

# ***Workshop Manual – Technical Reference***

***Service - Maintain - Repair***



# **TRIUMPH**

***Sprint – ST***  
***1050 – ABS***  
***2005***



**ROAD-RACE-TRACK**  
**P E R F O R M A N C E**

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**Triumph Sprint ST  
Triumph Sprint ST (ABS)  
Motorcycle Service Manual**

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# Introduction

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# Introduction

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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, an authorised Triumph dealer must undertake all adjustments, maintenance, and repair work.

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, an authorised Triumph Dealer must perform all repairs and scheduled maintenance.

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.

## Warnings, Cautions and Notes

Particularly important information is presented in the following form:

 <b>Warning</b>
This warning symbol identifies special instructions or procedures which, if not correctly followed, could result in personal injury, or loss of life.

 <b>Caution</b>
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 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 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 procedures

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.

# 1 General Information

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## Ignition System Safety Precautions

### Warning

The ignition system produces extremely high voltages. Do not touch any part of the ignition system or any cables while the engine is running. An electric shock caused by contact with the ignition system may lead to illness, injury or death.

### Warning

Wearers of surgically implanted heart pacemaker devices should not be in close proximity to ignition circuits and or diagnostic equipment. The ignition system and any diagnostic equipment may interrupt the normal operation of such devices causing illness or death.

## Dangerous Substances

### Warning

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

## Fluoroelastomers

### Warning

Fluoroelastomer material is used in the manufacture of various seals in Triumph motorcycles.

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

In the presence of any water or humidity hydrogen fluoride may dissolve to form extremely corrosive liquid hydrofluoric acid.

If such conditions exist, do not touch the material and avoid all skin contact. Skin contact with liquid or decomposition residues can cause painful and penetrating burns leading to permanent, irreversible skin and tissue damage.

## Oils

### Warning

The engine and bevel box oils 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

## General Information

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 your 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 that 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 during lifting or jacking or while repairs and servicing are carried out.

Never rely on a single means of support when working with the motorcycle. Use additional safety supports and straps to prevent toppling.

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.

## 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 engine damage.

# General Information

## 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

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

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

## Joints and joint faces

Assemble joints dry unless otherwise specified in this Manual.

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

## Gaskets, O-rings

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

## Liquid gasket, non-permanent locking agent

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

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

 **Warning**

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

## Screw Threads

Metric threads to ISO standard are used.

Damaged nuts, bolts and screws must always be discarded.

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

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

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

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

 **Warning**

Never lubricate a thread unless instructed to do so. When a thread of a fixing is lubricated, the thread friction is reduced. When the fixing is tightened, reduced friction will cause overtightening and possible fixing failure. A fixing which fails in service could cause component detachment leading to loss of control and an accident.

## Locking Devices

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

## Fitting a split pin

Always fit new split-pins of the correct size for the hole in the bolt or stud. Do not slacken back castle nuts when fitting split pin, except in those recommended cases when this forms part of an adjustment.

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 appropriate 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 or grease 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.

# General Information

## 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 any indoor environment by air currents, consequently, even a small spillage of petrol (gasoline) is potentially very dangerous.

### Warning

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

Turn the motorcycle ignition switch OFF.

Do not smoke.

Always have a fire extinguisher containing FOAM, CO<sub>2</sub>, 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, 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.

# General Information

## 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 genuine parts should be used to service, repair or convert Triumph motorcycles. To ensure that Triumph genuine 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 genuine 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.

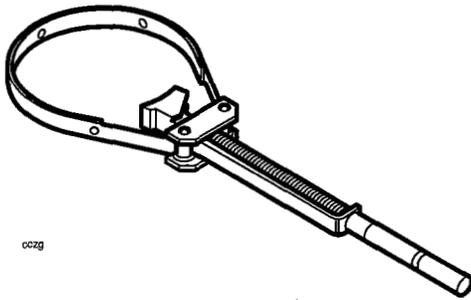
Authorised Triumph Dealers are not agents of Triumph and have no authority to bind the manufacturer by any expressed or implied undertaking or representation.

## 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

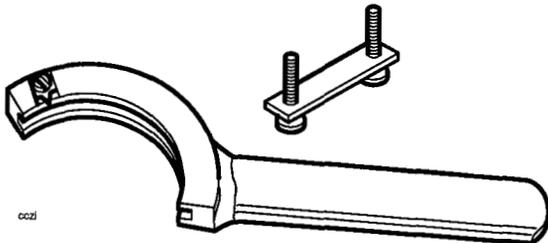
T3880375 – Alternator Rotor Holder



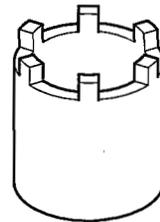
T3880365 – Puller, Alternator Rotor



T3880016 – Holder, Balancer Gear

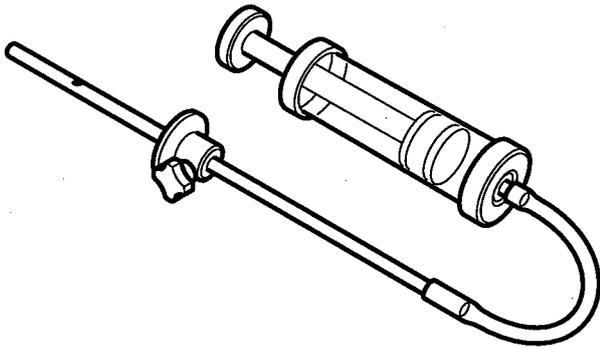


T3880023 - Headstock Bearing Wrench



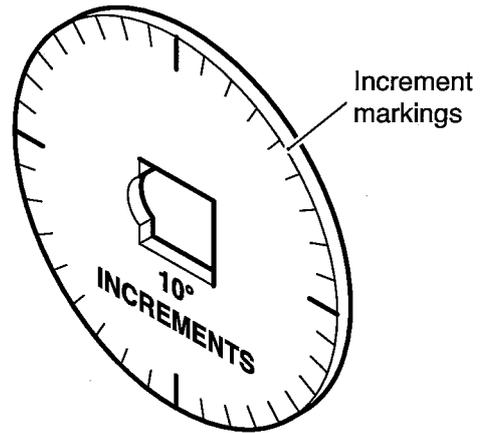
# General Information

3880160-T0301 – Fork Filler / Evacuator



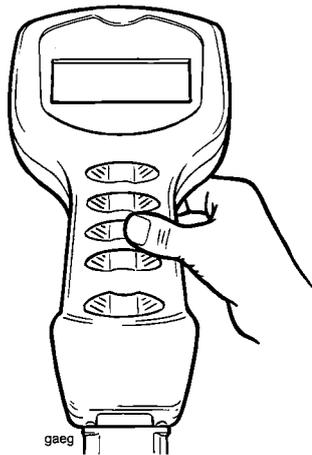
ccha

T3880105 – Angular Torque Gauge



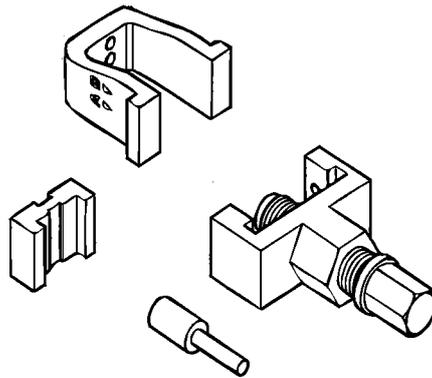
cbxt

T3880250 – Engine Management/ABS Diagnostics

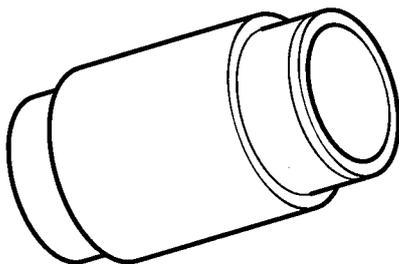


gaeg

A9930023 - Chain Link Took Kit

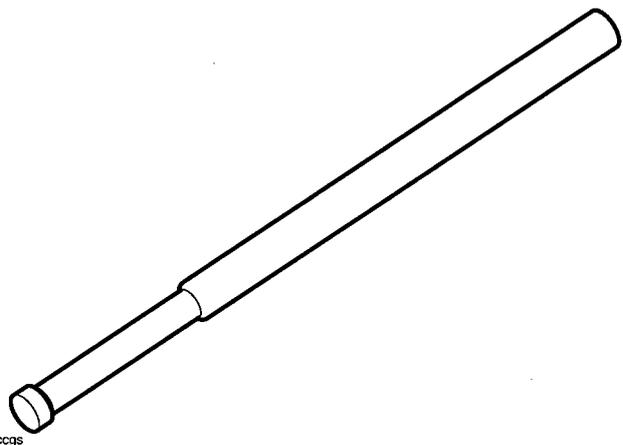


3880080-T0301 – Fork Seal / Bearing Drift



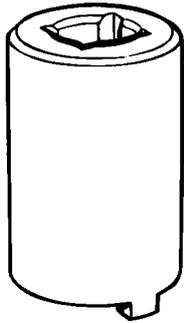
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3880085-T0301 - Fork Damper / Holder



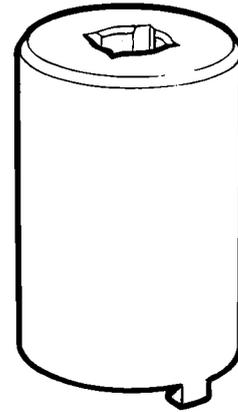
ccgs

T3880290 – Wrench, Swinging Arm Clamp



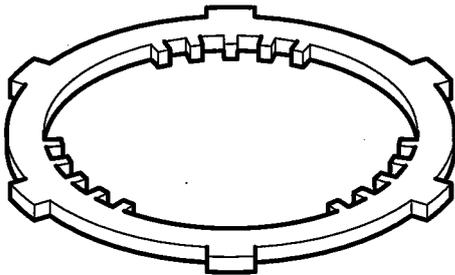
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T3880295 – Wrench, Swinging Arm Lock Ring



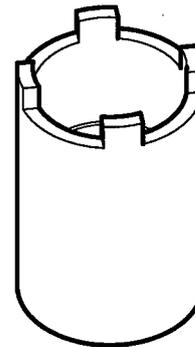
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T3880305 – Clutch Anti-rotation Tool



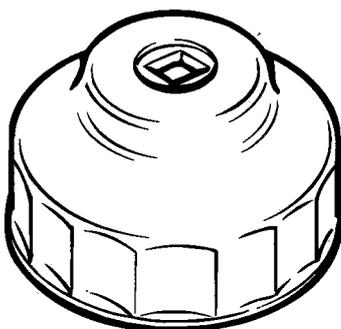
ccmi

T3880088 – Wrench, Engine Mountings



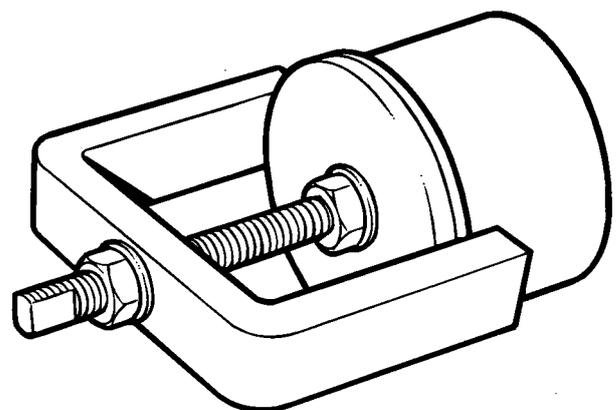
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T3880312 – Oil Filter Wrench



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T3880315 – Extractor, Cylinder Liners

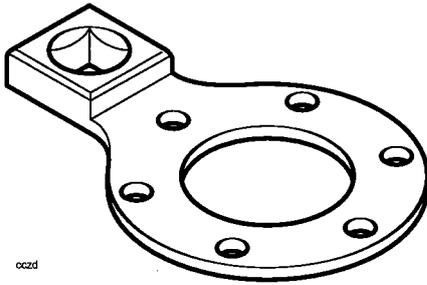


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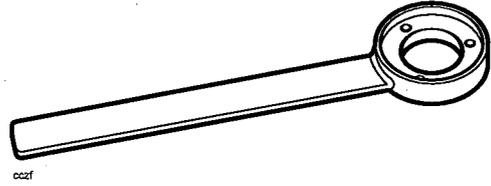
# General Information

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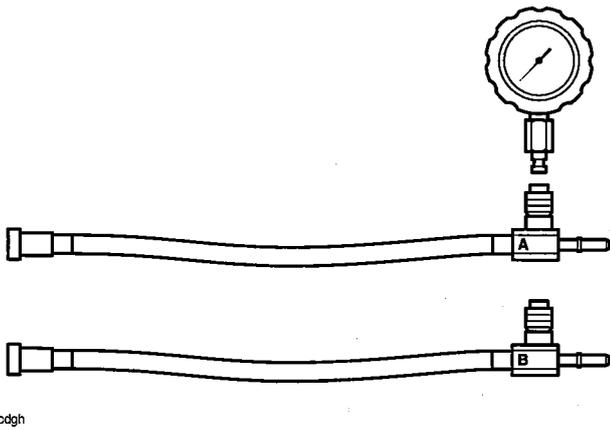
T3880371 – Holder, Oil Pump Drive Gear



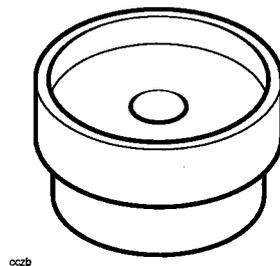
T3880017 – Holder, Sprag Clutch



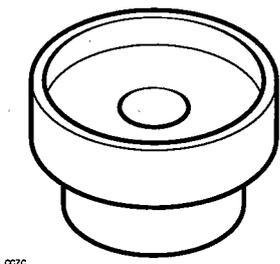
T3880001 – Fuel Pressure Gauge



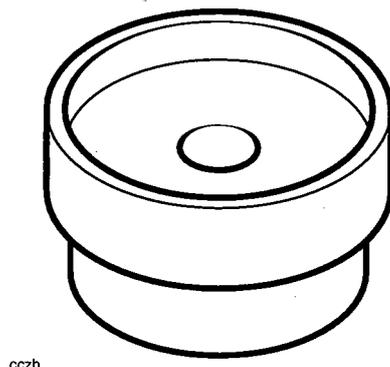
T3880065 – T0301 – Bearing Installer



T3880070 – T0301 – Bearing Installer



T3880075 – T0301 – Bearing Installer



## Full Specification

## Sprint ST

### Engine

Engine Configuration.....	3 Cylinder 12 valve DOHC
Arrangement.....	Transverse in-line
Displacement.....	1050 cc
Bore x Stroke.....	79 x 71.4 mm
Compression Ratio.....	12.0:1
Cylinder Numbering.....	Left to Right (no.3 adjacent to cam chain)
Cylinder Sequence.....	Number 1 at left
Firing Order.....	1-2-3
Maximum Power.....	125 PS (123bhp) at 9,250 rpm
Maximum Torque.....	104 Nm (77ft.lbf)at 5,000 rpm

### Cylinder Head Valves

Valve Head Diameter.....	In.....	33.5 mm
	Ex.....	27.0 mm
Valve Lift.....	In.....	8.75 mm
	Ex.....	7.45 mm
Inlet valve Stem Diameter.....		4.975-4.990 mm
Service Limit.....		4.965 mm
Exhaust Valve Stem Diameter.....		4.955-4.990 mm
Service Limit.....		4.945 mm
Inlet Valve Guide Bore Diameter.....		5.000-5.015 mm
Service Limit.....		5.043 mm
Exhaust Valve Guide Bore Diameter.....		5.000-5.035 mm
Service Limit.....		5.063 mm
Valve Stem to Guide Clearance.....	In.....	0.010-0.040 mm
	Ex.....	0.030-0.060 mm
Inlet Valve Seat Width (in head).....		0.9-1.1 mm
Service Limit.....		1.5 mm
Exhaust Valve Seat Width (in head).....		1.1-1.3 mm
Service Limit.....		1.7 mm
Valve Seat Width (valve).....		1.5-1.9 mm
Valve Seat Angle.....		45°
Inlet / Exhaust Valve Spring 'Load at Length'.....		470 N +/-30 at 26.3 mm (inner)
Valve Clearance.....	In.....	0.10-0.20 mm
	Ex.....	0.20-0.30 mm
Valve Bucket Diameter.....		28.476-28.490 mm
Service Limit.....		28.549 mm
Valve Bucket Bore Diameter.....		28.515-28.535 mm
Service Limit.....		28.549 mm

# General Information

## Full Specification

## Sprint ST

### Camshafts

Cam Timing Inlet		Open 11.25° BTDC (@ 1.0 mm lift)
		Close 41.25° ABDC (@1.0 mm lift)
	Duration	232.50°
Cam Timing Exhaust		Open 34° BBDC (@ 1.0 mm lift)
		Close 4° ATDC (@1.0 mm lift)
	Duration	218°
Camshaft Journal Diameter		22.930-22.960 mm
		22.953-22.956 mm (outrigger)
Camshaft Journal Clearance	Std.	0.040-0.091 mm
Service Limit		0.13 mm
	Outrigger	0.044-0.068 mm
Service Limit		0.13 mm
Camshaft Journal Bore Diameter		23.000-23.021 mm
Camshaft End Float		0.03-0.12 mm
Service Limit		0.20 mm
Camshaft Run-out		0.05 mm max.

### Clutch / Primary Drive

Primary Drive	Type	Gear
Reduction Ratio		1.750 (60/105)
Clutch	Type	Wet multi-phase
No. of Friction Plates		10
Plate Flatness		Within 0.2 mm
Friction Plate Thickness (inner and outer)		3.80 mm
Service Limit		3.60 mm
Friction Plate Thickness (all others)		3.30 mm
Service Limit		3.10 mm
Clutch Actuation Method		Cable
Cable Free Play (at lever)		2.0-3.0 mm

### Balancer

End Float		0.06-0.41 mm
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### Pistons

Cylinder Bore Diameter		79.040-79.060 mm
Service Limit		79.110 mm
Piston Diameter (at 90° to gudgeon pin)		78.970-78.980 mm
Service Limit		78.930 mm
Piston Ring to Groove Clearances		
Top		0.02-0.06 mm

<b>Full Specification</b>	<b>Sprint ST</b>
Service Limit .....	0.075
Second .....	0.02-0.06 mm
Service Limit .....	0.075
<b>Piston Ring End Gaps</b>	
Top .....	0.28-0.49 mm
Service Limit .....	0.61
Second .....	0.43-0.64 mm
Service Limit .....	0.76
Oil .....	0.33-0.89 mm
Service Limit .....	1.03 mm
Gudgeon Pin Bore Diameter in Piston .....	16.993-17.001 mm
Service Limit .....	17.029 mm
Gudgeon Pin Diameter .....	16.984-16.989 mm
Service Limit .....	16.974 mm
<b>Connecting Rods</b>	
Connecting Rod Small End Diameter .....	17.005- 17.018mm
Service Limit .....	17.028 mm
Connecting Rod Big End Side Clearance .....	0.15-0.30 mm
Service Limit .....	0.50 mm
<b>Crankshaft</b>	
Crankshaft Big End Journal Diameter .....	34.984-35.000 mm
Service Limit .....	34.960 mm
Crankshaft Big End Bearing Clearance .....	0.036 mm-0.066
Service Limit .....	0.10 mm
Crankshaft Main Bearing Journal Diameter .....	37.960-37.967 mm
Service Limit .....	37.936 mm
Crankshaft End Float .....	0.05-0.20 mm
Service Limit .....	0.40 mm
Crankshaft Run-out .....	0.02 mm or less
Service Limit .....	0.05 mm
<b>Transmission</b>	
Type .....	6 Speed, Constant Mesh
Gear Ratios.....	1st ..... 2.733 (15/41)
	2nd ..... 1.947 (19/37)
	3rd ..... 1.545 (22/34)
	4th ..... 1.292 (24/31)
	5th ..... 1.154 (26/30)
	6th ..... 1 074 (27/29)

## General Information

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### Full Specification

	Sprint ST
Gear Selector Fork Thickness .....	5.8-5.9 mm
Service Limit .....	5.7 mm
Gear Selector Groove Width .....	6.0-6.1 mm
Service Limit .....	6.25 mm
Gear Selector Fork to Groove Clearance...	0.55 mm max.

### Final Drive

Final Drive .....	Chain
Final Drive Ratio .....	2.333 (19/42)
Chain Type .....	DID X-ring
Number of Links .....	106
20 Link Length .....	321 mm
Drive Chain Play .....	35-40 mm
Chain Lubrication .....	Mobil chain spray

### Lubrication

Type .....	Pressure Lubrication, Wet Sump
Oil Capacity (dry fill) .....	3.50 litres
Oil Capacity (wet fill including filter) .....	3.20 litres
Oil Capacity (wet fill excluding filter) .....	3.00 litres
Oil pressure (in main gallery) .....	40.0 lb/in <sup>2</sup> min. @ 80°C oil temperature @ 5000 RPM
Oil Pump Rotor Tip Clearance .....	0.15 mm
Service Limit .....	0.20 mm
Oil Pump Body Clearance .....	0.15-0.22 mm
Service Limit .....	0.35 mm
Oil Pump Rotor End Float .....	0.02-0.07 mm
Service Limit .....	0.10 mm

### Ignition System

Type .....	Digital Inductive
Electronic Rev Limiter .....	10,900 (r/min)
Pick-up Coil Resistance .....	0.56 K $\Omega$ +/-10% @ 20°C
Ignition Coil Type .....	Plug-top
Spark Plug Type .....	NGK CR9EK
Spark Plug Gap .....	0.7 mm

### Fuel System

Fuel Type .....	Unleaded, 95 RON (U.S. 89 CLC/AKI)
Fuel Tank Capacity .....	21 litres
Low Level Warning Lamp .....	4 litres remaining

## Full Specification

Fuel Pump Type .....	Submerged
Fuel Pressure (nominal) .....	3.0 bar
Purge Control System .....	Electronic, via fuel system ECU

## Fuel Injection System

Type .....	Electronic, sequential
Idle Speed .....	1200 RPM
Injector Type .....	Twin jet, solenoid operated plate valve
Throttle .....	Cable / twist grip / electronic throttle potentiometer
Control Sensors .....	Barometric pressure, manifold absolute pressure, throttle position, coolant temperature, crankshaft position sensor, lambda sensor, induction air temperature

## Emissions Controls\*

Catalysts .....	2, in silencer 1, in downpipe
Oxygen sensor .....	Heated, in down pipe
Secondary Air Injection .....	Solenoid controlled, reed valve type
Evaporative control .....	Activated carbon canister (California only)

\* Catalysts and Oxygen sensors fitted in all markets except Australia, New Zealand and South Africa

## Coolant System

Coolant Mixture .....	50/50 Distilled water / anti-freeze
Anti-Freeze Type .....	Mobil anti-freeze
Freezing point .....	-35°C
Cooling System Capacity .....	2.3 litres
Radiator Cap Opening Pressure .....	1.1 bar
Thermostat Opening Temperature .....	88°C (nominal)
Cooling Fan Switch On Temperature .....	103°C
Temperature Gauge Sensor Resistance .....	2.9 – 3.3 K $\Omega$ @ 15°C

## Suspension

Front Fork Travel .....	120 mm
Recommended Fork Oil Grade .....	Showa SS8
Oil Level (fork fully compressed) .....	120 mm
Oil Volume (dry fill) .....	469 cc
Fork Pull Through .....	Flush with top of yoke upper face
Rear Wheel Travel .....	140 mm
grease HP 222	Rear Suspension Bearing Grease Mobil

## Brakes

Front Type .....	Two hydraulically actuated four piston callipers acting on twin discs
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# General Information

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## Full Specification

## Sprint ST

Caliper Piston Diameter . . . . .	33.96 mm / 30.23 mm
Disc Diameter . . . . .	320 mm
Disc Thickness . . . . .	4 mm (3.5 mm minimum)
Disc Run-out Max. . . . .	0.3 mm (0.1 mm standard)
Master Cylinder Diameter . . . . .	14 mm
Recommended Fluid	Mobil universal brake and clutch fluid DOT4
Rear Type . . . . .	Hydraulically actuated 2 piston calliper, single disc
Caliper Piston Diameter . . . . .	27 mm
Disc Diameter . . . . .	220 mm
Disc Thickness . . . . .	6.0 mm
Service Limit . . . . .	5.0 mm
Master Cylinder Diameter . . . . .	14 mm
Recommended Fluid . . . . .	Mobil universal brake and clutch fluid DOT4

## Wheels and Tyres

Front Wheel Size . . . . .	MT 3.5 x 17
Front Tyre Size . . . . .	120/70 ZR 17
Front Tyre Pressure . . . . .	2.5 Bar
Front Tyre: . . . . .	Option 1 . . . . . Bridgestone BT020 NN Option 2 . . . . . Metzeller Roadtec Z6 Radial
Front Wheel Rim Axial Run-out . . . . .	0.5 mm
Front Wheel Rim Radial Run-out . . . . .	0.5 mm
Rear Wheel Size . . . . .	MT 5.5 x 17
Rear Tyre Size . . . . .	180/55 ZR 17
Rear Tyre Pressure . . . . .	2.9 Bar
Rear Tyre: . . . . .	Option 1 . . . . . Bridgestone BT020 NN Option 2 . . . . . Metzeller Roadtec Z6 B Radial
Rear Wheel Rim Axial Run-out . . . . .	0.5 mm
Rear Wheel Rim Radial Run-out . . . . .	0.5 mm

## Frame

Frame Type . . . . .	Twin-spar aluminium
Overall Length . . . . .	2114mm (83.3in)

## Full Specification

## Sprint ST

Overall Width .....	745mm (30.7in)
Overall Height .....	1228mm (49.2 in)
Wheelbase .....	1457mm (56.2in) Full Specification Sprint ST
Seat Height .....	805mm (56.2in) Full Specification Sprint ST
Castor .....	24 °
Trail .....	90 mm
Dry Weight .....	210 kg
Maximum Payload .....	215kg (rider, passenger, luggage and accessories)

## Electrical Equipment

Battery Type .....	YUASA YTX12-BS	
Battery Rating .....	12V – 10 Amp. Hour	
Alternator Rating .....	35A	
Fuses .....	#1 .....	Starter solenoid, dip / main beam headlights
	#2 .....	Ignition switch, tail lights, number plate light, side lights, fuel pump
	#3 .....	Indicators, brake light, horn
	#4 .....	Blank
	#5 .....	Blank
	#6 .....	Accessory socket, heated grips
	#7 .....	Cooling fan
	#8 .....	Engine management system
	#9 .....	Alarm, diagnostic connector, instruments

# General Information

## Torque Wrench Settings

### Cylinder Head Area

Application	Torque (Nm)	Notes
Cam cover to cylinder head	10	
Secondary air injection valve covers to cam cover	9	
Cam chain tensioner to crankcase	9	
Cam chain tensioner to centre bolt	23	
Camshaft bearing caps and camshaft bearing ladder to head	See section 5	Lubricate threads
Camshaft sprocket to camshaft	15	Use new fixings
Cam chain tensioner blade to crankcase	18	Use new fixings
Cam chain top pad to head	10	Use new fixings
Cylinder head to crankcase (M6 screws)	10	
Cylinder head to crankcase bolts	See section 3	
Sound suppression bolt in head	10	
Oil feed pipe	25	
Spark plug to cylinder head	18	

### Clutch

Application	Torque (Nm)	Notes
Clutch cover to crankcase	9	
Clutch centre nut	105	
Clutch pressure plate to centre	10	
Clutch lever to handlebar	15	

### Balancer, Crankshaft and Crankcase

Application	Torque (Nm)	Notes
Crankcase lower to upper (M8 fixings)	See section 6	
Crankcase upper to lower (M6 fixings)	See section 6	
Connecting rod big end nut	See section 6	
Balancer retaining bolt	60	Apply Three-bond 1305 to the threads
Big end bearings	See section 6	
Sprag clutch to crankshaft	54	
Starter drive cover to crankcase	10	

## Engine Covers

Application	Torque (Nm)	Notes
Clutch cover to crankcase	9	
Clutch cover sound suppression plate to cover	9	
Sprocket cover to crankcase	9	
Water outlet cover	9	
Alternator cover to crankcase	9	
Crank cover to crankcase	9	
Starter cover to crank cover	9	
Plug, crank cover	18	

## Transmission

Application	Torque (Nm)	Notes
Output sprocket to output shaft	132	Use new tab washers
Detent wheel to selector drum	12	Use a new fixing
Detent arm bolt	12	Use a new fixing
Selector drum bearing retaining screw	12	Use a new fixing
Selector shaft retainer	12	Use a new fixing
Spring abutment bolt	23	
Neutral switch	10	
Gear pedal pinch bolt	9	
Gear pedal pivot bolt	22	

## Lubrication System

Application	Torque (Nm)	Notes
Sump to crankcase	12	
Sump drain plug to sump	25	Use a new washer
Oil pressure relief valve to crankcase	15	Apply Three-bond 1305 to the threads
Low oil pressure warning light switch to crankcase	13	Use new washers
Oil filter to adapter	10	
Oil cooler pipe union bolts	10	
Oil cooler to mountings	9	
Oil pump to crankcase	13.7	
Oil pump drive sprocket to pump shaft	15	
Oil feed pipe union to head	25	
Transmission oil feed pipes to crankcase	8	
Oil cooler to radiator	9	

# General Information

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## Final Drive

Application	Torque (Nm)	Notes
Rear sprocket to cush drive	33	
Chain guard bolts	4.5	
Chain rubbing strip to swinging arm	4.5	
Cush drive housing to shaft	146	Use a new fixing

## Cooling System

Application	Torque (Nm)	Notes
Water pump to crankcase	10	
Radiator to frame	9	
Water elbow to head	12	
Thermostat housing to head	12	
Fan shroud to radiator	2.5	
Expansion tank to frame	4	

## Fuel System, Exhaust System and Airbox

Application	Torque (Nm)	Notes
Fuel tank to frame (rear fixing)	9	
Fuel cap to fuel tank	3	
Fuel pump mounting plate to fuel tank	9	
Throttle body transition piece to cylinder head	12	
Fuel rail to bracket	6	
Throttle potentiometer to throttle body	3.5	
Exhaust downpipe to cylinder head	19	See section 10
Airbox to bracket	5	
Airbox upper to lower section	4	
Exhaust downpipe to frame	15	
Silencer mounting bracket to frame	27	
Exhaust clamp to downpipe	22	
Fuel sensor to fuel tank	5	
Fuel tank brackets to frame (front)	15	
Fuel tank brackets to frame (rear)	6	

## Rear Suspension

Application	Torque (Nm)	Notes
Swinging arm spindle bolt	60	
Chain rubbing strip bolts	4.5	
Rear hub / eccentric adjuster clamp bolt	55	
Chain guard bolts	4.5	
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	
Drop links to swinging arm	48	
Swinging arm end-float adjuster	15	
Swinging arm lateral adjuster lock nut	30	

## Front Suspension

Application	Torque (Nm)	Notes
Upper yoke pinch bolt	20	
Lower yoke pinch bolt	20	
Fork top cap to inner tube	25	
Upper yoke centre nut	90	
Damping cylinder bolt	24	
Handlebar to top yoke	26	
Handlebar clamp bolt	26	

## Wheels

Application	Torque (Nm)	Notes
Front wheel spindle / axle bolt	61	
Front wheel spindle pinch bolts	20	
Rear wheel to stub axle	146	

# General Information

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## Front Brakes

Application	Torque (Nm)	Notes
Front brake caliper to fork	40	
Front brake pad retaining pin	19	
Front brake calliper bleed screw	6	
Front brake hose to caliper	25	
Front brake master cylinder to handlebar	15	
Front brake master cylinder reservoir to mounting	9	
Front brake hose to master cylinder	25	
Front brake disc to wheel	22	Use new fixings

## Rear Brakes

Application	Torque (Nm)	Notes
Rear brake caliper to carrier	40	
Rear brake pad retaining pin	19	
Rear brake caliper bleed screw	6	
Rear brake hose to caliper	25	
Rear brake master cylinder to frame	20	Use new fixings
Rear brake master cylinder reservoir to battery box	3	
Rear brake hose to master cylinder (brake light switch)	15	
Rear brake disc to axle shaft	22	Use new fixings
Rear brake pedal pivot bolt	22	

## ABS System

Application	Torque (Nm)	Notes
Front wheel speed sensor to fork leg	9	
Rear wheel speed sensor to caliper carrier	9	
Front pulser ring to front wheel hub	5	
Rear pulser ring to rear brake disc	5	
ABS modulator to mounting bracket	9	
ABS modulator mounting bracket to frame	20	Use new fixings
Brake line unions to ABS modulator	17	

## Footrests, Control Plates and Engine Mountings

Application	Torque (Nm)	Notes
Upper crankcase to frame	See section 9	
Lower crankcase to frame	See section 9	
Cylinder head to frame	See section 9	
Control plate to frame, left hand	27	Use new fixings
Control plate and master cylinder to frame, right hand	27	Use new fixings
Rear footrest hanger to frame	27	
Side stand mounting bracket	40	
Side stand pivot	20	

## Electrical

Application	Torque (Nm)	Notes
Alternator rotor to crankshaft	105	
Alternator stator to cover	12	
Alternator regulator to frame	7	
Starter motor to crankcase	10	
Alternator cover to crankcase	9	

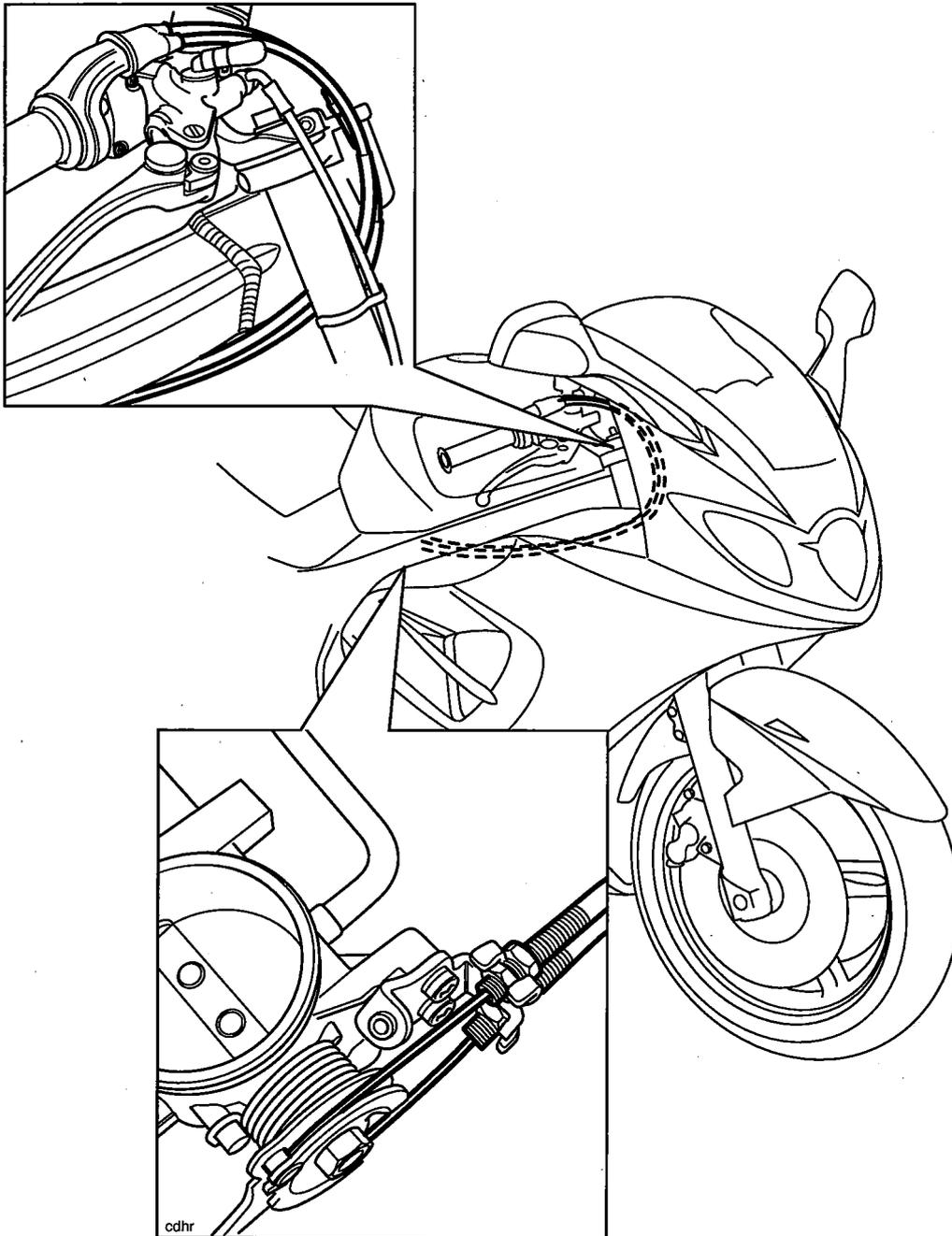
## Bodywork

Application	Torque (Nm)	Notes
Front mudguard to fork – front section	3	
Front mudguard to fork – rear section	7	
Rear side panels to brackets	3	
Cockpit to brackets / side panels	5	
Infill panels to frame	3	
Infill panels to cockpit	3	
Mirrors to cockpit	9	
Windscreen to cockpit subframe	1.5	
Cockpit subframe to frame	28	
Rear mudguard/heat shield bracket to frame	18	
Rear mudguard end section to bracket	9	

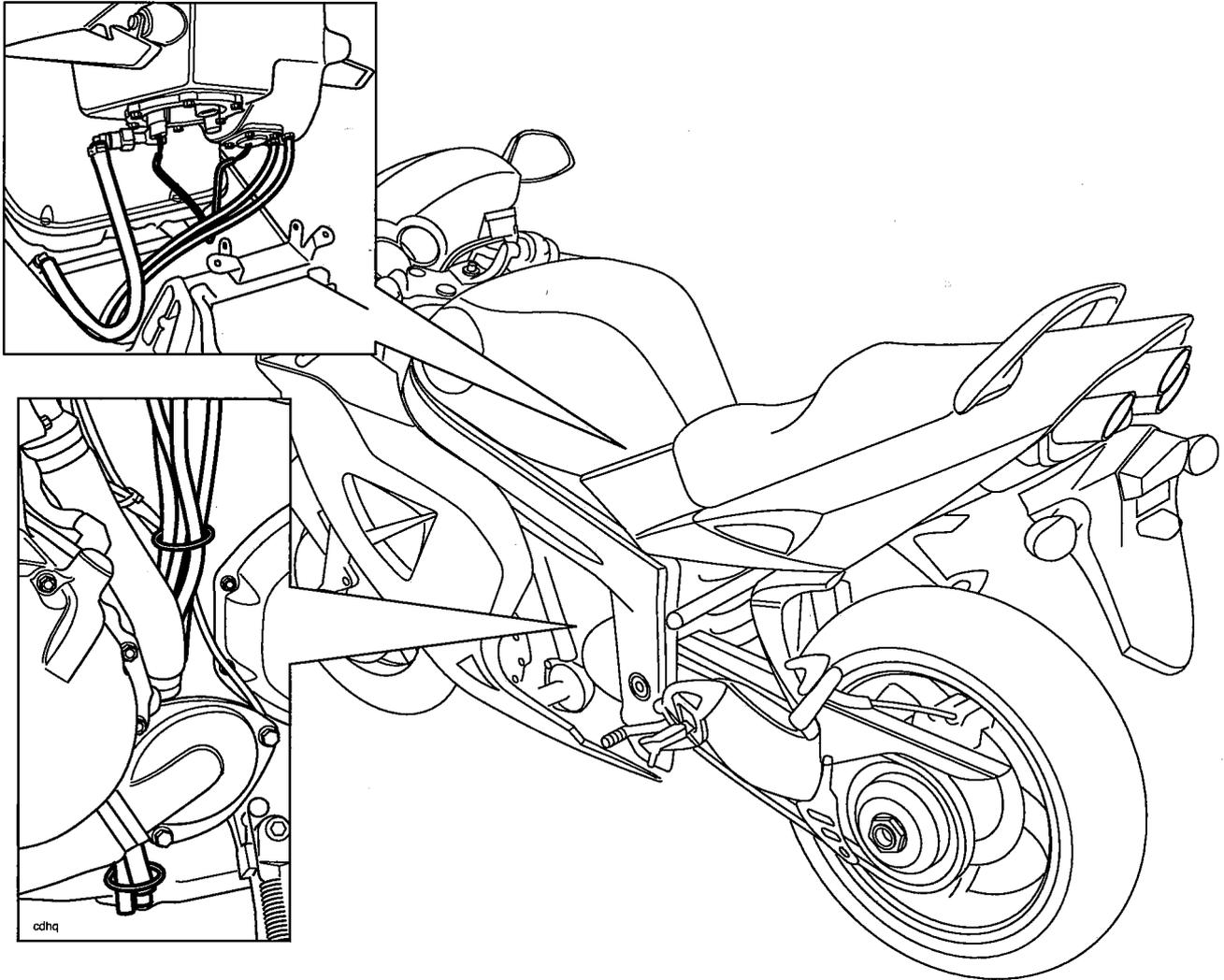
# General Information

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## Throttle Cable Routing



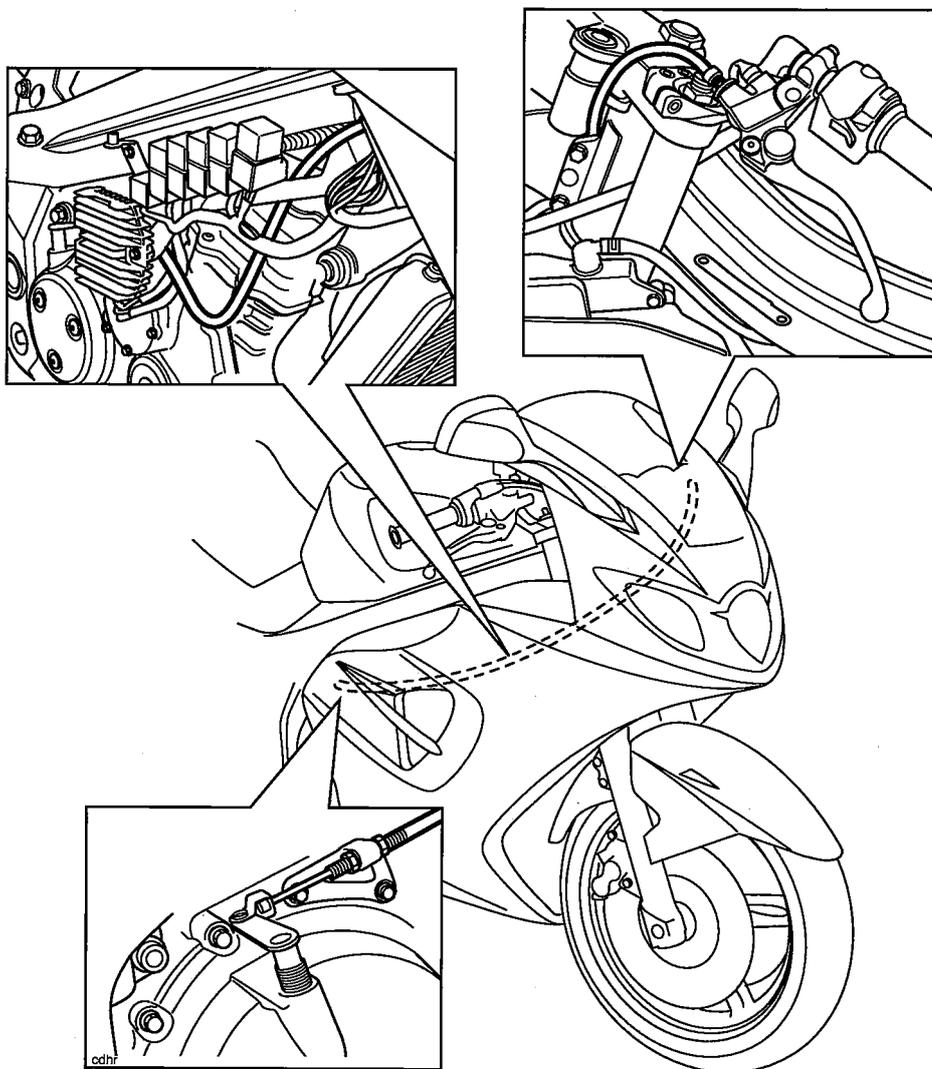
Fuel Tank Breather Hose Routing



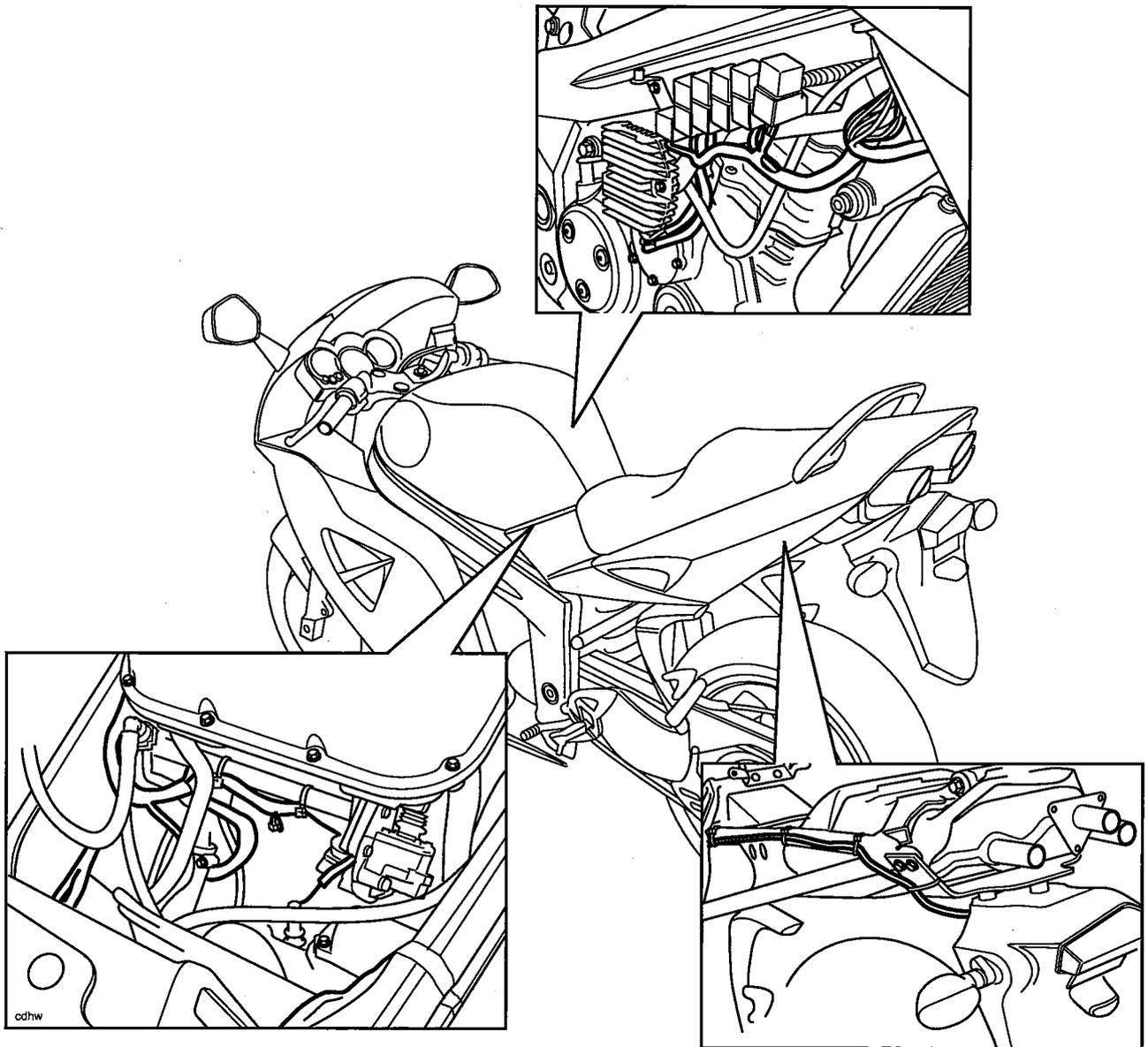
# General Information

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## Clutch Cable Routing



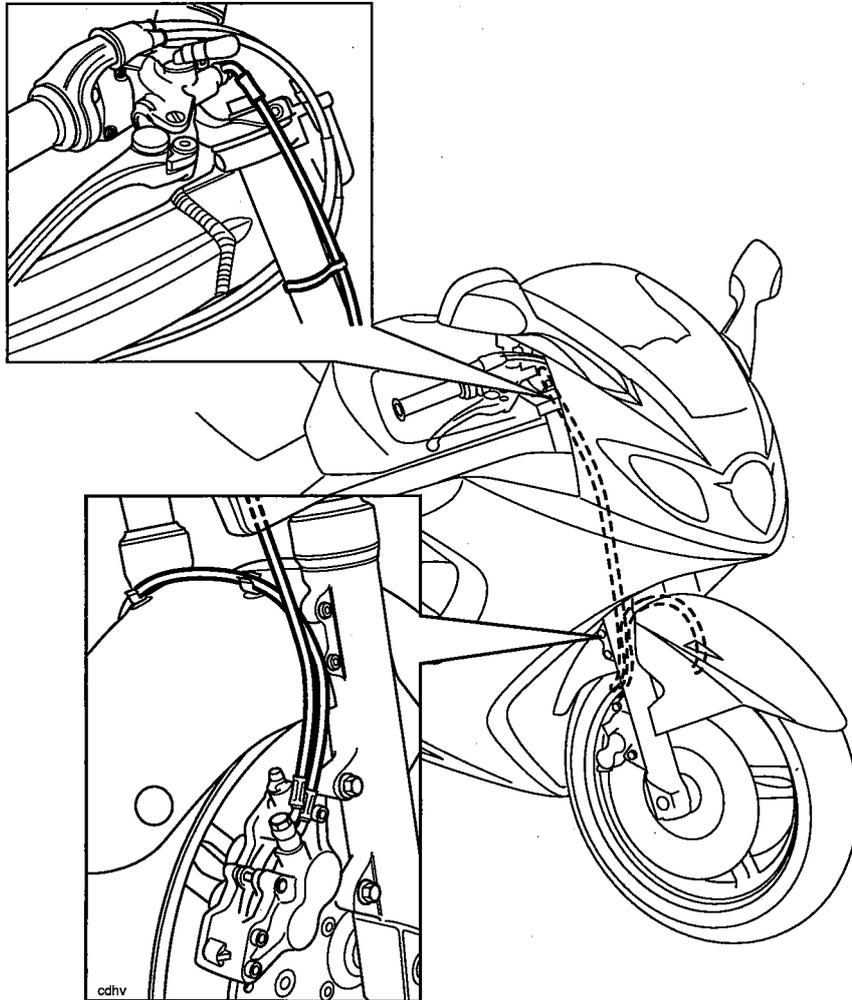
Main wiring Harness Routing



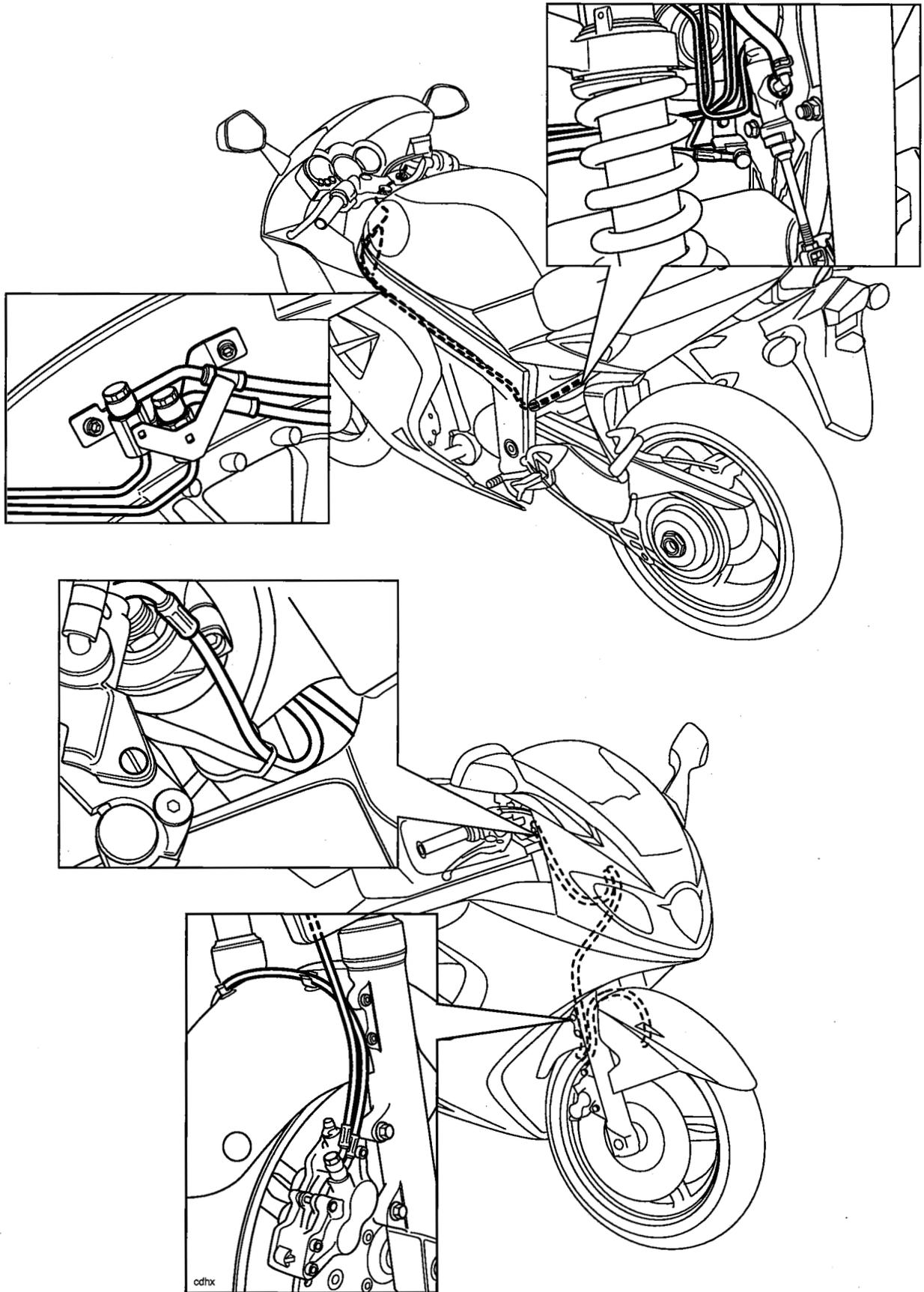
## General Information

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### Front Brake Hose Routing - Models without ABS Brakes



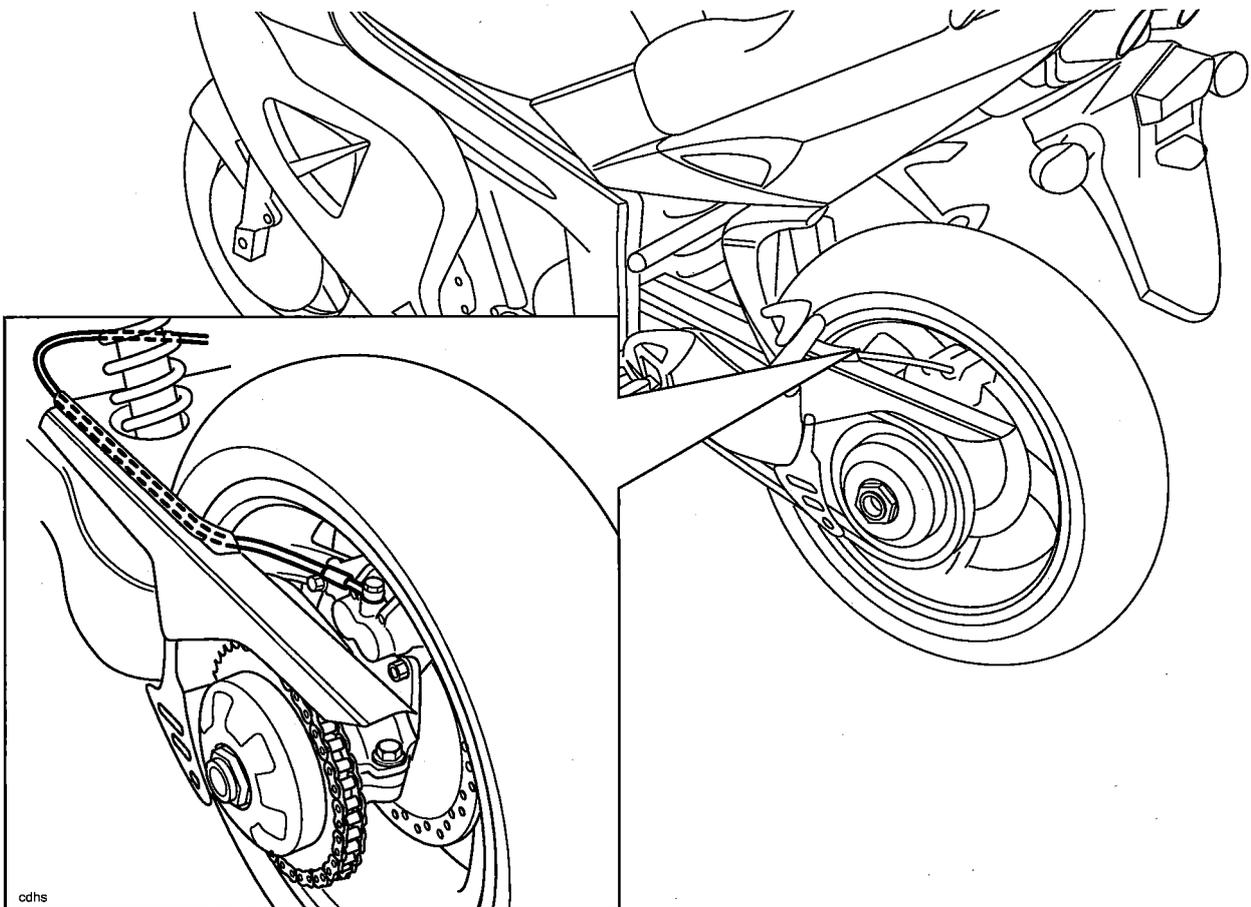
Front Brake Hose Routing - Models with ABS Brakes



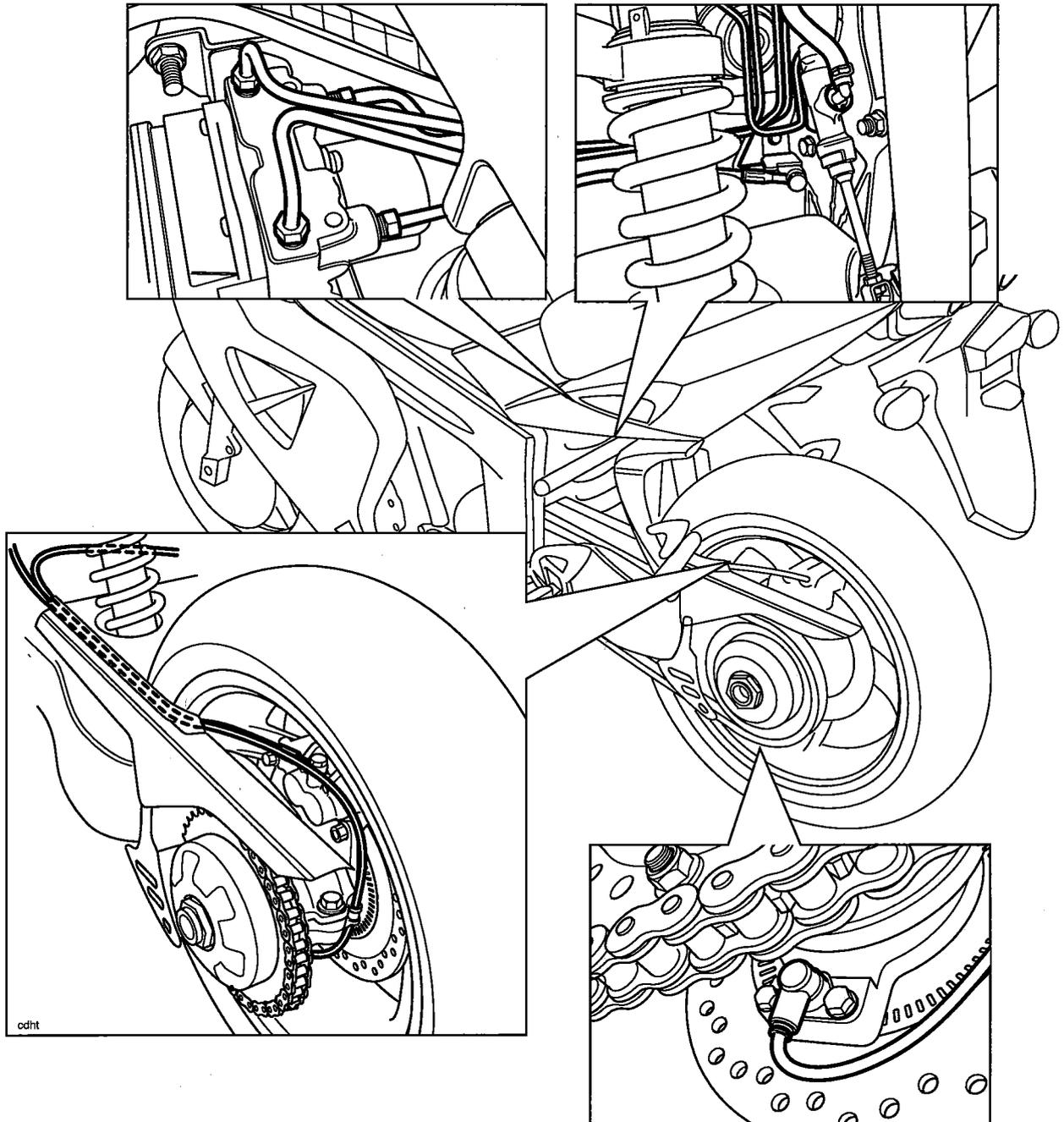
## General Information

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### Rear Brake Hose Routing - Models without ABS Brakes



Rear Brake Hose Routing - Models with ABS Brakes



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# 2 Scheduled Maintenance

## Table of Contents

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# Scheduled Maintenance

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## Introduction

To maintain the motorcycle in a safe and reliable condition, the maintenance and adjustments outlined in this section must be carried out as specified in the schedule of daily checks, and also in line with the scheduled maintenance chart.

Weather, terrain and geographical location affects maintenance. The maintenance schedule should be adjusted to match the particular environment in which the vehicle is used and the demands of the individual owner. For advice on adjusting the service schedule, consult your authorised Triumph dealer.

### Warning

In order to correctly carry out the maintenance items listed in the scheduled maintenance chart, special tools and specialist knowledge will be required. As only an authorised Triumph dealer will have this knowledge and equipment, Triumph strongly recommends that your authorised Triumph dealer carries out all scheduled maintenance.

A dangerous riding condition could result from incorrect maintenance leading to loss of motorcycle control and an accident.

### Warning

All maintenance is vitally important and must not be neglected. Incorrect maintenance or adjustment may cause one or more parts of the motorcycle to malfunction. A malfunctioning motorcycle is dangerous and may lead to an accident.

### Warning

Triumph Motorcycles cannot accept any responsibility for damage or injury resulting from incorrect maintenance or improper adjustment carried out by the owner.

Since incorrect or neglected maintenance can lead to a dangerous riding condition, always have an authorised Triumph dealer carry out the scheduled maintenance of this motorcycle.

## Scheduled Maintenance Chart

Operation Description	Odometer Reading in Miles (Kms) or time period, whichever comes first.							
	Every	500 (800) 1 month	10,000 (16000) 1 year	20,000 (32000) 2 years	30,000 (48000) 3 years	40,000 (64000) 4 years	50,000 (80000) 5 years	60,000 (96000) 6 years
Engine - check for leaks	Day	•	•	•	•	•	•	•
Engine oil - renew	-	•	•	•	•	•	•	•
Engine oil filter - renew	-	•	•	•	•	•	•	•
Valve clearances - check	-		•		•		•	
Air cleaner - renew	-			•		•		•
Engine ECM - check for stored DTC	-	•	•	•	•	•	•	•
Spark plugs - check	-		•	•		•	•	
Spark plugs - renew	-				•			•
Throttle bodies - balance	-		•	•	•	•	•	•
Throttle cables - check/adjust	Day	•	•	•	•	•	•	•
Cooling system - check for leaks	-	•	•	•	•	•	•	•
Coolant level - check/adjust	-	•	•		•		•	
Coolant - renew	-			•		•		•
Fuel system - check for leaks	Day	•	•	•	•	•	•	•
Lights, instruments & electrical systems - check	Day	•	•	•	•	•	•	•
Fuel filter - renew	-			•		•		•
Steering - check for free operation	Day	•	•	•	•	•	•	•
Headstock bearings - check/adjust	-	•	•	•	•	•	•	•
Headstock bearings - lubricate	-			•		•		•
Forks - check for leaks/smooth operation	Day	•	•	•	•	•	•	•
Fork oil - renew	-					•		
Brake fluid levels - check	Day	•	•	•	•	•	•	•
Brake fluid - renew								Every 2 years
Brake pad wear - check	Day	•	•	•	•	•	•	•
Brake calipers - check for leaks and seizures	-	•	•	•	•	•	•	•
Brake master cylinders - check for leaks	-	•	•	•	•	•	•	•
Final drive – check for oil leaks	-	•	•	•	•	•	•	•
Final drive oil - check	-	•	•		•		•	
Final drive oil - renew	-			•		•		•
Fasteners - inspect visually for security	Day	•	•	•	•	•	•	•
Wheels - inspect for damage	Day	•	•	•	•	•	•	•
Tyre wear/tyre damage - check	Day	•	•	•	•	•	•	•
Tyre pressures - check/adjust	Day	•	•	•	•	•	•	•
Clutch cable - check/adjust	Day	•	•	•	•	•	•	•
Stand – check operation	Day	•	•	•	•	•	•	•

## Scheduled Maintenance

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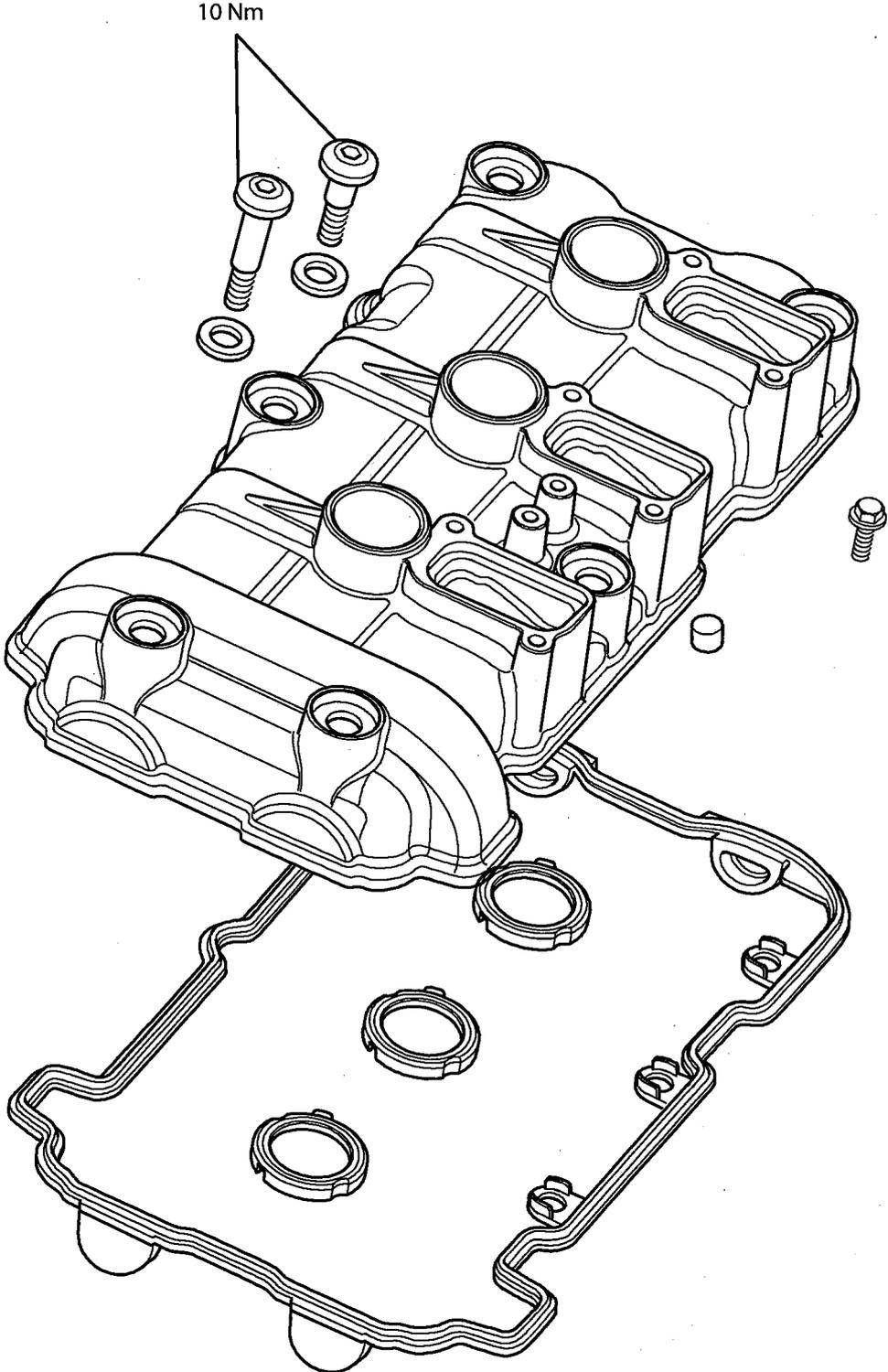
# 3 Cylinder Head

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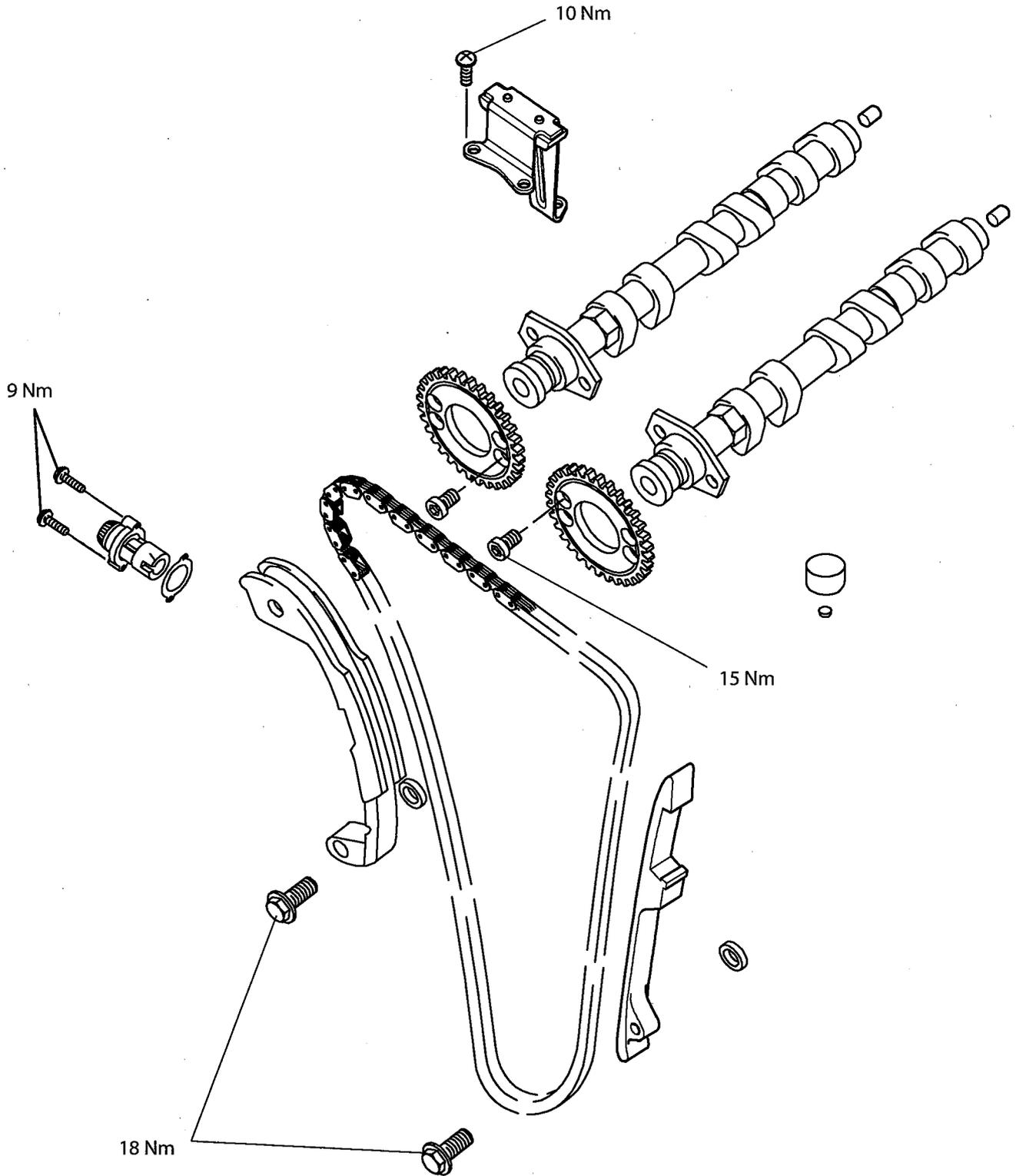


Exploded View - Cam Cover



# Cylinder Head

## Exploded View - Camshaft and Camshaft Drive



## Cylinder Head Description

The engine is fitted with an aluminium alloy cylinder head, which carries the camshafts, 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 separate bearings. Valve clearances are adjusted by changing variable thickness shims which sit between the valve tappet bucket and the valves.

The camshafts are driven by a silent-type chain. The cam chain is tensioned by a spring loaded device fitted in the cylinder head, 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.

Single valve springs are used to close the inlet valves and single springs to close the 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 seat and valve guides to the head, these parts cannot be replaced.



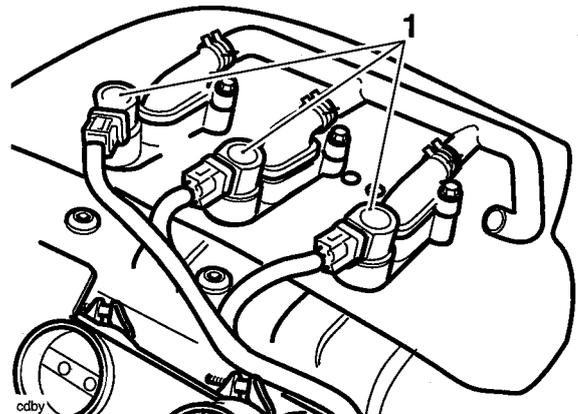
### Caution

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

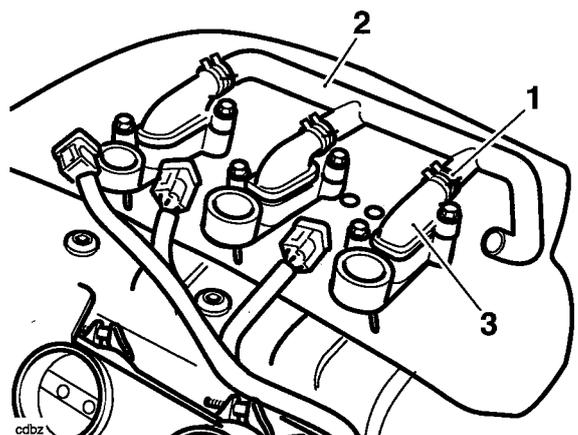
### Removal

1. Remove the seat (see page 16-8.).
2. Disconnect the battery, negative (black) lead first.
3. Remove the side panel assembly (see page 16-9).
4. Remove both lower fairings (see page 16-11).
5. Remove the fuel tank (see page 10-87).
6. Remove the airbox (see page 10-92).
7. Remove the ignition coils from the head by pulling them upwards.



### 1. Coils

8. Detach the secondary air injection hose from the reed valves on top of the cam cover (see page 10-111).



### 1. Spring-close hose clip

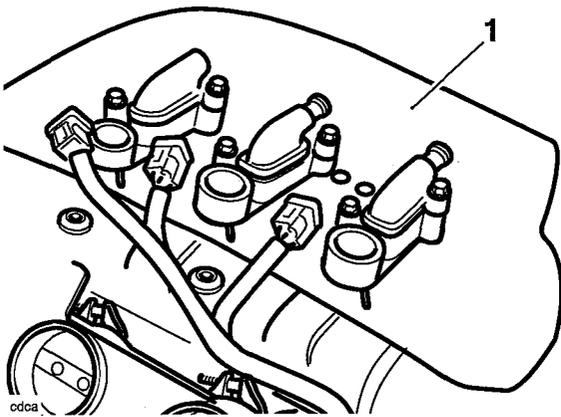
### 2. Secondary air injection hose

### 3. Reed valve assembly

9. Release the throttle cables at the throttle bodies (see page 10-97).

# Cylinder Head

10. Release the clips securing the air deflector shield, then remove the shield.

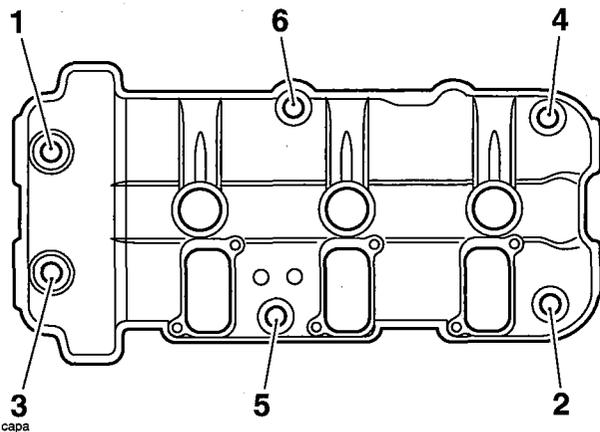


## 1. Air deflector shield

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

### Note:

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



### Cam cover bolt release sequence

12. Ease the water hoses to allow the cover to be removed from the left hand side of the motorcycle.



## Caution

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

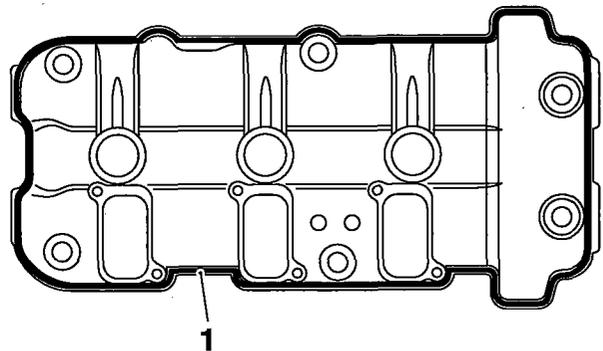
Using a lever will cause damage to the head and cam cover which could lead to an oil leak.

13. Remove the cam cover gasket and plug tower seals. If necessary, recover the dowels from the secondary air injection holes in the head (these may come away in the cover or gasket).

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

## Installation

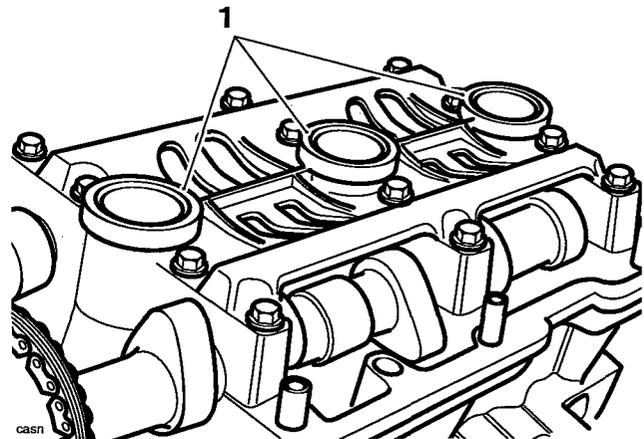
1. Check the condition of the cam cover gasket and plug tower seals. Replace as necessary.
2. Check the condition of the cam cover bolt seals. Replace as necessary.
3. Fit the cam cover seal to the groove in the cam cover.



capb

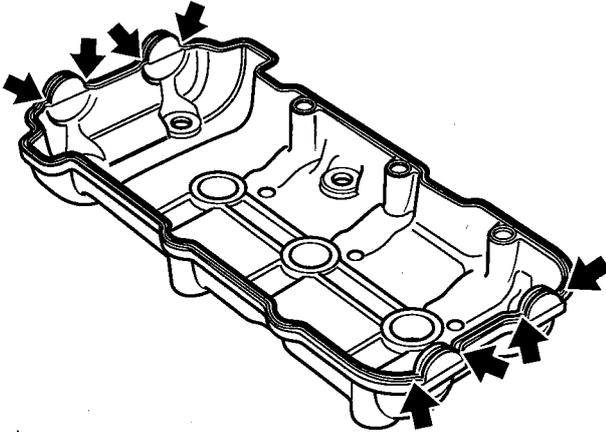
## 1. Cam cover seal groove

4. Fit the plug tower seals to the cam cap ladder.



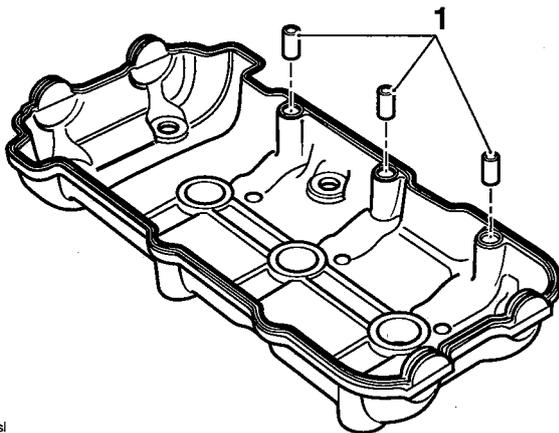
## 1. Plug tower seals

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



casl

- Fit the cam cover, ensuring that the gasket and seals remain in the correct positions.
- Refit the dowels to the cam cover before locating it to the head.

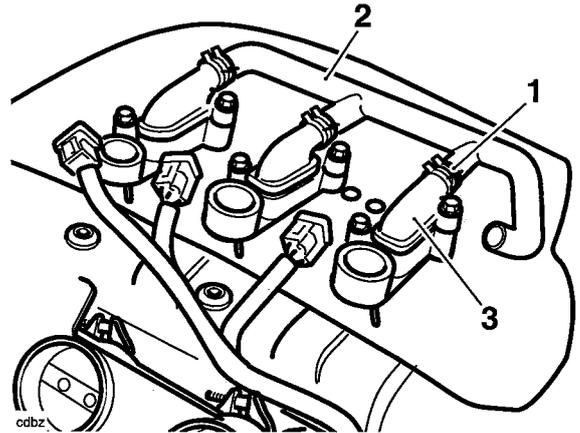


casl

## 1. Dowels

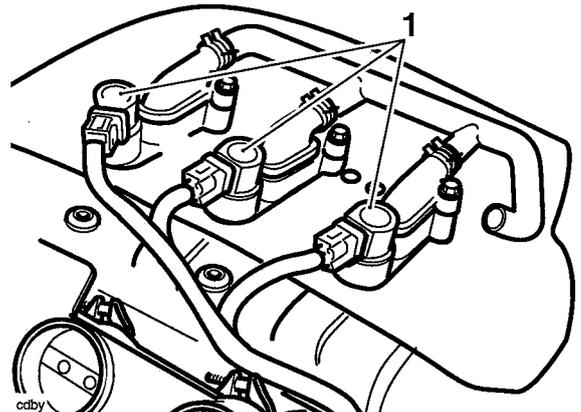
- Fit the cam cover screws and screw seals, then tighten until finger tight.
- Finally, tighten the cam cover screws, in same order as for removal, to **10 Nm**.
- Refit the air deflector shield and retain with the clips.
- Refit the throttle cables and adjust (see page 10-98).

- Refit the secondary air injection hose to the reed valves (see page 10-113).



cdbz

- Spring-close hose clip
  - Secondary air injection hose
  - Reed valve assembly
- Fit the ignition coils and reconnect.



cdby

## 1. Coils

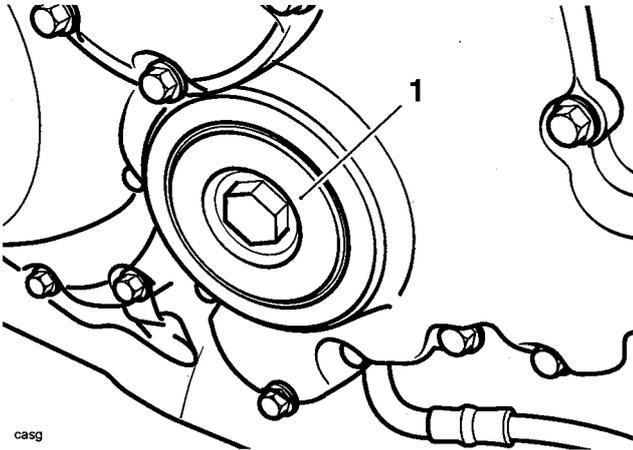
- Refit the airbox (see page 10-93).
- Refit the fuel tank (see page 10-88).
- Refit the lower fairings (see page 16-12).
- Refit the side panel assembly (see page 16-10).
- Reconnect the battery positive (red) lead first.
- Refit the seat (see page 16-8).

# Cylinder Head

## Cam Chain Tensioner

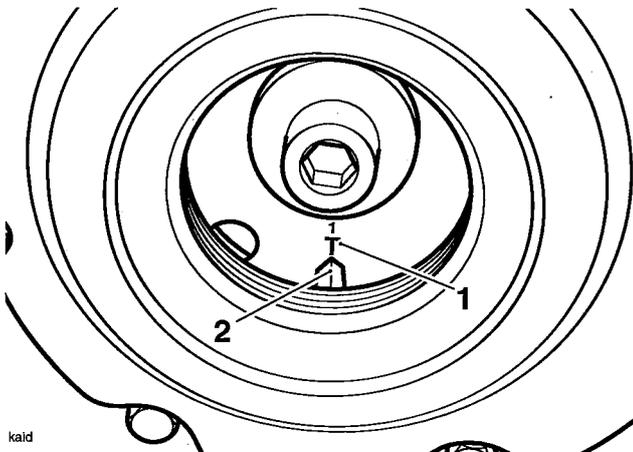
### Removal

1. Remove the cam cover (see page 3-5).
2. Remove the inspection plate from the right hand crank cover.



### 1. Inspection plate

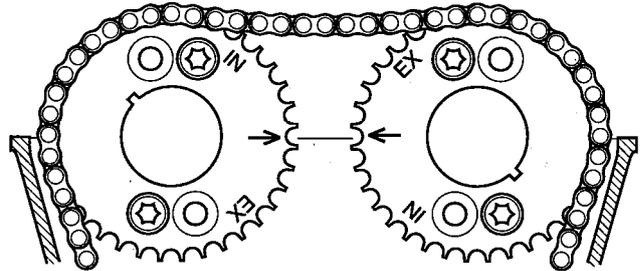
3. Rotate the crankshaft clockwise (the normal direction of rotation), using the bolt fitted to the end of the crankshaft. Stop rotation when number 1 cylinder is at top dead centre (TDC), that is when the 'T1' mark on the sprag clutch aligns with the line at the bottom of the cover.



1. 'T1' Mark
2. Marker line

### Note:

- In addition to the 'T1' mark alignment, at TDC, the alignment marks on the camshaft sprockets will point inwards at a point level with the joint face.



gaaa

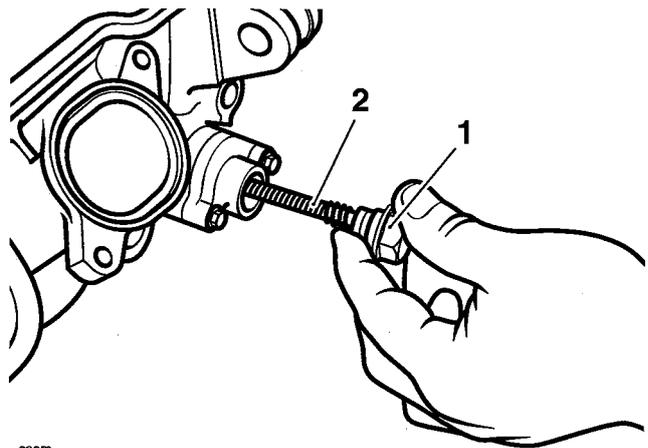
### Camshaft to Cylinder Head Alignment Marks

4. Place a suitable wedge between the tensioner blade and crankcase, to hold the cam chain taut during removal of the tensioner.

### 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.

5. Carefully remove the centre nut from the tensioner and withdraw the tensioner spring.

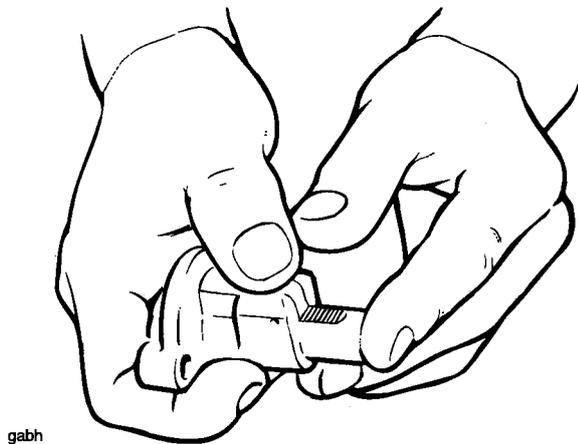


1. Centre nut
2. Spring

6. Remove the bolts securing the tensioner to the cylinder head. 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 cam chain. Check that the camshaft timing marks point inwards and are level with the joint face of the head.
3. Set the tensioner plunger onto the first tooth of the ratchet (i.e. minimum extension) by manually lifting the tensioner pawl.



gabh

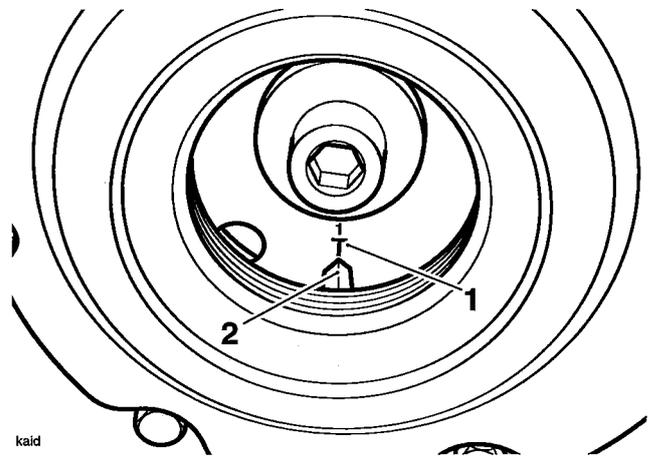
### Tensioner Plunger Set-up

4. Fit the tensioner, complete with a new gasket, to the cylinder head and tighten the retaining bolts to 9 Nm.

### Note:

- If fitting a new tensioner, observe the following:
  - Remove the new tensioner assembly from the packaging. On examination, it can be seen that the tensioner nut will not be tightened fully into the tensioner body and that the tensioner 'nose' (i.e., the part which actually contacts the chain rubbing strip) is fully retracted into the housing.
  - Prior to assembly into the engine it is necessary to disassemble the tensioner nut, washer and spring. To do this without damaging the internal components, turn the tensioner nut at least a half turn clockwise (i.e. tighten it further into the housing) until the plunger springs outwards. The tensioner nut can then be withdrawn safely without causing internal damage to tensioner components.
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 the 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 sprag clutch aligns with the line at the bottom of the cover.

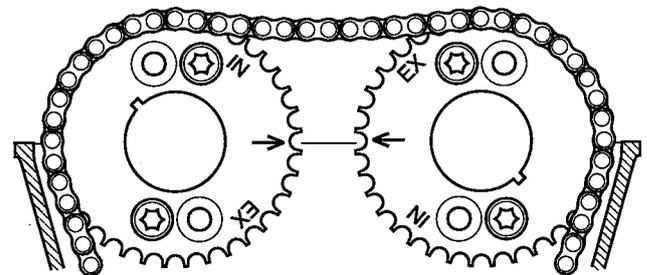


kaid

### 1. 'T1' Mark

### 2. Marker line

9. Check that the camshaft timing marks align as illustrated below.



gaaa

### Camshaft to Cylinder Head Alignment Marks

10. Re-check tensioner plunger location against the tensioner blade.
11. Refit the cam cover (see page 3-6).
12. Check the O-ring in the crank cover inspection plate. Renew as necessary.
13. Refit the crank cover inspection plate, tightening it to 18 Nm.

# Cylinder Head

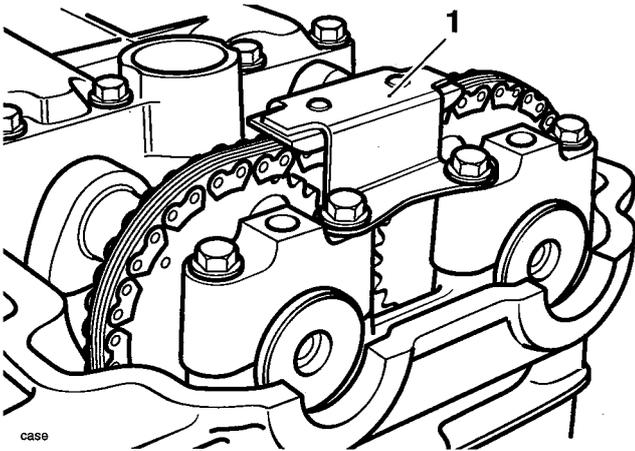
## Camshafts

### Removal

1. Remove the cam chain tensioner (see page 3-8).

#### Note:

- It is not necessary to remove the cam chain completely.
  - Each camshaft and sprocket is removed as an assembly.
  - Before commencing work, ensure the crankshaft T1 mark is in alignment with the line in the crank cover inspection plate.
2. Remove the cam chain top pad from the cam caps and cylinder head.



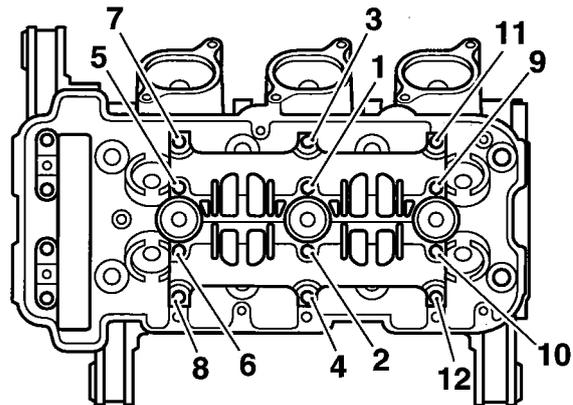
1. Cam Chain Top Pad
2. Cam caps

3. To ensure that all components are refitted in the same positions as prior to removal, mark the position of each cam cap and the orientation of the cam bearing ladder in relation to the head.

#### Note:

- A laundry marker or similar may be used to mark the cap positions.
4. Progressively release each of the remaining fasteners securing the individual cam caps to the cylinder head.
  5. Remove the caps.

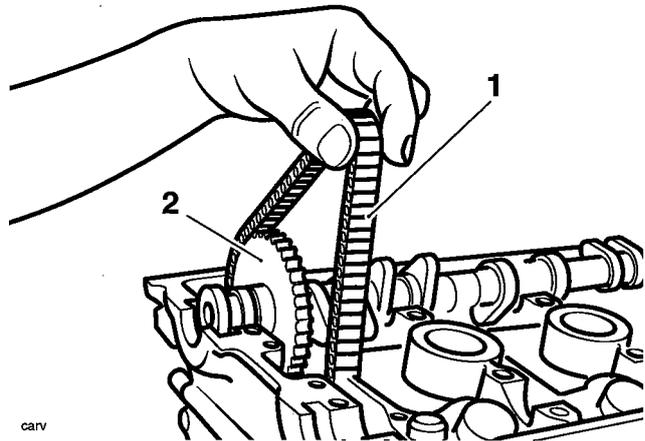
6. Progressively release the bolts securing the cam cap ladder to the head in the sequence shown below.



caqm

### Cam ladder bolt release sequence

7. Remove the cam cap ladder and collect the dowels (if loose) and spark plug tower O-rings.
8. Lift the cam chain from the exhaust camshaft sprocket and remove the exhaust camshaft.
9. Repeat the procedure for the inlet camshaft.

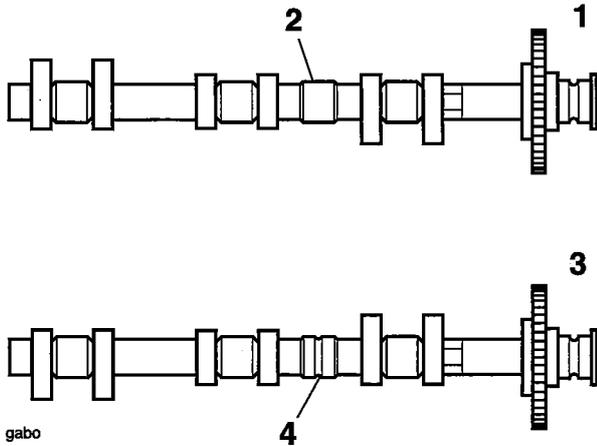


carv

1. Cam chain
2. Inlet camshaft

#### Note:

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



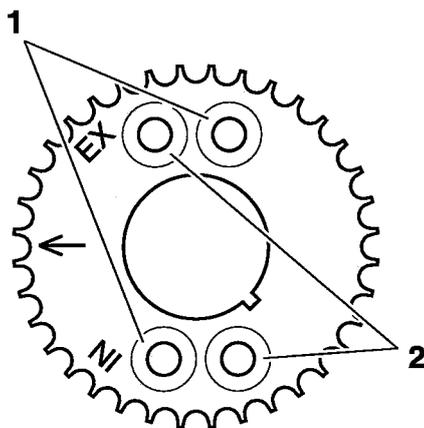
1. Exhaust Camshaft
2. Plain Section
3. Inlet Camshaft
4. Grooved section

## 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

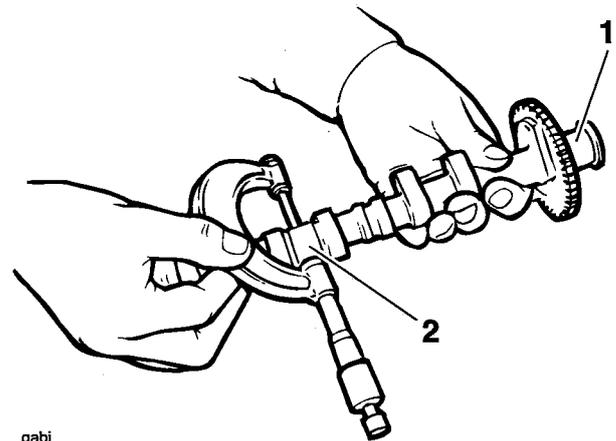
2. Measure the camshaft journals with a micrometer. If any journal is outside the specified tolerance, replace the camshaft.

## Outrigger Journal Diameter

Standard:	22.953 - 22.956 mm
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## Standard Journal Diameters

Standard:	22.93 - 22.96 mm
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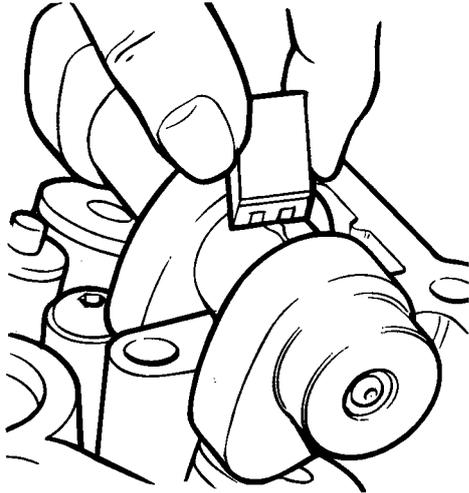
1. Outrigger Journal
2. Standard Journal

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 'Plastigage' (Triumph part number 3880150-T0301) as follows:
  5. Ensuring that the camshaft sprocket alignment marking is located as for removal, assemble one camshaft to the head and progressively tighten the bearing caps and cam cap ladder to **10 Nm**.
  6. Remove the cam cap and cam cap ladder using the bolt release sequence given earlier. Wipe the exposed areas of both the camshaft journal and a single cap or cap area of the ladder.
    - 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 Plastigage to fit across the camshaft journal. Fit the Plastigage to the camshaft journal using the grease to hold the strip in place.
    - Refit the cap and cam cap ladder then evenly and progressively tighten all the camshaft cap and ladder bolts to **10 Nm** in the correct sequence (see camshaft installation).
    - Release the cap bolts and remove the cap/ladder. Using the gauge provided with the Plastigage kit, measure the width of the now compressed Plastigage.

# Cylinder Head

## Note:

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



### Measuring The Compressed Plastigage.

7. Calculate the journal clearance using the Plastigage chart supplied with the Plastigage kit.

### Camshaft journal clearance, Standard

Standard:	0.040 - 0.091 mm
Service limit:	0.13 mm

### Camshaft journal clearance, Outrigger

Standard:	0.044 - 0.068 mm
Service limit:	0.13 mm

8. If the clearance measured is within the specified tolerance, remove the cap/ladder and clean off all traces of Plastigage. Assemble the camshafts.

## Note:

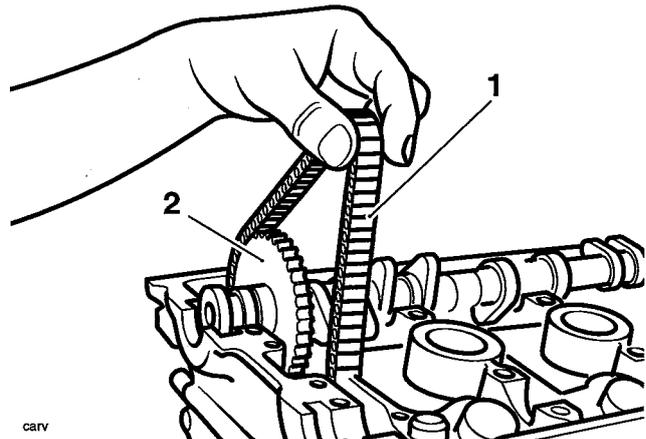
- If the measured clearance is outside the tolerance, and the camshaft journals are within tolerance, the cylinder head must be replaced.

### Caution

Although Plastigage 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 are 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 and ladder (that is, with the timing marks on the camshaft sprockets level and pointing inwards, and with the 'T1' mark on the sprag clutch in alignment with the line at the bottom of the cover).



### 1. Cam chain

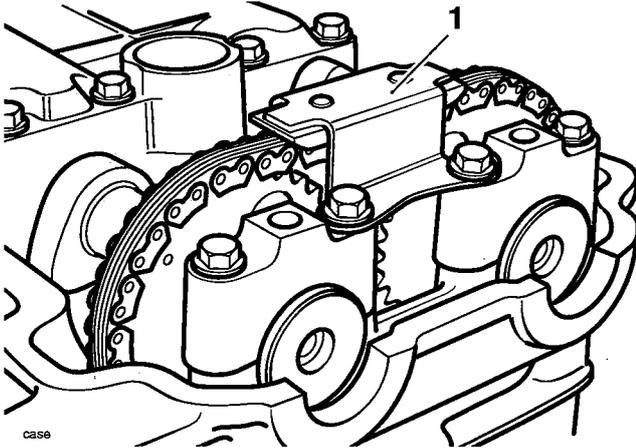
### 2. Inlet camshaft

4. Repeat the procedure for the other camshaft.

### Caution

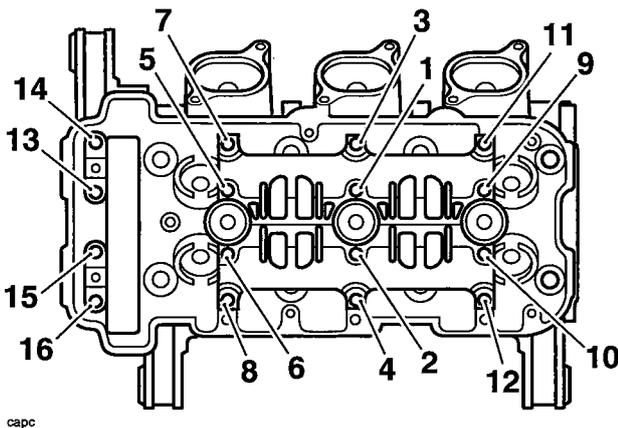
If the camshafts and caps/ladder are fitted without first aligning the timing marks on both the crankshaft and camshaft sprockets, the inlet and exhaust valves will contact each other causing damage to both the head and the valves.

- Assemble the cam caps, dowels, cam ladder and top pad in the same location and orientation as prior to removal.



### 1. Cam Chain Top Pad

- Fit and evenly tighten the cam cap screws to **10 Nm**, in the sequence shown below.



### Cam-cap and ladder bolt tightening sequence

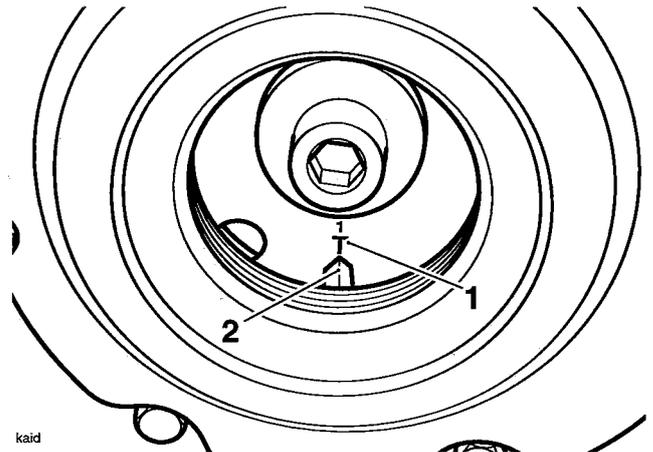
- Before fitting the cam chain tensioner, ensure that each camshaft rotates freely. Do not rotate either camshaft by more than 5°.

## ! 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.

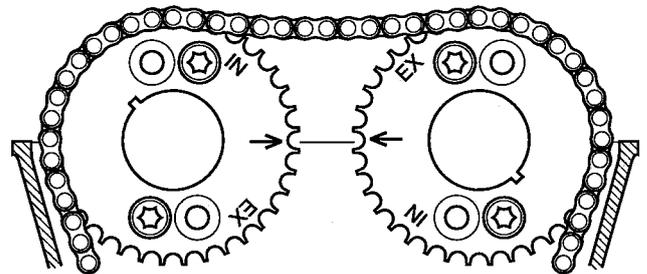
- Assemble the cam chain tensioner using the instructions given earlier in this section.

- Rotate the engine through 4 full revolutions, and reset number 1 cylinder to TDC. Ensure that the 'T1' mark on the sprag clutch aligns with the line at the bottom of the cover.



- 'T1' Mark
- Marker line

- Check that the camshaft timing marks align as illustrated below. Rectify any misalignment before proceeding.



gaaa

### Camshaft to Cylinder Head Alignment Marks

- Check the valve clearances. Adjust as necessary (see page 3-14).
- Refit the cam chain tensioner (see page 3-9).

### 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 tappet bucket, causing engine noise and improper running. If the valve clearances become too small, permanent damage to the valve and valve seat will take place. If the valve clearance becomes too great, the engine will become noisy and will not run correctly.

# Cylinder Head

## Valve Clearance Measurement

### Note:

- Valve clearance measurement must be carried out with the engine cold.
1. Remove the cam cover (see page 3-5).
  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.
  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.

Inlet:	0.10 - 0.20 mm
Exhaust:	0.20 - 0.30 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 seat and may cause serious engine damage.

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

## Typical Valve Clearance Chart

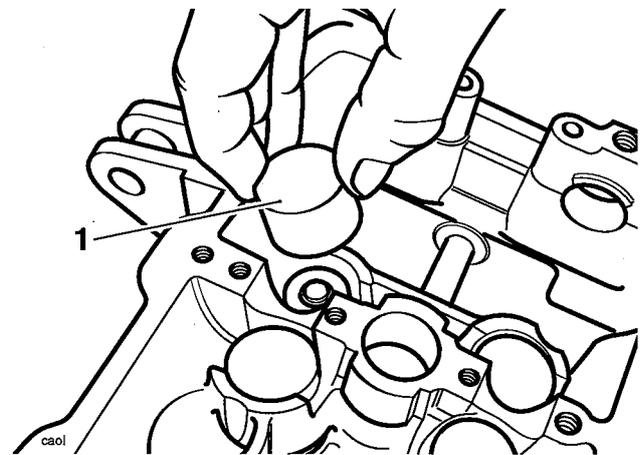
Inlet Valve No.	Gap Measured
1	as measured (mm)
2	as measured (mm)
3	as measured (mm)
4	as measured (mm)
5	as measured (mm)
6	as measured (mm)
Exhaust Valve No.	Gap Measured
1	as measured (mm)
2	as measured (mm)
3	as measured (mm)
4	as measured (mm)
5	as measured (mm)
6	as measured (mm)

## Valve Clearance Adjustment

### Note:

- To adjust the valve clearances the camshafts must be removed. Follow the camshaft removal procedure (see page 3-10).

1. Remove the camshafts (see page 3-10).
2. Remove the tappet bucket from the cylinder head.

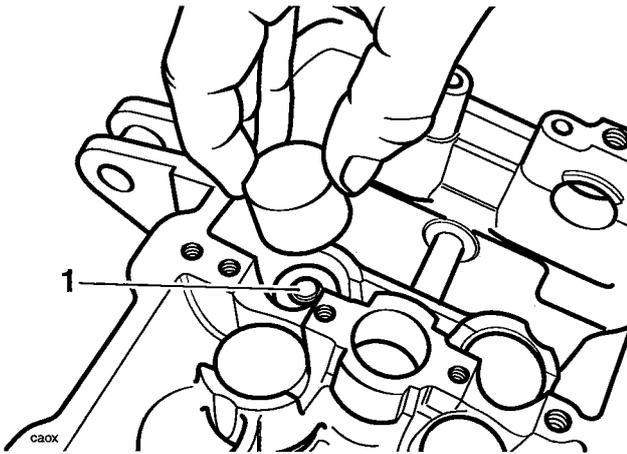


1. Tappet bucket

### Note:

- The shim may withdraw with the tappet bucket.

- Remove the shim from the valve head.



## 1. Shim

- Measure the original shim, using a micrometer and select the appropriate new shim as required.

Clearance too small:

- Fit a thinner shim.

Clearance too large:

- Fit a thicker shim.

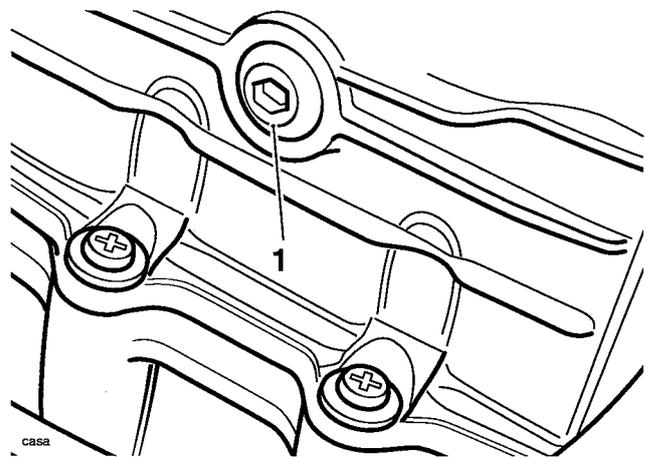
## Note:

- Shims are available ranging from 1.70 mm to 3.00 mm in increments of 0.025 mm.**
- Fit the new shim to the valve head.
  - Lubricate the tappet bucket(s) with a 50/50 solution of engine oil and molybdenum disulphide grease.
  - Refit the tappet bucket.
  - Refit the camshafts (see page 3-12).
  - Re-check all valve clearances.
  - Repeat the procedure if the valves require further adjustment.

## Cam Chain

### Removal

- Remove the camshafts (see page 3-10).
- Remove the starter gear cover (see page 7-20).
- Remove the right hand crank cover (see page 7-20).
- Remove the sprag clutch and drive gear (see page 7-20).
- Remove the bolt from the centre of the cam chain housing in the cylinder head.



### 1. Centre Bolt

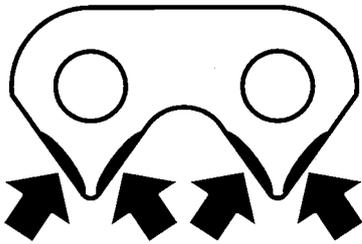
- The cam chain is removed from inside the head-space or through the crankcase, after first detaching the chain from the crankshaft gear.

# Cylinder Head

## Inspection

Visual in-situ checks can also be made as follows:

1. Check for significant blue discolouration of the chain plates indicating excessive heat build-up.
2. Examine all pins for signs of rotation.
3. Check for cracking or deep scratching of the chain plates.
4. Check for severe wear of the inner plates as indicated in the diagram below.



ccrv

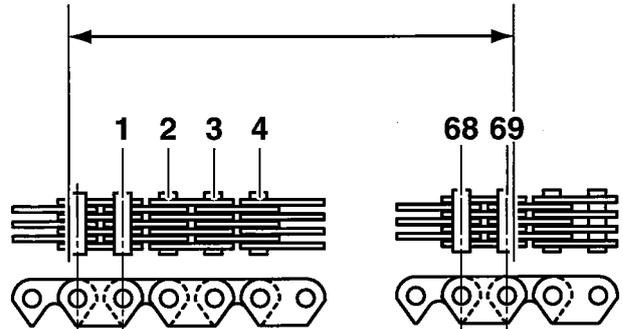
For a more thorough check, proceed as follows:

1. Remove the chain from the engine.
2. Suspend the chain from a pin or hook with a 13kg weight attached at the lower end.



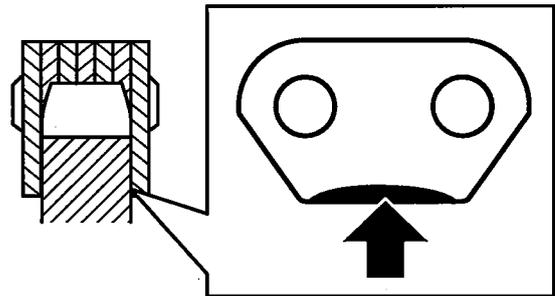
cajs

3. Measure across 69 links as shown in the diagram below. If the chain is within limits, the measurement should be no longer than 147.63 mm. Measurements beyond 147.63 mm indicate that the chain must be replaced.



cajt

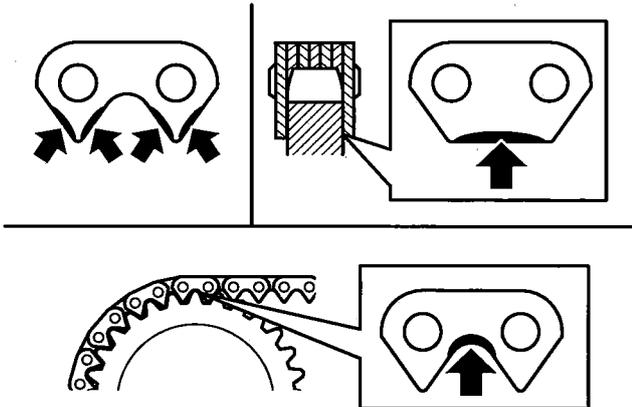
4. Check for severe wear of the inner surface of the outer plates at the side-contact points with the sprocket teeth.



ccru

5. Check for signs of stiffness or kinking.

6. Check for severe wear of the plates in the area shown below.



caju

If any of these symptoms are evident, the cam chain must be replaced.

## Installation

1. Fit the cam chain and locate the lower end around the crankshaft gear.
2. Refit the bolt to the centre of the cam chain housing in the cylinder head, tightening to **10 Nm**.
3. Refit the camshafts (see page 3-12).

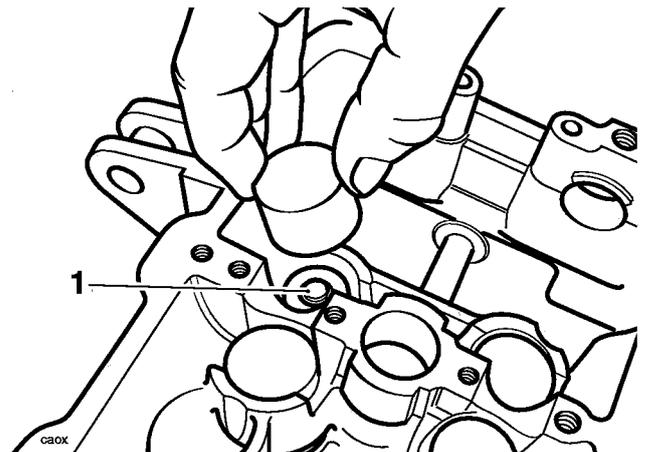
## Cylinder Head

### Removal

#### Note:

- The rubbing blades for the cam chain protrude from the crankcase such that removal of the head while in the frame is made extremely difficult and may lead to damage to the head, rubbing blades and frame.

1. Remove the engine from the frame (see page 9-2).
2. Remove the camshafts (see page 3-10).
3. Note the position of all tappet buckets and shims such that they can be refitted in the same positions. Remove all the tappet buckets and shims.



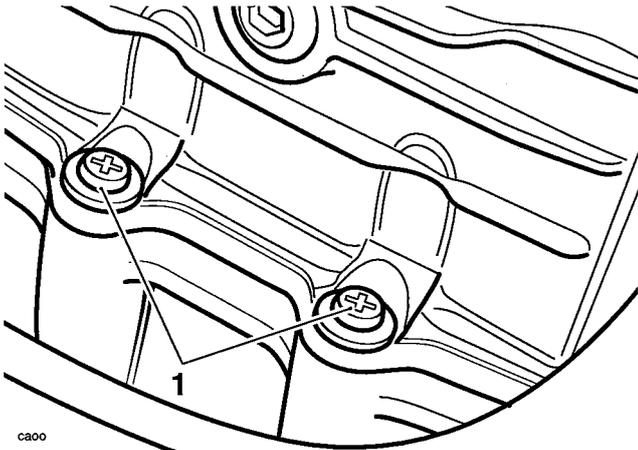
#### 1. Shim

#### Note:

- To prevent the tappet buckets and shims from becoming mixed, place the shim and tappet together in a marked container. The components must be refitted in their original positions.

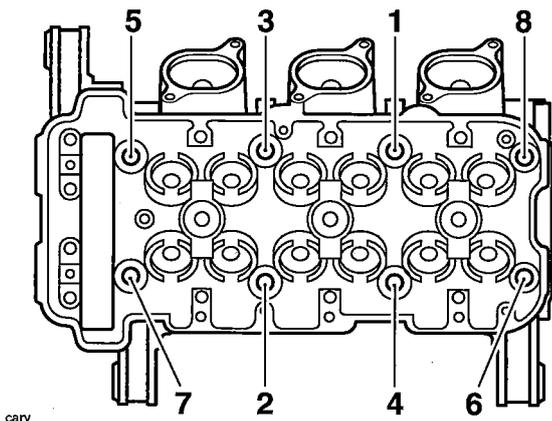
# Cylinder Head

- Release the screws securing the outside of the cylinder head to the upper crankcase.



## 1. Cylinder head to upper crankcase screws

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

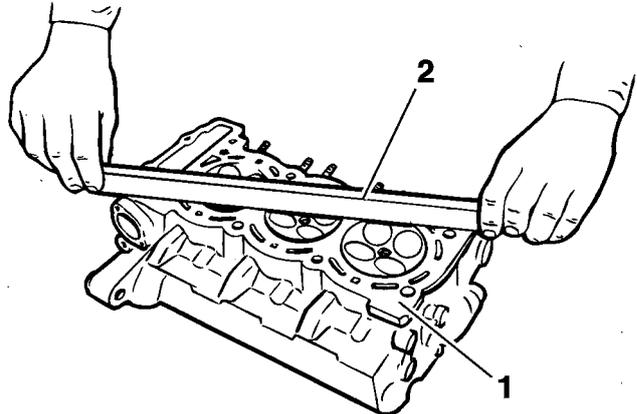


## Cylinder head bolt release sequence

- Lightly tap the cylinder head with a rubber mallet to break the seal of the gasket.
- Lift the head directly upwards until clear of the cam chain rubbing blades

## Inspection

- Thoroughly clean the surface of the head and check for damage and pitting of the combustion chambers.
- Using a straight edge, check the cylinder head gasket face for warp which could lead to gasket failure. Replace the head if warped.



gabp

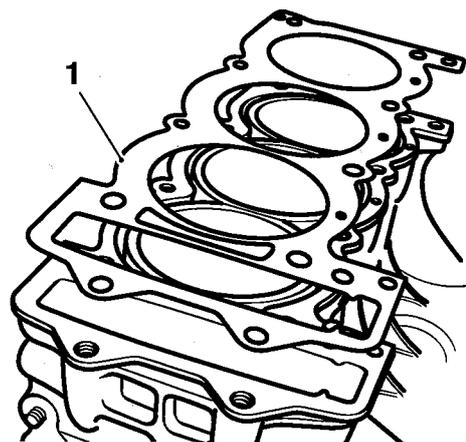
## 1. Straight edge

## 2. Cylinder head gasket face

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

## Installation

- 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.



cart

## 1. Cylinder Head Gasket

- Ensure that the cylinder head face is completely clean.
- If removed, install the cam chain rubbing strips.

- Carefully lower the cylinder head over the cam chain and rubbing strips and locate the head onto the dowels.

