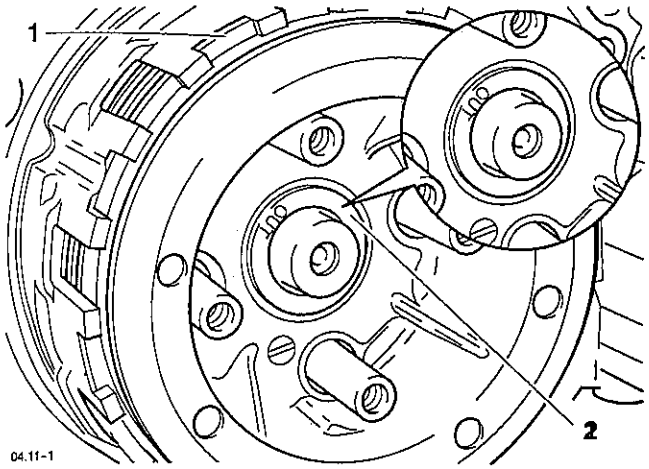
2. Remaining friction disc locations

3. Tool T3880360

7. Fit the inner drum and inner plate assembly to the outer drum. Ensure that (a) the teeth of the last friction disc locate in the shallow locators on the outer drum and (b) the splines on the inner drum locate on the gearbox input shaft splines.

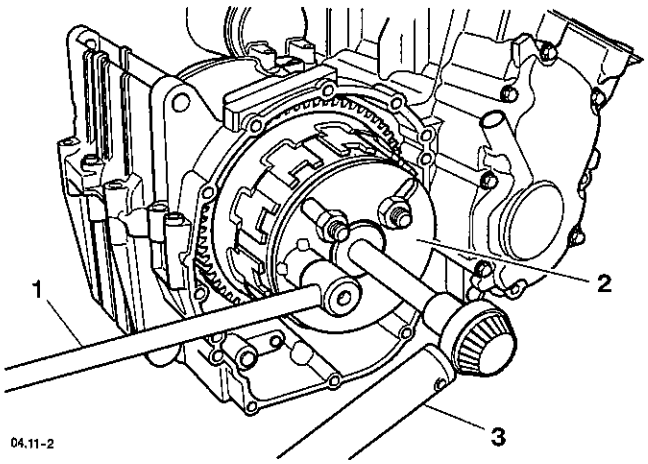
8. Fit the plain washer, Belleville washer ('out' mark facing outwards) and the nut, lip outwards.

CAUTION: Ensure that the flat washer is correctly located in the centre of the clutch. An incorrectly located washer could cause the clutch centre nut to come loose resulting in severe engine damage.



1. Outermost friction disc location teeth

2. Belleville washer



1. Holding tool

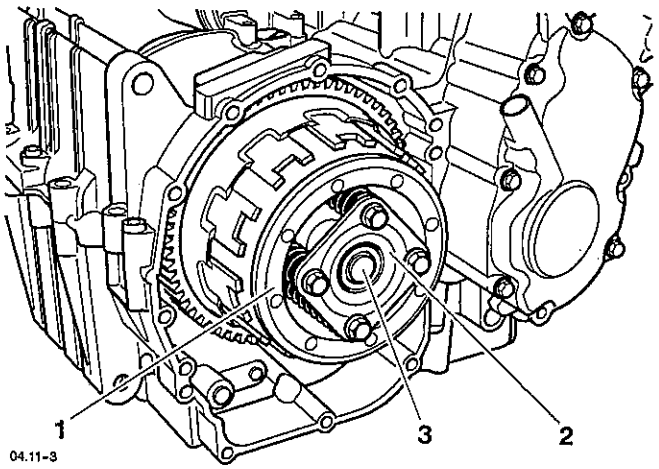
2. Service tool T3880360

3. Torque wrench

9. Hold tool T3880360 to prevent clutch rotation and torque the nut to **98Nm.**

10. Remove service tool T3880360 from the clutch inner drum.

11. Refit the four springs and the push plate, ensuring that the lifter piece is in place. Tighten the bolts evenly to **9 Nm.**



1. Inner plate

2. Push plate

3. Lifter piece

12. Clean and refit the clutch cover, incorporating a new clutch cover gasket. Do not tighten the bolts.

13. Refit the clutch inner cable to the clutch actuating arm and reaction bracket.

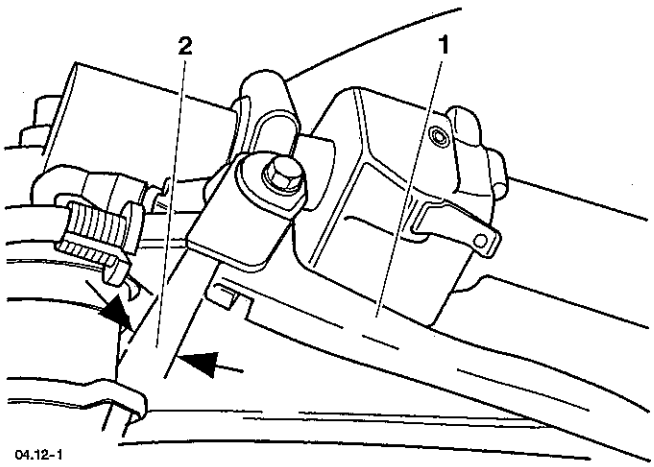
14. Refit the clutch reaction bracket to the clutch cover and evenly tighten all the clutch cover bolts to **9 Nm.**

15. Fill the engine with the correct grade and type of engine oil (refer to the lubrication section).

16. Set the adjuster at the clutch end to give a preliminary setting of 2-3 mm clutch cable free-play as measured at the clutch lever.

17. Operate the clutch lever several times and recheck the amount of free-play.

18. Set the final adjustment of the clutch cable to 2-3 mm of free-play at the clutch lever by turning the adjuster nut and lock nut on the clutch lever



1. Clutch Lever

2. Correct Setting, 2-3 mm

19. Refit the right hand lower fairing as described in the body section.

20. Reconnect the battery, positive (red) lead first.

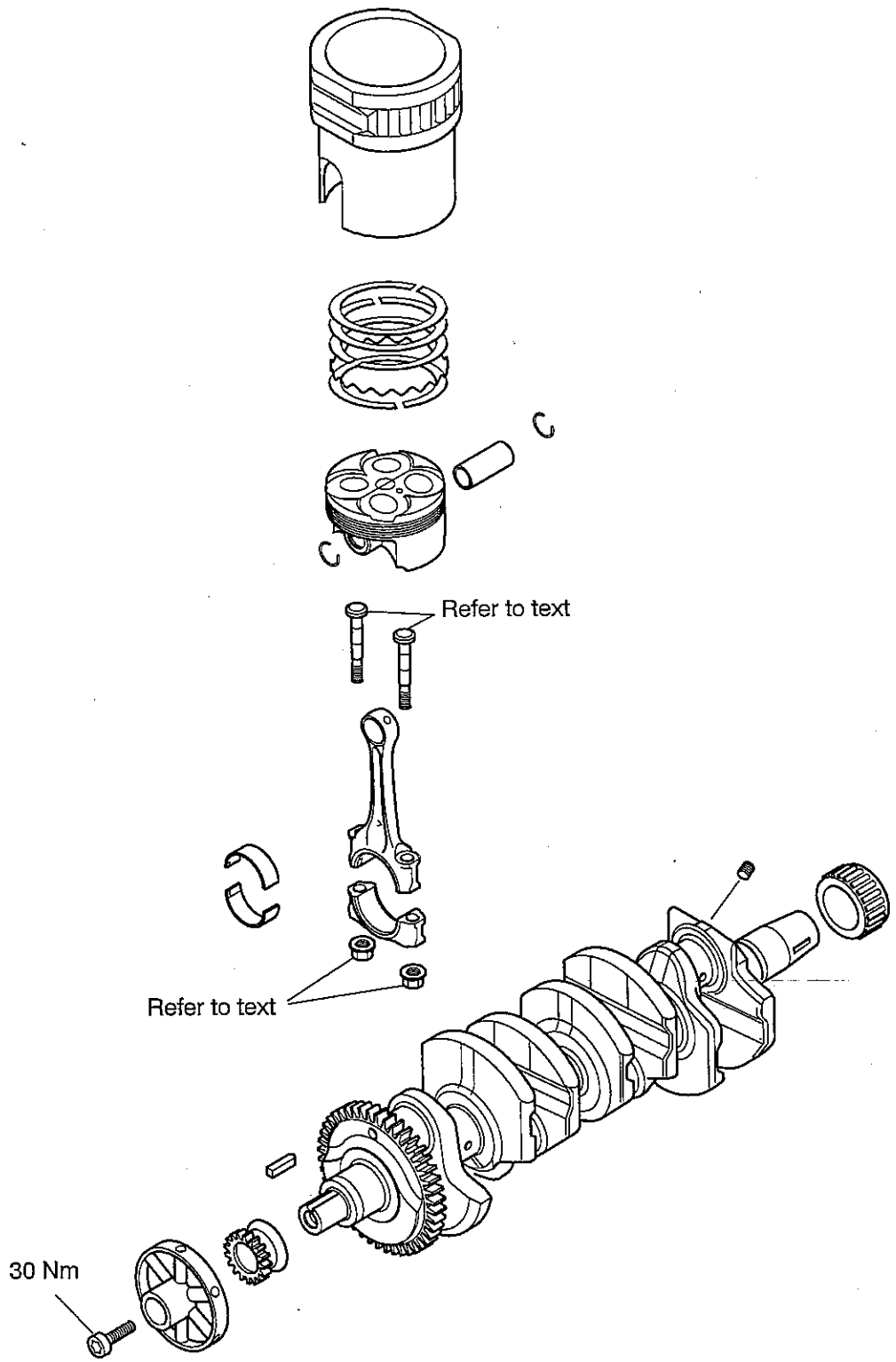
21. Refit the seats.

CRANKSHAFT, RODS and PISTONS

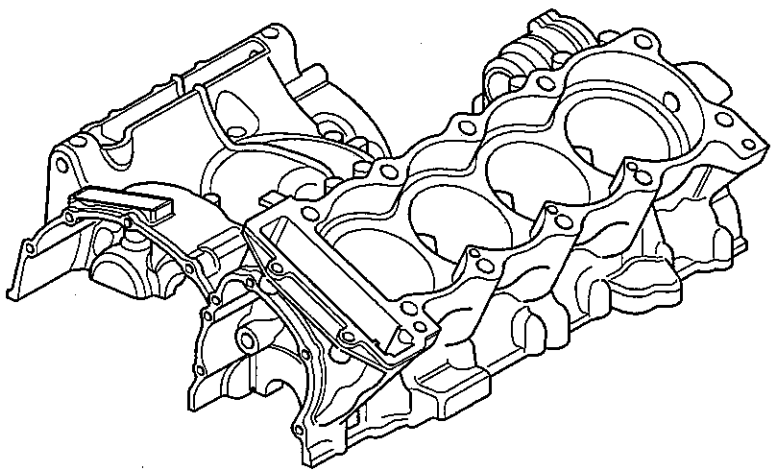
CONTENTS

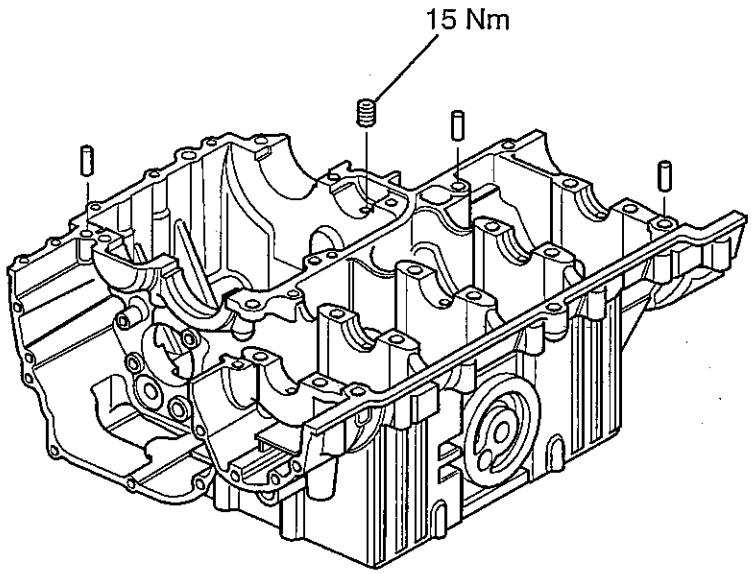
Exploded View

Crankshaft, Connecting Rod, Piston and Liner



Exploded View - Crankcase





ENGINE - REMOVE/REFIT

Removal

WARNING: Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

NOTE:

- **The engine may be removed after first removing the seat and disconnecting the battery negative (black) lead first. The fuel tank, airbox and both lower fairings must be removed. Refer to the relevant sections for removal procedures.**

1. Place the motorcycle on a paddock stand.

WARNING: The engine oil may be hot to the touch. Contact with hot oil may cause the skin to be scalded or burned.

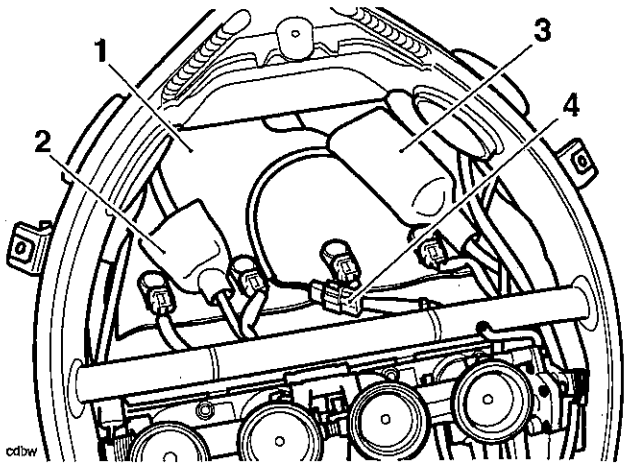
WARNING: Prolonged or repeated contact with engine oil can lead to skin dryness, irritation and dermatitis. In addition used engine oil contains potentially harmful contaminants which can cause cancer. Wear suitable clothing and avoid skin contact with the oil.

CAUTION: Do not pour engine oil on the ground, down sewers or drains, or into water courses. To prevent pollution of water courses etc., dispose of used oil sensibly. If in doubt contact your local authority

2. Drain the engine oil as described in the lubrication section. Once the oil has drained, refit the sump plug, with a new sealing washer and torque to **25 Nm.**

WARNING: Do not remove the coolant pressure cap when the engine is hot. When the engine is hot, the coolant inside the cooling system will be under pressure. Contact with the pressurised coolant will cause scalds and skin damage.

3. Drain the coolant, as described in the cooling section.
4. Disconnect the multiplugs leading to both switch cubes and the cooling fan.
5. Remove the air deflector shield.



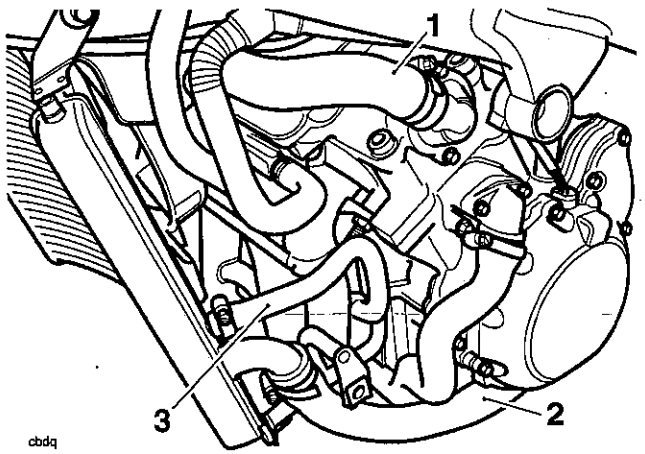
1. Air deflector

2. Left switch cube connection

3. Right switch cube connection

4. Fan connection

6. Release the radiator to heat exchanger hose from the heat exchanger.
7. Release the bottom hose from the water pump.
8. Disconnect the top hose from the cylinder head.

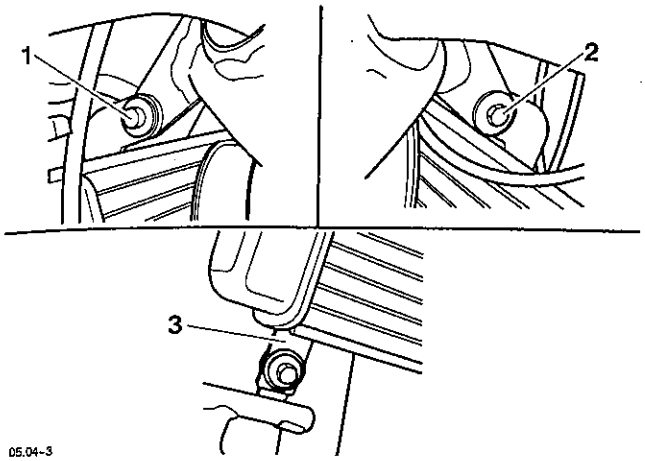


1. Top hose

2. Bottom Hose

3. Radiator to Heat Exchanger Hose

9. Remove the radiator top and bottom mountings and withdraw the radiator from the frame.

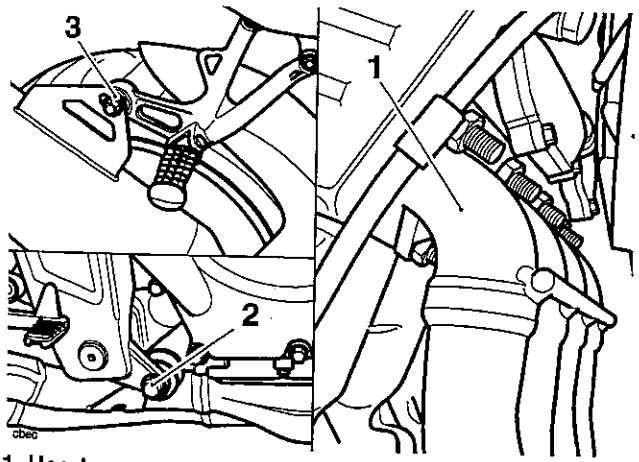


1. Radiator to frame locating dowel

2. Top mount bolt

3. Lower mounting (1 of 2)

10. Remove the exhaust system as described in the fuel system section



1. Headers

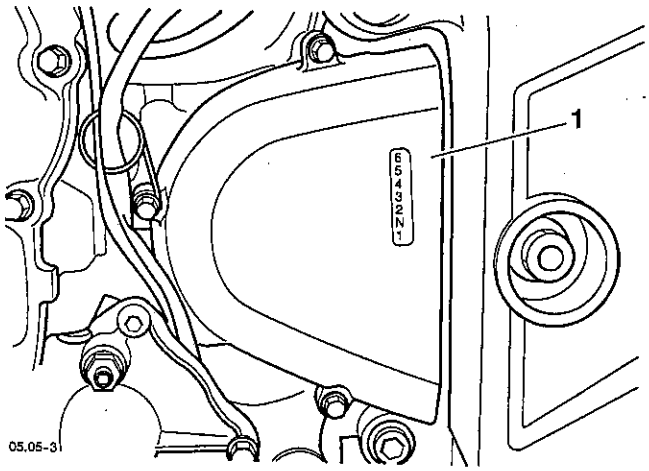
2. Center mounting

3. Rear mounting

11. Note the position of the gearchange lever in relation to the shaft on which it is fitted. Release and remove the gearchange lever.

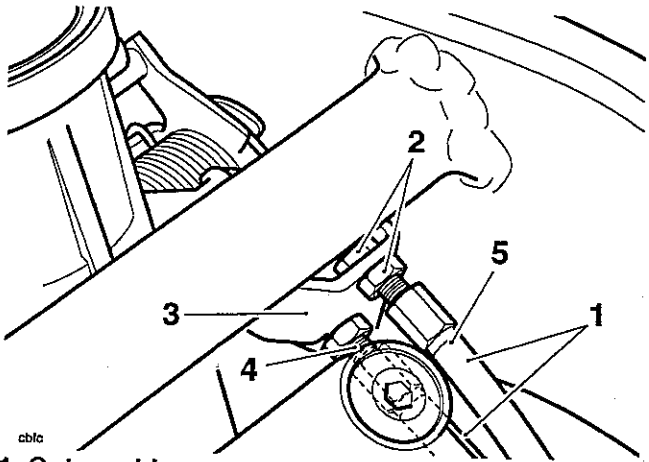
12. Set the drive chain adjustment to allow maximum free play in the chain. Refer to the rear suspension/final drive section for chain adjustment details.

13. Remove sprocket cover.



1. Sprocket cover

14. Disconnect the throttle cables from the throttle bodies.



1. Outer cables

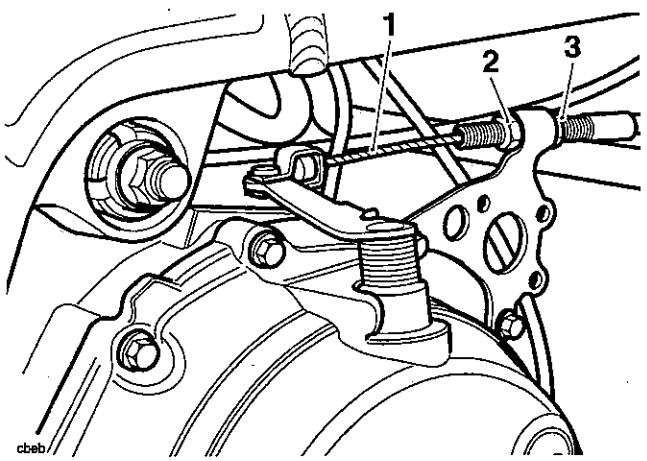
2. Adjuster locknuts

3. Cable bracket

4. Closing cable

5. Opening cable

15. Disconnect all electrical connections from the main harness to the engine:
    - Alternator.
    - Road speed sensor.
    - Oil pressure switch.
    - Starter motor.
    - Neutral switch.
    - All connections to the throttle bodies.
    - Coolant temperature sensor.
16. Slacken the clutch cable locknut and release the adjuster nut at the clutch cover end to give maximum play in the cable.
17. Release the clutch inner cable from the clutch actuating arm (push the inner cable nipple through the actuating arm and slide the cable out of the slot in the reaction bracket).

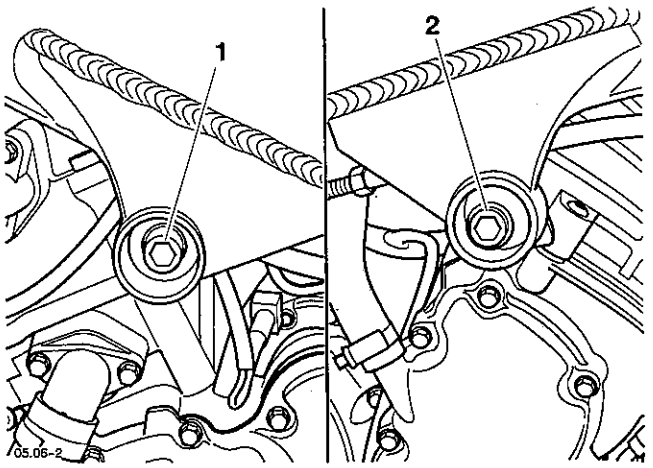


1. Clutch inner cable

2. Lock nut

3. Adjusting nut

18. Detach the clutch cable locknut and withdraw the clutch cable from the mounting bracket.
19. Place a support beneath the engine and ensure that the frame remains adequately and securely supported by the paddock stand.
20. Release and remove the engine mounting nuts and bolts.



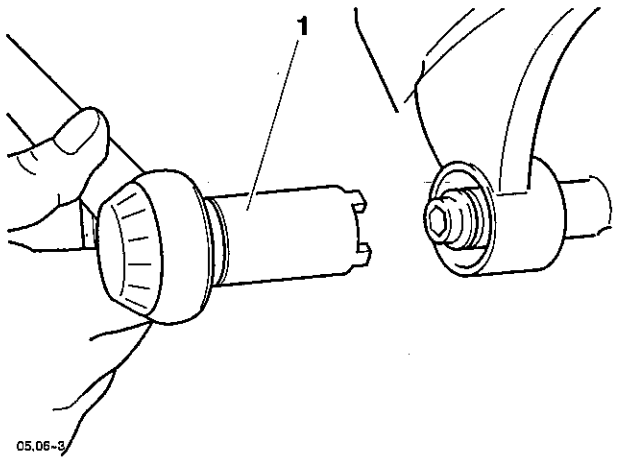
1. Left cylinder head to frame mounting bolt

2. Right cylinder head to frame mounting bolt

NOTE:

- **Collect the spacer, between the engine and frame, from the upper rear engine mounting bolt on the left side of the motorcycle.**

21. Lower the engine to remove the drive chain from the output sprocket.
22. Remove the engine from the frame.
23. Release the adjuster lockrings from the engine mountings using service tool T3880380.



1. Tool T3880380

24. Release all three adjusters until their inside faces are flush with the inside edge of the frame.

Installation

1. Position the engine beneath the frame.
2. Raise the engine and loop the drive chain over the output sprocket.

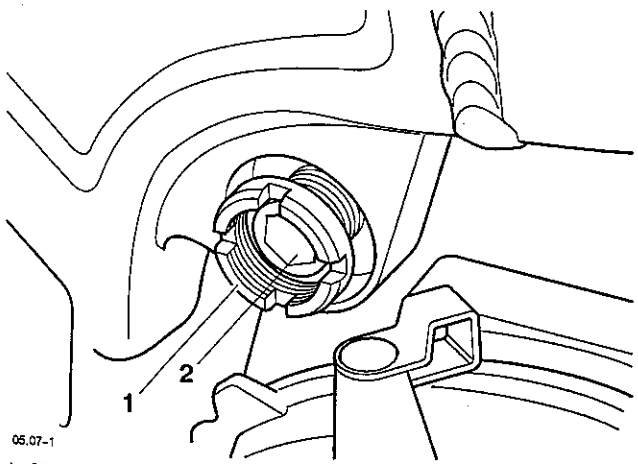
⚠ CAUTION: Unless the following engine mounting bolt tightening sequence is precisely followed, severe frame damage can occur.

3. Align the engine to the frame and fit the rear engine mounting bolts, from the left hand side.

NOTE:

- **Fit the spacer, between the engine and frame, to the upper rear engine mounting bolt on the left side of the motorcycle.**

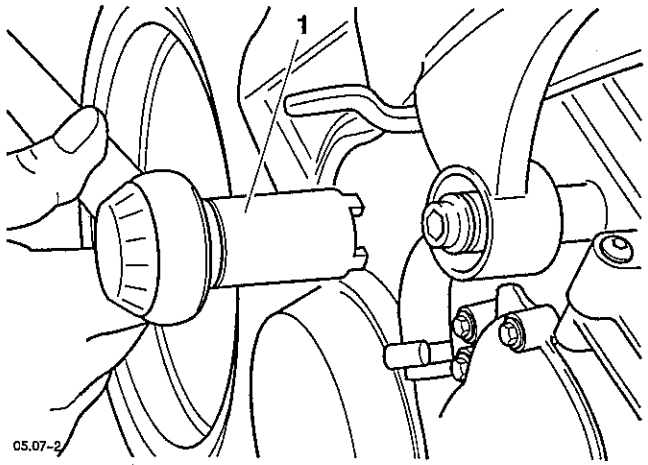
4. Fit the left hand frame-to-cylinder head mounting bolt. Tighten to **40 Nm.**
5. Tighten all engine mounting adjusters, on the right hand side of the engine, to **4 Nm.**



1. Mounting adjuster lockrings

2 Adjuster

6. Tighten the engine mounting adjuster lockrings, using service tool T3880380, to **45 Nm.**

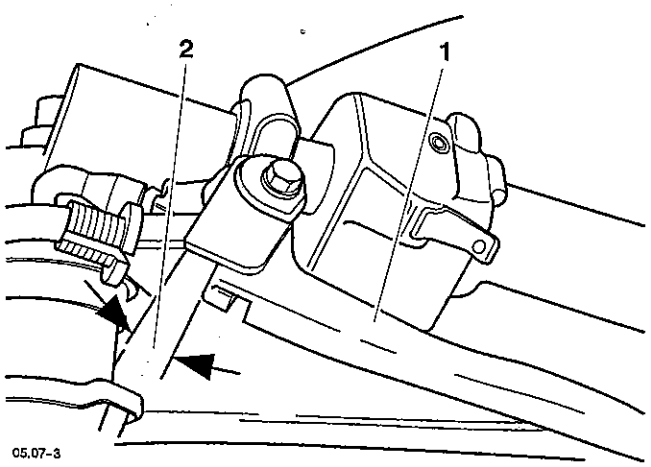


1. Tool T3880380

7. Fit the right hand frame-to-cylinder head mounting bolt. Tighten to **40 Nm.**
8. Fit the nuts to the rear engine mountings. Tighten the upper mounting, then the lower to **70 Nm.**

⚠ CAUTION: When tightening the engine mounting nuts/bolts, ensure that the engine mounting adjuster positions do not change from those set earlier. Any deviation from the 4 Nm torqued setting, or use of an incorrect tightening sequence for the engine mounting bolts/nuts, could cause severe engine and/or frame damage.

9. Refit the clutch cable and set the adjuster at the clutch end to give a preliminary setting of 2-3 mm of free play, measured at the clutch lever.
10. Operate the clutch several times and recheck the amount of free play.



1. Clutch Lever

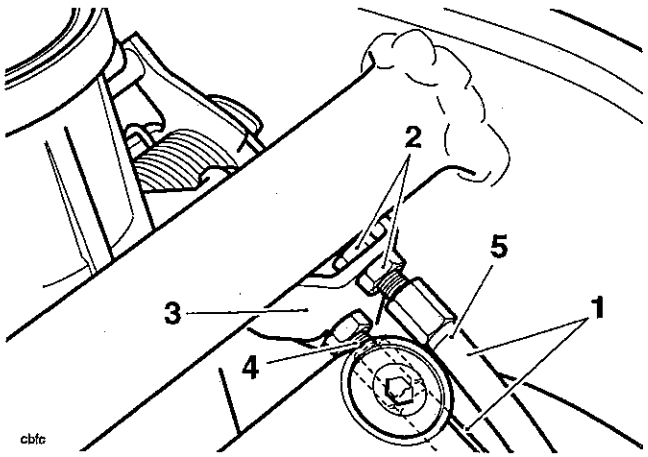
2. Correct Setting, 2-3 mm

11. Set the final adjustment of the clutch cable to give 2-3 mm of free play at the clutch lever by turning the adjuster nut and locknut at the clutch lever end. Tighten the locknut when the adjustment is correct.

12. Reconnect all electrical connections from the main harness to the engine:

- Alternator
- Oil pressure switch
- Starter motor
- Neutral switch
- Coolant temperature sensor.

13. Fit the throttle cables to the throttle bodies and set the throttle cable adjustment as described in paragraphs 14 to 21.



1. Outer cables

2. Adjuster locknuts

3. Cable bracket

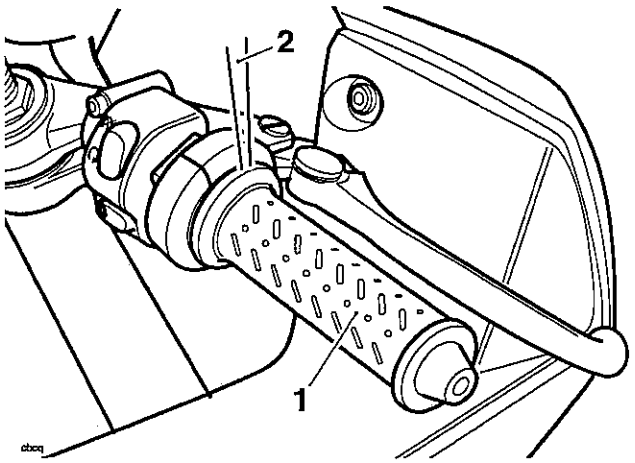
4. Closing cable

5. Opening cable

WARNING: Operation of the motorcycle with an incorrectly adjusted, incorrectly routed or damaged throttle cable could interfere with the operation of the brakes, clutch or the throttle itself. Any of these conditions could result in loss of control of the motorcycle and an accident.

WARNING: Move the handlebars to left and right full lock while checking that cables and harnesses do not bind. A cable or harness which binds will restrict the steering and may cause loss of control and an accident.

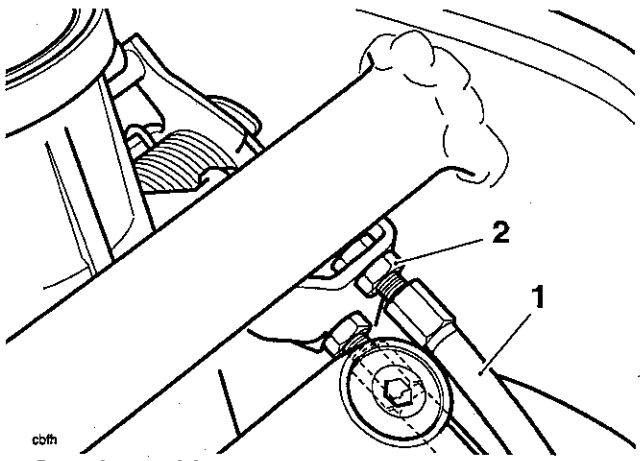
14. When correctly set, the throttle must have 2-3 mm of free-play at the throttle twist grip. If there is more or less than 2-3 mm of free-play present, the throttle cables must be adjusted.



1. Throttle twist grip

2. 2-3 mm

15. Release the locknut on the 'opening' cable adjuster.

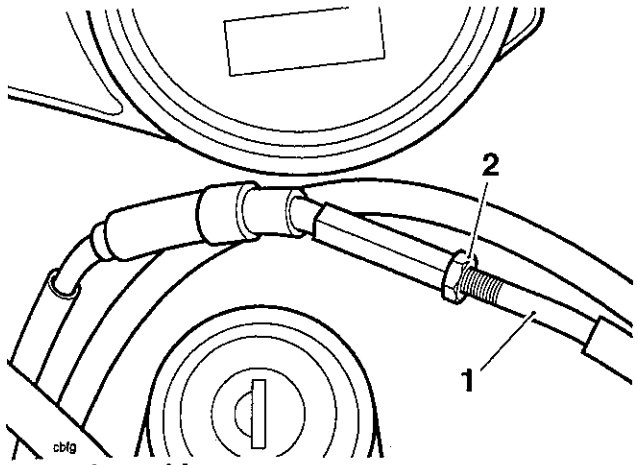


1. Opening cable

2. Locknut

16. Slide the cover off the opening cable adjuster at the twist grip end.

17. Rotate the 'opening' cable adjuster such that it has an equal amount of adjustment in each direction.



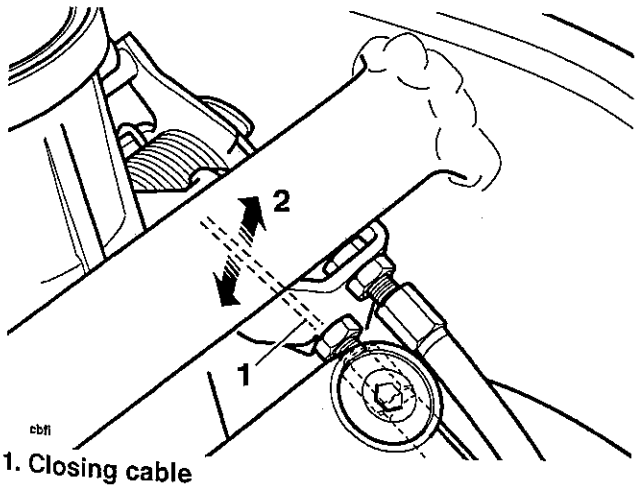
1. Opening cable

2. Adjuster

18. Rotate the 'opening' cable adjuster at the throttle body end of the cable to give 2-3 mm of play at the twist grip. Tighten the locknut.

19. Make any minor adjustments as necessary to give 2-3 mm of play using the adjuster near the twist grip end of the cable. Tighten the locknut.

20. With the throttle fully closed, ensure that there is 2-3mm of free play in the 'closing' cable. Adjust as for the 'opening' cable if necessary.



1. Closing cable

2. 2-3mm

WARNING: Ensure that all the adjuster locknuts of both cables are tightened as a sticking throttle could result from a loose locknut.

An incorrectly adjusted, sticking or stuck throttle will lead to loss of motorcycle control and an accident

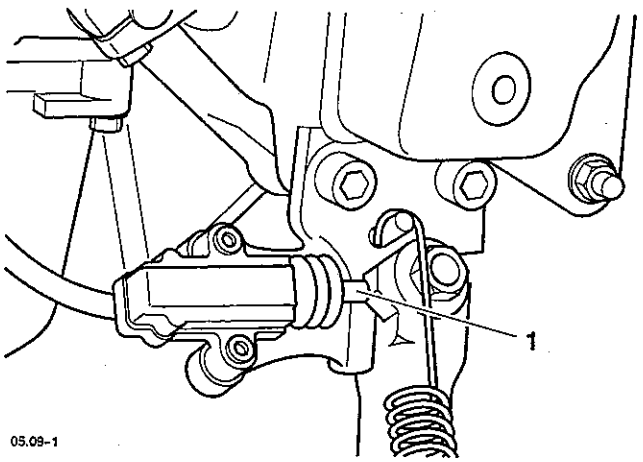
21. Check that the throttle opens smoothly, without undue force and that it closes without sticking.

WARNING: Operation of the motorcycle with an incorrectly adjusted, incorrectly routed or damaged throttle cable could interfere with the operation of the brakes, clutch or the throttle itself. Any of these conditions could result in loss of control of the motorcycle and an accident.

WARNING: Move the handlebars to left and right full lock while checking that cables and harnesses do not bind. A cable or harness which binds will restrict the steering and may cause loss of control and an accident.

22. Allow the swing arm to hang free and set the drive chain adjustment as described in the rear suspension/final drive section.

23. Fit the sprocket cover complete with the cable bracket for the side stand switch. Tighten the bolts to **9 Nm.**



1. Side stand switch

24. Fit the gearchange lever in the position noted during removal. Tighten the clamp bolt to **9 Nm.**

25. Fit the exhaust system as described in the fuel system section.

26. Position the radiator to the frame and locate to the top mounting dowel.

27. Fit the radiator top mounting bolt, hand tight.

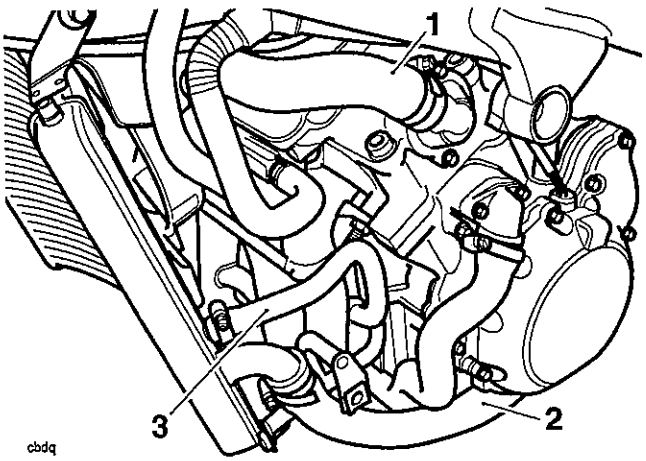
28. Fit the lower mounting bolts and tighten.

29. Fit the radiator to heat exchanger hose to the heat exchanger.

30. Fit the bottom hose to the water pump.

31. Fit the top hose to the side of the cylinder head.

32. Tighten all hose clips.

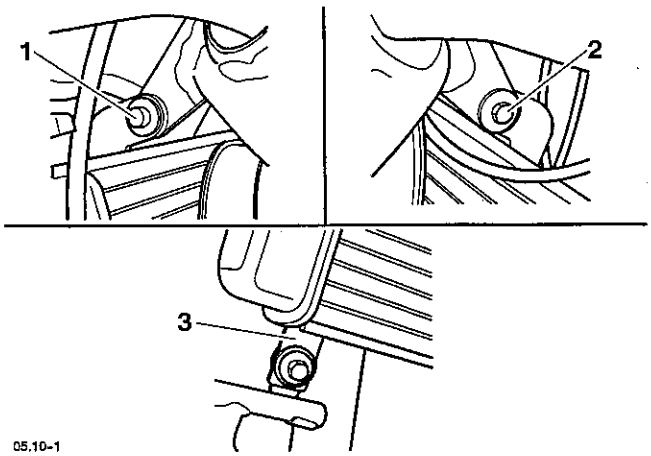


1. Top hose

2. Bottom Hose

3. Radiator to Heat Exchanger Hose

33. Tighten the radiator top mounting bolt to **6 Nm.**



1. Radiator to frame locating dowel

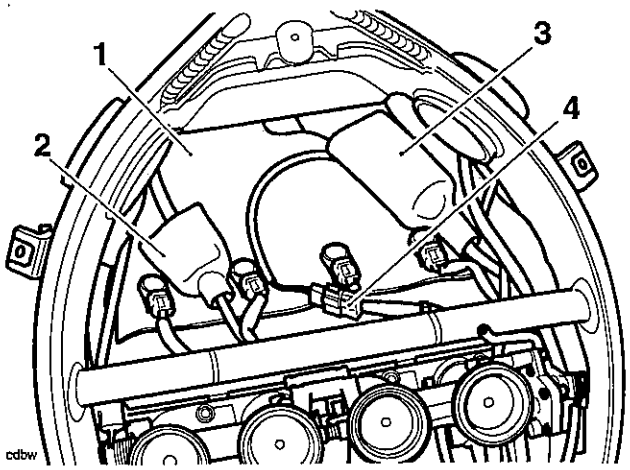
2. Top mount bolt

3. Lower mounting (1 of 2)

34. Fit the coolant drain plug and tighten to **13 Nm.**

35. Fill the engine with the correct grade and type of engine oil, as described in the lubrication system section.

36. Refit the air deflector, connecting the cooling fan and switch cubes after fitment.



1. Air deflector shield

2. Left switch cube connection

3. Right switch cube connection

4. Fan connection

37. Fit the airbox and fuel tank as described in the fuel system section.

38. Fill the cooling system as described in the cooling system section.

39. Reconnect the battery positive (red) lead first.

40. Fit the both lower fairings as described in the body section.

41. Fit the seat.

42. Remove the motorcycle from the paddock stand.

CRANKCASES

NOTE:

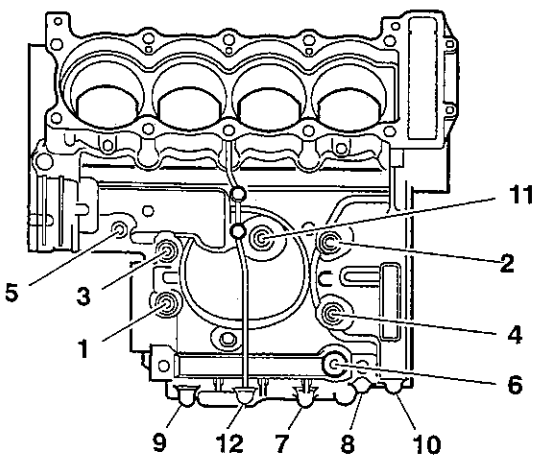
- **The crankcase consists of upper and lower halves which are machined as a matched set. They must never be assembled to non-matching halves.**
- **Before the crankcase halves can be separated, the engine must be removed from the frame, the oil drained and the following items removed:**
  - Sump
  - Engine covers
  - Alternator and sprag gear
  - Starter motor and gear
  - Crankshaft position sensor
  - Clutch
  - Oil pump drive
  - Heat exchanger

Refer to the relevant sections for removal procedures.

Disassembly

CAUTION: Failure to follow the correct bolt release sequence may result in permanent crankcase damage.

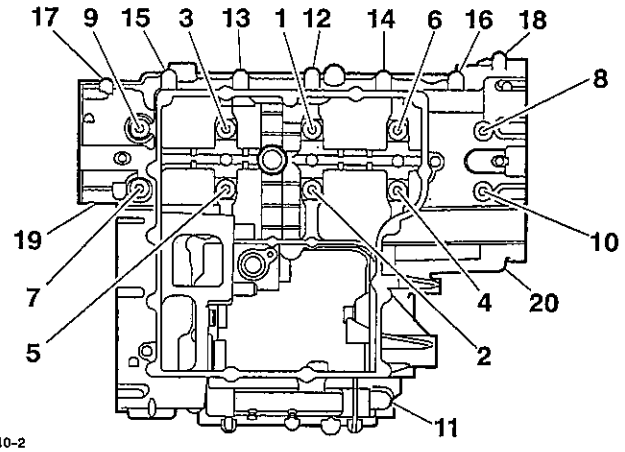
1. Working on the upper crankcase, release and remove the bolts (M6 and M8) in the sequence shown below:



1. Upper crankcase bolt release sequence

2. Invert the engine

3. Release and remove the lower crankcase bolts (M6, M8 and M8 main bearing bolts) in the sequence shown below:



1. Lower crankcase bolt release sequence

CAUTION: Do not use levers to separate the upper and lower crankcase halves or damage to the crankcase halves could result.

4. Withdraw the lower crankcase from the upper crankcase. Ensure that the three locating dowels and gear shafts remain in the upper crankcase and the crankshaft main shell bearings remain with the lower crankcase half.

NOTE:

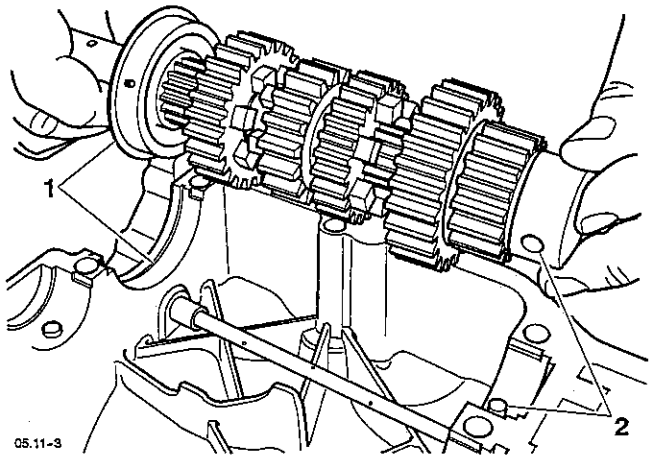
- **At this point the transmission shafts, crankshaft shell bearings etc. can be removed if required.**

Assembly

NOTE:

- **Fit the gearbox shafts (if removed).**

1. Ensure that the locating ring and dowels on the input and output shaft bearings are in position in the circlip grooves/locations in the crankcase.

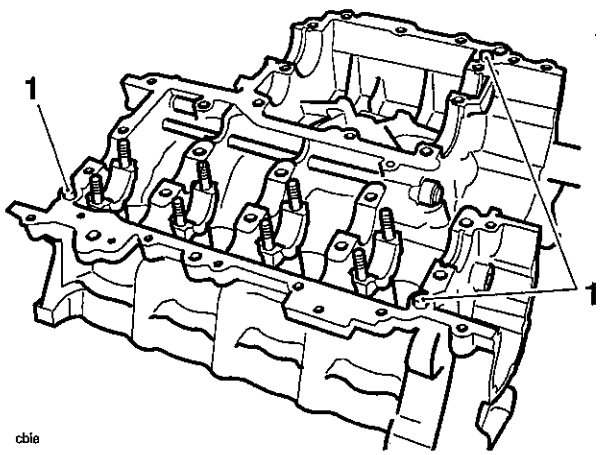


1. Locating ring and groove

2. Locating dowel and recess.

2. Ensure that the transmission is in neutral.

3. Ensure that the three locating dowels are located in the upper crankcase.

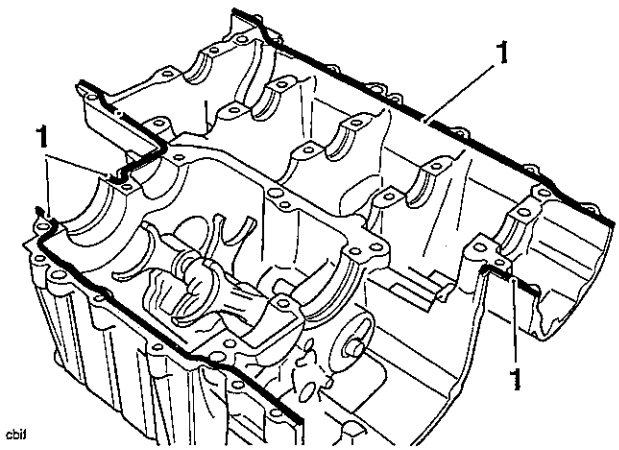


1. Locating dowel positions

4. Using a high flash point solvent, clean the crankcase mating surfaces. Wipe the surfaces clean with a lint-free cloth.

CAUTION: Do not use excessive amounts of sealant. The extra sealant may become dislodged and could block the oil passages in the crankcase causing severe engine damage

5. Apply a thin bead of silicone sealant (Three-bond 1215J liquid gasket is used at the factory) to the lower crankcase mating surface as shown in the diagram below:



1. Sealant areas

NOTE:

- **If a new set of main bearing shells are being fitted, use the bearing shell selection processes detailed later in this section.**
- **The bearing shells are keyed and can only be fitted one way.**

6. Install the crankshaft main bearings in the upper and lower crankcases (which should be clean and dry). Lubricate the main bearings with a 50/50 solution of engine oil and molybdenum disulphide grease.

7. Lubricate the crankshaft journals with a 50/50 solution of engine oil and molybdenum disulphide grease.

NOTE:

- **An assistant may be required to support the lower crankcase half during alignment.**

8. Position the lower crankcase to the upper, ensuring that the gear selectors are correctly engaged.

NOTE:

- **Ensure that both halves fit correctly before tightening any bolts.**

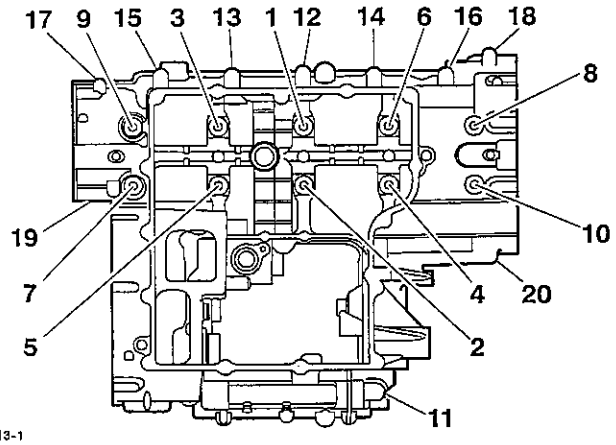
9. Fit the bolts (M6, M8 and M8 main bearing bolts) into the lower crankcase half and hand tighten.

10. Invert the crankcases. Fit the bolts (M6 and M8) into the upper crankcase half and hand tighten.

CAUTION: Failure to follow the correct bolt tightening sequence may result in permanent crankcase damage.

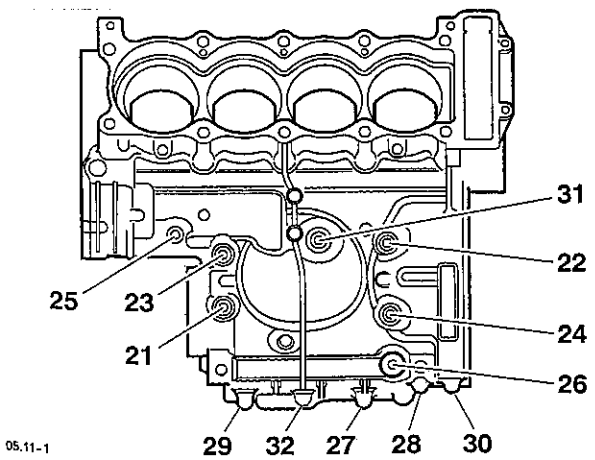
The torque characteristics of some of the crankcase bolts are sensitive to the rate at which they are tightened. If all the torque is applied in one action the bolt may be stretched and could become loose when in service, resulting in severe engine damage.

11. Invert the engine. In the correct sequence tighten lower crankcase bolts 1 through 11 to **12 Nm.**



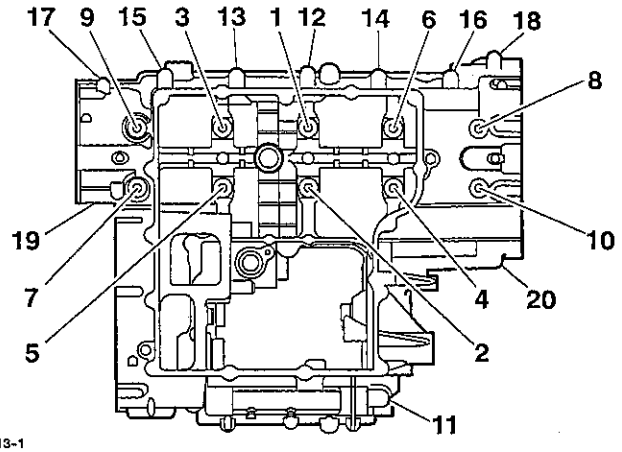
1. Bolt tightening sequence – lower crankcase

12. Invert the engine. In the correct sequence tighten **upper crankcase** bolts 21, 23, 25 and 26 to **12 Nm.**



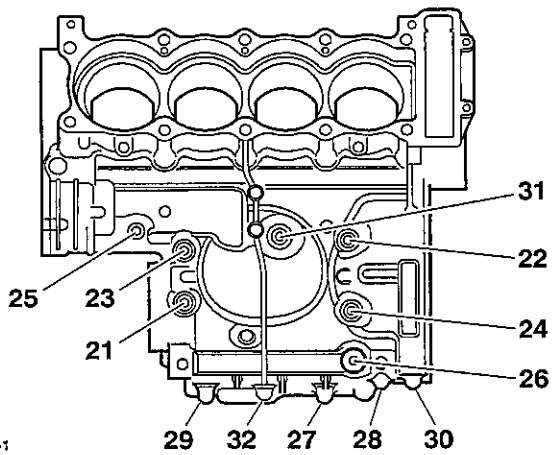
1. Bolt tightening sequence – upper crankcase

13. Invert the engine. In the correct sequence tighten **lower crankcase** bolts 12 through 20 to **12 Nm.**



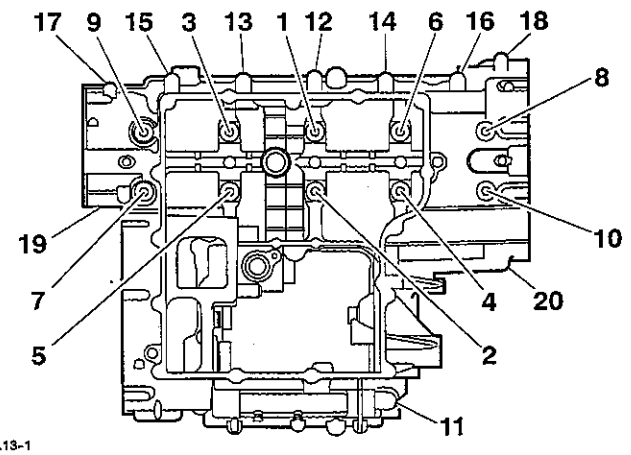
1. Bolt tightening sequence – lower crankcase

14. Invert the engine. In the correct sequence tighten bolts 27 through 32 then 22 and 24 to **12 Nm.**



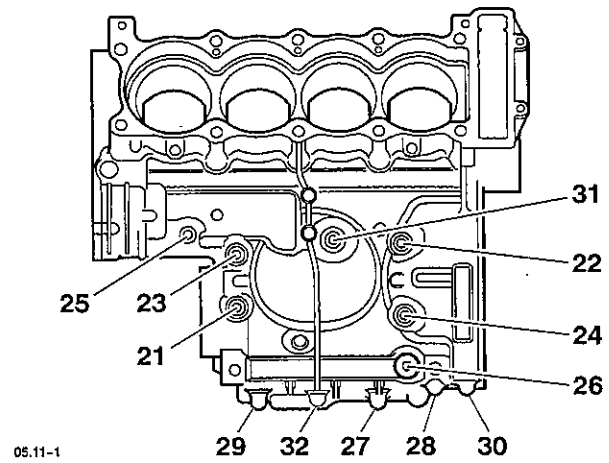
1. Bolt tightening sequence – upper crankcase

15. Invert the engine. In the correct sequence tighten **lower crankcase** bolts 1 through 10 to **27 Nm.** Tighten bolt 11 to **20 Nm.**



1. Bolt tightening sequence – lower crankcase

16. Invert the engine. In the correct sequence tighten bolts 21, 23, 25 and 26 to **20 Nm**. Tighten bolts 22 and 24 to **27 Nm**.



1. Bolt tightening sequence – upper crankcase

17. This completes the crankcase bolt tightening procedure.

18. Rotate the crankshaft clockwise. Check for tight spots and rectify as necessary.

19. Refit the:

- Sump
- Engine covers
- Alternator and sprag gear
- Starter motor and gear
- Crankshaft position sensor
- Clutch
- Oil pump drive
- Heat exchanger
- Refer to the relevant sections for replacement procedures.

20. Fill the engine with the correct grade and type of engine oil (refer to Lubrication section).

21. Fit the engine into the frame (for details, refer to engine remove/refit procedures in this section).

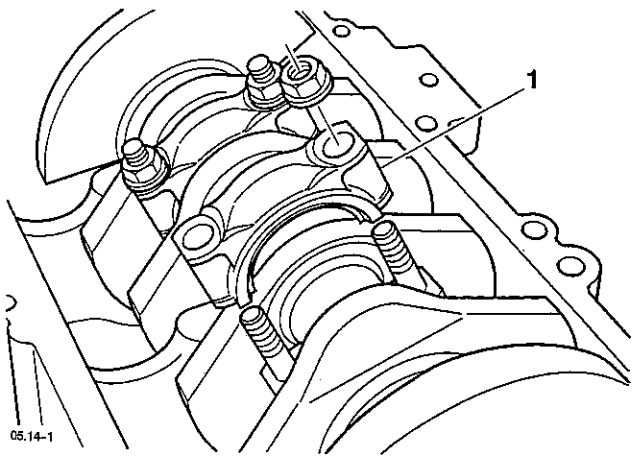
CRANKSHAFT

Removal

NOTE:

- **The crankshaft may be removed after first removing the engine from the frame. The crankcase upper and lower halves must separated and the cam chain removed. Refer to the relevant sections for removal procedures.**

1. Mark each big end cap and connecting rod to identify both items as a matched pair and their orientation to each half.
2. Release and remove the nuts securing the big end caps to the connecting rods. Remove the big end caps. Discard the nuts.



1. Big end cap

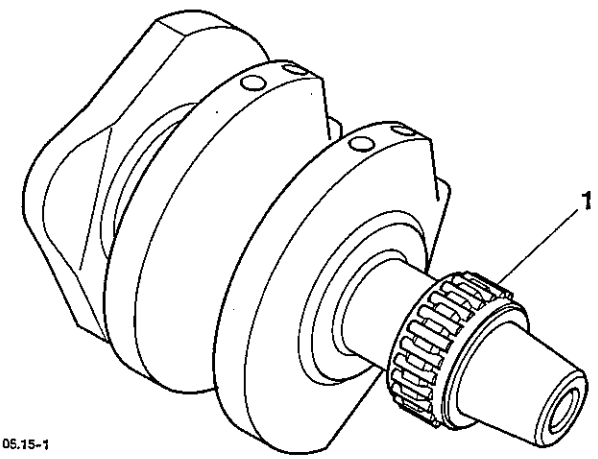
NOTE:

- **Ensure that one half of the bearing shell remains in the connecting rod and one half remains in the big end.**

3. Withdraw the crankshaft from the upper crankcase half.
4. Withdraw each connecting rod and piston assembly sufficiently from the cylinder liner to enable the big end bolts to be removed. Discard the bolts.

Inspection

1. Remove all main and big end bearing shells. Inspect for damage, wear, overheating (blueing) and any other signs of deterioration. Fit a new set of main and/or big end bearing shells if damage, wear, overheating or deterioration is found. If a new set of bearing shells are being fitted, use the bearing selection processes detailed later in this section.
2. Inspect the crankshaft bearing surfaces for grooves or pitting. If any grooving or pitting are found, fit a new crankshaft.
3. Check crankshaft end float (refer to elsewhere in this section for checking procedures). If the crankshaft end float is outside the specified service limits, the crankshaft and/or the crankcase must be replaced.



1. Needle roller bearing

4. Inspect the needle roller bearing for damage, wear, overheating (blueing) and any signs of deterioration. Fit a new needle roller bearing if damage, wear, overheating or any sign of deterioration is found.

Installation

CAUTION: Always check the bearing journal clearance, as described later in this section, before final assembly of the crankshaft. Failure to select the correct crankshaft bearing shells will result in severe engine damage.

1. Fit new big end bolts to the connecting rods.
2. Ease the connecting rod and piston assemblies back into the cylinder liners.

NOTE:

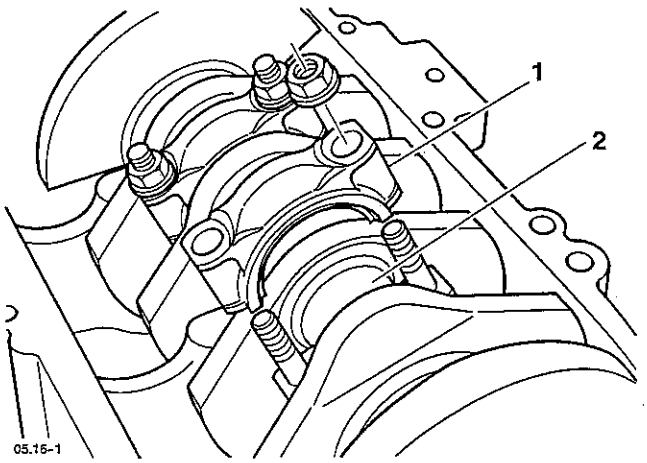
- **If new shell bearings are to be fitted, always follow the selection process described elsewhere in this section.**
- **The bearing shells are keyed and can only be fitted one way.**

3. Fit the shell bearings to the crankcases and connecting rods.
4. Lubricate the surfaces of the bearing shells with a 50/50 solution of engine oil and molybdenum disulphide grease.
5. Ensure that the crankshaft is clean and that the oil-ways within the crankshaft are free from blockages and debris.
6. Refit the crankshaft to the crankcase.
7. Align the connecting rods to the crankshaft journals.

NOTE:

- **Ensure that the big ends and big end caps are assembled as a matched pair.**

8. Fit the big end caps.



1. Big end cap

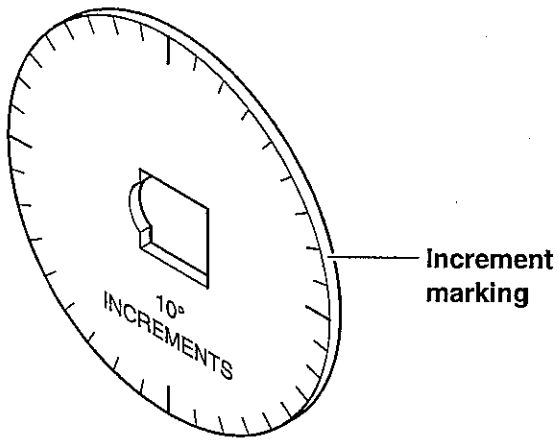
2. Crankpin

9. Lubricate the threads and the face of the nuts with molybdenum disulphide grease.
10. Fit new big end nuts and tighten progressively in four stages:

CAUTION: The torque characteristics of the connecting rod nuts and bolts are sensitive to the rate at which they are tightened. If all the torque is applied in one action the bolt may be stretched and the nut could become loose when in service, resulting in severe engine damage

NOTE:

- **To accurately gauge the torque angles specified, use tool 3880015-T0301.**



05.16-2

Service tool 3880105-T0301

1st stage – Torque the nuts to **20 Nm.**

2nd stage – Release (undo) the nuts through **140°.**

3rd stage – Tighten the nuts to **15 Nm.**

4th stage – Tighten the nuts through a further **150°.**

11. Assemble crankcase upper and lower halves as described earlier in this section.
12. Rotate the crankshaft clockwise. Check for tight spots and rectify as necessary.
13. Refit the:

- Cam chain.
- Camshaft cover.
- Engine into the frame.

Refer to the relevant sections for replacement procedures.

CONNECTING RODS

Removal

NOTE:

- **Connecting rods may be removed after first removing:**
- The engine from the frame.
- The cylinder head.
- Separating the crankcase upper and lower halves.

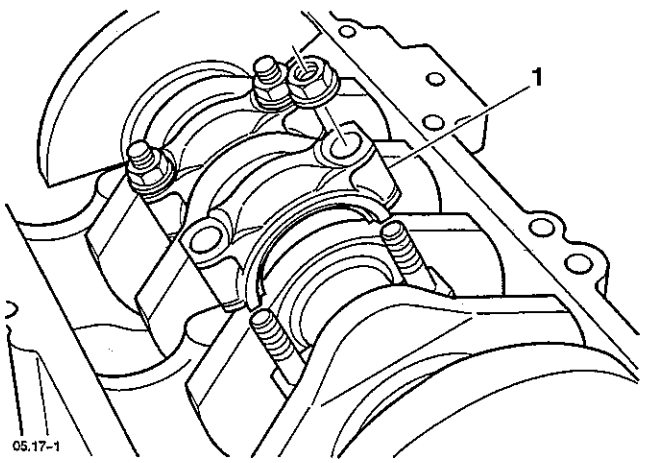
Refer to the relevant sections for removal procedures.

1. Mark each big end cap and connecting rod to identify both items as a matched pair and their orientation to each half.

NOTE:

- **It may be necessary to gently strike the big end cap with a rubber mallet to release the cap from the bolts.**

2. Release the nuts securing the big end cap to the connecting rod and remove the big end cap. Ensure that one half of the bearing shell remains in the big end cap and one half remains in the connecting rod. Discard the nuts.



05.17-1

1. Big end cap

3. Push the connecting rod up through the liner and remove the piston and connecting rod assembly.
4. Remove a gudgeon pin circlip, detach the gudgeon pin and piston from the connecting rod by pushing the gudgeon pin towards the end of the piston from which the circlip was removed.
5. Label the parts to identify the cylinder from which they were removed.

6. Repeat steps 1 to 5 for each cylinder.
7. Remove and discard the big end bolts.

NOTE:

- **Prior to removal, mark each liner to identify correct orientation and the cylinder from which it was removed.**

8. Remove the cylinder liners using service tool part number T3880315, fitted with adapter T3880316, as described later in this section.

Inspection

NOTE:

- **Connecting rod nuts and bolts are treated with an anti-rust solution which must not be removed.**

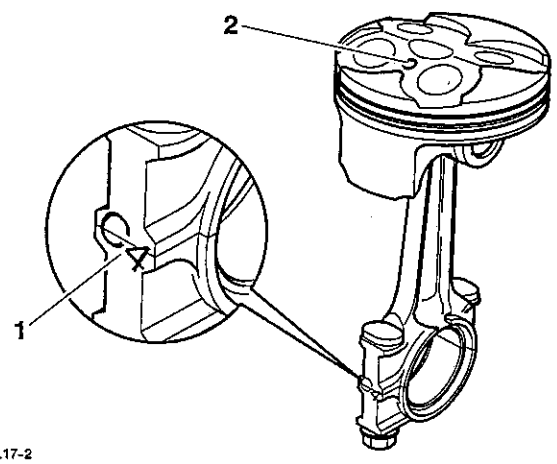
1. Remove all bearing shells and inspect for damage, wear, overheating (blueing) and any other signs of deterioration. Fit a new set of big end bearing shells if damage, wear, overheating or deterioration is found.

Installation

1. Lubricate the gudgeon pin with a 50/50 solution of engine oil and molybdenum disulphide grease and assemble to the connecting rod and piston.

NOTE:

- **Ensure the piston is fitted correctly to the connecting rod (small dimple in the piston crown towards the front of the engine, with the connecting rod stamp (e.g. C4) also towards the front).**



05.17-2

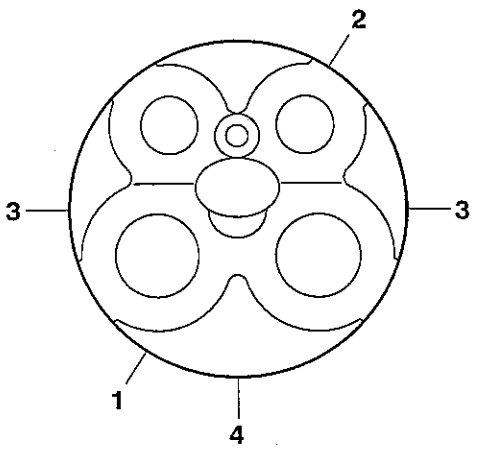
1. Connecting rod stamp

2. Small dimple

2. Retain the gudgeon pin with new circlips.
3. Fit new bolts to the connecting rod.

CAUTION: Never re-use connecting rod nuts or bolts. If the connecting rod cap is disturbed, always discard the nuts and bolts and fit new ones. Using the original nuts and bolts may lead to severe engine damage.

4. Arrange the piston rings as shown below:



05.18-1

1. Top ring

2. Second ring

3. First oil ring

4. Oil Control Ring

5. Fit the piston and connecting rod assembly (piston crown first) into the lower end of the cylinder liner from which it was removed. Use a gentle rocking motion to engage the rings into the bore.
6. Fit the selected bearing shells to the connecting rods and caps.

CAUTION: Always check the bearing journal clearance, as described later in this section, before final assembly of the crankshaft. Failure to select the correct crankshaft bearing shells will result in severe engine damage.

NOTE:

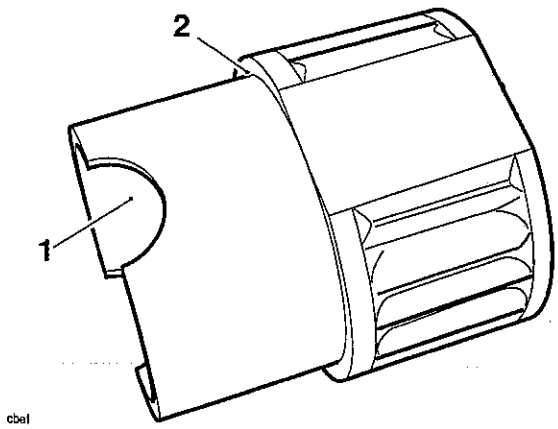
- **If a new set of bearing shells are being fitted, use the selection processes detailed later in this section.**
- **Avoid touching any bearing surface of the bearing shells with the hand.**

7. Lubricate the surfaces of the bearing shells with with a 50/50 solution of engine oil and molybdenum disulphide grease.

8. Apply silicone sealer to the cylinder liner/crankcase mating surface (see earlier in this section for sealer areas).

NOTE:

- **Silicone sealant 'Three Bond 1215J' is used at the factory.**



cbel

1. Chamfered End

2. Sealant area

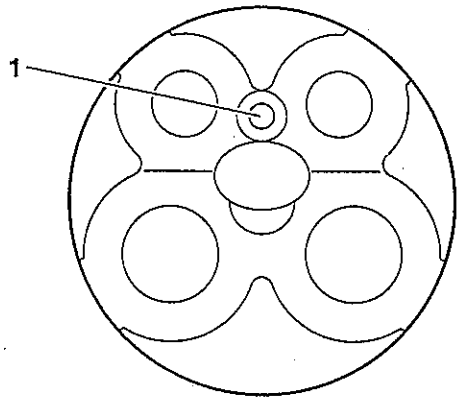
9. Fit the piston, connecting rod and liner assembly into the crankcase in the same location as prior to removal.

NOTE:

- **Ensure that the piston faces the front of the engine (small dimple in the piston crown towards the front).**

NOTE:

- **Ensure that the cylinder liners are square to each other with a minimum gap of 0.1mm between each liner.**

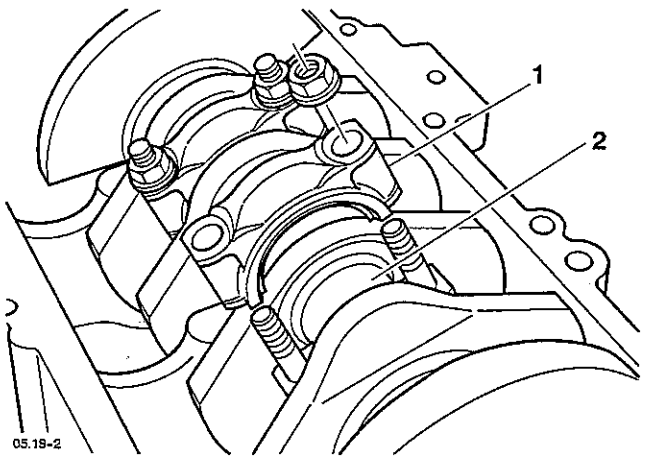


05.19-1

1. Dimple (faces forward)

10. Align the connecting rod to the crankshaft and fit the big end cap in the same orientation as noted during removal.

11. Lubricate the threads and face of new big end nuts with molybdenum disulphide grease.



05.19-2

1. Big End

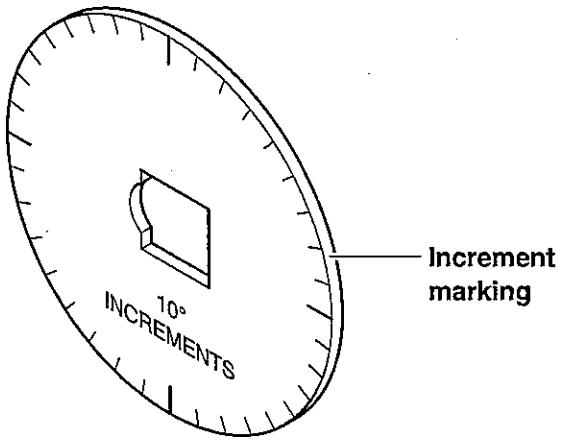
2. Crankpin

12. Fit the big end nuts and tighten progressively in four stages:

CAUTION: The torque characteristics of the connecting rod nuts and bolts are sensitive to the rate at which they are tightened. If all the torque is applied in one action the bolt may be stretched and the nut could become loose when in service, resulting in severe engine damage

NOTE:

- **To accurately gauge the torque angles specified, use tool 3880015-T0301.**



05.16-2

Service tool 3880105-T0301

1st stage – Torque the nuts to **20 Nm.**

2nd stage – Release (undo) the nuts through **140°.**

3rd stage – Tighten the nuts to **15 Nm.**

4th stage – Tighten the nuts through a further **150°.**

13. Repeat steps 1 to 12 for the other three cylinders.
14. Assemble crankcase upper and lower halves, as described earlier in this section.
15. Rotate the crankshaft clockwise. Check for tight spots and rectify as necessary
16. Refit the:

- Cylinder head
- Engine into the frame.

Refer to the relevant sections for assembly procedures.

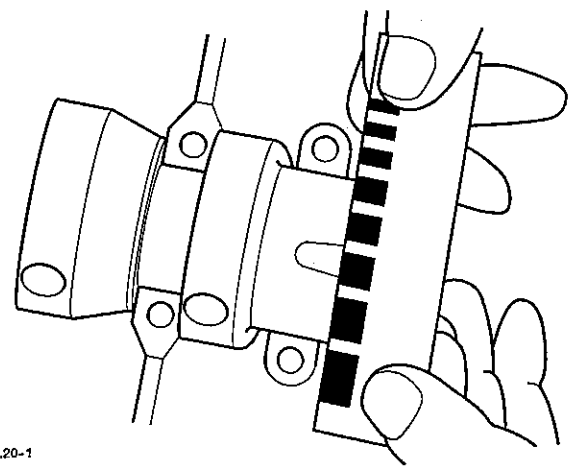
CONNECTING ROD BIG END BEARING SELECTION / CRANKSHAFT JOURNAL WEAR CHECK

Measure the connecting rod big end bearing and crankshaft journal clearance as follows:

NOTE:

- **The crankshaft journal clearances are measured using 'Plastigage' (Triumph part number 3880150-T0301).**
- **Do not turn the connecting rod and crankshaft during the clearance measurement as this will damage the Plastigage.**

1. Remove the big end cap from the crankshaft journal to be checked.
2. Wipe the exposed areas of the crankshaft journal and the bearing face inside the big end cap.
3. Apply a thin smear of grease to the crankshaft journal and a small quantity of silicon release agent to the bearing.
4. Trim a length of the Plastigage to fit across the crankshaft journal. Fit the strip to the crankshaft journal using the grease to hold the Plastigage in place.
5. Lubricate the threads and face of the nuts with molybdenum disulphide grease. Refit the bearing and big end cap and tighten the big end nuts as described earlier.
6. Release the nuts and remove the big end cap.
7. Using the gauge provided with the Plastigage kit, measure the width of the compressed Plastigage.



05.20-1

1. Checking the Measured Plastigage.

Connecting rod big end bearing to crankshaft journal clearance

Standard	**0.031 – 0.059 mm**
Service limit	**0.07 mm max**

If the measured clearance exceeds the service limit, measure the crankshaft journal diameter.

Crankshaft journal diameter

Standard	**29.984-30.000 mm**
Service limit	**29.960 mm**

NOTE:

- **If any crankshaft journal has worn beyond the service limit, the crankshaft must be replaced. Due to the advanced techniques used during manufacture, the crankshaft cannot be reground and no oversize bearings are available.**

CONNECTING ROD BEARING SELECTION

Minor differences in connecting rod dimensions are compensated for by using selective bearings.

Select the correct big end bearing shell as follows:

1. Measure each crankshaft journal diameter.

NOTE:

- **Connecting rod marks are an ink stamp which will be prefixed by a letter (e.g.. C4).**

2. Check the connecting rod for either an 4 or 5 mark.
3. Measure the internal diameter of the connecting rod big end (bearings removed).
4. Select the correct bearings by matching the information found with the chart below.

Connecting rod big end bearing selection chart (mm's)

Shell Colour	White	Red		Blue
Rod marking	5	5	4	4
Crankshaft journal diameter range	30.000 29.995	29.994 29.984	30.000 29.995	29.994 29.984
Connecting rod big end diameter range	33.008 33.000	33.008 33.000	33.018 33.009	33.018 33.009
Running clearance range	0.031 0.059			

For example:

Connecting rod mark - 5
Crankshaft journal diameter - 29.987
Connecting rod internal diameter - 33.005
Required bearing - Red

NOTE:

- **Repeat measurement for all connecting rods and their respective crankshaft journals.**
- **It is normal for the bearings selected to differ from one connecting rod to another.**

5. Install the new bearings in the connecting rod.
6. Check the running clearance using the Plastigage method.

CAUTION: Always confirm, using the Plastigage method, that the running clearance is correct before final assembly. Severe engine damage could result from incorrect clearance.

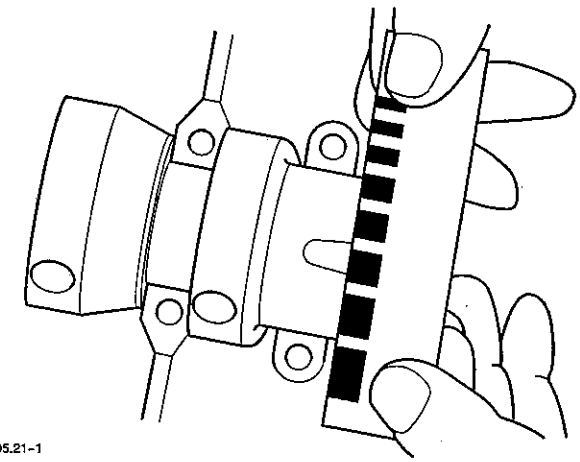
CRANKSHAFT MAIN BEARING/JOURNAL WEAR CHECK

NOTE:

- **Minor differences in connecting rod dimensions are compensated for by using selective bearings.**

Select the correct big end bearing shell as follows:

1. Measure the bearing to crankshaft main journal clearance using Plastigage (Triumph part number 3880150-T0301). Use the method described in connecting rod clearance measurement.



05.21-1

Measuring clearances

Bearing Clearance

Standard	**0.024-0.048 mm**
Service limit	**0.070 mm max**

2. If the clearance exceeds the service limit, measure the diameter of the crankshaft main journal.

Crankshaft main journal diameter:

Standard	**29.984-30.00 mm**
Service limit	**29.960 mm**

NOTE:

- **If any crankshaft main journal has worn beyond the service limit, the crankshaft must be replaced.**

Main Bearing selection chart (all dimensions in mm's)

Main bearing selection chart						
Shell Colour	White	Red		Blue		Green
Crankcase bore range	32.966 32.959	32.966 32.959	32.974 32.967	32.978 32.975	32.972 32.967	32.978 32.973
Journal diameter range	30.000 29.991	29.990 29.984	30.000 29.991	30.000 29.991	29.990 29.984	29.990 29.984
Running clearance range	0.048 0.024					

Select the bearings as follows:

CAUTION: Use of an incorrect bearing selection chart could lead to severe engine damage.

1. Measure and record the diameter of each crankshaft main bearing journal.
2. Measure and record the diameter of the bores in the crankcase (with the bearings removed).
3. Compare the data found for each corresponding journal/bore with the chart above and select bearings, journal by journal.

NOTE:

- **It is normal for the bearings selected to differ from one journal to another.**

4. After selection and fitment, confirm the running clearance of **EVERY** journal using the Plastigage method described elsewhere in this section.

CAUTION: Always confirm, using the Plastigage method, that the running clearance is correct before final assembly. Severe engine damage could result from incorrect clearance.

Crankshaft End Float

Standard	**0.050 – 0.200 mm**
Service limit	**0.40 mm max**

NOTE:

- **Crankshaft end float is controlled by the tolerances in crankshaft and crankcase machining. No thrust washers are used. If crankshaft end float is outside the specified limit, the crankshaft and /or crankcase must be replaced.**

PISTONS

Disassembly

NOTE:

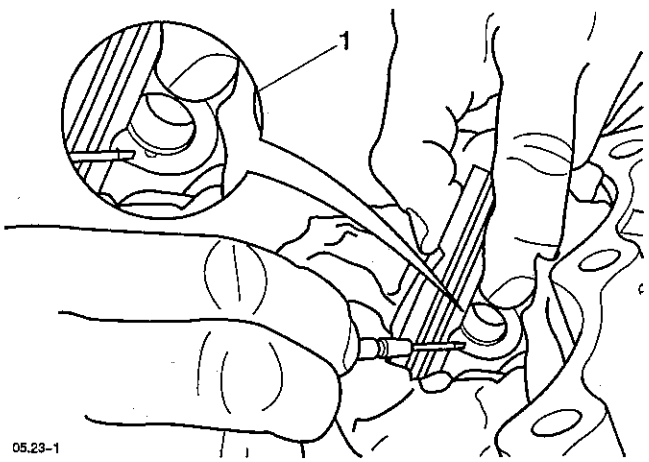
- **The pistons may be removed after first removing the cylinder head and cylinder liners. It is not necessary to remove the connecting rods from the crankshaft. Refer to the relevant sections for removal procedures.**

1. Turn the crankshaft until the piston to be removed is at TDC.

NOTE:

- **Place a cloth between the piston and crankcase to ensure the circlip does not fall into the crankcase**

2. Remove the gudgeon pin circlip from one side of the piston. Discard the circlip.



Gudgeon pin removal

> **CAUTION: Never force the gudgeon pin through the piston and connecting rod. This may cause damage to the piston which also may damage the cylinder liner when assembled.**

NOTE:

- **If the gudgeon pin is found to be tight in the piston, check the piston for a witness mark caused by the circlip. Carefully remove the mark to allow the gudgeon pin to be removed.**

- **If the gudgeon pin will not move then the crankcase will have to be split and the connecting rod removed.**

3. To remove the gudgeon pin, push the pin through the piston and connecting rod toward the side from which the circlip was removed.

4. Withdraw the piston from the connecting rod.

5. Remove the remaining circlip and discard.

NOTE:

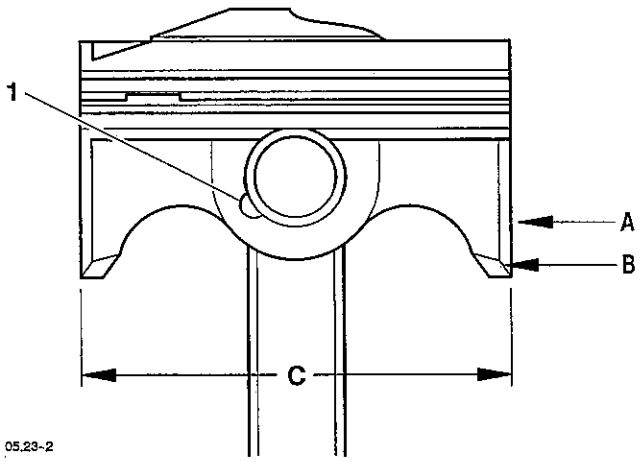
- **Piston rings must be removed from the piston using hand pressure only.**

6. Remove the piston rings

Inspection

Piston wear check

1. Measure the piston outside diameter between 3 and 14 mm up from the bottom of the skirt. Measure at 90° from the direction of the gudgeon pin.



1. Circlip removal groove

A = 14 mm from skirt bottom

B = 3 mm from skirt bottom

C = Piston outside diameter

Piston outside diameter:

Standard	67.990 +/- 0.005 mm
Service limit	67.91 mm

NOTE:

- **Replace the piston if the measured diameter falls outside the specified limit.**

Piston Ring Gap

NOTE:

- **Check the piston ring gap in the cylinder liner to which the piston ring will be fitted to on assembly.**

1. Place a piston ring in the top of cylinder liner.
2. Using the piston crown, push the piston ring into the top of the cylinder liner (the piston will hold the piston ring square).
3. Continue to push the piston into the bore until the third groove of the piston is level with the top of the liner.
4. Remove the piston and measure the gap between the ends of the piston ring, using a feeler gauge.

Piston ring gap tolerances (standard)

Top	**0.15 - 0.30 mm**
Second	**0.25 - 0.40 mm**
Oil Control	**0.20 - 0.70 mm**

Piston ring gap tolerances (service limits)

Top	**0.60 mm**
Second	**0.75 mm**
Oil Control	**0.70 mm**

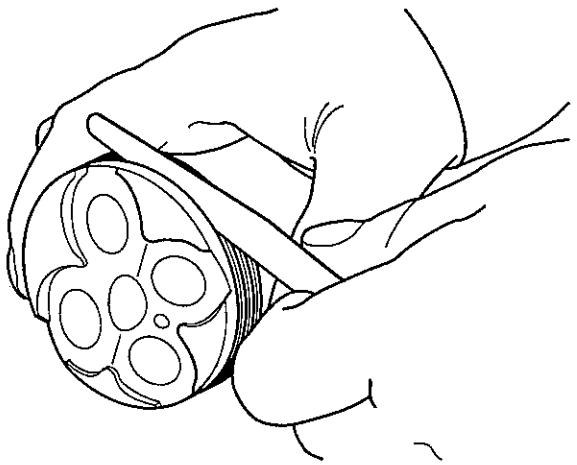
5. (a) If the piston ring gap is too large, replace the piston rings with a new set

   (b) If the gap remains too large with new piston rings, both the piston and cylinder liner must be replaced.

   (c) If the gap is too small, check the piston and liner for distortion, replacing as necessary. **Do not file piston rings!**

Piston Rings/Ring Grooves

1. Check the pistons for uneven groove wear by visually inspecting the ring grooves.
2. If all the rings do not fit parallel to the groove upper and lower surfaces, the piston must be replaced.
3. Clean the piston ring grooves.
4. Fit the piston rings to the piston. Check, using a feeler gauge, for the correct clearance between the ring grooves and the rings:



05.24-1

Checking ring-groove clearance

Piston ring/Groove clearance (standard)

Top	**0.02 - 0.03 mm**
Second	**0.02 - 0.06 mm**

Piston ring/Groove clearance (service limits)

Top	**0.16 mm**
Second	**0.16 mm**

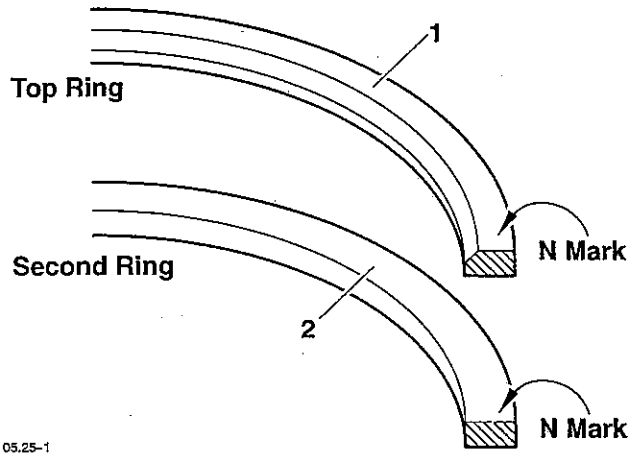
Replace the piston and rings if outside the specified service limit.

Assembly

1. Thoroughly clean the piston ring grooves and fit the piston rings to the pistons.

NOTE:

- **The top ring upper surface is marked with a 'N' and has a chamfer on the inside edge.**
- **The second ring upper surface is also marked with a 'N' but has no chamfer on it's inside edge.**
- **The oil control rings can be fitted with either face uppermost.**



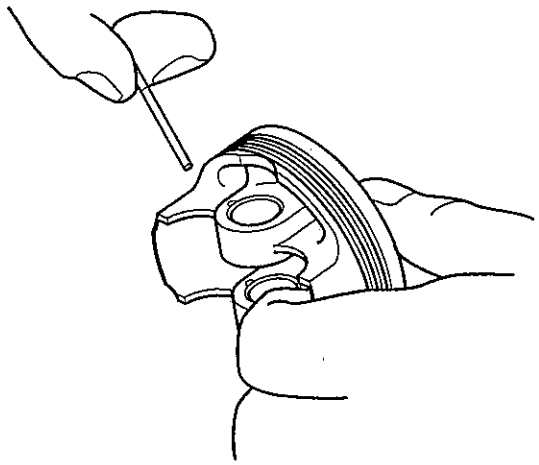
05.25-1

WARNING: Failure to use new gudgeon pin circlips could allow the gudgeon pin to detach from the piston. This could seize the engine and lead to an accident.

NOTE:

- **Fit the circlip to pistons 1 and 4 on the side which will be outermost in the engine when fitted to the connecting rod.**

2. Fit a new circlip to the piston. Ensure the new circlip is correctly fitted into it's groove.



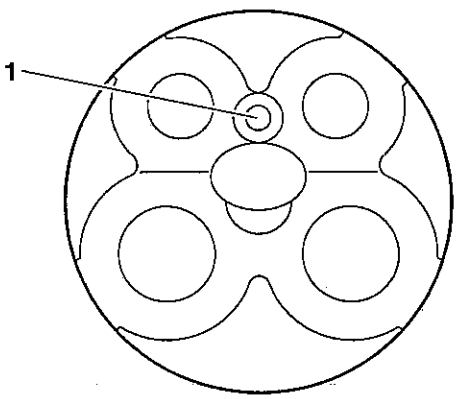
05.25-2

1. Circlip fitment

3. Lubricate the piston, connecting rod small end and the gudgeon pin with a 50/50 solution of engine oil and molybdenum disulphide grease.

NOTE:

- **Ensure that the small dimple on the piston crown faces to the front of the engine.**



05.25-3

1. Dimple (faces forward)

4. Place the piston to the connecting rod small end.

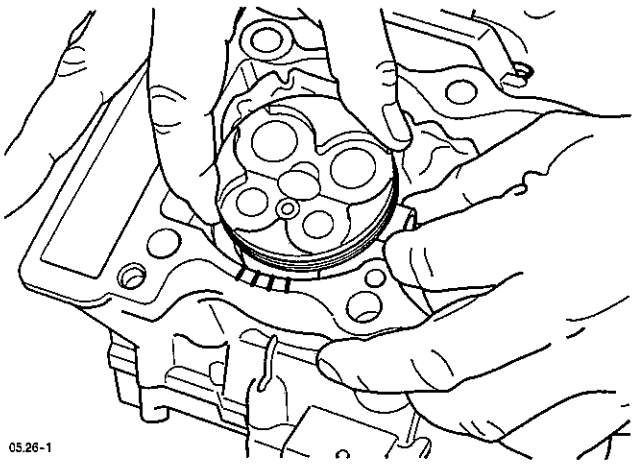
NOTE:

- **Use a clean cloth between the piston and cylinder liner to prevent any items falling into the crankcase.**

5. Align the small end of the connecting rod with the gudgeon pin hole in the piston.

WARNING: Failure to use new gudgeon pin circlips could allow the gudgeon pin to detach from the piston. This could seize the engine and lead to an accident.

6. Fit the gudgeon pin.



05.26-1

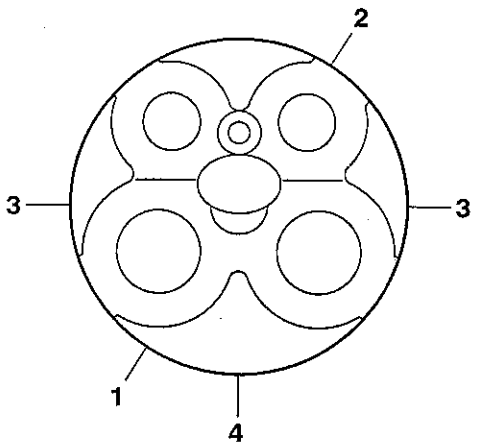
Gudgeon pin alignment

7. Fit the remaining new circlip to the piston. Ensure the new circlip is correctly fitted into its groove.

8. Arrange the piston rings as follows (piston viewed from above with the small dimple at the top):

NOTE:

- **The top piston ring gap should be in the 7 o'clock position.**
- **The second piston ring gap should be in the 1 o'clock position.**
- **The steel oil control ring gaps should be in the 3 and 9 o'clock positions (one in each position).**



05.26-3

1. Top Ring

2. Second Ring

3. Steel Oil Control Rings

4. Oil Control Ring Expander

9. Repeat steps 2 to 8 for the remaining pistons.

10. Refit the cylinder liners as described later in this section.

11. Refit the cylinder head as described earlier in this section.

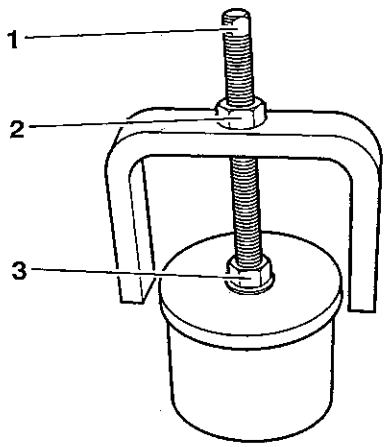
CYLINDER LINERS

Removal

NOTE:

- **The cylinder liners may be removed after first removing the cylinder head. Refer to the relevant section for removal procedures.**

1. Mark each cylinder liner to identify correct orientation and the cylinder number from which it will be removed.
2. Turn the crankshaft until the piston in the cylinder liner to be removed is at bottom dead centre.
3. Assemble service tool T3880315, with adapter T3880316.
4. Check that the locking nut on the service tool is loose, then unscrew the extraction nut.



05.27-2

1. Service Tool T3880315

2. Extraction Nut

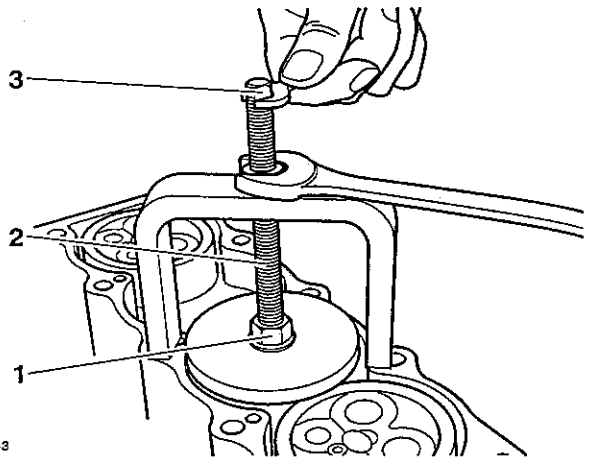
3. Locking Nut

CAUTION: The cylinder liners are made of aluminum alloy and can be easily damaged. Handle with care, ensuring the cylinder liner bore is not scratched.

NOTE:

- **Ensure adapter T3880316 is fitted to the service tool.**

5. Carefully fit the service tool fully in to the cylinder liner bore and position the legs of the service tool on the crankcase.



05.27-3

1. Locking nut

2. Bolt

3. Flats to locate a wrench

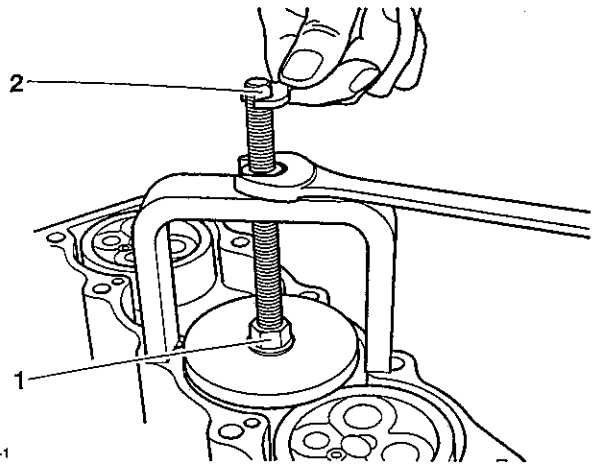
6. Hold the tool's threaded stud with a wrench and turn the locking nut, on the service tool, clockwise until the rubber sleeve on the service tool tightly grips the bore of the cylinder liner.

NOTE:

- **To avoid slipping off, the locking nut must be very tight and the liners and tool must be completely free of all oil deposits.**
- **As the extractor rubber becomes compressed, apply gentle downward pressure to ensure the full depth of the rubber is inside the liner during extraction.**

7. Check that the service tool legs are positioned to allow movement of the cylinder liner.

8. Support the tool and turn the extraction nut clockwise to lift the cylinder liner 4 to 6 mm (this will break the silicone seal between the crankcase and the cylinder liner).



1. Extraction nut

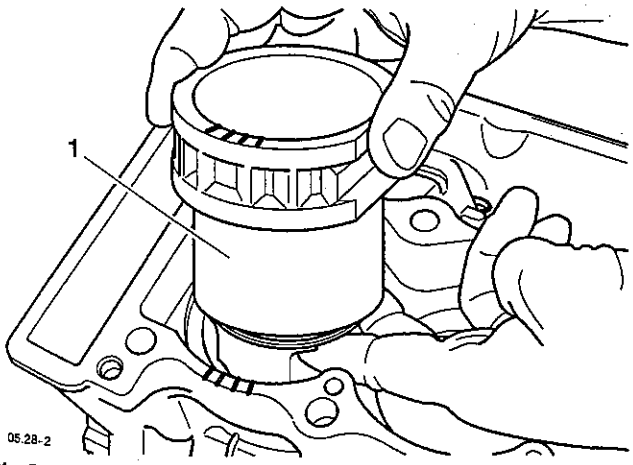
2. Flats

9. Turn the locking nut anti-clockwise to release the cylinder liner.

10. Remove the service tool.

> ⚠ **CAUTION: Take care, when removing the cylinder liner, to ensure that the piston is not allowed to fall against the inside of the crankcase. Piston damage could result if allowed to contact the crankcase**

11. Withdraw the cylinder liner from the crankcase by hand while supporting the piston.



1. Cylinder withdrawal

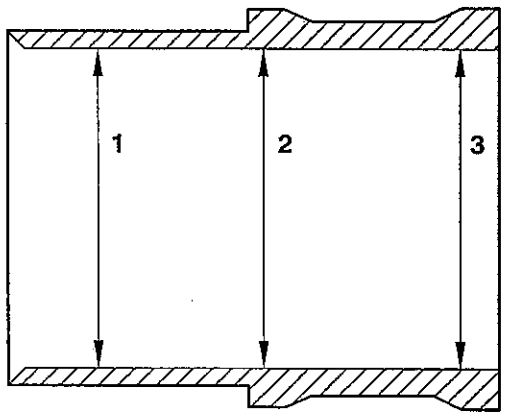
12. Repeat steps 4 to 11 for second piston at bottom dead centre.

13. Rotate the crankshaft until the remaining two pistons are at bottom dead centre.

14. Repeat steps 4 to 11 for each remaining cylinder liners and pistons.

Inspection

1. Measure the diameter of each cylinder liner using an internal micrometer or similar accurate measuring equipment.



Cylinder bore diameter

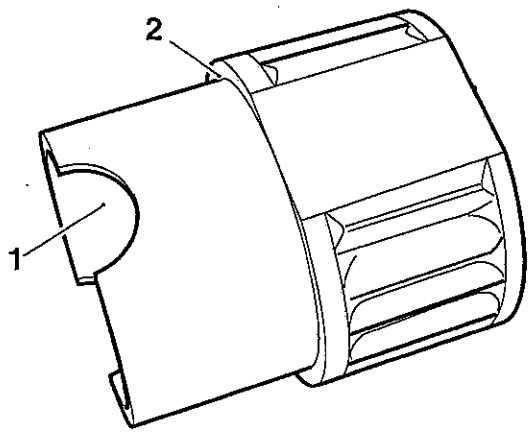
Standard	**68.000 - 68.015 mm**
Service limit	**68.10 mm**

NOTE:

- **Check the diameter at points 1, 2 and 3.**
- **If any reading is outside the specified limits, replace the cylinder liner and piston.**

Installation

1. Thoroughly clean each cylinder liner, removing all traces of the silicon sealant.
2. Remove all traces of silicone sealant from the crankcase.
3. Apply silicone sealant to a cylinder liner/crankcase mating surface.



cbsf

1. Chamfered End

2. Sealant area

NOTE:

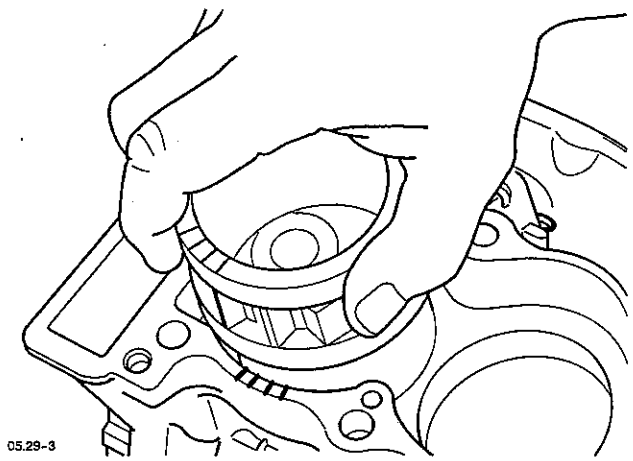
- **Silicone sealant 'Three Bond 1215J' is used at the factory.**
- **The cylinder liners have a chamfer at the bottom of the bore to enable the fitment of the piston with out the need for a piston ring compressor.**
- **Ensure the correct cylinder liner is fitted to the piston from which it was removed.**
- **The cylinder head must be fitted and torques within 30 minutes of fitting the liners.**

4. Noting the position and orientation from removal, locate the cylinder liner to its corresponding piston (which must be at TDC).
5. Insert the cylinder liner over the piston using a gentle rocking motion to allow compression of the piston rings.

NOTE:

- **When a cylinder liner has been installed it should not be disturbed. If it is necessary to remove a cylinder liner after fitting, sealant must be re-applied.**

6. Push the cylinder liner into the crankcase until fully seated.



05.29-3

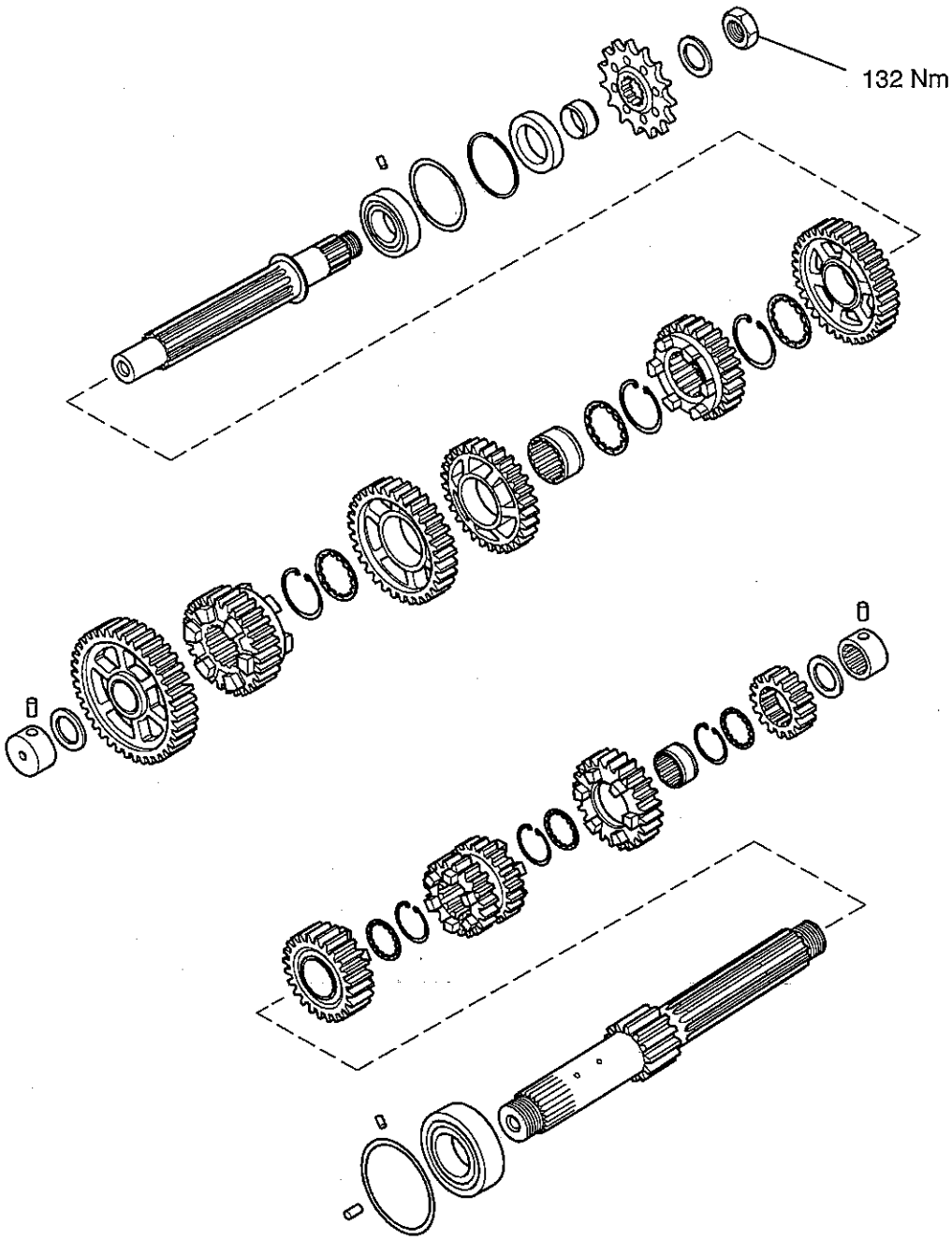
Refitting a cylinder liner

7. Repeat steps 3 to 6 for the other piston at TDC.
8. Rotate the engine until the two remaining pistons are at TDC
9. Repeat steps 3 to 6 for each remaining cylinder liner and piston.
10. Refit the cylinder head as described earlier in this section.

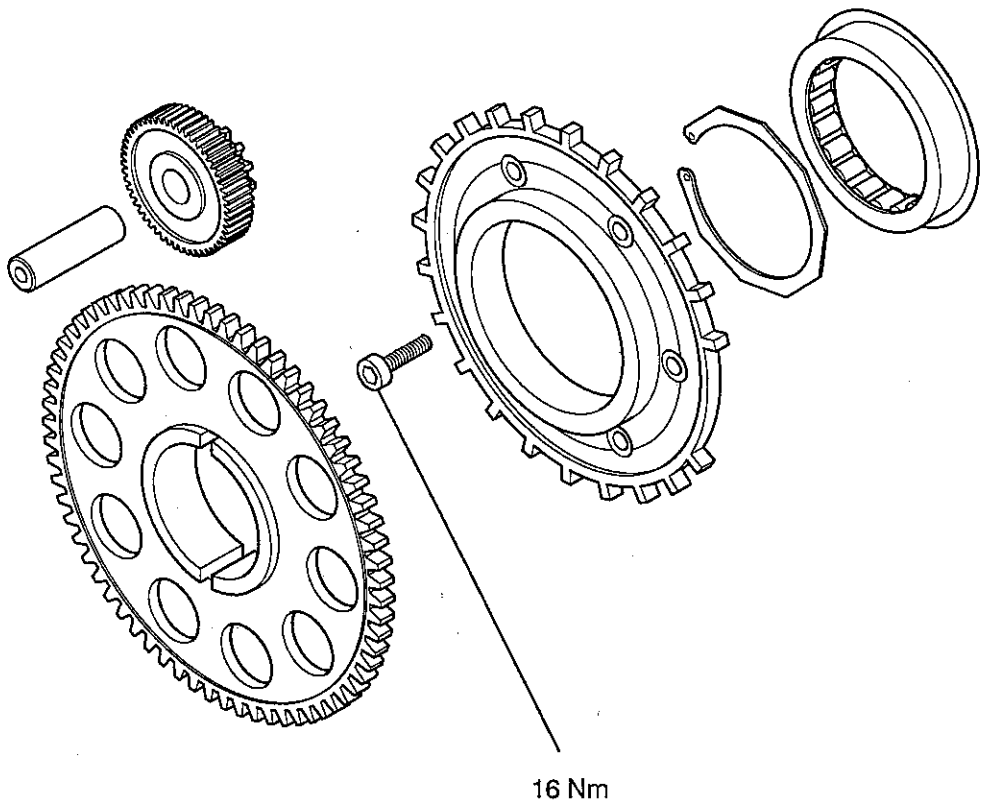
TRANSMISSION

CONTENTS

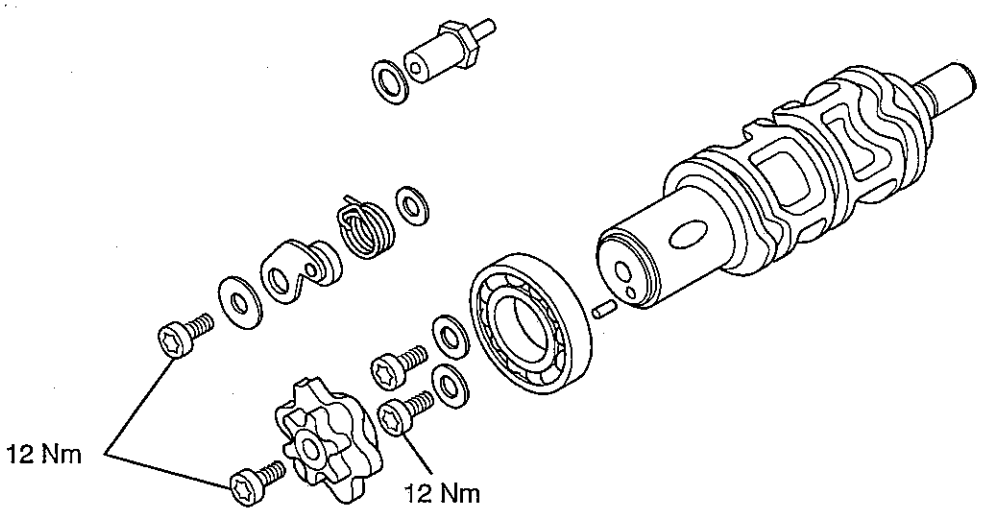
Exploded View, Input and Output Shafts



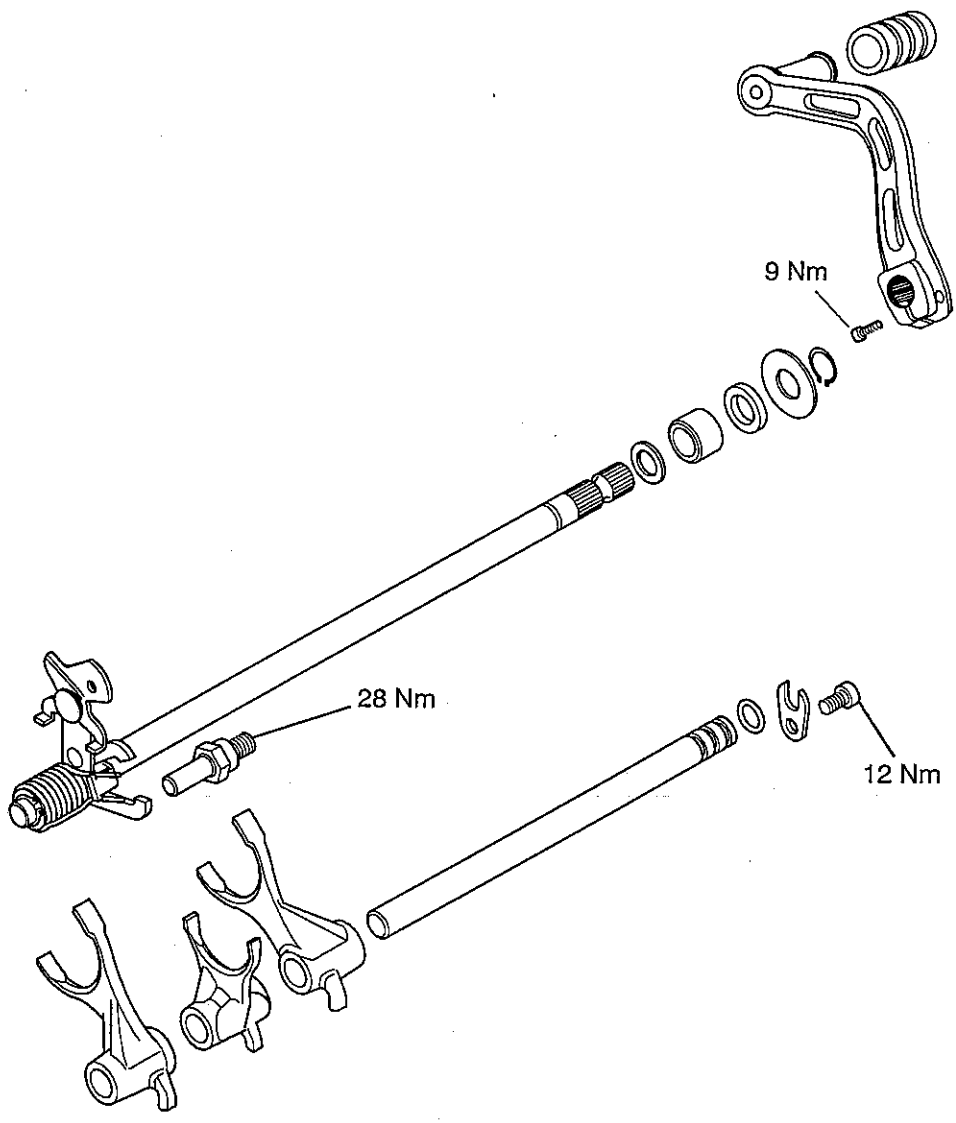
Exploded View, Sprag



Exploded View, Gear Change Mechanism



Exploded View, Gear Selector Mechanism



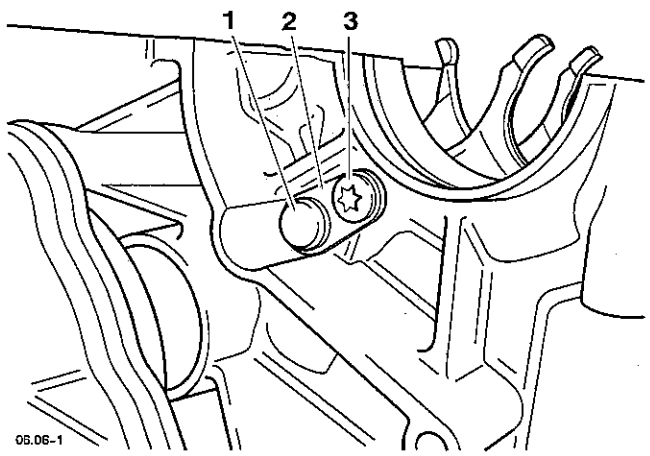
SELECTOR SHAFT, SELECTOR FORKS & DRUM

Removal

NOTE:

- **In order to remove the selector mechanism, the engine must first be removed from the frame and the two halves of the crankcase separated. Refer to the relevant sections for removal procedures.**

1. Remove the input and output shafts from the crankcase as described elsewhere in this section.
2. Remove the capscrew and take out the 'U' shaped keeper plate from the selector shaft. Discard the capscrew.

