Triumph Speed Triple*
Motorcycle Service Manual

Part Number T3856080 issue 1, 03.2005

* From VIN 210445 onwards.

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Introduction

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

A basic knowledge of mechanics, including the proper use of tools and workshop procedures is necessary in order to carry out maintenance and repair work satisfactorily. Whenever the owner has insufficient experience or doubts his ability to do the work, 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.

Warning, Caution and Note

Particularly important information is presented in the following form:

⚠ Warning

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

⚠ Caution

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

Note:

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

Tampering with Noise Control System Prohibited

Owners are warned that the law may prohibit:

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

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

References

References 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 procedure

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

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

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

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

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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 Susbstances

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

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.

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.

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, CO2, HALON or POWDER close at hand when handling or draining fuel or fuel systems. Fire extinguishers must also be present in areas where fuel is stored.

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

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

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

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

Warning

No one should be permitted to repair components associated with petrol/gasoline without first having specialist training on the fire hazards which may be created by incorrect installation and repair of items associated with petrol/gasoline.

Repairs carried out by untrained personnel could bring about a safety hazard leading to a risk of personal injury.

Warning

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

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

When petrol/gasoline has been extracted or drained from a fuel tank, the precautions governing naked lights and ignition sources should be maintained.

Failure to observe any of the above warnings could bring about a safety hazard leading to a risk of personal injury.

Fuel tank removal

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

Chassis repairs

Warning

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

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

Electrical Precautions

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

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

⚠ Warning

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

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

⚠ Warning

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

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

⚠ Warning

The battery contains harmful materials. Always keep children away from the battery whether or not it is fitted in the motorcycle.

Do not jump start the battery, touch the battery cables together or reverse the polarity of the cables as any of these actions may cause a spark which would ignite battery gasses causing a risk of personal injury.

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

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

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

Battery disconnecting

Before disconnecting the battery, switch off all electrical equipment.

⚠ Warning

To prevent the risk of a battery exploding and to prevent damage to electrical components ALWAYS disconnect the battery negative (black) lead first. When reconnecting the battery, always connect the positive (red) lead first, then the negative (black) lead. Always disconnect the battery when working on any part of the electrical system.

Failure to observe the above warnings may lead to electrical damage and a fire hazard which could cause personal injury.

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

Disciplines

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

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

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

Electrical wires

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

Inspection

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

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

Replacement Parts

Warning

Only Triumph 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.

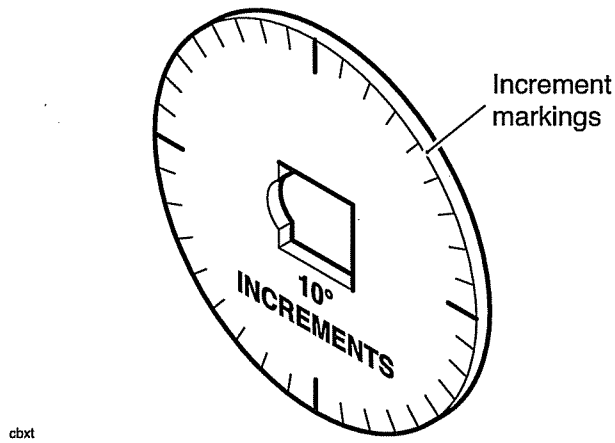
Authorised Triumph Dealers are not agents of Triumph and have no authority to bind the manufacturer by any expressed or implied undertaking or representation.

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.

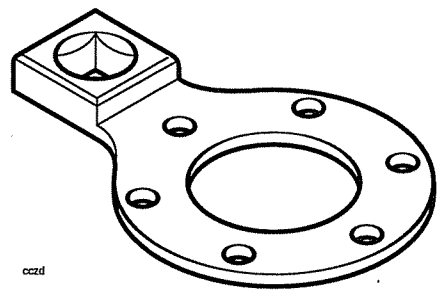
Special Service Tools

T3880105 – Angular Torque Gauge



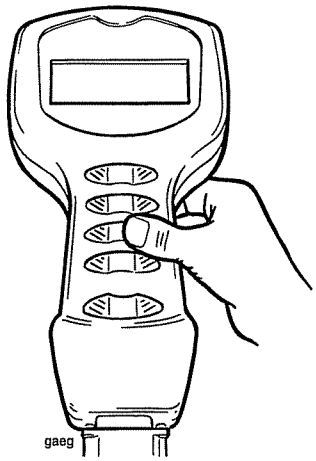
cbxt

T3880371 – Holder, Oil Pump Drive Gear



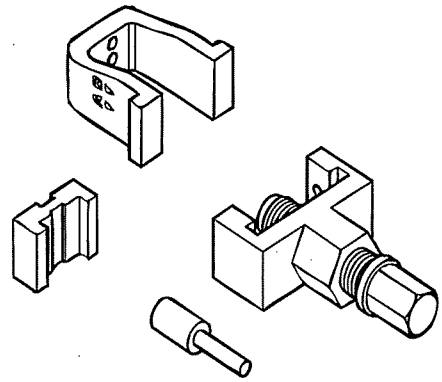
cczd

T3880250 – Engine Management Diagnostics

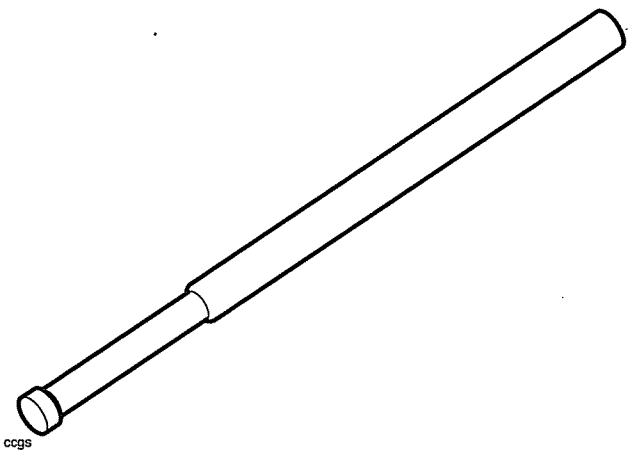


gaeg

A9938017 – Chain Link Took Kit

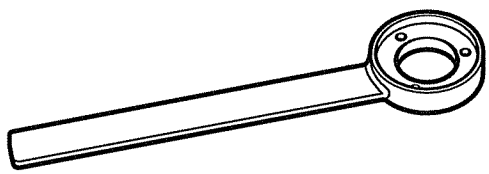


3880085-T0301 – Fork Piston Holder



ccgs

T3880017 – Holder, Sprag Clutch



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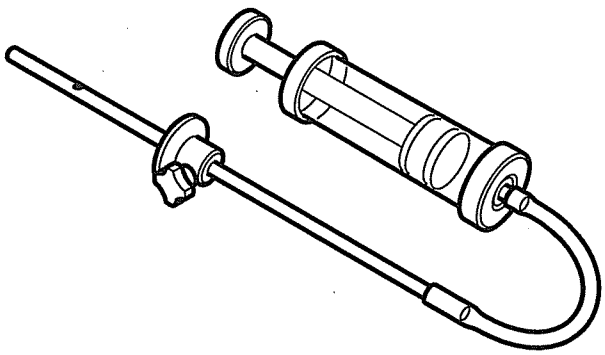
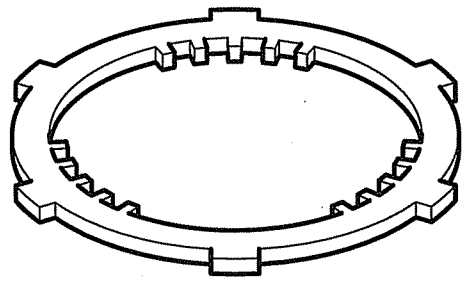
3880160-T0301 – Fork Filler / Evacuator



ccha

T3880305 – Clutch Anti-rotation Tool



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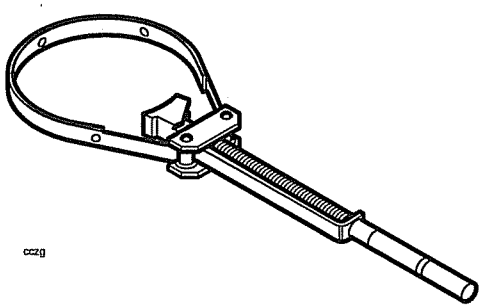
T3880375 – Alternator Rotor Holder



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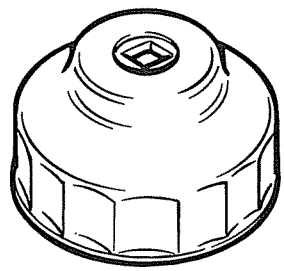
T3880312 – Oil Filter Wrench



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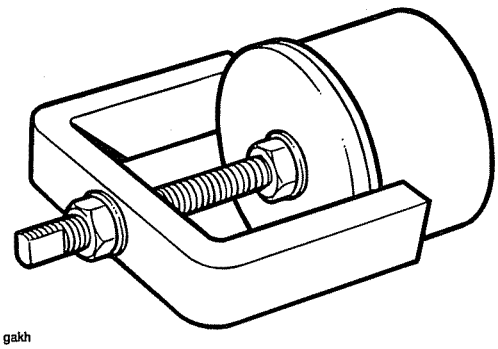
T3880315 – Extractor, Cylinder Liners



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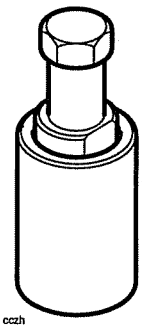
T3880365 – Puller, Alternator Rotor



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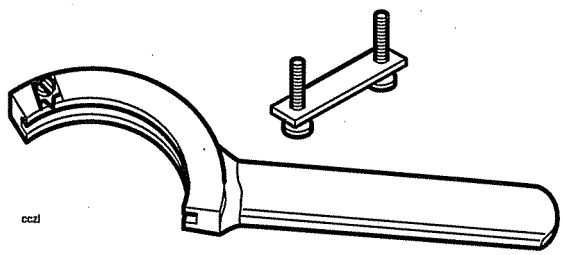
T3880016 – Holder, Balancer Gear



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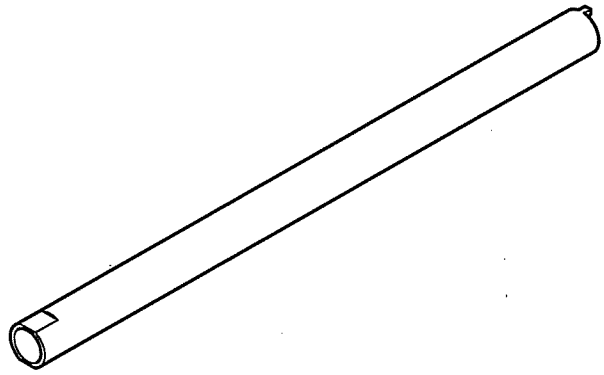
T3880004 – Holder, Damping Cylinder



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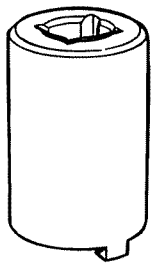
T3880290 – Wrench, Swinging Arm Adjuster



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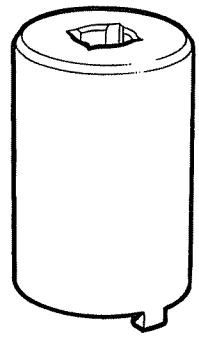
T3880295 – Wrench, Swinging Arm Adjuster Lock Ring



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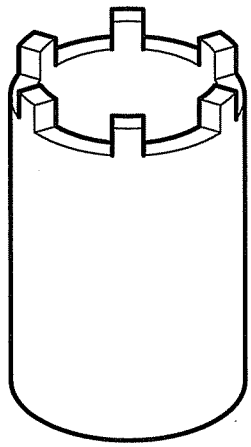
T3880024 - Socket 45 mm



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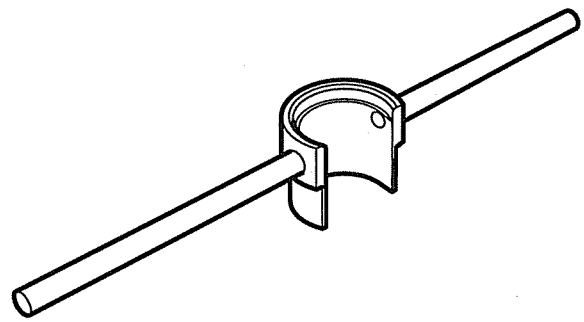
T3880003 –.Fork Seal and Bush Fitment



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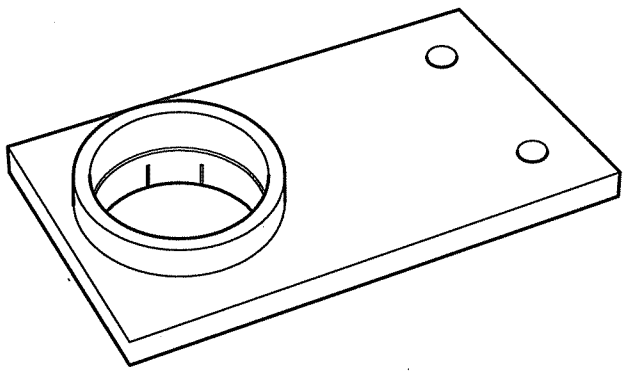
T3880002 – Support Plate



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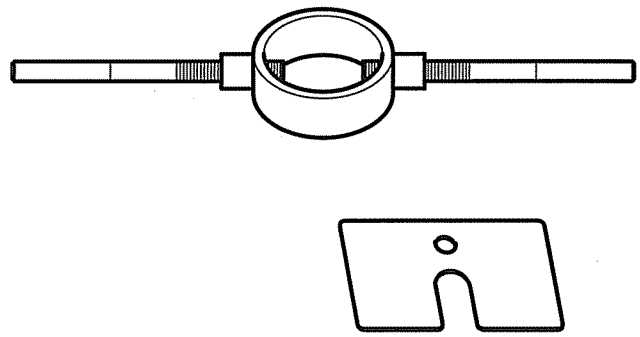
T3880067 - Fork Spring Compressor



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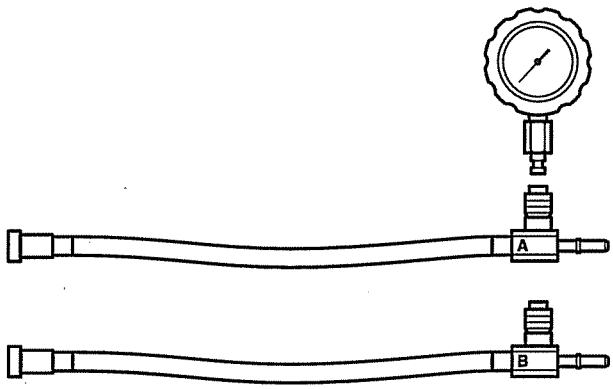
T3880001 - Fuel Pressure Gauge



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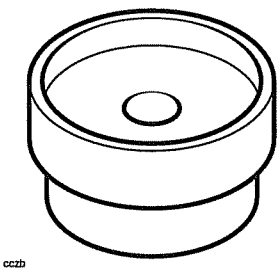
3880065-T0301 - Bearing Installer



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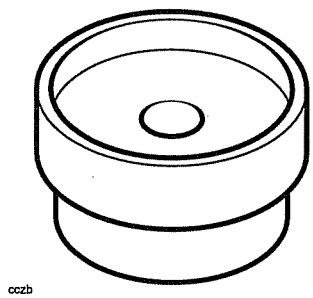
3880075-T0301 - Bearing Installer



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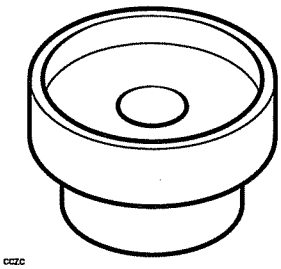
3880070-T0301 - Bearing Installer



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Full Specification		Speed Triple
Engine		
Engine Configuration		3 Cylinder 12 valve DOHC
Arrangement		Transverse in-line
Displacement		1050 cc
Bore x Stroke		79x71.4 mm
Compression Ratio		12.0:1
Cylinder Numbering		Left to Right (no.3 adjacent to camchain)
Cylinder Sequence		Number 1 at left
Firing Order		1-2-3
Maximum Power		130PS (128bhp) at 9,100rpm
Maximum Torque		105 Nm (78ft.lbf)at 5,100 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
Valve Stem Diameter	In	4.975-4.990 mm
Service Limit		4.965 mm
Valve Stem Diameter	Ex	4.955-4.990 mm
Service Limit		4.945 mm
Valve Guide Bore Diameter	In	5.000-5.015 mm
Service Limit		5.043 mm
Valve Guide Bore Diameter	Ex	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
Valve Seat Width (in head)	In	0.9-1.1 mm
Service Limit		1.5 mm
Valve Seat Width (in head)	Ex	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 26.30 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

Full Specification		Speed Triple
Valve Bucket Bore Diameter		28.515-28.535 mm
Service Limit		28.549 mm

Camshafts

Cam Timing	Inlet	Open 11.25° BTDC (@ 1.0 mm lift)
		Close 41.25° ABDC (@1.0 mm lift)
	Duration	232.50°
	Exhaust	Open 34° BBDC (@ 1.0 mm lift)
		Close 4° ATDC (@1.0 mm lift)
	Duration	228°
Camshaft Journal Diameter		22.930-22.960 mm
		22.953-22.956 mm (outrigger)
Camshaft Journal Clearance		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

Full Specification	Speed Triple

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
Service Limit	0.075
Second	0.02-0.06 mm
Service Limit	0.075
Piston Ring End Gaps	
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

Connecting Rods

Connecting Rod Small End Diameter	17.005-17.018 mm
Service Limit	17.028 mm
Connecting Rod Big End Side Clearance	0.15-0.30 mm
Service Limit	0.50 mm

Crankshaft

Crankshaft Big End Journal Diameter	34.948-35.000 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

Full Specification		Speed Triple

Transmission

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)
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 (18/42)
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/in2 min. @ 80°C oil temperature @ 5000 RPM
Oil Pump Rotor Tip Clearance	0.15 mm
Service Limit	0.2 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

Full Specification	Speed Triple

Ignition System

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

Fuel System

Fuel Type	Unleaded, 95 RON (U.S. 89 CLC/AKI
Fuel Tank Capacity	18 litres
Low Level Warning Lamp	4 litres remaining
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, throttle position, coolant temperature, crankshaft position sensor, lambda sensor, induction air temperature.

Emissions Controls*

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

* Catalysts and oxygen sensor 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	2.8 litres
Radiator Cap Opening Pressure	1.1 bar
Thermostat Opening Temperature	88°C (nominal)

Full Specification	Speed Triple
Cooling Fan Switch On Temperature	103°C
Temperature Gauge Sensor Resistance	2.9 – 3.3 KΩ @ 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
Rear Suspension Bearing Grease	Mobil grease HP 222

Brakes

Front Type	Two hydraulically actuated four piston radial callipers acting on twin discs
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		2.35 Bar
Recommended Front Tyre	Option 1	Michelin Pilot Power
	Option 2	Bridgestone BT014
	Option 3	Pirelli Diablo
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

Full Specification		Speed Triple
Rear Tyre Pressure		2.9 Bar
Recommended Rear Tyres	Option 1	Michelin Pilot Power
	Option 2	Bridgestone BT 014
	Option 3	Pirelli Diablo
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	2115mm (83.3in)
Overall Width	780mm (30.7in)
Overall Height	1250mm (49.2 in)
Wheelbase	1429mm (56.2in)
Seat Height	815mm (56.2in)
Castor	23.5 ^{o}
Trail	84 mm
Dry Weight	189 kg
Maximum Payload (rider, passenger, luggage and accessories)	185 kg

Electrical Equipment

Battery Type		YTX12BS
Battery Rating		12V – 10 Amp. Hour
Alternator Rating		35A
Fuses	#1	Instruments, fuel pump relay, EMS relay, starter relay
	#2	Ignition switch
	#3	Indicators, brake light, horn
	#4	Alarm, diagnostic connector, instruments, fuel pump
	#5	Blank
	#6	Engine management system
	#7	Cooling fan
	#8	Dip and main beam headlights, horn
	#9	Tail light, number plate light, side lights
	#10	Blank
	#11	Main fuse

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	
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 t crankcase (M6 screws)	10	
Cylinder head to crankcase bolts	See section 3	
Sound suppression bolt in head	10	
Airbox front bracket to cam cover	12	
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 upper to lower (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	
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	28	
Neutral switch	10	
Gear pedal pinch bolt	9	
Gear pedal pivot bolt	22	

Lubrication System

Application	Torque (Nm)	Notes
Sump to crancase	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 unions	10	
Oil cooler to mountings and radiator	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	

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	

Fuel System, Exhaust System and Airbox

Application	Torque (Nm)	Notes
Fuel tank to frame (front fixing)	8	
Fuel tank to frame (rear fixing)	9	
Fuel cap to fuel tank	3	
Fuel pump mounting plate to fuel tank	5	
Fuel pipe clamp screw	4	
Throttle body transition piece to cylinder head	12	
Fuel rail bracket to cylinder head	6	
Fuel rail to bracket	6	
Throttle potentiometer to throttle body	3.5	
Exhaust downpipe to cylinder head	See section 10	
Exhaust downpipe to frame	15	
Silencer mounting bracket to frame	15	
Exhaust clamp to downpipe	16	
Secondary air injection solenoid to frame	6	
Airbox upper section to lower	3	
Airbox to bracket	5	

Rear Suspension

Application	Torque (Nm)	Notes
Swinging arm spindle bolts	60	
Swinging arm rubbing strip bolts	4.5	
Caliper carrier location peg	40	
Rear hub / eccentric adjuster clamp bolt	55	
Rear suspension unit upper mounting bolt	48	
Rear suspension unit lower mounting bolt /drop to drag link pivot	100	
Drag link pivot at frame	95	
Drop links to swinging arm	48	
Swinging arm end-float adjuster	15	
Swinging arm lateral adjuster lock ring	30	

Front Suspension

Application	Torque (Nm)	Notes
Upper yoke pinch bolt	20	
Lower yoke pinch bolt	25	
Fork top cap	See text	
Upper yoke centre nut	90	
Damping cylinder bolt	See text	Use a new washer
Handlebar clamp base to top yoke	35	
Handlebar upper clamp to lower clamp	26	

Wheels

Application	Torque (Nm)	Notes
Front wheel spindle / axle bolt	110	
Front wheel spindle pinch bolts	20	
Rear wheel to stub axle	146	

Front Brakes

Application	Torque (Nm)	Notes
Front brake calliper to fork	40	
Front brake pad retaining pin	18	
Front brake calliper bleed screw	6	
Front brake hose to calliper	25	
Front brake master cylinder to handlebar	15	
Front brake master cylinder reservoir to mounting	6	
Front brake hose to master cylinder	25	
Front brake disc to wheel	22	Use new fixings

Rear Brakes

Application	Torque (Nm)	Notes
Rear brake calliper to carrier	40	
Rear brake pad retaining pin	20	
Rear brake calliper bleed screw	6	
Rear brake hose to calliper	25	
Rear brake master cylinder to control plate	18	
Rear brake master cylinder reservoir to battery box	6	
Rear brake hose to master cylinder	25	
Rear brake disc to axle shaft	22	Use new fixings

Frame, 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	
Engine mounting bracket to frame	See section 9	
Engine mounting bracket to cylinder head	30	
Control plate to frame	27	Use new fixings
Heel guard to control plate	18	
Rear footrest hanger to frame	27	
Side stand mounting bracket	40	
Side stand pivot	20	

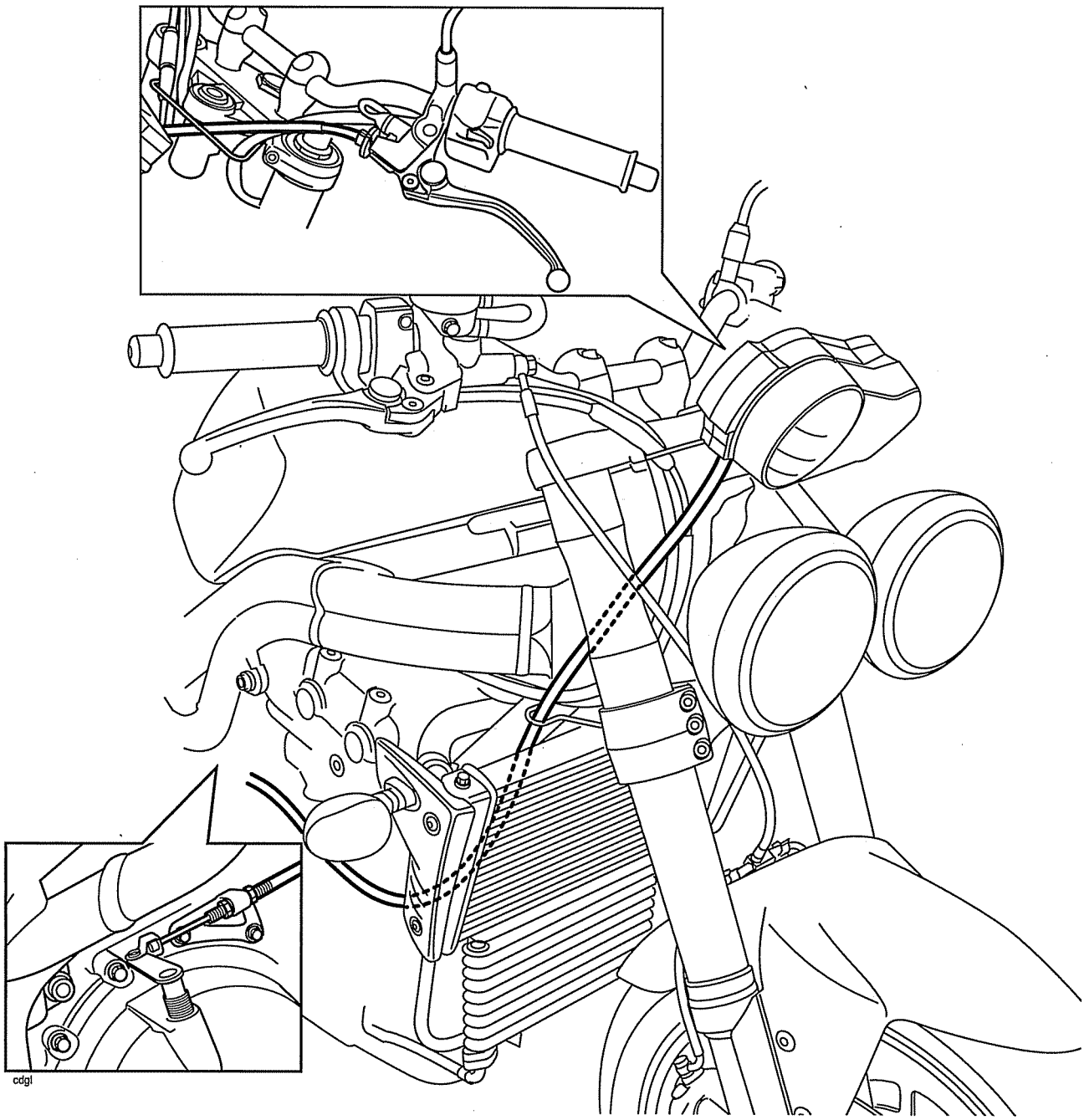
Electrical

Application	Torque (Nm)	Notes
Alternator rotor to crankshaft	105	
Alternator stator to cover	12	
Alternator regulator to frame	7	
Starter motor to crankcase	10	
Spark plug to cylinder head	18	

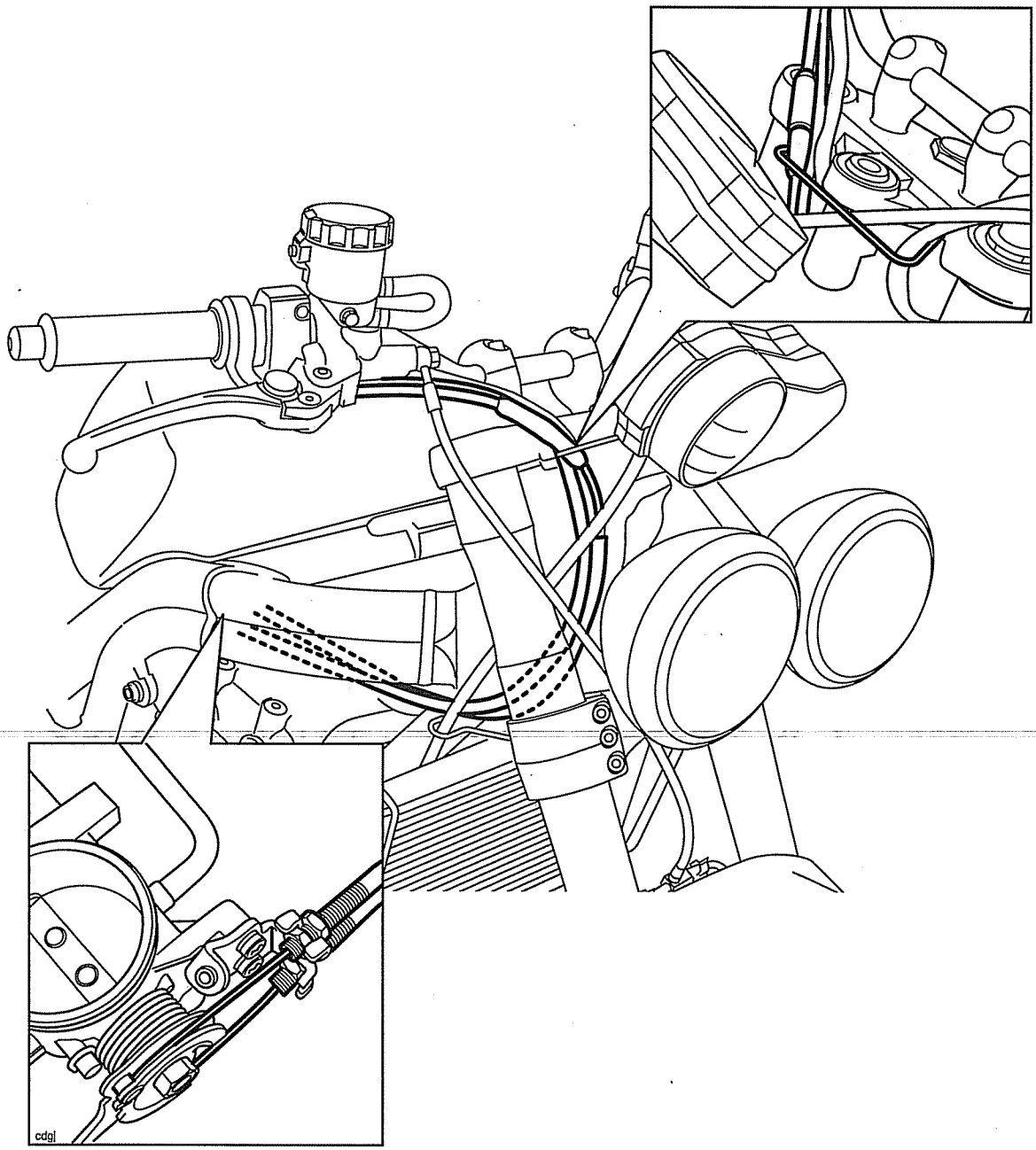
Bodywork

Application	Torque (Nm)	Notes
Mirror	25	
Rear panels to frame	4	
Front mudguard to forks	3	
Rear mudguard to subframe	6	
Rear mudguard rear section	9	

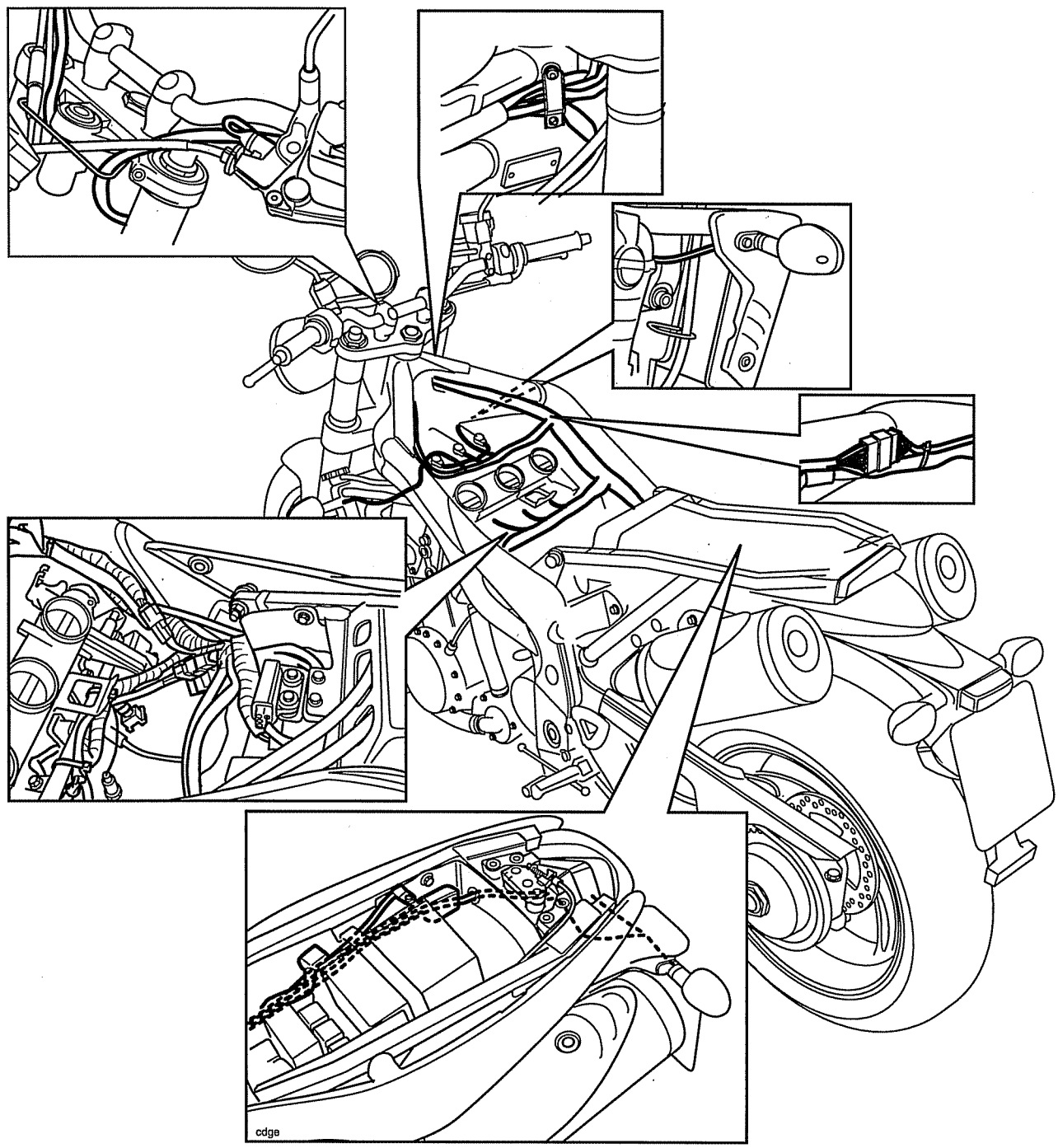
Clutch cable routing



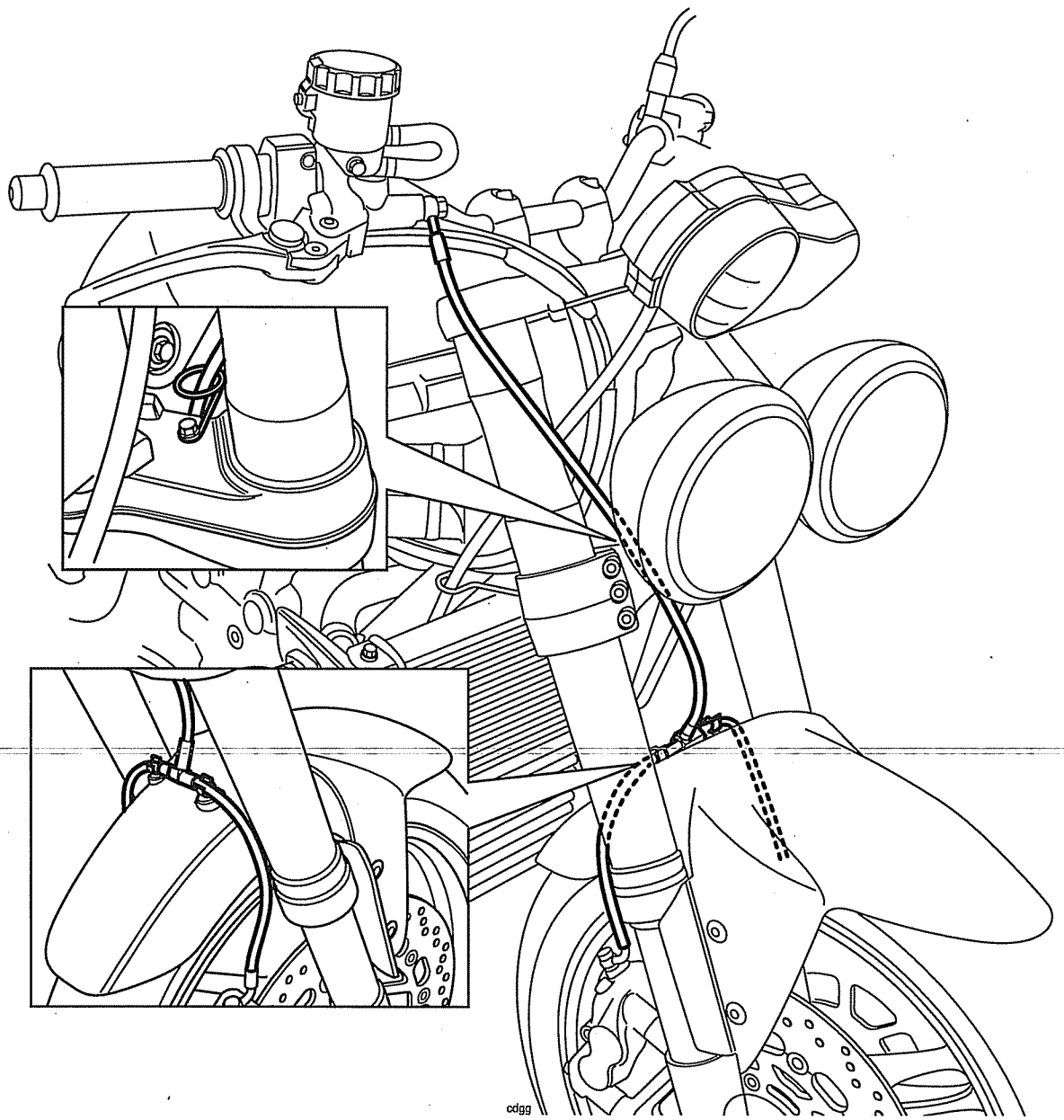
Throttle cable routing



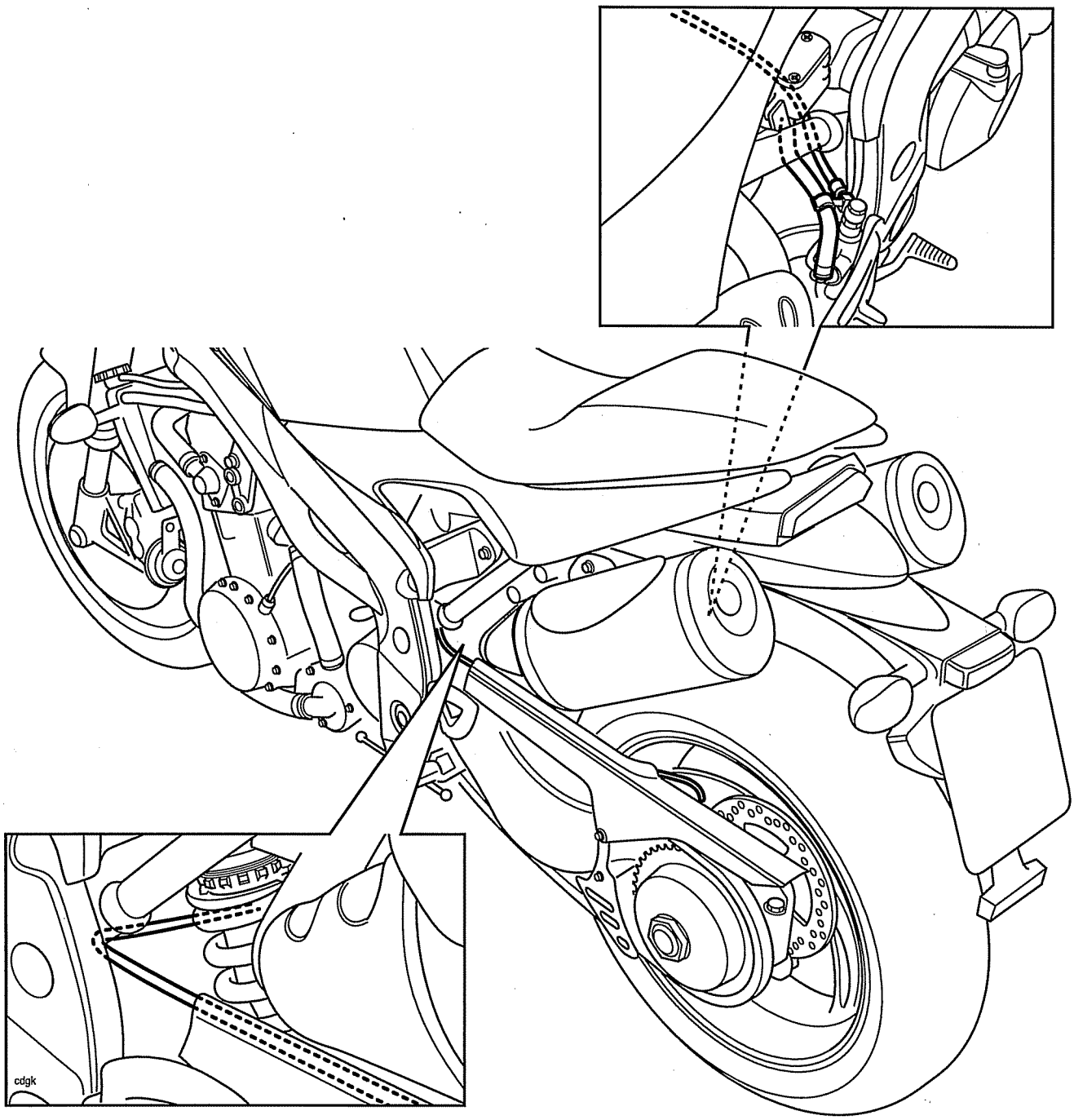
Main wiring harness routing



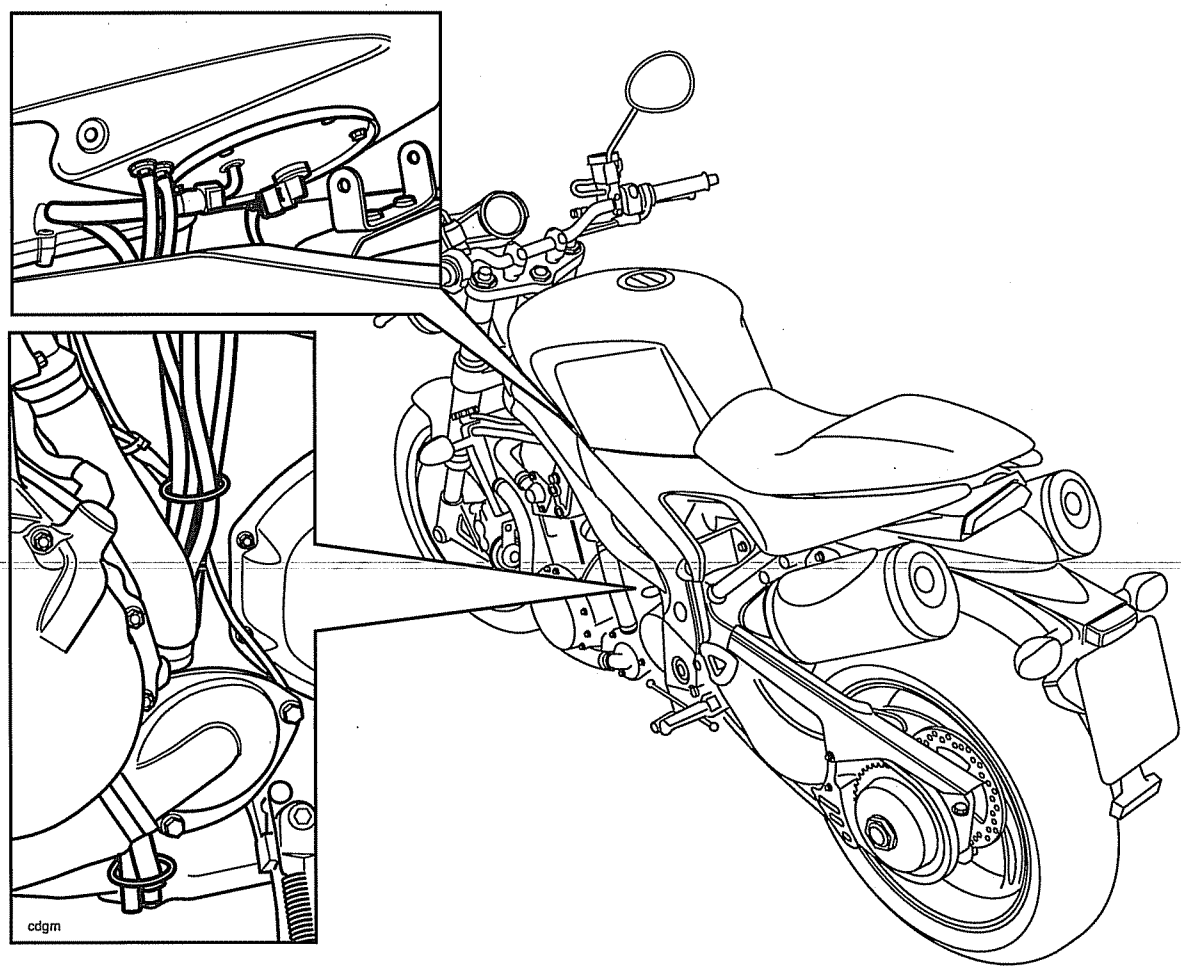
Front brake hose routing



Rear brake hose routing



Fuel tank breather hose routing



2 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	Every	Odometer Reading in Miles (Kms) or time period, whichever comes first					
		500 (800) 1 month	6,000 (10,000) 1 year	12,000 (20,000) 2 years	18,000 (30,000) 3 years	24,000 (40,000) 4 years	30,000 (50,000) 5 years
Engine oil cooler - check for leaks	-	•	•	•	•	•	•
Engine oil - renew	-	•	•	•	•	•	•
Engine oil filter - renew	-	•	•	•	•	•	•
Valve clearances - check	-			•		•	
Air cleaner - renew	-			•		•	
Engine ECM - check for stored DTC's	-	•	•	•	•	•	•
Spark plugs - check	-		•		•		•
Spark plugs - renew	-			•		•	
Throttle bodies - balance	-		•	•	•	•	•
Throttle cables - check/adjust	Day	•	•	•	•	•	•
Cooling system - check for leaks	Day	•	•	•	•	•	•
Coolant level - check/adjust	Day	•	•		•		•
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	-			•		•	
Brake pad wear - check	Day	•	•	•	•	•	•
Brake master cylinders – check for oil leaks		•	•	•	•	•	•
Brake callipers - check for leaks and seized pistons		•	•	•	•	•	•
Drive Chain - lubricate	Every 200 miles (300 kms)						
Drive Chain – wear check	Every 500miles (800kms)						
Drive chain slack – check/adjust	Day	•	•	•	•	•	•
Drive rubbing strip - check	-		•	•	•	•	•
Rear wheel bearing - lubricate	-			•		•	
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	•	•	•	•	•	•
Secondary air injection system - check	-			•		•	
Stand - check operation	Day	•	•	•	•	•	•
Fuel and evaporative loss* hoses - renew	-					•	

*Evaporative system fitted to California models only.