## Caution

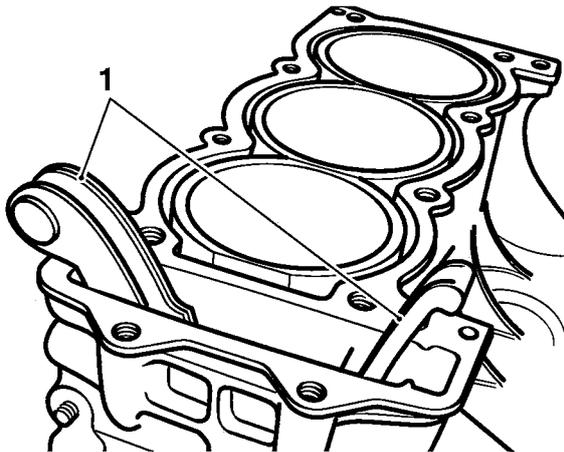
Using the correct procedure to fit and tighten the cylinder head bolts will ensure the long term reliability of the cylinder head gasket.

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.



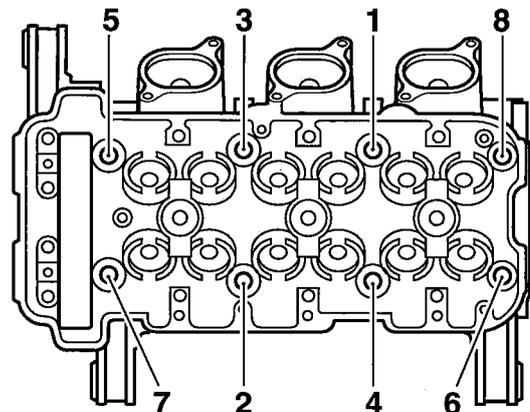
### 1. Rubbing strips

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

#### Note:

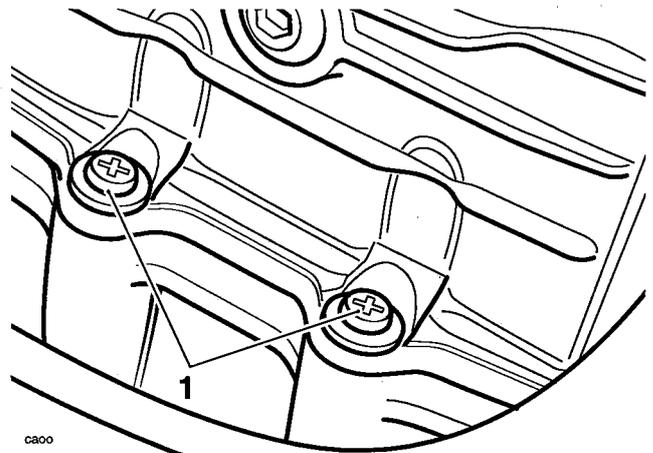
- For stages A and B of the head bolt tightening operation, a torque wrench of known, accurate calibration must be used.
- A:** Tighten the head bolts, in the same numerical sequence used to release the bolts, to 20 Nm.
- B:** Tighten the head bolts in the same numerical sequence used to release the bolts, to 35 Nm.

- 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.



### Cylinder head bolt tightening sequence

- Fit the screws securing the side of the cylinder head to the crankcase and tighten to 10 Nm.



### 1. Cylinder head to upper crankcase screws

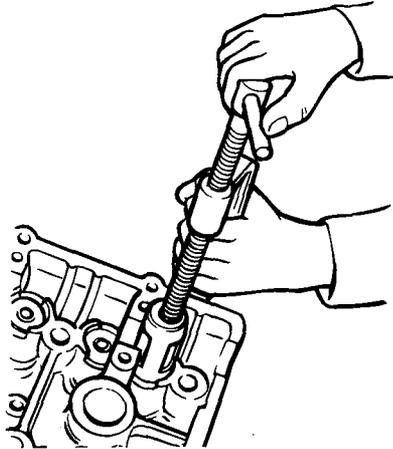
- Clean and lubricate the tappet buckets with clean engine oil and refit the buckets and shims in the same locations from which they were removed.
- Refit the cam shafts (see page 3-12).
- Install the engine to the frame (see page 9-5).

# Cylinder Head

## 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 spring
  - valve stem seal
  - spring platform
  - valve (de-burr before removal)

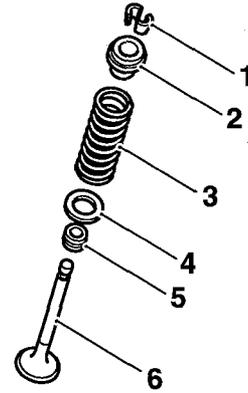


carr

1. Valve stem seal

#### Note:

- Ensure inlet and exhaust valve components do not become mixed.



ccrx

1. Collets
2. Valve spring retainer
3. Valve spring platform
4. Valve spring base
5. Stem oil seal
6. 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 spring platform to the valve spring recess in the head.
3. Fit the valve stem seal over the valve stem and, using a suitable tool, press down fully until the seal is correctly seated over the valve guide.

#### Note:

- During fitment of the valve stem seal, two distinctly different degrees of resistance will be noted when the seal is correctly fitted.
- Firstly, press the seal down the valve stem until the lower side of the seal comes into contact with the valve guide. Greater resistance is felt at this contact point and further gentle pressure is then required to locate the seal over the top end of the valve guide.
- On application of this pressure, the seal can be felt to positively locate over the top face of the valve guide. Once correctly positioned, the seal cannot be pushed down any further.



## Caution

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

4. Install the valve spring over the valve stem.
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 Stem to Guide Clearance

Inlet:	0.010 - 0.040 mm
Exhaust:	0.030 - 0.060 mm

### 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.

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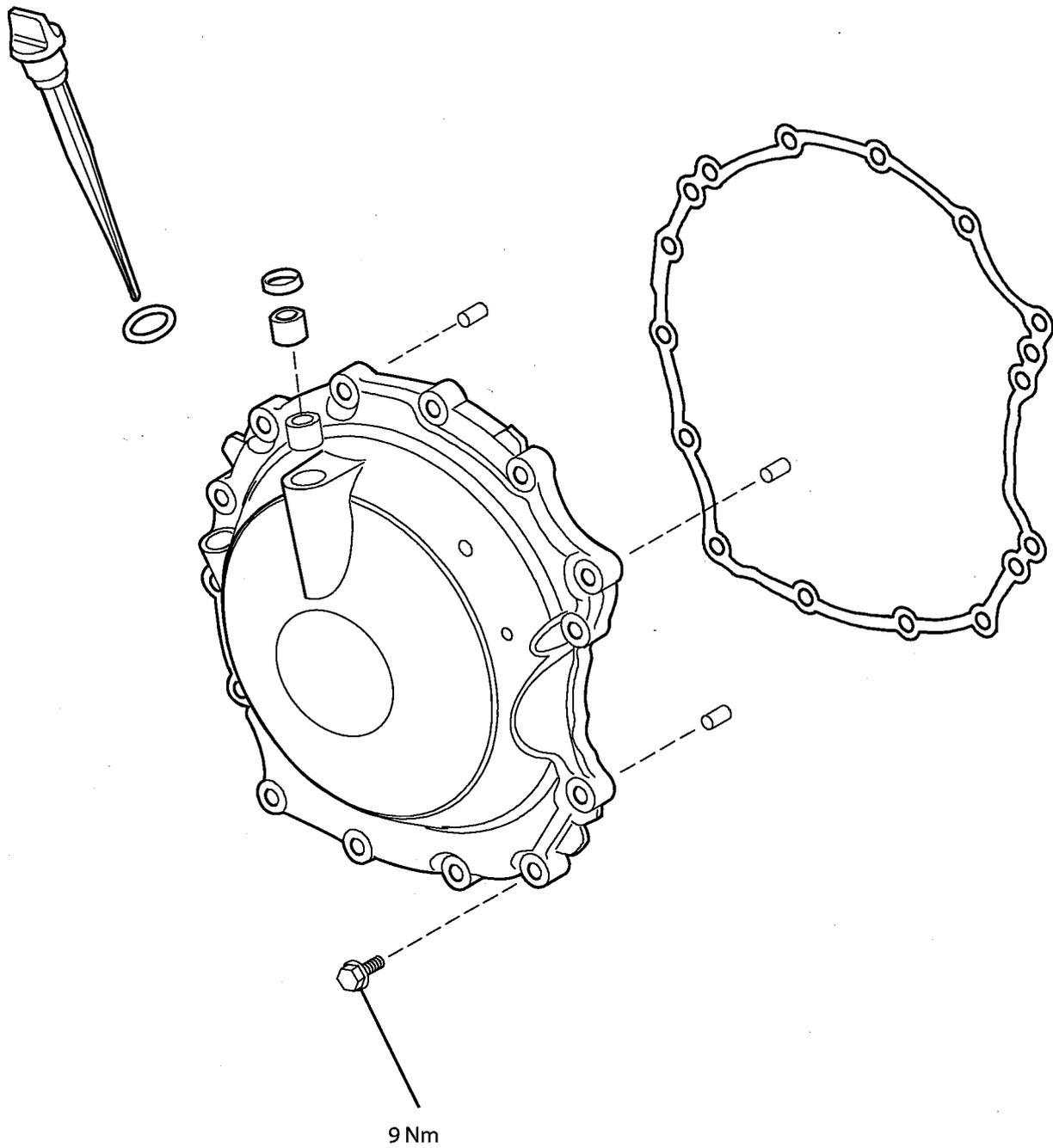
# 4 Clutch

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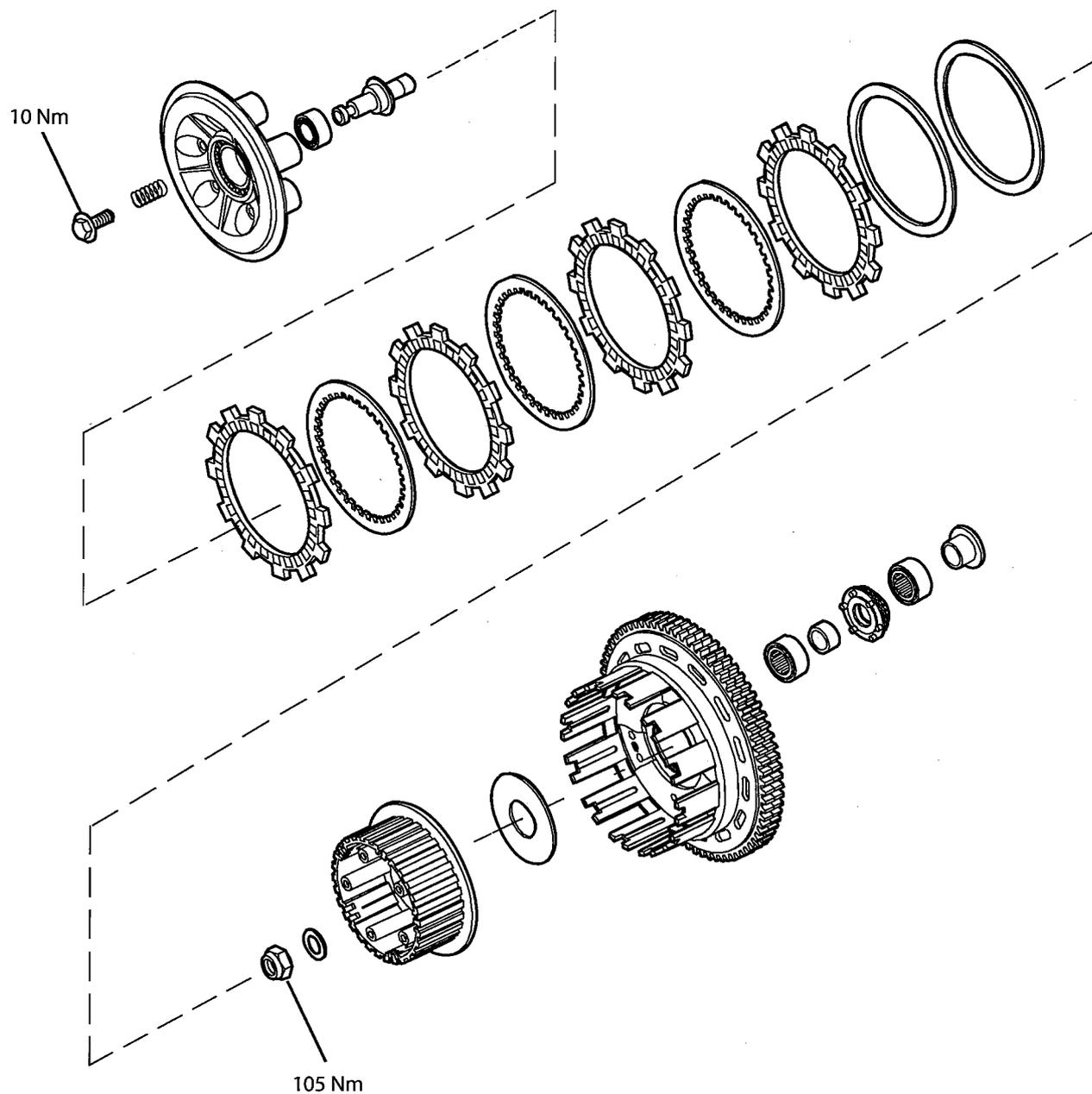
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# Clutch

## Exploded View - Clutch Cover

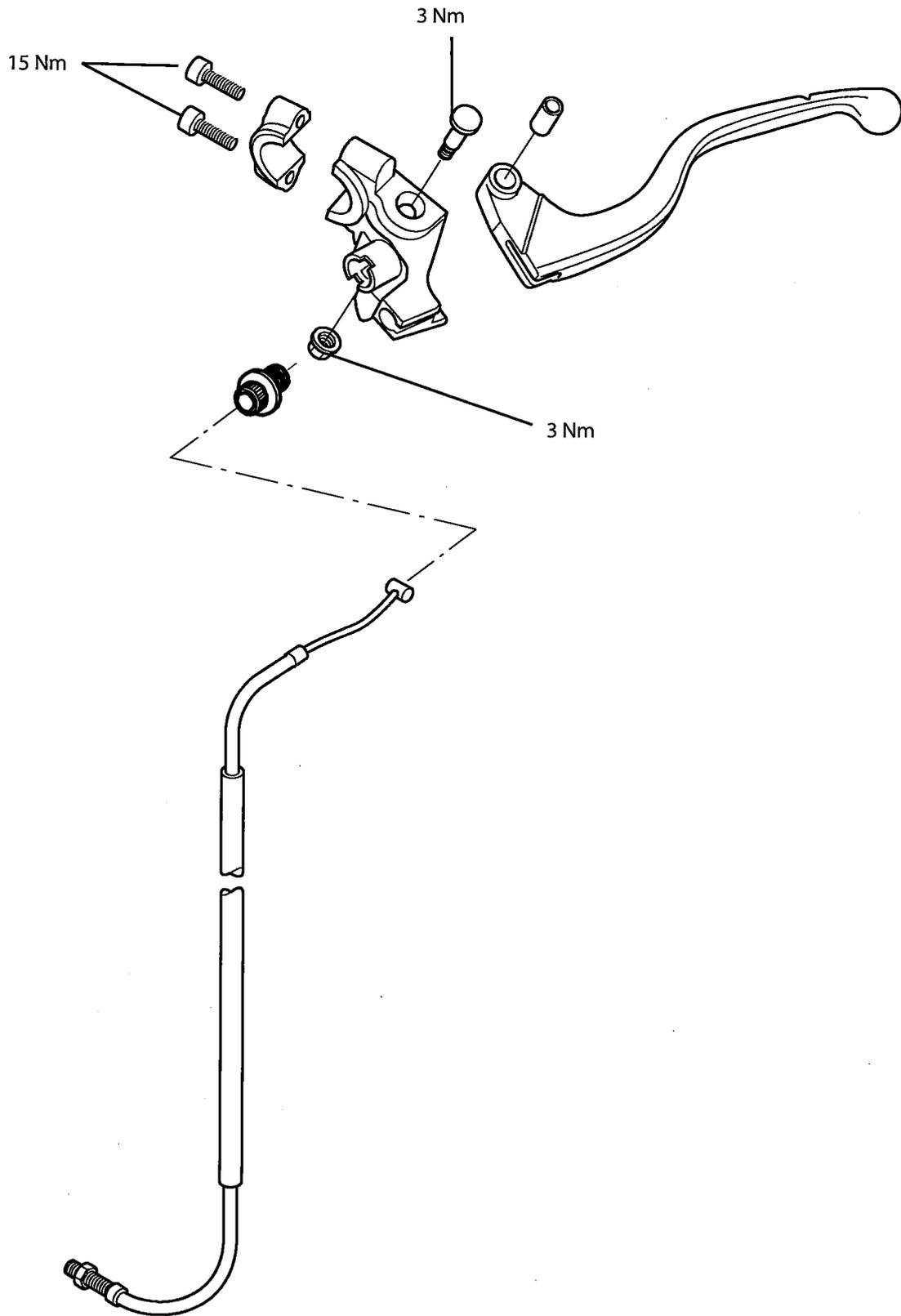


Exploded View - Clutch Assembly



# Clutch

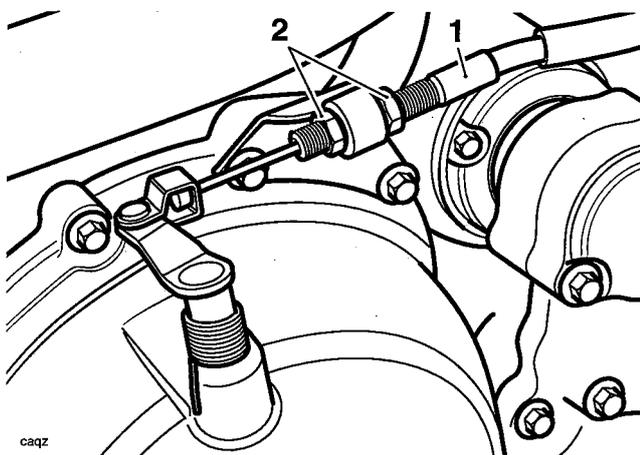
## Exploded View - Clutch Controls



## Clutch Cable

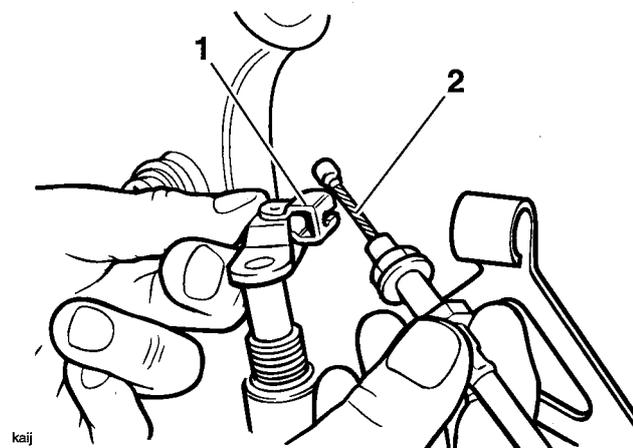
### Removal

1. Remove the seat (see page 16-8).
2. Disconnect the battery (see page 17-8).
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

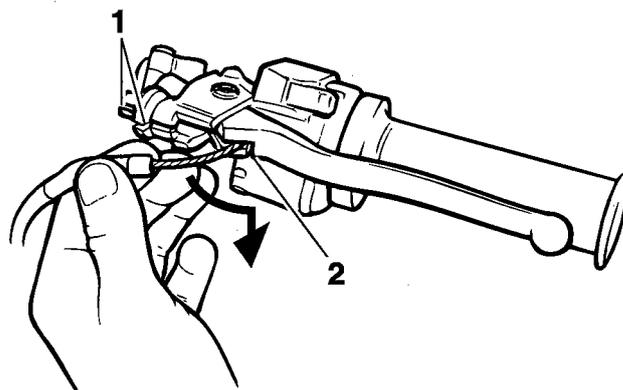
4. Release the clutch cable from the actuating arm by pushing the inner cable nipple through the arm and sliding the cable out of the slot. Detach the cable from the bracket.



1. Actuating Arm
2. Inner Cable

5. Align the lever 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.



gaaU

1. Nut/locknut Slots
2. Cable Release Point

7. Remove the cable from the motorcycle noting the cable routing, particularly where it passes through the air deflector shield.

### Inspection

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.

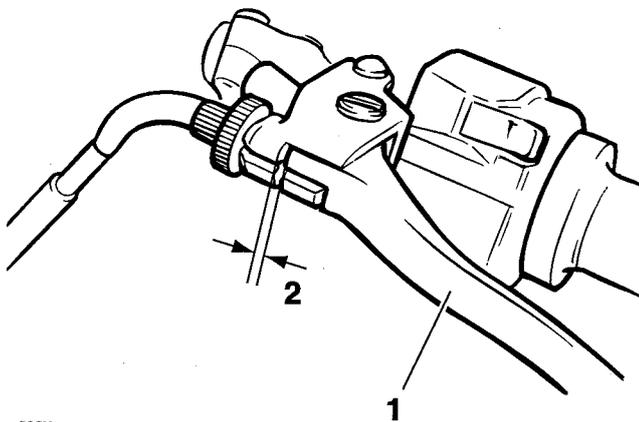
# Clutch

## 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. Tighten the locknut.
  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 2-3 mm of free-play at the lever by turning the adjuster nut and locknut at the lever end. Secure the setting with the knurled locknut.



gaav

### 1. Clutch Lever

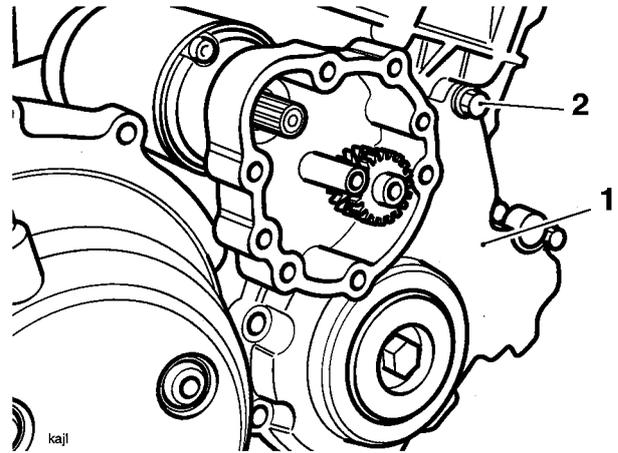
### 2. Correct Setting, 2-3 mm

8. Reconnect the battery positive (red) lead first.
9. Refit the seat (see page 16-8).

## Clutch

### Disassembly

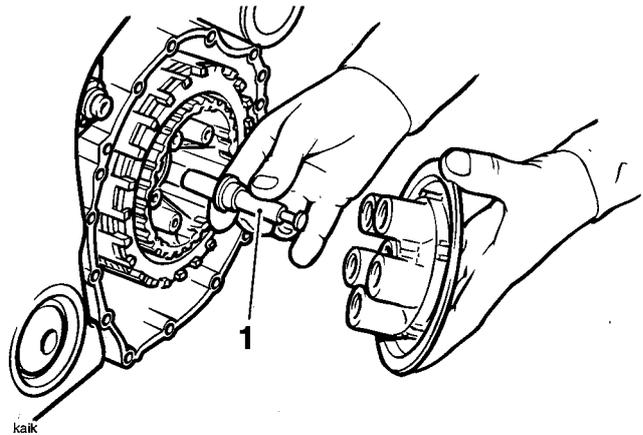
1. Release the clutch cable from the actuating arm (see page 4-5).
2. Remove the starter cover, right hand crank cover and associated starter gears to gain access to the clutch cover bolt at the centre-right hand side.



### 1. Right hand crank cover (starter cover removed)

### 2. Aluminium washer position

3. Remove the clutch cover.
4. Undo the bolts and springs and remove the clutch pressure plate.
5. Remove the clutch pull rod.

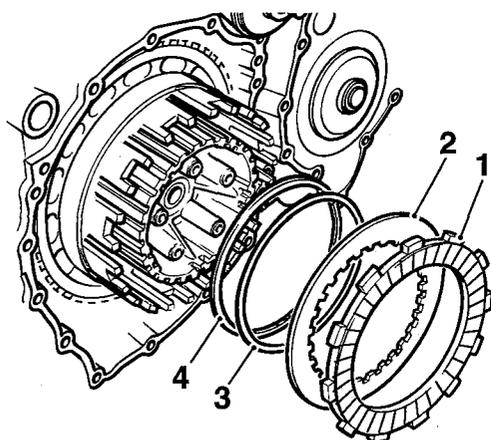


### 1. Clutch pull rod

- Remove all the clutch friction plates and steel plates together with the anti-judder spring and anti-judder seat washer.

**Note:**

- Record the orientation of all components as they are removed. The plates must be assembled in the same order.



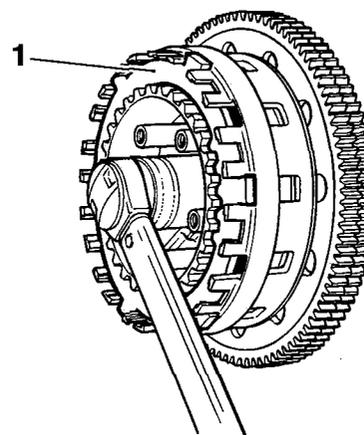
kain

- Friction Plate
- Steel Plate
- Anti-judder Spring
- 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 thicker and are also darker in colour.
- Refer to the following page of this section for details of clutch friction plate checking.
- 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:

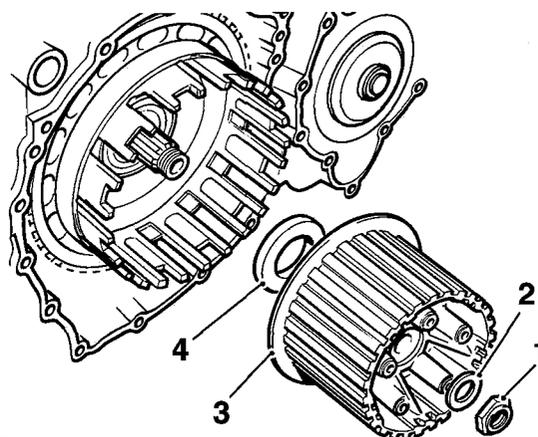
- Engage second gear and lock the inner and outer clutch drums together using service tool T3880305.



gaaz

**1. Service Tool T3880305**

- Depress the rear brake pedal to prevent the engine from turning, then release the clutch centre nut.
- Remove the centre nut, Belleville washer, clutch inner drum and thrust washer.

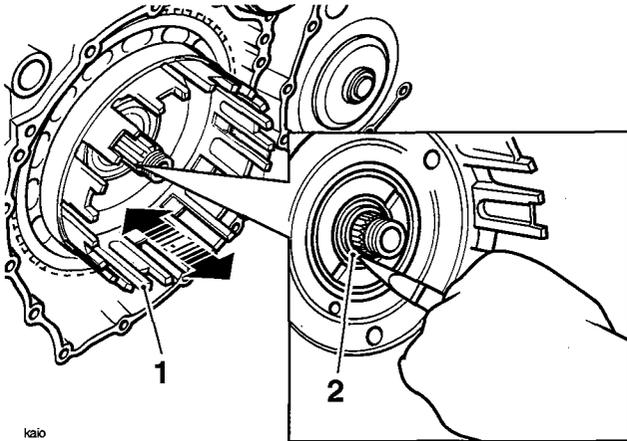


kain

- Centre Nut
- Belleville Washer
- Inner Drum
- Thrust Washer

# Clutch

10. Slide the clutch outer drum assembly gently backwards and forwards to dislodge the inner bearing sleeve. Carefully remove the bearing sleeve while supporting clutch drum.



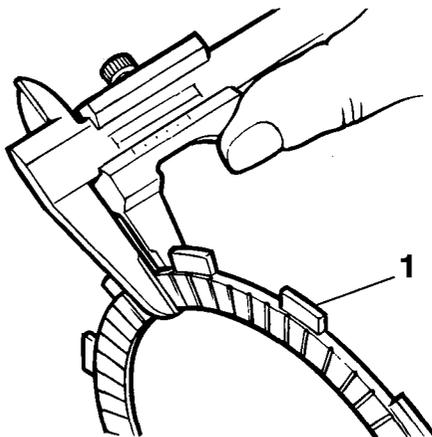
1. Outer drum  
2. Bearing sleeve

11. Remove clutch outer drum leaving the oil pump drive sprocket, bearing and sleeve in place on the input shaft.

## Friction Plate Inspection

### Thickness

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 - inner and outermost plates

Standard	3.80 mm
Service limit	3.60 mm

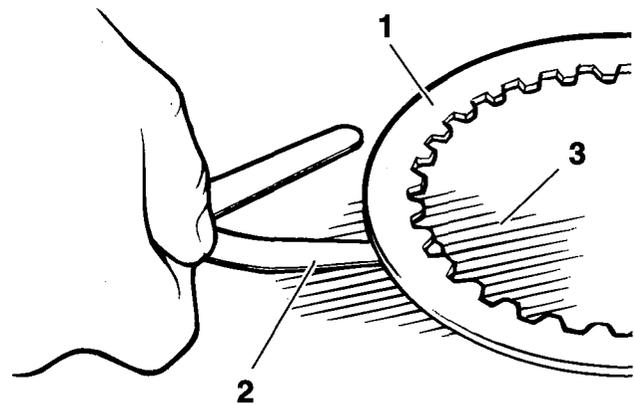
### Friction plate thickness - all other plates

Standard	3.30 mm
Service limit	3.10 mm

### Bend/warp

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.



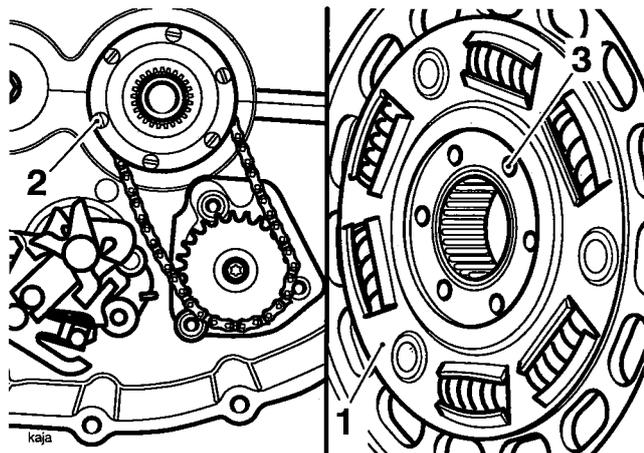
1. Friction Plate  
2. Feeler Gauge  
3. Surface Plate

### Friction plate bend/warp

Standard	up to 0.15 mm
Service limit	0.20 mm

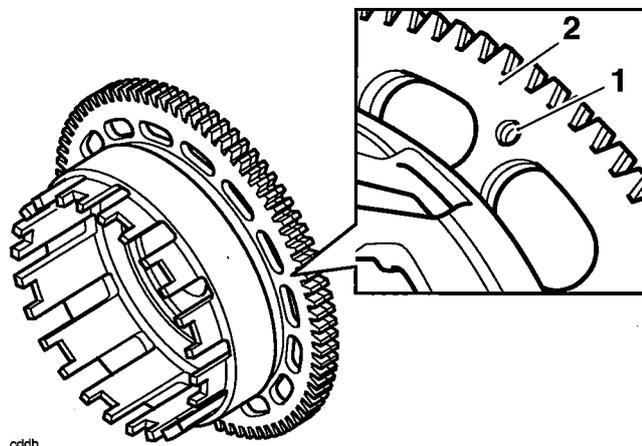
## Assembly

1. Position the clutch outer drum assembly to the input shaft and align the oil pump drive pegs with the corresponding holes in the rear of the clutch outer drum.



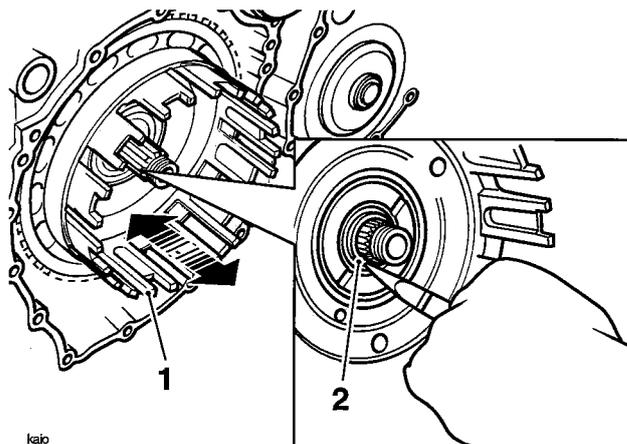
1. Clutch outer drum
2. Oil pump sprocket drive pegs
3. Oil pump drive holes

2. To fully engage the outer drum, insert a suitable tool to preload and align the primary gear and backlash eliminator gear through the hole shown in the illustration below.



1. Alignment hole
2. Outer drum

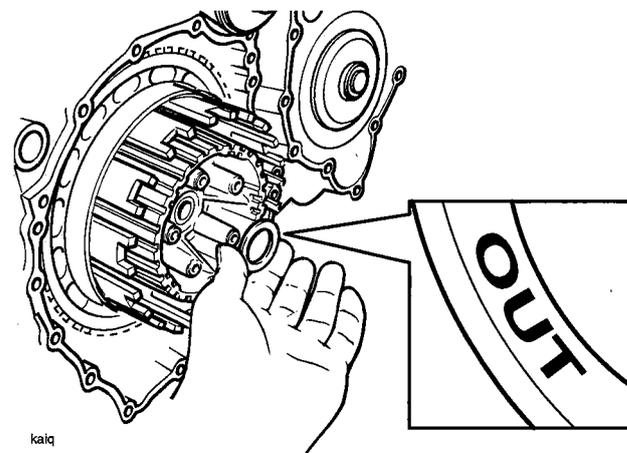
3. While holding the clutch outer drum in position and ensuring correct engagement with the oil pump drive, refit the bearing sleeve.



1. Outer drum
2. Bearing sleeve

### Note:

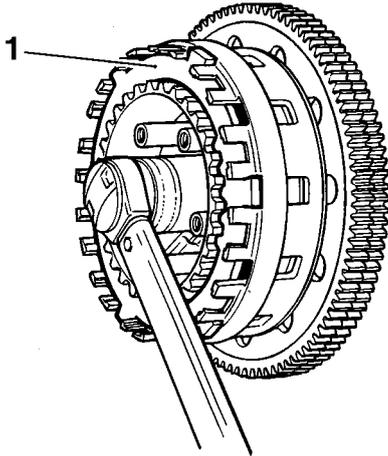
- When the bearing sleeve is correctly fitted, it will be a flush fit with the clutch drum face. In addition, a groove around the input shaft will be visible.
4. Fit the thrust washer to the shaft.
  5. Fit the clutch inner drum.
  6. Fit a new Belleville washer ('out' mark facing outwards), and refit the centre nut.



**Belleville Washer 'Out' Mark**

# Clutch

- 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.



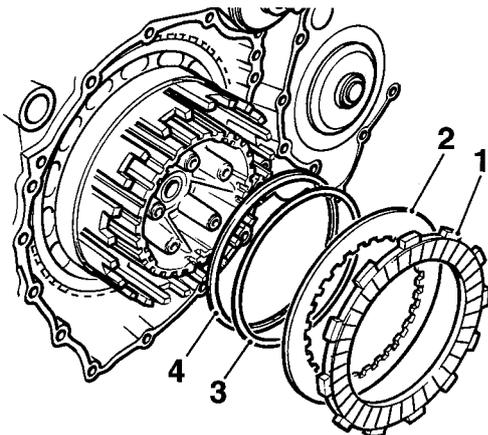
gaaz

## 1. Service Tool T3880305

- Disengage second gear and check for free rotation of the clutch inner drum.
- Coat 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 innermost and outermost friction plates are different to the remainder. For identification, they are darker in colour and are thicker.
- 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.



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- Outer Clutch Friction Plate
- Outer Drum
- Individual Tags

- Refit the clutch pullrod.
- Refit the clutch pressure plate together with the springs and bolts. Tighten the bolts to **10 Nm**.

## Note:

- The pull rod should be free to move in and out and also it should be free to turn.
- Clean and refit the clutch cover incorporating a new gasket. Tighten the clutch cover bolts to **9 Nm**.
  - Refit the starter cover and gears (see page 7-22).
  - Refit the outer cable to the adjuster bracket at the clutch end (see page 4-6).
  - Set the clutch adjustment (see page 4-6).

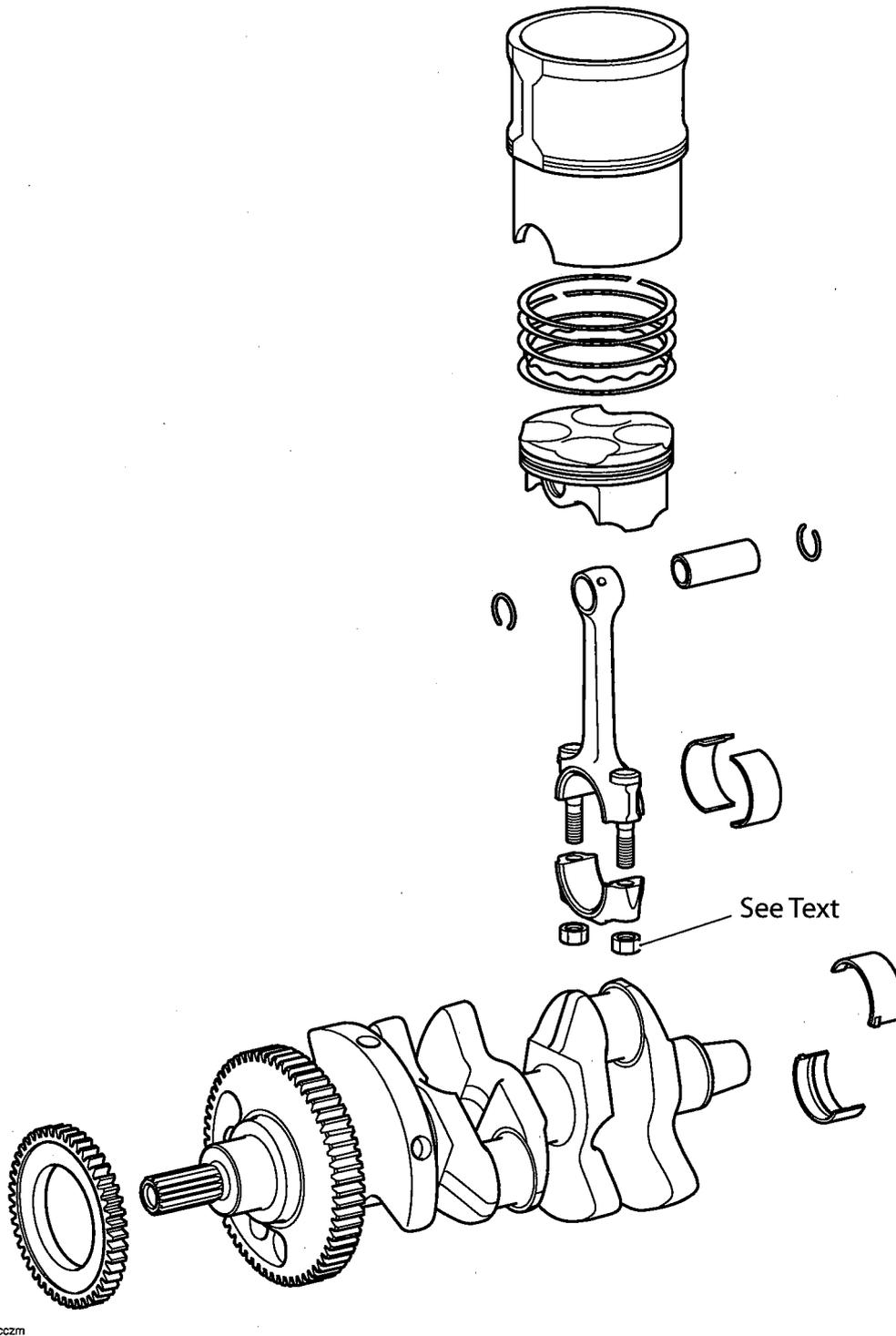
# 5 Crankshaft, Connecting Rods and Pistons

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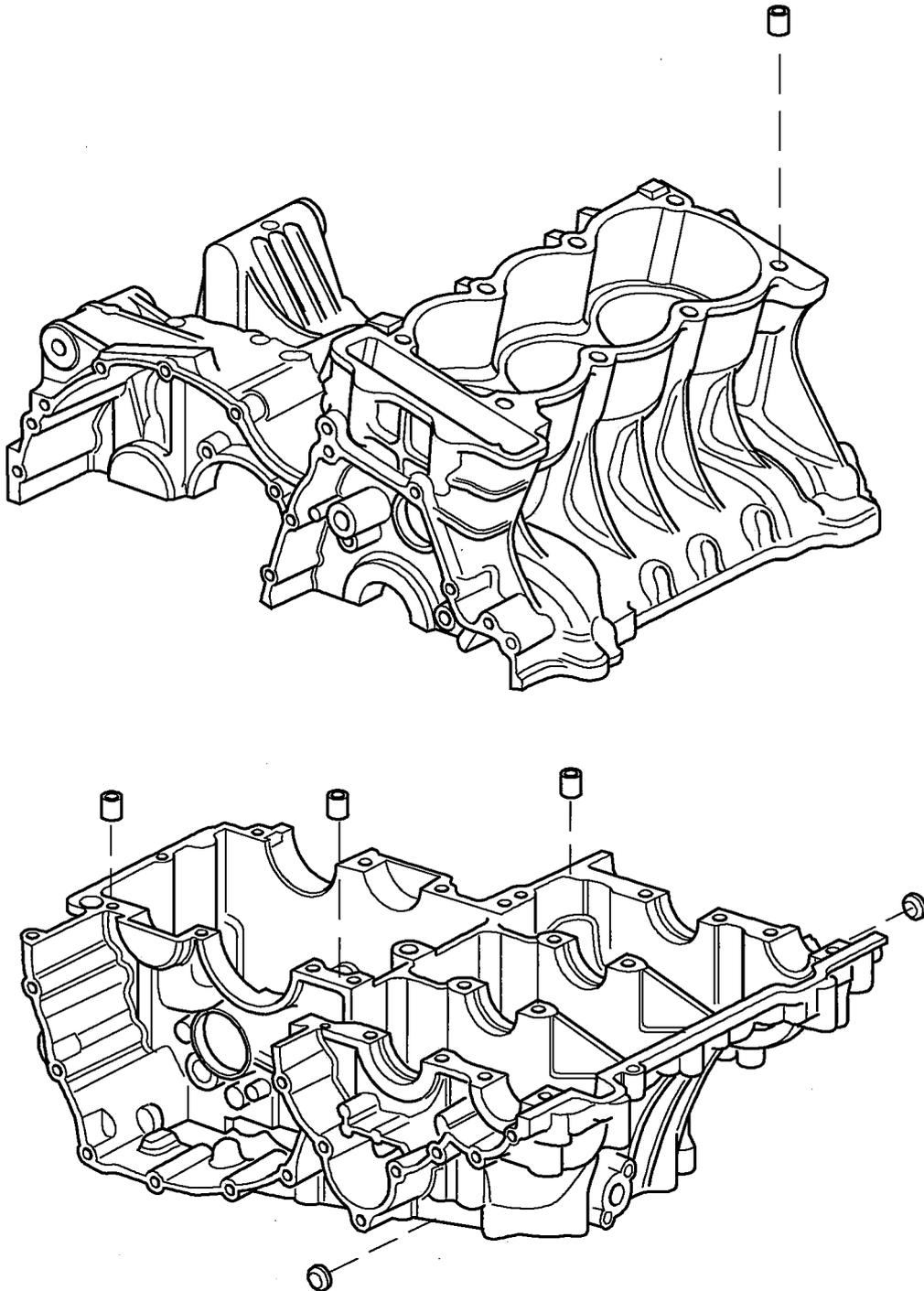
# Crankshaft, Connecting Rods and Pistons

## Exploded View - Crankshaft, Connecting Rod, Piston and Liner



# Crankshaft, Connecting Rods and Pistons

## Exploded View - Crankcase



# Crankshaft, Connecting Rods and Pistons

## Crankcases

### ! Caution

The upper and lower crankcases are machined as a matched set and must never be assembled to non-matching halves. Doing so may cause seizure of the engine.

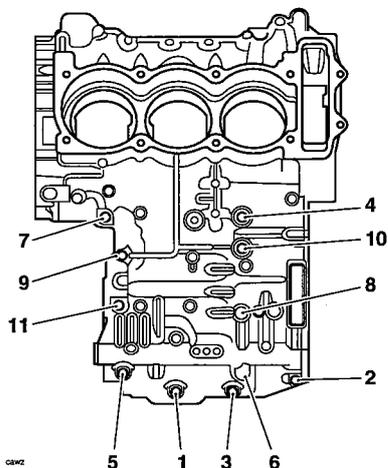
1. Remove the engine from the frame (see page 9-3).
2. Remove the sump (see page 8-11).
3. Remove the engine covers.
4. Remove the clutch (see page 4-6).
5. Remove the oil pump drive chain and gears (see page 8-9).

## Disassembly

### ! Caution

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

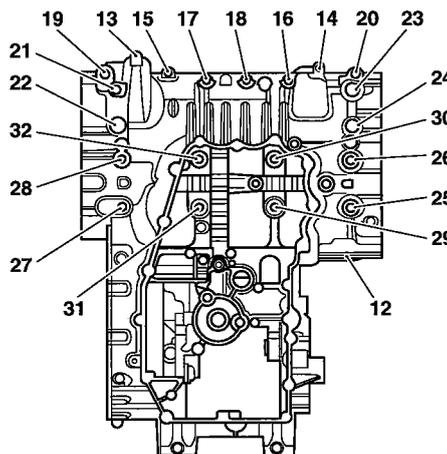
1. Working on the upper crankcase bolts first, release the bolts in the sequence shown below.



### 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, balancer, crankshaft, bearings etc. can be removed.

#### Note:

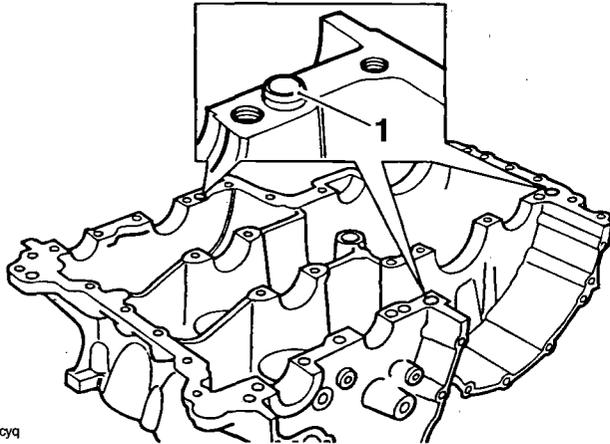
- The position of each individual bearing screw prior to removal.

## Assembly

1. Use high flash-point solvent to clean the crankcase mating faces. Wipe the surfaces clean with a lint-free cloth.
2. Fit the gearbox shafts (if removed), ensuring the locating ring on the input shaft is in position in the circlip groove on the crankcase.
3. Ensure that the transmission is in neutral.

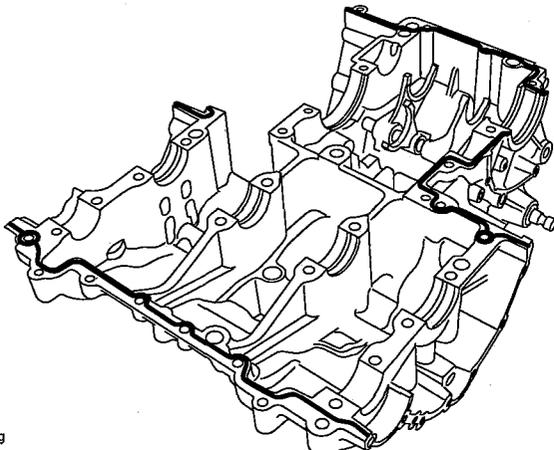
# Crankshaft, Connecting Rods and Pistons

4. Ensure that the 3 locating dowels are in position in the upper crankcase.



## 1. Locating dowels

5. Apply a thin bead of silicone sealant to the lower crankcase mating faces. (At the factory, Three Bond 12155 is used).



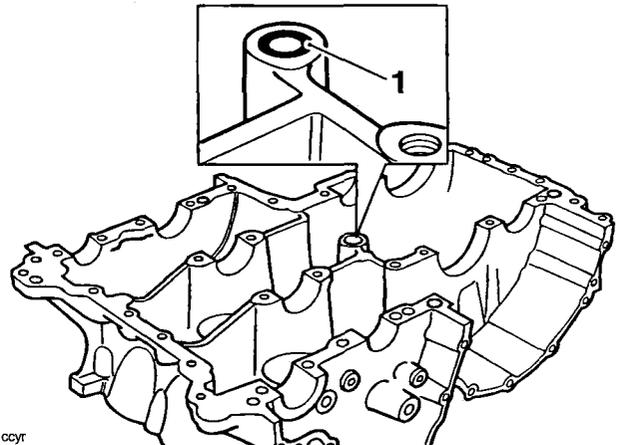
## 1. Sealer areas

### **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. Install and lubricate the crankshaft bearing shells with clean engine oil (see bearing selection before proceeding).
7. Lubricate the crankshaft journals with clean engine oil.

8. Locate a new oil gallery O ring to the upper crankcase.



## 1. O ring

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.
10. Fit the screws into the lower crankcase and hand tighten until the bolt heads are near contact with the crankcase.
11. Invert the engine.
12. Fit the screws into the upper crankcase and hand tighten until the bolt heads are near contact with the crankcase.

### Note:

- The crankcase screws are tightened in stages.
- Two different sizes of crankcase screw are used. All screws are tightened through the first stage of the tightening procedure but only the M8 size screws are tightened at the second stage.

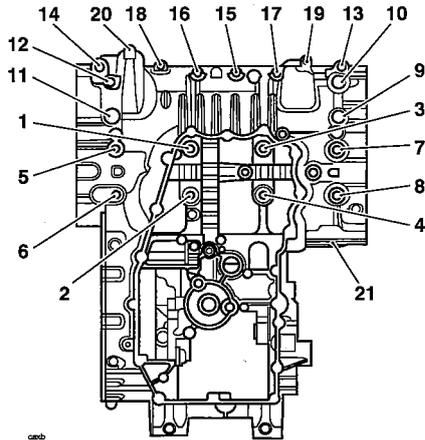
### **Caution**

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

# Crankshaft, Connecting Rods and Pistons

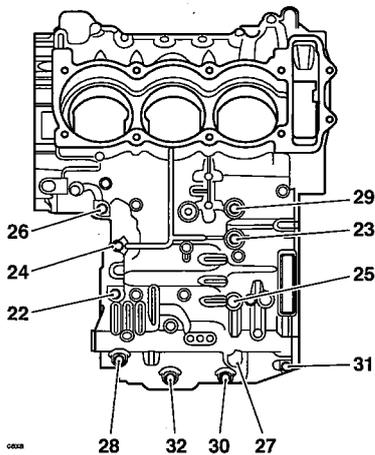
## Stage 1 - all screws

1. Invert the engine.
2. In the correct sequence, tighten all lower crankcase screws to **12 Nm**.



## Lower Crankcase Bolt Tightening Sequence

3. Invert the engine.
4. In the correct sequence, tighten all upper crankcase screws to **12 Nm**.



## Upper Crankcase Bolt Tightening Sequence

### Stage 2 - M8 screws only

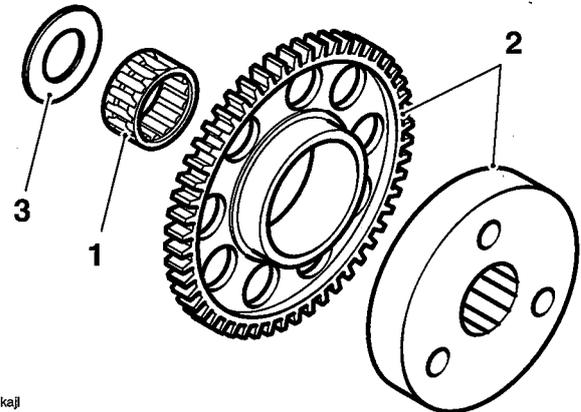
1. In the correct sequence, tighten only the M8 size upper crankcase screws (numbers 22 to 29) to **28 Nm**.
2. Invert the engine.
3. In the correct sequence, tighten only the M8 size lower crankcase screws (number 1 to 14) to **28 Nm**.
4. Rotate the crankshaft clockwise. Check for tight spots and rectify as necessary.
5. Refit the oil pump drive chain and gears (see page 8-10).
6. Refit the clutch (see page 4-9).

7. Refit the engine covers.
8. Refit the sump.
9. Install the engine in the frame (see page 9-5).

## Crankshaft

### Removal

1. Remove the sprag clutch (see page 7-20).



1. Needle roller bearing
2. Gear/sprag clutch assembly
3. Plain washer

2. Remove the alternator rotor from the crankshaft (see page 17-14).
3. Separate the two halves of the crankcase (see page 5-4).
4. Remove the connecting rods (see page 5-7).
5. Remove the cam chain (see page 3-15).
6. Release and remove the crankshaft from the upper crankcase.

### Note:

- Identify the location of each bearing shell.
  - Remove all bearings and inspect for damage, wear, overheating (blueing) and any other signs of deterioration. Replace the bearings as a set if necessary.
7. Remove the balancer (see page 6-3).

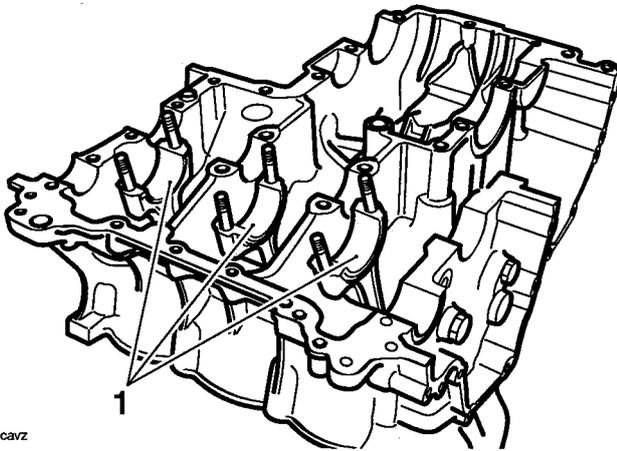
# Crankshaft, Connecting Rods and Pistons

## Installation

### Caution

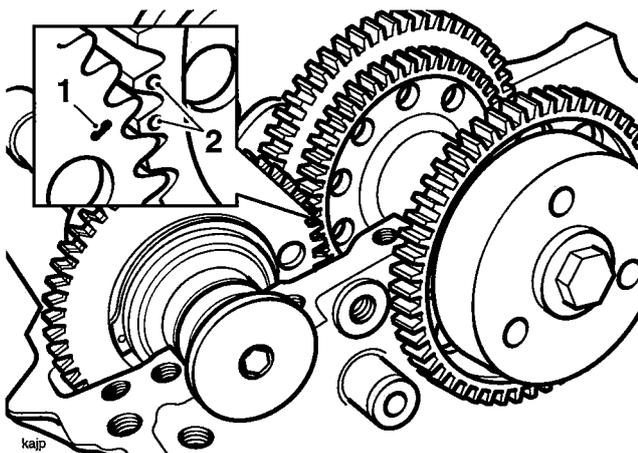
Always check the bearing journal clearance (see page 5-11), before final assembly of the crankshaft. Failure to correctly select crankshaft bearings will result in severe engine damage.

1. Select and fit new main and big end shell bearings using the selection processes detailed later in this section.



### 1. Big end shells

2. Lubricate all bearings with engine oil.
3. Ensure that the crankshaft is clean, and that the oilways within the crank are clean and free from blockages and debris.
4. Refit the balancer (see page 6-4).
5. Install the crankshaft ensuring that the crank pins align with the big ends and that the crankshaft and balancer gear markings align as shown in the next illustration.



1. Balancer backlash and drive gear markings
2. Crankshaft markings

6. Refit the connecting rods (see page 5-8).

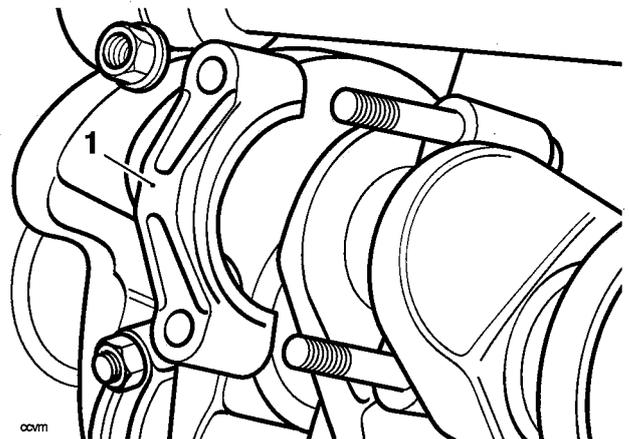
7. If removed, refit the transmission shafts.
8. Assemble the crankcases (see page 5-4).
9. Assemble the alternator rotor (see page 17-15).
10. Assemble the sprag clutch (see page 7-22).
11. Assemble the cam chain (see page 3-17).

## 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.

1. 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.
2. 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.
3. Push the connecting rod up through the crankcase and collect the piston and connecting rod from the top.
  4. Label the assembly to identify the cylinder from which it was removed.

# Crankshaft, Connecting Rods and Pistons



## 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.

5. Remove the liner using tool T3880315 (see page 5-15).
6. Detach the piston from the connecting rod (see page 5-12).

## 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.**



## Warning

Connecting rod bolts and nuts **MUST** only be used once. If the bolts or nuts are removed or undone for any reason, new bolts and nuts **MUST** always be used.

Re-using bolts can cause connecting rods and their caps to detach from the crankshaft causing severe engine damage, loss of motorcycle control and an accident.

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

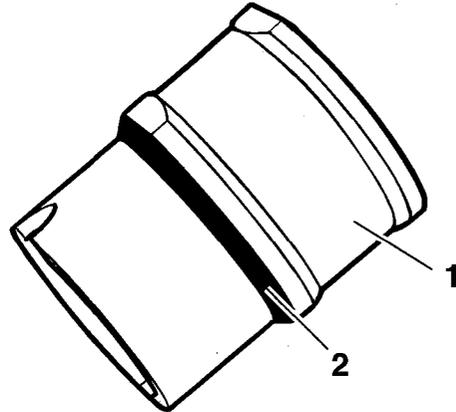
### Note:

- **Ensure the piston is fitted correctly to the connecting rod.**
  - **If a previously run engine is being rebuilt, always ensure that the piston and con-rod are assembled in the same orientation as prior to strip-down.**
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.



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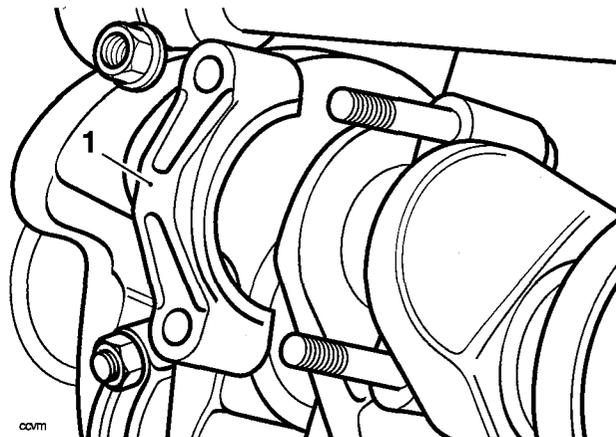
### 1. Liner

### 2. Sealer Area

4. Fit the piston and connecting rod assembly into the liner from the bottom.
5. Fit the liner into the crankcase ensuring that the arrow/dot on the piston faces forward.

### Note:

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



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### 1. Big End

6. Select big end bearing shells (see page 5-9).
7. Lubricate both halves 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:

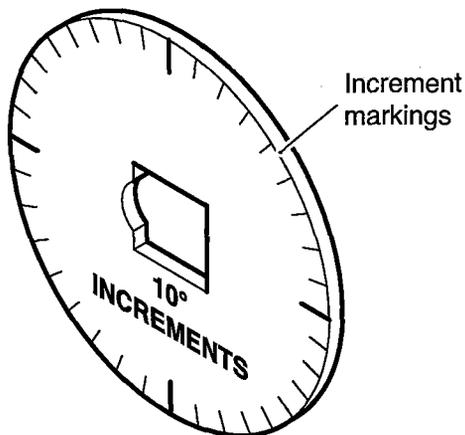
# Crankshaft, Connecting Rods and Pistons

9. Lubricate the threads of the bolt and the face of the nut with molybdenum disulphide grease. Tighten the nuts progressively in five stages as follows:

## ! 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.

- Tighten to **22 Nm**.
- Release by **140°**.
- Tighten to **10 Nm**.
- Tighten to **14 Nm**.
- Tighten through **120°** of nut rotation as measured using the Triumph torque turn gauge 3880105-T0301.



cbxt

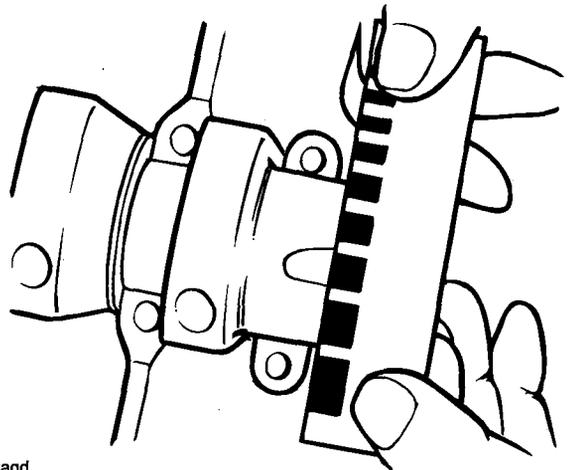
Service Tool 3880105-T0301

## Connecting Rod Big End Bearing Selection/Crankpin Wear Check

- 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 'Plastigage'. The crankpin clearances are measured using 'Plastigage' (Triumph part number 3880150-T0301).
- Remove the big end cap from the journal to be checked.
  - Wipe the exposed areas of the crankpin, and the bearing face inside the cap.
  - Apply a thin smear of grease to the journal and a small quantity of silicone release agent to the bearing.
  - Trim a length of the Plastigage to fit across the journal. Fit the strip to the journal using the grease to hold the Plastigage in place.
  - Release the nuts and remove the cap being measured. Using the gauge provided with the Plastigage kit, measure the width of the compressed Plastigage.
  - 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 (see page 5-8).



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# Crankshaft, Connecting Rods and Pistons

## 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:	34.984 - 35.000 mm
Service limit:	34.960 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 re-ground 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 information.

1. Select the correct big end bearing shell as follows:
  - Measure each crankpin diameter.
  - Note the connecting rod marking.
2. Select the correct bearings by matching the information found with the chart below.

### Big end bearing selection chart

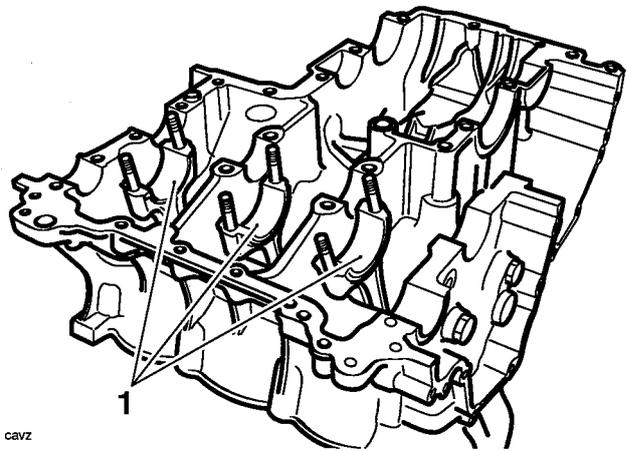
Shell Colour	White	Red	Red	Blue
Rod Marking	5	5	4	4
Con-rod Big End Bore Dia.	38.008 38.000	38.008 38.000	38.018 38.009	38.018 38.009
Crankpin Dia.	35.000 34.992	34.991 34.984	35.000 34.992	34.991 34.984
Running Clearance	0.066 0.036			

For instance:

Con-rod Mark	5
Con-rod Big End Diameter	38.002
Crankpin Diameter	34.987
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.



### 1. Big end bearings



## Caution

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

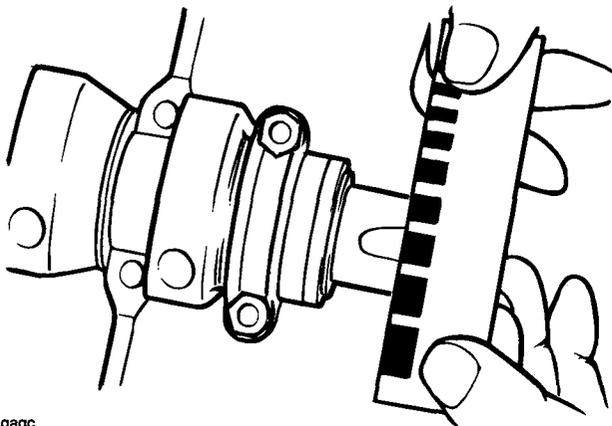
# Crankshaft, Connecting Rods and Pistons

## Crankshaft main bearing/journal wear

Main Bearing Selection Chart (all dimensions in mm's)						
Shell Colour	White	Red	Red	Blue	Blue	Green
Crankcase Bore	41.121	41.121	41.130	41.130	41.139	41.139
	41.113	41.113	41.122	41.122	41.131	41.131
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	0.043	0.044	0.044	0.043	0.043	0.044
	0.020	0.020	0.021	0.019	0.020	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.

- Measure the bearing to crankshaft main journal clearance using Plastigage (Triumph part number 3880150-T0301) (see page 5-8).



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### Checking crankpin clearance using Plastigage

#### Crankshaft main bearing/journal clearance

Standard:	0.019 - 0.044 mm
Service limit:	0.07 mm

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 re-ground 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	41.135 mm
Bearing Required	Blue

#### Note:

- It is normal for the bearings selected to differ from one journal to another.
- It is also normal for there to be two options of bearing shell colour. In such cases, pick the shell size which gives the greater running clearance.



### Caution

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

# Crankshaft, Connecting Rods and Pistons

## Crankshaft End Float

Standard	0.05 - 0.20 mm
Service Limit	0.40 mm

### Note:

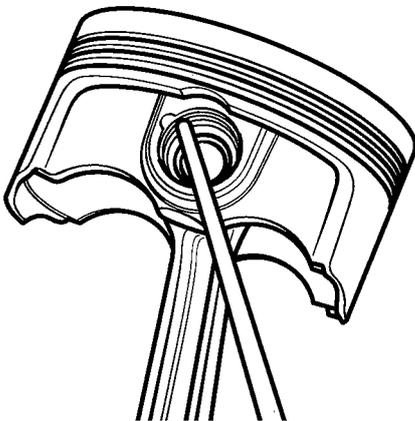
- Crankshaft end float is controlled by the tolerances in crankshaft and crankcase machining. No thrust washers are used. If crankshaft end float is outside the specified limit, the crankshaft and/or the crankcases must be replaced.

## Pistons

### Disassembly

#### Note:

- It is not necessary to remove the connecting rods from the crankshaft.
1. Remove the cylinder head (see page 3-17).
  2. Remove the liner, using tool T3880315 (see page 5-15).
  3. Remove the gudgeon pin circlip from one side of the piston.



### Removing the Gudgeon Pin Circlip

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



### Caution

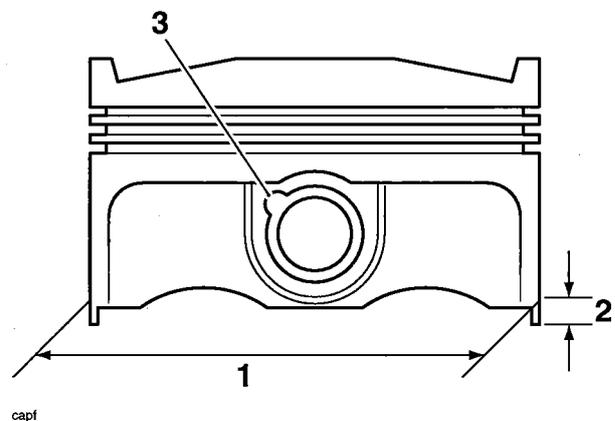
Never force the gudgeon pin through the piston. This may cause damage to the piston which may also damage the liner when assembled.

### 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.
5. 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
3. Circlip removal groove

All Cylinders	78.980 – 78.970 mm
Service limit	78.930 mm

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

# Crankshaft, Connecting Rods and Pistons

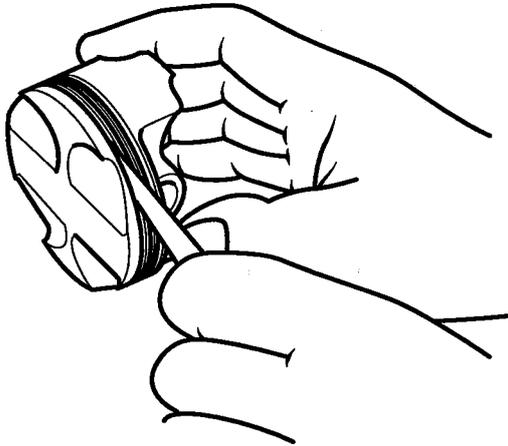
## Piston Rings/Ring Grooves

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

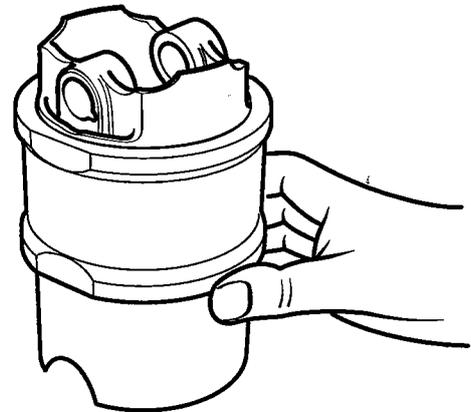
Top ring	0.02 - 0.06 mm
Service limit	0.075 mm
Second	0.02 - 0.06 mm
Service limit	0.075 mm

## 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

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

## Piston Ring End Gap Tolerances

Top	0.28 - 0.49 mm
Service limit	0.61 mm
Second	0.43 - 0.64 mm
Service limit	0.76 mm
Oil Control	0.33 - 0.89 mm
Service limit	1.03 mm

2. 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.

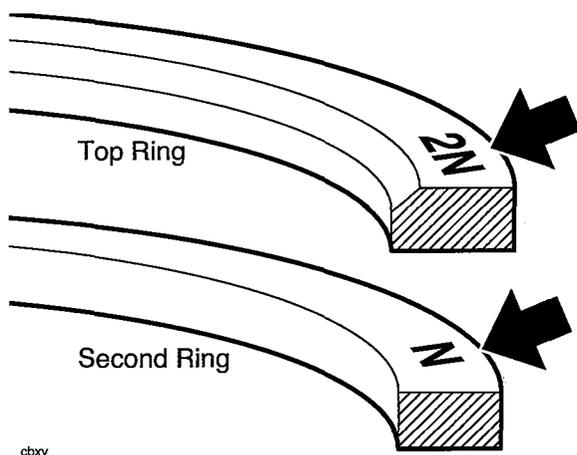
# Crankshaft, Connecting Rods and Pistons

## Piston Assembly

1. 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 second ring upper surface is marked '2N' 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

1. Fit the piston onto the connecting rod.

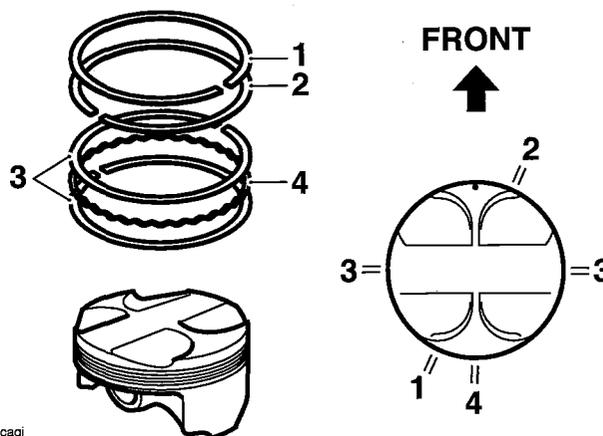
### Note:

- Connecting rods may be fitted either way around. However, ensure all three are fitted the same way.
2. Align the small end in the connecting rod with the gudgeon pin hole in the piston.
  3. Lubricate the piston, small end and gudgeon pin with clean engine oil and fit the gudgeon pin.
  4. 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.

5. 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).
6. Fit the piston into the liner using a gentle rocking motion to engage the rings in the bore.

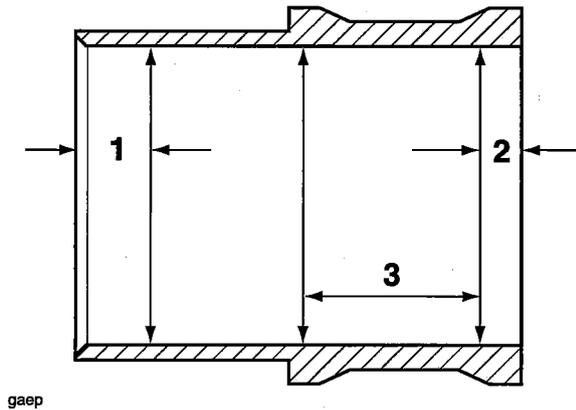
## Cylinder Wear

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

# Crankshaft, Connecting Rods and Pistons

## Cylinder bore diameter

Standard:	79.040 – 79.060 mm
Service limit:	79.110 mm

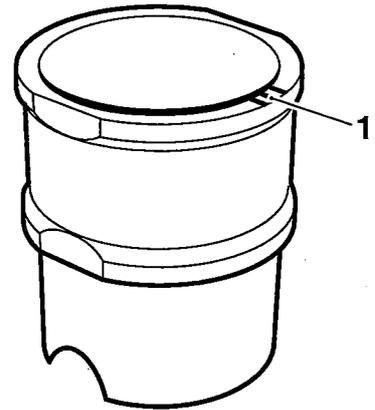


## Test Positions For Bore Wear Check (bore shown in section)

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

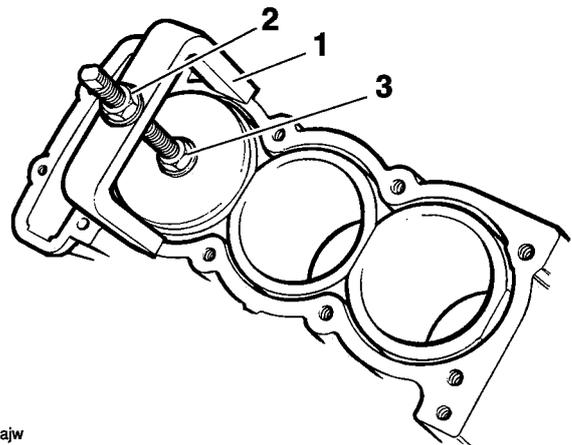
## Cylinder Liners

### Removal



### 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.



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.
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.

# Crankshaft, Connecting Rods and Pistons

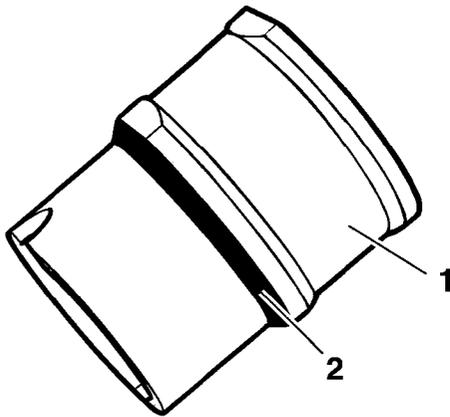
- Turn the locking nut anticlockwise to release the liner.

## Note:

- The tool must 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

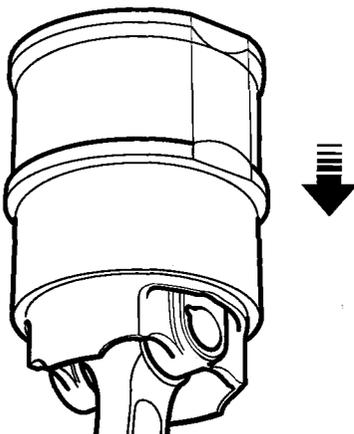
- Thoroughly clean the liner removing all traces of old silicone sealer.
- Remove all traces of sealer from the crankcase bores.
- Apply silicone sealer to the liner to crankcase mating face.



ccvk

- Liner
- Sealer Area

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



ccvl

Arrowed: Liner-piston fitment

## Note:

- The liners have a large 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.

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

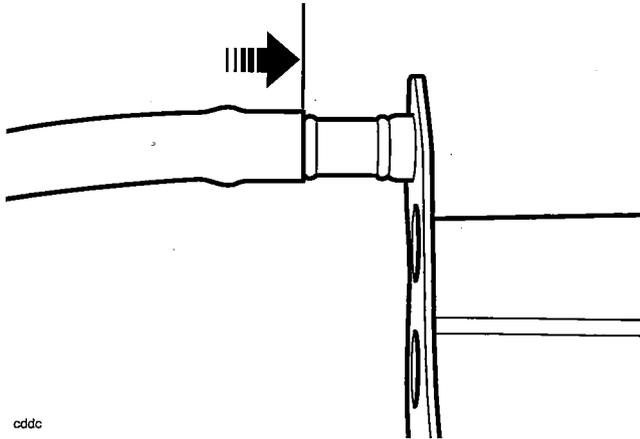
## Note:

- 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.

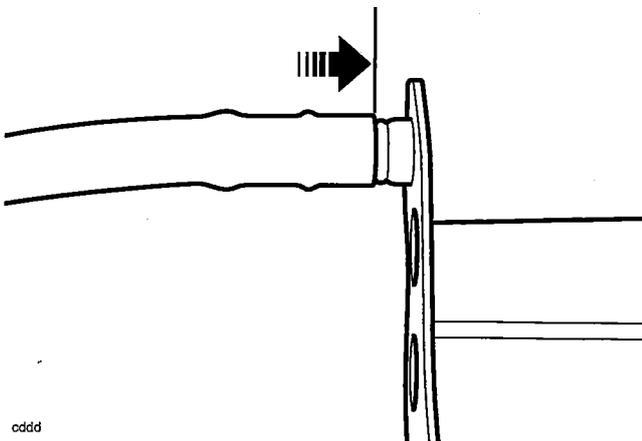
## Crankcase Breather

The upper crankcase is fitted with a labyrinth type breather system, which requires no maintenance. However, when assembling the crankcases, ensure that the breather hose is not damaged and is securely fitted to the breather as follows:

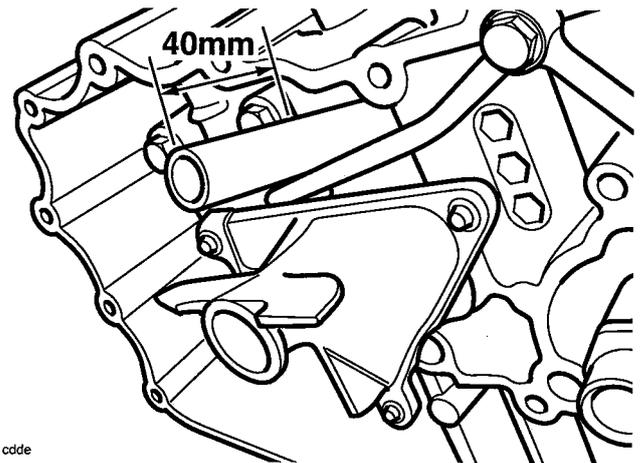
1. If the hose is **220 mm** in length, the hose should be pushed **half-way on** to the breather outlet.



2. If the hose is **240 mm** in length, the hose should be pushed **fully on** to the breather outlet.



3. In both cases, the hose is retained by means of a spring-clip and protrudes into the sump as shown below.



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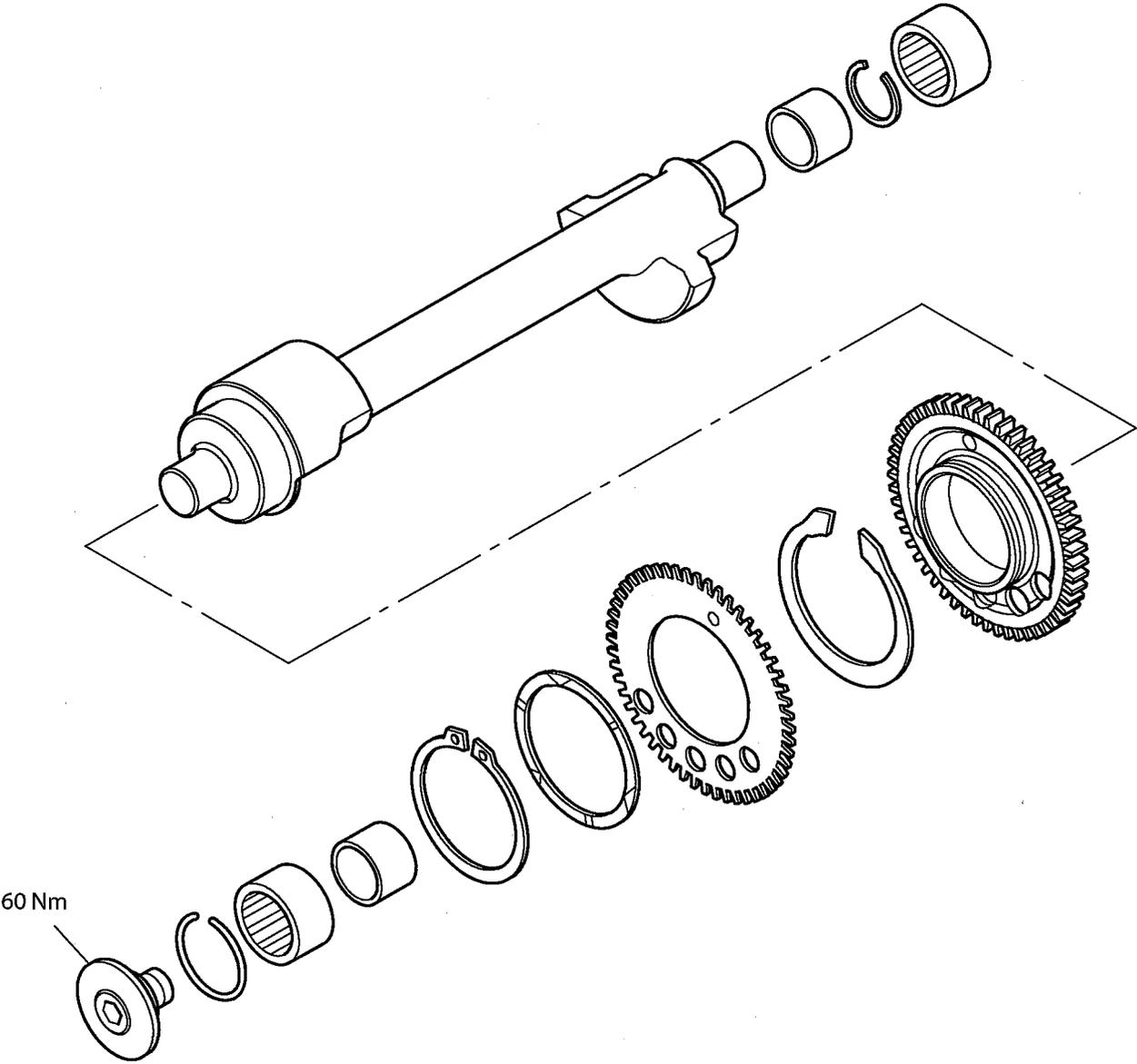
# 6 Balancer

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# Balancer

## Exploded View - Balancer Shaft



## Balancer

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.

The balancer shaft is hollow and also functions as the centrifugal breather.

## Removal

1. Separate the crankcase halves (see page 5-4).
2. With the crankcase halves separated, lift out the balancer shaft complete with the shaft bearings/circlips.

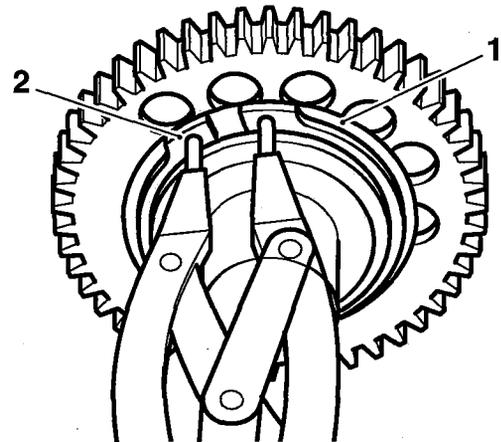
### Note:

- **As the shaft is released from the crankcase, the backlash eliminator gear will spring out of alignment with the crankshaft.**
3. To remove the left hand bearing, slide the bearing, circlip and bearing sleeve from the balancer shaft.
  4. To remove the right hand bearing, remove the bolt and slide the circlip, bearing race and inner ring from the shaft.

### Caution

When removing the circlip, always ensure that the area where the breather seal runs does not become scratched or damaged. A damaged seal track will cause oil to be ejected from the engine.

5. To strip the backlash eliminator from the drive gear, release the circlip and remove the wave-washer, backlash gear and spring.



1. Wave washer
2. Circlip

## Inspection

1. Inspect all gears for chipped or missing teeth.
2. Inspect all bearings for signs of overheating (blue discolouration), seized or damaged rollers, and any other damage.
3. Ensure the breather tube in the centre of the shaft is not blocked by oil, debris etc.
4. Inspect the backlash spring for deformities, damage etc.
5. Inspect the gear teeth for overheating (blue discolouration).

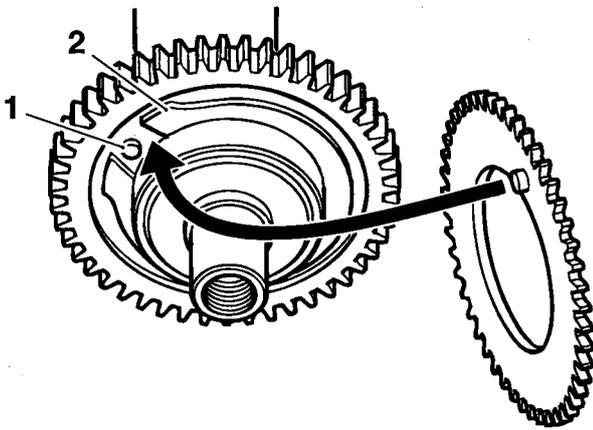
### Note:

- **Signs of blue discolouration on the gear centre are due to the manufacturing process and must be disregarded.**

# Balancer

## Assembly/Installation

1. If the backlash gear was disassembled, fit the backlash spring to the balancer drive gear, positioning the spring ends on either side of the peg.
2. Fit the backlash gear, ensuring its peg is located clockwise of the balancer gear peg and also between the spring ends.
3. Fit the wave washer and secure all components in position with the circlip.

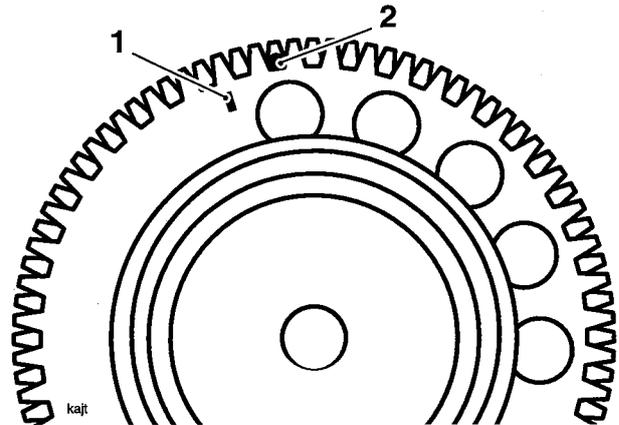


1. Wave washer
2. Circlip

4. Lubricate and fit the right hand bearing and circlip to the shaft.
5. Apply Threebond TB1305 locking compound to the threads of the balancer bearing bolt.
6. Fit the bolt and tighten to **60 Nm**.
7. Lubricate and fit the left hand bearing and circlip.

### Note:

- Prior to installation in the crankcase, it is essential that the markings on the backlash eliminator and drive gears are brought into alignment against the tension of the spring. This will facilitate correct positioning of the balancer in relation to the crankshaft when both are installed in the crankcase.



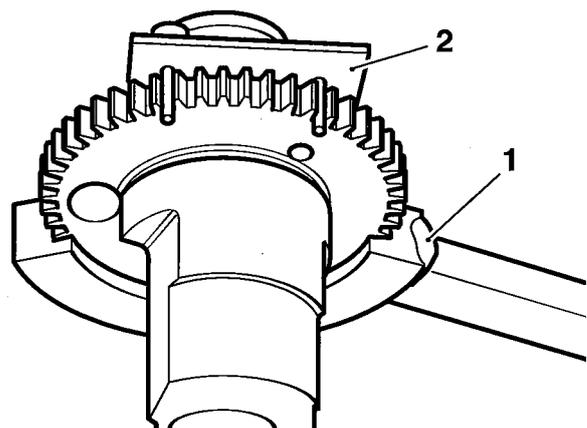
1. Backlash gear line

2. Drive gear dot

8. Using tool T3880016, bring the backlash and drive gear marks into alignment against the backlash spring.

### Note:

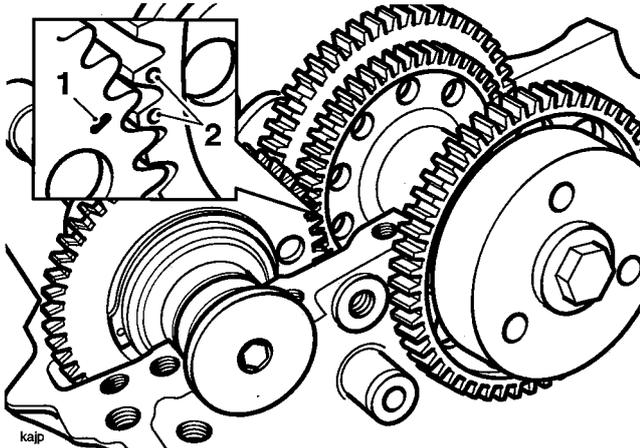
- When in alignment, the line on the backlash gear must be located directly above the drive gear tooth marked with a dot.
  - Since the drive gear dot cannot be seen when the backlash gear is in alignment, always mark the dot-marked gear tooth with chalk in order that it can always be identified.
9. Secure the backlash gear in position with the fixture supplied with the tool by placing the fixture pegs across two gear teeth (ensure that the fixture will not be in the way when assembling the balancer to the crank).



1. Tool T3880016

2. Securing fixture

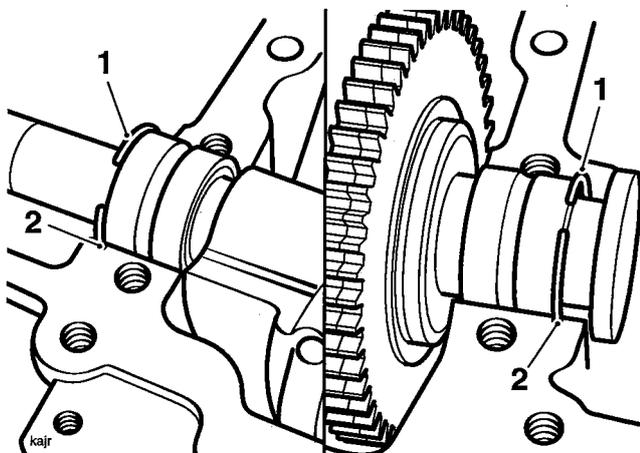
10. With the drive and backlash eliminator gears still correctly aligned, locate the balancer to the crankcase aligning the balancer gears and crankshaft as shown in the illustration below while ensuring that the bearing circlips locate correctly in their corresponding grooves in the crankcase.



- 1. Balancer backlash and drive gear markings
- 2. Crankshaft markings

**! Caution**

If the balancer and crankshaft are not correctly aligned, severe engine vibration will occur leading to damage to components.



- 1. Circlips
- 2. Crankcase Circlip Grooves

- 11. Remove the securing fixture.
- 12. Check that the balancer and crankshaft are correctly aligned before continuing to assemble the crankcase halves.

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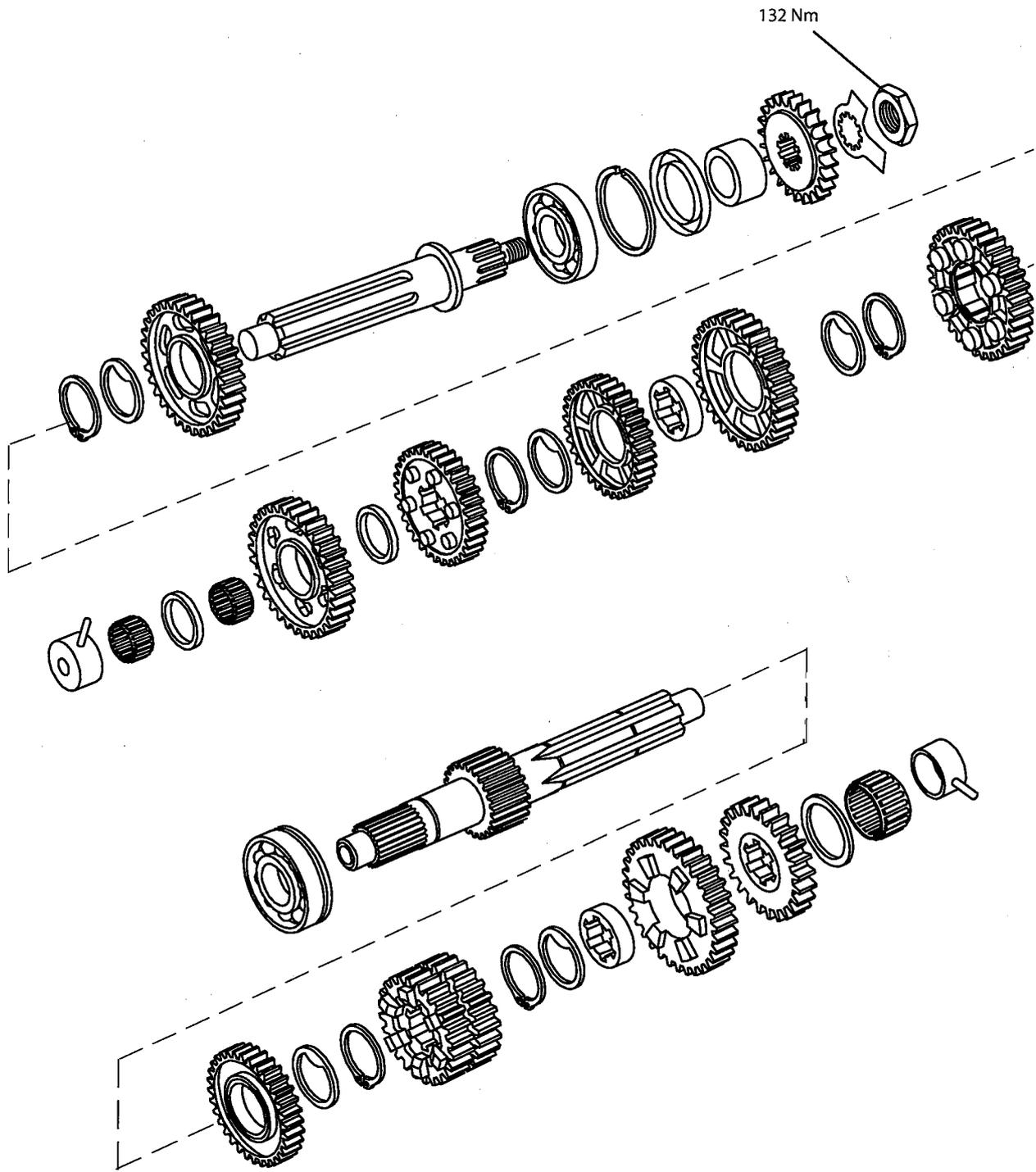
# 7 Transmission

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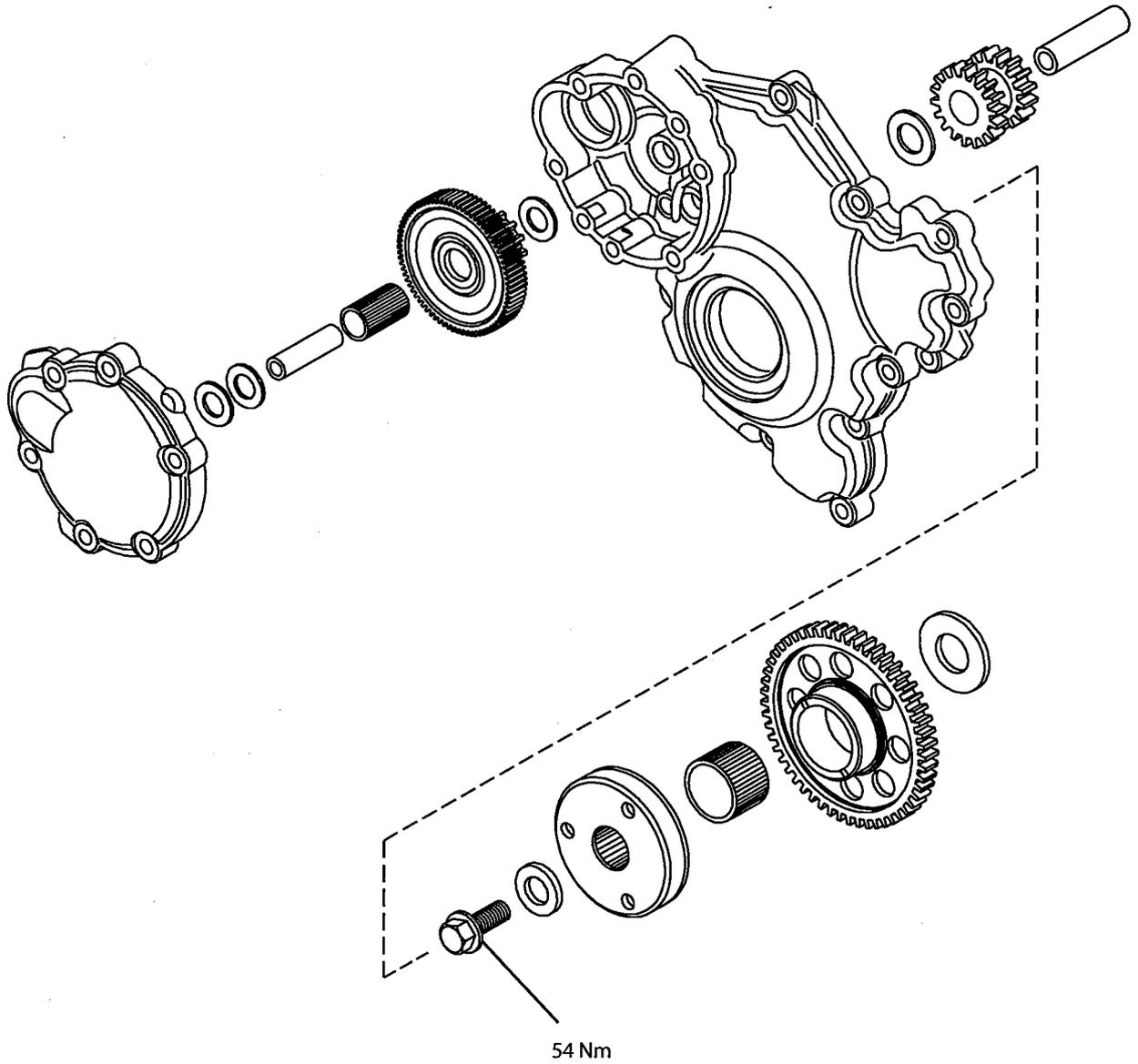
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# Transmission

## Exploded View, Input and Output Shafts

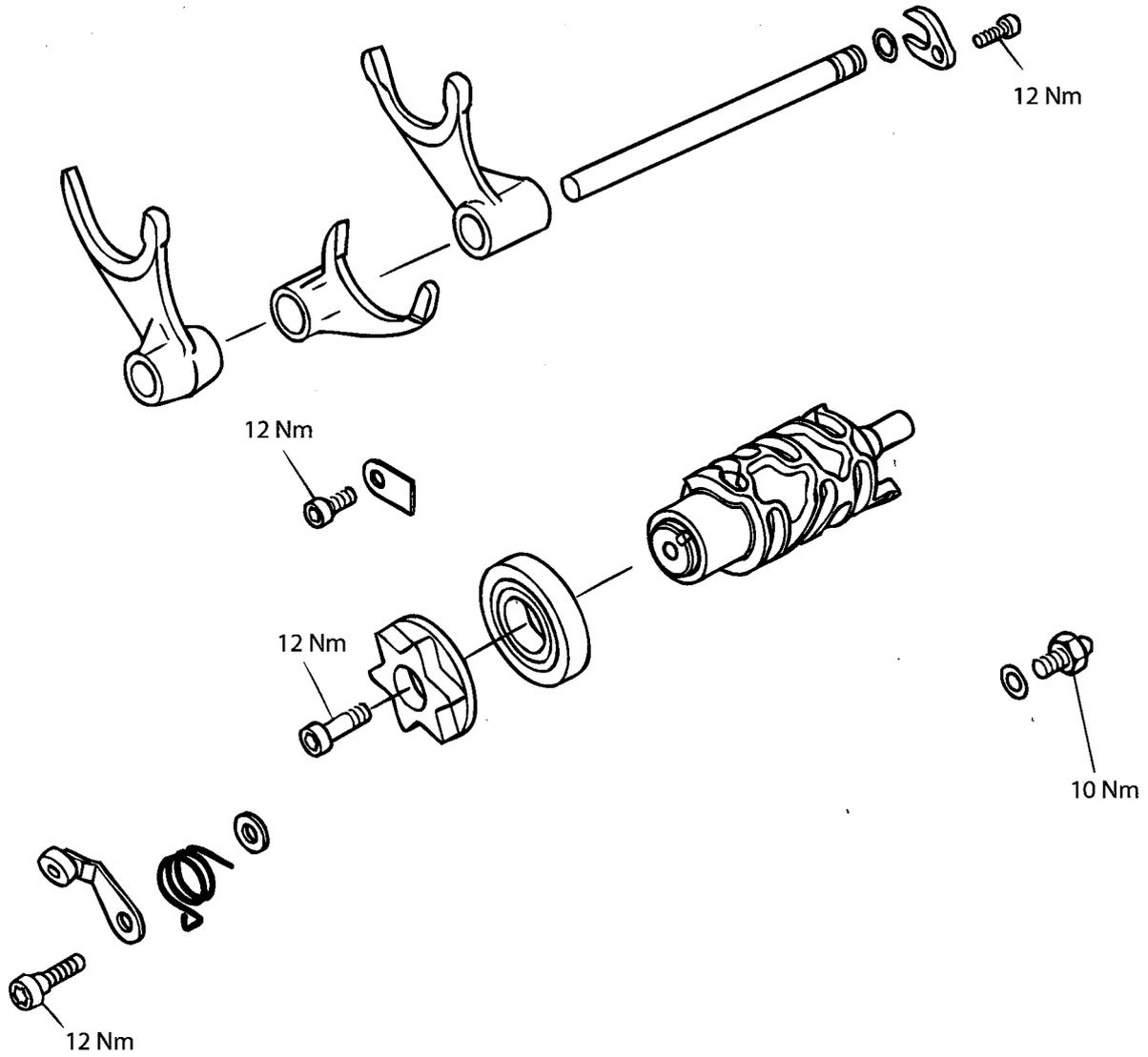


## Exploded View, Sprag Clutch and Starter Gears

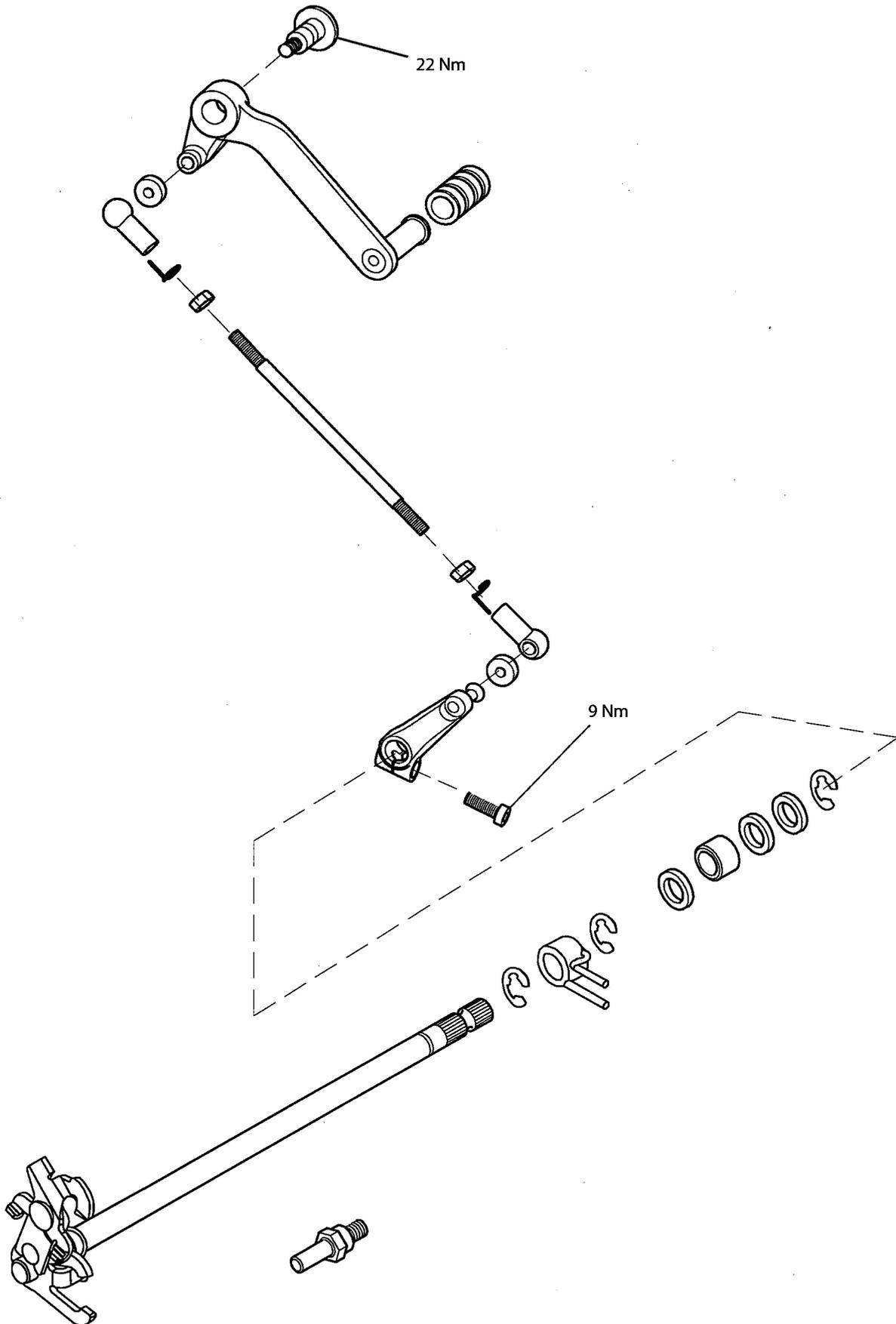


# Transmission

## Exploded View, Gear Selectors and Drum



Exploded View, Gear Change Mechanism

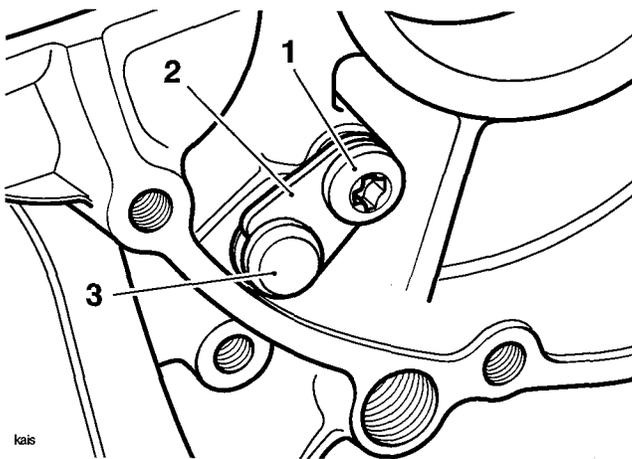


# Transmission

## Selector Shaft, Selector Forks and Drum

### Removal

1. Remove the engine from the frame (see page 9-2).
2. Separate the two halves of the crankcase (see page 5-4).
3. Remove the input and output shafts from the crankcase (see page 7-11).
4. Remove the fixing and take out the 'U' shaped keeper plate from the selector shaft. Discard the fixing.



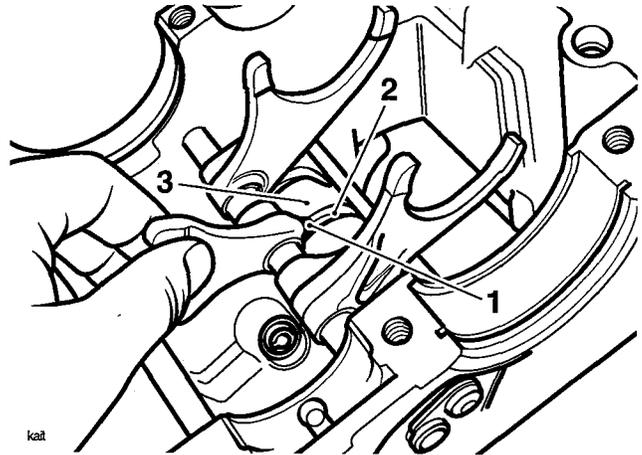
1. Fixing
2. Keeper plate
3. Selector shaft

### Caution

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

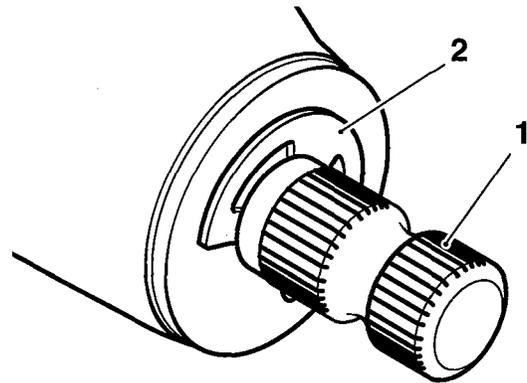
### Note:

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



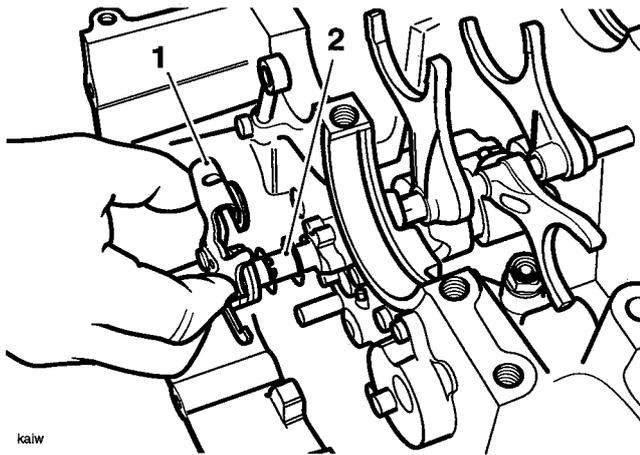
1. Selector fork stop
2. Selector fork guide
3. Selector drum

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



1. Gear change shaft
2. E-clip

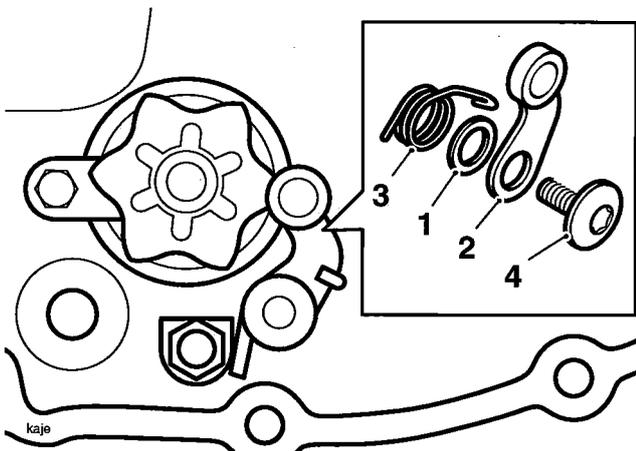
8. Withdraw the gear change shaft from the clutch end of the crankcase and collect the washer from inside the crankcase.



1. Gear change shaft
2. Washer

**Note:**

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



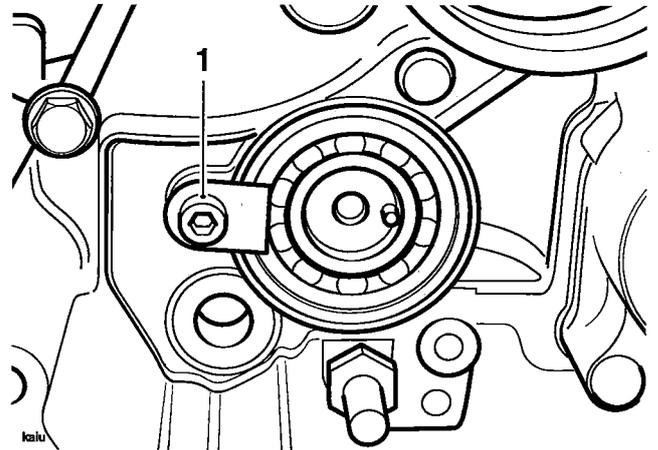
1. Washer
2. Detent arm
3. Spring
4. Fixing

9. Release and remove the fixing securing the detent arm.
10. Withdraw the detent arm complete with its spring and washer. Discard the fixing.
11. Remove the fixing from the centre of the detent wheel (discard the fixing) and withdraw the wheel.

**Note:**

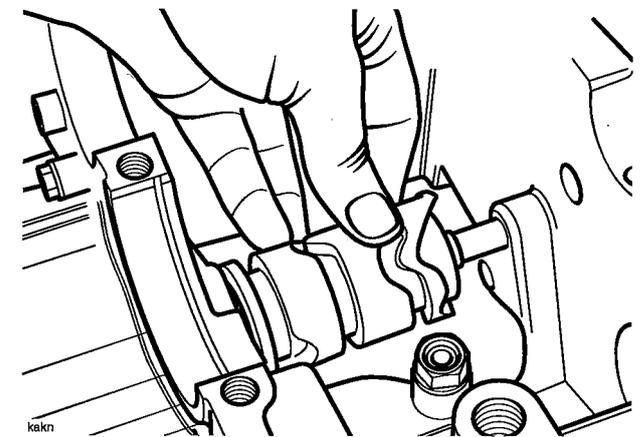
- To prevent drum rotation, use a stout rod through one of the through-holes in the drum. Care must be taken not to damage the oil pressure relief valve.

12. Release and remove the bolt securing the selector drum bearing to the crankcase. Discard the bolt.



1. Bolt

13. Ease the selector drum backwards and forwards to push the drum bearing out of the crankcase.
14. Withdraw the drum from within the crankcase.



**Selector drum removal**

# Transmission

## Inspection

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

### Gear selector fork thickness

Standard	5.80 - 5.90 mm
Service limit	5.70 mm

### Gear selector groove width

Standard	6.00 - 6.10 mm
Service limit	6.25 mm

### Selector fork to groove clearance

0.55 mm max.
--------------

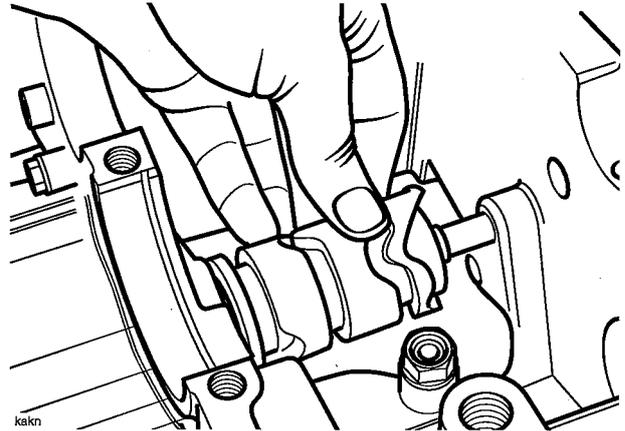
2. Examine the gear change shaft seal for damage and/or wear. Replace the seal if damaged and/or worn.

## Installation

### Note:

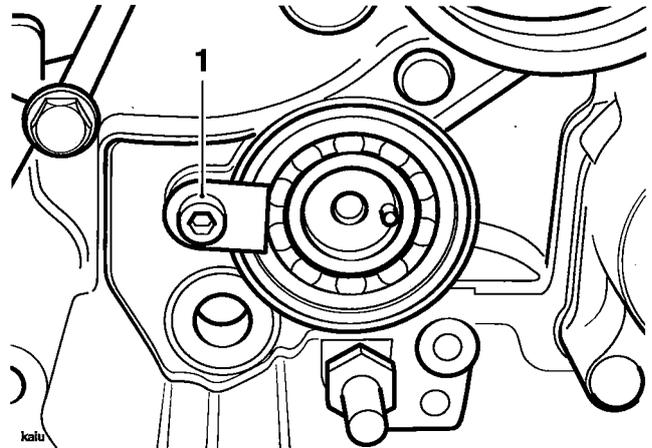
- The detent wheel is keyed to the selector drum

1. Position the selector drum into the crankcase.



### Locating the selector drum

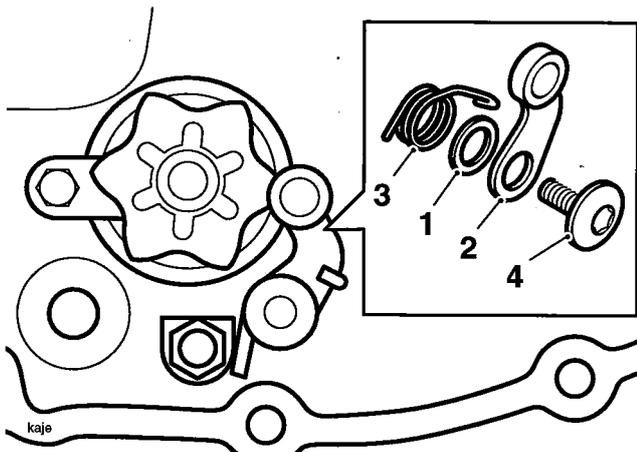
2. Using clean engine oil, lubricate the selector drum bearing.
3. Position the bearing into the crankcase recess and engage with the selector drum.
4. Refit the bearing retainer. Secure with a new bolt and tighten to **12 Nm**.



### 1. Bearing Retaining Bolt

5. Fit the detent wheel engaging the wheel with the locator pin in the selector drum. Tighten a new fixing to **12 Nm**.

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



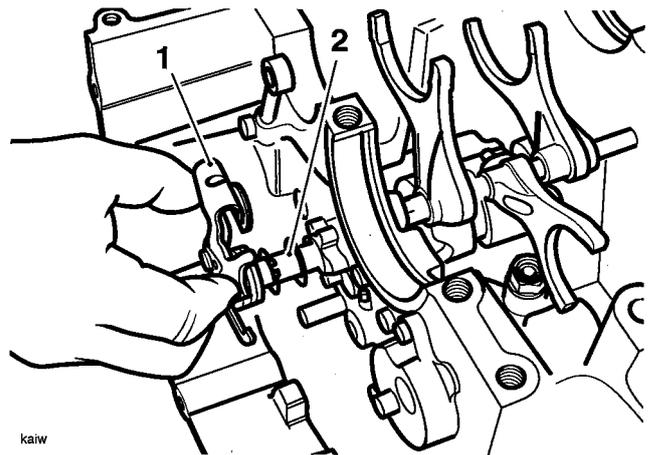
1. Washer
2. Detent arm
3. Spring
4. Fixing

7. Hold the detent arm assembly in position and fit a new fixing. Start the thread and push the detent arm, using finger pressure, to locate on the detent wheel. Ensure the detent arm remains correctly located on the detent wheel. Tighten the capscrew to **12 Nm**.
8. Rotate the selector drum and ensure a smooth movement. Rectify as necessary.
9. Using clean engine oil, lubricate the lip of the seal on the gear change shaft.
10. Lubricate, with a 50/50 solution of engine oil and molybdenum disulphide grease, both sides of the fingers of the selector mechanism on the gear change shaft.

## Caution

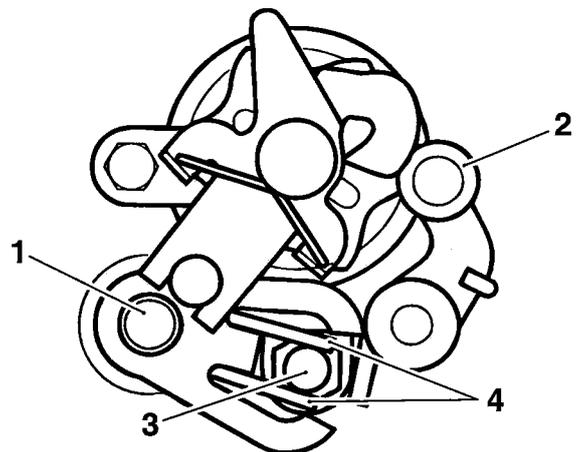
Take care to avoid damaging the lip of the seal when inserting the gear change shaft into the crankcase. A damaged seal will lead to oil loss and could result in engine damage.

11. Feed the washer onto the shaft and insert the gear change shaft into the crankcase. Gently push the gear pedal end of the shaft through the bearing and seal located, at the gear pedal end, in the crankcase.