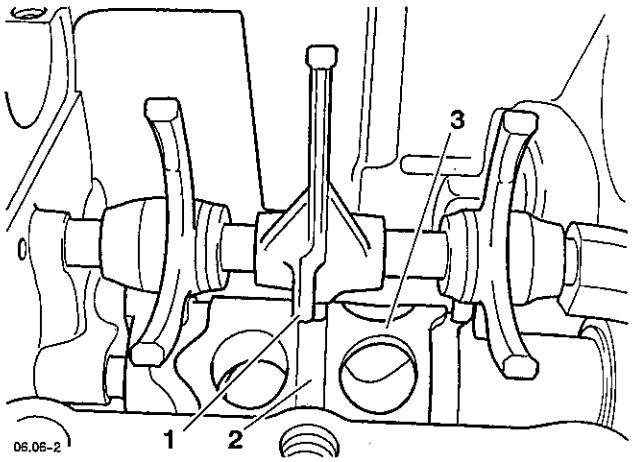


1. Selector shaft
2. Keeper plate
3. Capscrew

CAUTION: The selector forks can be fitted incorrectly. Ensure the position and orientation of the selector forks are marked prior to removal. Incorrect fitting of the selector forks will cause gearbox damage.

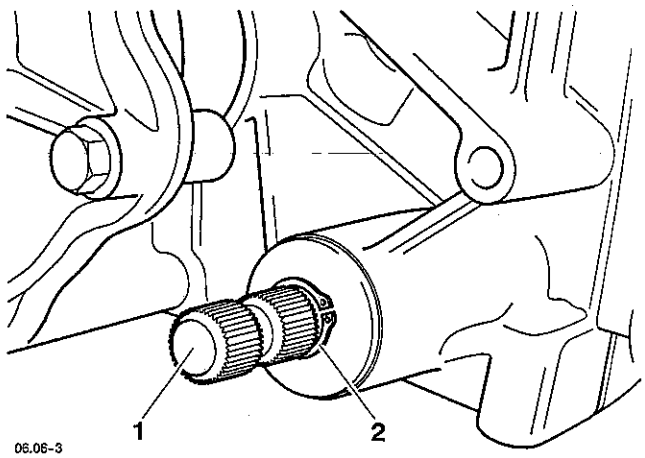
NOTE:

- **The centre selector fork locates in the selector drum as shown below:**



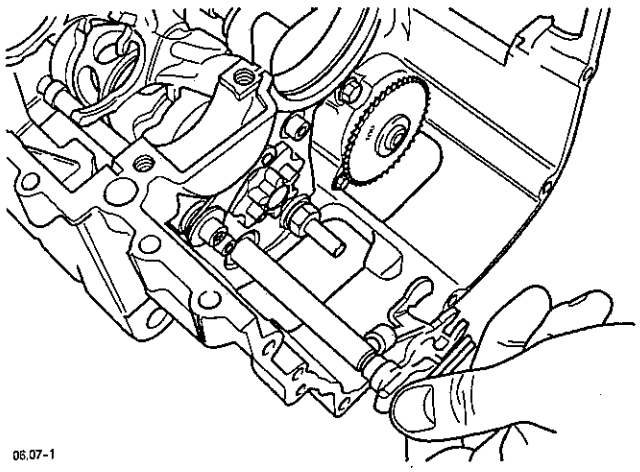
1. Selector fork stop
2. Selector fork drum guide
3. Selector drum

3. Using a suitable tool, push the selector shaft out from the crankcase in the direction of the keeper plate. Collect each selector fork as they are released by the selector shaft.
4. If not already removed, note the position and orientation of the gear pedal in relation to the shaft, then remove the pedal.
5. Remove the circlip and washer from the gear pedal end of the gear change shaft.



1. Gear change shaft
2. Circlip

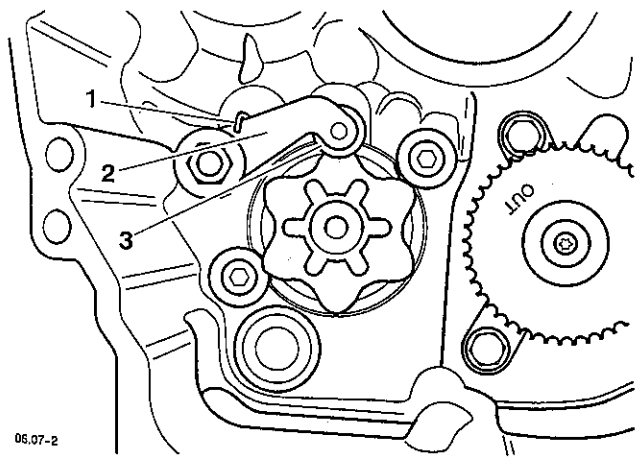
6. Withdraw the gear change shaft from the clutch end of the crankcase.



Gear change shaft removal

NOTE:

- **The detent arm is held in position under spring pressure.**
- **Prior to removal, note the orientation of the detent arm, capscrew, collar, spring and washer. The same orientation must be retained on assembly.**

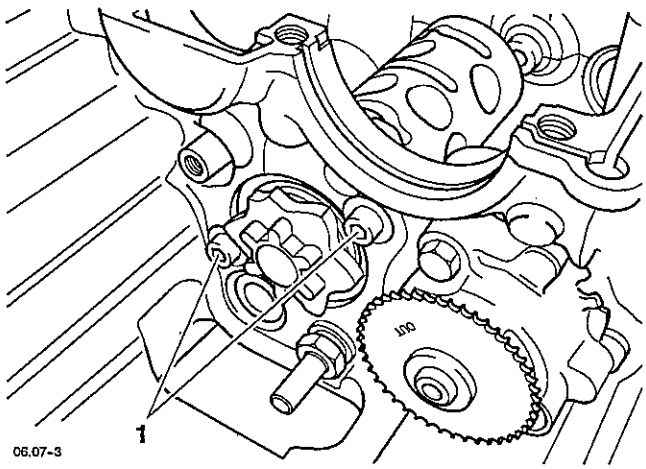


1. Spring
2. Detent arm
3. Detent wheel

7. Release and remove the capscrew securing the detent arm.

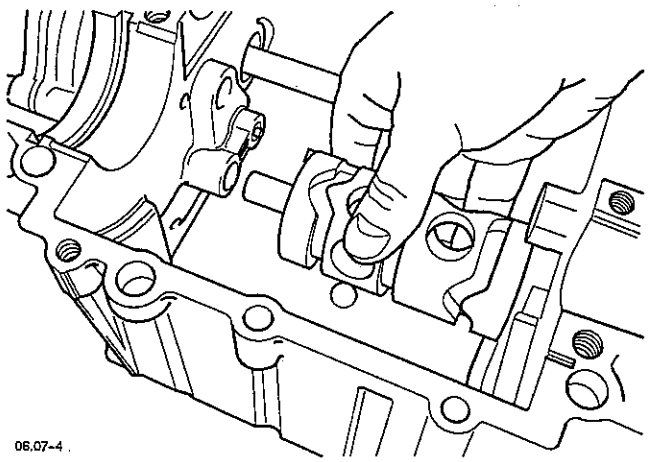
8. Withdraw the detent arm complete with it's collar, spring and washer. Discard the capscrew.

9. Release and remove the bolts securing the selector drum bearing to the crankcase. Discard the bolts.



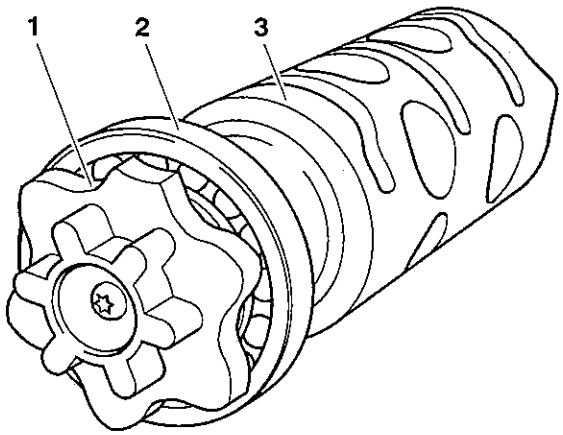
1. Bolts

10. Withdraw the selector drum complete with the detent wheel and bearing from the clutch end of the crankcase.



Selector drum removal

11. To remove the detent wheel and/or the ball bearing, place the selector drum into a vice fitted with soft grips, and remove the bolt from the center of the detent wheel. Withdraw the detent wheel and ball bearing from the selector drum. Discard the bolt.



06.08-1

1. **Detent wheel**
2. **Ball bearing**
3. **Selector drum**

Inspection

1. Examine all components for damage and/or wear, paying particular attention to the selector forks and selector drum. Replace any parts that are damaged and/or worn.

Gear selector fork thickness

Standard	**5.90 – 6.00 mm**
Service limit	**5.80 mm**

Gear selector groove width

Standard	**6.00 – 6.15 mm**
Service limit	**6.25 mm**

Selector fork to groove clearance

Standard	**0.25 mm**

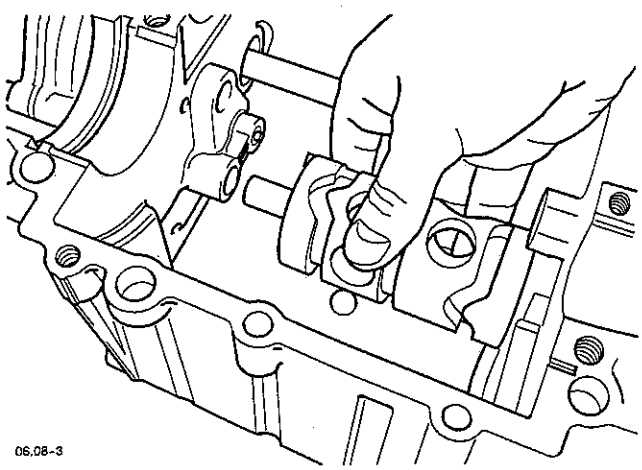
2. Examine the gear change shaft seal for damage and/or wear. Replace the seal if damaged and/or worn.

Installation

NOTE:

- **The detent wheel is keyed to the selector drum**

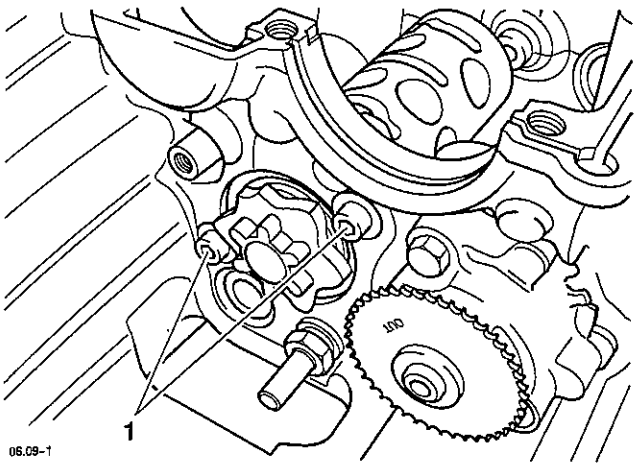
1. If removed, fit the ball bearing and detent wheel to the selector drum.
2. Fit a new bolt and tighten to **12 Nm.**
3. Using clean engine oil, lubricate the bearing.
4. Locate the selector drum assembly to the crankcase.



06.08-3

Locating the selector drum

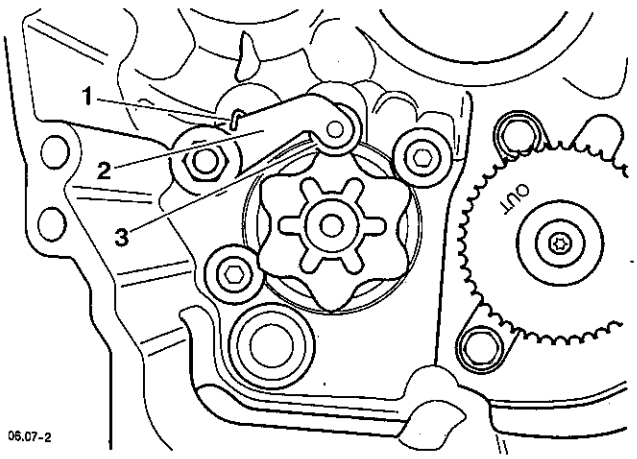
5. Fit new bolts and washers securing the bearing and selector drum in the crankcase. Tighten the bolts to **12 Nm.**



1. Bolts

NOTE:

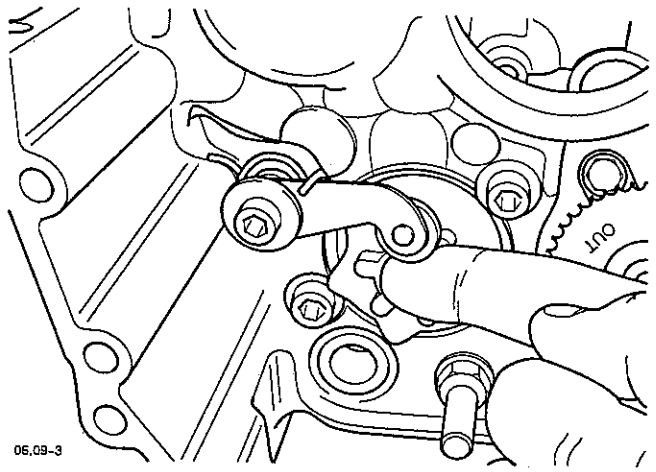
- **The detent arm is held in position under spring pressure.**



1. Spring
2. Detent arm
3. Detent wheel

6. Assemble the detent arm as noted on removal and place up to the crankcase.

7. Hold the detent arm assembly in position and fit a new capscrew. Start the thread and push the detent arm, using finger pressure, to locate on the detent wheel. Ensure the detent arm remains in the collar and correctly locates on the detent wheel. Tighten the capscrew to **12 Nm.**



Locating the detent arm

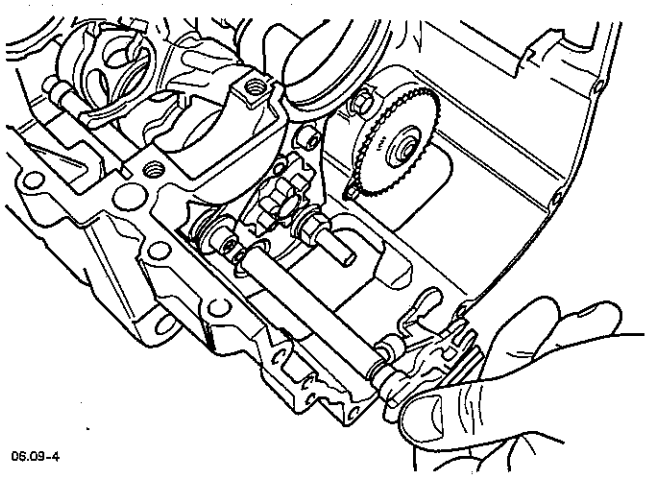
8. Rotate the selector drum and ensure a smooth movement. Rectify as necessary.

9. Using clean engine oil, lubricate the lip of the seal on the gear change shaft.

10. Lubricate, with a 50/50 solution of engine oil and molybdenum disulphide grease, both sides of the fingers of the selector mechanism on the selector shaft.

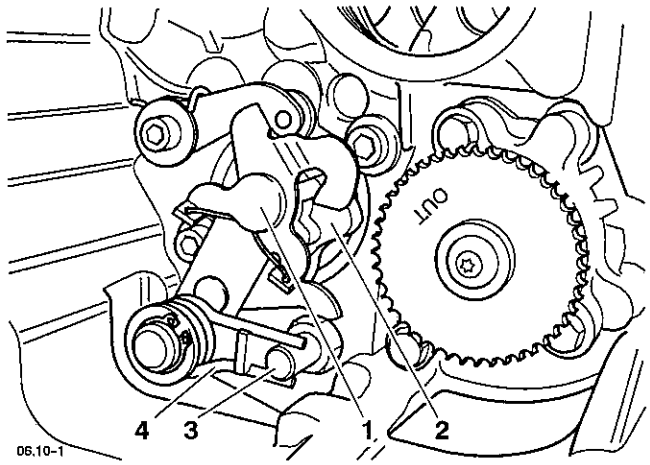
> ⚠ **CAUTION: Take care to avoid damaging the lip of the seal when inserting the gear change shaft into the crankcase. A damaged seal will lead to oil loss and could result in engine damage.**

11. Insert the gear change shaft into the crankcase. Gently push the gear change lever end of the shaft through the seal located, at the gear change lever end, in the crankcase.



Inserting the gear change shaft

12. Ensure that the gear change shaft locates in the detent wheel and that the spring fits over the bolt abutment.

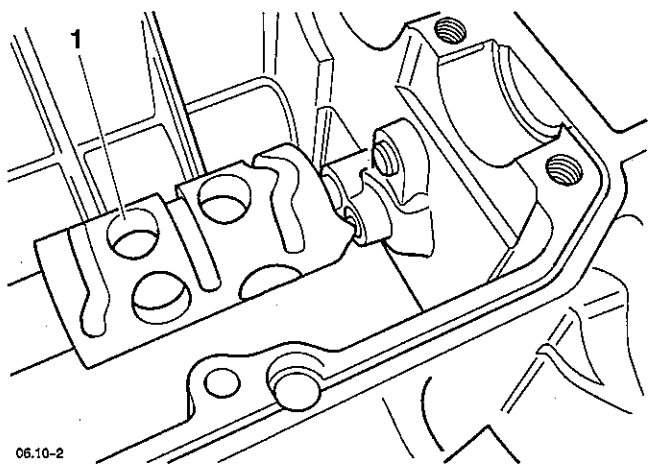


1. Gear change shaft
2. Detent wheel
3. Abutment bolt
4. Spring

13. Fit the large washer and circlip to the gear pedal end of the gear lever shaft.

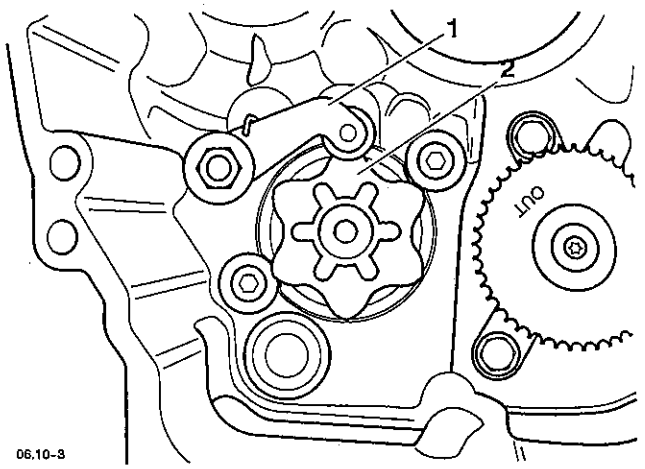
14. If previously removed, fit the gear pedal to the shaft in the same orientation as noted prior to removal. Tighten the fixing to **9 Nm.**

15. Position the selector drum in the neutral position.



1. Neutral position

16. Check that the detent arm locates in the raised profile in the detent wheel (neutral position).

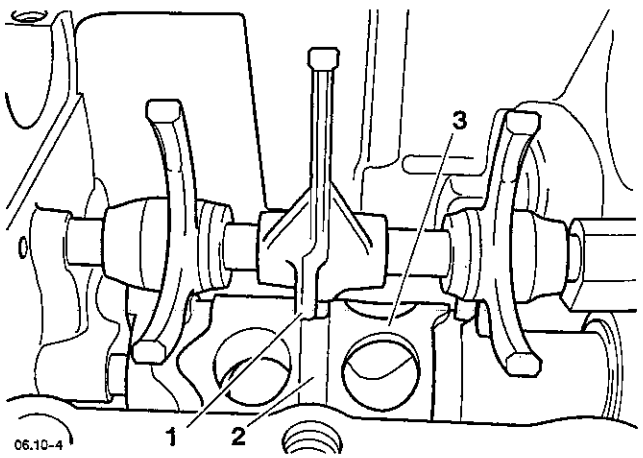


1. Detent arm
2. Raised profile

CAUTION: The selector forks can be fitted incorrectly. Ensure the position and orientation of the selector forks are the same as noted during removal. Incorrect fitting of the selector forks will cause gearbox damage when changing gear.

NOTE:

- **The center selector fork locates as shown below:**



1. Selector stop
2. Selector drum guide
3. Selector drum

17. Push the selector shaft into the crankcase from the keeper plate end. As the shaft is inserted locate the selector forks as noted during removal.

18. Fit the 'U' shaped keeper plate.

19. Fit a new capscrew, and tighten to **12 Nm.**

20. Fit the input and output shafts as described elsewhere in this section.

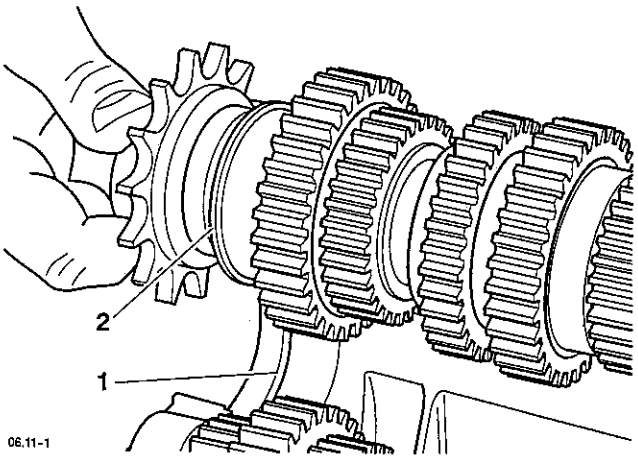
INPUT AND OUTPUT SHAFTS ASSEMBLIES

Removal

The input and output shaft assemblies can be lifted out of the upper crankcase after the crankcase halves have been separated. For details of crankcase separation, refer to the crankcase section.

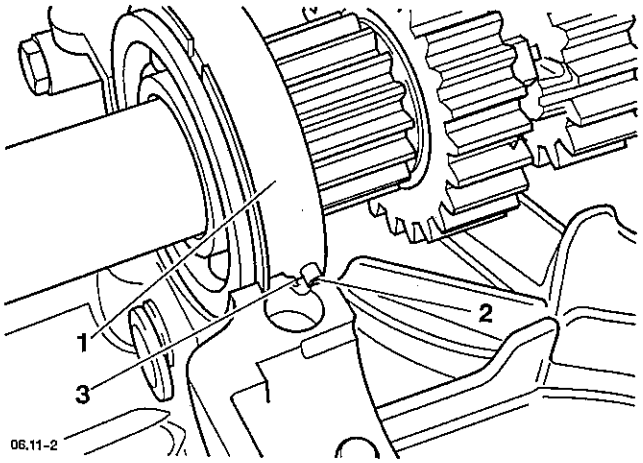
Installation

1. Place the output shaft in position in the crankcase.
2. Ensure the retaining ring on the roller bearing locates in the groove provided in the crankcase.



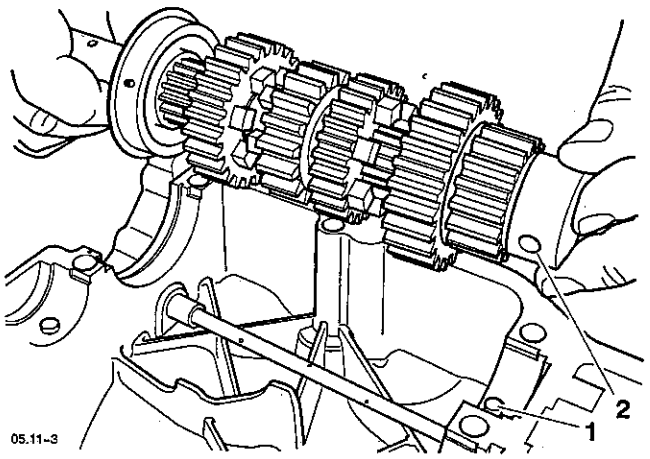
1. Groove in crankcase
2. Retaining ring

3. Ensure the roll pin in the roller bearing outer race locates in the recess provided in the crankcase.



1. Roller bearing
2. Roll pin
3. Recess in crankcase

4. Ensure the dowel in the needle roller bearing locates in the recess provided in the crankcase.



1. Dowel in crankcase
2. Recess in needle roller bearing

5. Ensure the output shaft seal aligns with its recess in the crankcase.
6. Place the output shaft to its position in the crankcase.
7. Repeat steps 1 to 6 (excluding 5) for the input shaft and ensure that both sets of gear mesh correctly.

INPUT SHAFT

Disassembly

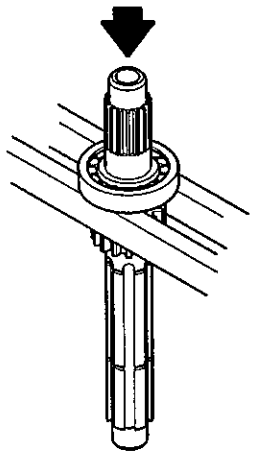
Remove the clutch assembly from the input shaft (if not already removed). Working from the opposite end to where the clutch assembly is fitted, dismantle the input shaft as follows:

1. Remove the needle roller bearing (13).
2. Remove the thrust washer (12).
3. Remove second gear (11).
4. Remove the circlip (9) and thrust washer (10).
5. Remove sixth gear (7), complete with the splined bush (8), which runs inside the gear.
6. Remove the thrust washer (6) and then the circlip (5).
7. Slide off the combined third and fourth gear (4).
8. Remove the circlip (3) and then the thrust washer (2).
9. Remove fifth gear (1).

WARNING: When using a press, always wear overalls, eye face and hand protection. Objects such as bearings frequently break-up under load and the debris caused during break-up may cause damage and injury to unprotected parts of the body.

Never wear loose clothing, which could become trapped in the press and cause crushing injury to the hand, arms or other parts of the anatomy.

10. Place the input shaft (14) in a press with the clutch end of the shaft facing the press ram and the input shaft ball bearing (15) supported on press bars.
11. Protect the shaft thread with a thread protector or similar.
12. Press the shaft through the bearing.



06.12-1

1. Pressing Off The Input Shaft Bearing

Inspection

1. Examine all gears, bearings and sleeves for damage, chipped teeth and wear beyond the service limits. Replace all suspect components and always use new circlips to assemble the shaft.

Assembly

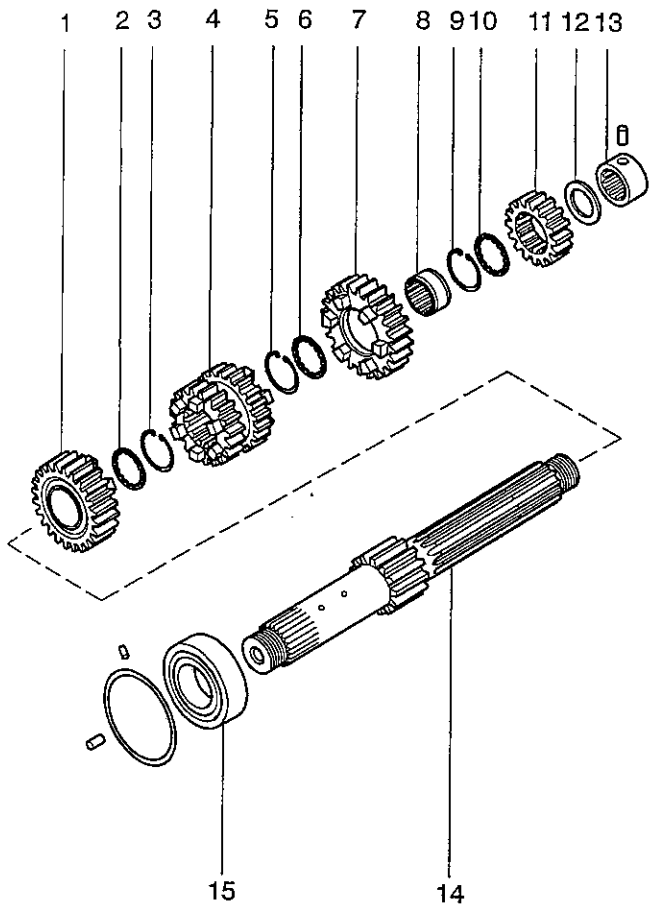
NOTE:

- **Lubricate each gear and bush with clean engine oil during assembly.**

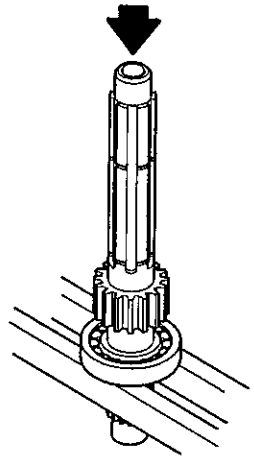
WARNING: When using a press, always wear overalls, eye face and hand protection. Objects such as bearings frequently break-up under load and the debris caused during break-up may cause damage and injury to unprotected parts of the body.

Never wear loose clothing, which could become trapped in the press and cause crushing injury to the hand, arms or other parts of the anatomy.

1. Place the input shaft bearing (15) on press bars, ensuring that the press bars support the inner race of the bearing and the circlip groove is facing downwards.



1. 5th gear
2. Thrust washer
3. Circlip
4. 3rd and 4th gear
5. Circlip
6. Thrust washer
7. 6th gear
8. Splined bush
9. Circlip
10. Thrust washer
11. 2nd gear
12. Needle roller bearing thrust washer
13. Needle roller bearing
14. Input shaft
15. Ball bearing



06.13-2

Pressing on the bearing

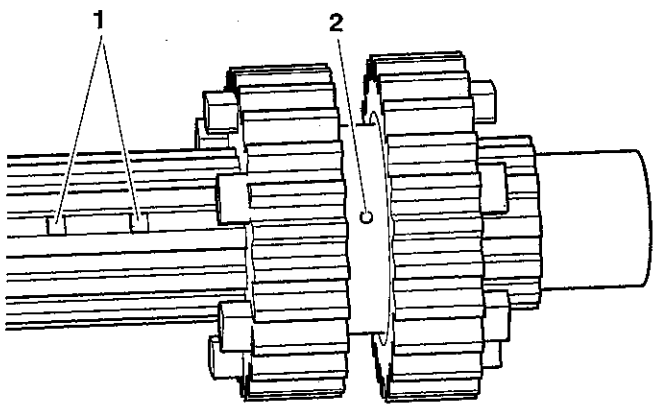
2. Position the input shaft (14) to the bearing with the clutch end pointing downwards through the bearing.

3. Press the shaft through the bearing until the bearing comes into contact with the fixed gear on the shaft.

4. Fit fifth gear (1), with the dog teeth pointing away from the input shaft ball bearing.

5. Fit a thrust washer (2) and then a new circlip (3), ensuring that the clip is correctly located in the circlip groove.

6. Fit the combined third/fourth gear (4), with the smaller gear facing toward fifth gear. Ensure that the double oil hole in the shaft aligns with the oil hole in the gear.

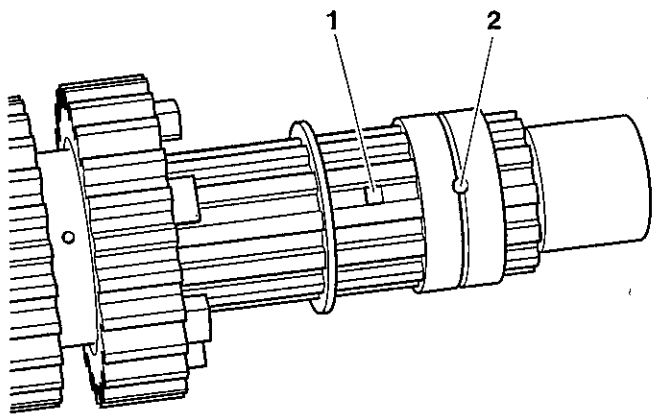


06.13-3

1. **Double oil hole in input shaft**
2. **Oil hole in third/fourth gear**

7. Fit a new circlip (5), ensuring that the clip is correctly located in the circlip groove, and then fit a thrust washer (6).

8. Fit the splined bush (8) for 6th gear (7), ensuring that the oil hole in the shaft aligns with one of the two oil holes in the splined bush.



06.14-1

1. Oil hole - shaft
2. Oil hole - bush

9. Fit sixth gear (7), with the dog teeth facing third/fourth gear.
10. Fit a thrust washer (10) and a new circlip (9), ensuring that the clip is correctly located in the circlip groove.
11. Fit second gear (11).
12. Fit the needle roller bearing thrust washer (12).
13. Fit the needle roller bearing (13).
14. Fit the input shaft to the crankcase as described elsewhere in this section.

OUTPUT SHAFT

Disassembly

Working from the opposite end to the drive sprocket dismantle the output shaft as follows:

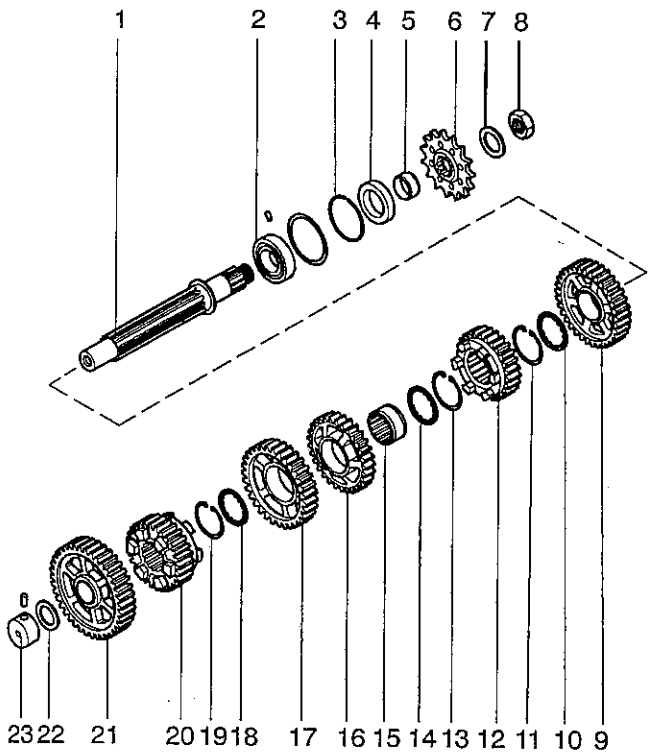
1. Remove the needle roller bearing (23) and thrust washer (22).
2. Remove first gear (21), noting its orientation.
3. Remove fifth gear (20).
4. Remove the circlip (19) and thrust washer (18).
5. Remove third and fourth gear (17 and 16), together with the splined bush (15).
6. Remove the circlip (13) and thrust washer (14).
7. Remove sixth gear (12).
8. Remove the circlip (11) and thrust washer (10).
9. Remove second gear (9), noting its orientation.
10. Position the output shaft (1) in a vice with soft jaws fitted. Tighten the vice to prevent the shaft from turning.
11. Release and remove the sprocket nut (8), washer (7) and sprocket (6).
12. Remove the oil seal (4), spacer (5) and retaining ring (3).

WARNING: When using a press, always wear overalls, eye face and hand protection. Objects such as bearings frequently break-up under load and the debris caused during break-up may cause damage and injury to unprotected parts of the body.

Never wear loose clothing, which could become trapped in the press and cause crushing injury to the hand, arms or other parts of the anatomy.

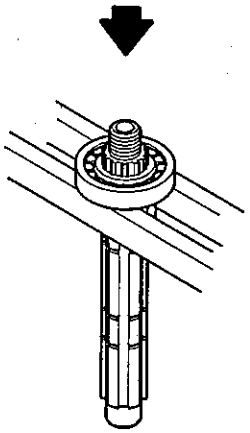
NOTE:

- **The output shaft incorporates a shoulder, which prevents using the inner race to remove the ball bearing on the press.**



1. **Output shaft**
2. **Ball bearing**
3. **Retaining ring**
4. **Oil seal**
5. **Spacer**
6. **Output Sprocket**
7. **Washer**
8. **Sprocket nut**
9. **2nd gear**
10. **Thrust washer**
11. **Circlip**
12. **6th gear**
13. **Circlip**
14. **Thrust washer**
15. **Splined bush**
16. **4th gear**
17. **3rd gear**
18. **Thrust washer**
19. **Circlip**
20. **5th gear**
21. **1st gear**
22. **Thrust washer**
23. **Needle roller bearing**

13. Place the output shaft in a press with the sprocket end of the shaft facing the press ram and the shaft ball bearing (2), supported on its outer race, on press bars.



1. Pressing off the bearing

14. Protect the shaft thread with a thread protector or similar.

15. Press the shaft through the bearing.

Inspection

1. Examine all gears, bearings and sleeves for damage, chipped teeth and wear beyond the service limits. Replace all suspect components and always use new circlips to assemble the shaft.

2. Examine the oil seal for damage and/or wear. Replace if damaged and/or worn.

Assembly

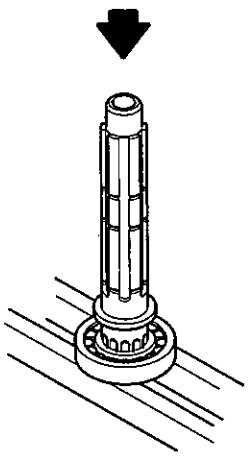
NOTE:

- **Lubricate the oil seal lip and each gear and bush with clean engine oil during assembly.**

WARNING: When using a press, always wear overalls, eye face and hand protection. Objects such as bearings frequently break-up under load and the debris caused during break-up may cause damage and injury to unprotected parts of the body.

Never wear loose clothing, which could become trapped in the press and cause crushing injury to the hand, arms or other parts of the anatomy.

1. Place the output shaft ball bearing (2) on press bars, ensuring that the press bars support the inner race of the bearing and the circlip groove is facing downwards.



05.16-1

Pressing on the bearing

2. Position the output shaft (1) to the bearing with the sprocket end pointing downwards through the bearing.
3. Press the shaft through the bearing until the bearing comes into contact with the shoulder on the output shaft.

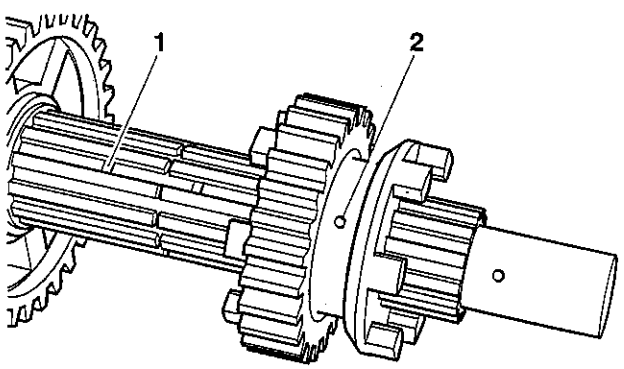
NOTE:

- **Lubricate the lip of the oil seal with clean engine oil prior to replacement.**

4. Fit the retaining ring (3), spacer (5) and oil seal (4) to the sprocket end of the shaft.
5. Position the output shaft in a vice, with soft jaws fitted, and tighten the vice to prevent the shaft from turning.
6. Fit the output sprocket (6), washer (7) and sprocket nut (8). Tighten the sprocket nut to **132 Nm.**
7. Withdraw the shaft from the vice and continue to assemble the shaft from the opposite end to the output sprocket.
8. Fit second gear (9), in the same orientation as from removal.
9. Fit a thrust washer (10) and then a new circlip (11), ensuring that the clip is correctly located in the circlip groove.

CAUTION: Incorrect alignment of the oil holes will result in server damage to the gears and selectors.

10. Fit sixth gear (12), with the selector fork groove facing away from the output sprocket end. Ensure that an oil hole in the gear aligns with an oil hole in the output shaft.

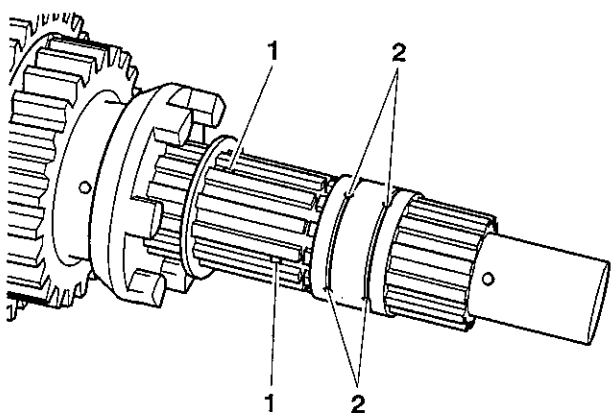


05.16-2

1. Oil hole in the output shaft
2. Oil hole in sixth gear

11. Fit thrust washer (14) and a new circlip (13), ensuring that the clip is correctly located in the circlip groove.

12. Fit the splined bush (15) for fourth and third gear. Ensure correct alignment of the oil holes in the shaft with the oil holes in the splined bush.



06.17-1

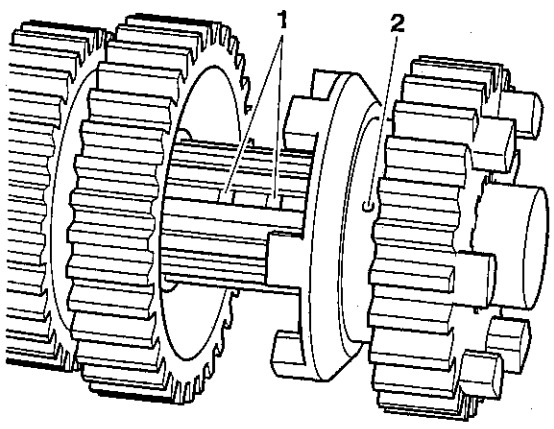
1. Oil holes in the output shaft
2. Oil holes in the splined bush

13. Fit fourth gear (16), with the raised center facing away from the output sprocket.

14. Fit third gear (17), with the raised center facing towards the output sprocket.

15. Fit thrust washer (18) and then a new circlip (19), ensuring that the clip is correctly located in the circlip groove.

16. Fit fifth gear (20), with the selector fork groove facing the output sprocket. Ensure correct alignment of the oil holes in the shaft with the oil holes in the gear.



06.17-2

1. Oil holes in the output shaft.
2. Oil holes in fifth gear

17. Fit first gear (21), in the same orientation as from removal (raised center facing away from the sprocket end).

18. Fit the needle roller bearing thrust washer 22).

19. Fit the needle roller bearing (23).

20. Fit the output shaft to the crankcase as described elsewhere in this section.

SPRAG CLUTCH

NOTE:

- **The sprag clutch may be detached after first removing the seat and the battery (disconnect the leads negative (black) lead first). The left hand lower fairing and the alternator must also be removed. Refer to the relevant sections for removal procedures.**

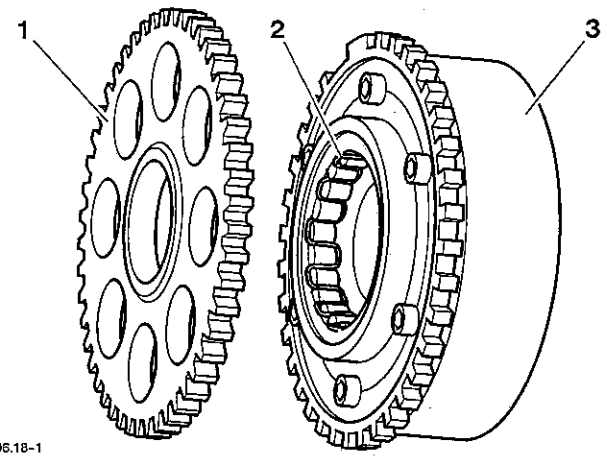
Removal

1. Remove the left hand lower fairing as described in the body section.
2. Remove the alternator cover and alternator as described in the electrical section.

NOTE:

- **The sprag clutch is located on the rear of the alternator rotor.**

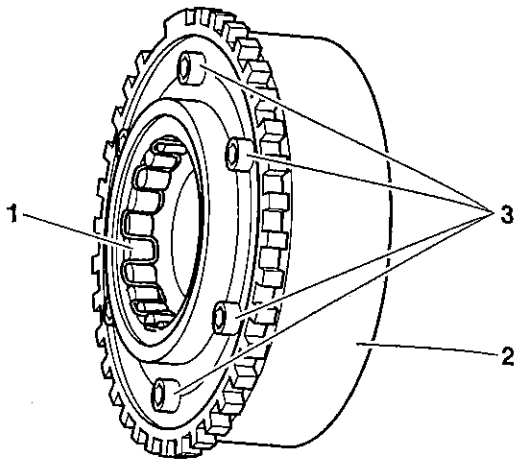
3. Withdraw the starter dive gear from the sprag clutch housing.



06.18-1

1. **Starter drive gear**
2. **Sprag clutch housing**
3. **Alternator rotor**

4. Release the bolts securing the sprag clutch housing to the alternator rotor. Withdraw the sprag clutch housing.



06.18-2

1. **Sprag clutch assembly**
2. **Alternator rotor**
3. **Bolts**

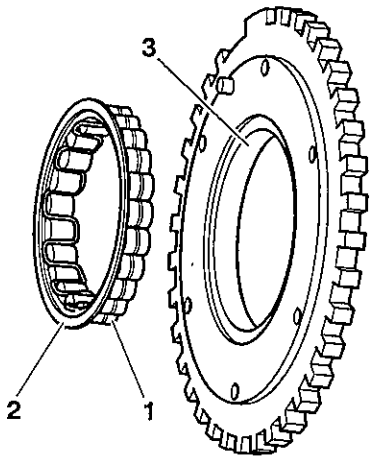
5. Detach the sprag clutch through the housing.

Inspection

1. Check the sprag clutch bearings for overheating, wear and/or non-smooth operation. Replace the sprag clutch if overheating, wear and/or non-smooth operation is found.
2. With the sprag clutch mounted in the housing, check the sprag clutch for smooth, free movement in **one** direction only (as indicated by the arrow marked on the sprag clutch body).

Installation

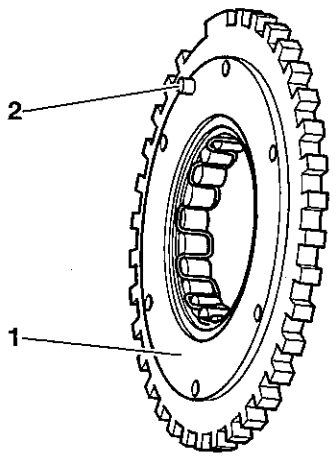
1. Locate the sprag clutch to the housing as shown below. Push firmly until the lip seats in the recess provided in the housing.



06.19-1

1. **Sprag clutch**
2. **Lip**
3. **Recess**

2. Fit the housing to the alternator rotor, ensuring the dowel mounted in the housing locates correctly in the rotor.

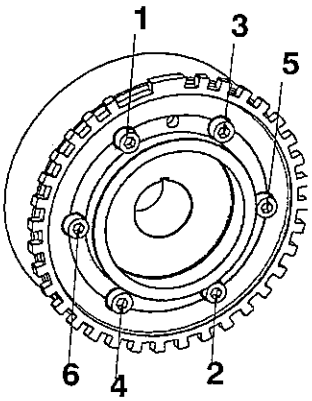


06.19-2

1. **Housing**
2. **Dowel**

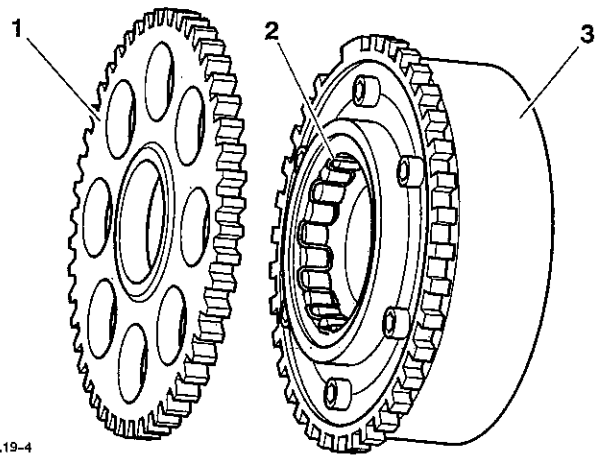
3. Ensure that the housing is squarely seated and is not jammed on the rotor (if assembled correctly, there should be a small amount of rotational movement detectable between the housing and rotor) then install new bolts.

4. Working in the sequence shown, tighten the bolts to **16 Nm.** Once all six bolts have been tightened, go around again in sequence and recheck each bolt is correctly torqued, if any bolt moves, go around again. Repeatedly check the bolts in sequence until all are correctly torqued and do not move when checked, this will ensure the sprag clutch housing is correctly seated on the rotor.



Bolt tightening sequence

5. Fit the starter drive gear to the sprag clutch housing.



06.19-4

1. **Starter drive gear**
2. **Sprag clutch housing**
3. **Alternator rotor**

6. Fit the alternator and alternator cover as described in the electrical section.

7. Fit the battery and connect the leads, positive (red) lead first.

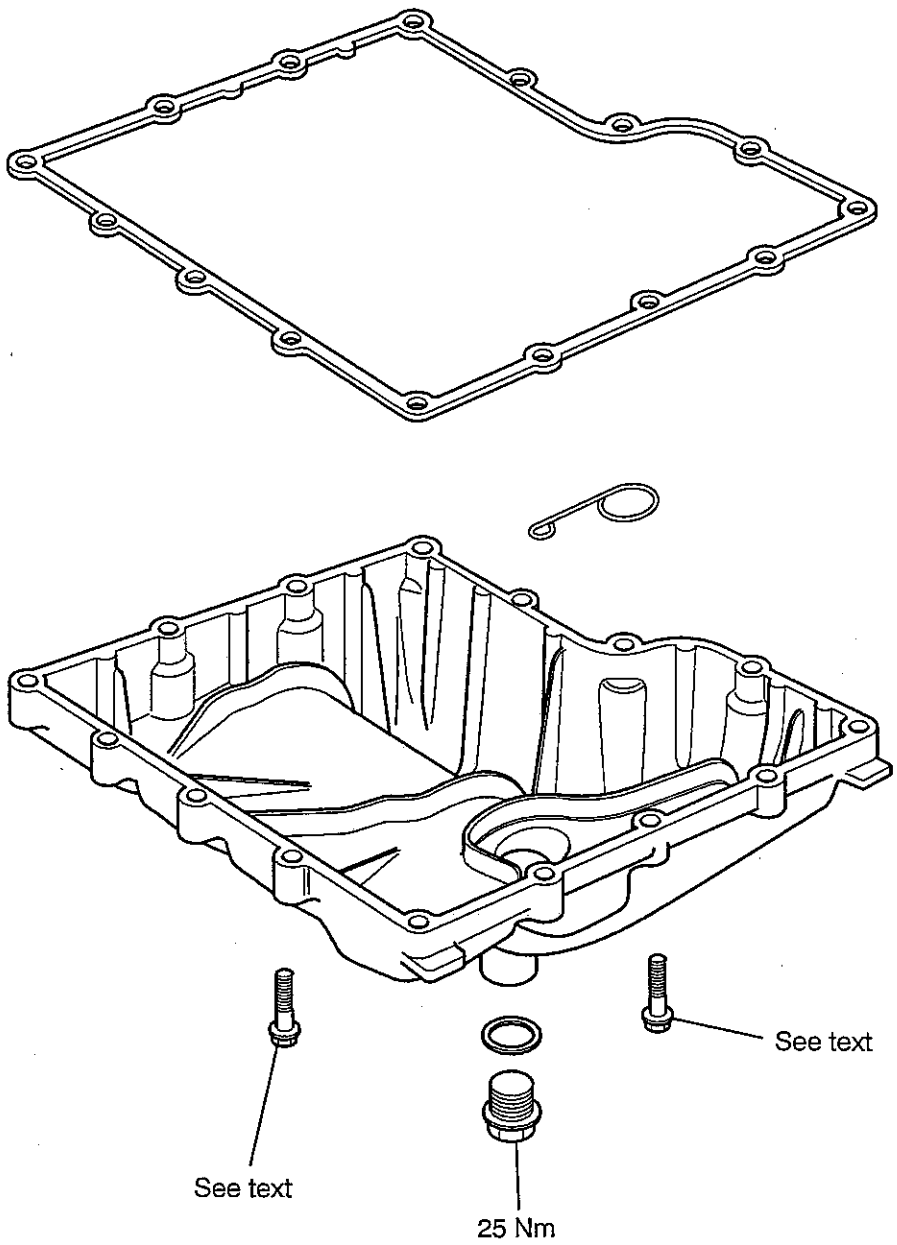
8. Fit the left hand lower faring, as described in the body section.

9. Fit the seat.

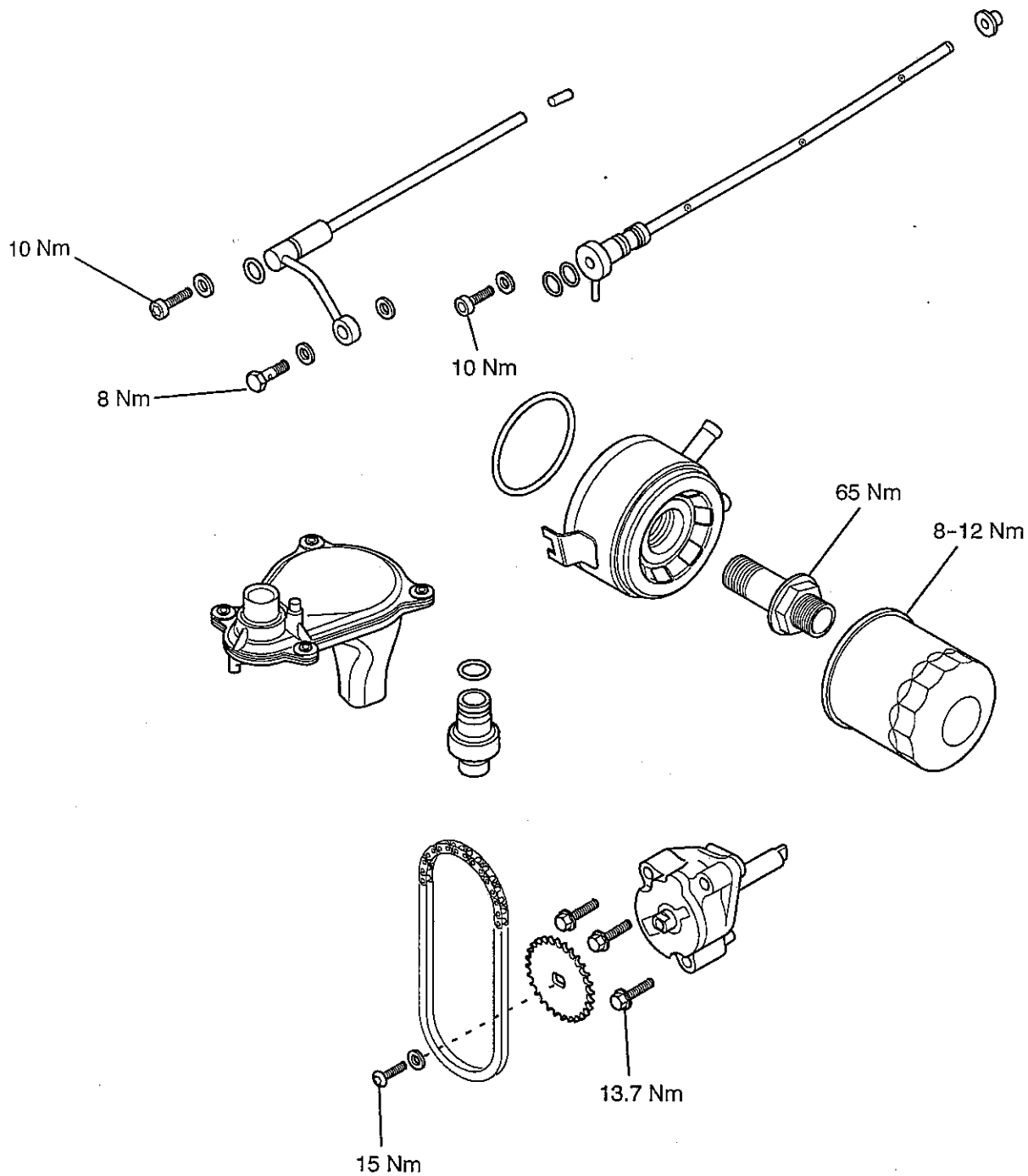
LUBRICATION SYSTEM

CONTENTS

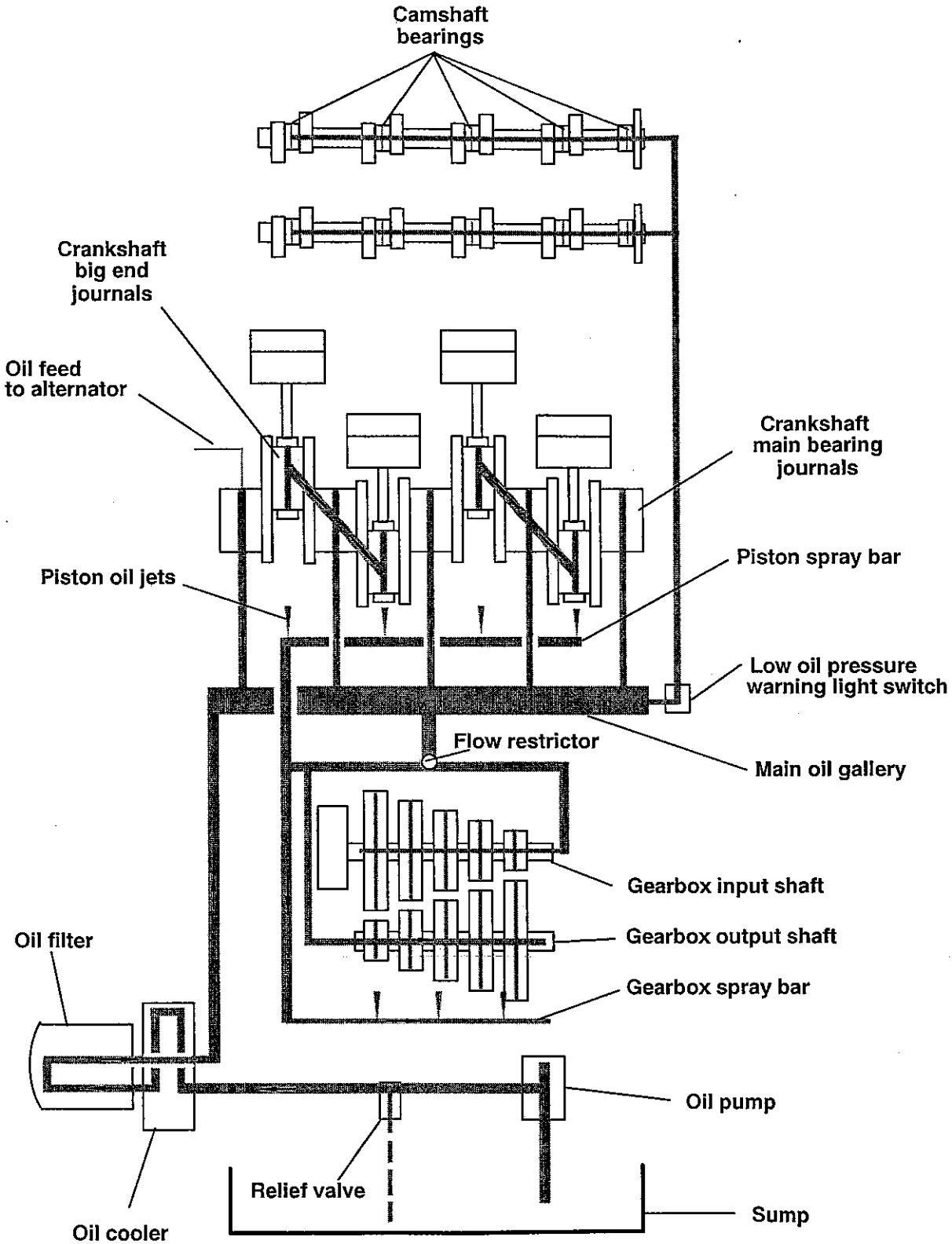
Exploded View - Sump



Exploded View - Oil Pump and Gears



Oil Circuit


Camshaft bearings
Crankshaft big end journals
Oil feed to alternator
Crankshaft main bearing journals
Piston oil jets
Piston spray bar
Low oil pressure warning light switch
Flow restrictor
Main oil gallery
Gearbox input shaft
Gearbox output shaft
Gearbox spray bar
Oil filter
Oil pump
Relief valve
Sump
Oil cooler

OIL CIRCUIT DESCRIPTION

Oil is collected from the sump and is drawn through a mesh strainer into the single rotor oil pump which requires oil priming before fitment.

Pressurised oil is fed along an internal passage to an oil to water heat exchanger mounted on the front of the crankcase. This passage houses the pressure relief valve which is a push fit into the crankcase. The oil pressure relief valve is set to open at 5 bar (73.5 lb/in^2) and, when open, returns oil directly to the sump.

From the heat exchanger, the oil passes through the oil filter which is mounted on the heat exchanger.

After leaving the oil filter, the oil enters the main oil gallery in the crankcase. From here, oil is distributed to the the cylinder head, transmission and crankshaft.

Vertical drillings from the main oil gallery feed oil to the five main bearings. The crankshaft is cross drilled to feed oil from the main bearings to the big end bearings.

From the right hand end of the main oil gallery, oil is fed via an external pipe to the cylinder head. The low oil pressure warning light switch is located at the lower end of this pipe.

Within the cylinder head, a passageway feeds oil to the camshafts which, via drillings, lubricates the camshafts, tappet buckets and valves. Spill oil returns via the cam chain area to the sump, lubricating the cam chain in the process.

A vertical passageway in the upper crankcase is fitted with a flow restrictor which allows the correct amount of oil to be fed to the piston spray bars and to the input and output shafts in the gearbox.

The piston spray bar is fitted with corresponding oil jets. These jets both cool the pistons and lubricate the little end of the connecting rod.

The transmission input shaft is both drilled through its entire length and cross-drilled. The cross drillings provide oil directly to the gears and bearings. Oil flowing through the centre of the shaft exits at the clutch end providing oil to the clutch assembly.

A similar passageway carries oil to the output shaft bearing and then on to the output shaft. The output shaft is also cross drilled to carry oil directly to the gears.

ENGINE OIL

Specification

Semi or fully synthetic 10W/40 or 15W/50 motorcycle engine oil which meets specification API SH (or higher) and JASO MA, such as Mobil 1 Racing 4T

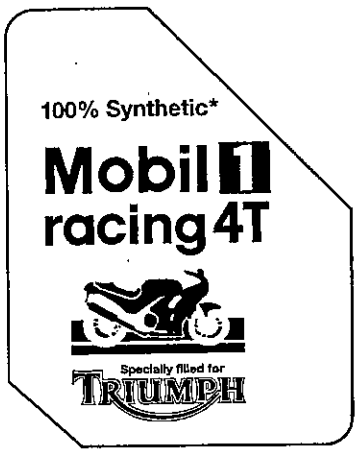
CAUTION: Triumph high performance fuel injected engines are designed to use semi or fully synthetic motorcycle engine oil which meets specification API SH (or higher) AND JASO MA.

Do not add any chemical additives to the engine oil. The engine oil also lubricates the clutch and any additives could cause the clutch to slip.

Do not use mineral, vegetable, non-detergent oil, castor based oils or any oil not conforming to the required specification. The use of these oils may cause instant, severe engine damage.

Ensure no foreign matter enters the crankcase during an oil change or top-up.

Triumph Engine Oil



Your Triumph Motorcycle is a quality engineered product which has been carefully built and tested to exacting standards. Triumph Motorcycles are keen to ensure that you enjoy optimum performance from your machine and with this objective in mind have tested many of the engine lubricants currently available to the limits of their performance.

Mobil 1 Racing 4T consistently performed well during our tests and has become our primary recommendation for the lubrication of all current Triumph motorcycle engines.

Mobil 1 Racing 4T, specially filled for Triumph, is available from your authorised Triumph dealer.

OIL LEVEL INSPECTION

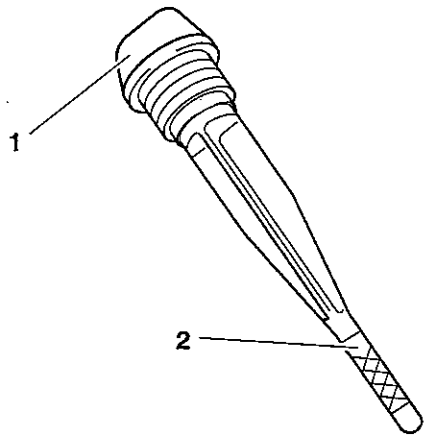
1. If the engine has been running, allow it to stand for at least 10 minutes before checking the oil level.

NOTE:

- **Accurate determination of the true oil level is only possible when the motorcycle is level and upright, not when it is on the side stand. In addition, the oil filler cap/dipstick must be screwed fully home in order to obtain a correct reading.**

2. Remove the oil filler cap/dipstick from the crankcase and wipe the dipstick with a clean cloth.

3. Refit the oil filler cap/dipstick, screw it fully home and then remove it promptly in order to establish the oil level. The oil level is indicated by hash marks on the filler plug/dipstick. When full, the indicated oil level must level with the top of the hashed area.



07.07-1

1. Filler plug/dipstick

2. Correct level

4. If the oil level requires adjustment, add oil, a little at a time, until the correct level is reached.

5. Refit the filler cap/dipstick.

ENGINE OIL AND FILTER CHANGE

WARNING: Prolonged or repeated contact with engine oil can lead to skin dryness, irritation and dermatitis. Furthermore, used engine oil contains potentially harmful contaminants which can cause cancer.

When handling used engine oil, always wear protective clothing and avoid any skin contact with the oil.

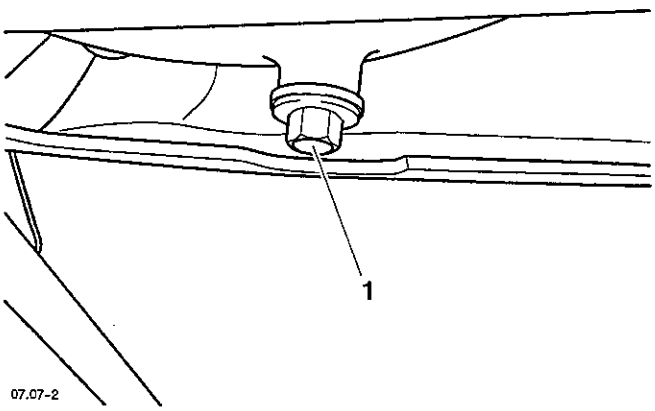
1. If the engine has been running, allow it to stand for at least 10 minutes to allow the oil and engine components to cool.

2. Position the motorcycle on level ground and on a paddock stand.

3. Place a suitable container beneath the sump plug to collect the displaced oil.

WARNING: The oil may be hot to the touch. Contact with hot engine oil may cause skin to be scalded or burnt.

4. Remove the sump drain plug and allow the oil to drain out completely.



07.07-2

1. Sump drain plug

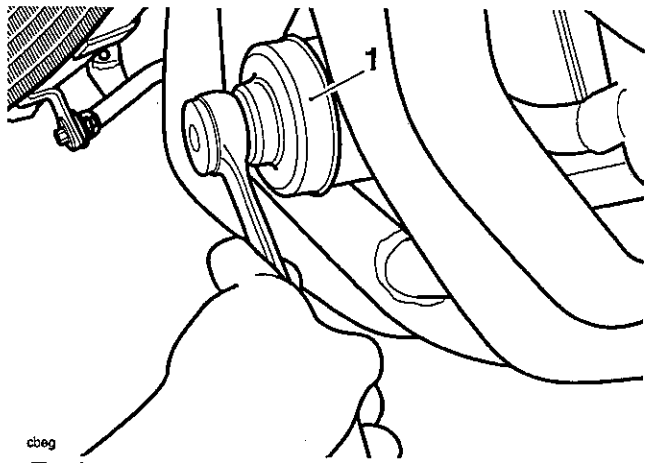
5. When the oil has completely drained out, fit a new sealing washer to the sump plug. Refit the plug tightening it to **25 Nm.**

CAUTION: Do not pour engine oil on the ground, down sewers or drains, or into water courses. To prevent pollution of water courses etc., dispose of used oil sensibly. If in doubt contact your local authority

6. Move the container to a point below the oil filter.

WARNING: If the engine has been running, the exhaust pipes may hot. Hot exhaust pipes can cause serious burns to the skin.

7. Using tool T3880311 to release the filter cartridge, unscrew and remove the oil filter from the front of the heat exchanger.



1. Tool T3880311

8. Apply a smear of clean engine oil to the seal of the new filter.

9. Fill the filter with new engine oil.

10. Fit the filter and tighten, using tool T3880311, to **8-12 Nm.**

11. Fill the engine with oil of the correct specification and viscosity.

NOTE:

- **Add oil slowly to avoid overfilling or spillage over the outside of the engine.**

CAUTION: Stop the engine if the low oil pressure warning light fails to extinguish.

Investigate and rectify the cause before restarting the engine. Running the engine with the low oil pressure warning light illuminated will cause engine damage.

12. Start the engine and allow it to run for a short time at idle. Check that the low oil pressure warning light extinguishes shortly after starting.

13. While the engine is running, check for oil leaks.

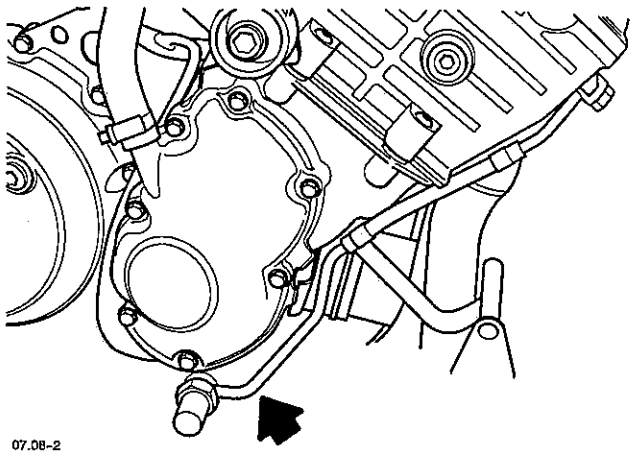
14. Stop the engine and adjust the oil level if necessary.

LOW OIL PRESSURE WARNING LIGHT SWITCH

NOTE:

- **The low pressure warning light may be removed after first removing the seats and disconnecting the battery leads, negative (black) lead first.**

The low oil pressure warning light switch is located on the right hand side of the engine, below the breather cover at the lower end of the oil feed pipe to the cylinder head.



Arrowed: Crankcase to cylinder head feed pipe

WARNING: Prolonged or repeated contact with engine oil can lead to skin dryness, irritation and dermatitis. Furthermore, used engine oil contains potentially harmful contaminants which can cause cancer.

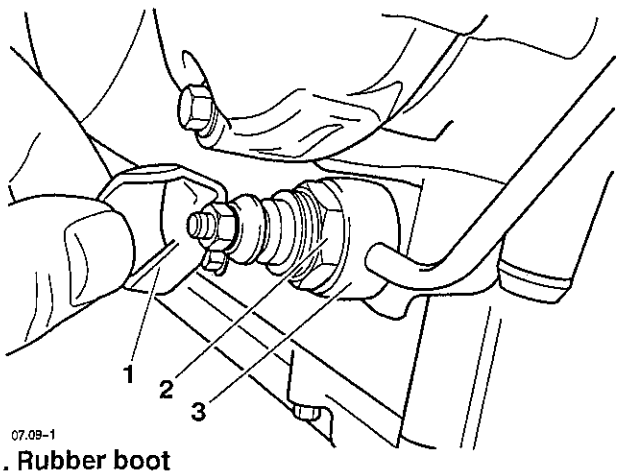
When handling used engine oil, always wear protective clothing and avoid any skin contact with the oil.

CAUTION: Do not pour engine oil on the ground, down sewers or drains, or into water courses. To prevent pollution of water courses etc., dispose of used oil sensibly. If in doubt contact your local authority

Removal

1. Remove the right hand lower fairing as described in the body section.

2. Withdraw the rubber boot from the low oil pressure light switch. Unscrew the electrical connection.



1. Rubber boot

2. Low oil pressure warning light switch

3. Oil pipe union

NOTE:

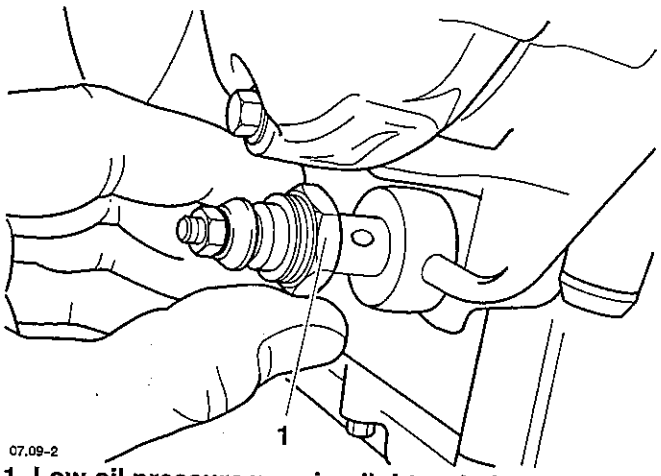
- **A small amount of oil will drain from the oil feed pipe when the banjo bolt is removed.**

3. Position a suitable clean receptacle to collect any displaced oil from the oil feed pipe.

4. Release the integral low oil pressure warning light switch/banjo bolt and remove from the oil feed pipe. Discard the two copper washers.

Installation

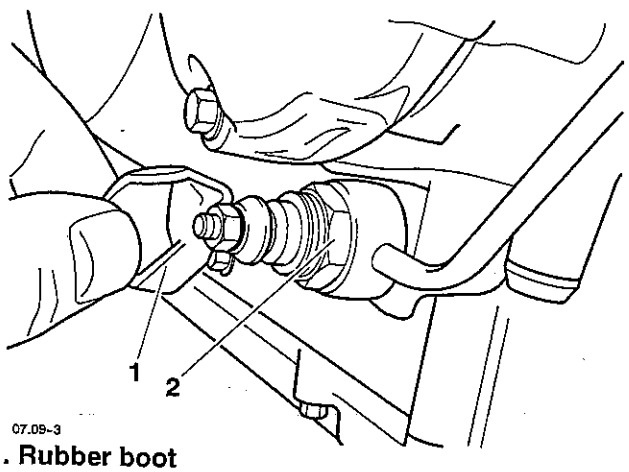
1. Fit the low oil pressure light switch/banjo bolt, incorporating new copper washers. Tighten the bolt to **28 Nm.**



1. Low oil pressure warning light switch

2. Reconnect the wire to the switch.

3. Refit the rubber boot.



1. Rubber boot

2. Low oil pressure light switch

4. Fit the right hand lower fairing as described in the body section.

5. Reconnect the battery, positive (red) lead first.

6. Fit the seats.

HEAT EXCHANGER

NOTE:

- **The heat exchanger may be removed after first removing the seats and disconnecting the battery, negative (black) lead first. Both lower fairings and belly panels must also be removed. Refer to the relevant sections of this manual for removal procedures.**

WARNING: Prolonged or repeated contact with engine oil can lead to skin dryness, irritation and dermatitis. Furthermore, used engine oil contains potentially harmful contaminants which can cause cancer.

When handling used engine oil, always wear protective clothing and avoid any skin contact with the oil.

CAUTION: Do not pour engine oil on the ground, down sewers or drains, or into water courses. To prevent pollution of water courses etc., dispose of used oil sensibly. If in doubt contact your local authority

1. Remove both lower fairings and belly panel as described in the body section.

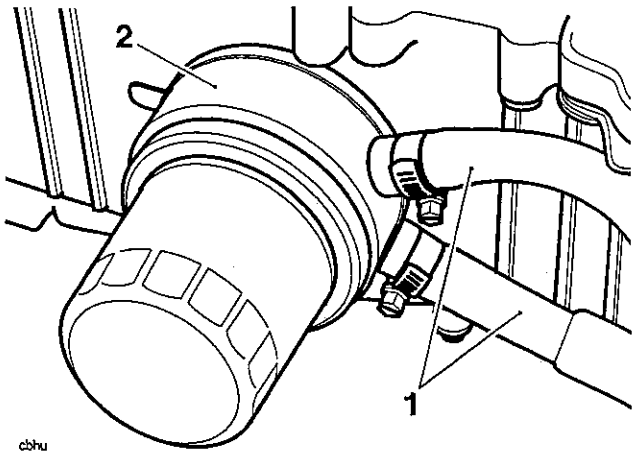
WARNING: Do not remove the coolant pressure cap when the engine is hot. When the engine is hot, the coolant inside the cooling system will be under pressure. Contact with the pressurised coolant will cause scalds and skin damage.

2. Drain the cooling system as described in the cooling section.

WARNING: The exhaust system will be hot if the engine has been recently running. Always allow sufficient time for the exhaust to cool before working on or near the exhaust system. Contact with a hot exhaust could result in burn injuries.

3. Position a suitable clean receptacle to collect any displaced oil from the oil filter and heat exchanger, when they are removed.

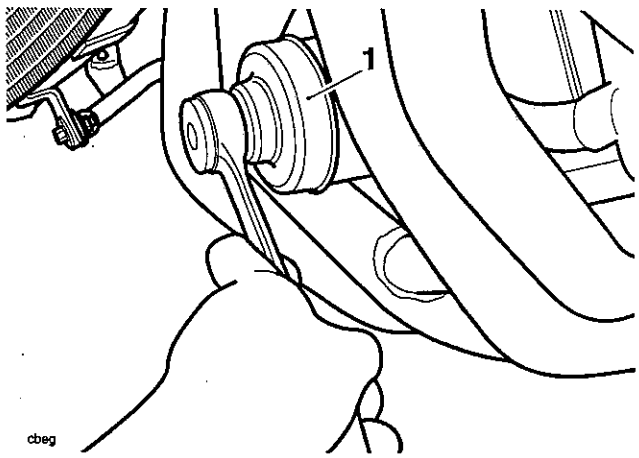
4. Remove the coolant hoses from the heat exchanger.



1. Heat exchanger

2. Coolant hoses

5. Remove the oil filter, using service tool T3880311.

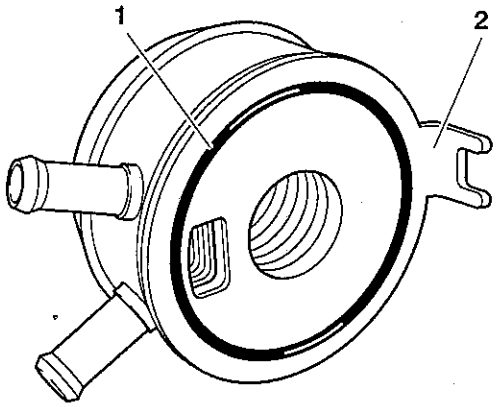


1. Service tool T3880311

6. Remove the center bolt from the heat exchanger and withdraw it from the crankcase.

Inspection

1. Check the heat exchanger 'O' ring for wear and/or damage. Replace the 'O' ring if it is found to be worn and/or damaged.



07.11-1

1. 'O' ring

2. Heat exchanger body

2. Check the heat exchanger body for corrosion and/or damage.

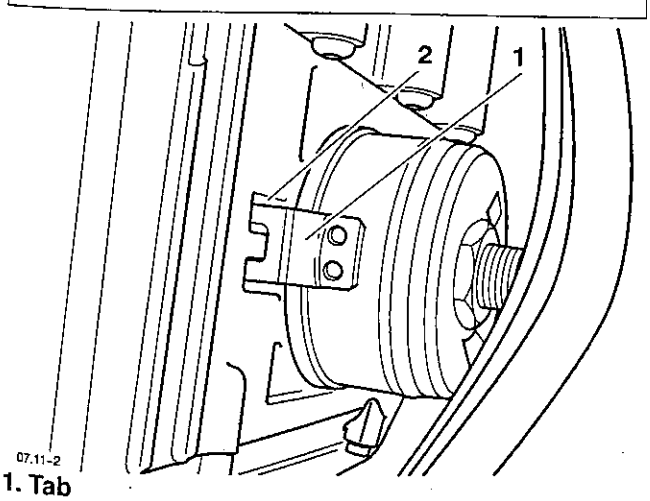
Installation

NOTE:

- **To ensure correct positioning, ensure that the tab on the heat exchanger locates in the recess provided in the crankcase.**

CAUTION: Do not rely on the tab to hold the heat exchanger in position while tightening the center bolt. The tab will bend and will not prevent the heat exchanger from turning.

Instead, firmly hold the heat exchanger in position by hand.



07.11-2

1. Tab

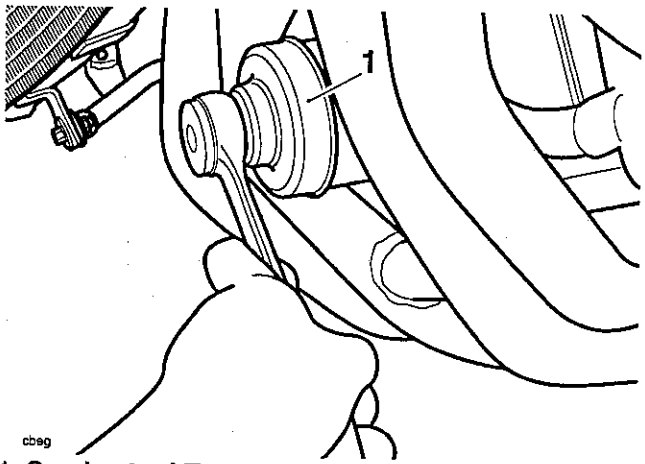
2. Crankcase location

1. Fit the heat exchanger to the crankcase and tighten the bolt to **65 Nm.**

2. Fit the coolant hoses to the heat exchanger and tighten the hose clips.

3. Take a new oil filter and fill with new engine oil.

4. Apply a smear of clean engine oil to the seal and fit the oil filter to the crankcase. Tighten, using service tool T3880311, to **8-12 Nm.**



cbeg

1. Service tool T3880311

5. Fill the cooling system as described in the cooling section.

6. Check the engine oil level, top up if necessary.

7. Fit both lower fairings and belly panels as described in he body section.

8. Reconnect the battery, positive (red) lead first.

9. Refit the seats.

SUMP

NOTE:

- **The sump may be removed after first removing the seats and disconnecting the battery, negative (black) lead first. Both lower fairings, both belly panels and the exhaust system must also be removed. Refer to the relevant sections for removal procedures.**

Removal

WARNING: The exhaust system will be hot if the engine has been recently running. Always allow sufficient time for the exhaust to cool before working on or near the exhaust system. Contact with a hot exhaust could result in burn injuries.

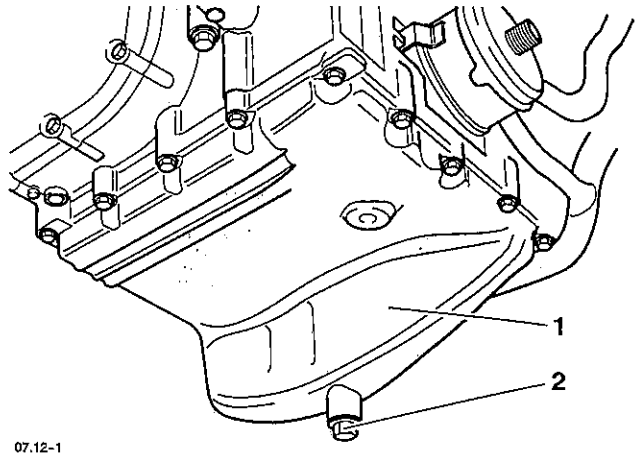
1. Remove the exhaust system, as described in the fuel system section.

WARNING: Prolonged or repeated contact with engine oil can lead to skin dryness, irritation and dermatitis. Furthermore, used engine oil contains potentially harmful contaminants which can cause cancer.

When handling used engine oil, always wear protective clothing and avoid any skin contact with the oil.

CAUTION: Do not pour engine oil on the ground, down sewers or drains, or into water courses. To prevent pollution of water courses etc., dispose of used oil sensibly. If in doubt contact your local authority

2. Position a suitable clean receptacle to collect the displaced oil from the sump.
3. Remove the sump plug and allow the engine oil to drain.

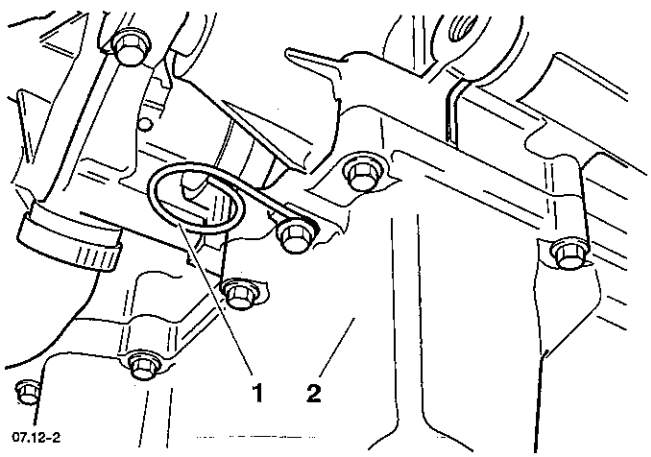


07.12-1

1. Sump

2. Sump plug

4. Replace the sump plug, complete with a new copper washer. Tighten to **25 Nm.**
5. Remove the bracket securing the side stand switch cable.

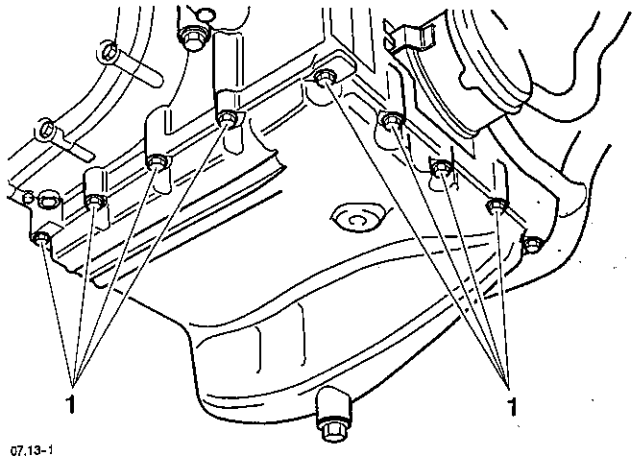


07.12-2

1. Side stand switch cable bracket

2. Sump

6. Progressively release the bolts securing the sump to the crankcase.

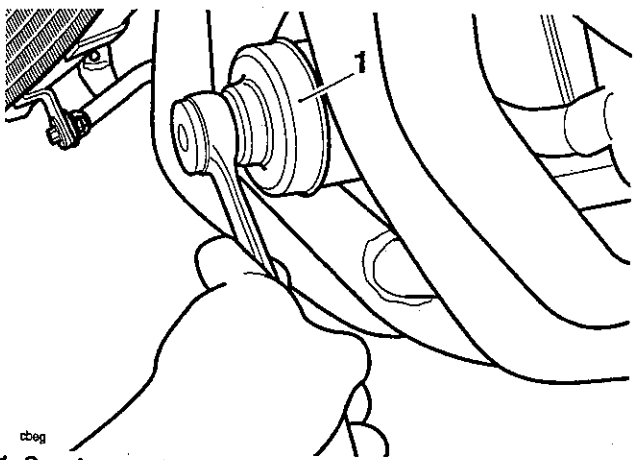


07.13-1

1. Sump bolts

7. Remove the bolts and lower the sump from the crankcase. Discard the sump gasket.

8. Remove the oil filter, using service tool T3880311.



cbeg

1. Service tool T3880311

Inspection

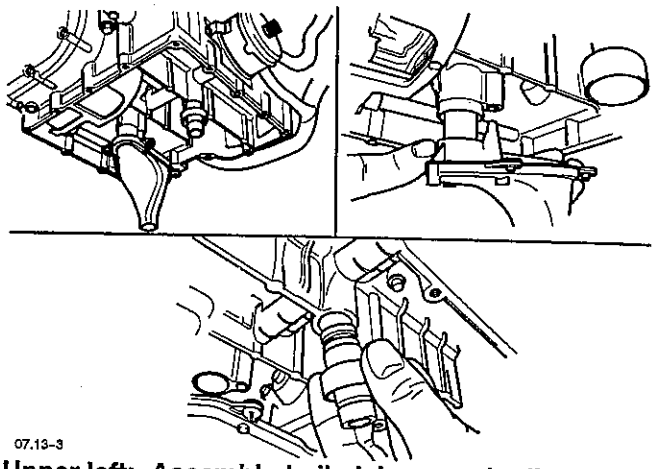
> **WARNING: Ensure the oil pick-up is clean and free of blockages or restrictions. If the oil flow is restricted oil pressure will be reduced and may cause severe engine damage.**

1. Check the oil pick-up for blockages or restrictions. Remove and clean if found to be blocked or restricted.

2. Check the pressure relief valve 'O' ring for wear and/or damage. Replace if wear and/or damage is found.

Installation

1. If removed, fit the oil pick-up.



07.13-3

Upper left: Assembled oil pick-up and relief valve

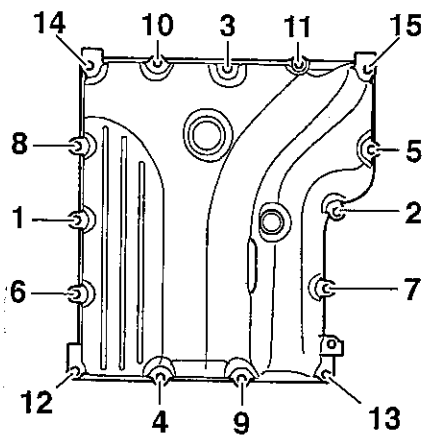
Upper right: Pick-up assembly

Bottom: Relief valve assembly

2. If removed, fit the pressure relief valve.

3. Position a new sump gasket to the sump and locate to the crankcase.

4. Fit the bolts to the sump and progressively tighten in the order shown below to **12 Nm.**



cbgx

Sump bolt tightening sequence

5. Fit the bracket securing the side stand cable. Tighten the bolt to **9 Nm.**

6. Fill a new oil filter with clean engine oil.

7. Apply a smear of clean engine oil to the filter seal and fit to the heat exchanger. Tighten, using service tool T3880311, to **8-12 Nm.**

8. Fit the exhaust system, as described in the exhaust section.

9. Fill the engine with new engine oil, as described elsewhere in this section.

10. Fit both lower fairings and belly panels as described in the body section.

11. Connect the battery, positive (red) lead first.

12. Refit the seats.

OIL PUMP

NOTE:

- **The oil pump may be removed after first removing the seats and disconnecting the battery, negative (black) lead first. The left hand lower fairing, both belly panels and the clutch must also be removed. Refer to the relevant sections for removal procedures.**

WARNING: Prolonged or repeated contact with engine oil can lead to skin dryness, irritation and dermatitis. Furthermore, used engine oil contains potentially harmful contaminants which can cause cancer.

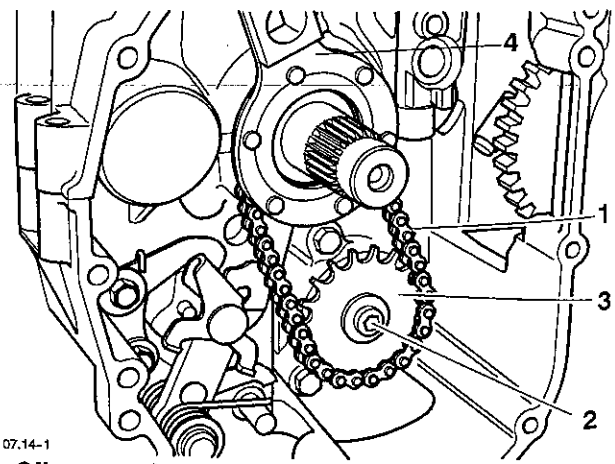
When handling used engine oil, always wear protective clothing and avoid any skin contact with the oil.

CAUTION: Do not pour engine oil on the ground, down sewers or drains, or into water courses. To prevent pollution of water courses etc., dispose of used oil sensibly. If in doubt contact your local authority

Removal

1. Remove the clutch as described in the clutch section

2. Fit tool T3880370 to the drive dogs on the upper oil pump drive sprocket. Hold the tool to prevent rotation and release the bolt securing the oil pump sprocket to the oil pump.



1. Oil pump chain

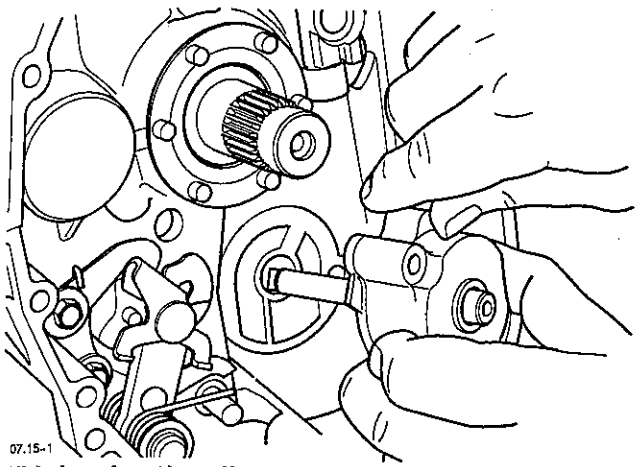
2. Bolt

3. Sprocket

4. Tool T3880370

3. Remove the tool, sprocket and chain.

4. Release the bolts securing the oil pump to the crankcase and withdraw the oil pump.

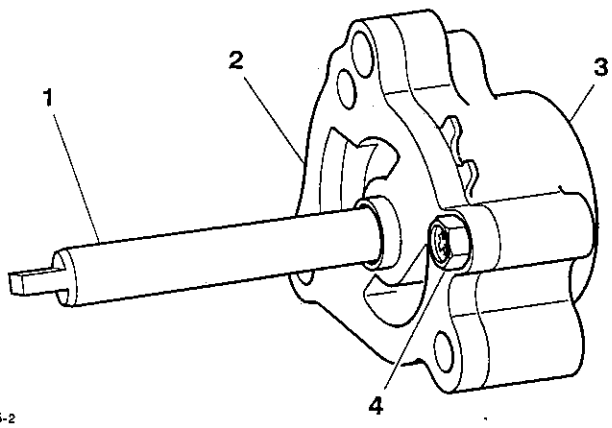


07.15-1

Withdrawing the oil pump.

Inspection

1. Release the screw and withdraw the oil pump plate from the pump body.



07.15-2

1. Oil pump drive shaft

2. Oil pump plate

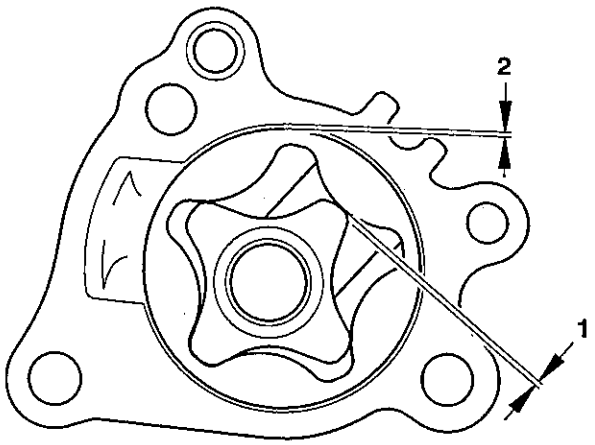
3. Oil pump body

4. Screw

> **CAUTION: If any part of the oil pump is found to be outside the service limit, the complete pump must be replaced. Severe engine damage may result from the continued use of a faulty oil pump.**

2. Measure the rotor tip clearance using feeler gauges.

Service limit	0.20 mm max



07.15-3

1. Rotor tip clearance

2. Pump body clearance

3. Measure the pump body clearance using feeler gauges.

Standard	0.15 – 0.22 mm
Service limit	0.35 mm max

4. Measure the pump end clearance.

Standard	0.02 – 0.07 mm
Service limit	0.10 mm max

5. (a) If all clearances are within service limits, liberally apply clean engine oil to all internal components and refit the oil pump plate to the oil pump body.

   (b) If any clearance measured is outside the service limits, renew the complete pump.

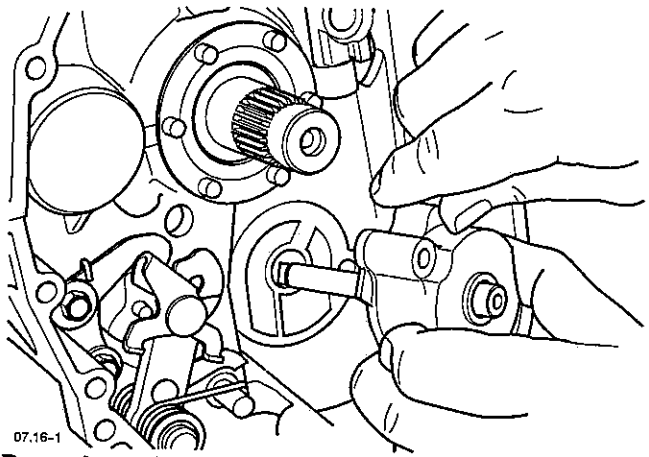
6. Inspect all the sprocket and chain for wear and/or damage. Replace the sprocket and chain if wear and/or damage is found.

Installation

CAUTION: Before fitting the oil pump to the crankcase ensure the pump internal surfaces have been 'wetted' with clean engine oil. The pump may fail to pick-up oil from the sump if the surfaces have not been 'wetted'. This will cause the engine to run without engine oil pressure and will lead to severe engine damage.

1. Fill the oil pump with new engine oil, turning the pump rotor as the oil is poured in to ensure all surfaces are coated with oil.

2. Position the oil pump to the crankcase and insert into the opening provided.



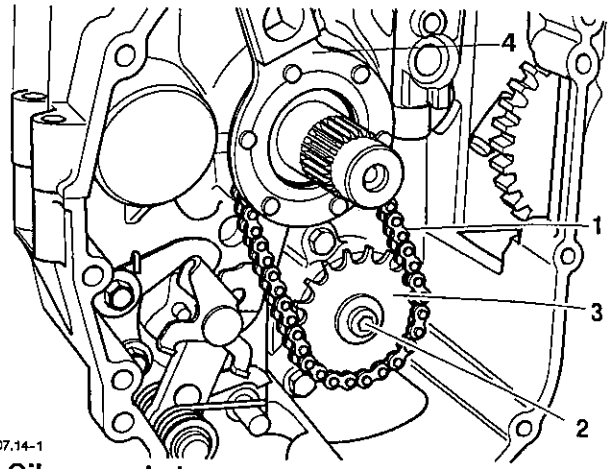
Pump Insertion

NOTE:

- **Use the sprocket end of the oil pump shaft to turn the drive peg in alignment with the drive on the water pump.**

3. Fit the oil pump to the crankcase, ensure the drive peg locates into the drive on the water pump shaft. Tighten the bolts to **13.7 Nm.**

4. Fit the drive chain and sprocket.



1. Oil pump chain

2. Bolt

3. Sprocket

4. Tool T3880370

5. Fit a new center bolt and washer to the pump sprocket. Assemble the chain and drive sprocket to the pump and input shaft.

6. Refit tool T3880370 to the upper drive sprocket and tighten the centre bolt to **15 Nm.** Remove the tool.

7. Fit the clutch as described in the clutch section.

8. Fit the left hand lower fairing and both belly panels as described in the body section.

9. Reconnect the battery, positive (red lead) first.

10. Refit the seats.

FUEL SYSTEM/ENGINE MANAGEMENT

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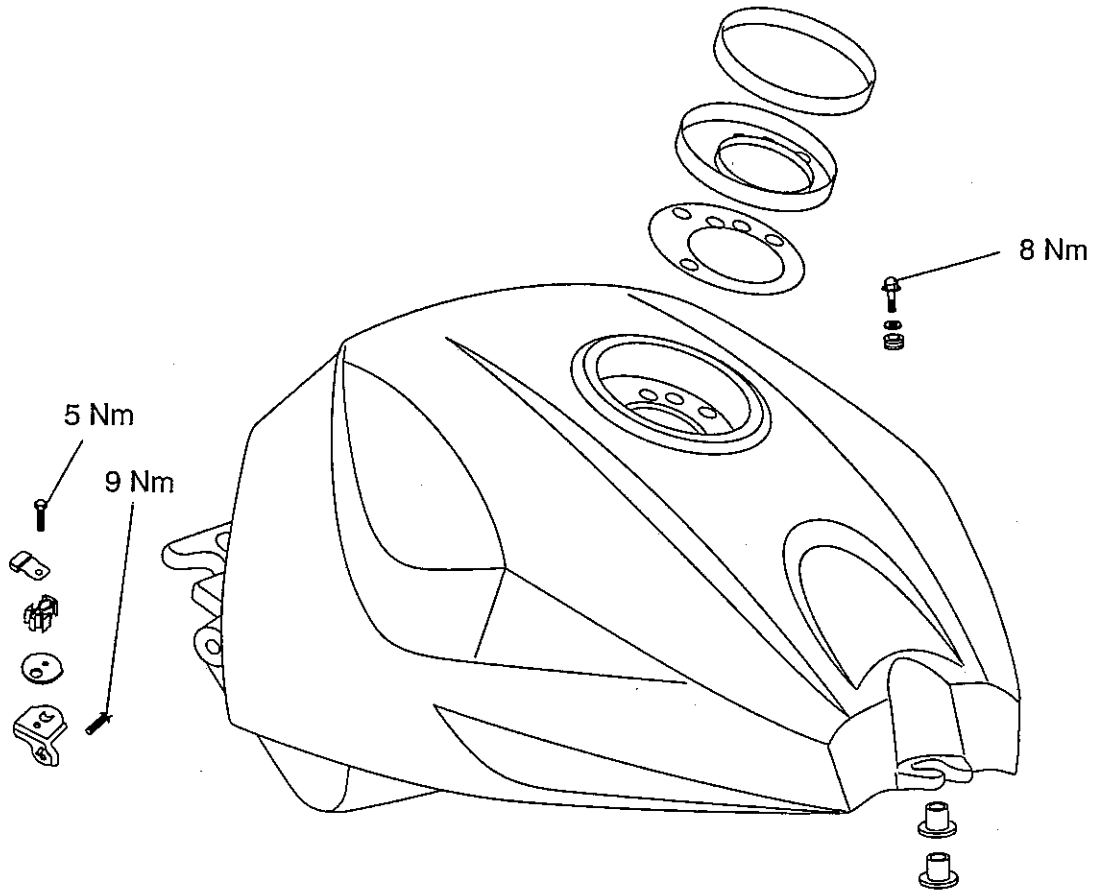
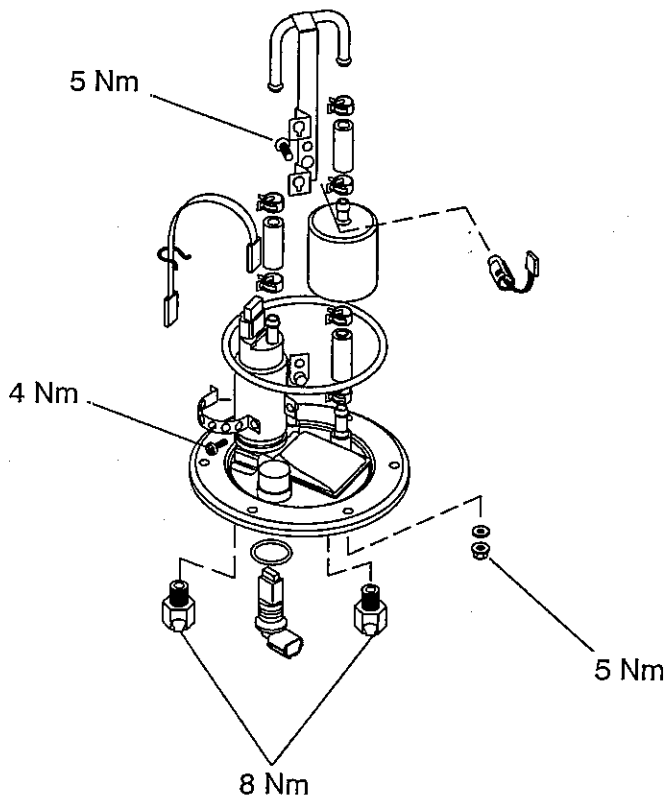
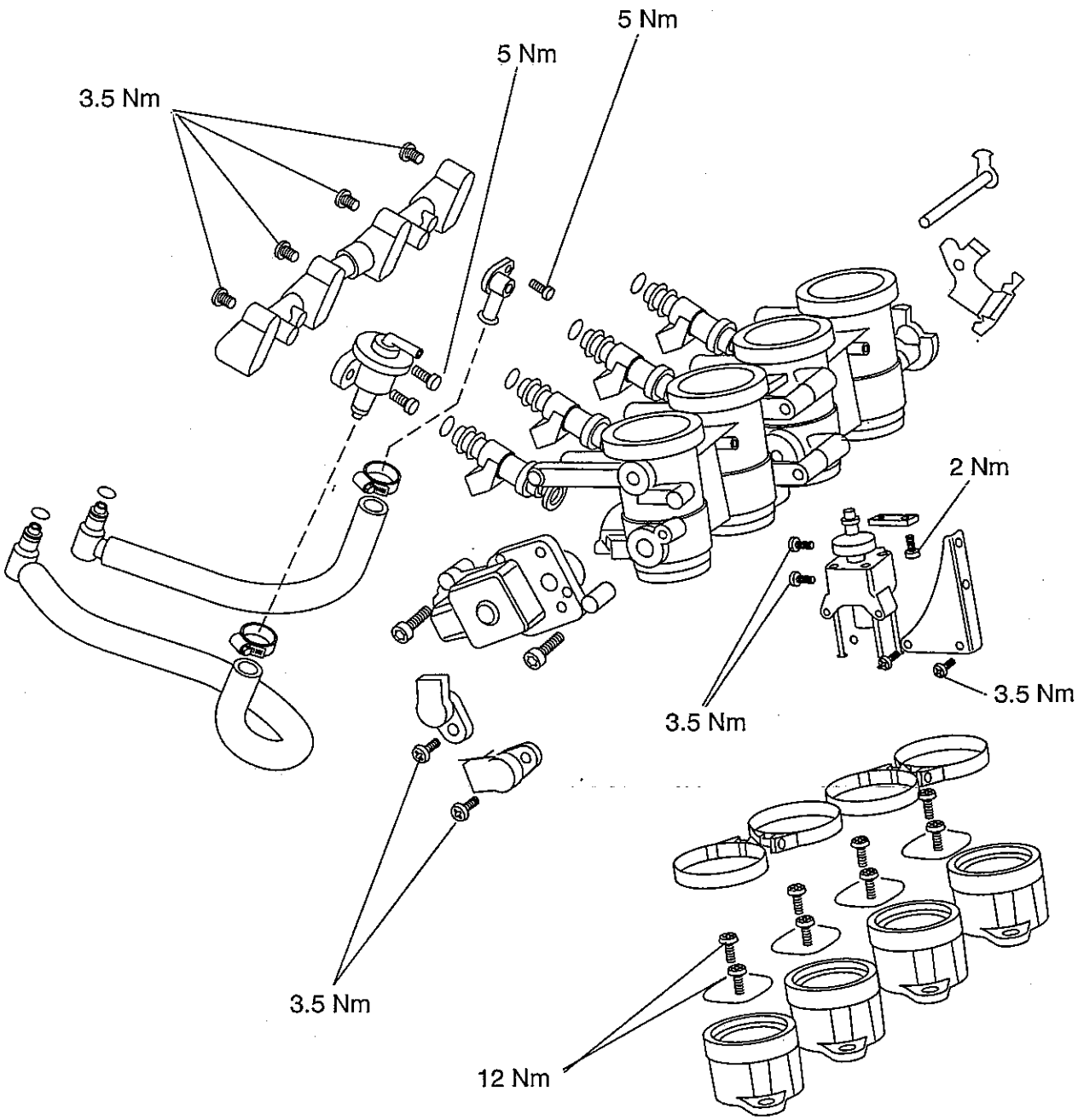
Exploded View - Fuel Tank and Pump

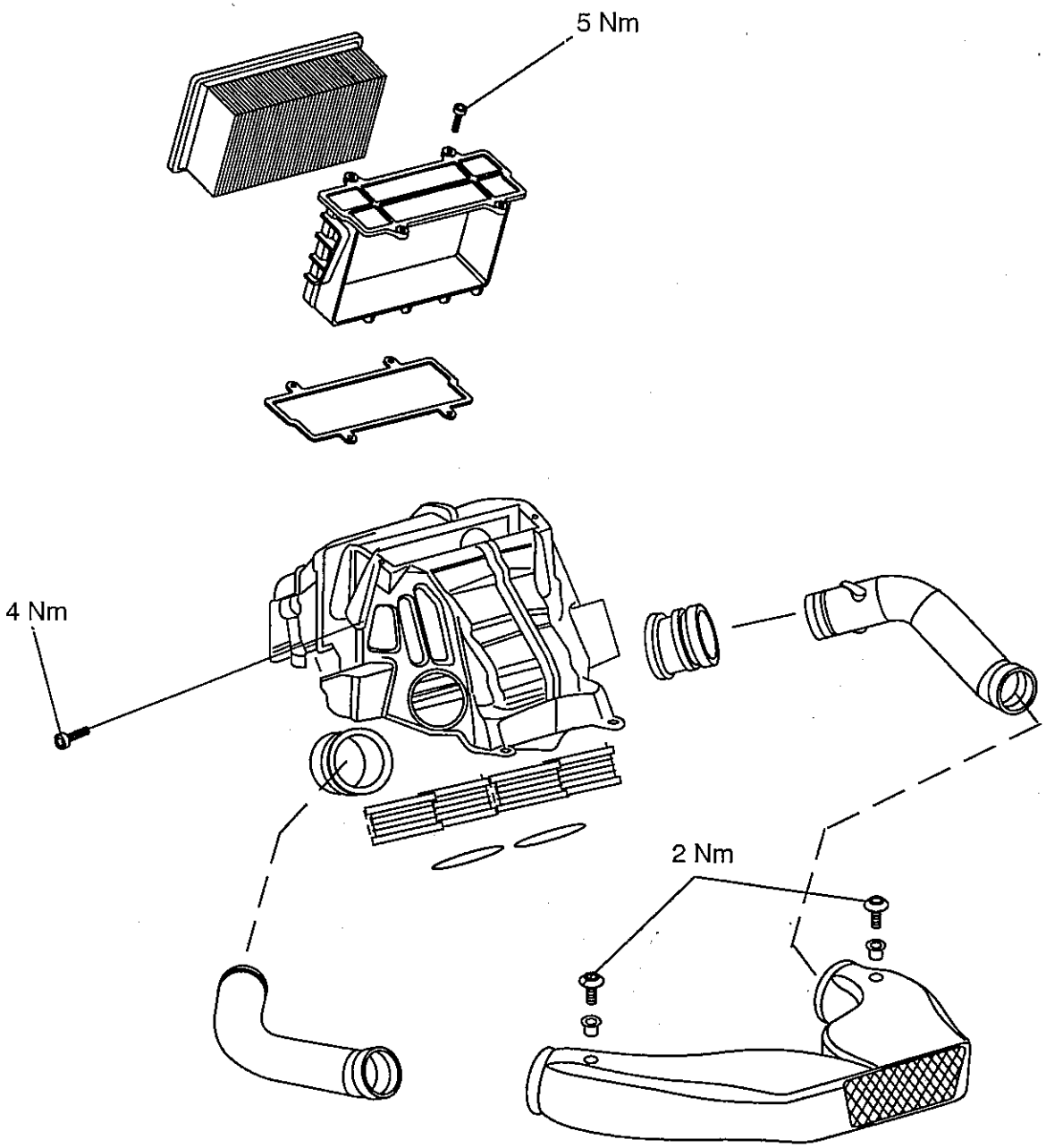




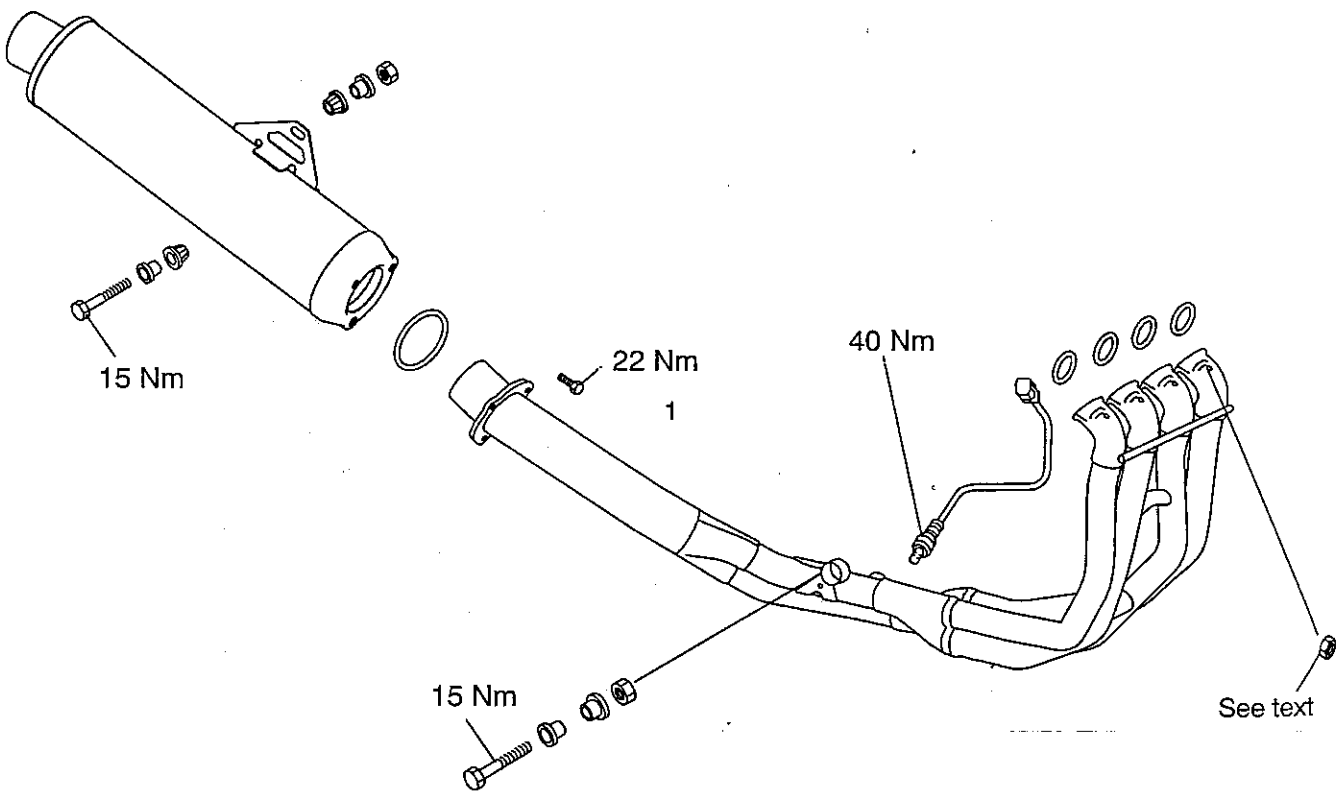
Exploded View - Fuel Rail, Throttles and Injectors



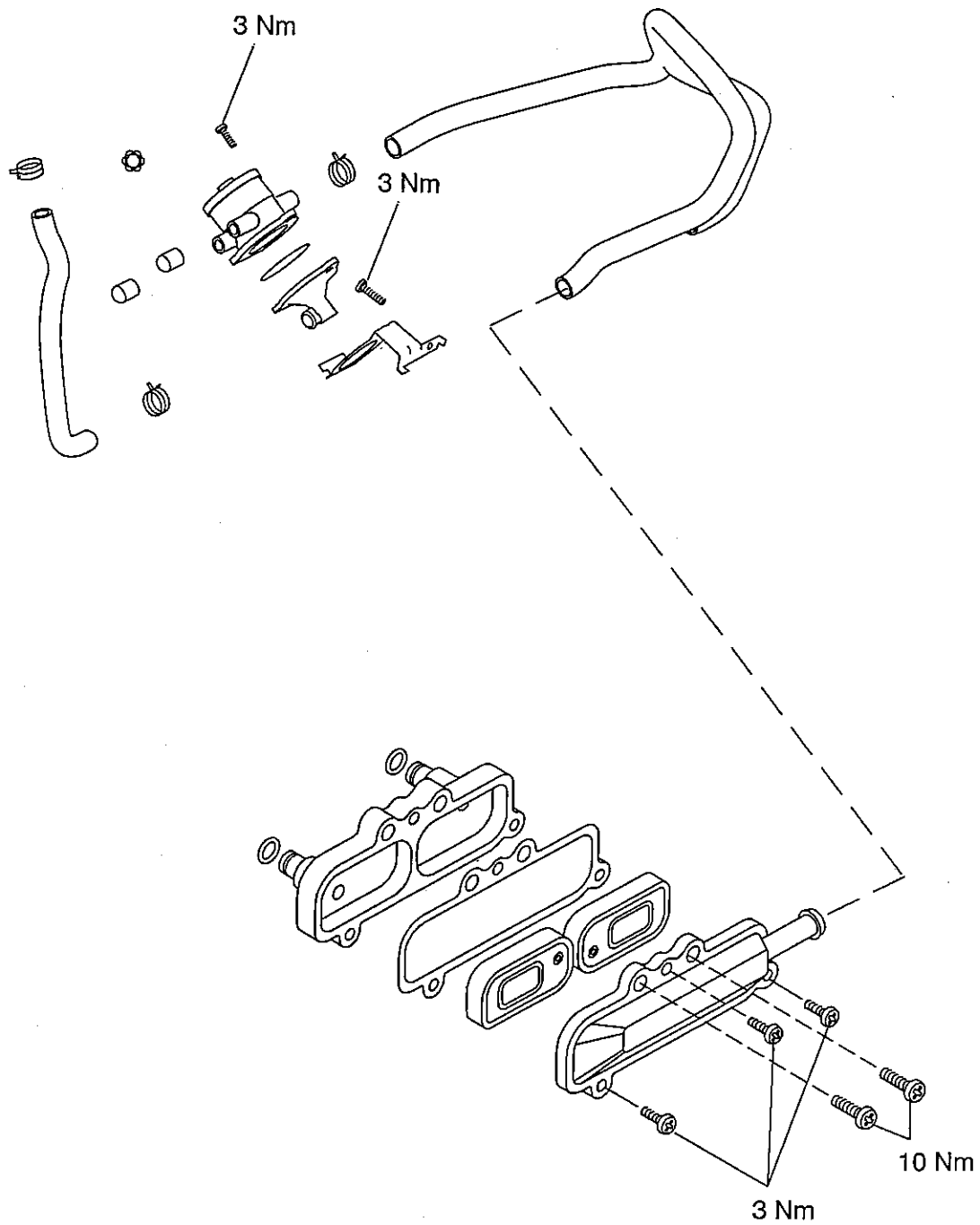
Exploded View - Airbox



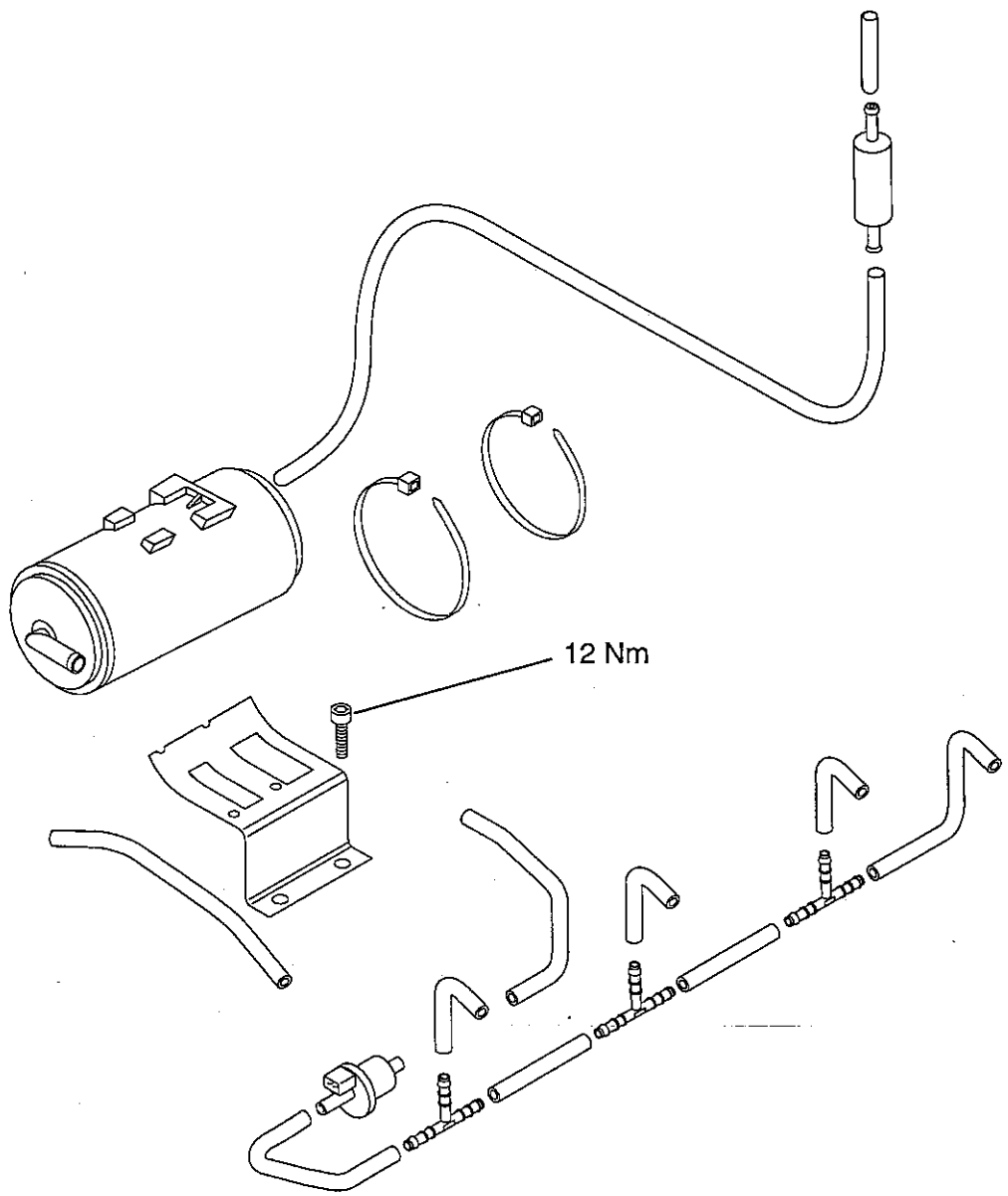
Exploded View - Exhaust System



Exploded View - Secondary Air Injection System



Exploded View - Evaporative System



FUEL REQUIREMENTS

Fuel Requirements - all countries except USA

Outside America, all motorcycles must be run on 95 RON unleaded fuel.