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3 Cylinder Head

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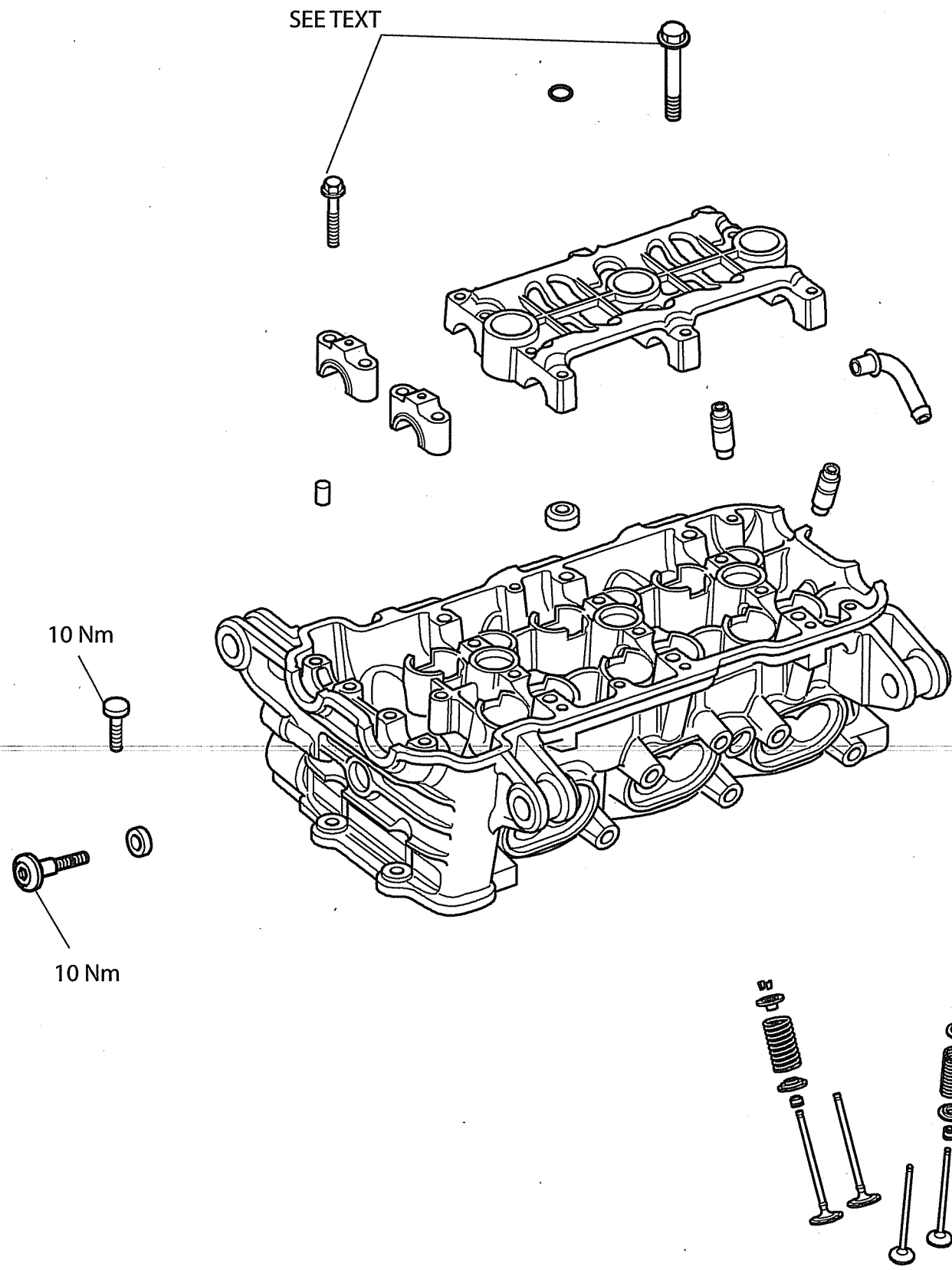
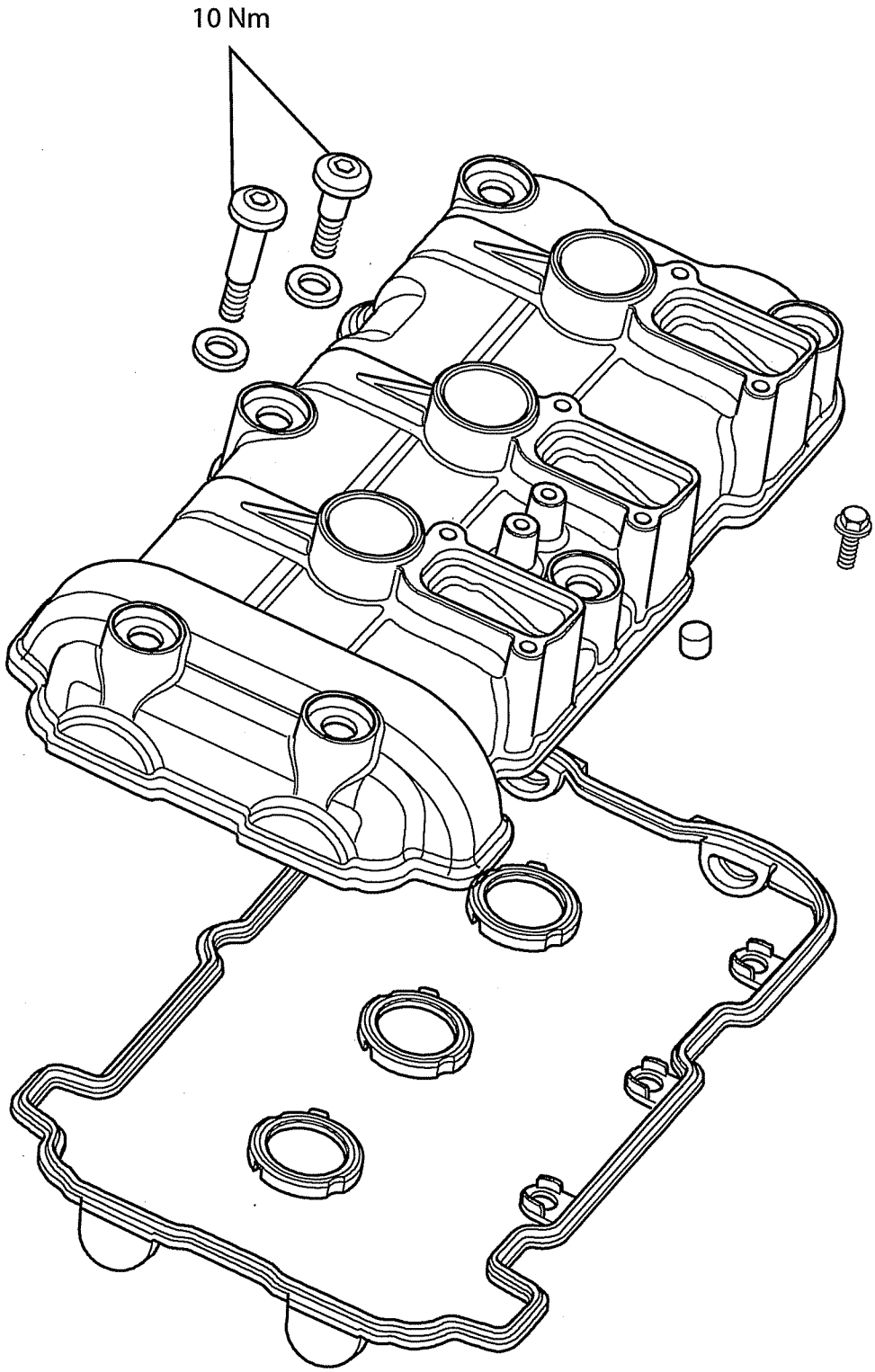
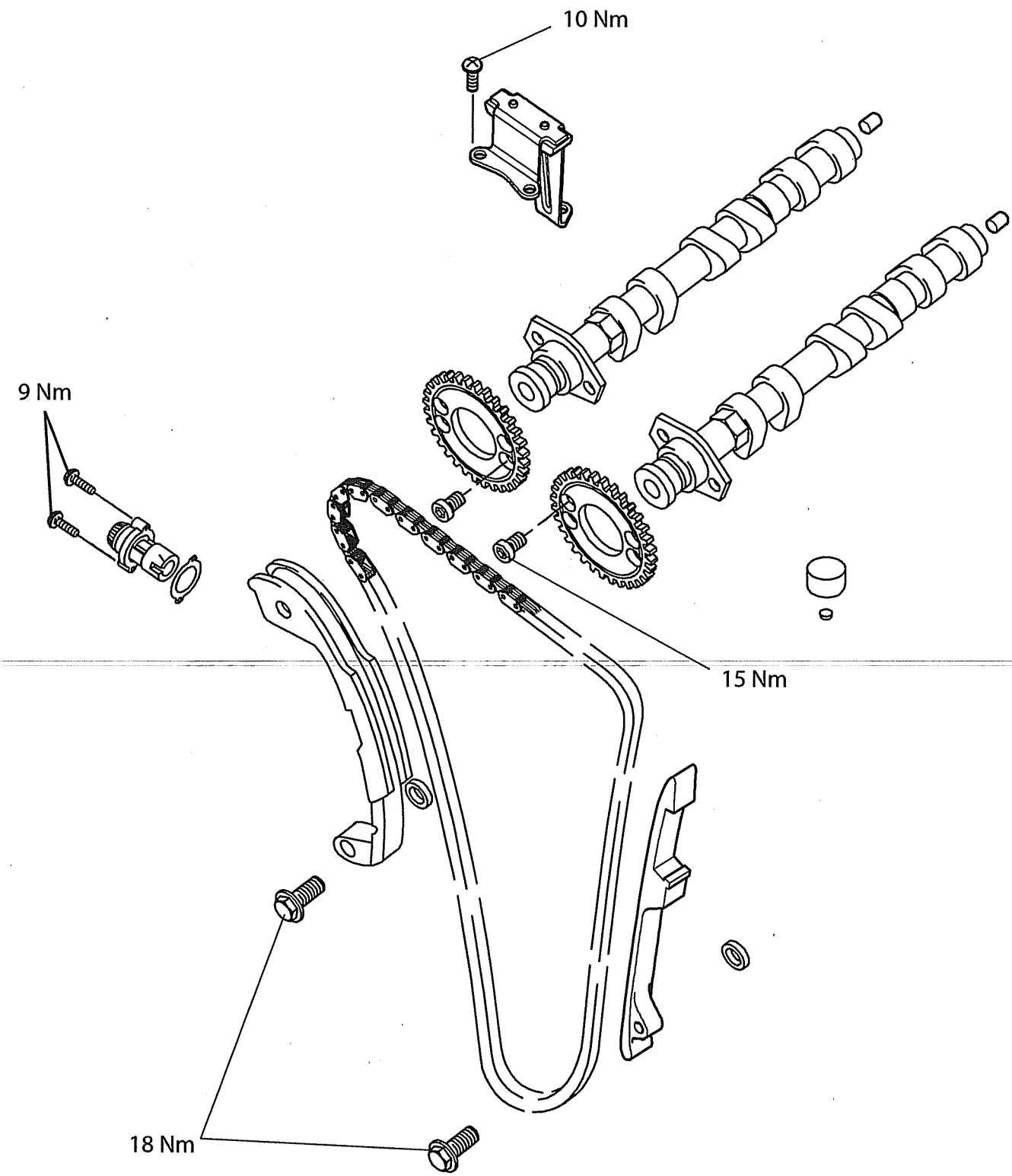
Exploded View - Cylinder Head and Valves



Exploded View - Cam Cover



Exploded View - Camshaft and Camshaft Drive



Cylinder Head Description

The engine is fitted with an aluminium alloy cylinder head, which carries the 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.

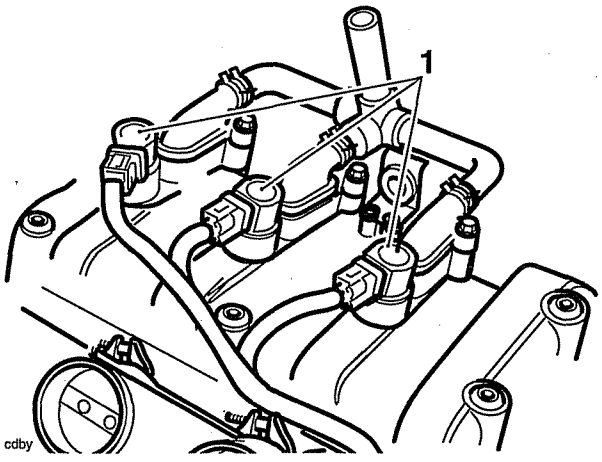
⚠ Caution

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

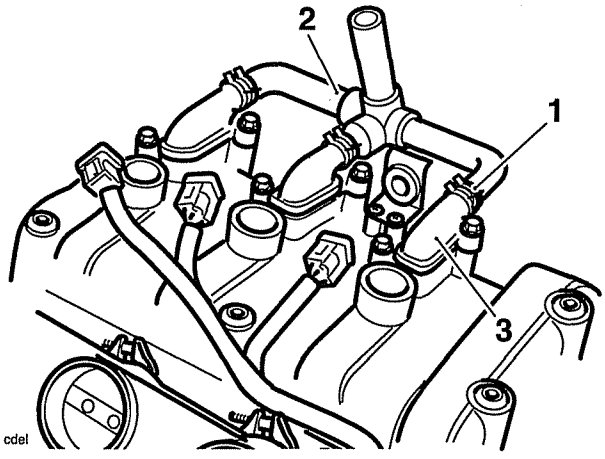
Removal

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 the fuel tank (see page *10-88*).
5. Remove the airbox (see page *10-92*).
6. Remove the ignition coils from the cam cover.



1. Coils

7. Detach the secondary air injection hose from the reed valves on top of the cam cover (see page *10-109*).

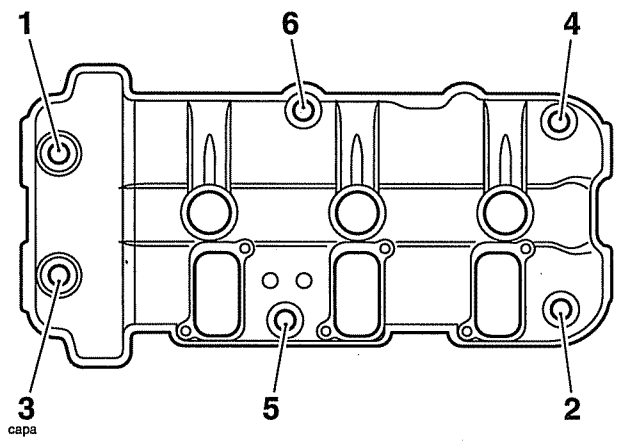


1. Spring-close hose clip
2. Secondary air injection hose
3. Reed valve assembly

8. Release the throttle cables at the throttle bodies (see page *10-96*).
9. 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

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

⚠ Caution

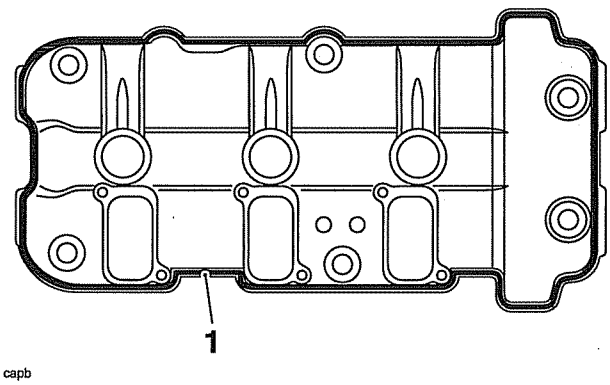
Never use a lever to remove the camshaft cover from the head.

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

11. 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).
12. Remove any residual oil from the front of the head using a syringe or lint free cloth.

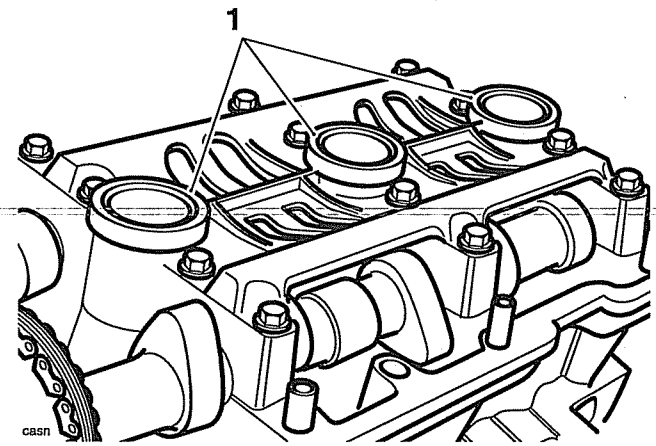
Installation

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.



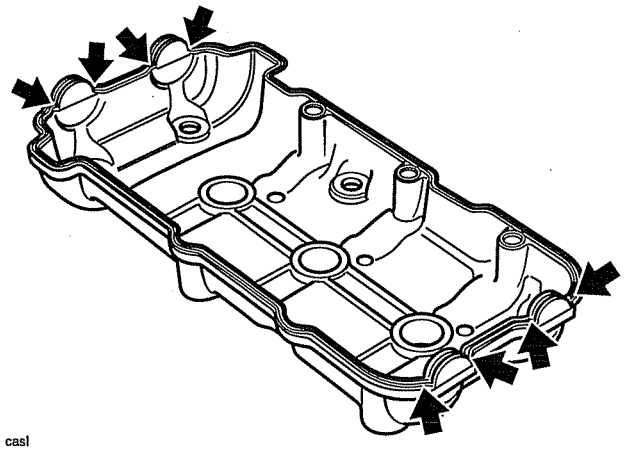
1. Cam cover seal groove

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

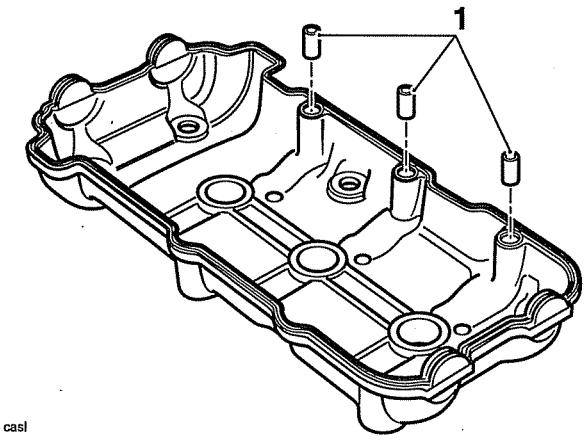


1. Plug tower seals

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

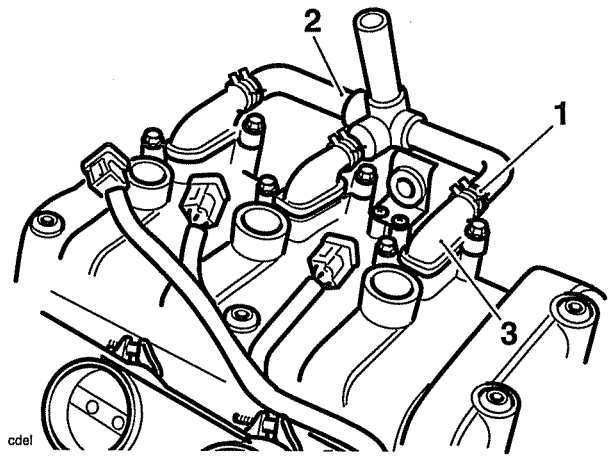


6. Fit the cam cover, ensuring that the gasket and seals remain in the correct positions.
7. Refit the dowels to the cam cover before locating it to the head.



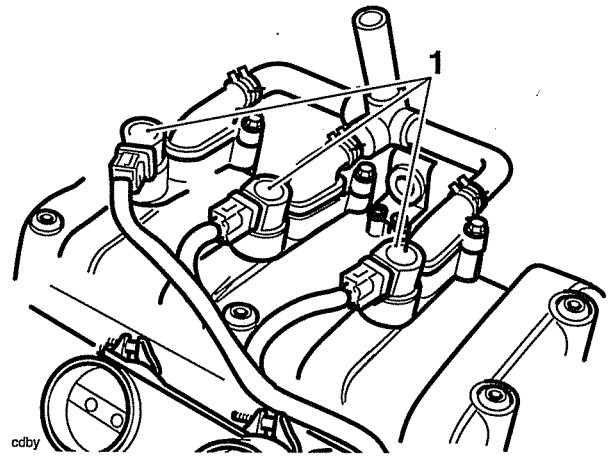
1. Dowels

8. Fit the cam cover screws and screw seals, then tighten until finger tight.
9. Finally, tighten the cam cover screws, in same order as for removal, to **10 Nm**.
10. Refit the air deflector shield and retain with the clips.
11. Refit the throttle cables and adjust (see page *10-95*).
12. Refit the secondary air injection hose to the reed valves (see page *10-110*).



1. Spring-close hose clip
2. Secondary air injection hose
3. Reed valve assembly

13. Fit the ignition coils and reconnect.



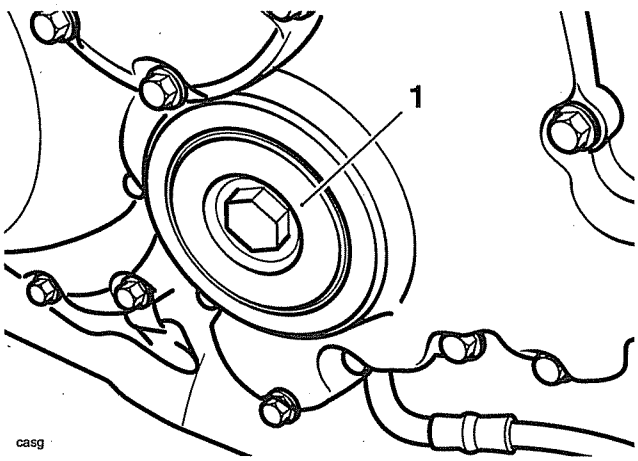
1. Coils

14. Refit the airbox (see page *10-93*).
15. Refit the fuel tank (see page *10-88*).
16. Refit the side panel assembly (see page *16-9*).
17. Reconnect the battery positive (red) lead first.
18. Refit the seat (see page *16-9*).

Cam Chain Tensioner

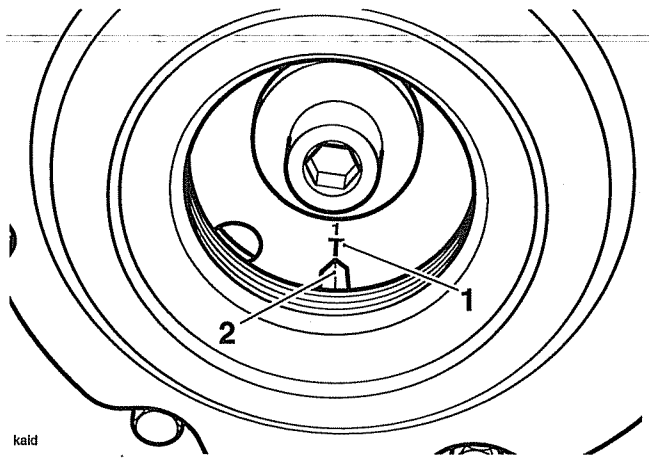
Removal

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



1. Inspection plate

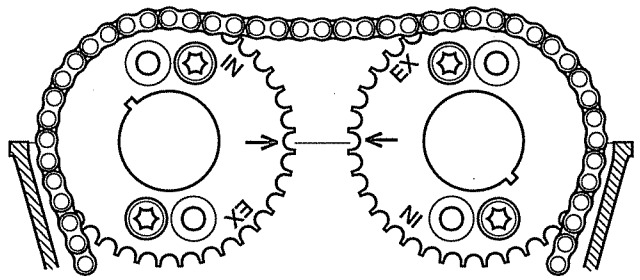
3. Rotate the crankshaft clockwise (the normal direction of rotation), using the bolt fitted to the end of the crankshaft. Stop rotation when number 1 cylinder is at top dead centre (TDC), that is when the `T1' mark on the sprag clutch aligns with the line at the bottom of the cover.



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.**



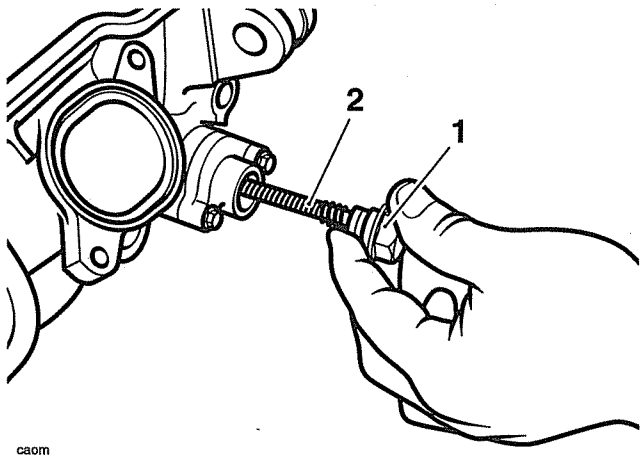
Camshaft to Cylinder Head Alignment Marks

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.

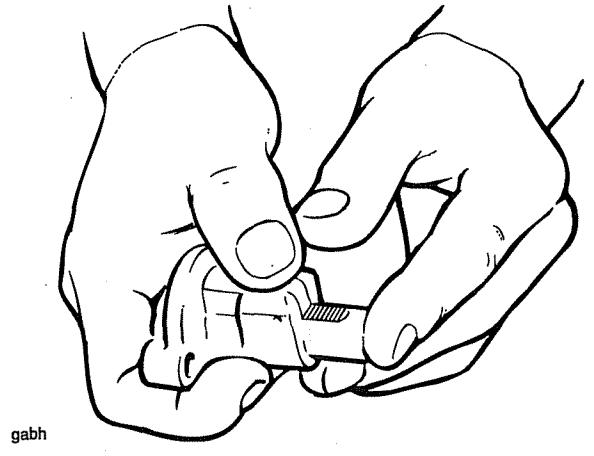


1. Centre nut
2. Spring

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.



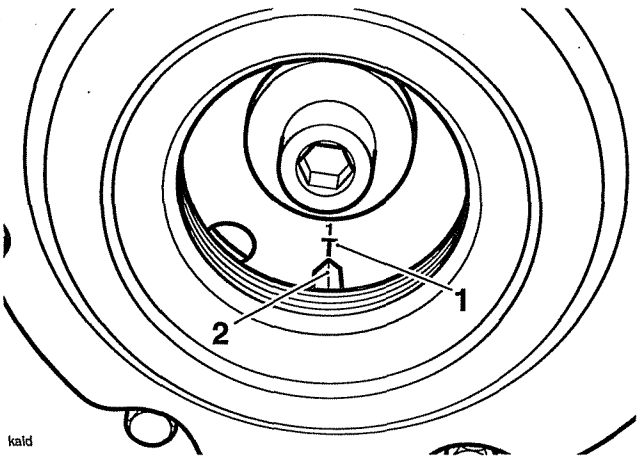
Tensioner Plunger Set-up

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

Note:

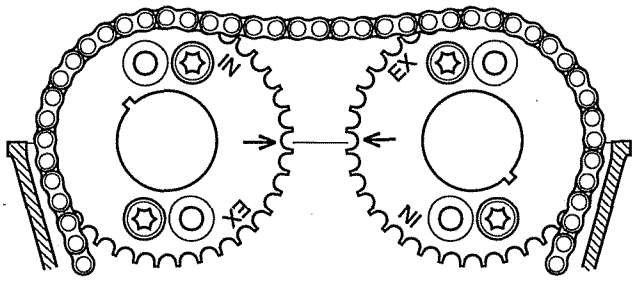
- **If fitting a new tensioner, observe the following:**
- **Remove the new tensioner assembly from the packaging. On examination, it can be seen that the tensioner nut will not be tightened fully into the tensioner body and that the tensioner `nose' (i.e., the part which actually contacts the chain 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.



1. `T1' Mark
2. Marker line

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



Camshaft to Cylinder Head Alignment Marks

10. Re-check tensioner plunger location against the tensioner blade.
11. Refit the cam 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**.

Camshafts

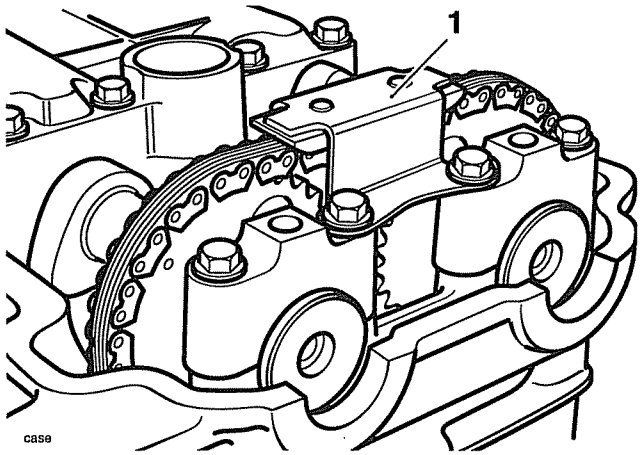
Removal

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.



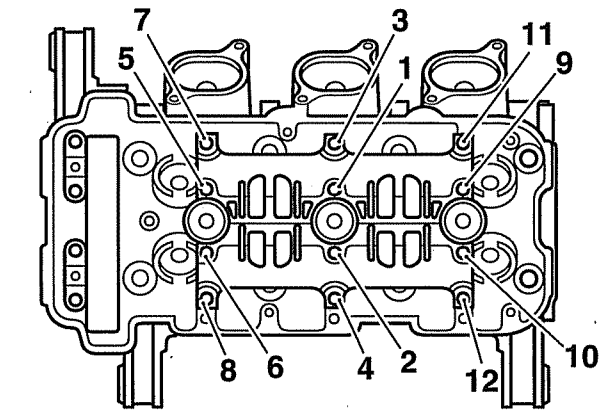
1. Cam Chain Top Pad
2. Cam caps

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:

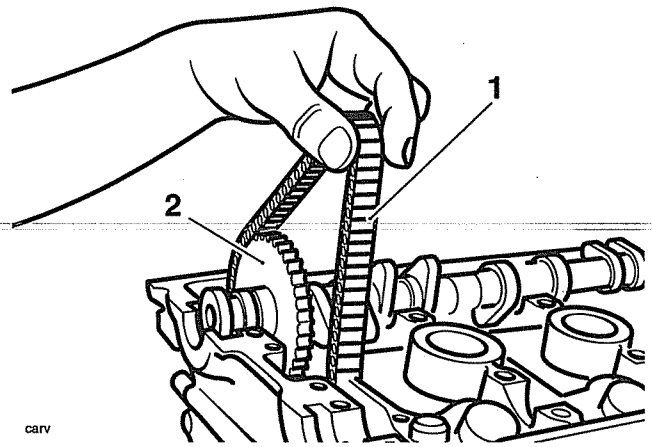
- **A laundry marker or similar may be used to mark the cap positions.**

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.



Cam ladder bolt release sequence

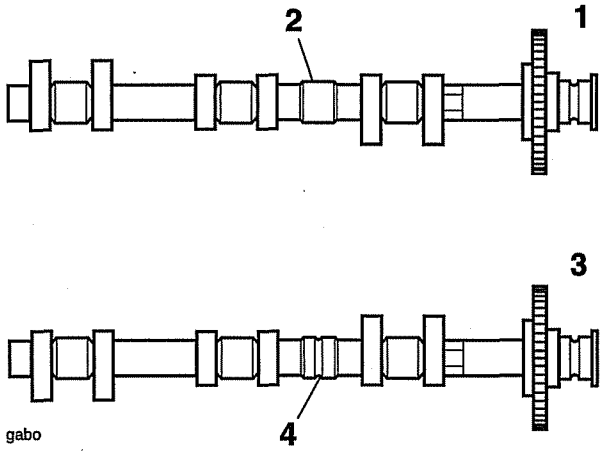
7. Remove the cam cap ladder and collect the dowels (if loose) and spark plug tower O-rings.
8. Lift the cam chain from the exhaust camshaft sprocket and remove the exhaust camshaft.
9. Repeat the procedure for the inlet camshaft.



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

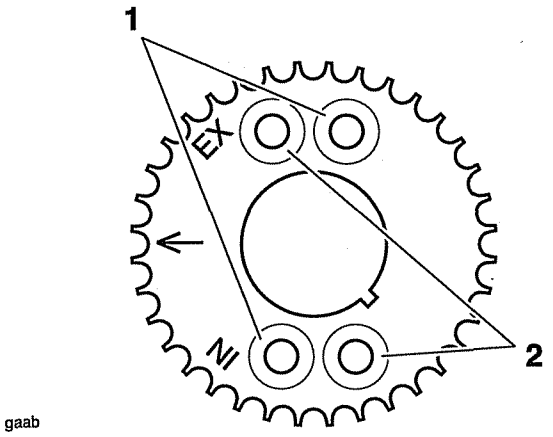
Camshaft and Bearing Cap Inspection

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

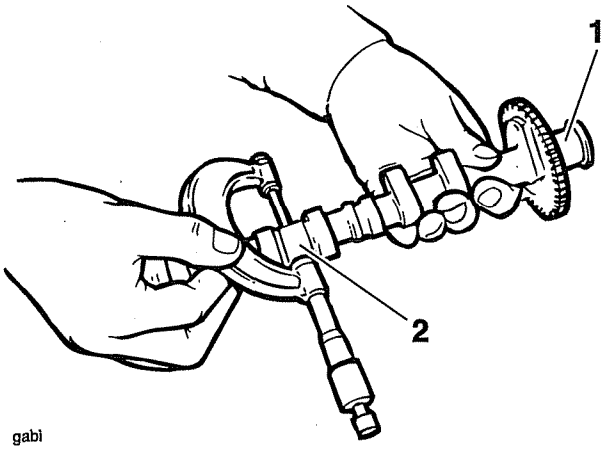
2. Measure the camshaft journals with a micrometer. If any journal is outside the specified tolerance, replace the camshaft.

Outrigger Journal Diameter

Standard:	22.953 - 22.956 mm

Standard Journal Diameters

Standard:	22.93 - 22.96 mm

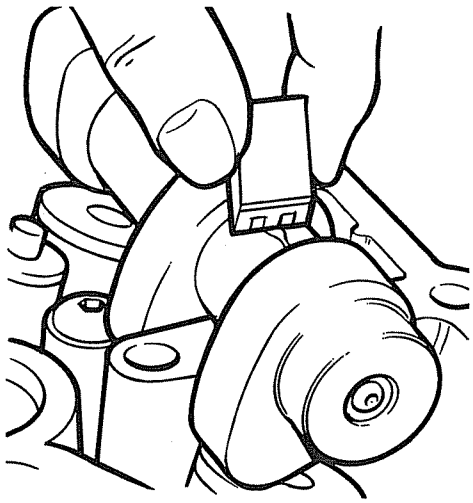


1. Outrigger Journal
2. Standard Journal

3. Examine all camshaft and camshaft bearing caps for excessive wear and damage, paying particular attention to the outrigger caps.
4. Check the journal-to-head clearances, using `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.

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 (see page *3-12*).

Note:

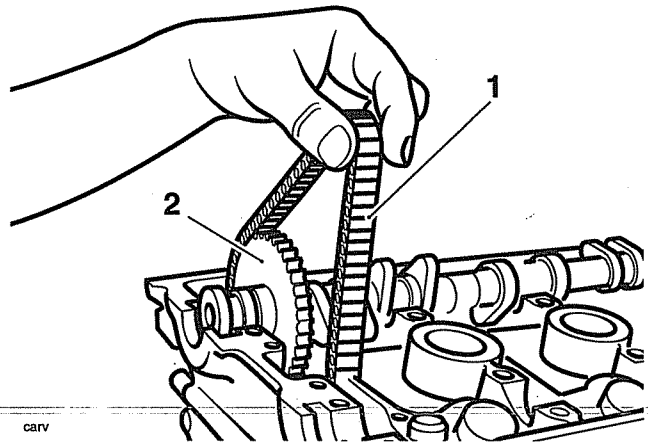
- **If the measured clearance is outside the tolerance, and the camshaft journals are within tolerance, the cylinder head must be replaced.**

⚠ 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).



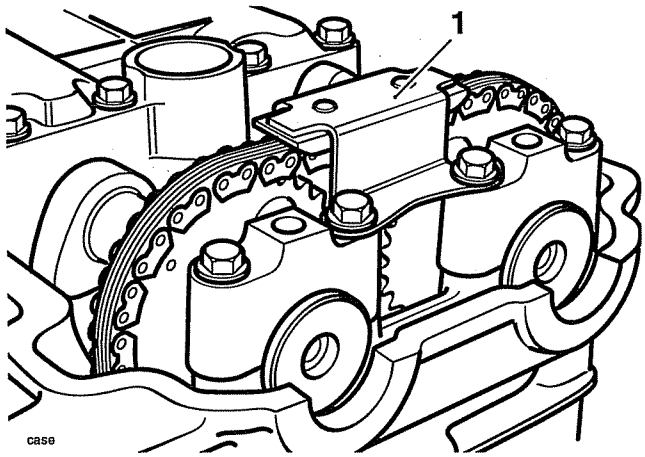
1. Cam chain
2. Inlet camshaft

4. Repeat the procedure for the other camshaft.

⚠ Caution

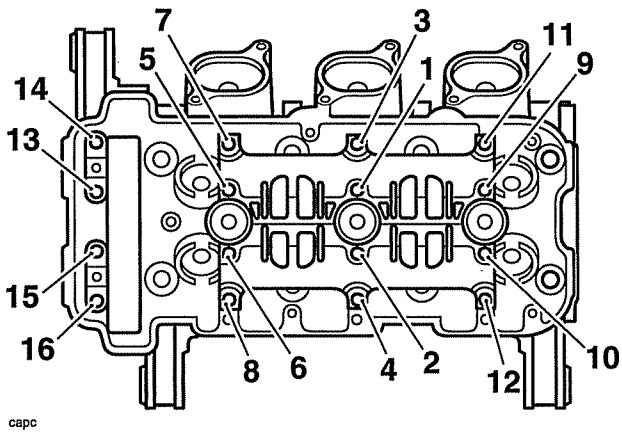
If the camshafts and caps/ladder are fitted without first aligning the timing marks on both the crankshaft and camshaft sprockets, the inlet and exhaust valves will contact each other causing damage to both the head and the valves.

5. 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

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



Cam-cap and ladder bolt tightening sequence

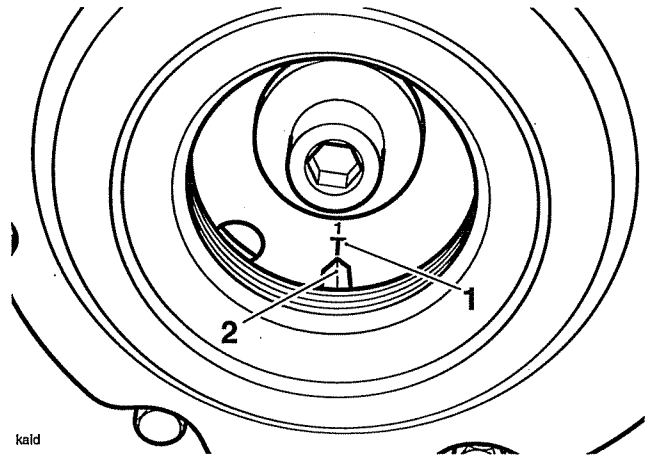
7. Before fitting the cam chain tensioner, ensure that each camshaft rotates freely. Do not rotate either camshaft by more than 5°.

⚠ 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.

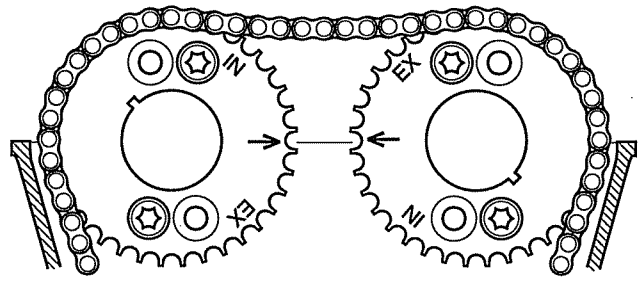
8. Assemble the cam chain tensioner using the instructions given earlier in this section.

9. 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.



1. `T1' Mark
2. Marker line

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



Camshaft to Cylinder Head Alignment Marks

11. Check the valve clearances. Adjust as necessary (see page *3-14*).
12. 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.

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

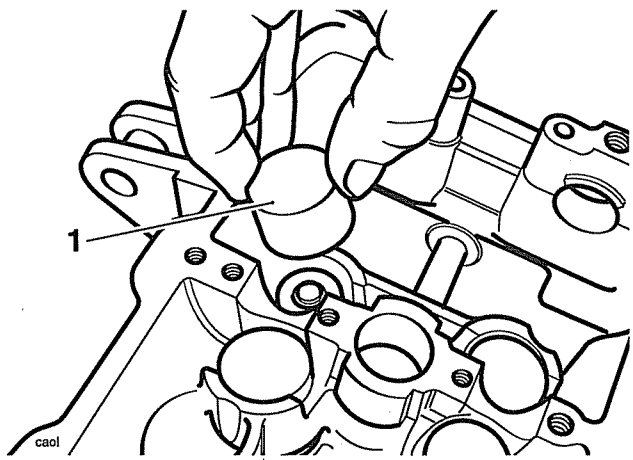
Inlet Vale No.	Gap Measured
1	as measured (mm)
2	as measured (mm)
3	as measured (mm)
4	as measured (mm)
5	as measured (mm)
6	as measured (mm)
Exhaust Valve No.	**Gap Measured**
1	as measured (mm)
2	as measured (mm)
3	as measured (mm)
4	as measured (mm)
5	as measured (mm)
6	as measured (mm)

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.