1. Gear change shaft
2. Washer

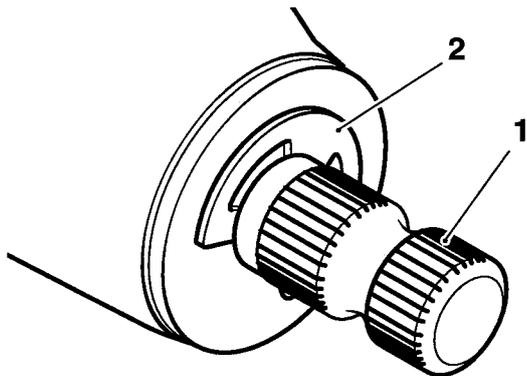
12. Ensure that the gear change shaft locates in the detent wheel/arm and that the spring fits over the abutment bolt.



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

# Transmission

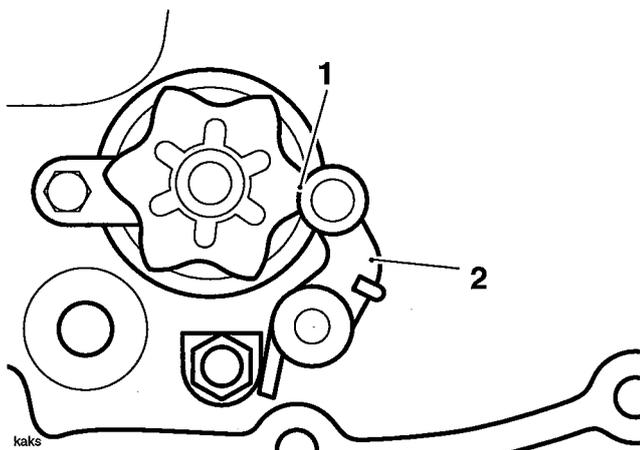
13. Fit the large washer and e-clip to the gear pedal end of the gear change shaft.



kakh

1. Gear change shaft
2. E-clip
3. Washer

14. Fit the gear pedal crank to the shaft in the same orientation as noted prior to removal. Tighten the fixing to **9 Nm**.
15. Position the selector drum in the neutral position.
16. Check that the detent arm locates in the raised profile in the detent wheel (neutral position).



kaks

1. Raised profile
2. Detent arm

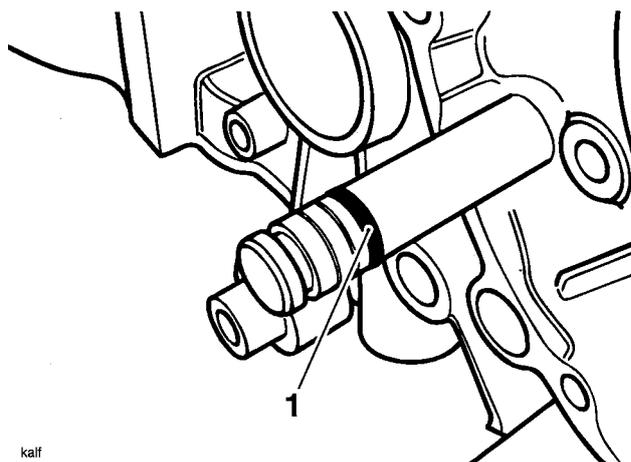


## Caution

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

17. Push the selector shaft into the crankcase from the keeper plate end. As the shaft is inserted locate the selector forks and also fit a new O-ring

(O-ring located at the keeper plate end). Ensure the forks are fitted in the positions noted during removal.

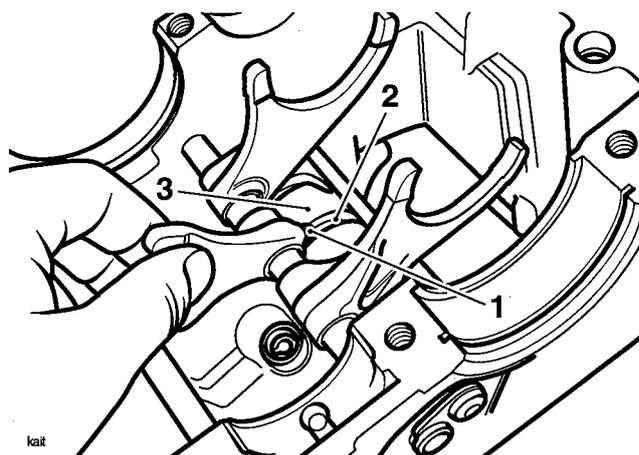


kalf

1. O-ring

### Note:

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



kait

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

18. Fit the 'U' shaped keeper plate.
19. Fit a new capscrew, and tighten to **12 Nm**.
20. Fit the input and output shafts (see page 7-11).

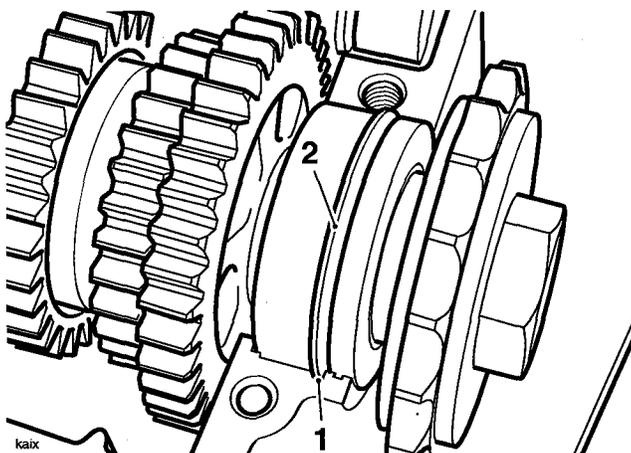
## Input and Output Shafts Assemblies

### Removal

1. Remove the engine from the frame (see page 9-2).
2. Separate the two halves of the crank case (see page 5-4).
3. Lift the input and output shaft assemblies out of the upper crankcase.

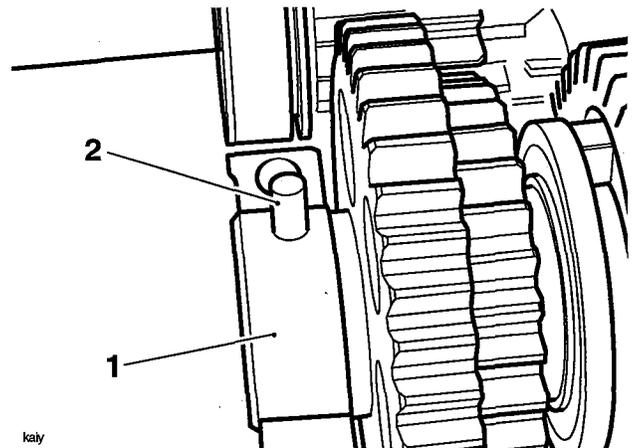
### Installation

1. Place the output shaft in position in the crankcase.
2. Ensure the retaining ring on the bearing locates in the groove provided in the crankcase.
3. Ensure the output shaft seal aligns with its recess in the crankcase.



1. Groove in crankcase
2. Retaining ring
3. Seal

4. Ensure the dowel in the output shaft needle roller bearing is positioned to locate in the hole provided in the upper crankcase.



1. Roller bearing
2. Dowel

5. Ensure the output shaft seal aligns with its recess in the crankcase.
6. Repeat steps 1 to 3 for the input shaft and ensure that both sets of gear mesh correctly and that the half-circlip is correctly located and is not accidentally omitted.

# Transmission

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## Input Shaft

### Disassembly

Working from the opposite end to where the clutch assembly is fitted, dismantle the input shaft as follows:

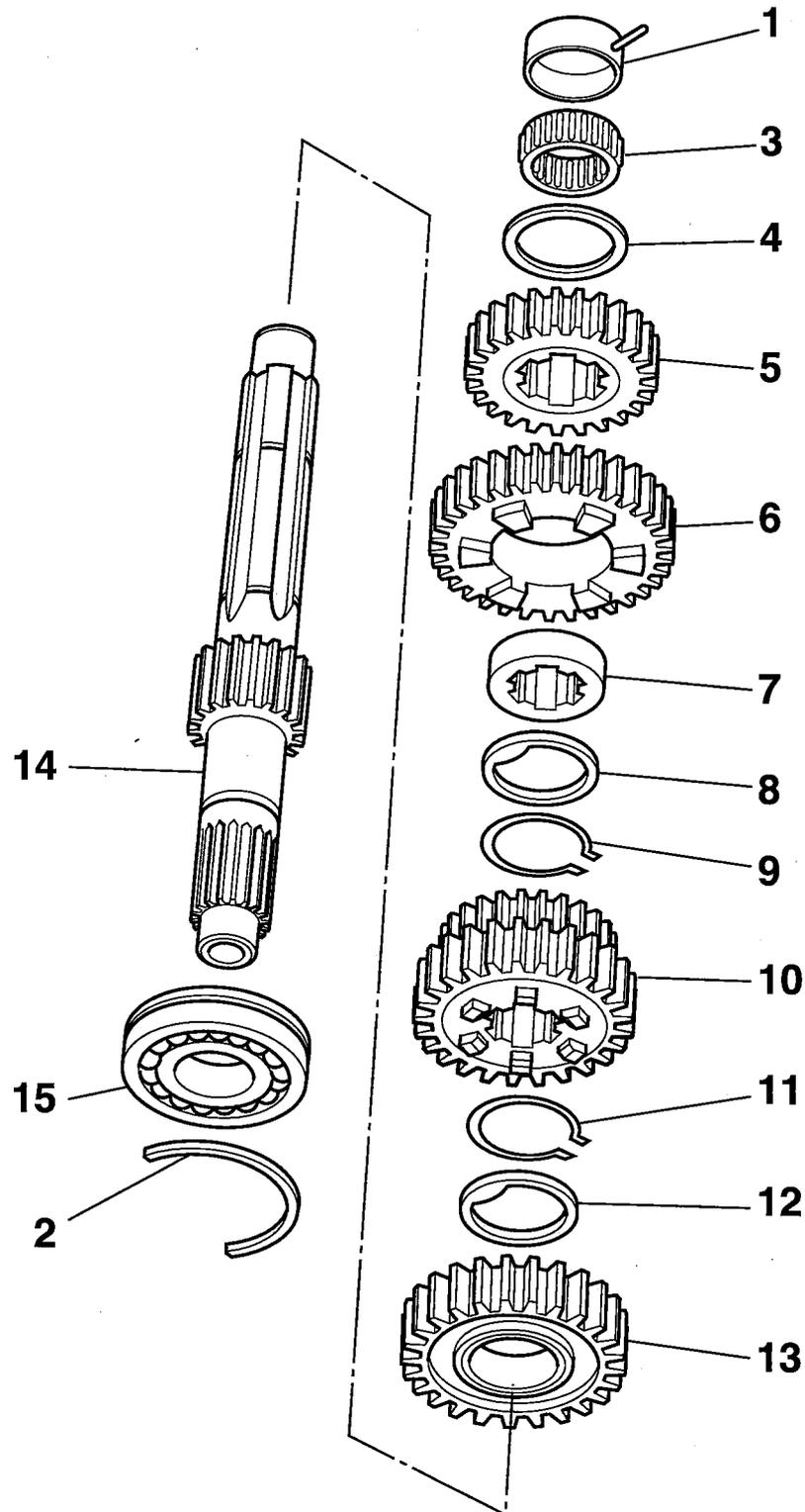
1. Remove the pegged bearing sleeve (1) from the end of the shaft.
2. Slide off the needle bearing (3) and thrust washer (4).
3. Remove second gear (5).
4. Remove sixth gear (6), complete with the splined bush (7) which runs inside the gear.
5. Remove the thrust washer (8) from in front of the circlip between sixth and third/fourth gear.
6. Remove the circlip (9) from the shaft.
7. Slide off the combined third/fourth gear (10).
8. Remove the circlip (11) from in front of fifth gear.
9. Remove the thrust washer (12) adjacent to fifth gear.
10. Remove fifth gear (13).
11. 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.



### 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.

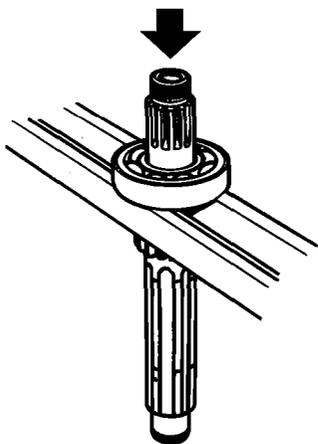
Never wear loose clothing which could become trapped in the press and cause crushing injury to the hand, arms or other parts of the anatomy.



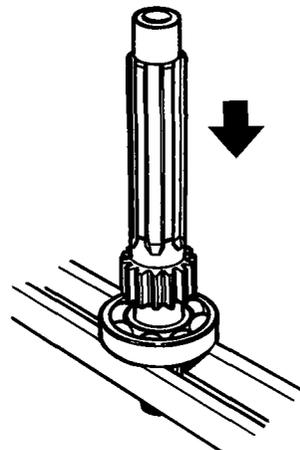
ccsa

- 1. Bearing Sleeve
- 2. Half Circlip
- 3. Needle Roller Bearing
- 4. Thrust Washer
- 5. Second Gear
- 6. Sixth Gear
- 7. Splined Bush
- 8. Thrust Washer

- 9. Circlip
- 10. Third/Fourth Gear
- 11. Circlip
- 12. Thrust Washer
- 13. Fifth Gear
- 14. Input Shaft
- 15. Input Shaft Bearing



ccsh



ccsi

## 1. Pressing Off The Input Shaft Bearing

### Assembly

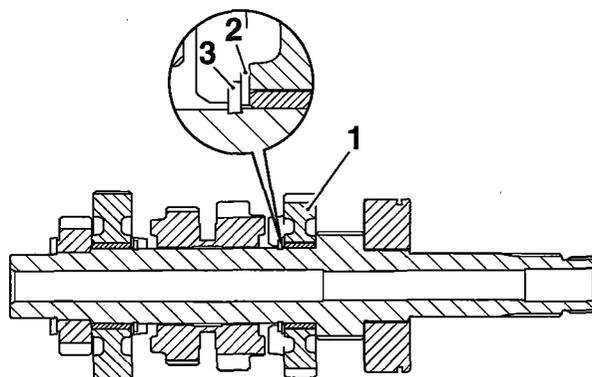
#### Note:

- 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.

## 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 located in the circlip groove.



ccwb

1. Fifth gear
2. Thrust washer
3. Circlip
5. Fit the combined third/fourth gear (10) with the larger gear facing toward fifth gear. Ensure that the oil hole in the input shaft DOES NOT align with the oil hole in the gear.

### 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.

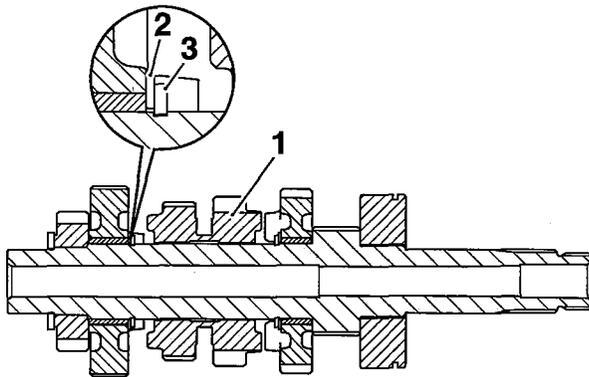
Never wear loose clothing which could become trapped in the press and cause crushing injury to the hand, arms or other parts of the anatomy.

### Warning

If the oil hole in the third/fourth gear is aligned with the corresponding hole in the input shaft, engine oil pressure and gear lubrication will be reduced.

Reduced oil pressure and gear lubrication will cause engine damage and could also lead to engine seizure resulting in loss of motorcycle control and an accident.

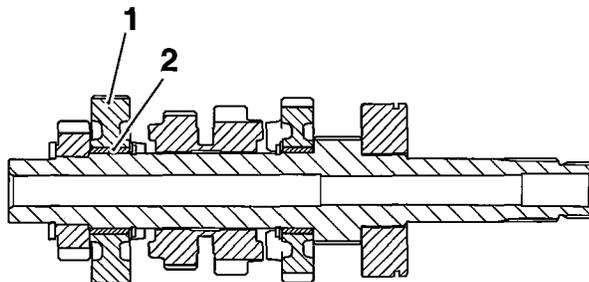
6. Fit a new circlip (9) to the input shaft ensuring that the circlip is located in the circlip groove.



ccwa

- 1. Third/forth gear**  
**2. Thrust washer**  
**3. Circlip**

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 (7) from sixth gear taking care that the oil hole in the shaft aligns with the hole in the bush.  
 9. Fit sixth gear (6) with the dog teeth facing third/ fourth gear.

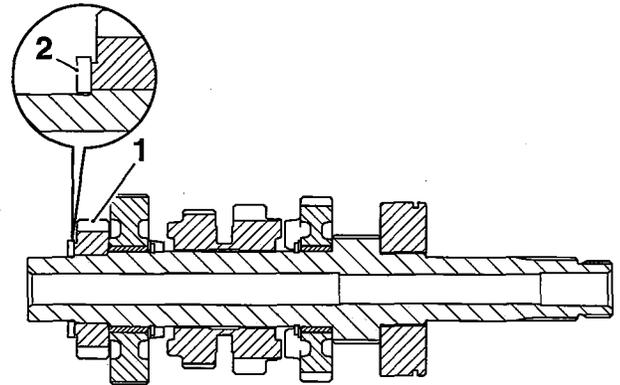


ccvz

- 1. Sixth gear**  
**2. Splined bush**

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).



ccvq

- 1. Second gear**  
**2. Thrust washer**

12. Finally, fit the bearing sleeve (1) to the needle roller bearing.

# Transmission

---

## Output Shaft

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

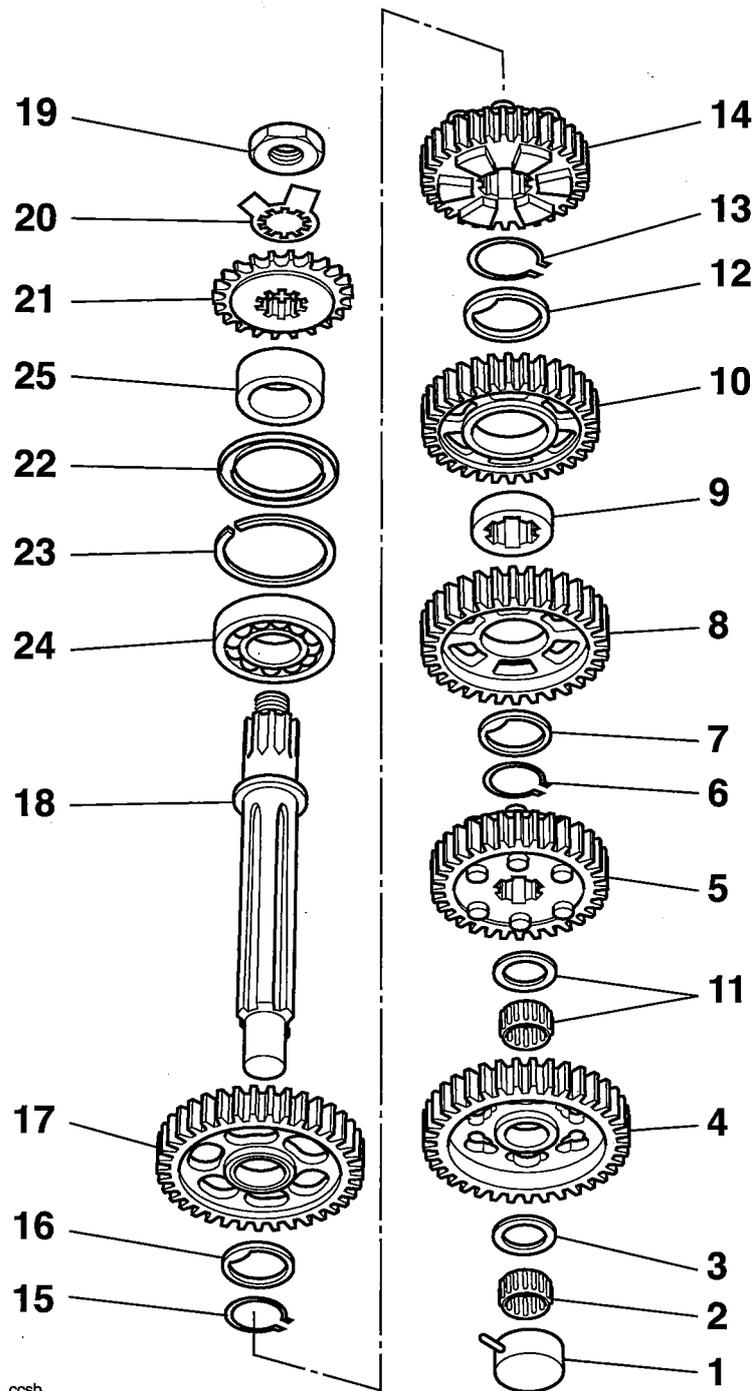
### Disassembly

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. Remove the first gear bearing and thrust washer (11).
4. Slide fifth gear (5) from the shaft.
5. Remove the circlip (6) from in front of the third gear.
6. Remove the splined thrust washer (7) from the shaft.
7. Remove the third gear (8).
8. Slide fourth gear (10) off the shaft and also remove the splined bush (9) and thrust washer (12).
9. Remove the circlip (13) from in front of sixth gear.
10. Remove sixth gear (14) from the shaft.
11. Remove the circlip (15) from in front of second gear.
12. Remove thrust washer (16) and slide off second gear (17).
13. 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.
14. Remove the transmission sprocket nut (19), locktab (20) and sprocket (21).
15. Collect the oil seal (22) and retaining ring (23).
16. If it is found necessary to replace the large bearing (24) at the end of the shaft, use a press to remove both the bearing and output sprocket sleeve together.



### 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.



ccsb

- 1. Bearing Sleeve
- 2. Needle Roller Bearing
- 3. Thrust Washer
- 4. First Gear
- 5. Fifth Gear
- 6. Circlip
- 7. Thrust Washer
- 8. Third Gear
- 9. Third Gear Bush
- 10. Fourth Gear
- 11. First gear bearing & washer
- 12. Thrust Washer
- 13. Circlip

- 14. Sixth Gear
- 15. Circlip
- 16. Thrust washer
- 17. Second Gear
- 18. Output Shaft
- 19. Nut
- 20. Locktab
- 21. Output Sprocket
- 22. Oil Seal
- 23. Retaining Ring
- 24. Bearing
- 25. Sleeve

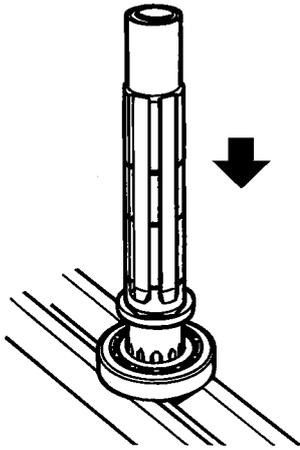
# Transmission

## Assembly

### Note:

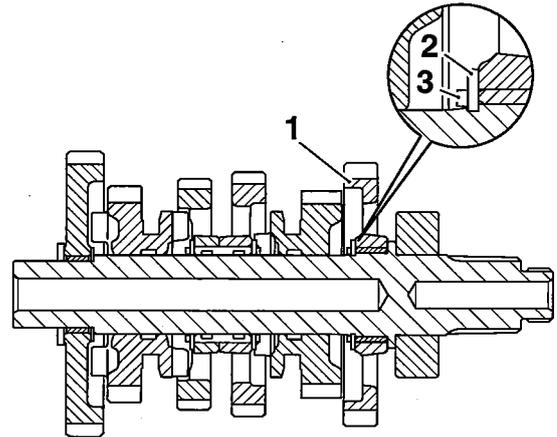
- Lubricate each gear and bush with clean engine oil during assembly.
- Examine all gears, bearings and sleeves for damage, chipped teeth and wear beyond the service limits. Replace all suspect components and always use new circlips to assemble the shaft

1. Working from the output sprocket end of the shaft, fit a new bearing (24) and new sleeve (25) to the shaft using a press and press bars. Fit the sleeve with the large chamfer facing outwards.
2. Fit the retaining ring (23) to the shaft. Lubricate and fit a new oil seal (22).



3. 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.
4. Withdraw the shaft from the vice and continue to assemble from the opposite end to the output sprocket.

5. 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).



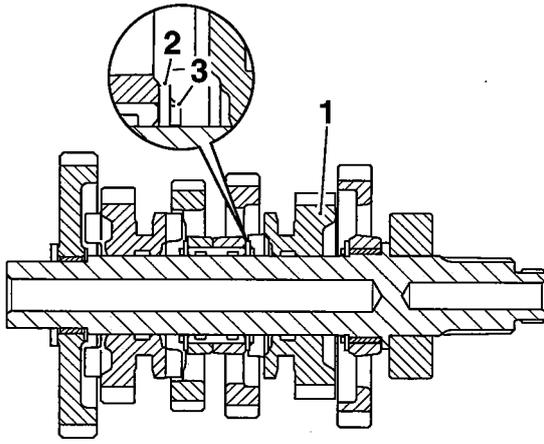
1. Second gear
2. Thrust washer
3. Circlip

6. Fit sixth gear (14) with the selector fork groove facing away from the output sprocket end. Ensure that the oil holes in the gear **DO NOT** align with the corresponding oil hole in the output shaft.

**Warning**

If the oil holes in the sixth gear are aligned with the corresponding hole in the output shaft, engine oil pressure and gear lubrication will be reduced. Reduced oil pressure and gear lubrication will cause engine damage and could also lead to engine seizure resulting in loss of motorcycle control and an accident.

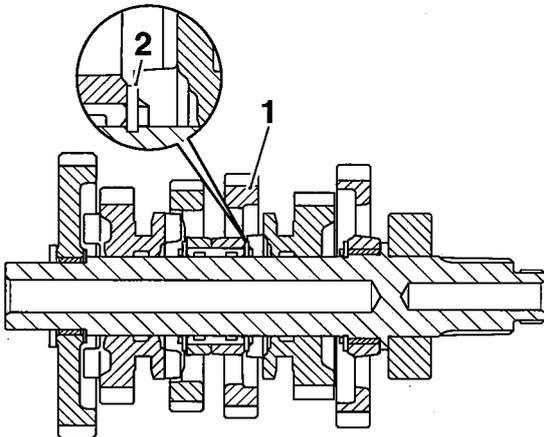
7. Fit a new circlip (13) to retain sixth gear.



ccvp

- 1. Sixth gear
- 2. Thrust washer
- 3. Circlip

8. Fit the thrust washer (12) to the rear of fourth gear. Fit the splined sleeve (9) for fourth gear, taking care to align the oil hole in the shaft with the corresponding hole in the bush. Fit fourth gear (10) to the shaft with the large step side facing towards the output sprocket.

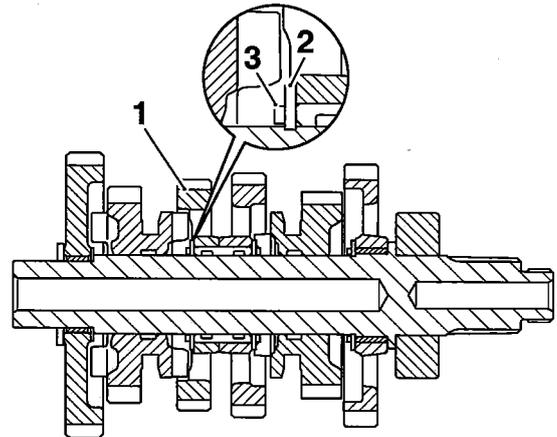


ccwd

- 1. Fourth gear
- 2. Thrust washer

9. Fit third gear (8) with the larger step side facing away from the output sprocket.

10. Fit the thrust washer (7) and retain with a new circlip (6).



ccwe

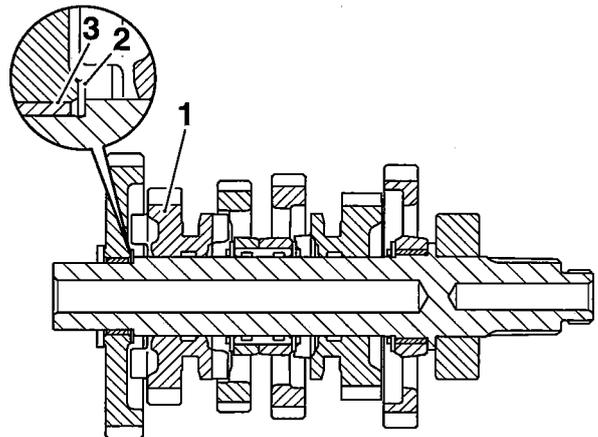
- 1. Third gear
- 2. Thrust washer
- 3. Circlip

11. Fit the fifth gear (5) to the shaft with the groove facing towards the output sprocket. Ensure that the oil holes in the gear DO NOT align with the corresponding oil hole in the output shaft.

**Warning**

If the oil holes in the fifth gear are aligned with the corresponding hole in the input shaft, engine oil pressure and gear lubrication will be reduced. Reduced oil pressure and gear lubrication will cause engine damage and could also lead to engine seizure resulting in loss of motorcycle control and an accident.

12. Fit the first gear thrust washer and bearing (11).

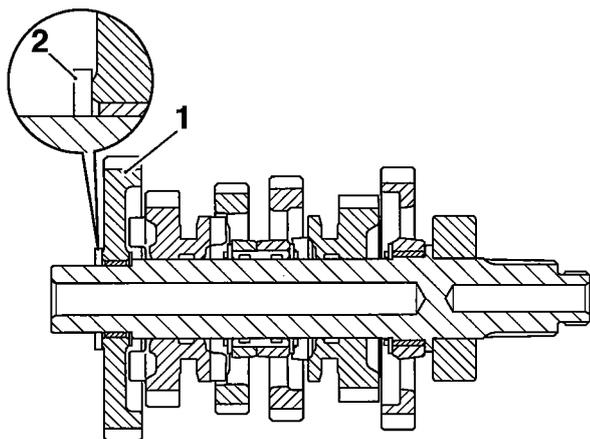


ccwf

- 1. Fifth gear
- 2. Thrust washer
- 3. Bearing

# Transmission

13. Fit first gear (4) to the shaft as marked during disassembly.



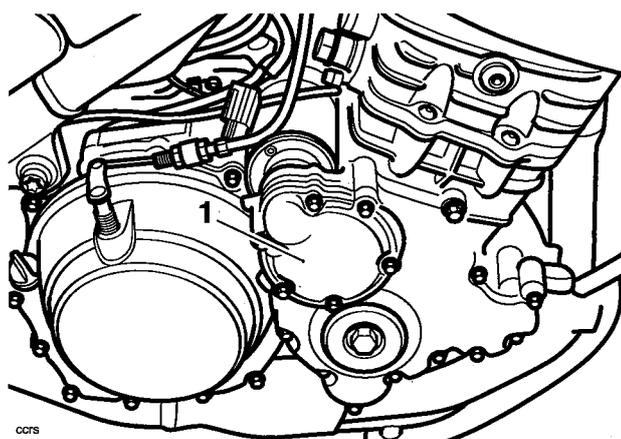
1. First gear  
2. Thrust washer

14. Finally fit the thrust washer (3), needle roller bearing (2) and bearing cap (1) to the end of the shaft.

## Starter Drive Gears/Sprag Clutch

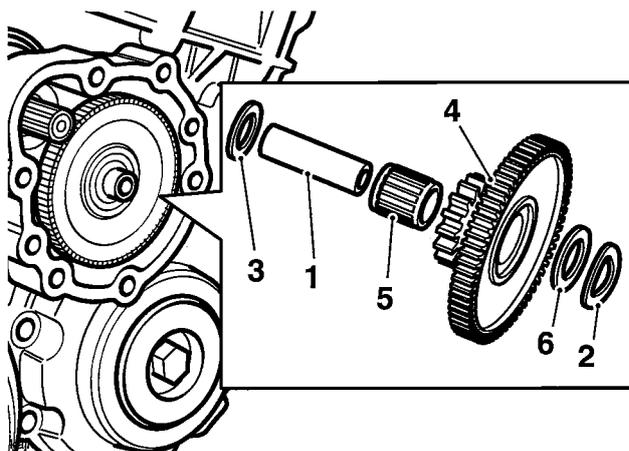
### Removal

1. Disconnect the battery, negative (black) lead first (see page 17-8).
2. Remove the rear bodywork and the right hand lower fairing (see page 16-9).
3. Remove the starter cover.



1. Starter cover

4. Withdraw the large starter idler gear noting the fitted position of all components.

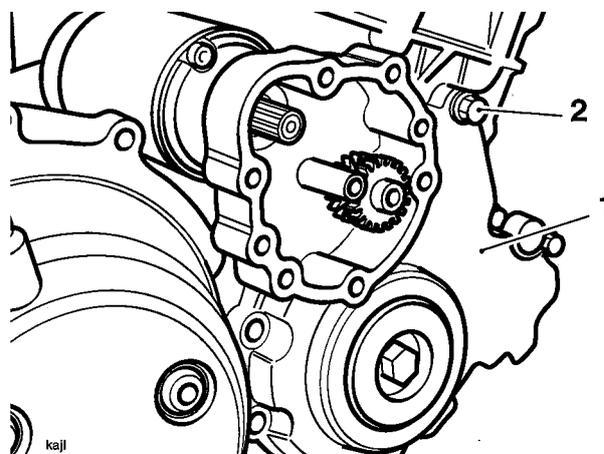


1. Idler shaft  
2. Wave washer  
3. Flat washer  
4. Idler gear  
5. Bearing  
6. Flat washer

5. Remove the bolts securing the right hand crank cover noting the position of the aluminium washer under the head of one of the upper bolts.

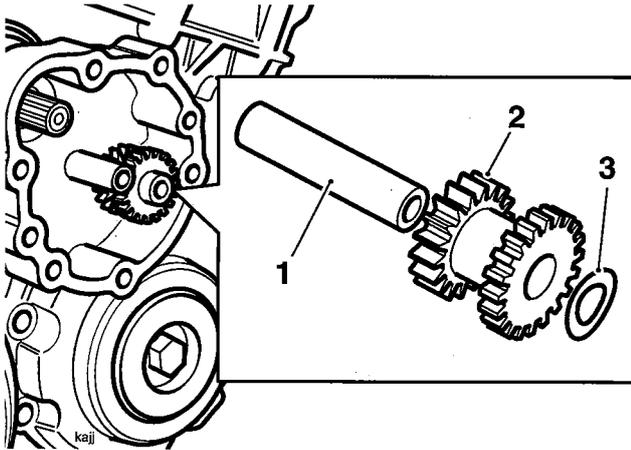
### Note:

- There are two bolts located inside the cover in the area behind the starter idler gear.



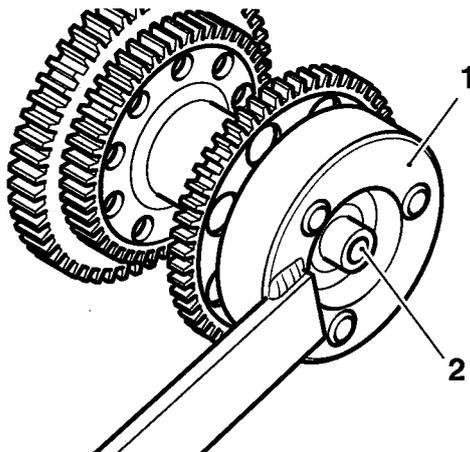
1. Right hand crank cover  
2. Aluminium washer position

6. Ease the cover from the crankcase and collect the small starter idler gear again noting the position of all components.



- 1. Idler shaft
- 2. Gear
- 3. Wave washer

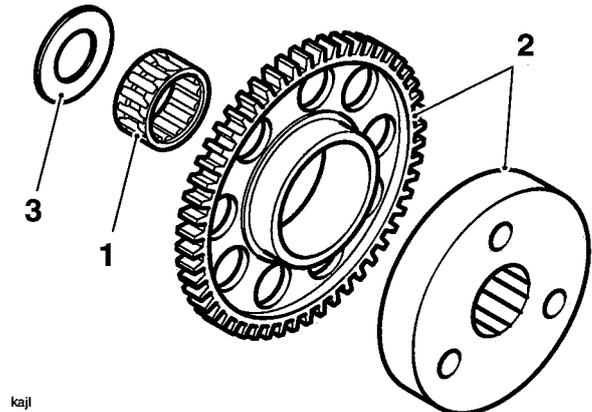
7. Using tool T3880017, prevent the sprag from turning and remove the sprag fixing and washer from the end of the crankshaft.



- 1. Tool T3880017
- 2. Sprag fixing

8. Slide the sprag clutch and gear from the crankshaft.

9. Separate the sprag clutch, bearing and gear from each other.



- 1. Needle roller bearing
- 2. Sprag clutch and gear
- 3. Plain washer

10. Recover the washer from the end of the crankshaft.

## Inspection

1. Examine the sprag clutch for signs of slipping, overheating (going blue) and for any other damage.
2. Examine all gears for chipped teeth, overheating (going blue) and for any other damage.
3. Examine all bearings for chipped, broken or seized rollers, overheating (going blue) and for any other damage.
4. Examine the end of the crankshaft for damage.

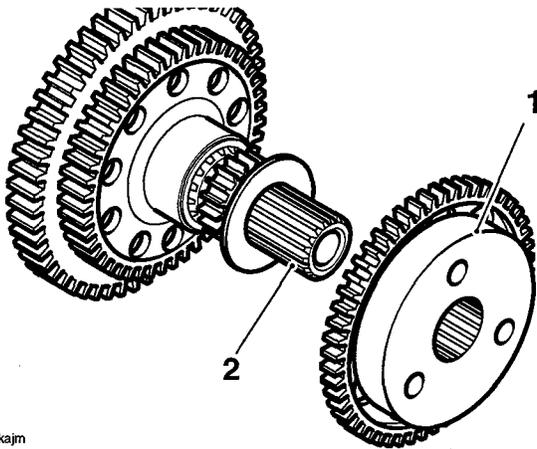
# Transmission

## Installation

1. Fit the sprag's washer to the crankshaft.
2. Assemble the needle roller bearing and sprag gear to the sprag clutch.
3. Locate the sprag clutch assembly to the crankshaft.

### Note:

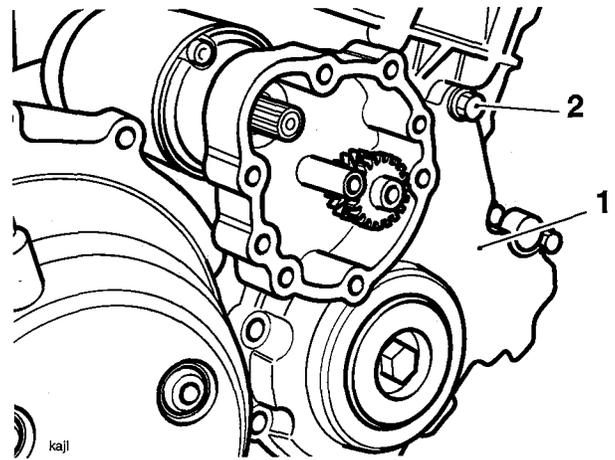
- The sprag clutch will only fit with the crankshaft when the master splines on both components are aligned.



1. Sprag clutch
2. Crankshaft end

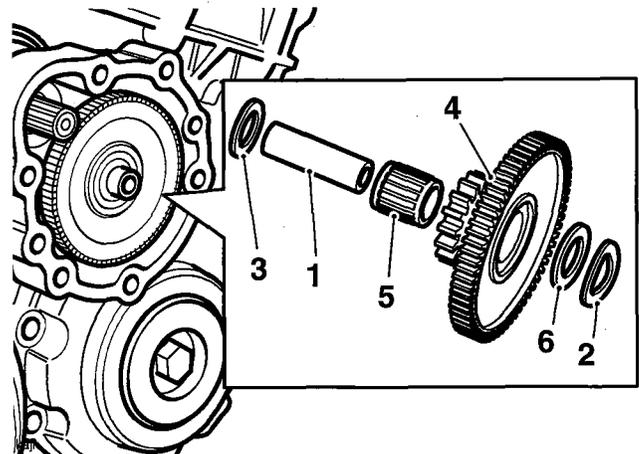
4. Prevent the sprag from turning using tool T3880017 then fit and tighten a new sprag fixing and washer to **54 Nm**.
5. Lubricate the idler gear shaft.
6. Fit the small idler gear, shaft and wave-washer (washer to the outside of the gear) to the crankcase.
7. Thoroughly clean the right hand crank cover.
8. Position a new gasket to the crankcase dowels then refit the right hand crank cover.

9. Ensure the bolt with the aluminium washer is correctly located then tighten the cover bolts to **9 Nm**.



1. Right hand crank cover
2. Aluminium washer position

10. Lubricate then refit the large starter idler gear ensuring that all components are located in the positions noted on removal.



1. Idler shaft
2. Wave washer
3. Flat washer
4. Gear
5. Bearing
6. Flat Washer

11. Thoroughly clean the starter cover.
12. Position a new gasket to the dowels then refit the starter cover.
13. Fit and tighten the cover bolts to **9 Nm**.
14. Refit any removed bodywork (see page 16-9).
15. Reconnect the battery positive (red) lead first.

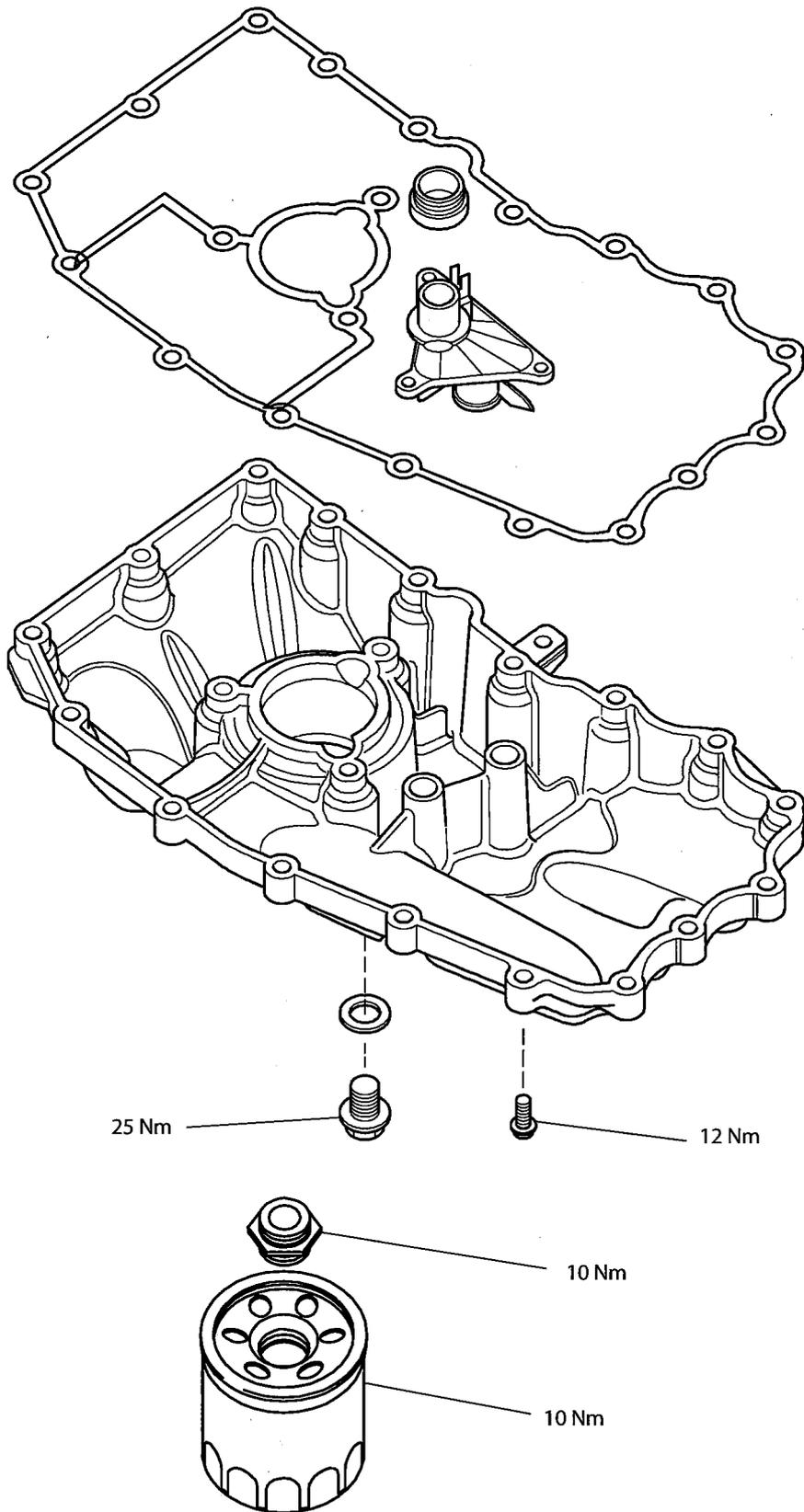
# 8 Lubrication

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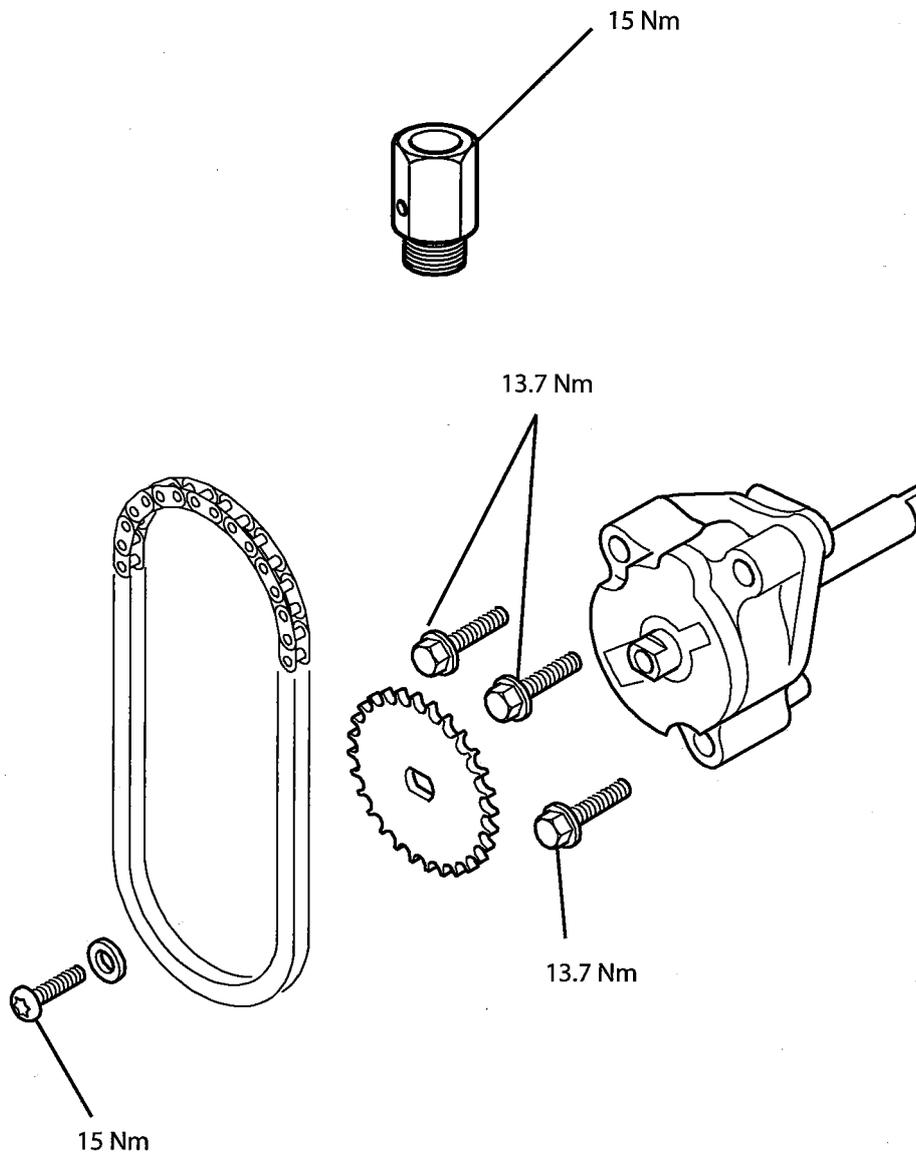
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# Lubrication

## Exploded View - Sump

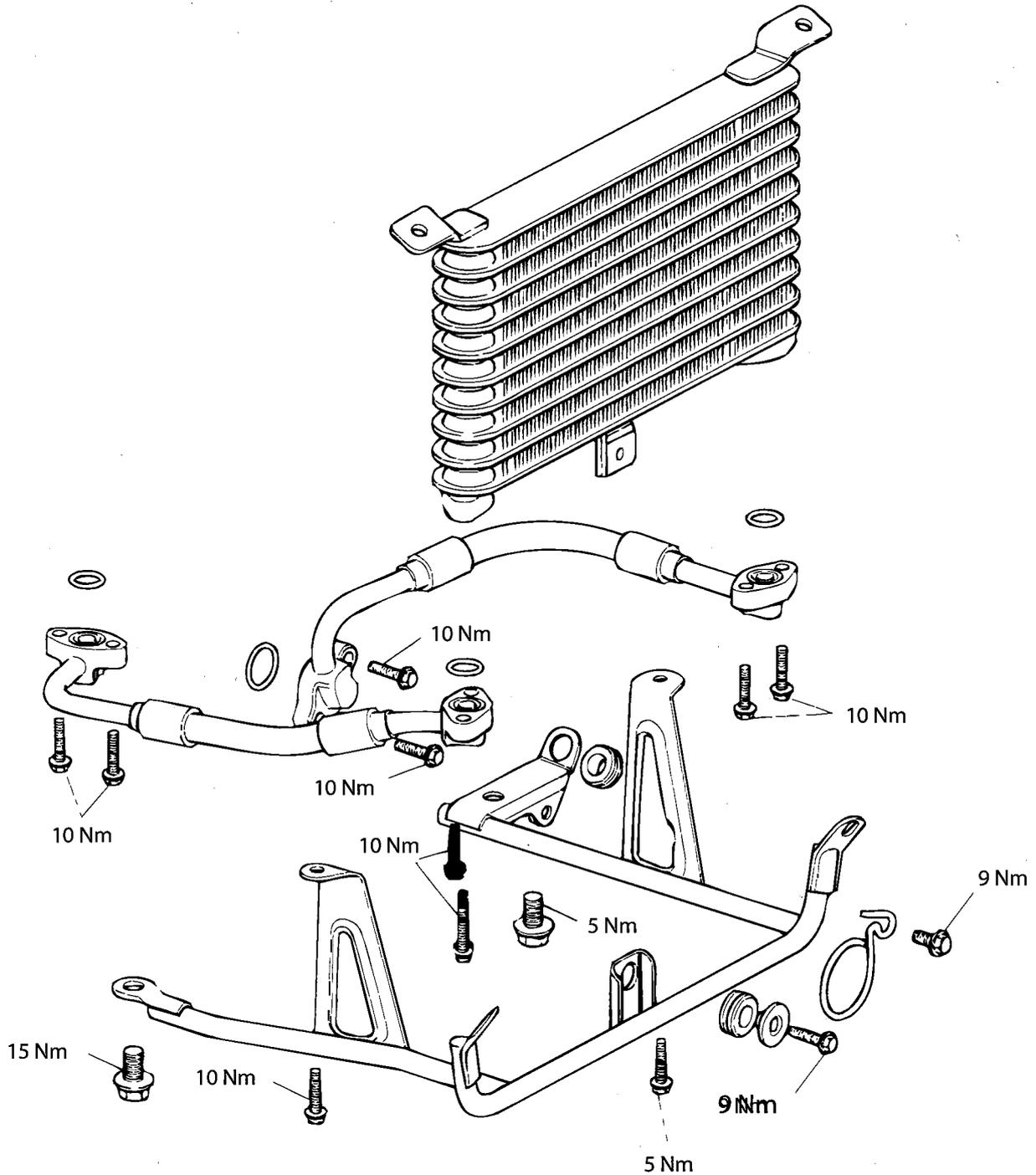


Exploded View - Oil Pump and Gears

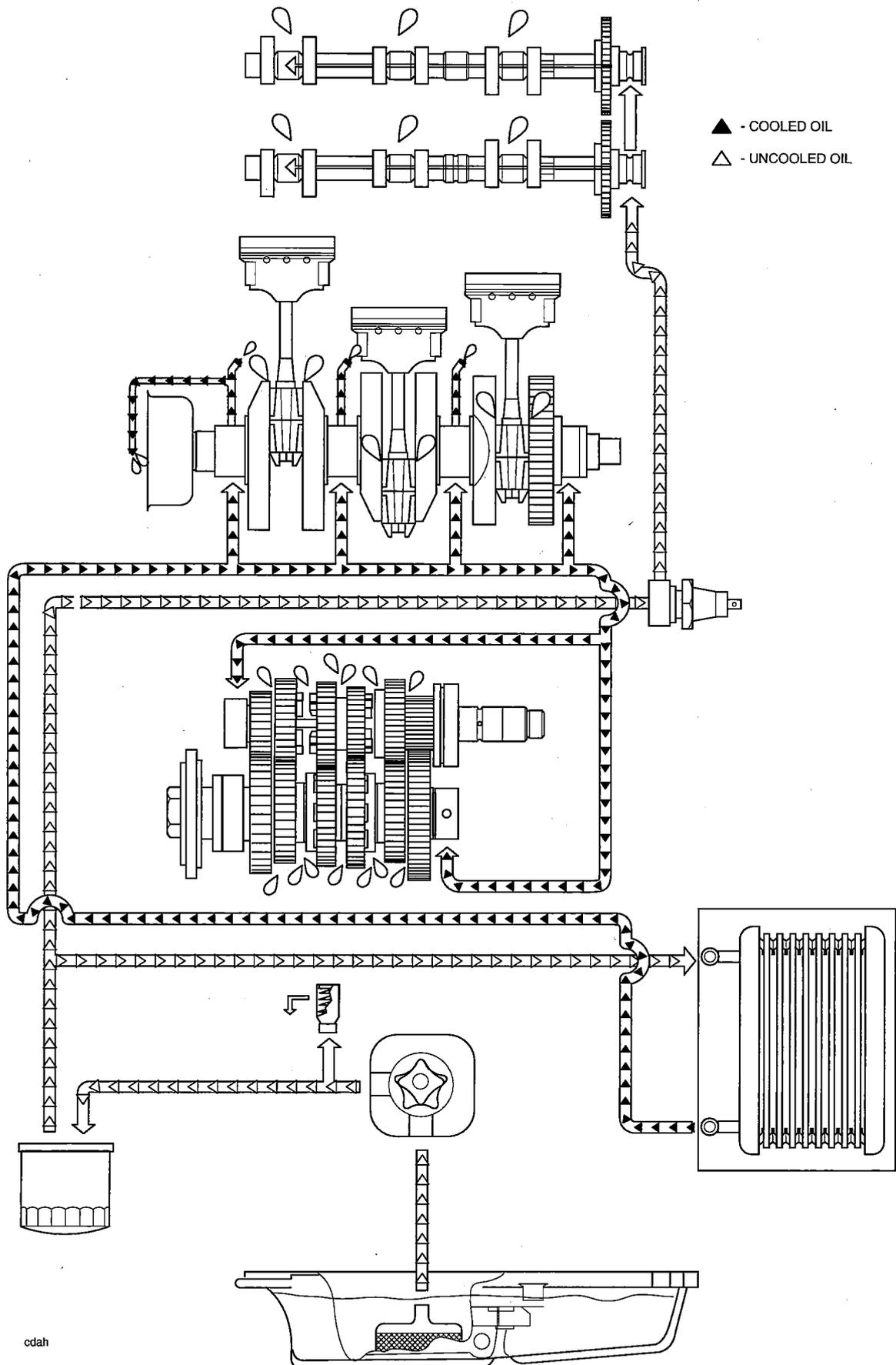


# Lubrication

## Exploded View - Oil Cooler



Engine Oil Circuit



cdah

# Lubrication

## Engine Oil Circuit Description

Oil is collected from the sump and is drawn through a mesh strainer into the oil pump rotor. The oil pump is fitted with a single pumping rotor which supplies pressurised oil to the lubrication circuit and the oil cooler.

Pressurised oil is delivered to the outside rim of the oil filter near to where the oil pressure relief valve is fitted. The relief valve is set to open at 75 lb/in<sup>2</sup> and when open, returns high pressure oil direct to the sump.

Filtered oil is then fed into the lower crankcase gallery. From here is distributed around the engine:

1. Some oil is sent directly to the cylinder head via a drilling in the upper crankcase and an external link pipe. A low oil pressure warning light switch is located at the crankcase end of the link pipe. Oil that arrives at the cylinder head is fed to both cams via a gallery in the cylinder head casting that delivers oil directly to the sprocket end cam bearings. Oil is then fed through the hollow camshafts to the other camshaft bearings, the tappet buckets and the valves.
2. The remaining oil is sent directly to the remote oil cooler (mounted beneath the radiator). Cooled oil is returned to the main gallery located under the crankshaft. Here it is delivered to the crankshaft main bearings and, via drillings in the crankshaft, to the big end bearings.

Spray jets located in the upper crankcase, behind the main bearing shells, lubricate the pistons and connecting rod small ends. These jets are fed oil from the crankshaft oil feed.

Oil is fed to the gearbox via internal oil pipes and drilling that supply oil directly to the end of each shaft. Oil is circulated along the gearbox shafts to exit holes that feed directly to the bearings, gears and selectors.

On the Sprint, oil is also fed to the alternator cover to aid cooling of the alternator. The oil is taken from the crankshaft oil feed and directed to the cover via drillings in the upper crankcase and through a small hole in the cover gasket.

## Engine Oil

### Specification

Use semi or fully synthetic 10W/40 or 15W/50 motorcycle engine oil which meets specification API SH (or higher) and JASO MA, such as Mobil 1 Racing 4T.

### Caution

Triumph high performance fuel injected engines are designed to use semi or fully synthetic motorcycle engine oil which meets specification API SH (or higher) AND JASO MA.

Do not add any chemical additives to the engine oil. The engine oil also lubricates the clutch and any additives could cause the clutch to slip.

Do not use mineral, vegetable, non-detergent oil, castor based oils or any oil not conforming to the required specification. The use of these oils may cause instant, severe engine damage.

Ensure no foreign matter enters the crankcase during an oil change or top-up.

### Triumph Engine Oil

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

Mobil 1 Racing 4T consistently performed well during our tests and has become our primary recommendation for the lubrication of all current Triumph motorcycle engines.

Mobil 1 Racing 4T, specially filled for Triumph, is available from your authorised Triumph dealer.

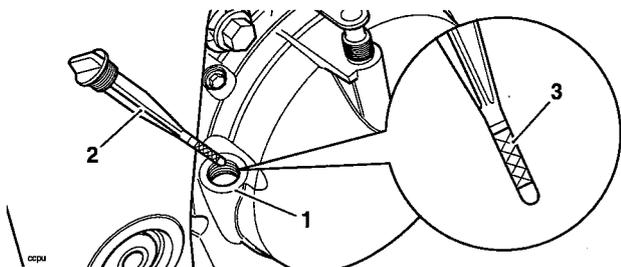
## Oil Level Inspection

In order for the engine, transmission, and clutch to function correctly, maintain the engine oil at the correct level, and change the oil and oil filter in accordance with scheduled maintenance requirements.

### Warning

Motorcycle operation with insufficient, deteriorated, or contaminated engine oil will cause accelerated engine wear and may result in engine or transmission seizure. Seizure of the engine or transmission may lead to loss of motorcycle control and an accident.

1. Stop engine, then wait for at least 10 minutes to allow the oil to settle.
2. Remove the filler plug/dipstick, wipe the dipstick clean and screw the plug/dipstick fully home in the clutch cover.



1. Filler
2. Filler Plug/Dipstick
3. Hash-marked area

#### Note:

- The actual level is indicated when the motorcycle is level and upright, not on the side stand, and when the filler has been screwed fully home.
3. Remove the filler plug/dipstick.
  4. The oil level is indicated by hash marks on the filler plug/dipstick. When full, the indicated oil level must be level with the top of the hashed area.
  5. If the oil level is too low, add oil a little at a time through the dipstick hole in the clutch cover.

6. After each small amount of oil has been added, check the oil level by fully inserting and removing the dipstick. Continue to adjust as necessary until the oil level is correct.

## Oil and Oil Filter Change

### Warning

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

The engine oil and filter must be replaced in accordance with scheduled maintenance requirements.

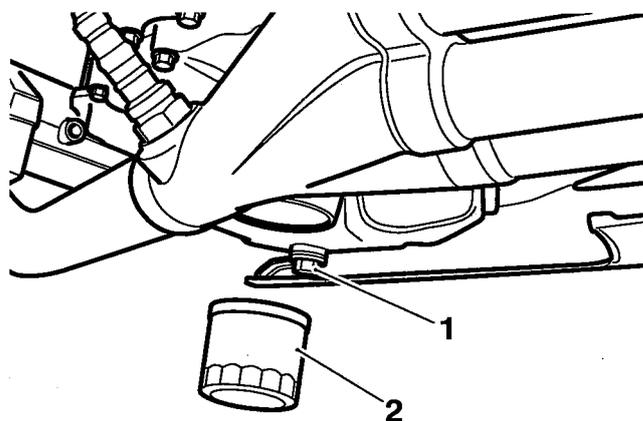
1. Warm up the engine thoroughly, and then stop the engine.

Place an oil pan beneath the engine.

### Warning

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

2. Remove the oil drain plug.

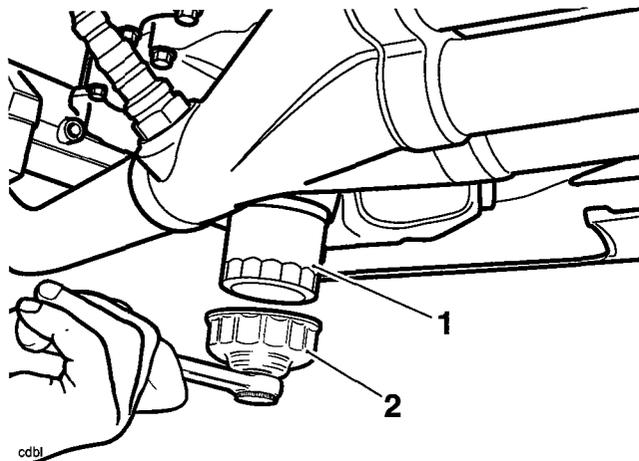


cd/bk

1. Oil Drain Plug
2. Oil Filter
3. With the motorcycle on level ground, and on the sidestand, allow the oil to completely drain.

# Lubrication

- Unscrew and remove the oil filter using Triumph service tool T3880312.



## 1. Oil Filter

## 2. Tool T3880312

- Discard the oil filter.
- Pre-fill a new oil filter with clean engine oil.
- Apply a smear of clean engine oil to the sealing ring of the new oil filter.
- Fit the oil filter and tighten to **10 Nm**.
- After the oil has completely drained out, fit a new sealing washer to the drain plug. Fit and tighten the plug to **25 Nm**.
- Fill the engine with new oil of the type and grade listed previously and in the specification section.
- Start the engine and allow to idle.

### **Caution**

Racing the engine before the oil reaches every part can cause engine damage or seizure.

- Ensure that the oil pressure warning light extinguishes shortly after starting.

### **Caution**

If the engine oil pressure is too low, the low oil pressure warning light will illuminate. If this light stays on when the engine is running, stop the engine immediately and investigate the cause. Running the engine with low oil pressure will cause engine damage.

- Stop the engine and check the oil level. Adjust if necessary.

## Disposal of Used Engine Oil

To protect the environment, do not pour oil on the ground, down sewers or drains, or into water courses. Dispose of used oil sensibly. If in doubt contact your local authority.

## Oil Pump

### **Warning**

Prolonged or repeated contact with engine oil can lead to skin dryness, irritation and dermatitis. Furthermore, used engine oil contains potentially harmful contaminants which can cause cancer.

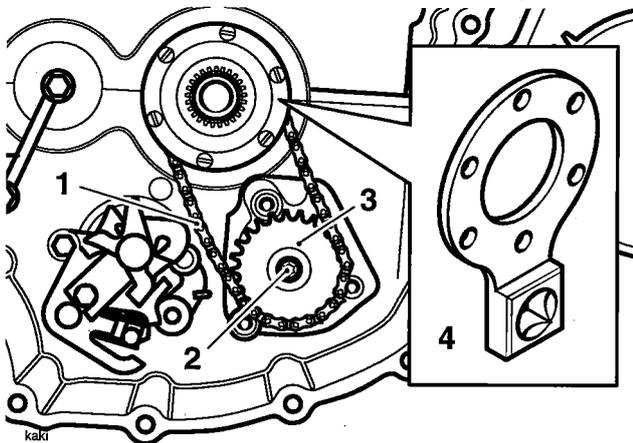
When handling used engine oil, always wear protective clothing and avoid any skin contact with the oil.

### **Caution**

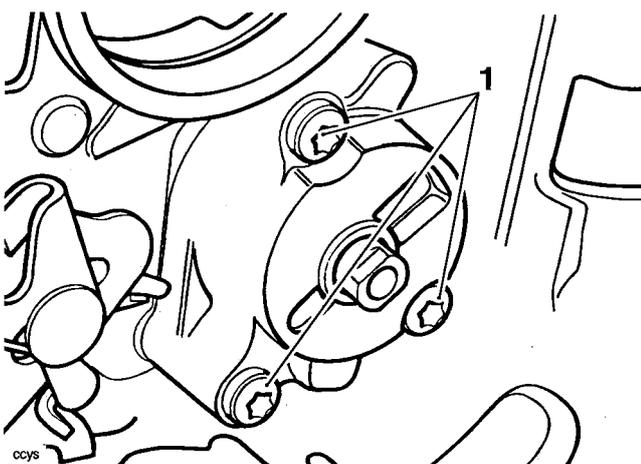
Do not pour engine oil on the ground, down sewers or drains, or into water courses. To prevent pollution of water courses etc., dispose of used oil sensibly. If in doubt contact your local authority.

## Removal

1. Remove the seat (see page 16-8).
2. Disconnecting the battery, negative (black) lead first.
3. Remove the clutch (see page 4-5).
4. Fit tool T3880371 to the drive dogs on the upper oil pump drive sprocket. Hold the tool to prevent rotation and release the bolt securing the oil pump drive sprocket to the oil pump.



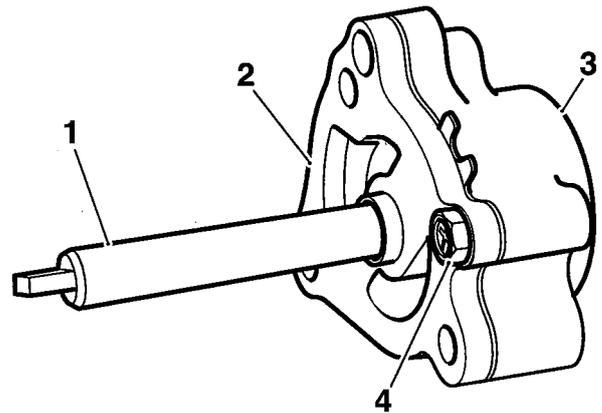
1. Oil pump drive chain
2. Pump drive sprocket fixing
3. Pump drive sprocket
4. Tool T3880371
5. Remove the tool, upper and lower sprockets, upper sprocket bearing and the drive chain by sliding all components off the shaft together.
6. Release the bolts securing the oil pump to the crankcase and withdraw the oil pump.



1. Pump bolts

## Inspection

1. Release the screw and withdraw the oil pump plate from the pump body.



1. Oil pump drive shaft
2. Oil pump plate
3. Oil pump body
4. Screw



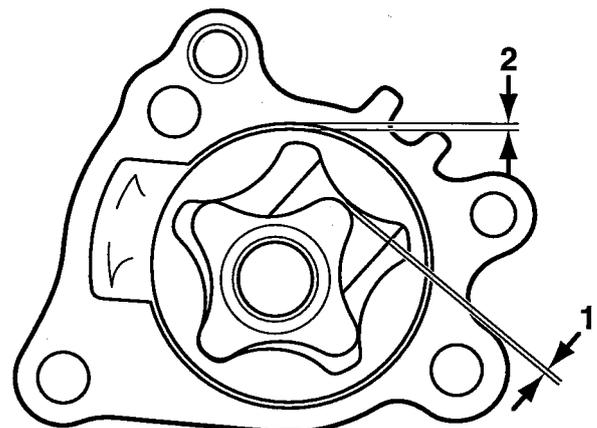
## Caution

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

2. Measure the rotor tip clearance using feeler gauges.

## Rotor Tip Clearance

Standard:	0.15 mm
Service limit:	0.20 mm



1. Rotor tip clearance
2. Pump body clearance

## Lubrication

3. Measure the pump body clearance using feeler gauges.

### Body Clearance

Standard:	0.15 - 0.22 mm
Service limit:	0.35 mm

4. Measure the pump end clearance.

### Pump End Clearance

Standard:	0.02 - 0.07 mm
Service limit:	0.10 mm

5. (a) If all clearances are within service limits, liberally apply clean engine oil to all internal components and refit the oil pump plate to the oil pump body.  
(b) If any clearance measured is outside the service limits, renew the complete pump.
6. Inspect all the sprocket and chain for wear and/or damage. Replace the sprocket and chain if wear and/or damage is found.

## Installation

### Caution

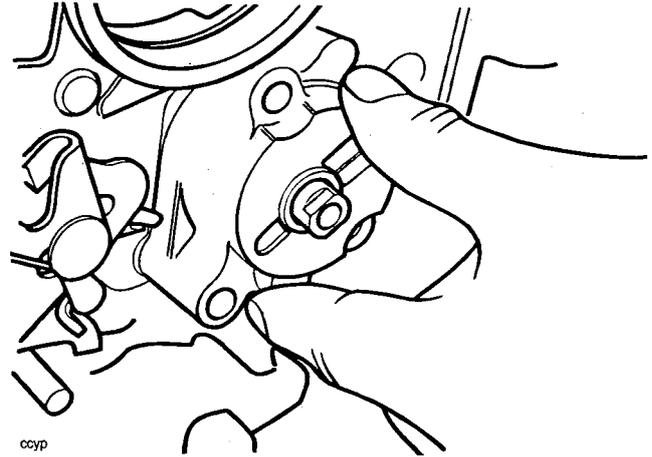
Before fitting the oil pump to the crankcase ensure the pump internal surfaces have been 'wetted' with clean engine oil. The pump may fail to pick-up oil from the sump if the surfaces have not been 'wetted'. This will cause the engine to run without engine oil pressure and will lead to severe engine damage.

1. Fill the oil pump with new engine oil, turning the pump rotor as the oil is poured in to ensure all surfaces are coated with oil.
2. Position the oil pump to the crankcase and insert into the opening provided.

### Note:

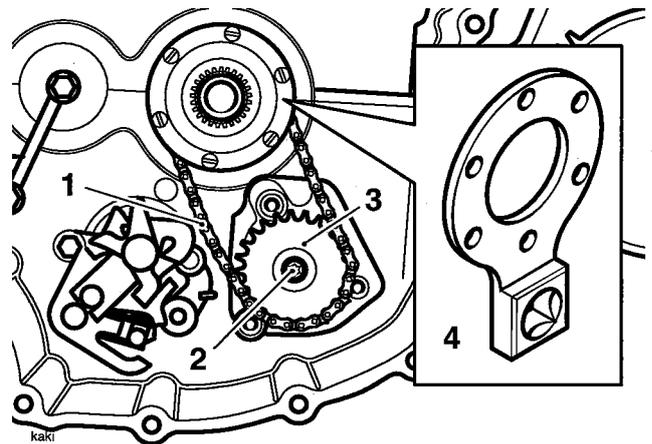
- Use the sprocket end of the oil pump shaft to turn the drive peg into alignment with the drive on the water pump.

3. Fit the oil pump to the crankcase, ensure the water pump drive peg locates into the drive on the water pump shaft. Tighten the bolts to **13.7 Nm**.



### Pump Insertion

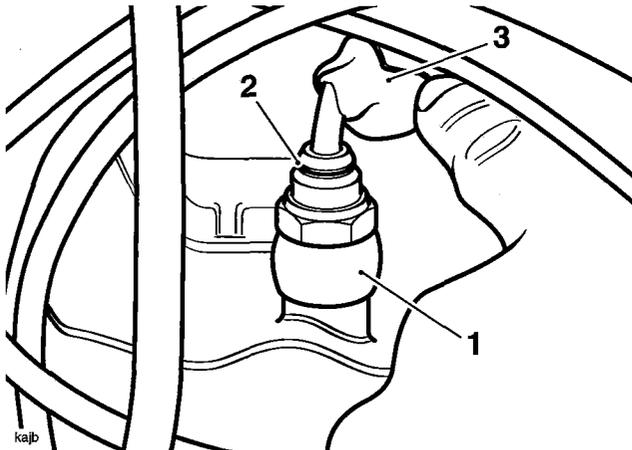
4. As an assembly, slide the upper drive sprocket bearing, upper drive sprocket, drive chain and pump sprocket onto the input shaft and oil pump.



1. Oil pump drive chain
2. Pump drive sprocket fixing
3. Pump drive sprocket
4. Tool T3880371
5. Locate the pump drive sprocket onto the pump ensuring that the drive engages correctly.
6. Refit tool T3880371 to the upper drive sprocket and tighten a new oil pump drive sprocket centre bolt to **15 Nm**. Remove the tool.
7. Assemble the clutch (see page 4-9).
8. Reconnect the battery, positive (red lead) first.
9. Refill the engine with oil (see page 8-7).

## 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/Covering Boot

1. Remove the seat (see page 16-8).
2. Disconnect the battery negative (black) lead first.
3. Remove the right hand lower fairing (see page 16-11).
4. Lift the covering boot and disconnect the electrical connection to the switch.
5. Remove the switch and collect the copper washers.

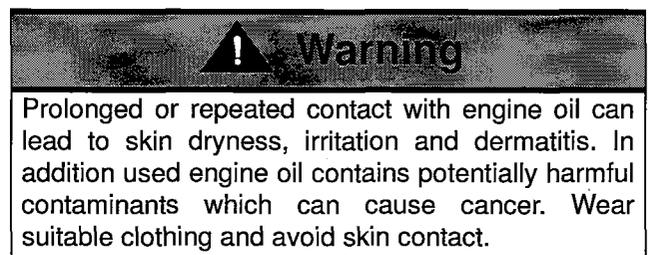
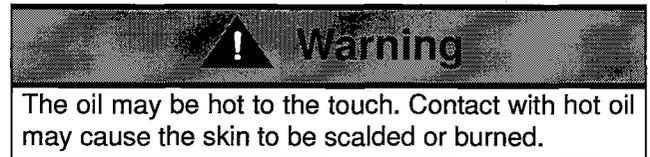
### Installation

1. Using new copper washers on both sides of the oil pipe union, fit the switch and tighten to **13 Nm**.
2. Refit the electrical connection.
3. Refit the covering boot.
4. Refit the right hand lower fairing (see page 16-12).
5. Reconnect the battery, positive (red) lead first.

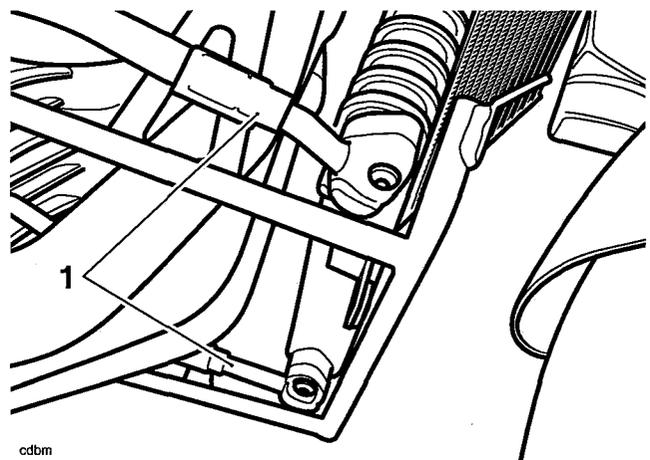
## Sump

### Removal

1. Remove the seat (see page 16-8).
2. Disconnect the battery negative (black) lead first.
3. Drain the engine oil (see page 8-7).

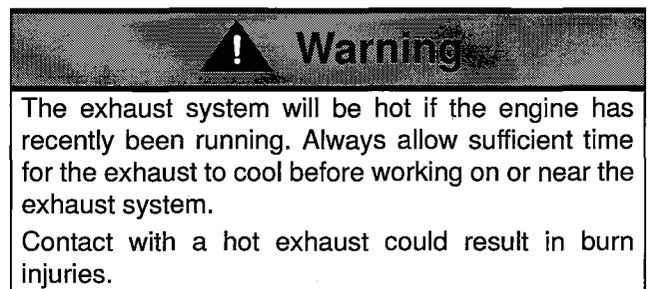


4. Remove the lower fairings (see page 16-11).
5. Note the position of the oil cooler pipes prior to disconnecting the pipes from the sump.



### 1. Oil Cooler Pipes

6. Remove the exhaust system (see page 10-105).



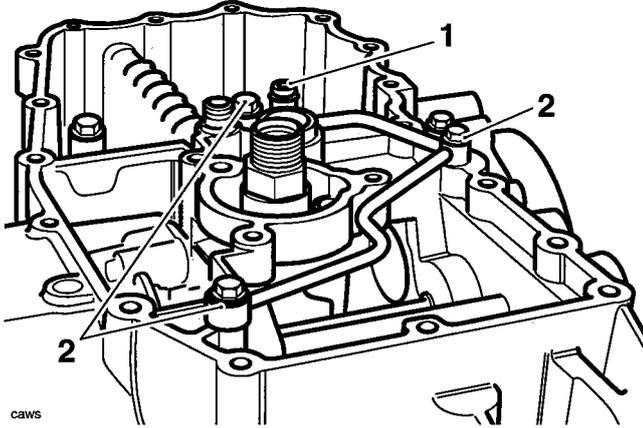
7. Remove the oil filter (see page 8-7).

# Lubrication

8. Release the bolts securing the sump to the lower crankcase.
9. 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
2. Transmission oil feed pipe fixings

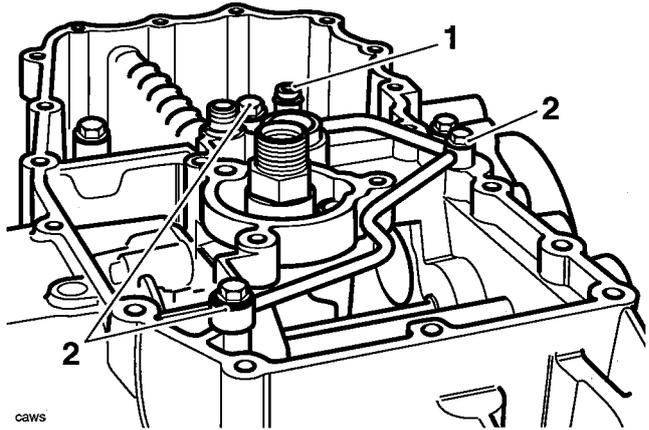
10. Remove the sump gasket.
11. If necessary, remove the oil transfer pipe and collect the sealing washer from either side of each joint.

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

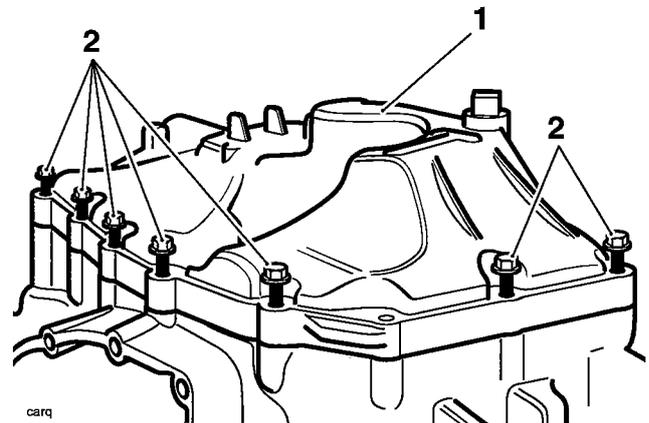
## Installation

1. Fit the oil transfer tube to the crankcase.



1. Oil transfer tube
2. Transmission oil feed pipe fixings

2. If removed, fit the oil transfer pipe incorporating new washers. Tighten the fixings to **8 Nm**.
3. Incorporating a new sump gasket, position the sump to the lower crankcase.
4. Tighten the sump fixings to **12 Nm**.



1. Sump
2. Fixings

5. Incorporating new 'O' rings, reconnect the oil cooler pipes. Tighten the cooler pipe bolts to **10 Nm**.
6. Pre-fill a new oil filter with clean engine oil.
7. Apply a smear of clean engine oil to the seal of the new oil filter.
8. Fit the oil filter and tighten to **12 Nm** using tool T3880012.
9. Refit the exhaust system (see page 10-106).

**Note:**

- **Use new exhaust gaskets at the downpipe connections with the cylinder head.**
10. Fill the engine with the correct grade of engine oil
  11. Reconnect the battery positive (red) lead first.
  12. Start the engine and ensure that the low oil pressure warning light goes out shortly after starting.
  13. Stop the engine and adjust the engine oil level.
  14. Refit the lower fairings (see page 16-12).
  15. Refit the seat (see page 16-8).

## Oil Cooler

### Removal

1. Remove the seat (see page 16-8).
2. Disconnect the battery negative (black) lead first.
3. Remove both lower fairings (see page 16-11).
4. Drain the engine oil (see page 8-7).

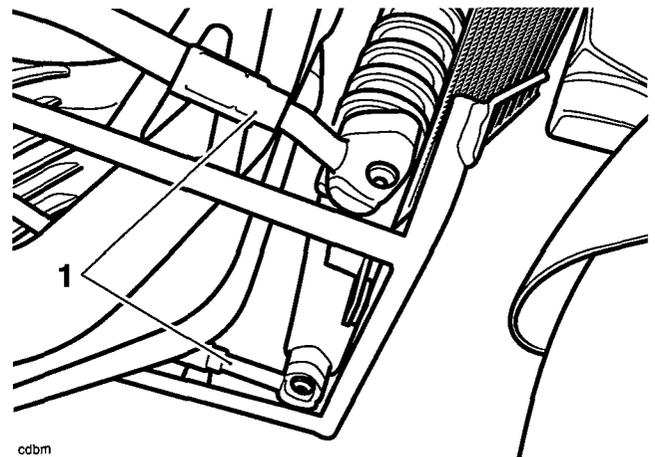
**! Warning**

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. Disconnect the oil cooler feed and return hoses.

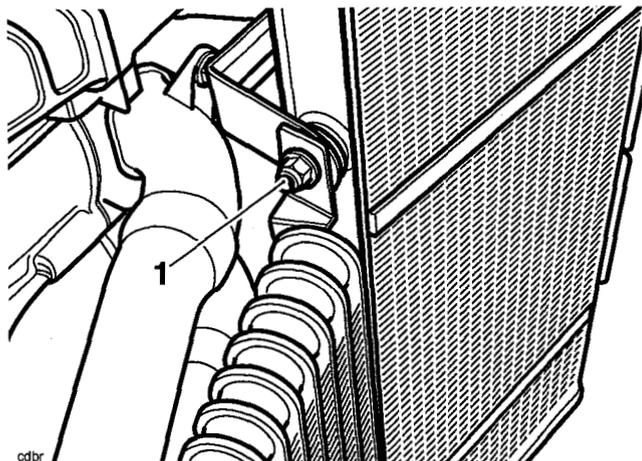


cdbm

**1. Oil cooler hoses**

## Lubrication

6. Release the oil cooler fixings.



### 1. Upper oil cooler fixing

7. Detach the oil cooler.

## Inspection

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

## Installation

1. Position the oil cooler to the retaining brackets.
2. Refit and tighten the oil cooler fixings to **9 Nm**.
3. Align the oil cooler pipes to the cooler and, incorporating new O-rings, tighten the fixings to **10 Nm**.
4. Refill the engine with oil (see page 8-7).
5. Reconnect the battery positive (red) lead first.
6. 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.
7. Adjust the engine oil level (see page 8-7).
8. Refit both lower fairings (see page 16-12).
9. Refit the seat (see page 16-8).

# 9 Engine Removal/Refit

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Engine Removal/Refit .....	9.2
Engine Installation .....	9.4

# Engine Removal/Refit

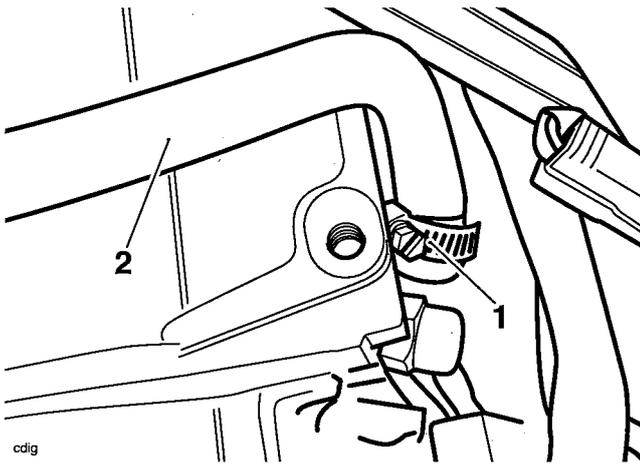
## Engine Removal/Refit

1. Remove the seat (see page 16-8).
2. Remove the battery (see page 17-8).

### Warning

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

3. Place the motorcycle on a paddock stand.
4. Remove the body side panels and lower fairings (see page 16-11).
5. Remove the airbox (see page 10-92).
6. Drain the engine oil (see page 8-7).
7. Drain the coolant detaching the bottom hose at the water pump (see page 11-4).
8. Detach the bypass hose at the cylinder head.



1. Hose Clip
2. Cylinder Head Bypass Hose

9. Detach the top hose at the thermostat housing (see page 11-6).

### Note:

- **Secure the hoses to prevent damage as the engine is removed.**

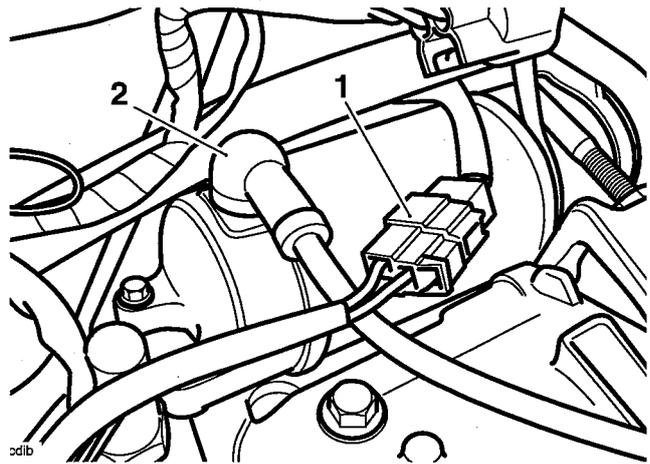
10. Remove the exhaust system (see page 10-105).
11. Remove the oil cooler (see page 8-13).
12. Set the drive chain adjustment to allow maximum free play in the chain (see page 12-10).

### Caution

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

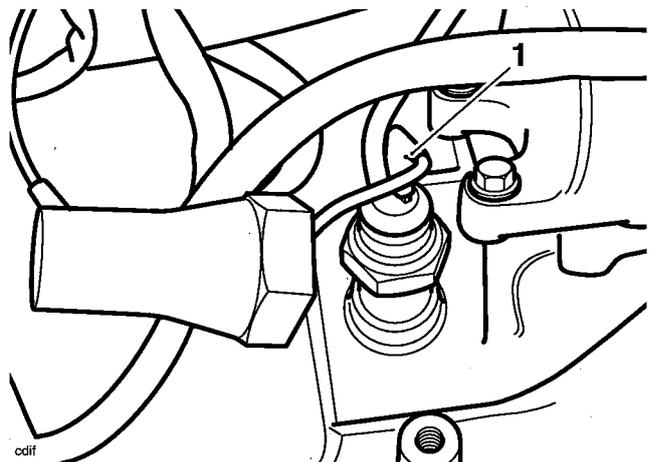
13. Remove the sprocket cover.

14. Ease the lead from the starter boot and then release the lead nut. Detach the lead.
15. Disconnect the alternator multiplug.



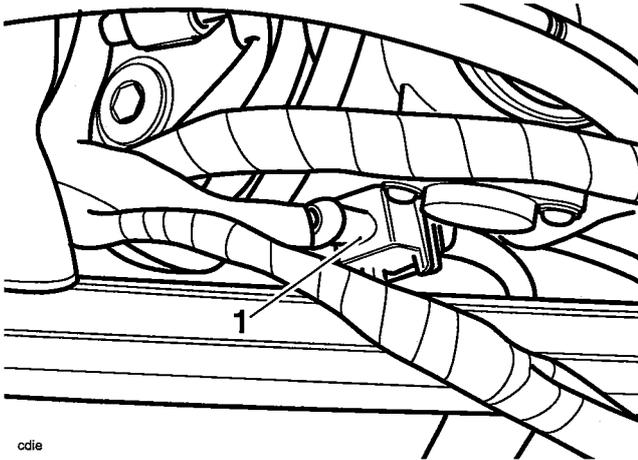
1. Alternator Multiplug
2. Starter Motor Connection

16. Ease the boot from the low oil pressure warning light switch and disconnect the electrical connector.



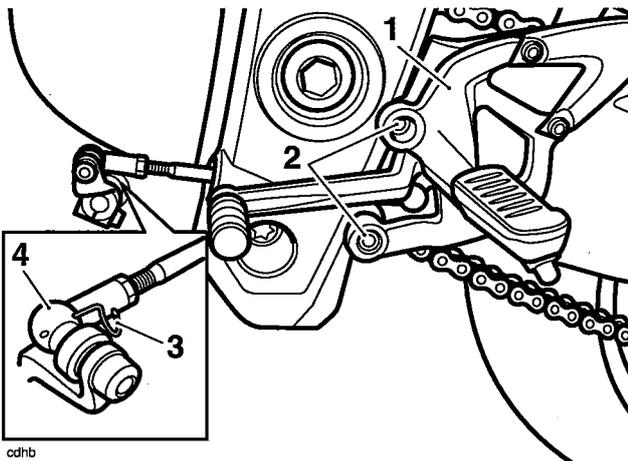
17. Disconnect the vehicle speed sensor multiplug.
18. Disconnect the side stand switch multiplug.
19. Disconnect the engine ground connections.

20. Disconnect the crankshaft position sensor multiplug.



cdie

21. Disconnect the neutral position switch indicator electrical connector.  
 22. Release the clip from the gear change linkage, and detach the rod from the arm.  
 23. Release the bolts securing the gear change linkage and footrest to the frame, and remove the gear change linkage and footrest as an assembly.



cdhb

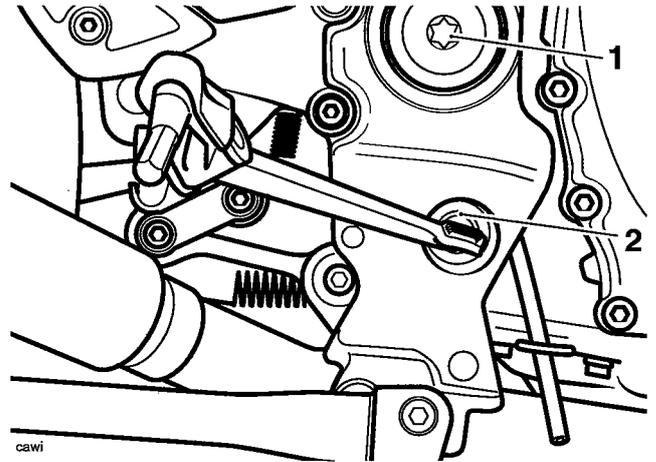
1. Footrest Bracket  
 2. Fixings  
 3. Securing Clip  
 4. Gear Change Linkage

24. Remove the throttle bodies, injectors and fuel rail from the cylinder head (see page 10-99).

**Note:**

- It is not necessary to disconnect the throttle cables.

25. Disconnect the clutch cable (see page 4-5).  
 26. Remove the swinging arm pivot bolt, leaving the spindle in place.  
 27. Slacken the drag link pivot bolt.



cawi

1. Swinging arm pivot bolt  
 2. Drag link pivot bolt

**! Caution**

Failure to ensure adequate support for either the engine or motorcycle could cause both components to fall or move unexpectedly. A fall or sudden movement could lead to injury

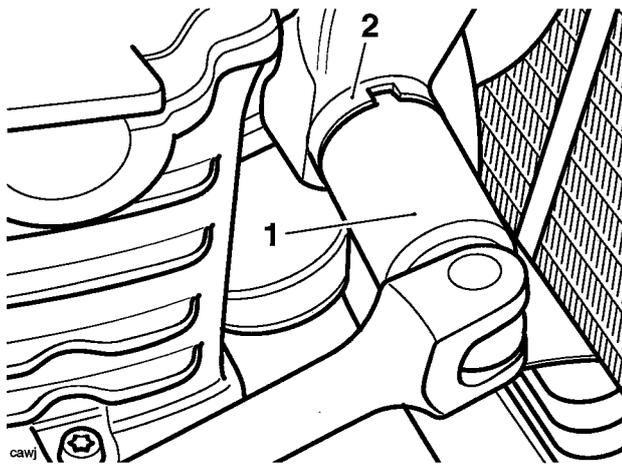
28. Place a support beneath the engine and ensure that the frame is still adequately and securely supported.

**! Caution**

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

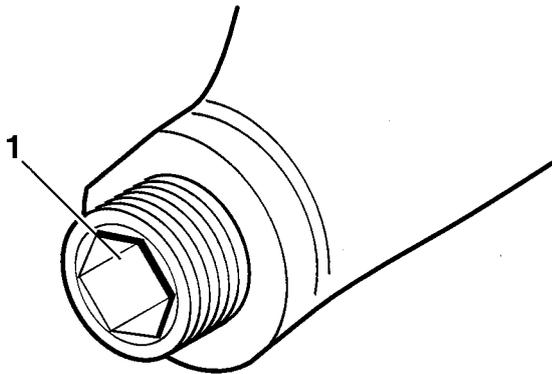
29. Remove the engine mounting bolts and lower the engine sufficiently to allow the drive chain to be detached from the output sprocket.  
 30. Remove the engine from the frame.  
 31. Slacken the engine mounting adjuster locknuts, on the right hand side of the frame, using tool T3880088.

# Engine Removal/Refit



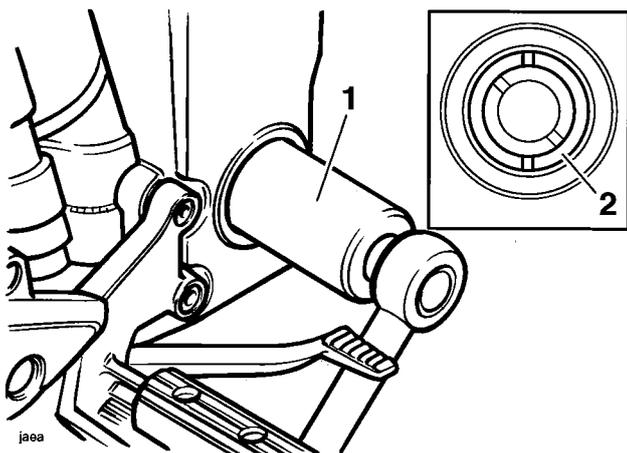
- 1. Tool T3880088
- 2. Engine mounting adjuster locknut

32. Slacken the engine mounting adjusters.



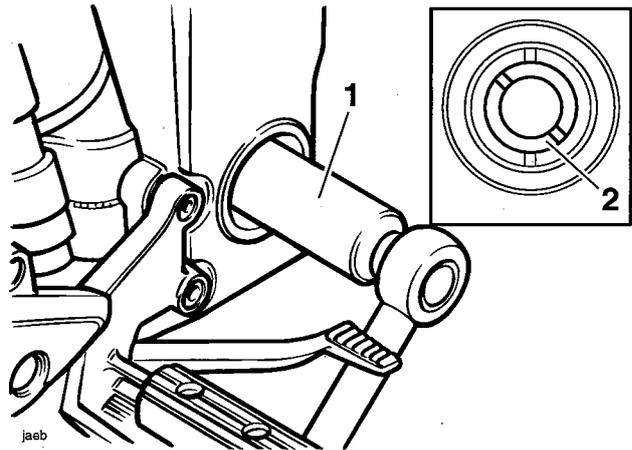
- 1. Engine mounting adjuster

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



- 1. Tool T3880295
- 2. Locking ring

34. 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

## Engine Installation

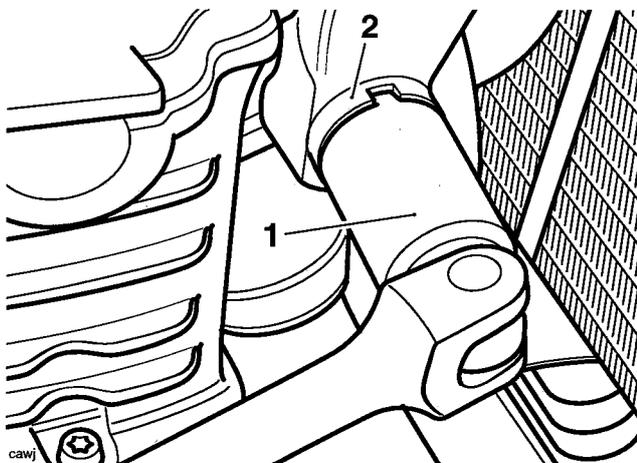
1. Position the engine beneath the frame.
2. Raise the engine and loop the drive chain over the output sprocket.
3. Align the engine to the frame and fit, but do not tighten, all engine mounting bolts to support the engine.



### Caution

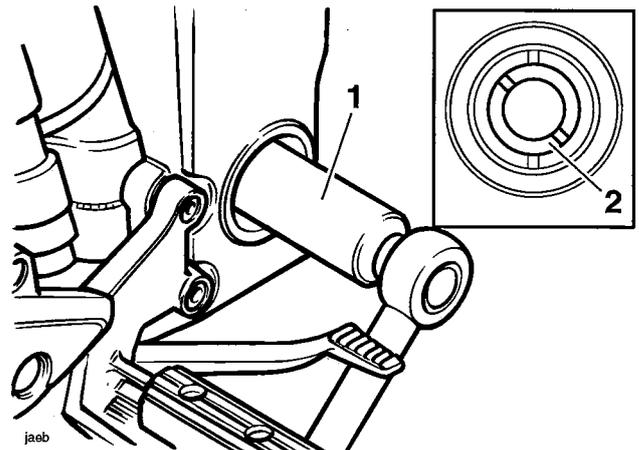
Unless the following engine mounting bolt tightening sequence is precisely followed, severe frame damage can occur.

4. Remove the support from beneath the engine.
5. Tighten left hand engine mounting bolts to **80 Nm** in the following sequence:
  - a) upper rear
  - b) lower rear
  - c) front
6. On the right hand side, tighten all engine mounting adjusters to **3 Nm**.
7. Tighten the right hand engine mounting bolts to **80 Nm** in the following sequence:
  - a) front
  - b) lower rear
  - c) upper rear
8. Tighten the engine mounting adjuster locknuts to **55 Nm** using tool T3880088

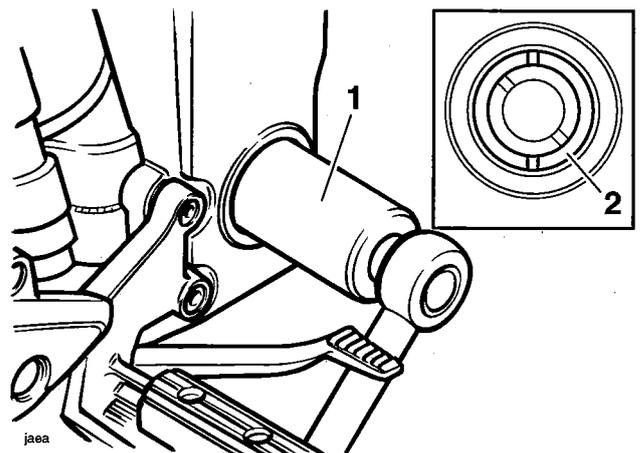


1. Tool T3880088
2. Engine mounting adjuster locknut

9. Tighten the swinging arm inner adjustment ring to **15 Nm** and the outer ring to **30 Nm** using service tools T3880290 and T3880295 respectively.



1. Tool T3880295
2. Locking ring

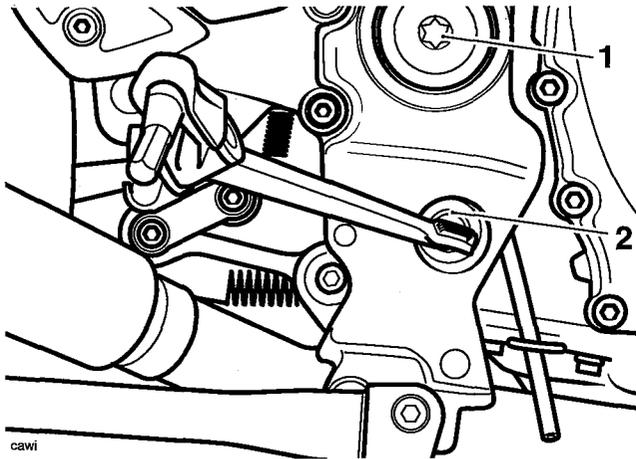


1. Tool T3880290
2. Clamping ring

10. Fit the swinging arm bolt and tighten to **60 Nm**.

# Engine Removal/Refit

11. Tighten the drag link spindle bolt to **48 Nm**.



- 1. Swinging arm pivot bolt**  
**2. Drag link pivot bolt**

12. Reposition the gear change linkage and footrest assembly, passing the gear change rod through the frame.
13. Refit the gear change rod to the arm and refit the clip to the rod. Tighten the fixings to 27 Nm.
14. Refit the air deflector shield to the cam cover.
15. Refit the clutch cable (see page 4-6).
16. Check the injector O-rings for splits and other damage. Replace as necessary.
17. Refit the throttle bodies, injectors and fuel rail to the cylinder head (see page 10-100).

## Warning

Operation of the motorcycle with incorrectly adjusted, incorrectly routed or damaged throttle cables 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.

18. Adjust the throttle cables as necessary (see page 10-96).

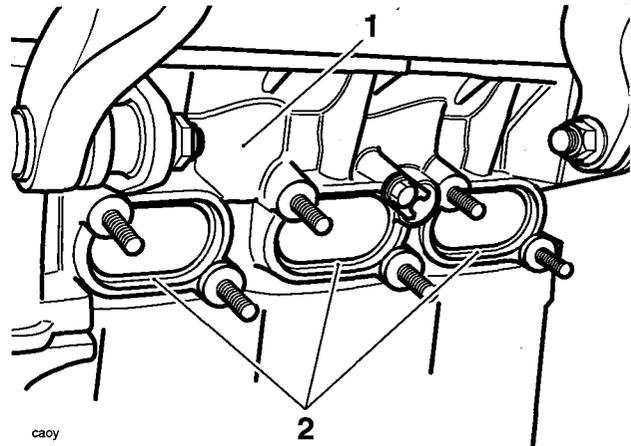
## Warning

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

## 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. Allow the swinging arm to hang free, and set the drive chain adjustment (see page 12-10).
21. Refit the sprocket cover and tighten the bolts to **9 Nm**.
22. Using new seals at the cylinder head end, refit the exhaust system (see page 10-106).



- 1. Cylinder head**  
**2. Seals**

23. Refit the oil cooler (see page 8-13).
24. Reconnect the top hose at the cylinder head, the bottom hose at the water pump and the bypass hose at the cylinder head (see page 11-9).
25. Refill the cooling system (see page 11-4).
26. Fill the engine with oil of the correct grade and viscosity (see page 8-7).
27. Refit the airbox (see page 10-92).
28. Refit the bodywork (see page 16-12).
29. Refit the battery (see page 17-8).
30. Remove the motorcycle from the paddock stand and place on the side stand.

# 10 Fuel System/Engine Management

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# Fuel System/Engine Management

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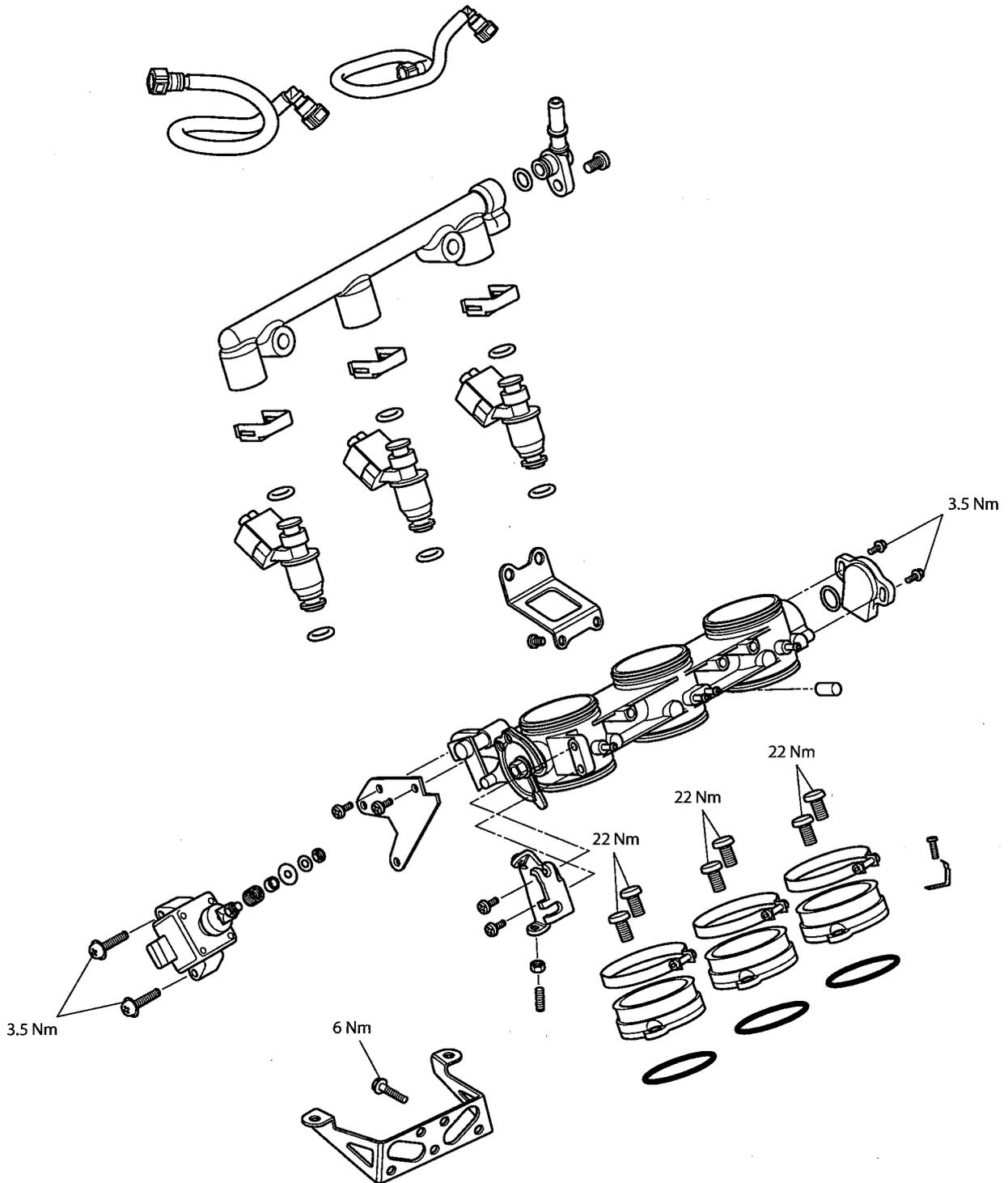
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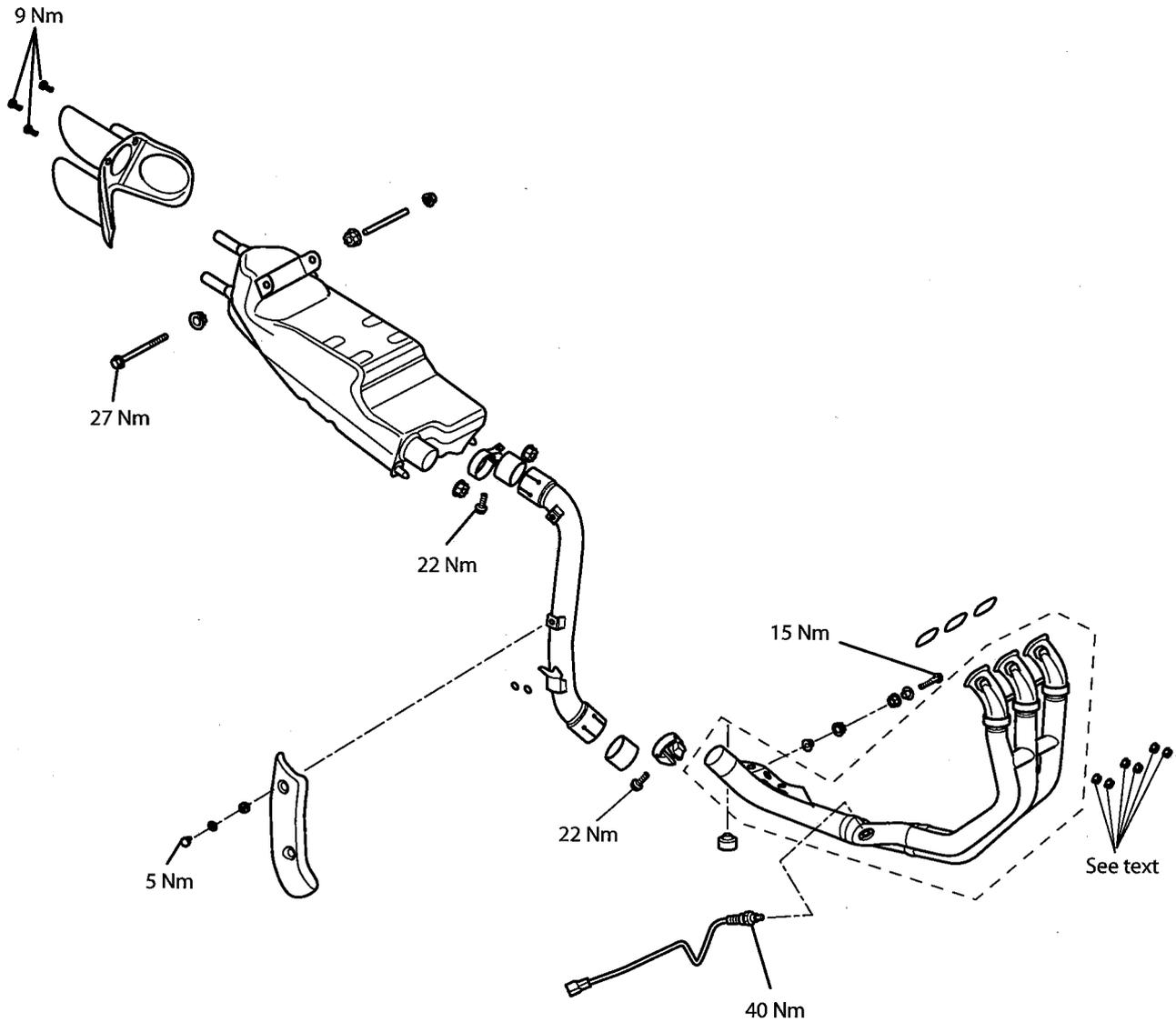


## Exploded View - Fuel Rail, Throttles and Injectors



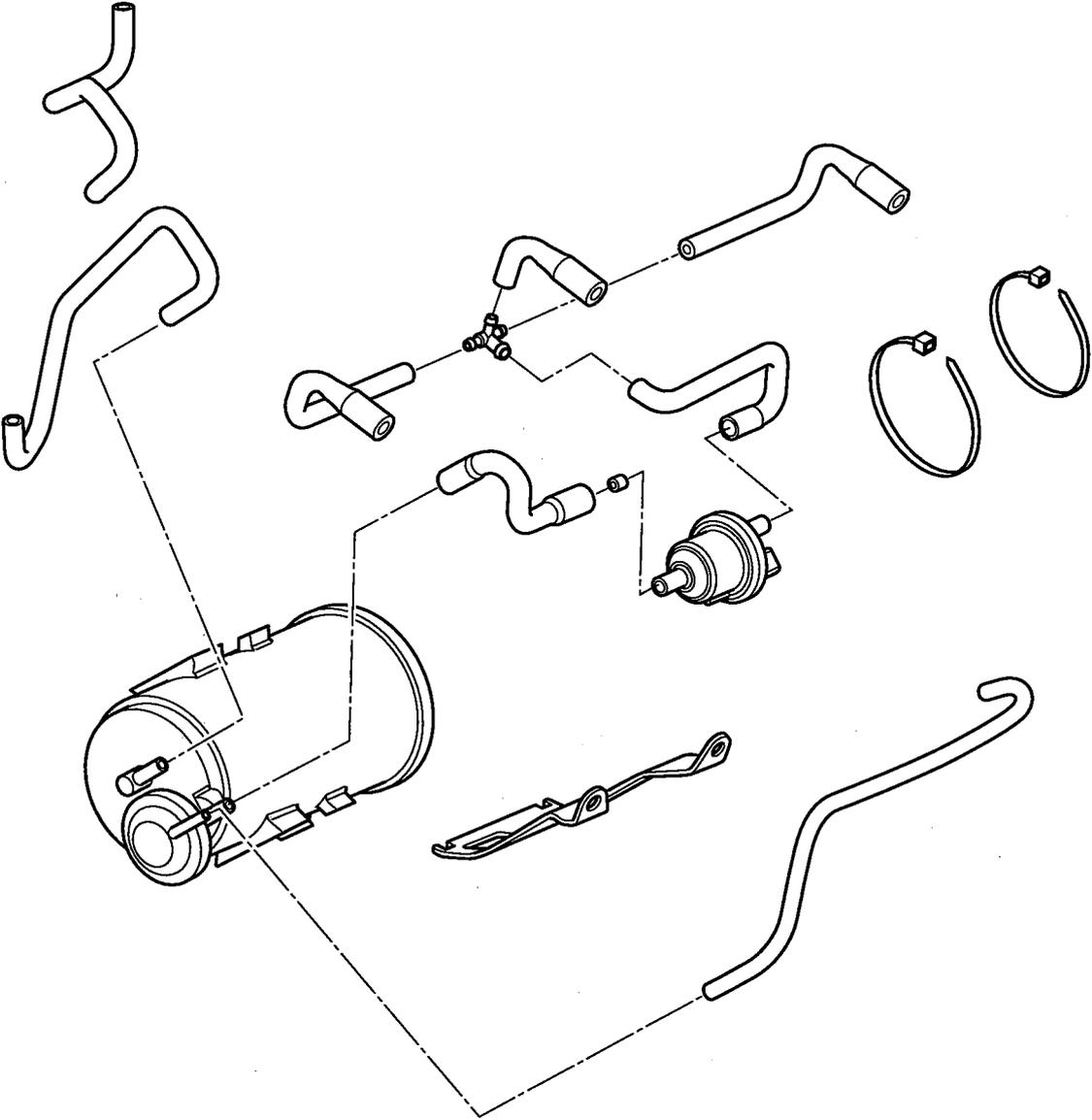


## Exploded View - Exhaust System



# Fuel System/Engine Management

## Exploded View - Evaporative System



## Fuel Requirements

### Fuel Requirements - all countries except USA

Outside America, this model must be run on 95 RON unleaded fuel.

### Fuel Requirements - USA

In the United States of America where the octane rating of fuel is measured in a different way, the following information may be applied: This model is designed to run on unleaded gasoline with a CLC or AKI octane rating  $(R+M)/2$  of 89 or higher.



### Caution

The use of leaded gasoline is illegal in some countries, states or territories and will invalidate the vehicle and emissions control warranties. Additionally, leaded gasoline will cause damage to emissions control components

### MTBE (Methyl Tertiary Butyl Ether)

The use of gasolines containing up to 15% MTBE (Methyl Tertiary Butyl Ether) is permitted in Triumph motorcycles.

### Oxygenated Gasoline

To help in meeting clean air standards, some areas of the U.S. use oxygenated gasoline to help reduce harmful emissions. This model 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.

# Fuel System/Engine Management

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## Glossary of Terms

The following terms and abbreviations will be found in this section. Below is given a brief explanation of what some of the more common terms and abbreviations mean.

### Air temperature

The air temperature in the air box and intake system.

### Air temperature sensor

Sensor located in the airbox to detect the temperature of the incoming air.

### ATDC

After Top Dead Centre.

### Barometric pressure

Pressure of the air in the airbox.

### Battery voltage

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

### BTDC

Before Top Dead Centre (TDC).

### Catalyst

Device placed in the exhaust system which reduces exhaust emissions by stimulating secondary combustion of the exhaust gases.

### Closed throttle position

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

### Coolant temperature

The coolant temperature in the cylinder head.

### Coolant temperature sensor

Sensor which detects coolant temperature.

### Cooling fan status

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

### DTC

Diagnostic Trouble Code.

### ECM

Engine Control Module.

### Engine speed

The crankshaft revolutions per minute.

### Freeze frame

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

### Idle fuel trim

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

### Idle fueling

Adjustment of fueling at idle to suit the actual air inducted.

### Idle reference speed

The target idle speed as determined by the Electronic Control Module (ECM). (It should be the same as the actual idle speed if the motorcycle is operating correctly.)

### Ignition advance

The timing of ignition at the spark plug relative to top dead centre.

### Ignition switch position

The 'on' or 'off' position of either or both the ignition switch and the engine stop switch.

### Ignition timing

Same as 'ignition advance'.

### Injector pulse time

The time during which an injector remains open (i.e. delivering fuel).

### Long term fuel trim

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

## MAP sensor

Manifold absolute pressure (the air pressure in the intake system).

## MIL

Malfunction Indicator Lamp.

Illuminates when most Diagnostic Trouble Codes (DTCs) are set.

## Neutral switch status

The 'neutral' or 'in gear' status of the gear change.

## Off idle fuel trim

The percentage above or below the nominal fuel requirement for the volume of air entering at engine speeds other than idle. This function is not currently used in the Triumph system.

## Open circuit

A break in an electrical circuit - current cannot flow.

## Over temp

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

## Primary Throttle Position Sensor

Sensor for the primary (lower) throttle position.

## Primary Throttle Stepper Motor

Stepper motor used to vary throttle opening at idle and when the engine is clod.

## Purge valve duty cycle

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

## Road Speed Sensor

Gearbox mounted sensor which delivers information to the ECM that is converted to the road speed value that is displayed on the speedometer.

## Sensor reference voltage

Supply voltage to the system sensors (nominally 5 volts).

## Short circuit

A 'short cut' in an electrical circuit - current by-passes the intended circuit (usually to earth).

## Short term fuel trim

A correction applied to the fuel mixture during closed loop catalyst operation. This, in turn has an effect on the long term fuel trim in that, if an engine constantly requires mixture correction, the long term fuel trim will adapt to this requirement thus reducing the need for constant short term adjustment.

## Sidestand status

The 'up' or 'down' position of the side stand.

## Target dwell time

The actual time from coil 'on' to coil 'off'.

## Throttle position

The position of the throttle butterfly given as a percentage of the movement range. When the data is displayed on the tool, fully open need not be 100% nor fully closed 0%.

## Throttle voltage

Voltage at the throttle potentiometer.

## Vbatt

Battery voltage.

## Engine Management System

### System Description

The Sprint ST is fitted with an electronic engine management system which encompasses control of both ignition and fuel delivery. The electronic control module (ECM) draws information from sensors positioned around the engine, cooling and air intake systems and precisely calculates ignition advance and fueling requirements for all engine speeds and loads.

