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Motorcycle Service Manual

Part Number 3850760 issue 3, 10.99

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Motocycle Service Manual

Part Number: 12070-1200-0000

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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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Warning: Always use the correct tools and procedures when working on the engine. Failure to do so may result in personal injury or damage to the engine.

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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 re-assembly. 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 re-assembly, 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, CO², 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.

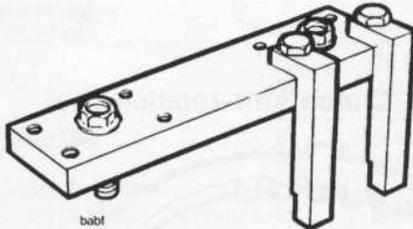
Authorised Triumph Dealers are not agents of Triumph and have no authority to bind the manufacturer by any expressed or implied undertaking or representation.

Service tools and garage equipment

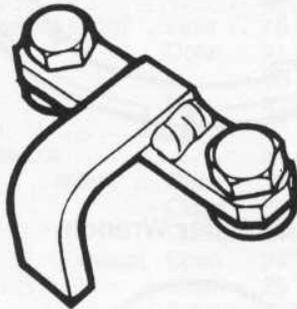
Special service tools have been developed to facilitate removal, dismantling and assembly of certain mechanical components in a practical manner without causing damage. Some operations in this Service Manual cannot be carried out without the aid of the relevant service tools. Where this is the case,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

Special service tools:-

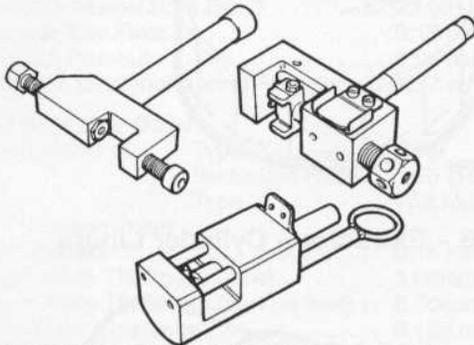
T3880012 - Valve Shim Removal Tool



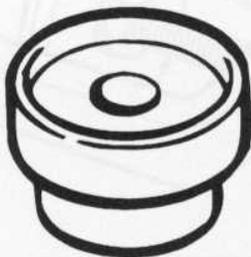
3880040-T0301 - Alternator Shaft Locking Jig



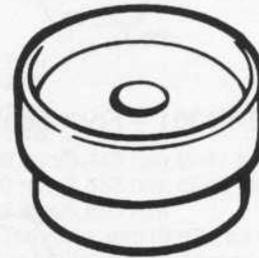
3880205 - Drive Chain Service (3 tools)



3880070-T0301 - Wheel Bearing Fitment



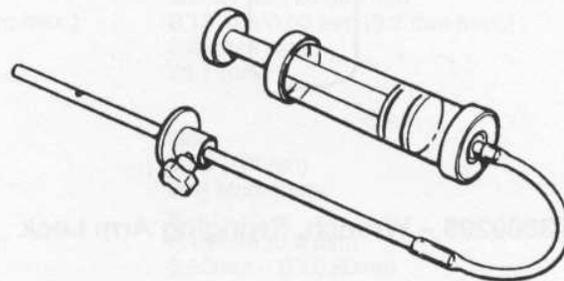
3880075-T0301 - Wheel Bearing Fitment



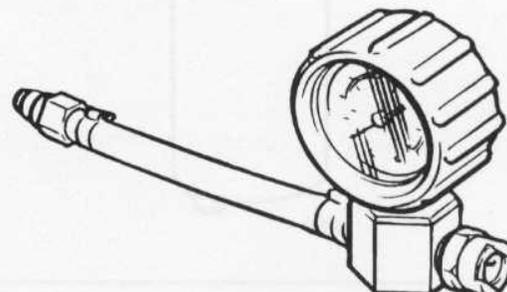
T3880105 - Angular Torque Gauge



3880160-T0301 - Fork Filler/Evacuator



T3880048 - Fuel Pressure Gauge

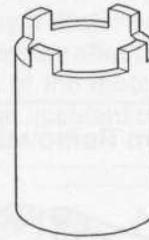


T3880250 - Engine Management Diagnostics

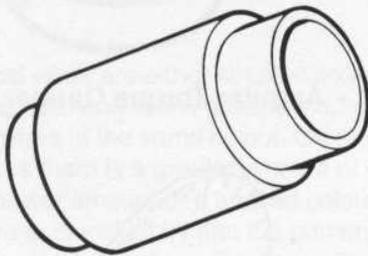


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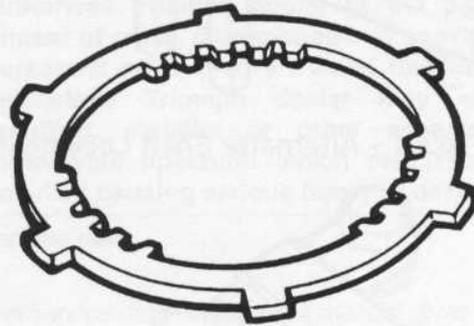
T3880088 - Wrench - Engine Mountings



3880080-T0301 - Fork Seal/Bearing Drift



T3880305 - Clutch Anti-rotation Tool



T3880290 - Wrench, Swinging Arm Clamp



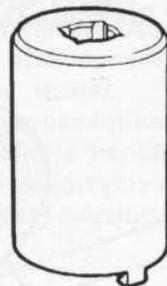
gabc

T3880311 - Oil Filter Wrench



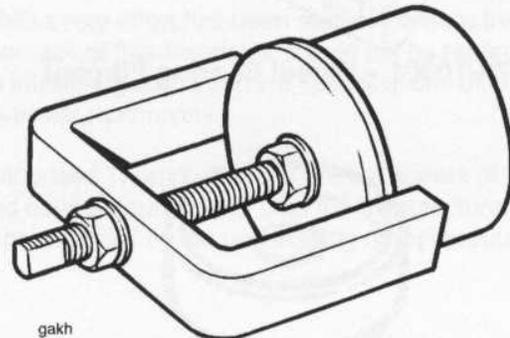
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T3880295 - Wrench, Swinging Arm Lock



gabd

T3880315 - Extractor - Cylinder Liners



gakh

Full Specification	Sprint ST	Sprint RS
Engine	3 Cylinder 12 Valve DOHC	3 Cylinder 12 Valve DOHC
Arrangement	Transverse In-line	Transverse In-line
Displacement	955 cc	955 cc
Bore x Stroke	79.0 mm x 65 mm	79.0 mm x 65 mm
Compression Ratio	11.2 : 1	11.2 : 1
Cylinder Numbering	Left to Right (No.3 adjacent to camchain)	Left to Right (No.3 adjacent to camchain)
Firing order	1-2-3	1-2-3
Max. Power	110 PS @ 9200 RPM	110 PS @ 9200 RPM
Max. Torque	97 Nm @ 6200 RPM	97 Nm @ 6200 RPM
Cylinder Head		
Valve Head Dia.	In. 32.5 mm Ex. 26.0 mm	32.5 mm 26.0 mm
Valve Lift	In. 9.35 mm Ex. 9.30 mm	9.35 mm 9.30 mm
Valve Stem Dia.	In. 5.490 mm/5.475 mm (5.47 mm min.) Ex. 5.470 mm/5.455 mm (5.45 mm min.)	5.490 mm/5.475 mm (5.47 mm min.) 5.470 mm/5.455 mm (5.45 mm min.)
Valve Guide Bore Dia.	5.515 mm/5.500 mm	5.515 mm/5.500 mm
Valve Stem to Guide Clearance	In. 0.04 mm/0.01 mm (0.07 mm max.) Ex. 0.06 mm/0.03 mm (0.09 mm max.)	0.04 mm/0.01 mm (0.07 mm max.) 0.06 mm/0.03 mm (0.09 mm max.)
Valve Seat Width (in head)	1.1 mm/0.9 mm (1.5 mm max.)	1.1 mm/0.9 mm (1.5 mm max.)
Valve Seat Width (valve)	2.5 mm/1.8 mm	2.5 mm/1.8 mm
Valve Seat Angle	45°	45°
Valve Spring 'Load at Length'	Inner .. 15 kg min. at 24.0 mm Outer 41 kg min. at 26.5 mm	15 kg min. at 24.0 mm 41 kg min. at 26.5 mm
Valve Clearance	In. 0.15 mm/0.10 mm Ex. 0.20 mm/0.15 mm	0.15 mm/0.10 mm 0.20 mm/0.15 mm
Valve Bucket Dia.	27.993 mm/27.987 mm	27.993 mm/27.987 mm
Valve Bucket Bore Dia.	28.021 mm/28.000 mm	28.021 mm/28.000 mm
Valve Timing	Inlet Open 25° BTDC (@ 1.0 mm Lift) Close 36° ABDC (@ 1.0 mm Lift) Duration 241° Exhaust Open 34° BBDC (@ 1.0 mm Lift) Close 25° ATDC (@ 1.0 mm Lift) Duration 237°	25° BTDC (@ 1.0 mm Lift) 36° ABDC (@ 1.0 mm Lift) 241° 34° BBDC (@ 1.0 mm Lift) 25° ATDC (@ 1.0 mm Lift) 237°
Camshaft Journal Dia.	22.93 mm/22.90 mm 22.936 mm/22.923 mm (Outrigger)	22.93 mm/22.90 mm 22.936 mm/22.923 mm (Outrigger)
Camshaft Journal Clearance	0.12 Max	0.12 Max
Camshaft Journal Bore Dia.	23.021 mm/23.000 mm	23.021 mm/23.000 mm
Camshaft End Float	0.13 mm/0.03 mm (0.2 mm max.)	0.13 mm/0.03 mm (0.2 mm max.)
Camshaft Run-out	0.05 mm max	0.05 mm max
Camchain Tensioner Spring Free Length	73.7 mm	73.7 mm
Clutch/Primary Drive		
Primary Drive	Type Gear Reduction Ratio . 1.75 (105/60)	Gear 1.75 (105/60)
Clutch	Type Wet Multi-plate	Wet Multi-plate
No. of Friction Plates	9	9
Plate Flatness	0.15 mm (0.2 mm)	0.15 mm (0.2 mm)
Friction Plate Thickness (new)	3.80mm - 0 +0.80mm	3.80mm - 0 +0.80mm
Friction Plate Thickness (service limit)	3.60mm	3.60mm
Clutch Shim Clearance	0.125 mm/0.075 mm	0.125 mm/0.075 mm
Clutch Actuation Method	Cable	Cable
Cable Free Play (at lever)	0.4 mm/0.8 mm	0.4 mm/0.8 mm

Full Specification	Sprint ST	Sprint RS
Piston/Crankshaft		
Cylinder Bore Diameter (std)	79.030 mm/79.050 mm	79.030 mm/79.050 mm
Cylinder Bore Diameter (service limit) ..	79.10 mm	79.10 mm
Piston Dia. (at 90° to gudgeon pin)	78.980 mm/78.960 mm Cyl. Nos. 1 & 3 78.970 mm/78.960 mm Cyl. No. 2	78.980 mm/78.960 mm Cyl. Nos. 1 & 3 78.970 mm/78.960 mm Cyl. No. 2
Piston Ring to Groove Clearance Top ..	0.02 mm/0.06 mm	0.02 mm/0.06 mm
	Second 0.02 mm/0.06 mm	0.02 mm/0.06 mm
Piston Ring Groove Width Top ..	1.03 mm/1.01 mm	1.03 mm/1.01 mm
	Second 0.83 mm/0.81 mm	0.83 mm/0.81 mm
	Oil . . . 1.53 mm/1.51 mm	1.53 mm/1.51 mm
Piston Ring End Gap Top ..	0.15 mm/0.30 mm	0.15 mm/0.30 mm
(new ring when fitted in bore)	Second 0.26 mm/0.41 mm	0.26 mm/0.41 mm
	Oil . . . 0.20 mm/0.70 mm	0.20 mm/0.70 mm
Gudgeon Pin Bore Dia. In Piston	19.008 mm/19.002 mm	19.008 mm/19.002 mm
Gudgeon Pin Dia.	19.000 mm/18.995 mm	19.000 mm/18.995 mm
Connecting Rod Small End Dia.	19.034 mm/19.016 mm	19.034 mm/19.016 mm
Connecting Rod Big End Side Clearance	0.3 mm/0.15 mm (0.5 mm max.)	0.3 mm/0.15 mm (0.5 mm max.)
Crankshaft Big End Journal Dia.	40.960 mm/40.946 mm (40.932 mm min.)	40.960 mm/40.946 mm (40.932 mm min.)
Crankshaft Big End Bearing Clearance .	0.066 mm/0.036 mm (0.1 mm max.)	0.066 mm/0.036 mm (0.1 mm max.)
Crankshaft Main Journal Dia.	37.976 mm/37.960 mm (37.936 mm min.)	37.976 mm/37.960 mm (37.936 mm min.)
Crankshaft Main Bearing Clearance	0.044 mm/0.020 mm (0.1 mm max.)	0.044 mm/0.020 mm (0.1 mm max.)
Crankshaft End Float	0.20 mm/0.05 mm (0.4 mm max.)	0.20 mm/0.05 mm (0.4 mm max.)
Transmission		
Type	6 Speed Constant Mesh	6 Speed Constant Mesh
Gear Ratios 1st . . .	2.733 (41/15)	2.733 (41/15)
	2nd .. 1.947 (37/19)	1.947 (37/19)
	3rd . . . 1.545 (34/22)	1.545 (34/22)
	4th . . . 1.291 (31/24)	1.291 (31/24)
	5th . . . 1.154 (30/26)	1.154 (30/26)
	6th . . . 1.074 (29/27)	1.074 (29/27)
Gear Selector Fork Thickness	5.9 mm/5.8 mm (5.7 mm min.)	5.9 mm/5.8 mm (5.7 mm min.)
Gear Selector Groove Width	6.1 mm/6.0 mm (6.25 mm max.)	6.1 mm/6.0 mm (6.25 mm max.)
Gear Selector Fork to Groove Clearance	0.55 mm max.	0.55 mm max.
Final Drive	Chain	Chain
Final Drive Ratio (1999 model year)	2.388 (18/43)	N/A
Final Drive Ratio (2000 model year on) . .	2.263 (19/43)	2.263 (19/43)
Chain Type	Regina 136 ORP	Regina 136 ORP
No. of Links	108	108
20 Link Length	321 mm	321 mm
Drive Chain Slack	35-40 mm	35-40 mm
Chain Lubrication	Mobil chain spray	Mobil chain spray
Lubrication		
Pressure Lubrication, Wet Sump		
Oil Capacity (dry fill, incl. filter)	4.00 litres	4.00 litres
Recommended Oil	Semi or fully synthetic 15w/40 oil meeting specification API/SH	Semi or fully synthetic 15w/40 oil meeting specification API/SH
Oil Pressure (in main gallery)	40.0 lb/in ² min. (@ 80°C Oil Temp.) (@ 5000 rpm)	40.0 lb/in ² min. (@ 80°C Oil Temp.) (@ 5000 rpm)
Oil Pump Rotor Tip Clearance	0.15 mm (0.2 mm max.)	0.15 mm (0.2 mm max.)
Oil Pump Body Clearance	0.22 mm/0.15 mm (0.35 mm max.)	0.22 mm/0.15 mm (0.35 mm max.)
Oil Pump Rotor End Float	0.02 mm/0.007 (0.1 mm max.)	0.02 mm/0.007 (0.1 mm max.)
Ignition System		
Type	Digital Inductive	Digital Inductive
Electronic Rev-Limiter	9600 rpm	9600 rpm
Pick up Coil Air Gap	1.00 mm ± 0.2 mm	1.00 mm ± 0.2 mm
Pick up Coil Resistance	1.3 KΩ ± 10% @ 20°C	1.3 KΩ ± 10% @ 20°C
Ignition Coil Type	Plug-top	Plug-top
Spark Plug Type	NGK-DPR8EA-9	NGK-DPR8EA-9
Spark Plug Gap	0.9 mm	0.9 mm

Full Specification	Sprint ST	Sprint RS
Fuel System		
Fuel Type	Unleaded, 95 RON (U.S. 89 CLC/AKI)	Unleaded, 95 RON (U.S. 89 CLC/AKI)
Fuel Tank Capacity	21 Litres	21 Litres
Low Level Warning Lamp	3.0 litres remaining	3.0 litres remaining
Fuel Pump Type	Submerged	Submerged
Fuel Pressure (nominal)	3.0 Bar	3.0 Bar
Purge control system	Electronic via fuel system ECU	Electronic via fuel system ECU
Fuel Injection System		
Type	Electronic, sequential	Electronic, sequential
Idle Speed	1200 RPM	1200 RPM
Injector Type	Twin jet, solenoid operated plate valve	Twin jet, solenoid operated plate valve
Throttle	Cable/twist grip/electronic throttle potentiometer	Cable/twist grip/electronic throttle potentiometer
Control Sensors	Barometric Pressure Throttle Position, Coolant Temperature Crankshaft Position, Induction air temperature	Barometric Pressure Throttle Position, Coolant Temperature Crankshaft Position, Induction air temperature
Cooling System		
Coolant Mixture	50/50 Distilled Water/Anti-Freeze	50/50 Distilled Water/Anti-Freeze
Anti-Freeze Type	Mobil Antifreeze	Mobil Antifreeze
Freezing Point	-35°C	-35°C
Cooling System Capacity	2.8 Litres	2.8 Litres
Radiator Cap Opening Pressure	1.1 Bar	1.1 Bar
Thermostat Opening Temperature	85°C (nominal)	85°C (nominal)
Cooling Fan Switch On Temperature	95°C	95°C
Temperature Gauge Sensor Resistance	2.9 - 3.3KΩ @ 15°C	2.9 - 3.3KΩ @ 15°C
Suspension		
Front Fork Travel	127 mm	127 mm
Recommended Fork Oil Grade	Showa SS8	Showa SS8
Oil Level (fork fully compressed)	145 mm	145 mm
Oil Volume (dry fill)	459cc	459cc
Front Fork Pull Through	Tube flush with handlebar upper face	Tube flush with handlebar upper face
Rear Wheel Travel	120 mm	120 mm
Rear Suspension Bearing Grease	Mobil Grease HP 222	Mobil Grease HP 222
Brakes		
Front type	Two Hydraulically Actuated Four Piston Calipers acting on twin discs	Two Hydraulically Actuated Four Piston Calipers acting on twin discs
Caliper Piston Dia.	33.96 mm/30.23 mm	33.96 mm/30.23 mm
Disc Dia.	320 mm	320 mm
Disc Thickness	4 mm (3.5 mm minimum)	4 mm (3.5 mm minimum)
Disc Run-out Max.	0.3 mm (0.1 mm standard)	0.3 mm (0.1 mm standard)
Master Cylinder Diameter	14mm	14mm
Recommended Fluid	Mobil Universal Brake and Clutch Fluid DOT4	Mobil Universal Brake and Clutch Fluid DOT4
Rear Type	Hydraulically Actuated 2 Piston Caliper Single disc	Hydraulically Actuated 2 Piston Caliper Single disc
Caliper Piston Dia.	27 mm	27 mm
Disc Dia.	255 mm	255 mm
Disc Thickness	6 mm (5 mm minimum)	6 mm (5 mm minimum)
Disc Run-out Max.	0.3 mm (0.1 mm standard)	0.3 mm (0.1 mm standard)
Master Cylinder Diameter	14mm	14mm
Recommended Fluid	Mobil Universal Brake and Clutch Fluid DOT4	Mobil Universal Brake and Clutch Fluid DOT4

TORQUE WRENCH SETTINGS

NOTE: Figures apply to both models unless stated

Cylinder Head Area

Application	Torque(Nm)	Notes
Cam cover to cylinder head	10	
Cam chain tensioner to crankcase	10	
Cam chain tensioner centre bolt	23	
Camshaft bearing caps to head	10	
Camshaft sprocket to camshaft	15	
Cam chain tensioner blade to crankcase	18	
Cam chain top pad to head	10	
Cylinder head to crankcase (M6 screws)	12	
Cylinder head to crankcase bolts	See Text	

Clutch

Application	Torque(Nm)	Notes
Clutch cover to crankcase	9	
Clutch centre nut	105	
Clutch pressure plate to centre	10	
Clutch cover sound suppression plate to cover	12	

Balancer, Crankshaft and Crankcase

Application	Torque(Nm)	Notes
Crankcase upper to lower (M8 fixings)	See Text	
Crankcase upper to lower (M6 fixings)	See Text	
Balancer bearing caps	See text	
Balancer retaining bolt	40	
Connecting rod big end nut	See Text	
Crankshaft sensor disc to crankshaft	22	
Crankshaft sensor mounting plate to crankcase	13	
Breather disc to crankshaft	7	

Engine Covers

Application	Torque(Nm)	Notes
Crankshaft cover to crankcase	9	
Sprocket cover to crankcase	9	
Clutch cover to crankcase	9	
Oil sight glass to clutch cover	5	
Clutch cover sound suppression plate to cover	12	
Water outlet cover to cylinder head	9	

Transmission

Application	Torque(Nm)	Notes
Output sprocket to output shaft	132	
Detent wheel to selector drum	12	
Detent arm stud	9	
Detent arm nut	9	
Selector drum bearing retaining screw	12	
Stop plate to crankcase	9	
Selector shaft retainer	6	
Spring abutment bolt	23	
Alternator drive gear/housing to spindle	40	

Lubrication System

Application	Torque(Nm)	Notes
Sump to crankcase	12	
Sump drain plug to sump	25	
Oil pressure relief valve to crankcase	15	
Low oil pressure warning light switch to crankcase	13	
Oil filter to adapter	10	
Oil feed pipe to cylinder head	25	
Oil cooler connections to sump	25	Use new washers
Oil cooler connections to cooler	25	Use new washers
Oil cooler to radiator mountings	9	
Oil pump to crankcase	12	

Final Drive

Application	Torque(Nm)	Notes
Rear sprocket to cush drive - ST model only	33	
Rear sprocket to cush drive - RS model only	55	
Chain rubbing strip to swinging arm - ST model only	4.5	
Cush drive housing to shaft - ST model only	146	Use a new nut

Cooling System

Application	Torque(Nm)	Notes
Water pump to crankcase	10	
Thermostat housing to radiator	5	
Thermostat front housing to rear	7	
Radiator to frame	9	
Water elbow to cylinder head	12	
Coolant Drain Plug	13	Use a new washer

Fuel System and Airbox

Application	Torque(Nm)	Notes
Fuel tank to frame - forward fixing	8	
Fuel tank to frame - rear fixings	5	
Fuel cap to fuel tank	3	
Fuel pump mounting plate to fuel tank	5	Never overtighten
Fuel pump clamp screw	6	
Fuel filter clamp screw	4	
Throttle body to cylinder head	12	
Throttle potentiometer to throttle body	2	
Fuel feed/return pipe connections to fuel rail	5	
Fuel rail to throttle bodies	5	
Exhaust downpipe clamp to cylinder head	See text	
Exhaust mounting bracket to frame	15	
Airbox to bracket	5	
Oxygen sensor to exhaust system	40	

Wheels

Application	Torque(Nm)	Notes
Front wheel spindle/axle bolt - both models	61	
Fork pinch bolts - both models	20	
Rear wheel to stub axle - ST model only	146	
Rear wheel spindle nut - RS model only	110	

Rear Suspension - ST Model only

Application	Torque(Nm)	Notes
Swinging arm spindle bolts	60	
Swinging arm rubbing strip bolts	4.5	
Caliper carrier location peg	40	
Rear hub/eccentric adjuster clamp bolt	55	
Chain guard bolts	4.5	
Rear wheel drive pin to axle	9	
Rear suspension unit upper mounting bolt	48	
Rear suspension unit lower mounting bolt/drop to drag link pivot	48	
Drag link pivot at frame	48	

Rear Suspension - RS Model only

Application	Torque(Nm)	Notes
Swinging arm spindle	110	
Chain guard to swinging arm	7	
Chain adjuster locknut	27	
Rear suspension unit upper mounting bolt	48	
Rear suspension unit lower mounting bolt to drop links	48	
Drag link pivot at frame	48	
Drop links to swinging arm	48	

Front Suspension

Application	Torque(Nm)	Notes
Upper yoke pinch bolt	20	
Lower yoke pinch bolt	35	
Fork top cap to inner tube	30	
Fork pinch bolts	20	
Upper yoke centre nut	65	
Damping cylinder bolt	25	
Handlebar to top yoke	22	

Brakes

Application	Torque(Nm)	Notes
Front brake caliper to fork	40	
Front brake pad retaining pin	20	
Front brake caliper bleed screw	7	
Front brake hose to caliper	25	Use new washers
Front brake master cylinder to handlebar	15	
Front brake master cylinder reservoir to bracket	12	
Front brake hose to master cylinder	25	
Front brake disc to wheel	22	
Rear brake caliper to carrier	40	
Rear brake pad retaining pin	20	
Rear brake caliper bleed screw	7	
Rear brake hose to caliper	25	
Rear brake master cylinder to frame	27	
Rear brake master cylinder reservoir to battery box	7	
Rear brake hose to master cylinder	25	
Rear brake disc fixings	22	

Footrests, Control Plates and Engine Mountings

Application	Torque(Nm)	Notes
Upper crankcase to frame	See text	
Lower crankcase to frame	See text	
Cylinder head to frame	See text	
Control plate to frame	30	
Rear footrest hanger to frame	30	
Side stand mounting bracket	40	
Side stand pivot bolt	20	

Electrical

Application	Torque(Nm)	Notes
Alternator to crankcase	20	
Alternator drive to alternator	44	
Starter motor to crankcase	10	
Side stand switch to bracket	5	
Instruments to housing - ST	4	
Instruments to subframe	2	

Bodywork - ST model only

Application	Torque(Nm)	Notes
Front mudguard to fork - front section	5	
Front mudguard to fork - rear section	7	
Side panels to frame	3	
Grab rail to frame	27	
Belly panel to bodywork	3	
Side panel to bracket	7	
Cockpit to brackets	5	
Mirrors to cockpit	9	
Cockpit subframe to frame	28	

Bodywork - RS model only

Application	Torque(Nm)	Notes
Front mudguard to fork - front section	5	
Front mudguard to fork - rear section	7	
Side panels to brackets	6	
Side panels brackets to frame	7	
Seat cowl to seat	5	
Cockpit to brackets	6	
Mirrors to cockpit	9	
Windscreen to cockpit	6	
Cockpit subframe to frame	28	

MAINTENANCE

CONTENTS

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INTRODUCTION

This maintenance schedule given overleaf describes the maintenance requirements for the Sprint ST 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.

Service Check Sheets

Triumph are pleased to be able to offer pads of service check sheets to aid technicians during servicing of Triumph motorcycles. Each pad has 50 single sided service sheets which have tick boxes to indicate the correct maintenance requirement at each mileage interval.

The pads are available from your Triumph parts department under the following part numbers:

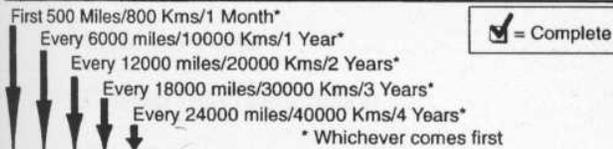
T3854095 - Service Sheet Pad, English Language

T3854096 - Service Sheet Pad, French Language

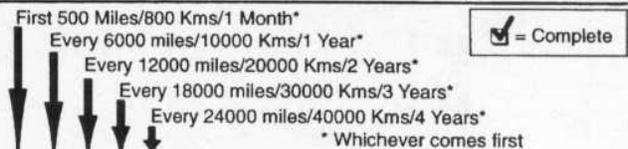
T3854097 - Service Sheet Pad, German Language

SCHEDULED MAINTENANCE REQUIREMENTS - ALL FUEL INJECTED MODELS

Carry out all the operations specified below at the required intervals. Additional operations must be carried at the specified time/mileage interval whichever comes first. **IMPORTANT: under severe operating conditions, certain items require more frequent servicing, refer to the Owner's handbook for further information.**



- 1. Position motorcycle in a position for repair. Ensure that the motorcycle is safely supported on/by any lifting equipment used.
- 2. Check lights, horn, indicators, instrument warning lights, brake lights and instruments for correct operation.
- 3. Check engine management system for stored diagnostic trouble codes.
- 4. Disconnect battery, negative (black) lead first. Remove bodywork, fuel tank and airbox as necessary. Always store displaced bodywork safely to prevent accidental damage and observe the fuel handling precautions in the service manual.
- 5. Check/adjust battery electrolyte level (Yuasa batteries only).
- 6. Inspect fuel system and hoses for leaks damage, cracks, deterioration and chafing.
- 7. Renew fuel filter.
- 8. Inspect cooling system and hoses for signs of leaks, damage, chafing, cracks and deterioration. Visually inspect hose clips for security.
- 9. Inspect for oil leaks from all areas including oil cooler, oil cooler pipes and engine area.
- 10. Add 50% coolant mixture to the expansion tank as necessary. Do not overfill.
- 11. Inspect throttle cable for damage, fraying and for correct level of free play. Adjust if necessary.†
- 12. Inspect brake pads for wear.
- 13. Check and top up both brake master cylinders.
- 14. Check and adjust clutch cable.
- 15. Renew air cleaner element.
- 16. Inspect wheels for cracks, kerb damage etc.
- 17. Inspect tyres for damage, tread wear, bulges, cuts and splits. Check/adjust tyre inflation pressures.
- 18. Remove sump plug and allow oil to drain out.
- 19. Renew the sump plug washer and refit sump plug.
- 20. Renew the engine oil filter.
- 21. Refill the engine with correct specification engine oil.
- 22. Adjust spark plug gaps.
- 23. Renew spark plugs.
- 24. Check all valve clearances, adjust as necessary.†
- 25. Inspect drive chain for wear.††
- 26. Inspect drive chain for correct adjustment. (also to be checked every 500 miles)



- 27. Lubricate drive chain. (also to be checked every 200 miles)
- 28. Lubricate rear wheel bearing (not Tiger)
- 29. Raise front wheel off the ground and inspect steering head (headstock) bearings for free play. Lower the front wheels to the ground when complete.
- 30. Check steering for free operation.
- 31. Inspect front forks for oil leaks/damage/smooth operation.
- 32. Lubricate the headstock bearing.
- 33. Renew fork oil.
- 34. Temporarily fit slave fuel supply.
- 35. Attach exhaust extraction equipment, refit the battery and start the engine. Check that low oil pressure warning light extinguishes. Stop the engine. Check and adjust the engine oil level.
- 36. Attach vacuum gauges to each throttle body. Start the engine and allow to reach normal operating temperature. Check/adjust the throttle body vacuum synchronisation.
- 37. Download latest tune software version to ECM then adjust idle CO setting (not closed loop catalyst models)
- 38. Reset the adaptive stepper position (not closed loop catalyst or pre 99 model-year models)
- 39. Visually inspect all fixings for security. Tighten to the correct torque as necessary.
- 40. Refit all items removed during operation 4.
- 41. Renew the pressure control valve in the evaporative loss control system. (U.S. California models only).
- 42. Carry out road test (minimum 15 km/10 miles).

Additional Operations

The following additional operations must be carried out at the specified time/mileage interval whichever comes first.

Every 2 years/12,000 miles/20,000 Km

- 1. Renew all brake master cylinder, and brake caliper pressure and dust seals.
- 2. Renew brake fluid.
- 3. Renew coolant. Ensure 50% coolant mixture is maintained.

Every 3 years

- 1. Lubricate the swinging arm bearings.

Every 4 years/24,000 miles/40,000Km

- 1. Renew all brake hoses.

† Adjustments subject to additional charge above basic cost of servicing.

†† Renew drive chain if worn to or above the service limit..

CYLINDER HEAD

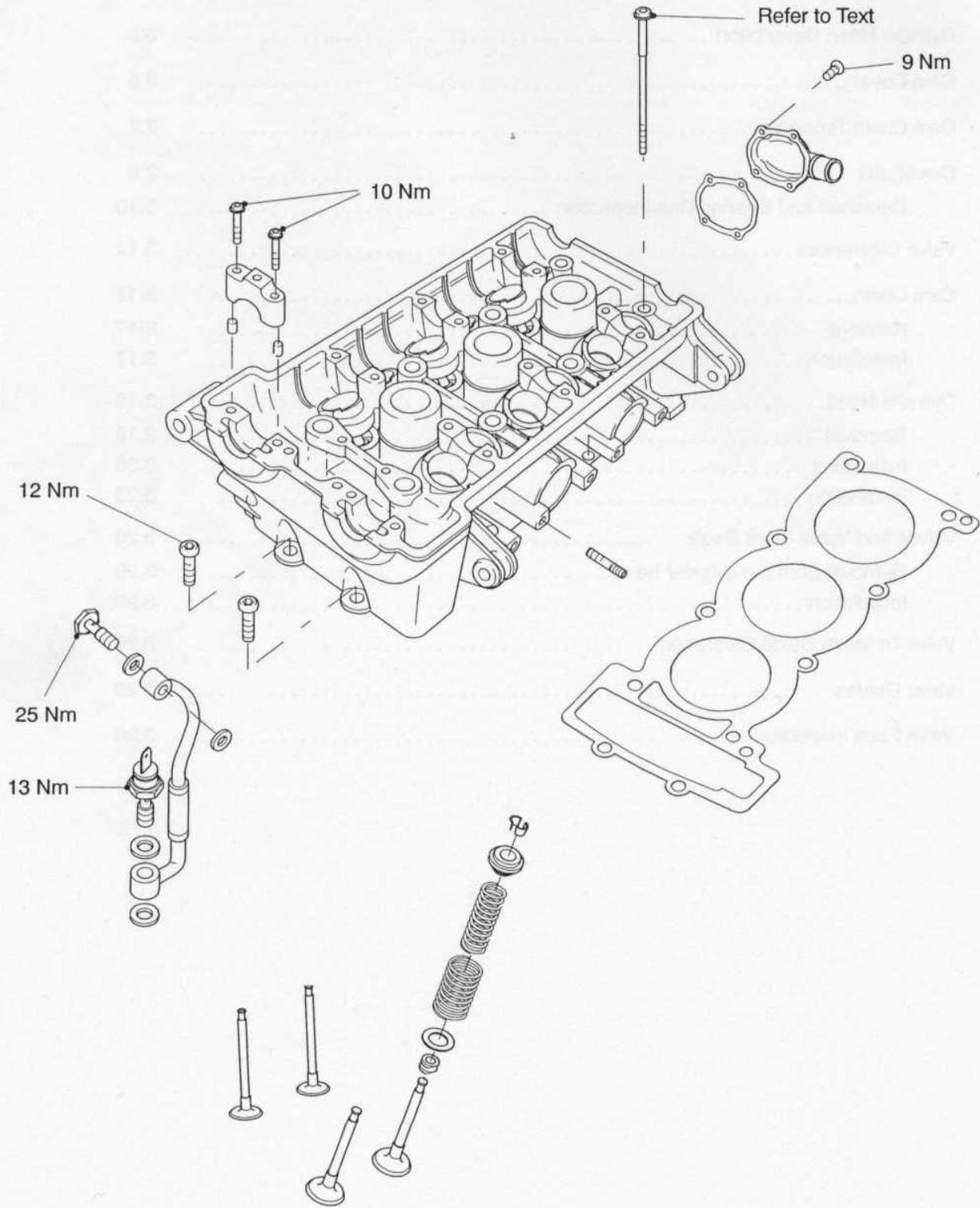
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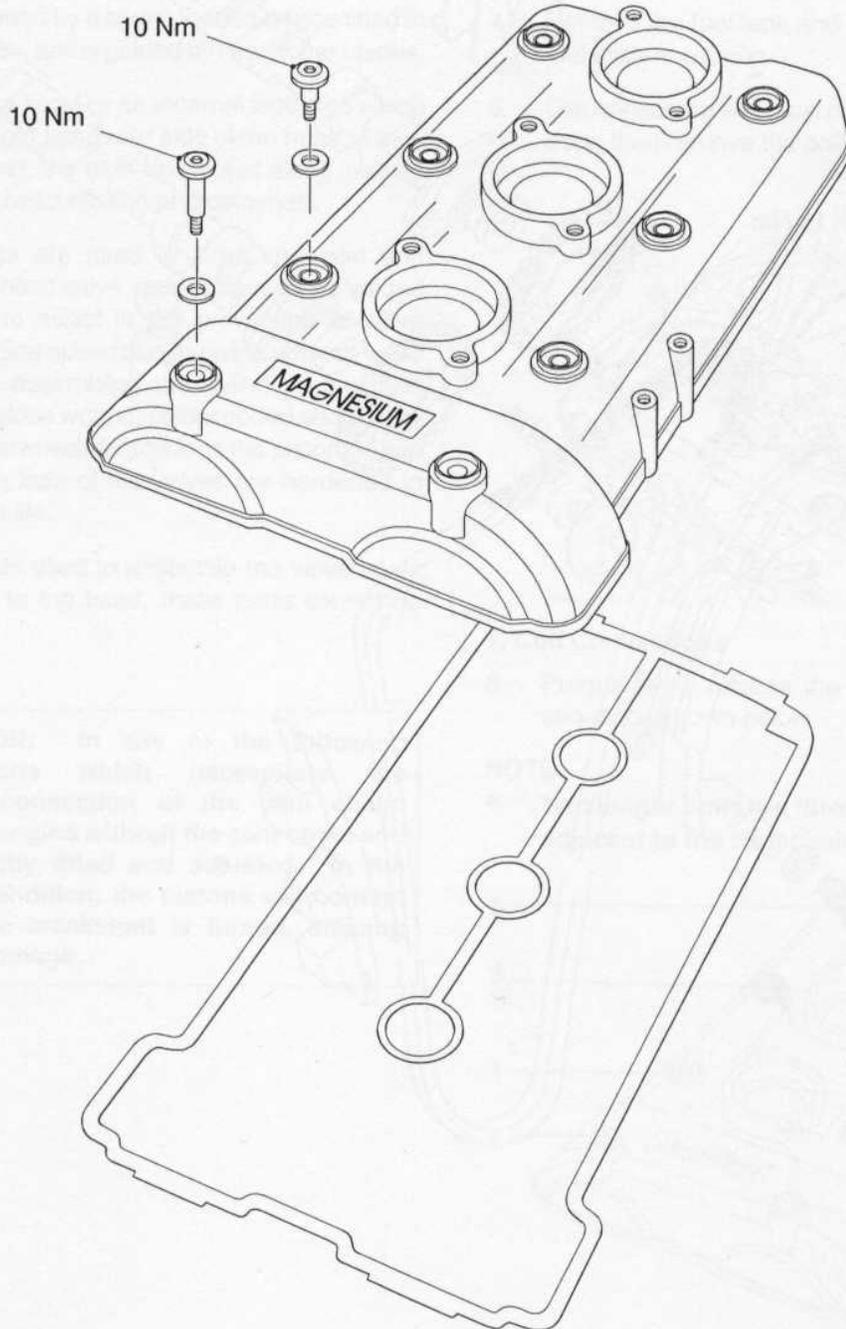
Exploded View

Cylinder Head and Valves



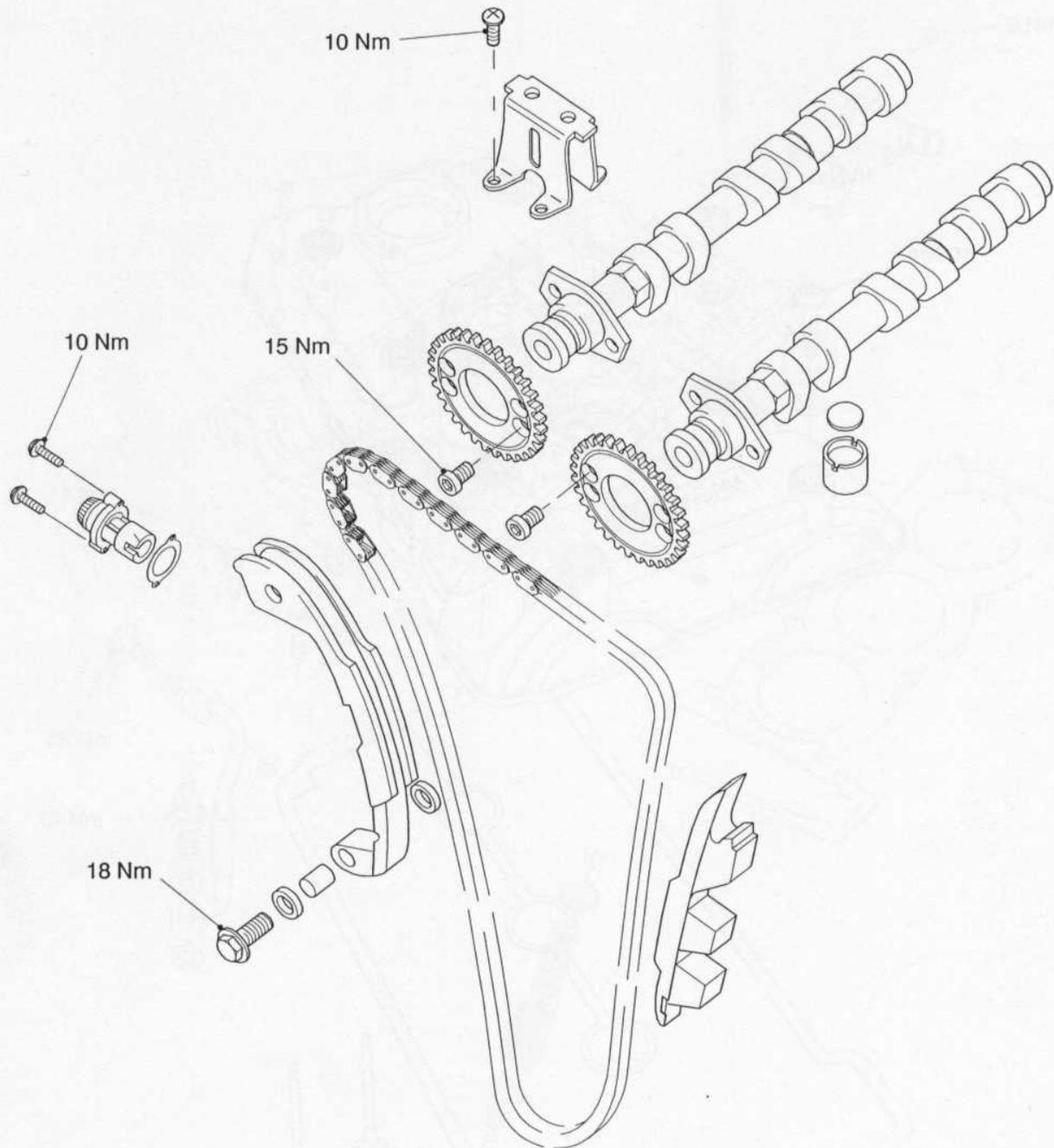
Exploded View

Cam Cover



Exploded View

Camshaft and Camshaft Drive



CYLINDER HEAD DESCRIPTION

The engine is fitted with an aluminium 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 head without additional bearings. Valve clearances are adjusted by changing variable thickness shims which sit between the valve tappet and the camshaft.

The camshafts are driven by a silent-type chain.

The chain is tensioned by a spring loaded device fitted in the upper crankcase, and is guided by two rubber blades.

Oil is supplied to the head by an external feed pipe which is situated at the right hand rear side of the head. Once supplied to the head, the oil is distributed along internal drillings within the head casting and camshaft.

Dual valve springs are used to close the inlet and exhaust valves. These valve springs have close wound coils at one end to assist in the prevention of valve bounce at high engine speed and to give a smooth valve actuation. When assembling the cylinder head it is important that the close wound, colour coded ends of the springs are fitted downwards (towards the piston). Both the tip and seating face of the valves are hardened to give a long service life.

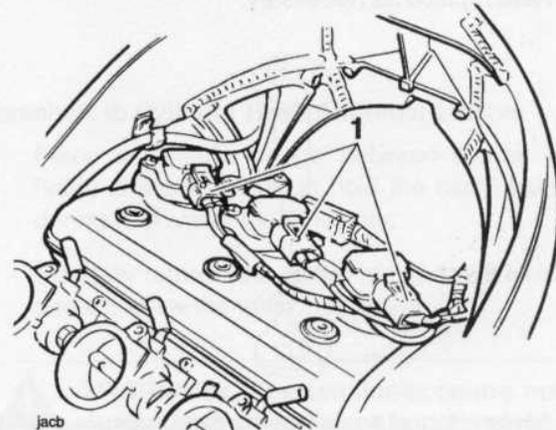
Due to the methods used to assemble the valve seats and valve guides to the head, these parts cannot be replaced.

CAUTION: In any of the following operations which necessitate the removal or disconnection of the cam chain, NEVER turn the engine without the cam 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

1. Remove the seat and disconnect the battery, negative (black) lead first.
2. Remove the side panel assembly as detailed in the body section.
3. Remove belly panel (Sprint ST only) and both lower fairings.
4. Remove the fuel tank and airbox as detailed in the fuel system section.
5. Disconnect the electrical connections to the ignition coils, then remove the coils from the cam cover.

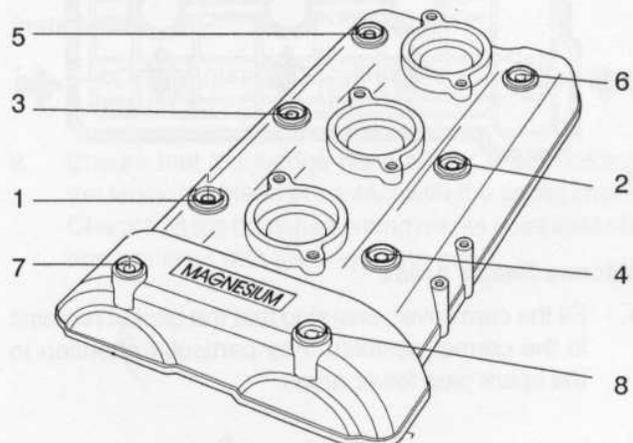


1. Coil Connections

6. Progressively release the cam cover bolts in the sequence shown below.

NOTE:

- Two longer bolts are fitted at the right hand end adjacent to the cam chain.



Cam Cover Bolt Release Sequence

7. Remove the cover.



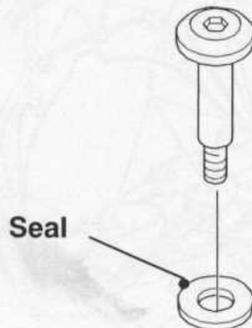
CAUTION: Never use a lever to remove the camshaft cover from the head.

Using a lever will cause damage to the head and cam cover which could lead to an oil leak.

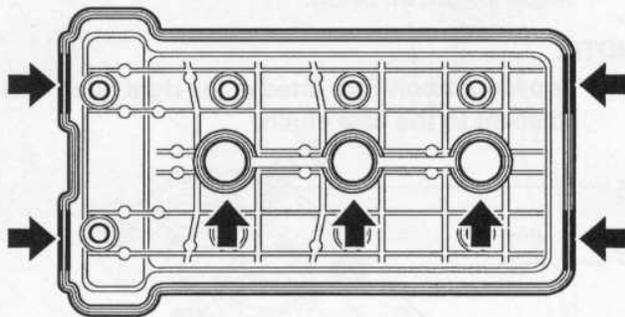
8. Remove the cam cover gasket.
9. Remove any residual oil from the front of the head using a syringe or lint free cloth.

Installation

1. Check the condition of the cam cover seal. Refit/replace as necessary.
2. Check the condition of the cam cover bolt seals. Refit/replace as necessary.



3. Apply silicone sealer to the areas arrowed in the diagram below.



jaoc

Silicone Sealer Areas

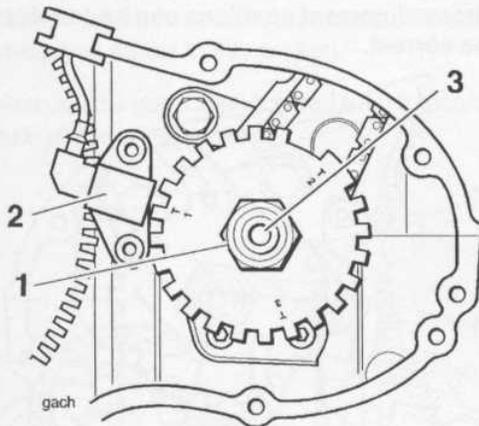
4. Fit the cam cover, ensuring that the gasket remains in the correct position. Pay particular attention to the spark plug tower areas.

5. Fit the cam cover screws and screw seals, then tighten until finger tight.
6. Finally, tighten the cam cover screws, in same order as for removal, to **10 Nm**.
7. Fit the ignition coils and tighten the coil fixings to **10 Nm**.
8. Reconnect the ignition coils.
9. Refit the airbox and fuel tank as described in the fuel system section.
10. Refit any bodywork previously removed.
11. Reconnect the battery positive (red) lead first.
12. Refit the seat.

CAM CHAIN TENSIONER

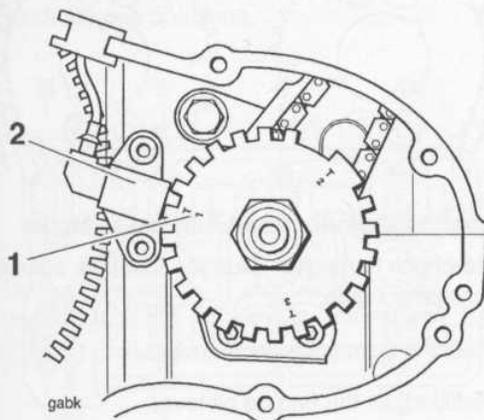
Removal

1. Remove the cam cover as described earlier in this section.
2. Drain the engine oil into a suitable container.
3. Remove the clutch cover to give access to the ignition rotor.



1. Crankshaft Rotor Clamp Nut
2. Crankshaft Position Sensor
3. Centre Bolt

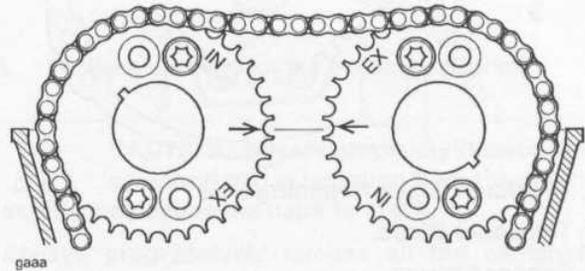
4. Rotate the crankshaft clockwise (the normal direction of rotation), using the nut fitted to the end of the crankshaft. Stop rotation when number 1 cylinder is at top dead centre (TDC), that is when the 'T1' mark on the crankshaft rotor aligns with the crankshaft position sensor.



1. 'T1' Mark
2. Crankshaft Position Sensor

NOTE:

- In addition to the crank sensor/wheel alignment, at TDC, the alignment marks on the camshaft sprockets will point inwards at a point level with the joint face.



Camshaft to Cylinder Head Alignment Marks

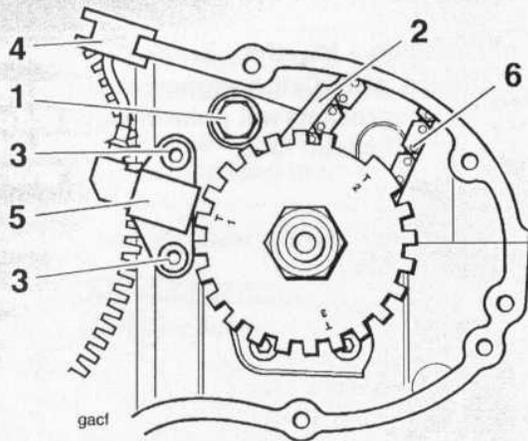
5. Place a suitable wedge between the tensioner blade and crankcase, to hold the cam chain taut during removal of the tensioner.
6. Carefully remove the centre nut from the tensioner and withdraw the tensioner spring.

! WARNING: The tensioner centre nut is under spring tension. Always wear hand, eye and face protection when withdrawing the centre nut and take great care in order to minimise the risk of injury and loss of components.

7. Remove the bolts securing the tensioner to the upper crankcase and remove the tensioner and gasket.

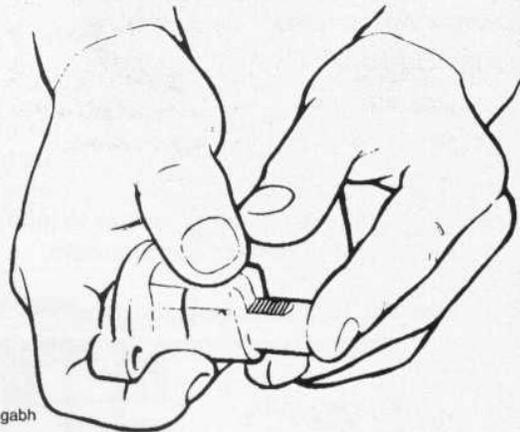
Installation

1. Check that number 1 cylinder is still at top dead centre (TDC).
2. Ensure that the wedge fitted earlier is still holding the tensioner blade in contact with the timing chain. Check that the camshaft timing marks point inwards and are level with the line of the head.



1. Tensioner Blade Retaining Bolt
2. Tensioner Blade
3. Sensor Screws
4. Grommet
5. Crankshaft Position Sensor
6. Cam Chain

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



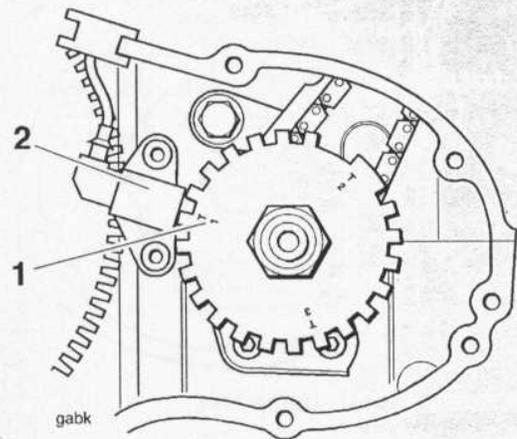
Tensioner Plunger Set-up

4. Fit the tensioner, complete with a new gasket, to the upper crankcase and tighten the retaining bolts to **10 Nm**.
5. Remove the tensioner blade wedge, taking care not to move or damage the tensioner blade.
6. Fit a new sealing washer to the centre nut. Using finger pressure only, push the ratchet section of the tensioner into firm contact with the tensioner blade. Refit the spring and centre nut to the tensioner. Tighten the centre nut to **23 Nm**.
7. Check that the tensioner plunger is correctly located in the middle of tensioner blade when viewed from above.

8. Rotate the engine through 4 full revolutions, and reset number 1 cylinder to TDC. Ensure that the 'T1' mark on the crankshaft rotor is aligned with the crankshaft position sensor.

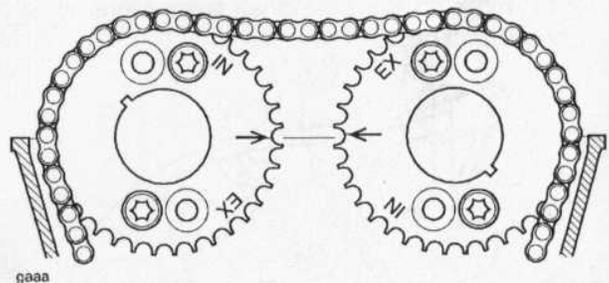
NOTE:

- Depending on the engine configuration, with the camshaft arrows aligned as shown, the 'T1' mark on the crankshaft may align with the crankshaft position sensor at either the rear, centre or front edge of the gear tooth. Any of those alignment positions can be considered to be correct.



1. Ignition Rotor
2. Crankshaft Position Sensor

9. Re-check that the camshaft timing marks align as illustrated below.



Camshaft to Cylinder Head Alignment Marks

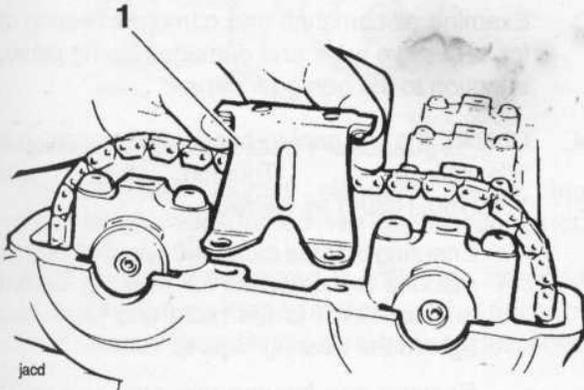
10. Re-check tensioner plunger location against the tensioner blade.
11. Refit the cam and clutch covers.
12. Refill/adjust the engine oil level.

CAMSHAFTS

Removal

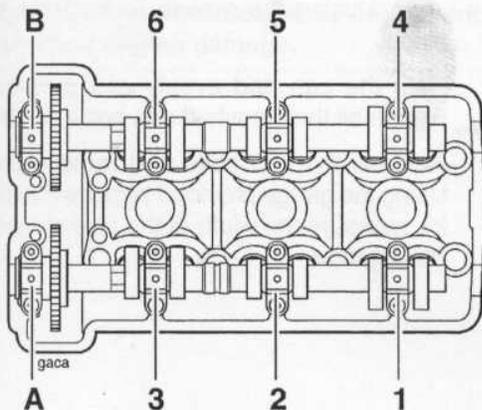
NOTE:

- The camshafts can be removed from the head without the complete removal of the timing chain. However, the chain must first be detached from the camshafts. The camshafts and sprockets are removed as an assembly.
1. Remove the cam cover and cam chain tensioner as described earlier in this section.
 2. Remove the cam chain top pad from the cam chain side of the cylinder head.



1. Cam Chain Top Pad

3. To ensure that the camshaft caps are refitted in the same positions as prior to removal, mark the position of each camshaft cap in relation to the head. A laundry marker or similar may be used to mark the cap positions.



Camshaft Cap Numbering

NOTE:

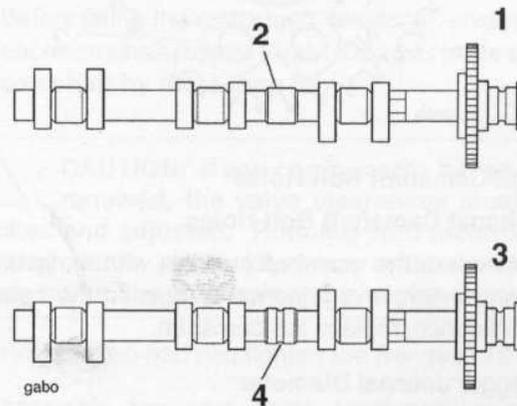
- The caps are numbered sequentially and must not be interchanged for a different position on the head. The camshaft caps on the outside of the timing chain (known as outriggers) are marked 'A' for the exhaust and 'B' for the inlet.
4. Progressively release each of the fasteners securing the camshaft caps of the inlet camshaft to the cylinder head.
 5. Release the caps for the exhaust camshaft.

CAUTION: Never completely release one camshaft cap in isolation from the others as this may cause the caps to crack. Always progressively release all the camshaft caps of one camshaft before final removal.

CAUTION: Always completely release and remove one camshaft before starting to release the other. 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.

NOTE:

- The inlet and exhaust camshafts are different. They can be identified by a plain area in the centre of the exhaust cam and a groove in the same place on the inlet cam.



1. Exhaust Camshaft
2. Plain Section
3. Inlet Camshaft
4. Grooved section

6. Once the pressure on all the camshaft caps has been released, remove the fasteners and caps complete with dowels.

NOTE:

- Each cap is located by two dowels which align the cap to the head. If the caps cannot be removed using hand pressure, gently tap each cap with a soft faced tool to release.
7. Lift the cam chain from the exhaust camshaft sprocket and remove the exhaust camshaft.
 8. Repeat the procedure for the inlet camshaft.

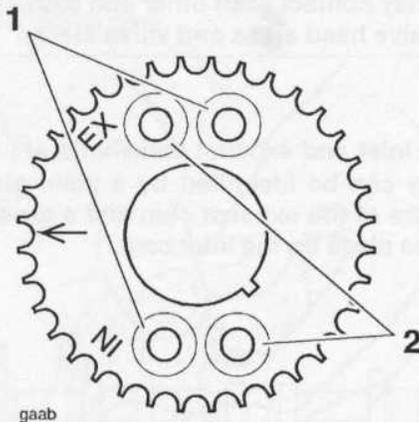
Camshaft and Bearing Cap Inspection

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



CAUTION: The same sprocket is used for both inlet and exhaust camshafts. To attach the sprocket to the 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.

**1. Inlet Camshaft Bolt Holes****2. Exhaust Camshaft Bolt Holes**

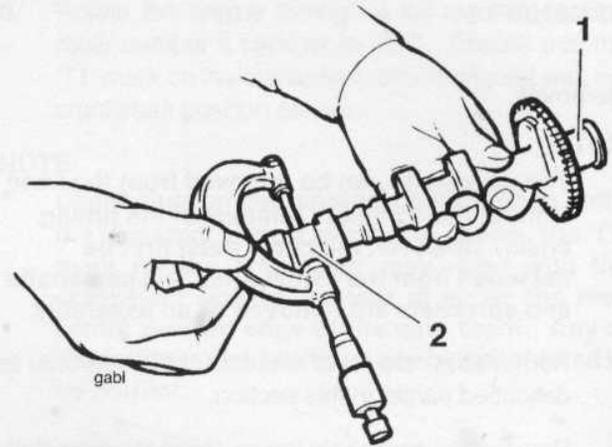
2. Measure the camshaft journals with a micrometer or vernier. If any journal is outside the specified tolerance, replace the camshaft.

Outrigger Journal Diameter

Standard: 22.923 - 22.936 mm

Standard Journal Diameters

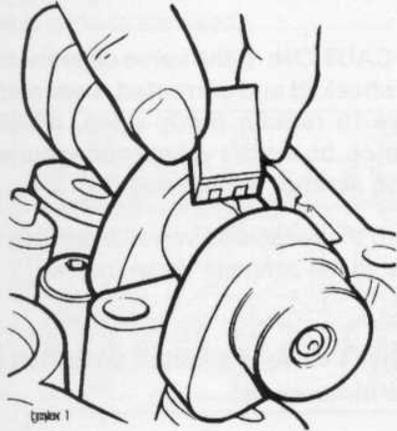
Standard: 22.93 mm

**1. Outrigger Journal****2. Standard Journal**

3. Examine all camshaft and camshaft bearing caps for excessive wear and damage, paying particular attention to the outrigger caps.
4. Check the journal-to-head clearances, using 'Plastigauge' (Triumph part number 3880150-T0301) as follows:
 - Ensuring that the camshaft sprocket alignment marking is located as for removal, assemble one camshaft to the head and progressively tighten the bearing caps to **10 Nm**.
 - Remove one bearing cap only and wipe the exposed areas of both the camshaft journal and cap.
 - Apply a thin smear of grease to the journal and a small quantity of silicone release agent to the cap.
 - Size a length of the Plastigauge to fit across the camshaft journal. Fit the Plastigauge to the journal using the grease to hold the strip in place.
 - Refit the cap and evenly and progressively tighten all the camshaft cap bolts to **10 Nm**.
 - Release the cap bolts and remove the cap. Using the gauge provided with the Plastigauge kit, measure the width of the now compressed Plastigauge.

NOTE:

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



Measuring The Compressed Plastigauge.

5. Calculate the journal clearance using the Plastigauge chart supplied with the Plastigauge kit.
6. If the clearance measured is within the specified tolerance, remove the cap and clean off all traces of Plastigauge. Assemble the camshafts as described in this section.

NOTE:

- If the measured clearance is outside the tolerance, and the camshaft journals are within tolerance, the cylinder head must be replaced.

CAUTION: Although Plastigauge is oil soluble, all traces of the material must be removed to prevent blockage of the oil drillings and resultant engine damage.

Installation

1. Thoroughly clean the camshafts and journals. Inspect the ends of the camshafts for correct fitment of the sealing plugs. Lubricate the camshafts with clean engine oil before fitting to the head.
2. Locate each camshaft to the head ensuring the camshafts are correctly identified (inlet and exhaust) and also correctly located over their respective valve banks.
3. Working on one camshaft at a time, locate the cam chain over the cam sprocket. Position the camshaft in the same position as for removal **before attempting to fit the caps** (that is, with the timing marks on the camshaft sprockets level and pointing inwards, and with the crankshaft position sensor in line with the 'T1' mark on the crank rotor).
4. Repeat the procedure for the other camshaft.

CAUTION: If the camshafts and caps are fitted without first aligning the timing marks on both the crankshaft and camshaft sprockets, or if both camshafts are fitted at the same time, the inlet and exhaust valves will contact each other causing damage to both the head and the valves.

5. Lubricate the threads of the camshaft cap screws with engine oil and evenly and progressively tighten to 10 Nm.
6. Before fitting the cam chain tensioner, ensure that each camshaft rotates freely. **Do not rotate either camshaft by more than 5°.**

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.

7. Refit the top pad and tighten the fixings to 10 Nm.
8. Assemble the cam chain tensioner using the instructions given earlier in this section.
9. Check the valve clearances. Adjust as necessary.
10. Refit the engine covers, coils, airbox, fuel tank and bodywork as described earlier in this section.

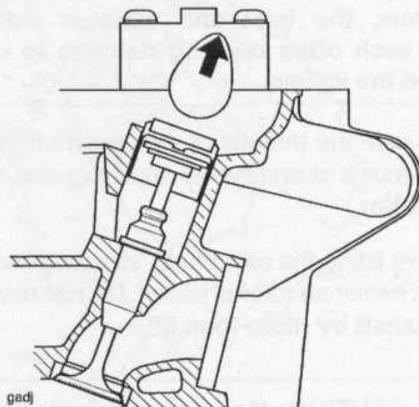
VALVE CLEARANCES

Camshaft, valve, valve shim and valve seat wear affects the valve clearances. The effect of this wear is to change the gap between the camshaft and valve shim, 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.

VALVE CLEARANCE MEASUREMENT

NOTE:

- **Valve clearance measurement must be carried out with the engine cold.**
1. Remove the cam 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 until a pair of camshaft lobes are positioned pointing away from the valves.



Cam Lobe Pointing Away From Valve

4. Using feeler gauges, measure and record the clearances **for this pair of valves only**.
5. Repeat the process until the valve clearances for all valves have been checked.

NOTE:

- **If the measurement does not fall within the specified range, adjustment must be made.**

NOTE:

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

INLET	0.10 - 0.15 mm
EXHAUST	0.15 - 0.20 mm



CAUTION: If the valve clearances are not checked and corrected, wear could cause the valves to remain partly open, which lowers performance, burns the valves and valve seats and may cause serious engine damage.

6. Record the measured valve clearances on a chart similar to the example shown below.

NOTE:

- **Number 1 valve is situated on the left hand side of the motorcycle.**

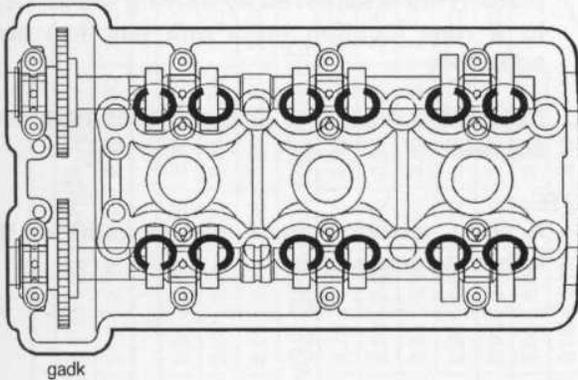
Typical Valve Clearance Chart

Inlet Valve N ^o	Gap Measured
1	as measured (mm)
2	as measured (mm)
3	as measured (mm)
4	as measured (mm)
5	as measured (mm)
6	as measured (mm)
Exhaust Valve N ^o	Gap Measured
1	as measured (mm)
2	as measured (mm)
3	as measured (mm)
4	as measured (mm)
5	as measured (mm)
6	as measured (mm)

VALVE CLEARANCE ADJUSTMENT

Valves are adjusted, in pairs, using tool T3880012 to hold the valve open during shim removal and replacement.

1. Rotate each tappet bucket until the slots in the buckets are positioned such that they are pointing to the outside of the head.

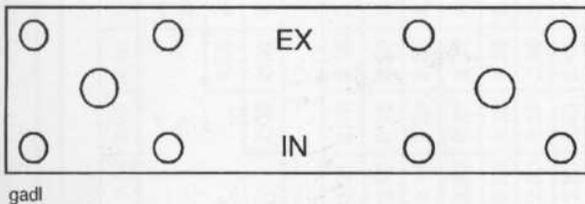


Buckets Positioned to outside of head

2. Remove the spark plugs to reduce compression resistance. Engage a high gear and, with the aid of an assistant, rotate the engine by turning the rear wheel forward until the pair of valves to be adjusted are fully open. Take care to ensure that the tappet buckets do not turn during opening.

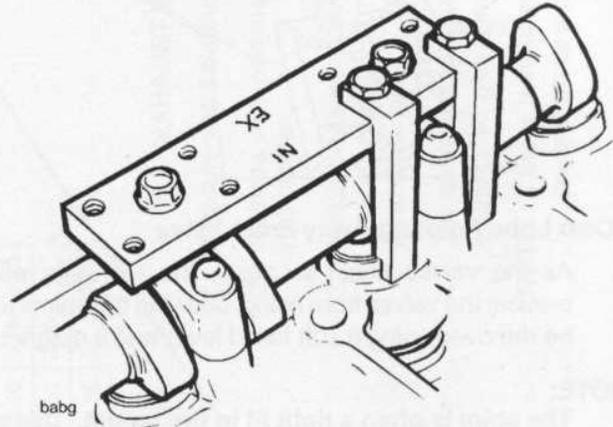
NOTE:

- The tool mounting plate is marked 'IN' and 'EX' denoting which are the inlet and exhaust sides of the tool. Always ensure that the tool assembly instructions are closely followed to ensure correct tool operation.



Tool Mounting Plate Markings

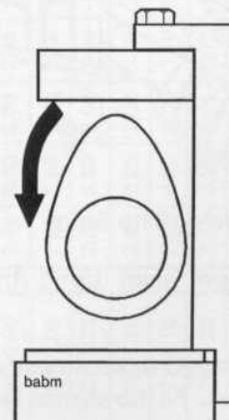
3. Loosely assemble the tool legs to the mounting plate ensuring that the legs are assembled to the correct side of the mounting plate for the valve shims being changed. For example, if changing inlet valve shims, the legs must be fitted to the side marked 'IN'.
4. Locate the mounting plate to the camshaft caps above the valves to be adjusted. The tool legs must face towards the spark plug tubes. Tighten the mounting plate fixings to **7 Nm**.



Tool in Position on Inlet Camshaft

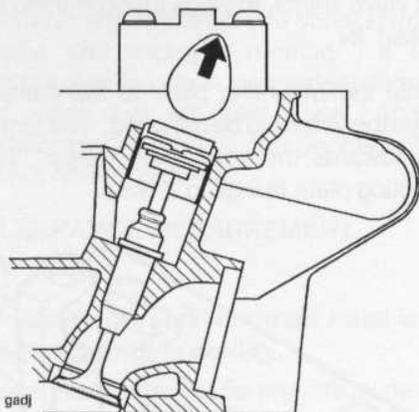
5. Hold the tool legs firmly against the mounting plate and tighten the leg to mounting plate fixings to **7 Nm**.

CAUTION: With the tool fitted, full 360° rotation of the engine/camshaft is not possible. The engine must be turned such that the camshaft lobes turn within the available free space allowed by the tool. Severe tool and camshaft damage will result from camshaft contact with the tool.



Rotate in direction of arrow, not towards tool.

6. Turn the engine over until the camshaft lobes for the valves to be adjusted point directly away from the valves.

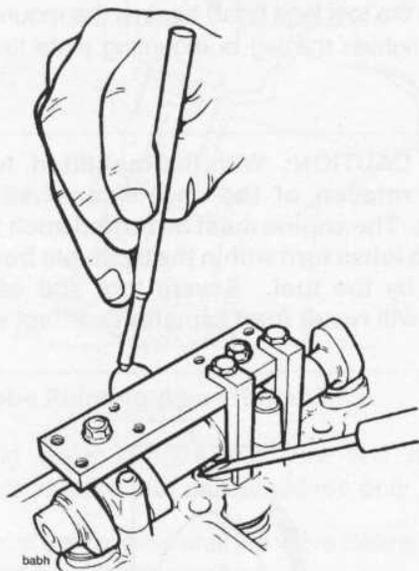


Cam Lobe Pointing Away From Valve

7. As the valves begin to close, the tool legs will prevent the valves from rising, allowing the shims to be removed using a soft faced lever and a magnet.

NOTE:

- The shim is often a tight fit in the tappet. Use a suitable soft faced lever and a magnet to remove the shim from the tappet.



Removing/Replacing The Shim

8. Select a new shim using the charts shown overpage.
9. Take the selected replacement shim and lubricate with engine oil. Fit the shim to the top of the tappet by reversing the removal procedure.

10. Turn the engine over until the camshaft fully opens the valves being adjusted. Remove the tool when the valve is fully open. Check that the shim has seated correctly and adjust, if necessary, before proceeding.

NOTE:

- The tool is designed to allow adjustment of 2 pairs of valves without moving the mounting plate. This is achieved by moving the tool legs to a new location once one pair has been adjusted.

11. Repeat the procedure until all valves have been adjusted.

NOTE:

- A shim selection chart can be found on the following two pages.

Exhaust Valve Clearance Adjustment Chart

MEASURED EXHAUST VALVE CLEARANCE	MEASURED THICKNESS OF FITTED SHIM																									
	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	
0.00-0.04				2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	
0.05-0.09			2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	
0.10-0.14	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15		
0.15-0.20	CORRECT CLEARANCE. NO CHANGE OF SHIM REQUIRED																									
0.21-0.25	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20		
0.26-0.30	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20			
0.31-0.35	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20				
0.36-0.40	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20					
0.41-0.45	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20						
0.46-0.50	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20							
0.51-0.55	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20								
0.56-0.60	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20									
0.61-0.65	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20										
0.66-0.70	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20											
0.71-0.75	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20												
0.76-0.80	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20													
0.81-0.85	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20														
0.86-0.90	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20															
0.91-0.95	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20																
0.96-1.00	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20																	
1.01-1.05	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20																		
1.06-1.10	2.90	2.95	3.00	3.05	3.10	3.15	3.20																			
1.11-1.15	2.95	3.00	3.05	3.10	3.15	3.20																				
1.16-1.20	3.00	3.05	3.10	3.15	3.20																					
1.21-1.25	3.05	3.10	3.15	3.20																						
1.26-1.30	3.10	3.15	3.20																							
1.31-1.35	3.15	3.20																								
1.36-1.40	3.20																									

SHIM SIZE REQUIRED

EXHAUST VALVE

1. Measure valve clearance (with engine cold).
2. Remove shim and measure thickness with a micrometer.
3. Match measured valve clearance from the left hand vertical column with measured thickness of fitted shim.
4. The shim size specified where the lines intersect will give correct clearance.

NOTE: If there is no clearance fit a shim several sizes smaller and re-measure.

3.15

Inlet Valve Clearance Adjustment Chart

MEASURED INLET VALVE CLEARANCE	MEASURED THICKNESS OF FITTED SHIM																								
	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20
0.00-0.04			2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10
0.05-0.09	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	
0.10-0.15	CORRECT CLEARANCE, NO CHANGE OF SHIM REQUIRED																								
0.16-0.20		2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20
0.21-0.25		2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	
0.26-0.30		2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20		
0.31-0.35		2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20			
0.36-0.40		2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20				
0.41-0.45		2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20					
0.46-0.50		2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20						
0.51-0.55		2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20							
0.56-0.60		2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20								
0.61-0.65		2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20									
0.66-0.70		2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20										
0.71-0.75		2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20											
0.76-0.80		2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20												
0.81-0.85		2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20													
0.86-0.90		2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20														
0.91-0.95		2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20															
0.96-1.00		2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20																
1.01-1.05		2.90	2.95	3.00	3.05	3.10	3.15	3.20																	
1.06-1.10		2.95	3.00	3.05	3.10	3.15	3.20																		
1.11-1.15		3.00	3.05	3.10	3.15	3.20																			
1.16-1.20		3.05	3.10	3.15	3.20																				
1.21-1.25		3.10	3.15	3.20																					
1.26-1.30		3.15	3.20																						
1.31-1.35		3.20																							

SHIM SIZE REQUIRED

INLET VALVE

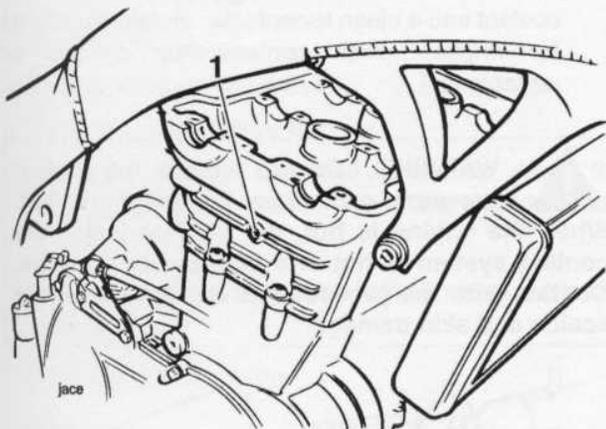
1. Measure valve clearance (with engine cold).
2. Remove shim and measure thickness with a micrometer.
3. Match measured valve clearance from the left hand vertical column with measured thickness of fitted shim.
4. The shim size specified where the lines intersect will give correct clearance.

NOTE: If there is no clearance fit a shim several sizes smaller and re-measure.

CAM CHAIN

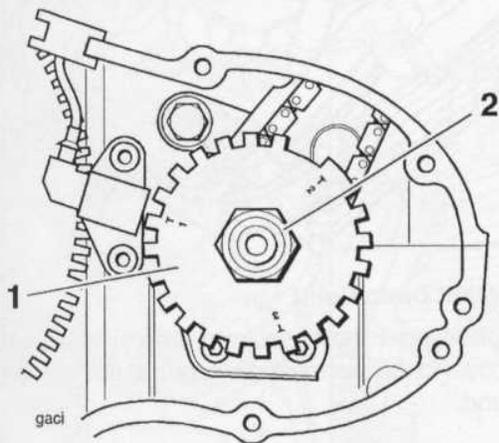
Removal

1. Remove the camshafts as detailed earlier in this section.
2. Release the screws securing the crankshaft position sensor to the crankcase. Slide the sensor grommet out from the crankcase and remove the sensor.
3. Remove the bolt from the centre of the cam chain housing, in the cylinder head.



1. Centre Bolt

4. Remove the crankshaft rotor.

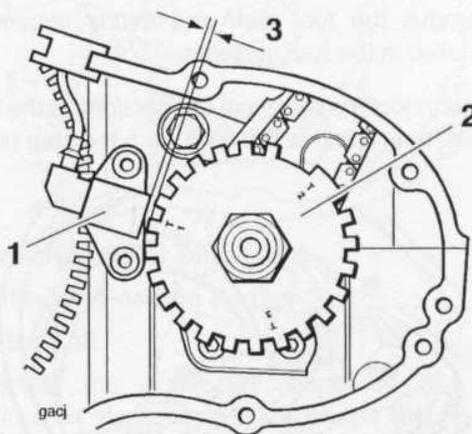


**1. Crankshaft Rotor
2. Rotor Retaining Bolt**

5. The cam chain is removed from inside the head or through the crankcase, after first detaching the chain from the crankshaft gear.

Installation

1. Refit the cam chain and locate the lower end around the crankshaft gear.
2. Fit the crankshaft position sensor.
3. Refit the crankshaft rotor.
4. Adjust the crankshaft position sensor to give an air gap of $1.00 \text{ mm} \pm 0.20 \text{ mm}$ between the crankshaft rotor and the sensor.



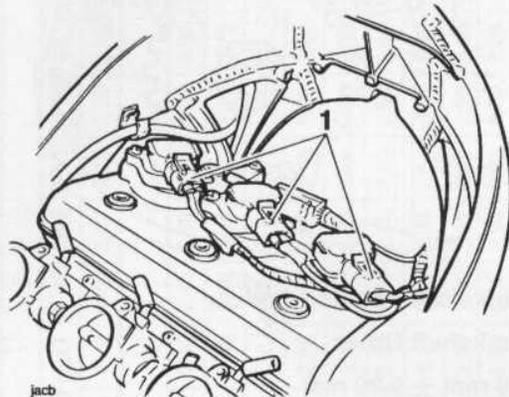
**1. Crankshaft Position Sensor
2. Crankshaft Rotor
3. $1.00 \text{ mm} \pm 0.20 \text{ mm}$**

5. Apply Triumph silicone grease to the grommet on the crankshaft position sensor and refit the grommet to the crankcase.
6. Refit the camshafts etc. as described earlier in this section.
7. Refit the bolt to the centre of the cam chain housing in the cylinder head, tightening to **10 Nm**.

CYLINDER HEAD

Removal

1. Remove the seat and disconnect the battery negative (black) lead first.
2. Remove the side panel assembly as described in the body section.
3. Remove the belly panel (ST model only) and both lower fairings.
4. Remove the fuel tank and airbox assembly as detailed in the fuel system section.
5. Disconnect the electrical connections to the ignition coils, then remove the coils from the cam cover.

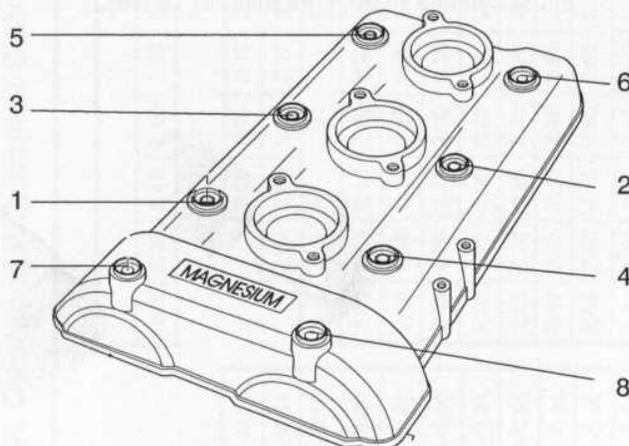


1. Coil Connections

6. Progressively release the cam cover bolts in the sequence shown below.

NOTE:

- Two longer bolts are fitted at the right hand end adjacent to the cam chain.



Cam Cover Bolt Release Sequence

7. Remove the cam cover.



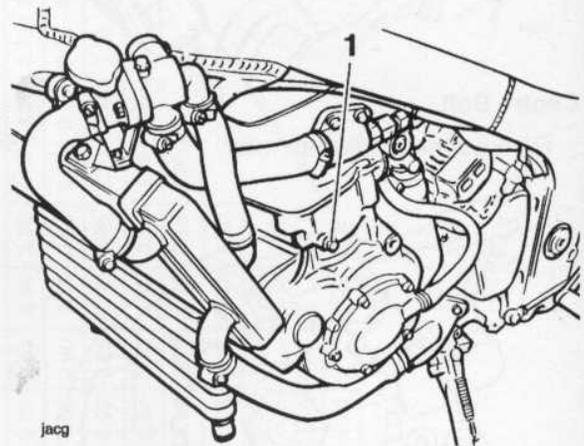
CAUTION: Never use a lever to remove the camshaft cover from the head.

Using a lever will cause damage to the head and cam cover which could lead to an oil leak.

8. Remove the cam cover gasket.
9. Remove any residual oil from the front of the head using a syringe or lint free cloth.
10. Release the coolant drain plug and drain the coolant into a clean receptacle. Retain the coolant for re-use unless contaminated or due for replacement.

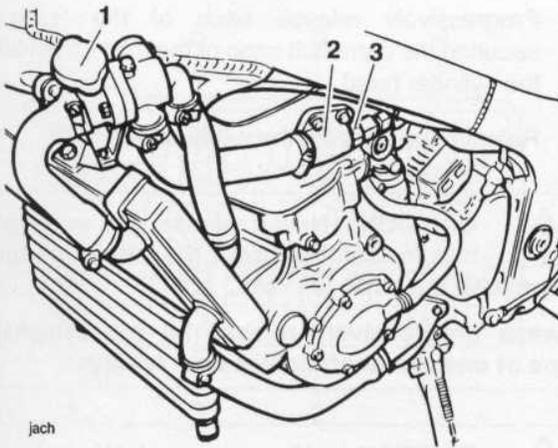


WARNING: Do not remove the coolant pressure cap when the engine is hot. When the engine is hot, the coolant inside the cooling system is hot and also under pressure. Contact with the pressurised coolant will cause scalds and skin damage.



1. Coolant Drain Point

11. Disconnect the hose from the cylinder head side cover to the thermostat housing at the cylinder head end.

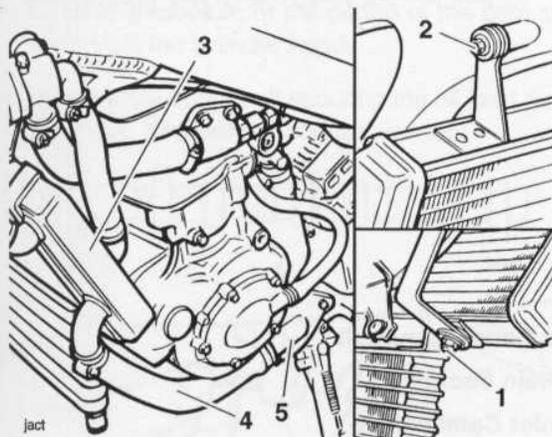


- 1. Radiator Cap
- 2. Cylinder Head Side Cover
- 3. Coolant Temperature Sensor

- 12. Disconnect the electrical connector from the coolant temperature sensor in the cylinder head side cover.
- 13. Disconnect the bottom radiator hose at the water pump.
- 14. Remove the radiator.

NOTE:

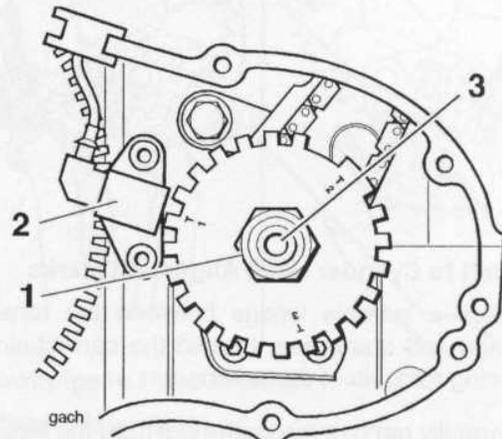
- Support the oil cooler while the radiator is detached as this will prevent the hoses from becoming twisted or damaged.



- 1. Oil Cooler Upper Fixings
- 2. Radiator Fixings
- 3. Radiator
- 4. Bottom Hose
- 5. Water Pump

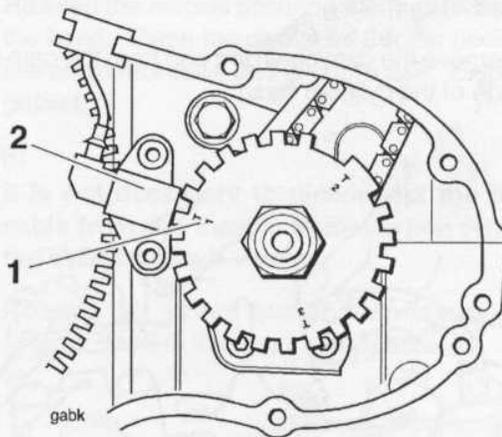
- 15. Drain the engine oil as described in the lubrication section.

- 16. Disconnect the clutch cable as detailed in the clutch section.
- 17. Remove the clutch cover to give access to the crankshaft rotor.



- 1. Crankshaft Rotor Clamp Nut
- 2. Crankshaft Position Sensor
- 3. Centre Bolt

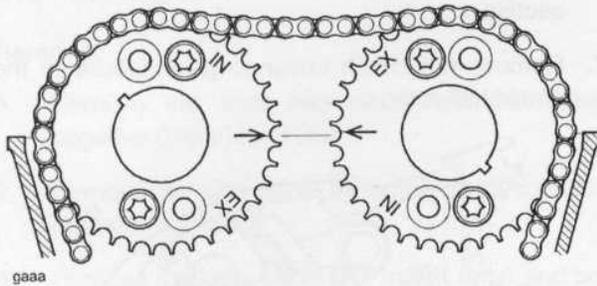
- 18. Rotate the crankshaft clockwise (the normal direction of rotation), using the nut fitted to the end of the crankshaft. Stop rotation when number 1 cylinder is at top dead centre (TDC), that is when the 'T1' mark on the crankshaft rotor aligns with the crankshaft position sensor.



- 1. 'T1' Mark
- 2. Crankshaft Position Sensor

NOTE:

- In addition to the crankshaft alignment described above, at TDC the alignment marks on the camshaft sprockets will point inwards at a point level with the joint face.

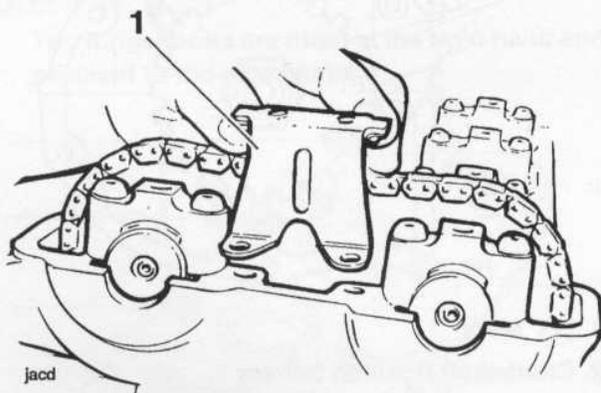


Camshaft to Cylinder Head Alignment Marks

19. Place a suitable wedge between the tensioner blade and crankcase, to hold the cam chain taut during removal of the tensioner.
20. Carefully remove the centre nut from the tensioner and withdraw the tensioner spring.

! WARNING: The tensioner centre nut is under spring tension. Always wear hand, eye and face protection when withdrawing the centre nut and take great care in order to minimise the risk of injury and the loss of components.

21. Remove the bolts securing the tensioner to the upper crankcase and remove the tensioner and gasket.
22. Remove the cam chain top pad from the cam chain side of the cylinder head.



1. Cam Chain Top Pad

23. To ensure that the camshaft caps are refitted in the same positions as prior to removal, mark the position of each camshaft cap in relation to the head. A laundry marker or similar may be used to mark the cap positions.

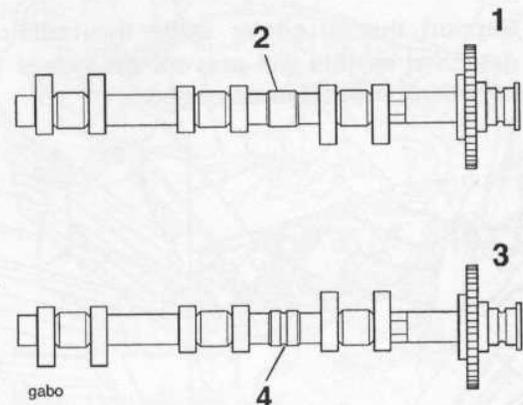
24. Progressively release each of the fasteners securing the camshaft caps of the inlet camshaft to the cylinder head.
25. Release the caps for the exhaust camshaft.

! CAUTION: Never release one camshaft cap in isolation from the others as this may cause the caps to crack.
Always progressively release all the camshaft caps of one camshaft before final removal.

! CAUTION: Always completely release and remove one camshaft before starting to release the other. 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.

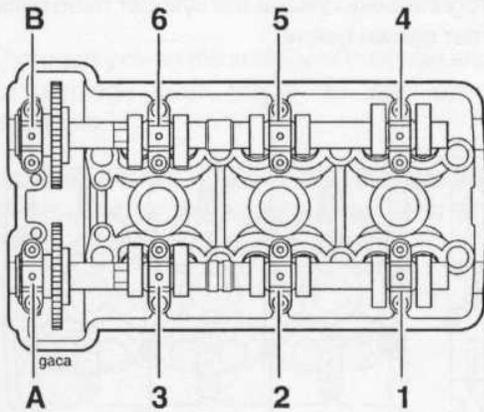
NOTE:

- The inlet and exhaust camshafts are different. They can be identified by a plain area in the centre of the exhaust cam and a groove in the same place on the inlet cam.



1. Exhaust Camshaft
2. Plain Section
3. Inlet Camshaft
4. Grooved section

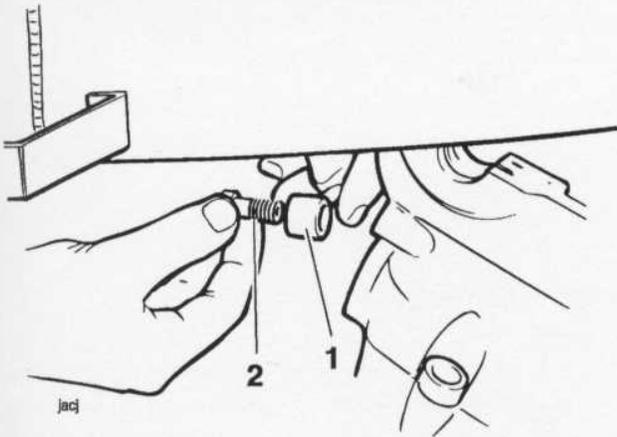
26. Once the pressure on all the camshaft caps has been released, remove the fasteners and caps complete with dowels.



Camshaft Cap Numbering

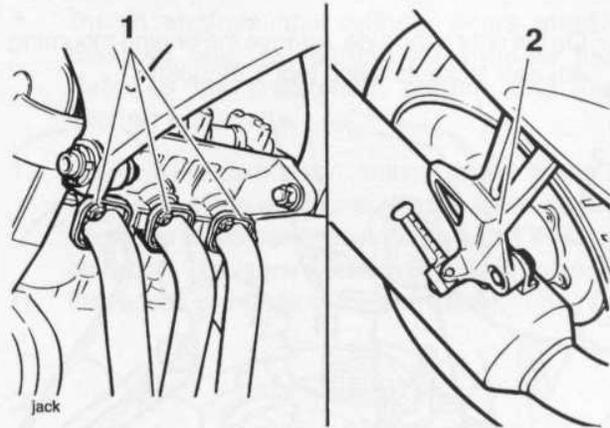
NOTE:

- The caps are numbered sequentially and must not be interchanged for a different position on the head. The camshaft caps on the outside of the timing chain (known as outriggers) are marked 'A' for the exhaust and 'B' for the inlet.
 - Each cap is located by two dowels which align the cap to the head. If the caps cannot be removed using hand pressure, gently tap each cap with a soft faced tool to release.
27. Lift the cam chain from the exhaust camshaft sprocket and remove the exhaust camshaft.
 28. Repeat the procedure for the inlet camshaft.
 29. Remove the bolt from the centre of the cam chain housing in the cylinder head.
 30. Remove the banjo bolt securing the oil feed pipe to the head. Discard the copper washers.



1. Oil Feed Pipe
2. Banjo Bolt

31. Remove the exhaust downpipes and silencer as detailed in the fuel system section.



1. Downpipe to Head Fixings
2. Silencer Mounting

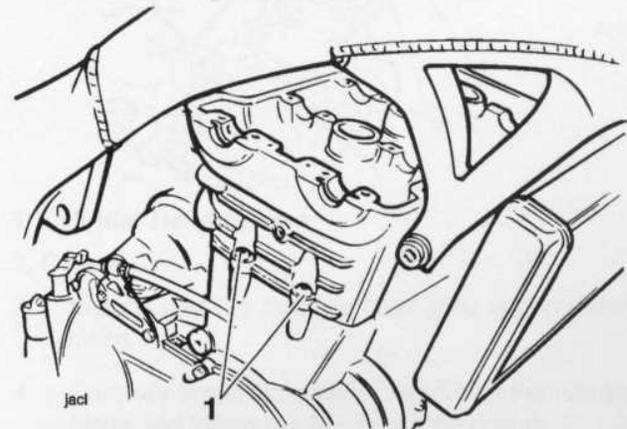
32. Note the position of all tappet buckets and shims such that they can be refitted in the same positions. Remove all the buckets and shims.

NOTE:

- To prevent the tappets and shims from becoming mixed, place the shim and tappet together in a marked container. The components must be refitted in their original positions.
33. Release the screws securing the throttle bodies to the head. Place the displaced throttle bodies and idle air control valve on the crankcase. Discard the gasket.

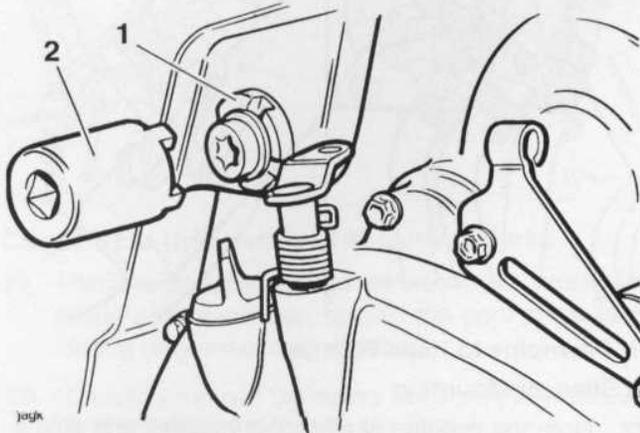
NOTE:

- It is not necessary to disconnect the throttle cable from the throttle bodies when removing the cylinder head.
34. Release the screws securing the outside of the cylinder head to the upper crankcase.



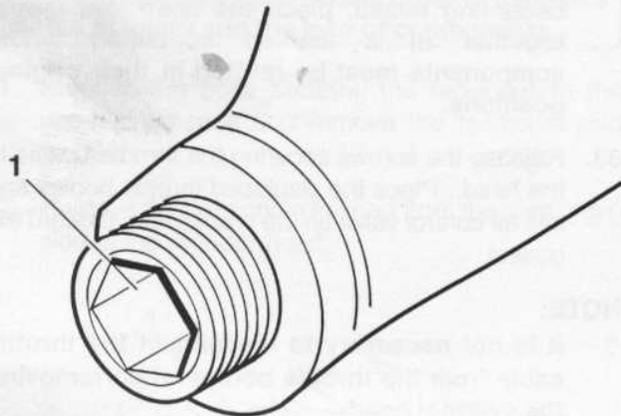
1. Cylinder Head to Upper Crankcase Screws

- 35. Support the engine beneath the sump.
- 36. Release the frame to cylinder head bolts.
- 37. On the right hand side, remove the engine mounting adjuster locknuts using tool T3880088



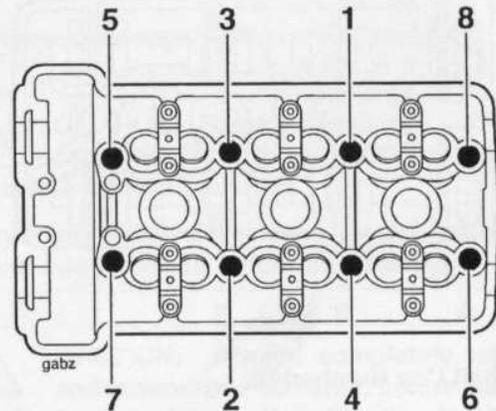
- 1. Engine Mounting Adjuster Locknut
- 2. Tool T3880088

- 38. Release the engine mounting adjuster from contact with the head by turning it anti-clockwise.



- 1. Adjuster

- 39. Progressively release the cylinder head bolts in the order shown below.

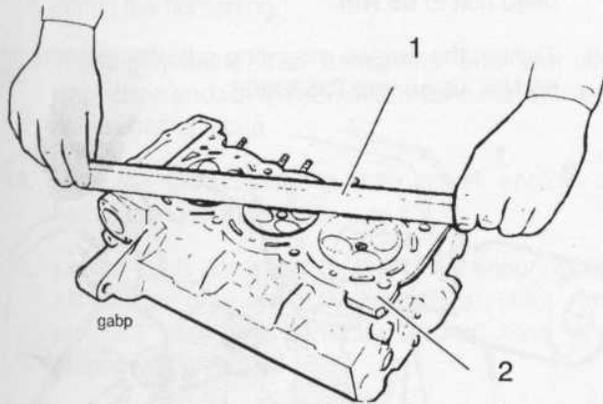


Cylinder Head Bolt Release Sequence

- 40. Lightly tap the cylinder head with a rubber mallet to break the seal of the gasket. Remove the cylinder head.
- 41. Remove and discard the cylinder head gasket.
- 42. Collect the cam chain rubbing blade from the crankcase.
- 43. Remove the cylinder liners as described in section 6 of this manual.

Inspection

1. Thoroughly clean the surface of the head and check for damage and 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 head if warped.



1. Straight Edge

2. Cylinder Head Gasket Face

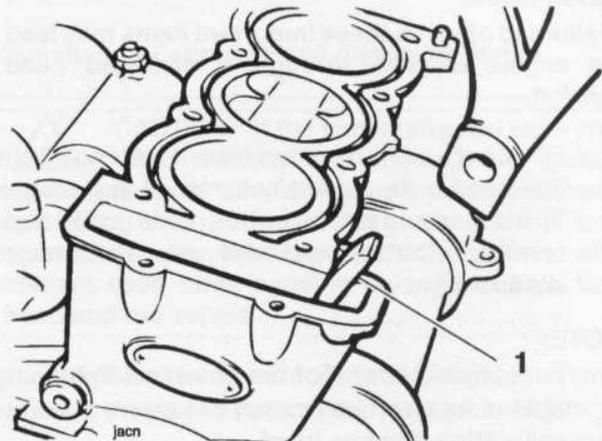
3. Check the cam chain rubbing blade. Renew if worn or damaged.

Installation

NOTE:

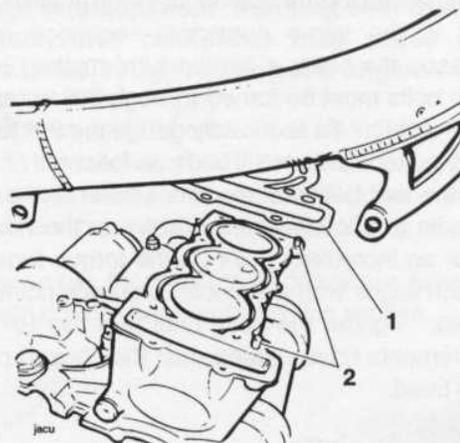
- On all engines, the cylinder liners must be resealed prior to refitting the cylinder head. Refer to the crankshaft, pistons and liners section for details.

1. Position the cam chain rubbing blade to the left hand side of the upper crankcase. When correctly fitted, the blade positively locates at the lower end on a web. The upper section will then fit snugly into the recess in the top of the crankcase.



1. Cam Chain Rubbing Blade

2. Thoroughly clean the upper faces of the crankcase taking care not to damage the mating surfaces. Fit a new cylinder head gasket ('top' marking uppermost) ensuring that the head to crankcase location dowels are correctly in place.



1. Cylinder Head Gasket

2. Dowels

3. Ensure that the cylinder head face is completely clean.
4. Carefully lower the cylinder head over the rubbing blade and locate the head onto the dowels.



CAUTION: Using the correct procedure to fit and tighten the cylinder head bolts 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 bolt(s).

Lubricate the threads with engine oil, and then wipe clean with a lint-free cloth leaving minimal oil on the threads (that is, almost dry to touch).

Tighten the bolts using the three-stage procedure given below.

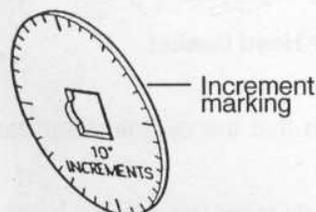
Failure to observe these important items may lead to engine damage through a damaged head gasket.

5. Fit the bolts to the head and tighten until finger tight. The head bolts are finally tightened in 3 stages. This is to ensure that the cylinder head gasket seals correctly to the head and crankcase. The 3 stages are as follows:

NOTE:

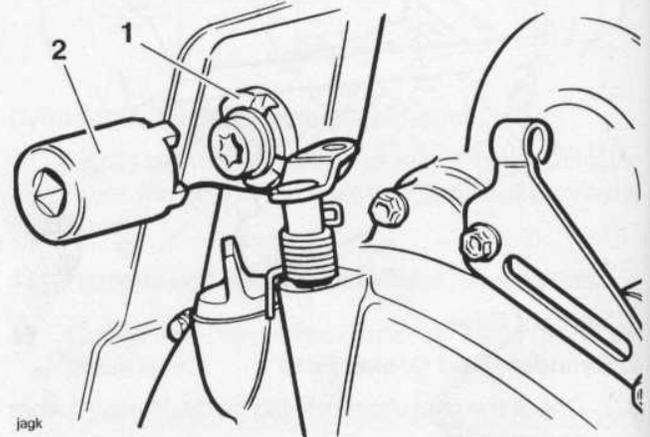
- For stages A and B of the head bolt tightening operation, a torque wrench of known, accurate calibration must be used.

- A Tighten the head bolts, in the same numerical sequence used to release the bolts, to **20 Nm**.
- B Tighten the head bolts in the same numerical sequence used to release the bolts, to **27 Nm**.
- C For the final torque operation, which again is carried out in the same numerical sequence used to release the bolts, a 'torque turn' method is used. The bolts must be turned through 90° to reach the final setting. To accurately gauge the 90° turn, use service tool 3880105-T0301 as follows:
Fit the tool between the torx socket and the drive handle and locate the torx drive to the head bolt. Pick an increment point on the torque turn gauge which aligns with a suitable reference point on the head. Tighten the bolts until 9 of the 10° gauge increments have rotated past the chosen point on the head.



Tool 3880105-T0301

6. Fit the screws securing the side of the cylinder head to the crankcase and tighten to **12 Nm**.
7. Refit and tighten the left hand frame to cylinder head bolt to **95 Nm**.
8. On the right hand side, tighten the engine mounting adjusters to **3 Nm**.
9. Refit and tighten the right hand frame to cylinder head bolt to **95 Nm**.
10. Tighten the engine mounting adjuster locknuts, to **55 Nm**, using tool T3880088.



1. Engine Mounting Adjuster Locknut

2. Tool T3880088

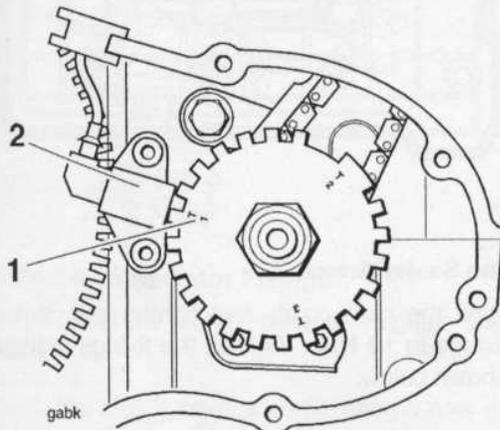
11. Remove the support from beneath the engine.
12. Lubricate the tappet buckets with clean engine oil and refit the buckets and shims in the same locations from which they were removed.
13. Fit a new gasket over the throttle body locating dowels ensuring that the gasket tab is positioned to the left hand side.
14. Refit the throttle bodies. Tighten the fixings to **12 Nm**.
15. Check that there is 2-3 mm of free play at the throttle twist grip. Adjust as necessary.



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.

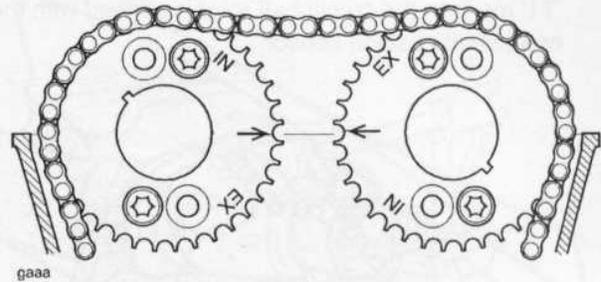
16. Refit the oil feed pipe to the head using new sealing washers to the banjo bolt. Tighten the banjo bolt to **25 Nm**. Ensure that the oil feed pipe is not distorted during the tightening.
17. Thoroughly clean the camshafts and journals. Inspect the ends of the camshafts for correct fitment of the sealing plugs.
18. Lubricate the camshafts with clean engine oil before fitting to the head.
19. Locate each camshaft to the head ensuring the camshafts are correctly identified (inlet and exhaust) and also correctly located over their respective valve banks.
20. Check that the crankshaft sensor remains aligned with the 'T1' mark on the crankshaft rotor.



1. 'T1' Mark

2. Crankshaft Position Sensor

21. Working on one camshaft at a time, locate the cam chain over the cam sprockets. Position the camshaft in the same position as for removal **before attempting to fit the caps** (that is, with the timing marks on the camshaft sprockets level and pointing inwards, and with the crankshaft position sensor in line with the 'T1' mark on the crank rotor.
22. Repeat the procedure for the other camshaft.



Camshaft to Cylinder Head Alignment Marks

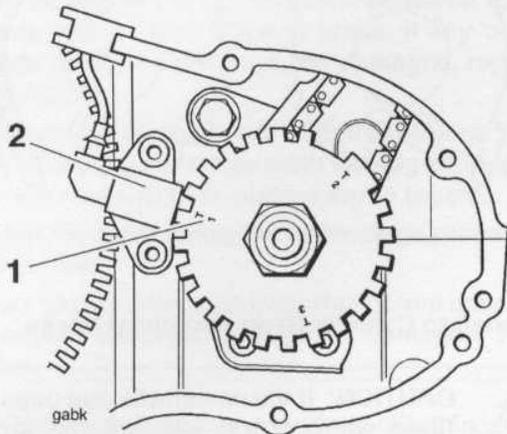
! CAUTION: If the camshafts and caps are fitted without first aligning the timing marks on both the crankshaft and camshaft sprockets, or if both camshafts are fitted at the same time, the inlet and exhaust valves will contact each other causing damage to both the head and the valves.

23. Lubricate the threads of the camshaft cap screws and evenly and progressively tighten to **10 Nm**.
24. Before fitting the cam chain tensioner, ensure that each camshaft rotates freely. Do not rotate either camshaft by more than 5°.

! 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.

25. Recheck that the crankshaft rotor 'T1' mark aligns with the crankshaft position sensor when the timing marks on both camshaft sprockets are level with the cylinder head and point inwards,
26. Assemble the cam chain tensioner following the instructions given earlier in this section.

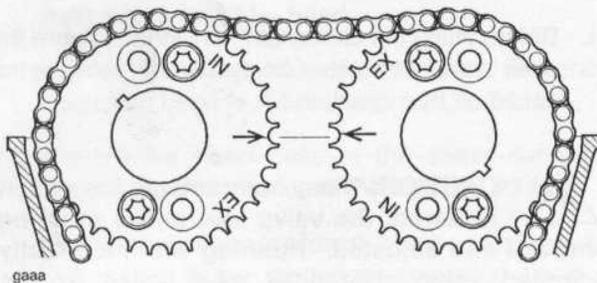
27. Rotate the engine through 4 full revolutions, and reset number 1 cylinder to TDC. Ensure that the 'T1' mark on the crankshaft rotor is aligned with the crankshaft position sensor.



1. Ignition Rotor

2. Crankshaft Position Sensor

28. Re-check that the camshaft timing marks align as illustrated below.

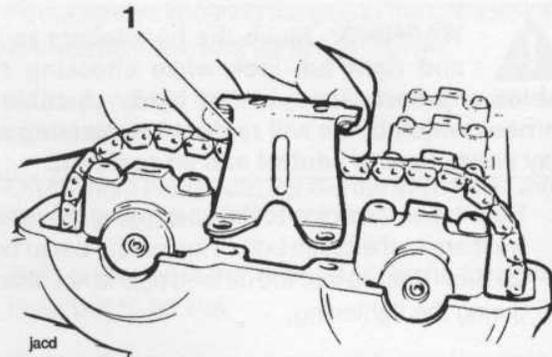


Camshaft to Cylinder Head Alignment Marks

NOTE:

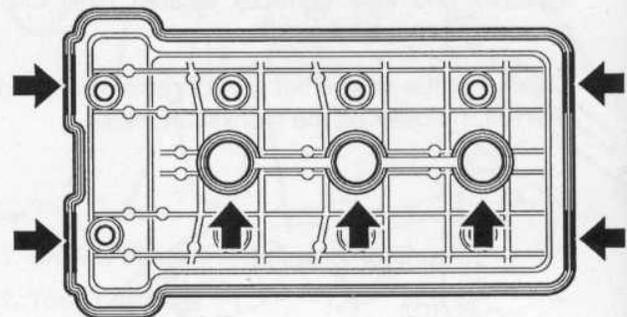
- Depending on the engine configuration, with the camshaft arrows aligned as shown, the 'T1' mark on the crankshaft may align with the crankshaft position sensor at either the rear, centre or front edge of the gear tooth. Any of those alignment positions can be considered to be correct.

- Re-check tensioner plunger location against the tensioner blade.
- Check the valve clearances. Adjust as necessary.
- Refit the cam chain top pad and tighten the fixings to 10 Nm.



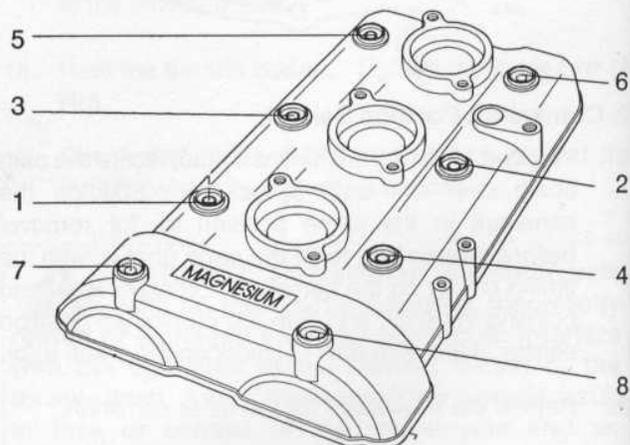
1. Cam Chain Top Pad

- Refit the bolt to the centre of the cam chain housing in the cylinder head, tightening to 10 Nm.
- Apply silicone sealer to the areas arrowed in the diagram below.



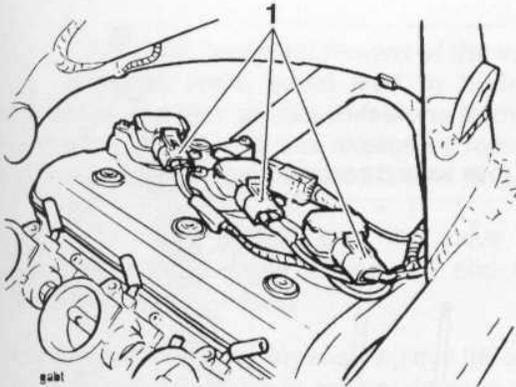
Silicone Sealer Areas

- Refit the cam cover and tighten the cam cover fixings to 10 Nm. Tighten the fixings in the order shown below.



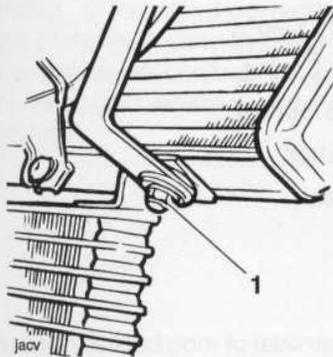
Cam Cover Bolt Tightening Sequence

- Refit and reconnect the ignition coils.



1. Coil Connections

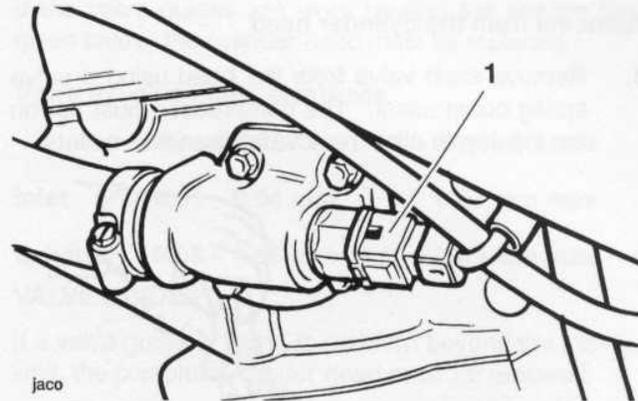
- 36. Refit the exhaust system as described in the fuel system and engine management section.
- 37. Refit the radiator and oil cooler. Tighten the radiator to frame fixings to **9 Nm** and the oil cooler to radiator fixings to **5 Nm**.



1. Oil Cooler to Radiator Fixings

- 38. Reconnect the water hoses and tighten the hose clips.
- 39. Refit the clutch cover incorporating a new gasket. Tighten the clutch cover fixings to **9 Nm**.
- 40. Refit the clutch cable and adjust as described in the clutch section.

- 41. Reconnect the coolant temperature sensor.



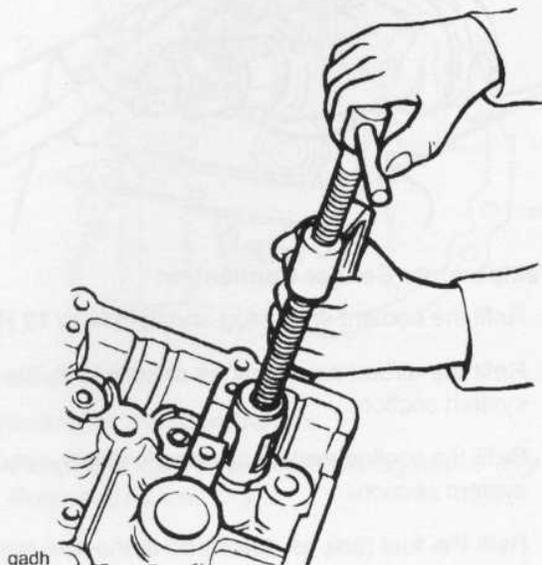
1. Temperature Sensor Connection

- 42. Refit the coolant drain plug and tighten to **13 Nm**.
- 43. Refit the airbox assembly as described in the fuel system section.
- 44. Refill the cooling system as described in the cooling system section.
- 45. Refit the fuel tank as described in the fuel system section.
- 46. Fit a new sealing washer to the sump plug, refit the plug and tighten to **25 Nm**.
- 47. Refill the engine with the correct grade of oil.
- 48. Refit the fairings/belly panel.
- 49. Refit the body side panel assembly as described in the body section.
- 50. Reconnect the battery positive (red) lead first.
- 51. Start the engine and check for oil, fuel and water leaks.
- 52. Refit the seat.

VALVES AND VALVE STEM SEALS

Removal from the cylinder head

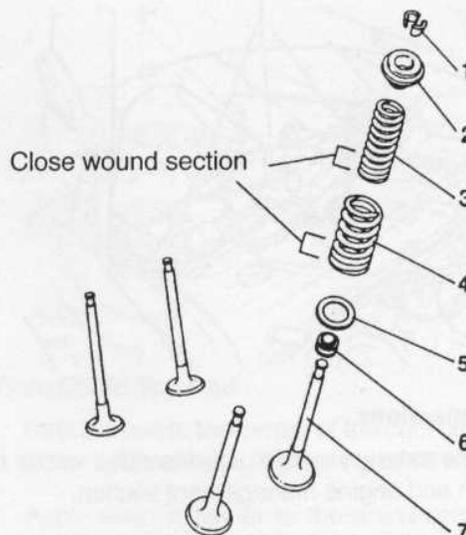
1. Remove each valve from the head using a valve spring compressor. The compressor must act on the top cup to allow removal of the valve collets.



gadh

1. Valve Removal

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



1. Collets
2. Valve Spring Cap
3. Inner Valve Spring
4. Outer Valve Spring
5. Thrust Washer
6. Stem Oil Seal
7. Valve

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 springs 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.

VALVE TO VALVE GUIDE CLEARANCE

If the valve guides are worn beyond the service limit given below, the cylinder head must be replaced.

Valve to valve guide clearance

	Standard	Service Limit
Inlet	0.01 - 0.04 mm	0.07 mm max
Exhaust	0.03 - 0.06 mm	0.09 mm max

VALVE GUIDES

If a valve guide is found to be worn beyond the service limit, the complete cylinder head must be renewed.

VALVE FACE INSPECTION

1. Remove any carbon build-up from the valve head area. Examine the valve seat face, checking in particular for signs of cracking or pitting.

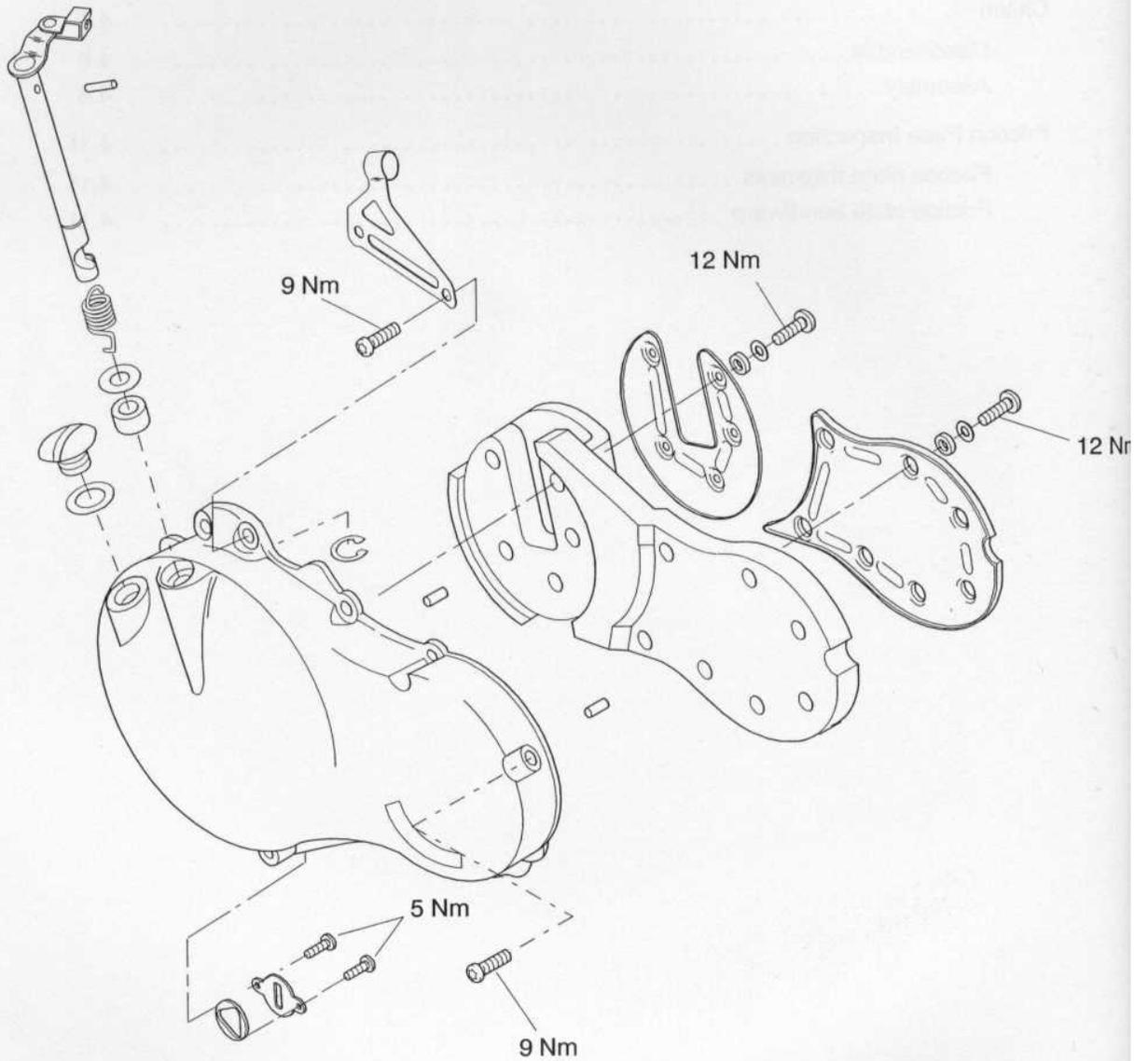
CLUTCH

CONTENTS

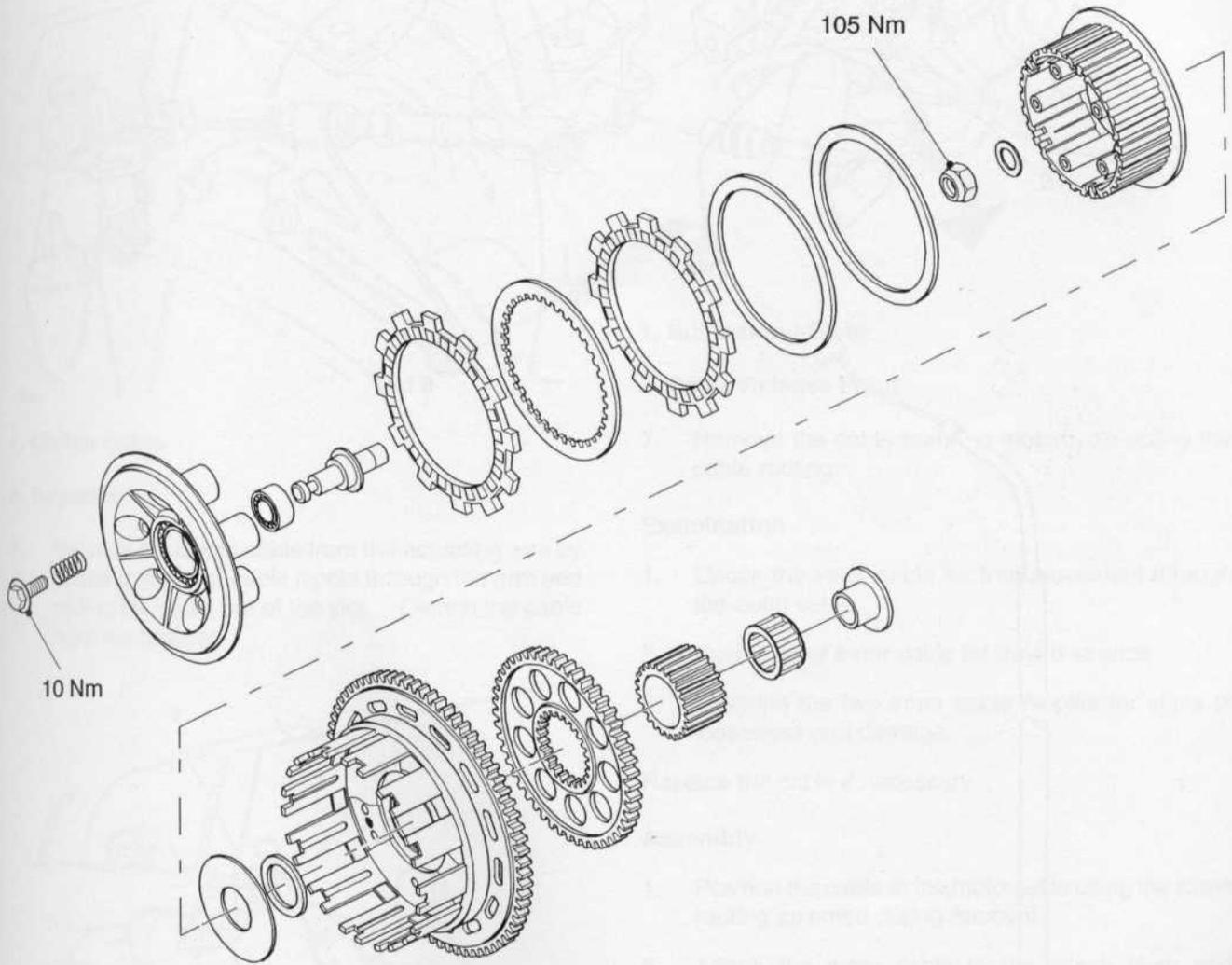
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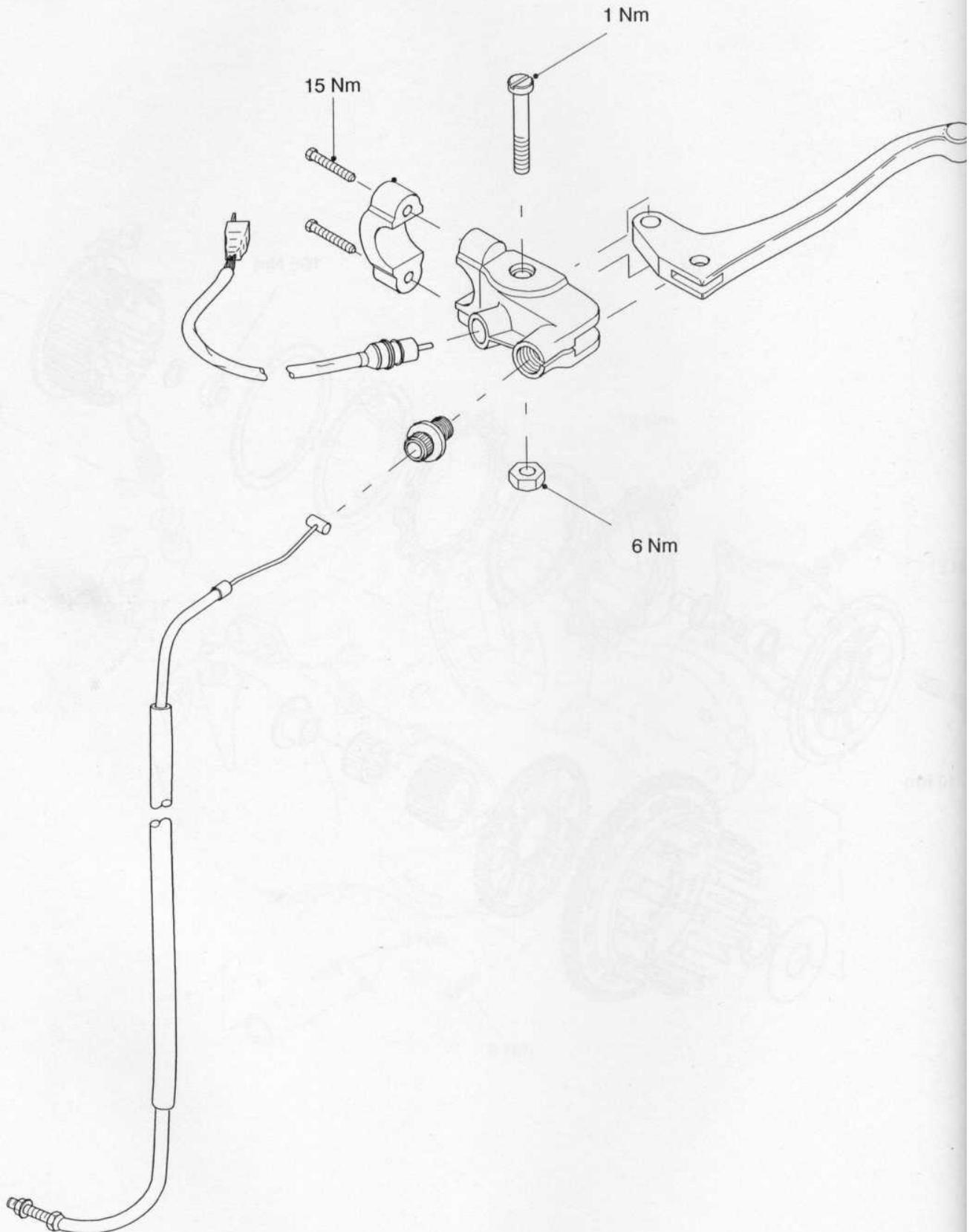
Exploded View - Clutch Cover



Exploded View - Clutch Assembly



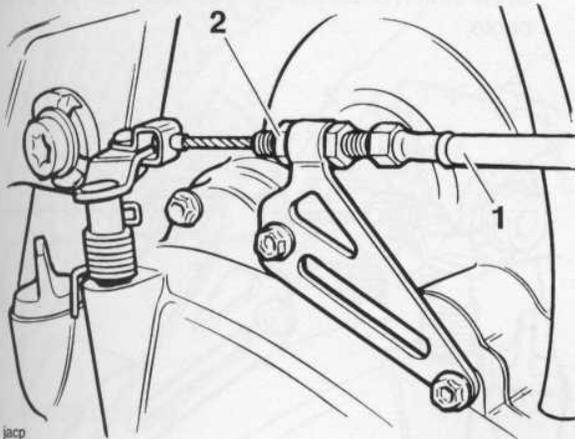
Exploded View - Clutch Controls



CLUTCH CABLE

Removal

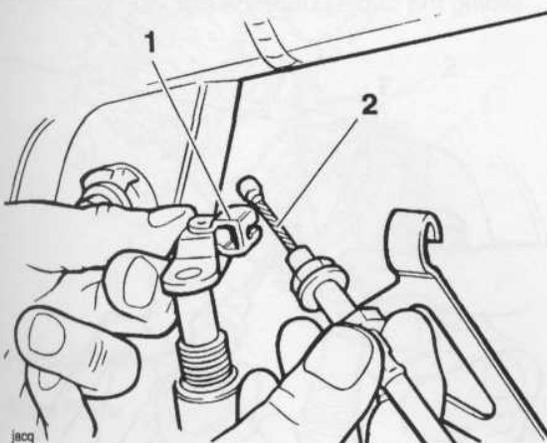
1. Remove the seat and disconnect the battery.
2. Remove the belly panel and right hand lower fairing (Sprint ST only).
3. Slacken the cable locknut and release the adjuster at the clutch cover end to give maximum play in the cable.