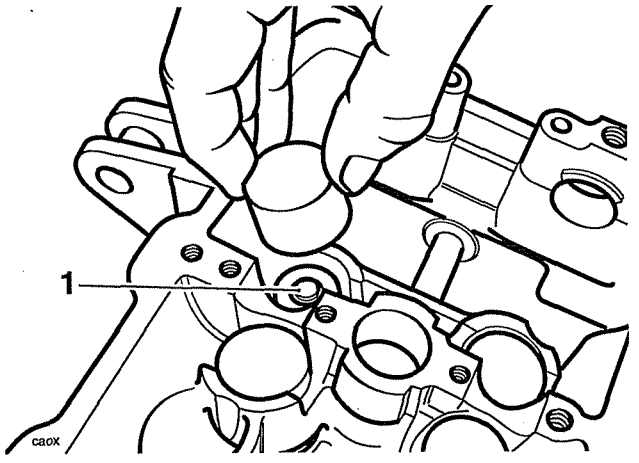


1. Tappet bucket

Note:

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

3. Remove the shim from the valve head.



1. Shim

4. 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:

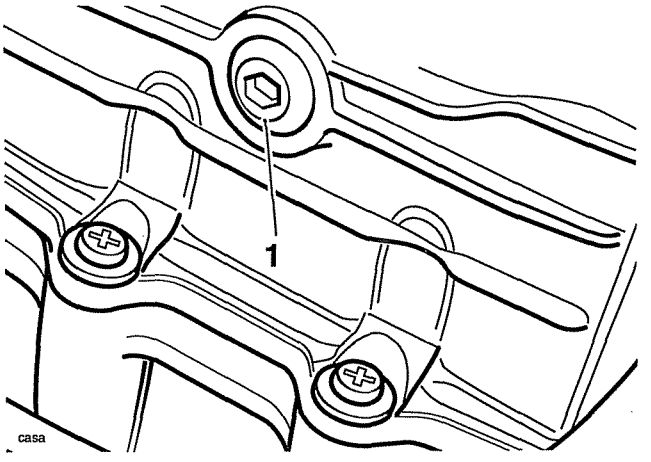
- **Shims are available ranging from 1.70 mm to 3.00 mm in increments of 0.025 mm.**

5. Fit the new shim to the valve head.
6. Lubricate the tappet bucket(s) with a 50/50 solution of engine oil and molybdenum disulphide grease.
7. Refit the tappet bucket.
8. Refit the camshafts (see page *3-12*).
9. Re-check all valve clearances.
10. Repeat the procedure if the valves require further adjustment.

Cam Chain

Removal

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



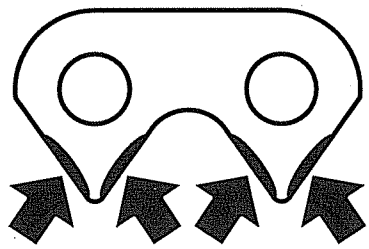
1. Centre Bolt

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

Inspection

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

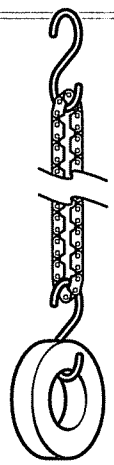
1. Check for significant blue discolouration of the chain plates indicating excessive heat build-up.
2. Examine all pins for signs of rotation.
3. Check for cracking or deep scratching of the chain plates.
4. Check for severe wear of the inner plates as indicated in the diagram below.



ccrv

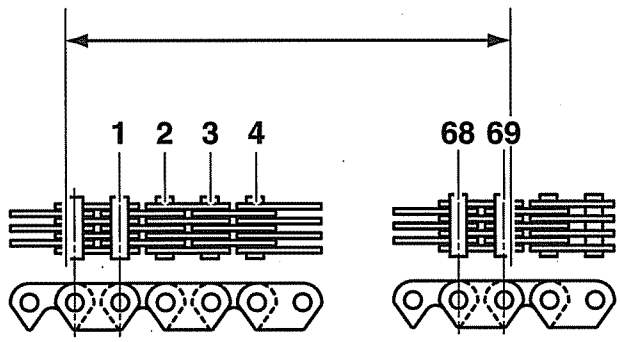
For a more thorough check, proceed as follows:

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.



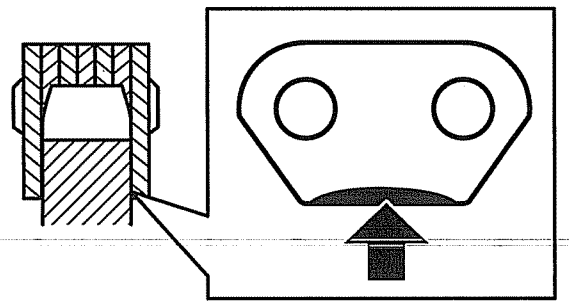
cajs

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

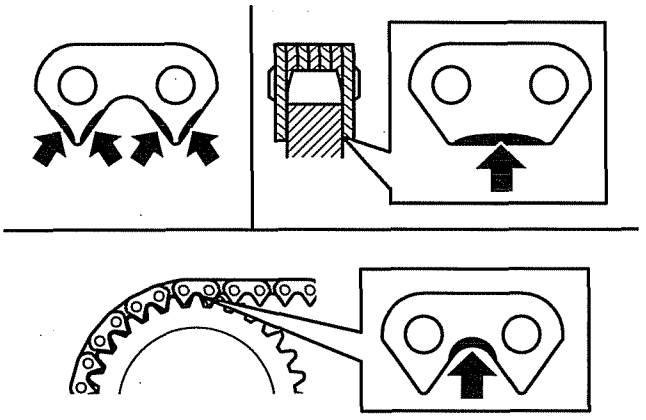
4. Check for severe wear of the inner surface of the outer plates at the side-contact points with the sprocket teeth.



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*).

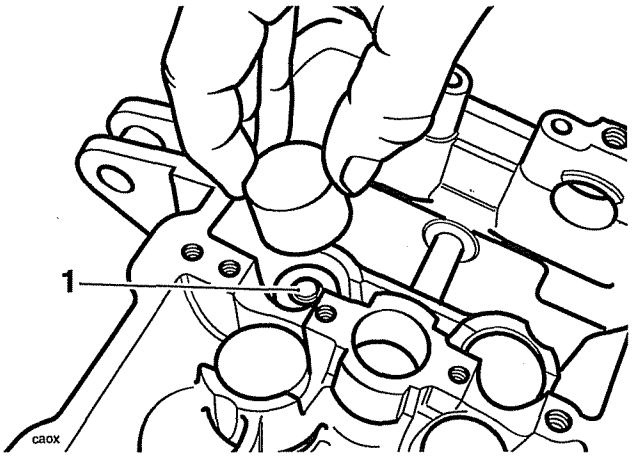
Cylinder Head

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.

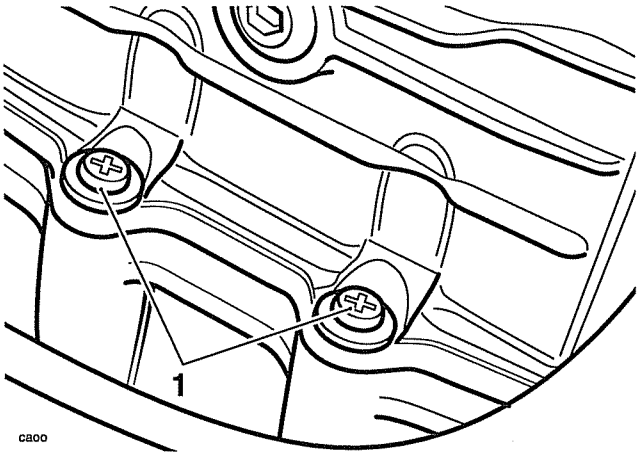


1. Shim

Note:

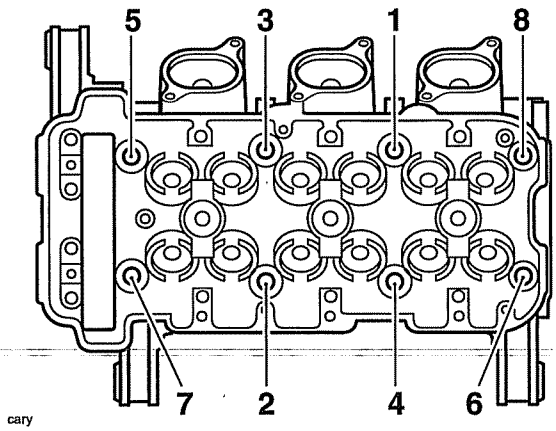
- **To prevent the tappet buckets and shims from becoming mixed, place the shim and tappet together in a marked container. The components must be refitted in their original positions.**

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



1. Cylinder head to upper crankcase screws

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

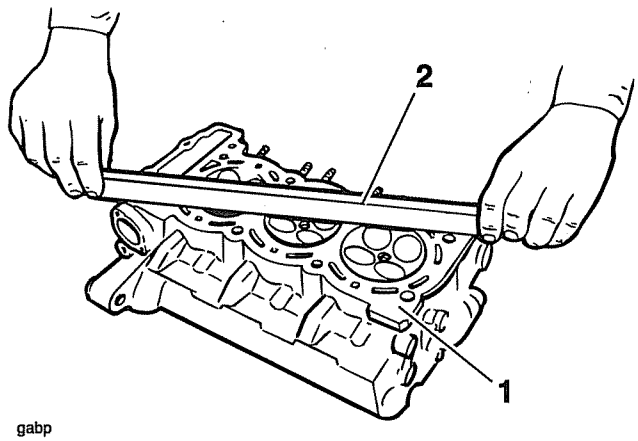


Cylinder head bolt release sequence

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

Inspection

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

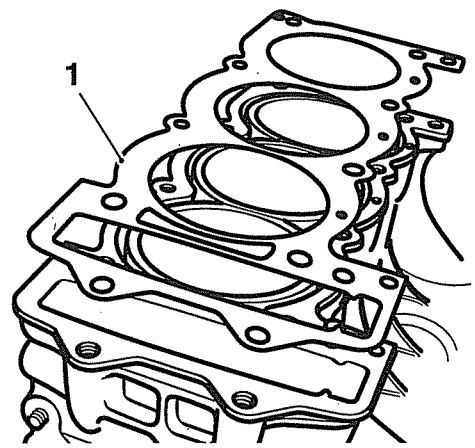


1. Straight edge
2. Cylinder head gasket face

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

Installation

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



1. Cylinder Head Gasket

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

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

⚠ Caution

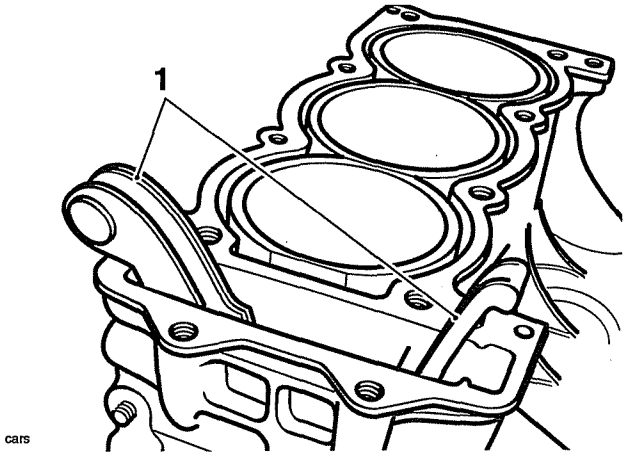
Using the correct procedure to fit and tighten the cylinder head bolts will ensure the long term reliability of the cylinder head gasket.

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

6. 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:

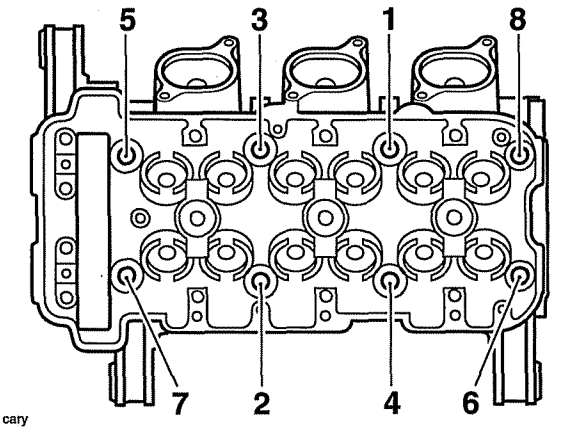
Note:

- **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.

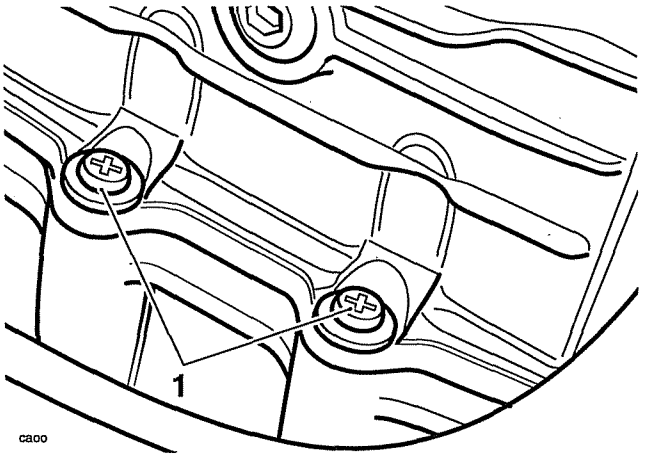
B: Tighten the head bolts in the same numerical sequence used to release the bolts, to 35 Nm.

- **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

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



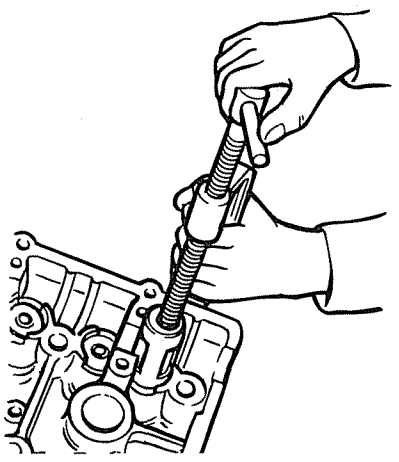
1. Cylinder head to upper crankcase screws

4. 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.
5. Refit the cam shafts (see page *3-12*).
6. Install the engine to the frame (see page *9-3*).

Valves and Valve Stem Seals

Removal from the Cylinder Head

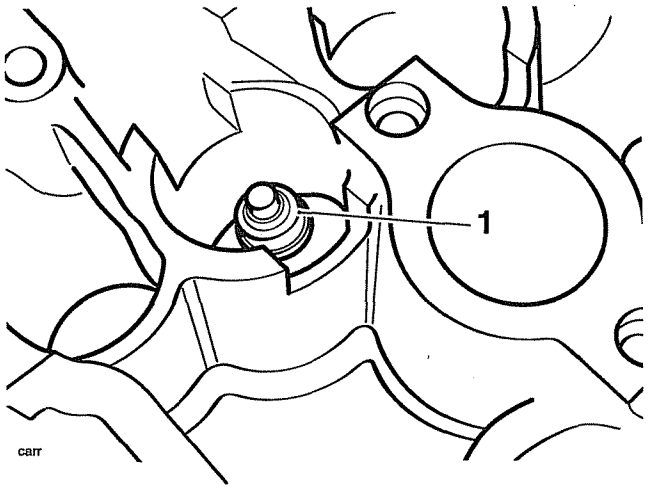
1. Remove each valve from the head using a valve spring compressor. The compressor must act on the top cup to allow removal of the valve collets.



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)

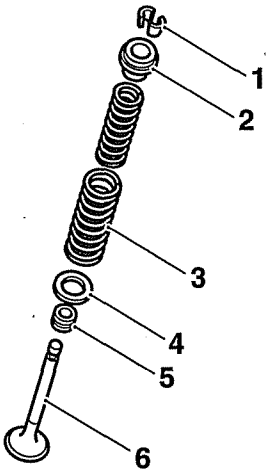


carr

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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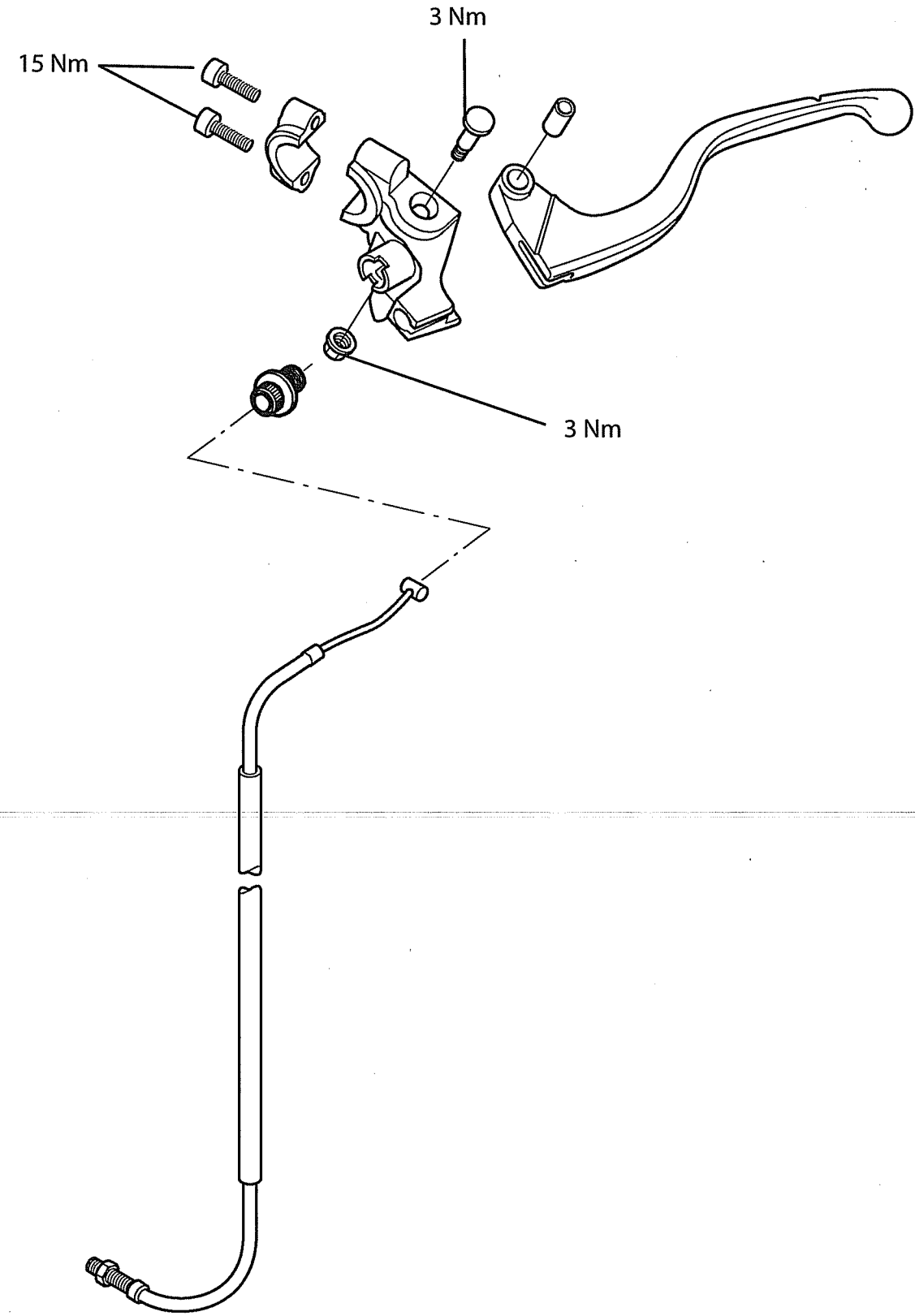
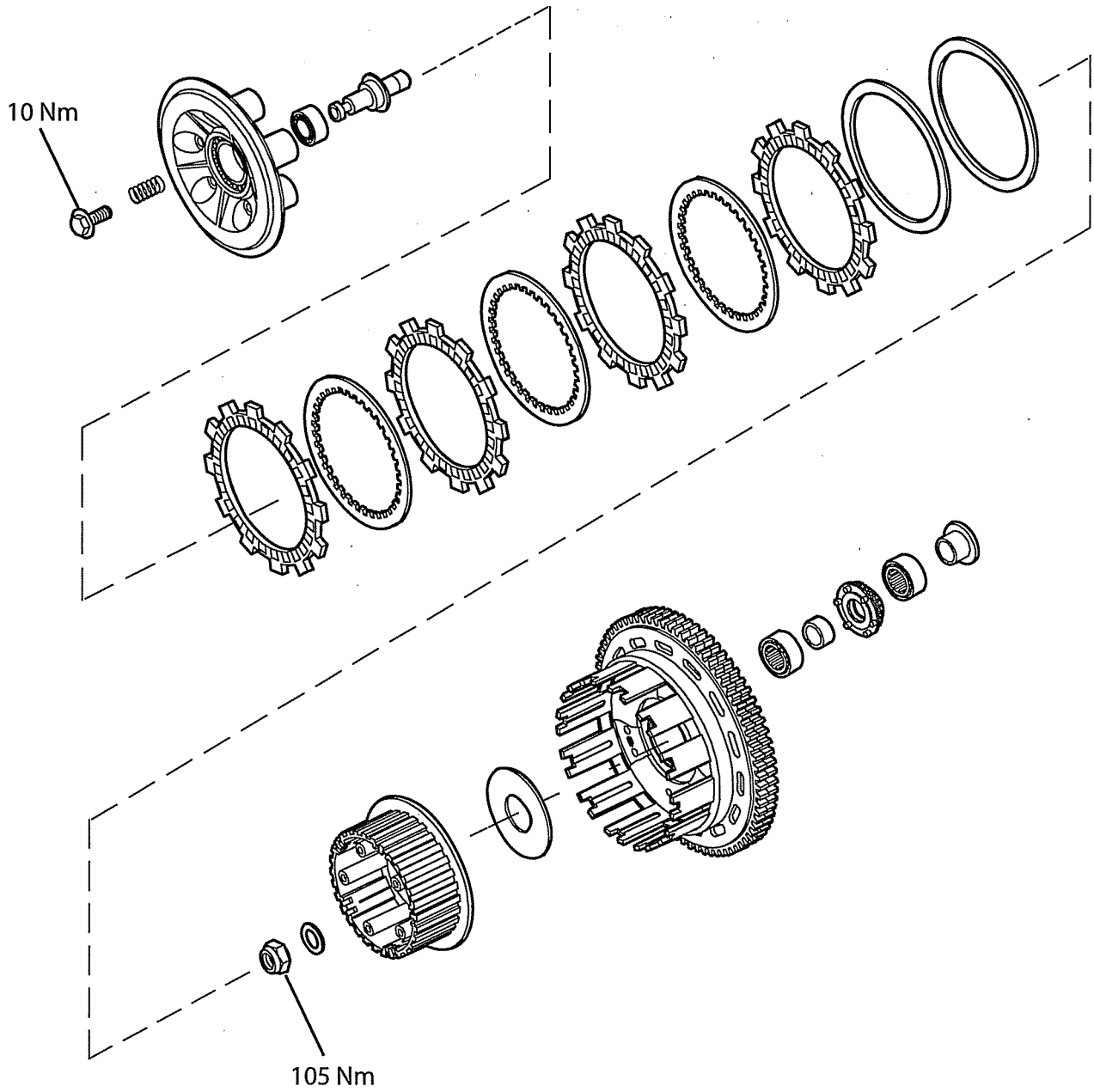
4 Clutch

Table of Contents

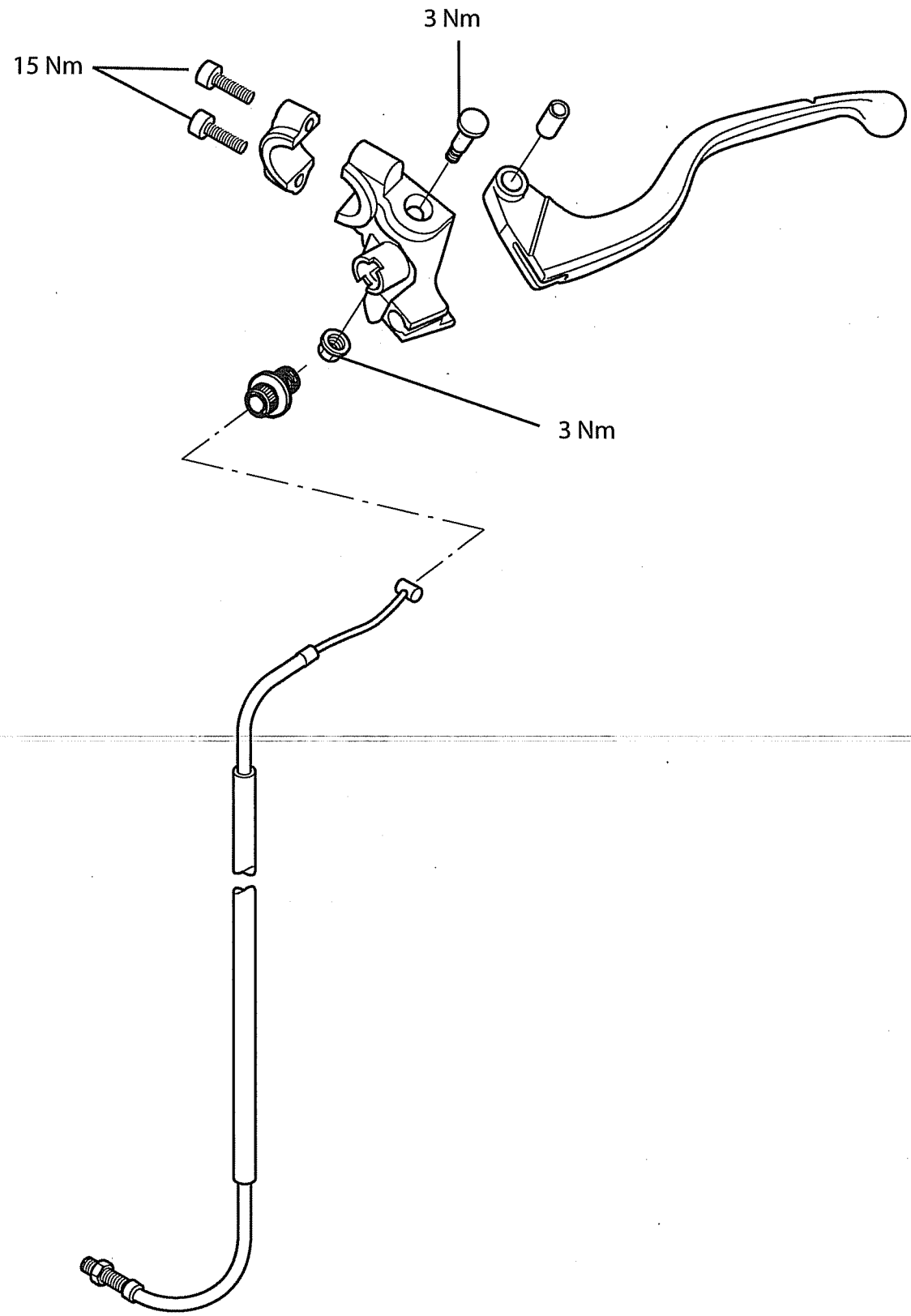
Exploded View - Clutch Cover



Exploded View - Clutch Assembly



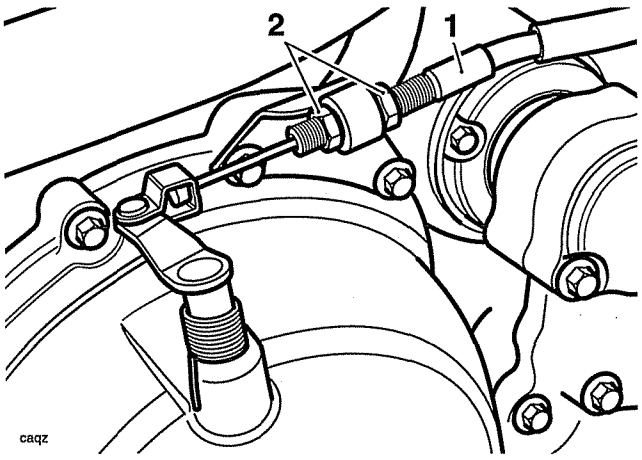
Exploded View - Clutch Controls



Clutch Cable

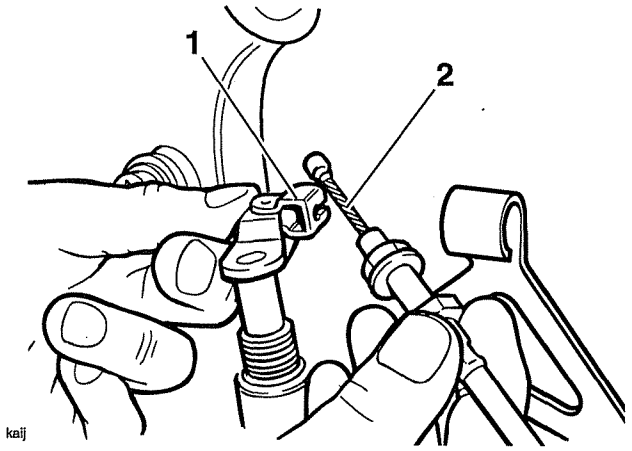
Removal

1. Remove the seat (see page *16-8*).
2. Disconnect the battery (see page *17-7*).
3. Slacken the cable locknut and release the adjuster at the clutch cover end to give maximum play in the cable.



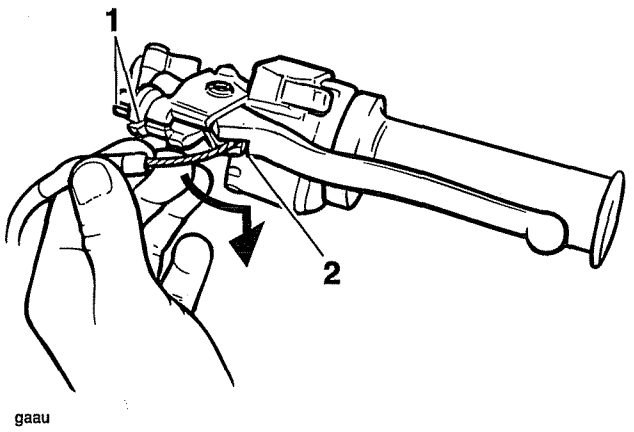
1. Clutch Cable
2. Adjuster

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.



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.

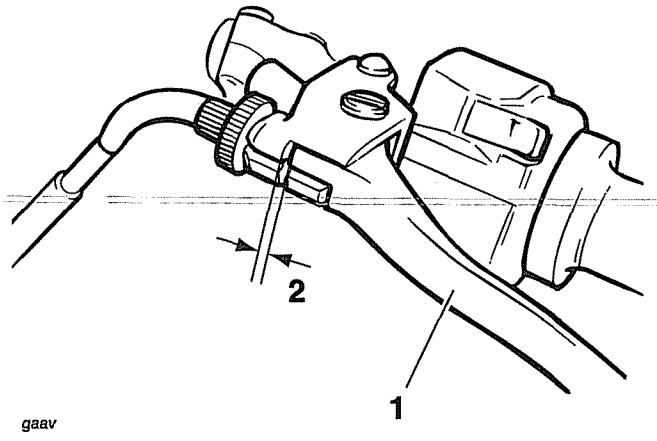
Assembly

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.



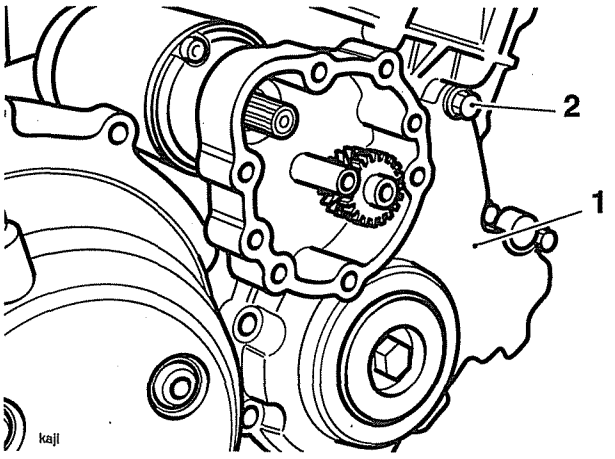
1. Clutch Lever
2. Correct Setting, 2-3 mm

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

Clutch

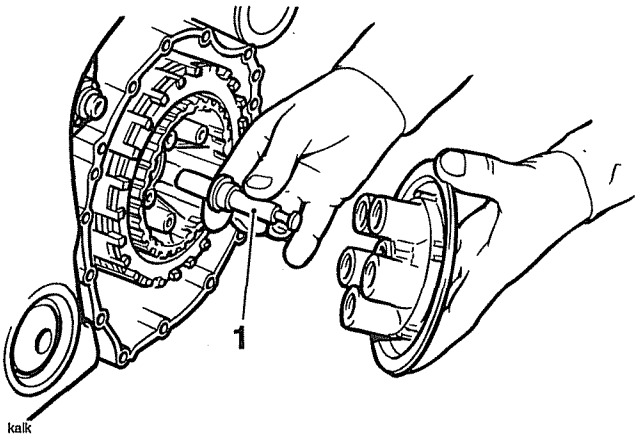
Disassembly

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 (see page *7-20*).



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.

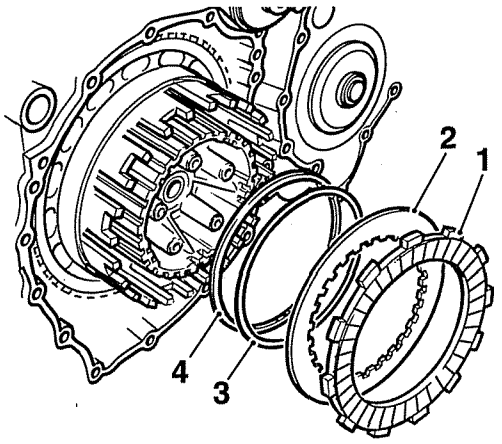


1. Clutch pull rod

6. 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.**



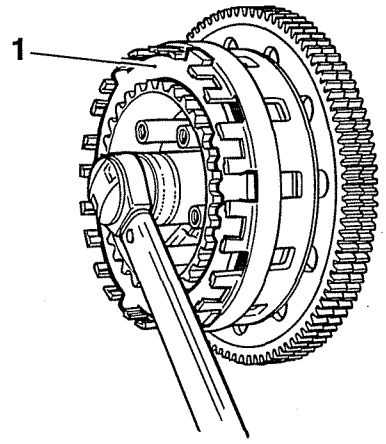
kain

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

Note:

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

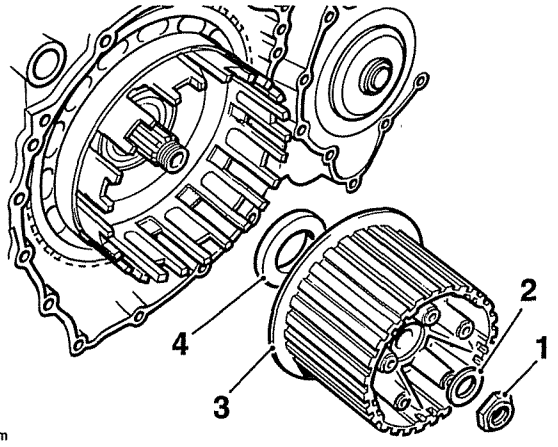
7. Engage second gear and lock the inner and outer clutch drums together using service tool T3880305.



gaaz

1. Service Tool T3880305

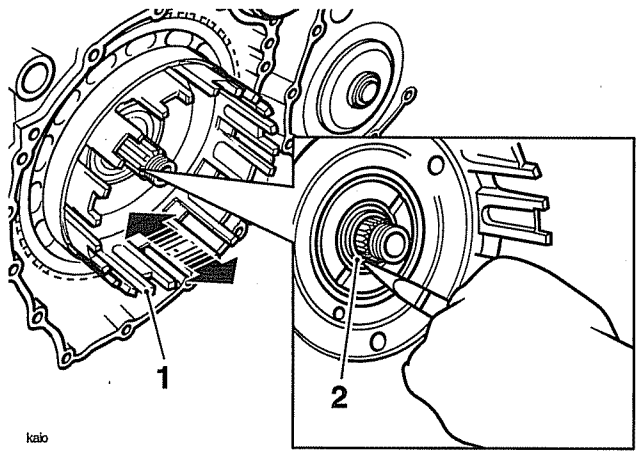
8. Depress the rear brake pedal to prevent the engine from turning, then release the clutch centre nut.
9. Remove the centre nut, belleville washer, clutch inner drum and thrust washer.



kaim

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

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.



kalo

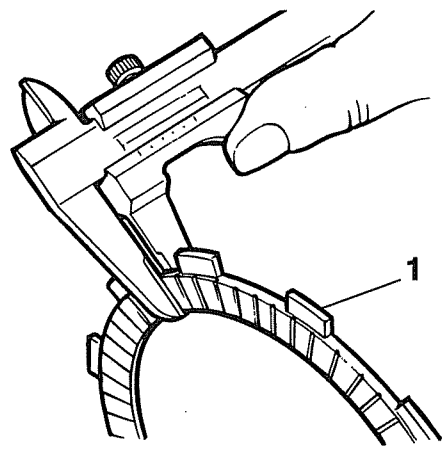
1. Outer drum
2. Bearing sleeve

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.



gaal

1. Clutch friction Plate

Friction plate thickness - inner and outermost plates

Standard	3.80 mm
Service limit	3.60 mm

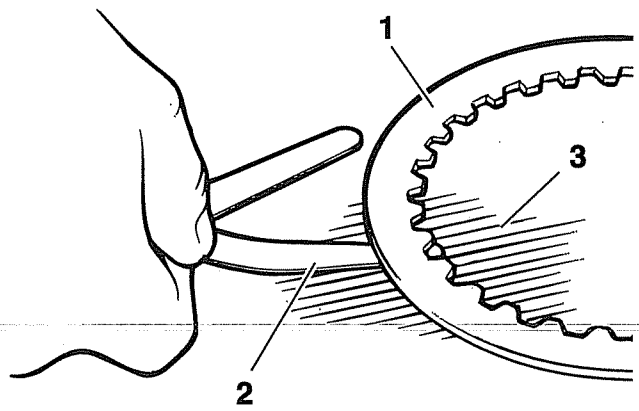
Friction plate thickness - all other plates

Standard	3.30 mm
Service limit	3.10 mm

Bend/warp

Check all plates for bend and warp as follows:

1. 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.



gaas

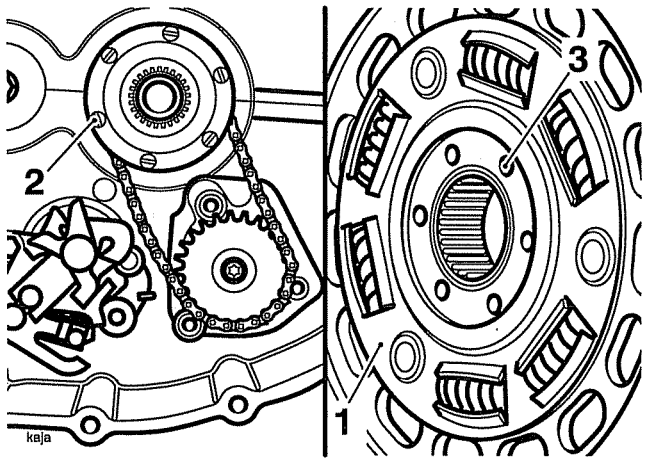
1. Friction Plate
2. Feeler Gauge
3. Surface Plate

Friction plate bend/warp

Standard	up to 0.15 mm
Service limit	0.20 mm

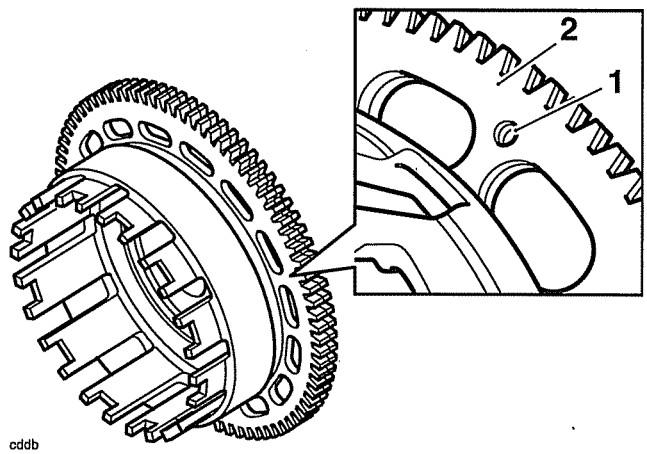
Assembly

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.



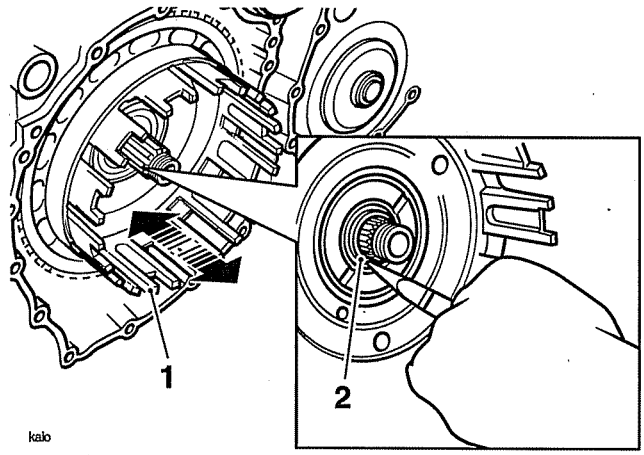
1. Clutch outer drum
2. Oil pump sprocket drive pegs
3. Oil pump drive holes

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.

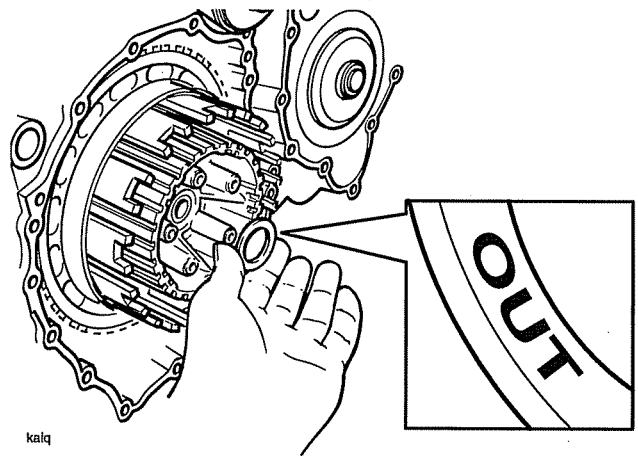


1. Outer drum
2. Bearing sleeve

Note:

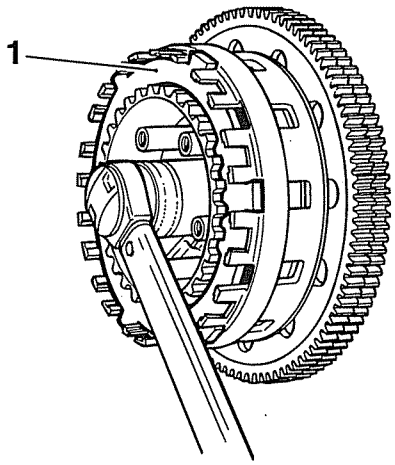
- **When the bearing sleeve is correctly fitted, it will be a flush fit with the clutch drum face. In addition, a groove around the input shaft will be visible.**

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

7. 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.



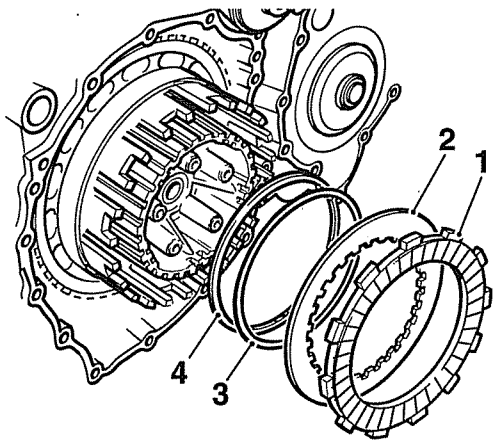
gaaz

1. Service Tool T3880305

8. Disengage second gear and check for free rotation of the clutch inner drum.
9. 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.**



kain

1. Outer Clutch Friction Plate
2. Outer Drum
3. Individual Tags

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

Note:

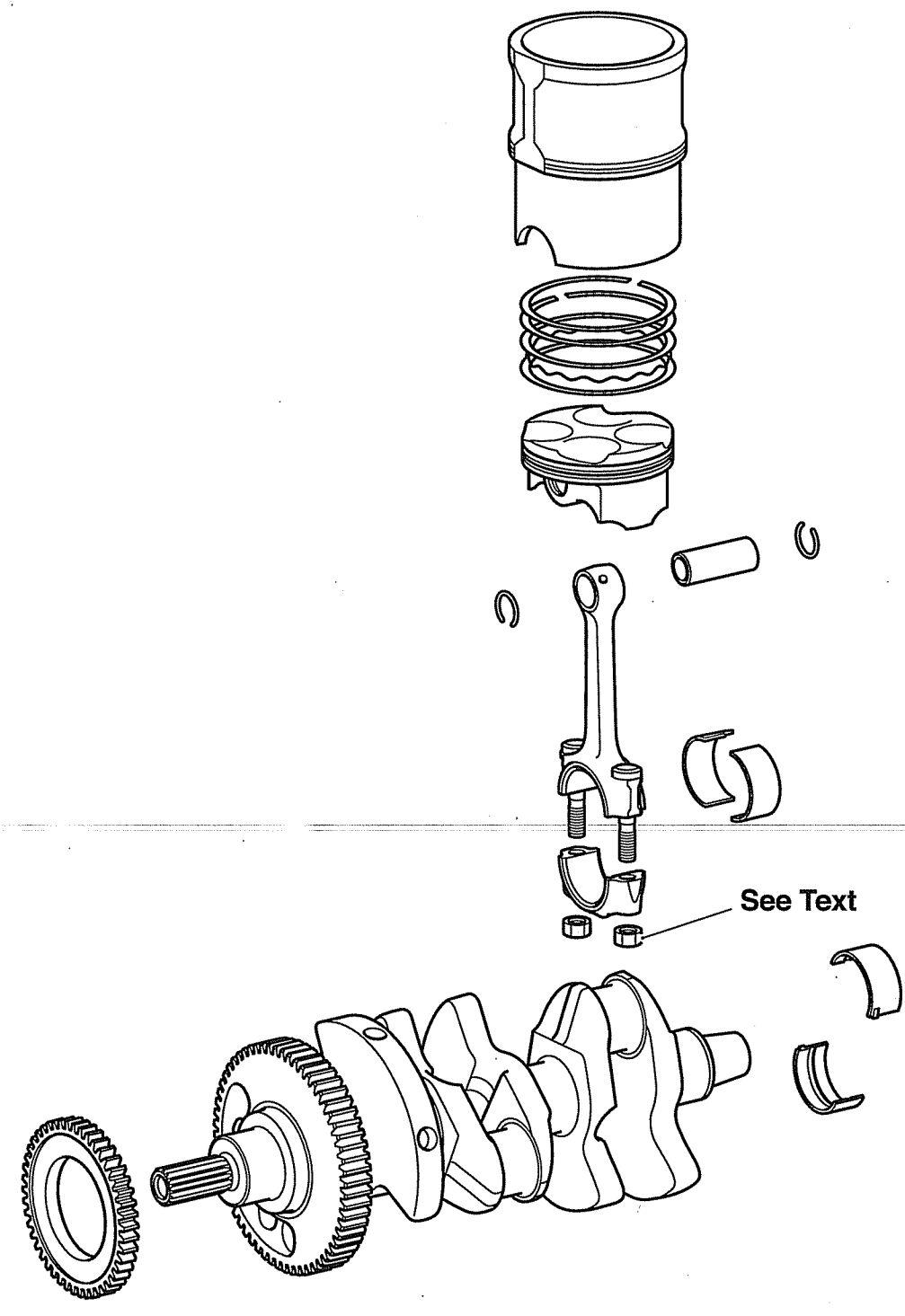
- **The pull rod should be free to move in and out and also it should be free to turn.**

12. Clean and refit the clutch cover incorporating a new gasket. Tighten the clutch cover bolts to **9 Nm.**
13. Refit the starter cover and gears (see page *7-20*).
14. Refit the outer cable to the adjuster bracket at the clutch end (see page *4-6*).
15. Set the clutch adjustment (see page *4-6*).