In addition, the system has an on-board diagnostic function. This ensures that, should a malfunction occur in the engine management system, the malfunction type, and engine data at the time the malfunction occurred, are stored in the ECM memory. This stored data can then be recovered 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

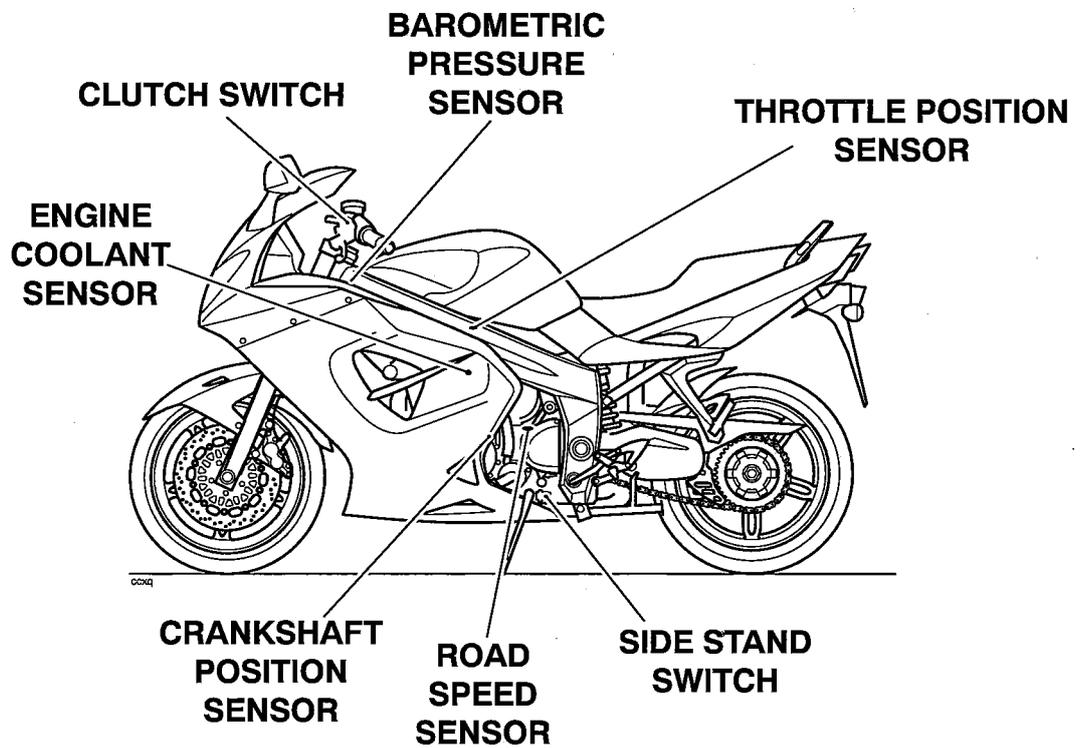
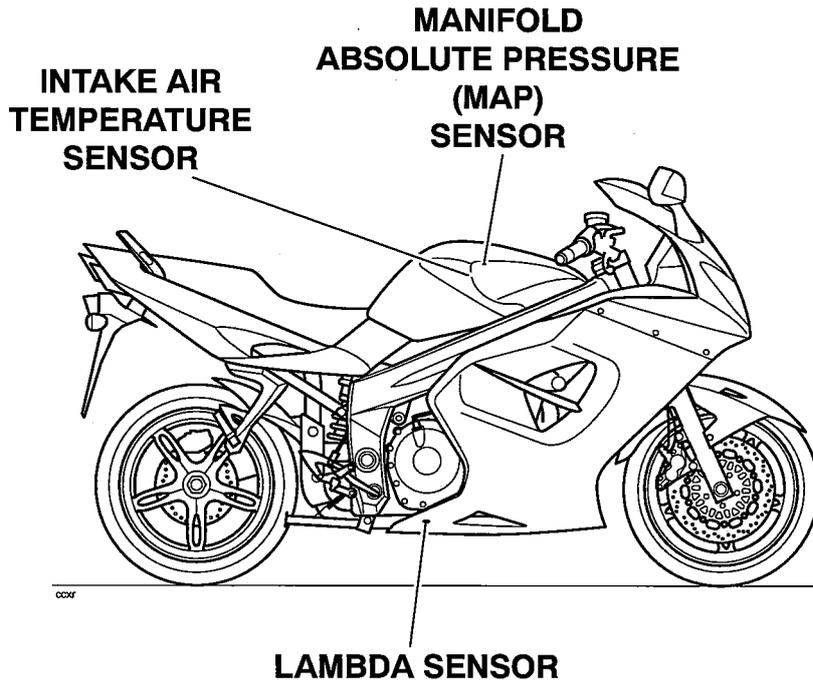
- **Intake air temperature sensor** - situated in the top of the airbox. As the density of the air (and therefore the amount of oxygen available to ignite the fuel) changes with temperature, an intake air temperature sensor is fitted. Changes in air temperature (and therefore air density) are compensated for by adjusting the amount of fuel injected to a level consistent with clean combustion and low emissions.
- **Barometric pressure sensor** - situated on the lower left hand side, at the front of the airbox. The barometric pressure sensor measures atmospheric air pressure. With this information, the amount of fuel per injection is adjusted to suit the prevailing conditions.
- **Manifold Absolute Pressure (MAP) sensor** - situated at the left side of the airbox, connected to each of the three throttle bodies by equal length tubes. The MAP sensor provides information to the ECM which is used at shallow throttle angles (very small throttle openings) to provide accurate engine load indications to the ECM. This degree of engine load accuracy allows the ECM to make very small adjustments to fuel and ignition which would otherwise not be possible from throttle angle data alone.
- **Clutch switch** - situated on the clutch lever. The clutch must be pulled in for the starter motor to operate.
- **Crankshaft position sensor** - situated in the crankcase, near the alternator cover. The

crankshaft position sensor detects movement of a toothed wheel attached to the alternator rotor.

The toothed wheel gives a reference point from which the actual crankshaft position is calculated. The crankshaft position sensor information is used by the ECM to determine engine speed and crankshaft position in relation to the point where fuel is injected and ignition of the fuel occurs.

- **Engine coolant temperature sensor** - situated at the rear of the cylinder head, on the left hand side. Coolant temperature information, received by the ECM, is used to optimise fueling at all engine temperatures and to calculate hot and cold start fueling requirements.
- **Throttle position sensor** - situated at the left end of the throttle body. Used to relay throttle position information to the ECM. Throttle opening angle is used by the ECM to determine fueling and ignition requirements for all throttle positions.
- **Road speed sensor** - situated in the upper crankcase, on the left hand side, above the sprocket cover. The road speed sensor provides the ECM with data from which road speed is calculated and displayed on the speedometer. A vehicle speed limitation device also receives information from the road speed sensor.
- **Lambda sensor** - situated in the exhaust header system upstream of the catalyst. The lambda sensor constantly feeds information to the ECM on the content of the exhaust gases. Based on this information, adjustments to air/fuel ratio are made.
- **Side stand switch** - situated at the top of the sidestand leg. If the sidestand is in the down position, the engine will not run unless the transmission is in neutral.

## Sensor Locations



# Fuel System/Engine Management

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## System Actuators

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

- **Primary throttle stepper motor** - situated at the right end of the throttle bodies. The primary throttle stepper actuates a cam/lever which causes variations in the closed throttle position. Although used primarily to ensure target idle speed is maintained, it also increases throttle opening when the engine is cold.
- **Canister purge valve (California models only)** - situated in the vapour return line between the carbon canister and the throttle bodies. The purge valve controls the return of vapour which has been stored in the carbon canister during the period when the engine is switched off. The valve is 'pulsed' by the ECM to give control over the rate at which the canister is purged.
- **Injectors** - located in the cylinder head. The engine is fitted with three injectors. The spray pattern of the injectors is fixed but the length of time each injector can remain open is variable according to operating conditions. The duration of each injection is calculated by the ECM using data received from the various sensors in the system.
- **Ignition coils** - plug-top coils are located in the cam cover. There are three coils fitted, one for 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 epitomised for good engine performance.
- **Fall detection switch** - situated at the front of the motorcycle. The fall detection switch will detect if the motorcycle is on its side and will cut power to the ECM immediately. This prevents the engine from running and the fuel pump from delivering fuel. In the event of a fall, the switch is reset by returning the bike to an upright position and switching the ignition off then back on again.
- **Main power relay** - situated under the seat. When the ignition is switched on, the main power relay is powered up to provide a stable voltage supply for the ECM.
- **Fuel pump** - located inside the fuel tank. The electric pump delivers fuel into the fuel system, via a pressure regulator, at a constant 3 bar pressure. The pump is run continuously when

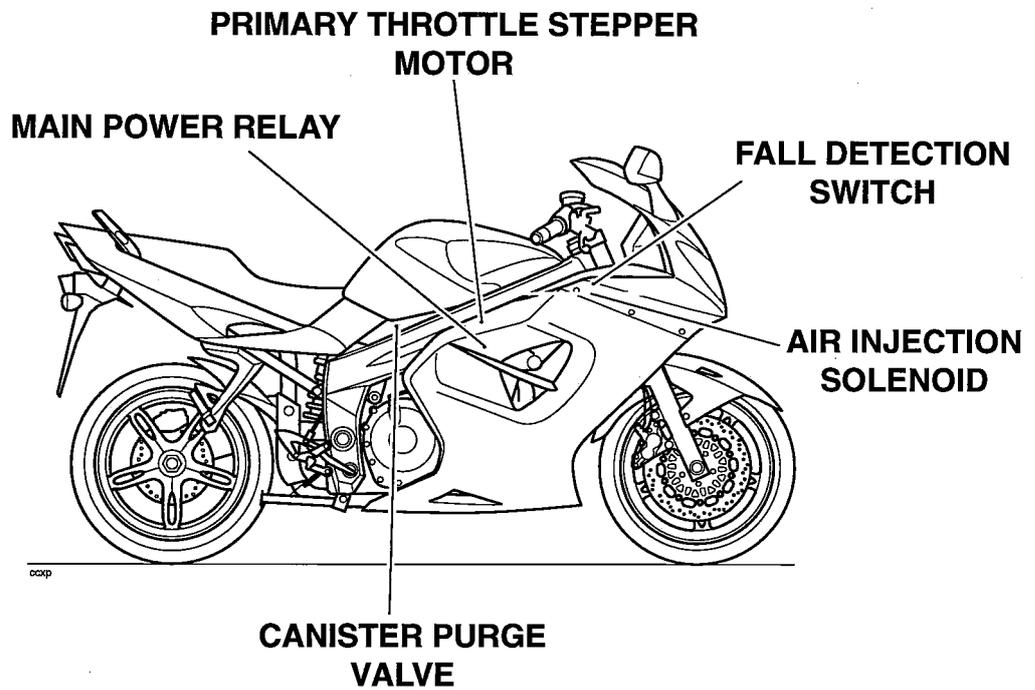
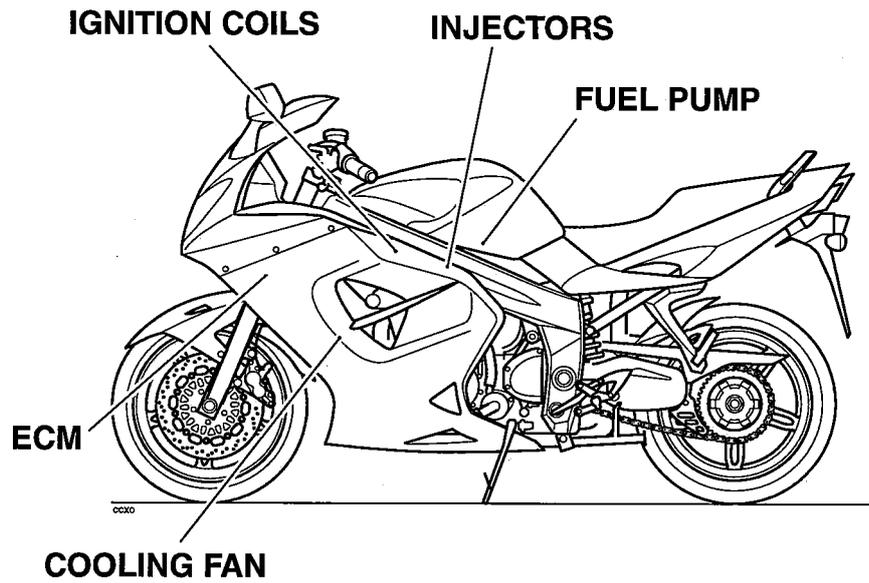
the engine is operating and is also run briefly when the ignition is first switched on to ensure that 3 bar is available to the system as soon as the engine is cranked. Fuel pressure is controlled by a regulator also situated inside the fuel tank.

- **Cooling fan** - located behind the radiator. The ECM controls switching on and off of the cooling fan in response to a signal received from the coolant temperature sensor. When the coolant temperature rises to a level where the cooling effect of natural airflow is insufficient, the cooling fan is turned on by the ECM. When the coolant temperature falls sufficiently, the ECM turns the cooling fan off. The fan only becomes operational when the engine is running. It will not operate at any other time.
- **Secondary air injection solenoid** - located in front of the airbox. The secondary air injection solenoid controls airflow through the secondary air injection system.

### Note:

- **In this system, the starter lockout system (clutch switch, neutral switch, sidestand switch) all operate through the engine management ECM.**

## Actuator Locations



# Fuel System/Engine Management

## Engine Management Circuit Diagram - Sprint ST

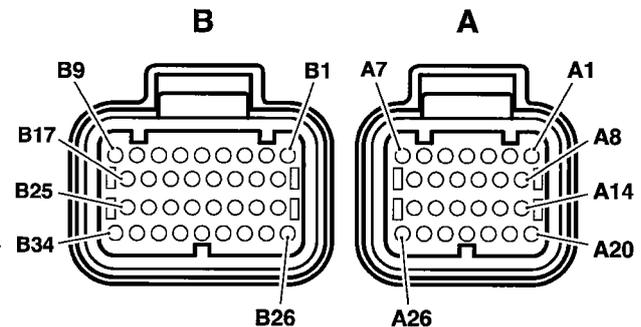
### Key To Wiring Circuit Diagram

Key	Item Description
1	Engine Control Module
2	Diagnostic Connector
3	Vehicle Speed Sensor
4	Instrument Assembly
5	Clutch Switch
6	Starter Relay
7	Sidestand Switch
8	Fuel level sender
9	Fall Detection Sensor
10	Ambient Air Pressure Sensor
11	Intake Air Temperature Sensor
12	MAP Sensor
13	Coolant Temperature Sensor
14	Lambda Sensor
15	Throttle Position Sensor
16	Neutral switch
17	Fuel Pump
18	Fuel Pump Relay
19	Fuse Box (Fuse 7)
20	Cooling Fan
21	Cooling Fan Relay
22	Idle Speed Control Stepper Motor
23	Ignition Coils
24	Secondary Air Injection Solenoid
25	Fuel Injectors
26	Purge Valve
27	Crankshaft Sensor
28	Engine Management System Relay

### Key To Wiring Colour Codes

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

### ECM Connector Pin Numbering

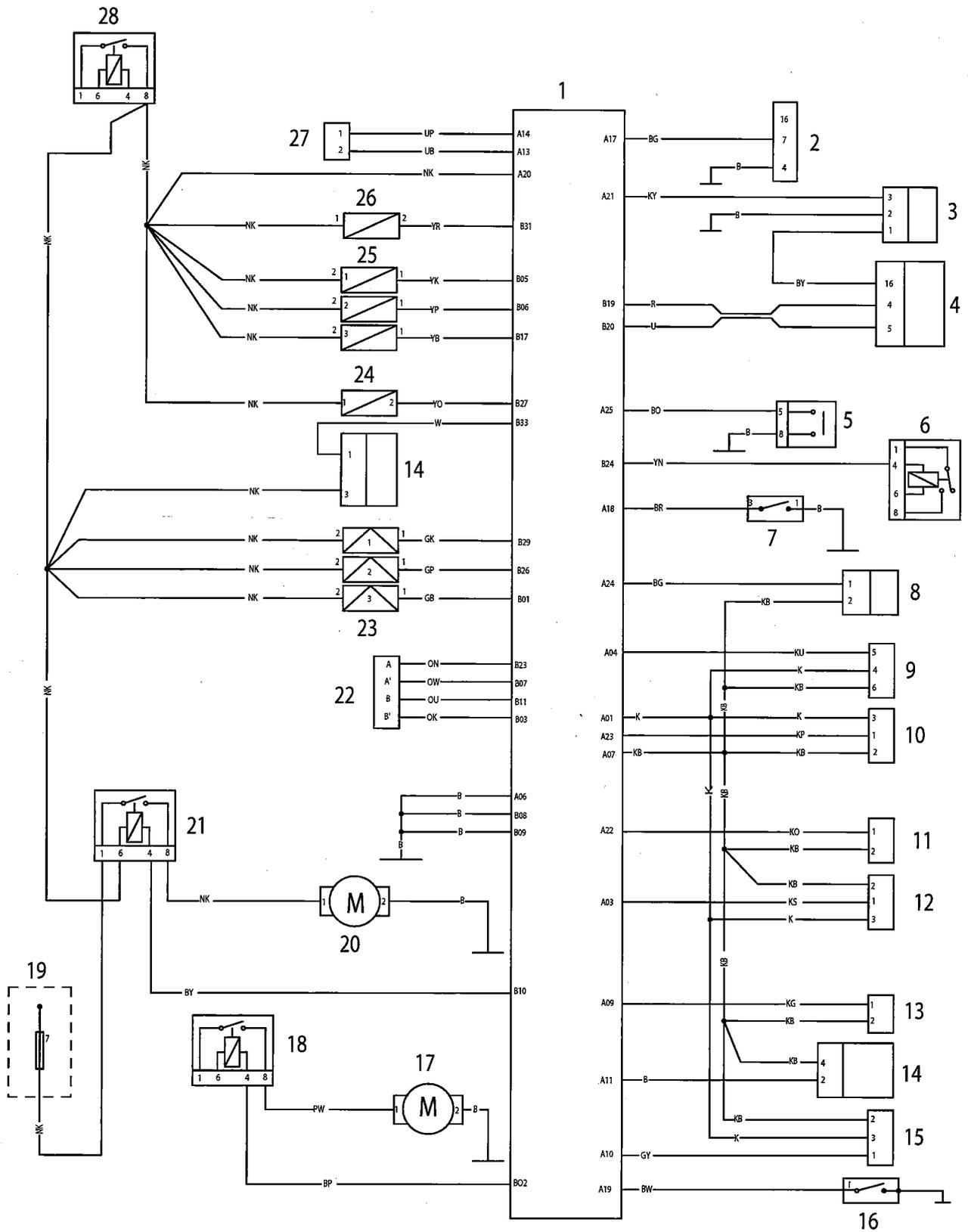


cbhs

The above illustration shows the pin numbering system used in the engine management circuit diagram.

The small connector's pins are prefixed A and the large connector's pins B. As viewed on the mating face with the ECM (as per the illustration), pins are numbered from right to left with number one in the top right corner.

## Circuit Diagram - Engine Management System - Sprint ST



# Fuel System/Engine Management

## System Diagnostics

The engine management system has an on-board diagnostics feature which allows service technicians to retrieve stored data from the ECM using a Triumph service tool. **Full details of the tool's operation and how to interpret the results are given elsewhere in this section.**

The tool is connected to the motorcycle using a dedicated diagnostic plug situated beneath the seats. By using a dedicated plug, no electrical connectors associated with the system are disturbed, reducing potential connector damage.

The tool allows the user to retrieve data associated with the system sensors and actuators, test various component functions, read build data and make minor adjustments to the set-up of the system. The data and tests available are described on the following pages.

## On-board Fault Detection System

The on-board diagnostic system has two stages to fault detection. When a fault is detected, the DSM (Diagnostic Status Manager) raises a flag to indicate that a fault is present and increments a counter. The counter checks the number of instances that the fault is noted. For example, if there is a fault in the crankshaft position sensor, the counter will increment its count each time the crankshaft turns through 360°, provided the fault is still present.

When the count begins, the fault is detected but not confirmed. If the fault continues to be detected and the count reaches a pre-determined threshold, the fault becomes confirmed. If the fault is an emissions related fault or a serious malfunction affecting engine performance, a DTC (Diagnostic Trouble Code) and freeze-frame data will be logged in the ECM's memory and the MIL (Malfunction Indicator Lamp) on the motorcycle instrument panel is illuminated. Once a fault is confirmed, the number of warm-up cycles made by the engine is counted. If the fault clears, the warm-up cycle counter will extinguish the MIL (Malfunction Indicator Lamp) at a pre determined count, and erase the DTC and freeze frame data from the ECM memory at another (higher) count.

A single warm-up cycle is deemed to have taken place when the following criteria have been met:

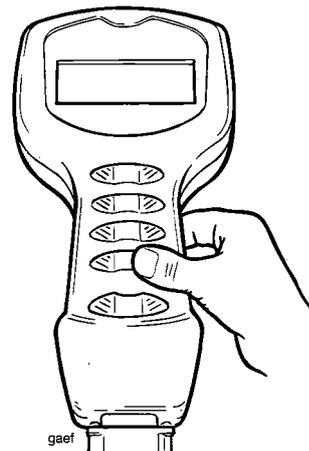
- The coolant temperature must be raised to 72°C or more.
- The coolant temperature must have risen by 23°C or more from its start temperature, when 72°C is reached.
- A controlled power-down sequence must take place.

### Note:

- When a fault has been rectified, the MIL will remain illuminated until sufficient non-fault warm-up cycles have taken place to turn it off. The MIL will be immediately extinguished if, after first rectifying the fault, the DTC (diagnostic trouble code) that caused the MIL illumination is erased from the ECM memory using the Triumph diagnostic tool.

### Note:

- In most cases, when a fault is detected, the engine management system will revert to a 'limp-home' mode. In this mode, the engine will still function though the performance and fuel economy may be marginally affected. In some cases, the rider may not notice any appreciable difference from normal operation.



## Triumph Diagnostic Tool

Described on the following pages is the range of information which can be retrieved from the ECM's memory and the adjustments which can be performed using the Triumph service diagnostic tool.

The tables indicate which tests are performed by the on-board system and what information can be retrieved by the Triumph diagnostic tool.

Full details of how to operate the tool and how to interpret the data follow later in this section.

## Current Data

By using the Triumph diagnostic tool, live engine data (engine running) can be recovered from the motorcycle. The data available is:

Function Examined	Result Reported (Scale)
Engine speed	RPM
Calculated load	%
Coolant temperature	°C
Short term fuel trim	%
Throttle Position	%
Intake air temperature	°C
Vehicle speed	km/h
Ignition Advance	degrees
Heated oxygen sensor output voltage	volts
Intake manifold absolute pressure	mm/hg
Fuel system status	open or closed loop operation

## Freeze-frame Data

Freeze frame data is stored at the time a DTC is recorded (confirmed) by the ECM. If multiple DTCs are recorded, the freeze-frame data which is stored will relate to the first recorded DTC only.

By calling up freeze frame data associated with the first recorded DTC, the technician can check the engine condition at the time the fault occurred. The data available is:

Function Examined	Result Reported (Scale)
Engine speed	RPM
Calculated load	%
Coolant temperature	°C
Short term fuel trim	%
Throttle Position	%
Intake air temperature	°C
Vehicle speed	km/h
Ignition Advance	degrees
Heated oxygen sensor output voltage	volts
Intake manifold absolute pressure	mm/hg
Fuel system status	open or closed loop operation

# Fuel System/Engine Management

## Function Tests

The system allows the diagnostic tool to perform a series of function tests on various actuators in the engine management system. In some cases it is necessary to make a visual observation of a component and in other, if faults are present, DTCs will be logged.

The function tests available are:

Function Examined	Report Method
Instrument panel	Visual inspection of instruments
Idle speed control stepper motor	Stored fault code*
Purge control valve	Stored fault code*
Fuel pump relay	Stored fault code*
Fuel pump operation	Stored fault code*/Fuel pressure test
Cooling fan	Stored fault code*/fan operation

\* If a fault is detected.

## Checks/Adjustments

### Adjustments

Using the Triumph diagnostic tool, it is possible to reset the ECU to the factory default settings and to balance the throttle bodies.

Further facilities are provided to allow correct replacement/adjustment of the primary throttle position sensor and the primary throttle stepper motor. These facilities are needed as, after replacement of the parts concerned, adjustments have to be made to specific voltage settings, all with the throttles in a specific position.

Full details of these procedures are provided later in this section.

## Adaption status

Because the fuel system is adaptive, the tool is able to automatically adjust to new working conditions. This screen displays information as to the adaption status of the vehicle which will show if it has adapted or not.

Function Examined	Report Method
Closed throttle position reference status	adapted/not adapted
Idle speed control adaption status	%
Oxygen sensor adaption status (off idle)	%
Oxygen sensor adaption range (off idle)	%
Oxygen sensor adaption status (idle)	%
Oxygen sensor adaption range (idle)	%

## Build data

The following items of build data can also be read.

Function Examined
Vehicle identification Number (VIN)
Triumph ECM part number
ECM manufacturer's part number
ECM serial number
Software version number (tune number)

## Checks

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

The data sets are divided into three groups, voltages/pressures, throttles/coils/injectors and other data

The data available under voltages is:

Item Checked	Result Unit
Throttle position sensor voltage	Volts
Throttle position	% open
Manifold absolute pressure sensor voltage	Volts
Manifold absolute pressure (one reading per cylinder)	mmHg
Atmospheric pressure sensor voltage	Volts
Atmospheric pressure	mmHg
Battery voltage	Volts
Battery voltage scaling	Volts
Coolant temperature sensor voltage	Volts
Air temperature sensor voltage	Volts
Oxygen sensor voltage	Volts
Oxygen sensor reading	Volts
Gear position sensor voltage	Volts
Fuel level sensor voltage	Volts
Fall detection switch voltage	Volts
Fuel sensor voltage	Volts

The data available under throttles/coils/injectors is:

Item Checked	Result Unit
Injector 1 pulse time	milliseconds
Injector 2 pulse time	milliseconds
Injector 3 pulse time	milliseconds
Ignition timing cyl 1	degrees BTDC
Ignition timing cyl 2	degrees BTDC
Ignition timing cyl 3	degrees BTDC
Coil 1 dwell time	milliseconds
Coil 2 dwell time	milliseconds
Coil 3 dwell time	milliseconds

The data available under 'other' is:

Item Checked	Result Unit
Malfunction indicator light status	MIL off/on
Fan relay status	Fan off/on
Starter relay status	Starter on/off
Fall detection status	Normal/over
Oxygen sensor heater status	Heater on/off
Secondary air injection status	SAI on/off
Engine rpm	RPM
Vehicle speed	km/h
Short term fuel trim	+/-100%
Calculated load	%
Idle reference speed	RPM
Idle speed control target steps	numeric
Purge valve duty cycle	%
Gear position	numeric value
Neutral switch	Gear/neutral
Low fuel alarm status	On/off

# Fuel System/Engine Management

## 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 mentioned earlier, when the system detects a fault, it begins to count the number of times the fault occurs before illuminating the MIL and storing a fault code.

Similarly, if a fault clears, the ECM also records this fact and will turn off the MIL when sufficient no-fault warm-up cycles have taken place. Any fault codes will remain in the ECM memory until the required number of no-fault warm-up cycles have taken place. The number of warm-up cycles required to extinguish the MIL will always be less than the number required to remove a DTC from the ECM memory. DTCs can be removed at any time using the Triumph diagnostic tool

The system will log the diagnostic trouble codes listed below/over:

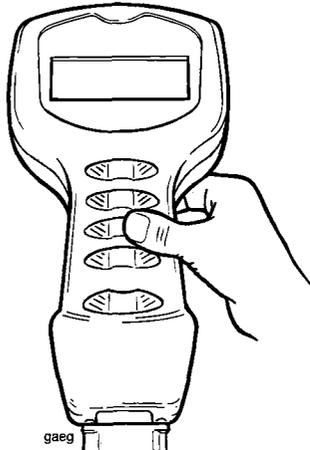
Diagnostic Trouble Code (DTC)	Fault Description	Number of no-fault cycles before turning off MIL	Number of no-fault cycles before DTC is erased	MIL illuminated when fault is logged
P0201	Injector 1 circuit malfunction	3	40	Yes
P0202	Injector 2 circuit malfunction	3	40	Yes
P0203	Injector 3 circuit malfunction	3	40	Yes
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
P0335	Crankshaft sensor circuit malfunction	3	40	Yes
P0032	Oxygen sensor heater short circuit to battery	3	40	Yes
P0031	Oxygen sensor heater open circuit/short to ground	3	40	Yes
P0030	Oxygen sensor heater circuit malfunction	3	40	Yes
P0136	Oxygen sensor circuit malfunction	3	40	Yes
P0122	Throttle position sensor low input	3	40	Yes
P0123	Throttle Position sensor high input	3	40	Yes
P0107	Manifold absolute pressure sensor low voltage	3	40	Yes
P0108	Manifold absolute pressure sensor high voltage	3	40	Yes
P1105	Manifold absolute pressure sensor pipe malfunction	3	40	Yes
P1107	Ambient air pressure sensor circuit low voltage	3	40	Yes
P1108	Ambient air pressure sensor circuit high voltage	3	40	Yes
P0112	Intake air temperature too high	3	40	Yes
P0113	Intake air temperature too low	3	40	Yes
P0117	Engine coolant temperature too high	3	40	Yes
P0118	Engine coolant temperature too low	3	40	Yes
P0500	Vehicle speed sensor malfunction	3	40	Yes

## Fuel System/Engine Management

Diagnostic Trouble Code (DTC)	Fault Description	Number of no-fault cycles before turning off MIL	Number of no-fault cycles before DTC is erased	MIL illuminated when fault is logged
P1552	Cooling fan short circuit/open circuit	3	40	Yes
P1553	Cooling fan short to battery voltage/over temperature	3	40	Yes
P1231	Fuel pump short circuit to ground or open circuit	3	40	Yes
P1232	Fuel pump relay short circuit to battery	3	40	Yes
P0444	Purge valve system short circuit to ground or open circuit	3	40	Yes
P0445	Purge valve system short circuit to battery	3	40	Yes
P0617	Starter relay short circuit to battery	3	40	Yes
P0616	Starter relay short circuit to ground or open circuit	3	40	Yes
P0414	Secondary air injection system short circuit to battery	3	40	Yes
P0413	Secondary air injection system short circuit to ground or open circuit	3	40	Yes
P0505	Idle speed control system malfunction	3	40	Yes
P1631	Fall detection sensor circuit low voltage	3	40	Yes
P1632	Fall detection sensor circuit high voltage	3	40	Yes
P0560	System voltage - battery circuit malfunction	3	40	Yes
P1500	Vehicle speed output circuit malfunction	0	40	No
P0654	Tachometer circuit malfunction	0	40	No
P1115	Coolant temperature gauge circuit malfunction	0	40	No
P0460	Fuel level sensor circuit malfunction	0	40	No
P0705	Gear position sensor circuit malfunction	0	40	No
P0656	Fuel gauge circuit malfunction	0	40	No
P1610	Low fuel output circuit malfunction	0	40	No
P0630	EEPROM fault	0	40	No
P1690	CAN communication fault	0	40	No

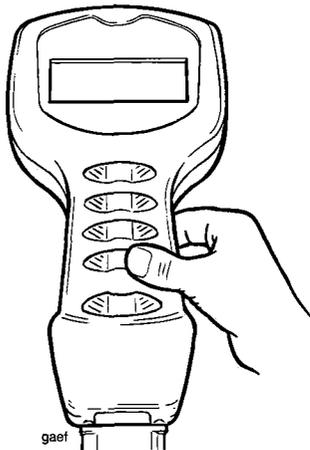


The **Up** and **Down** keys - press to move the lines of text up or down. They are also used to enter the Dealer number and the date.



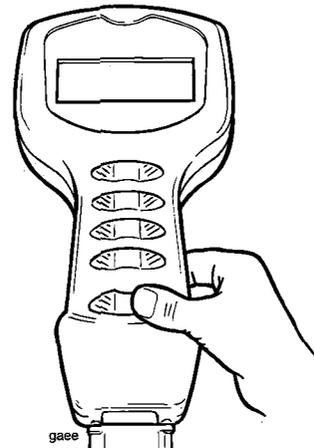
**Up/down keys (2 separate keys)**

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**

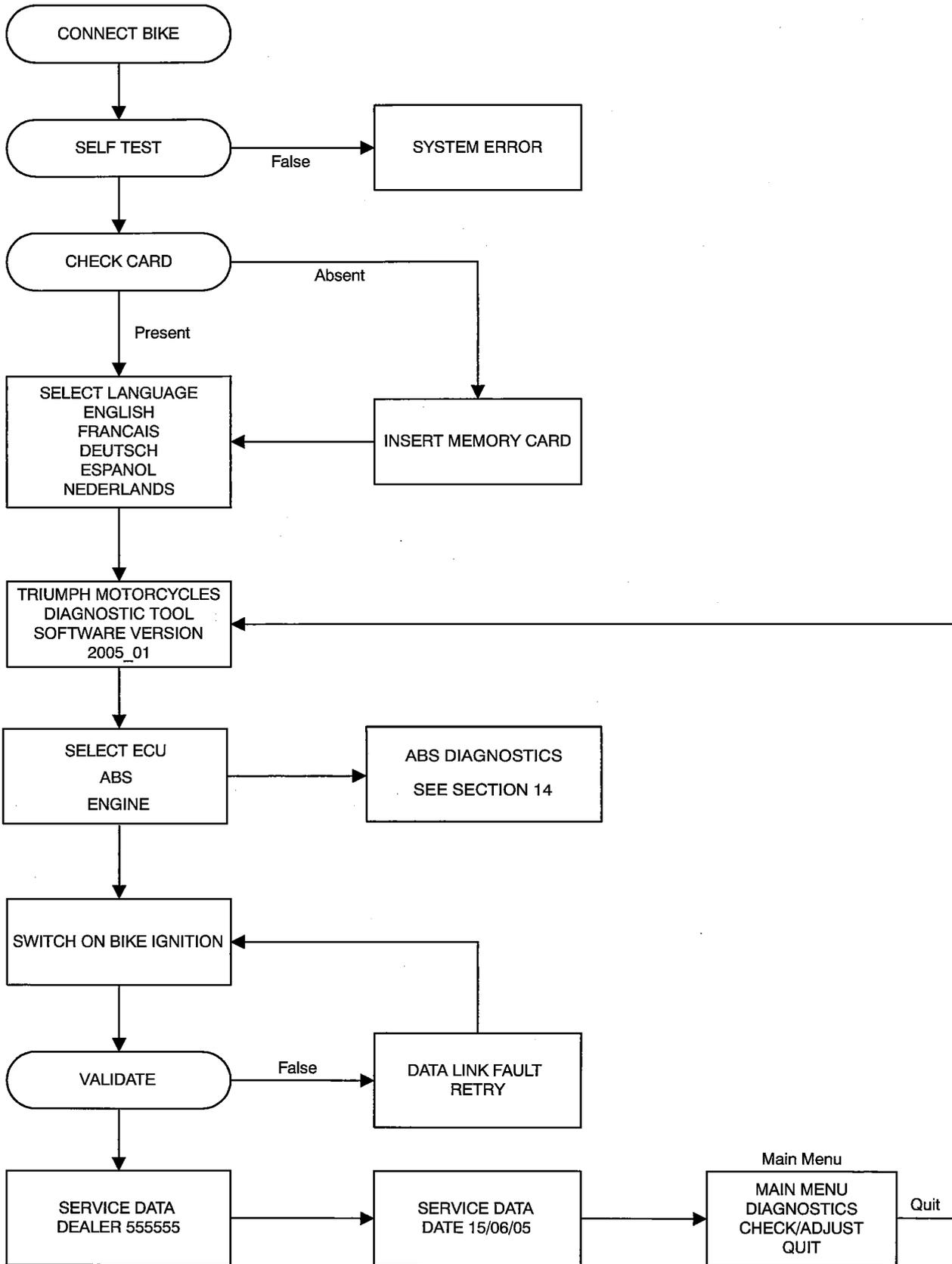
## Test Procedure

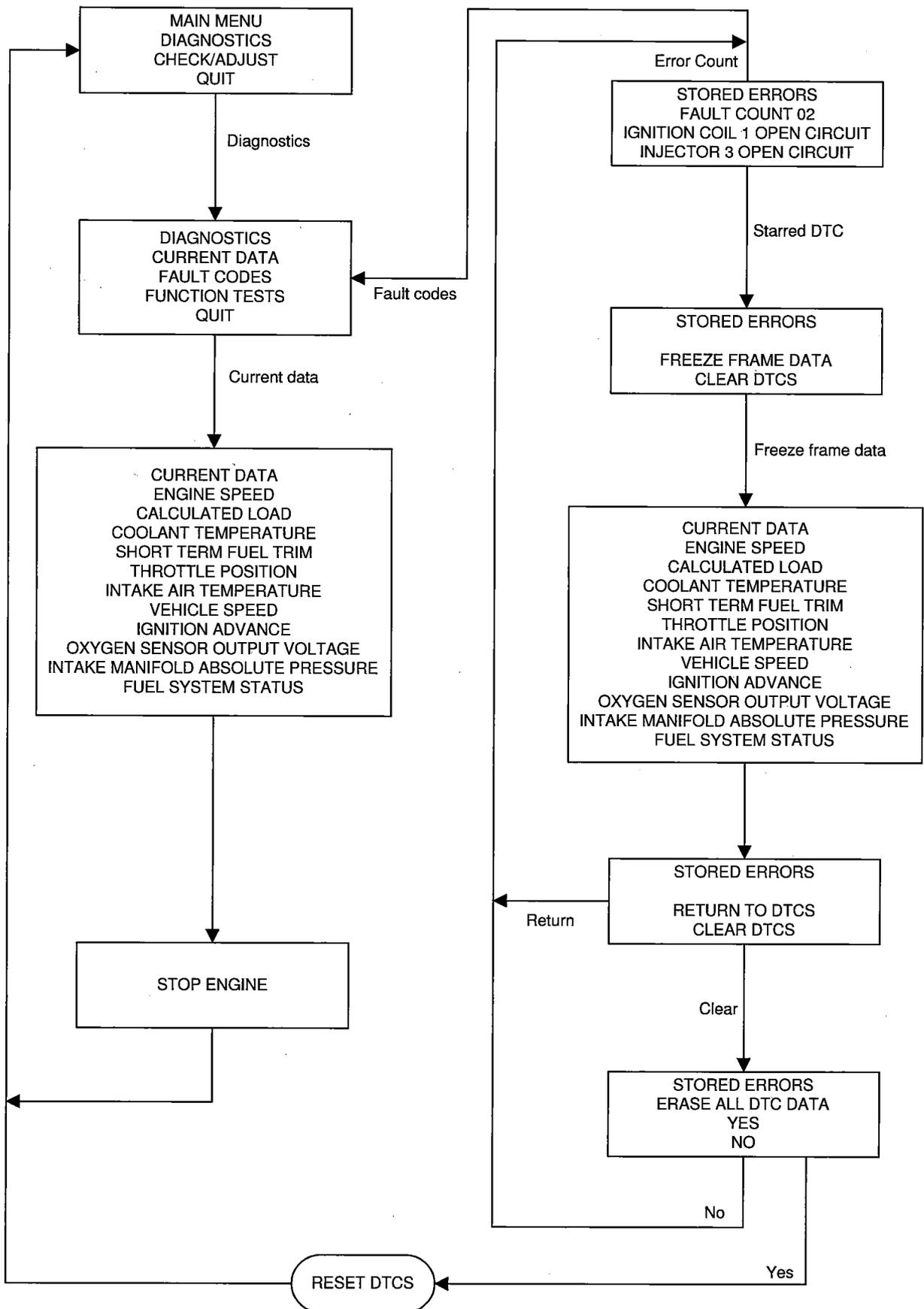
The following describes the procedure to follow when using the service diagnostic tool. It does not cover the further diagnosis that must be carried out once a fault area has been identified. For details of the procedure to follow when a fault area or fault code has been identified, refer to the diagnosis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

### Note:

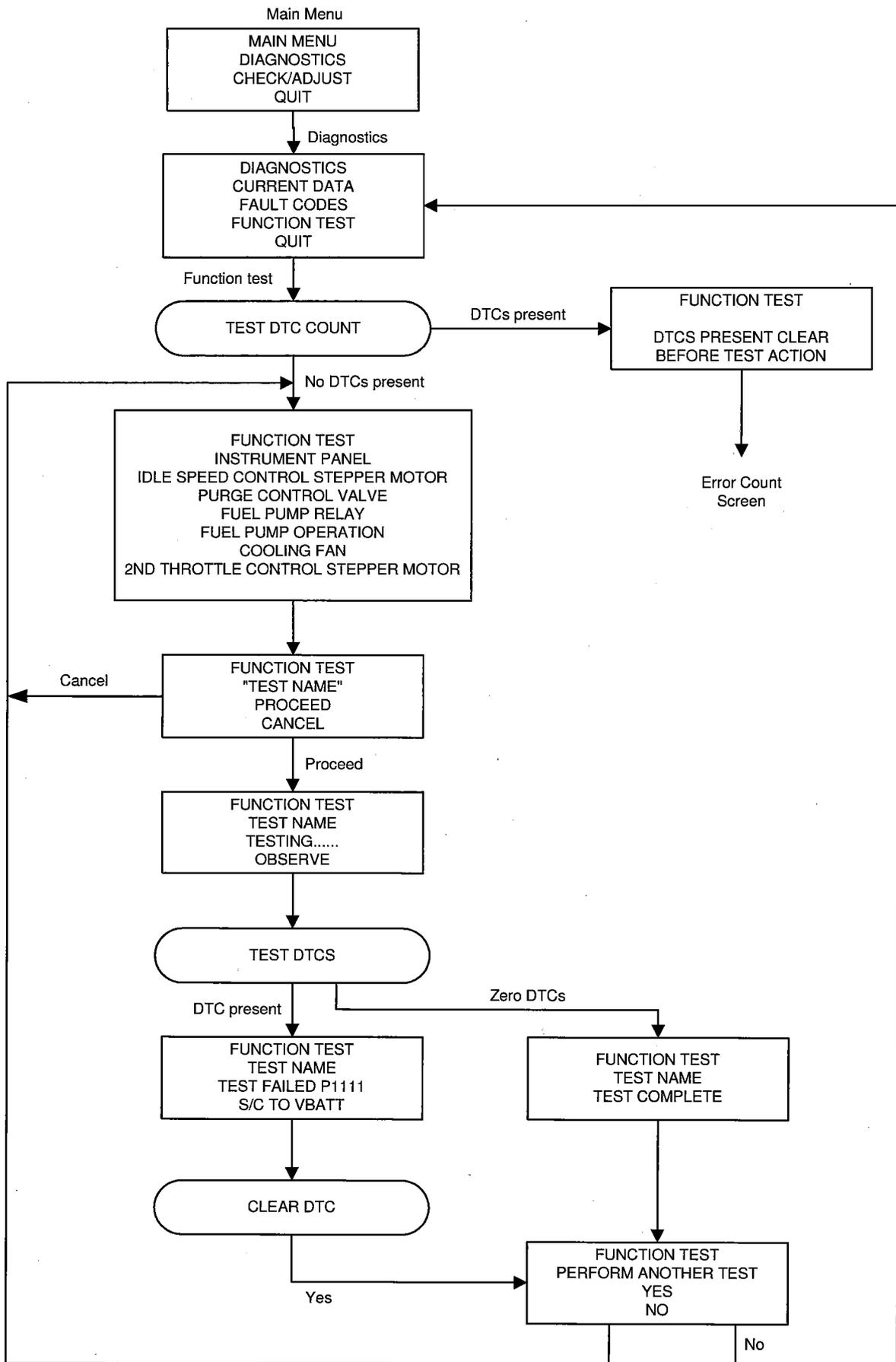
- The tool does not retain any memory of faults, diagnosis etc. carried out on any particular motorcycle. Any such memory is only retained in the motorcycle's ECM.
- The following five pages describe the tool operations in flow chart form.

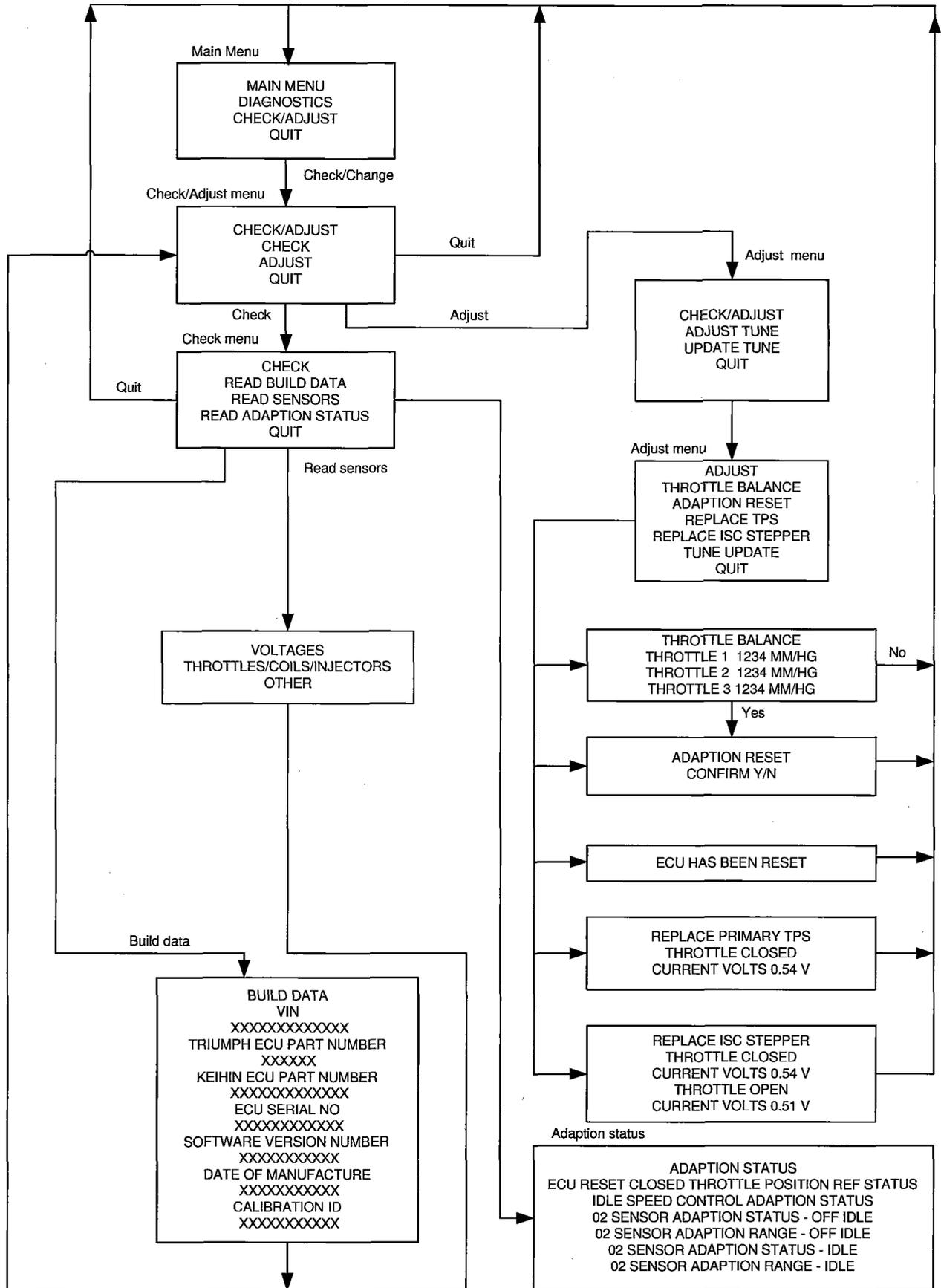
# Fuel System/Engine Management



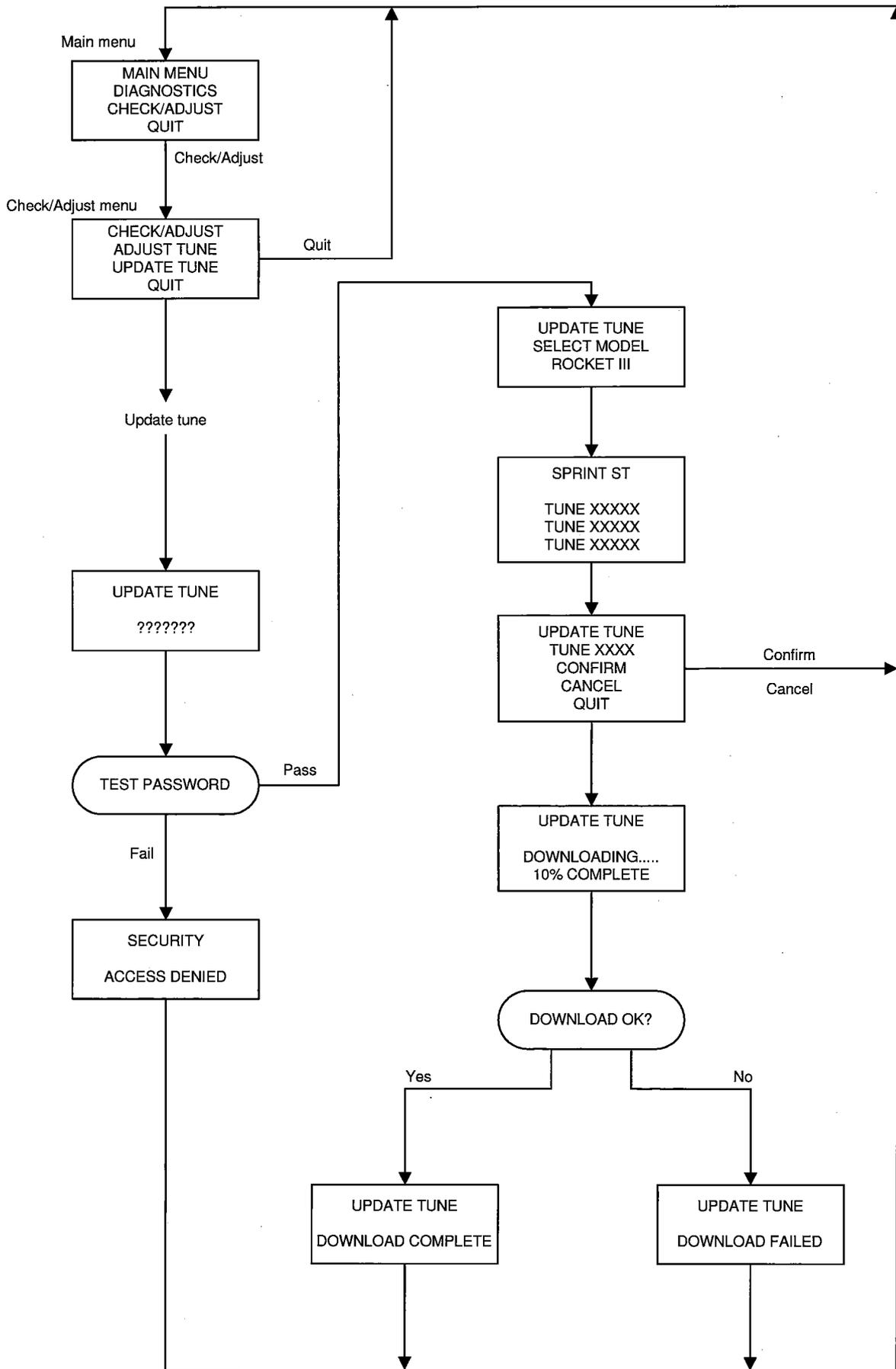


# Fuel System/Engine Management

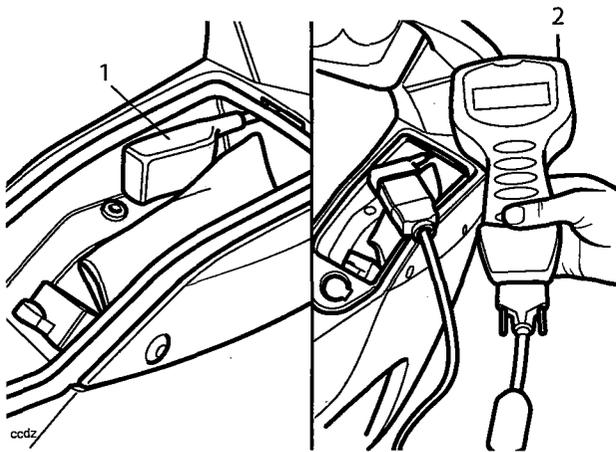




# Fuel System/Engine Management



## 1. Connection and Power-Up



1. Connection to Main Harness
2. Triumph Service Diagnostic Tool

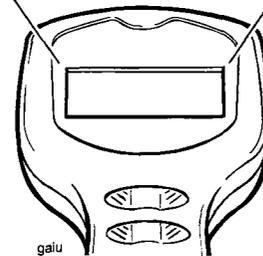
Connect the tool to the dedicated multiplug in the storage compartment on the right hand side of the motorcycle.

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

			S	E	L	E	C	T		L	A	N	G	U	A	G	E		
▶										E	N	G	L	I	S	H			
										F	R	A	N	C	R	I	S		
										D	E	U	T	S	C	H			
										E	S	P	A	N	O	L			
										I	T	A	L	I	A	N	O		
										N	E	D	E	R	L	A	N	D	S



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.

























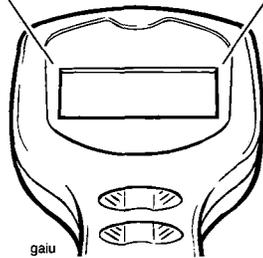






## 32. ADAPTION STATUS

				A	D	A	P	T	I	O	N	S	T	A	T	U	S
		E	N	G	I	N	E	T	E	M	P	O	U	T			
				O	F	R	A	N	G	E							
		P	L	E	A	S	E	W	A	I	T						



Because adaption only takes place at normal operating temperature, the above screen will be displayed until the engine reaches normal operating temperature.

Until the engine warms or cools to the correct temperature range, the tool will not allow access to any other functions. If you wish to escape from this area (and not carry out the adjustment) switch off the ignition and disconnect the tool.

Once the correct temperature range has been reached, the **ADAPTION STATUS** screen (operation 33.) will automatically be displayed.

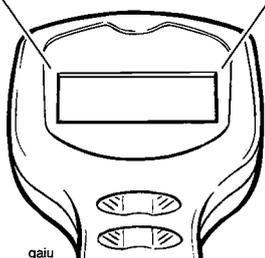




# Fuel System/Engine Management

## 35. ADJUST TUNE (adaption reset)

				A	D	A	P	T	I	O	N	R	E	S	E	T
				C	O	N	F	I	R	M						
▶				Y	E	S										
				N	O											



After selecting the adaption reset option, confirm or reject the option by positioning the cursor 'opposite the option chosen and press the Validation key '\*'.

If YES is chosen, a screen will confirm that adaptions have been reset.

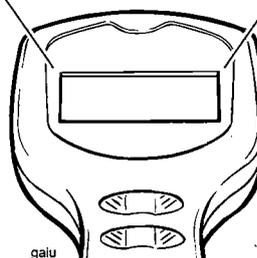
If NO is chosen, you will be returned to the adjust tune menu.

### Note:

- Resetting the adaption values does not adapt the motorcycle. This can only be done by the method explained later in this section. Adaption reset only returns adaption values to their 'start' point.

## 36. BALANCE THROTTLES

T	H	R	O	T	T	L	E	S		B	A	L	A	N	C	E	D		
T	H	R	O	T	T	L	E		1		1	2	3	4	M	M	/	H	G
T	H	R	O	T	T	L	E		2		1	2	3	4	M	M	/	H	G
T	H	R	O	T	T	L	E		3		1	2	3	4	M	M	/	H	G



Using the **BALANCE THROTTLES** command, the throttles may be balanced without the need to connect an external device to measure the vacuum levels in each throttle body. The diagnostic tool displays data taken from the manifold absolute pressure sensor reading for each throttle.

Once throttle imbalance has been reduced to a pre-determined level, the top line of information will display the word **\*BALANCED\***. Under any other conditions where imbalance is detected, nothing will be displayed indicating that the throttles require balancing.







## 43. RESTARTING TUNE DOWNLOAD

	<b>Caution</b>
<p>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.</p> <p>In these circumstances, a special-tool key-press-sequence must be followed which is described below</p>	

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.

T	R	I	U	M	P	H		M	O	T	O	R	C	Y	C	L	E	S
			D	I	R	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			
								2	0	0	5	-	0	1				

From this screen, use the following button press sequence:

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

The dealer log-in screen will then be displayed. From that screen, download can be restarted in the normal way.

**Note:**

- **The software version number is not relevant to this procedure. All versions of the diagnostic software will operate in the way described.**

## Electrical Connectors

Before beginning any diagnosis, the following connector related information should be noted:

### Note:

- A major cause of hidden electrical faults can be traced to faulty electrical connectors. For example:
- Dirty/corroded terminals.
- Damp terminals.
- Broken or bent cable pins within multi-plugs.

For example, the electronic control module (ECM) relies on the supply of accurate information to enable it to plan the correct fuelling and ignition timing. One dirty terminal will cause an excessive voltage drop resulting in an incorrect signal to the ECM.

If, when carrying out fault diagnosis, a fault appears to clear by simply disconnecting and reconnecting an electrical plug, examine each disconnected plug for the following.

### Before Disconnection:

- If testing with a voltmeter, the voltage across a connector should be virtually battery volts (unless a resistor is fitted in the circuit). If there is a noticeable change, suspect faulty/dirty connections.

### When Disconnecting a Connector:

- Check for a security device that must be released before the connector can be separated. E.G. barb, hook and eye etc.

### When Inspecting a Connector:

- Check that the individual pins have not been bent.
- Check for dampness/dirt/corrosion.
- Check cables for security.
- Check cable pin joints for damage.

### When Connecting a Connector.

- Ensure there is no dirt around the connector/seal.
- Push together squarely to ensure terminals are not bent or incorrectly located.
- Push the two halves together positively.

## Disconnection of ECM connectors

### Note:

- Two different sized connectors are used in the ECM, which ensures correct connection is always made.

**! Caution**

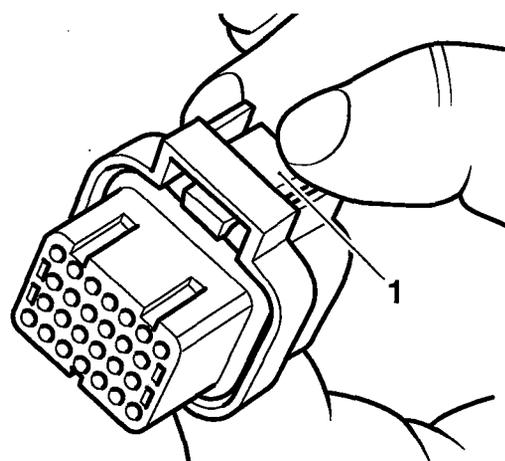
When disconnecting a connector, never pull directly on the wires as this may result in cable and connector damage.

**! Caution**

Never disconnect an ECM when the ignition switch is in the ON position as this may cause multiple fault codes to be logged in the ECM memory.

Always disconnect an ECM after disconnecting the battery negative (black) lead first.

1. Press down on the locking device and gently pull back on the connector to release it from the ECM.



oddx  
1. Locking device

### Note:

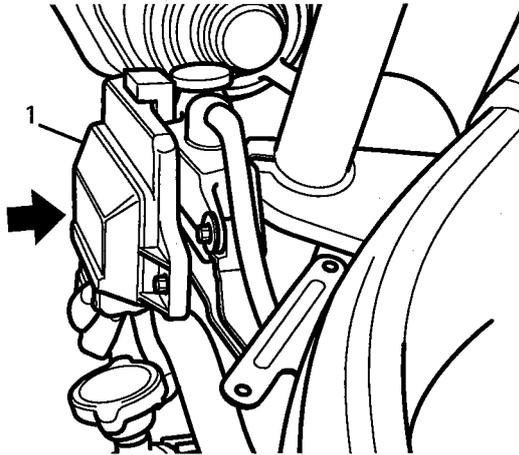
- The ECM is located on the left hand side of the motorcycle near to the cooling system expansion tank.

# Fuel System/Engine Management

## Reconnection of ECM connectors

### **Caution**

Damage to the connector pins may result if an attempt to fit the connectors incorrectly is made.



cdea

1. ECM (arrowed)
2. Fit the connector into its socket and, whilst holding the connector in place, insert it fully into the ECM until the locking device retains it.

## Further Diagnosis

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

## Crankshaft Sensor

Fault Code	Possible cause	Action
P0335	Crankshaft sensor system fault	View & note diagnostic tool 'freeze frame' data if available. Ensure sensor is fitted correctly and connector is secure. Disconnect ECM and proceed to pinpoint test 1

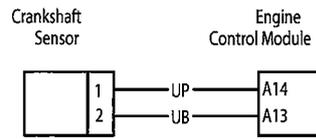
## Pinpoint Tests

Test	Result	Action
1 Check terminal and cable integrity: - ECM pin A13 - ECM pin A14	OK	Disconnect sensor and proceed to test 2
	Faulty	Rectify fault, proceed to test 6
2 Check cable for short circuit: - ECM pin A13 to earth - ECM pin A14 to earth	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 6
3 Check cable continuity: - ECM pin A14 to sensor pin 1 - ECM pin A13 to sensor pin 2	OK	Proceed to test 4
	Open circuit	Locate and rectify wiring fault, proceed to test 6
4 Check cable for short circuit:  - ECM pin A13 to ECM pin A14	OK	Renew crankshaft sensor, proceed to test 6
	Short circuit	Locate and rectify wiring fault, proceed to test 6
5 Check crank toothed wheel: - Damage to teeth - magnetic debris contamination	OK	Proceed to test 6
	Faulty	Clean / renew toothed wheel, proceed to test 6
6 Reconnect harness, clear fault code and run engine to verify fault cleared	OK	Action complete - quit test
	Fault still present	Contact Triumph service

# Fuel System/Engine Management

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## Circuit Diagram



## Idle Speed Control

Fault Code	Possible cause	Action
P0505	ISC stepper motor / wiring fault	View & note diagnostic tool 'freeze frame' data if available. View & note diagnostic tool 'sensor' data. Ensure sensor connector is secure. Disconnect ECM and proceed to pinpoint test 1

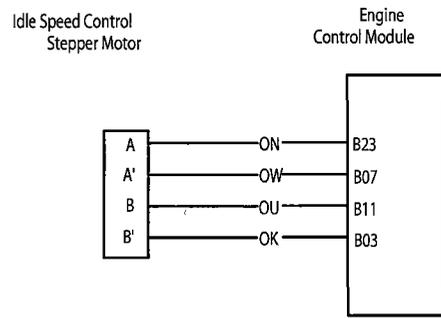
## Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin B23 - ECM pin B07 - ECM pin B11 - ECM pin B03	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 7
2 Check resistance value:  - ECM pin B23 to ECM pin B07 - ECM pin B11 to ECM pin B03	4Ω to 12Ω	Disconnect stepper motor and proceed to test 3
	Open circuit	Proceed to test 4
	Short circuit	Disconnect stepper motor and proceed to test 5
3 Check cable for short circuit: - ECM pin B23 to earth - ECM pin B07 to earth - ECM pin B11 to earth - ECM pin B03 to earth	OK	Proceed to test 7
	Short circuit	Locate and rectify wiring fault, proceed to test 7
4 Check cable continuity: - ECM pin B23 to stepper motor pin A - ECM pin B07 to stepper motor pin A1 - ECM pin B11 to stepper motor pin B - ECM pin B03 to stepper motor pin B1	OK	Proceed to test 6
	Open circuit	Locate and rectify wiring fault, proceed to test 7
5 Check cable for short circuit: - ECM pin B23 to ECM pin B07 - ECM pin B11 to ECM pin B03	OK	Proceed to test 6
	Short circuit	Locate and rectify wiring fault, proceed to test 7
6 Check stepper motor resistance: - Motor pin A to motor pin A1 - Motor pin B to motor pin B1	4Ω to 12Ω	Proceed to test 7
	Faulty	Renew stepper motor, proceed to test 7
7 Reconnect harness, clear fault code and run diagnostic tool function test to visually verify operation of stepper motor	OK	Action complete - quit test
	Fault	Contact Triumph service

# Fuel System/Engine Management

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## Circuit Diagram



## Fuel Injectors

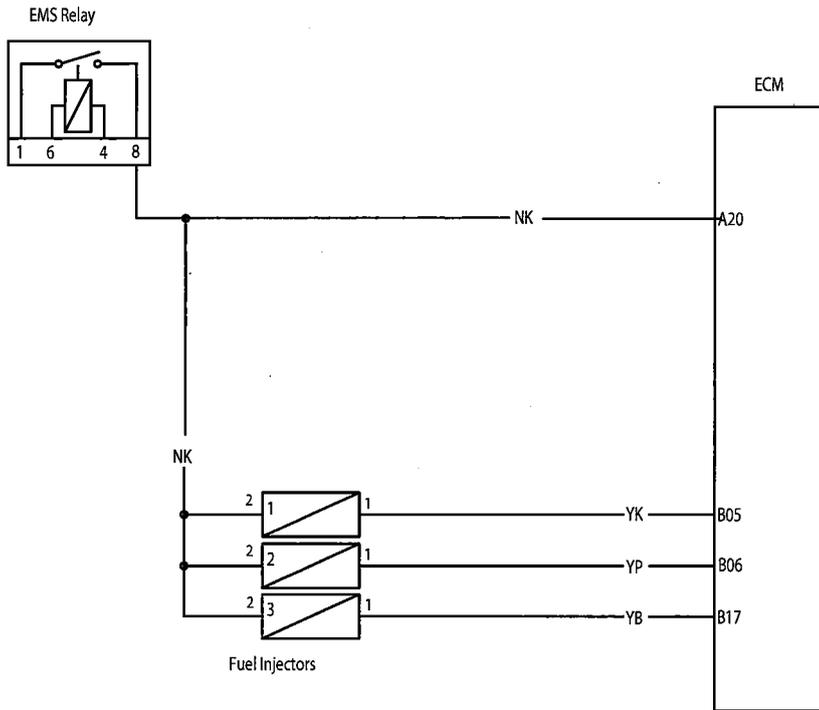
Fault Code	Possible cause	Action
P0201/02/03	Injection system fault - Injector 1/2/3 - Misfire indicates open circuit - Flooding indicates short circuit	View & note diagnostic tool 'freeze frame' data if available. Ensure relevant injector connector is secure. Disconnect ECM and proceed to pinpoint test 1

## Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin B05 - ECM pin B06 - ECM pin B17	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 7
2 Check resistance value: - ECM pin A20 to ECM pin B05 (injector 1) - ECM pin A20 to ECM pin B06 (injector 2) - ECM pin A20 to ECM pin B17 (injector 3)	12.5Ω to 14.0Ω	Proceed to test 3
	Open circuit	Disconnect relevant injector and proceed to test 4
	Short circuit	Disconnect relevant injector and proceed to test 5
3 Check cable for short circuit to ground: - ECM pin B05 to earth - ECM pin B06 to earth - ECM pin B17 to earth	OK	Proceed to test 7
	Short circuit	Locate and rectify wiring fault, proceed to test 7
4 Check cable continuity: - ECM pin A20 to relevant injector pin 2 - ECM pin B05 to injector 1 pin 1 - ECM pin B06 to injector 2 pin 1 - ECM pin B17 to injector 3 pin 1	OK	Proceed to test 6
	Open circuit	Locate and rectify wiring fault, proceed to test 7
5 Check cable for short circuit to supply box: - ECM pin A20 to ECM pin B05 (inj 1) - ECM pin A20 to ECM pin B06 (inj 2) - ECM pin A20 to ECM pin B17 (inj 3)	OK	Proceed to test 6
	Short circuit	Locate and rectify wiring fault, proceed to test 7
6 Check relevant injector resistance: - Injector pin 1 to injector pin 2	12.5Ω to 14.0Ω	Proceed to test 7
	Faulty	Renew relevant injector, proceed to test 7
7 Reconnect harness, clear fault code and run engine to verify fault cleared	OK	Action complete - quit test
	Fault still present	Contact Triumph service

# Fuel System/Engine Management

## Circuit Diagram



## Throttle Position Sensor

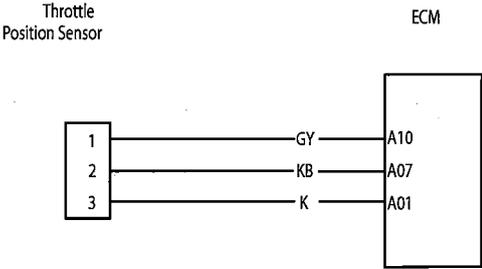
Fault Code	Possible cause	Action
P0122 P0123	Throttle position sensor low input voltage (short to ground or open circuit) Throttle position sensor high input voltage (short circuit to sensor supply)	View & note diagnostic tool 'freeze frame' data if available. View & note diagnostic tool 'sensor' data. Ensure sensor connector is secure. Disconnect ECM and proceed to pinpoint test 1

### Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin A01 - ECM pin A07 - ECM pin A10	OK	Disconnect sensor and proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable for short circuit: - ECM pin A10 to ground	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 5
3 Check cable continuity: - ECM pin A10 to sensor pin 1 - ECM pin A07 to sensor pin 2 - ECM pin A01 to sensor pin 3	OK	Proceed to test 4
	Open circuit	Locate and rectify wiring fault, proceed to test 5
4 Check cable for short circuit: - ECM pin A10 to ECM pin A01 - ECM pin A10 to ECM pin A07	OK	Renew throttle position sensor, proceed to test 5
	Short circuit	Locate and rectify wiring fault, proceed to test 5
5 Reconnect harness, clear fault code and run engine to verify fault cleared	OK	Action complete - quit test
	Fault still present	Contact Triumph service

# Fuel System/Engine Management

## Circuit Diagram



## Purge Valve

Fault Code	Possible cause	Action
P0444	Open circuit or short circuit to earth	View & note diagnostic tool 'sensor' data. Ensure purge valve connector is secure. Disconnect ECM and proceed to pinpoint test 1
P0445	Short circuit to battery+	Disconnect purge valve and proceed to pinpoint test 5

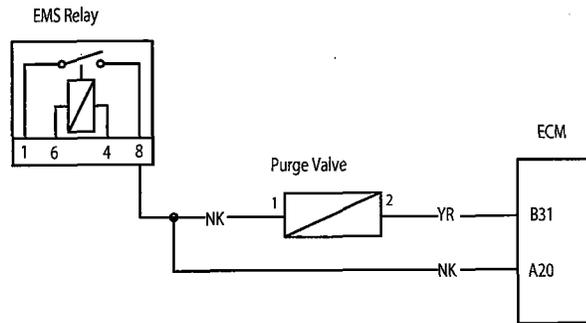
## Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin B31	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 7
2 Check resistance value: - ECM pin A20 to ECM pin B31	24Ω to 28Ω	Disconnect purge valve and proceed to test 3
	Open circuit	Proceed to test 4
	Short circuit	Disconnect purge valve and proceed to test 5
3 Check cable for short circuit: - ECM pin B31 to earth	OK	Proceed to test 7
	Short circuit	Locate and rectify wiring fault, proceed to test 7
4 Check cable continuity: - ECM pin B31 to valve pin 2 - ECM pin A20 to valve pin 1	OK	Proceed to test 6
	Open circuit	Locate and rectify wiring fault, proceed to test 7
5 Check cable for short circuit: - ECM pin A20 to ECM pin B31	OK	Proceed to test 6
	Short circuit	Locate and rectify wiring fault, proceed to test 7
6 Check purge valve resistance: - Valve pin 1 to valve pin 2	24Ω to 28Ω	Proceed to test 7
	Faulty	Renew purge valve, proceed to test 7
7 Reconnect harness, clear fault code and run diagnostic tool function test to visually verify operation of purge valve	OK	Action complete - quit test
	Fault	Contact Triumph service

# Fuel System/Engine Management

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## Circuit Diagram



## Ignition Coils

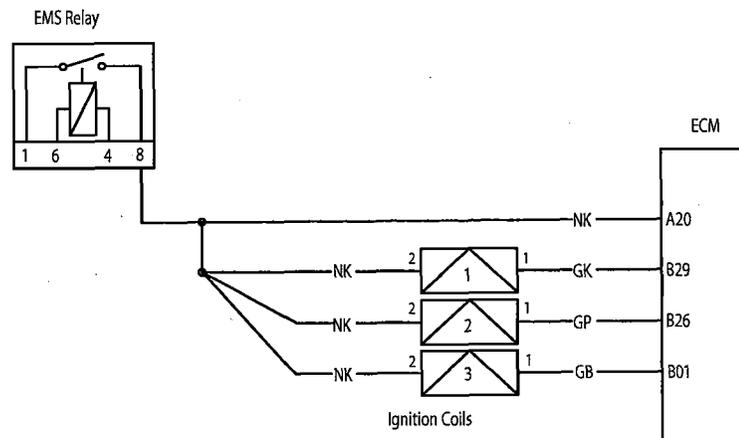
Fault Code	Possible cause	Action
P0351/52/53	Ignition system fault - Ign coil 1/2/3	View & note diagnostic tool 'freeze frame' data if available. Ensure relevant ign coil connector is secure. Disconnect ECM and proceed to pinpoint test 1:-

## Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin B29 - ECM pin B26 - ECM pin B01	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 7
2 Check resistance value: ECM pin A20 to - ECM pin (ign coil 1) B29 - ECM pin (ign coil 2) B26 - ECM pin (ign coil 3) B01	0.8Ω to 1.2Ω	Proceed to test 3
	Open circuit	Disconnect relevant ignition coil and proceed to test 4
	Short circuit	Disconnect relevant ignition coil and proceed to test 5
3 Check cable for short circuit: - ECM pin to earth B29 - ECM pin to earth B26 - ECM pin to earth B01	OK	Proceed to test 7
	Short circuit	Locate and rectify wiring fault, proceed to test 7
4 Check cable continuity: Power latch relay pin 8 to any ign coil pin 2 - ECM pin B29 to ign coil 1 pin 1 - ECM pin B26 to ign coil 2 pin 1 - ECM pin B01 to ign coil 3 pin 1	OK	Proceed to test 6
	Open circuit	Locate and rectify wiring fault, proceed to test 7
5 Check cable for short circuit: ECM pin A20 to - ECM pin (ign coil 1) B29 - ECM pin (ign coil 2) B26 - ECM pin (ign coil 3) B01	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 to 1.2Ω	Proceed to test 7
	Faulty	Renew relevant ignition coil, proceed to test 7
7 Reconnect harness, clear fault code and run engine to verify fault cleared	OK	Action complete - quit test
	Fault still present	Contact Triumph service

# Fuel System/Engine Management

## Circuit Diagram



## Coolant Temperature Sensor

Fault Code	Possible cause	Action
P0118	Open circuit, or short circuit to battery+	View & note diagnostic tool 'freeze frame' data if available. View & note diagnostic tool 'sensor' data. Ensure sensor connector is secure. Disconnect ECM and proceed to pinpoint test 1:-
P0117	Short circuit to ground	Disconnect sensor and proceed to test 6

### Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin A09 - ECM pin A07	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 7
2 Check resistance value: - ECM pin A09 to ECM pin A07 (Temperature dependent, -see below)	OK	Disconnect temp sensor and proceed to test 6
	Open circuit	Disconnect sensor and proceed to test 3
	Short circuit	Disconnect temp sensor and proceed to test 4
3 Check cable continuity: - ECM pin A09 to sensor pin 1 - ECM pin A07 to sensor pin 2	OK	Proceed to test 5
	Open circuit	Locate and rectify wiring fault, proceed to test 7
4 Check cable for short circuit: - ECM pin A09 to ECM pin A07	OK	Proceed to test 5
	Short circuit	Locate and rectify wiring fault, proceed to test 7
5 Check sensor resistance: - Sensor pin 1 to sensor pin 2 (Temperature dependent - see below)	OK	Proceed to test 7
	Faulty	Renew temp sensor, proceed to test 7
6 Check cable for short circuit: - ECM pin A09 to ground	OK	Proceed to test 7
	Short circuit	Locate and rectify wiring fault, proceed to test 7
7 Reconnect harness, clear fault code and run engine to verify fault cleared	OK	Action complete - quit test
	Fault	Contact Triumph service

# Fuel System/Engine Management

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## Circuit Diagram

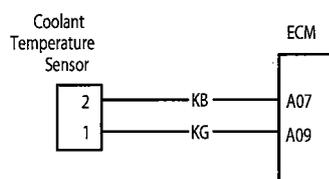
Resistance data under typical conditions:

Warm engine: 200 to 400 $\Omega$

Cold engine:

20°C ambient 2.35 to 2.65K $\Omega$

-10°C ambient 8.50 to 10.25K $\Omega$



## Inlet Air Temperature Sensor

Fault Code	Possible cause	Action
P0113	Open circuit, or short circuit to battery+	View & note diagnostic tool 'freeze frame' data if available. View & note diagnostic tool 'sensor' data. Ensure sensor connector is secure. Disconnect ECM and proceed to pinpoint test 1:-
P0112	Short circuit to ground	Disconnect sensor and proceed to pinpoint test 6

### Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin A22 - ECM pin A07	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 7
2 Check resistance value: - ECM pin A22 to ECM pin A07 (Temperature dependent—see below)	OK	Disconnect temp sensor and proceed to test 6
	Open circuit	Disconnect temp sensor and proceed to test 3
	Short circuit	Disconnect temp sensor and proceed to test 4
3 Check cable continuity: - ECM pin A22 to sensor pin 1 - ECM pin A07 to sensor pin 2	OK	Proceed to test 5
	Open circuit	Locate and rectify wiring fault, proceed to test 7
4 Check cable for short circuit: - ECM pin A22 to ECM pin A07	OK	Proceed to test 5
	Short circuit	Locate and rectify wiring fault, proceed to test 7
5 Check sensor resistance: - Sensor pin 1 to sensor pin 2 (Temperature dependent—see below)	OK	Proceed to test 7
	Faulty	Renew temp sensor, proceed to test 7
6 Check cable for short circuit: - ECM pin A22 to ground	OK	Proceed to test 7
	Short circuit	Locate and rectify wiring fault, proceed to test 7
7 Reconnect harness, clear fault code and run engine to verify fault cleared	OK	Action complete - quit test
	Fault	Contact Triumph service

# Fuel System/Engine Management

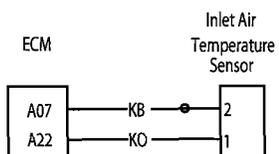
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## Circuit Diagram

If engine is warm, remove sensor and allow time to cool to ambient prior to test.

Resistance data:

Ambient temp	Resistance value
80°C	200 to 400Ω
20°C	2.35 to 2.65KΩ
-10°C	8.50 to 10.25KΩ



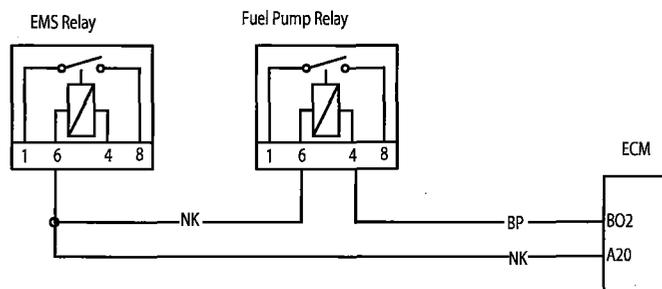
## Fuel Pump Relay

Fault Code	Possible cause	Action
P1231	Fuel pump relay open circuit, or short circuit to ground	Check if pump runs briefly when ignition is switched on. Ensure fuel pump relay connector is secure. Disconnect ECM and proceed to pinpoint test 1:-
P1232	Short circuit to battery+	Disconnect fuel pump relay and proceed to pinpoint test 4

### Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin B02	OK	Disconnect fuel pump relay and proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable for short circuit: - ECM pin B02 to earth	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 5
3 Check cable continuity: - ECM pin B02 to fuel pump relay pin 4 - Fuel pump relay pin 6 to EMS relay pin 8	OK	Proceed to test 4
	Open circuit	Locate and rectify wiring fault, proceed to test 5
4 Check cable for short circuit: - ECM pin B02 to ECM pin A20	OK	Proceed to test 5
	Short circuit	Locate and rectify wiring fault, proceed to test 5
5 Reconnect harness, clear fault code and run diagnostic tool function test to verify fault cleared	OK	Action complete - quit test
	Fault still present	Contact Triumph service

### Circuit Diagram



# Fuel System/Engine Management

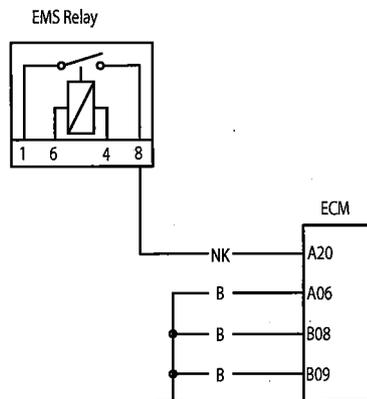
## System Voltage

Fault Code	Possible cause	Action
P0560	Bike voltage system fault	View & note diagnostic tool 'sensor' data. Ensure voltage across battery is acceptable, note voltage. Disconnect ECM and proceed to pinpoint test 1

## Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin A20	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 3
2 With Ignition 'on', check voltage at: - ECM pin A20	Same as 'across battery' voltage	Proceed to test 3
	Less than 'across battery' voltage	Locate and rectify wiring fault, proceed to test 3
3 Reconnect harness, clear fault code and run engine to verify fault cleared	OK	Action complete - quit test
	Fault still present	Contact Triumph service

## Circuit Diagram



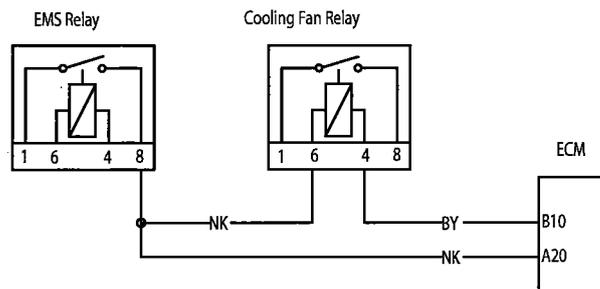
## Cooling Fan Relay

Fault Code	Possible cause	Action
P1552	Fan relay open circuit, or short circuit to ground	View & note diagnostic tool 'sensor' data. Ensure fan relay connector is secure. Disconnect ECM and proceed to pinpoint test1:-
P1553	Short circuit to battery+	Disconnect fan relay and proceed to pinpoint test 4

## Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin B10	OK	Disconnect fan relay and proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable for short circuit: - ECM pin B10 to ground	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 5
3 Check cable continuity: - Fan relay pin 4 to ECM pin B10 - Fan relay pin 6 to EMS relay pin 8	OK	Proceed to test 4
	Open circuit	Locate and rectify wiring fault, proceed to test 5
4 Check cable for short circuit: - ECM pin B10 to ECM pin A20	OK	Proceed to test 5
	Short circuit	Locate and rectify wiring fault, proceed to test 5
5 Reconnect harness, clear fault code and run diagnostic tool function test to visually verify operation of cooling fan	OK	Action complete - quit test
	Fault still present	Contact Triumph service

## Circuit Diagram



# Fuel System/Engine Management

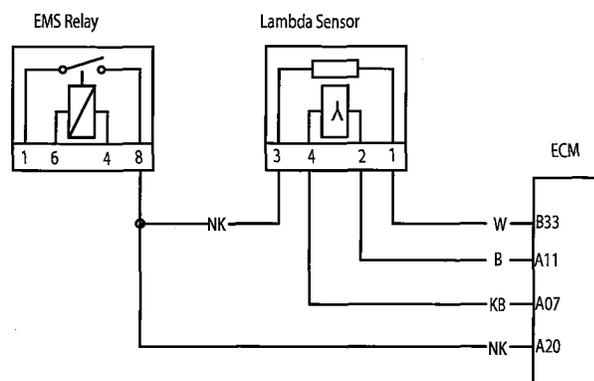
## Lambda Sensor

Fault Code	Possible cause	Action
P0130	Lambda sensor circuit fault.	View & note "freeze frame" data if available. View & note "sensor" data. Ensure sensor connector is secure. Disconnect ECM and proceed to pinpoint test 1:

### Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity:  - ECM pin A11 - ECM pin A07	OK	Disconnect lambda sensor and proceed to test 2
	Faulty	Rectify fault, proceed to test 4
2 Check cable for short circuit:  - ECM pin A11 to ECM pin A07 - ECM pin A11 to ECM pin A20	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 4
3 Check cable continuity:  - ECM pin A11 to sensor pin 2 - ECM pin A11 to sensor pin 4	OK	Proceed to test 4
	Open circuit	Locate and rectify wiring fault, proceed to test 4
4 Reconnect harness, clear fault code and run engine. Check adaptation status.	OK	Action complete - quit test
	Fault still present	Contact Triumph service

### Circuit Diagram



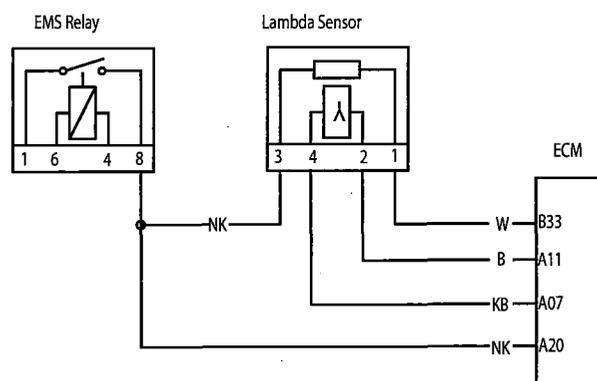
## Lambda Sensor Heater

Fault Code	Possible cause	Action
P0031	Lambda sensor heater circuit short circuit to ground or open circuit.	View & note "freeze frame" data if available. View & note "sensor" data. Ensure sensor connector is secure. Disconnect ECM and proceed to pinpoint test 1:
P0032	Lambda sensor heater circuit, short circuit to battery.	Disconnect lambda sensor and proceed to pinpoint test 4

## Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin B33	OK	Disconnect lambda sensor and proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable for short circuit: - ECM pin B33 to ground	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 5
3 Check cable continuity: - ECM pin B33 to sensor pin 1 - ECM pin A20 to sensor pin 3	OK	Proceed to test 5
	Open circuit	Locate and rectify wiring fault, proceed to test 5
4 Check cable for short circuit: - ECM pin B33 to ECM pin A20	OK	Renew lambda sensor and proceed to test 5
	Short circuit	Locate and rectify wiring fault, proceed to test 5
5 Reconnect harness, clear fault code and run engine. Check adaption status.	OK	Action complete, quit test
	Fault still present	Contact Triumph service

## Circuit Diagram



## Fuel System/Engine Management

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### EEPROM Error

Fault Code	Possible cause	Action
P0603	EEPROM error	View & note "freeze frame" data if available. No tests available - contact Triumph service.

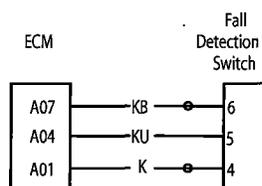
## Fall Detection Switch

Fault Code	Possible cause	Action
P1631	Fall detection switch low input voltage	View & note "freeze frame" data if available.
P1632	Fall detection switch high input voltage or open circuit	View & note "sensor" data Ensure switch connector is secure. Disconnect ECM and proceed to pinpoint test1:

## Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin A04	OK	Disconnect sensor and proceed to test 2
	Faulty	Rectify fault, proceed to test 6
2 Check cable for short circuit: - ECM pin A04 to ground - ECM pin A04 to ECM pin A20	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 6
3 Check cable continuity: - ECM pin A01 to sensor pin 4 - ECM pin A04 to sensor pin 5 - ECM pin A07 to sensor pin 6	OK	Proceed to test 4
	Open circuit	Locate and rectify wiring fault, proceed to test 6
4 Check cable for short circuit: - Sensor pin 4 to sensor pin 5 - Sensor pin 4 to sensor pin 6	OK	Proceed to test 5
	Short circuit	Locate and rectify wiring fault, proceed to test 6
5 Check voltage (with ignition on):  - Sensor pin 4	5V	Renew fall detection switch and proceed to test 6
	Less than 4.8V	Locate and rectify wiring fault, proceed to test 6
6 Reconnect harness, clear fault code.	OK	Action complete, quit test
	Fault still present	Contact Triumph service

## Circuit Diagram



# Fuel System/Engine Management

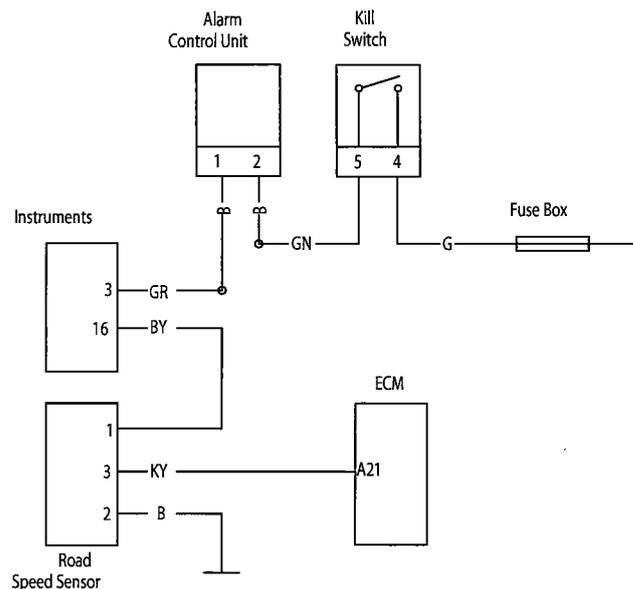
## Vehicle Speed Sensor

Fault Code	Possible cause	Action
P0500	Vehicle speed sensor circuit fault	View & note "freeze frame" data if available. View & note "sensor" data. Ensure sensor connector is secure. Disconnect ECM and proceed to pinpoint test1:

### Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity:  - ECM pin A21 - Instrument pin 16	OK	Disconnect ambient pressure sensor and proceed to test 2
	Faulty	Rectify fault, proceed to test 4
2 Check cable for short circuit:  - ECM pin A21 to ground - ECM pin A21 to ECM pin A01 - ECM pin A21 to battery	OK	Proceed to test 3
	Faulty	Locate and rectify wiring fault, proceed to test 4
3 Check cable for continuity:  - ECM pin A21 to sensor pin 3 - Sensor pin 2 to ground - Instruments pin 16 to sensor pin 1	OK	Renew vehicle speed sensor and proceed to test 4
	Open circuit	Locate and rectify wiring fault, proceed to test 4
4 Reconnect harness, clear fault code and run engine.	OK	Action complete, quit test
	Fault still present	Contact Triumph service

### Circuit Diagram



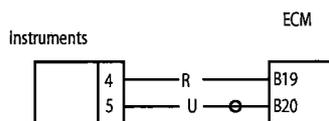
## Instrument Communication (CAN)

Fault Code	Possible cause	Action
P1690	Fault in CAN communication between ECM and Instrument pack.	View & note "freeze frame" data if available. View & note "sensor" data. Ensure Instrument connector is secure. Disconnect ECM and proceed to pinpoint test 1:

## Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity:  - ECM pin B19 - ECM pin B20 - Instrument pin 4 - Instrument pin 5	OK	Disconnect instruments and proceed to test 2
	Faulty	Rectify fault, proceed to test 4
2 Check cable for short circuit:  - ECM pin B19 to ground - ECM pin B20 to ground	OK	Proceed to test 3
	Faulty	Locate and rectify wiring fault, proceed to test 4
3 Check cable continuity:  - ECM pin B19 to Instrument pin 4 - ECM pin B20 to Instrument pin 5	OK	Contact Triumph service
	Open circuit	Locate and rectify wiring fault, proceed to test 4
5 Reconnect harness, clear fault code and run engine.	OK	Action complete, quit test
	Fault still present	Contact Triumph service

## Circuit Diagram



# Fuel System/Engine Management

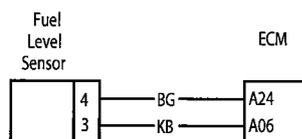
## Fuel Level Sensor

Fault Code	Possible cause	Action
P0460	Fuel level sensor circuit fault	View & note "freeze frame" data if available. View & note "sensor" data. Ensure sensor connector is secure. Disconnect ECM and proceed to pinpoint test1:

## Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ECM pin A24 - ECM pin A06	OK	Disconnect sensor and proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable for short circuit: - ECM pin A24 to ground	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 5
3 Check cable continuity: - ECM pin A24 to sensor pin 4 - ECM pin A06 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: - Sensor pin 3 to sensor pin 4	OK	Renew fuel level sensor and proceed to test 5
	Short circuit	Locate and rectify wiring fault, proceed to test 5
5 Reconnect harness, clear fault code.	OK	Action complete, quit test
	Fault still present	Contact Triumph service

## Circuit Diagram



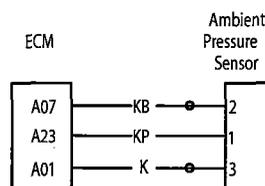
## Ambient Pressure Sensor

Fault Code	Possible cause	Action
P1107	Ambient pressure sensor circuit short circuit to ground	View & note "freeze frame" data if available. View & note "sensor" data. Ensure sensor connector is secure. Disconnect ECM and proceed to pinpoint test1:
P1108	Ambient pressure sensor circuit, short circuit to supply or open circuit	Disconnect ambient pressure sensor and proceed to pinpoint test 4.

## Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity:  - ECM pin A23 - ECM pin A07 - ECM pin A01	OK	Disconnect ambient pressure sensor and proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable for short circuit: - ECM pin A23 to ECM A07	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 5
3 Check cable for continuity:  - ECM pin A23 to sensor pin 1 - ECM pin A07 to sensor pin 2 - ECM pin A01 to sensor pin 3	OK	Renew ambient pressure sensor and proceed to test 5
	Open circuit	Locate and rectify wiring fault, proceed to test 5
4 Check cable for short circuit: - ECM pin A23 to ECM pin A01	OK	Renew ambient pressure sensor and proceed to test 5
	Short circuit	Locate and rectify wiring fault, proceed to test 5
5 Reconnect harness, clear fault code and run engine	OK	Action complete, quit test
	Fault still present	Contact Triumph service

## Circuit Diagram



# Fuel System/Engine Management

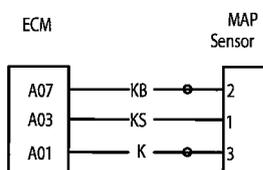
## Manifold Absolute Pressure (Map) Sensor

Fault Code	Possible cause	Action
P0107	MAP sensor circuit short circuit to ground	View & note "freeze frame" data if available. View & note "sensor" data. Ensure sensor connector is secure. Disconnect ECM and proceed to pinpoint test1:
P0108	MAP sensor circuit, short circuit to supply or open circuit	Disconnect MAP sensor and proceed to test 4
P1105	MAP sensor pipe fault	Check connection/condition of pipe from MAP sensor to throttle body

### Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity:  - ECM pin A03 - ECM pin A07 - ECM pin A01	OK	Disconnect MAP sensor and proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable for short circuit: - ECM pin A03 to ECM A07	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 5
3 Check cable for continuity: - ECM pin A03 to sensor pin 1 - ECM pin A07 to sensor pin 2 - ECM pin A01 to sensor pin 3	OK	Renew MAP sensor and proceed to test 5
	Open circuit	Locate and rectify wiring fault, proceed to test 5
4 Check cable for short circuit: - ECM pin A03 to ECM pin A01	OK	Renew MAP sensor and proceed to test 5
	Short circuit	Locate and rectify wiring fault, proceed to test 5
5 Reconnect harness, clear fault code and run engine	OK	Action complete, quit test
	Fault still present	Contact Triumph service

### Circuit Diagram



## Fuel Tank

### Removal

#### Warning

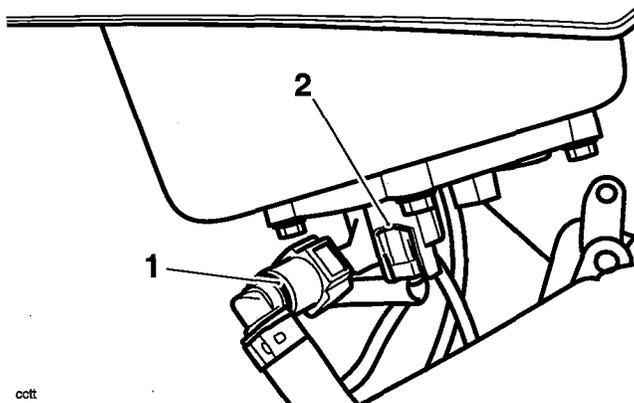
Observe the warning advice given in the general information section on the safe handling of fuel and fuel containers.

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 (see page 16-8).
2. Disconnect the battery negative (black) lead first.
3. Remove the lower fairings and side panels (see page 16-11).
4. Disconnect the fuel pump electrical connection then disconnect the fuel hose by squeezing the sides of the connector and pulling the hose free from the spigot.

#### Note:

- The fuel pump has two electrical connection points, one is not used. Note the position of the connection point used.

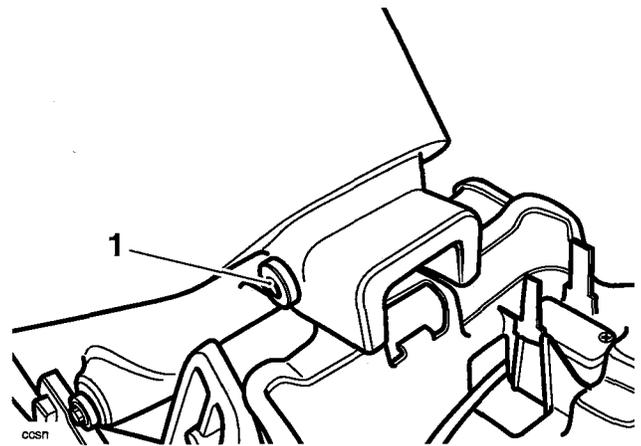


1. Fuel hose
2. Fuel pump electrical connection

#### Note:

- When disconnected, the fuel tank is self-sealing. Some fuel may dribble from the hose though.

5. Release and remove the bolt securing the rear of the fuel tank to the frame.

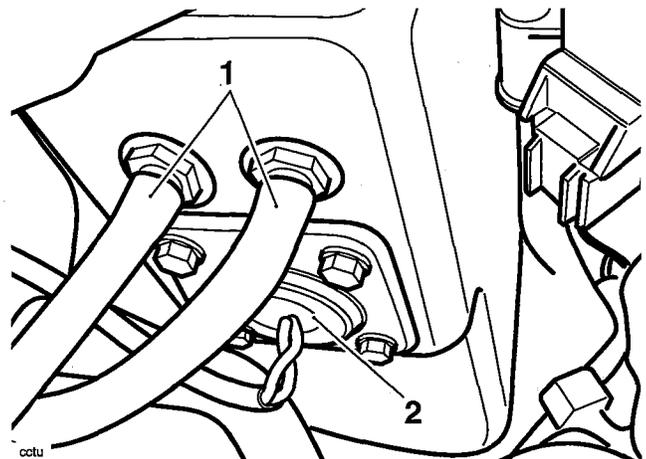


1. Fuel tank to frame bolt

6. Disconnect the two breather hoses and the electrical connection to the fuel level sender.

#### Note:

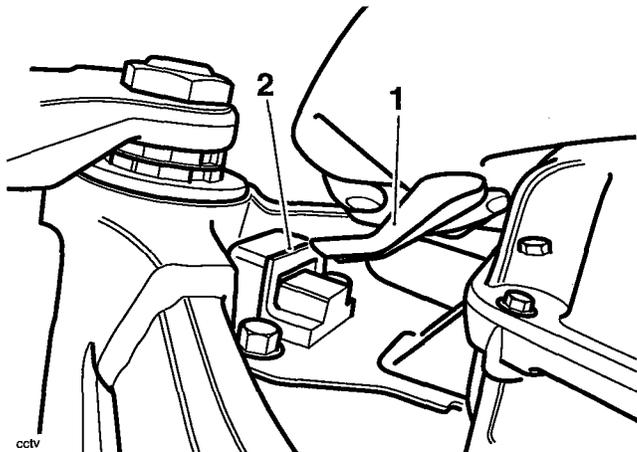
- Before disconnection, note the position of the two breather hoses so that they can be returned to the same locations when refitting the tank.



1. Breather hoses
2. Fuel level sender

# Fuel System/Engine Management

7. Move the tank towards the rear of the motorcycle until the locating tab is released from the mounting bracket.

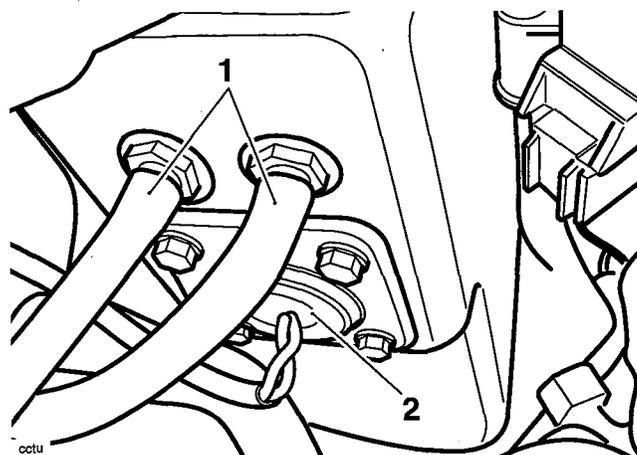


1. Locating tab
2. Mounting bracket

8. Remove the tank.

## Installation

1. Position the fuel tank to the mounting points.
2. Connect the two breather hoses and the electrical connection to the fuel level sender as noted prior to removal.



1. Breather hoses
2. Fuel level sender

3. Align the fuel tank to the mounting points and tighten the rear fixing to **9 Nm**.
4. Reconnect the fuel feed hose by gently pushing inwards until the hose engages with a click.

### Note:

- The fuel pump has two electrical connection points, one is not used. Ensure the connection point noted prior to removal is used.
5. Reconnect the fuel pump electrical connection.
  6. Refit the side panels (see page 16-10).

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 (see page 16-8).

## Fuel Pump and Filter Assembly

### Removal

#### Note:

- The fuel pump and filter assembly is a sealed for life unit and must be replaced as a complete assembly.

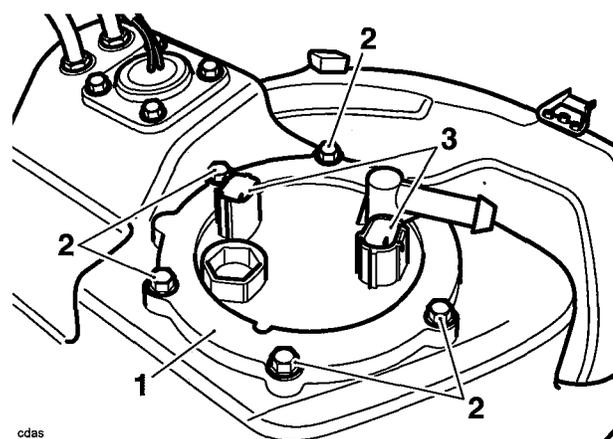
1. Remove the seat (see page 16-8).
2. Disconnect the battery negative (black) lead first.
3. Remove the fuel tank (see page 10-87).
4. Drain the fuel tank into a suitable container.

**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.

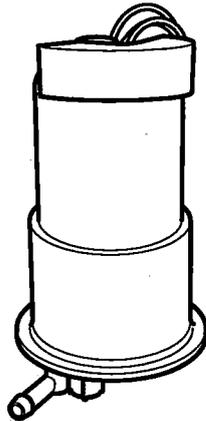
5. Invert the fuel tank and place on a protective surface to prevent paint damage.
6. Remove the fixings securing the fuel pump mounting plate to the tank. Remove the plate.



1. Mounting plate
2. Mounting plate fixings
3. Fuel pump electrical connection

7. Lift the fuel pump and filter assembly and manoeuvre it from the tank aperture.

- Check the condition of the mounting plate 'O'-ring seal in the tank aperture and only remove if necessary.

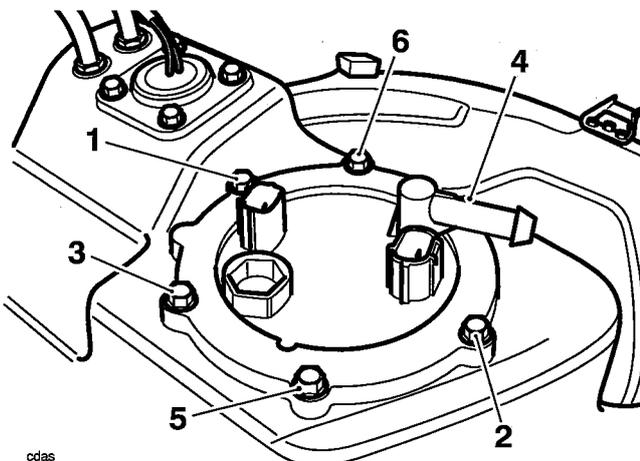


ccxh

## 1. Fuel pump and filter assembly

### Assembly

- Position a new 'O'-ring seal in the tank aperture and ensure that it is correctly seated.
- Carefully manoeuvre the fuel pump and filter assembly into the tank aperture.
- Locate the pump mounting plate to the fuel tank. Tighten the fixings in the sequence shown below to **9 Nm**.



cdas

### Pump Mounting Plate Torque Sequence

- Refit the fuel tank (see page 10-88).
- Refill the fuel tank with the fuel drained earlier.
- Reconnect the battery, positive (red) lead first.
- Refit the seat (see page 16-8).

## Fuel Level Sender Assembly / Float Replacement

### Removal

- Remove the seat (see page 16-8).
- Disconnect the battery negative (black) lead first.
- Remove the fuel tank (see page 10-87).
- Drain the fuel tank into a suitable container.

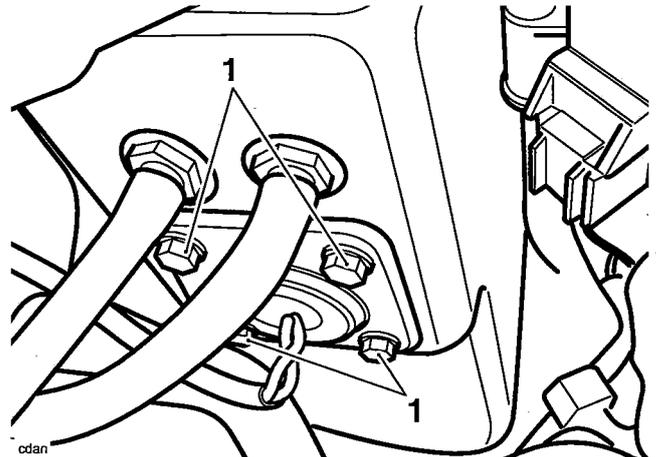


### Warning

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.

- Invert the fuel tank and place on a protective surface to prevent paint damage.
- Remove the four fixings securing the fuel level sender assembly to the tank.



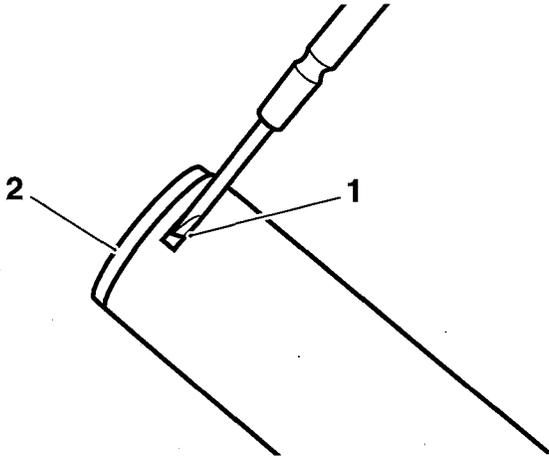
cdan

### 1. Fixings

- Withdraw the assembly from the tank and allow any remaining fuel to drain into a suitable container.

# Fuel System/Engine Management

8. Insert a small screwdriver into one of the tabs at the top of the float assembly and gently prise the lid free.

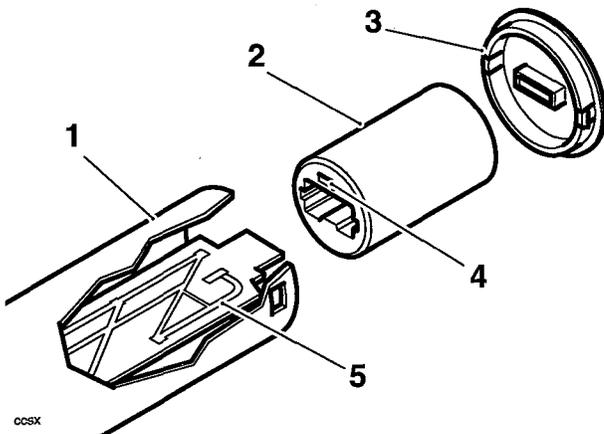


- ccsw
1. Tab
  2. Lid

9. Invert the assembly and allow the float unit to slide free.
10. Discard the old float unit.
11. Insert the new float unit in the orientation shown below ensuring the magnet cover on the face of the unit faces towards the bottom of the support tube.

### Note:

- It is possible to fit the float unit upside down. An incorrect fuel level reading will be indicated during motorcycle operation if the float unit is fitted upside down.



- ccsx
1. Support tube
  2. Float unit
  3. Lid
  4. Magnet cover
  5. Slider

12. Refit the lid ensuring the tabs on the lid locate correctly with the cut-outs in the top of the support tube.

## Inspection

1. Check that the float unit slides easily on the slider. When correctly fitted the float unit should:
  - Slide to the bottom of the support tube when the assembly is slowly tilted upwards.
  - Slide to the top of the support tube when the assembly is slowly tilted downwards.
2. Check the rubber gasket at the base of the support tube for wear or damage. Ensure that the four metal spacers fitted to the gasket are correctly located. Replace as necessary.

## Assembly

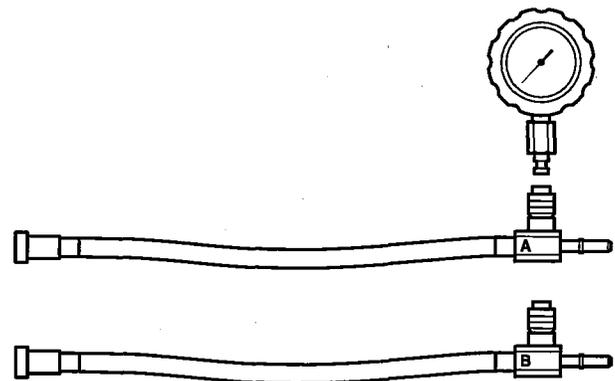
1. Refit the fuel level sender assembly to the fuel tank ensuring that the area where the assembly is to be fitted is clean. Tighten the bolts to **5 Nm**.
2. Refit the fuel tank (see page 10-88).
3. Refill the fuel tank with the fuel drained earlier.
4. Reconnect the battery, positive (red) lead first.
5. Refit the seat (see page 16-8).

## Fuel Pressure Checking

 **Warning**

Observe the fuel handling precautions given in the general information system.

Fuel pressure is checked using service tool T3880001.



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### Tool T3880001

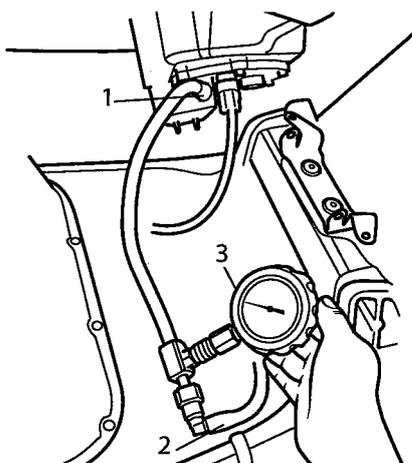
1. Release the fuel tank fixings and bodywork to gain access to the fuel pipe connections (see page 10-87).

2. With the aid of an assistant, support the fuel tank and disconnect the fuel pipe from the fuel pump plate.
3. Select the fuel pressure gauge adapter marked 'B' from service tool T3880001.
8. Reconnect the fuel hose and refit the fuel tank (see page 10-88).

**Warning**

Always use the correct fuel pressure gauge adapter (**adapter 'B' for 2005-onwards Sprint ST**). Use of an incorrect adapter will result in a fuel leak. A fuel leak can result in a fire causing damage to property and injury to persons.

4. Connect the adapter between the fuel pump plate outlet and fuel hose as shown in the illustration below. Insert the gauge to the adapter also as shown in the illustration.



1. Fuel pump plate outlet
2. Fuel hose
3. Tool T3880001

**Note:**

- To release the fuel pressure gauge from the adapter, slide the outer ferrule downwards. This will allow the gauge to spring upwards from the adapter.
- To insert the gauge to the adapter, push the gauge spigot in to adapter until a click can be heard.

5. Ensuring the gauge is visible to the side of the motorcycle, lower the fuel tank into position.
6. Start the engine and observe the fuel pressure reading on the gauge.

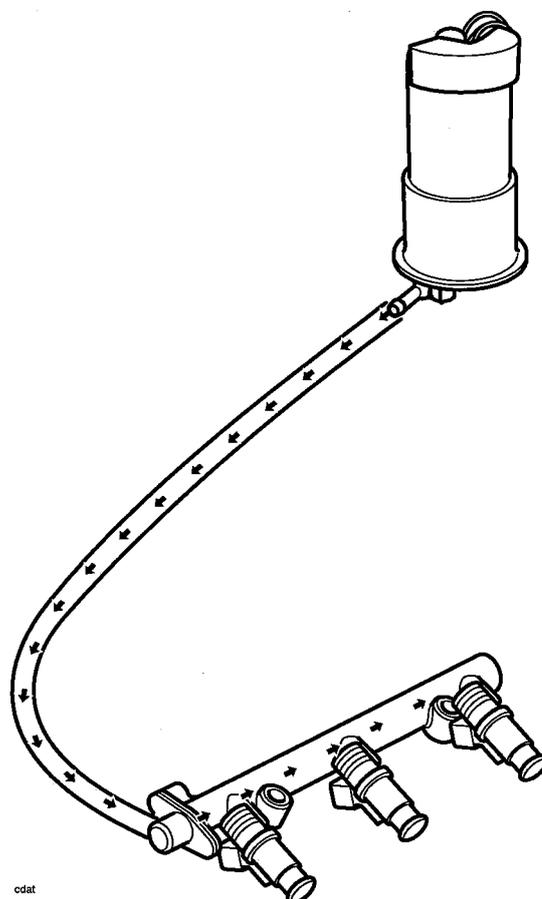
**Note:**

- The fuel pressure should be 3.0 bar nominally.
7. When fuel pressure checking is complete, have an assistant raise the fuel tank and disconnect the fuel pressure gauge adapter.

## Fuel Delivery System

Fuel is delivered to injectors by a 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 a pick-up strainer.

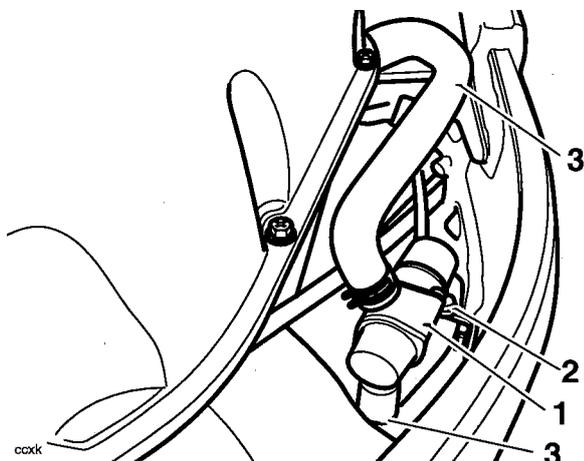


# Fuel System/Engine Management

## Airbox

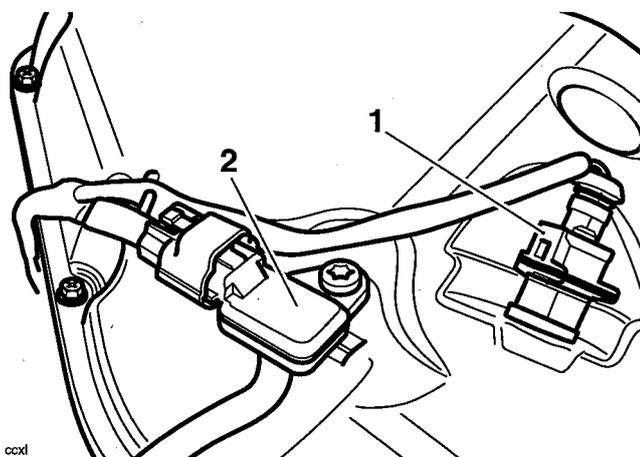
### Removal

1. Remove the seat (see page 16-8).
2. Disconnect the battery negative (black) lead first.
3. Remove the fuel tank (see page 10-87).
4. Disconnect the secondary air injection hose at the airbox.



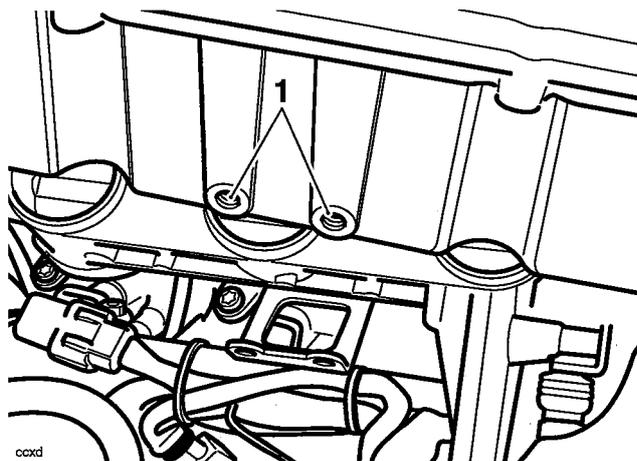
1. Secondary air injection control valve
2. Valve retainer
3. Hoses

5. Disconnect the air temperature and map sensor connectors.



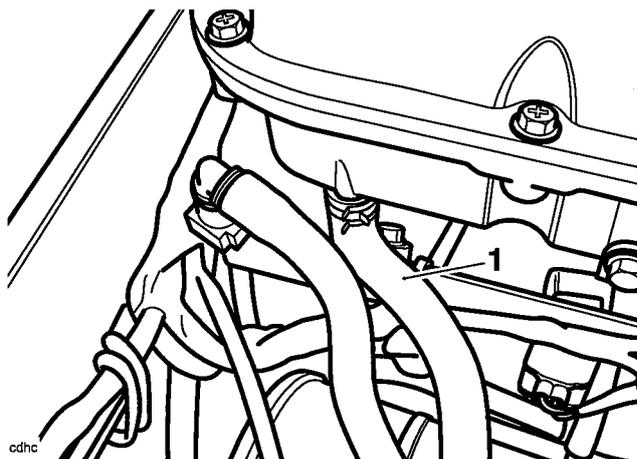
1. Intake air temperature connector
2. Map sensor connector

6. Release the fixings securing the airbox to its bracket.



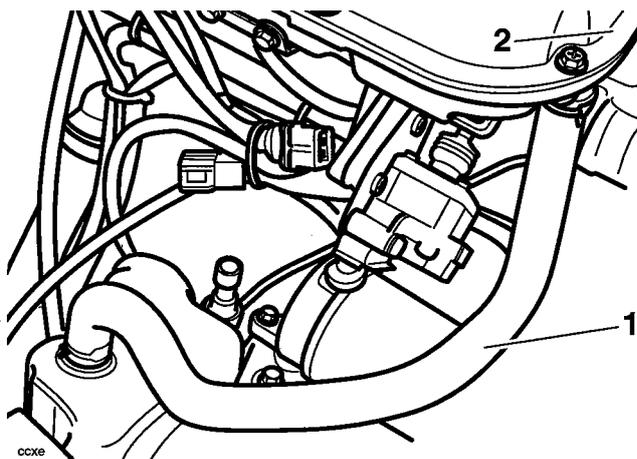
1. Airbox fixing locations

7. Disconnect the drain tube from the rear of the airbox.



1. Drain tube

8. Disconnect the breather hose from the rear of the airbox.



1. Breather hose
2. Airbox

9. Gently lift the rear of the airbox to release it from the throttle bodies.

- Once the airbox has cleared the throttle bodies, slide it rearwards to release it from its forward locating peg.



- Airbox
- Throttle bodies
- Forward locating peg

## Inspection

- Inspect the intake rubbers for splits, damage and distortion.
- Inspect the intake rubber retaining rings for loss of elasticity.
- Check the airbox itself for damage.

## Installation

- Position the airbox to the forward location and push home into the locating grommet.
- Press down on the rear of the airbox to locate the intake rubbers to the throttle bodies.



## Caution

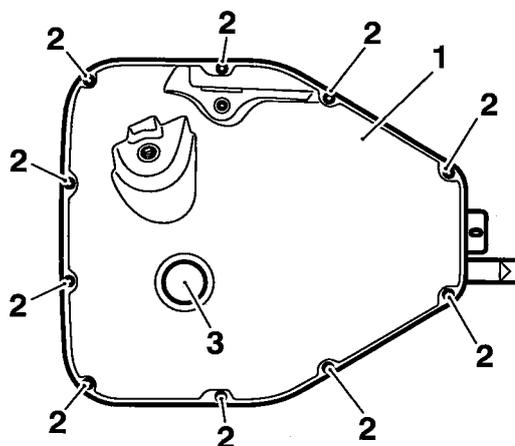
Always ensure that all 3 intake rubbers seal to the throttles through 360° as poor performance and lack of power can result from incorrect sealing.

- Fit and tighten the airbox fixings to **5 Nm**.
- Reconnect the air temperature and map sensor connectors.
- Reconnect and secure the secondary air injection hose.
- Reconnect the airbox breather hose.
- Reconnect the airbox drain tube.
- Refit the fuel tank (see page 10-88).
- Reconnect the battery, positive (red) lead first.
- Refit the seat (see page 16-8).

## Air Filter Element

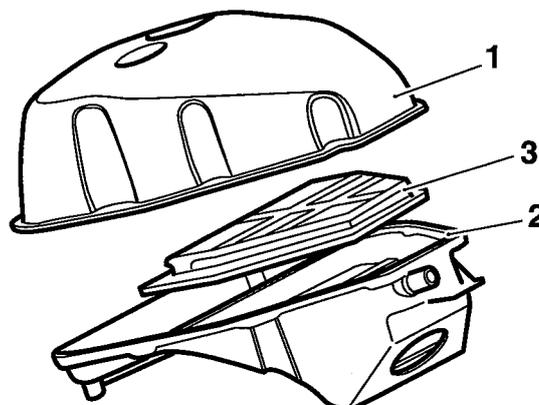
### Removal

- Remove the seat (see page 16-8).
- Disconnect the battery negative (black) lead first.
- Remove the fuel tank (see page 10-87).
- Remove the airbox (see page 10-92).
- Release the ring of bolts securing the upper half of the airbox to its corresponding lower section.
- Release the airbox centre fixing which is accessed through the centre hole in the airbox upper section.



- Airbox
- Ring of bolts
- Centre fixing location

- Separate the two halves of the airbox and recover the air filter element.



- Airbox upper section
- Airbox lower section
- Air filter element

# Fuel System/Engine Management

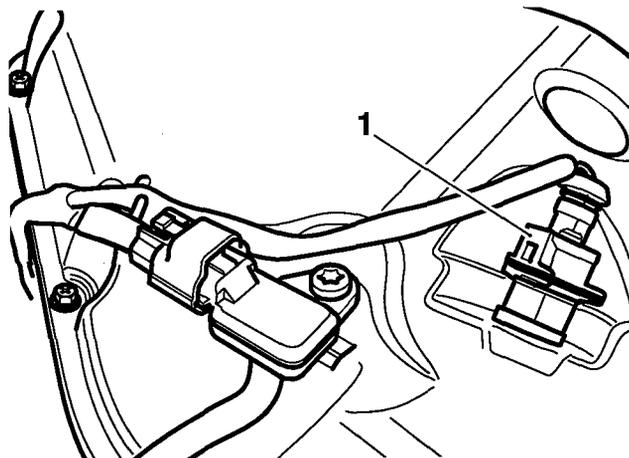
## Installation

1. Thoroughly clean the inside and outside of the airbox.
2. Seat the air filter element in the lower section.
3. Locate the upper section to the lower and secure with the fixings. Tighten to **4 Nm**.
4. Refit the airbox (see page 10-93).
5. Refit the fuel tank (see page 10-88).
6. Reconnect the battery, positive (red) lead first
7. Refit the seat (see page 16-8).