1. Clutch Cable

2. Adjuster

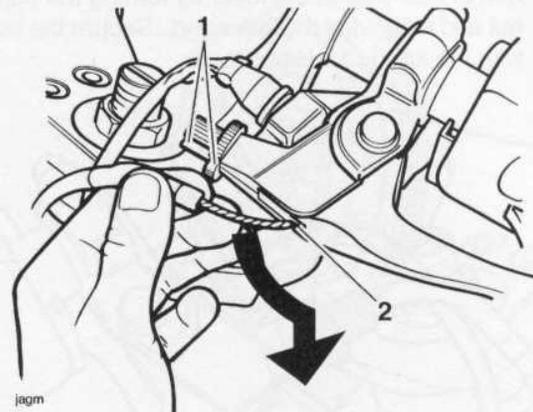
4. Release the clutch cable from the actuating arm by pushing the inner cable nipple through the arm and sliding the cable out of the slot. Detach the cable from the bracket.



1. Actuating Arm

2. Inner Cable

5. At the clutch lever end, align the adjuster and locknut slots.
6. Pull in the clutch lever and turn the inner cable, anti-clockwise through the slots in the adjuster and locknut, until the cable can be detached from the lever by pushing downwards.



1. Nut/locknut Slots

2. Cable Release Point

7. Remove the cable from the motorcycle noting the cable routing.

Examination

1. Check the inner cable for free movement through the outer cable.
2. Examine the inner cable for frayed strands.
3. Examine the two inner cable nipples for signs of looseness and damage.

Replace the cable if necessary

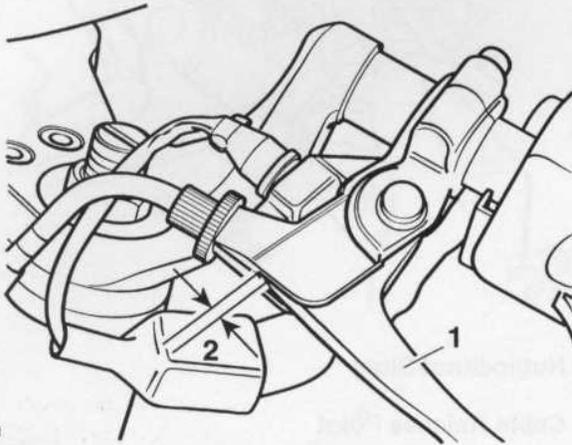
Assembly

1. Position the cable to the motorcycle using the same routing as noted during removal.
2. Attach the inner cable to the clutch lever and actuating arm using a reversal of the removal process.
3. Refit the outer cable to the adjuster bracket at the clutch end.

NOTE:

- Ensure that the two adjuster nuts are positioned, one either side of the bracket.
4. Set the lever adjuster to a point where an equal adjustment is possible in both directions.

5. Set the adjuster at the clutch end to give a preliminary setting of 2-3 mm of free play as measured at the lever.
6. Operate the clutch lever several times and recheck the amount of free-play present.
7. Set the final adjustment of the cable to give 0.4-0.8 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.



jagl

1. Clutch Lever

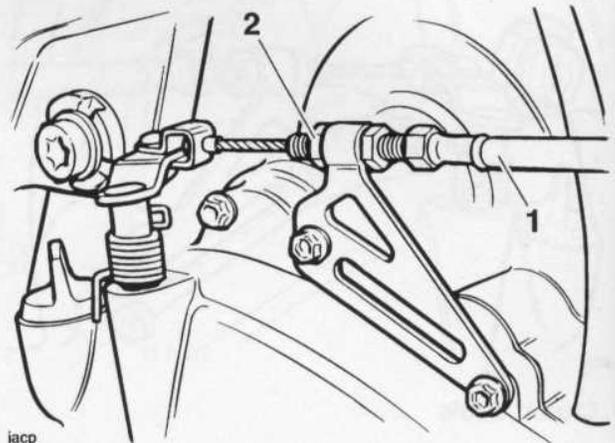
2. Correct Setting, 0.4-0.8 mm

8. Refit the bodywork (if previously removed).
9. Reconnect the battery positive (red) lead first.
10. Refit the seat.

CLUTCH

Disassembly

1. Remove the seat and disconnect the battery, negative (black) lead first.
2. Remove the belly panel and right hand lower fairing (Sprint ST only).
3. Slacken the cable locknut and release the adjuster at the clutch cover end, to give maximum play in the cable.

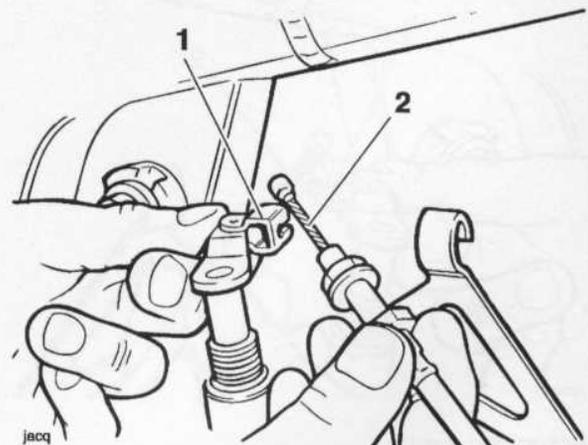


jacp

1. Clutch Cable

2. Adjuster

4. 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.

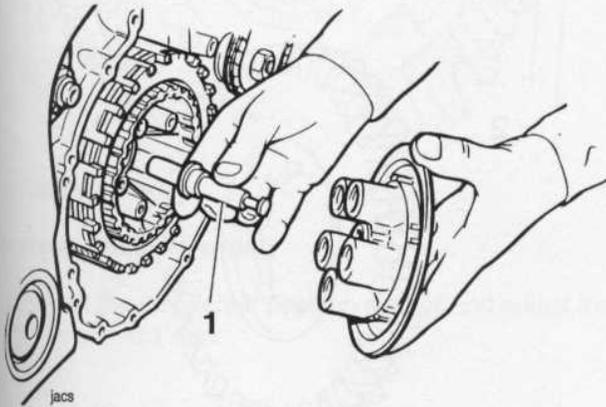


jacq

1. Actuating Arm

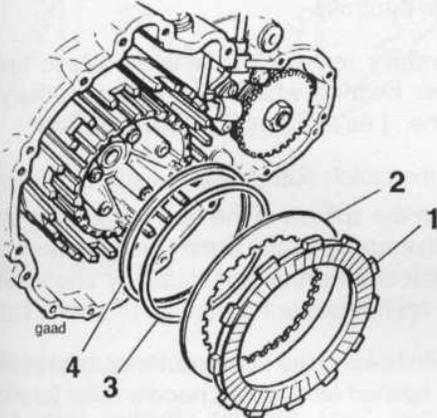
2. Inner Cable

5. Drain the engine oil as described in the lubrication section.
6. Remove the clutch cover.
7. Undo the bolts and springs and remove the clutch pressure plate.
8. Remove clutch pull rod.



1. Clutch pull rod

9. Remove all the clutch friction plates and steel plates together with the anti-judder spring and anti-judder seat washer. Note the orientation of all components as they are removed.



1. Friction Plates
2. Steel Plate
3. Anti-judder Spring
4. Anti-judder Seat Washer

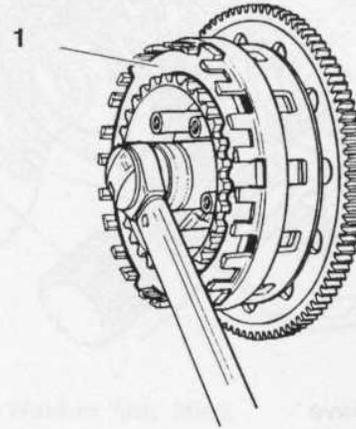
NOTE:

- The outermost and innermost friction plates differ from all others and must not be fitted in any other positions. They are also darker in colour.

NOTE:

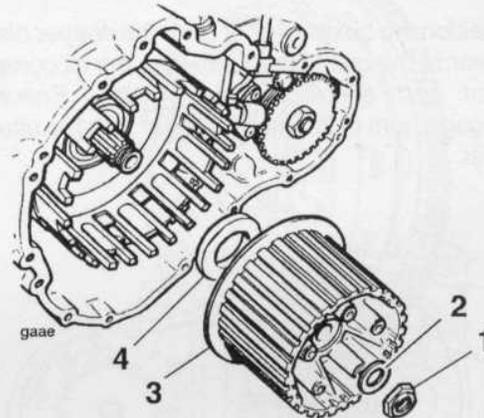
- It is not normally necessary to disassemble the clutch further, but if the clutch inner and outer drums are to be removed, proceed as follows:

10. Engage first gear and lock the inner and outer clutch drums together using service tool T3880305.



1. Service Tool T3880305

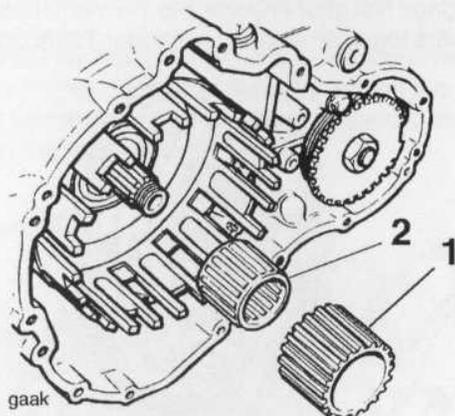
11. Depress the rear brake pedal to prevent the engine from turning, then loosen the clutch centre nut.
12. Remove the centre nut, Belleville washer, clutch inner drum and spacer.



1. Centre Nut
2. Belleville Washer
3. Inner Drum
4. Spacer

13. Remove the shim from the input shaft.
14. Remove the crankshaft position sensor.

- Slide the clutch outer drum gently backwards and forwards to dislodge the splined bearing sleeve. Carefully remove the splined sleeve and needle roller bearing while supporting clutch drum.



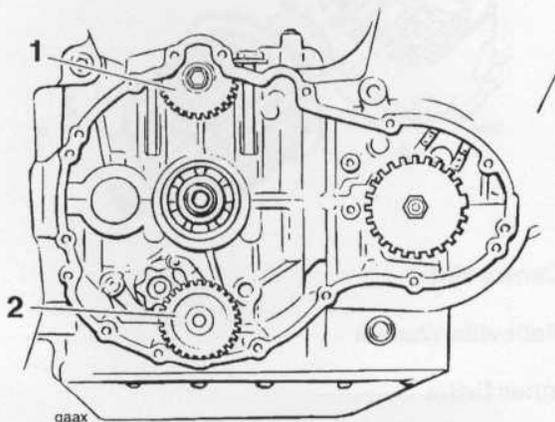
1. Splined Sleeve

2. Needle Roller Bearing

- Remove clutch outer drum by easing out of the crankcase, left-hand side first.
- Remove the auxiliary drive gear and plain sleeve.

Assembly

- Position the auxiliary gear (with the deeper dish side towards the crankcase) between the oil pump drive gear and alternator drive gear. Ensure full engagement of the auxiliary gear with the alternator gear.

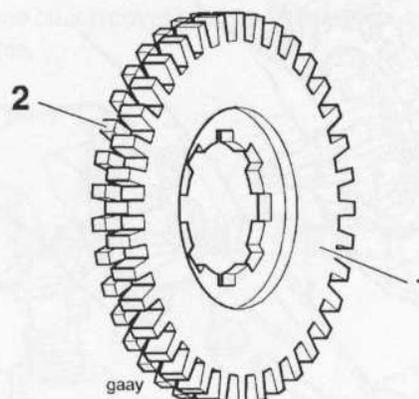


1. Alternator Drive Gear

2. Oil Pump Drive Gear

NOTE:

- The alternator drive gear is fitted with a backlash eliminator gear. The backlash eliminator is a parallel thinner gear, which follows the main alternator drive gear. To ensure correct engagement of the auxiliary gear with the alternator drive gear, align the teeth of the alternator drive gear and backlash eliminator gears.



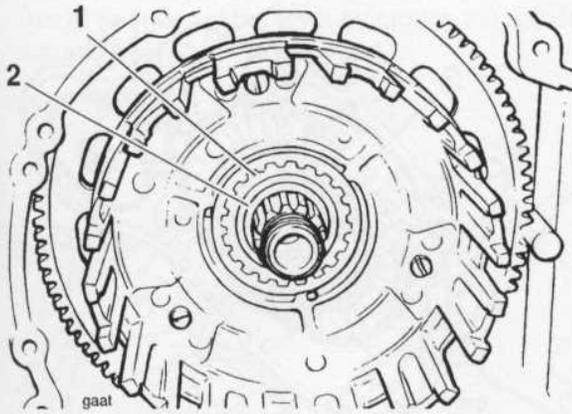
1. Alternator Drive Gear

2. Backlash Eliminator

- Temporarily fit the plain sleeve, needle roller bearing and splined sleeve to locate the auxiliary gear centrally.
- Carefully remove the splined sleeve and needle roller bearing while holding the auxiliary gear in place. Leave the plain sleeve in place.
- Fit the clutch outer drum.
- Align the splines of the outer drum with the splines on the auxiliary gear (it may be necessary to remove clutch outer drum and rotate by one tooth to align the splines).
- While holding the clutch outer drum in position, refit the splined sleeve and needle roller bearing.

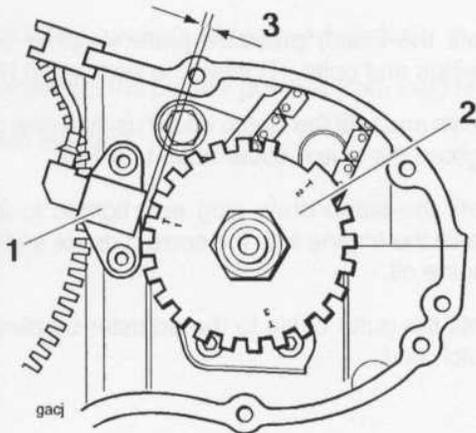
NOTE:

- When the sleeve is correctly fitted, it will be a flush fit with clutch drum face.



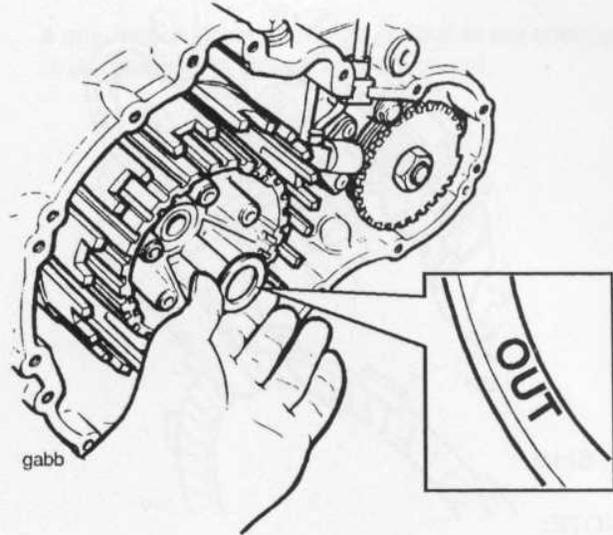
- 1. Splined Sleeve
- 2. Needle Roller Bearing

7. Refit the crankshaft position sensor and adjust the air gap to 1 mm.



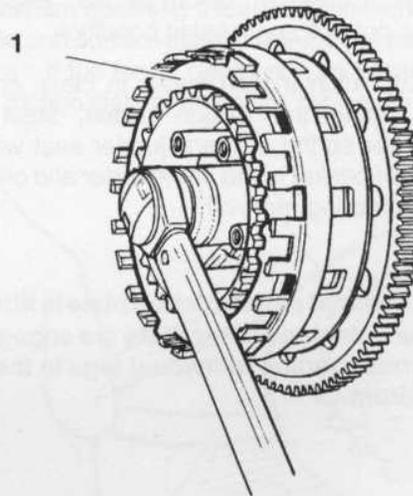
- 1. Crankshaft Position Sensor
- 2. Crankshaft Rotor
- 3. 1.00 mm ± 0.20 mm

- 8. Fit the shim and spacer to the shaft.
- 9. Fit the clutch inner drum.
- 10. Fit a new belleville washer ('out' mark facing outwards), and refit the centre nut.



Belleville Washer 'Out' Mark

11. Lock the inner and outer drums together using service tool T3880305. Depress the rear brake pedal to prevent the engine from turning, and tighten the clutch centre nut to **105 Nm**. Remove the service tool.

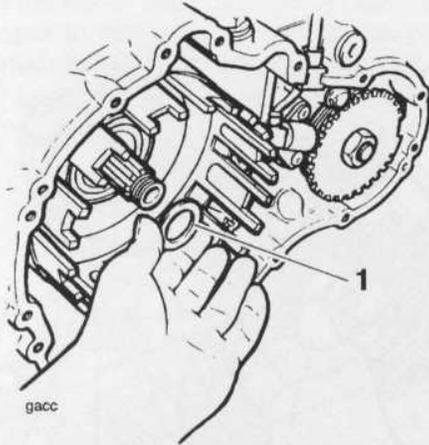


1. Service Tool T3880305

12. Disengage first gear and check for free rotation of the clutch inner drum.

NOTE:

- If the drum does not rotate freely, or free play is present in the inner drum, the shim which controls the inner drum position must be changed for one of a different thickness. To reduce free play, fit a thinner shim and if the drum is too tight, a thicker shim must be fitted.



1. Shim

NOTE:

- The following size shims are available:- 0.10mm, 0.15mm, 0.20mm, 0.25mm, 0.30mm and 0.35mm.

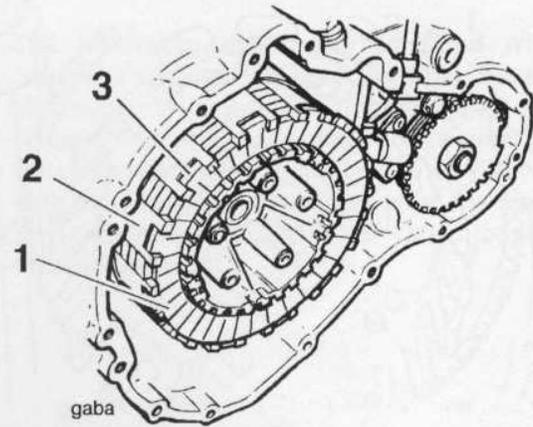


CAUTION: Severe engine damage will result from an incorrectly shimmed clutch drum.

13. Inspect all friction and steel plates for signs of wear, damage or distortion before re-use. Replace any that are not in a serviceable condition.
14. Soak all clutch friction plates in clean engine oil before fitting the friction plates, steel plates, anti-judder spring and anti-judder seat washer to the clutch basket in the same order and orientation as noted during removal.

NOTE:

- The outermost clutch friction plate is fitted such that the outer tags of the plate are engaged with the corresponding individual tags in the clutch outer drum.



1. Outer Clutch Friction Plate

2. Outer Drum

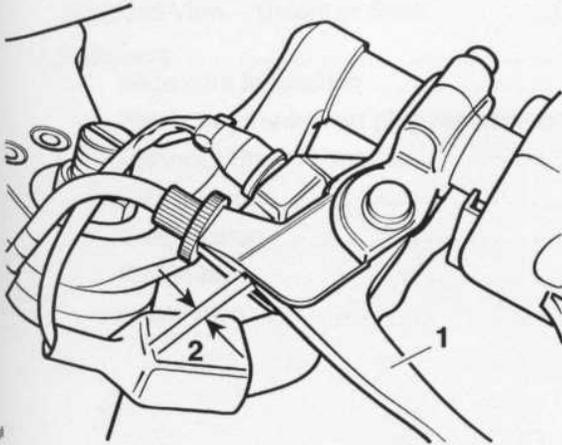
3. Individual Tags

15. Refit the clutch pullrod.
16. Refit the clutch pressure plate together with the springs and bolts. Tighten the bolts to **10 Nm**.
17. Clean and refit the clutch cover using a new gasket. Tighten the clutch cover bolts to **9 Nm**.
18. Refit the sump drain plug and tighten to **25 Nm**. Re-fill the engine with the correct grade and type of engine oil.
19. Refit the outer cable to the adjuster bracket at the clutch end.

NOTE:

- Ensure that the two adjuster nuts are positioned, one either side of the bracket.
20. Set the lever adjuster to a point where an equal adjustment is possible in both directions.
 21. Set the adjuster at the clutch end to give a preliminary setting of 2-3mm of free-play as measured at the lever.
 22. Operate the clutch lever several times and recheck the amount of free-play present at the lever.

23. Set the final adjustment of the cable to give 0.4-0.8 mm of free-play at the lever by turning the adjuster nut and locknut at the lever end.



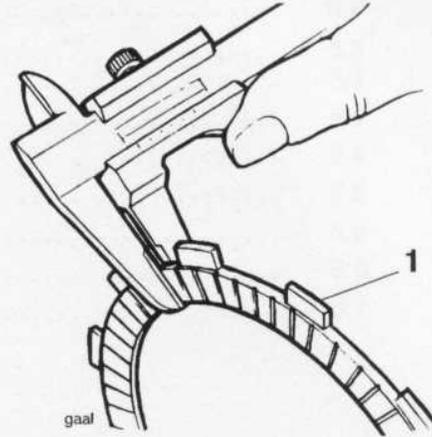
1. Clutch Lever

2. Correct Setting, 0.4-0.8 mm

24. Refit the bodywork (if removed earlier).
25. Reconnect the battery positive (red) lead first.
26. Refit the seat.

FRICITION PLATE INSPECTION

1. If any friction plate thickness is outside the service limit, replace the friction plates as a set.

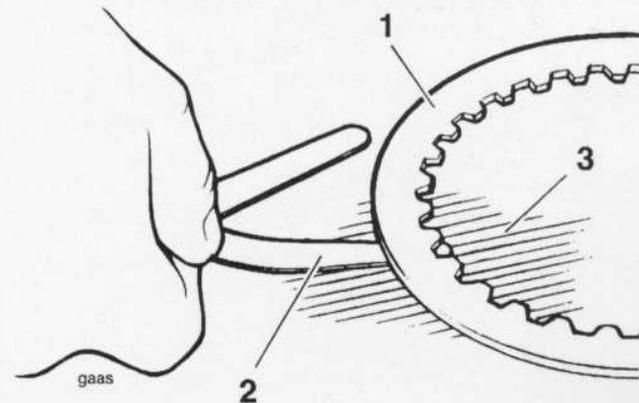


1. Clutch friction Plate

Friction plate thickness

Standard: 3.80 mm - 0.00 + 0.08 mm
Service limit: 3.60 mm

2. Check all plates for bend and warp as follows: Place the plate being checked on a clean surface plate and attempt to pass a feeler gauge of the maximum specified thickness between the friction plate and surface plate at several points around the plate. If the feeler gauge can be passed beneath the friction plate at any point, renew the plates as a set.



1. Friction Plate
 2. Feeler Gauge
 3. Surface Plate

Friction plate bend/warp

Standard: 0.15 mm
Service limit: 0.20 mm

BALANCER

CONTENTS

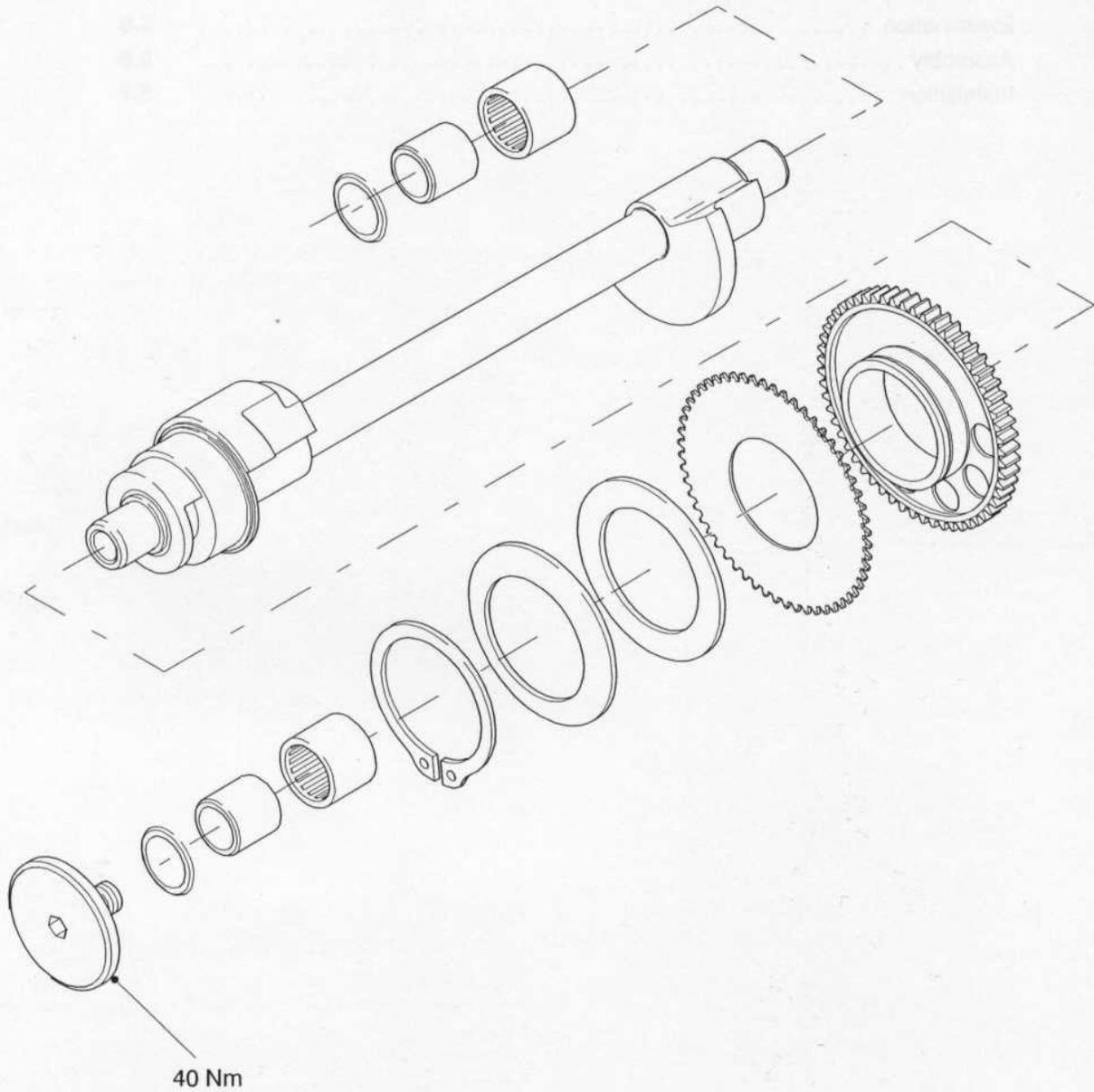
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1. Balance Shaft Bearings
2. Crankshaft Pin/Joint

CAUTION: If the markings on the shaft are aligned, the balancer must be removed, checked and refilled in the correct amount position. Continued engine operation with an incorrectly aligned balancer will cause premature engine wear and performance engine damage.

3. Fill engine oil to the correct level (see oil level chart in balance page 5.7)
4. Verify the correct torque on the bolts in the crank pin/joint.

Exploded View - Balancer Shaft



BALANCERS

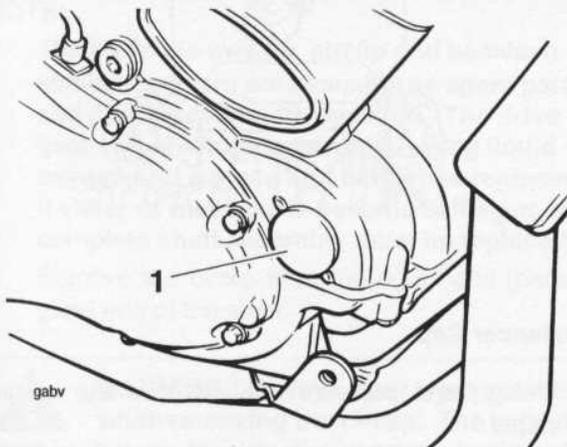
The balancer is fitted to control 'pulsing' within the engine. Without any form of balancer, the engine would 'pulse' each time the crankshaft rotated. This 'pulsing' would be felt as a vibration which would amplify as the engine speed was increased.

The balancer has the effect of a pair of counterbalance weights which create an equal amount of energy in the opposite direction, and at the same time as that produced by the crankshaft, pistons and connecting rods. Because the opposing pulses occur at the same point of crankshaft rotation, and are of an equal magnitude, a state of equilibrium or balance is reached.

Alignment Inspection

If the balancer is not correctly orientated in relation to the crankshaft, severe engine vibration will occur. In circumstances where severe engine vibration is experienced, the relationship of the balancer to the crankshaft must be checked.

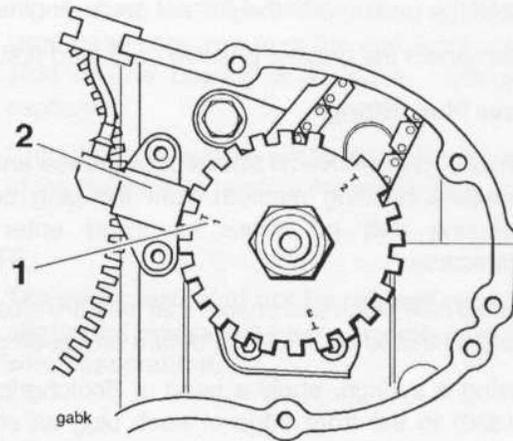
1. Disconnect the battery, negative (black) lead first.
2. Drain the engine oil into a clean container.
3. Remove the clutch cover as described in the clutch section.
4. Lever out the plug shown in the illustration below from the right hand side of the crankcase. Take care not to mark or damage the case during removal.



1. Crankcase Plug

NOTE:

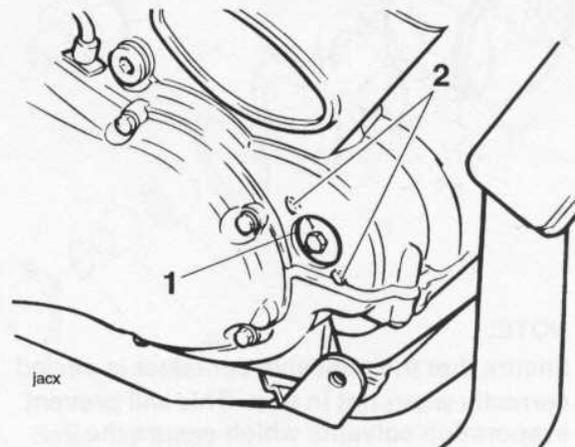
- The plug will be damaged during removal and must be discarded.
5. Turn the engine over until the 'T1' mark on the crankshaft rotor aligns with the centre of the crankshaft position sensor.



1. 'T1' Mark

2. Crankshaft Position Sensor

6. Examine the marking on the end of the balancer shaft and check that the markings align with the corresponding pointers on the outside of the crankcase. If the markings align as shown below, the balancer is correctly aligned.



1. Balancer Shaft Markings

2. Crankcase Pointers



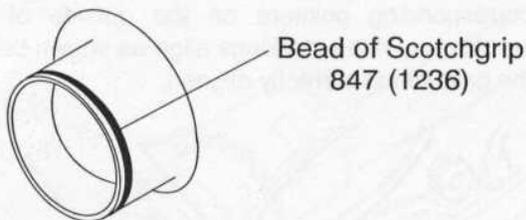
CAUTION: If the markings do not align as shown, the balancer must be removed, checked and refitted in the correct alignment position. Continued engine operation with an incorrectly aligned balancer will cause premature engine wear and permanent engine damage.

7. Fit a new plug to the right hand side of the crankcase as described in 'balancer plug fitting'.
8. Refit the clutch cover as described in the clutch section.

9. Refill the engine with the correct grade engine oil.
10. Reconnect the battery, positive (red) lead first.

Balancer Plug Fitting

1. Thoroughly remove all traces of oil/grease and the previous bonding medium from the plug bores, ensuring that no debris or swarf enter the crankcase.
2. Select new plugs and ensure that they are also free from all traces of oil/grease before proceeding.
3. Using a syringe, apply a bead of Scotchgrip 847 (1236) to the front edge of each plug as shown below. The adhesive is available from Triumph under part number T3450301. The adhesive must cover the complete circumference of the plug.



NOTE:

- **Ensure that the adhesive container is sealed correctly when not in use. This will prevent evaporation solvents which ensure the sealer's bonding efficiency.**
4. Fit the plugs to the crankcase immediately after application of the adhesive. Ensure that the plugs are square to the crankcase and insert by applying a constant pressure with the palm of the hand.
 5. Allow the adhesive to cure for at least one hour before starting the engine.

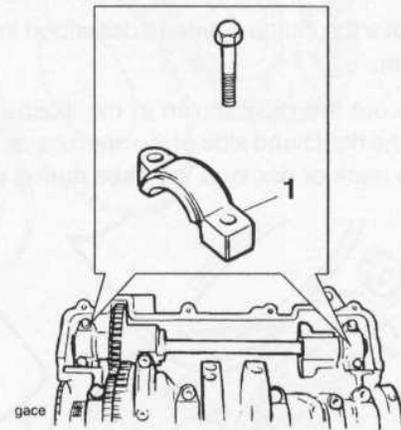
Balancer Shaft Removal

NOTE:

- **To remove the balancer, the engine must be removed from the frame and the two halves of the crankcase separated to allow removal of the crankshaft. For details of engine removal, crankcase separation and crankshaft removal, see the crankcase/crankshaft/piston and connecting rod section.**
1. Invert the upper crankcase ensuring that its weight is adequately supported.
 2. Mark the balancer cap positions to ensure that they are refitted in their original orientation and positions in the crankcase.

CAUTION: The crankcase and balancer bearing caps are align bored during manufacture. Refitting the balancer bearing caps incorrectly may cause the shaft to seize or the caps to break resulting in severe engine damage.

3. Remove the balancer cap bolts.



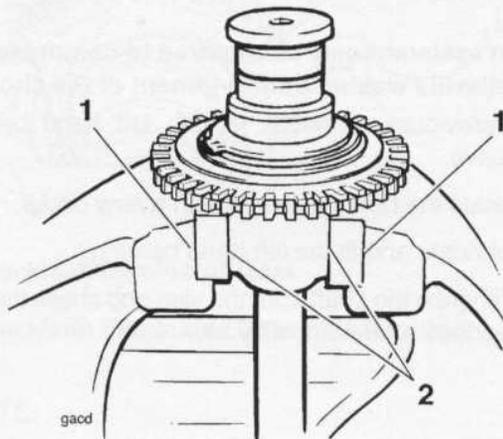
1. Balancer Cap

4. Using hand pressure only, remove the bearing caps.

5. Withdraw the balancer assembly from the crankcase.
6. Collect the bearing from the left hand end of the balancer shaft.

Disassembly

1. Locate the balancer assembly to a vice fitted with soft jaw-plates.
2. Close the vice such that the vice jaws grip the balancer across the flats on the balancer weight.



1. Vice Jaws
2. Balancer Weight Flats

NOTE:

- The belleville washer, circlip and backlash eliminator gears are available as spare parts and can, therefore, be replaced. The drive gear and shaft are assembled using liquid oxygen and a press and cannot be replaced. If either of these parts become damaged, the complete shaft assembly must be replaced.
3. Remove the circlip from the right hand (balancer gear) end of the shaft.

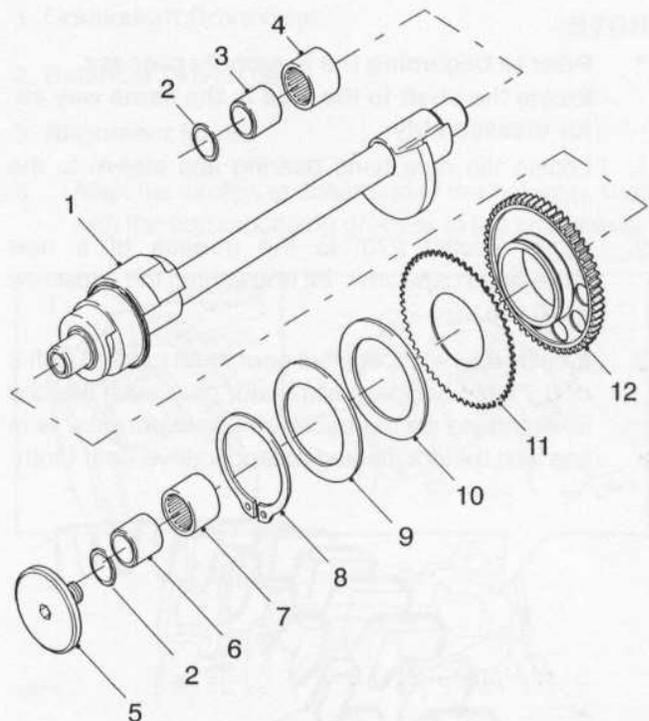
! WARNING: Always wear eye protection when removing the circlip. The belleville washer below the circlip exerts considerable upward pressure and can cause the clip to jump off during release.
 Eye damage could result from contact with a displaced circlip.

4. Collect the belleville washer, flat washer and backlash eliminator gear.

5. To remove the right hand bearing, undo the large-head capscrew from the end of the shaft and slide off the bearing and sleeve. Discard the capscrew.
6. If required, remove the circlip from the left hand end of the balancer to release the bearing sleeve.

NOTE:

- The capscrew must not be re-used as its alignment marks will be incorrectly positioned when assembled.



1. Balancer Shaft
2. Circlip
3. Sleeve, Left Hand
4. Bearing, Left Hand
5. Large-head Capscrew
6. Sleeve, Right Hand
7. Bearing, Right Hand
8. Circlip
9. Belleville Washer
10. Washer
11. Backlash Eliminator Gear
12. Balancer Drive Gear

Examination

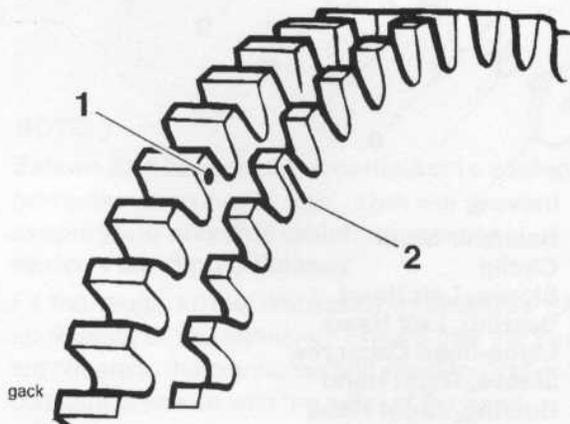
Before assembly, check the following items:

- Shaft bearings for overheating (blue coloured areas), loose or missing rollers etc.
- Shaft bearing areas and sleeves for overheating (blue coloured areas), grooving, scoring etc.
- Drive gear and backlash eliminator gears for tooth damage, overheating etc.
- Belleville washer for distortion.

Assembly

NOTE:

- **Prior to beginning the assembly process, locate the shaft to the vice in the same way as for disassembly.**
1. Locate the right hand bearing and sleeve to the shaft.
 2. Apply 'Loctite 270' to the threads of a new large-head capscrew. Fit and tighten the capscrew to **40 Nm**.
 3. Identify the balancer drive gear tooth marked with a dot. Fit the backlash eliminator gear such that the line marking on the backlash eliminator gear is in line with the dot marked balancer drive gear tooth.



1. Drive Gear Dot Marking

2. Backlash Eliminator Gear Line Marking

4. Fit the flat washer, belleville washer (dished face outwards) and circlip.



WARNING: Always wear eye protection when fitting the circlip. The belleville washer below the circlip exerts considerable upward pressure and can cause the clip to jump off during assembly.

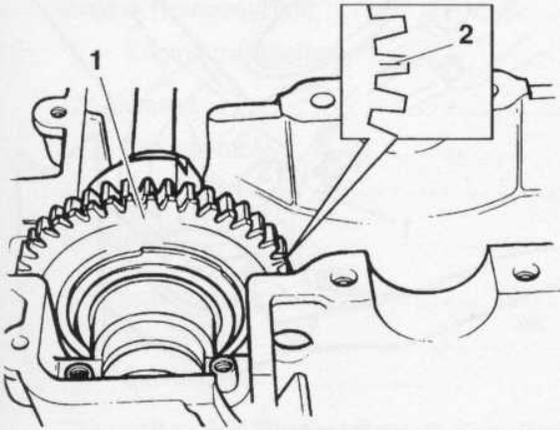
Eye damage could result from contact with a displaced circlip.

NOTE:

- **An assistant may be required to compress the belleville washer during fitment of the circlip.**
5. If previously removed, fit the left hand bearing sleeve.
 6. Retain the bearing sleeve with a new circlip.
 7. Lubricate and fit the left hand bearing.
 8. Withdraw the shaft from the vice and check that the bearings rotate smoothly etc.

Installation

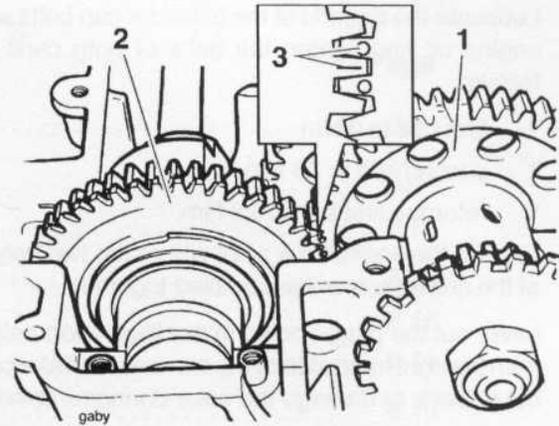
1. Check that the backlash eliminator gear tooth which is marked with a line is directly in front of the balancer drive gear marked with a dot.



1. Backlash Eliminator Gear
2. Backlash Eliminator Gear Line Marking

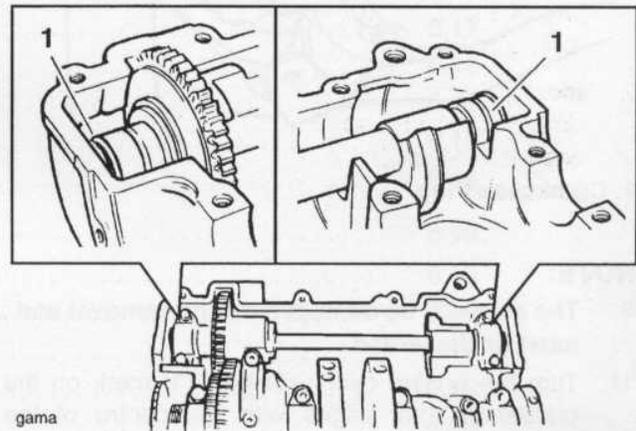
NOTE:

- If the markings on the gears do not align at the same point, the backlash eliminator gear can be rotated by gently moving it against the teeth of the drive gear.
 - For ease of identification during assembly, apply a small paint spot to the outside face of the dot marked balancer drive gear tooth.
2. Apply 'Three Bond 1375B' high strength locking fluid (or a direct equivalent) to the balancer bearing locations in the upper crankcase.
 3. Locate the retaining circlips to each end of the balancer shaft.
 4. Install the balancer assembly into the crankcase ensuring that the oil holes in the balancer bearings face away from the sealer area.
 5. Fit the crankshaft to the crankcase aligning the two dot marked teeth on the crankshaft gear with the marked balancer driven gear.



1. Crankshaft Drive Gear
2. Balancer Driven Gear
3. Alignment Marks

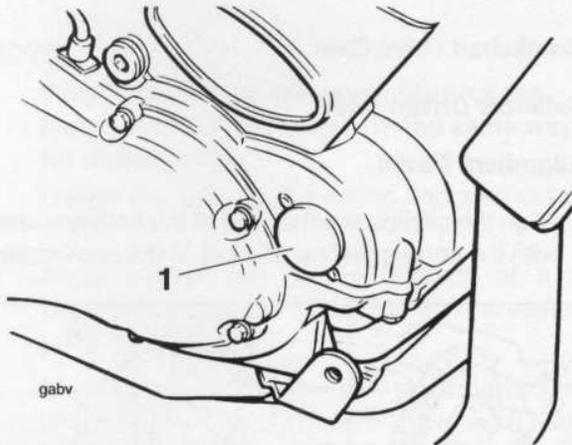
6. Align the circlips at either end of the balancer shaft with the corresponding grooves in the crankcase.



1. Circlip Locations

7. Refit the bearing caps in the position and orientation noted during disassembly. It is not necessary to apply locking fluid to the bearing locations in the caps.

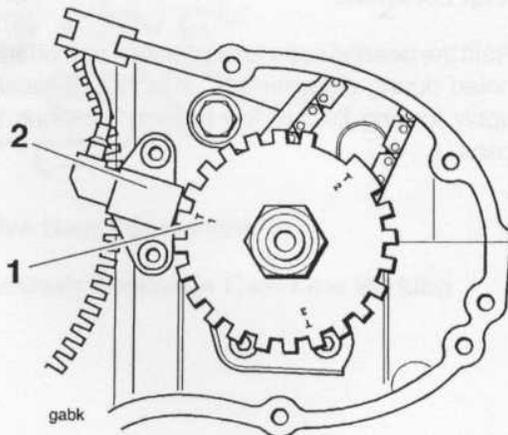
8. Lubricate the threads of the balancer cap bolts with engine oil and tighten the bolts of both caps as follows;
 - first bolt to 8 Nm.
 - second bolt to 28 Nm,
 - retorque first bolt to 28 Nm.
9. Rebuild the engine to a point where the two halves of the crankcase are assembled together.
10. Lever out the plug, shown in the illustration below, from the right hand side of the crankcase. Take care not to mark or damage the case during removal.



1. Crankcase Plug

NOTE:

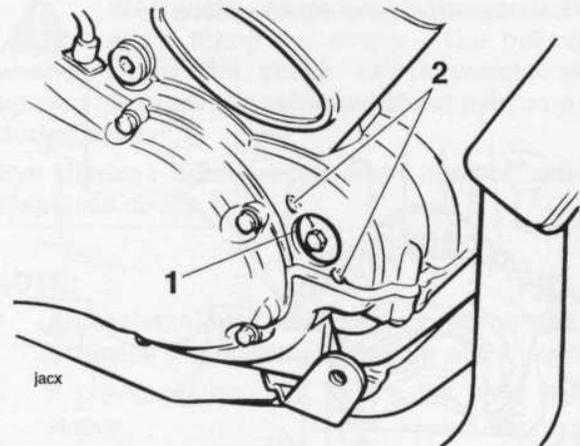
- **The plug will be damaged during removal and must be discarded.**
11. Turn the engine over until the 'T1' mark on the crankshaft rotor aligns with the centre of the crankshaft position sensor.



1. 'T1' Mark

2. Crankshaft Position Sensor

12. Make permanent marks on the bolt that accurately align with the two marks on the outside of the crankcase.



1. Balancer Shaft Bolt Marking

2. Crankcase Pointers

13. Fit a new plug to the right hand side of the crankcase (see 'balancer plug fitting' earlier in this section).
14. Continue to assemble and refit the engine as described in the crankcase/crankshaft/piston and connecting rod section.

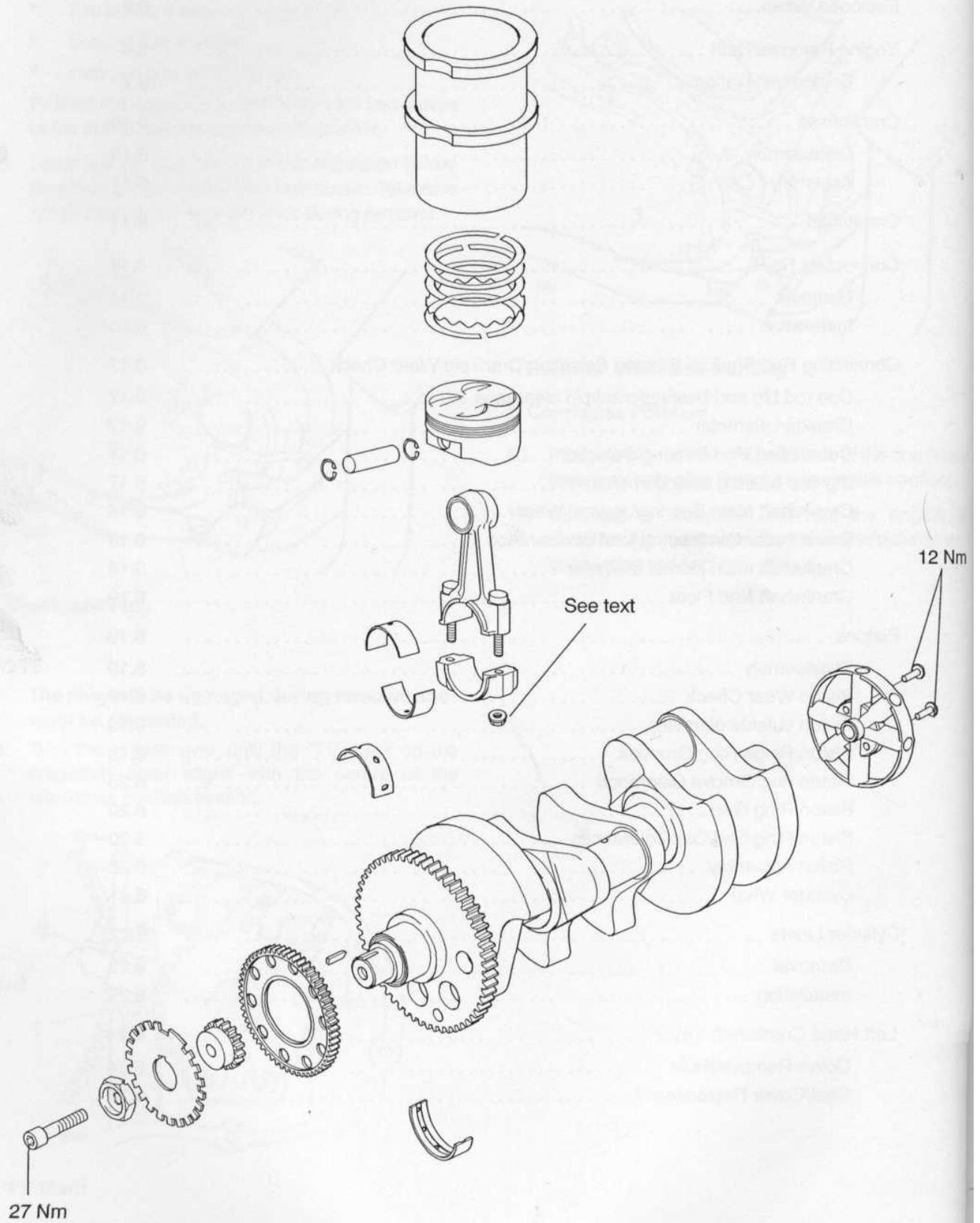
CRANKSHAFT, RODS and PISTONS

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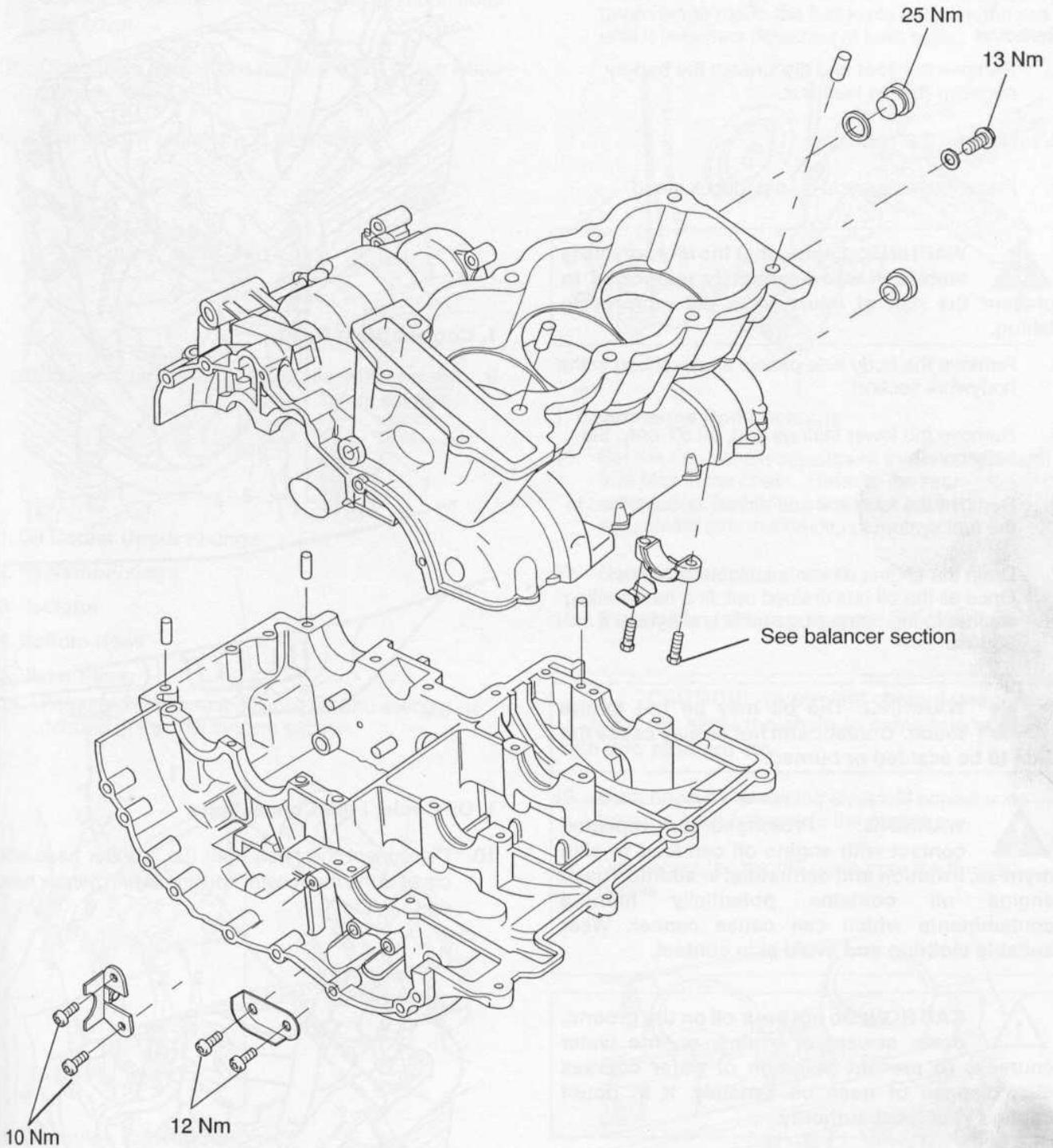
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Exploded View

Crankshaft, Connecting Rod, Piston and Liner



Exploded View - Crankcase



ENGINE REMOVAL/REFIT

Removal

1. Remove the seat and disconnect the battery, negative (black) lead first.
2. Remove the battery.
3. Place the motorcycle on a paddock stand.



WARNING: Ensure that the motorcycle is stabilised and adequately supported to prevent the risk of injury from the motorcycle falling.

4. Remove the body side panels as described in the bodywork section.
5. Remove the lower fairings and, on ST only, the belly panel.
6. Remove the fuel tank and airbox as described in the fuel system section.
7. Drain the engine oil into a suitable container. Once all the oil has drained out, fit a new sealing washer to the sump plug and fit and tighten it to 25 Nm.



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.

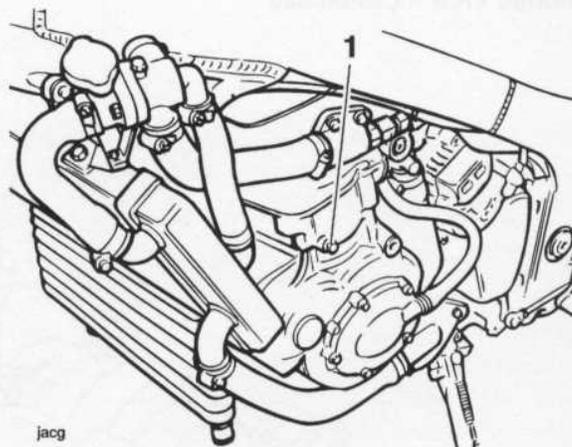


CAUTION: Do not pour oil on the ground, down sewers or drains, or into water courses. To prevent pollution of water courses etc., dispose of used oil sensibly. If in doubt contact your local authority.

8. Drain the coolant as described in the cooling system section.



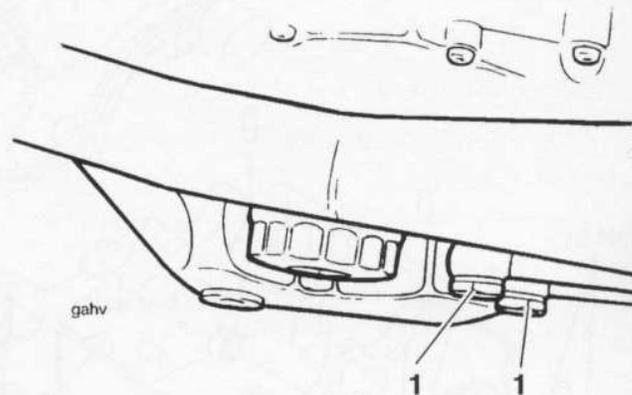
WARNING: Do not remove the coolant pressure cap when the engine is hot. When the engine is hot, the coolant inside the cooling system is hot and also under pressure. Contact with the pressurised coolant will cause scalds and skin damage.



jacg

1. Coolant Drain Point

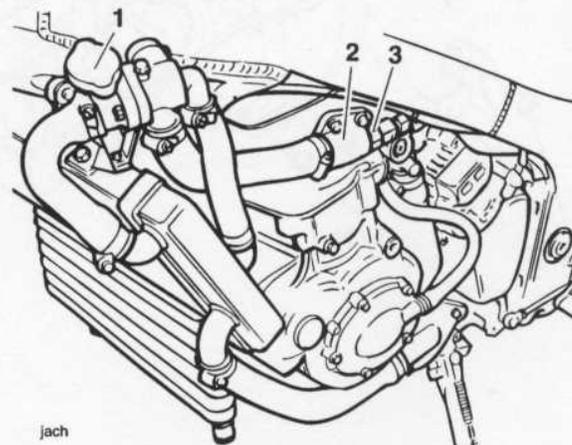
9. Release the oil cooler pipes at their connections with the sump.



gahv

1. Oil Cooler Pipe Connections

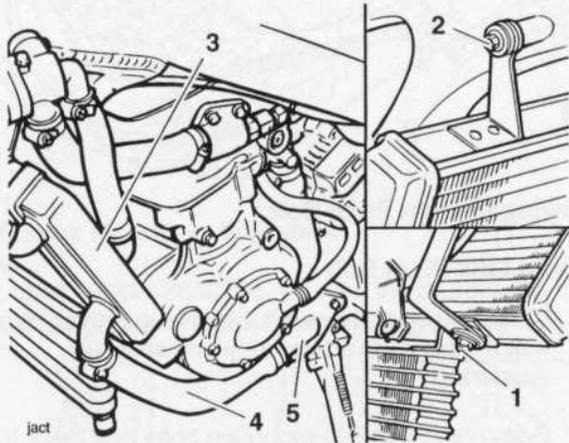
10. Disconnect the hose from the cylinder head side cover to the thermostat housing at the cylinder head end.



jach

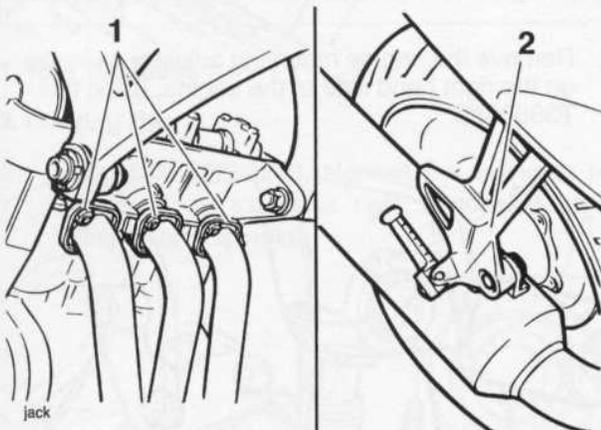
1. Radiator Cap
2. Cylinder Head Side Cover
3. Coolant Temperature Sensor

11. Disconnect the electrical connector from the coolant temperature sensor in the cylinder head side cover.
12. Disconnect the bottom radiator hose at the water pump.
13. Remove the radiator and oil cooler.



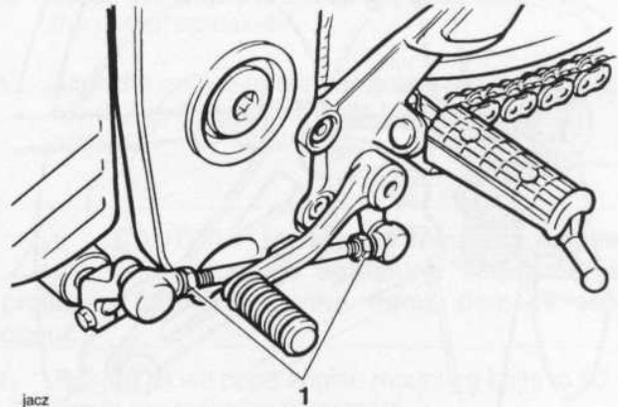
1. Oil Cooler Upper Fixings
2. Radiator Fixings
3. Radiator
4. Bottom Hose
5. Water Pump

14. Remove the exhaust downpipes and silencer as detailed in the fuel system section.



1. Downpipe to Head Fixings
2. Silencer Mounting

15. Note the setting position of the gearchange adjuster rod. Slacken the locknuts securing the gearchange rod to the ball joints and turn the rod until it becomes detached at both ends.

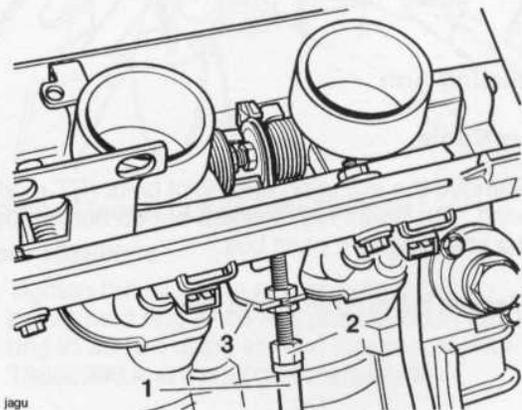


1. Gearchange Rod Locknuts

16. Set the drive chain adjustment to allow maximum free play in the chain. Refer to the rear suspension/final drive section for chain adjustment information.
17. Remove the sprocket cover.
18. Detach the chain from the rear sprocket.

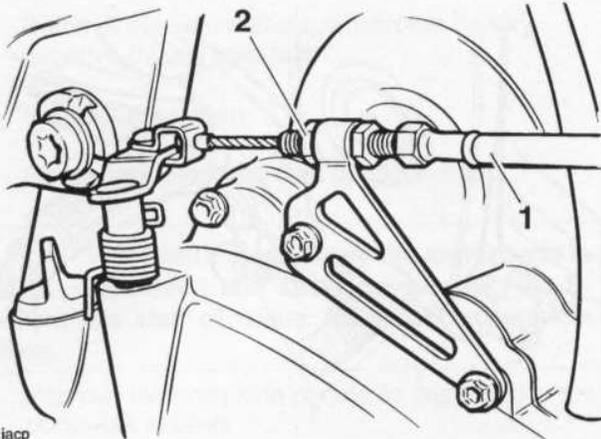
CAUTION: To prevent chain damage, do not allow the chain to come into contact with dirt, road grit etc.

19. Disconnect all remaining electrical connections from the main harness to the engine.
20. Disconnect the throttle cable from the throttle bodies.



1. Outer Cable
2. Adjuster Locknut
3. Cable Bracket

21. Slacken the clutch cable locknut and release the adjuster at the clutch cover end to give maximum play in the cable.

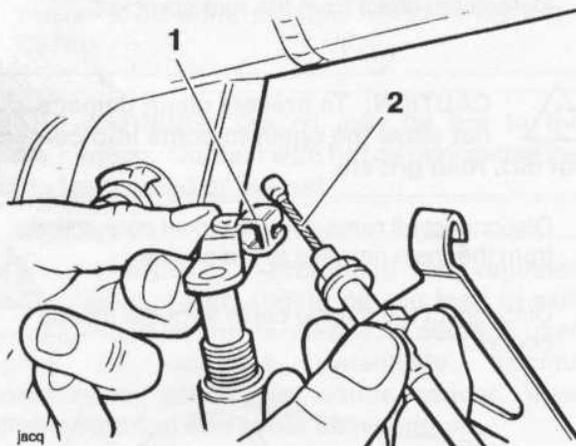


jacp

1. Clutch Cable

2. Adjuster

22. 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 in the arm. Detach the cable from the bracket.

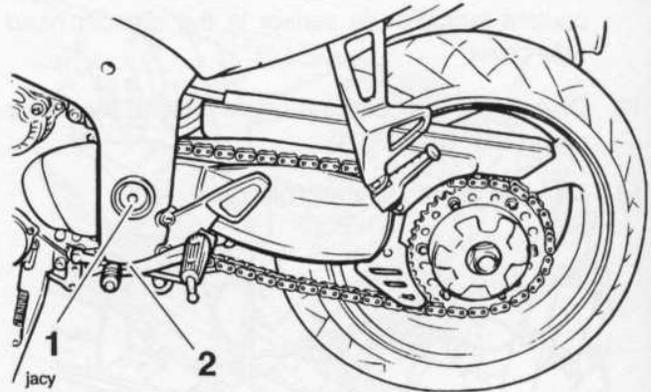


jacq

1. Actuating Arm

2. Inner Cable

23. Remove the swinging arm pivot bolts (ST model only). On Sprint RS, slacken but do not remove the swinging arm pivot bolt.
24. Slacken the drag link pivot bolt.



jacy

1. Swinging Arm Pivot Bolt

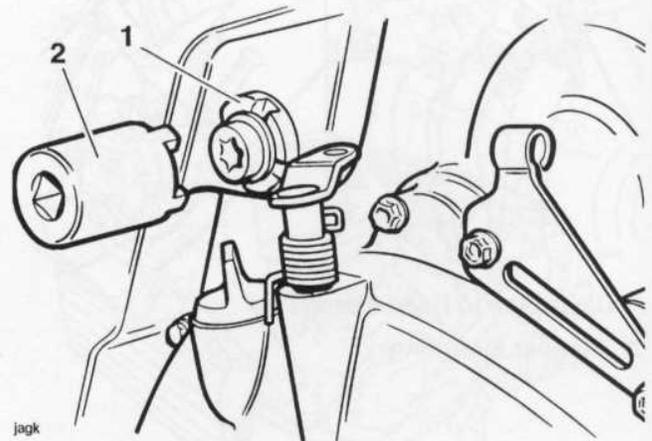
2. Drag Link Pivot Bolt

25. Place a support beneath the engine and ensure that the frame is adequately and securely supported.
26. Remove the engine mounting bolts and lower the engine to allow the drive chain to be detached from the output sprocket.
27. Remove the engine from the frame.



CAUTION: To prevent damage to components, lower the engine very carefully. Particularly vulnerable items include the throttle position sensor, cam sensor and radiator.

28. Remove the engine mounting adjuster locknuts, on the right hand side of the engine, using tool T3880088.

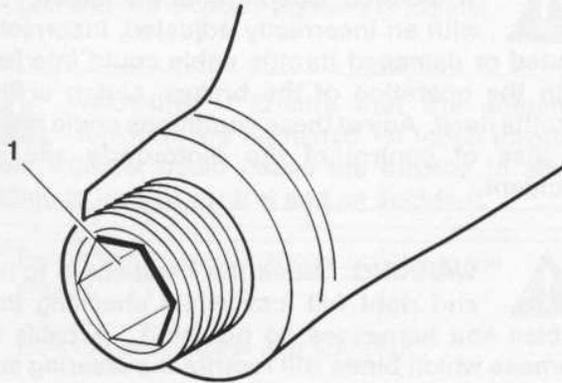


jagk

1. Engine Mounting Adjuster Locknut

2. Tool T3880088

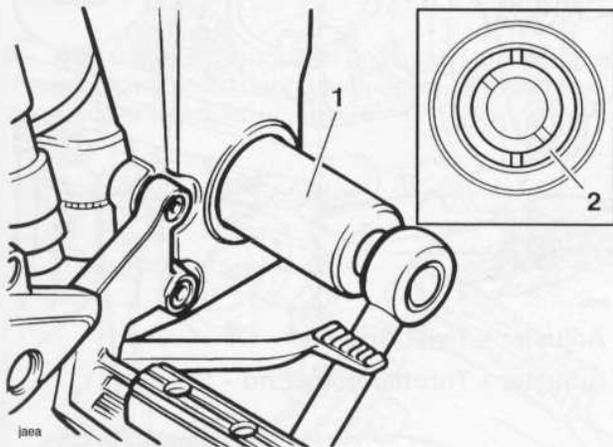
29. Slacken the engine mounting adjusters.



jahty

1. Engine Mounting Adjusters

30. Using tool T3880295, slacken the locking ring from the right hand side of the swinging arm spindle.

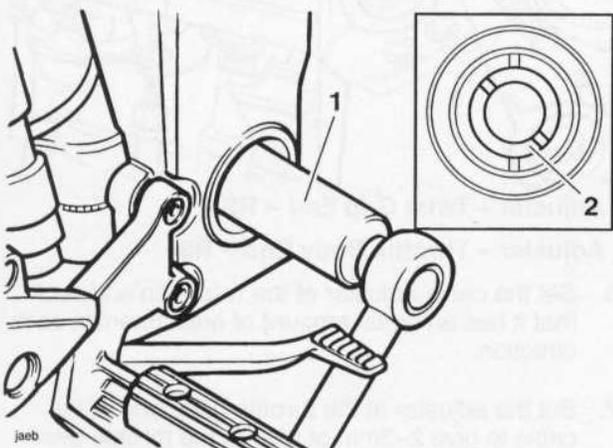


jaea

1. Tool T3880295

2. Locking ring

31. Using tool T3880290, slacken the swinging arm clamping ring from the right hand side of the swinging arm spindle.



jaeb

1. Tool T3880290

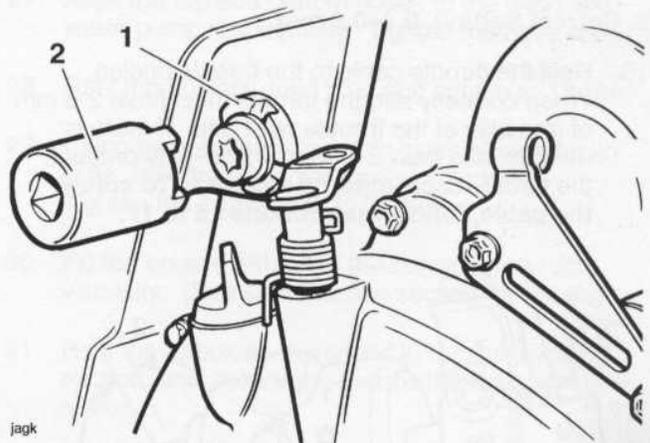
2. Clamping ring

Engine Installation

1. Position the engine beneath the frame.
2. Raise the engine and loop the drive chain over the output sprocket.
3. Align the engine to the frame and refit the left hand engine mounting bolts to support the engine.

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

4. Tighten all left hand engine mounting bolts to **95 Nm** in the following sequence;
 - upper rear,
 - front,
 - lower rear.
5. On the right hand side, tighten all engine mounting adjusters to **3 Nm**.
6. Fit and tighten the right hand engine mounting bolts to **95 Nm**.
7. Tighten the engine mounting adjuster locknuts to **55 Nm** using tool T3880088.



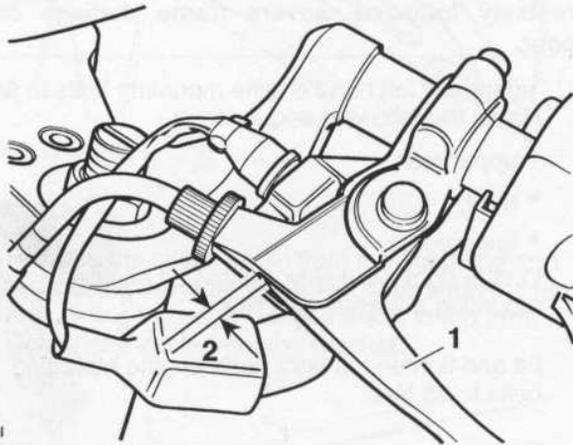
jagk

1. Engine Mounting Adjuster Locknut

2. Tool T3880088

8. Tighten the swinging arm spindle inner adjustment ring to **15 Nm** and the outer locking ring to **30 Nm** using service tool part numbers T3880290 and T3880295 respectively.
9. On Sprint ST fit the swinging arm bolts and tighten the swinging arm spindle bolt to **60 Nm**.
10. On Sprint RS, tighten the swinging arm pivot bolt to **110 Nm**.

11. Tighten the drag link spindle bolt to **48 Nm**.
12. Refit the clutch cable and set the adjuster at the clutch end to give a preliminary setting of 2-3 mm of free-play as measured at the lever.
13. Operate the clutch lever several times and recheck the amount of free-play present.
14. Set the final adjustment of the cable to give 0.4-0.8 mm of free-play at the lever by turning the adjuster nut and locknut at the lever end. Tighten the lock ring.

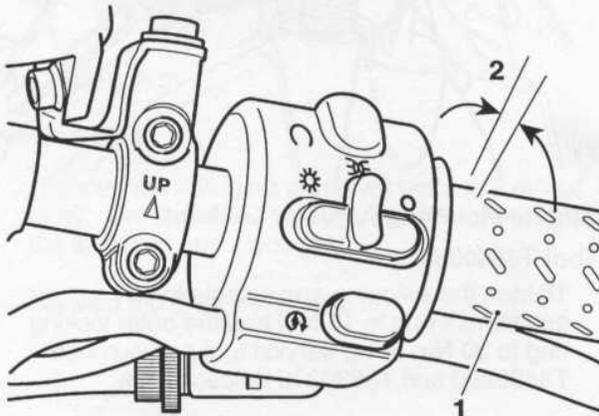


jagl

1. Clutch Lever

2. Correct Setting, 0.4-0.8 mm

15. Refit the throttle cable to the throttle bodies. 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 cable must be adjusted. **To adjust the cable, follow instructions 15 to 17.**



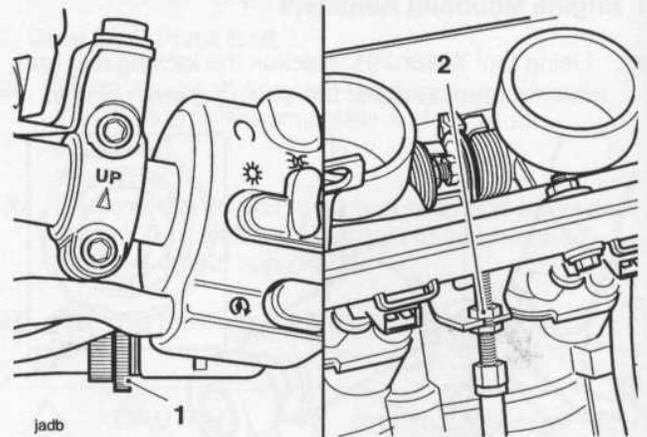
jada

1. Throttle Twist Grip

2. 2-3 mm

! 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.

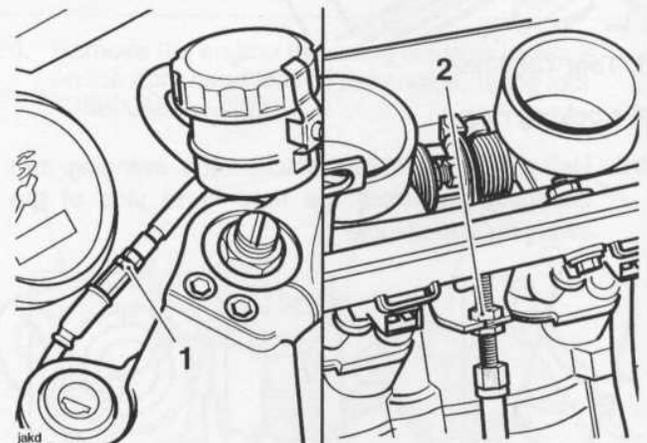
! WARNING: Move the handlebars to left and right full lock while checking that cables and harnesses do not bind. A cable or harness which binds will restrict the steering and may cause loss of control and an accident.



jadb

1. Adjuster - Twist Grip End - ST

2. Adjuster - Throttle Body End - ST



jakd

1. Adjuster - Twist Grip End - RS

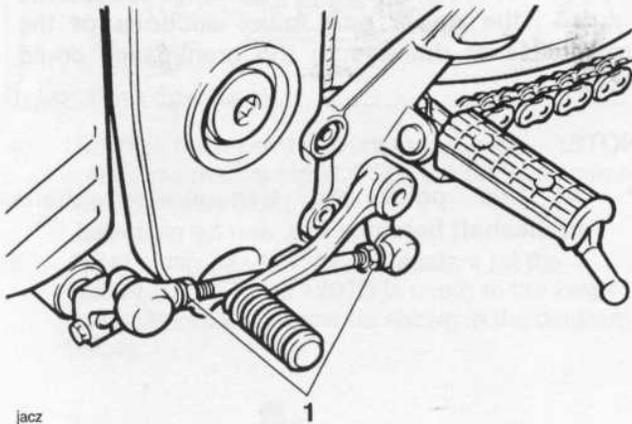
2. Adjuster - Throttle Body End - RS

16. Set the cable adjuster at the twist grip end such that it has an equal amount of adjustment in each direction.
17. Set the adjuster at the throttle body end of the cable to give 2-3mm of play at the throttle twist grip. Tighten the locknut.

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

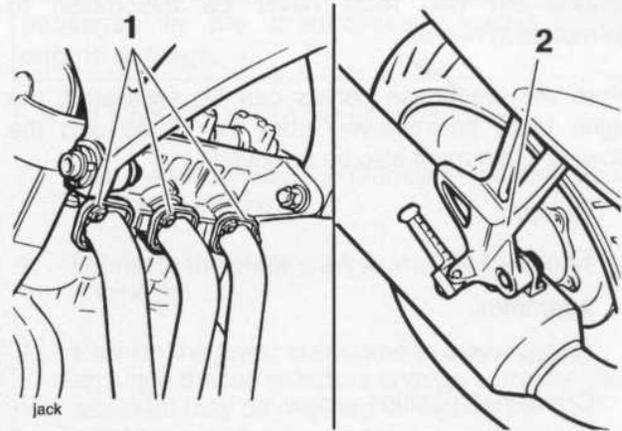
! WARNING: Ensure that the adjuster locknuts are tightened. A loose throttle cable adjuster could cause the throttle to stick leading to loss of control and an accident.

19. Reconnect all electrical connections to the engine.
20. Refit the chain to the rear sprocket.
21. Allow the swinging arm to hang free, and set the chain adjustment as described in the rear suspension/final drive section.
22. Refit the sprocket cover and tighten the bolts to **9 Nm**.
23. Refit the gearchange rod and adjust to the same setting as noted during strip-down. Tighten the adjuster locknuts.



1. Locknuts

24. Using new seals at the cylinder head end, refit the exhaust system as described in the fuel system section.



1. Downpipe to Head Fixings

2. Silencer Mounting

25. Refit the radiator/thermostat housing as an assembly as described in the cooling system section. Before attaching the radiator fixings, also align the upper oil cooler mountings to the lower radiator mountings. Tighten the radiator to frame fixings to **9 Nm**.
26. Tighten the oil cooler and radiator fixings to **5 Nm**.
27. Align the top and bottom hoses to the head and water pump respectively. Tighten the hose clips.
28. Refit the coolant drain plug and tighten to **13 Nm**.
29. Using new washers, on both sides of both banjo bolts, refit the oil cooler pipes to the sump. Tighten the banjo bolts to **25 Nm**.
30. Fill the engine with oil of the correct grade and viscosity. (See specification section for details).
31. Refit the airbox as described in the fuel system section, and secure the thermostat housing to the airbox.
32. Refill the cooling system as described in the cooling system section.
33. Refit the fuel tank as described in the fuel system section.
34. Refit the battery to the battery box.
35. Reconnect the battery positive (red) lead first.
36. Refit any bodywork previously removed.
37. Remove the motorcycle from the paddock stand and place on the side stand.

CRANKCASES

The upper and lower crankcases are machined as a matched set and must never be assembled to non-matching halves.

Before the crankcase halves can be separated, the engine must be removed from the frame and the following items must also be removed

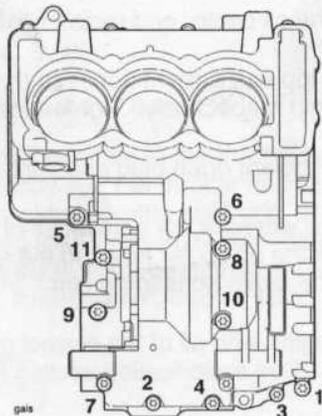
1. Sump.
2. Engine covers
3. Alternator.
4. Starter motor.
5. Crankshaft position sensor.

Disassembly



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

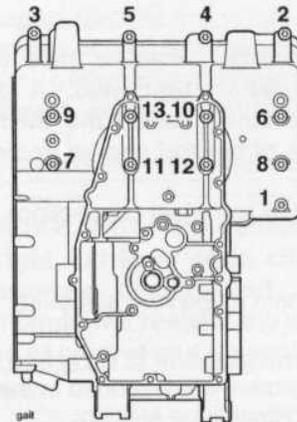
1. Working on the upper crankcase bolts first, release the bolts in the sequence shown below.



Upper Crankcase Bolt Release Sequence

2. Invert the engine to give access to the lower crankcase bolts.

3. Release the lower crankcase bolts in the sequence shown in the diagram below.



Lower Crankcase Bolt Release Sequence

4. Separate the lower and upper crankcases ensuring that the 3 locating dowels remain in the upper crankcase.



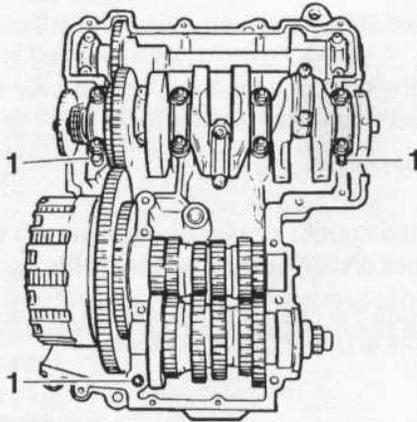
CAUTION: Do not use levers to separate the upper and lower sections of the crankcase or damage to the crankcases could result.

NOTE:

- At this point the transmission shafts, crankshaft bearings etc. can be removed.

Assembly

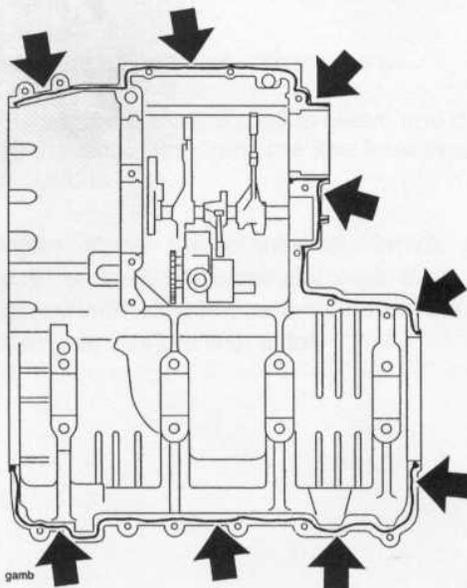
1. Apply Loctite 648 to the outer races of the gearbox bearings. Fit the gearbox shafts (if removed), ensuring the locating ring on the input shaft is in position in the circlip groove on the crankcase. Engage the clutch primary gear with crankshaft gear.
2. Ensure that the transmission is in neutral.
3. Ensure that the 3 locating dowels are in position in the upper crankcase.



gagr

1. Locating dowels

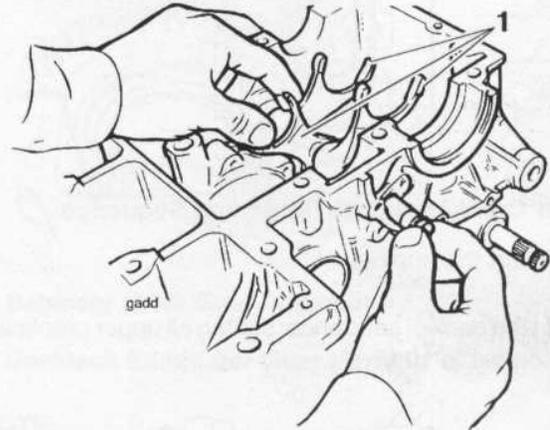
4. Use high flash-point solvent to clean the crankcase mating faces. Wipe the surfaces clean with a lint-free cloth.
5. Apply a thin bead of silicone sealant (at the factory, Three Bond 1207B is used) to the lower crankcase mating faces as shown in the diagram below.



gamb

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

6. Fit a new 'O' ring to the oil pump outlet.
7. Install and lubricate the crankshaft bearing shells with clean engine oil.
8. Lubricate the crankshaft journals with clean engine oil.
9. Position the lower crankcase to the upper, ensuring that all selectors engage correctly. An assistant may be required to support the crankcase during alignment.



gadd

Selector Forks

10. Fit the screws into the lower crankcase and hand tighten.
11. Invert the engine.
12. Fit the screws into the upper crankcase and hand tighten.

NOTE:

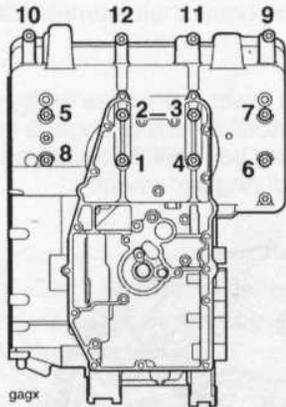
- The crankcase screws are tightened in stages, in the same sequences used during strip down.
- Two different sizes of crankcase screw are used. All screws are tightened through the first two stages of the tightening procedure but only the M8 size screws are tightened at the third stage.

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

Stage 1 - all screws

13. Invert the engine.

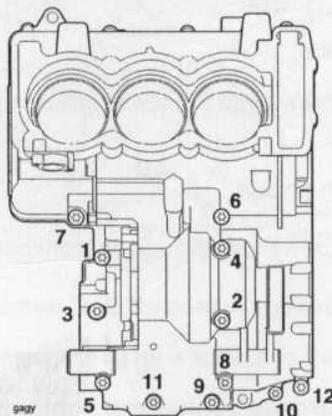
In the correct sequence, tighten all lower crankcase screws to **10 Nm**.



Lower Crankcase Bolt Tightening Sequence

14. Invert the engine.

In the correct sequence, tighten all upper crankcase screws to **10 Nm**.



Upper Crankcase Bolt Tightening Sequence

Stage 2 - all screws

15. Invert the engine.

In the correct sequence, tighten all lower crankcase screws to **12 Nm**.

16. Invert the engine.

In the correct sequence, tighten all upper crankcase screws to **12 Nm**.

Stage 3 - M8 screws only

17. Invert the engine.

In the correct sequence, tighten only the **M8** size lower crankcase screws to **28 Nm**.

18. Invert the engine.

In the correct sequence, tighten only the **M8** size upper crankcase screws to **28 Nm**.

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

CRANKSHAFT

NOTE:

- Before the crankshaft can be removed, the two halves of the crankcase must first be separated.

Removal

1. Remove the connecting rods as described in the previous section.
2. Remove the breather disc from the crankshaft.
3. Remove the cam chain as described in the cylinder head section.
4. Release and remove the crankshaft from the upper crankcase.

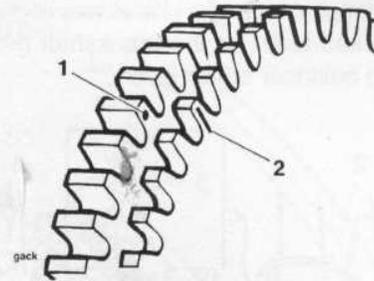
NOTE:

- Remove all bearings and inspect for damage, wear, overheating (blueing) and any other signs of deterioration. Replace the bearings as a set if necessary.

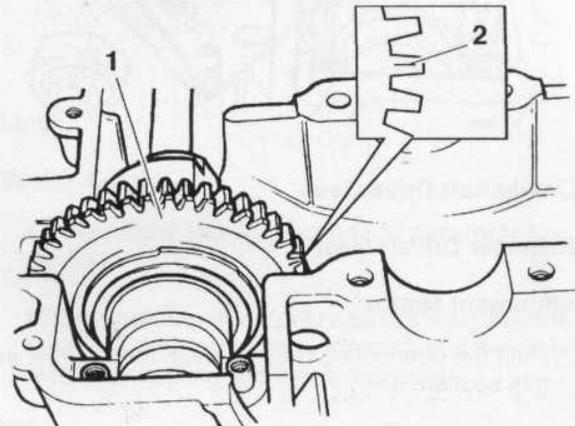
Installation

CAUTION: Always check the bearing journal clearance, as described in the following pages, before final assembly of the crankshaft. Failure to correctly select crankshaft bearings will result in severe engine damage.

1. Select and fit new main and big end bearings using the selection processes detailed later in this section.
2. Lubricate all bearings with engine oil.
3. Ensure that the crankshaft is clean, and that the oilways within the crank are free from blockages and debris.
4. Before fitting the crankshaft, check that the balancer backlash eliminator gear tooth which is marked with a line is directly in front of the balancer drive gear marked with a dot.



1. Drive Gear Dot Marking
2. Backlash Eliminator Gear Line Marking

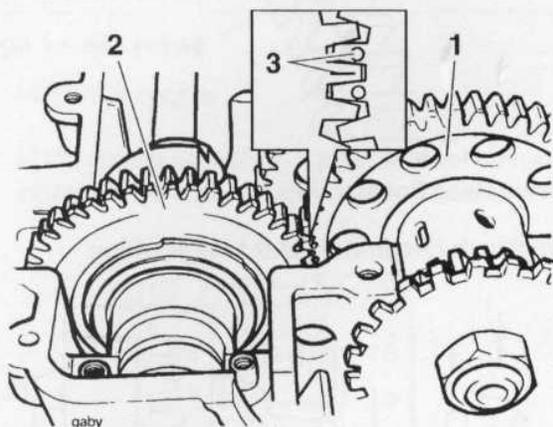


1. Balancer Drive Gear Assembly
2. Backlash Eliminator Gear Marking

NOTE:

- If the markings on the balancer gears do not align at the same point, the backlash eliminator gear can be rotated independently of the drive gear by gently moving it against the drive gear teeth.
- For ease of identification during assembly, apply a small paint spot to the outside face of the dot marked balancer drive gear tooth.

- Fit the crankshaft to the crankcase aligning the two dot marked teeth on the crankshaft gear with the marked balancer driven gear.



1. Crankshaft Drive Gear

2. Balancer Driven Gear

3. Alignment Marks

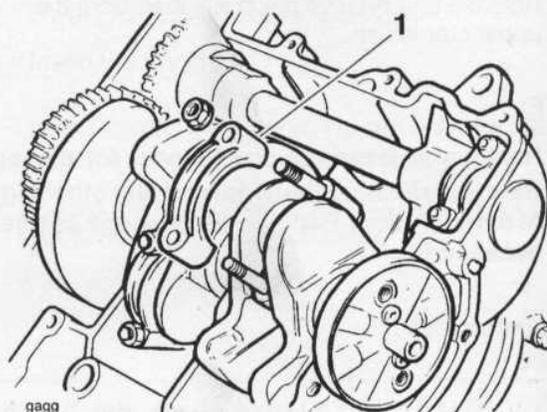
- Refit the connecting rods as described earlier in this section.
- Assemble the crankcases as described earlier in this section.

CONNECTING RODS

Removal

Connecting rods may be removed from the engine after first removing it from the frame. The cylinder head must be removed and the crankcase halves separated.

- Mark each big end cap and connecting rod to identify both items as a matched pair and to identify the correct orientation of the bearing cap to the connecting rod.
- Release the connecting rod nuts and remove the big end cap. Ensure that the bearing shell remains in place in the cap.



1. Big End Cap

NOTE:

- It may be necessary to gently tap the big end cap with a rubber mallet to release the cap from the bolts.
- Push the connecting rod up through the crankcase and collect the piston and connecting rod from the top.
 - Label the assembly to identify the cylinder from which it was removed.



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

- Remove the liner using tool T3880315 as described later in this section.

Installation

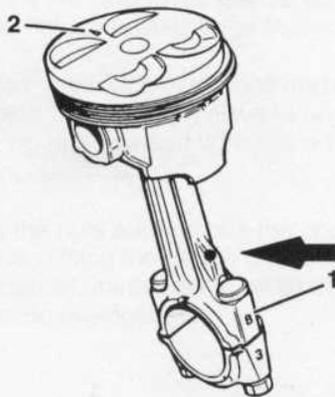
NOTE:

- Connecting rod bolts and nuts are treated with an anti-rust solution which must not be removed.
- Clean the connecting rod with high flash-point solvent.
- Remove all bearings and inspect for damage, wear and any signs of deterioration and replace as necessary.

1. Fit new connecting rod bolts to the big end.

NOTE:

- Ensure the piston is fitted correctly to the connecting rod, (that is with the oil hole in the connecting rod on the opposite side from the arrow on the piston crown).



1. Connecting Rod with Oil Hole Arrowed

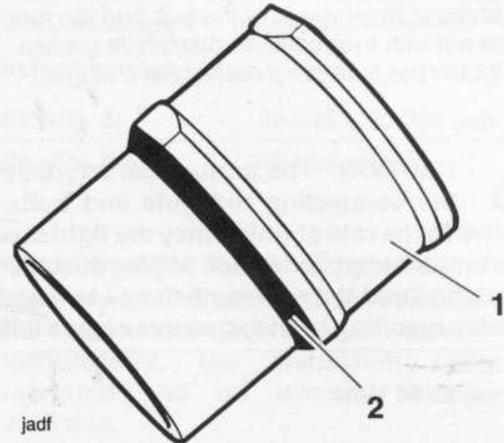
2. Piston Arrow

2. Apply molybdenum disulphide grease to the upper inner surface of the connecting rod big end.

NOTE:

- Avoid touching any bearing surfaces of the bearing shells with the hand.

3. Apply silicone sealer to the liner to crankcase mating face.



1. Liner

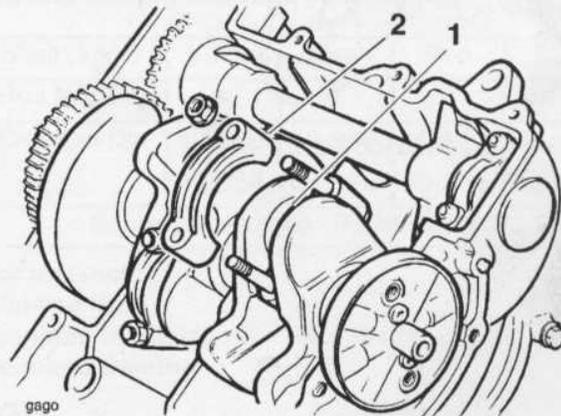
2. Sealer Area

4. Fit the piston and connecting rod assembly into the liner.

5. Fit the liner into the crankcase ensuring that the arrow on the piston faces forward, and the oil hole in the connecting rod faces rearward.

NOTE:

- Ensure that the piston/liner/connecting rod assembly aligns correctly with the crankpin during assembly into the crankcase.



1. Crankpin

2. Big End

6. Select big end bearing shells using the selection process described elsewhere in this section.

7. Lubricate both surfaces of the bearing shells with engine oil and fit to the connecting rod and big end cap.

8. Align the connecting rod to the crankshaft and fit the big end cap. Tighten the cap (using new nuts and bolts) as follows:
 - Lubricate the threads of the bolt and the face of the nut with molybdenum disulphide grease.
 - Tighten the nuts progressively in 2 stages;-

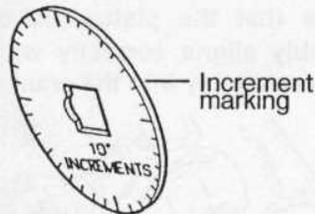


CAUTION: The torque characteristics of the connecting rod nuts and bolts are sensitive to the rate at which they are tightened. If all the torque is applied in one action, the bolt may be stretched and the nut may become loose when in service resulting in an expensive engine failure.

firstly to 14 Nm

then through 120° of nut rotation as measured using the Triumph torque turn gauge 3880105-T0301.

To accurately gauge the 120° turn, fit the tool between the socket and the drive handle and locate the socket to the big end nut. Pick an increment point on the torque turn gauge which aligns with a suitable reference point. Tighten the bolts until 12 of the 10° gauge increments have rotated past the chosen point.



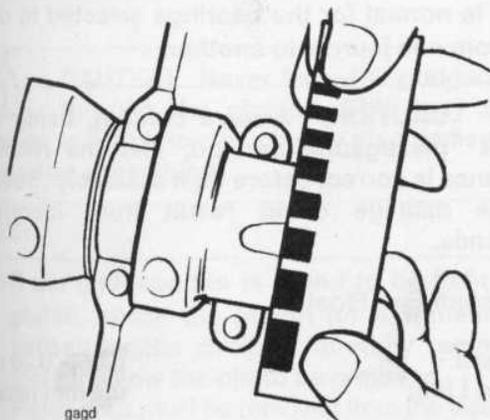
Service Tool 3880105-T0301

CONNECTING ROD BIG END BEARING SELECTION/CRANKPIN WEAR CHECK

1. Measure the bearing and crankpin clearance as follows.

NOTE:

- Do not turn the connecting rod and crankshaft during the clearance measurement as this will damage the plastigauge. The crankpin clearances are measured using 'Plastigauge' (Triumph part number 3880150-T0301).
2. Remove the big end cap from the journal to be checked.
 3. Wipe the exposed areas of the crankpin, and the bearing face inside the cap.
 4. Apply a thin smear of grease to the journal and a small quantity of silicone release agent to the bearing.
 5. Trim a length of the plastigauge to fit across the journal. Fit the strip to the journal using the grease to hold the plastigauge in place.
 6. Lubricate the threads of the bolt and the face of the nut with molybdenum disulphide grease. Refit the bearing and cap and tighten the big end nuts as described earlier.
 7. Release the nuts and remove the cap being measured. Using the gauge provided with the plastigauge kit, measure the width of the compressed plastigauge.



gagd

Checking the Measured Clearance

Con rod big end bearing/crankpin clearance

- Standard: 0.036 - 0.066 mm
- Service limit: 0.1 mm

NOTE:

- If the measured clearance exceeds the service limit, measure the crankpin diameter.

Crankpin diameter

- Standard: 40.946 - 40.960 mm
- Service limit: 40.932 mm

NOTE:

- If any crankpin 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. For further information on bearing part number to colour cross-references, see the latest parts microfiche.

1. Select the correct big end bearing shell as follows:
 - Measure each crankpin diameter.
 - Check connecting rod for either an A or B mark.
2. Select the correct bearings by matching the information found with the chart below.

Big end bearing selection chart (mm's)

0.006 0.007 0.006 0.007

Shell Colour	White	Red	Red	Blue
Rod Marking	A	A	B	B
Crankpin Dia	40.960	40.953	40.960	40.953
	40.954	40.946	40.954	40.946
Running Clearance: 0.036 - 0.0666				

For instance:

- Con-rod Mark **A**
- Crankpin Diameter **40.951 mm**
- Required Bearing **Red**

NOTE:

- Repeat the measurements for all connecting rods and their respective crankpins.
 - It is normal for the bearings selected to differ from one connecting rod to another.
3. Install the new bearings in the connecting rod.



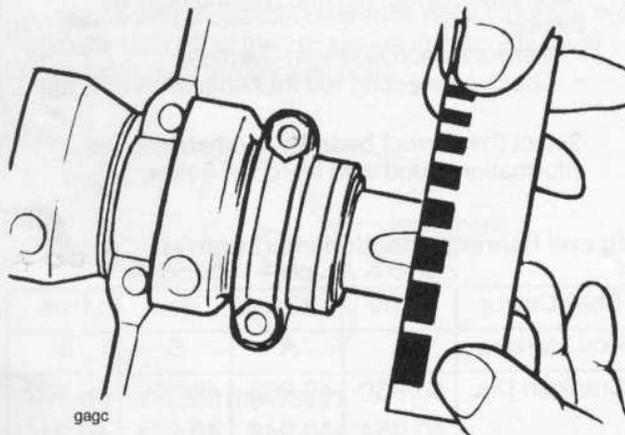
CAUTION: Always confirm, using the plastigauge method, that the running clearance is correct before final assembly. Severe engine damage could result from incorrect clearance.

CRANKSHAFT MAIN BEARING/JOURNAL WEAR

Main Bearing Selection Chart (all dimensions in mm's)						
Shell Colour	White	Red	Red	Blue	Blue	Green
Crankcase Bore	41.126	41.126	41.135	41.135	41.144	41.144
	41.118	41.118	41.127	41.127	41.136	41.136
Journal Dia'	37.976	37.968	37.976	37.968	37.976	37.968
	37.969	37.960	37.969	37.960	37.969	37.960
Running Clearance	All types 0.044 - 0.020					

Minor differences in crankshaft dimensions are compensated for by using selective bearings. For further information on bearing part number to colour cross-references, see the latest parts microfiche.

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



Checking crankpin clearance using plastigauge

Crankshaft main bearing/journal clearance

Standard: 0.020 - 0.044 mm
Service limit: 0.08 mm max.

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

Crankshaft main journal diameter

Standard: 37.960 - 37.976 mm
Service limit: 37.936 mm

NOTE:

- If any journal has worn beyond the service limit, the crankshaft must be replaced. Due to the techniques used during manufacture, the

crankshaft cannot be reground and no oversize bearings are available.

Select bearings as follows:

1. Measure and record the diameter of each crankshaft main bearing journal.
2. Measure and record each main bearing bore diameter in the crankcase (bearings removed).

Compare the data found with the chart above to select bearings individually by journal.

For example:

Crankshaft Journal diameter 37.972 mm
Crankcase Bore 41.130 mm
Bearing Required RED

NOTE:

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



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

Crankshaft End Float

Standard 0.05 - 0.20 mm
Service Limit 0.4 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 the crankcases must be replaced.

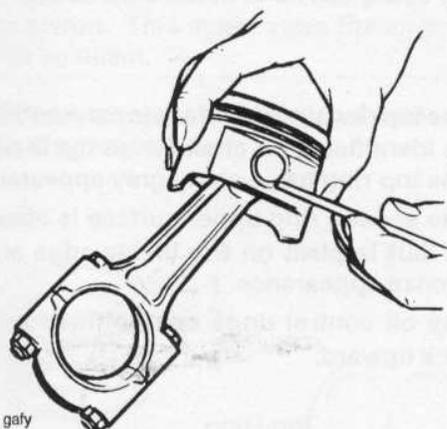
PISTONS

Disassembly

NOTE:

• The pistons and connecting rods can be separated after removing the cylinder head and liners. It is not necessary to remove the connecting rods from the crankshaft.

1. Remove the liner, using tool T3880315, as described later in this section.
2. Remove the gudgeon pin circlip from one side of the piston.



Removing the Gudgeon Pin Circlip

3. Remove the gudgeon pin by pushing the pin through the piston and rod toward the side from which the circlip was removed.



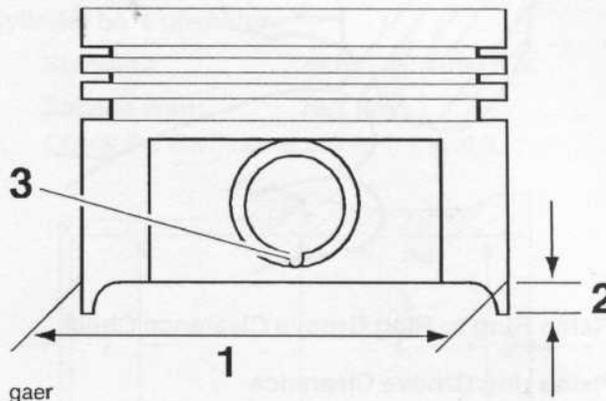
CAUTION: Never force the gudgeon pin through the piston. This may cause damage to the piston which may also damage the liner when assembled.

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 pin to be removed.
4. Piston rings must be removed from the piston using hand pressure only.

Piston Wear Check

1. Measure the piston outside diameter, 5 mm up from the bottom of the piston and at 90° to the direction of the gudgeon pin.



1. Piston Outside Diameter
2. Measurement Point (5mm Up The Piston Skirt)
3. Circlip Removal Groove

Piston outside diameter

Cylinders 1 & 3:	78.96 - 78.98 mm
Service limit	78.92
Cylinder 2:	78.97 - 78.96 mm
Service limit	78.90

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

Piston Rings/Ring Grooves

Check the pistons for uneven groove wear by visually inspecting the ring grooves.

If all the rings do not fit parallel to the groove upper and lower surfaces, the piston must be replaced.

Clean the piston ring grooves.

Fit the piston rings to the pistons. Check, using feeler gauges, for the correct clearance between the ring grooves and the rings. Replace the piston and rings if outside the specified limit.



Piston Ring to Ring Groove Clearance Check

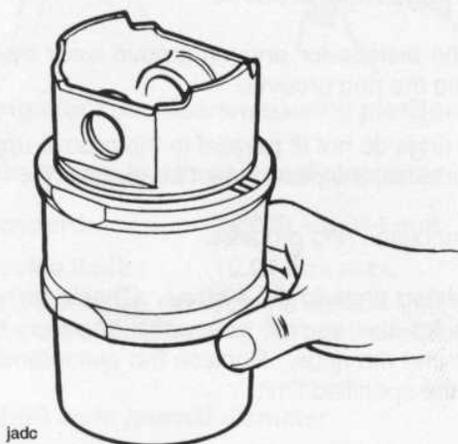
Piston ring/Groove Clearance

Top	0.02 - 0.06 mm
Second	0.02 - 0.06 mm

Piston Ring Gap

NOTE:

- Before final assembly the piston ring gap, when fitted in the liner, must first be checked.
1. Place the piston ring inside the liner.
 2. Push the ring into the top of the cylinder, using the piston to hold the ring square with the inside of the bore. Continue to push the ring into the bore until the third groove of the piston is level with the cylinder top, around full circumference of cylinder.



Aligning Piston Rings using the Piston

3. Remove the piston and measure the gap between the ends of the piston ring using feeler gauges.

Piston Ring End Gap Tolerances

Top	0.15 - 0.30 mm
Second	0.26 - 0.41 mm
Oil Control	0.20 - 0.70 mm

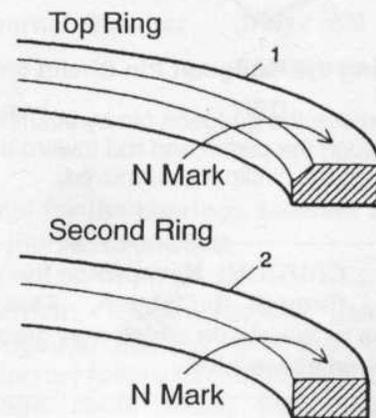
4. If the ring gap is found to be too small, the ring end must be carefully filed until the correct gap is achieved. If the gap is too large, replace the rings with a new set. If the gap remains too large with new rings fitted, both the piston and liner must be replaced.

Piston Assembly

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

NOTE:

- The top ring upper surface is marked 'N' and can be identified by a chamfer on the inside edge. The top ring has a shiny grey appearance.
- The second ring upper surface is also marked 'N' but is plain on the inside edge and has a bronze appearance.
- The oil control rings can be fitted with either face upward.

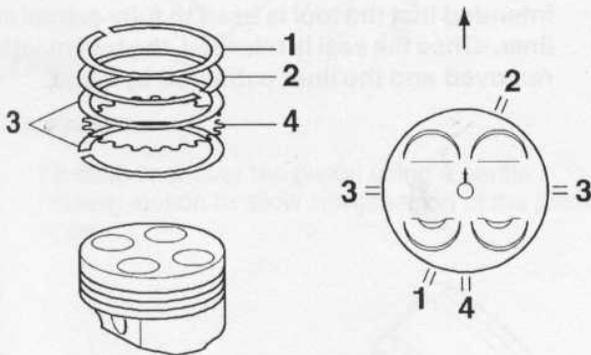


Piston Ring Identification

2. Fit the piston onto the connecting rod with the arrow on the piston crown facing AWAY from the oil hole in the connecting rod.
3. Align the small end in the connecting rod with the gudgeon pin hole in the piston.
4. Lubricate the piston, small end and gudgeon pin with clean engine oil and fit the gudgeon pin.
5. Fit new circlips on both sides of the gudgeon pin ensuring the circlips are correctly fitted in the grooves.

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

6. The piston ring gaps must be arranged as shown in the diagram below



1. Top Ring
2. Second Ring
3. Steel Oil Control Rings
4. Oil Control Ring Expander

NOTE:

- The top ring gap should be positioned in the 7 o'clock position, the second ring gap in the 1 o'clock position and the steel oil control ring gaps in the 9 & 3 o'clock positions (one in each position).
7. Fit the piston into the liner using a gentle rocking motion to engage the rings in the bore.

Cylinder Wear

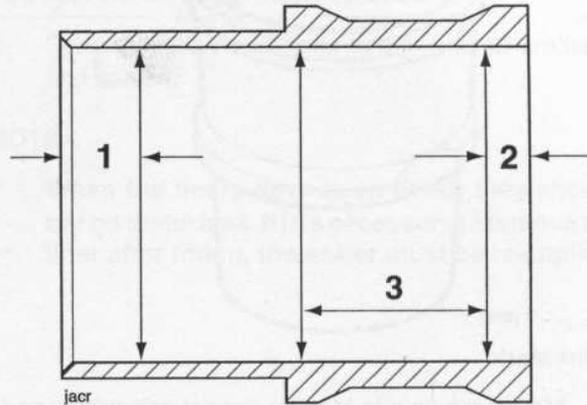
Measure the inside diameter of each cylinder using an internal micrometer or similar accurate measuring equipment.

Cylinder bore diameter

Standard: 79.030 - 79.050 mm

Service limit: 79.1 mm

1. Check the diameter at points 1, 2 and 3.



Test Positions For Bore Wear Check (bore shown in section)

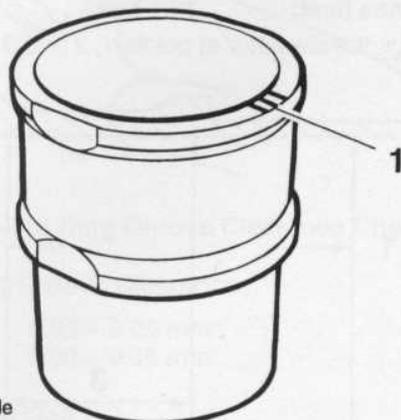
2. If any reading is outside the specified limits, replace the liner and piston as an assembly.

CYLINDER LINERS

Removal (Engine In Or Out Of The Frame)

NOTE:

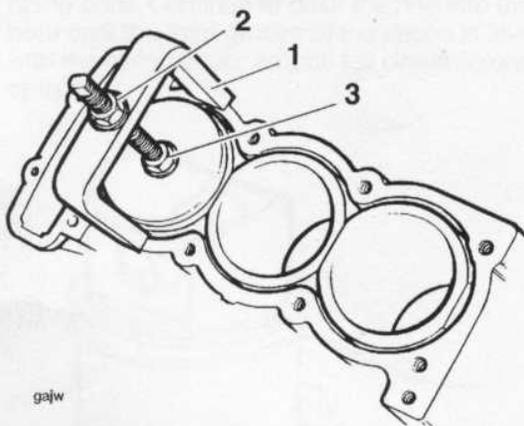
- Cylinder liners can be removed with engine in the frame, after the cylinder head has been removed.



jade

Paint Mark

1. Mark each liner to identify correct orientation and the cylinder number from which it has been removed.
2. Turn the crankshaft until the piston in the liner to be removed is at the bottom of its stroke.



gafw

1. Tool T3880315

2. Extraction nut

3. Locking nut

3. Check that the locking nut on tool T3880315 is loose, then fully unscrew the extraction nut.



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

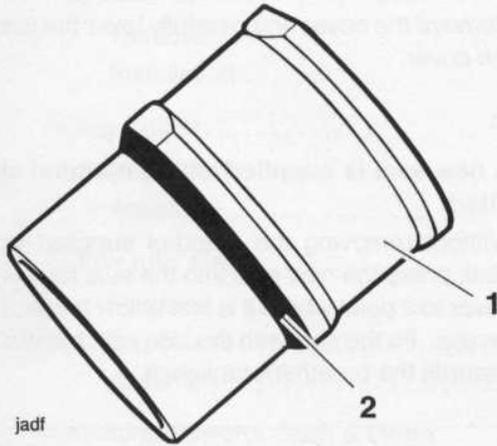
4. Carefully fit the tool fully into the cylinder bore, positioning the tool legs on the crankcase. Turn the locking nut clockwise until the rubber sleeve on the tool **tightly** grips the bore of the liner.
5. Check that the tool legs are positioned to allow withdrawal of the liner, then turn the extraction nut clockwise to extract the liner. Take care to ensure that the piston / connecting rod is not allowed to fall against the inside of the crankcase.
6. Turn the locking nut anticlockwise to release the liner.

NOTE:

- The tool must only be used to release the seal between the liner and the crankcase. It is not intended that the tool is used to fully extract the liner. Once the seal is released, the tool must be removed and the liner extracted by hand.

Installation

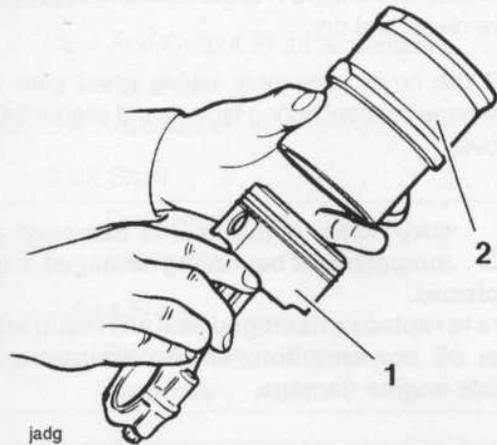
1. Thoroughly clean the liner removing all traces of old silicone sealer.
2. Remove all traces of sealer from the crankcase bores.
3. Apply silicone sealer to the liner to crankcase mating face.



1. Liner

2. Sealer Area

4. Fit each liner over the piston using a gentle rocking motion to allow compression of the piston rings.



1. Piston

2. Liner

NOTE:

- The liners have a chamfer at the bottom of the bore enabling fitting of the piston without need for a piston ring compressor.

CAUTION: Fit each liner over whichever piston is at TDC. When turning the engine, do not allow the pistons to contact the inside of the crankcase and also do not allow fitted liners to lift off the crankcase base.

5. Continue fitting each liner in turn until all are fitted and sealed.

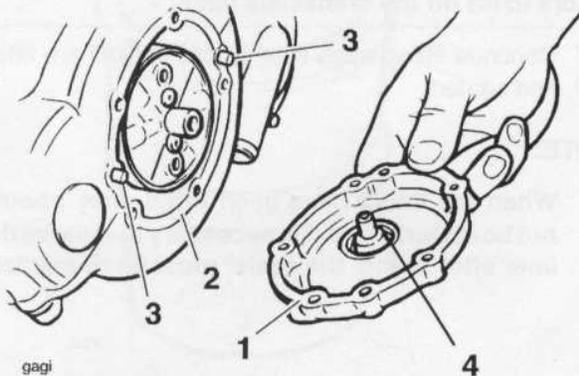
NOTE:

- When the liners have been fitted, they should not be disturbed. If it is necessary to remove the liner after fitting, the sealer must be re-applied.

LEFT HAND CRANKSHAFT COVER

The left hand crankshaft cover is fitted, on the inside face, with a lip type seal. The lip seal prevents oil from entering the outlet port for the crankcase gases.

Under normal circumstances it should not be necessary to disturb the cover or the seal. However, should the cover require removal, the following procedure must be used.



1. Left Hand Engine Cover
2. Gasket face
3. Dowels
4. Mandrel

Cover Removal/Refit

1. If the cover and seal are to be replaced without renewing either component, a mandrel **MUST** be inserted into the seal to prevent seal distortion.

NOTE:

- **Always examine the seal for splits, damage and general wear and replace if necessary. The mandrel must remain in the seal from immediately after removal until the point where the cover is to be fitted.**
2. When refitting the cover, remove the mandrel only at the point when the cover assembly is to be refitted and ensure that the seal and breather shaft are clean and dry.
 3. Fit the cover assembly taking great care not to damage the seal during fitment and alignment of the cover.



CAUTION: If the seal is damaged or is suspected of becoming damaged, it must be replaced.

Failure to replace a damaged seal will result in high engine oil consumption, smoke emissions and possible engine damage.



CAUTION: The engine must not be started or turned over for a minimum of 15 minutes after assembly to allow the seal to fully expand onto the breather shaft.

Failure to allow time for seal expansion will result in high engine oil consumption, smoke emissions and possible engine damage.

Seal/Cover Replacement

1. Remove the cover and carefully lever the seal from the cover.

NOTE:

- **A new seal is supplied with a mandrel already fitted.**
2. Without removing the mandrel supplied with the seal, press the new seal into the seal recess in the cover to a point where it is just below the face of the recess. Fit the seal with the side which is written on towards the breather/crankshaft



CAUTION: The seal must be kept level during and after fitment. A non-level seal will cause high engine oil consumption, smoke emissions and possible engine damage.

3. When refitting the cover, remove the mandrel only at the point when the cover assembly is to be refitted, and ensure that the seal and breather shaft are clean and dry.
4. Fit the cover assembly taking great care not to damage the seal during fitment and alignment of the cover.



CAUTION: If the seal is damaged or is suspected of becoming damaged, it must be replaced.

Failure to replace a damaged seal will result in high engine oil consumption, smoke emissions and possible engine damage.



CAUTION: The engine must not be started or turned over for a minimum of 15 minutes after assembly to allow the seal to fully expand onto the breather shaft.

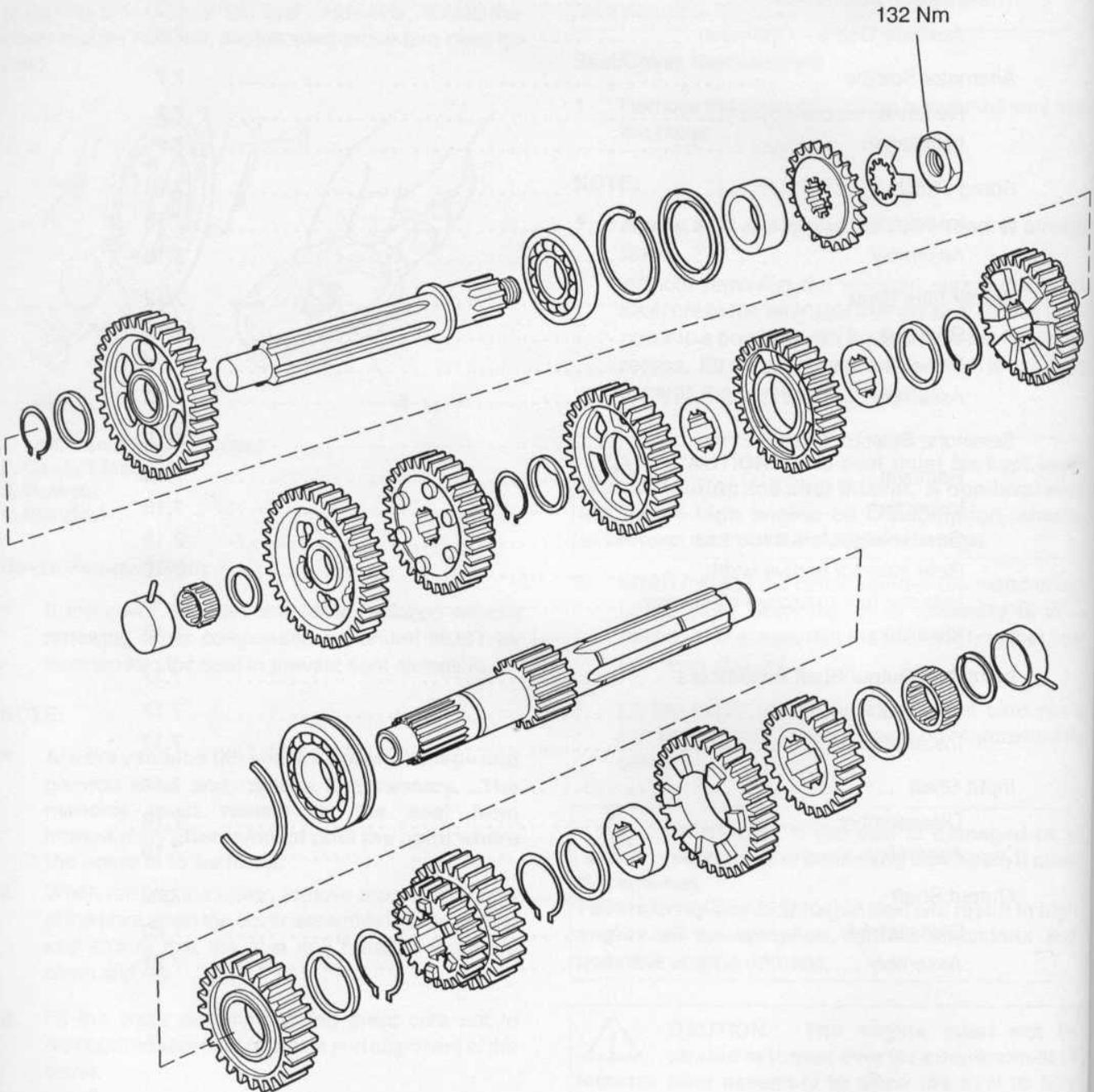
Failure to allow time for seal expansion will result in high engine oil consumption, smoke emissions and possible engine damage.