Fuel Requirements - USA

In the United States of America where the octane rating of fuel is measured in a different way, the following information may be applied: Triumph motorcycles are designed to run on unleaded gasoline with a CLC or AKI octane rating (R+M)/2 of 89 or higher.

CAUTION: The use of leaded gasoline is illegal in some countries, states or territories and will invalidate the vehicle and emissions control warranties. Additionally, leaded gasoline will cause damage to emissions control components

Oxygenated Gasoline

To help in meeting clean air standards, some areas of the U.S. use oxygenated gasoline to help reduce harmful emissions. Triumph motorcycles will give best performance when using unleaded gasoline. However, the following should be used as a guide to the use of oxygenated fuels.

CAUTION: Because of the generally higher volatility of oxygenated fuels, starting, engine response and fuel consumption may be adversely affected by their use. Should any of these difficulties be experienced, run the motorcycle on normal unleaded gasoline.

Ethanol

Ethanol fuel is a mixture of 10% ethanol and 90% gasoline and is often described under the names 'gasohol', 'ethanol enhanced', or 'contains ethanol'. This fuel may be used in Triumph motorcycles.

Methanol

CAUTION: Fuels containing methanol should not be used in Triumph motorcycles as damage to components in the fuel system can be caused by contact with methanol.

MTBE (Methyl Tertiary Butyl Ether)

The use of gasolines containing up to 15% MTBE (Methyl Tertiary Butyl Ether) is permitted in Triumph motorcycles.

GLOSSARY OF TERMS

The following terms and abbreviations will be found in this section. Below is given a brief explanation of what some of the more common terms and abbreviations mean.

Air temperature

The intake air temperature in the air box.

Air temperature sensor

Sensor located in the airbox to detect the temperature of the incoming air.

ATDC

After Top Dead Centre.

Barometric pressure

Pressure of the air in the airbox.

Battery voltage

The voltage at the input to the Electronic Control Module (ECM).

BTDC

Before Top Dead Centre (TDC).

Calculated load

The actual volume of air per stroke flowing into the engine, expressed as a percentage of the maximum volume that can enter. Provides an indication of the percent engine capacity that is being used (100% = full throttle).

Catalyst

Device placed in the exhaust system which reduces exhaust emissions.

Closed throttle position

Throttle position at idle (i.e. against end stop), measured as a voltage and expressed as percentage.

Coolant temperature

The coolant temperature in the cylinder head.

Coolant temperature sensor

Sensor which detects coolant temperature.

Cooling fan status

The 'on' or 'off' condition of the cooling fan.

DTC

Diagnostic Trouble Code.

ECM

Engine Control Module.

Engine speed

The crankshaft revolutions per minute.

Freeze frame

A data set captured at the time a Diagnostic Trouble Code (DTC) is set.

Idle fuel trim

The percentage above or below the nominal fuel requirement for the volume of air entering at idle.

Idle fueling

Adjustment of fueling at idle to suit the actual air inducted.

Idle reference speed

The target idle speed as determined by the Electronic Control Module (ECM). (It should be the same as the actual idle speed if the motorcycle is operating correctly.)

Ignition advance

The timing of ignition at the spark plug relative to top dead centre.

Ignition switch position

The 'on' or 'off' position of either or both the ignition switch and the engine stop switch.

Ignition timing

Same as 'ignition advance'.

Injector pulse time

The time during which an injector remains open (i.e. delivering fuel).

Long term fuel trim

Fueling after adapting to the engine's long term fueling requirements (closed loop only). See also short term fuel trim.

MAP sensor

Manifold absolute pressure (the air pressure in the intake system).

MIL

Malfunction Indicator Lamp.

Illuminates when most Diagnostic Trouble Codes (DTC's) are set.

Neutral switch status

The 'neutral' or 'in gear' status of the gearchange.

Off idle fuel trim

The percentage above or below the nominal fuel requirement for the volume of air entering at engine speeds other than idle. This function is not currently used in the Triumph system.

Open circuit

A break in an electrical circuit – current cannot flow.

Over temp'

High temperature within the Electronic Control Module (ECM) caused by an internal or external failure.

Primary Throttle Position Sensor

Sensor for the primary (lower) throttle position.

Primary Throttle Stepper Motor

Stepper motor used to vary throttle opening at idle and when the engine is clod.

Purge valve duty cycle

The time the purge valve is open in an open / close cycle, expressed as a percentage of the cycle time.

Road Speed Sensor

Gearbox mounted sensor which delivers information to the ECM that is converted to the road speed value that is displayed on the speedometer.

Second Throttle Position Sensor

Sensor for the second (upper) throttle position.

Second Throttle Stepper Motor

Stepper motor used to vary all second throttle positions, on or off idle.

Sensor reference voltage

Supply voltage to the system sensors (nominally 5 volts).

Short circuit

A 'short cut' in an electrical circuit – current by-passes the intended circuit (usually to earth).

Short term fuel trim

A correction applied to the fuel mixture during closed loop catalyst operation. This, in turn has an effect on the long term fuel trim in that, if an engine constantly requires mixture correction, the long term fuel trim will adapt to this requirement thus reducing the need for constant short term adjustment.

Sidestand status

The 'up' or 'down' position of the side stand.

Target dwell time

The actual time from coil 'on' to coil 'off'.

Throttle position

The position of the throttle butterfly given as a percentage of the movement range. When the data is displayed on the tool, fully open need not be 100% nor fully closed 0%.

Throttle voltage

Voltage at the throttle potentiometer.

Vbatt

Battery voltage.

ENGINE MANAGEMENT SYSTEM

System Description

This model is fitted with an electronic engine management system which encompasses control of both ignition and fuel delivery. The electronic control module (ECM) draws information from sensors positioned around the engine, cooling and air intake systems and precisely calculates ignition advance and fueling requirements for all engine speeds and loads.

In addition, the system has on-board diagnostic functions. This ensures that, should a malfunction occur in the engine management system, the malfunction type, and engine data at the time the malfunction occurred, are stored in the ECM memory. This stored data can then be recovered by a Triumph dealer using a special service tool which is mandatory for all Triumph dealers. In this way, precise diagnosis of a fault can be made and the fault quickly rectified.

System Sensors

- **Intake air temperature sensor** - situated in the base of the airbox, between the centre two throttle bodies. As the density of the air (and therefore the amount of oxygen available to ignite the fuel) changes with temperature, an intake air temperature sensor is fitted. Changes in air temperature (and therefore air density) are compensated for by adjusting the amount of fuel injected to a level consistent with clean combustion and low emissions.

- **Barometric pressure sensor** - situated beneath the rear seat, on the left hand side of the motorcycle. The barometric pressure sensor measures atmospheric air pressure. With this information, the amount of fuel per injection is adjusted to suit the prevailing conditions.

- **Manifold Absolute Pressure (MAP) sensor** - situated on the right hand side of the airbox, connected to the throttle body for number four cylinder. The MAP sensor provides information to the ECM which is used at shallow throttle angles (very small throttle openings) to provide accurate engine load indications to the ECM.
  This degree of engine load accuracy allows the ECM to make very small adjustments to fuel and ignition which would otherwise not be possible from throttle angle data alone.

- **Clutch switch** - situated on the clutch lever. The clutch must be pulled in for the starter motor to operate.

- **Crankshaft position sensor** - situated on top of the crankcase directly above the alternator cover. The crankshaft position sensor detects movement of a toothed wheel attached to the alternator rotor.

  The toothed wheel gives a reference point from which the actual crankshaft position is calculated. The crankshaft position sensor information is used by the ECM to determine engine speed and crankshaft position in relation to the point where fuel is injected and ignition of the fuel occurs.

- **Engine coolant temperature sensor** - situated at the rear of the cylinder head, on the left hand side. Coolant temperature information, received by the ECM, is used to optimise fueling at all engine temperatures and to calculate hot and cold start fueling requirements.

- **Primary throttle position sensor** - situated at the right hand end of the lower throttle spindle. Used to relay throttle position information to the ECM. Throttle opening angle is used by the ECM to determine fueling and ignition requirements for all throttle positions.

- **Secondary throttle position sensor** - situated at the right hand end of the upper throttle spindle. Used to relay secondary throttle position information to the ECM. Secondary throttle angle is used by the ECM to determine secondary throttle opening position under all engine running conditions.

- **Road speed sensor** - situated in the upper crankcase, immediately above the input shaft. The road speed sensor provides the ECM with data from which road speed is calculated and displayed on the speedometer. It also provides data used to calculate minute fuel and ignition changes which help maintain slow speed driveability.

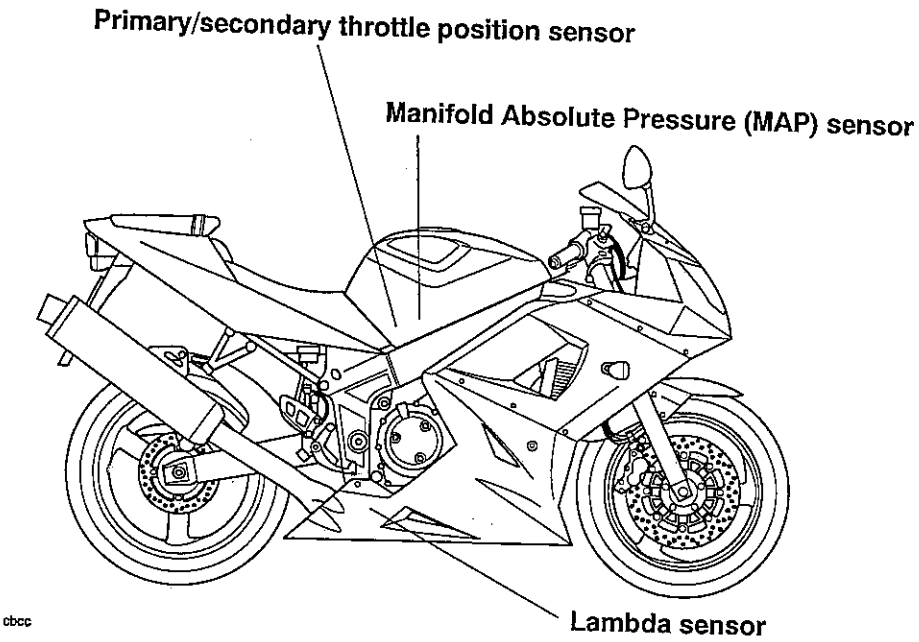
- **Road speed sensor** - situated in the gearbox. The neutral switch indicates when the transmission is in neutral. In addition, the neutral switch provides an interlock facility, preventing the rider from riding off with sidestand down. If a gear is selected with the sidestand down, the ECM will cause the engine to cut-out.

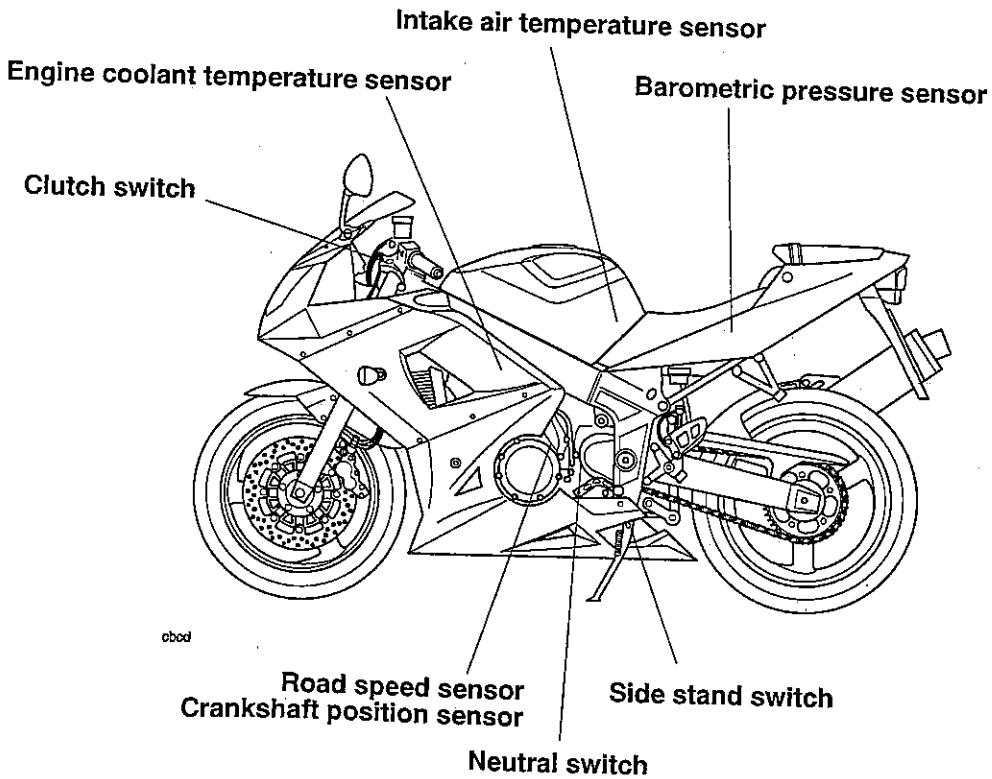
- **Lambda sensor** - situated in the exhaust system. The lambda sensor constantly feeds in formation to the ECM on the content of the exhaust gases. Based on this information, adjustments to air/fuel ratio are made.

- **Side stand switch** - situated at the top of the sidestand leg. If the sidestand is in the down position, the engine will not run unless the transmission is in neutral.

Engine Management System

Sensor Locations





System Actuators

In response to signals received from the sensors, the ECM controls and directs messages to a series of electronic and electro-mechanical actuators. The function and location of the actuators is given below.

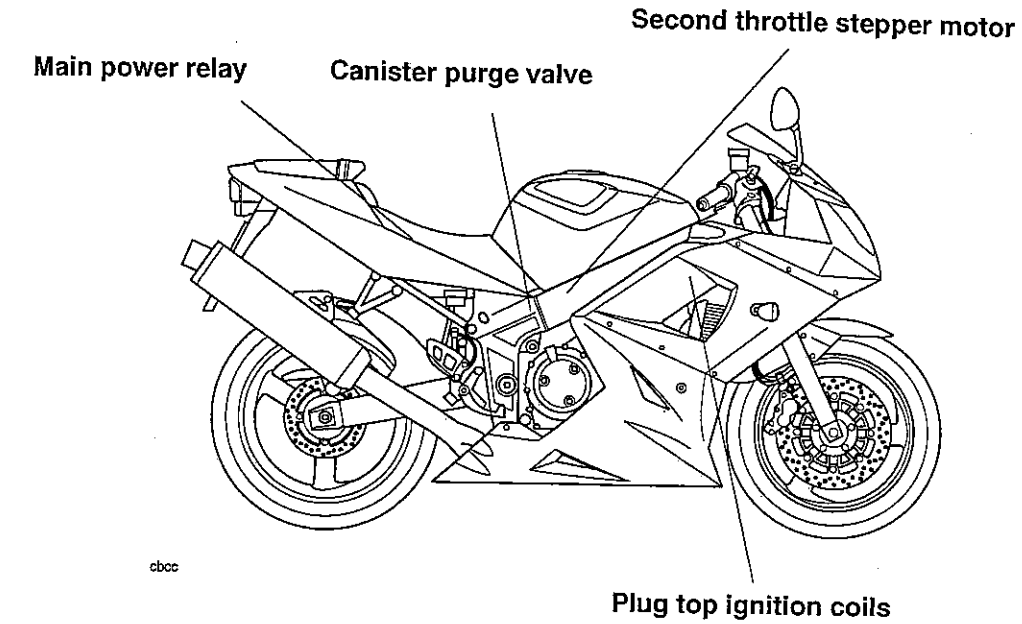
- **Primary throttle stepper motor** - situated below the throttle body at the left hand side. The primary throttle stepper actuates a cam/lever which causes variations in the closed throttle position. Although used all the time to ensure target idle speed is maintained, it also increases throttle opening when the engine is cold.
- **Second throttle stepper motor** - situated at the right hand end of the throttle body. In response to direction from the ECM, the second throttle stepper motor moves the second throttle spindle to the position directed by the ECM. The second butterfly optimises engine torque by maintaining intake air flow speed. It does not act as a choke for cold start purposes.
- **Canister purge valve (California models only) -** situated in the vapour return line between the carbon canister and the throttle bodies. The purge valve controls the return of vapour which has been stored in the carbon canister during the period when the engine is switched off. The valve is 'pulsed' by the ECM to give control over the rate at which the canister is purged.
- **Injectors -** located in the throttle body assembly. The engine is fitted with four injectors. The spray pattern of the injectors is fixed but the length of time each injector remains open is variable. The duration of each injection is calculated by the ECM using data received from the various sensors in the system.
- **Plug top ignition coils -** mounted directly onto the top of each spark plug. The ECM controls the point at which the coils are switched on and off. In calculating the switch-on time, the ECM allows sufficient time for the coils to charge to a level where a spark can be produced. The coils are switched off at the point of ignition, the timing of which is optimised for good engine performance.
- **Fall detection switch** - situated beneath the front seat. The fall detection switch will detect if the motorcycle is on its side and will cut power to the ECM immediately. This prevents the engine from running and the fuel pump from delivering fuel. In the event of a fall, the switch is reset by returning the bike to an upright position and switching the ignition off then back on again.
- **Main power relay** - located beneath the motorcycle seat. When the ignition is switched on, the main power relay is powered up to provide a stable voltage supply for the ECM.
- **Fuel pump -** located inside the fuel tank. The electric pump delivers fuel into the fuel system, via a pressure regulator, at a constant 3 bar pressure. The pump is run continuously when the engine is operating and is also run briefly when the ignition is first switched on to ensure that 3 bar is available to the system as soon as the engine is cranked. Fuel pressure is controlled by a regulator situated between numbers 3 and 4 cylinder.
- **Cooling fan -** located behind the radiator. The ECM controls switching on and off of the cooling fan in response to a signal received from the coolant temperature sensor. When the coolant temperature rises to a level where the cooling effect of natural airflow is insufficient, the cooling fan is turned on by the ECM. When the coolant temperature falls sufficiently, the ECM turns the cooling fan off. The fan only becomes operational when the engine is running. It will not operate at any other time.

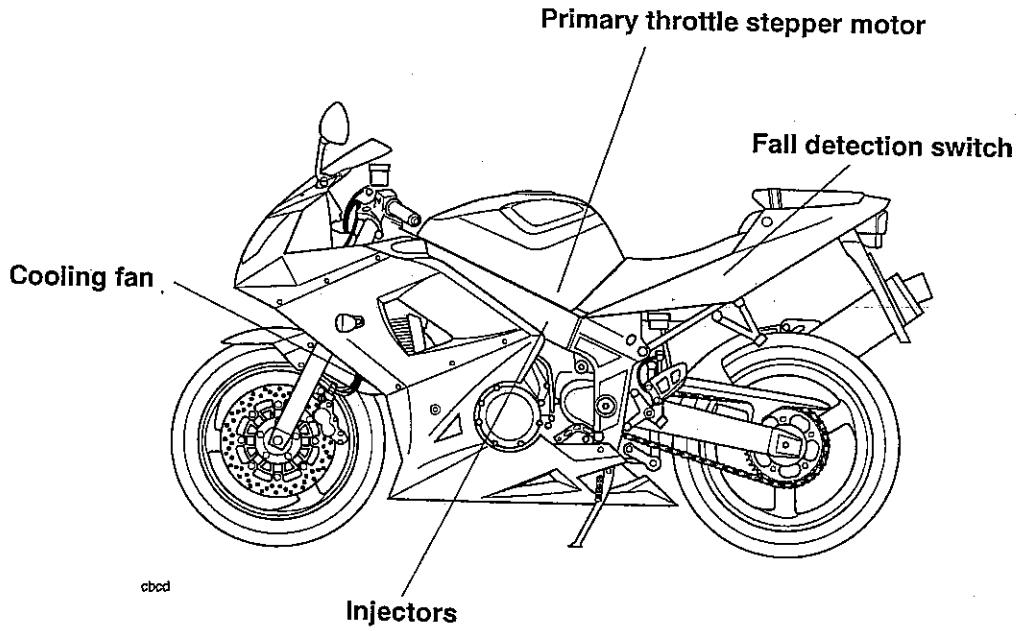
NOTE:

- **In this system, the starter lockout system (clutch switch, neutral switch, sidestand switch) all operate through the engine management ECM. In addition, the low fuel warning light sender also is controlled through the ECM.**

Engine Management System

Actuator Locations





ENGINE MANAGEMENT CIRCUIT DIAGRAM - Daytona 600

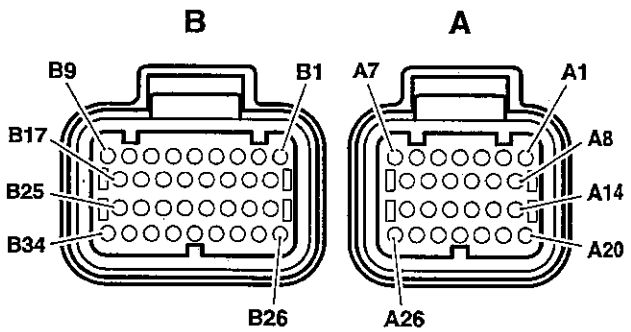
Key To Wiring Circuit Diagram

Key	Item
1	Engine control module
2	Diagnostic connector
3	Vehicle speed sensor
4	Instrument assembly
5	Neutral switch
6	Clutch switch
7	Starter relay
8	Crankshaft sensor
9	Sidestand switch
10	Air pressure sensor
11	MAP sensor
12	Inlet air temperature sensor
13	Lambda sensor
14	Fall detection switch
15	Cooling fan
16	Fuel pump
17	Fuel pump relay
18	Cooling fan relay
19	Rear fuse box (fuse 6)
20	Ignition coils
21	Throttle position sensor
22	Second throttle position sensor
23	Coolant temperature sensor
24	Idle speed control stepper motor
25	Second throttle actuator
26	Fuel injectors
27	Evaporative purge valve
28	Engine sub-harness connector
29	Secondary air injection solenoid
30	Engine management system relay

Key To Wiring Colour Codes

Code	Wiring Colour
B	Black
U	Blue
N	Brown
G	Green
S	Grey
O	Orange
K	Pink
R	Red
P	Purple
W	White
Y	Yellow
LG	Light Green
LU	Light blue

ECM Connector Pin Numbering

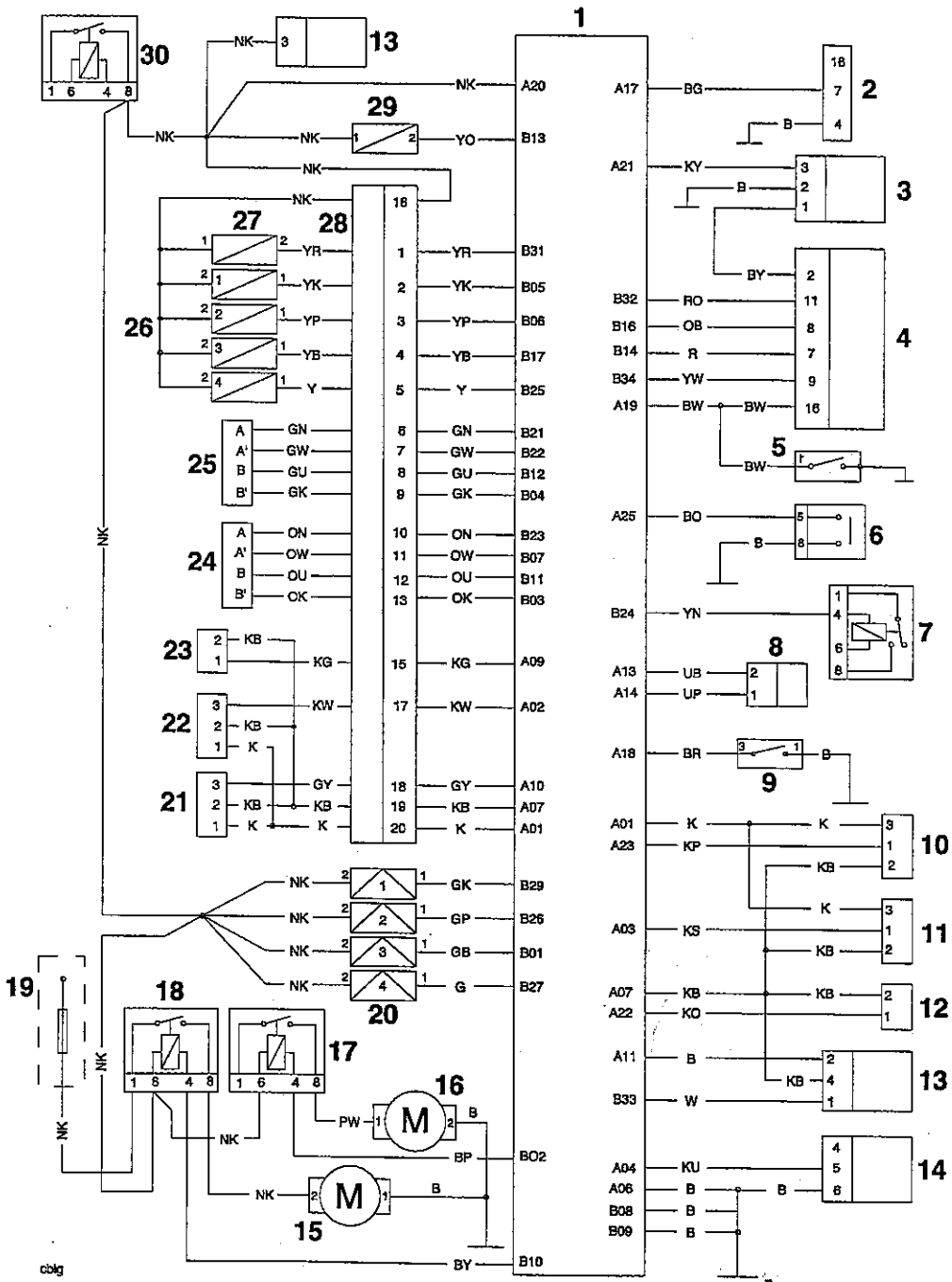


cbhs

The above illustration shows the pin numbering system used in the engine management circuit diagram.

The small connector's pins are prefixed A and the large connector's pins B. As viewed on the mating face with the ECM (as per the illustration), pins are numbered from right to left with number one in the top right corner.

Circuit Diagram - Engine Management System - Daytona 600



System Diagnostics

The engine management system has an on-board diagnostics feature which allows service technicians to retrieve stored data from the ECM using a Triumph service tool. **Full details of the tool's operation and how to interpret the results are given elsewhere in this section.**

The tool is connected to the motorcycle using a dedicated diagnostic plug situated beneath the seats. By using a dedicated plug, no electrical connectors associated with the system are disturbed, reducing potential connector damage.

The tool allows the user to retrieve data associated with the system sensors and actuators, test various component functions, read build data and make minor adjustments to the set-up of the system. The data and tests available are described on the following pages.

On-board Fault Detection System

The on-board diagnostic system has two stages to fault detection. When a fault is detected, the DSM (Diagnostic Status Manager) raises a flag to indicate that a fault is present and increments a counter. The counter checks the number of instances that the fault is noted. For example, if there is a fault in the crankshaft position sensor, the counter will increment its count each time the crankshaft turns through 360°, provided the fault is still present.

When the count begins, the fault is detected but not confirmed. If the fault continues to be detected and the count reaches a pre-determined threshold, the fault becomes confirmed. If the fault is an emissions related fault or a serious malfunction affecting engine performance, a DTC (Diagnostic Trouble Code) and freeze-frame data will be logged in the ECM's memory and the MIL (Malfunction Indicator Lamp) on the motorcycle instrument panel is illuminated. Once a fault is confirmed, the number of warm-up cycles made by the engine is counted. If the fault clears, the warm-up cycle counter will extinguish the MIL (Malfunction Indicator Lamp) at a pre determined count, and erase the DTC and freeze frame data from the ECM memory at another (higher) count.

A single warm-up cycle is deemed to have taken place when the following criteria have been met:

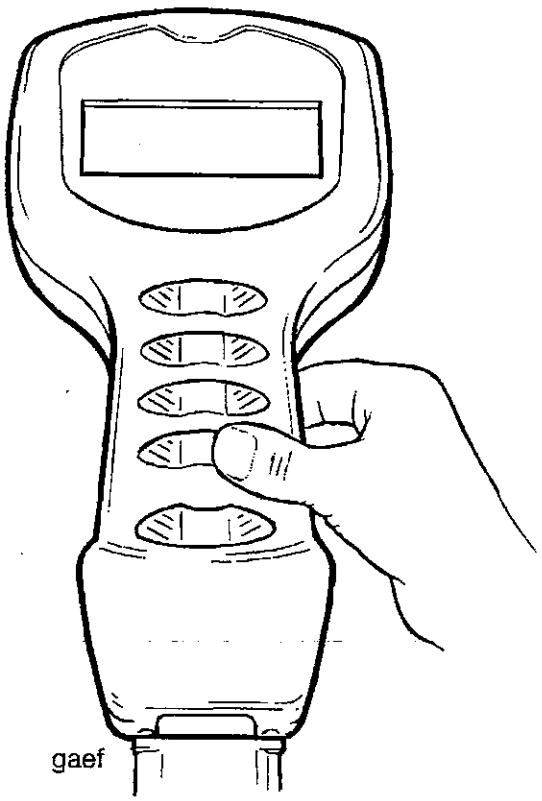
- The coolant temperature must be raised to 72°C or more.
- The coolant temperature must have risen by 23°C or more from its start temperature, when 72°C is reached.
- A controlled power-down sequence must take place.

NOTE:

- **When a fault has been rectified, the MIL will remain illuminated until sufficient non-fault warm-up cycles have taken place to turn it off. The MIL will be immediately extinguished if, after first rectifying the fault, the DTC (diagnostic trouble code) that caused the MIL illumination is erased from the ECM memory using the Triumph diagnostic tool.**

NOTE:

- **In most cases, when a fault is detected, the engine management system will revert to a 'limp-home' mode. In this mode, the engine will still function though the performance and fuel economy may be marginally affected. In some cases, the rider may not notice any appreciable difference from normal operation.**



Triumph Diagnostic Tool

Described on the following pages is the range of information which can be retrieved from the ECM's memory and the adjustments which can be performed using the Triumph service diagnostic tool.

The tables indicate which tests are performed by the on-board system and what information can be retrieved by the Triumph diagnostic tool.

Full details of how to operate the tool and how to interpret the data follow later in this section.

Current Data

By using the Triumph diagnostic tool, live engine data (engine running) can be recovered from the motorcycle. The data available is:-

Function Examined	Result Reported (Scale)
Engine speed	RPM
Calculated load	%
Coolant temperature	°C
Short term fuel trim	%
Throttle Position	%
Intake air temperature	°C
Vehicle speed	km/h
Ignition Advance	degrees
Heated oxygen sensor output voltage	volts
Intake manifold absolute pressure	mm/hg
Fuel system status	open or closed loop operation

Freeze-frame Data

Freeze frame data is stored at the time a DTC is recorded (confirmed) by the ECM. If multiple DTCs are recorded, the freeze-frame data which is stored will relate to the first recorded DTC only.

By calling up freeze frame data associated with the first recorded DTC, the technician can check the engine condition at the time the fault occurred. The data available is:-

Function Examined	Result Reported (Scale)
Engine speed	RPM
Calculated load	%
Coolant temperature	°C
Short term fuel trim	%
Throttle Position	%
Intake air temperature	°C
Vehicle speed	km/h
Ignition Advance	degrees
Heated oxygen sensor output voltage	volts
Intake manifold absolute pressure	mm/hg
Fuel system status	open or closed loop operation

Function Tests

The system allows the diagnostic tool to perform a series of function tests on various actuators in the engine management system. In some cases it is necessary to make a visual observation of a component and in other, if faults are present, DTCs will be logged.

The function tests available are:-

Function Examined	Report Method
Instrument panel	Visual inspection of instruments
Idle speed control stepper motor	Stored fault code*
Purge control valve	Stored fault code*
Fuel pump relay	Stored fault code*
Fuel pump operation	Stored fault code*/Fuel pressure test
Cooling fan	Stored fault code*/fan operation
2nd throttle control stepper motor	Stored fault code*
Secondary air injection	Stored fault code*

* If a fault is detected.

Checks/Adjustments

Adjustments

Using the Triumph diagnostic tool, it is possible to reset the ECU to the factory default settings.

Further facilities are provided to allow correct replacement/adjustment of the primary throttle position sensor and the primary throttle stepper motor. These facilities are needed as, after replacement of the parts concerned, adjustments have to be made to specific voltage settings, all with the throttles in a specific position.

NOTE:

- **Replacement of the second throttle potentiometer also requires specific adjustments to be made. However this can be done via the 'read sensors' facility.**

Full details o these procedures are provided later in this section.

Adaption status

Because the fuel system is adaptive, it is able to automatically adjust to new working conditions. This screen displays information as to the adaption status of the vehicle which will show if it has adapted or not.

Function Examined	Report Method
Closed throttle position reference status	adapted/not adapted
Idle speed control adaption status	%
Oxygen sensor adaption status (off idle)	%
Oxygen sensor adaption range (off idle)	%
Oxygen sensor adaption status (idle)	%
Oxygen sensor adaption range (idle)	%

Build data

The following items of build data can also be read.

Function Examined
Vehicle identification Number (VIN)
Triumph ECM part number
ECM manufacturer's part number
ECM serial number
Software version number (tune number)

Checks

When using this function it is possible to check the status of various sensors and actuators and also check certain items of factory data logged during vehicle assembly.

The data available is:-

Item Checked	Result Unit
Throttle position sensor voltage	Volts
Throttle position	% open
Manifold absolute pressure sensor voltage	Volts
Manifold absolute pressure	mmHg
Atmospheric pressure sensor voltage	Volts
Atmospheric pressure	mmHg
Battery voltage	Volts
Battery voltage scaling	Volts
Coolant temperature sensor voltage	Volts
Coolant temperature	°C
Air temperature sensor voltage	Volts
Air temperature	°C
Oxygen sensor voltage	Volts
Oxygen sensor reading	Volts
2nd throttle position sensor voltage	Volts
2nd throttle position	% open
Gear position sensor voltage	Volts
Fuel level sensor voltage	Volts
Fall detection switch voltage	Volts
Gear status	gear/neutral
Clutch switch status	grip/release
Sidestand status	up/down
Fuel pump relay status	fuel pump off/on

Checks (continued)

Item Checked	Result Unit
Malfunction indicator light status	MIL off/on
Fan relay status	Fan off/on
Starter relay status	Starter on/off
Fall detection status	Normal/over
Oxygen sensor heater status	Heater on/off
Secondary air injection status	SAI on/off
Engine rpm	RPM
Vehicle speed	km/h
Short term fuel trim	+/-100%
Calculated load	%
Idle reference speed	RPM
Injector 1 pulse time	milliseconds
Injector 2 pulse time	milliseconds
Injector 3 pulse time	milliseconds
Injector 4 pulse time	milliseconds
Ignition timing cyl 1	degrees BTDC
Ignition timing cyl 2	degrees BTDC
Ignition timing cyl 3	degrees BTDC
Ignition timing cyl 4	degrees BTDC
Coil 1 dwell time	milliseconds
Coil 2 dwell time	milliseconds
Coil 3 dwell time	milliseconds
Coil 4 dwell time	milliseconds
Idle speed control target steps	numeric
2nd throttle current steps	numeric
2nd throttle target steps	numeric
Purge valve duty cycle	%

Diagnostic Trouble Codes

Diagnostic trouble codes (DTCs) are logged in the ECM memory when there is a confirmed fault in the system.

The codes are reported to the Triumph diagnostic tool as a four digit code, as required by California legislation.

As mentioned earlier, when the system detects a fault, it begins to count the number of times the fault occurs before illuminating the MIL and storing a fault code.

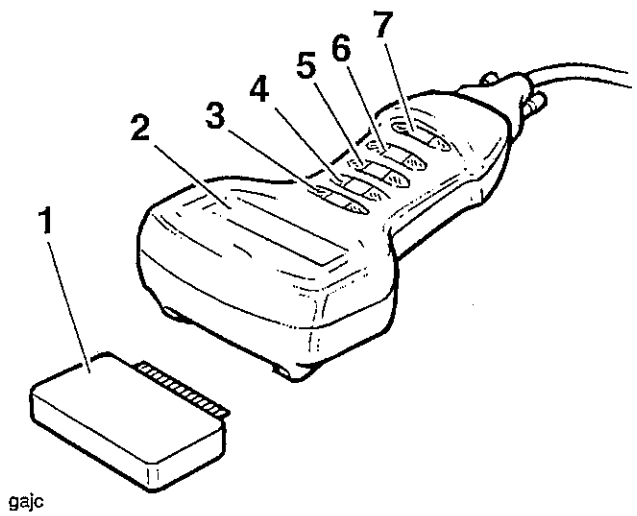
Similarly, if a fault clears, the ECM also records this fact and will turn off the MIL when sufficient no-fault warm-up cycles have taken place. Any fault codes will remain in the ECM memory until the required number of no-fault warm-up cycles have taken place. The number of warm-up cycles required to extinguish the MIL will always be less than the number required to remove a DTC from the ECM memory. DTCs can be removed at any time using the Triumph diagnostic tool

The system will log the diagnostic trouble codes listed below/over:-

Diagnostic Trouble Code (DTC)	Fault Description	Number of no-fault cycles before turning off MIL	Number of no-fault cycles before DTC is erased	MIL illuminated when fault is logged
P0201	Injector 1 circuit malfunction	3	40	Yes
P0202	Injector 2 circuit malfunction	3	40	Yes
P0203	Injector 3 circuit malfunction	3	40	Yes
P0204	Injector 4 circuit malfunction	3	40	Yes
P1201	Injector 1 open circuit/short to ground	3	40	Yes
P1202	Injector 2 open circuit/short to ground	3	40	Yes
P1203	Injector 3 open circuit/short to ground	3	40	Yes
P1204	Injector 4 open circuit/short to ground	3	40	Yes
P0335	Crankshaft sensor circuit malfunction	3	40	Yes
P0032	Oxygen sensor heater short circuit to battery	3	40	Yes
P0031	Oxygen sensor heater open circuit/short to ground	3	40	Yes
P0030	Oxygen sensor heater circuit malfunction	3	40	Yes
P0136	Oxygen sensor circuit malfunction	3	40	Yes
P0122	Throttle position sensor low input	3	40	Yes
P0123	Throttle Position sensor high input	3	40	Yes
P0107	Manifold absolute pressure sensor low voltage	3	40	Yes
P0108	Manifold absolute pressure sensor high voltage	3	40	Yes
P1105	Manifold absolute pressure sensor pipe malfunction	3	40	Yes
P1107	Ambient air pressure sensor circuit low voltage	3	40	Yes
P1108	Ambient air pressure sensor circuit high voltage	3	40	Yes
P0112	Intake air temperature too high	3	40	Yes
P0113	Intake air temperature too low	3	40	Yes
P0117	Engine coolant temperature too high	3	40	Yes
P0118	Engine coolant temperature too low	3	40	Yes
P0500	Vehicle speed sensor malfunction	3	40	Yes

Diagnostic Trouble Code (DTC)	Fault Description	Number of no-fault cycles before turning off MIL	Number of no-fault cycles before DTC is erased	MIL illuminated when fault is logged
P1552	Cooling fan short circuit/open circuit	3	40	Yes
P1553	Cooling fan short to battery voltage/over temperature	3	40	Yes
P1231	Fuel pump short circuit to ground or open circuit	3	40	Yes
P1232	Fuel pump relay short circuit to battery	3	40	Yes
P0444	Purge valve system short circuit to ground or open circuit	3	40	Yes
P0445	Purge valve system short circuit to battery	3	40	Yes
P0617	Starter relay short circuit to battery	3	40	Yes
P0616	Starter relay short circuit to ground or open circuit	3	40	Yes
P0414	Secondary air injection system short circuit to battery	3	40	Yes
P0413	Secondary air injection system short circuit to ground or open circuit	3	40	Yes
P0222	2nd throttle position sensor system low voltage	3	40	Yes
P0223	2nd throttle position sensor high voltage	3	40	Yes
P0638	2nd throttle circuit malfunction	3	40	Yes
P0505	Idle speed control system malfunction	3	40	Yes
P1631	Fall detection sensor circuit low voltage	3	40	Yes
P1632	Fall detection sensor circuit high voltage	3	40	Yes
P0560	System voltage - battery circuit malfunction	3	40	Yes
P1500	Vehicle speed output circuit malfunction	0	40	No
P0654	Tachometer circuit malfunction	0	40	No
P1115	Coolant temperature gauge circuit malfunction	0	40	No
P0460	Fuel level sensor circuit malfunction	0	40	No
P0705	Gear position sensor circuit malfunction	0	40	No
P0656	Fuel gauge circuit malfunction	0	40	No
P1610	Low fuel output circuit malfunction	0	40	No
P0630	EEPROM fault	0	40	No

SERVICE DIAGNOSTIC TOOL



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1. Memory card

2. Screen

3. Return key

4. Up key

5. Down key

6. Validate key

7. Help key

The memory card (1) contains all the information necessary to allow the technician to follow a number of different paths to:

- Diagnose faults
- Obtain data
- Make checks / adjustments

It is removeable to allow replacement / update cards to be inserted.

The screen comprises four horizontal lines and twenty vertical columns forming a series of boxes into which letters and numbers can be displayed to provide the necessary question, message, answer etc.

At the left of the screen, one or more symbols as detailed below may be displayed.

```
                    DIAGNOSTICS
      CURRENT DATA
▶     READ STORED DTCS
▼     FUNCTION TESTS
```

Typical screen showing symbol examples

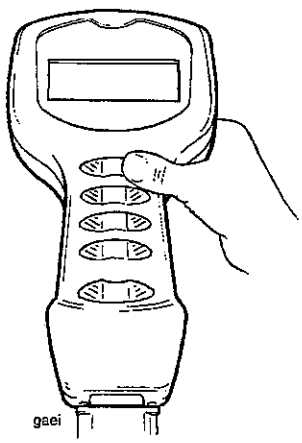
▲▼ Cursors to indicate that further lines of text are available to be seen above and/or below those already in view, by scrolling the text up or down using the 'Up' or 'Down' keys.

▶ Cursor to show which line of text is 'active'.

? Indicates further help/guidance information available on that line by pressing the help key.

Tool Keys

In most cases, the **Return** key (↵) enables the user to return to the screen last displayed.



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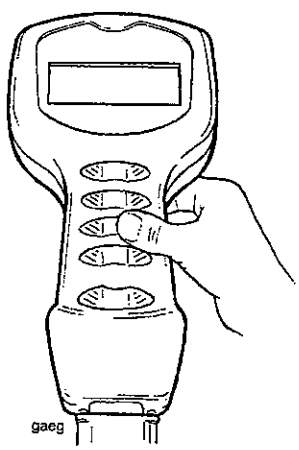
Return key

The **Up** and **Down** keys – press to move the lines of text up or down. They are also used to enter the Dealer number and the date.



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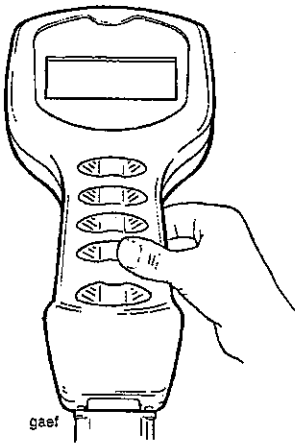
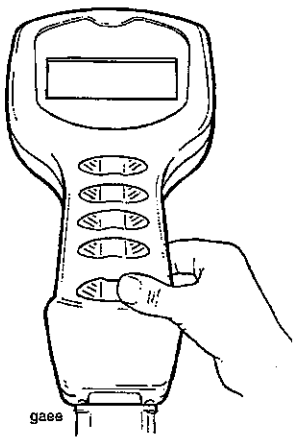
Up/down keys (2 separate keys)

Press the **Validation** key (*) to move on to the next message.



Validation key

The **Help** key can be used when the **'?'** symbol shows, to get more information about that line of text . To return to the diagnostic screen from the help area, press the help **'?'** button again.



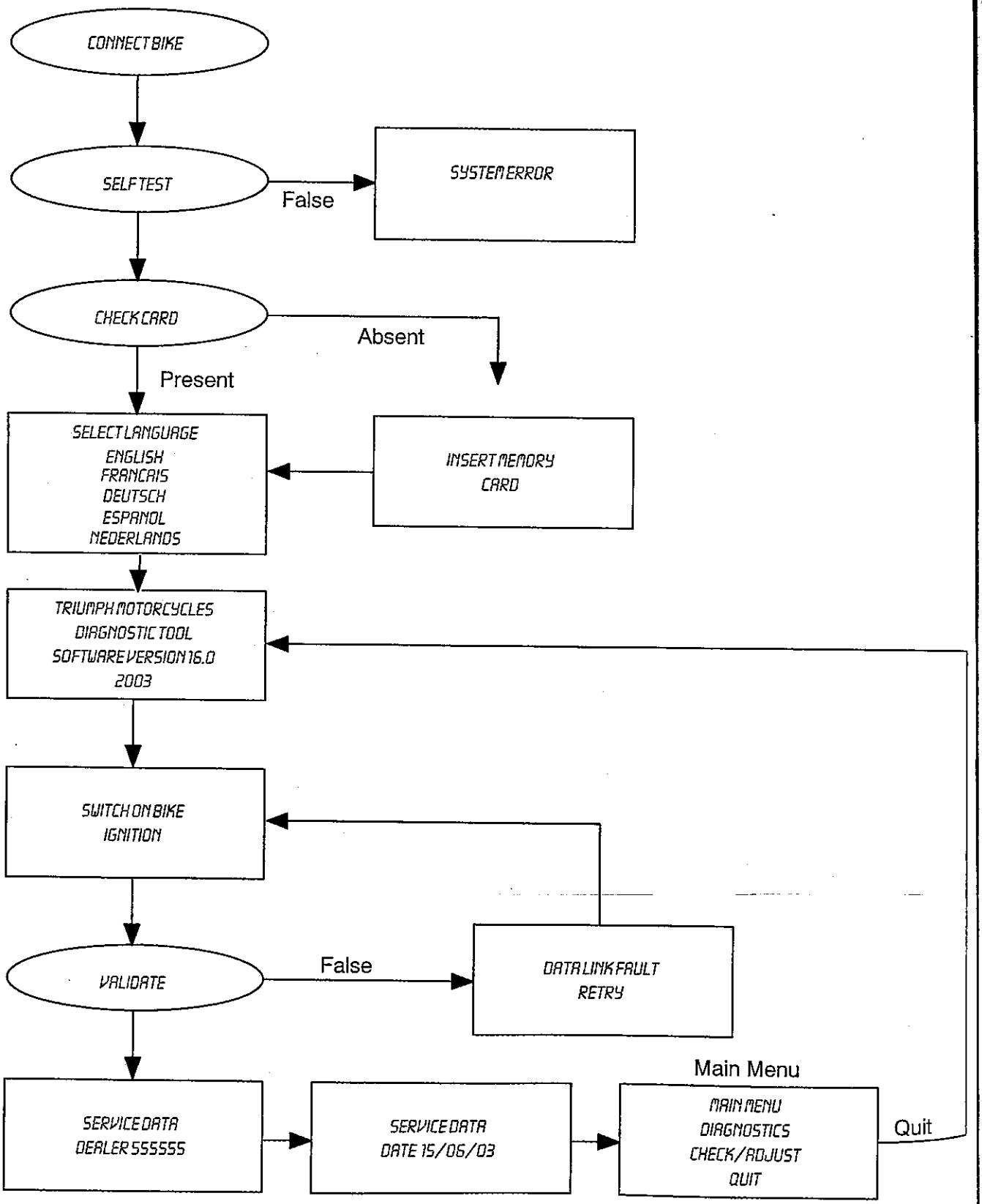
Help key

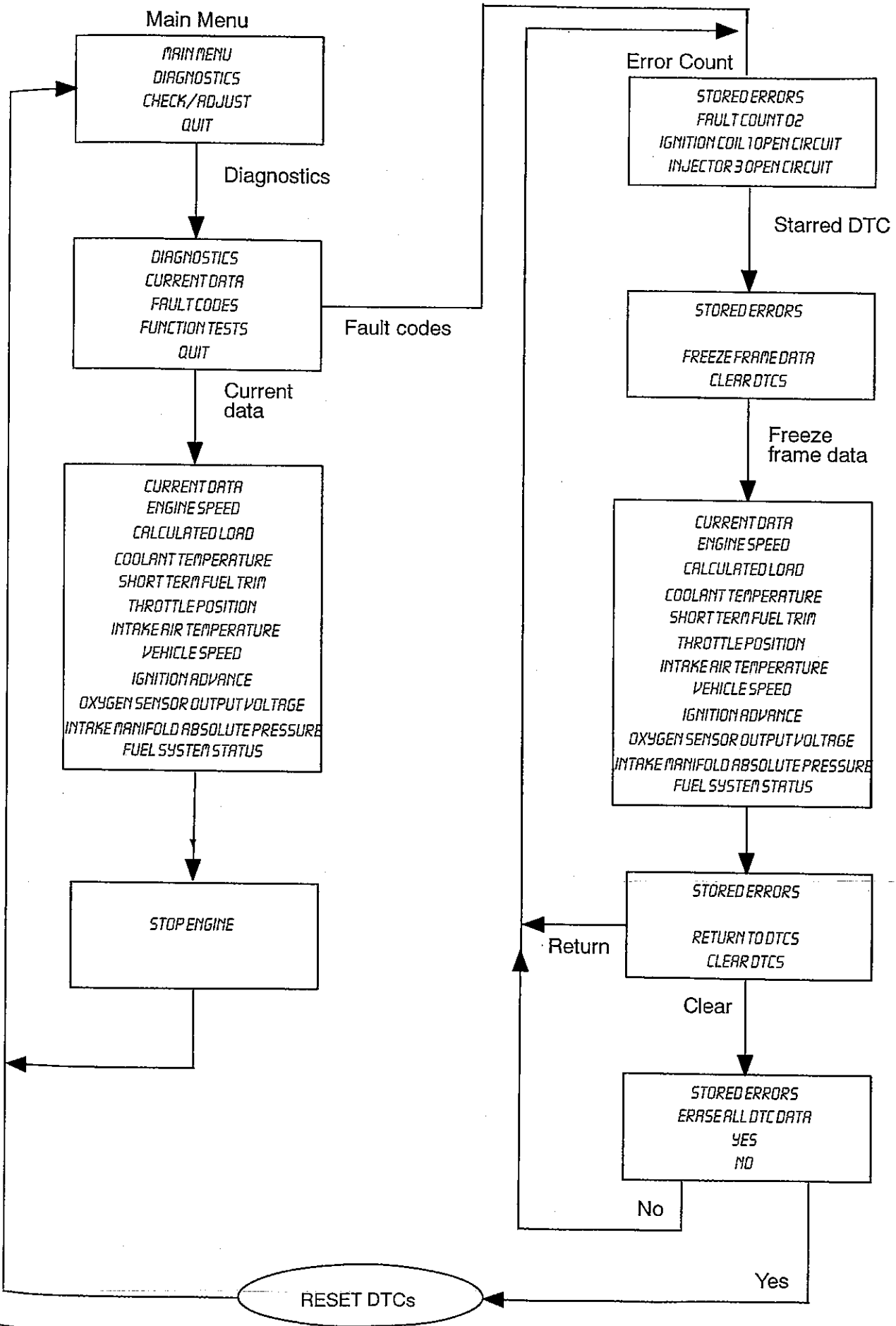
TEST PROCEDURE

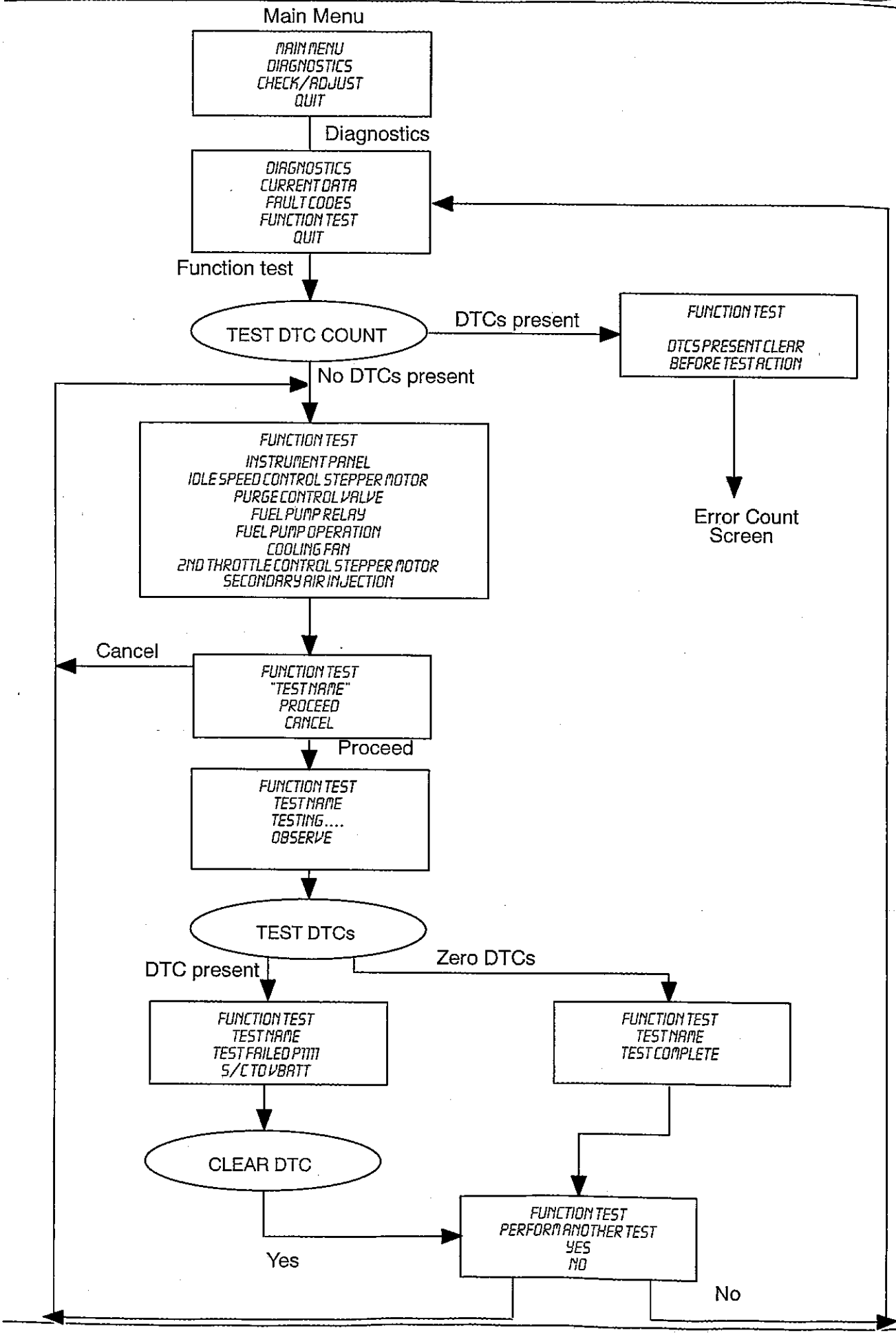
The following describes the procedure to follow when using the service diagnostic tool. It does not cover the further diagnosis that must be carried out once a fault area has been identified. For details of the procedure to follow when a fault area or fault code has been identified, refer to the diagnosis details later in this section.

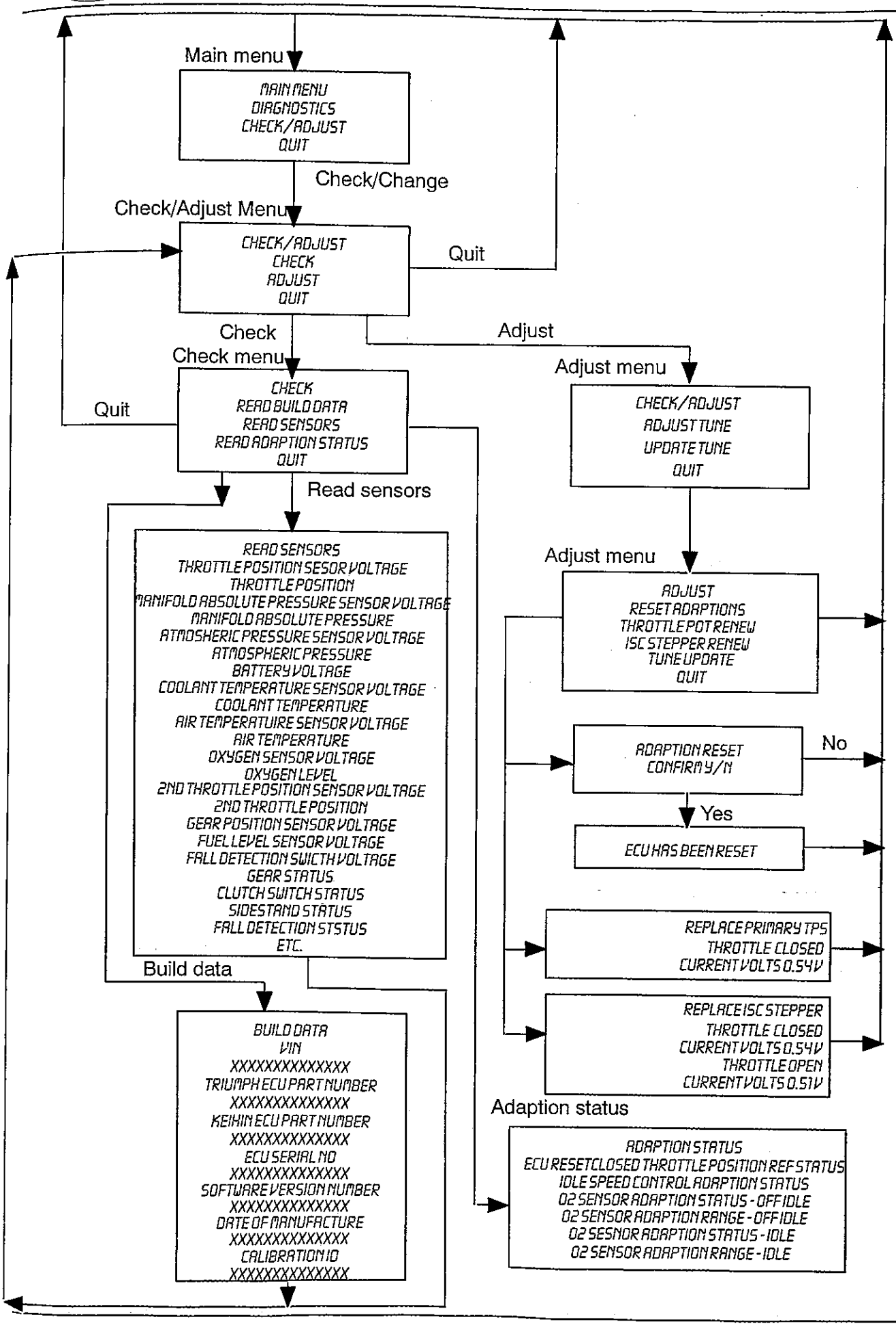
NOTE:

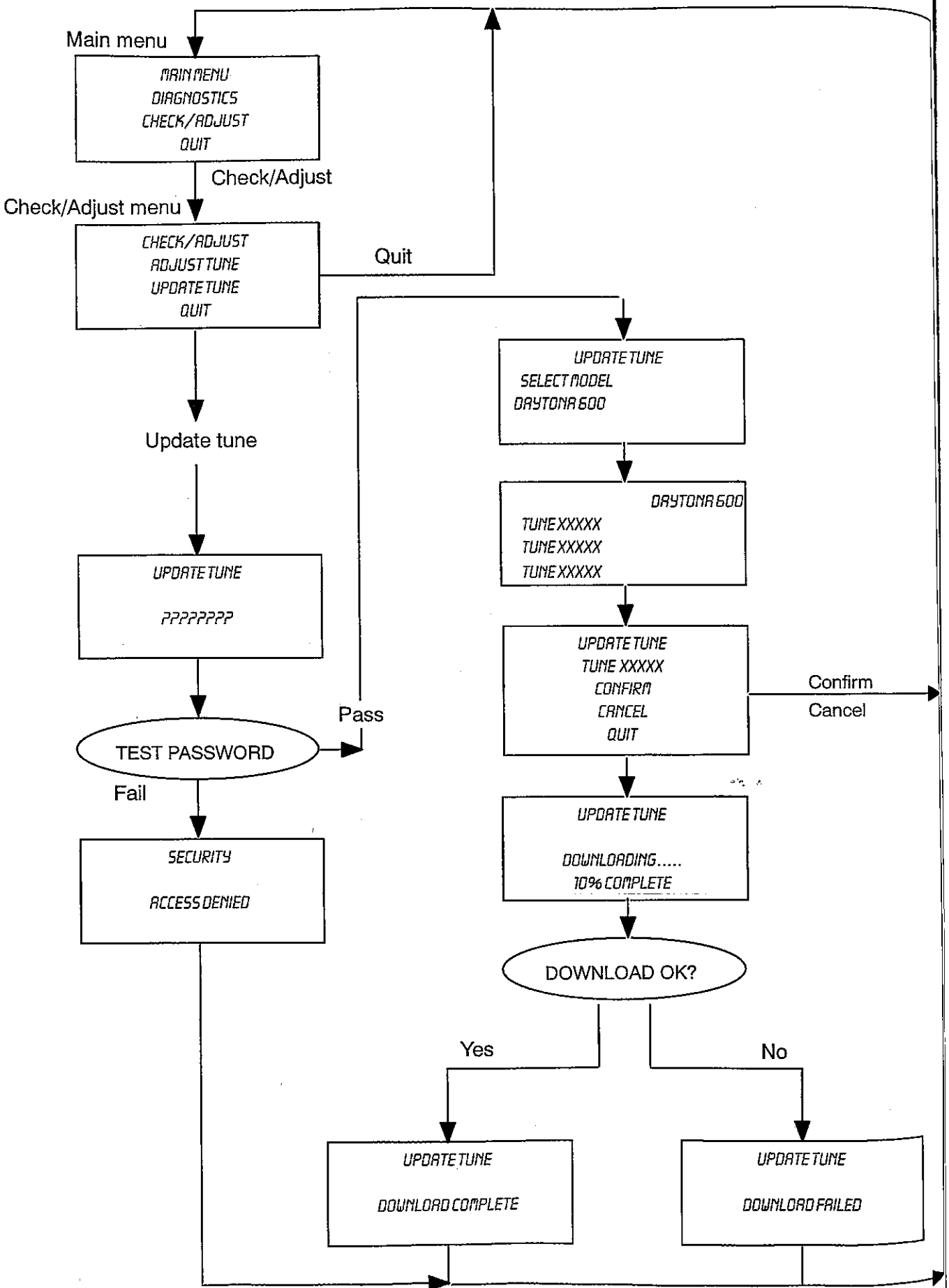
- **The tool does not retain any memory of faults, diagnosis etc. carried out on any particular motorcycle. Any such memory is only retained in the motorcycle's ECM.**
- **The following five pages describe the tool operations in flow chart form.**


CONNECT BIKE
SELF TEST
False
SYSTEM ERROR
CHECK CARD
Absent
Present
SELECT LANGUAGE
ENGLISH
FRANCAIS
DEUTSCH
ESPANOL
NEDERLANDS
INSERT MEMORY CARD
TRIUMPH MOTORCYCLES
DIAGNOSTIC TOOL
SOFTWARE VERSION 16.0
2003
SWITCH ON BIKE IGNITION
VALIDATE
False
DATA LINK FAULT
RETRY
Main Menu
SERVICE DATA
DEALER 555555
SERVICE DATA
DATE 15/06/03
MAIN MENU
DIAGNOSTICS
CHECK/ADJUST
QUIT
Quit

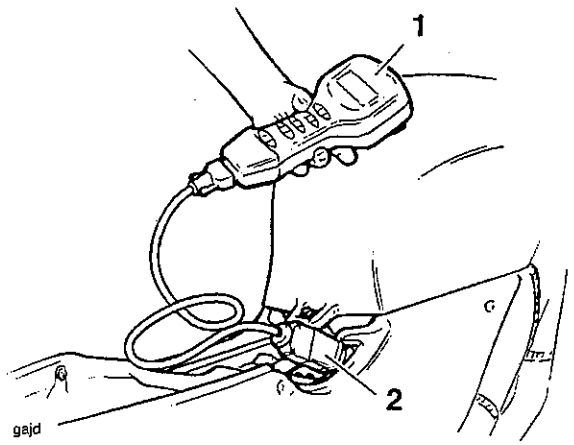

Main Menu
MAIN MENU
DIAGNOSTICS
CHECK/ADJUST
QUIT
Diagnostics
DIAGNOSTICS
CURRENT DATA
FAULT CODES
FUNCTION TESTS
QUIT
Fault codes
Current data
CURRENT DATA
ENGINE SPEED
CALCULATED LOAD
COOLANT TEMPERATURE
SHORT TERM FUEL TRIM
THROTTLE POSITION
INTAKE AIR TEMPERATURE
VEHICLE SPEED
IGNITION ADVANCE
OXYGEN SENSOR OUTPUT VOLTAGE
INTAKE MANIFOLD ABSOLUTE PRESSURE
FUEL SYSTEM STATUS
STOP ENGINE
Error Count
STORED ERRORS
FAULT COUNT 02
IGNITION COIL 1 OPEN CIRCUIT
INJECTOR 3 OPEN CIRCUIT
Starred DTC
STORED ERRORS
FREEZE FRAME DATA
CLEAR DTCS
Freeze frame data
CURRENT DATA
ENGINE SPEED
CALCULATED LOAD
COOLANT TEMPERATURE
SHORT TERM FUEL TRIM
THROTTLE POSITION
INTAKE AIR TEMPERATURE
VEHICLE SPEED
IGNITION ADVANCE
OXYGEN SENSOR OUTPUT VOLTAGE
INTAKE MANIFOLD ABSOLUTE PRESSURE
FUEL SYSTEM STATUS
STORED ERRORS
RETURN TO DTCS
CLEAR DTCS
Return
Clear
STORED ERRORS
ERASE ALL DTC DATA
YES
NO
No
Yes
RESET DTCs


Main Menu
MAIN MENU
DIAGNOSTICS
CHECK/ADJUST
QUIT
Diagnostics
DIAGNOSTICS
CURRENT DATA
FAULT CODES
FUNCTION TEST
QUIT
Function test
TEST DTC COUNT
DTCs present
FUNCTION TEST
DTCS PRESENT CLEAR
BEFORE TEST ACTION
Error Count
Screen
No DTCs present
FUNCTION TEST
INSTRUMENT PANEL
IDLE SPEED CONTROL STEPPER MOTOR
PURGE CONTROL VALVE
FUEL PUMP RELAY
FUEL PUMP OPERATION
COOLING FAN
2ND THROTTLE CONTROL STEPPER MOTOR
SECONDARY AIR INJECTION
Cancel
FUNCTION TEST
"TEST NAME"
PROCEED
CANCEL
Proceed
FUNCTION TEST
TEST NAME
TESTING....
OBSERVE
TEST DTCs
DTC present
Zero DTCs
FUNCTION TEST
TEST NAME
TEST FAILED P1111
S/C TO VBATT
FUNCTION TEST
TEST NAME
TEST COMPLETE
CLEAR DTC
FUNCTION TEST
PERFORM ANOTHER TEST
YES
NO
Yes
No


Main menu
MAIN MENU
DIAGNOSTICS
CHECK/ADJUST
QUIT
Check/Change
Check/Adjust Menu
CHECK/ADJUST
CHECK
ADJUST
QUIT
Quit
Check
Adjust
Check menu
Adjust menu
CHECK
READ BUILD DATA
READ SENSORS
READ ADAPTION STATUS
QUIT
Quit
CHECK/ADJUST
ADJUST TUNE
UPDATE TUNE
QUIT
Read sensors
READ SENSORS
THROTTLE POSITION SESOR VOLTAGE
THROTTLE POSITION
MANIFOLD ABSOLUTE PRESSURE SENSOR VOLTAGE
MANIFOLD ABSOLUTE PRESSURE
ATMOSHERIC PRESSURE SENSOR VOLTAGE
ATMOSPHERIC PRESSURE
BATTERY VOLTAGE
COOLANT TEMPERATURE SENSOR VOLTAGE
COOLANT TEMPERATURE
AIR TEMPERATUIRE SENSOR VOLTAGE
AIR TEMPERATURE
OXYGEN SENSOR VOLTAGE
OXYGEN LEVEL
2ND THROTTLE POSITION SENSOR VOLTAGE
2ND THROTTLE POSITION
GEAR POSITION SENSOR VOLTAGE
FUEL LEVEL SENSOR VOLTAGE
FALL DETECTION SWICTH VOLTAGE
GEAR STATUS
CLUTCH SWITCH STATUS
SIDESTAND STATUS
FALL DETECTION STSTUS
ETC.
Adjust menu
ADJUST
RESET ADAPTIONS
THROTTLE POT RENEW
ISC STEPPER RENEW
TUNE UPDATE
QUIT
ADAPTION RESET
CONFIRM Y/N
No
Yes
ECU HAS BEEN RESET
REPLACE PRIMARY TPS
THROTTLE CLOSED
CURRENT VOLTS 0.54V
REPLACE ISC STEPPER
THROTTLE CLOSED
CURRENT VOLTS 0.54V
THROTTLE OPEN
CURRENT VOLTS 0.51V
Build data
BUILD DATA
VIN
XXXXXXXXXXXXXX
TRIUMPH ECU PART NUMBER
XXXXXXXXXXXXXX
KEIHIN ECU PART NUMBER
XXXXXXXXXXXXXX
ECU SERIAL NO
XXXXXXXXXXXXXX
SOFTWARE VERSION NUMBER
XXXXXXXXXXXXXX
DATE OF MANUFACTURE
XXXXXXXXXXXXXX
CALIBRATION ID
XXXXXXXXXXXXXX
Adaption status
ADAPTION STATUS
ECU RESETCLOSED THROTTLE POSITION REF STATUS
IDLE SPEED CONTROL ADAPTION STATUS
02 SENSOR ADAPTION STATUS - OFF IDLE
02 SENSOR ADAPTION RANGE - OFF IDLE
02 SESNOR ADAPTION STATUS - IDLE
02 SENSOR ADAPTION RANGE - IDLE


Main menu
MAIN MENU
DIAGNOSTICS
CHECK/ADJUST
QUIT
Check/Adjust
Check/Adjust menu
CHECK/ADJUST
ADJUST TUNE
UPDATE TUNE
QUIT
Quit
Update tune
UPDATE TUNE
????????
TEST PASSWORD
Pass
Fail
SECURITY
ACCESS DENIED
UPDATE TUNE
SELECT MODEL
DAYTONA 600
DAYTONA 600
TUNE XXXXX
TUNE XXXXX
TUNE XXXXX
UPDATE TUNE
TUNE XXXXX
CONFIRM
CANCEL
QUIT
Confirm
Cancel
UPDATE TUNE
DOWNLOADING.....
10% COMPLETE
DOWNLOAD OK?
Yes
No
UPDATE TUNE
DOWNLOAD COMPLETE
UPDATE TUNE
DOWNLOAD FAILED

1. CONNECTION AND POWER-UP



1. Tool

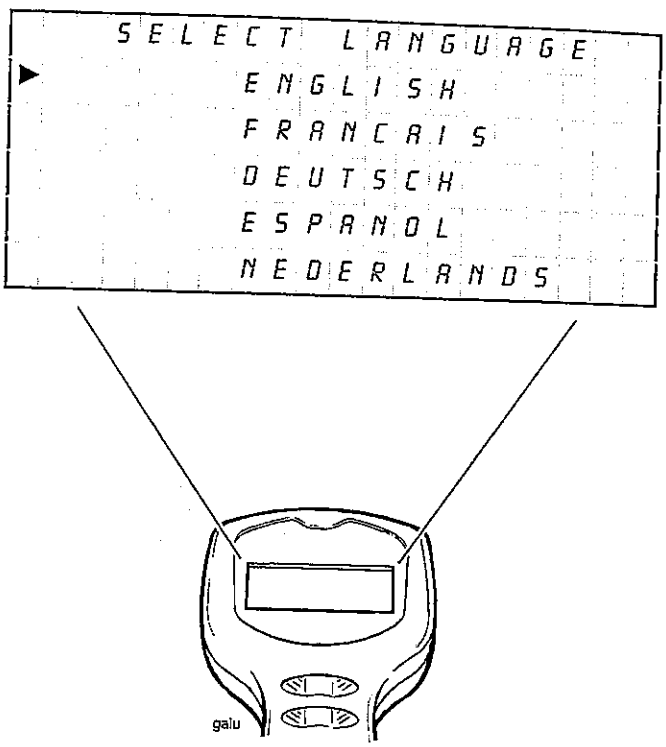
2. Connection to Main Harness

Connect the tool to the dedicated multiplug under the seat.

A message appears on the screen and certain checks are made automatically, e.g. Is the memory card fitted ?

'SELECT LANGUAGE' will then be displayed.

2. SELECT LANGUAGE



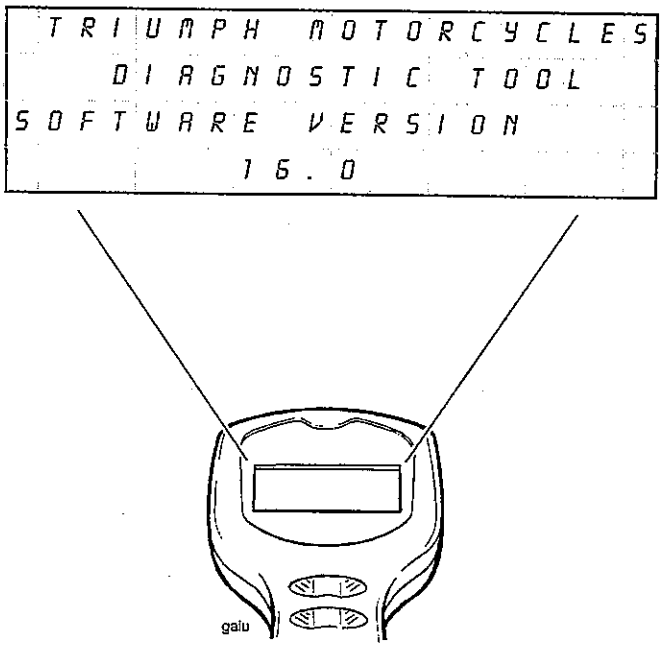
Use the 'Up' and 'Down' keys to move the cursor in column 1 and select the language required.

NOTE:

- **The tool will always select English as the default language, and it is only necessary to use the cursor to select one of the other languages. The entire diagnostic session will then continue in the chosen language.**

Press the validation key '✳' to move on.

3. TRIUMPH MOTORCYCLES

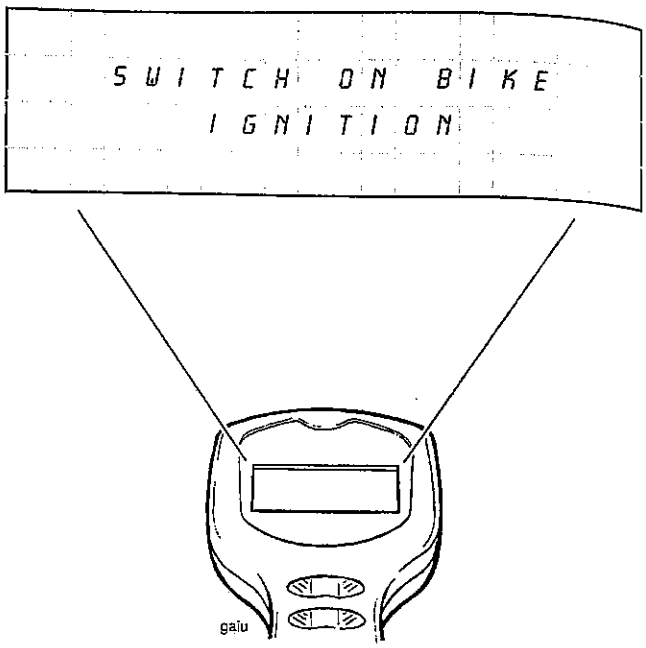


The screen will display the message 'Triumph Motorcycles Diagnostic Tool' and will also give the diagnostic software version and the software release year.

Press the validation key '*' to move on.

If the Return key (↵) is pressed, the tool will return to the **'SELECT LANGUAGE'** display.

4. SWITCH ON BIKE IGNITION



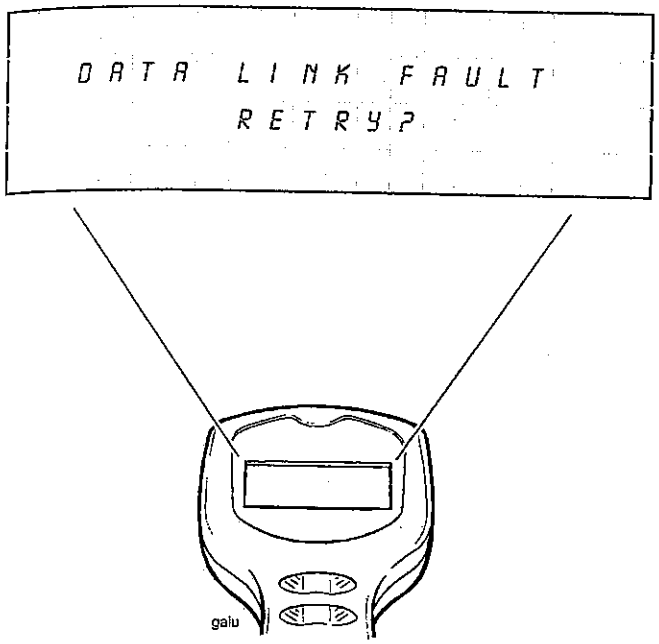
Switch on the ignition. Do NOT start the engine.

Press the validation key '*'. During a short delay period the tool will carry out certain validation checks.

If it detects a problem which will invalidate the test, **'DATA LINK FAULT RETRY?'** will be displayed.

If all is OK, **'SERVICE DATA'** will appear on the screen.

5. DATA LINK FAULT RETRY?



If the above is displayed, check that the ignition is switched on.

If the ignition is already on, the problem may be caused by bad connections, faulty ignition switch, cable break, faulty ECM, flat battery etc.

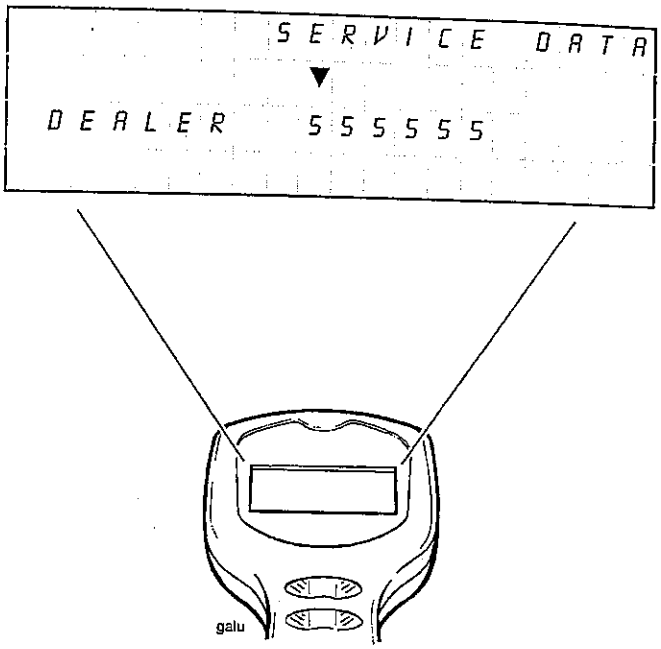
Press the **Help** key **'?'** for advice.

Rectify the problem and press the Validation key '*' to return to **'SWITCH ON BIKE IGNITION'.**

Press the Validation key '*' again. If the tool accepts that the problem has been rectified, **'SERVICE DATA'** will be displayed.

This is the first of 2 screens for which the operator has to input information, without which the testing cannot proceed further.

6. SERVICE DATA – DEALER



Enter your Dealer number as follows:

The number **'555555'** is displayed, with the cursor pointing down at the first digit.

Press the 'Up' or 'Down' keys to change this digit to the first digit of your dealer code.

Press the Validation key '*'.

The cursor will now re-position over the second digit '5'. Enter the 2nd digit of your Dealer number in the same way.

Continue until all 5 digits of your dealer code have been entered.

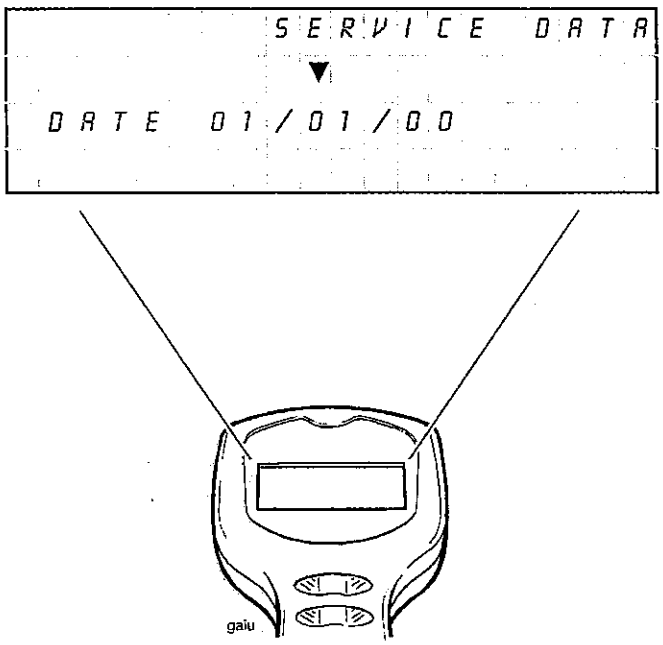
NOTE:

- **If any digit has been entered incorrectly, press the 'Return' key (↵) to start again.**

When all 5 digits have been entered correctly, press the Validation key '*'.

You must enter a valid Dealer Number to continue. If you do not know your dealer number, contact Triumph or your importer for advice.

7. SERVICE DATA – DATE



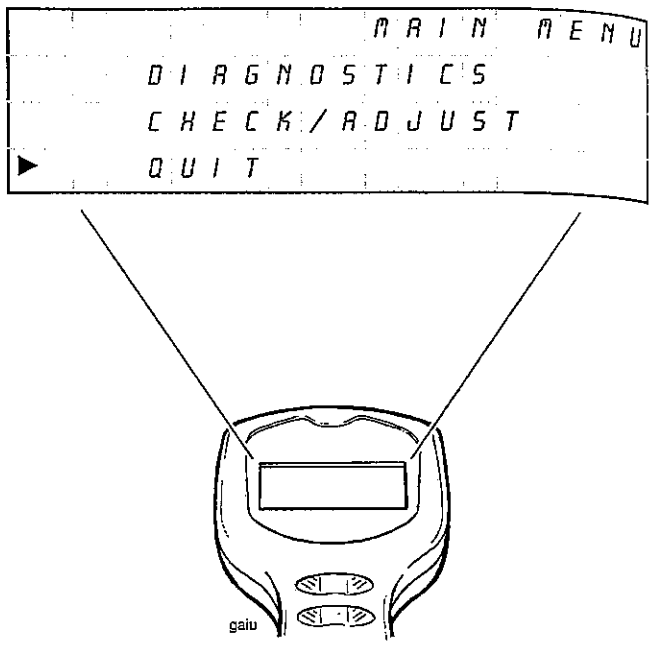
Enter the date using the 'Up' and 'Down' keys in the same way that the Dealer number was entered.

NOTE:

- **6 digits must always be entered, e.g. if it is the 7th month this must be entered as 07.**
- **The date must be entered in the order Day/Month / Year.**

When complete, press the Validation key '✳' to display – **'MAIN MENU'.**

8. MAIN MENU



When this screen is displayed, you have to decide whether to proceed along one of two routes:

– **'DIAGNOSTICS'**
– **'CHECK/ADJUST'**

The **'DIAGNOSTICS'** menu provides access to:

Current data e.g. actual engine temperature, engine speed etc.

Diagnostic Trouble Codes (DTC's) i.e. access to codes stored in the motor cycle ECM which indicate a confirmed fault(s) in the system.

Function tests e.g. of tachometer, water temperature gauge, fuel pump etc.

The **'CHECK/ADJUST'** menu provides:

Checks i.e. build information, system data.

Adjustments e.g. adjustment of idle fuel/CO etc., and entry of software updates.

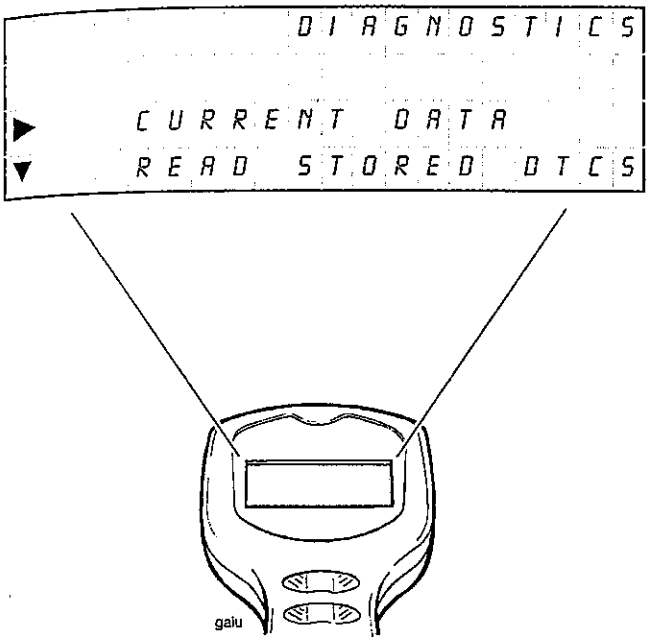
Use the 'Up and Down' keys to position the cursor opposite the desired choice, and press the Validation key '✳'.

Either **'DIAGNOSTICS'** (operation 9) or **'CHECK/ADJUST'** (operation 27) will be displayed, dependent on the selection.

NOTE:

- **If 'QUIT' is selected and the validation key '✳' pressed, the display will return to 'TRIUMPH MOTORCYCLES'.**

9. DIAGNOSTICS *(If 'DIAGNOSTICS' is selected)*



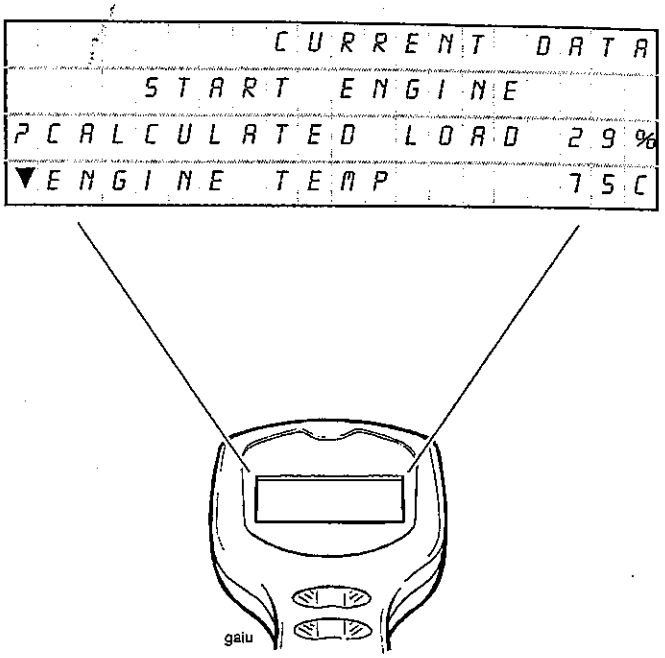
This display is the **'DIAGNOSTICS'** menu.

Use the 'Up' and 'Down' keys to scroll the text until the horizontal arrowhead is positioned opposite the desired choice, and press the Validation key '✳'.

The choices are:

- **'CURRENT DATA'** (see operation 10)
- **'READ STORED DTCS'** (see operation 12)
- **'CLEAR DTCS'** (see operation 17)
- **'FUNCTION TESTS'** (see operation 18)
- If **'QUIT'** is selected, the display will return to **'TRIUMPH MOTORCYCLES'**.

10. CURRENT DATA



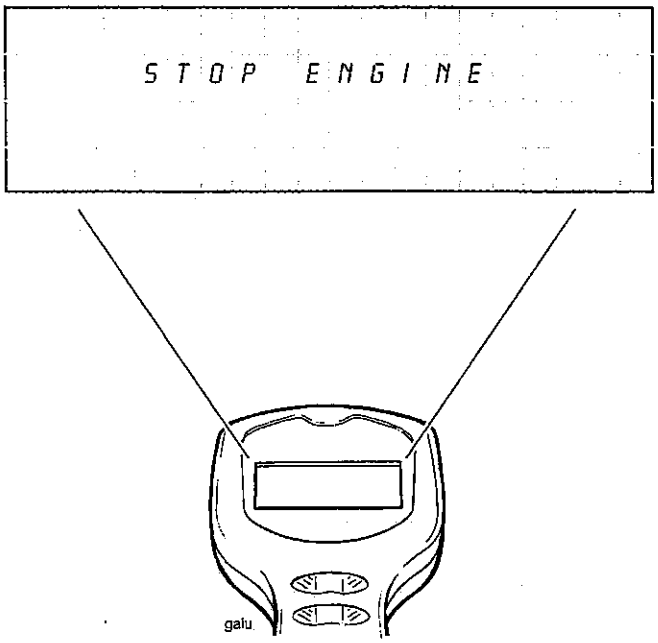
Start the engine. **'CURRENT DATA'** includes the information shown in the table below which can be accessed by scrolling, using the 'Up' and 'Down' keys. At the end of each line of text, the actual reading at that instant is provided to assist diagnosis e.g. **ENGINE TEMP - 75C.**

For a complete list of the items reported, see the table titled 'CURRENT DATA' earlier in this section.

If further clarification of any line of displayed text is required, scroll that line opposite the **'?'** symbol in the left hand column and press the **Help** key (**?**). Limited information on the selected topic will then be displayed.

Press any key to return to the **'CURRENT DATA'** text. When all information has been noted, press either the Validation '✳' or Return (↵) keys.

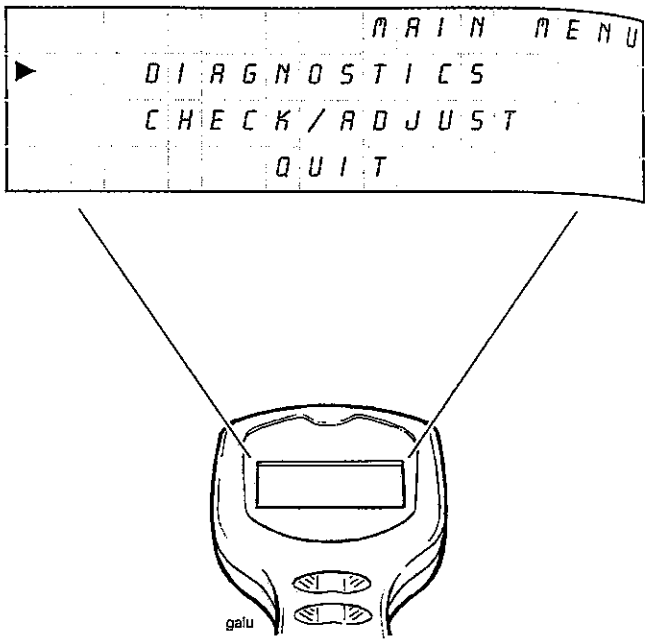
11. STOP ENGINE



Switch off the engine.

As the tool is powered from the motorcycle, this will end the diagnostic session. To continue, return to the power-up section and select tests as required.

12. To select 'READ STORED DTCS' (Diagnostic Trouble Codes) from the MAIN MENU:–



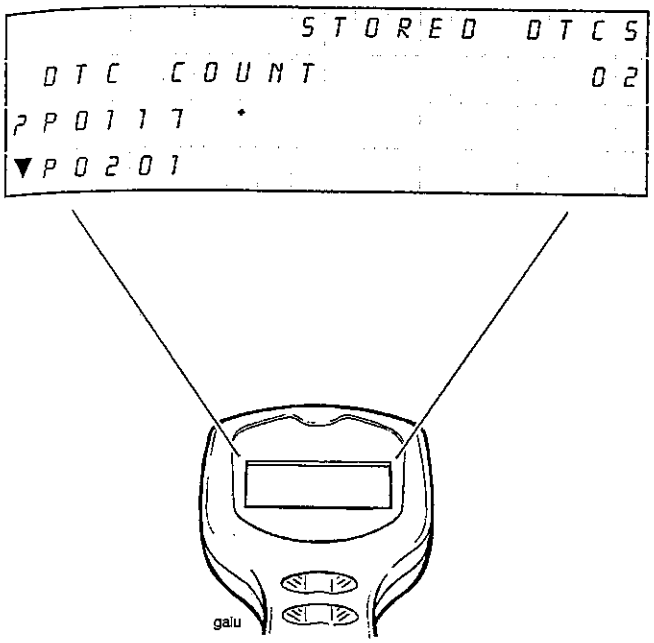
Use the 'Up' and 'Down' keys to position the cursor opposite **DIAGNOSTICS.**

Press the Validation key '⁎' to display **'DIAGNOSTICS'** menu.

Select **'READ STORED DTCS'**, and press the Validation key '⁎'.

'STORED DTCS' will be displayed.

13. STORED DTCS



The second line – **'DTC COUNT',** shows the number of DTC's stored in the ECM memory.

Lines 3 and 4 display up to two of the DTC'S stored (if any). If additional DTC'S are stored, this will be indicated by a downward pointing arrowhead, and it/they can be accessed using the 'Up' and 'Down' keys.

If there are no DTC's shown, press the Return key (↵) to return to **MAIN MENU.**

(If DTC's are present when the Return key is pressed, display will read **'STORED DTCS, ERASE ALL DTC DATA YES/NO'.**)

Information about each DTC can be obtained by scrolling the text until the appropriate code is opposite the **'?'** in line 3; then press the **Help** key **(?).**

DTC example: *P0117*

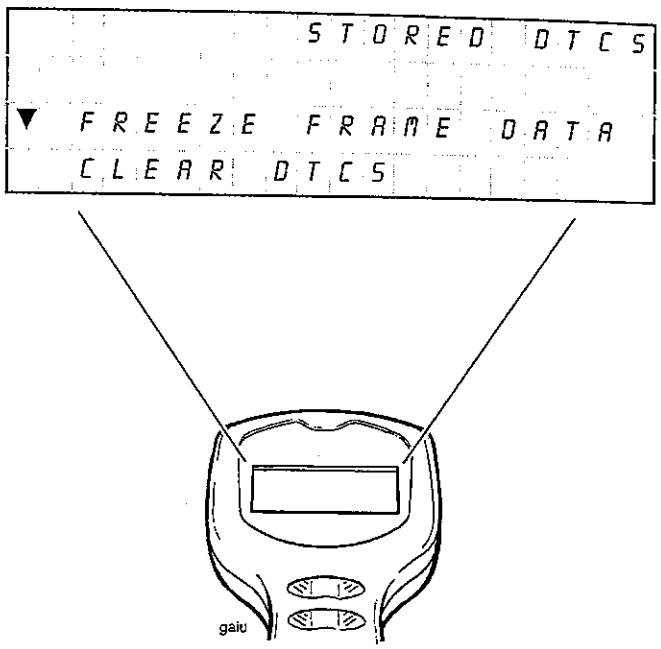
Help text *MAP SENSOR LOW VOLTAGE*

Press the Validation key '✳' to continue (operation 14).

IMPORTANT:

If a DTC has an asterisk (*) to its right, this indicates that a snap shot of engine data at the time the DTC was stored is available to aid your fault diagnosis. To access this information, press the Validation key '✳' to go to operation 14 and open **'FREEZE FRAME DATA'.**

14. Three options are now available:–

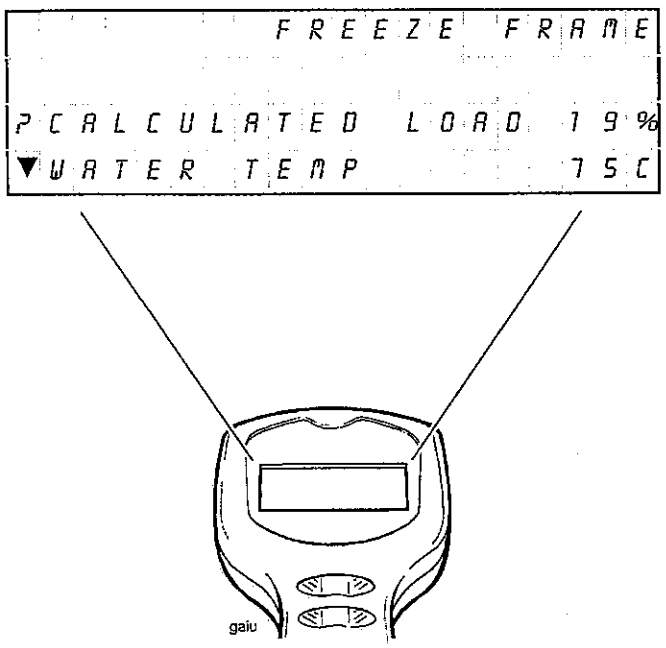


Align **'FREEZE FRAME DATA'** with the cursor, and press the validation key '✳' to display **'FREEZE FRAME'** (see 15).

Align **'CLEAR DTCS'** with the cursor, and press the validation key '✳' to display **'ERASE ALL DTC DATA'** (see 17).

Press the Return key (↵) to go back to **'STORED DTCS'** (operation 13).

15. FREEZE FRAME

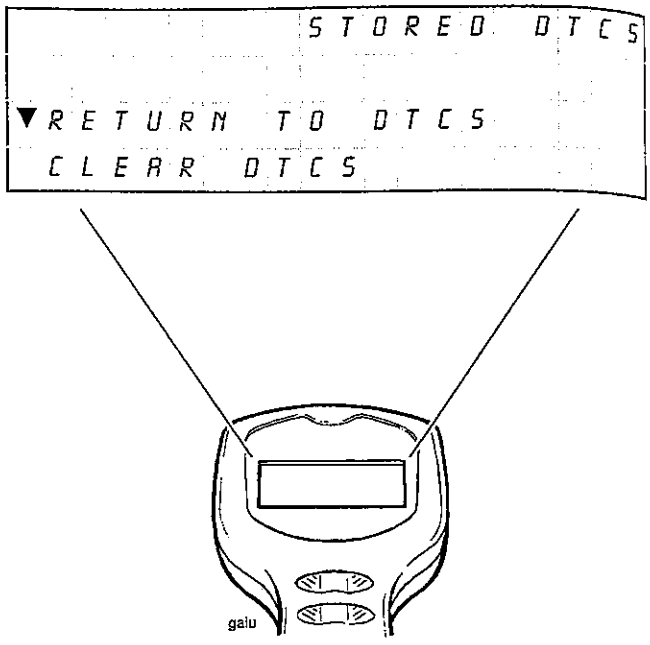


When a fault occurs which causes a DTC to be stored in the memory, the engine condition data at that instant is logged in the ECM. If another, more serious DTC is subsequently set, the original DTC data is automatically erased and new data associated with the latest DTC is logged in its place.

By selecting **'FREEZE FRAME'**, this information becomes available on the screen to aid diagnosis. Scroll the text up or down to view the data. More information can be gained by scrolling the text line in question to line 3 (**?**), then press the **Help** key (**?**) as before. Press the Validation key '*' to display **'STORED DTCS'** (operation 16).

For a complete list of the items reported, see the table titled '**FREEZE FRAME DATA**' earlier in this section.

16. STORED DTCS



2 options are now available:

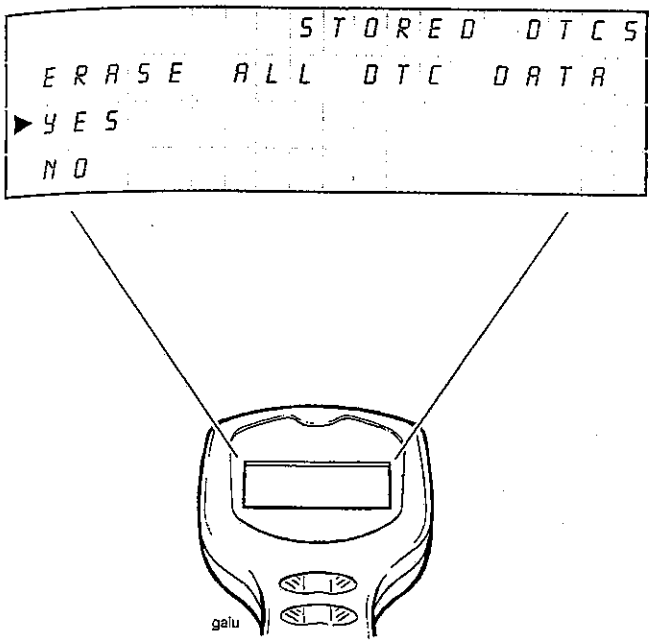
Scroll to **'RETURN TO DTCS'** and press the Validate key '*' to return to operation 13.

Scroll to **'CLEAR DTCS'** and press the Validation key '*' to go on to operation 17.

NOTE:

- **A full list of all the possible DTCs can be found earlier in this section.**

17. STORED DTCS, ERASE ALL DTC DATA



Scroll to position either **'YES'** or **'NO'** opposite the cursor.

If **'YES'** is selected, press the Validation key '*' to erase all DTC data from the memory. **'MAIN MENU'** will then be displayed.

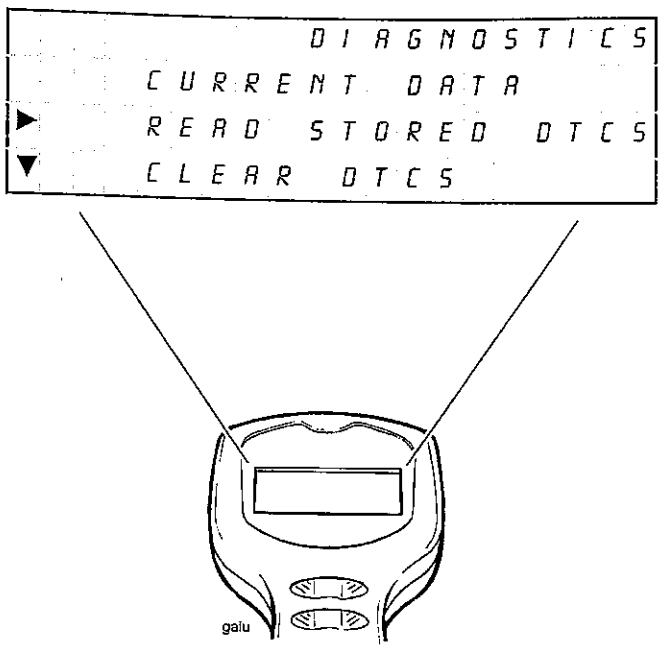
NOTE:

- **If you intend to examine the Function Tests, entry will be inhibited unless the DTC's have been erased.**

If **'NO'** is selected, press the Validation key '*' to return to operation 13.

That completes the DTC cycle.