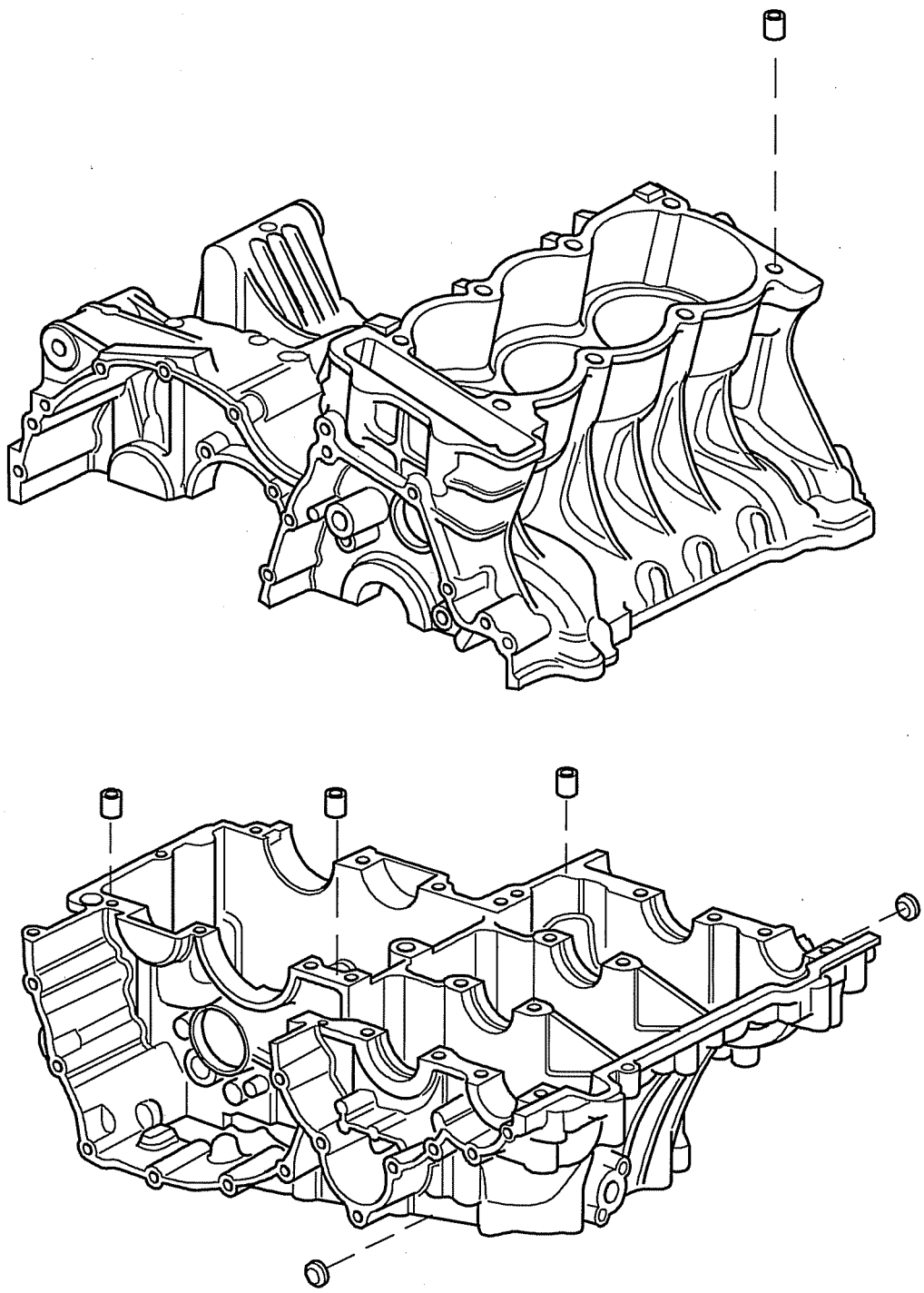
5 Crankshaft, Connecting Rods and Pistons

Table of Contents

Exploded View - Crankshaft, Connecting Rod, Piston and Liner



Exploded View - Crankcase



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.

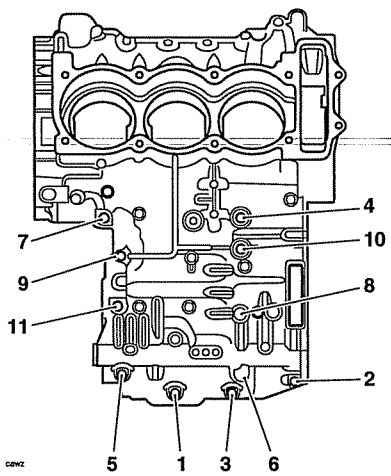
1. Remove the engine from the frame (see page *9-2*).
2. Remove the sump (see page *8-11*).
3. Remove the engine covers (see page *7-20*).
4. Remove the clutch (see page *4-5*).
5. Remove the oil pump drive chain and gears (see page *12-6*).

Disassembly

Caution

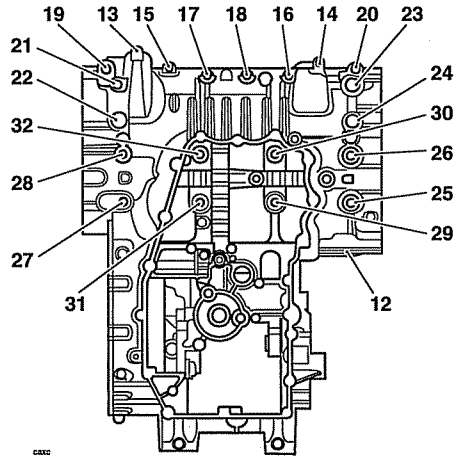
Failure to follow the correct screw release sequence may result in permanent crankcase damage.

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.**

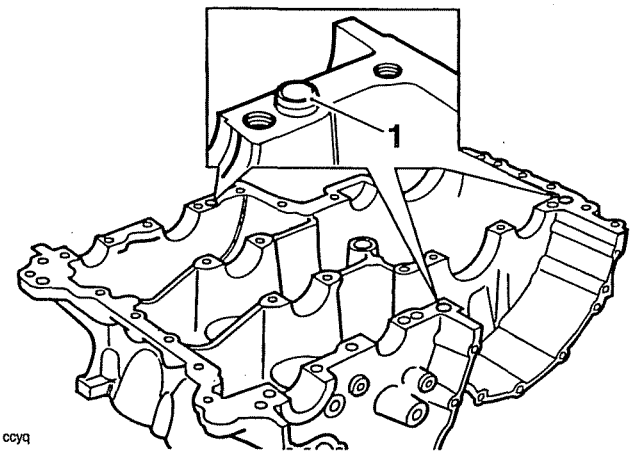
Note:

- **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.

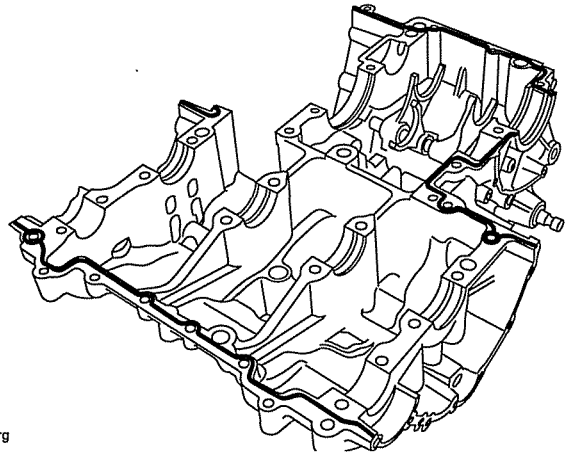
4. Ensure that the 3 locating dowels are in position in the upper crankcase.



ccyq

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).



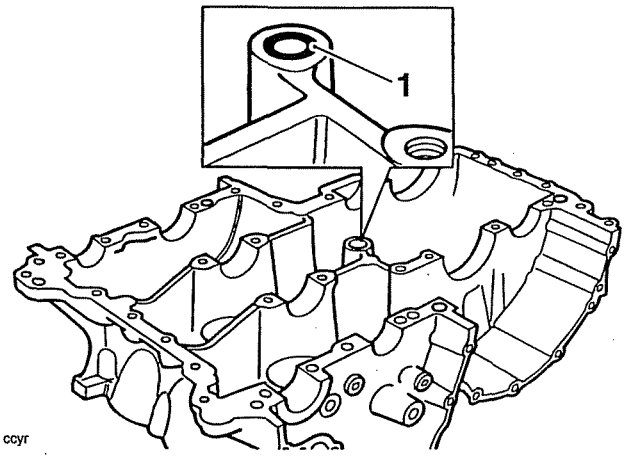
carg

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.



ccyr

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:

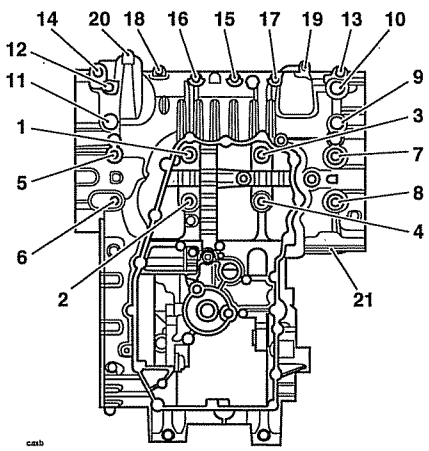
- **The crankcase screws are tightened in stages.**
- **Two different sizes of crankcase screw are used. All screws are tightened through the first stage of the tightening procedure but only the M8 size screws are tightened at the second stage.**

⚠ Caution

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

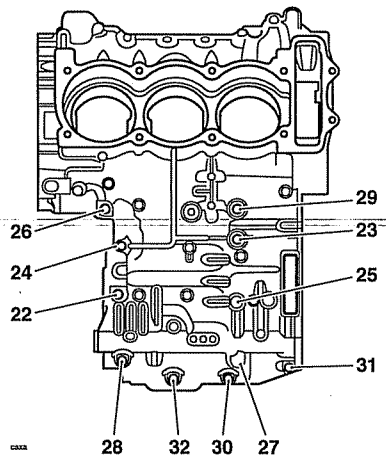
Stage 1 - all screws

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

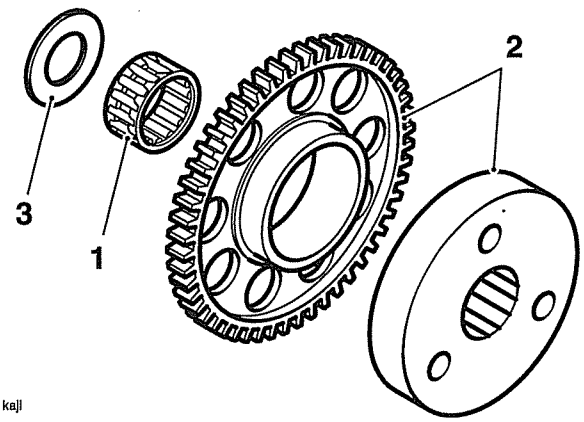
Stage 2 - M8 screws only

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 *12-21*).
6. Refit the clutch (see page *4-6*).
7. Refit the engine covers (see page *7-22*).
8. Refit the sump.
9. Install the engine in the frame (see page *9-3*).

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 connecting rods (see page *5-7*).
3. Remove the alternator rotor from the crankshaft (see page *17-13*).
4. Separate the two halves of the crankcase (see page *5-4*).
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.**

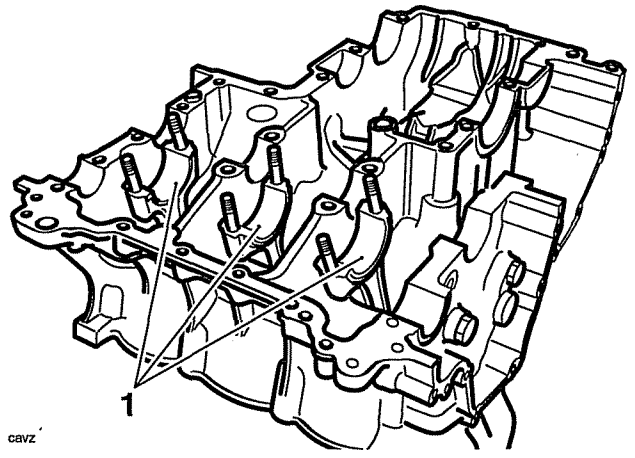
7. Remove the balancer (see page *6-3*).

Installation

⚠ Caution

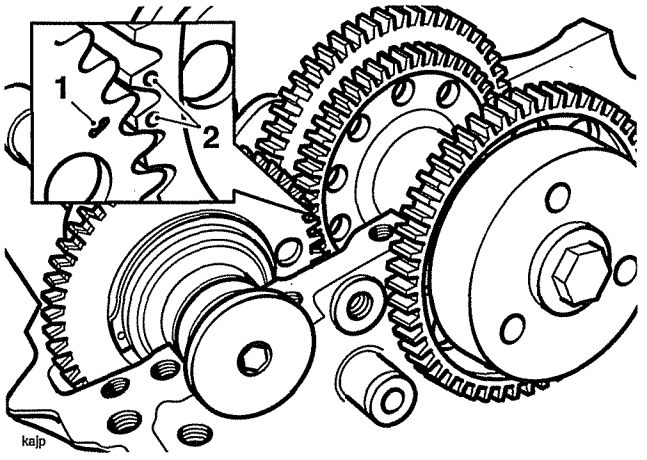
Always check the bearing journal clearance (see page *5-11*), before final assembly of the crankshaft. Failure to correctly select crankshaft bearings will result in severe engine damage.

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

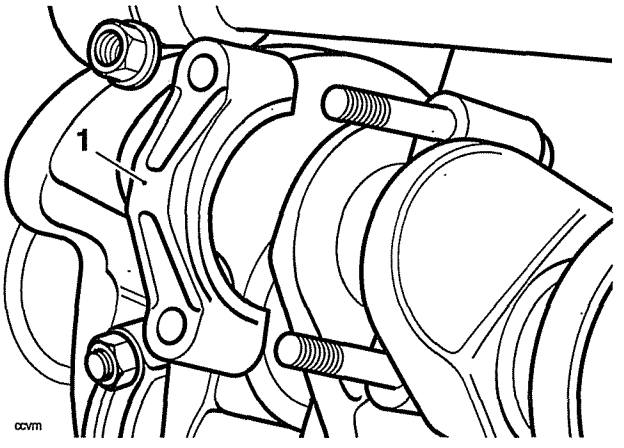
6. Refit the connecting rods (see page *5-8*).
7. If removed, refit the transmission shafts.
8. Assemble the crankcases (see page *5-4*).
9. Assemble the alternator rotor (see page *17-15*).
10. Assemble the sprag clutch (see page *7-22*).
11. Assemble the cam chain (see page *3-17*).

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.

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:

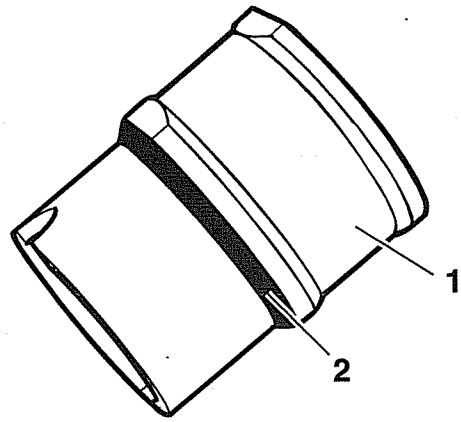
- **Ensure the piston is fitted correctly to the connecting rod.**
- **If a previously run engine is being rebuilt, always ensure that the piston and con-rod are assembled in the same orientation as prior to strip-down.**

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.



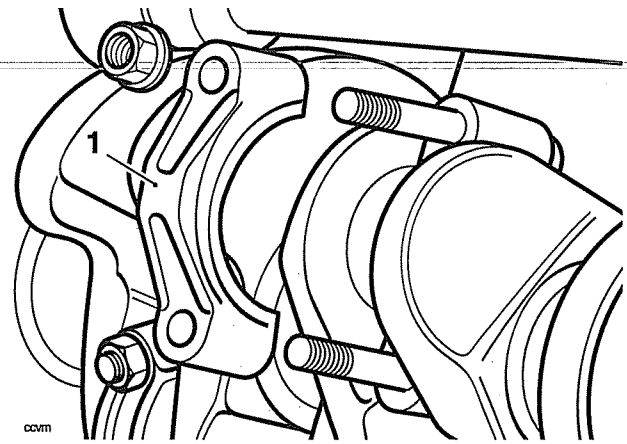
ccvk

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.**



ccvm

1. Big End

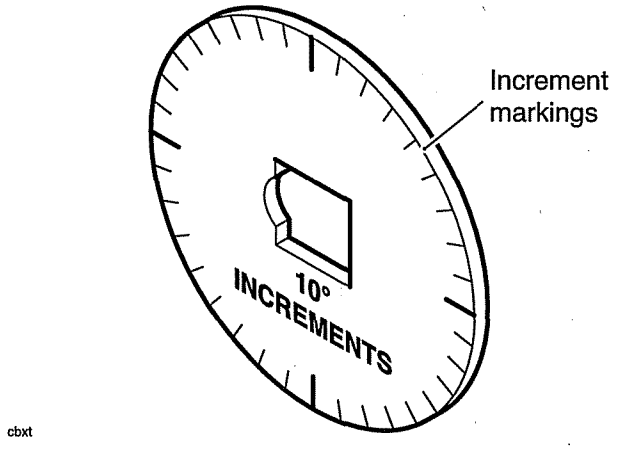
6. Select big end bearing shells (see page *5-9*).
7. Lubricate both halves of the bearing shells with engine oil and fit to the connecting rod and big end cap.
8. Align the connecting rod to the crankshaft and fit the big end cap. Tighten the cap (using new nuts and bolts) as follows:

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.

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



cbxt

Service Tool 3880105-T0301

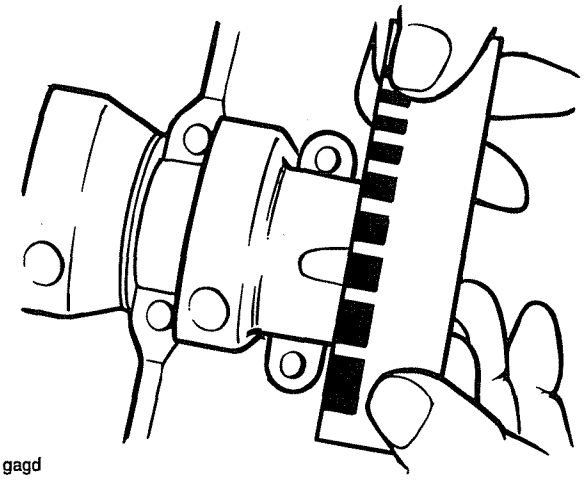
Connecting Rod Big End Bearing Selection/Crankpin Wear Check

1. Measure the bearing and crankpin clearance as follows.

Note:

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

2. Remove the big end cap from the journal to be checked.
3. Wipe the exposed areas of the crankpin, and the bearing face inside the cap.
4. Apply a thin smear of grease to the journal and a small quantity of silicone release agent to the bearing.
5. Trim a length of the Plastigage to fit across the journal. Fit the strip to the journal using the grease to hold the Plastigage in place.
6. Release the nuts and remove the cap being measured. Using the gauge provided with the Plastigage kit, measure the width of the compressed Plastigage.
7. 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*).



gagd

Checking the Measured Clearance

Con rod big end bearing/crankpin clearance

Standard:	0.036 - 0.066 mm
Service limit:	0.1 mm

Note:

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

Crankpin diameter

Standard:	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 reground and no oversize bearings are available.**

Connecting Rod Bearing Selection

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

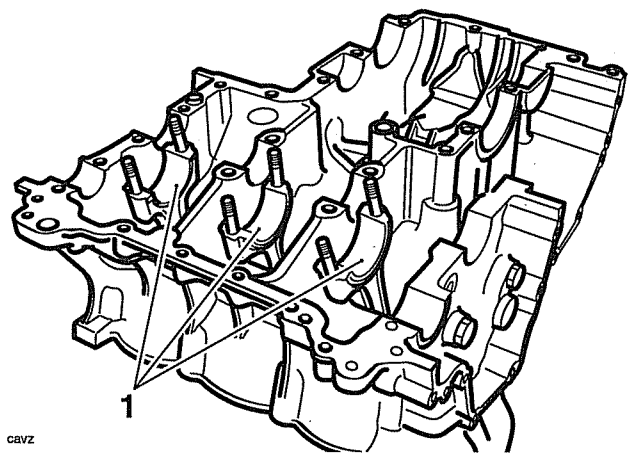
For instance:

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

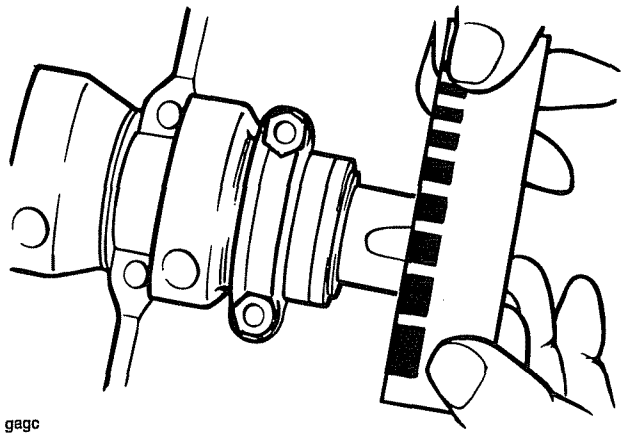
Always confirm, using the Plastigage method, that the running clearance is correct before final assembly. Severe engine damage could result from incorrect clearance.

Crankshaft 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 41.113	41.121 41.113	41.130 41.122	41.130 41.122	41.139 41.131	41.139 41.131
Journal Dia.	37.976 37.969	37.968 37.960	37.976 37.969	37.968 37.960	37.976 37.969	37.968 37.960
Running Clearance	0.043 0.020	0.044 0.020	0.044 0.021	0.043 0.019	0.043 0.020	0.044 0.020

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

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



gagc

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 reground and no oversize bearings are available.**

Select bearings as follows:

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

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

For example:

Crankshaft Journal diameter	37.972 mm
Crankcase Bore	41.135 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 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.**

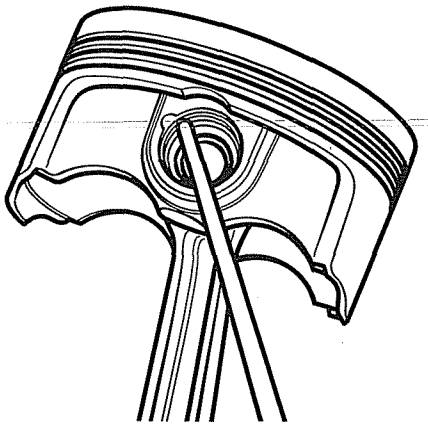
Pistons

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.



cape

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.

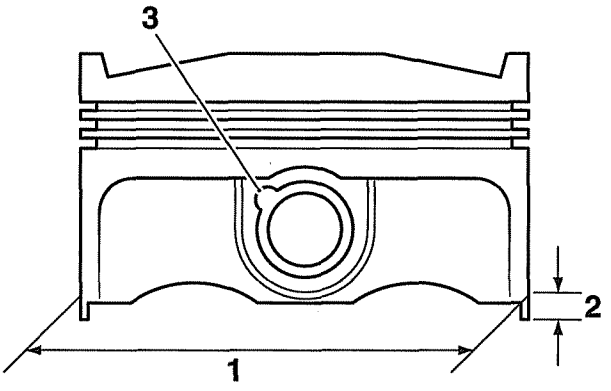
Note:

- **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.



capf

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.

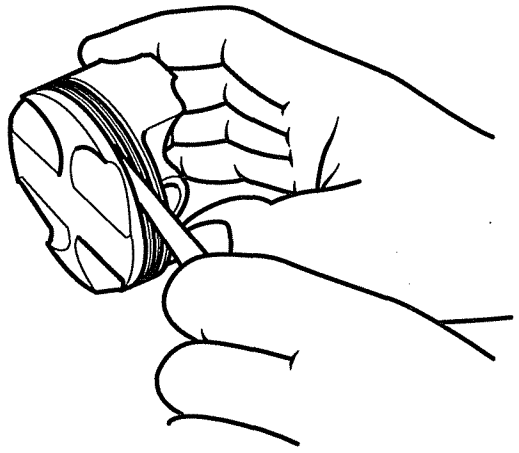
Piston Rings/Ring Grooves

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.



capg

Piston Ring to Ring Groove Clearance Check

Piston ring/Groove Clearance

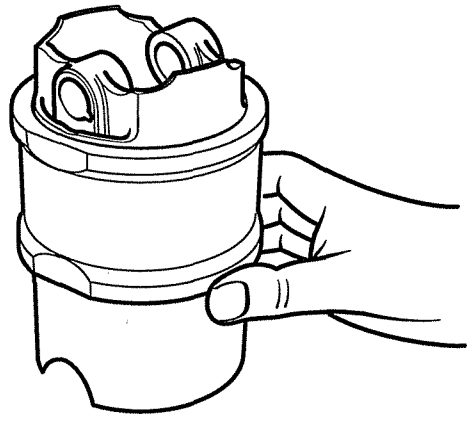
Top ring	0.02 - 0.06 mm
Service limit	0.075 mm
Second	0.02 - 0.06 mm
Service limit	0.0.75 mm

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.



ccvj

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

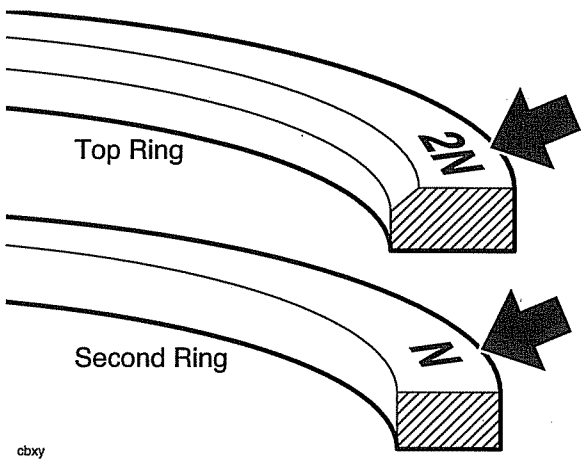
2. If the ring gap is found to be too small, the ring end must be carefully filed until the correct gap is achieved. If the gap is too large, replace the rings with a new set. If the gap remains too large with new rings fitted, both the piston and liner must be replaced.

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:

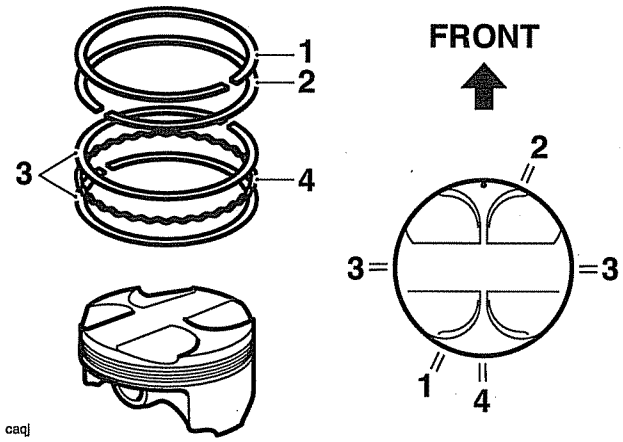
- **Connecting rods may be fitted either way around. However, ensure all three are fitted the same way.**

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).**

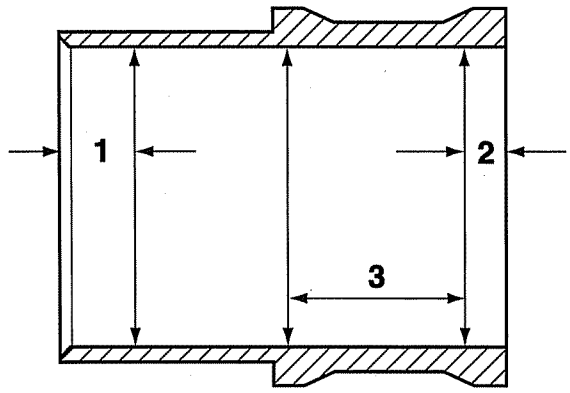
6. Fit the piston into the liner using a gentle rocking motion to engage the rings in the bore.

Cylinder Wear

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

Cylinder bore diameter

Standard:	79.040 – 79.060 mm
Service limit:	79.110 mm



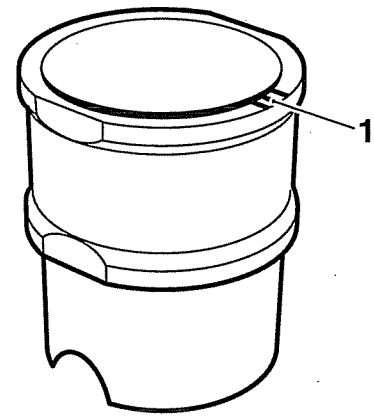
gaep

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

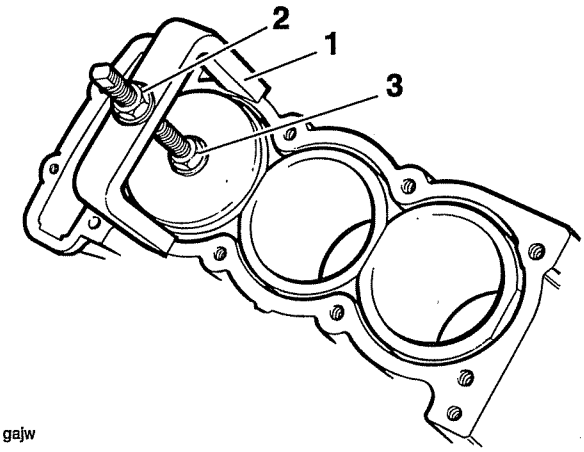
Removal



ccvi

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.



gajw

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.

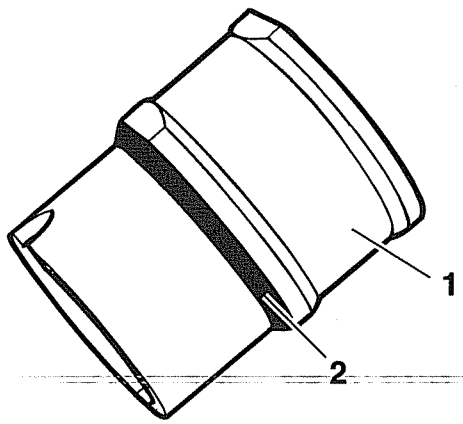
6. Turn the locking nut anticlockwise to release the liner.

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

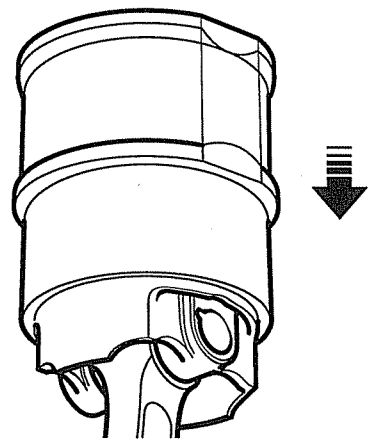
1. Thoroughly clean the liner removing all traces of old silicone sealer.
2. Remove all traces of sealer from the crankcase bores.
3. Apply silicone sealer to the liner to crankcase mating face.



ccvk

1. Liner
2. Sealer Area

4. 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.

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

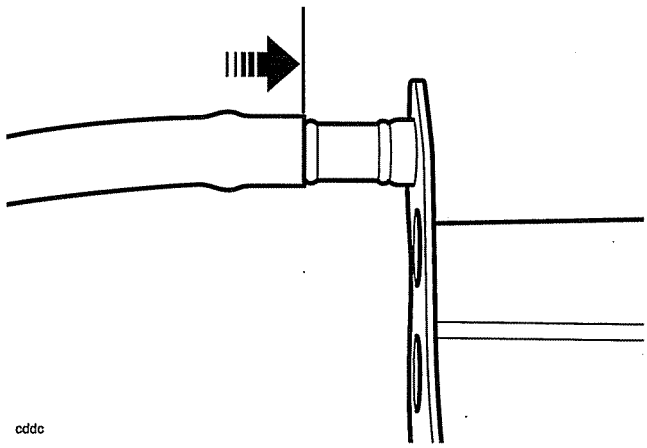
Note:

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

Crankcase Breather

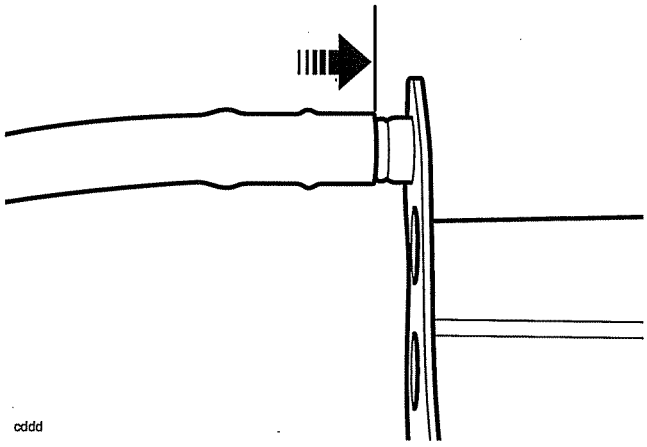
The upper crankcase is fitted with a labyrinth type breather system, which requires no maintenance. However, when assembling the crankcases, ensure that the breather hose is not damaged and is securely fitted to the breather as follows:

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



cddc

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



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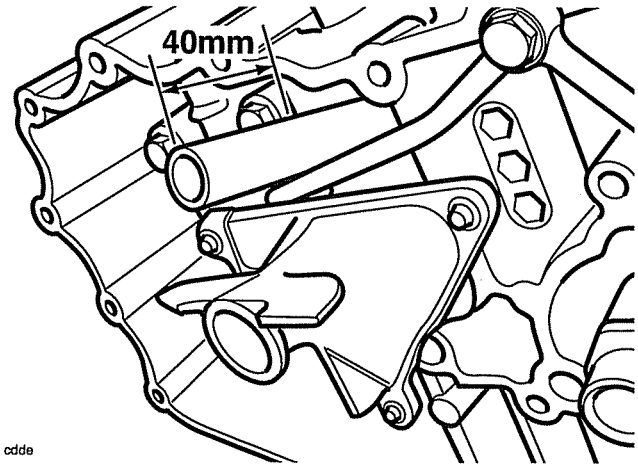
3. In both cases, the hose is retained by means of a spring-clip and protrudes into the sump as shown below.



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6 Balancer

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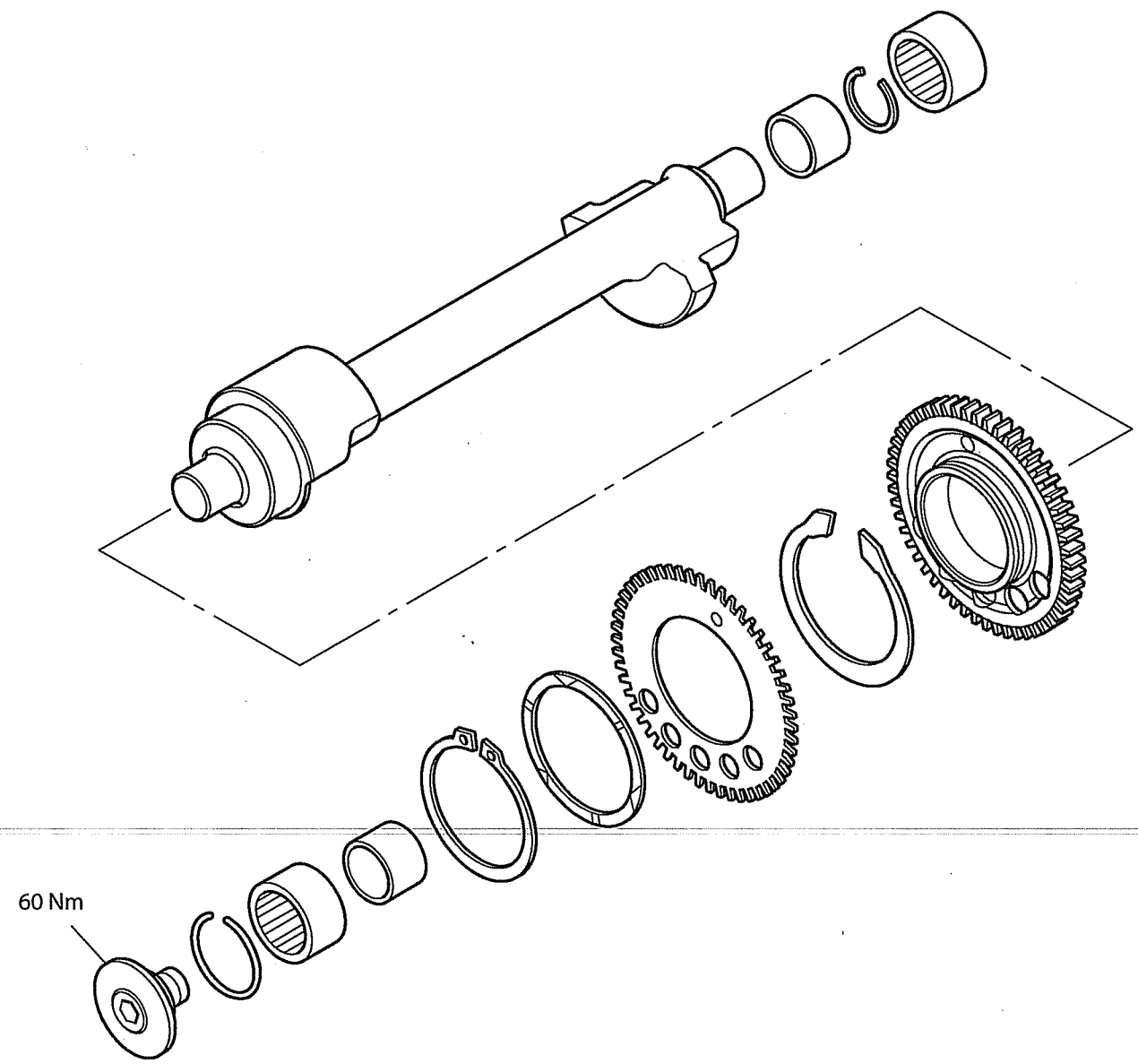
Exploded View - Balancer Shaft



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:

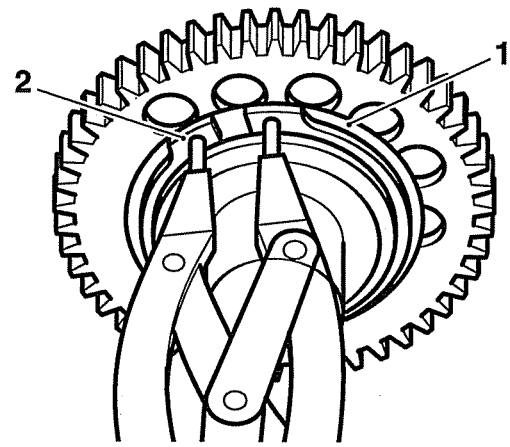
- **As the shaft is released from the crankcase, the backlash eliminator gear will spring out of alignment with the crankshaft.**

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

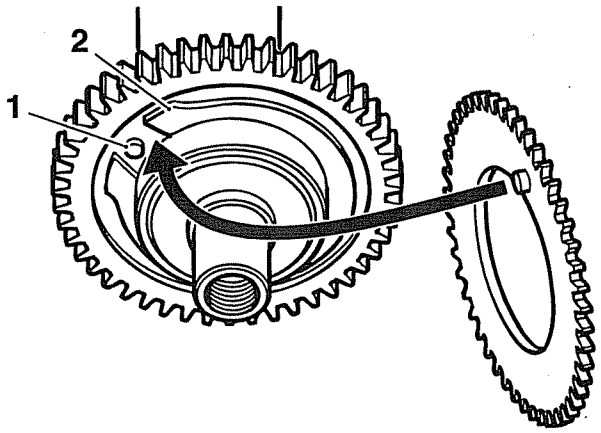
1. Inspect all gears for chipped or missing teeth.
2. Inspect all bearings for signs of overheating (blue discolouration), seized or damaged rollers, and any other damage.
3. Ensure the breather tube in the centre of the shaft is not blocked by oil, debris etc.
4. Inspect the backlash spring for deformities,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

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..



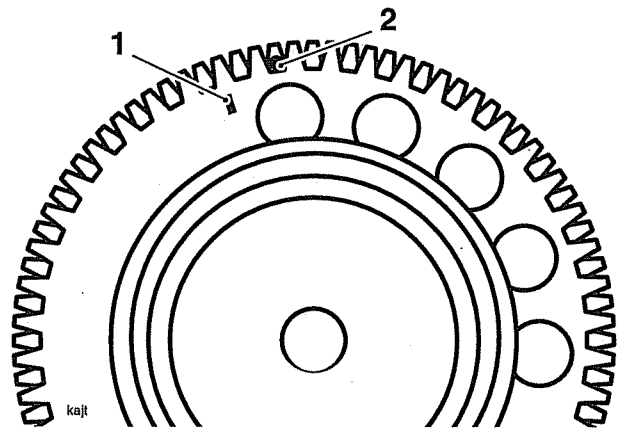
kalb

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.**



kajt

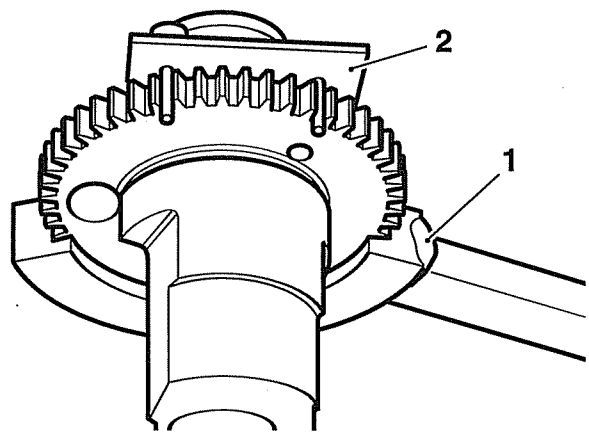
1. Backlash gear line
2. Drive gear dot

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.**

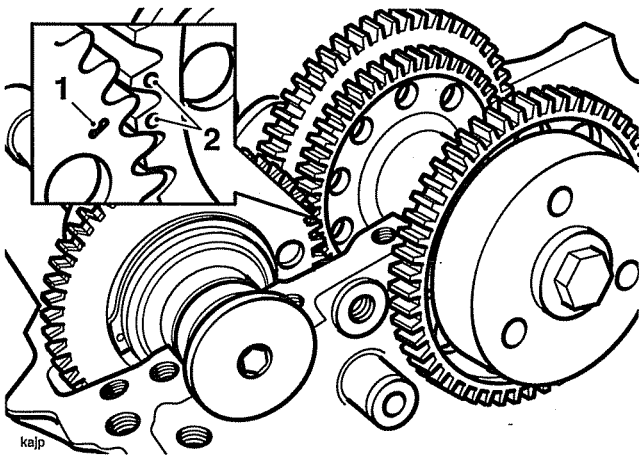
9. Secure the backlash gear in position with the fixture supplied with the tool by placing the fixture pegs across two gear teeth (ensure that the fixture will not be in the way when assembling the balancer to the crank).



kajs

1. Tool T3880016
2. Securing fixture

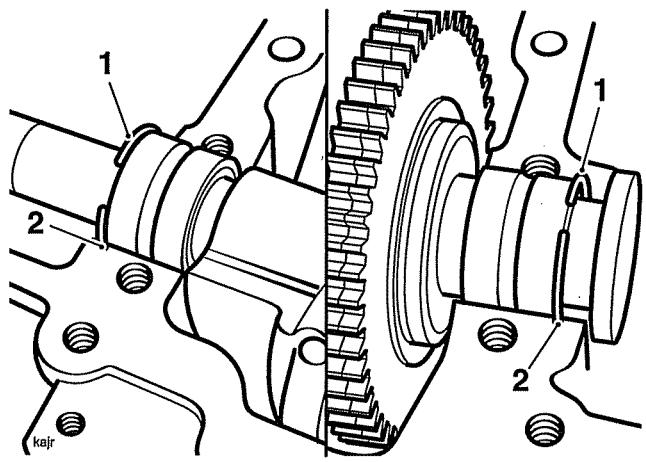
10. With the drive and backlash eliminator gears still correctly aligned, locate the balancer to the crankcase aligning the balancer gears and crankshaft as shown in the illustration below while ensuring that the bearing circlips locate correctly in their corresponding grooves in the crankcase.