TRANSMISSION

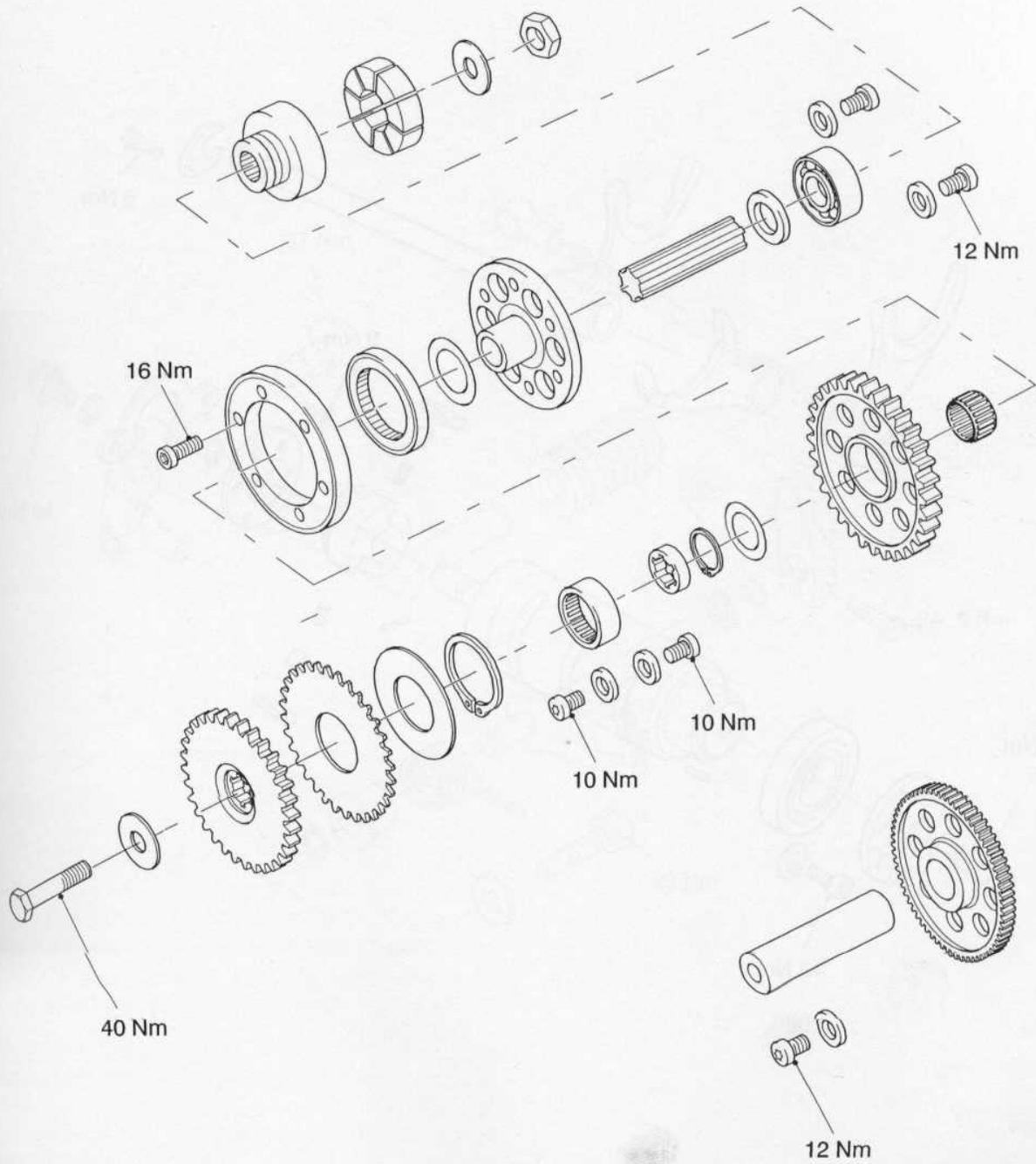
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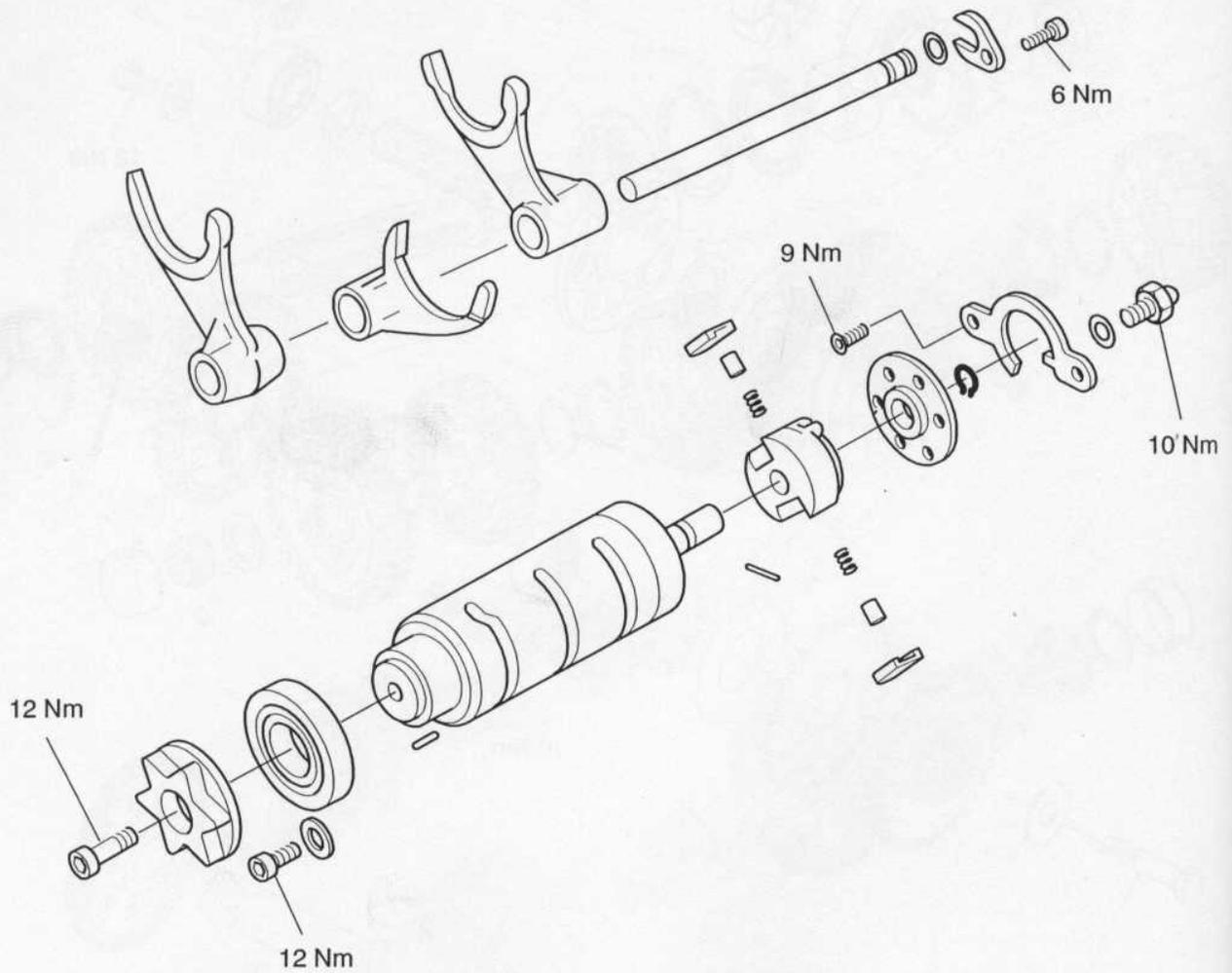
Exploded View, Input and Output Shafts



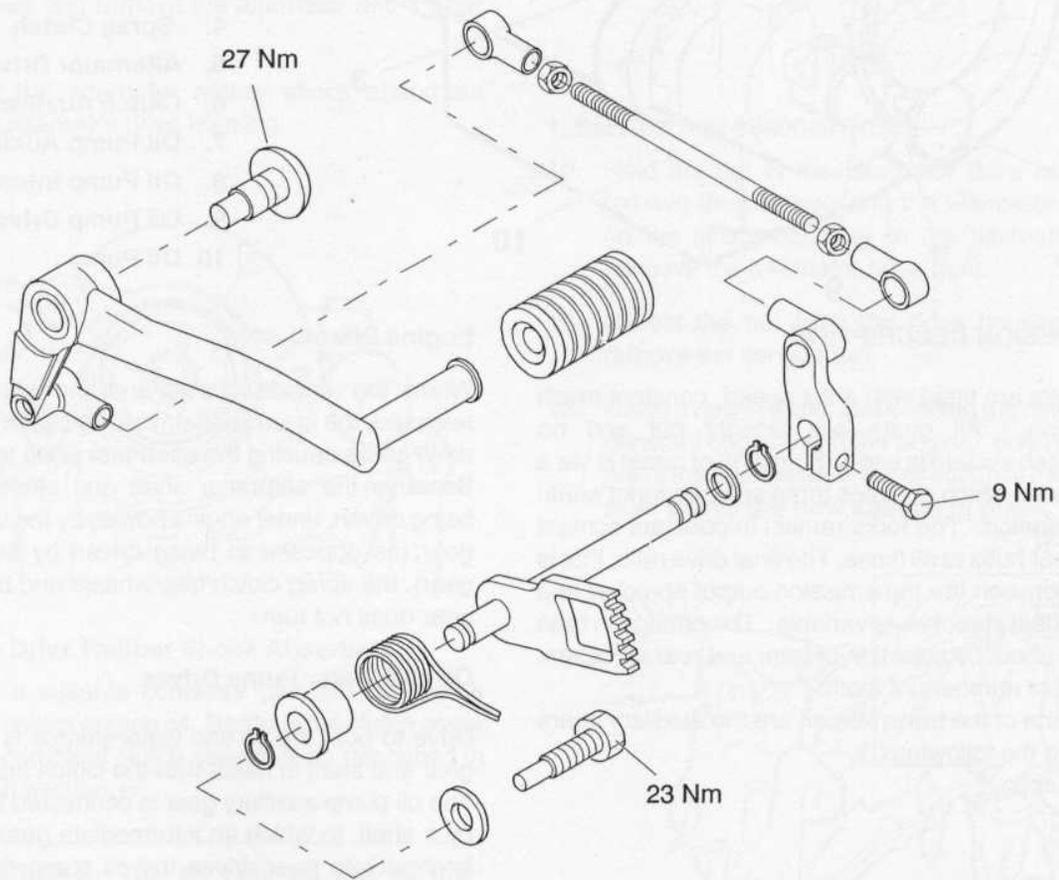
Exploded View, Auxiliary Gears



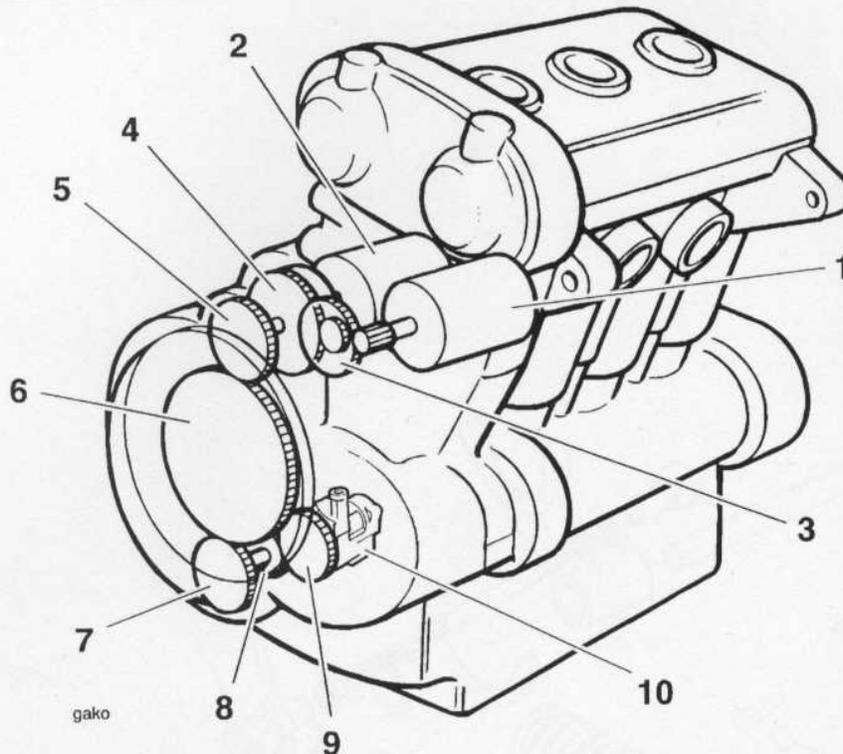
Exploded View, Selector Mechanism



Exploded View, Gear Pedal



AUXILIARY GEARS



1. Starter Motor
2. Alternator
3. Starter Idler Gear
4. Sprag Clutch
5. Alternator Drive Gear
6. Clutch Auxiliary Gear
7. Oil Pump Auxiliary Gear
8. Oil Pump Intermediate Gear
9. Oil Pump Drive Gear
10. Oil Pump

TRANSMISSION DESCRIPTION

Both models are fitted with a six speed, constant mesh transmission. All gears are straight cut and no synchromesh system is used. Selection of gears is via a grooved drum which actuates three selector forks within the transmission. The forks remain in constant contact with the gear hubs at all times. The final drive ratio, that is the ratio between the transmission output sprocket and the rear wheel sprocket, is variable. The change in ratio is brought about by selection of front and rear sprockets with different numbers of teeth.

Integral parts of the transmission are the auxiliary gears which drive the following:

- Water pump
- Oil pump
- Alternator
- Starter Motor

Auxiliary Gears - Operation

Engine Cranking

The starter motor, which is fitted in the upper crankcase, drives an idler gear in constant mesh with the sprag clutch. The sprag clutch is mounted on the alternator shaft. When the starter is energised, the sprag clutch action allows the alternator shaft on which it is mounted to be driven by the starter idler gear. The alternator shaft transmits drive to the crankshaft via the alternator drive gear and clutch auxiliary drive gear.

Engine Started

When the engine starts, and the starter button is released, the crankshaft drives the clutch and alternator drive gears causing the alternator shaft to rotate. Because the alternator shaft and alternator are now being driven, under engine power, by the alternator drive gear (as opposed to being driven by the starter idler gear), the sprag clutch free-wheels and the starter idler gear does not turn.

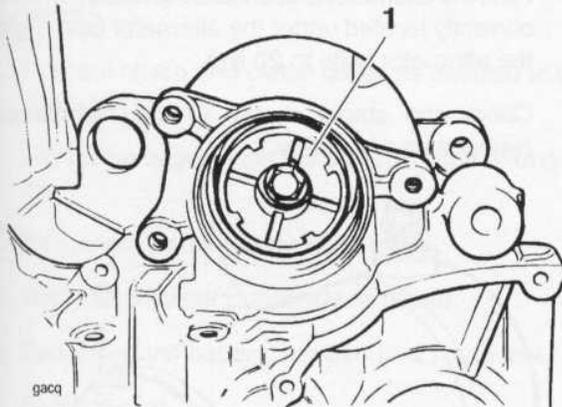
Oil and Water Pump Drives

Drive to both the oil and water pumps is supplied by a gear and shaft in mesh with the clutch auxiliary gear. The oil pump auxiliary gear is connected to the oil pump by a shaft, to which an intermediate gear is fitted. The intermediate gear drives the oil pump drive gear thus driving the oil pump. At the other side of the oil pump, a slotted shaft extends, from which the water pump is directly driven.

ALTERNATOR SPINDLE

Removal

1. Remove the seat and disconnect the battery, negative (black) lead first.
2. Remove the rear body panels.
3. Remove the lower fairings and belly panel (ST only).
4. Remove the three bolts securing the alternator to the crankcase noting the position of the earth lead under one of the alternator bolt holes.
5. Disconnect and remove the alternator and starter motor.
6. Remove the alternator rubber shock absorbers from the alternator drive housing.



1. Alternator Drive Rubber Shock Absorbers

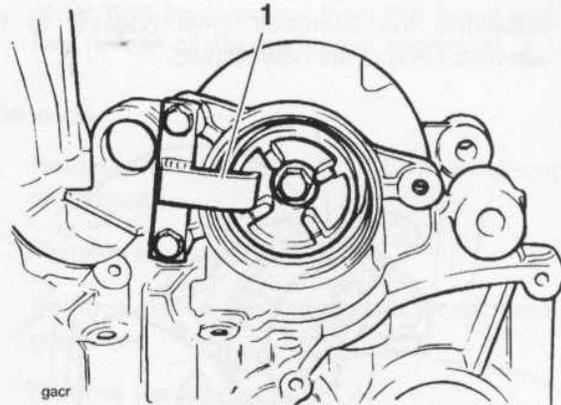
7. Position a suitable container beneath the clutch cover to collect engine oil. Remove the clutch cover and the complete clutch assembly as described in the clutch section.

! 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.

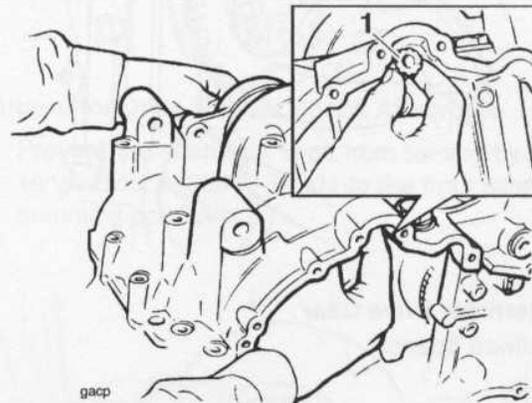
8. Drain the coolant as described in the cooling section then remove the water elbow from the rear of the upper crankcase.

9. Prevent the alternator shaft from turning by fitting service tool 3880040-T0301 to the front alternator mounting-bolt holes.



1. Service Tool 3880040-T0301

10. Hold the nut in the alternator drive housing and remove the bolt securing the alternator drive gear (in the clutch housing) to the alternator spindle. Remove the alternator drive gear.
11. Collect the nut from the drive housing end and remove the service tool.
12. Using a new spindle, and keeping the new spindle in constant contact with the original, push the spindle out of the crankcase in the direction of the alternator side. **Leave the new spindle in place.**



1. New Spindle

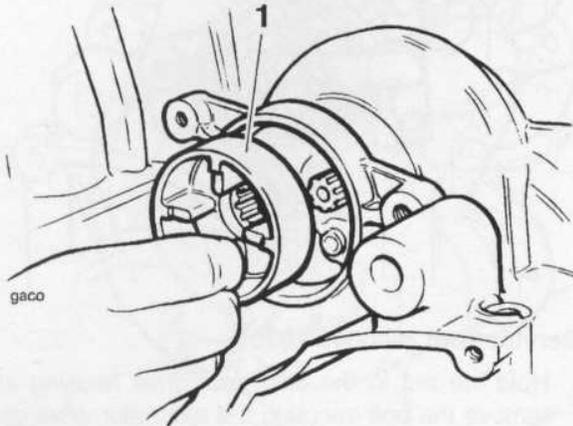
! CAUTION: Ensure that the new spindle is kept in constant contact with the old item during the removal process.

If constant contact is not maintained, internal components may become displaced and it may become necessary to strip the engine to recover them.

13. Remove the alternator drive housing from the old spindle.
6. Check the alternator 'O' ring for damage and distortion. Replace as necessary.

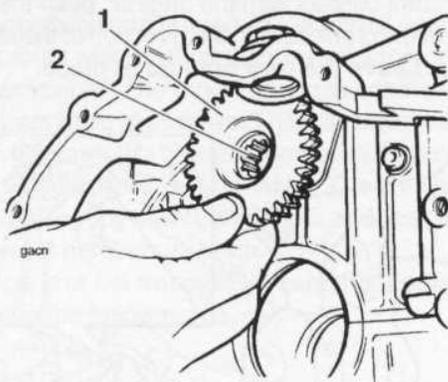
Installation

1. Assemble the alternator drive housing to the alternator end of the new spindle.



1. Alternator Housing

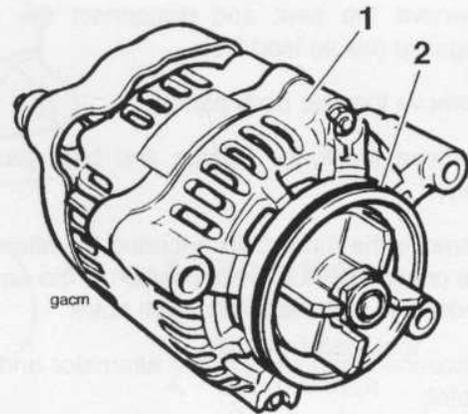
2. Check that the splined spacer is in place on the clutch side and assemble the alternator drive gear to the clutch housing end of the spindle. Fit a new bolt *from the clutch side*.



1. Alternator Drive Gear
2. Splined Spacer

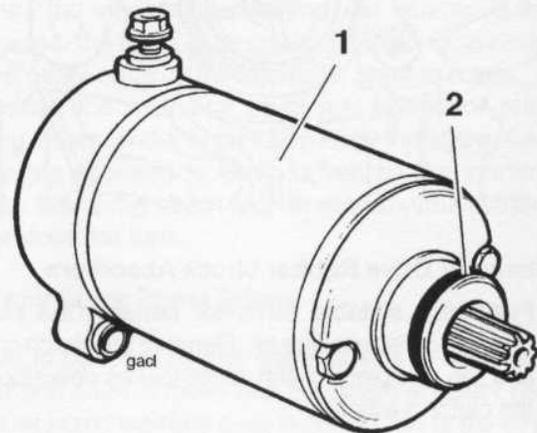
NOTE:

- The alternator drive gear must be fitted with the backlash eliminator gear facing inwards.
3. Fit tool 3880040-T0301 to the front alternator mounting-bolt holes.
 4. Fit a new nut to the alternator drive housing end where the bolt head extends through. Hold the nut and tighten the bolt to **40 Nm**.
 5. Remove tool 3880040-T0301 and refit the rubber shock absorbers to the alternator drive housing.



1. Alternator
2. 'O' ring

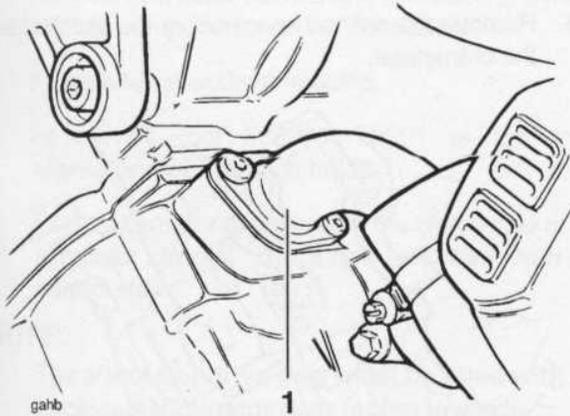
7. Refit the alternator and ensure that the earth strap is correctly located under the alternator bolt. Tighten the alternator bolts to **20 Nm**.
8. Check the starter motor 'O' ring for damage. Replace as necessary.



1. Starter
2. 'O' ring

9. Refit the starter motor tightening the starter bolts to **10 Nm**.

10. Refit the water elbow to the upper crankcase using a new gasket. Tighten the water elbow bolts to 12 Nm.



1. Water Elbow

11. Refill the cooling system as described in the cooling section.
12. Refit the clutch and clutch cover as detailed in the clutch section.
13. Top up the engine with the correct grade of engine oil.
14. Reconnect the alternator multi-plug.
15. Refit all bodywork previously removed.
16. Reconnect the battery, positive (red) lead first.
17. Refit the seat.

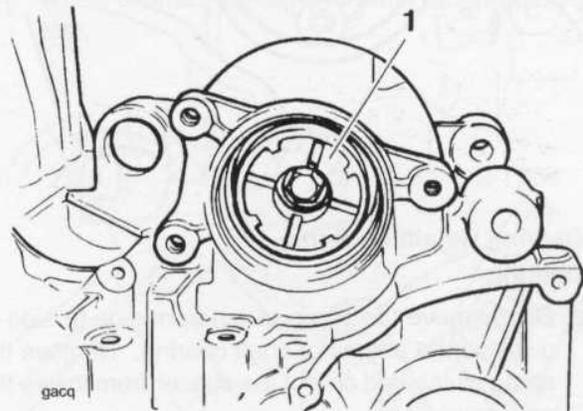
SPRAG CLUTCH

NOTE:

- In order to remove the sprag clutch, the engine must first be removed from the frame and the two halves of the crankcase separated.

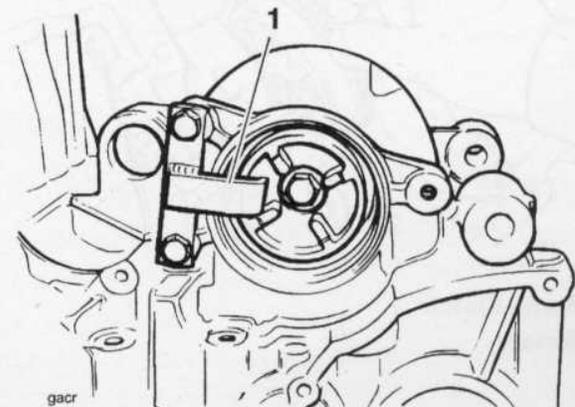
Removal

1. Remove the water elbow from the rear of the upper crankcase.
2. Remove the starter motor.
3. Remove the input and output shafts from the crankcase.
4. Remove the alternator.
5. Remove the alternator rubber shock absorbers from the alternator drive housing.



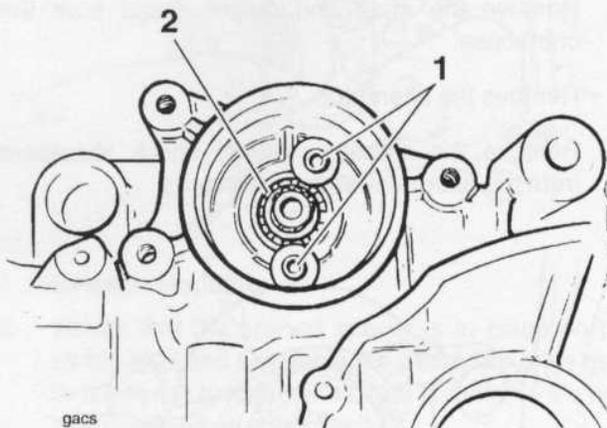
1. Alternator Drive Rubber Shock Absorbers

6. Prevent the alternator shaft from turning by fitting service tool 3880040-T0301 to the front alternator mounting bolt holes.



1. Service Tool 3880040-T0301

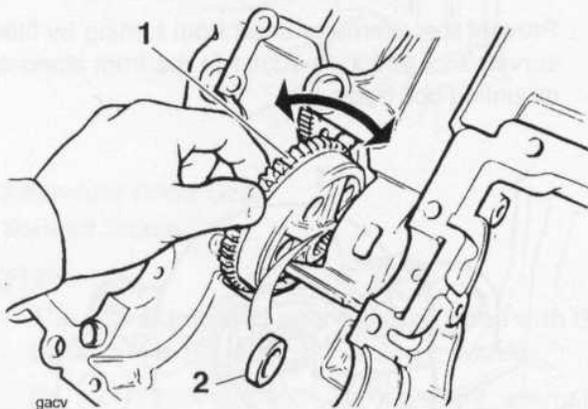
7. Hold the nut at the drive housing end and remove the bolt securing the alternator drive gear (in the clutch housing) to the alternator spindle.
8. Remove the gear.
9. Remove service tool 3880040-T0301.
10. Remove the alternator spindle, drive and nut from the alternator side of the crankcase.
11. Working from the alternator side of the crankcase, release the two bolts and washers which secure the alternator shaft bearing to the crankcase.



1. Bearing Retaining Bolts

2. Bearing

12. Gently move the sprag clutch from side to side to displace the alternator shaft bearing. Remove the sprag clutch and collect the spacer from inside the crankcase.

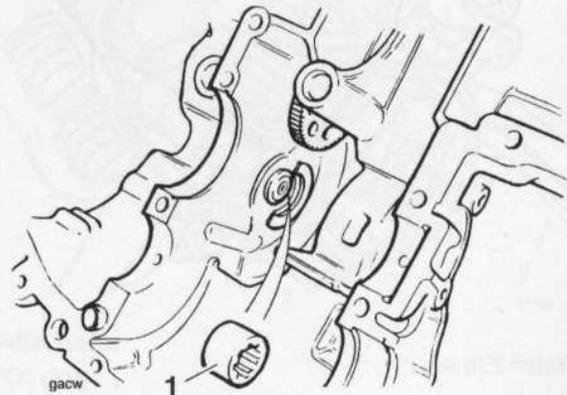


1. Sprag Clutch

2. Spacer

NOTE:

- The bearing is not an interference fit, no force is required to move the bearing within the crankcase.
13. Remove the splined spacer from the clutch side of the crankcase.



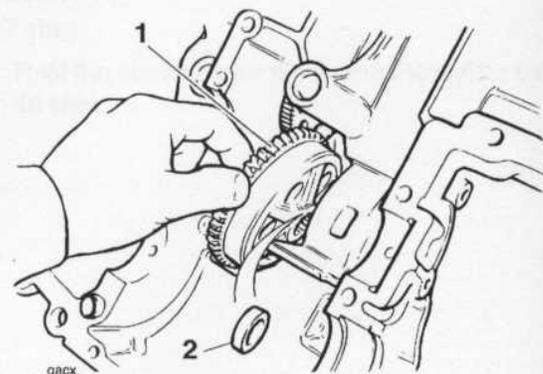
1. Splined Spacer

Inspection

1. Check all bearings for overheating (blue areas), wear and non-smooth operation. Replace any suspect components.
2. Check the sprag clutch for smooth, free movement in one direction only. Check the sprag gear for damaged or broken teeth. Replace if necessary.
3. Check the spindle for damage, pitting etc. Replace if necessary.

Assembly

1. Refit the splined sleeve to the alternator spindle bearing on the clutch side of the crankcase.
2. Refit the spacer (alternator side) and sprag clutch assembly.



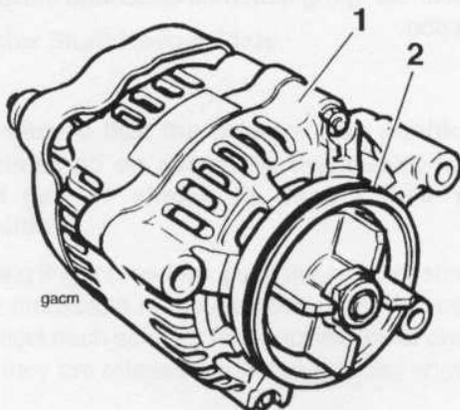
1. Sprag Clutch

2. Spacer

3. Refit the bearing to the alternator side of the crankcase and tighten the two retaining screws to **12 Nm**.
4. Refit the alternator spindle and drive taking care to align all components during installation.
5. Fit the alternator drive housing.
6. Fit service tool 3880040-T0301 to the front alternator mounting bolt holes.
7. Fit the alternator drive gear to the clutch side of the alternator spindle. Use a new bolt **fitted from the clutch side**.

NOTE:

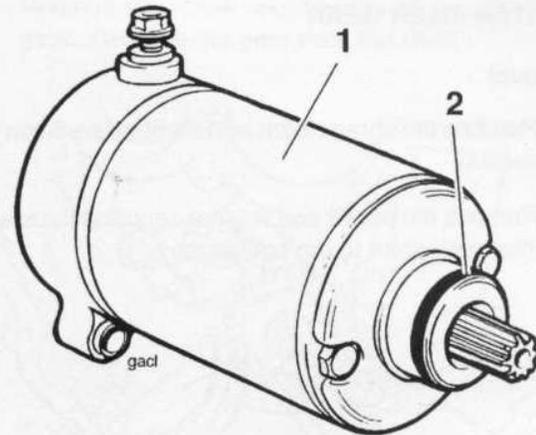
- **The alternator drive gear must be fitted with the backlash eliminator gear facing inwards.**
8. Fit a new nut to the alternator drive housing end where the bolt head extends through. Hold the nut and tighten the bolt to **40 Nm**.
 9. Remove tool 3880040-T0301.
 10. Check the alternator 'O' ring for damage and distortion. Replace as necessary.



1. Alternator

2. 'O' ring

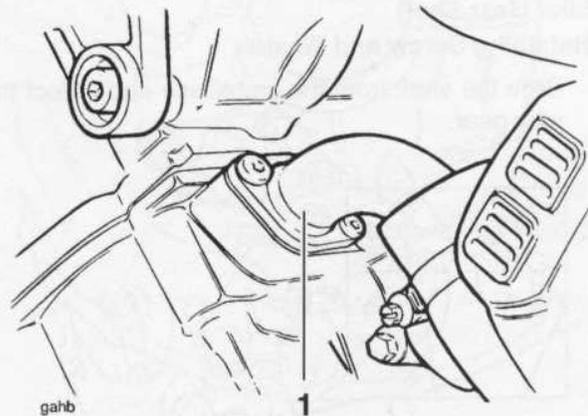
11. Refit the alternator and ensure that the earth strap is correctly located under the alternator bolt. Tighten the alternator retaining bolts to **20 Nm**.
12. Check the starter motor 'O' ring for damage. Replace as necessary.



1. Starter

2. 'O' ring

13. Refit the starter motor tightening the starter bolts to **10 Nm**.
14. Refit the water elbow to the upper crankcase using a new gasket. Tighten the water elbow bolts to **12 Nm**.

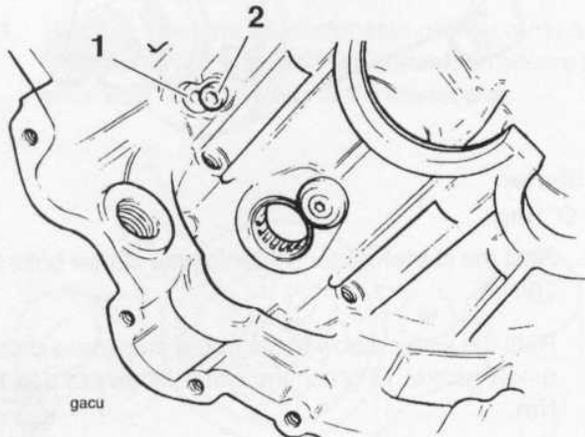


1. Water Elbow

STARTER IDLER GEAR

Removal

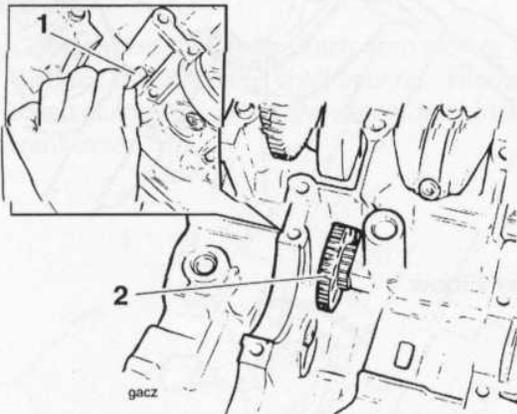
1. Remove the sprag clutch as described earlier in this section.
2. Remove the screw and washer securing the starter idler gear shaft to the crankcase.



1. Idler Gear Shaft

2. Retaining Screw and Washer

3. Slide the shaft from the crankcase and collect the idler gear.



1. Shaft

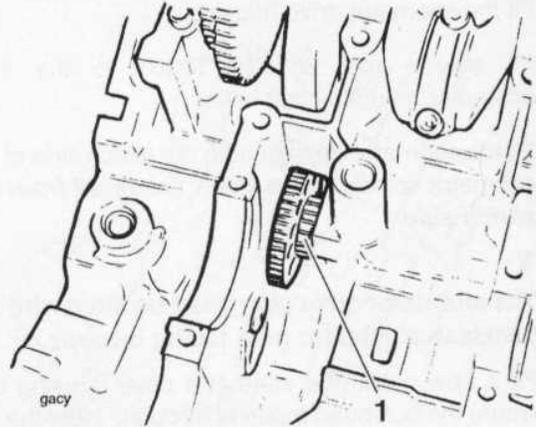
2. Gear

Inspection

1. Check the spindle for damage, pitting etc. Replace if necessary.
2. Check the gear for broken or damaged teeth, overheating (blue areas) etc. Replace if necessary.

Assembly

1. Position the gear into the crankcase with the smaller gear (which meshes with the sprag clutch) facing inwards.



1. Smaller Gear Facing Inwards

2. Support the gear and install the shaft.
3. Fit the shaft retaining bolt and washer. Tighten the bolt to **12 Nm**.
4. Install the sprag clutch as described earlier in this section.

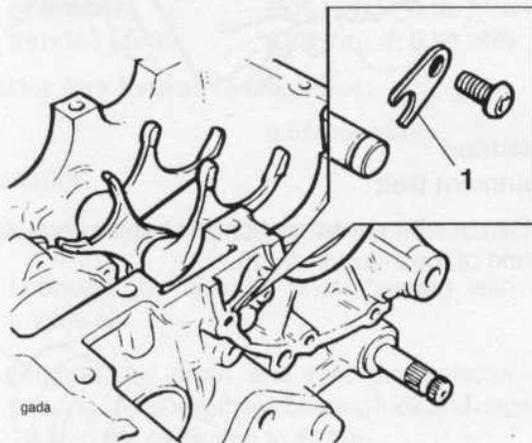
SELECTORS, SELECTOR SHAFT & DRUM

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.

1. Remove both the input and output shafts.
2. Remove the capscrew and take out the 'U' shaped keeper plate from the selector shaft.

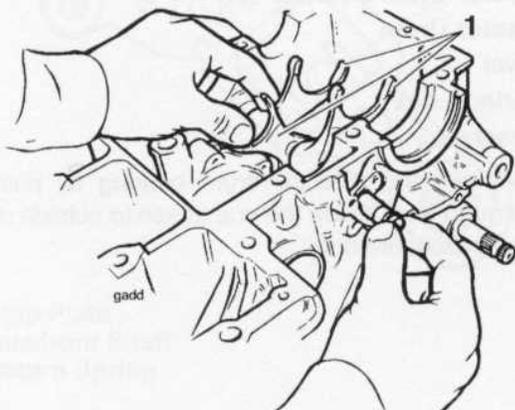


1. Selector Shaft Keeper Plate

NOTE:

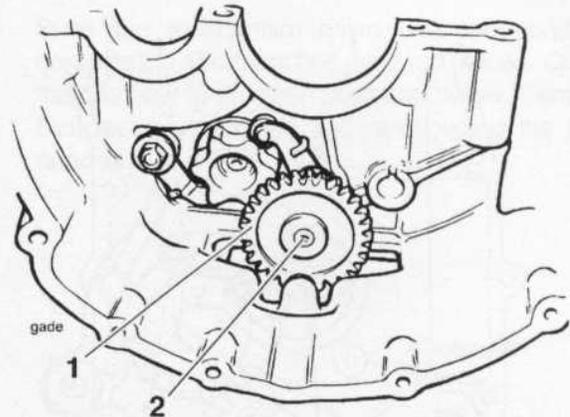
- To ensure that the selector fork positions are maintained on assembly, mark each fork with felt pen or similar to denote their relative positions.

3. Using finger pressure, push the selector shaft out of the crankcase in the direction of the keeper plate. Collect each selector fork from the lower crankcase as they are released from the selector shaft.



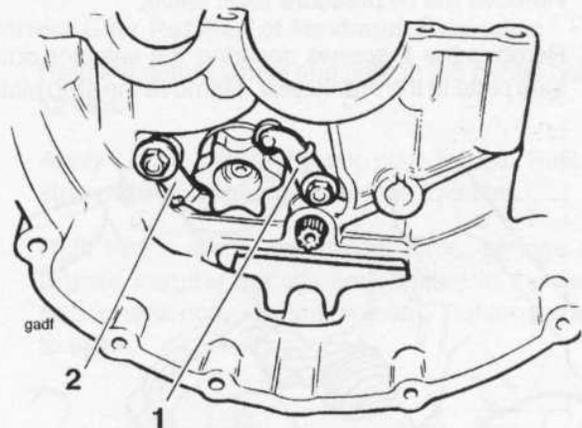
1. Selector Forks

4. Remove the screw securing the oil pump auxiliary gear. Remove the gear from the shaft.



1. Oil Pump Drive Gear
2. Gear Retaining Screw

5. Remove the nuts and washers securing both the neutral and gear detent arms to the lower crankcase.



1. Gear Detent Arm
2. Neutral Detent Arm

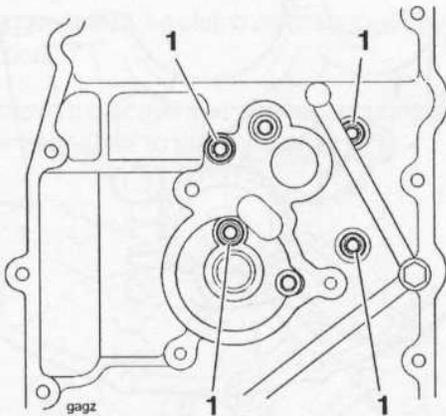
6. Remove the detent arms and springs noting the colour of the detent springs and the position of each component.

NOTE:

- Detent springs **MUST NOT** be interchanged. The **NEUTRAL** spring has a white mark and is fitted rearmost in the crankcase.

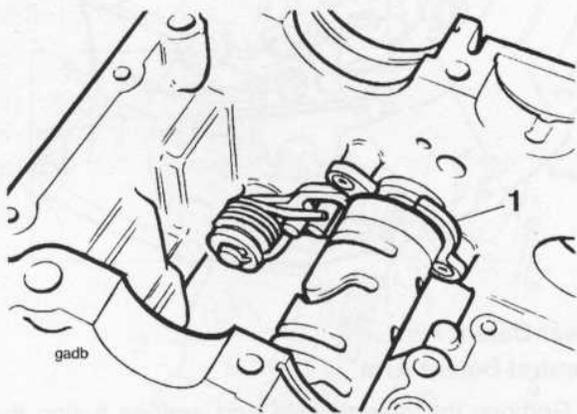
7. Invert the crankcase.

8. Release the screws securing the oil pump to the lower crankcase.



1. Oil Pump Retaining Screws

9. Invert the crankcase.
10. Remove the oil pump from inside the lower crankcase.
11. Remove the oil pressure relief valve.
12. Remove the 2 screws securing the selector drum stop plate to the crankcase. Remove the stop plate.



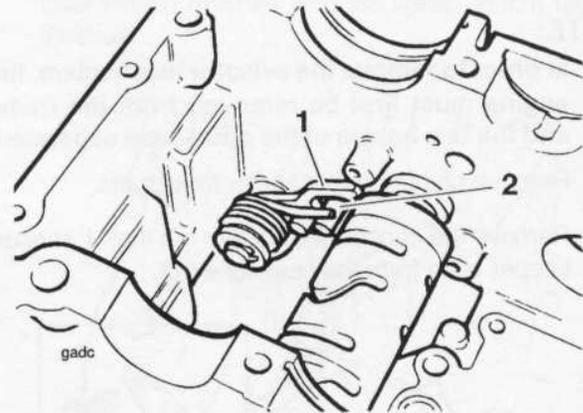
1. Selector Drum Stop Plate

13. Remove the screw securing the detent wheel to the selector drum. Remove the detent wheel.

NOTE:

- The selector drum will not turn through 360° provided the stop plate has been removed.

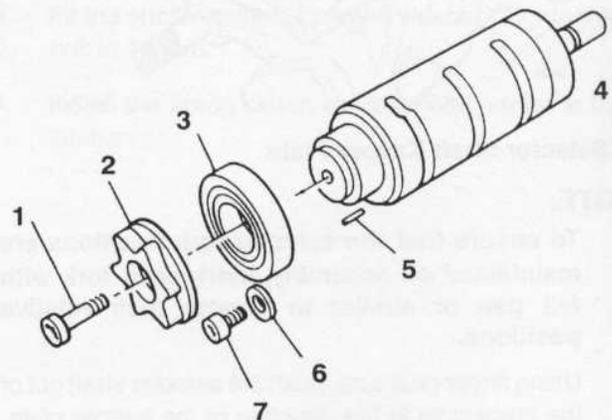
14. Remove the spring abutment bolt from the gear quadrant and slide the quadrant out of mesh.



1. Quadrant

2. Abutment Bolt

15. Remove the capscrew from the bearing lock (detent end of the selector drum).



1. Detent Wheel Bolt

2. Detent Wheel

3. Selector Drum Bearing

4. Selector Drum

5. Dowel

6. Bearing Lock

7. Capscrew

16. Remove the selector drum bearing by pushing through from inside the crankcase to outside using hand pressure only.

17. Lift out the selector drum.

Inspection

Examine all components for damage or wear paying particular attention to selector drum and selector forks. Replace any suspect parts.

Gear selector fork thickness:

Standard:	5.85 mm ± 0.05 mm
Service Limit:	5.70 mm ± 0.00 mm

Gear selector groove width:

Standard:	6.05 mm ± 0.05 mm
Service Limit:	6.25 mm ± 0.00 mm

Selector fork to groove clearance:

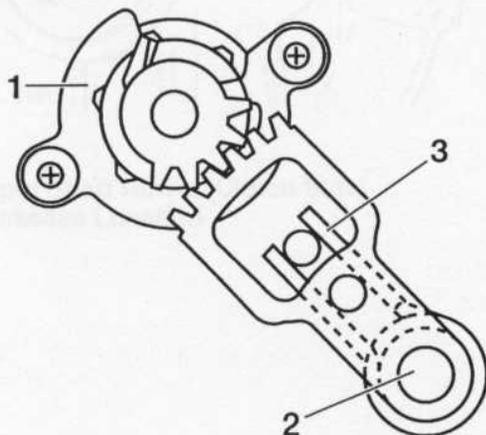
0.55mm max

Installation

1. Locate the selector drum into the crankcase.
2. Lubricate the selector drum bearing with clean engine oil.
3. Support the drum and refit the selector drum bearing. Retain with the bearing lock and capscrew. Tighten the capscrew to **12 Nm**.
4. Align the quadrant with the selector drum.

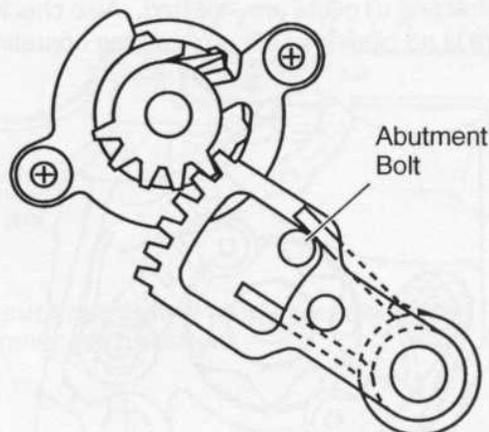
NOTE:

- **Align the gear centre tooth on the selector drum between the centre gear teeth on the gear quadrant.**



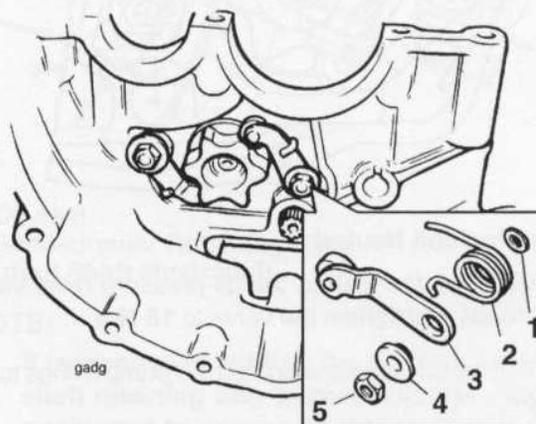
1. Stop Plate
2. Quadrant Shaft
3. Return Spring

5. Fit a new sealing washer to the gearchange abutment bolt and refit it to the lower crankcase. Tighten the bolt to **28 Nm**.
6. Push the mechanism down until the quadrant contacts the abutment bolt (arrowed below). Check that the gear teeth mesh as shown below. Rectify if incorrect by removing and re-engaging the gear quadrant.



Correct Gear Position at Maximum Extension

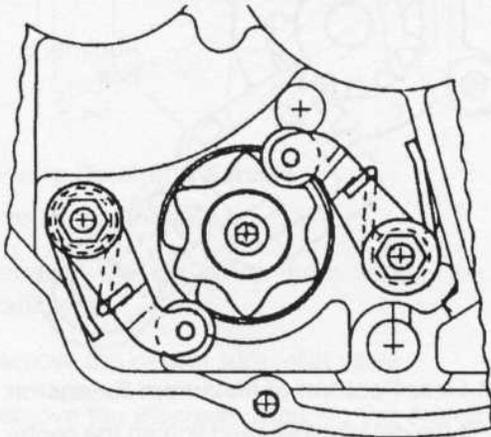
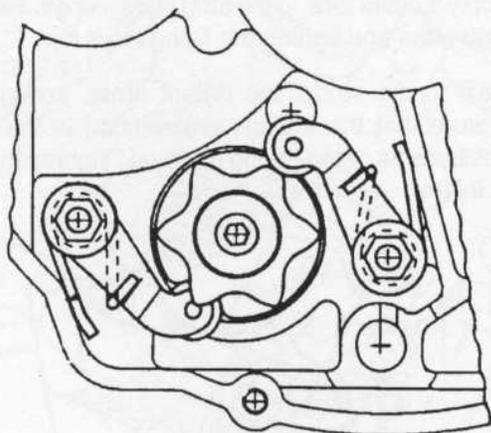
7. Refit the detent wheel and tighten the centre bolt to **12 Nm**.
8. Apply 'Loctite 242' to the stop plate fixings. Refit the stop plate and tighten the fixings to **9 Nm**.
9. Refit to the studs, the detent arms, springs etc. Ensure that the springs are re-fitted in the same positions as noted during removal. Tighten the nuts to **9 Nm**.



1. Washer
2. Spring
3. Detent Arm
4. Flanged Washer
5. Nut

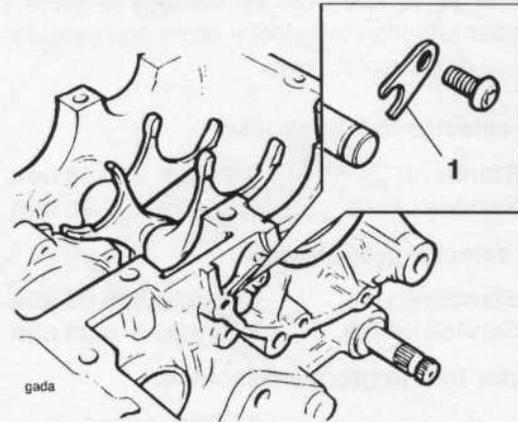
NOTE:

- **Detent springs MUST NOT be interchanged. The NEUTRAL spring has a white mark and is fitted rearmost in the crankcase.**
 - **The neutral detent arm is angled in toward the crankcase whereas the gearchange detent arm is angled out towards the detent wheel.**
10. Check that the detent arms correctly align when neutral and all gears are selected. Also check that there is no binding of the arms during operation.

**Detent Position 1st. Gear****Detent Position Neutral**

11. Apply 'Loctite 270' to the oil pressure relief valve threads and tighten the valve to **15 Nm**.
12. Refit the oil pump and tighten the pump fixings to **12 Nm**.
13. Position the selector forks to the selector drum, in the order noted during removal.

14. Support the selectors and feed the selector shaft through the crankcase and selectors. Fit the shaft keeper plate and tighten the retaining bolt to **6 Nm**.

**1. Selector Shaft Keeper Plate**

INPUT AND OUTPUT SHAFT ASSEMBLIES

Removal

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

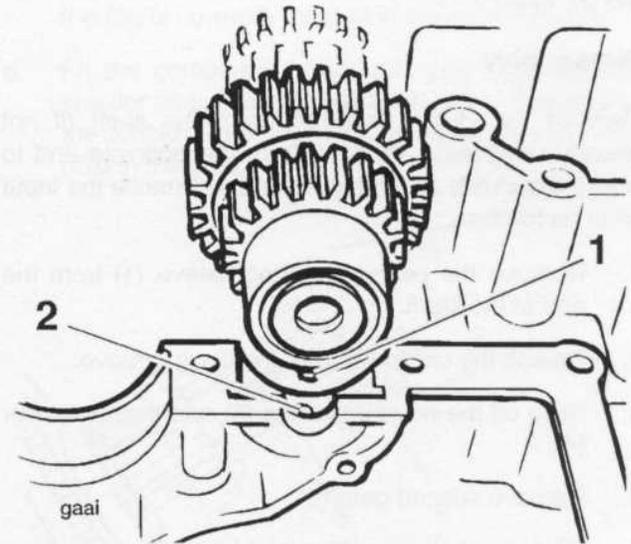
Installation

Ensure the bearing sleeve dowels, oil seal and retaining rings are correctly located when refitting both shafts.

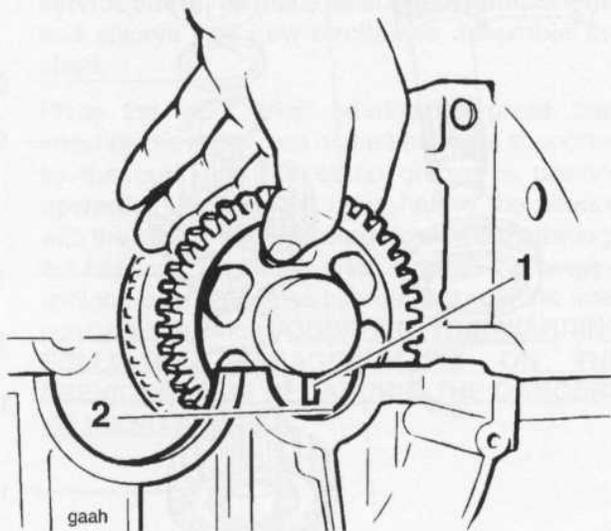
NOTE:

- Apply a small amount of 'Loctite 648' to the bearing locations in the upper crankcase before fitting the assembled transmission shafts.

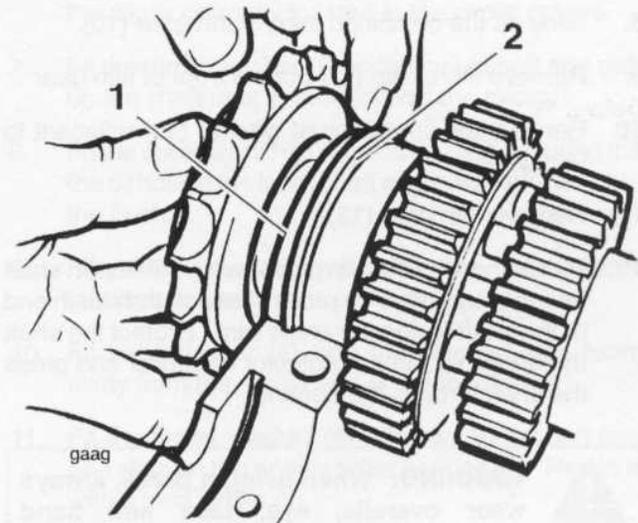
Ensure that all gears are correctly meshed.



1. Input Shaft Dowel (drive sprocket side)
2. Crankcase Location



1. Output Shaft Dowel (Clutch Side)
2. Crankcase Location



1. Oil seal
2. Semi-circular Retaining Ring (Output Shaft Illustrated)

NOTE:

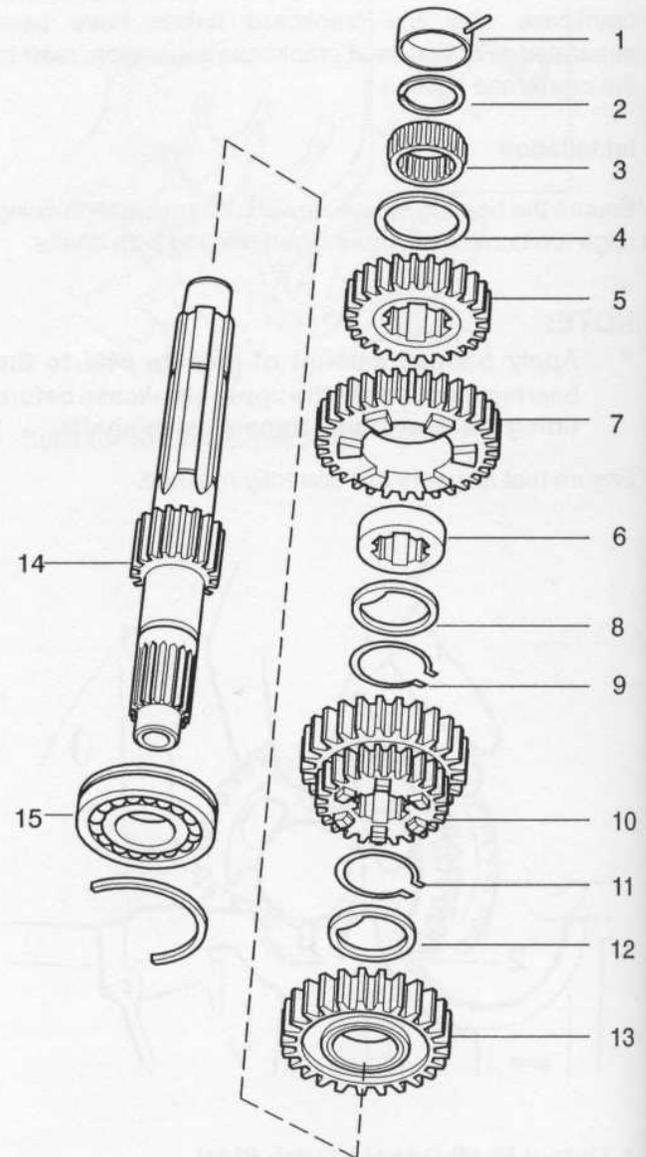
- It is recommended that the semi-circular input shaft retaining ring (adjacent to the clutch) is positioned to engage an equal amount in the upper and lower crankcases.

INPUT SHAFT

Disassembly

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

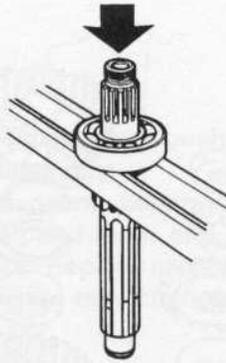
1. Remove the pegged bearing sleeve (1) from the end of the shaft.
2. Detach the circlip (2) from the circlip groove.
3. Slide off the needle bearing (3) and thrust washer (4).
4. Remove second gear (5).
5. Remove sixth gear (7), complete with the splined bush (6) which runs inside the gear.
6. Remove the lipped thrust washer (8) from in front of the circlip between sixth and third/fourth gear.
7. Remove the circlip (9) from the shaft.
8. Slide off the combined third/fourth gear (10).
9. Remove the circlip (11) from in front of fifth gear.
10. Remove the lipped thrust washer (12) adjacent to fifth gear.
11. Remove fifth gear (13).
12. Place the shaft in a press with the input shaft bearing supported on press bars and the clutch end of the shaft facing the press ram. Protect the shaft thread with a thread protector or similar and press the shaft through the bearing.



1. Bearing Sleeve
2. Circlip
3. Needle Roller Bearing
4. Thrust Washer
5. Second Gear
6. Splined Bush
7. Sixth Gear
8. Thrust Washer
9. Circlip
10. Third/Fourth Gear
11. Circlip
12. Thrust Washer
13. Fifth Gear
14. Input Shaft
15. Input Shaft Bearing

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.



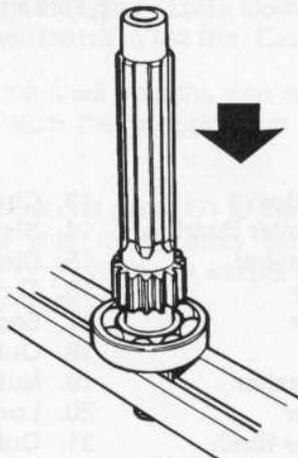
1. Pressing Off The Input Shaft Bearing

Assembly

NOTE:

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

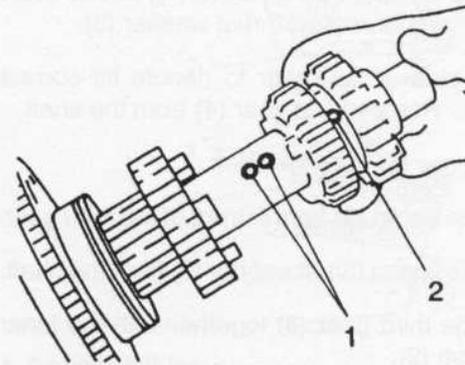
1. Place the input shaft bearing on press bars ensuring the **inner** race of the bearing is supported by the bars and the circlip groove is pointing **upwards**. Position the mainshaft to the bearing with the **clutch end pointing downwards** through the bearing. Press the shaft through the bearing until the bearing comes into contact with the fixed gear on the shaft. **OBSERVE THE WARNING FOLLOWING PARAGRAPH 12 ON THE PREVIOUS PAGE REGARDING THE DANGERS OF USING A PRESS**



Pressing On the Input Shaft Bearing

2. Fit fifth gear (13) to the input shaft with the dog teeth pointing away from the input shaft bearing.
3. Slide on the thrust washer (12).

4. Fit a new circlip (11) to the input shaft ensuring that the clip is correctly located in the circlip groove.
5. Fit the combined third/fourth gear (10) with the smaller gear facing toward fifth gear. Ensure that the double oil hole in the mainshaft aligns with the oil hole in the gear.



1. Input Shaft Double Oil Hole
2. Third/Fourth Gear Oil Hole

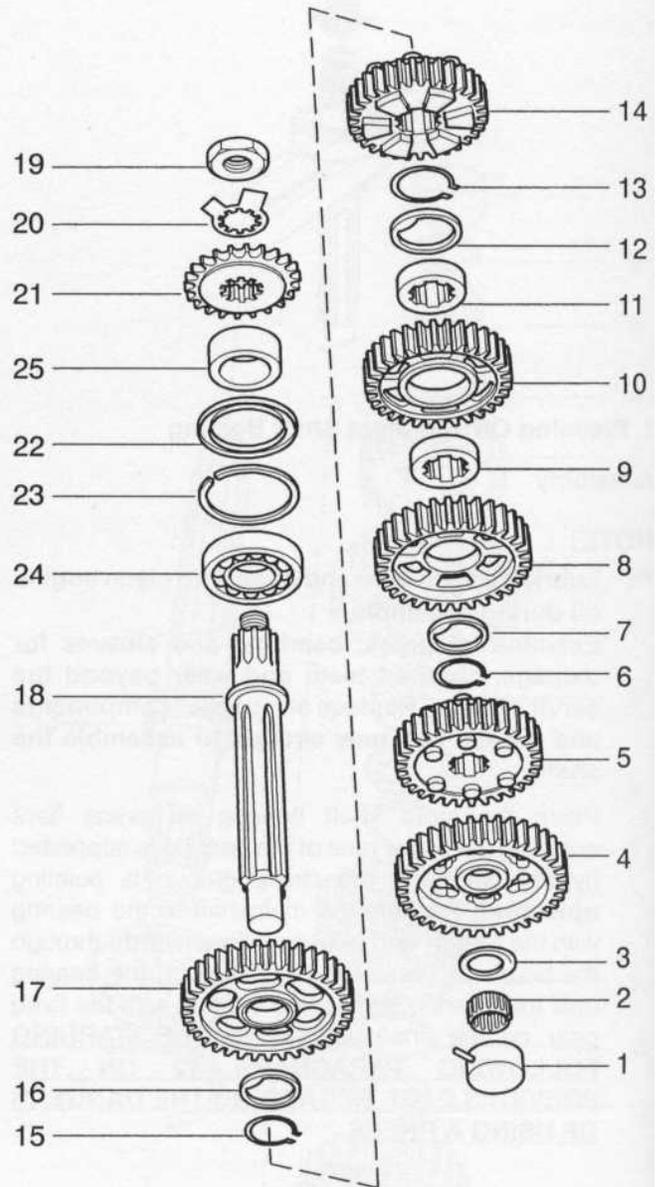
6. Fit a new circlip (9) to the input shaft ensuring that the clip is correctly located in the circlip groove.
7. Fit the thrust washer (8) to the input shaft and slide up the shaft until in contact with the circlip.
8. Fit the splined bush (6) from sixth gear ensuring that the oil hole in the input shaft aligns with the oil hole in the bush.
9. Fit sixth gear (7) with the dog teeth facing third/fourth gear.
10. Fit second gear (5) with the stepped side facing away from the clutch end of the input shaft.
11. Fit the thrust washer (4) adjacent to second gear and slide on the needle roller bearing (3). Retain all with a new circlip (2).
12. Finally, fit the bearing sleeve (1) to the needle roller bearing.

OUTPUT SHAFT

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

Disassembly

1. Remove the output bearing sleeve (1), needle roller bearing (2) and hardened thrust washer (3).
2. Mark one side of first gear to denote its correct orientation. Remove first gear (4) from the shaft.
3. Slide fifth gear (5) from the shaft.
4. Remove the circlip (6) from in front of the third gear.
5. Remove the lipped thrust washer (7) from the shaft.
6. Remove the third gear (8) together with the inner splined bush (9).
7. Slide fourth gear (10) off the shaft and also remove the splined bush (11) and thrust washer (12).
8. Remove the circlip (13) from in front of sixth gear.
9. Remove sixth gear (14) from the shaft.
10. Remove the circlip (15) from in front of second gear.
11. Remove thrust washer (16) and slide off second gear (17).
12. Position the output shaft (18) in a vice with soft jaws fitted. Tighten the vice to prevent the shaft from turning and release the lock tab (20) from the output sprocket nut (19), then release the nut.
13. Remove the transmission sprocket nut (19), locktab (20), sprocket (21) and sleeve (25).
14. Collect the oil seal (22) and retaining ring (23).
15. If it is found necessary to replace the large bearing (24) at the end of the shaft, remove the outer race and detach the inner section from the shaft by splitting.



- | | |
|--------------------------|---------------------|
| 1. Bearing Sleeve | 13. Circlip |
| 2. Needle Roller Bearing | 14. Sixth Gear |
| 3. Thrust Washer | 15. Circlip |
| 4. First Gear | 16. Thrust washer |
| 5. Fifth Gear | 17. Second Gear |
| 6. Circlip | 18. Output Shaft |
| 7. Thrust Washer | 19. Nut |
| 8. Third Gear | 20. Locktab |
| 9. Third Gear Bush | 21. Output Sprocket |
| 10. Fourth Gear | 22. Oil Seal |
| 11. Fourth Gear Bush | 23. Retaining Ring |
| 12. Thrust Washer | 24. Bearing |
| | 25. Sleeve |

WARNING: When removing the output shaft bearing, always wear overalls, eye, face and hand protection. The bearing races are hardened and are liable to splinter if broken. Debris from broken bearings could cause injury to eyes, face and any unprotected parts of the body.

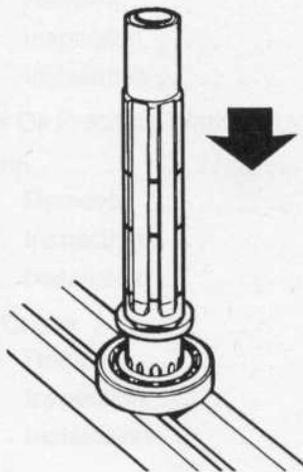
CAUTION: The bearing cannot be removed intact. If the bearing is removed from the shaft, the complete bearing will be damaged and must be renewed.

Assembly

NOTE:

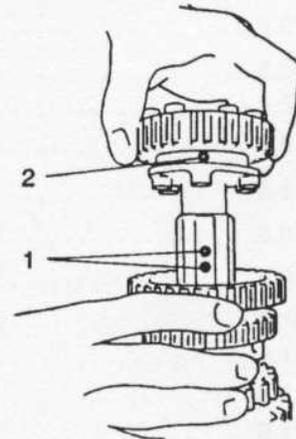
- Lubricate each gear and bush with clean engine oil during assembly. Examine all gears, bearings and sleeves for damage, chipped teeth and wear beyond the service limits. Replace all suspect components and always use new circlips to assemble the shaft

- Working from the output sprocket end of the shaft, fit a new bearing (24) to the shaft using a press and press bars.



- Fit the retaining ring (23) to the shaft. Lubricate and fit a new oil seal (22) and fit the sprocket sleeve (25).
- Transfer the shaft to the vice and secure between soft jaws. Fit the sprocket (21), locktab (20) and nut (19). Tighten the nut to **132 Nm**. Close the lock tab.
- Withdraw the shaft from the vice and continue to assemble from the opposite end to the output sprocket.
- Locate the second gear (17) to the shaft with the large step side facing away from the output sprocket end. Fit the thrust washer (16) and retain with a new circlip (15).

- Fit sixth gear (14) with the selector fork groove facing away from the output sprocket end. Ensure that the oil hole in the gear aligns with the double oil hole in the output shaft.



- Double Oil Hole
- Gear Oil Hole

CAUTION: Incorrect alignment of the oil holes will result in severe damage to the gears and gear selectors.

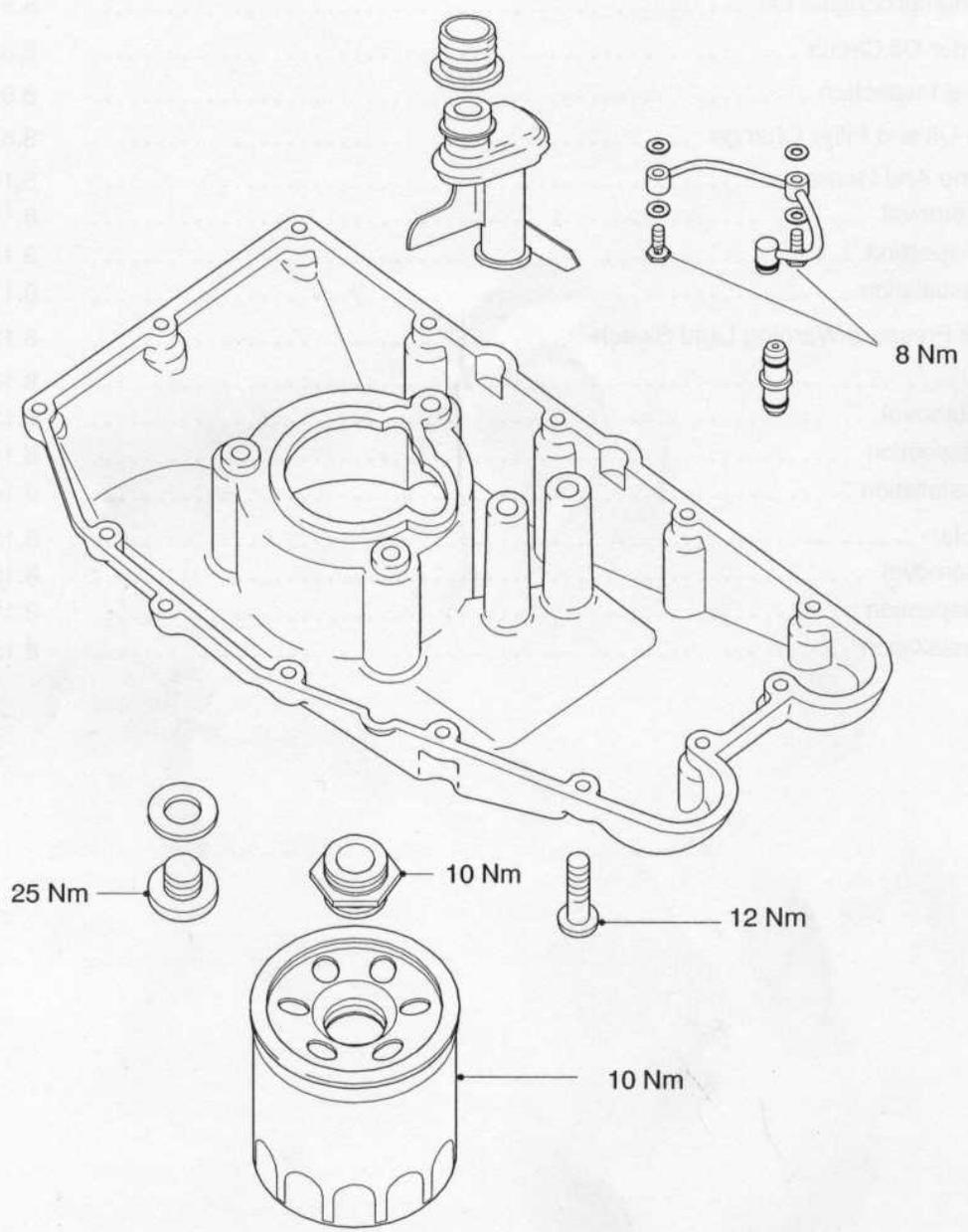
- Fit a new circlip (13) to retain sixth gear.
- Fit the thrust washer (12) to the rear of fourth gear and fit the splined sleeve (11) for fourth gear. Ensure correct alignment of the oil hole in the shaft with the oil hole in the sleeve. Fit fourth gear (10) to the shaft with the large step side facing away from the output sprocket.
- Fit the splined bush (9) for third gear taking care to align the oil hole in the shaft with the corresponding hole in the bush. Fit third gear (8) with the larger step side facing the output sprocket.
- Fit the thrust washer (7) and retain with a new circlip (6).
- Fit the fifth gear (5) to the shaft with the circular dog teeth facing away from the output sprocket.
- Fit first gear (4) to the shaft as marked during disassembly.
- Finally fit the thrust washer (3), needle roller bearing (2) and bearing cap (1) to the end of the shaft.

LUBRICATION SYSTEM

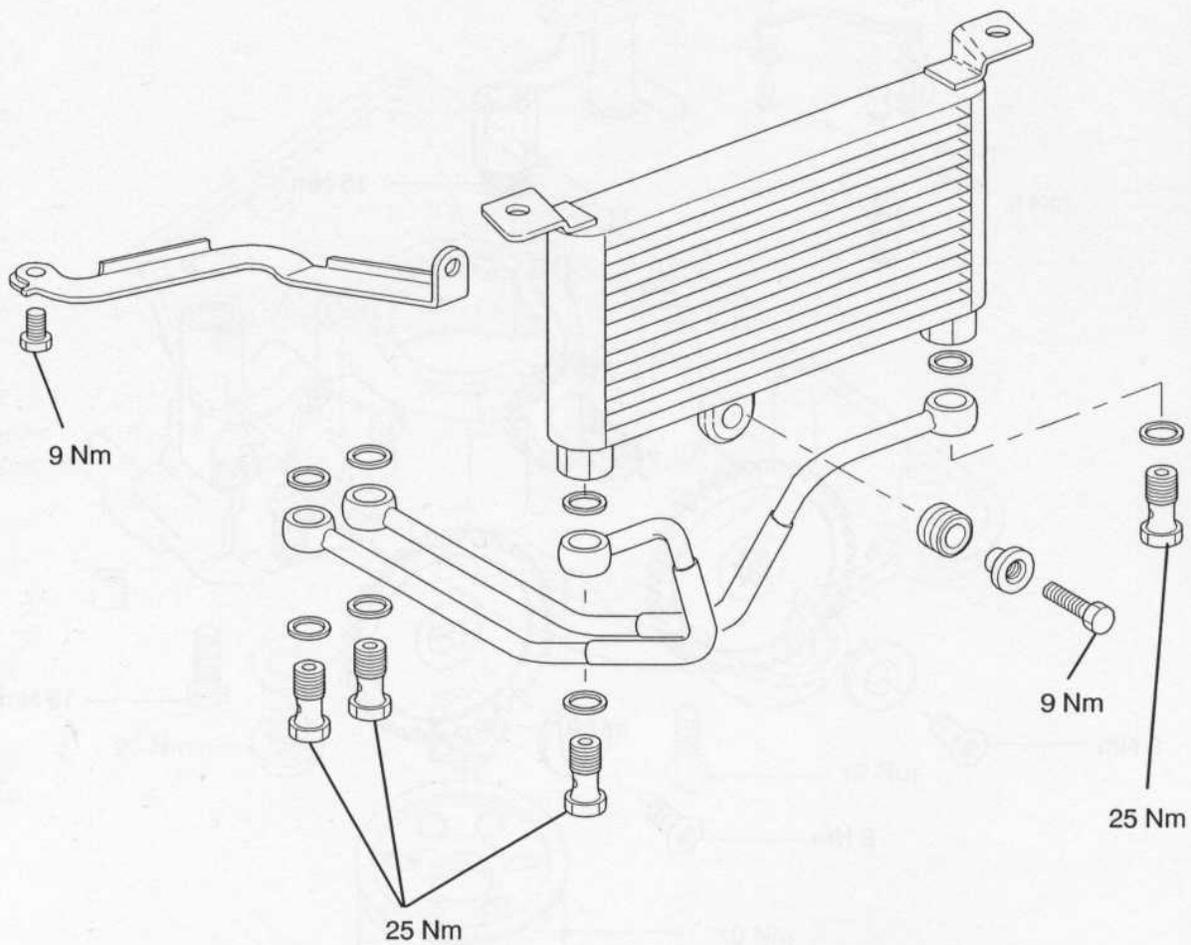
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Exploded View - Sump



Exploded View - Oil Cooler



ENGINE OIL

Specification

All Triumph fuel injected engines must be filled with 10W-40, 15W-40 or 15W-50 motorcycle engine oil which meets API-SG or API-SH specification. Mobil 1 Racing 4T specially filled for Triumph is an oil which meets the above requirements.



CAUTION: Do not use oils which do not meet API-SG or API-SH specification.

Do not use 10W rated oils with a hot viscosity rating greater than 40. For example, DO NOT use an oil with a viscosity rating of 10W-50.

Do not use oils with a cold viscosity rating of 0W or 5W.

Engine damage may result from using any engine oil which does not meet the required specification or does not fall into the correct viscosity band.

Triumph Engine Oil



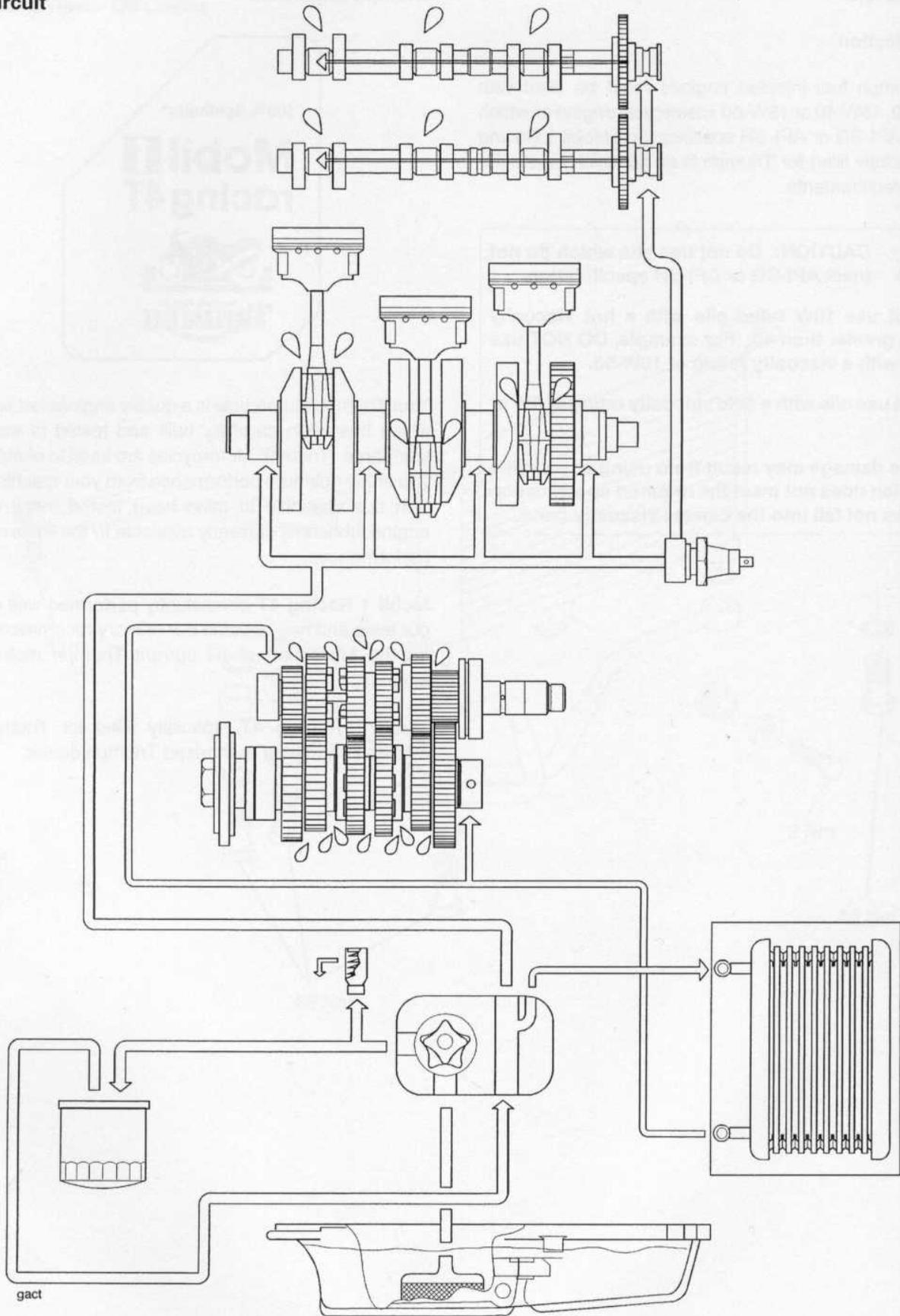
Your Triumph Motorcycle is a quality engineered product which has been carefully built and tested to exacting standards. Triumph Motorcycles are keen to ensure that you enjoy optimum performance from your machine and with this objective in mind have tested many of the engine lubricants currently available 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 Circuit



OIL CIRCUIT DESCRIPTION

Oil is collected from the sump and is drawn through a mesh strainer into the oil pump rotor. Pressurised oil is then delivered to the outside of the oil filter where the oil pressure relief valve is fitted. The relief valve is set to open at 75 lb/in² and when open, returns high pressure oil direct to the sump.

The oil pump is fitted with a single pumping rotor which supplies pressurised oil to the lubrication circuit and the oil cooler.

Filtered oil is drawn from the centre of the oil filter along the oil filter retaining tube. Part of this filtered oil is supplied, through a non-pumping passage in the oil pump, to a horizontal gallery at the rear of the upper crankcase.

Once received in the upper crankcase gallery, the oil is delivered to the crankshaft main bearings and, via drillings in the crankshaft, to the big end bearings. Oil exits from the big ends through holes in the connecting rods and then splash lubricates the bores and pistons.

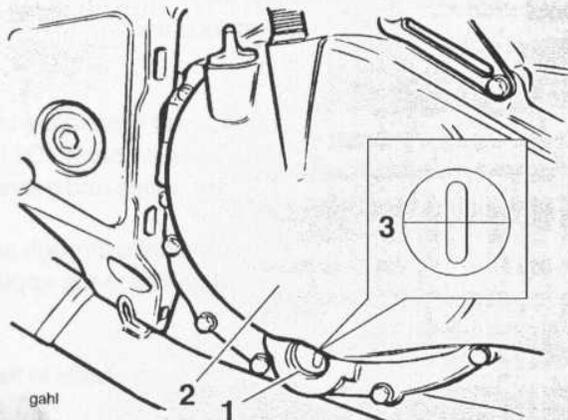
The remainder of the filtered oil is passed through an oil cooler and is supplied to drillings in the lower crankcase by internal, detachable pipes. These lower crankcase drillings deliver oil directly to the end of each gearbox shaft. Oil is circulated along the inside of the gearbox shafts to exit holes which feed directly onto the selectors, bearings and gears.

The same upper crankcase gallery which feeds the crankshaft also feeds the cylinder head and camshafts through an external link pipe. The pipe, located at the rear of the engine, links a drilling in the head to the oil gallery in the upper crankcase. The low oil pressure warning light switch is located at the base of this pipe.

The head drilling supplies oil to the front camshaft bearings which, in turn, deliver oil through the hollow camshafts to the other camshaft bearings, the tappet buckets and the valves.

Oil Level Inspection

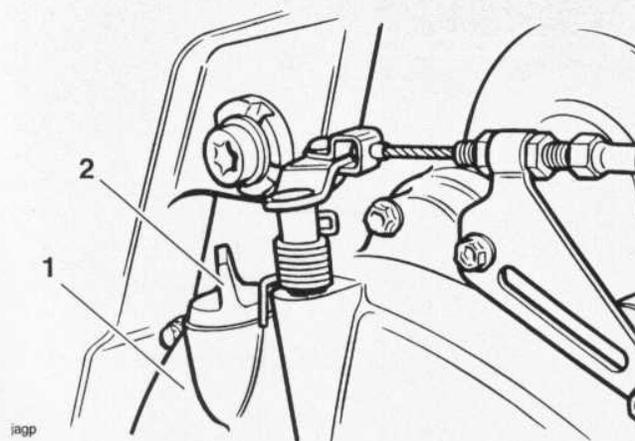
1. If the engine has been running, allow it to stand for at least 10 minutes before checking the oil level.
2. Check the oil level visible in the sight glass situated at the lower end of the clutch cover on the right hand side of the motorcycle. When correct, the level of oil should be half way up the sight glass.



1. Clutch Cover
2. Sight Glass
3. Oil Level (correct level shown)

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.
3. If the oil level requires adjustment, remove the filler plug from the clutch cover and add oil, a little at a time, until the correct level is reached.



1. Clutch Cover
2. Filler Plug
4. Refit the filler plug.

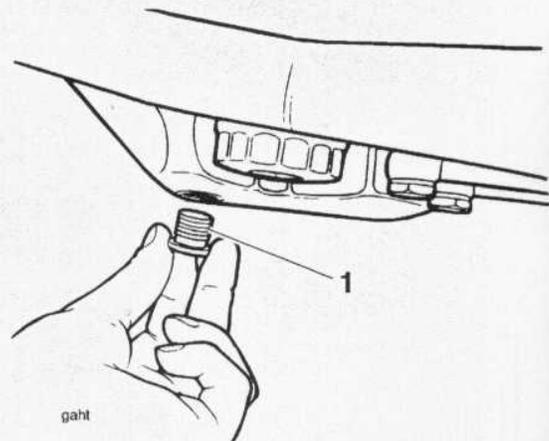
Engine Oil and Filter Change

! 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.

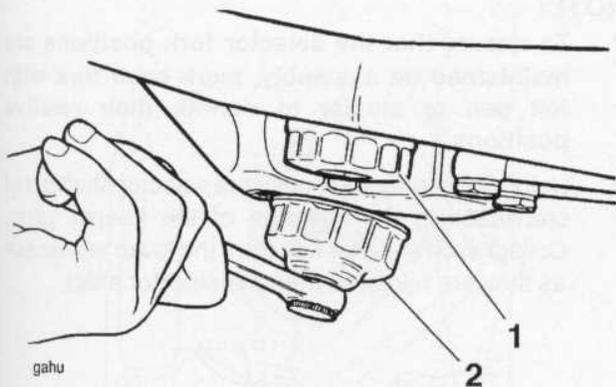
1. Position the motorcycle on level ground and in an upright position.
2. Start the engine and allow it to reach normal operating temperature.
3. Stop the engine and place a container beneath the sump to collect the displaced oil.
4. Remove the sump drain plug and allow the oil to drain out completely.

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



1. Sump Drain Plug

5. When the oil has completely drained out, fit a new sealing washer to the sump plug and refit the plug tightening it to **25 Nm**.
6. Move the container to a point below the oil filter.
7. Using tool T3880311 to release the filter cartridge, unscrew and remove the oil filter.



1. Oil Filter

2. Tool T3880311

- 8. Apply a smear of clean engine oil to the seal of the new filter.
- 9. Fit the filter and tighten, using tool T3880311, to **10 Nm**.
- 10. 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.**
- 11. 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.



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.

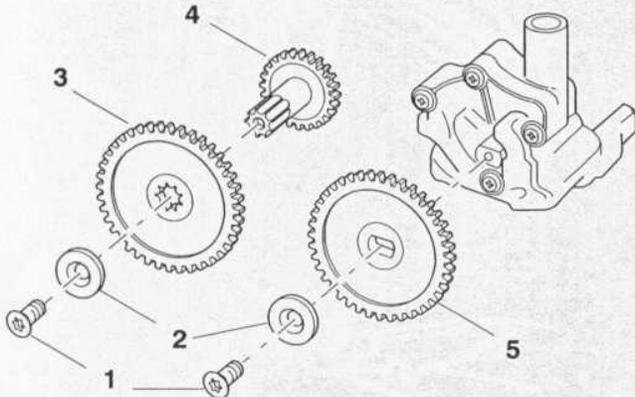
- 12. While the engine is running, check for oil leaks.
- 13. Stop the engine and adjust the oil level if necessary.

OIL PUMP AND GEARS

Removal

NOTE:

- The oil pump is located in the lower crankcase. In order to remove the oil pump, the engine must be removed from the frame and the crankcase halves separated.



1. Gear Screws

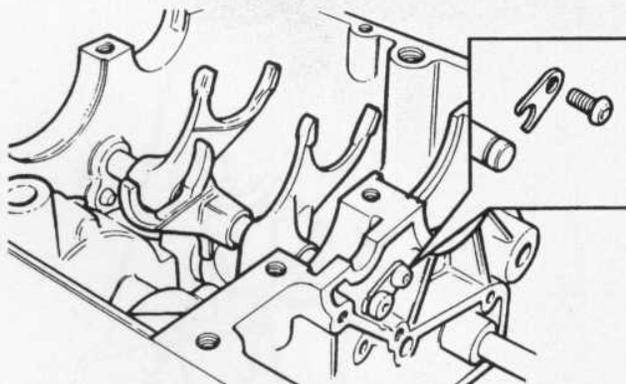
2. Washers

3. Auxiliary Gear

4. Intermediate Gear And Shaft

5. Oil Pump Gear

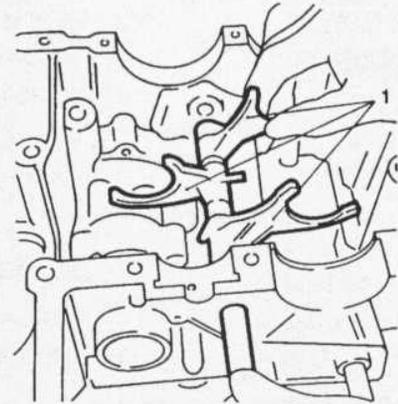
- Remove both the input and output shafts.
- Remove the capscrew and take out the 'U' shaped keeper plate from the selector shaft.



Inset:- Selector Shaft Keeper Plate

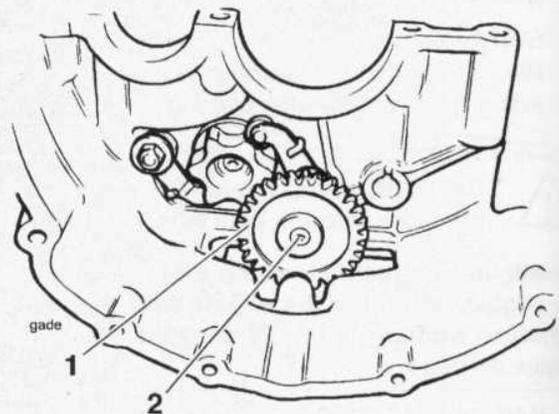
NOTE:

- To ensure that the selector fork positions are maintained on assembly, mark each fork with felt pen or similar to denote their relative positions.
- Using finger pressure, push the selector shaft out of crankcase in the direction of the keeper plate. Collect each selector fork from the lower crankcase as they are released from the selector shaft.



1. Selector Forks

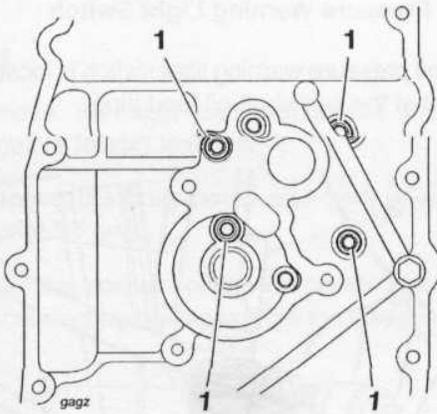
- Remove the screw securing the oil pump auxiliary gear. Remove the gear from the shaft.



1. Oil Pump Auxiliary Gear

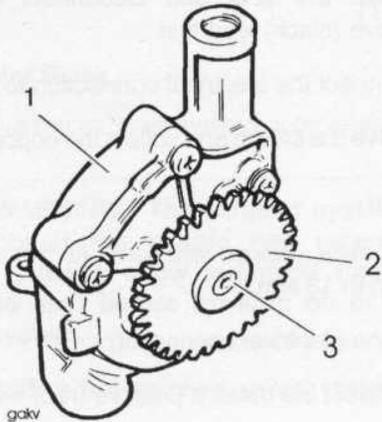
2. Gear Retaining Screw

- Invert the crankcase.
- Release the screws securing the oil pump to the lower crankcase.
- Invert the crankcase.



1. Oil Pump Retaining Screws

8. Remove the oil pump from inside the lower crankcase.
9. Withdraw the oil pump intermediate gear by sliding through the crankcase from outside to in.
10. To remove the oil pump gear from the pump, release the securing screw and remove from the shaft.



1. Oil Pump
2. Gear
3. Screw

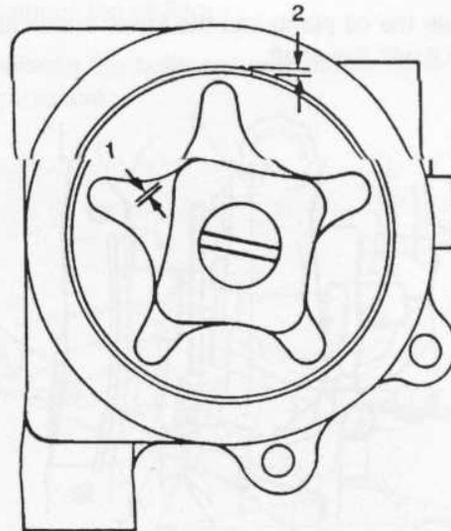
Inspection

1. Remove the oil pump end cover.
2. Measure the rotor tip clearance using feeler gauges.

Standard: 0.15 mm
Service Limit: 0.20 mm max.

2. Measure the pump body clearance using feeler gauges.

Standard: 0.22 - 0.15 mm
Service Limit: 0.35 mm max.



1. Rotor Tip Clearance
2. Pump Body Clearance

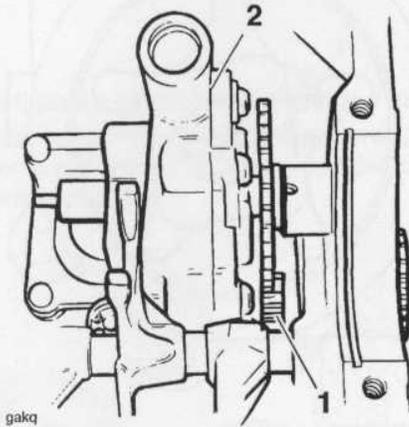
CAUTION: If any part of the oil pump is found to be outside the service limit, the complete pump must be renewed. Severe engine damage may result from the continued use of a faulty oil pump.

3. Refit the end cover if all clearances are within the service limits. Renew the complete pump if outside the service limit.
4. Inspect all gears for damage, pitting etc. Renew as necessary.

Installation

1. Locate the oil pump gear to the pump and tighten the retaining screw to **9 Nm**.
2. Fit the oil pump intermediate gear and shaft to the crankcase.

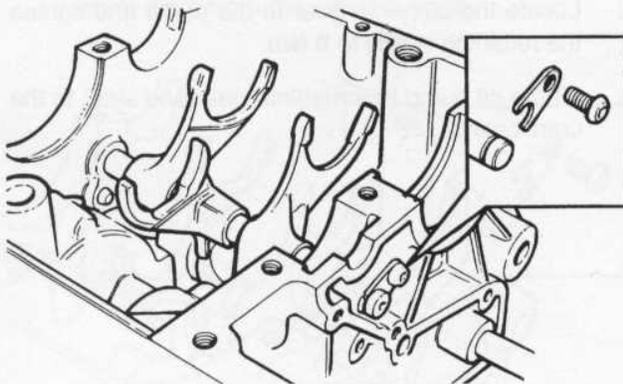
3. Locate the oil pump into the lower crankcase and align it with the shaft.



1. Oil Pump Intermediate Gear

2. Oil Pump

4. Invert the crankcase and support the pump in position.
5. Fit and tighten the oil pump screws to **12 Nm**.
6. Refit the oil pump auxiliary gear and tighten the gear fixing to **9 Nm**.
7. Position the selector forks to the selector drum, in the order noted during removal.
8. Support the selectors and feed the selector shaft through the crankcase and selectors. Fit the shaft keeper plate and tighten the retaining bolt to **6 Nm**.

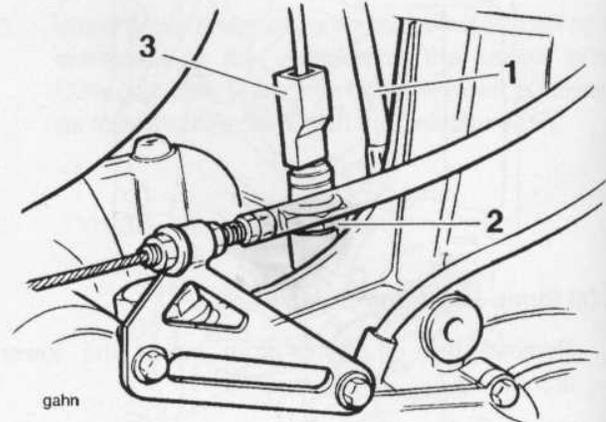


Inset:- Selector Shaft Keeper Plate

9. Refit the input and output shafts.

Low Oil Pressure Warning Light Switch

The low oil pressure warning light switch is located at the lower end of the camshaft oil feed pipe.



1. Oil Feed Pipe

2. Low Oil Pressure Warning Light Switch

3. Electrical Connection

1. Remove the seat and disconnect the battery negative (black) lead first.
2. Disconnect the electrical connection to the switch.
3. Remove the switch and collect the copper washers.

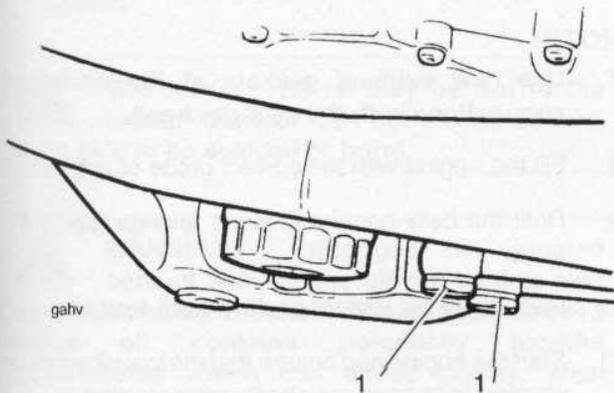
Installation

1. Using new copper washers, fit the switch and tighten to **13 Nm**.
2. Refit the electrical connection.
3. Reconnect the battery, positive (red) lead first.

SUMP

Removal

1. Remove the seat and disconnect the battery negative (black) lead first.
2. Remove the belly panel and both lower fairings (Sprint ST only).
3. Note the position of the oil cooler pipes prior to disconnecting the pipes from the sump.



1. Oil Cooler Pipes

4. Remove the exhaust system completely.

WARNING: The exhaust system will be hot if the engine has recently been running. Always allow sufficient time for the exhaust to cool before working on or near the exhaust system.

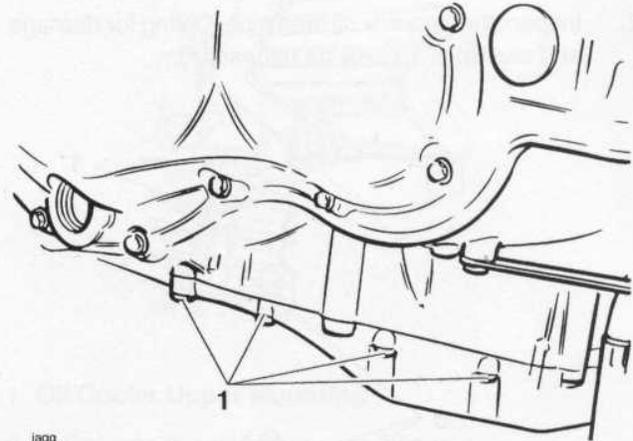
Contact with a hot exhaust could result in burn injuries.

5. Position a container beneath the sump, release the sump plug and drain the engine oil from the sump.

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.

6. Remove the oil filter.
7. Release the bolts securing the sump to the lower crankcase.



1. Sump to Lower Crankcase Fixings

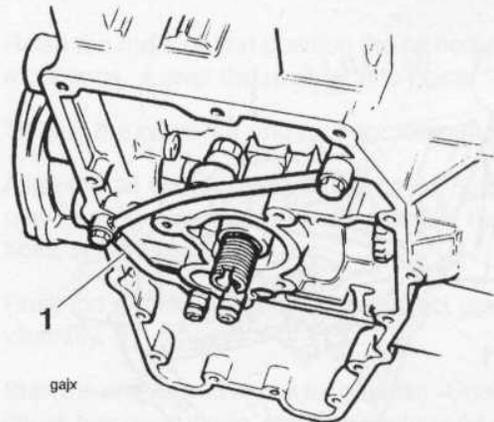
NOTE:

- Note the position of the hose guide on the right hand side of the sump in order that it can be refitted in the same location.

8. Detach the sump and collect the oil transfer tube.

NOTE:

- The oil transfer tube may remain in the crankcase or become detached with the sump.

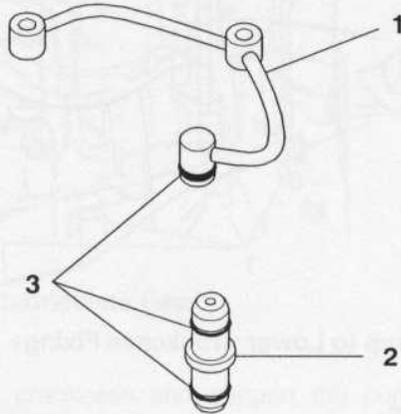


1. Oil Transfer Tube

9. Remove the sump gasket.

Inspection

1. Inspect the oil transfer tube 'O' rings for damage and swelling. Renew as necessary.
2. Inspect the gearbox oil feed pipe 'O' ring for damage and swelling. Renew as necessary.



1. Oil Transfer Tube

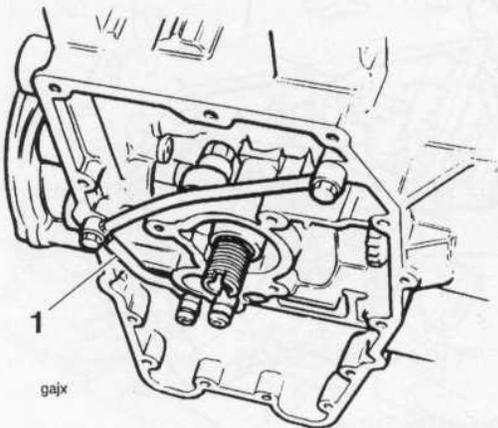
2. Gearbox Oil Feed Pipe

3. 'O' rings

3. Inspect the oil pick-up for correct fitment in the lower crankcase.

Installation

1. Fit the oil transfer tube to the crankcase.



1. Transfer Tube Location

2. Using a new sump gasket, position the sump to the lower crankcase and locate to the oil transfer tube and gearbox oil transfer pipe.

3. Tighten the sump fixings to **12 Nm**.
4. Using new sealing washers, reconnect the oil cooler pipes. Tighten the cooler pipe banjo bolts to **25 Nm**.
5. Apply a smear of clean engine oil to the seal of a new oil filter.
6. Fit the oil filter and tighten to **10 Nm** using tool T3880011.
7. Refit the exhaust system as described in the fuel system section.

NOTE:

- Use new exhaust gaskets at the downpipe connections with the cylinder head.
8. Fill the engine with the correct grade of engine oil
 9. Refit the belly panel and lower fairings (Sprint ST only).
 10. Reconnect the battery positive (red) lead first.
 11. Start the engine and ensure that the low oil pressure warning light goes out shortly after starting.
 12. Stop the engine and adjust the engine oil level.
 13. Refit the seat.

OIL COOLER

Removal

1. Remove the seat and disconnect the battery negative (black) lead first.
2. Remove the lower fairings and belly panel (Sprint ST only).
3. Position a suitable container beneath the oil cooler to catch any oil spillages.
4. Drain the engine oil as described elsewhere in this section.

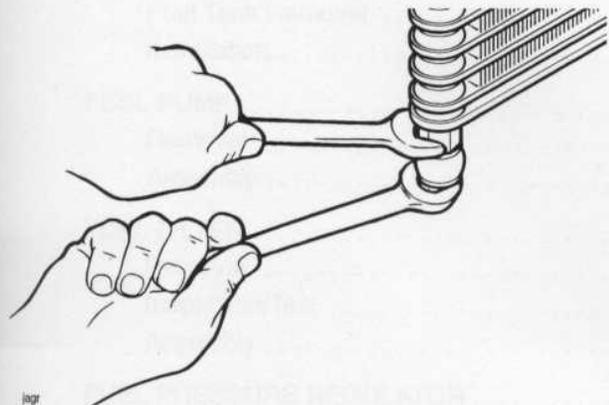
! WARNING: The oil may be hot to the touch. Contact with hot engine oil may cause skin to be scalded or burnt.

! 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.

5. Using an open-ended spanner, support the oil cooler connection point and disconnect the feed hose.

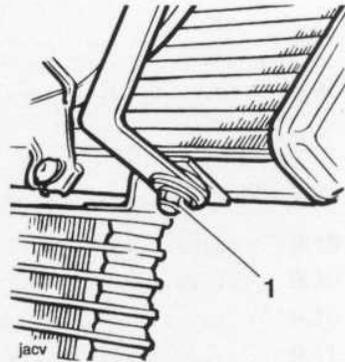
! CAUTION: If the cooler connection point is not supported, the oil cooler may become damaged during release of the hose connections. Always follow the above method to avoid oil cooler damage.

6. Using the same method, disconnect the return hose.



Oil Cooler Hose Disconnection

7. Release the oil cooler fixings.



1. Oil Cooler Upper Mounting

8. Release the radiator upper fixings.
9. Raise the radiator to release the oil cooler.
10. Temporarily place the radiator back into the lower mountings in the period that the cooler is removed from the bike.

Inspection

1. Inspect the cooler connection points for fractures and signs of oil leakage.
2. Check the cooler fins for damage and leaks.

Installation

1. Raise the radiator and position the oil cooler upper mountings. Lower the radiator into place.
2. Tighten the oil cooler and radiator fixings to **9 Nm**.
3. Align the oil cooler pipes to the cooler and, using new sealing washers on both sides of the banjo bolts, tighten to **25 Nm**.
4. Refill the engine with oil of the correct grade and viscosity.
5. Start the engine and check for oil leaks. Once a leak check has been made, stop the engine and allow to stand for 10 minutes.
6. Adjust the engine oil level.
7. Refit the lower fairings and belly panel (Sprint ST only).
8. Reconnect the battery positive (red) lead first.
9. Refit the seat.

FUEL SYSTEM/ENGINE MANAGEMENT

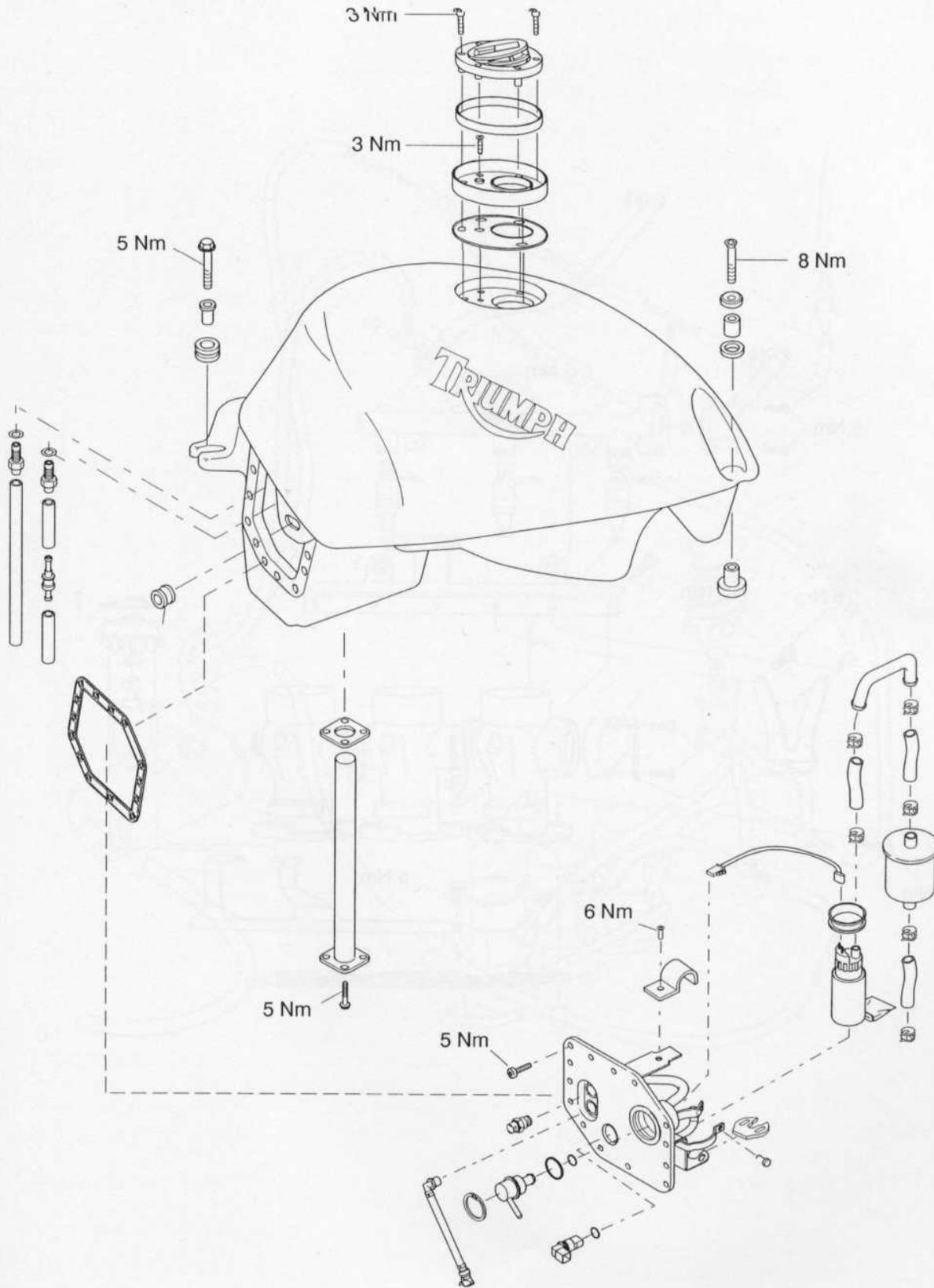
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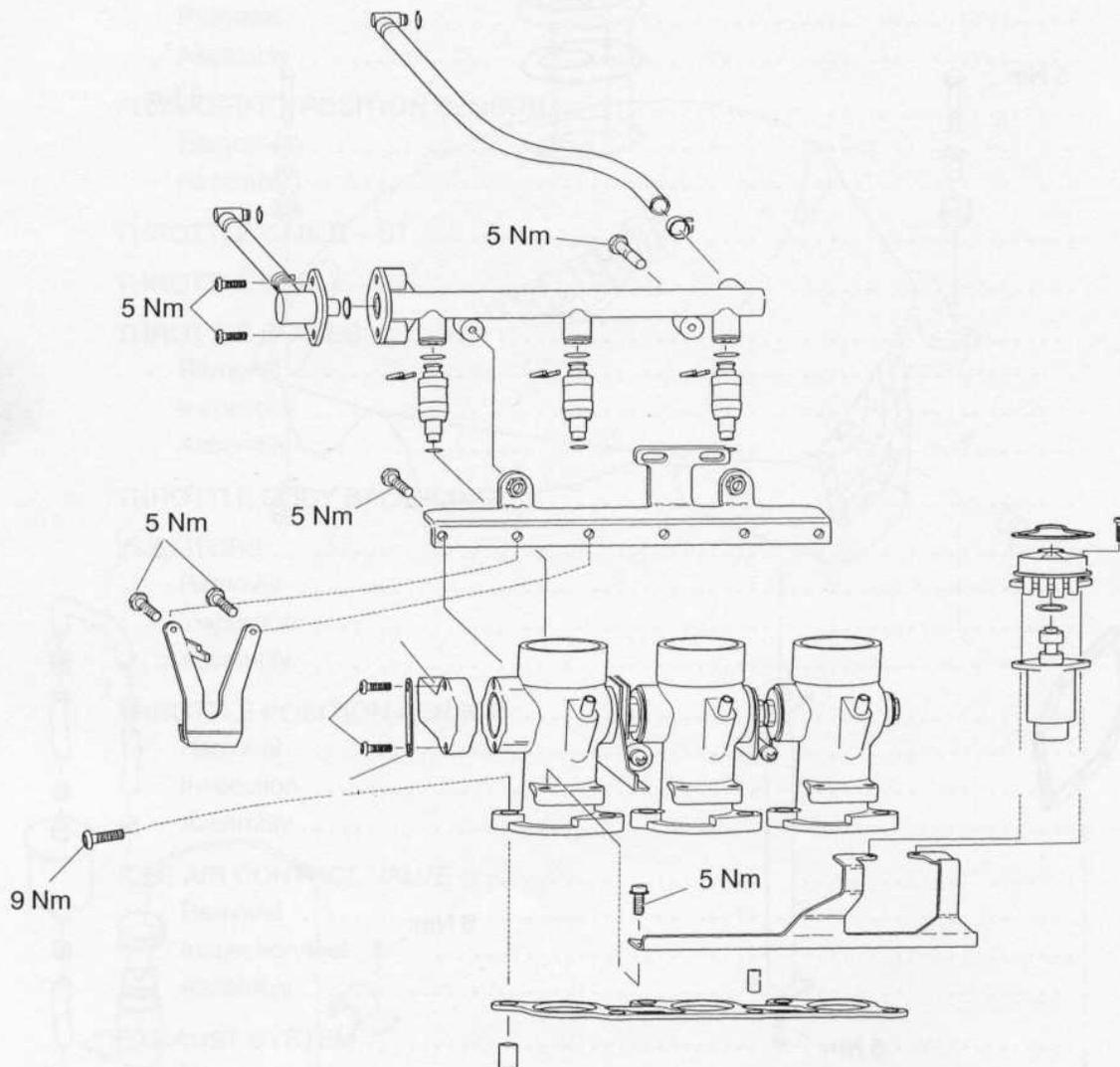
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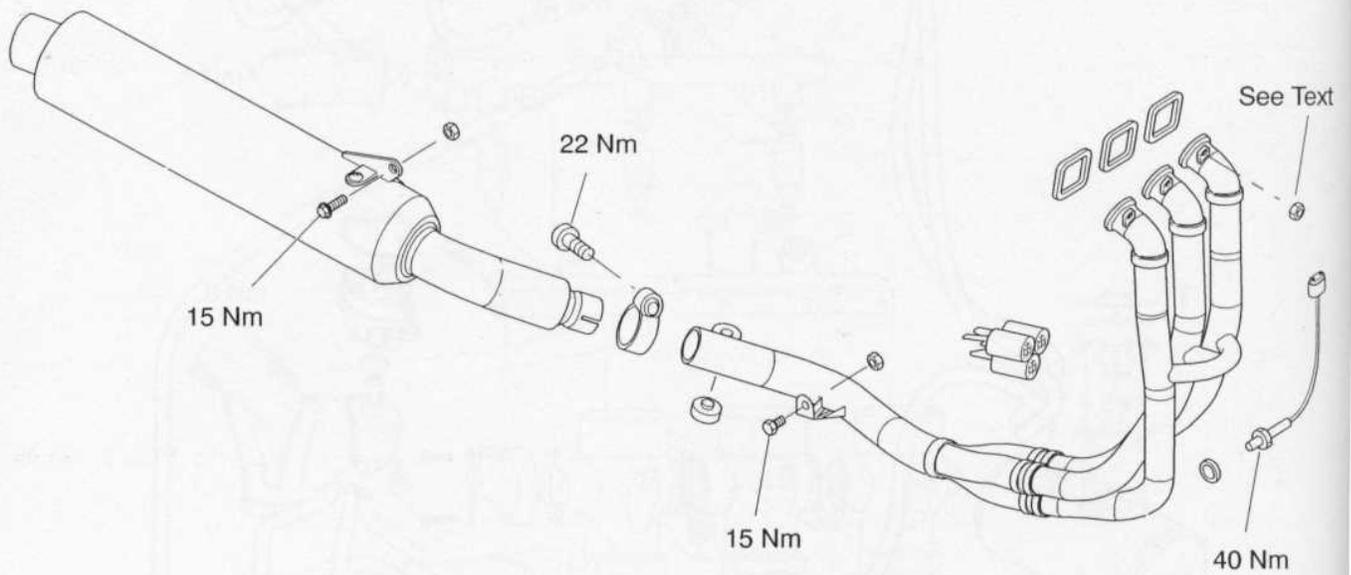
Exploded View - Fuel Tank and Pump



Exploded View - Fuel Rail, Throttles and Injectors



Exploded View - Exhaust System



FUEL REQUIREMENTS

Fuel Requirements - all countries except USA

Outside America, all motorcycles are designed to 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. Check local regulations before using leaded gasoline.

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.

Adaptive Stepper Position

The position of the idle air control valve stepper motor after adapting to a particular engine's operational characteristics.

Air temperature

The intake air temperature in the air box.

Air temperature sensor

Measurement in volts at the Electronic Control Module (ECM) of the air temperature in the air box as signalled by the air temperature sensor. Data is read out on the diagnostic tool in degrees Celsius.

ATDC

After Top Dead Centre.

Barometric pressure

Pressure of the air in the air box.

Battery voltage

The voltage at the input to the Electronic Control Module (ECM).

BTDC

Before Top Dead Centre.

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 loop fuelling

Fuel system incorporating a catalyst and oxygen sensor which helps to maintain air fuel ratios within a specific band.

Closed throttle position

Throttle position at idle (i.e. against end stop), measured as a voltage and expressed as percentage.

0% = 0 volts

100% = 5 volts

Coolant temperature

The coolant temperature in the thermostat housing.

Coolant temperature sensor

Measurement in volts at the Electronic Control Module (ECM) of the coolant temperature in the thermostat housing as signalled by the coolant temperature sensor.

Cooling fan status

The 'on' or 'off' condition of the cooling fan.

Corrected Throttle Position

The electronic value of the throttle position corrected according to the closed value of the throttle potentiometer. The reading for corrected throttle position will be different to the actual throttle position.

DTC

Diagnostic Trouble Code.

ECM

Electronic Control Module.

Engine speed

The crankshaft revolutions per minute of the engine.

Freeze frame

A data set captured at the time a Diagnostic Trouble Code (DTC) is set.

IACV

Idle Air Control valve.

Idle air control valve stepper position

The position of the idle air control valve stepper motor;

0 = fully closed.

180 = fully open

Idle fuel trim

The percentage above or below the nominal fuel requirement for the volume of air entering at idle.

Idle fuelling

Adjustment of fuel 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.

Lambda sensor

See oxygen sensor.

Long term fuel trim

Fueling after adapting to the engine's long term fuelling requirements (closed loop only). See also short term fuel trim.

MIL

Malfunction Indicator Lamp.

Illuminates when 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.

Open loop

Fuel system without a catalyst fitted or one which is operating in open loop mode due to a catalyst fault.

Over temp'

High temperature within the Electronic Control Module (ECM) caused by an internal or external failure.

Oxygen sensor

Device in the exhaust system which senses the content of the exhaust gases and signals to the ECM to adjust the air-fuel ratio to within a specific parameter.

Purge valve duty cycle

The time the purge valve is open in an open / close cycle, expressed as a percentage of the cycle time.

Sensor reference voltage

Supply voltage to certain 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%. Generally, fully open will be in the 70% range. (See also corrected throttle position).

Throttle voltage

Voltage at the throttle potentiometer.

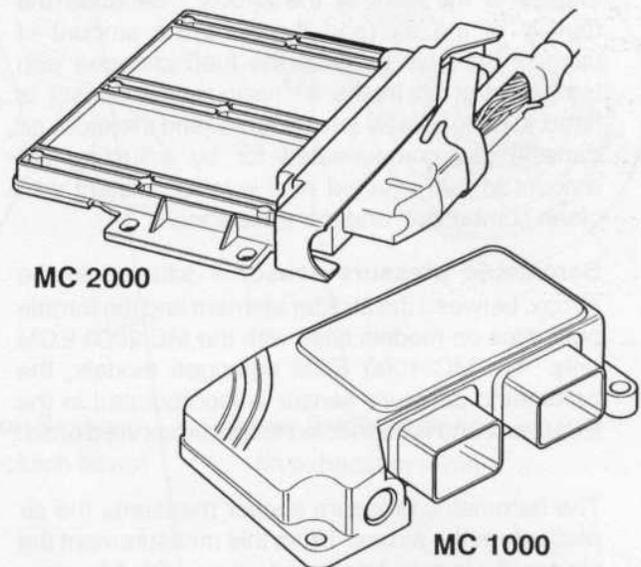
Vbatt

Battery voltage.

ECM RECOGNITION

Depicted below are the MC 2000 and MC1000 ECMs.

The MC 1000 ECM can be easily recognised as it has two smaller wiring connectors leading to it whereas, the MC 2000 had only one large wiring connector.



MC 2000 ECMs were fitted to Sprint ST models only up to VIN 89736. MC 1000 ECMs are fitted to Sprint ST models from VIN 89737 and is the only ECM type fitted to the Sprint RS model.

ENGINE MANAGEMENT SYSTEM

System Description

Each 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 fuelling requirements for all engine speeds and loads. In addition, the system has hardware diagnostic functions similar to the US state of California requirements for on-board diagnostics (OBDII). This function ensures that, should a malfunction occur in the 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

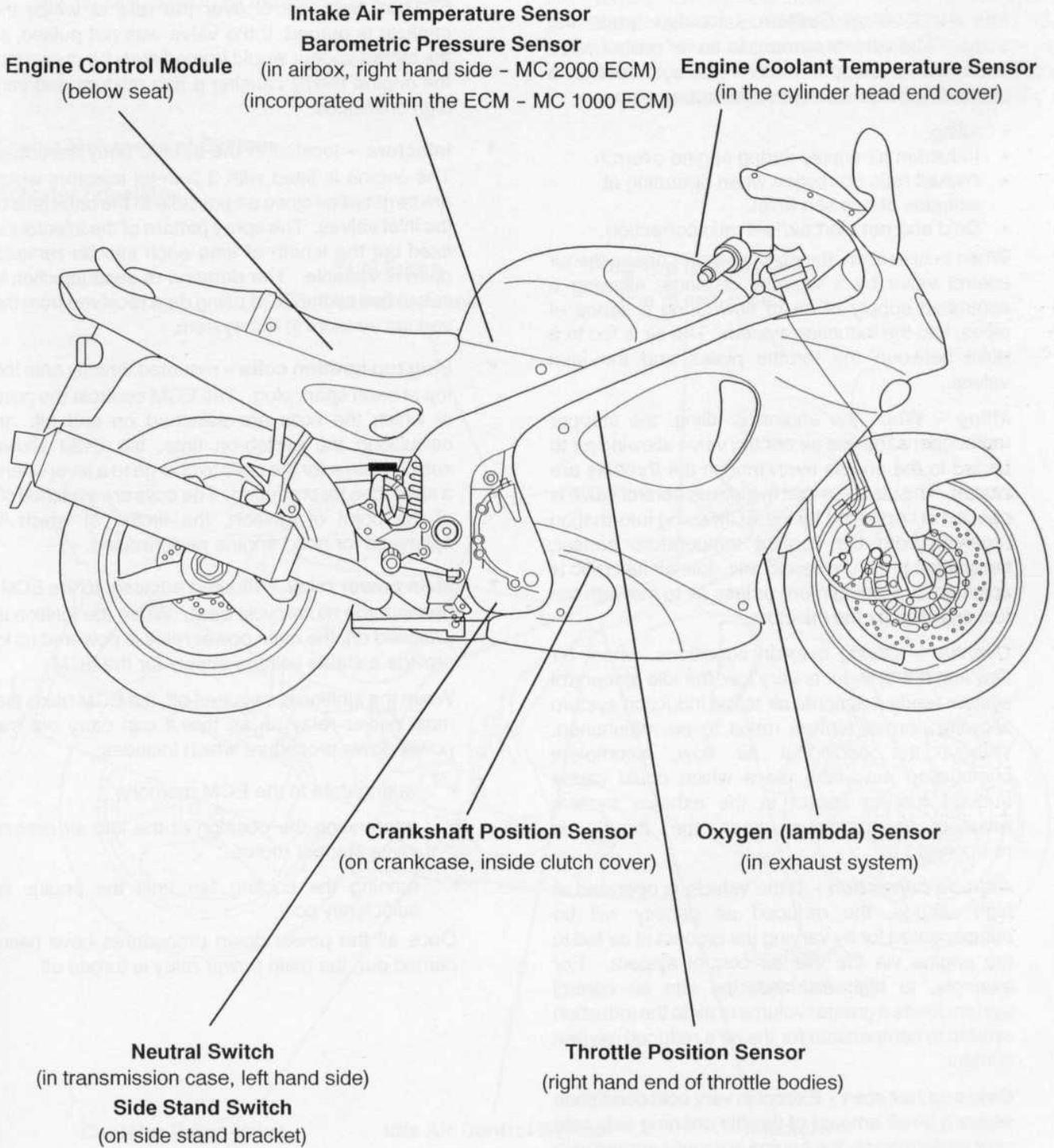
- **Intake air temperature sensor** - situated in the airbox, between the air filter element and the air intakes at the front of the airbox. Because the density of the air (and therefore the amount of oxygen available to ignite the fuel) changes with temperature, an intake air temperature sensor is fitted. 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 in the airbox, between the air filter element and the throttle butterflies on models fitted with the MC 2000 ECM only. On MC 1000 ECM equipped models, the barometric pressure sensor is incorporated in the ECM itself and is connected to the airbox via a hose.

The barometric pressure sensor measures the air pressure in the airbox. From this measurement the air density is calculated, and when added to other inputs to the ECM, the engine load is calculated. With this information, the amount of fuel per injection is adjusted to suit the prevailing conditions.

- **Crankshaft position sensor** - situated inside the right hand engine cover. The crankshaft position sensor detects movement of a toothed wheel attached to the right hand end of the crankshaft. The wheel has 21 teeth which are evenly spaced, and one triple length tooth next to a triple length gap. The triple length tooth/gap 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.
- **Oxygen (Lambda) Sensor** - situated in the exhaust system of closed loop catalyst equipped models. The oxygen sensor continuously senses the content of the exhaust gases and signals to the ECM to adjust the air/fuel ratio to within a specific parameter.
- **Engine coolant temperature sensor** - situated in the cylinder head end cover. Coolant temperature information, received by the ECM, is used to optimise fuelling at all engine temperatures and to calculate hot and cold start fuelling requirements.
- **Throttle position sensor** - situated at the right hand end of the throttle spindle. The throttle position sensor gives a reading in the fully closed position and all other throttle opening angles are calculated using the fully closed position as a base. Throttle angle is used by the ECM to determine fuelling requirements for all throttle positions.
- **Neutral switch** - 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 supply to the ECM is removed causing the engine to cut out.
- **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 or the clutch lever, which also has a switch, is pulled to the handlebar.

Engine Management System

Sensor Locations



System Actuators

In response to signals received from the sensors, the ECM directs messages to a series of electronic and electro-mechanical actuators. The function and location of the actuators is given below.

- **Idle Air Control System** - located inside the airbox. The system comprises an air control valve fitted with a stepper motor. The system has a controlling influence over the following:
 - Idling.
 - Induction air supply during engine overrun.
 - Air/fuel ratio correction when operating at altitudes above sea level.
 - Cold and hot start air/fuel ratio correction.

When in operation, the stepper motor opens the air control valve by a variable distance, allowing a controlled supply of air to flow along a series of pipes, into the induction system. The air is fed to a point between the throttle plates and the inlet valves.

Idling - When the engine is idling, the stepper motor opens the idle air control valve allowing air to be fed to the engine even though the throttles are closed. The distance that the idle air control valve is opened is controlled by the ECM using information received from the coolant temperature sensor, barometric pressure sensor etc. Idle air fuel ratio is adjusted by feeding more or less air to mix with the fuel supplied by the injectors.

Overrun - During overrun conditions, where air flow into the cylinder is very low, the idle air control system feeds additional air to the induction system allowing normal air/fuel ratios to be maintained. Without the additional air flow, incomplete combustion may take place which could cause unburnt fuel to collect in the exhaust system resulting in backfiring when the throttle is re-opened.

Altitude correction - If the vehicle is operated at high altitude, the reduced air density will be compensated for by varying the amount of air fed to the engine via the idle air control system. For example, at high altitudes, the idle air control system feeds a greater volume of air to the induction system to compensate for the air's reduced oxygen content.

Cold and hot start - Except in very cold conditions where a small amount of throttle opening aids cold start performance, the engine is usually started with the throttle in the closed position. The idle air control system regulates the start-up air supply to the induction system.

- **Canister purge valve (California models only)** - situated in the vapour return line between the carbon canister and the throttle. 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. If the valve was not pulsed, all the stored vapour would immediately be drawn into the engine briefly causing a rich mixture and very high emissions.
- **Injectors** - located in the throttle body assembly. The engine is fitted with 3 twin-jet injectors which are targeted as close as possible to the back face of the inlet valves. 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.
- **Main power relay** - situated adjacent to the ECM, 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.

When the ignition is switched off, the ECM holds the main power relay on so that it can carry out the power down procedure which includes;

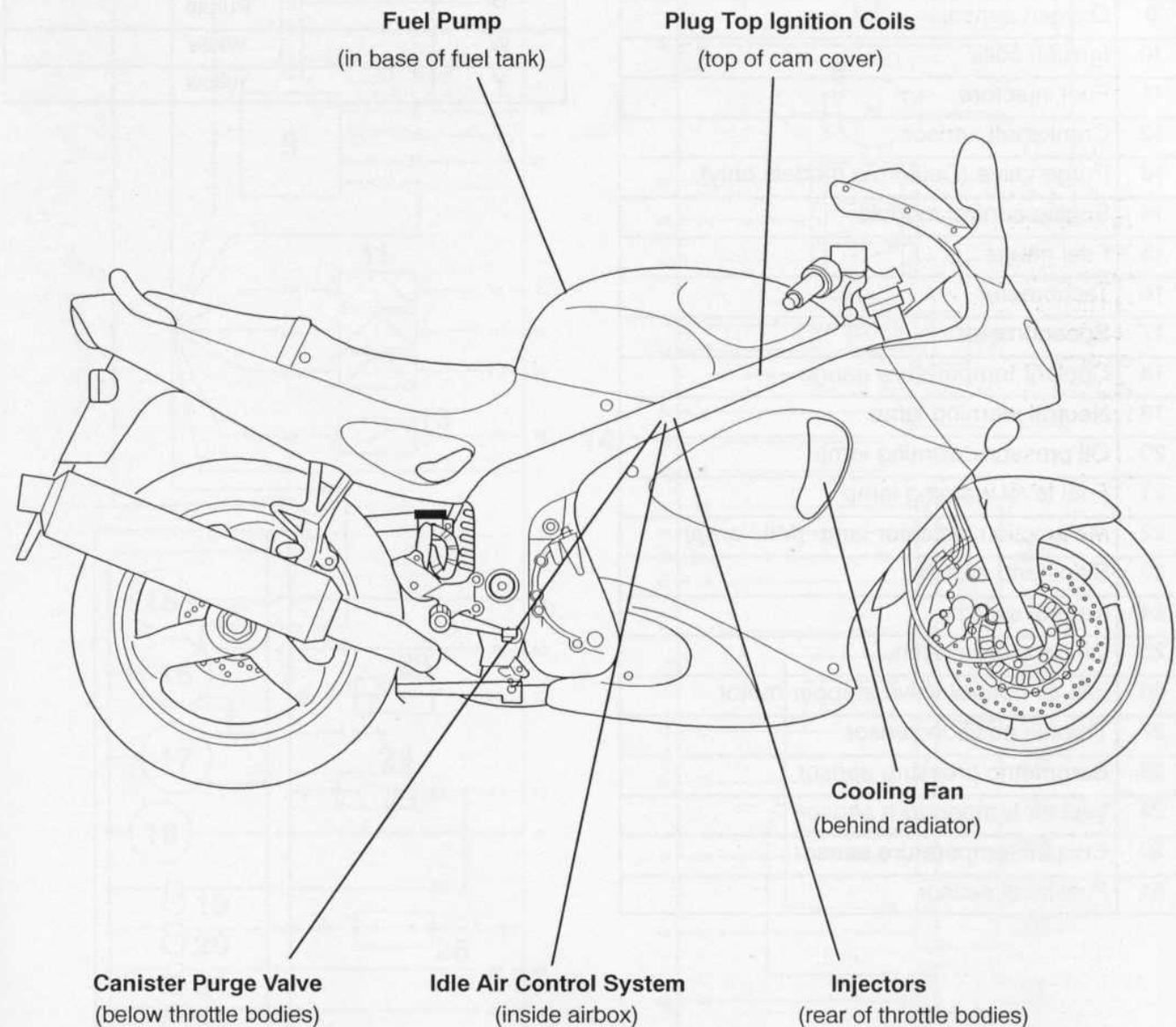
 - writing data to the ECM memory,
 - referencing the position of the idle air control valve stepper motor,
 - running the cooling fan until the engine is sufficiently cool.

Once all the power down procedures have been carried out, the main power relay is turned off.

- 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 rotating 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.
- Cooling fan** - located in front of 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. If the engine is switched off when the fan is running, the fan will continue to run until the temperature has been reduced to a normal level.