18. To select 'FUNCTION TESTS' from the MAIN MENU:



Use 'Up' and 'Down' keys to select **'DIAGNOSTICS'** menu.

The following choices are available.

Press the Validation key '*'. **'DIAGNOSTICS'** will be displayed.

Select **'FUNCTION TESTS'**, and press the Validation key '*'.

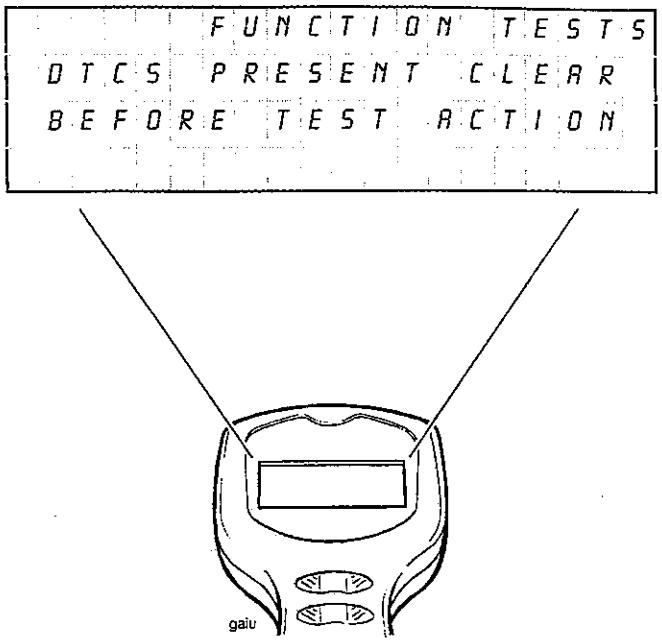
If no DTC'S are stored, **'FUNCTION TEST'** will be displayed (see operation 20).

If one or more DTC'S are stored, the message **'DTCS PRESENT CLEAR BEFORE TEST ACTION'** will be displayed (see operation 19).

NOTE:

- **The diagnostic tool will not allow Function Tests to be accessed until all DTC's in the memory are removed.**

19. FUNCTION TESTS



To clear the DTC's, press the Validation key '*'. **'STORED DTCS'** will be displayed (see operation 13).

Proceed as before via operations 14 to 17. Scroll to **'YES'** and press the Validation key '*' to erase all DTC data; the **MAIN MENU** will be displayed again.

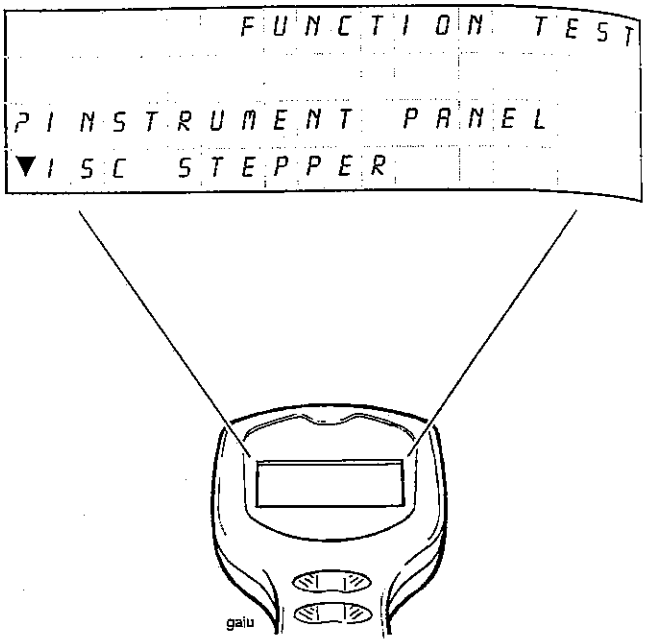
NOTE:

- **The fault(s) which caused the DTC's to be set must be rectified and cleared before continuing the Function Tests.**
- **A full list of all the possible DTCs can be found earlier in this section.**

Select **'DIAGNOSTICS'** menu and **'FUNCTION TESTS'** again pressing the Validation key '*' each time.

Because the DTC's have now been erased, **'FUNCTION' TEST'** (operation 20) will now be displayed.

20. FUNCTION TEST



The following can be tested:

1 Instrument panel.
2 Idle speed control stepper.
3 Purge valve.
4 Fuel pump prime.
5 Cooling fan operation.
6 Fuel pump operation.
7 Second throttle control stepper motor.
8 Secondary air injection solenoid valve.

If the fault is electrical, this will then be reported as a DTC.

Instrument Panel test: A signal is sent which should cause the tachometer to read approximately 7,500 RPM, the water temperature gauge to show 100°C* and the speedometer 100 km/h*, all for 10 seconds.

Idle speed control stepper: A signal is sent which should cause the stepper to be driven to the fully closed position, then to the fully open position, pausing briefly in each position. DTCs are set if a malfunction is found.

* Or the imperial equivalents.

Purge valve (California models only): This test allows you to check operation of the valve. To detect valve operation, use a stethoscope to listen for valve operation. DTCs are set if a malfunction is found.

Fuel pump prime: This test provides you with the means to physically check the pump and relay operation. DTCs are set if a malfunction is found.

Cooling fan test: A signal is sent which should cause the fan to operate for a 10 second period. DTCs are set if a malfunction is found.

Fuel pump operation: This test provides you with the means to physically check the pump operation. DTCs are set if a malfunction is found. The pump is energised when the test is confirmed and ended when the Validation key '✳' is pressed for a second time.

Second throttle stepper motor: A signal is sent which should cause the 2nd throttle stepper to be driven to the fully closed position, then to fully open. DTCs are set if a malfunction is found.

Secondary air injection: A signal is sent which will open and close the solenoid valve for 10 seconds. To detect valve operation, listen for valve operation (it is quite loud if working correctly). DTCs are set if a malfunction is found.

Use the 'Up' and 'Down' keys to scroll the text lines, and position the function for which you wish to obtain information opposite the **'?'**.

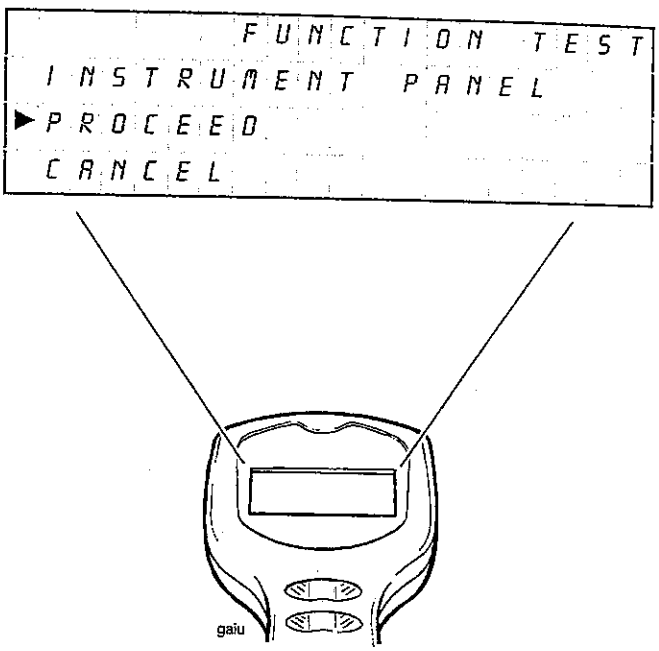
By pressing the Validation key '✳', your selection will be noted and **'FUNCTION TEST'** (operation 21) will be displayed.

Press the **Help** key (**?**) for more information.

NOTE:

- **If the Return key (↵) is pressed, the tool will return to 'DIAGNOSTICS' menu (operation 9).**

21. FUNCTION TEST



The function selected at operation 20 will now show on line 2. To show an example of this, we have chosen the **'INSTRUMENT PANEL'** test.

If you press the **Help** key (**?**). help relating to the specific test will be given. In this example, the screen will now read

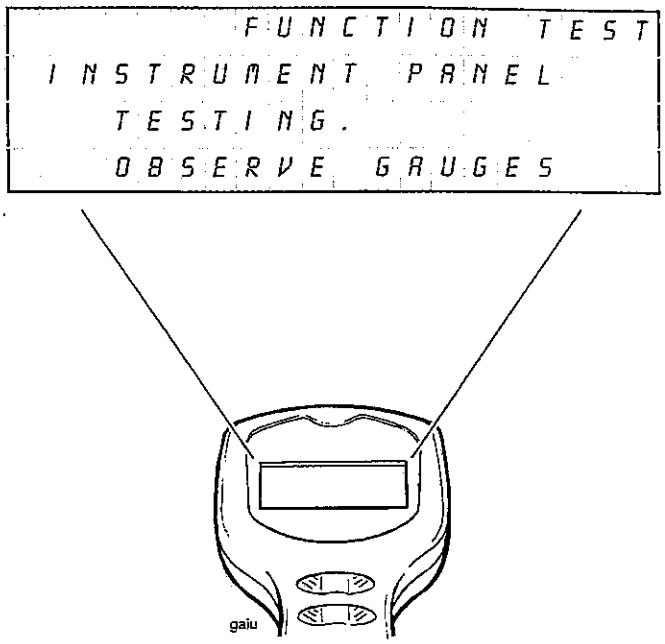
TACHOMETER - 7500 RPM
TEMP GAUGE - 100 °C*
SPEEDOMETER - 100 km/h*

* Or the imperial equivalents.

If you wish to cancel that selection, scroll to **'CANCEL'** and press the Validation key '✳'. The display will return to operation 20.

If you wish to test the component selected, scroll to **'PROCEED'** and press the Validation key '✳'.

22. FUNCTION TEST

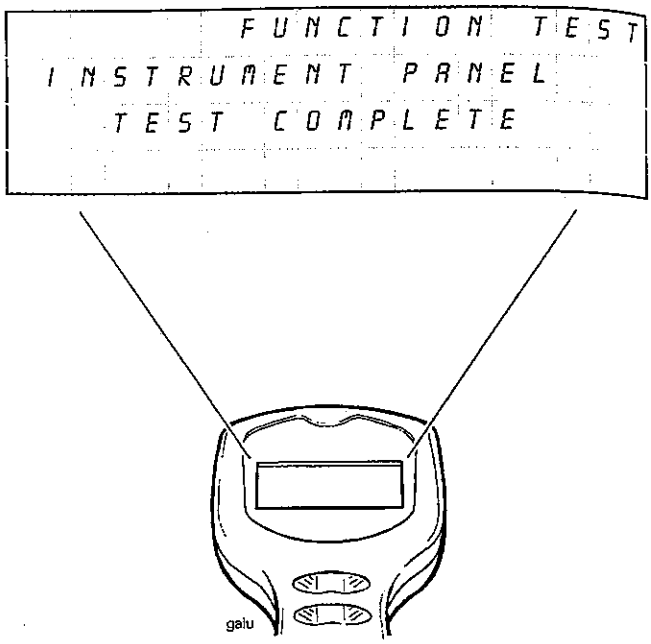


The screen now displayed will be specific to the component being tested:

In the example selected – **'INSTRUMENT PANEL'**, the instruction is to observe the gauges.

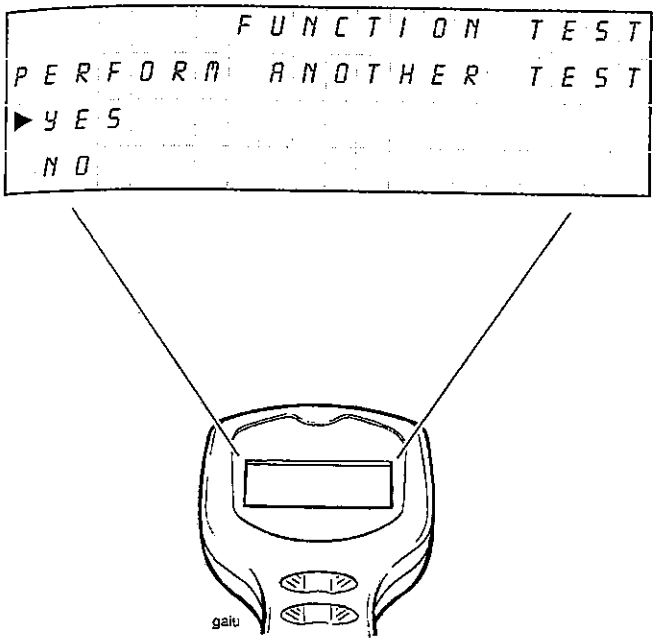
After a period of time, the screen will automatically change to either **'TEST COMPLETE'** (see operation 23) which will indicate a satisfactory completion, or to **'TEST FAILED'** (see operation 25) which will indicate failure.

23. FUNCTION TEST



If the test is satisfactory the display will read **'TEST COMPLETE'**. Press the Validation key '*' to display **'FUNCTION TEST'** (operation 24).

24. FUNCTION TEST

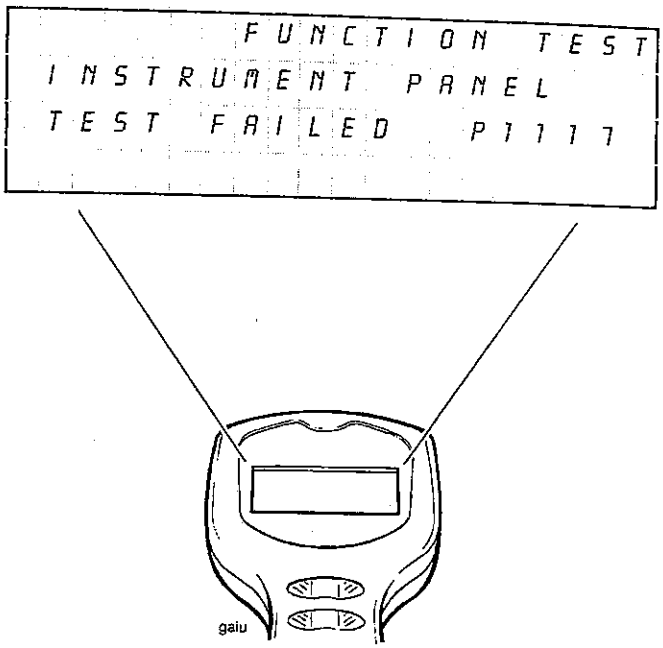


This display allows you to decide whether you wish to test another component.

Either – position the cursor on line 3 **'YES'** and press the Validation key '✳' to return to the **'FUNCTION TEST'** selection menu,

or – position the cursor on line 4 **'NO'** and press the Validation key '✳' to return to **'DIAGNOSTICS'** menu (operation 9).

25. FUNCTION TEST



If the test selected at operation 22 is unsatisfactory, a DTC will be displayed on line 3 of this display.

Press the Help key (**?**) to access the diagnosis information associated with that code.

Press the Validation key '✳' if you wish to test another component (operation 24).

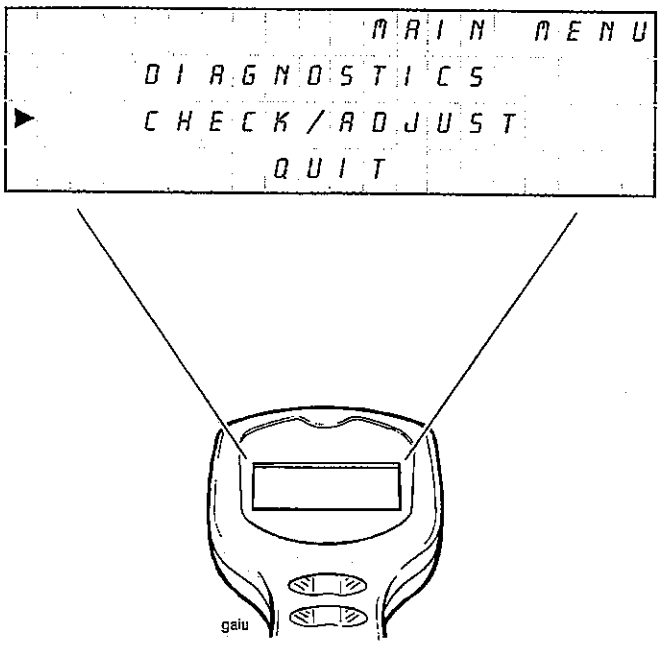
NOTE:

- **Any DTC's logged in the system will be automatically cleared at this point.**

To return to the **'DIAGNOSTICS'** menu, Select **'QUIT'** and press the Validation key '✳' to return to the **'MAIN MENU'** (operation 8).

That completes the **FUNCTION TESTS** cycle.

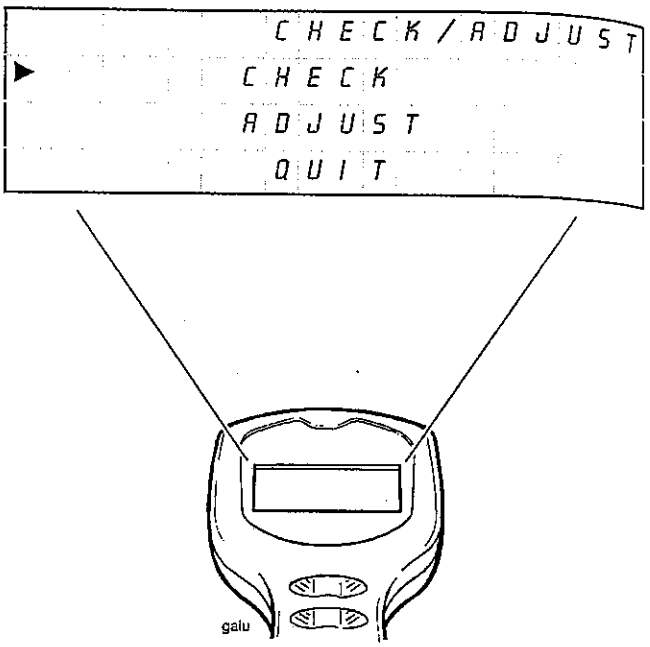
26. To select 'CHECKS/ADJUSTMENTS' from the MAIN MENU (operation 8):–



Use the 'Up' and 'Down' keys to position the cursor opposite **'CHECK/ADJUST'.**

Press the Validation key '*'; the **'CHECK/ADJUST'** menu will be displayed.

27. CHECK/ADJUST



This is the Checks and Adjustments menu.

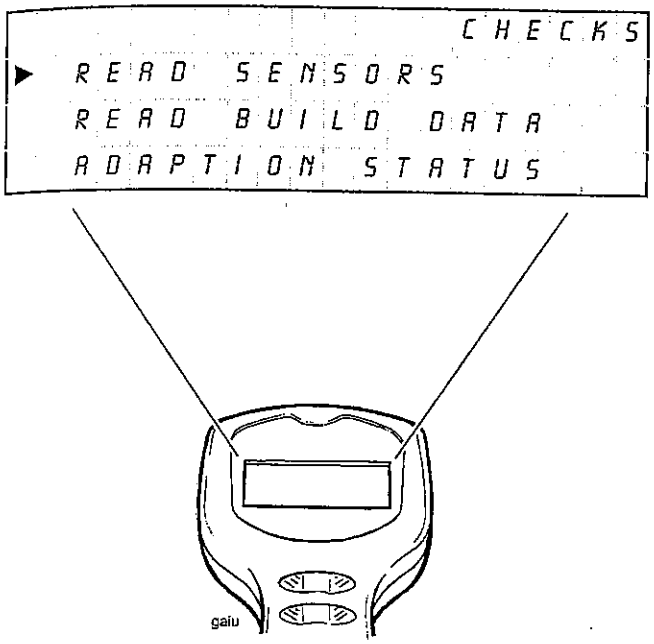
Use the 'Up' and 'Down' keys to position the cursor as follows, and then press the Validation key '*':

Opposite **'CHECK'** – **'CHECKS'** will be displayed (operation 28).

Opposite **'ADJUST'** – **'ADJUST'** will be displayed (operation 32).

Opposite **'QUIT'** – to return to **'MAIN MENU'** (operation 8).

28. CHECKS



You now have the option to access the motorcycle **'BUILD DATA'** or the **'SYSTEM DATA'**, or to quit.

Position the cursor as follows and then press the Validation key '✳':

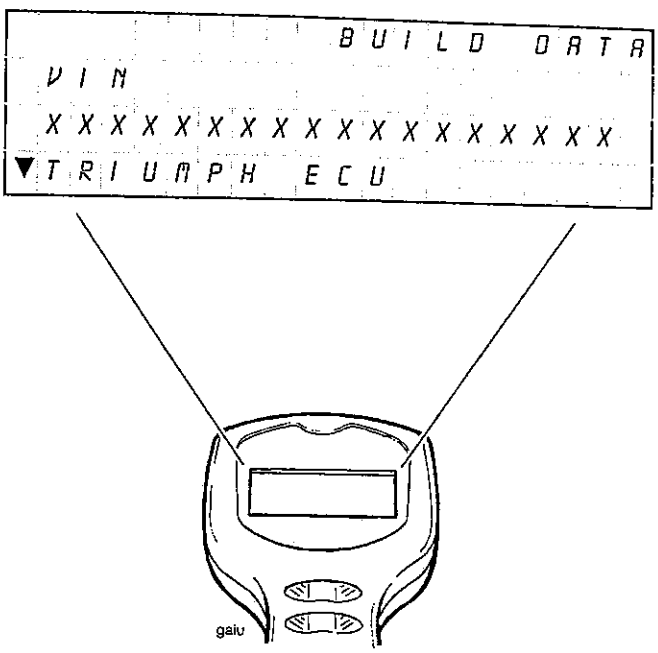
Opposite **'READ SENSORS'** – **'SENSOR DATA'** (operation 30) will be displayed.

Opposite **'READ BUILD DATA'** – **'BUILD DATA'** (operation 29) will be displayed.

Opposite **'ADAPTION STATUS'** – **'ADAPTION DATA'** (operation 31) will be displayed if the coolant temperature is higher than 90°C. If not, a holding screen will be displayed indicating the current temperature.

Opposite **'QUIT'** – to return to **'MAIN MENU'** (operation 8).

29. BUILD DATA

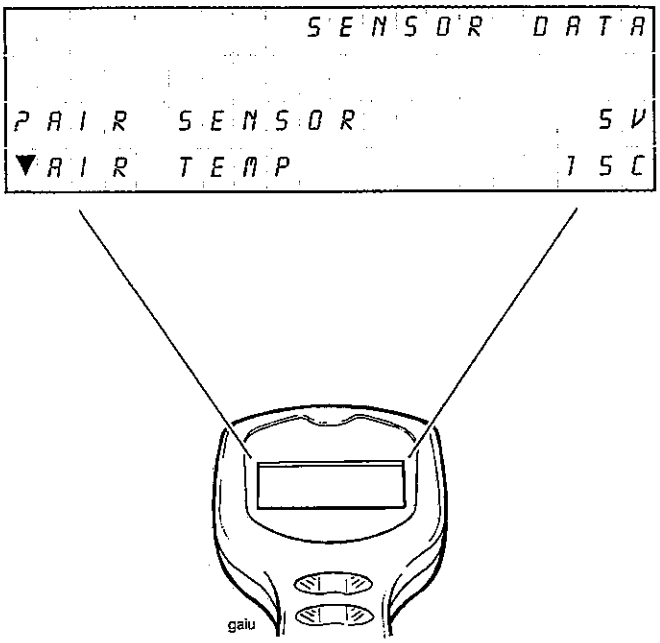


Providing the information was recorded at the time of build, the display will show the following information relating to the motorcycle under test by scrolling up and down. Before displaying the recorded information, the tool will briefly display the message, **'PLEASE WAIT, CHECKING BUILD DATA'.**

Vehicle Identification Number (VIN)
Triumph ECM part number
Manufacturer's ECM part number
ECM Serial number
Tune Number

Press the Validation '✳' keys to return to **'CHECK/ADJUST'** menu (operation 27).

30. SENSOR DATA



The display can be scrolled to show:

The status of the various sensors and actuators

To obtain further data information, scroll the appropriate line to the help key mark (?) and press the Help key.

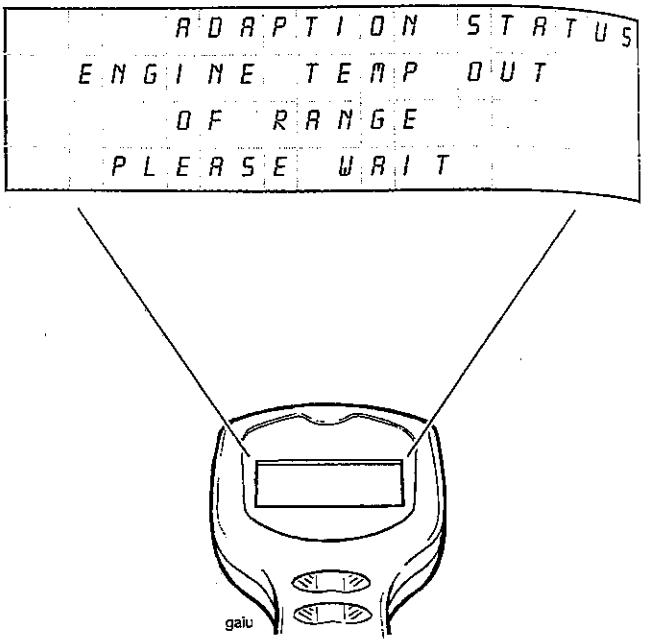
NOTE:

- **The help information shows the likely range of readings for a correctly functioning system at normal operating temperature.**

That completes examination of the Checks.

Press the Validation key '*' to return to **'CHECK/ADJUST'** (operation 27).

31. ADAPTION STATUS

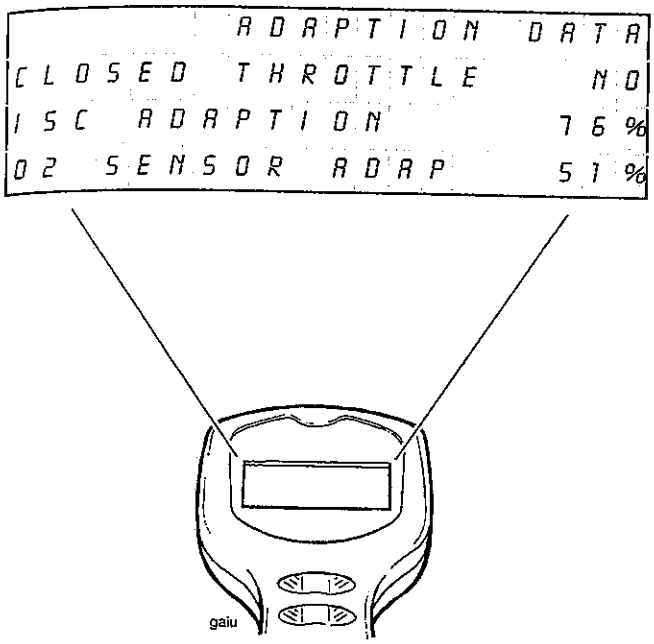


Because adaption only takes place at normal operating temperature, the above screen will be displayed until the engine reaches normal operating temperature.

Until the engine warms or cools to the correct temperature range, the tool will not allow access to any other functions. If you wish to escape from this area (and not carry out the adjustment) switch off the ignition and disconnect the tool.

Once the correct temperature range has been reached, the **ADAPTION STATUS** screen (operation 32) will automatically be displayed.

31 (CONT'D). ADAPTION STATUS



The display can be scrolled to show:

The adaption status of the various sensors and actuators involved in the adaption process will give an indication as to whether or not the vehicle is correctly adapted. If the readings show an incorrect adaption status, refer to the table of contents for the location of further information and the actions necessary to force correct adaption.

See page 8-110 for additional information on forcing adaption.

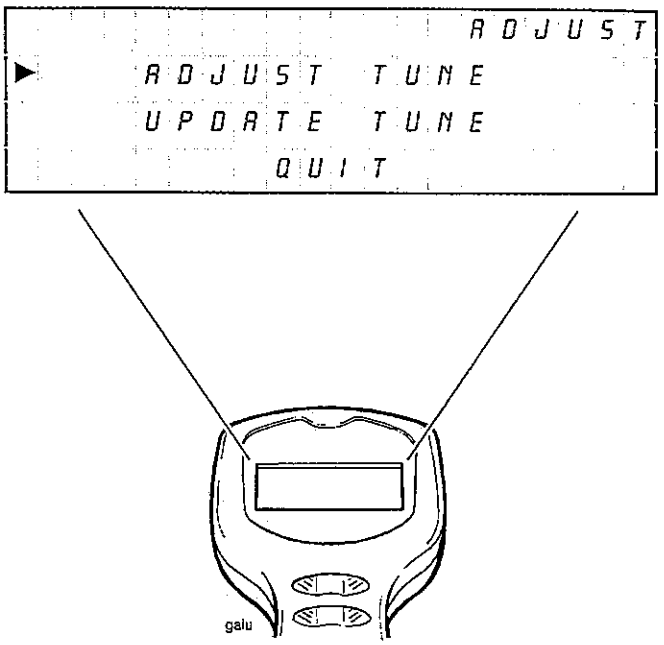
The data displayed under this option are:

Function Examined	Report Method
Closed throttle position reference status	adapted/not adapted
Idle speed control adaption status	%
Oxygen sensor adaption status (off idle)	%
Oxygen sensor adaption range (off idle)	%
Oxygen sensor adaption status (idle)	%
Oxygen sensor adaption range (idle)	%

NOTE:

- **Several forced adaptions may be needed to fully adapt an individual motorcycle.**

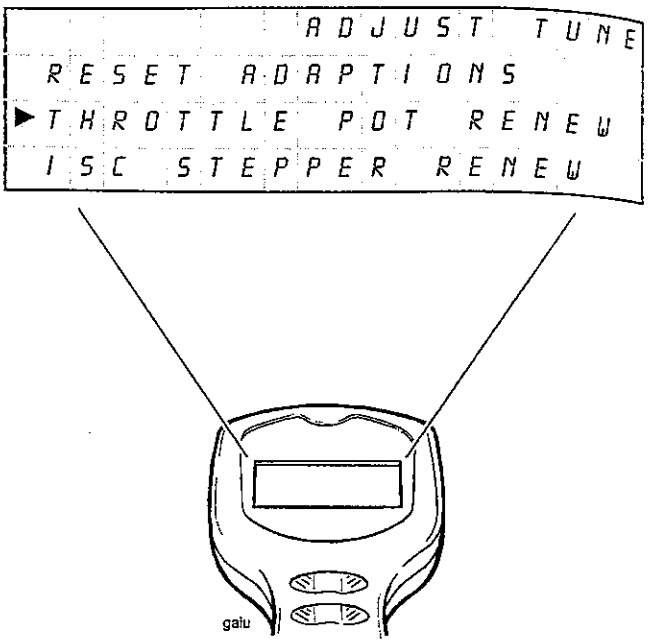
32. ADJUST



Position the cursor on line 2 **'ADJUST TUNE'** if you wish to check and/or adjust the values of certain tune items. Then press the Validation key '✳' to display **ADJUST TUNE** (see operation 33).

In special circumstances, Triumph will request you to introduce a completely new engine tune. Given this situation, select **'UPDATE TUNE'** and press the Validation key '✳' (see operation 36).

33. ADJUST TUNE



The following allow adjustments to be made to items which affect the engine operation

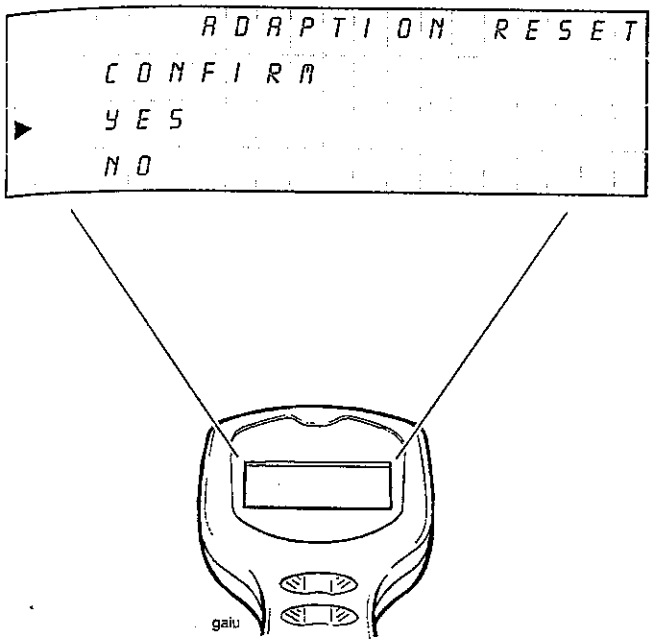
Position the cursor opposite the setting you wish to adjust and press the Validation key '✳'.

RESET ADAPTIONS. – See operation 34

THROTTLE POT RENEW. – See page 8-102 for details on when and how to use this function.

IDLE SPEED CONTROL STEPPER RENEW - Seepage 8-106 for details on when and how to use this function.

34. ADJUST TUNE (adaption reset)



After selecting the adaption reset option, confirm or reject the option by positioning the cursor opposite the option chosen and press the Validation key '*'.

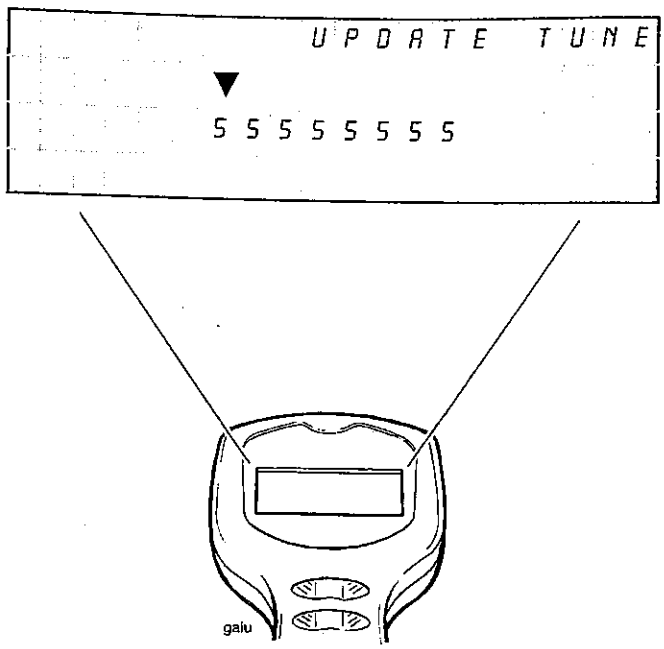
If YES is chosen, a screen will confirm that adaptions have been reset.

If NO is chosen, you will be returned to the adjust tune menu.

NOTE:

- **Resetting the adaption values does not adapt the motorcycle. This can only be done by the method explained later in this section. Adaption reset only returns adaption values to their 'start' point.**

35. UPDATE TUNE



(Accessed from operation 32). On receipt of special instructions from Triumph you may be asked to input a completely new engine tune.

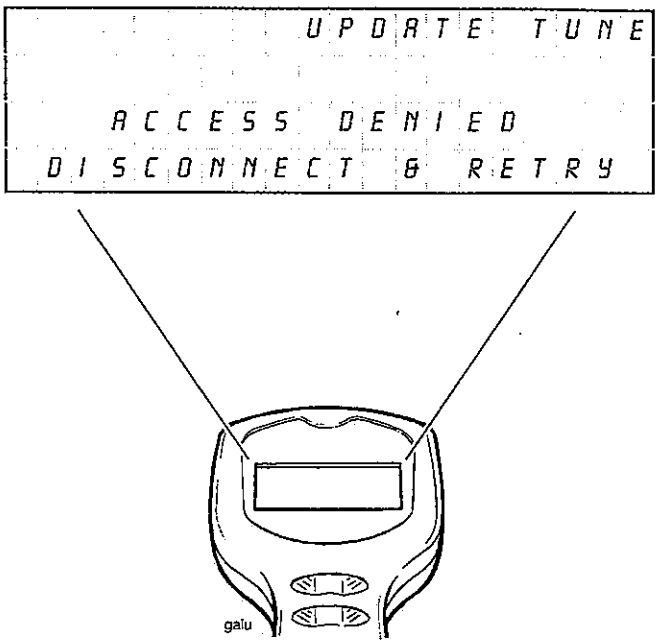
To do this, they will give you a password number which must be entered using the 'Up' and 'Down' keys in the same way as was done to enter your dealer code number.

After entering the final digit, press the Validation key '*' again.

If the password number entered is invalid, the screen shown in operation 36 will be displayed.

If the password number is valid, the tool will briefly display the message, **'PLEASE WAIT, CHECKING ECM TYPE'** then, **'UPDATE TUNE'** (operation 37) will be displayed.

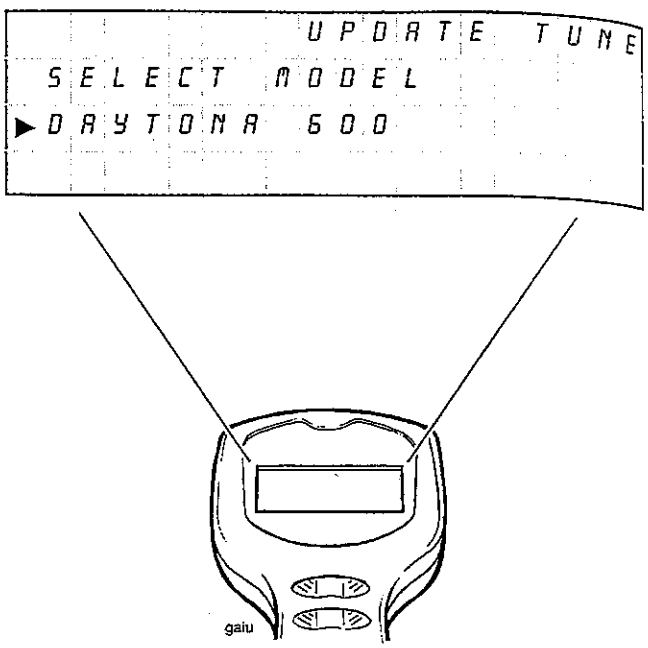
36. UPDATE TUNE



If the Password number has been incorrectly entered, the screen will display **'ACCESS DENIED'**. Press the Validation key '*' to return to **MAIN MENU** (operation 8) and start again.

If after a second attempt the entry is still invalid, the screen will display **'ACCESS DENIED DISCONNECT AND RETRY'**. The diagnostic tool must be disconnected and the complete procedure re-started.

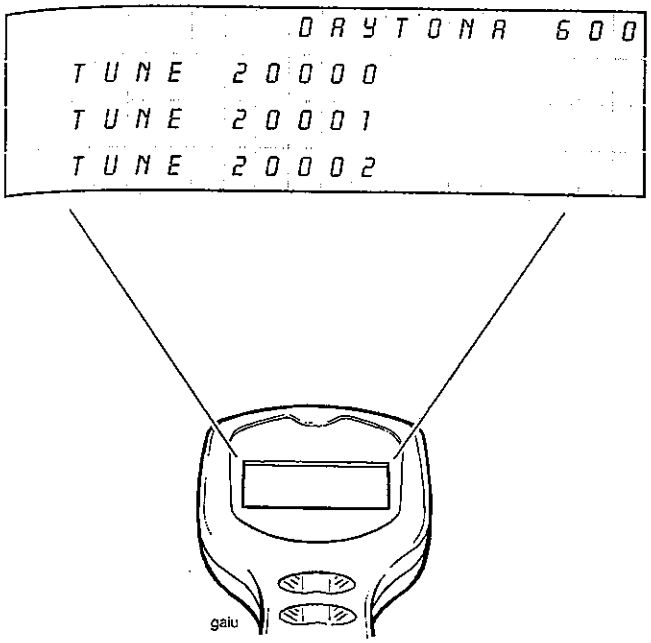
37. UPDATE TUNE



Align the cursor with the model to which a tune is to be downloaded and, when satisfied that the selection is correct, press the validation key '*'.

Once a model has been selected and the validation key pressed, screen 38 will be displayed.

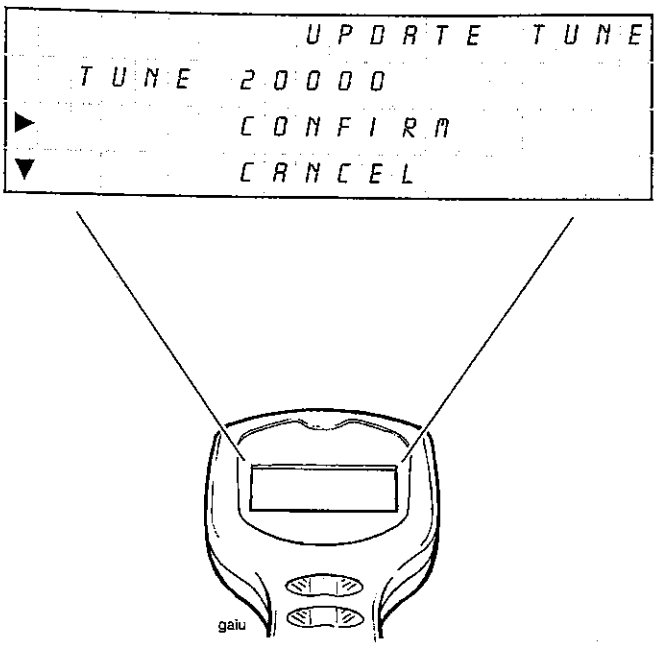
38. UPDATE TUNE



Scroll to the tune required and press the Validation key '*' to move on to operation 39.

Press the help key for information on the applicability of each tune number.

39. UPDATE TUNE



Scroll to either **'CONFIRM'**, **'CANCEL'** or **'QUIT'** (quit option will not be visible until the text has been scrolled) then press the Validation key '*'.

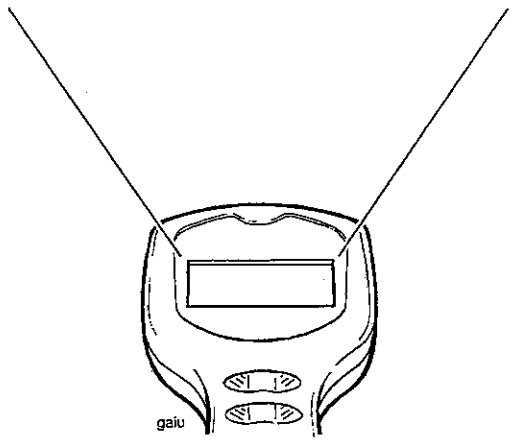
If **'QUIT'** has been selected – this will return to **MAIN MENU** (operation 8)

If **'CANCEL'** has been selected – return to operation 38.

If **'CONFIRM'** has been selected, downloading will begin.

40. UPDATE TUNE (confirm selected)

```
UPDATE TUNE
DOWNLOADING.....
10% COMPLETE
```



The screen will show **'DOWNLOADING'**, and the selected software will be automatically downloaded into the ECM.

When complete, the screen will display **'DOWNLOAD COMPLETE'**.

Press the Validation key '*' to return to the **'MAIN MENU'** (operation 8).

If downloading has been unsuccessful the screen will display **'DOWNLOAD FAILED'**. Should this message appear, refer to 41, restarting tune download.

Press the Validation key '*' to return to the **'MAIN MENU'** (operation 8).

NOTE:

- **A TUNE DOWNLOAD CAN TAKE UP TO 15 MINUTES TO COMPLETE.**

41. RESTARTING TUNE DOWNLOAD

CAUTION: If, for any reason downloading is interrupted, the ECM will not function and tune download cannot be restarted in the normal way. This is because the tool's operating system has been erased from the ECM's memory and has not yet been fully replaced.

Download interruption can occur for a variety of reasons such as, accidental disconnection of the tool, a flat battery, turning the ignition switch to OFF during download etc.

In these circumstances, a special-tool key-press-sequence must be followed which is described below

To restart download, switch the motorcycle ignition to OFF and disconnect the tool. Reconnect the tool, switch the motorcycle ignition to ON, and scroll through to the screen shown below.

```
TRIUMPH MOTORCYCLES
DIAGNOSTIC TOOL
SOFTWARE VERSION
16.0
```

From this screen, use the following button press sequence:

HELP (?) - HELP (?) - RETURN (↵) - HELP (?) VALIDATE (*).

The dealer log-in screen will then be displayed. From that screen, download can be restarted in the normal way.

NOTE:

- **The software version number is not relevant to this procedure. All versions of the diagnostic software will operate in the way described.**

ELECTRICAL CONNECTORS

Before beginning any diagnosis, the following connector related information should be noted:

NOTE:

- **A major cause of hidden electrical faults can be traced to faulty electrical connectors. For example:**
- **Dirty/corroded terminals**
- **Damp terminals**
- **Broken or bent cable pins within multiplugs**

For example, the electronic control module (ECM) relies on the supply of accurate information to enable it to plan the correct fuelling and ignition timing. One dirty terminal will cause an excessive voltage drop resulting in an incorrect signal to the ECM.

If, when carrying out fault diagnosis, a fault appears to clear by simply disconnecting and reconnecting an electrical plug, examine each disconnected plug for the following.

Before Disconnection:

- If testing with a voltmeter, the voltage across a connector should be virtually battery volts (unless a resistor is fitted in the circuit). If there is a noticeable change, suspect faulty/dirty connections.

When Disconnecting A Connector

- Check for a security device which must be released before the connector can be separated. E.G. barb, hook and eye etc.

When Inspecting A Connector

- Check that the individual pins have not been bent
- Check for dampness/dirt/corrosion
- Check cables for security
- Check cable pin joints for damage

When Connecting A Connector

- Ensure there is no dirt around the connector/seal
- Push together squarely to ensure terminals are not bent or incorrectly located
- Push the two halves together positively.

Disconnection of ECM connectors

NOTE:

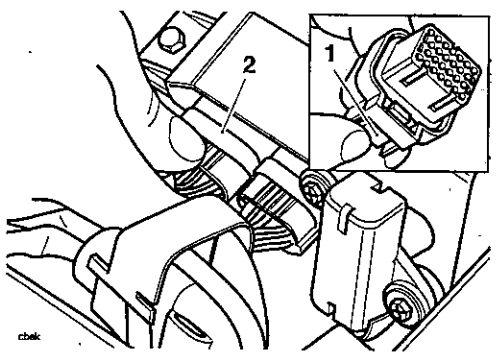
- **Two different sized connectors are used in the ECM which ensures correct connection is always made.**

CAUTION: When disconnecting a connector, never pull directly on the wires as this will result in cable and connector damage.

CAUTION: Never disconnect an ECM when the ingniton switch is in the ON position as this will cause multiple fault codes to be logged in the ECM memory.

Always disconnect an ECM after disconnecting the battery negative (black) lead first.

1. Press down on the locking device and gently pull back on the connector to release it from the ECM.

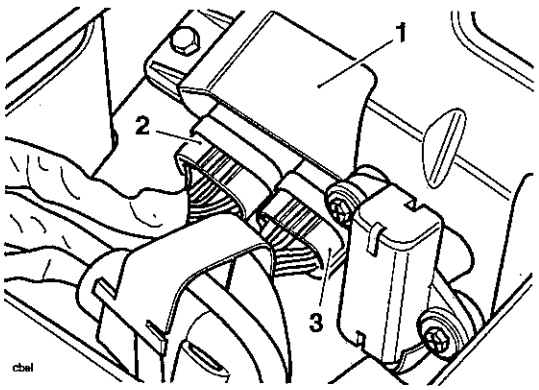


1. Locking device (inset)

2. Socket

Reconnection of ECM connectors.

CAUTION: Damage to the connector pins may result if an attempt to fit the connectors incorrectly is made.



1. ECM

2. Large connector

3. Small connector

2. Fit the connector into its socket and, whilst holding the connector in place, insert it fully into the ECM until the locking device retains it.

FURTHER DIAGNOSIS

The tables which follow will, if used correctly, help to pinpoint a fault in the system once a diagnostic trouble code has been stored.

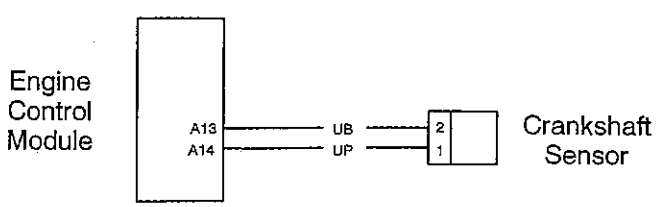
CRANKSHAFT SENSOR

Fault Code	Possible cause	Action
P0335	Crankshaft sensor system fault	View & note diagnostic tool 'freeze frame' data if available. Ensure sensor is fitted correctly and connector is secure. Disconnect ECM and proceed to pinpoint test 1

Pinpoint Tests

Test	Result	Action
1 Check terminal and cable integrity: - ECM pin A13 - ECM pin A14	OK	Disconnect sensor and proceed to test 2
	Faulty	Rectify fault, proceed to test 7
2 Check cable for short circuit: - ECM pin A13 to earth - ECM pin A14 to earth	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 7
3 Check cable continuity: - ECM pin A14 to sensor pin 1 - ECM pin A13 to sensor pin 2	OK	Proceed to test 4
	Open circuit	Locate and rectify wiring fault, proceed to test 7
4 Check cable for short circuit: - ECM pin A13 to ECM pin A14	OK	Renew crankshaft sensor, proceed to test 7
	Short circuit	Locate and rectify wiring fault, proceed to test 7
5 Check cable continuity: - Sensor screen cable to earth	OK	Proceed to test 6
	Open circuit	Locate and rectify wiring fault, proceed to test 7
6 Check crank toothed wheel: - Damage to teeth- magnetic debris contamination	OK	Proceed to test 7
	Faulty	Clean / renew toothed wheel, proceed to test 7
7 Reconnect harness, clear fault code and run engine to verify fault cleared	OK	Action complete - quit test
	Fault still present	Contact Triumph service

Circuit Diagram



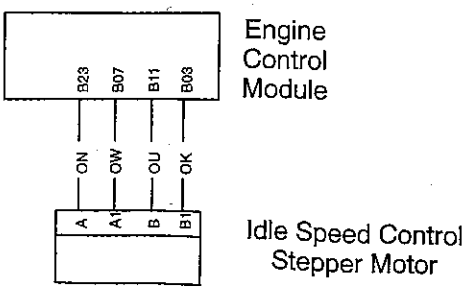
IDLE SPEED CONTROL

Fault Code	Possible cause	Action
P0505	ISC stepper motor / wiring fault	View & note diagnostic tool 'freeze frame' data if available. View & note diagnostic tool 'sensor' data. Ensure sensor connector is secure. Disconnect ECM and proceed to pinpoint test 1

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin B23 - ECM pin BO7 - ECM pin B11 - ECM pin B03	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 7
2	Check resistance value: - ECM pin B23 to ECM pin B07 - ECM pin B11 to ECM pin B03	4Ω to 12Ω	Disconnect stepper motor and proceed to test 3
		Open circuit	Proceed to test 4
		Short circuit	Disconnect stepper motor and proceed to test 5
3	Check cable for short circuit: - ECM pin B23 to earth - ECM pin B07 to earth - ECM pin B11 to earth - ECM pin B03 to earth	OK	Proceed to test 7
		Short circuit	Locate and rectify wiring fault, proceed to test 7
4	Check cable continuity: - ECM pin B23 to stepper motor pin A - ECM pin B07 to stepper motor pin A1 - ECM pin B11 to stepper motor pin B - ECM pin B03 to stepper motor pin B1	OK	Proceed to test 6
		Open circuit	Locate and rectify wiring fault, proceed to test 7
5	Check cable for short circuit: - ECM pin B23 to ECM pin B07 - ECM pin B11 to ECM pin B03	OK	Proceed to test 6
		Short circuit	Locate and rectify wiring fault, proceed to test 7
6	Check stepper motor resistance: - Motor pin A to motor pin A1 - Motor pin B to motor pin B1	4Ω to 12Ω	Proceed to test 7
		Faulty	Renew stepper motor, proceed to test 7
7	Reconnect harness, clear fault code and run diagnostic tool function test to visually verify operation of stepper motor	OK	Action complete - quit test
		Fault	Contact Triumph service

Circuit Diagram



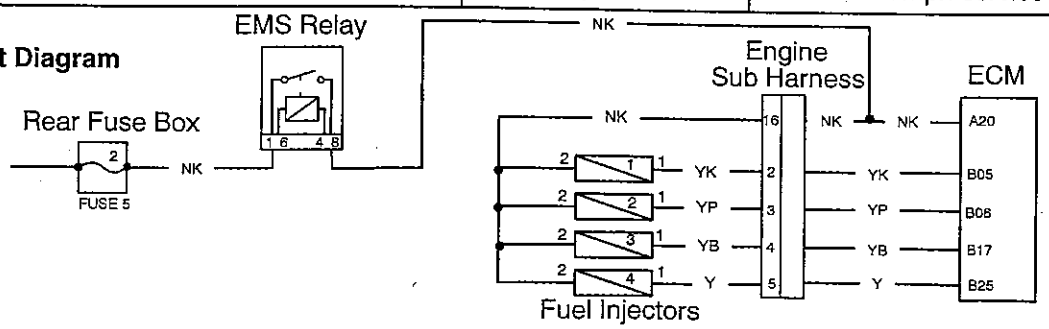
FUEL INJECTORS

Fault Code	Possible cause	Action
P0201/02/03/04	Injection system fault - Injector 1/2/3/4 - Misfire indicates open circuit - Flooding indicates short circuit	View & note diagnostic tool 'freeze frame' data if available. Ensure relevant injector connector is secure. Disconnect ECM and proceed to pinpoint test 1

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin B05 - ECM pin B06 - ECM pin B17 - ECM pin B25	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 7
2	Check resistance value: - ECM pin A20 to ECM pin B05 (injector 1) - ECM pin A20 to ECM pin B06 (injector 2) - ECM pin A20 to ECM pin B17 (injector 3) - ECM pin A20 to ECM pin B25 (injector 4)	12.5Ω to 14.0Ω	Proceed to test 3
		Open circuit	Disconnect relevant injector and proceed to test 4
		Short circuit	Disconnect relevant injector and proceed to test 5
3	Check cable for short circuit to ground: - ECM pin B05 to earth - ECM pin B06 to earth - ECM pin B17 to earth - ECM pin B25 to earth	OK	Proceed to test 7
		Short circuit	Locate and rectify wiring fault, proceed to test 7
4	Check cable continuity: - ECM pin A20 to relevant injector pin 2 - ECM pin B05 to injector 1 pin 1 - ECM pin B06 to injector 2 pin 1 - ECM pin B17 to injector 3 pin 1 - ECM pin B25 to Injector 4 pin 1	OK	Proceed to test 6
		Open circuit	Locate and rectify wiring fault, proceed to test 7
5	Check cable for short circuit to supply box: - ECM pin A20 to ECM pin B05 (inj 1) - ECM pin A20 to ECM pin B06 (inj 2) - ECM pin A20 to ECM pin B17 (inj 3) - ECM pin A20 to ECM pin B25 (inj 4)	OK	Proceed to test 6
		Short circuit	Locate and rectify wiring fault, proceed to test 7
6	Check relevant injector resistance: - Injector pin 1 to injector pin 2	12.5Ω to 14.0Ω	Proceed to test 7
		Faulty	Renew relevant injector, proceed to test 7
7	Reconnect harness, clear fault code and run engine to verify fault cleared	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



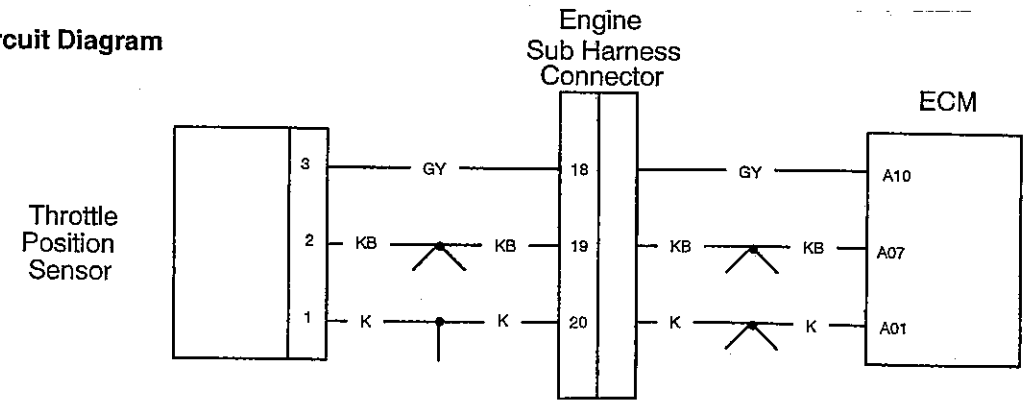
THROTTLE POSITION SENSOR

Fault Code	Possible cause	Action
P0122 P0123	Throttle position sensor low input voltage (short to ground or open circuit) Throttle position sensor high input voltage (short circuit to sensor supply)	View & note diagnostic tool 'freeze frame' data if available. View & note diagnostic tool 'sensor' data. Ensure sensor connector is secure. Disconnect ECM and proceed to pinpoint test 1

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin A01 - ECM pin A07 - ECM pin A10	OK	Disconnect sensor and proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable for short circuit: - ECM pin A10 to ground	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 5
3 Check cable continuity: - ECM pin A01 to sensor pin 1 - ECM pin A07 to sensor pin 2 - ECM pin A10 to sensor pin 3	OK	Proceed to test 4
	Open circuit	Locate and rectify wiring fault, proceed to test 5
4 Check cable for short circuit: - ECM pin A10 to ECM pin A01 - ECM pin A10 to ECM pin A07	OK	Renew throttle position sensor, proceed to test 5
	Short circuit	Locate and rectify wiring fault, proceed to test 5
5 Reconnect harness, clear fault code and run engine to verify fault cleared	OK	Action complete - quit test
	Fault still present	Contact Triumph service

Circuit Diagram



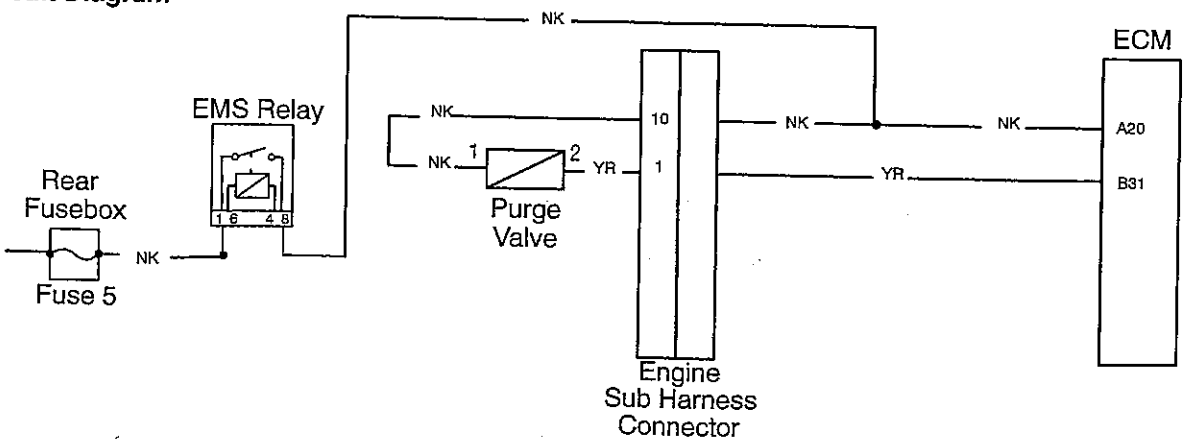
PURGE VALVE

Fault Code	Possible cause	Action
P0444	Open circuit or short circuit to earth	View & note diagnostic tool 'sensor' data. Ensure purge valve connector is secure. Disconnect ECM and proceed to pinpoint test 1
P0445	Short circuit to battery+	Disconnect purge valve and proceed to pinpoint test 5

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin B31	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 7
2 Check resistance value: - ECM pin A20 to ECM pin B31	24Ω to 28Ω	Disconnect purge valve and proceed to test 3
	Open circuit	Proceed to test 4
	Short circuit	Disconnect purge valve and proceed to test 5
3 Check cable for short circuit: - ECM pin B31 to earth	OK	Proceed to test 7
	Short circuit	Locate and rectify wiring fault, proceed to test 7
4 Check cable continuity: - ECM pin B31 to valve pin 2 - ECM pin A20 to valve pin 1	OK	Proceed to test 6
	Open circuit	Locate and rectify wiring fault, proceed to test 7
5 Check cable for short circuit: - ECM pin A20 to ECM pin B31	OK	Proceed to test 6
	Short circuit	Locate and rectify wiring fault, proceed to test 7
6 Check purge valve resistance: - Valve pin 1 to valve pin 2	24Ω to 28Ω	Proceed to test 7
	Faulty	Renew purge valve, proceed to test 7
7 Reconnect harness, clear fault code and run diagnostic tool function test to visually verify operation of purge valve	OK	Action complete - quit test
	Fault	Contact Triumph service

Circuit Diagram



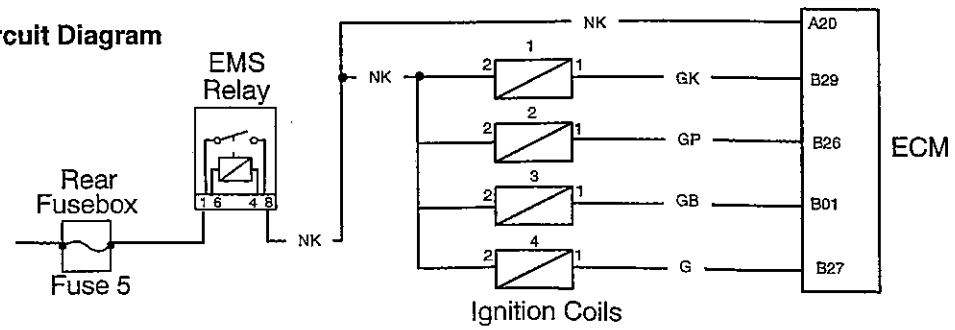
IGNITION COILS

Fault Code	Possible cause	Action
P0351/52/53/54	Ignition system fault - Ign coil 1/2/3/4	View & note diagnostic tool 'freeze frame' data if available. Ensure relevant ign coil connector is secure. Disconnect ECM and proceed to pinpoint test 1:-

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin B29 - ECM pin B26 - ECM pin B01 - ECM pin B27	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 7
2	Check resistance value: ECM pin A20 to - ECM pin (ign coil 1) B29 - ECM pin (ign coil 2) B26 - ECM pin (ign coil 3) B01 - ECM pin (ign coil 4) B27	0.9Ω to 1.6Ω	Proceed to test 3
		Open circuit	Disconnect relevant ignition coil and proceed to test 4
		Short circuit	Disconnect relevant ignition coil and proceed to test 5
3	Check cable for short circuit: - ECM pin to earth B29 - ECM pin to earth B26 - ECM pin to earth B01 - ECM pin to earth B27	OK	Proceed to test 7
		Short circuit	Locate and rectify wiring fault, proceed to test 7
4	Check cable continuity: Power latch relay pin 8 to any ign coil pin 2 - ECM pin B29 to ign coil 1 pin 1 - ECM pin B26 to ign coil 2 pin 1 - ECM pin B01 to ign coil 3 pin 1 - ECM pin B27 to ign coil 4 pin 1	OK	Proceed to test 6
		Open circuit	Locate and rectify wiring fault, proceed to test 7
5	Check cable for short circuit: ECM pin A20 to - ECM pin (ign coil 1) B29 - ECM pin (ign coil 2) B26 - ECM pin (ign coil 3) B01 - ECM pin (ign coil 4) B27	OK	Proceed to test 6
		Short circuit	Locate and rectify wiring fault, proceed to test 7
6	Check relevant ign coil resistance: - Ign coil pin 1 to ign coil pin 2	0.9Ω to 1.6Ω	Proceed to test 7
		Faulty	Renew relevant ignition coil, proceed to test 7
7	Reconnect harness, clear fault code and run engine to verify fault cleared	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



COOLANT TEMPERATURE SENSOR

Fault Code	Possible cause	Action
P0118	Open circuit, or short circuit to battery+	View & note diagnostic tool 'freeze frame' data if available. View & note diagnostic tool 'sensor' data. Ensure sensor connector is secure. Disconnect ECM and proceed to pinpoint test 1:-
P0117	Short circuit to ground	Disconnect sensor and proceed to test 6

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin A09 - ECM pin A07	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 7
2 Check resistance value: - ECM pin A09 to ECM pin A07 (Temperature dependent,-see below)	OK	Disconnect temp sensor and proceed to test 6
	Open circuit	Disconnect sensor and proceed to test 3
	Short circuit	Disconnect temp sensor and proceed to test 4
3 Check cable continuity: - ECM pin A09 to sensor pin 1 - ECM pin A07 to sensor pin 2	OK	Proceed to test 5
	Open circuit	Locate and rectify wiring fault, proceed to test 7
4 Check cable for short circuit: - ECM pin A09 to ECM pin A07	OK	Proceed to test 5
	Short circuit	Locate and rectify wiring fault, proceed to test 7
5 Check sensor resistance: - Sensor pin 1 to sensor pin 2 (Temperature dependent,-see below)	OK	Proceed to test 7
	Faulty	Renew temp sensor, proceed to test 7
6 Check cable for short circuit: - ECM pin 1/B2 to ground	OK	Proceed to test 7
	Short circuit	Locate and rectify wiring fault, proceed to test 7
7 Reconnect harness, clear fault code and run engine to verify fault cleared	OK	Action complete - quit test
	Fault	Contact Triumph service

Resistance data under typical conditions:

Warm engine - 200 to 400Ω.

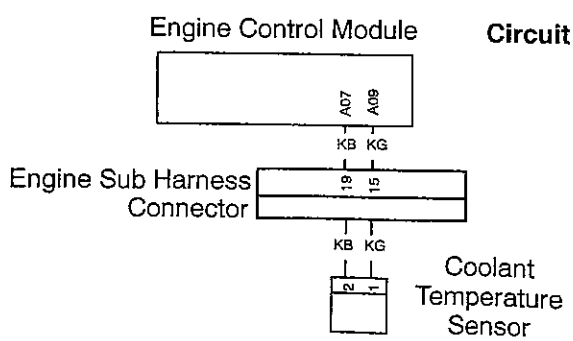
Cold engine:

20ºC ambient 2.35 to 2.65KΩ.

10ºC ambient 3.60 to 4.00KΩ.

0ºC ambient 5.60 to 6.25KΩ

Circuit Diagram



INLET AIR TEMPERATURE SENSOR

Fault Code	Possible cause	Action
P0113	Open circuit, or short circuit to battery+	View & note diagnostic tool 'freeze frame' data if available. View & note diagnostic tool 'sensor' data. Ensure sensor connector is secure. Disconnect ECM and proceed to pinpoint test 1:-
P0112	Short circuit to ground	Disconnect sensor and proceed to pinpoint test 6

Pinpoint Tests

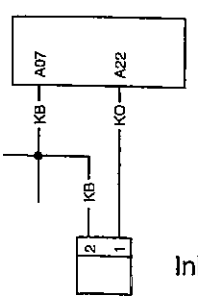
	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin A22 - ECM pin A07	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 7
2	Check resistance value: - ECM pin A22 to ECM pin A07 (Temperature dependent-see below)	OK	Disconnect temp sensor and proceed to test 6
		Open circuit	Disconnect temp sensor and proceed to test 3
		Short circuit	Disconnect temp sensor and proceed to test 4
3	Check cable continuity: - ECM pin A22 to sensor pin 1 - ECM pin A07 to sensor pin 2	OK	Proceed to test 5
		Open circuit	Locate and rectify wiring fault, proceed to test 7
4	Check cable for short circuit: - ECM pin A22 to ECM pin A07	OK	Proceed to test 5
		Short circuit	Locate and rectify wiring fault, proceed to test 7
5	Check sensor resistance: - Sensor pin 1 to sensor pin 2 (Temperature dependent-see below)	OK	Proceed to test 7
		Faulty	Renew temp sensor, proceed to test 7
6	Check cable for short circuit: - ECM pin A22 to ground	OK	Proceed to test 7
		Short circuit	Locate and rectify wiring fault, proceed to test 7
7	Reconnect harness, clear fault code and run engine to verify fault cleared	OK	Action complete - quit test
		Fault	Contact Triumph service

If engine is warm, remove sensor and allow time to cool to ambient prior to test.

Resistance data:

Ambient temp	Resistance value
30ºC	1.6 to 1.8KΩ
25ºC	1.9 to 2.2KΩ
20ºC	2.3 to 2.7KΩ
15ºC	2.9 to 3.3KΩ
10ºC	3.5 to 4.0KΩ
5ºC	4.4 to 4.9KΩ
0ºC	5.5 to 6.1KΩ

Circuit Diagram



Engine Control Module

Inlet Air Temperature Sensor

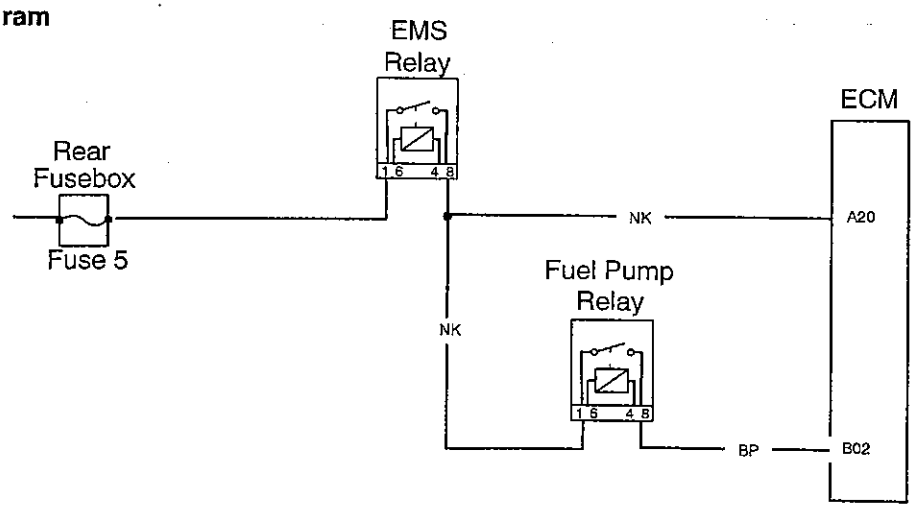
FUEL PUMP RELAY

Fault Code	Possible cause	Action
P1231	Fuel pump relay open circuit, or short circuit to ground	Check if pump runs briefly when ignition is switched on. Ensure fuel pump relay connector is secure. Disconnect ECM and proceed to pinpoint test 1:-
P1232	Short circuit to battery+	Disconnect fuel pump relay and proceed to pinpoint test 4

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin B02	OK	Disconnect fuel pump relay and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - ECM pin B02 to earth	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable continuity: - ECM pin B02 to fuel pump relay pin 4 - Fuel pump relay pin 6 to EMS relay pin 8	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable for short circuit: - ECM pin B02 to ECM pin A20	OK	Proceed to test 5
		Short circuit	Locate and rectify wiring fault, proceed to test 5
5	Reconnect harness, clear fault code and run diagnostic tool function test to verify fault cleared	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



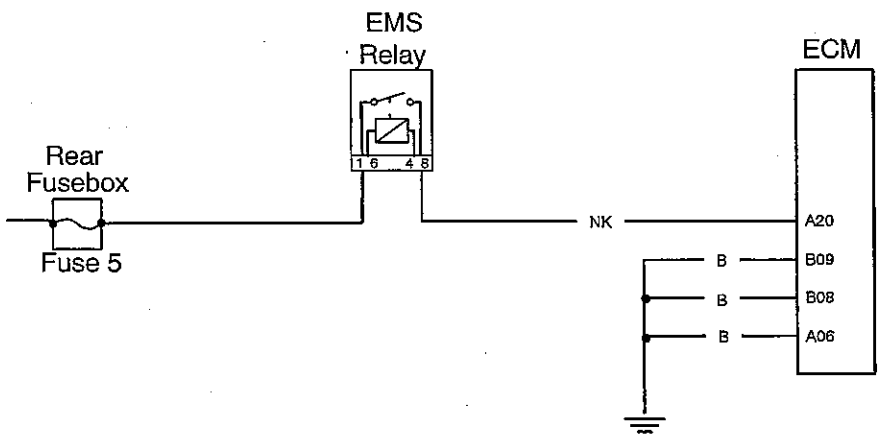
SYSTEM VOLTAGE

Fault Code	Possible cause	Action
P0560	Bike voltage system fault	View & note diagnostic tool 'sensor' data. Ensure voltage across battery is acceptable, note voltage. Disconnect ECM and proceed to pinpoint test 1

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin A20	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 3
2	With Ignition 'on', check voltage at: - ECM pin A20	Same as 'across battery' voltage	Proceed to test 3
		Less than 'across battery' voltage	Locate and rectify wiring fault, proceed to test 3
3	Reconnect harness, clear fault code and run engine to verify fault cleared	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



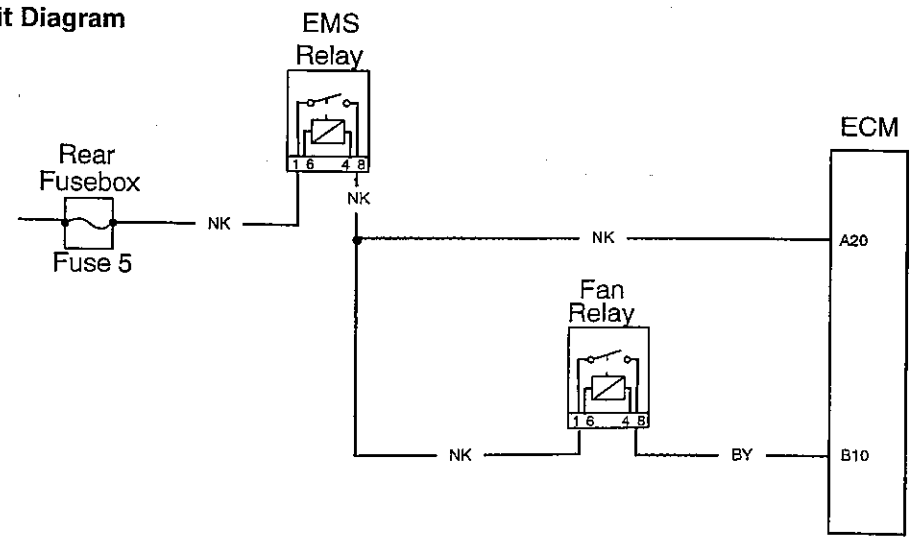
COOLING FAN RELAY

Fault Code	Possible cause	Action
P1552	Fan relay open circuit, or short circuit to ground	View & note diagnostic tool 'sensor' data. Ensure fan relay connector is secure. Disconnect ECM and proceed to pinpoint test1:-
P1553	Short circuit to battery+	Disconnect fan relay and proceed to pinpoint test 4

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin B10	OK	Disconnect fan relay and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - ECM pin B10 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable continuity: - Fan relay pin 4 to ECM pin B10 - Fan relay pin 6 to EMS relay pin 8	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable for short circuit: - ECM pin B10 to ECM pin A20	OK	Proceed to test 5
		Short circuit	Locate and rectify wiring fault, proceed to test 5
5	Reconnect harness, clear fault code and run diagnostic tool function test to visually verify operation of cooling fan	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



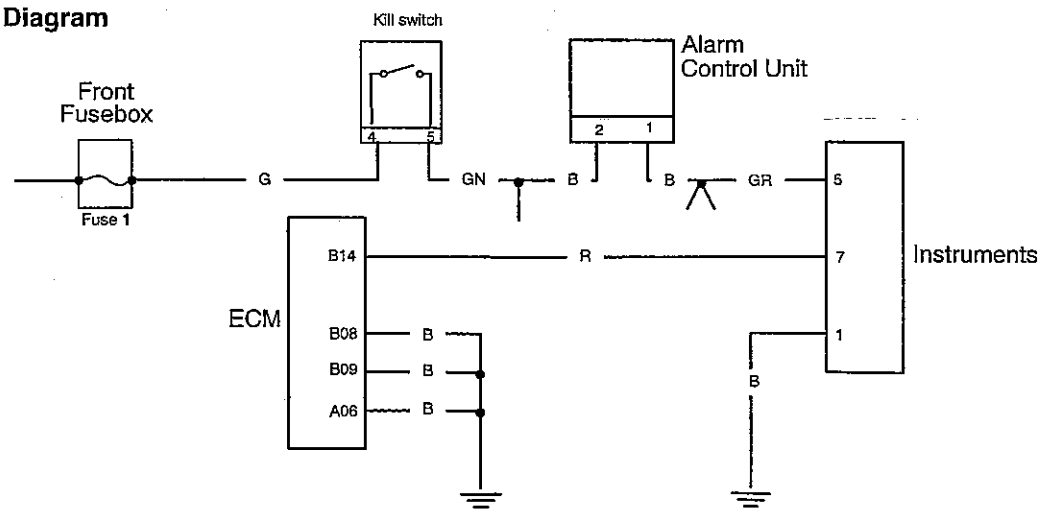
TACHOMETER

Fault Code	Possible cause	Action
P0654	Tachometer system fault	View & note 'freeze frame' data if available. View & note 'sensor' data. Ensure instrument connector is secure. Disconnect ECM and proceed to pinpoint test 1:-

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin B14	OK	Disconnect instrument and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - ECM pin B14 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable continuity: - Instrument pin 7 to ECM pin B14 - Instrument pin 1 to earth - Instrument pin 5 to alarm control unit pin1	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable for short circuit: - ECM pin B14 to ECM pin A20	OK	Renew instruments, proceed to test 5
		Short circuit	Locate and rectify wiring fault, proceed to test 5
5	Reconnect harness, clear fault code and run diagnostic tool function test to visually verify operation of tachometer	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



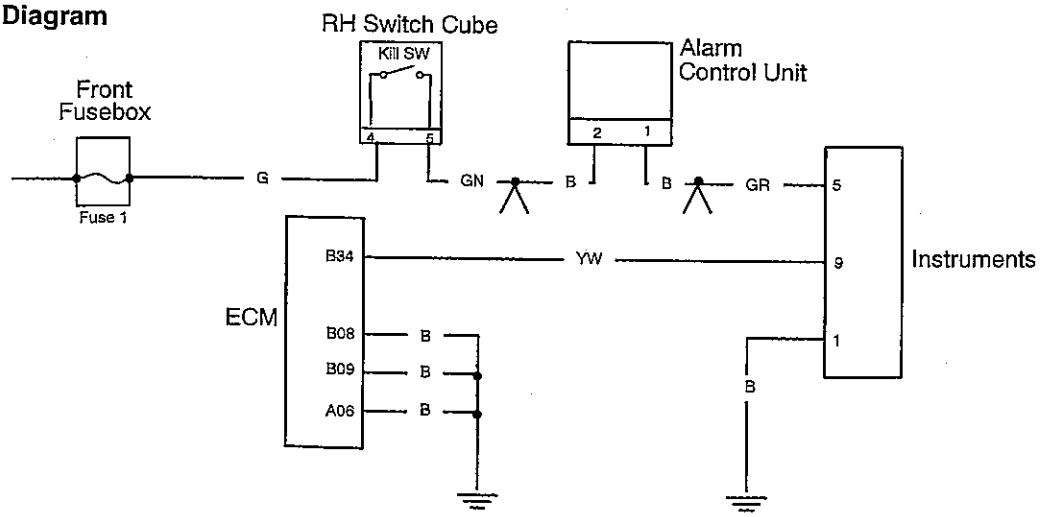
COOLANT TEMPERATURE GAUGE

Fault Code	Possible cause	Action
P1115	Temperature gauge system fault	View & note 'freeze frame' data if available. View & note 'sensor' data. Ensure instrument connector is secure. Disconnect ECM and proceed to pinpoint test 1:-

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin B08 - ECM pin A06 - ECM pin B09 - ECM pin B34	OK	Disconnect instruments and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - ECM pin B34 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable continuity: - Instrument pin 9 to ECM pin B34 - Instrument pin 1 to ground - Instrument pin 5 to alarm control unit pin 1	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable for short circuit: ECM pin B34 to ECM pin A20	OK	Renew instruments, proceed to test 5
		Short circuit	Locate and rectify wiring fault, proceed to test 5
5	Reconnect harness, clear fault code and run diagnostic tool function test to visually verify operation of instruments	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



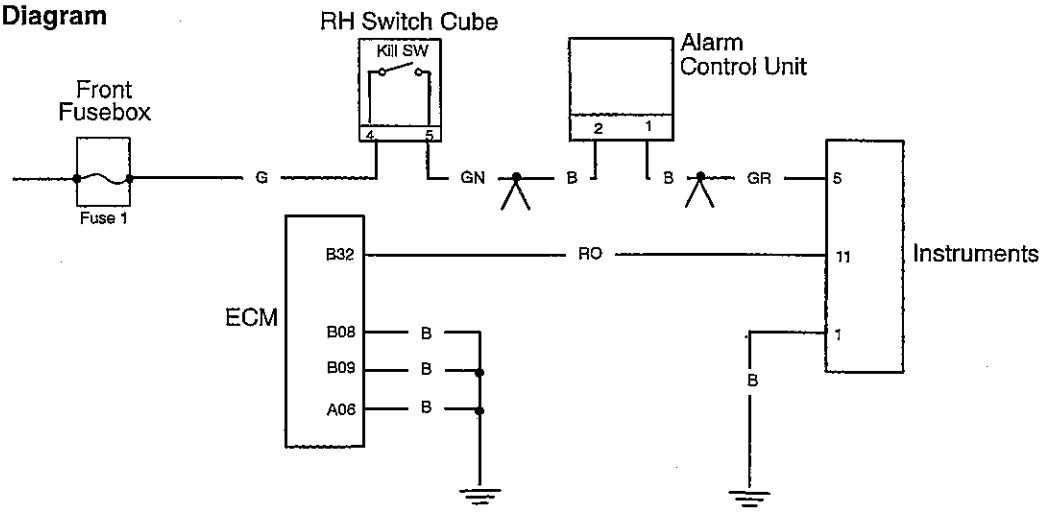
VEHICLE SPEED OUTPUT

Fault Code	Possible cause	Action
P1500	Vehicle Speed Circuit Fault	View & note 'freeze frame' data if available. View & note 'sensor' data. Ensure instrument connector is secure. Disconnect ECM and proceed to pinpoint test 1:-

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin B32 - ECM pin B08 - ECM pin B09 - ECM pin A06	OK	Disconnect instruments and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - ECM pin B32 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable continuity: - Instrument pin 11 to ECM pin B32 - Instrument pin 1 to ground - Instrument pin 5 to alarm control unit pin 1	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable for short circuit: ECM pin A20 to ECM pin B32	OK	Renew instruments, proceed to test 5
		Short circuit	Locate and rectify wiring fault, proceed to test 5
5	Reconnect harness, clear fault code and run diagnostic tool function test to visually verify operation of speedometer.	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



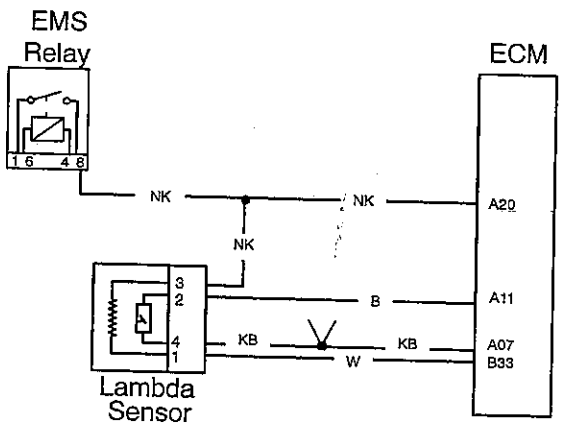
LAMBDA SENSOR

Fault Code	Possible cause	Action
P0130	Lambda sensor circuit fault.	View & note "freeze frame" data if available. View & note "sensor" data. Ensure sensor connector is secure. Disconnect ECM and proceed to pinpoint test 1:

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin A11 - ECM pin A07	OK	Disconnect lambda sensor and proceed to test 2
	Faulty	Rectify fault, proceed to test 4
2 Check cable for short circuit: - ECM pin A11 to ECM pin A07 - ECM pin A11 to ECM pin A20	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 4
3 Check cable continuity: - ECM pin A11 to sensor pin 2 - ECM pin A11 to sensor pin 4	OK	Proceed to test 4
	Open circuit	Locate and rectify wiring fault, proceed to test 4
4 Reconnect harness, clear fault code and run engine. Check adaptation status.	OK	Action complete - quit test
	Fault still present	Contact Triumph service

Circuit Diagram



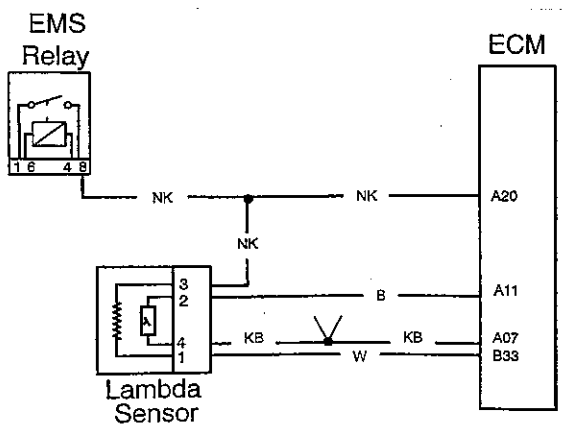
LAMBDA SENSOR HEATER

Fault Code	Possible cause	Action
P0031	Lambda sensor heater circuit short circuit to ground or open circuit.	View & note "freeze frame" data if available. View & note "sensor" data. Ensure sensor connector is secure. Disconnect ECM and proceed to pinpoint test 1:
P0032	Lambda sensor heater circuit, short circuit to battery.	Disconnect lambda sensor and proceed to pinpoint test 4

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - Ecm pin B33	OK	Disconnect lambda sensor and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - ECM pin A33 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable continuity: - ECM pin B33 to sensor pin 1 - ECM pin A20 to sensor pin 3	OK	Proceed to test 5
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable for short circuit: - ECM pin B33 to ECM pin A20	OK	Renew lambda sensor and proceed to test 5
		Short circuit	Locate and rectify wiring fault, proceed to test 5
5	Reconnect harness, clear fault code and run engine. Check adaption status.	OK	Action complete, quit test
		Fault still present	Contact Triumph service

Circuit Diagram



EEPROM ERROR

Fault Code	Possible cause	Action
P0603	EEPROM error	View & note "freeze frame" data if available. No tests available - contact Triumph service

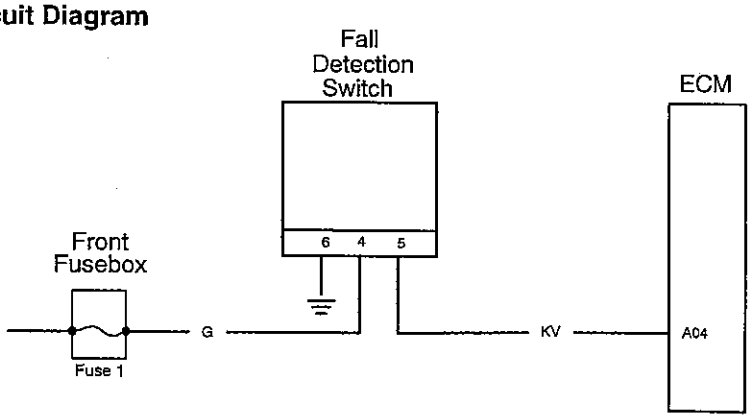
FALL DETECTION SWITCH

Fault Code	Possible cause	Action
P1632	Fall detection switch circuit fault	View & note "freeze frame" data if available. View & note "sensor" data Ensure switch connector is secure. Disconnect ECM and proceed to pinpoint test1:

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin A04	OK	Disconnect sensor and proceed to test 2
		Faulty	Rectify fault, proceed to test 6
2	Check cable for short circuit: - ECM pin A04 to ground - ECM pin A04 to ECM pin A20	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 6
3	Check cable continuity: - ECM pin A04 to sensor pin 5 - Sensor pin 6 to ground	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 6
4	Check cable for short circuit: - Sensor pin 4 to sensor pin 5	OK	Proceed to test 5
		Short circuit	Locate and rectify wiring fault, proceed to test 6
5	Check voltage (with ignition on): - Sensor pin 4	12V (battery voltage)	Renew fall detection switch and proceed to test 6
		Less than 12V	Locate and rectify wiring fault, proceed to test 6
6	Reconnect harness, clear fault code.	OK	Action complete, quit test
		Fault still present	Contact Triumph service

Circuit Diagram



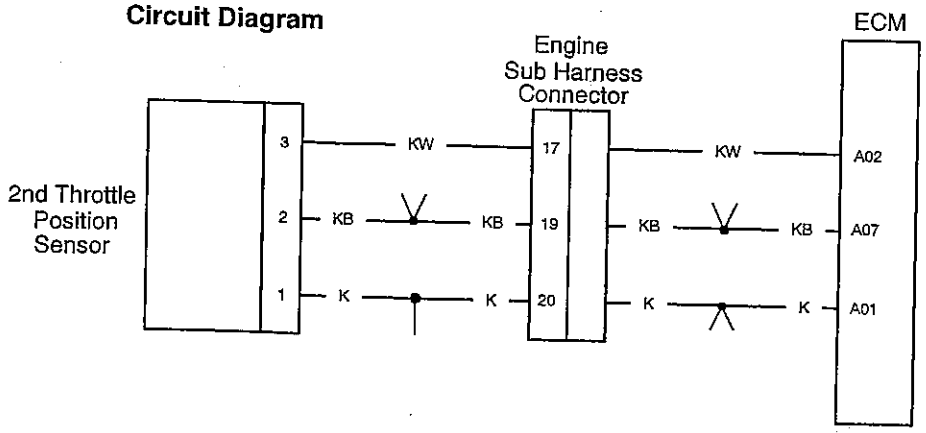
2nd THROTTLE POSITION SENSOR

Fault Code	Possible cause	Action
P0222	2nd throttle position sensor low voltage. (short circuit to ground or open circuit)	View & note "freeze frame" data if available. View & note "sensor" data Ensure sensor connector is secure. Disconnect ECM and proceed to pinpoint test1:
P0223	2nd throttle position sensor high voltage. (short circuit to sensor supply)	

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin A01 - ECM pin A07 - ECM pin A02	OK	Disconnect sensor and proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable for short circuit: - ECM pin A02 to ground	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 5
3 Check cable continuity: - ECM pin A01 to sensor pin 1 - ECM pin A07 to sensor pin 2 - ECM pin A02 to sensor pin 3	OK	Proceed to test 4
	Open circuit	Locate and rectify wiring fault, proceed to test 5
4 Check cable for short circuit: - ECM pin A02 to ECM pin A01 - ECM pin A02 to ECM pin A07	OK	Renew 2nd throttle position sensor and proceed to test 5
	Short circuit	Locate and rectify wiring fault, proceed to test 5
5 Reconnect harness, clear fault code.	OK	Action complete, quit test
	Fault still present	Contact Triumph service

Circuit Diagram



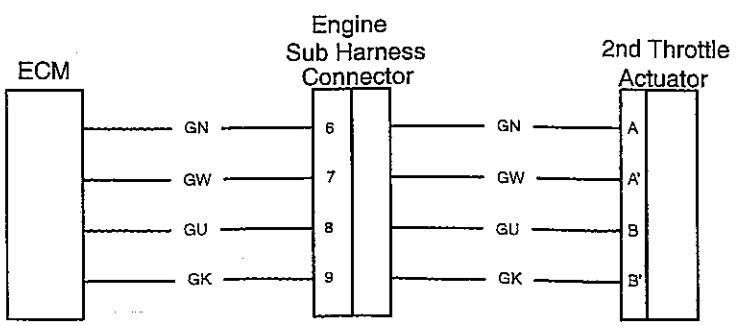
2nd THROTTLE ACTUATOR

Fault Code	Possible cause	Action
P0638	2nd throttle actuator motor / wiring fault	View & note "freeze frame" data if available. View & note "sensor" data Ensure actuator connector is secure. Disconnect ECM and proceed to pinpoint test1:

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin B21 - ECM pin B22 - ECM pin B12 - ECM pin B04	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 7
2	Check resistance value: - ECM pin B21 to ECM pin B22 - ECM pin B12 to ECM pin B04	4Ω to 10Ω	Disconnect actuator and proceed to test 3
		Open circuit	Proceed to test 4
		Short circuit	Disconnect actuator and proceed to test 5
3	Check cable continuity: - ECM pin B21 to ground - ECM pin B22 to ground - ECM pin B12 to ground - ECM pin B04 to ground	OK	Proceed to test 7
		Short circuit	Locate and rectify wiring fault, proceed to test 7
4	Check cable continuity: - ECM pin B21 to actuator pin A - ECM pin B22 to actuator pin A - ECM pin B12 to actuator pin B - ECM pin B04 to actuator pin B	OK	Proceed to test 6
		Open circuit	Locate and rectify wiring fault, proceed to test 7
5	Check cable for short circuit: - ECM pin B21 to ECM pin B22 - ECM pin B12 to ECM pin B04	OK	Proceed to test 6
		Short circuit	Locate and rectify wiring fault, proceed to test 7
6	Check actuator resistance: - Sensor pin A to sensor pin A - Sensor pin B to sensor pin B	4Ω to 10Ω	Proceed to test 7
			renew actuator and proceed to test 7
7	Reconnect harness, clear fault code. Run diagnostic tool function test to visually verify operation of actuator	OK	Action complete, quit test
		Fault still present	Contact Triumph service

Circuit Diagram



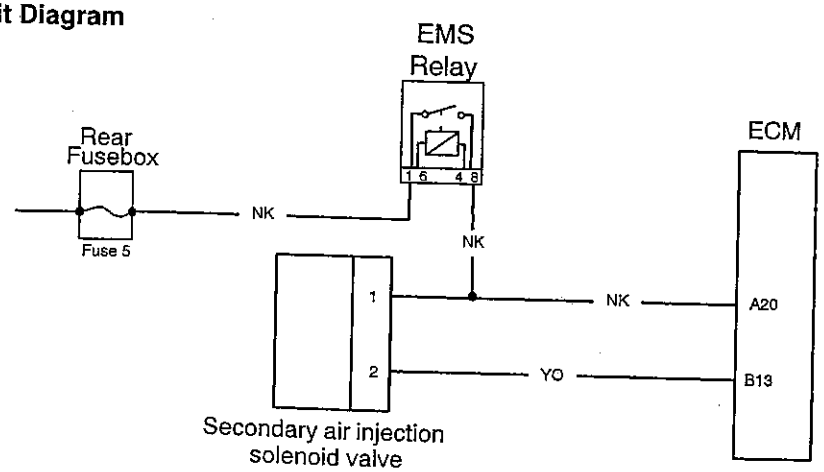
SECONDARY AIR INJECTION VALVE

Fault Code	Possible cause	Action
P0413	Secondary air injection valve circuit, short circuit to ground or open circuit	View & note "freeze frame" data if available. Ensure valve connector is secure. Disconnect ECM and proceed to pinpoint test1:
P0414	Short circuit to battery	Disconnect valve and proceed to test 4

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin B13	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check resistance value: - ECM pin A20 to ECM pin B13	28Ω to 32Ω	Disconnect valve and proceed to test 3
	Faulty	Disconnect valve and proceed to test 4
3 Check cable for short circuit: - ECM pin B13 to ground	OK	Proceed to test 6
	Short circuit	Locate and rectify wiring fault, proceed to test 7
4 Check cable continuity: - ECM pin B13 to valve pin 2 - ECM pin A20 to valve pin 1	OK	Proceed to test 5
	Open circuit	Locate and rectify wiring fault, proceed to test 7
5 Check resistance of valve: - Valve pin 1 to valve pin 2	28Ω to 32Ω	Proceed to test 6
	Faulty	Renew valve and proceed to test 7
6 Check cable for short circuit - ECM pin B13 to ECM pin A20	OK	Renew valve and proceed to test 7
	Short circuit	Locate and rectify wiring fault, proceed to test 7.
7 Reconnect harness, clear fault code.	OK	Action complete, quit test
	Fault still present	Contact Triumph service

Circuit Diagram



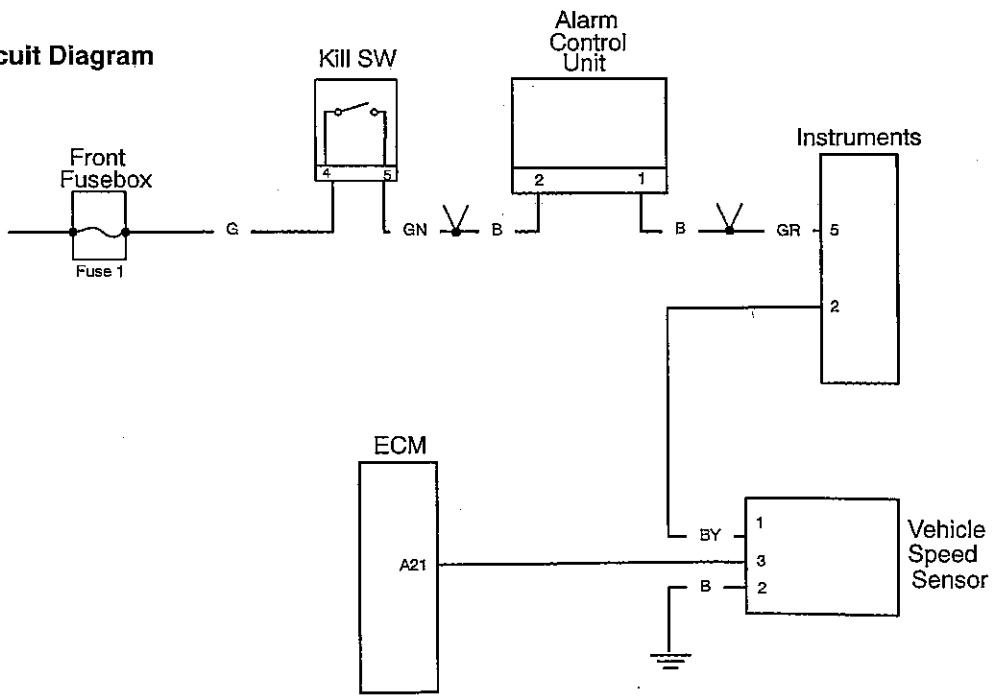
VEHICLE SPEED SENSOR

Fault Code	Possible cause	Action
P0500	Vehicle speed sensor circuit fault	View & note "freeze frame" data if available. View & note "sensor" data Ensure sensor connector is secure. Disconnect ECM and proceed to pinpoint test1:

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin A21 - Instrument pin 2	OK	Disconnect ambient pressure sensor and proceed to test 2
		Faulty	Rectify fault, proceed to test 4
2	Check cable for short circuit: - ECM pin A21 to ground - ECM pin A21 to ECM pin A01 - ECM pin A21 to battery	OK	Proceed to test 3
		Faulty	Locate and rectify wiring fault, proceed to test 4
3	Check cable for continuity: - ECM pin A21 to sensor pin 3 - Sensor pin 2 to ground - Instruments pin 2 to sensor pin 1	OK	Renew vehicle speed sensor and proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 4
4	Reconnect harness, clear fault code and run engine.	OK	Action complete, quit test
		Fault still present	Contact Triumph service

Circuit Diagram



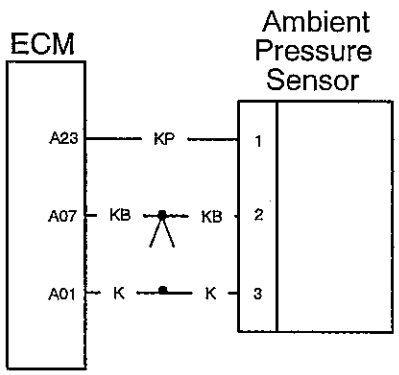
AMBIENT PRESSURE SENSOR

Fault Code	Possible cause	Action
P1107	Ambient pressure sensor circuit short circuit to ground	View & note "freeze frame" data if available. View & note "sensor" data Ensure sensor connector is secure. Disconnect ECM and proceed to pinpoint test1:
P1108	Ambient pressure sensor circuit, short circuit to supply or open circuit	Disconnect ambient pressure sensor and proceed to pinpoint test 4.

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin A23 - ECM pin A07 - ECM pin A01	OK	Disconnect ambient pressure sensor and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - ECM pin A23 to ECM A07	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable for continuity: - ECM pin A23 to sensor pin 1 - ECM pin A07 to sensor pin 2 - ECM pin A01 to sensor pin 3	OK	Renew ambient pressure sensor and proceed to test 5
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable for short circuit: - ECM pin A23 to ECM pin A01	OK	Renew ambient pressure sensor and proceed to test 5
		Short circuit	Locate and rectify wiring fault, proceed to test 5
5	Reconnect harness, clear fault code and run engine	OK	Action complete, quit test
		Fault still present	Contact Triumph service

Circuit Diagram



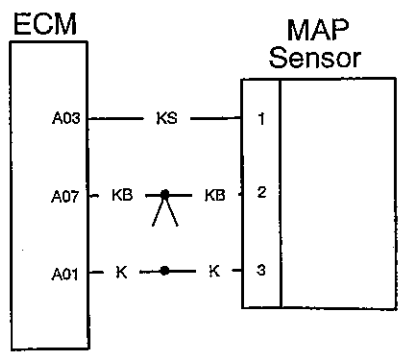
MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR

Fault Code	Possible cause	Action
P0107	MAP sensor circuit short circuit to ground	View & note "freeze frame" data if available. View & note "sensor" data Ensure sensor connector is secure. Disconnect ECM and proceed to pinpoint test1:
P0108	MAP sensor circuit, short circuit to supply or open circuit	Disconnect MAP sensor and proceed to test 4
P1105	MAP sensor pipe fault	Check connection/condition of pipe from MAP sensor to throttle body

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin A03 - ECM pin A07 - ECM pin A01	OK	Disconnect MAP sensor and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - ECM pin A03 to ECM A07	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable for continuity: - ECM pin A03 to sensor pin 1 - ECM pin A07 to sensor pin 2 - ECM pin A01 to sensor pin 3	OK	Renew MAP sensor and proceed to test 5
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable for short circuit: - ECM pin A03 to ECM pin A01	OK	Renew MAP sensor and proceed to test 5
		Short circuit	Locate and rectify wiring fault, proceed to test 5
5	Reconnect harness, clear fault code and run engine	OK	Action complete, quit test
		Fault still present	Contact Triumph service

Circuit Diagram



FAULT FINDING - NON ELECTRICAL

Symptom	Possible cause(s)
Poor throttle response at low RPM	Low fuel pressure caused by filter blockage/leaks
	Low fuel pressure caused by loose fuel pipes to the fuel pump and filter
Cutting out at idle	Throttle bodies out of balance
	ISC (Idle Speed Control) actuator inoperative
	Low fuel pressure caused by loose fuel pipes to the fuel pump and filter.
	Low fuel pressure
	Weak mixture caused by air leak at the throttle body/transition piece to cylinder head face
	Low fuel pressure caused by loose fuel pipes to the fuel pump and filter.
Idle speed too low/high	ISC (Idle Speed Control) actuator sticking
	Incorrect closed throttle position setting
	Mechanical fault with the throttle linkage
Actia tool malfunctions during tune download procedure	Low battery voltage
Throttle hang-up	Incorrect closed throttle position setting
	Low fuel pressure caused by loose fuel pipes to the fuel pump and filter.
	Low fuel pressure due to split fuel filter
Bike will start but cuts out immediately	ISC motor stuck
Abnormally high fuel pressure	Fuel pressure regulator inoperative.
Temperature gauge reads cooler than normal	Cooling system air-locked resulting in coolant temperature sensor operating in air instead of coolant.

FUEL TANK

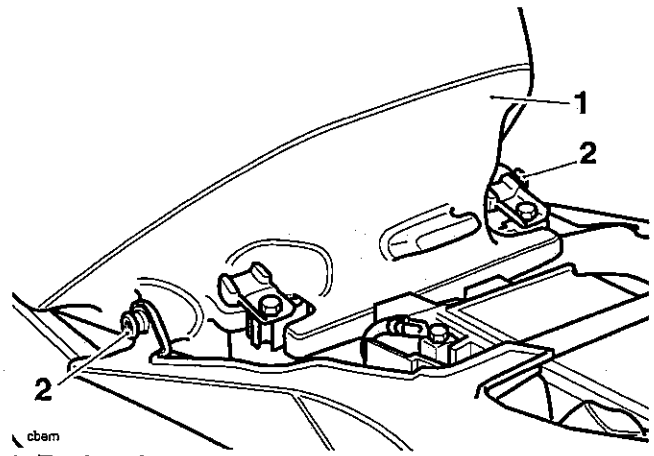
Fuel Tank Removal

WARNING: Observe the warning advice given in the general information section on the safe handling of fuel and fuel containers.

A fire, causing personal injury and damage to property could result from spilled fuel or fuel not handled or stored correctly.

1. Remove the seats and disconnect the battery negative (black) lead first.

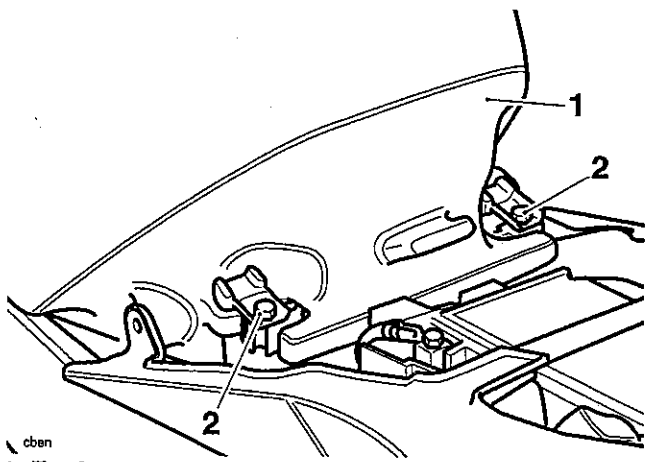
2. Release the two fixings securing the side panels to the fuel tank.



1. Fuel tank

2. Side panel fixings

3. Release the three fixings securing the fuel tank to the frame. Two at the rear, left and right, and one in the centre at the front.



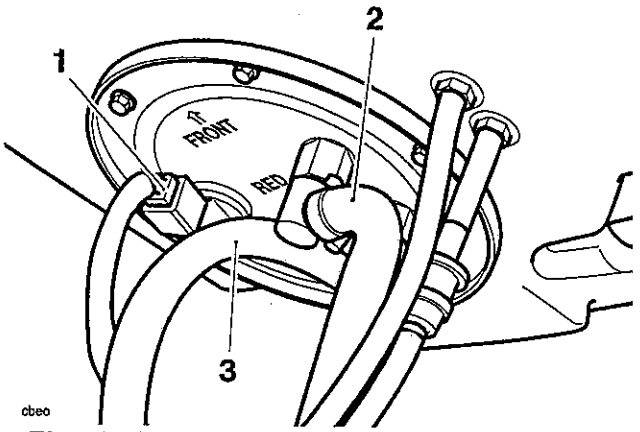
1. Fuel tank

2. Rear fixings

4. Carefully raise the fuel tank and disconnect the electrical connection to the fuel pump plate and both fuel hoses.

NOTE:

- **Disconnect the fuel hoses by pressing the metal tag between the hose and socket inwards. Once released, the hoses will spring out from the socket.**



1. Electrical connection

2. Fuel feed hose

3. Fuel return hose

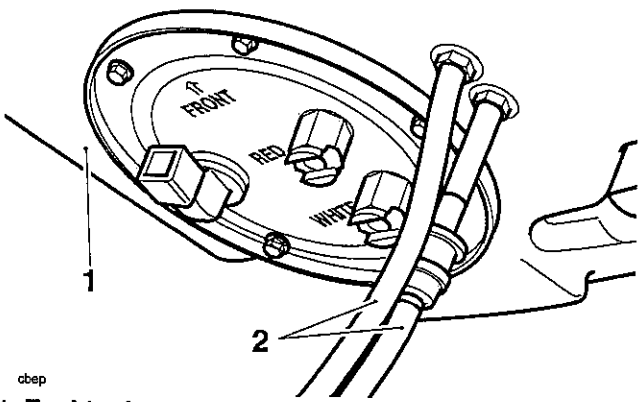
CAUTION: When raising the fuel tank to disconnect the fuel hoses etc., ensure that the painted surfaces of the tank are protected from contact with other adjacent surfaces.

Damage to the tank itself, and particularly the painted surface could result from inadequate care and/or protection during this process.

NOTE:

- **Before disconnection, mark the two breather hoses such that they can be returned to the same locations when refitting the tank. One is the drain hose for the filler cap area and the other is the fuel tank breather (or evaporative connector hose where an evaporative system is fitted).**

5. Disconnect the two breather hoses from the left hand side of the tank.



cbep

1. Fuel tank

2. Breather hoses

6. The fuel tank can now be removed from the motorcycle.

Installation

1. Position the fuel tank to the frame.

2. Connect the breather hoses to the underside of the tank, in the same locations as noted prior to disconnection.

CAUTION: When fitting the fuel hoses, ensure that the hoses are located to their connector squarely.

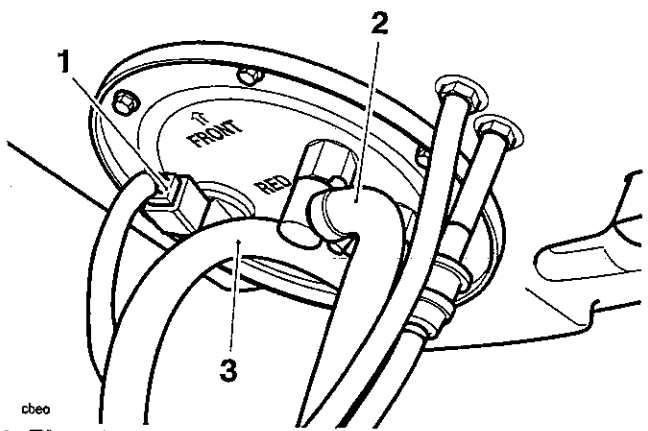
Fitting the hoses at an angle can damage the O ring which could cause a fuel leak.

NOTE:

- **The fuel feed and return hoses MUST be fitted to specific connectors on the fuel pump mounting plate.**

- **The fuel feed hose, which comes from the left hand side of the fuel rail, is fitted to the red coloured connector on the fuel pump mounting plate. The return hose, which comes from the fuel pressure regulator on the right hand side of the fuel rail, is fitted to the white connector.**

3. Refit the fuel hoses to the fuel pump plate.



cbeo

1. Electrical connection

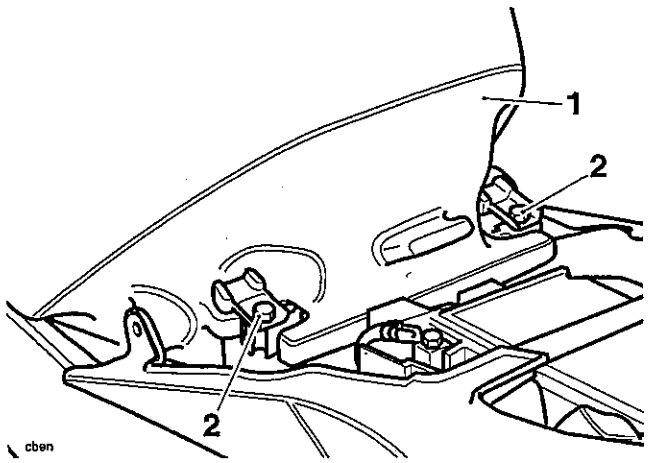
2. Fuel feed hose (red connector)

3. Fuel return hose (white connector)

4. Refit the electrical connector to the fuel pump mounting plate.

5. Lower the fuel tank onto the frame.

6. Align the fixing points and fit the three fixings. Tighten the fixings to **9 Nm.**



cben

1. Fuel tank

2. Rear fixings

7. Align the side panels to their fixing points and fit the two fixings. Tighten the fixings to **9 Nm.**

8. Reconnect the battery positive (red) lead first.

9. Refit the seats.

FUEL PUMP

Removal

1. Remove the seats and disconnect the battery negative (black) lead first.

2. Remove the fuel tank as described earlier in this section.

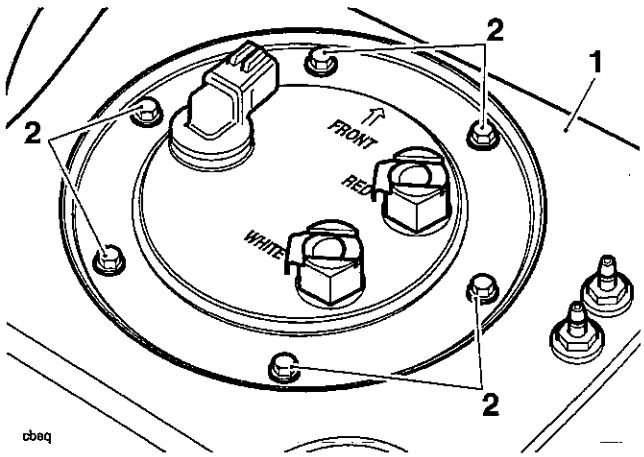
WARNING: Observe the warning advice given in the general information section on the safe handling of fuel and fuel containers.

A fire, causing personal injury and damage to property could result from spilled fuel or fuel not handled or stored correctly.

3. Drain all fuel into a suitable container.

4. Invert the fuel tank and place on a protective surface to prevent paint damage.

5. Remove the lock nuts and washers securing the fuel pump mounting plate to the tank.



cbeq

1. Fuel tank

2. Fuel pump mounting plate fixings

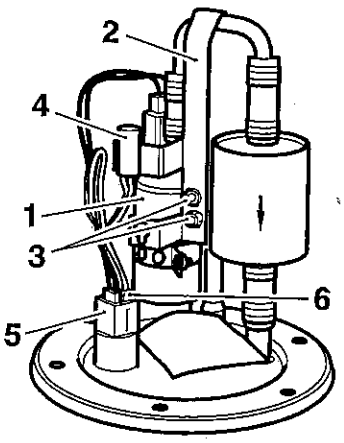
6. Lift the fuel pump assembly and manoeuvre it from tank aperture.