## Intake Air Temperature Sensor

### Removal

1. Remove the seat (see page 16-8).
2. Disconnect the battery negative (black) lead first.
3. Remove the fuel tank (see page 10-87).
4. Disconnect the multiplug from the air temperature sensor.



1. Intake air temperature connector

### Note:

- The intake air temperature sensor has a threaded base.
5. Unscrew the sensor to remove it from the airbox.

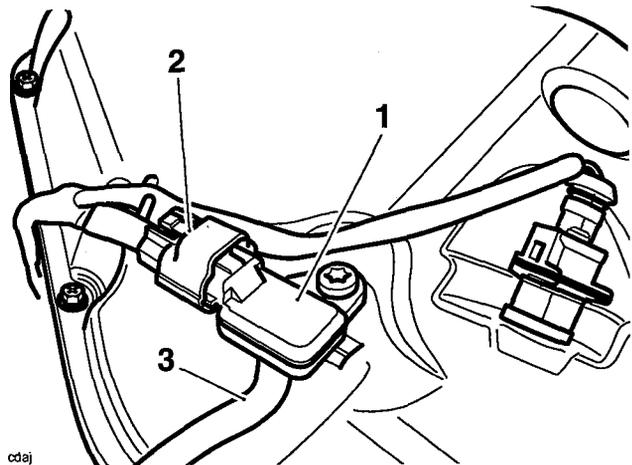
### Assembly

1. Fit the air temperature sensor to the airbox taking care not to overtighten.
2. Reconnect the air temperature sensor.
3. Refit the fuel tank (see page 10-88).
4. Reconnect the battery, positive (red) lead first.
5. Refit the seat (see page 16-8).

## Map Sensor

### Removal

1. Remove the seat (see page 16-8).
2. Disconnect the battery negative (black) lead first.
3. Remove the fuel tank (see page 10-87).
4. Disconnect the multiplug from the map sensor.



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1. Map sensor
2. Multi-plug
3. Air hose

5. Disconnect the air hose from the sensor.
6. Release the fixing screw securing the sensor to the airbox.
7. Raise the sensor to remove it from the airbox and collect the O-ring.

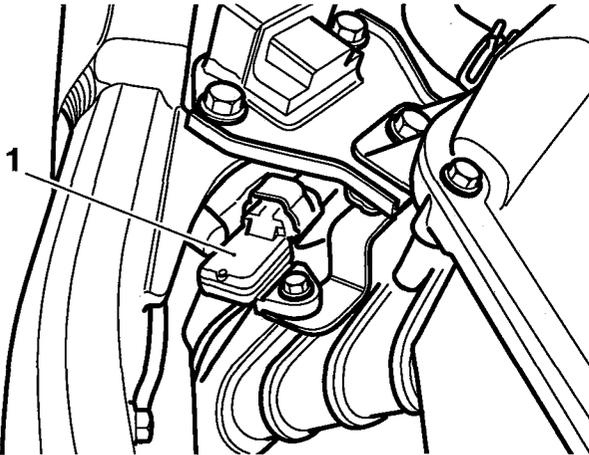
### Installation

1. Take a new O-ring and lubricate it with a smear of petroleum jelly. Fit the O-ring to the sensor, then fit the sensor to the airbox, tightening the screw to **3 Nm**.
2. Refit the air hose.
3. Reconnect the multi-plug.
4. Refit the fuel tank (see page 10-88).
5. Reconnect the battery, positive (red) lead first.
6. Refit the seat (see page 16-8).

## Barometric Pressure Sensor

### Removal

1. Remove the fuel tank (see page 10-87)
2. Disconnect the barometric pressure sensor multiplug.
3. Release the fixing screw securing the sensor to the mounting bracket and remove the barometric pressure sensor.



1. Barometric Pressure Sensor

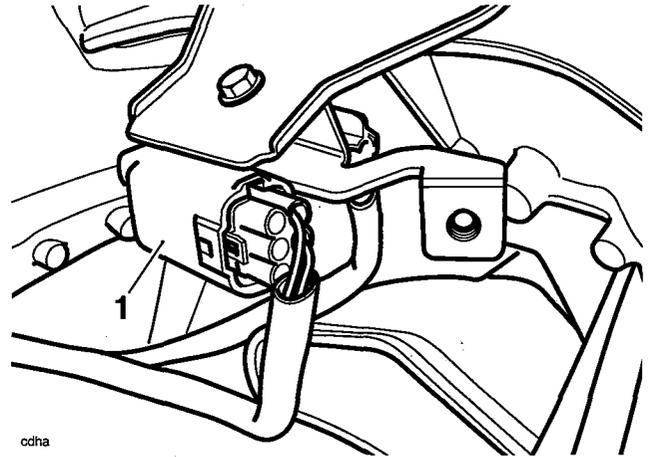
### Installation

1. Fit the barometric pressure sensor to the mounting bracket, tightening the fixing screw to **3 Nm**.
2. Connect the barometric pressure sensor multiplug.
3. Fit the fuel tank (See page 10-88).

## Fall Detection Switch

### Removal

1. Remove the airbox (See page 10-92).
2. Disconnect the fall detection switch multiplug.
3. Release and discard the fixing screws securing the switch to the mounting bracket and remove the switch.



1. Fall Detection Switch

### Installation

1. Fit the fall detection switch to the mounting bracket, fit new fixing screws and tighten to **4 Nm**.
2. Connect the fall detection switch multiplug.
3. Fit the airbox (See page 10-93).

# Fuel System/Engine Management

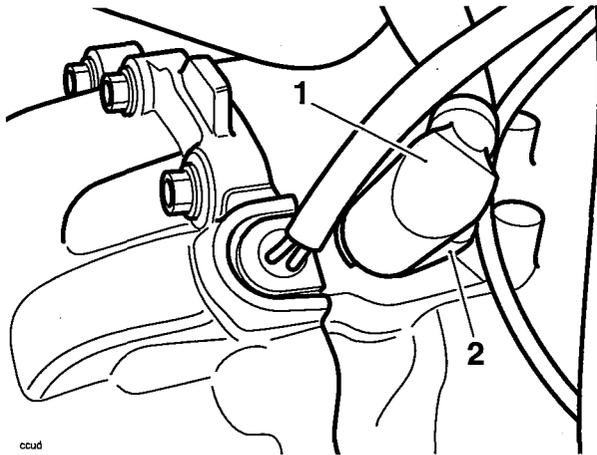
## Crankshaft position sensor

### Note:

- The air gap for the crankshaft position sensor is not adjustable.

### Removal

1. Remove the seat (see page 16-8).
2. Disconnect the battery negative (black) lead first.
3. Remove the fixing securing the sensor bracket to the crankcase. Ease the sensor from the crankcase.

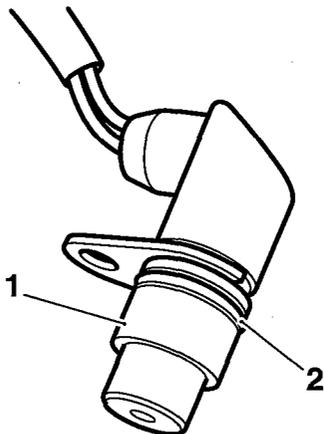


1. Sensor
2. Sensor bracket

4. Disconnect the sensor multi-plug.

### Installation

1. Check the sensor O ring for damage or deterioration. Renew as necessary.



1. Sensor
2. O ring

1. Apply a smear of oil to the sensor O ring to aid assembly.

2. Refit the sensor taking care not to damage the O ring.
3. Refit the sensor bracket. Fit and tighten the fixing to 10 Nm.
4. Reconnect the sensor multi-plug.
5. Reconnect the battery, positive (red) lead first.
6. Refit the seat (see page 16-8).

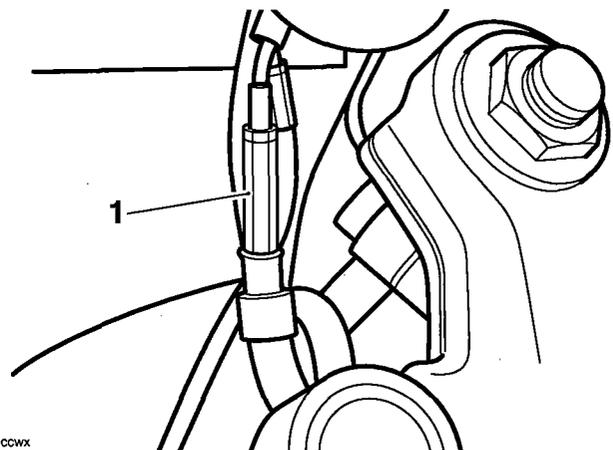
## Throttle Cable

### Adjustment

### Note:

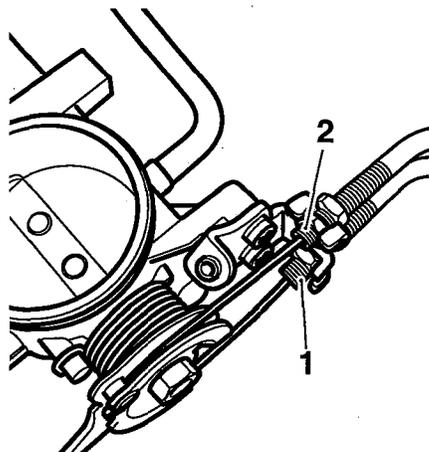
- Minor adjustments to the opening cable can be made using the adjuster near the twist grip end of the throttle. Where a correct setting cannot be achieved this way, the adjusters at the throttle end of both cables must be used. The opening cable must be set first followed by the closing cable.

1. Remove the seat (see page 16-8).
2. Disconnect the battery negative (black) lead first.
3. Set the 'opening' cable adjuster at the twist grip end such that it has an equal amount of adjustment in each direction. Tighten the locknut.



1. 'Opening' Cable Adjuster (Twist Grip End)
4. Remove the fuel tank (see page 10-87).
5. Remove the airbox (see page 10-92).

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



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1. 'Opening' Cable Adjuster (Throttle End)

2. 'Closing' Cable Adjuster (Throttle End)

- With the throttle fully closed, ensure that there is 2-3mm of free play in the 'closing' cable. Adjust if necessary ensuring that the locknut is secure afterwards.



## Warning

Operation of the motorcycle with incorrectly adjusted, incorrectly routed or damaged throttle cables 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. Cables or harness that bind will restrict the steering and may cause loss of control and an accident.



## 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.

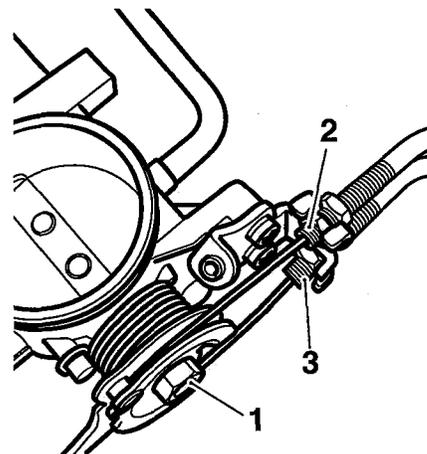
- Refit the airbox (see page 10-93).
- Refit the fuel tank (see page 10-88).
- Reconnect the battery, positive (red) lead first.
- Refit the seat (see page 16-8).

## Removal

### Note:

- Before beginning to remove the throttle cables, note the exact routing and location of both cables to help ensure that they are returned to the same locations and routing on assembly.

- Remove the seat (see page 16-8).
- Disconnect the battery negative (black) lead first. (see page 17-8).
- Remove the fuel tank (see page 10-87).
- Remove the airbox (see page 10-92).
- Slacken the adjuster locknuts at the throttle body end of the cables such that they will allow the outer cables to be detached from the cable bracket.
- Detach the inner portion of the cables from the throttle cam.



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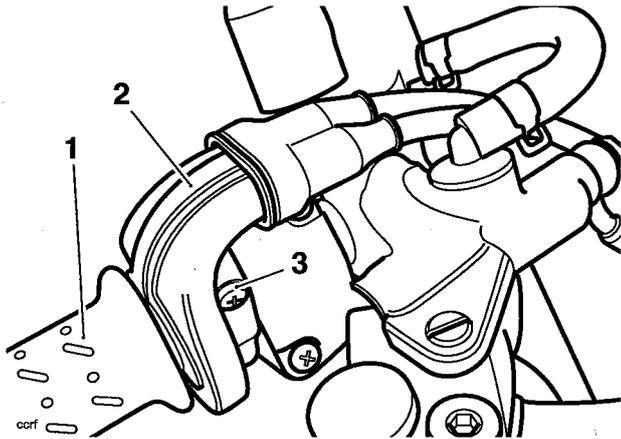
1. Throttle cam

2. Closing cable

3. Opening cable

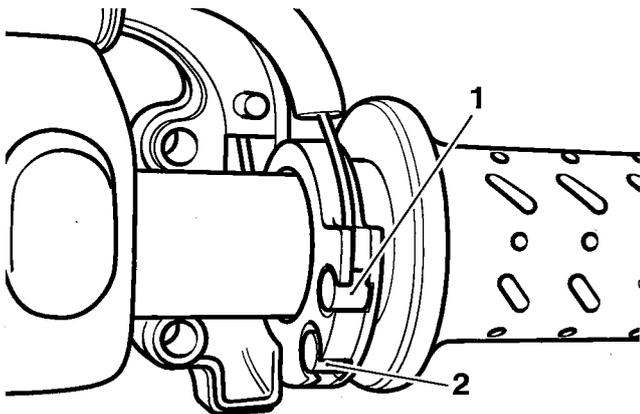
# Fuel System/Engine Management

- 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.



- Twist grip
- Twist grip guide
- Screws

- Separate the two halves of the guide then release the inner cables from the twist grip.



- Opening cable
- Closing cable

- Detach the cables from the motorcycle.

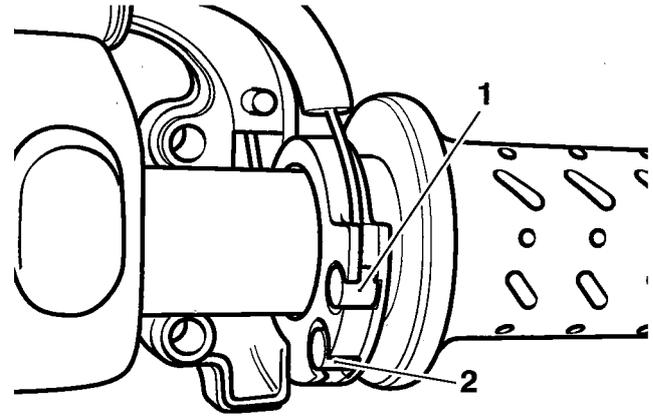
## Examination

- Check that both the throttle cables operate smoothly, without sticking or binding. Replace the cables if there is any doubt as to their correct operation.

## Installation

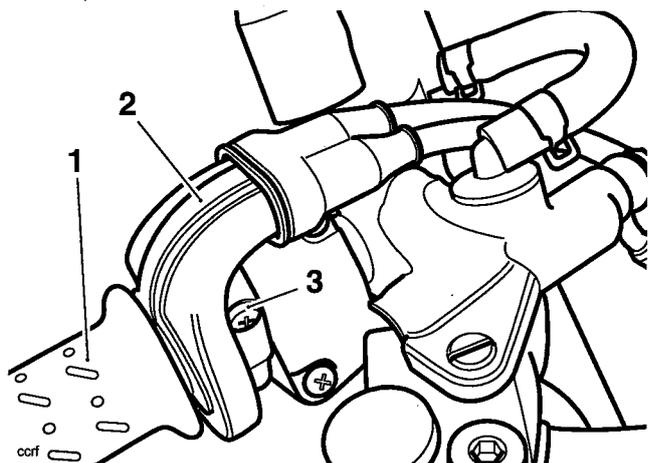
- Locate the cables to the frame following the routing noted during removal.

- Engage the inner cable nipples to the twist grip.



- Opening cable
- Closing cable

- Assemble the two halves of the cable guide ensuring that the outer cables are correctly located in the guide and the guide is positioned on the handlebars as prior to removal.



- Twist grip
- Twist grip guide
- Screws

- Refit the boot.
- Attach the other end of the inner cables to the throttle cam ensuring the opening cable is fitted to the bottom of the throttle cam and the closing cable to the top.
- Locate the outer cables to the bracket and secure with the adjuster and locknuts.
- Set the cable adjustment (see page 10-96).
- Refit the airbox (see page 10-93).
- Refit the fuel tank (see page 10-88).
- Reconnect the battery, positive (red) lead first
- Refit the seat (see page 16-8).

## Throttle Bodies/Injectors

### Removal

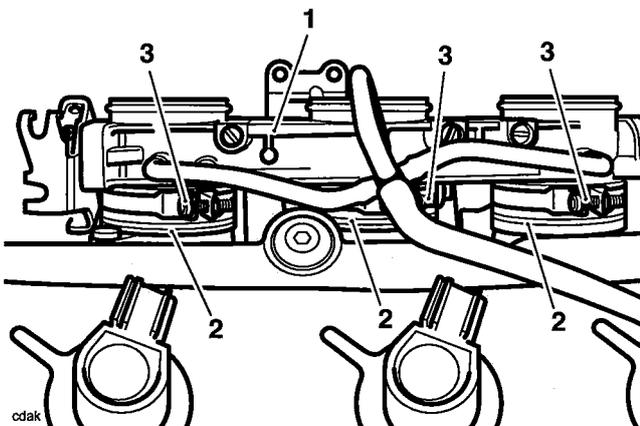
#### Note:

- 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 fuel rail takes place. To reduce pressure, briefly crank the engine with the fuel pump disconnected.

### Warning

If the fuel rail is dismantled without first reducing pressure 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.

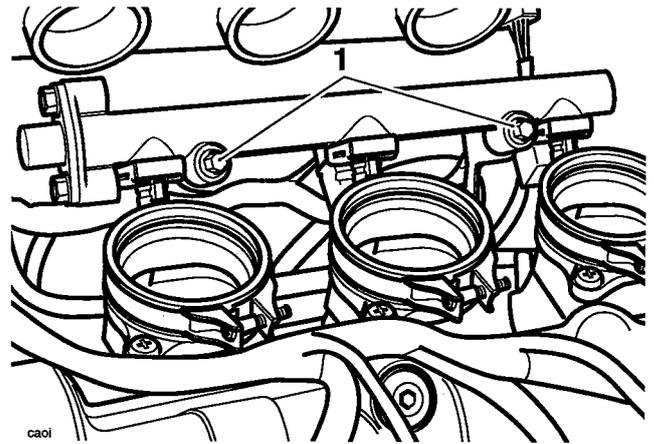
- Remove the seat (see page 16-8).
- Disconnect the battery negative (black) lead first.
- Remove the fuel tank (see page 10-87).
- Remove the airbox (see page 10-92).
- Remove the side panels (see page 16-9).
- Disconnect the throttle position sensor.
- Release both throttle cables from the throttle cam (see page 10-96).
- Release the clips securing the throttle bodies to the transition pieces.



- Throttle body
- Transition piece (one per cylinder)
- Clip (one per cylinder)

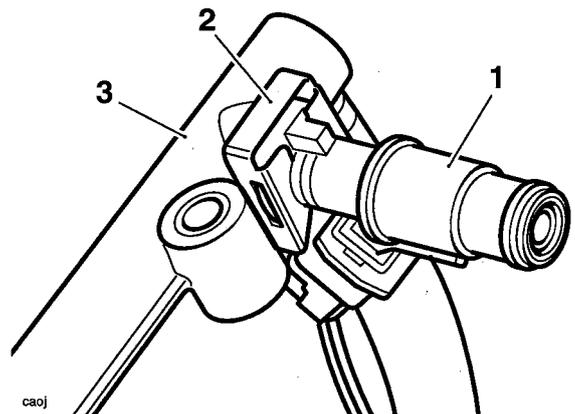
- Ease the throttle bodies from the transition pieces and lay the assembly on the crankcase.

- Release the bolts securing the fuel rail to its bracket.



#### 1. Fuel rail bolts

- Ease the fuel rail and injectors from the cylinder head.
- To detach the injectors from the fuel rail, release the clip at the fuel rail end of each injector and ease the injector from the rail.



- Injector
- Clip
- Fuel rail

- To detach the transition pieces from the head, release the screws, raise the transition pieces and collect the O rings.

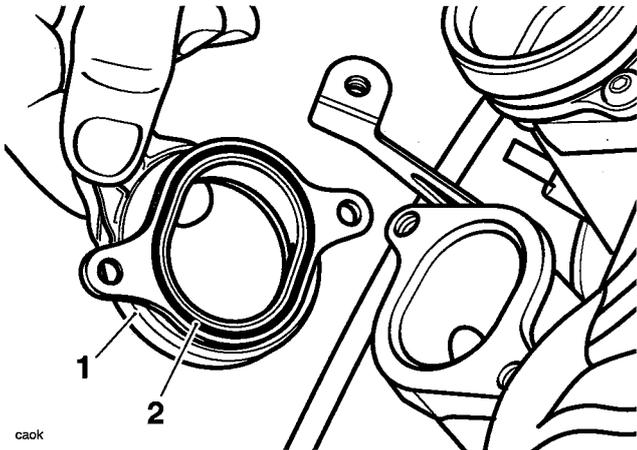
### Inspection

- Check all joints and seals for splits, cuts and damage.
- Check the throttles for sticking, loose or damaged throttle plates.
- Check the O rings for damage.

# Fuel System/Engine Management

## Installation

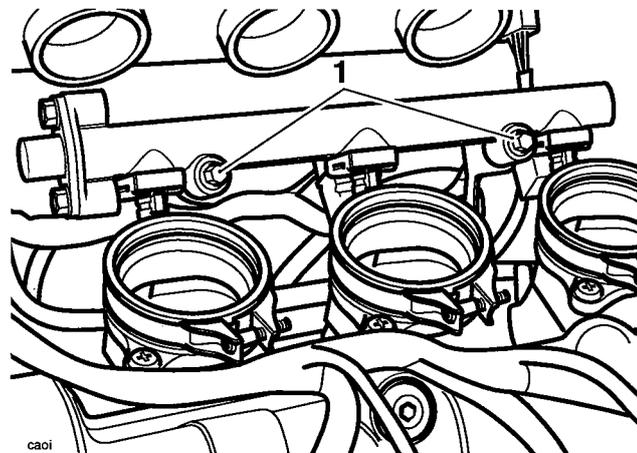
1. Thoroughly clean the transition piece to cylinder head mating faces.
2. Refit the transition pieces to the head incorporating new O rings to the joint face. Tighten the transition piece fixings to **12 Nm**.



caok

1. Transition piece
2. O ring

3. If the injectors have been removed from the fuel rail, refit them to the rail and secure with the clips.
4. Check the injector O rings for splits and other damage. Replace as necessary.
5. Refit the injectors and fuel rail to the cylinder head. Tighten the fuel rail fixings to **6 Nm**.



caoi

1. Fuel rail bolts

6. Refit the throttle bodies to the transition pieces and secure with clips.
7. Re-attach and adjust the throttle cables (see page 10-96).
8. Refit the airbox (see page 10-93).
9. Refit the fuel tank (see page 10-88).
10. Refit all bodywork.
11. Reconnect the battery, positive (red) lead first.
12. Refit the seat (see page 16-8).

## Throttle Body Balancing

### Note:

- The throttles cannot be balanced using equipment to measure vacuum in each throttle. Instead, the Triumph diagnostic tool must be used.

1. Remove the fuel tank (see page 10-87).
2. Remove the airbox (see page 10-92).



### Warning

If the engine has recently been running, the components beneath the fuel tank may be hot to the touch.

3. Connect the diagnostic tool.
4. Temporarily refit the fuel tank and reconnect the hoses and fuel pump connection.
5. Attach exhaust extraction hoses to the silencers.
6. Start the engine.
7. On the diagnostic tool navigate to 'ADJUSTMENTS' (see page 10-22).
8. Select 'balance throttles'.

T	H	R	O	T	T	L	E	S		B	A	L	A	N	C	E	D		
T	H	R	O	T	T	L	E		1	1	2	3	4	M	M	/	H	G	
T	H	R	O	T	T	L	E		2	1	2	3	4	M	M	/	H	G	
T	H	R	O	T	T	L	E		3	1	2	3	4	M	M	/	H	G	

Balance throttles screen

### Note:

- The balance throttle screens show the vacuum valve of each throttle in mm/hg. In addition, when the throttles are balanced to an acceptable range of each other the word 'balanced' will appear in the top right hand corner of the screen. At this point, no further adjustment is necessary or productive.



# Fuel System/Engine Management

13. Disconnect the diagnostic tool.
14. Disconnect the battery negative (black) lead first.
15. Check that the throttle opens and closes without obstruction/sticking and has a smooth action throughout the full range of its movement. Rectify as necessary.

**Warning**

Operation of the motorcycle with an incorrectly adjusted throttle position sensor, or a throttle position sensor that causes the throttle to stick could result in loss of throttle control. Loss of throttle control could result in loss of control of the motorcycle and an accident.

**Warning**

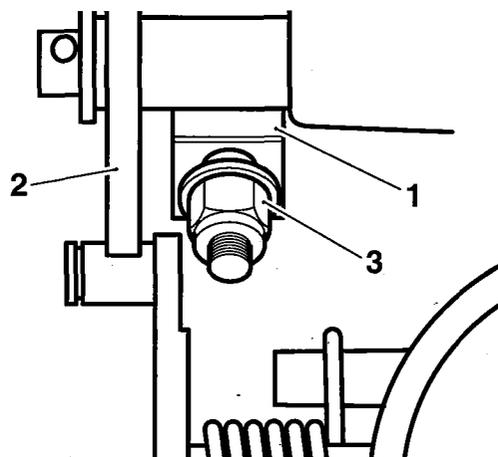
Operation of the motorcycle with an incorrectly adjusted, incorrectly routed or damaged throttle cable could interfere with the operation of the brakes, clutch or the throttle itself. Any of these conditions could result in loss of control of the motorcycle and an accident.

16. Disconnect the battery negative (black) lead first.
17. Refit the throttle body assembly (see page 10-100).
18. Refit the airbox (see page 10-93).
19. Refit the fuel tank (see page 10-88).
20. Reconnect the battery, positive (red) lead first.
21. Check and clear any stored faults using the same tool.
22. Refit the seat (see page 16-8).

## Idle Speed Control Stepper Motor

### Removal

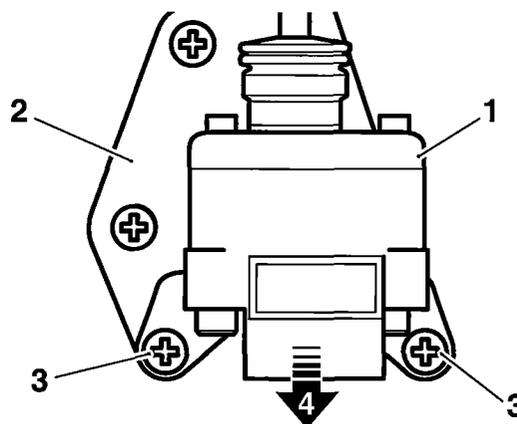
1. Remove the seat (see page 16-8).
2. Disconnect the battery negative (black) lead first.
3. Remove the fuel tank (see page 10-87).
4. Remove the airbox (see page 10-92).
5. Remove the throttle bodies (see page 10-99).
6. Remove the nylon nut, metal washer and plastic washer attaching the idle control stepper arm to the idle speed control lever



cdaw

1. Idle control stepper arm
2. Idle speed control lever
3. Nut etc.

7. Remove the two screws securing the idle speed control stepper motor to its bracket, then remove the stepper motor in the direction shown.



cdaw

1. Idle speed control stepper motor
2. Bracket
3. Fixings
4. Direction of removal



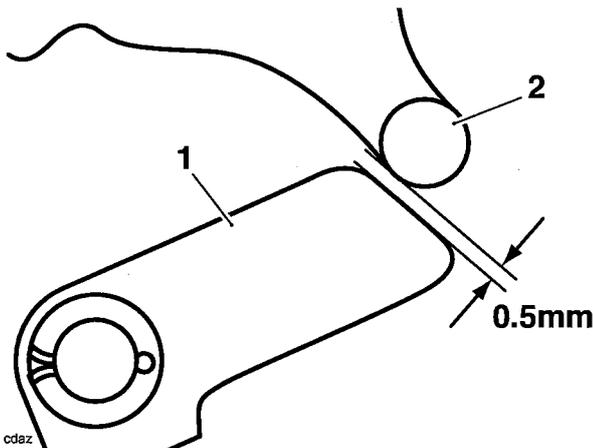
# Fuel System/Engine Management

► I S C S T E P P E R R E N E W

10. On pressing the validation key, the diagnostic tool will send a command that drives the throttle to the fully closed position. The tool will also display the voltage reading coming from the throttle position sensor which will be needed for a check/adjustment made later in the process.

R	E	P	L	A	C	E	I	S	C	S	T	E	P	P	E	R					
							T	H	R	O	T	T	L	E	C	L	O	S	E	D	
C	U	R	R	E	N	T	V	O	L	T	S										

11. Tighten the stepper arm until a clearance of 0.5 mm can be measured between the idle speed control cam and the throttle roller.



1. Idle speed control lever  
2. Throttle roller

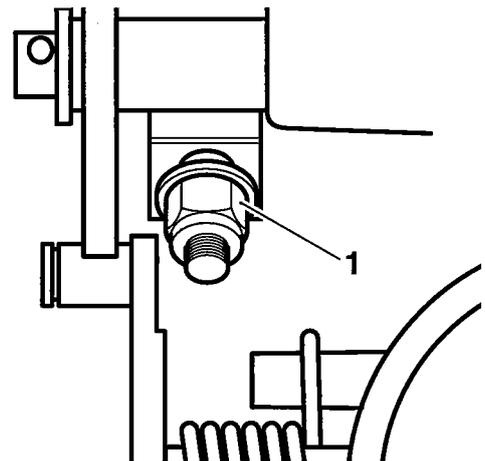
12. Check the voltage reading on the tool. If the reading is 0.6 volts +/- 0.02 volts, MAKE A NOTE OF THE EXACT VOLTAGE READING then proceed to step 18. If the reading is not within this tolerance band, adjustment must be made as described in paragraphs 13 to 15.
13. Slacken the screws on the throttle position sensor.
14. Gently turn the throttle position sensor until the voltage reading on the tool shows 0.6 volts +/- 0.02 volts. MAKE A NOTE OF THE EXACT VOLTAGE READING.
15. Tighten the sensor retaining screw to **3.5 Nm** and recheck the voltage reading shown on the tool. Repeat the adjustment if the reading is outside the specified range, NOTING THE FINAL VOLTAGE READING IF ADJUSTMENT IS MADE.
16. Press the validation key marked "\*" to progress to the next adjustment.

17. On pressing the validation key, the diagnostic tool will send a command that drives the throttle to the fully open position. The tool will also display the voltage reading coming from the throttle position sensor.

R	E	P	L	A	C	E	I	S	C	S	T	E	P	P	E	R					
							T	H	R	O	T	T	L	E	O	P	E	N			
C	U	R	R	E	N	T	V	O	L	T	S										

18. With the stepper fully opened, check the voltage shown on the tool and adjust the nut on the top of the stepper arm until the tool shows a voltage equivalent to  $X+0.15$  (+/- 0.05V) where X= the voltage measured in step 12 (or 14 if re-adjusted).

For example, if the voltage measured was 0.6 volts, then the correct setting would be 0.70-0.80 volts.



1. Adjustment nut

19. Press the validation key marked "\*" to fully close the idle speed control stepper motor. After a minimum of 15 seconds (the tool will not allow further actions to take place during this period), press the validation key again to return the ECM to normal control.

## Caution

Do not operate the throttle while the stepper motor is being adjusted, otherwise the incorrect value will be adapted and the engine will not start.

20. Turn the ignition to the OFF position.
21. Disconnect the battery, negative (black) lead first.
22. Check and adjust the throttle cable settings (see page 10-96).

## Warning

Move the handlebars to left and right full lock while checking that the 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.

23. Refit the airbox (see page 10-93).
24. Refit the fuel tank (see page 10-88).
25. Reconnect the battery, positive (red) lead first.
26. Refit the seat (see page 16-8).

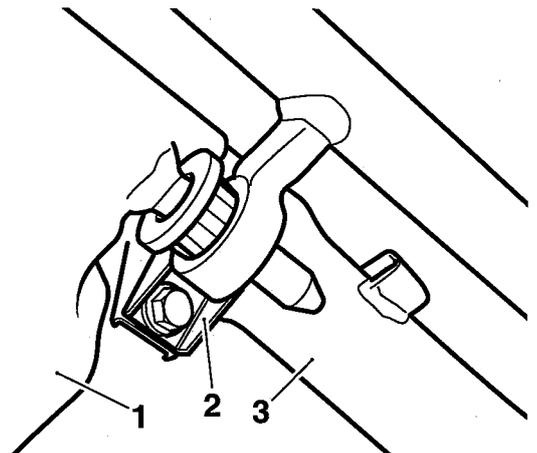
## Exhaust System

### 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.

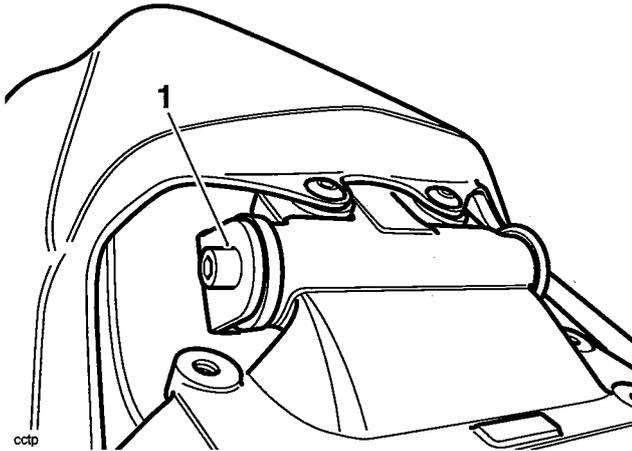
1. Remove the seat (see page 16-8).
2. Disconnect the battery, negative (black) lead first.
3. Remove the rear bodywork (see page 16-9).
4. Release the clamp securing the silencer to the exhaust pipe.
5. Release the rear light mounting bracket (see page 17-13).



- cdam
1. Silencer
  2. Clamp
  3. Exhaust pipe

# Fuel System/Engine Management

6. Support the silencer and release the bolts securing the silencer mounting bracket to the rear frame



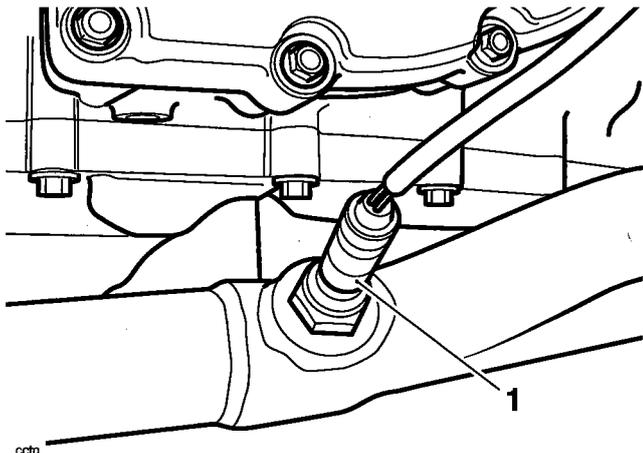
**1. Silencer mounting bracket/fixing**

7. Move the silencer rearwards to disengage its front mountings and remove.



**1. Silencer mounting points**

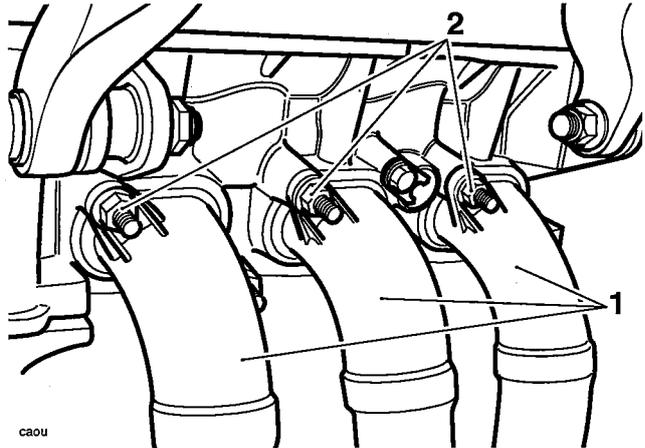
8. Disconnect the oxygen sensor.



**1. Oxygen sensor**

9. Remove the oil cooler (see page 8-13).  
10. Remove the radiator (see page 11-8).

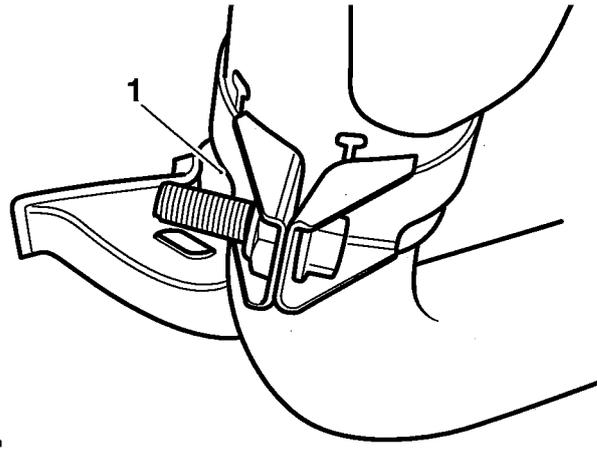
11. Release the fixings securing the exhaust pipe joints to the cylinder head.



**1. Down pipes**

**2. Fixings (upper fixings shown)**

12. Remove the bolt from the exhaust pipe rear mounting point.



**1. Exhaust pipe rear mounting point**

13. Detach the exhaust pipe assembly and collect the seals from the head ports.

**Note:**

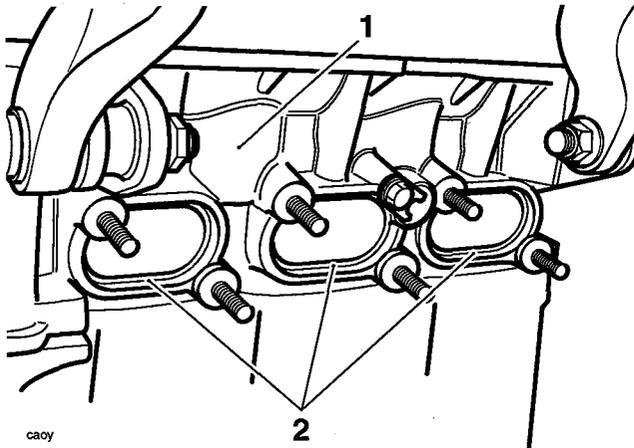
- The intermediate pipe and cover may be removed prior to, or after removal of the downpipes.

## Assembly

1. Fit new seals to the cylinder head.

### Note:

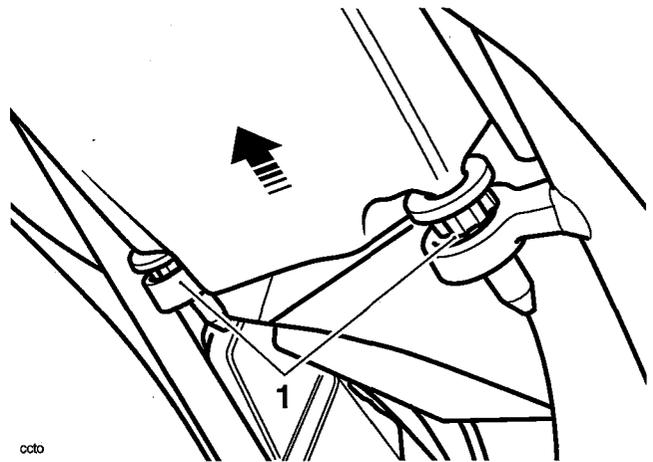
- A smear of grease may be used to retain the seals in the cylinder head during assembly



1. Cylinder head
2. Seals

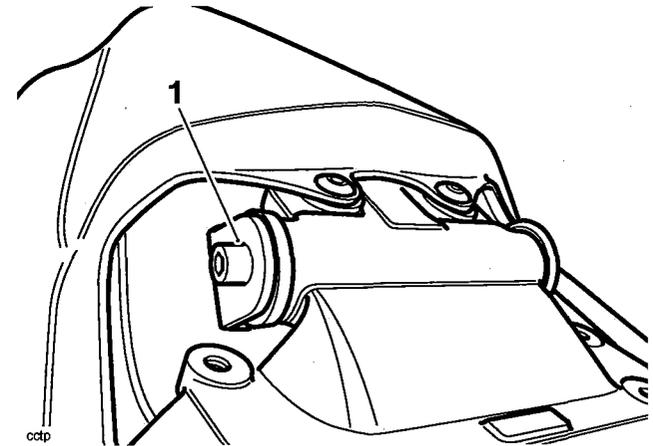
2. Locate the exhaust pipes and align the exhaust pipe flanges to the fixing points.
3. Assemble the rear mounting points fixings but do not tighten at this stage.
4. Tighten the exhaust pipe to cylinder head fixings in the following sequence:
  - a) Working from left to right, tighten the upper row of nuts to **19 Nm**.
  - b) Working from left to right, tighten the lower row of nuts to **19 Nm**.
  - c) Working from left to right, re-tighten the upper row of nuts to **19 Nm**.
5. Tighten the rear mounting point fixing to **15 Nm**.
6. Refit the radiator and refill the cooling system (see page 11-9).
7. Refit the oil cooler (see page 8-14).

8. Position and engage the silencer to its front mountings.



1. Silencer mounting points

9. Position and engage the silencer to the exhaust pipe.
10. Align the silencer mounting brackets to the frame



1. Silencer mounting bolt

11. Align the clamp to the silencer to exhaust pipe joint and tighten to **27 Nm**.
12. Refit the rear light bracket (see page 17-13).
13. Reconnect the battery, positive (red) lead first.
14. Refit the seat (see page 16-8).



## Caution

Do not install the exhaust system or run the engine without the exhaust heatshields fitted. Components protected by the exhaust heatshields may suffer severe damage or a fire if the motorcycle is operated without the heatshields being fitted.

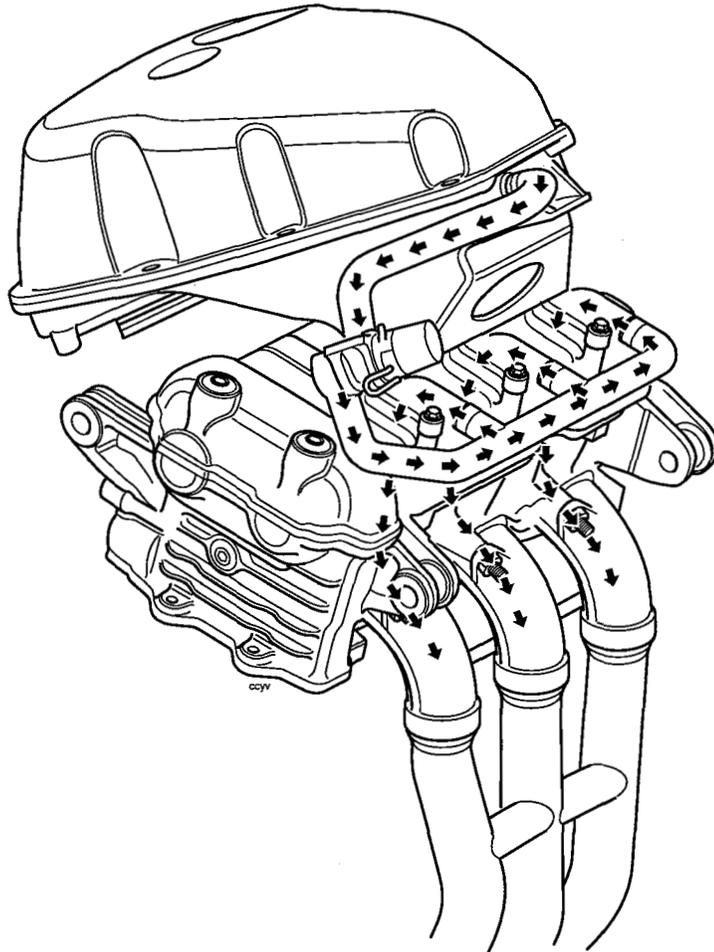
15. Start the engine and check for exhaust gas leaks. Rectify if necessary.

# Fuel System/Engine Management

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## Secondary Air Injection

### System Purpose and Operation



The secondary air injection system is an aid to reducing levels of pollutants in the exhaust gases. It does this by introducing a small amount of air into each exhaust port as the exhaust valve opens. The introduced air helps promote further combustion of the fuel mixture in the exhaust system after it has left the combustion chamber.

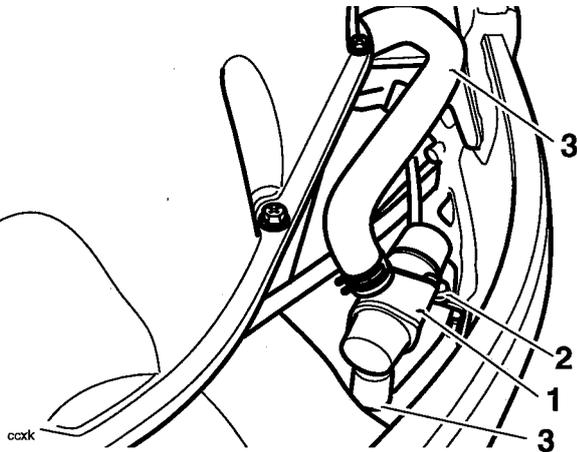
At certain specific engine speeds above idle (determined by the factory programming of engine management system), the secondary air injection control valve is opened by the ECM and allows an air feed into the secondary air system where, each time a pair of exhaust valves open, the exhaust gases in the exhaust port create a depression which causes reed valves in the secondary air injection system to open. When open, the depression in the exhaust port draws air from the control valve, through the open reed valves, into the exhaust port. This air promotes secondary combustion of the exhaust gases in the ports and the header system.

At other engine speeds, the system is disabled by closing the control valve in the system. This allows an oxygen sensor to control air to fuel ratios. If air was fed to the exhaust system when the oxygen sensor was operational, the incoming air would cause inaccuracies in the readings sensed by the oxygen sensor (which requires access to 'raw' combustion gases) which would lead to rough running.

## Secondary Air Injection Solenoid Valve

### Removal

1. Remove the seat (see page 16-8).
2. Disconnect the battery negative (black) lead first.
3. Remove the fuel tank (see page 10-87).
4. Release the hoses attached to the valve.



1. Solenoid valve
2. Retainer
3. Hoses

5. Tilt the valve to detach from the retainer.

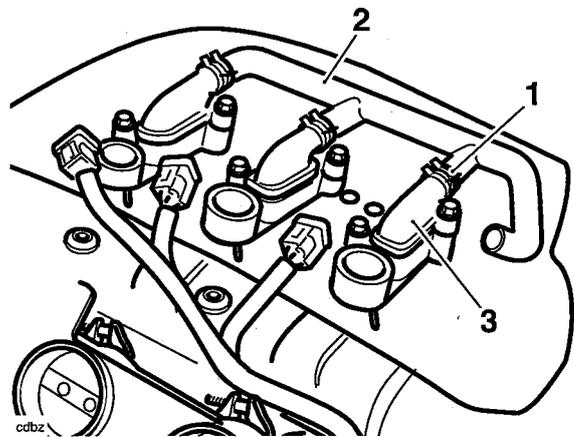
### Installation

1. Refit the hoses to the valve.
2. Locate the valve to the retainer.
3. Refit the fuel tank (see page 10-88).
4. Reconnect the battery, positive (red) lead first.
5. Refit the seat (see page 16-8).

## Secondary Air Injection Reed Valves

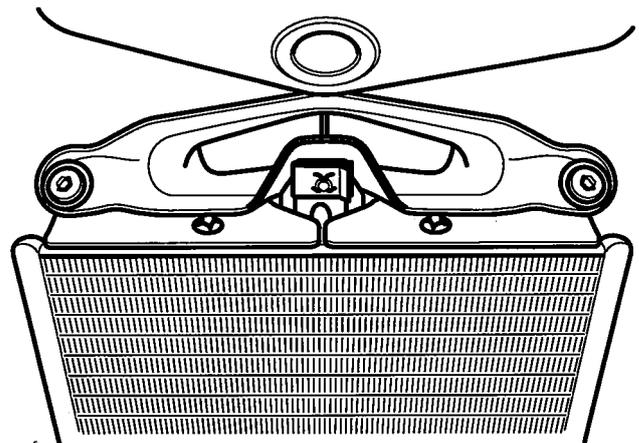
### Removal

1. Remove the seat (see page 16-8).
2. Disconnect the battery negative (black) lead first.
3. Remove the fuel tank (see page 10-87).
4. Remove the airbox (see page 10-92).
5. Disconnect the electrical connectors to the ignition coils, then remove the coils from the cam cover.
6. Detach the secondary air injection feed hoses from the reed valves on the cam cover.



1. Spring-close clip
2. Secondary air injection hose
3. Reed valve assembly

7. Remove the airbox front bracket from the cam cover.
8. Release the clips from the air deflector shield above the cam cover.

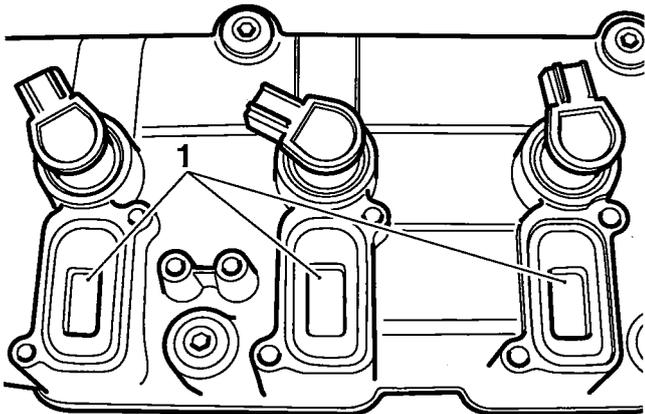


1. Air deflector shield
2. Clip locations

9. Release the clutch cable at the clutch end and pass the loose end through the air deflector shield, then remove the shield.

# Fuel System/Engine Management

10. Release the bolts securing the valve covers to the cam cover.
11. Ease the valve covers from the valves.
12. Detach the valves from the cam cover.



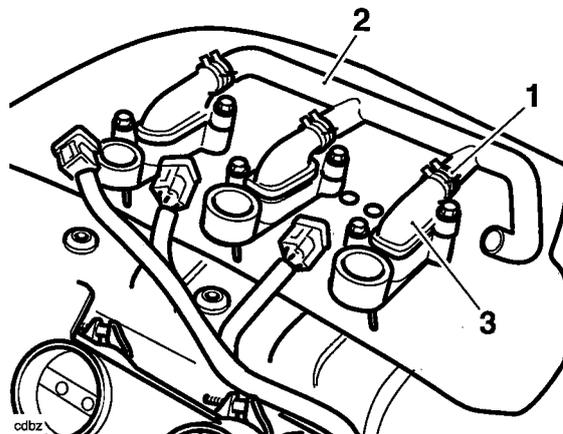
1. Valves

## Inspection

1. Check for cracks, bending or other damage to the valve flaps. Replace as necessary.
2. Check for damage to the seal areas. Replace as necessary.
3. Check the valve body to cylinder head seal for damage.

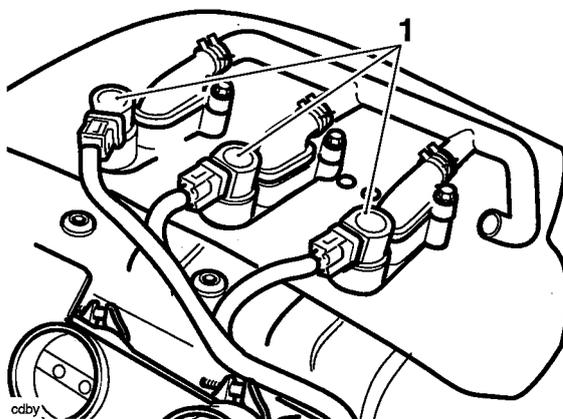
## Installation

1. Fit the reed valves to the cam cover.
2. Refit the valve covers and tighten the fixings to **9 Nm**.
3. Refit the the air deflector shield to the cam cover and retain with clips.
4. Pass the clutch cable through the hole provided in the air deflector shield.
5. Refit the air hoses to the reed valves.



1. Spring-close hose clip
2. Secondary air injection hose
3. Reed valve assembly

6. Fit the ignition coils and reconnect.



1. Coils

7. Refit the airbox (see page 10-93).
8. Refit the fuel tank (see page 10-88).
9. Reconnect the battery, positive (red) lead first
10. Refit the seat (see page 16-8).

## Evaporative Emissions Control System

### California Models Only

All California models are fitted with a system to control the evaporation of fuel vapour to the atmosphere.

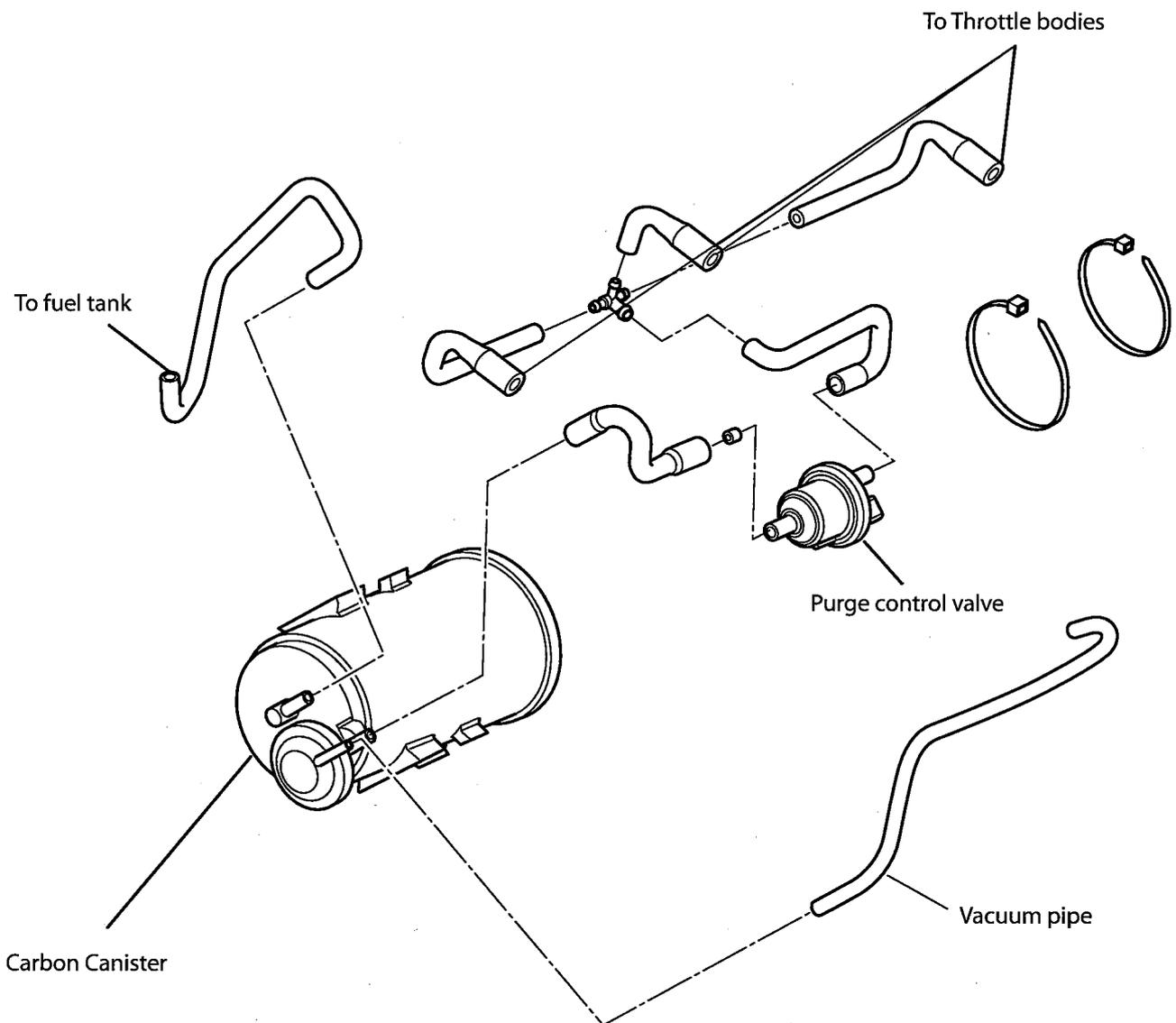
A carbon canister absorbs vapour while the engine is not running. When the engine is started, the vapour is returned to the engine and burnt.

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

**Purge Control Valve** - adjacent to frame, left hand side (electronically controlled by the ECM)

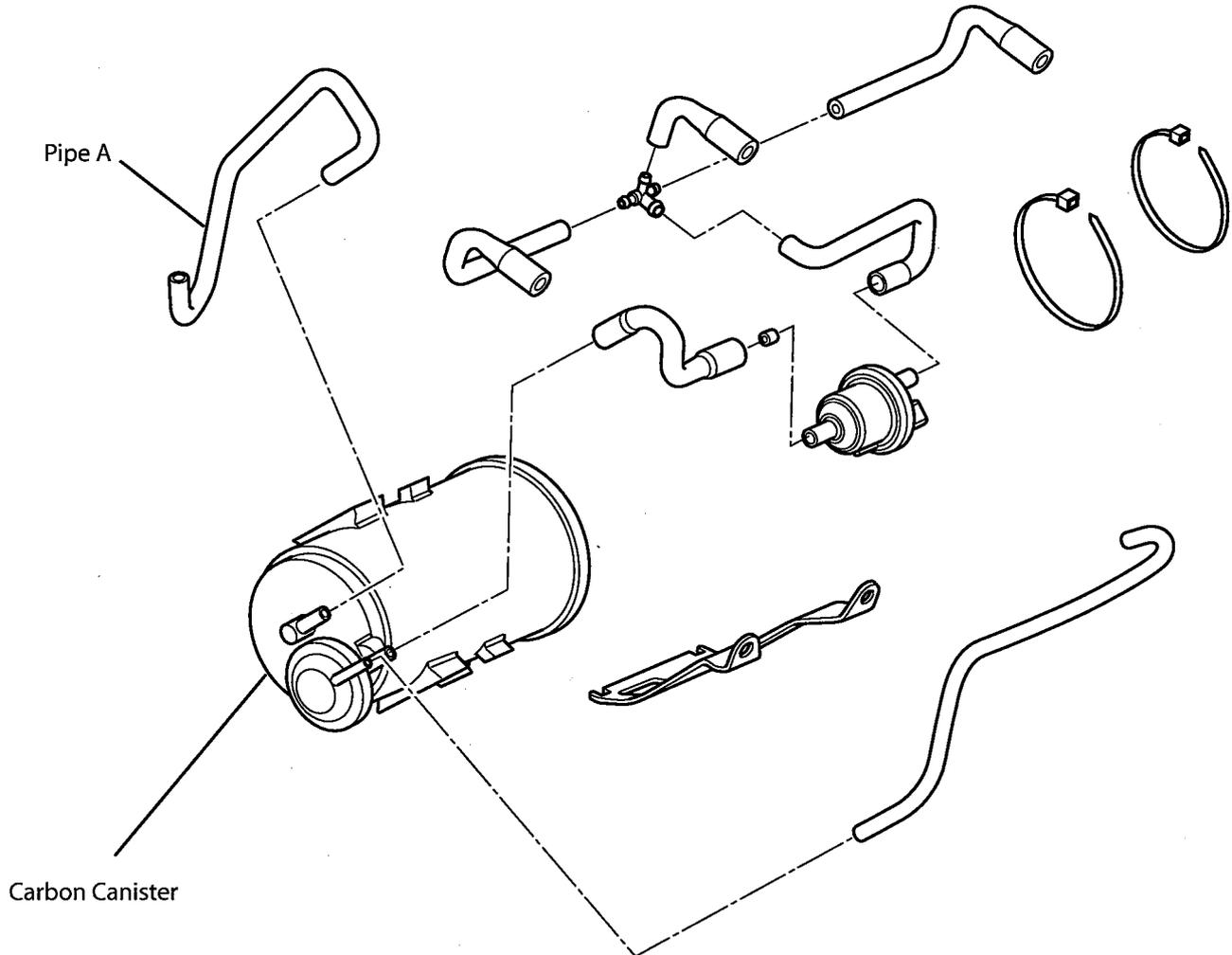


# Fuel System/Engine Management

## 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 to a carbon filled canister which stores the vapour.

Once in the canister, vapour cannot return to the fuel tank because of a one-way valve in the canister.

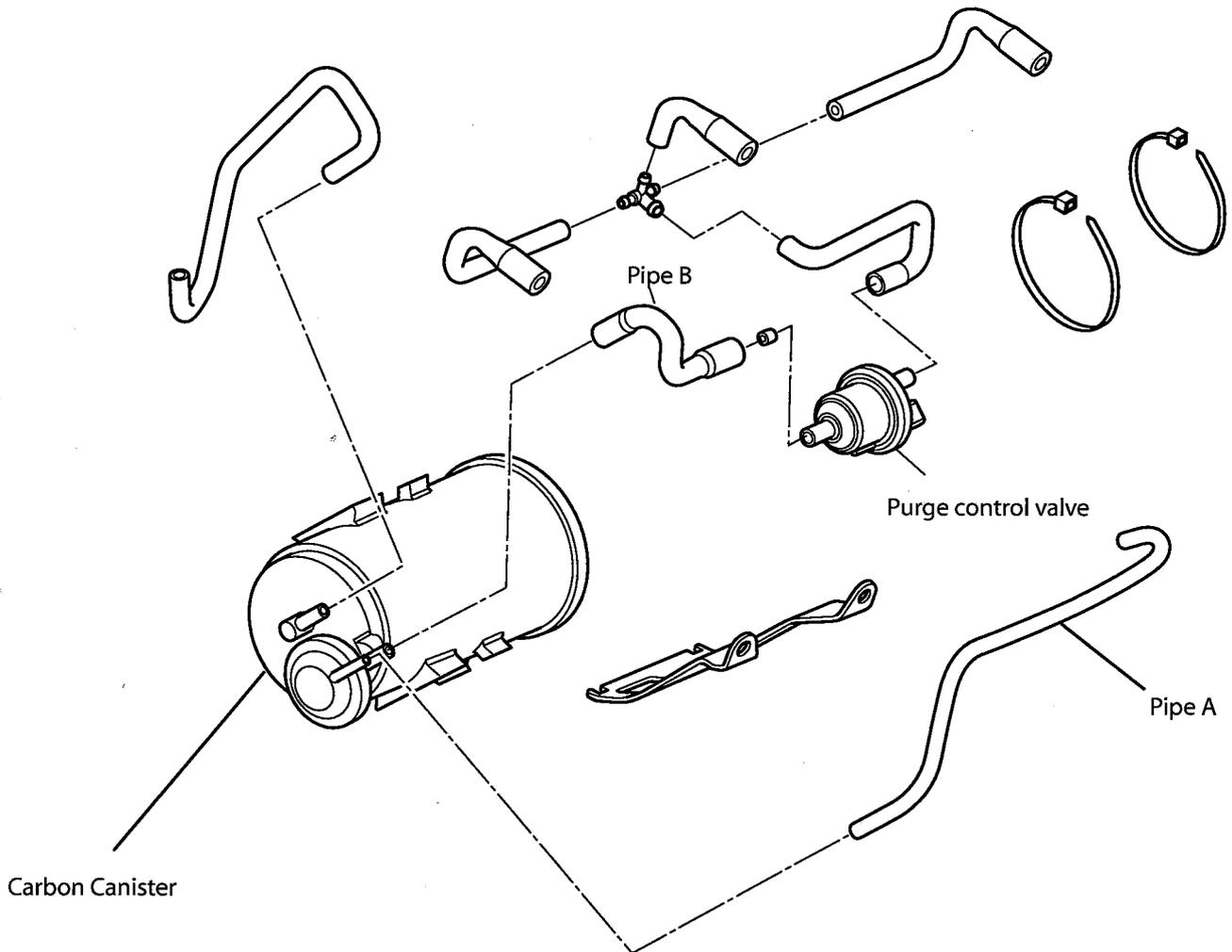


## Evaporative Control System - Engine Running

When the engine is started, a vacuum is applied via pipe A to a vent valve on the canister, causing it to open. Simultaneously, vacuum is applied along pipe B, via the purge control valve to the canister vent port.

Because the vent valve has been opened, the vacuum applied at point B begins to draw stored vapour from the carbon filled area of the canister via the vent port and returns it to the throttle bodies for burning in the engine.

In order to control the speed at which vapour is purged from the canister, the engine management system regularly shuttles the purge control valve between open and closed positions.



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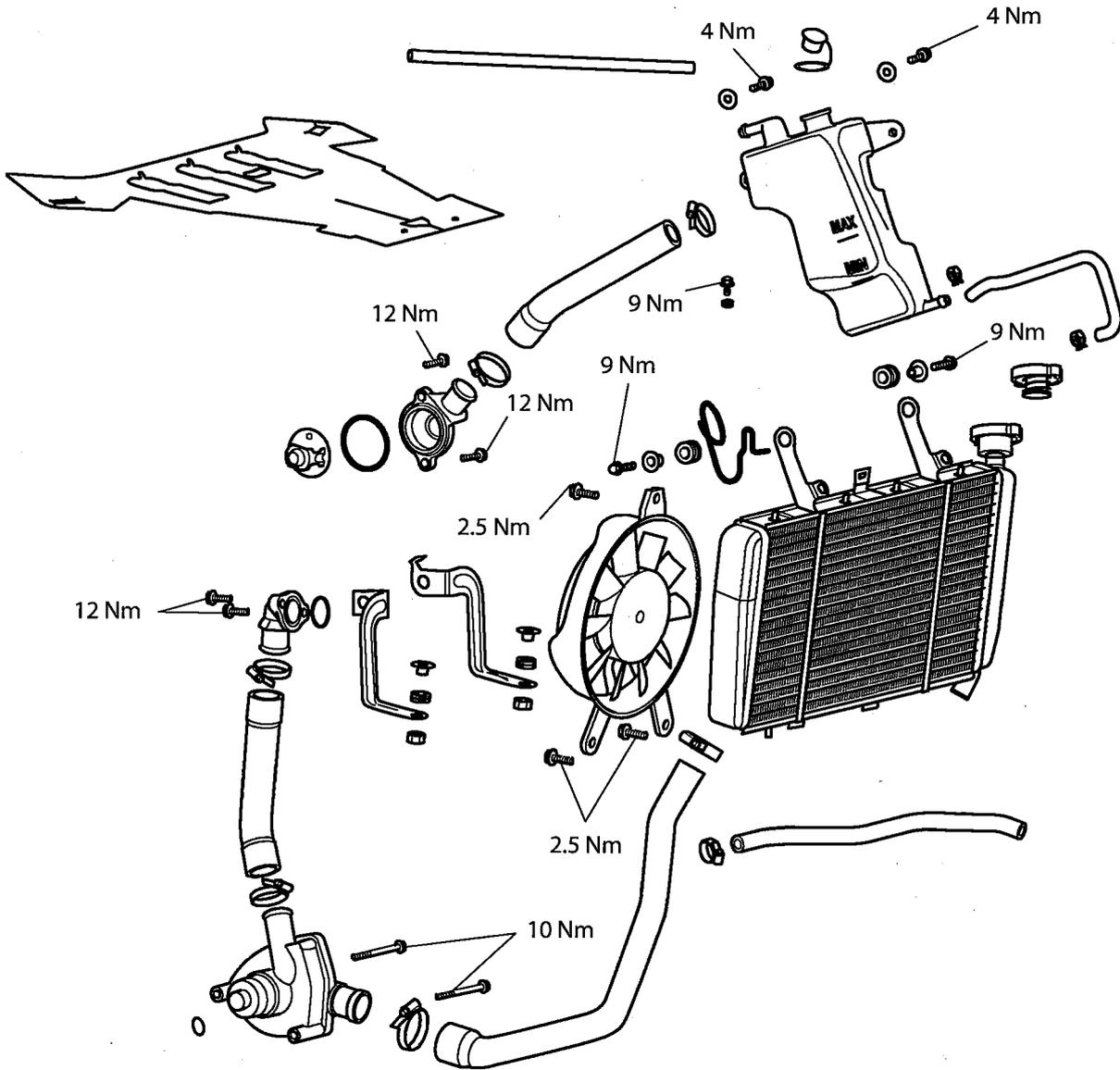
# 11 Cooling

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# Cooling

## 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  $-35^{\circ}\text{C}$  ( $-31^{\circ}\text{F}$ ).

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.

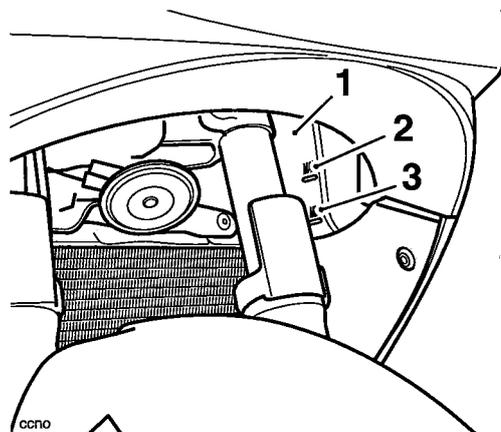
If hard water is used in the system, it causes scale accumulation in the water passages, and considerably reduces the efficiency of the cooling system. Reduced cooling system efficiency may cause the engine to overheat and suffer severe damage.

## 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 up, through the centre opening of the front fairing. The coolant level should be between the 'MAX' and 'MIN.' marks.



### 1. Expansion tank

### 2. 'Max' mark

### 3. 'Min.' mark

3. If the level of coolant is low, coolant must be added as follows:-
4. Remove the upper and lower left hand infill panels (see page 16-9).
5. 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.

6. Refit the cap.
7. Refit the upper and lower left hand filler panels (see page 16-10).

# Cooling

## Coolant Replacement

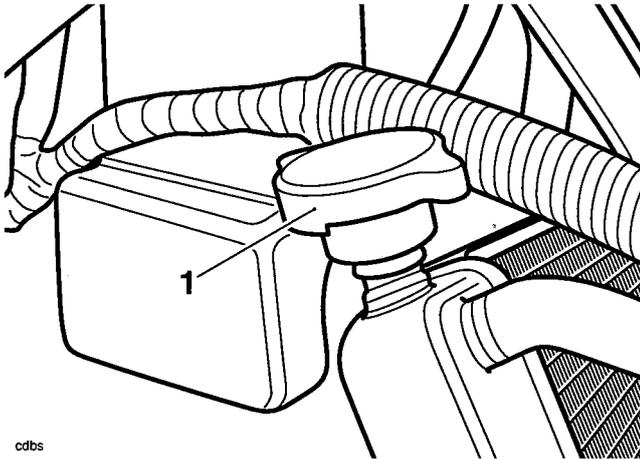
### Drainage

1. Remove the seat (see page 16-8).
2. Disconnect the battery negative (black) lead first.
3. Remove lower fairings (see page 16-11).

**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.

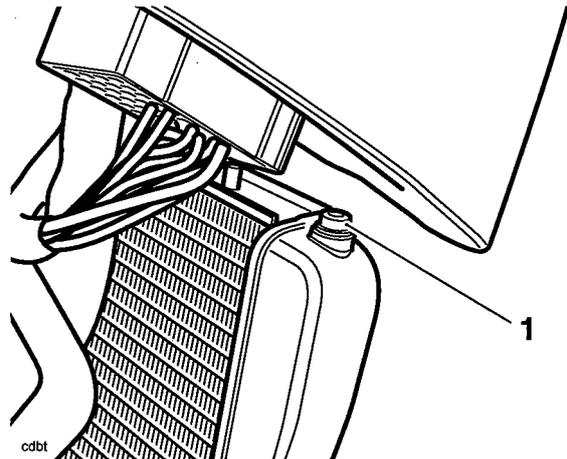
4. Remove the coolant pressure cap on the radiator.



#### 1. Radiator cap

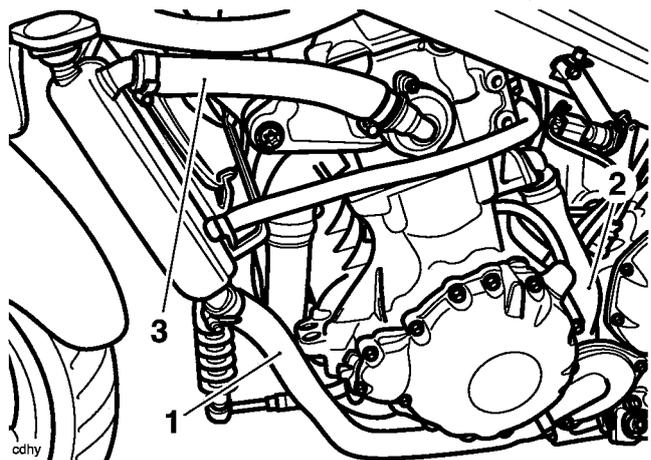
5. Position a container to collect the displaced coolant.

6. Release the bleed screw on the right hand side of the radiator.



#### 1. Bleed screw

7. To ensure full drain-out of the system, release the bottom hose from the water pump.



1. Bottom Hose
2. Bypass Hose
3. Top Hose

### Filling

1. Reconnect the bottom hose and tighten the clip.
2. Slowly add coolant mixture to the system, through the filler opening in the radiator, 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 into the bleed screw side of the radiator.

**Note:**

- **A hand operated vacuum pump or similar should be used to syphon the coolant through the system.**
4. If necessary, top up the system through the filler and refit the pressure cap.
  5. Refit the coolant pressure cap.
  6. Reconnect the battery positive (red) lead first.
  7. 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.

 **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.

8. Stop the engine and top up the coolant level as necessary.
9. Fit the coolant pressure cap.
10. Check the expansion tank level and top up if necessary.
11. Refit the seat (see page 16-8).
12. Refit both lower fairings (see page 16-12).

## 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.

# Cooling

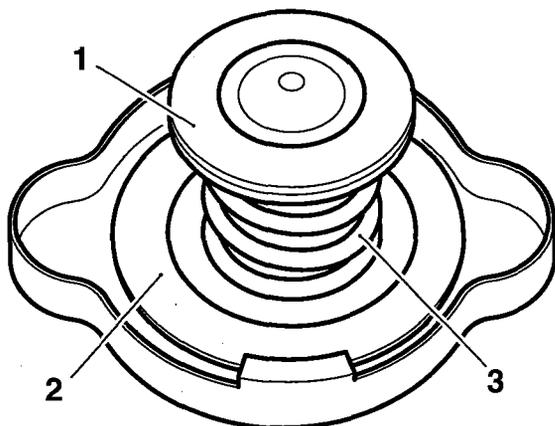
## Coolant Pressure Cap

### 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.



cawr

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.

## Water Pump

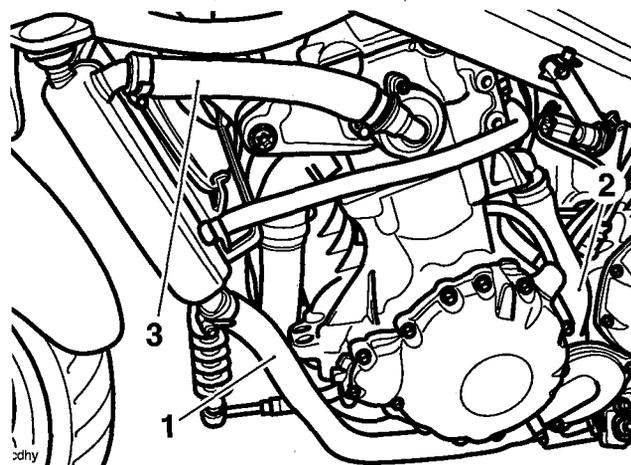
### Removal

1. Remove the seat.
2. Disconnect the battery, negative (black) lead first.
3. Drain the coolant (see page 11-4).

**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. Disconnect the coolant hoses to the water pump.



1. Bottom Hose
2. Bypass Hose
3. Top Hose

5. Release the bolts securing the water pump to the crankcase.
6. Withdraw the water pump.

### Inspection

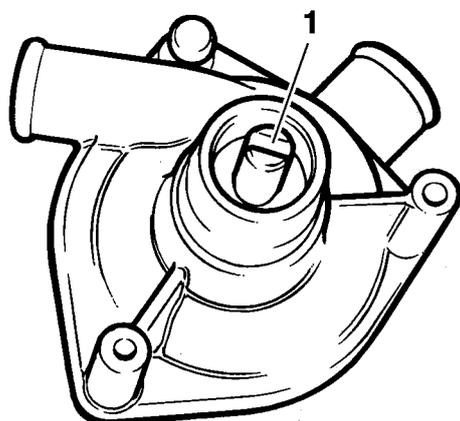
1. Check the water pump shaft and shaft bearings for side and end float. Renew if necessary
2. Check for corrosion and scale build-up around the impeller and in the pump body. Renew if necessary.

## 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.**



gake

### 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. Refill the cooling system (see page 11-4).

## Thermostat

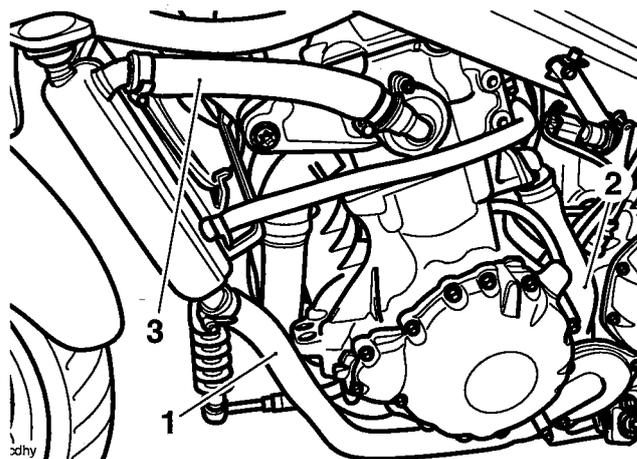
### Removal

1. Remove the seat (see page 16-8).
2. Disconnect the battery, negative (black) lead first.
3. Drain the coolant (see page 11-4).

**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. Detach the top hose from the thermostat elbow.



1. Bottom Hose
2. Bypass Hose
3. Top Hose

5. Release the fixings securing the thermostat elbow to the cylinder head.
6. Remove the thermostat housing. Discard the 'O'-ring.
7. Remove the thermostat from the cylinder head.

### Inspection

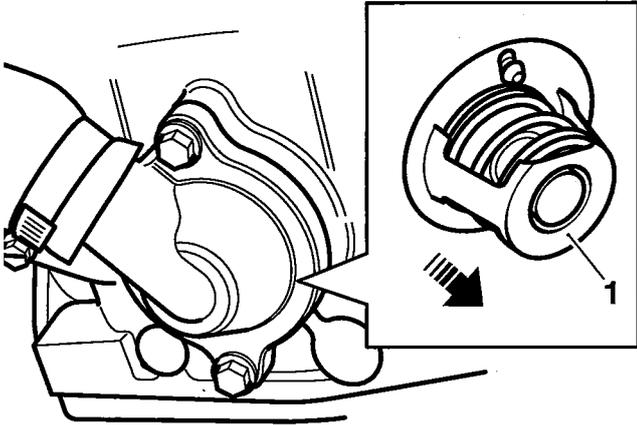
1. Inspect the thermostat at room temperature. If the valve is open, the thermostat must be replaced.
2. To check the valve opening temperature, suspend the thermostat in a container of water and raise the temperature of the water until the thermostat opens. The thermostat should start to open at 88°C +/- 5°C.

# Cooling

3. If the temperature at which thermostat opening takes place is incorrect, replace the thermostat.

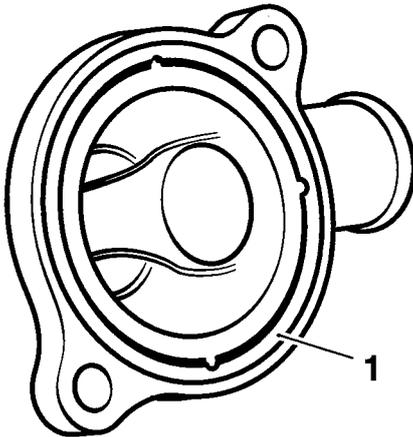
## Installation

1. Locate the thermostat into the cylinder head.



cdbv

1. Thermostat (face is shown inserted into the head)
2. Fit a new 'O'-ring to the thermostat elbow.



cash

1. O-ring/groove
3. Tighten the bolts to **12 Nm**.
4. Reconnect the top hose clips.
5. Refill the cooling system (see page 11-4).

## Radiator

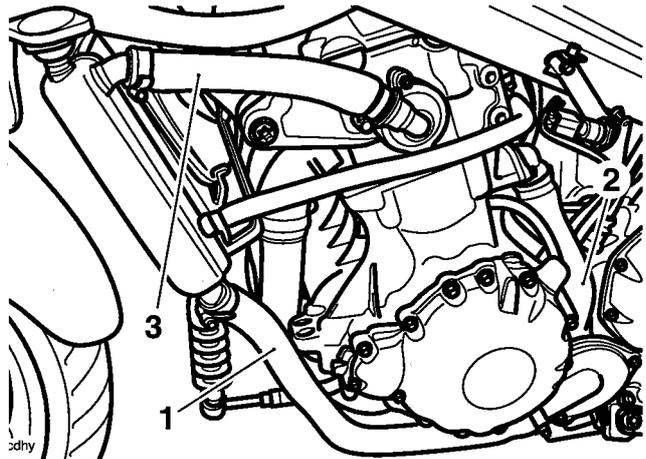
### Removal

1. Remove the seat (see page 16-8).
2. Disconnect the battery negative (black) lead first.

### Warning

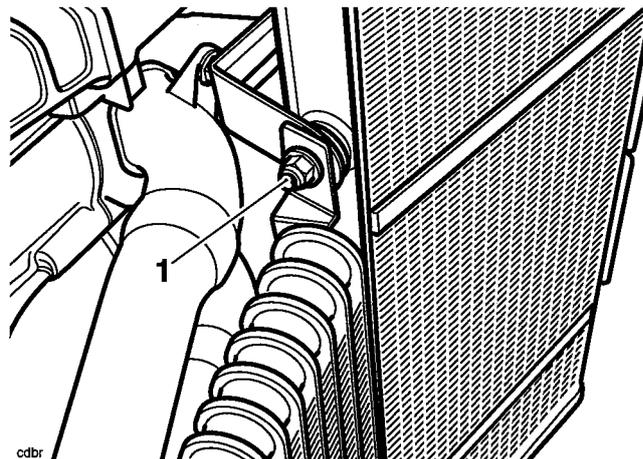
Do not remove the coolant pressure cap when the engine is hot. When the engine is hot, the coolant inside the radiator is hot and also under pressure. Contact with the pressurised coolant will cause scalds and skin damage.

3. Drain the coolant (see page 11-4).  
Disconnect the top and bottom hoses at the radiator.



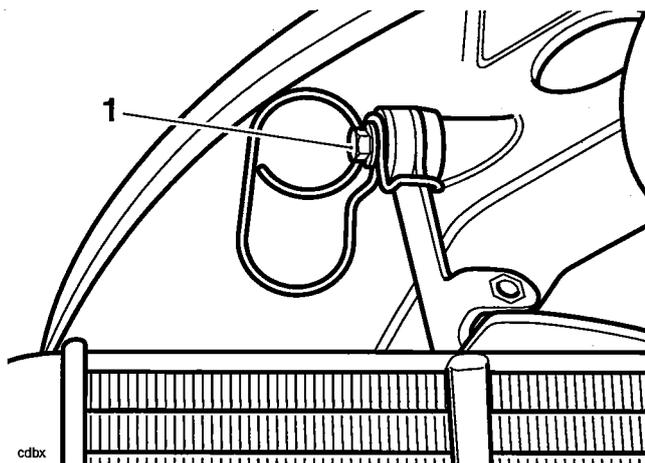
1. Bottom Hose
2. Bypass Hose
3. Top Hose

4. Release the oil cooler fixings from the radiator lower mounting.



1. Radiator lower fixings

5. Disconnect the cooling fan multiplug located above the cam cover.
6. Release the bolts securing the radiator to the frame.



### 1. Radiator to frame bolts (right hand shown)

7. Remove the radiator by raising it to allow the lower locating studs to clear the brackets.

## 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.

4. Check that the fan spins freely and without tight spots.
5. Check the fan blades for signs of heat distortion.

## Installation

1. Align the radiator to the frame and fit the upper mounting bolts. Tighten the bolts to **9 Nm**.
2. Reconnect the cooling fan.
3. Align the oil cooler to the radiator. Fit the lower mounting bolts and tighten to **9 Nm**.
4. Reconnect the top and bottom hoses to the radiator. Tighten the hose clips.
5. Refill the cooling system (see page 11-4).
6. Reconnect the battery positive (red) lead first.
7. Fill the cooling system (see page 11-4).

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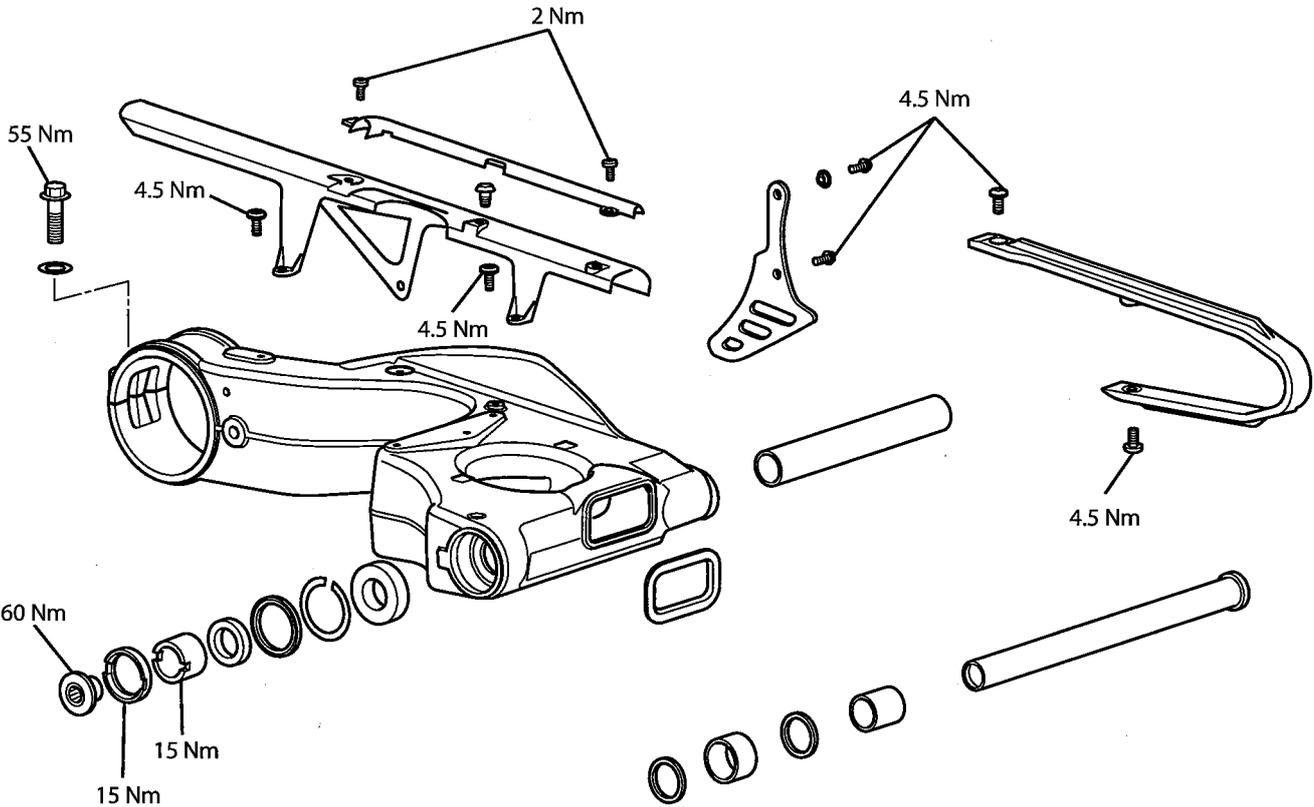
# 12 Rear Suspension

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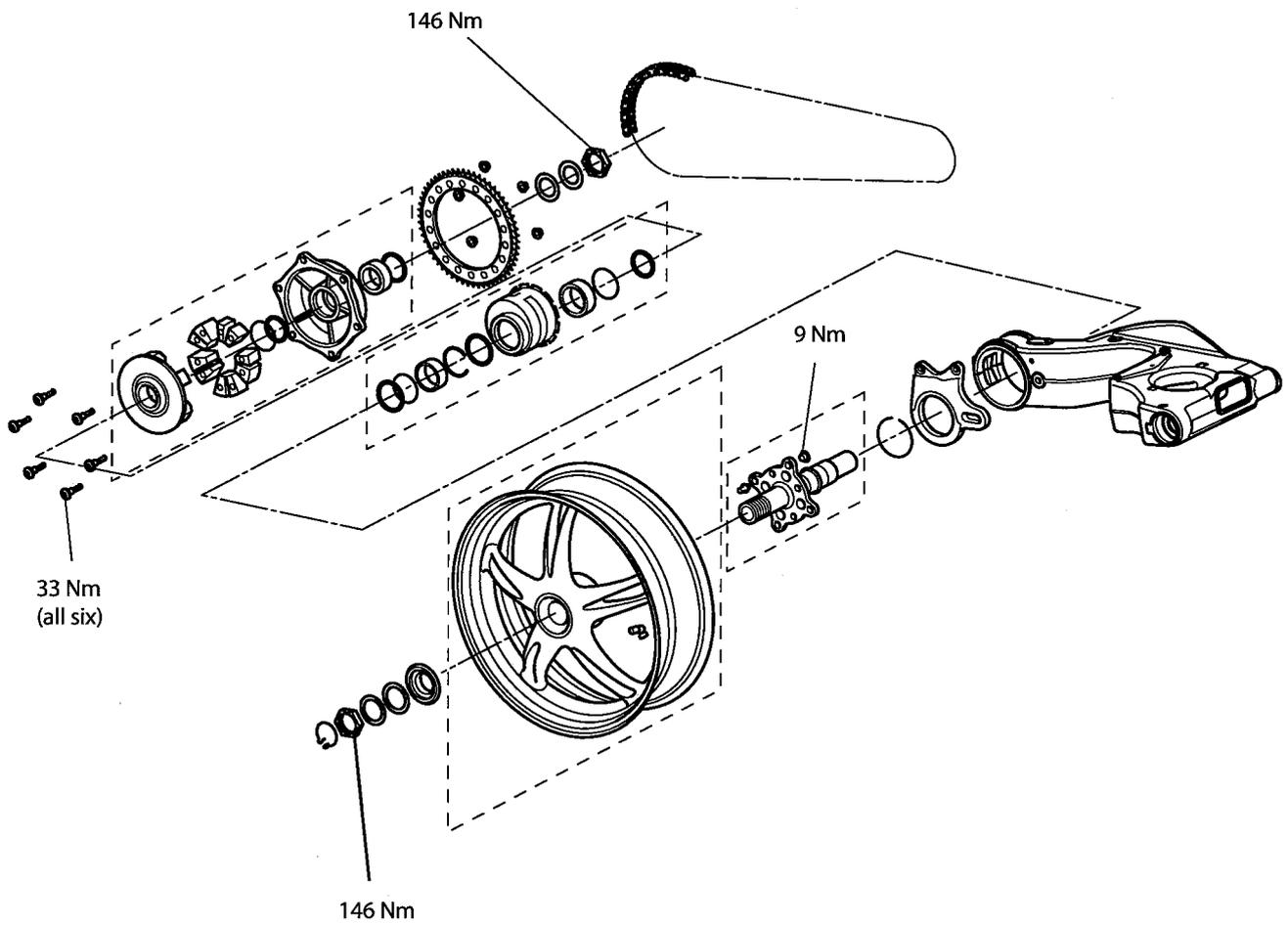
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# Rear Suspension

## Exploded View - Swinging Arm

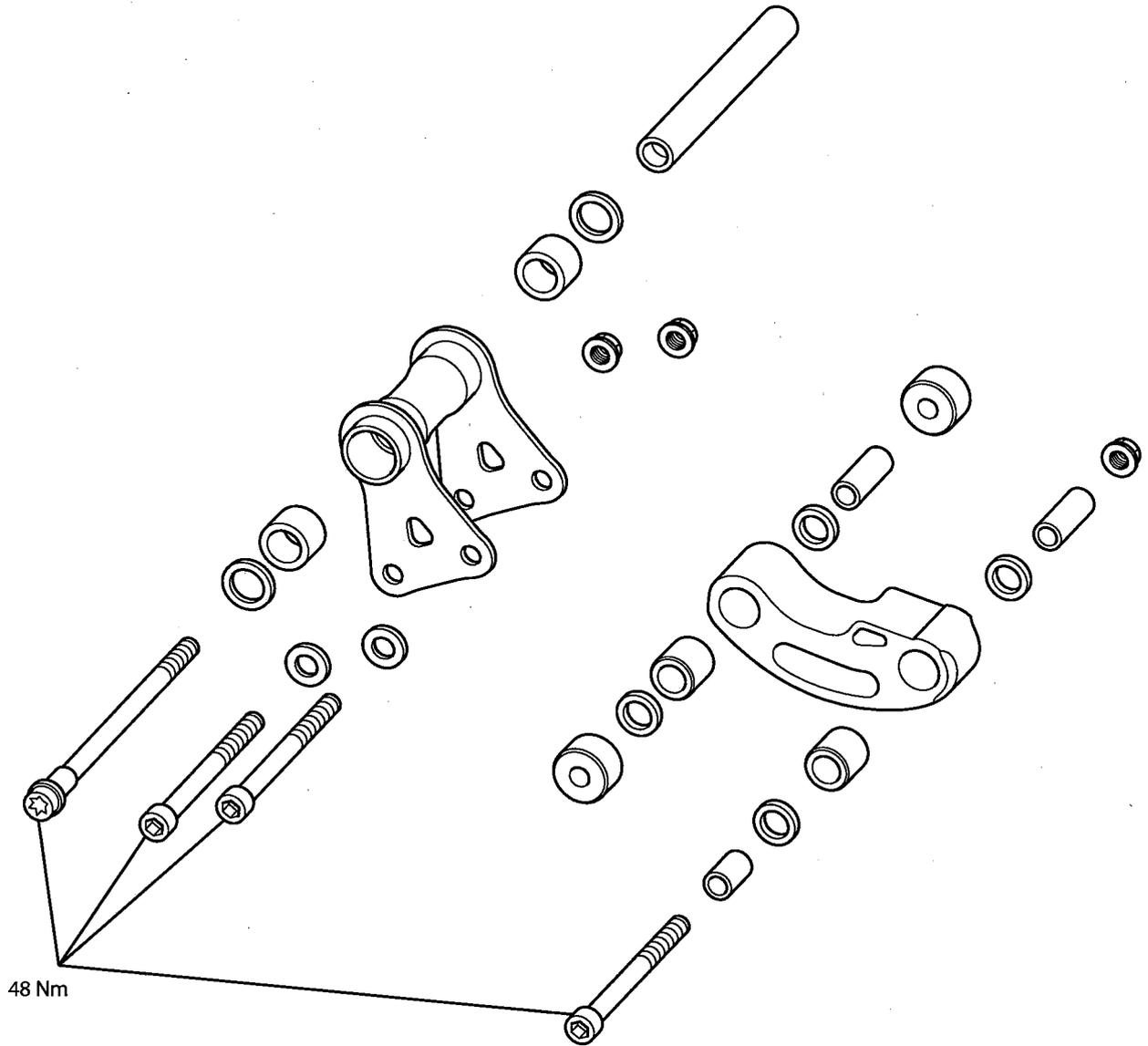


## Exploded View - Rear Hub and Wheel





Exploded View - Drop/Drag Link



# Rear Suspension

## Rear Suspension Unit

### 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.

#### Note:

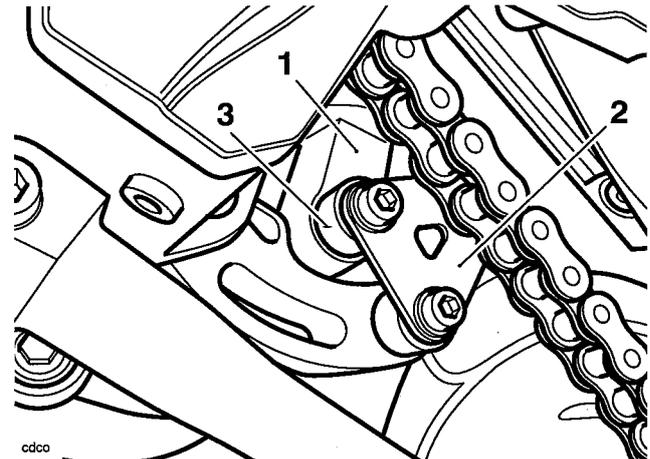
- A stand that supports the rear wheel or swinging arm will not support the motorcycle when the suspension linkage is removed.
1. Raise and support the rear of the motorcycle under the frame or engine. Position a block to support the rear wheel.
  2. Remove the seat (see page 16-8).
  3. Disconnect the battery, negative (black) lead first.
  4. Remove the fuel tank (see page 10-87).

**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. Collect the spacers from the back side of the suspension unit.



1. Rear suspension unit
2. Drop link
3. Spacers

6. Remove the rear suspension unit upper mounting nut and bolt.
7. Withdraw the rear suspension unit upwards through the frame.

### Inspection

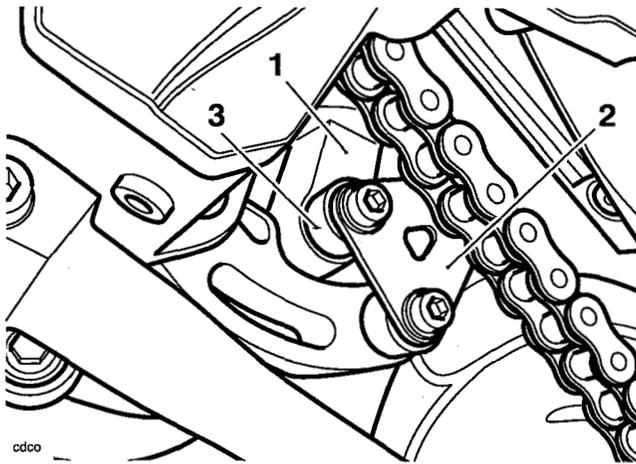
1. Clean all components and inspect for damage and wear to:
  - rear suspension unit upper and lower mountings,
  - lower mounting sleeve.
2. Renew parts as necessary.

## Installation

1. Locate the rear suspension unit and loosely fit the upper mounting bolt / nut and sleeve (if detached during renewal).

### Note:

- **The unit must be fitted such that the preload adjuster faces to the left of the motorcycle.**
2. Align the spacers to each side of the lower suspension unit mounting.



### 1. Rear suspension unit

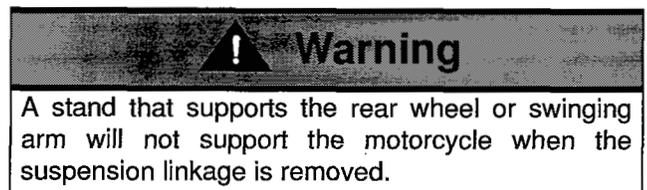
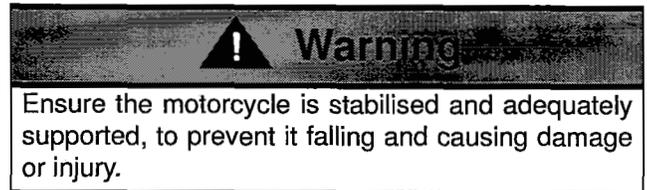
### 2. Drop link

### 3. Spacers

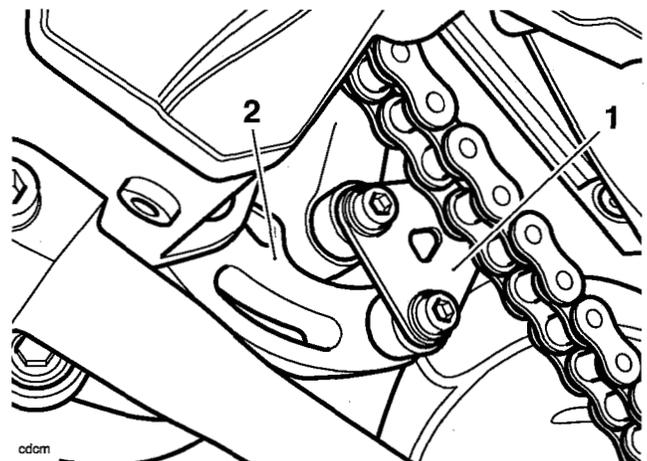
3. Align the rear suspension unit and spacers to the drop link. Loosely fit the bolt / nut (from the right).
4. Tighten the rear suspension unit upper mounting to **48 Nm**.
5. Tighten the rear suspension unit lower mounting to **48 Nm**.
6. Refit the fuel tank (see page 10-88).
7. Connect the battery, red (positive) lead first.
8. Refit the seat (see page 16-8).
9. Remove the support.

## Drag Link

### Removal



1. Raise and support the rear of the motorcycle under the frame or engine. Position a block to support the rear wheel.



### 1. Drop link

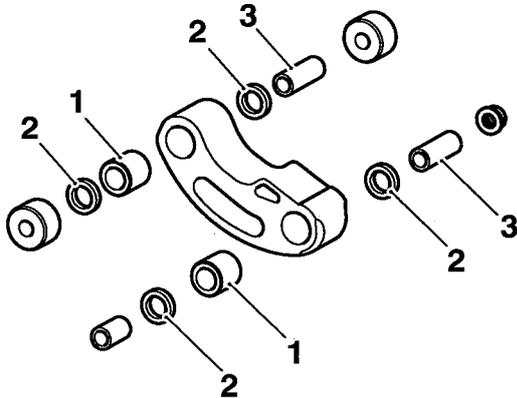
### 2. Drag link

2. Remove the section of exhaust between the header system and the silencer (see page 10-105).
3. Remove the nut and bolt securing the drag link to the drop link.
4. Remove the bolt and nut securing the drag link to the frame.
5. Detach the drag link from the frame and drop link.
6. Collect the spacers from either side of the link.

# Rear Suspension

## Inspection

1. Clean all components and inspect for damage / wear to:
  - drag link bearing, sleeve and seals
  - fixing bolts
  - spacers
2. Renew as necessary.



odcn

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 in the correct orientation to the frame and drop link and refit the spacers and bolts. Ensure that the sleeves are fitted to the drag to drop link bolt.
4. Refit both nuts and 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

### Removal

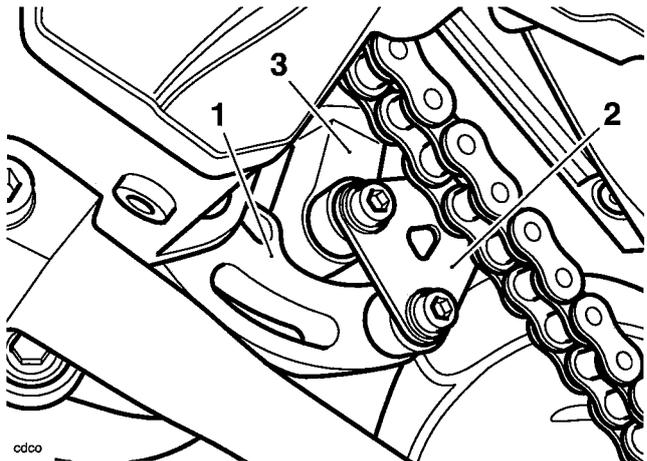
**Warning**

Ensure the motorcycle is stabilised and adequately supported, to prevent it falling and causing damage or injury.

**Warning**

A stand that supports the rear wheel or swinging arm will not support the motorcycle when the suspension linkage is removed.

1. Raise and support the rear of the motorcycle beneath the frame or engine. Position a block to support the rear wheel.



odco

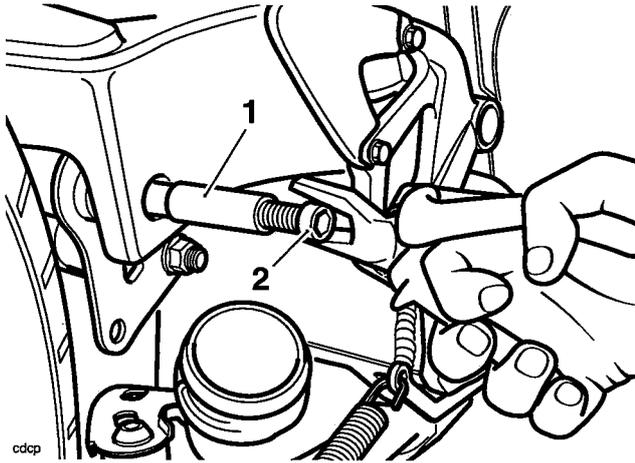
1. Drag Link
2. Drop Link
3. Rear Suspension Unit

2. Remove the section of exhaust between the header system and the silencer (see page 10-105).
3. Remove the nut and bolt securing the drag link to the drop link.
4. Detach the drag link from the drop link.
5. Remove the nut and bolt securing the rear suspension unit to the drop link.
6. Ease the suspension unit and spacer forward to clear the drop link. Collect the spacers.
7. Remove the bolt securing the drop link to the swinging arm.

- 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.



- Drop Link Spindle
- M14 Bolt

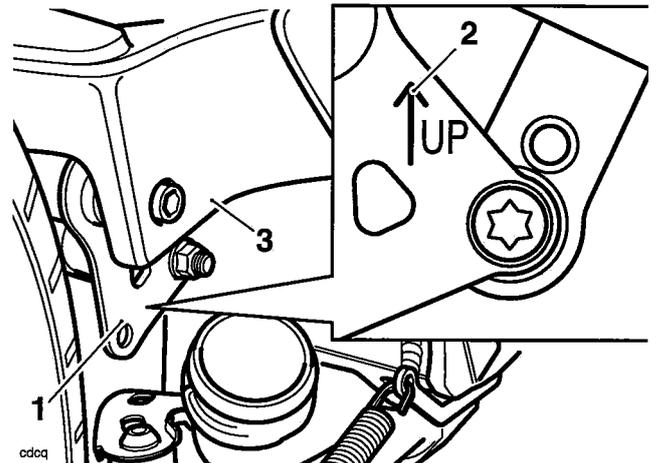
- Remove the drop link from the swinging arm.

**Inspection**

- 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.
- Check the drop link upper bearings for wear.

**Installation**

- Apply grease to the drop and drag link bearings. Also apply grease to the bearing at the lower end of the rear suspension unit.
- Locate the drop link to the swinging arm with the 'up' arrow pointing upwards.



- Drop link
- 'Up' Arrow
- Swinging Arm

- Refit the drop link spindle.
- Refit the drop link spindle bolt and tighten to **48 Nm**.
- Align the rear suspension unit and spacers to the drop link. Fit the spacers, bolt (from the right) and nut. Tighten to **48 Nm**.
- If removed, fit the sleeve to the drag link and align the drag link to the drop link.
- Fit the spacers, retaining bolt (from the right hand side) and nut. Tighten to **48 Nm**.
- Remove the support block from the rear wheel and lower the motorcycle to the ground, parking it on either the side or centre stand.

# Rear Suspension

## Drive Chain

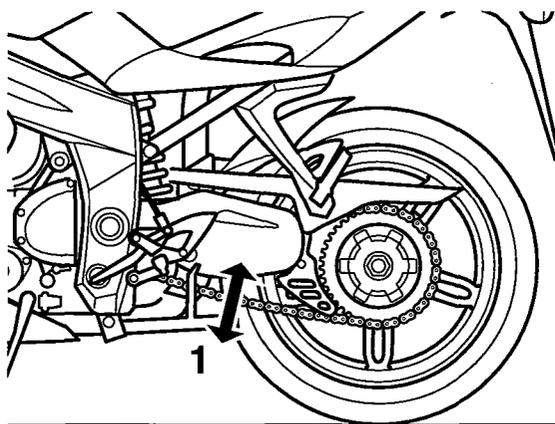
The drive chain must be checked, adjusted, and lubricated in accordance with the scheduled maintenance chart. For reasons of safety, and to prevent excessive wear, never neglect any part of the drive chain maintenance. If the chain is badly worn, or incorrectly adjusted - either too loose or too tight - 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

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.

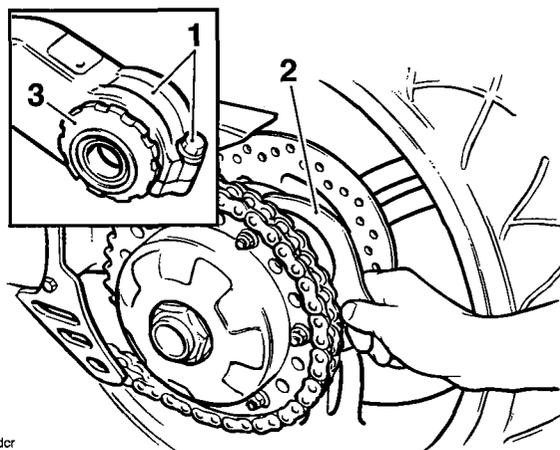


ccmv

1. Vertical Movement 35-40mm

## Drive Chain Adjustment

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. The eccentric adjuster should be held in towards the swinging arm.



cdcr

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**.

## Chain Lubrication

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.

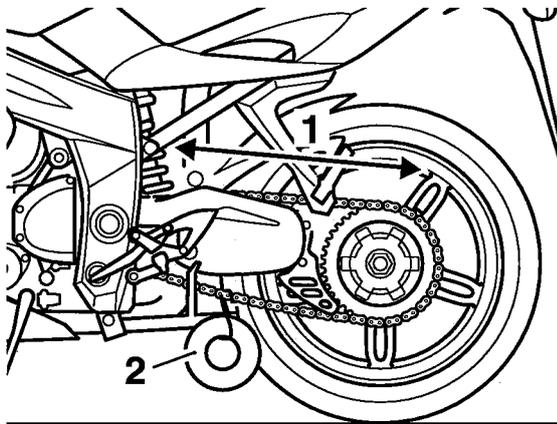
1. Apply chain lubricant to the sides of the chain rollers, and also the 'O'-rings. The lubricant will penetrate the rollers and bushings and also prevent the O-rings from deterioration.

## Chain Lubrication Positions

1. Wipe off any excess oil.
2. If the chain is especially dirty, clean using paraffin before applying the lubricant.

## Chain Wear Inspection

1. Remove the rear brake hose cover from the upper chain guard.
2. Remove the chain guard from the swinging arm.
3. Stretch the chain taut by hanging a 10-20 kg (20-40 lb) weight on the chain.
4. 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.



ccmw

### 1. Measurement Position

### 2. 10-20kg Weight

5. 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.

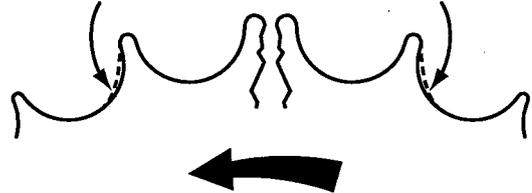
A chain that breaks or jumps off the sprockets could snag on the engine sprocket or lock the rear wheel, severely damaging the motorcycle and causing loss of motorcycle control and an accident.

Never neglect chain maintenance and always have chains installed by an authorised Triumph Dealer.

6. 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.

7. Inspect sprockets for unevenly or excessively worn teeth. Also examine the sprockets for damaged teeth.

WORN TOOTH      WORN TOOTH  
(ENGINE SPROCKET) (REAR SPROCKET)



(Sprocket wear exaggerated for illustrative purposes)

ccol

### (Wear exaggerated for clarity of information)

8. If there is any irregularity found in any of the components, replace the drive chain and/or any other damaged components.
9. Refit the chain guard. Tighten the fixings to **9 Nm**.
10. Refit the rear brake hose cover, ensuring the hose and, if fitted, the ABS sensor lead are correctly routed. Tighten the fixings to **2 Nm**.

# Rear Suspension

## Swinging Arm/Drive Chain

### Removal

1. Remove the seat (see page 16-8).
2. Disconnect the battery, negative (black) lead first.

#### **Warning**

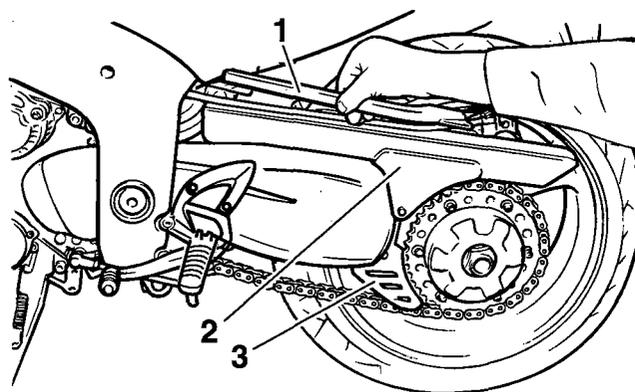
If the engine has recently been running, the exhaust system will be hot. Before working on or near the exhaust system, allow sufficient time for the exhaust system to cool as touching any part of a hot exhaust system could cause burn injuries.

3. 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.

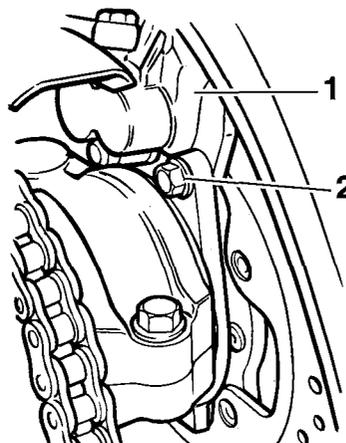
4. Remove the rear wheel (see page 15-10).
5. Remove the rear brake hose cover from the upper chain guard.
6. Models with ABS brakes: Remove the rear wheel speed sensor (see page 14-30).
7. Remove the chain guard from the swinging arm.



1. Brake hose cover
2. Upper chain guard
3. Lower chain guard

8. Remove the lower chain guard.
9. De-stake then slacken the nut securing the final drive unit to the axle shaft.

10. Without disconnecting the brake hose, detach then support the rear brake caliper.

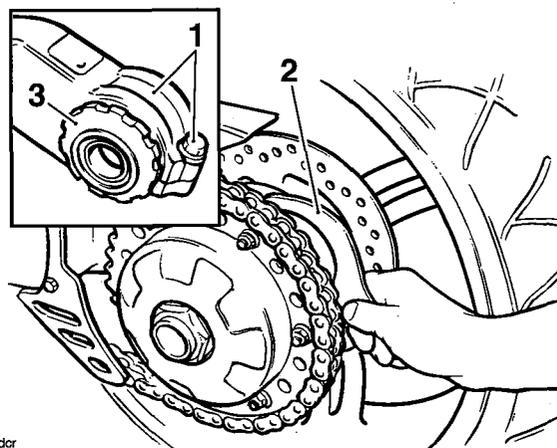


1. Rear brake caliper
2. Caliper mounting bolts (1 of 2)

#### **Caution**

To prevent damage to the brake pipe and caliper, do not allow the caliper to hang on the brake pipe.

11. Slacken the swinging arm / hub pinch bolt.
12. Use the 'C' spanner from the motorcycle tool kit to turn the hub and slacken the drive chain.



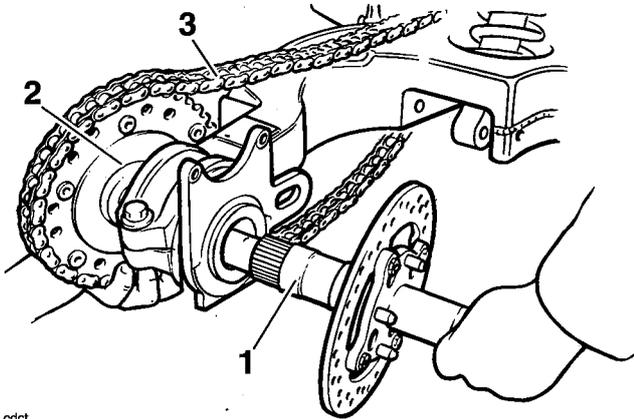
1. 'C' spanner
2. Swinging arm/hub pinch bolt

13. Remove the staked nut (discard the nut), Belleville washer and stepped washer from the axle shaft.

- 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:**

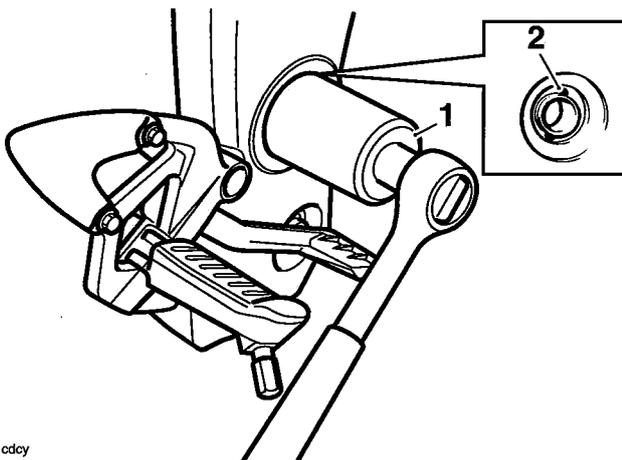
- Collect the spacer fitted between the final drive and the hub.
- Support the chain while the final drive is being removed to prevent it from contamination.



cdct

1. Axle shaft
2. Final drive
3. Chain

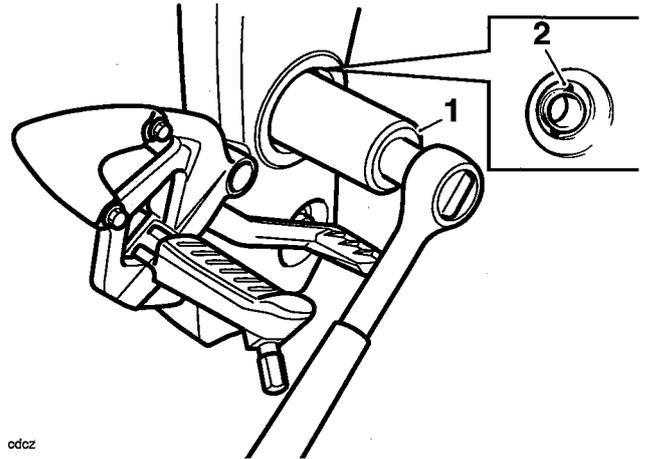
15. Place the axle shaft/brake disc assembly to one side.
16. Support the swinging arm and remove the rear suspension unit (see page 12-6).
17. Remove the drop link (see page 12-8).
18. Release the swinging arm spindle bolt.
19. Using tool T3880295, remove the locking ring from the right hand side of the swinging arm spindle.



odcy

1. Tool T3880295
2. Locking ring

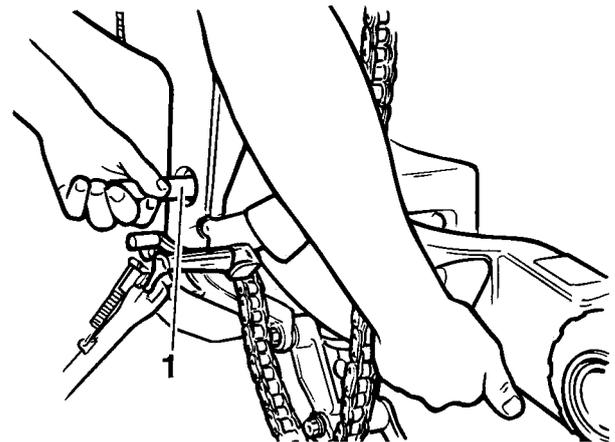
20. Using tool T3880290, slacken the swinging arm clamping ring from the right hand side of the swinging arm spindle.



odcz

1. Tool T3880290
2. Clamping ring

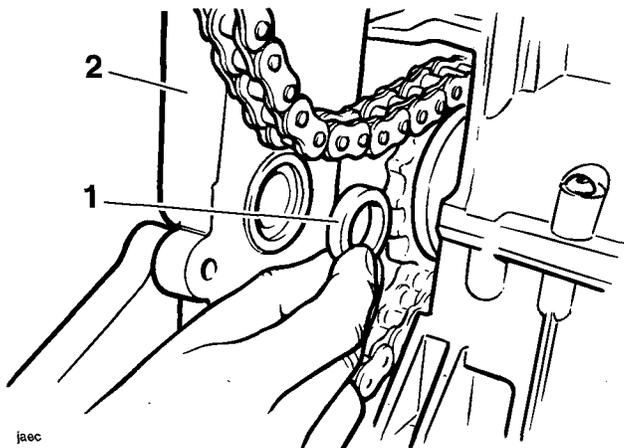
21. Support the swinging arm and remove the swinging arm spindle.