Engine Management System

Actuator Locations



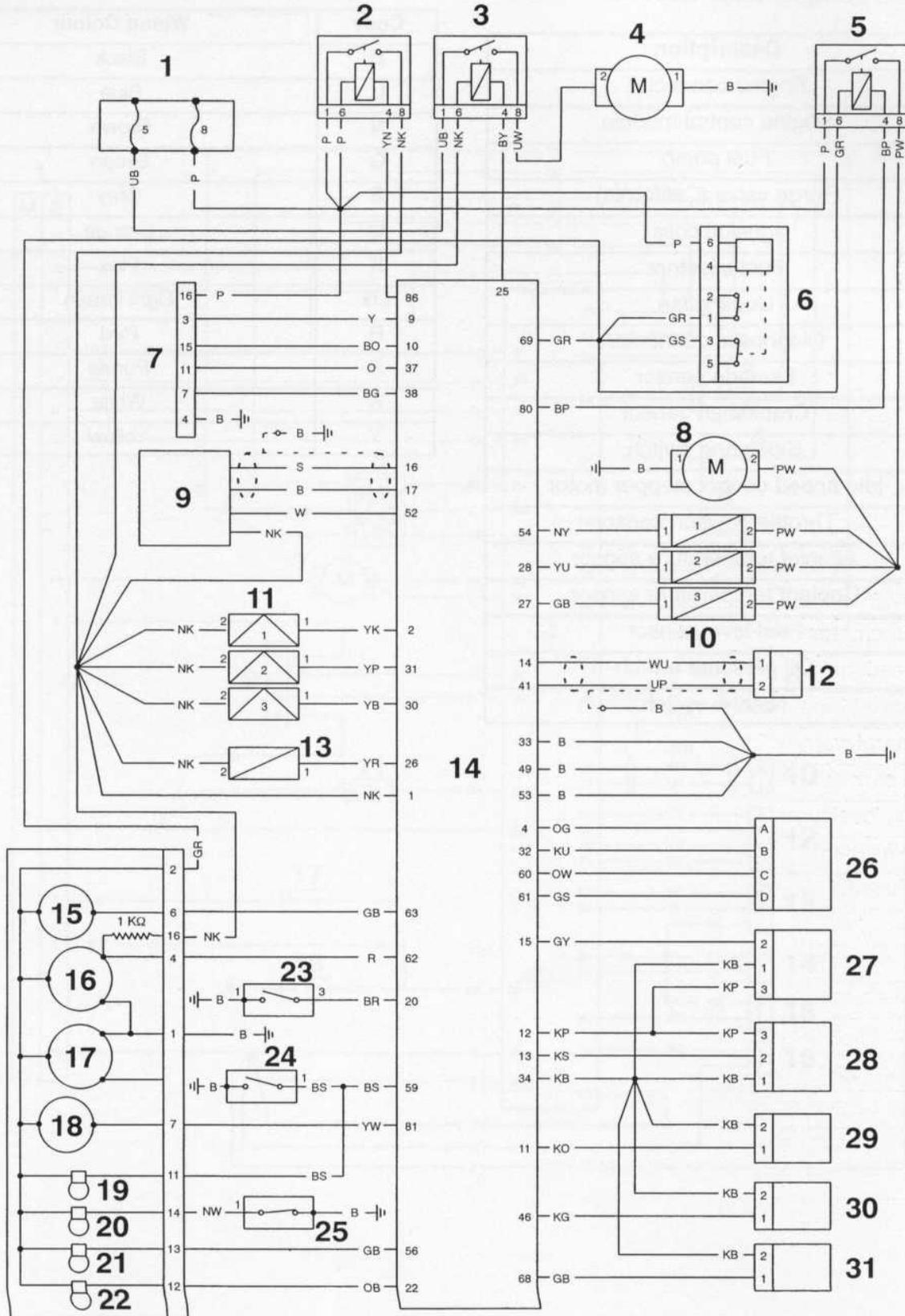
Key To Wiring Circuit Diagram - Sprint ST Engine Management System with MC 2000 ECM

Key	Item
1	Fusebox
2	ECM main power relay
3	Cooling fan relay
4	Cooling fan
5	Fuel pump relay
6	Alarm control unit (where fitted)
7	Diagnostic connector
8	Fuel pump
9	Oxygen sensor
10	Ignition coils
11	Fuel injectors
12	Crankshaft sensor
13	Purge valve (California models only)
14	Engine control module
15	Fuel gauge
16	Tachometer
17	Speedometer
18	Coolant temperature gauge
19	Neutral warning lamp
20	Oil pressure warning lamp
21	Fuel level warning lamp
22	Malfunction indicator lamp (MIL lamp)
23	Sidestand switch
24	Neutral switch
25	Oil pressure switch
26	Idle air control valve stepper motor
27	Throttle position sensor
28	Barometric pressure sensor
29	Inlet air temperature sensor
30	Coolant temperature sensor
31	Fuel level sensor

Key To Wiring Colour Codes

Code	Wiring Colour
B	Black
U	Blue
N	Brown
G	Green
S	Grey
O	Orange
K	Pink
LG	Light Green
R	Red
P	Purple
W	White
Y	Yellow

Circuit Diagram - Sprint ST Engine Management System with MC 2000 ECM



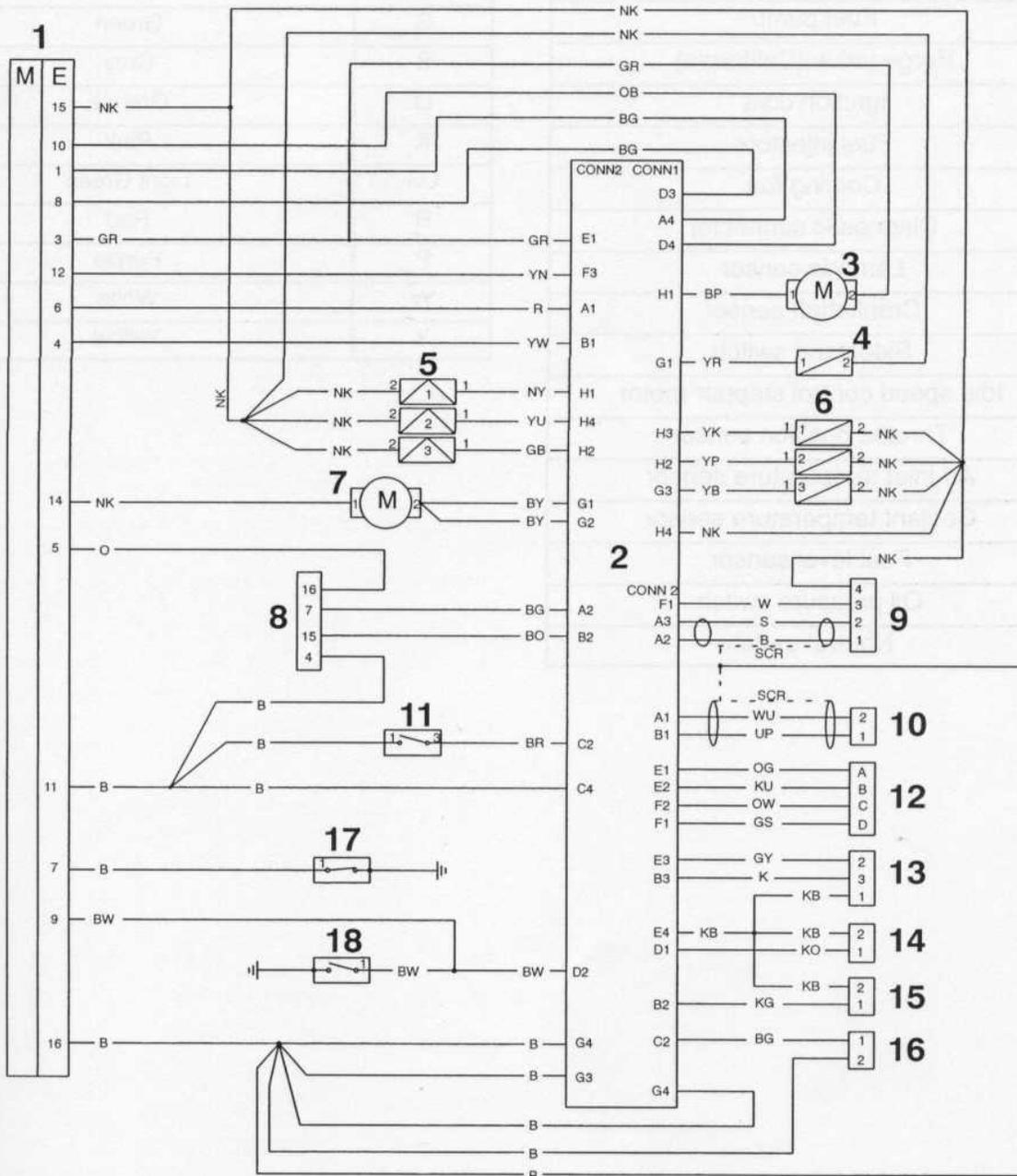
Key To Wiring Circuit Diagram - Sprint ST Engine Management System with MC 1000 ECM

Key	Description
1.	Engine connector
2.	Engine control module
3.	Fuel pump
4.	Purge valve (California)
5.	Ignition coils
6.	Fuel injectors
7.	Cooling fan
8.	Diagnostic connector
9.	Lambda sensor
10.	Crankshaft sensor
11.	Sidestand switch
12.	Idle speed control stepper motor
13.	Throttle position sensor
14.	Air inlet temperature sensor
15.	Coolant temperature sensor
16.	Fuel level sensor
17.	Oil pressure switch
18.	Neutral switch

Key To Wiring Colour Codes

Code	Wiring Colour
B	Black
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Circuit Diagram - Sprint ST Engine Management System with MC 1000 ECM



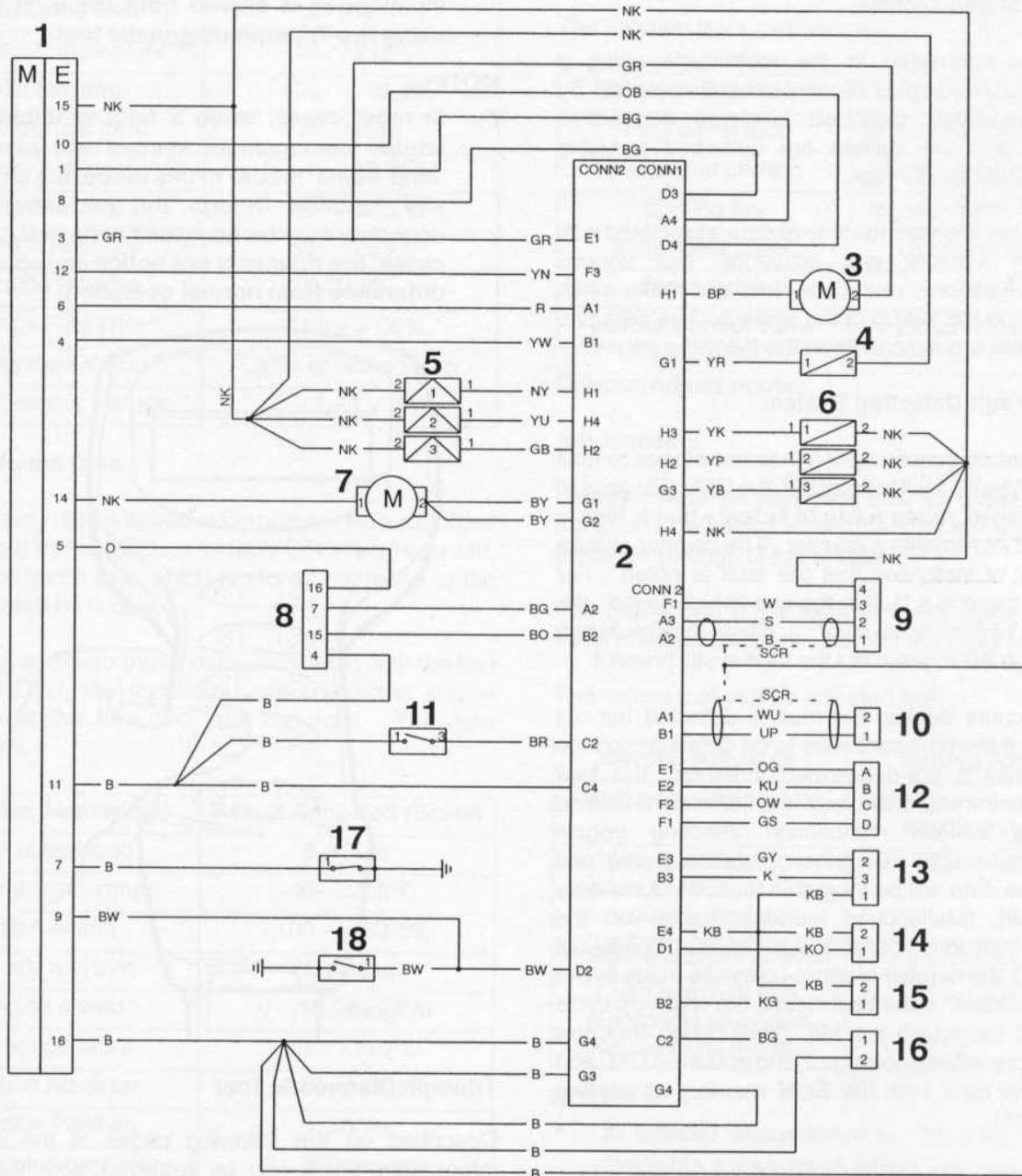
Key To Wiring Circuit Diagram - Sprint RS Engine Management System with MC 1000 ECM

Key	Description
1.	Engine connector
2.	Engine control module
3.	Fuel pump
4.	Purge valve (California)
5.	Ignition coils
6.	Fuel injectors
7.	Cooling fan
8.	Diagnostic connector
9.	Lambda sensor
10.	Crankshaft sensor
11.	Sidestand switch
12.	Idle speed control stepper motor
13.	Throttle position sensor
14.	Air inlet temperature sensor
15.	Coolant temperature sensor
16.	Fuel level sensor
17.	Oil pressure switch
18.	Neutral switch

Key To Wiring Colour Codes

Code	Wiring Colour
B	Black
U	Blue
N	Brown
G	Green
S	Grey
O	Orange
K	Pink
LG	Light Green
R	Red
P	Purple
W	White
Y	Yellow

Circuit Diagram - Sprint RS Engine Management System with MC 1000 ECM



System Diagnostics

As mentioned earlier, 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 seat. 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 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:

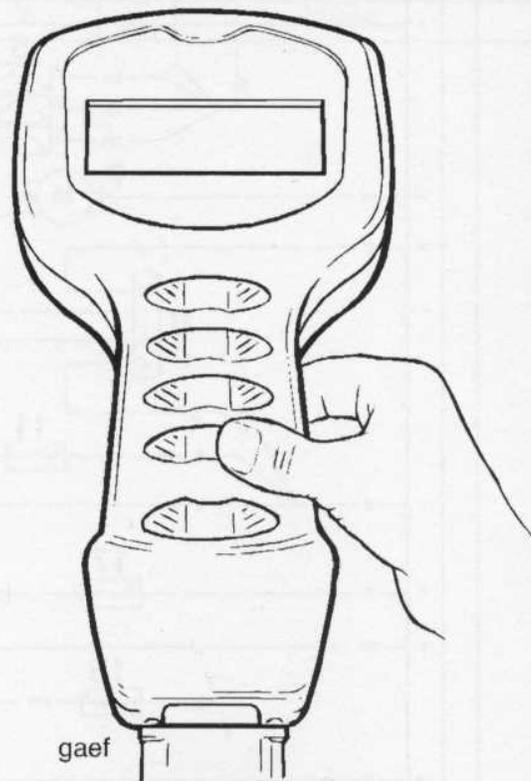
- The coolant temperature must be raised to 72°C or more.
- The coolant temperature must have risen by 23°C or more from its start temperature, when 72°C is reached.
- A controlled power-down sequence must take place.

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 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)
Calculated load	0-100%
Coolant temperature	-40- +215°C
Idle fuel trim	-100 - + 99.2%
Off idle fuel trim	Not Used
Engine speed	0 - 16,383 RPM
Air temperature	-40 - +215°C
Ignition Advance	-64° - +63.5°
Throttle Position	0-100%
Lambda Fuel Trim *	-100 - + 99%
Fuel system status *	Open or closed loop
Oxygen sensor voltage *	0 - 1.25 Volts.

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 Memorised	Result Reported (Scale)
Calculated load	0-100%
Coolant temperature	-40- +215°C
Idle fuel trim	-100 - + 99.2%
Off idle fuel trim	Not Used
Engine speed	0 - 16,383 RPM
Air temperature	-40 - +215°C
Ignition Advance	-64° - +63.5°
Throttle Position	0-100%
Barometric pressure	0 - 983 mm/Hg
Lambda Fuel Trim *	-100 - + 99%
Fuel system status *	Open or closed loop
Oxygen sensor voltage *	0 - 1.25 Volts.

* These screen messages will not appear unless a closed loop catalyst system is fitted and a closed loop tune resident in the ECM.

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	Result Reported
Fuel pump test	None (observation only)
Fuel pump priming	None (observation only)
Cooling fan	None (observation only)
Instrument panel	Observation/DTCs
Purge valve	DTCs
Idle Air Control Valve	Observation/DTCs

Checks/Adjustments
Adjustments

Using the Triumph diagnostic tool, it is possible to adjust the value of two items which affect the idle speed and idle emission settings of the system.

The tool allows adjustment of these items by making small changes to certain parts of the ECM software.

The values that can be adjusted are

Setting Adjusted	Setting Affected
Closed Throttle position	Voltage value of closed throttle threshold
Idle fuelling (not applicable on closed loop catalysts models)	Idle emissions
Adaptive stepper position	IACV start point
Long term fuel trim (applicable on closed loop catalysts models)	Fuel mixture

NOTE:

- In special circumstances, Triumph will make available a password which can be keyed into the tool which will allow download of a completely new engine tune. This special facility will be made available only when necessary. For example, this may be necessary if a motorcycle is transferred to a country or area where legislation requires a different tune to the original version installed at the factory.

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
P0335	Crankshaft sensor circuit malfunction	3	40	Yes
P1335	Crankshaft sensor incorrect sequence pattern	3	40	Yes
P0505	Idle air control valve system malfunction	3	40	Yes
P0201	Injector 1 circuit malfunction	3	40	Yes
P0202	Injector 2 circuit malfunction	3	40	Yes
P0203	Injector 3 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
P1205	Injector 1 short to battery voltage/over temperature	3	40	Yes
P1206	Injector 2 short to battery voltage/over temperature	3	40	Yes
P1207	Injector 3 short to battery voltage/over temperature	3	40	Yes
P0105	Barometric pressure sensor circuit malfunction	3	40	Yes
P0120	Throttle position sensor circuit malfunction	3	40	Yes
P0122	Throttle position sensor low input	3	40	Yes
P0123	Throttle Position sensor high input	3	40	Yes
P0443	Purge valve system fault/circuit malfunction	3	40	Yes
P0444	Purge valve system open circuit/short circuit to ground	3	40	Yes
P0445	Purge valve system short circuit to battery voltage/over temperature	3	40	Yes
P0351	Ignition coil 1 malfunction	3	40	Yes
P0352	Ignition coil 2 malfunction	3	40	Yes
P0353	Ignition coil 3 malfunction	3	40	Yes
P1351	Ignition coil 1 open circuit/short circuit to ground	3	40	Yes
P1352	Ignition coil 2 open circuit/short circuit to ground	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
P1353	Ignition coil 3 open circuit/short circuit to ground	3	40	Yes
P1355	Ignition coil 1 short to battery voltage/over temperature	3	40	Yes
P1356	Ignition coil 2 short to battery voltage/over temperature	3	40	Yes
P1357	Ignition coil 3 short to battery voltage/over temperature	3	40	Yes
P0115	Coolant temperature system circuit malfunction	3	40	Yes
P0117	Engine coolant temperature too high	3	40	Yes
P0118	Engine coolant temperature too low	3	40	Yes
P0119	Engine coolant sensor high voltage	3	40	Yes
P0110	Intake air temperature sensor circuit malfunction	3	40	Yes
P0112	Intake air temperature too high	3	40	Yes
P0113	Intake air temperature too low	3	40	Yes
P0230	Fuel pump relay fault	3	40	Yes
P1231	Fuel pump relay open circuit	3	40	Yes
P1232	Fuel pump relay short circuit	3	40	Yes
P1560	Sensor supply voltage circuit fault	3	40	Yes
P0560	System voltage malfunction	3	40	Yes
P0562	System voltage low	3	40	Yes
P0563	System voltage high	3	40	Yes
P1600	MIL system fault	N/A	40	No
P1601	MIL open circuit/short to ground	N/A	40	No
P1602	MIL short to battery voltage	N/A	40	No
P0131	Lambda sensor ground too high	3	40	Yes
P0132	Lambda sensor signal too high	3	40	Yes
P0133	Lambda sensor over voltage	3	40	Yes
P0135	Lambda sensor heater malfunction	3	40	Yes
P0170	Lambda feedback fuel trim malfunction	3	40	Yes
P1171	Lambda feedback maximum enrichment	3	40	Yes
P1172	Lambda feedback maximum enleanment	3	40	Yes
P1178	Lambda feedback reached maximum air leakage adaption	3	40	Yes
P1179	Lambda feedback reached minimum air leakage adaption	3	40	Yes
P1551	Cooling fan circuit 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 relay short circuit/open circuit	3	40	Yes
P1553	Cooling fan relay short to battery voltage/over temperature	3	40	Yes
P1115	Coolant temperature gauge circuit malfunction	3	40	Yes
P1116	Coolant temperature gauge short circuit/open circuit	N/A	40	No
P1117	Coolant temperature gauge short to battery voltage/over temperature	N/A	40	No
P1385	Tachometer circuit malfunction	N/A	40	No
P1386	Tachometer short circuit/open circuit	N/A	40	No
P1387	Tachometer short to battery voltage/over temperature	N/A	40	No
P0462	Fuel sensor circuit low input	N/A	40	No
P0463	Fuel sensor circuit high input	N/A	40	No
P1611	Low fuel level indicator lamp short circuit to ground/open circuit	N/A	40	No
P1612	Low fuel level indicator lamp short to Vbatt	N/A	40	No
P1621	Fuel gauge short circuit to ground/open circuit	N/A	40	No
P1622	Fuel gauge short circuit to Vbatt	N/A	40	No

Checks

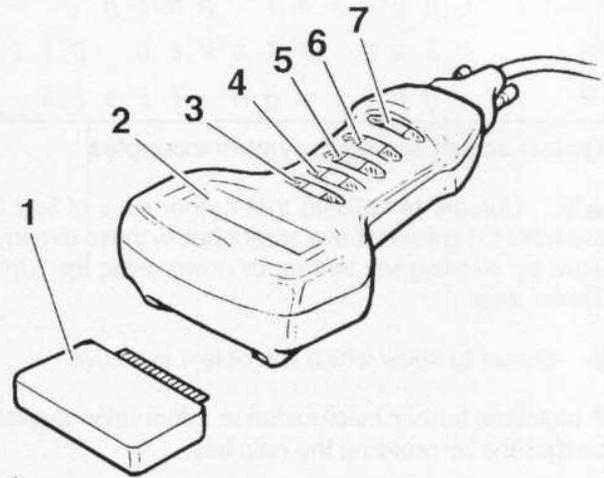
When using this function It is possible to check the status of various sensors and actuators and also check certain items of factory data logged during vehicle assembly.

It is also possible to check when the ECM was last interrogated for stored information and who the dealer was that did it.

The data available is:-

Item Checked	Result Unit
Air temperature sensor	Volts
Air temperature	Degrees Celsius
Coolant temperature sensor	Volts
Coolant temperature	Degrees Celsius
Engine speed	RPM
Idle reference speed	RPM
Battery voltage	Volts
Sensor reference voltage	Volts
Injector pulse time	Milliseconds
Barometric pressure	mm/Hg
Calculated load	Percentage
Target dwell time	Milliseconds
Ignition timing	Degrees BTDC/ATDC
Throttle voltage	Volts
Corrected Throttle position	Percentage
Purge valve duty cycle	Percentage
Idle air control valve stepper position	Incremental steps ranging from 0 to 255
Ignition switch position	On/Off
Cooling fan status	On/Off
Sidestand status	Up/Down
Neutral switch status	Neutral/In gear

Service Diagnostic Tool



1. Memory card
2. Screen
3. Return key
4. Up key
5. Down key
6. Validate key
7. Help key

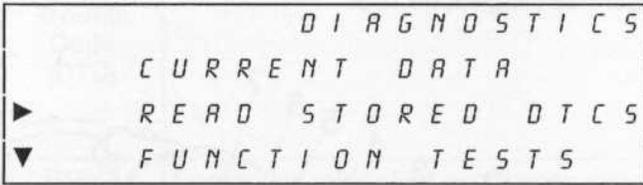
The memory card (1) contains all the information necessary to allow the technician to follow a number of different paths to:

- Diagnose faults
- Obtain data
- Make checks / adjustments

It is removeable to allow replacement / update cards to be inserted.

The screen (2) comprises 4 horizontal lines and 20 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.



Typical screen showing symbol examples

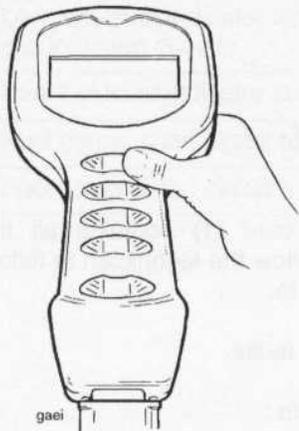
▲▼ Cursors to indicate that further lines of text are available to be seen above and/or below those already in view, by scrolling the text up or down using the 'Up' or 'Down' keys.

▶ Cursor to show which line of text is 'Active'.

? Indicates further help/guidance information available on that line by pressing the help key.

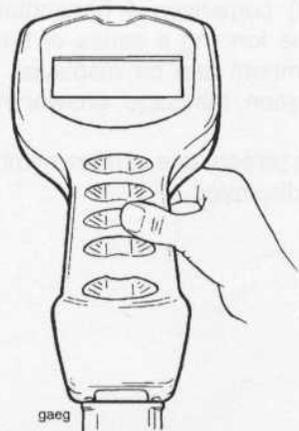
Tool Keys

In most cases, the **Return** key (↵) enables the user to return to the screen last displayed.



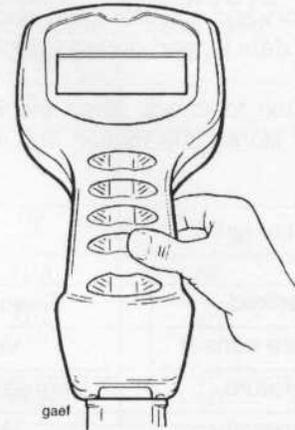
Return key

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.



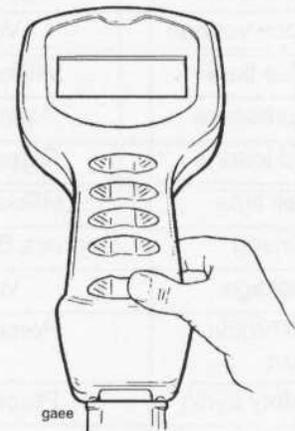
Up/down keys (2 separate keys)

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.



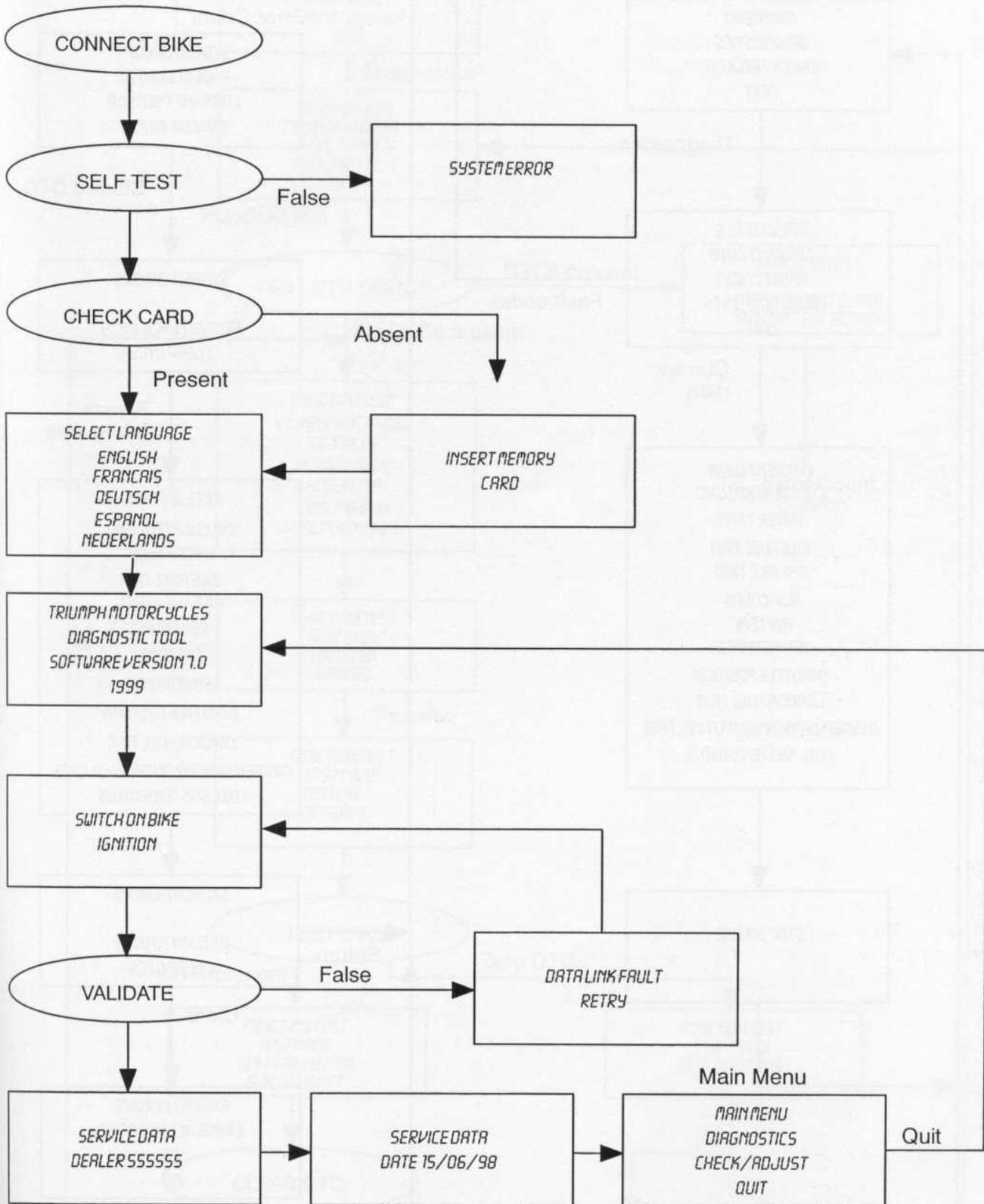
Help key

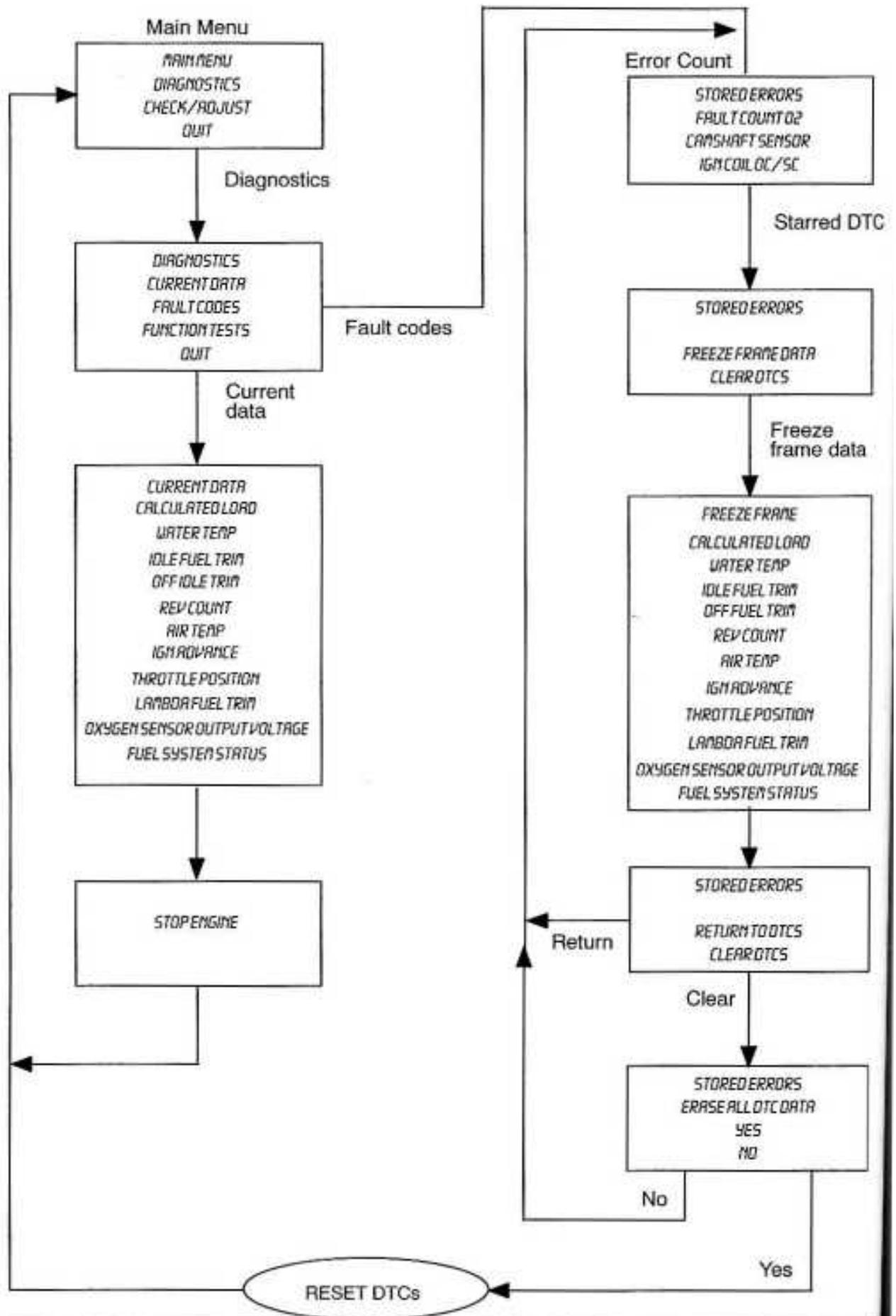
TEST PROCEDURE

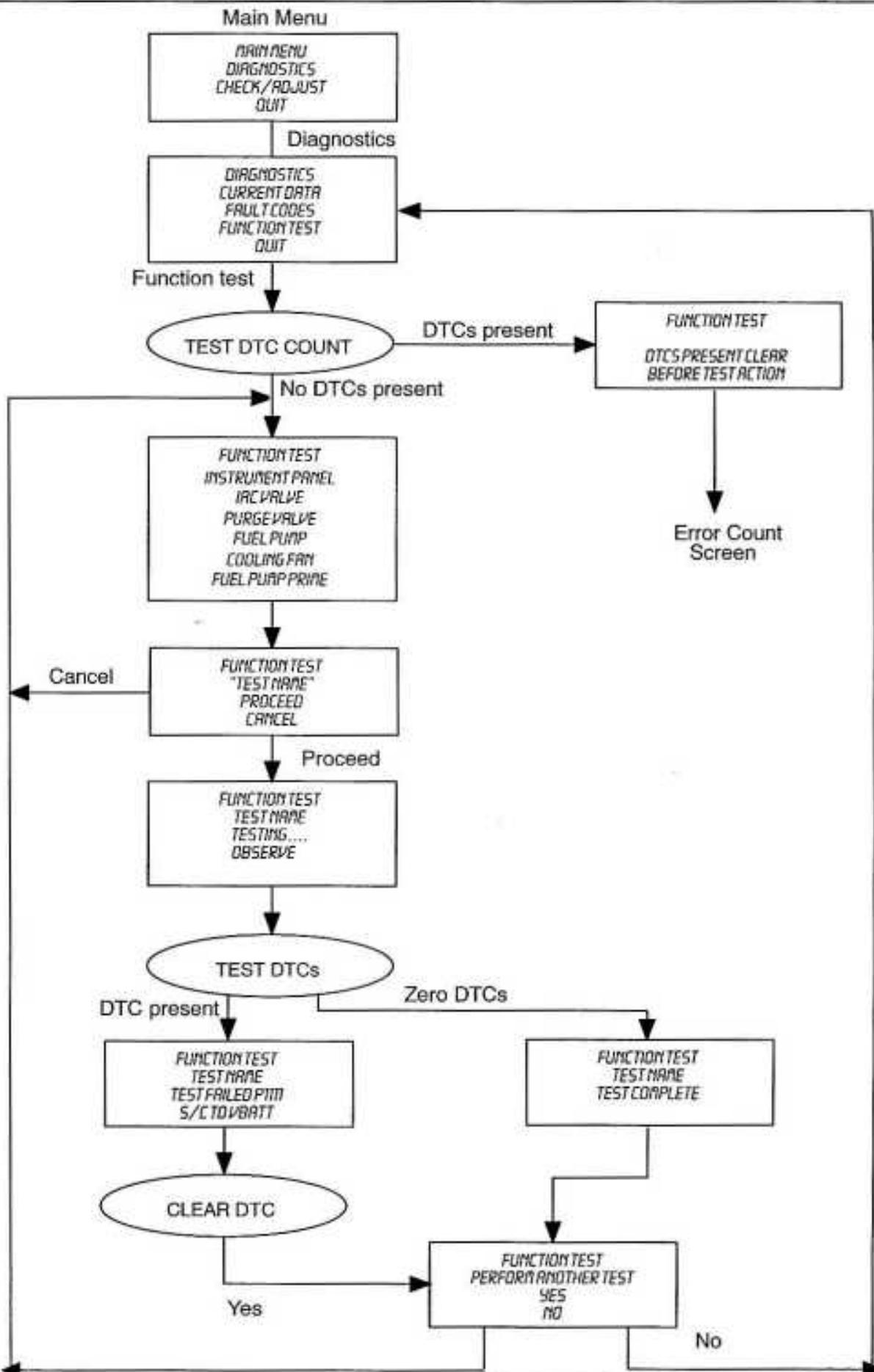
The following describes the procedure to follow when using the service diagnostic tool. It does not cover the further diagnosis that must be carried out once a fault area has been identified. For details of the procedure to follow when a fault area or fault code has been identified, refer to the diagnosis details later in this section.

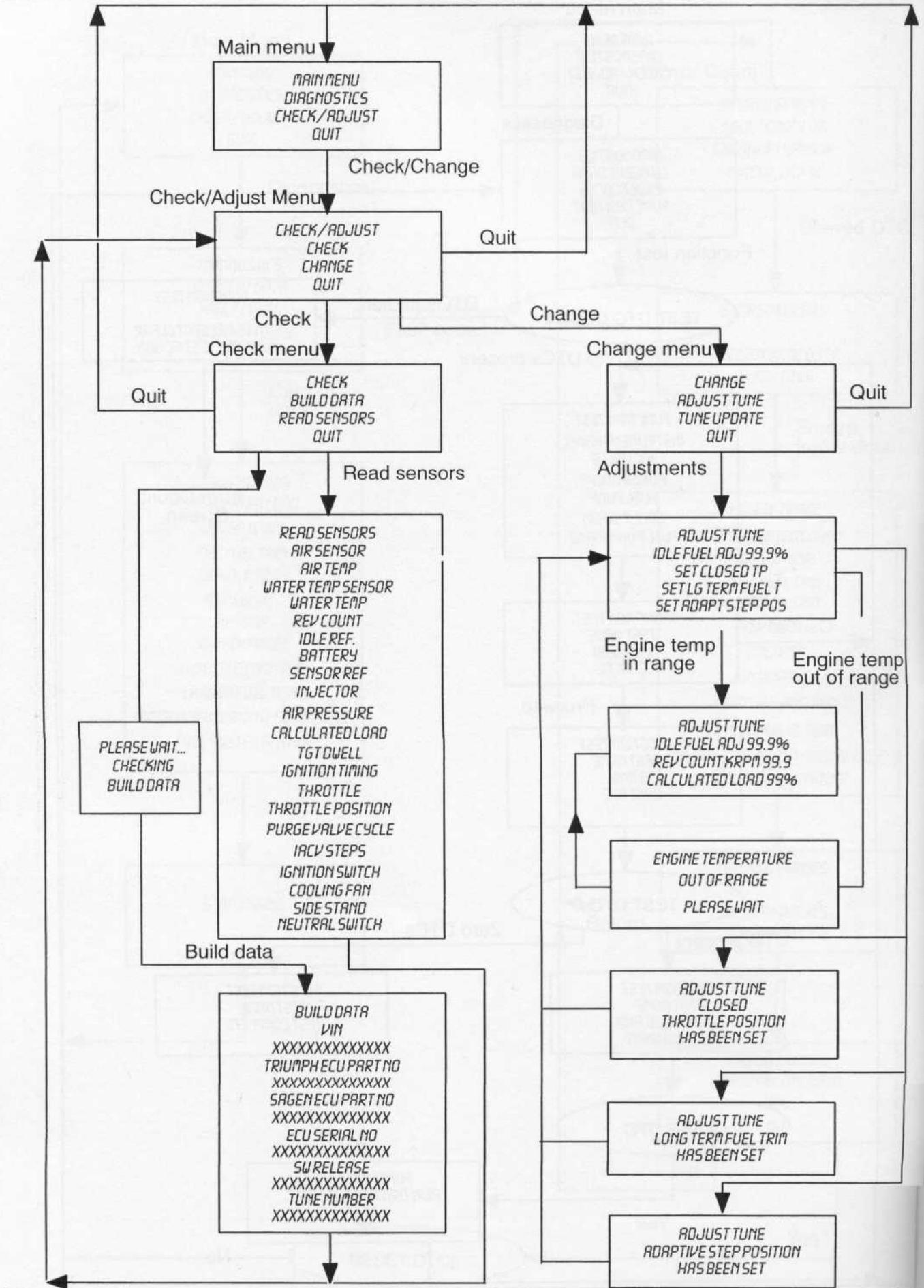
NOTE:

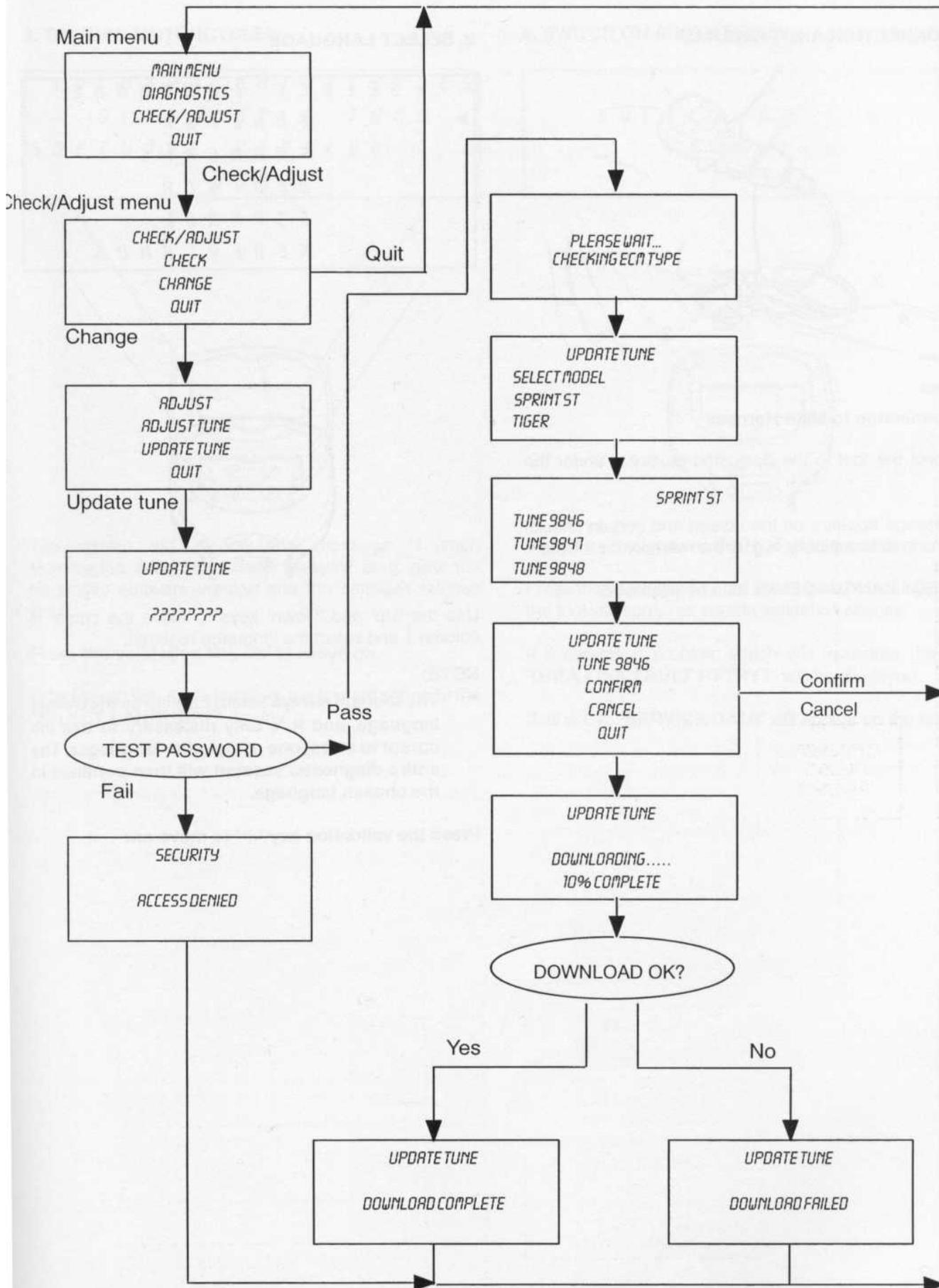
- The tool does not retain any memory of faults, diagnosis etc. carried out on any particular motorcycle. Any such memory is only retained in the motorcycle's ECM.
- The following five pages describe the tool operations in flow chart form.



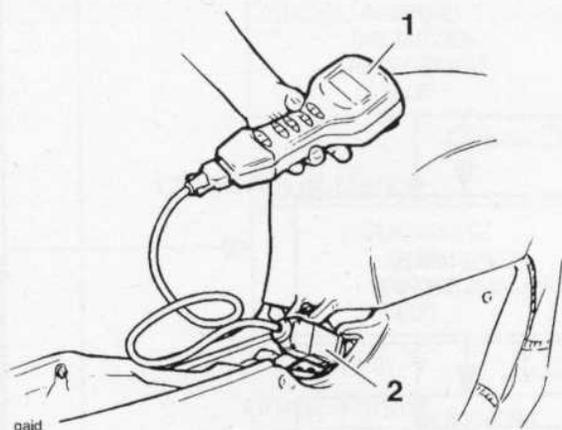








1. CONNECTION AND POWER-UP



1. Tool

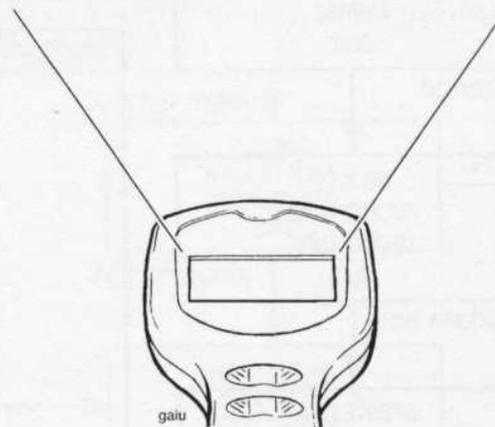
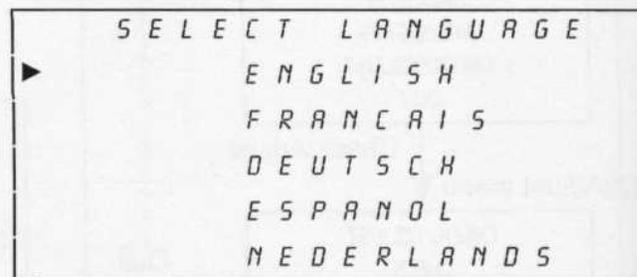
2. Connection to Main Harness

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:

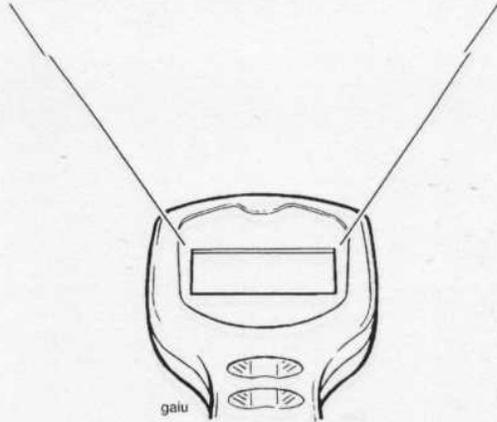
- The tool will always select English as the default language, and it is only necessary to use the cursor to select one of the other languages. The entire diagnostic session will then continue in the chosen language.

Press the validation key '*' to move on.

3. TRIUMPH MOTORCYCLES

```

T R I U M P H   M O T O R C Y C L E S
  D I A G N O S T I C   T O O L
S O F T W A R E   V E R S I O N   7 . 0
      1 9 9 9
    
```



The screen will display the message 'Triumph Motorcycles Diagnostic Tool' and will also give the diagnostic software version and the software release year.

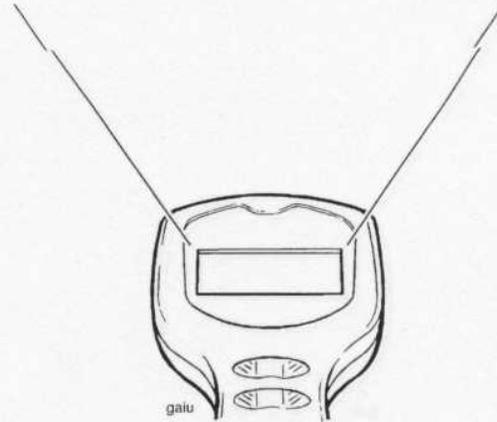
Press the validation key '*' to move on.

If the Return key (↵) is pressed, the tool will return to the 'SELECT LANGUAGE' display.

4. SWITCH ON BIKE IGNITION

```

S W I T C H   O N   B I K E
      I G N I T I O N
    
```



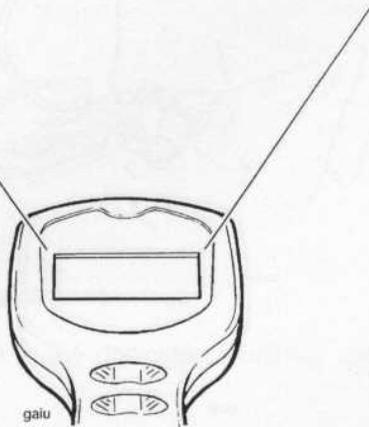
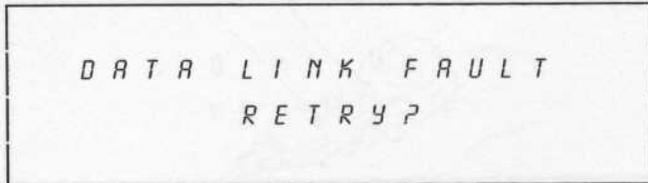
Switch on the ignition. Do NOT start the engine.

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.

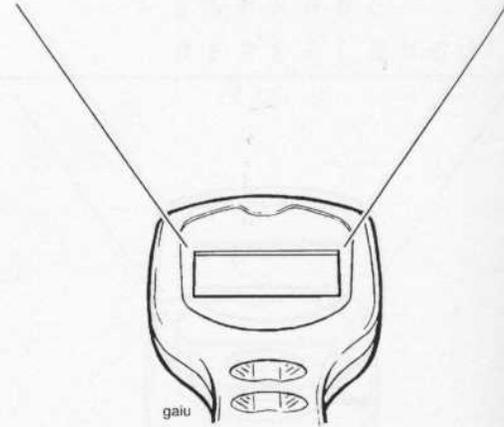
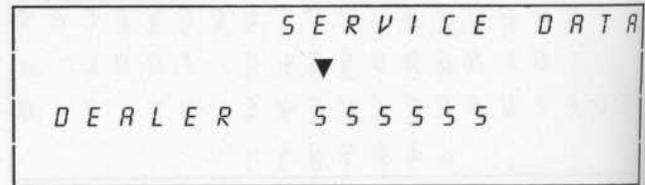
Press the **Help** key '?' for advice.

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.

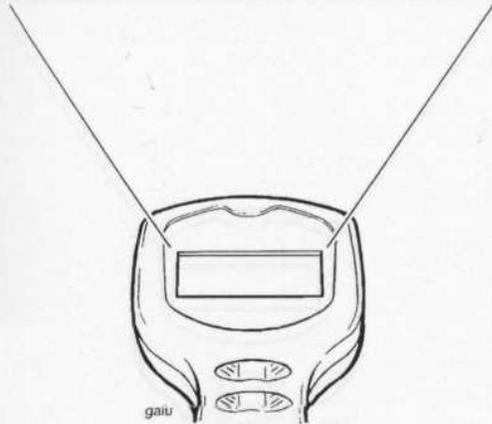
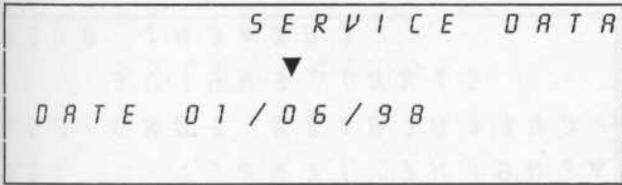
NOTE:

- 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



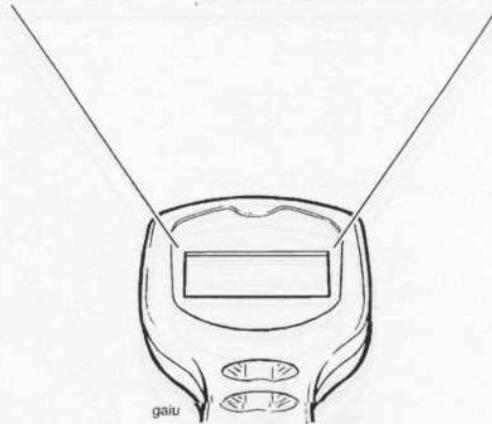
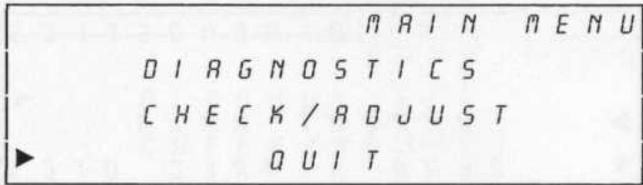
Enter the date using the 'Up' and 'Down' keys in the same way that the Dealer number was entered.

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, RPM etc., and entry of software updates.

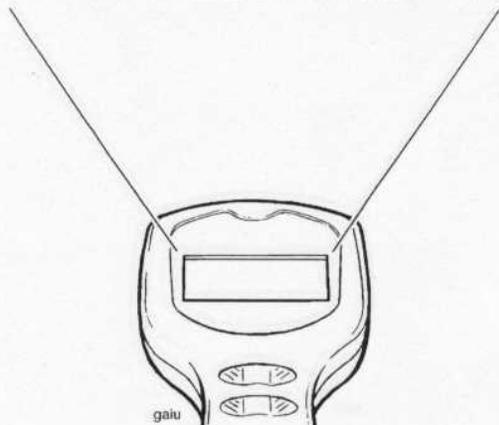
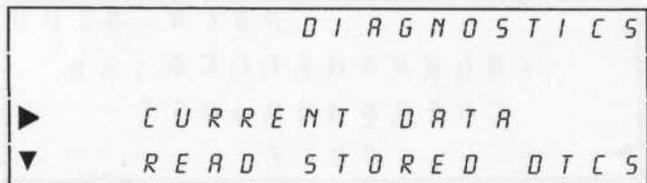
Use the 'Up and Down' keys to position the cursor opposite the desired choice, and press the Validation key '*'.

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)



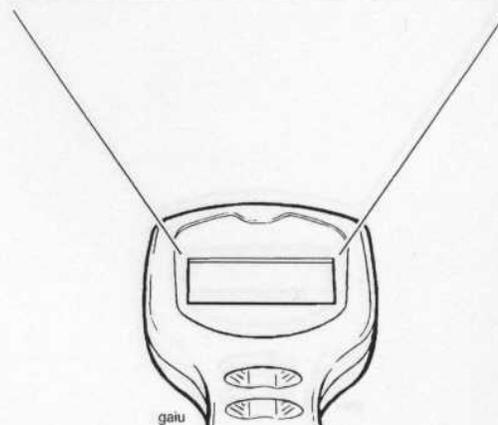
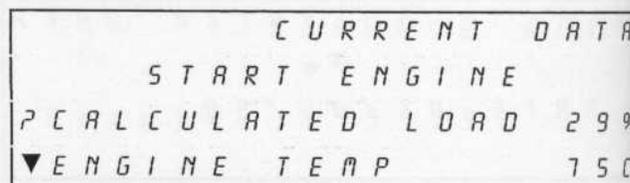
This display is the 'DIAGNOSTICS' menu.

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)
- '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 95C**.

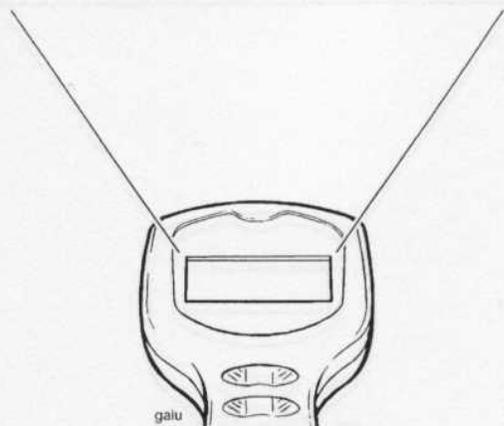
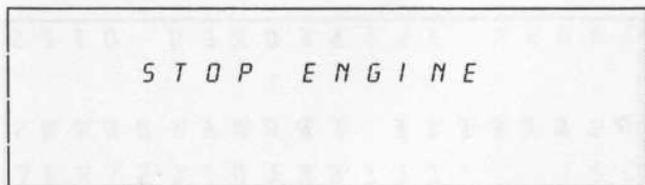
CURRENT DATA AVAILABLE	
Function Examined	Result Reported (Scale)
Faults stored (quantity)	1-127
Calculated load	0-100%
Coolant temperature	-40- +215°C
Idle fuel trim	-100 - + 99.2%
Off idle fuel trim	Not used
Engine speed	0 - 16,383 RPM
Air temperature	-40 - +215°C
Ignition Advance	-64° - +63.5°
Throttle Position	0-100%
Lambda fuel trim *	-100 - + 99%
Fuel system status *	Open or closed loop
Oxygen sensor voltage *	0 - 1.25 Volts.

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.

* Closed loop models only.

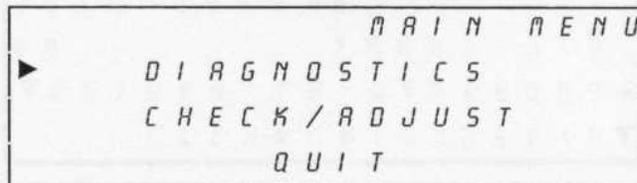
11. STOP ENGINE



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:-



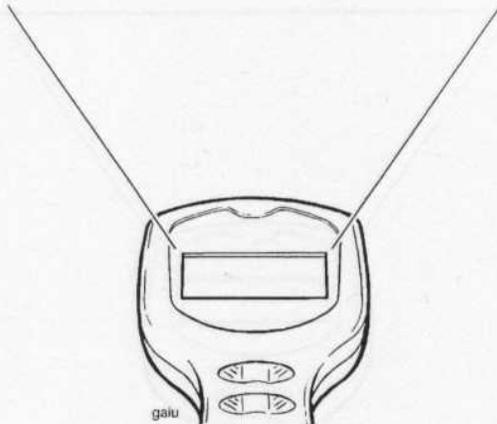
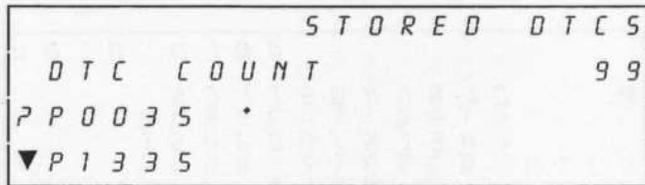
Use the 'Up' and 'Down' keys to position the cursor opposite **DIAGNOSTICS**.

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 (?).

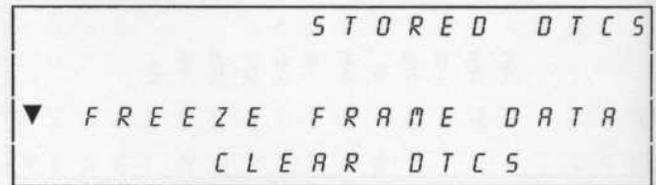
DTC example: P0035
Help text: CRANKSHAFT SENSOR
 CIRCUIT MALFUNCTION

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).

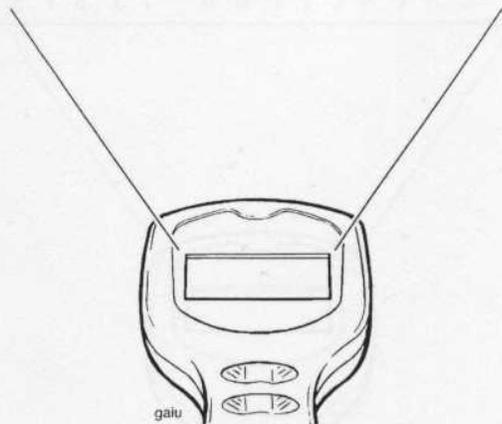
Align **'CLEAR DTCS'** with the cursor, and press the validation key '*' to display **'ERASE ALL DTC DATA'** (see 17).

Press the Return key (↵) to go back to **'STORED DTCS'** (operation 13).

15. FREEZE FRAME

```

      F R E E Z E   F R A M E
P C A L C U L A T E D   L O A D   1 9 %
▼ W A T E R   T E M P           7 5 C
    
```



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.

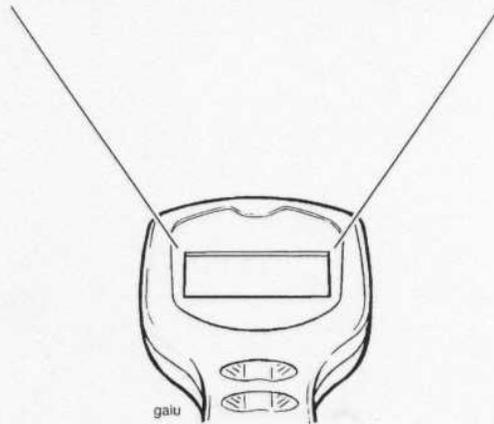
By selecting 'FREEZE FRAME', this information becomes available on the screen to aid diagnosis. Scroll the text up or down to view the data. More information can be gained by scrolling the text line in question to line 3 (?), then press the **Help** key (?) as before. Press the Validation key '*' to display 'STORED DTCS' (operation 16).

FREEZE FRAME DATA AVAILABLE	
Function Memorised	Result Reported (Scale)
Calculated load	0-100%
Coolant temperature	-40- +215°C
Idle fuel trim	-100 - + 99.2%
Off idle fuel trim	Not used
Engine speed	0 - 16,383 RPM
Air temperature	-40 - +215°C
Ignition Advance	-64° - +63.5°
Throttle Position	0-100%
Barometric pressure	0 - 983 mm/Hg
Lambda fuel trim *	-100 - + 99%
Fuel system status *	Open or closed loop
Oxygen sensor voltage *	0 - 1.25 Volts.

16. STORED DTCS

```

      S T O R E D   D T C S
▼ R E T U R N   T O   D T C S
      C L E A R   D T C S
    
```



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:

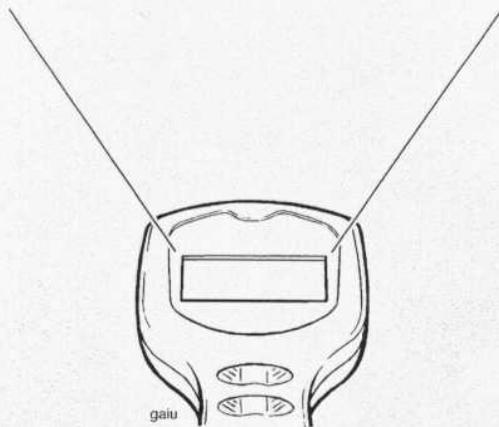
- A full list of all the possible DTCs can be found earlier in this section.

* Closed loop models only.

17. STORED DTCS, ERASE ALL DTC DATA

```

                S T O R E D   D T C S
    E R A S E   A L L   D T C   D A T A
    ▶           Y E S
                N O
  
```



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.

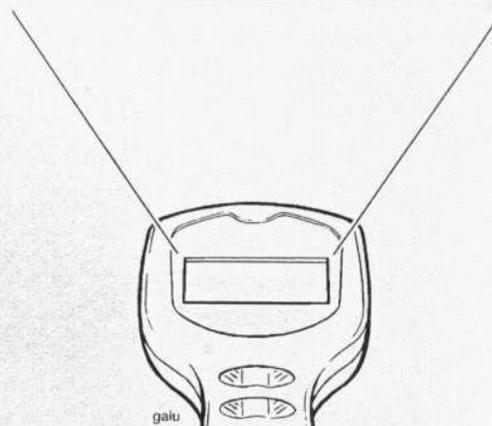
If 'NO' is selected, press the Validation key '*' to return to operation 13.

That completes the DTC cycle.

18. To select 'FUNCTION TESTS' from the MAIN MENU:

```

                D I A G N O S T I C S
    C U R R E N T   D A T A
    ▶           R E A D   S T O R E D   D T C S
    ▼           F U N C T I O N   T E S T S
  
```



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 '*'.

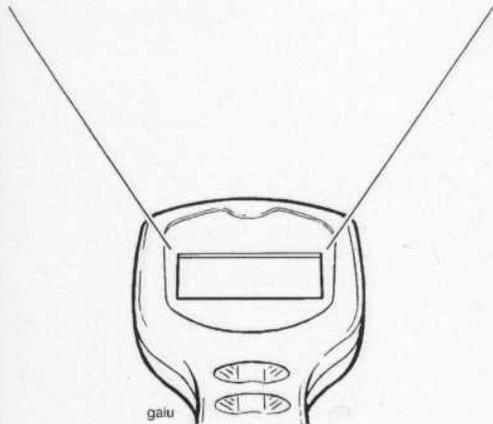
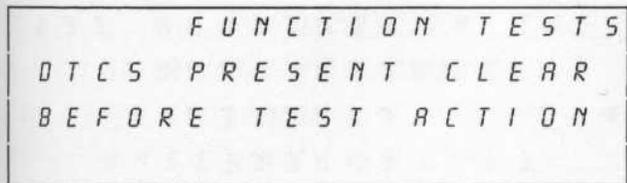
If no DTC'S are stored, 'FUNCTION TEST' will be displayed (see operation 20).

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.

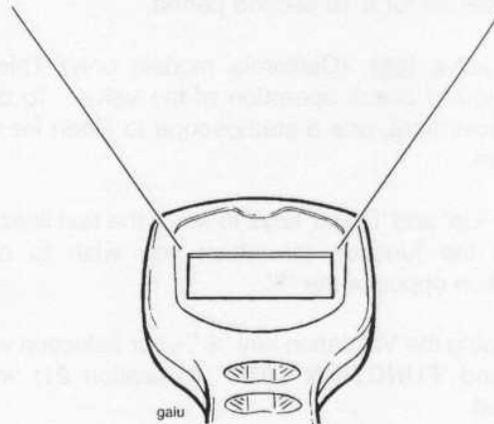
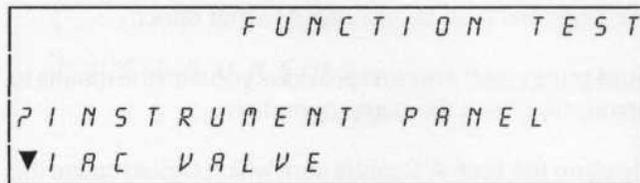
NOTE:

- 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 Function Tests can be made:

- 1 Instrument Panel
- 2 Idle air control valve (IACV) test
- 3 Purge valve test
- 4 Fuel pump test
- 5 Cooling fan test
- 6 Fuel pump priming test

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 give an RPM reading for about 15 seconds, the water temperature gauge to show 100°C for 15 seconds and the fuel gauge (if fitted) to register 50% full (all simultaneously).

Idle air control valve (IACV) test: A signal is sent which should cause the valve to move through its full range of step positions and then leave it in the park position. The signal will cause the valve to operate several times. To detect valve movement, use a stethoscope to listen for valve operation.

Fuel pump priming test: The fuel pump is run for a specific time to check for satisfactory priming. A message will then be displayed to that effect.

Fuel pump test: This test provides you with the means to physically check the pump operation.

Cooling fan test: A signal is sent which should cause the fan to operate for a 10 second period.

Purge valve test: (California models only) This test allows you to check operation of the valve. To detect valve movement, use a stethoscope to listen for valve operation.

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.

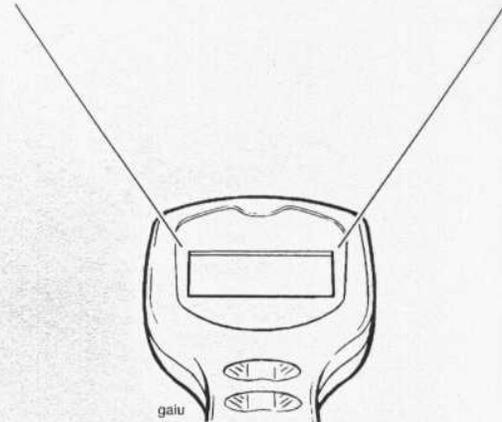
NOTE:

- If the Return key (↵) is pressed, the tool will return to 'DIAGNOSTICS' menu (operation 9).

21. FUNCTION TEST

```

          F U N C T I O N   T E S T
    I N S T R U M E N T   P A N E L
    ►
          P R O C E E D
          C A N C E L
  
```



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

```

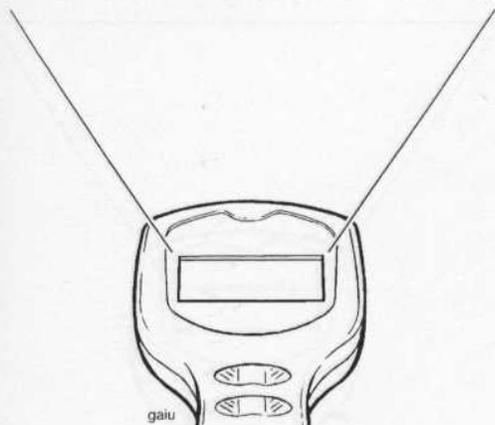
TACHOMETER - 7500 RPM
TEMP GAUGE - 100 °C
FUEL GAUGE - 50%
  
```

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 '*:'. The display will return to operation 20.

22. FUNCTION TEST

FUNCTION TEST
INSTRUMENT PANEL
TESTING.
OBSERVE GAUGES



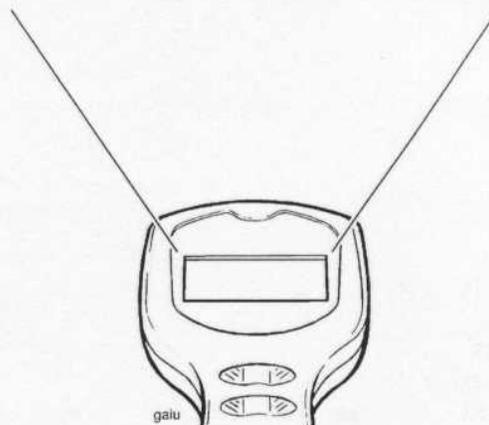
The screen now displayed will be specific to the component being tested:

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

FUNCTION TEST
INSTRUMENT PANEL
TEST COMPLETE

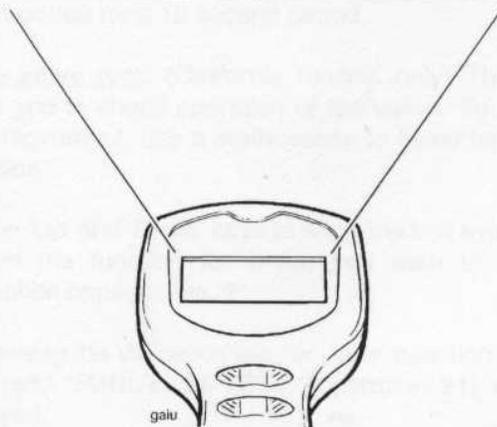


If the test is satisfactory the display will read 'TEST COMPLETE'. Press the Validation key '*' to display 'FUNCTION TEST' (operation 24).

24. FUNCTION TEST

```

          F U N C T I O N   T E S T
P E R F O R M   A N O T H E R   T E S T
▶
          Y E S
          N O
  
```



This display allows you to decide whether you wish to test another component.

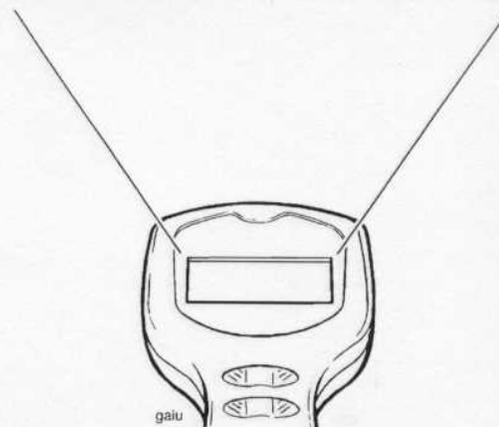
Either – position the cursor on line 3 **'YES'** and press the Validation key **'*'** to return to the **'FUNCTION TEST'** selection menu,

or – position the cursor on line 4 **'NO'** and press the Validation key **'*'** to return to **'DIAGNOSTICS'** menu (operation 9).

25. FUNCTION TEST

```

          F U N C T I O N   T E S T
I N S T R U M E N T   P A N E L
T E S T   F A I L E D   P 1 1 1 1
  
```



If the test at operation 22 is unsatisfactory, a DTC will be displayed on line 3 of this display (except fuel pump tests).

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).

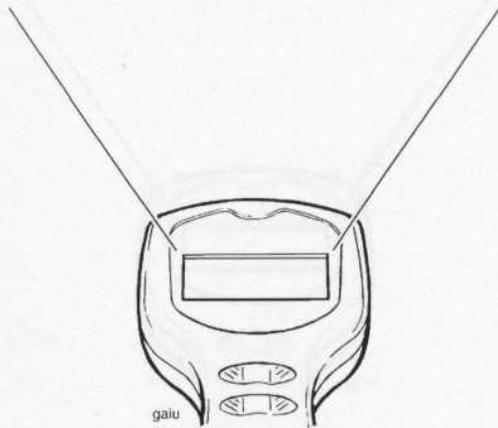
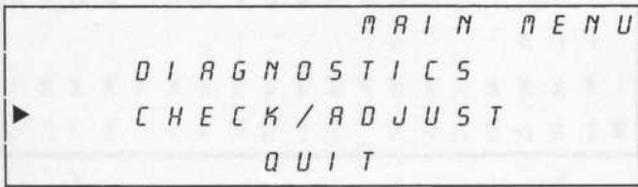
NOTE:

- 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.

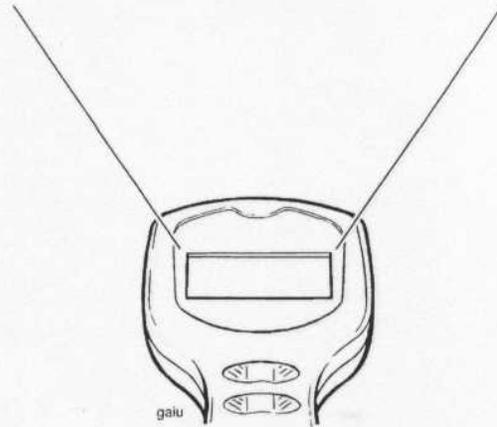
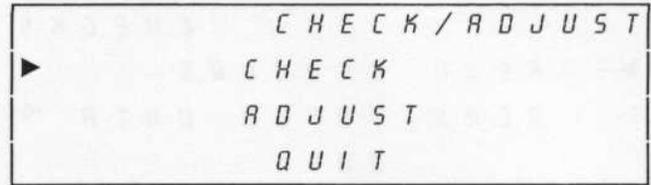
26. To select 'CHECKS/ADJUSTMENTS' from the MAIN MENU (operation 8):-



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).

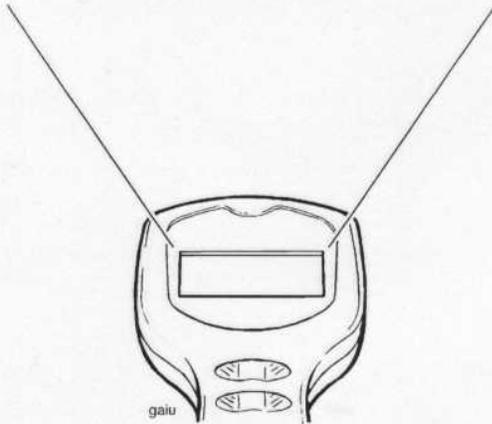
Opposite 'ADJUST' – 'ADJUST' will be displayed (operation 32).

Opposite 'QUIT' – to return to 'MAIN MENU' (operation 8).

28. CHECKS

```

                                C H E C K S
▶  R E A D  S E N S O R S
   R E A D  B U I L D  D A T A
                                Q U I T
    
```



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.

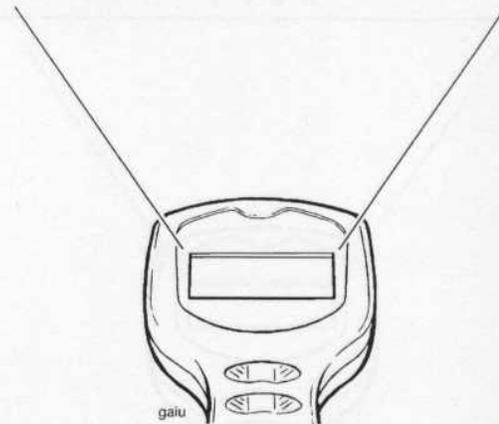
Opposite 'READ BUILD DATA' – 'BUILD DATA' (operation 29) will be displayed.

Opposite 'QUIT' – to return to 'MAIN MENU' (operation 8).

29. BUILD DATA

```

                                B U I L D  D A T A
V I N
X X X X X X X X X X X X X X X X X X X
▼ T R I U M P H  E C U
    
```

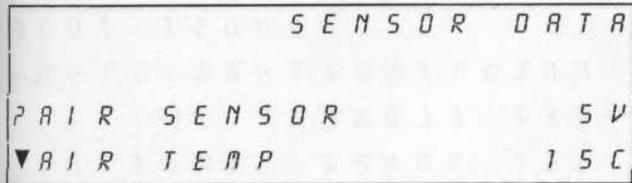


Providing the information was recorded at the time of build, the display will show the following information relating to the motorcycle under test by scrolling up and down. Before displaying the recorded information, the tool will briefly display the message, 'PLEASE WAIT, CHECKING BUILD DATA'.

- Vehicle Identification Number (VIN)
- Triumph ECM part number
- Supplier'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.

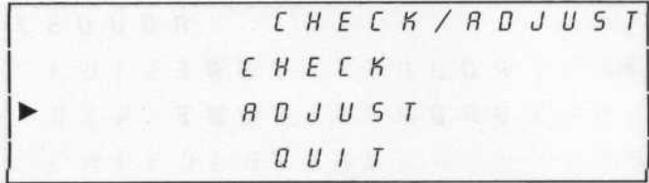
NOTE:

- 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. To access the 'ADJUSTMENTS' menu.



Use the 'Up' and 'Down' keys to position the cursor opposite 'ADJUST'.

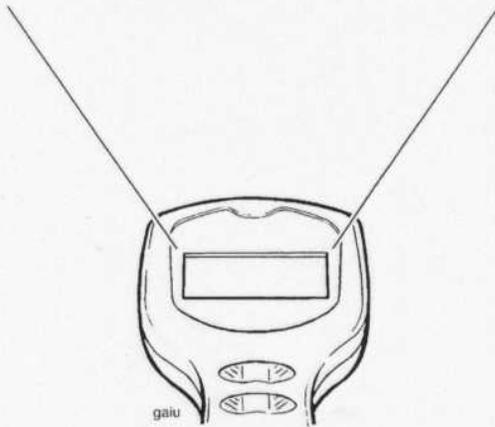
Press the Validation key '*'; 'ADJUST' will be displayed.

Start the engine.

32. ADJUST

```

                                A D J U S T
    ▶  A D J U S T  T U N E
      U P D A T E  T U N E
          Q U I T
    
```



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

```

                                A D J U S T  T U N E
    I D L E  F U E L  A D J .  1 9 %
    ▶  S E T  C L O S E D  T P
      S E T  A D A P T .  S T E P P  P O S
      S E T  L G  T E R M  F U E L  T .
    
```



The following sequence shows status data and allows adjustments to be made to items which affect the engine operation

IDLE FUEL ADJ. (Idle fuelling) **

– See operation 34

The current setting for idle fuelling is shown in the right hand column.

SET CLOSED TP (Closed throttle position)

– See operation 36

SET ADAPT STEPP POS (adaptive stepper position)

– See operation 37

SET LG TERM FUEL T* (set long term fuel trim)

– See operation 38

Position the cursor opposite the setting you wish to adjust and press the Validation key '*'.

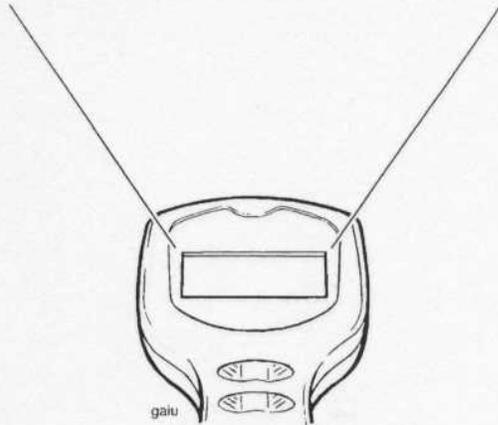
* Closed loop catalyst models only

** Not available on closed loop models

34. ADJUST TUNE (Idle fuel adjustment)

```

ADJUST TUNE
ENGINE TEMP OUT
OF RANGE
PLEASE WAIT
    
```



Because idle fuelling adjustment must be made at normal operating temperature, the above screen may be displayed if the engine is either too cold (thermostat closed) or too hot (cooling fan operating). The current temperature is displayed while the engine warms/cool.

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 **ADJUST TUNE** screen (operation 35) will automatically be displayed.

The Idle Fuelling (idle Co) can be adjusted when this display is showing, in fuelling increments of 1% by pressing the 'Up' or 'Down' keys as appropriate.

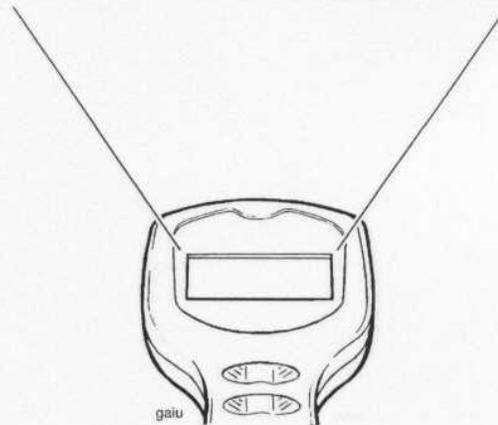
The idle fuel adjustment read out will change accordingly, and the new values of engine speed and calculated load will be displayed.

CAUTION: Do not confuse the percentage reading on the tool with the carbon monoxide percentage reading as measured by an exhaust gas analyser. The tool reports idle fuelling as a percentage of the maximum fuelling range **NOT AS A PERCENTAGE CO READING.**

35. ADJUST TUNE (Idle fuel adjustment)

```

ADJUST TUNE
IDLE FUEL ADJ. 99%
REV COUNT 99.9 KRPM
CALCULATED LOAD 99%
    
```



Start the engine and allow it to warm up at idle until the tool allows access to the adjustment screen. Ensure that the fuel tank is at least half full.

Once adjustment is enabled by the tool, turn on the headlights, blip the throttle to stabilise combustion and begin sampling the exhaust gases.

Adjust the idle CO level until the correct reading is shown on the CO meter. Ensure the meter reading is stable before pressing the Validation key '*' to confirm the new setting and to return to operation 33.

If the desired setting is not reached before the tool locks out further adjustment due to a rise in the coolant temperature, stop the engine and allow it to cool for 30 minutes before repeating the adjustment process. This will allow airbox temperatures to fall and will help ensure an accurate setting is ultimately achieved.

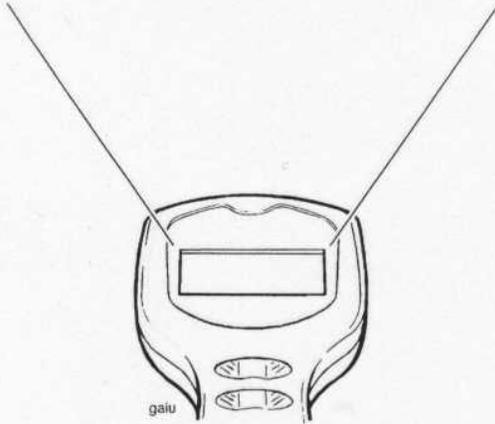
NOTE:

- **Idle fuelling adjustment must always be carried out using an accurate exhaust gas analyser to measure idle carbon monoxide levels.**
- **On California models, an open loop catalyst is fitted. In order to correctly set the idle CO level, the gas analyzer probe must be inserted in the port on the exhaust header, not in the silencer outlet.**
- **Correct idle CO level is 1.5 % +/- 0.3% unless a 'race' silencer is fitted in which case a 2% CO level would be beneficial:**

36. ADJUST TUNE (closed throttle position)

```

                A D J U S T   T U N E
    C L O S E D   T H R O T T L E
    P O S I T I O N   H A S   B E E N
                S E T
    
```



The electronic value of the closed throttle position is automatically reset by the tool.

Press either the validate '*' or return (↵) to return to the main menu.

37. ADJUST TUNE (set adaptive stepper position)

```

                A D J U S T   T U N E
    A D A P T I V E   S T E P P E R
    P O S I T I O N   H A S   B E E N
                S E T
    
```



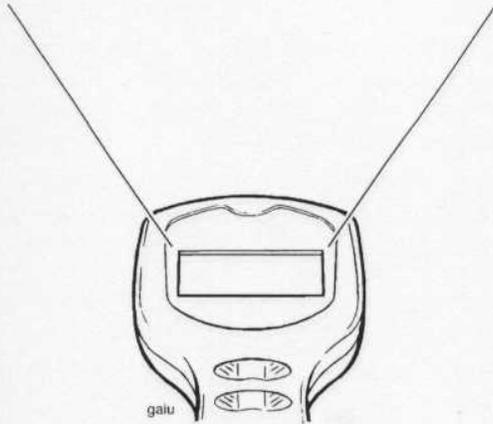
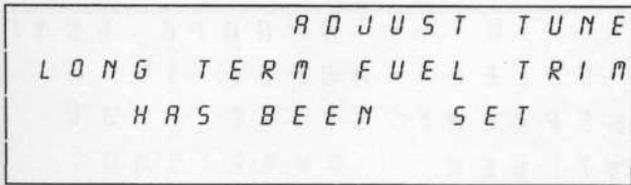
The electronic value of the adaptive stepper position is automatically reset by the tool.

NOTE:

- **The adaptive stepper position should be reset AFTER completing idle CO adjustments.**

Press either the validate '*' or return (↵) to return to the main menu.

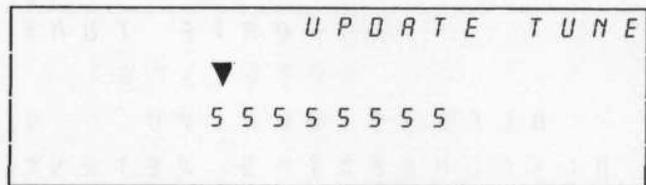
38. ADJUST TUNE (set long term fuel trim)



The electronic value of the long term fuel trim setting is automatically reset to nominal by the tool.

Press either the validate '*' or return (↵) to return to the main menu.

39. 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 40 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 41) will be displayed.

40. UPDATE TUNE

```

UPDATE TUNE
ACCESS DENIED
DISCONNECT & RETRY
  
```



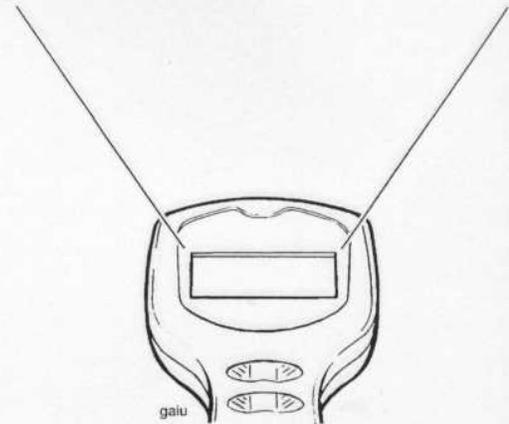
If the Password number has been incorrectly entered, the screen will display '**ACCESS DENIED**'. Press the Validation key '*' to return to **MAIN MENU** (operation 8) and start again.

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.

41. UPDATE TUNE

```

UPDATE TUNE
SELECT MODEL
▶ SPRINT ST
▼ TIGER
  
```



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 '*'.

The models available at the time of writing are (for MC2000 ECMs):

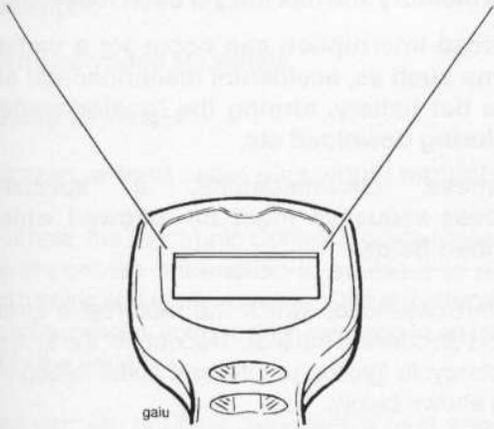
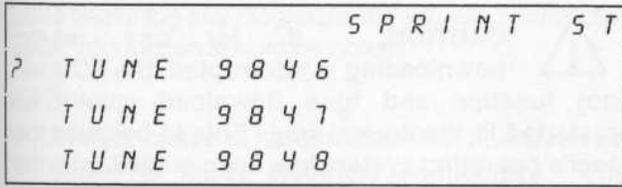
- T595 Daytona (all markets except France)
- T595 Daytona (French 108 PS engine)
- Daytona 955i
- 885cc Speed Triple
- 955cc Speed Triple
- Sprint ST
- Tiger

The models available at the time of writing are (for MC1000 ECMs):

- Daytona 955i
- 955cc Speed Triple
- Sprint ST/RS
- Tiger

Once a model has been selected and the validation key pressed, screen 42 will be displayed.

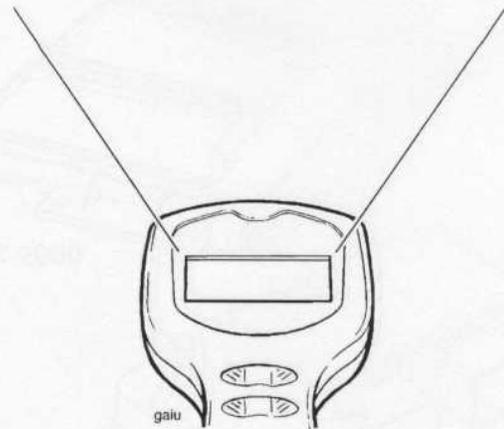
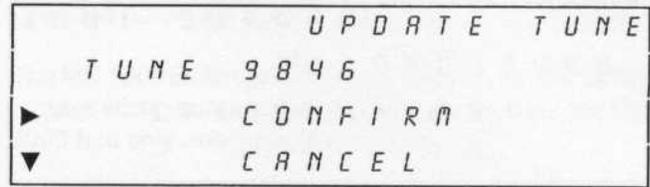
42. UPDATE TUNE



Scroll to the tune required and press the Validation key '*' to move on to operation 43.

Press the help key for information on the applicability of each tune number.

43. 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)

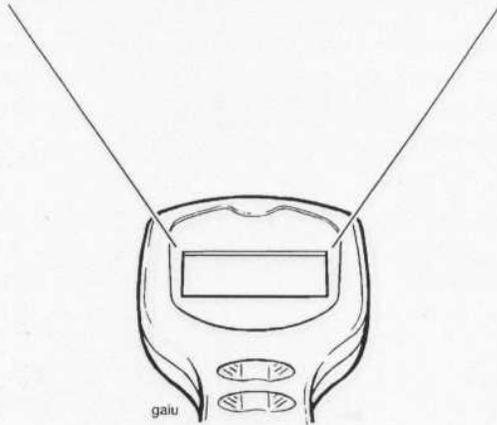
If 'CANCEL' has been selected – return to operation 39.

If 'CONFIRM' has been selected, downloading will begin.

44. 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**'.

Press the Validation key '*' to return to the '**MAIN MENU**' (operation 8).