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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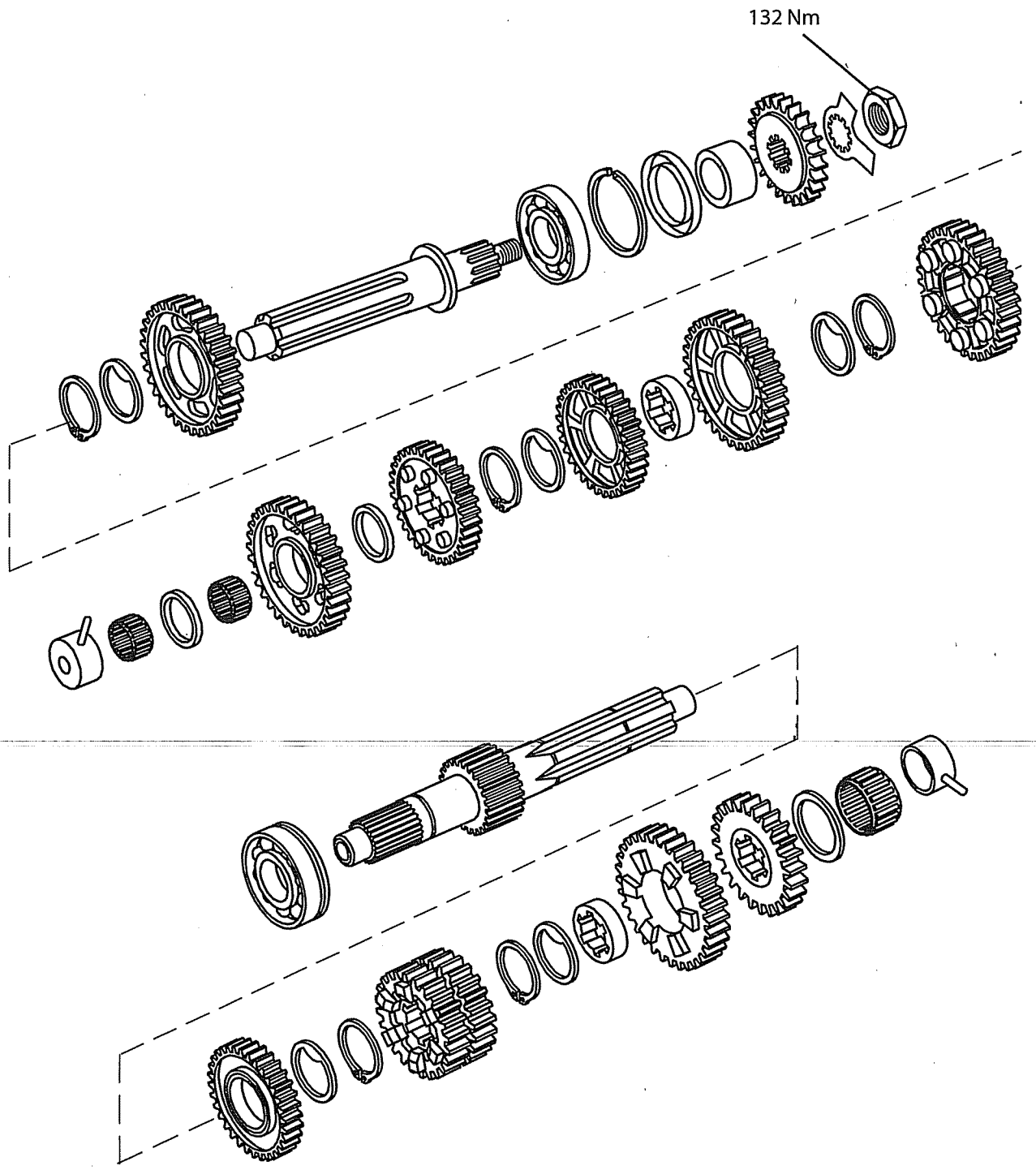
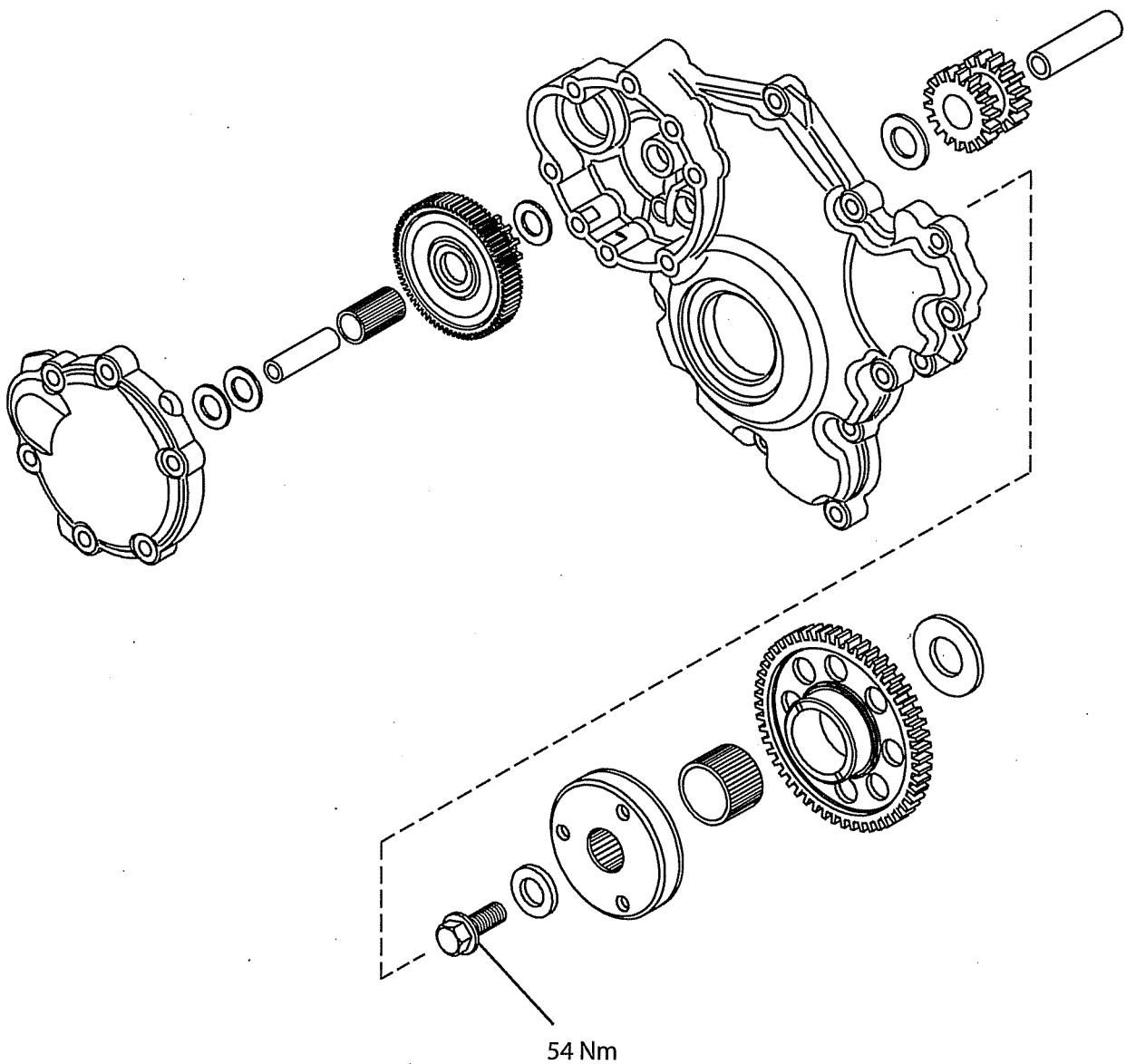
7 Transmission

Table of Contents

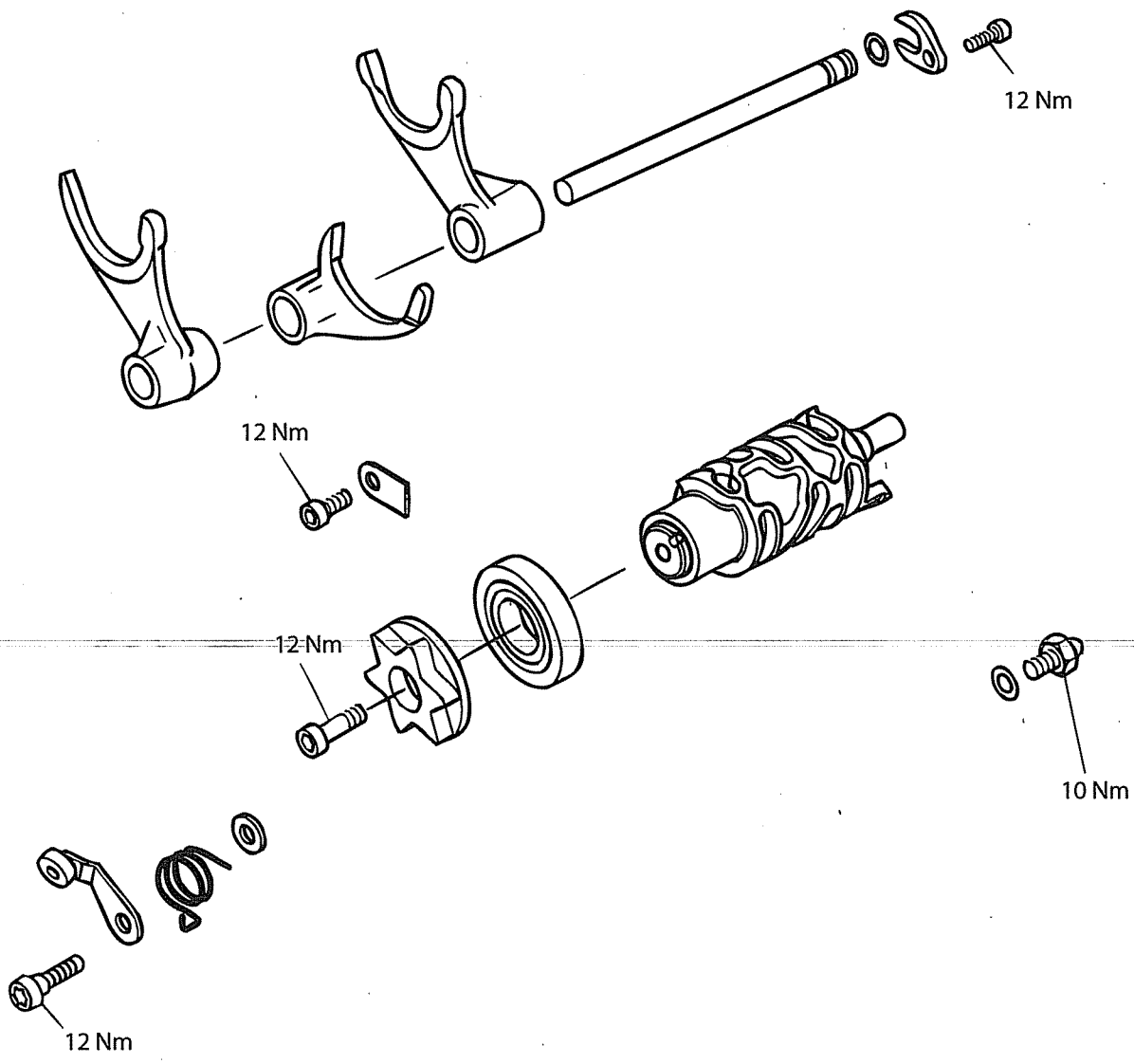
Exploded View, Input and Output Shafts



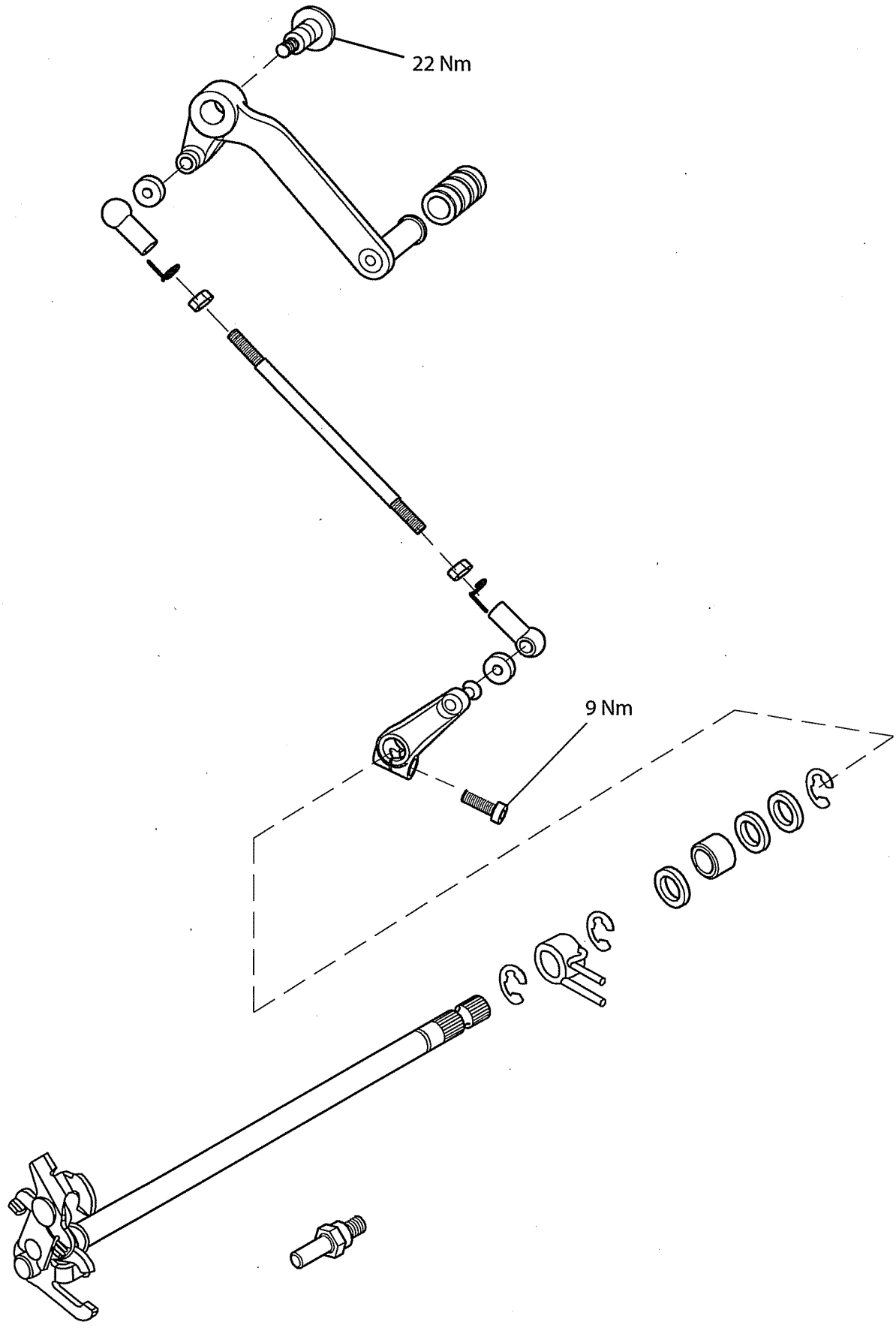
Exploded View, Sprag Clutch and Starter Gears



Exploded View, Gear Selectors and Drum



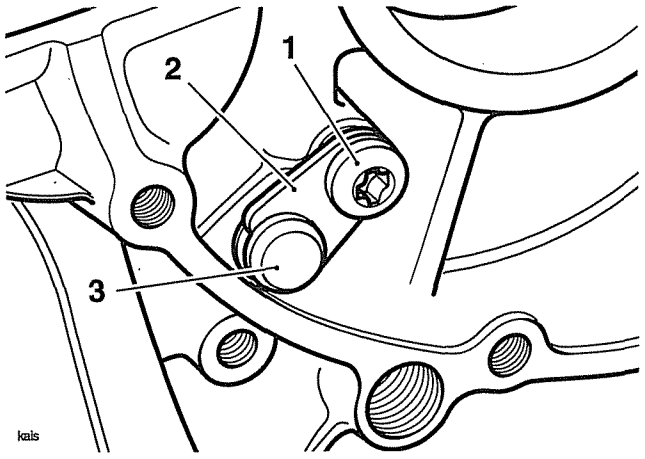
Exploded View, Gear Change Mechanism



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.



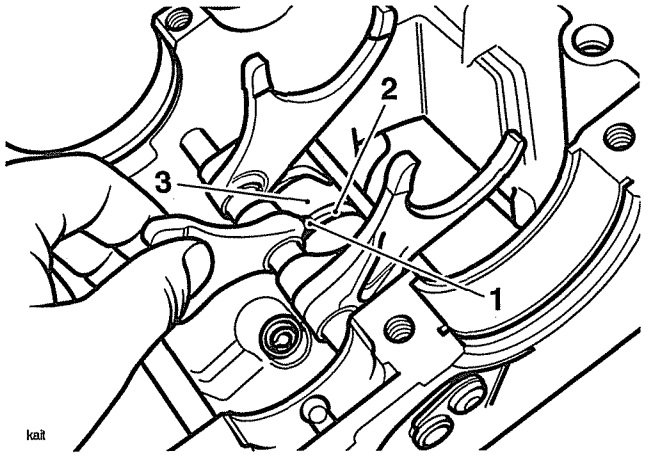
1. Fixing
2. Keeper plate
3. Selector shaft

⚠ 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.

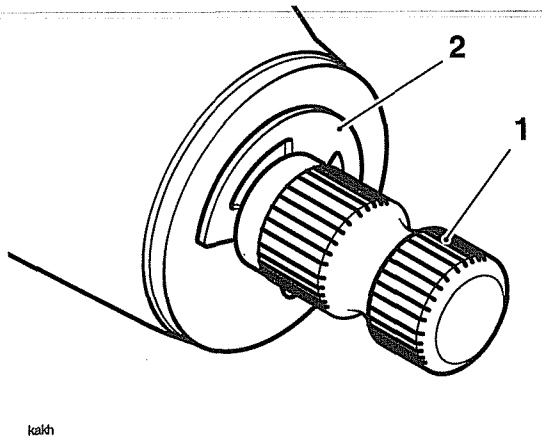
Note:

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



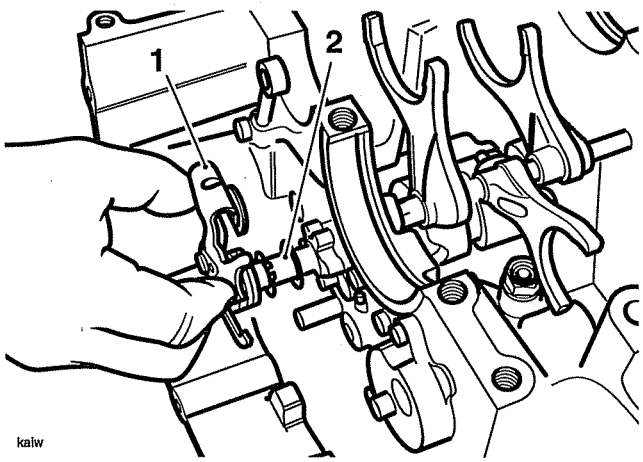
1. Selector fork stop
2. Selector fork guide
3. Selector drum

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

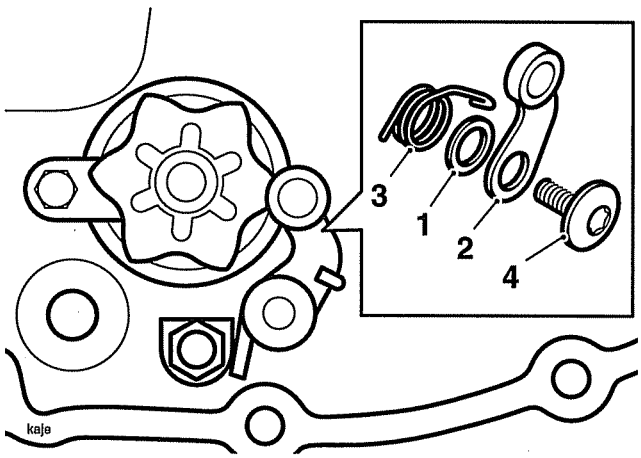
8. Withdraw the gear change shaft from the clutch end of the crankcase and collect the washer from inside the crankcase.



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.**



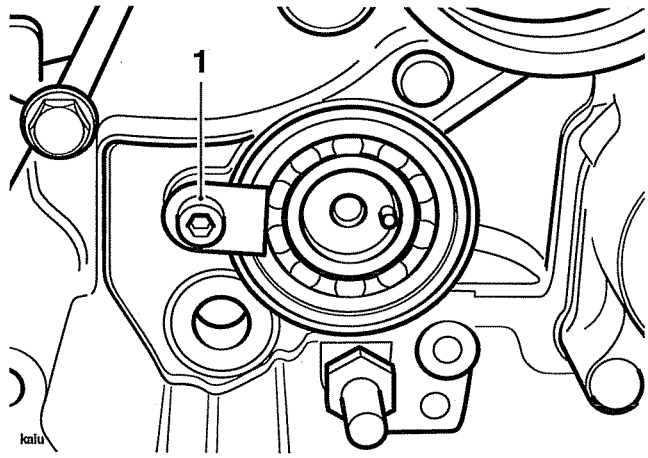
1. Washer
2. Detent arm
3. Spring
4. Fixing

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:

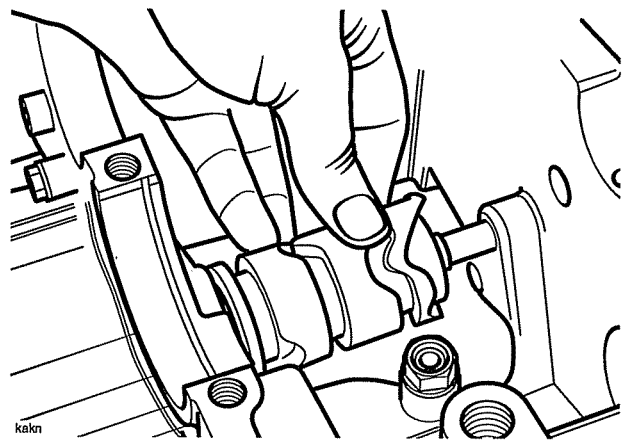
- **To prevent drum rotation, use a stout rod through one of the through-holes in the drum. Care must be taken not to damage the oil pressure relief valve.**

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

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.

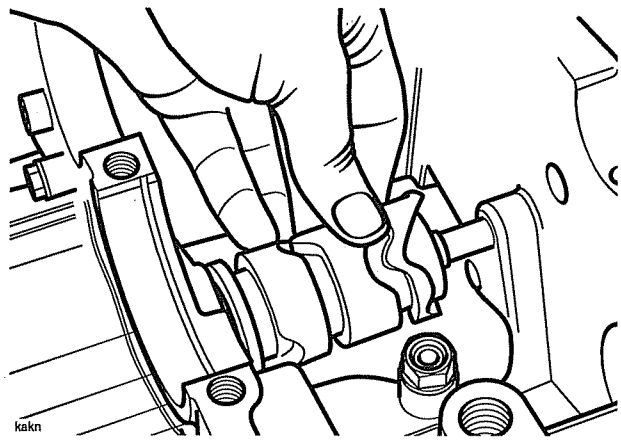
2. Examine the gear change shaft seal for damage and/or wear. Replace the seal if damaged and/or worn.

Installation

Note:

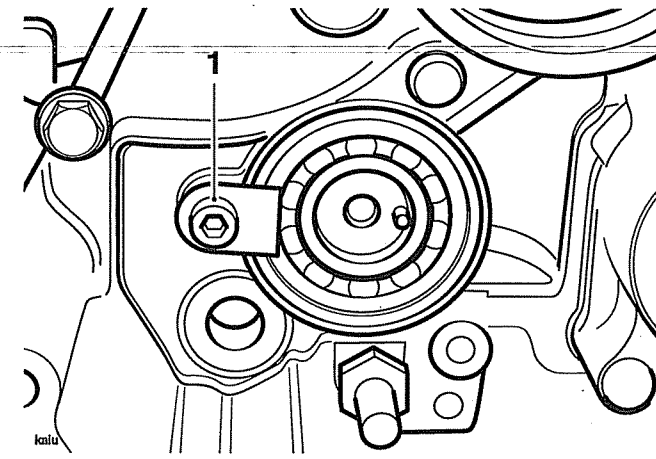
- **The detent wheel is keyed to the selector drum**

1. Position the selector drum into the crankcase.



Locating the selector drum

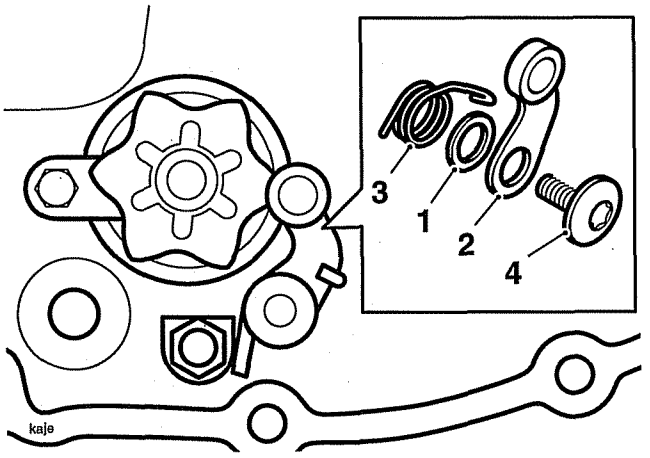
2. Using clean engine oil, lubricate the selector drum bearing.
3. Position the bearing into the crankcase recess and engage with the selector drum.
4. Refit the bearing retainer. Secure with a new bolt and tighten to **12 Nm**.



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.



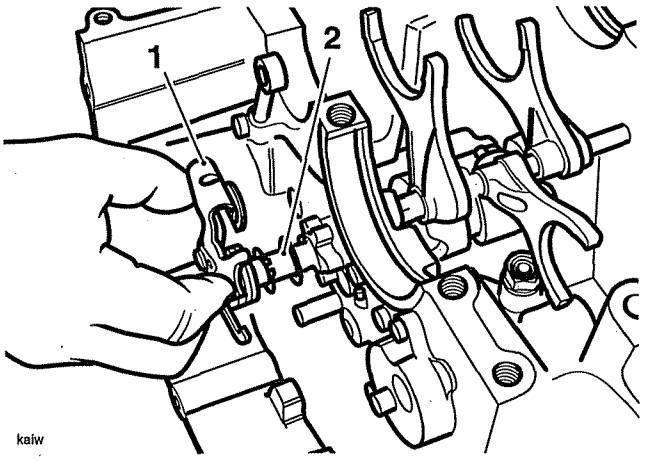
1. Washer
2. Detent arm
3. Spring
4. Fixing

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

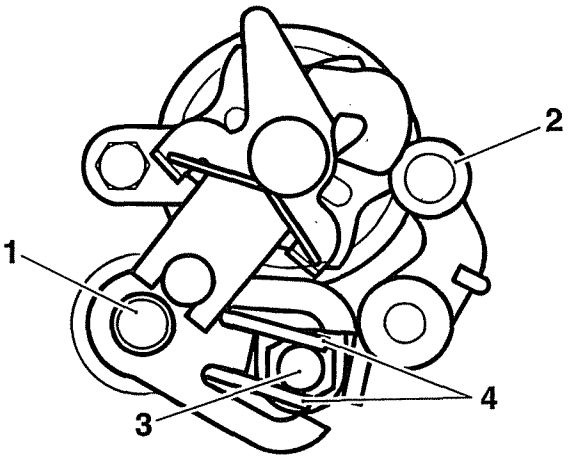
Take care to avoid damaging the lip of the seal when inserting the gear change shaft into the crankcase. A damaged seal will lead to oil loss and could result in engine damage.

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.



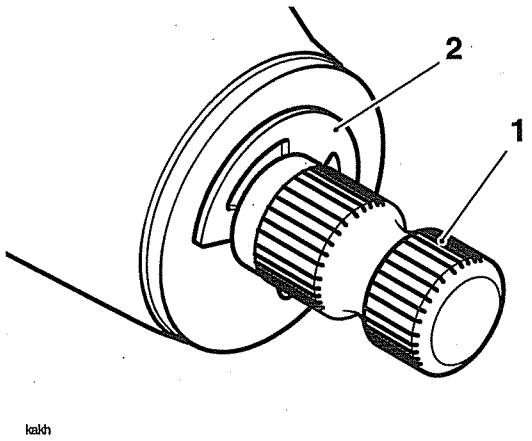
1. Gearchange shaft
2. Washer

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

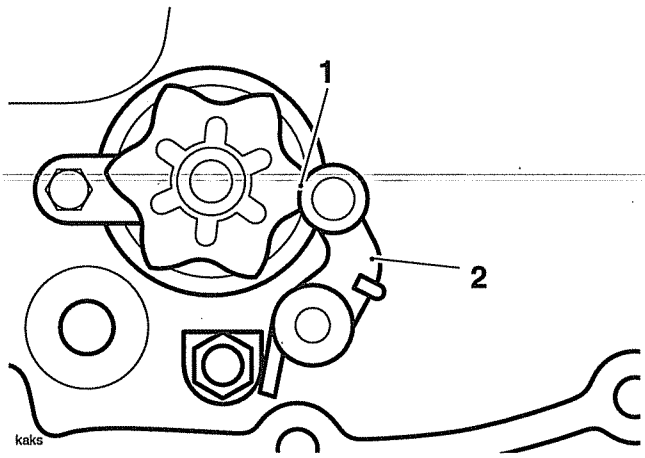
13. Fit the large washer and e-clip to the gear pedal end of the gear change shaft.



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).



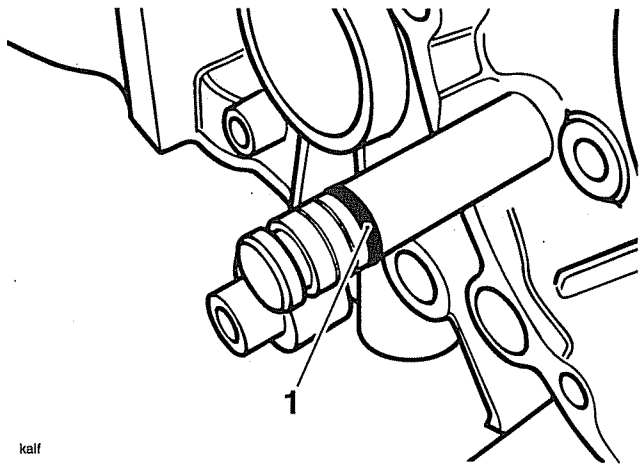
kaks

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.

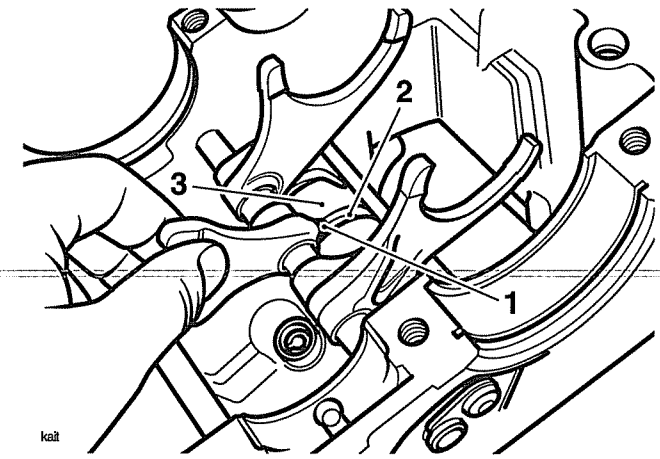


kalf

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*).

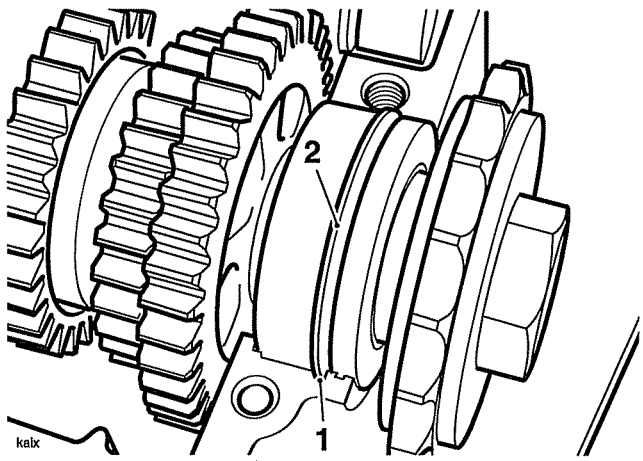
Input and Output Shafts Assemblies

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.

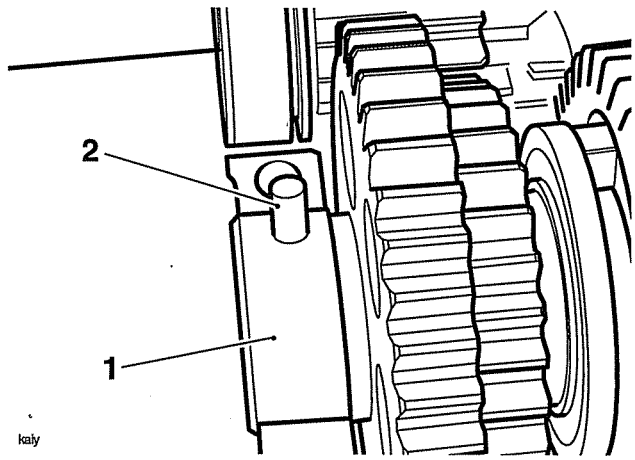
Installation

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.

Input Shaft

Disassembly

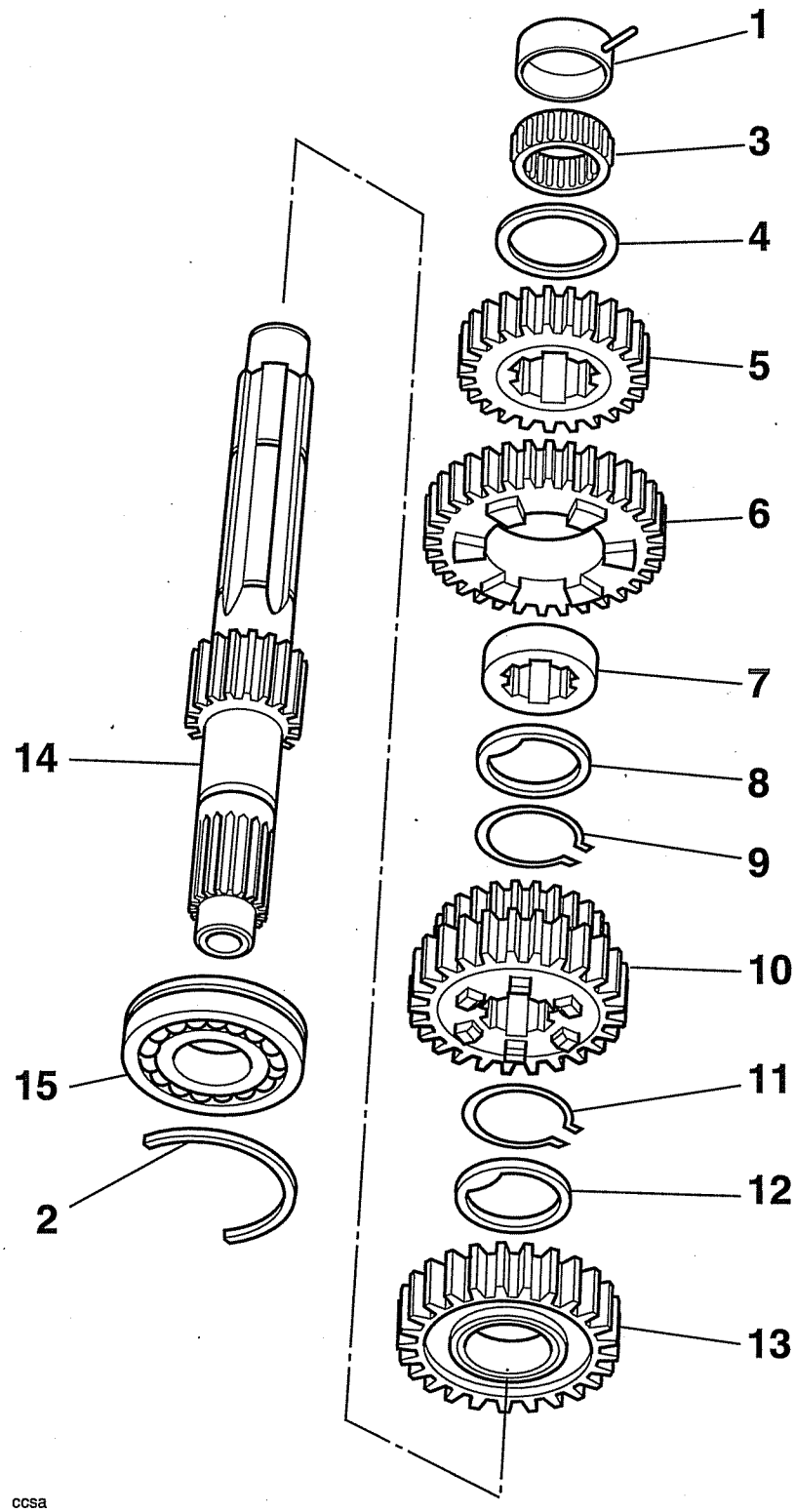
Working from the opposite end to where the clutch assembly is fitted, dismantle the input shaft as follows:

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.

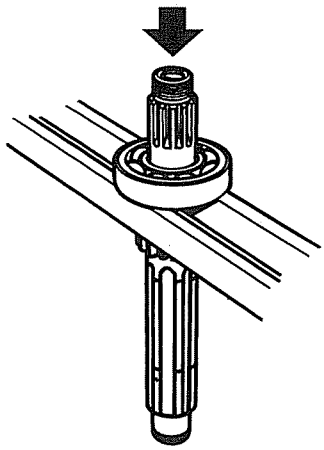
⚠ Warning

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.



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

1. Pressing Off The Input Shaft Bearing

Assembly

Note:

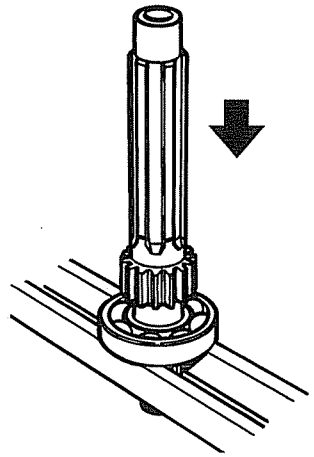
- **Lubricate each gear and bush with clean engine oil during assembly.**
- **Examine all gears, bearings and sleeves for damage, chipped teeth and wear beyond the service limits. Replace all suspect components and always use new circlips to assemble the shaft.**

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.

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.

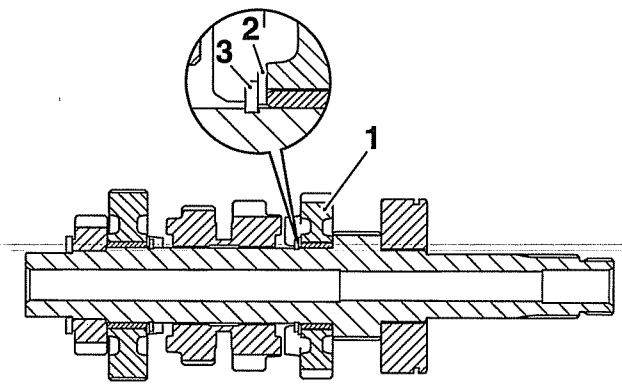
Never wear loose clothing which could become trapped in the press and cause crushing injury to the hand, arms or other parts of the anatomy.



ccsi

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

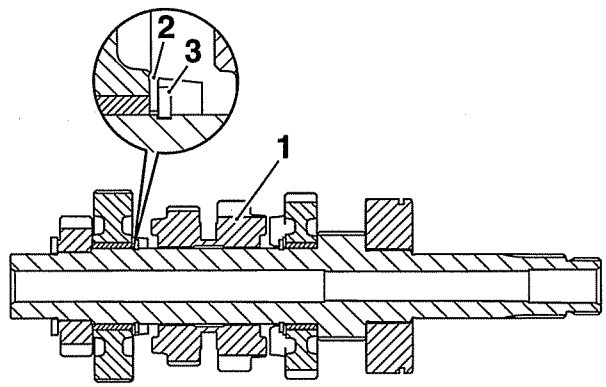
5. Fit the combined third/fourth gear (10) with the larger gear facing toward fifth gear. Ensure that the oil hole in the input shaft DOES NOT align with the oil hole in the gear.

Warning

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.

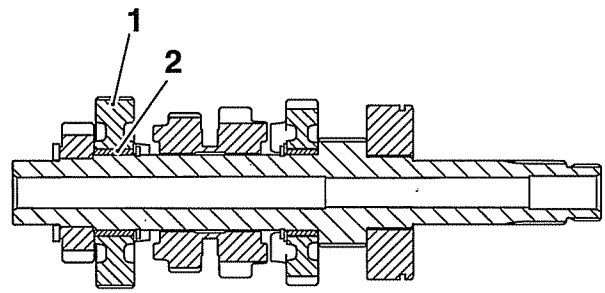
6. Fit a new circlip (9) to the input shaft ensuring that the circlip is located in the circlip groove.



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.

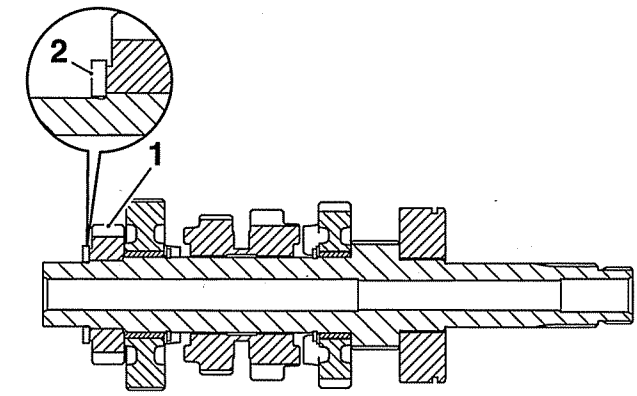


ccvz

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.

Output Shaft

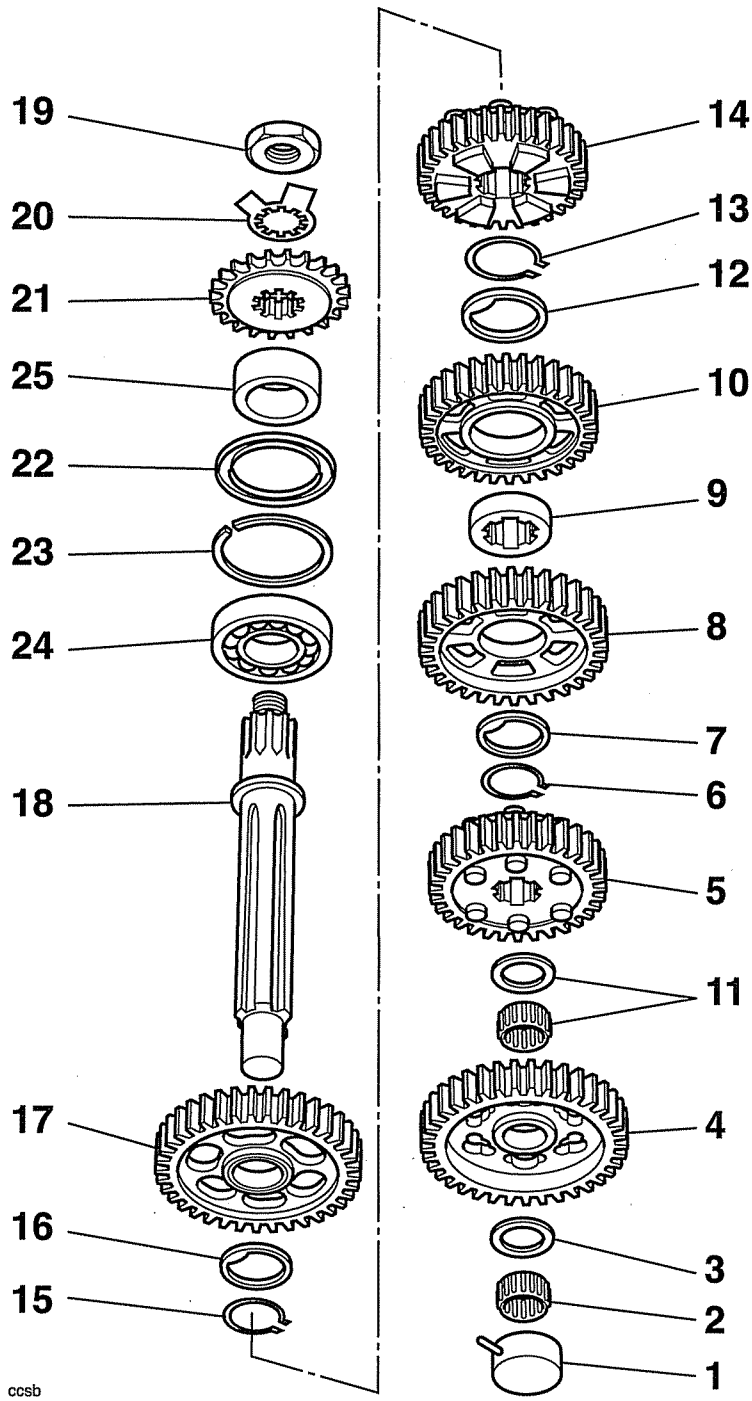
Working from the opposite end to the drive sprocket, dismantle the output shaft as follows.