1. Swinging arm spindle
22. Carefully detach the arm from the frame.

# Rear Suspension

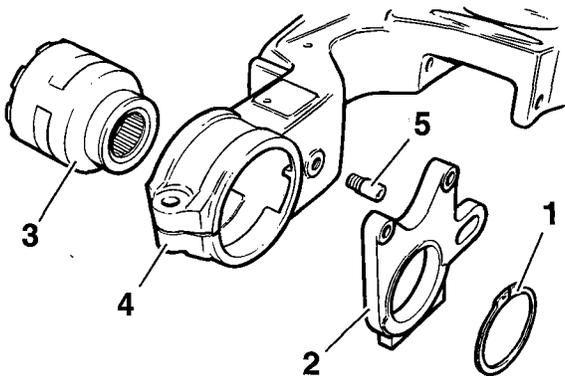
23. Collect the spacer from the recess inside the left hand frame outrigger.



1. Spacer  
2. Frame outrigger

**Note:**

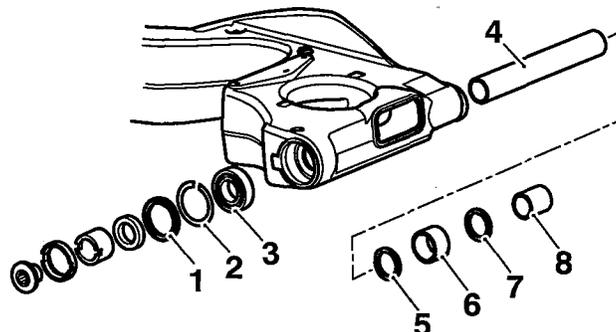
- If the swinging arm is to be replaced continue through this section.
  - If the drive chain is being replaced, but not the swinging arm (see page 12-20).
24. Remove the large circlip securing the caliper carrier to the hub and detach the carrier.



1. Circlip  
2. Caliper Carrier  
3. Hub  
4. Swinging arm  
5. Caliper Carrier Positioning Stud

25. Remove the hub from the left hand side of the swinging arm.  
26. Remove the caliper carrier positioning stud.  
27. Remove the chain rubbing strip.  
28. Remove the rubber blanking grommet from the front of the arm.

29. Remove the thread blanking plates from the machined top face of the swing arm.  
30. Remove the bearing sleeves from both sides.  
31. Remove the right hand bearing by drifting through from the left.  
32. Collect the spacer tube.



odda

1. Seal  
2. Circlip  
3. Bearing Sleeve  
4. Sleeve  
5. Seal  
6. Needle Roller Bearing  
7. Seal  
8. Bearing Sleeve

**Note:**

- The needle roller bearing in the left hand side of the arm cannot be removed undamaged.
  - If the drive chain is being replaced, see page 12-20.
33. Remove the sprocket cover.  
34. Detach the chain from the output sprocket and remove the chain.

## Inspection

1. Check all swinging arm bearings 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.

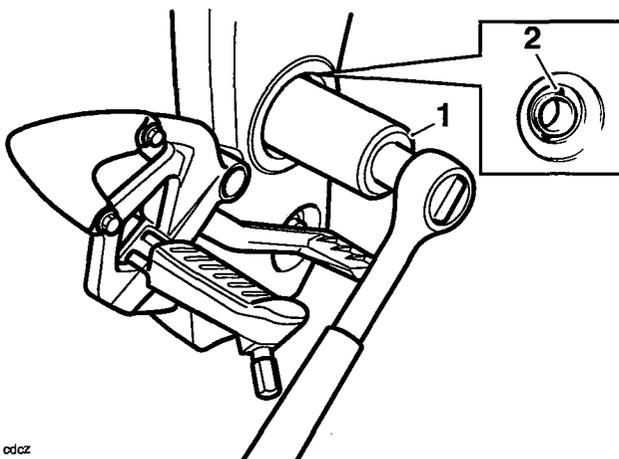
## Installation

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. Use new seals throughout.
4. Fit a new caliper carrier positioning stud and tighten to **40 Nm**.
5. Refit thread blanking plugs in the top machined face of swinging arm.
6. Refit the rubber blanking grommet to front of swinging arm.
7. Refit, or replace if excessively worn, the chain rubbing strip.
8. Refit the hub with the circlip groove to the right hand side.
9. Refit the caliper carrier and retain with a new circlip.
10. 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.**

11. Position the swinging arm to the frame.
12. Refit the swinging arm spindle.
13. Using tool T3880290, tighten the swinging arm spindle inner adjustment ring to **15 Nm**.



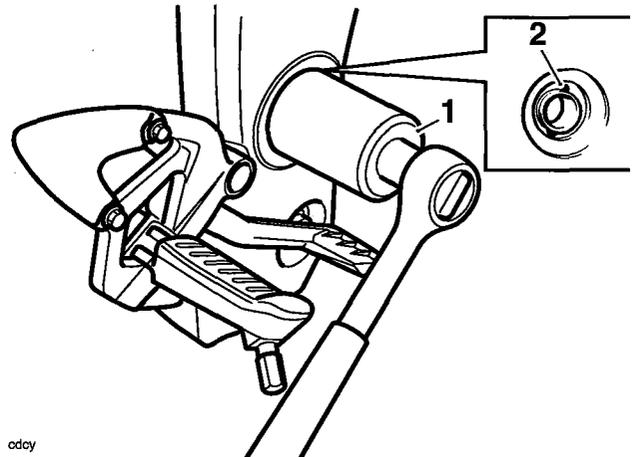
1. Tool T3880290
2. Clamping ring

## Caution

Incorrect adjustment of the swinging arm clamping ring will damage the bearings, seals and swinging arm.

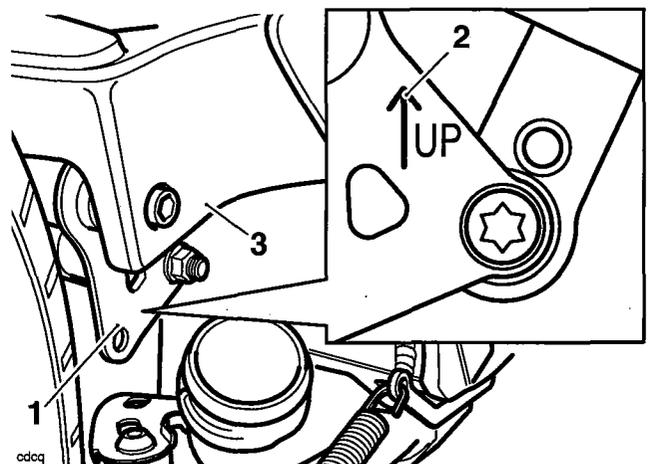
Never over-tighten the clamping ring or set the adjustment to allow excessive sideways movement.

14. Fit the locking ring and tighten to **30 Nm** using tool T3880295.



1. Tool T3880295
2. Locking ring

15. Check that the clamping ring adjustment has not changed, re-adjust if necessary.
16. From the right, fit the swinging arm spindle bolt and tighten to **60 Nm**.
17. Apply a smear of grease to the drop link bearings.
18. 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

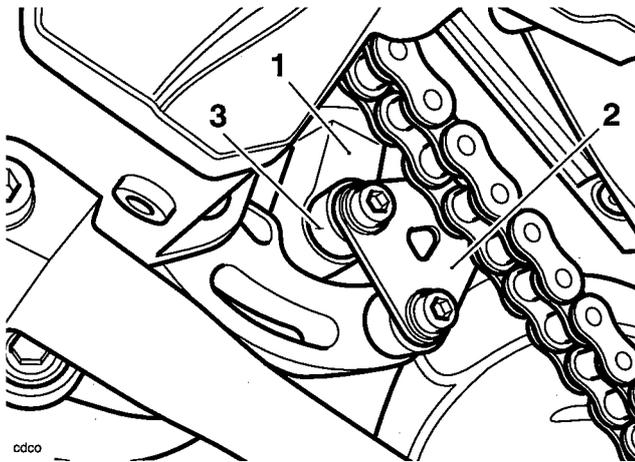
# Rear Suspension

19. From the right, fit the drop link to swinging arm bolt and tighten to **48 Nm**.
20. 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 rear of the motorcycle.**

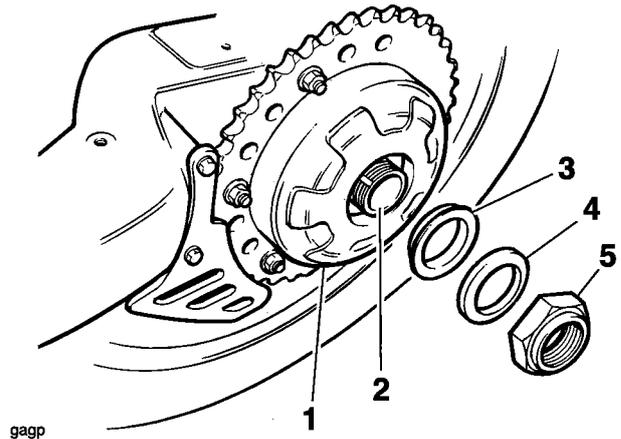
21. Fit the spacers to the lower suspension unit mounting.



1. Rear suspension unit
2. Drop link
3. Spacers

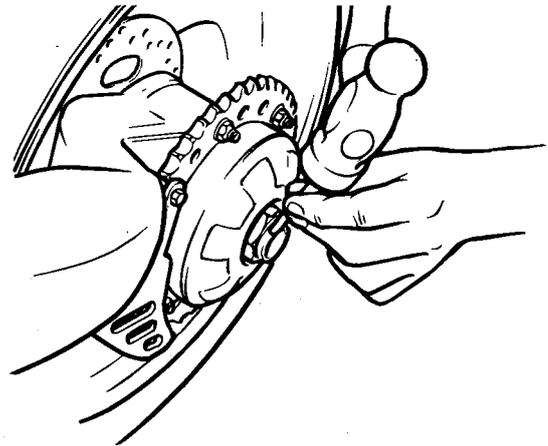
22. Align the rear suspension unit to the drop link and, from the right, loosely fit the securing bolt / nut.
23. Tighten the rear suspension unit upper mounting to **48 Nm**.
24. Tighten the rear suspension unit lower mounting to **48 Nm**.
25. Fit the axle shaft/rear disc assembly ensuring that the final drive spacer is fitted to the left hand side of the axle shaft.
26. Align the final drive assembly to the axle shaft fitting the chain during assembly.

27. 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

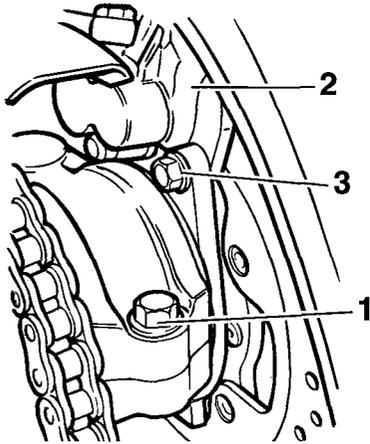
28. Prevent the axle from turning and tighten the nut to **146 Nm**. Stake to secure.



**Staking the nut**

29. Adjust the chain tension to give 35-40 mm of slack by turning the hub with the 'C' spanner.
30. Tighten the swinging arm / hub pinch bolt to **55 Nm**.
31. Thoroughly clean and degrease the brake disc.
32. Refit the rear brake caliper. Tighten the caliper fixings to **40 Nm**.

33. 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 (see page 14-21).



1. Swinging arm / hub pinch bolt

2. Rear brake caliper

3. Rear brake caliper fixings (1 of 2)

34. Refit the upper and lower chain guards. Tighten the fixings to **9 Nm**.
35. Models with ABS brakes: Refit the rear wheel speed sensor (see page 14-31).
36. Align the rear brake hose and, if fitted, the ABS sensor harness to the chain guard and refit the hose cover. Tighten the hose cover fixings to **2 Nm**.
37. Refit the rear wheel (see page 15-10).
38. Lower the motorcycle to the ground and place on the side or centre stand.
39. Reconnect the battery positive (red) lead first.
40. Refit the seat (see page 16-8).

## Final Drive/Rear Hub and Bearings

### Removal

1. Remove the seat (see page 16-8).
2. Disconnect the battery, negative (black) lead first.

**Warning**

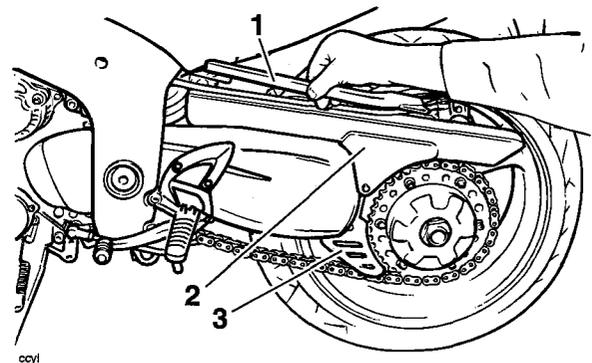
If the engine has recently been running, the exhaust system will be hot. Before working on or near the exhaust system, allow sufficient time for the exhaust system to cool as touching any part of a hot exhaust system could cause burn injuries.

3. 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.

4. Remove the rear wheel (see page 15-10).
5. Remove the rear brake hose cover from the upper chain guard.
6. Models with ABS brakes: Remove the rear wheel speed sensor (see page 14-30).
7. Remove the chain guard from the swinging arm.



1. Brake hose cover

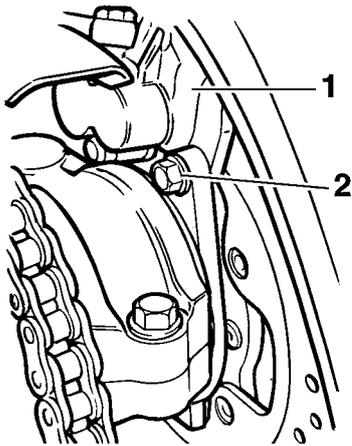
2. Upper chain guard

3. Lower chain guard

8. Remove the lower chain guard.

## Rear Suspension

9. Without disconnecting the brake hose, detach then support the rear brake caliper.

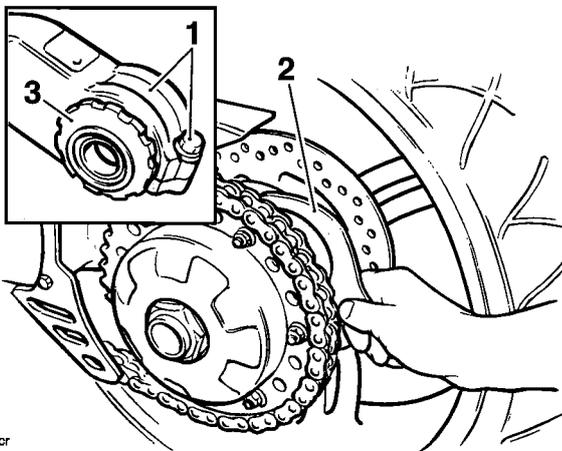


1. Rear brake caliper  
2. Caliper mounting bolts (1 of 2)

### Caution

To prevent damage to the brake pipe and caliper, do not allow the caliper to hang on the brake pipe.

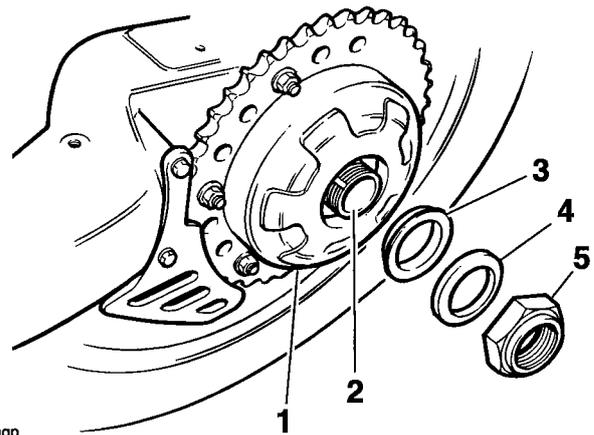
10. De-stake then slacken the nut securing the final drive unit to the axle shaft.  
11. Slacken the swinging arm / hub pinch bolt.  
12. Use the 'C' spanner from the motorcycle tool kit to turn the hub and slacken the drive chain.



1. 'C' Spanner  
2. Swinging arm/hub pinch bolt

13. To release the final drive unit, remove the staked nut (discard the nut), Belleville washer and stepped washer.

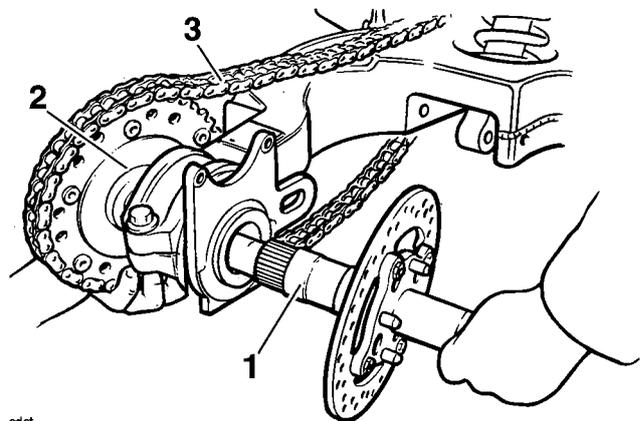
14. Pull the axle shaft through the hub to the right hand side such that the shaft clears the final drive assembly. Remove the final drive unit disconnecting the chain at the same time.



1. Final drive unit  
2. Axle shaft  
3. Stepped washer  
4. Belleville washer  
5. Staked nut

#### Note:

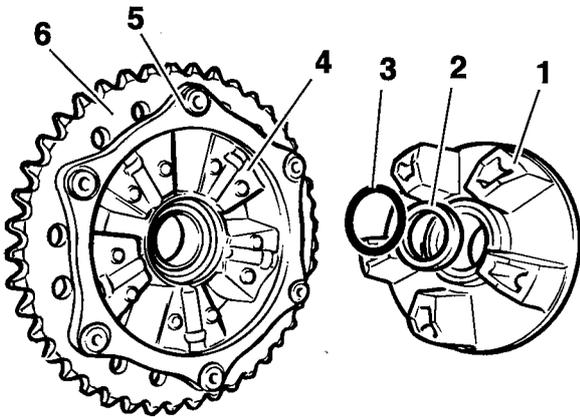
- Collect the spacer fitted between the final drive and the hub.



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 (see page 14-26).
15. Ease off the cush drive hub, and capture the spacer.
  16. Remove the cush drive rubbers.
  17. If required, remove the nuts to release the chain sprocket.



gases

1. Cush drive hub
2. Spacer
3. 'O' ring
4. Cush drive rubbers
5. Cush drive housing
6. Sprocket

## Note:

- Rear wheel bearing replacement procedure can be found in section 15.

## Inspection

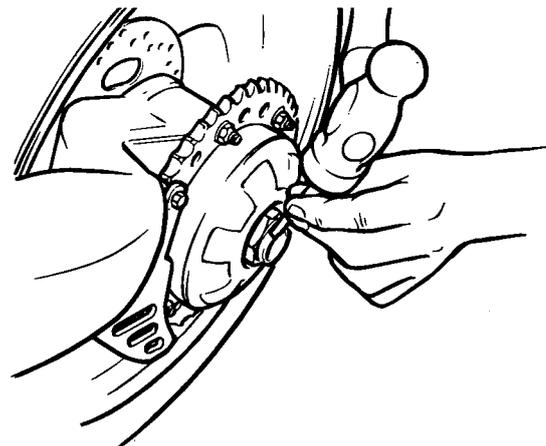
1. Thoroughly clean all components and inspect for damage, wear etc. Renew as necessary.
2. Pay particular attention to the condition of the cush rubbers, examining for splits, damage, softness etc.
3. Check the final drive bearing for wear or rough running, and the seal for damage.
4. Inspect the 'O' 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 drive 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.

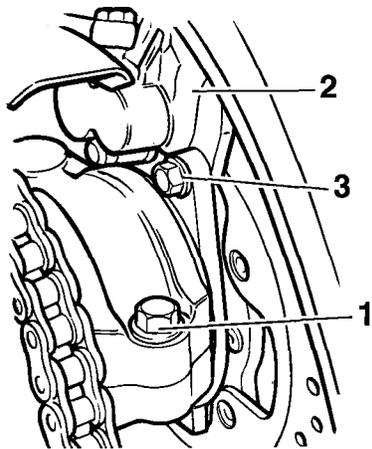


## Staking the nut

5. Adjust the chain tension (see page 12-10).
6. Tighten the swinging arm / hub pinch bolt to **55 Nm**.
7. Thoroughly clean and degrease the brake disc.

## Rear Suspension

8. 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 (1 of 2)**

9. 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.
10. Refit the upper and lower chain guards. Tighten the fixings to **9 Nm**.
11. Motorcycles with ABS brakes: Refit the rear wheel speed sensor (see page 14-31).
12. Align the rear brake hose to the chain guard and refit the hose cover. Tighten the hose cover fixings to **2 Nm**.
13. Refit the rear wheel (see page 15-10).
14. Lower the motorcycle to the ground and place on the side or centre stand.
15. Reconnect the battery positive (red) lead first.
16. Refit the seat (see page 16-8).

## Drive Chain Replacement

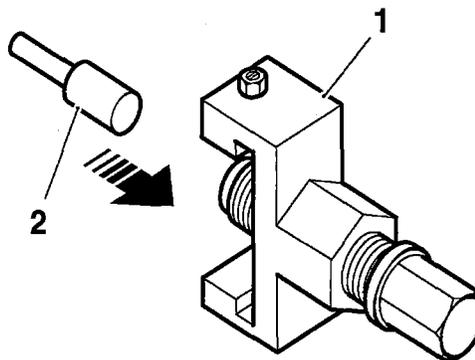
### Rivet link type

The following instructions for the replacement of rivet link type drive chains requires the use of service tool A9930023.

### Warning

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

1. Support the motorcycle on a stand so the rear wheel is clear of the ground.
2. Insert the pin into the pin holder so its smaller diameter end (cutting point) is facing away from the holder as shown.

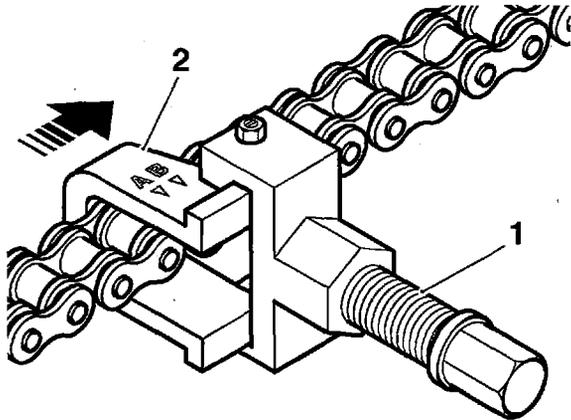


**1. Tool body and pin holder**

**2. Pin**

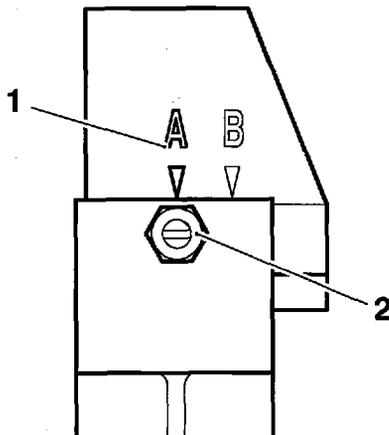
3. Position the 'U' shaped holder behind the chain ensuring its A and B marks are uppermost.

4. Slide the tool body assembly onto the 'U' shaped holder ensuring its adjustment screw is uppermost.



1. Tool body assembly  
2. 'U' shaped holder

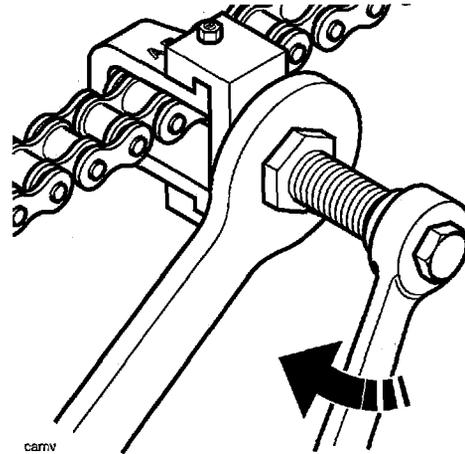
5. Align the A mark on the 'U' shaped holder with the tool body adjustment screw ensuring the adjustment screw spring-loaded ball locates correctly in the holder indent.



1. 'U' shaped holder A mark  
2. Tool body adjustment screw and locknut

6. Locate the chain link pin which is to be removed in the hole in the centre of the 'U' shaped holder then screw the pin holder in until its pin contacts the link pin. **Ensure that the holder pin is centralised on the link pin to be removed.**

7. Retain the tool body with a wrench then tighten the pin holder until the link pin is pressed out from the chain.



8. Remove the tool and separate the two ends of the chain.

**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.

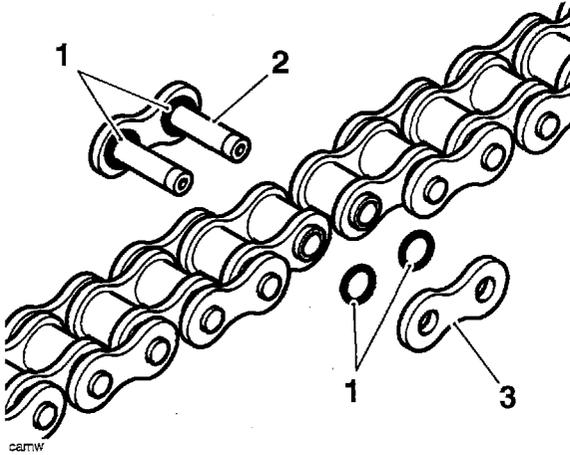
9. Use the old drive chain to pull the new chain into position as follows: Temporarily attach the end of the new chain to a free end of the old chain using the old connector link. Carefully pull the other end of the old chain to pull the new chain around the sprockets.

**Note:**

- Do not use the new connector link as the special grease on it may be removed.

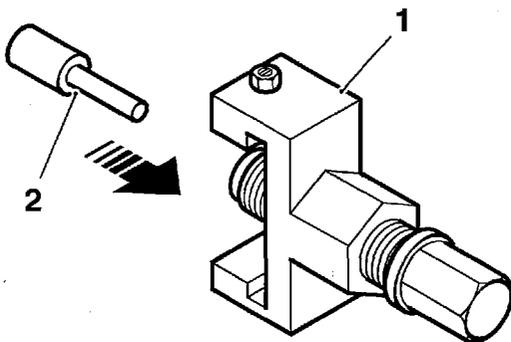
# Rear Suspension

10. Using the new link supplied with the chain kit, join the two ends of the chain. Ensure that the 'O' rings are positioned as shown below and the link plate is fitted with its markings facing outwards.



- 1. 'O' rings
- 2. Link
- 3. Link plate

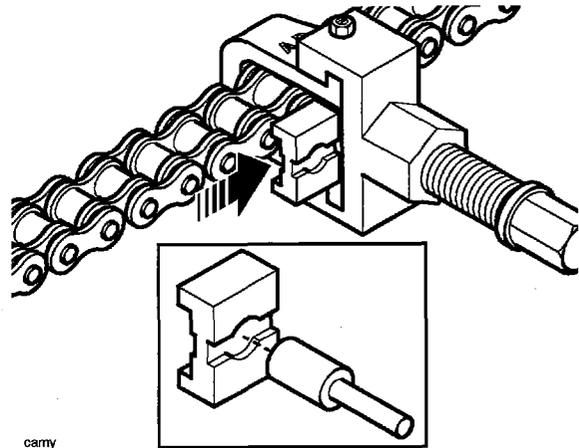
11. Insert the pin into the pin holder so its larger diameter end (riveting point) is facing away from holder as shown.



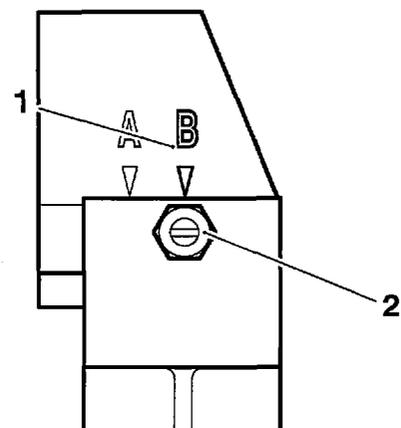
- 1. Tool body and pin holder
- 2. Pin

12. Position the 'U' shaped holder behind the chain ensuring its A and B marks are uppermost.
13. Slide the tool body assembly onto the 'U' shaped holder, ensuring its adjustment screw is uppermost.
14. Align the A mark on the U-shaped holder with the tool body adjustment screw ensuring the adjustment screw spring-loaded ball locates correctly in the holder indent (see step 5).

15. Slide the link plate holder into the 'U' shaped holder and locate it on the end of the pin. **Ensure the pin is correctly located in the link plate holder circular cutout.**

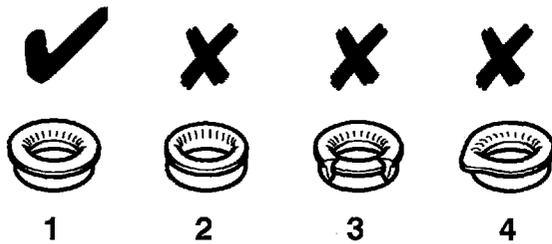


16. Locate both the split link pins in the circular cutouts in the 'U' shaped holder then screw the pin holder in until the plate holder contacts the link plate. **Ensure both the split link and link plate are correctly located in their holders**
17. Retain the tool body with a wrench then tighten the pin holder until the link plate is pressed fully onto the link.
18. Back off the pin holder then slide the tool assembly to one side and check that the split link is correctly assembled.
19. Remove the link plate holder from the tool.
20. Slide the tool body along the 'U' shaped holder until the B mark on the holder is aligned with the adjustment screw. Ensure the adjustment screw spring-loaded ball is correctly located in the holder indent.



- 1. 'U' shaped holder B mark
- 2. Tool body adjustment screw and locknut

21. Locate one of the split link pins in the right hand circular cutout of the 'U' shaped holder then screw the pin holder in until its pin contacts the split link end. Ensure the split link pin is centrally located on the holder pin.
22. Retain the tool body with a wrench then tighten the pin holder until the split link end is riveted-over.
23. Back off the pin holder and rivet the remaining split link pin as described above.
24. Remove the tool from the chain and check that both the split link pins are correctly riveted as shown below.



cana

1. Correct riveting
2. Insufficient riveting
3. Excessive riveting
4. Riveting off-centre

## Warning

If either split link pin is not correctly riveted, the split link must be removed and replaced with a new link. Never operate the motorcycle with an incorrectly riveted split link as the link could fail resulting in an unsafe riding condition leading to loss of control and an accident.

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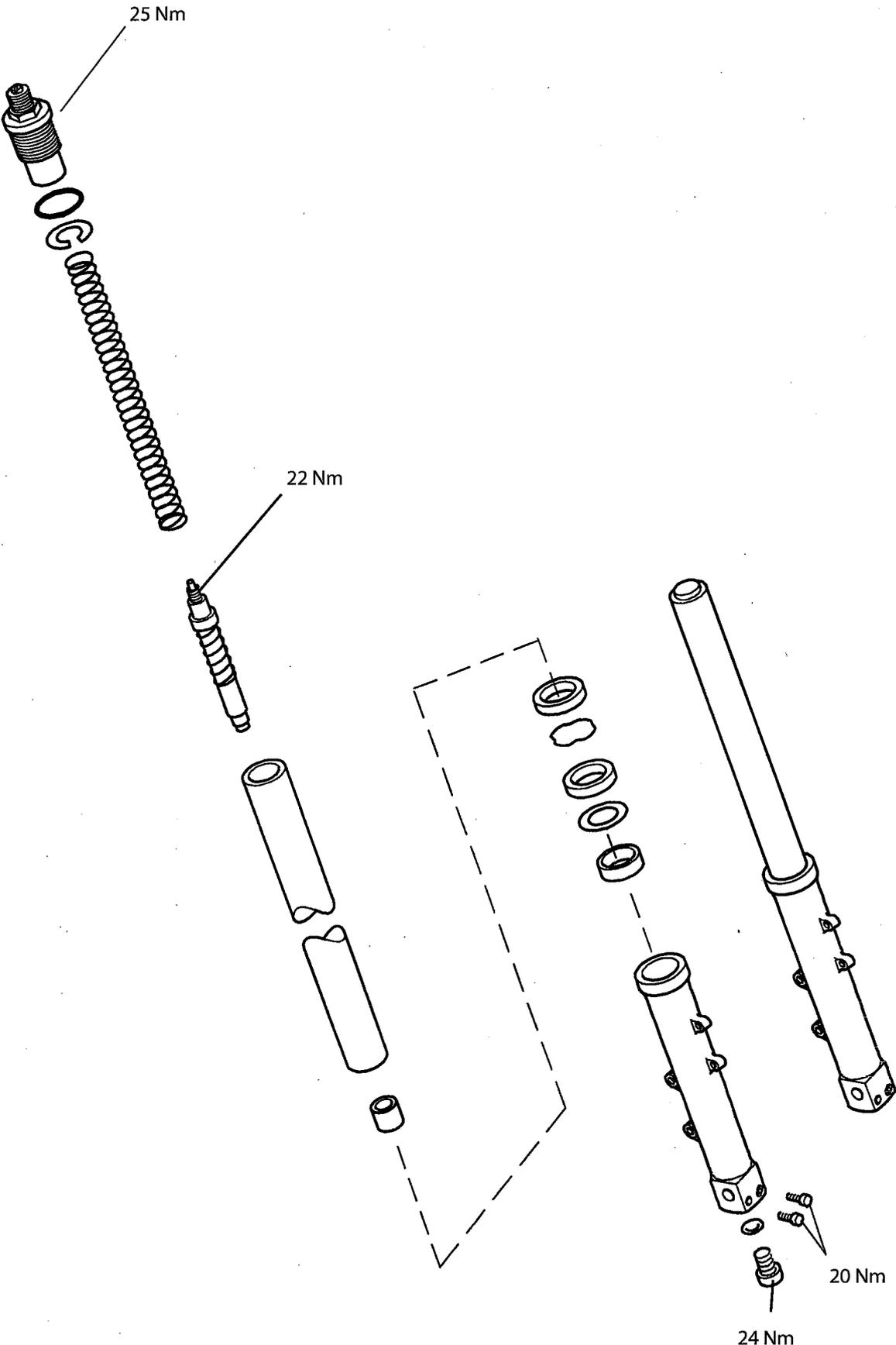
# 13 Front Suspension

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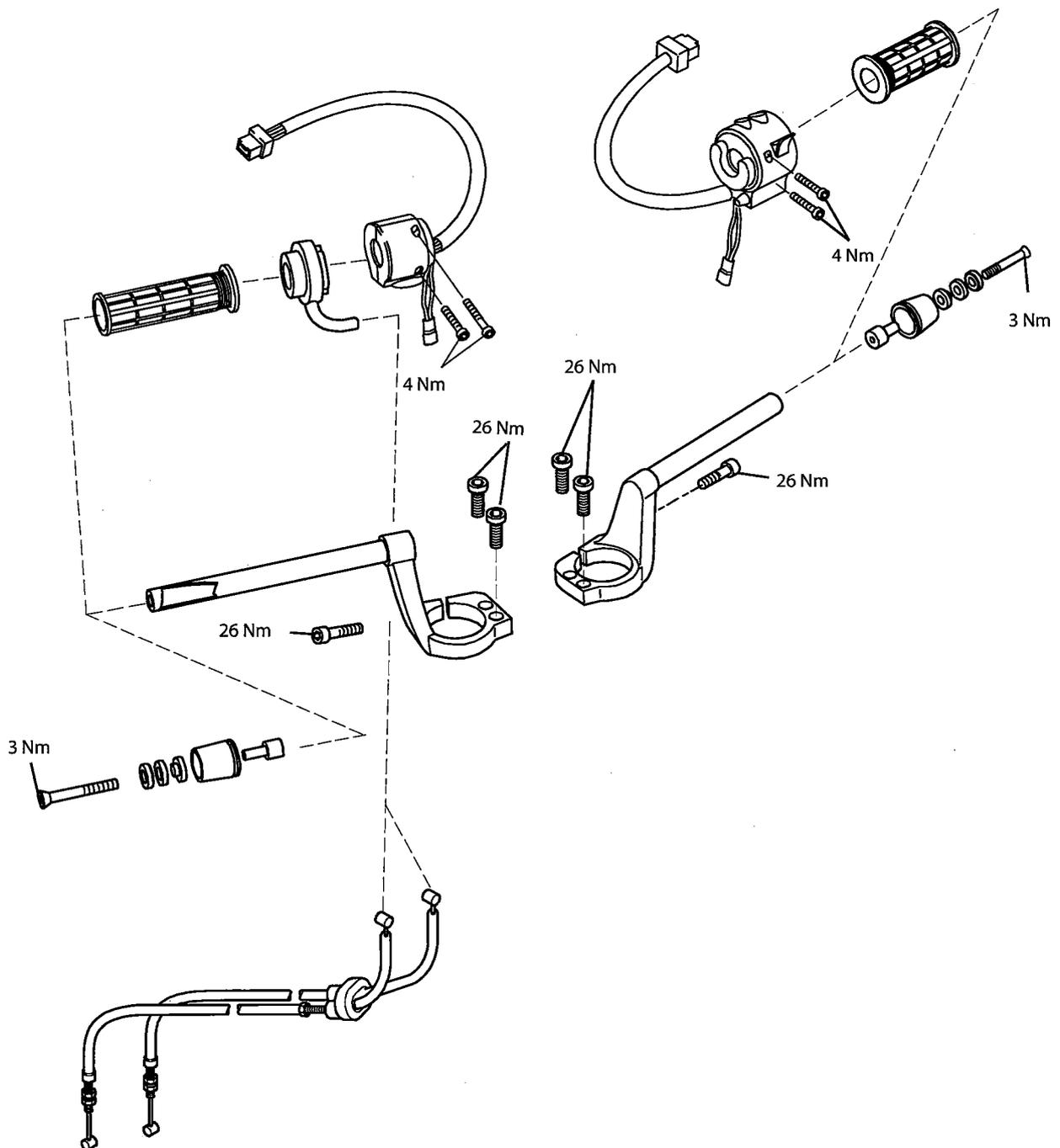
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# Front Suspension

## Exploded View - Front Fork



## Exploded View - Handlebars



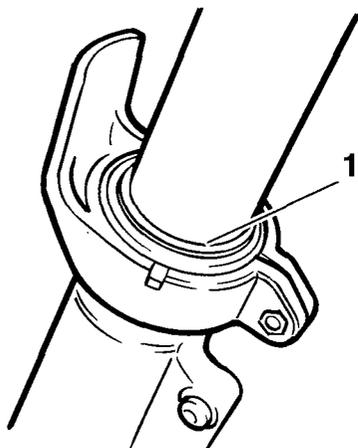
# Front Suspension

## Front Suspension

The motorcycle is 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

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.



jaifj

### 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.

Never ride with damaged or defective suspension.

## Warning

All suspension units contain pressurised oil. Always wear eye, face and skin protection during fork disassembly.

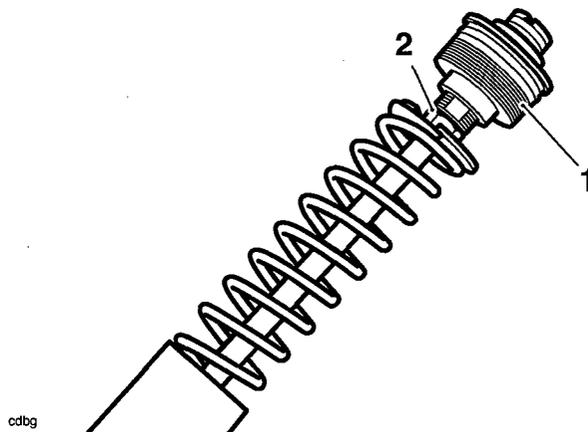
## Fork Oil

### Oil change

1. Remove the fork assembly (see page 13-9).

#### 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. Release the locknut on the damper rod to allow the top cap to be removed completely. Discard the cap 'O' ring.



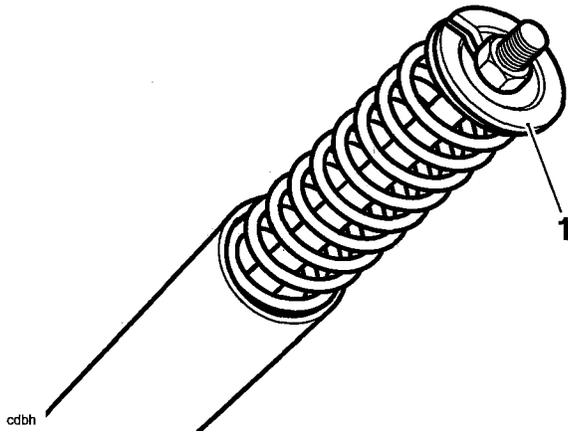
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### 1. Fork cap

### 2. Locknut

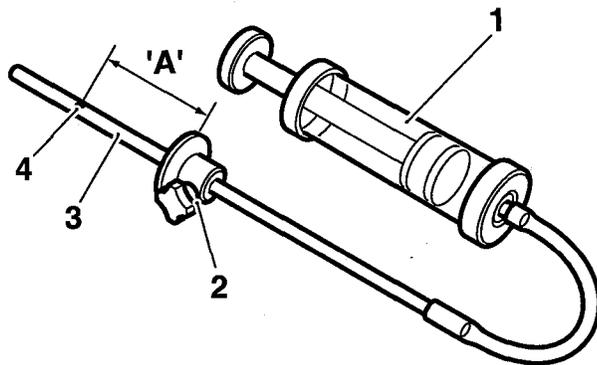
3. Raise the damper rod slightly and remove the dished, slotted washer from the upper end of the spring,

- Remove the spring.



**1. Dished, slotted washer**

- Invert the fork assembly and allow all the oil to drain into a suitable container. Turn the fork back to an upright position.
- 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.
- 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 or the illustration following paragraph 8).



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- Tool 3880160-T0301
- Adjustment Plate
- Scale Area
- Hole (zero position)

**Note:**

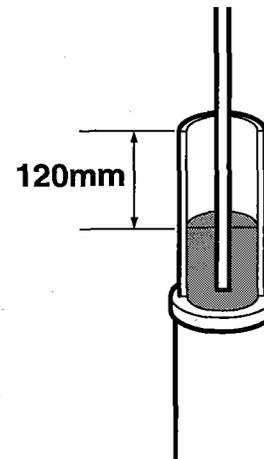
- Zero level on the tool is set at the small exit hole in the side of the scale tube, **NOT AT THE END TIP**. Do not attempt to block this side hole as this will cause the final fluid level to be incorrect.

- Operate the fork several times to expel any trapped air from the valves, then fully compress the fork.

**Warning**

Incorrect tool adjustment and/or failure to keep the tool level with the fork slider will affect the final fluid level setting.

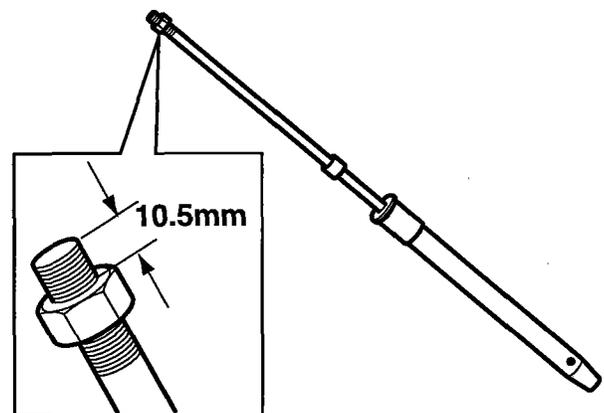
Incorrect fork oil levels could result in an unsafe riding condition leading to loss of control and an accident.



cbyf

**1. Fork Oil Level Setting (fork fully compressed)**

- Insert the scale end of the tool into the fork inner tube.
- 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).
- 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.
- Check that the locknut remains in the position shown in the diagram below. Adjust as necessary.



cdep

- Refit the spring, closed coils down.

## Front Suspension

14. Fit a new 'O' ring to the fork cap, and fit the cap to the damper rod.
15. Prevent the cap from turning by holding the inner flats then tighten the locknut to **22 Nm**.
16. Screw the fork cap into the inner tube, tightening down by hand as far as possible.
17. Refit the fork as described in 'front fork Installation'.
18. Tighten the fork cap to **25 Nm**. Check that the preload height adjustment remains at the mark noted prior to dismantling.

### Fork Oil Level Chart

Oil Level*	Oil Volume	Oil Grade	Fork Pull Through
120 mm	469 cc	SAE 10W	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.

## Front Fork

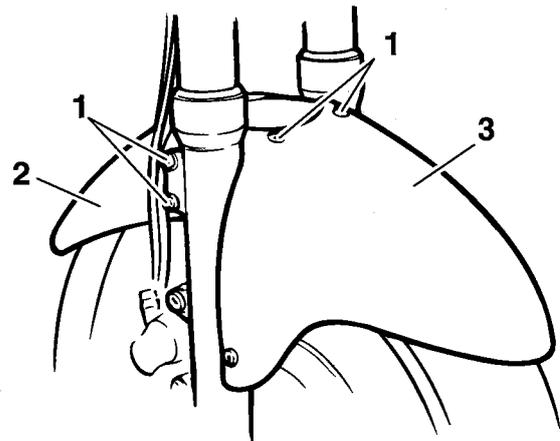
### Removal

1. Raise and support the front of the motorcycle.

**Warning**

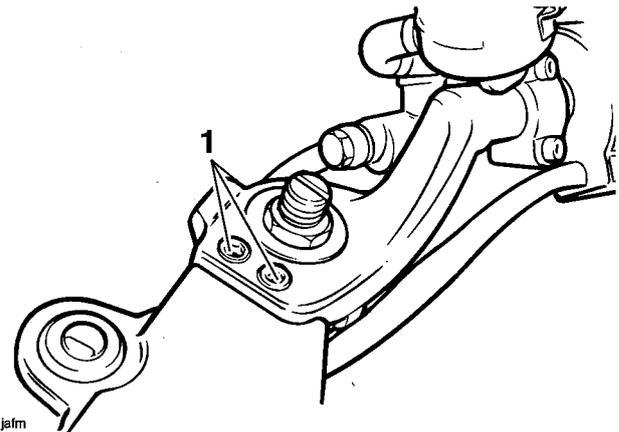
Ensure the motorcycle is stabilised and adequately supported, to prevent it falling and causing damage or injury.

2. Remove the front wheel (see page 15-6).
3. Models with ABS brakes: Remove the front wheel speed sensor (see page 14-29).
4. Remove both sections of the front mudguard.



1. Mudguard fixings
2. Rear Section
3. Front Section

5. 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.

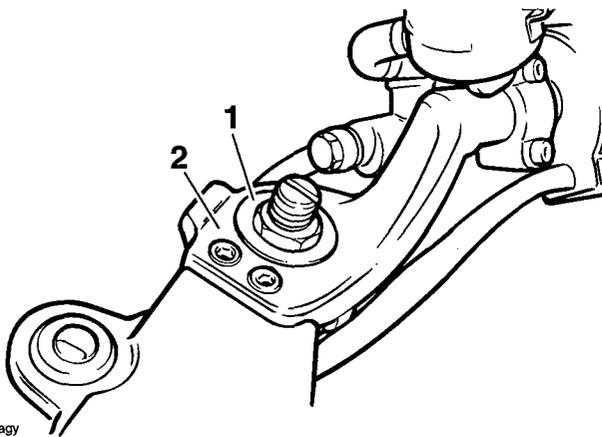
### **Caution**

After slackening the damping cylinder securing bolt, lightly secure it again to prevent oil escaping.

6. 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 and bottom yoke pinch bolts to **20 Nm**.
3. Tighten the handlebar clamp bolts to **26 Nm**.
4. Fit the mudguard and tighten the mudguard fixings to **5 Nm**.
5. Models with ABS brakes: Refit the front wheel speed sensor (see page 14-29).
6. Fit the front wheel (see page 15-7).

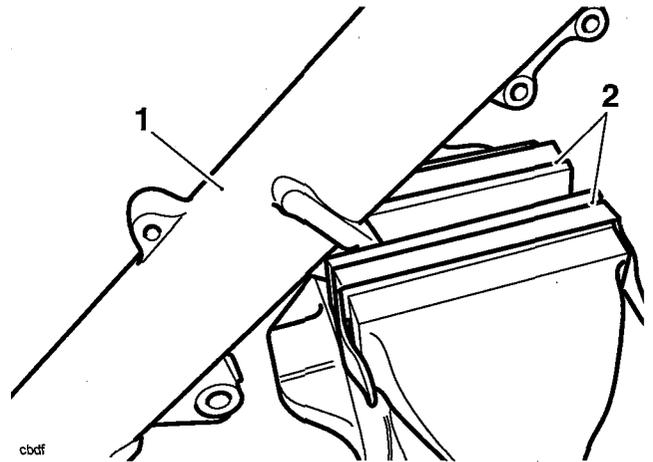
## Fork Dismantling/Assembly

### Dismantling

### **Caution**

If securing the fork in a vice use the caliper mounting points. Never clamp directly onto the tube as this will cause irreparable damage.

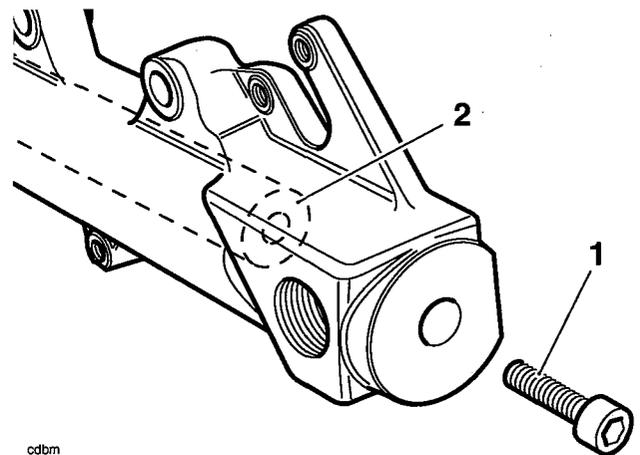
1. Secure the fork by its calliper mountings in a soft jawed vice, taking care not to mark or damage the mountings.



### 1. Fork

### 2. Soft jaws

2. If not already done, release the torque on the damping cylinder bolt, then lightly re-tighten it to prevent oil loss.

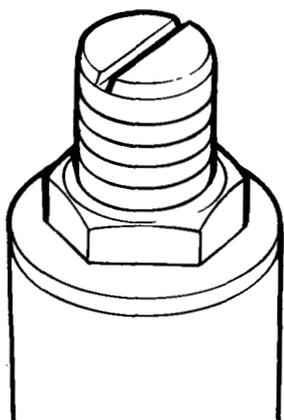


### 1. Bolt

### 2. Damping Cylinder

## Front Suspension

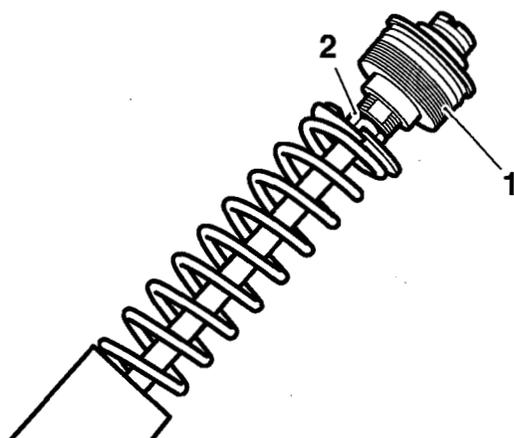
3. Note the position of the preload adjuster relative to the fork cap to ensure the setting is retained on re-assembly.



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### Preload adjuster marks

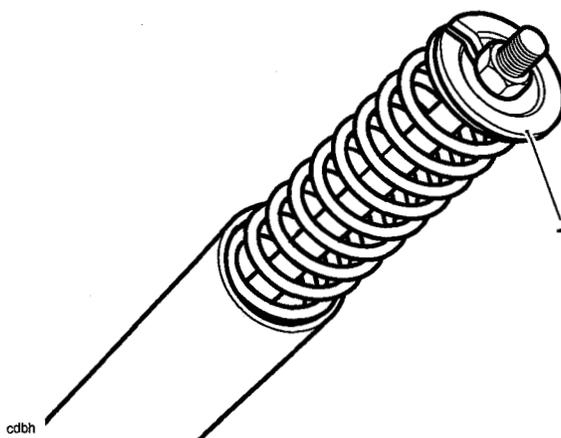
4. Unscrew the fork cap from the inner tube. Release the locknut on the damper rod to allow the top cap to be removed completely. Discard the cap 'O' ring.



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1. Fork cap  
2. Locknut

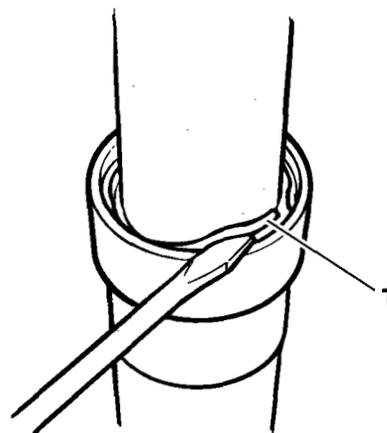
5. Raise the damper rod slightly and remove the dished, slotted washer from the upper end of the spring,



cdbh

### 1. Dished, slotted washer

6. Remove the spring.  
7. Drain the oil from the fork by removing it from the vice and inverting over a suitable container.  
8. Return the fork to the vice.  
9. Prise out the dust seal from the outer tube and remove the circlip from beneath the seal.

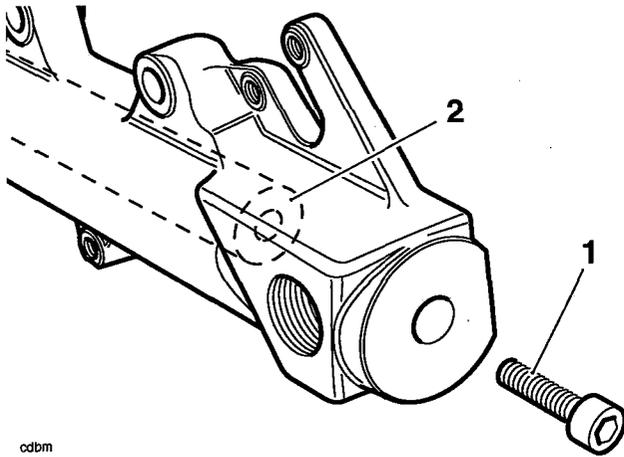


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### 1. Circlip

10. Remove the damping cylinder securing bolt from the lower end of the assembly. Discard the copper washer.

- Remove the damping cylinder.



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- Damping cylinder bolt
- Damping cylinder

- Pull sharply upwards on the inner tube to release it from the outer tube and remove the seal, washer and bush.

**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. Always renew the oil lock 'O' ring if the lock is removed.

**Inspection**

- Thoroughly clean and examine all components for damage, wear, scoring, corrosion etc. Renew as necessary.
- Always renew the oil and dust seals.

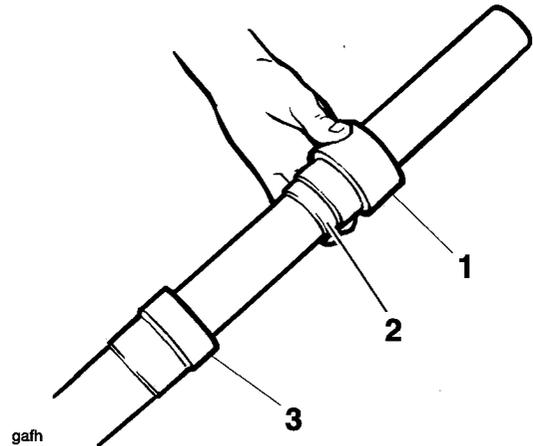
**Assembly**

**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.

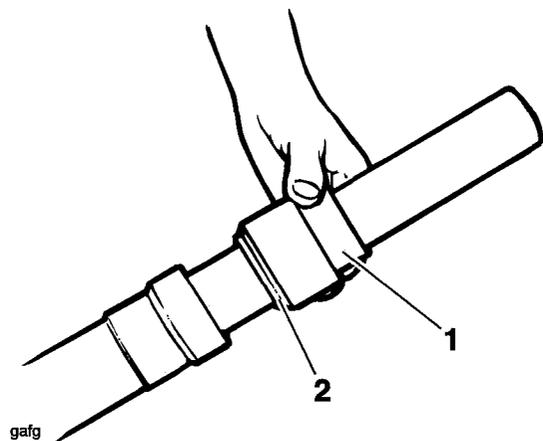
- Fit the inner tube into the outer tube.
- Fit the bearing over the inner tube.

- Slide the bearing down the tube and tap it into its location in the outer tube using the smaller diameter end of tool 3880080-T0301.



- Tool 3880080-T0301
- Bearing
- Outer tube

- Fit the washer.
- Lubricate a new oil seal and fit it into the outer tube (text face upwards). Tap it into position again using the smaller diameter end of tool 3880080-T0301.
- Secure the assembly with the circlip
- Fit a new dust seal (spring band upwards) over the inner tube, tapping it into position in the outer tube using the larger diameter end of tool 3880080-T0301.

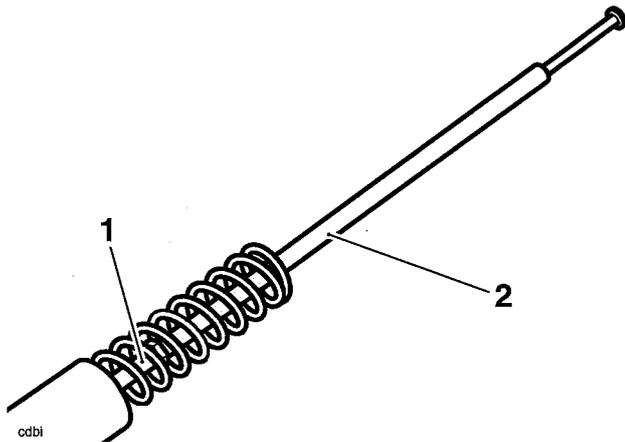


- Tool 3880080-T0301
- Dust seal

- Fit a new copper washer to the damper bolt.
- Locate the damping cylinder in the fork inner tube and secure with the bolt in the base of the outer tube. Fit a new washer to the bolt.
- Fill the fork with the specified grade of oil, as described in the section 'Fork Oil Change'.
- Fit the spring, close coils downward.

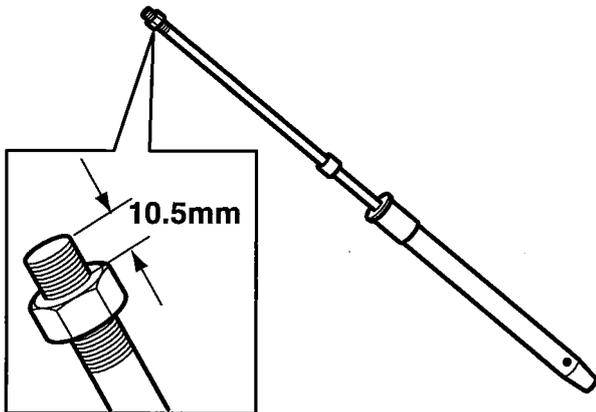
# Front Suspension

12. Raise the damper rod, using tool 3880085-T0301 if necessary, and fit the slotted washer.



1. Damper rod
2. Tool 3880085-T0301

13. Check that the locknut remains in the position shown in the diagram below. Adjust as necessary.



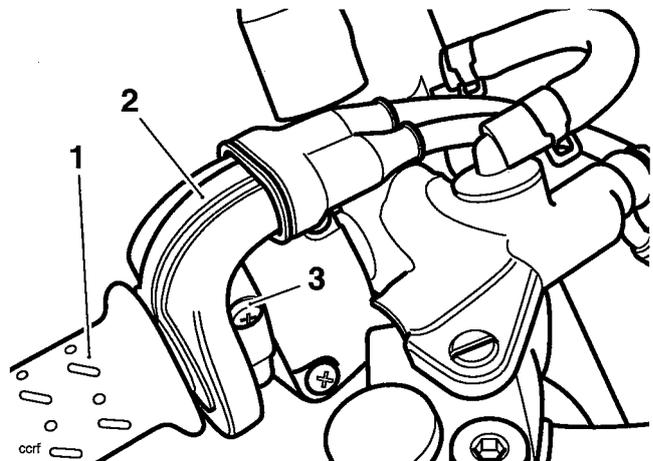
14. Fit a new 'O' ring to the fork cap, and fit the cap to the damper rod.
15. Prevent the cap from turning by holding the inner flats then tighten the locknut to **22 Nm**.
16. Screw the fork cap into the inner tube, tightening down by hand as far as possible.
17. Tighten the damping cylinder securing bolt to **24 Nm**.
18. Refit the fork as described in 'front fork Installation'.
19. Tighten the fork cap to **25 Nm**. Check that the preload height adjustment remains at the mark noted prior to dismantling.

## Handlebars

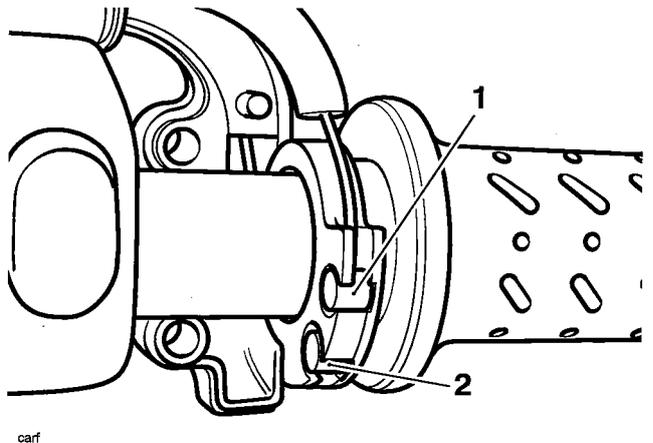
### Right Hand

#### Removal

1. Remove the right hand handle bar end.
2. Slide the rubber boot off the twist grip guide.
3. Release the screws securing the two halves of the twist grip guide to each other.

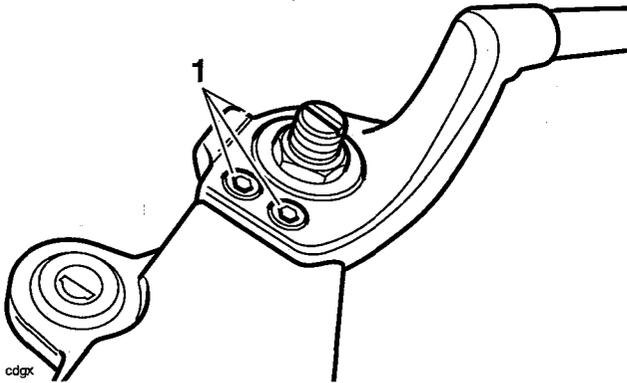


1. Twist grip
2. Twist grip guide
3. Screws
4. Separate the two halves of the twist grip guide then release the inner cables from the twist grip.



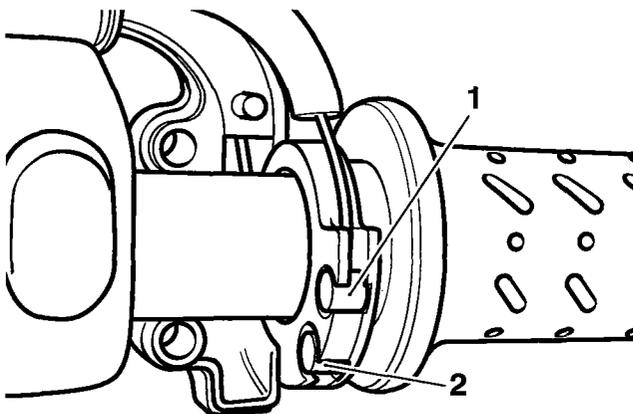
1. Opening cable
2. Closing cable
5. Remove the twist grip from the handlebar.
6. Release the screws from right hand switch assembly and position aside.
7. Release the clamp screws from the brake master cylinder assembly and position aside.

- Release the right hand handlebar fixings and remove the handlebar.



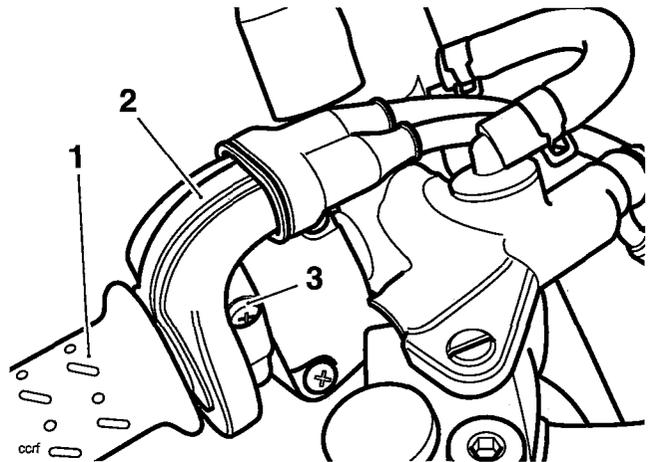
## Installation

- Fit the handlebar to the top yoke. Tighten the handlebar fixings to **26 Nm**.
- 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. Tighten the fixings to **15 Nm**.
- Fit the right hand switch assembly. Tighten the fixings to **4 Nm**.
- Fit the twist grip to the handlebar.
- Engage the inner cable nipples to the twist grip.



- Opening cable
- Closing cable

- Assemble the two halves of the twist grip guide ensuring that the outer cables are correctly located in the guide and the guide is positioned on the handlebars as prior to removal.



- Twist grip
- Twist grip guide
- Screws

- Refit the boot.
- Install the right hand handlebar end. Tighten the fixing to **3 Nm**.

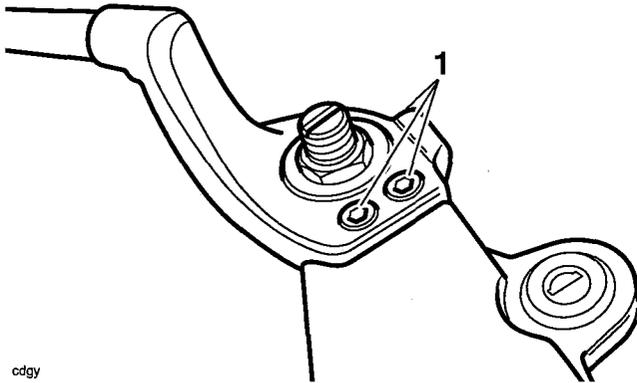
## Left Hand

### Removal

- Remove the left hand handle bar end.
- Remove the left hand grip.
- Release the screws from left hand switch assembly and position aside.
- Release the clamp screws from the clutch lever assembly and position aside.

## Front Suspension

5. Release the left hand handlebar fixings and remove the handlebar.



### Installation

1. Fit the handlebar to the top yoke. Tighten the handlebar fixings to **26 Nm**.
2. Locate the clutch lever assembly to the handlebar and position the clamp with the 'UP' arrow pointing upwards. Align the clutch lever assembly clamp split line with the dot mark on the handlebar. Tighten the fixings to **15 Nm**
3. Fit the left hand switch assembly. Tighten the fixings to **4 Nm**.
4. Install the left hand grip.
5. Install the left hand handlebar end. Tighten the fixing to **3 Nm**.

## Headstock Bearing Check/ Adjustment

### Adjustment

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.

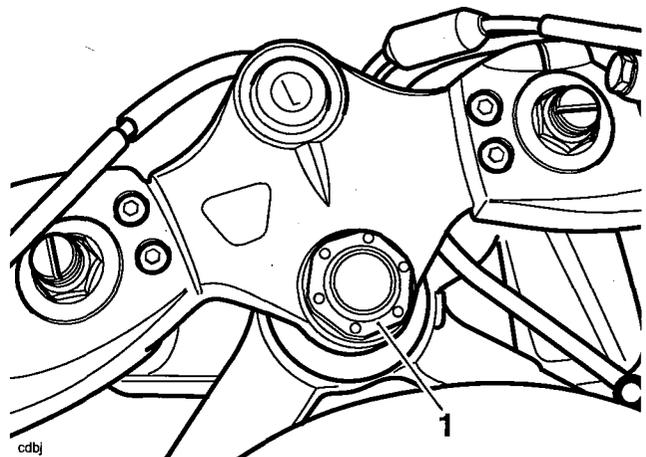
2. Remove the seat and disconnect the battery, negative (black) lead first.
3. Slacken the handlebar clamp bolts.
4. Slacken the pinch bolts on the top yoke.

#### 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 injury.

5. Remove the headstock top nut.

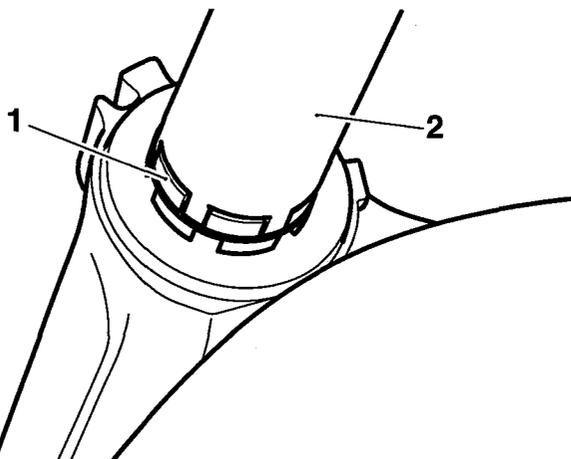


### Headstock top nut

6. As an assembly, raise the top yoke and handlebars until clear of the steering stem. Rest the assembly forward of the steering stem such that access to the adjustment nuts is unrestricted.
7. Adjust the bearing free-play as follows:

## Note:

- Throughout, tool T3880023 is used in setting the adjuster and locknut torques.
- a) Remove the locknut and tab washer.



1. Locknut
2. T3880023

- b) Slacken then tighten the adjuster nut to **40 Nm**.
- c) Release the adjuster nut and re-torque to **15 Nm**.
- d) Fit the tab washer and locknut.
- e) Prevent the adjuster nut from turning then tighten the locknut to **40 Nm**.
8. Locate the upper yoke to the steering stem and forks.
9. Tighten the top nut to **65 Nm**.
10. Tighten the top yoke pinch bolts to **20 Nm**.
11. Tighten the handlebar clamp bolts to **26 Nm**.
12. Recheck the bearing adjustment and repeat the adjustment procedure if necessary.
13. Reconnect the battery, positive (red) lead first.
14. Refit the seat.

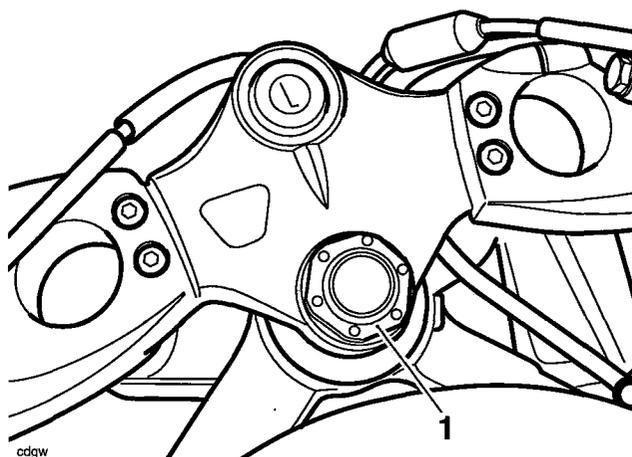
## Headstock Bearings

### Removal

**Warning**

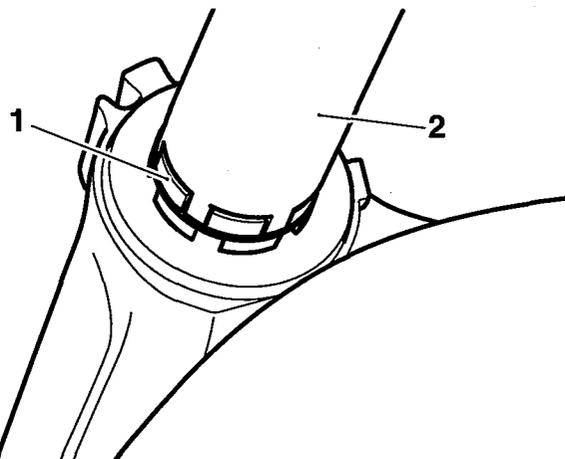
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help to prevent it falling and causing injury to the operator or damage to the motorcycle.

1. Remove both forks as described on page 13-6
2. Remove the headstock top nut.



### 1. Headstock top nut

3. As an assembly, raise the top yoke and handle bars until clear of the steering stem. Rest the assembly forward of the steering stem such that access to the adjustment nuts is unrestricted.
4. Using tool T3880023 remove the locknut and tab washer. Discard the tab washer.



1. Locknut
2. T3880023

5. Using the same tool, remove the adjuster nut.

# Front Suspension

6. Remove the bottom yoke from below the frame headstock.

**Warning**

Always wear eye, hand and face protection when using a drift as use of a hammer and drift can cause bearings to fragment. Pieces of fragmented bearing could cause eye and hand injuries if suitable protective apparel is not worn.

7. Using a suitable drift, evenly and progressively drive the bearing outer races from the frame headstock.
8. Remove the inner race and dust seal from the bottom yoke using a press or puller.

## Inspection

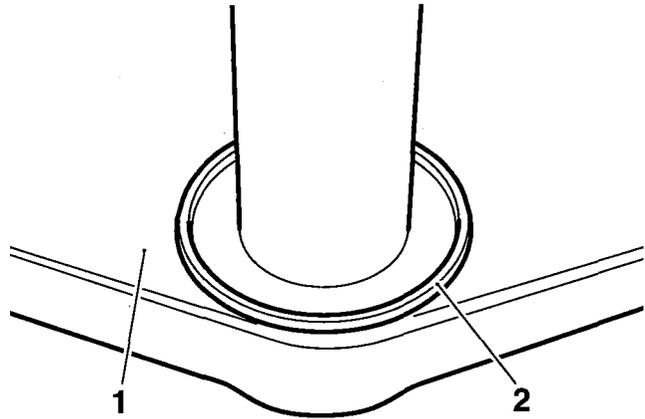
**Warning**

Only remove raised witness marks from within the frame. Removal of material below any raised areas will reduce the level of interference between the frame and the bearings. Loss of interference could cause the bearing to become loose in the frame leading to loss of motorcycle control and an accident.

1. Examine the frame for any raised witness marks caused by the removal process. Remove any such marks with fine emery paper or a gentle file.

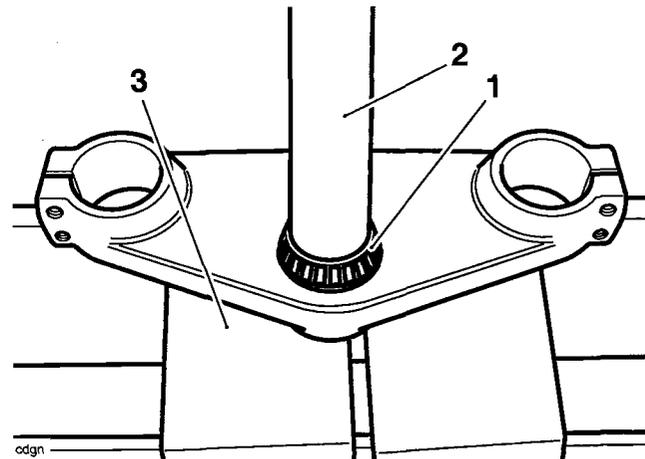
## Installation

1. Fit a new dust seal to the steering stem on the bottom yoke.



1. Steering stem
2. Dust shield

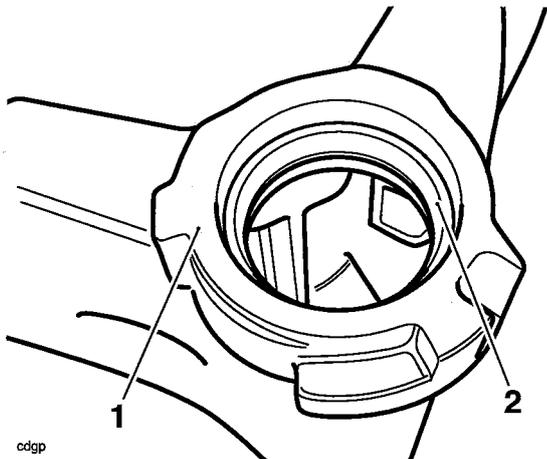
2. Press a new inner race onto the steering stem of the bottom yoke.



1. Bearing
2. Bottom Yoke
3. Press bed

3. Protect the threads of the bottom yoke when using a press or puller as damaged threads may mean replacing the yoke completely.

4. Evenly and progressively drive new bearing outer races into the frame headstock.



1. Frame Headstock
2. Bearing outer race

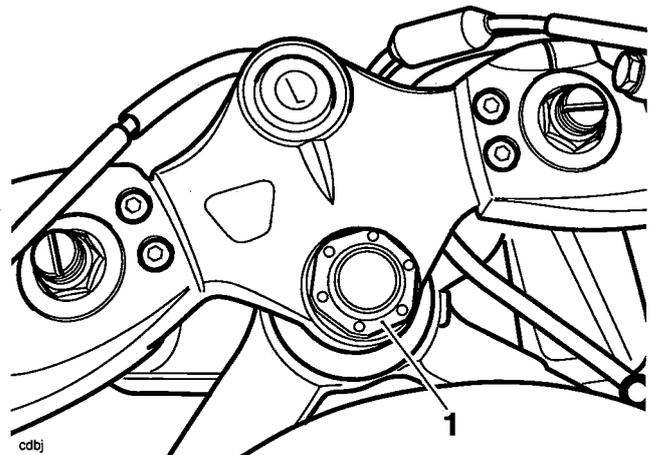
5. Lubricate the headstock bearings using multi-purpose grease.
6. Fit the lower headstock bearing to the bottom yoke.
7. Insert the lower yoke to the frame headstock, fit the upper bearing and race, and retain with the adjuster nut.
8. Adjust the headstock bearings (see page 13-12).
9. Locate the upper yoke to the steering stem. Install but do not fully tighten the headstock top nut at this stage.

**Warning**

Operation of the motorcycle with incorrectly adjusted steering head bearings, either too loose or too tight, may cause a dangerous riding condition leading to loss of motorcycle control and an accident.

10. Fit the forks (see page 13-7).
11. Check that no free play exists in the headstock bearings and that the steering can be turned freely from lock to lock without any sign of tightness. Re-adjust as necessary (see page 13-12).

12. Tighten the headstock top nut to 65 Nm.



1. Headstock top nut

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# 14 Brakes

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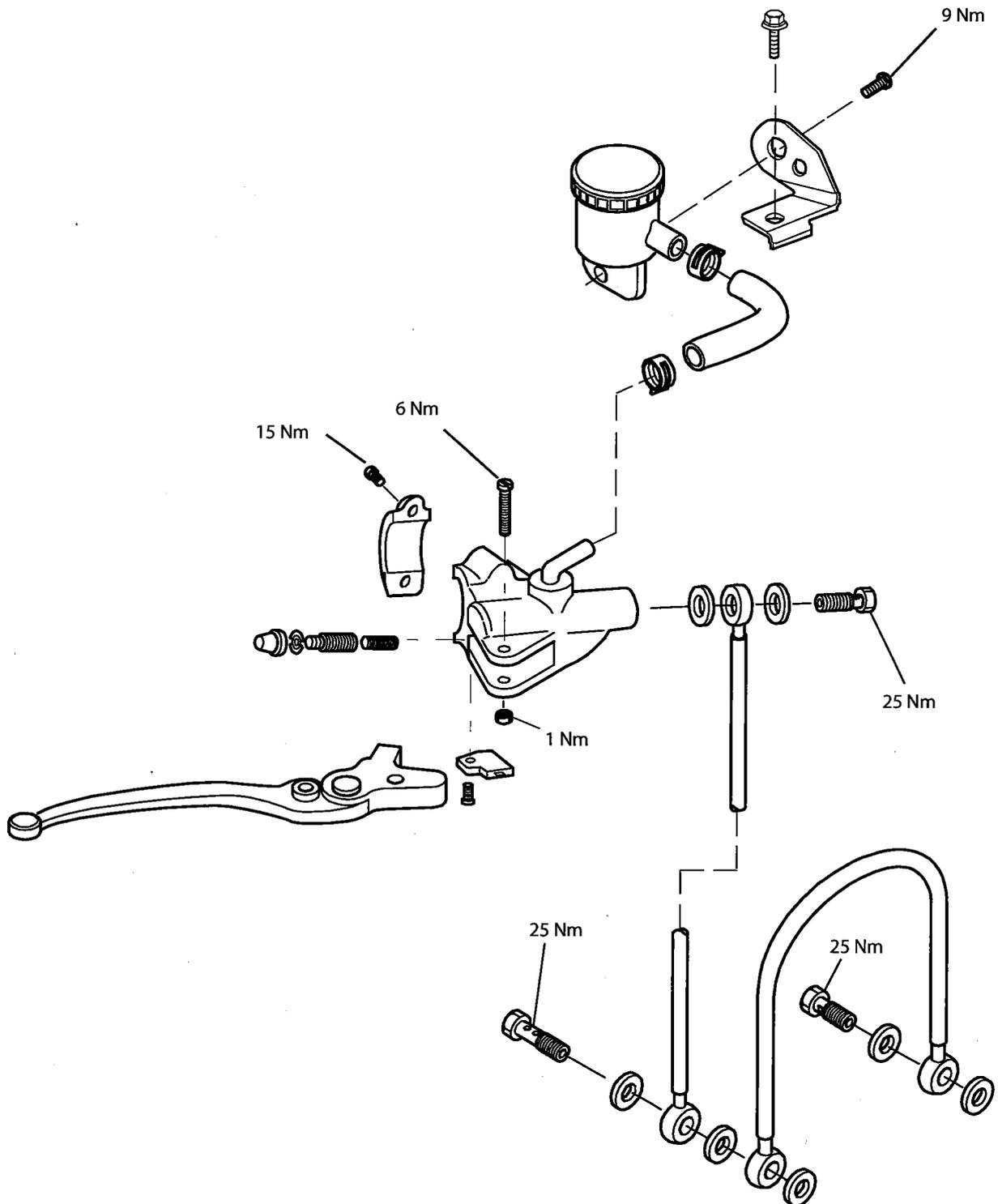
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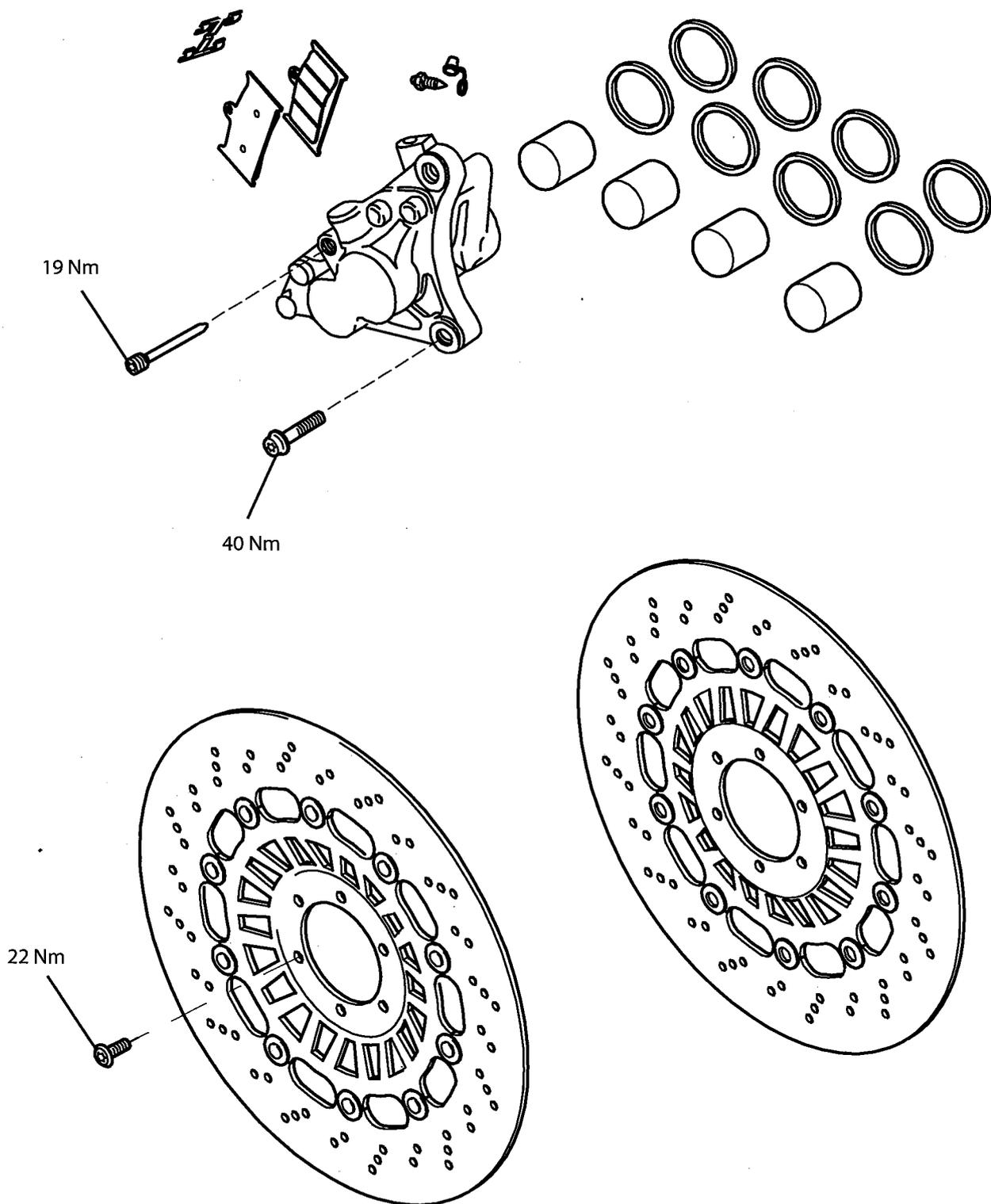
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Exploded View - Front Brake Master Cylinder

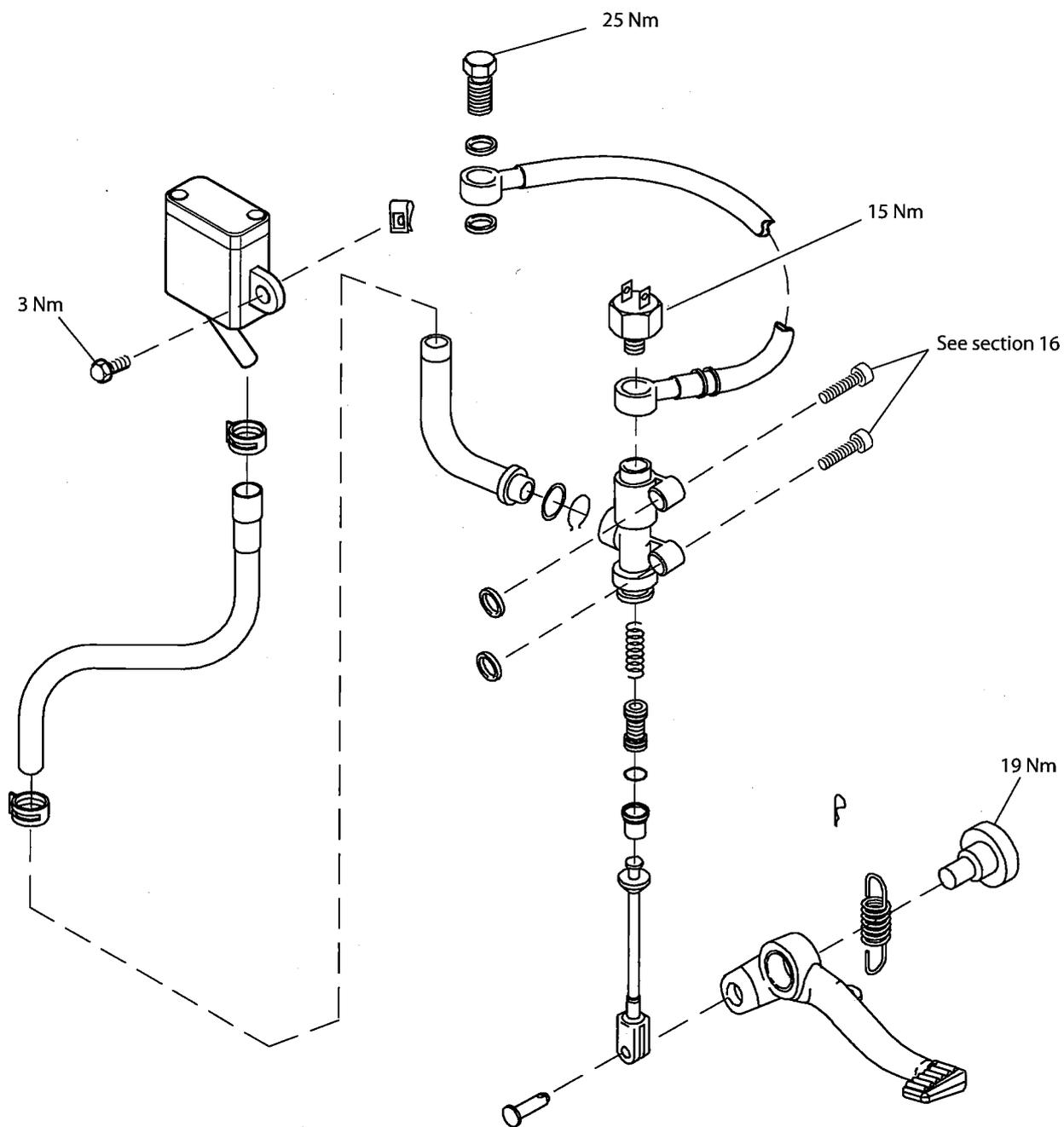


# Brakes

## Exploded View - Front Brake Caliper

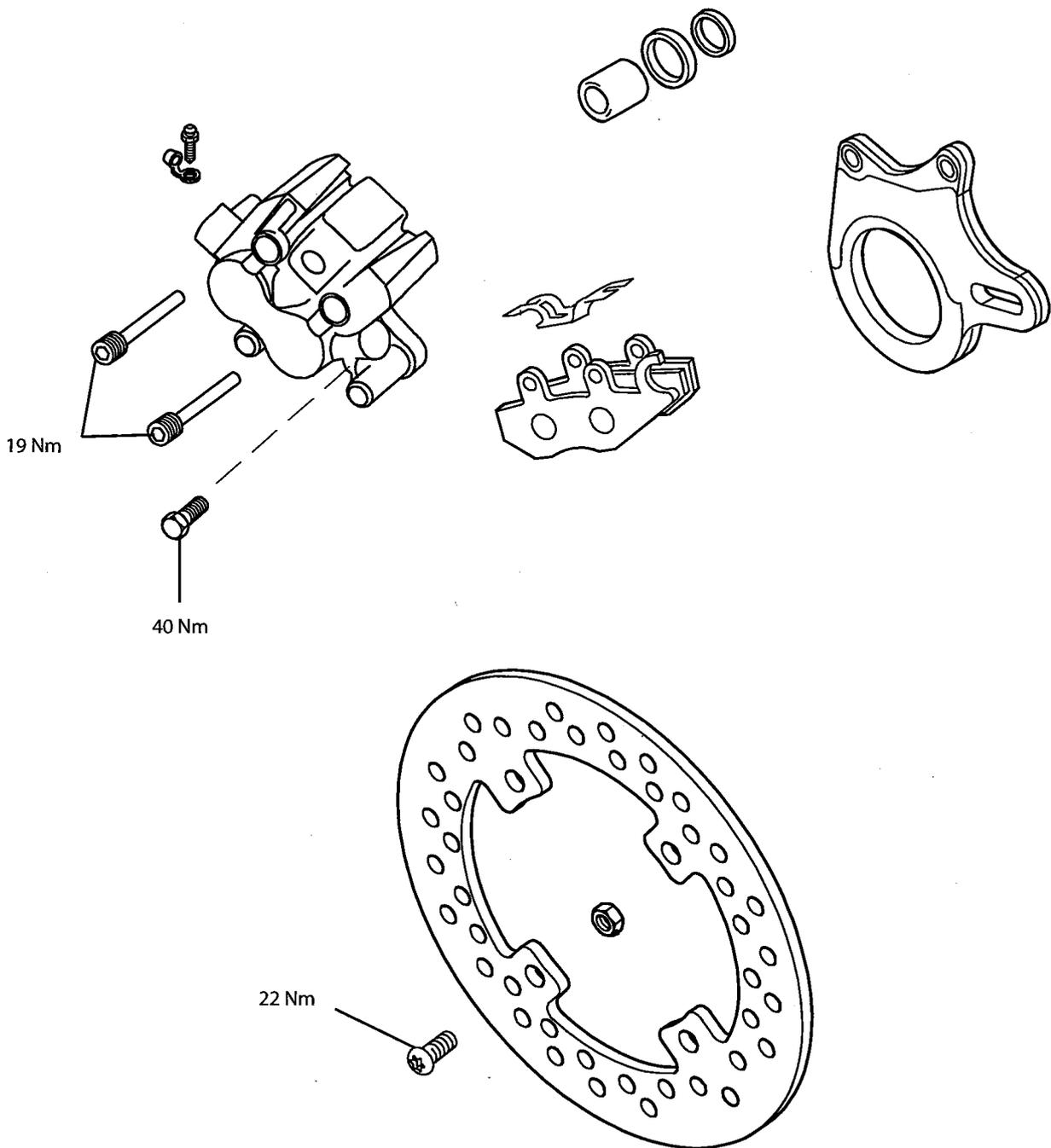


### Exploded View - Rear Brake Master Cylinders

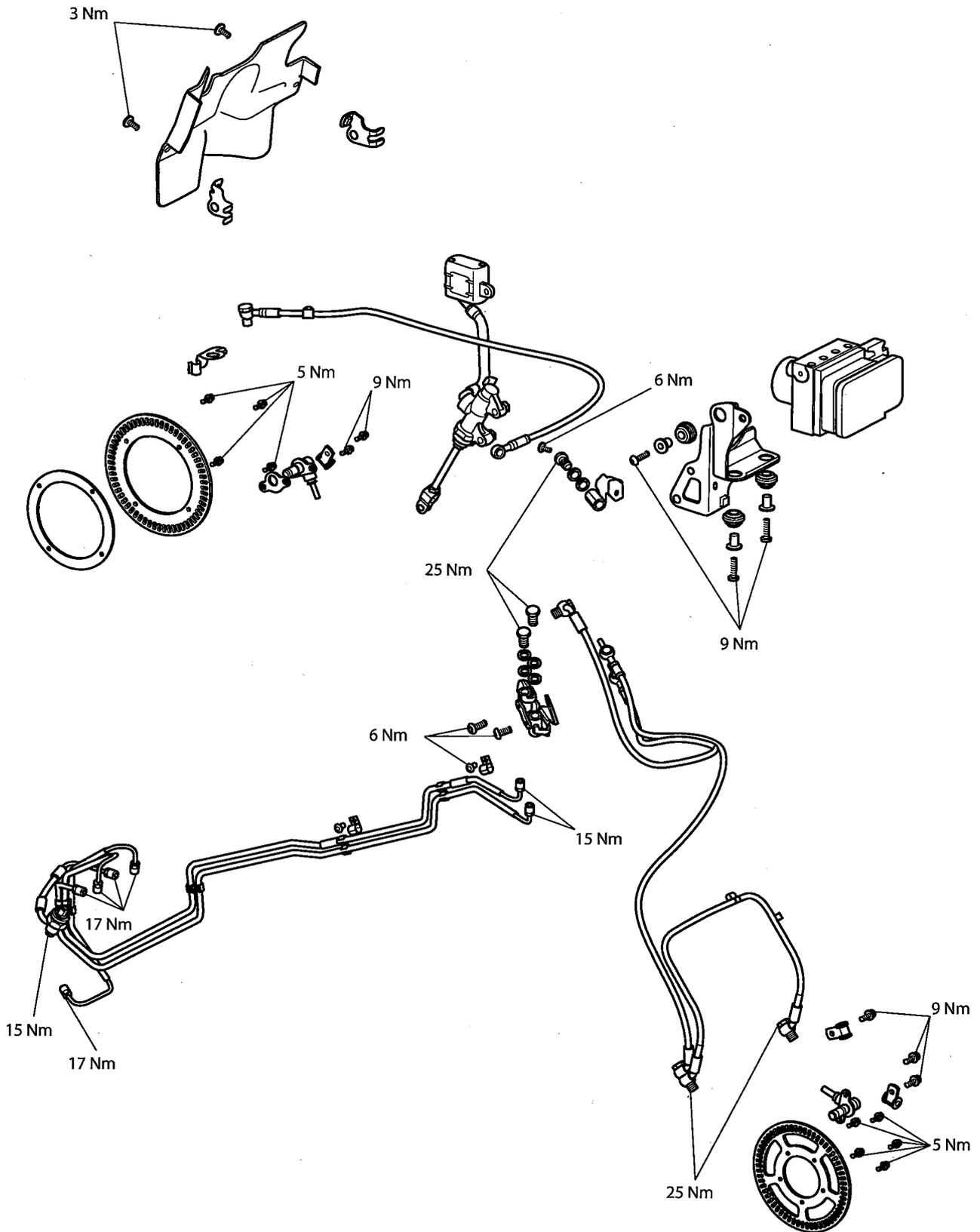


# Brakes

## Exploded View - Rear Brake Caliper



Exploded View - ABS System



# Brakes

## 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

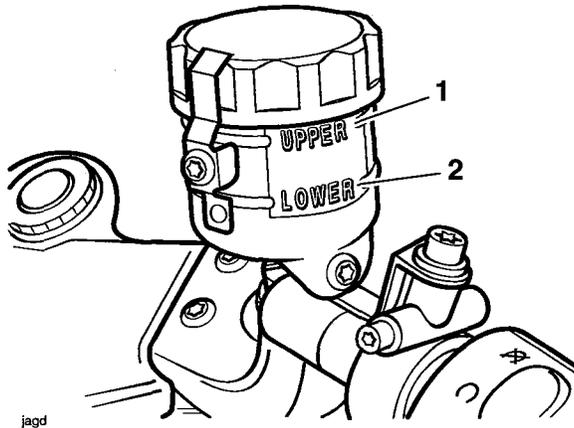
Never use mineral based grease in any part of the braking system or in any area where contact with the braking system is possible. Mineral based grease will damage the hydraulic seals in the calipers and master cylinders.

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

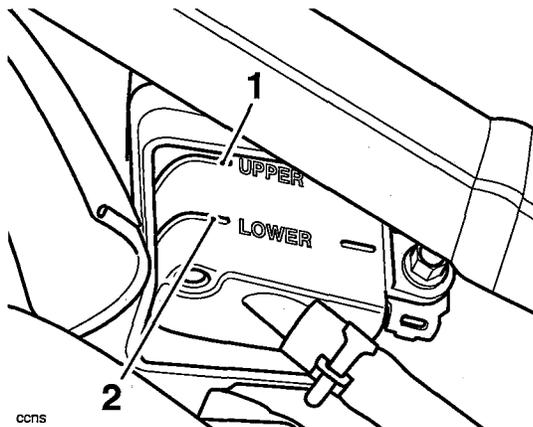
## Fluid Level Inspection

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

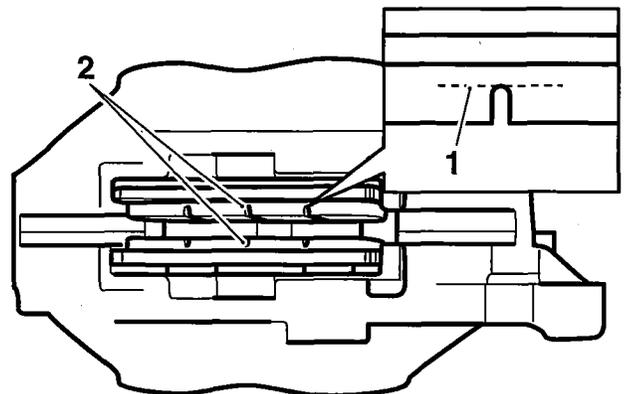
Brake fluid should be changed at the interval specified in the scheduled maintenance chart.

## 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 1.5 mm. 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.

# Brakes

## Bleeding the Front Brakes, Renewing Brake Fluid

### Note:

- **Models with ABS brakes: Refer to bleeding ABS brakes later in this section (see page 14-29).**

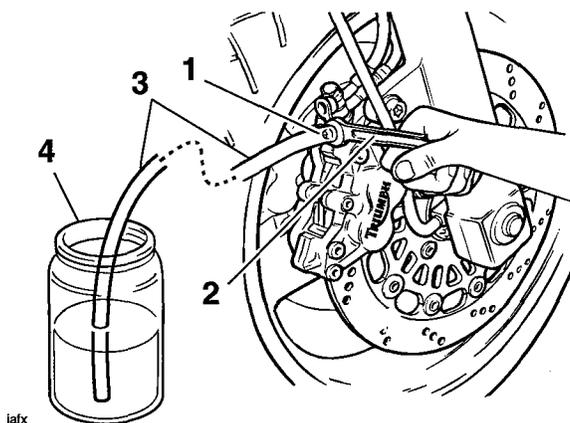
1. Note the original setting of the brake lever adjuster in order that it can be returned to the same position when the bleeding operation is complete. Set the brake lever adjuster to position No.1.



#### 1. Adjuster

#### 2. Indicator Mark

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

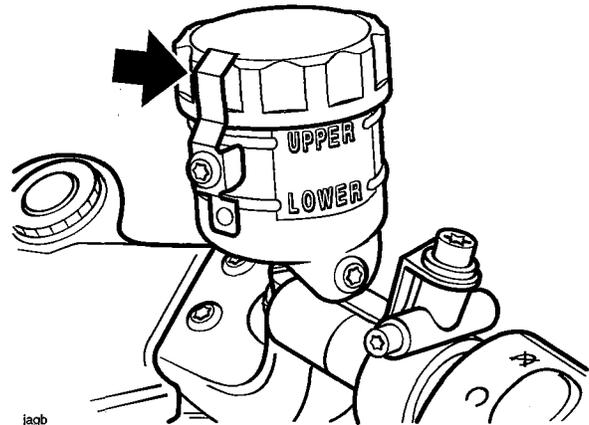
#### 2. Spanner

#### 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 **6 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.

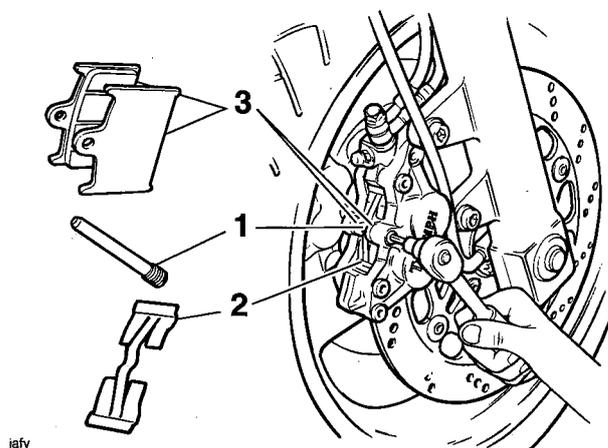
18. Reset the brake lever adjuster to the original setting.
19. Check that the brake operates correctly.

## Warning

It is dangerous to operate the motorcycle with defective brakes and you must have your authorised Triumph Dealer take remedial action. Failure to take remedial action may reduce braking efficiency leading to loss of motorcycle control and an accident.

## 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.

# Brakes

## 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 pin to **19 Nm**, and secure with a new split pin.
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 (see page 14-13).
7. Check that the brake operates correctly.

## Warning

It is dangerous to operate the motorcycle with defective brakes and you must have your authorised Triumph Dealer take remedial action. Failure to take remedial action may reduce braking efficiency leading to loss of motorcycle control and an accident.

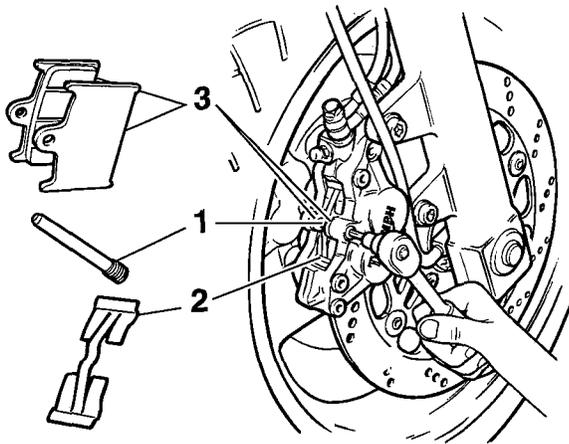
## Front Brake Caliper

### 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 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.



jafy

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. Extract the brake pads (see page 14-15).

## ! 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.

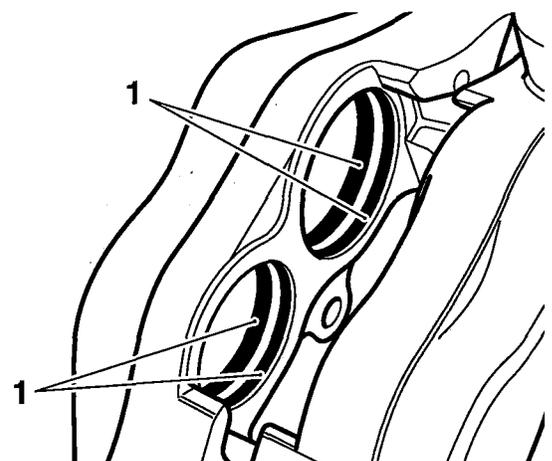
## Assembly

## ! 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.



cdff

1. Fluid Seals

# Brakes

## 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 **19 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 on page 14-14.
9. Check that the brake operates correctly.

## Warning

It is dangerous to operate the motorcycle with defective brakes and you must have your authorised Triumph Dealer take remedial action. Failure to take remedial action may reduce braking efficiency leading to loss of motorcycle control and an accident.

## Front Discs

### Wear

1. Replace any brake disc if worn beyond the service limit or that exceeds the disc run-out limit.

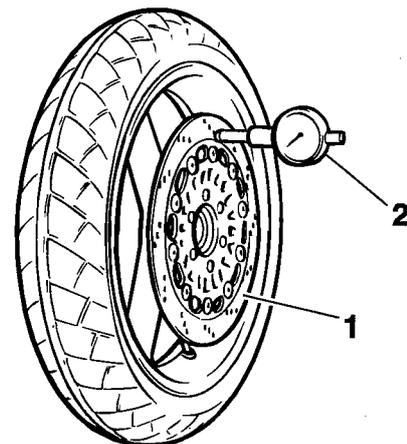
### Front Disc Thickness

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.



gaeb

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.

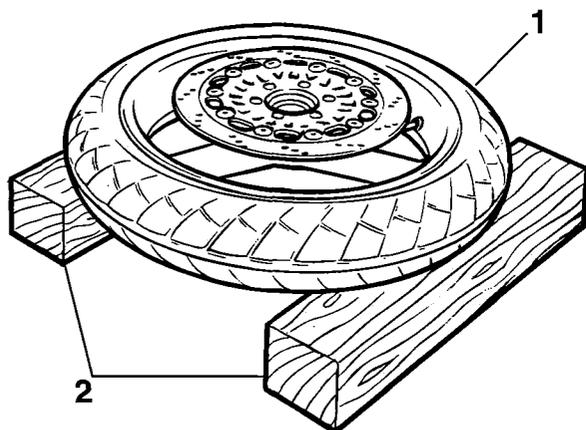
A dangerous riding condition leading to an accident could result if this warning is ignored.

1. Remove the front wheel (see page 15-6).

### 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.



gads

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 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 outwards) as noted during removal.
2. Fit new 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 (see page 15-7).
6. Check that the brake operates correctly.

### Warning

It is dangerous to operate the motorcycle with defective brakes and you must have your authorised Triumph Dealer take remedial action. Failure to take remedial action may reduce braking efficiency leading to loss of motorcycle control and an accident.

## Front Brake Master Cylinder

### Removal

1. Remove the seat (see page 16-8).
2. Disconnect the battery negative (black) lead first.

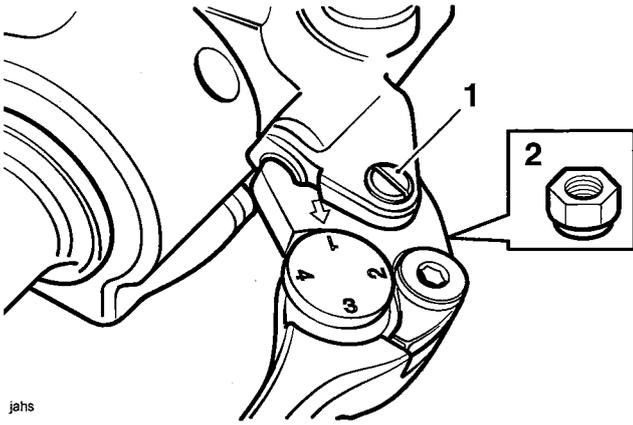
### Caution

To prevent body damage, do not spill brake fluid onto any area of the bodywork.

3. 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.
4. Note the setting of the brake lever adjuster to ensure it is returned to the same position when the overhaul operation is complete.

# Brakes

5. Remove the pivot locknut and bolt securing the brake lever to the master cylinder, and remove the lever.

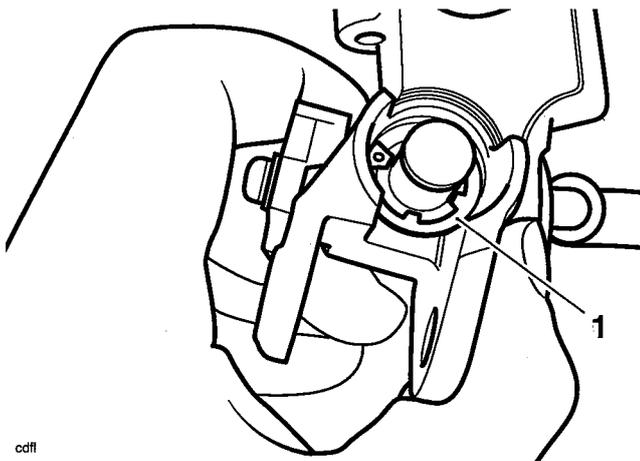


1. Pivot Bolt
2. Pivot Bolt Nut

6. Disconnect from the master cylinder:
  - brake hose.
  - brake light switch connections.
7. Release the clamp screws from the handlebar to remove the master cylinder.

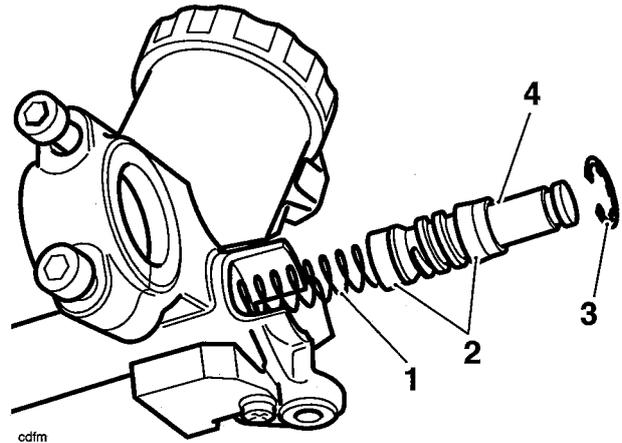
## Disassembly

1. Remove or support the reservoir.
2. Detach the boot from the lever end of the cylinder.
3. Remove the circlip from beneath the boot.



1. Circlip

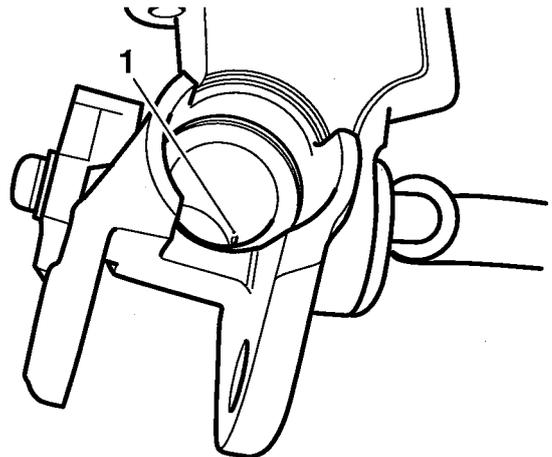
4. Remove the piston set from the master cylinder bore noting the relative position of the seals and piston components.



1. Spring
2. Piston Seals
3. Circlip
4. Piston

## 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.



1. Port

## 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.

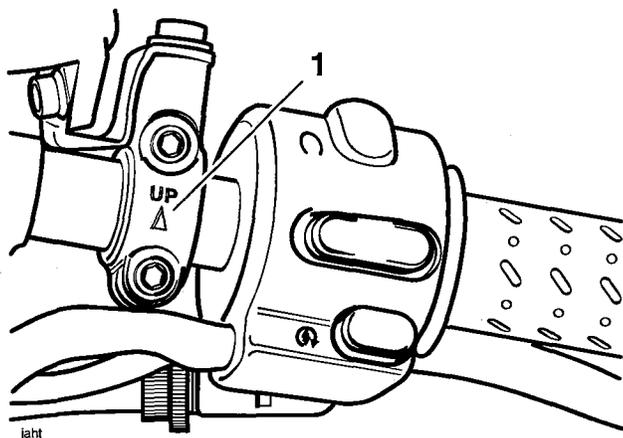
1. Lubricate the piston and cylinder with new, clean brake fluid.

### 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 **1 Nm**, and the locknut to **6 Nm**.
5. Connect the brake hose to the master cylinder using new sealing washers. Tighten the brake light switch to **25 Nm**.
6. Fill and bleed the front brakes (see page 14-14).

### 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.

7. Reset the brake lever adjuster to the original setting.
8. Examine the system for correct operation and fluid leaks. Rectify as necessary.

### Warning

It is dangerous to operate the motorcycle with defective brakes and you must have your authorised Triumph Dealer take remedial action. Failure to take remedial action may reduce braking efficiency leading to loss of motorcycle control and an accident.

9. Connect the battery positive, (red) lead first.
10. Refit the seat.

## Bleeding the Rear Brakes, Renewing Brake Fluid

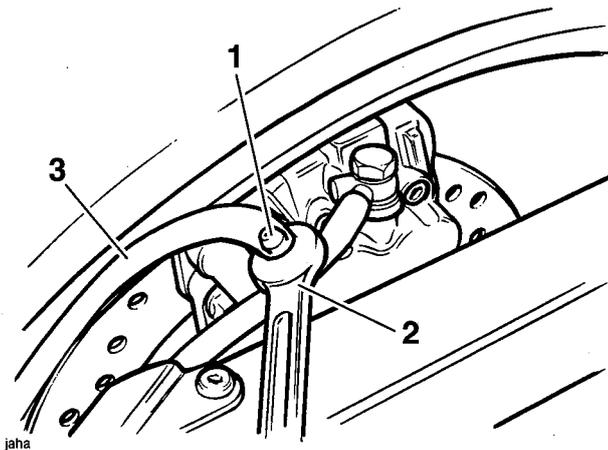
### Note:

- **Models with ABS brakes: Refer to bleeding ABS brakes later in this section (see page 14-30).**

1. Remove the seat (see page 16-8).
2. Remove the cap from the rear bleed nipple.

# Brakes

3. Attach a transparent tube to the bleed nipple.



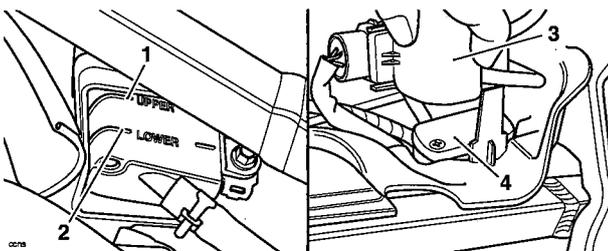
1. Bleed Nipple
2. Spanner
3. Bleed Tube

4. 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.

5. Gently pull off the starter solenoid / main fuse assembly with the rubber mounting that fits over the brake reservoir.
6. Remove the rear brake reservoir cover taking care not to spill any fluid.



1. Lower Level Line
2. Upper Level Line
3. Starter Solenoid / Main Fuse Assembly
4. Rear Brake Fluid Reservoir

## ! 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.

7. Check the condition of the sealing diaphragm. Replace the diaphragm as necessary.
8. 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.**
9. Slowly depress the brake pedal and, holding the pedal fully down, close the bleed nipple. Repeat steps 8 and 9 until no more air appears in the bleed tube.
  10. Maintain the brake fluid level between the upper and lower reservoir levels whilst bleeding is being carried out.
  11. When all air has been expelled from the system, hold down the brake pedal and close the bleed nipple. Tighten the nipple to **6 Nm**.
  12. Fill the reservoir to the maximum level with new 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.

13. Fit the reservoir cover and diaphragm. Check for correct diaphragm fitment before final tightening of the cover.
14. Refit the starter solenoid / main fuse assembly with the rubber mounting over the brake reservoir

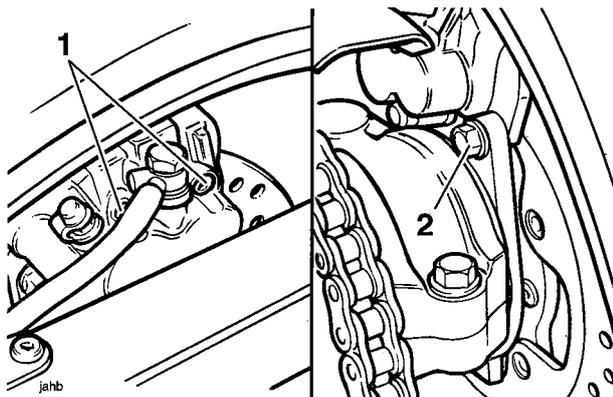
15. Refit the seat (see page 16-8).
16. Remove the bleed tube from the nipple.
17. Replace the bleed nipple dust cap.
18. Check that the brake operates correctly.

## Warning

It is dangerous to operate the motorcycle with defective brakes and you must have your authorised Triumph Dealer take remedial action. Failure to take remedial action may reduce braking efficiency leading to loss of motorcycle control and an accident.

## Rear Brake Pads

### Removal



1. Pad Retaining Pins
2. Caliper Mounting Bolts

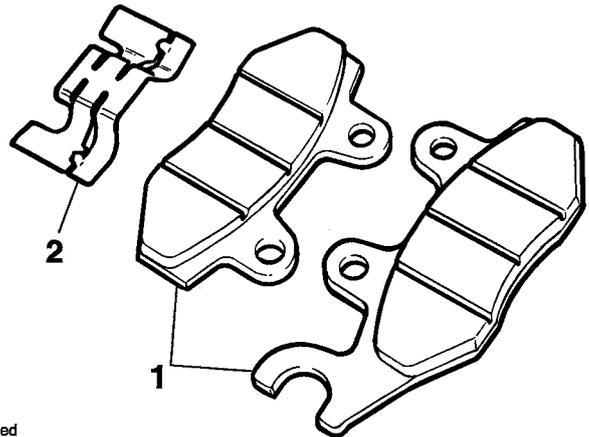
1. Remove the rear brake hose cover and upper chain guard.
2. Slacken the brake pad retaining pins.

## 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.

# Brakes

## 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 **40 Nm**.
7. Tighten the brake pad retaining pin to **19 Nm**.
8. Pump the brake pedal to correctly position the caliper pistons.
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.
11. Check that the brake operates correctly.

## Warning

It is dangerous to operate the motorcycle with defective brakes and you must have your authorised Triumph Dealer take remedial action. Failure to take remedial action may reduce braking efficiency leading to loss of motorcycle control and an accident.

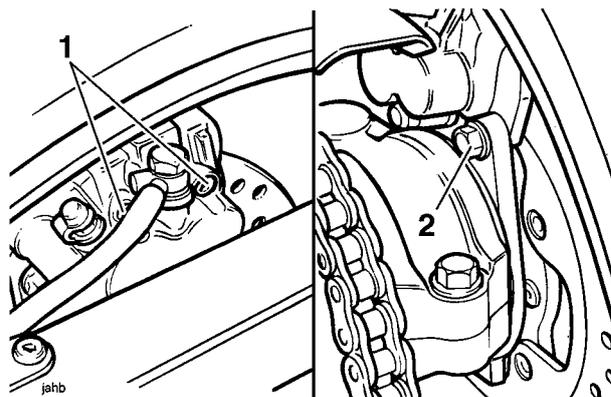
## Rear Brake Caliper

### 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.
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 (1 of 2)

### Disassembly

1. Remove the brake pads (see page 14-23).

## 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 (see page 14-13).

## 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.

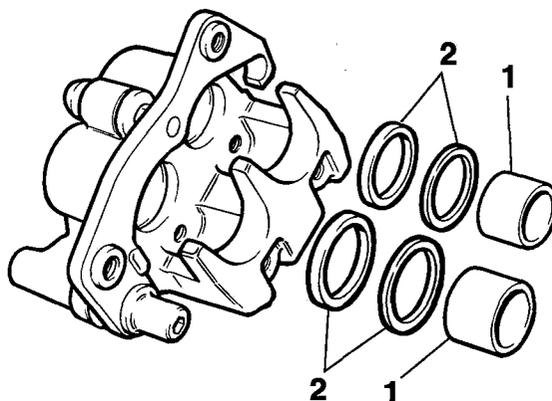
A dangerous riding condition leading to an accident could result if this warning is ignored.

### 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.



gaec

1. Pistons

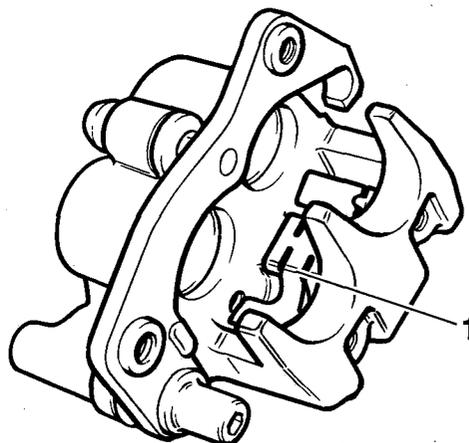
2. Seals

### 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.



akw

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.