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 7.0
1999
  
```

From this screen, use the following button press sequence:

HELP (?) - HELP (?) - RETURN (↵) - HELP (?) VALIDATE (*).

The update tune password 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 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.

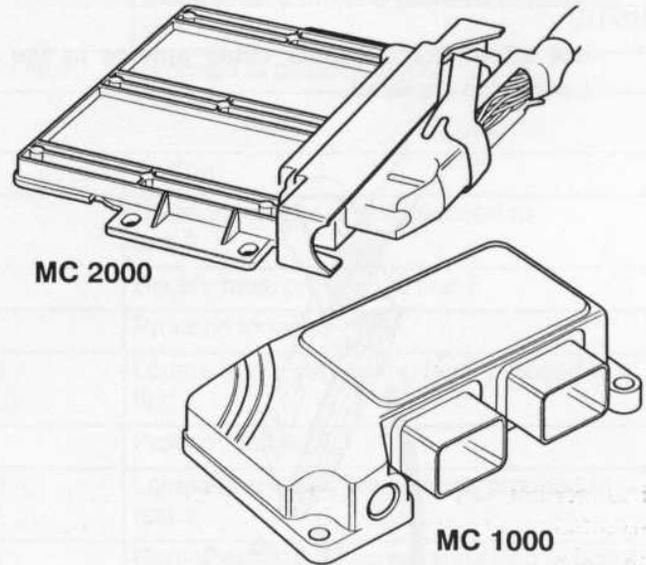
WHEN CONNECTING A CONNECTOR

- 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.

ECM RECOGNITION

Depicted below are the MC 2000 and MC1000 ECMs.

The MC 1000 ECM can be easily recognised as it has two smaller wiring connectors leading to it whereas, the MC 2000 had only one large wiring connector.



MC 2000 ECMs were fitted to Sprint ST models only up to VIN 89736.

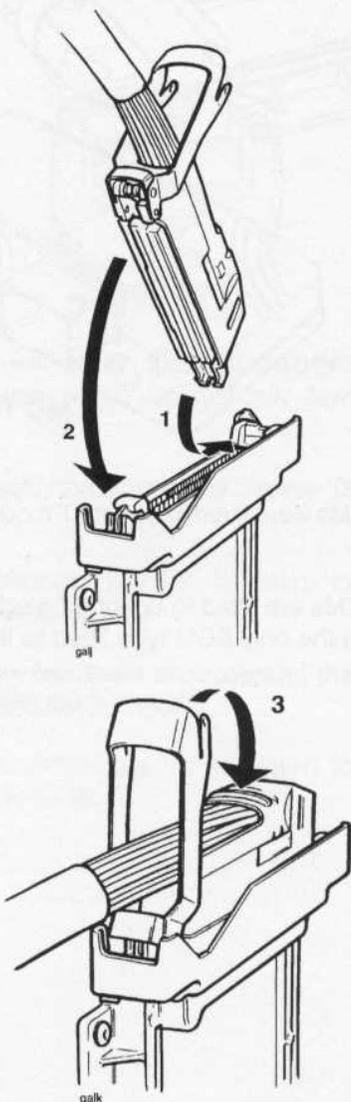
MC 1000 ECMs are fitted to Sprint ST models from VIN 89737 and is the only ECM type fitted to the Sprint RS model.

ECM Connector - MC 2000

Many of the diagnostic routines described in the following tables call for checking of ECM connections by cable number. The illustrations given below, describe the method of connection and disconnection of the ECM connector.

NOTE:

- Not all of the available cable spaces in the connector are used.

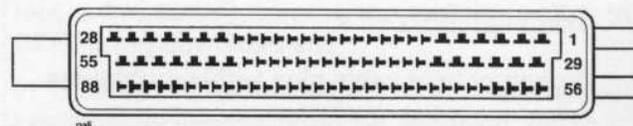


NOTE:

- The sequence shown in the diagram above must be used when reconnecting the ECM main connector. When disconnecting, reverse the sequence.

MC 2000 ECM Connector Pin Numbering

The diagram below shows the pin sequence of the ECM main connector. These pin numbers correspond directly with the pin numbers given in the diagnostic routines and schematic wiring diagrams used throughout this manual.



MC 2000 ECM Connector Pin Numbers

FURTHER DIAGNOSIS - MC 2000 ECM ONLY

The tables which follow will, if used correctly, help to pinpoint a fault in the system once a diagnostic trouble code has been stored.

In addition, a further chart on page 104 gives advice on non-electrical fault diagnosis.

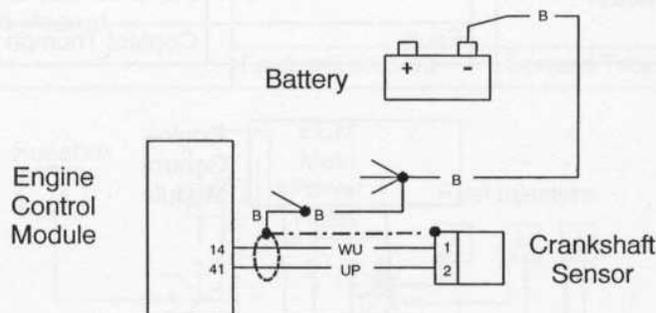
CRANKSHAFT SENSOR - MC 2000 ECM ONLY

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. Check for 1 mm sensor air gap. Disconnect ECM and proceed to pinpoint test 1
P1335	Crank toothed wheel / screen cable fault	proceed to pinpoint test 5

Pinpoint Tests

Test	Result	Action
1 Check terminal and cable integrity: - ECM pin 14 - ECM pin 41	OK	Disconnect sensor and proceed to test 2
	Faulty	Rectify fault, proceed to test 7
2 Check cable for short circuit: - ECM pin 14 to earth - ECM pin 41 to earth	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 7
3 Check cable continuity: - ECM pin 14 to sensor pin 1 - ECM pin 41 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 14 to ECM pin 41	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



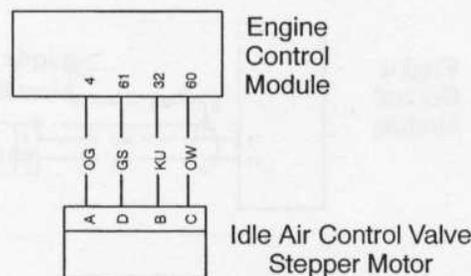
IDLE AIR CONTROL - MC 2000 ECM ONLY

Fault Code	Possible cause	Action
P0505	IACV 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 4 - ECM pin 32 - ECM pin 60 - ECM pin 61	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 7
2 Check resistance value: - ECM pin 4 to ECM pin 61 - ECM pin 32 to ECM pin 60	47 to 59Ω	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 4 to earth - ECM pin 32 to earth - ECM pin 60 to earth - ECM pin 61 to earth	OK	Proceed to test 7
	Short circuit	Locate and rectify wiring fault, proceed to test 7
4 Check cable continuity: - ECM pin 4 to stepper motor pin A - ECM pin 32 to stepper motor pin B - ECM pin 60 to stepper motor pin C - ECM pin 61 to stepper motor pin D	OK	Proceed to test 6
	Open circuit	Locate and rectify wiring fault, proceed to test 7
5 Check cable for short circuit: - ECM pin 4 to ECM pin 61 - ECM pin 32 to ECM pin 60	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 D - Motor pin B to motor pin C	47 to 59Ω	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



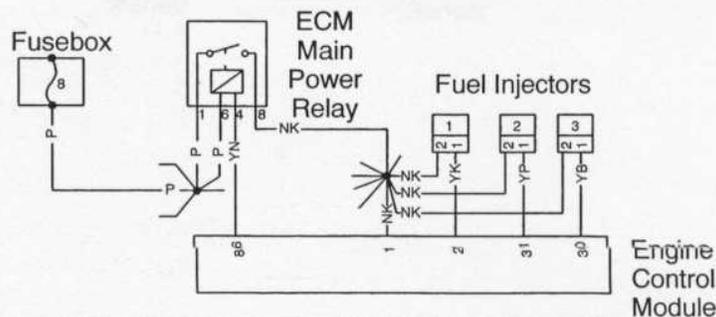
FUEL INJECTORS - MC 2000 ECM ONLY

Fault Code	Possible cause	Action
P0201/02/03	Injection system fault - Injector 1/2/3 - 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
P1201/02/03	Open or short circuit - Injector 1/2/3	
P1205/06/07	Short circuit to battery+ - Injector 1/2/3	Disconnect relevant injector and proceed to pinpoint test 5

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 2 - ECM pin 30 - ECM pin 31	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 7
2 Check resistance value: - ECM pin 1 to ECM pin 2 (injector 1) - ECM pin 1 to ECM pin 31 (injector 2) - ECM pin 1 to ECM pin 30 (injector 3)	15.5 to 16.3Ω	Disconnect relevant injector and proceed to test 3
	Open circuit	Proceed to test 4
	Short circuit	Disconnect relevant injector and proceed to test 5
3 Check cable for short circuit: - ECM pin 2 to earth - ECM pin 31 to earth - ECM pin 30 to earth	OK	Proceed to test 7
	Short circuit	Locate and rectify wiring fault, proceed to test 7
4 Check cable continuity: - ECM pin 1 to relevant injector pin 2 - ECM pin 2 to injector 1 pin 1 - ECM pin 31 to injector 2 pin 1 - ECM pin 30 to injector 3 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 1 to ECM pin 2 (injector 1) - ECM pin 1 to ECM pin 31 (injector 2) - ECM pin 1 to ECM pin 30 (injector 3)	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	15.5 to 16.3Ω	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



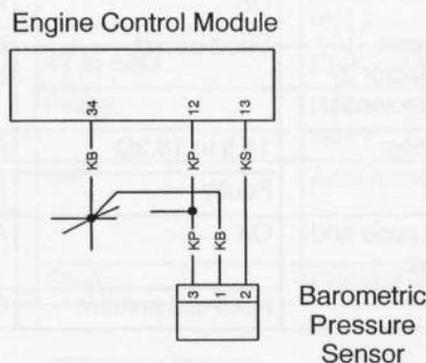
BAROMETRIC PRESSURE SENSOR - MC 2000 ECM ONLY

Fault Code	Possible cause	Action
P0105	Barometric pressure sensor / 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 12 - ECM pin 13 - ECM pin 34	OK	Disconnect sensor and proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable for short circuit: - ECM pin 13 to earth	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 5
3 Check cable continuity: - ECM pin 34 to sensor pin 1 - ECM pin 13 to sensor pin 2 - ECM pin 12 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 13 to ECM pin 12 - ECM pin 13 to ECM pin 34	OK	Renew barometric pressure 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



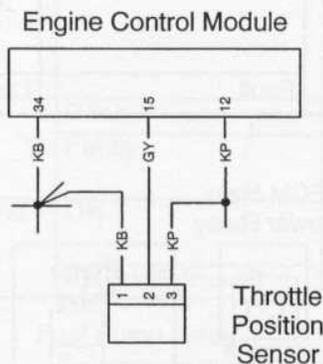
THROTTLE POSITION SENSOR - MC 2000 ECM ONLY

Fault Code	Possible cause	Action
P0120	Throttle position sensor system fault	View & note diagnostic tool 'freeze frame' data if available.
P0122	Sensor low input voltage	View & note diagnostic tool 'sensor' data.
P0123	Sensor high input voltage	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 12 - ECM pin 15 - ECM pin 34	OK	Disconnect sensor and proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable for short circuit: - ECM pin 15 to earth	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 5
3 Check cable continuity: - ECM pin 34 to sensor pin 1 - ECM pin 15 to sensor pin 2 - ECM pin 12 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 15 to ECM pin 12 - ECM pin 15 to ECM pin 34	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



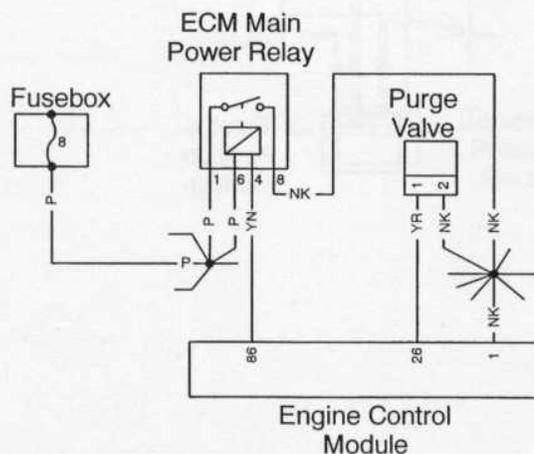
PURGE VALVE - MC 2000 ECM ONLY

Fault Code	Possible cause	Action
P0443	Purge valve system fault	View & note diagnostic tool 'sensor' data. Ensure purge valve connector is secure. Disconnect ECM and proceed to pinpoint test 1
P0444	Open circuit or short circuit to earth	
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 26	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 7
2 Check resistance value: - ECM pin 1 to ECM pin 26	26Ω	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 26 to earth	OK	Proceed to test 7
	Short circuit	Locate and rectify wiring fault, proceed to test 7
4 Check cable continuity: - ECM pin 26 to valve pin 1 - ECM pin 1 to valve pin 2	OK	Proceed to test 6
	Open circuit	Locate and rectify wiring fault, proceed to test 7
5 Check cable for short circuit: - ECM pin 1 to ECM pin 26	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	26Ω	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



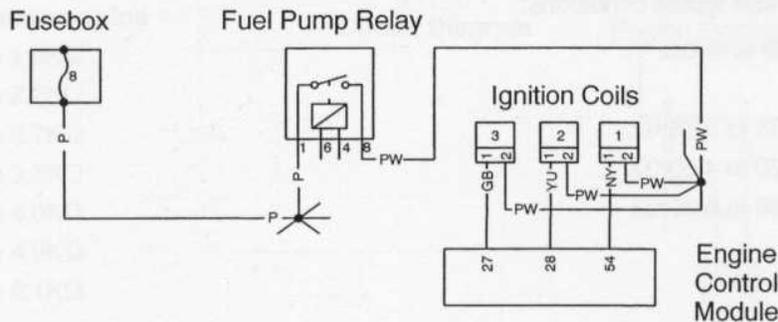
IGNITION COILS - MC 2000 ECM ONLY

Fault Code	Possible cause	Action
P0351/52/53	Ignition system fault - Ign coil 1/2/3	View & note diagnostic tool 'freeze frame' data if available. Ensure relevant ign coil connector is secure. Disconnect ECM and proceed to pinpoint test 1:-
P1351/52/53	Open or short circuit - Ign coil 1/2/3	
P1355/56/57	Short circuit to battery+ - Ign coil 1/2/3	disconnect relevant ign coil and proceed to pinpoint test 5

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 27 - ECM pin 28 - ECM pin 54	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 7
2 Check resistance value: Fuel pump relay pin 8 to - ECM pin 54 (ign coil 1) - ECM pin 28 (ign coil 2) - ECM pin 27 (ign coil 3)	0.8Ω	Disconnect relevant ign coil and proceed to test 3
	Open circuit	Proceed to test 4
	Short circuit	Disconnect relevant ign coil and proceed to test 5
3 Check cable for short circuit: - ECM pin 27 to earth - ECM pin 28 to earth - ECM pin 54 to earth	OK	Proceed to test 7
	Short circuit	Locate and rectify wiring fault, proceed to test 7
4 Check cable continuity: - Fuel pump relay pin 8 to any ign coil pin 2 - ECM pin 54 to ign coil 1 pin 1 - ECM pin 28 to ign coil 2 pin 1 - ECM pin 27 to ign coil 3 pin 1	OK	Proceed to test 6
	Open circuit	Locate and rectify wiring fault, proceed to test 7
5 Check cable for short circuit: Fuel pump relay pin 8 to - ECM pin 54 (ign coil 1) - ECM pin 28 (ign coil 2) - ECM pin 27 (ign coil 3)	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	0.8Ω	Proceed to test 7
	Faulty	Renew relevant ign 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 - MC 2000 ECM ONLY

Fault Code	Possible cause	Action
P0115	Coolant temperature system 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:-
P0117	Open circuit, or short circuit to battery+	
P0118	Short circuit to earth	disconnect sensor and proceed to test 6
P0119	Voltage signal too high	proceed to pinpoint test 4

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 34 - ECM pin 46	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 7
2 Check resistance value: - ECM pin 46 to ECM pin 34 (Temperature dependent - see data below)	OK	Disconnect temp sensor and proceed to test 6
	Open circuit	Proceed to test 3
	Short circuit	Disconnect temp sensor and proceed to test 4
3 Check cable continuity: - ECM pin 46 to sensor pin 1 - ECM pin 34 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 46 to ECM pin 34	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 data below)	OK	Proceed to test 7
	Faulty	Renew temp sensor, proceed to test 7
6 Check cable for short circuit: - ECM pin 46 to earth	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:

20°C ambient 2.35 to 2.65KΩ.

10°C ambient 3.60 to 4.00KΩ.

0°C ambient 5.60 to 6.25KΩ

INLET AIR TEMPERATURE SENSOR - MC 2000 ECM ONLY

Fault Code	Possible cause	Action
P0110	Inlet air temperature system 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:-
P0113	Open circuit, or short circuit to battery+	disconnect sensor and proceed to pinpoint test 6
P0112	Short circuit to earth	

Pinpoint Tests

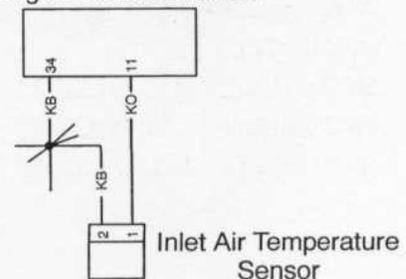
Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 34 - ECM pin 11	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 7
2 Check resistance value: - ECM pin 11 to ECM pin 34 (Temperature dependent - see data below)	OK	Disconnect temp sensor and proceed to test 6
	Open circuit	Proceed to test 3
	Short circuit	Disconnect temp sensor and proceed to test 4
3 Check cable continuity: - ECM pin 11 to sensor pin 1 - ECM pin 34 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 11 to ECM pin 34	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 data below)	OK	Proceed to test 7
	Faulty	Renew temp sensor, proceed to test 7
6 Check cable for short circuit: - ECM pin 11 to earth	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
30°C	1.6 to 1.8KΩ
25°C	1.9 to 2.2KΩ
20°C	2.3 to 2.7KΩ
15°C	2.9 to 3.3KΩ
10°C	3.5 to 4.0KΩ
5°C	4.4 to 4.9KΩ
0°C	5.5 to 6.1KΩ

Circuit Diagram

Engine Control Module



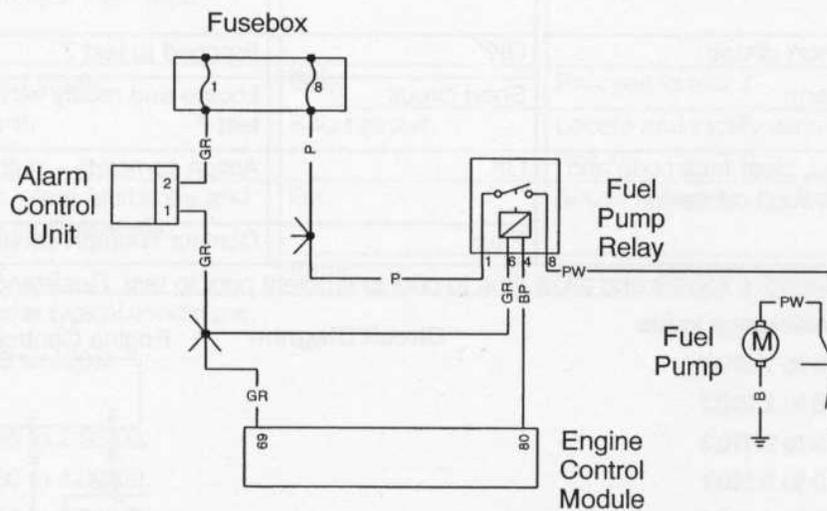
FUEL PUMP RELAY - MC 2000 ECM ONLY

Fault Code	Possible cause	Action
P0230	Fuel pump relay system fault	Check if pump runs briefly when ignition is switched on. Ensure relay connector is secure and relay is operational - renew if faulty. Disconnect ECM and proceed to pinpoint test 1:-
P1231	Open circuit, or short circuit to earth	
P1232	Short circuit to battery+	Disconnect relay and proceed to pinpoint test 4

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 80	OK	Disconnect relay and proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable for short circuit: - ECM pin 80 to earth	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 5
3 Check cable continuity: - ECM pin 80 to relay pin4 - Relay pin 6 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 80 to ECM pin 69	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



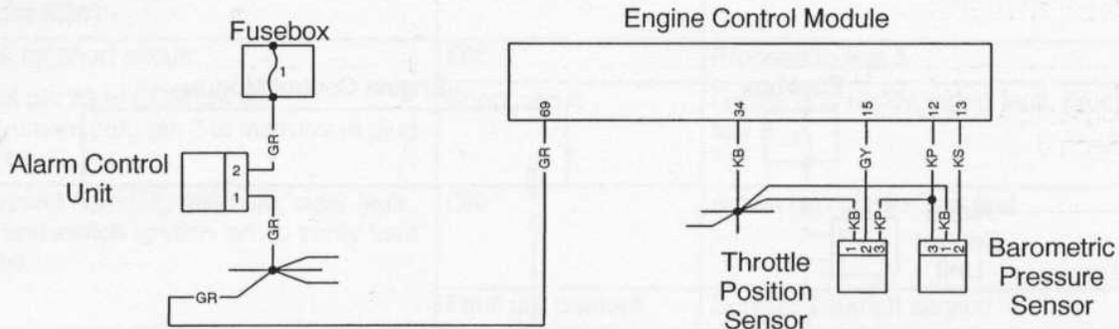
SENSOR SUPPLY VOLTAGE - MC 2000 ECM ONLY

Fault Code	Possible cause	Action
P1560	Engine control module / wiring fault	View & note diagnostic tool 'sensor' data. Disconnect ECM and proceed to pinpoint test 1

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 12	OK	Disconnect throttle position sensor and air pressure sensor, proceed to test 2
	Faulty	Rectify fault, proceed to test 4
2 Check for short circuit: - ECM pin 12 to ECM pin 34	OK	Reconnect ECM, proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 4
3 With ignition 'on', check voltage at: - barometric pressure sensor pin 3 or throttle position sensor pin 3.	4.5 to 5.5v	Proceed to test 4
	Faulty	Check for wiring fault between ECM and sensors, if wiring is OK, renew ECM, proceed to test 4
4 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



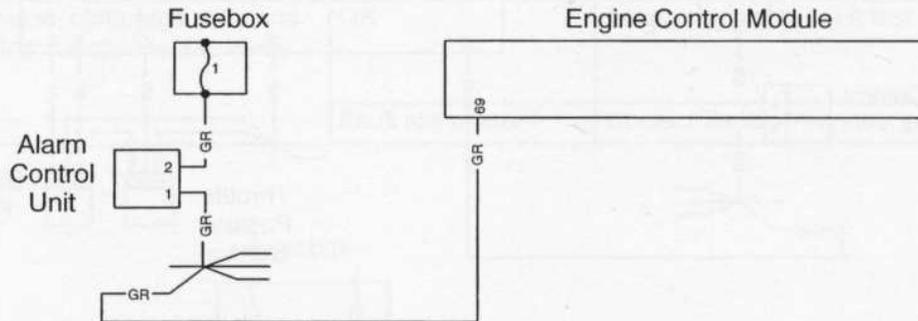
SYSTEM VOLTAGE - MC 2000 ECM ONLY

Fault Code	Possible cause	Action
P0560	Bike voltage system fault	View & note diagnostic tool 'sensor' data. Ensure voltage across battery is acceptable, note voltage.
P0562	Wiring / alternator / battery fault - low voltage	Disconnect ECM and proceed to pinpoint test 1
P0563	Alternator fault - high voltage	

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 69	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 3
2 With Ignition 'on', check voltage at: - ECM pin 69	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



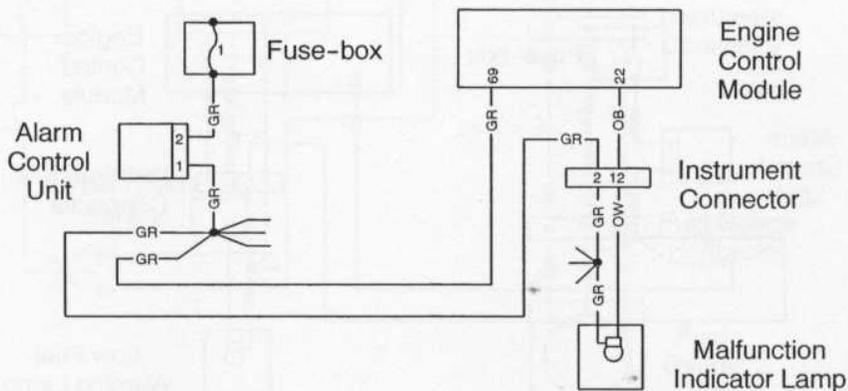
MALFUNCTION INDICATION LAMP - MC 2000 ECM ONLY

Fault Code	Possible cause	Action
P1600	MIL system fault	Ensure warning lamp connector is secure and bulb is operational - renew if faulty. Disconnect ECM and proceed to pinpoint test 1:-
P1601	Open circuit, or short circuit to earth	
P1602	Short circuit to battery+	Disconnect instrument connector, remove bulb and proceed to test 4

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 22	OK	Disconnect instrument connector and proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable for short circuit: - ECM pin 22 to earth	OK	Remove bulb and proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 5
3 Check cable continuity: - Instrument plug pin 12 to ECM pin 22 - Instrument plug pin 2 to alarm pin 1 - Instrument plug pin 2 to bulb holder (GR) - Instrument plug pin 12 to bulb holder (OW)	OK	Proceed to test 4
	Open circuit	Locate and rectify wiring fault, proceed to test 5
4 Check for short circuit: - ECM pin 22 to ECM pin 69 - Instrument plug pin 2 to instrument plug pin 12	OK	Proceed to test 5
	Short circuit	Locate and rectify wiring fault, proceed to test 5
5 Reconnect harness, refit bulb, clear fault code and switch ignition 'on' to verify fault cleared	OK	Action complete - quit test
	Fault still present	Contact Triumph service

Circuit Diagram



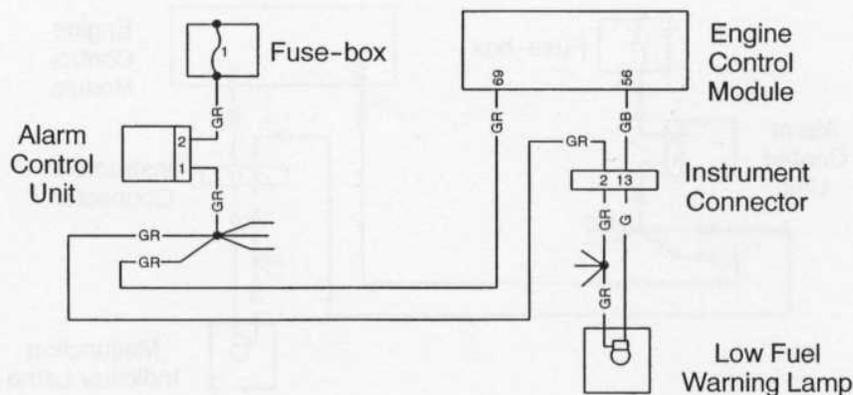
LOW FUEL LEVEL WARNING LAMP - MC 2000 ECM ONLY

Fault Code	Possible cause	Action
P1610	Low fuel warning lamp - system fault	Ensure warning lamp connector is secure and bulb is operational - renew if faulty. Disconnect ECM and proceed to pinpoint test 1:-
P1611	Open circuit, or short circuit to earth	
P1612	Short circuit to battery+	Disconnect instrument connector, remove bulb and proceed to test 4

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 22	OK	Disconnect instrument connector and proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable for short circuit: - ECM pin 22 to earth	OK	Remove bulb and proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 5
3 Check cable continuity: - Instrument plug pin 13 to ECM pin 22 - Instrument plug pin 2 to alarm pin 1 - instrument plug pin 2 to bulb holder (GR) - instrument plug pin 12 to bulb holder (G)	OK	Proceed to test 4
	Open circuit	Locate and rectify wiring fault, proceed to test 5
4 Check for short circuit: - ECM pin 22 to ECM pin 69 - Instrument plug pin 2 to instrument plug pin 13	OK	Proceed to test 5
	Short circuit	Locate and rectify wiring fault, proceed to test 5
5 Reconnect harness, refit bulb, clear fault code and switch ignition 'on' to verify fault cleared	OK	Action complete - quit test
	Fault still present	Contact Triumph service

Circuit Diagram



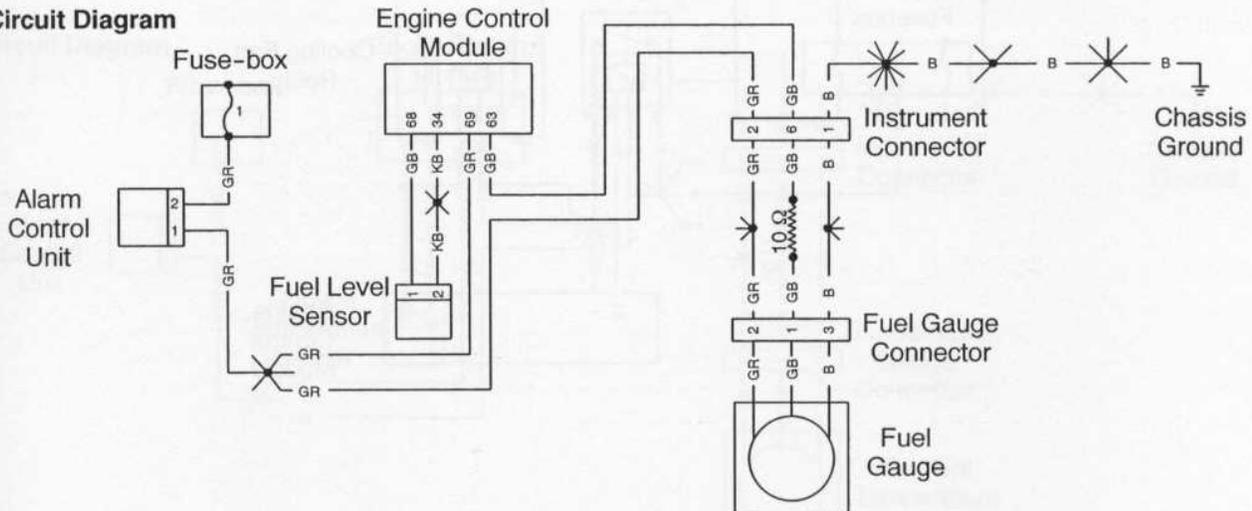
FUEL GAUGE - MC 2000 ECM ONLY

Fault Code	Possible cause	Action
P1620	Fuel gauge system fault	View & note 'freeze frame' data if available. View & note 'sensor' data. Ensure temp gauge connector is secure. Disconnect ECM and proceed to pinpoint test 1:-
P1621	Open circuit, or short circuit to earth	
P1622	Short circuit to battery+	Disconnect temp gauge and proceed to pinpoint test 5

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 63	OK	Disconnect temp gauge and proceed to test 2
	Faulty	Rectify fault, proceed to test 6
2 Check cable for short circuit: - ECM pin 63 to earth	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 6
3 Check cable resistance: - ECM pin 63 to temp gauge pin 1	9 to 11 Ω	Proceed to test 4
	Faulty	Renew in-line resistor, proceed to test 6
4 Check cable continuity: - Fuel gauge pin 3 to earth - Fuel gauge pin 2 to alarm control unit pin 1	OK	Proceed to test 5
	Open circuit	Locate and rectify wiring fault, proceed to test 6
5 Check cable for short circuit: ECM pin 63 to ECM pin 69	OK	Renew temp gauge, proceed to test 6
	Short circuit	Locate and rectify wiring fault, proceed to test 6
6 Reconnect harness, clear fault code and run diagnostic tool function test to visually verify operation of temp gauge	OK	Action complete - quit test
	Fault still present	Contact Triumph service

Circuit Diagram



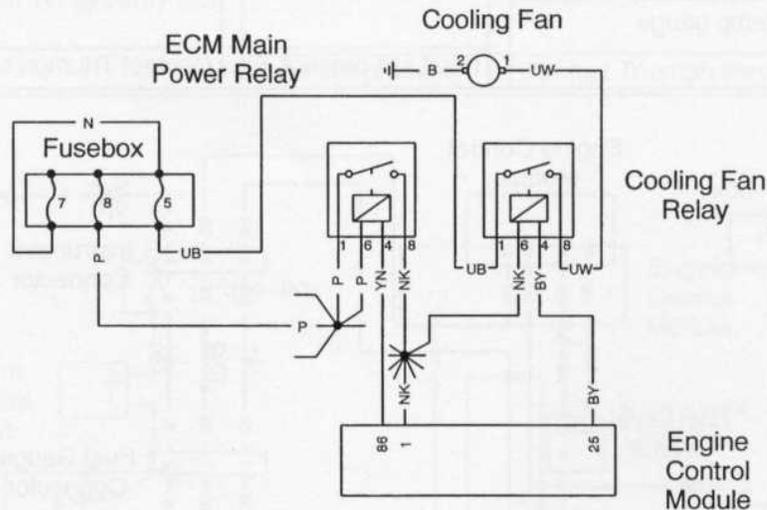
COOLING FAN RELAY - MC 2000 ECM ONLY

Fault Code	Possible cause	Action
P1551	Cooling fan relay system fault	View & note diagnostic tool 'sensor' data. Ensure relay connector is secure and relay is operational - renew if faulty. Disconnect ECM and proceed to pinpoint test1:-
P1552	Open circuit, or short circuit to earth	
P1553	Short circuit to battery+	Disconnect relay and proceed to pinpoint test 4

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 25	OK	Disconnect relay and proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable for short circuit: - ECM pin 25 to earth	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 5
3 Check cable continuity: - Relay pin 4 to ECM pin 25 - Relay pin 6 to ECM 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 25 to ECM pin 1	OK	Proceed to test5
	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



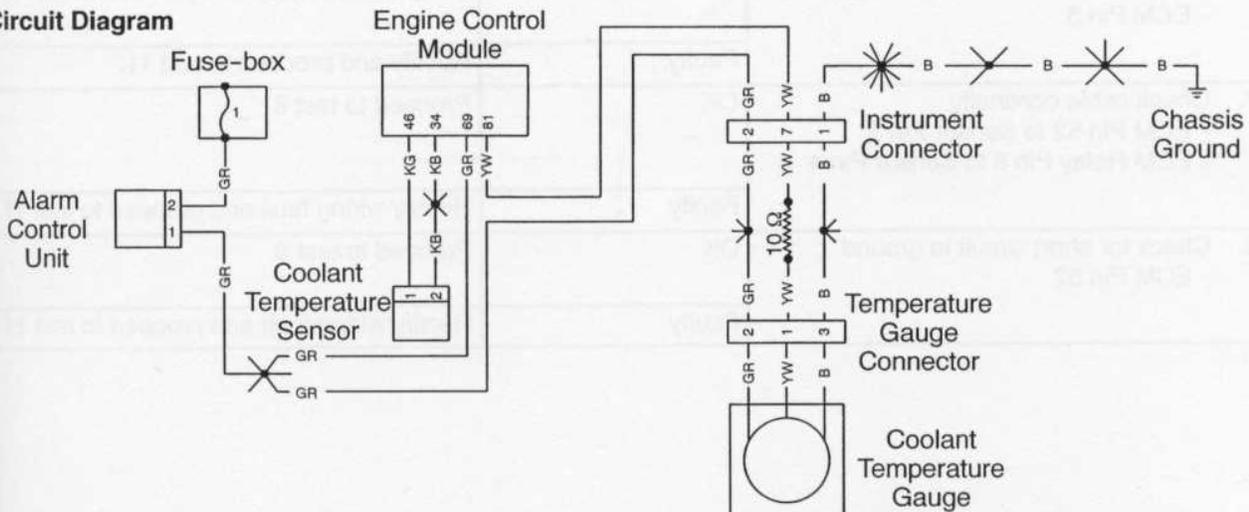
COOLANT TEMPERATURE GAUGE - MC 2000 ECM ONLY

Fault Code	Possible cause	Action
P1115	Temperature gauge system fault	View & note 'freeze frame' data if available. View & note 'sensor' data. Ensure temp gauge connector is secure. Disconnect ECM and proceed to pinpoint test 1:-
P1116	Open circuit, or short circuit to earth	
P1117	Short circuit to battery+	Disconnect temp gauge and proceed to pinpoint test 5

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 81	OK	Disconnect temp gauge and proceed to test 2
	Faulty	Rectify fault, proceed to test 6
2 Check cable for short circuit: - ECM pin 81 to earth	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 6
3 Check cable resistance: - ECM pin 81 to temp gauge pin 1	9 to 11 Ω	Proceed to test 4
	Faulty	Renew in-line resistor, proceed to test 6
4 Check cable continuity: - Temp gauge pin 3 to earth - Temp gauge pin 2 to alarm control unit pin 1	OK	Proceed to test 5
	Open circuit	Locate and rectify wiring fault, proceed to test 6
5 Check cable for short circuit: ECM pin 81 to ECM pin 69	OK	Renew temp gauge, proceed to test 6
	Short circuit	Locate and rectify wiring fault, proceed to test 6
6 Reconnect harness, clear fault code and run diagnostic tool function test to visually verify operation of temp gauge	OK	Action complete - quit test
	Fault still present	Contact Triumph service

Circuit Diagram



LAMBDA SENSOR - MC 2000 ECM ONLY

Fault Code	Possible Cause	Action
P0131	Open Circuit or Short Circuit to Battery. Poor electrical contact between exhaust and ECM ground.	View and note freeze frame data. Ensure Lambda sensor connector is secure. Disconnect ECM and proceed to pinpoint test 1.
P0132	Open Circuit or Short Circuit to Battery.	Proceed to pinpoint test 1.
P1133	Faulty Lambda Sensor	Replace Lambda Sensor
P0135	Open Circuit or Short circuit	Proceed to test 7

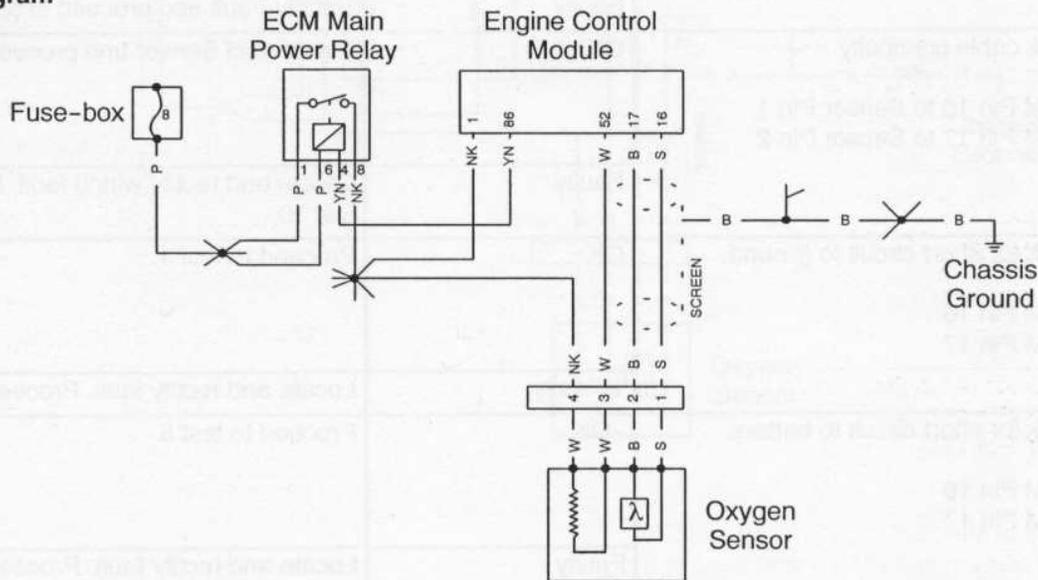
Pinpoint Tests

Test	Result	Action
1. Check cable and terminal integrity. - ECM Pin 16 - ECM Pin 17	OK	Disconnect Sensor and proceed to test 2.
	Faulty	Rectify Fault and proceed to test 11.
2. Check cable continuity - ECM Pin 16 to Sensor Pin 1 - ECM Pin 17 to Sensor Pin 2	OK	Proceed to test 3.
	Faulty	Locate and rectify wiring fault. Proceed to test 11.
3. Check for short circuit to ground. - ECM Pin 16 - ECM Pin 17	OK	Proceed to test 4.
	Faulty	Locate and rectify fault. Proceed to test 11.
4. Check for short circuit to battery. - ECM Pin 16 - ECM Pin 17	OK	Proceed to test 5
	Faulty	Locate and rectify fault. Proceed to test 11.
5. Check continuity between sensor boss and battery negative terminal.	OK	Replace Lambda Sensor and proceed to test 11.
	Faulty	Locate and rectify fault and proceed to test 11.
6. Check cable and terminal integrity. - ECM Pin 5	OK	Disconnect sensor and proceed to test 7.
	Faulty	Rectify and proceed to test 11.
7. Check cable continuity - ECM Pin 52 to Sensor Pin 3 - ECM Relay Pin 8 to Sensor Pin 4	OK	Proceed to test 8.
	Faulty	Rectify wiring fault and proceed to test 11.
8. Check for short circuit to ground - ECM Pin 52	OK	Proceed to test 9.
	Faulty	Rectify wiring fault and proceed to test 11.

Pinpoint Tests(continued)

Test	Result	Action
9. Check for short circuit to battery - ECM Pin 52	OK	Proceed to test 10.
	Faulty	Rectify wiring fault and proceed to test 11.
10. Check resistance of Lambda sensor heater		Proceed to test 11.
	Faulty	Replace Lambda Sensor and proceed to test 11.
11. Reconnect harness, clear fault code and switch ignition key 'ON' to verify fault cleared.	OK	Action complete – Quit test.
	Fault still present	Contact Triumph Service

Circuit Diagram



LAMBDA SENSOR - MC 2000 ECM ONLY (Short Term Feedback)

Fault Code	Possible Cause	Action
P0170	Fault Code P1171 or P1172 will be present.	View and note freeze frame data. Ensure sensor connector is secure.
P1171	Wiring fault, Air leak, low fuel pressure, faulty purge system, faulty sensor.	Disconnect ECM connector and proceed to test 1.
P1172	Wiring fault, high fuel pressure, faulty purge system, faulty sensor.	Disconnect ECM connector and proceed to test 1.

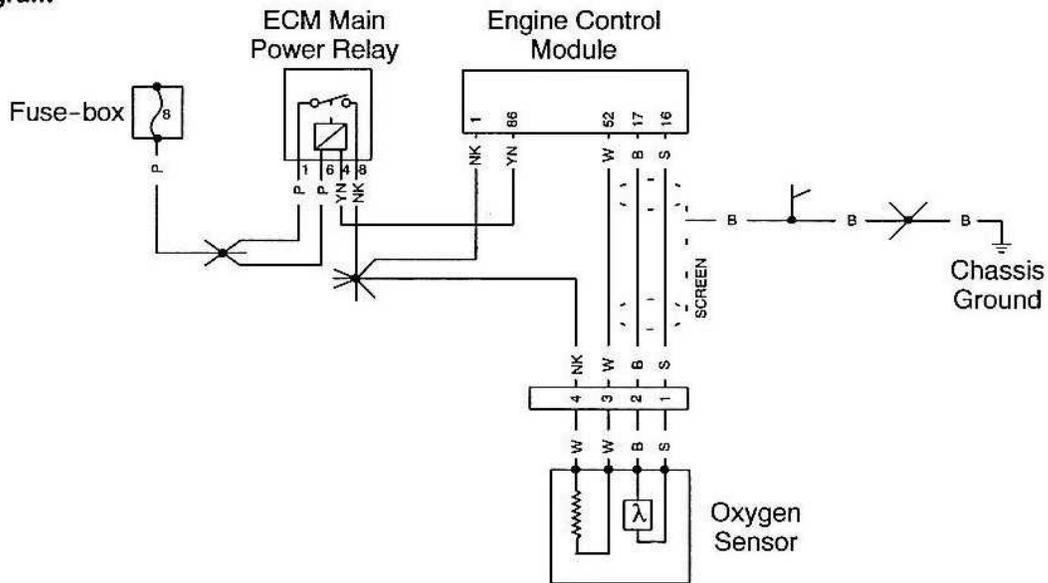
Pinpoint Tests

Test	Result	Action
1. Check cable and terminal integrity. - ECM Pin 16 - ECM Pin 17	OK	Disconnect Sensor and proceed to test 2.
	Faulty	Rectify Fault and proceed to test 10.
2. Check cable continuity - ECM Pin 16 to Sensor Pin 1 - ECM Pin 17 to Sensor Pin 2	OK	Disconnect Sensor and proceed to test 3.
	Faulty	Locate and rectify wiring fault. Proceed to test 10.
3. Check for short circuit to ground. - ECM Pin 16 - ECM Pin 17	OK	Proceed to test 4.
	1.Faulty	Locate and rectify fault. Proceed to test 10.
4. Check for short circuit to battery. - ECM Pin 16 - ECM Pin 17	-OK	Proceed to test 5
	Faulty	Locate and rectify fault. Proceed to test 10.
5. Check continuity between sensor boss and battery negative terminal.	OK	Proceed to test 6.
	Faulty	Locate and rectify fault and proceed to test 10.
6. Check for air leaks into the intake system	OK	Proceed to test 7.
	Faulty	Rectify air leak and proceed to test 10.
7. Check fuel rail pressure.	OK	Proceed to test 8.
	Faulty	Rectify and proceed to test 10.
8. Check integrity of purge system pipes, valve and canister.	OK	Proceed to test 9
	Faulty	Rectify and proceed to test 10.

Pinpoint Tests(continued)

Test	Result	Action
9. Check purge valve is not stuck open.	OK	Replace Lambda Sensor and proceed to test 10
	Faulty	Replace purge valve and proceed to test 10
10. Reconnect harness, clear fault code and switch ignition key 'ON' to verify fault cleared.	OK	Action complete – Quit test.
	Fault still present	Contact Triumph Service

Circuit Diagram



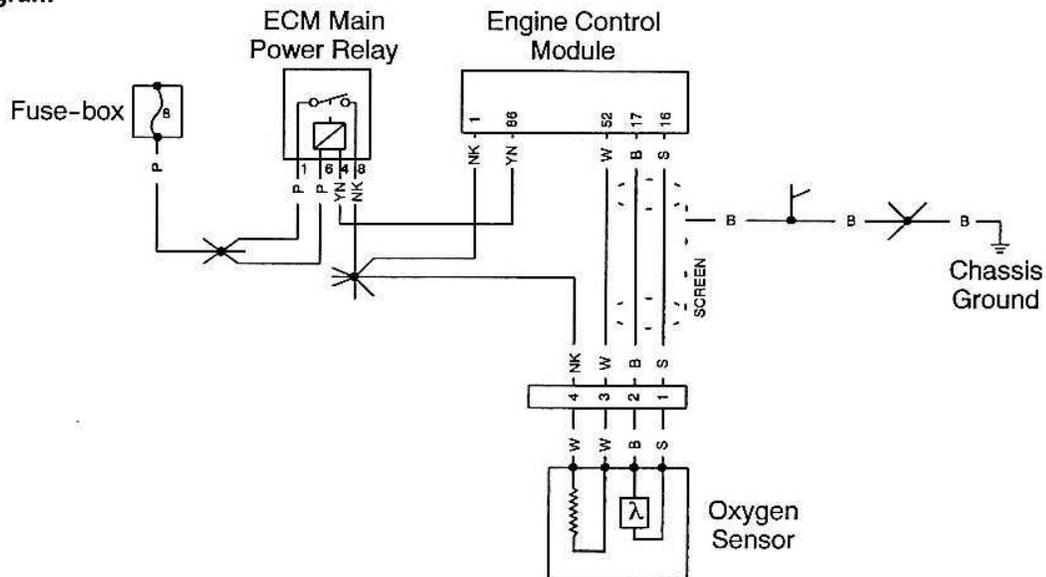
LAMBDA SENSOR - MC 2000 ECM ONLY (Long Term Feedback)

Fault Code	Possible Cause	Action
P1178	Air Leak, Low fuel pressure, Faulty purge system, Poor throttle balance.	View and note freeze frame data. Proceed to test 1.
P1179	Blocked idle air control system, High fuel pressure, Faulty purge system	Proceed to test 2

Pinpoint Tests

Test	Result	Action
1. Check throttle balance	OK	Proceed to test 2
	Faulty	Reset and proceed to test 7.
2. Check idle air control system is not blocked.	OK	Proceed to test 3
3. Check for air leaks into the intake system	OK	Proceed to test 4.
	Faulty	Rectify air leak and proceed to test 7.
4. Check fuel rail pressure.	OK	Proceed to test 5.
5. Check integrity of purge system pipes, valve and canister.	OK	Proceed to test 6.
6. Check purge valve is not stuck open.	OK	Proceed to test 7
	Faulty	Replace purge valve and proceed to test 7.
7. Reconnect harness, clear fault code and switch ignition key 'ON' to verify fault cleared.	OK	Action complete – Quit test.
	Fault still present	Contact Triumph Service

Circuit Diagram



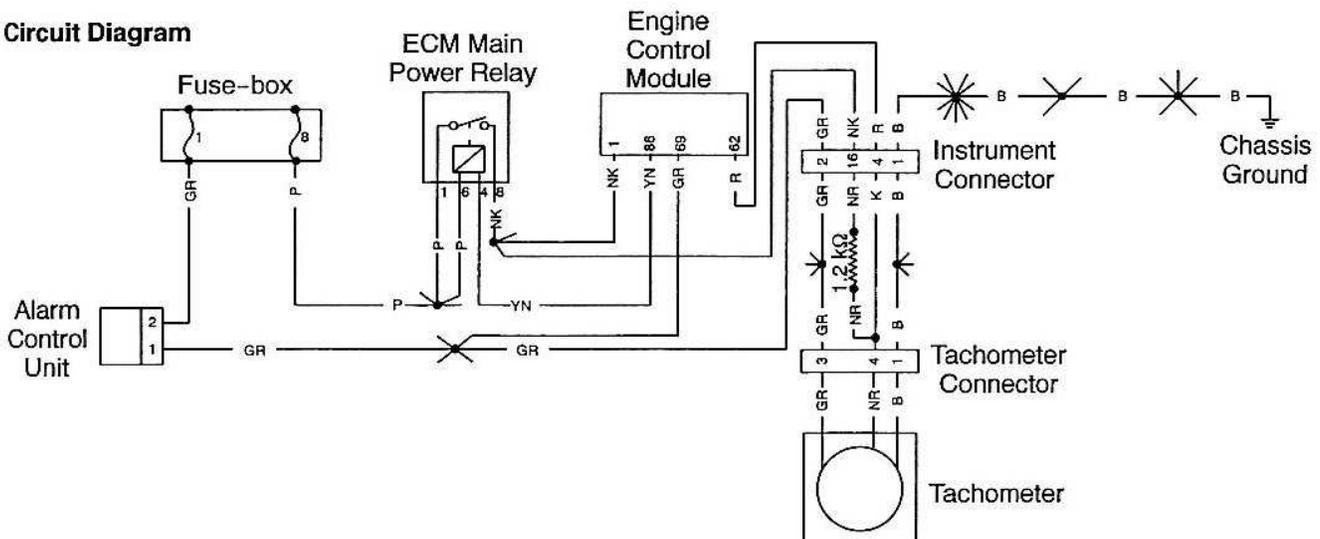
TACHOMETER - MC 2000 ECM ONLY

Fault Code	Possible cause	Action
P1385	Tachometer system fault	View & note 'freeze frame' data if available. View & note 'sensor' data. Ensure tachometer connector is secure. Disconnect ECM and proceed to pinpoint test 1:-
P1386	Open circuit, or short circuit to earth	
P1387	Short circuit to battery+	Disconnect tachometer and proceed to pinpoint test 5

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 62	OK	Disconnect tachometer and proceed to test 2
	Faulty	Rectify fault, proceed to test 6
2 Check cable for short circuit: - ECM pin 62 to earth	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 6
3 Check cable resistance: - ECM pin 62 to ECM pin 1	1.1 to 1.3KΩ	Proceed to test 4
	Faulty	Renew in-line resistor, proceed to test 6
4 Check cable continuity: - Tachometer pin 4 to ECM pin 62 - Tachometer pin 1 to earth - Tachometer pin 3 to alarm control unit pin1	OK	Proceed to test 5
	Open circuit	Locate and rectify wiring fault, proceed to test 6
5 Check cable for short circuit: ECM pin 62 to ECM pin 69	OK	Renew tachometer, proceed to test 6
	Short circuit	Locate and rectify wiring fault, proceed to test 6
6 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

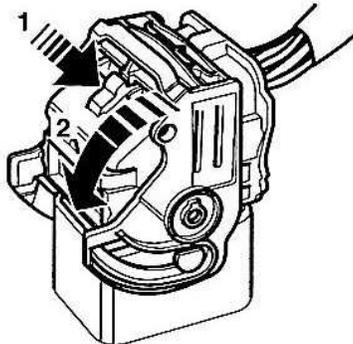


ECM - MC1000

Many of the diagnostic routines described in the following tables call for checking of ECM connections by cable number. The illustrations given below, describe the method of disconnection and connection of the ECM connectors.

Removal of ECM connectors

1. Press the locking tab in and rotate the clamping ring until a definite click is felt.



1. Locking tab
 2. Clamping ring
2. Remove the connector from the ECM socket.

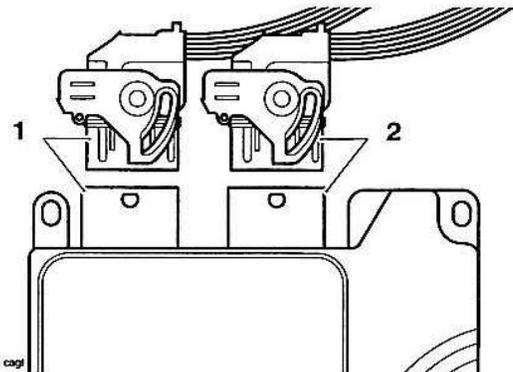
Refitting of ECM connectors.

NOTE:

- The connectors are both colour coded and individually shaped. The grey connector fits into the grey ECM socket and the black connector fits into the black ECM socket.



CAUTION: Damage to the connector pins may result if an attempt to fit the connectors incorrectly is made.



1. Grey socket and connector

2. Black socket and connector

1. Fit the connector into its socket and, whilst holding the connector in place, rotate the clamping ring, locking it into place behind the locking tab.
2. Check that both connectors are correctly fitted and their clamping rings are fully rotated and locked.

ECM Connector - MC 1000 only

The diagram below shows the pin sequence of the ECM main connectors. These pin numbers correspond directly with the pin numbers given in the diagnostic routines and schematic wiring diagrams used throughout this manual.

Each connector has 32 pins, arranged in four rows, marked 1, 2, 3 and 4 and eight columns as shown below. The first of these columns is column A and the eighth column is column H.

NOTE:

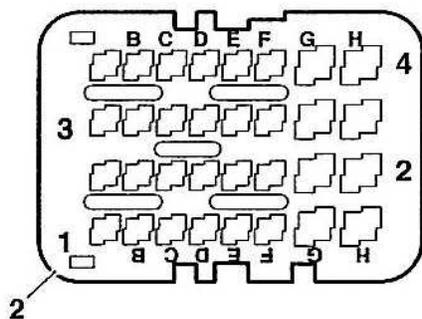
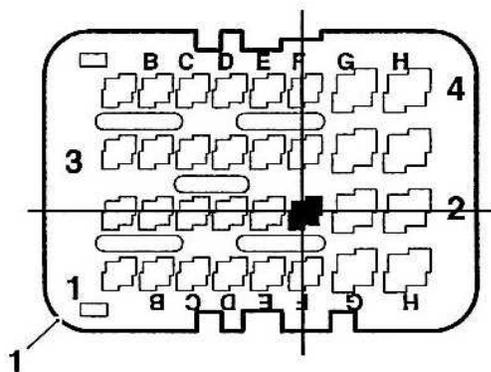
- It is important to note that the first column is not marked with a letter A due to space constraints on the face of the connector.

The diagram below shows the pin numbering as it appears on the connector.

Each ECM connector pin location is described throughout this manual by identifying the connector, 1 (black) or 2 (grey), followed by the column number, and then the row number in which it is situated. In the example below, pin 1/F2 is shown by the intersecting lines.

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.



ECM Connector Pin Numbers

1. Black connector, 1/
2. Grey connector, 2/

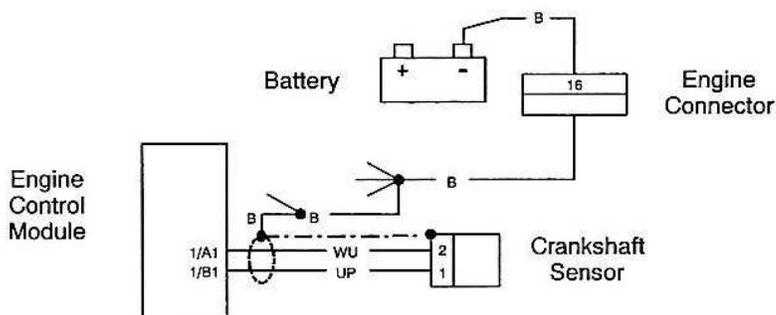
CRANKSHAFT SENSOR - MC 1000 ECM ONLY, ON BOTH MODELS

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. Check for 1 mm sensor air gap. Disconnect ECM and proceed to pinpoint test 1
P1335	Crank toothed wheel / screen cable fault	proceed to pinpoint test 5

Pinpoint Tests

Test	Result	Action
1 Check terminal and cable integrity: - ECM pin 1/A1 - ECM pin 1/B1	OK	Disconnect sensor and proceed to test 2
	Faulty	Rectify fault, proceed to test 7
2 Check cable for short circuit: - ECM pin 1/A1 to earth - ECM pin 1/B1 to earth	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 7
3 Check cable continuity: - ECM pin 1/B1 to sensor pin 1 - ECM pin 1/A1 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 1/A1 to ECM pin 1/B1	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



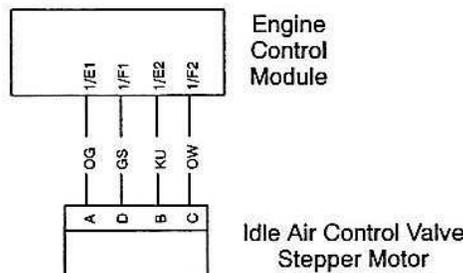
IDLE AIR CONTROL - MC 1000 ECM ONLY, ON BOTH MODELS

Fault Code	Possible cause	Action
P0505	IACV 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 1/E1 - ECM pin 1/E2 - ECM pin 1/F1 - ECM pin 1/F2	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 7
2 Check resistance value: - ECM pin 1/E1 to ECM pin 1/F1 - ECM pin 1/E2 to ECM pin 1/F2	47 to 59Ω	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 1/E1 to earth - ECM pin 1/E2 to earth - ECM pin 1/F1 to earth - ECM pin 1/F2 to earth	OK	Proceed to test 7
	Short circuit	Locate and rectify wiring fault, proceed to test 7
4 Check cable continuity: - ECM pin 1/E1 to stepper motor pin A - ECM pin 1/E2 to stepper motor pin B - ECM pin 1/F2 to stepper motor pin C - ECM pin 1/F1 to stepper motor pin D	OK	Proceed to test 6
	Open circuit	Locate and rectify wiring fault, proceed to test 7
5 Check cable for short circuit: - ECM pin 1/E1 to ECM pin 1/F1 - ECM pin 1/E2 to ECM pin 1/F2	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 D - Motor pin B to motor pin C	47 to 59Ω	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



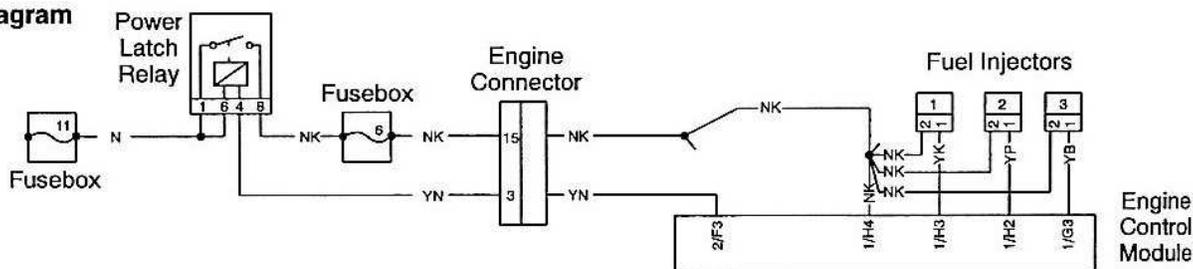
FUEL INJECTORS - MC 1000 ECM ONLY, ON BOTH MODELS

Fault Code	Possible cause	Action
P0201/02/03	Injection system fault - Injector 1/2/3 - 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
P1201/02/03	Open or short circuit - Injector 1/2/3	
P1205/06/07	Short circuit to battery+ - Injector 1/2/3	Disconnect relevant injector and proceed to pinpoint test 5

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 1/G3 - ECM pin 1/H2 - ECM pin 1/H3	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 7
2 Check resistance value: - ECM pin 1/H4 to ECM pin 1/H3 (injector 1) - ECM pin 1/H4 to ECM pin 1/H2 (injector 2) - ECM pin 1/H4 to ECM pin 1/G3 (injector 3)	15.5 to 16.3Ω	Disconnect relevant injector and proceed to test 3
	Open circuit	Proceed to test 4
	Short circuit	Disconnect injector and proceed to test 5
3 Check cable for short circuit: - ECM pin 1/G3 to earth - ECM pin 1/H2 to earth - ECM pin 1/H3 to earth	OK	Proceed to test 7
	Short circuit	Locate and rectify wiring fault, proceed to test 7
4 Check cable continuity: - ECM pin 1/H4 to relevant injector pin 2 - ECM pin 1/H3 to injector 1 pin 1 - ECM pin 1/H2 to injector 2 pin 1 - ECM pin 1/G3 to injector 3 pin 1	OK	Proceed to test 6
	Open circuit	Rectify wiring fault, proceed to test 7
5 Check cable for short circuit: - ECM pin 1/H4 to ECM pin 1/H3 (injector 1) - ECM pin 1/H4 to ECM pin 1/H2 (injector 2) - ECM pin 1/H4 to ECM pin 1/G3 (injector 3)	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	15.5 to 16.3Ω	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



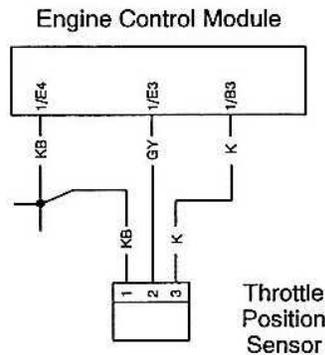
THROTTLE POSITION SENSOR - MC 1000 ECM ONLY, ON BOTH MODELS

Fault Code	Possible cause	Action
P0120	Throttle position sensor system fault	View & note diagnostic tool 'freeze frame' data if available.
P0122	Sensor low input voltage	View & note diagnostic tool 'sensor' data.
P0123	Sensor high input voltage	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 1/B3 - ECM pin 1/E3 - ECM pin 1/E4	OK	Disconnect sensor and proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable for short circuit: - ECM pin 1/E3 to earth	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 5
3 Check cable continuity: - ECM pin 1/E4 to sensor pin 1 - ECM pin 1/E3 to sensor pin 2 - ECM pin 1/B3 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 1/E3 to ECM pin 1/B3 - ECM pin 1/E3 to ECM pin 1/E4	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



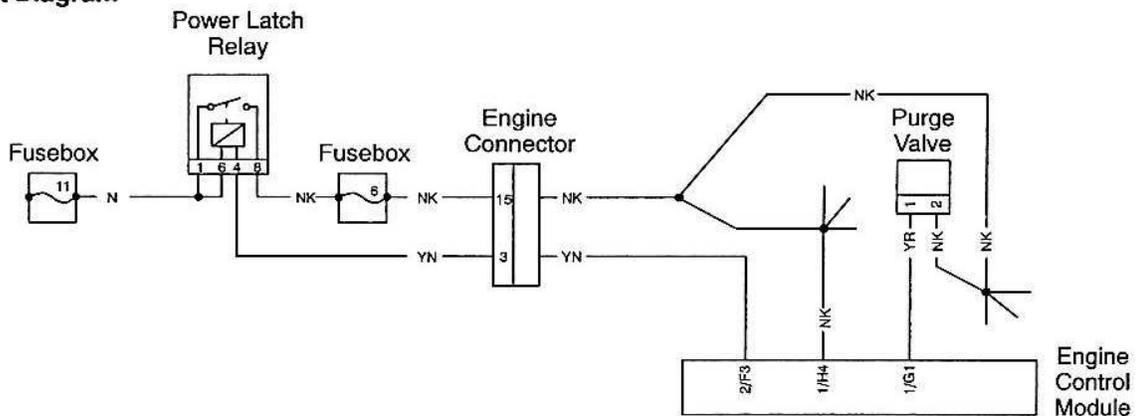
PURGE VALVE - MC 1000 ECM ONLY, ON BOTH MODELS

Fault Code	Possible cause	Action
P0443	Purge valve system fault	View & note diagnostic tool 'sensor' data. Ensure purge valve connector is secure. Disconnect ECM and proceed to pinpoint test 1
P0444	Open circuit or short circuit to earth	
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 1/G1	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 7
2 Check resistance value: - ECM pin 1/H4 to ECM pin 1/G1	26Ω	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 1/G1 to earth	OK	Proceed to test 7
	Short circuit	Locate and rectify wiring fault, proceed to test 7
4 Check cable continuity: - ECM pin 1/G1 to valve pin 1 - ECM pin 1/H4 to valve pin 2	OK	Proceed to test 6
	Open circuit	Locate and rectify wiring fault, proceed to test 7
5 Check cable for short circuit: - ECM pin 1/H4 to ECM pin 1/G1	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	26Ω	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



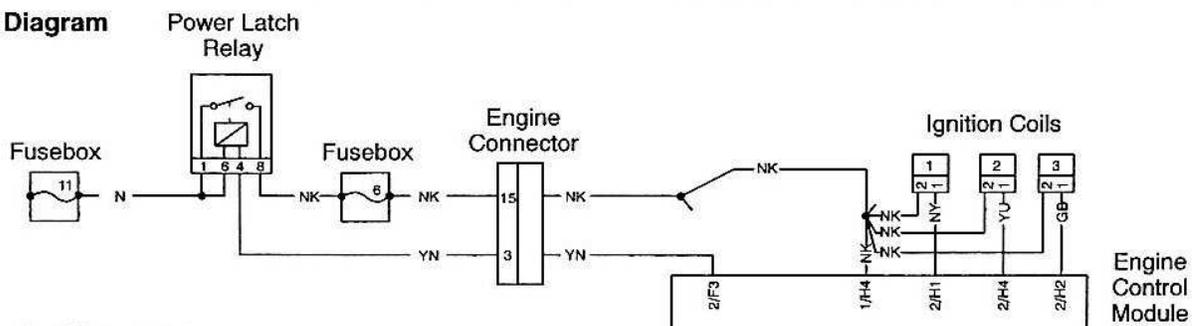
IGNITION COILS - MC 1000 ECM ONLY, ON BOTH MODELS

Fault Code	Possible cause	Action
P0351/52/53	Ignition system fault - Ign coil 1/2/3	View & note diagnostic tool 'freeze frame' data if available. Ensure relevant ign coil connector is secure. Disconnect ECM and proceed to pinpoint test 1:-
P1351/52/53	Open or short circuit - Ign coil 1/2/3	
P1355/56/57	Short circuit to battery+ - Ign coil 1/2/3	disconnect relevant ign coil and proceed to pinpoint test 5

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 2/H1 - ECM pin 2/H2 - ECM pin 2/H4	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 7
2 Check resistance value: Power latch relay pin 8 to - ECM pin 2/H1 (ign coil 1) - ECM pin 2/H4 (ign coil 2) - ECM pin 2/H2 (ign coil 3)	0.8Ω	Disconnect relevant ign coil and proceed to test 3
	Open circuit	Proceed to test 4
	Short circuit	Disconnect relevant ign coil and proceed to test 5
3 Check cable for short circuit: - ECM pin 2/H1 to earth - ECM pin 2/H2 to earth - ECM pin 2/H4 to earth	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 2/H1 to ign coil 1 pin 1 - ECM pin 2/H4 to ign coil 2 pin 1 - ECM pin 2/H2 to ign coil 3 pin 1	OK	Proceed to test 6
	Open circuit	Locate and rectify wiring fault, proceed to test 7
5 Check cable for short circuit: - Power latch relay pin 8 to - ECM pin 2/H1 (ign coil 1) - ECM pin 2/H4 (ign coil 2) - ECM pin 2/H2 (ign coil 3)	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	0.8Ω	Proceed to test 7
	Faulty	Renew relevant ign 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 - MC 1000 ECM ONLY ON BOTH MODELS

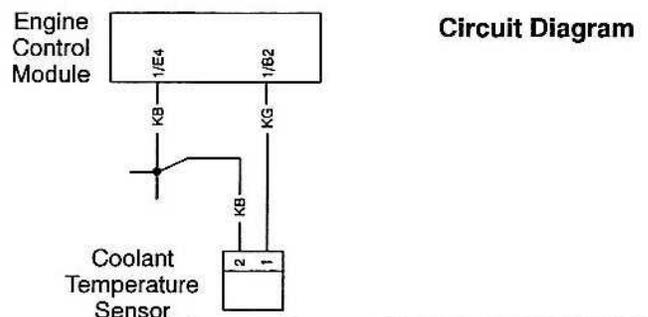
Fault Code	Possible cause	Action
P0115	Coolant temperature system fault	View & note diagnostic tool 'freeze frame' data if available. View & note diagnostic tool 'sensor' data. Ensure sensor connector is secure. Disconnect ECM and proceed to pinpoint test 1:-
P0117	Open circuit, or short circuit to battery+	
P0118	Short circuit to earth	disconnect sensor and proceed to test 6
P0119	Voltage signal too high	proceed to pinpoint test 4

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 1/E4 - ECM pin 1/B2	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 7
2 Check resistance value: - ECM pin 1/E4 to ECM pin 1/B2 (Temperature dependent - see data below)	OK	Disconnect temp sensor and proceed to test 6
	Open circuit	Proceed to test 3
	Short circuit	Disconnect temp sensor and proceed to test 4
3 Check cable continuity: - ECM pin 1/B2 to sensor pin 1 - ECM pin 1/E4 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 1/B2 to ECM pin 1/E4	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 data 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 earth	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:
- 20°C ambient 2.35 to 2.65KΩ.
- 10°C ambient 3.60 to 4.00KΩ.
- 0°C ambient 5.60 to 6.25KΩ



INLET AIR TEMPERATURE SENSOR - MC 1000 ECM ONLY ON BOTH MODELS

Fault Code	Possible cause	Action
P0110	Inlet air temperature system 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:-
P0113	Open circuit, or short circuit to battery+	disconnect sensor and proceed to pinpoint test 6
P0112	Short circuit to earth	

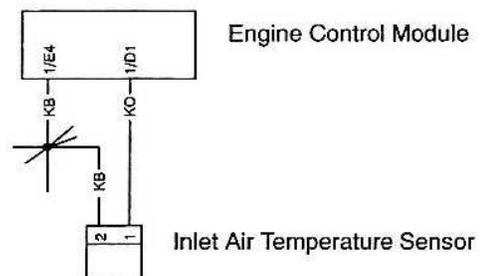
Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 1/D1 - ECM pin 1/E4	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 7
2 Check resistance value: - ECM pin 1/D1 to ECM pin 1/E4 (Temperature dependent - see data below)	OK	Disconnect temp sensor and proceed to test 6
	Open circuit	Proceed to test 3
	Short circuit	Disconnect temp sensor and proceed to test 4
3 Check cable continuity: - ECM pin 1/D1 to sensor pin 1 - ECM pin 1/E4 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 1/D1 to ECM pin 1/E4	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 data below)	OK	Proceed to test 7
	Faulty	Renew temp sensor, proceed to test 7
6 Check cable for short circuit: - ECM pin 1/D1 to earth	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.

Ambient temp Resistance value

30°C	1.6 to 1.8KΩ
25°C	1.9 to 2.2KΩ
20°C	2.3 to 2.7KΩ
15°C	2.9 to 3.3KΩ
10°C	3.5 to 4.0KΩ
5°C	4.4 to 4.9KΩ
0°C	5.5 to 6.1KΩ

Circuit Diagram



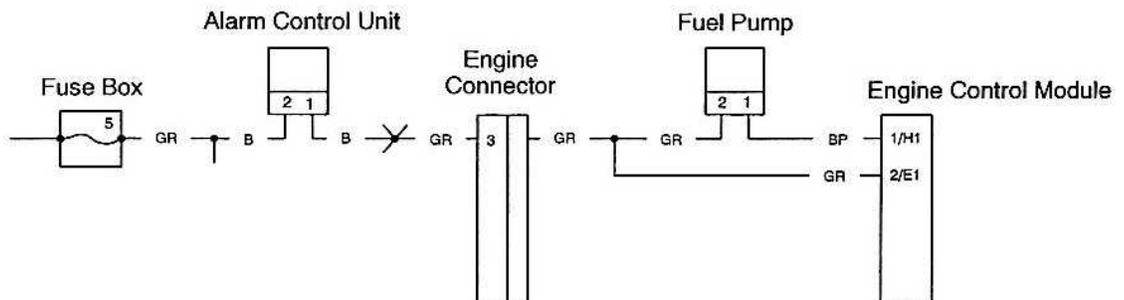
FUEL PUMP - MC 1000 ECM ONLY ON BOTH MODELS

Fault Code	Possible cause	Action
P0230	Fuel pump system fault	Check if pump runs briefly when ignition is switched on. Ensure fuel pump connector is secure. Disconnect ECM and proceed to pinpoint test 1:-
P1231	Open circuit, or short circuit to earth	
P1232	Short circuit to battery+	Disconnect fuel pump and proceed to pinpoint test 4

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 1/H1	OK	Disconnect fuel pump and proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable for short circuit: - ECM pin 1/H1 to earth	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 5
3 Check cable continuity: - ECM pin 1/H1 to fuel pump pin 1 - Fuel pump pin 2 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 1/H1 to ECM pin 2/E1	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



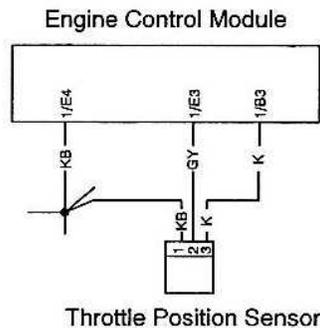
SENSOR SUPPLY VOLTAGE - MC 1000 ECM ONLY ON BOTH MODELS

Fault Code	Possible cause	Action
P1560	Engine control module / wiring fault	View & note diagnostic tool 'sensor' data. Disconnect ECM and proceed to pinpoint test 1

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 1/B3	OK	Disconnect throttle position sensor and proceed to test 2.
	Faulty	Rectify fault, proceed to test 4
2 Check for short circuit: - ECM pin 1/B3 to ECM pin 1/E4	OK	Reconnect ECM, proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 4
3 With ignition 'on', check voltage at throttle position sensor pin 3.	4.5 to 5.5v	Proceed to test 4
	Faulty	Check for wiring fault between ECM and sensor, if wiring is OK, renew ECM, proceed to test 4
4 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



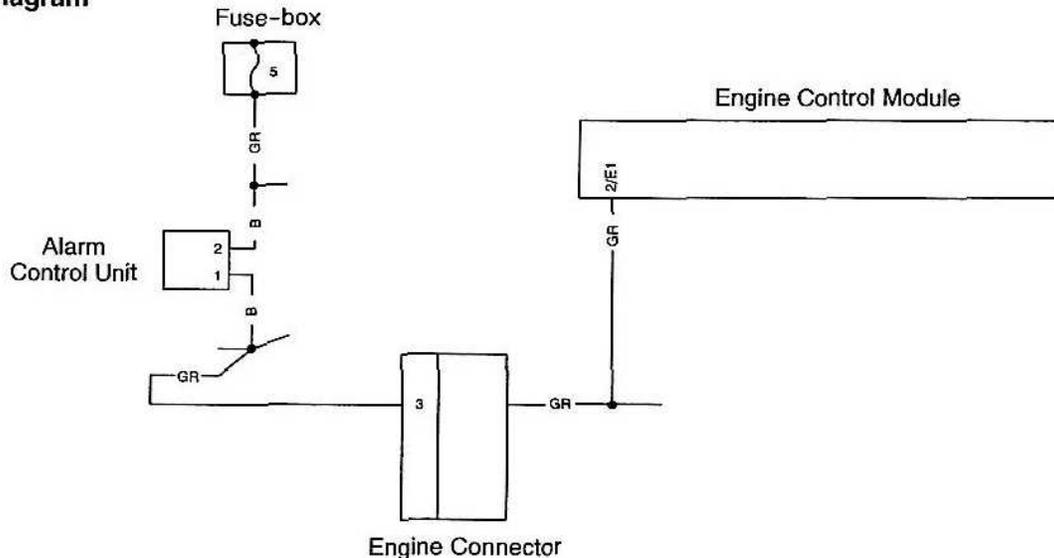
SYSTEM VOLTAGE - MC 1000 ECM ONLY ON BOTH MODELS

Fault Code	Possible cause	Action
P0560	Bike voltage system fault	View & note diagnostic tool 'sensor' data. Ensure voltage across battery is acceptable, note voltage.
P0562	Wiring / alternator / battery fault - low voltage	Disconnect ECM and proceed to pinpoint test 1
P0563	Alternator fault - high voltage	Ensure alternator output voltage is acceptable, note voltage.

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 2/E1	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 3
2 With Ignition 'on', check voltage at: - ECM pin 2/E1	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



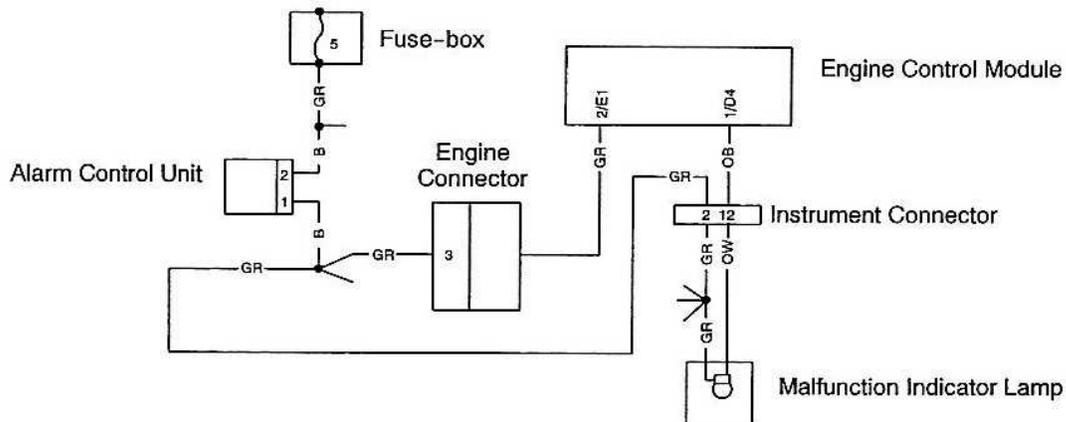
MALFUNCTION INDICATION LAMP - MC 1000 ECM ON ST MODEL ONLY

Fault Code	Possible cause	Action
P1600	MIL system fault	Ensure warning lamp connector is secure and bulb is operational - renew if faulty. Disconnect ECM and proceed to pinpoint test 1:-
P1601	Open circuit, or short circuit to earth	
P1602	Short circuit to battery+	Disconnect instrument connector, remove bulb and proceed to test 4

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 1/D4	OK	Disconnect instrument connector and proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable for short circuit: - ECM pin 1/D4 to earth	OK	Remove bulb and proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 5
3 Check cable continuity: - Instrument plug pin 12 to ECM pin 1/D4 - Instrument plug pin 2 to alarm pin 1 (GR) - Instrument plug pin 2 to bulb holder (OW)	OK	Proceed to test 4
	Open circuit	Locate and rectify wiring fault, proceed to test 5
4 Check for short circuit: - ECM pin 1/D4 to ECM pin 2/E1 - Instrument plug pin 2 to instrument plug pin 12	OK	Proceed to test 5
	Short circuit	Locate and rectify wiring fault, proceed to test 5
5 Reconnect harness, refit bulb, clear fault code and switch ignition 'on' to verify fault cleared	OK	Action complete - quit test
	Fault still present	Contact Triumph service

Circuit Diagram



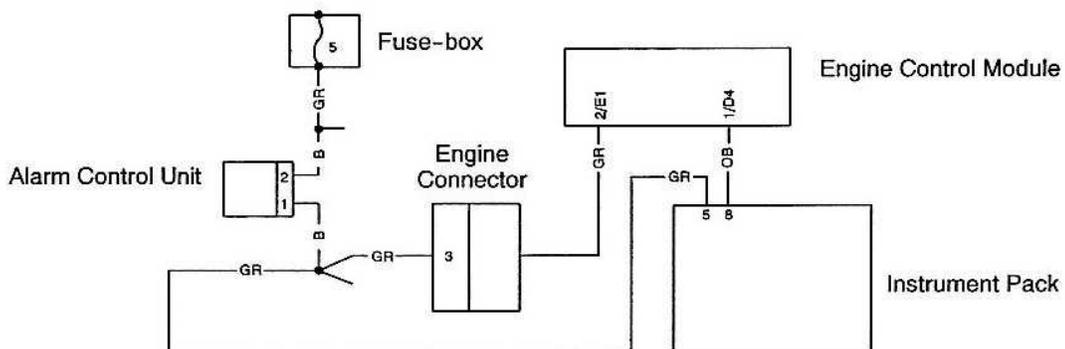
MALFUNCTION INDICATION LAMP - MC 1000 ECM ON RS MODEL ONLY

Fault Code	Possible cause	Action
P1600	MIL system fault	Ensure instrument connector is secure and bulb is operational - renew if faulty. Disconnect ECM and proceed to pinpoint test 1:-
P1601	Open circuit, or short circuit to earth	
P1602	Short circuit to battery+	Disconnect instrument connector and proceed to test 4

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 1/D4	OK	Disconnect instrument connector and proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable for short circuit: - ECM pin 1/D4 to earth	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 5
3 Check cable continuity: - Instrument plug pin 8 to ECM pin 1/D4 - Instrument plug pin 5 to alarm pin 1	OK	Proceed to test 4
	Open circuit	Locate and rectify wiring fault, proceed to test 5
4 Check for short circuit: - ECM pin 1/D4 to ECM pin 2/E1	OK	Proceed to test 5
	Short circuit	Locate and rectify wiring fault, proceed to test 5
5 Reconnect harness clear fault code and switch ignition 'on' to verify fault cleared	OK	Action complete - quit test
	Fault still present	Contact Triumph service

Circuit Diagram



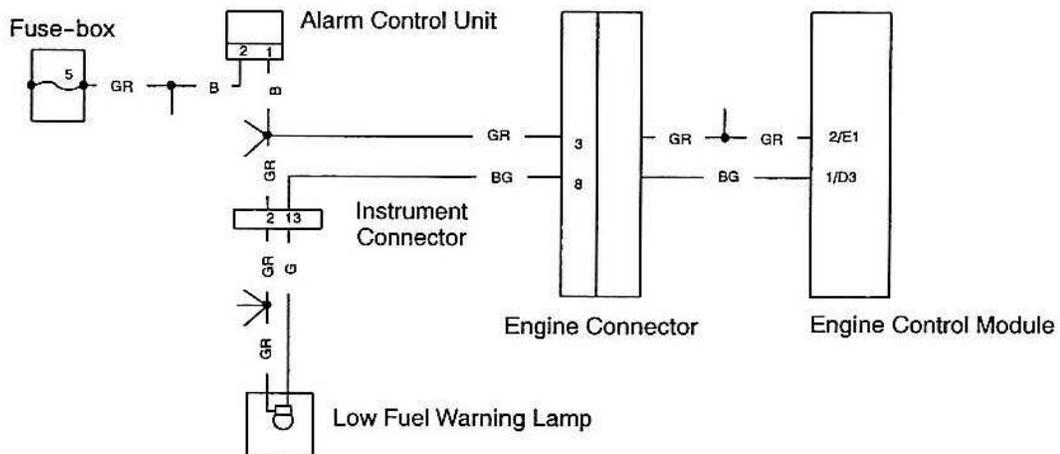
LOW FUEL LEVEL WARNING LAMP - MC 1000 ECM ON ST MODEL ONLY

Fault Code	Possible cause	Action
P1610	Low fuel warning lamp - system fault	Ensure warning lamp connector is secure and bulb is operational - renew if faulty. Disconnect ECM and proceed to pinpoint test 1:-
P1611	Open circuit, or short circuit to earth	
P1612	Short circuit to battery+	Disconnect instrument connector, remove bulb and proceed to test 4

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 1/D3	OK	Disconnect instrument connector and proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable for short circuit: - ECM pin 1/D3 to earth	OK	Remove bulb and proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 5
3 Check cable continuity: - Instrument plug pin 13 to ECM pin 1/D3 - Instrument plug pin 2 to alarm pin 1 - instrument plug pin 2 to bulb holder (GR) - instrument plug pin 12 to bulb holder (G)	OK	Proceed to test 4
	Open circuit	Locate and rectify wiring fault, proceed to test 5
4 Check for short circuit: - ECM pin 1/D3 to ECM pin 2/E1 - Instrument plug pin 2 to instrument plug pin 13	OK	Proceed to test 5
	Short circuit	Locate and rectify wiring fault, proceed to test 5
5 Reconnect harness, refit bulb, clear fault code and switch ignition 'on' to verify fault cleared	OK	Action complete - quit test
	Fault still present	Contact Triumph service

Circuit Diagram



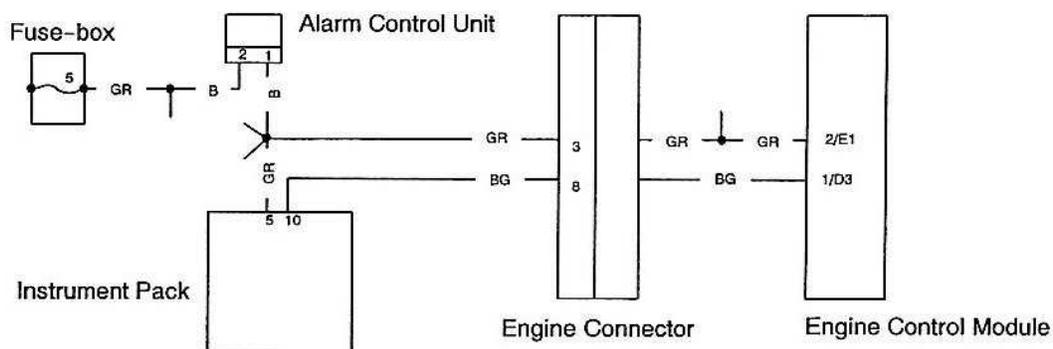
LOW FUEL LEVEL WARNING LAMP - MC 1000 ECM ON RS MODEL ONLY

Fault Code	Possible cause	Action
P1610	Low fuel warning lamp - system fault	Ensure instrument connector is secure and bulb is operational - renew if faulty. Disconnect ECM and proceed to pinpoint test 1:-
P1611	Open circuit, or short circuit to earth	
P1612	Short circuit to battery+	Disconnect instrument connector and proceed to test 4

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 1/D3	OK	Disconnect instrument connector and proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable for short circuit: - ECM pin 1/D3 to earth	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 5
3 Check cable continuity: - Instrument pin 10 to ECM pin 1/D3 - Instrument pin 5 to alarm pin 1	OK	Proceed to test 4
	Open circuit	Locate and rectify wiring fault, proceed to test 5
4 Check for short circuit: - ECM pin 1/D3 to ECM pin 2/E1 - Instrument pin 5 to instrument pin 1	OK	Proceed to test 5
	Short circuit	Locate and rectify wiring fault, proceed to test 5
5 Reconnect harness, refit bulb, clear fault code and switch ignition 'on' to verify fault cleared	OK	Action complete - quit test
	Fault still present	Contact Triumph service

Circuit Diagram



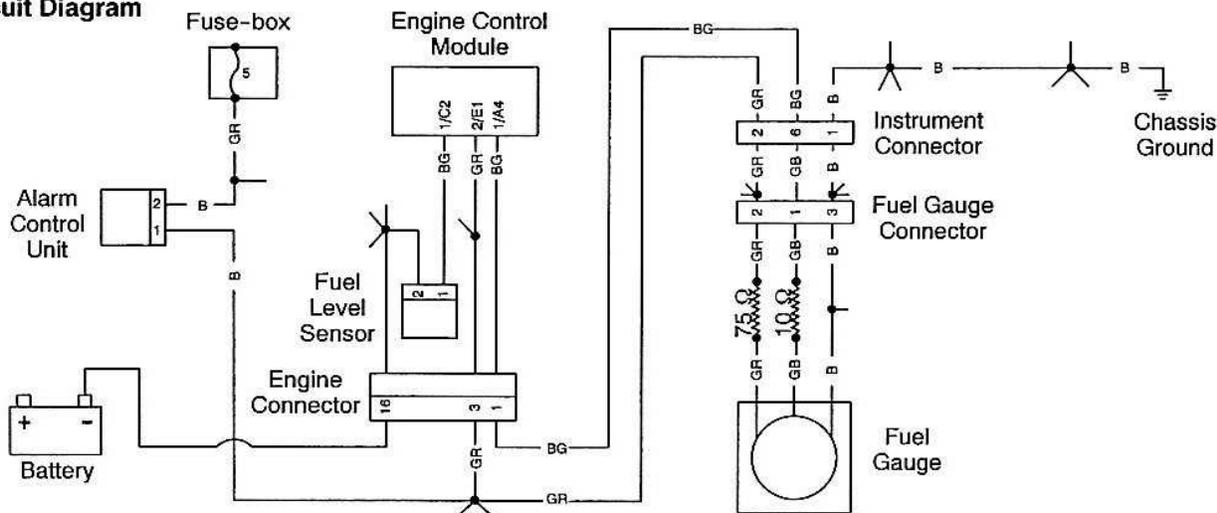
FUEL GAUGE - MC 1000 ECM ON ST MODEL ONLY

Fault Code	Possible cause	Action
P1620	Fuel gauge system fault	View & note 'freeze frame' data if available. View & note 'sensor' data. Ensure fuel gauge connector is secure. Disconnect ECM and proceed to pinpoint test 1:-
P1621	Open circuit, or short circuit to earth	
P1622	Short circuit to battery+	Disconnect fuel gauge and proceed to pinpoint test 4

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 1/A4	OK	Disconnect fuel gauge and proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable for short circuit: - ECM pin 1/A4 to earth	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 5
3 Check cable continuity: - ECM pin 1/A4 to fuel gauge pin 1 - Fuel gauge pin 3 to earth - Fuel gauge pin 2 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 1/A4 to ECM pin 2/E1	OK	Renew fuel gauge, 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 fuel gauge	OK	Action complete - quit test
	Fault still present	Contact Triumph service

Circuit Diagram



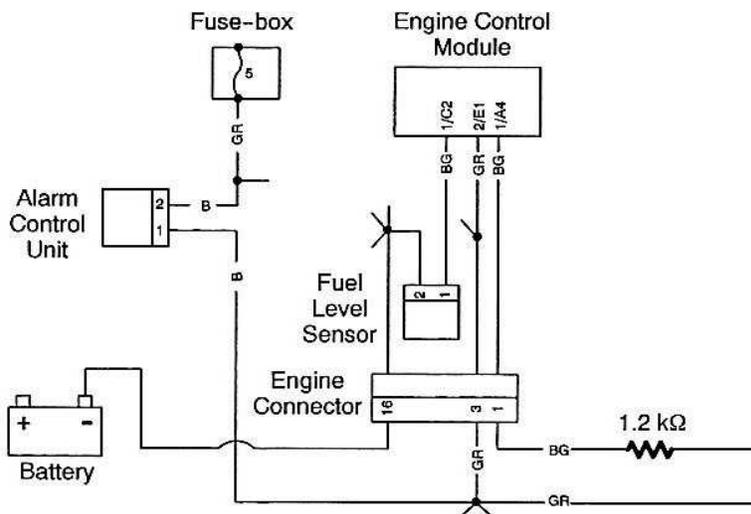
DUMMY FUEL GAUGE - MC 1000 ECM ON RS MODEL ONLY

Fault Code	Possible cause	Action
P1620	Fuel gauge system fault	View & note 'freeze frame' data if available. View & note 'sensor' data. Ensure fuel gauge connector is secure. Disconnect ECM and proceed to pinpoint test 1:-
P1621	Open circuit, or short circuit to earth	
P1622	Short circuit to battery+	Disconnect fuel gauge and proceed to pinpoint test 4

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 1/A4	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable for short circuit: - ECM pin 1/A4 to earth	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 5
3 Measure resistance ECM pin 1/A4 to alarm control unit pin 1	1.0 kΩ to 1.4 kΩ	Proceed to test 4
	Open circuit	Renew main harness, proceed to test 5
4 Check cable for short circuit: ECM pin 1/A4 to ECM pin 2/E1	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 gauge test to visually verify operation of fuel gauge	OK	Action complete - quit test
	Fault still present	Contact Triumph service

Circuit Diagram



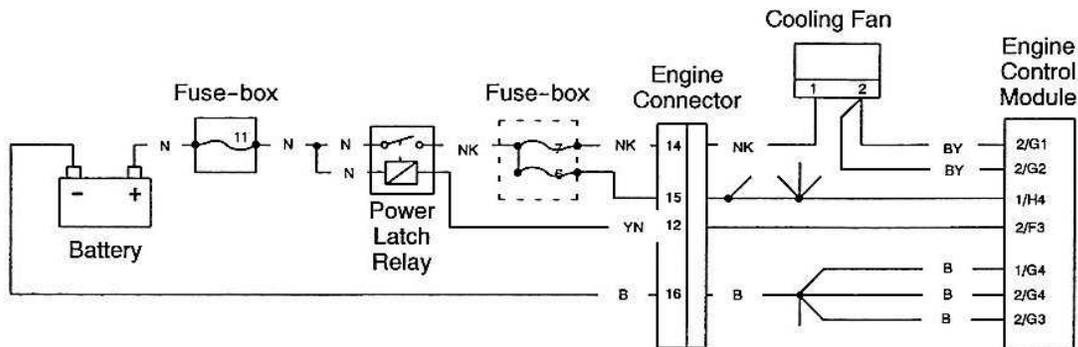
COOLING FAN - MC 1000 ECM ONLY ON BOTH MODELS

Fault Code	Possible cause	Action
P1551	Cooling fan system fault	View & note diagnostic tool 'sensor' data. Ensure fan connector is secure. Disconnect ECM and proceed to pinpoint test1:-
P1552	Open circuit, or short circuit to earth	
P1553	Short circuit to battery+	Disconnect fan and proceed to pinpoint test 4

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 2/G1 - ECM pin 2/G2	OK	Disconnect fan and proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable for short circuit: - ECM pin 2/G1 to earth - ECM pin 2/G2 to earth	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 5
3 Check cable continuity: - Fan pin 2 to ECM pin 2/G1 & 2/G2 - Fan pin 1 to power latch 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 1/H4 to ECM pin 2/G1 & 2/G2	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



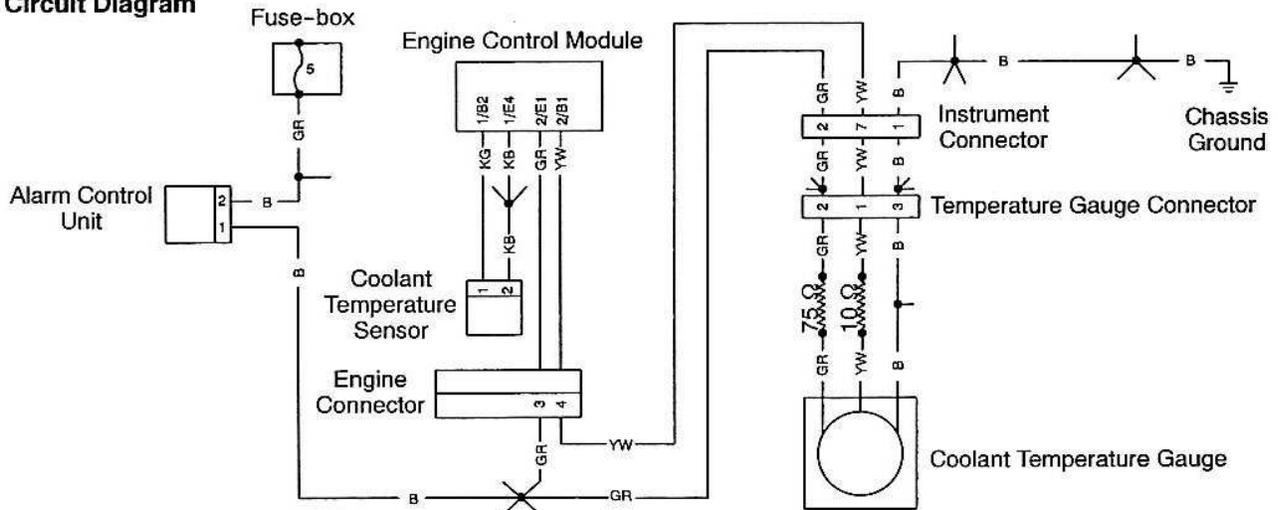
COOLANT TEMPERATURE GAUGE - MC 1000 ECM ON ST MODEL ONLY

Fault Code	Possible cause	Action
P1115	Temperature gauge system fault	View & note 'freeze frame' data if available. View & note 'sensor' data. Ensure temp gauge connector is secure. Disconnect ECM and proceed to pinpoint test 1:-
P1116	Open circuit, or short circuit to earth	
P1117	Short circuit to battery+	Disconnect temp gauge and proceed to pinpoint test 5

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 2/B1	OK	Disconnect temp gauge and proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable for short circuit: - ECM pin 2/B1 to earth	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 5
3 Check cable continuity: - Temp. gauge pin 1 to ECM pin 2/B1 - Temp gauge pin 3 to earth - Temp gauge pin 2 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 2/B1 to ECM pin 2/E1	OK	Renew temp gauge, 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 temp gauge	OK	Action complete - quit test
	Fault still present	Contact Triumph service

Circuit Diagram



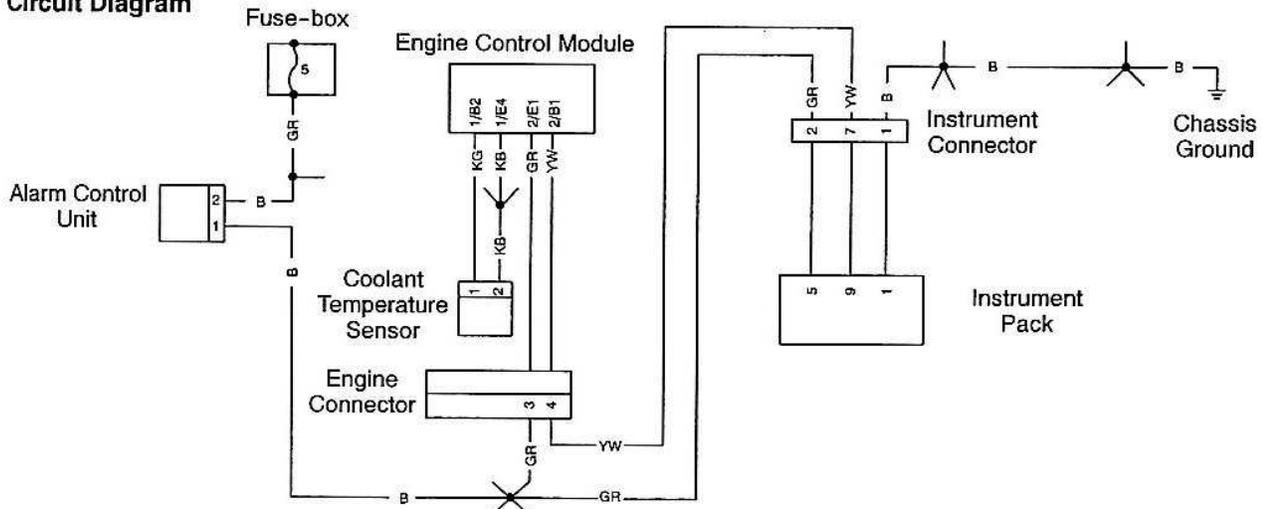
COOLANT TEMPERATURE GAUGE - MC 1000 ECM ON RS MODEL ONLY

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:-