7. Check the condition of mounting plate 'O'-ring seal in the tank aperture and only remove if necessary.

8. Disconnect the electrical connection to the fuel pump.

9. Disconnect the two-way multiplug from the low fuel warning light sender unit.

10. Remove the fixing from the pipe bracket.



cber

1. Fuel pump

2. Pipe bracket

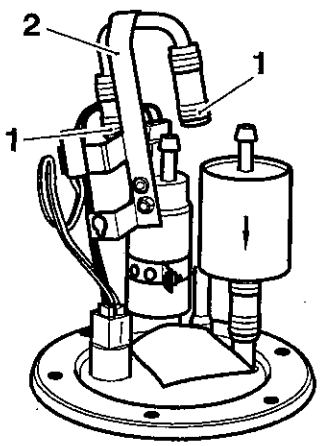
3. Pipe bracket fixings

4. Low fuel level sender

5. Pump electrical connector

6. Low fuel level sender multiplug

11. Release the hose clips from the pump and filter. Remove the pipe bracket and hose assembly.



cbes

1. Hose clips

2. Bracket/hose assembly

12. Remove the fixing from the pump clamp, release the clamp and collect the fuel pump.

Assembly

NOTE:

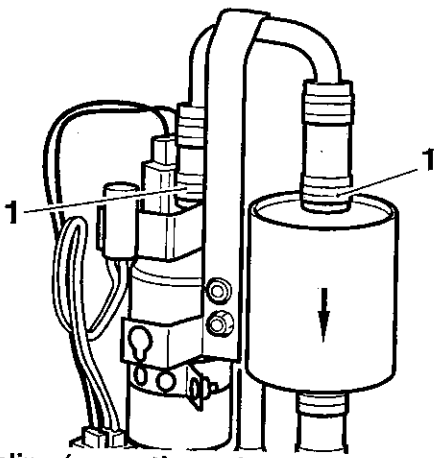
- **If the low fuel warning light sender unit has been removed, it must be refitted to the upper position on its bracket. If it is incorrectly fitted, the low fuel warning light will come on at the wrong fuel level.**

1. Position the fuel pump to the bracket. Refit the clamp and fixing then tighten to **4 Nm.**

2. Position the pipe bracket and hose assembly to the fuel pump and filter and fully locate the hoses onto their respective mounting points.

3. Secure the pipe bracket with the fixing.

4. Position the hose clips to ensure that both hoses are correctly retained.



cbet

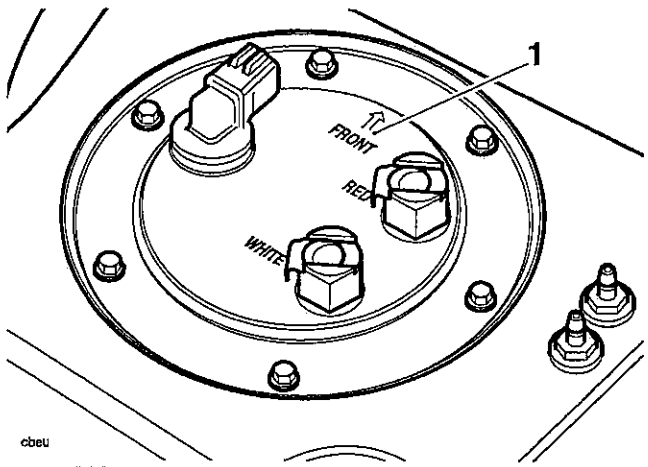
1. Hose clips (correctly positioned)

5. Connect the multiplug connector to the fuel pump and ensure that it is secure.

6. Reconnect the low fuel level sender two-way multiplug.

7. If removed, position a new 'O'-ring seal in the tank aperture and ensure that it is correctly seated.

8. Carefully manoeuvre fuel pump assembly into tank aperture and ensure that the 'FRONT' arrow is facing towards the front of the tank.



1. FRONT marking

9. Locate the washers and lock nuts to the studs and tighten sequentially to **5 Nm.**

10. Refit the fuel tank as described earlier in this section.

11. Check integrity of all fuel system pipes and connections.

12. Reconnect the battery positive (red) lead first.

13. Refit the seats.

FUEL PRESSURE CHECKING

Triumph service tool T3880048, allows diagnosis of fuel pump, fuel pressure relief valve and hose related problems without first removing the component concerned.

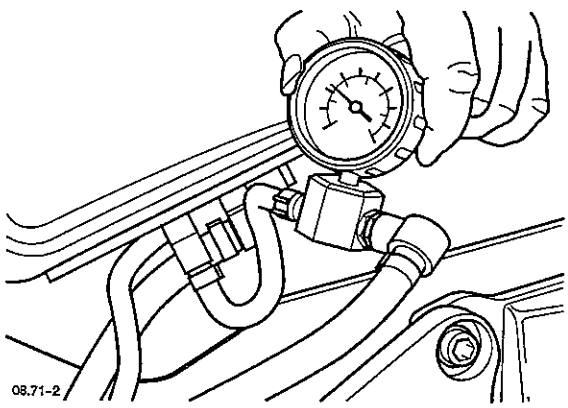
Test Procedure

1. In order to connect the gauge, turn the ignition to the OFF position and raise the fuel tank.

> ⚠ **CAUTION: Never turn the ignition on with either fuel hose disconnected as this will by-pass the fuel pressure regulator and cause excess pressure in the system.**

2. Disconnect the fuel feed hose from the red connector on the fuel pump mounting plate.

3. Connect the gauge between the detached hose and the fuel pump mounting plate.



Checking fuel pressure

4. Start the engine and check the gauge reading.

NOTE:

- **If correct, the fuel pressure should be 3.0 Bar +/- 0.25 Bar.**

FUEL FILTER

Removal

1. Remove the seats and disconnect the battery negative (black) lead first.

2. Remove the fuel tank as described earlier in this section.

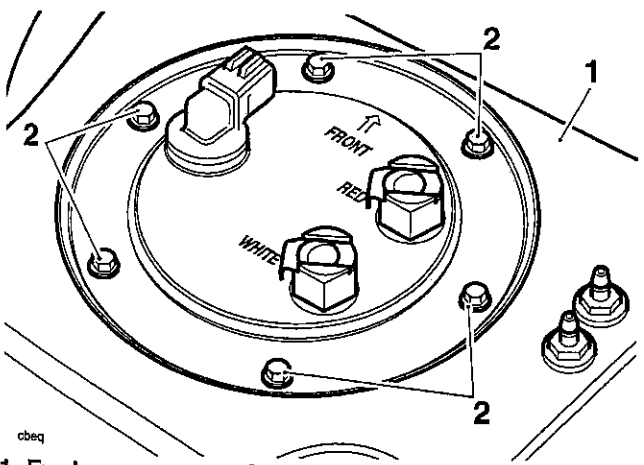
WARNING: Observe the warning advice given in the general information section on the safe handling of fuel and fuel containers.

A fire, causing personal injury and damage to property could result from spilled fuel or fuel not handled or stored correctly.

3. Drain all fuel into a suitable container.

4. Invert the fuel tank and place on a protective surface to prevent paint damage.

5. Remove the lock nuts and washers securing fuel pump mounting plate to tank.



cbeq

1. Fuel pump mounting plate

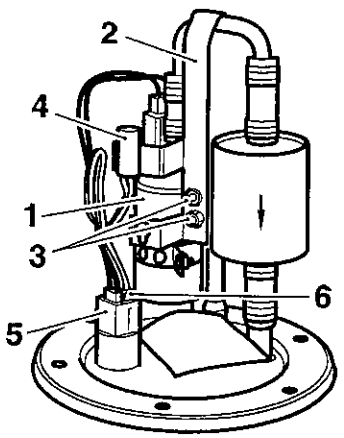
2. Fixings

6. Lift fuel pump assembly and manoeuvre from the tank aperture.

7. Check the condition of the mounting plate 'O'-ring seal in the tank aperture and only remove if necessary.

8. Disconnect the low fuel level sender two-way multiplug.

9. Remove the fixing from the pipe bracket.



cber

1. Fuel pump

2. Pipe bracket

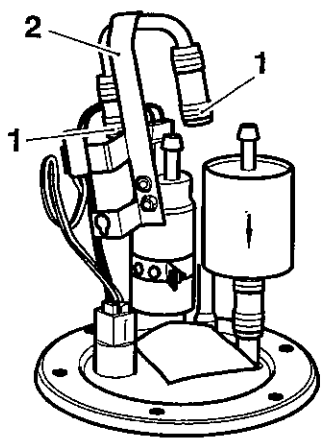
3. Pipe bracket fixings

4. Low fuel level sender

5. Pump electrical connector

6. Low fuel level sender multiplug

10. Release the hose clips from the pump and filter and remove pipe bracket and hose assembly.



cbes

1. Hose clips

2. Bracket/hose assembly

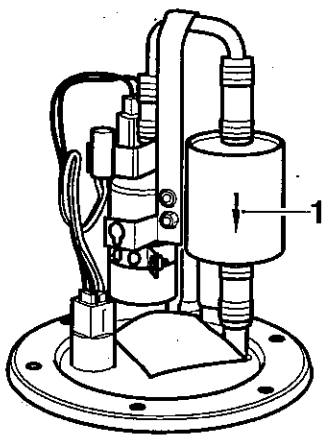
11. Release the clip from the exit side of the filter and detach the filter from the exit hose.

Assembly

NOTE:

- **If the low fuel warning light sender unit has been removed, it must be refitted to the upper position on its bracket. If it is incorrectly fitted, the low fuel warning light will come on at the wrong fuel level.**

1. Position the filter to the exit hose ensuring that the arrow on the filter casing is pointing in a downward direction (i.e. into the exit hose).



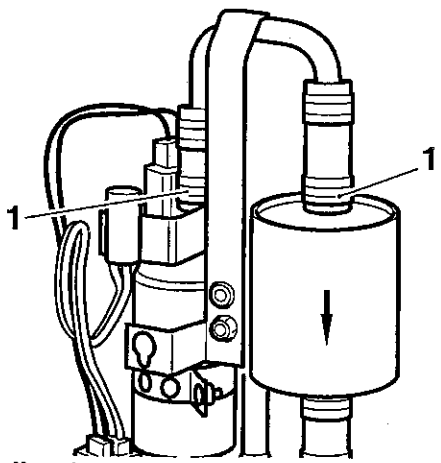
cbev

1. Arrow

2. Position the pipe bracket and hose assembly to the fuel pump and filter and fully locate the hoses onto their respective mounting points.

3. Secure the pipe bracket with the fixing.

4. Position the hose clips to ensure that all hoses are correctly retained.



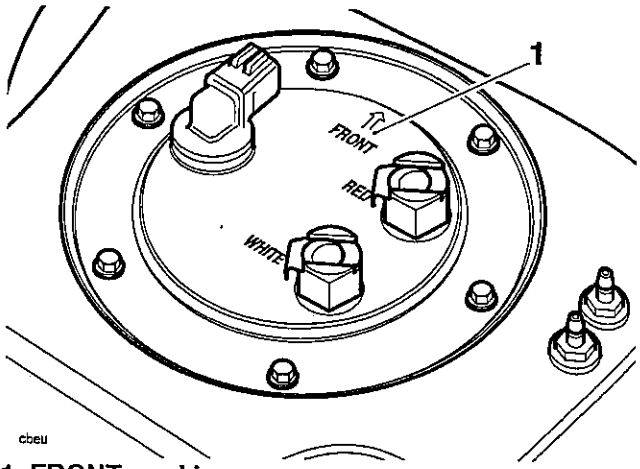
cbet

1. Hose clips (correctly positioned)

5. Reconnect the low fuel level sender two-way multiplug.

6. If removed, position a new O-ring seal in the tank aperture and ensure that it is correctly seated.

7. Carefully manoeuvre the fuel pump assembly into the tank aperture and ensure that the 'FRONT' arrow is facing towards the front of the tank.



cbeu

1. FRONT marking

8. Locate the washers and lock nuts to the studs and tighten sequentially to **5 Nm.**

9. Refit the fuel tank as described earlier in this section.

10. Check integrity of all fuel system pipes and connections.

11. Reconnect the battery positive (red) lead first.

12. Refit the seats.

LOW FUEL LEVEL SENDER

Removal

1. Remove the seats and disconnect the battery negative (black) lead first.

2. Remove the fuel tank as described earlier in this section.

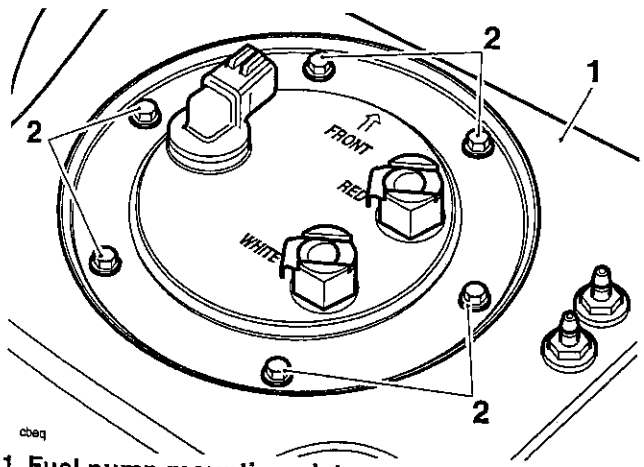
WARNING: Observe the warning advice given in the general information section on the safe handling of fuel and fuel containers.

A fire, causing personal injury and damage to property could result from spilled fuel or fuel not handled or stored correctly.

3. Drain all fuel into a suitable container.

4. Invert the fuel tank and place on a protective surface to prevent paint damage.

5. Remove the lock nuts and washers securing the fuel pump mounting plate to the tank.



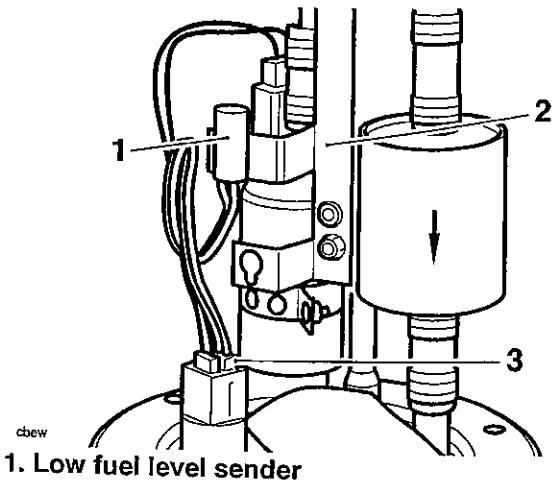
1. Fuel pump mounting plate

2. Fixings

6. Lift the fuel pump assembly and manoeuvre from the tank aperture.

7. Check the condition of the mounting plate O-ring seal in the tank aperture and only remove if necessary.

8. Disconnect the low fuel level sender two-way multiplug.

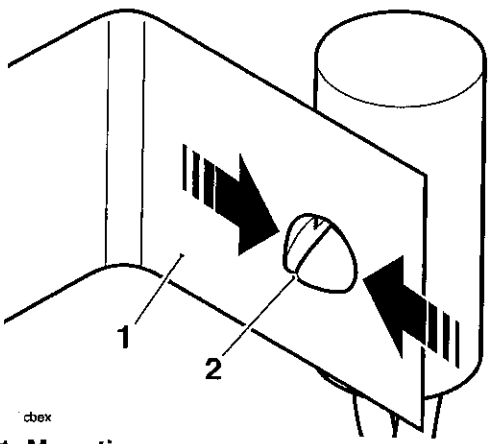


1. Low fuel level sender

2. Pipe bracket

3. Multiplug

9. Note the position of the sender on its bracket, then release the sender by squeezing together, the two barbs on the plastic holder.



1. Mounting

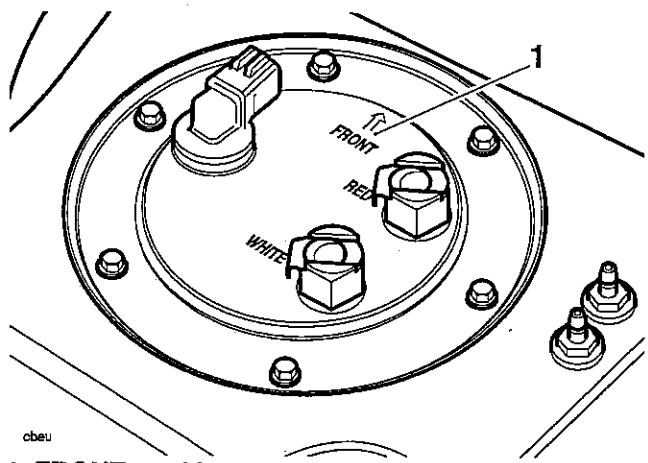
2. Barbs

NOTE:

- **The low fuel warning light sender unit must be assembled to the same position on its bracket as prior to removal. If it is fitted in the wrong position, the low fuel warning light will come on at the wrong fuel level.**

Assembly/Installation

1. Position sender to the upper position on its bracket. Push the barb through the bracket until secure.
2. Reconnect the two-way multiplug.
3. If removed, position a new 'O'-ring seal in the tank aperture and ensure that it is correctly seated.
4. Carefully manoeuvre the fuel pump assembly into tank aperture and ensure that the 'FRONT' arrow is facing towards the front of the tank.



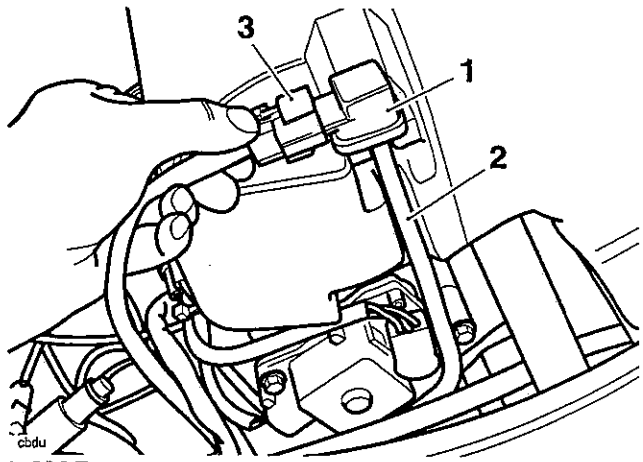
1. FRONT marking

5. Locate the washers and lock nuts to the studs and tighten sequentially to **5 Nm.**
6. Refit the fuel tank as described earlier in this section.
7. Check integrity of all fuel system pipes and connections.
8. Reconnect the battery positive (red) lead first.
9. Refit the seats.

AIRBOX

Removal

1. Remove the seats and disconnect the battery negative (black) lead first.
2. Remove the fuel tank as described earlier in this section.
3. Detach the hose and electrical connector from the MAP sensor on the right hand side of the airbox.



1. MAP sensor

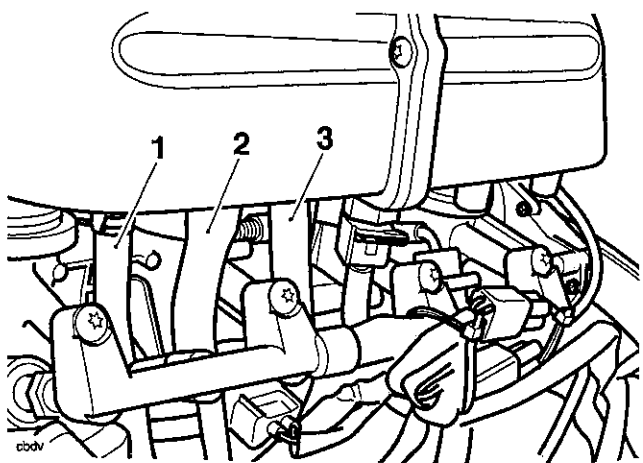
2. MAP sensor hose

3. MAP sensor connector

NOTE:

- **Prior to removal, note the location of each hose attached to the underside of the airbox. The two hose connection points to the right of the air temperature sensor are unused.**

4. Disconnect the hoses from the underside of the air box.



1. Drain hose

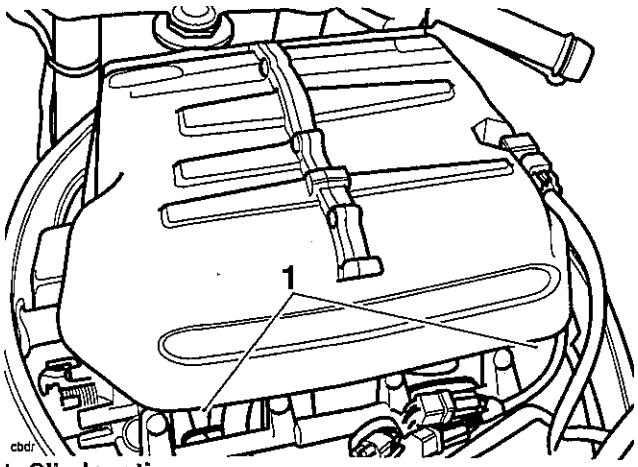
2. Secondary air injection feed hose

3. Breather hose

5. Release the hose clips from the two outer throttle bodies.

NOTE:

- **Clips are not fitted to the two centre throttle bodies.**



1. Clip locations

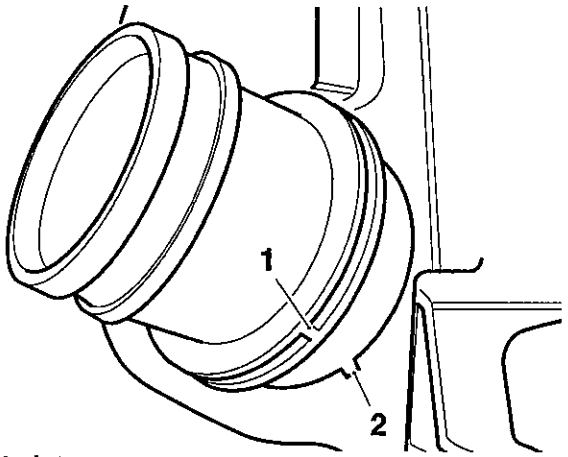
6. Raise the airbox from the throttle bodies and disconnect the multiplug to the air temperature sensor.

7. Detach the airbox assembly from the intake ducts and remove from the motorcycle in a rearward direction, inverting the airbox as it is removed.

Installation

NOTE:

- **If the flexible ducts in the airbox become detached at any time, when refitting, align the slot in the duct with the corresponding slot in the airbox.**



1. Duct slot

2. Airbox slot

1. Locate the airbox assembly to the motorcycle, reconnect the air temperature sensor and refit the retaining wire.

2. Ease the two air intakes over the air feed pipes from the front of the motorcycle.

NOTE:

- **Ensure both intakes are fully engaged over the feed pipes through 360°.**

3. Position the airbox to the throttle bodies and push fully home.

4. Tighten the hose clips on the outer two throttle bodies to **1.5 Nm.**

5. Reconnect all hoses to the under side of the airbox.

6. Reconnect the map sensor hose and electrical multiplug.

7. Refit the fuel tank.

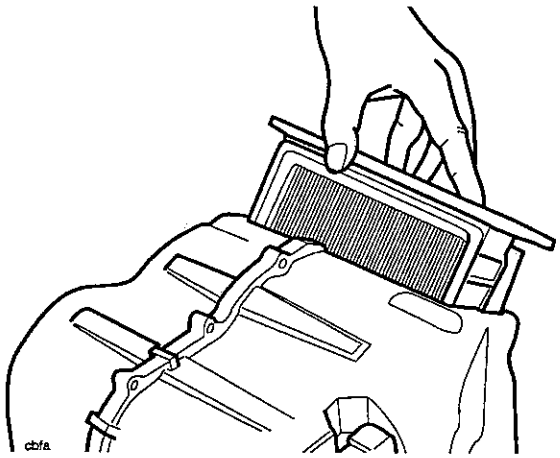
8. Reconnect the battery, positive (red) lead first.

9. Refit the seats.

AIR FILTER

Removal

1. Remove the seats and disconnect the battery negative (black) lead first.
2. Remove the fuel tank as described elsewhere in this section.
3. Release the screws securing the air filter housing to the airbox and raise the housing. Retain the gasket for future re-use.

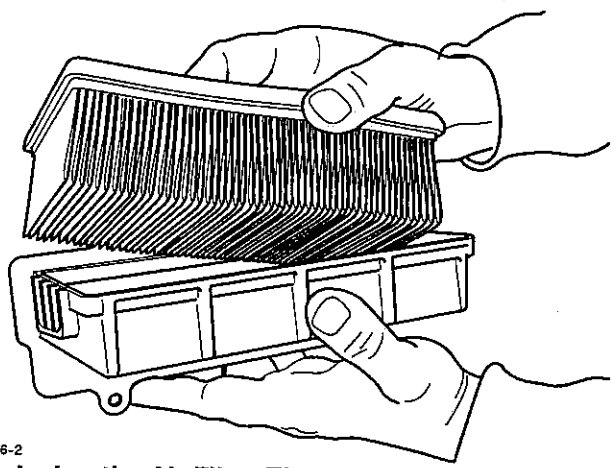


Raising the filter housing

4. Detach the air filter element from the housing.

NOTE:

- **Note the orientation of the element before final detachment. The replacement item must be assembled in the same orientation.**



Replacing the Air Filter Element

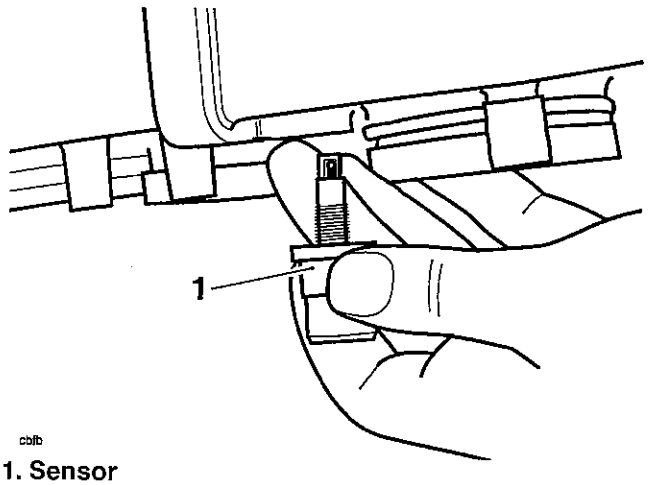
Assembly

1. Clean the air filter housing and locate the new filter element in the same orientation noted during removal.
2. Locate the housing to the airbox ensuring the gasket is correctly positioned. Tighten the screws.
3. Refit the fuel tank as described elsewhere in this section.
4. Reconnect the battery, positive (red) lead first.
5. Refit the seats.

INTAKE AIR TEMPERATURE SENSOR

Removal

1. Remove the seats and disconnect the battery negative (black) lead first.
2. Remove the fuel tank and airbox as described earlier in this section.
3. Unscrew the sensor.



cbfb

1. Sensor

Installation

1. Fit the sensor to the airbox and tighten to **4 Nm.**
2. Refit the airbox and fuel tank as described elsewhere in this section.
3. Reconnect the battery, positive (red) lead first.
4. Refit the seat.

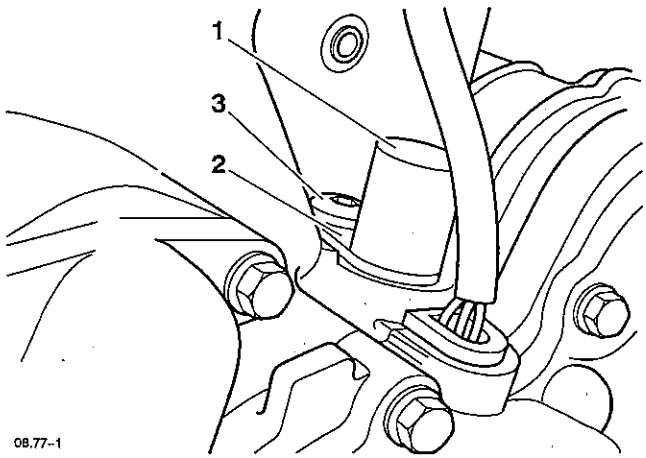
CRANKSHAFT POSITION SENSOR

Removal

NOTE:

- **The air gap for the crankshaft position sensor is not adjustable.**

1. Remove the seats and disconnect the battery negative (black) lead first.
2. Remove the left hand lower fairing as described in the body section.
3. Remove the fixing securing the sensor bracket to the crankcase.



08.77-1

1. Sensor

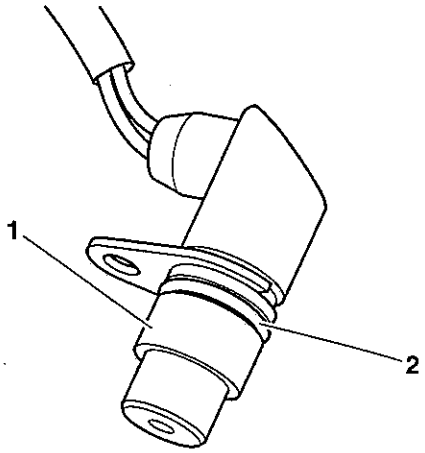
2. Sensor bracket

3. Sensor bracket fixing

4. Disconnect the sensor multi-plug.
5. Remove the sensor from the crankcase.

Installation

1. Check the sensor O ring for damage or deterioration. Renew as necessary.



08.77-2

1. Sensor

2. O ring

2. Apply a smear of oil to the sensor O ring to aid assembly.
3. Refit the sensor taking care to not damage to damage the O ring.
4. Refit the sensor bracket. Fit and tighten the fixing to **10 Nm.**
5. Reconnect the sensor multi-plug.

THROTTLE CABLES

Removal

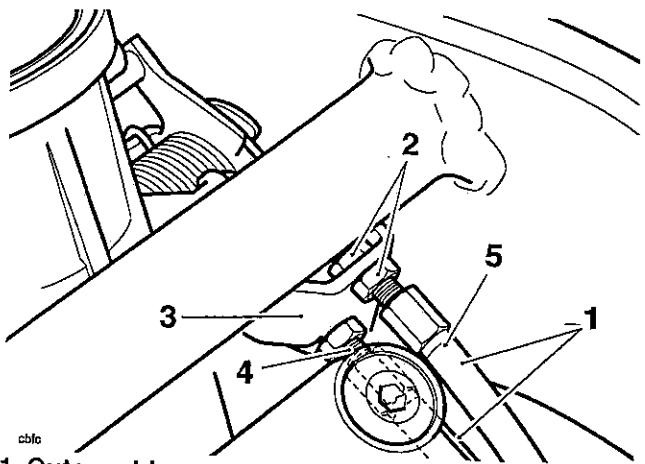
NOTE:

- **Prior to removal, clearly identify the opening and closing cables so that they may be refitted in the correct positions.**

1. Remove the seat and disconnect the battery negative (black) lead first.

2. Remove the fuel tank and airbox as described earlier in this section.

3. Slacken the adjuster locknuts at the throttle body such that it will allow the outer cables to be detached from the cable brackets.



1. Outer cables

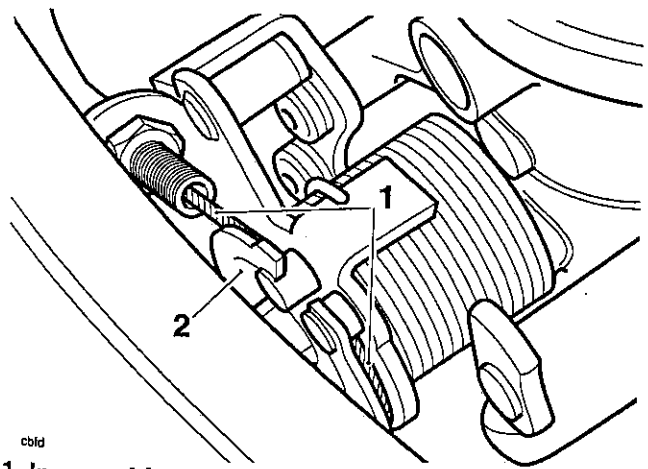
2. Adjuster locknuts

3. Cable bracket

4. Closing cable

5. Opening cable

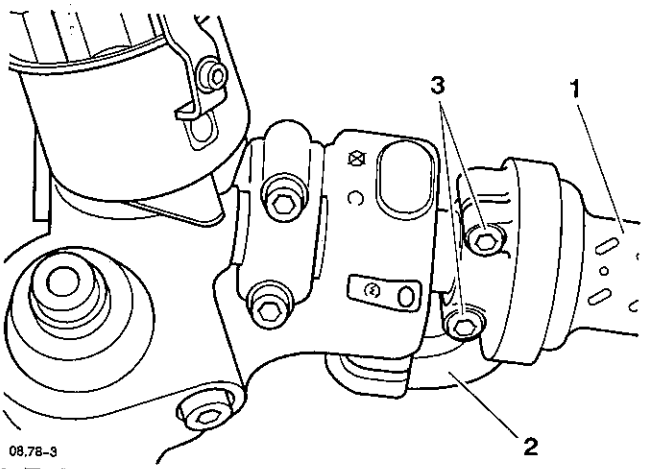
4. Detach the inner cables from the throttle cam.



1. Inner cables

2. Throttle cam

5. At the twist grip end, slide off the rubber boot and release the screws which secure the two halves of the twist grip guide to each other.

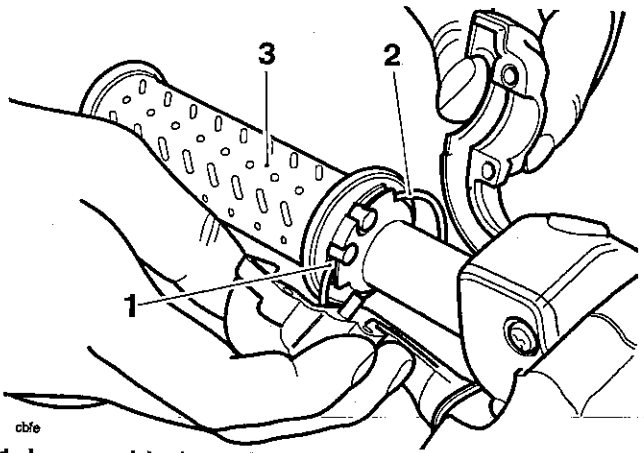


1. Twist grip

2. Twist grip guide

3. Screws

6. Separate the two halves of the guide. Release the throttle inner cables from the twist grip.



1. Inner cable (opening cable)

2. Inner cable (closing cable)

3. Twist grip

7. Note the routing of the throttle cables and remove them from the frame.

Examination

1. Check that the throttle cables operate smoothly, without sticking or binding. Replace the cable if there is any doubt as to its correct operation.

Installation

NOTE:

- **The opening and closing cables must be correctly identified and fitted to the correct positions as noted prior to removal.**

1. Locate the cables to the frame following the routing noted during removal.
2. Engage the nipples of the inner cables to the twist grip.
3. Assemble the two halves of the cable guide ensuring that the outer cable is correctly located in the guide.
4. Refit the boot to the cable guide.
5. Attach the other end of the inner cables to the throttle cam and locate the outer cables to the cable bracket. Fit the cable locknuts.

NOTE:

- **The opening cable is the uppermost cable at the junction with the throttle bodies.**

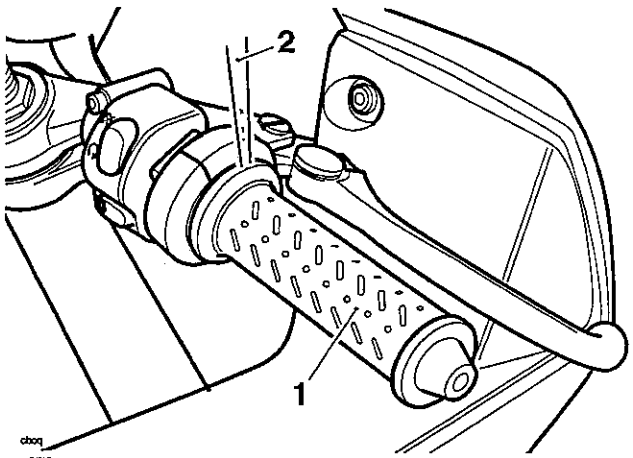
6. Set the cable adjustment using the following adjustment instructions:

Throttle cable adjustment

WARNING: Operation of the motorcycle with an incorrectly adjusted, incorrectly routed or damaged throttle cable could interfere with the operation of the brakes, clutch or the throttle itself. Any of these conditions could result in loss of control of the motorcycle and an accident.

WARNING: Move the handlebars to left and right full lock while checking that cables and harnesses do not bind. A cable or harness which binds will restrict the steering and may cause loss of control and an accident.

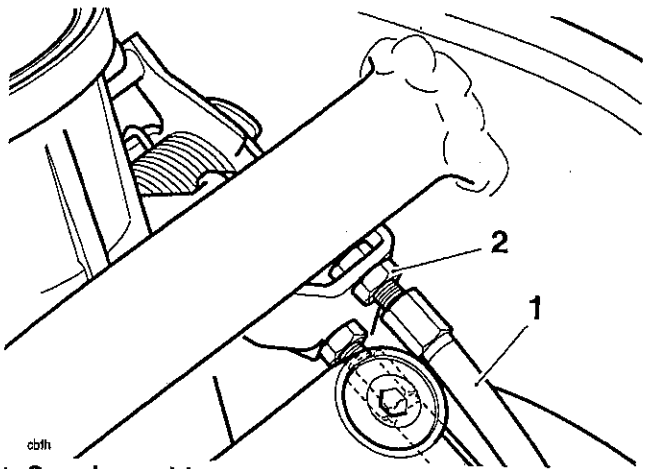
1. When correctly set, the throttle must have 2-3 mm of free-play at the throttle twist grip. If there is more or less than 2-3 mm of free-play present, the throttle cables must be adjusted.



1. Throttle twist grip

2. 2-3 mm

2. Release the locknut on the 'opening' cable adjuster.

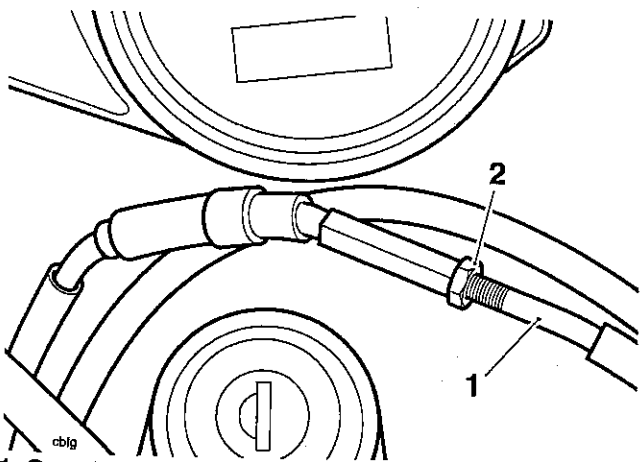


1. Opening cable

2. Locknut

3. Slide the cover off the opening cable adjuster at the twist grip end.

4. Rotate the 'opening' cable adjuster such that it has an equal amount of adjustment in each direction.



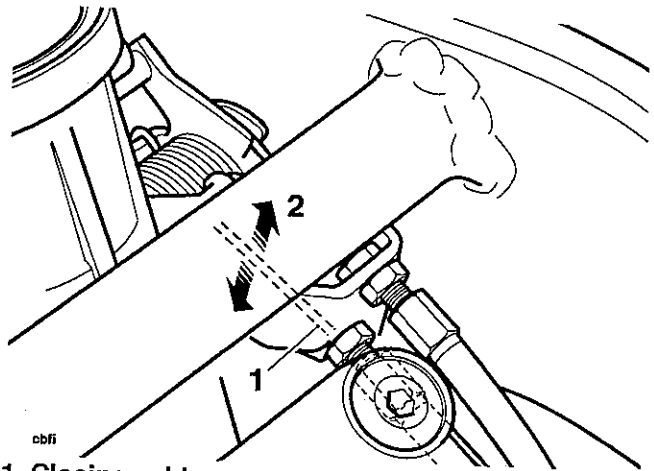
1. Opening cable

2. Adjuster

5. Rotate the 'opening' cable adjuster at the throttle body end of the cable to give 2-3 mm of play at the twist grip. Tighten the locknut.

6. Make any minor adjustments as necessary to give 2-3 mm of play using the adjuster near the twist grip end of the cable. Tighten the locknut.

7. With the throttle fully closed, ensure that there is 2-3mm of free play in the 'closing' cable. Adjust as for the 'opening' cable if necessary.



1. Closing cable

2. 2-3mm

WARNING: Ensure that all the adjuster locknuts of both cables are tightened as a sticking throttle could result from a loose locknut.

An incorrectly adjusted, sticking or stuck throttle will lead to loss of motorcycle control and an accident

8. Refit the fuel tank.

9. Reconnect the battery, positive (red) lead first.

10. Refit the seats.

11. Check that the throttle opens smoothly, without undue force and that it closes without sticking.

WARNING: Operation of the motorcycle with an incorrectly adjusted, incorrectly routed or damaged throttle cable could interfere with the operation of the brakes, clutch or the throttle itself. Any of these conditions could result in loss of control of the motorcycle and an accident.

WARNING: Move the handlebars to left and right full lock while checking that cables and harnesses do not bind. A cable or harness which binds will restrict the steering and may cause loss of control and an accident.

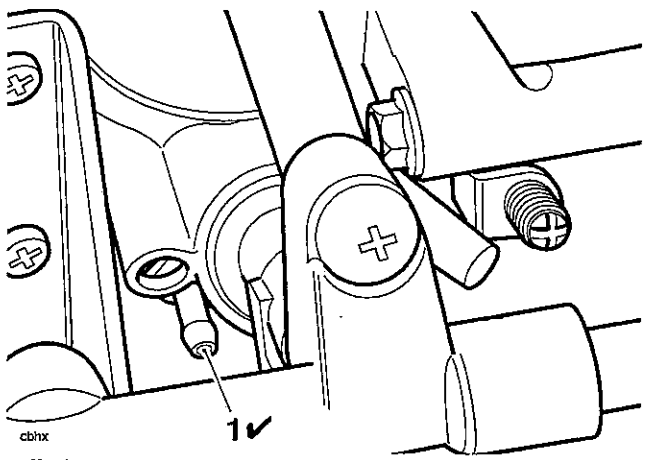
THROTTLE BODY BALANCING

NOTE:

- **In order to accurately balance the throttle bodies, Triumph recommend the use of the *Souriau Indiana* digital inlet vacuum analyser or another similar device. Although mercury columns or analogue gauges will allow balancing of the throttle bodies, use of a digital meter will allow a more accurate balance to be achieved.**

1. Remove the fuel tank and airbox as described elsewhere in this section.

2. Remove the plugs from the ports shown below. On California models, the return hoses for the evaporative system will be fitted instead of plugs.



1. Balance ports (1 of 4)

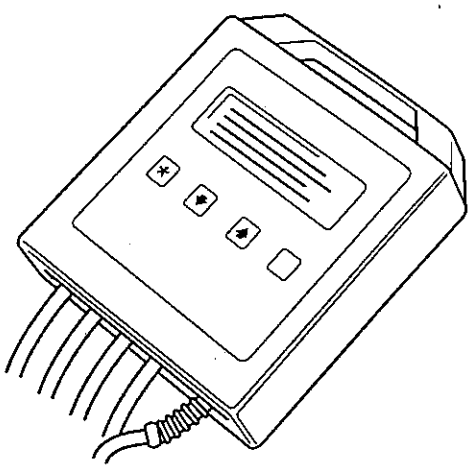
NOTE:

- **Never use the right hand port on the second throttle body from the left as this will not give a true reading.**

3. Position the analyser in a position that it can be easily read and attach the hoses to the balance/evaporative return ports.

WARNING: If the engine has recently been running, the components beneath the fuel tank cover may be hot to the touch.

Contact with the hot components may cause damage to exposed skin. To avoid skin damage, always allow the hot parts to cool before hose disconnection/connection.



Typical analyser display

NOTE:

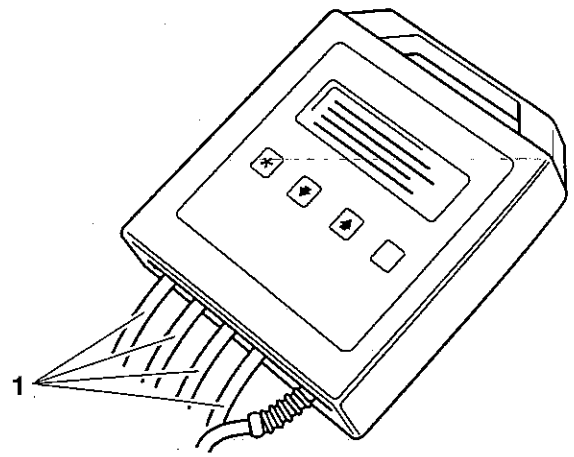
- **The hose connections on the tool are marked 1, 2, 3 & 4 denoting which cylinder they should be connected to. When connecting the hoses to the throttles, ensure that hose 1 is connected to cylinder number one etc. Cylinder 1 is on the left hand side of the motorcycle.**

4. Temporarily refit the fuel tank and reconnect the fuel hoses and fuel pump connection.

5. Attach an exhaust extraction hoses to the silencer.

6. Start the engine.

7. Select the bar chart display on the analyser and assess which cylinders require adjustment.



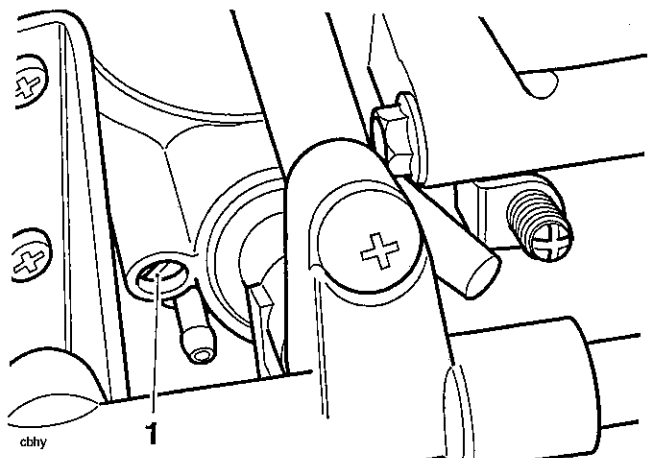
Typical display of imbalanced throttles.

NOTE:

- **All four cylinders can be adjusted.**

8. Calculate the average of all four readings.

9. Make adjustments such that all four throttle bodies are set to the average figure calculated above.



1. Adjusters (1 of 4)

10. Stop the engine.

11. Disconnect the tool.

12. Remove the fuel tank.

13. Reconnect the evaporative return hoses (California models) or the port plugs (rest of world).

CAUTION: Inspect the plugs or hoses for damage and splits as air leaks could cause a weak mixture and poor running.

Either of the above conditions could lead to engine damage and unsatisfactory operation of the motorcycle.

14. Permanently refit the air box and fuel tank as described earlier in this section.

15. Start the engine and check that the idle speed is in the range 1250 ± 100 rpm.

NOTE:

- **If the idle speed now falls outside the above range, use the RESET ADAPTIONS facility on the diagnostic tool. Refer to the tool's operating instructions for details.**

THROTTLE BODY

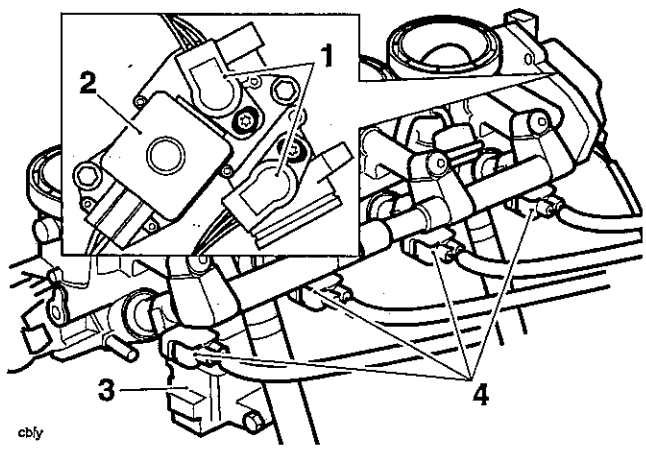
Removal

1. Remove the seats and disconnect the battery negative (black) lead first.

2. Remove the fuel tank and airbox as described earlier in this section.

3. Disconnect throttle cables from throttle linkage as described elsewhere in this section.

4. Disconnect the electrical multiplugs from;
   - both of the throttle position sensors,
   - the idle speed control stepper motor,
   - the second throttle stepper motor,
   - all four injectors.



1. Throttle position sensors

2. Second throttle stepper motor

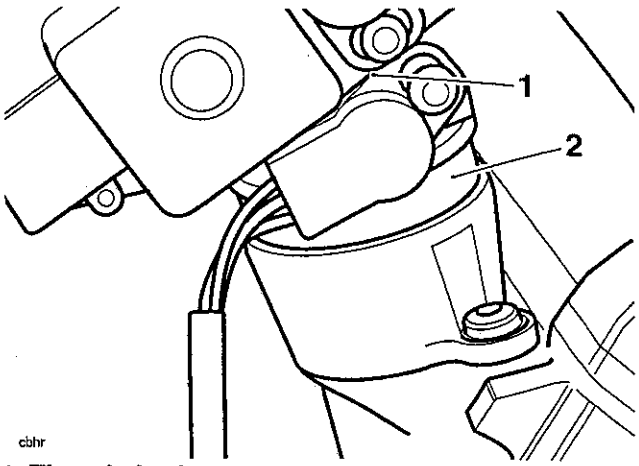
3. Idle speed control stepper motor

4. Injectors

5. Detach the MAP sensor hose from the right hand outer throttle body.

6. On California models, disconnect the evaporative return hoses from each throttle body.

7. Release the clips securing the throttle bodies to the transition pieces.



1. Throttle body

2. Clip (1 of 4)

8. Remove the screws securing each transition piece to the cylinder head.

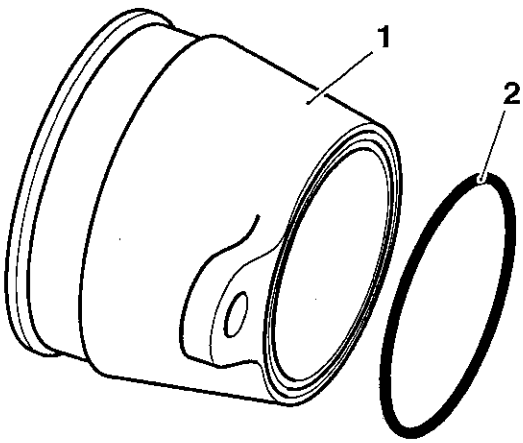
9. Remove the transition pieces and discard the 'O'-ring seals.

10. Cover the inlet ports to prevent the ingress of dirt and other objects.

Installation

1. Remove the covers from the inlet ports and ensure that the mating faces are clean.

2. Locate new 'O'-ring seals to the transition pieces.



cbhl

1. Transition piece

2. 'O' ring

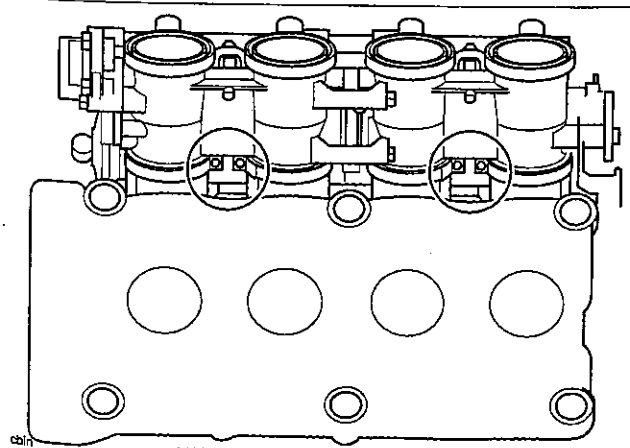
3. Position each transition piece to the cylinder head and tighten the screws to **12 Nm.**

4. Position the throttle body assembly and push each throttle body into its respective transition piece. Ensure that each throttle body is fully seated.

5. Tighten the throttle body clips, with the screw heads positioned as shown circled in the diagram below, to **1.5 Nm.**

WARNING: Failure to orientate the clips as shown in the diagram could result in a sticking throttle. Always orientate the throttle body clips as shown in the diagram below.

A sticking or stuch throttle will lead to loos of motorcycle control and an acident.



cbln

Circled - Clip screw-heads

NOTE:

- **Ensure the throttles seat correctly in the transition pieces and seal each throttle through 360 degrees.**

6. On California models, reconnect the evaporative return hoses to each throttle body.

7. Connect the multiplugs to;
   - both of the throttle position sensors,
   - the idle speed control stepper motor,
   - the second throttle stepper motor,
   - all four injectors.

8. Connect and adjust the throttle cables as described earlier in this section.

WARNING: Ensure that all the adjuster locknuts of both cables are tightened as a sticking throttle could result from a loose locknut.

An incorrectly adjusted, sticking or stuck throttle will lead to loss of motorcycle control and an accident

WARNING: Operation of the motorcycle with an incorrectly adjusted, incorrectly routed or damaged throttle cable could interfere with the operation of the brakes, clutch or the throttle itself. Any of these conditions could result in loss of control of the motorcycle and an accident.

WARNING: Move the handlebars to left and right full lock while checking that cables and harnesses do not bind. A cable or harness which binds will restrict the steering and may cause loss of control and an accident.

9. Refit the airbox and fuel tank as described earlier in this section.

10. Reconnect the battery, positive (red) lead first.

11. Refit the seats.

INJECTORS/FUEL RAIL/FUEL PRESSURE REGULATOR

Removal

1. Remove seat, fuel tank and airbox as described elsewhere in this section.

WARNING: Because fuel stored in the fuel rail will be at 3 bar pressure, it is essential that the fuel pressure is reduced before any dismantling of the throttle bodies takes place.

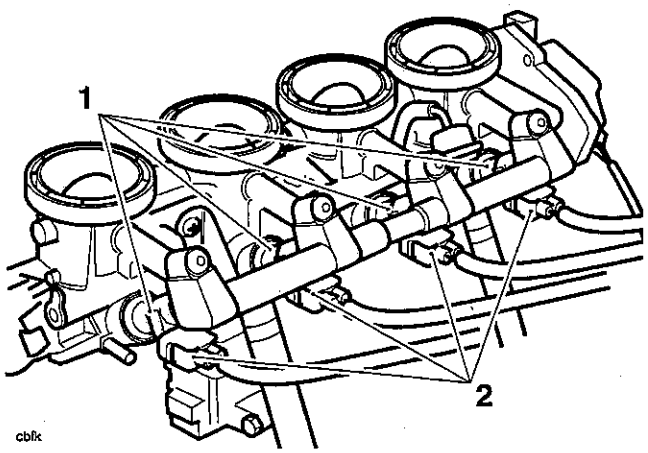
If the throttle bodies are dismantled without first reducing fuel pressure, pressurised fuel may escape causing clothing and components to be coated with fuel.

This would represent a serious fire hazard which could lead to burn injuries and damage to property.

2. Move the gearchange to neutral and crank the engine briefly to reduce fuel pressure in the fuel rail.

3. Disconnect the battery negative (black) lead first.

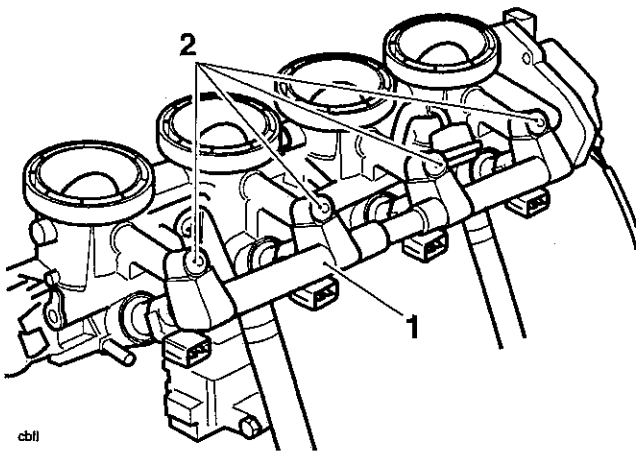
4. Remove the multiplug connectors from the four fuel injectors.



1. Injectors

2. Connectors

5. Remove the four screws securing the fuel rail to the throttle body assembly.



1. Fuel rail

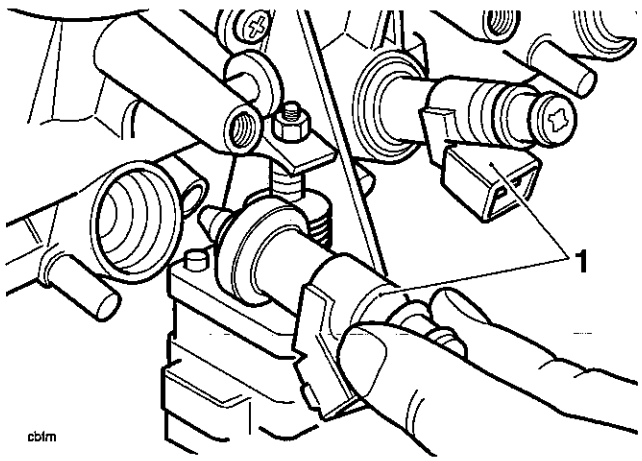
2. Screws

6. Gently ease fuel rail upwards to release it from the injectors.

NOTE:

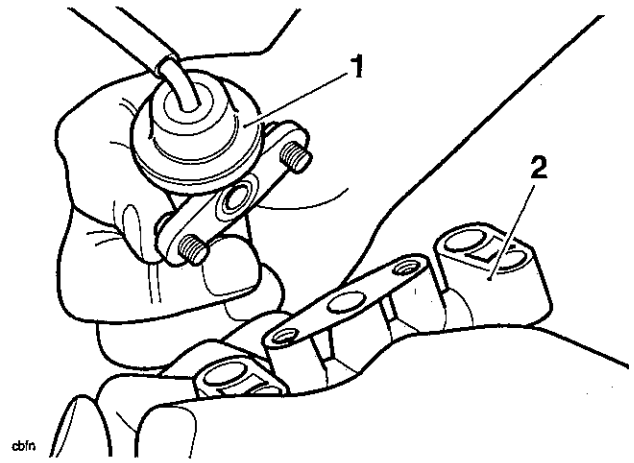
- **The fuel rail is made in two separate pieces linked by a metal bridge piece.**

7. Detach the injectors from each throttle body.



1. Injectors

8. To separate the fuel pressure regulator from the fuel rail, release the two screws and gently ease it from the rail.



1. Fuel pressure regulator

2. Fuel rail

Assembly/installation

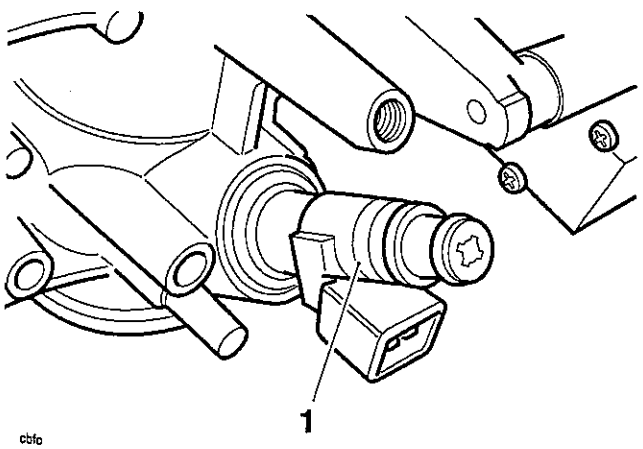
1. Ensure the pressure regulator and mating face on the fuel rail are clean.

2. Incorporating a new 'O'-ring seal, position the fuel pressure regulator to the fuel rail and secure with two screws. Tighten to **5 Nm.**

NOTE:

- **The short hose leading from the pressure regulator is not connected to another point and remains open to the atmosphere.**

3. Incorporating new 'O'-ring seals at both ends of each injector, position the injectors to the throttle body. Ensure that each injector's electrical connection point is facing downwards.



1. Correct injector position

4. Carefully position the fuel rail to the injectors and push home. Ensure each injector is fully seated in its bore in the fuel rail and throttle body.

5. Secure the fuel rail to the throttle body assembly and tighten the screws to **3.5 Nm.**

6. Refit the multiplugs to each injector.

7. Refit the air box and fuel tank as described earlier in this section.

8. Reconnect the battery, positive (red) lead first.

9. Refit the seat.

PRIMARY THROTTLE POTENTIOMETER

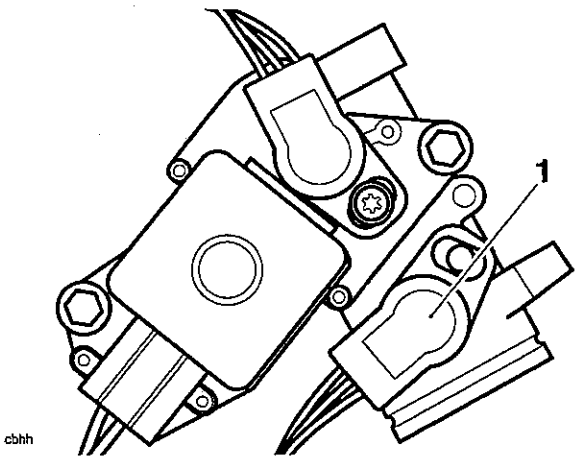
NOTE:

- **Although it is possible to remove and refit the sensor without removing the throttle bodies, removal does make the task much easier. However, the throttle bodies must be in the installed position to set the sensor voltage.**

- **The primary and secondary throttle position sensors are different and must never be switched around. For ease of identification, the primary throttle position sensor has a black coloured connector whereas the secondary sensor has a white connector.**

Removal

1. Remove the seats and disconnect the battery negative (black) lead first.
2. Remove the fuel tank and airbox as described earlier in this section.
3. Optionally, remove the throttle bodies as described earlier in this section.
4. Remove the Torx screw securing the primary throttle position sensor to the throttle body.

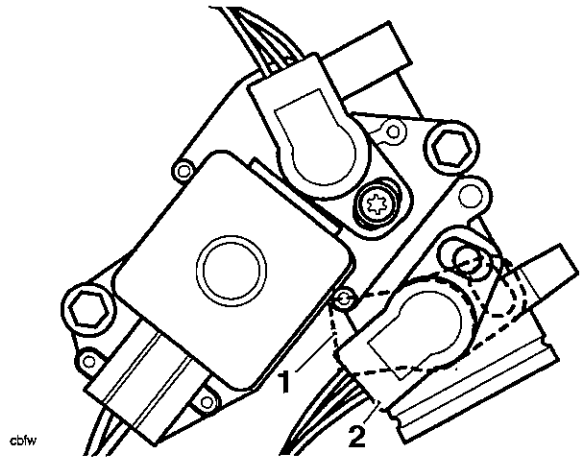


1. Primary throttle position sensor

5. Turn the sensor clockwise and detach it from the throttle body by gently pulling outwards.

Installation

1. Lubricate the sensor 'O'-ring with a smear of engine oil.
2. Insert the sensor to the throttle body at the angle shown below then turn it anti-clockwise until the screw hole aligns with the thread in the throttle body.



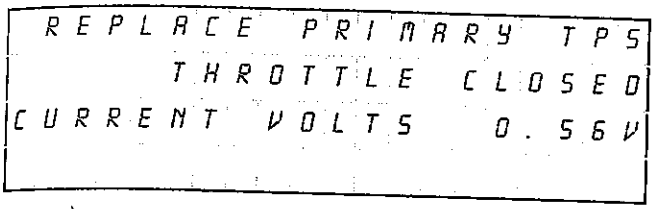
1. Sensor insertion position (dotted line)

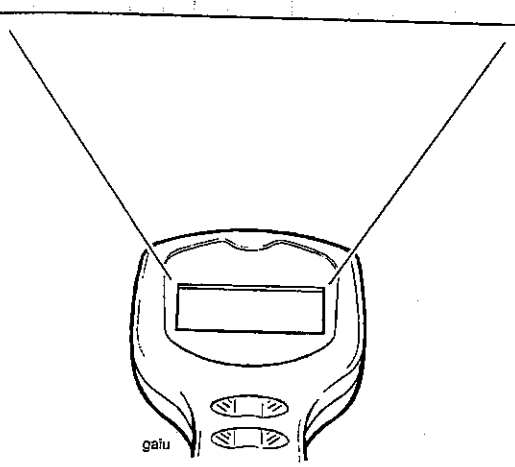
2. Sensor initial fitted position (solid line)

3. Insert the Torx screw to secure the throttle potentiometer, but do not fully tighten the screw yet.
4. If necessary, refit the throttle bodies as described earlier in this section, but do not fit the airbox etc.
5. Temporarily reconnect the battery, positive (red) lead first.
6. Connect the service diagnostic tool and scroll through to, and select the 'ADJUST TUNE' option.
7. At the next screen, align the cursor with THROTTLE POT RENEW (see below) then press the validation key which is marked '*'.

```
                ADJUST TUNE
  RESET ADAPTIONS
▶ THROTTLE POT RENEW
  ISC STEPPER RENEW
```

8. On pressing the validation key, the diagnostic tool will send a command which drives the primary throttle to the fully closed position. The tool will also display the voltage reading coming from the throttle position sensor.





9. Gently rotate the new throttle position sensor until the voltage reading on the tool shows 0.6 volts +/- 0.02 volts.

10. Tighten the sensor retaining screw to **3 Nm** and recheck the voltage reading shown on the tool. Repeat the adjustment if the reading is outside the specified range.

11. Press the the validation key marked '✳' to return the throttle to normal control and return the diagnostic tool to the ADJUST TUNE menu.

12. Disconnect the diagnostic tool.

13. Disconnect the battery, negative (black) lead first.

14. Check that the throttle opens and closes without obstruction/sticking and has a smooth action throughout the full range of its movement. Rectify as necessary.

WARNING: Operation of the motorcycle with an incorrectly adjusted throttle position sensor, or a throttle position sensor that causes the throttle to stick could result in loss a throttle control Loss of throttle control could result in loss of control of the motorcycle and an accident.

WARNING: Operation of the motorcycle with an incorrectly adjusted, incorrectly routed or damaged throttle cable could interfere with the operation of the brakes, clutch or the throttle itself. Any of these conditions could result in loss of control of the motorcycle and an accident.

WARNING: Move the handlebars to left and right full lock while checking that cables and harnesses do not bind. A cable or harness which binds will restrict the steering and may cause loss of control and an accident.

15. Refit the airbox and fuel tank as described earlier in this section.

16. Reconnect the battery, positive (red) lead first.

17. Refit the seats.

SECONDARY THROTTLE POTENTIOMETER

NOTE:

- **Although it is possible to remove and refit the sensor without removing the throttle bodies, removal does make the task much easier. However, the throttle bodies must be in the installed position to set the sensor voltage.**

- **The primary and secondary throttle position sensors are different and must never be switched around. For ease of identification, the primary throttle position sensor has a black coloured connector whereas the secondary sensor has a white connector.**

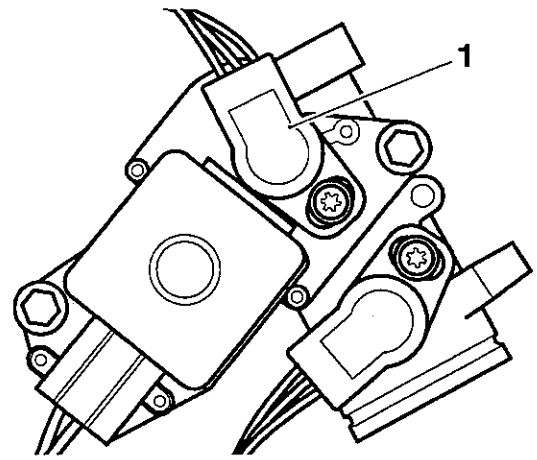
Removal

1. Remove the seats and disconnect the battery negative (black) lead first.

2. Remove the fuel tank and airbox as described earlier in this section.

3. Optionally, remove the throttle bodies as described earlier in this section.

4. Remove the Torx screw securing the secondary throttle position sensor to the throttle body.



1. Secondary throttle position sensor

5. Manually hold the second throttle in the fully open position.

NOTE:

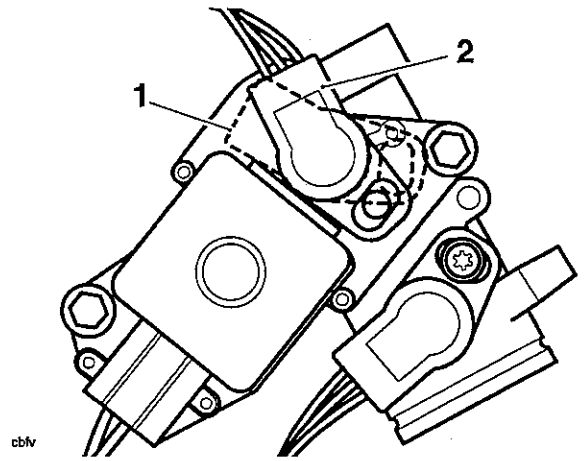
- **The second throttle will not open if the battery is still connected and the ignition in the on position.**

6. Turn the sensor anti-clockwise until there is no gap between it and the stepper motor, then detach it from the throttle body by gently pulling outwards.

Installation

1. Lubricate the sensor 'O'-ring with a smear of engine oil.

2. With the second throttle still held in the fully open position, insert the sensor to the throttle body at the angle shown below then turn it clockwise until the screw hole aligns with the thread in the throttle body.



1. Sensor insertion position (dotted line)

2. Sensor initial fitted position (solid line)

3. Insert the Torx screw but do not fully tighten yet.

4. Release the second throttle.

5. If necessary, refit the throttle bodies as described earlier in this section, but do not fit the airbox etc.

6. Temporarily reconnect the battery, positive (red) lead first.

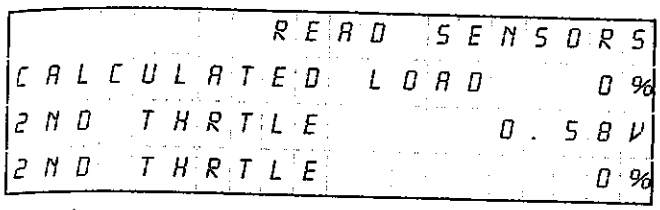
7. Turn the ignition to the ON position which will close the second throttle.

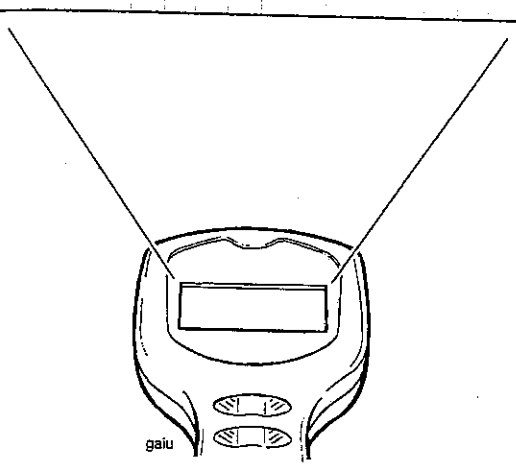
NOTE:

- **To ensure the second throttle is totally closed, have an assistant manually press the butterfly closed.**

8. Connect the service diagnostic tool and scroll through to the CHECK/ADJUST menu, select CHECK then select the 'READ SENSORS' option.

9. Scroll through the sensor data until the second throttle position sensor voltage is displayed.





10. Gently rotate the new throttle position sensor until the voltage reading on the tool shows 0.6 volts +/- 0.02 volts.

11. Tighten the sensor retaining screw to **3 Nm** and recheck the voltage reading shown on the tool. Repeat the adjustment if the reading is outside the specified range.

12. Turn the ignition to the OFF position.

13. Disconnect the diagnostic tool.

14. Disconnect the battery, negative (black) lead first.

15. Check that the throttle opens and closes without obstruction/sticking and has a smooth action throughout the full range of its movement. Rectify as necessary.

WARNING: Operation of the motorcycle with an incorrectly adjusted throttle position sensor, or a throttle position sensor that causes the throttle to stick could result in loss a throttle control Loss of throttle control could result in loss of control of the motorcycle and an accident.

WARNING: Operation of the motorcycle with an incorrectly adjusted, incorrectly routed or damaged throttle cable could interfere with the operation of the brakes, clutch or the throttle itself. Any of these conditions could result in loss of control of the motorcycle and an accident.

WARNING: Move the handlebars to left and right full lock while checking that cables and harnesses do not bind. A cable or harness which binds will restrict the steering and may cause loss of control and an accident.

16. Refit the airbox and fuel tank as described earlier in this section.

17. Reconnect the battery, positive (red) lead first.

18. Refit the seats.

IDLE SPEED CONTROL STEPPER MOTOR

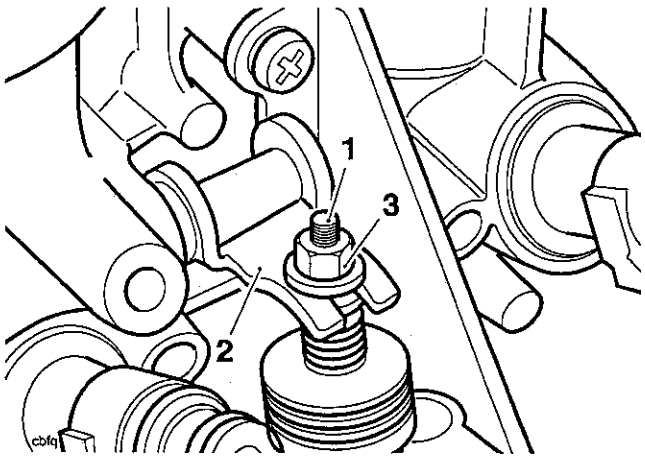
Removal

1. Remove the seats and disconnect the battery negative (black) lead first.

2. Remove the fuel tank and airbox as described earlier in this section.

3. Remove the throttle bodies as described earlier in this section.

4. Remove the nut, metal washer and plastic washer attaching the idle control stepper arm to the idle speed control lever.



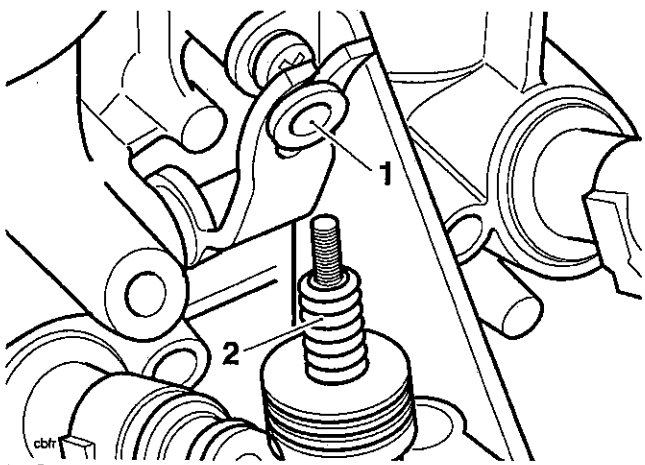
1. Idle control stepper arm

2. Idle speed control lever

3. Nut etc.

5. Fully open the primary throttle by hand.

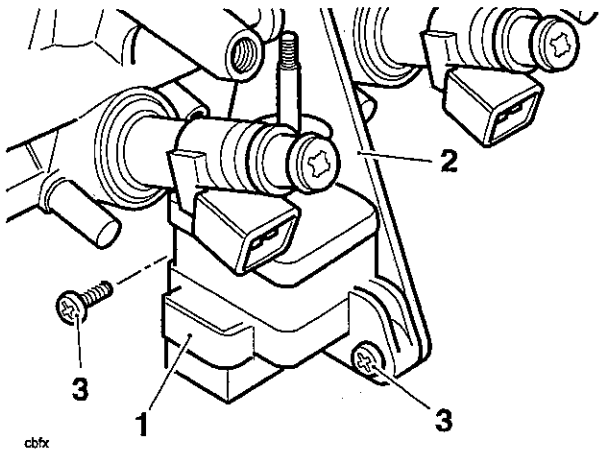
6. Turn the idle speed control lever away from the stepper arm and remove the plastic collar and spring.



1. Collar

2. Spring

7. Remove the two screws securing the idle speed control stepper motor to its bracket, then remove the stepper motor.



1. Idle speed control stepper motor

2. Bracket

3. Fixings

Installation

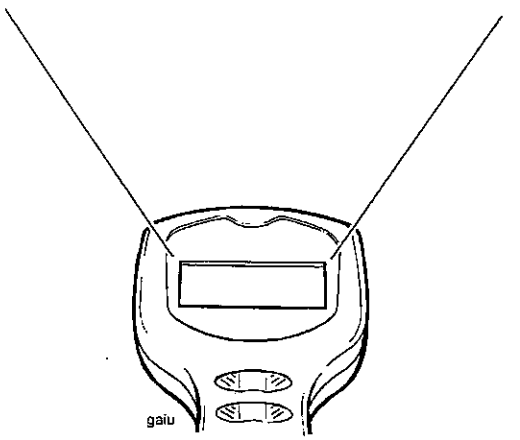
1. Open the throttle and turn the idle speed control lever until it the stepper motor can be fitted without obstruction of any kind.
2. Locate the stepper motor to its bracket and tighten the fixings to **3 Nm.**
3. Lower the idle speed control lever over the stepper arm and close the primary throttle.
4. Apply a thin smear of grease to the idle speed control lever.
5. Locate the spring and plastic collar.
6. Fit the plastic washer through the lever then fit the metal washer and nut.
7. Refit the throttle bodies as described earlier in this section, but do not fit the airbox etc.
8. Temporarily reconnect the battery, positive (red) lead first.
9. Turn the ignition to the ON position.
10. Connect the service diagnostic tool and scroll through to, and select the 'ADJUST TUNE' option.
11. At the next screen, align the cursor with ISC* STEPPER RENEW (see below) then press the validation key which is marked '*'.

```
                ADJUST TUNE
  RESET ADAPTIONS
  THROTTLE POT RENEW
▶ISC STEPPER RENEW
```

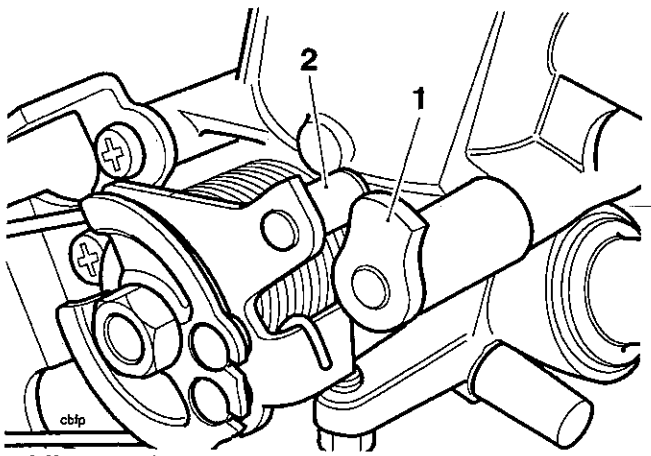
* ISC = Idle Speed Control

12. On pressing the validation key, the diagnostic tool will send a command which drives the primary throttle to the fully closed position. The tool will also display the voltage reading coming from the throttle position sensor which will be needed for a check/adjustment made later in the process.

```
REPLACE ISC STEPPER
      THROTTLE CLOSED
CURRENT VOLTS   0.58V
```



13. Tighten the stepper arm nut until a clearance of 0.5 mm can be measured between the idle speed control cam and the throttle roller (see the diagram below).

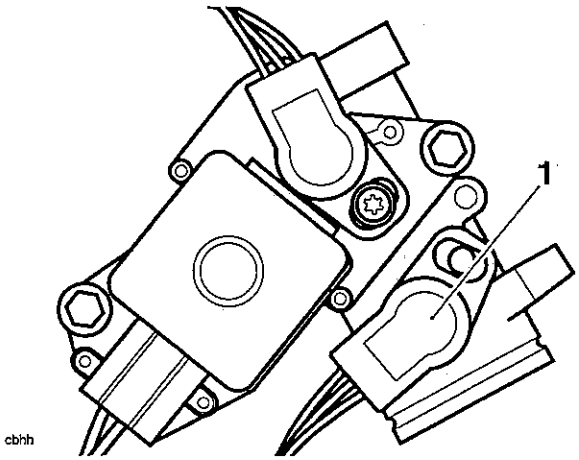


1. Idle speed control cam

2. Throttle roller

14. Check the voltage reading on the tool. If the reading is 0.6 volts +/- 0.02 volts, **MAKE A NOTE OF THE EXACT VOLTAGE READING** then proceed to step 18. If the reading is not within this tolerance band, adjustmnent must be made as described in steps 15 to 17.

15. Slacken the retaining screw on the primary throttle position sensor.



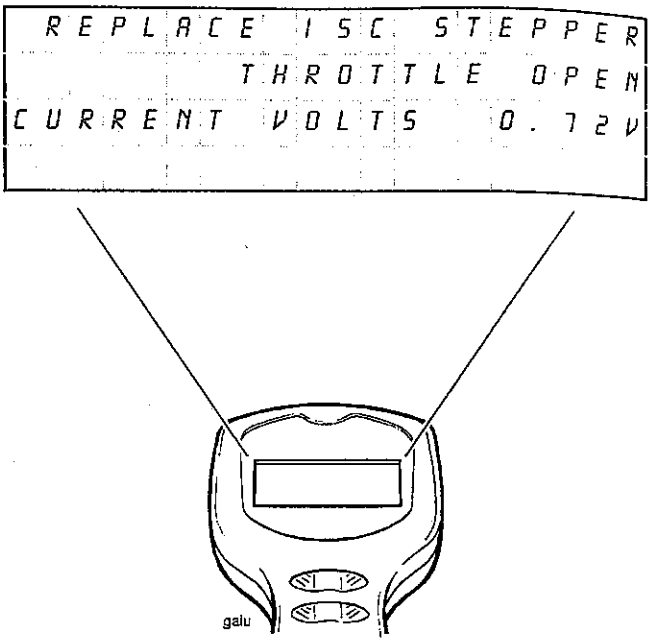
1. Primary throttle position sensor

16. Gently turn the primary throttle position sensor until the voltage reading on the tool shows 0.6 volts +/- 0.02 volts. **MAKE A NOTE OF THE EXACT VOLTAGE READING.**

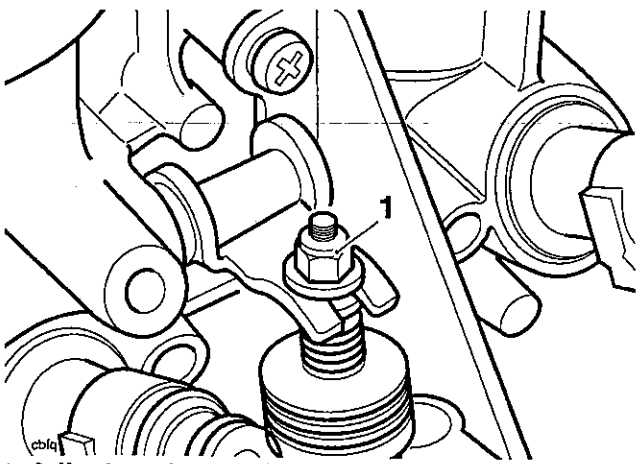
17. Tighten the sensor retaining screw to **3 Nm** and recheck the voltage reading shown on the tool. Repeat the adjustment if the reading is outside the specified range, **NOTING THE FINAL VOLTAGE READING IF ADJUSTMENT IS MADE.**

18. Press the validation key marked '✳' to progress to the next adjustment.

19. On pressing the validation key, the diagnostic tool will send a command which drives the primary throttle to the fully open position. The tool will also display the voltage reading coming from the throttle position sensor.



20. With the stepper fully opened, check the voltage shown on the tool and adjust the nut on the top of the stepper arm until the tool shows a voltage equivalent to X+0.12 (+/- 0.05V) where X= the voltage measured in step 14 (or 16/17 if re-adjusted).
For example, if the voltage measured was 0.6 volts, then the correct setting would be 0.72 volts with a tolerance of +/- 0.05 volts.



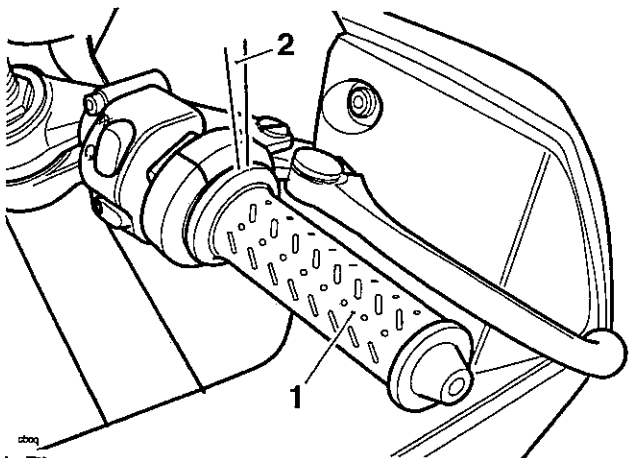
1. Adjustment nut.

21. Press the validation key marked '✳' to fully close the idle speed control stepper motor. After a minimum of 15 seconds (the tool will not allow further actions to take place during this period), press the validation key again to return the ECM to normal control.

22. Turn the ignition to the OFF position.

23. Disconnect the battery, negative (black) lead first.

24. Check that the throttle opens and closes without obstruction/sticking and has a smooth action throughout the full range of its movement. Also check that there is 2–3mm of free movement in the throttle. Rectify as necessary using the throttle adjustment procedure described earlier in this section.



1. Throttle twist grip

2. 2-3 mm

WARNING: Operation of the motorcycle with an incorrectly adjusted throttle position sensor, or a throttle position sensor that causes the throttle to stick could result in loss a throttle control Loss of throttle control could result in loss of control of the motorcycle and an accident.

WARNING: Operation of the motorcycle with an incorrectly adjusted, incorrectly routed or damaged throttle cable could interfere with the operation of the brakes, clutch or the throttle itself. Any of these conditions could result in loss of control of the motorcycle and an accident.

WARNING: Move the handlebars to left and right full lock while checking that cables and harnesses do not bind. A cable or harness which binds will restrict the steering and may cause loss of control and an accident.

25. Permanently refit the airbox and fuel tank as described earlier in this section.

26. Reconnect the battery, positive (red) lead first.

27. Refit the seats.

ENGINE MANAGEMENT ADAPTION

General Information

The engine management system fitted to this model is adaptive. This means that the system is able to learn about new or changing operating conditions and continuously adapt itself without needing to constantly make major adjustments from a fixed baseline setting.

Adaptive changes can become necessary because of changing rider behavior, changes in the region in which the bike is operated (i.e. operation at high altitude where it was previously used at sea level) or because a new part may have been fitted which has slightly different characteristics to the old part. All adaptive changes are automatic and require no intervention by rider or dealer.

Adaption Status

To see if a motorcycle has adapted, a facility named 'ADAPTION STATUS' is provided on the diagnostic tool. The following adaption details can be examined:

Function Examined	Report Method
Closed throttle position reference status	adapted/not adapted
Idle speed control adaption status	%
Oxygen sensor adaption status (off idle)	%
Oxygen sensor adaption range (off idle)	%
Oxygen sensor adaption status (idle)	%
Oxygen sensor adaption range (idle)	%

Terminology

Where the term 'status' is used, this indicates how far the present operating parameter is from the stored (baseline) value. The nearer these figures are to zero the better as it indicates the motorcycle is basically adapted to its current operating conditions.

The term 'range' indicates how much (in percentage terms) of the adjustment range has been used to reach the current operating status.

Typical Values

In a correctly adapted motorcycle, the following will be typical:

Function Examined	Read Out
Closed throttle position reference status	Adapted
Idle speed control adaption status	Between +100 and -100%
Oxygen sensor adaption status (off idle)	0% +/- 10%
Oxygen sensor adaption range (off idle)	Between +100 and -100%
Oxygen sensor adaption status (idle)	0% +/- 10%
Oxygen sensor adaption range (idle)	Between +100 and -100%

Forcing adaption to take place

If the read out indicates that the motorcycle is not adapted, the following will force the system to make adaptions:

1. Ensure the coolant is at ambient temperature.
2. Start the engine and allow it to warm WITHOUT TOUCHING THE THROTTLE until the cooling fan comes on.
3. Leave the engine to idle for a further 12 minutes.

NOTE:

- **To fully adapt a particular motorcycle, it may be necessary to force adaption to take place more than once.**

Fault Indications

If 'range' figures at 100% are seen, then the adjusted has reached maximum indicating a mechanical fault exists on the motorcycle. This can be due to a number a faults but the most likely causes will be low/high fuel pressure, faulty injectors or air leaks at the throttle bodies or airbox.

In these circumstances, locate and rectify the fault, use the RESET ADAPTIONS facility on the diagnostic tool (found under the adjust tune menu) and begin the adaption process described above.

EXHAUST SYSTEM

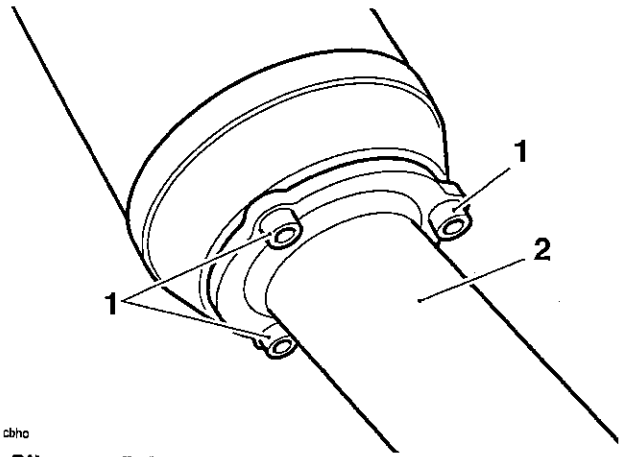
Removal

NOTE:

- **To remove the exhaust system, the belly panel assembly, both lower fairings and the radiator must first be removed. Refer to the body and cooling sections for details.**

WARNING: If the engine has recently been running, the exhaust components may be hot to the touch. Contact with the hot components may cause damage to exposed skin. To avoid skin damage, always allow the hot parts to cool before working on the exhaust system.

1. Release the fixings securing the silencer to the header pipe.

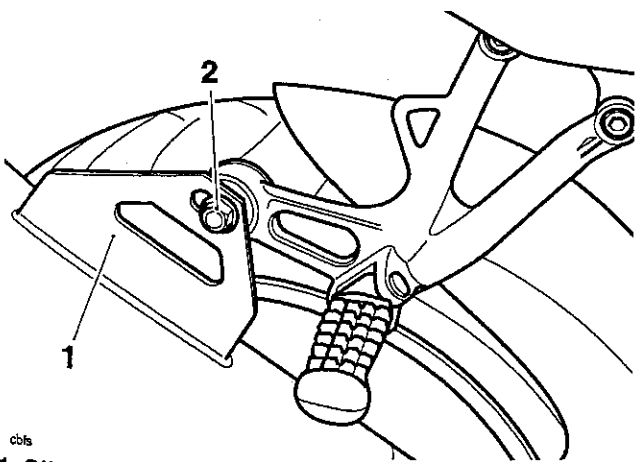


cbhc

1. Silencer fixings

2. Header pipe

2. Release the fixing securing the silencer bracket to the rear footrest hanger.



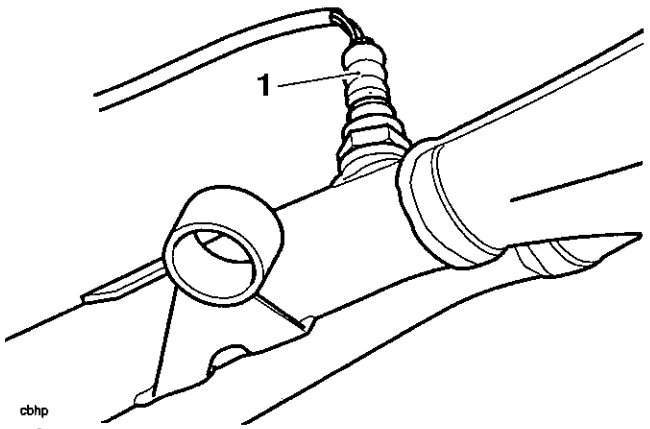
cbfs

1. Silencer bracket

2. Fixing

3. Detach the silencer in a rearward direction.

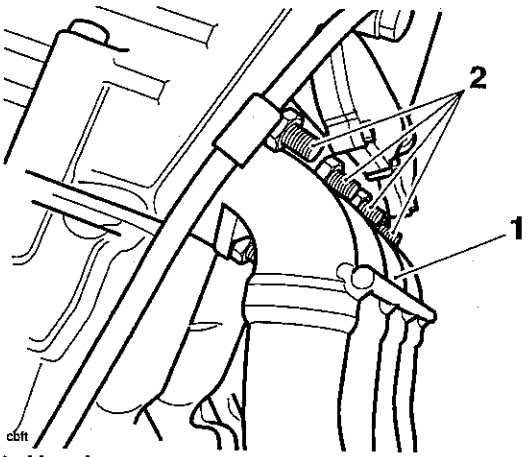
4. Disconnect the oxygen sensor.



cbhp

1. Oxygen sensor connection

5. At the cylinder head, release the nuts securing the header pipes.

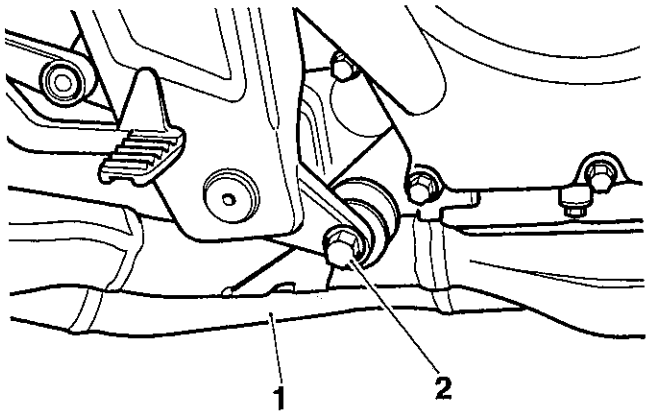


cbft

1. Headers

2. Fixings (upper row only shown)

6. Release the fixing securing the header pipe to the frame.



cbed

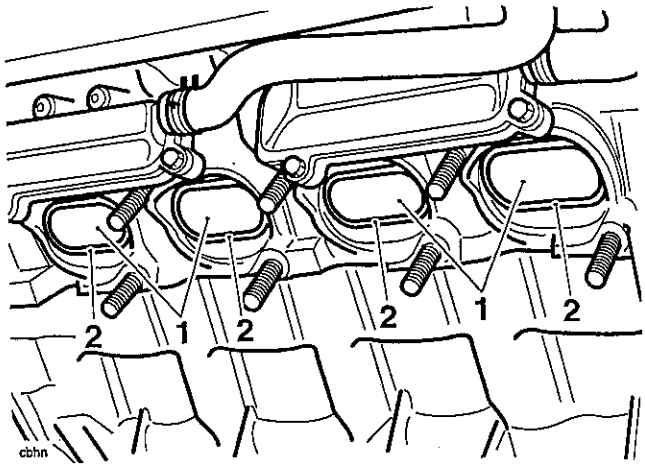
1. Header

2. Fixing

7. Detach and remove the header assembly.

Installation

1. Fit new gaskets to the cylinder head ports.



cbhn

1. Cylinder head ports

2. Gaskets

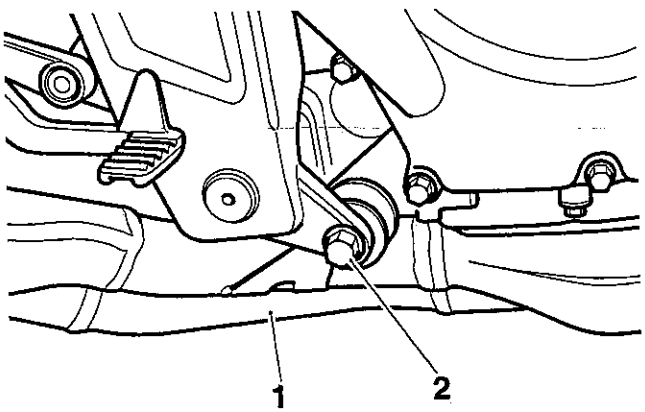
NOTE:

- **To retain the gaskets during assembly, apply a smear of grease to the gasket faces in the head.**

2. Apply 'Copperslip' grease top the header studs on the cylinder head.

3. Locate the headers to the cylinder head and secure with the fixings (hand tight only). Ensure the gaskets do not become displaced during assembly.

4. Align the header to the rear mounting point and refit the fixing (hand tight only).



cbed

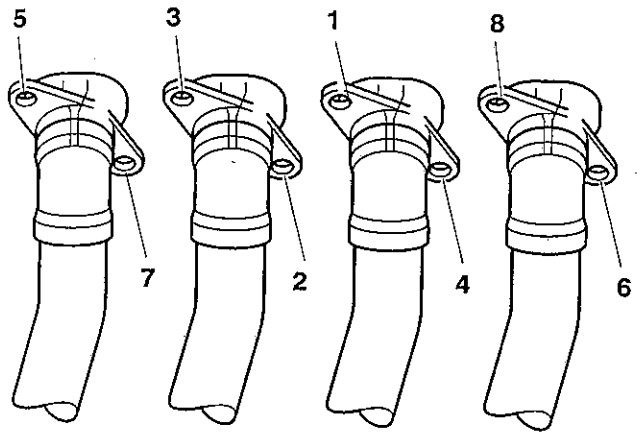
1. Header

2. Fixing

NOTE:

- **Header to cylinder head nuts must be tightened in two stages.**

5. Tighten all the header nuts to **10 Nm** in sequence shown below.



08.88-3

Header tightening sequence

6. Tighten all the header nuts to **19 Nm** in sequence shown above.

7. Tighten the rear header mounting to **15 Nm.**

8. If removed, fit the oxyegn sensor and tighten it to **40 Nm.**

9. Reconnect the oxygen sensor.

10. Fit an new silencer 'O'-ring.

11. Refit the silencer to the header and locate with the three fixings.

12. Align the silencer mounting to the rear footrest hanger and locate with the fixing.

13. Tighten the silencer to header fixings to **22 Nm.**

14. Tighten the silencer mounting to **15 Nm.**

15. Refit the radiator and lower fairings as described in the cooling and bodywork sections respectively.

SECONDARY AIR INJECTION SYSTEM

System Operation

The secondary air injection system is an aid to reducing levels of pollutants in the exhaust gases. It does this by introducing air into the exhaust system to promote secondary combustion of the exhaust gases in the ports and header system.

A solenoid valve, which is controlled by the engine management system, activates and deactivates the secondary air injection system as necessary.

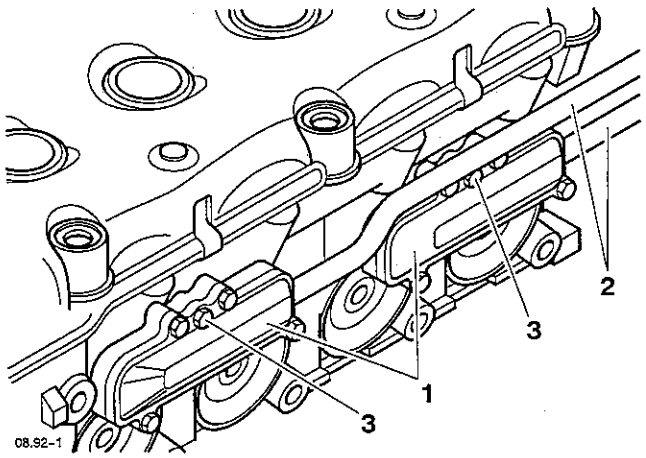
When activated by the engine management system, air is made available to an exhaust port mounted reed valve control system. Each time a pair of exhaust valves open, the exhaust gases in the exhaust port create a depression which causes reed valves in the secondary air injection system to open. When open, the depression in the exhaust port draws air through the open the reed valves, into the exhaust port.

Once the exhaust valves close, the depression is reduced and the reed valves close.

REED VALVE ASSEMBLY

Removal

1. Remove the seats and disconnect the battery negative (black) lead first.
2. Remove fuel tank and airbox as described elsewhere in this section.
3. Remove the radiator as described in the cooling system section.
4. Release the hoses from the two secondary air injection reed valve assemblies.
5. Release the fixings securing the valves to the cylinder head.



08.92-1

1. Reed valve assemblies

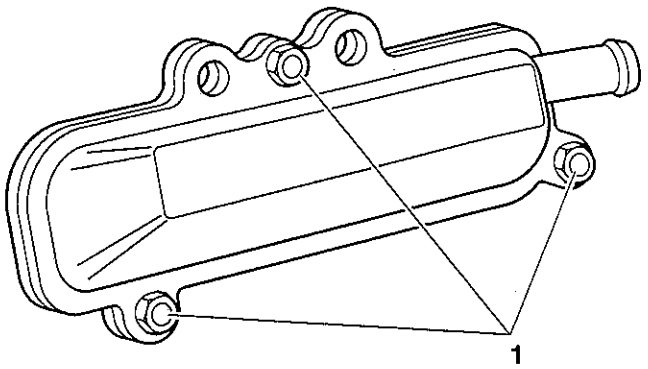
2. Hose connections

3. Fixings to head

6. Gently ease the valve assemblies upwards to remove from the cylinder head.

Disassembly

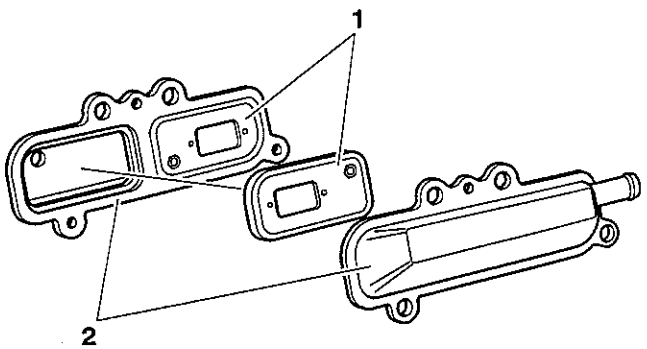
1. Release the fixings securing the valve cover.



08.93-1

1. Valve cover fixings

2. Remove the cover.
3. Ease the valves from the valve body.



08.93-2

1. Valves

2. Valve body

Inspection

1. Check for cracks, bending or other damage to the valve flaps. Replace as necessary.
2. Check for damage to the red coloured seals. Replace as necessary.
3. Check the valve body to cylinder head 'O'-rings. Replace as necessary.

Assembly

1. Fit a new gasket to the cover.
2. Refit the valves to the valve body.

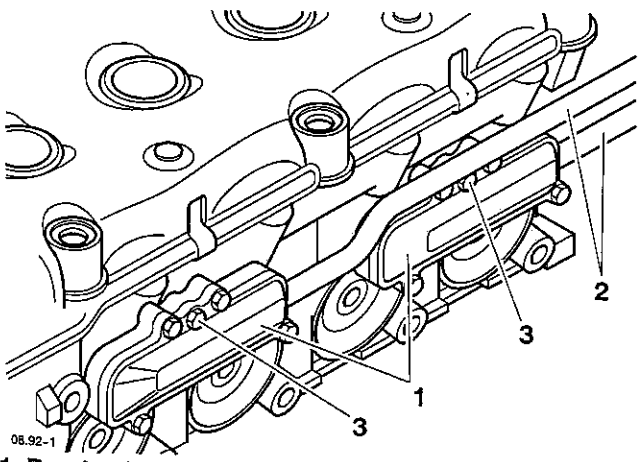
NOTE:

- **The valves will only fit in one orientation.**

3. Refit the cover and secure with the cover fixings.

Installation

1. Apply a light smear of grease to the valve body 'O'-rings, to aid assembly.
2. Locate the valve assemblies to the cylinder head. Tighten the fixings to **10 Nm.**
3. Refit the air hoses to the valve bodies.



1. Reed valve assemblies

2. Hose connections

3. Fixings to head

4. Refit airbox and fuel tank as described elsewhere in this section.
5. Refit the radiator and refill the cooling system as described in the cooling system section.
6. Reconnect the battery negative (black) lead first.
7. Refit the seats.

EVAPORATIVE LOSS CONTROL SYSTEM - CALIFORNIA MODELS ONLY

California Models Only

All California models are fitted with an evaporative emissions control system to prevent the exhausting of fuel vapour into the atmosphere.

A cannister containing activated charcoal, located behind the engine, absorbs fuel vapour given off by the fuel in the fuel tank. Generally, vapour delivery to the canister occurs when the motorcycle is parked in sunlight. This causes the fuel temperature in the fuel tank to rise, resulting in a rise in the vapour pressure inside the tank. Normally this vapour would be vented to atmosphere but on California models, it is stored in the charcoal canister. When the engine is started, the vapour is returned to the engine by means of induction vacuum and is burnt in the engine.

There are two distinct phases to the system's operation, engine off and engine running. These two conditions are explained overleaf.

Component Locations

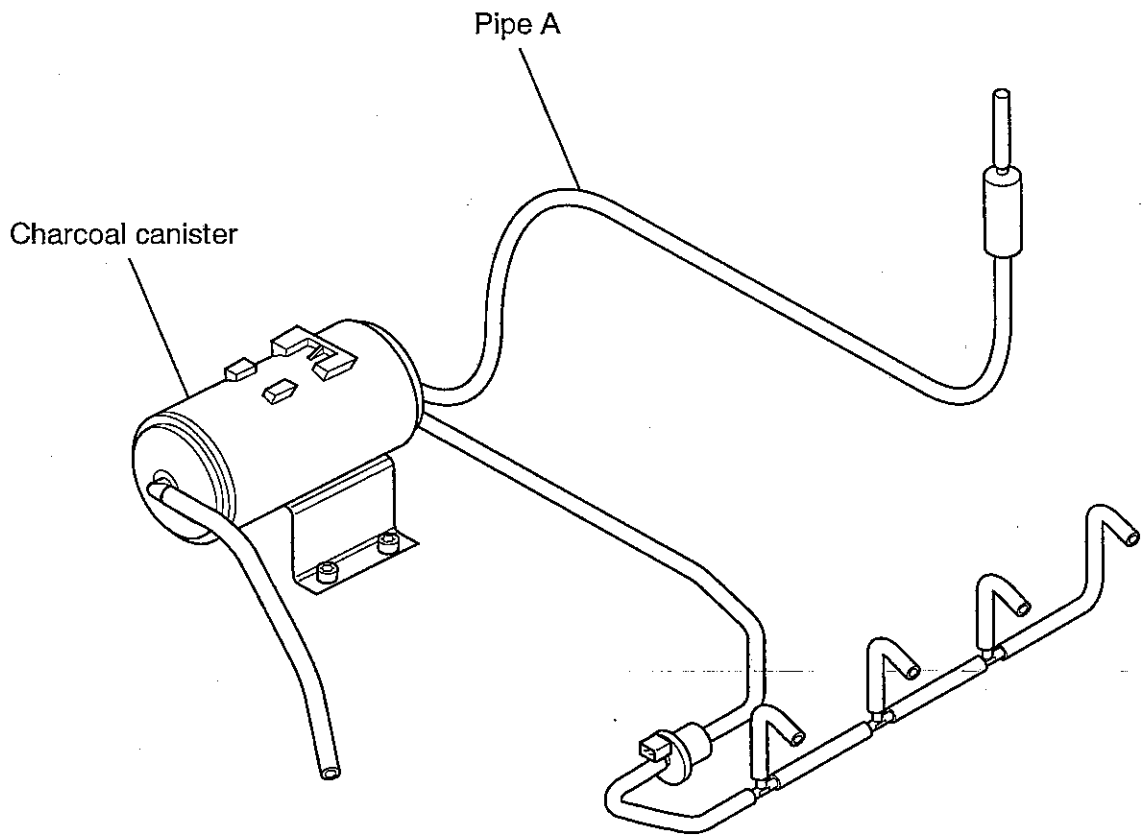
Carbon Cannister - behind the engine.

Purge Valve - adjacent to frame, left hand side (electronically controlled by the ECM).

Roll Over Valve - in the vapour line from the fuel tank.

Evaporative Control System - Engine Off.

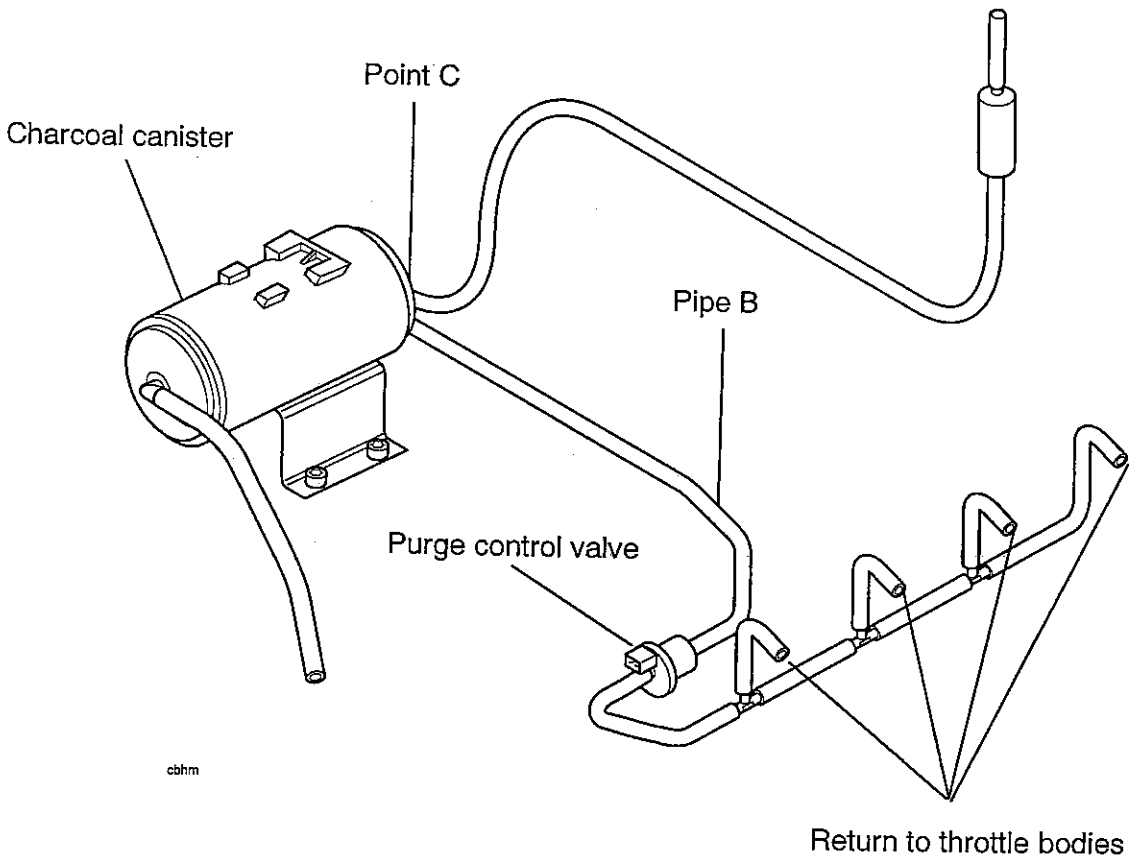
When the engine is stationary any pressure increase in the fuel tank due to a rise in ambient temperature or through direct heating by sunlight will cause the fuel vapour to pass down the breather pipe A to the canister. Vapour is then stored in charcoal layers within the canister.



Evaporative Control System - Engine Running

When the engine is started, vacuum from the engine is applied to point C (the vacuum switch on the canister), causing the canister return valve to open. Direct return of vapour, along pipe B, to the throttle bodies is prevented by the purge control valve which is governed by the engine management system. When open, the valve allows stored vapour to return to the throttle bodies where it enters the engine and is burnt in the cylinders.

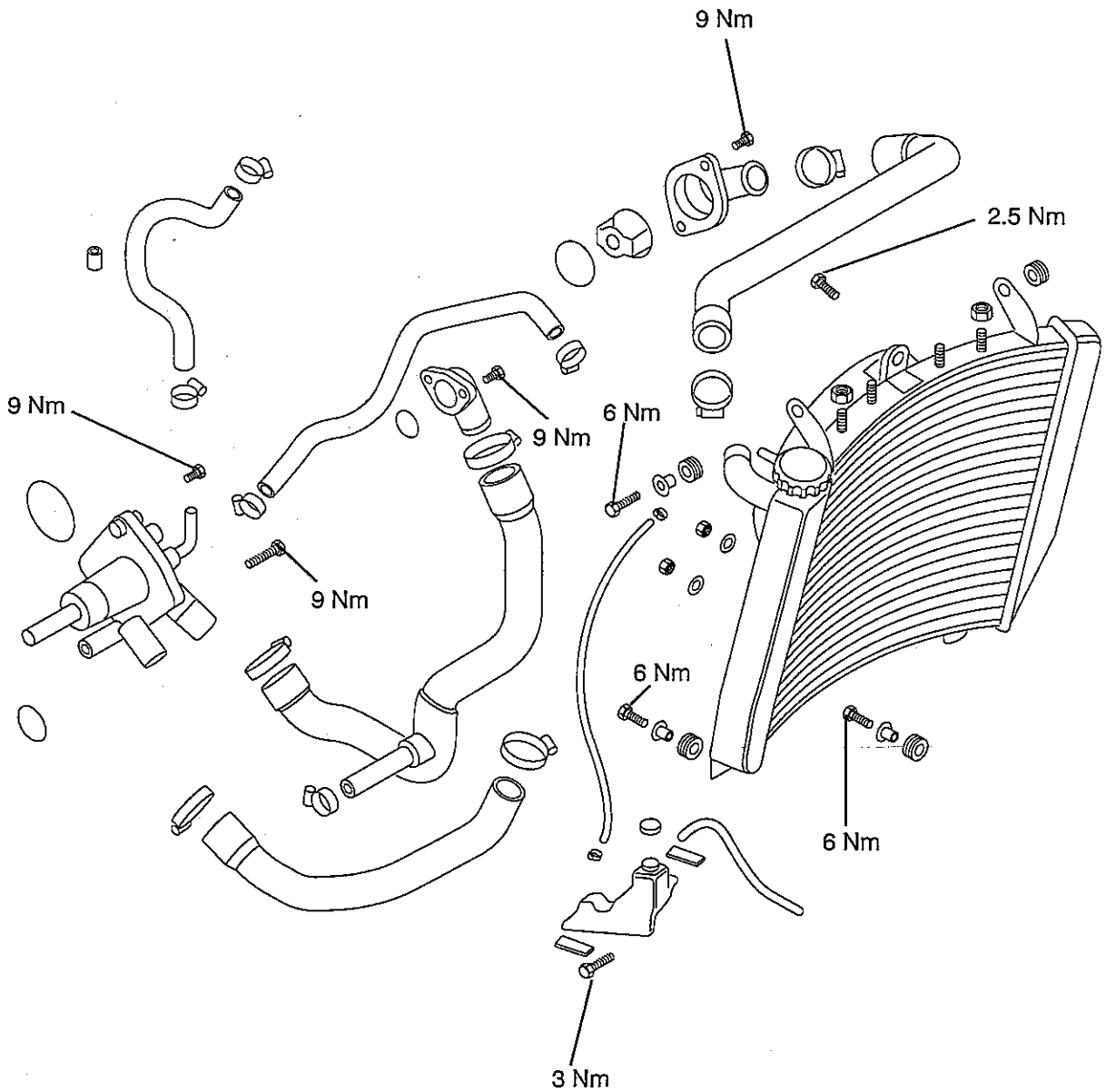
The purge control valve is shuttled between the open and closed position during purging to prevent transient rich mixture and high emissions.