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.



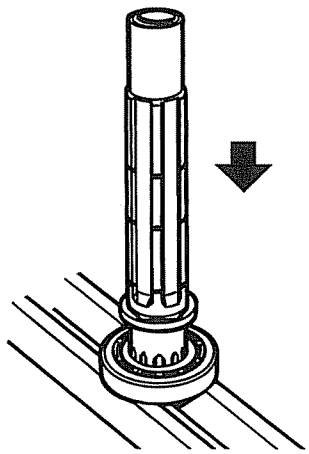
1. Bearing Sleeve
2. Needle Roller Bearing
3. Thrust Washer
4. First Gear
5. Fifth Gear
6. Circlip
7. Thrust Washer
8. Third Gear
9. Third Gear Bush
10. Fourth Gear
11. First gear brg & washer
12. Thrust Washer
13. Circlip
14. Sixth Gear
15. Circlip
16. Thrust washer
17. Second Gear
18. Output Shaft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

Assembly

Note:

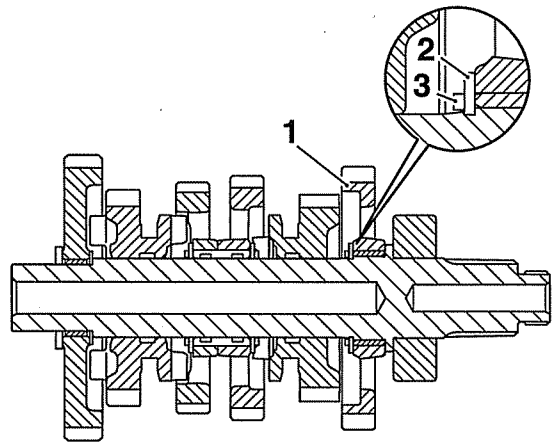
- **Lubricate each gear and bush with clean engine oil during assembly.**
- **Examine all gears, bearings and sleeves for damage, chipped teeth and wear beyond the service limits. Replace all suspect components and always use new circlips to assemble the shaft**

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).



ccsj

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).



ccww

1. Second gear
2. Thrust washer
3. Circlip

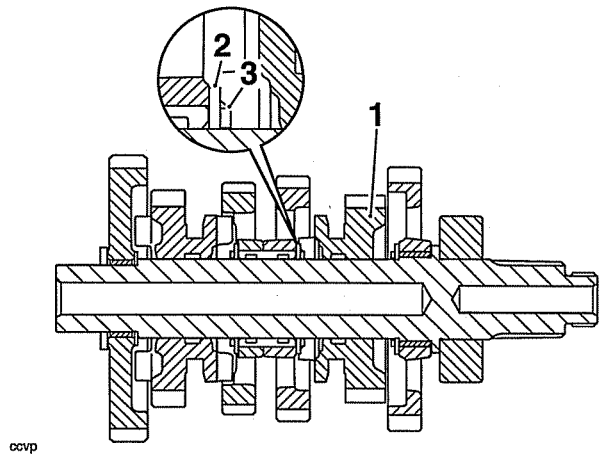
6. Fit sixth gear (14) with the selector fork groove facing away from the output sprocket end. Ensure that the oil holes in the gear DO NOT align with the corresponding oil hole in the output shaft.

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.

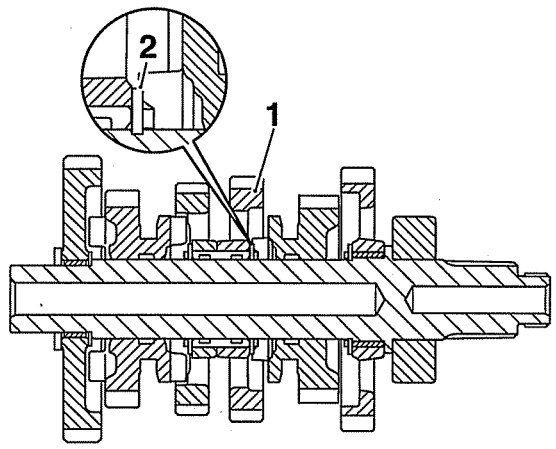
7. Fit a new circlip (13) to retain sixth gear.



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.

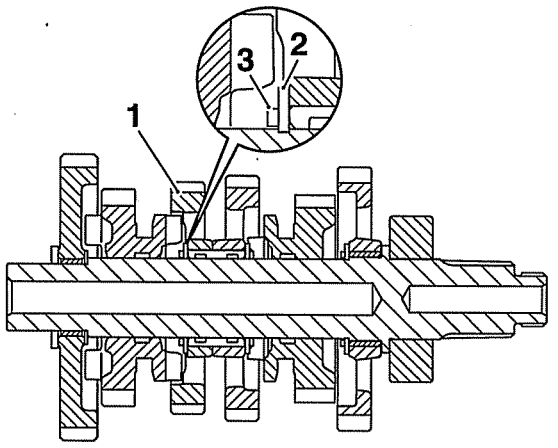


ccwd

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

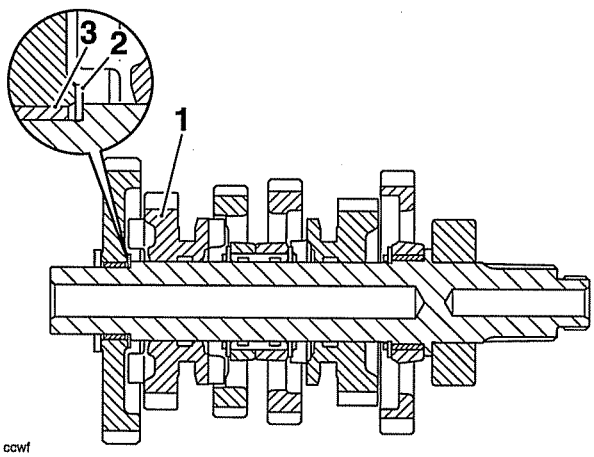
11. Fit the fifth gear (5) to the shaft with the groove facing towards the output sprocket. Ensure that the oil holes in the gear DO NOT align with the corresponding oil hole in the output shaft.

⚠ 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.

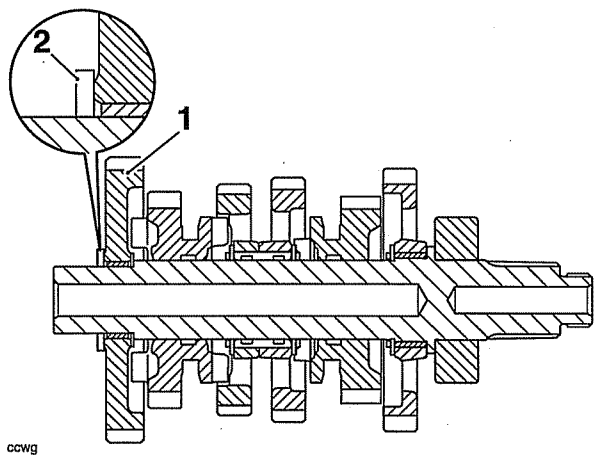
12. Fit the first gear thrust washer and bearing (11).



ccwf

1. Fifth gear
2. Thrust washer
3. Bearing

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



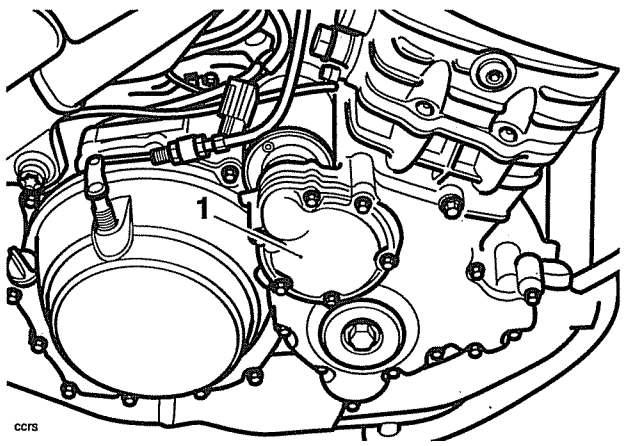
1. First gear
2. Thrust washer

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

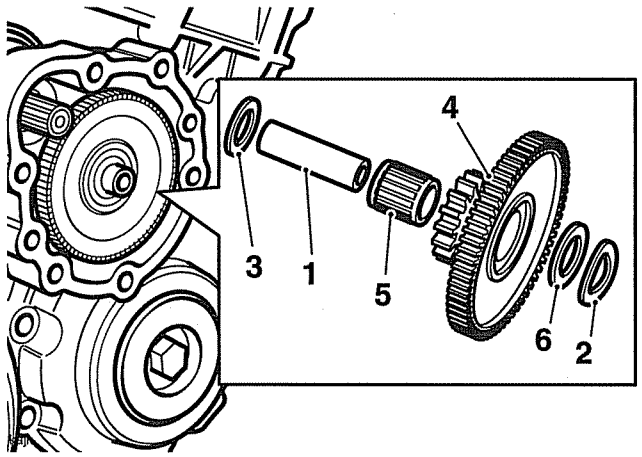
Removal

1. Disconnect the battery, negative (black) lead first (see page *9-2*).
2. Remove the starter cover.



1. Starter cover

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

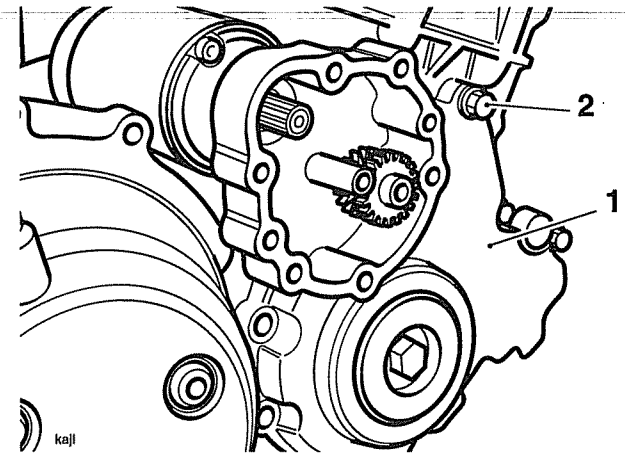


1. Idler shaft
2. Wave washer
3. Flat washer
4. Idler gear
5. Bearing
6. Flat washer

4. 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.

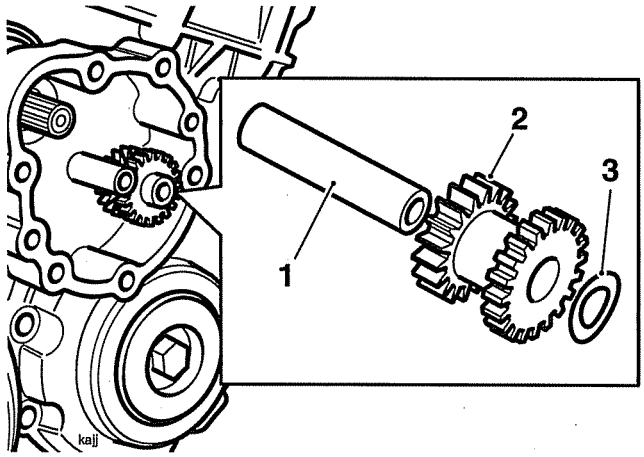
Note:

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



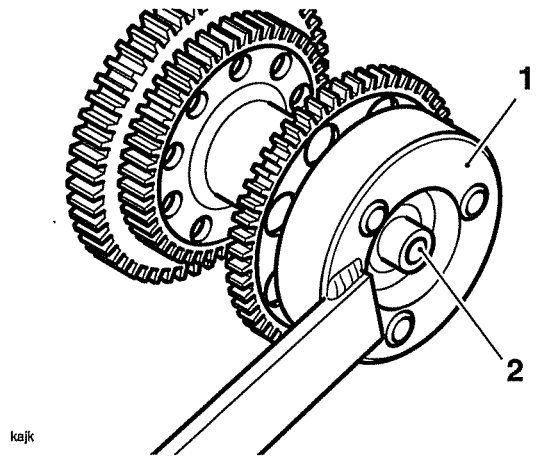
1. Right hand crank cover
2. Aluminium washer position

5. 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

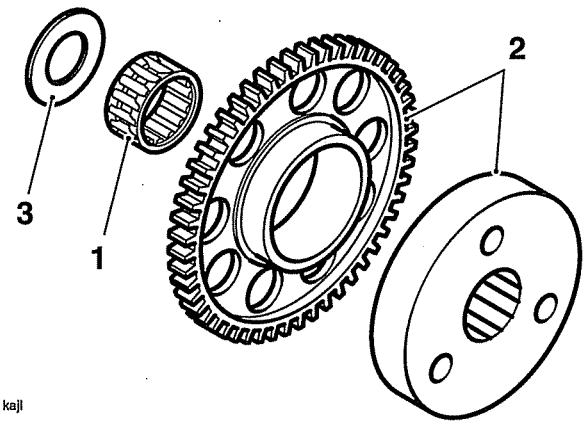
6. Using tool T3880017, prevent the sprag from turning and remove the sprag fixing and washer from the end of the crankshaft.



1. Tool T3880017
2. Sprag fixing

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

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



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

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

Inspection

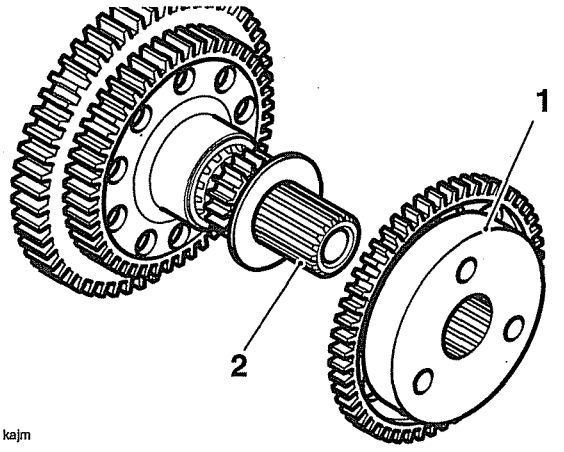
1. Examine the sprag clutch for signs of slipping, overheating (going blue) and for any other damage.
2. Examine all gears for chipped teeth, overheating (going blue) and for any other damage.
3. Examine all bearings for chipped, broken or seized rollers, overheating (going blue) and for any other damage.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

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.

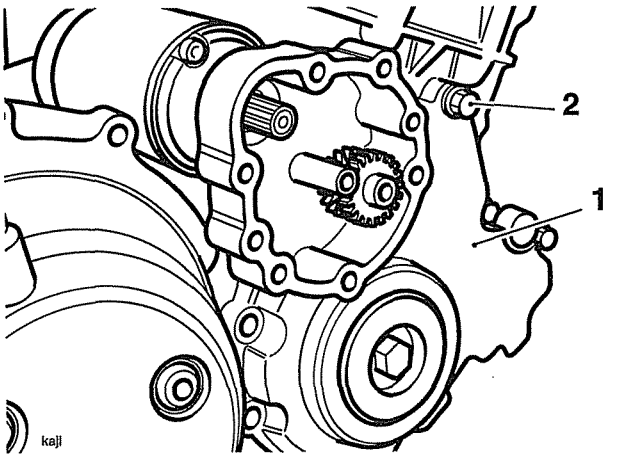
Note:

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



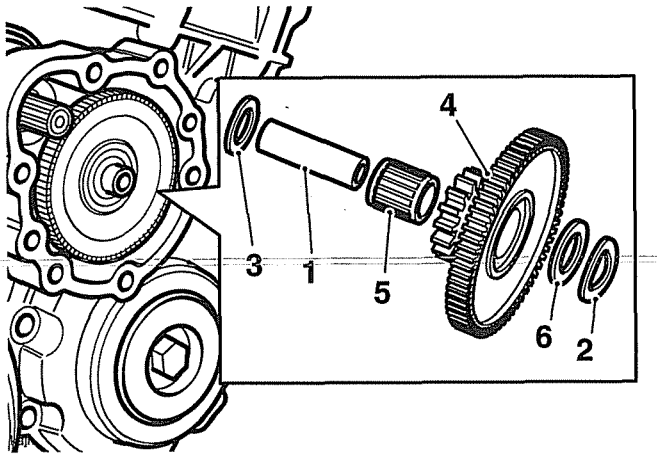
1. Sprag clutch
2. Crankshaft end

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.



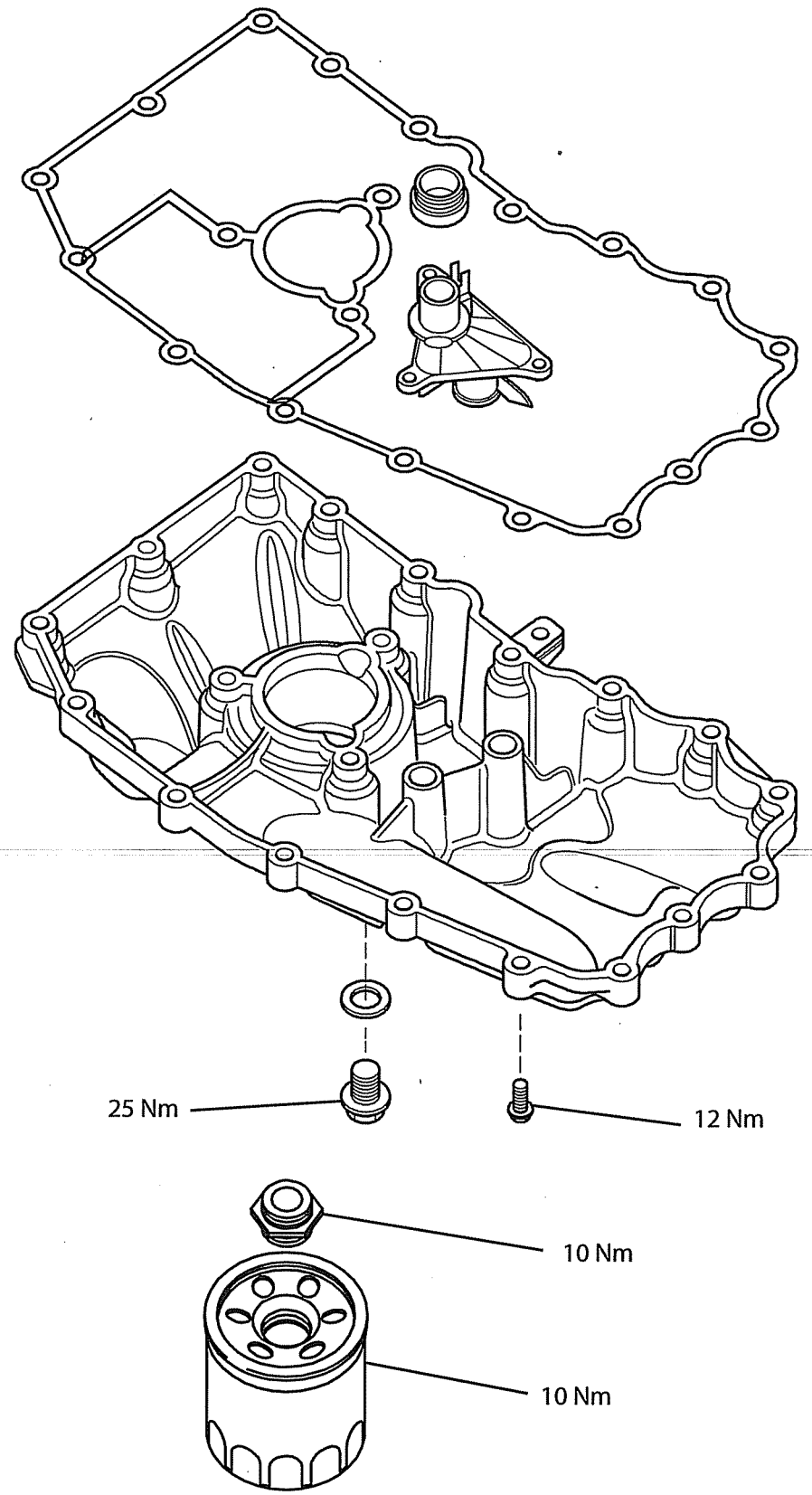
1. Idler shaft
2. Wave washer
3. Flat washer
4. Gear
5. Bearing
6. Flat Washer

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. Reconnect the battery positive (red) lead first.

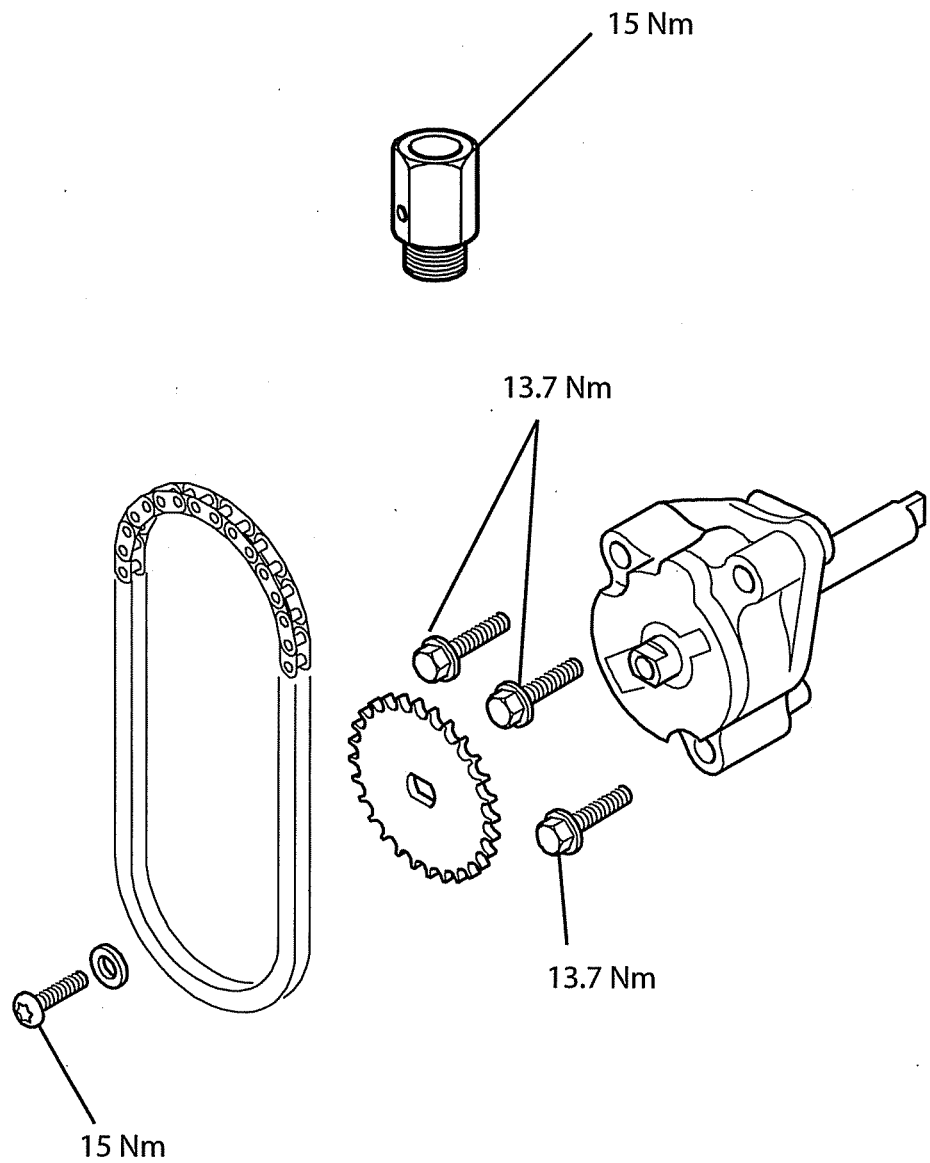
8 Lubrication

Table of Contents

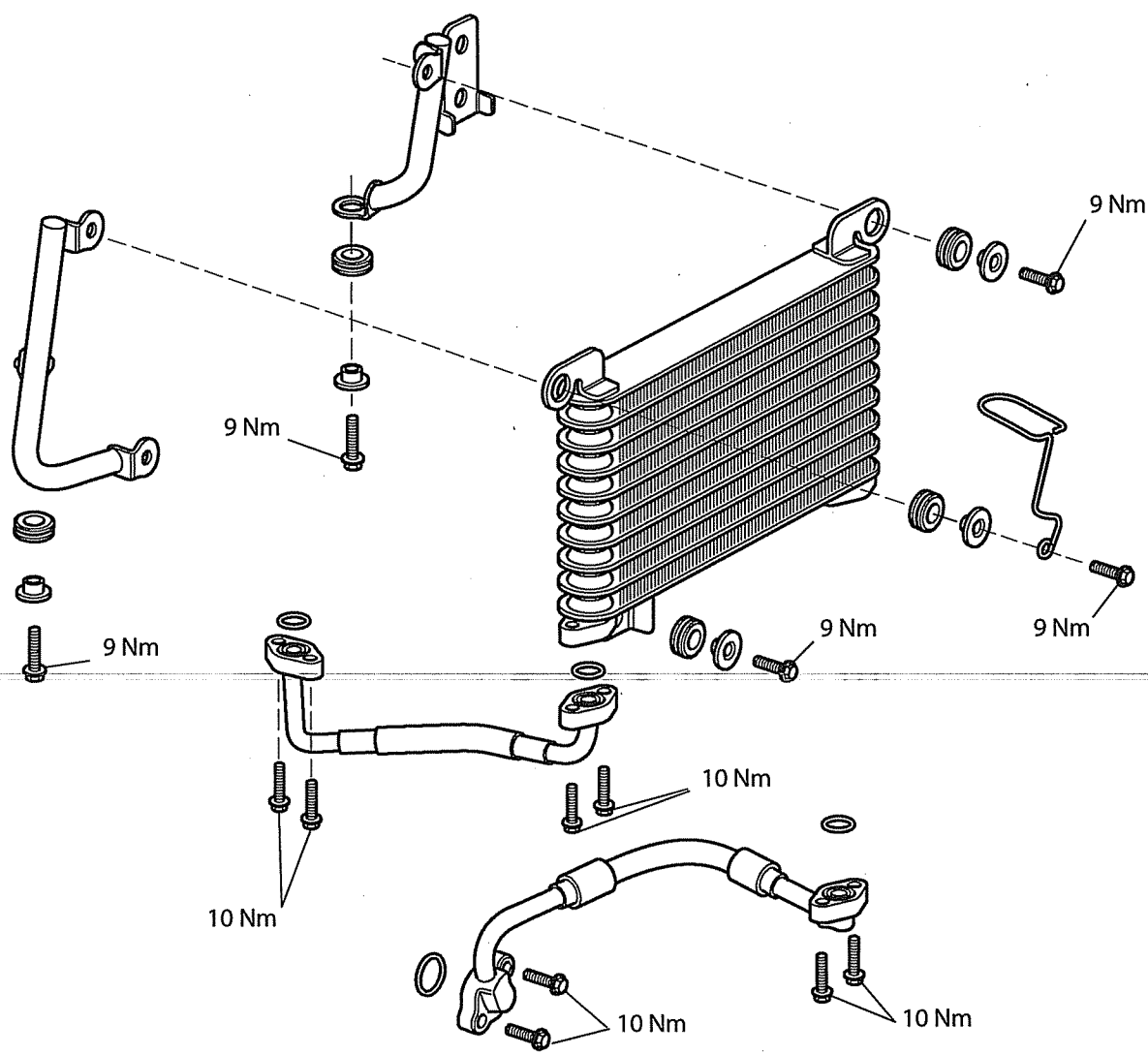
Exploded View - Sump



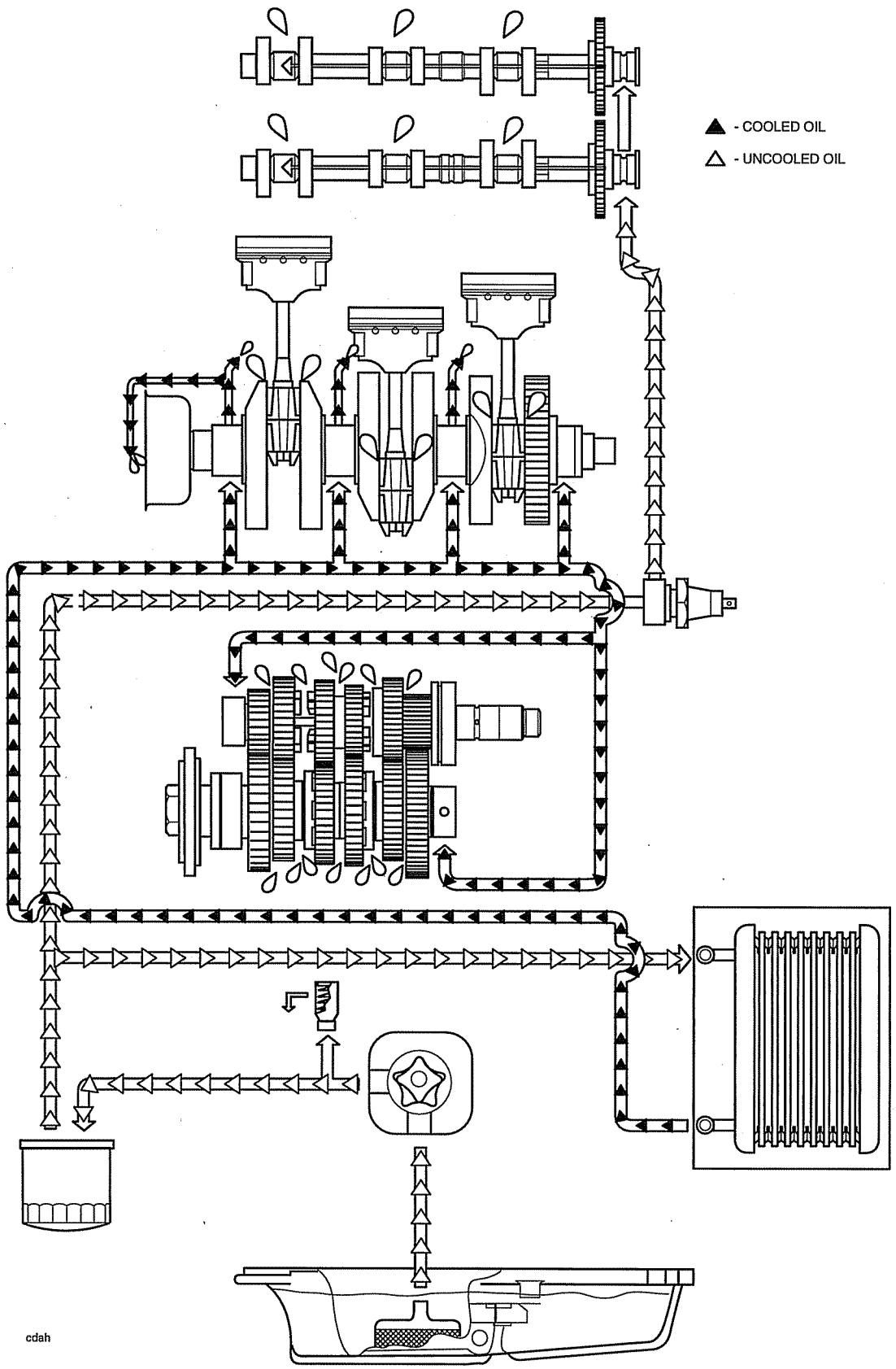
Exploded View - Oil Pump and Gears



Exploded View - Oil Cooler



Engine Oil Circuit



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/in² 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.

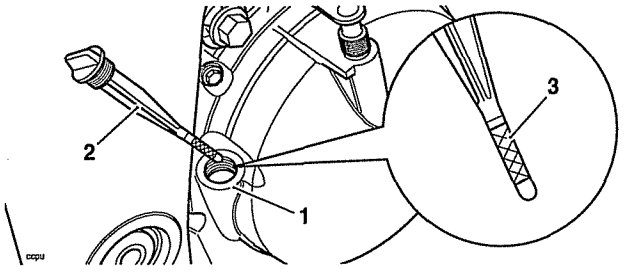
Oil Level Inspection

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.

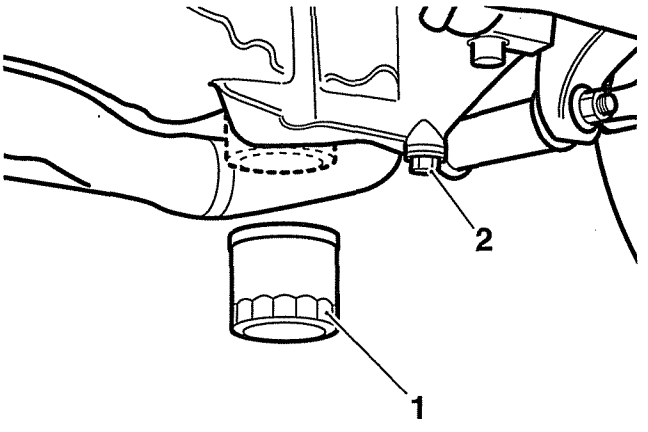
The engine oil and filter must be replaced in accordance with scheduled maintenance requirements.

1. Warm up the engine thoroughly, and then stop the engine.
2. 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.

3. Remove the oil drain plug.

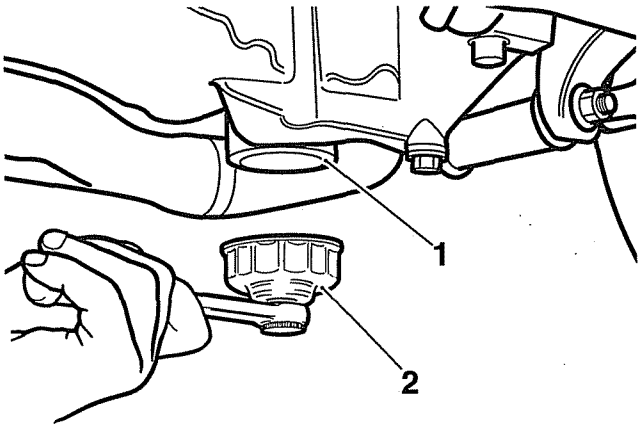


cden

1. Oil Filter
2. Oil Drain Plug

4. With the motorcycle on level ground, and on the sidestand, allow the oil to completely drain.

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



cdeo

1. Oil Filter
2. Tool T3880312

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

⚠ Caution

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

13. 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.

14. 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.

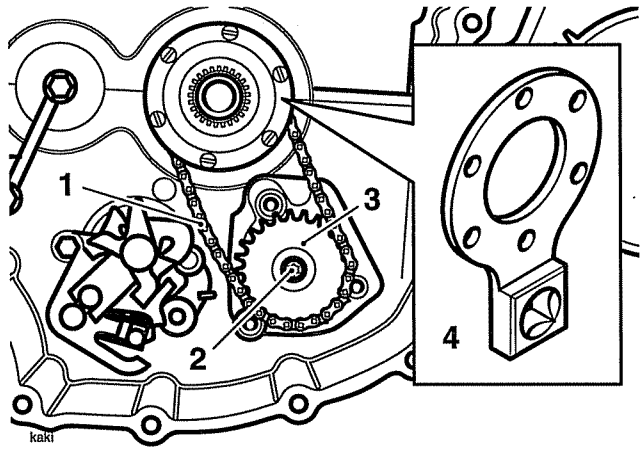
When handling used engine oil, always wear protective clothing and avoid any skin contact with the oil.

⚠ 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.

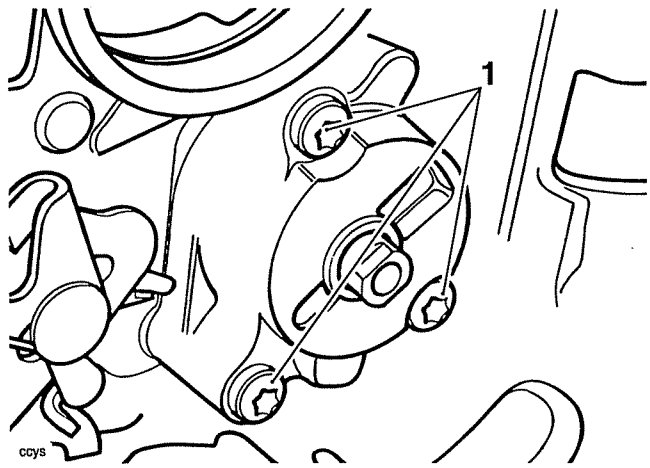
Removal

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

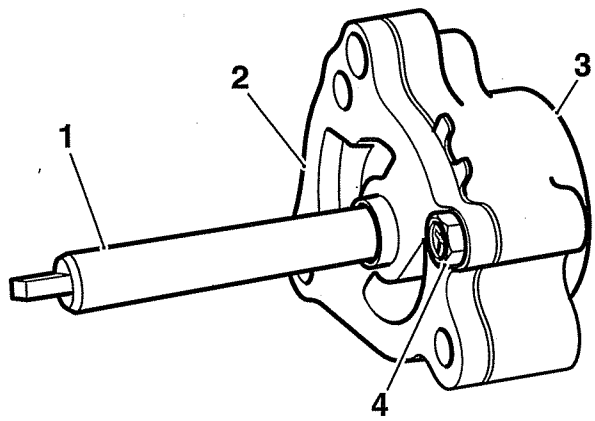
5. Remove the tool, upper and lower sprockets, upper sprocket bearing and the drive chain by sliding all components off the shaft together.
6. Release the bolts securing the oil pump to the crankcase and withdraw the oil pump.



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

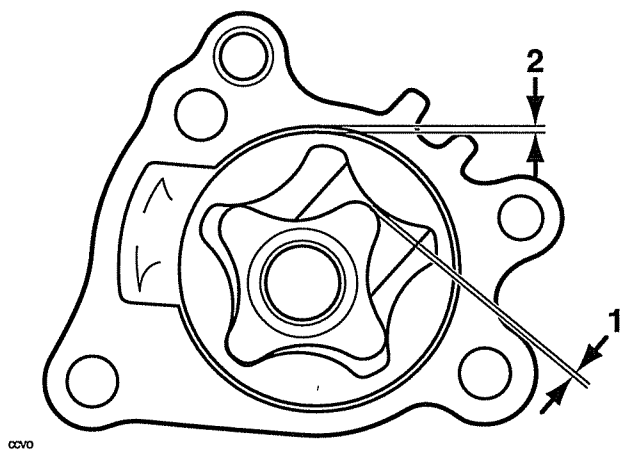
⚠ Caution

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

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

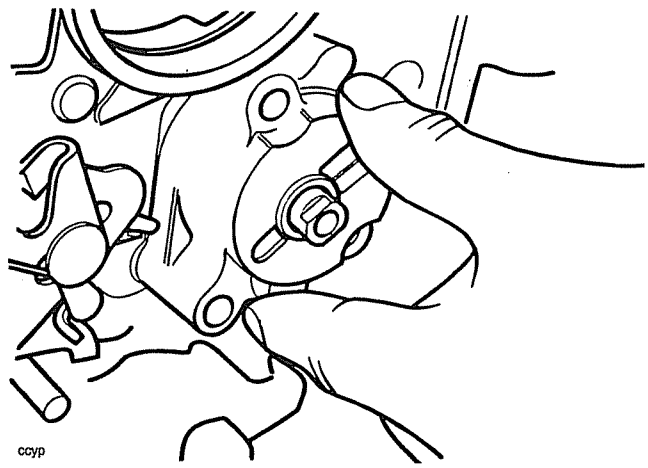
Before fitting the oil pump to the crankcase ensure the pump internal surfaces have been `wetted' with clean engine oil. The pump may fail to pick-up oil from the sump if the surfaces have not been `wetted'. This will cause the engine to run without engine oil pressure and will lead to severe engine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

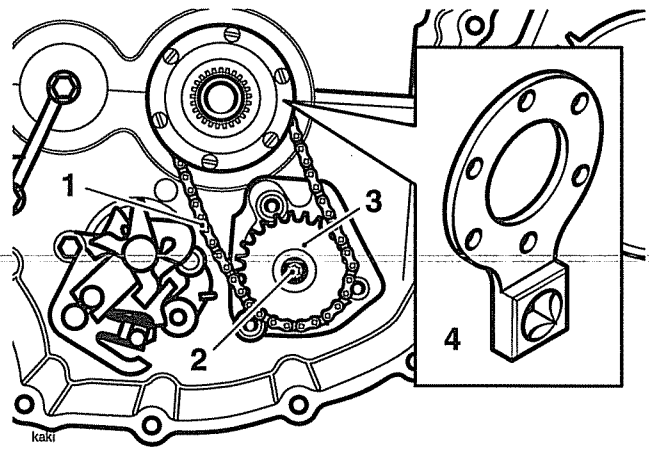
- **Use the sprocket end of the oil pump shaft to turn the drive peg into alignment with the drive on the water pump.**

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.

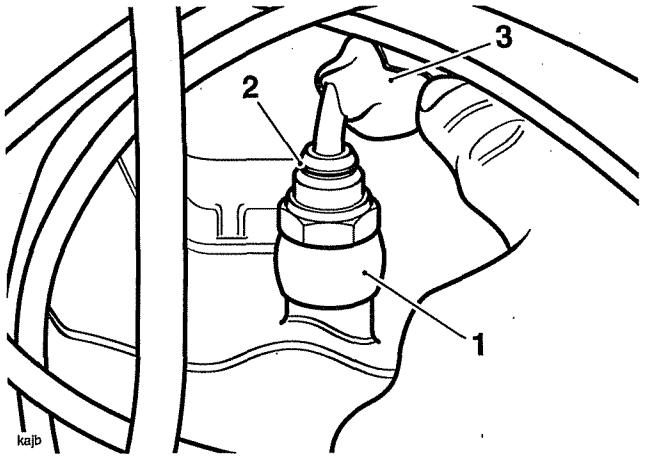


1. Oil pump drive chain
2. Pump drive sprocket fixing
3. Pump drive sprocket
4. Tool T3880371

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. Lift the covering boot and disconnect the electrical connection to the switch.
4. 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. 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*).

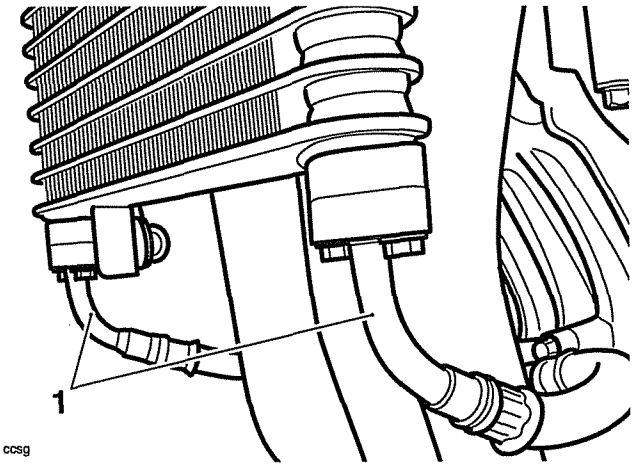
Warning

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

Warning

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

4. Note the position of the oil cooler pipes prior to disconnecting the pipes from the sump.



1. Oil Cooler Pipes

5. Remove the exhaust system (see page *10-104*).

Warning

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

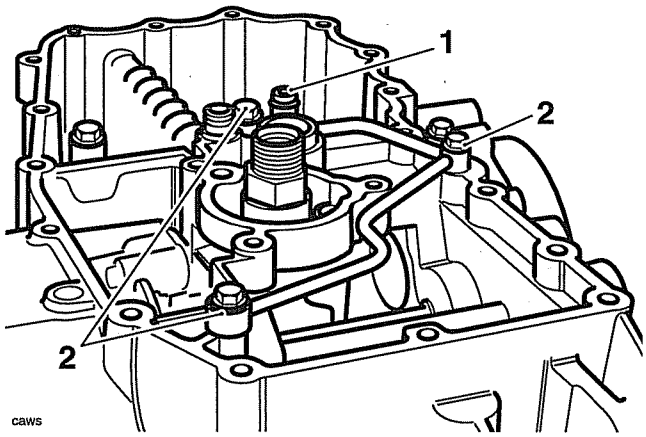
Contact with a hot exhaust could result in burn injuries.