P1116	Open circuit, or short circuit to earth	
P1117	Short circuit to battery+	Disconnect instruments and proceed to pinpoint test 5

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 2/B1	OK	Disconnect instruments and proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable for short circuit: - ECM pin 2/B1 to earth	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 2/B1 - Instrument pin 1 to earth - 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 2/B1 to ECM pin 2/E1	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



LAMBDA SENSOR - MC 1000 ECM ONLY ON BOTH MODELS

Fault Code	Possible Cause	Action
P0131	Open Circuit or Short Circuit to Battery. Poor electrical contact between exhaust and ECM ground.	View and note freeze frame data. Ensure Lambda sensor connector is secure. Disconnect ECM and proceed to pinpoint test 1.
P0132	Open Circuit or Short Circuit to Battery.	Proceed to pinpoint test 1.
P1133	Faulty Lambda Sensor	Replace Lambda Sensor
P0135	Open Circuit or Short circuit	Proceed to test 7

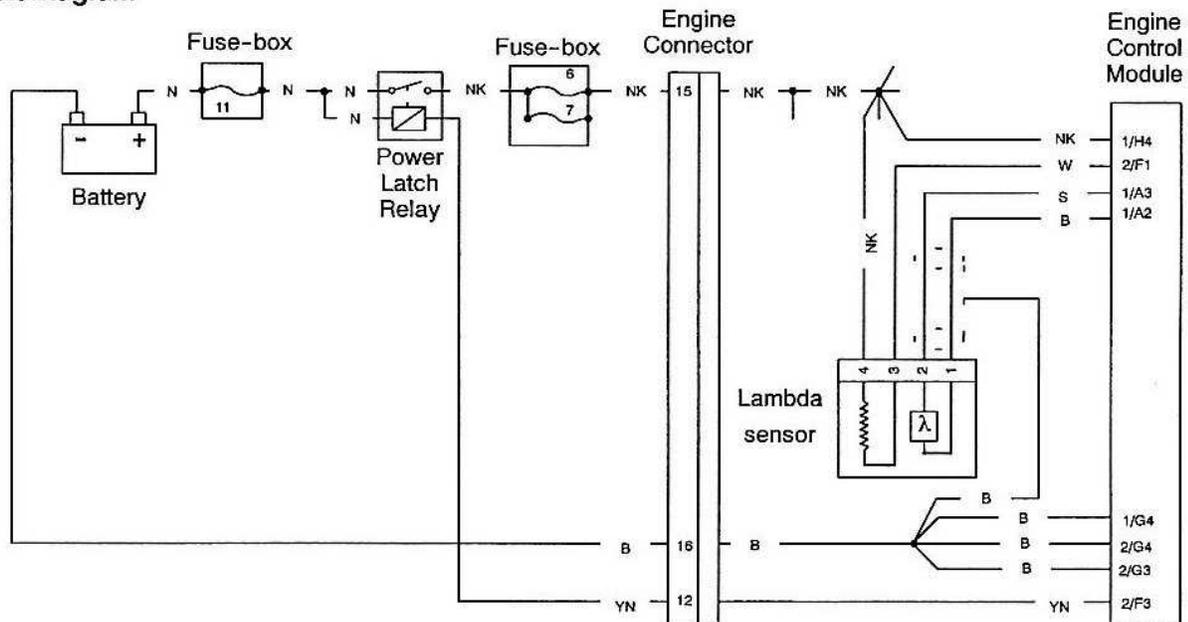
Pinpoint Tests

Test	Result	Action
3. Check cable and terminal integrity - ECM Pin 1/A2 - ECM Pin 1/A3	OK	Disconnect Sensor and proceed to test 2.
	Faulty	Rectify Fault and proceed to test 11.
4. Check cable continuity - ECM Pin 1/A2 to Sensor Pin 1 - ECM Pin 1/A3 to Sensor Pin 2	OK	Proceed to test 3.
	Faulty	Locate and rectify wiring fault. Proceed to test 11.
3. Check for short circuit to ground. - ECM Pin 1/A2 - ECM Pin 1/A3	OK	Proceed to test 4.
	Faulty	Locate and rectify fault. Proceed to test 11.
4. Check for short circuit to battery. - ECM Pin 1/A2 - ECM Pin 1/A3	OK	Proceed to test 5
	Faulty	Locate and rectify fault. Proceed to test 11.
5. Check continuity between sensor boss and battery negative terminal.	OK	Replace Lambda Sensor and proceed to test 11.
	Faulty	Locate and rectify fault and proceed to test 11.
6. Check cable and terminal integrity.	OK	Disconnect sensor and proceed to test 7.
	Faulty	Rectify and proceed to test 11.
7. Check cable continuity. - ECM Pin 2/F1 to Sensor Pin 3 - Power latch relay Pin 8 to Sensor Pin 4	OK	Proceed to test 8.
	Faulty	Rectify wiring fault and proceed to test 11.
8. Check for short circuit to ground. - ECM Pin 2/F1	OK	Proceed to test 9.
	Faulty	Rectify wiring fault and proceed to test 11.

Pinpoint Tests(continued)

Test	Result	Action
9. Check for short circuit to battery - ECM Pin 2/F1	OK	Proceed to test 10.
	Faulty	Rectify wiring fault and proceed to test 11.
10. Check resistance of Lambda sensor heater - Sensor pin 3 to sensor pin 4	4Ω to 8Ω	Proceed to test 11.
	Faulty	Replace Lambda Sensor and proceed to test 11.
11. Reconnect harness, clear fault code and switch ignition key 'ON' to verify fault cleared.	OK	Action complete – Quit test.
	Fault still present	Contact Triumph Service

Circuit Diagram



LAMBDA SENSOR - MC 1000 ECM ONLY ON BOTH MODELS (Short Term Feedback)

Fault Code	Possible Cause	Action
P0170	Fault Code P1171 or P1172 will be present.	View and note freeze frame data. Ensure sensor connector is secure.
P1171	Wiring fault, Air leak, low fuel pressure, faulty purge system, faulty sensor.	Disconnect ECM connector and proceed to test 1.
P1172	Wiring fault, high fuel pressure, faulty purge system, faulty sensor.	Disconnect ECM connector and proceed to test 1.

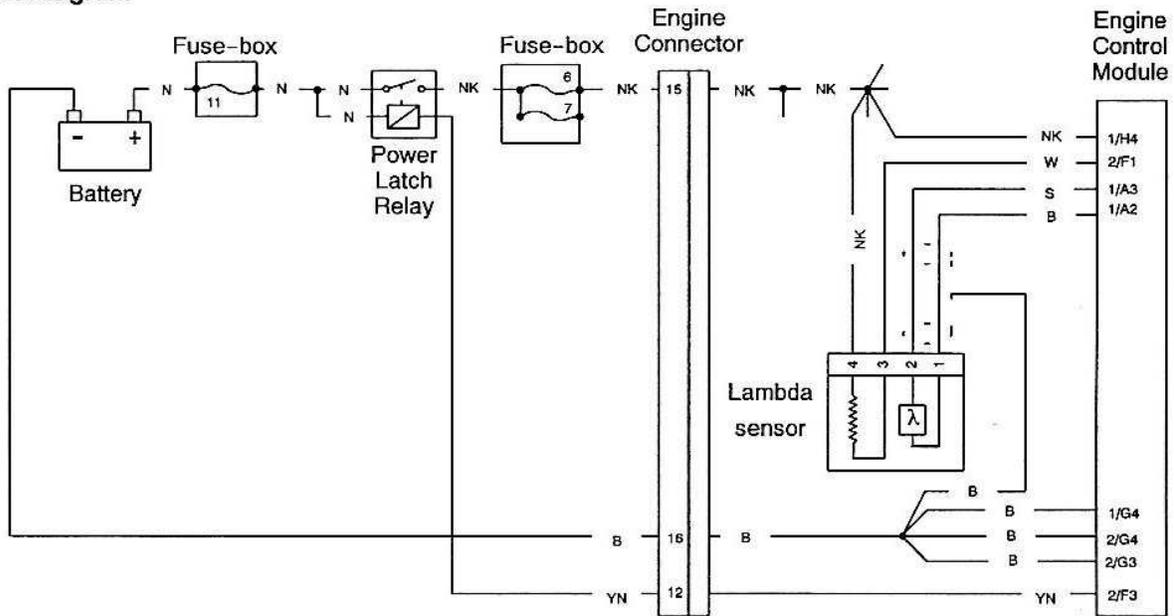
Pinpoint Tests

Test	Result	Action
3. Check cable and terminal integrity. - ECM Pin 1/A2 - ECM Pin 1/A3	OK	Disconnect Sensor and proceed to test 2.
	Faulty	Rectify Fault and proceed to test 10.
4. Check cable continuity - ECM Pin 1/A2 to Sensor Pin 1 - ECM Pin 1/A3 to Sensor Pin 2	OK	Disconnect Sensor and proceed to test 3.
	Faulty	Locate and rectify wiring fault. Proceed to test 10.
3. Check for short circuit to ground. - ECM Pin 1/A2 - ECM Pin 1/A3	OK	Proceed to test 4.
	1.Faulty	Locate and rectify fault. Proceed to test 10.
4. Check for short circuit to battery. - ECM Pin 1/A2 - ECM Pin 1/A3	-OK	Proceed to test 5
	Faulty	Locate and rectify fault. Proceed to test 10.
5. Check continuity between sensor boss and battery negative terminal.	OK	Proceed to test 6.
	Faulty	Locate and rectify fault and proceed to test 10.
6. Check for air leaks into the intake system	OK	Proceed to test 7.
	Faulty	Rectify air leak and proceed to test 10.
7. Check fuel rail pressure.	OK	Proceed to test 8.
	Faulty	Rectify and proceed to test 10.
8. Check integrity of purge system pipes, valve and canister.	OK	Proceed to test 9
	Faulty	Rectify and proceed to test 10.

Pinpoint Tests(continued)

Test	Result	Action
9. Check purge valve is not stuck open.	OK	Replace Lambda Sensor and proceed to test 10
	Faulty	Replace purge valve and proceed to test 10
10. Reconnect harness, clear fault code and switch ignition key 'ON' to verify fault cleared.	OK	Action complete – Quit test.
	Fault still present	Contact Triumph Service

Circuit Diagram



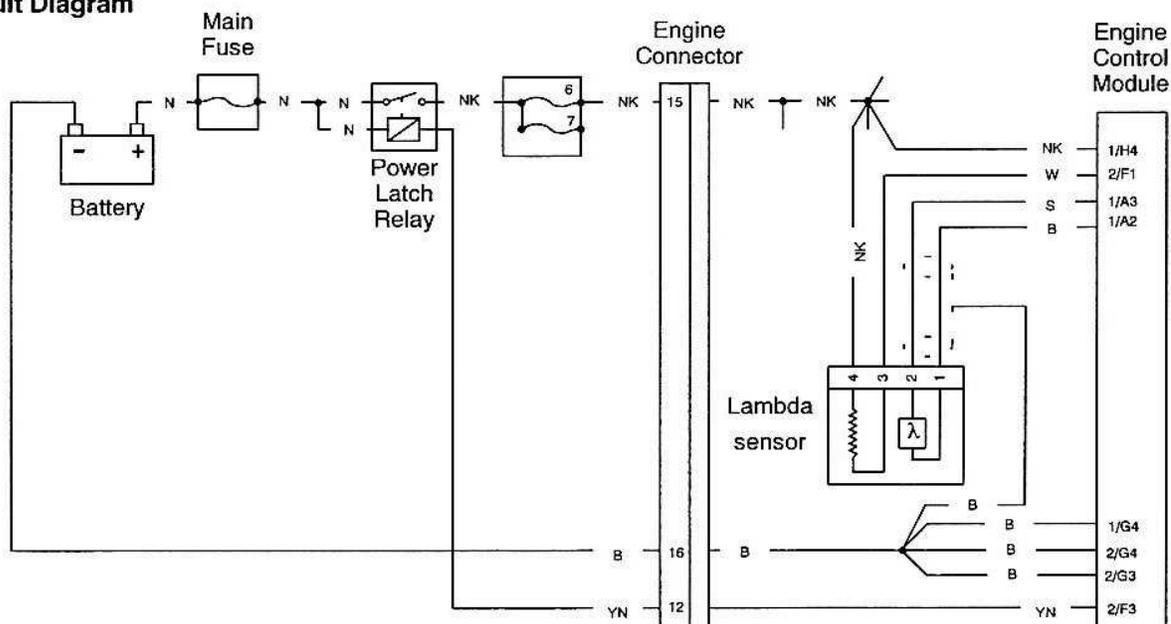
LAMBDA SENSOR - MC 1000 ECM ONLY ON BOTH MODELS (Long Term Feedback)

Fault Code	Possible Cause	Action
P1178	Air Leak, Low fuel pressure, Faulty purge system, Poor throttle balance.	View and note freeze frame data. Proceed to test 1.
P1179	Blocked idle air control system, High fuel pressure, Faulty purge system	Proceed to test 2

Pinpoint Tests

Test	Result	Action
1. Check throttle balance	OK	Proceed to test 2
	Faulty	Reset and proceed to test 7.
2. Check idle air control system is not blocked.	OK	Proceed to test 3
3. Check for air leaks into the intake system	OK	Proceed to test 4.
	Faulty	Rectify air leak and proceed to test 7.
4. Check fuel rail pressure.	OK	Proceed to test 5.
5. Check integrity of purge system pipes, valve and canister.	OK	Proceed to test 6.
6. Check purge valve is not stuck open.	OK	Proceed to test 7
	Faulty	Replace purge valve and proceed to test 7.
7. Reconnect harness, clear fault code and switch ignition key 'ON' to verify fault cleared.	OK	Action complete – Quit test.
	Fault still present	Contact Triumph Service

Circuit Diagram



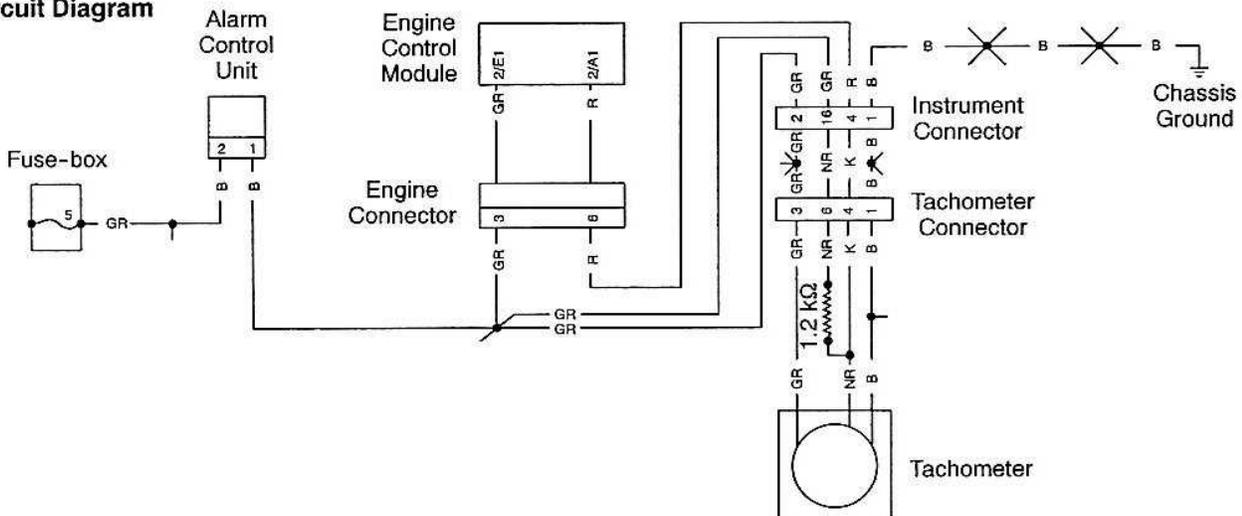
TACHOMETER - MC 1000 ECM ON ST MODEL ONLY

Fault Code	Possible cause	Action
P1385	Tachometer system fault	View & note 'freeze frame' data if available. View & note 'sensor' data. Ensure tachometer connector is secure. Disconnect ECM and proceed to pinpoint test 1:-
P1386	Open circuit, or short circuit to earth	Disconnect tachometer and proceed to pinpoint test 5
P1387	Short circuit to battery+	

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 2/A1	OK	Disconnect tachometer and proceed to test 2
	Faulty	Rectify fault, proceed to test 6
2 Check cable for short circuit: - ECM pin 2/A1 to earth	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 6
3 Check cable resistance: - ECM pin 2/A1 to ECM pin 1	1.1 to 1.3KΩ	Proceed to test 4
	Faulty	Renew in-line resistor, proceed to test 6
4 Check cable continuity: - Tachometer pin 4 to ECM pin 2/A1 - Tachometer pin 1 to earth - Tachometer pin 3 to alarm control unit pin1	OK	Proceed to test 5
	Open circuit	Locate and rectify wiring fault, proceed to test 6
5 Check cable for short circuit: - ECM pin 2/A1 to ECM pin 2/E1	OK	Renew tachometer, proceed to test 6
	Short circuit	Locate and rectify wiring fault, proceed to test 6
6 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



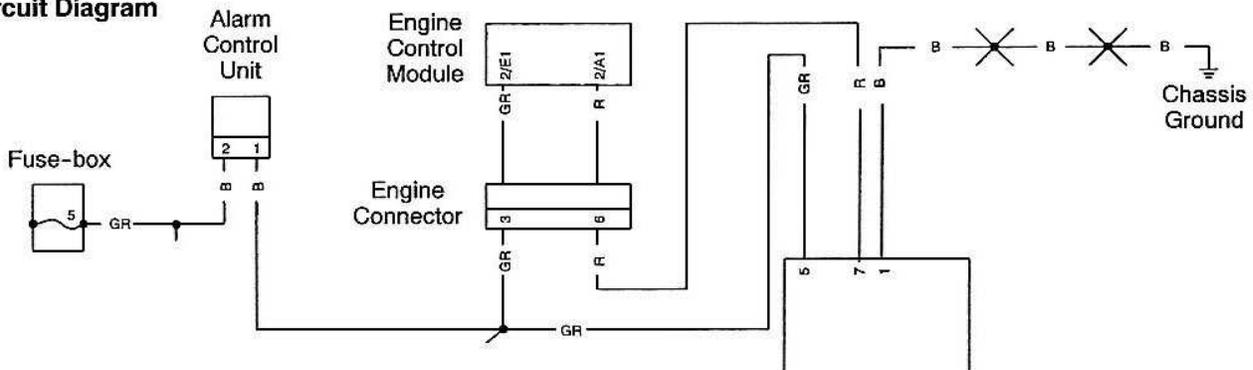
TACHOMETER - MC 1000 ECM ON RS MODEL ONLY

Fault Code	Possible cause	Action
P1385	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:-
P1386	Open circuit, or short circuit to earth	
P1387	Short circuit to battery+	
		Disconnect tachometer and proceed to pinpoint test 5

Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin 2/A1	OK	Disconnect instrument and proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable for short circuit: - ECM pin 2/A1 to earth	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 2/A1 - 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 2/A1 to ECM pin 2/E1	OK	Renew tachometer, 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



Fault Finding - Non Electrical

Symptom	Possible cause(s)
Poor throttle response at low RPM	Excessively low/high C.O. setting*
	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
	IACV (Idle Air Control Valve) inoperative
	Low fuel pressure caused by loose fuel pipes to the fuel pump and filter.
	Excessively low/high C.O. setting*
	Low fuel pressure
Poor response to C.O. adjustment when using the Actia Diagnostic Tool	Weak mixture caused by air leak at the throttle body gasket to cyl. head face
	Low fuel pressure caused by loose fuel pipes to the fuel pump and filter.
Rev limitation cutting in too early	Crankshaft sensor air gap too wide
Tick over too low/high	IACV (Idle Air Control Valve) 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	IACV Stepper Motor stuck
	One way valve inside pipe from throttle bodies to IACV (Idle Air Control Valve) sticking
Abnormally high fuel pressure	Fuel pressure regulator inoperative.
Temperature gauge reads cold	Cooling system air-locked resulting in coolant temperature sensor operating in air instead of coolant.

* Not applicable on closed loop catalyst models.

Fuel Delivery System

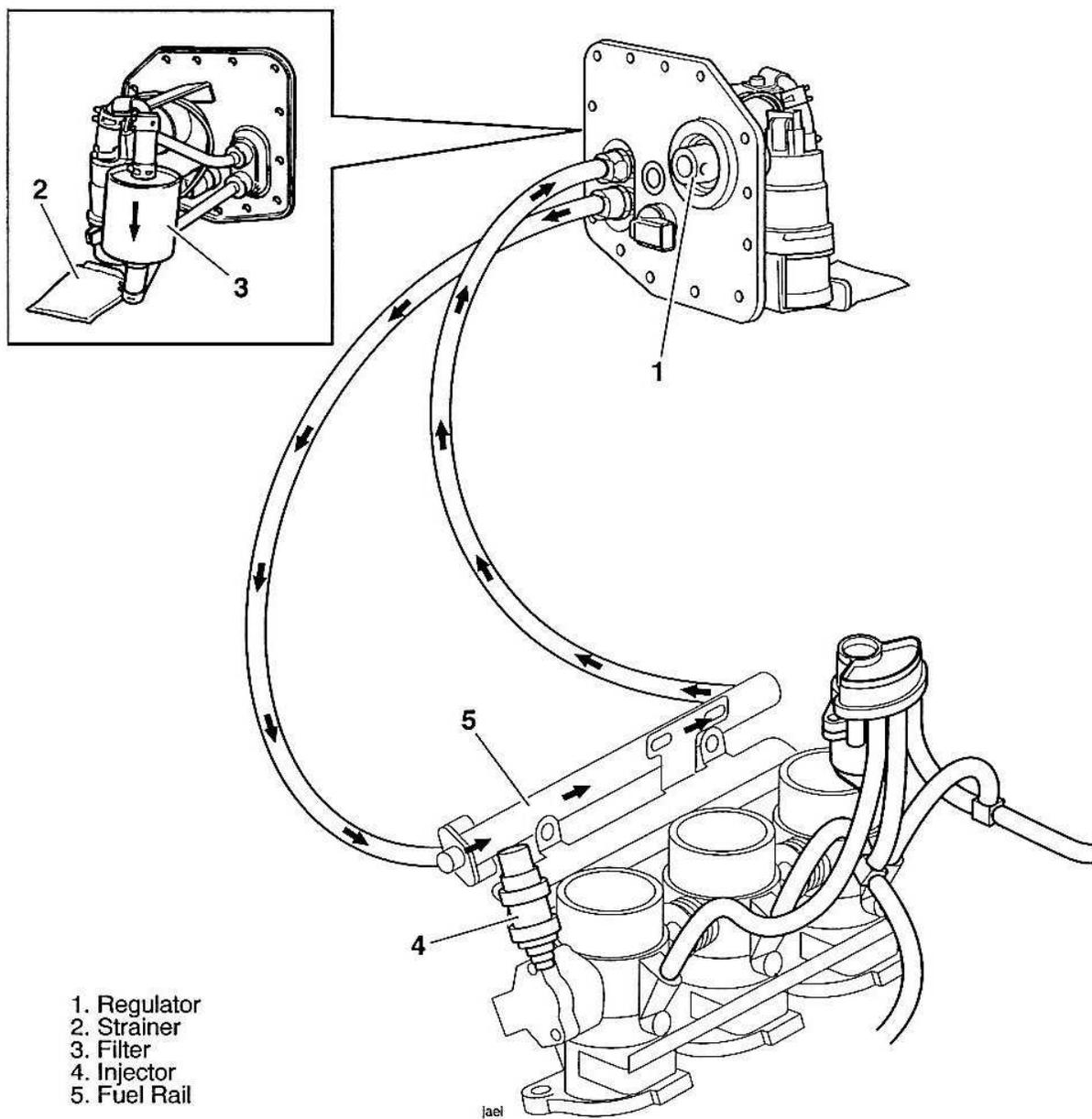
Fuel is delivered to the injectors by a fully submerged pump located inside the fuel tank. Fuel flows in the direction of the arrows shown in the diagram below.

Incorporated in the system is a filter, a pressure regulator and pick-up strainer.

CAUTION: Under no circumstances should the fuel pump be activated (by switching on the ignition) with either, or both, of the fuel hoses disconnected.

Although there is little risk of a fuel leak due to the use of dry-fit connectors, if the fuel pump is activated in this condition, the fuel pressure regulator is bypassed as the system is incomplete.

In this condition, unregulated fuel pressure can be delivered to the fuel filter and hoses which may lead to damage to the filter and detachment of the hoses inside the fuel tank. To ensure this does not happen, always disconnect the battery, negative (black) lead first, when working on the fuel system.



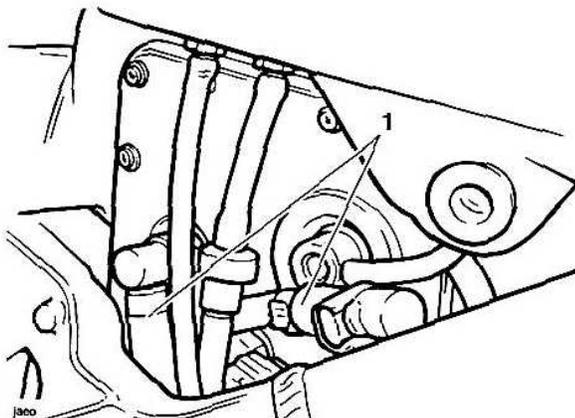
- 1. Regulator
- 2. Strainer
- 3. Filter
- 4. Injector
- 5. Fuel Rail

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 seat and disconnect the battery negative (black) lead first.
2. Remove the body side panels as described in the body section.
3. 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.

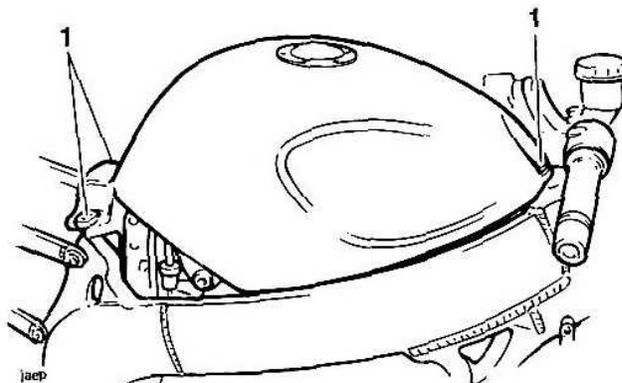


1. Fuel Hose Connectors

NOTE:

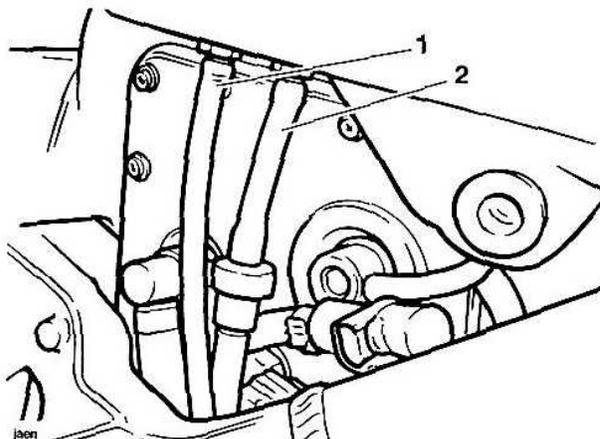
- When disconnected, the fuel hoses are self-sealing.
 - One hose connector is located a short distance into the fuel line itself.
4. Disconnect the vacuum hose leading to the fuel pressure regulator.

5. Release the bolts securing the fuel tank to the frame.



1. Fuel Tank to Frame Bolts

6. Disconnect the fuel tank drain hose and the connection to the roll-over valve from the right hand side of the tank.



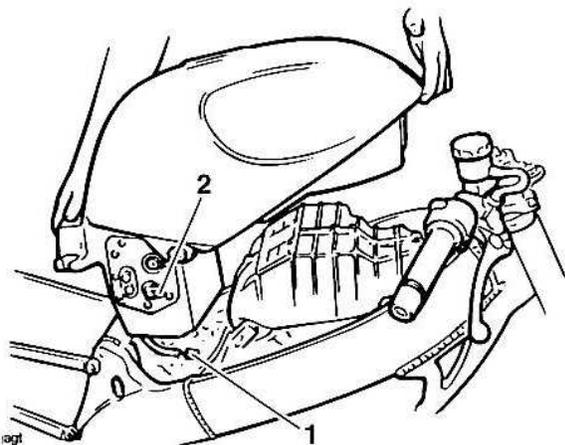
1. Drain Hose Connection

2. Roll-over Valve Connection

7. Raise the fuel tank and disconnect the electrical connections from the fuel pump and fuel level sensor.
8. Remove the tank from the frame.

Installation

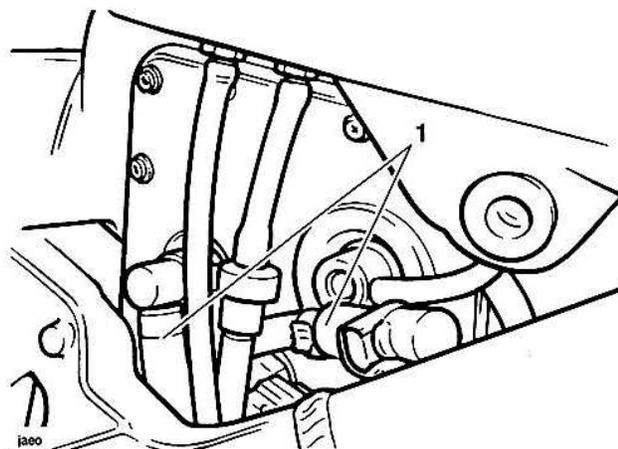
1. Position the fuel tank to the motorcycle frame and reconnect the electrical connections to the fuel pump and fuel level sensor.



1. Low Fuel Level Sensor Connection

2. Fuel Pump Connection

2. Reconnect the hoses to the fuel tank drain point and the roll-over valve connection point.
3. Align the fuel tank to the mounting points on the frame and tighten the mounting bolts to **5 Nm** and the front mounting bolt to **8 Nm**.
4. Reconnect the fuel feed and return hoses by inserting each hose into the corresponding socket and gently pushing inwards until the hoses engage.



1. Fuel Hoses

NOTE:

- When a fuel hose is correctly engaged, an audible 'click' will be heard.

5. Reconnect the hose leading to the fuel pressure regulator.
6. Refit the body side panels as described in the bodywork section.
7. Reconnect the battery, positive (red) lead first.
8. Start the engine and check carefully for fuel leaks. Rectify as necessary.
9. Refit the seat.

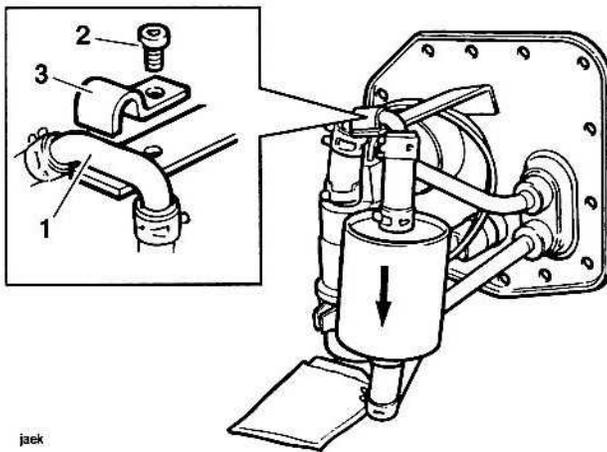
FUEL PUMP

Removal

1. Remove the seat and disconnect the battery negative (black) lead first.
2. Remove the fuel tank as described elsewhere in this section.
3. Drain the fuel tank into a suitable container.

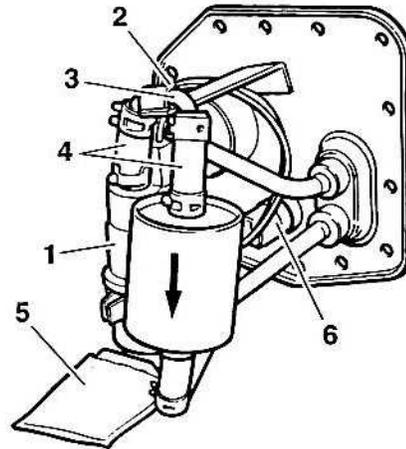
⚠ WARNING: Observe the warning advice given in the general information section on the safe handling of fuel and fuel containers. A fire, causing personal injury and damage to property, could result from spilled fuel or fuel not handled or stored correctly.

4. Release the ring of bolts securing the fuel pump mounting plate to the fuel tank.
5. Remove the mounting plate and discard the gasket.
6. Release the clamp bolt securing the fuel hose link pipe to the bracket. Collect the clamp.



1. Link Pipe
2. Retaining Bolt
3. Clamp

7. Release the clips securing the fuel hoses to the pump and filter. Remove the link pipe and hoses as an assembly.
8. Disconnect the fuel pump electrical connection at the pump.
9. Undo the fuel pump clamp screw and ease the pump from the bracket ensuring the gauze pick-up filter is not damaged during removal.
10. Collect the fuel pump support rubber.



1. Fuel Pump
2. Clamp Screw
3. Link Pipe
4. Fuel Hoses
5. Gauze Pick-up Filter
6. Fuel Pump Connection

Assembly

1. Locate the pump to the mounting bracket ensuring that the rubber support ring is in place at the base of the pump.
2. Tighten the fuel pump clamp screw to **4 Nm**.
3. Refit the fuel hoses and link pipe to the pump and filter and secure with the clips.
4. Refit the link pipe clamp and secure with the clamp bolt.
5. Reconnect the fuel pump cable.
6. Position a new gasket to the fuel tank opening and locate the pump mounting plate to the fuel tank. Tighten the mounting plate fixings to **6 Nm**.

⚠ CAUTION: Never overtighten the fuel pump mounting plate bolts as this will damage the threaded inserts in the fuel tank.

7. Refit the fuel tank as described elsewhere in this section.
8. Refill the fuel tank with the fuel drained earlier.
9. Reconnect the battery, positive (red) lead first.
10. Refit the seat.

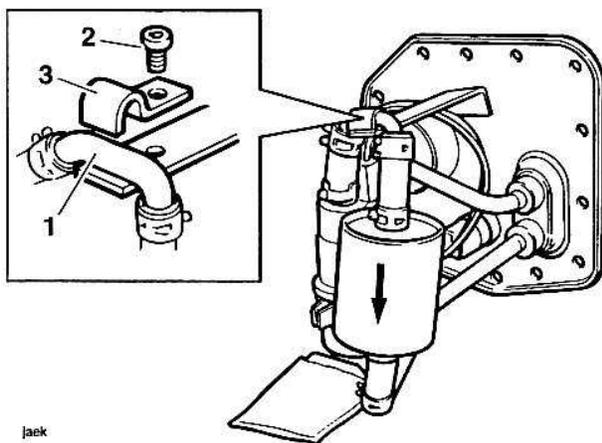
FUEL FILTER

Removal

1. Remove the seat and disconnect the battery negative (black) lead first.
2. Remove the fuel tank as described elsewhere in this section.
3. Drain the fuel tank into a suitable container.

! 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.

4. Release the ring of bolts securing the fuel pump mounting plate to the fuel tank.
5. Ease the mounting plate away from the fuel tank and discard the gasket.
6. Release the clamp bolt securing the fuel hose link pipe to the bracket. Collect the clamp.



- jaek
1. Link Pipe
 2. Retaining Bolt
 3. Clamp

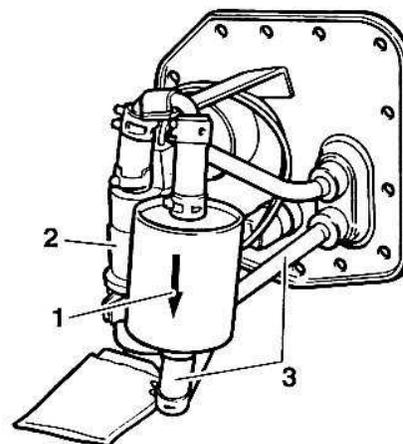
7. Release the clips securing the fuel hoses and link pipe to the pump and filter. Remove the link pipe and hoses as an assembly.
8. Release the clip at the exit side of the filter.
9. Ease the filter from the exit hose and discard it.

NOTE:

- Renew the fuel filter in accordance with the scheduled maintenance chart.

Assembly

1. Locate the filter to the lower (exit) fuel hose with the arrow on the filter pointing downwards into the hose (i.e. away from the fuel pump).



- jael
1. Arrow
 2. Fuel Pump
 3. Lower (exit) Fuel Hose
2. Refit the fuel hoses and link pipe to the filter and pump and secure with the hose clips.
 3. Refit the link pipe clamp and secure with the clamp bolt.
 4. Position a new gasket to the fuel tank opening and locate the pump mounting plate to the fuel tank. Tighten the mounting plate fixings to **6 Nm**.

! CAUTION: Never overtighten the fuel pump mounting plate bolts as this will damage the threaded inserts in the fuel tank.

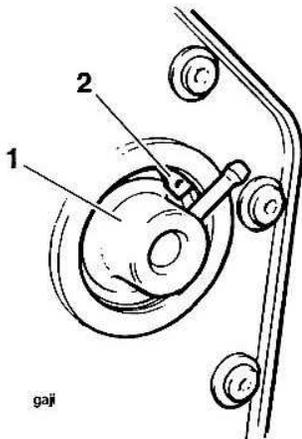
5. Refit the fuel tank as described elsewhere in this section.
6. Refill the fuel tank with the fuel drained earlier.
7. Reconnect the battery, positive (red) lead first.
8. Refit the seat.

FUEL PRESSURE REGULATOR

1. Remove the seat and disconnect the battery negative (black) lead first.
2. Remove the fuel tank as described elsewhere in this section.
3. Drain the fuel tank into a suitable container.

! 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.

4. Remove the circlip securing the pressure regulator to the fuel pump mounting plate.



1. Fuel Pressure Regulator

2. Circlip

5. Ease the pressure regulator from the mounting plate.
6. Remove and discard the regulator 'O' rings.

Assembly

1. Fit new 'O' rings to the pressure regulator and lightly lubricate the 'O' rings with petroleum jelly.
2. Fit the pressure regulator and retain with a new circlip.
3. Refit the fuel tank as described elsewhere in this section.
4. Refill the fuel tank with the fuel drained earlier.
5. Reconnect the battery, positive (red) lead first.
6. Refit the seat.

FUEL PRESSURE CHECKING

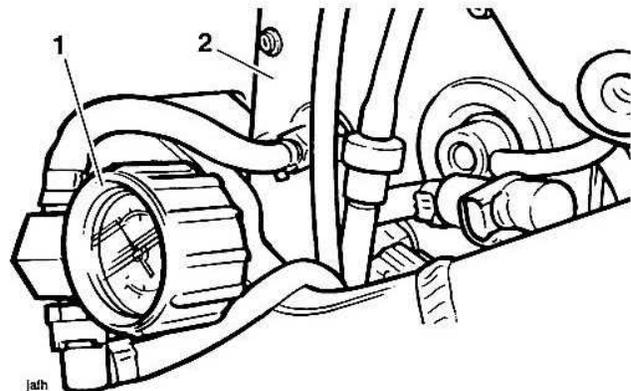
Using Triumph service tool T3880048, allows diagnosis of fuel pump, fuel pressure relief valve and hose related problems without first removing the component concerned.

Test Procedure

1. In order to connect the gauge, turn the ignition to the OFF position and remove the motorcycle side panel assembly.

! 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 either of the fuel hoses and connect the gauge between the detached hose and the fuel pump mounting plate.



1. Gauge (Tool part number T3880048)

2. Mounting Plate

3. Start the engine and check the gauge reading.

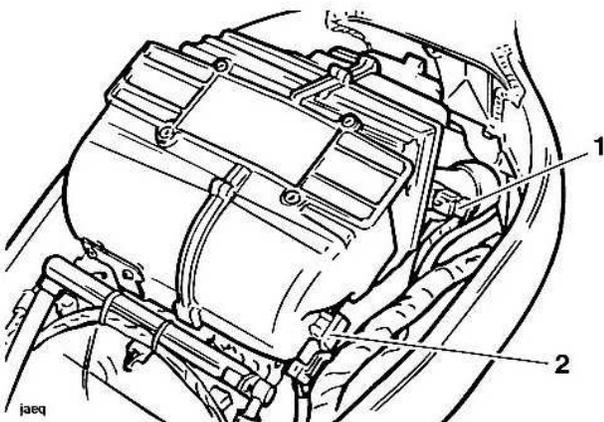
NOTE:

- If the fuel pressure is being checked because the engine will not start, use the fuel pump test facility on the diagnostic service tool.
- If correct, the fuel pressure should be 3.0 Bar +/- 0.25 Bar.
- If a higher or lower fuel pressure reading is shown on the gauge, refer to the non-electrical diagnosis table earlier in this section.

AIRBOX

Removal

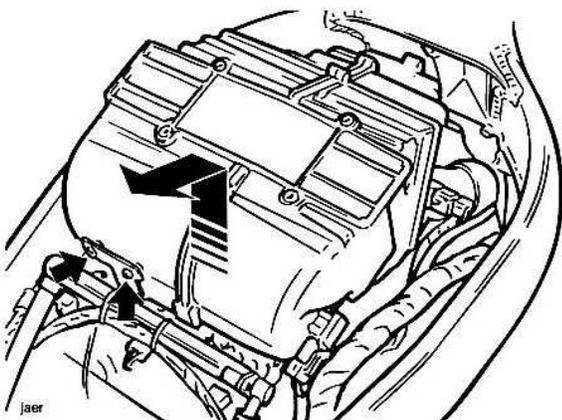
1. Remove the seat and disconnect the battery negative (black) lead first.
2. Remove the fuel tank as described elsewhere in this section.
3. Disconnect the multi-plug connections to the inlet air temperature and barometric pressure sensors.



1. Inlet Air Temperature Connection

2. Barometric Pressure Sensor

4. Disconnect the engine breather hose and fuel pressure regulator hose.
5. Release the bolts securing the airbox to the bracket above the fuel rail.
6. Raise the rear of the airbox, slide to the rear and remove the airbox from the frame complete with the drain hose.



Arrowed: Airbox Retaining Bolts



CAUTION: To prevent dirt and debris from falling into the throttle openings while the airbox is removed, seal the openings with tape.

If the openings are not protected, debris may fall into the throttles causing damage to the engine and causing the throttles to stick.

Assembly

1. Assemble the airbox to the throttle bodies ensuring full engagement of the intakes over the throttles and correct engagement of the front airbox retaining latch.
2. Guide the drain hose into its original location.
3. Tighten the airbox retaining bolts to **5 Nm**.
4. Reconnect the airbox fuel pressure regulator hose and engine breather hose.
5. Reconnect the inlet air temperature sensor and barometric pressure sensor.
6. Refit the fuel tank as described elsewhere in this section.
7. Reconnect the battery, positive (red) lead first.
8. Refit the seat.

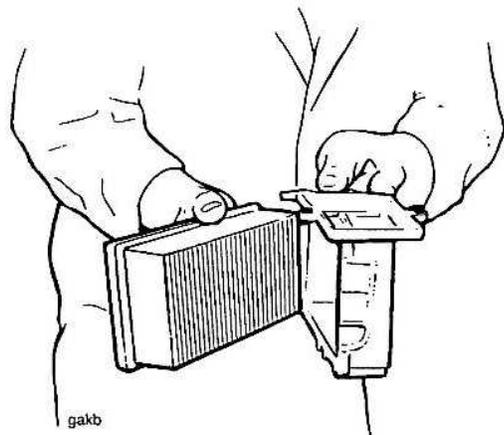
Air Filter Element

Removal

1. Remove the seat 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 lift up the housing. Retain the gasket for future re-use.
4. Detach the air filter element from the housing.

NOTE:

- **Note the orientation of the element before final detachment. The new item must be assembled in the same orientation.**



Replacing the Air Filter Element

Assembly

1. Clean the air filter housing and locate the new element in the 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 seat.

BAROMETRIC PRESSURE SENSOR - MC 2000 ECM ONLY

NOTE:

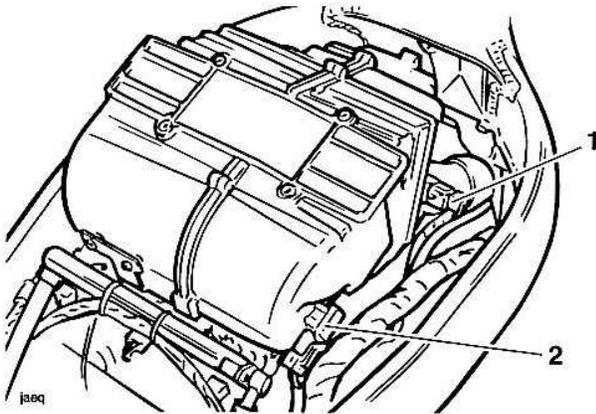
- On models fitted with an MC 1000 ECM, the barometric pressure sensor is incorporated in the ECM itself. These instructions apply to the MC 2000 ECM only.

Removal

1. Remove the seat and disconnect the battery negative (black) lead first.
2. Remove the fuel tank as described elsewhere in this section.
3. Disconnect the multiplug connection to the sensor.

NOTE:

- The barometric pressure sensor is a push fit in the airbox and is retained by a barbed seal.
4. Remove the sensor by gently pulling in an outward direction.



1. Intake Air Temperature Sensor

2. Barometric Pressure Sensor

Assembly

1. Align the sensor to the airbox and push fully home.
2. Reconnect the multiplug.
3. Refit the fuel tank as described elsewhere in this section
4. Reconnect the battery, positive (red) lead first.
5. Refit the seat.

INTAKE AIR TEMPERATURE SENSOR

Removal

1. Remove the seat and disconnect the battery negative (black) lead first.
2. Remove the fuel tank and airbox as described elsewhere in this section.
3. Disconnect the connection to the sensor after first removing the wire retainer from the multiplug.

NOTE:

- The intake air temperature sensor has a threaded base which retains it to the airbox.
4. Unscrew the sensor to remove it from the airbox.

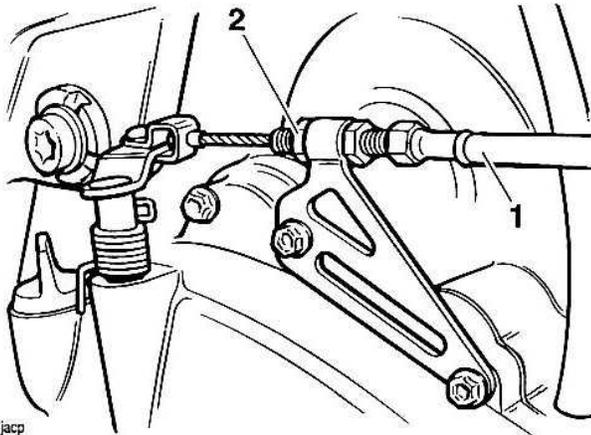
Assembly

1. Fit the temperature sensor to the airbox taking care not to overtighten.
2. Reconnect the multiplug and fit the wire retainer.
3. Refit the airbox and fuel tank as described elsewhere in this section.
4. Reconnect the battery, positive (red) lead first.
5. Refit the seat.

CRANKSHAFT POSITION SENSOR

Removal

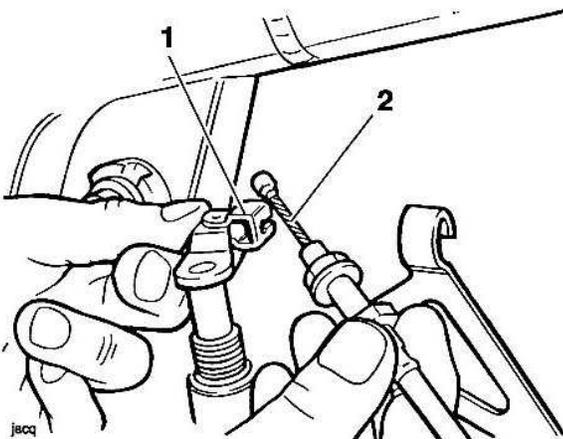
1. Remove the seat and disconnect the battery, negative (black) lead first.
2. Remove the belly panel and right hand lower fairing (ST model only).
3. Slacken the clutch cable locknut and release the adjuster at the clutch cover end, to give maximum play in the cable.



1. Clutch Cable

2. Adjuster

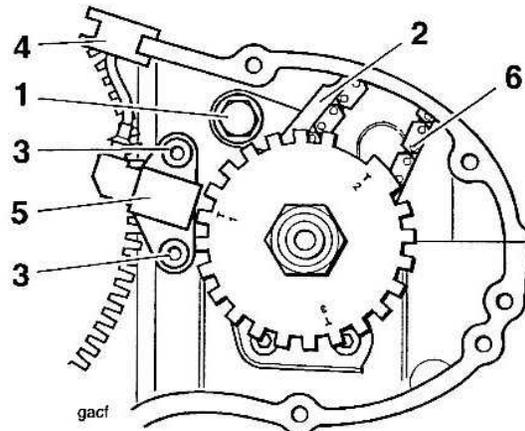
4. Release the clutch cable from the actuating arm by pushing the inner cable nipple through the arm and sliding the cable out of the slot.



1. Actuating Arm

2. Inner Cable

5. Drain the engine oil as described in the lubrication section.
6. Remove the clutch cover.
7. Release the sensor multiplug and detach the sensor grommet from the crankcase.
8. Release the sensor screws and detach the sensor.



1. Camchain Tensioner Blade Retaining Bolt

2. Camchain Tensioner Blade

3. Sensor Screws

4. Rubber Grommet

5. Crankshaft Position Sensor

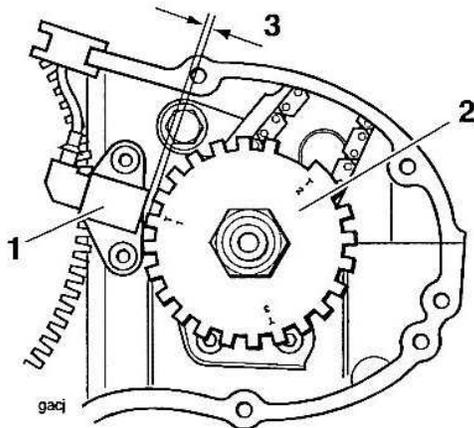
6. Cam Chain

Assembly

1. Assemble the sensor to the crankcase and tighten the screws.
2. Refit the sensor grommet to the crankcase and reconnect the multiplug.
3. Turn the engine over until the 'T1' mark on the crankshaft rotor aligns with the centre of the sensor.
4. Adjust the air gap between the sensor probe and the rotor to $1\text{mm} \pm 0.20\text{ mm}$.

NOTE:

- **Always recheck the gap after tightening the screws. Reset the gap if the setting has moved.**

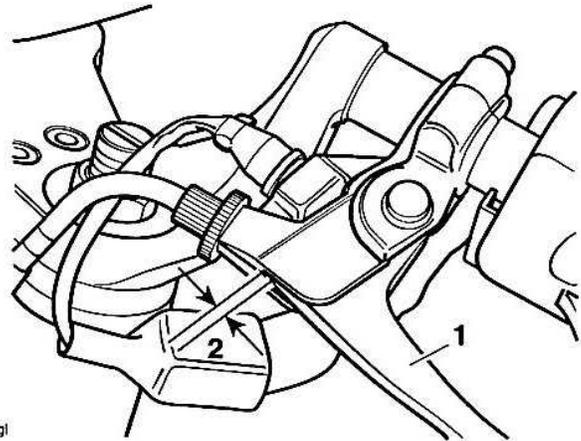
**1. Crankshaft Position Sensor****2. Crankshaft Rotor****3. $1.00\text{ mm} \pm 0.20\text{ mm}$**

5. Clean and refit the clutch cover using a new gasket. Tighten the clutch cover bolts to **9 Nm**.
6. Refit the sump drain plug and tighten to **25 Nm**.
7. Re-fill the engine with the correct grade and type of engine oil.
8. Refit the outer cable to the adjuster bracket at the clutch end.

NOTE:

- **Ensure that the two adjuster nuts are positioned, one either side of the bracket.**
9. Set the lever adjuster to a point where an equal adjustment is possible in both directions.
 10. Set the adjuster at the clutch end to give a preliminary setting of 2-3mm of free-play as measured at the lever.

11. Operate the clutch lever several times and recheck the amount of free-play present at the lever.

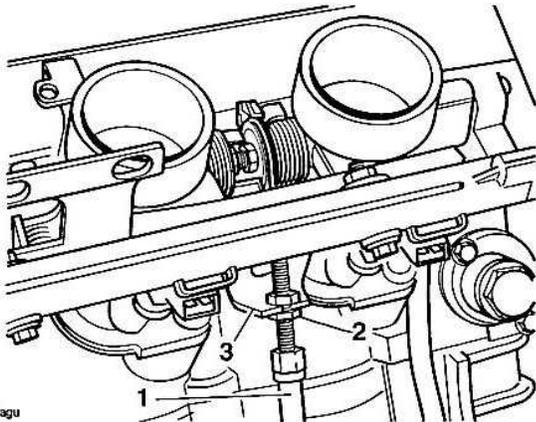
**1. Clutch Lever****2. 0.4-0.8mm Free Play**

12. Set the final adjustment of the cable to give 0.4-0.8 mm of free-play at the lever by turning the adjuster nut and locknut at the lever end.
13. Refit any bodywork removed earlier.
14. Reconnect the battery positive (red) lead first then the negative (black) lead.
15. Refit the seat.

THROTTLE CABLE - ST

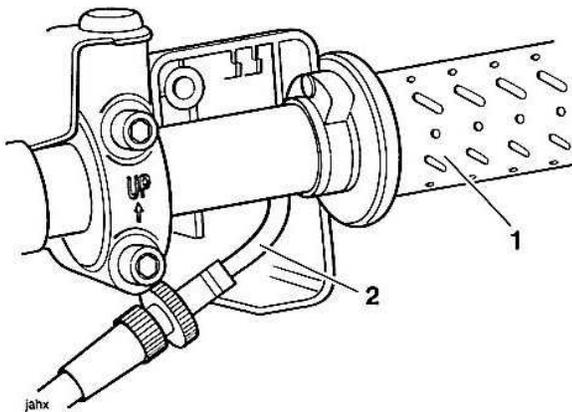
Removal

1. Remove the seat and disconnect the battery negative (black) lead first.
2. Remove the fuel tank and airbox as described in this section.
3. Slacken the adjuster locknut at the throttle body end of the cable such that it will allow the outer cable to be detached from the cable bracket.



1. Outer Cable
2. Adjuster Locknut
3. Cable Bracket

4. Detach the inner cable from the throttle cam.
5. At the twist grip end, separate the two halves of the right hand switch cube.



1. Twist Grip
2. Twist Grip Guide

6. Release the throttle inner cable from the twist grip.

7. Note the routing of the throttle cable and remove from the frame.

Examination

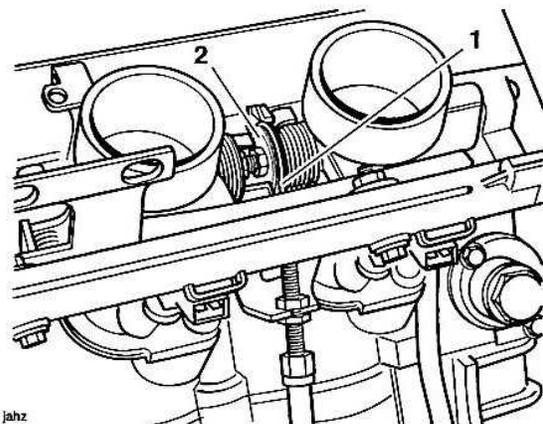
1. Check that the throttle cable operates smoothly, without sticking or binding. Replace the cable if there is any doubt as to its correct operation.

! 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.

Installation

1. Locate the cable to the frame following the routing noted during removal.
2. Engage the inner cable nipple to the twist grip.
3. Assemble the two halves of the switch cube ensuring that the cable remains in place on the twist grip.
4. Attach the other end of the inner cable to the throttle cam and locate the outer cable to the cable bracket. Tighten the cable locknut.

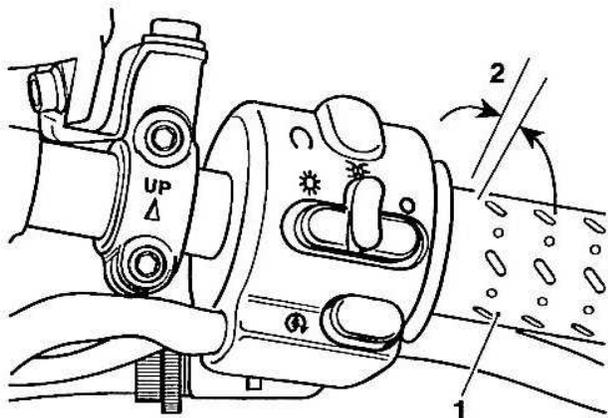


1. Inner Cable
2. Throttle Cam

5. Set the cable adjustment as described below/over.

Adjustment

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 cable must be adjusted.

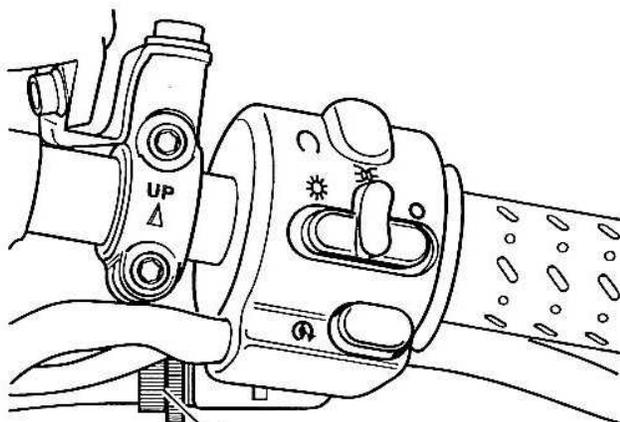


jada

1. Throttle Twist Grip
2. 2-3 mm

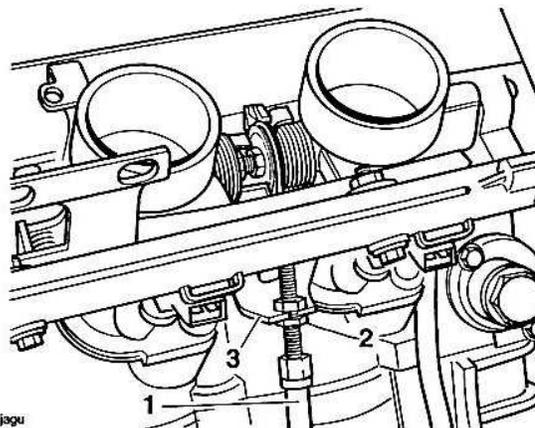
NOTE:

- Minor adjustments can be made using the adjuster at the twist grip. Where a correct setting cannot be achieved in this way, the adjuster at the throttle body end must be used.



jagv

1. Adjuster - Twist Grip End
2. Set the cable adjuster at the twist grip end such that it has an equal amount of adjustment in each direction.
3. Set the adjuster at the throttle body end of the cable to give 2-3mm of play at the twist grip. Tighten the locknut.



jagu

1. Outer Cable
2. Adjuster Locknut
3. Cable Bracket
4. Refit the airbox and fuel tank.
5. Make any minor adjustments as necessary to give 2-3 mm of play using the adjuster at the twist grip end of the cable. Tighten the locknut.

WARNING: Ensure that the adjuster locknuts are tightened. A loose throttle cable adjuster could cause the throttle to stick leading to loss of 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.

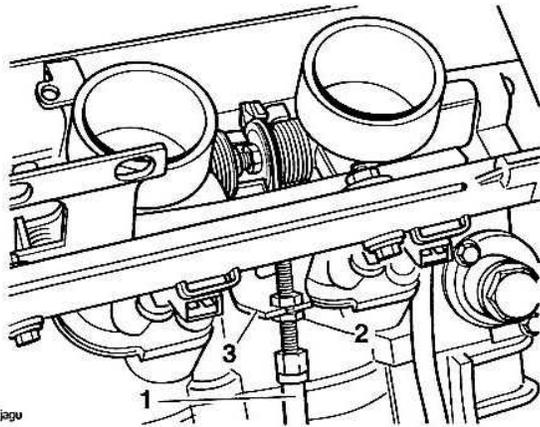
WARNING: Move the handlebars to left and right full lock while checking that cables and harnesses do not bind. A cable or harness which binds will restrict the steering and may cause loss of control and an accident.

6. Reconnect the battery, positive (red) lead first.
7. Refit the seat.

THROTTLE CABLE - RS

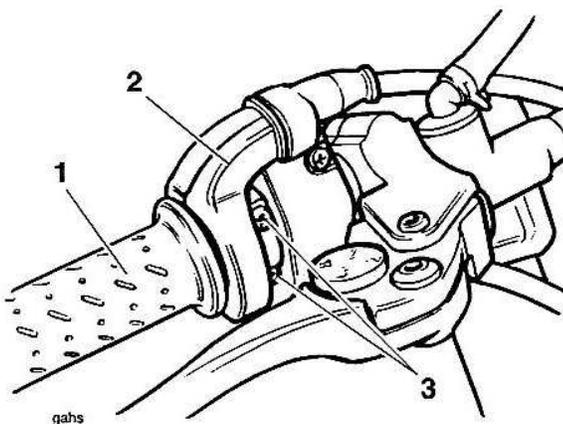
Removal

1. Remove the seat and disconnect the battery negative (black) lead first.
2. Remove the fuel tank and airbox as described in this section.
3. Slacken the adjuster locknut at the throttle body end of the cable such that it will allow the outer cable to be detached from the cable bracket.



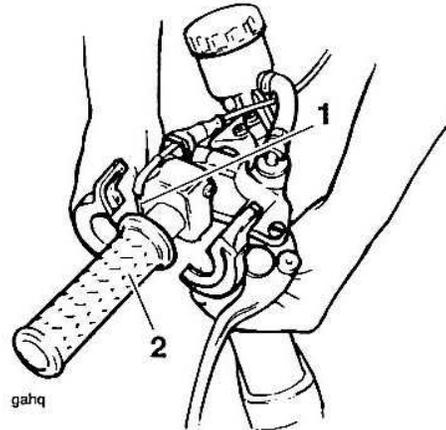
1. Outer Cable
2. Adjuster Locknut
3. Cable Bracket

4. Detach the inner cable from the 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. Slide off the boot and separate the two halves of the guide. Release the throttle inner cable from the twist grip.



1. Inner Cable
2. Twist Grip

7. Note the routing of the throttle cable and remove from the frame.

Examination

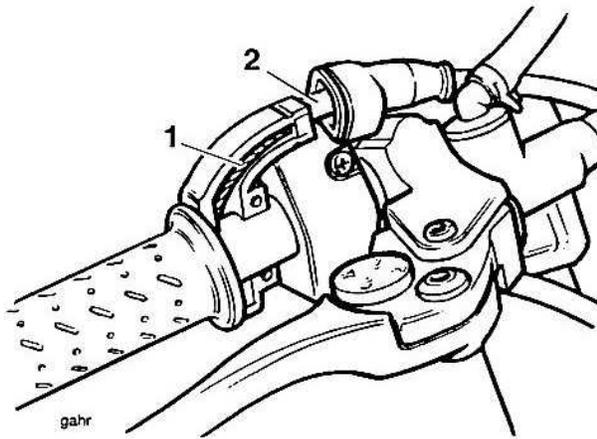
1. Check that the throttle cable operates smoothly, without sticking or binding. Replace the cable if there is any doubt as to its correct operation.

! 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.

Installation

1. Locate the cable to the frame following the routing noted during removal.
2. Engage the inner cable nipple to the twist grip.
3. Assemble the two halves of the cable guide ensuring that the outer cable is correctly located in the guide. Refit the boot.



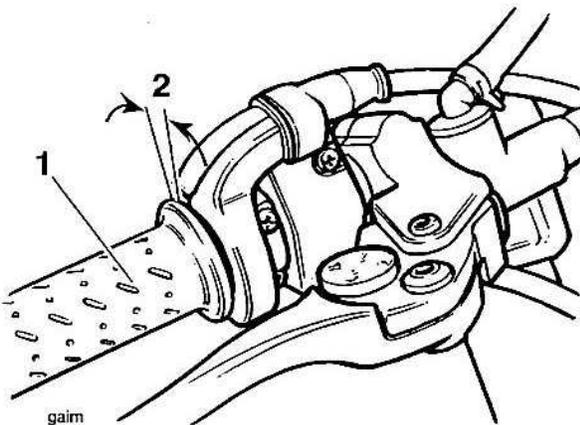
1. Cable Guide

2. Outer Cable

4. Attach the other end of the inner cable to the throttle cam and locate the outer cable to the cable bracket. Tighten the cable locknut.
5. Set the cable adjustment as described below.

Adjustment

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 cable must be adjusted.

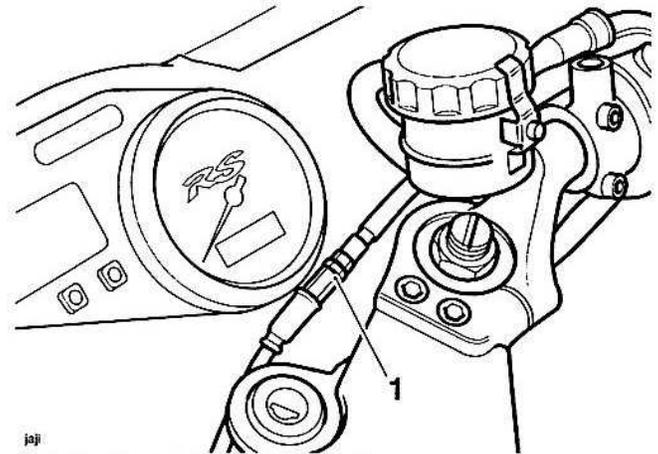


1. Throttle Twist Grip

2. 2-3 mm

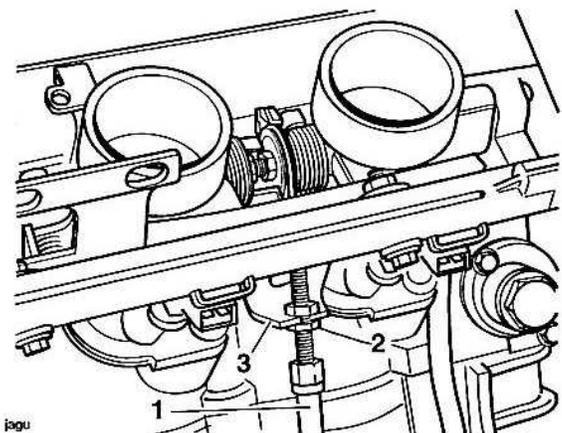
NOTE:

- Minor adjustments can be made using the adjuster near the twist grip end of the throttle. Where a correct setting cannot be achieved in this way, the adjuster at the throttle body end must be used.



1. Adjuster - Twist Grip End

2. Set the cable adjuster at the twist grip end such that it has an equal amount of adjustment in each direction.
3. Set the adjuster at the throttle body end of the cable to give 2-3mm of play at the twist grip. Tighten the locknut.



1. Outer Cable

2. Adjuster Locknut

3. Cable Bracket

4. Refit the airbox and fuel tank.
5. Make any minor adjustments as necessary to give 2-3 mm of play using the adjuster at the twist grip end of the cable. Tighten the locknut.

WARNING: Ensure that the adjuster locknuts are tightened. A loose throttle cable adjuster could cause the throttle to stick leading to loss of control and an accident.

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

7. Refit the seat.

THROTTLE BODIES

Removal

NOTE:

- If the fuel rail is to be removed, select neutral, disconnect the wiring connection to the fuel pump and crank the engine briefly to reduce fuel pressure in the fuel rail.

! 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.

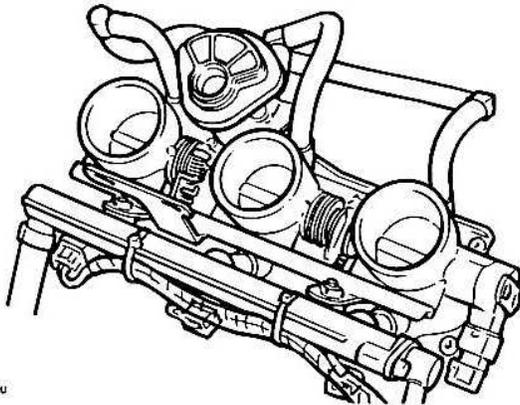
If the throttle bodies are dismantled without first reducing fuel pressure, pressurised fuel may escape causing clothing and components to be coated with fuel.

This would represent a serious fire hazard which could lead to burn injuries and damage to property.

1. Remove the seat and disconnect the battery negative (black) lead first.
2. Remove the fuel tank and airbox as described elsewhere in this section.

NOTE:

- It is not necessary to disconnect the air bypass hoses when removing the throttle bodies.

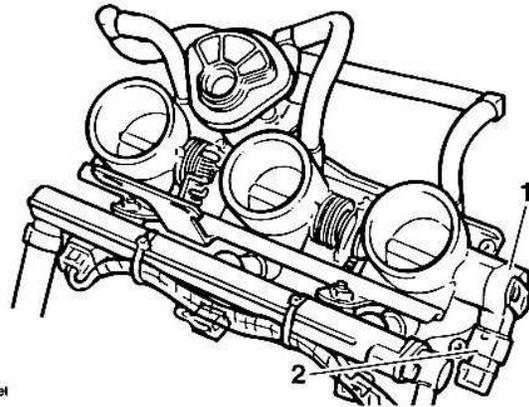


Air Bypass System

3. Disconnect the multi-plug leading to the throttle position sensor.

NOTE:

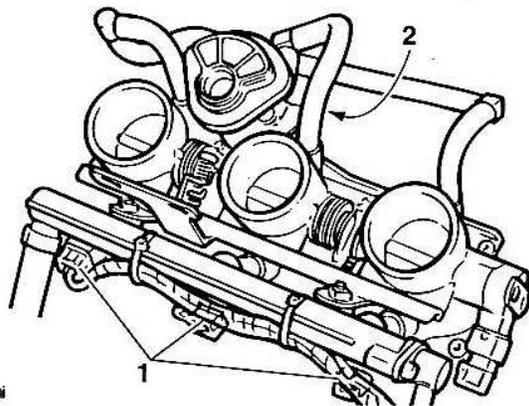
- Make a note of the location of any cable ties and ensure that, on assembly, the ties are replaced in the same positions.



1. Throttle Position Sensor

2. Multi-plug

4. Release the throttle cable adjusters and disconnect the throttle cable.
5. Release any cable ties securing the injector cables to the fuel rail.
6. Disconnect the multi-plugs to each injector.
7. Disconnect the multiplug to the idle air control valve.



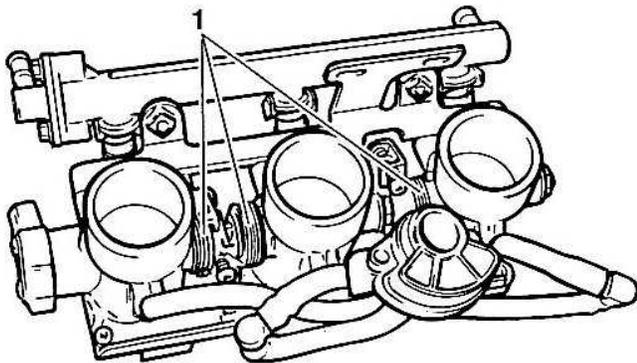
1. Injector Multi-plugs

2. Idle Control Valve Multiplug

8. Release the screws securing the throttle body assembly to the cylinder head.
9. Remove the throttle body assembly and collect the gasket.

Inspection

1. Check that the throttles open and close smoothly and do not stick in any position.
2. Examine all throttle springs for damage, looseness and breakages.



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1. Throttle Springs

3. Check for signs of fuel leaks at the injector connections with the fuel rail.

Assembly

1. Thoroughly clean the throttle body to cylinder head mating surfaces.

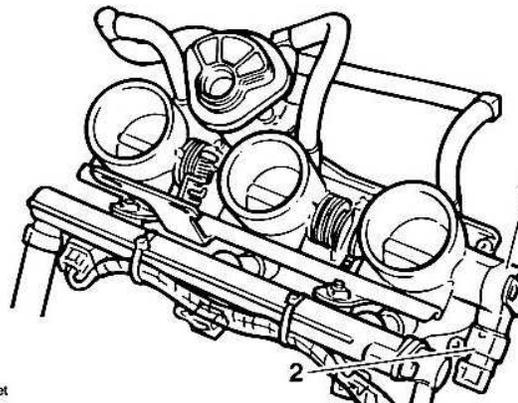


CAUTION: Ensure that no debris is allowed to fall into the engine or throttles.

Engine damage will result from ingress of debris to the cylinder head or throttles.

2. Check that the two locating dowels are correctly seated in the cylinder head.
3. Fit a new gasket over the locating dowels ensuring that the gasket tab is positioned to the left hand side.
4. Locate the throttle body assembly to the cylinder head.
5. Tighten the throttle body to cylinder head screws to **12 Nm**.
6. Refit the throttle cable and adjust to give 2-3mm of free-play at the twist grip (the adjustment procedure is detailed elsewhere in this section). Check for smooth throttle operation. Rectify as necessary.

7. Reconnect the injector multi-plugs and secure using new cable ties.
8. Reconnect the throttle position sensor.
9. Reconnect the multiplug to the idle air control valve.



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1. Throttle Position Sensor

2. Multi-plug

10. Refit the airbox and fuel tank as described elsewhere in this section.
11. Reconnect the battery, positive (red) lead first.
12. Refit the seat.

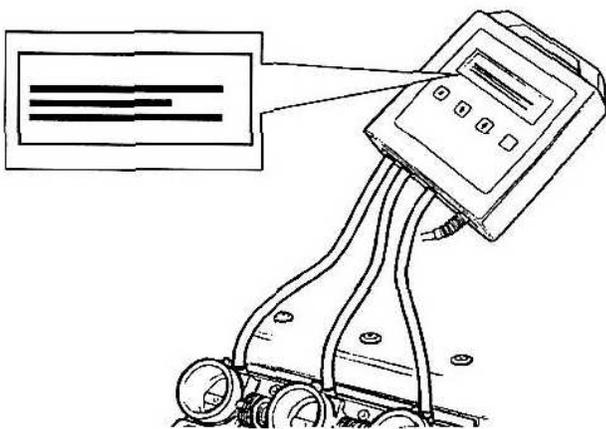
THROTTLE BODY BALANCING

NOTE:

- In order to accurately balance the throttle bodies, Triumph recommend the use of the *Sagem-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. Disconnect the idle air control hoses from the throttle bodies.
3. Position the analyser in a position that it can be easily read and attach the hoses to the idle air control ports on the throttle bodies.
4. Remove the sealer (if any) from the adjustment screws.

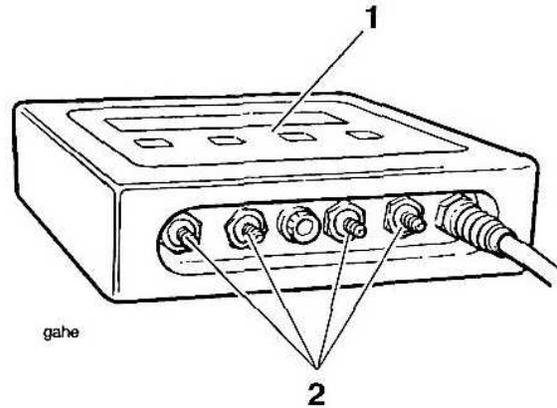
! WARNING: If the engine has recently been running, the components beneath the fuel tank cover may be hot to the touch. Contact with the hot components may cause damage to exposed skin. To avoid skin damage, always allow the hot parts to cool before hose disconnection/connection.



Typical Analyser Display

NOTE:

- The hose connections on the tool are marked 1, 2, 3 etc. 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.



1. Analyser marking

2. Throttle body connections

5. Temporarily refit the fuel tank and reconnect the fuel hoses and fuel pump connection.

NOTE:

- A kit of parts is available from Triumph to allow the tank to be remotely located yet still run the engine.

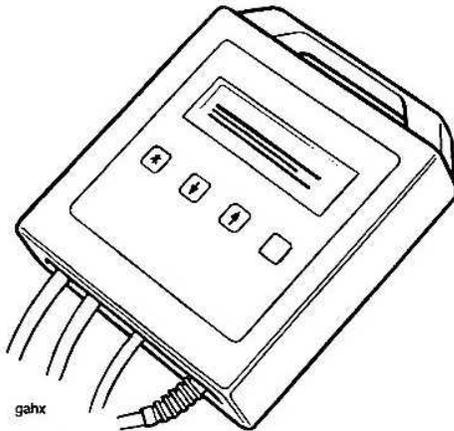
6. Attach an exhaust extraction hose to the silencer.
7. Start the engine.

NOTE:

- Throughout the balancing procedure, it will be necessary to open the throttle slightly to prevent the engine from stalling. This is because the idle air control system has been disconnected to allow attachment of the analyser hoses.

8. Using the throttle twist grip, hold the engine speed at approximately 1200 RPM.

9. Select the bar chart display on the analyser and assess which cylinders require adjustment.



Typical display of imbalanced throttles.

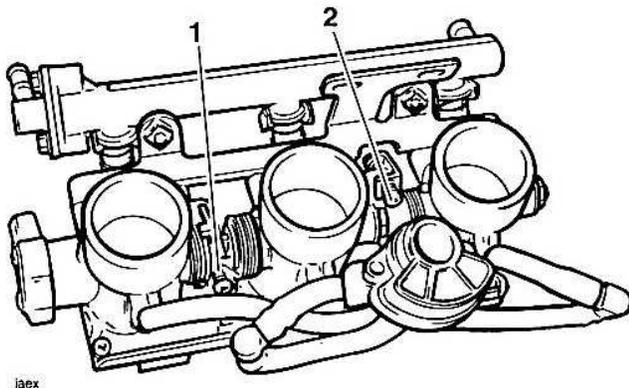
NOTE:

- The left hand (number 1) cylinder is non-adjustable. All other cylinders are adjusted to match the setting of number 1 cylinder, though it should be noted that adjustment of any cylinder will marginally affect the setting of the other two.

10. Keeping the engine speed at around 1200 rpm, set both adjusters such that all three throttle bodies have an equal vacuum reading.

NOTE:

- The adjusters can be reached by working in the space where the fuel tank cover would normally fit.



1. Adjuster - number 2 cylinder
2. Adjuster - number 3 cylinder

11. Stop the engine.
12. Disconnect the fuel tank.
13. Reconnect the idle air control hoses.
14. 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 1200 ± 50 rpm.
16. Re-apply sealer to the adjustment screws.

NOTE:

- If the idle speed now falls outside the above range, adjust the closed throttle position using the Triumph service diagnostic tool. Refer to the tool's operating instructions for details.

INJECTORS

Removal

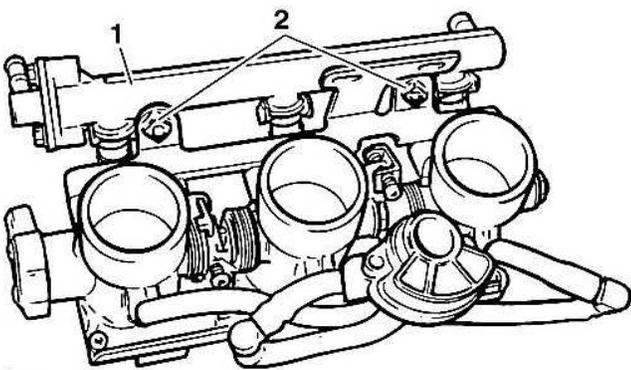
1. Remove the seat and disconnect the battery negative (black) lead first.
2. Remove the fuel tank and airbox as described elsewhere in this section.
3. Move the gearchange to neutral and crank the engine briefly to reduce fuel pressure in the fuel rail.

! 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.

4. Release any cable ties securing the injector cables to the fuel rail.
5. Disconnect the multi-plugs to each injector.

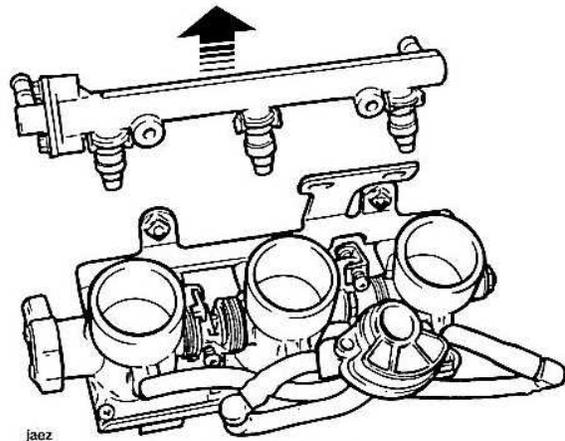
NOTE:

- Make a note of the location of any cable ties and ensure that, on assembly, the ties are replaced in the same positions.
6. Release the two screws securing the fuel rail to its support bracket.



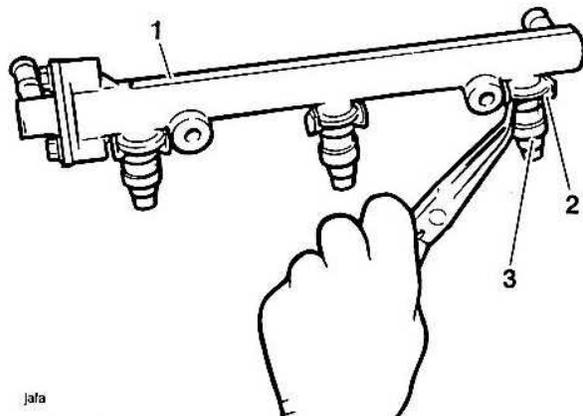
1. Fuel Rail
2. Fuel Rail Screws

7. Leaving the injectors attached to the fuel rail, ease the injectors upwards and remove from the throttle body assembly.



Removing the Injectors/Fuel Rail

8. Remove the clips from the top of each injector.



1. Fuel Rail
2. Circlip
3. Injector

9. Ease the injectors from the fuel rail to remove each injector.

Inspection

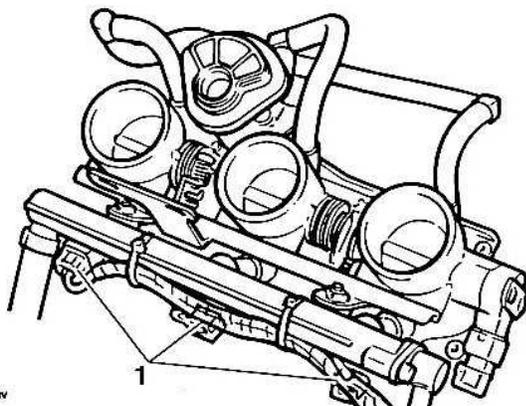
1. Check the injector 'O' rings for damage, splits etc. Renew as necessary.

NOTE:

- The injectors cannot be pressure tested.

Assembly

1. Fit new injector 'O' rings.
2. Locate the injectors to the fuel rail and rotate the injectors such that the electrical connections will face down and to the rear of the motorcycle when fitted.
3. Refit the injector retaining clips.
4. Locate the injectors to the throttle bodies and engage to a depth that allows the fuel rail to bracket screws to be refitted.
5. Refit the fuel rail to bracket screws and tighten to **5 Nm**.
6. Reassemble the injector multiplugs to each injector and secure with cable ties as noted during strip down.



1. Injector Multiplugs

7. Refit the airbox as described elsewhere in this section.
8. Refit the fuel tank as described elsewhere in this section.
9. Reconnect the battery positive (red) lead first.
10. Refit the seat.

THROTTLE POSITION SENSOR



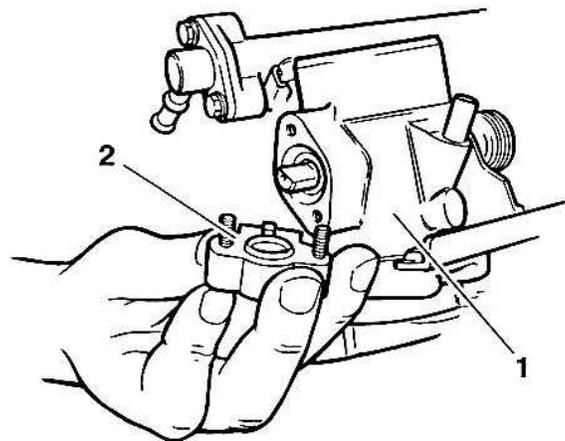
CAUTION: If the throttle position sensor is replaced, the electronic value of the closed throttle position must be adjusted using the Triumph service diagnostic tool.

If the closed throttle position value is not reset, fuel consumption, idle speed and engine performance will be adversely affected.

For details of how to reset the closed throttle position value, refer to the 'adjustment' instructions elsewhere in this section.

Removal

1. Remove the seat and disconnect the battery, negative (black) lead first.
2. Remove the throttle bodies as described elsewhere in this section.
3. Release the screws securing the sensor to the right hand throttle body. Remove the sensor.



- a/b
1. Right Hand Throttle Body
 2. Throttle Position Sensor

Inspection

1. Check the electrical connectors for pin damage and corrosion. Renew as necessary.
2. Check the sensor body for damage, splits, cracks etc. Renew as necessary.

Assembly

1. Locate the sensor to the throttle body ensuring that the 'D' shaped extension of the throttle spindle engages in the mating recess in the sensor.
2. Tighten the sensor fixings to **2 Nm**.
3. Refit the throttle bodies as described elsewhere in this section.
4. Reconnect the battery, positive (red) lead first.
5. Adjust the closed throttle position electronic value using the Triumph service diagnostic tool.

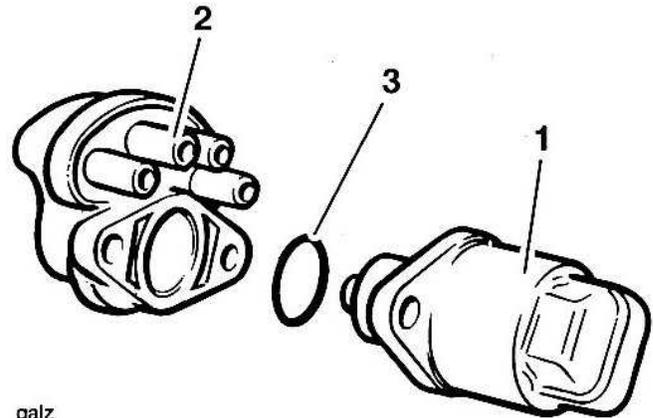
NOTE:

- **For details of how to reset the closed throttle position value, refer to the diagnostic tool instructions elsewhere in this section.**
6. Refit the seat.

IDLE AIR CONTROL VALVE

Removal

1. Remove the seat and disconnect the battery, negative (black) lead first.
2. Remove the fuel tank as detailed elsewhere in this section.
3. Remove the airbox.
4. To ensure that they are returned to the same positions on assembly, note the position of each hose leading from the idle air control valve to the throttle bodies. Disconnect the hoses at the valve.
5. Release the two screws securing the valve to the upper side of the throttle body and remove the valve assembly.
6. Release the screws securing the stepper motor to the valve body.



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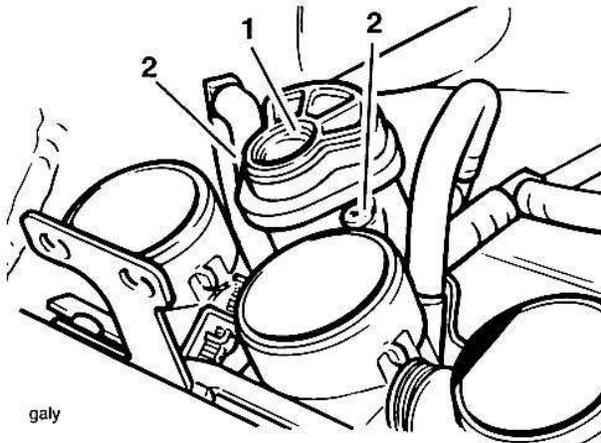
1. Stepper Motor
2. Valve Body
3. 'O' ring

Inspection/test

1. The valve is checked for correct operation using the Triumph service diagnostic tool. No other tests are possible.
2. Check the valve body for cracks, damage and deterioration. Replace as necessary.

Assembly

1. Assemble the stepper motor to the valve body and secure using the original fixings.
2. Position the valve bracket to the throttle body and tighten the fixing to **12 Nm**.



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1. Idle Air Control Valve

2. Retaining Screws

3. Reconnect the hoses as noted during the removal process.
4. Refit the airbox as described elsewhere in this section.
5. Refit the fuel tank as described elsewhere in this section.
6. Reconnect the battery, positive (red) lead first.
7. Reset the adaptive step position using the service diagnostic tool.
8. Refit the seat.

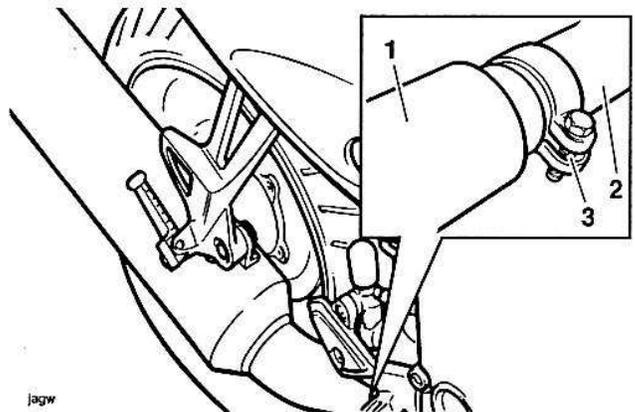
EXHAUST SYSTEM

Removal

! 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.

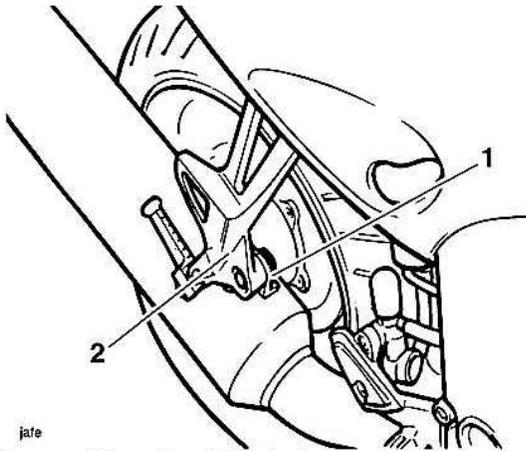
1. Remove the seat.
2. Disconnect the battery, negative (black) lead first.
3. Remove the fairing belly panel (Sprint ST model only).
4. Release the silencer to downpipe clamp.



lagw

- 1. Silencer**
- 2. Downpipe**
- 3. Clamp**

- Support the silencer and release the bolt securing the silencer mounting bracket to the right hand rear footrest support.

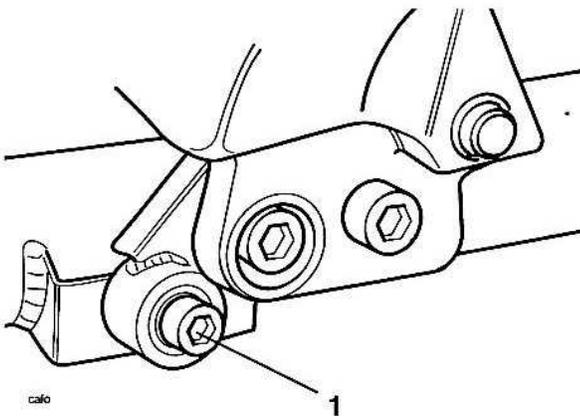


- Silencer Mounting Bracket
- Rear Footrest Support

- Remove the silencer.
- Drain the cooling system and remove the radiator (as described in the cooling system section) to gain access to the downpipe fixings.

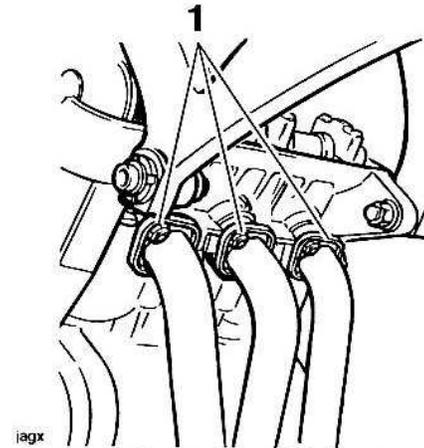
! WARNING: Do not remove the coolant pressure cap when the engine is hot. When the engine is hot, the coolant inside the radiator is hot and also under pressure. Contact with the pressurised coolant will cause scalds and skin damage.

- Release the fixing securing the header pipe to the frame.



- Frame to Header Fixing

- Release the fixings securing the downpipe joints to the cylinder head.

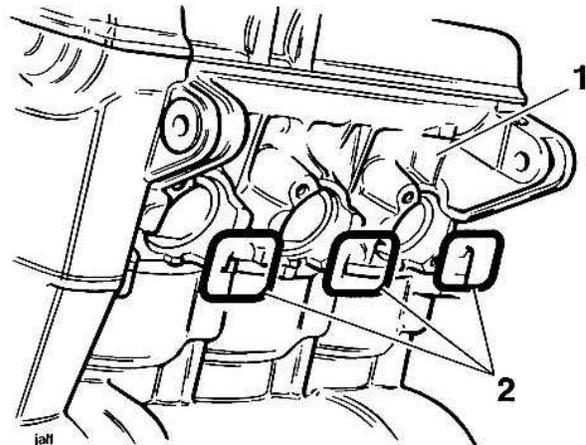


- Downpipe to Cylinder Head Fixings

- Detach the downpipe assembly and collect the seals from the head ports.

Assembly

- Fit new seals to the cylinder head.

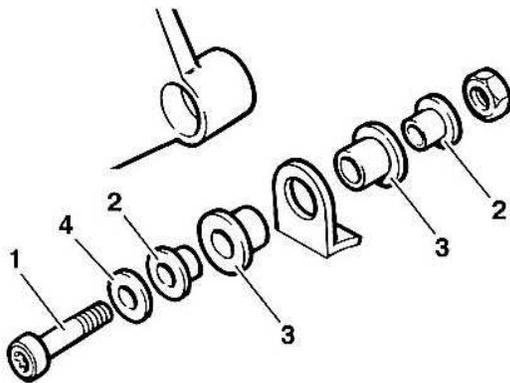


- Cylinder Head
- Seals

NOTE:

- A smear of grease may be used to retain the seals in the cylinder head during assembly.
- Locate the downpipes and align the downpipe flanges to the fixings points.
 - Locate the frame to header fixing but do not fully tighten.
 - Tighten the downpipe flange fixings in stages; first tighten all downpipe fixings to **8 Nm**, then tighten all downpipe fixings to **12 Nm**.
 - Tighten the frame to header fixing to **15 Nm**.

6. Refit the radiator and refill the cooling system as described in the cooling section.
7. Position and engage the silencer to the downpipe.
8. Align the silencer mounting bracket to the rear footrest support.
9. Ensuring that the flanged sleeves, bushes and washers are positioned as shown in the diagram, fit the silencer mounting bolt and tighten to **15 Nm**.



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1. Silencer Mounting Bolt
2. Flanged Sleeves
3. Rubber Bushes
4. Flat Washer

10. Tighten the silencer clamp bolt to **22 Nm**.
11. Refit the fairing belly panel.
12. Reconnect the battery, positive (red) lead first.
13. Refit the seat.
14. Start the engine and check for exhaust gas leaks etc. Rectify as necessary.

EVAPORATIVE LOSS CONTROL SYSTEM

California Models Only

All California models are fitted with a system to control the evaporation of fuel vapour into the atmosphere.

A carbon canister absorbs vapour while the engine is not running and, when the engine is started, the vapour is returned to the engine and burnt.

There are two distinct phases to the system's operation, engine off and engine running. These two conditions are explained overleaf.

Component Locations

Carbon Canister - behind the throttle bodies.

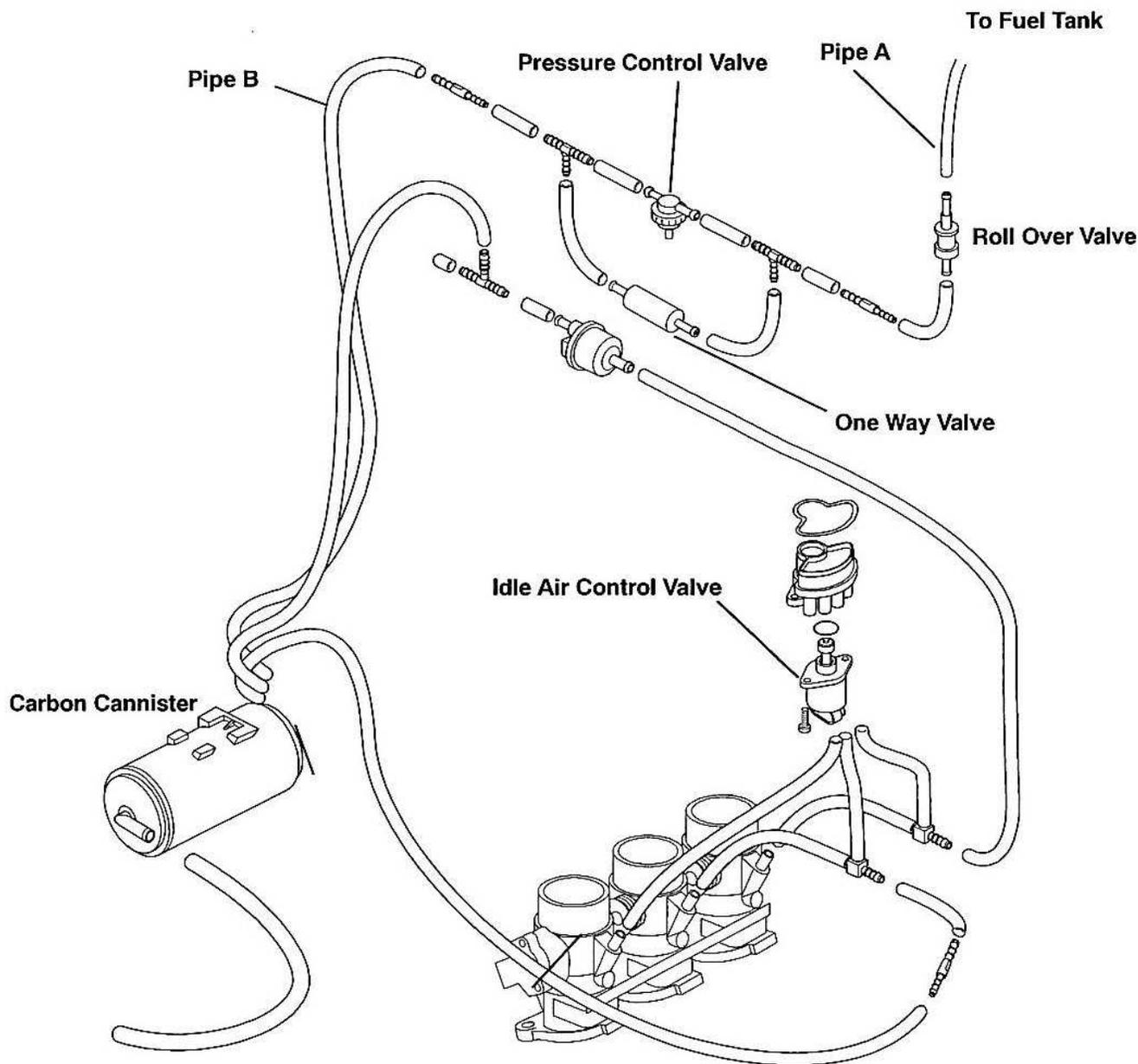
Pressure Control Valve - in the vapour line from the fuel tank.

Purge Control 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 will cause the fuel vapour to pass down the breather pipe A, through the roll over valve to the pressure control valve. When the pressure is greater than 0.75 lb/in² the valve opens allowing vapour to pass through pipe B to the canister. A one-way valve in pipe A will allow vapour to return to the fuel tank if vapour pressures falls and a vacuum is, therefore, created in the fuel tank.

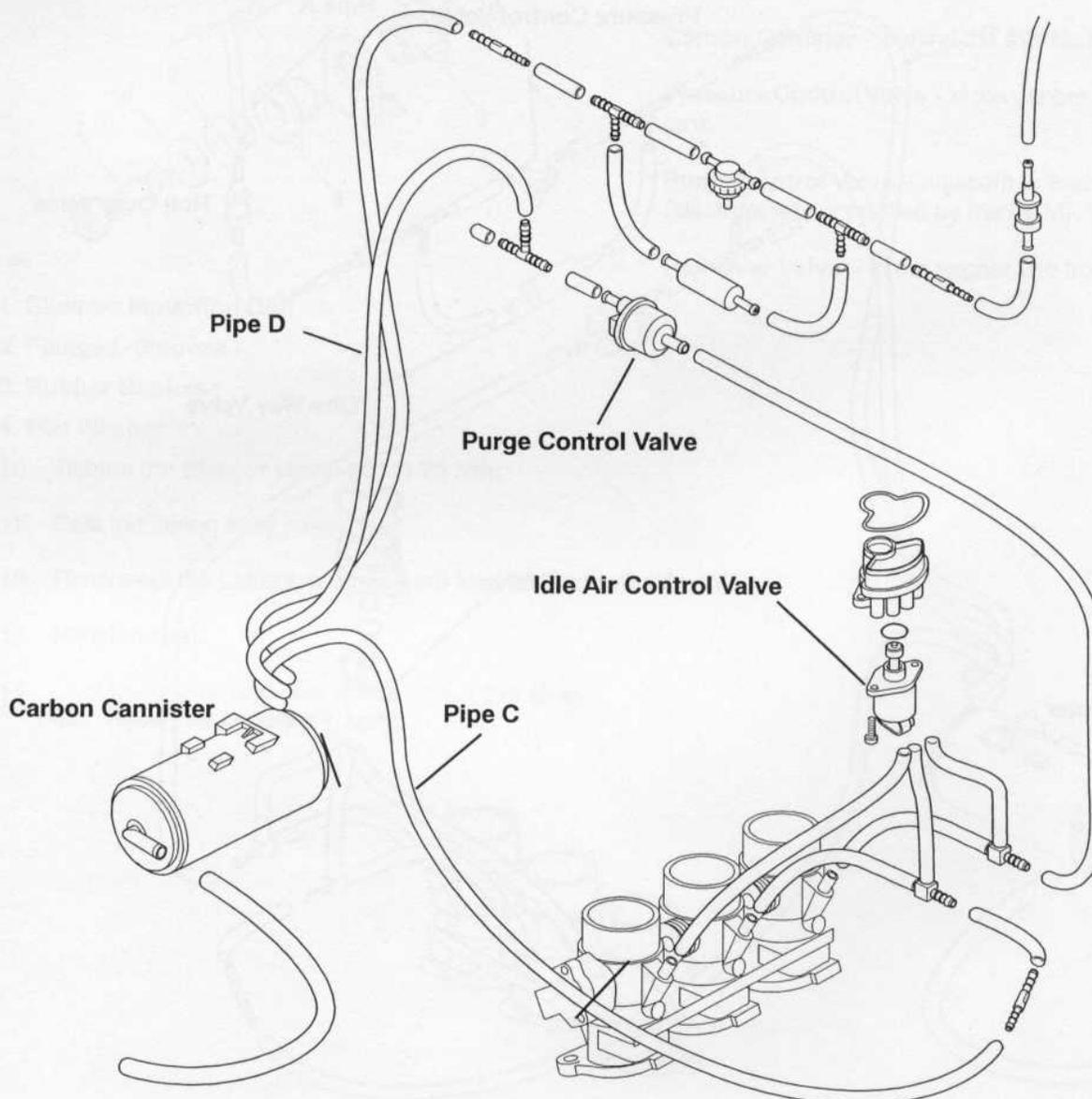


Evaporative Control System - Engine Running

When the engine is started, vacuum is applied via pipe C to the vacuum switch on the canister, causing the canister valve to open.

Direct return of vapour, along pipe D to the throttles, is prevented by the purge control valve which is governed by the engine management system ECM.

The purge control valve is shuttled between the open and closed position during purging to prevent the transient rich mixture and high emissions that would result from continuous purging.

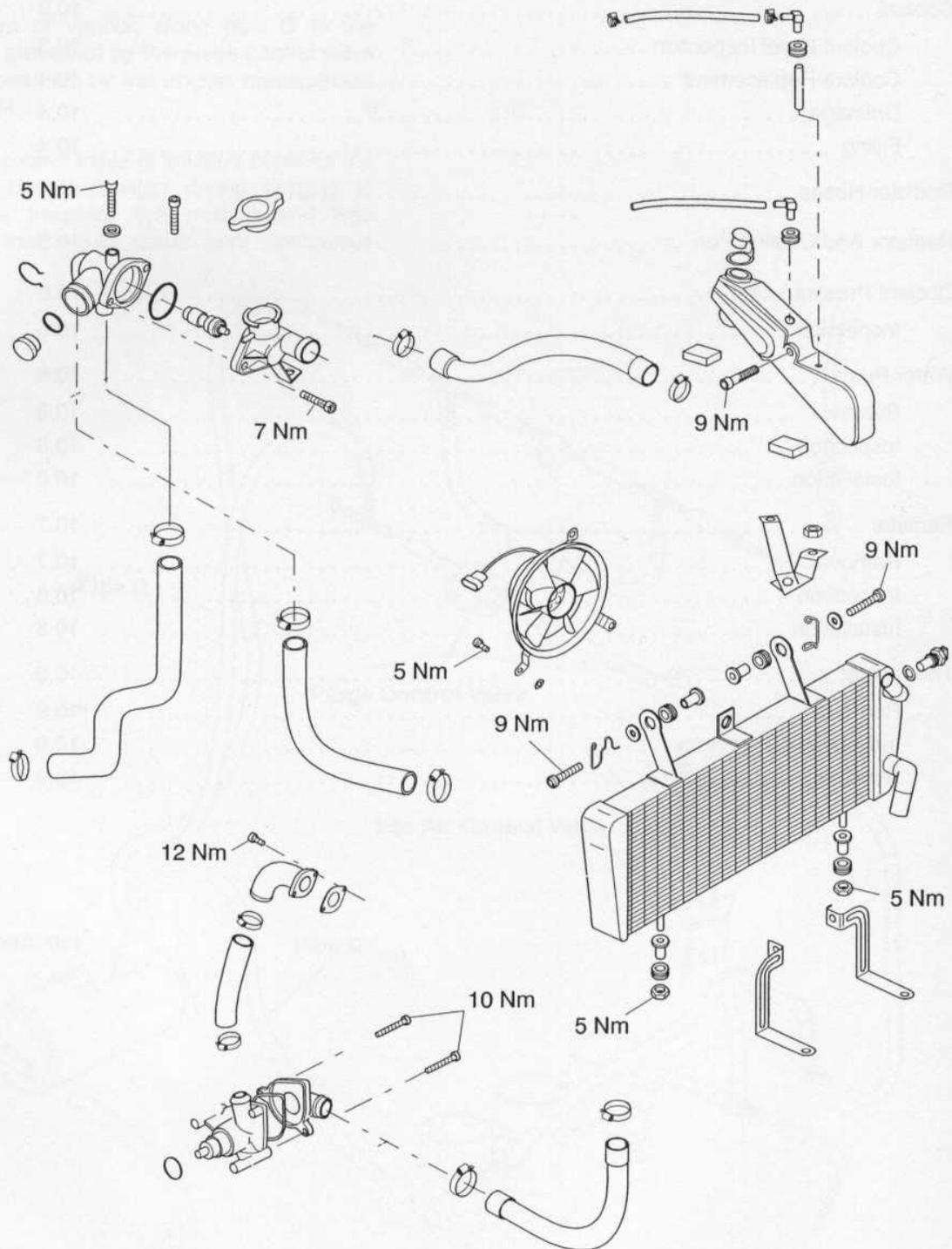


COOLING SYSTEM

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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.

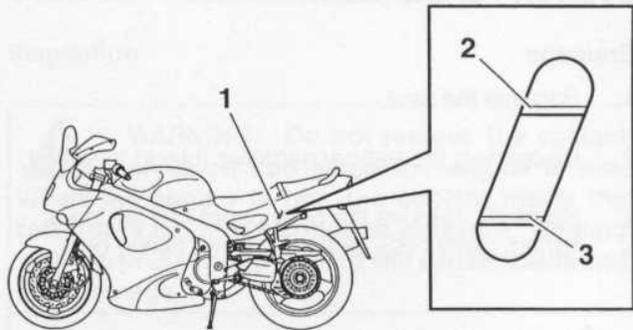
! CAUTION: Distilled water must be used with the anti-freeze (see specification for anti-freeze) in the cooling system.

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 and suffer severe damage.

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 radiator is hot and also under pressure. Contact with the pressurised coolant will cause scalds and skin damage.

1. Position the motorcycle on level ground and in an upright position.
2. Check the coolant level in the expansion tank by looking through the 'window' in the left hand rear side panel. The coolant level should be between the 'MAX and 'MIN.' marks.



Jack

1. Window
 2. 'Max' Mark
 3. 'Min.' Mark
 3. If the level of coolant is low, coolant must be added as follows:-
 4. Remove the seat.
 5. Remove the body side panels.
 6. Remove the expansion tank cap and add coolant mixture as necessary to bring the coolant level up to the 'MAX' mark.
- ! CAUTION:** If the coolant level is found to be low, or if coolant has to be added regularly, inspect the cooling system for coolant leaks. If necessary, pressure test the system to locate the source of the leak and rectify as necessary. Loss of coolant may cause the engine to overheat and suffer severe damage.
7. Refit the cap.
 8. Refit the bodywork and seat.

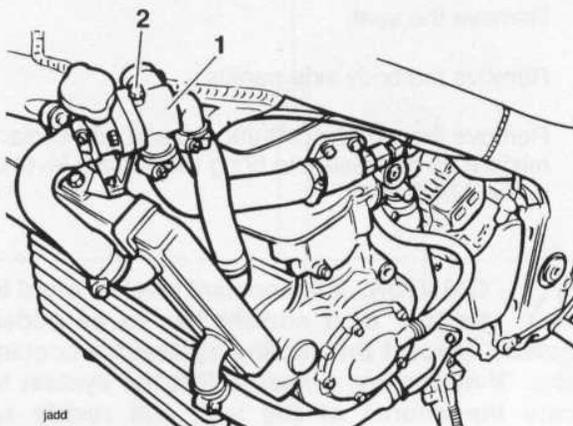
COOLANT REPLACEMENT

Drainage

1. Remove the seat.
2. Disconnect the battery negative (black) lead first.
3. Sprint ST, remove the belly panel and left lower fairing. Sprint RS, remove the left fairing only.

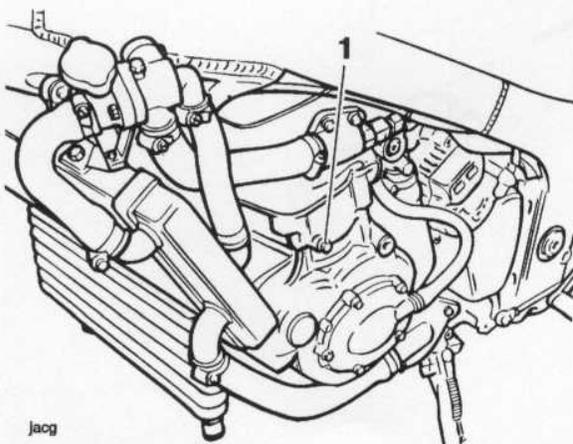
WARNING: Do not remove the coolant pressure cap when the engine is hot. When the engine is hot, the coolant inside the radiator is hot and also under pressure. Contact with the pressurised coolant will cause scalds and skin damage.

4. Remove the coolant pressure cap on the thermostat housing and slacken the bleed screw to help drainage.



1. Thermostat Housing
2. Bleed Screw

5. Position a container to collect the coolant.
6. Remove the coolant drain plug.



1. Coolant Drain Plug

Filling

1. Refit the coolant drain plug and tighten to 13 Nm.
2. **Slowly** add coolant mixture to the system, through the filler opening, until the system is full. If the system has filled correctly and fully, there should be coolant visible through the bleed screw opening as well as in the filler opening.
3. If there is no coolant visible through the bleed screw opening, but the filler side appears to be full, attach a length of clear tubing to the bleed screw spigot and syphon coolant from the cylinder head etc. into the bleed screw side of the thermostat housing.

NOTE:

- A hand operated vacuum pump or similar should be used to syphon the coolant through the system. Ensure that the coolant that flows into the bleed screw side of thermostat housing comes from within the cylinder head etc. and is not merely drawn through the thermostat from the filler opening side.
4. If necessary, top up the system through the filler and refit the pressure cap.
 5. Refit the bleed screw and tighten to 7 Nm.
 6. Refit the coolant pressure cap.
 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 as necessary.
 10. Fit the coolant pressure cap.
 11. Check the expansion tank level and top up if necessary.
 12. Refit the bodywork previously removed.
 13. Refit the seat.

RADIATOR HOSES

Regularly check all radiator hoses and hose clips for cracks, leaks or deterioration in accordance with the scheduled maintenance chart.

RADIATOR AND COOLING FAN

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.

! 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 radiator's efficiency.

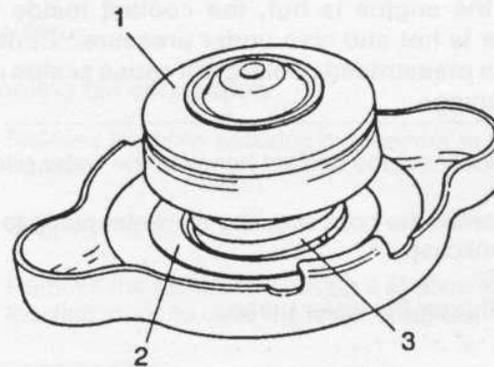
Do not obstruct or deflect airflow through the radiator by installing unauthorized accessories in front of the radiator or behind the cooling fan. Interference with the radiator airflow can lead to overheating and consequent engine damage.

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 radiator is hot and also under pressure. Contact with the pressurised coolant will cause scalds and skin damage.

1. Check condition of the upper and lower seals of the coolant pressure cap.



1. Lower Seal
2. Upper Seal
3. Spring

NOTE:

- If there is any sign of damage or deterioration replace the cap.
2. Pressure test the cap to the blow-off pressure of 1.1 bar. If the cap opens at a lower pressure or fails to open at 1.1 bar, replace the cap.

Lower seal

! CAUTION: To prevent damage to the radiator, do not use high-pressure water to clean the radiator. Use a soft brush and low-pressure water to clean the radiator.

Failure to support the fan's wiring can result in damage to the fan's wiring.

WATER PUMP

Removal

1. Remove the seat.
2. Disconnect the battery, negative (black) lead first.
3. Sprint ST only, remove the belly panel and left 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 coolant hoses to the water pump.
6. Release the bolts securing the water pump to the crankcase.