# Brakes

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 **19 Nm**.
4. Connect the brake hose to the caliper using new washers on each side of the banjo bolt.
5. Tighten the brake light switch to **15 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 rear brake (see page 14-21).
8. Refit the upper chain guard and rear brake hose cover.
9. Check that the brake operates correctly.

**Warning**

It is dangerous to operate the motorcycle with defective brakes and you must have your authorised Triumph Dealer take remedial action. Failure to take remedial action may reduce braking efficiency leading to loss of motorcycle control and an accident.

## Rear Brake Disc

### Wear

1. Replace any brake disc if worn beyond the service limit or that exceeds the disc run-out limit.

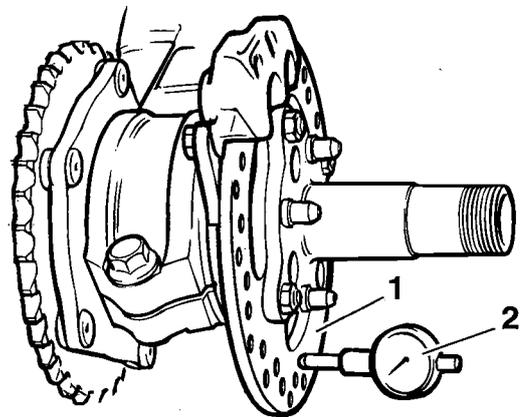
### Rear Disc Thickness

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
2. Dial Gauge

### Removal

1. Remove the rear axle shaft (see page 12.17).
2. Support the axle shaft carefully to avoid damage to the disc or axle shaft threads.
3. Motorcycles with ABS: Remove the ABS pulser ring and spacer (see page 14-31).
4. Remove and discard the 4 bolts to detach the disc.

### Installation

1. Locate the disc on the axle shaft.
2. Fit new bolts and tighten to **22 Nm**.
3. Motorcycles with ABS: Refit the ABS pulser ring and spacer (see page 14-31)
4. Thoroughly clean and degrease the disc.
5. Refit the axle shaft (see page 12.19).
6. Check that the brake operates correctly.

## Rear Master Cylinder

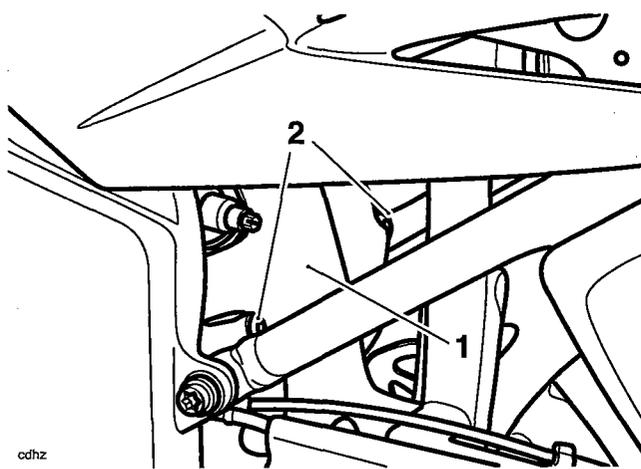
### Removal

1. Remove the seat (see page 16-8).
2. Disconnect the battery negative (black) lead first.

### ! Caution

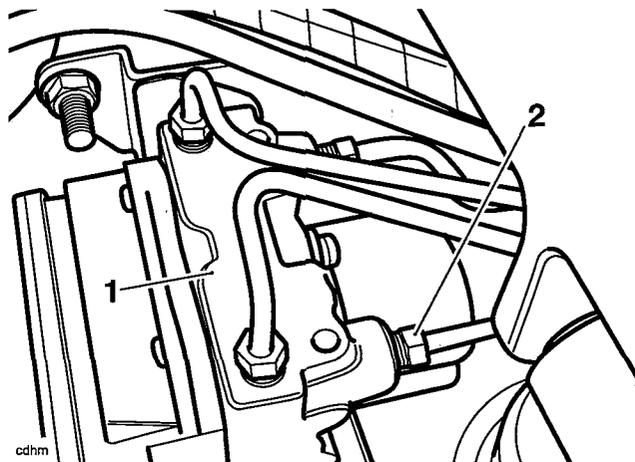
To prevent body damage, do not spill brake fluid onto any area of the bodywork or wheels.

3. Drain the fluid from the master cylinder by bleeding the system at the rear caliper until all fluid has been expelled (see page 14-21).
4. Remove the clip and washer from the clevis pin at the lower end of the brake pushrod. Remove the clevis pin.
5. Carefully slide the cover off the brake light switch and disconnect the brake light switch multiplug.
6. Disconnect the reservoir hose from the master cylinder.
7. Models without ABS brakes: Disconnect the rear brake hose (noting orientation).
8. Models with ABS brakes: Remove the rear wheel splash shield.



1. Splash Shield
2. Fixings

9. Models with ABS brakes: Loosen the rear brake line union and, taking care not to bend the brake line, detach the line from the ABS modulator.



1. ABS Modulator
2. Rear Brake Line Union

10. Remove the nuts securing the master cylinder to the frame and collect the master cylinder.
11. Models with ABS brakes: Noting the orientation, remove the rear brake line from the master cylinder.

### Disassembly

1. Detach the boot from the cylinder and pushrod.
2. Remove and discard 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.

# Brakes

## 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.

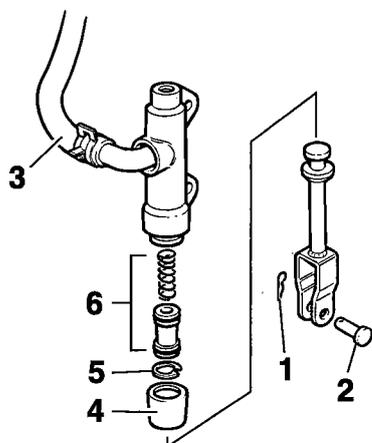
A dangerous riding condition leading to an accident could result if this warning is ignored.

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. Models with ABS brakes: Incorporating new washers, fit the brake line and brake light switch to the master cylinder. Ensuring the brake line is located as noted on removal, tighten the switch to **15 Nm**.
2. Connect the reservoir hose to the master cylinder.
3. Secure the master cylinder to the frame studs. Tighten the securing nuts to **20 Nm**.
4. Models with ABS brakes: Taking care not to bend the brake line, refit the rear brake line to the ABS modulator and tighten to **17 Nm**.
5. Models with ABS brakes: Fit the rear wheel splash shield. Tighten the fixings to **3 Nm**.
6. Connect the push rod to the brake pedal using the clevis pin and a new split pin.
7. Models without ABS brakes: Incorporating 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 **15 Nm**.
8. Connect the brake light switch multiplug 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.

9. Fill and bleed the rear brake (see page 14-21).
10. Reconnect the battery positive, (red) lead first.
11. Fit the seat (see page 16-8).

**Warning**

It is dangerous to operate the motorcycle with defective brakes and you must have your authorised Triumph Dealer take remedial action. Failure to take remedial action may reduce braking efficiency leading to loss of motorcycle control and an accident.

12. Check that the brake operates correctly.

## Bleeding the Front Brakes, Renewing Brake Fluid, Motorcycles with ABS

1. Complete the brake bleed procedure as for models without ABS brakes (see page 14-14).
2. Connect the Triumph service diagnostic tool (See page 14-47).
3. Follow the on screen menu to ABS diagnostics. From the menu, select 'BLEED SYSTEM' (see page 14-52).
4. Select 'BLEED SYSTEM?' from the menu (see page 14-53).

### Note:

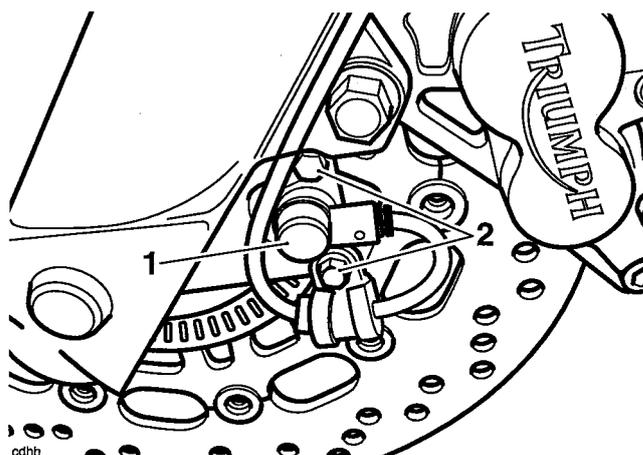
- When the ABS modulator 2<sup>nd</sup> circuit is activated by the bleed command, the front brake lever travel will increase as ABS modulator solenoids are opened and will then decrease as the solenoids are automatically closed.
  - Pressure must be applied to the front brake lever before operating the bleed sequence on the diagnostic tool. An assistant will be required to open the bleed nipple while pressure is applied to the brake lever.
5. Apply pressure to the front brake lever, activate the bleed sequence on the diagnostic tool, and with assistance, release the bleed nipple.
  6. Repeat the above procedure as necessary until all air is expelled from the system.
  7. When all air has been expelled from the system, apply pressure to the brake lever and close the bleed nipple. Tighten the nipple to **6 Nm**.
  8. Repeat the brake bleed procedure as for models without ABS brakes (see page 14-14).

## Front ABS Wheel Speed Sensor

### Removal

1. Remove the seat (see page 16-8).
2. Disconnect the battery, negative (black) lead first.
3. Disconnect the wheel speed sensor multiplug.
4. Release the wheel speed sensor harness from the brake hose clips.
5. Release the bolt securing the wheel speed sensor harness to the fork leg.

6. Release the bolts securing the wheel speed sensor to the fork leg, and remove the sensor.



1. Front ABS Wheel Speed Sensor
2. Fixings

### Installation

1. Position the wheel speed sensor to the fork leg and tighten the fixings to **9 Nm**.
2. Secure the wheel speed sensor harness to the fork leg and tighten the fixing to **9 Nm**.
3. Secure the wheel speed sensor harness to the brake hose clips.
4. Connect the wheel speed sensor multiplug.
5. Connect the battery, positive (red) lead first.
6. Fit the seat (see page 16-8).

## Front ABS Pulsar ring

### Removal

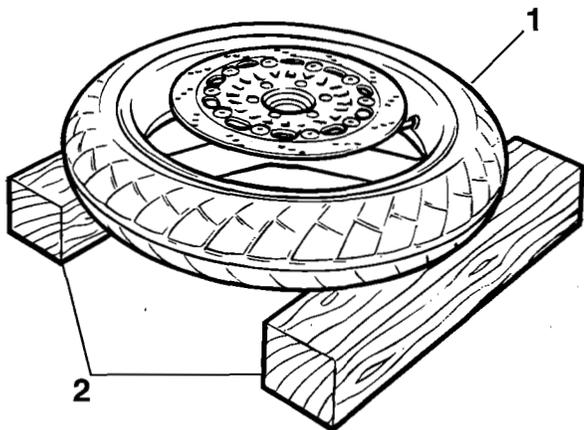
1. Remove the front wheel (see page 15-6).

**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.

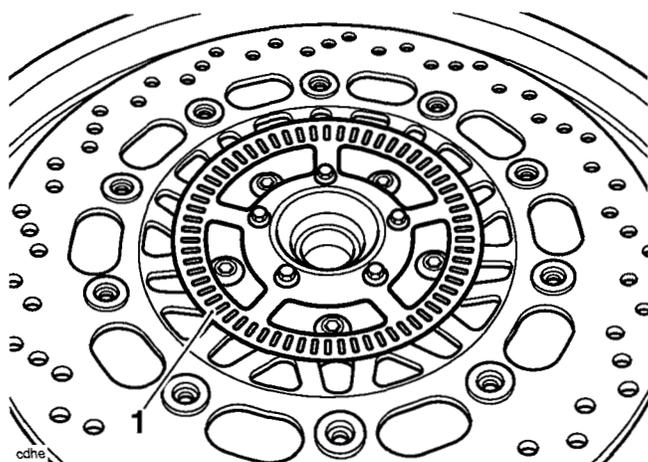
2. Support the wheel on blocks as illustrated to avoid damage to the wheel centre.

# Brakes



- gads
1. Wheel
  2. Support Block

3. Remove the 5 bolts to detach the pulser ring.



- cdhe
1. Pulser Ring

## Inspection

1. Check the pulser ring for damaged, missing or cracked teeth or distortion. Renew the pulser ring as necessary.

## Installation

1. Locate the pulser ring on the wheel. Tighten the fixings to **5 Nm**.
2. Refit the front wheel (see page 15-7).

## Bleeding the Rear Brakes, Renewing Brake Fluid, Motorcycles with ABS

1. Complete the brake bleed procedure as for models without ABS brakes (see page 14-21).
2. Connect the Triumph service diagnostic tool (See page 14-47).

3. Follow the on screen menu to ABS diagnostics. From the menu, select 'BLEED SYSTEM' (see page 14-52).
4. Select 'BLEED SYSTEM?' from the menu (see page 14-53).

### Note:

- When the ABS modulator 2<sup>nd</sup> circuit is activated by the bleed command, the rear brake pedal travel will increase as ABS modulator solenoids are opened and will then decrease as the solenoids are automatically closed.
  - Pressure must be applied to the rear brake pedal before operating the bleed sequence on the diagnostic tool. An assistant will be required to open the bleed nipple while pressure is applied to the brake pedal.
5. Apply pressure to the front brake lever, activate the bleed sequence on the diagnostic tool, and with assistance, release the bleed nipple.
  6. Repeat the above procedure as necessary until all air is expelled from the system.
  7. When all air has been expelled from the system, hold down the brake pedal and close the bleed nipple. Tighten the nipple to **6 Nm**.
  8. Repeat the brake bleed procedure as for models without ABS brakes (see page 14-21).

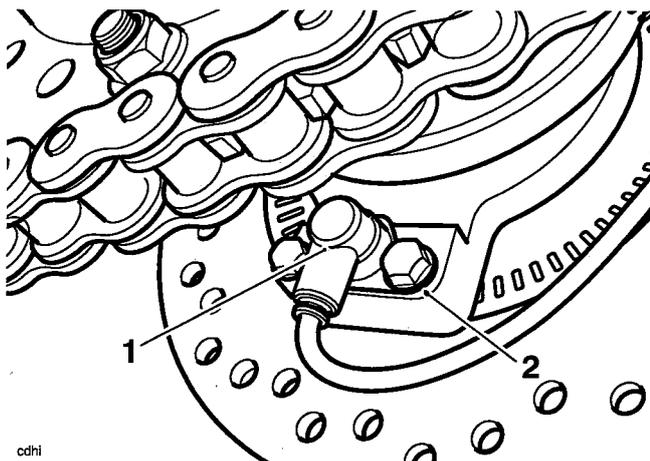
## Rear ABS Wheel Speed Sensor

### Removal

1. Remove the seat (see page 16-8).
2. Disconnect the battery, negative (black) lead first.
3. Remove the fuel tank (see page 10-87).
4. Disconnect the wheel speed sensor multiplug.
5. Release the screws and remove the brake hose guide from the chain guard.
6. Release the wheel speed sensor harness from the clips.

**Note:** Note the position of the shim.

- Release the bolts securing the wheel speed sensor to the rear brake caliper carrier, and remove the sensor. Collect the shim.



- Rear ABS Wheel Speed Sensor
- Shim Position

## Installation

**Note:**

- Check the condition of the shim before use. Do not use a shim which has been bent or damaged.

- Position the shim to the rear wheel speed sensor such that the shim will be installed between the wheel speed sensor and the brake caliper carrier.
- Position the wheel speed sensor to the brake caliper carrier and tighten the fixings to **9 Nm**.

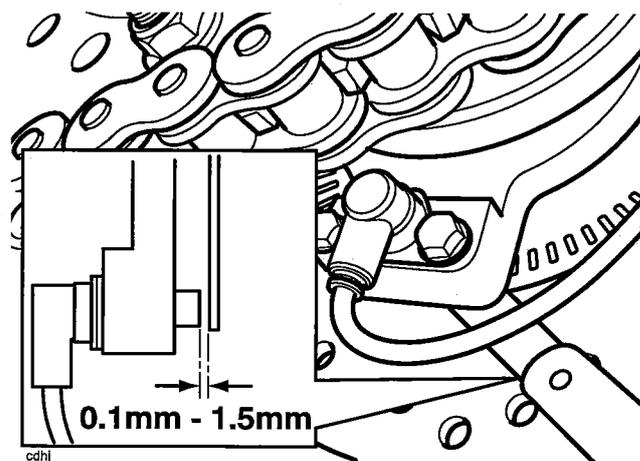


## Caution

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.

- Carefully slide the caliper carrier towards the brake disc to eliminate any play in the caliper carrier.
- Using feeler gauges, measure the air gap between the wheel speed sensor and the pulser ring.
- Carefully slide the caliper carrier away from the brake disc to eliminate any play in the caliper carrier.

- Repeat the air gap measurement.



## ABS wheel speed sensor air gap measurement

- Rotate the wheel and repeat the measurement in several places to ensure the pulser ring is not distorted or bent. Renew a damaged pulser ring.
- Adjust the air gap using the correct shim to achieve an air gap of between 0.1 mm to 1.5 mm.

**Note:** Shims are available in the following 4 sizes:

- 0.5 mm
- 1.0 mm
- 1.5 mm
- 2.0 mm

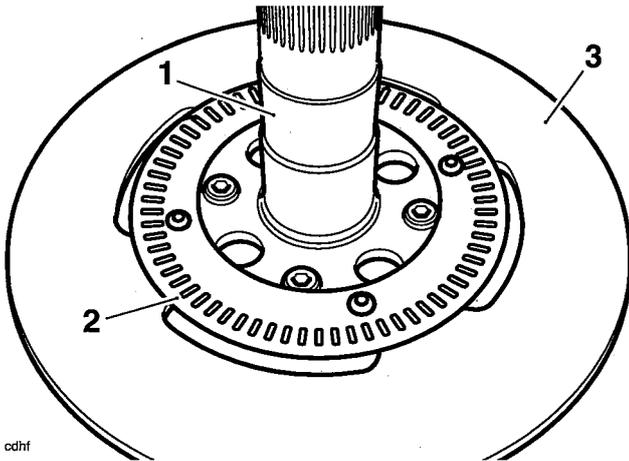
- If necessary, release the wheel speed sensor, fit the correct thickness shim and refit the wheel speed sensor. Tighten the fixings to **9 Nm**.
- Repeat the air gap measurement. Re-adjust as necessary.
- Reposition the brake hose guide to the chain guard, ensuring the brake hose and wheel speed sensor harness are correctly routed. Tighten the fixings to **2 Nm**.
- Secure the wheel speed sensor harness to the brake hose clips.
- Connect the wheel speed sensor multiplug.
- Refit the fuel tank (see page 10-88).
- Connect the battery, (red) lead first.
- Fit the seat (see page 16-8).

## Rear ABS Pulser Ring

### Removal

- Remove the rear axle shaft (see page 12.17).
- Remove the 4 bolts to detach the pulser ring from the rear brakes disc. Collect the spacer ring.

# Brakes



- cdhf
1. Axle Shaft
  2. Pulser Ring
  3. Brake Disc

## Inspection

1. Check the pulser ring for damaged, missing or cracked teeth or distortion. Renew the pulser ring as necessary.

## Installation

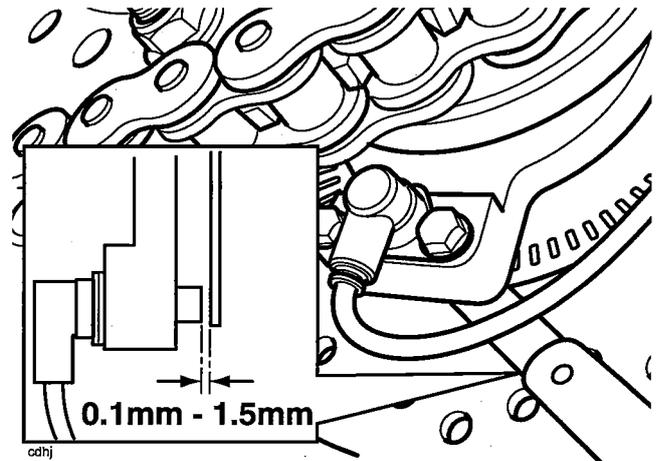
1. Locate the spacer ring on to the rear brake disc.
2. Locate the pulser ring on to the rear brake disc and tighten the fixings to **5 Nm**.
3. Refit the rear axle shaft (see page 12-19).



## 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.

4. Carefully slide the caliper carrier towards the brake disc to eliminate any free-play in the caliper carrier.
5. Using feeler gauges, measure the air gap between the wheel speed sensor and the pulser ring.
6. Carefully slide the caliper carrier away from the brake disc to eliminate any free-play in the caliper carrier.
7. Repeat the air gap measurement.



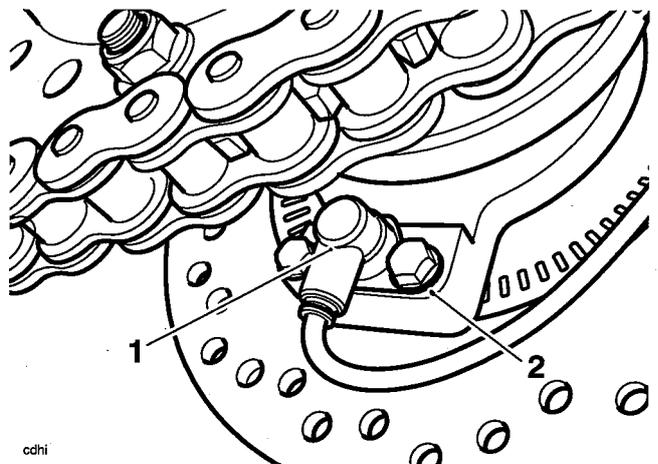
## ABS wheel speed sensor air gap measurement

8. Rotate the wheel and repeat the measurement in several places to ensure the pulser ring is not distorted or bent. Renew a damaged pulser ring.
9. Adjust the air gap using the correct shim to achieve an air gap of between 0.1 mm to 1.5 mm.

**Note: Shims are available in the following 4 sizes:**

- 0.5 mm
- 1.0 mm
- 1.5 mm
- 2.0 mm

10. If necessary, release the wheel speed sensor, fit the correct thickness shim and refit the wheel speed sensor. Tighten the fixings to **9 Nm**.



1. Rear ABS Wheel Speed Sensor
2. Shim Position

11. Repeat the air gap measurement. Re-adjust as necessary.

## .ABS Hydraulic Modulator / ECM

### Removal

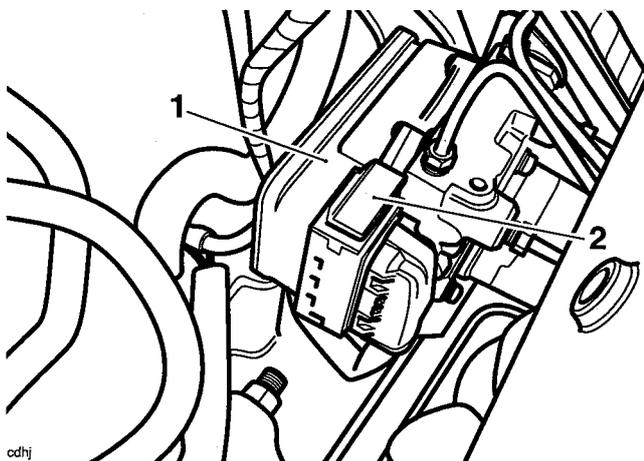
1. Remove the seat (see page 16-8).
2. Disconnect the battery negative (black) lead first.
3. Remove the fuel tank (see page 10-87).



### Caution

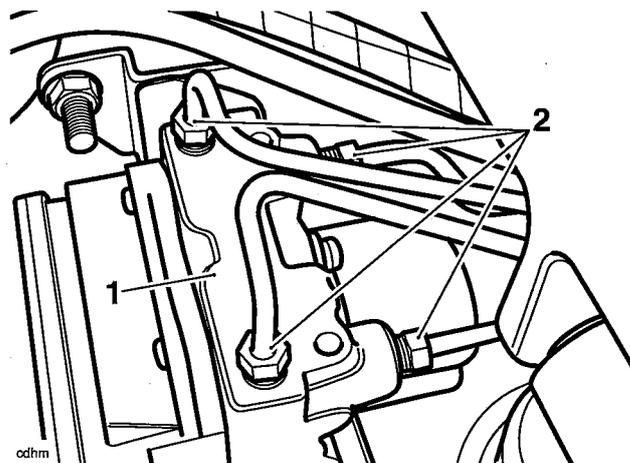
To prevent body damage, do not spill brake fluid onto any area of the bodywork or wheels.

4. Drain the fluid from the front 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 (see page 14-14).
5. Drain the fluid from the rear master cylinder by bleeding the system at the rear caliper until all fluid has been expelled (see page 14-21).
6. Disconnect the ABS modulator multiplug (See page 14-56).



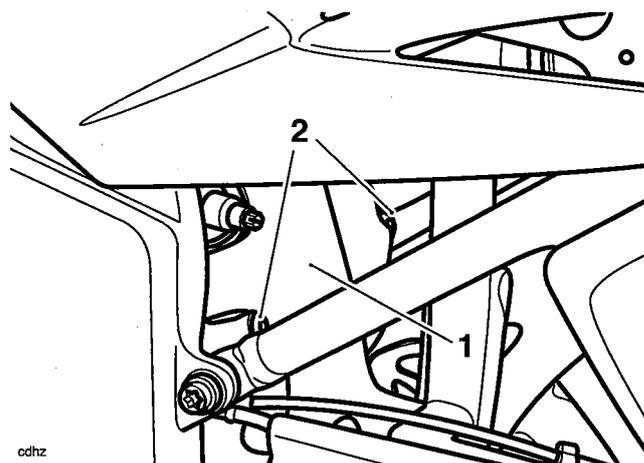
1. ABS Modulator
2. Multiplug

7. Carefully slide the cover off the brake light switch and disconnect the switch wires.
8. Loosen the 4 brake line unions and, taking care not to bend the brake lines, detach the lines from the ABS modulator.



1. ABS Modulator
2. Brake Line Unions

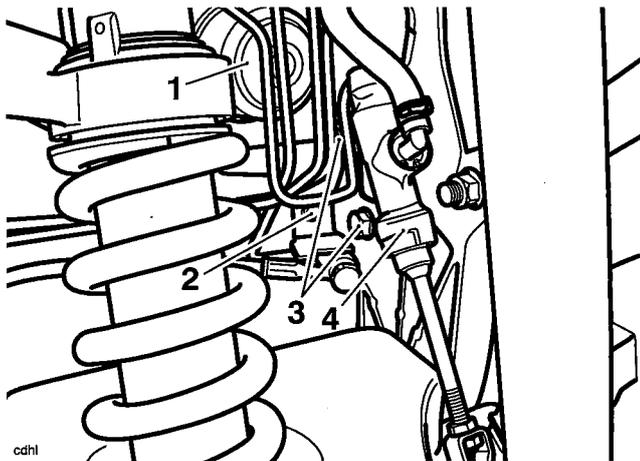
9. Remove the clip and washer from the clevis pin at the lower end of the brake pushrod. Remove the clevis pin.
10. Remove the 2 fixings securing the rear wheel splash shield to the frame and remove the shield.



1. Splash Shield
2. Fixings

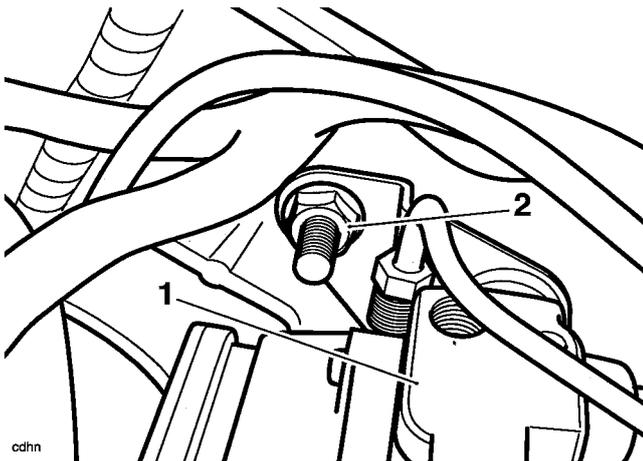
11. Remove the bolt securing the rear brake line to the ABS modulator mounting bracket.
12. Remove and discard the 2 nuts securing the rear master cylinder to the ABS modulator mounting bracket.
13. Noting the routing of the brake line from the modulator to the rear master cylinder, withdraw the master cylinder from the frame studs and position aside.

## Brakes



1. ABS Modulator
2. Rear Brake Line Fixing
3. Rear Master Cylinder Fixings
4. Rear Master Cylinder

14. Remove and discard the upper ABS modulator fixing nut, and withdraw the modulator from the frame studs.



1. ABS Modulator
2. Upper Fixing

15. Carefully manoeuvre the modulator from the frame, taking care not to damage the rear suspension unit. If the modulator is to be renewed, remove the mounting bracket from the modulator.

### Installation

1. Install the mounting bracket to the modulator. Tighten the fixings to **9 Nm**.
2. Carefully manoeuvre the modulator on to the frame studs, taking care not to damage the rear suspension unit. Fit but do not fully tighten a new upper fixing nut.

3. Refit the rear master cylinder, ensuring the brake line is correctly routed as noted on removal. Fit new nuts.
4. Tighten the rear master cylinder and upper ABS modulator fixing to **20 Nm**.
5. Fit the rear wheel splash shield. Tighten the fixings to **3 Nm**.
6. Connect the push rod to the brake pedal using the clevis pin and a new split pin.
7. Connect the brake light switch multiplug and refit the cover.
8. Taking care not to bend the brake lines, refit the lines to the modulator and tighten to **17 Nm**.
9. Reconnect the ABS modulator multiplug, ensuring the locking device is fully engaged.
10. Bleed the front brakes (see page 14-29).
11. Bleed the rear brakes (see page 14-30).
12. Refit the fuel tank (see page 10-88).
13. Connect the battery positive (red) lead first.



### Warning

It is dangerous to operate the motorcycle with defective brakes and you must have your authorised Triumph Dealer take remedial action. Failure to take remedial action may reduce braking efficiency leading to loss of motorcycle control and an accident.

14. Refit the seat (see page 16-8).
15. Check that the brakes operate correctly.

## ABS

### System Description

The ABS versions of the Sprint ST are fitted with an electronic anti-lock brake system (ABS) which is designed to prevent the wheels from locking or skidding by reducing braking effort to the front or rear brake caliper as required.

The system consists of a hydraulic modulator and ECM assembly mounted to a bracket beneath the fuel tank, a front wheel speed sensor mounted to the front fork, and a rear wheel speed sensor mounted to the rear brake caliper carrier.

Both front and rear wheels have a pulser ring mounted on to the wheel, the front being mounted to the wheel hub, the rear being mounted to the rear brake disc.

The front and rear master cylinders are connected via lines to the modulator and from the modulator the pipes connect to the brake calipers. The calipers and master cylinders are identical to the non-ABS equipped motorcycle.

The front and rear brake circuits operate as separate systems. The front and rear brakes are not connected in any way inside the modulator.

The modulator ECM continuously calculates the front and rear wheel speeds, and from these inputs the ECM calculates the estimated motorcycle speed, wheel deceleration/acceleration, the wheel speed difference and the wheel slip (skid) rate. This is calculated by comparing the calculated wheel speeds with the calculated vehicle speed, so that if one wheel speed deviates significantly from the other two readings, this wheel is calculated to be slipping (skidding).

Under braking, if the modulator detects that either wheel is about to slip, due to the brake force exceeding the available traction between the tyre and road surface (the wheel will begin to slip or 'skid'), the ECM very rapidly releases and re-applies the brake pressure to prevent the wheel from slipping.

This is felt through the brake pedal or lever as a rapid 'pulsing'.

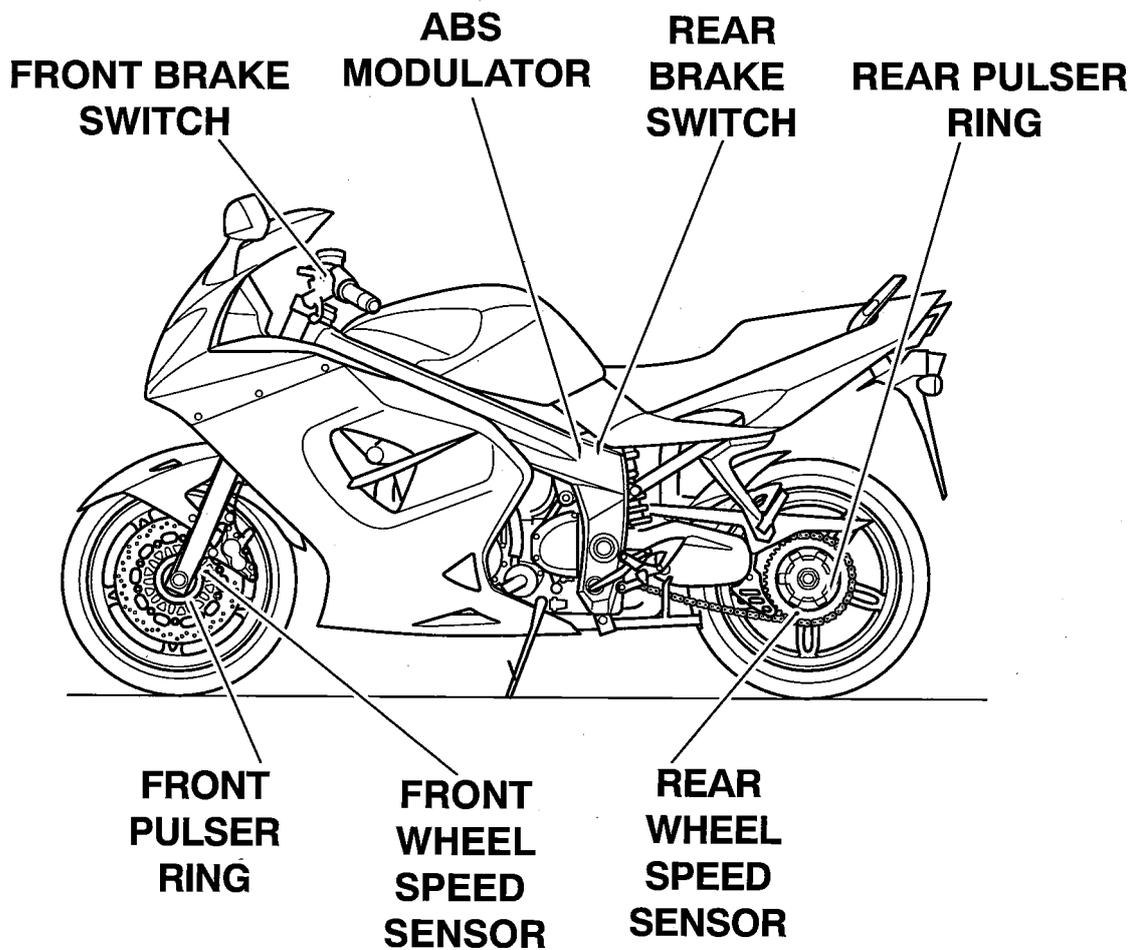
If the rider reduces braking effort, or traction increases (so that traction exceeds braking force, the wheel will rotate once more) the wheel will no longer lock up. The ABS system will detect this and stop controlling brake pressure, and return to its monitoring state.

The system has a self diagnostic function built-in which monitors the fail safe relay, solenoid valves, motor relay, wheel speed sensors, power supply and ground, as well as internal ECM functions. In the event of a malfunction being detected, the ECM will illuminate the ABS warning light, and store a diagnostic trouble code in the system memory. This stored data can then be recovered 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.

Under normal operation, the ABS warning light will stay illuminated after ignition on until the vehicle speed exceeds 6 km/h. The ABS performs a self check and if no faults are found the light is extinguished. If a trouble code is stored the ABS warning light will stay illuminated and the ABS will not function, however the brakes will operate normally. If the ABS warning light does not extinguish, or illuminates whilst the motorcycle is being ridden, refer to the ABS system diagnostics (see page 14.39).

# Brakes

## Component Locations



## ABS System Circuit Diagram - Sprint ST

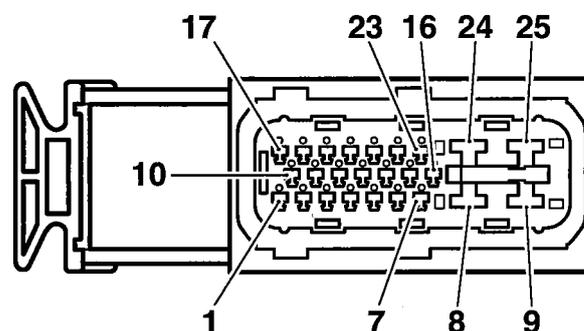
### Key To Wiring Circuit Diagram

Key	Item Description
1	Fuse Box (Fuses 2 to 5)
2	Headlamp Relay
3	Ignition Switch
4	ABS Module
5	Diagnostic Connector
6	Engine Control Module
7	Front Wheel Speed Sensor
8	Rear Wheel Speed Sensor
9	Instruments
10	Rear Brake Light Switch Sub Harness Connector
11	Rear Brake Light Switch
12	Front Brake Light Switch
13	Brake Light

### Key To Wiring Colour Codes

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

### ABS ECM Connector Pin Numbering



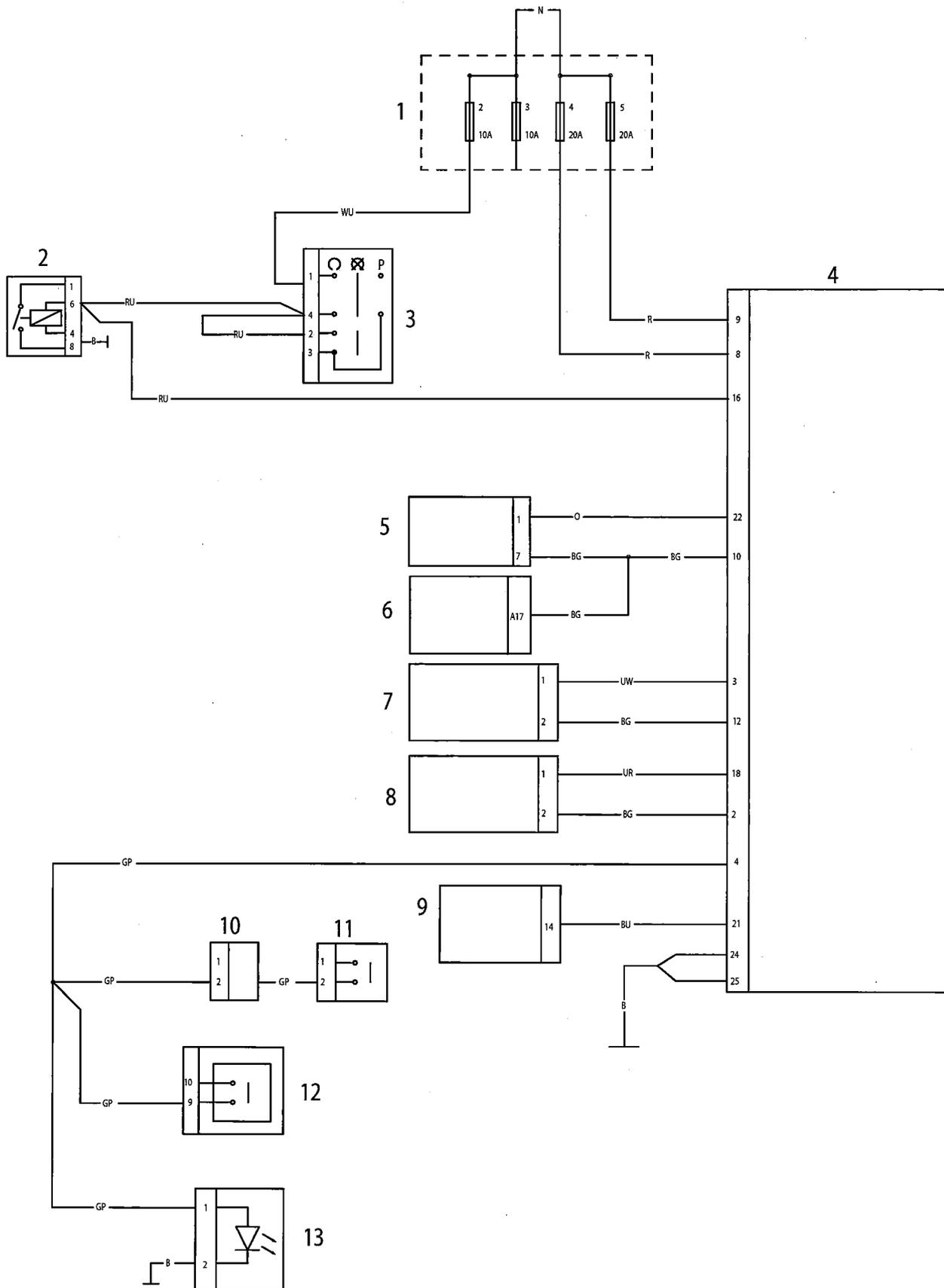
cdhg

The above illustration shows the pin numbering system used in the ABS circuit diagram.

As viewed on the mating face with the ABS ECM (as per the illustration), pins are numbered from left to right with number one in the bottom left hand corner.

# Brakes

## ABS System Circuit Diagram - Sprint ST

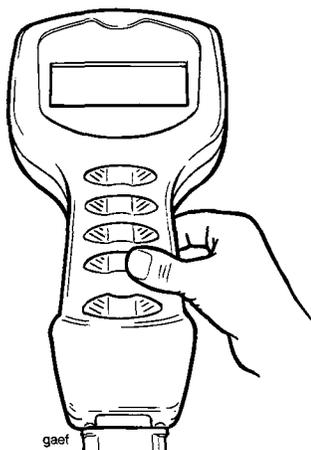


## System Diagnostics

The ABS 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 in the right hand storage compartment. 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, read build data and bleed the brake system. The data and tests available are described on the following pages.



### 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 ABS data can be recovered from the motorcycle. The data available is:

Function Examined	Result Reported (Scale)
Front wheel speed	KPH
Rear wheel speed	KPH
Brake switch status	ON / OFF
ABS warning light status	ON / OFF

### Bleed System

Using the Triumph diagnostic tool, it is possible to bleed the ABS modulator of trapped air. This is necessary when the hydraulic brake system has been dismantled, or the ABS modulator renewed.

Full details of this procedure are provided later in this section.

### Build data

The following items of build data can also be read.

Function Examined
ECM serial number

# Brakes

## Diagnostic Trouble Codes

Diagnostic trouble codes (DTCs) are logged in the ABS 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.

DTCs can be removed at any time using the Triumph diagnostic tool

The system will log the diagnostic trouble codes listed below:

Diagnostic Trouble Code (DTC)	Fault Description
C1611	Front Wheel Sensor Open Circuit / Short Circuit
C1612	Front Wheel Sensor Abnormal Input / Loosing Contact
C1613	Rear Wheel Sensor Open Circuit / Short Circuit
C1614	Rear Wheel Sensor Abnormal Input / Loosing Contact
C1621	Front Wheel Pulser Gear Missing Teeth
C1623	Rear Wheel Pulser Gear Missing Teeth
C1631	Front Wheel Input Solenoid Open / Short Circuit
C1632	Front Wheel Output Solenoid Open / Short Circuit
C1633	Rear Wheel Input Solenoid Open / Short Circuit
C1634	Rear Wheel Output Solenoid Open / Short Circuit
C1641	Front Wheel Actuator (Hydraulic Control) Wheel Lock
C1643	Rear Wheel Actuator (Hydraulic Control) Wheel Lock
C1651	Motor - Lock
C1652	Motor - Stuck OFF
C1653	Motor - Stuck ON
C1654	Solenoid Relay - Stuck OFF/ON
C1661	Power Source Voltage Drop
C1662	Power Source Voltage Rise
C1671	Different Tyre Diameter
C1681	Abnormal ECU

# Brakes

## Diagnostic Trouble Codes

Dependant on the DTC stored, the ABS ECM will act in one of two ways:

- Inhibit ABS operation immediately, irrespective of the ABS operating mode.

Or:

- Allow the ABS operation to complete before inhibiting the ABS.

Once the ABS ECM has inhibited ABS function, the ECM will act in one of three ways:

- Allow the ABS to resume operation if the fault clears.

Or:

- Allow ABS operation after an ignition cycle if the fault clears.

Or:

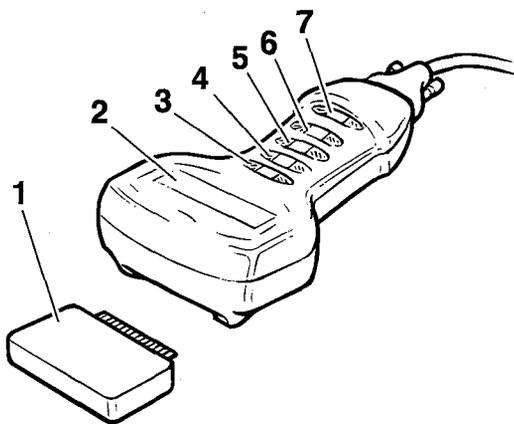
- Inhibit the ABS function until the fault is rectified and the DTC erased.

The ABS system will act on the DTC stored according to the following table:

Fault Description	ABS warning light illuminated when fault is logged	ABS operation is inhibited when fault is logged	ABS continues to operate when fault is logged (Only when ABS is Active. When ABS is no longer active, operation is inhibited)	ABS will resume operation if fault clears
Front Wheel Sensor Open Circuit / Short Circuit	Yes	Yes		No
Front Wheel Sensor Abnormal Input / Loosing Contact	Yes	Yes	Yes	Yes, if after ignition cycle, no fault is detected. DTC remains stored
Rear Wheel Sensor Open Circuit / Short Circuit	Yes	Yes		No
Rear Wheel Sensor Abnormal Input / Loosing Contact	Yes	Yes	Yes	Yes, if after ignition cycle, no fault is detected. DTC remains stored
Front Wheel Pulser Gear Missing Teeth	Yes		Yes	Yes, if after ignition cycle, no fault is detected for 1 second and speed exceeds 30 km/h. DTC remains stored
Rear Wheel Pulser Gear Missing Teeth	Yes		Yes	Yes, if after ignition cycle, no fault is detected for 1 second and speed exceeds 30 km/h. DTC remains stored
Front Wheel Input Solenoid Open / Short Circuit	Yes	Yes		No
Front Wheel Output Solenoid Open / Short Circuit	Yes		Yes	No

<b>Fault Description</b>	<b>ABS warning light illuminated when fault is logged</b>	<b>ABS operation is inhibited when fault is logged</b>	<b>ABS continues to operate when fault is logged (Only when ABS is Active. When ABS is no longer active, operation is inhibited)</b>	<b>ABS will resume operation if fault clears</b>
Rear Wheel Input Solenoid Open / Short Circuit	Yes	Yes		No
Rear Wheel Output Solenoid Open / Short Circuit	Yes		Yes	No
Front Wheel Actuator (Hydraulic Control) Wheel Lock	Yes		Yes	Yes, if after ignition cycle, no fault is detected. DTC remains stored
Rear Wheel Actuator (Hydraulic Control) Wheel Lock	Yes		Yes	Yes, if after ignition cycle, no fault is detected. DTC remains stored
Motor - Lock	Yes		Yes	No
Motor - Stuck OFF	Yes		Yes	No
Motor - Stuck ON	Yes		Yes	No
Solenoid Relay - Stuck OFF/ ON	Yes	Yes		No
Power Source Voltage Drop	Yes, Light will extinguish if fault clears	Yes		Yes, if voltage rises above a preset threshold for more than 10 seconds
Power Source Voltage Rise	Yes, Light will extinguish if fault clears	Yes		Yes, if voltage drops below a preset threshold for more than 10 seconds
Different Tyre Diameter	Yes	Yes		No
Abnormal ECU	Yes	Yes		No

## Service Diagnostic Tool



gaic

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
- Bleed the system

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

The screen comprises four horizontal lines and twenty vertical columns forming a series of boxes into which letters and numbers can be displayed to provide the necessary question, message, answer etc.

At the left of the screen, one or more symbols as detailed below may be displayed.

				A	B	S		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
▼				C	L	E	A	R		D	T	C	S						

### Typical screen showing symbol examples

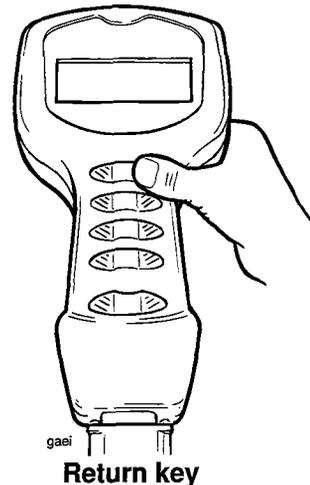
▲▼ Cursors to indicate that further lines of text are available to be seen above and/or below those already in view, by scrolling the text up or down using the 'Up' or 'Down' keys.

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

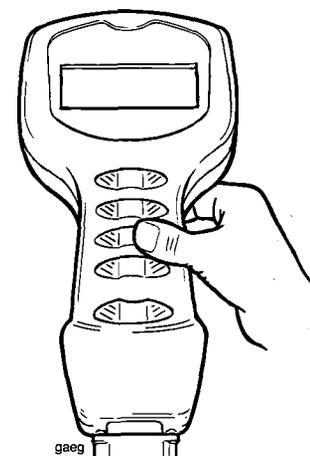
? Indicates further help/guidance information available on that line by pressing the help key.

## Tool Keys

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

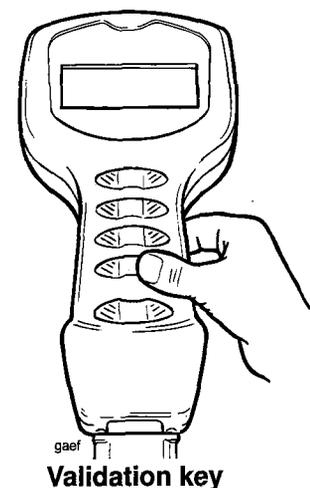


The Up and Down keys - press to move the lines of text up or down.

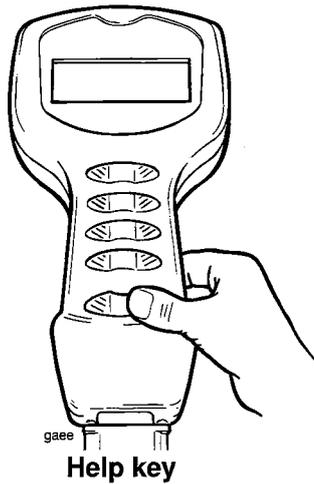


### Up/down keys (2 separate keys)

Press the **Validation** key (\*) to move on to the next message.



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.

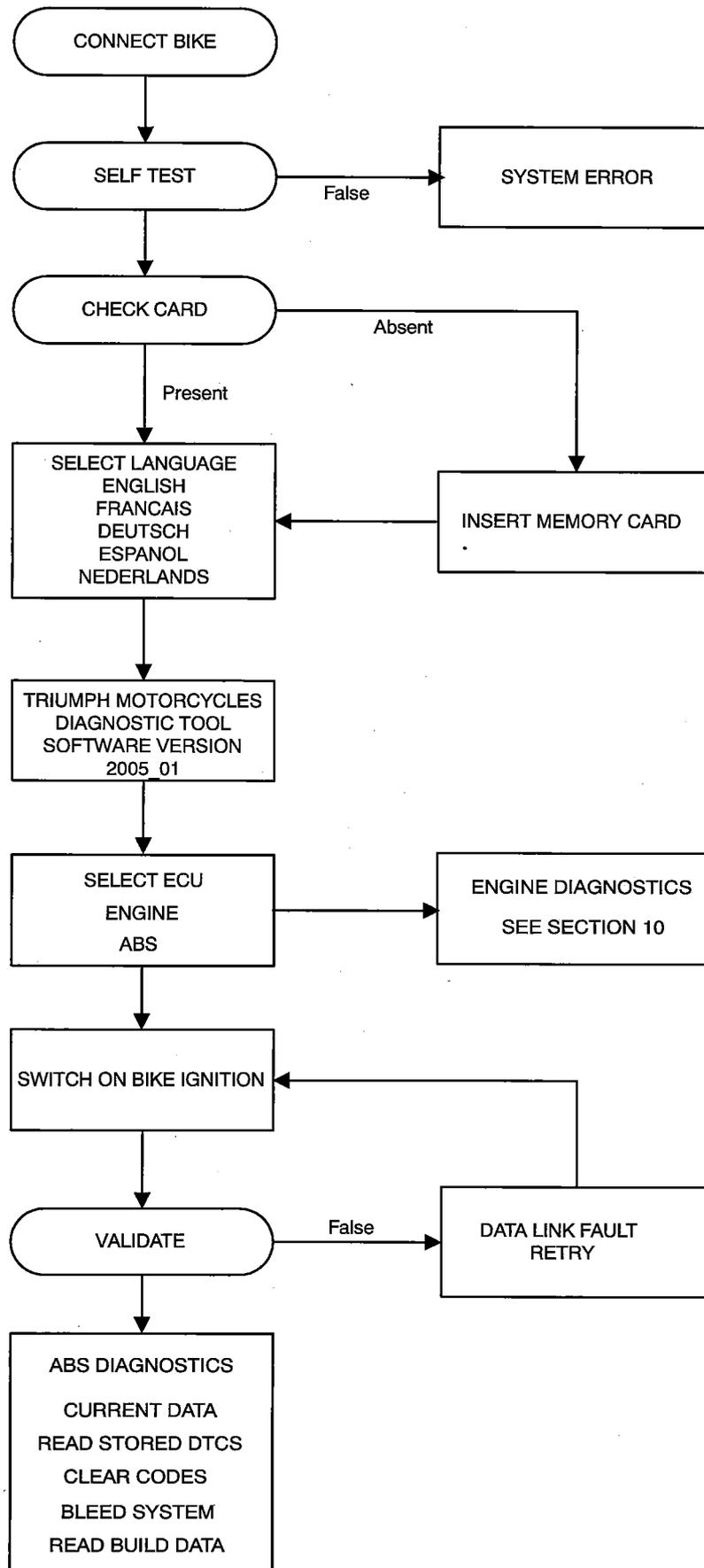


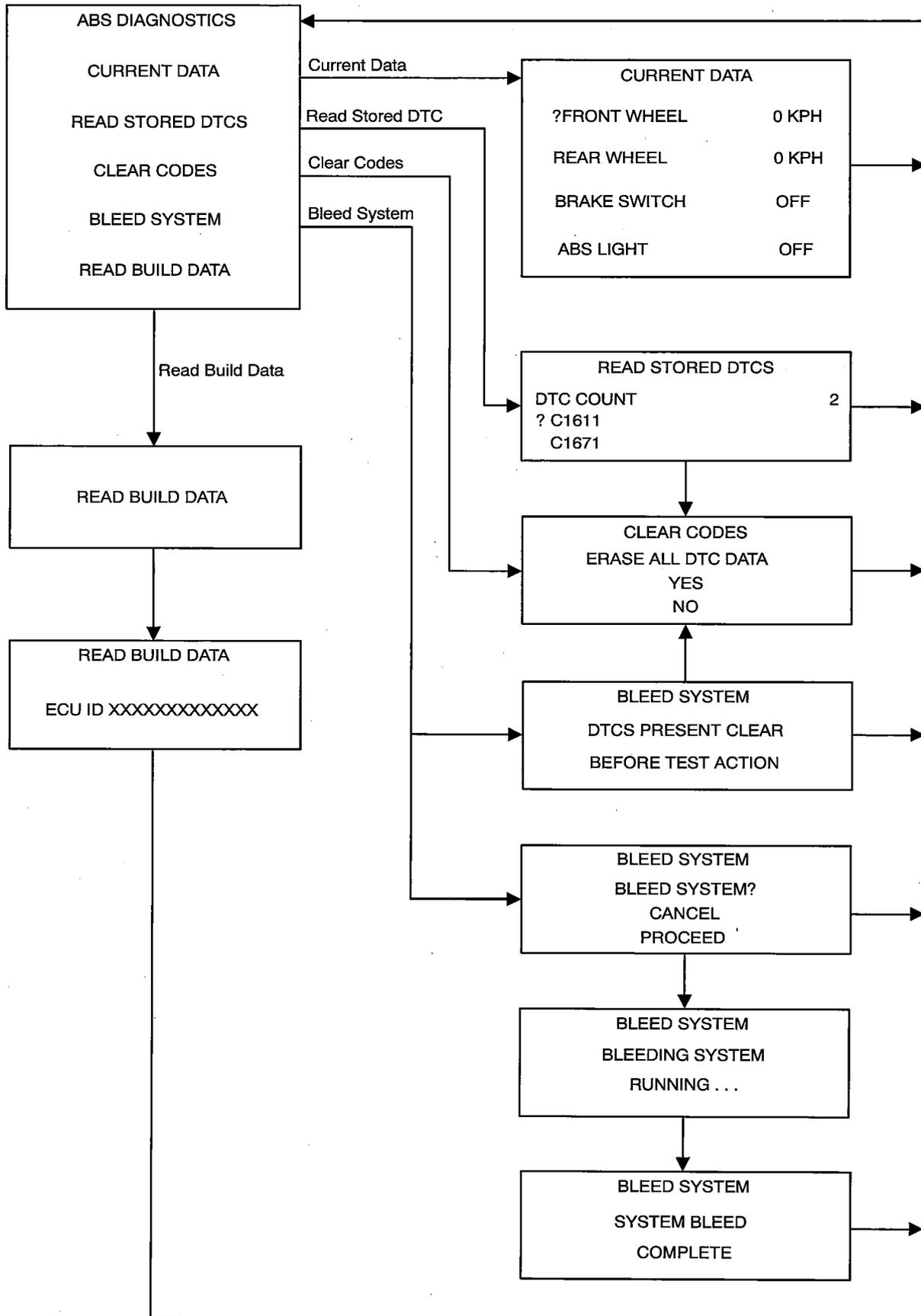
## Test Procedure

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:

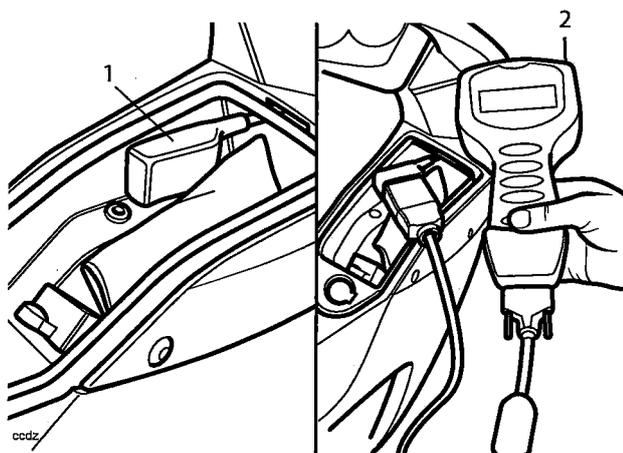
- **The tool does not retain any memory of faults, diagnosis etc. carried out on any particular motorcycle. Any such memory is only retained in the motorcycle's ECM.**
- **The following pages describe the tool operation in flow chart form.**





# Brakes

## 1. Connection and Power-Up



1. Connection to Main Harness (arrowed)
2. Triumph Service Diagnostic Tool

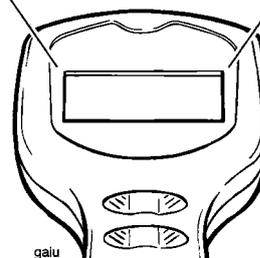
Connect the tool to the dedicated multiplug in the storage compartment on the right hand side of the motorcycle.

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

		S	E	L	E	C	T		L	A	N	G	U	A	G	E		
▶						E	N	G	L	I	S	H						
						F	R	A	N	C	A	I	S					
						D	E	U	T	S	C	H						
						E	S	P	A	N	O	L						
						I	T	A	L	I	A	N	O					
						N	E	D	E	R	L	A	N	D	S			



Use the 'Up' and 'Down' keys to move the cursor in column 1 and select the language required.

### Note:

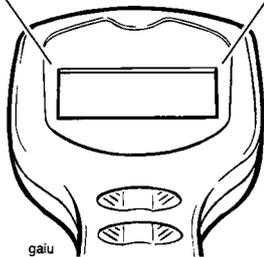
- The tool will always select English as the default language, and it is only necessary to use the cursor to select one of the other languages. The entire diagnostic session will then continue in the chosen language.

Press the validation key '\*' to move on.

# Brakes

## 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			
			2	0	0	5	-	0	1								



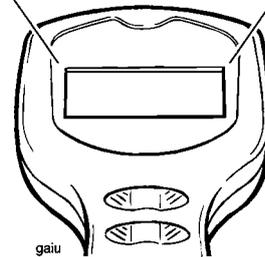
The screen will display the message 'Triumph Motorcycles Diagnostic Tool' and will also give the diagnostic software version and the software release year.

**Press the validation key '\*' to move on.**

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

## 4 SELECT ECU

								S	E	L	E	C	T	E	C	U
								E	N	G	I	N	E			
▶								A	B	S						



Use the 'Up' and 'Down' keys to scroll the text until the horizontal arrowhead is positioned opposite the 'ABS', and press the Validation key '\*'.

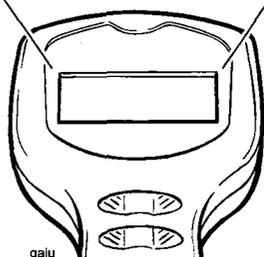
'SWITCH ON BIKE IGNITION' will appear on the screen (see operation 5).





## 9 To select 'READ STORED DTCS' (Diagnostic Trouble Codes) from the ABS DIAGNOSTICS menu:

				A	B	S	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
▼				C	L	E	A	R	D	T	C	S					



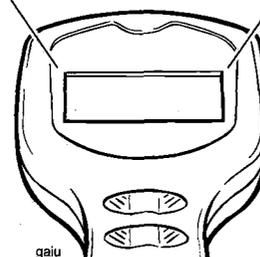
Use the 'Up' and 'Down' keys to position the cursor opposite **'READ STORED DTCS'**.

Press the Validation key '\*'.

**'STORED DTCS'** will be displayed.

## 10 STORED DTCS

									S	T	O	R	E	D	D	T	C	S	
				D	T	C	C	O	U	N	T							0	2
				P	C	1	6	7	1										
				▼	C	1	6	7	1										



The second line - **'DTC COUNT'**, shows the number of DTCs stored in the ABS ECM memory.

Lines 3 and 4 display up to two of the DTCs stored (if any). If additional DTCs 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 DTCs shown, press the Return key (↵) to return to **MAIN MENU**.

(If DTCs 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:**

*C1671*

**Help text:**

*FRONT WHEEL SENSOR OPEN / SHORT CIRCUIT*

Press the Validation key '\*' to continue.

Scroll to **'CLEAR DTCS'** and press the Validation key '\*' to go on to operation **11**

**Note:**

- A full list of all the possible DTCs can be found earlier in this section (see page 14-40).

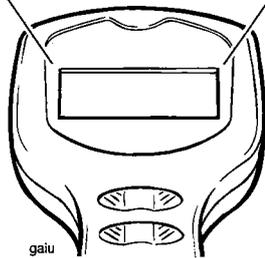






**17 READ BUILD DATA**

				R	E	A	D		B	U	I	L	D		D	R	T	A
E	C	U	I	D	X	X	X	X	X	X	X	X	X	X	X	X	X	X



The display will show the following information relating to the motorcycle under test.

- ABS ECM Serial number

Press the Validation '\*' key to return to '**ABS DIAGNOSTICS**' menu (operation 7).

# Brakes

## 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 multi-plugs.

For example, the ABS electronic control module (ABS ECM) relies on the supply of accurate information to enable it to monitor and control the brake system. 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 that must be released before the connector can be separated. E.G. barb, hook and eye etc.

### When Inspecting a Connector:

- Check that the individual pins have not been bent.
- Check for dampness/dirt/corrosion.
- Check cables for security.
- Check cable pin joints for damage.

### When Connecting a Connector.

- Ensure there is no dirt around the connector/seal.
- Push together squarely to ensure terminals are not bent or incorrectly located.
- Push the two halves together positively.

## Disconnection of ABS ECM connector

### Caution

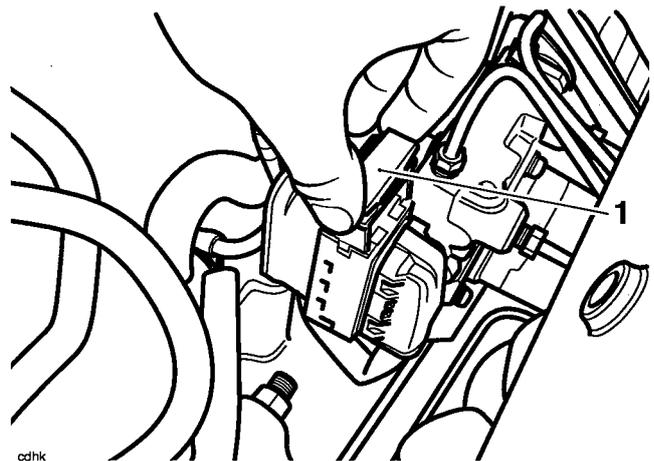
When disconnecting a connector, never pull directly on the wires as this may result in cable and connector damage.

### Caution

Never disconnect the ABS ECM when the ignition switch is in the 'ON' position as this may cause multiple fault codes to be logged in the ECM memory.

Always disconnect an ECM after disconnecting the battery negative (black) lead first.

1. Lift up the locking device and gently pull back on the connector to release it from the ECM.



1. Locking device

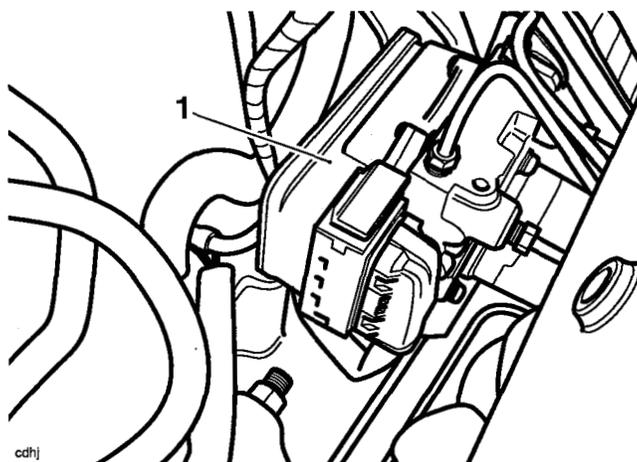
### Note:

- The ABS ECM is an integral part of the ABS modulator. Under no circumstances should the ECM be removed from the ABS modulator. If a new ECM is required, repair is by replacement of the ABS modulator and ECM as an assembly only.

## Reconnection of ABS ECM connector

### Caution

Damage to the connector pins may result if an attempt to fit the connectors incorrectly is made.



cdhj

## 1. ABS ECM

2. Fit the connector into its socket and, whilst holding the connector in place, push down gently on the locking device until it locks.

## Further Diagnosis

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

## Pinpoint Tests

### Before starting pinpoint tests:

1. Delete the stored DTCs.
2. Switch the ignition OFF and ON.
3. Ride the motorcycle at a road speed in excess of 30 Km/h. If the DTC is repeated proceed to the relevant pinpoint test.
4. If the DTC is not repeated this indicates the DTC may have been stored due to external influences such as bad road surfaces or electrical interference.

### After completion of the pinpoint tests:

1. Delete the stored DTCs.
2. Switch the ignition OFF and ON.
3. Ride the motorcycle at a road speed in excess of 30 Km/h. If the DTC is repeated proceed to the relevant pinpoint test.
4. If a DTC is stored there is a further fault. Read the stored DTC and refer to the relevant pinpoint test.

## Brakes

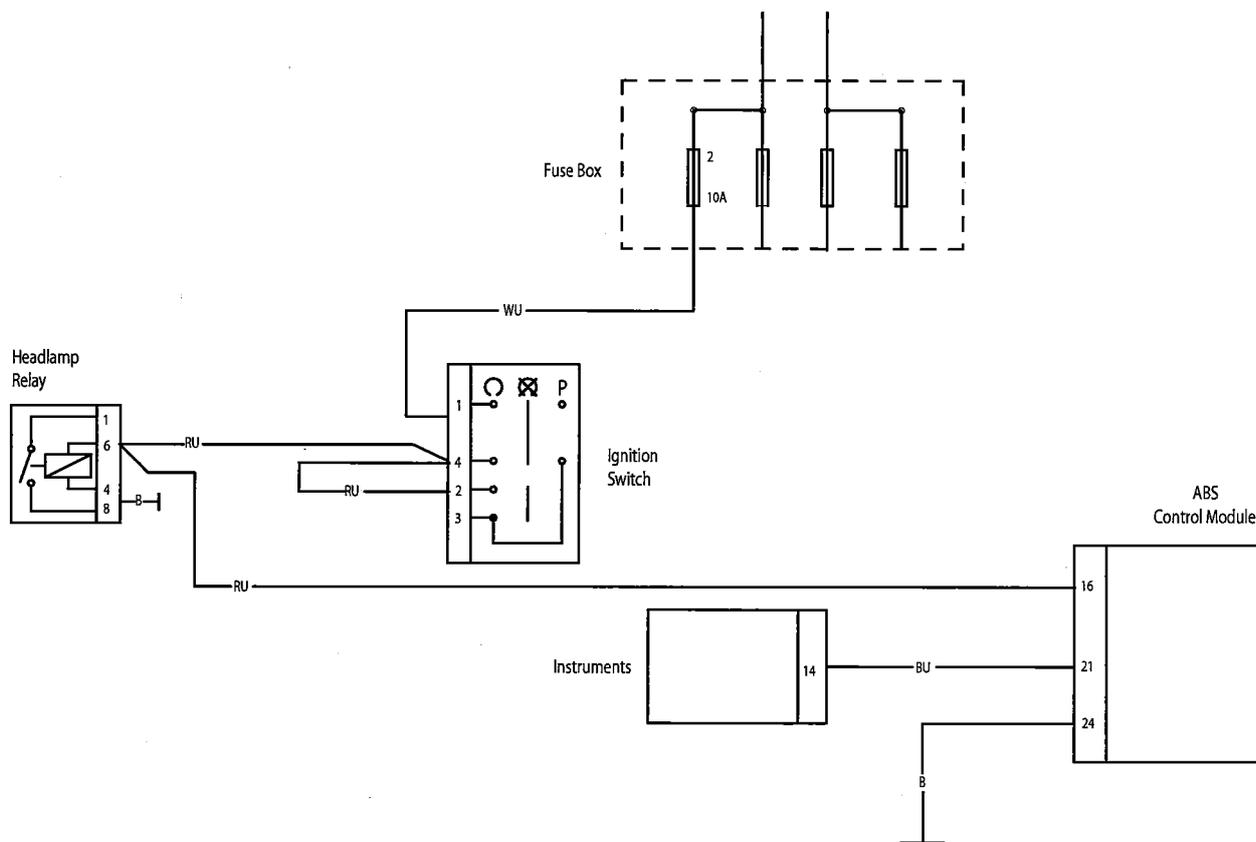
### ABS Warning Light ON (No DTCs Stored)

Fault Code	Possible cause	Action
ABS Warning Light ON (No DTC's Stored)	ABS Ignition supply fuse/circuit fault ABS Warning light circuit fault	Ensure ABS ECM connector is secure. Disconnect ABS ECM connector and proceed to pinpoint test 1:-

### Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ABS ECM connector pin 16 and Ground pin 24	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check cable continuity of the ABS ignition supply circuit: With Ignition 'ON', check voltage between - ABS ECM connector pin 16 and Ground	Same as 'across battery' voltage	Proceed to test 3
	Less than 'across battery' voltage	Locate and rectify wiring fault, proceed to test 5
3 Check cable continuity of the ABS warning light circuit: Check voltage between: - ABS ECM connector pin 21 and Ground	Voltage greater than 1.5 V	Proceed to test 4
	Voltage less than 1.5 V	Locate and rectify fault, proceed to test 5
4 Check cable continuity of the ABS warning light circuit: - Short ABS ECM connector pin 21 and Ground pin 24 together:  Turn Ignition 'ON'	ABS warning light 'OFF'	Proceed to test 5
	ABS warning light 'ON'	Locate and rectify fault, proceed to test 5
5 Reconnect ABS ECM harness, clear fault code and test ABS to verify fault cleared	OK	Action complete - quit test
	Fault still present	Contact Triumph service

## Circuit Diagram



## Brakes

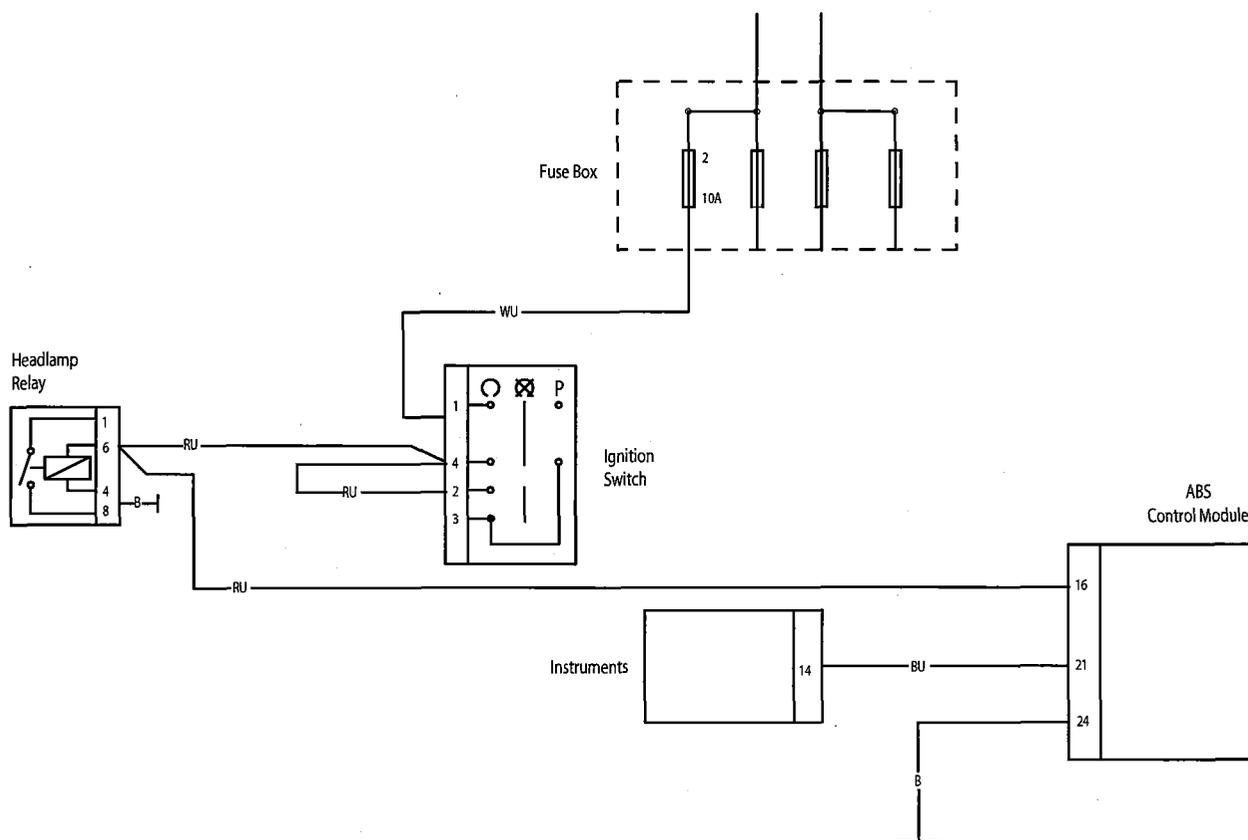
### ABS Warning Light Does not Illuminate (No DTCs Stored)

Fault Code	Possible cause	Action
ABS Warning Light OFF (No DTC's Stored)	Warning light circuit fault ABS ECM ground circuit fault	Ensure ABS ECM connector is secure. Ensure ABS ECM ground connection is secure. Disconnect ABS ECM connector and proceed to pinpoint test 1:-

### Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ABS ECM connector pin 16 and Ground	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 6
2 Check the ABS warning light circuit fuse (fuse 2):	OK	Proceed to test 3
	Faulty	Replace fuse, proceed to test 6
3 Check cable for short to voltage: With Ignition 'OFF', check voltage between - ABS ECM connector pin 16 and Ground	0 V	Proceed to test 4
	Above 3 V	Locate and rectify wiring fault, proceed to test 6
4 Check cable for short to ground: With ignition 'ON', Check the ABS warning light circuit voltage between: - ABS ECM connector pin 21 and Ground	Voltage greater than 1.5 V	Proceed to test 5
	Voltage less than 1.5 V	Locate and rectify fault, proceed to test 6
5 Check cable for continuity: ABS ECM connector pin 24 and Ground: Turn Ignition 'ON'	OK	Proceed to test 6
	Faulty	Locate and rectify fault, proceed to test 6
6 Reconnect ABS ECM harness, clear fault code and test ABS to verify fault cleared	OK	Action complete - quit test
	Fault still present	Contact Triumph service

## Circuit Diagram



# Brakes

## Front Wheel Sensor Open Circuit / Short Circuit

Fault Code	Possible cause	Action
C1611	Front wheel speed sensor circuit fault	Ensure ABS ECM connector is secure. Ensure wheel speed sensor connector is secure. Disconnect ABS ECM connector and proceed to pinpoint test 1:-

### Pinpoint Tests

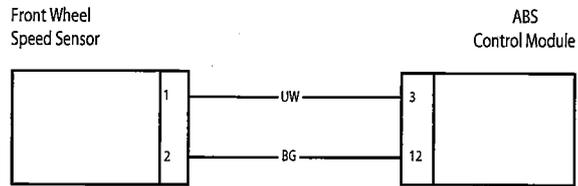
Test	Result	Action
1 Check cable and terminal integrity: - ABS ECM connector pin 3 and ABS ECM connector pin 12	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 9
2 Check cable for short circuit: - ABS ECM connector pin 12 and Ground	OK	Proceed to test 4
	Short circuit	Proceed to test 3
3 Disconnect the front wheel speed sensor connector. Check cable for short circuit: Wheel speed sensor connector pin 2 (motorcycle harness side) and Ground	OK	Replace the wheel speed sensor, proceed to test 9
	Short circuit	Locate and rectify wiring harness fault, proceed to test 9
4 Check cable for short circuit: - ABS ECM connector pin 3 and Ground	OK	Proceed to test 6
	Short circuit	Proceed to test 5
5 Check cable for short circuit: - Wheel speed sensor connector pin 1 (motorcycle harness side) and Ground	OK	Replace the wheel speed sensor, proceed to test 9
	Short circuit	Locate and rectify wiring harness fault, proceed to test 9
6 Check cable continuity: - ABS ECM connector pin 12 and Wheel speed sensor connector pin 2 (motorcycle harness side)	OK	Proceed to test 7
	Open circuit	Locate and rectify wiring harness fault, proceed to test 9
7 Check cable continuity: - ABS ECM connector pin 3 and Wheel speed sensor connector pin 1 (motorcycle harness side)	OK	Proceed to test 8
	Open circuit	Locate and rectify wiring harness fault, proceed to test 9
8 Reconnect the front wheel speed sensor connector. Check the wheel speed sensor operation: - Connect a suitable voltage supply between 4.5 V and 16 v between ABS ECM connector pin 12 (positive) and pin 3 (negative), and measure the current consumption of the wheel speed sensor	3 mA to 14 mA	Proceed to test 9
	Faulty	Replace the wheel speed sensor, proceed to test 9

9 Reconnect ABS ECM harness, clear fault code and test ABS to verify fault cleared	OK	Action complete - quit test
	Fault still present	Contact Triumph service

## Circuit Diagram

Wheel speed sensor current consumption data under typical conditions:

Voltage	Min	Typical	Max
Low (4.5 V)	3.1 mA	4.1 mA	5.3 mA
High (16V)	8.1 mA	10.5 mA	13.6 mA



## Brakes

### Front Wheel Sensor Abnormal Input / Loosing Contact

Fault Code	Possible cause	Action
C1612	Front wheel speed sensor poor signal Incorrect Wheel speed sensor air gap Damaged or dirty pulser ring Loose or incorrectly installed wheel speed sensor	Ensure ABS ECM connector is secure. Ensure wheel speed sensor connector is secure. Proceed to pinpoint test 1:-

### Pinpoint Tests

Test	Result	Action
1 Measure the air gap of the front wheel speed sensor between the sensor and the pulser ring:  -Air gap between 0.1 mm to 1.5 mm	OK	Proceed to test 2
	Faulty	Rectify the fault and proceed to test 5
2 Check the pulser ring for damage or contamination by road grime or ferrous metal filings	OK	Proceed to test 3
	Faulty	Clean or replace the ABS pulser ring, proceed to test 5
3 Check the wheel speed sensors for correct installation, and the fixings for correct torque	OK	Proceed to test 4
	Faulty	Rectify the fault and proceed to test 5
4 Check the wheel speed sensor circuit (See page 14.62)	OK	Contact Triumph service
	Faulty	Rectify the fault and proceed to test 5
5 Clear fault code and test ABS to verify fault cleared	OK	Action complete - quit test
	Fault still present	Contact Triumph service

## Rear Wheel Sensor Open Circuit / Short Circuit

Fault Code	Possible cause	Action
C1613	Rear wheel speed sensor circuit fault	Ensure ABS ECM connector is secure. Ensure wheel speed sensor connector is secure. Disconnect ABS ECM connector and proceed to pinpoint test 1:-

### Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ABS ECM connector pin 2 and ABS ECM connector pin 18	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 9
2 Check cable for short circuit: - ABS ECM connector pin 2 and Ground	OK	Proceed to test 4
	Short circuit	Proceed to test 3
3 Disconnect the front wheel speed sensor connector. Check cable for short circuit: - Wheel speed sensor connector pin 2 (motorcycle harness side) and Ground	OK	Replace the wheel speed sensor, proceed to test 9
	Short circuit	Locate and rectify wiring harness fault, proceed to test 9
4 Check cable for short circuit: - ABS ECM connector pin 18 and Ground	OK	Proceed to test 6
	Short circuit	Proceed to test 5
5 Check cable for short circuit: - Wheel speed sensor connector pin 1 (motorcycle harness side) and Ground	OK	Replace the wheel speed sensor, proceed to test 9
	Short circuit	Locate and rectify wiring harness fault, proceed to test 9
6 Check cable continuity: - ABS ECM connector pin 2 and Wheel speed sensor connector pin 2 (motorcycle harness side)	OK	Proceed to test 7
	Open circuit	Locate and rectify wiring harness fault, proceed to test 9
7 Check cable continuity: - ABS ECM connector pin 18 and Wheel speed sensor connector pin 1 (motorcycle harness side)	OK	Proceed to test 8
	Open circuit	Locate and rectify wiring harness fault, proceed to test 9
8 Reconnect the front wheel speed sensor connector. Check the wheel speed sensor operation: - Connect a suitable voltage supply between 4.5 V and 16 v between ABS ECM connector pin 2 (positive) and pin 18 (negative), and measure the current consumption of the wheel speed sensor	3 mA to 14 mA	Proceed to test 9
	Faulty	Replace the wheel speed sensor, proceed to test 9

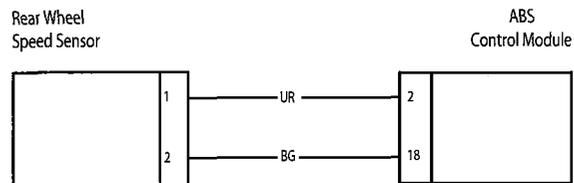
# Brakes

9 Reconnect ABS ECM harness, clear fault code and test ABS to verify fault cleared	OK	Action complete - quit test
	Fault still present	Contact Triumph service

## Circuit Diagram

Wheel speed sensor current consumption data under typical conditions:

Voltage	Min	Typical	Max
Low (4.5 V)	3.1 mA	4.1 mA	5.3 mA
High (16V)	8.1 mA	10.5 mA	13.6 mA



## Rear Wheel Sensor Abnormal Input / Loosing Contact

Fault Code	Possible cause	Action
C1614	Rear wheel speed sensor poor signal Incorrect Wheel speed sensor air gap Damaged or dirty pulser ring Loose or incorrectly installed wheel speed sensor	Ensure ABS ECM connector is secure. Proceed to pinpoint test 1:-

### Pinpoint Tests

Test	Result	Action
1 Measure the air gap of the front wheel speed sensor between the sensor and the pulser ring: - Air gap between 0.1 mm to 1.5 mm	OK	Proceed to test 2
	Faulty	Rectify the fault and proceed to test 5
2 Check the pulser ring for damage or contamination by road grime or ferrous metal filings	OK	Proceed to test 3
	Faulty	Clean or replace the ABS pulser ring, proceed to test 5
3 Check the wheel speed sensors for correct installation, and the fixings for correct torque:	OK	Proceed to test 4
	Faulty	Rectify the fault and proceed to test 5
4 Check the wheel speed sensor circuit (See page 14.65)	OK	Contact Triumph service
	Faulty	Rectify the fault and proceed to test 5
5 Clear fault code and test ABS to verify fault cleared	OK	Action complete - quit test
	Fault still present	Contact Triumph service

# Brakes

## Front Wheel Pulser Gear Missing Teeth

Fault Code	Possible cause	Action
C1621	Incorrect Wheel speed sensor air gap Damaged or dirty pulser ring Loose or incorrectly installed wheel speed sensor Damaged/incorrect wheels	Ensure ABS ECM connector is secure. Proceed to pinpoint test 1:-

### Pinpoint Tests

Test	Result	Action
1 Measure the air gap of the front wheel speed sensor between the sensor and the pulser ring:  - Air gap between 0.1 mm to 1.5 mm	OK	Proceed to test 2
	Faulty	Rectify the fault and proceed to test 5
2 Check the pulser ring for damage or contamination by road grime or ferrous metal filings	OK	Proceed to test 3
	Faulty	Clean or replace the ABS pulser ring, proceed to test 5
3 Check the wheel speed sensors for correct installation, and the fixings for correct torque:	OK	Proceed to test 4
	Faulty	Rectify the fault and proceed to test 5
4 Check the motorcycle wheel for damage/incorrect size	OK	Proceed to test 4
	Faulty	Rectify the fault and proceed to test 5
5 Clear fault code and test ABS to verify fault cleared	OK	Action complete - quit test
	Fault still present	Contact Triumph service

## Rear Wheel Pulsar Gear Missing Teeth

Fault Code	Possible cause	Action
C1623	Incorrect Wheel speed sensor air gap Damaged or dirty pulser ring Loose or incorrectly installed wheel speed sensor Damaged/incorrect wheels	Ensure ABS ECM connector is secure. Proceed to pinpoint test 1:-

### Pinpoint Tests

Test	Result	Action
1 Measure the air gap of the front wheel speed sensor between the sensor and the pulser ring: - Air gap between 0.1 mm to 1.5 mm	OK	Proceed to test 2
	Faulty	Rectify the fault and proceed to test 5
2 Check the pulser ring for damage or contamination by road grime or ferrous metal filings	OK	Proceed to test 3
	Faulty	Clean or replace the ABS pulser ring, proceed to test 5
3 Check the wheel speed sensors for correct installation, and the fixings for correct torque:	OK	Proceed to test 4
	Faulty	Rectify the fault and proceed to test 5
4 Check the motorcycle wheel for damage/incorrect size	OK	Proceed to test 4
	Faulty	Rectify the fault and proceed to test 5
5 Clear fault code and test ABS to verify fault cleared.	OK	Action complete - quit test
	Fault still present	Contact Triumph service

# Brakes

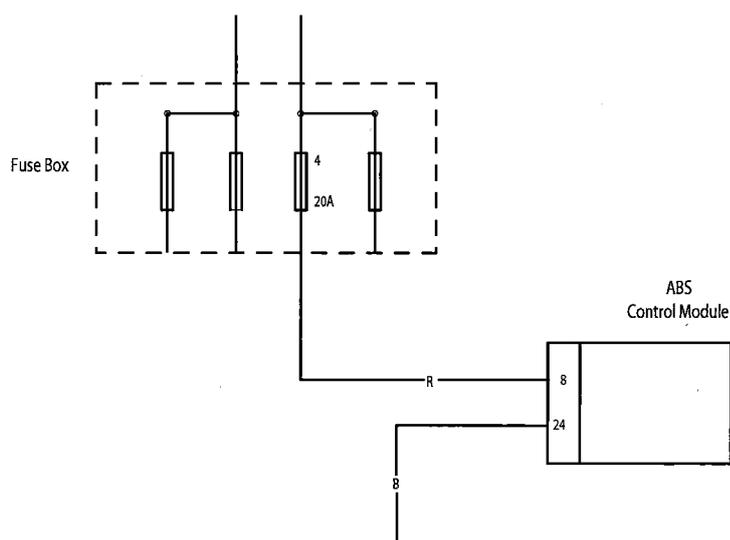
## Front or Rear Input/output solenoid Open / Short Circuit

Fault Code	Possible cause	Action
Front: C1631; C1632 Rear: C1633; C1634 C1654	ABS solenoid circuit fault	Ensure ABS ECM connector is secure. Disconnect ABS ECM connector and proceed to pinpoint test 1:-

### Pinpoint Tests

Test	Result	Action
1 Check cable and terminal integrity: - ABS ECM connector pin 8 and Ground	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check the ABS solenoid fuse (fuse 4):	OK	Proceed to test 3
	Faulty	Replace fuse, proceed to test 5
3 Check cable continuity: With Ignition 'ON', check voltage between - ABS ECM connector pin 8 and Ground	Same as 'across battery' voltage	Proceed to test 4
	Less than 'across battery' voltage	Locate and rectify wiring fault, proceed to test 5
4 Check cable for continuity: - ABS ECM connector pin 24 and Ground	OK	Proceed to test 5
	Faulty	Locate and rectify fault, proceed to test 5
5 Clear fault code and test ABS to verify fault cleared	OK	Action complete - quit test
	Fault still present	Contact Triumph service

### Circuit Diagram



## Front or Rear Wheel Actuator (Hydraulic Control) Wheel Lock

Fault Code	Possible cause	Action
C1641; C1643	Binding brake Incorrect Wheel speed sensor air gap Loose or incorrectly installed wheel speed sensor	Ensure ABS ECM connector is secure. Proceed to pinpoint test 1:-

### Pinpoint Tests

Test	Result	Action
1 Check the relevant wheel for brake bind caused by caliper or master cylinder faults, or other mechanical causes	OK	Proceed to test 2
	Faulty	Rectify the fault and proceed to test 4
2 Measure the air gap of the wheel speed sensor between the sensor and the pulser ring: - Air gap between 0.1 mm to 1.5 mm	OK	Proceed to test 3
	Faulty	Rectify the fault and proceed to test 4
3 Check the wheel speed sensors for correct installation, and the fixings for correct torque	OK	Proceed to test 4
	Faulty	Rectify the fault and proceed to test 4
4 Clear fault code and test ABS to verify fault cleared	OK	Action complete - quit test
	Fault still present	Contact Triumph service

# Brakes

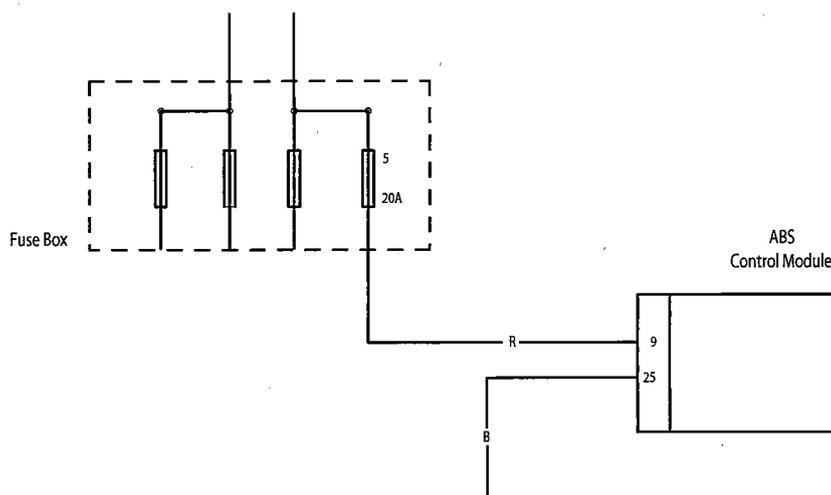
## Motor - Lock; Motor Stuck OFF; Motor stuck ON

Fault Code	Possible cause	Action
C1651; C1652; C1653	Motor circuit fault Motor runs continually Motor does not run at all	Ensure ABS ECM connector is secure. Turn the ignition 'ON'. Proceed to pinpoint test 1:-

### Pinpoint Tests

Test	Result	Action
1 Check the motor function: Check that with the motorcycle stationary and the ABS ACM modulator connected, the motor does not operate.	OK	Proceed to test 2
	Motor runs continually.	Contact Triumph service
2 Check the ABS motor circuit fuse (fuse 5)	OK	Proceed to test 3
	Faulty	Replace fuse and proceed to test 5
3 Check cable continuity: With Ignition 'ON', check voltage between: - ABS ECM connector pin 9 and Ground	Same as 'across battery' voltage	Proceed to test 4
	Less than 'across battery' voltage	Locate and rectify wiring fault, proceed to test 5
4 Check cable for continuity: - ABS ECM connector pin 25 and Ground	OK	Proceed to test 5
	Faulty	Locate and rectify fault, proceed to test 5
5 Reconnect ABS ECM harness, clear fault code and test ABS to verify fault cleared	OK	Action complete - quit test
	Fault still present	Contact Triumph service

### Circuit Diagram



**Power Source Voltage Drop/Voltage Rise**

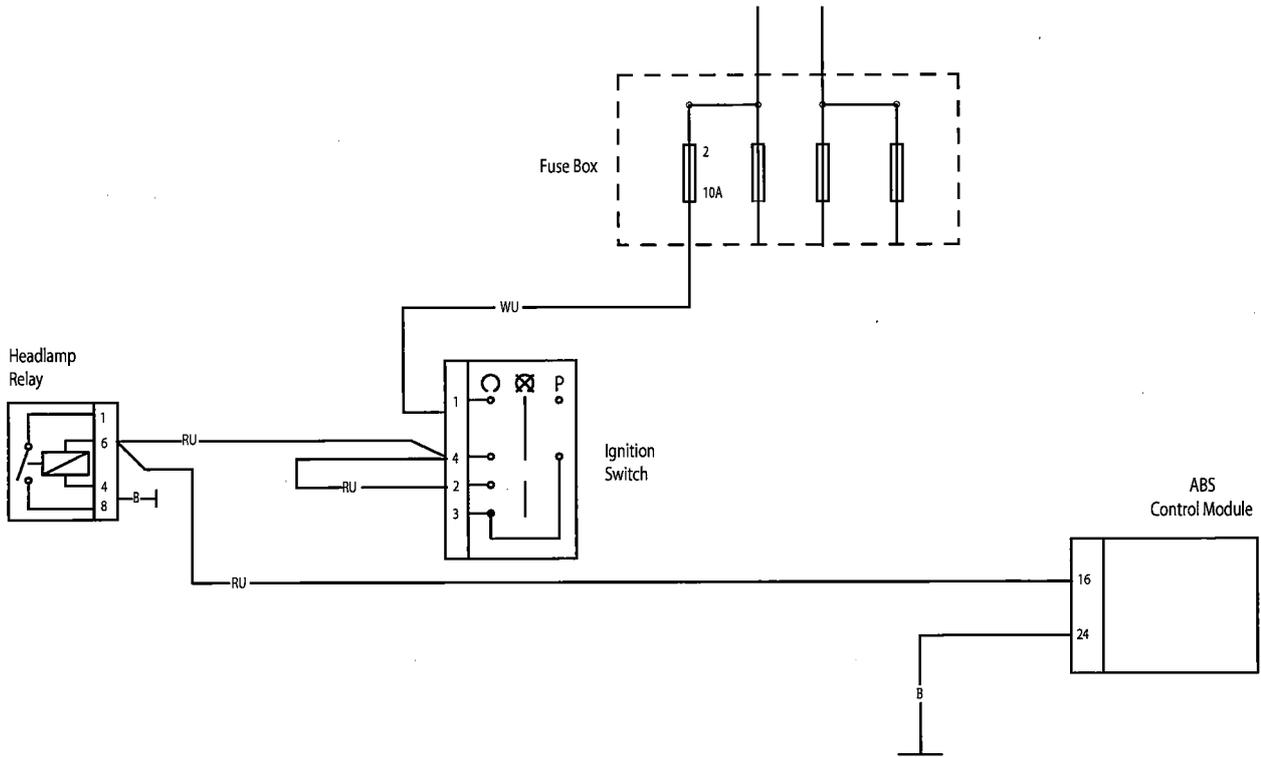
<b>Fault Code</b>	<b>Possible cause</b>	<b>Action</b>
C1661; C1662	Power supply circuit fault Battery charging circuit fault	Ensure ABS ECM connector is secure. Disconnect ABS ECM connector and proceed to pinpoint test 1:-

**Pinpoint Tests**

<b>Test</b>	<b>Result</b>	<b>Action</b>
1 Check cable and terminal integrity: - ABS ECM connector pin 16 and Ground pin 24	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check the cable for continuity: - ABS ECM connector pin 24 and Ground	OK	Proceed to test 3
	Faulty	Rectify wiring harness fault, proceed to test 5
3 Check battery voltage: With ignition 'ON', Check the voltage between: - ABS ECM connector pin 16 and Ground pin 24	Voltage greater than 10 V	Proceed to test 4
	Voltage less than 10V	Locate and rectify fault, proceed to test 5
4 Check battery voltage: Reconnect ABS ECM connector and start the engine, Check the voltage between: - Battery positive (red) terminal and negative (black) terminal	Voltage between 10 V and 16 V	Proceed to test 4
	Voltage greater than 16V	Check the battery charging circuit. Locate and rectify fault, proceed to test 5
5 Clear fault code and test ABS to verify fault cleared.	OK	Action complete - quit test
	Fault still present	Contact Triumph service

# Brakes

## Circuit Diagram



## Different Tyre Diameter

Fault Code	Possible cause	Action
C1671	Incorrect diameter wheels installed Incorrect tyre pressures Incorrect Wheel speed sensor air gap Damaged or dirty pulser ring	Ensure ABS ECM connector is secure. Proceed to pinpoint test 1:-

## Pinpoint Tests

Test	Result	Action
1 Check for installation of wheels and tyres of the correct size	OK	Proceed to test 2
	Faulty	Rectify fault, proceed to test 5
2 Check the tyre pressures	OK	Proceed to test 3
	Faulty	Rectify fault, proceed to test 5
3 Check the pulser ring for damage or contamination by road grime or ferrous metal filings	OK	Proceed to test 4
	Faulty	Clean or replace the ABS pulser ring, proceed to test 5
4 Measure the air gap of the front wheel speed sensor between the sensor and the pulser ring: - Air gap between 0 mm to 1.5 mm	OK	Proceed to test 5
	Faulty	Rectify the fault and proceed to test 5
5 Clear fault code and test ABS to verify fault cleared	OK	Action complete - quit test
	Fault still present	Contact Triumph service

# Brakes

## Abnormal ECU

Fault Code	Possible cause	Action
C1681	Incorrect Wheel speed sensor air gap Damaged or dirty pulser ring Loose or incorrectly installed wheel speed sensor	Ensure ABS ECM connector is secure. Proceed to pinpoint test 1:-

## Pinpoint Tests

Test	Result	Action
1 Measure the air gap of the wheel speed sensors between the sensor and the pulser ring: - Air gap between 0 mm to 1.5 mm	OK	Proceed to test 1
	Faulty	Rectify the fault and proceed to test 4
2 Check the pulser rings for damage or contamination by road grime or ferrous metal filings	OK	Proceed to test 2
	Faulty	Clean or replace the ABS pulser ring, proceed to test 4
3 Check the wheel speed sensors for correct installation, and the fixings for correct torque	OK	Proceed to test 4
	Faulty	Rectify the fault and proceed to test 4
4 Clear fault code and test ABS to verify fault cleared.	OK	Action complete - quit test
	Fault still present	Contact Triumph service

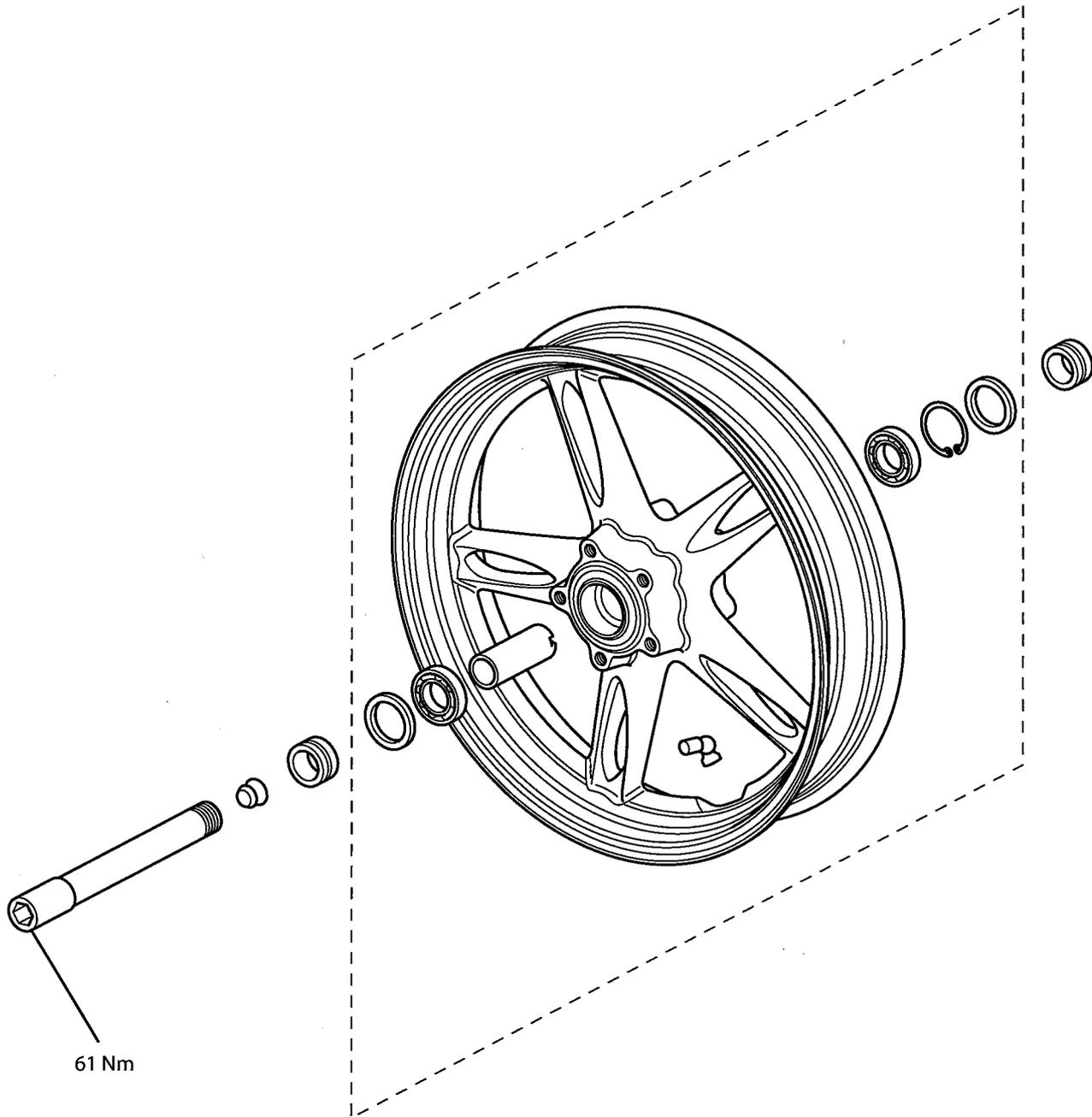
# 15 Wheels/Tyres

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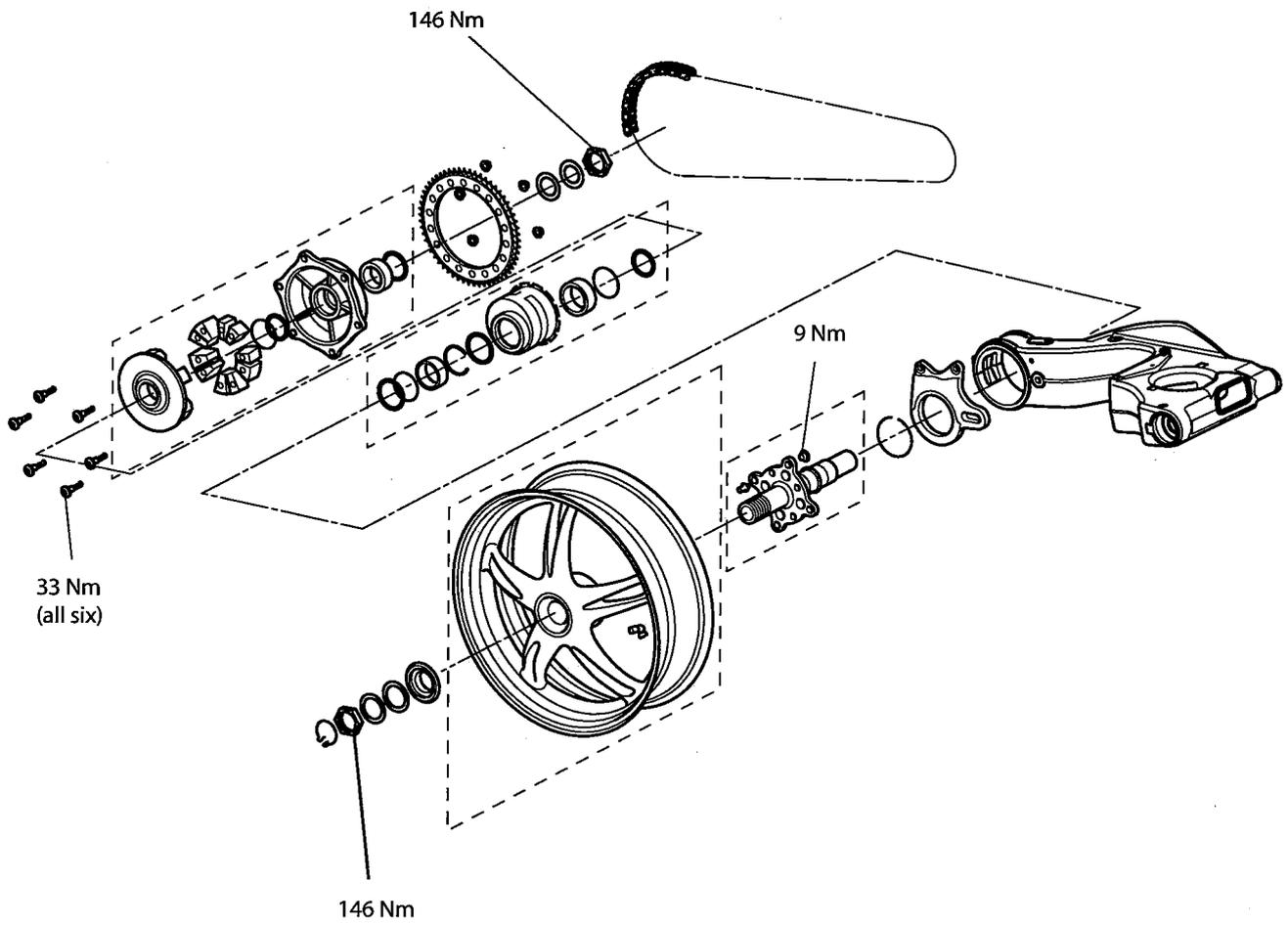
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## Wheels/Tyres

### Exploded view - Front Wheel

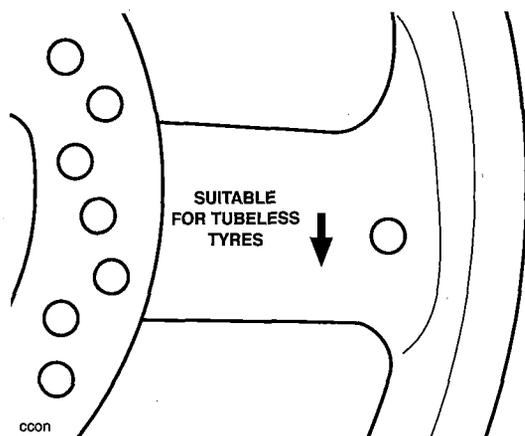


Exploded View – Rear Wheel & Final Drive

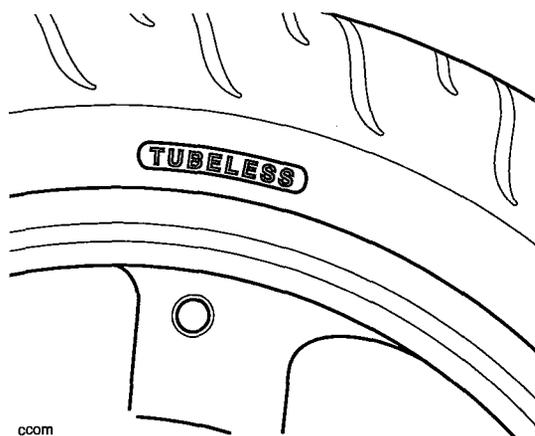


## Tyres

This model is equipped with tubeless tyres, valves, and wheel rims. Only tyres marked 'TUBELESS' and tubeless type tyre valves mounted on rims marked 'SUITABLE FOR TUBELESS TYRES' can be used.



Typical Wheel Marking



Typical 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. Correct tyre pressures are:

Front - 2.35 Bar (34 Psi)

Rear - 2.90 Bar (42 Psi)

**Warning**

Incorrect tyre inflation will cause abnormal tread wear and instability problems which may lead to loss of control and an accident.

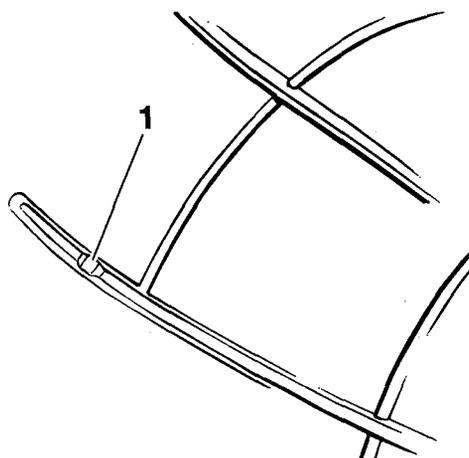
Under-inflation may result in the tyre slipping on, or coming off the rim. Over-inflation will cause instability and accelerated tread wear.

Both conditions are dangerous as they may cause loss of control leading to an accident.

## Tyre Wear/Wheel Inspection

As the tyre tread wears down, the tyre becomes more susceptible to puncture and failure. It is estimated that 90% of all tyre failures occur during the last 10% of tread life (90% worn). It is false economy and unsafe to use tyres until they are worn to their minimum.

All tyres are fitted with tread wear indicators. When the tyre becomes worn down as far as the top of a tread wear indicator, the tyre is worn beyond its service life and must be replaced.



### 1. Tread Wear Indicator

In accordance with the scheduled maintenance chart, measure the depth of the tread with a depth gauge, and replace any tyre that has worn to, or beyond the minimum allowable tread depth.

Inspect wheels for cracks, splits and kerb damage. Always replace wheels that are suspected of having become damaged.

## Warning

Operation with excessively worn tyres is hazardous and will adversely affect traction, stability and handling which may lead to loss of control or an accident.

When tubeless tyres become punctured, leakage is often very slow. Always inspect tyres very closely for punctures.

Check the tyres for cuts, embedded nails or other sharp objects.

Check the rims for dents or deformation. Operation with damaged or defective wheels or tyres is dangerous and loss of control or an accident could result.

Always consult your Triumph dealer for tyre replacement, or for a safety inspection of the tyres.

### Minimum Recommended Tread Depth

The following chart can be used as a guide to the minimum safe tread depth.

Speed	Minimum Tread Depth
Under 130 km/h (80 mph)	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.

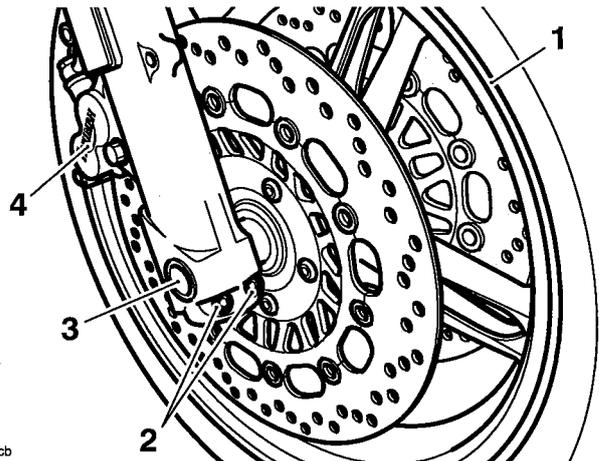
When tyres are replaced, allow time for the tyre to seat itself to the rim (approximately 24 hours). During this seating period, ride cautiously as an incorrectly seated tyre could cause loss of control or an accident. Initially, the new tyre will not produce the same handling characteristics as the 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



- cdcb
1. Front wheel
  2. Fork pinch bolts
  3. Wheel spindle
  4. Brake caliper

1. Remove the brake caliper bolts and detach both calipers. Do not disconnect the brake hoses (see page 14-16).

### Warning

Do not allow the calipers to hang on the brake hoses as this may damage the hoses and could lead to an accident.

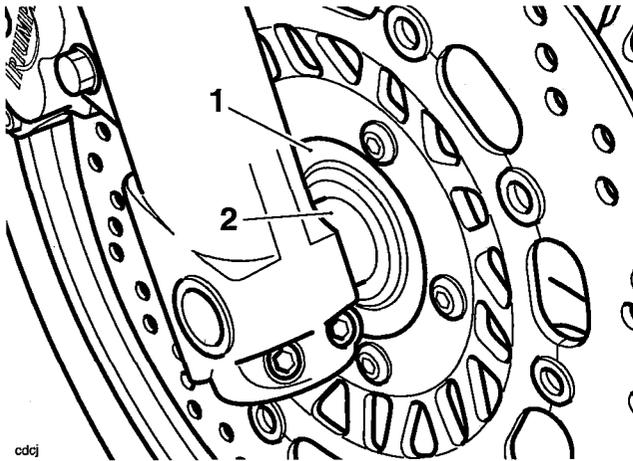
2. Raise and support the front of the motorcycle to allow removal of the front wheel.

### Warning

Ensure the motorcycle is stabilised and adequately supported, to prevent it falling and causing damage or injury.

3. Remove the four fixings from the front section of the mudguard.
4. Remove the mudguard section.
5. Slacken the two pinch bolts at the lower end of the right hand fork leg.
6. Undo the wheel spindle which is threaded into the left hand fork leg. Support the wheel and remove the wheel spindle.

- Remove the wheel, recovering the spacers from either side of the wheel. Place the wheel on wooden blocks.



1. Wheel  
2. Spacers

## ! Caution

To prevent wheel and bearing damage, ensure absolute cleanliness and ensure there is no dirt ingress to the wheel bearings while the wheel is removed.

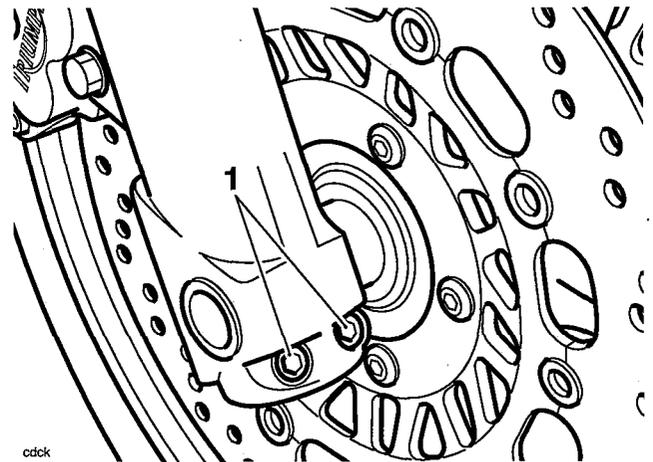
## ! Warning

Do not allow the wheel to rest on either brake disc as this may damage the discs and could lead to loss of motorcycle control and an accident.

- Thoroughly clean all components and inspect for wear or damage.

## Installation

- Align the wheel to the motorcycle.
- Lightly smear the sleeve surfaces with grease and locate to the seals on either side of the hub.
- Position the wheel between the forks and fit the wheel spindle.
- Tighten the wheel spindle to **61 Nm**.
- Lower the motorcycle to the ground and pump the front suspension to allow the right hand fork to 'float' to its natural position on the wheel spindle.
- Tighten the right hand fork pinch bolts to **20 Nm**.



## 1. Fork Pinch Bolts

- Thoroughly clean and degrease the brake discs.
- Fit the brake calipers, tightening the mounting bolts to **40 Nm**.
- Check the operation of the front brake by pumping the brake lever several times.

## ! Warning

It is dangerous to operate the motorcycle with defective brakes and you must have your authorised Triumph Dealer take remedial action. Failure to take remedial action may reduce braking efficiency leading to loss of motorcycle control and an accident.

- Refit the front mudguard and tighten the fixings to **5 Nm**.

# Wheels/Tyres

## Front Wheel Bearing

### Removal

1. Remove the front wheel (See page 15-6).
2. Models with ABS brakes: Remove the ABS pulser ring (See page 14-29).

### ! Caution

Do not allow the wheel to rest on the brake disc, as this may damage the disc. Support the wheel on wooden blocks, equally spaced around the rim, such that the brake disc is raised above the ground.

3. Lay the wheel on its side while supporting the wheel on wooden blocks to prevent damage to the brake disc.
4. Remove and discard the seals and the bearing circlip.

### ! Warning

Always wear eye, hand and face protection when using a drift as use of a hammer and drift can cause bearings to fragment. Pieces of fragmented bearing could cause eye and hand injuries if suitable protective apparel is not worn.

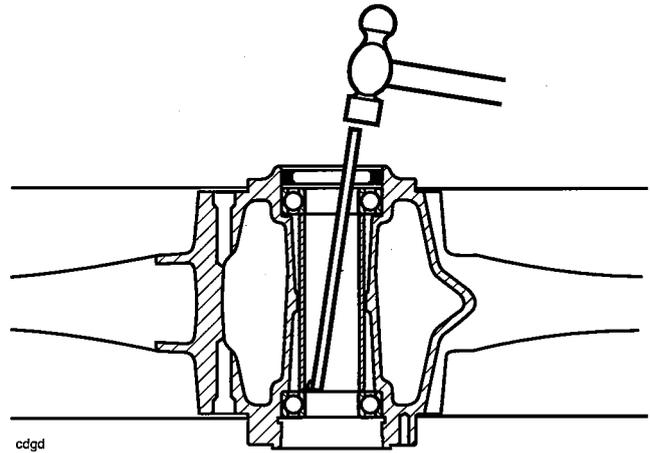
### ! Caution

To prevent wheel damage and to aid bearing removal, always apply force evenly on both sides of the bearing to prevent it from 'tipping' and becoming stuck. Application of uneven force will lead to difficulty in removing the bearing and to a damaged wheel.

### Note:

- The right hand wheel bearing must be removed first. The pin punch must be located in the cut-outs provided in the centre sleeve.

5. Using a suitable pin punch, through the centre of the wheel, drift out the right hand wheel bearing. Collect the centre sleeve. Remove the left hand wheel bearing in the same way.



Wheel bearing removal

### Inspection

### ! Warning

Only remove raised witness marks from within the wheel. Removal of material below any raised areas will reduce the level of interference between the wheel and the bearings. Loss of interference could cause the bearing to become loose in the wheel leading to loss of motorcycle control and an accident.

1. Examine the wheel for any raised witness marks caused by the removal process. Remove any such marks with fine emery paper or a gentle file.

# Wheels/Tyres

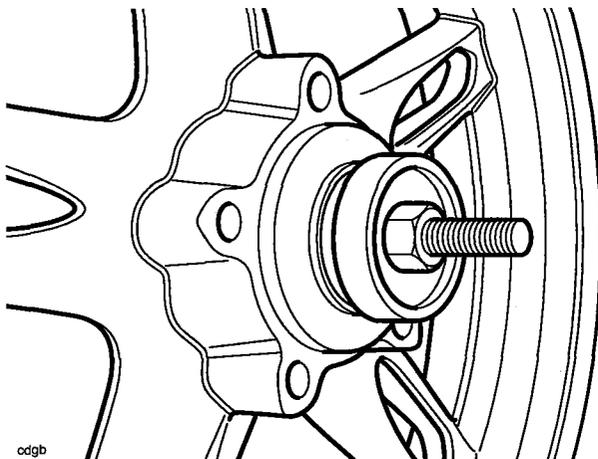
## Installation

### Note:

- Refer to the chart below for the correct tool and tool face when inserting bearings. Bearings are inserted by means of a draw-bolt acting on the insertion tool. A support tool is located on the opposite side of the wheel to the insertion tool and as the bolt is tightened, the bearing is drawn in to the wheel.
- Insert bearings with the marked or shielded side facing outwards and always fit a new bearing circlip and seals.

	Bearing insertion tool	Support tool
Left bearing	3880070-T0310 Small face to bearing	3880075-T0310 Large face to wheel
Right bearing	3880070-T0310 Small face to bearing	3880075-T0310 Large face to bearing

- Fit the wheel bearings and centre sleeve using the method described above.