COOLING SYSTEM

CONTENTS

Exploded View - Cooling System



COOLANT

A permanent type of anti-freeze is installed in the cooling system when the motorcycle leaves the factory. It is coloured blue, contains a 50% solution of ethylene glycol, and has a freezing point of -35°C (-31°F).

Always change the coolant at the intervals specified in the scheduled maintenance chart.

WARNING: Coolant mixture which contains anti-freeze and corrosion inhibitors contains toxic chemicals which are harmful to the human body. Never swallow anti-freeze or any of the motorcycle coolant.

CAUTION: The coolant anti-freeze contains a corrosion inhibitor which helps prevent damage to the metal surfaces inside the cooling system. Without this inhibitor, the coolant would 'attack' the metals and the resulting corrosion would cause blockages in the cooling system leading to engine overheating and damage. Always use the correct anti-freeze as specified in the owner's handbook. Never use a methanol based anti-freeze as this does not contain the required corrosion inhibition properties.

CAUTION: Distilled water must be used with the anti-freeze (see specification for anti-freeze) in the cooling system.

If hard water is used in the system, it causes scale accumulation in the water passages, and considerably reduces the efficiency of the cooling system. Reduced cooling system efficiency may cause the engine to overheat leading to severe engine damage.

Oil Cooler/Heat Exchanger

For details of the heat exchanger, refer to the lubrication system section.

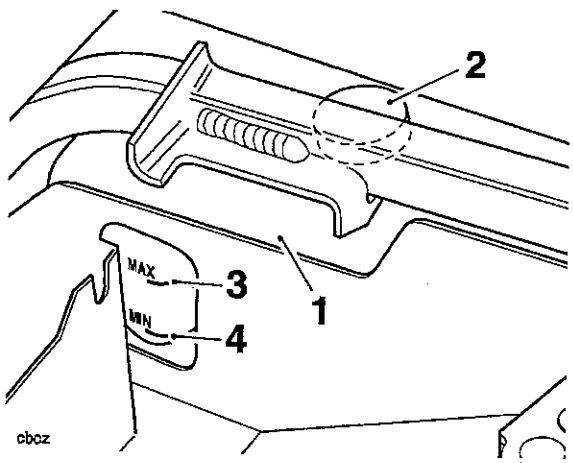
Coolant Level Inspection

WARNING: Do not remove the coolant pressure cap when the engine is hot. When the engine is hot, the coolant inside the cooling system will be under pressure. Contact with the pressurised coolant will cause scalds and skin damage.

NOTE:

- **The tank is located on the right hand side of the motorcycle. The expansion tank level marks can be seen by removing the seats.**

1. Remove the seats.
2. Position the motorcycle on level ground and in an upright position.
3. Check the coolant level in the expansion tank. The coolant level should be between the 'MAX' and 'MIN' marks.



1. **Expansion Tank**
2. **Filler Cover**
3. **Max Mark**
4. **Min Mark**

4. If the level of the coolant is below minimum, coolant must be added as follows:

CAUTION: If the coolant level is found to be low, or if coolant has to be added regularly, inspect the cooling system for a coolant leak. If necessary, pressure test the cooling system to locate the source of any leak and rectify as necessary. Loss of coolant may cause the engine to overheat and suffer severe engine damage.

5. Remove the rear bodywork, as described in the body section.

6. Remove the expansion tank cap and add coolant mixture as necessary to bring the coolant level up to the 'MAX' mark (bike upright).

7. Refit the expansion tank cap.

8. Refit the rear bodywork, as described in the body section.

9. Refit the seats.

Coolant Replacement

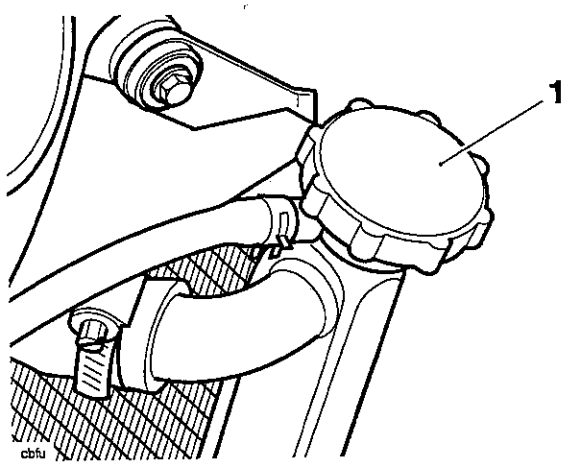
Drainage

WARNING: Do not remove the coolant pressure cap when the engine is hot. When the engine is hot, the coolant inside the cooling system will be under pressure. Contact with the pressurised coolant will cause scalds and skin damage.

NOTE:

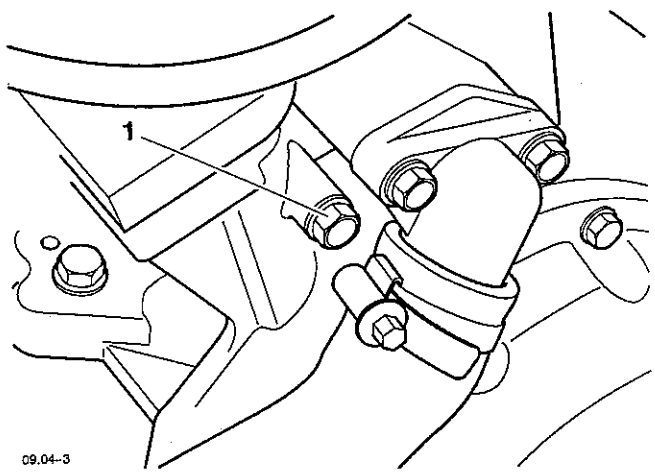
- **The coolant may be replaced after first removing the seats and disconnecting the battery, negative (black) lead first. The left hand belly panel and lower fairing must also be removed. Refer to the relevant sections for removal procedures.**

1. Remove the coolant pressure cap on the radiator.



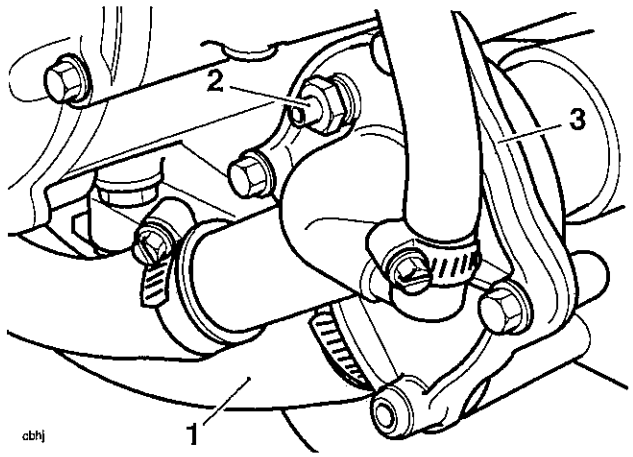
1. Coolant pressure cap

2. Remove the drain plug from the crankcase.



1. Coolant drain plug

3. Slacken the bleed screw on the water pump to help drainage.



1. **Crankcase feed hose**
2. **Bleed screw**
3. **Water pump**

4. Position a suitable clean receptacle to collect the displaced coolant.

5. Remove the crankcase feed hose from the water pump and allow the remaining coolant to drain out.

NOTE:

- **Retain the coolant for re-use unless contaminated or due for renewal.**

6. Close the bleed screw.

7. Fit the coolant drain plug. Tighten to **13 Nm.**

Refill

1. Fit the bottom hose to the water pump and tighten the hose clip.

2. Open the bleed screw on the water pump to allow any air in the system to evacuate.

3. Slowly add coolant mixture to the system, through the filler opening in the radiator, until the system is full.

4. Once all the air has escaped, close the bleed screw and top up the coolant level.

5. Reconnect the battery, positive (red) lead first.

6. Start the motorcycle and allow the engine to idle for a short period of time to allow any remaining air to be expelled from the system.

7. Stop the engine and top up the coolant level, if required.

8. Fit the coolant pressure cap.

9. Check the expansion tank level and top up, if required.

10. Refit the belly panel and lower fairing as described in the body section.

11. Refit the seats.

RADIATOR HOSES

Inspection

1. Regularly check all radiator hoses and clips for cracks, leaks or deterioration in accordance with the scheduled maintenance chart.

RADIATOR AND COOLING FAN

Inspection

WARNING: The cooling fan operates automatically, even with the ignition switched off. To prevent injury, keep hands and clothing away from the fan blades at all times.

CAUTION: Using high pressure water, as from a car-wash facility, can damage the radiator fins and impair the radiators efficiency.

Do not obstruct or deflect airflow through the radiator by installing unauthorised accessories in front of the radiator or behind the cooling fan. Interference with the radiator air flow can lead to overheating and consequent engine damage.

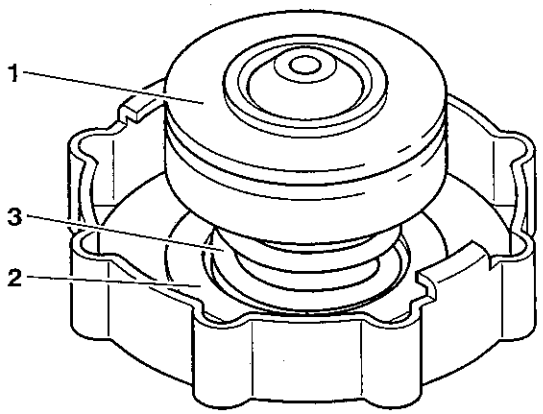
1. Check the radiator fins for obstruction by insects, mud, leaves and general debris. Clean off any obstructions by hand or with a stream of low pressure water.

COOLANT PRESSURE CAP

Inspection

WARNING: Do not remove the coolant pressure cap when the engine is hot. When the engine is hot, the coolant inside the cooling system will be under pressure. Contact with the pressurised coolant will cause scalds and skin damage.

1. Check the condition of the upper and lower seals of the coolant pressure cap for damage or deterioration. If any damage of deterioration is found, replace the cap.



09.05-1

1. Lower seal

2. Upper seal

3. Spring

2. Pressure test the cap to the blow-off pressure of 1.1 bar. If the pressure cap opens at a lower pressure or fails to open at 1.1 bar, replace the cap.

WATER PUMP

Removal

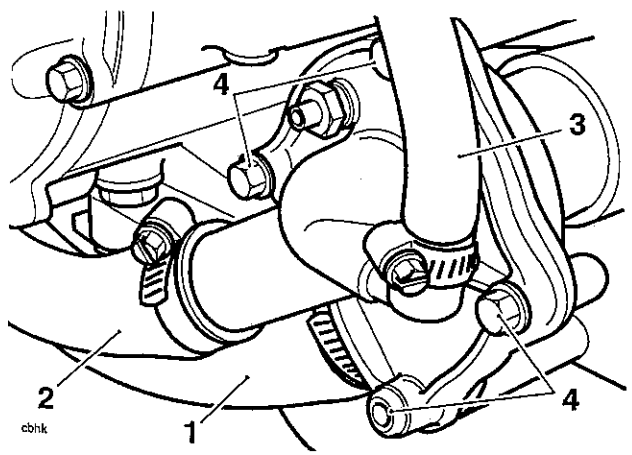
WARNING: Do not remove the coolant pressure cap when the engine is hot. When the engine is hot, the coolant inside the cooling system will be under pressure. Contact with the pressurised coolant will cause scalds and skin damage.

NOTE:

- **The water pump may be removed after first removing the seats and disconnecting the battery negative (black) lead first. The left hand belly panel and lower fairing must also be removed. Refer to the relevant sections for removal procedures.**

1. Drain the coolant, as described elsewhere in this section.

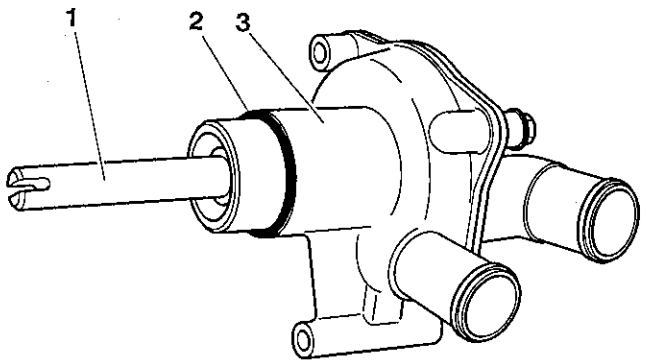
2. Disconnect the coolant hoses from the water pump.



1. **Heat exchanger/crankcase feed hose**
2. **Bottom hose**
3. **Bypass hose**
4. **Water pump fixings**

3. Release and remove the bolts securing the water pump to the crankcase.

4. Withdraw the water pump, complete with its 'O' ring.



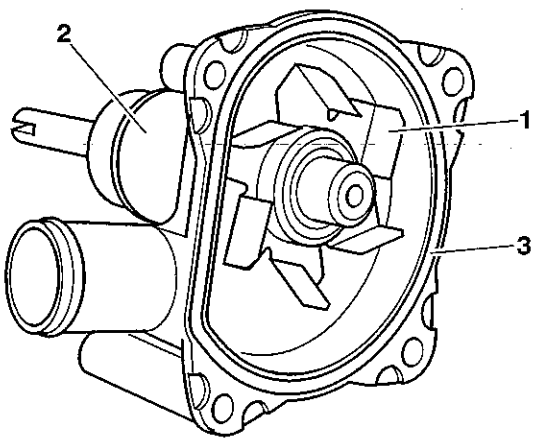
1. **Drive shaft**
2. **'O' ring**
3. **Water pump**

Inspection

1. Check the water pump shaft and bearings for side and end float. Replace if necessary.

2. Release and remove the pump cover bolts and separate the pump cover from the pump body.

3. Check for corrosion and/or scale build up around the impeller and in the pump body. Replace if corrosion and/or scale build up is found.



1. **Pump impeller**
2. **Pump body**
3. **'O' ring**

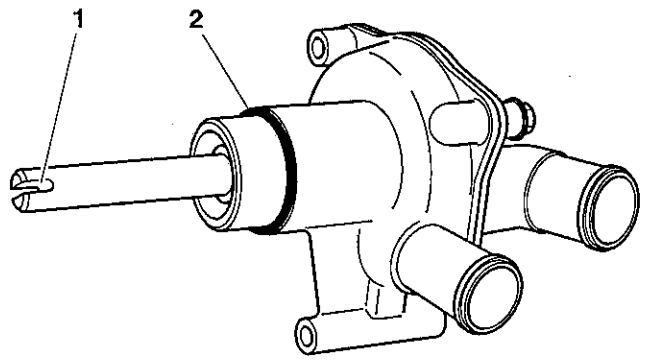
4. Check the 'O' ring (pump body) for damage or deterioration. Replace if necessary.

5. Check the external 'O' ring for damage or deterioration. Replace if necessary.

Installation

1. Fit the pump cover to the pump body, complete with a new 'O' ring if required. Tighten the bolts to **12 Nm.**

2. Fit the external 'O' ring to the pump body.



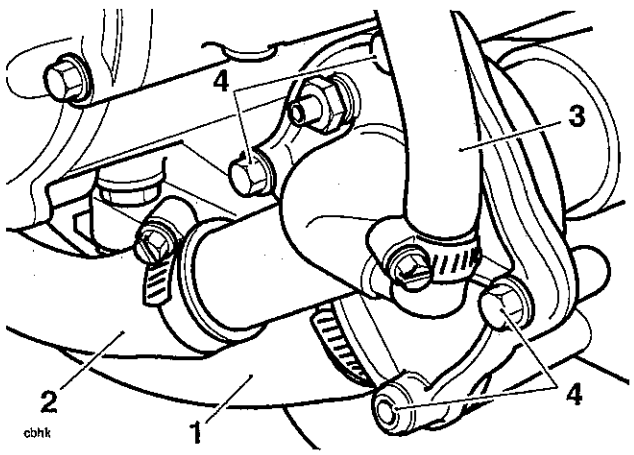
09.08-2

1. **Drive slot**
2. **'O' ring**

3. Align the drive slot in the water pump with the drive peg on the oil pump (inside the crankcase).

4. Fit the water pump to the crankcase and tighten the bolts to **9 Nm.**

5. Fit the hoses to the water pump and tighten the clips.



1. **Heat exchanger/crankcase feed hose**
2. **Bottom hose**
3. **Bypass hose**
4. **Water pump fixings**

6. Fill the cooling system, as described elsewhere in this section.

7. Reconnect the battery, positive (red) lead first.

8. Start the motorcycle and allow the engine to idle for a short period of time to allow any air to be expelled from the system.

9. Stop the engine and top up the coolant level, if required.

10. Fit the coolant pressure cap.

11. Check the expansion tank level and top up, if required.

12. Refit the belly panel and lower fairing as described in the body section.

13. Refit the seats.

RADIATOR

Removal

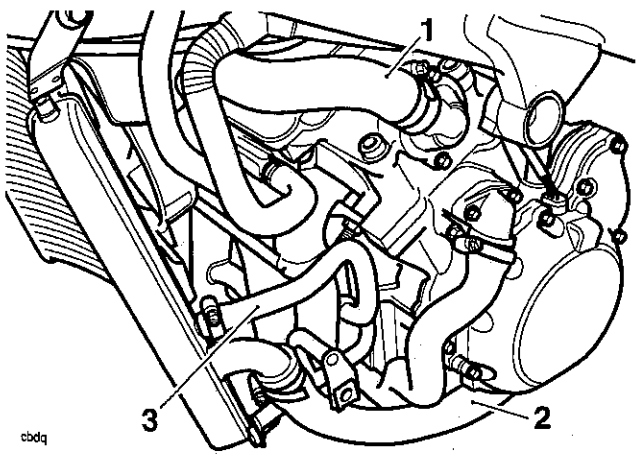
WARNING: Do not remove the coolant pressure cap when the engine is hot. When the engine is hot, the coolant inside the cooling system will be under pressure. Contact with the pressurised coolant will cause scalds and skin damage.

NOTE:

- **The radiator may be removed after first removing the seats and disconnecting the battery negative (black) lead first. The fuel tank, airbox and both belly panels and lower fairings must also be removed. Refer to the relevant sections for removal procedures.**

1. Drain the coolant as described elsewhere in this section.

2. Disconnect the top, bottom and heat exchanger hoses from the radiator.



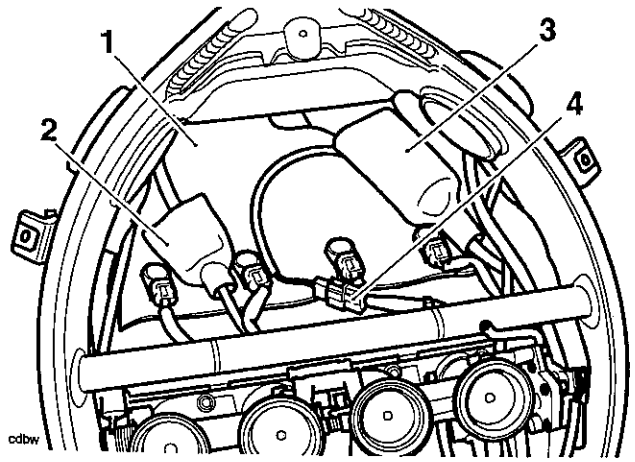
1. Top hose

2. Bottom hose

3. Heat exchanger hose

3. Disconnect the multiplugs leading to both switch cubes and the cooling fan.

4. Release the clips securing the air deflector shield to the top of the radiator, then detach the shield.



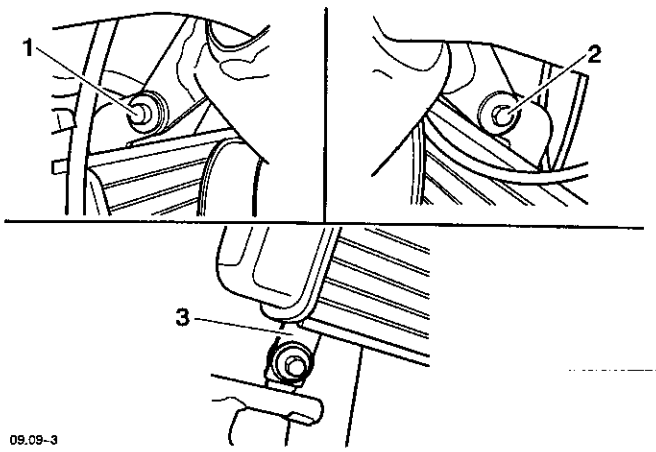
1. Air deflector

2. Left switch cube connection

3. Right switch cube connection

4. Fan connection

5. Undo the radiator top and bottom mounting bolts and move the radiator off the left hand top mounting dowel.



1. Dowel

2. Top mount bolt

3. Lower mounting (1 of 2)

6. Remove the radiator from the frame.

7. Release the fixings securing the cooling fan to the radiator and remove the cooling fan.

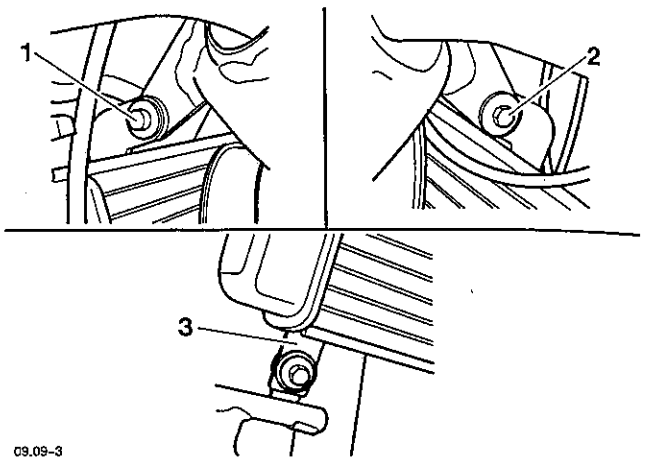
Inspection

CAUTION: To avoid overheating and consequent engine damage, replace the radiator if the cores are blocked or if the fins are badly deformed or broken.

1. Check the radiator for stone damage.
2. Check the radiator core for damage to fins or obstructions of air flow. Any damage to the fins should be repaired or the radiator replaced, as required. Any blockages found should be rectified.
3. Check the cooling fan for damage and/or wear. If damage and/or wear is found, repair or replace the radiator.

Installation

1. Fit the cooling fan to the radiator. Tighten the fixings to **2.5 Nm.**
2. Position the radiator to the frame and locate to the top mounting dowel. Ensure the grommet in the mounting bracket does not become detached during assembly.

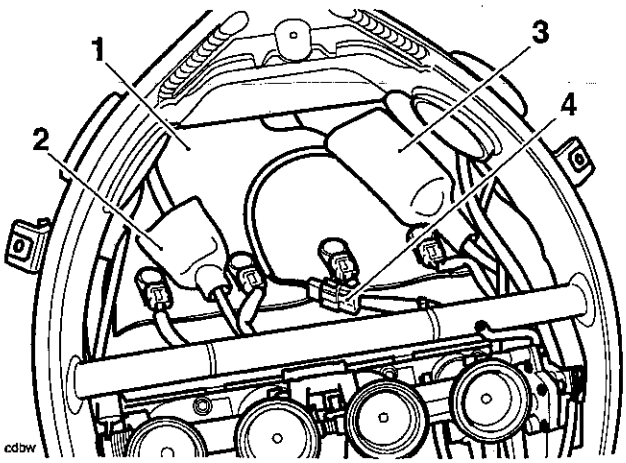


1. Dowel

2. Top mount bolt

3. Lower mounting (1 of 2)

3. Fit the top mounting bolt, hand tight, to the right hand bracket.
4. Fit and tighten the lower mounting bolts to **6 Nm** then tighten the upper bolt also to **6 Nm.**
5. Refit the air deflector, connecting the cooling fan and switch cubes after fitment.



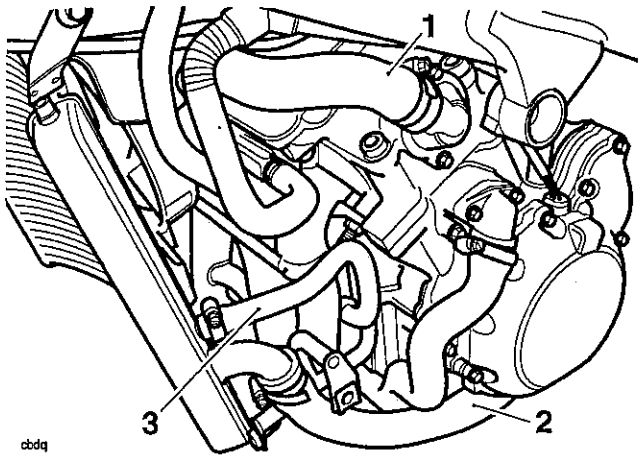
1. Air deflector

2. Left switch cube connection

3. Right switch cube connection

4. Fan connection

6. Reconnect the top, bottom and heat exchanger hoses to the radiator. Tighten the hose clips.



1. Top hose

2. Bottom hose

3. Heat exchanger hose

7. Fill the coolant system as described elsewhere in this section.

8. Fit the airbox and fuel tank as described in the fuel system section.

9. Connect the battery, positive (red) lead first.

10. Start the motorcycle and allow the engine to idle for a short period of time to allow any air to be expelled from the system.

11. Stop the engine and top up the coolant level, if required.

12. Fit the coolant pressure cap.

13. Check the expansion tank level and top up, if required.

14. Refit both belly panels and lower fairings, as described in the body section.

15. Refit the seats.

THERMOSTAT

Removal

1. Remove the seats.

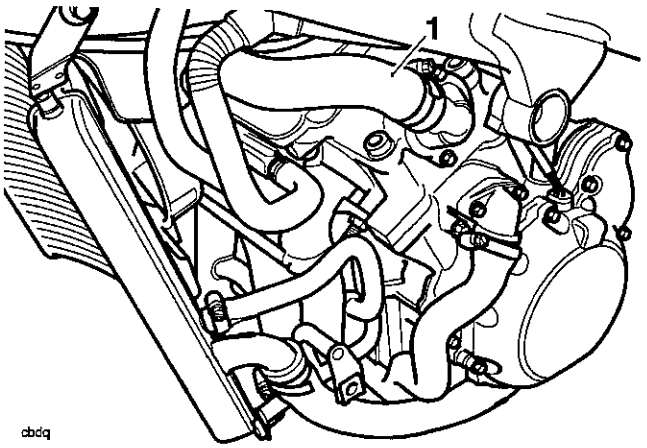
2. Disconnect the battery, negative (black) lead first.

3. Remove the left hand belly panel and lower fairing.

4. Drain the coolant as described earlier.

> **WARNING: Do not remove the coolant pressure cap when the engine is hot. When the engine is hot, the coolant inside the radiator is hot and also under pressure. Contact with the pressurised coolant will cause scalds and skin damage.**

5. Disconnect the top hose at the thermostat housing.



1. Top hose (thermostat housing end)

6. Release the fixings securing the thermostat housing to the cylinder head.

7. Withdraw the housing and collect the thermostat.

Inspection

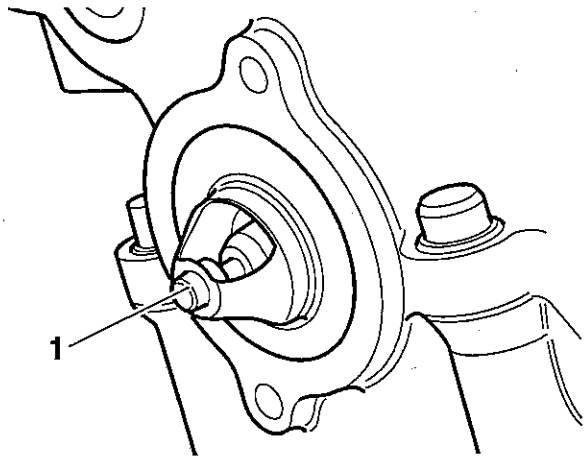
1. Inspect the thermostat at room temperature. If the valve is open, the thermostat must be replaced.

2. To check the valve opening temperature, suspend the thermostat in a container of water and raise the temperature of the water until the thermostat opens. **The thermostat should start to open at 88°C +/- 5°C.**

3. If the temperature at which thermostat opening takes place is incorrect, replace the thermostat.

Installation

1. Clean the mating surfaces of the cylinder head and thermostat housing.
2. Locate the thermostat into the head with the jiggle pin 15 degrees to the left of the fully upright position.
3. Rotate the thermostat until the jiggle pin is in the fully upright position and at the top.



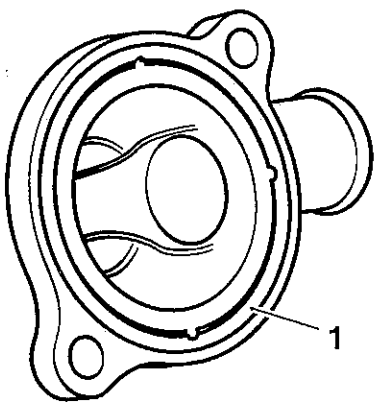
cbhw

1. Thermostat

NOTE:

- **When correctly positioned, the thermostat will fit snugly into the head, the jiggle pin will be in the twelve O-clock position and the thermostat will not turn any further clockwise.**

4. Position a new O-ring to the thermostat housing and seat into the groove.



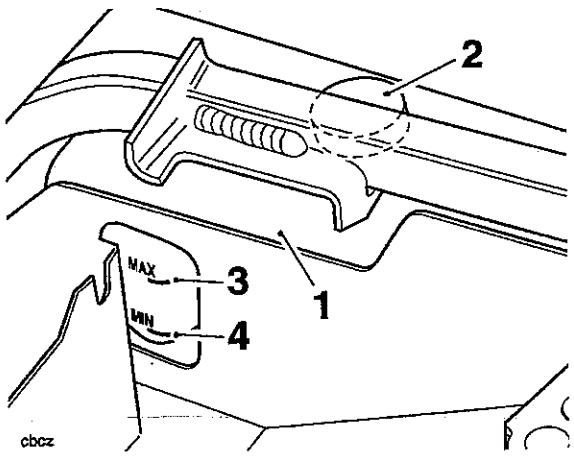
cash

1. O-ring/groove

5. Locate the housing to the head, ensuring that the O-ring does not become detached. Tighten the fixings to **9 Nm.**
6. Reconnect the top hose and secure with the hose clip.
7. Refill the cooling system as described earlier in this section.
8. Reconnect the battery positive (red) lead first.
9. Start the motorcycle engine and allow the engine to idle for a short period of time to allow any air to be expelled from the system.

WARNING: Do not remove the coolant pressure cap when the engine is hot. When the engine is hot, the coolant inside the cooling system is hot and also under pressure. Contact with the pressurised coolant will cause scalds and skin damage.

10. Stop the engine and top up the coolant level as necessary.
11. Fit the coolant pressure cap.
12. Refit the belly panel and lower fairing as described in the body section.



cbcz

1. Expansion Tank

2. Expansion Tank Filler Cap

3. 'Max' Mark

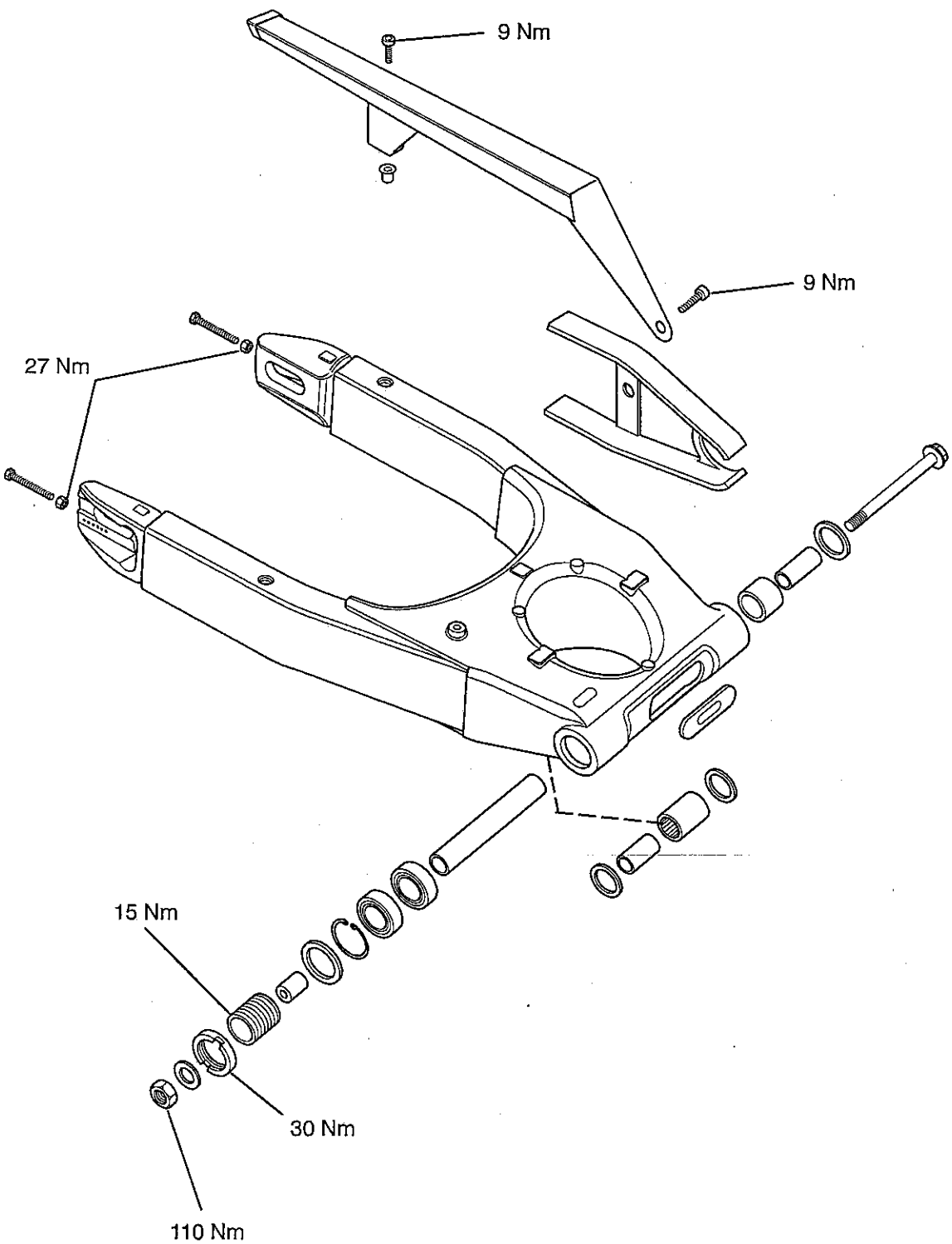
4. 'Min.' Mark

13. Refit the seats.

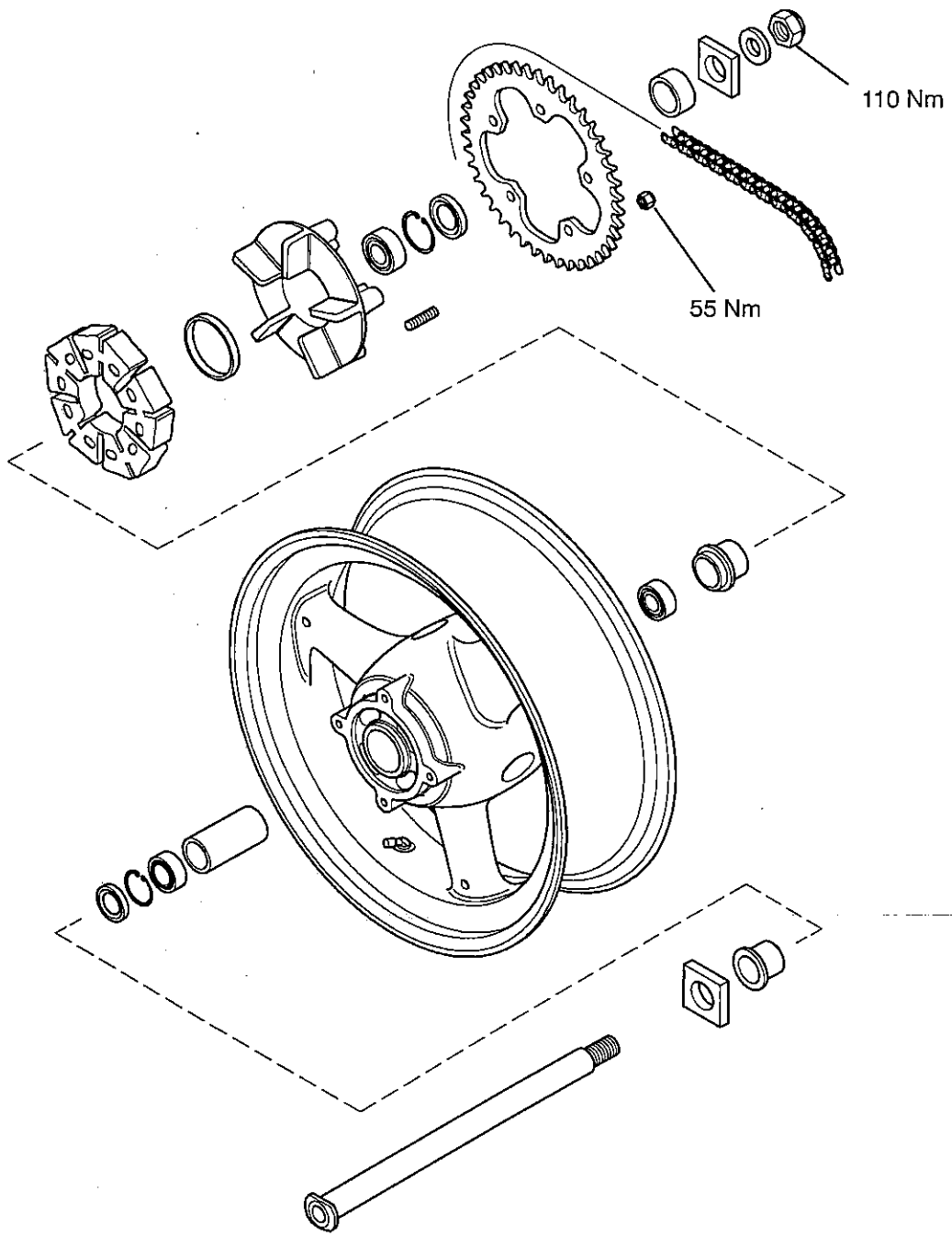
REAR SUSPENSION

CONTENTS

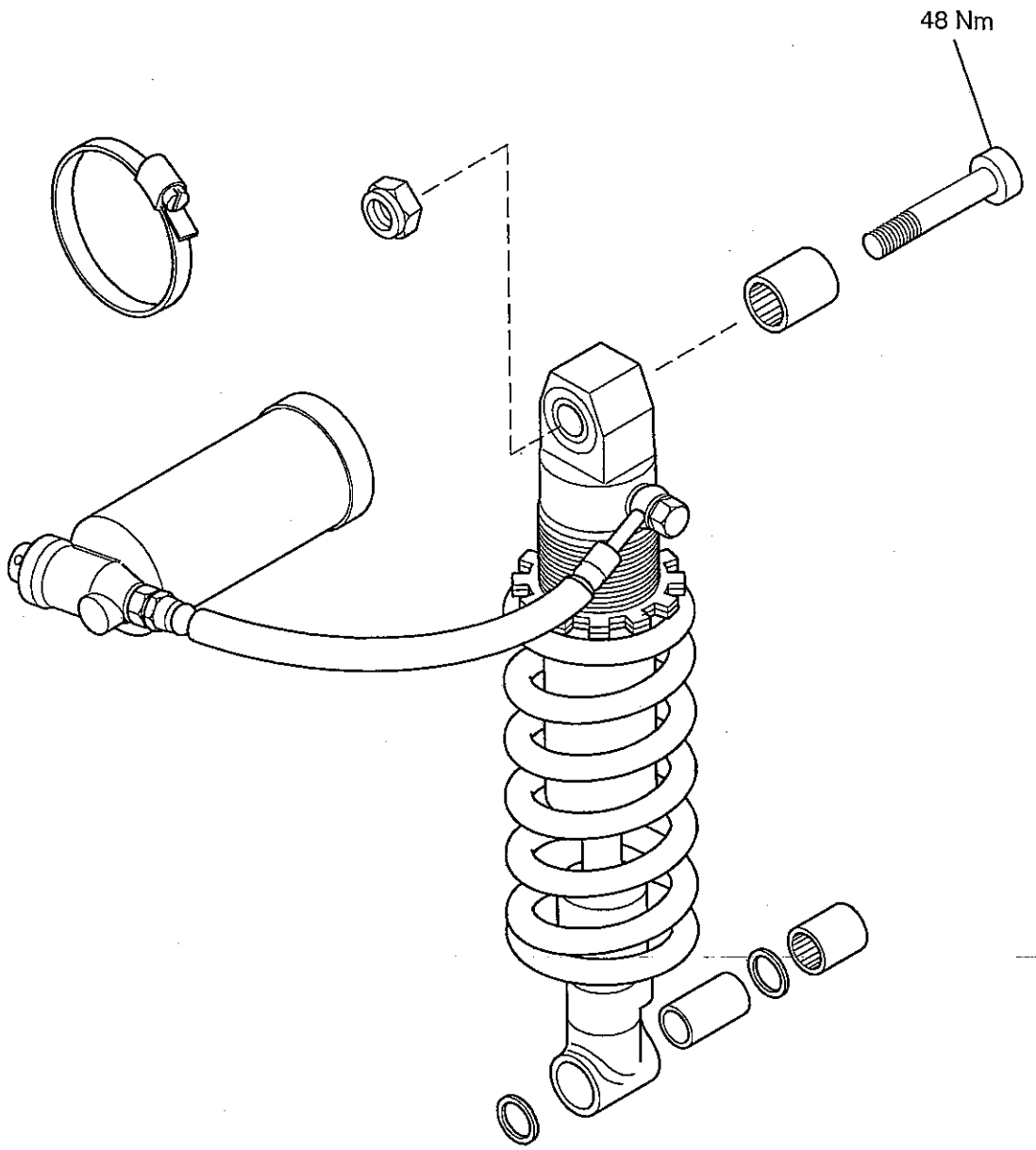
Exploded View - Swinging Arm



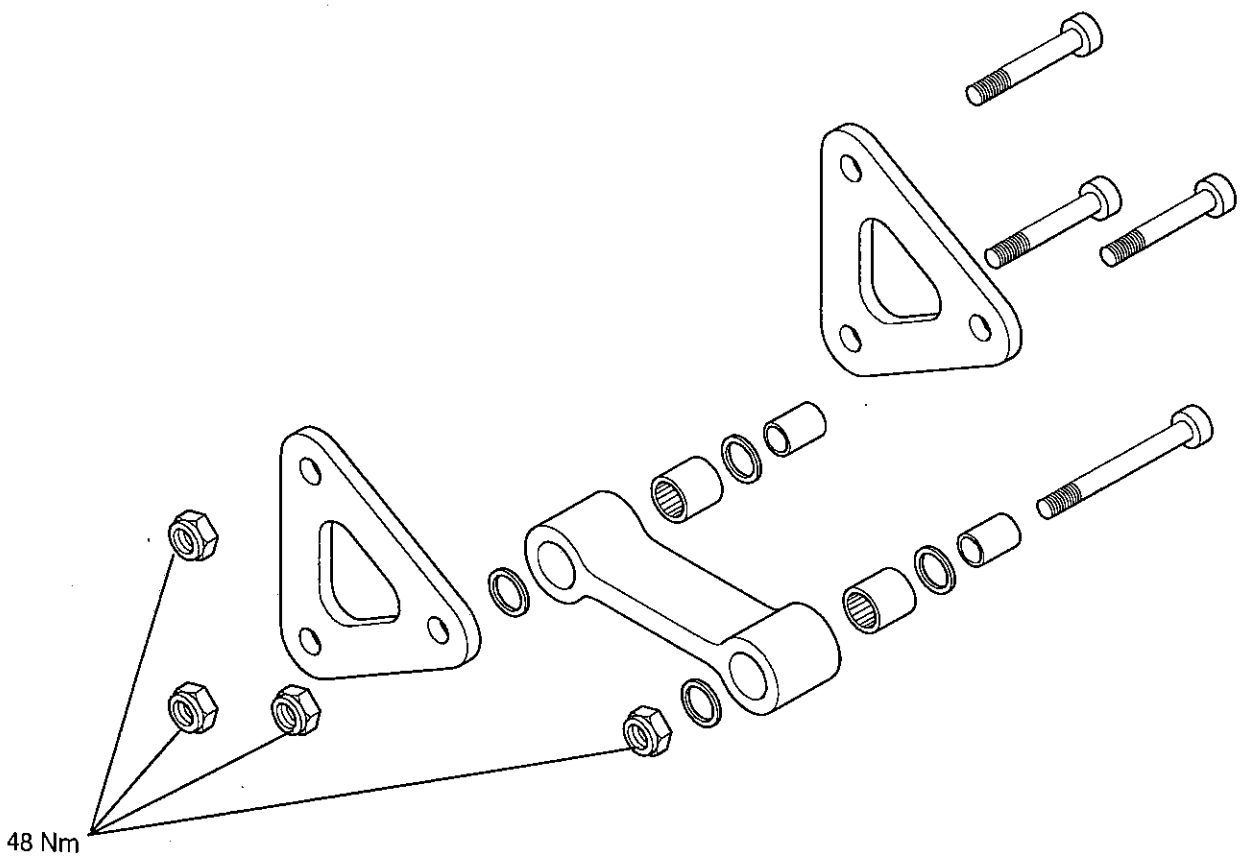
Exploded View - Rear Hub



Exploded View - Rear Suspension Unit



Exploded View - Drop/Drag Link



REAR SUSPENSION UNIT

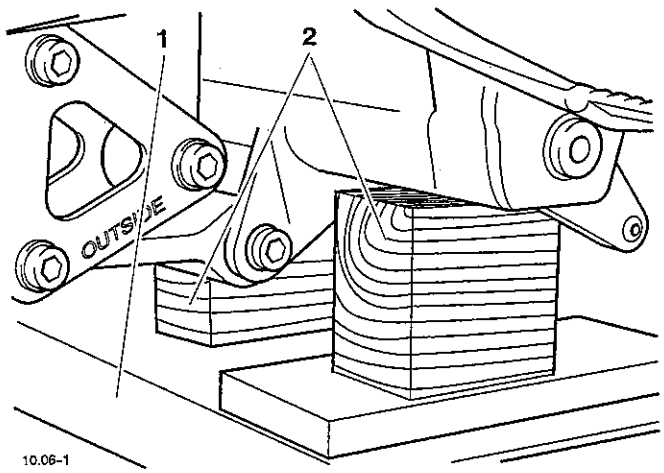
Removal

WARNING: Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Place the motorcycle on a paddock stand.
2. Remove the seat.
3. Disconnect the battery, negative (black) lead first.

WARNING: If the engine has recently been running, the exhaust system will be hot. Before working on or near the exhaust system, allow sufficient time for the exhaust system to cool as touching any part of a hot exhaust system could cause burn injuries.

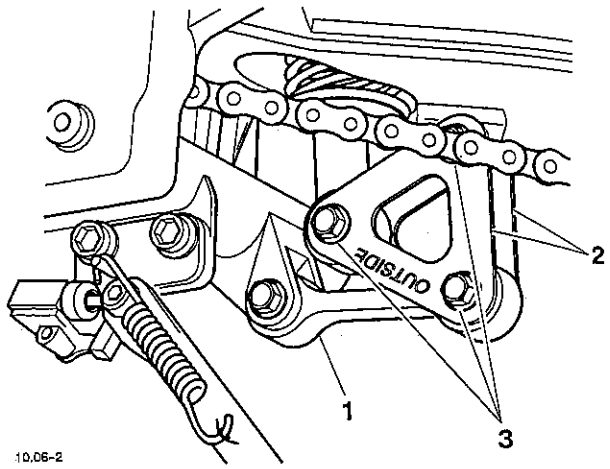
4. Remove the belly panels and lower fairings as detailed in the bodywork section.
5. Remove the exhaust system as detailed in the fuel system section.
6. Place a jack beneath the frame with two wooden blocks positioned so that the motorcycle can be lifted from beneath the frame outriggers.



1. Jack

2. Wooden blocks

7. Raise the jack until the swinging arm is just clear of the paddock stand.
8. Remove the three drop link fixings as shown in the illustration below. Remove drop link plates and position the drag link clear.



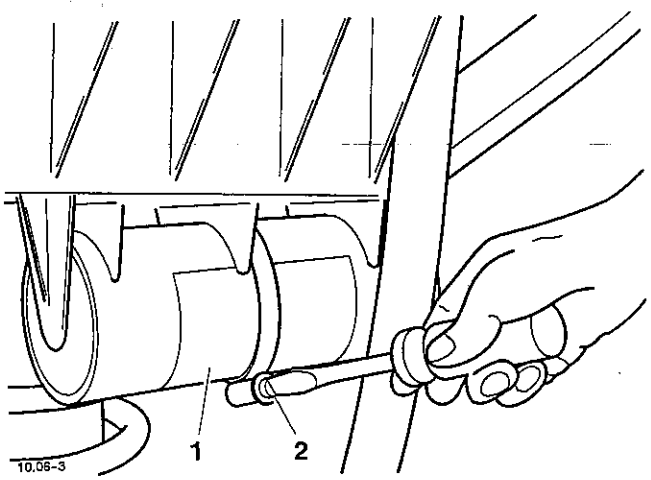
1. Drag link

2. Drop links

3. Fixings

WARNING: Never disconnect the reservoir from the rear suspension unit. It contains fluid under pressure and serious injury could result if any part of the system is disturbed.

9. Detach the rear suspension unit reservoir from the re-usable clip.



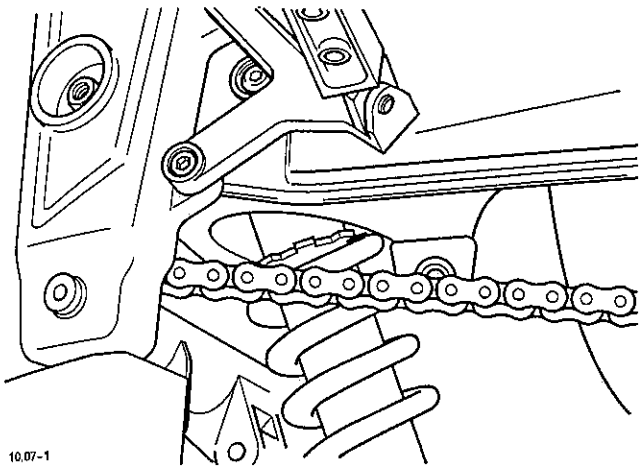
1. Reservoir

2. Securing clip

10. Remove the fixing from the suspension unit upper mounting.

11. Recover the upper mounting spacer from the left hand side.

12. Lower the rear suspension unit through the swinging arm.



Removing the rear suspension unit.

Inspection

1. Clean all components and inspect for damage/wear to the rear suspension unit upper mounting, lower mounting, spacers and seals. Renew as necessary.

2. Inspect the reservoir hose for damage and check for fluid leaks from all parts of the unit. If there is any damage, or any leaks are evident, the unit must be replaced.

3. Check the drag link bearings, bushes and seals. Replace as necessary.

Installation

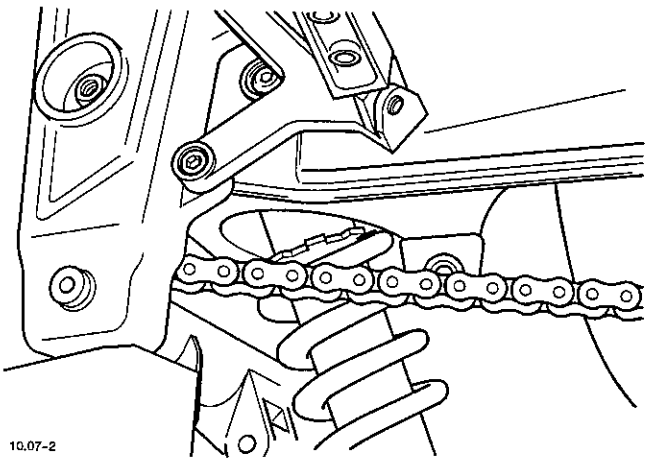
1. Remove the drag link sleeve and pack the bearing with fresh grease.

2. Refit the sleeve.

3. Remove the sleeve and pack the bearing in the rear suspension unit lower mounting with fresh grease.

4. Refit the sleeve.

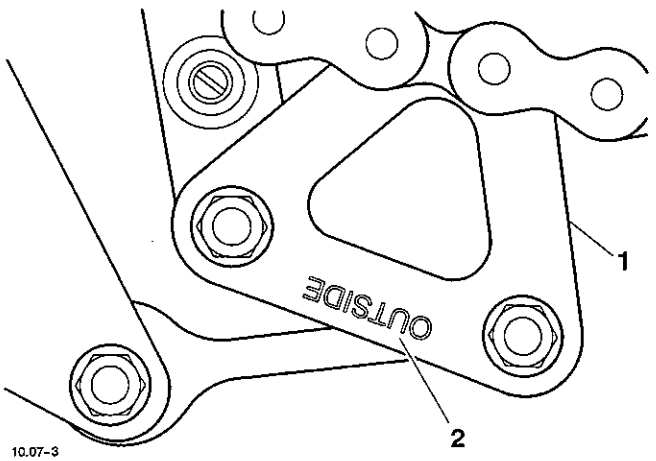
5. Refit the rear suspension unit by sliding the reservoir up through the hole in the swinging arm, followed by the suspension unit itself. Retain the suspension unit at its upper mounting with the fixing and spacer (spacer on the left) but do not tighten.



1. Rear suspension installation

6. Refit the rear suspension unit reservoir into its support bracket and secure with the clip.

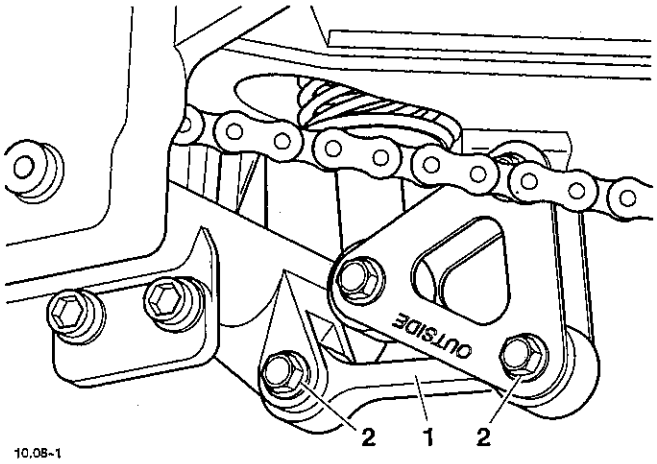
7. Position the two drop link plates with the sides marked 'OUTSIDE' facing outwards.



1. Drop link plate

2. 'OUTSIDE' marking

8. Locate with the fixing to the swinging arm.
9. Align the lower mounting of the rear suspension unit with the holes in the drop links. Refit the fixings.
10. Position the drag link and secure with the fixing to the drop links. Tighten the fixing to **48 Nm.**



1. Drag link

2. Drag link fixings

11. Tighten the drop link to swinging arm fixing to **48Nm.**
12. Tighten the drop link to rear suspension unit fixing to **48 Nm.**
13. Lower the jack so that the weight of the motorcycle is taken on the paddock stand. Remove the wooden blocks and the jack.
14. Tighten the rear suspension unit upper fixings to **48 Nm.**
15. Refit the exhaust system as detailed in the fuel system section.
16. Refit the belly panels and lower fairings as described in the bodywork section.
17. Connect the battery, red (positive) lead first.
18. Refit the seats.
19. Remove the paddock stand and place the motorcycle on its side stand.

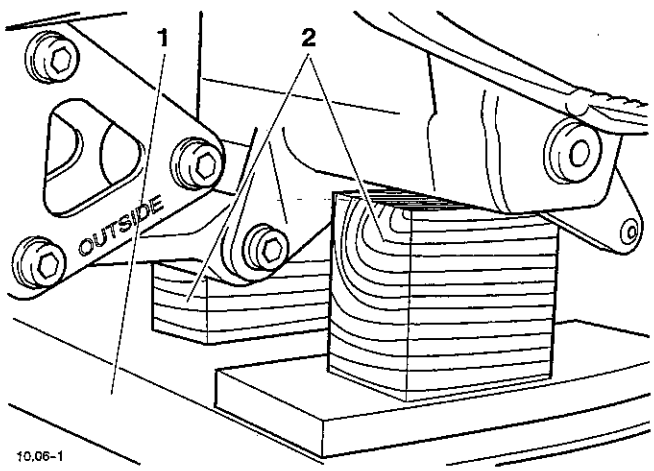
DRAG LINK

Removal

WARNING: Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

WARNING: If the engine has recently been running, the exhaust system will be hot. Before working on or near the exhaust system, allow sufficient time for the exhaust system to cool as touching any part of a hot exhaust system could cause burn injuries.

1. Place the motorcycle on a paddock stand.
2. Remove the seats.
3. Disconnect the battery, negative (black) lead first.
4. Remove the belly panels and lower fairings as detailed in the bodywork section.
5. Remove the exhaust system as detailed in the fuel system section.
6. Place a jack beneath the frame with two wooden blocks positioned so that the motorcycle can be lifted from beneath the frame outriggers.

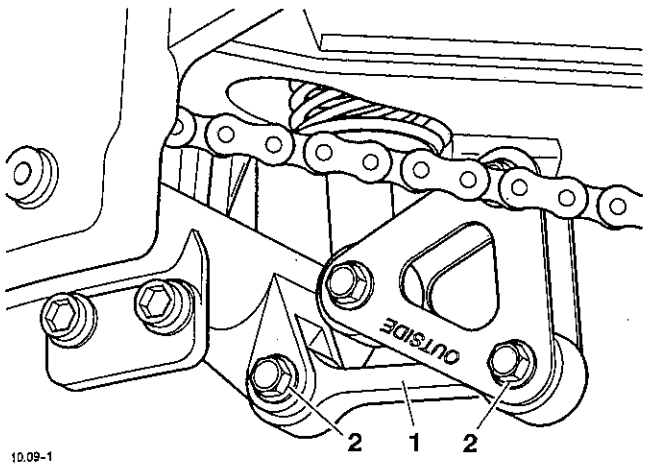


1. Jack

2. Wooden blocks

7. Raise the jack until the swinging arm is just clear of the paddock stand.

8. Remove the two fixings securing the drag link.
9. Remove the link.



10.09-1

1. Drag link

2. Drag link fixings

Inspection

1. Clean all components and inspect for damage/wear to:

- Needle roller bearings,
- Sleeves,
- Seals,

NOTE:

- **If any of the above items are worn or damaged, they must be replaced with new components.**

Installation

1. Refit the drag link and tighten the fixings to **48 Nm.**
2. Lower the jack so that the weight of the motorcycle is taken be the paddock stand. Remove the wooden blocks and the jack.
3. Refit the exhaust system as described in the fuel system section.
4. Refit the belly panels and lower fairings as described in the bodywork section.
5. Connect the battery, red (positive) lead first.
6. Refit the seats.
7. Remove the paddock stand and position the motorcycle on its side stand.

DRIVE CHAIN

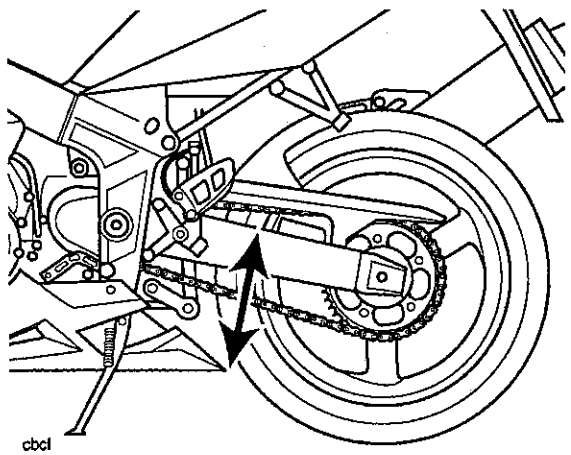
The drive chain must be checked, adjusted, and lubricated in accordance with the scheduled maintenance chart. For reasons of safety, and to prevent excessive wear, do not neglect any part of the drive chain maintenance. If the chain is badly worn, or incorrectly adjusted - either too loose or too tight - the chain could jump off the sprockets or break. Checking of the adjustment and lubrication should be carried out more frequently where the motorcycle is regularly used in dirty or dusty conditions or where large amounts of road salt are used.

WARNING: A chain that breaks or jumps off the sprockets could snag on the engine drive sprocket or the rear wheel severely damaging the motorcycle and causing an accident. Never neglect chain maintenance.

Chain Slack Inspection

WARNING: Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Position the motorcycle on the side stand.
2. Rotate the rear wheel to find the position where the chain has least slack. Measure the chain's vertical movement, mid-way between sprockets.
3. If correct, the vertical movement of the drive chain midway between the sprockets should be **25-35 mm.**

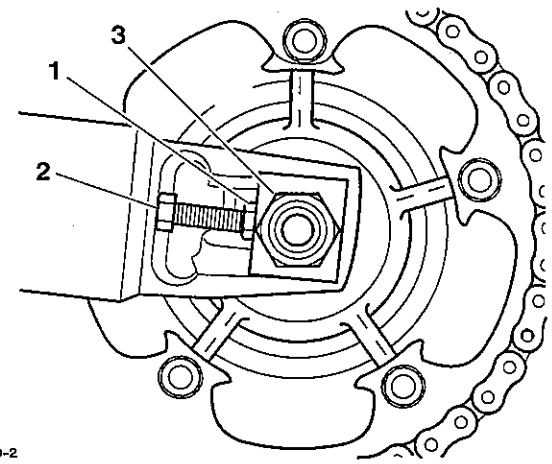


1. Arrowed: Maximum vertical Movement 25-35 mm

Drive chain adjustment

WARNING: Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Position the motorcycle on its side stand.
2. Loosen the rear wheel spindle nut.
3. Slacken the adjuster locknuts on each side of the swinging arm.



1. Chain adjuster

2. Adjuster locknut

3. Rear wheel spindle nut

4. Moving both adjusters by an equal amount, turn the adjuster bolts clockwise to increase chain free-movement and anti-clockwise to reduce chain free-movement. **Ensure that the wheel spindle blocks on both sides of the motorcycle remain in contact with the adjusters throughout the adjustment process.**

NOTE:

- **Check for equal adjustment on both sides using the graduation marks on the swinging arm.**

5. When the correct amount of chain free-movement has been set, push the wheel into firm contact with the adjuster. Tighten both adjuster locknuts to **27 Nm** and the rear wheel spindle nut to **110 Nm.**

6. Rotate the rear wheel and repeat the chain adjustment check. Re-adjust if necessary

WARNING: Operation of the motorcycle with insecure adjuster locknuts or a loose wheel spindle may result in impaired stability and handling. This impaired stability and handling may lead to loss of control or an accident.

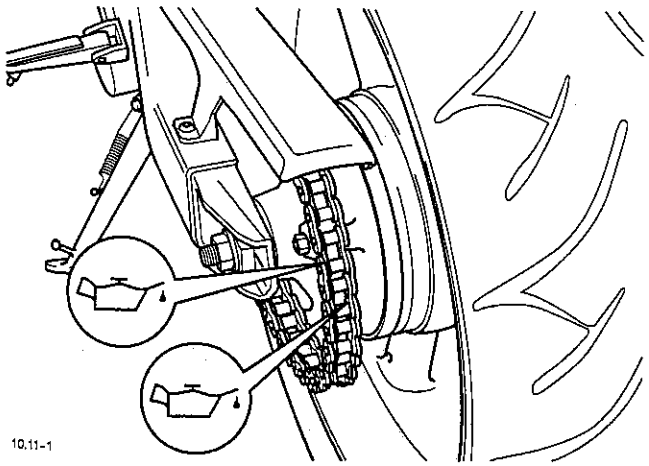
7. Check the rear brake effectiveness.

Chain Lubrication

Chain lubrication is necessary after riding in the rain, through standing water, on wet roads, roads treated to relieve frost/ice or any time that the chain appears dry of oil. Use the chain lubricant recommended in the specification section.

CAUTION: Never use a power wash system to clean the chain as this may cause damage to the chain components.

1. Apply chain lubricant to the sides of the chain rollers, and also the seals. The lubricant will penetrate the rollers and bushes and will help prevent the seals from deteriorating.



Chain Lubrication Positions

2. Wipe off any excess oil.

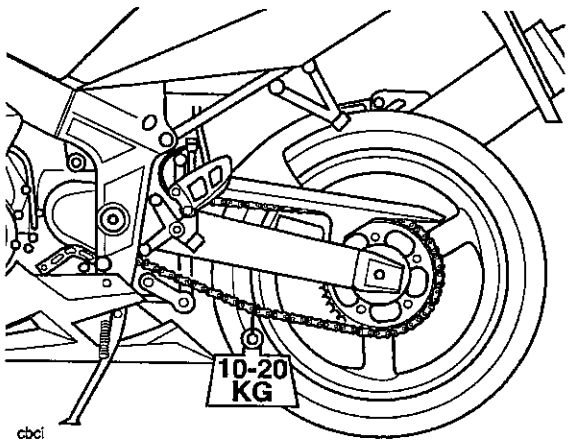
3. If the chain is especially dirty, clean using a degreaser before applying the lubricant.

Chain Wear Inspection

1. Remove the chainguard from the swinging arm.

2. Stretch the chain taut by hanging a 10-20 kg (20-40 lb) weight on the chain.

3. Measure the length of 20 links on the straight part of the chain from pin centre of the 1st pin to pin centre of the 21st pin. Repeat the test at various sections of the chain to establish an average reading. This is because the chain may wear unevenly.



1. Measurement position

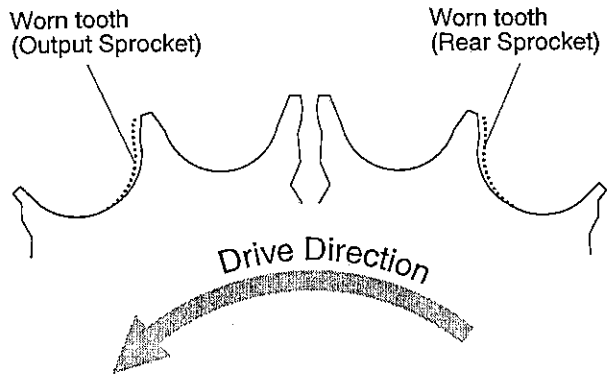
2. 10-20kg Weight

4. If the length exceeds the service limit of 321 mm, the chain must be replaced.

WARNING: Use a genuine Triumph supplied chain as specified in the Triumph Parts Catalogue. The use of non-approved chains may result in a broken chain or may cause the chain to jump off the sprockets. A chain that breaks or jumps off the sprockets could snag on the engine sprocket or lock the rear wheel, severely damaging the motorcycle and causing loss of motorcycle control and an accident.
Never neglect chain maintenance and always have chains installed by an authorised Triumph Dealer.

5. Examine the whole length of the chain. If there are any excessively tight or loose sections, loose pins or damaged rollers, the chain should be replaced.

6. Inspect sprockets for unevenly or excessively worn teeth. Also examine the sprockets for damaged teeth.



10.12-1

NOTE:

- **Sprocket wear is exaggerated for illustration purposes.**

7. If there is any irregularity found in any of the components, replace the drive chain and/or any other damaged components.
8. Refit the chain/wheel guard.

SWINGING ARM/DRIVE CHAIN RENEWAL

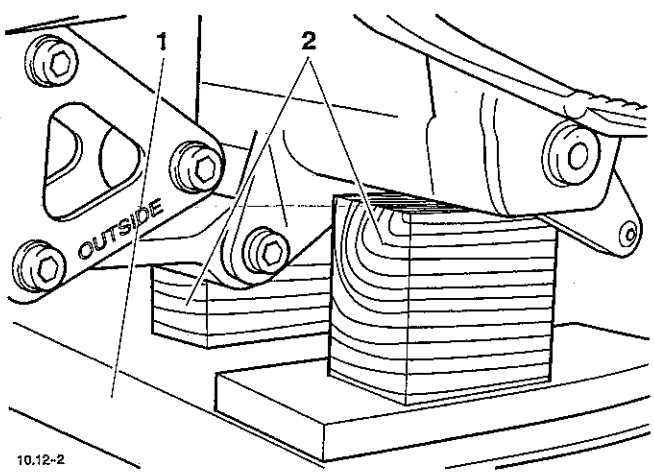
Removal

WARNING: Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Place the motorcycle on a paddock stand.
2. Remove the seats.
3. Disconnect the battery, negative (black) lead first.

WARNING: If the engine has recently been running, the exhaust system will be hot. Before working on or near the exhaust system, allow sufficient time for the exhaust system to cool as touching any part of a hot exhaust system could cause burn injuries.

4. Remove the belly panels and lower fairings as detailed in the bodywork section.
5. Remove the exhaust system as detailed in the fuel system section.
6. Place a suitable jack beneath the frame with two wooden blocks positioned so that the motorcycle can be lifted from beneath the frame.



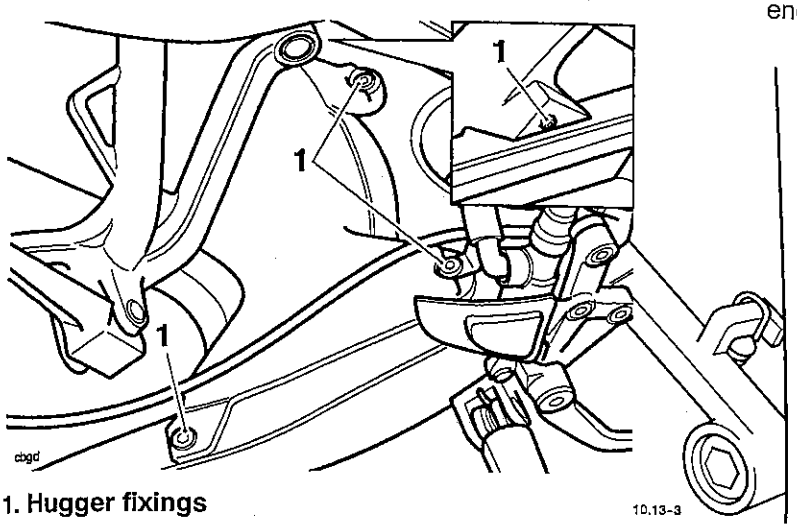
10.12-2

1. Jack

2. Wooden blocks

7. Raise the jack until the swinging arm is just clear of the paddock stand.

8. Remove the rear wheel hugger.



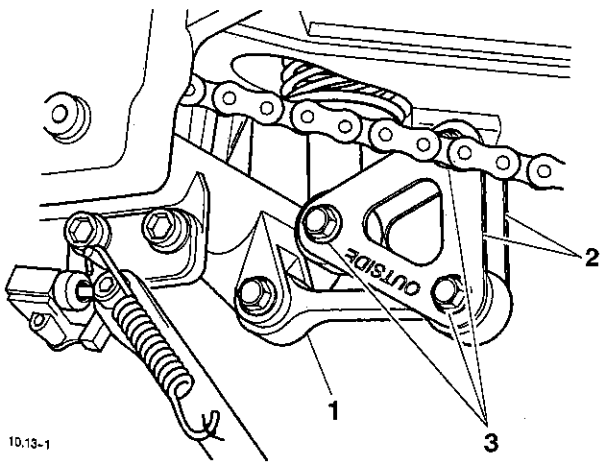
1. Hugger fixings

9. Remove the rear wheel, rear brake caliper and chain guard as described in the wheels and tyres section.

NOTE:

- **It is not necessary to disconnect the brake pipe union from the caliper.**

10. Remove the three drop link fixings as shown in the illustration below. Detach the drag link and remove both drop link plates.



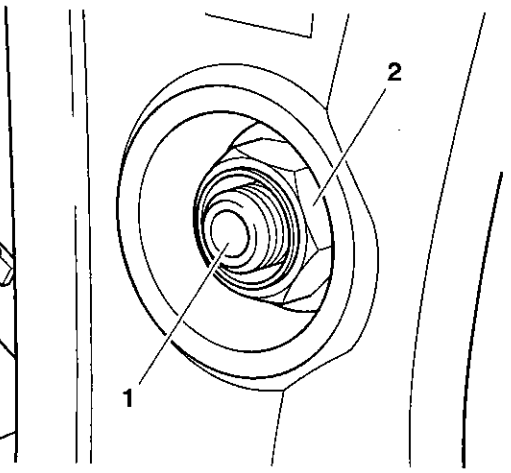
1. Drag link

2. Drop links

3. Drop Link Fixings

11. If replacing the chain, remove the sprocket cover.

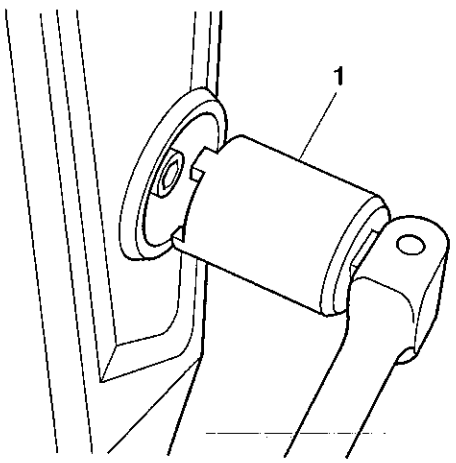
12. Remove the locknut and washer from the right hand end of the swinging arm spindle.



1. Spindle

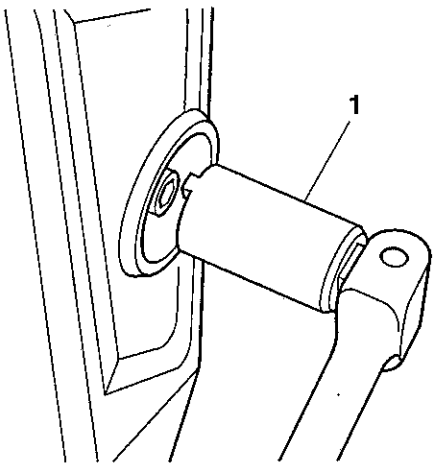
2. Spindle locknut

13. Using special tool, part number T3880350, remove the lock ring from the end float adjuster.



1. Special tool T3880350

14. Using special tool, part number T3880355, slacken the end float adjuster.

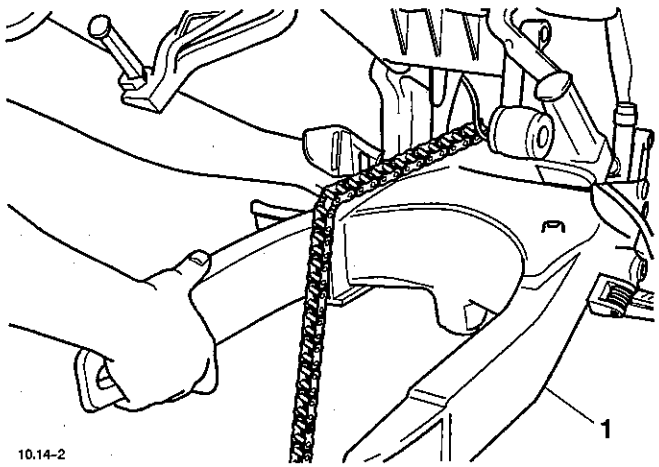


1. Special tool T3880355

15. Remove the paddock stand.

16. Whilst supporting the swinging arm, remove the swinging arm spindle from the left hand side of the motorcycle.

17. Remove the swinging arm sliding the chain over the left hand swinging arm beam.



1. Swinging arm

18. Collect the spacers from the seals in both sides of the swinging arm.

19. Remove the rubber chain guide, chain, drag link and rectangular rubber grommet from the swinging arm.

Inspection

1. Clean all components and inspect for damage/wear to:

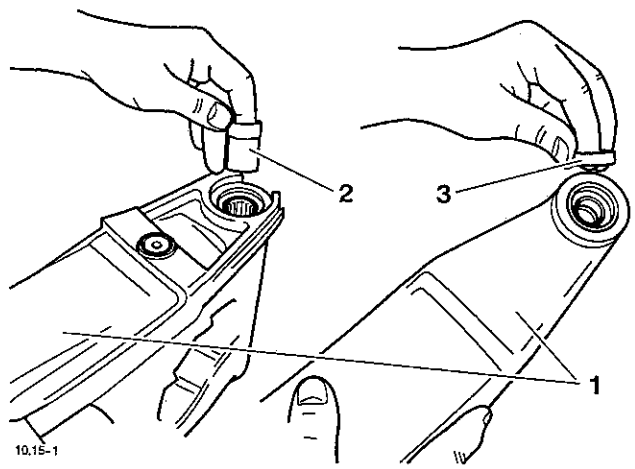
- Needle roller bearings.
- Sleeves.
- Seals.
- Swinging arm pivot.
- Spacer.

NOTE:

- **If any of the above items are worn or damaged, they must be replaced with new components.**

Installation

1. If removed, refit the rubber grommet to the rectangular hole in the front of the swinging arm.
2. Refit the chain guide to the swinging arm.
3. Refit the drag link to the swinging arm and tighten the fixing to **48 Nm.**
4. Fit the thicker spacer into the seal in the left hand side of the swinging arm and the thinner distance piece in the right.

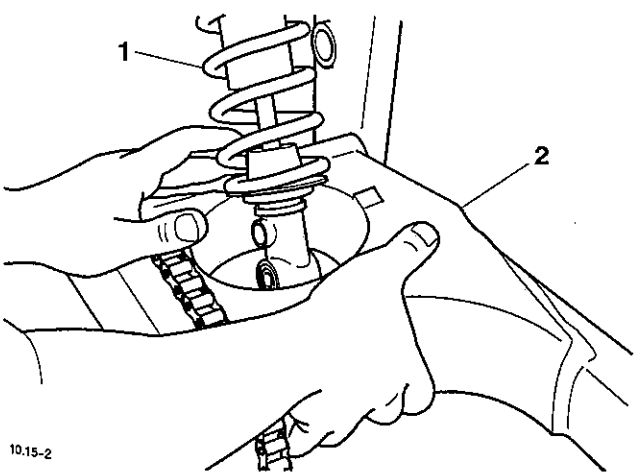


1. Swinging arm

2. Thicker spacer (left side)

3. Thinner spacer (right side)

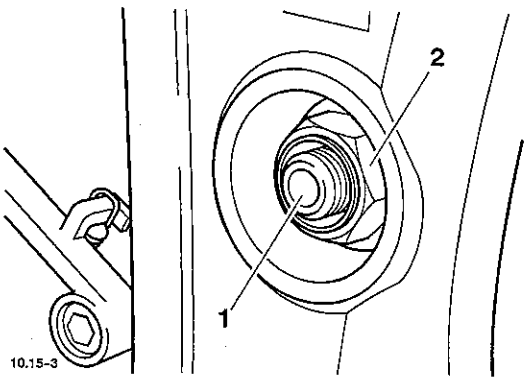
5. Loop the chain over the left swinging arm beam.
6. Refit the swinging arm, passing the lower part of the rear suspension unit through the hole in the swinging arm.



1. Rear suspension unit

2. Swinging arm

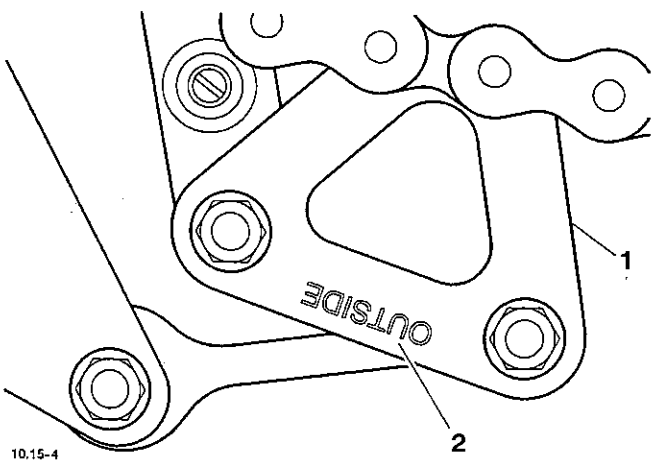
7. Align the swinging arm to the frame and refit the swinging arm spindle from the left hand side.
8. Refit the end float adjuster to the right hand frame outrigger and, using special part tool T3880355, tighten to **15 Nm.**
9. Refit the end float adjuster lock ring and, using special tool part number T3880350, tighten to **30 Nm.**
10. Refit the plain washer to the swinging arm spindle followed by the locknut. Tighten to **110 Nm.**



1. Spindle

2. Spindle locknut

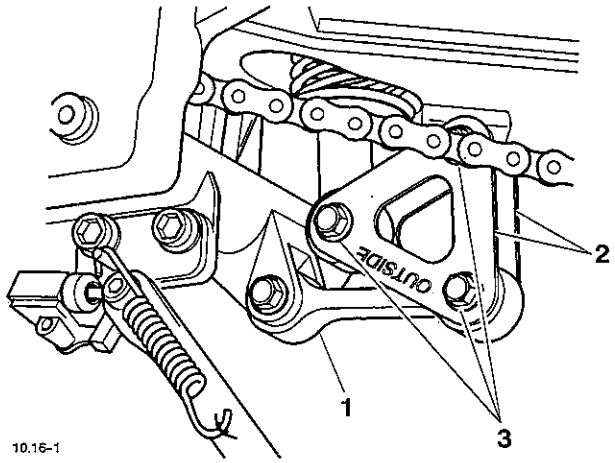
11. If previously removed, refit the chain to the output sprocket.
12. Position the two drop link plates with the word 'OUTSIDE' facing outwards. Secure with the fixing to the swinging arm. Do not tighten at this stage.



1. Drop link plate

2. 'OUTSIDE' marking

13. Reposition the paddock stand.
14. Using the jack to adjust the height of the frame, align the lower mounting of the rear suspension unit with the holes in the drop links and rear suspension unit. Refit the fixing.
15. Align the drag link to drop links.
16. Tighten all three drop link fixings to **48 Nm.**



1. Drag link

2. Drop link

3. Fixings

17. Lower the jack so that the weight of the motorcycle is taken on the paddock stand. Remove the wooden blocks and the jack.
18. Refit the rear wheel, rear brake caliper, caliper carrier and chain guard as described in the relevant sections.
19. Refit the rear wheel hugger tightening its fixings to **5 Nm.**
20. If removed, refit the sprocket cover.
21. Refit the exhaust system as described in the fuel system section.
22. Refit the belly panels and lower fairings as described in the bodywork section.
23. Connect the battery, red (positive) lead first.
24. Refit the seats.
25. Remove the paddock stand.
26. Check the rear brakes effectiveness.
27. Position the motorcycle on its side stand.
28. Check the drive chain tension. Adjust if necessary.

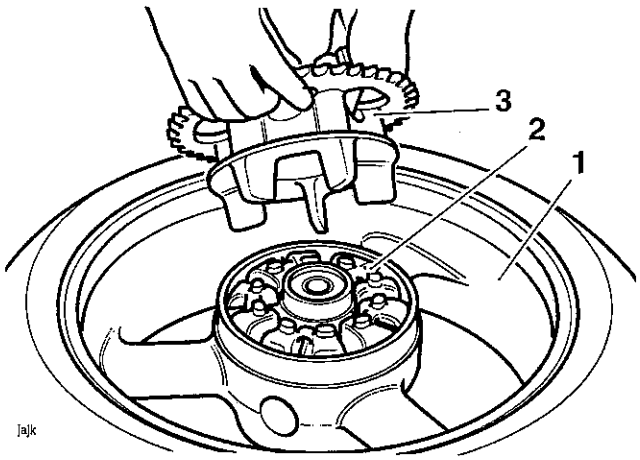
FINAL DRIVE

Removal

1. Raise and support the rear of the motorcycle.

WARNING: Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

2. Remove the seat.
3. Disconnect the battery, negative (black) lead first.
4. Remove the rear wheel as described in the wheel section.
5. Gently lever the drive flange from the wheel hub and remove the cush drive rubbers.



1. Rear Wheel

2. Cush Drive Rubbers

3. Drive Flange

Inspection

1. Check the rubbers for deterioration, cracks etc.
2. Check the wheel and drive flange for cracks.

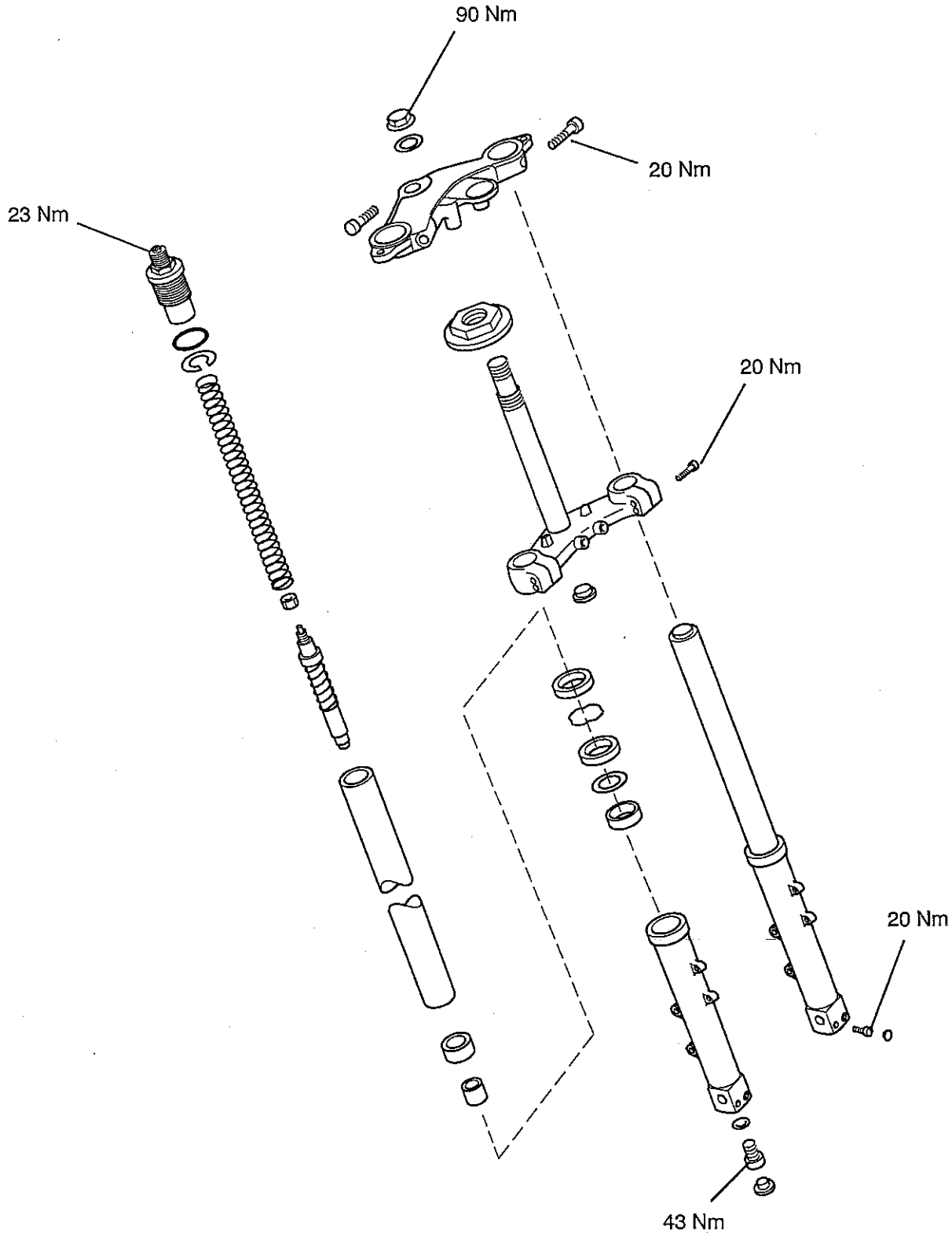
Installation

1. Install the cush drive rubbers into the wheel.
2. Refit the drive flange to the rubbers/wheel.
3. Refit the wheel as described in the wheel section.
4. Lower the motorcycle to the ground and place on the side stand.
5. Reconnect the battery positive (red) lead first.
6. Refit the seat.

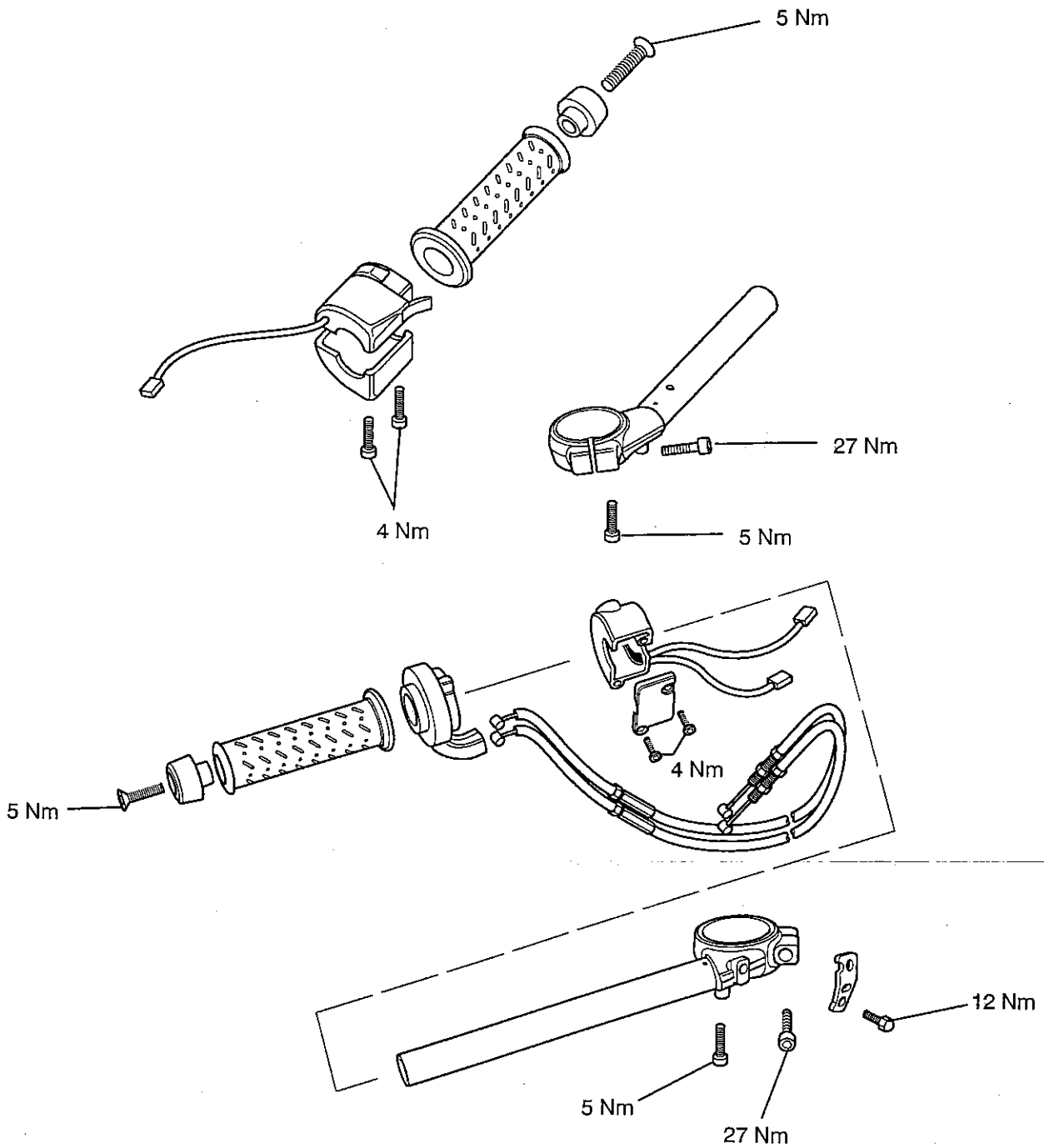
FRONT SUSPENSION

CONTENTS

Exploded View - Front Fork



Exploded View - Handlebars



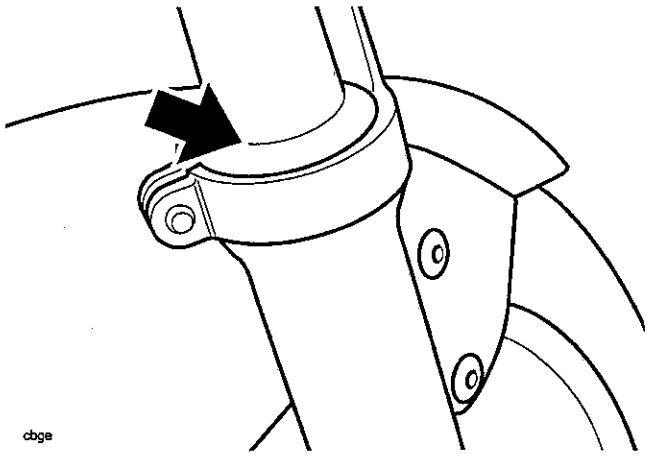
FRONT SUSPENSION

This model is equipped with hydraulic, telescopic front forks which are fully adjustable for spring pre-load, rebound and compression damping. Periodic inspection for damage and fluid leaks is essential for safe riding. Always follow the inspection instructions at the intervals stated in the scheduled maintenance chart.

FORK INSPECTION

1. Visually inspect the fork inner tube assembly for stone-chips and damage. Repair or replace as necessary.

2. Visually inspect the dust/oil seal areas for signs of damage and fluid leaks. If oil leaks are found, the fork must be stripped and overhauled or replaced completely.



Arrowed: Fork Seal Area

WARNING: If roughness or excessive stiffness is detected, investigate the cause and take the necessary remedial action before riding the motorcycle.

Riding the motorcycle with defective or damaged suspension can cause loss of control and an accident.

3. Check for smooth operation of the forks as follows:
   - Place the motorcycle on level ground.
   - While holding the handlebars and applying the front brake, pump the forks up and down several times. The forks should operate smoothly with no excessive stiffness, roughness or tight spots

FRONT FORK

Removal

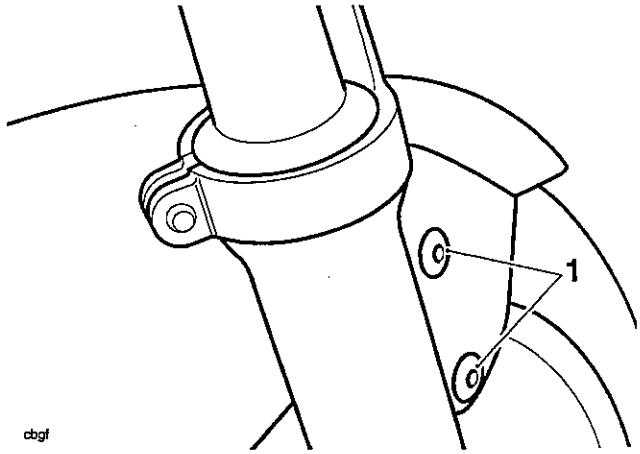
WARNING: Before staring work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Raise and support the front of the motorcycle.

2. Remove the front wheel as described in the 'wheels' section.

3. Remove both lower fairings as described in the bodywork section.

4. Remove the front mudguard.

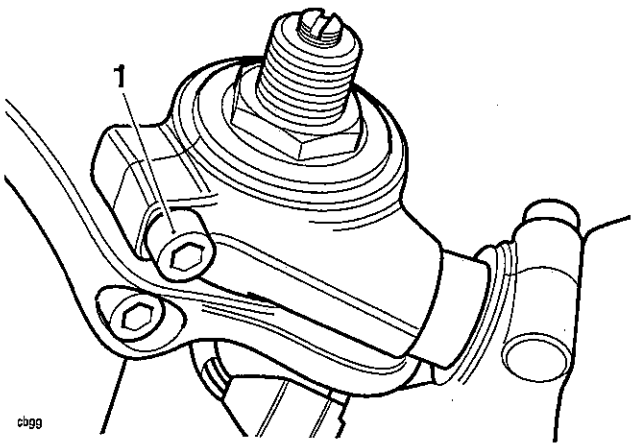


1. Mudguard fixings

5. Slacken the handlebar clamp bolts.

NOTE:

- **It is not necessary to remove the handlebars.**



1. Handlebar clamp bolt

NOTE:

- **If the fork is to be dismantled, slacken the fork cap before releasing the yoke clamps.**

6. Slacken but do not remove the pinch bolts on the top and bottom yokes and, using a downward twisting motion, slide each fork out of the yokes.

Installation

1. Fit the forks into the yokes and adjust the fork pull through to that shown in the chart later in this section.
2. Tighten the top and bottom yoke pinch bolts to **20 Nm.**
3. Tighten the handlebar clamp bolts to **27 Nm.**
4. Refit the mudguard. Tighten the mudguard fixings to **3 Nm.**
5. Refit the lower fairings as described in the body section.
6. Refit the front wheel as described in the wheel section.
7. Lower the motorcycle to the ground and place on the sidestand.

FORK OIL

WARNING: Before staring work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

Oil change

NOTE:

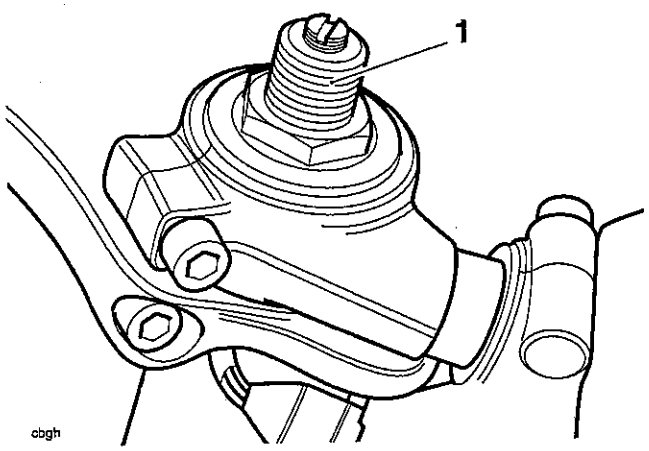
- **Slacken the fork cap before releasing the yoke clamps.**

1. Remove the fork assembly described elsewhere in this section.
2. Secure the fork in a soft jawed vice taking care not to mark or damage the mountings.

CAUTION: If securing the fork in a vice, use the caliper mounting points. Never clamp directly onto the tube itself as this will cause the tube to distort beyond repair.

3. Record the position of the spring preload adjuster. This setting must be retained on re-assembly.

WARNING: Do not change the compression and rebound adjuster settings. If they are changed, this will affect the handling of the motorcycle from those which the rider is familiar with. Riding with unfamiliar fork settings may cause unexpected handling characteristics leading to loss of motorcycle control and an accident.

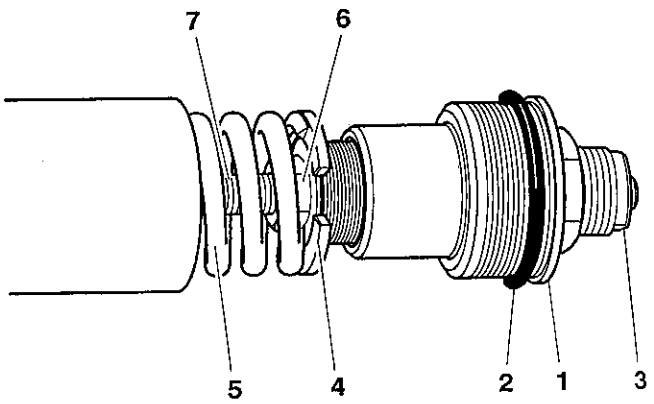


1. Preload adjuster marks

4. Remove the top cap.

WARNING: The fork cap will spring clear due to internal spring tension. To prevent injury, always wear eye, face and hand protection when removing spring loaded items.

5. Using hand pressure only, compress the fork spring to allow removal of the slotted washer.



1. Top cap

2. Top cap O ring

3. Preload adjuster

4. Slotted washer

5. Spring

6. Locknut

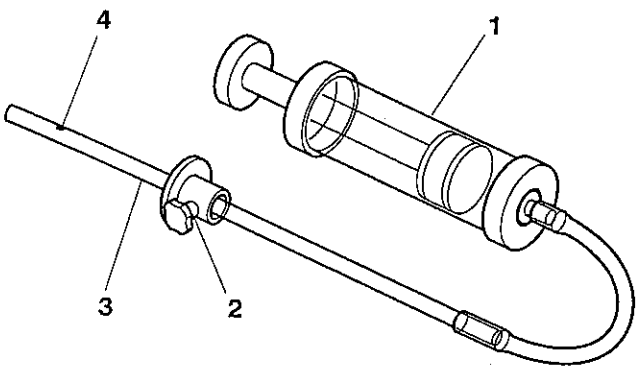
7. Damper rod

NOTE:

- **Before releasing the locknut on the damper rod, note the number of visible threads below the locknut. During re-assembly, the same number of visible threads must still be present after tightening the locknut.**

6. Slacken the locknut and remove the top cap from the damper rod. Discard the top cap 'O'-ring.
7. Remove the fork spring.
8. Invert the fork assembly and allow all the oil to drain into a suitable container. Pump the fork several times to ensure all the oil has been drained.
9. Turn the fork back to an upright position.
10. Fill the fork with the grade of oil specified in the fork oil table, to a level above that which will finally be required.

11. Set the scale on tool 3880160-T0301 to the level specified in the fork oil table.



11.07-1

1. Tool 3880160-T0301

2. Adjustment plate

3. Scale area

4. Hole (zero position)

NOTE:

- **Zero level on the tool is set at the small exit hole in the side of the scale tube, NOT AT THE END TIP. Do not attempt to block this side hole as this will cause the final fluid level to be incorrect.**

12. Operate the fork several times to expel any trapped air from the valves, then **fully compress the fork.**

13. Insert the scale end of the tool into the fork inner tube.

14. Hold the tool adjuster plate level with the upper surface of the fork inner tube and draw fluid into the syringe until fluid flow ceases (empty the syringe if the body becomes full before fluid flow stops).

15. The fluid level in the fork is now set to the height set on the tool scale. Check the tool scale setting and repeat the process if incorrectly set.

16. Fit a new 'O' ring to the top cap.

17. Reassemble the fork components in the reverse order in which they were removed.

NOTE:

- **Ensure that the damper rod locknut is returned to the same position as prior to removal.**

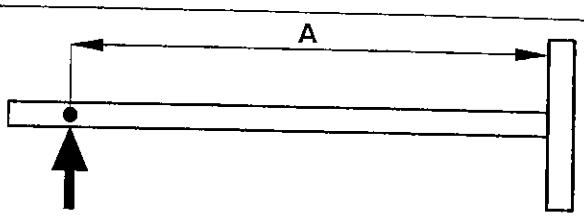
18. Refit the fork and tighten the top cap to **23 Nm.**

19. Reset the spring pre-load.

Using the tool

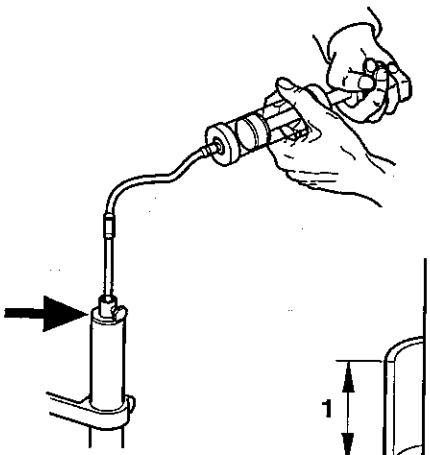
WARNING: Incorrect tool adjustment and/or failure to keep the tool level with the fork inner tube will affect the final fluid level setting.

Incorrect fork oil levels could result in an unsafe riding condition leading to loss of control and an accident.



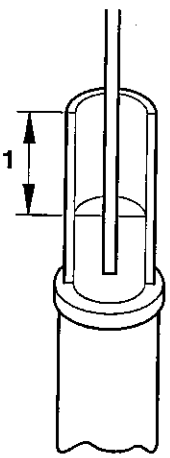
Zero level measured from oil hole
Set dimension 'A' to the required oil level

TEC11.07-2



TEC11.07-3

Plate arrowed must be level with fork slider



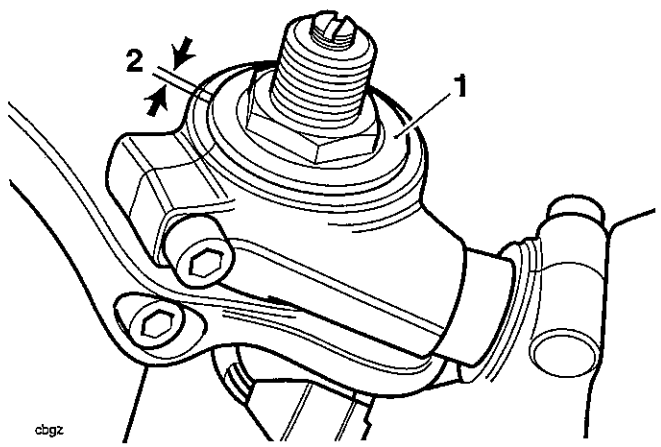
TEC11.07-4

1. Fork oil level setting (fork fully compressed)

FORK OIL LEVEL CHART

Model	Oil Level (fork fully com-pressed)	Oil Volume	Oil Grade	Fork Pull Through
Daytona 600	112 mm	465 cc	SAE 10W	3 mm above handlebar upper surface

WARNING: Any variation in fork oil level from the figures quoted above could result in an unsafe riding condition leading to loss of control and an accident.



1. Fork inner tube

2. Fork pull-through dimension

FRONT FORK

Dismantling

WARNING: Before staring work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Remove the fork assembly as previously described.

NOTE:

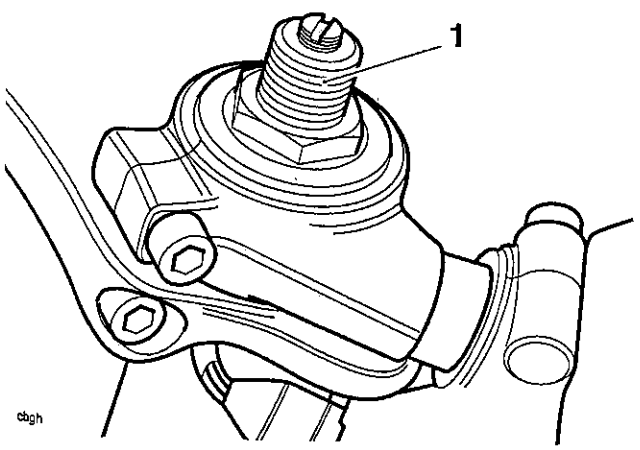
- **To aid removal, slacken but do not remove the top cap before releasing the fork from the yoke.**

CAUTION: When securing the fork in a vice use the caliper mounting points. Never clamp directly onto the tube itself as this will cause the tube to distort beyond repair.

2. Secure the fork in a soft jawed vice taking care not to mark or damage the mountings.

WARNING: Do not change the compression and rebound adjuster settings. If they are changed, this will affect the handling of the motorcycle from those which the rider is familiar with. Riding with unfamiliar fork settings may cause unexpected handling characteristics leading to loss of motorcycle control and an accident.

3. Record the position of the spring preload adjuster. This setting must be retained on re-assembly.



1. Preload adjuster marks

WARNING: The fork cap will spring clear due to spring tension. To prevent injury, always wear eye, face and hand protection when removing spring loaded items.

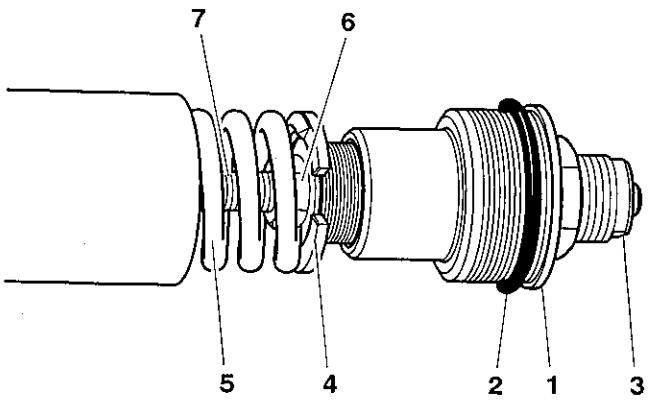
4. Release the fork cap from the inner tube.

5. Using hand pressure only, compress the fork spring to allow removal of the slotted washer.

6. Slacken the locknut and remove the top cap from the damper rod. Discard the top cap 'O' ring.

NOTE:

- **When releasing the locknut, do not hold the hexagonal portion of the top cap. Instead use the two flats used to change the preload setting.**



1. Top cap

2. Top cap 'O' ring

3. Preload adjuster

4. Slotted washer

5. Spring

6. Locknut

7. Damper rod

7. Remove the locknut.

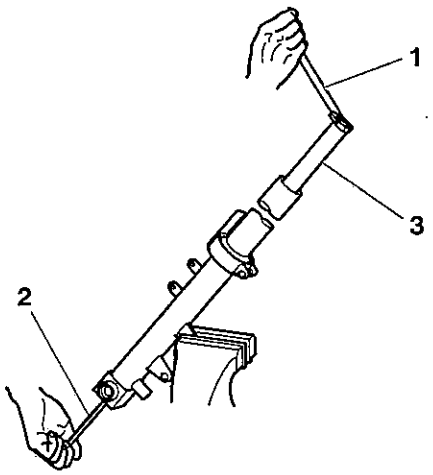
8. Remove the damper tube from inside the damper rod.

9. Remove the fork spring.

10. Invert the fork assembly and drain the oil into a suitable container for re-use. Turn the fork back to an upright position.

11. Return the fork to the vice.

12. Slide the square end of service tool 3880090-T0301 over the damper rod and turn until a positive engagement is felt in the cylinder.



11.10-1

1. Spanner

2. Allen key

3. Tool 3880090-T0301

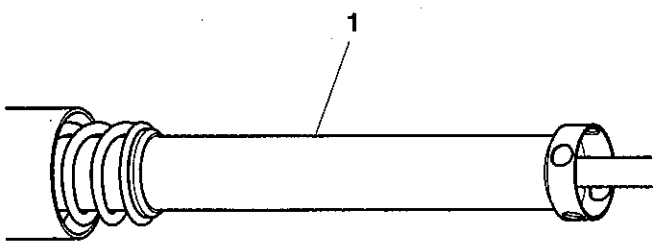
13. Hold the hexagonal end of service tool 3880090-T0301 with a spanner.

14. With the service tool preventing damper rotation, remove the capscrew from the base of the fork using an allen key.

15. Remove the copper washer from the capscrew and discard.

16. Remove the special tool.

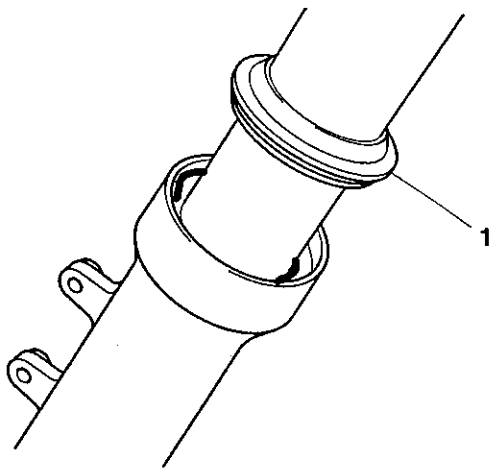
17. Withdraw the damper assembly.



11.10-2

1. Damper assembly

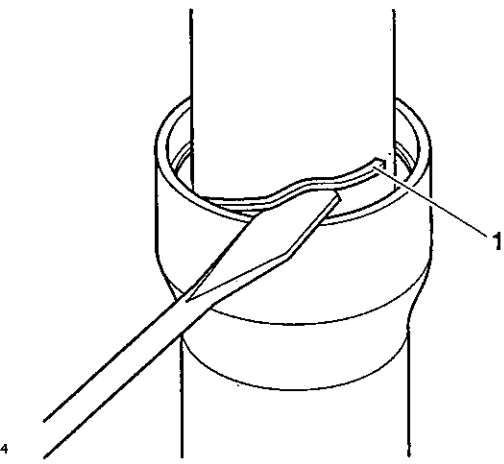
18. Ease the dust seal up the fork inner tube.



11.10-3

1. Dust seal

19. Remove the circlip from beneath the dust seal.



TEC11.10-4

1. Circlip

20. Using a sharp upward movement of the inner tube against the outer, withdraw the inner fork tube from the outer tube complete with the oil seal, oil seal washer, upper and lower bearings.

21. Discard the oil seal and remove the washer and upper bearing from the inner fork tube.

CAUTION: Do not attempt to remove the lower bearing from the inner tube as this will damage the bearing.

22. Remove the fork from the vice, invert the fork and collect the oil lock assembly and any remaining oil.

Inspection

1. Thoroughly clean and examine all components for damage, wear, scoring, corrosion etc. Renew as necessary.
2. Renew the oil and dust seals.