7. Withdraw the water pump.

Inspection

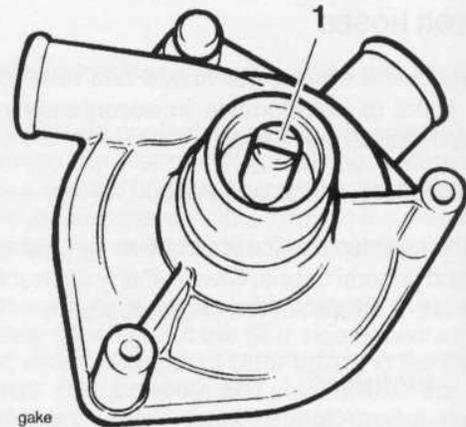
1. Check the water pump shaft and shaft bearings for side and end float. Renew if necessary.
2. Check for corrosion and scale build-up around the impellor and in the pump body. Renew if necessary.

Installation

1. Replace the water pump 'O' ring seal.
2. Align the drive slot in the water pump with the drive slot on the oil pump (inside the crankcase).

NOTE:

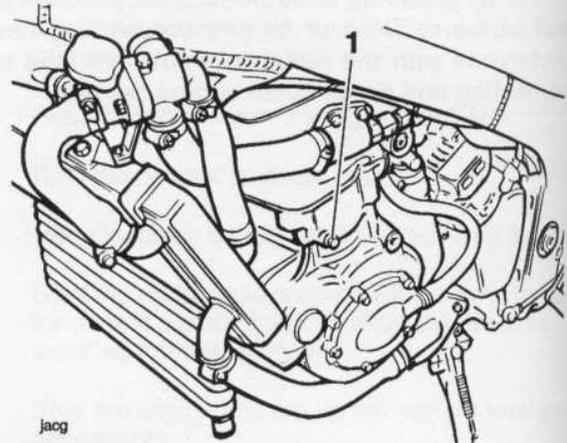
- The water pump will not engage fully into the crankcase unless the drive slots are engaged.



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1. Water pump slot

3. Fit the pump and tighten the fixings to 10 Nm.
4. Refit the hoses to the water pump and tighten the clips.
5. Refit the coolant drain plug and tighten to 13 Nm.



jaog

1. Coolant Drain Plug

6. Refill the cooling system as described earlier 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 adjust the coolant level.
10. Fit the coolant pressure cap.
11. Check the expansion tank level and top up if necessary.
12. Sprint ST only, refit the belly panel and left hand lower fairing.
13. Refit the seat.

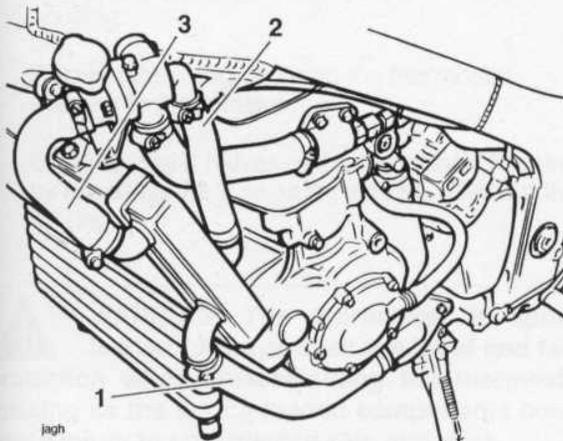
RADIATOR

Removal

1. Remove the seat.
2. Disconnect the battery negative (black) lead first.
3. Remove the belly panel (from ST only) and lower fairings.
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, bottom and bypass hoses at the radiator.



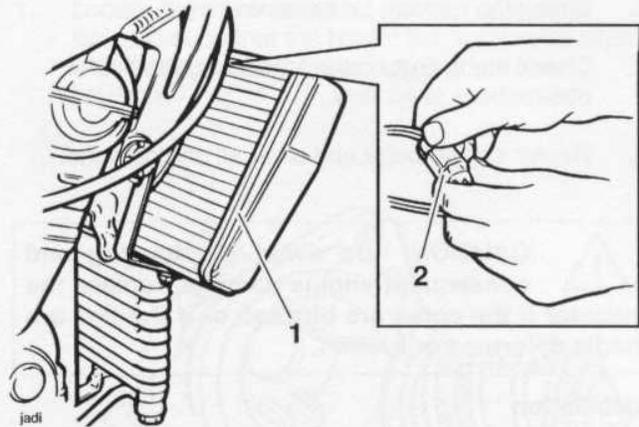
1. Bottom hose

2. Bypass Hose

3. Top Hose

6. Release the fixing which secures the thermostat housing to the radiator.
7. Release the oil cooler fixings from the radiator lower mounting.

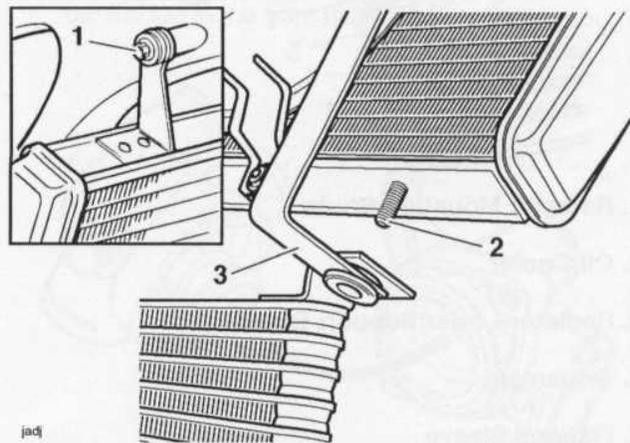
8. Disconnect the cooling fan.



1. Radiator

2. Cooling fan connection

9. Release the bolts securing the radiator to the frame.
10. Support the oil cooler.
11. Remove the radiator by raising it to allow the locating studs to clear the lower brackets.



1. Radiator to frame bolts

2. Locating studs

3. Lower brackets

! CAUTION: To prevent damage to the cooler pipes and the oil cooler, always support the oil cooler while it is detached from the radiator.

Failure to support the cooler could lead to damage to components which may lead to oil leaks.

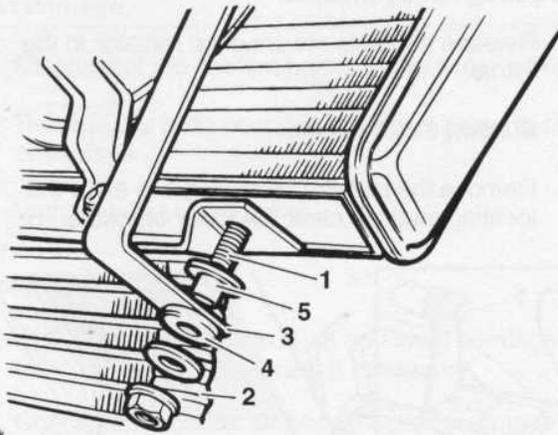
Inspection

1. Check the radiator for stone damage.
2. Check the radiator core, for damage to fins or obstructions to air flow.
3. Repair any damage and clear all obstructions.

 **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.

Installation

1. Position the oil cooler to the radiator lower mounting studs.



1. Radiator Mounting Studs

2. Oil Cooler

3. Radiator Lower Support Brackets

4. Grommets

5. Flanged Sleeve

2. Engage the radiator mounting studs into the radiator lower support brackets. Ensure the grommets do not become detached from the lower brackets during assembly.
3. Align the radiator to the frame and fit the upper mounting bolts. Tighten the bolts to **9 Nm**.
4. Reconnect the cooling fan.
5. Tighten the oil cooler to radiator fixings to **5 Nm**.
6. Reconnect the top, bottom and bypass hoses to the radiator. Tighten the hose clips.

7. Refit the crankcase drain plug and tighten to **13 Nm**.
8. Refill the cooling system as described earlier in this section.
9. Reconnect 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 as necessary.
12. Fit the coolant pressure cap.
13. Check the expansion tank level and top up if necessary.
14. Refit the bodywork previously removed.
15. Refit the seats.

THERMOSTAT

Removal

1. Remove the seat.
2. Disconnect the battery, negative (black) lead first.
3. On Sprint ST, remove the belly panel and left hand lower fairing. On Sprint RS, remove the left lower fairing.
4. Drain the cooling system as described earlier in this section.

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. Detach all hoses connected to the thermostat housing.
6. Release the fixing securing the thermostat housing to the radiator.
7. Separate the 2 halves of the thermostat housing by releasing the 2 securing screws. Discard the 'O' ring.

WARNING: The thermostat is spring loaded. Always wear eye hand and face protection when disassembling the thermostat housing as the spring loaded components could cause injury to unprotected skin and eyes.

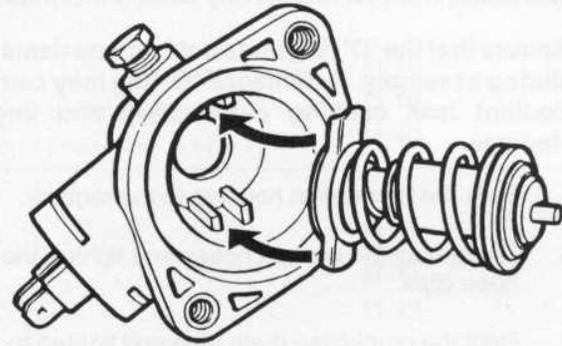
8. Remove the thermostat from the housing.

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.
3. If the temperature at which thermostat opening takes place is incorrect, replace the thermostat.

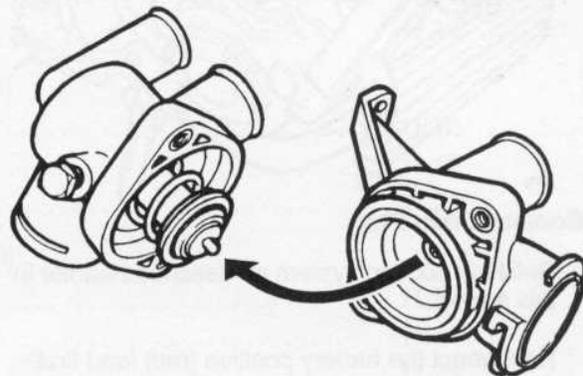
Assembly/Installation

1. Locate the thermostat into the rear half of the housing such that the feet of the thermostat align with the thermostat mounting points in the housing.



Arrowed: Thermostat Mounting Point

2. Fit a new 'O' ring to the front half of the thermostat housing.
3. Align the two halves of the thermostat housing so that the 'nose' of the thermostat aligns with the central lug in the front half of the housing.



Arrowed: Thermostat 'Nose' Mounting Point

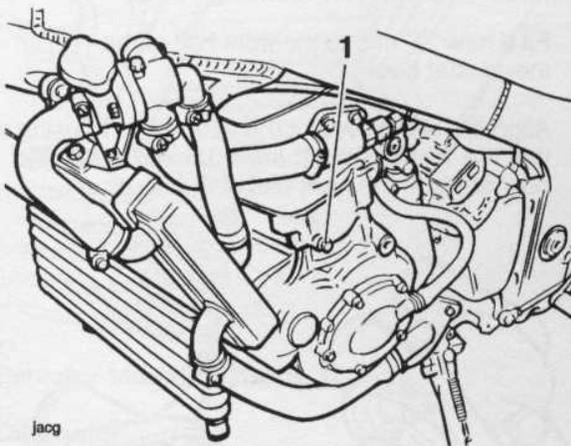
4. Evenly close the two halves of the thermostat housing and tighten the retaining screws to **7 Nm**.



CAUTION: Ensure that the thermostat is correctly seated in both sides of the housing before tightening the thermostat housing screws. Damage to the housing and thermostat will result from an incorrectly seated thermostat.

Ensure that the 'O' ring does not become damaged during assembly. A damaged 'O' ring may cause a coolant leak causing overheating and engine damage.

5. Refit the thermostat housing to the radiator.
6. Reconnect the coolant hoses and tighten the hose clips.
7. Refit the crankcase drain plug and tighten to **13 Nm**.



1. Coolant Drain Plug

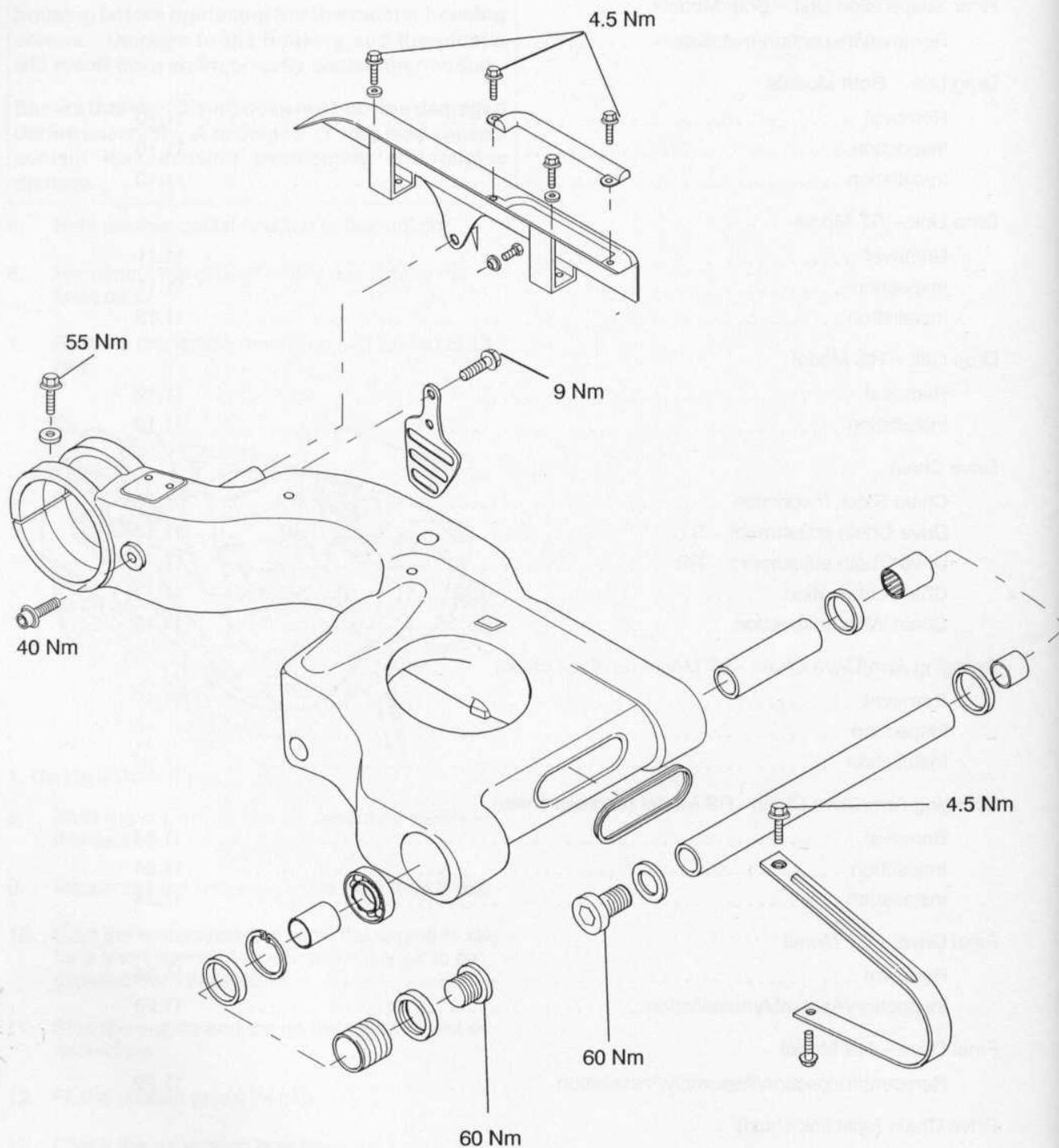
8. Refill the cooling system as described earlier in this section.
9. Reconnect the battery positive (red) lead first.
10. Start the motorcycle and allow the engine to idle for a short period of time to allow any air to be expelled from the system.
11. Stop the engine and top up the coolant level as necessary.
12. Fit the coolant pressure cap.
13. Check the expansion tank level and top up if necessary.
14. Refit the bodywork previously removed.
15. Refit the seat.

REAR SUSPENSION

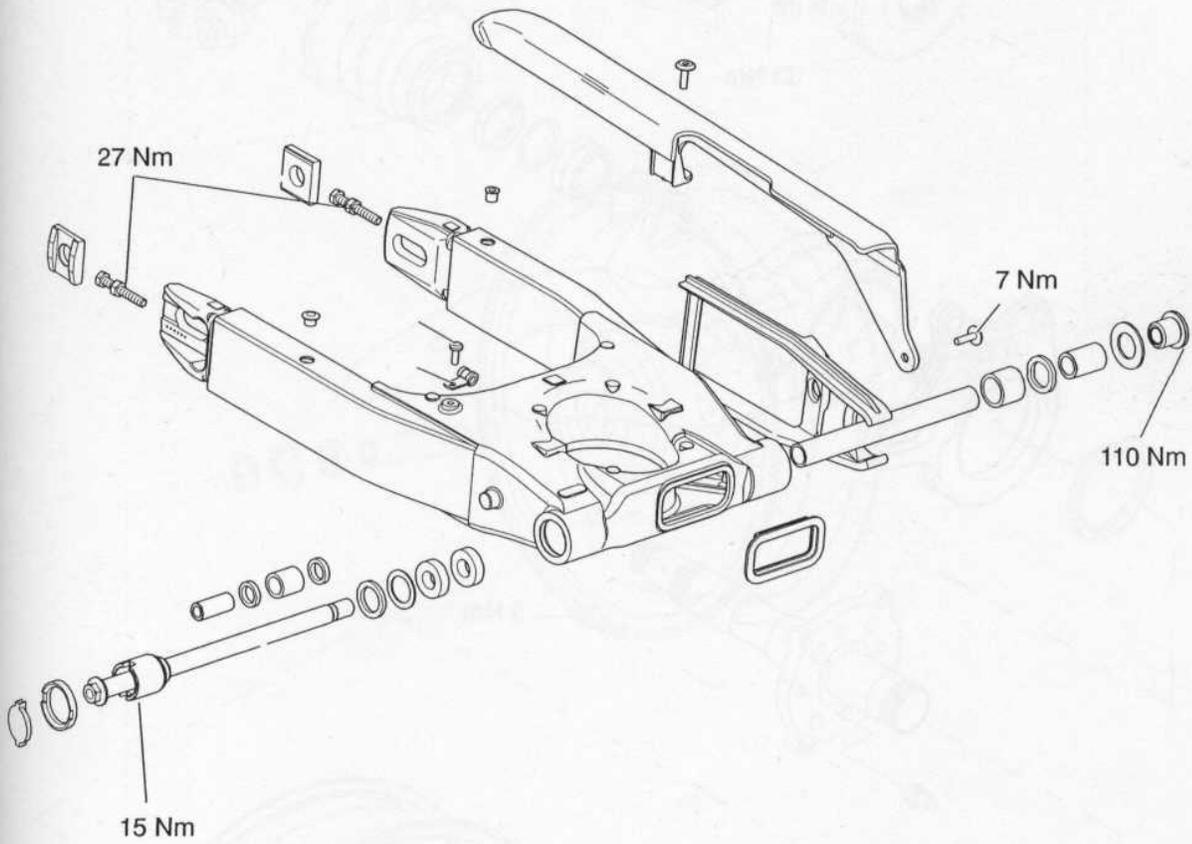
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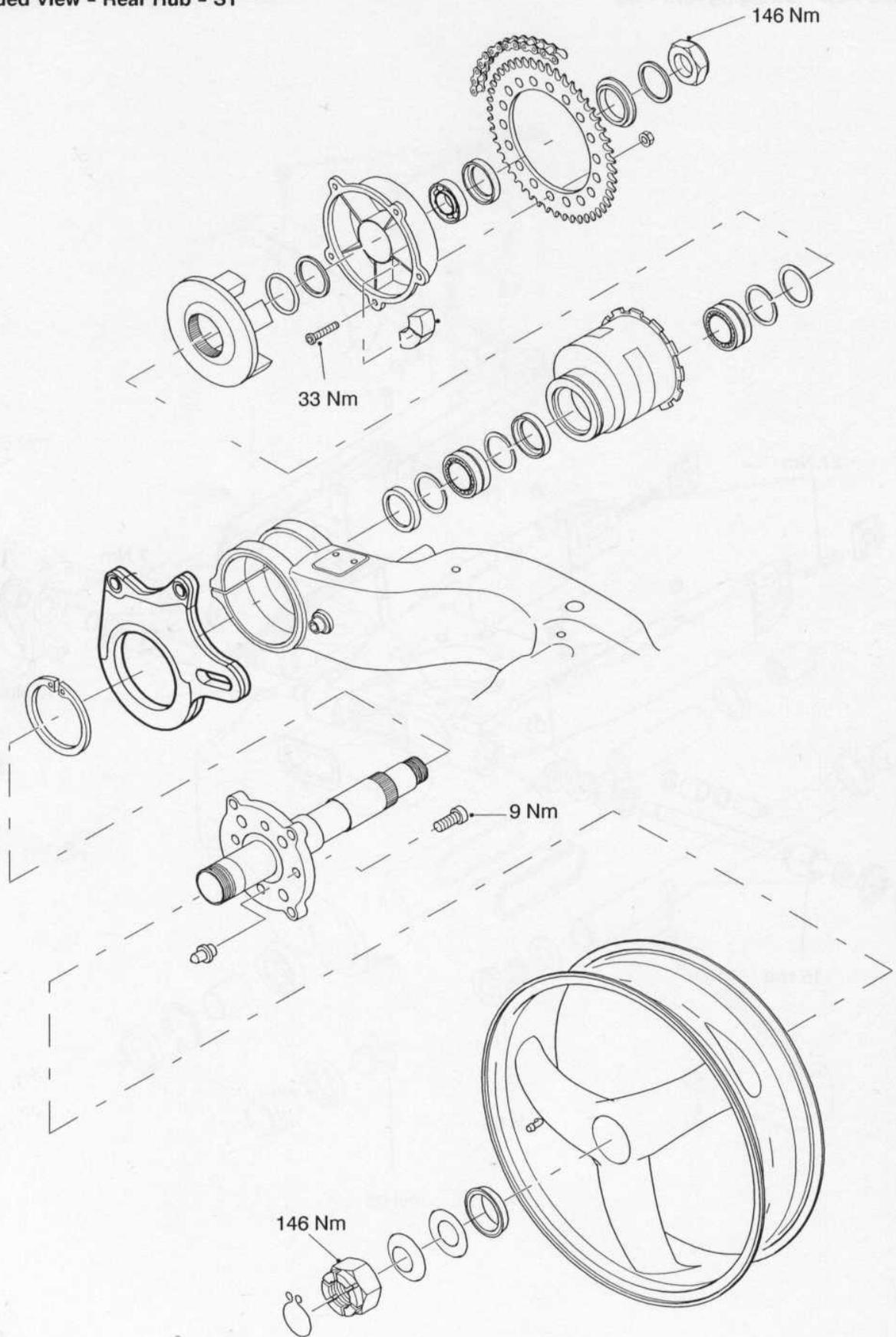
Exploded View - Swinging Arm - ST



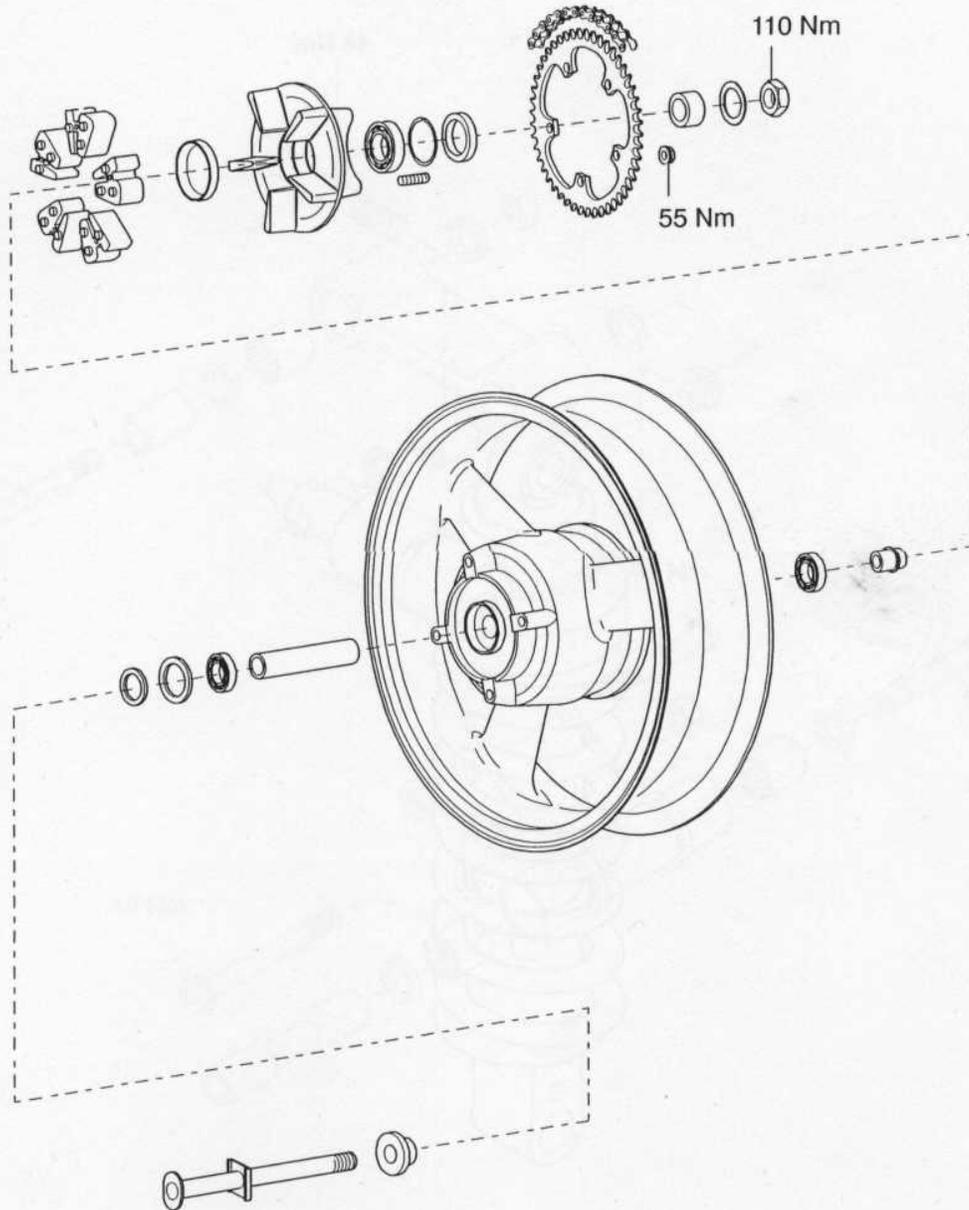
Exploded View - Swinging Arm - RS



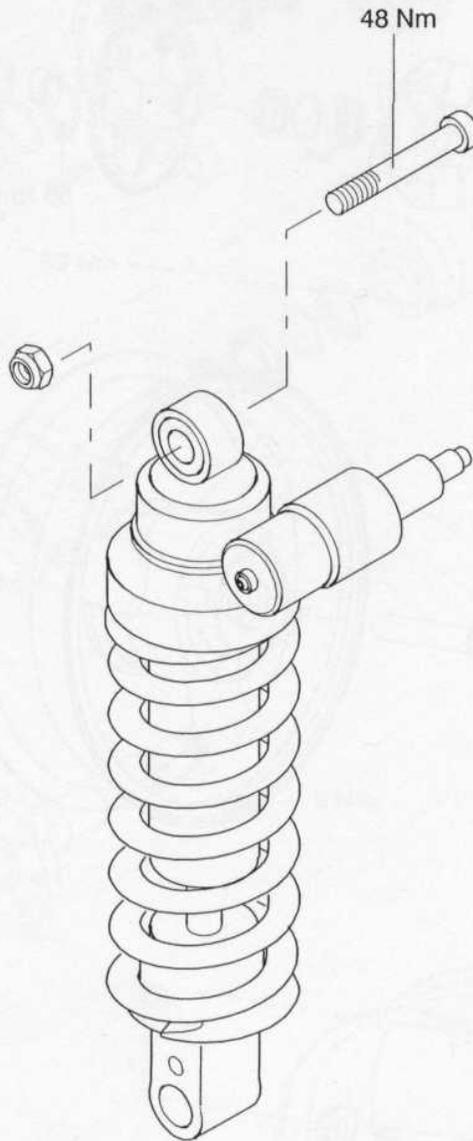
Exploded View - Rear Hub - ST



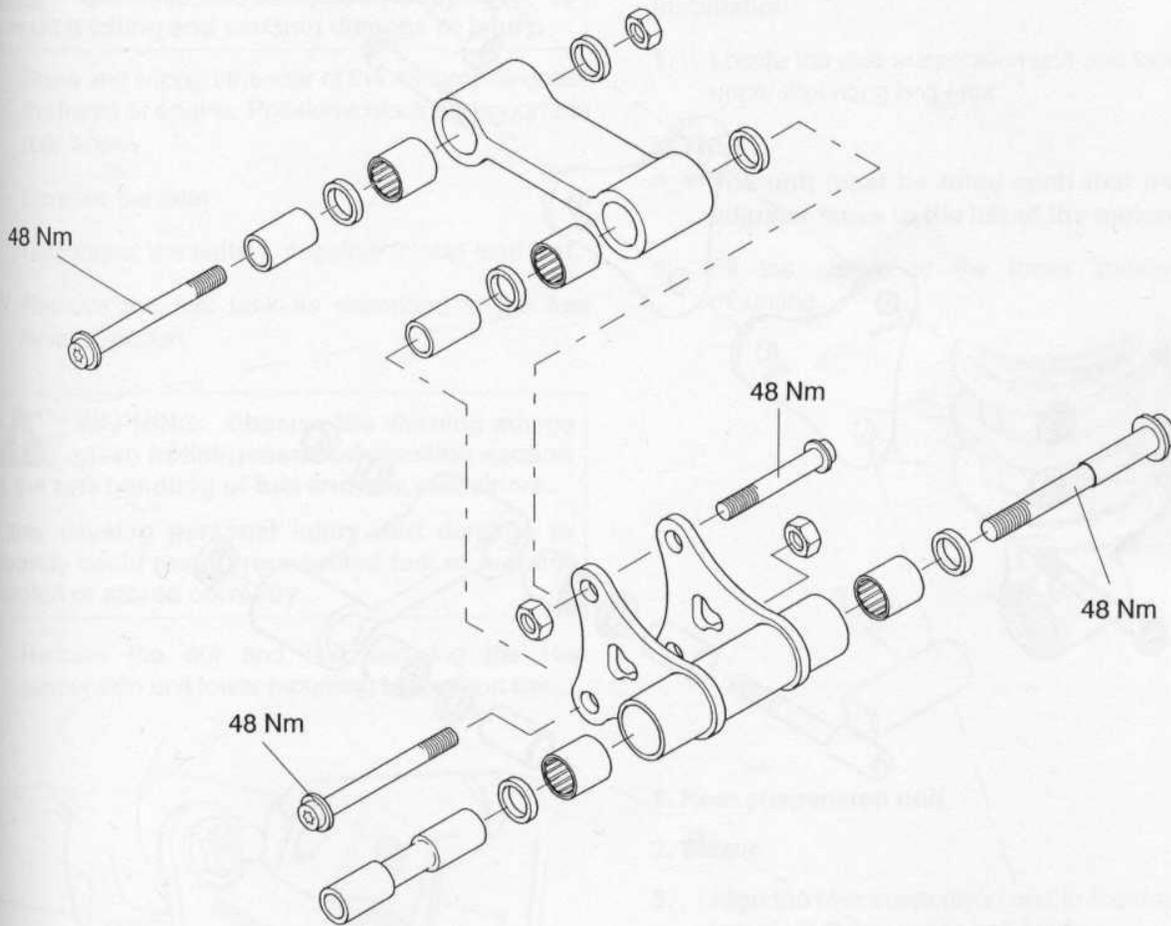
Exploded View - Rear Wheel and Final Drive - RS



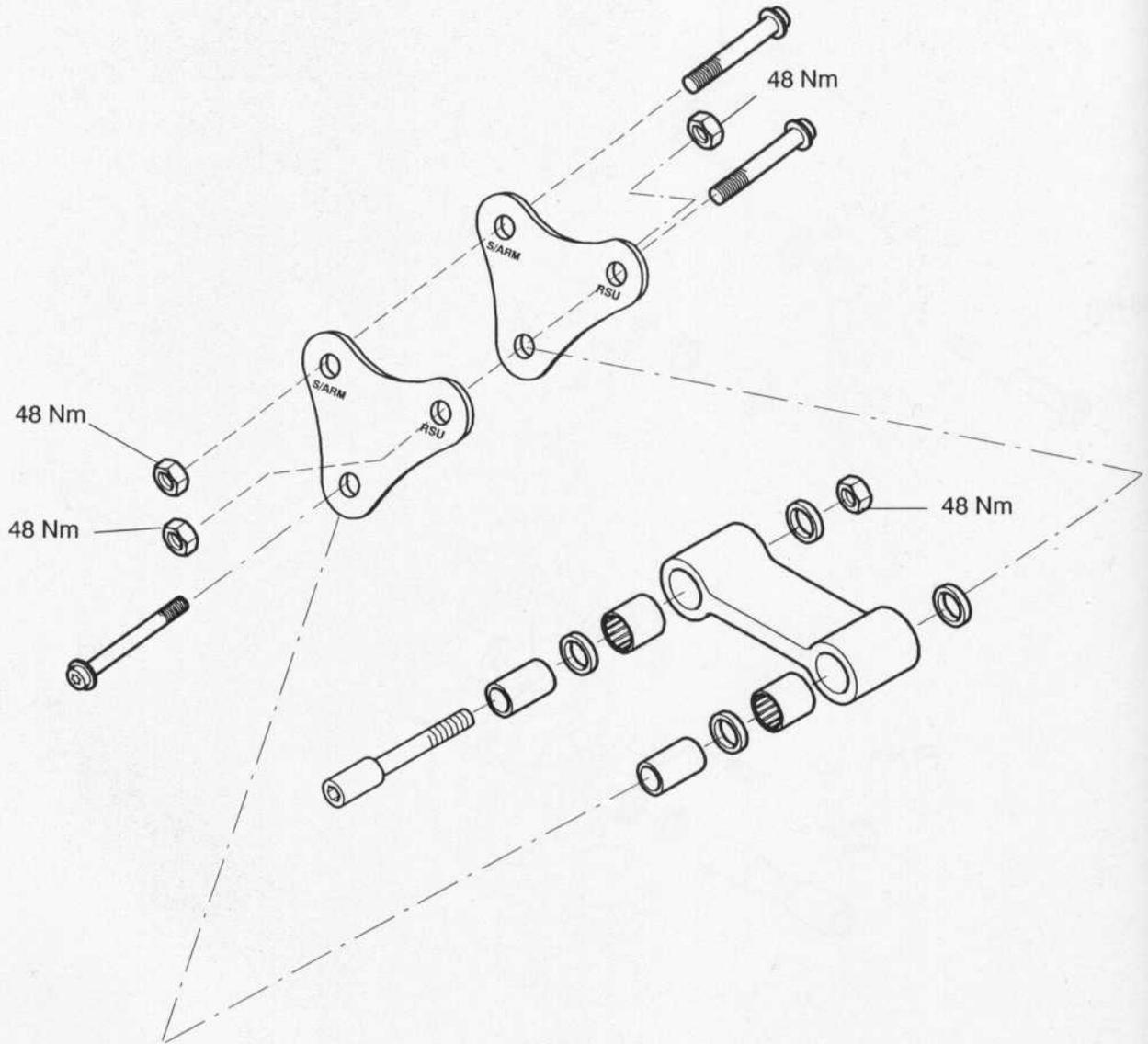
Exploded View - Rear Suspension Unit



Exploded View - Drop/Drag Link - ST



Exploded View - Drop/Drag Link - RS



REAR SUSPENSION UNIT - BOTH MODELS

Removal

! 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.

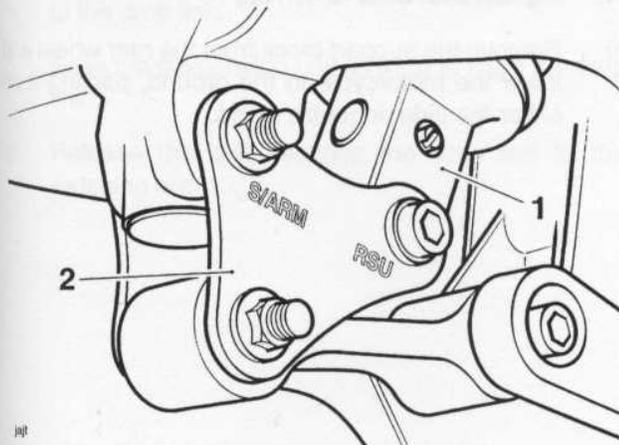
! WARNING: Ensure the motorcycle is stabilised and adequately supported, to prevent it falling and causing damage or injury.

1. Raise and support the rear of the motorcycle under the frame or engine. Position a block to support the rear wheel.
2. Remove the seat
3. Disconnect the battery, negative (black) lead first.
4. Remove the fuel tank as described in the fuel system 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.

5. Remove the nut and bolt securing the rear suspension unit lower mounting to the drop link.



1. Rear suspension unit

2. Drop link

6. Remove the rear suspension unit upper mounting nut and bolt.

7. Withdraw the rear suspension unit upwards through the frame.
8. Collect the sleeve from the lower end of the unit.

Inspection

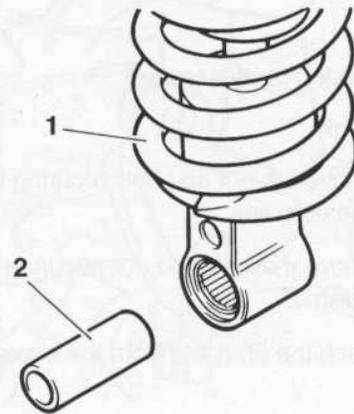
1. Clean all components and inspect for damage and wear to:
 - rear suspension unit upper and lower mountings,
 - lower mounting sleeve.
 Renew parts as necessary.

Installation

1. Locate the rear suspension unit and loosely fit the upper mounting bolt / nut.

NOTE:

- The unit must be fitted such that the preload adjuster faces to the left of the motorcycle.
2. Fit the sleeve to the lower suspension unit mounting.



jadm

1. Rear suspension unit

2. Sleeve

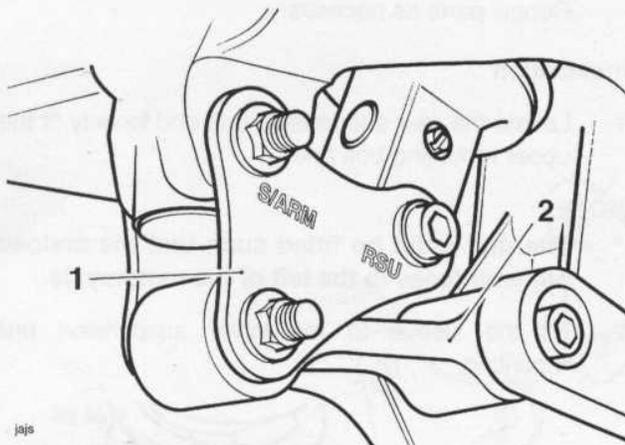
3. Align the rear suspension unit to the drop link and loosely fit the securing bolt / nut.
4. Tighten the rear suspension unit upper mounting to **48 Nm**.
5. Tighten the rear suspension unit lower mounting to **48 Nm**.
6. Refit the fuel tank.
7. Connect the battery, red (positive) lead first.
8. Refit the seat.
9. Remove the support.

DRAG LINK - BOTH MODELS

Removal

! WARNING: Ensure the motorcycle is stabilised and adequately supported, to prevent it falling and causing damage or injury.

1. Raise and support the rear of the motorcycle under the frame or engine. Position a block to support the rear wheel.



jajs

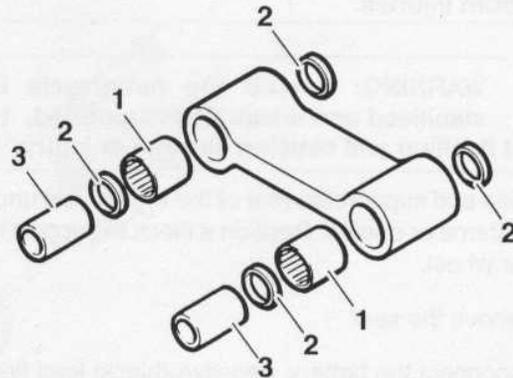
1. Drop link (RS illustrated)

2. Drag link

2. Remove the nut and bolt securing the the drag link to the drop link.
3. Remove the bolt and nut securing the drag link to the frame.
4. Detach the drag link from the frame and drop link.

Inspection

1. Clean all components and inspect for damage / wear to:
 - drag link bearing, sleeve and seals,
 - fixing bolts,
 Renew as necessary.



jado

1. Drag link bearing

2. Drag link seals

3. Drag link sleeve

Installation

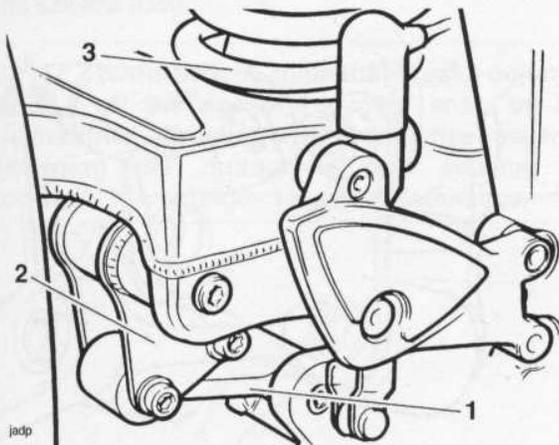
1. Pack the drag link bearings with grease.
2. Fit the drag link sleeves and seals.
3. Position the drag link to the frame and drop link and refit the bolts.
4. Tighten both bolts to **48 Nm**.
5. Remove the support block from the rear wheel and lower the motorcycle to the ground, parking it on either the side or centre stand.

DROP LINK - ST MODEL ONLY

Removal

! WARNING: Ensure the motorcycle is stabilised and adequately supported, to prevent it falling and causing damage or injury.

1. Raise and support the rear of the motorcycle beneath the frame or engine. Position a block to support the rear wheel.



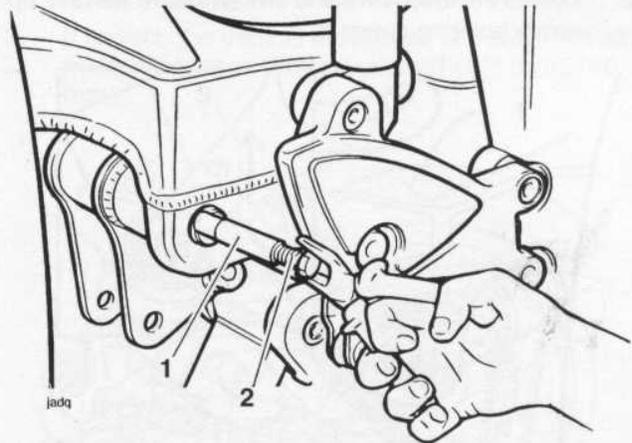
- 1. Drag Link
- 2. Drop Link
- 3. Rear Suspension Unit

2. Remove the nut and bolt securing the the drag link to the drop link.
3. Detach the drag link from the drop link.
4. Release the bolt securing the rear suspension unit to the drop link.
5. Ease the suspension unit forward to clear the drop link.
6. Release the bolt securing the drop link to the swinging arm.

7. Withdraw the drop link spindle from the swinging arm.

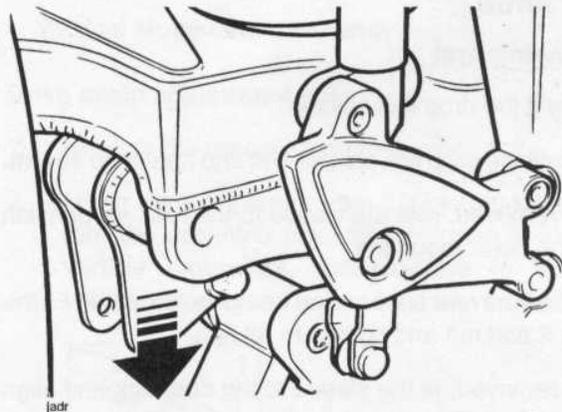
NOTE:

- If tight, an M14 (1.5 mm thread pitch) bolt can be threaded into the spindle to assist extraction.



- 1. Drop Link Spindle
- 2. M14 Bolt

8. Remove the drop link from the swinging arm.

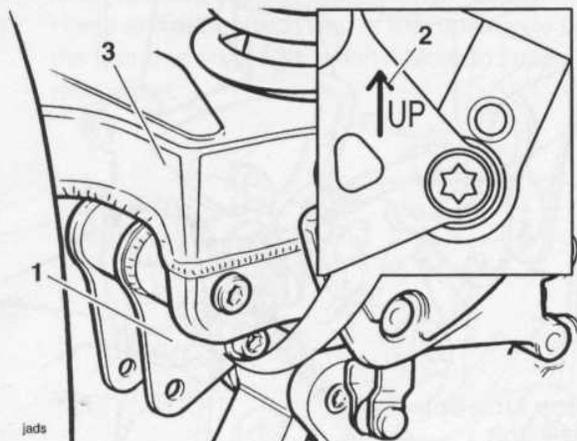


Inspection

1. Clean all components and inspect for damage / wear to:
 - drag link bearings,
 - drag link sleeve and bolt,
 - rear suspension unit lower mounting,
 - drop link bearings and seals.
 Renew as necessary.
2. Check the drop link upper bearings for wear.

Installation

1. Apply grease to the drop and drag link bearings. Also apply grease to the bearing at the lower end of the rear suspension unit.
2. Locate the drop link to the swinging arm with the 'up' arrow pointing upwards



1. Drop link
2. 'Up' Arrow
3. Swinging Arm

3. Refit the drop link spindle.
4. Refit the drop link spindle bolt and tighten to **48 Nm**.
5. If removed, refit the sleeve to the rear suspension unit lower mounting.
6. Align the rear suspension unit to the drop link. Fit the bolt and nut and tighten to **48 Nm**.
7. If removed, fit the sleeve to the drag link and align the drag link to the drop link.
8. Fit the retaining bolt from the right hand side of the motorcycle and tighten to **48 Nm**.
9. Remove the support block from the rear wheel and lower the motorcycle to the ground, parking it on either the side or centre stand.

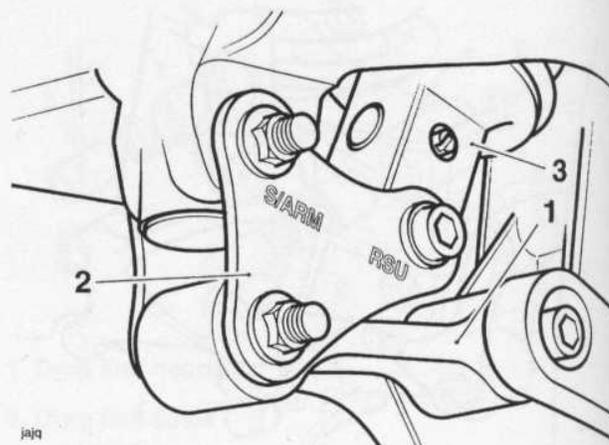
DROP LINKS - RS MODEL ONLY

Removal



WARNING: Ensure the motorcycle is stabilised and adequately supported, to prevent it falling and causing damage or injury.

1. Raise and support the rear of the motorcycle beneath the frame or engine. Position a block to support the rear wheel.



1. Drag Link
2. Drop Link
3. Rear Suspension Unit

2. Remove the nut and bolt securing the the drag link to the drop links.
3. Detach the drag link from the drop links.
4. Release the bolt securing the rear suspension unit to the drop links.
5. Ease the suspension unit forward to clear the links.
6. Release the bolt securing the drop links to the swinging arm. Collect the link plates.

Installation

Installation can be achieved by directly reversing the removal process. Tighten fasteners as follows:

- Drop links to swinging arm - **48 NM**
- Drag link to drop links - **48 Nm**.
- Rear suspension unit to drop links - **48 Nm**.

NOTE:

- The drop links are marked 'S/ARM' and 'RSU'. Ensure that the holes marked 'S/ARM' are aligned with the swinging arm and the holes marked 'RSU' with the rear suspension unit.

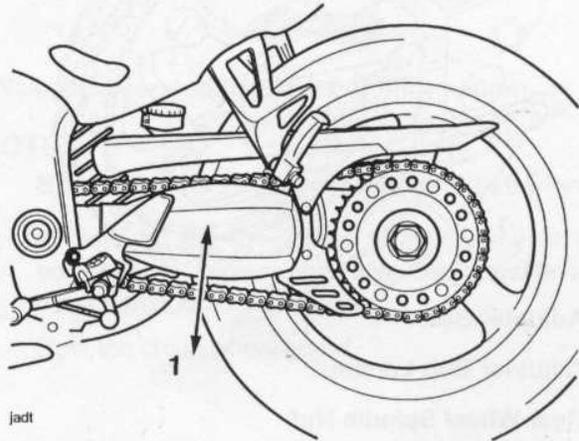
DRIVE CHAIN

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, never 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 machine 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 (ST Illustrated)

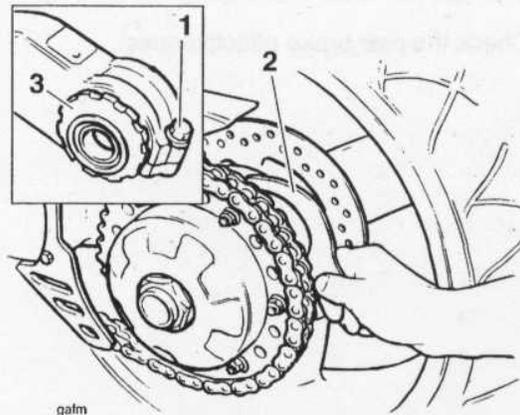
1. Set the motorcycle up on the side or centre stand.
2. Rotate the rear wheel to find the position where the chain has least slack. Measure the chain's vertical movement, mid-way between sprockets.
3. If correct, the vertical movement of the drive chain midway between the sprockets should be 35–40 mm.



1. Vertical Movement 35–40mm

Drive chain adjustment - ST

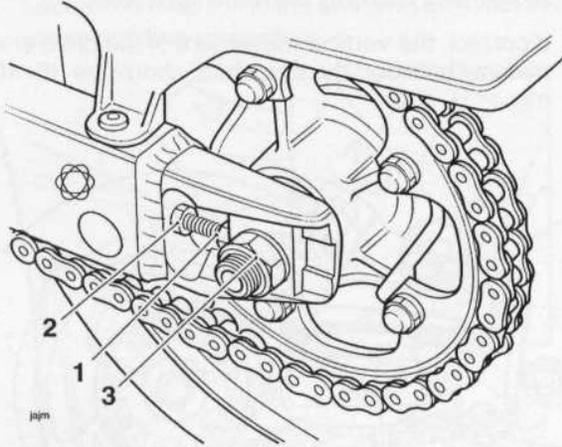
1. Slacken the swinging arm/hub pinch bolt.
2. Using the 'C' spanner from the motorcycle tool kit, turn the eccentric adjuster clockwise to increase vertical movement, anticlockwise to take out vertical movement.



1. Pinch bolt
 2. 'C' spanner
 3. Eccentric adjuster
3. Once the correct chain setting has been achieved, tighten the swinging arm/eccentric adjuster pinch bolt to **55 Nm**.

Drive chain adjustment - RS

1. Loosen the wheel spindle nut.
2. Release the locknuts on both the left and right chain adjuster bolts.



1. Adjuster Bolt

2. Adjuster Bolt Locknut

3. Rear Wheel Spindle Nut

3. 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.
4. When the correct amount of chain free-movement has been set, tighten both adjuster locknuts to **27 Nm** and the rear wheel spindle nut to **110 Nm**.
5. Rotate the rear wheel and repeat the chain adjustment check. Re-adjust if necessary
6. Check the rear brake effectiveness.

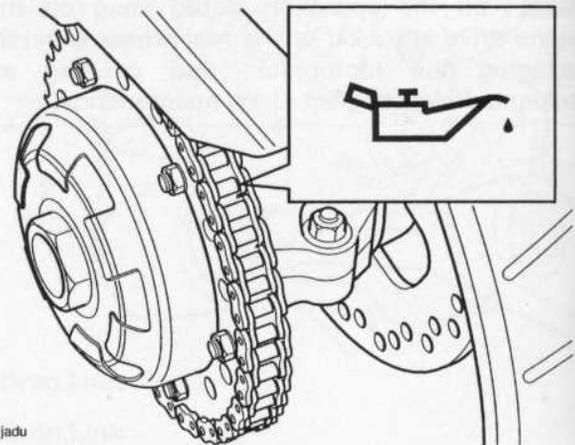
Chain Lubrication - Both Models

Chain lubrication is necessary after riding through rain, standing water, on wet roads, or any time that the chain appears dry. Use the chain lubricant recommended in the specification.



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 'O'-rings. The lubricant will penetrate the rollers and bushings and also prevent the O-rings from deterioration.

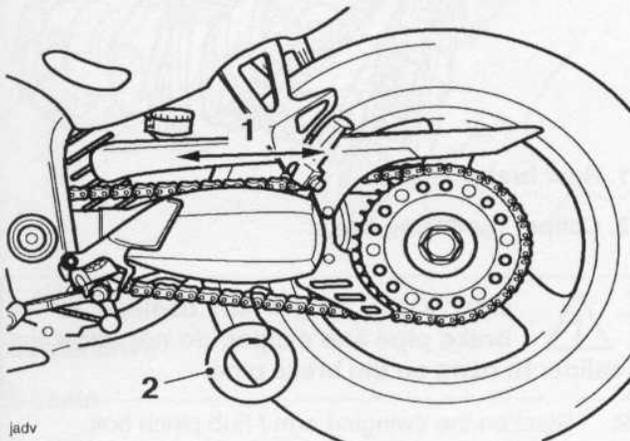


Chain Lubrication Positions

2. Wipe off any excess oil.
3. If the chain is especially dirty, clean using paraffin before applying the lubricant.

Chain Wear Inspection - Both Models

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 a 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 - ST Illustrated

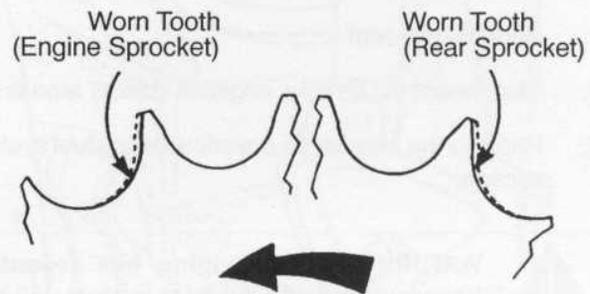
2. 10-20kg Weight

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.



(Wear exaggerated for clarity of information)

NOTE:

- Sprocket wear is exaggerated for illustration.
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 - ST

Removal

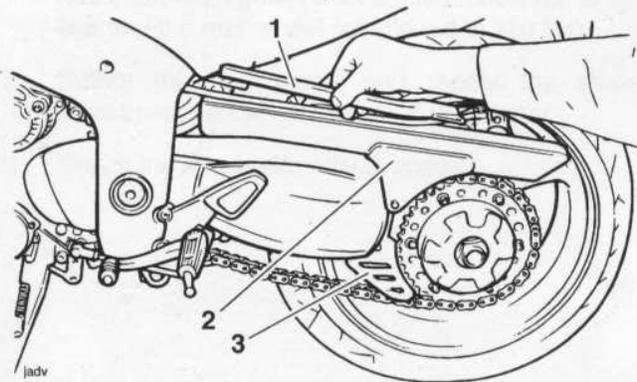
1. Remove the seat.
2. Disconnect the battery, negative (black) lead first.
3. Remove the silencer as described in the fuel system section.

! 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. Raise and support the rear of the motorcycle under the frame or engine.

! WARNING: Ensure the motorcycle is stabilised and adequately supported, to prevent it falling and causing damage or injury.

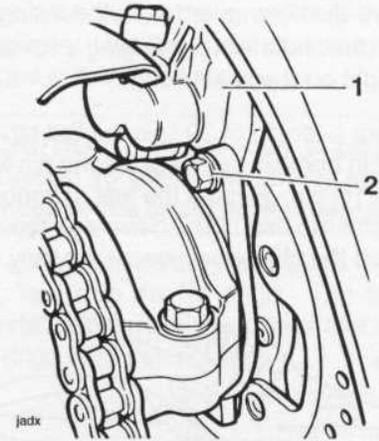
5. Remove the rear wheel as described in the wheel section.
6. Remove the rear brake hose cover from the upper chain guard, then remove the upper chain guard.



1. Brake hose cover
2. Upper chain guard
3. Lower chain guard

7. Remove the lower chain guard.

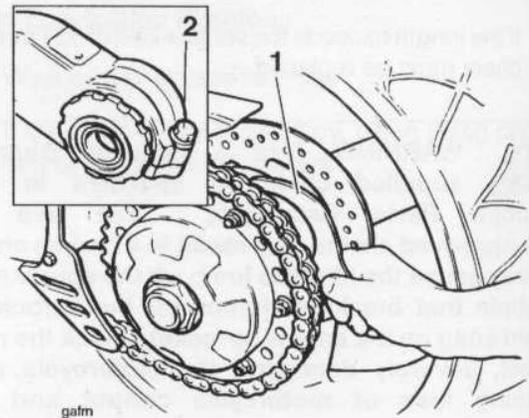
8. Without disconnecting the brake hose, detach then support the rear brake caliper.



1. Rear brake caliper
2. Caliper mounting bolts

! CAUTION: To prevent damage to the brake pipe and caliper, do not allow the caliper to hang on the brake pipe.

9. Slacken the swinging arm / hub pinch bolt.
10. Use the 'C' spanner from the motorcycle tool kit to turn the hub and slacken the drive chain.

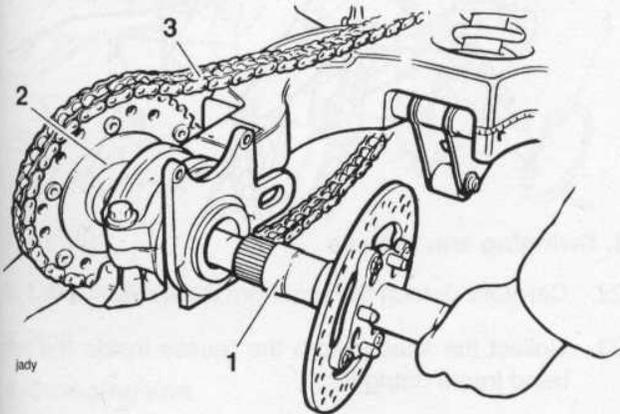


1. 'C' spanner
2. Swinging arm/hub pinch bolt

11. De-stake then slacken the nut securing the final drive unit to the axle shaft.
12. Remove the staked nut (discard the nut), belleville washer and stepped washer from the axle shaft.
13. Pull the axle shaft through the hub to the right hand side such that the shaft clears the final drive assembly. Remove the final drive unit disconnecting the chain at the same time.

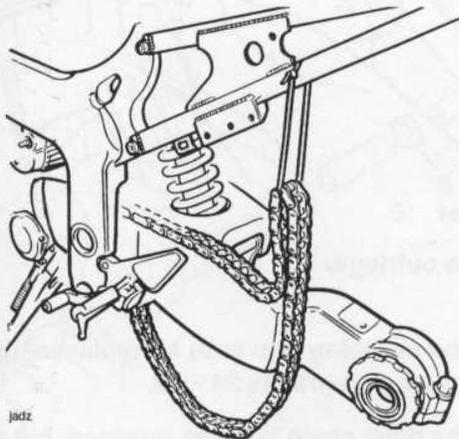
NOTE:

- Collect the spacer fitted between the final drive and the hub.
- Support the chain while the final drive is being removed to prevent it dragging through the dirt.



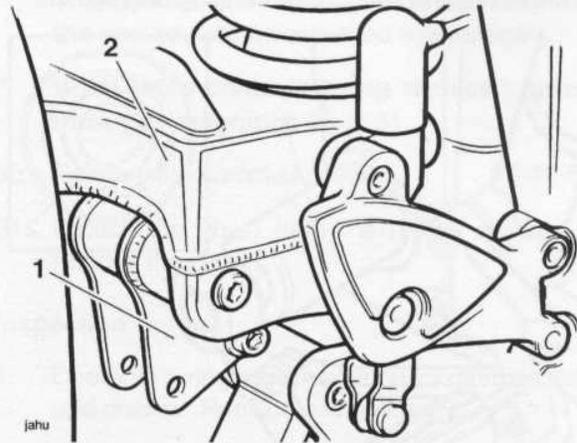
- 1. Axle shaft
- 2. Final drive
- 3. Chain

14. Place the axle shaft/brake disc assembly to one side.



Typical Drive Chain Support

15. Remove the drop link bolt from the swinging arm.

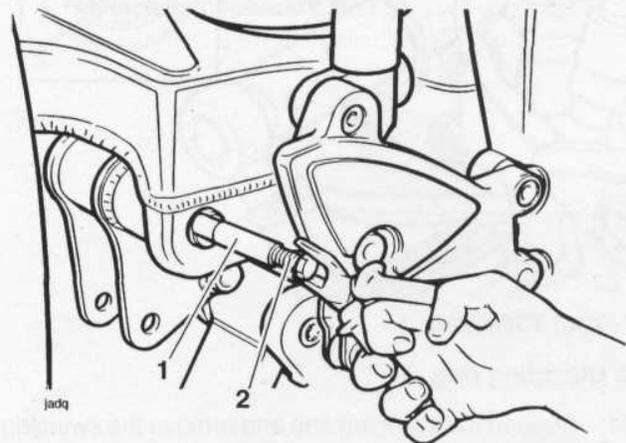


- 1. Drop Link
- 2. Swinging Arm

16. Support the swinging arm and remove the rear suspension unit as described earlier in this section.
17. Detach the drop link by pulling out its mounting spindle from the swinging arm.

NOTE:

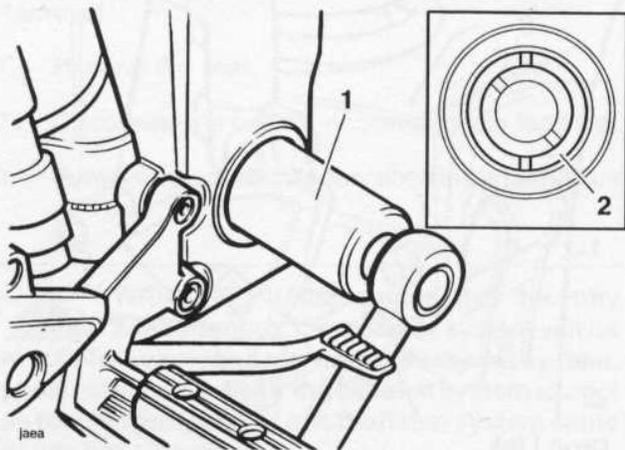
- If tight, an M14 (1.5 mm thread pitch) bolt can be threaded into the spindle to assist extraction.



- 1. Drop Link Spindle
- 2. M14 Bolt

18. Release the swinging arm spindle bolts from both sides of the motorcycle.

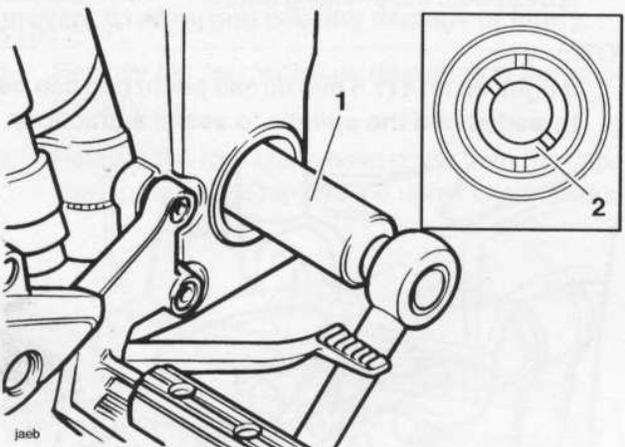
19. Using tool T3880295, remove the locking ring from the right hand side of the swinging arm spindle.



1. Tool T3880295

2. Locking ring

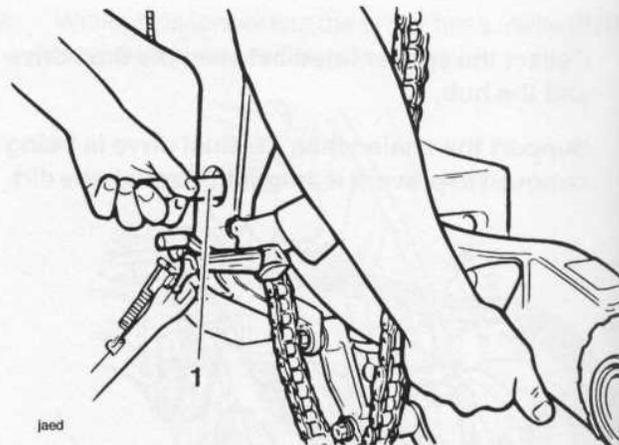
20. Using tool T3880290, slacken the swinging arm clamping ring from the right hand side of the swinging arm spindle.



1. Tool T3880290

2. Clamping ring

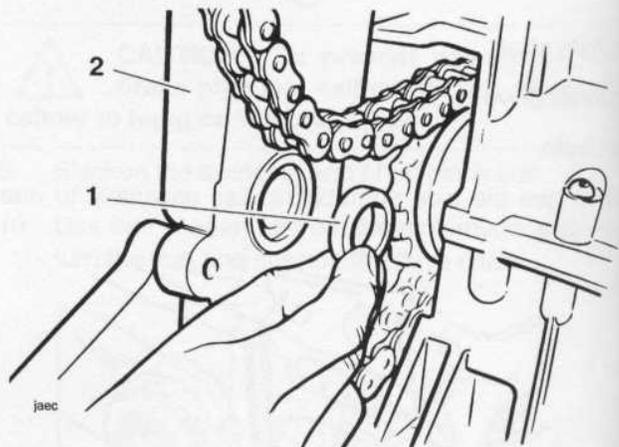
21. Support the swinging arm and remove the swinging arm spindle.



1. Swinging arm spindle

22. Carefully detach the arm from the frame.

23. Collect the spacer from the recess inside the left hand frame outrigger.



1. Spacer

2. Frame outrigger

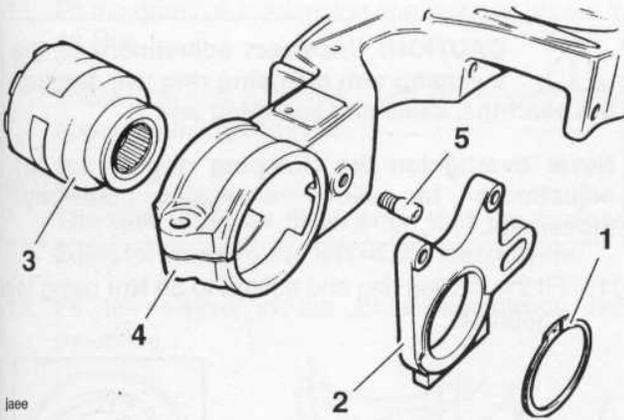
NOTE:

- If the swinging arm is to be replaced, proceed through paragraphs 24 - 29.
- If the drive chain is being replaced, but not the swinging arm, proceed through paragraphs 30 to 31.

24. Remove the large circlip securing the caliper carrier to the hub and detach the carrier.

25. Remove the hub from the left hand side of the swinging arm.

26. Remove the caliper carrier positioning stud.



jaee

- 1. Circlip
- 2. Caliper Carrier
- 3. Hub
- 4. Swinging arm
- 5. Caliper Carrier Positioning Stud

- 27. Remove the bearing sleeves from both sides.
- 28. Remove the right hand bearing by drifting through from the left.
- 29. Collect the spacer tube.

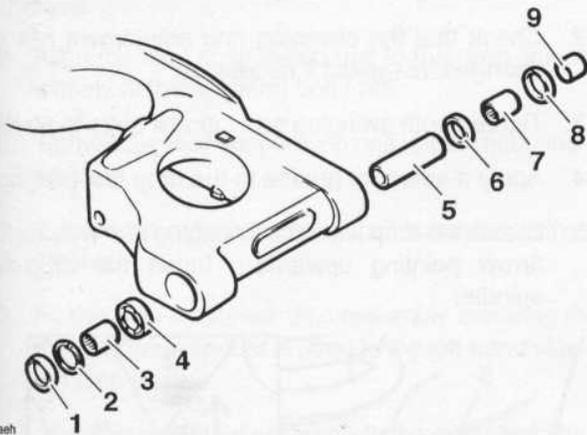
NOTE:

- The needle roller bearing in the left hand side of the arm cannot be removed undamaged.
- If the drive chain is being replaced, proceed through paragraphs 30 to 31.

- 30. Remove the sprocket cover.
- 31. Detach the chain from the output sprocket and remove the chain.

Inspection

- 1. Check all swinging arm bearing for damage, pitting, and cracks. Replace as necessary.
- 2. Check the swinging arm for damage. Replace as necessary.
- 3. Check the axle bearings for damage, pitting, and cracks. Replace as necessary.
- 4. Check all bearing seals for damage, splits etc. Replace as necessary.
- 5. Check the chain for wear, damage etc. Replace as necessary.
- 6. Check both sprockets for wear, damage etc. Replace as necessary.



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- 1. Seal
- 2. Circlip
- 3. Bearing Sleeve
- 4. Ball bearing
- 5. Sleeve
- 6. Seal
- 7. Needle Roller Bearing
- 8. Seal
- 9. Bearing Sleeve

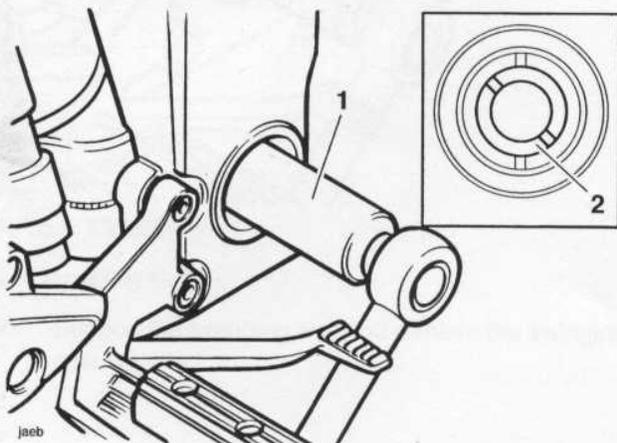
Installation

1. Fit the drive chain to the output sprocket.
2. Refit the sprocket cover. Tighten the sprocket cover bolts to **9 Nm**.
3. Install the bearings (marked faces outwards), sleeves etc. into the swinging arm in the order shown on the previous page. Use new seals throughout.
4. Refit the caliper carrier positioning stud and tighten to **40 Nm**.
5. Refit the hub with the circlip groove to the right hand side.
6. Refit the caliper carrier and retain with the circlip.
7. Fit the spacer to the recess on the inside of the left hand frame outrigger.

NOTE:

- **A smear of grease will help to retain the spacer while the swinging arm is being positioned.**

8. Position the swinging arm to the frame.
9. Refit the swinging arm spindle.
10. Using tool T3880290, tighten the swinging arm spindle inner adjustment ring to **15 Nm**.

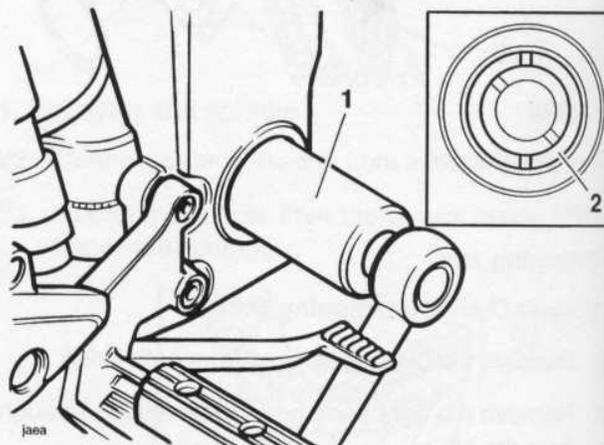


1. Tool T3880290
2. Clamping ring

CAUTION: Incorrect adjustment of the swinging arm clamping ring will damage the bearings, seals and swinging arm.

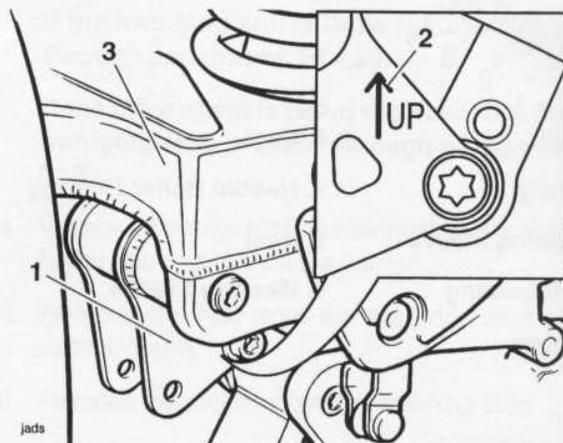
Never overtighten the clamping ring or set the adjustment to allow excessive sideways movement.

11. Fit the locking ring and tighten to **30 Nm** using tool T3880295.



1. Tool T3880295
2. Locking ring

12. Check that the clamping ring adjustment has not changed, re-adjust if necessary.
13. Tighten both swinging arm spindle bolts to **60 Nm**.
14. Apply a smear of grease to the drop link bearings.
15. Locate the drop link to the swinging arm with the 'up' arrow pointing upwards. Insert the drop link spindle.

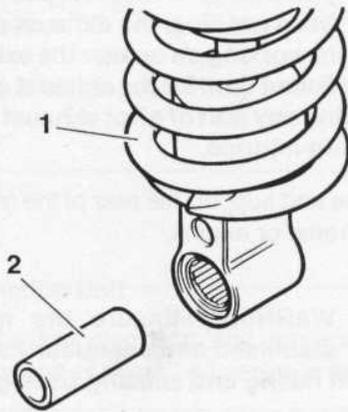


1. Drop link
2. 'Up' Arrow
3. Swinging Arm

16. Fit the drop link to swinging arm bolt and tighten to **48 Nm**.
17. Locate the rear suspension unit and loosely fit the upper mounting bolt / nut.

NOTE:

- **The unit must be fitted such that the preload adjuster faces to the left of the motorcycle.**
18. Fit the sleeve to the lower suspension unit mounting.



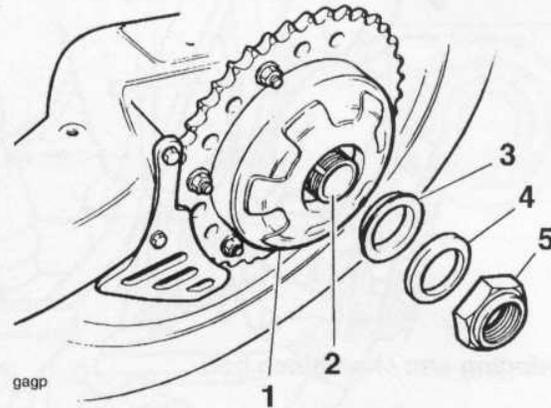
jadm

1. Rear suspension unit

2. Sleeve

19. Align the rear suspension unit to the drop link and loosely fit the securing bolt / nut.
20. Tighten the rear suspension unit upper mounting to **48 Nm**.
21. Tighten the rear suspension unit lower mounting to **48 Nm**.
22. Fit the axle shaft/rear disc assembly ensuring that the *final drive spacer* is fitted to the left hand side of the axle shaft.
23. Align the final drive assembly to the axle shaft fitting the chain during assembly.

24. Fit the stepped washer, belleville washer (dished side out) and a **new** staked nut to the shaft.



1. Final drive unit

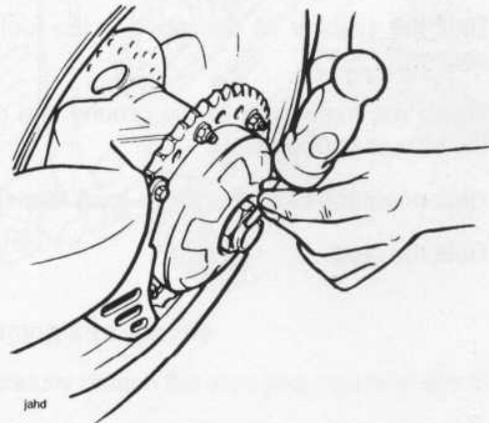
2. Axle shaft

3. Stepped washer

4. Belleville washer

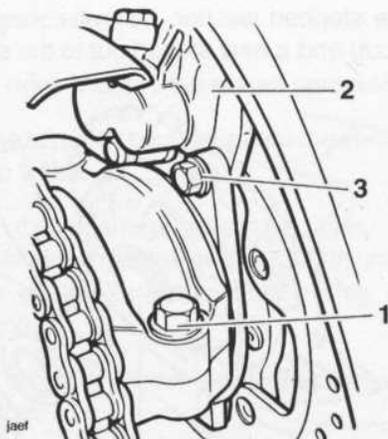
5. Retaining nut

25. Prevent the axle from turning and tighten the nut to **146 Nm**. Stake to secure.



Staking the nut

26. Adjust the chain tension to give 35-40 mm of slack by turning the hub with the 'C' spanner.
27. Tighten the swinging arm / hub pinch bolt to **55 Nm**.
28. Thoroughly clean and degrease the brake disc.
29. Refit the rear brake caliper. Tighten the caliper fixings to **40 Nm**.
30. Pump the rear brake pedal a few times to position the brake pads in the caliper. Rectify as necessary if correct brake operation is not restored.



1. Swinging arm / hub pinch bolt

2. Rear brake caliper

3. Rear brake caliper fixings

31. Refit the upper and lower chain guards. Tighten the fixings to **9 Nm**.
32. Align the rear brake hose to the chain guard and refit the hose cover. Tighten the hose cover fixings to **9 Nm**.
33. Refit the rear wheel as described in the wheel section.
34. Refit the silencer as described in the fuel system section.
35. Lower the motorcycle to the ground and place on the side or centre stand.
36. Reconnect the battery positive (red) lead first.
37. Refit the seat.

SWINGING ARM/DRIVE CHAIN - RS

Removal

1. Remove the seat.
2. Disconnect the battery, negative (black) lead first.
3. Remove the silencer as described in the fuel system section.

! 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.

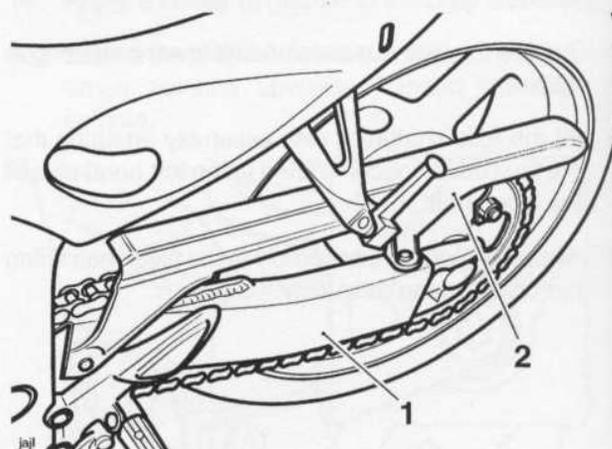
4. Raise and support the rear of the motorcycle under the frame or engine.

! WARNING: Ensure the motorcycle is stabilised and adequately supported, to prevent it falling and causing damage or injury.

5. Remove the rear wheel as described in the wheel section.

! CAUTION: To prevent damage to the brake pipe and caliper, do not allow the caliper to hang on the brake pipe.

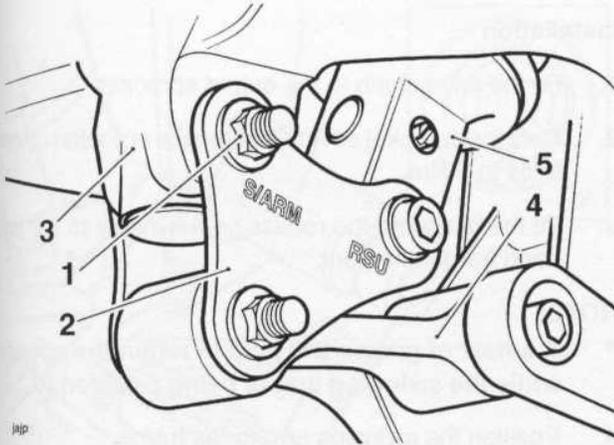
6. Remove the chain guard.



1. Swinging Arm

2. Chain Guard

7. Detach the brake hose 'P' clip from the front right hand side of the swinging arm.



1. Drop Link to Swinging Arm Bolt

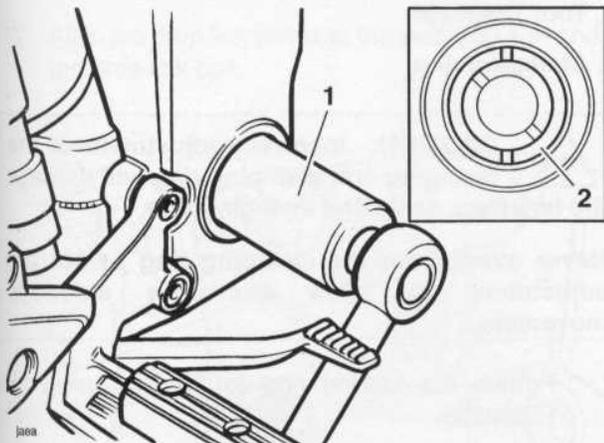
2. Drop Link

3. Swinging Arm

4. Drag Link

5. Rear Suspension Unit

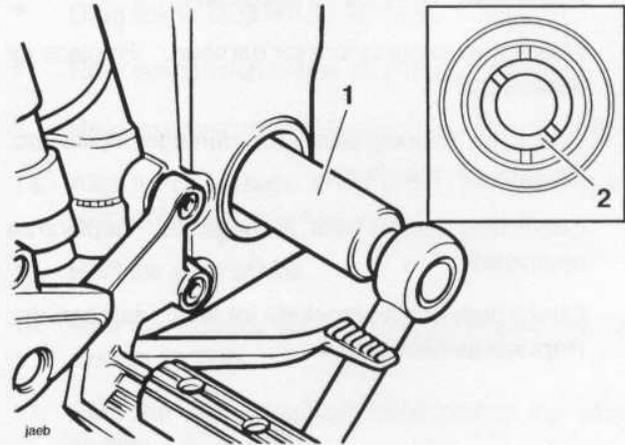
8. Support the swinging arm and remove the rear suspension unit as described earlier in this section.
9. Remove the drop link bolt from the swinging arm.
10. Pivot the drag link downwards until the drop links clear the swinging arm.
11. Release the swinging arm spindle bolt.
12. Using tool T3880295, slacken the locking ring from the right hand side of the swinging arm spindle.



1. Tool T3880295

2. Locking ring

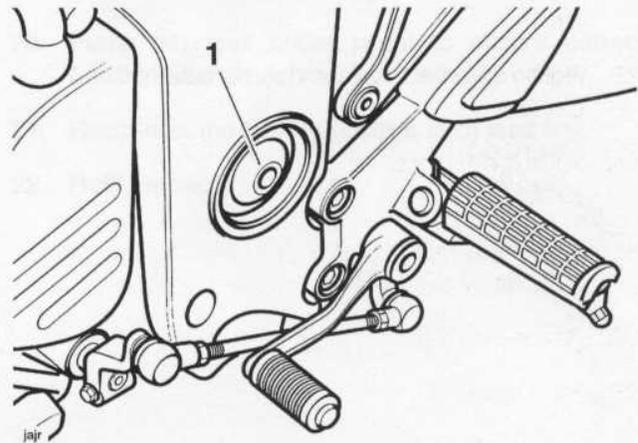
13. Using tool T3880290, slacken the swinging arm clamping ring on the right hand side of the swinging arm spindle.



1. Tool T3880290

2. Clamping ring

14. Support the swinging arm and remove the swinging arm spindle/bolt.



1. Swinging arm spindle

15. Carefully detach the swinging arm from the frame.
16. Collect the spacer from the recess inside the left hand frame outrigger.

NOTE:

- If the drive chain is being replaced, but not the swinging arm, proceed through paragraphs 17 to 18.
17. Remove the sprocket cover.
 18. Detach the chain from the output sprocket and remove the chain.

Inspection

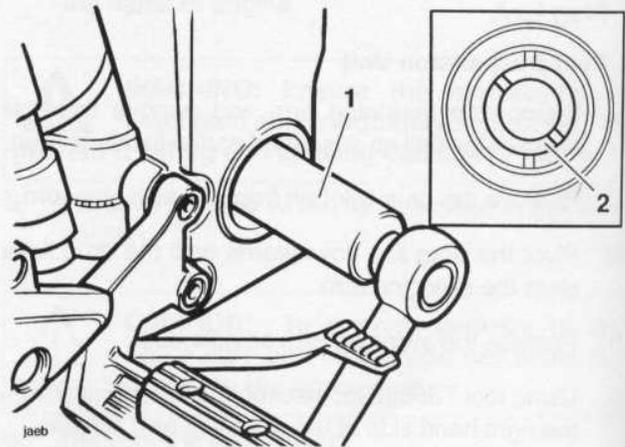
1. Check all swinging arm bearing for damage, pitting, and cracks. Replace as necessary.
2. Check the swinging arm for damage. Replace as necessary.
3. Check all bearing seals for damage, splits etc. Replace as necessary.
4. Check the chain for wear, damage etc. Replace as necessary.
5. Check both chain sprockets for wear, damage etc. Replace as necessary.

Installation

1. Fit the drive chain to the output sprocket.
2. Refit the sprocket cover. Tighten the sprocket cover bolts to **9 Nm**.
3. Fit the spacer to the recess on the inside of the left hand frame outrigger.

NOTE:

- **A smear of grease will help to retain the spacer while the swinging arm is being positioned.**
4. Position the swinging arm to the frame.
 5. Refit the swinging arm spindle bolt.
 6. Using tool T3880290, tighten the swinging arm adjustment ring to **15 Nm**.



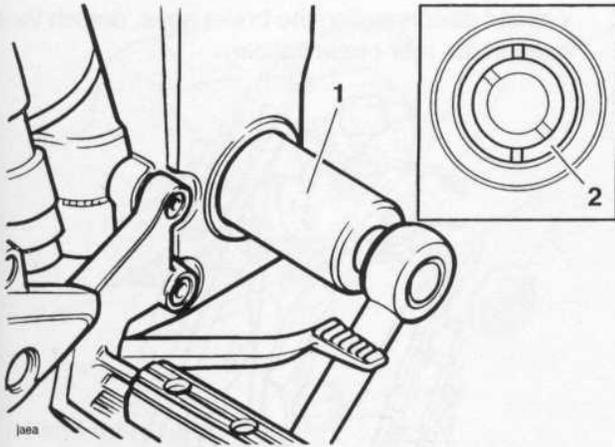
1. Tool T3880290

2. Clamping ring

CAUTION: Incorrect adjustment of the swinging arm clamping ring will damage the bearings, seals and swinging arm.

Never overtighten the clamping ring or set the adjustment to allow excessive sideways movement.

7. Tighten the locking ring to **30 Nm** using tool T3880295.



1. Tool T3880295

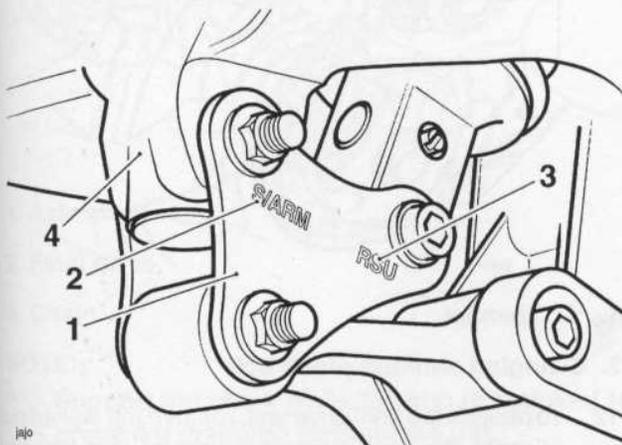
2. Locking ring

8. Check that the adjustment has not changed, re-adjust if necessary.
9. Tighten the swinging arm spindle bolt to **110 Nm**.
10. Apply a smear of grease to the drop link bearing in the swinging arm.

NOTE:

- **The holes in the drop links are marked 'S/ARM' and 'RSU'. Ensure that the holes marked 'RSU' are aligned with the rear suspension unit and the holes marked 'S/ARM' are aligned with the swinging arm.**

11. Refit the rear suspension unit and loosely retain with the upper and lower bolts.
12. Align the drop link plates to the swinging arm and fit the drop link bolt.



1. Drop link

2. 'S/ARM' Marking

3. 'RSU' Marking

4. Swinging Arm

13. Tighten all bolts as follows:-
 - Drop links to swinging arm - **48 Nm**.
 - Drag link to drop links - **48 Nm**.
 - Rear suspension unit to drop links - **48 Nm**.
 - Rear suspension unit upper mounting - **48 Nm**.
14. Align the brake hose 'P' clip to the swinging arm and refit/tighten the retaining screw.
15. Refit the chainguard.
16. Refit the exhaust silencer as described in the fuel system section.
17. Refit the rear wheel as described in the wheel section.
18. Check, and if necessary adjust, the chain free movement.
19. Support the motorcycle and remove the paddock stand. Park the motorcycle on the side stand.
20. Pump the rear brake pedal to ensure correct function after detachment of the brake caliper.
21. Reconnect the battery positive (red) lead first.
22. Refit the seat.

FINAL DRIVE - ST

Removal

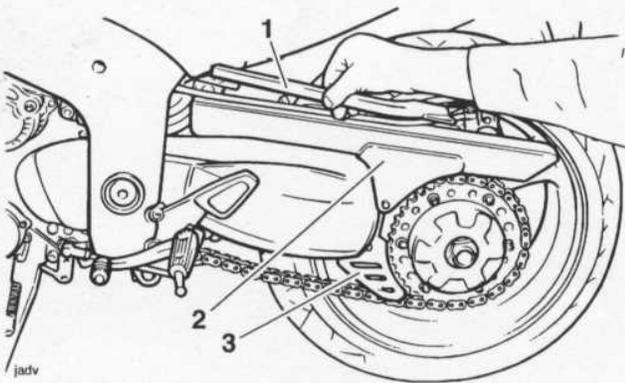
1. Remove the seat.
2. Disconnect the battery, negative (black) lead first.
3. Remove the silencer as described in the fuel system section.

! 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. Raise and support the rear of the motorcycle under the frame or engine.

! WARNING: Ensure the motorcycle is stabilised and adequately supported, to prevent it falling and causing damage or injury.

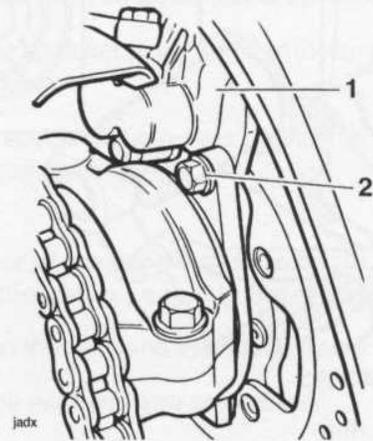
5. Remove the rear wheel as described in the wheel section.
6. Remove the rear brake hose cover from the upper chain guard, then remove the chain guard.



1. Brake hose cover
2. Upper chain guard
3. Lower chain guard

7. Remove the lower chain guard.

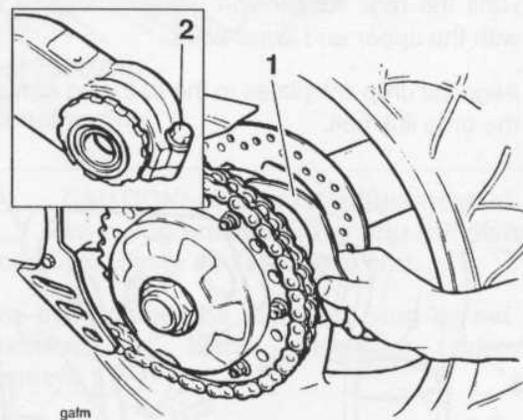
8. Without disconnecting the brake hose, detach then support the rear brake caliper.



1. Rear brake caliper
2. Caliper mounting bolts

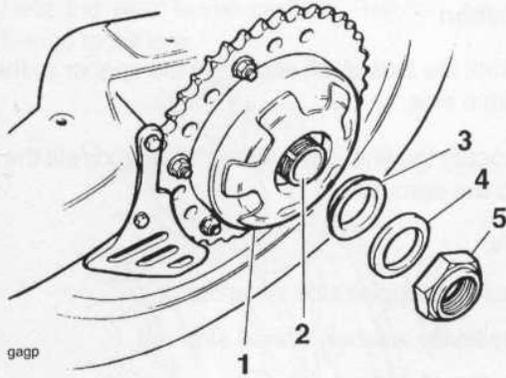
! CAUTION: To prevent damage to the brake pipe and caliper, do not allow the caliper to hang on the brake pipe.

9. De-stake then slacken the nut securing the final drive unit to the axle shaft.
10. Slacken the swinging arm / hub pinch bolt.
11. Use the 'C' spanner from the motorcycle tool kit to turn the hub and slacken the drive chain.



1. 'C' Spanner
2. Swinging arm/hub pinch bolt

12. To release the final drive unit, remove the staked nut (discard the nut), Belleville washer and stepped washer.

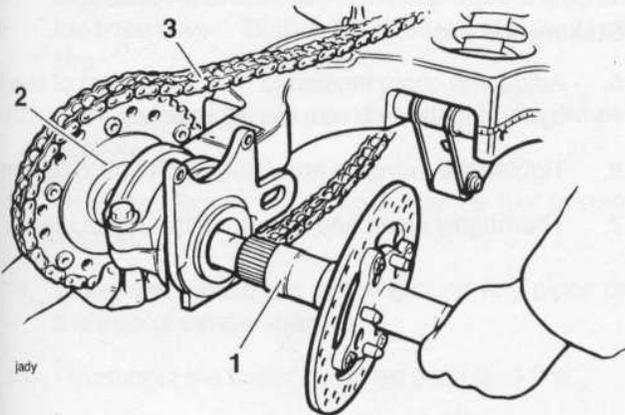


- 1. Final drive unit
- 2. Axle shaft
- 3. Stepped washer
- 4. Belleville washer
- 5. Retaining nut

13. Pull the axle shaft through the hub to the right hand side such that the shaft clears the final drive assembly. Remove the final drive unit disconnecting the chain at the same time.

NOTE:

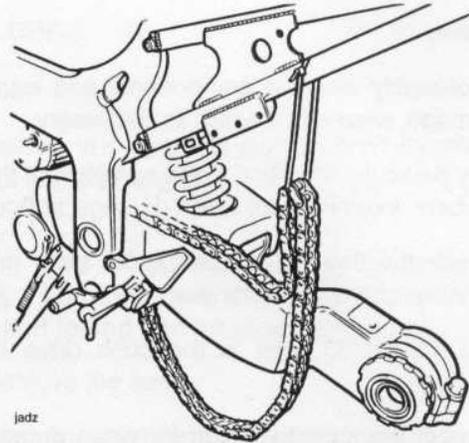
- Collect the spacer fitted between the final drive and the hub.



- 1. Axle shaft
- 2. Final drive
- 3. Chain

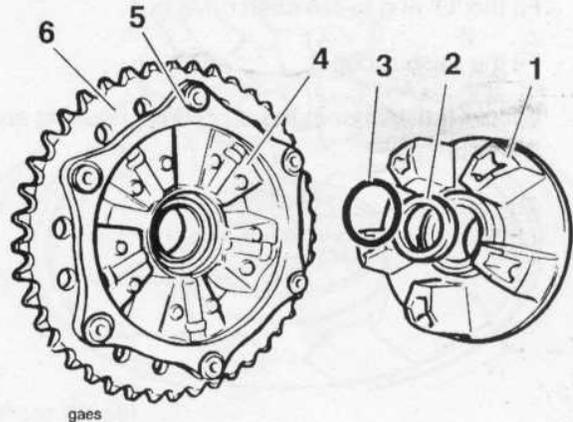
NOTE:

- Support the chain while the hub is removed to prevent it dragging through the dirt.
- If necessary, the brake disc can be removed at this point.



Typical Drive Chain Support

- 14. Ease off the cush drive hub, and capture the spacer.
- 15. Remove the cush drive rubbers.
- 16. If required, remove the securing nuts to release the chain sprocket.



- 1. Cush drive hub
- 2. Spacer
- 3. 'O' ring
- 4. Cush drive rubbers
- 5. Cush drive housing
- 6. Sprocket

Inspection

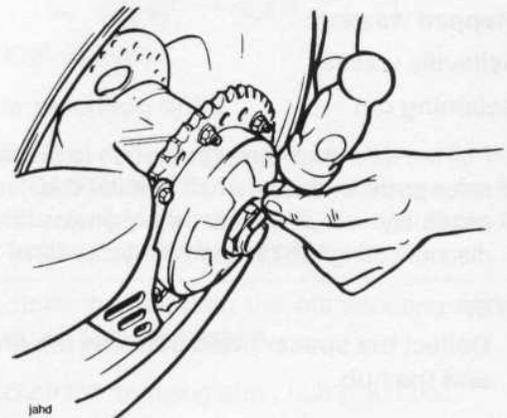
1. Thoroughly clean all components and inspect for damage, wear etc. Renew as necessary.
2. Pay particular attention to the condition of the cush rubbers, examining for splits, damage, softness etc.
3. Check the final drive bearing for wear or rough running, and the seal for damage.
4. Inspect the 'O' ring in the cush drive hub for damage.
5. Inspect the sprocket teeth for wear, damage and chips.

Assembly

1. Position the sprocket, fit the bolts from the inside face of the cush drive housing and secure with nuts tightened to **33 Nm**.
2. Fit the 'O' ring to the cush drive hub.
3. Fit the cush rubbers.
4. Locate the spacer in the cush drive housing and fit the hub.

Installation

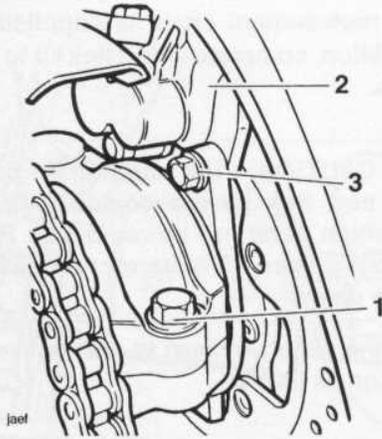
1. Refit the axle shaft and align the spacer to the final drive side.
2. Locate the final drive on the shaft and refit the chain to the sprocket.
3. Fit:
 - collar, stepped side inwards,
 - belleville washer, dished side out,
 - a new stake nut.
4. Tighten the nut to **146 Nm**, and stake to secure.



Staking the nut

5. Adjust the chain tension to give 35-40 mm of slack by turning the hub with the 'C' spanner
6. Tighten the swinging arm / hub pinch bolt to **55 Nm**.
7. Thoroughly clean and degrease the brake disc.

- Refit the rear brake caliper. Tighten the caliper fixings to **40 Nm**.



1. Swinging arm / hub pinch bolt

2. Rear brake caliper

3. Rear brake caliper fixings

- Pump the rear brake pedal a few times to position the brake pads in the caliper. Rectify as necessary if correct brake operation is not restored.
- Refit the upper and lower chain guards. Tighten the fixings to **9 Nm**.
- Align the rear brake hose to the chain guard and refit the hose cover. Tighten the hose cover fixings to **9 Nm**.
- Refit the rear wheel as described in the wheel section.
- Refit the silencer as described in the fuel system section.
- Lower the motorcycle to the ground and place on the side or centre stand.
- Reconnect the battery positive (red) lead first.
- Refit the seat.

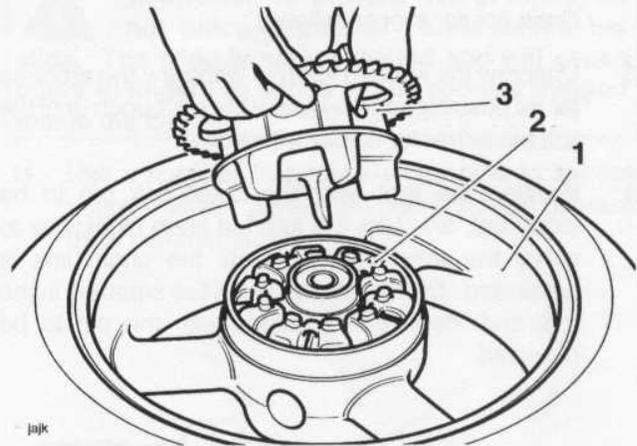
FINAL DRIVE - RS

Removal

- Raise and support the rear of the motorcycle under the frame or engine.

! WARNING: Ensure the motorcycle is stabilised and adequately supported, to prevent it falling and causing damage or injury.

- Remove the seat.
- Disconnect the battery, negative (black) lead first.
- Remove the rear wheel as described in the wheel section.
- 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

- Check the rubbers for deterioration, cracks etc.
- Check the wheel and drive flange for cracks.

Installation

- Install the cush drive rubbers into the wheel.
- Refit the drive flange to the rubbers/wheel.
- Refit the wheel as described in the wheel section.
- Lower the motorcycle to the ground and place on the side or centre stand.
- Reconnect the battery positive (red) lead first.
- Refit the seat.

DRIVE CHAIN (Split link type)

Removal

NOTE:

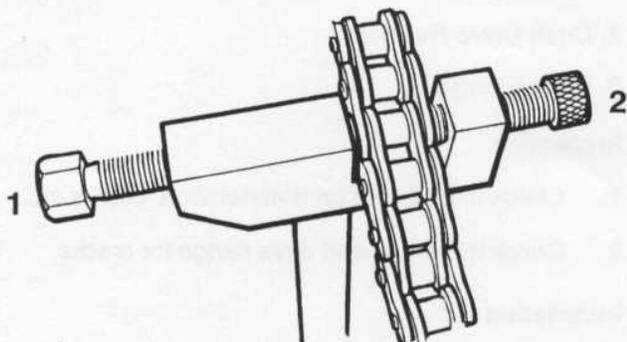
- The following procedure describes the fitment of a replacement chain using a split link. If the replacement chain to be fitted is a 'continuous' type, removal of the swinging arm and sprocket cover is necessary (as described earlier in this section).

1. Raise the rear of the motorcycle and securely support with the rear wheel clear of the ground.



WARNING: Ensure the motorcycle is stabilised and adequately supported, to prevent it falling and causing damage or injury.

2. Remove any convenient chain link pin using the chain splitter tool as follows:
3. Unscrew the knurled knob to withdraw the arbor as far as possible, and unscrew the pin punch until the link pin extractor is fully withdrawn.
4. Position the tool over the chain link pin to be extracted, and turn the knurled knob clockwise to move the arbor inwards until the chain link is supported. Check that the chain lies squarely in the tool and the extractor aligns with the pin to be removed.



1. Pin punch

2. Arbor

5. Turn the pin punch clockwise, and continue to turn with the aid of a suitably sized spanner until the link pin has been pushed out of its link.
6. Remove the tool and separate the two ends of the chain.

Replacement

NOTE:

- The replacement chain is supplied in a 'split' condition, complete with a link kit to join the two ends.

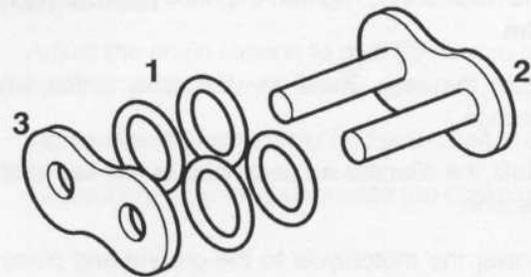


CAUTION: The component parts of the new link kit are coated with a special grease which must not be removed. Removal of this special grease will severely reduce the service life of the chain.

1. Use the old drive chain to pull the new chain into position as follows:

NOTE:

- Do not use the new connector link as the special grease on it may be removed.
2. Temporarily attach the end of the new chain to a free end of the old chain using an old connector link. Carefully pull the other end of the old chain to pull the new chain around the sprockets.
 3. Disconnect the two chains. Turn the chain and the rear wheel until the ends of the chain are in a convenient working position.



Link kit

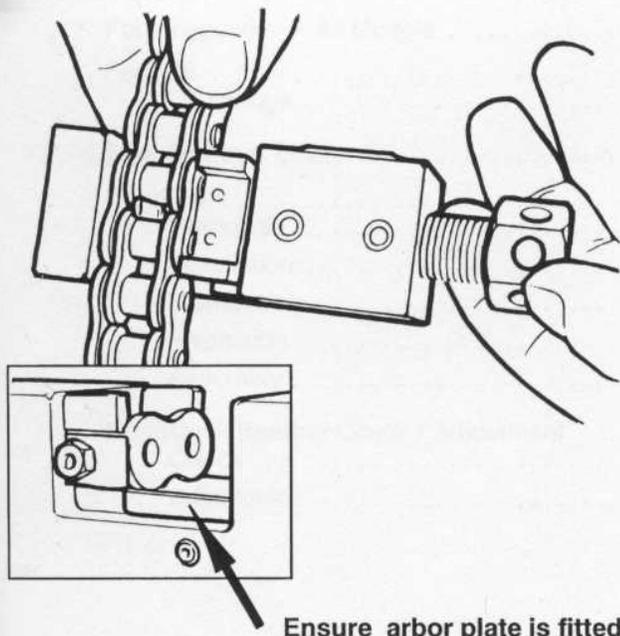
1. 'O' rings (4)
2. Connector link
3. Side plate



CAUTION: Always hold the connector link by its plate, NOT by the pins. The special grease on the pins must not be disturbed. Removal of the special grease will severely reduce the service life of the chain.

4. Fit two of the 'O' rings onto the inboard side of the links to be joined, and fit the connector link from the same side without disturbing the 'O' rings.

- Fit the other two 'O' rings on the outboard side of the links.

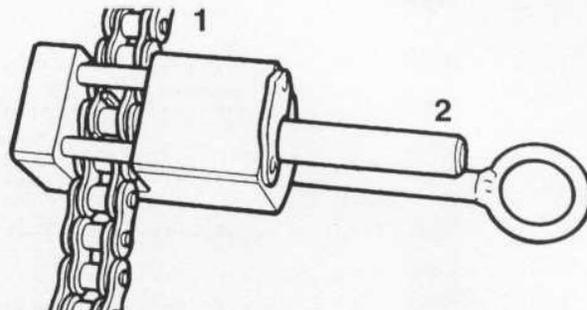


Fitting side plate

- Retract the threaded arbor of the side plate installer tool as far as it will go and place the arbor plate over the chain location pin. Fit the side plate into the arbor and position the tool over the chain link to be connected.

CAUTION: Fitting the side plate without the arbor plate present will cause damage to the chain link resulting in premature failure of the chain.

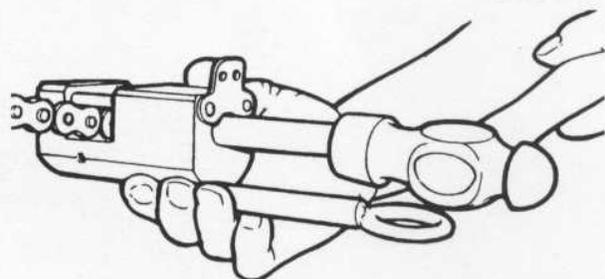
- Turn the threaded arbor clockwise to press the side plate onto the connector link pins. The tool will not allow the plate to be fitted too deeply as a stop mechanism is incorporated in the tool to prevent incorrect fitment. Turn the threaded arbor as far as it will go without excessive force.
- Remove the tool.
- Use the riveting tool to secure the side plate as follows:
- Pull back the slide on the riveting tool and position the tool over one of the two pins to be secured. Release the slide.



- Slide
- Punch

WARNING: To prevent risk of injury, do not place fingers or hands inside the slide. The slide is spring loaded and will cause injury to fingers or hands which become trapped inside the slide.

- Use a hammer to apply a sharp blow to the tool punch 4 times. Rotate the punch by 45° between each hammer blow.



- Remove the tool and examine the end of the link pin to check that it has been securely riveted over.
- Repeat the riveting operation with the second link pin.
- Check that the links can rotate freely around the pins. If not, the link just fitted must be removed and discarded and a new link fitted.
- Adjust the drive chain tension.
- Lower the motorcycle to the ground.

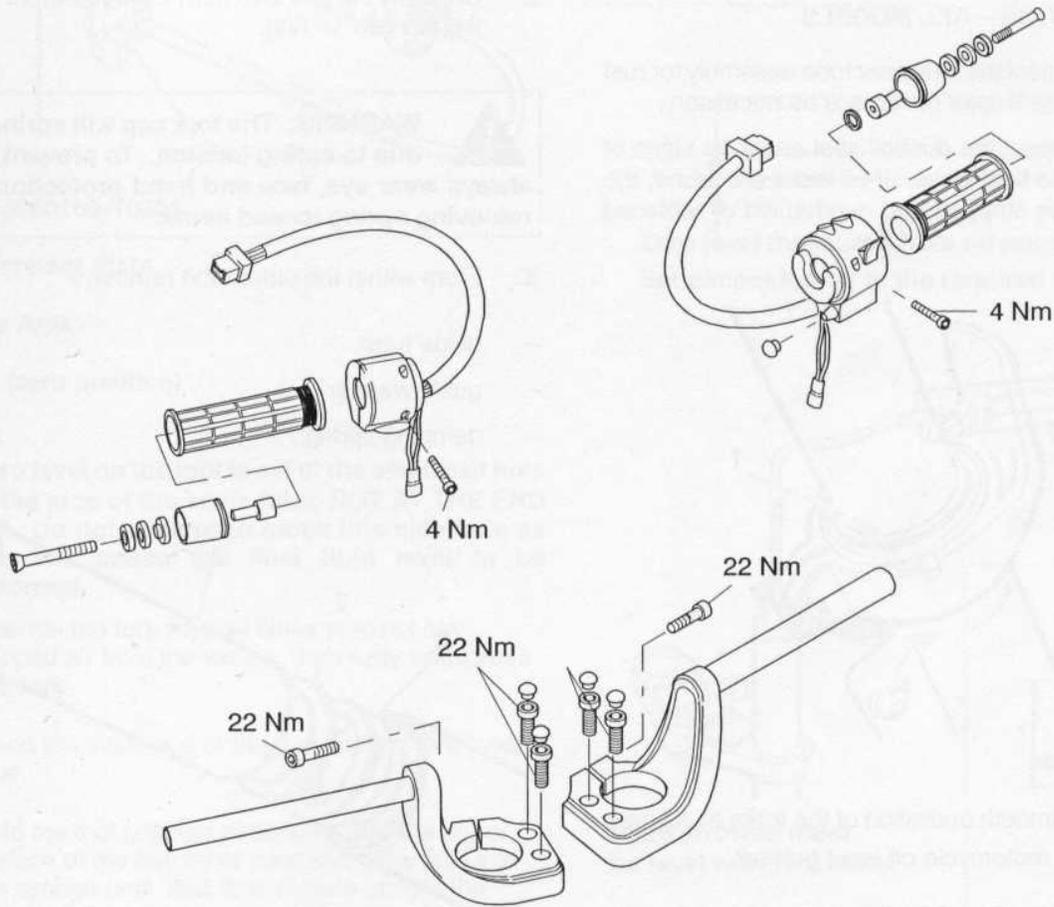
FRONT SUSPENSION

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Exploded View - Handlebars

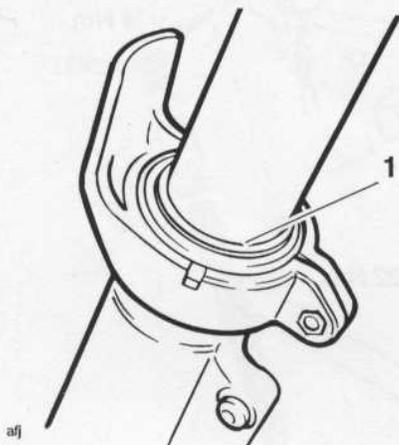


FRONT SUSPENSION

Both models are equipped with hydraulic, telescopic front forks which are adjustable for spring pre-load. 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 - ALL MODELS

1. Visually inspect the fork inner tube assembly for rust 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.



1. Fork Seal Area

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.

! 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 damage the motorcycle, cause loss of control, or an accident.

! WARNING: All suspension units contain pressurised gas. Always wear eye, face and skin protection during fork disassembly.

FORK OIL

Oil change

1. Remove the fork assembly as described later in this section.

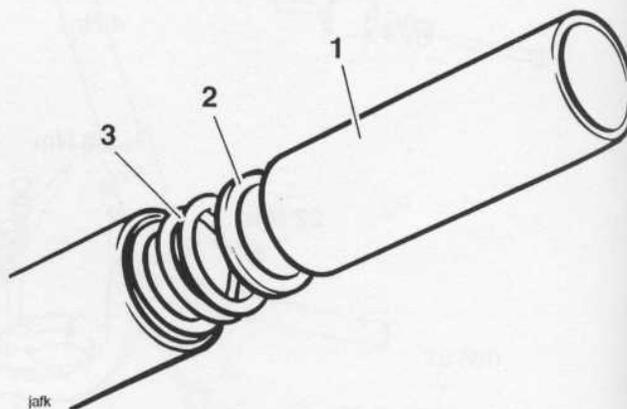
NOTE:

- To aid removal, slacken but do not remove the top cap before releasing the fork from the yoke.
2. Unscrew the fork cap from the inner tube. Discard the top cap 'O' ring.



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.

3. From within the outer tube remove:-
 - guide tube
 - guide washer
 - damping spring.



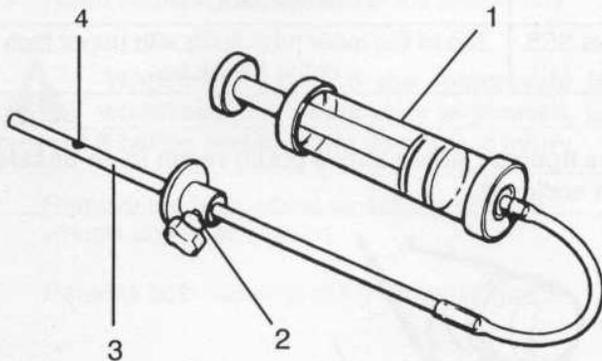
1. Guide Tube

2. Guide Washer

3. Damping spring

4. Invert the fork assembly and allow all the oil to drain into a suitable container. Turn the fork back to an upright position.
5. Fill the fork with the grade of oil specified in the fork oil table, to a level slightly above that which will finally be required.

6. Set the scale on tool 3880160-T0301 to the level specified for the model being worked on (see the fork oil table for the correct level setting).



- 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.
7. Operate the fork several times to expel any trapped air from the valves, then **fully compress the fork**.
 8. Insert the scale end of the tool into the fork inner tube.
 9. 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).
 10. 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.
 11. When the correct level has been set, assemble the fork components removed earlier ensuring that they are assembled in the same order in which they were removed.

12. Refit the fork and tighten the top cap to **30 Nm**.

! WARNING: Incorrect tool adjustment and/or failure to keep the tool level with the fork slider 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.

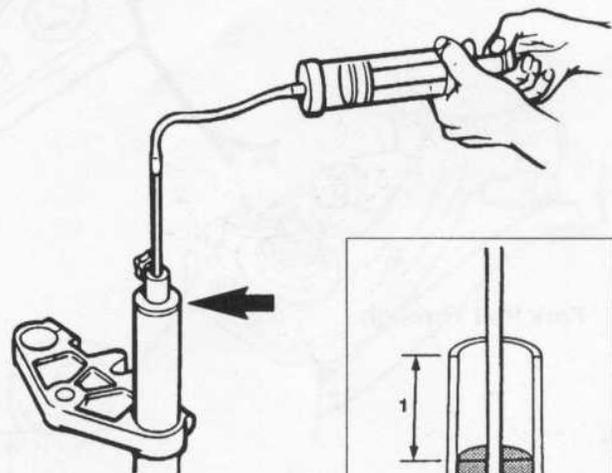
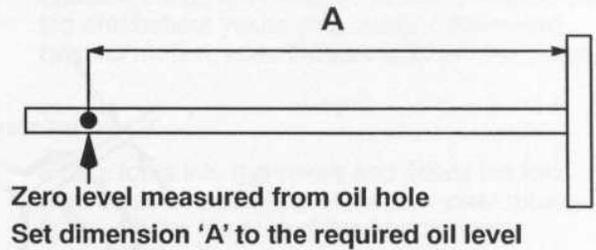
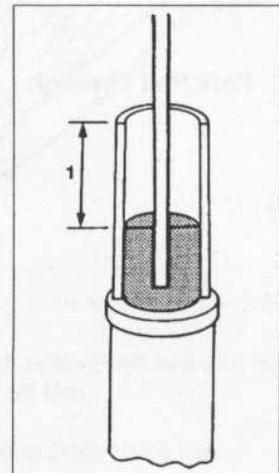


Plate arrowed must be level with fork slider



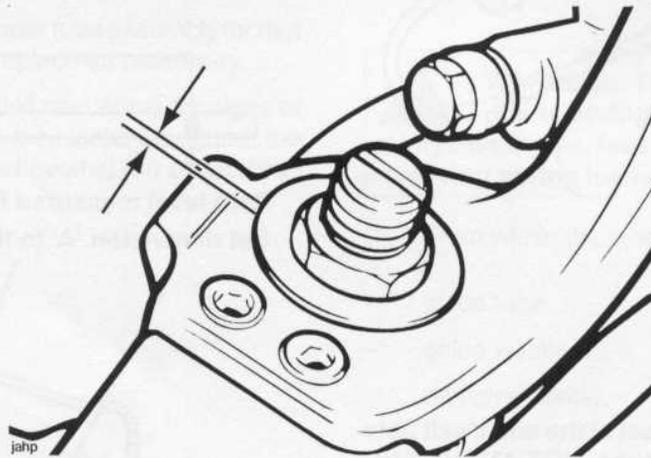
1. Fork Oil Level Setting (fork fully compressed)

FORK OIL LEVEL CHART

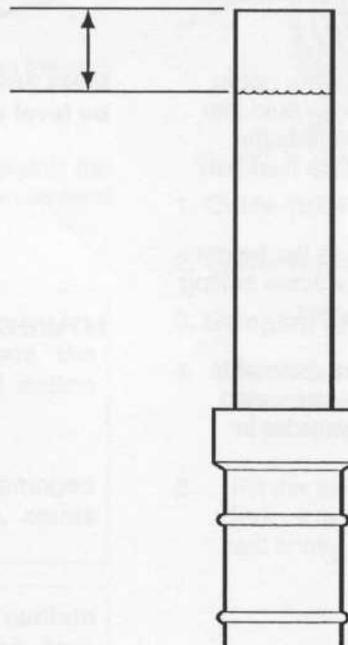
Model	Oil Level*	Oil Volume	Oil Grade	Fork Pull Through
Sprint ST	145 mm	459 cc	Showa SS8	Top of the inner tube flush with upper face of the handlebar
Sprint RS	145 mm	459 cc	Showa SS8	Top of the inner tube flush with upper face of the handlebar



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.



Fork Pull Through



Fork Oil Level*

* Fork fully compressed

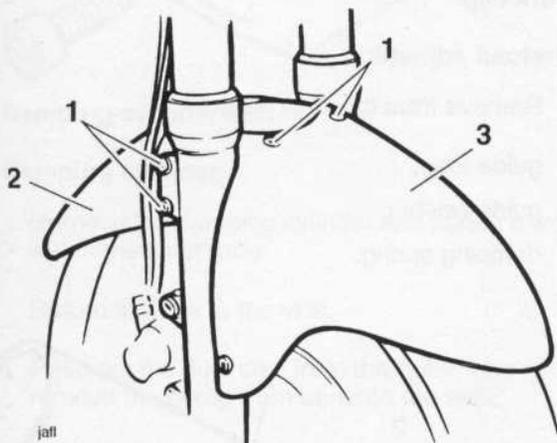
FRONT FORK

Removal

1. Raise and support the front of the motorcycle.

! WARNING: Ensure the motorcycle is stabilised and adequately supported, to prevent it falling and causing damage or injury.

2. Remove the front wheel as described in the wheels and tyres section.
3. Remove both sections of the front mudguard.

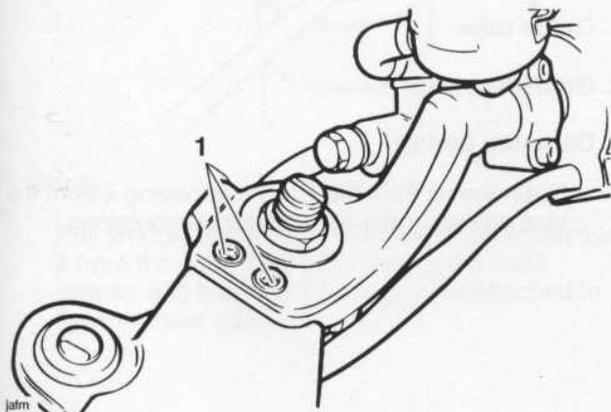


1. Mudguard fixings

2. Rear Section

3. Front Section

4. Release the handlebar fixings but do not remove the handlebars.



1. Handlebar Fixings

NOTE:

- If the fork is to be dismantled, slacken the fork cap (at the top of the fork) and the damping cylinder securing bolt (at the bottom) before releasing the yoke clamps.

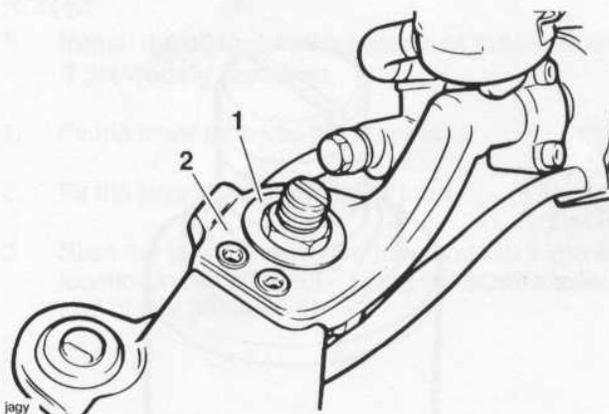


CAUTION: After slackening the damping cylinder securing bolt, lightly secure it again to prevent oil escaping.

5. Slacken but do not remove the pinch bolts on the top and bottom yokes and, using a downward twisting motion, slide the fork out from the yokes.

Installation

1. Fit the forks into the yokes and adjust the fork height such that the top of the fork inner tube is flush with the top face of the handlebars



1. Fork Inner Tube

2. Handlebar Upper Face

2. Tighten the top yoke pinch bolts to **20 Nm** and the lower yoke pinch bolts to **35 Nm**.
3. Tighten the handlebar clamp bolts to **22 Nm**.
4. Fit the mudguard and tighten the mudguard fixings to **5 Nm**.
5. Fit the front wheel as described in the wheel section.

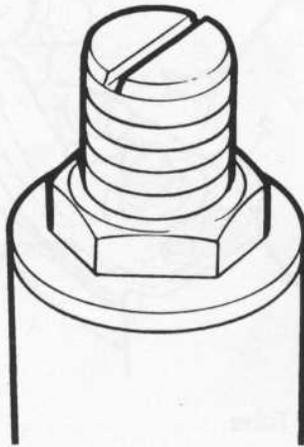
FORK DISMANTLING / ASSEMBLY

Dismantling



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.

1. Secure the fork by its caliper mountings in a soft jawed vice, taking care not to mark or damage the mountings.
2. If not already done, release the torque on the damping cylinder securing bolt (located in the bottom of the fork outer tube), then lightly re-tighten to prevent oil from escaping.
3. Note the position of the preload adjuster relative to the fork cap to ensure the setting is retained on re-assembly.

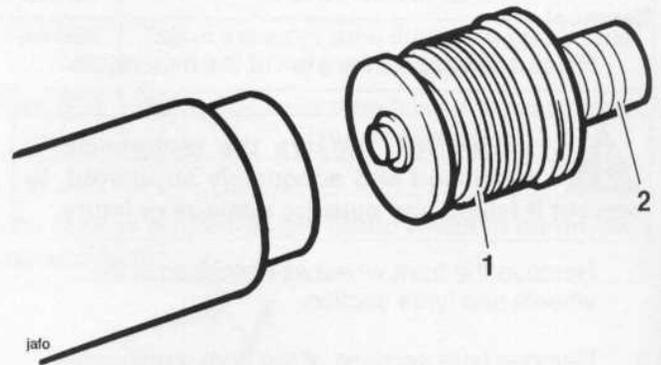


Preload adjuster marks



WARNING: Do not change the damper compression and rebound adjuster settings. If they are changed, this will affect the handling of the motorcycle from those which the rider is used to. Riding with unfamiliar fork settings may cause unexpected handling characteristics leading to loss of control and an accident.

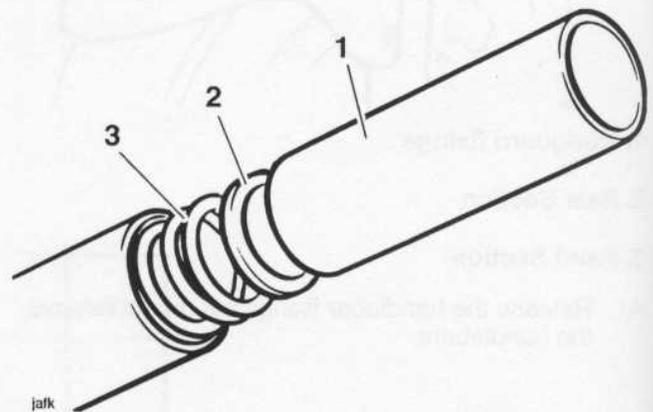
4. Unscrew the fork cap from the inner tube. Discard the cap 'O' ring.



1. Fork cap

2. Preload adjuster

5. Remove from the inner tube:-
 - guide tube,
 - guide washer,
 - damping spring.



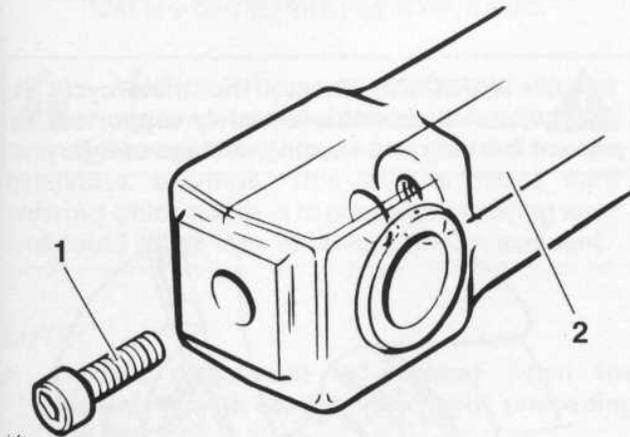
1. Guide tube

2. Guide washers

3. Damping spring

6. Drain the oil from the fork by removing it from the vice and inverting over a suitable container.

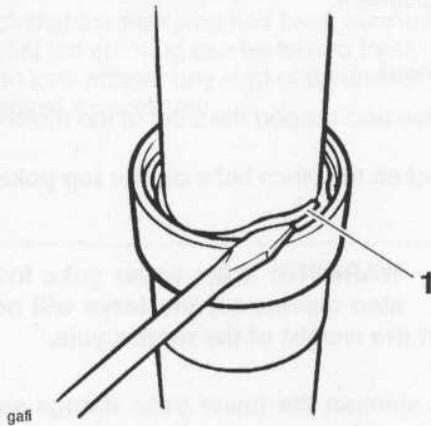
7. Remove the damping cylinder bolt from the lower end of the assembly. Discard the copper washer.



1. Damping cylinder bolt

2. Damping cylinder

8. Remove the damping cylinder and spring from within the inner tube.
9. Return the fork to the vice.
10. Prise out the dust seal from the outer tube and remove the circlip from beneath the seal.



1. Circlip

11. Pull sharply upwards on the inner tube to release it from the outer tube and remove the seal, washer and bush. A further bush is attached to the fork inner tube.

NOTE:

- The oil lock at the base of the outer tube may be removed, if necessary, by pushing the oil lock upwards through the damping cylinder bolt hole.

Inspection

1. Thoroughly clean and examine all components for damage, wear, scoring, corrosion etc. Renew as necessary.
2. Always renew the oil and dust seals.

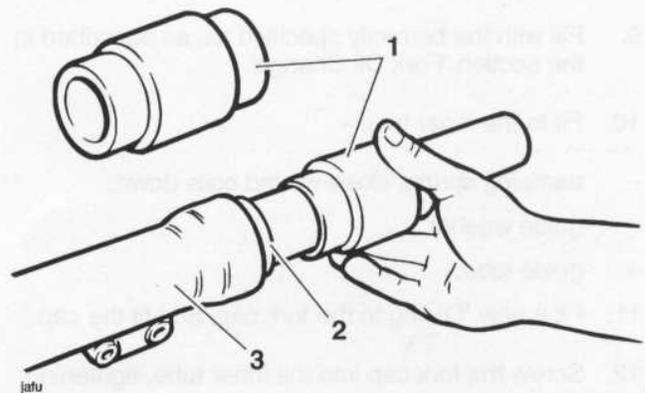
Assembly

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:

- Install the oil lock in the bottom of the inner tube if previously removed.
1. Fit the inner tube into the outer tube.
 2. Fit the bearing over the inner tube.
 3. Slide the bearing down the tube and tap it into its location in the outer tube using the square faced end of tool 3880080-T0301.



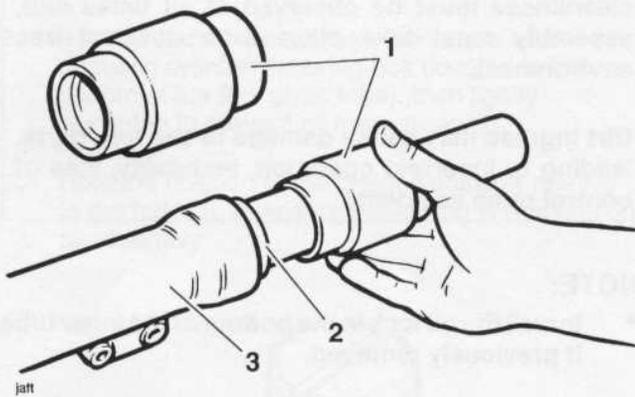
1. Tool 3880080-T0301

2. Bearing

3. Outer tube

4. Fit the washer.

5. Lubricate a new oil seal and fit it into the outer tube (seal-text facing upwards). Tap it into position using the square faced end of tool 3880080-T0301.
6. Secure the assembly with the circlip.
7. Fit a new dust seal (spring band upwards) over the inner tube, tapping it into position in the outer tube using the recessed end of tool 3880080-T0301.



1. Tool 3880080-T0301

2. Dust seal

8. Locate the damping cylinder and spring in the fork inner tube and secure with the bolt in the base of the outer tube. Use a new copper washer on the bolt (the bolt will be subject to final tightening later).
9. Fill with the correctly specified oil, as described in the section 'Fork Oil Change'.
10. Fit to the inner tube:-
 - damping spring, close-wound coils down,
 - guide washer,
 - guide tube,
11. Fit a new 'O' ring to the fork cap, and fit the cap.
12. Screw the fork cap into the inner tube, tightening down by hand as far as possible (the cap will be subject to final tightening later).
13. Refit the fork as described in 'front fork Installation'.
14. Tighten the fork cap to **30 Nm**. Check that the preload height adjustment remains at the mark noted prior to dismantling.
15. Tighten the damping cylinder securing bolt to **25 Nm**.

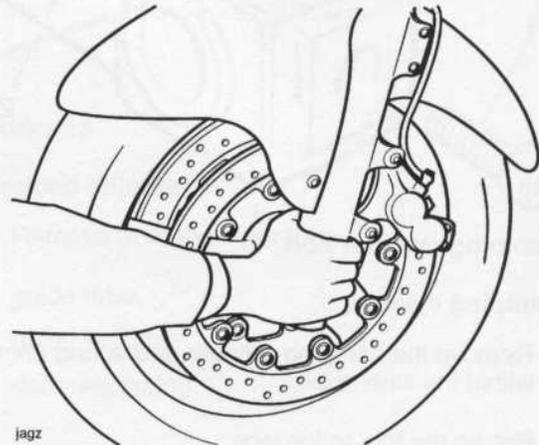
HEADSTOCK BEARING CHECK / ADJUSTMENT

Check

1. Raise and support the front of the motorcycle.



WARNING: Ensure the motorcycle is stabilised and adequately supported, to prevent it falling and causing damage or injury.



Checking headstock bearing adjustment

2. Hold the lower end of the front forks as illustrated and 'rock' with a front-to-rear motion. If free play can be detected, the headstock bearings require adjustment.

Adjustment

1. Raise and support the front of the motorcycle.
2. Slacken the 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.

3. Slacken the headstock top nut.
4. Slacken the handlebar clamp screws.

5. Adjust the bearing free-play as follows:-
 - Tighten the adjuster nut to **32 Nm**.
 - Loosen the nut and then retighten by hand until any bearing free play is eliminated.



WARNING: It is essential that the adjuster nut is not over-tightened. If the adjuster is over-tightened it will cause a pre-load on the headstock bearings. This will introduce tight steering which will lead to premature bearing wear and could cause loss of control and an accident.

NOTE:

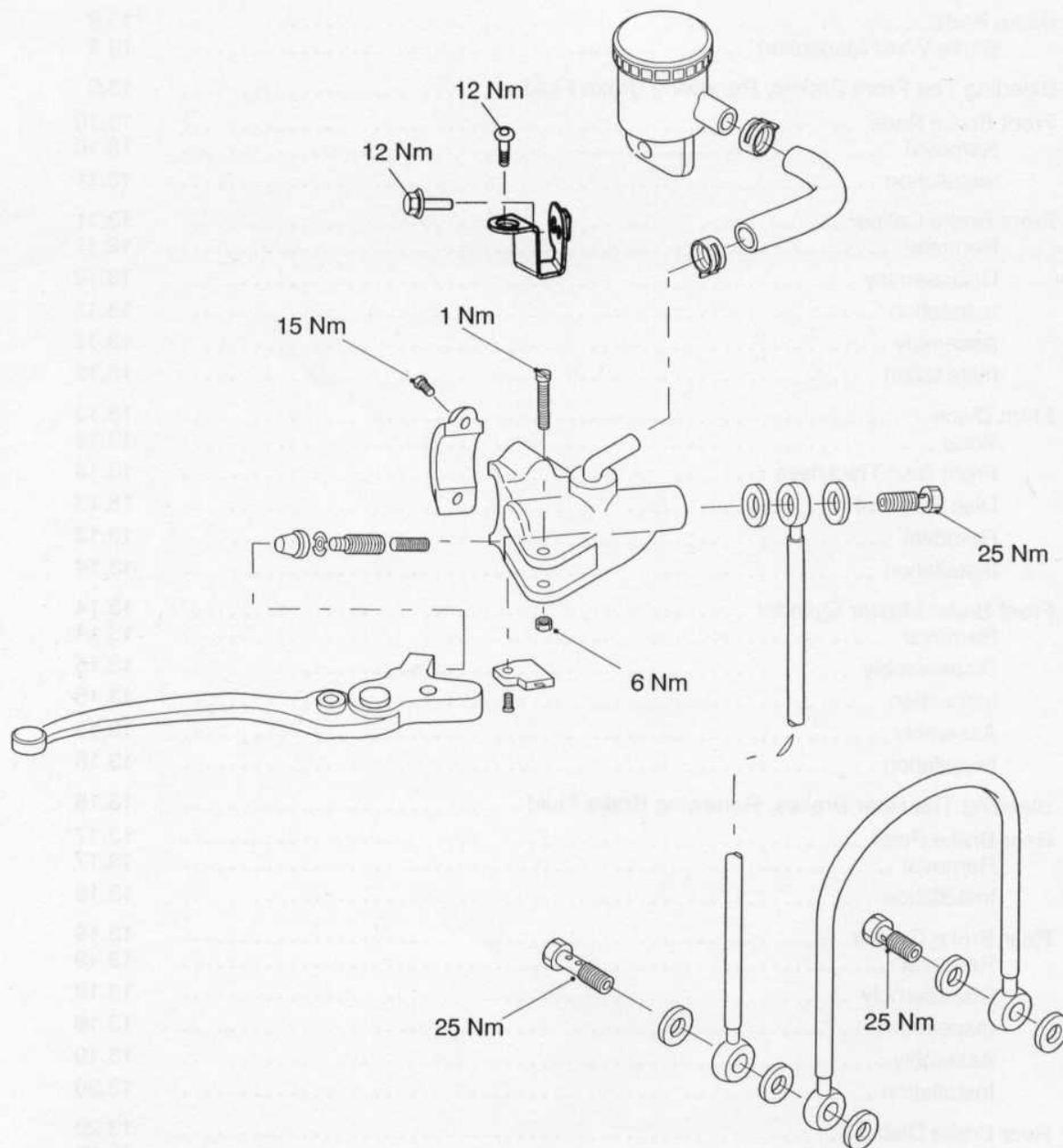
- Correct adjustment is attained when the bearing play is eliminated without preloading the bearings.
 - Before tightening the headstock nut, or if the nut is ever removed for any other reason, apply a smear of 'copperslip' grease to the nut threads in order to prevent the nut from binding.
6. Hold the adjuster nut and tighten the top nut to **65 Nm**.
 7. Tighten the top yoke pinch bolts to **20 Nm**.
 8. Tighten the handlebar clamp screws to **22 Nm**.
 9. Check that the free play has been eliminated, and that the steering can be turned freely from lock to lock without any sign of tightness. Re-adjust if necessary.

BRAKING SYSTEM

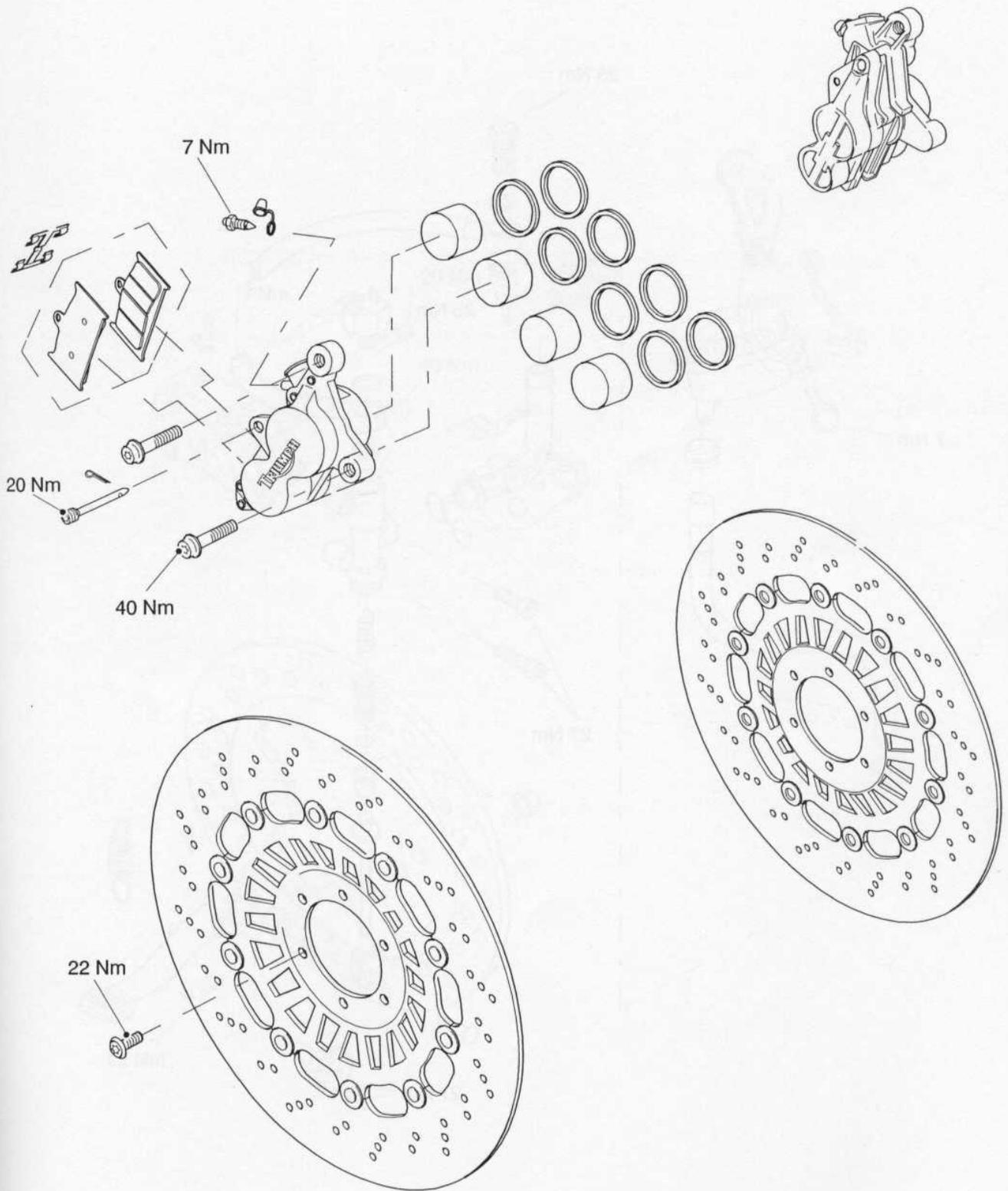
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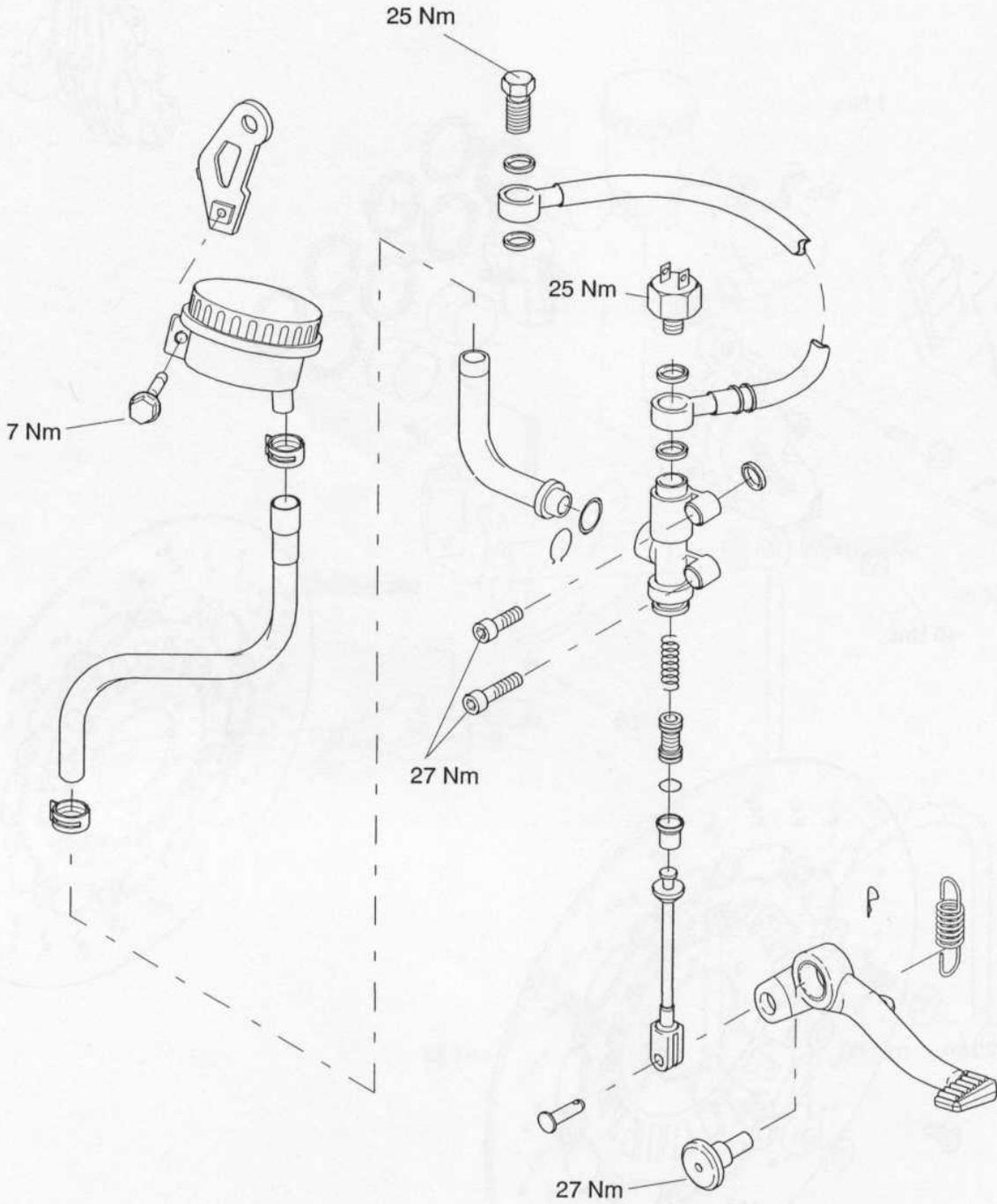
Exploded View - Front Brake Master Cylinder



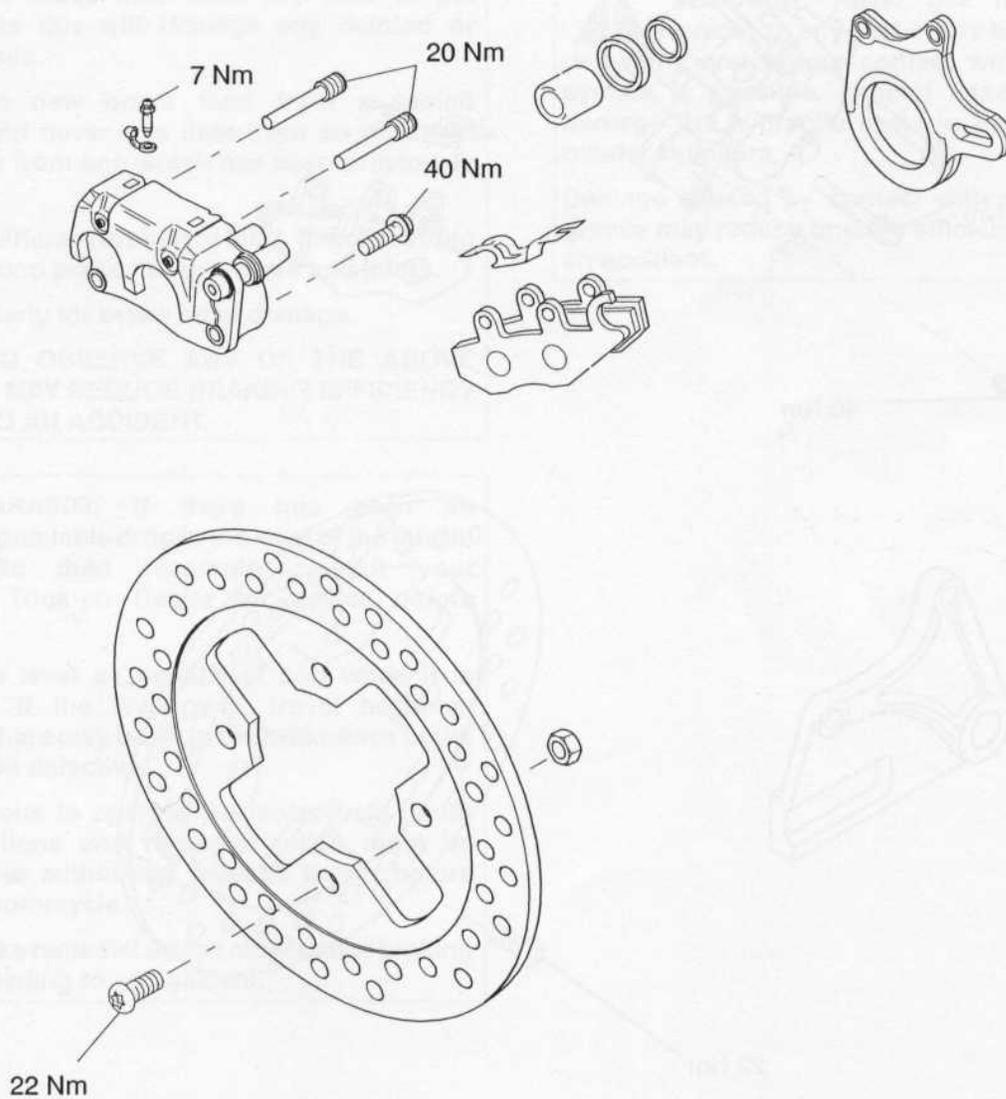
Exploded View - Front Brake Caliper



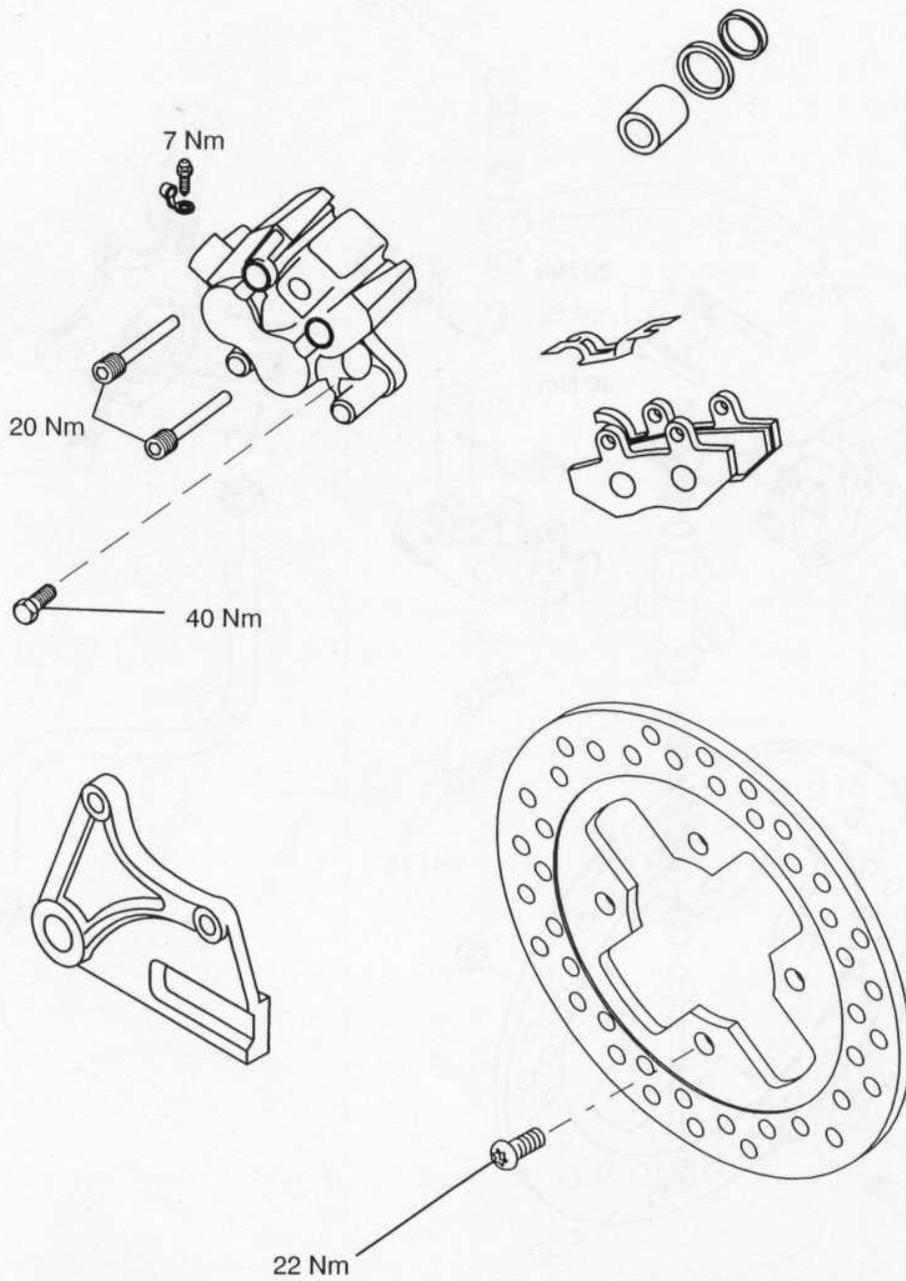
Exploded View - Rear Brake Master Cylinders



Exploded View - Rear Brake Caliper - Sprint ST



Exploded View - Rear Brake Caliper - Sprint RS



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.

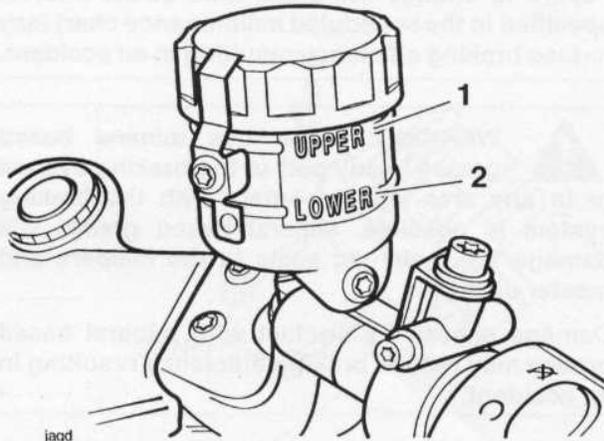
! **WARNING:** Never use mineral based grease in any part of the braking system or in any area where contact with the braking system is possible. Mineral based grease will damage the hydraulic seals in the calipers and master cylinders.

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

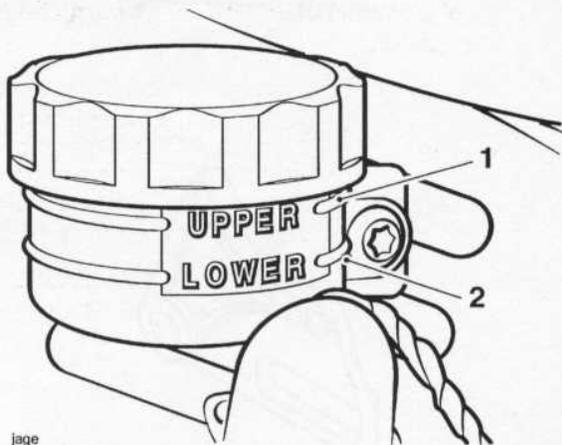
FLUID LEVEL INSPECTION

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

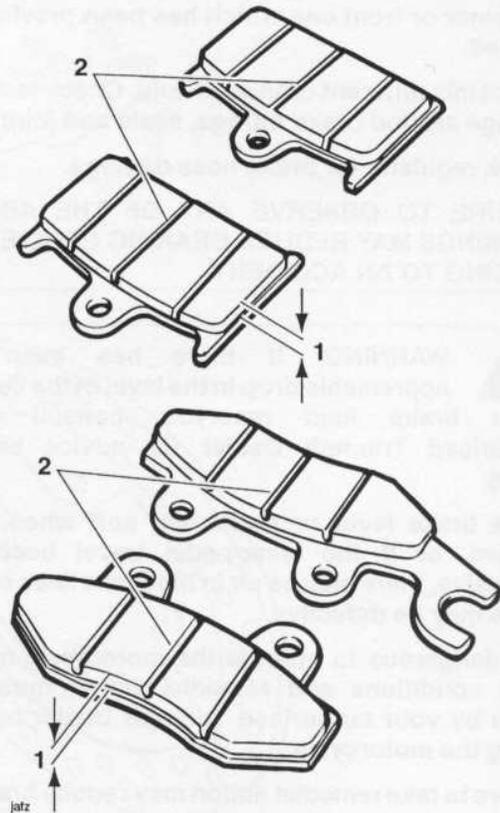