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

7. Release the bolts securing the sump to the lower crankcase.
8. Detach the sump and collect the oil transfer tube.

Note:

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



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

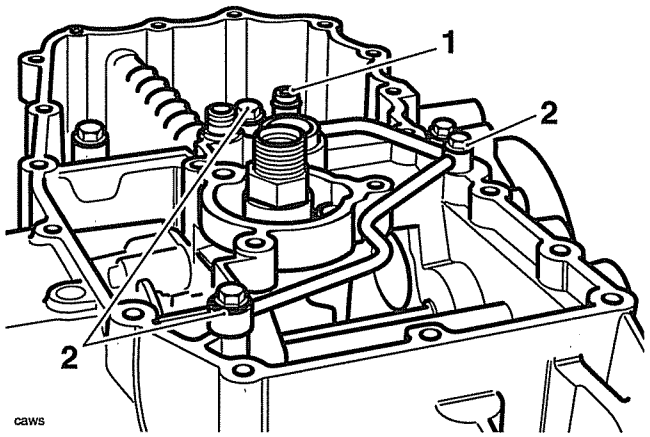
9. Remove the sump gasket.
10. If necessary, remove the oil transfer pipe and collect the sealing washer from either side of each joint.

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.

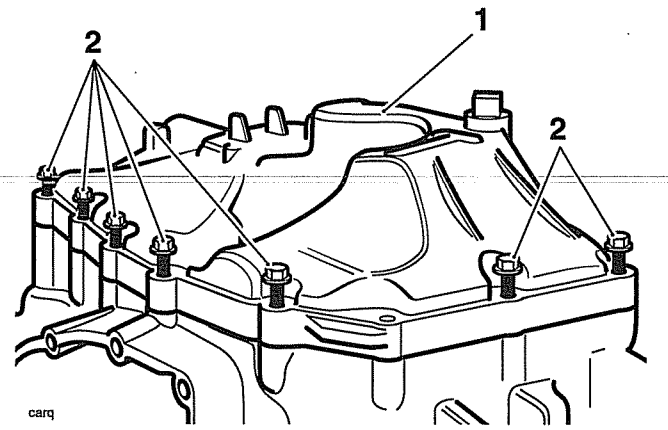
Installation

1. Fit the oil transfer tube to the crankcase.



1. Oil transfer tube
2. Transmssion 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 **10 Nm** using tool T3880012.
9. Refit the exhaust system (see page *10-105*).

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 *16-1*).
15. Refit the seat (see page *16-9*).

Oil Cooler

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*).

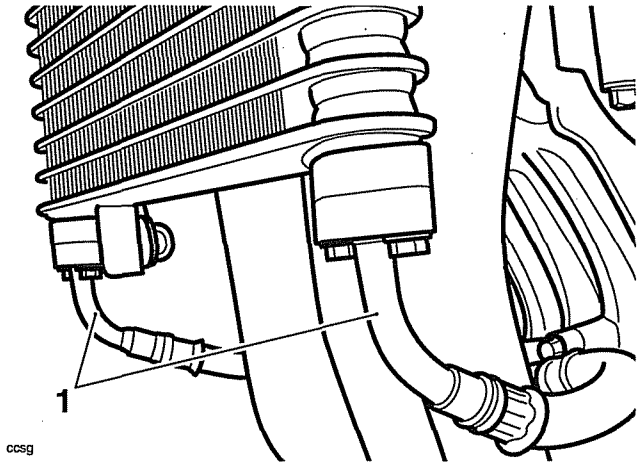
⚠ Warning

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

⚠ Warning

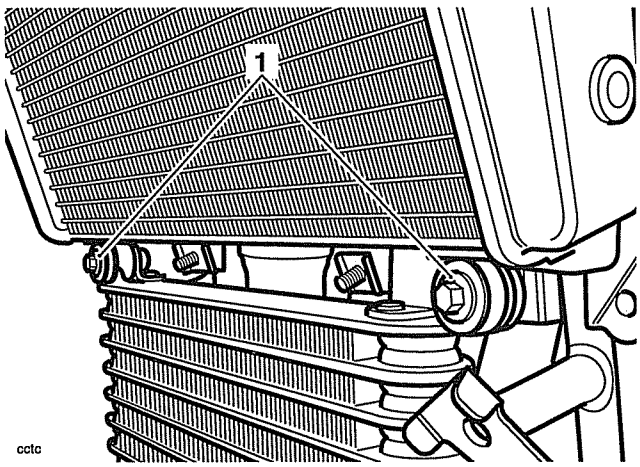
Prolonged or repeated contact with engine oil can lead to skin dryness, irritation and dermatitis. In addition used engine oil contains potentially harmful contaminants which can cause cancer. Wear suitable clothing and avoid skin contact.

4. Disconnect the oil cooler feed and return hoses.



1. Oil cooler hoses

5. Release the oil cooler fixings.



1. Upper oil cooler fixings

6. 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 the seat (see page *16-9*).

9 Engine Removal/Refit

Table of Contents

Engine Removal/Refit

Removal

1. Remove the seat (see page *16-8*).
2. Disconnect the battery, negative (black) lead first and remove the battery (see page *9-2*).
3. Place the motorcycle on a paddock stand.

⚠ Warning

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

4. Remove the body side panels (see page *16-9*).
5. Remove the fuel tank (see page *10-88*).
6. Remove the airbox (see page *10-92*).
7. Drain the engine oil (see page *8-7*).
8. Drain the coolant by detaching the bottom hose at the water pump (see page *11-6*).
9. Detach the bypass hose at the cylinder head (see page *11-6*).
10. Detach the top hose at the thermostat housing (see page *11-7*).

Note:

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

11. Remove the oil cooler (see page *8-9*).
12. Remove the exhaust system completely (see page *10-105*).
13. Set the drive chain adjustment to allow maximum free play in the chain (see page *12-6*).
14. Disconnect the gearchange linkage at the shaft.
15. Remove the sprocket cover.

⚠ Caution

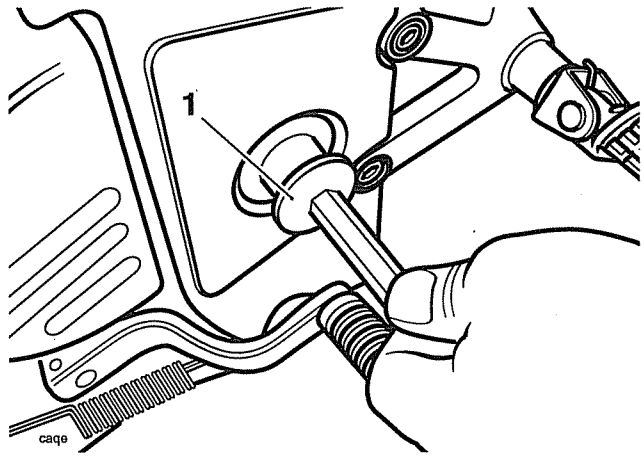
To prevent chain damage, do not allow the chain to come into contact with dirt, road grit etc.

16. Disconnect all electrical connections from the main harness to the engine.
17. Remove the throttle bodies, injectors and fuel rail from the cylinder head (see page *10-96*).

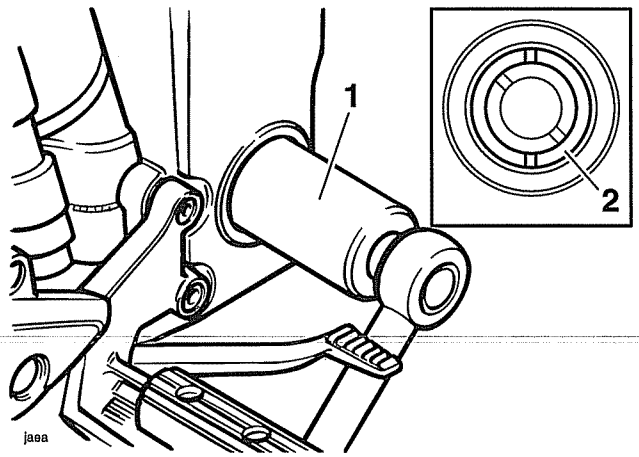
Note:

- **It is not necessary to disconnect the throttle cables. Instead, lay the assembly over the frame during the period when the engine is separated from the frame.**

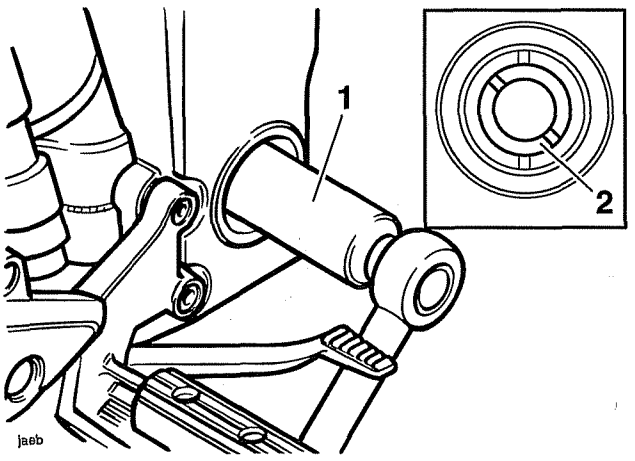
18. Remove the clutch cable (see page *4-5*).
19. Slacken the nut securing the swinging arm spindle.



20. Remove the swinging arm lock ring and slacken the adjustment ring using service tool part numbers T3880295 and T3880290 respectively.

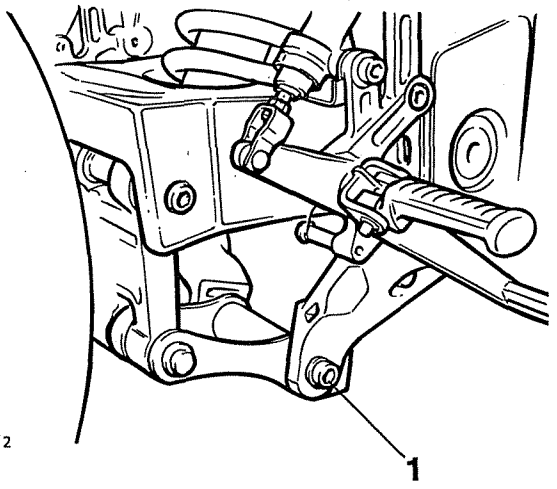


1. T3880295
2. Lock ring



1. T3880290
2. Adjuster

21. Slacken the drag link pivot bolt.



1. Drag Link Pivot Bolt

22. Place a support beneath the engine and ensure that the frame is still adequately and securely supported.
23. Remove the frame to head bracket from the left hand side of the motorcycle.
24. Remove the remaining engine mounting bolts and lower the engine sufficiently to allow the drive chain to be detached from the output sprocket.
25. Remove the engine from the frame.

⚠ Caution

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

Installation

1. Position the engine beneath the frame.
2. Raise the engine, looping the drive chain over the output sprocket as it is raised.
3. Align the engine to the frame and refit the engine mounting bolts to support the engine.
4. Refit the frame to cylinder head bracket to the left hand side of the motorcycle. Tighten the bracket to cylinder head bolts to **30 Nm. DO NOT TIGHTEN THE BRACKET TO FRAME BOLT UNTIL INSTRUCTED TO DO SO.**

⚠ Caution

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

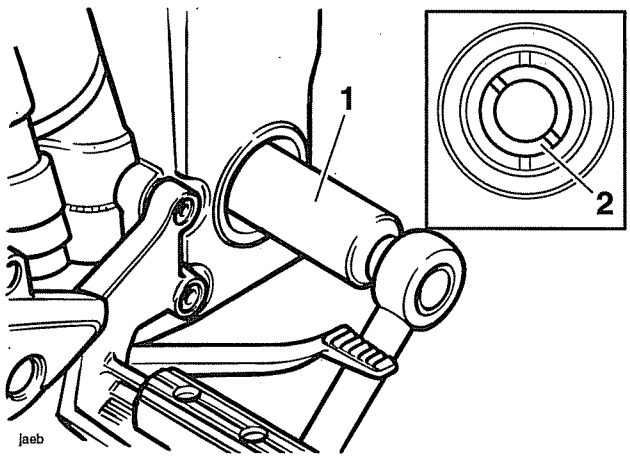
5. Remove the support from beneath the engine.
6. Tighten the bolt securing the frame to the left hand front cylinder head mounting to **80 Nm.**
7. Tighten the bolt securing the frame to the rear left hand upper engine mounting to **80 Nm.**
8. Tighten the bolt securing the frame to the rear left hand lower engine mounting to **80 Nm.**
9. Check the gap between the frame and engine at all four right hand engine mounting locations. If a gap is found between the engine and frame, add spacers as necessary to eliminate the gap.
10. If a spacer is needed for the lower right hand rear engine mounting bolt, a spacer (part number T3550355) must also be fitted to the drag link to frame bolt on the right hand side.

Note:

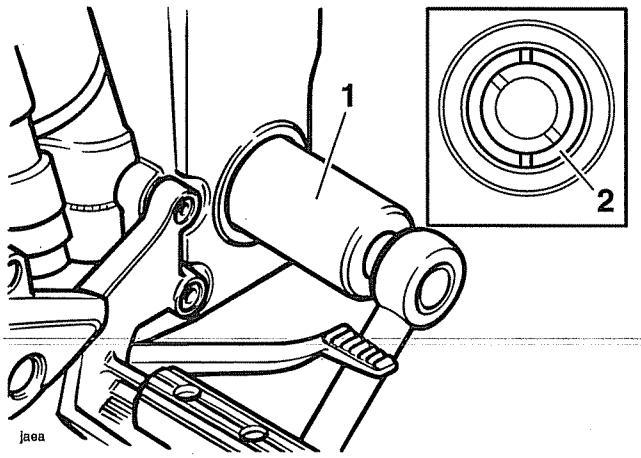
- **Four sizes of spacer are available, 2 mm, 1.5 mm, 1.0 mm and 0.5 mm. Refer to the parts catalogue for part number information.**

11. Once all the necessary spacers have been added, tighten the bolt securing the frame to the right front cylinder head mounting to **80 Nm.**
12. Tighten the bolt securing the frame to the right hand rear cylinder head mounting to **80 Nm.**
13. Tighten the bolt securing the frame to the rear right hand upper engine mounting to **80 Nm.**
14. Tighten the bolt securing the frame to the rear right hand lower engine mounting to **80 Nm.**
15. Tighten the bolt securing the frame to the cylinder head mounting bracket on the left side of the cylinder head to **80 Nm.**

16. Tighten the swinging arm spindle inner adjustment ring to **15 Nm** and the outer locking ring to **30 Nm** using service tool part numbers T3880290 and T3880295 respectively.

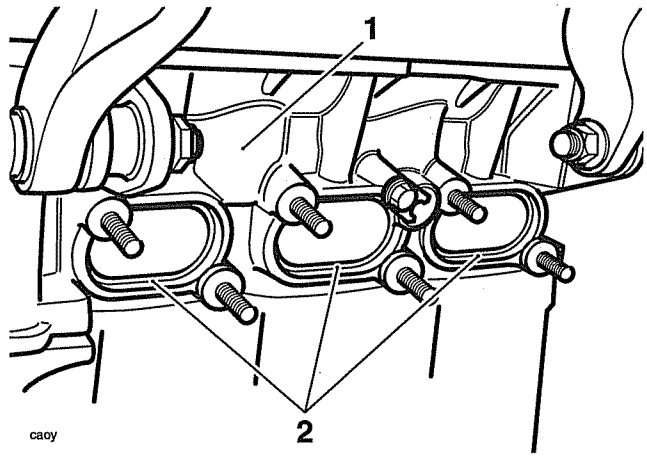


1. T3880290
2. Adjuster



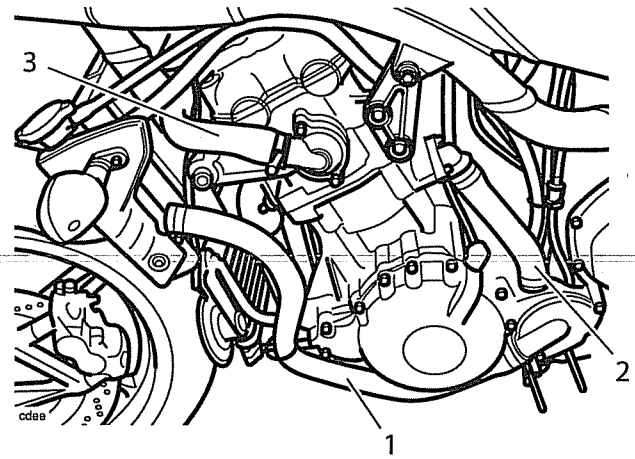
1. T3880295
2. Lock ring

17. Fit and tighten the swinging arm spindle bolt to **60 Nm.**
18. Tighten the drag link spindle bolt to **95 Nm.**
19. Attach and clip the air deflector shield to the cam cover.
20. Refit the clutch cable (see page *4-6*).
21. Check the injector O-rings for splits and other damage. Replace as necessary.
22. Refit the throttle bodies, injectors and fuel rail to the cylinder head (see page *10-99*).
23. Reconnect all electrical connections to the engine.
24. Allow the swinging arm to hang free, and set the chain adjustment (see page *12-6*).
25. Refit the gearchange linkage.
26. Refit the sprocket cover and tighten the bolts to **9 Nm.**
27. Using new seals at the cylinder head, refit the exhaust system (see page *10-106*).



1. Cylinder head
2. Seals

28. Refit the oil cooler (see page *8-14*).
29. 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 *11-6*).

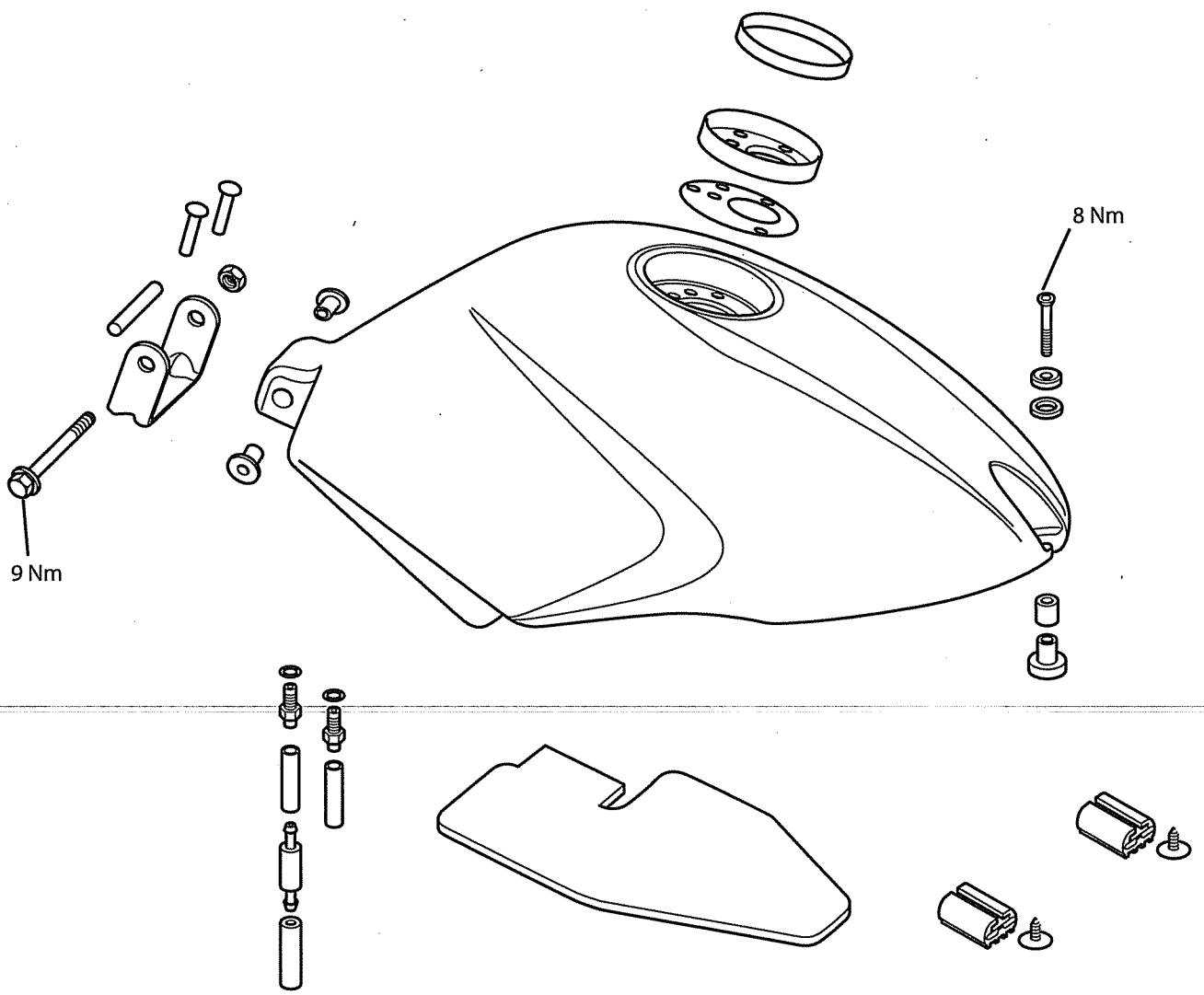


1. Bottom hose
2. Bypass hose
3. Water pump

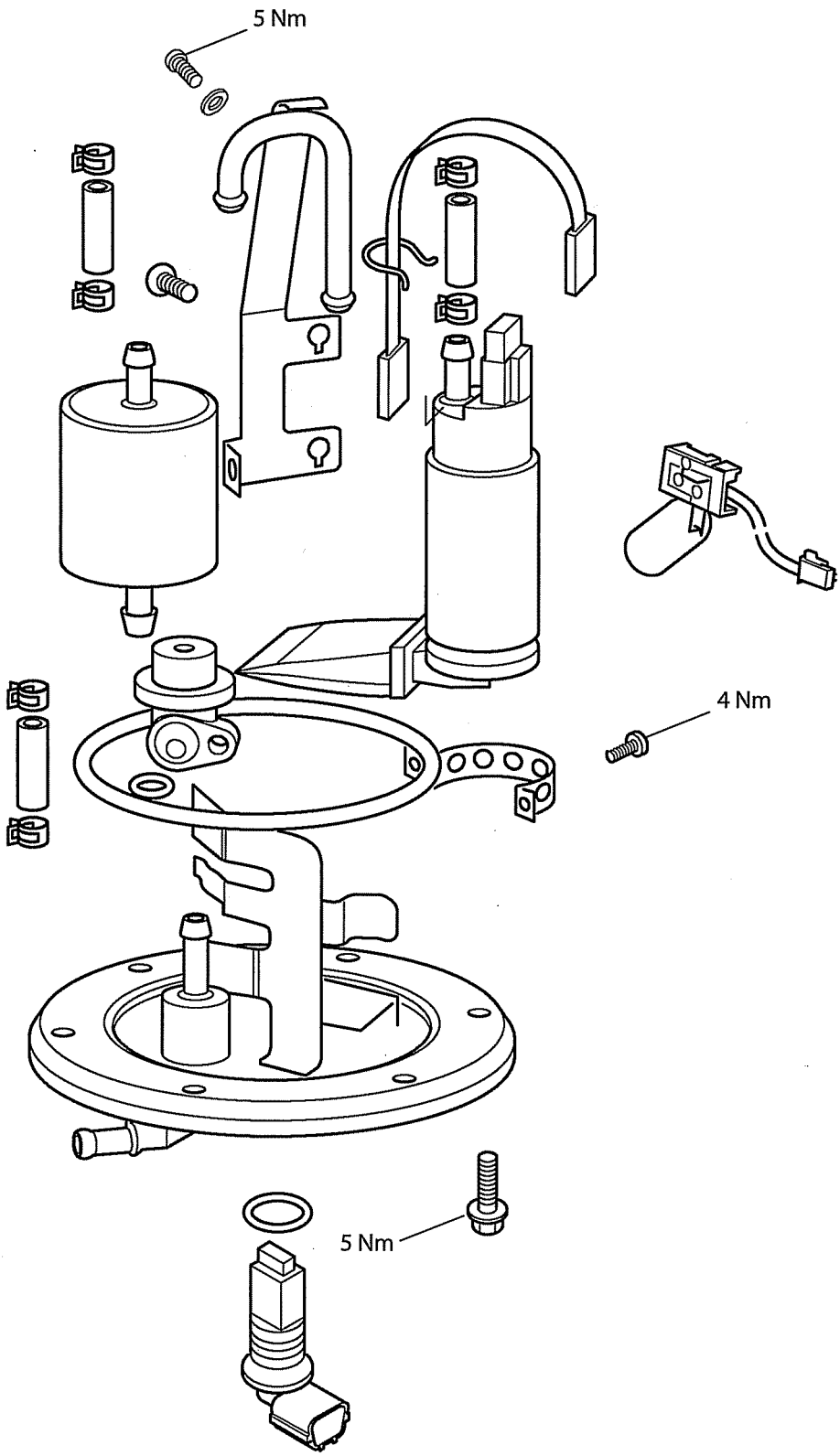
30. Refill the cooling system (see page *11-5*).
31. Fill the engine with oil of the correct grade and viscosity (see page *8-7*).
32. Refit the airbox (see page *10-93*).
33. Refit the fuel tank (see page *10-88*).
34. Refit the side panels (see page *16-9*).
35. Refit the battery to the battery box and reconnect, positive (red) lead first (see page *17-7*).
36. Remove the motorcycle from the paddock stand and place on the side stand.
37. Refit the seat.

10 Fuel System/Engine Management

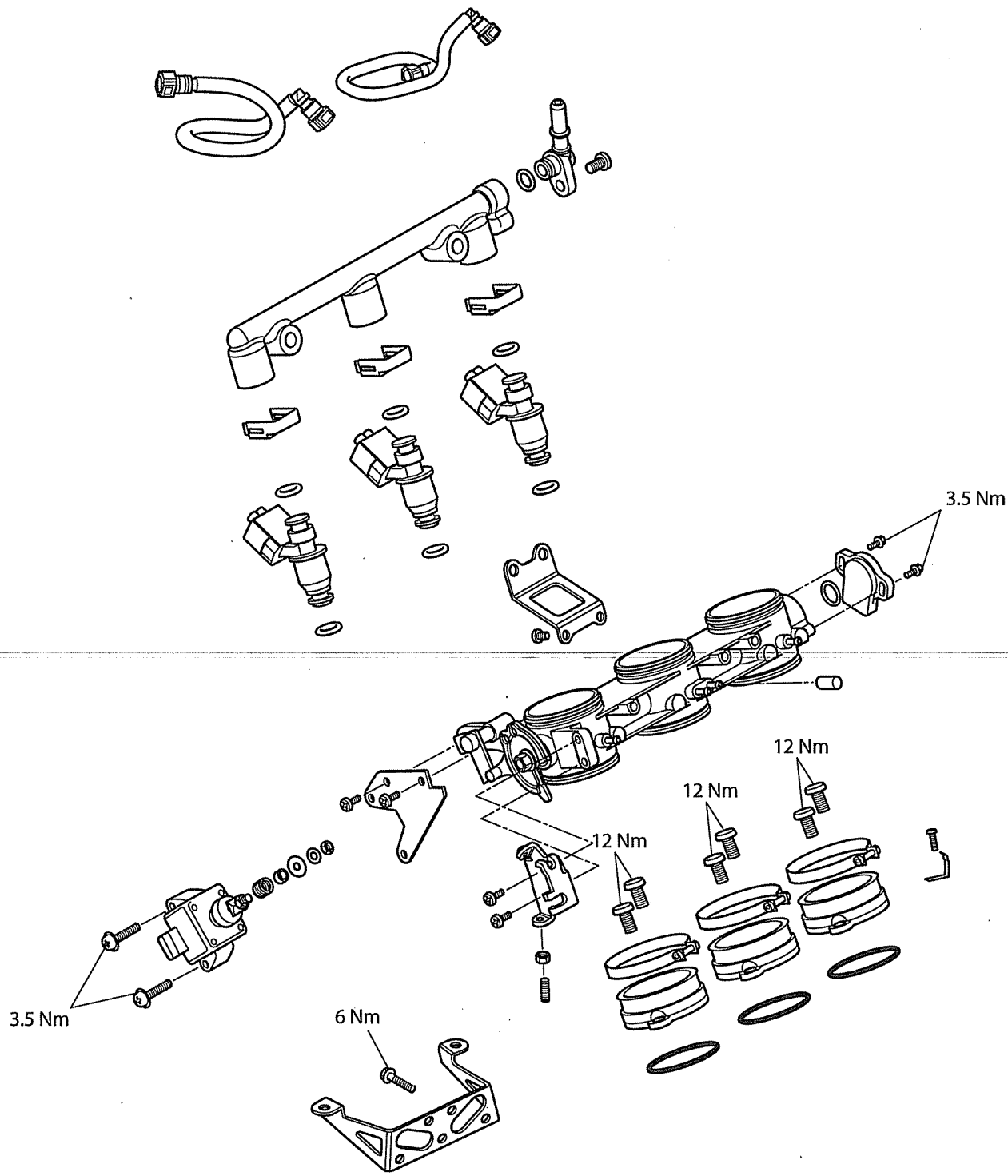
Exploded View - Fuel Tank



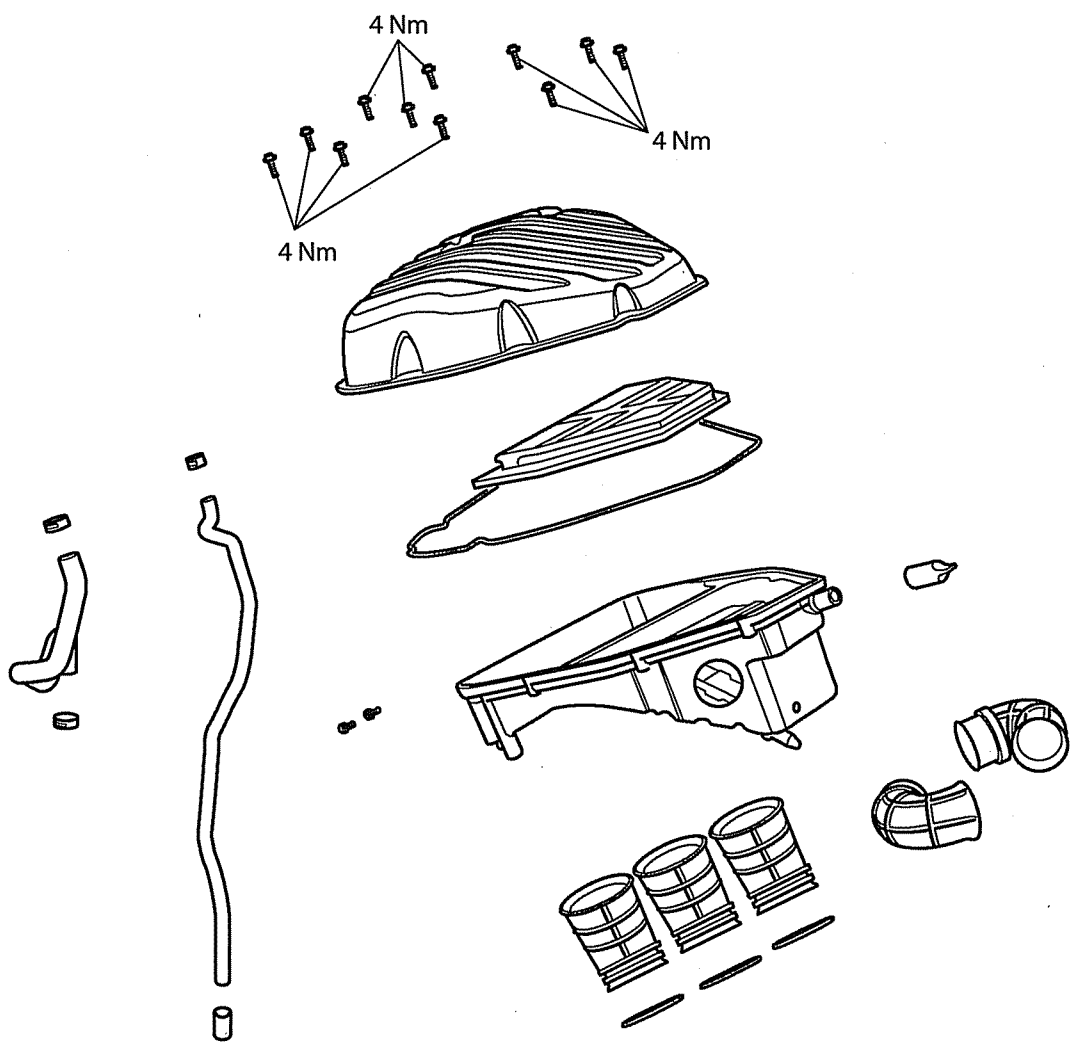
Exploded View - Fuel Pump



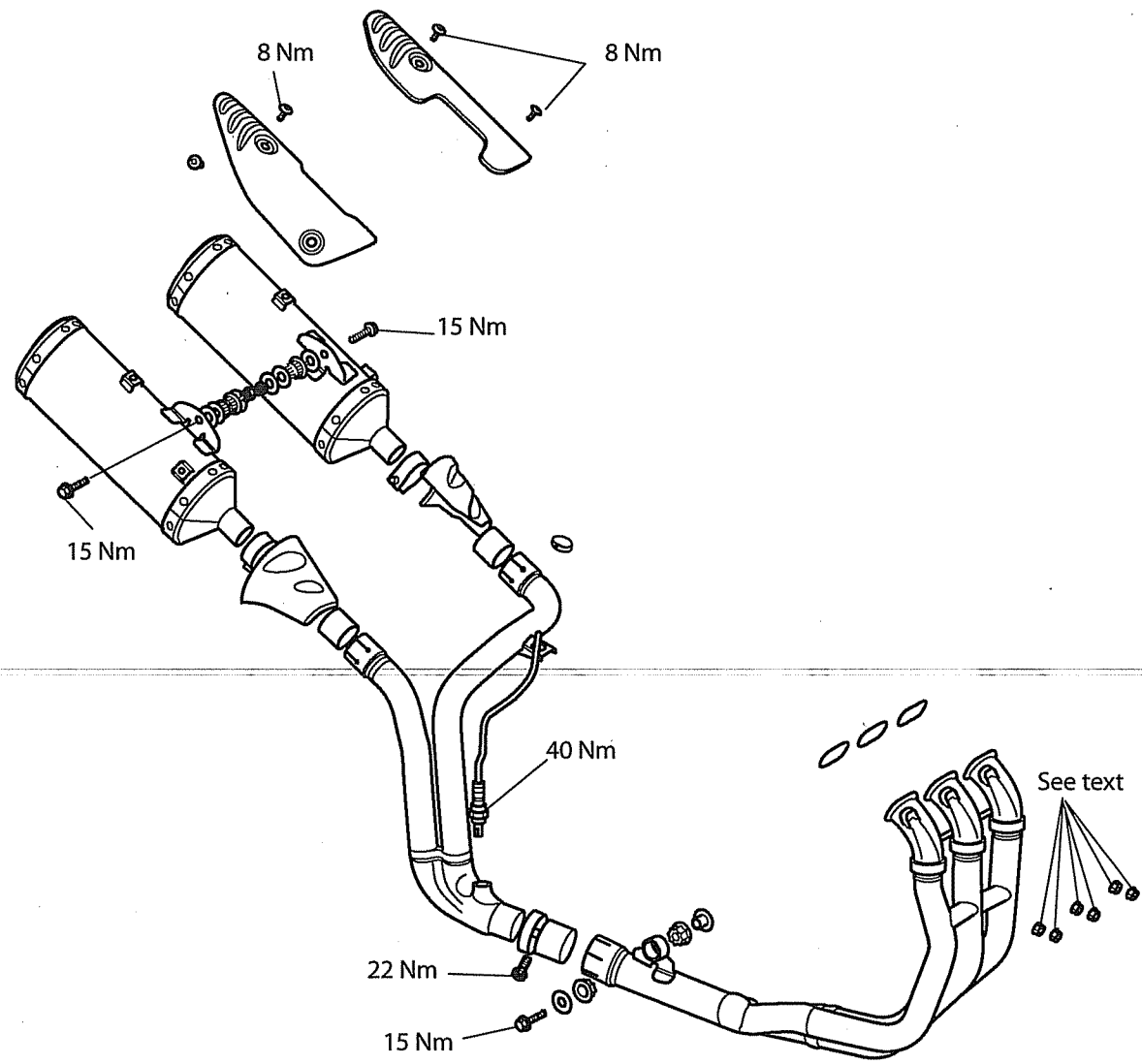
Exploded View - Fuel Rail, Throttles and Injectors



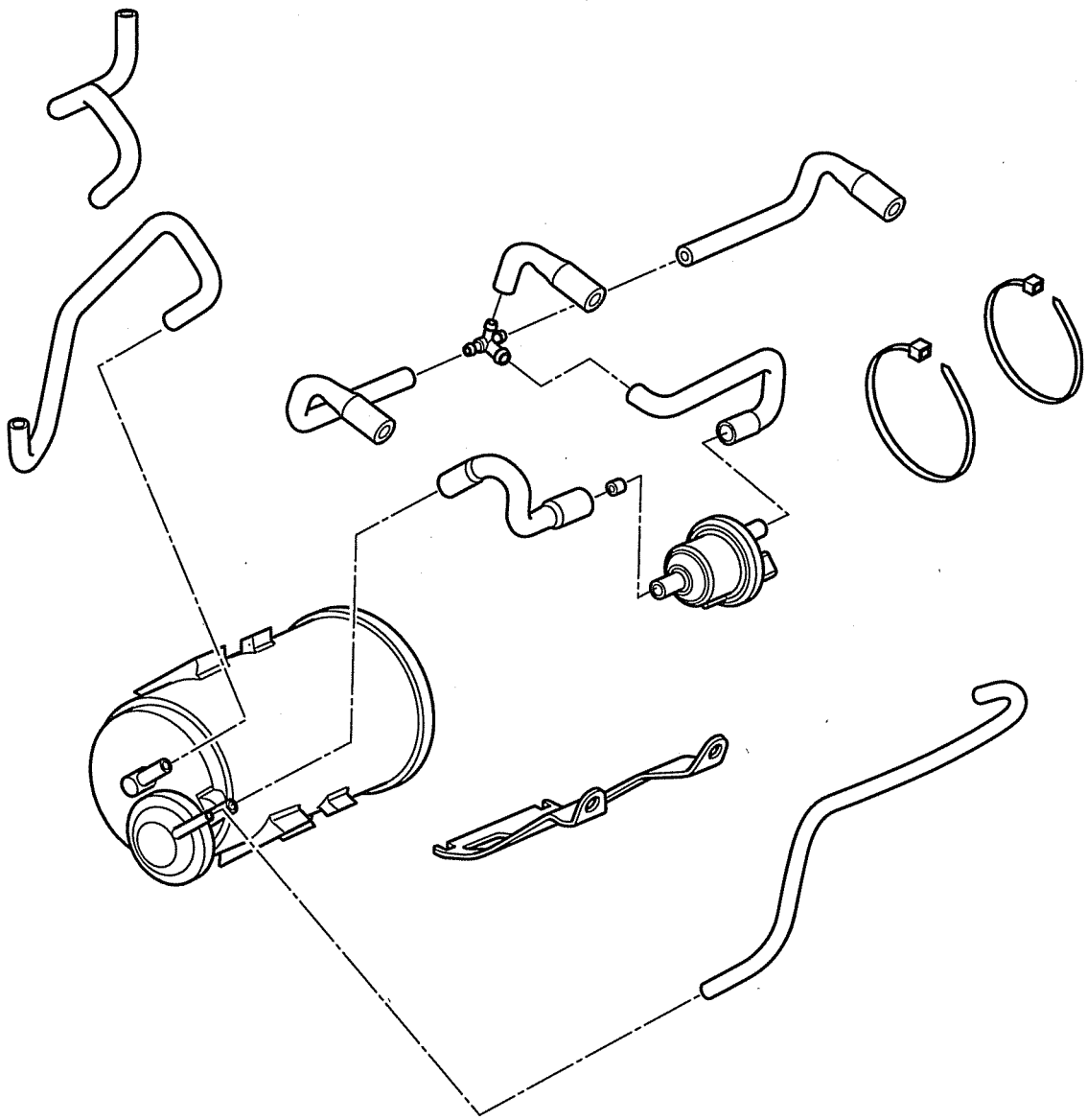
Exploded View - Airbox



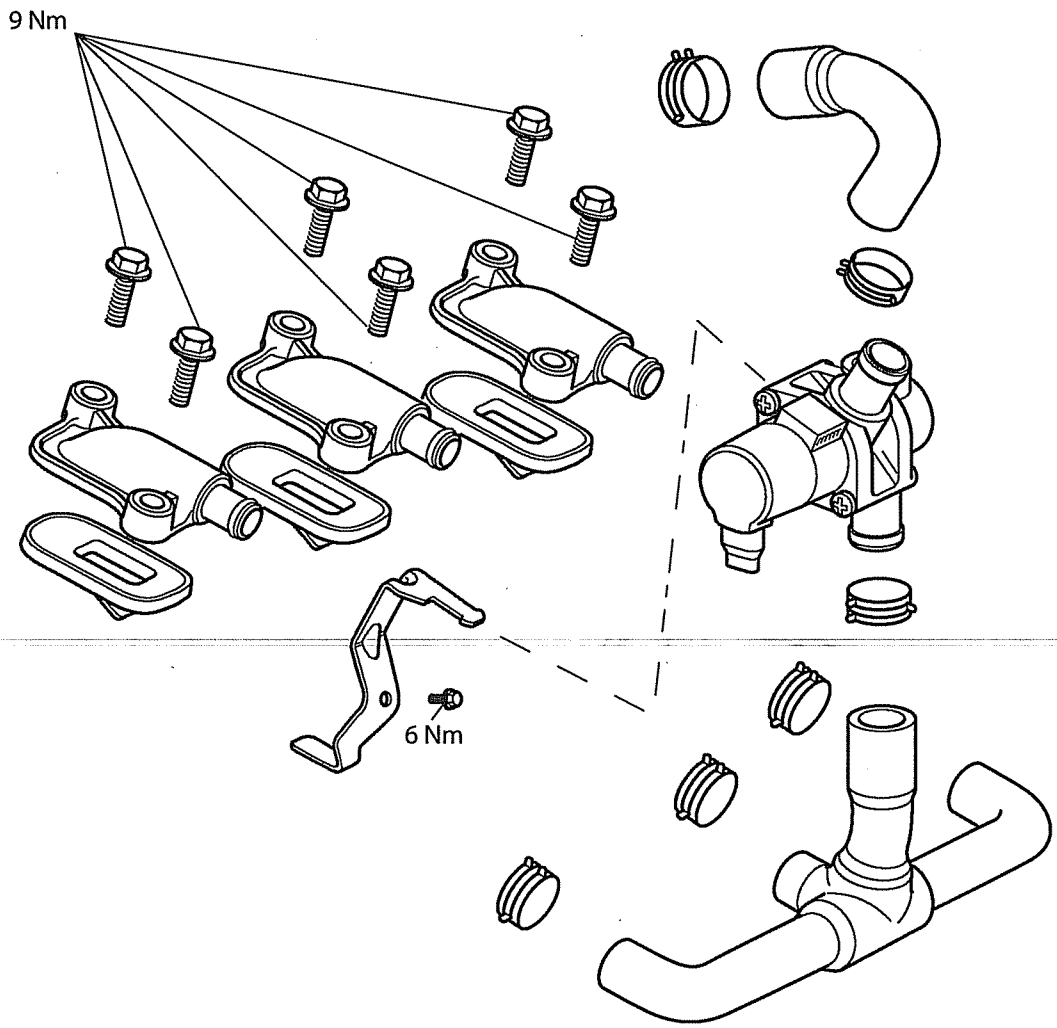
Exploded View - Exhaust System



Exploded View - Evaporative System



Exploded View - Secondary Air Injection



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

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.

MTBE (Methyl Tertiary Butyl Ether)

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

Glossary of Terms

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

Air temperature

The 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 (DTC's) are set.

Neutral switch status

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

Off idle fuel trim

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

Open circuit

A break in an electrical circuit - current cannot flow.

Over temp

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

Primary Throttle Position Sensor

Sensor for the primary (lower) throttle position.

Primary Throttle Stepper Motor

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

Purge valve duty cycle

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

Road Speed Sensor

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

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 Speed Triple 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.