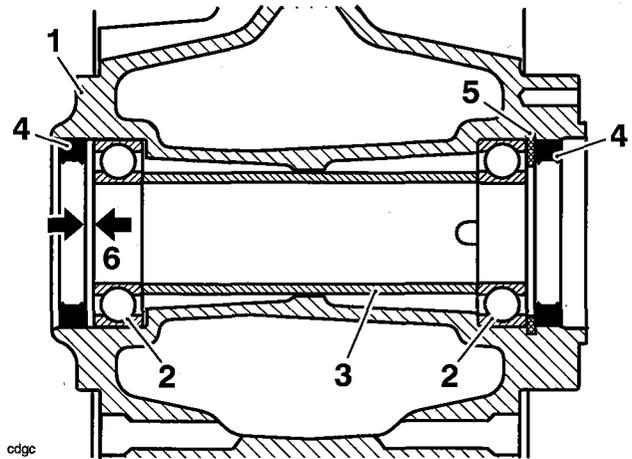
Tool 3880070 in position on wheel

- Fit a new circlip.

### **Caution**

The left oil seal must not contact the wheel bearing. The seal must be installed until the wheel's machined chamfer is just visible. The right hand seal must be installed until it contacts the circlip.

- Lubricate and fit new seals to the front wheel. Lubricate the seal's knife-edge with grease to NLGI 2 specification (we recommend Mobil HP222). Install the right hand oil seal fully. Install the left hand oil seal until the wheel's machined chamfer is just visible.

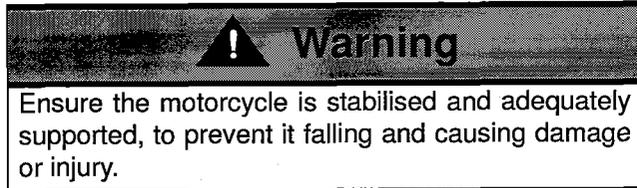


- Front wheel
  - Wheel bearings
  - Centre Sleeve
  - Oil Seals
  - Circlip
  - Left hand oil seal position
- Models with ABS brakes: Refit the ABS pulser ring (See page 14-30).
  - Fit the front wheel. (See page 15-7).

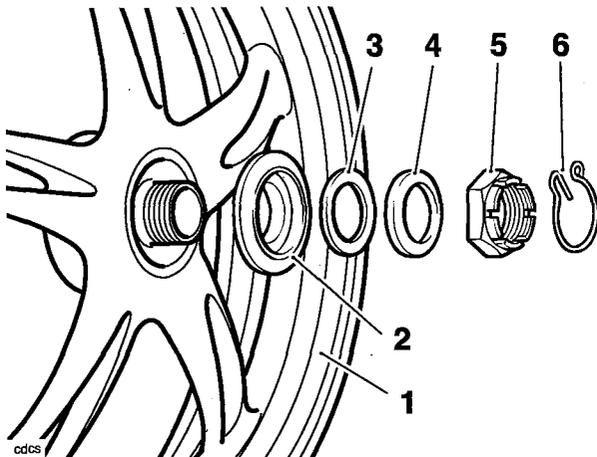
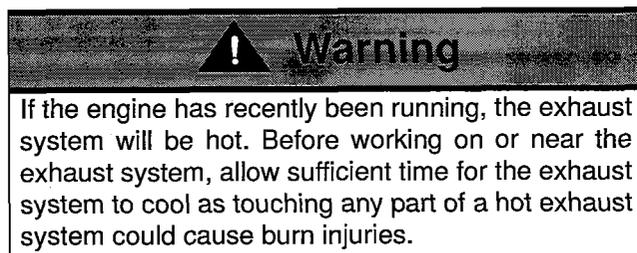
# Wheels/Tyres

## Rear Wheel

### Removal



1. Raise and support the rear of the motorcycle to allow removal of the rear wheel.



1. Rear Wheel
2. Conical spacer
3. Plain washer
4. Belleville washer
5. Nut
6. Clip

2. To release the wheel, remove:

- clip,
- nut,
- belleville washer,
- plain washer,
- conical spacer.

3. Remove the wheel.

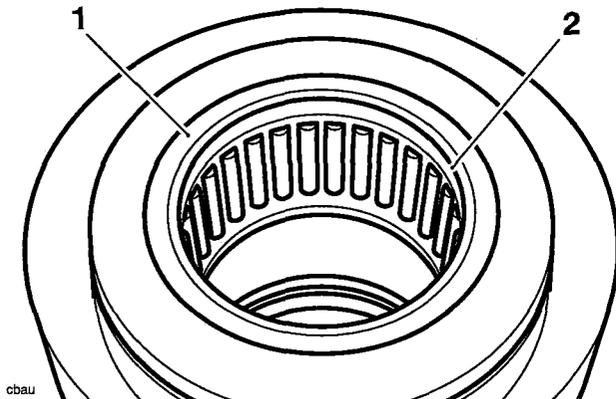
### Installation

1. Fit the wheel, aligning with the four location dowels.
2. Hold the wheel squarely in position while fitting the:
  - conical spacer
  - plain washer
  - belleville washer, dished face outwards
  - nut
3. Tighten the wheel nut to **146 Nm**, and fit the clip.

## Rear Wheel Bearing

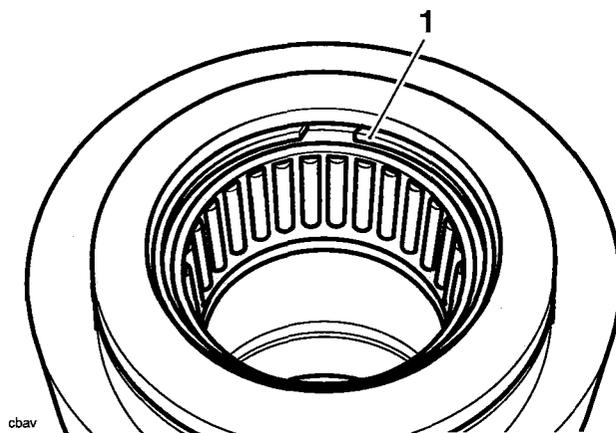
### Removal

1. Remove the rear hub (see page 12-17).
2. Transfer the hub to a work bench.
3. Note the orientation of the right hand outer hub seal then, using a soft, blunt faced tool, lever the seal from the recess in the hub.



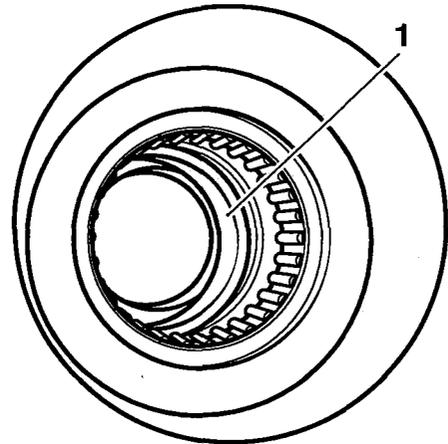
1. Seal
2. Knife-edge

4. Remove the bearing retaining ring from the right hand side of the hub.



1. Bearing Retaining Ring

5. Note the orientation of the right hand inner hub seal then, while still working from the right hand side of the hub, using a similar tool as for the outer hub seal, detach the inner hub seal from within the centre of the hub.



1. Inner Hub Seal

#### Note:

- The right hand inner seal and circlip will remain within the hub until the bearing is removed.
- Working through the hole in the centre of the left hand bearing, detach the right hand inner circlip using circlip pliers.

### Caution

Always support the hub as instructed because fully closing the vice onto the hub, supporting the hub on any other area than that specified above (particularly the eccentric adjuster slots) will cause damage and may also lead to premature wear of the new bearing once it is fitted.

6. Fit soft jaw-clamps to a vice and position the hub with the right hand side facing downwards. Do not clamp the hub in the vice. Close the vice only sufficiently to fully support the broadest possible area of the hub.

### Warning

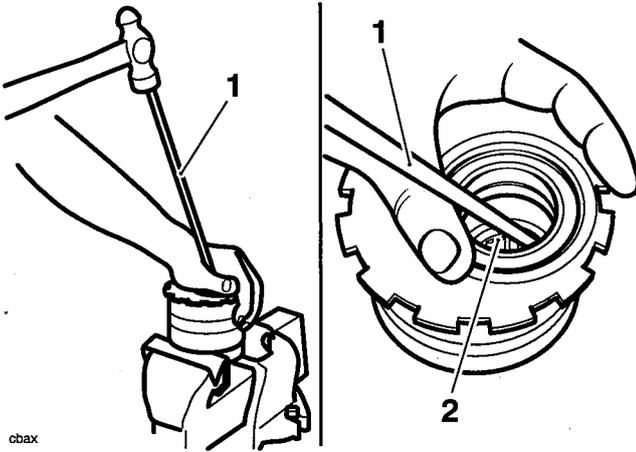
Always wear eye and hand protection when using a drift as use of a hammer and drift can cause bearings to fragment. Pieces of fragmented bearing could cause eye and hand injuries if suitable protective apparel is not worn.

## Wheels/Tyres

### ! Caution

To prevent hub damage and to aid bearing removal, always apply force evenly on both sides of the bearing to prevent it from 'tipping' and becoming stuck. Application of uneven force will lead to difficulty in removing the bearing and to a damaged hub.

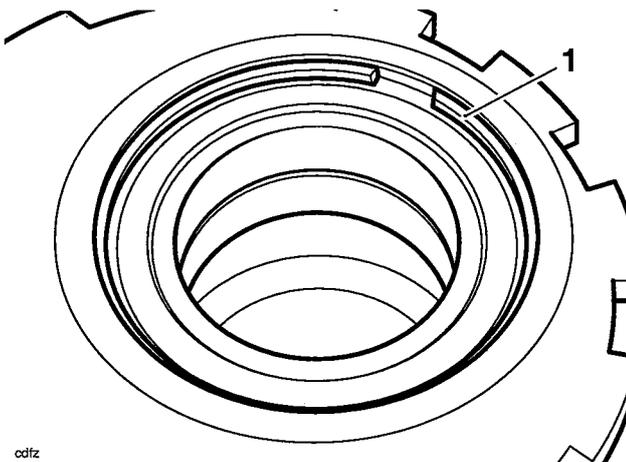
7. Working through the hole in the centre of the left hand bearing, use a pin punch to drift out the right hand bearing.



cbax

1. Punch
2. Bearing

8. Remove the inner circlip from the hub.
9. Remove the inner hub seal.
10. Remove the bearing retaining ring from the left hand side of the hub.



cdiz

1. Bearing Retaining Ring

### ! Warning

Always wear eye and hand protection when using a drift as use of a hammer and drift can cause bearings to fragment. Pieces of fragmented bearing could cause eye and hand injuries if suitable protective apparel is not worn.

### ! Caution

To prevent hub damage and to aid bearing removal, always apply force evenly on both sides of the bearing to prevent it from 'tipping' and becoming stuck. Application of uneven force will lead to difficulty in removing the bearing and to a damaged hub.

11. Working through the hole in the centre of the hub, use a pin punch to drift out the left hand bearing.

### Inspection

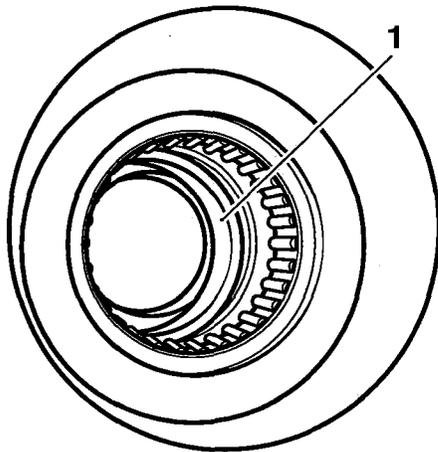
### ! Warning

Only remove raised witness marks from within the hub. Removal of material below any raised areas will reduce the level of interference between the hub and the new bearing. Loss of interference could cause the bearing to become loose in the hub leading to loss of motorcycle control and an accident.

1. Examine the hub for any raised witness marks caused by the removal process. Remove any such marks with fine emery paper or a gentle file, taking care to ensure that filings do not contaminate the bearings.

## Installation

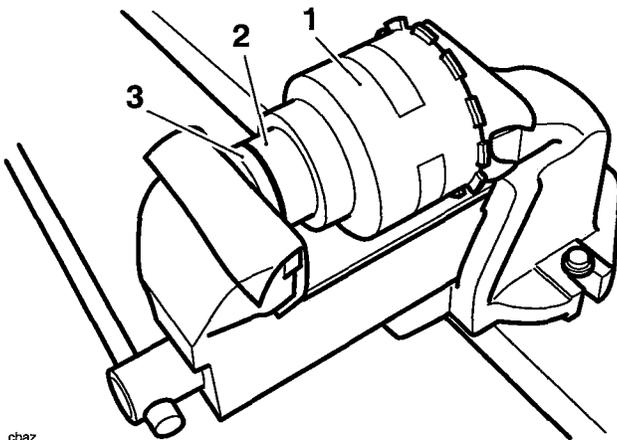
1. Lubricate and place a new inner hub seal within the hub. Lubricate the seal's knife-edge with grease to NLGI 2 specification (we recommend Mobil grease HP222).
2. Fit a new inner circlip. Ensure the circlip is retained in the groove through its entire circumference.



cbaw

### 1. Inner Circlip

3. Position the inner hub seal to the hub and push it evenly and fully into place against the inner circlip.
4. Open the vice to a distance that will accept the hub, new right hand bearing and service tool 3880065-T0301 all aligned together inside the soft vice jaws. Align the large end of tool 3880065-T0301 to the new bearing.



cbaz

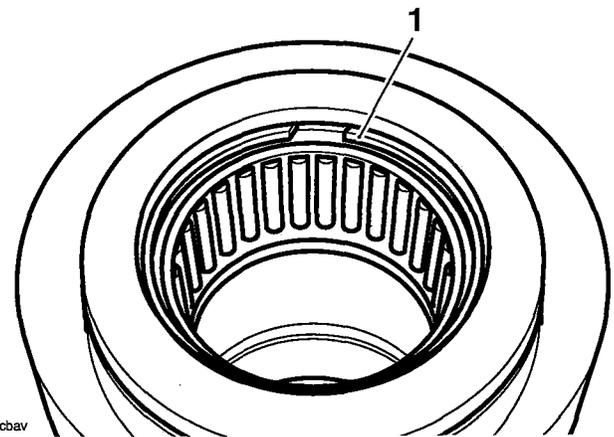
1. Hub
2. Right hand bearing
3. Service Tool 3880065-T0301

5. Progressively close the vice until the outer cage of the new bearing is pushed fully up to the inner circlip inside the hub. Open the vice and collect the hub and tool then place the tool aside.

**! Caution**

Ensure the hub, new bearing and tool remain in alignment throughout the assembly process. Misalignment of any of these items could cause damage to the bearing and/or the hub.

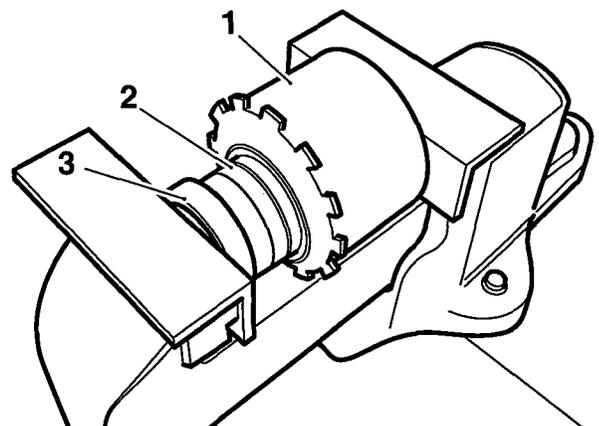
6. Should misalignment occur at any point, remove the components, check and rectify any damage and then repeat the bearing installation process.
7. Retain the new bearing by fitting a new retaining ring to the groove inside the hub. Ensure the ring is retained in the groove through its entire circumference.



cbav

### 1. Bearing Retaining Ring

8. Open the vice to a distance that will accept the hub, new left hand bearing and service tool 3880075-T0301 all aligned together inside the soft vice jaws. Align the Small end of tool 3880075-T0301 to the new bearing.



cdga

1. Hub
2. Left hand bearing
3. Service Tool 3880075-T0301

## Wheels/Tyres

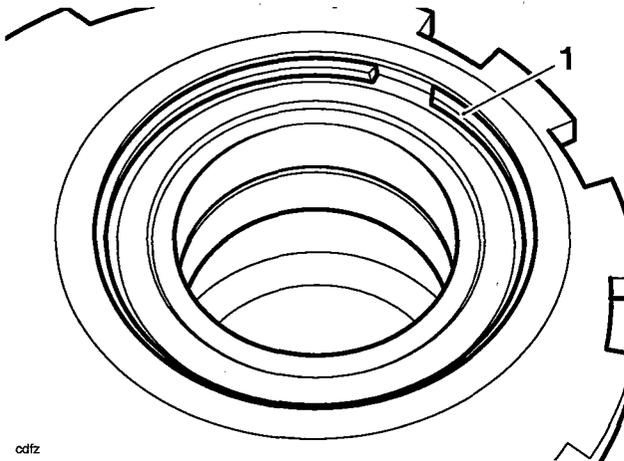
- Progressively close the vice until outer race of the left hand new bearing is pushed fully up to the inner flange inside the hub. Open the vice and collect the hub and tool then place the tool aside.

### **Caution**

Ensure the hub, new bearing and tool remain in alignment throughout the assembly process. Misalignment of any of these items could cause damage to the bearing and/or the hub.

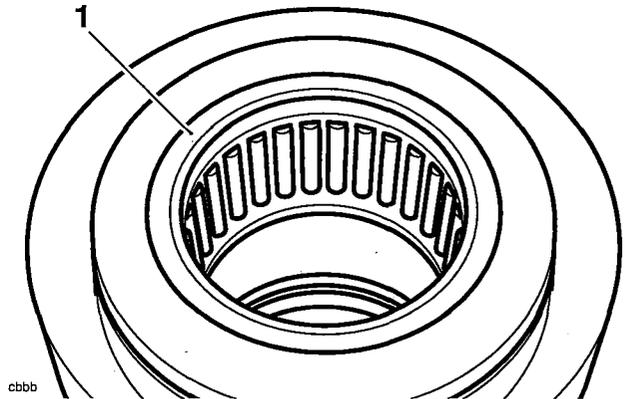
Should misalignment occur at any point, remove the components, check and rectify any damage and then repeat the bearing installation process.

- Retain the new bearing by fitting a new retaining ring to the groove inside the hub. Ensure the ring is retained in the groove through its entire circumference.



1. Bearing Retaining Ring

- Lubricate a new outer seal's knife-edge with grease to NLGI 2 specification (we recommend Mobil grease HP222). Position the outer hub seal to the hub and push it evenly and fully into place against the bearing retaining ring.



1. Outer Hub Seal

- Lubricate the new bearing with 5 grammes of grease to NLGI 2 specification (we recommend Mobil grease HP222).
- Thoroughly clean the hub-bore in the swinging arm.
- Refit the hub (see page 12-19).

# 16 Frame and Bodywork

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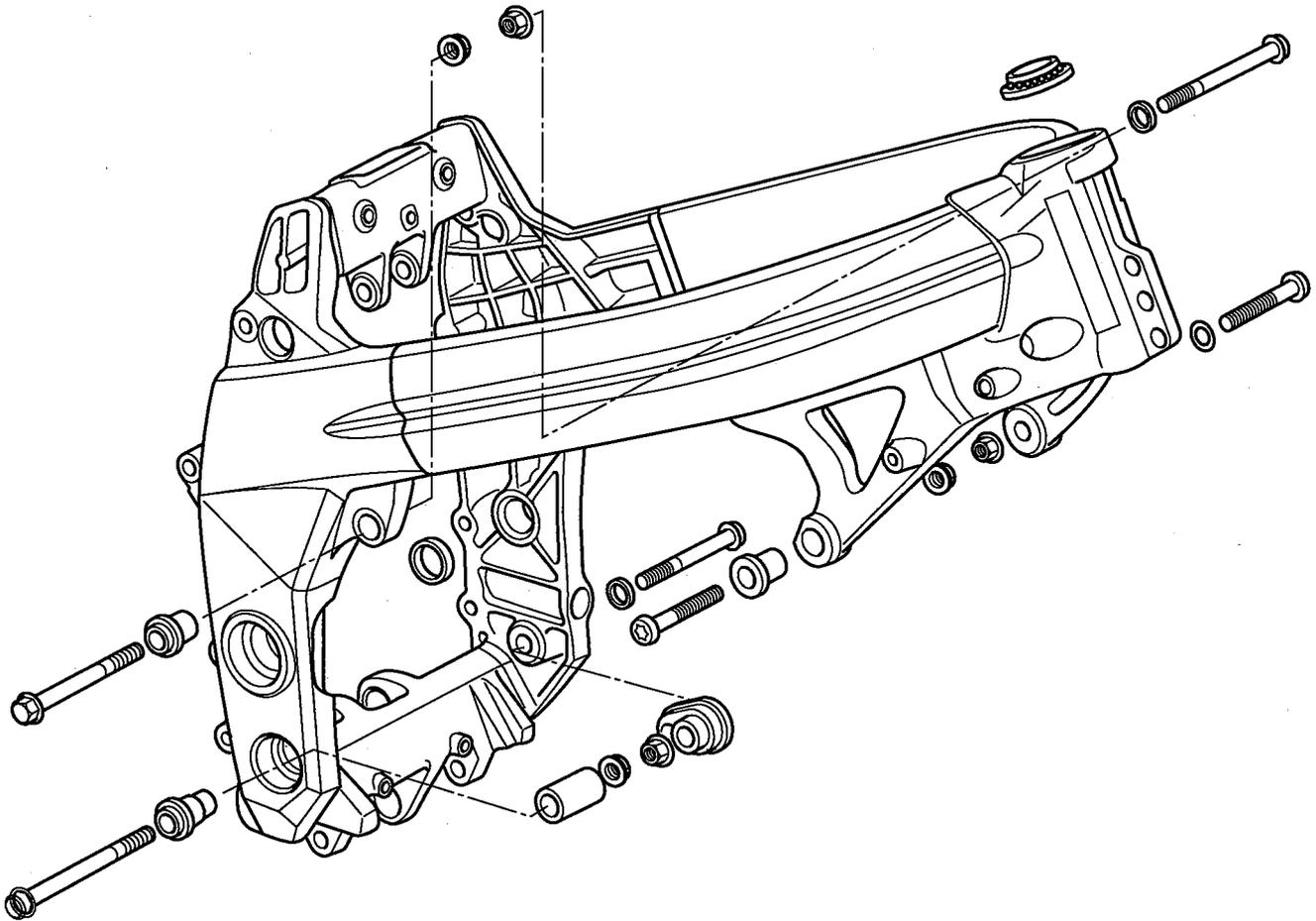
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# Frame and Bodywork

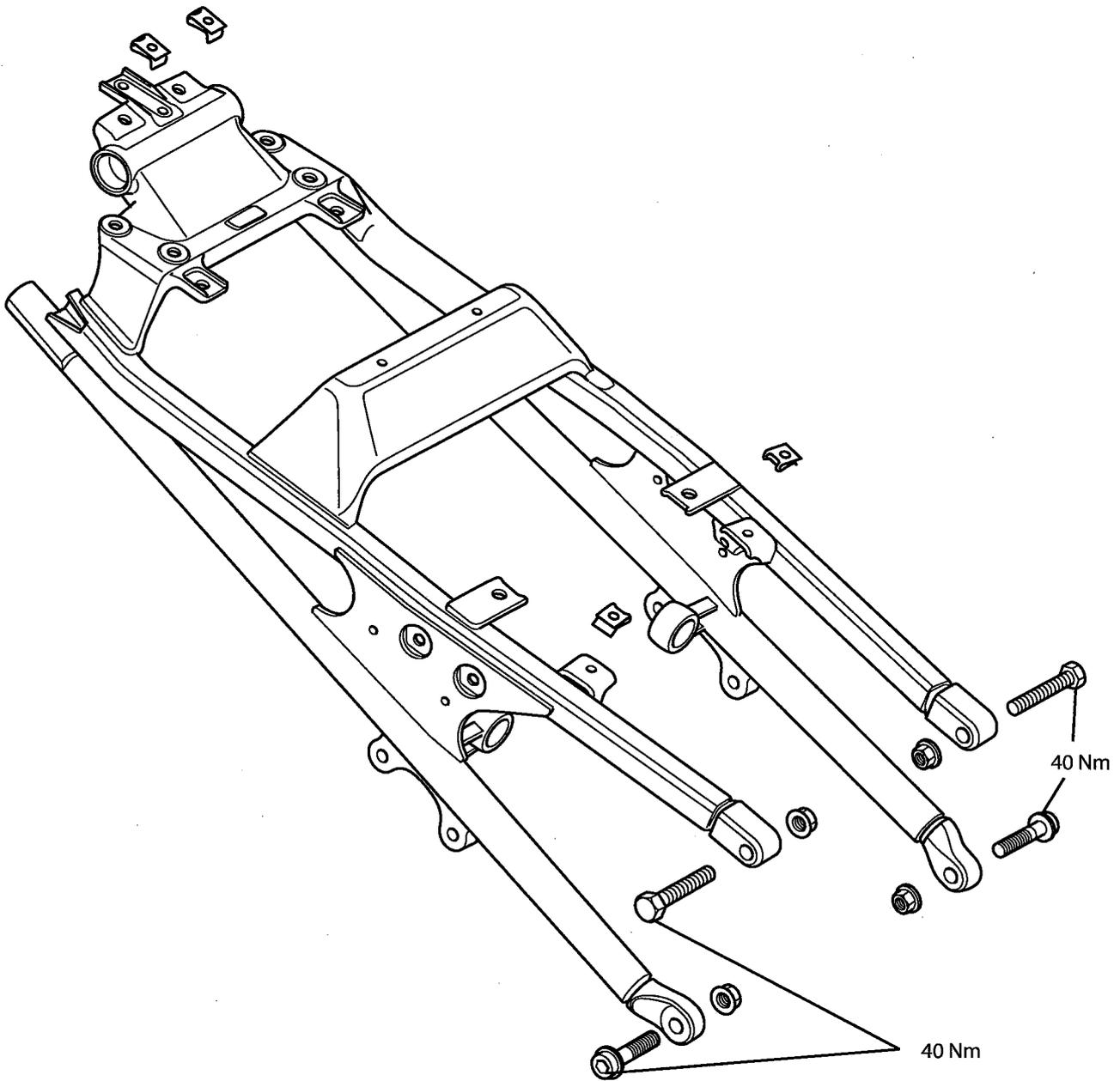
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## Exploded View - Frame

All engine mouning fixings - see text in section 9

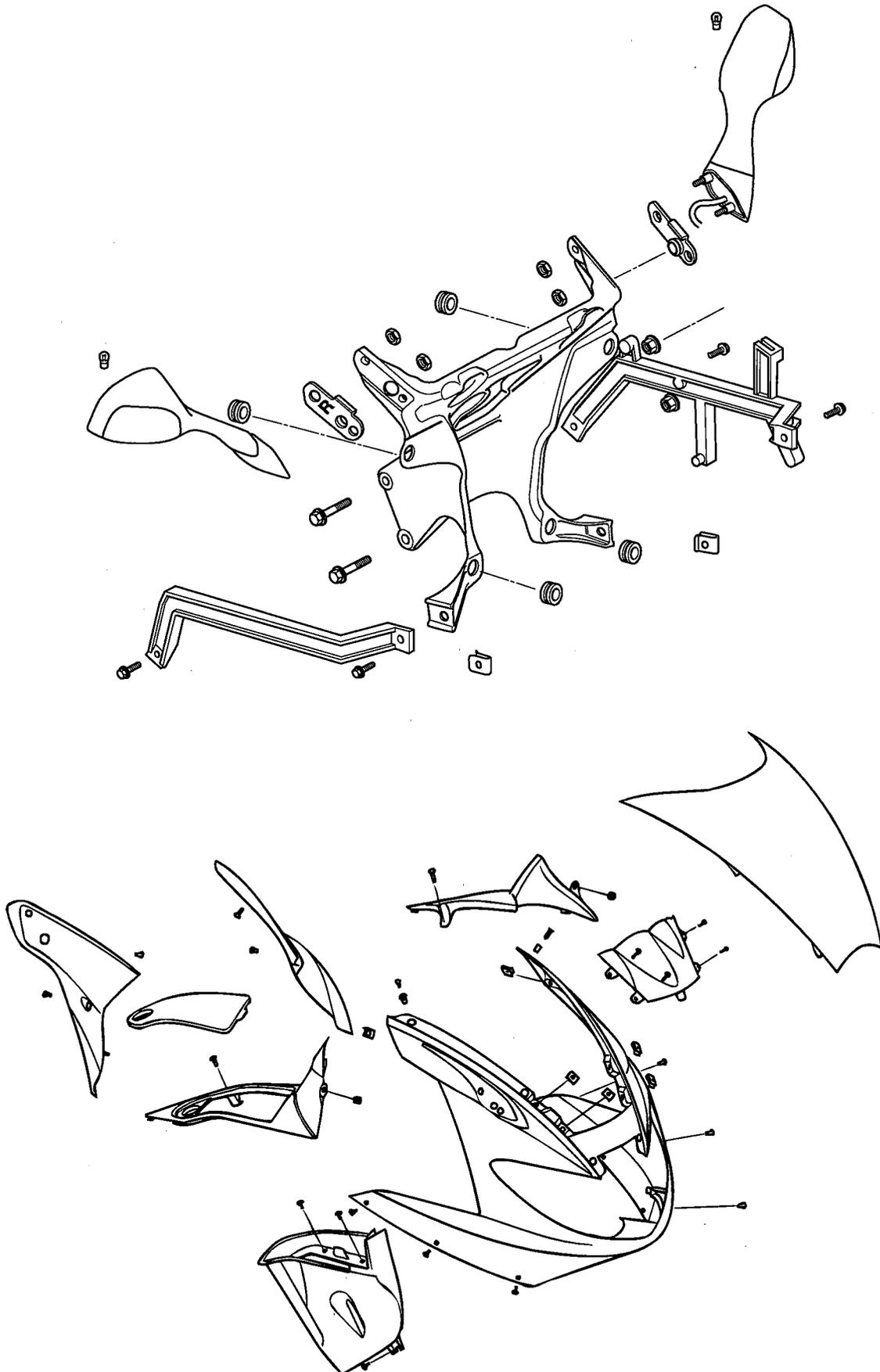


Exploded View - Seat Rails



# Frame and Bodywork

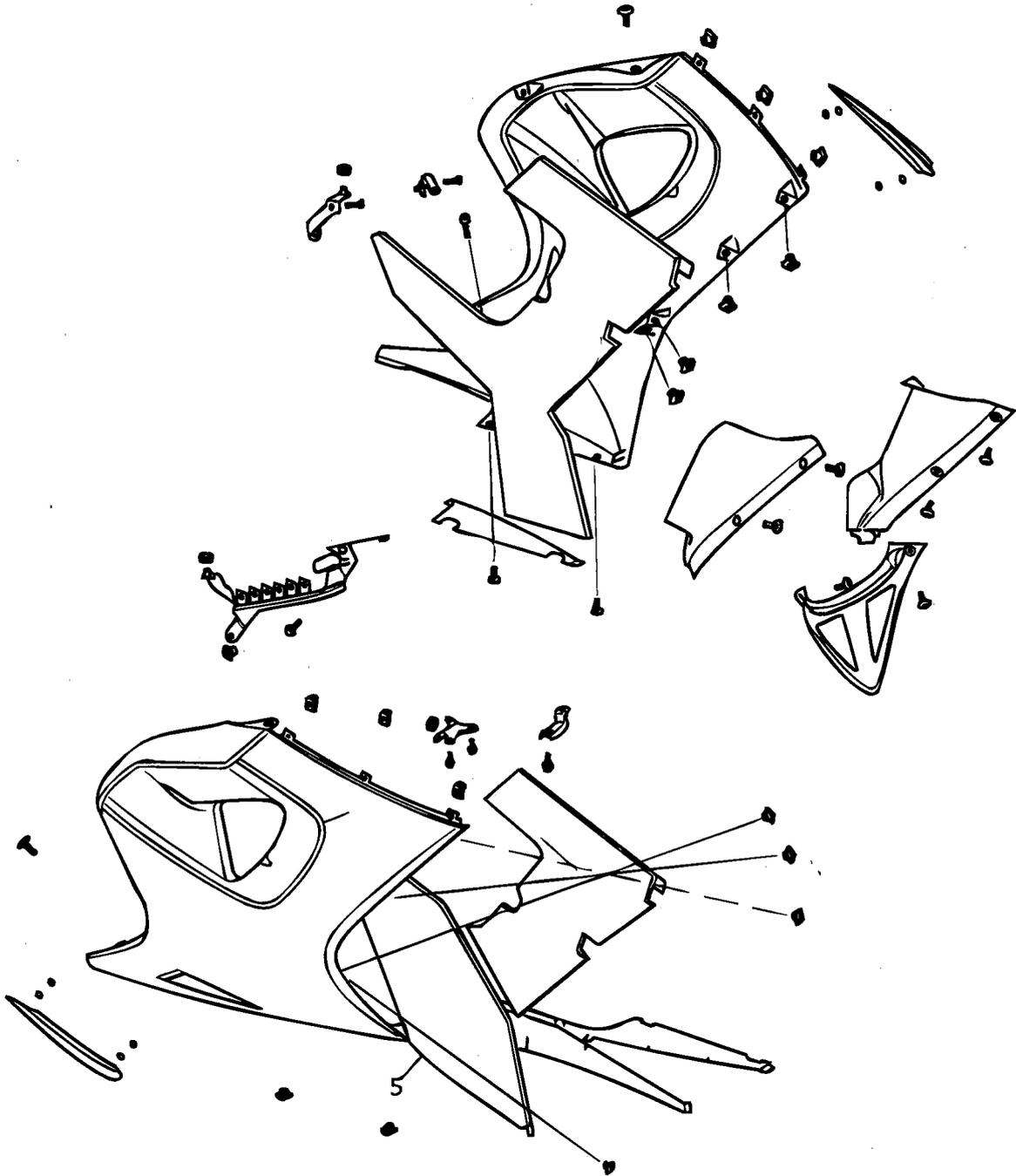
## Exploded View - Cockpit and Mountings



All fixings - see text

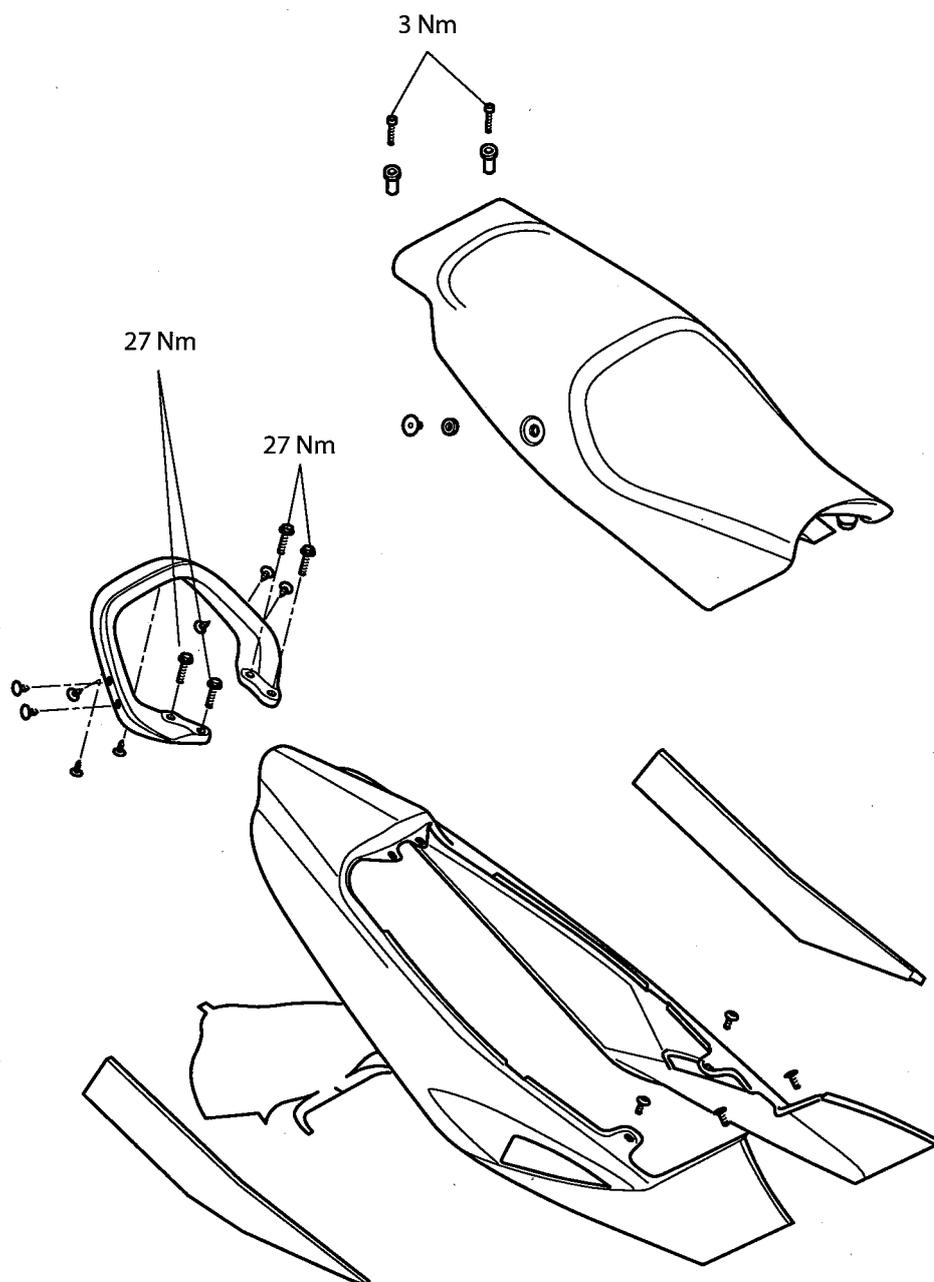
Exploded View - Lower Fairings

All fixings - see text



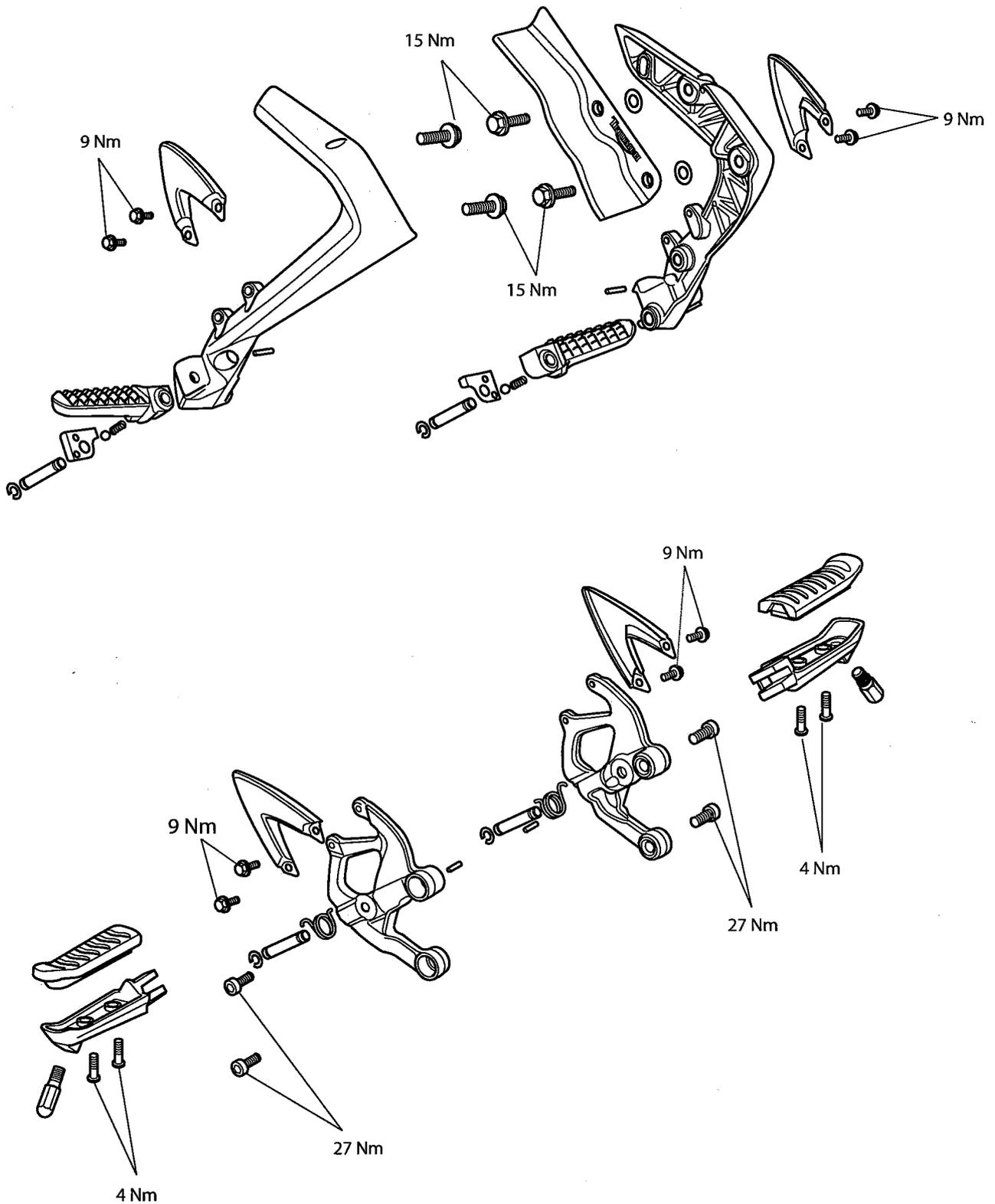
# Frame and Bodywork

## Exploded View - Rear Panels



All body panel fixings - 3 Nm

## Exploded View - Footrests and Mountings



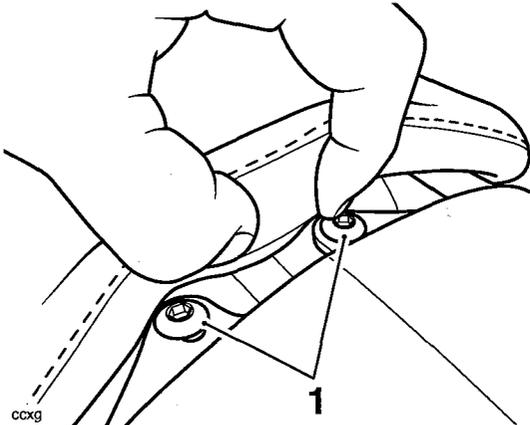
# Frame and Bodywork

## Seat

### Removal

The seat fasteners are located under the rear edge of the seat.

1. Push back the rear edge of the seat and unscrew the exposed fixings. Collect the spacers from beneath the fixings.



### 1. Seat fasteners

2. To detach the seat, lift the rear of the seat and slide it rearwards.

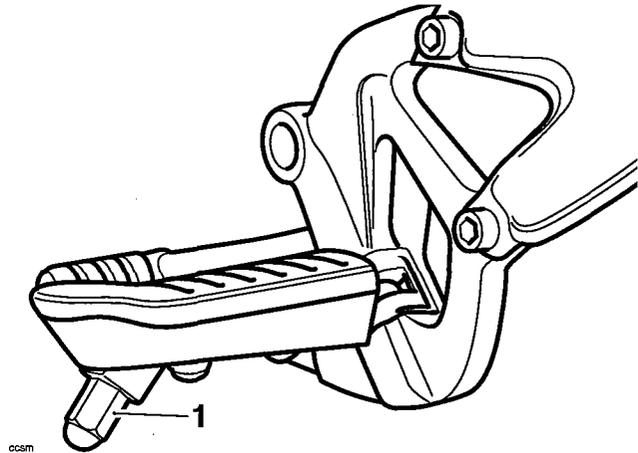
### Refit

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.
3. Push back the rear edge of the seat and secure the fixings. Tighten to **3 Nm**.
4. 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 bank angle indicators on the rider's footrests for wear. The bank angle indicators are worn out when 5mm of the bank indicator remains.



### 1. Bank angle indicator



### Warning

Use of a motorcycle with bank angle indicators 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.

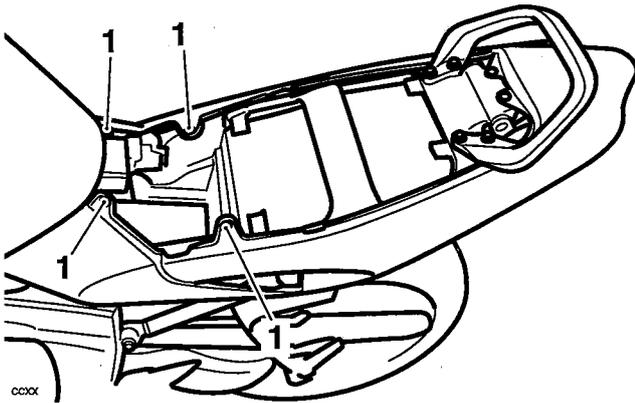
## Warning

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.

## Rear Panel

### Removal

1. Remove the seat (see page 16-8).
2. Disconnect the battery, negative (black) lead first.
3. Remove the grab rail.
4. To release the rear panel assembly, remove the fixings shown in the illustration below and collect the four washers on the two rearmost fixings.



### 1. Rear Panel Fixings

5. Gently pull the panel outwards.
6. Withdraw the panel assembly from the rear of the motorcycle.

### Installation

1. Installation is the reverse of removal noting the following.

#### Note:

- The two rearmost fixings have a washer above and below the panel mountings.
- Tighten fixings to 3 Nm.
- Reconnect the battery, positive (red) lead first.

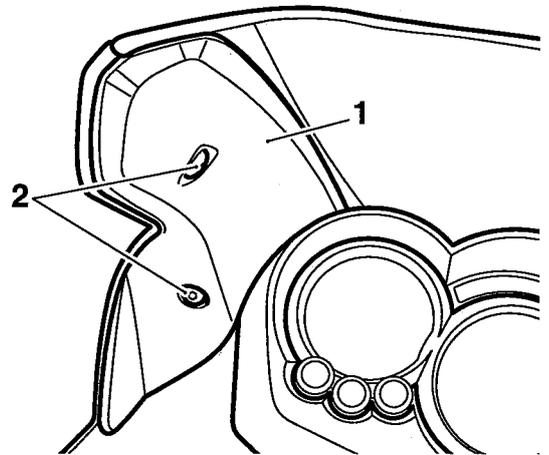
## Left and Right Facia / Cockpit Infill Panels

### Removal

#### Note:

- Follow the same procedure for both left and right hand sides.

1. Remove the seat (see page 16-8).
2. Disconnect the battery, negative (black) lead first.



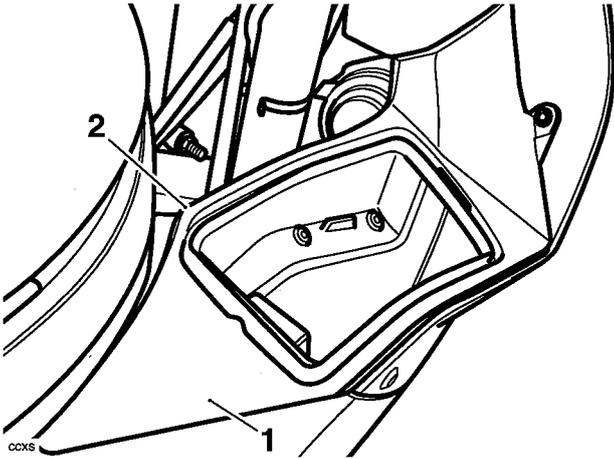
### 1. Facia infill panel

### 2. Fixings

3. Remove the two screws securing the upper facia infill panel. Note the length and position of the screws.
4. To remove the facia infill panel ease the top towards the motorcycle centre line. This will allow the lip under the instruments to be withdrawn. Pull to the rear to extract the bayonet from the grommet in the cockpit infill panel.
5. Remove the lid from the stowage compartment.

## Frame and Bodywork

- Remove the screws securing the cockpit infill panel.



### 1. Cockpit infill panel

### 2. Fixings

- The rear of the cockpit infill is located into the fairing with a hook. The panel must be moved forwards until the hook is clear of the slot.
- Remove the panel.

## Installation

- Installation is the reverse of removal noting the following.

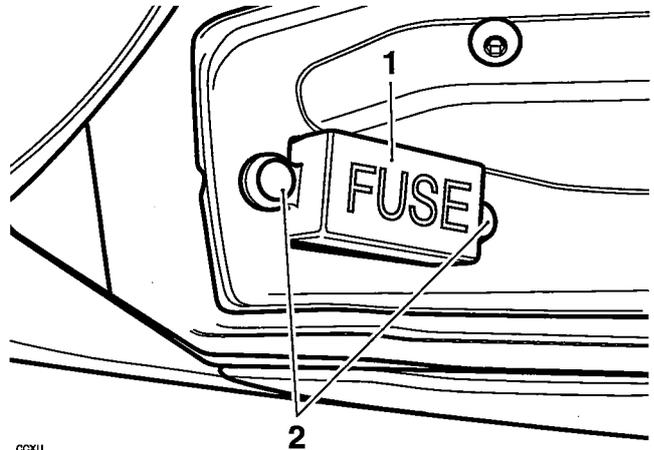
### Note:

- Tighten fixings to 5 Nm.
- Reconnect the battery, positive (red) lead first.

## Fuse Box / Stowage Box

### Removal

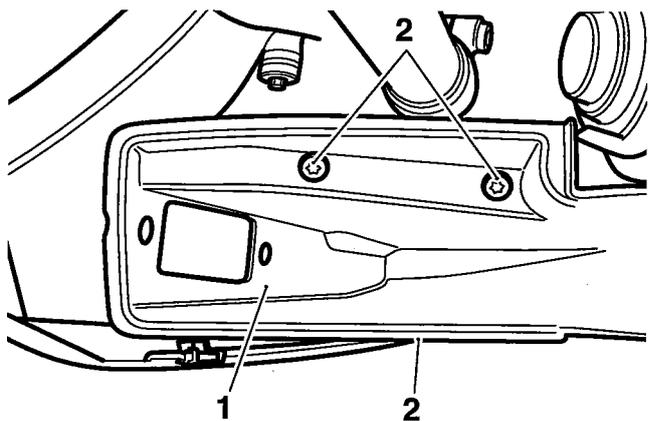
- Remove the right hand facia and cockpit infill panels (see page 16-9).
- Remove the right hand lower fairing (see page 16-11).
- Remove the contents of the stowage compartment.



### 1. Fuse box

### 2. Fuse box fixings

- Remove the fir tree fixings securing the fuse box to the stowage compartment. Detach the fuse box.
- Remove the three screws securing the stowage box to the subframe.
- Remove the stowage box.



### 1. Stowage box

### 2. Stowage box fixing locations

## Installation

1. Installation is the reverse of removal noting the following.

### Note:

- Tighten the stowage box fixings to 6 Nm.
- Tighten the lower fairing fixings to 5 Nm.
- Reconnect the battery, positive (red) lead first.

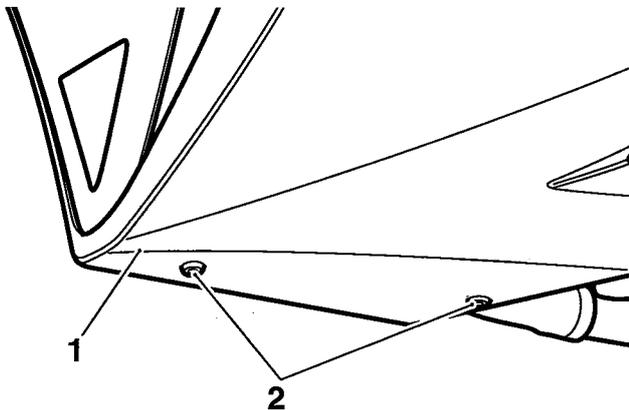
## Lower Fairing

### Removal

#### Note:

- The cockpit does NOT need to be removed in order to remove the lower fairings.

1. Remove the seat (see page 16-8).
2. Disconnect the battery, negative (black) lead first.
3. Remove the fascia and cockpit infill panels (see page 16-9).
4. Remove the two screws securing the fairing lower halves to each other.

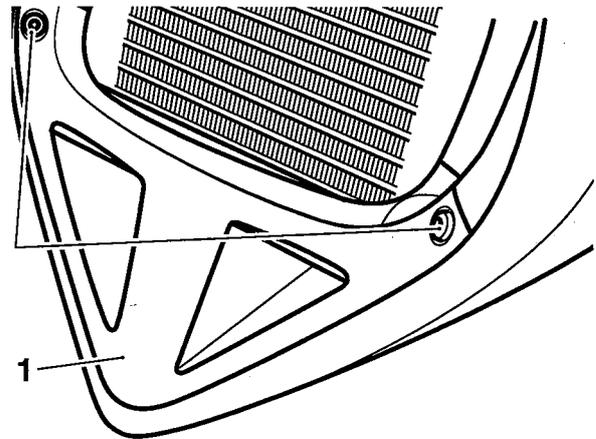


cdhd

#### 1. Lower Fairing

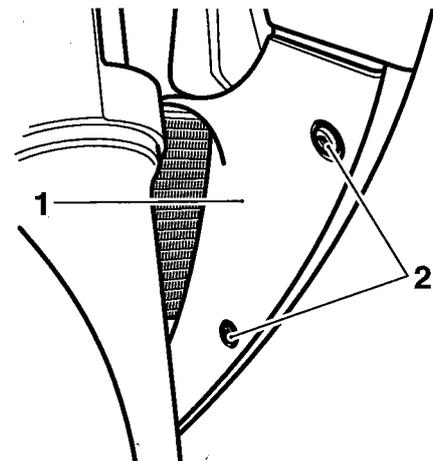
#### 2. Fixings

5. Remove the two screws holding the oil cooler infill panel. Withdraw the panel in an upward direction.



#### 1. Oil cooler infill panel

#### 2. Fixings

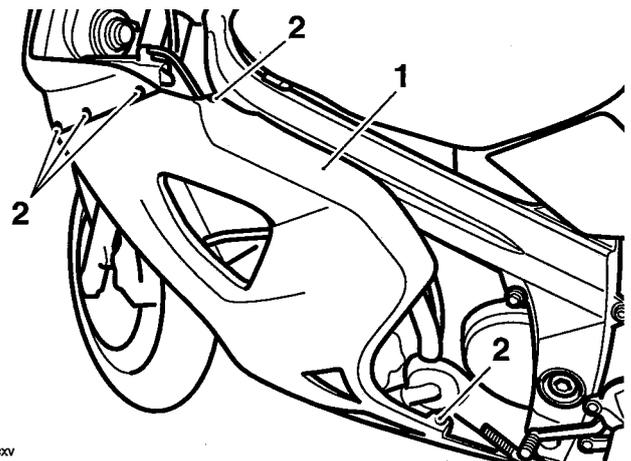


ccxw

#### 1. Radiator infill panel (LH shown)

#### 2. Fixings

6. Remove the two screws securing each of the radiator infill panels.
7. Remove the two screws securing each fairing to the fairing brackets.



ccxv

#### 1. Lower Fairing (RH shown)

## Frame and Bodywork

### 2. Fairing Retaining Screws

8. Remove the three screws securing each fairing to the cockpit.
9. Ease the panel away from the cockpit to remove it.

### Installation

1. Position each fairing to the rear of the upper mounting.
2. Refit the fairing to the cockpit, tighten the fixings to **5 Nm**.
3. Refit the fairings to the fairing brackets, tighten the fixings to **5 Nm**.
4. Refit the radiator infill panels, tighten the fixings to **6 Nm**.
5. Refit the oil cooler infill panel, tighten the fixings to **6 Nm**.
6. Refit the lower fairing fixings, tighten the fixings to **5 Nm**.
7. Refit the facia and cockpit infill panels (see page 16-11).
8. Reconnect the battery, positive (red) lead first.
9. Refit the seat (see page 16-8).

## Windscreen and Under-Screen Trim

### Removal



1. Windscreen
2. Under-screen trim

1. Release the windscreen upper fixings.
2. Slide the windscreen upwards and to the rear.
3. Release the fixings securing the under-screen trim and remove the trim.

### Installation

Installation is the reverse of removal noting the following.

#### Note:

- Tighten fixings to **5 Nm**.

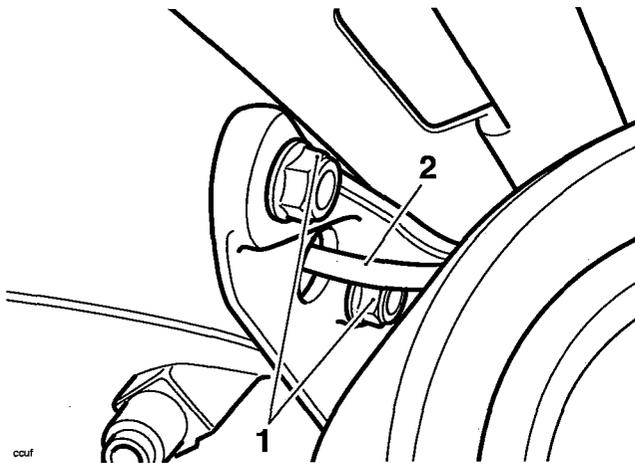
## Cockpit

### Removal

#### Note:

- The cockpit is removed as an assembly. It is not necessary to remove the lower fairings, instruments or headlight unit.

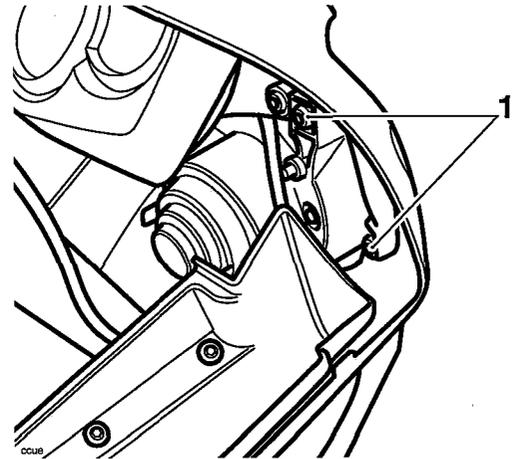
- Remove the seat (see page 16-8)
- Disconnect the battery, negative (black) lead first.
- Remove the facia and cockpit infill panels (see page 16-9).
- Remove the windscreen and under-screen trim (see page 16-12).



- Mirror fixings
- Indicator wires

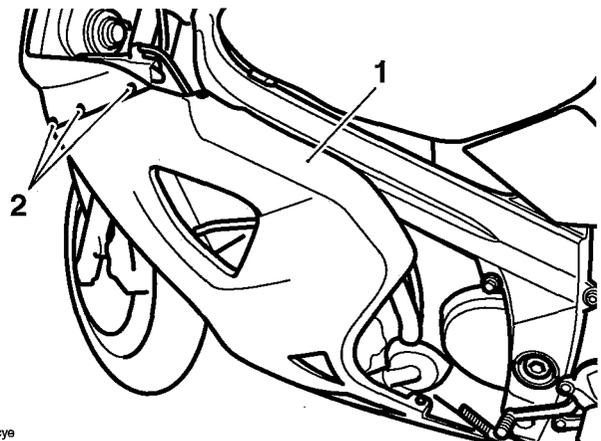
- Release the two nuts on each mirror.
- Disconnect the direction indicators at their multiplugs in the area under the screen trim.

- Remove both mirrors.



- Cockpit to headlight screws (right hand shown)

- Remove the four screws securing the cockpit to the headlight assembly



- Lower fairing
- Cockpit to lower fairing screws

- Remove the three screws securing the cockpit to each lower fairing.
- Remove the cockpit in a forward direction.

### Installation

- Position the cockpit to each lower fairing.
- Refit the cockpit to the fairings, tighten the fixings to **5 Nm**.
- Refit the fairing to the headlight assembly, tighten the fixings to **6 Nm**.
- Fit the mirrors, tighten the fixings to **9 Nm**.
- Refit the instruments (see page 17-17).
- Refit the windscreen and under-screen trim (see page 16-12).

## Frame and Bodywork

---

7. Refit the facia and cockpit infill panels (see page 16-11).
8. Connect the battery, positive (red) lead first.
9. Refit the seat (see page 16-8).

# 17 Electrical

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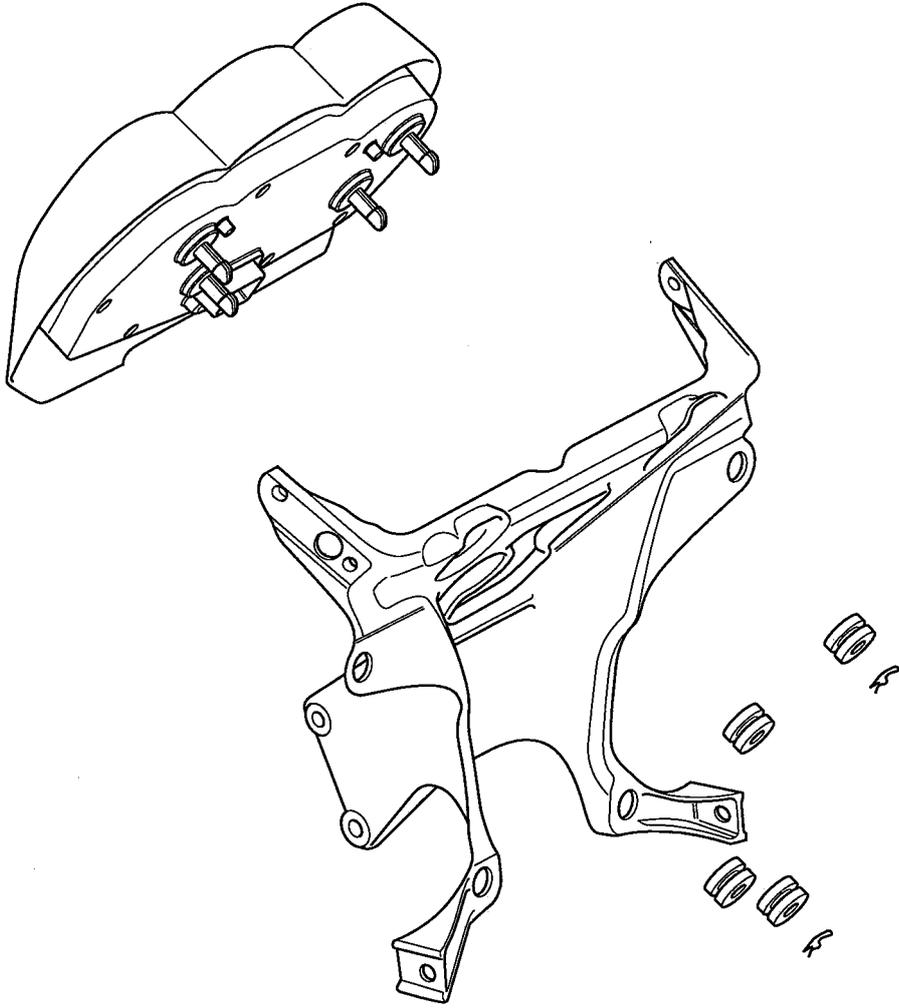
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# Electrical

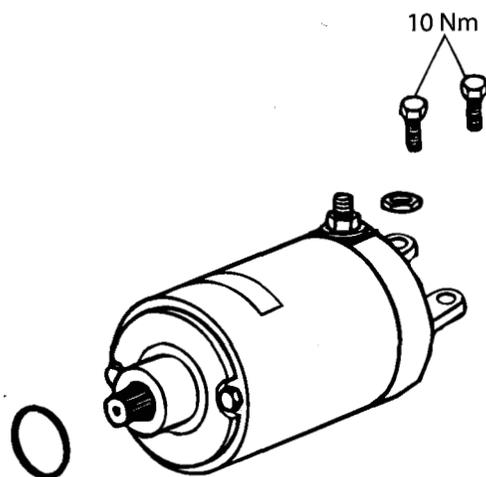
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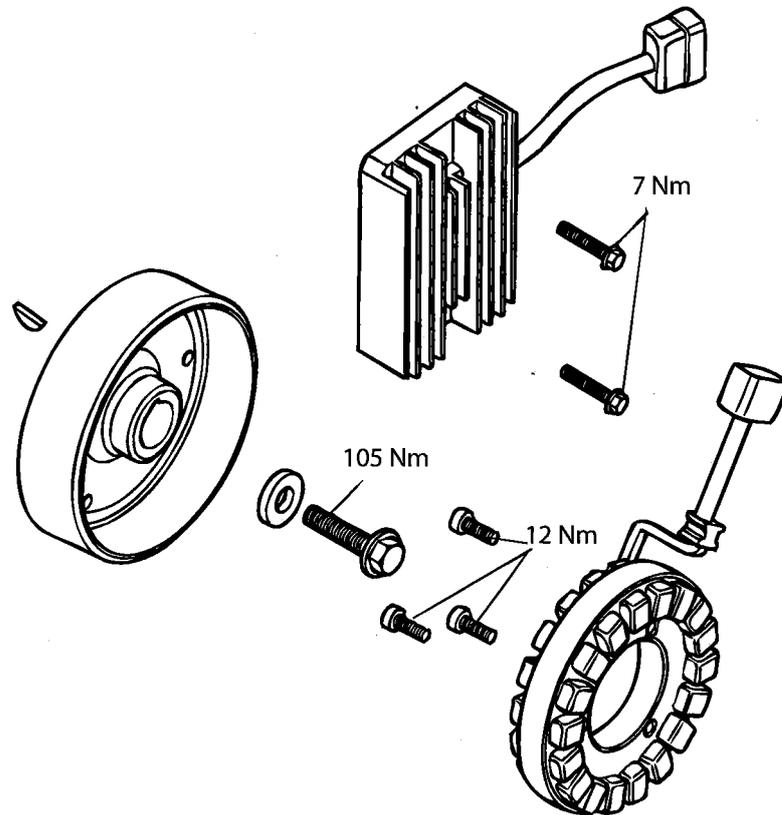
Exploded View - Instruments



## Exploded View - Starter Motor

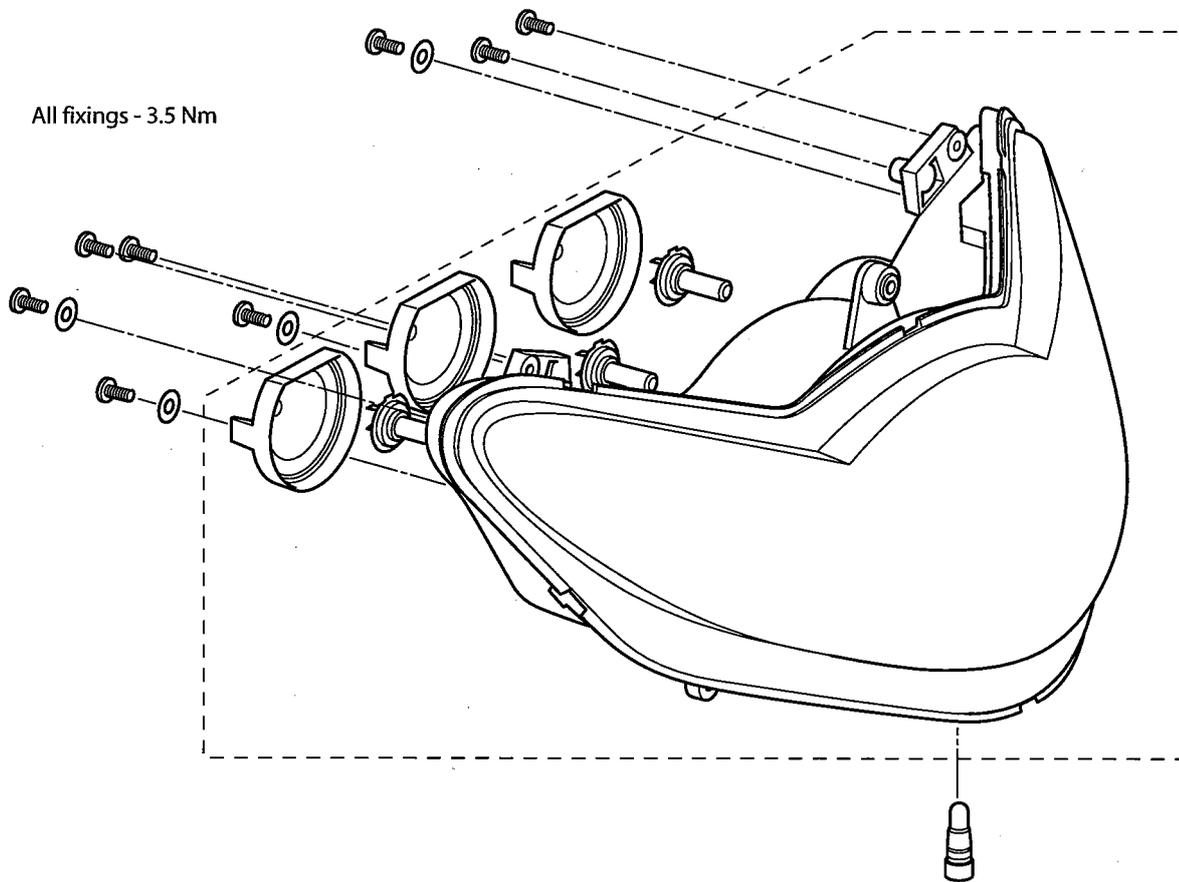


Exploded View - Alternator

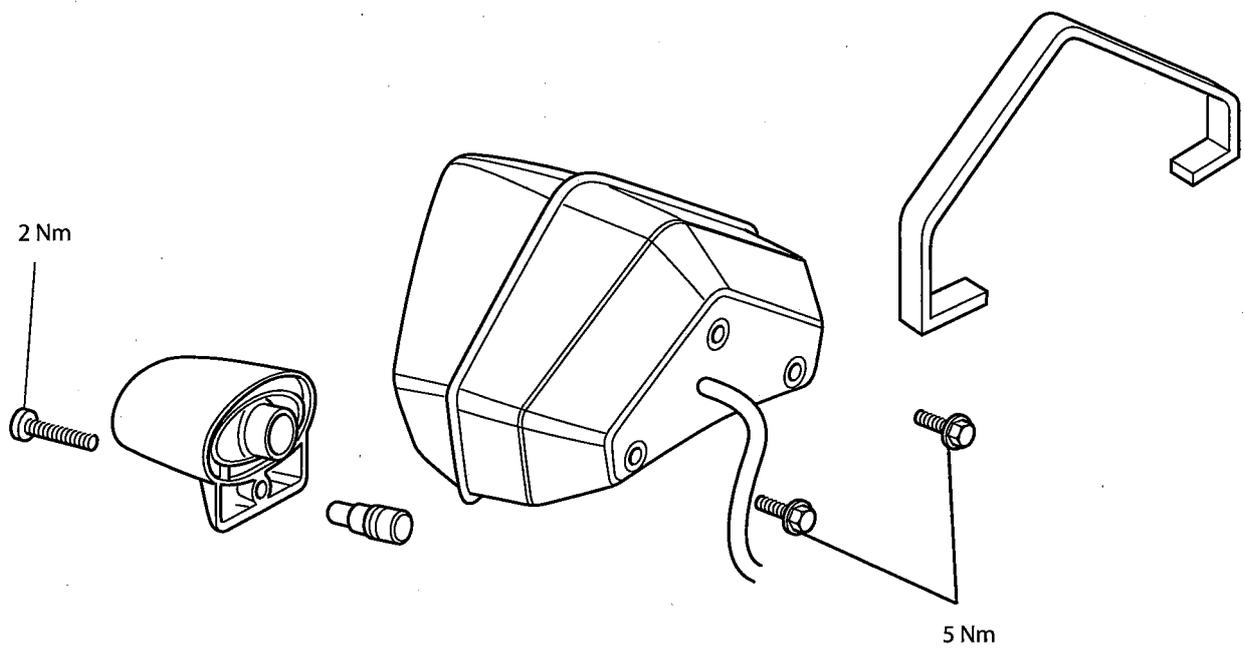


# Electrical

## Exploded View - Headlight



Exploded View - Rear Light and Indicators



## Battery

### Warning

The battery gives off explosive gases; keep sparks, flames and cigarettes away. Provide adequate ventilation when charging or using the battery in an enclosed space.

The battery contains sulphuric acid (electrolyte). Contact with skin or eyes may cause severe burns. Wear protective clothing and a face shield.

- If electrolyte gets on your skin, flush with water immediately.
- If electrolyte gets in your eyes, flush with water for at least 15 minutes and SEEK MEDICAL ATTENTION IMMEDIATELY.
- If electrolyte is swallowed, drink large quantities of water and SEEK MEDICAL ATTENTION IMMEDIATELY.

KEEP ELECTROLYTE OUT OF THE REACH OF CHILDREN.

### Warning

The battery contains harmful materials. Always keep children away from the battery whether or not it is fitted in the motorcycle.

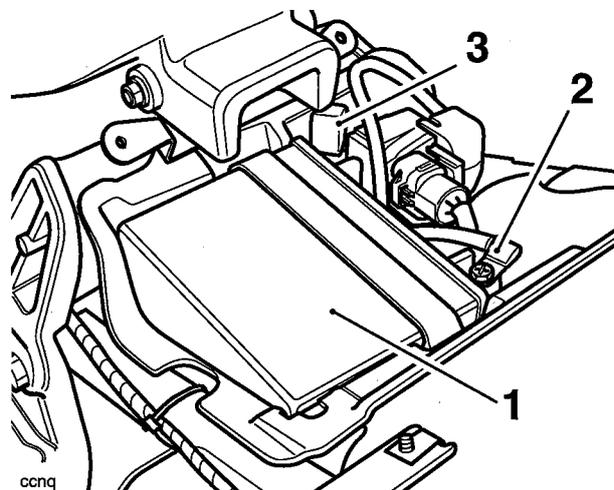
Do not jump start the battery, touch the battery cables together or reverse the polarity of the cables as any of these actions may cause a spark which would ignite battery gasses causing a risk of personal injury.

### 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. Remove the seat (see page 16-8).
2. Disconnect the battery, negative (black) lead first.
3. Remove the rear bodywork (see page 16-9).
4. Remove the fuel tank (see page 10-87).
5. Remove the battery strap.
6. Take the battery out of the case.



- ccng
1. Battery
  2. Negative (-) terminal
  3. Positive (+) terminal

### 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 positive terminal with a protective cap.
5. Refit the battery strap.
6. Seat the fuel tank (see page 10-88).
7. Refit the rear bodywork (see page 16-9).

- Refit the seat (see page 16-8).

## New Battery Commissioning

 <b>Warning</b>	
The battery electrolyte is corrosive and poisonous. Never swallow battery electrolyte or allow it to come into contact with the skin. To help reduce the risk of injury, always wear eye and skin protection when filling and sealing the battery.	

To ensure that a new battery is correctly commissioned and will deliver maximum capacity for starting, the following procedure must be followed.

- Read the instructions and warnings delivered with the battery!
- Place the battery on a flat level surface and remove the sealing foil.
- Remove the battery sealing strip from the electrolyte container (if fitted) and save for use later in this procedure. Do not break the seal on the electrolyte container.
- Place the electrolyte container and adapter (if supplied) on the battery and fill the battery according to the manufacturers instructions.
- After starting to fill the battery with electrolyte, allow the battery to stand for 30 minutes with the filling container in place.
- Check that all of the electrolyte has drained from the container, do not remove container at this point. If the container has not completely drained, gently tap the sides of the container to start the electrolyte flowing again.
- After all of the electrolyte has drained into the battery, allow the battery to stand, with the electrolyte container in place, for a further 30 minutes for batteries 3Ah - 12Ah or 1 hour for batteries greater than 12Ah.
- Remove the electrolyte container and adapter carefully, and dispose of both immediately.
- Fit the sealing caps to the battery according to the battery manufacturers instructions.
- Measure the terminal voltage on the battery to assess the battery condition.
- Charge the battery as necessary (see table of charging time) using a suitable charger (i.e. a charger with a suitably controlled charging current and appropriate cut off voltage.)

<b>Charging Time</b>		
<b>Terminal Voltage Measured</b>	<b>Charge Time (hours)</b>	<b>Charge Cutoff Voltage</b>
12.8	2	14.5
12.7	3	14.5
12.6	4	14.5
12.5	5	14.5
Less than 12.5	8-10	14.5

- Charging current should be controlled to 10% of the nominal capacity (i.e. for a 10AH battery charging current  $I = 0.1 \times 10 = 1A$ ).
- Disconnect the charger and allow the battery to stand for 1 hour before fitting to the motorcycle.
- Fit the battery to the motorcycle, positive (Red) lead first.

## Charging - Battery Already in Service

When re-charging a battery in service, the following precautions must be taken to avoid damage to the battery.

- The charging rate must not exceed 1.0 A except for a boost charge where a maximum charge rate of 5 Amps. (for no longer than 1 hour) is allowed.

 <b>Caution</b>	
Boost charge should only be performed if the battery is in a severely discharged state. Boost charging a part discharged battery will damage the cells and plates leading to permanent battery damage.	

## Battery Charging – Battery Already in Service

When re-charging a battery in service, the following precautions must be taken to avoid damage to the battery.

- The charging rate must not exceed 1.0 A except for a boost charge where a maximum charge rate of 6 A (for no longer than 1 hour) is allowed.

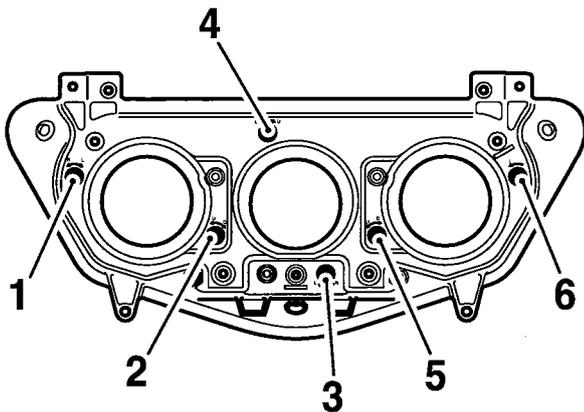
## Battery Maintenance

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 Adjustment

The headlights can be adjusted by means of vertical and horizontal adjustment screws located on the rear of each headlight.



ccoy

1. Horizontal adjustment screw (LH dipped headlight)
2. Vertical adjustment screw (LH dipped headlight)
3. Horizontal adjustment screw (main beam headlight)
4. Vertical adjustment screw (main beam headlight)
5. Vertical adjustment screw (RH dipped headlight)
6. Horizontal adjustment screw (RH dipped headlight)

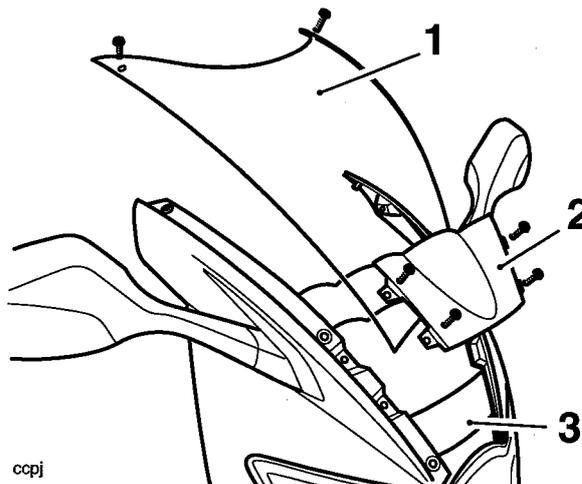
## Main Beam Horizontal Adjustment

### Note:

- The main beam horizontal adjustment screw is accessible without removing any panels. It can be reached from below the lights.

1. Switch the headlight beam on.
2. Turn the horizontal adjustment screw clockwise to move the beam to the left or anti-clockwise to move the beam to the right.
3. Switch the headlights off when the beam settings are satisfactory.

## Main Beam Vertical Adjustment



ccpj

1. Windscreen
  2. Cover panel
  3. Adjustment screw access
1. Remove the windscreen (see page 16-12).
  2. Remove the screws securing the cover panel and remove the panel.
  3. The vertical adjustment screw is now accessible.
  4. Switch the headlight main beam on.
  5. Turn the vertical adjustment screw clockwise to raise the beam or anti-clockwise to lower the beam.
  6. Switch the headlight off when the beam setting is satisfactory.
  7. Refit the cover panel.
  8. Refit the windscreen (see page 16-12).

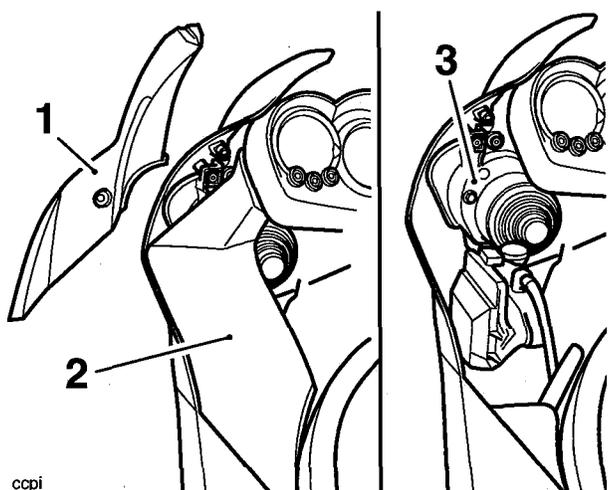
## Dipped Beam Vertical Adjustment

### Note:

- The dipped beam vertical adjustment screws are accessible without removing any panels. They can be reached from below the lights on the left or right hand side.
- Turn the handlebars for ease of access.

1. Switch the headlight dip beam on.
2. Turn the vertical adjustment screws anti-clockwise to raise the beams or clockwise to lower the beams.
3. Switch the headlights off when the beam settings are satisfactory.

## Dipped Beam Horizontal Adjustment



ccpi

Left hand headlight adjustment shown.

1. Left hand infill panel
2. Coolant expansion tank cover
3. Left hand dip beam adjustment screw

1. Remove the infill and cover panels (see page 16-9).

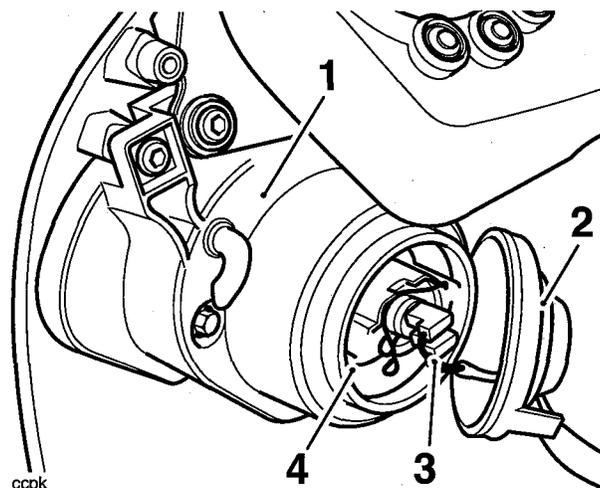
### Note:

- It is not necessary to remove the stowage box liner or the fuse box.
2. Switch the headlight dipped beam on.
  3. The adjustment screws are now accessible.
  4. On the right hand headlight turn the horizontal adjustment screw clockwise to move the beam to the right or anti-clockwise to move the beam to the left.
  5. On the left hand headlight turn the horizontal adjustment screw anti-clockwise to move the beam to the right or clockwise to move the beam to the left.
  6. Switch the headlights off when the beam settings are satisfactory.
  7. Refit the infill panels.

## Dipped Headlight Bulb Access

### Note:

- It is not necessary to remove the headlights when bulb replacement becomes necessary. The left and right infill panels, coolant expansion tank and stowage / fuse box cover panels do have to be removed.



ccpk

1. Headlight
2. Rubber cover
3. Multi pin electrical connection
4. Bulb retainer

1. Remove the seat (see page 16-8).
2. Disconnect the battery, negative (black) lead first.
3. Remove the infill panels (see page 16-9).

### Note:

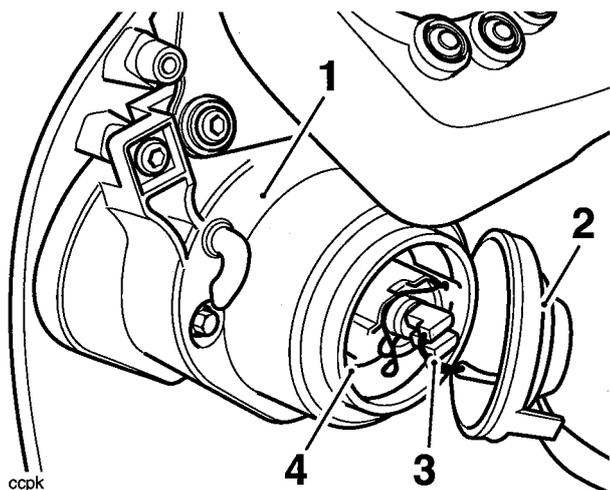
- It is not necessary to remove the stowage box liner or the fuse box.
4. Switch the headlight main beam on.
  5. Turn the vertical adjustment screw clockwise to raise the beam or anti-clockwise to lower the beam.
  6. Switch the headlight off when the beam setting is satisfactory.
  7. Bulb replacement is as per dipped beam.

## Main Beam Headlight Bulb Replacement

1. Remove the seat (see page 16-8).
2. Disconnect the battery, negative (black) lead first.
3. Unscrew the nuts securing the headlight unit to the support bracket and release the unit.
4. Remove the rubber cover and disconnect the electrical connectors from the bulb to be replaced.

## Electrical

- Detach the wire bulb retainer from the clip. It is not necessary to undo the screw.



- Headlight
- Rubber cover
- Multi pin electrical connection
- Bulb retainer

- Remove the bulb from the headlight unit.
- Installation is the reverse of the removal procedure.

### Caution

When reconnecting the battery, connect the positive (red) lead first.

### Warning

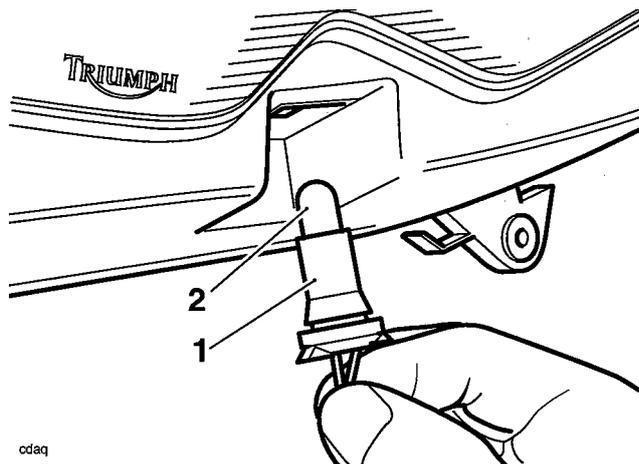
Do not reconnect the battery until the assembly process has been completed. Premature battery reconnection could result in ignition of the battery gases causing risk of injury.

### 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

The position lamp is fitted within the headlight aperture.



- Position Light
- Bulb Holder

## Bulb Replacement

- Carefully remove the rubber bulb holder from the back of the position lamp and detach the bulb.
- Installation is the reverse of the removal procedure.

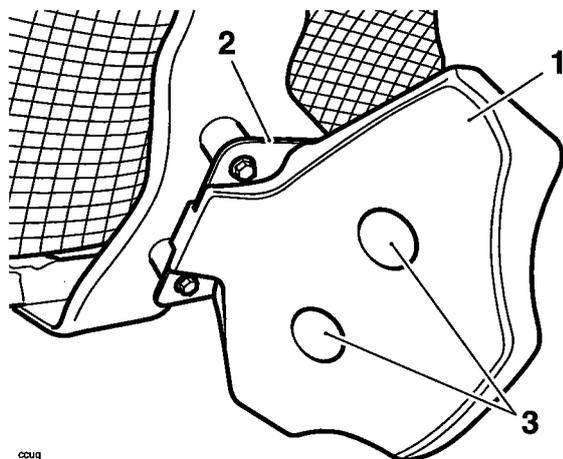
## Rear Light

### Note:

- The rear light is a sealed for life LED unit and must be replaced in the event of a failure.

### Rear Light Replacement

1. Remove the rear seat (see page 16-8).
2. Disconnect the battery negative (black) lead first.



ccug

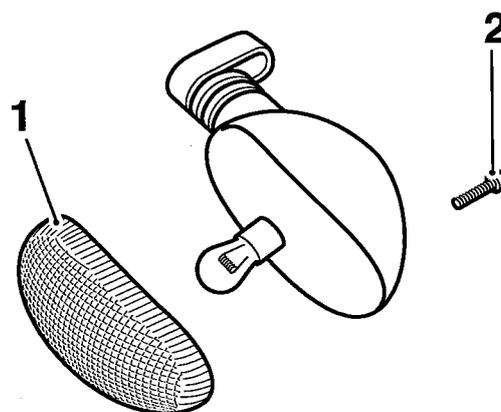
1. Protective cover
2. Mounting bracket
3. Fixings locations

3. Release the two fixings securing the protective cover and slide out.
4. Disconnect the wiring harness.
5. Release the three fixings securing the lighting unit to the mounting bracket.
6. Release the light from the rear mudguard and remove the assembly.
7. Installation is the reverse of the removal procedure.

### Note:

- Connect the battery positive (red) lead first.

## Rear Indicator Bulb Replacement



ccoa

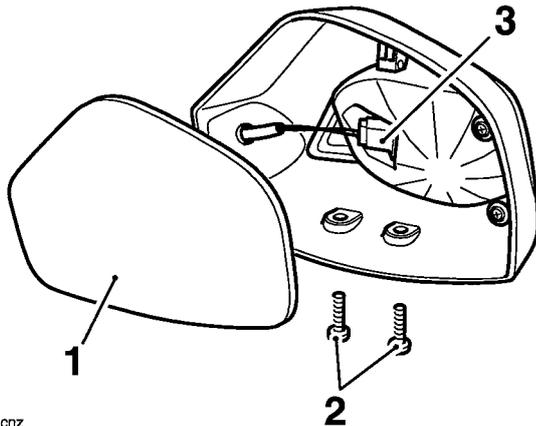
1. Indicator lens
2. Lens screw

The lens on each indicator light is held in place by a securing screw located in the body of the light.

1. Release the screws and remove the lens to gain access to the bulb for replacement.
2. Installation is the reverse of the removal procedure.

# Electrical

## Front Indicator Bulb Replacement

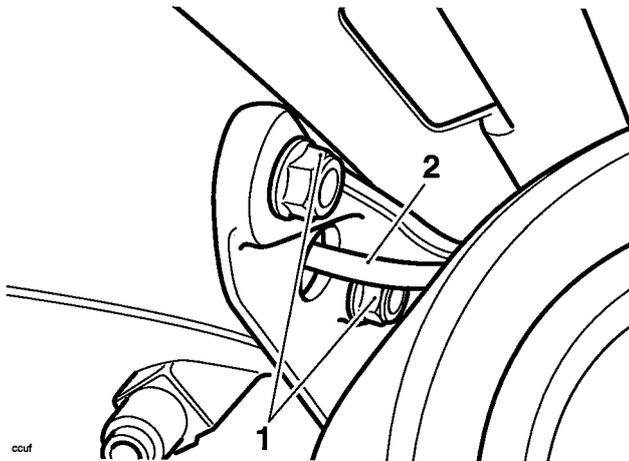


ccnz

- 1. Mirror
- 2. Securing screws
- 3. Bulb holder

1. Release the screws in the underside of the mirror shell and remove the mirror glass to gain access to the bulb holder.
2. Carefully detach the rubber bulb holder from its grommet and detach the bulb.
3. Installation is the reverse of the removal procedure.

## Number Plate Light Bulb



ccuf

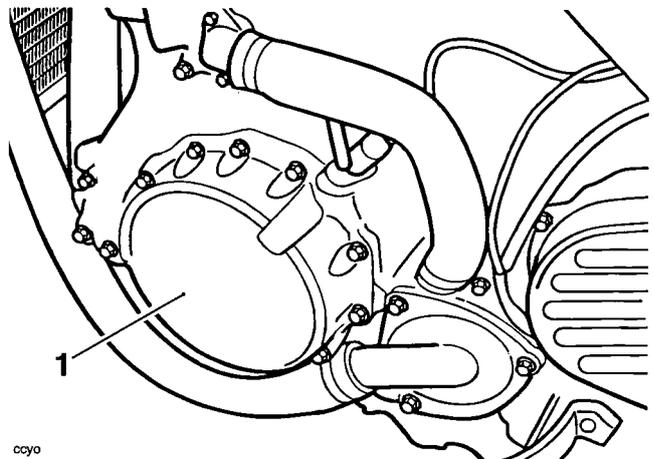
- 1. Securing screw
- 2. Number plate light unit

1. Remove the protective cover as described in Rear Light.
2. Carefully remove the rubber bulb holder and detach the bulb.
3. Installation is the reverse of the removal procedure.

## Alternator

### Removal

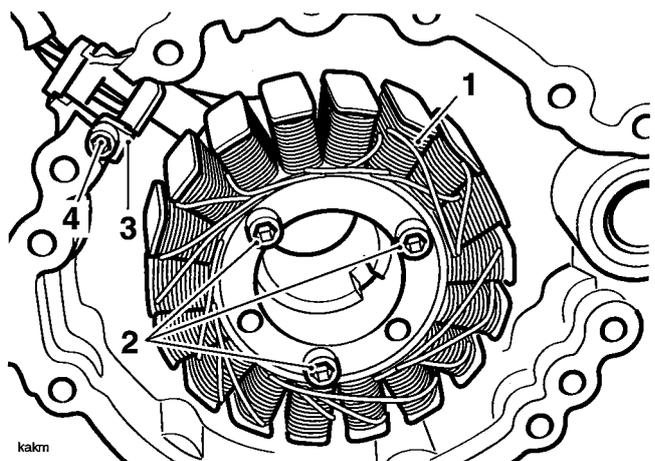
1. Remove the seats (see page 16-8).
2. Disconnect the battery negative (black) lead first.
3. Remove the left hand lower fairing (see page 16-11).
4. Release the bolts securing the left hand crankshaft cover to the engine.



ccyo

### 1. Left hand engine cover

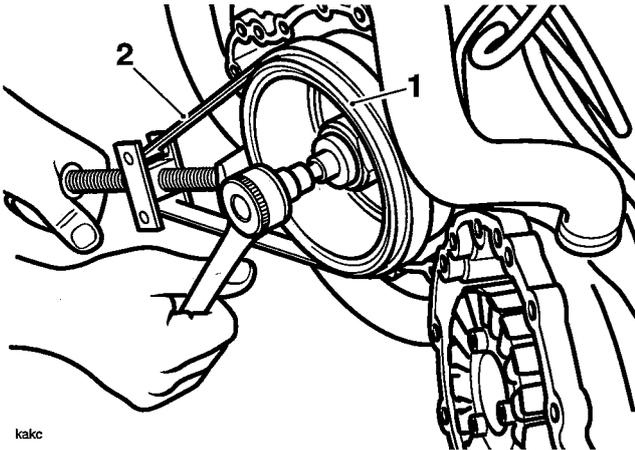
5. Remove the cover.
6. Withdraw the cover from the crankcase against the pull of the alternator magnet.
7. To remove the stator from the cover, release the three bolts in the centre of the cover and release the bolt securing the cable bracket.



kakm

- 1. Stator
  - 2. Stator bolts
  - 3. Cable bracket
  - 4. Cable bracket bolt
8. Withdraw the stator.

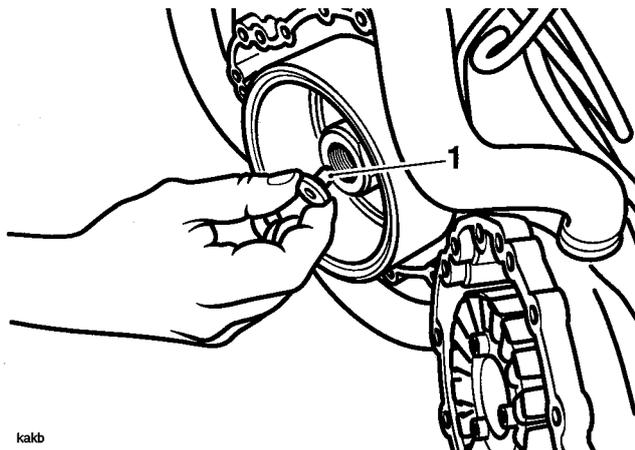
9. To remove the rotor, prevent the crankshaft from rotating using tool T3880375, and remove the centre bolt from the left hand end of the crankshaft.



kakc

1. Rotor  
2. Tool T3880375

10. With the rotor bolt removed, locate the spigot from the larger of the two thrust pads supplied with tool T3880365 to the crankshaft.



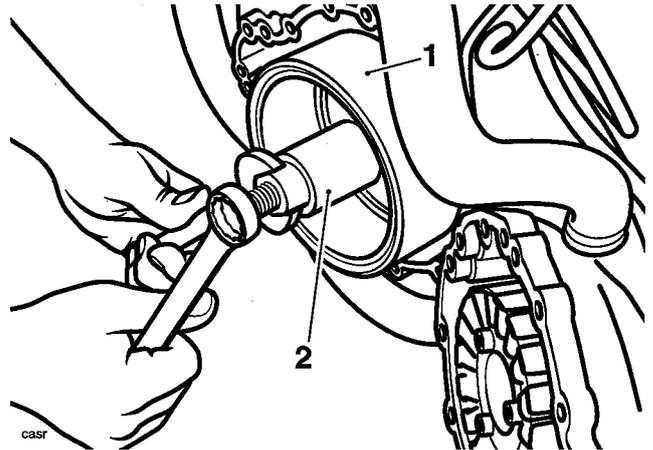
kakb

1. Thrust pad  
11. Assemble tool T3880365 to the threaded centre section of the rotor.

**Note:**

- Ensure that the thrust pad does not fall out during assembly of the tool.

12. Hold the centre of the tool to prevent rotation then tighten the draw-bolt in the centre of the tool to release the taper seating of the rotor from the crankshaft.



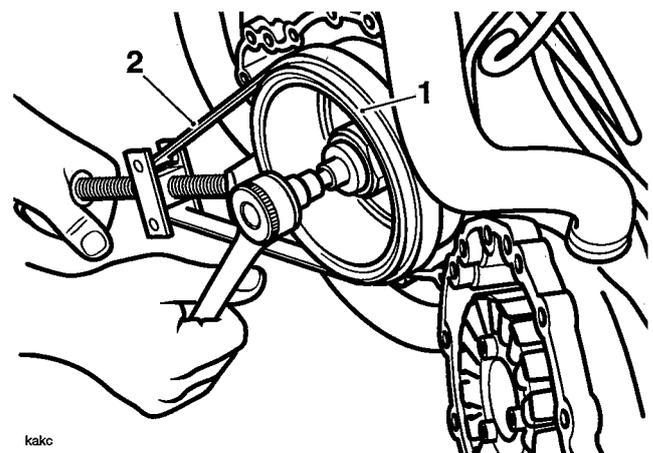
casr

1. Rotor  
2. Tool T3880365

13. Withdraw the rotor and tool as an assembly and then separate the tool from the rotor.

**Assembly**

1. Assemble the rotor to the keyway on the crankshaft.
2. Refit tool T3880375 to prevent the crankshaft from rotating.
3. Tighten the rotor retaining bolt to **105 Nm**.



kakc

1. Rotor  
2. Tool T3880375

4. Remove tool T3880375.
5. Locate the stator to the engine cover.
6. Apply silicone sealer to the cable grommet and align the cable to the exit slot.
7. Fit the cable retainer bracket and tighten the retainer bolt to **12 Nm**.

# Electrical

8. Tighten the stator bolts to **12 Nm**.
9. Refit the left hand engine cover incorporating a new gasket. Tighten the cover fixings to **9 Nm**.
10. Refit the left hand fairing (see page 16-12).
11. Reconnect the battery positive (red) lead first.
12. Refit the seat (see page 16-8).

## Alternator Rectifier

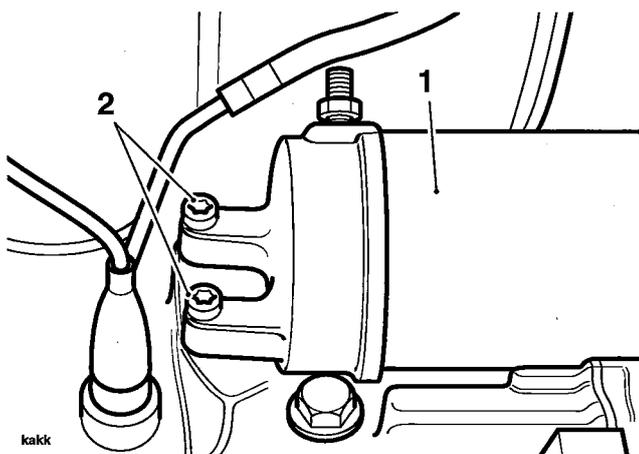
### Note:

- The alternator rectifier is located on the right hand side of the engine. The rectifier does not contain any serviceable parts and must be replaced if faulty.

## Starter Motor

### Removal

1. Remove the seat (see page 16-8).
2. Disconnect the battery negative (black) lead first.
3. Remove the left hand fairing (see page 16-11).
4. Remove the fuel tank (see page 10-87).
5. Remove the low oil pressure warning light switch (see page 8-11).
6. Ease the boot from the starter lead and then release the lead nut.
7. Detach the lead.
8. Release the bolts securing the starter to the crankcase.



### 1. Starter motor

### 2. Bolts

9. Ease the starter motor from the right hand engine cover while gently moving the camshaft oil feed pipe out of the way.

## Inspection

1. Ensure the motor turns freely and without binding.
2. Check the starter 'O' ring for damage and deterioration. Replace as necessary.

## Installation

1. Fit the starter motor to the right hand engine cover ensuring that the 'O' ring does not become damaged during installation.
2. Fit and tighten the starter bolts to **10 Nm**.
3. Refit the lead and secure with the nut. Tighten to **7 Nm**.
4. Refit the boot.
5. Refit the low oil pressure warning light switch (see page 8-11).
6. Refit the left hand fairing (see page 16-12).
7. Refit the fuel tank (see page 10-88).
8. Reconnect the battery positive (red) lead first.
9. Refit the seat (see page 16-8).

## 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

Circuit Protected	Rating (Amps)	Position
Starter solenoid, dip and main beam headlights	20	1
Ignition switch main feed, tail lights, number plate light, side lights, fuel pump	10	2
Indicators, brake light, horn	10	3
Blank	N/A	4
Blank	N/A	5
Accessory socket, heated grips	10	6
Cooling fan	15	7
Engine management system	20	8
Alarm, diagnostic connector, instruments	15	9
GPS	2	10

**Note:**

- The fuse identification numbers listed above correspond with those printed on the fuse box cover.

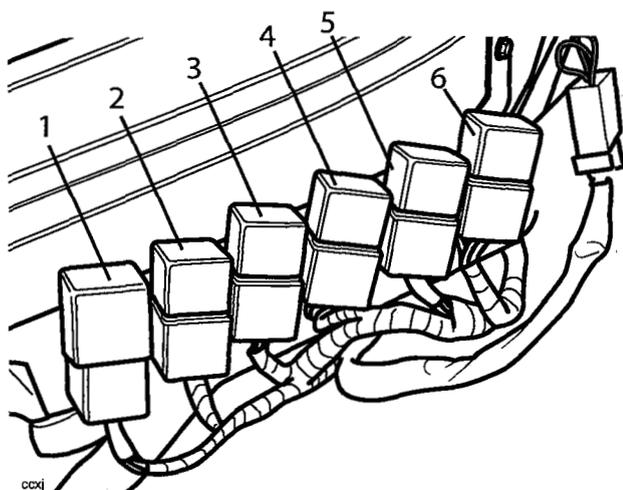
## Relay Pack

The relay pack is situated on the right hand side of the motorcycle behind the side panel.

**Note:**

- 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

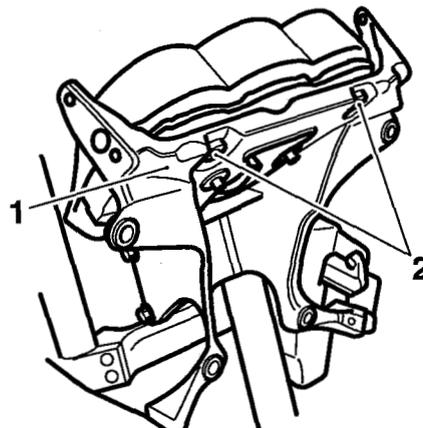


1. Indicator relay
2. Headlamp relay
3. Starter relay
4. Cooling fan relay
5. Fuel pump relay
6. Engine Management System (EMS) relay

## Instrument Pack

### Removal

1. Remove the seat (see page 16-8).
2. Disconnect the battery, negative (black) lead first.
3. Remove the cockpit (see page 16-13).
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. Refit the clips to the clevis pins.
5. Refit the cockpit (see page 16-13).
6. Reconnect the battery positive (red) lead first.
7. Refit the seat (see page 16-8).

# Electrical

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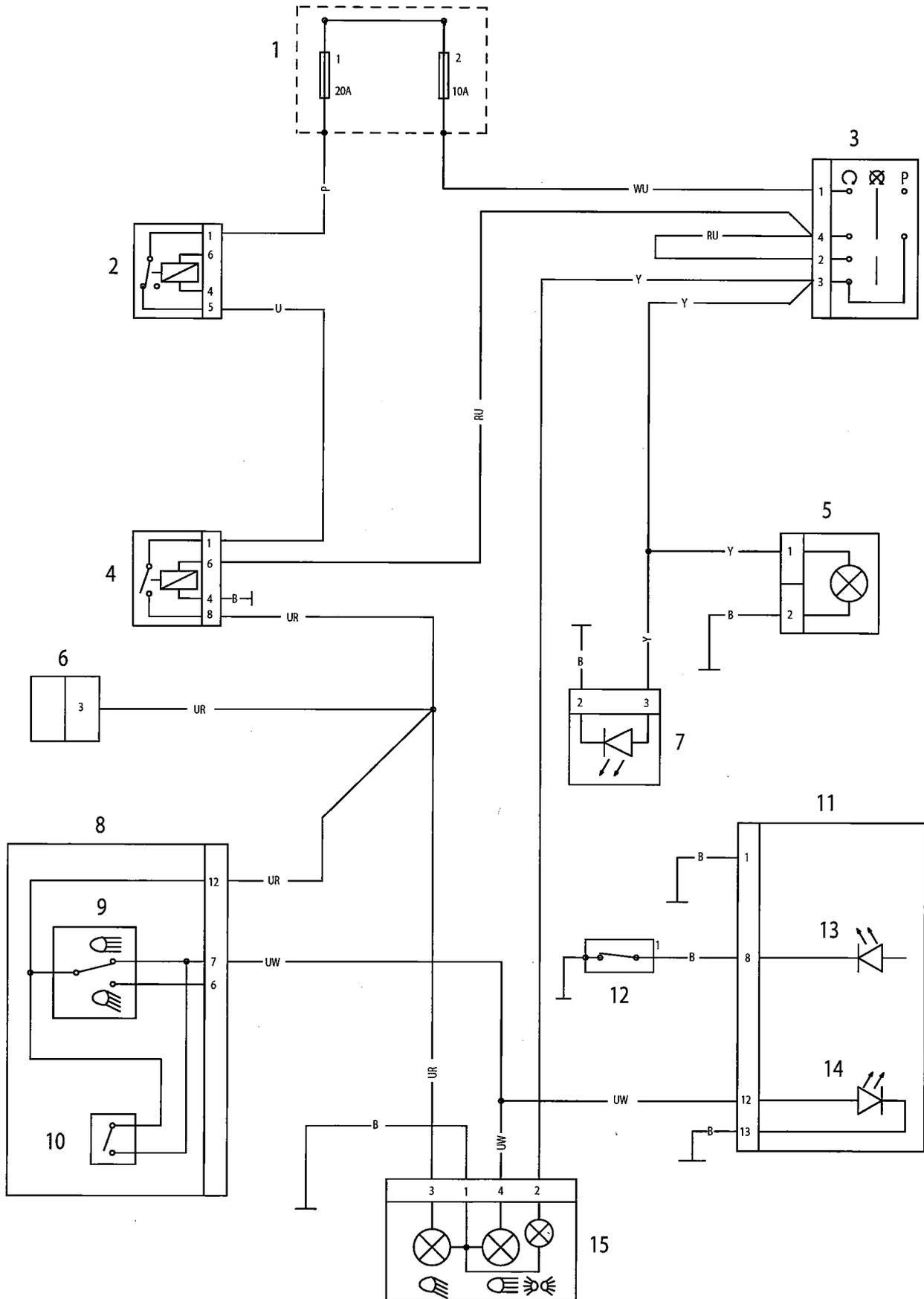
## Lighting Circuit Diagram

### Key to circuit diagram

Key	Item Description
1	Fuse Box (Fuses 1 and 2)
2	Starter relay
3	Ignition switch
4	Headlamp relay
5	Number plate light
6	Accessory Heated Handlebar Grips
7	Tail light
8	Left-Hand switch cube assembly
9	Main / dip beam switch
10	Pass switch
11	Instrument assembly
12	Oil pressure switch
13	Oil pressure warning light
14	Main beam warning light
15	Headlight assembly

### Key to wiring colours

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



# Electrical

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## Starting/charging Circuit Diagram

### Key to circuit diagram

Key	Item Description
1	Battery
2	Starter Solenoid (fused)
3	Starter Motor
4	Starter Relay
5	Engine Control Module
6	Regulator / Rectifier
7	Fuse box (Fuses 1 to 10)
8	Engine Management System Relay
9	Fuel Pump Relay
10	Instrument Assembly
11	Ignition Switch
12	Engine Kill Switch
13	Starter Switch
14	Alarm

### Key to wiring colours

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



# Electrical

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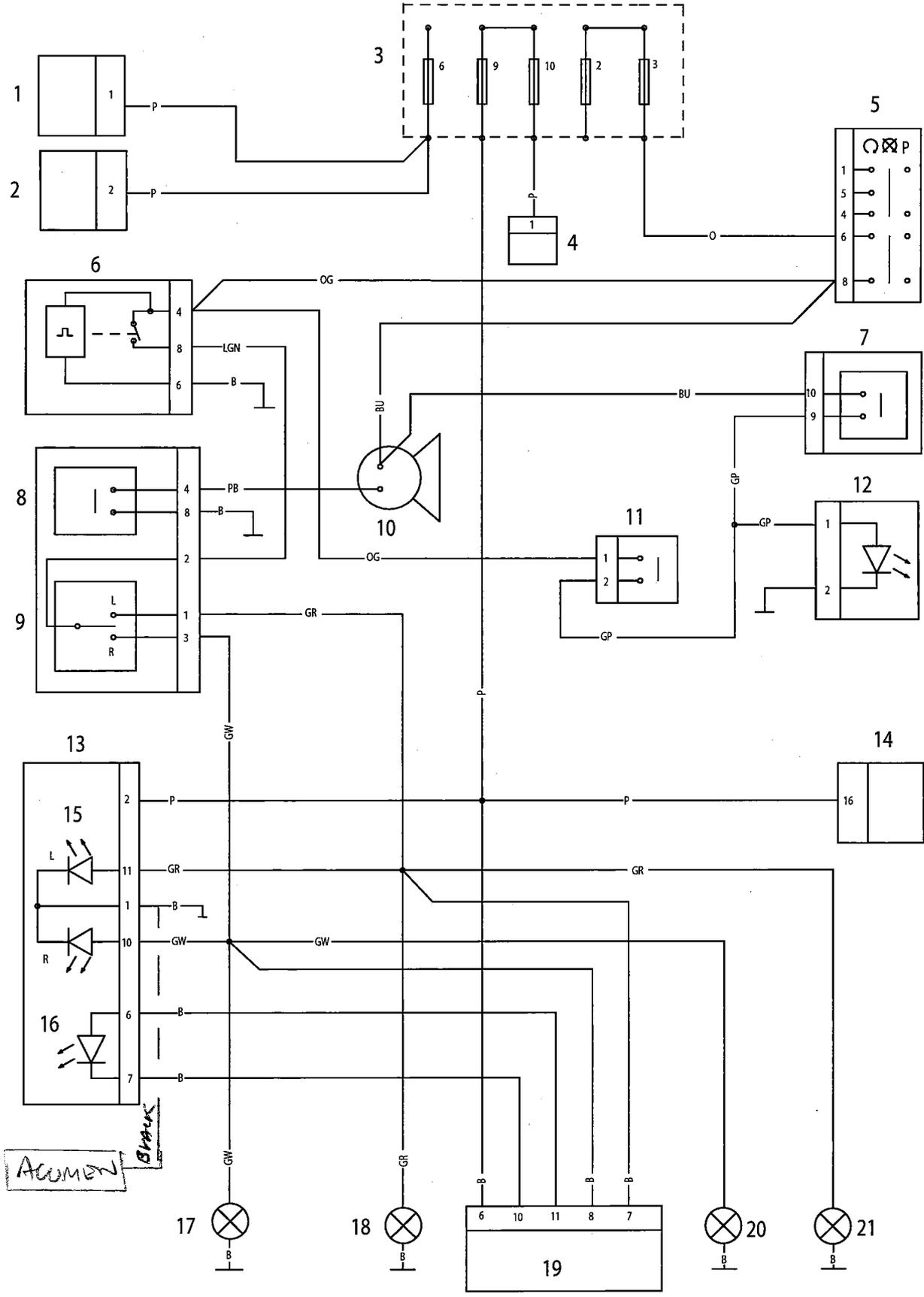
## Auxiliary and Accessory Circuit

### Key to circuit diagram

Key	Item Description
1	Accessory Heated Handlebar Grips
2	Accessory Socket
3	Fuse Box (Fuse #2, 3, 6, 9 & 10)
4	Accessory Satellite Navigation system
5	Ignition Switch
6	Indicator Relay
7	Front Brake Light Switch
8	Horn Switch
9	Direction Indicator Switch
10	Horn
11	Rear brake light switch
12	Brake light
13	Instrument Assembly
14	Diagnostic connector
15	Direction indicator (Instruments)
16	Alarm LED
17	Front right direction Indicator
18	Front left direction Indicator
19	Alarm unit
20	Rear right direction indicator
21	Rear left direction indicator

### Key to wiring colours

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



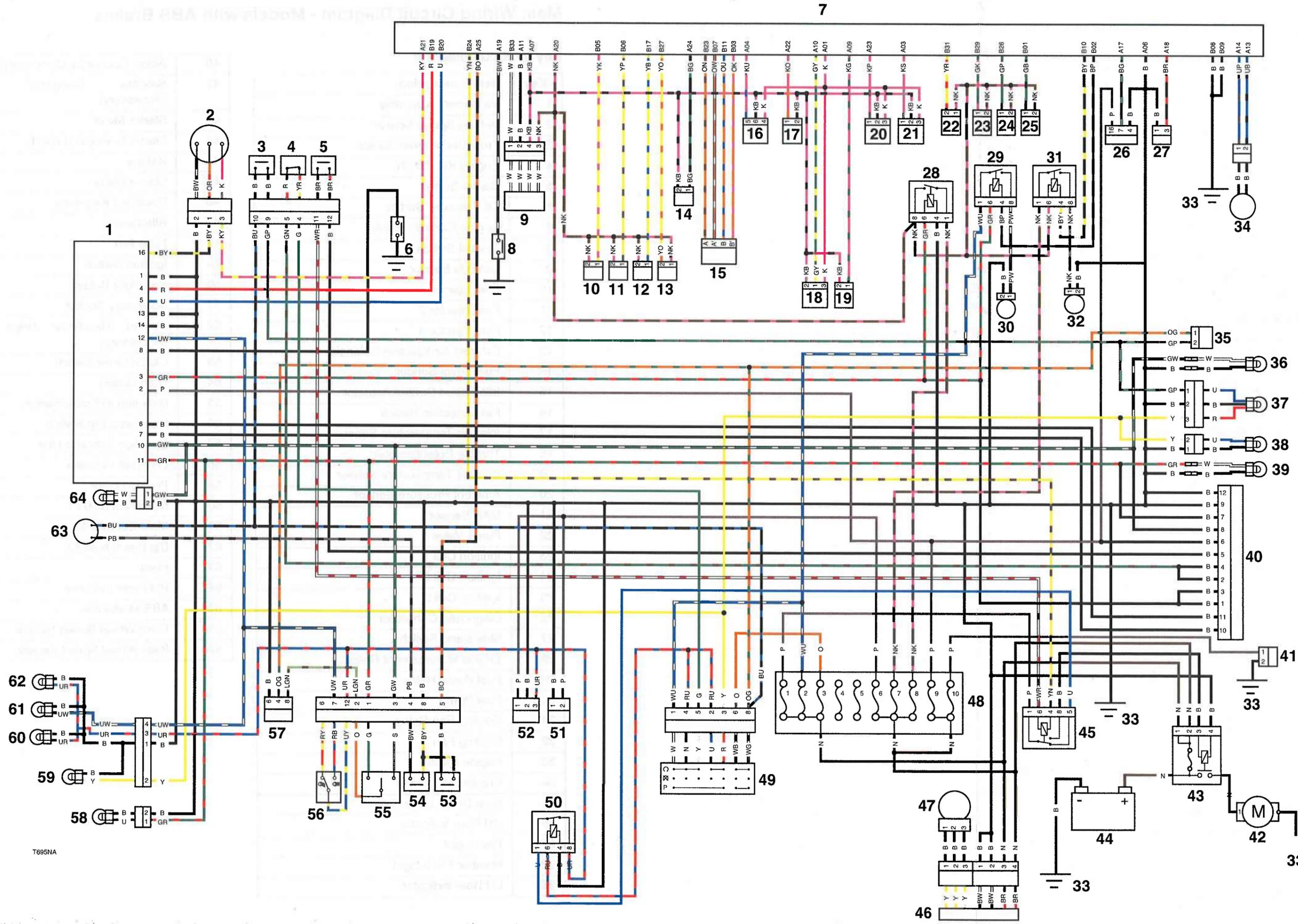
# Electrical

## Main Wiring Circuit Diagram - Models without ABS Brakes

### Key to circuit diagram

Key	Item Description
1	Instrument Assembly
2	Vehicle Speed Sensor
3	Front Brake Lever Switch
4	Engine Kill Switch
5	Starter Button
6	Oil Pressure Switch
7	Engine Control Module
8	Neutral Switch
9	Lambda Sensor
10	Fuel Injector 1
11	Fuel Injector 2
12	Fuel Injector 3
13	Exhaust Air Injection Solenoid
14	Fuel Level Sender
15	Idle Speed Control Actuator
16	Fall Detection Switch
17	Inlet Air Temperature Sensor
18	Throttle Potentiometer
19	Coolant Temperature Sensor
20	Ambient Pressure Sensor
21	MAP Sensor
22	Purge Valve
23	Ignition Coil 1
24	Ignition Coil 2
25	Ignition Coil 3
26	Diagnostic Connector
27	Side stand Switch
28	Engine Management Relay
29	Fuel Pump Relay
30	Fuel Pump
31	Cooling Fan Relay
32	Cooling Fan
33	Engine Earth
34	Crankshaft Sensor
35	Rear Break Lever Switch
36	RH Rear Indicator
37	Rear Light
38	Number Plate Light
39	LH Rear Indicator

40	Alarm Connector (Accessory)
41	Satellite Navigation Connector (Accessory)
42	Starter Motor
43	Starter Solenoid (Fused)
44	Battery
45	Starter Relay
46	Rectifier / Regulator
47	Alternator
48	Fuse Box
49	Ignition Switch
50	Headlight Relay
51	Accessory Socket
52	Heated Handlebar Grips Connector (Accessory)
53	Clutch Lever Switch
54	Horn Button
55	Direction Indicator Switch
56	Headlamp Dip Switch
57	Direction Indicator Unit
58	LH Front Indicator
59	Position Light
60	Dip Beam bulb #1
61	Main Beam bulb
62	Dip Beam bulb #2
63	Horn
64	RH Front Indicator



T695NA

## Electrical

### Main Wiring Circuit Diagram - Models with ABS Brakes

#### Key to circuit diagram

Key	Item Description
1	Instrument Assembly
2	Vehicle Speed Sensor
3	Front Brake Lever Switch
4	Engine Kill Switch
5	Starter Button
6	Oil Pressure Switch
7	Engine Control Module
8	Neutral Switch
9	Lambda Sensor
10	Fuel Injector 1
11	Fuel Injector 2
12	Fuel Injector 3
13	Exhaust Air Injection Solenoid
14	Fuel Level Sender
15	Idle Speed Control Actuator
16	Fall Detection Switch
17	Inlet Air Temperature Sensor
18	Throttle Potentiometer
19	Coolant Temperature Sensor
20	Ambient Pressure Sensor
21	MAP Sensor
22	Purge Valve
23	Ignition Coil 1
24	Ignition Coil 2
25	Ignition Coil 3
26	Diagnostic Connector
27	Side stand Switch
28	Engine Management Relay
29	Fuel Pump Relay
30	Fuel Pump
31	Cooling Fan Relay
32	Cooling Fan
33	Engine Earth
34	Crankshaft Sensor
35	Rear Break Lever Switch
36	RH Rear Indicator
37	Rear Light
38	Number Plate Light
39	LH Rear Indicator

40	Alarm Connector (Accessory)
41	Satellite Navigation Connector (Accessory)
42	Starter Motor
43	Starter Solenoid (Fused)
44	Battery
45	Starter Relay
46	Rectifier / Regulator
47	Alternator
48	Fuse Box
49	Ignition Switch
50	Headlight Relay
51	Accessory Socket
52	Heated Handlebar Grips Connector (Accessory)
53	Clutch Lever Switch
54	Horn Button
55	Direction Indicator Switch
56	Headlamp Dip Switch
57	Direction Indicator Unit
58	LH Front Indicator
59	Position Light
60	Dip Beam bulb #1
61	Main Beam bulb
62	Dip Beam bulb #2
63	Horn
64	RH Front Indicator
65	ABS Modulator
66	Front Wheel Speed Sensor
67	Rear Wheel Speed Sensor