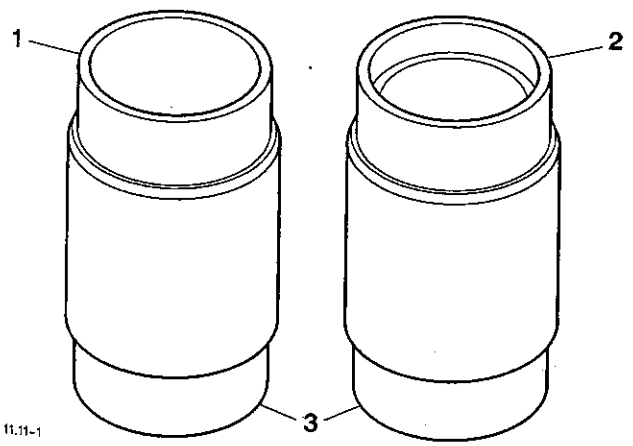
Assembly

WARNING: The front forks comprise many precision machined parts. Total cleanliness must be observed at all times and, assembly must take place in a dirt/dust-free environment.

Dirt ingress may cause damage to the fork parts, leading to incorrect operation, instability, loss of control or an accident.

NOTE:

- **During assembly of the fork, tool 3880080-T0301 will be used extensively. In the text, reference to a plain end and a recessed end will be made. This describes the the two ends of the tool, as shown in the illustration below.**

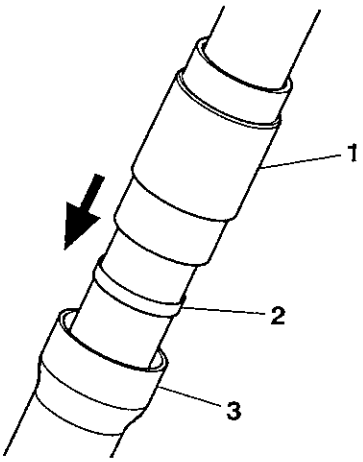


1. Plain end

2. Recessed end

3. Tool 3880080-T0301

1. Refit the upper bearing over the inner fork tube.
2. Locate the oil lock into the lower end of the fork outer tube.
3. With the outer fork tube secured in the vice by the caliper mounting, slide the inner tube into the outer tube.
4. Slide the upper bearing down the tube and drift it into its location in the outer tube using the plain end of tool 3880080-T0301.

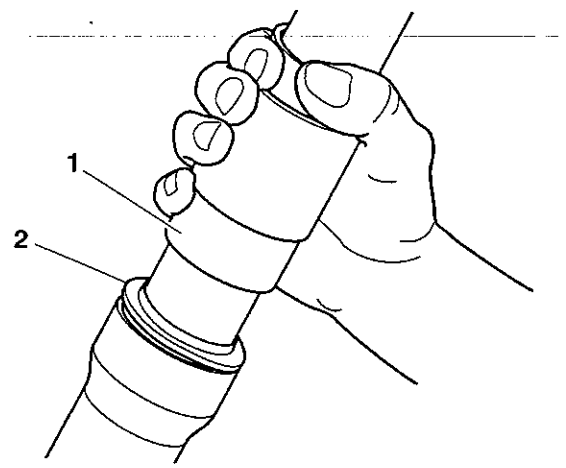


1. Tool 3880080-T0301

2. Bearing

3. Outer tube

5. Fit the oil seal washer.
6. Lubricate a new oil seal and position over the inner tube.
7. Drift it into position in the outer tube using the plain end of tool 3880080-T0301.
8. Secure the assembly with a new circlip.
9. Fit a new dust seal over the inner tube, drifting it into position in the outer tube using the recessed end of tool 3880080-T0301.



1. Tool 3880080-T0301

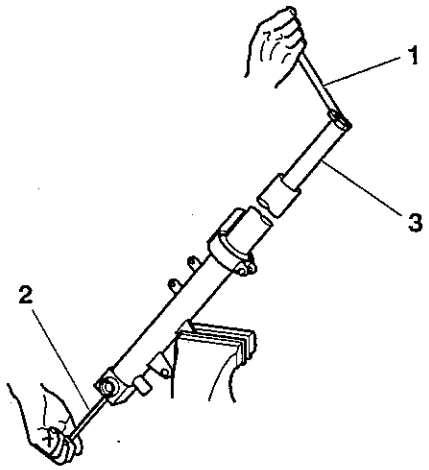
2. Dust seal

10. Refit the damper assembly to the inner tube.

11. Refit tool 3880090-T0301 to the damper rod and engage the square end in the damper.

12. Fit a new copper washer to the capscrew in the base of the fork outer tube.

13. Prevent the damper from turning by holding tool 3880090-T0301 and tighten the capscrew in the base of the outer tube to **43 Nm.**



11.12-1

1. Spanner

2. Allen Key

3. Tool 3880090-T0301

14. Remove the special tool.

15. Refit the damper tube to the damper rod.

16. Fill the forks with oil as previously described in this section.

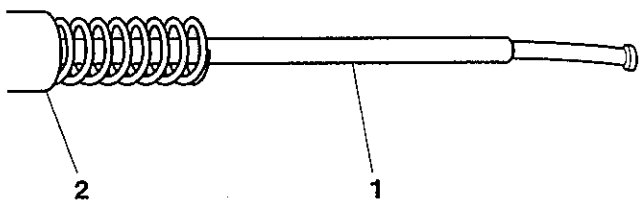
NOTE:

- **Operate the fork several times to ensure oil enters the valves etc.**

17. Refit the fork spring.

18. Fit a new 'O' ring to the top cap.

19. Locate the threaded end of tool 3880085-T0301 to the damper rod and temporarily engage the thread. Raise the damper rod using the tool then hold the damper rod and remove the tool.

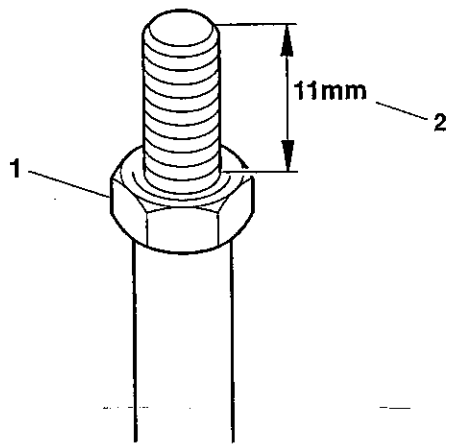


11.12-2

1. Tool 3880085-T0301

2. Damper rod (inside inner tube)

20. Refit the locknut to the damper rod and adjust the nut until 11mm of thread are visible above the nut.



11.12-3

1. Locknut

2. 11 mm

21. Refit the slotted washer.

22. Ensuring the 11 mm setting for the locknut does not change, locate the top cap to the damper rod and tighten the locknut to **15 Nm.**

23. Compress the spring and engage the threads of the top cap. Tighten by hand as far as possible.

NOTE:

- **Final tightening of the top cap can only be correctly achieved when the fork is installed in the yokes. Prior to installation in the yokes, attempts to tighten the cap will result in the inner tune and cap rotation, thus preventing the correct torque being achieved.**

24. Return the spring pre-load adjuster to the original setting.

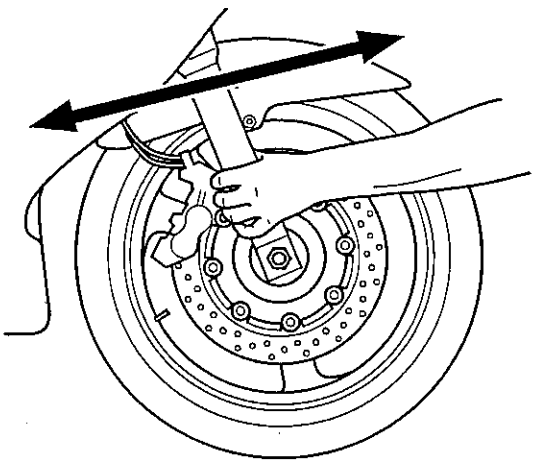
25. Tighten the top cap to **23 Nm** after the fork has been securely refitted into the yokes.

HEADSTOCK BEARING CHECK / ADJUSTMENT

Check

WARNING: Before staring work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Raise and support the front of the motorcycle.



11.13-1

Checking headstock bearings

2. Hold the lower end of the front forks and try to move them forward and backward. If any free-play can be detected, the headstock bearings require adjustment.

Adjustment

1. Raise and support the front of the motorcycle.

WARNING: Before staring work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

2. Remove the seats.
3. Disconnect the battery negative (black) lead first.
4. Slacken the yoke pinch bolts **on the top yoke only.**

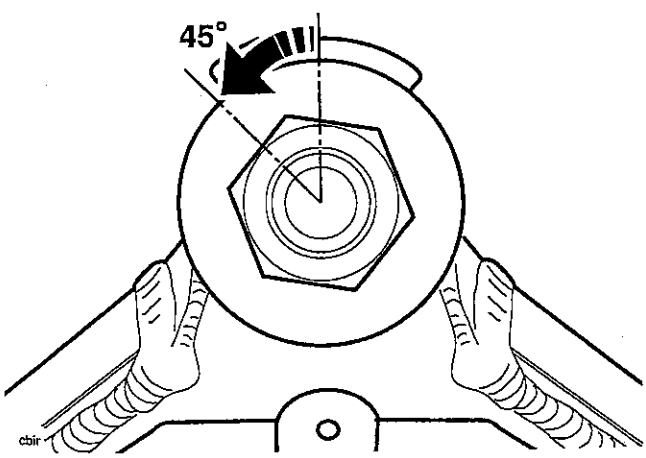
WARNING: If the lower yoke fixings are also slackened, the forks will no longer support the weight of the motorcycle. Do not slacken the lower yoke fixings as, in this condition, the motorcycle could topple over causing damage and/or risk of injury.

5. Remove the nut in the centre of the top yoke.
6. Remove the handlebar fixings the detach the handlebars from the top yokes.

NOTE:

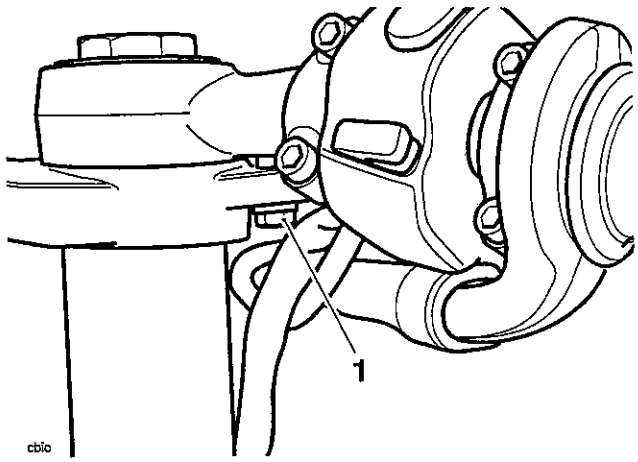
- **It is not necessary to disconnect any control cables or electrical connectors**

7. Adjust the bearing free-play as follows:-
   - Undo the adjuster nut then torque to **5 Nm.**
   - Release the adjuster nut by 45°.



   - Check fork play at this time. Some play should be evident, which is normal at this stage of the procedure.

8. Refit the top yoke, washer (burred face upwards) and centre nut.
9. Tighten the top nut to **90 Nm.**
10. Tighten the top yoke to fork clamp bolts to **20 Nm.**
11. Refit the handlebars then tighten the handlebar clamp bolts to **27 Nm.**
12. Fit the handlebar anti-rotation fixings and spacers and tighten to **5 Nm.**



1. Handlebar

2. Anti-rotation fixing

13. Check for steering tightness and play in the headstock bearings. No play should be present in the bearing but the handlebars should fall to full lock on their own. If play is evident, repeat the adjustment process.

WARNING: Tight or stiff headstock bearings or play in the bearings will cause steering difficulties, potentially resulting loss of motorcycle control and an accident. If tight, stiff or loose bearings are found, always readjust following the adjustment procedure accurately.

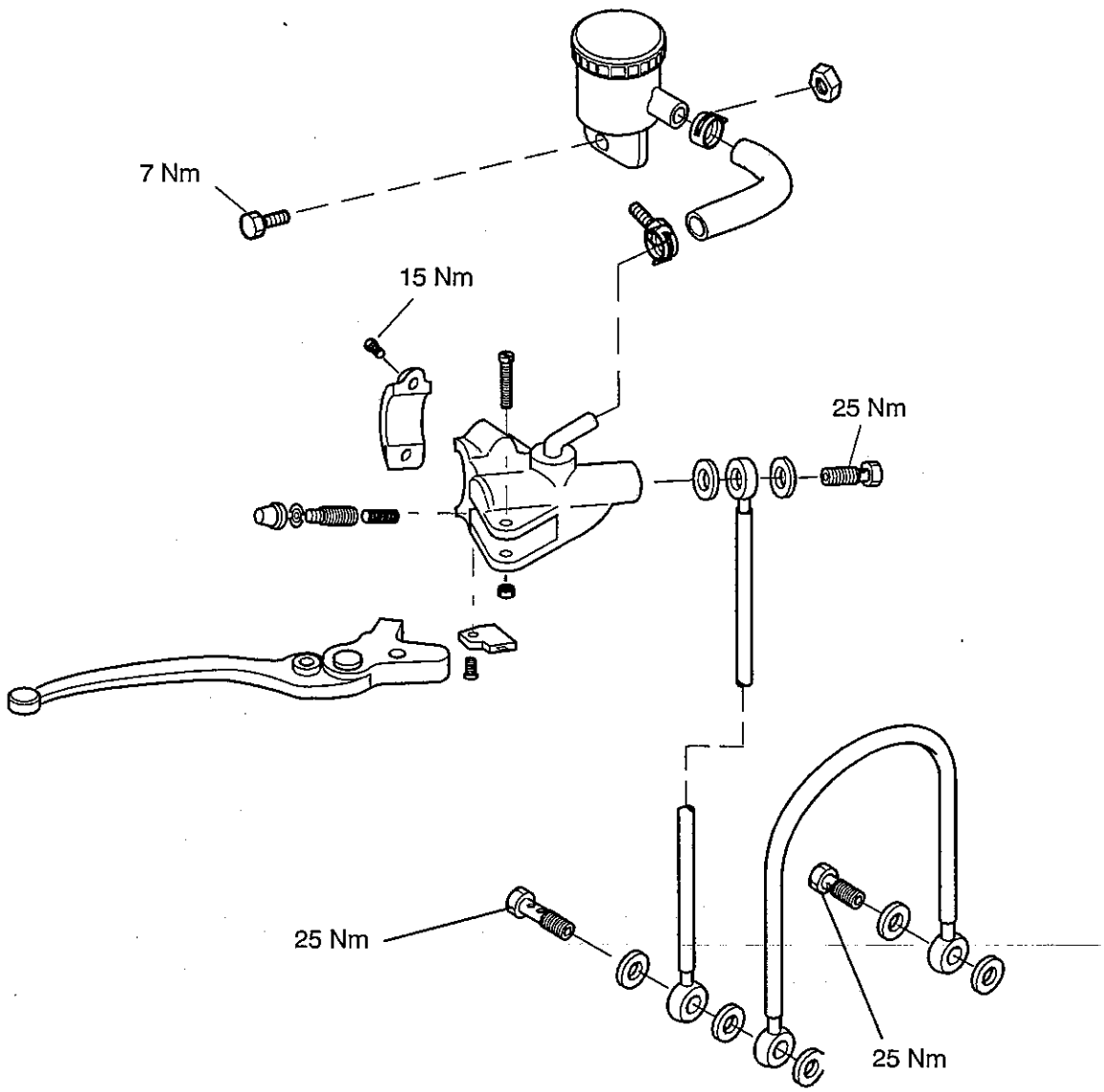
WARNING: Move the handlebars to left and right full lock while checking that cables and harnesses do not bind. A cable or harness which binds will restrict the steering and may cause loss of control and an accident.

14. Once all adjustment and assembly has been completed, lower the motorcycle to the ground and place on its sidestand.
15. Reconnect the battery, positive (red) lead first.
16. Refit the seats.

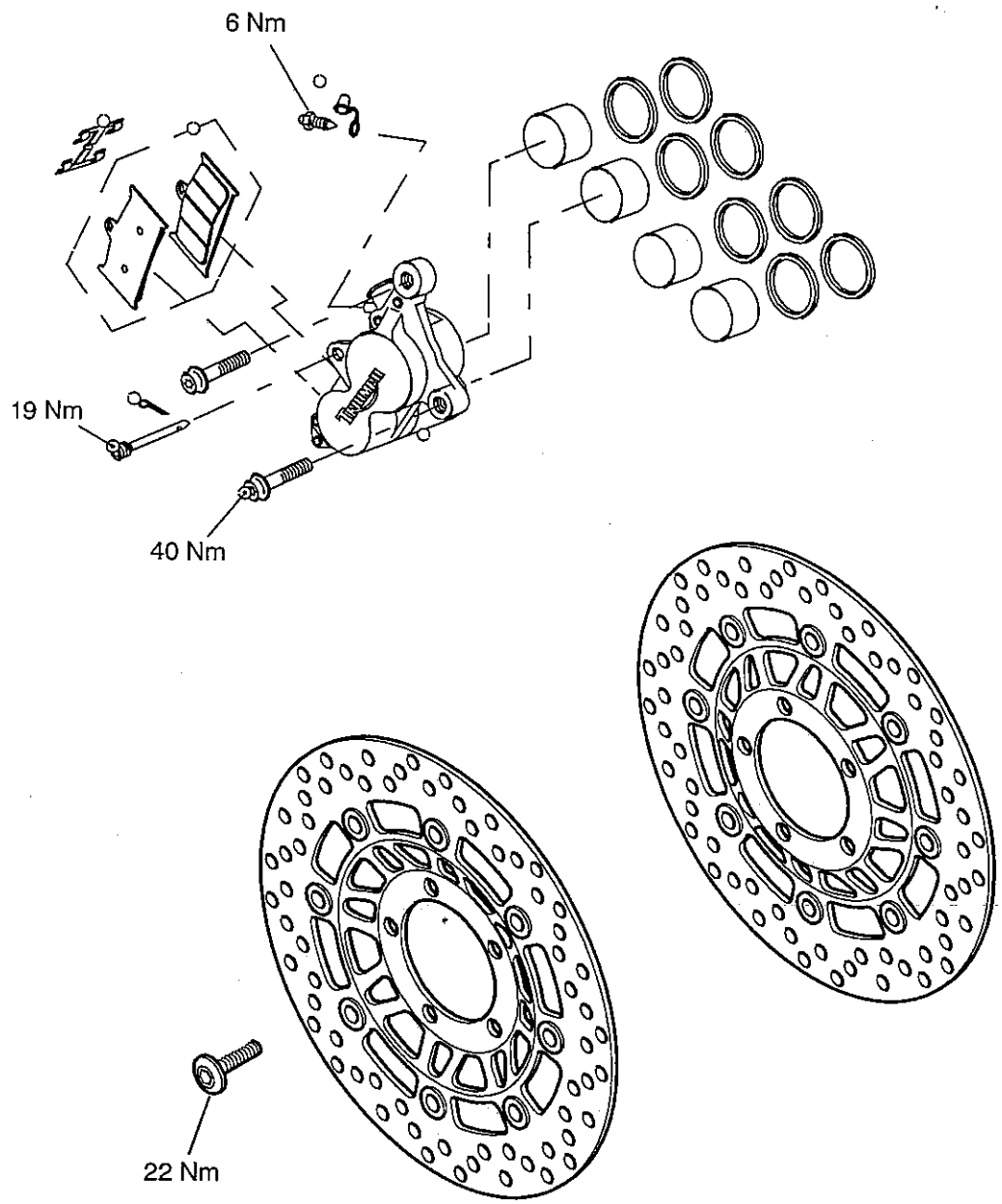
BRAKING SYSTEM

CONTENTS

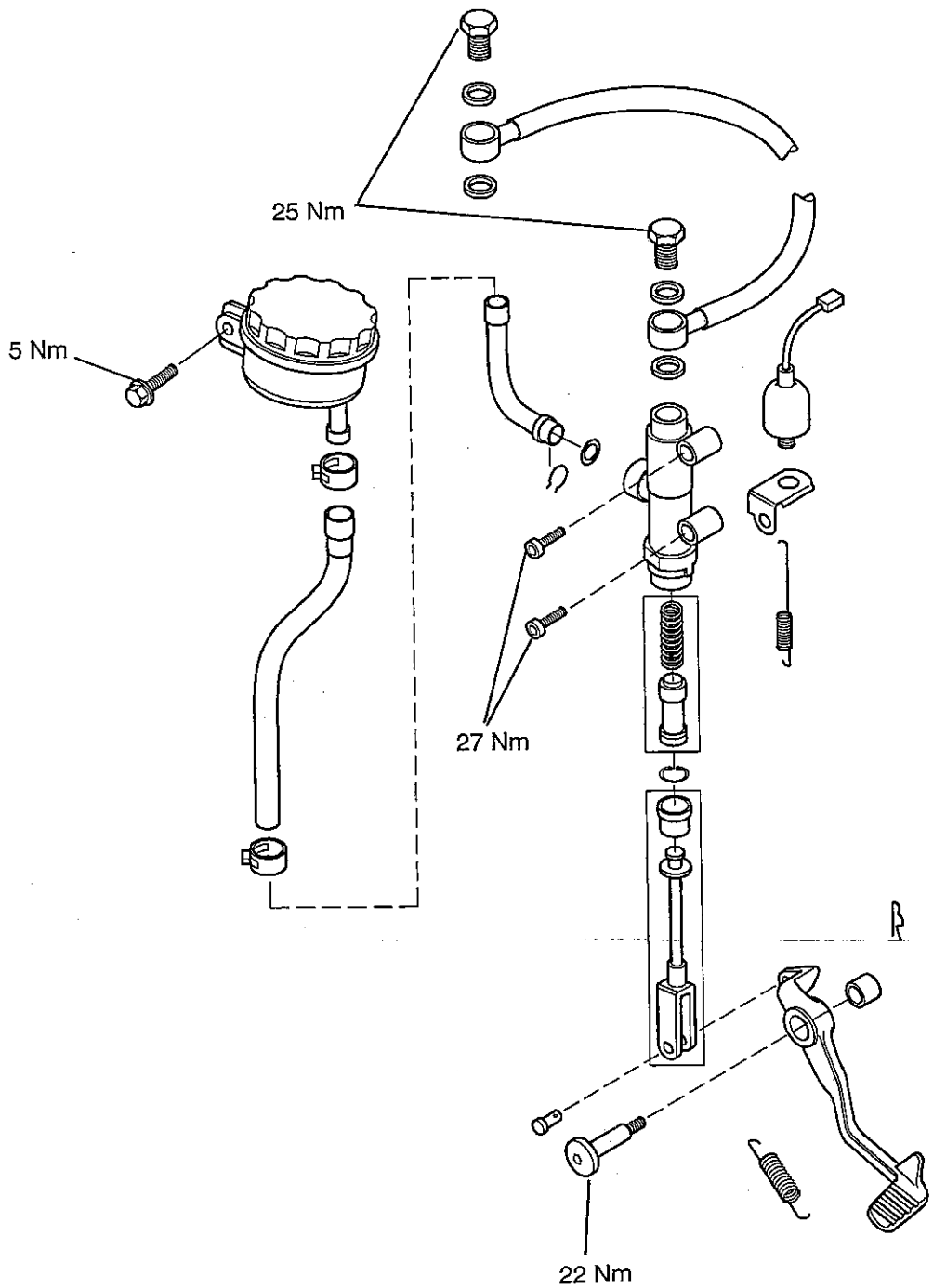
Exploded View - Front Brake Master Cylinder



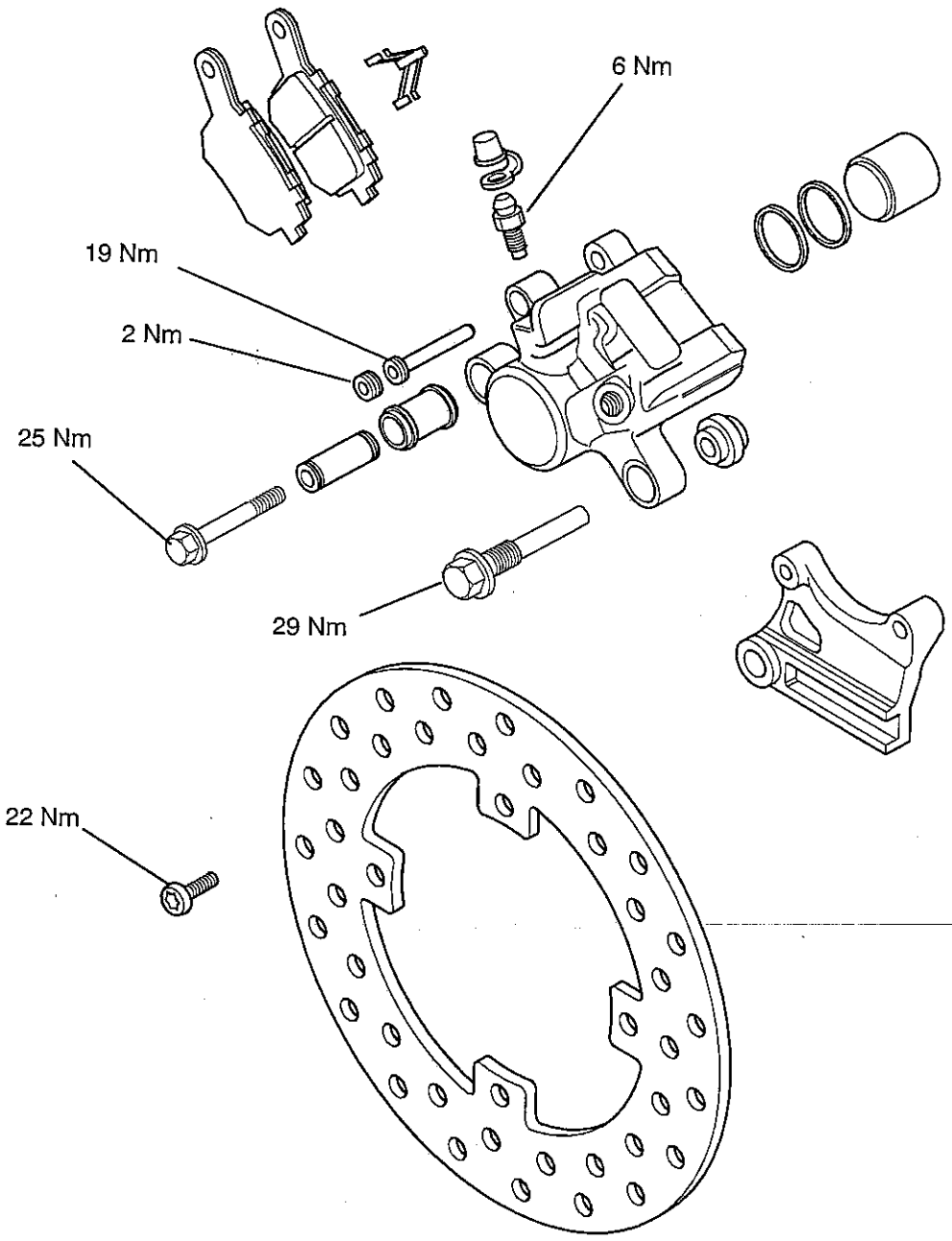
Exploded View - Front Brake Caliper



Exploded View - Rear Brake Master Cylinder



Exploded View - Rear Brake Caliper



BRAKING SYSTEM MAINTENANCE SAFETY PRECAUTIONS

WARNING: Brake fluid is hygroscopic which means it will absorb moisture from the air. The absorbed moisture will greatly reduce the boiling point of the brake fluid causing a reduction in braking efficiency.

Replace brake fluid in line with the scheduled maintenance chart. A dangerous riding condition could result if this important maintenance item is neglected.

Do not spill brake fluid onto any area of the bodywork as this will damage any painted or plastic surface.

Always use new brake fluid from a sealed container and never use fluid from an unsealed container or from one which has been previously opened.

Do not mix different brands of fluid. Check for fluid leakage around brake fittings, seals and joints.

Check regularly for brake hose damage.

FAILURE TO OBSERVE ANY OF THE ABOVE WARNINGS MAY REDUCE BRAKING EFFICIENCY LEADING TO AN ACCIDENT.

WARNING: If there has been an appreciable drop in the level of the fluid in either brake fluid reservoir, consult your authorised Triumph Dealer for advice before riding.

If the brake lever or pedal feel soft when it is applied, or if the lever/pedal travel becomes excessive, there may be air in the brake lines or the brake may be defective.

It is dangerous to operate the motorcycle under such conditions and remedial action must be taken by your authorised Triumph Dealer before riding the motorcycle.

Failure to take remedial action may reduce braking efficiency leading to an accident.

WARNING: Use only D.O.T. 4 specification brake fluid as listed in the general information section of this manual. The use of brake fluids other than those D.O.T. 4 fluids listed in the general information section may reduce the efficiency of the braking system leading to an accident.

Failure to change the brake fluid at the interval specified in the scheduled maintenance chart may reduce braking efficiency resulting in an accident.

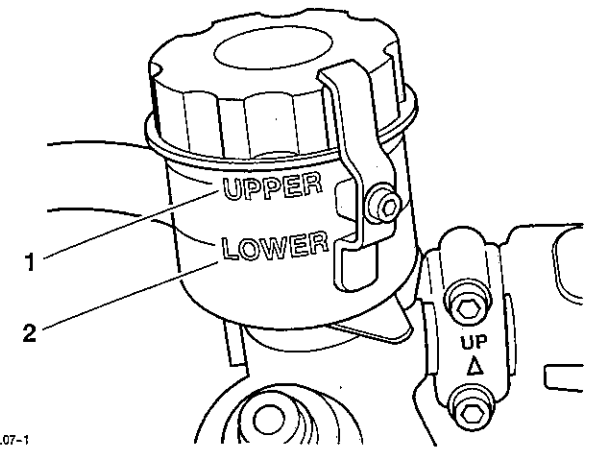
WARNING: Never use mineral based grease in any part of the braking system or in any area where contact with the braking system is possible. Mineral based grease will damage the hydraulic seals in the calipers and master cylinders.

Damage caused by contact with mineral based grease may reduce braking efficiency resulting in an accident.

FLUID LEVEL INSPECTION

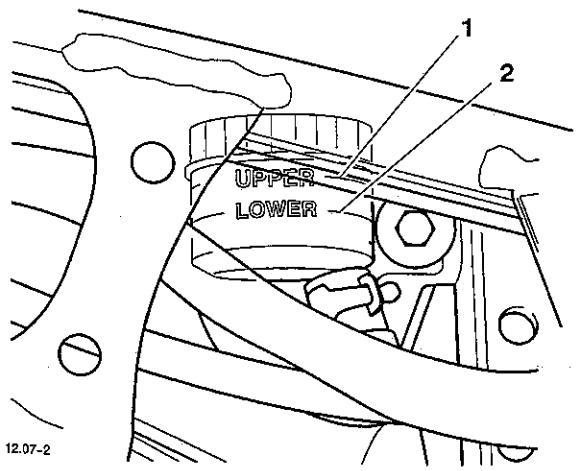
In accordance with the scheduled maintenance chart, inspect the brake fluid level in the front and rear master cylinder reservoirs.

1. Ensure that the brake fluid level in the front and rear brake fluid reservoirs is between the upper and lower level lines (reservoir held horizontal).



1. Front reservoir upper level

2. Front reservoir lower level



1. Rear reservoir upper level

2. Rear reservoir lower level

CHANGING BRAKE FLUID

Brake fluid should be changed at the interval specified in the scheduled maintenance chart.

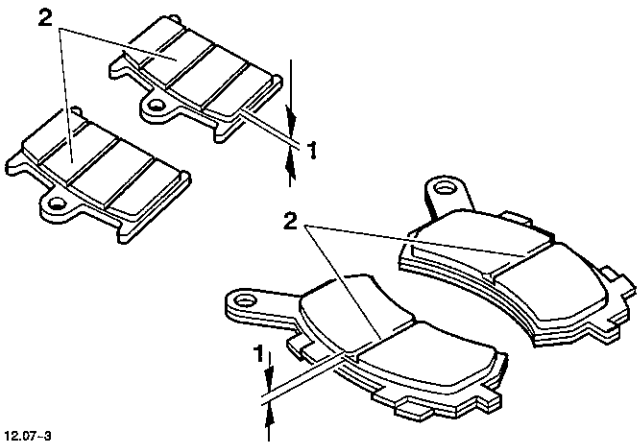
BRAKE PADS

Front and rear pad wear is automatically compensated for and has no effect on brake lever or pedal action.

Brake Wear Inspection

In accordance with the scheduled maintenance chart, inspect the brake pads for wear. The minimum thickness of lining material for any front or rear brake pad is 1.5mm.

If any pad has worn to the bottom of the groove in the pad centre, replace all the brake pads on that wheel.



1. Lining material thickness

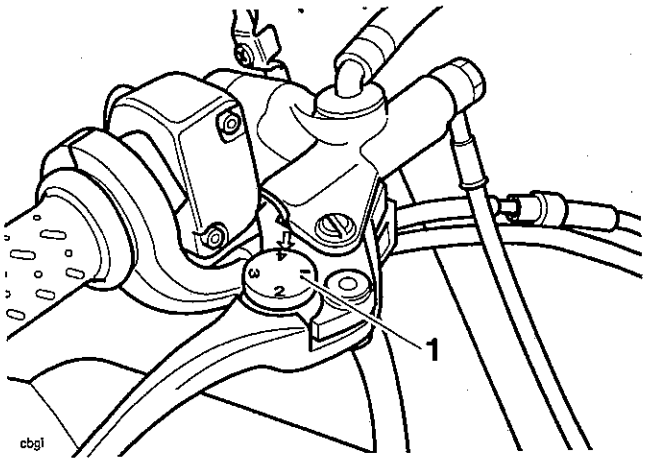
2. Centre groove

WARNING: Do not replace individual brake pads, instead always replace both pads in the brake caliper. On the front where two calipers are mounted on the same wheel, all the pads in both calipers must be replaced together. Replacing individual pads will reduce braking efficiency and may cause an accident.

BLEEDING THE FRONT BRAKES, RENEWING BRAKE FLUID

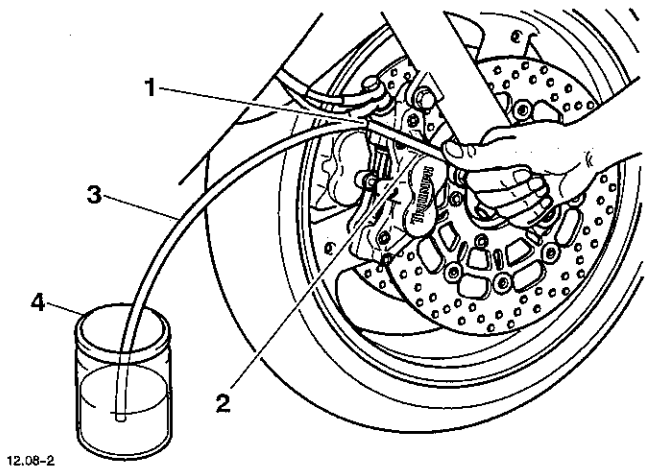
WARNING: Before staring work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Note the original setting of the brake lever adjuster in order that it can be returned to the same position when the bleeding operation is complete.
2. Set the brake lever adjuster to position No.1.



1. Adjuster

3. Remove the rubber cap from the bleed nipple on the right hand caliper.
4. Attach a transparent tube to the bleed nipple.



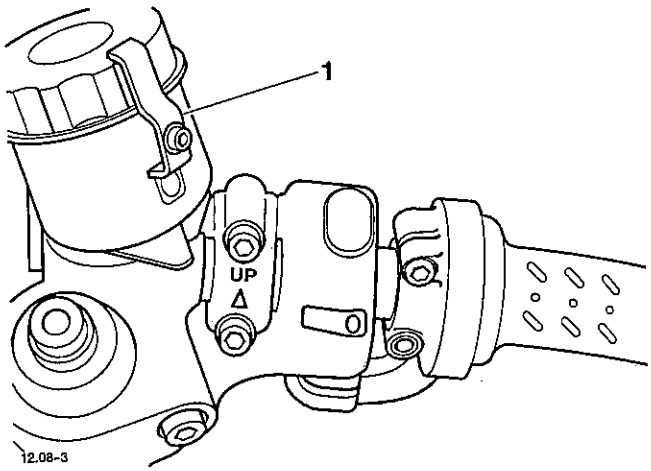
1. Bleed nipple

2. Spanner

3. Bleed tube

4. Container

5. Place the other end of the tube in a suitable receptacle containing new brake fluid, keeping the tube end below the level of fluid.
6. Turn the handlebars to bring the fluid reservoir to a level position.



1. Safety clip

7. Remove the safety clip from the brake reservoir cover.

WARNING: Ensure absolute cleanliness when adding brake fluid to the brake fluid reservoir. Do not allow moisture or debris to enter the cylinder as this will adversely affect the fluid properties. Always use fluid from a sealed container and do not use fluid from a container which has been previously opened. Always check for fluid leakage around hydraulic fittings and for damage to hoses.

A dangerous riding condition leading to an accident could result if any element of this warning is ignored.

CAUTION: To prevent body/paint damage, do not spill brake fluid onto any area of the bodywork or other painted or plastic surface.

8. Carefully remove the reservoir cover taking care not to spill any fluid.
9. Check the condition of the sealing diaphragm inside the reservoir. Replace if necessary.
10. Release the bleed nipple.

WARNING: Use only D.O.T. 4 specification brake fluid as listed in the general information section of this manual. The use of brake fluids other than those D.O.T. 4 fluids listed in the general information section may reduce the efficiency of the braking system leading to an accident.

Observe the brake fluid handling warnings given earlier in this section of the manual.

NOTE:

- **During bleeding, do not allow the fluid level to fall below the lower level mark in the reservoir. If the level is allowed to fall below this mark, air may enter the system and the sequence of bleeding must be repeated.**

11. Slowly pull the brake lever to the handlebar and, holding the lever fully in, close the bleed nipple.

    Repeat steps 10 and 11 until no more air appears in the bleed tube.

12. Maintain the brake fluid level between the upper and lower reservoir levels whilst bleeding is being carried out.

13. When all air has been expelled from the system, hold the lever in and close the bleed nipple. Tighten the nipple to **6 Nm**.

14. Fill the reservoir to the upper level with new D.O.T. 4 fluid.

WARNING: Use only D.O.T. 4 specification brake fluid as listed in the general information section of this manual. The use of brake fluids other than those D.O.T. 4 fluids listed in the general information section may reduce the efficiency of the braking system leading to an accident.

Observe the brake fluid handling warnings given earlier in this section of the manual.

15. Remove the transparent bleed tube.

16. Replace the bleed nipple cap.

17. Repeat the procedure for the left-hand caliper.

18. Refit the reservoir cover and diaphragm. Refit the safety clip and screw.

WARNING: Always return the lever adjuster to the original setting as noted in paragraph 1. Operating the motorcycle with lever settings which are unfamiliar may lead to loss of control or an accident.

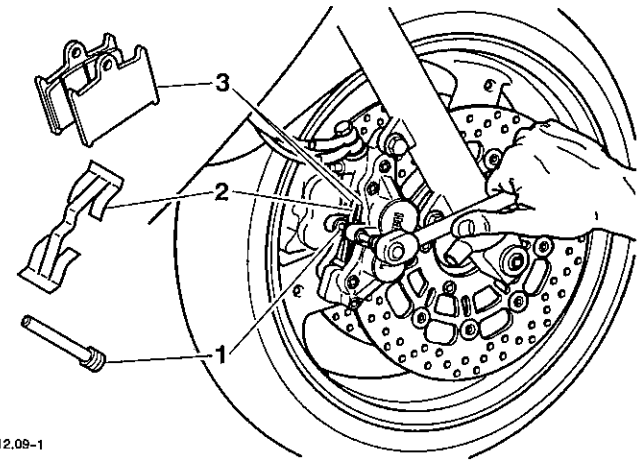
19. Reset the brake lever adjuster to the original setting.

20. Check that the brake operates correctly.

FRONT BRAKE PADS

Removal

WARNING: Before staring work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.



12.09-1

1. Retaining pin

2. Anti-rattle spring

3. Brake pads

1. Remove the split pin from the inner end of the pad retaining pin.

2. Release and remove the pad retaining pin.

3. Remove the anti-rattle spring and inspect the spring for damage, replace if necessary.

CAUTION: Never lever directly against the disc, caliper or the brake pad as this will damage these components. Always use a levering tool made from a soft material which will not cause damage to the load bearing surfaces.

Brake fluid will be displaced as the caliper pistons are compressed. To prevent body/paint damage, do not spill brake fluid onto any area of the bodywork or other painted or plastic surface.

4. Carefully push the brake pads apart to force the caliper pistons back and allow withdrawal of the pads.

5. Remove both brake pads and inspect for damage and wear beyond the service limit, replace if necessary.

Installation

WARNING: Never use mineral based grease in any part of the braking system or in any area where contact with the braking system is possible. Mineral based grease will damage the hydraulic seals in the calipers and master cylinders.

Damage caused by contact with mineral based grease may reduce braking efficiency resulting in an accident.

1. Fit new brake pads as an axle set or, if all the pads are in a serviceable condition, clean the pad grooves before refitting all pads in their original positions.

WARNING: Do not apply more than a minimum coating of grease to the pad retaining pins. Excess grease may contaminate the brake pads, hydraulic seals and discs causing reduced braking efficiency and an accident.

2. Lubricate the pad retaining pins using a minimum amount of proprietary high temperature 'Copperslip' type grease.
3. Fit the anti-rattle spring over the pads and push down in the centre to allow the pad retaining pin to slide across the top of the spring.
4. Tighten the pad retaining pins to **19 Nm**, and secure with new split pins at the inner end.
5. Pump the brake lever to correctly position the caliper pistons.

WARNING: Use only D.O.T. 4 specification brake fluid as listed in the general information section of this manual. The use of brake fluids other than those D.O.T. 4 fluids listed in the general information section may reduce the efficiency of the braking system leading to an accident.

Observe the brake fluid handling warnings given earlier in this section of the manual.

6. Check the front brake fluid level and adjust as required with new D.O.T. 4 fluid.

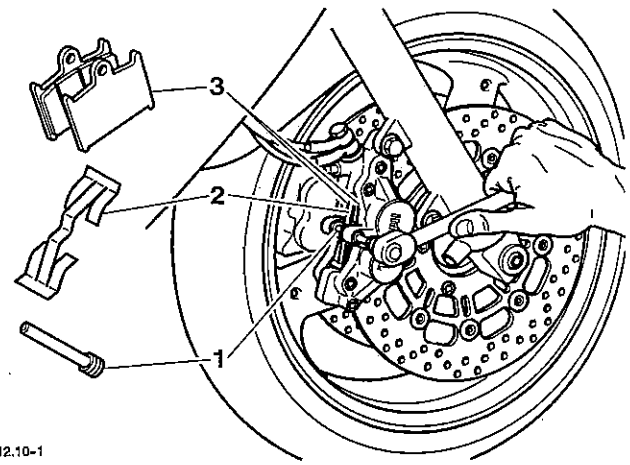
FRONT BRAKE CALIPER

Removal

WARNING: Before staring work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

CAUTION: To prevent body/paint damage, do not spill brake fluid onto any area of the bodywork or other painted or plastic surface.

1. Disconnect the brake hose at the caliper (two hoses on right hand caliper), and place the free end of the hose(s) in a suitable container to collect brake fluid.
2. If the caliper is to be overhauled, remove the split pin and slacken the pad retaining pin.



12.10-1

1. Retaining pin

2. Anti-rattle spring

3. Brake pads

CAUTION: Never lever directly against the disc, caliper or the pad lining material. Always use a levering tool made from a soft material which will not cause damage to the load bearing surfaces.

Brake fluid will be displaced from the hose joint as the caliper pistons are compressed. To prevent body damage, ensure that the displaced fluid does not come into contact with any part of the bodywork

3. Remove the two caliper securing bolts.
4. Manoeuvre the caliper clear of the disc, taking care not to damage the wheel.

Disassembly

WARNING: Do not attempt to split the two halves of the caliper. A dangerous riding condition leading to an accident could occur if this warning is ignored.

1. Remove the pad retaining pin and extract the pads.

WARNING: To prevent injury, never place fingers or hands inside the caliper opening when removing the pistons. Always wear eye, hand and face protection when using compressed air. Eye, face and skin damage will result from direct contact with compressed air.

2. Cover the caliper opening with a clean, heavy cloth and, using either compressed air or by reconnecting the master cylinder and pumping the brake lever, eject the pistons one at a time.

Inspection

1. Check the pistons and caliper bores for corrosion, scoring and damage. Renew as necessary.

WARNING: Always renew caliper seals and pistons after removal from the caliper. An effective hydraulic seal can only be made if new components are used.

A dangerous riding condition leading to an accident could result if this warning is ignored.

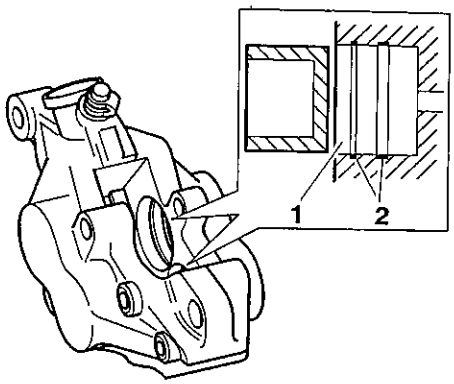
2. Inspect the brake pads for damage and wear beyond the service limit. Renew as necessary.

Assembly

WARNING: Never use mineral based grease in any part of the braking system or in any area where contact with the braking system is possible. Mineral based grease will damage the hydraulic seals in the calipers and master cylinders.

A dangerous riding condition leading to an accident could result if this warning is ignored.

1. Fit new fluid seals.



12.11-1

1. Caliper bore

2. Piston seals

WARNING: Ensure that the caliper bores do not become scratched during piston removal and assembly. Ensure that the pistons remain square to their bores during fitment otherwise damage to the caliper could result.

A dangerous riding condition leading to an accident could result if this warning is ignored.

2. Apply brake fluid to the outside of the caliper pistons and fluid seals, then carefully push the pistons fully into the caliper bores by hand.

Installation

1. Position the caliper over the disc and tighten the caliper bolts to **40 Nm.**
2. Fit the brake pads to the caliper and locate the anti-rattle spring over the pads.

WARNING: Do not apply more than a minimum coating of grease to the pad retaining pins. Excess grease may contaminate the brake pads, hydraulic seals and discs causing reduced braking efficiency and an accident.

3. Lubricate the pad retaining pins using a minimum amount of proprietary high temperature 'Copperslip' type grease. Push down in the centre of the anti-rattle spring and fit the retaining pin.
4. Tighten the brake pad retaining pin to **19 Nm** and fit a new split pin to the inner end.
5. Connect the brake hose(s) to the caliper incorporating new sealing washers on each side of the banjo bolt(s).
6. Tighten the banjo bolts to **25 Nm.**

WARNING: Use only D.O.T. 4 specification brake fluid as listed in the general information section of this manual. The use of brake fluids other than those D.O.T. 4 fluids listed in the general information section may reduce the efficiency of the braking system leading to an accident.

Observe the brake fluid handling warnings given earlier in this section of the manual.

7. Fill the master cylinder with new, D.O.T. 4 brake fluid from a sealed container.
8. Bleed the front brakes as described earlier in this section.

FRONT DISCS

Wear

1. Replace any brake disc if worn beyond the service limit or if it exceeds the disc run-out limit.

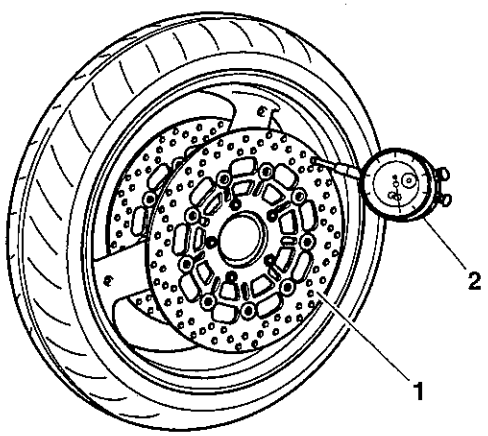
Front disc thickness

Standard	**4.0 mm**
Service Limit	**3.5 mm**

Disc run-out

Service Limit	**0.15 mm**

Measure disc run out using an accurate dial gauge mounted on a surface plate.



12.12-1

1. Disc

2. Dial gauge

Removal

WARNING: Before staring work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

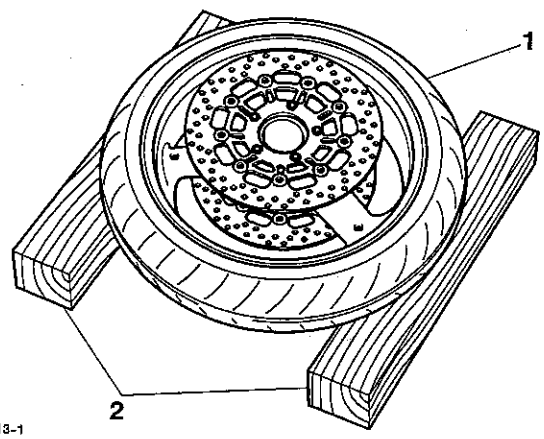
WARNING: Do not renew front brake discs individually. Discs must always be renewed in pairs even if one of a pair is serviceable.

A dangerous riding condition leading to an accident could result if this warning is ignored.

1. Remove the front wheel as described in the wheel section.

WARNING: Damage to the wheel centre could cause misalignment of the wheel when refitted. A dangerous riding condition leading to an accident could result if this warning is ignored.

2. Support the wheel on blocks as illustrated to avoid damage to the wheel centre and brake disc.



1. Wheel

2. Support block

3. Remove the disc bolts and detach the disc.
4. Repeat operations 2 and 3 for the other disc.

Installation

1. Locate the first disc to the wheel (offset outwards).
2. Fit **new** disc bolts and tighten to **22 Nm.**
3. Repeat steps 1 & 2 for the other disc.
4. Thoroughly clean and degrease both discs.
5. Refit the wheel as described in the wheel section.

FRONT BRAKE MASTER CYLINDER

Removal

WARNING: Before staring work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Remove the seats and disconnect the battery, negative (black) lead first.

CAUTION: To prevent body/paint damage, do not spill brake fluid onto any area of the bodywork or other painted or plastic surface.

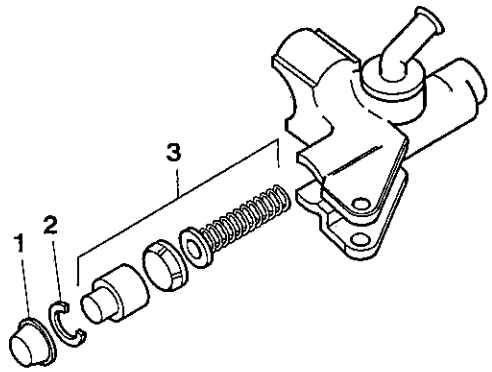
2. To drain the fluid from the master cylinder, attach a tube to the right hand caliper bleed nipple, slacken the nipple and allow the fluid to drain into a suitable container. Operate the brake lever until all fluid has been expelled.
3. Note the setting of the brake lever adjuster to ensure it is returned to the same position when the overhaul operation is complete.
4. Remove the pivot locknut and bolt securing the brake lever to the master cylinder. Remove the lever.
5. Disconnect from the master cylinder the;

- brake hose,
- brake light switch connections,
- reservoir hose.

6. Release the clamp screws from the handlebar and collect the master cylinder.

Disassembly

1. Detach the boot from the lever end of the cylinder.
2. Remove the circlip from beneath the boot.
3. Remove the piston set from the master cylinder bore noting the relative position of the seals and piston components.



12.14-1

1. Boot

2. Circlip

3. Piston set

Inspection

1. Check the following for wear, damage, cracks or deterioration:

- Cylinder bore.
- Dust cover.
- Spring.
- Piston.
- Pivot bolt.

2. Always renew the piston and seal set if the cylinder is dismantled.
3. Check that the relief and supply ports on the cylinder are not blocked.

Assembly

WARNING: Never use mineral based grease in any part of the braking system or in any area where contact with the braking system is possible. Mineral based grease will damage the hydraulic seals in the calipers and master cylinders.

A dangerous riding condition leading to an accident could result if this warning is ignored.

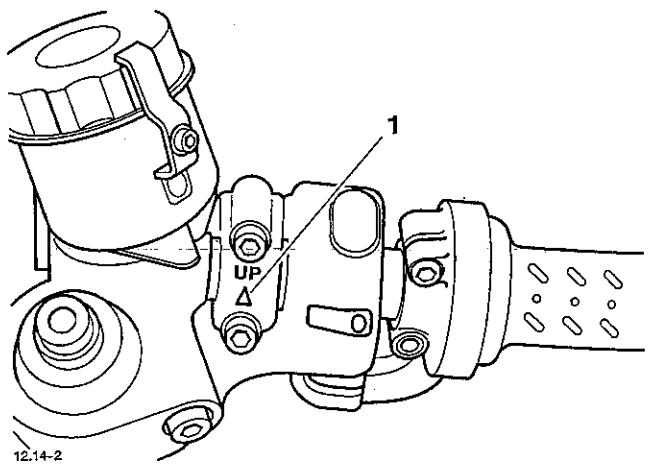
1. Lubricate the piston and cylinder with new, clean brake fluid.

WARNING: Ensure that the piston and piston seal are fitted facing the same way as noted during removal. A dangerous riding condition leading to an accident could result from incorrect assembly of the master cylinder.

2. Fit the new piston set into the master cylinder and retain with a new circlip.
3. Refit the master cylinder boot.

Installation

1. Locate the master cylinder to the handlebars and position the clamp with the 'UP' arrow pointing upwards. Align the master cylinder to clamp split line with the dot mark on the handlebar.



12.14-2

1. 'Up' arrow mark

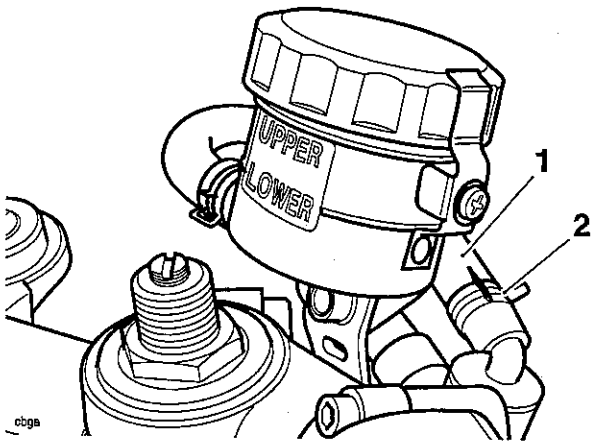
2. Tighten the clamp bolts, upper first and then the lower to **15 Nm**.
3. Connect the brake light switch.
4. Position the brake lever ensuring that pivot boss is correctly aligned to the push rod. Fit and tighten the pivot bolt to **6 Nm**, and the locknut to **1 Nm**.

5. Connect the brake hose to the master cylinder incorporating new sealing washers. Tighten the banjo bolt to **25 Nm.**

WARNING: To prevent brake fluid leaks from the reservoir hose, ensure the reservoir hose clip is correctly positioned over the joint with the master cylinder.

An incorrectly positioned hose clip could cause a brake fluid leak and impaired brake performance, resulting in loss of motorcycle control and an accident.

6. Reconnect the reservoir hose.



1. **Reservoir hose**
2. **Clip (correctly positioned)**

7. Fill the master cylinder reservoir with new DOT4 brake fluid.

WARNING: Use only D.O.T. 4 specification brake fluid as listed in the general information section of this manual. The use of brake fluids other than those D.O.T. 4 fluids listed in the general information section may reduce the efficiency of the braking system leading to an accident.

Observe the brake fluid handling warnings given earlier in this section of the manual.

8. Bleed the front brakes as described earlier in this section.

WARNING: Always return the lever adjuster to the original setting noted during removal. Operating the motorcycle with lever settings which are unfamiliar may lead to loss of control or an accident.

9. Return the brake lever adjuster to the setting previously noted.

10. Examine the system for correct operation and fluid leaks. Rectify as necessary.

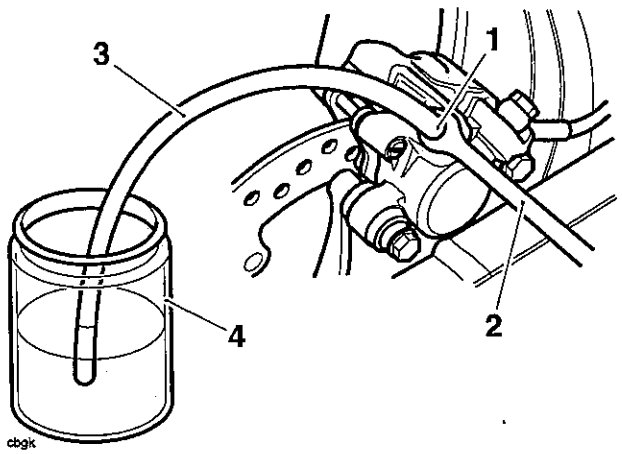
11. Connect the battery positive, (red) lead first.

12. Refit the seats.

BLEEDING THE REAR BRAKES, RENEWING BRAKE FLUID

WARNING: Before staring work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Remove the rubber cap from the bleed nipple.
2. Attach a transparent tube to the nipple.



1. Bleed nipple

2. Spanner

3. Bleed tube

4. Fluid jar

3. Place the other end of the tube in a suitable receptacle containing new brake fluid, keeping the tube end below the level of fluid.
4. Remove the seats.

CAUTION: To prevent body/paint damage, do not spill brake fluid onto any area of the bodywork or other painted or plastic surface.

5. Unscrew and remove the rear brake reservoir cover taking care not to spill any fluid.

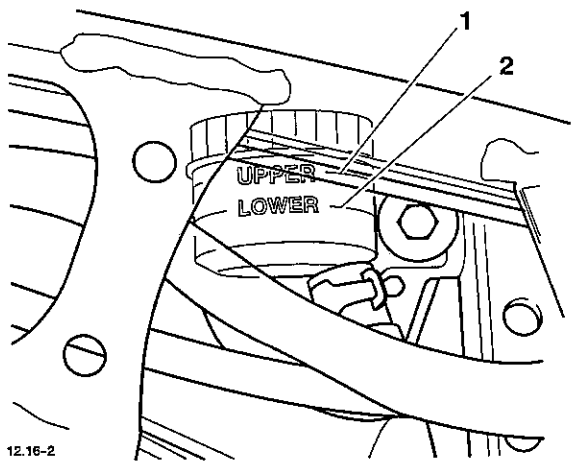
WARNING: Ensure absolute cleanliness when adding brake fluid to the brake fluid reservoir. Do not allow moisture or debris to enter the cylinder as this will adversely affect the fluid properties. Always use fluid from a sealed container and do not use fluid from a container which has been opened for any period of time. Always check for fluid leakage around hydraulic fittings and for damage to hoses. A dangerous riding condition leading to an accident could result if this warning is ignored.

6. Check the condition of the reservoir sealing diaphragm. Replace the diaphragm as necessary.
7. Release the bleed nipple.

NOTE:

- **During bleeding, do not allow the fluid level to fall below the lower level mark in the reservoir. If the level is allowed to fall below this mark, air may enter the system and the sequence of bleeding must be repeated.**

8. Slowly depress the brake pedal and, holding the pedal fully down, close the bleed nipple.
9. Repeat steps 7 and 8 until no more air appears in the bleed tube.
10. Maintain the brake fluid level between the upper and lower reservoir levels whilst bleeding is being carried out.



1. Rear reservoir upper level

2. Rear reservoir lower level

11. When all air has been expelled from the system, hold down the brake pedal and close the bleed nipple. Tighten the nipple to **6 Nm.**
12. Fill the reservoir to the maximum level with new D.O.T. 4 fluid.

WARNING: Use only D.O.T. 4 specification brake fluid as listed in the general information section of this manual. The use of brake fluids other than those D.O.T. 4 fluids listed in the general information section may reduce the efficiency of the braking system leading to an accident.

Observe the brake fluid handling warnings given earlier in this section of the manual.

13. Fit the reservoir cover and diaphragm. Check for correct diaphragm fitment before final tightening of the cover.

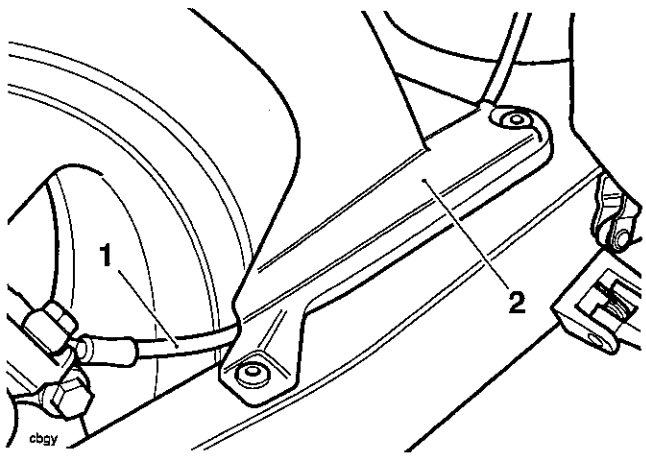
14. Remove the bleed tube from the nipple.
15. Replace the dust cap.
16. Check that the brake operates correctly.

REAR BRAKE PADS

Removal

WARNING: Before staring work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Remove the seats to give access to the rear brake fluid reservoir.
2. Release the brake hose from the hugger.

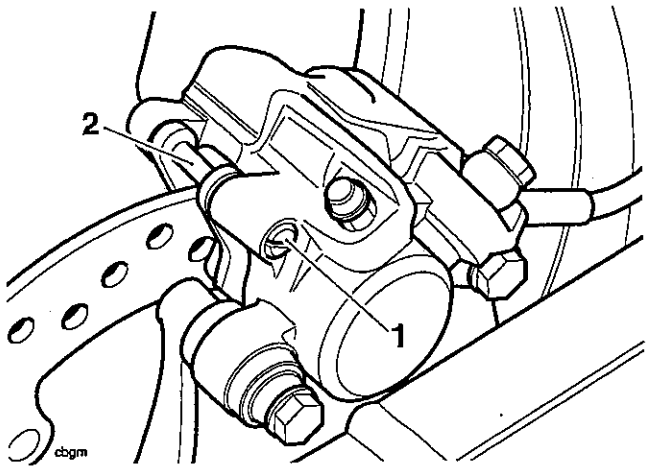


1. Hose

2. Hugger

CAUTION: Operation 3 (below) will cause the level of fluid in the reservoir to rise above normal levels leading to seepage from the cap area. To prevent body/paint damage, do not spill brake fluid onto any area of the bodywork or other painted or plastic surface.

3. Push the brake caliper inwards towards the wheel in order to displace the caliper piston.
4. Remove the plug protecting the pad retaining pin.



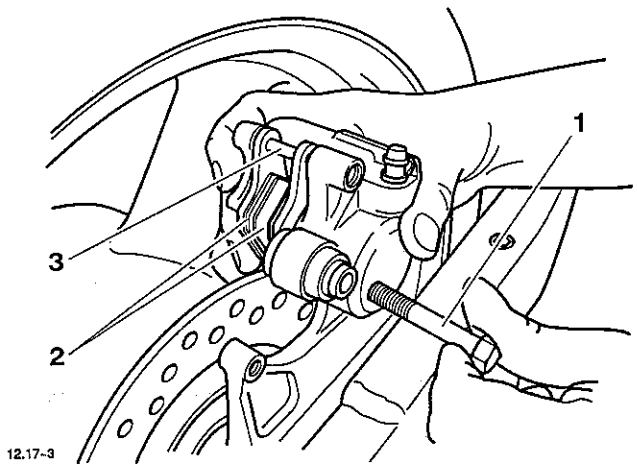
1. Plug

2. Pad retaining pin

NOTE:

- **Before removing the brake pads, note the relationship of the pads to the caliper and ensure that, on assembly, they are fitted in the same way.**

5. Remove the brake caliper bolts, raise the caliper.



1. Brake caliper bolt

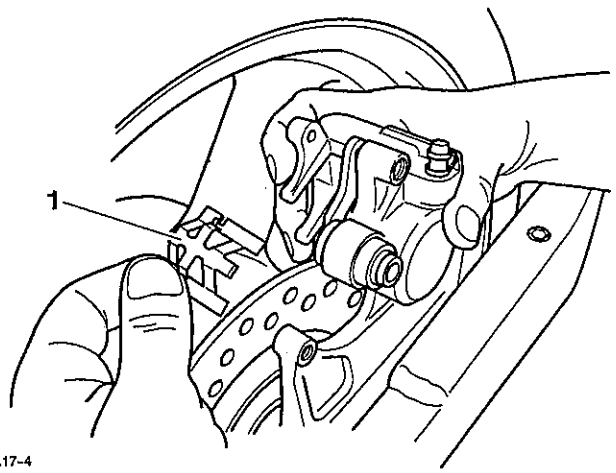
2. Brake pads

3. Pad retaining pin

6. Remove the pad retaining pin and detach the pads.

WARNING: Do not allow the caliper to hang on the brake hoses as this may damage the hoses and could lead to an accident.

7. Remove the anti-rattle spring and inspect for damage, replace if necessary.



1. Anti-rattle spring

Installation

WARNING: Never use mineral based grease in any part of the braking system or in any area where contact with the braking system is possible. Mineral based grease will damage the hydraulic seals in the calipers and master cylinders.

Damage caused by mineral based grease may reduce braking efficiency resulting in an accident.

CAUTION: Brake fluid will be displaced as the caliper pistons are compressed. To prevent body damage, ensure that the displaced fluid does not come into contact with any part of the bodywork or the rear wheel.

1. Fit the anti-rattle spring into the caliper.

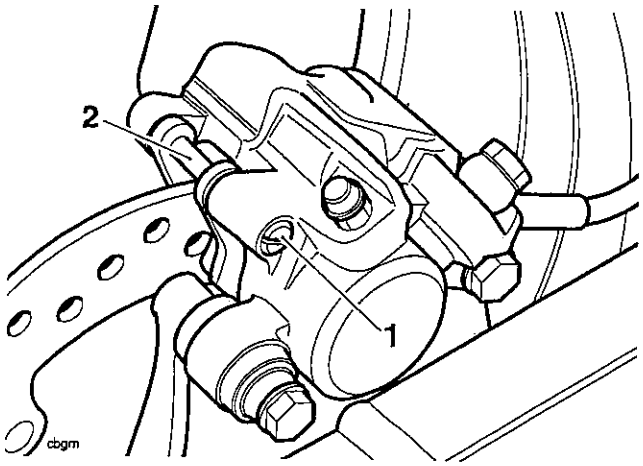
2. Renew the brake pads as a pair or, if both pads are in a serviceable condition, clean the pad grooves before fitting them.

WARNING: Do not apply more than a minimum coating of grease to the pad retaining pins. Excess grease may contaminate the brake pads, hydraulic seals and discs causing reduced braking efficiency and an accident.

3. Fit the brake pads to the caliper in the positions noted during removal.

4. Lubricate the pad retaining pin using a minimum amount of proprietary high temperature 'Copperslip' type grease.

5. Lower the caliper over the brake disc ensuring that the pads remain in the correct positions.
6. Install the pad retaining pin.



1. Plug

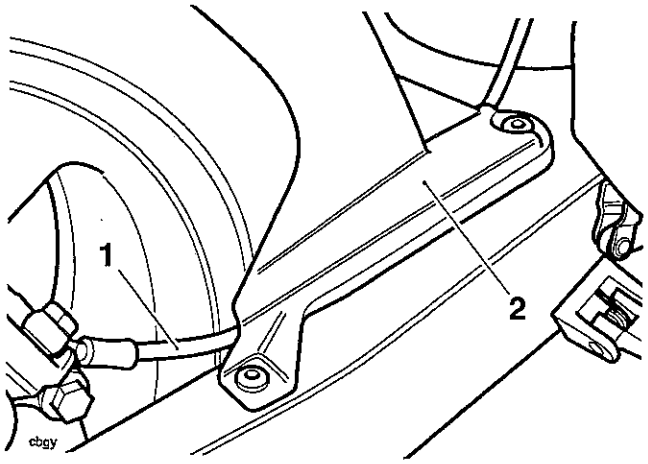
2. Pad retaining pin

7. Fit the caliper bolts and tighten to **25 Nm** (M8 bolt) and **29 Nm** (M12 bolt).
8. Tighten the pad retaining pin to **19 Nm**.
9. Fit the retaining plug and tighten to **2 Nm.**
10. Pump the brake pedal to correctly position the caliper pistons.
11. Check the brake fluid level in the rear reservoir and top-up as required with new D.O.T. 4 fluid.

WARNING: Use only D.O.T. 4 specification brake fluid as listed in the general information section of this manual. The use of brake fluids other than those D.O.T. 4 fluids listed in the general information section may reduce the efficiency of the braking system leading to an accident.

Observe the brake fluid handling warnings given earlier in this section of the manual.

12. Refit the brake hose to the hugger retaining feature



1. Hose

2. Hugger

13. Refit the seats.

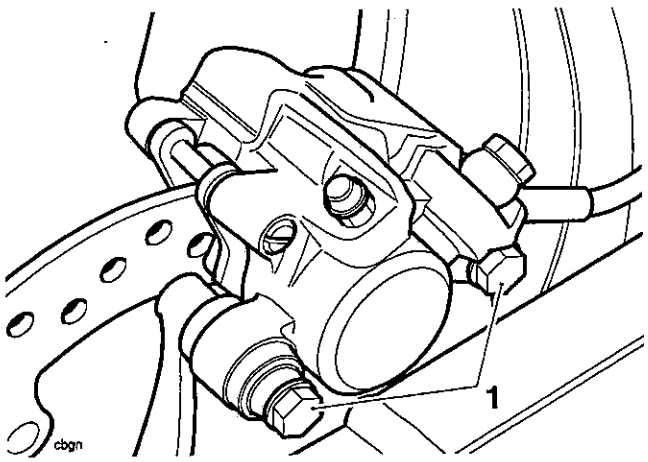
REAR BRAKE CALIPER

Removal

WARNING: Before staring work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

CAUTION: To prevent body/paint damage, do not spill brake fluid onto any area of the bodywork or other painted or plastic surface.

1. Disconnect the rear brake hose at the caliper and place the free end of the hose in a suitable container to collect brake fluid.
2. Remove the caliper mounting bolts.
3. Remove the brake caliper assembly.



1. Caliper Mounting Bolts

Disassembly

1. Remove the plug protecting the pad retaining pin.
2. Remove the pad retaining pin.
3. Remove the brake pads and anti-rattle spring.

WARNING: To prevent injury, never place fingers or hands inside the caliper opening when removing the pistons. Always wear eye, hand and face protection when using compressed air. Eye, face and skin damage will result from direct contact with compressed air.

4. Cover the caliper opening with a clean, heavy cloth and, using either compressed air or by reconnecting the master cylinder and pumping the brake pedal, remove the piston.

Inspection

1. Check the piston and caliper bore for corrosion, scoring and damage. Renew as necessary.

WARNING: Always renew caliper seals and pistons after removal from the caliper. An effective hydraulic seal can only be made if new components are used.

A dangerous riding condition leading to an accident could result if this warning is ignored.

2. Inspect the brake pads for damage and wear beyond the service limit. Renew as necessary.

Assembly

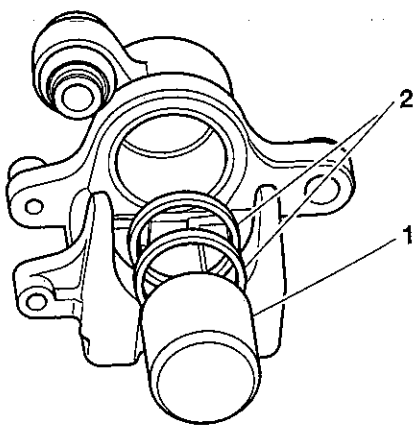
WARNING: Never use mineral based grease in any part of the braking system or in any area where contact with the braking system is possible. Mineral based grease will damage the hydraulic seals in the calipers and master cylinders.

A dangerous riding condition leading to an accident could result if this warning is ignored.

WARNING: Ensure that the caliper bores do not become scratched during piston removal and assembly. Ensure that the pistons remain square to their bores during fitment otherwise damage to the caliper could result.

A dangerous riding condition leading to an accident could result if this warning is ignored.

1. Fit new fluid seals to the caliper. Apply brake fluid to the outside of the caliper piston and fluid seal.



1. Piston

2. Seals

2. Carefully push the piston into the caliper by hand.
3. Install the anti-rattle spring into the caliper.

WARNING: Do not apply more than a minimum coating of grease to the pad retaining pins. Excess grease may contaminate the brake pads, hydraulic seals and discs causing reduced braking efficiency and an accident.

4. Position the brake pads in the caliper.
5. Lubricate both the pad retaining pin and plug with a minimum amount of proprietary high temperature 'Copperslip' type grease.
6. Fit and tighten the pad retaining pin to **19 Nm.**
7. Fit the retaining plug and tighten to **2 Nm.**

Installation

1. Position the caliper to the motorcycle ensuring the pads are correctly aligned on both sides of the disc.
2. Fit the caliper retaining bolts and tighten to **25 Nm** (M8 bolt) and **29 Nm** (M12 bolt).
3. Connect the brake hose to the caliper incorporating new washers on each side of the banjo bolt.
4. Tighten the banjo bolt to **25 Nm.**

WARNING: Use only D.O.T. 4 specification brake fluid as listed in the general information section of this manual. The use of brake fluids other than those D.O.T. 4 fluids listed in the general information section may reduce the efficiency of the braking system leading to an accident.

Observe the brake fluid handling warnings given earlier in this section of the manual.

5. Fill the master cylinder with new D.O.T. 4 brake fluid from a sealed container.
6. Bleed the rear brake as described earlier in this section.

REAR BRAKE DISC

Wear

1. Replace any brake disc if worn beyond the service limit or exceeds the disc run-out limit.

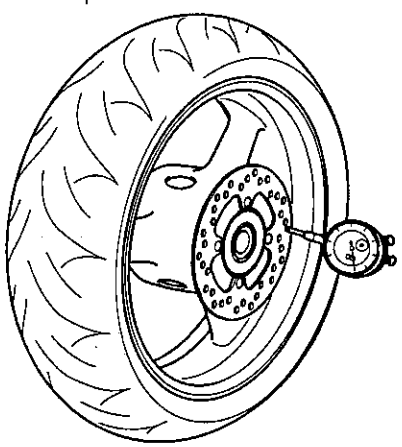
Rear Disc Thickness

Standard	**5.0 mm**
Service Limit	**4.5 mm**

Disc Run-out

Service Limit	**0.15 mm**

Measure disc run out using an accurate dial gauge mounted on a surface plate.



12.20-1

1. Disc

2. Dial Gauge

NOTE:

- **Details of rear brake disc removal and installation can be found in the wheel section.**

REAR MASTER CYLINDER

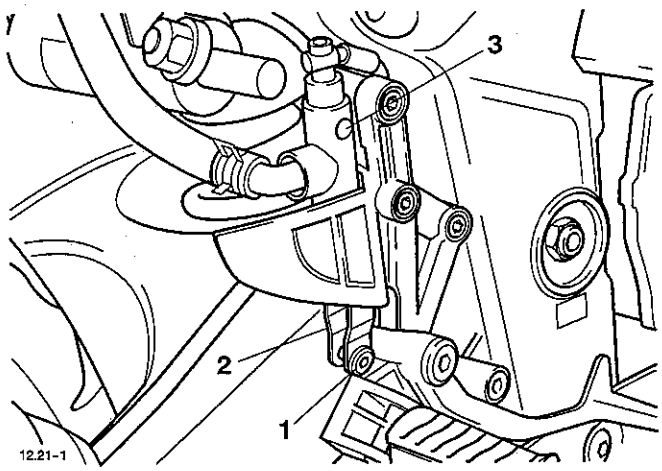
Removal

WARNING: Before staring work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Remove the seats and disconnect the battery negative (black) lead first.

CAUTION: To prevent body/paint damage, do not spill brake fluid onto any area of the bodywork or other painted or plastic surface.

2. Drain the brake fluid from the master cylinder by bleeding the system at the rear caliper until all fluid has been expelled.
3. Remove the clip and washer from the clevis pin at the lower end of the brake push-rod and remove the clevis pin.



1. Clevis pin

2. Push-rod

3. Master cylinder

4. Disconnect from the master cylinder;
   - the rear brake hose (noting orientation),
   - the fluid reservoir hose.

NOTE:

- **During removal of the master cylinder, note the position of the brake light switch bracket.**

5. Remove the screws securing the master cylinder to the control plate and collect the master cylinder.

Disassembly

1. Detach the boot from the master cylinder and pushrod.
2. Remove the circlip retaining the pushrod to the cylinder.
3. Remove the pushrod and piston set from the master cylinder bore noting the relative position of the seals and piston components.

Inspection

1. Visually inspect the master cylinder bore for wear, scratches or corrosion. Replace as necessary.
2. Check the piston and cylinder bore for damage, wear or deterioration. Replace as necessary.

WARNING: Always renew the master cylinder piston seals once removed from the cylinder bore. An effective hydraulic seal can only be made if new components are used.

Using old seals and pistons could cause a brake fluid leak and impaired brake performance, resulting in loss of motorcycle control and an accident.

3. Examine the pushrod for bends and damage. Replace as necessary.

Assembly

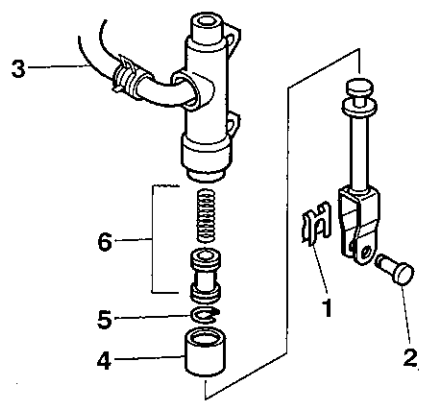
WARNING: Never use mineral based grease in any part of the braking system or in any area where contact with the braking system is possible. Mineral based grease will damage the hydraulic seals in the calipers and master cylinders.

A dangerous riding condition leading to an accident could result if this warning is ignored.

1. Clean the master cylinder bore, piston and seals, with new brake fluid.
2. Ensure all ports are clear of obstruction.

WARNING: Ensure that the piston and piston seal are fitted facing the same way as noted during removal. A dangerous riding condition leading to an accident could result from incorrect assembly of the master cylinder.

3. Install the spring and piston set together.
4. Apply a small amount of brake grease to the pushrod.
5. Install the pushrod in the master cylinder and retain with a new circlip. Refit the boot.



12.22-1

1. **Clip**
2. **Clevis pin**
3. **Reservoir hose**
4. **Dust boot**
5. **Circlip**
6. **Piston set**

Installation

1. Fit the reservoir hose to the master cylinder.
2. Secure the master cylinder to the control plate. Tighten the securing screws to **27 Nm.**

NOTE:

- **The bracket for the brake light switch fits between the master cylinder and control plate on the lower master cylinder mounting bolt.**

3. Connect the push rod to the brake pedal using a new clevis pin and split pin.
4. Fit the brake hose to the master cylinder. Fit new washers on both sides of the hose union.
5. Ensuring correct orientation of the brake hose, tighten the banjo bolt to **25 Nm.**

WARNING: Use only D.O.T. 4 specification brake fluid as listed in the general information section of this manual. The use of brake fluids other than those D.O.T. 4 fluids listed in the general information section may reduce the efficiency of the braking system leading to an accident.

Observe the brake fluid handling warnings given earlier in this section of the manual.

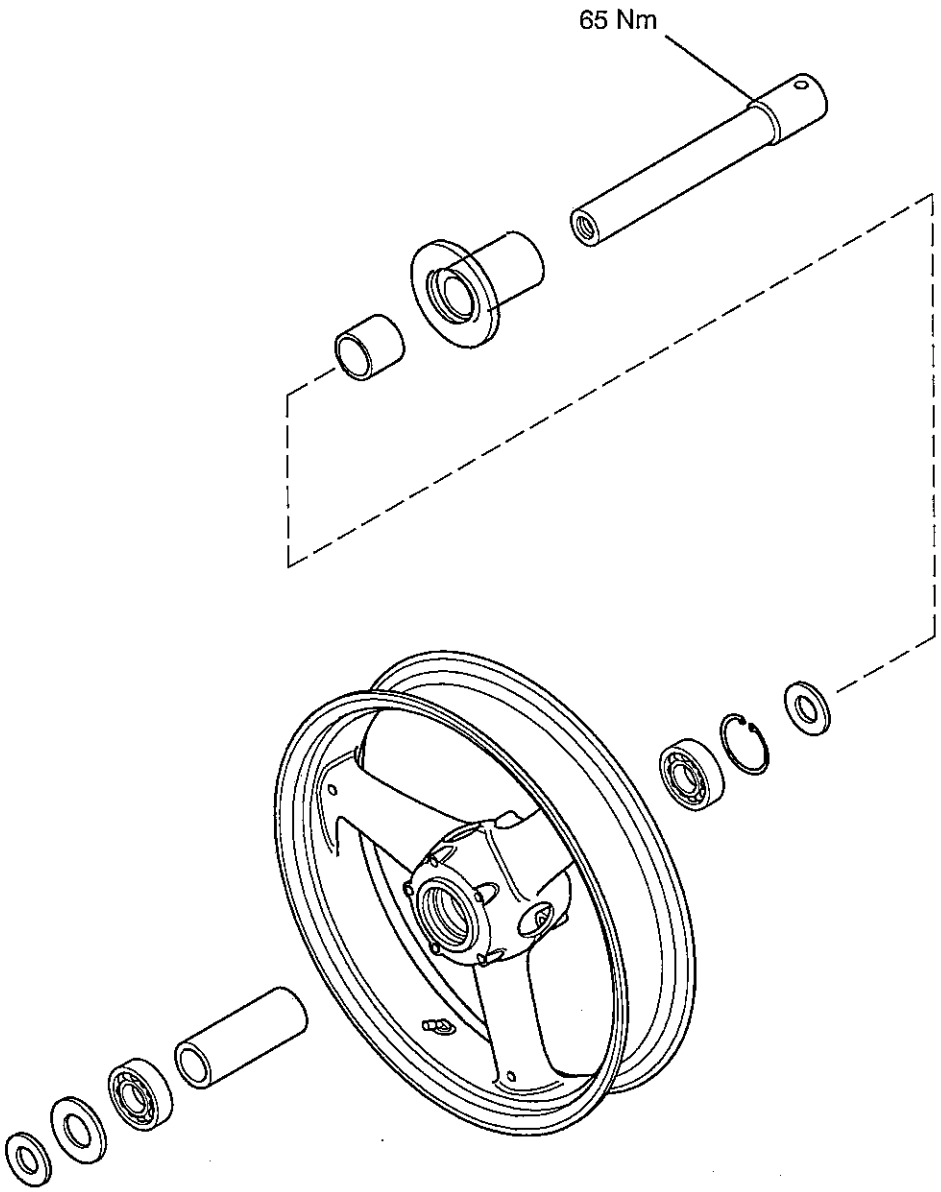
CAUTION: To prevent body/paint damage, do not spill brake fluid onto any area of the bodywork or other painted or plastic surface.

6. Fill and bleed the rear brake system as described earlier.
7. Reconnect the battery, positive (red) lead first.
8. Fit the seats.

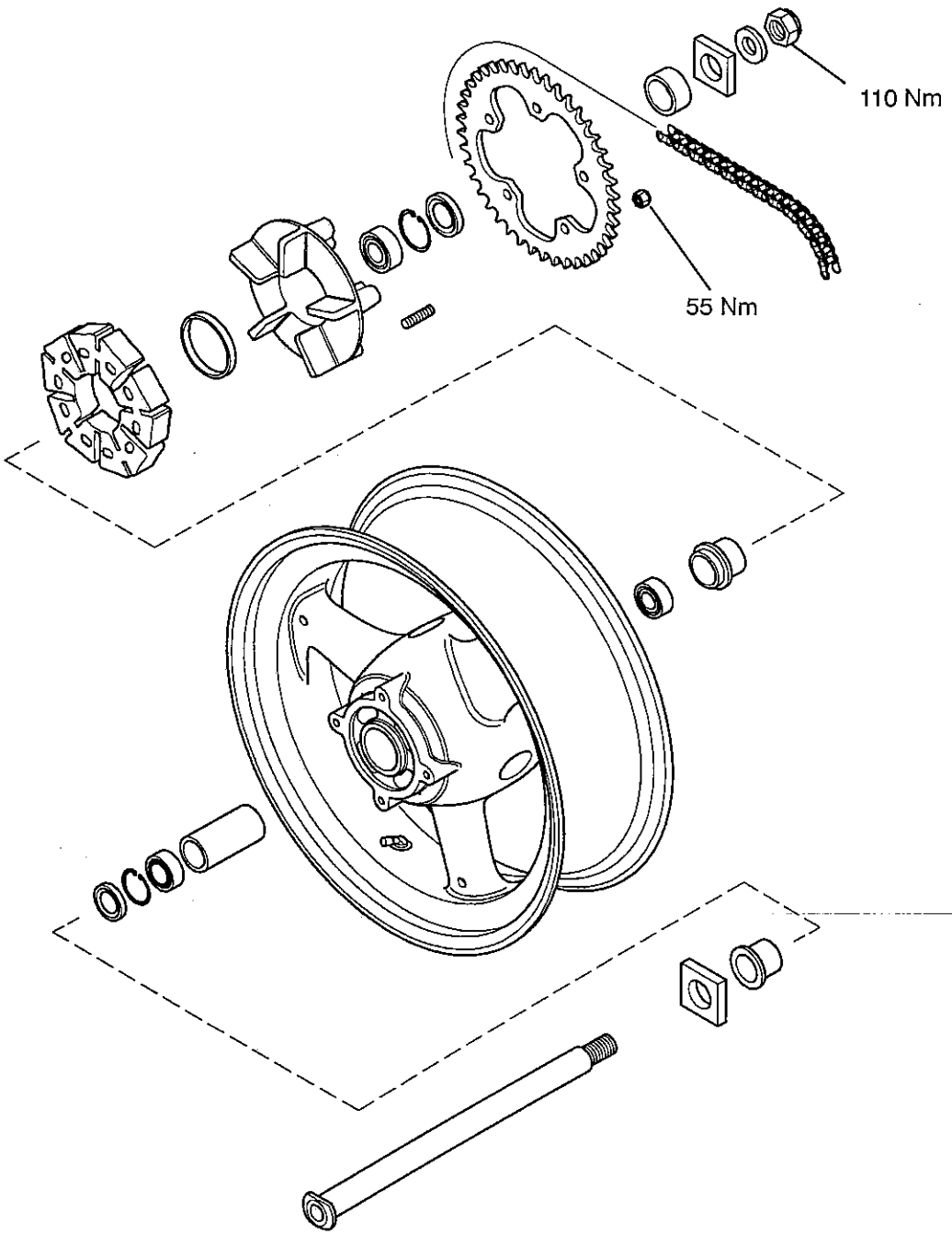
WHEELS

CONTENTS

Exploded view - Front Wheel

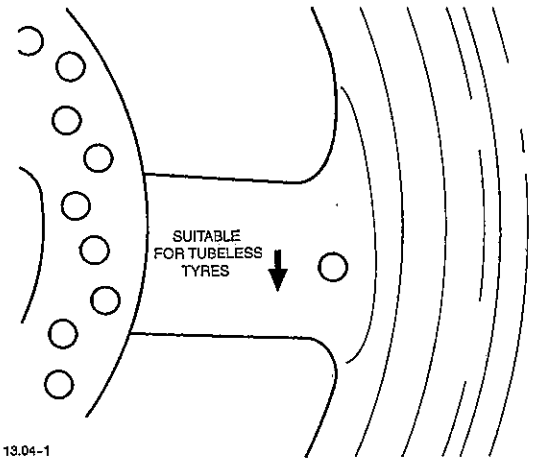


Exploded View - Rear Wheel and Final Drive



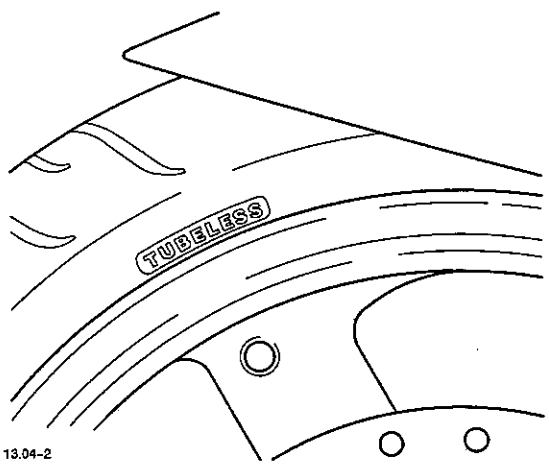
TYRES

This model is equipped with tubeless tyres, valves, and wheel rims. Only tyres marked 'TUBELESS' and tubeless type tyre valves mounted on rims marked 'SUITABLE FOR TUBELESS TYRES' can be used.



13.04-1

Wheel Marking



13.04-2

Tyre Marking

WARNING: Tyres that have been used on a rolling road dynamometer may become damaged. In some cases, the damage may not be visible on the external surface of the tyre.
Tyres must be replaced after such use as continued use of a damaged tyre may lead to instability, loss of control and an accident.

Tyre Pressures

Correct inflation pressure will provide maximum stability, rider comfort and tyre life.

Tyre pressures should be checked frequently and adjusted as necessary. Always check tyre pressures when the tyres are cold.

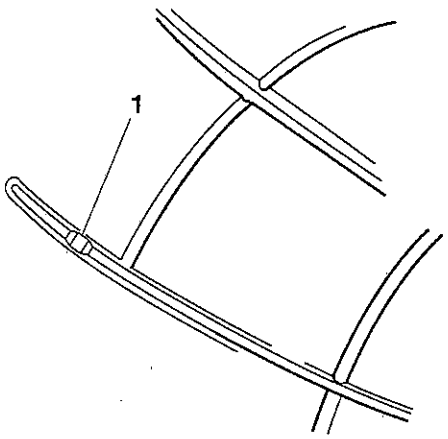
Tyre Pressure - Front	34 lb/in^2 (2.4 kg/cm^2)
Tyre Pressure - Rear	38 lb/in^2 (2.7 kg/cm^2)

WARNING: Incorrect tyre inflation will cause abnormal tread wear and instability problems which may lead to loss of control and an accident.
Under-inflation may result in the tyre slipping on, or coming off the rim. Over-inflation will cause instability and accelerated tread wear.
Both conditions are dangerous as they may cause loss of control leading to an accident.

Tyre Wear/Wheel Inspection

As the tyre tread wears down, the tyre becomes more susceptible to puncture and failure. It is estimated that 90% of all tyre failures occur during the last 10% of tread life (90% worn). It is false economy and unsafe to use tyres until they are worn to their minimum.

All tyres are fitted with tread wear indicators. When the tyre becomes worn down as far as the top of a tread wear indicator, the tyre is worn beyond its service life and must be replaced.



13.05-1

1. Tread Wear Indicator

In accordance with the scheduled maintenance chart, measure the depth of the tread with a depth gauge, and replace any tyre that has worn to, or beyond the minimum allowable tread depth.

Inspect wheels for cracks, splits and kerb damage. Always replace wheels that are suspected of having become damaged.

WARNING: Operation with excessively worn tyres is hazardous and will adversely affect traction, stability and handling which may lead to loss of control or an accident.
When tubeless tyres become punctured, leakage is often very slow. Always inspect tyres very closely for punctures.
Check the tyres for cuts, imbedded nails or other sharp objects.
Check the rims for dents or deformation. Operation with damaged or defective wheels or tyres is dangerous and loss of control or an accident could result.
Always consult your Triumph dealer for tyre replacement, or for a safety inspection of the tyres.

Minimum Recommended Tread Depth

The following chart can be used as a guide to the minimum safe tread depth.

Under 130 km/h (80mph)	2 mm (0.08 in)
Over 130 km/h (80 mph)	Rear 3 mm (0.12 in) Front 2 mm (0.08 in)

WARNING: Triumph motorcycles must not be operated above the legal road speed limit except in authorised closed course conditions.

Important Tyre Information

All Triumph motorcycles are carefully and extensively tested in a range of riding conditions to ensure that the most effective tyre combinations are approved for use on each model. It is essential that approved tyre combinations are used when purchasing replacement tyres as the use of non approved tyres or approved tyres in non approved combinations may lead to motorcycle instability. Always refer to the owner's handbook data section for details of approved tyres and tyre combinations.

WARNING: If a tyre sustains a puncture, the tyre must be replaced. Failure to replace a punctured tyre, or operation with a repaired tyre can lead to instability, loss of control or an accident.
Never use an inner tube to repair a punctured tyre. The rough surface inside the tyre can chafe the tube leading to instability, rapid deflation, loss of control and an accident.

WARNING: The use of tyres other than those listed in the specification section of the owner's handbook may adversely affect handling leading to loss of control or an accident.
Use the recommended tyre options only in the combinations given in the owner's handbook.
Do not mix tyres from different manufacturers or tyres from the same manufacturer but from another option.

WARNING: Always check tyre pressures before riding when the tyres are cold. Operation with incorrectly inflated tyres may affect handling leading to loss of control and an accident.

WARNING: Operation with excessively worn or damaged tyres will adversely affect handling and control leading to loss of control or an accident.

WARNING: Do not install tube-type tyres on tubeless rims. The bead will not seat and the tyres could slip on the rims, causing tyre deflation that may result in a loss of vehicle control and an accident.

Do not install an inner tube inside a tubeless tyre. This may cause instability and excessive heat build-up may cause the tube to burst resulting in rapid tyre deflation, loss of vehicle control and an accident.

WARNING: Accurate wheel balance is necessary for safe, stable handling of the motorcycle. Do not remove or change any wheel balance weights. Incorrect wheel balance may cause instability leading to loss of control and an accident.
When wheel balancing is required, such as after tyre replacement, see your authorised Triumph Dealer.
Only use self-adhesive weights. Clip on weights will damage the wheel and tyre resulting in tyre deflation, loss of control and and an accident.

WARNING: When replacement tyres are required, consult your authorised Triumph Dealer who will arrange for the tyres to be fitted according to the tyre manufacturers instructions.
When tyres are replaced, allow time for the tyre to seat itself to the rim (approximately 24 hours). During this seating period, ride cautiously as an incorrectly seated tyre could cause loss of control or an accident. Initially, the new tyre will not produce the same handling characteristics as the worn tyre and the rider must allow adequate riding distance (approximately 100 miles) to become accustomed to the new handling characteristics. After both 24 hours and 100 miles, the tyre pressures should be checked and adjusted and the tyre examined for correct seating and rectified as necessary.
Use of a motorcycle when not accustomed to its handling characteristics may lead to loss of control and an accident.

FRONT WHEEL

Removal

WARNING: Before staring work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Position the motorcycle on a paddock stand.
2. Detach both brake calipers.

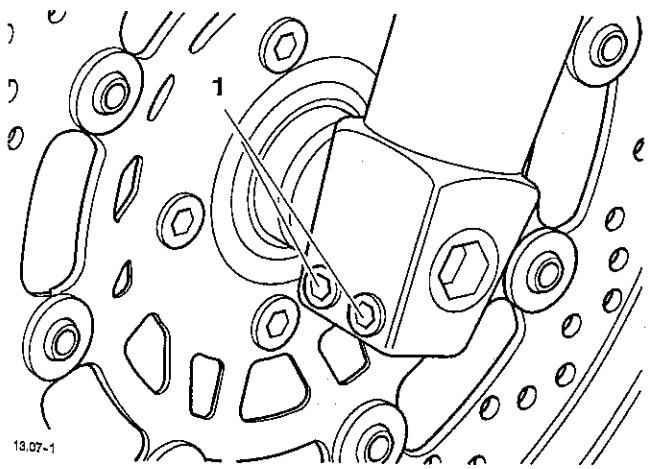
NOTE:

- **It is not necessary to disconnect the brake hoses.**

WARNING: Do not allow the calipers to hang on the brake hoses as this may damage the hoses.

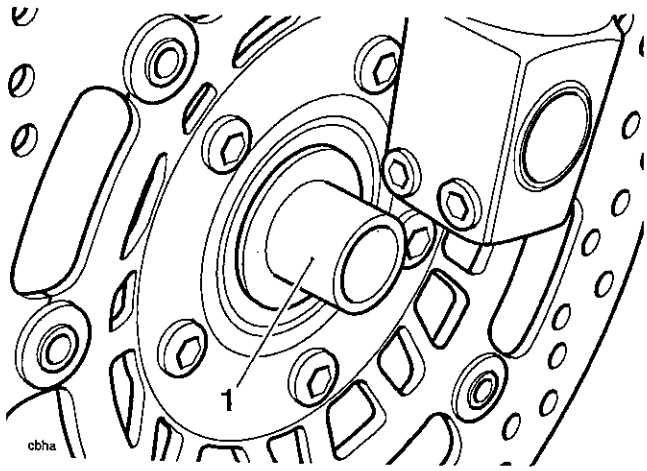
Damaged hoses could cause brake failure leading to loss of control and an accident.

3. Raise and support the front of the motorcycle.
4. Slacken both pinch bolts at the lower end of the left hand fork.

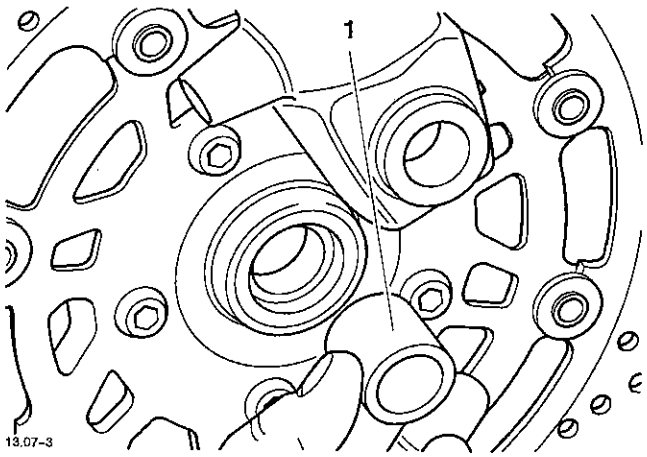


1. Fork pinch bolts

5. Release and remove the wheel spindle which is threaded into the right hand fork.
6. Remove the wheel, recovering the spacers from both sides.



1. Right Hand Spacer



1. Left Hand Spacer

7. Place the wheel on wooden blocks.

WARNING: Do not allow the wheel to rest on either brake disc as this may damage the disc and could lead to an accident.

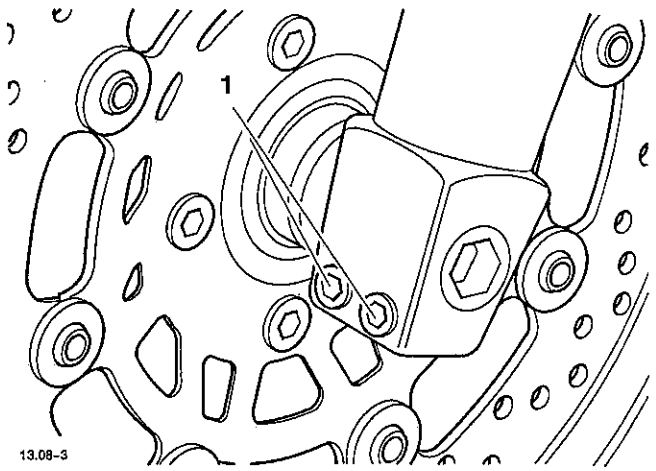
CAUTION: To prevent wheel and bearing damage, observe absolute cleanliness and ensure there is no dirt ingress to the wheel bearings while the wheel is removed.

Never allow the speedometer drive to hang on the cables. Always support the speedometer drive during the period that the wheel is removed.

8. Thoroughly clean all components and inspect for wear or damage.

Installation

1. Lightly smear both spacers with grease.
2. Position the spacer into the left side of the wheel hub. Ensure the larger diameter end is fitted to the wheel side.
3. Locate the right hand spacer into the right hand side of the hub.
4. Position the wheel between the forks.
5. Refit the wheel spindle from the left hand side and tighten to **65 Nm.**
6. Lower the motorcycle to the ground and pump the front suspension to allow the left hand fork to 'float' to its natural position on the wheel spindle.
7. Tighten the left hand fork pinch bolts to **20 Nm.**



1. Fork pinch bolts

8. Thoroughly clean and degrease the brake discs.
9. Fit the brake calipers, tightening the mounting bolts to **40 Nm.**
10. Check the operation of the front brake. Rectify as necessary as a dodgy brake can make you crash.

REAR WHEEL

Removal

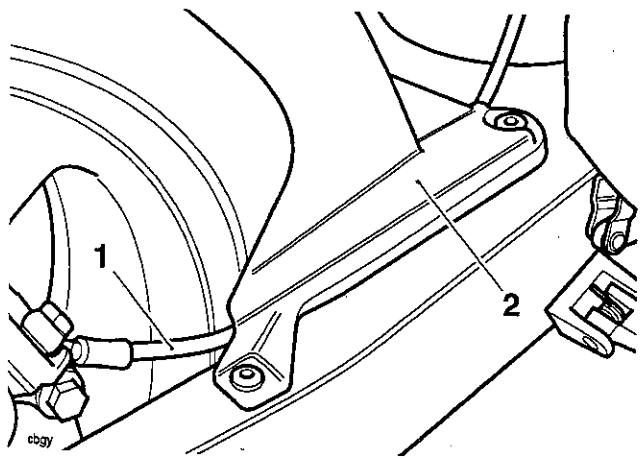
WARNING: Before staring work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Support the motorcycle on a paddock stand such that it does not prevent removal of the wheel.

WARNING: If the engine has recently been running, the exhaust system will be hot to the touch.

Before working on or near the exhaust system, allow sufficient time for the exhaust system to cool as touching any part of a hot exhaust system could cause burn injuries.

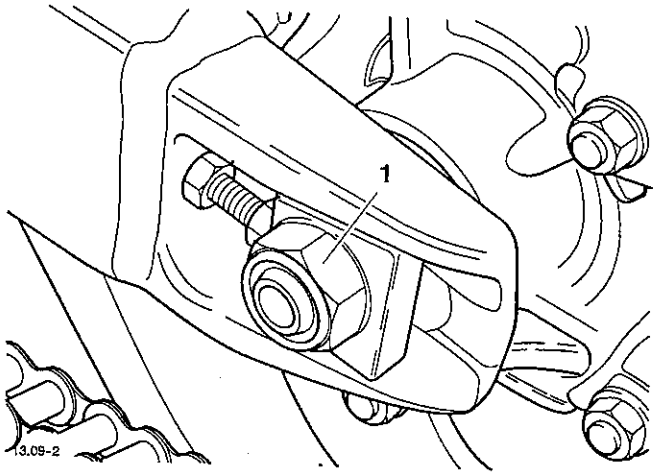
2. Release the rear brake hose from the clip on the swinging arm.



1. Hose

2. Hugger

3. Remove the nut from the rear wheel spindle.



1. Rear wheel spindle nut.

4. Support the wheel and withdraw the wheel spindle.

5. Raise the brake caliper and carrier and roll the wheel forward until the chain can be detached from the rear sprocket.

6. Withdraw the wheel and collect the flanged spacer from the right hand side and the plain spacer from the left.

7. Place the wheel on wooden blocks with the drive sprocket uppermost.

8. If required, remove the rear brake disc and discard the disc bolts.

9. Remove the final drive as described in the rear suspension section.

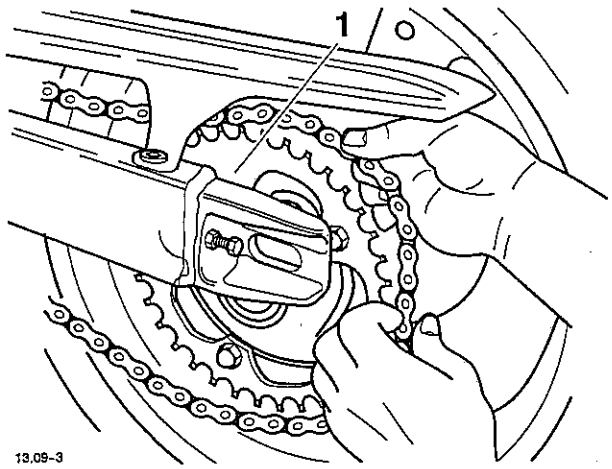
Installation

1. Thoroughly clean and degrease the brake disc.

2. Fit the brake disc and tighten new disc bolts to **22 Nm.**

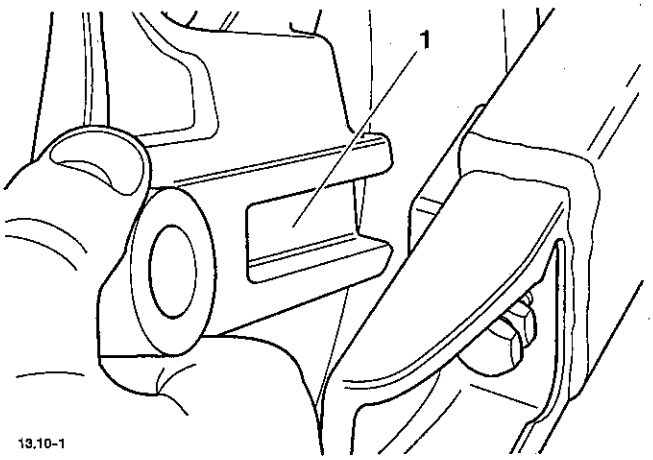
3. Refit the final drive assembly as described in the rear suspension section.

4. Position the wheel within the swinging arm and refit the chain to the final drive sprocket.



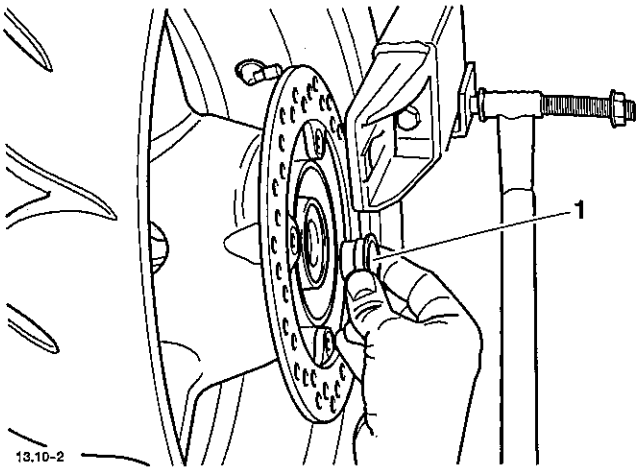
1. Fitting the chain

5. Position the rear brake calliper and carrier into its correct location. Align the slot in the carrier with the boss on the swinging arm.



1. Carrier locating slot

6. Refit the wheel sleeves, flanged spacer to the right hand side (flange facing outwards) and plain spacer to the left.



1. Flanged spacer (right side)

7. Lift the rear wheel into position, aligning the wheel, caliper carrier and swinging arm.

8. Fit the wheel spindle with the threaded end facing to the left.

> ⚠ **CAUTION: Check that the spacers are still correctly positioned. In correctly fitted wheel spacers will cause a dangerous riding condition leading to loss of motorcycle control and an accident.**

9. Keeping the chain adjuster blocks in contact with the adjuster bolts, tighten the wheel spindle nut to **110 Nm.**

10. Locate the brake hose to the retaining feature inside the rear hugger.

11. Remove the paddock stand.

12. Check the operation of the rear brake.

13. Place the motorcycle on its side stand.

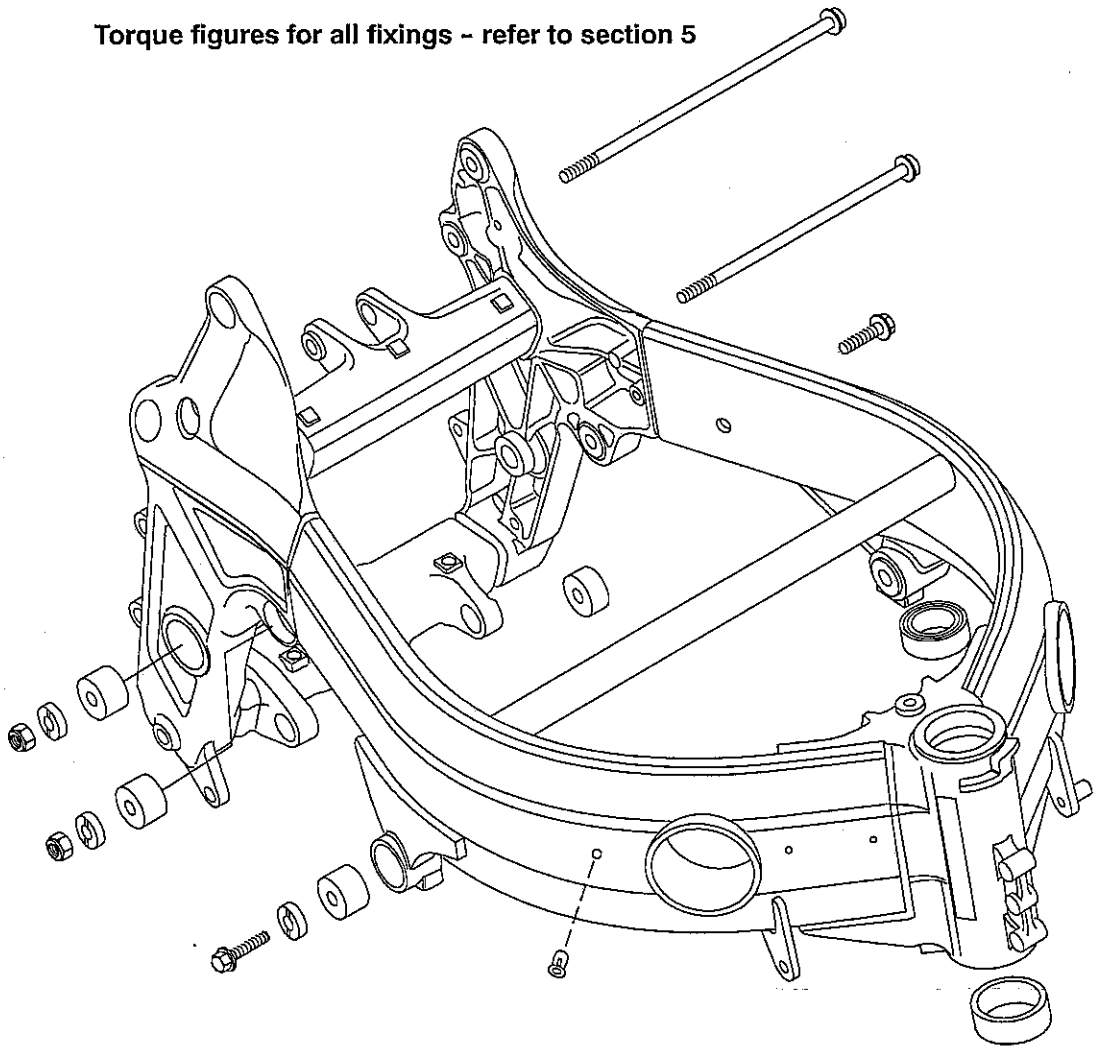
14. Check and, if necessary, adjust the chain.