Brake fluid should be changed at the interval specified in the scheduled maintenance chart.

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.



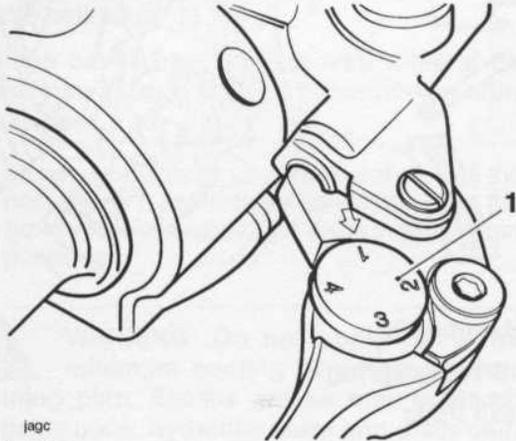
1. Lining material thickness
2. Centre groove



WARNING: Do not replace individual brake pads, 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

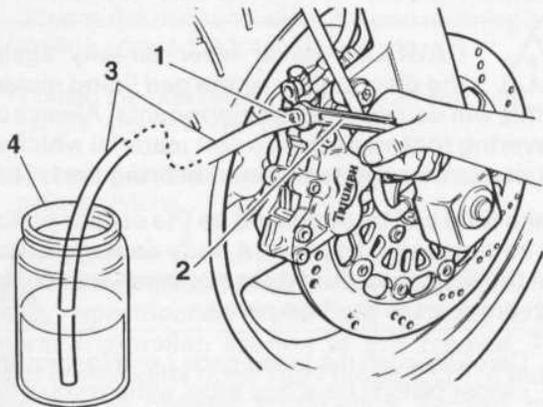
1. Note the original setting of the brake lever adjuster in order that it can be returned to the same position when the bleeding operation is complete. Set the brake lever adjuster to position No.1.



jagc

1. Adjuster

2. Remove the rubber cap from the bleed nipple on the right hand caliper.
3. Attach a transparent tube to the bleed nipple.



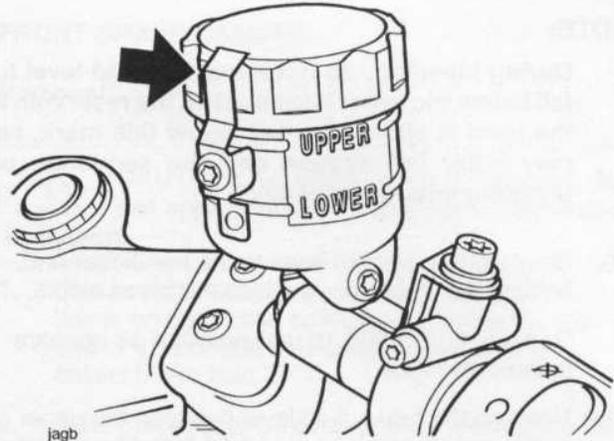
1. Bleed Nipple

2. Spanner

3. Bleed Tube

4. Container

4. Place the other end of the tube in a suitable receptacle containing new brake fluid.
5. Turn the handlebars to bring the fluid reservoir to a level position.



Arrowed - Safety Clip

6. 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 this warning is ignored.

! CAUTION: To prevent body damage, do not spill brake fluid onto any area of the bodywork.

7. Carefully remove the reservoir cover taking care not to spill any fluid.
8. Check the condition of the sealing diaphragm for the reservoir. Replace if necessary.
9. 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.
10. Slowly pull the brake lever to the handlebar and, holding the lever fully in, close the bleed nipple.

Repeat steps 9 and 10 until no more air appears in the bleed tube.
 11. Maintain the brake fluid level between the upper and lower reservoir levels whilst bleeding is being carried out.
 12. When all air has been expelled from the system, hold the lever in and close the bleed nipple. Tighten the nipple to **7 Nm**.
 13. Fill the reservoir to the upper level with new DOT 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.

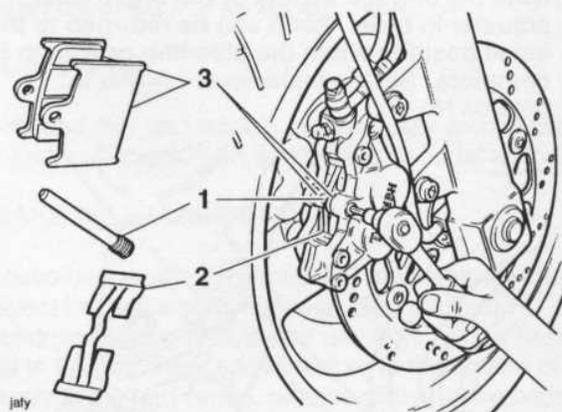
14. Remove the transparent bleed tube.
15. Replace the bleed nipple cap.
16. Repeat the procedure for the left-hand caliper.
17. Refit the reservoir cover and diaphragm. Refit the safety clip and screw.

! 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.

18. Reset the brake lever adjuster to the original setting.
19. Check that the brake operates correctly.

FRONT BRAKE PADS

Removal



1. Retaining Pin
2. Anti-rattle Spring
3. Brake Pads

1. Remove the brake pad retaining pin after removing and discarding its split pin. Inspect the retaining pin for damage, replace if necessary.
2. Remove the anti-rattle spring and inspect the spring for damage, replace if necessary.

! CAUTION: Never lever directly against the disc, caliper or the pad lining material 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 damage, ensure that the displaced fluid does not come into contact with any part of the bodywork.

3. Carefully push the brake pads apart to force the caliper pistons back and allow withdrawal of the pads.
4. Remove both brake pads and inspect for damage and wear beyond the service limit, replace if necessary.

NOTE:

- Complete the assembly of the brake pads to one caliper (see assembly for details) before removing the pads from the other caliper.

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 **20 Nm**, and secure with new split pins.
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.

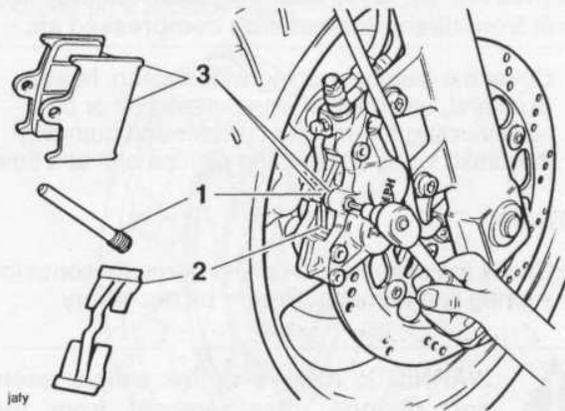
6. Check the front brake fluid level and top up as required with new DOT 4 fluid.

FRONT BRAKE CALIPER

Removal

! CAUTION: To prevent body damage, do not spill brake fluid onto any area of the bodywork.

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.



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, remove 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.

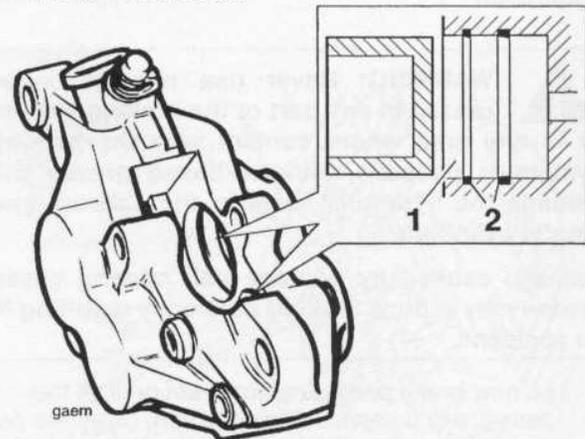
2. Inspect the brake pads for damage and wear beyond the service limit. Renew as necessary.

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.



- 1 Caliper bore
2. Piston seal

! 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, and 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 **20 Nm** and fit a new split pin.
5. Connect the brake hose(s) to the caliper using new sealing washers on each side of the banjo(s).
6. 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.

7. Fill the master cylinder with new, DOT 4 brake fluid from a sealed container.
8. Bleed the front brake line as described earlier in this section.

FRONT DISCS

Wear

1. Replace any brake disc if worn beyond the service limit or exceeds the disc run-out limit.

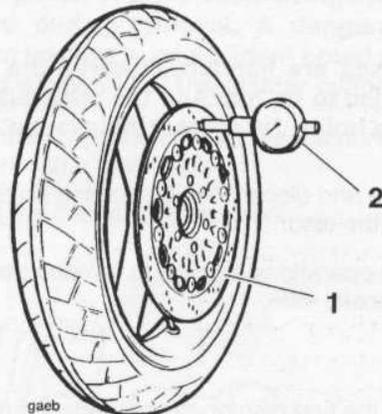
Front Disc Thickness

Standard: 4.0 mm
Service Limit: 3.5 mm

Disc Run-out

Standard: 0.1 mm
Service Limit: 0.3 mm

Measure disc run out using an accurate dial gauge mounted on a surface plate.



1. Disc
2. Dial Gauge

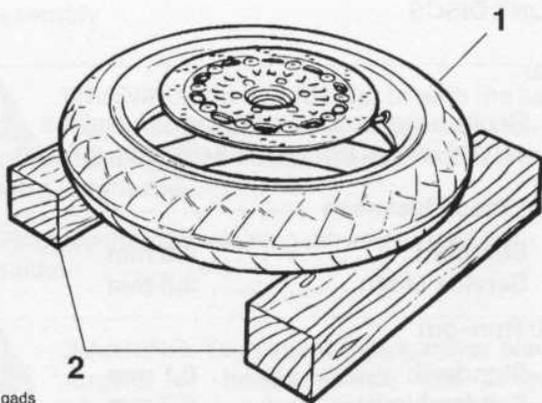
Removal

! 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.

**1. Wheel****2. Support block****NOTE:**

- The discs are handed. Observe the offset of each disc to its hub and the orientation of the cooling holes, for correct installation.
3. Remove and discard the 6 securing bolts to detach the disc.
 4. Repeat operations 2 and 3 to remove the disc on the opposite side.

Installation

1. Locate the first disc on the correct side of the wheel (offset of disc outwards) as noted during removal.
2. Fit new securing bolts and tighten to **22 Nm**.
3. Fit the other disc in the same way.
4. Thoroughly clean and degrease the discs.
5. Refit the wheel as described in the wheel section.

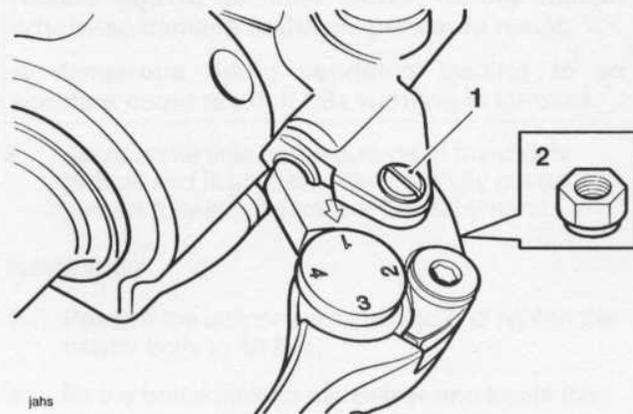
FRONT BRAKE MASTER CYLINDER**Removal**

1. Remove the seat and disconnect the battery negative (black) lead first.



CAUTION: To prevent body damage, do not spill brake fluid onto any area of the bodywork.

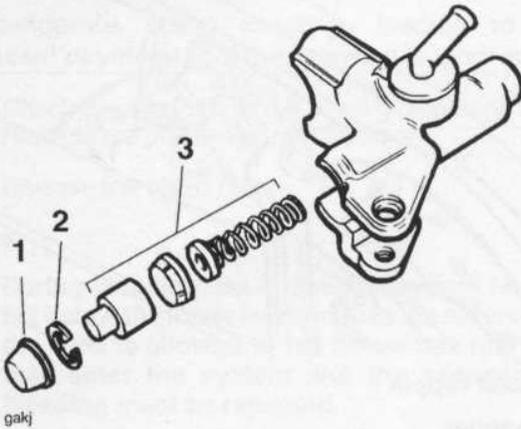
2. To drain the fluid from the master cylinder, attach a tube to the right hand caliper bleed nipple, slacken the nipple and allow the fluid to drain into a suitable container. Operate the brake lever until all fluid has been expelled.
3. Note the setting of the brake lever adjuster to ensure it is returned 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, and remove the lever.

**1. Pivot Bolt****2. Pivot Bolt Nut**

5. Disconnect from the master cylinder:
 - brake hoses,
 - brake light switch connections.
6. Release the clamp screws from the handlebar to remove the master cylinder.

Disassembly

1. Remove the reservoir.
2. Detach the boot from the lever end of the cylinder.
3. Remove the circlip from beneath the boot.
4. Remove the piston set from the master cylinder bore noting the relative position of the seals and piston components.



- 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.

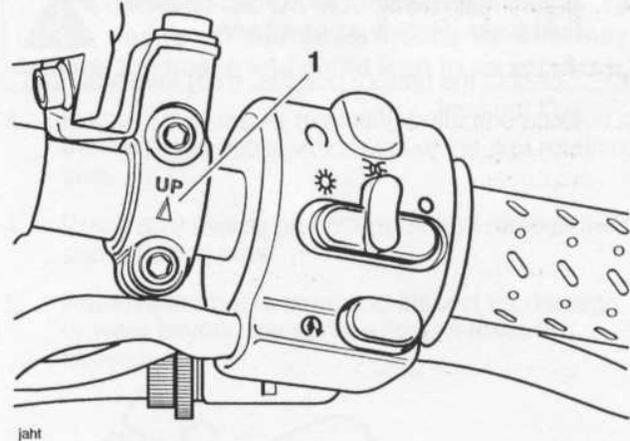
A dangerous riding condition leading to an accident could result if this warning is ignored.

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. 'Up' Arrow Mark

1. Locate the master cylinder to the handlebars and position the clamp with the 'UP' arrow pointing upwards. Align the master cylinder/clamp split line with the dot mark on the handlebar.
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**.

- Connect the brake hose to the master cylinder using new sealing washers. 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.

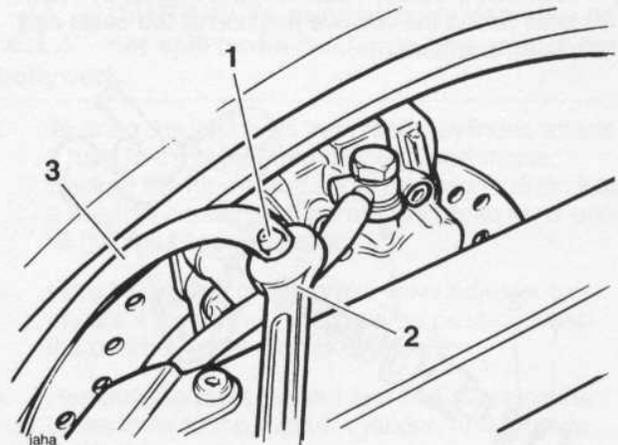
- Fill and bleed the front brakes as described earlier.

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.

- Reset the brake lever adjuster to the original setting.
- Examine the system for correct operation and fluid leaks. Rectify as necessary.
- Connect the battery positive, (red) lead first, and refit the seat.

BLEEDING THE REAR BRAKES, RENEWING BRAKE FLUID

- Remove the body side panel assembly.
- Remove the cap from the rear bleed nipple.
- Attach a transparent tube to the bleed nipple.



1. Bleed Nipple

2. Spanner

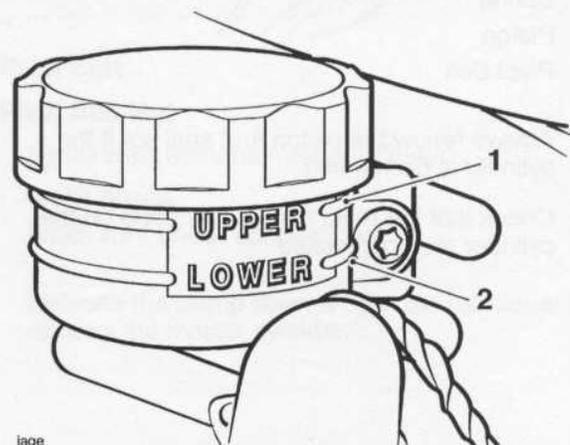
3. Bleed Tube

- Place the other end of the tube in a suitable receptacle containing new brake fluid.



CAUTION: To prevent body damage, do not spill brake fluid onto any area of the bodywork.

- Unscrew and remove the rear brake reservoir cover taking care not to spill any fluid.



1. Rear Reservoir Upper Level

2. Rear Reservoir Lower Level

! 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 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. Repeat steps 7 and 8 until no more air appears in the bleed tube.
 9. Maintain the brake fluid level between the upper and lower reservoir levels whilst bleeding is being carried out.
 10. When all air has been expelled from the system, hold down the brake pedal and close the bleed nipple. Tighten the nipple to **7 Nm**.
 11. Fill the reservoir to the maximum level with new DOT 4 fluid.

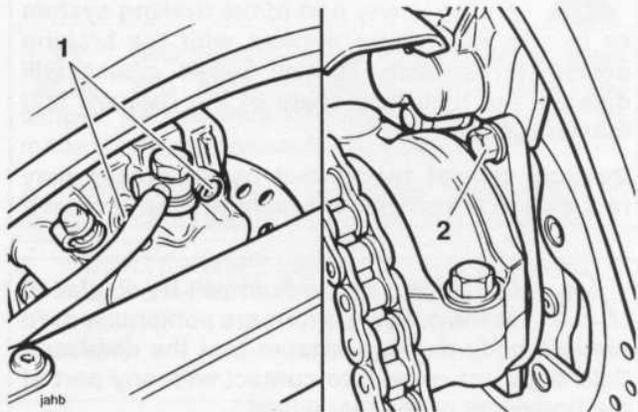
! WARNING: Use only D.O.T. 4 specification brake fluid as listed in the general information section of this manual. The use of brake fluids other than those D.O.T. 4 fluids listed in the general information section may reduce the efficiency of the braking system leading to an accident.

Observe the brake fluid handling warnings given earlier in this section of the manual.

12. Fit the reservoir cover and diaphragm. Check for correct diaphragm fitment before final tightening of the cover.
13. Remove the bleed tube from the nipple.
14. Replace the bleed nipple dust cap.
15. Check that the brake operates correctly.

REAR BRAKE PADS

Removal

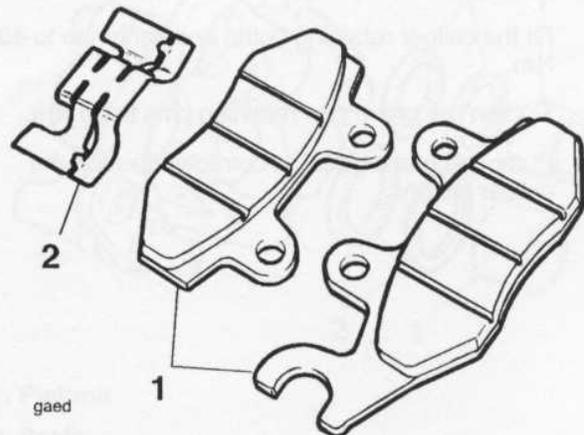


- 1. Pad Retaining Pins**
- 2. Caliper Mounting Bolts**

1. Remove the rear brake hose cover and upper chain guard (ST only).
2. Slacken the brake pad retaining pins.

! WARNING: Do not allow the caliper to hang on the brake hoses as this may damage the hoses and could lead to an accident.

3. Remove the caliper mounting bolts and position the caliper to allow withdrawal of the pad retaining pins.
4. Press downwards on both pads and remove the pad retaining pins.
5. Remove the brake pads and inspect for damage or wear beyond the service limit, replace if necessary.



- 1. Brake Pads**
- 2. Anti Rattle Spring**

6. Remove the anti-rattle spring and inspect for damage, 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 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. If fitting new pads, use hand pressure to compress the caliper pistons fully into their bores.
2. Fit the anti-rattle spring into the caliper.
3. 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.

4. Lubricate the pad retaining pins using a minimum amount of proprietary high temperature 'Copperslip' type grease. Press down on both pads and fit the retaining pins.
5. Position the caliper over the disc ensuring both pads are correctly aligned.
6. Fit the caliper retaining bolts, and tighten to to **40 Nm**.
7. Tighten the brake pad retaining pins to **20 Nm**.
8. Pump the brake pedal 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.

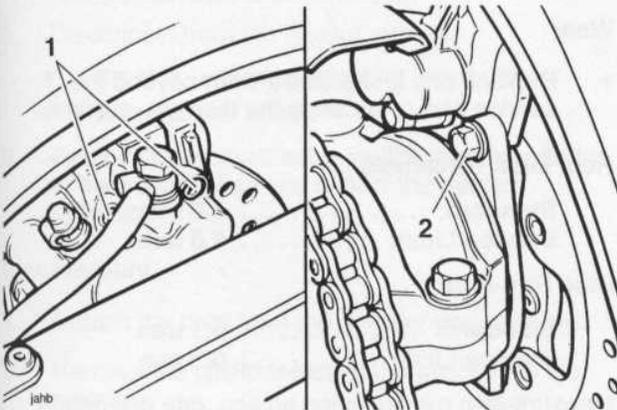
9. Check the brake fluid level and top-up as required with new DOT 4 fluid.
10. Refit the upper chain guard and rear brake hose cover (ST only).

REAR BRAKE CALIPER

Removal

CAUTION: To prevent body damage, do not allow brake fluid to contact any area of the bodywork or the rear wheel.

1. Remove the rear brake hose cover and upper chain guard (ST only).
2. Disconnect the rear brake hose at the caliper and place the free end of the hose in a suitable container to collect brake fluid.
3. Slacken the pad retaining pins.
4. Remove the caliper mounting bolts.
5. Remove the brake caliper assembly.



1. Pad Retaining Pins
2. Caliper Mounting Bolts

Disassembly

1. Press downwards on both pads and remove the retaining pins. Remove the brake 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, remove the pistons one at a time.

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

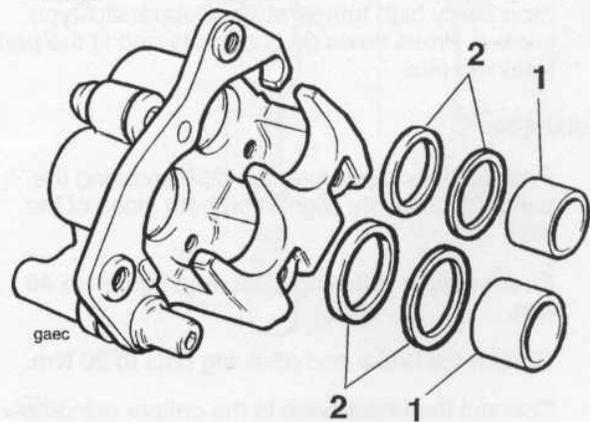
WARNING: Never use mineral based grease in any part of the braking system or in any area where contact with the braking system is possible. Mineral based grease will damage the hydraulic seals in the calipers and master cylinders.

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 removal and assembly.

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.

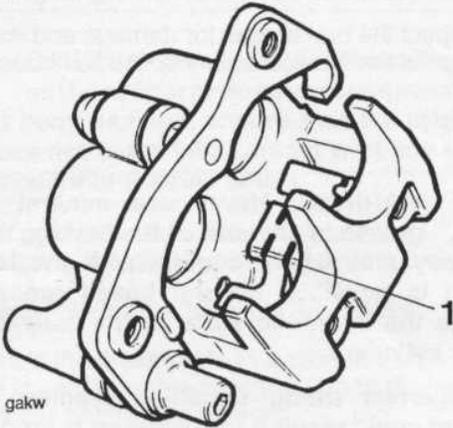


1. Pistons
2. Seals

! WARNING: Ensure that the pistons do not tip during assembly as this could damage the caliper.

A dangerous riding condition leading to an accident could result if this warning is ignored.

2. Carefully push both pistons into the caliper by hand.
3. Install the anti-rattle spring into the caliper.



1. Anti Rattle Spring

! 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. Lubricate the pad retaining pins using a minimum amount of proprietary high temperature 'Copperslip' type grease. Press down on both pads and fit the pad retaining pins.

Installation

1. Position the caliper over the disc ensuring the pads are correctly aligned on both sides of the disc.
2. Fit the caliper retaining bolts, and tighten to **40 Nm**.
3. Tighten the brake pad retaining pins to **20 Nm**.
4. Connect the brake hose to the caliper using new washers on each side of the banjo bolt.
5. 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.

6. Fill the master cylinder with new, DOT 4 brake fluid from a sealed container.
7. Bleed the brake line as described earlier.
8. Refit the upper chain guard and rear brake hose cover (ST only).

REAR BRAKE DISC

Wear

1. Replace any brake disc if worn beyond the service limit or exceeds the disc run-out limit.

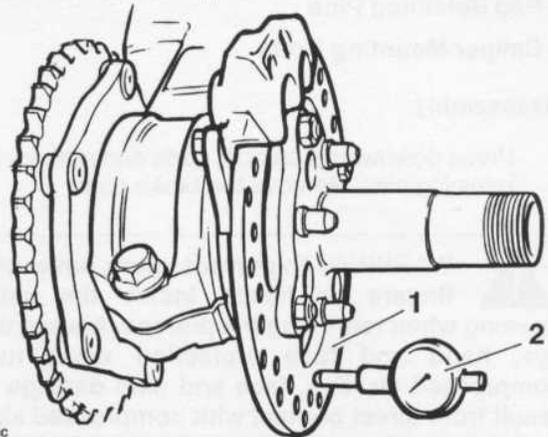
Rear Disc Thickness

Standard: 6.0 mm
 Service Limit: 5.0 mm

Disc Run-out

Standard: 0.1 mm
 Service Limit: 0.3 mm

Measure disc run out using an accurate dial gauge mounted on a surface plate.



1. Disc (ST illustrated)
2. Dial Gauge

NOTE:

- Details of rear brake disc removal and installation can be found in the rear suspension section.

REAR MASTER CYLINDER

Removal

1. Remove the seat and disconnect the battery negative (black) lead first.



CAUTION: To prevent body damage, do not spill brake fluid onto any area of the bodywork or wheels.

2. Drain the 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 pushrod. Remove the clevis pin.
4. Carefully slide the cover off the brake light switch and disconnect the switch wires.
5. Disconnect from the master cylinder:
 - the rear brake hose (noting orientation),
 - the reservoir hose.
6. Remove the screws securing the master cylinder to the control plate and collect the master cylinder.

Disassembly

1. Detach the boot from the 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. Always renew the piston seals if the cylinder has been dismantled.
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.

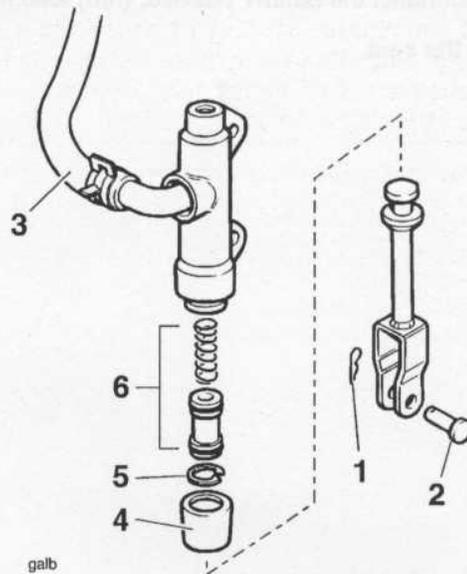
A dangerous riding condition leading to an accident could result if this warning is ignored.

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.



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 and cover to the control plate. Tighten the securing screws to **27 Nm**.
3. Connect the push rod to the brake pedal using a new clevis pin and split pin.
4. Using new washers, fit the brake hose and brake light switch to the master cylinder. Ensuring correct orientation of the brake hose, tighten the switch to **25 Nm**.
5. Connect the brake light switch and refit the cover.



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.

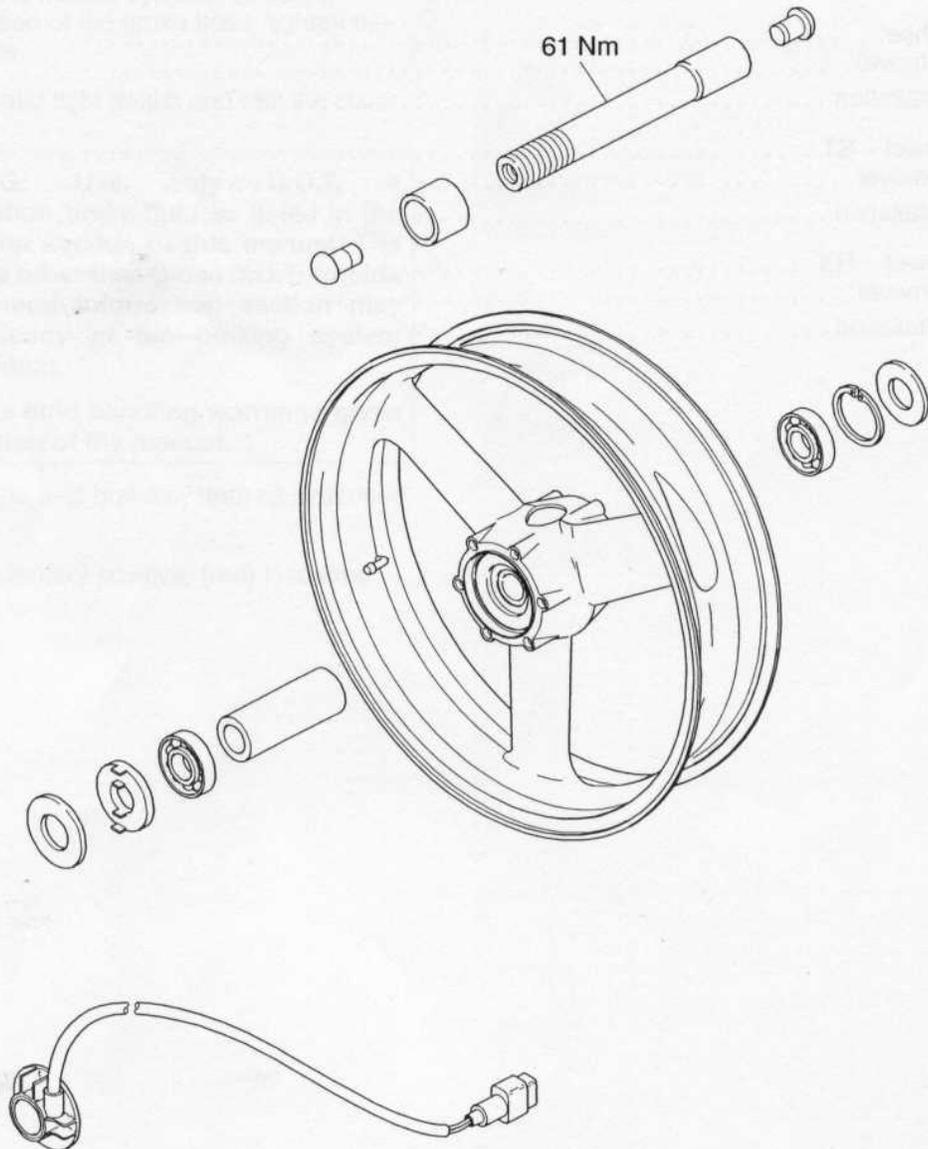
6. Fill and bleed the rear brake system as described earlier.
7. Reconnect the battery positive, (red) lead first.
8. Fit the seat.

WHEELS

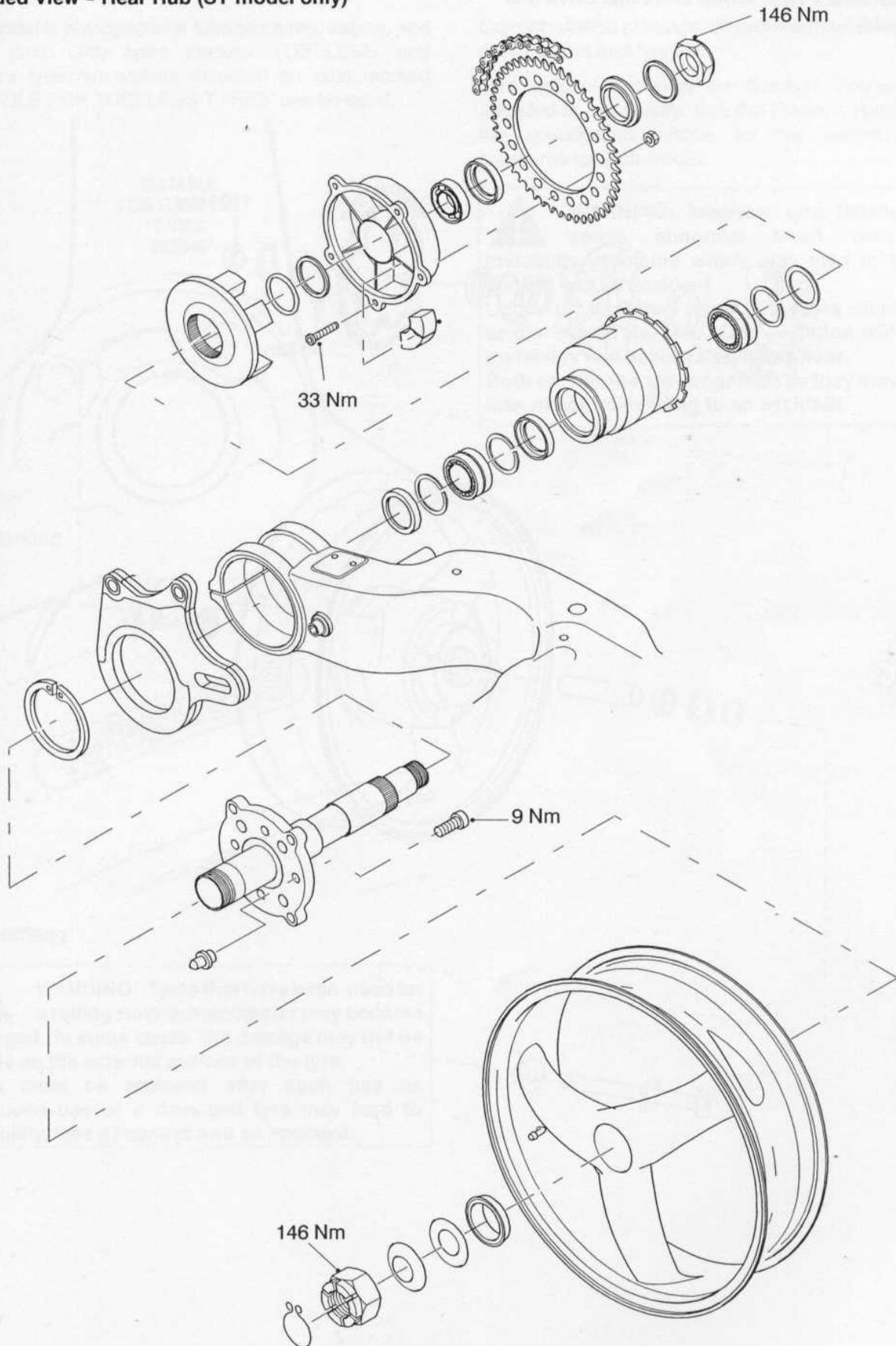
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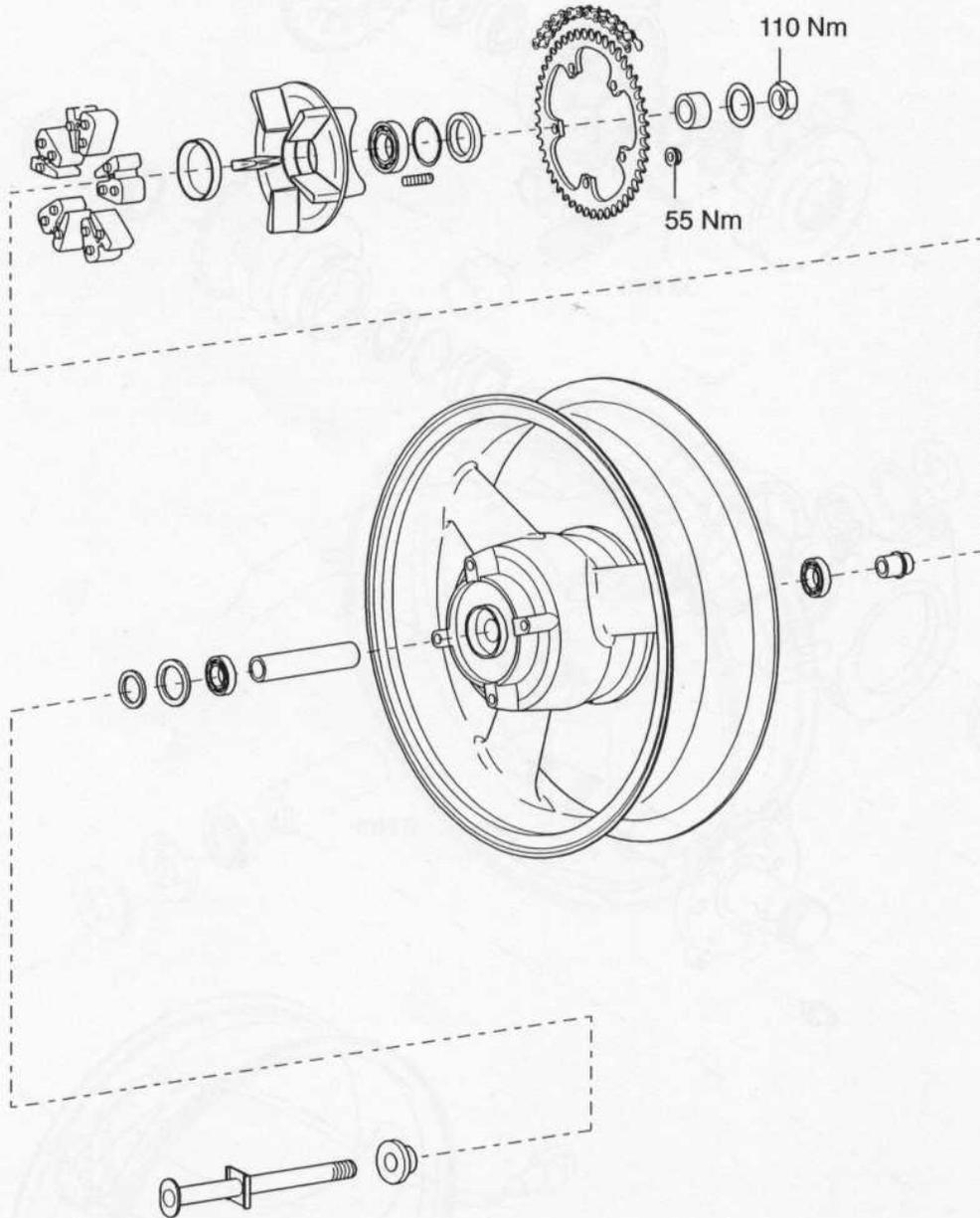
Exploded view - Front Wheel



Exploded View - Rear Hub (ST model only)

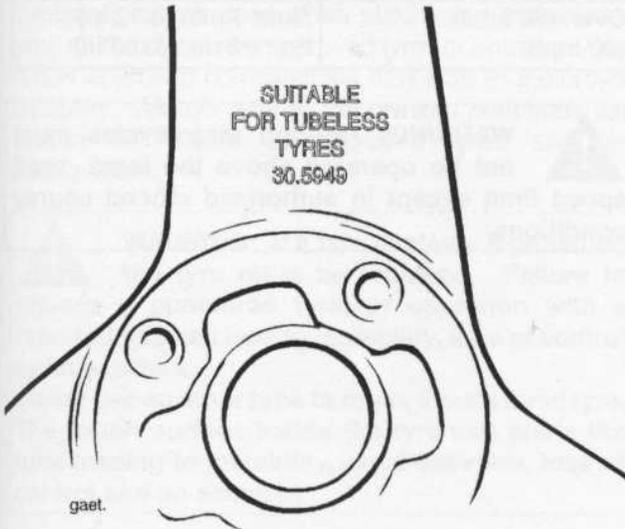


Exploded View - Rear Wheel and Final Drive (RS model only)

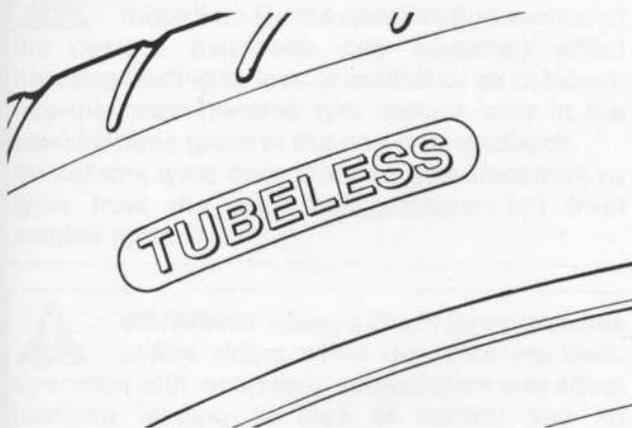


TYRES

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.



Rim Marking



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.

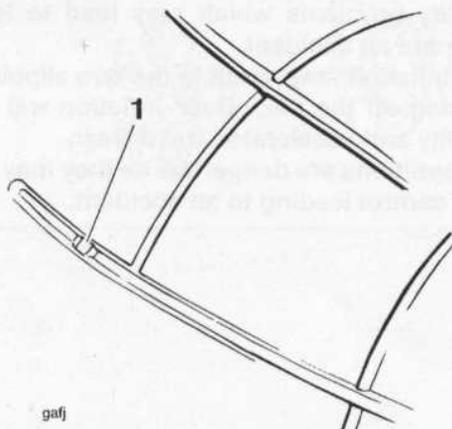
Tyre pressures should be checked frequently and adjusted as necessary. See the Owner's Handbook or the specification section for the correct inflation pressures for your model.

! **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, All Models

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.



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 being 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. On spoked wheels, check spokes for looseness and damage. 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 an accident.

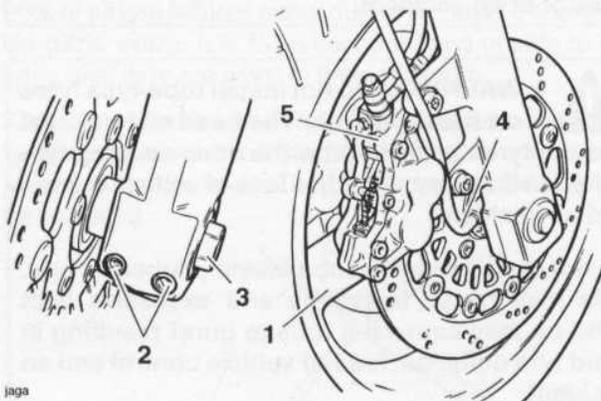
 **WARNING:** When replacement tyres are required, consult your authorised Triumph Dealer who will arrange for the tyres to be fitted according to the tyre manufacturers instructions.

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 - ST and RS models



1. Front wheel

2. Fork pinch bolts

3. Wheel spindle

4. Speedo drive

5. Brake caliper

1. Remove the brake caliper mounting bolts and detach the calipers on each side of the wheel. Do not disconnect the brake hoses.



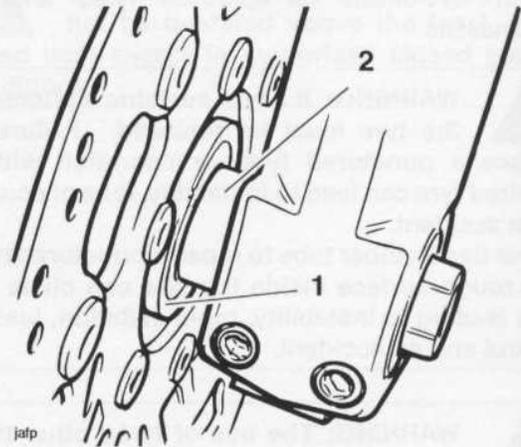
WARNING: Do not allow the calipers to hang on the brake hoses as this may damage the hoses and could lead to an accident.

2. Raise and support the front of the motorcycle to allow removal of the front wheel.



WARNING: Ensure the motorcycle is stabilised and adequately supported, to prevent it falling and causing damage or injury.

3. Slacken the two wheel spindle pinch bolts at the lower end of the left hand fork.
4. Undo the wheel spindle which is threaded into the right hand fork. Support the wheel and remove the wheel spindle.
5. Remove the wheel, recovering the speedometer drive assembly from the right hand side of the wheel, and the sleeve from the left hand side. Place the wheel on wooden blocks.



1. Wheel

2. Spacer



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.

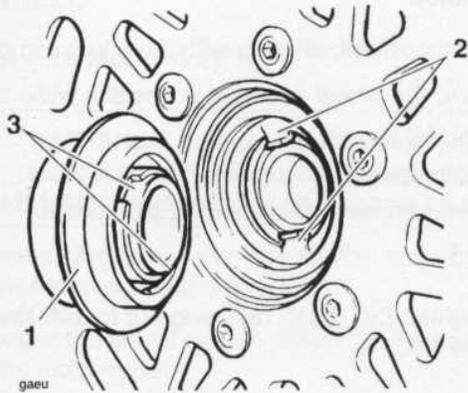
Never allow the speedometer drive to hang on the cables. Always support the speedometer drive during the period that the wheel is removed.



WARNING: Do not allow the wheel to rest on either brake disc as this may damage the disc and could lead to an accident.

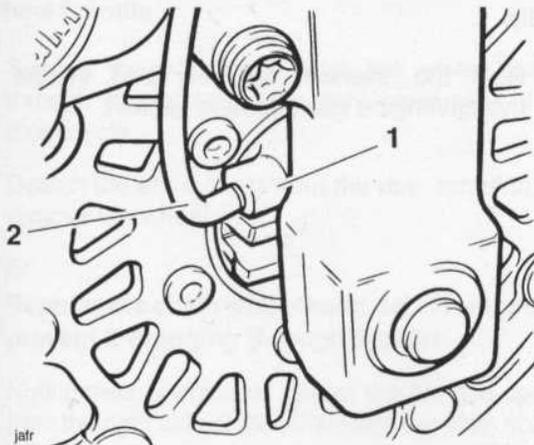
6. Thoroughly clean all components and inspect for wear or damage.

Installation



- 1. Speedometer drive
- 2. Drive tongues
- 3. Drive cut-outs

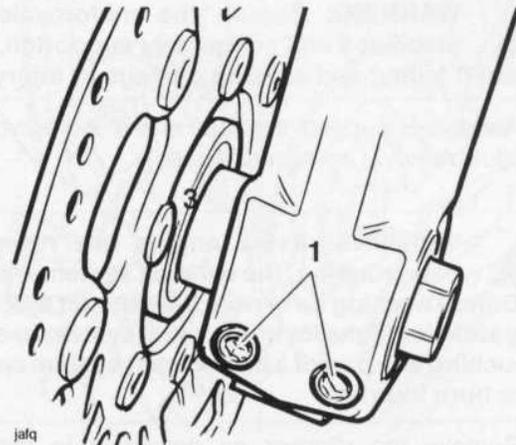
1. Align the wheel to the motorcycle and position the speedometer drive on the wheel hub, ensuring the two drive cut-outs engage with the drive tongues in the wheel.
2. Lightly smear the sleeve surface with grease and locate it in the left hand side of the hub.
3. Position the wheel between the forks and fit the wheel spindle. Turn the speedometer drive such that the cables exit the drive at right angles to the fork and facing to the rear of the motorcycle.



- 1. Speedometer Drive
- 2. Cable Exit Direction

4. Tighten the wheel spindle to **61 Nm**.

5. 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.
6. Tighten the left hand fork pinch bolts to **20 Nm**.



1. Fork Pinch Bolts

7. Thoroughly clean and degrease the brake discs.
8. Fit the brake calipers, tightening the mounting bolts to **40 Nm**.
9. Check the operation of the front brake by pumping the brake lever several times.

REAR WHEEL

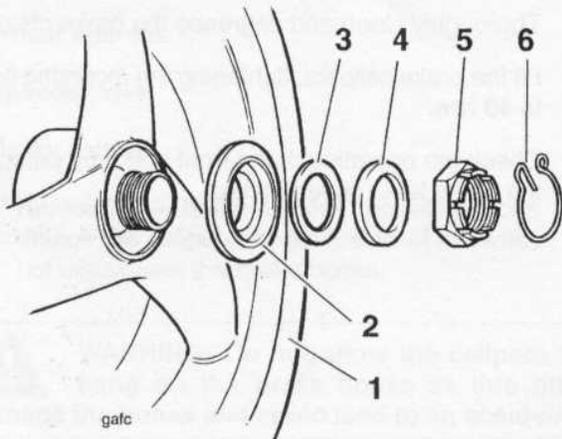
Removal - ST Model only

! WARNING: Ensure the motorcycle is stabilised and adequately supported, to prevent it falling and causing damage or injury.

1. Raise and support the rear of the motorcycle to allow removal of the rear wheel.

! 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.

2. Remove the silencer as described in the fuel system/engine management section.



1. Rear Wheel

2. Conical spacer

3. Plain washer

4. Belleville washer

5. Nut

6. Clip

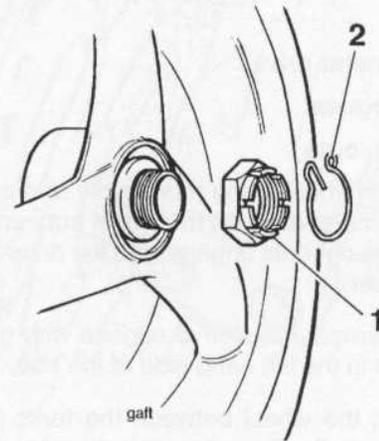
3. To release the wheel, remove:

- clip,
- nut,
- belleville washer,
- plain washer,
- conical spacer.

4. Remove the wheel.

Installation

1. Fit the wheel, aligning with the 4 location dowels.
2. Hold the wheel squarely in position while fitting:
 - conical spacer
 - plain washer
 - belleville washer, dished face outwards
 - nut
3. Tighten the wheel retaining nut to **146 Nm**, and fit the clip.



1. Wheel nut

2. Clip

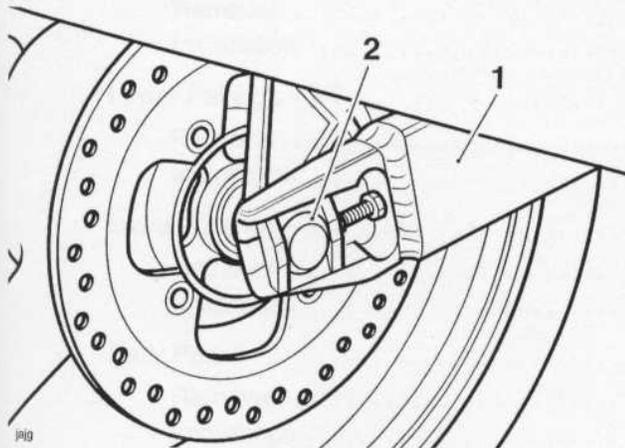
4. Refit the silencer as described in the fuel system/engine management section.

REAR WHEEL

Removal - RS Model only

WARNING: Ensure the motorcycle is stabilised and adequately supported, to prevent it falling and causing damage or injury.

1. Raise and support the rear of the motorcycle to allow removal of the rear wheel.
2. Release the wheel spindle nut on the left hand side of the motorcycle.



1. Swinging Arm

2. Wheel Spindle

3. Support the wheel and push the wheel spindle through the wheel to the right hand side of the motorcycle.
4. Detach the drive chain from the rear sprocket and remove the wheel.

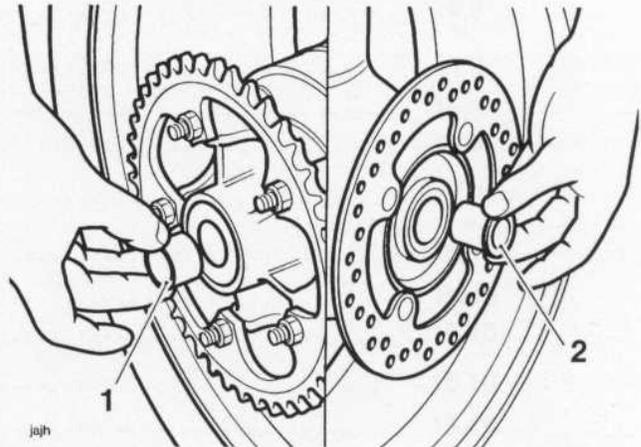
NOTE:

- Support the chain while the wheel is removed to prevent it dragging through the dirt.
5. Noting their orientation, collect the flanged spacer from the right side of the wheel and the plain spacer from the left.

CAUTION: To prevent damage to the brake pipe and caliper, do not allow the caliper to hang on the brake pipe.

Installation

1. Refit the flanged spacer to the right side of the wheel and the plain spacer to the left.



1. Plain Spacer

2. Flanged Spacer

2. Remove the supports from the caliper carrier and chain.
3. Refit the drive chain to the rear sprocket.
4. Align the wheel, swinging arm spacers and caliper carrier then refit the wheel spindle from the right hand side.
5. Tighten the wheel spindle nut to **110 Nm**.
6. Lower the motorcycle to the ground and place on the side stand.

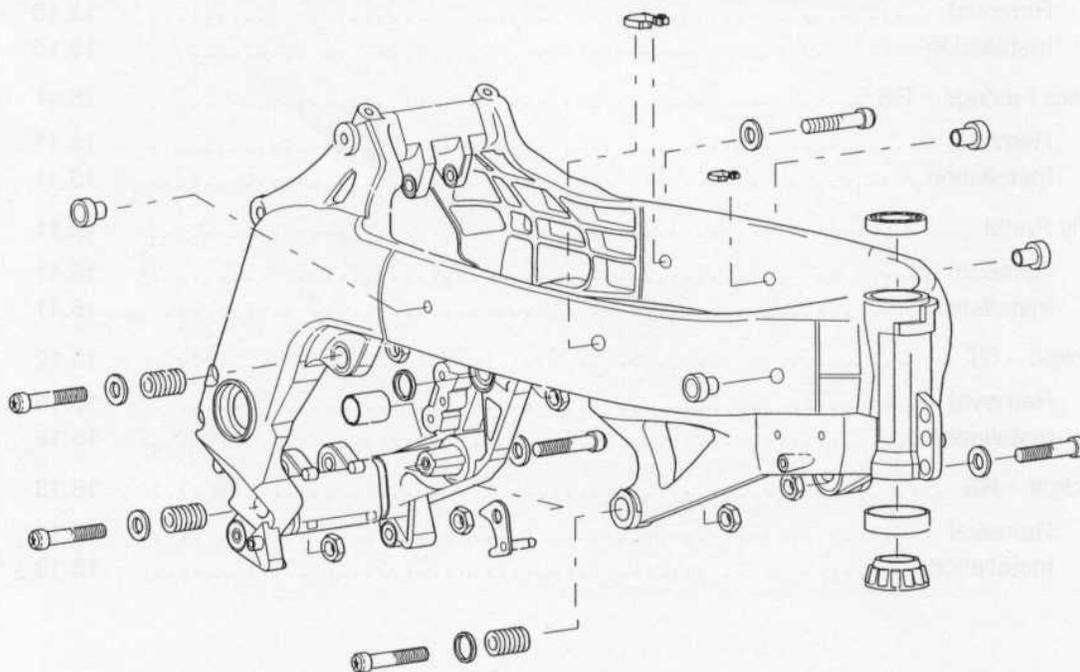
BODYWORK & FRAME

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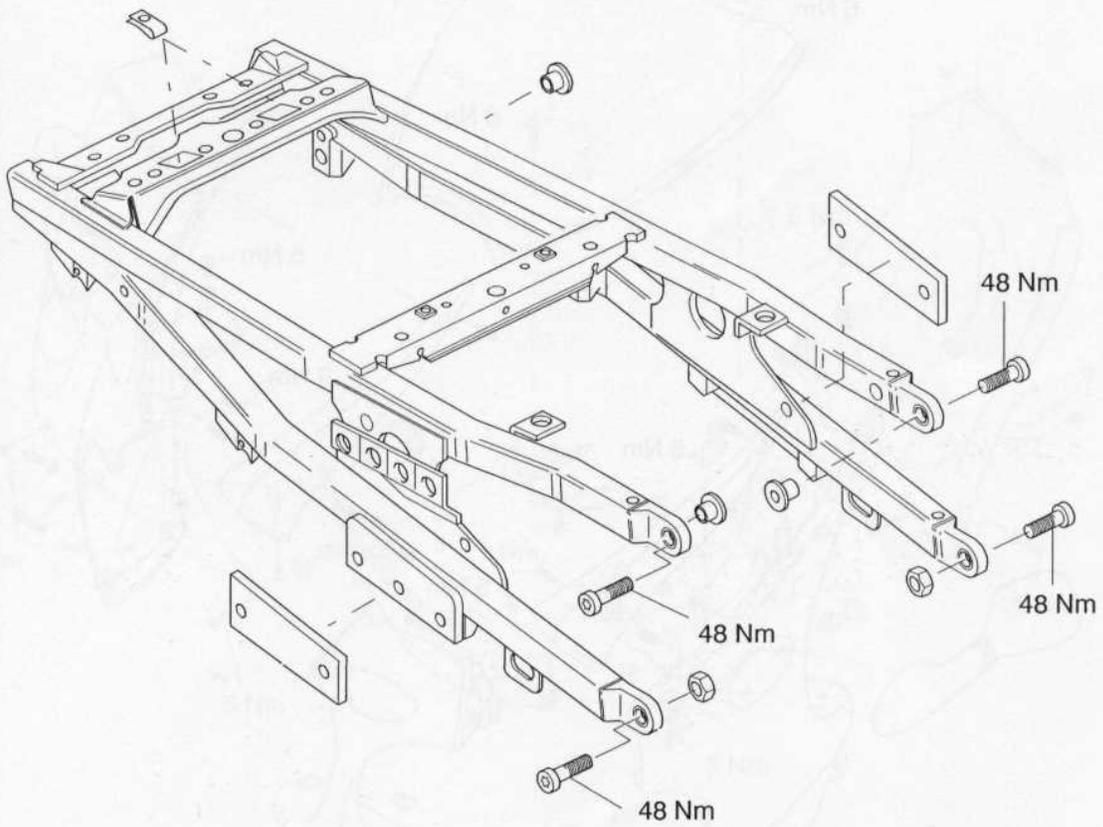
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Exploded View - Frame

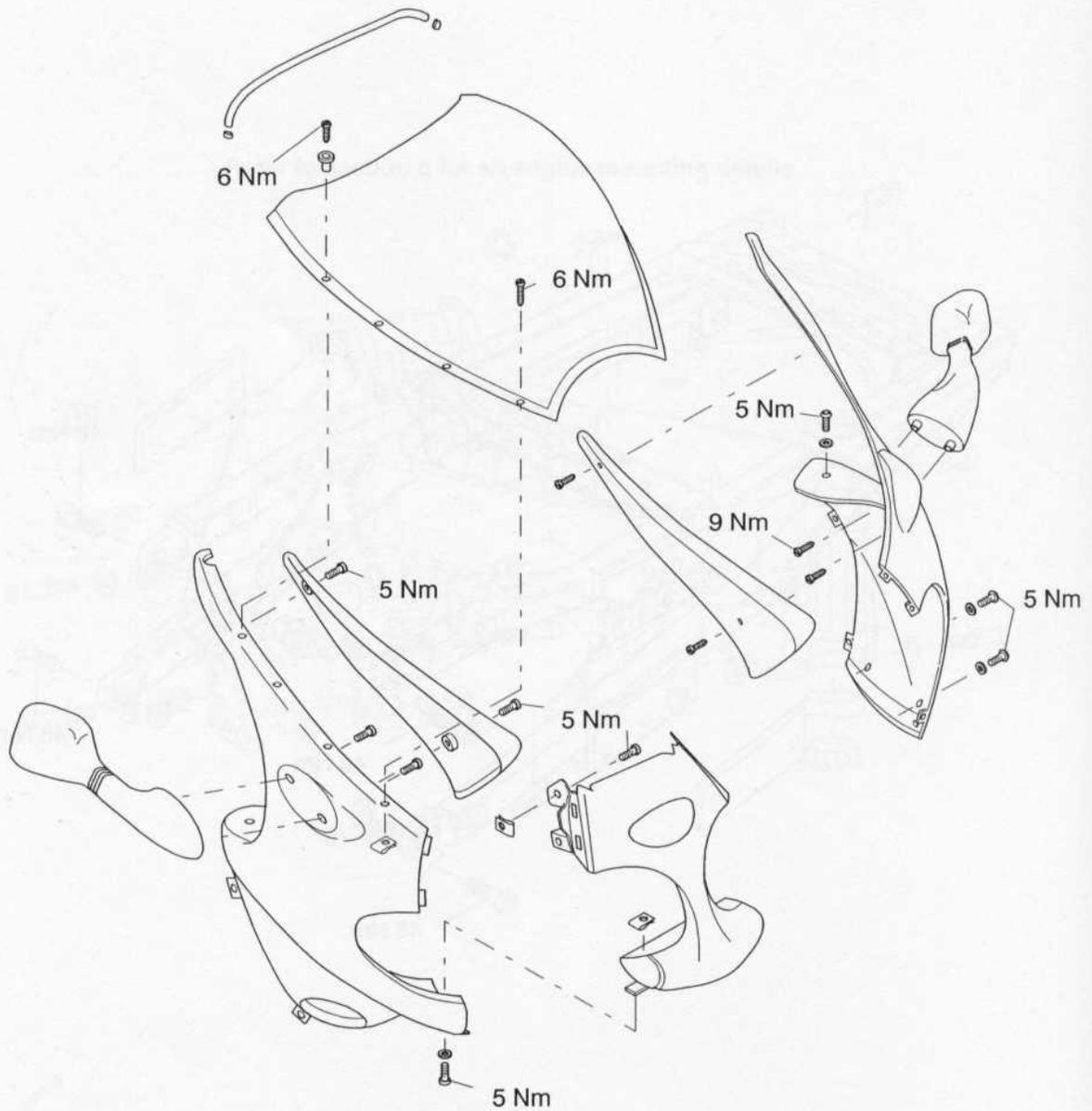
Refer to section 6 for all engine mounting details



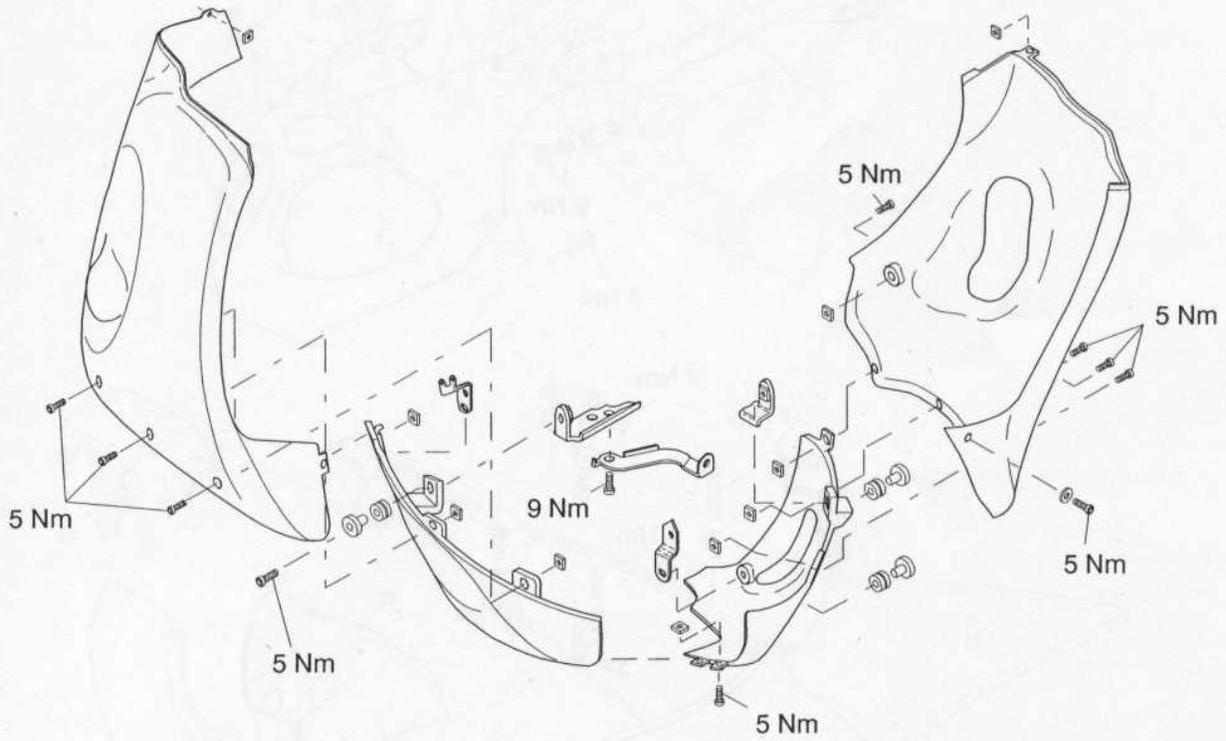
Exploded View - Seat Rails



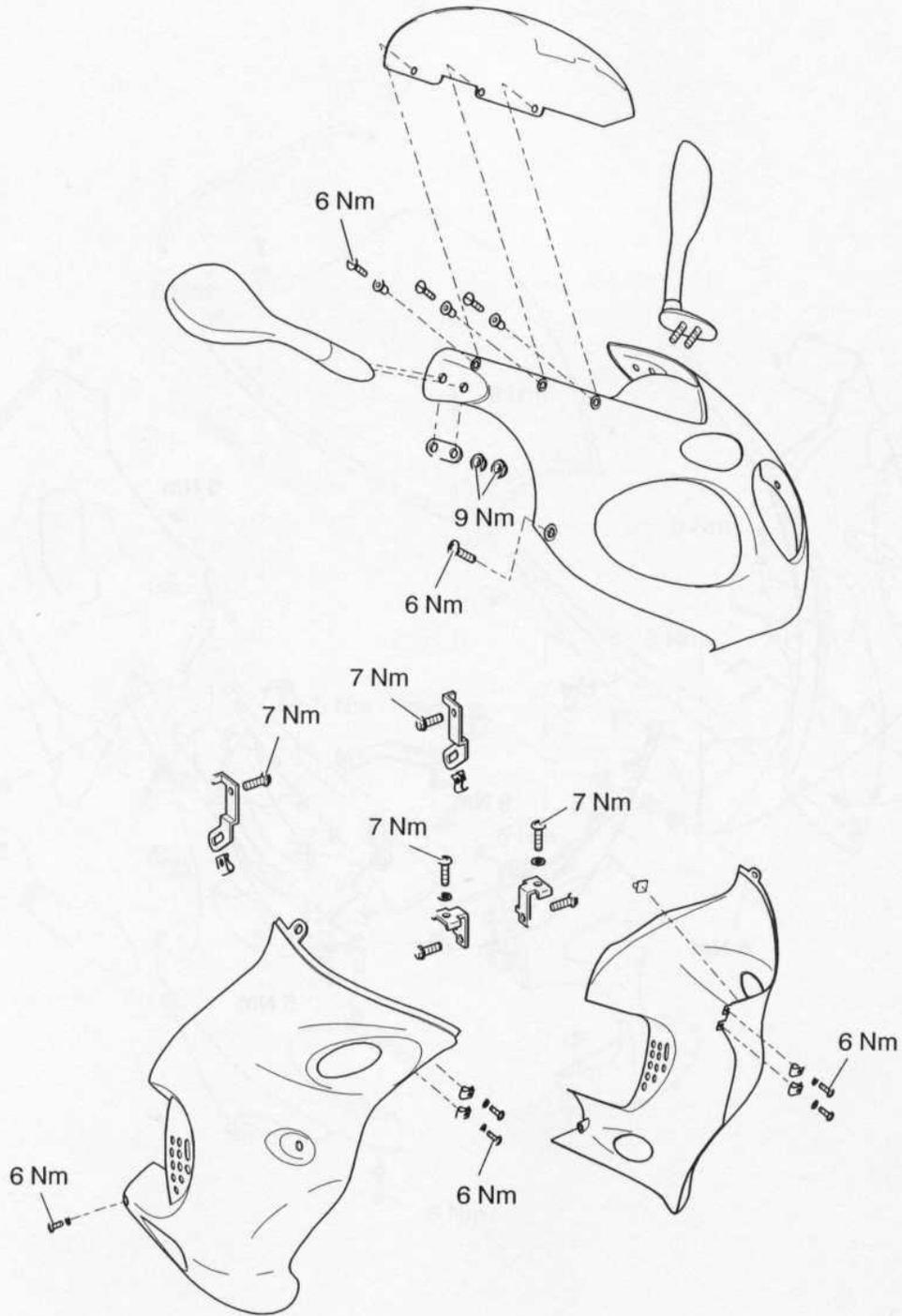
Exploded View - Cockpit and Mountings - ST Model



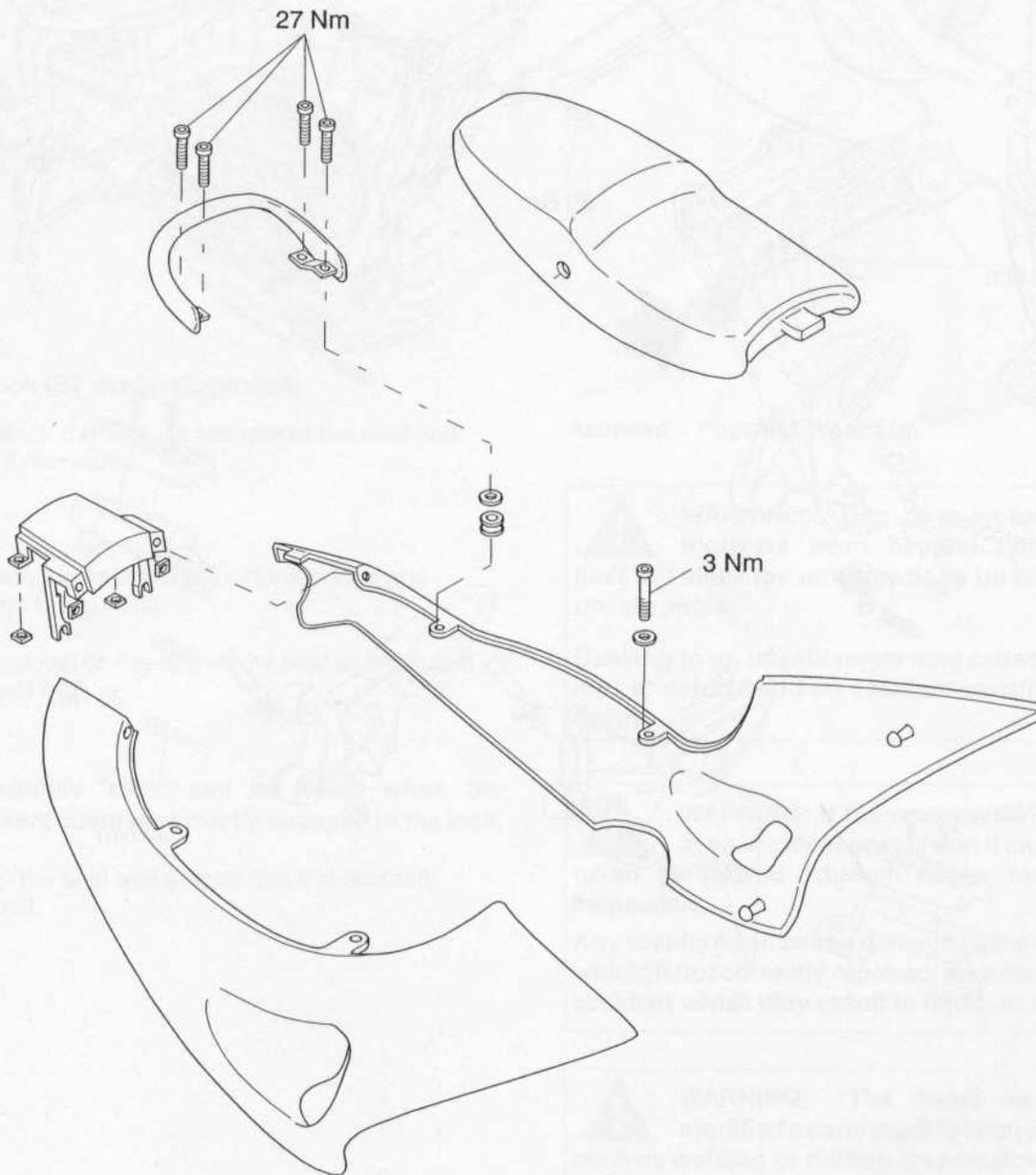
Exploded View - Lower Fairings - ST Model



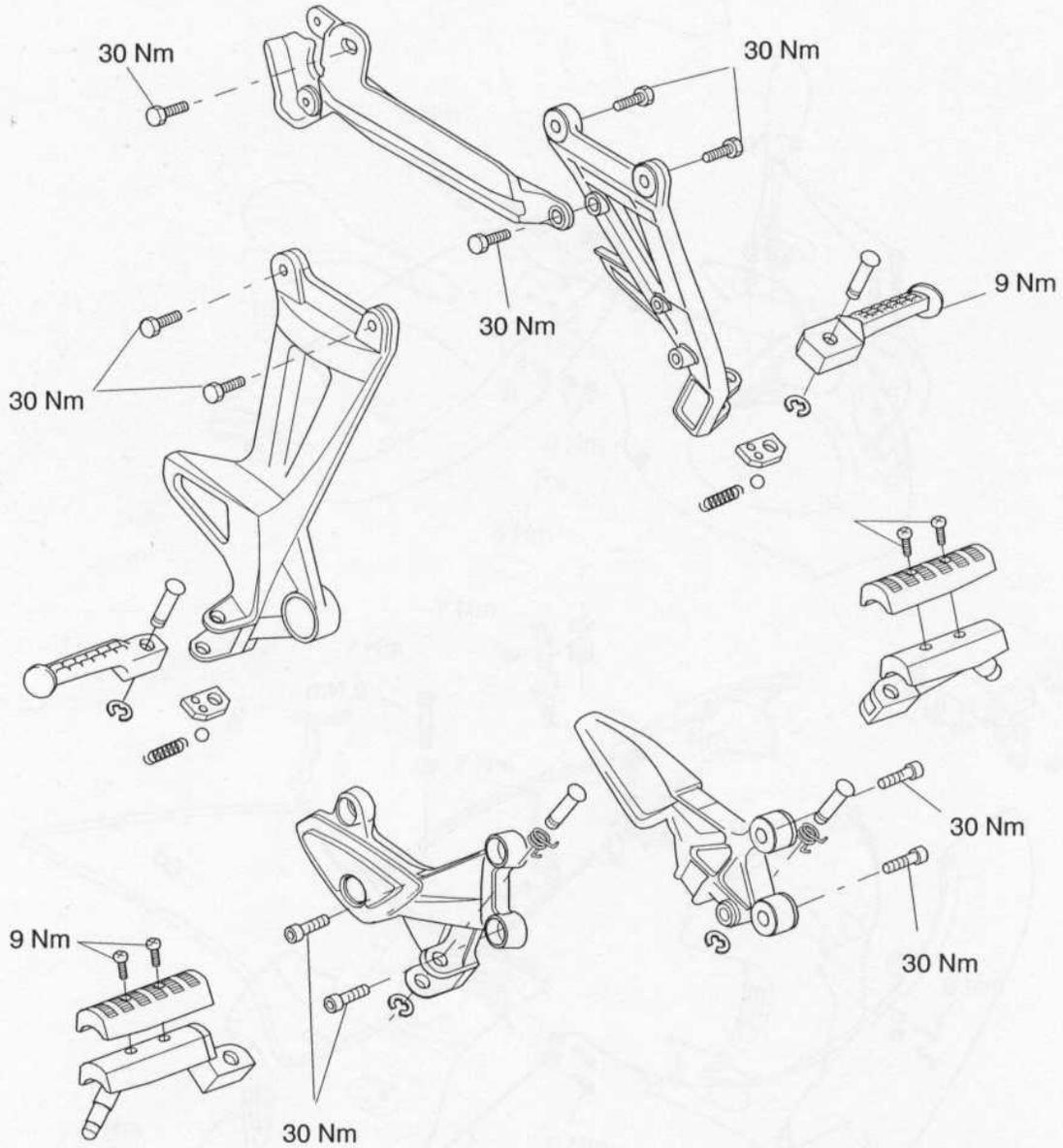
Exploded View - Cockpit Fairing - RS Model



Exploded View - Rear Panels - Both Models



• Exploded View - Footrests and Mountings - Both Models

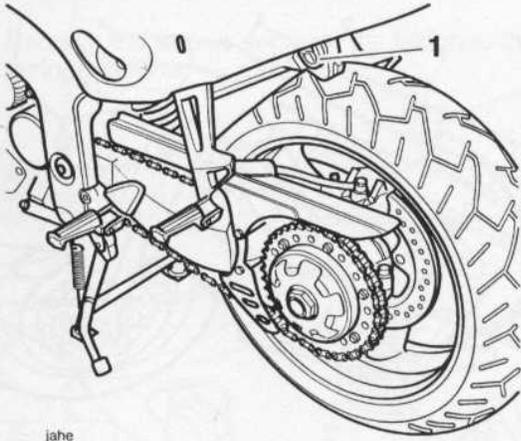


SEAT

Removal

NOTE:

- **The seat lock is situated at the rear end of the lifting handle.**
1. Insert the ignition key into the seat lock and turn the key anti-clockwise while pressing down on the rear part of the rear seat/rear cover.



jahe

1. Seat Lock (ST model illustrated)

2. To detach the seat, lift the rear of the seat and slide it rearwards.

Refit

1. Position the seat to the fuel tank bridge and engage the front lip.
2. Press down on the rear of the seat to engage in the seat lock.

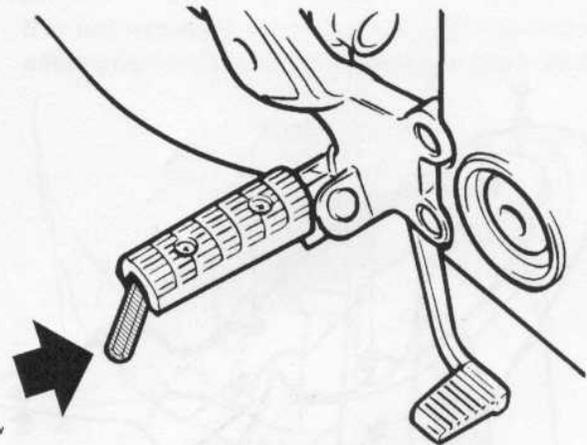
NOTE:

- **An audible 'click' can be heard when the seat/seat cover is correctly engaged in the lock.**
3. Grasp the seat and ensure that it is securely retained.

FRAME, FOOTRESTS AND FIXINGS

Inspection

1. Inspect the frame, footrests and fairings for damage, cracks, chafing and other dangerous conditions. Check fairing and frame fixings for security.
2. Inspect the footrests for wear. If more than 50% of the radiused end is worn away, the footrest must be replaced.



jatw

Arrowed - Footrest Wear Limit



WARNING: Use of a motorcycle with footrests worn beyond the maximum limit will allow the motorcycle to be banked to an unsafe angle.

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.

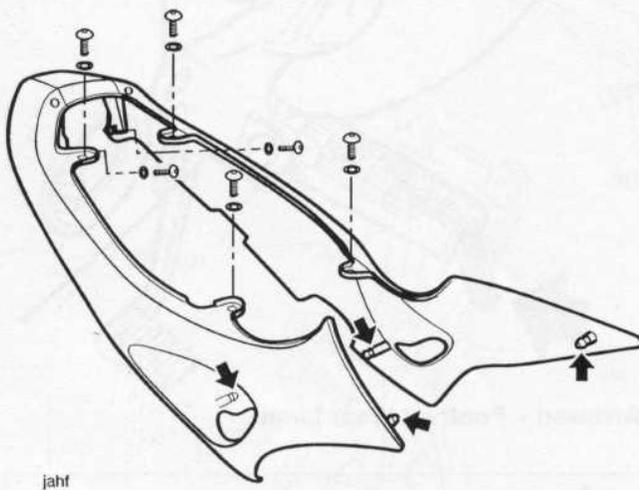


WARNING: The frame must not be modified as any modification to the frame such as welding or drilling may weaken the frame resulting in an accident.

SIDE PANEL - ST & RS

Removal

1. Remove the seat.
2. Disconnect the battery, negative (black) lead first.
3. Remove the grab rail.
4. To release the side panel assembly, remove the fixings shown in the illustration below.



Side Panel Fixings

5. On both the left and right hand sides of the motorcycle, release the side panel retaining studs in the positions arrowed by gently pulling the panel outwards.
6. Disconnect the rear light.
7. Withdraw the panel assembly from the rear of the motorcycle.

Installation

1. Installation is the reverse of removal noting the following.

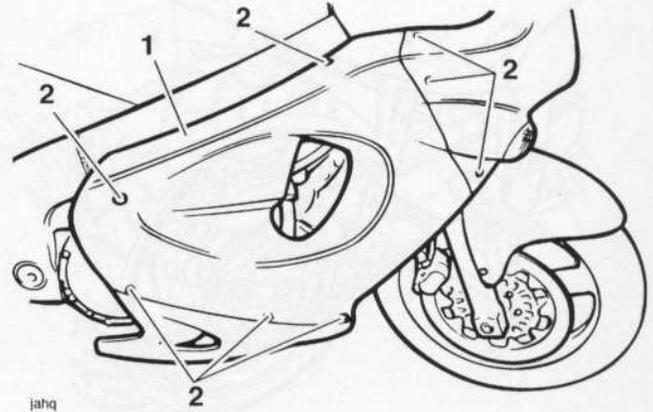
NOTE:

- Reconnect the battery, positive (red) lead first.
- Check the rear light for correct operation after reconnection.

LOWER FAIRINGS - ST

Removal

1. Remove the seat.
2. Disconnect the battery, negative (black) lead first.
3. Remove the screws securing the fairing to the fairing brackets.



1. Lower Fairing

2. Fairing Retaining Screws

Installation

1. Installation is the reverse of removal noting the following points.

NOTE:

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

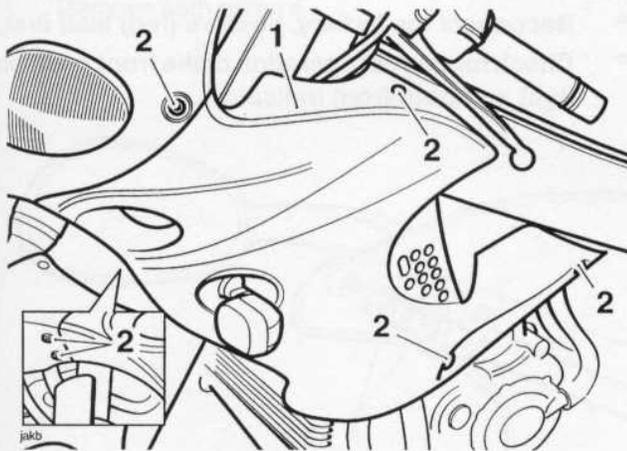
LOWER FAIRINGS - RS

Removal

NOTE:

- **The cockpit does NOT need to be removed in order to remove the lower fairings.**

1. Remove the seat.
2. Disconnect the battery, negative (black) lead first.
3. Remove the screws securing the fairing to the fairing brackets.



1. Fairing

2. Fairing Retaining Screws

4. Detach the fairing and disconnect the multiplug to the indicator.

Installation

1. Installation is the reverse of removal noting the following points.

NOTE:

- **Reconnect the battery, positive (red) lead first.**
- **Ensure that the indicators function correctly.**

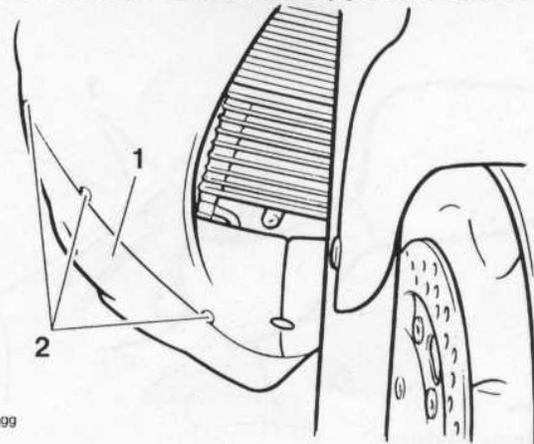
BELLY PANEL- ST

Removal

1. Remove both lower fairings.
2. Remove the screws on each side which attach the belly panel to the engine/fairing.
3. Support the belly panel while releasing the fasteners.

NOTE:

- **It is not necessary to release the fixings which secure each half of the belly panel to each other.**



1. Belly Panel

2. Fasteners

Installation

1. Installation is the reverse of removal.

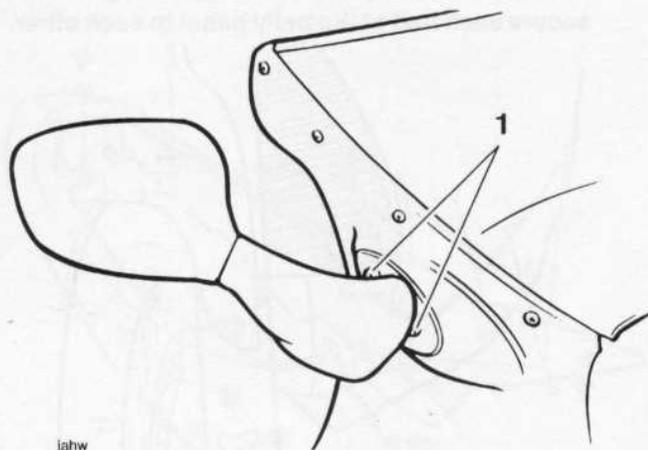
COCKPIT - ST

Removal

NOTE:

- **The cockpit is removed as an assembly. It is not necessary to remove the belly panel.**

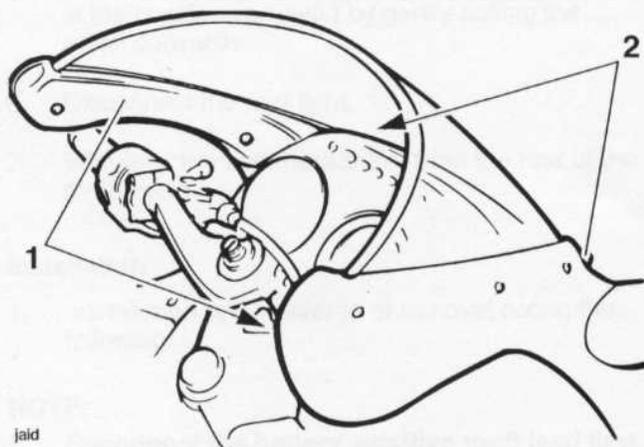
1. Remove the front seat.
2. Disconnect the battery, negative (black) lead first.
3. Remove both mirrors.



jahw

1. Mirror Fixings

4. Remove the trim panel from both sides of the windscreen.
5. Remove the two lower-most windscreen securing screws.



jaid

1. Windscreen Trim Panels

2. Lower Windscreen Screws

6. Remove both lower fairings.

7. Release the fixings securing the cockpit.
8. Lift the cockpit gently forward and disconnect the front position light.
9. Disconnect the direction indicators at their multiplugs.
10. The cockpit can now be removed.

Installation

1. Refitting is the reverse of removal.

NOTE:

- **Reconnect the battery, positive (red) lead first.**
- **Check for correct operation of the front position light and both front indicators.**

ELECTRICAL SYSTEM
COCKPIT

COCKPIT - RS

Removal

NOTE:

- The cockpit is **NOT** removed as an assembly. The front and side sections are removed independently of each other.
- It is not necessary to remove the windscreen.

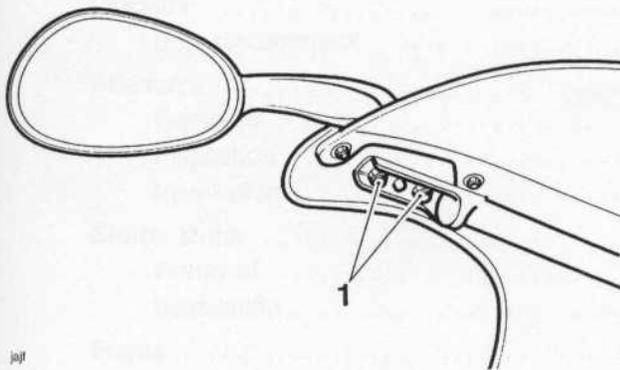
1. Remove the front seat.
2. Disconnect the battery, negative (black) lead first.
3. Remove both mirrors.

Installation

1. Refitting is the reverse of removal.

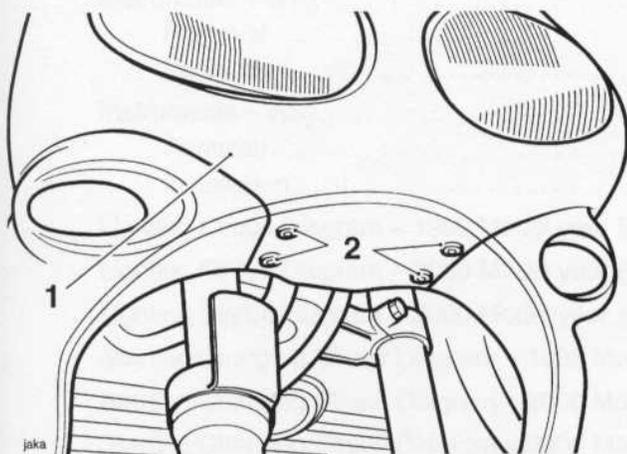
NOTE:

- Reconnect the battery, positive (red) lead first.
- Check for correct operation of the front position light and both front indicators.



1. Mirror Fixings

4. Release the four fixings from the underside of the cockpit.



1. Cockpit

2. Lower Fixings

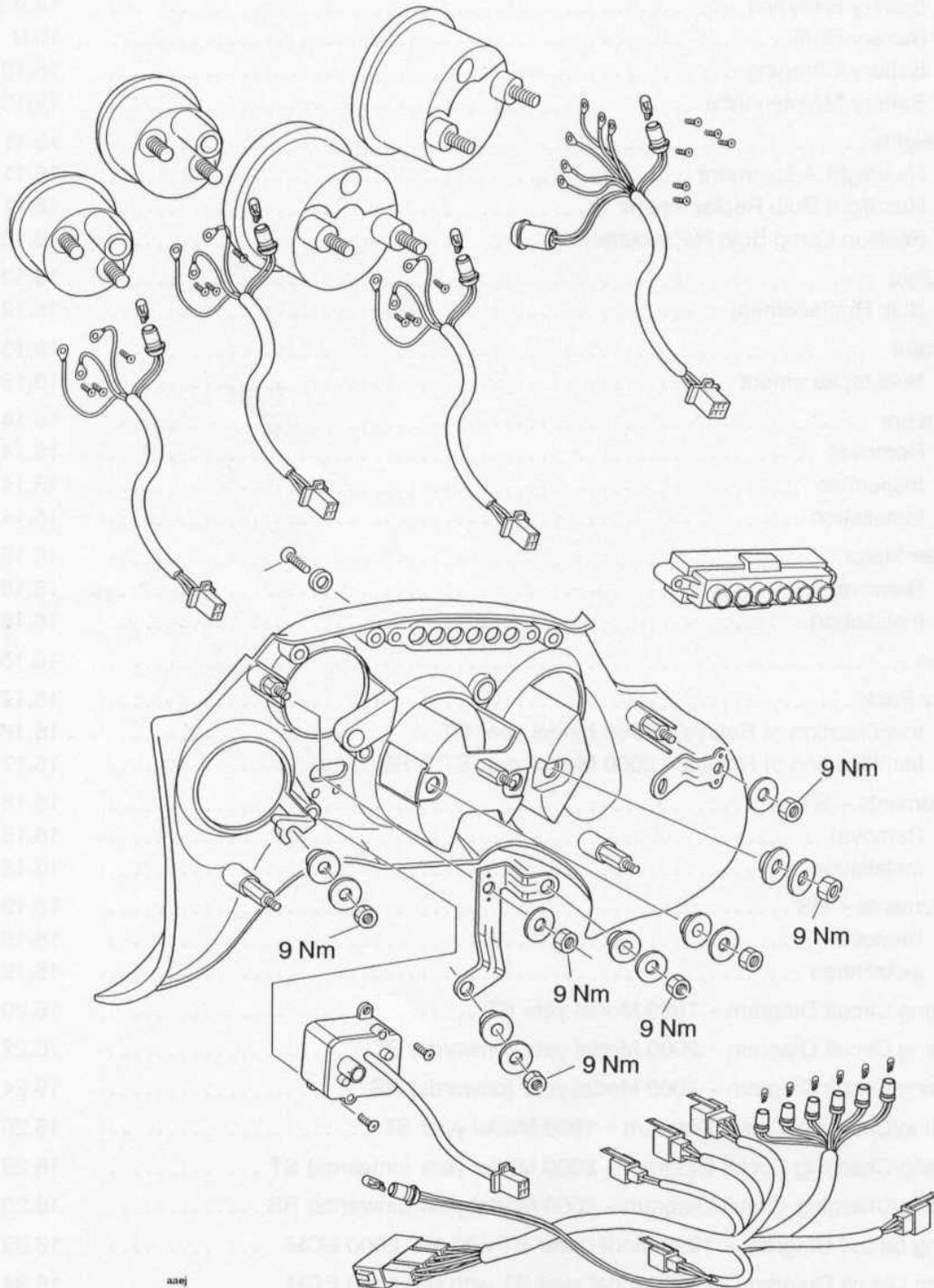
5. Release the two upper cockpit fixings.
6. Remove the cockpit.

ELECTRICAL SYSTEM

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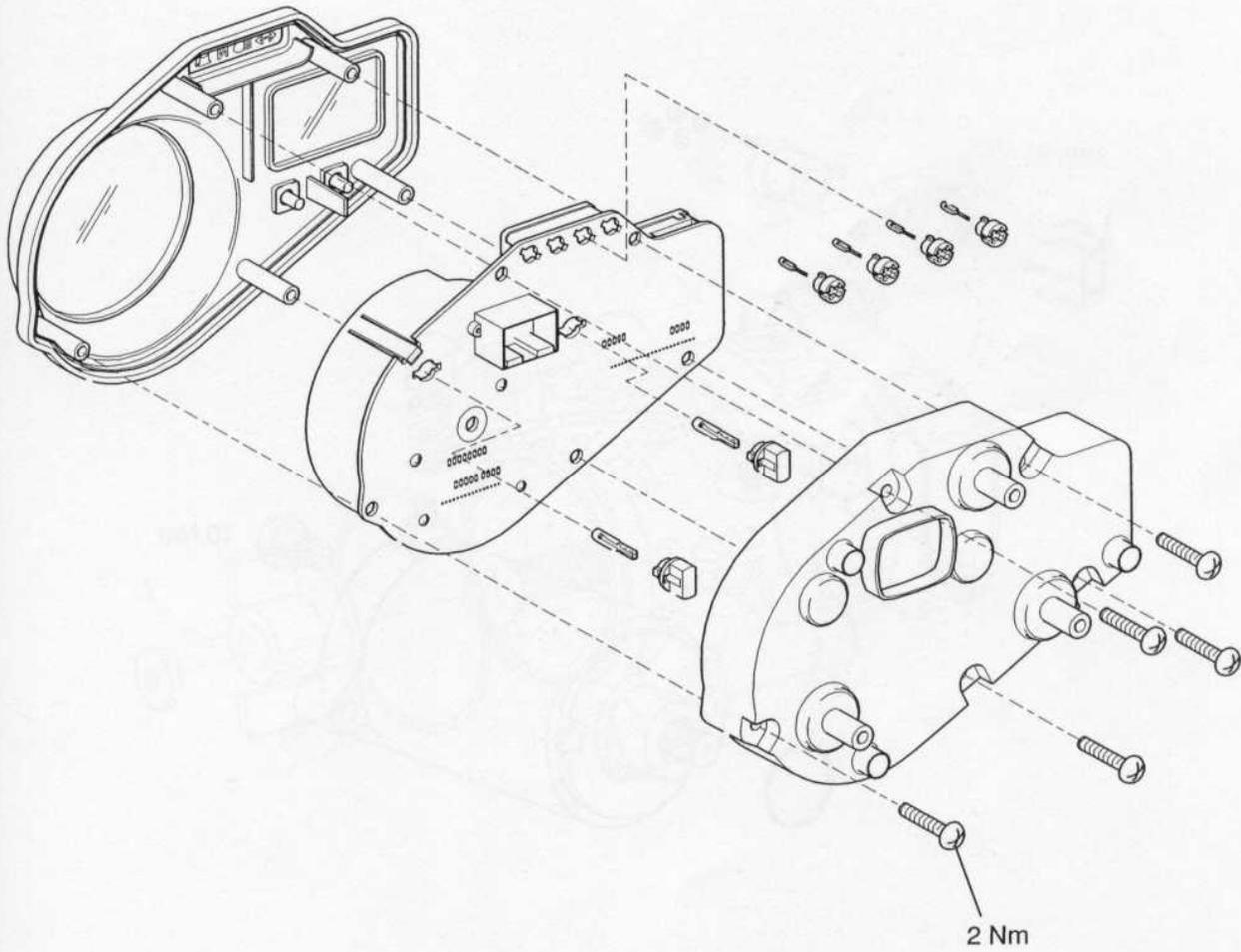
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Exploded View - Instruments - ST

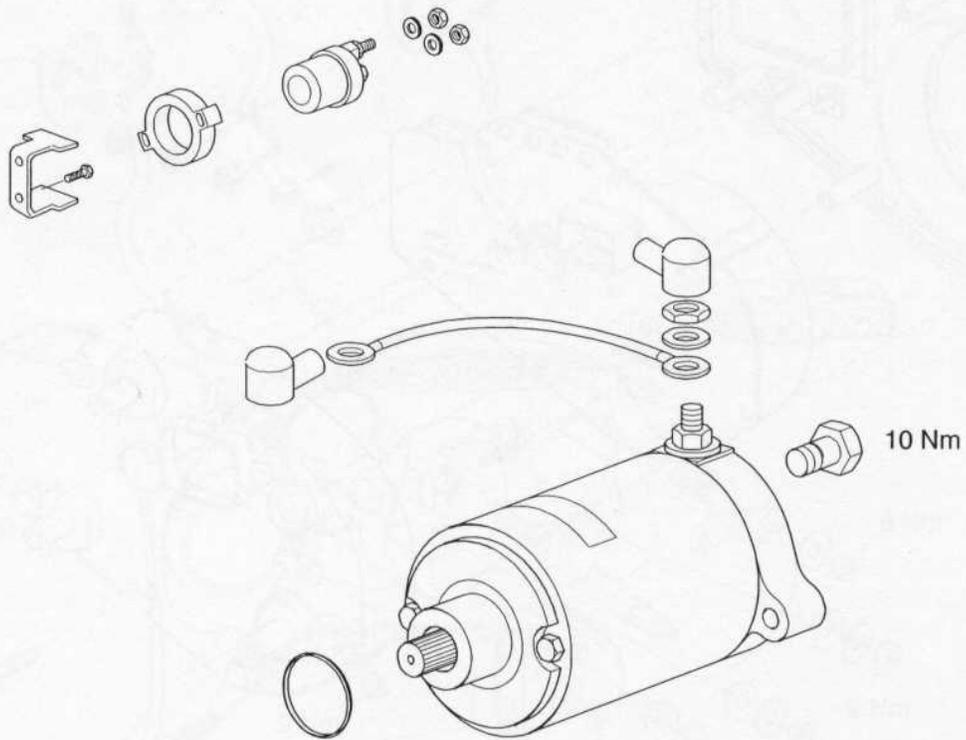


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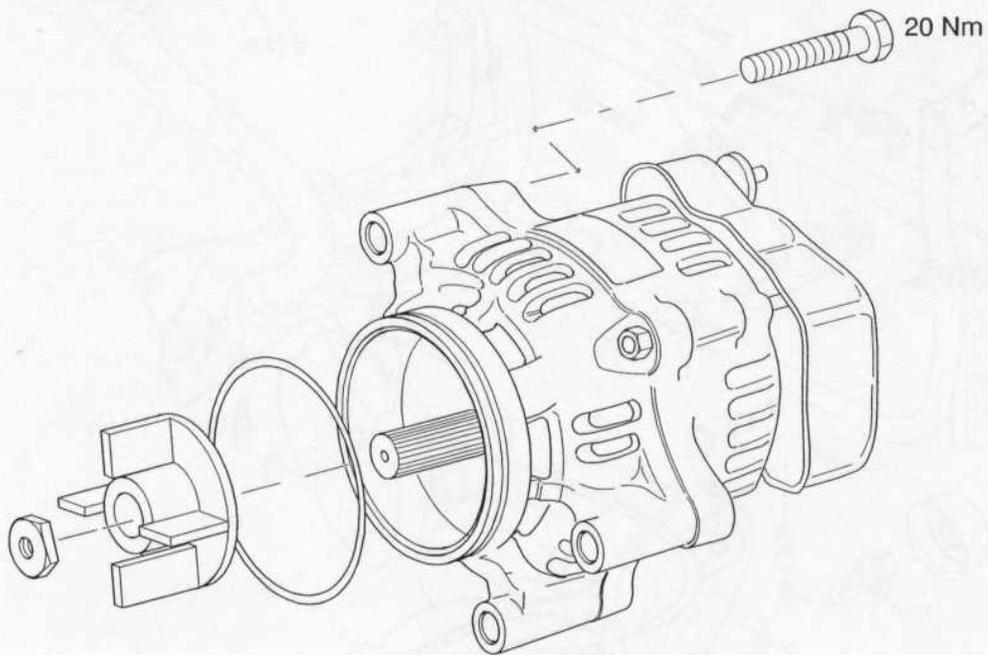
Exploded View - Instruments - RS



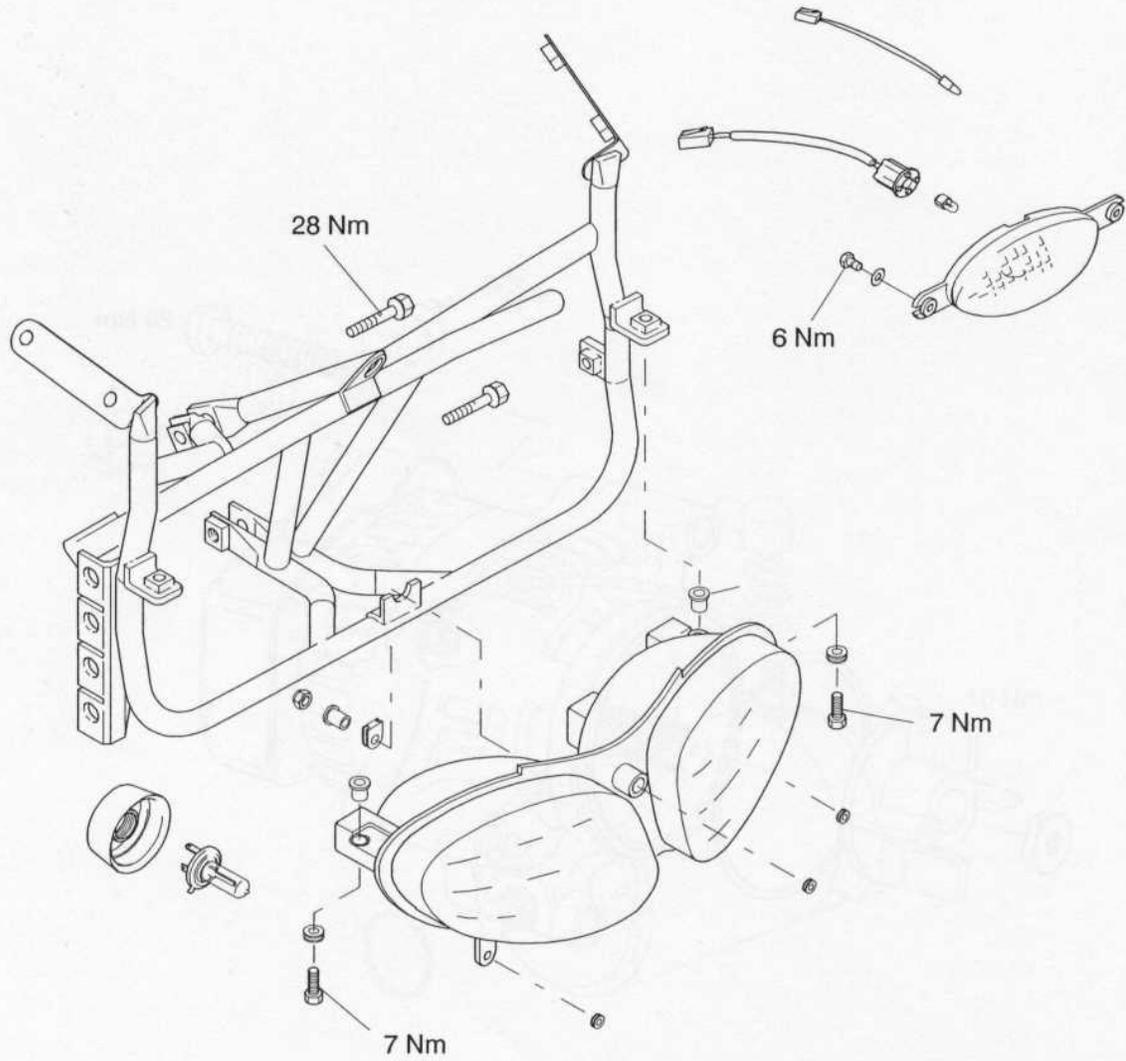
Exploded View - Starter Motor



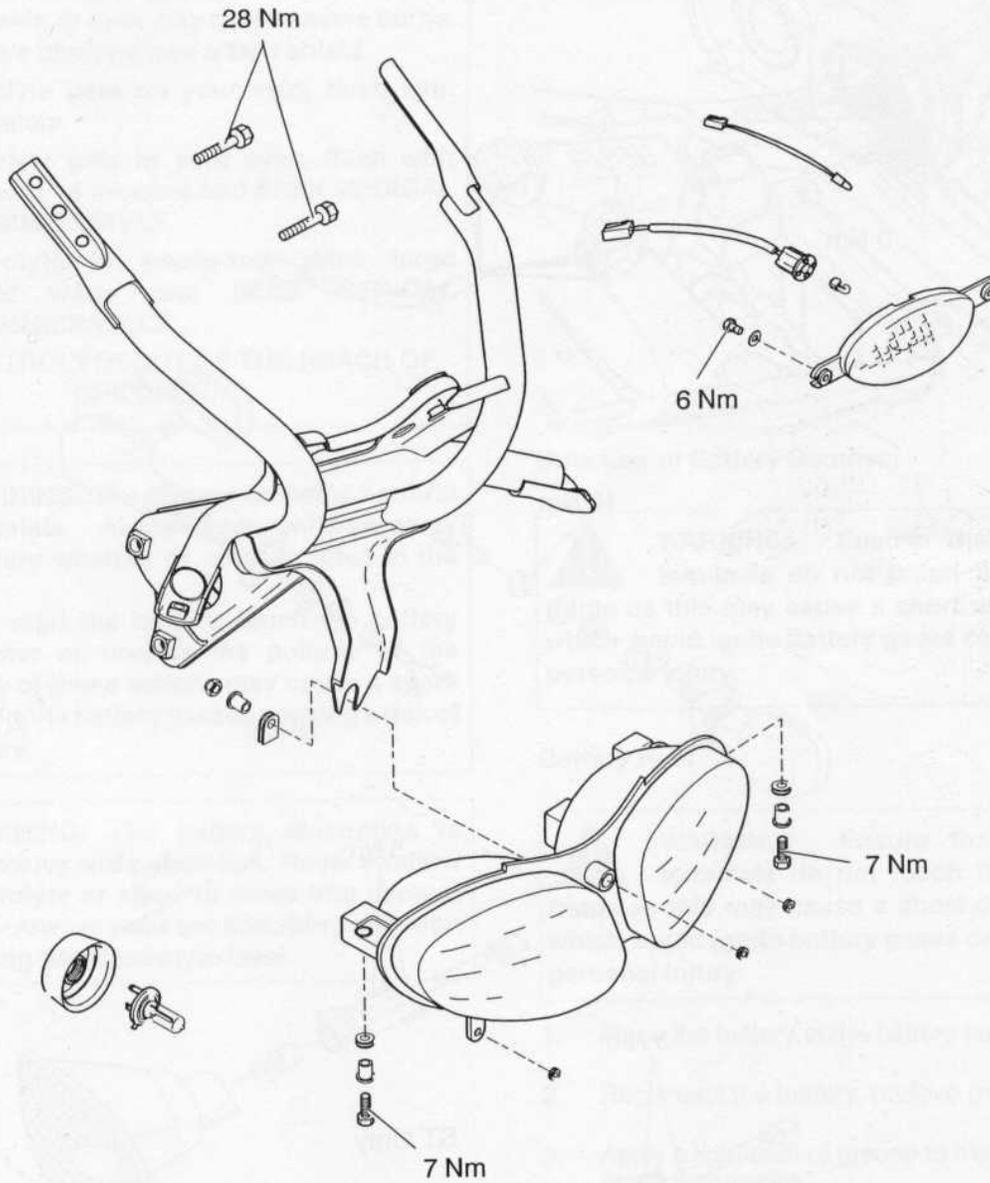
Exploded View - Alternator



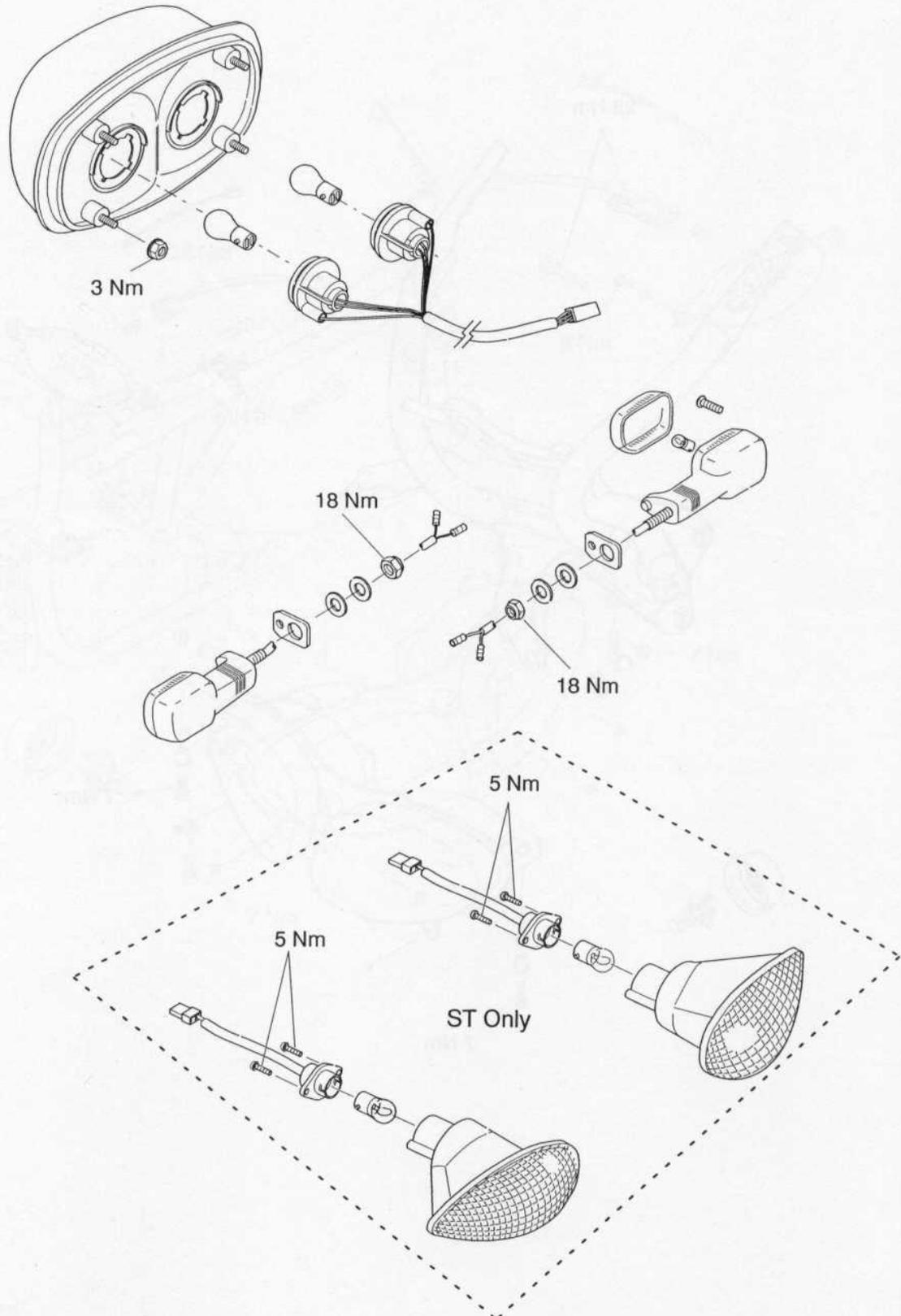
Exploded View - Headlight - ST



Exploded View - Headlight - RS



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.**

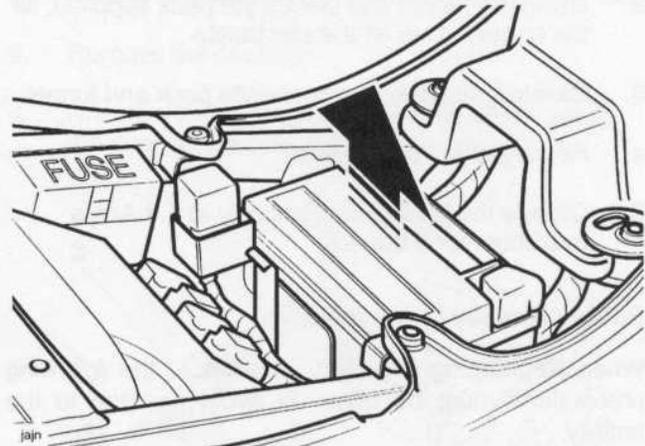
KEEP ELECTROLYTE OUT OF THE REACH OF CHILDREN.

! **WARNING:** The battery contains harmful materials. Always keep children away from the battery whether or not it is fitted 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.

! **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 adjusting the electrolyte level.

Battery Removal

1. Unlock and remove the seat.
2. Disconnect the battery, negative (black) lead first.
3. Remove the battery strap.
4. Take the battery out of the case.



Direction of Battery Removal

! **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.

Battery Refit

! **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. Place the battery in the battery case.
2. Reconnect the battery, positive (red) lead first.
3. Apply a light coat of grease to the terminals to prevent corrosion.
4. Cover the terminals with the protective caps.
5. Refit the battery strap.
6. Refit the seat.

BATTERY CHARGING

New Battery

To ensure that a new battery is correctly commissioned and will deliver maximum capacity for starting, the following procedure must be followed.

1. Remove the sealing tape.
2. Using the funnel and electrolyte pack supplied, fill the battery. Use all the electrolyte.
3. Carefully remove the electrolyte pack and funnel.
4. Fit the battery cell covers.
5. Charge the battery continuously at 1.4 Amps maximum for 5 hours

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 1.4 A except for a boost charge where a maximum charge rate of 6 A (for no longer than 1 hour) is allowed.

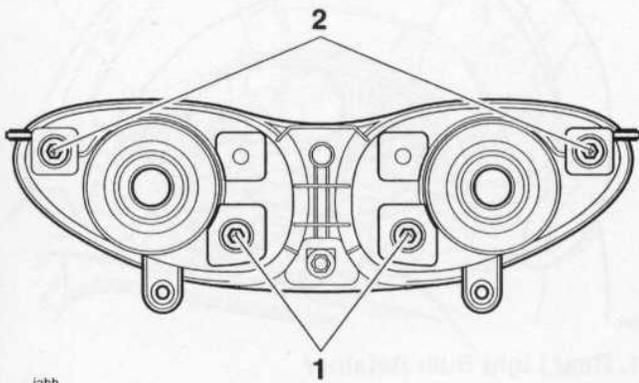
Battery Maintenance

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.

HEADLIGHT BEAM ADJUSTMENT

1. Remove the cockpit.
2. Switch the headlight dipped beam on.
3. Turn the vertical adjustment screw on each headlight clockwise to lower the beam or anti-clockwise to raise the beam.



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1. Vertical Adjustment Screws

2. Horizontal Adjustment Screws

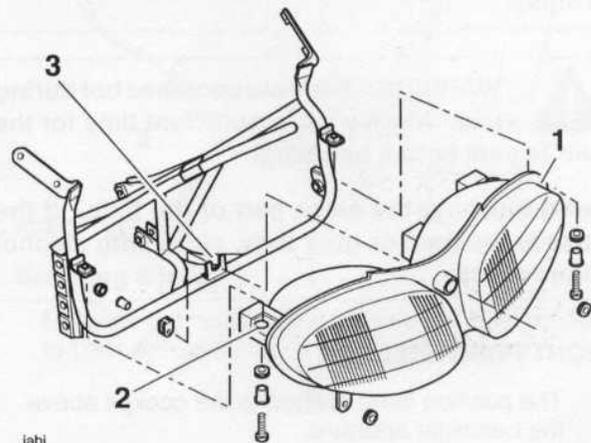
3. On the RH headlight turn the horizontal adjustment screw clockwise to move the beam to the right or anti-clockwise to move the beam to the left.
4. On the LH headlight turn the horizontal adjustment screw anti-clockwise to move the beam to the right or clockwise to move the beam to the left.
5. Switch the headlights off when the beam settings are satisfactory.

HEADLIGHT BULB REPLACEMENT

NOTE:

- **The complete headlight unit must be removed to gain access for bulb replacement.**

1. Remove the seat.
2. Disconnect the battery, negative (black) lead first.
3. Remove the cockpit.
4. Unscrew the nuts securing the headlight unit to the support bracket and release the unit.



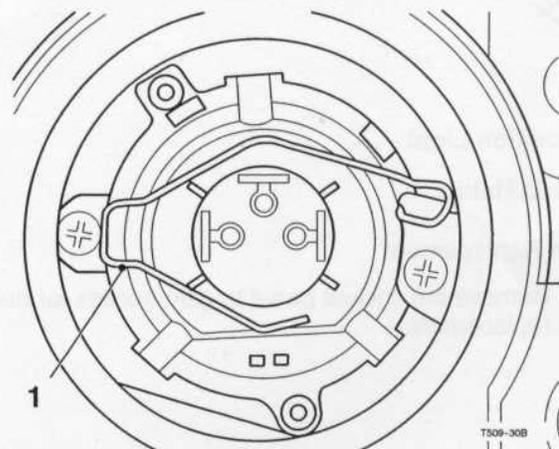
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1. Headlight Unit

2. Side Fixing Point (ST right hand shown)

3. Centre Fixing Point

4. Disconnect the multi-pin electrical connector from the bulb to be replaced and remove the rubber cover.
5. Detach the wire bulb retainer from the clip. It is not necessary to undo the screw.



T309-308

1. Bulb Retainer

6. Remove the bulb from the headlight unit.
7. Installation is the reverse of the removal procedure.

CAUTION: When reconnecting the battery, connect the positive (red) lead first.

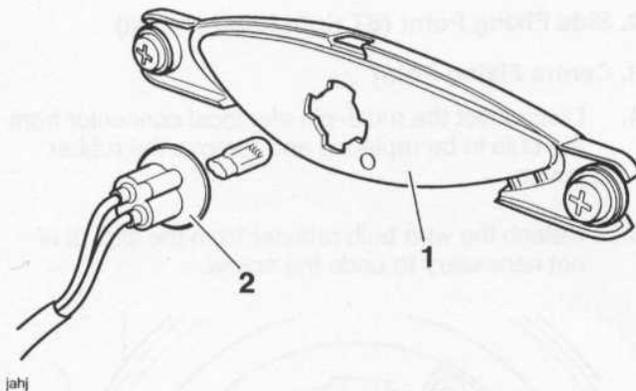
WARNING: Do not reconnect the battery until the assembly process has been completed. Premature battery reconnection could result in ignition of the battery gases causing risk of injury.

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.

FRONT POSITION LIGHT

1. The position lamp is fitted to the cockpit above the headlight aperture.



1. Position Light

2. Bulb Holder

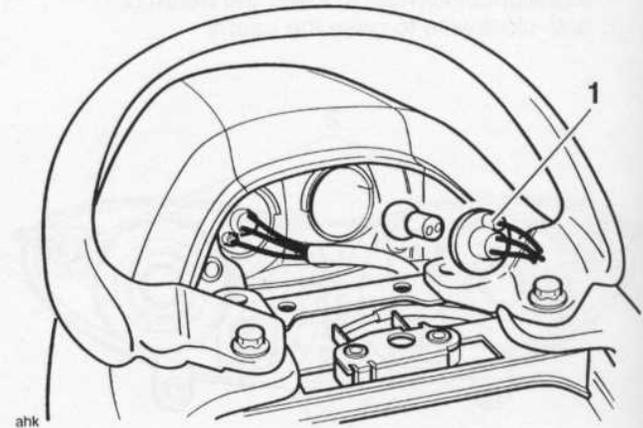
Bulb Replacement

3. Remove the cockpit panel to gain access for bulb replacement.

REAR LIGHT

Bulb Replacement

1. Remove the rear seat/cover to gain access to the tail light unit.



1. Rear Light Bulb Retainer

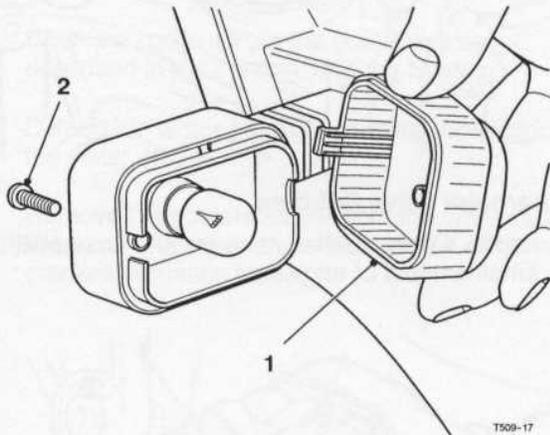
2. Rotate the bulb holder anti-clockwise to release.
3. Replace the bulb. Fit the bulb holder to the tail light unit.
4. Refit the seat.

REAR INDICATOR LIGHT - ST

FRONT & REAR INDICATOR LIGHT - RS

Bulb Replacement

1. The lens on each indicator light is held in place by a securing screw located in the body of the light.



1. Indicator Lens

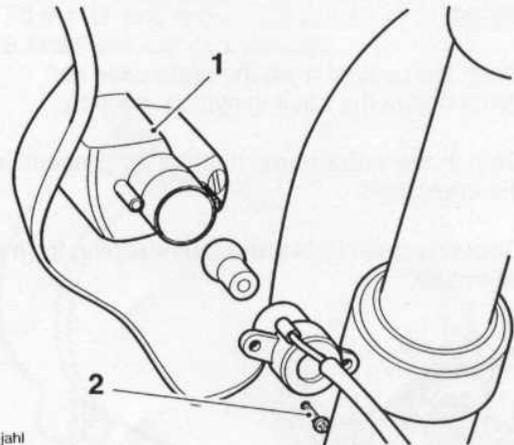
2. Securing Screw

2. Release the screw and remove the amber lens to gain access to the bulb for replacement.

FRONT INDICATOR LIGHT - ST

Bulb Replacement

1. The lens on the front indicators cannot be removed. To gain access to the bulb holder, remove the lower fairing.



1. Indicator Lens

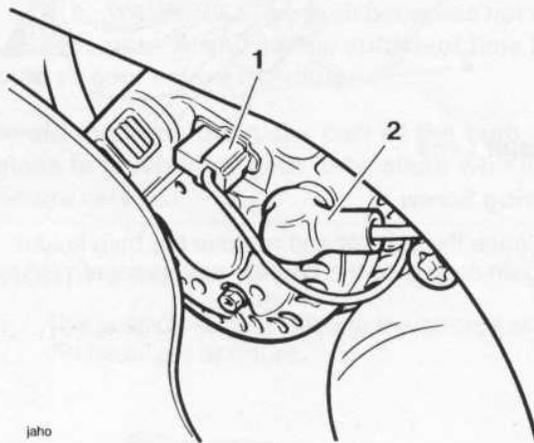
2. Securing Screw

2. Release the screws and remove the bulb holder to gain access to the bulb for replacement.

ALTERNATOR

Removal

1. Remove the seat and disconnect the battery, negative (black) lead first.
2. Remove the belly panel (ST only) and left hand fairing.
3. Drain the coolant from the crankcase as described in the cooling system section.
4. Detach the water pump hose at its connection to the crankcase.
5. Disconnect the cable and the multiplug from the alternator.



jaho

1. Multiplug

2. Cable

6. Release the alternator by removing the alternator to crankcase securing bolts.
7. Remove the alternator, capturing the cush drive rubbers from the cush drive.

Inspection

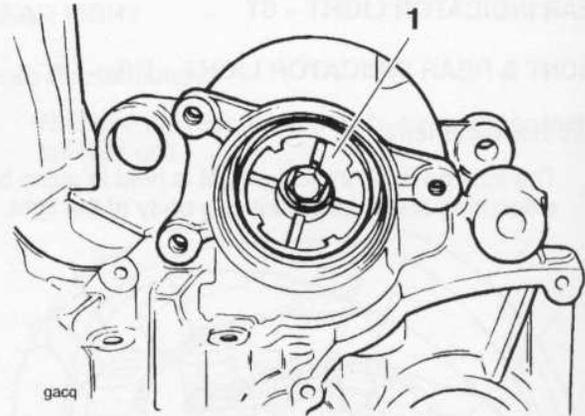
1. Inspect the alternator 'O' ring and renew if damaged / stretched.

Installation

1. Fit the cush drive rubbers into the alternator cush drive.

NOTE:

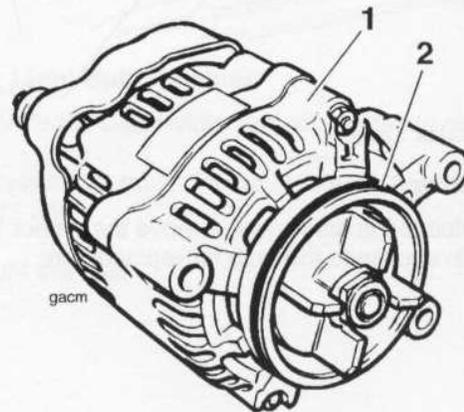
- If necessary, a small amount of petroleum jelly can be used to hold the rubbers in position.



gacq

1. Alternator Drive Rubbers

2. Fit the 'O' ring to the alternator and smear with a small amount of engine oil.



gacm

1. Alternator

2. Alternator 'O' ring

3. Fit the alternator and tighten the bolts to **20 Nm**.

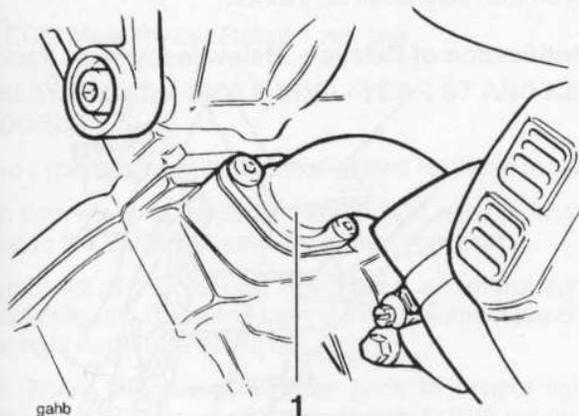
NOTE:

- Ensure the earth cable is fitted to the rear bolt.
4. Connect the cable and the multiplug to the alternator.
 5. Refit the water pump hose.
 6. Fit a new washer to the coolant drain screw and tighten the screw to **12 Nm**.
 7. Fill the cooling system with the specified coolant (see section 'Cooling System' for correct filling procedure).
 8. Refit the fairing and belly panel on ST only.
 9. Connect the battery, positive (red) lead first.
 10. Refit the seat.

STARTER MOTOR

Removal

1. Remove the seat and disconnect the battery, negative (black) lead first.
2. Remove the left hand fairing and belly panel (ST only).
3. Drain the coolant from the crankcase as described in the section 'Cooling System'.
4. Detach the water pump hose at its connection to the water elbow.
5. Remove the coolant elbow from the crankcase. Clean off all traces of gasket from the elbow and crankcase mating faces.

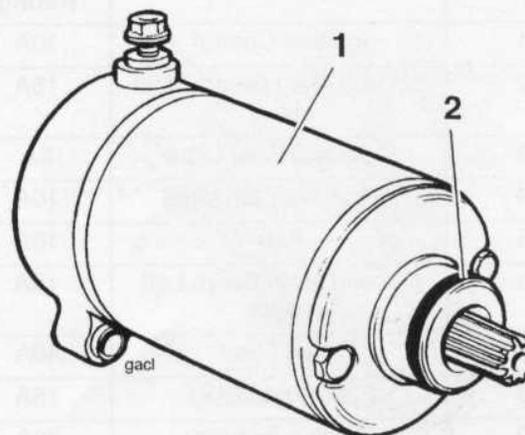


1. Coolant Elbow

6. Disconnect the starter motor cable .
7. Release the starter motor from the crankcase.
8. Remove the starter motor.

Installation

1. Clean the mating faces of the crankcase and starter motor to ensure efficient grounding.
2. Inspect the sealing 'O' ring and renew if damaged / stretched.
3. Fit the 'O' ring to the starter motor and smear with a small amount of engine oil.



1. Starter Motor

2. 'O' ring

4. Fit the starter motor and tighten the securing bolts to **10 Nm**.
5. Connect the starter motor cable.
6. Apply sealant to both sides of a new coolant elbow gasket. Fit the elbow and tighten the securing nuts to **12 Nm**.
7. Fit a new washer to the coolant drain screw and tighten the screw to **13 Nm**.
8. Fill the cooling system with the specified coolant (see section 'Cooling System' for correct filling procedure).
9. Refit the fairing and belly panel (on ST only).
10. Connect the battery, positive (red) lead first.
11. Refit the seat.

FUSES

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.

Fuse Identification - 1999 model year ST only

Fuse No	Circuits Protected	Fuse Rating
1	Ignition Control	10A
2	Dip and Main Beam Right Hand	15A
3	Side and Rear Light	5A
4	Indicators/Stop Light	10A
5	Fan	10A
6	Dip and Main Beam Left Hand	15A
7	Main Fuse	40A
8	Fuel Pump ECU	15A
9	All circuits from ignition switch	30A
10	Accessories	10A

Fuse Identification - 2000 model year onwards ST & RS

Fuse No	Circuits Protected	Fuse Rating
1	Headlights	15A
2	Ignition control	30A
3	Instruments, accessory socket, heated grips.	15A
4	Stop lights, indicators, horn, diagnostics, alarm.	20A
5	Ignition control	15A
6	Engine management	20A
7	Cooling fan	15A
8	Instrument illumination, parking lights	5A
9	Headlights	15A
10	Parking lights	5A
11	Main fuse	40A

NOTE:

- The fuse identification numbers listed above correspond with those printed on the fuse box cover.

RELAY PACKS - 1999 MODEL-YEAR ST MODEL

Two separate relay packs are fitted to this motorcycle.

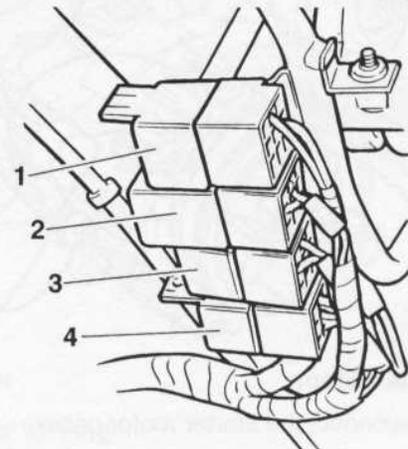
An 'engine management' relay pack is situated on the left hand side of the motorcycle behind the side panel. A second relay pack to control lights and indicators is situated below the instrument pack.

NOTE:

- The physical positions of the relays in both packs are subject to variation. However, the relay cables are identified by a coloured tag which remains unique to each particular relay. See the illustrations (below/over) for details.

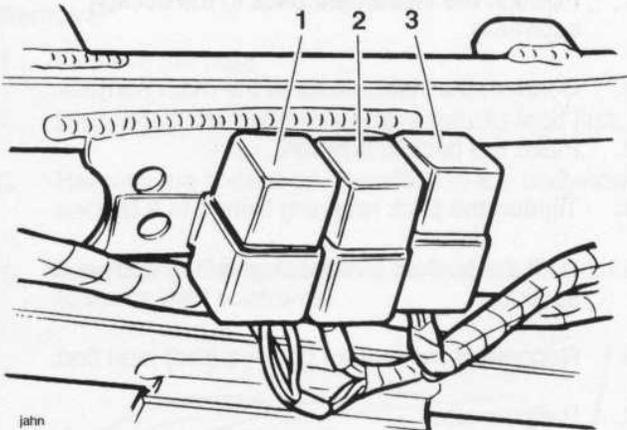
The relays are attached to their brackets by means of barbed extensions. Never exert extreme force when removing a relay as this may cause damage and never pull on the relay block connector.

Identification of Relays - 'Below Instrument Pack'



1. Headlight Dip Beam - white tag
2. Indicator Unit - red tag
3. Headlight Main Beam - black tag
4. Headlight Cut-out - blue tag

Identification of Relays - 'Behind Side Panel'



- 1. Cooling Fan - blue tag
- 2. Fuel Pump - white tag
- 3. ECM Main Power Relay - red tag

RELAY PACKS - 2000 MODEL-YEAR ST AND RS MODELS

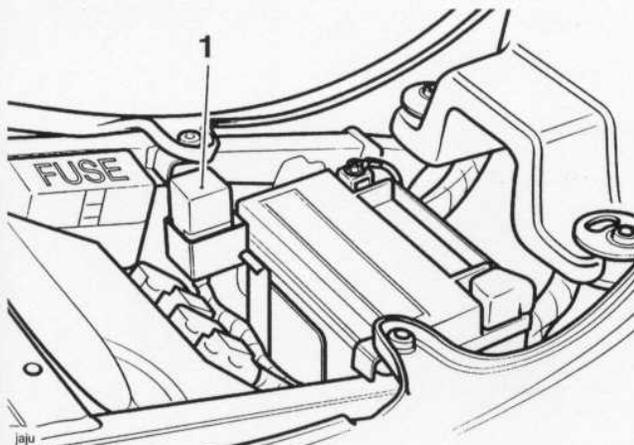
Two separate relay locations are used on these models.

On both models, the ECM main power relay is located next to the ECM, beneath the motorcycle seat.

On Sprint ST, a second relay pack to control lights, indicators etc. is located behind the instrument panel on the right hand side of the motorcycle.

On Sprint RS a second relay pack to control lights, indicators etc. is located behind the body side panels on the right hand side of the motorcycle.

Identification of Relays - 'Adjacent to ECM'

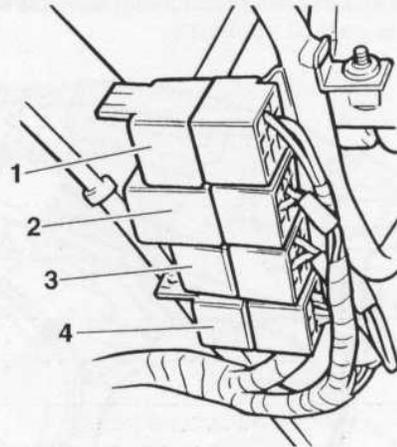


- 1. Main Power Relay

NOTE:

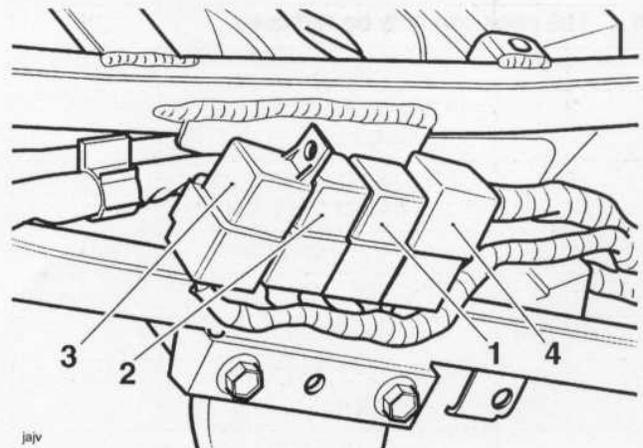
- The physical positions of the relays on both models are subject to variation. However, the relay cables are identified by a coloured tag which remains unique to each particular relay. See the illustrations (below) for details.

Identification of Relays - 'Beneath Instrument Panel - ST'



- 1. Dip Beam Relay - White tag
- 2. Main Beam Relay - Red tag
- 3. Headlight Cut-out Relay - yellow tag
- 4. Indicator Unit - Blue tag

Identification of Relays - 'Behind Side Panel - RS'

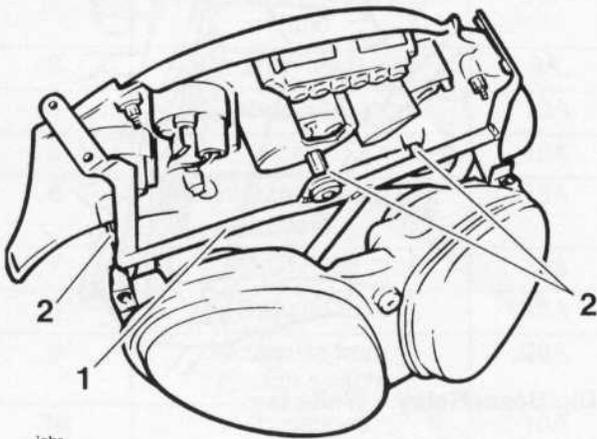


- 1. Dip Beam Relay - White tag
- 2. Main Beam Relay - Red tag
- 3. Headlight Cut-out Relay - Yellow tag
- 4. Indicator Unit - Blue tag

INSTRUMENT PACK - ST

Removal

1. Remove the seat.
2. Disconnect the battery negative (black) lead first.
3. Remove the cockpit as described in the bodywork section.
4. Release the fixings securing the instrument pack to the cockpit subframe.



jahr

1. Cockpit Subframe

2. Instrument Pack Fixings

5. Raise the instrument pack and disconnect the connections to the main harness.
6. The pack can now be removed.

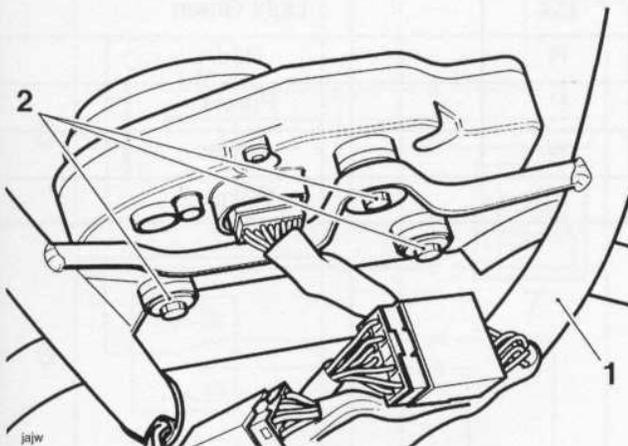
Installation

1. Position the instrument pack to the cockpit subframe.
2. Connect the instruments to the main harness.
3. Place the pack in position.
4. Tighten the pack retaining fixings to **9 Nm**.
5. Refit the cockpit as described in the bodywork section.
6. Reconnect the battery positive (red) lead first.
7. Refit the seat.

INSTRUMENT PACK - RS

Removal

1. Remove the seat.
2. Disconnect the battery negative (black) lead first.
3. Remove the cockpit as described in the bodywork section.
4. Release the fixings securing the instrument pack to the cockpit subframe.



1. Cockpit Subframe

2. Instrument Pack Fixings

5. Raise the instrument pack and disconnect the connections to the main harness.
6. The pack can now be removed.

Installation

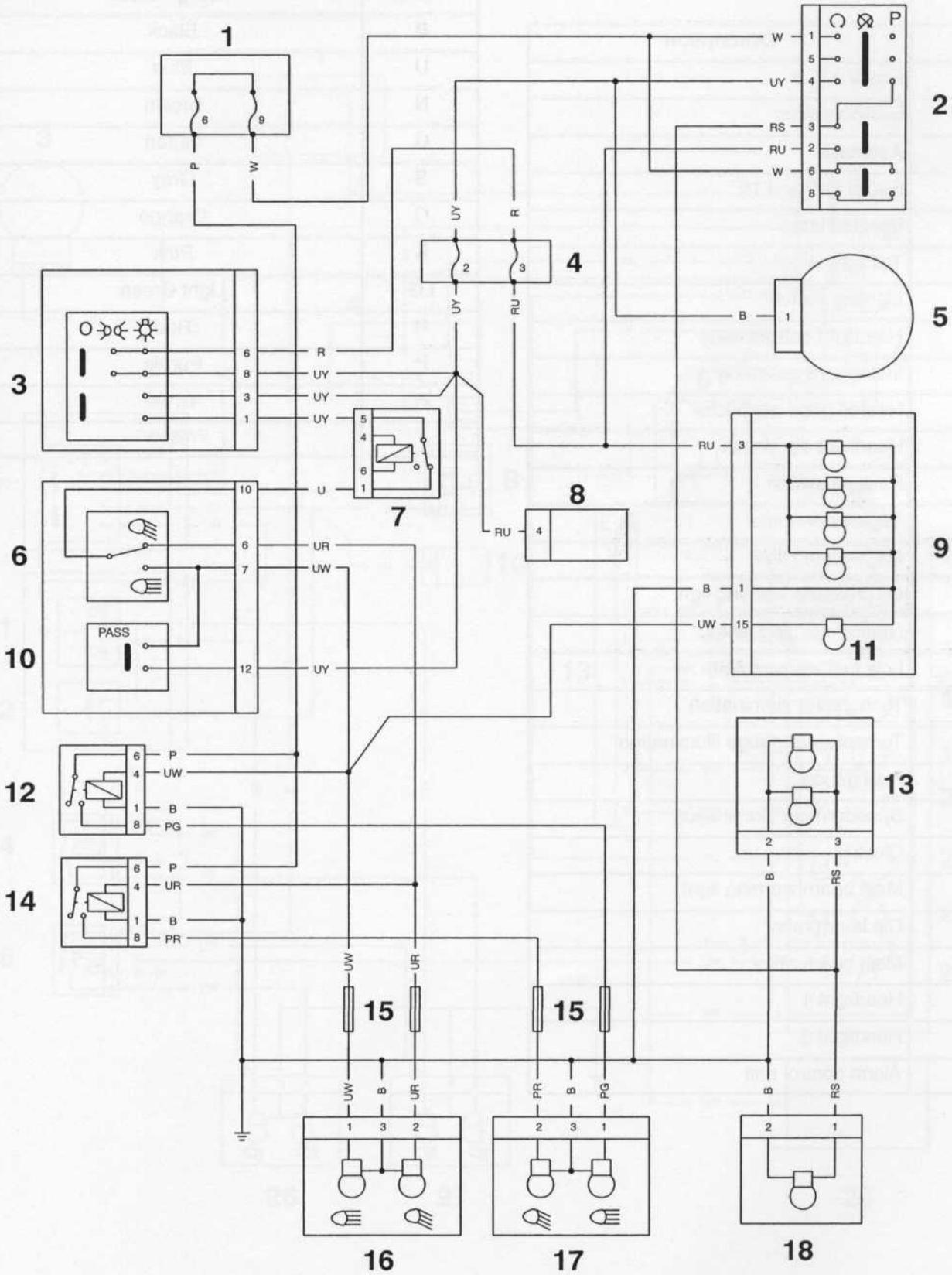
1. Position the instrument pack to the cockpit subframe.
2. Connect the instruments to the main harness.
3. Place the pack in position.
4. Tighten the pack retaining fixings to **9 Nm**.
5. Refit the cockpit as described in the bodywork section.
6. Reconnect the battery positive (red) lead first.
7. Refit the seat.

Lighting Circuit Diagram - 1999 Model Year ST

Key No:	Item Description
1	Fuses 6 & 9
2	Ignition switch
3	Lighting switch
4	Fuses 2 & 3
5	Alternator
6	Headlight dip switch
7	Headlight cut-out relay
8	Alarm control unit (where fitted)
9	Instruments
10	Passing button
11	Main beam warning lamp
12	Headlight main beam relay
13	Tail light
14	Headlight dip beam relay
15	Wire links
16	Headlight
17	Headlight
18	Position light

Code	Wiring Colour
B	Black
U	Blue
N	Brown
G	Green
S	Grey
O	Orange
K	Pink
LG	Light Green
R	Red
P	Purple
W	White
Y	Yellow

Lighting Circuit Diagram - 1999 Model Year ST

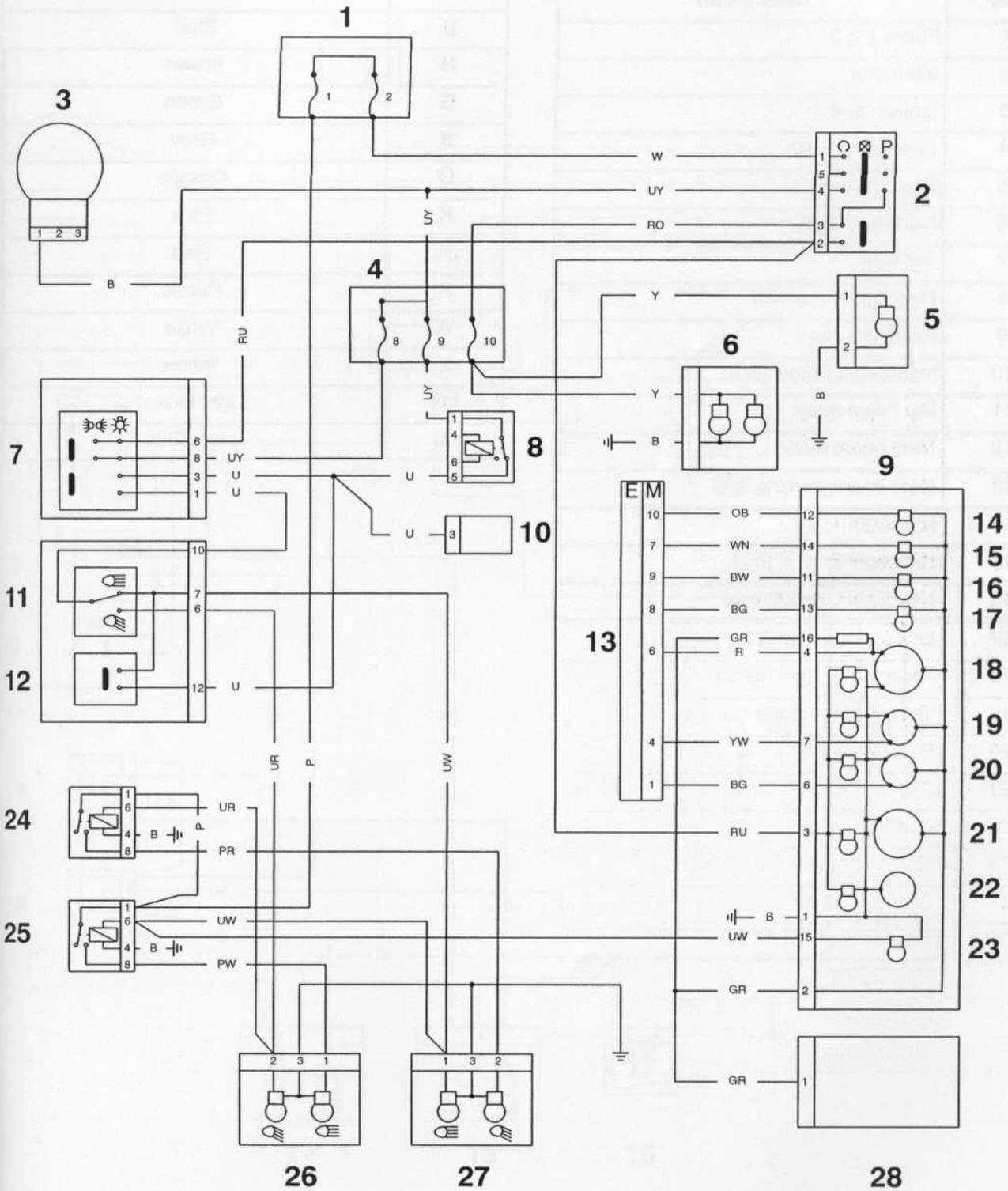


Lighting Circuit Diagram - 2000 Model Year ST

Key	Description
1	Fuses 1 & 2
2	Ignition switch
3	Alternator
4	Fuses 8, 9 and 10
5	Position lamp
6	Tail light
7	Lighting switch
8	Headlight cut-out relay
9	Instrument assembly
10	Heated grips connector
11	Headlight dip switch
12	Passing switch
13	Engine connector
14	MIL warning light
15	Oil pressure warning light
16	Neutral warning lamp
17	Low fuel warning light
18	Tachometer illumination
19	Temperature gauge illumination
20	Fuel gauge
21	Speedometer illumination
22	Clock
23	Main beam warning light
24	Dip beam relay
25	Main beam relay
26	Headlight 1
27	Headlight 2
28	Alarm control unit

Code	Wiring Colour
B	Black
U	Blue
N	Brown
G	Green
S	Grey
O	Orange
K	Pink
LG	Light Green
R	Red
P	Purple
W	White
Y	Yellow

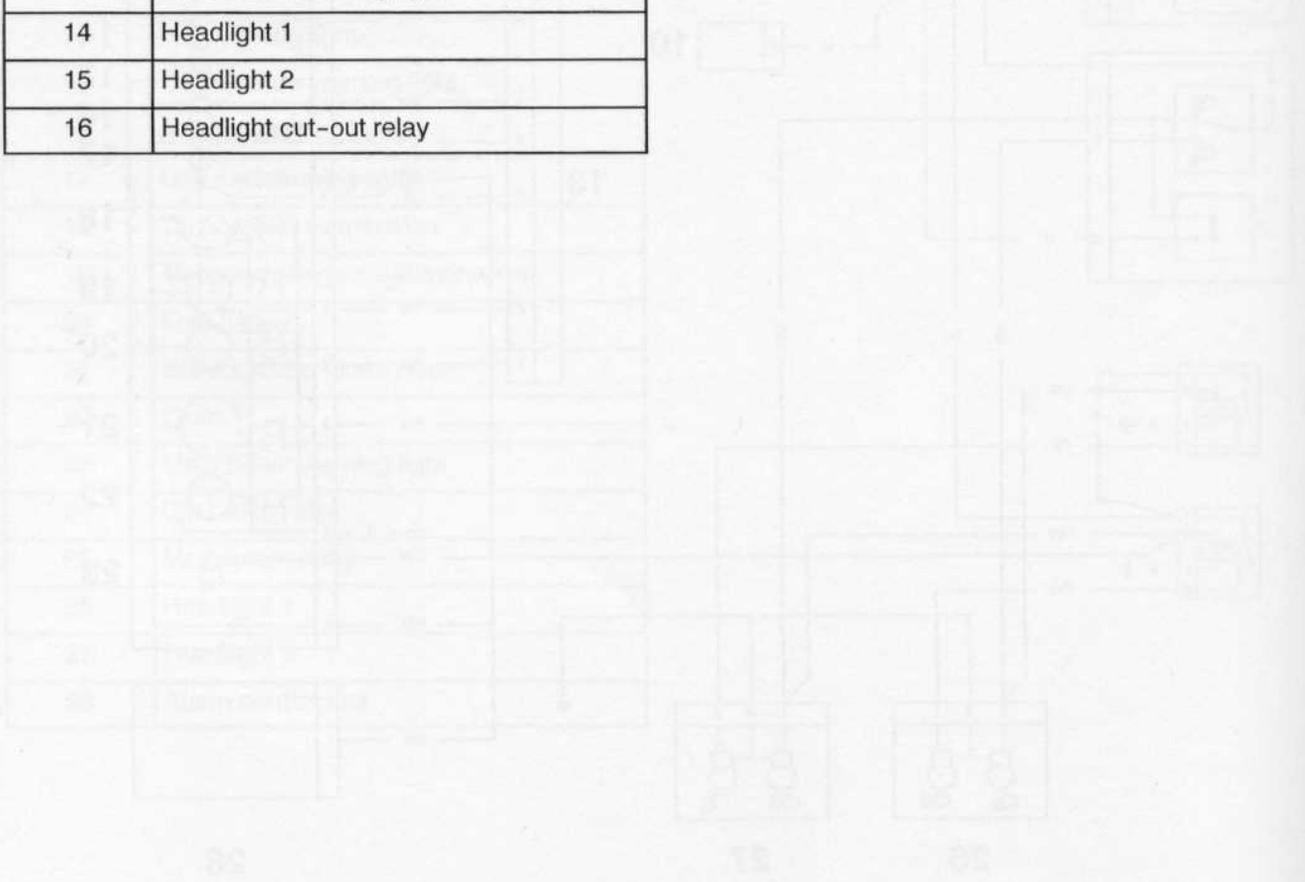
Lighting Circuit Diagram - 2000 Model Year ST



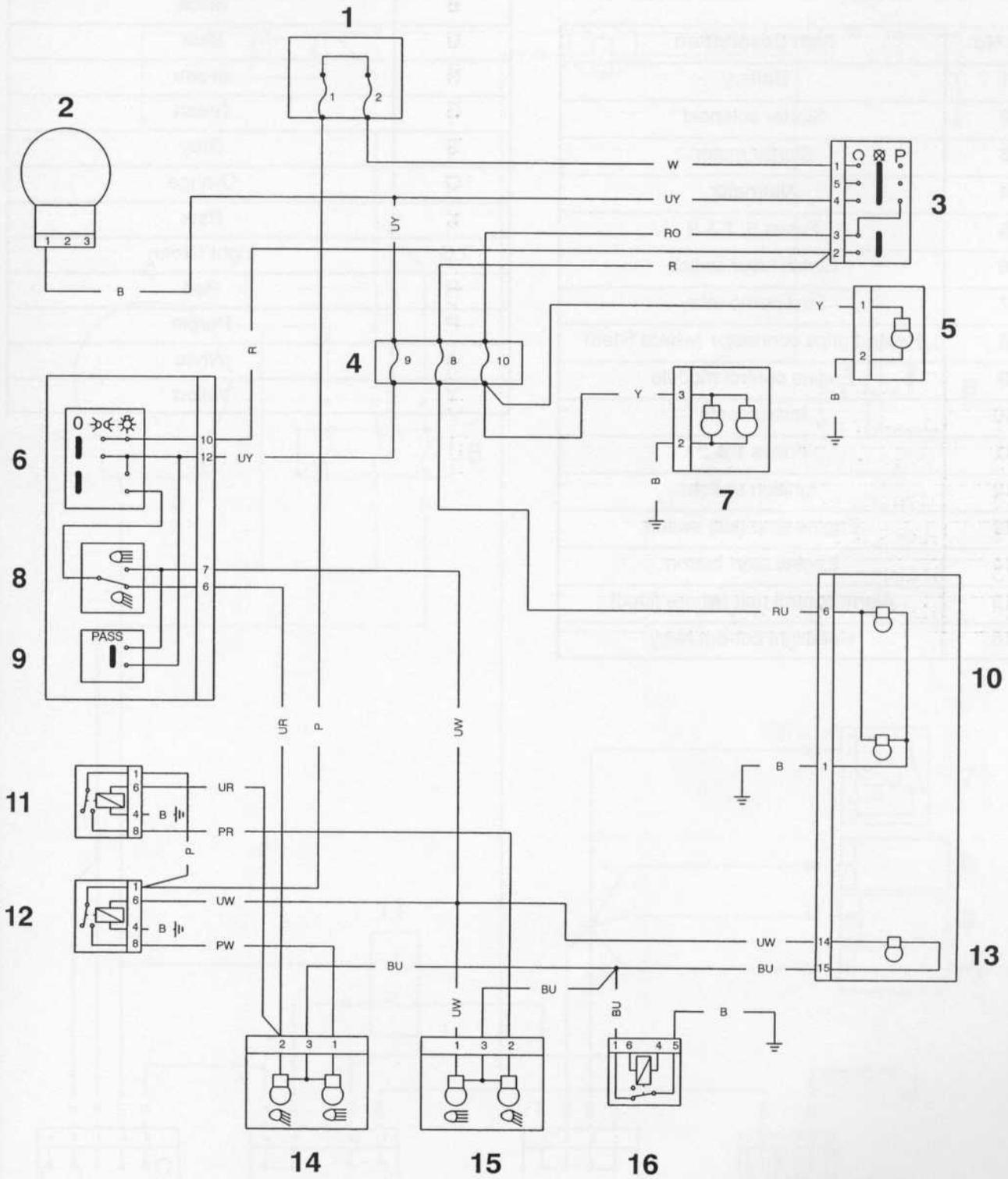
Lighting Circuit Diagram - 2000 Model Year RS

Key	Description
1	Fuses 1 & 2
2	Alternator
3	Ignition switch
4	Fuses 8, 9 & 10
5	Position lamp
6	Lighting switch
7	Tail light
8	Headlight dip switch
9	Passing switch
10	Instrument illumination
11	Dip beam relay
12	Main beam relay
13	Main beam warning light
14	Headlight 1
15	Headlight 2
16	Headlight cut-out relay

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



Lighting Circuit Diagram - 2000 Model Year RS

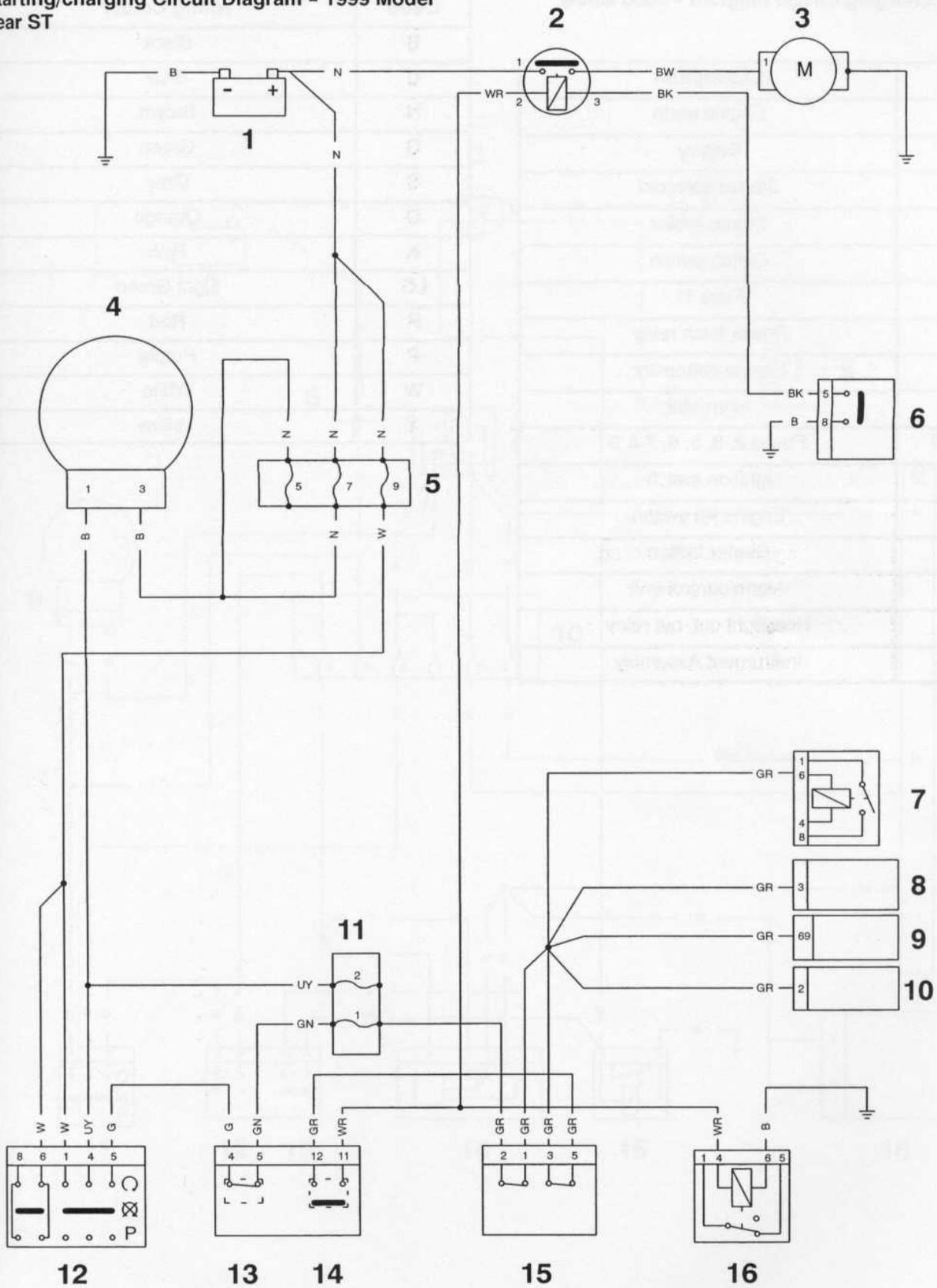


**Starting/charging Circuit Diagram - 1999 Model
Year ST**

Key No:	Item Description
1	Battery
2	Starter solenoid
3	Starter motor
4	Alternator
5	Fuses 5, 7 & 9
6	Clutch lever switch
7	Fuel pump relay
8	Heated grips connector (where fitted)
9	Engine control module
10	Instruments
11	Fuses 1 & 2
12	Ignition switch
13	Engine stop (kill) switch
14	Engine start button
15	Alarm control unit (where fitted)
16	Headlight cut-out relay

Code	Wiring Colour
B	Black
U	Blue
N	Brown
G	Green
S	Grey
O	Orange
K	Pink
LG	Light Green
R	Red
P	Purple
W	White
Y	Yellow

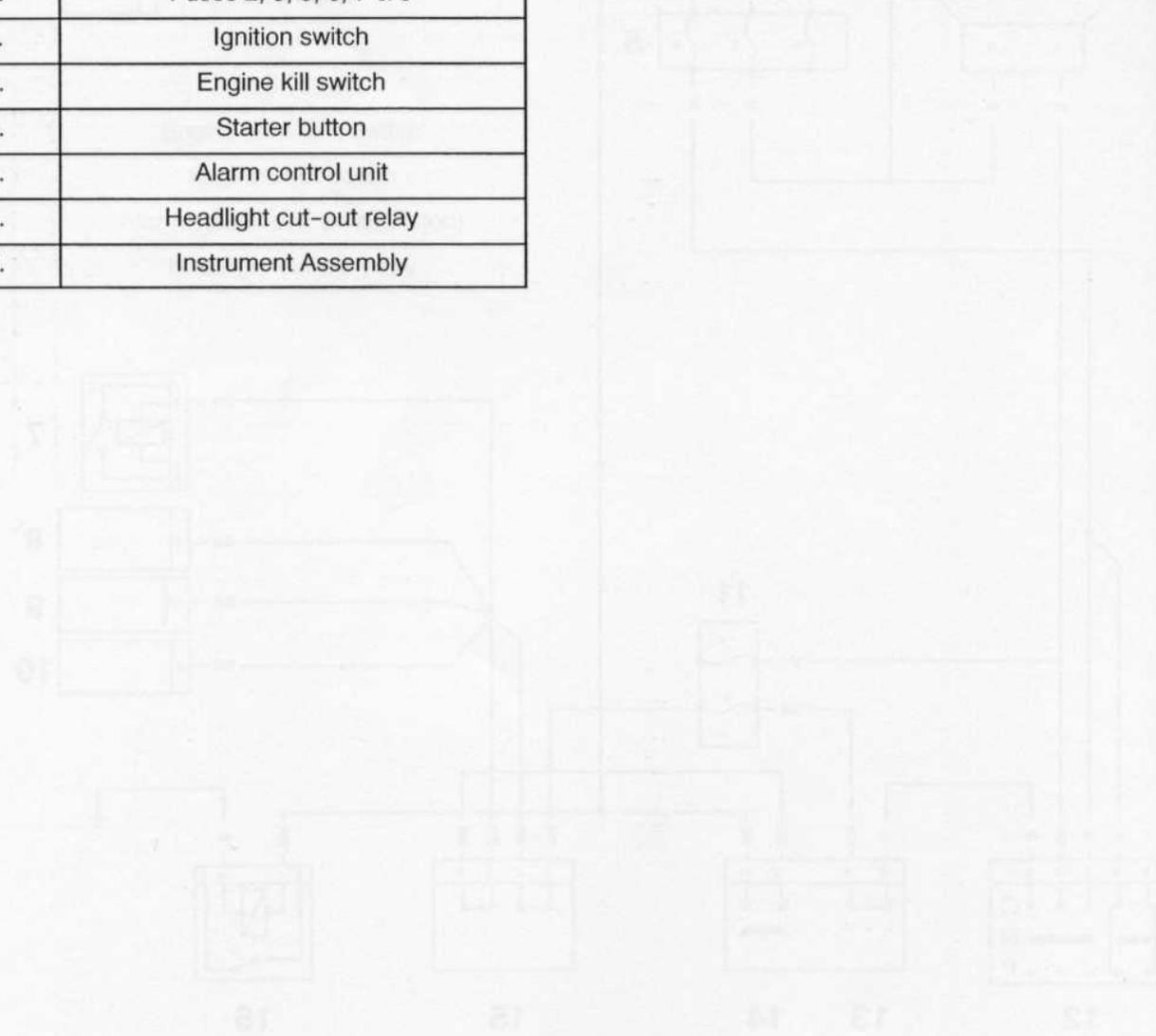
Starting/charging Circuit Diagram - 1999 Model Year ST



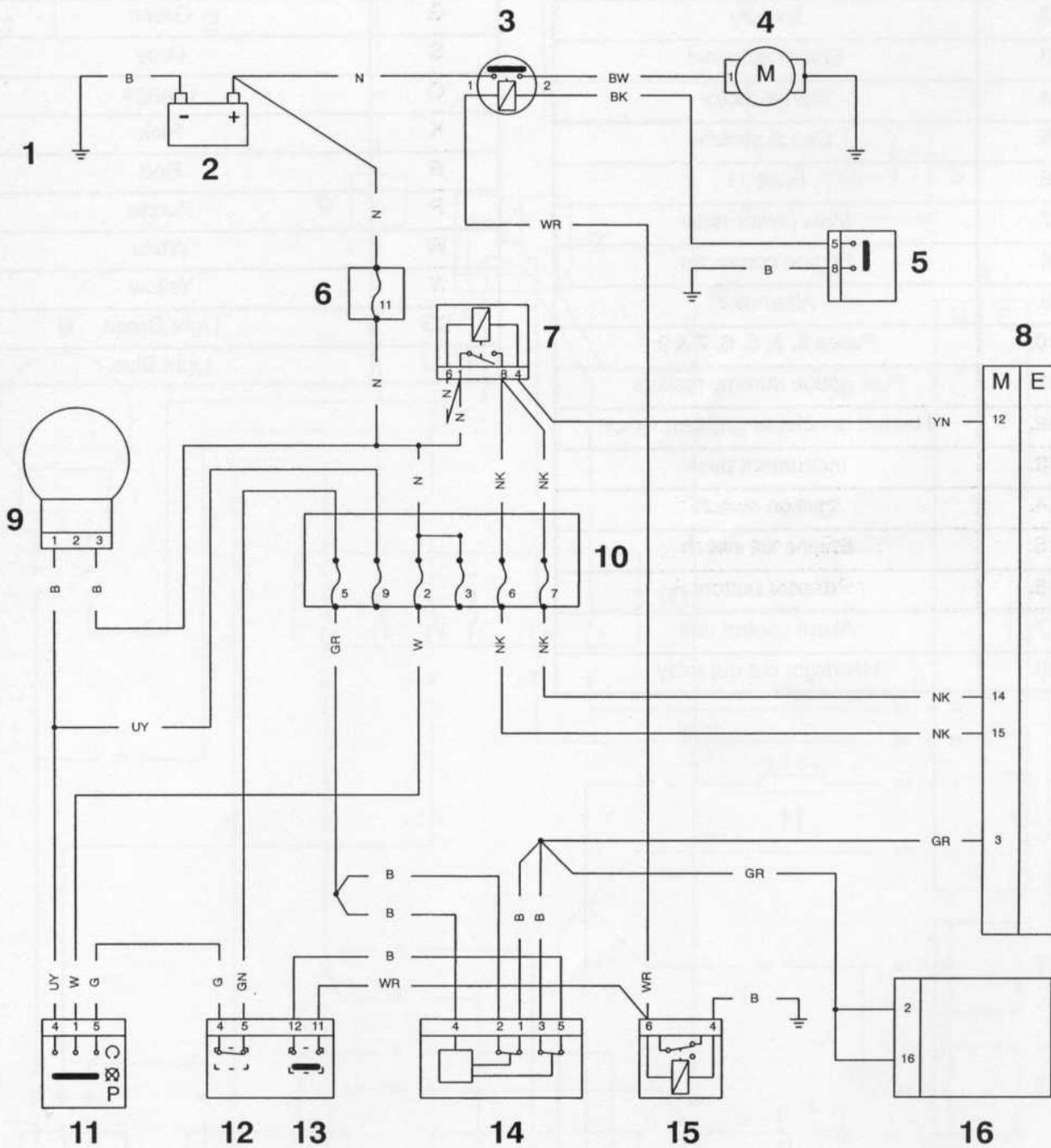
Starting/charging Circuit Diagram - 2000 Model Year ST

Key	Description
1.	Engine earth
2.	Battery
3.	Starter solenoid
4.	Starter motor
5.	Clutch switch
6.	Fuse 11
7.	Power latch relay
8.	Engine connector
9.	Alternator
10.	Fuses 2, 3, 5, 6, 7 & 9
11.	Ignition switch
12.	Engine kill switch
13.	Starter button
14.	Alarm control unit
15.	Headlight cut-out relay
16.	Instrument Assembly

Code	Wiring Colour
B	Black
U	Blue
N	Brown
G	Green
S	Grey
O	Orange
K	Pink
LG	Light Green
R	Red
P	Purple
W	White
Y	Yellow



**Starting/charging Circuit Diagram - 2000 Model
Year ST**

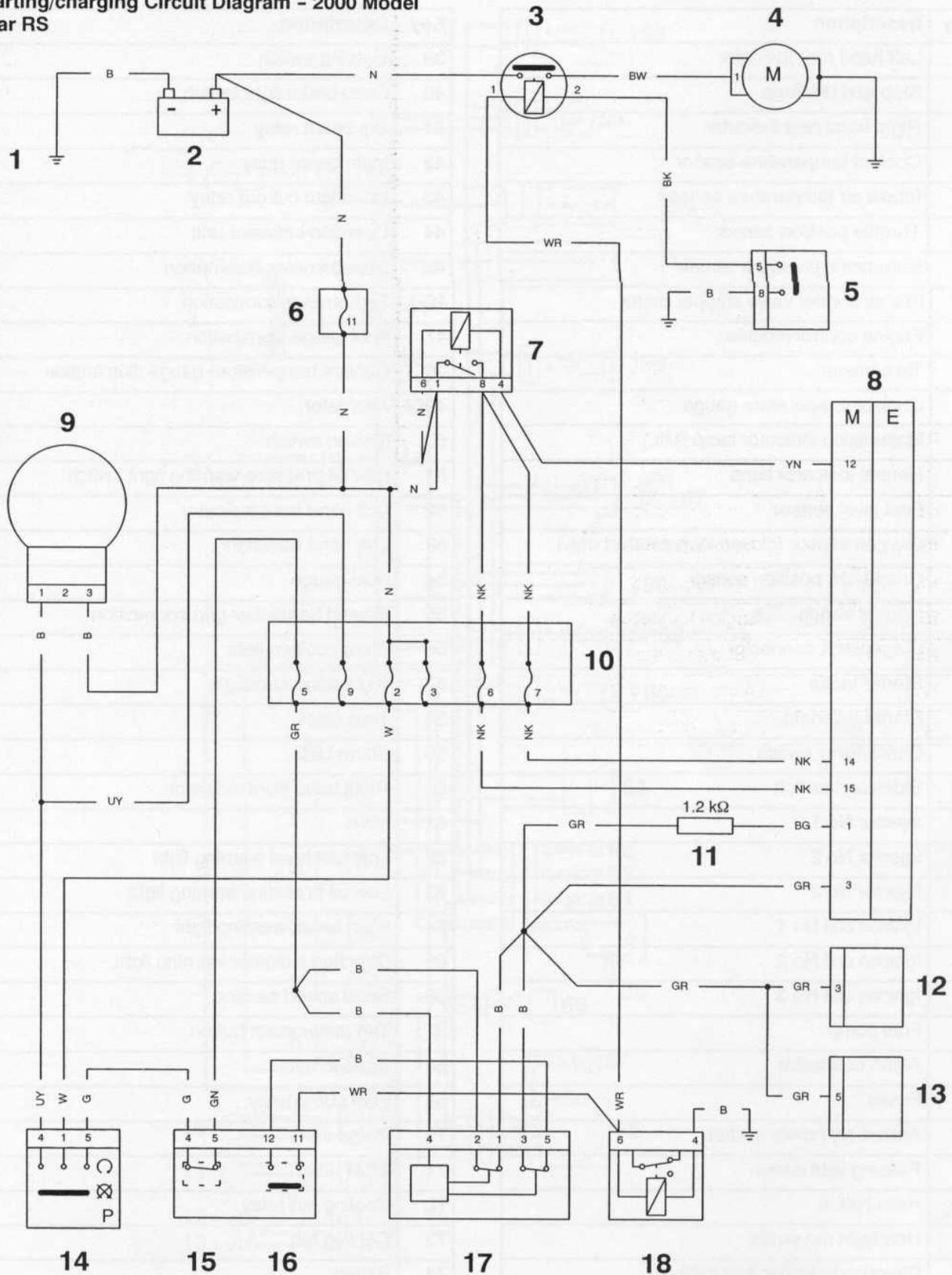


**Starting/charging Circuit Diagram - 2000 Model
Year RS**

Key	Description
1.	Engine earth
2.	Battery
3.	Starter solenoid
4.	Starter motor
5.	Clutch switch
6.	Fuse 11
7.	Main power relay
8.	Engine connector
9.	Alternator
10.	Fuses 2, 3, 5, 6, 7 & 9
11.	Fuel gauge dummy resistor
12.	Heated handlebar grip connector
13.	Instrument pack
14.	Ignition switch
15.	Engine kill switch
16.	Starter button
17.	Alarm control unit
18.	Headlight cut out relay

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

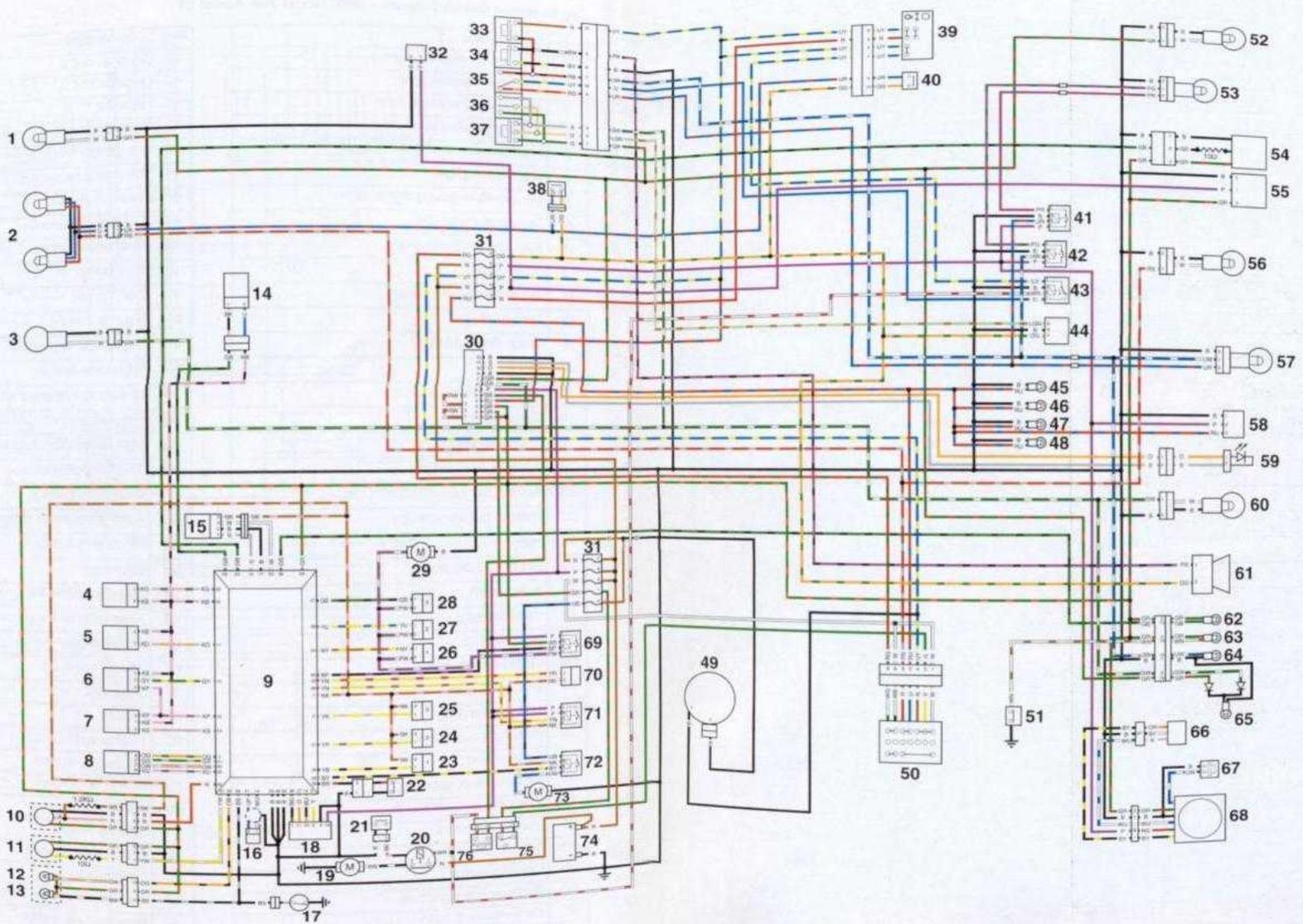
**Starting/charging Circuit Diagram - 2000 Model
Year RS**



Key To Wiring Circuit Diagram - 1999 Model Year ST

Key	Description
1	Left hand rear indicator
2	Stop and tail lamp
3	Right hand rear indicator
4	Coolant temperature sensor
5	Intake air temperature sensor
6	Throttle position sensor
7	Barometric pressure sensor
8	Idle air control valve stepper motor
9	Engine control module
10	Tachometer
11	Coolant temperature gauge
12	Malfunction indicator lamp (MIL)
13	Neutral indicator lamp
14	Fuel level sensor
15	Oxygen sensor (closed loop catalyst only)
16	Crankshaft position sensor
17	Neutral switch
18	Diagnostics connector
19	Starter motor
20	Starter solenoid
21	Clutch lever switch
22	Sidestand switch
23	Injector No 1
24	Injector No 2
25	Injector No 3
26	Ignition coil No 1
27	Ignition coil No 2
28	Ignition coil No 3
29	Fuel pump
30	Alarm connector
31	Fuses
32	Accessory power socket
33	Passing light switch
34	Horn button
35	Headlight dip switch
36	Direction indicator light switch
37	Hazard warning light switch
38	Rear brake light switch

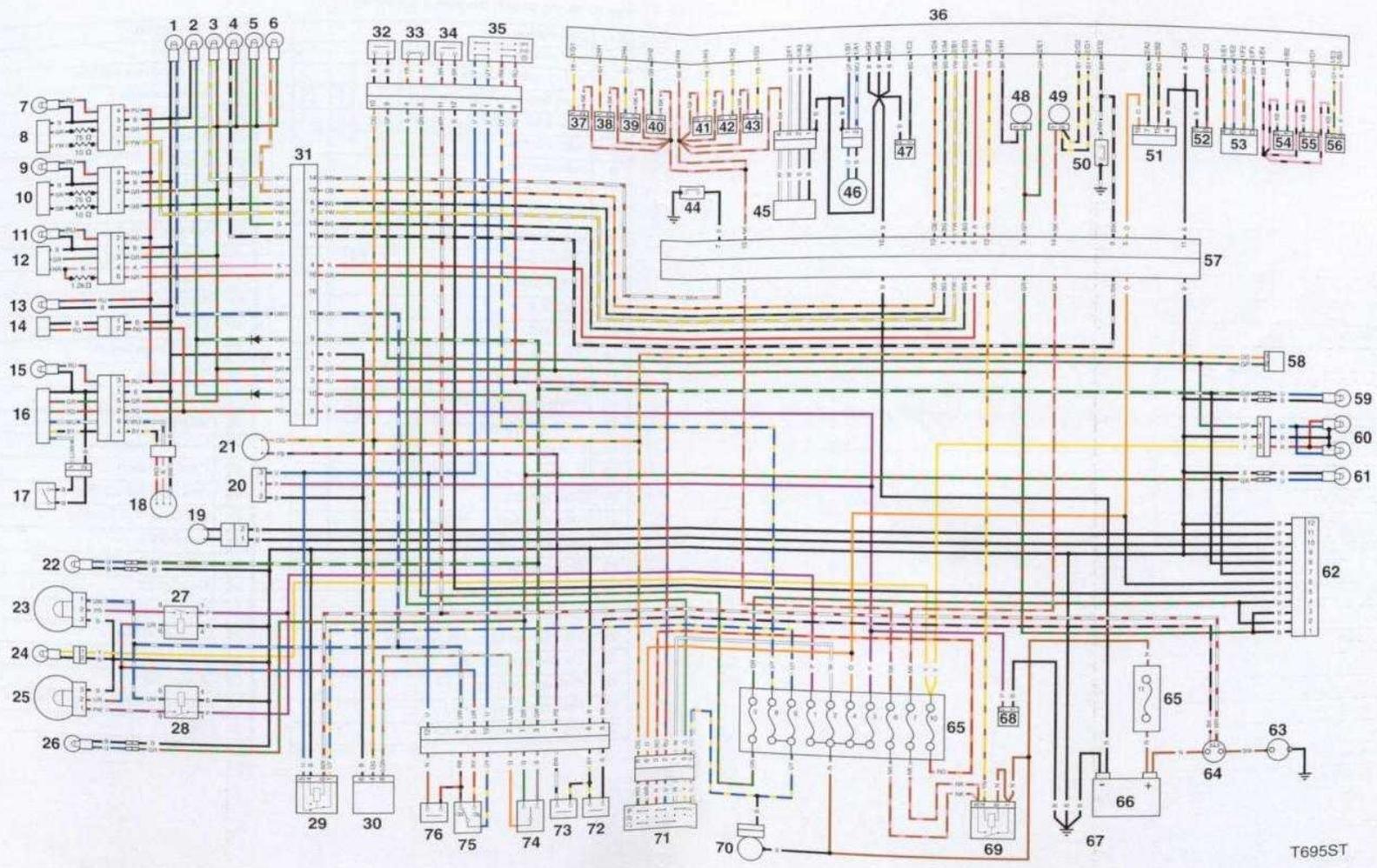
Key	Description
39	Lighting switch
40	Front brake light switch
41	Dip beam relay
42	Main beam relay
43	Headlight cut out relay
44	Direction indicator unit
45	Speedometer illumination
46	Tachometer illumination
47	Fuel gauge illumination
48	Coolant temperature gauge illumination
49	Alternator
50	Ignition switch
51	Low oil pressure warning light switch
52	Left hand front indicator
53	Left hand headlight
54	Fuel gauge
55	Heated handlebar grip connection
56	Front position light
57	Right hand headlight
58	Time clock
59	Alarm LED
60	Right hand front indicator
61	Horn
62	Low fuel level warning light
63	Low oil pressure warning light
64	Main beam warning light
65	Direction indicator warning light
66	Road speed sensor
67	Trip meter reset button
68	Speedometer
69	Fuel pump relay
70	Purge valve
71	ECM relay
72	Cooling fan relay
73	Cooling fan
74	Battery
75	Engine kill switch
76	Starter switch



Key To Wiring Circuit Diagram - 2000 Model Year Sprint ST

Key	Description
1	Main beam warning light
2	Indicator warning light
3	Oil pressure warning light
4	Neutral warning lamp
5	Low fuel warning light
6	MIL warning light
7	Temperature gauge illumination
8	Temperature gauge
9	Fuel gauge illumination
10	Fuel gauge
11	Tachometer illumination
12	Tachometer
13	Clock illumination
14	Clock
15	Speedometer illumination
16	Speedometer
17	Trip/reset button
18	Wheel speed sensor
19	Alarm LED
20	Heated grips connector
21	Horn
22	RH front indicator
23	Headlight 1
24	Position lamp
25	Headlight 2
26	LH front indicator
27	Dip beam relay
28	Main beam relay
29	Headlight cut-out relay
30	Flasher unit
31	Instrument connector
32	Front brake lever switch
33	Engine kill switch
34	Starter button
35	Lighting switch
36	Engine control module
37	Purge valve (California only)
38	Ignition coil 1

Key	Description
39	Ignition coil 2
40	Ignition coil 3
41	Injector 1
42	Injector 2
43	Injector 3
44	Oil pressure switch
45	Lambda Sensor
46	Crankshaft sensor
47	Fuel level sensor
48	Fuel pump
49	Cooling fan
50	Neutral switch
51	Diagnostic connector
52	Sidestand switch
53	Idle control stepper motor
54	Coolant temperature sensor
55	Inlet air temperature sensor
56	Throttle potentiometer
57	Engine connector
58	Rear brake lever switch
59	RH rear indicator
60	Rear light
61	LH rear indicator
62	Alarm connector (accessory)
63	Starter motor
64	Starter solenoid
65	Fuse box
66	Battery
67	Engine earth
68	Accessory socket
69	Power latch relay
70	Alternator
71	Ignition switch
72	Clutch lever switch
73	Horn button
74	Direction indicator switch
75	Headlight dip switch
76	Passing button

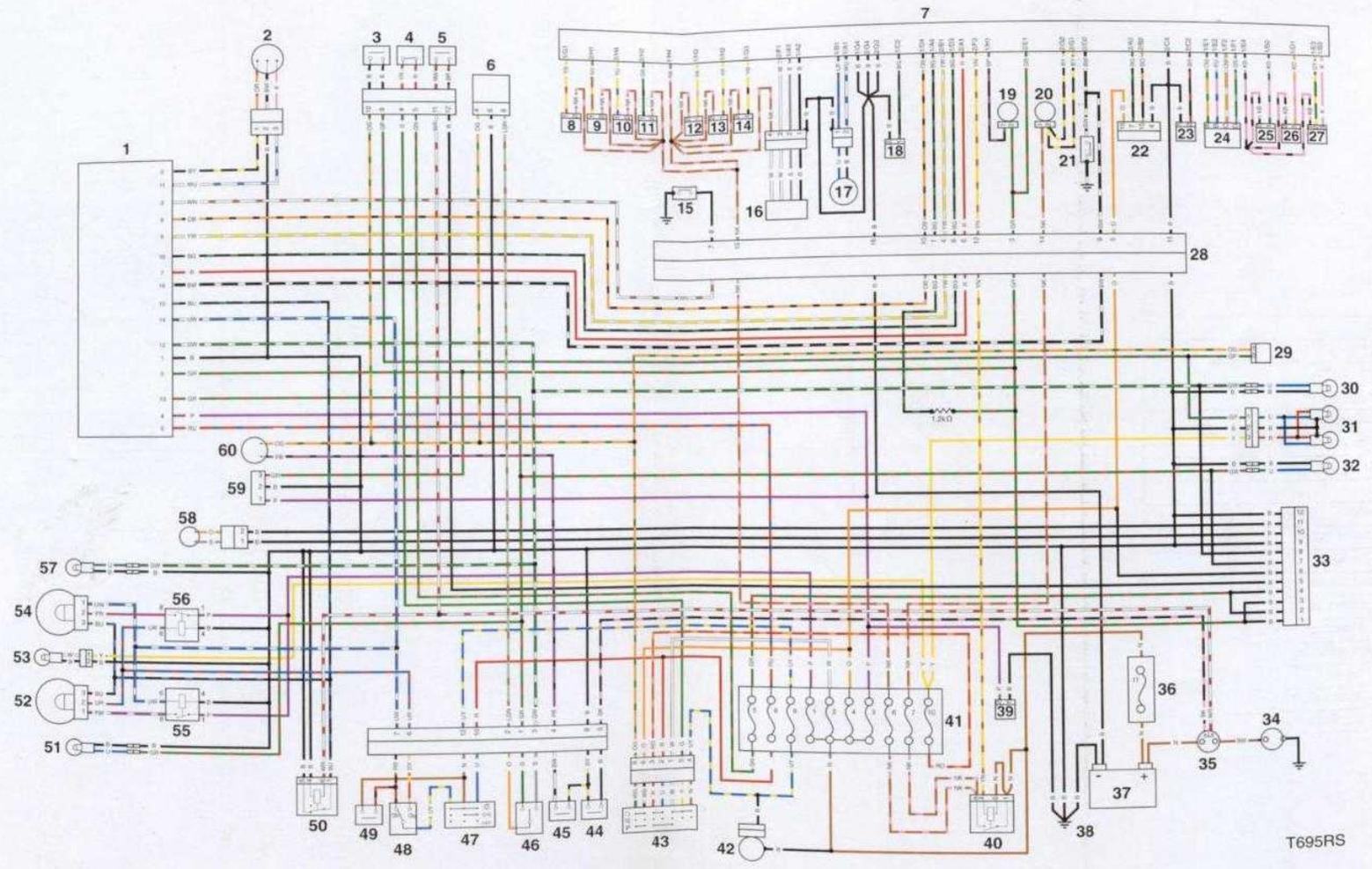


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Key To Wiring Circuit Diagram - Sprint RS

Key	Description
1	Instruments
2	Wheel speed sensor
3	Front brake lever switch
4	Engine kill switch
5	Starter button
6	Indicator unit
7	Engine control module
8	Evaporative system purge valve
9	Ignition coil 1
10	Ignition coil 2
11	Ignition coil 3
12	Injector 1
13	Injector 2
14	Injector 3
15	Oil pressure switch
16	Heated oxygen sensor
17	Crank position sensor
18	Fuel level sensor
19	Fuel pump
20	Cooling fan
21	Neutral switch
22	Diagnostic connector
23	Sidestand switch
24	Idle control valve stepper motor
25	Coolant temperature sensor
26	Induction air temperature sensor
27	Throttle potentiometer
28	Engine connector
29	Rear brake lever switch
30	Right hand rear indicator

Key	Description
31	Rear light
32	Left hand rear indicator
33	Alarm connector
34	Starter motor
35	Starter solenoid
36	Fuse box
37	Battery
38	Engine earth
39	Accessory socket connection
40	Main power relay
41	Fuse box
42	Alternator
43	Ignition switch
44	Clutch lever switch
45	Horn button
46	Indicator switch
47	Lighting switch
48	Headlight dipswitch
49	Passing button
50	Headlight cut-out relay
51	Left hand front indicator
52	Headlight 1
53	Front position light
54	Headlight 2
55	Main beam relay
56	Dip beam relay
57	Right hand front indicator
58	Alarm LED
59	Heated handlebar grips connector
60	Horn



T695RS

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