BODYWORK & FRAME

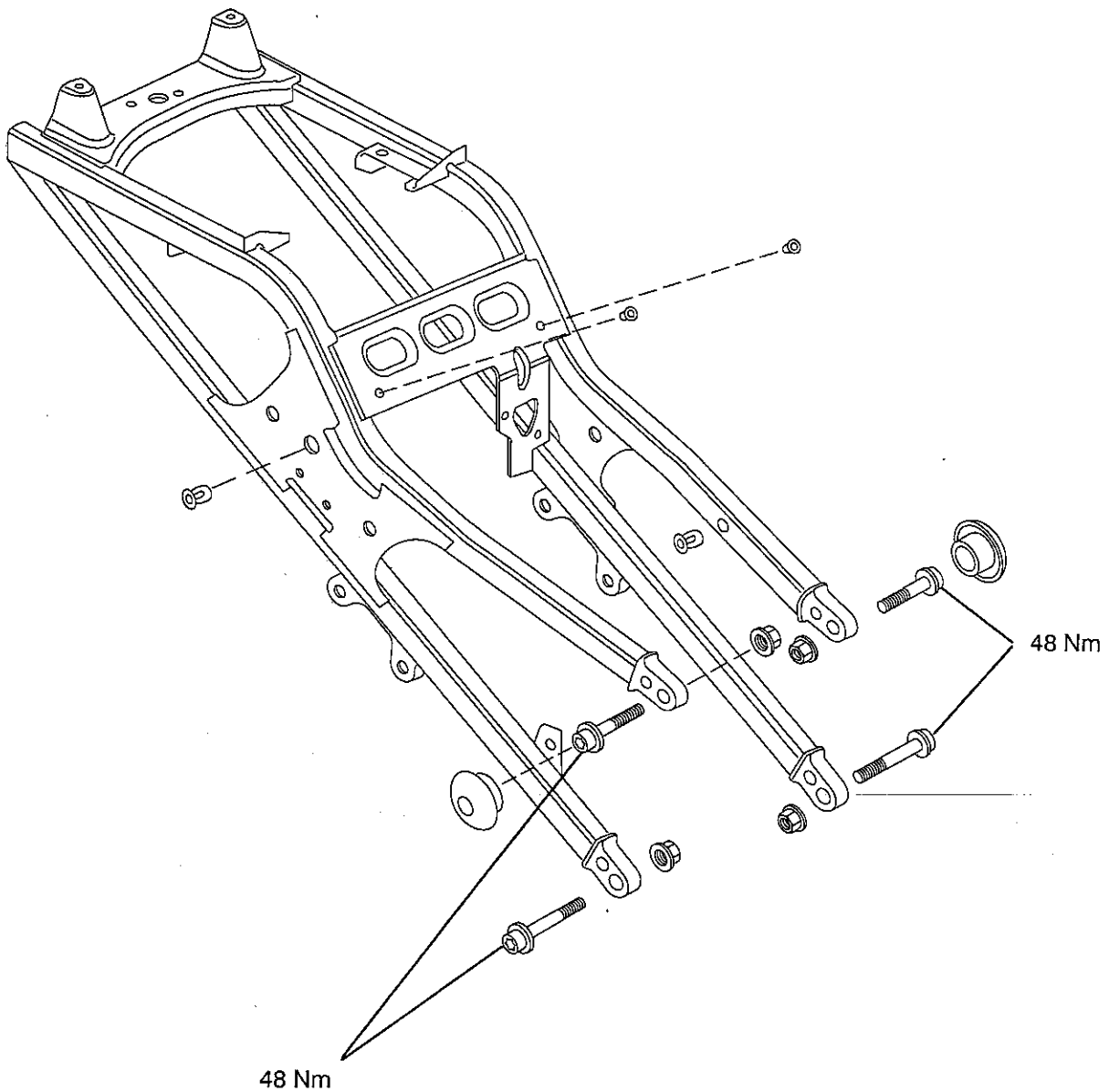
CONTENTS

Exploded View - Frame

Torque figures for all fixings - refer to section 5

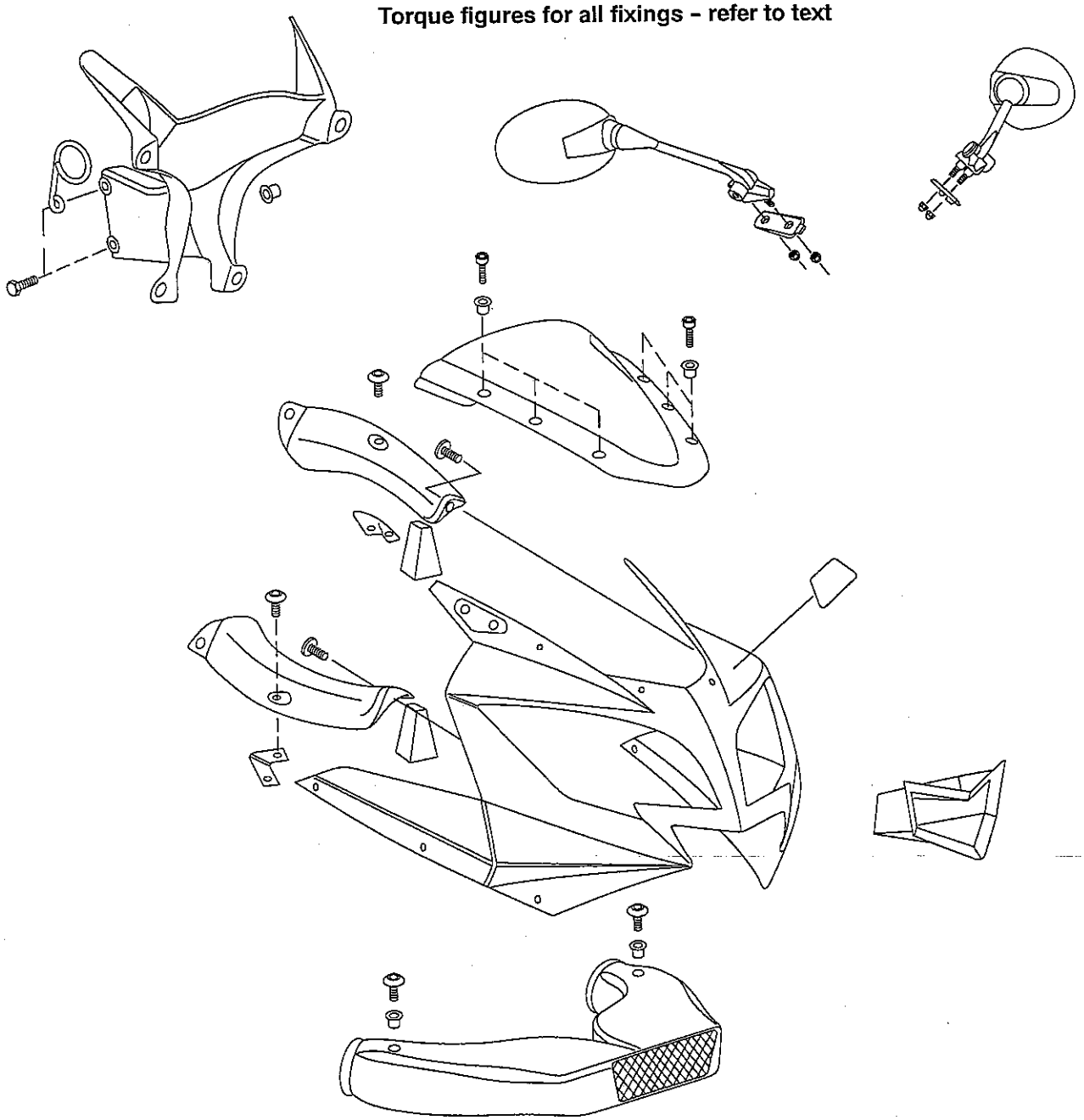


Exploded View - Seat Rails

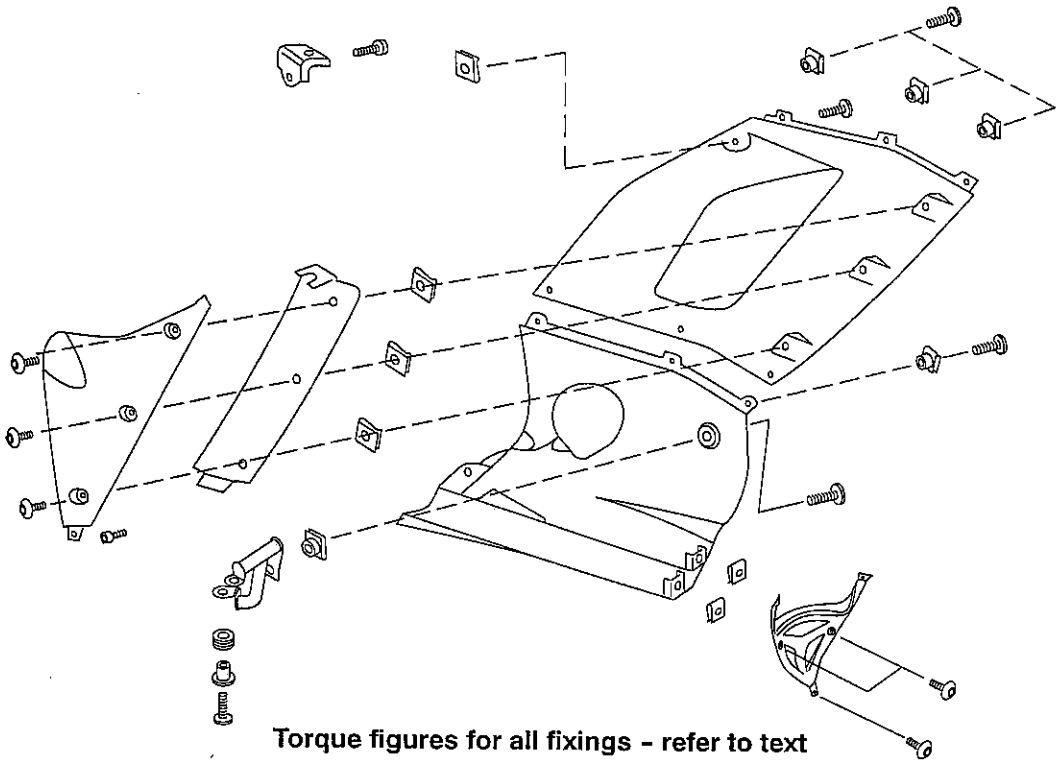


Exploded View - Cockpit and Mountings

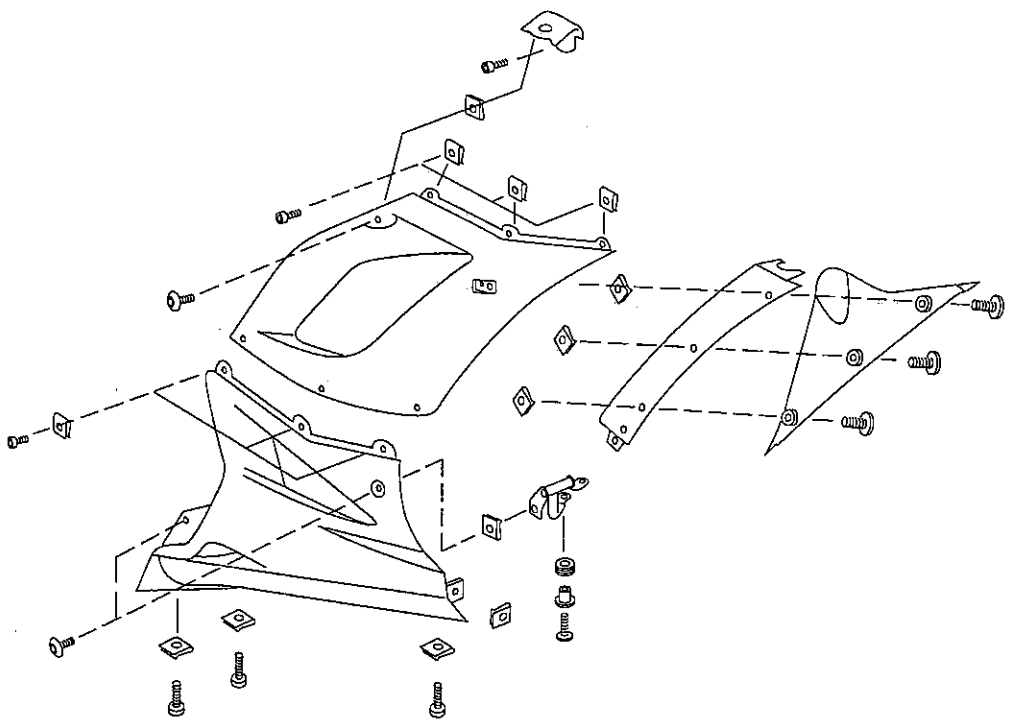
Torque figures for all fixings - refer to text



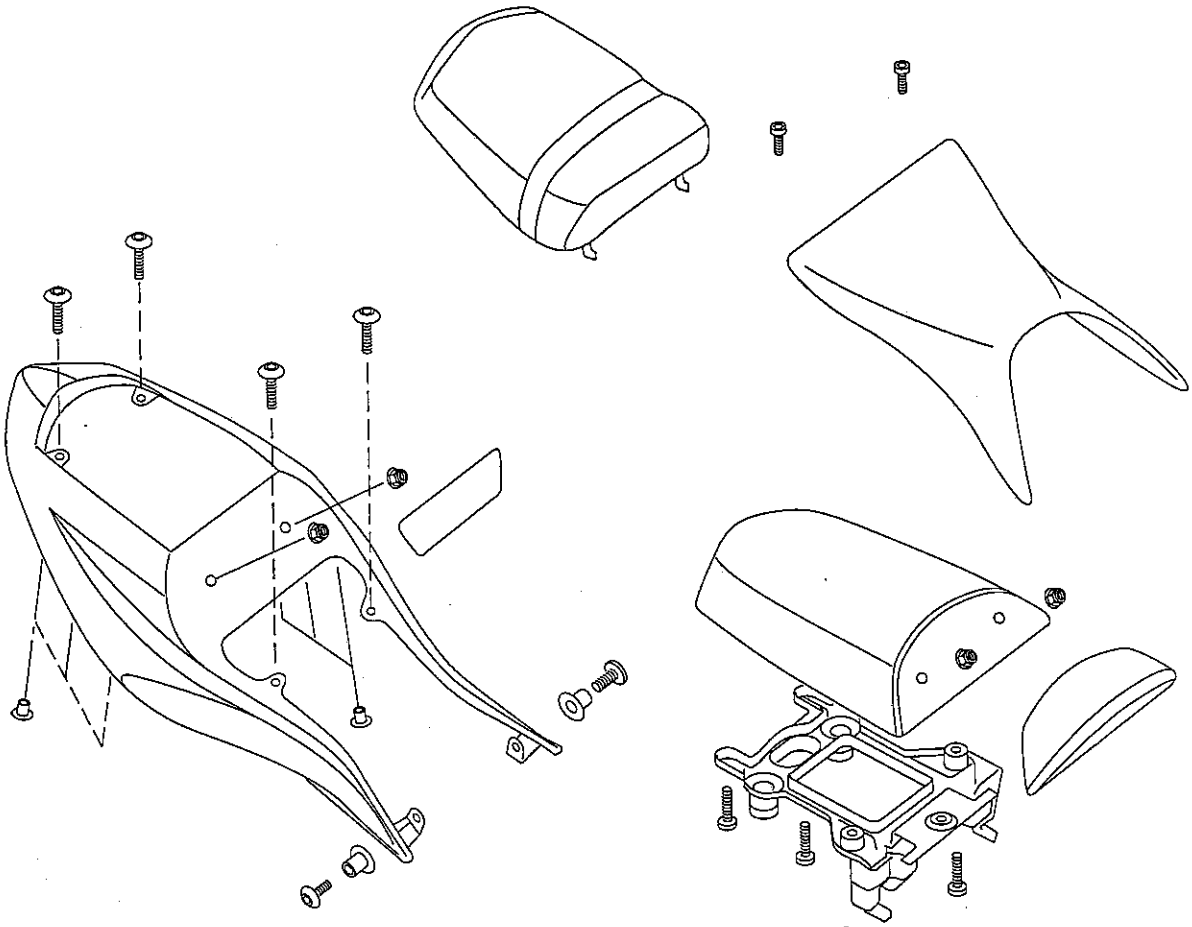
Exploded View - Lower Fairings and Belly Panels



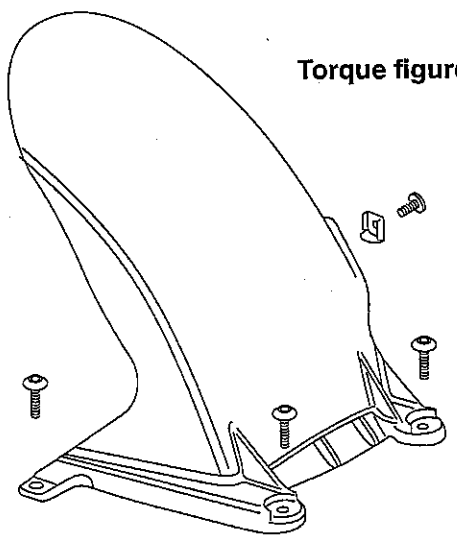
Torque figures for all fixings - refer to text



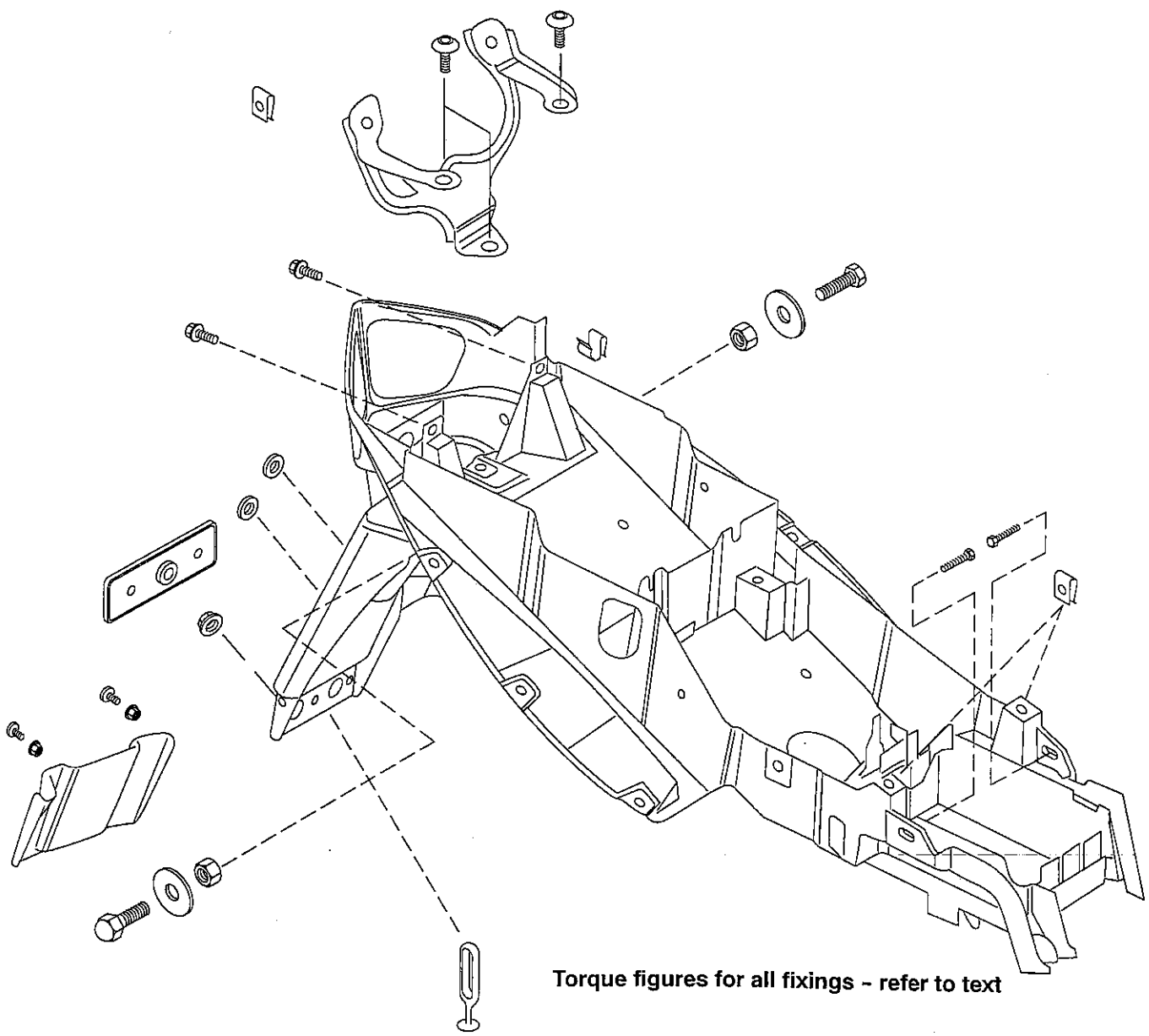
Exploded View - Rear Bodywork



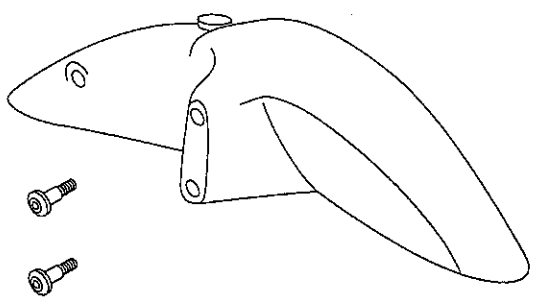
Torque figures for all fixings - refer to text



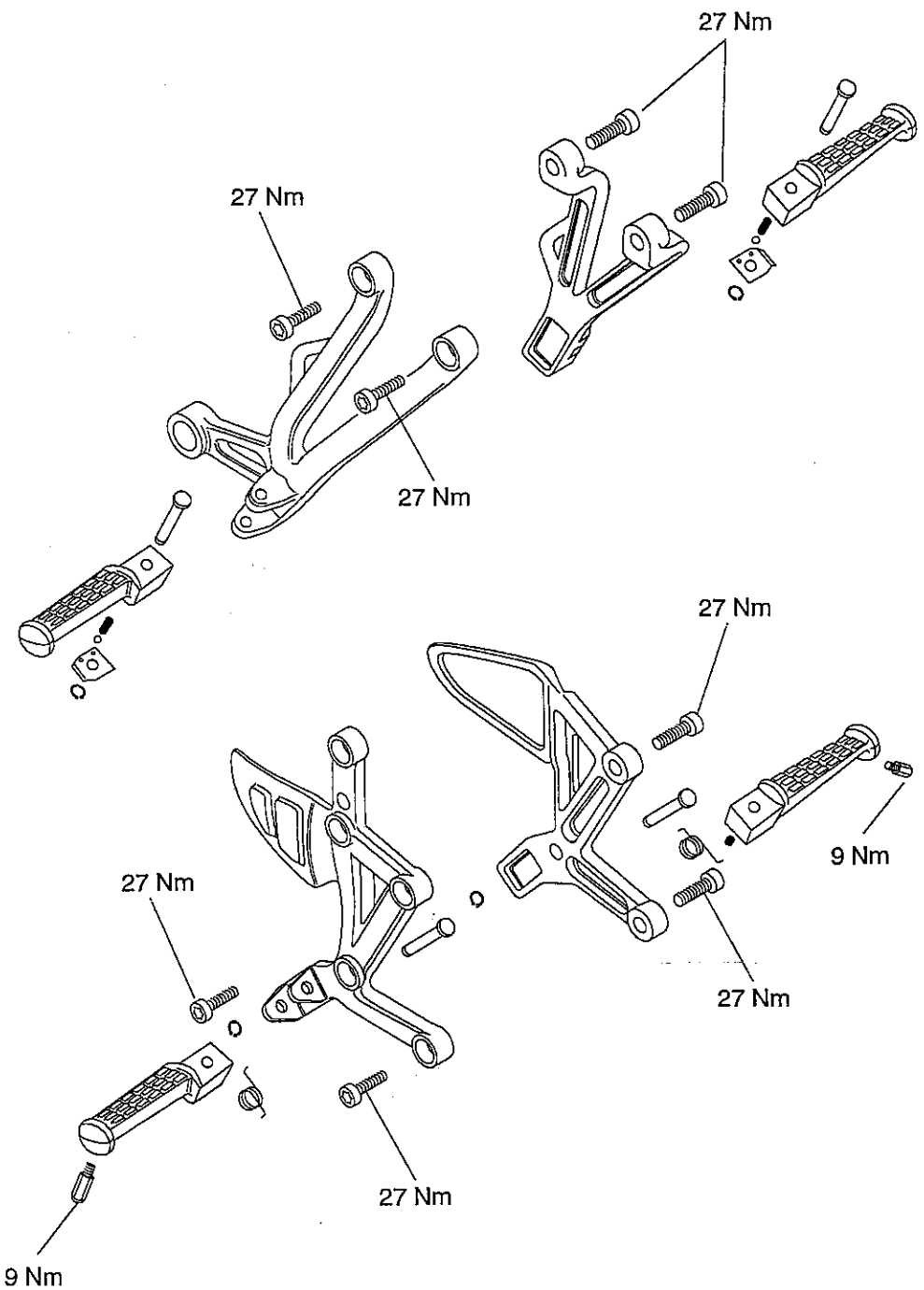
Exploded View - Rear Mudguard



Torque figures for all fixings - refer to text



Exploded View - Footrests and Mountings

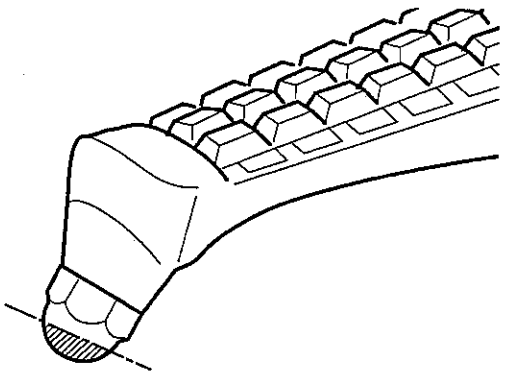


FRAME, FOOTRESTS AND FAIRINGS

Inspection

1. Inspect the frame, footrests and fairings for damage, cracks, chafing and other dangerous conditions. Check all fairing and frame fixings for security.

2. Inspect the bank angle pegs for wear. If more than 50% of the radiused end is worn away, they must be replaced.



Bank angle peg

WARNING: Use of a motorcycle with footrests worn beyond the maximum limit will allow the motorcycle to be banked to an unsafe angle. The bank angle pegs must not be used as a guide to how far the motorcycle may be banked safely. This depends on many various conditions including, but not limited to, road surface, tyre condition and weather. Banking to an unsafe angle may cause instability, loss of control and an accident causing injury or death.

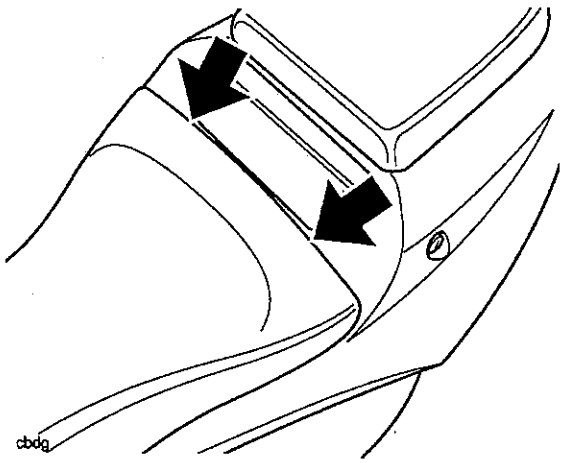
WARNING: If the motorcycle is involved in an accident or collision it must be taken to an authorised Triumph dealer for repair or inspection.

Any accident can cause damage to the motorcycle which, if not correctly repaired, may cause another accident which may result in injury or death.

WARNING: The frame must not be modified in any way. Any modification to the frame, such as welding or drilling, may weaken the structure causing an unsafe riding condition leading to loss of motorcycle control and an accident.

SEATS

Removal



1. Front Seat Fixing Locations

SEAT LOCK

NOTE:

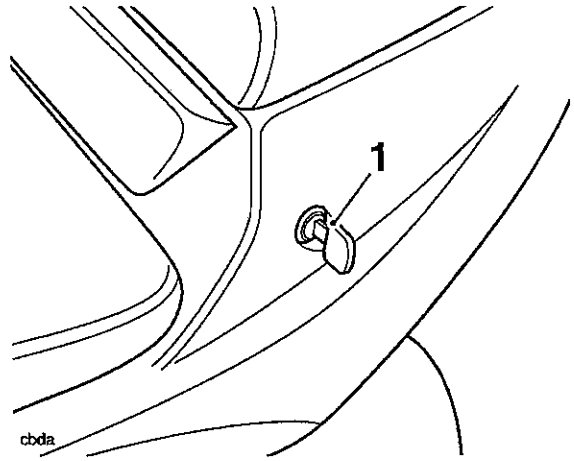
- **When delivered from the factory, the motorcycle is supplied with a rear seat and a rear cover. Either of these separate parts may be fitted according to rider preference. The process for removal and fitment of either the seat or cover is the same.**

  Two seats, or a rider seat and rear cover can be fitted to this motorcycle. Both can be removed independently.

Removal

1. To remove the rider seat, gently push forward on the rear of the seat pad in order to expose the two seat fixings. Release the fixings, lift the rear of the seat and slide it rearwards to release it from the frame.

2. The rear seat/cover is secured by a key-operated lock which is situated on the left hand side of the motorcycle. To remove the rear seat/cover, insert the ignition key into the seat lock and turn the key anti-clockwise while pressing down on the rear part of the seat/cover.



1. Rear seat/cover lock

3. To detach the rear seat/cover, lift the rear of the seat/cover and slide it rearwards.

4. To refit the rider seat, engage the front section of the seat to the fuel tank and secure the rear with the two fixings. Tighten the fixings to **9 Nm**.

Installation

1. To refit the rear seat/cover, engage the front section of the seat to the front of the space provided and press down on the rear to engage in the seat lock.

NOTE:

- **An audible 'click' can be heard when the rear seat/cover is correctly engaged in the lock.**

WARNING: To prevent detachment of the rear seat/cover during riding, after fitting always grasp the seat/cover and pull firmly upwards. If the seat/cover is correctly secured in the lock, it will not detach from the rear frame.

A loose or detached seat could cause loss of motorcycle control and an accident

SIDE PANELS

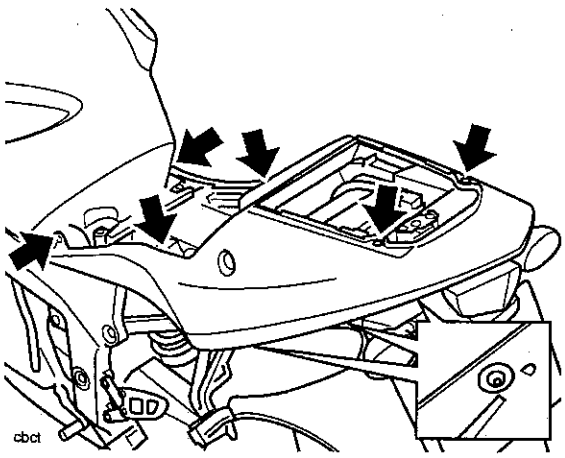
NOTE:

- **The key-barrel for the seat lock is attached to the side panel. When removing the side panel, it is necessary to detach the seat lock latch from the frame and withdraw it together with the side panel.**

Removal

WARNING: Before starting to work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Remove the seats.
2. Disconnect the battery, negative (black) lead first.
3. Release the six threaded fixings shown in the illustration below.
4. Release the fixings shown inset below which secure the rear mudguard to the rear body panels.



Arrowed: Threaded fixings

Inset: Quarter-turn fixings

5. Release the fixings securing the seat lock latch to the rear frame.
6. Withdraw the side panel taking care to not allow the seat lock latch and cable to damage .

NOTE:

- **It may be necessary to gently ease the sides of the panels outwards during removal.**

Installation

1. Installation is the reverse of the removal procedure with the exception of the following:

   Reconnect the battery, positive (red) lead first.

   Tighten the threaded panel fixings to **3 Nm.**

   Tighten the rear seat lock mechanism fixings to **9Nm.**

WARNING: To prevent detachment of the rear seat/cover during riding, after fitting always grasp the seat/cover and pull firmly upwards. If the seat/cover is correctly secured in the lock, it will not detach from the rear frame.

A loose or detached seat could cause loss of motorcycle control and an accident

BELLY PANELS

Removal

WARNING: Before starting to work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

NOTE:

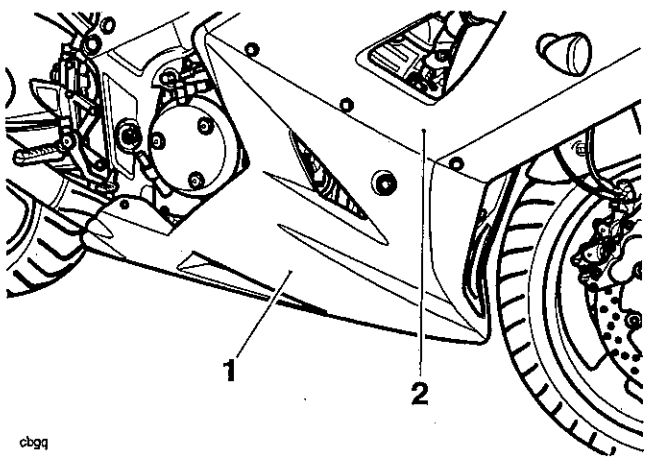
- **The belly panel assembly comprises two separate panels, left and right, which can be removed independently of each other or as an assembly.**

1. Remove the seats.
2. Disconnect the battery, negative (black) lead first.

NOTE:

- **If removing the belly panels as an assembly, steps 3 and 4 can be omitted.**

3. Release the screws securing the lower infill panel to the belly panels.



cbgq

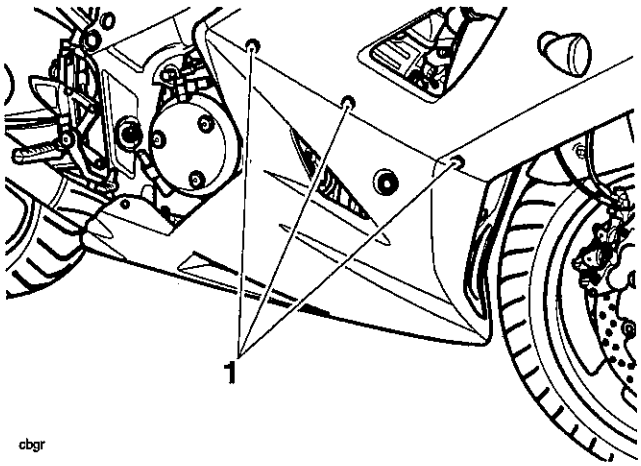
1. Belly panel

2. Lower infill panel

NOTE:

- **Turn the steering from lock to lock to gain access to the screws.**

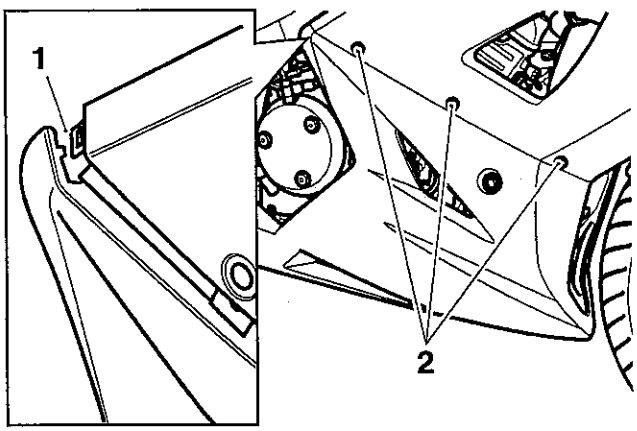
4. Release the three screws along the bottom joint line which secure the right hand belly panel to the left.



cbgr

1. Panel to panel fixings

5. Remove the remaining fixings from the panels taking care to detach the hook-and-eye latches from the rear upper corner of each belly panel.



cbhb

1. Hook and eye attachments

2. Panel fixings

6. Detach the panel assembly or panels from the lower fairings and place in a safe position where it will not become damaged.

Installation

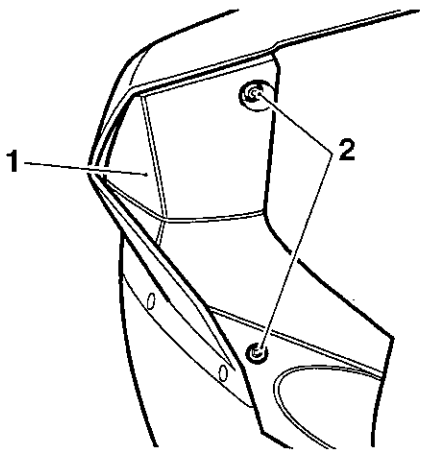
1. Manouvre the panel into position and secure loosely with its fixings. Ensure the joints overlap correctly (i.e. inner joints not protruding outside etc.).
2. Engage the hook-and-eye latches.
3. Tighten the belly panel fixings to **3 Nm.**
4. If removed separately, secure the two panels to each other by fitting and tightening the joint-line fixings to **3 Nm.** Refit the lower infill panel and tighten its fixings to **3 Nm.**
5. Reconnect the battery, positive (red) lead first.
6. Refit the seats.

LOWER FAIRING

Removal

WARNING: Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

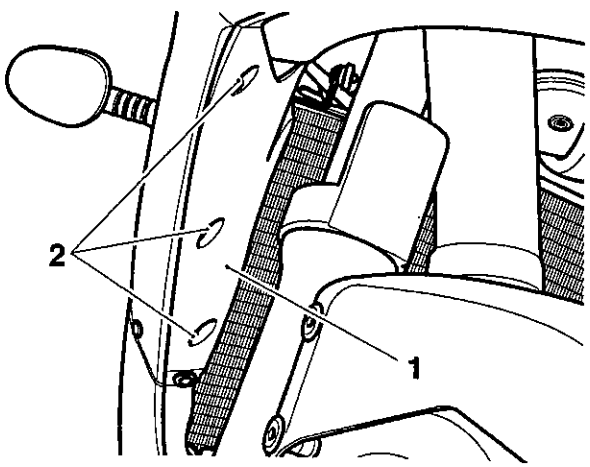
1. Place the motorcycle on a paddock stand.
2. Remove the seat and disconnect the battery, negative (black) lead first.
3. Remove the cockpit infill panels.



1. Infill panel

2. Fixings

4. Carefully detach the infill panels.
5. Remove the fixings securing the cooling ducts to the lower fairings.

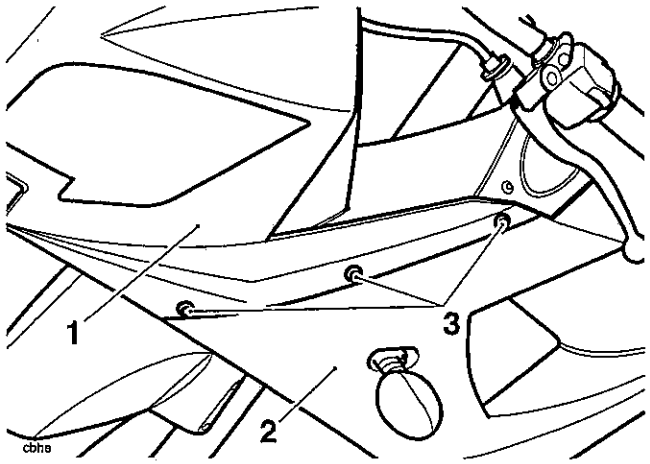


1. Cooling ducts

2. Duct fixings

6. Remove the belly panels as described elsewhere in this section.

7. Release the fixings securing the left hand fairing to the cockpit.



1. Cockpit

2. Left hand lower fairing

3. Fixings

8. Detach the fairing, disconnect the indicator and place in a position where it will not become damaged.

9. Repeat, if necessary, for the right hand fairing panel.

10. If necessary, detach the indicator from the fairing by releasing its retaining screw and locknut.

Installation

1. If removed, fit the indicator and tighten the fixing to **5 Nm.**

2. Manouvre the fairing panel into position and reconnect the indicator.

3. Loosely secure the fairing with its fixings. Ensure the joints overlap correctly (i.e. inner joints not protruding outside etc.).

4. Tighten the fairing panel fixings to **3 Nm.**

5. Repeat for the other fairing panel if removed.

6. Refit the belly panel as described previously.

7. Reconnect the battery, positive (red) lead first.

8. Check the indicators for correct operation.

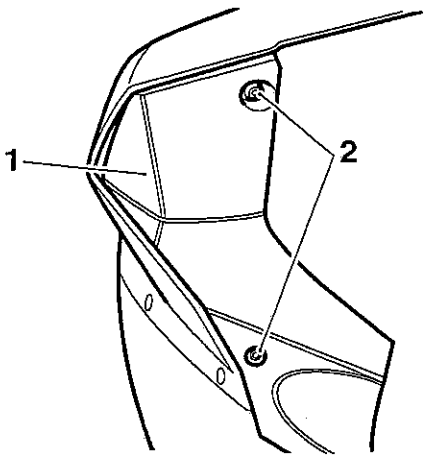
9. Refit the seats.

COCKPIT

Removal

> **WARNING: Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.**

1. Place the motorcycle on a paddock stand.
2. Remove the seat and disconnect the battery, negative (black) lead first.
3. Remove the cockpit infill panels.

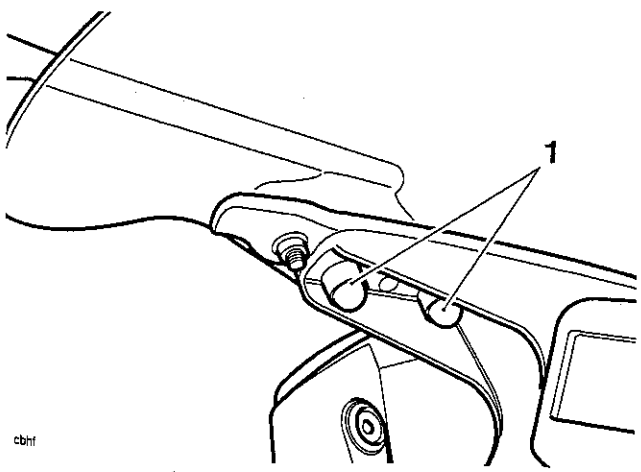


cbhd

1. Infill panel

2. Fixings

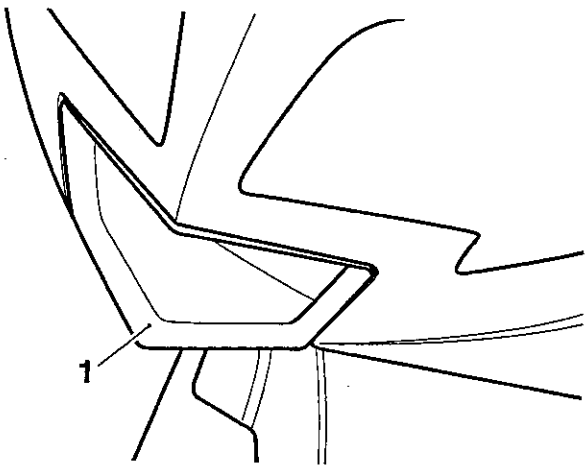
4. Remove the mirror fixing covers.
5. Release the mirror fixings and remove the mirrors.



cbhf

1. Mirror fixings

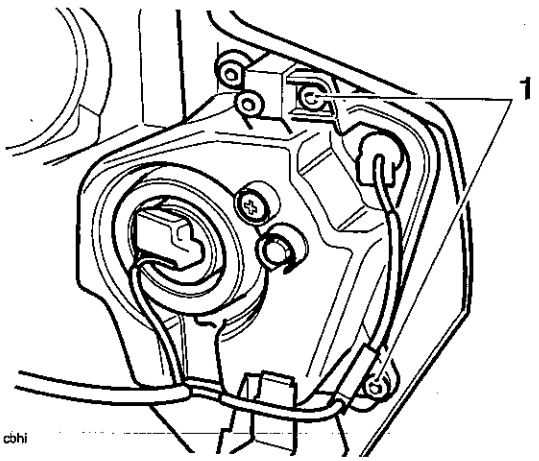
6. Remove the lower fairings as described earlier in this section.
7. Remove the air intake finisher by gently pulling it forward to release it from its clips.



cbhg

1. Air intake finisher

8. Release the fixings securing the cockpit to the cockpit subframe (2 per side).



cbhi

1. Cockpit subframe fixings

9. Careful ease the cockpit forward and outwards to clear the headlight.
10. Place the cockpit in a position where it will not become damaged.

Installation

1. Carefully place the cockpit over the headlight and retain with the cockpit to cockpit subframe fixings.
2. Tighten the fixings to **3 Nm.**
3. Refit the air intake finisher.

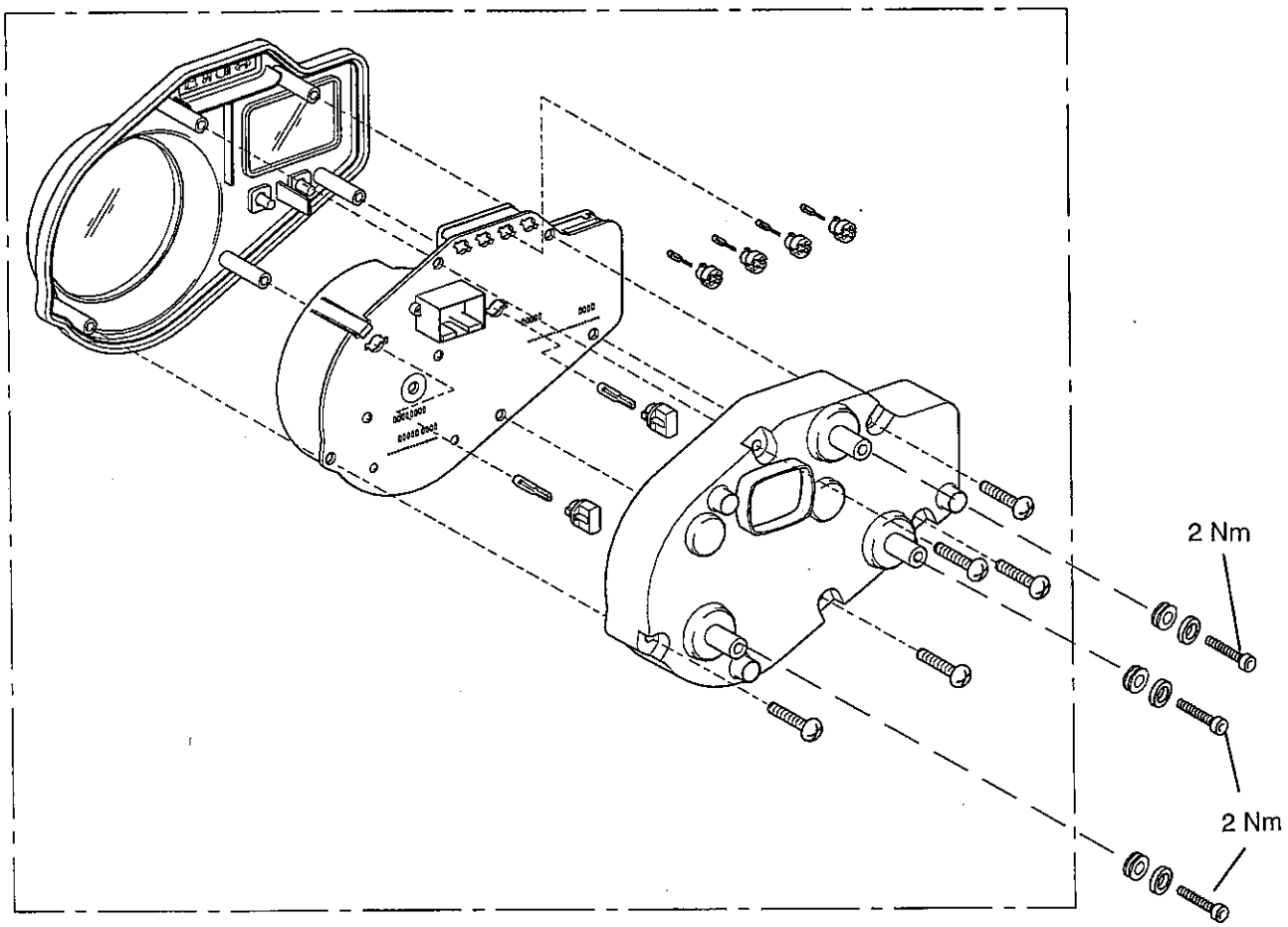
> **CAUTION: Do not use force to refit the air intake finisher as this may cause the retaining tags to break off.**
>
> **To avoid damage, use only gentle pressure to refit the finisher and guide the tags onto their respective locations.**

4. Refit the lower fairings as described earlier in this section.
5. Refit the mirrors tightening the mirror fixings to **9 Nm.**
6. Refit the mirror fixing covers.
7. Refit the cockpit infill panels tightening the fixings to **3 Nm.**
8. Reconnect the battery, positive (red) lead first.
9. Refit the seats.

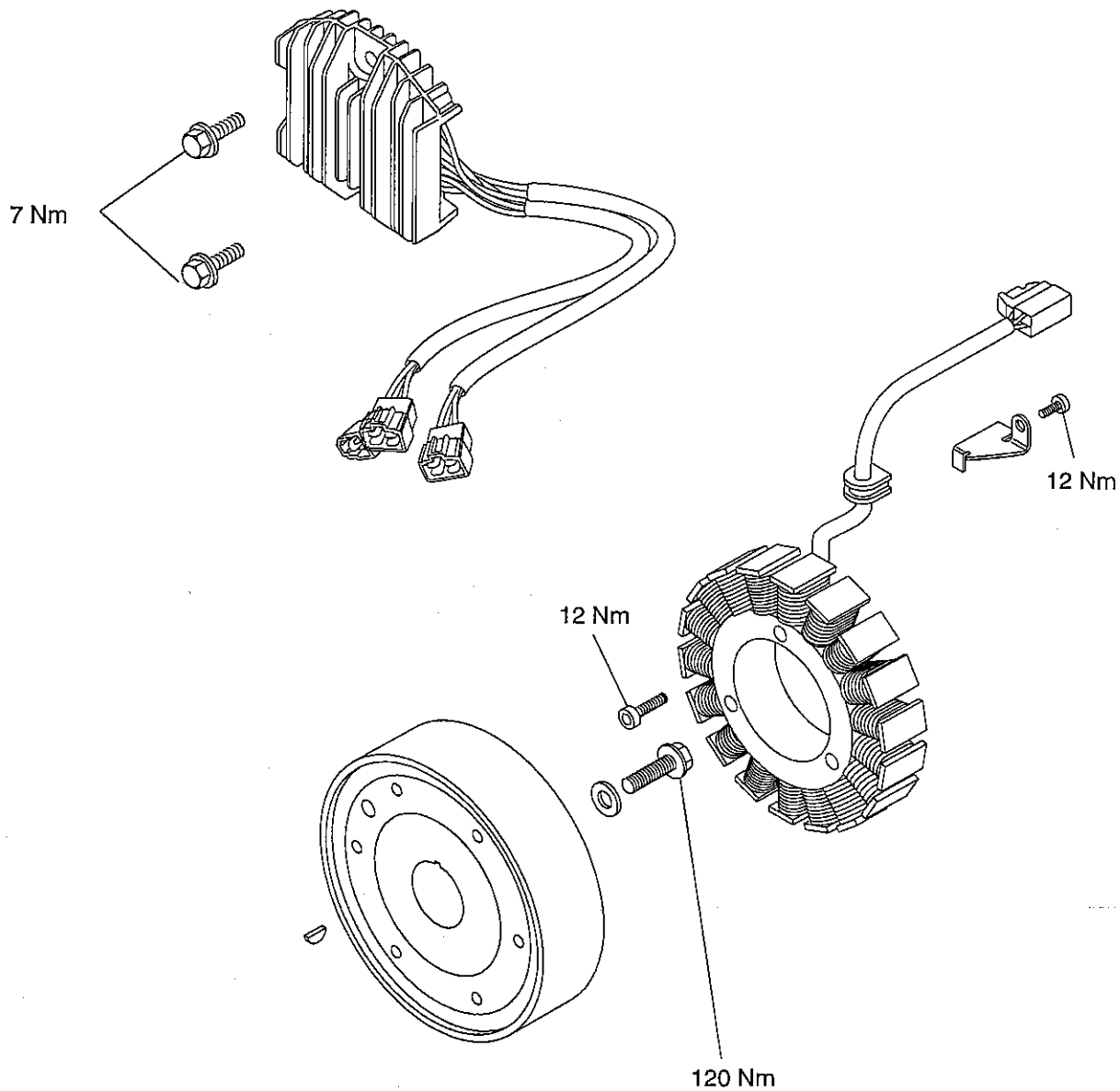
ELECTRICAL SYSTEM

CONTENTS

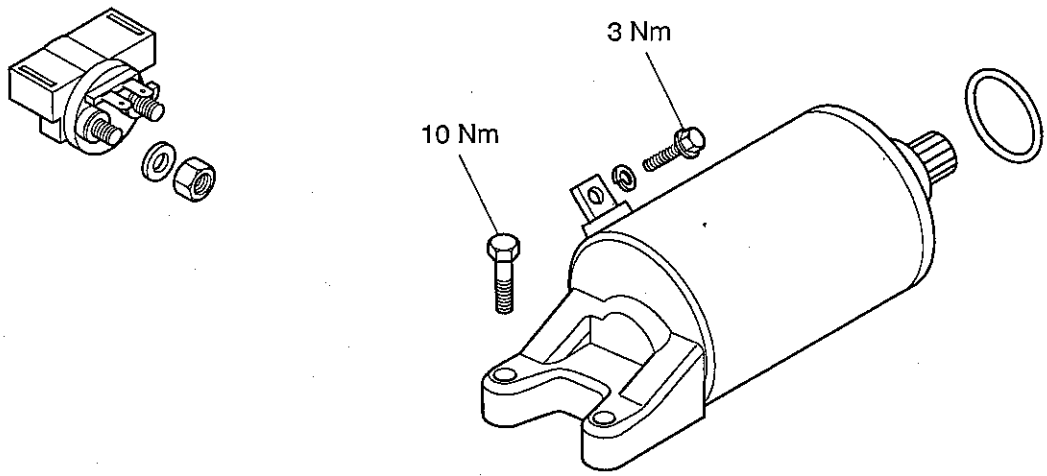
Exploded View - Instruments



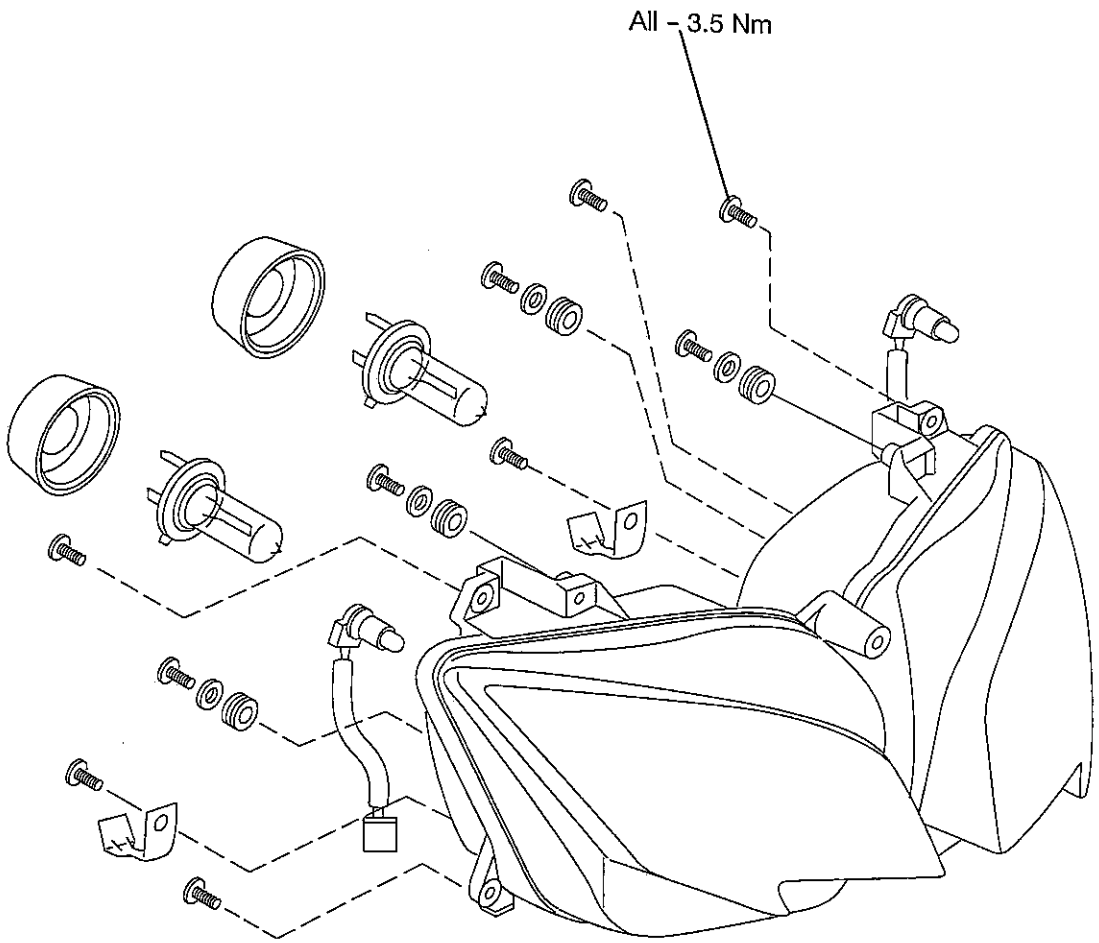
Exploded View - Alternator



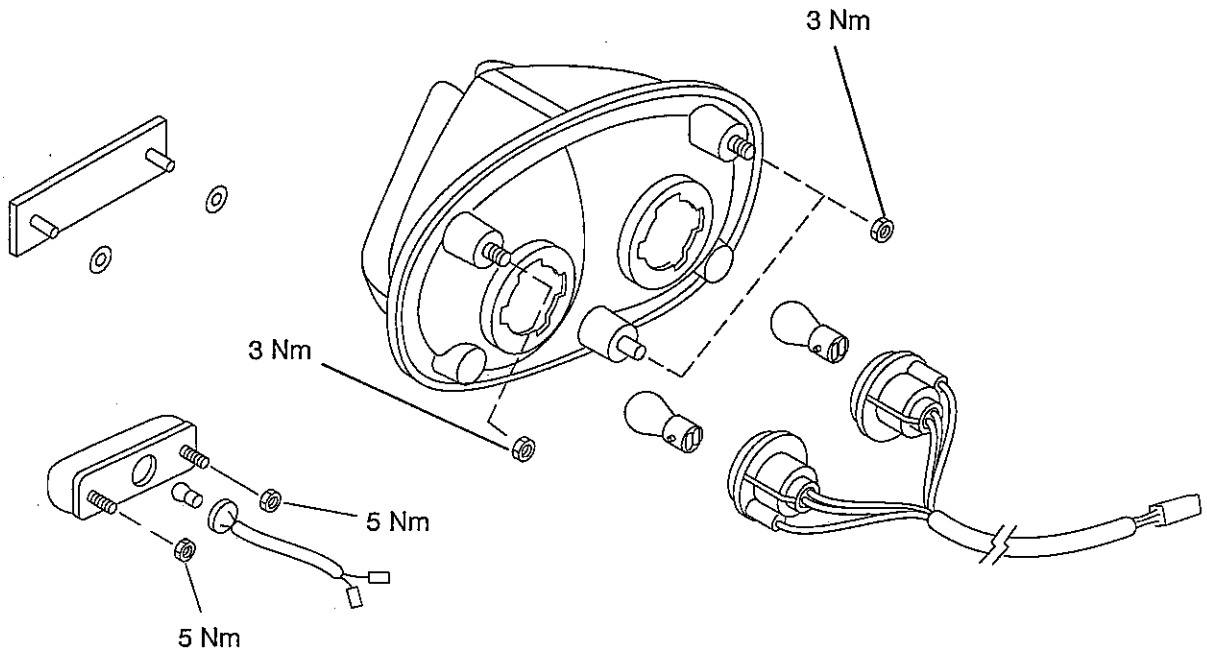
Exploded View - Starter Motor

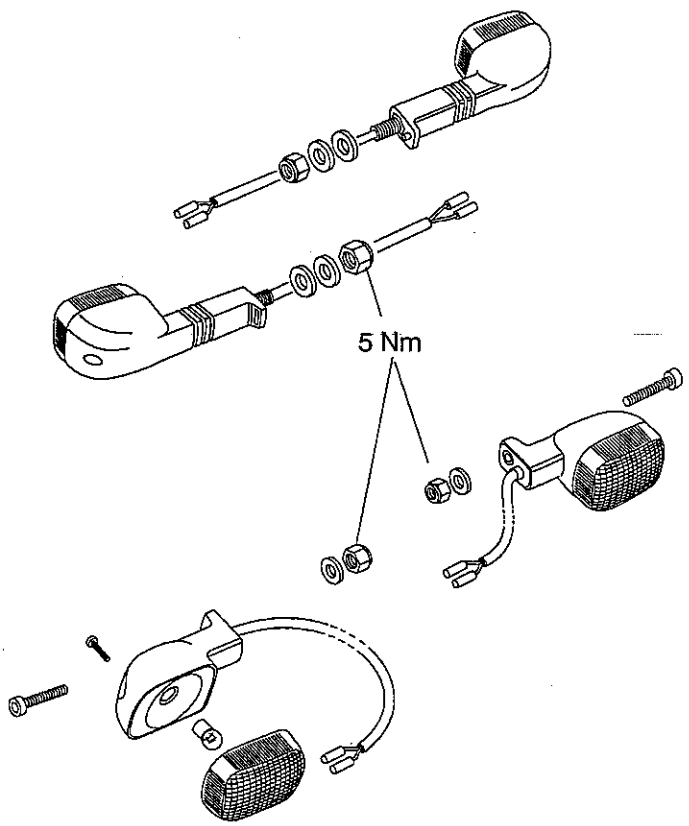


Exploded View - Headlight



Exploded View - Rear Light and Indicators





BATTERY

WARNING: The battery gives off explosive gases; keep sparks, flames and cigarettes away. Provide adequate ventilation when charging or using the battery in an enclosed space.

The battery contains sulphuric acid (electrolyte). Contact with skin or eyes may cause severe burns. Wear protective clothing and a face shield.

- **If electrolyte gets on your skin, flush with water immediately.**
- **If electrolyte gets in your eyes, flush with water for at least 15 minutes and SEEK MEDICAL ATTENTION IMMEDIATELY.**
- **If electrolyte is swallowed, drink large quantities of water and SEEK MEDICAL ATTENTION IMMEDIATELY.**

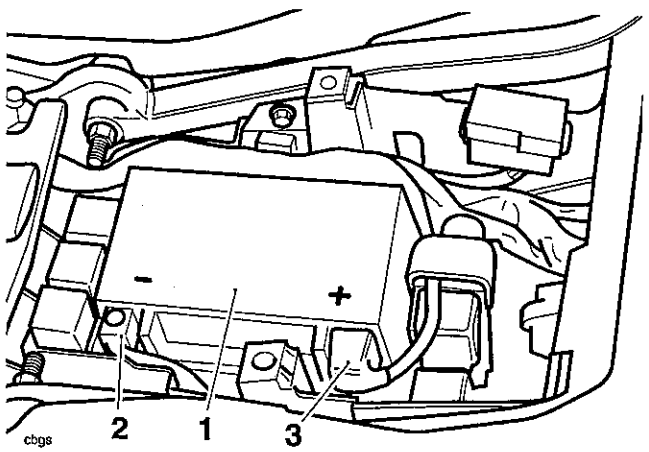
KEEP ELECTROLYTE OUT OF THE REACH OF CHILDREN.

WARNING: The battery contains harmful materials. Always keep children away from the battery whether or not it is fitted to the motorcycle.
Do not jump start the battery, touch the battery cables together or reverse the polarity of the cables as any of these actions may cause a spark which would ignite battery gasses causing a risk of personal injury.

WARNING: The battery electrolyte is corrosive and poisonous. Never swallow battery electrolyte or allow to come into contact with the skin. Always wear eye and skin protection when filling and sealing the battery.

Removal

1. Remove the seats.
2. Disconnect the battery, negative (black) lead first.
3. Remove the battery strap.
4. Take the battery out of the case.



1. Battery

2. Negative lead

3. Positive lead

WARNING: Ensure that the battery terminals do not touch the motorcycle frame as this may cause a short circuit or spark which would ignite battery gases causing a risk of personal injury.

Installation

WARNING: Ensure that the battery terminals do not touch the motorcycle frame as this may cause a short circuit or spark which would ignite battery gases causing a risk of personal injury.

1. Locate the battery to the battery case.
2. Reconnect the battery, positive (red) lead first.
3. Apply a light coat of petroleum jelly to the battery terminals.
4. Cover the positive terminal with the protective cap.
5. Refit the battery strap.
6. Refit the seats.

NEW BATTERY COMMISSIONING

WARNING: The battery electrolyte is corrosive and poisonous. Never swallow battery electrolyte or allow to come into contact with the skin. To help reduce the risk of injury, always wear eye and skin protection when filling and sealing the battery.

To ensure that a new battery is correctly commissioned and will deliver maximum capacity for starting, the following procedure must be followed.

1. Read the instructions and warnings delivered with the battery!
2. Place the battery on a flat level surface and remove the sealing foil.
3. Remove the battery sealing strip from the electrolyte container (if fitted) and save for use later in this procedure. Do not break the seal on the electrolyte container.
4. Place the electrolyte container and adapter (if supplied) on the battery and fill the battery according to the manufacturers instructions.
5. After starting to fill the battery with electrolyte, allow the battery to stand for 30 minutes with the filling container in place.
6. Check that all of the electrolyte has drained from the container, do not remove container at this point. If the container has not completely drained, gently tap the sides of the container to start the electrolyte flowing again.
7. After all of the electrolyte has drained into the battery, allow the battery to stand, with the electrolyte container in place, for a further 30 minutes for batteries 3Ah - 12Ah or 1 hour for batteries greater than 12Ah.
8. Remove the electrolyte container and adapter carefully, and dispose of both immediately.
9. Fit the sealing caps to the battery according to the battery manufacturers instructions.
10. Measure the terminal voltage on the battery to assess the battery condition.
11. Charge the battery as necessary (see table of charging time) using a suitable charger (i.e. a charger with a suitably controlled charging current and appropriate cut off voltage.)

12. Charging current should be controlled to 10% of the nominal capacity (i.e. for a 10AH battery charging current I = 0.1 x 10 = 1A).

Charging Time		
Terminal Voltage Measured	ChargeTime (hours)	Charge Cutoff Voltage
12.8	2	14.5
12.7	3	14.5
12.6	4	14.5
12.5	5	14.5
Less than 12.5	8-10	14.5

11. Disconnect the charger and allow the battery to stand for 1 hour before fitting to the motorcycle.

12. Fit the battery to the motorcycle, positive (Red) lead first.

Charging - Battery Already in Service

When re-charging a battery in service, the following precautions must be taken to avoid damage to the battery.

1. The charging rate must not exceed 1.2 A except for a boost charge where a maximum charge rate of 5 Amps. (for no longer than 1 hour) is allowed.

CAUTION: Boost charge should only be performed if the battery is in a severely discharged state. Boost charging a part discharged battery will damage the cells and plates leading to permanent battery damage.

Battery Maintenance

The battery is a sealed type and does not require any maintenance other than routine recharging such as during storage.

It is not possible to adjust the electrolyte level in the battery.

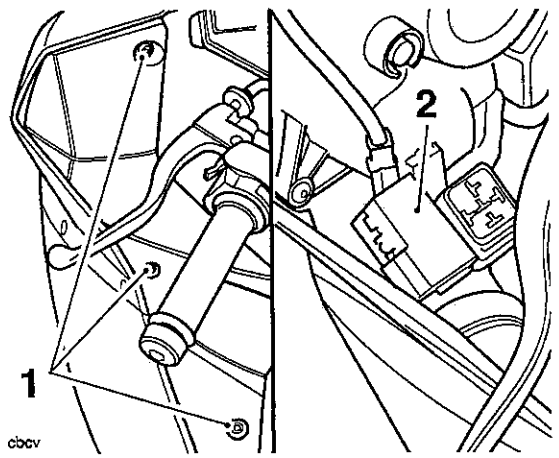
FUSES

The motorcycle is fitted with two fuse boxes.

The front fuse box is located under the left hand cockpit infill panel. The rear fuse box is located under the passenger seat.

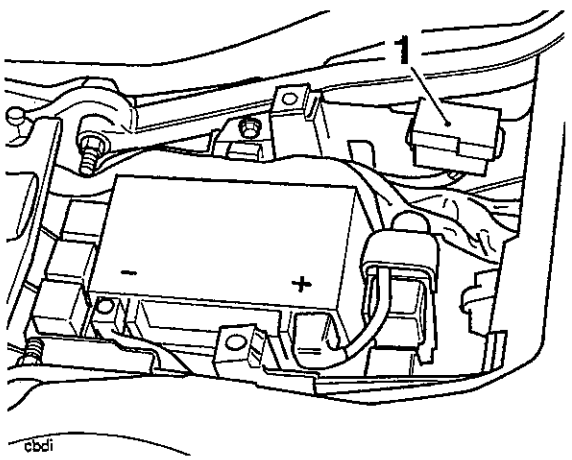
To allow access to the rear fuse box, the rider's seat must be removed.

To allow access to the front fuse box, the left hand cockpit infill panel must be removed as follows:



1. Panel Fixings

2. Front Fuse Box



1. Rear Fuse Box

Front Fuse Box Access

1. Release cockpit infill fixings shown in diagram above.

2. Ensuring that the front wheel is pointing straight ahead (which allows space for removal), detach the panel.

NOTE:

- **Refitting is the reverse of removal but ensure that the infill panel fixings are tightened to 3 Nm.**

Fuse Identification

WARNING: Always replace blown fuses with new ones of the correct rating (as specified on the fuse box cover) and never use a fuse of higher rating. Use of an incorrect fuse could lead to an electrical problem, resulting in motorcycle damage, loss of motorcycle control and an accident.

A blown fuse is indicated when all of the systems protected by that fuse become inoperative. When checking for a blown fuse, use the table below to establish which fuse has blown.

Front fuse box

Fuse No	Circuits Protected	Fuse Rating (Amp.)
1	Ignition/starter circuit	10
2	Instrument illumination	5
3	Main lighting system	20
4	Position lights	5

Rear fuse box

Fuse No	Circuits Protected	Fuse Rating (Amp.)
1	Dip & main beam	15
2	Ignition switch main feed	30
3	Diagnostics/alarm/instrument memory	10
4	Indicators/brake lights/horn	15
5	Engine management system	20
6	Cooling fan	15

NOTE:

- **The fuse identification numbers listed above correspond with those printed on the fuse box lid.**

HEADLIGHT

WARNING: Adjust road speed to suit the visibility and weather conditions in which the motorcycle is being operated.

Ensure that the beam is adjusted to illuminate the road surface sufficiently far ahead without dazzling oncoming traffic. An incorrectly adjusted headlight may impair visibility causing an accident.

WARNING: Never attempt to adjust the headlight beam when the motorcycle is in motion.

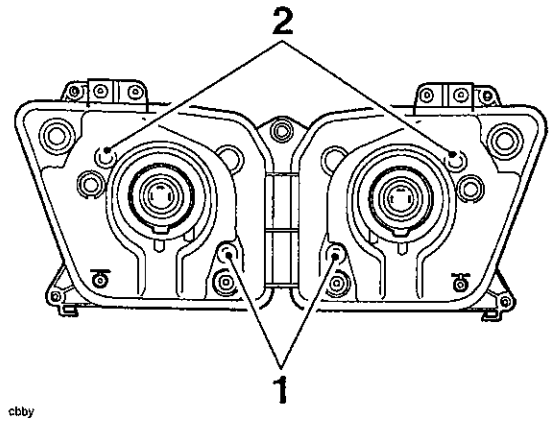
Any attempt to adjust the headlight beam when the motorcycle is in motion may result in loss of control and an accident.

Headlight Adjustment

NOTE:

- **The left and right hand headlights are adjusted independently. Unless stated, the following instructions apply to either headlight but the adjustments made will only affect the particularly light being adjusted.**

1. Switch the headlight dipped beam on.
2. Turn the vertical adjustment screw clockwise to lower the beam or anti-clockwise to raise the beam.
3. On the **left hand** headlight, turn the horizontal adjustment screw anti-clockwise to move the headlight beam to the right, and clockwise to move the beam to the left.
4. On the **right hand** headlight, turn the horizontal adjustment screw anti-clockwise to move the headlight beam to the left, and clockwise to move the beam to the right.



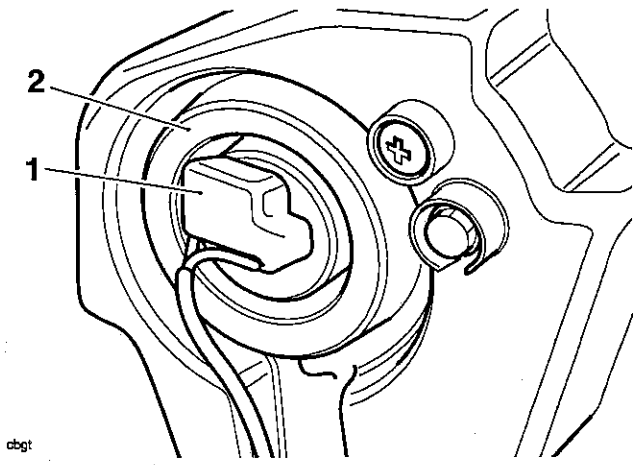
1. Vertical Adjustment Screw

2. Horizontal Adjustment Screw

5. Switch the headlights off when the beams are correctly set.

Headlight Bulb Replacement

1. Remove the seats.
2. Disconnect the battery, negative (black) lead first.
3. Remove the cockpit infill panels as described in section 14.
4. To remove the headlight bulb, disconnect the multi-pin electrical connector from the headlight bulb and remove the cover.

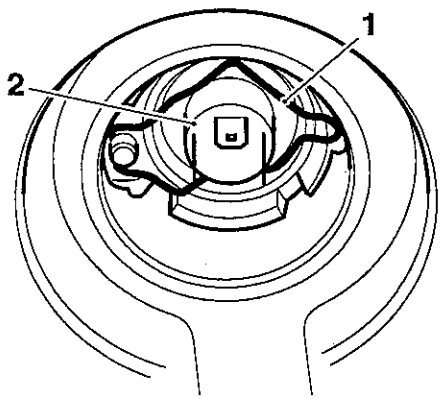


cbgt

1. Connector

2. Cover

5. Detach the wire bulb retainer from the clip. It is not necessary to undo the screw.



cbgu

1. Wire retainer

2. Bulb

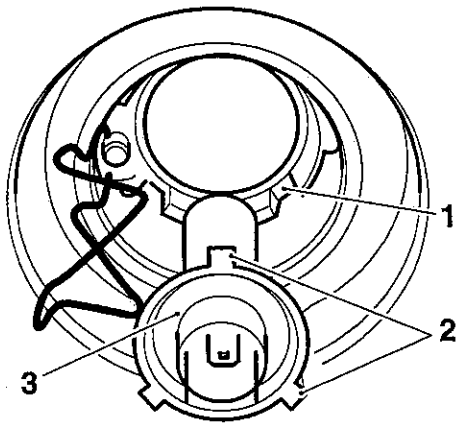
6. Remove the bulb from the headlight.
7. To remove the bulb from its holder, push and twist anti-clockwise.
8. Repeat for the second bulb if necessary.

Installation

1. Locate the bulb to the bulb holder, align the bayonets with the corresponding slots in the holder, push down and twist clockwise. If correctly engaged, the bulb will be retained in the holder.

NOTE:

- **The slots and bayonets are offset and will only fit one way around**



cbia

1. Bulb Holder Slots

2. Bayonets

3. Bulb

2. Fit the bulb to the headlight and secure with the wire clip.
3. Refit the cover to the rear of the bulb.
4. Reconnect the multiplug.
5. Refit the cockpit infill panels as described in section 14.
6. Reconnect the battery, positive (red) lead first.
7. Check for correct operation of the headlight. Rectify if necessary.
8. Refit the seats.

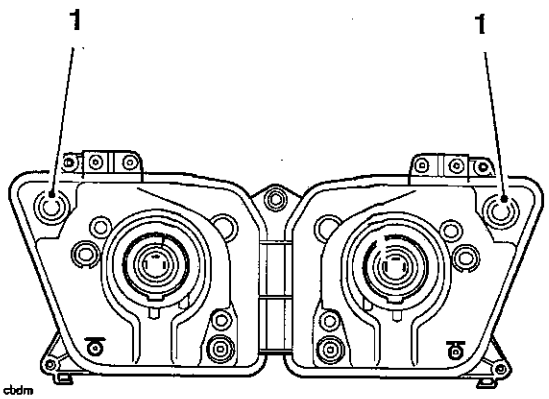
FRONT POSITION LIGHTS

Bulb Replacement

WARNING: The bulb becomes hot during use. Always allow sufficient time for the bulb to cool before handling.

Avoid touching the glass part of the bulb. If the glass is touched or gets dirty, clean with alcohol before re-use.

WARNING: Do not reconnect the battery until the assembly process has been completed. Premature battery reconnection could result in ignition of the battery gases causing risk of injury.



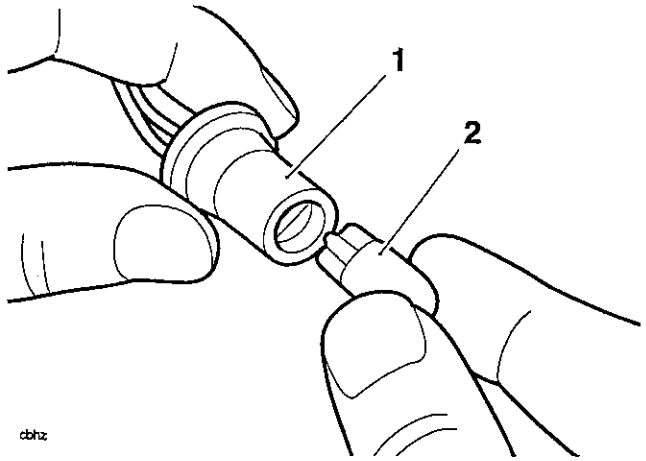
1. Position Light Bulb Location

1. Remove the seats.
2. Disconnect the battery, negative (black) lead first.
3. Remove the cockpit infill panels as described in section 14.
4. To remove the position light bulb holders, gently pull each bulb holder grommet from the headlight (do not pull on the wires).

NOTE:

- **A rubber tab is provided on the grommets to assist removal of the position light bulb holder.**

5. To remove the bulbs from the holders, pull directly outwards.



1. Bulb Holder

2. Bulb

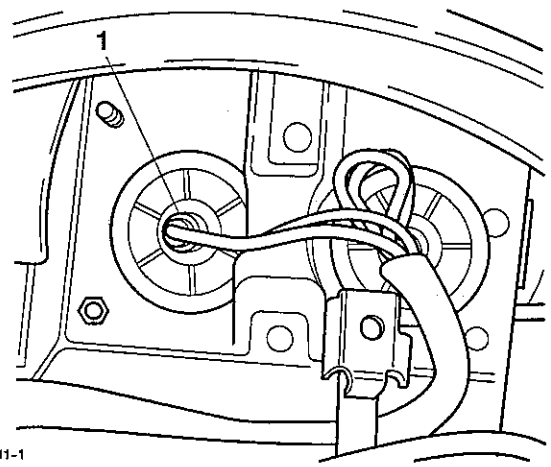
Installation

1. Install the bulbs into the bulb holders by reversal of the removal process.
2. Refit the bulb holders to the headlight body ensuring they are fully and correctly engaged.
3. Refit the cockpit infill panels as described in section 14.
4. Reconnect the battery, positive (red) lead first.
5. Check for correct operation of the position lamps. Rectify if necessary.
6. Refit the seats.

REAR LIGHT

Bulb Replacement

1. Remove the seats.
2. Disconnect the battery, negative (black) lead first.
3. Detach the seat lock latch.
4. Rotate the bulb retainer anti-clockwise to release.



15.11-1

1. Rear light bulb retainer

5. To remove the bulb from its holder, push and twist anti-clockwise.
6. Locate the bulb to the bulb holder, align the bayonets with the corresponding slots in the holder, push down and twist clockwise. If correctly engaged, the bulb will be retained in the holder.

NOTE:

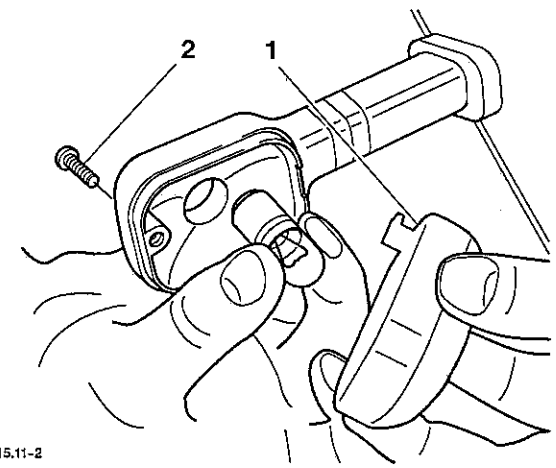
- **The slots and bayonets are offset and will only fit one way around**

7. To refit the bulb holder, push the holder into the lamp body and twist clockwise.
8. Refit the seat lock latch tightening its fixings to **9 Nm.**
9. Reconnect the battery, positive (red) lead first.
10. Check for correct operation of the position lamps. Rectify if necessary.
11. Refit the seats.

INDICATOR LIGHTS

Bulb Replacement

1. The lens on each indicator is held in place by a securing screw located in the light body.



15.11-2

1. Indicator Lens

2. Securing Screw

2. Release the screw and remove the lens to gain access to the bulb.

3. To remove the bulb from its holder, push and twist anti-clockwise.

4. Locate the bulb to the bulb holder, align the bayonets with the corresponding slots in the holder, push down and twist clockwise. If correctly engaged, the bulb will be retained in the holder.

5. Refit the lens and secure with the screw.

6. Reconnect the battery, positive (red) lead first.

7. Check for correct operation of the indicator lamps. Rectify if necessary.

8. Refit the seats.

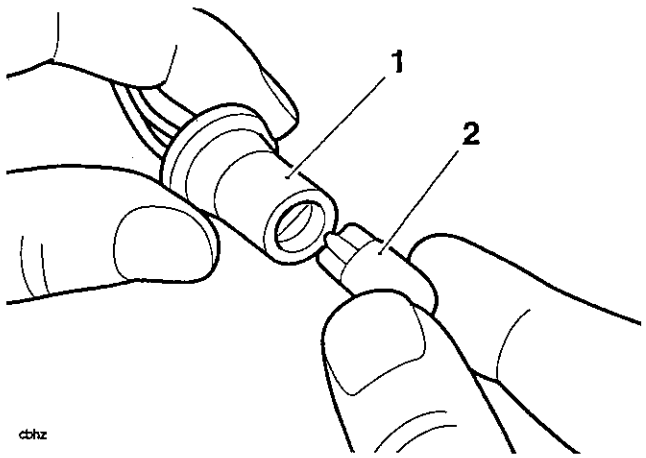
LICENCE PLATE LIGHT

Bulb Replacement

NOTE:

- **To gain access to the licence plate bulb, remove the rear light as described earlier in this section and detach the bulb holder from the rear of the license plate light.**

1. To remove the bulb from the holder, pull directly outwards.



cbhz

1. Bulb Holder

2. Bulb

2. Install the bulb into the bulb holders by reversal of the removal process.

3. Refit the bulb holders to the light body ensuring it is fully and correctly engaged.

4. Reconnect the battery, positive (red) lead first.

5. Check for correct operation of the licence plate light. Rectify if necessary.

6. Refit the rear light as described earlier in this section.

7. Refit the seats.

ALTERNATOR

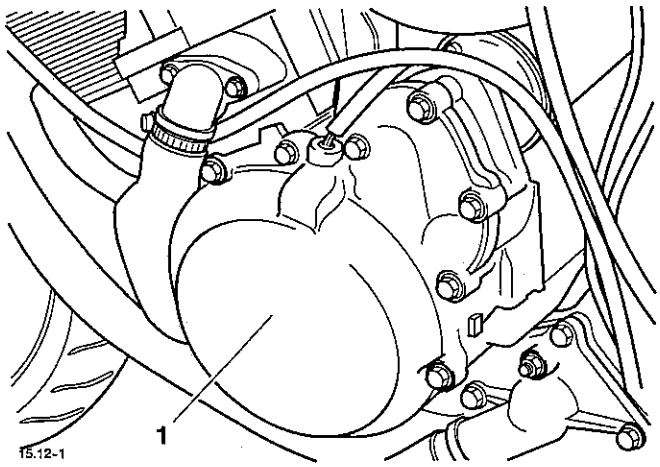
Removal

1. Remove the seats and disconnect the battery negative (black) lead first.

2. Remove the left hand lower fairing and belly panel as described in section 14.

3. Disconnect the alternator lead from the engine wiring harness.

4. Release the bolts securing the left hand engine cover to the crankcase.

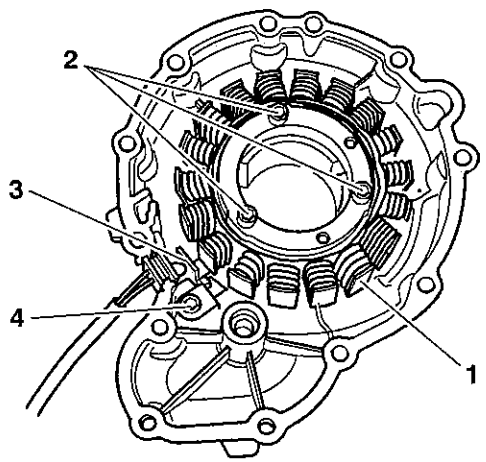


15.12-1

1. Left hand crankshaft cover

5. Withdraw the cover from the crankcase against the pull of the alternator magnet.

6. To remove the stator from the cover, release the three bolts in the centre of the cover and release the bolt securing the cable bracket.



15.12-2

1. Stator

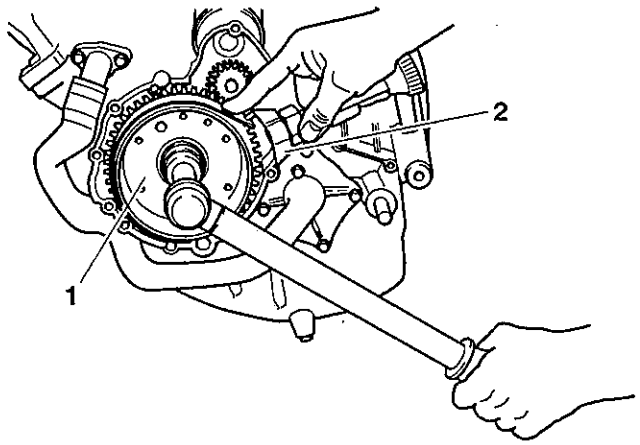
2. Stator bolts

3. Cable bracket

4. Cable bracket bolt

7. Withdraw the stator.

8. To remove the rotor, prevent the crankshaft from rotating using tool T3880375, and remove the centre bolt from the left hand end of the crankshaft.



15.12-3

1. Rotor

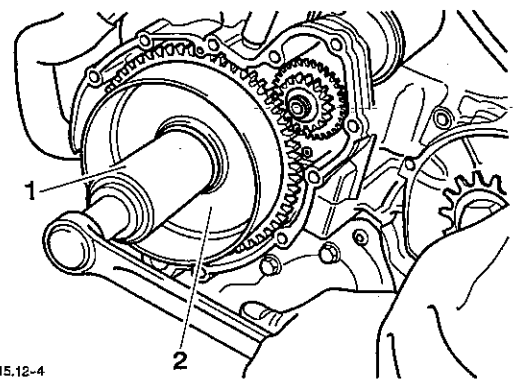
2. Tool T3880375

9. Assemble tool T3880365 to the threaded centre section of the rotor.

10. Tighten the draw-bolt in the centre of the tool to release the taper seating of the rotor to the crankshaft.

NOTE:

- **Prevent the assembly from turning by securing the flats on the tool body with a spanner.**



15.12-4

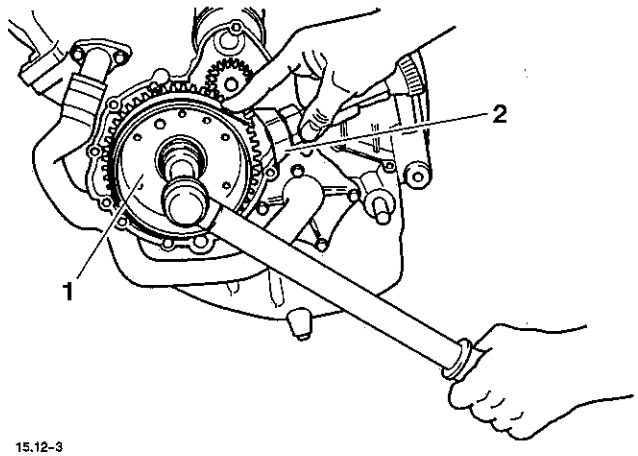
1. Tool T3880365

2. Rotor

11. Withdraw the rotor and tool as an assembly and then separate the tool from the rotor.

Assembly

1. Assemble the rotor to the keyway on the crankshaft.
2. Refit tool T3880375 to prevent the crankshaft from rotating.
3. Tighten the rotor retaining bolt to **120 Nm.**



15.12-3

1. Rotor

2. Tool T3880375

4. Remove tool T3880375.
5. Locate the stator to the engine cover.
6. Apply silcone sealer to the cable grommet and align the cable to the exit slot.
7. Fit the cable retainer bracket and tighten the retainer bolt to **12 Nm.**
8. Tighten the stator bolts to **12 Nm.**
9. Refit the left hand engine cover incorporating a new gasket. Tighten the cover fixings to **9 Nm.**
10. Reconnect the battery positive (red) lead first.
11. Refit all bodywork as described in section 14.
12. Refit the seat.

ALTERNATOR RECTIFIER

NOTE:

- **The alternator rectifier is located behind the engine, attached to the frame cross brace. The rectifier does not contain any serviceable parts and must be replaced if faulty.**

STARTER MOTOR

Removal

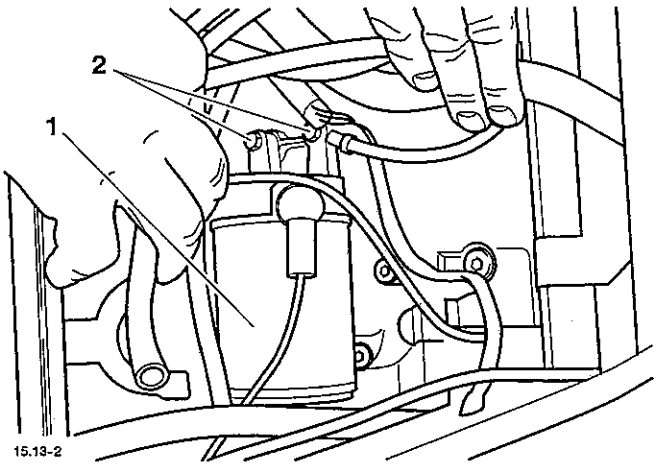
1. Remove the left hand lower fairing as described in section 14.

2. Remove the seat and disconnect the battery negative (black) lead first.

3. Remove the fuel tank as described in the fuel system section.

4. Disconnect the starter lead from the starter motor.

5. Release the two bolts securing the starter motor to the crankcase.



1. Starter motor

2. Starter to crankcase bolts

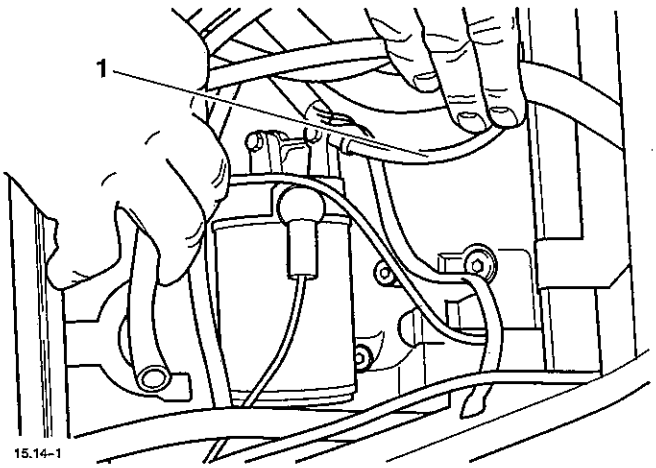
6. Detach the starter by easing the motor towards the centre of the engine.

Installation

1. Examine the starter O ring and replace if necessary. When fitted, apply a smear of grease to the 'O'-ring to aid assembly.

2. Locate the starter to the engine and engage the starter teeth to the drive gear.

3. Fit and tighten the two starter motor securing bolts ensuring that the earth lead is located under the head of the rearmost bolt. Tighten the fixings to **10 Nm.**



1. Earth lead

4. Reconnect the starter lead.

5. Refit the fuel tank as described in the fuel system section.

6. Refit the left hand lower fairing as described in the body section.

7. Reconnect the battery positive (red) lead first.

8. Refit the seat.

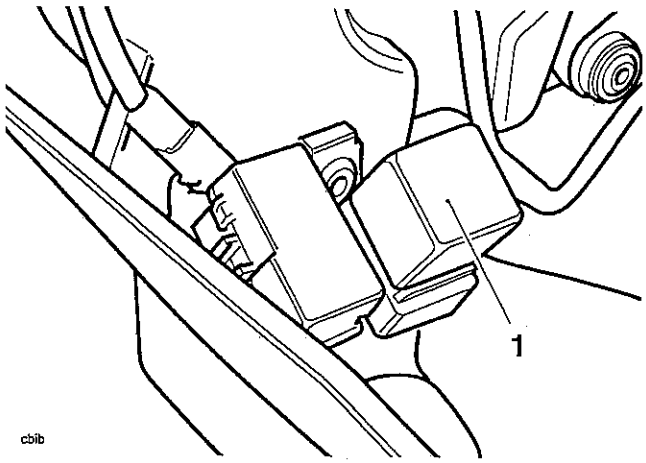
RELAYS

Identification and location

NOTE:

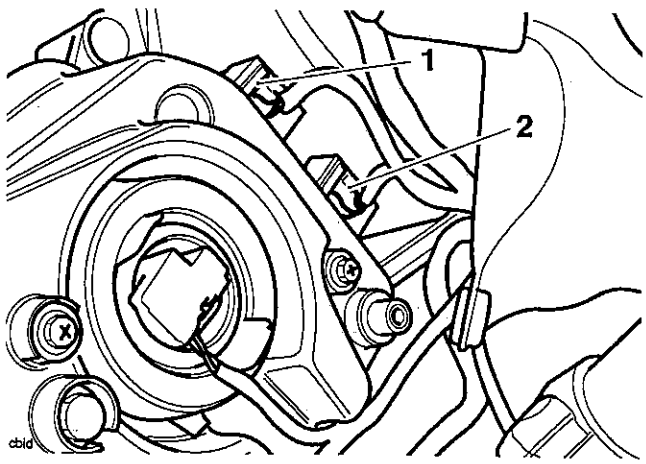
- **Relays can be found in three locations on the motorcycle, beneath the seats, behind the headlight and in the cockpit area.**

Cockpit Area



1. Direction Indicator Unit

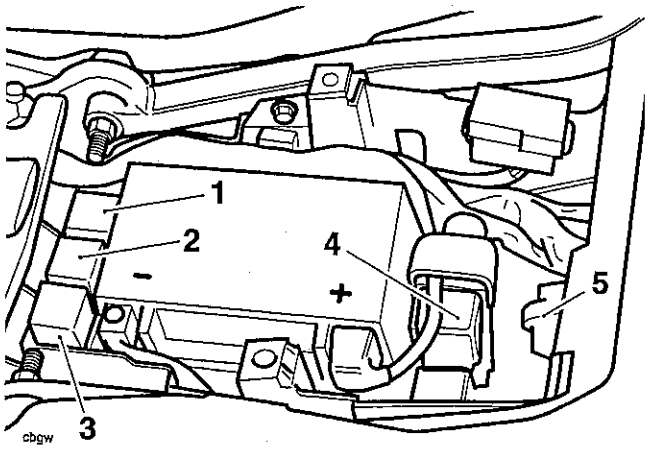
Headlight Area



1. Dip beam headlight relay

2. Main beam headlight relay

Under Seat Area



1. Fan relay

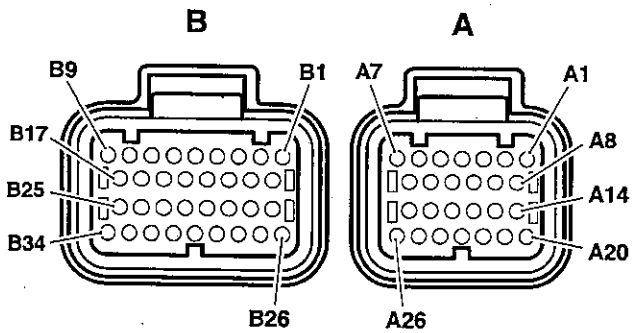
2. Fuel pump relay

3. Starter relay

4. Engine management relay

5. Fall detection switch

ECM Connector Pin Numbering



The above illustration shows the pin numbering system used in the engine management and other electrical circuit diagrams.

The small connector's pins are prefixed A and the large connector's pins B. As viewed on the mating face with the ECM (as per the illustration), pins are numbered from right to left with number one in the top right corner.

STARTING AND CHARGING

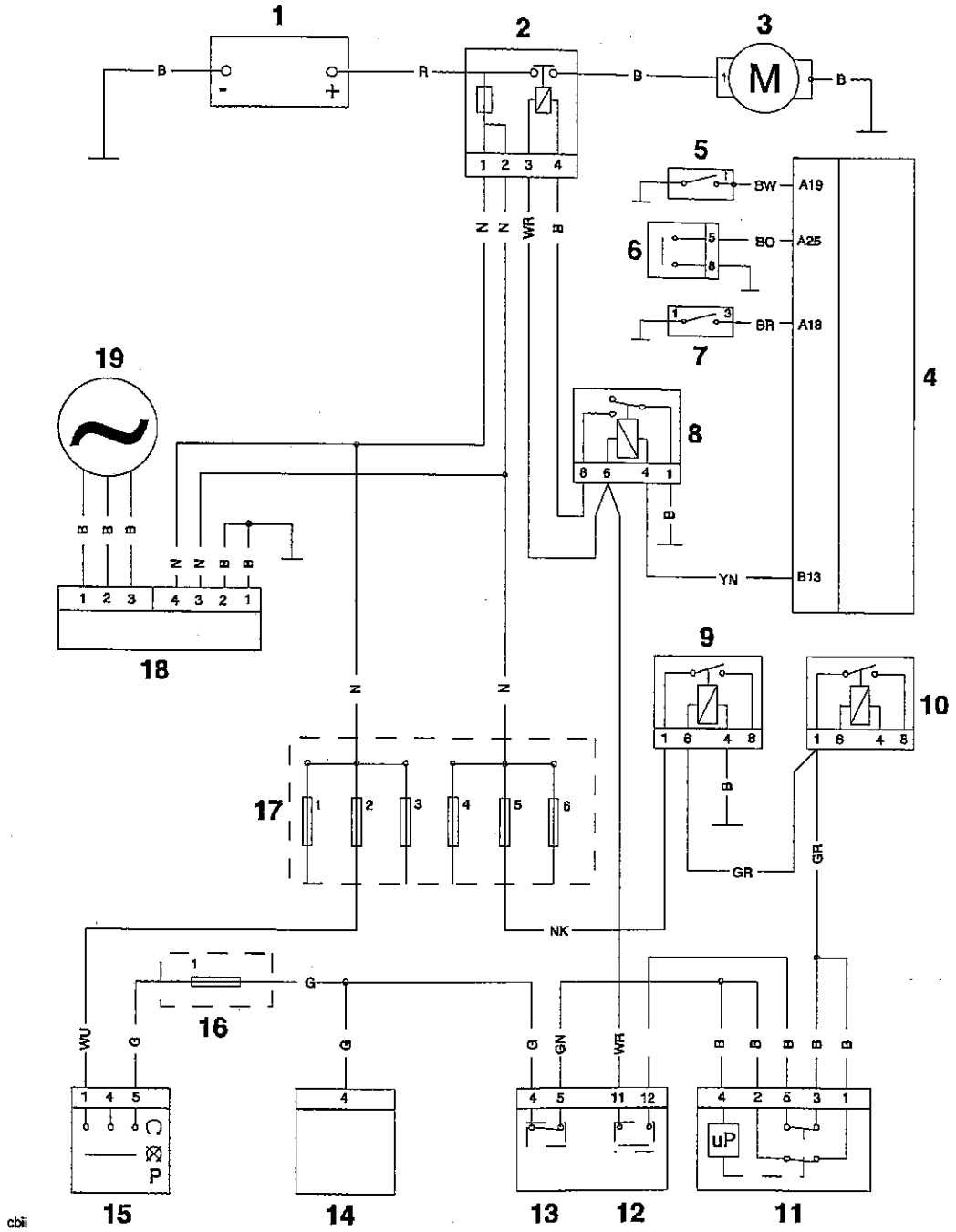
Key to circuit diagram

Key	Item Description
1	Battery
2	Starter solenoid
3	Starter motor
4	Engine control module
5	Neutral switch
6	Clutch switch
7	Sidestand switch
8	Starter relay
9	Engine management system relay
10	Fuel pump relay
11	Alarm control unit
12	Starter button
13	Engine kill switch
14	Fall detection switch
15	Ignition switch
16	Front fuse box (fuse 1)
17	Rear fuse box
18	Regulator/rectifier
19	Alternator

Key to wiring colours

Key	Wiring colour
B	Black
U	Blue
N	Brown
G	Green
S	Slate/grey
O	Orange
K	Pink
R	Red
P	Purple
W	White
Y	Yellow
LG	Light green
LU	Light blue

Circuit diagram - starting and charging



LIGHTING

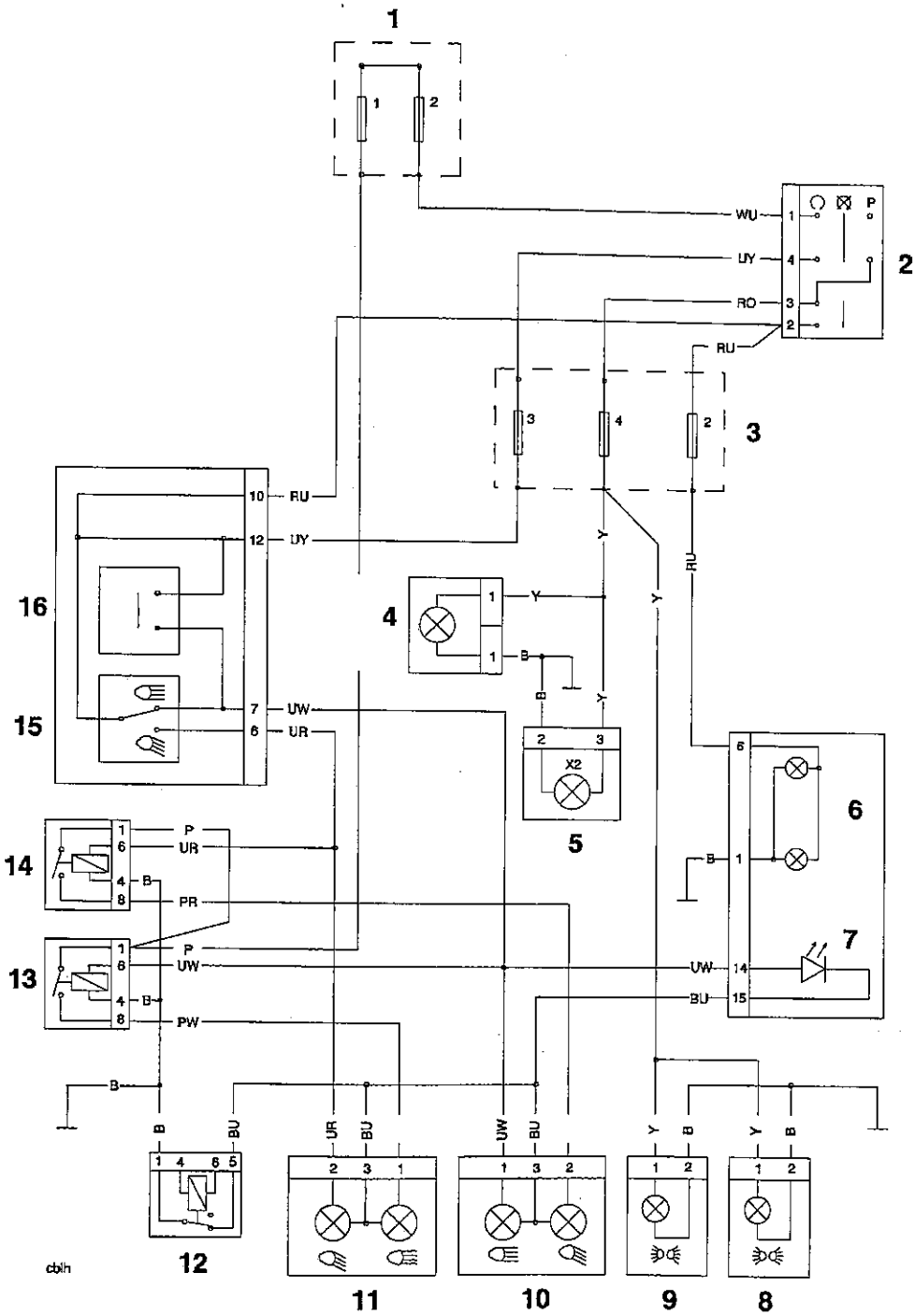
Key to circuit diagram

Key	Item Description
1	Rear fuse box (fuses 1 and 2)
2	Ignition switch
3	Front fuse box (fuses 2, 3 and 4)
4	Number plate lamp
5	Tail lamp
6	Instrument illumination
7	Main beam warning light
8	Position lamp 1
9	Position lamp 2
10	Headlamp 2
11	Headlamp 1
12	Starter relay
13	Main beam relay
14	Dip beam relay
15	Headlamp dip switch
16	Passing switch

Key to wiring colours

Key	Wiring colour
B	Black
U	Blue
N	Brown
G	Green
S	Slate/grey
O	Orange
K	Pink
R	Red
P	Purple
W	White
Y	Yellow
LG	Light green
LU	Light blue

Circuit diagram - lighting



AUXILIARY CIRCUITS

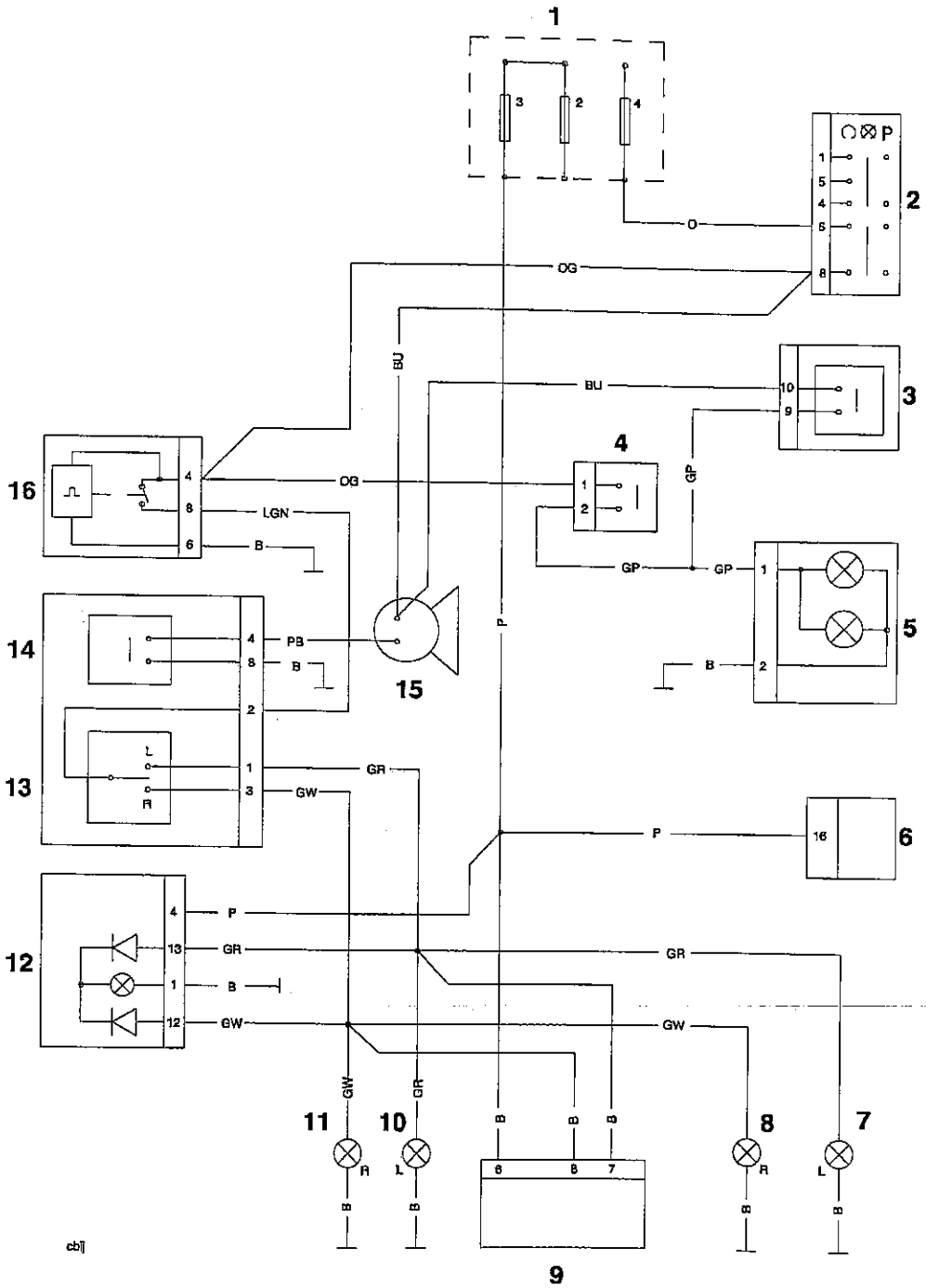
Key to circuit diagram

Key	Item Description
1	Rear fuse box (fuses 2, 3 and 4)
2	Ignition switch
3	Front brake light switch
4	Rear brake light switch
5	Brake light
6	Diagnostic connector
7	Rear left direction indicator
8	Rear right direction indicator
9	Alarm control unit
10	Front left direction indicator
11	Front right direction indicator
12	Instrument assembly
13	Direction indicator switch
14	Horn switch
15	Horn
16	Indicator relay

Key to wiring colours

Key	Wiring colour
B	Black
U	Blue
N	Brown
G	Green
S	Slate/grey
O	Orange
K	Pink
R	Red
P	Purple
W	White
Y	Yellow
LG	Light green
LU	Light blue

Circuit diagram - auxiliary circuits



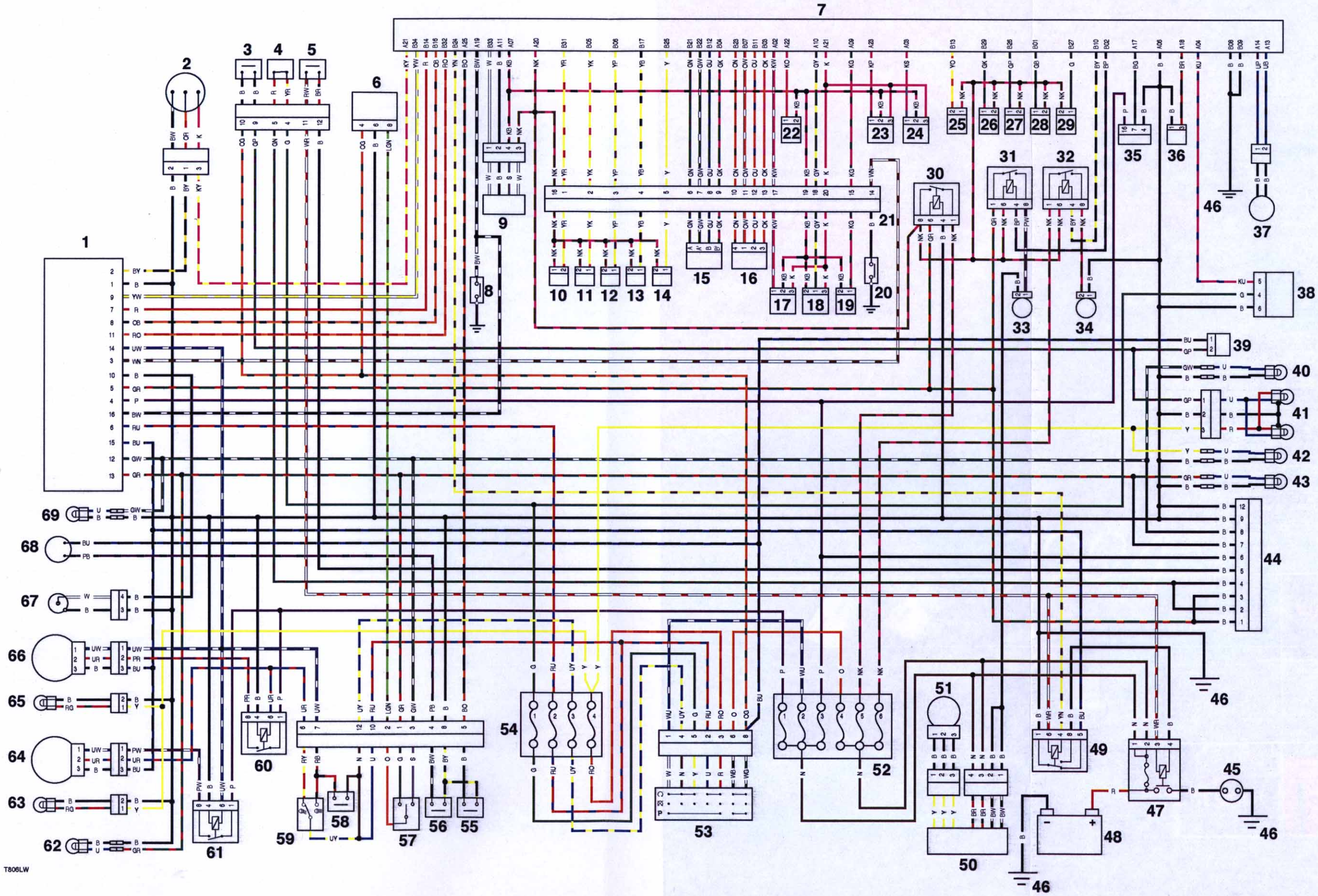
COMPLETE SYSTEM

Key to circuit diagram

Key	Item
1	Instruments
2	Wheel Speed Sensor
3	Front Brake Lever Switch
4	Engine Kill Switch
5	Starter Button
6	Direction Indicator Unit
7	Engine Control Module
8	Neutral Switch
9	Lambda Sensor
10	Purge Valve (California \Models Only)
11	Injector 1
12	Injector 2
13	Injector 3
14	Injector 4
15	2nd Throttle Actuator
16	Idle Speed Control Actuator
17	2nd Throttle Potentiometer
18	Throttle Potentiometer
19	Coolant Temperature Sensor
20	Oil Pressure Switch
21	Engine Sub Harness Connector
22	Inlet Air temperature Sensor
23	Ambient Pressure Sensor
24	MAP Sensor
25	Secondary air injection Solenoid
26	Ignition Coil 1
27	Ignition Coil 2
28	Ignition Coil 3
29	Ignition Coil 4
30	Engine management relay
31	Fuel Pump Relay
32	Cooling Fan Relay
33	Fuel Pump
34	Cooling Fan
35	Diagnostic Connector
36	Sidestand Switch
37	Crankshaft Sensor
38	Fall Detect ion Switch
39	Rear Brake Lever Switch
40	RH Rear Indicator
41	Rear light
42	Number Plate light
43	LH Rear Indicator
44	Alarm Connector (Accessory)
45	Starter Motor
46	Engine Earth
47	Starter Solenoid
48	Battery
49	Starter Relay
50	Rectifier / Regulator
51	Alternator
52	Rear Fuse Box
53	Ignition Switch
54	Front Fuse Box
55	Clutch Lever Switch
56	Horn Button
57	Direction Indicator Switch
58	Passing Button
59	Headlamp Dip Switch
60	Dip Beam Relay
61	Main Beam Relay
62	LH Front Indicator
63	Position light 1
64	Headlamp 1
65	Position light 2
66	Headlamp 2
67	Low Fuel Level Sensor
68	Horn
69	RH Front Indicator

Key to wiring colours

Key	Wiring colour
B	Black
U	Blue
N	Brown
G	Green
S	Slate/grey
O	Orange
K	Pink
R	Red
P	Purple
W	White
Y	Yellow
LG	Light green
LU	Light blue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