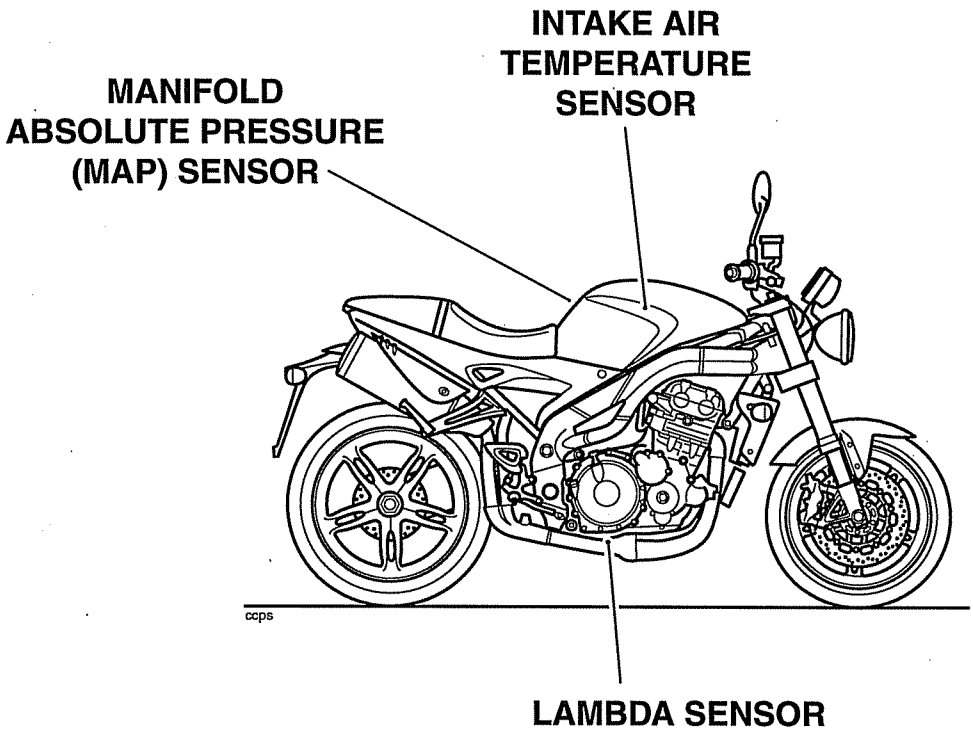
In addition, the system has an on-board diagnostic function. This ensures that, should a malfunction occur in the engine management system, the malfunction type, and engine data at the time the malfunction occurred, are stored in the ECM memory. This stored data can then be recovered using a special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

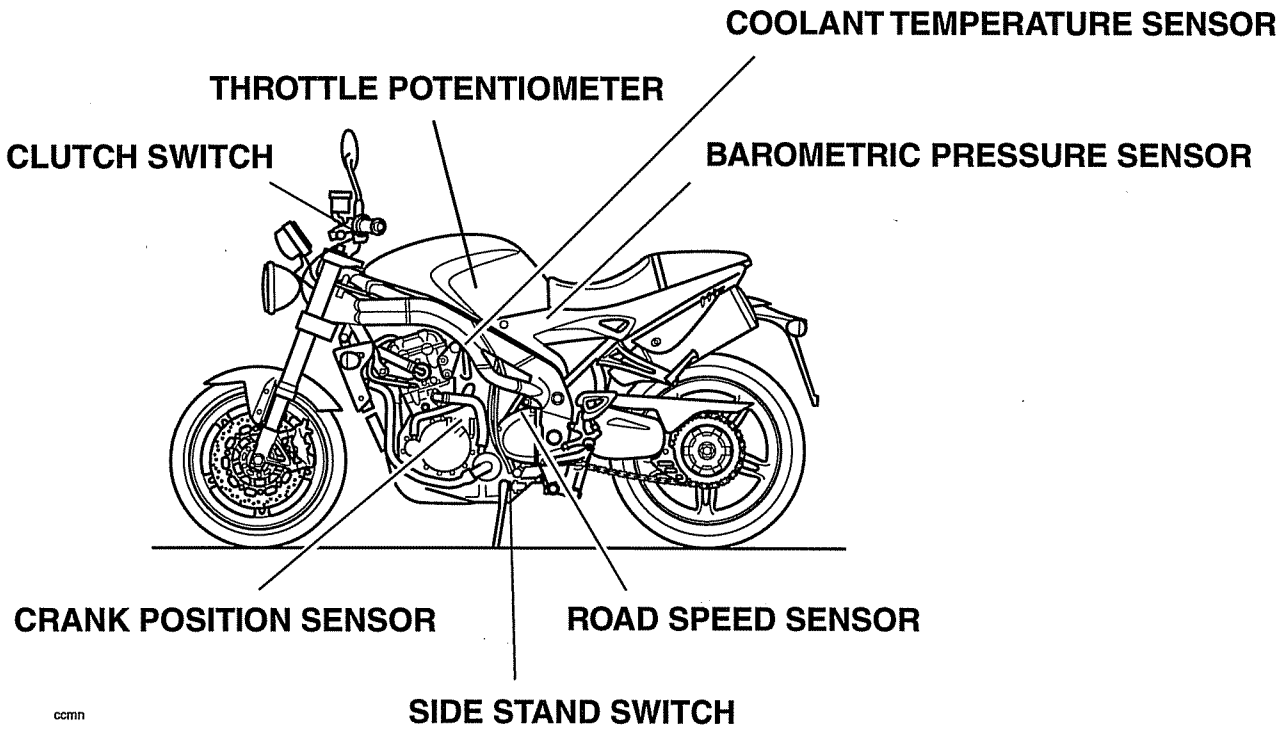
System Sensors

- **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 left hand side, at the front of the rear mudguard beneath the seat. 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 to 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





System Actuators

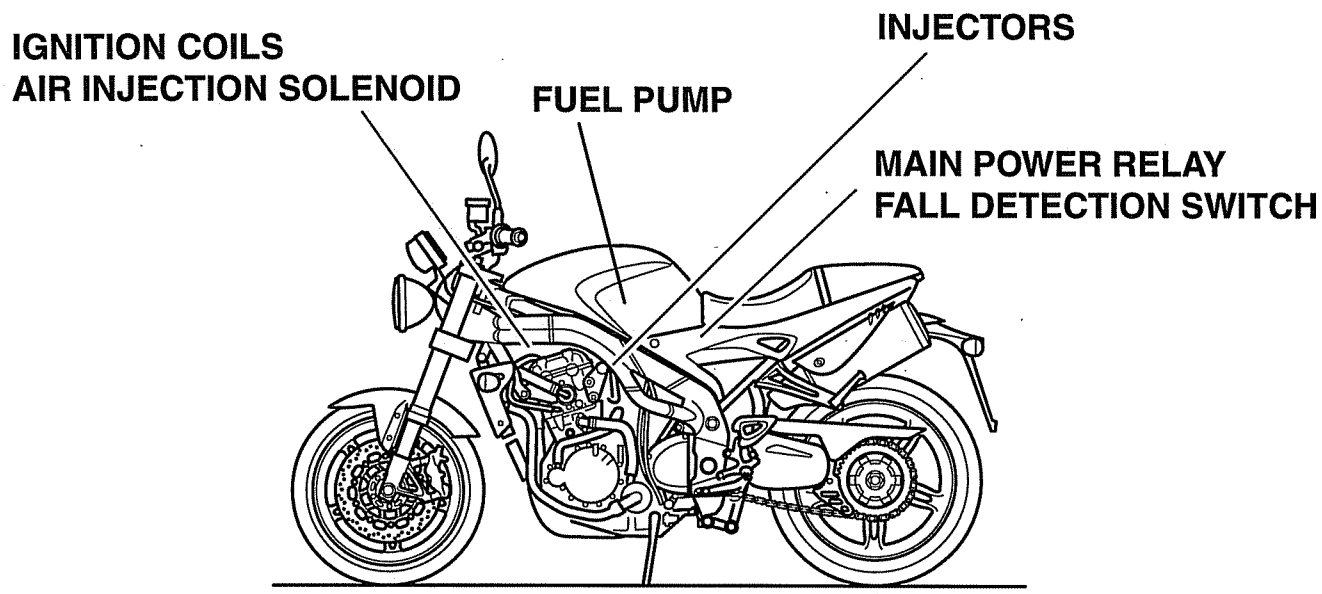
In response to signals received from the sensors, the ECM controls and directs messages to a series of electronic and electro-mechanical actuators. The function and location of the actuators is given below.

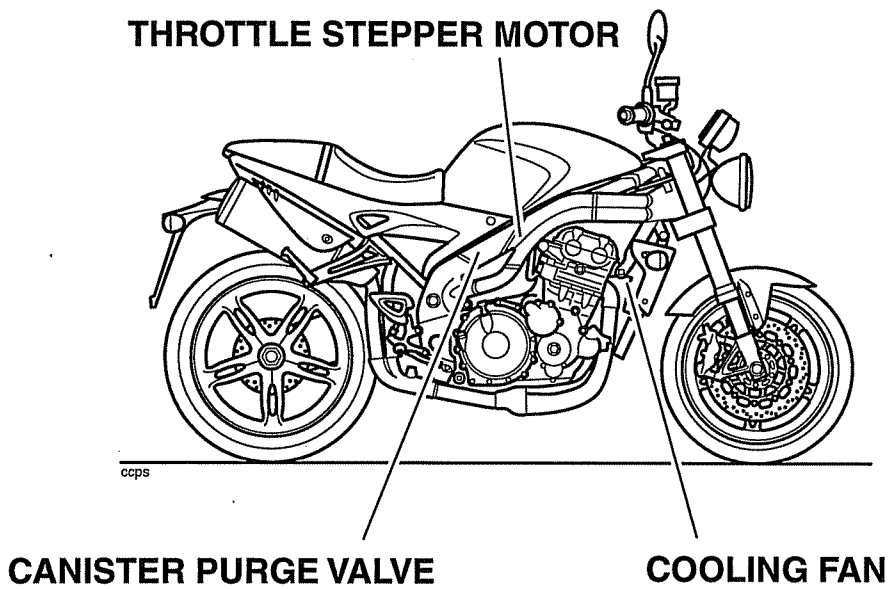
- **Throttle stepper motor** - situated at the right end of the throttle bodies. The throttle stepper actuates a cam/lever which causes variations in the closed throttle position. Although used primarily to ensure target idle speed is maintained, it also increases throttle opening when the engine is 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 optimised for good engine performance.
- **Fall detection switch** - situated next to the barometric pressure sensor, beneath the seat. The fall detection switch will detect if the motorcycle is on its side and will cut power to the ECM immediately. This prevents the engine from running and the fuel pump from delivering fuel. In the event of a fall, the switch is reset by returning the bike to an upright position and switching the ignition off then back on again.
- **Main power relay** - 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





Engine Management Circuit Diagram - Speed Triple

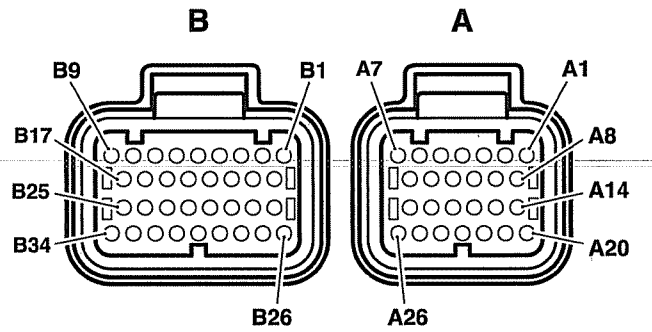
Key To Wiring Circuit Diagram

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 pump and level sender
9	Fall Detection switch
10	Barometric 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 Relay
18	Fuel Box (7)
19	Cooling Fan
20	Cooling Fan Relay
21	Idle Speed Control Stepper Motor
22	Ignition Coils
23	Secondary Air Injection Solenoid
24	Fuel Injectors
25	Purge Valve
26	Crankshaft Sensor
27	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

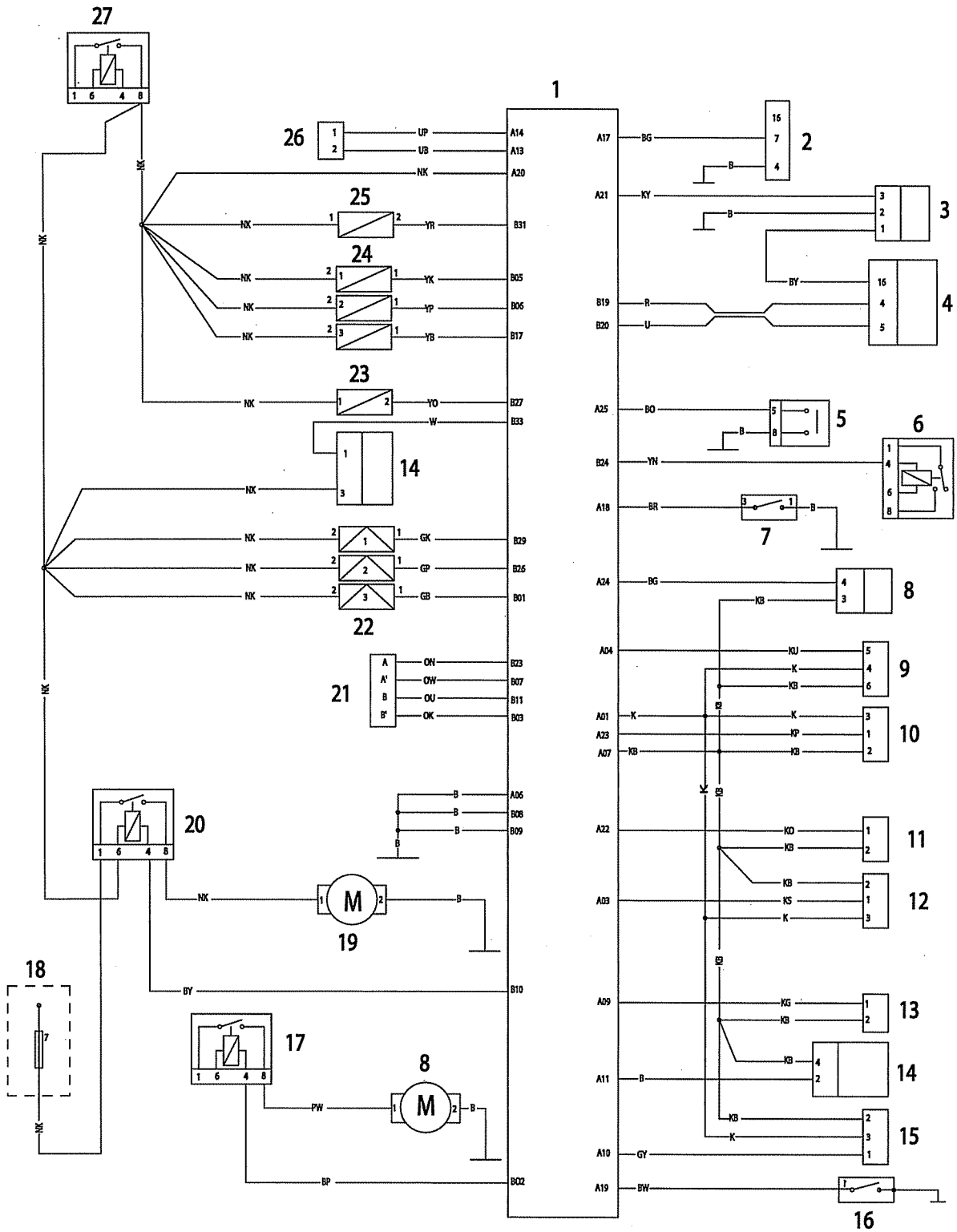


cbhs

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 - Speed Triple



System Diagnostics

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

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

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

On-board Fault Detection System

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

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

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

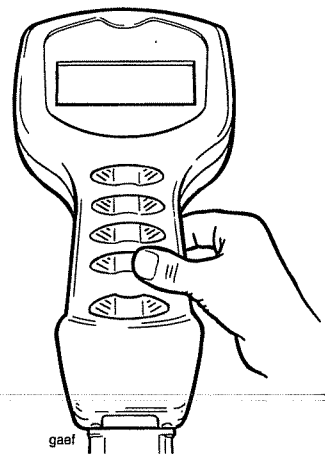
- The coolant temperature must be raised to 72°C or more.
- The coolant temperature must have risen by 23°C or more from its start temperature, when 72°C is reached.
- A controlled power-down sequence must take place.

Note:

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

Note:

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



Triumph Diagnostic Tool

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

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

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

Current Data

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

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

Freeze-frame Data

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

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

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

Function Tests

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

The function tests available are:

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

* 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 dived 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

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.

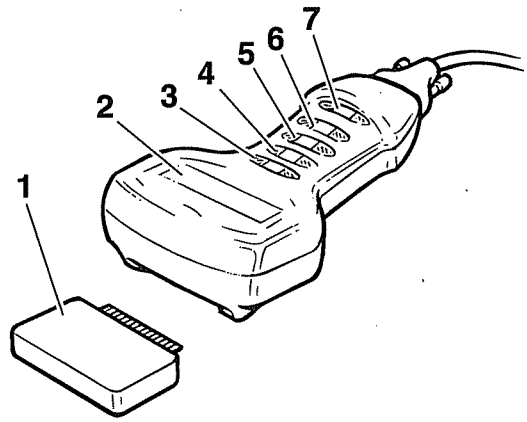
Similarly, if a fault clears, the ECM also records this fact and will turn off the MIL when sufficient no-fault warm-up cycles have taken place. Any fault codes will remain in the ECM memory until the required number of no-fault warm-up cycles have taken place. The number of warm-up cycles required to 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

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

Service Diagnostic Tool



gajc

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

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

- Diagnose faults
- Obtain data
- Make checks / adjustments

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

The screen comprises four horizontal lines and twenty vertical columns forming a series of boxes into which letters and numbers can be displayed to provide the necessary question, message, answer etc.

At the left of the screen, one or more symbols as detailed below may be displayed.

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

Typical screen showing symbol examples

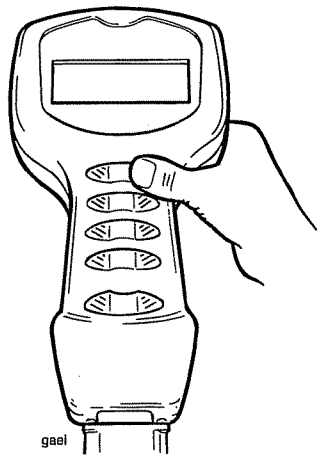
▲▼ Cursors to indicate that further lines of text are available to be seen above and/or below those already in view, by scrolling the text up or down using the 'Up' or 'Down' keys.

▶ 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

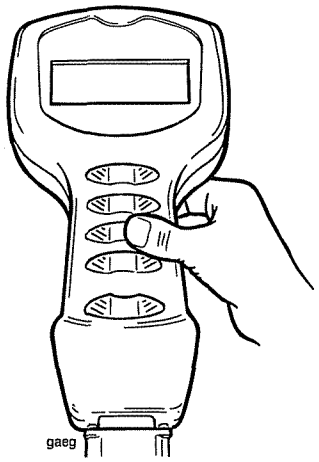
In most cases, the **Return** key (↵) enables the user to return to the screen last displayed.



gael

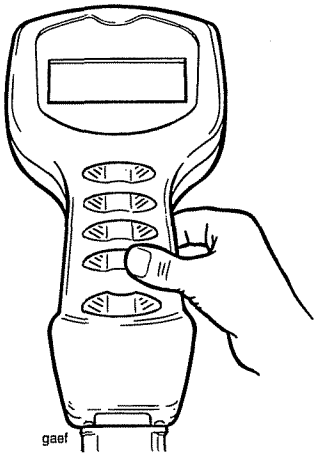
Return key

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



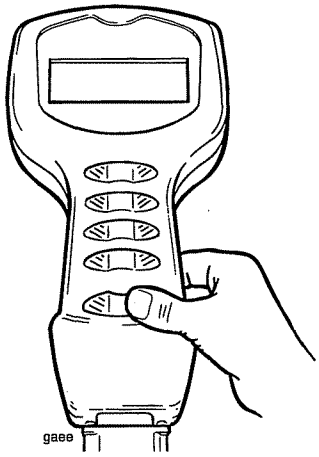
Up/down keys (2 separate keys)

Press the **Validation** key (*) to move on to the next message.



Validation key

The **Help** key can be used when the **'?'** symbol shows, to get more information about that line of text . To return to the diagnostic screen from the help area, press the help **'?'** button again.



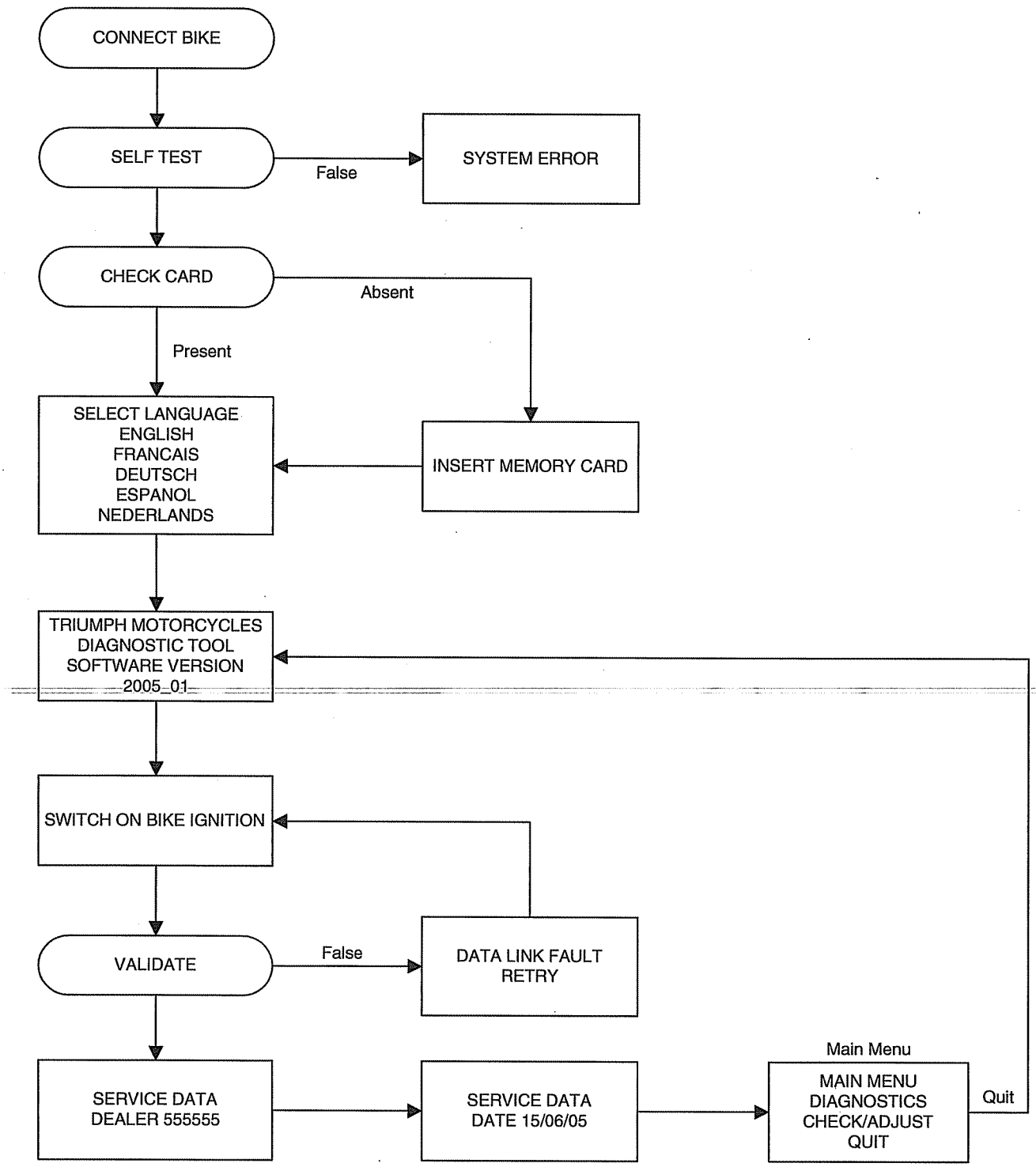
Help key

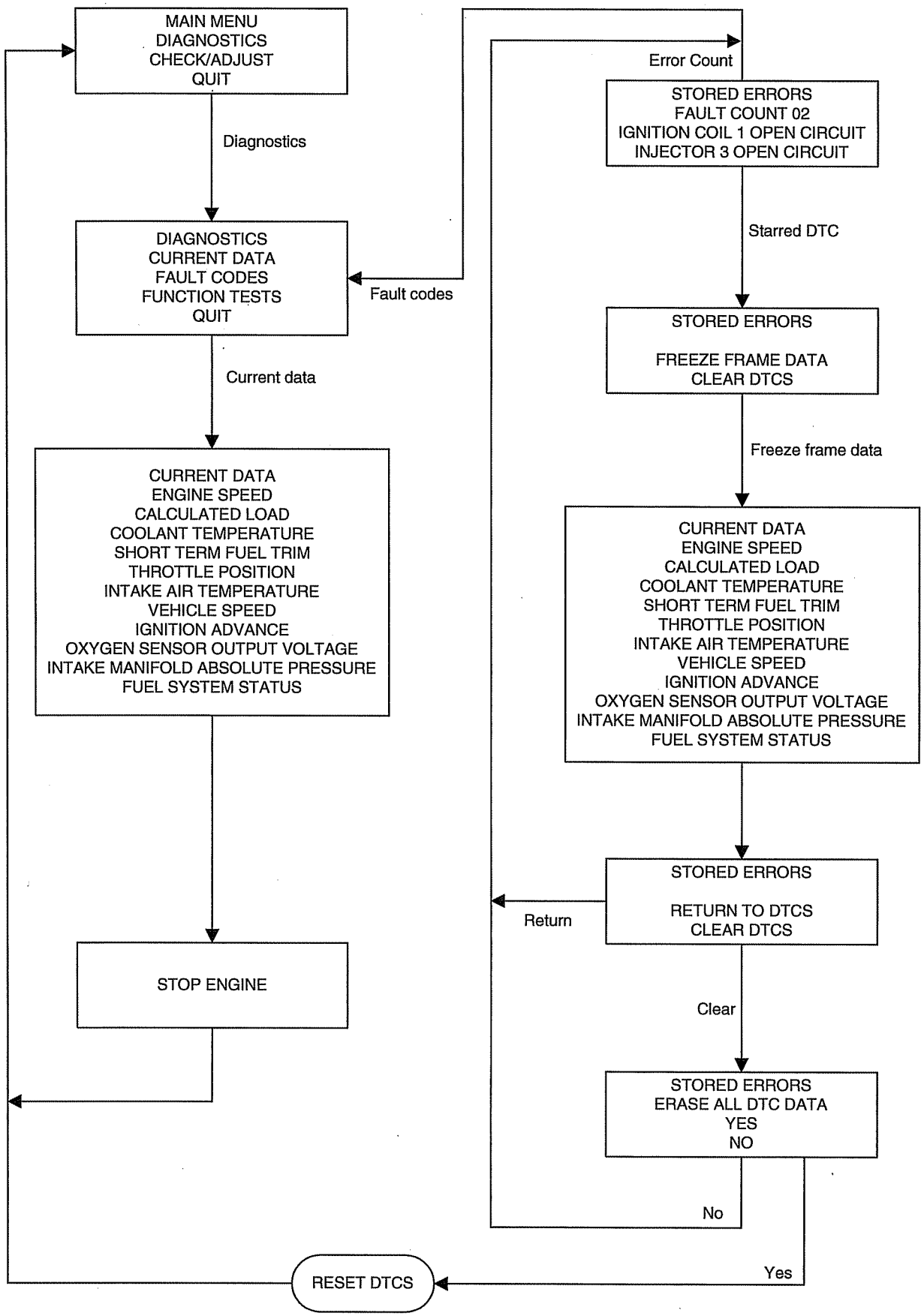
Test Procedure

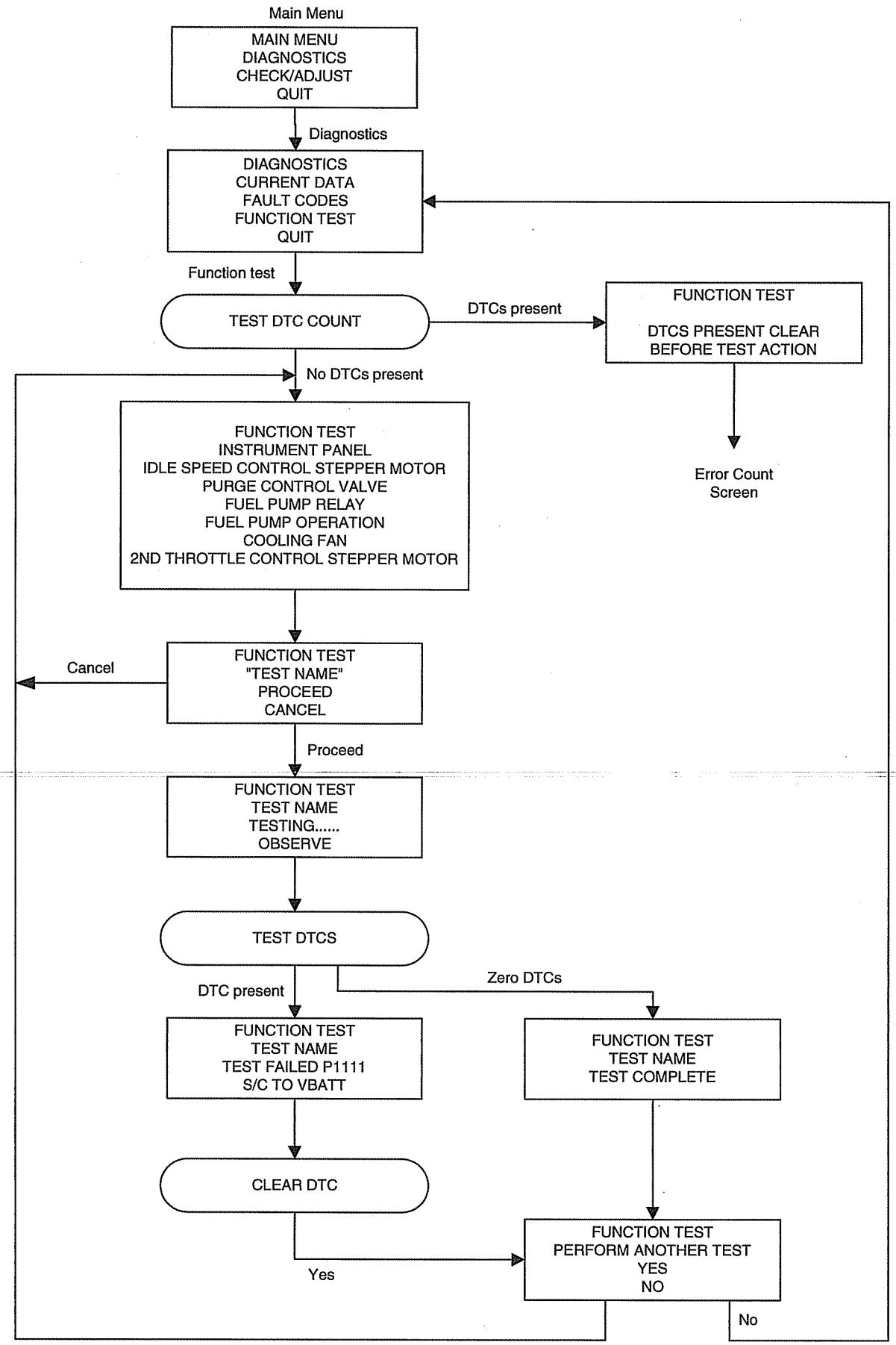
The following describes the procedure to follow when using the service diagnostic tool. It does not cover the further diagnosis that must be carried out once a fault area has been identified. For details of the procedure to follow when a fault area or fault code has been identified, refer to the diagnosis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

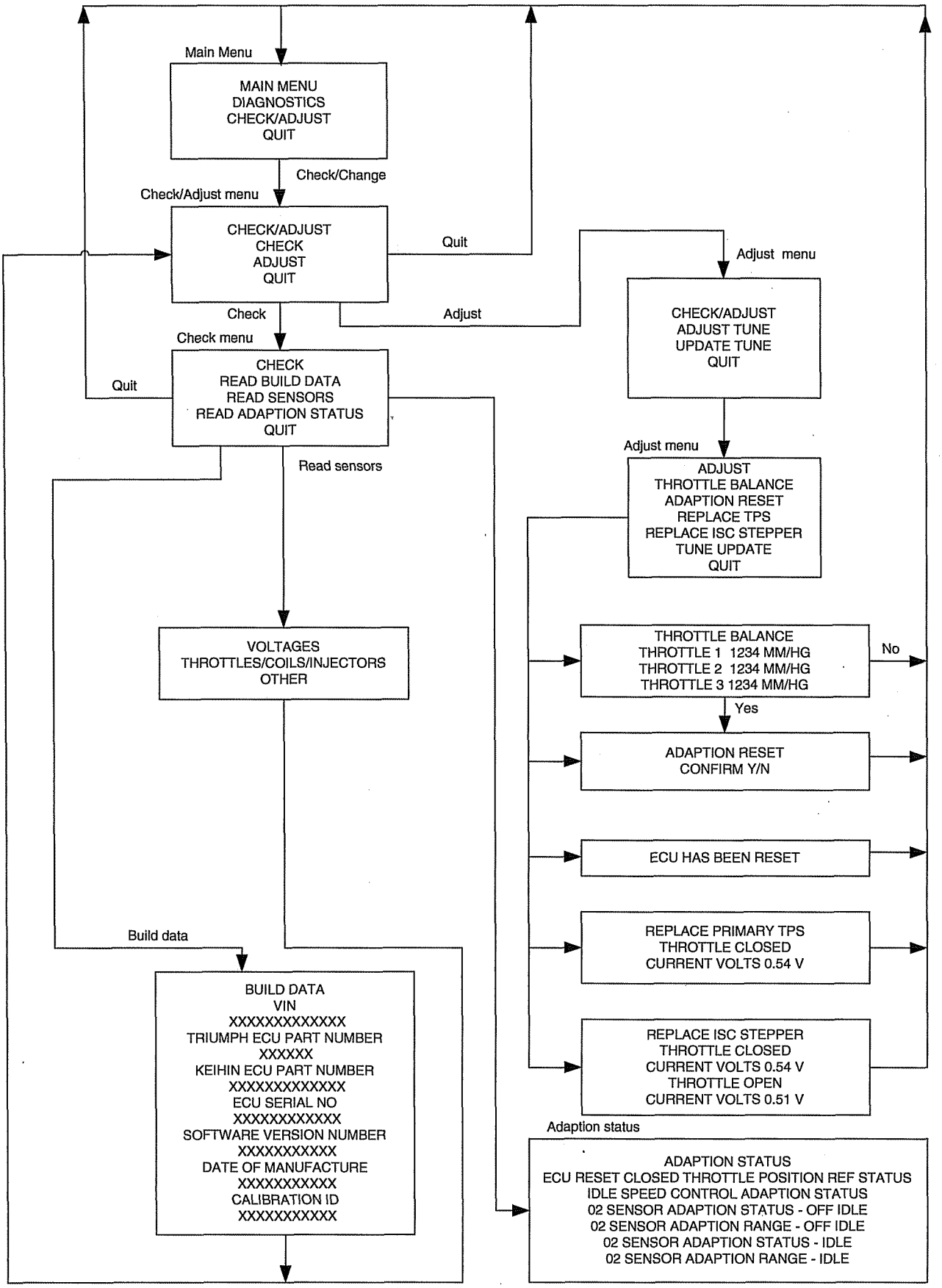
Note:

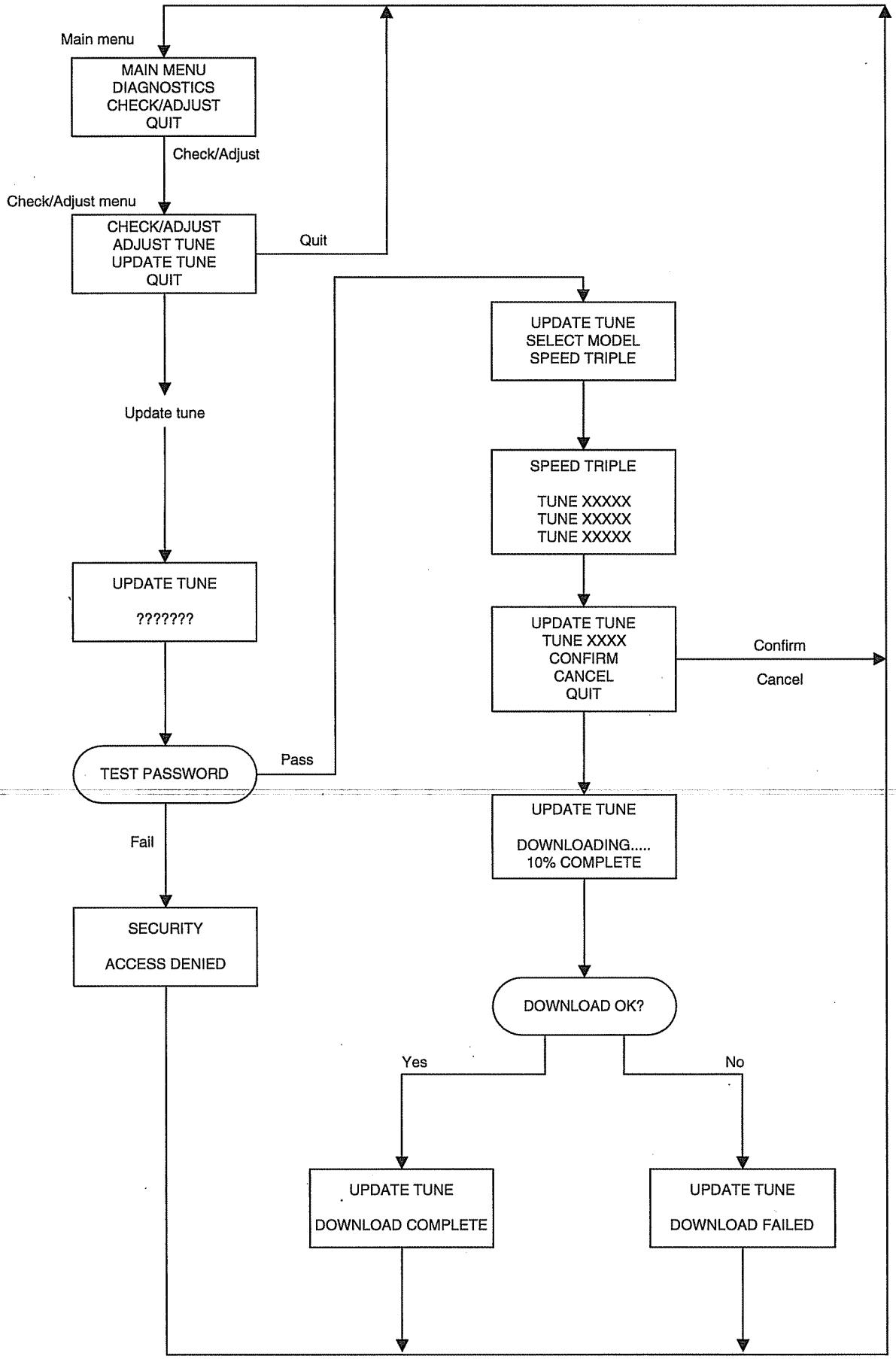
- **The tool does not retain any memory of faults, diagnosis etc. carried out on any particular motorcycle. Any such memory is only retained in the motorcycle's ECM.**
- **The following five pages describe the tool operations in flow chart form.**


CONNECT BIKE
SELF TEST
False
SYSTEM ERROR
CHECK CARD
Absent
Present
SELECT LANGUAGE
ENGLISH
FRANCAIS
DEUTSCH
ESPANOL
NEDERLANDS
INSERT MEMORY CARD
TRIUMPH MOTORCYCLES
DIAGNOSTIC TOOL
SOFTWARE VERSION
2005_01
SWITCH ON BIKE IGNITION
VALIDATE
False
DATA LINK FAULT
RETRY
SERVICE DATA
DEALER 555555
SERVICE DATA
DATE 15/06/05
Main Menu
MAIN MENU
DIAGNOSTICS
CHECK/ADJUST
QUIT
Quit

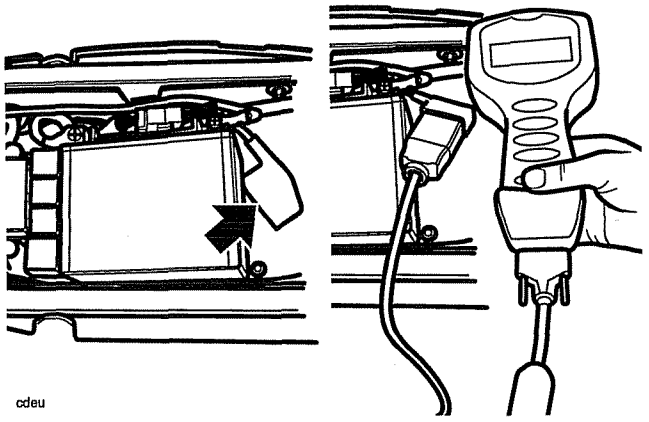

MAIN MENU
DIAGNOSTICS
CHECK/ADJUST
QUIT
Diagnostics
DIAGNOSTICS
CURRENT DATA
FAULT CODES
FUNCTION TESTS
QUIT
Fault codes
Current data
CURRENT DATA
ENGINE SPEED
CALCULATED LOAD
COOLANT TEMPERATURE
SHORT TERM FUEL TRIM
THROTTLE POSITION
INTAKE AIR TEMPERATURE
VEHICLE SPEED
IGNITION ADVANCE
OXYGEN SENSOR OUTPUT VOLTAGE
INTAKE MANIFOLD ABSOLUTE PRESSURE
FUEL SYSTEM STATUS
STOP ENGINE
Error Count
STORED ERRORS
FAULT COUNT 02
IGNITION COIL 1 OPEN CIRCUIT
INJECTOR 3 OPEN CIRCUIT
Starred DTC
STORED ERRORS
FREEZE FRAME DATA
CLEAR DTCS
Freeze frame data
CURRENT DATA
ENGINE SPEED
CALCULATED LOAD
COOLANT TEMPERATURE
SHORT TERM FUEL TRIM
THROTTLE POSITION
INTAKE AIR TEMPERATURE
VEHICLE SPEED
IGNITION ADVANCE
OXYGEN SENSOR OUTPUT VOLTAGE
INTAKE MANIFOLD ABSOLUTE PRESSURE
FUEL SYSTEM STATUS
STORED ERRORS
RETURN TO DTCS
CLEAR DTCS
Return
Clear
STORED ERRORS
ERASE ALL DTC DATA
YES
NO
No
Yes
RESET DTCS


Main Menu
MAIN MENU
DIAGNOSTICS
CHECK/ADJUST
QUIT
Diagnostics
DIAGNOSTICS
CURRENT DATA
FAULT CODES
FUNCTION TEST
QUIT
Function test
TEST DTC COUNT
DTCs present
FUNCTION TEST
DTCS PRESENT CLEAR
BEFORE TEST ACTION
Error Count
Screen
No DTCs present
FUNCTION TEST
INSTRUMENT PANEL
IDLE SPEED CONTROL STEPPER MOTOR
PURGE CONTROL VALVE
FUEL PUMP RELAY
FUEL PUMP OPERATION
COOLING FAN
2ND THROTTLE CONTROL STEPPER MOTOR
Cancel
FUNCTION TEST
"TEST NAME"
PROCEED
CANCEL
Proceed
FUNCTION TEST
TEST NAME
TESTING.....
OBSERVE
TEST DTCS
DTC present
Zero DTCs
FUNCTION TEST
TEST NAME
TEST FAILED P1111
S/C TO VBATT
FUNCTION TEST
TEST NAME
TEST COMPLETE
CLEAR DTC
Yes
FUNCTION TEST
PERFORM ANOTHER TEST
YES
NO
No


Main Menu
MAIN MENU
DIAGNOSTICS
CHECK/ADJUST
QUIT
Check/Change
Check/Adjust menu
CHECK/ADJUST
CHECK
ADJUST
QUIT
Quit
Adjust menu
Adjust
Check
Check menu
CHECK/ADJUST
ADJUST TUNE
UPDATE TUNE
QUIT
Quit
CHECK
READ BUILD DATA
READ SENSORS
READ ADAPTION STATUS
QUIT
Adjust menu
Read sensors
ADJUST
THROTTLE BALANCE
ADAPTION RESET
REPLACE TPS
REPLACE ISC STEPPER
TUNE UPDATE
QUIT
VOLTAGES
THROTTLES/COILS/INJECTORS
OTHER
THROTTLE BALANCE
THROTTLE 1 1234 MM/HG
THROTTLE 2 1234 MM/HG
THROTTLE 3 1234 MM/HG
No
Yes
ADAPTION RESET
CONFIRM Y/N
ECU HAS BEEN RESET
REPLACE PRIMARY TPS
THROTTLE CLOSED
CURRENT VOLTS 0.54 V
Build data
BUILD DATA
VIN
XXXXXXXXXXXX
TRIUMPH ECU PART NUMBER
XXXXXX
KEIHIN ECU PART NUMBER
XXXXXXXXXXXX
ECU SERIAL NO
XXXXXXXXXXX
SOFTWARE VERSION NUMBER
XXXXXXXXXX
DATE OF MANUFACTURE
XXXXXXXXXX
CALIBRATION ID
XXXXXXXXXX
REPLACE ISC STEPPER
THROTTLE CLOSED
CURRENT VOLTS 0.54 V
THROTTLE OPEN
CURRENT VOLTS 0.51 V
Adaption status
ADAPTION STATUS
ECU RESET CLOSED THROTTLE POSITION REF STATUS
IDLE SPEED CONTROL ADAPTION STATUS
02 SENSOR ADAPTION STATUS - OFF IDLE
02 SENSOR ADAPTION RANGE - OFF IDLE
02 SENSOR ADAPTION STATUS - IDLE
02 SENSOR ADAPTION RANGE - IDLE


Main menu
MAIN MENU
DIAGNOSTICS
CHECK/ADJUST
QUIT
Check/Adjust
Check/Adjust menu
CHECK/ADJUST
ADJUST TUNE
UPDATE TUNE
QUIT
Quit
Update tune
UPDATE TUNE
???????
TEST PASSWORD
Pass
Fail
SECURITY
ACCESS DENIED
UPDATE TUNE
SELECT MODEL
SPEED TRIPLE
SPEED TRIPLE
TUNE XXXXX
TUNE XXXXX
TUNE XXXXX
UPDATE TUNE
TUNE XXXX
CONFIRM
CANCEL
QUIT
Confirm
Cancel
UPDATE TUNE
DOWNLOADING.....
10% COMPLETE
DOWNLOAD OK?
Yes
No
UPDATE TUNE
DOWNLOAD COMPLETE
UPDATE TUNE
DOWNLOAD FAILED

1. Connection and Power-Up



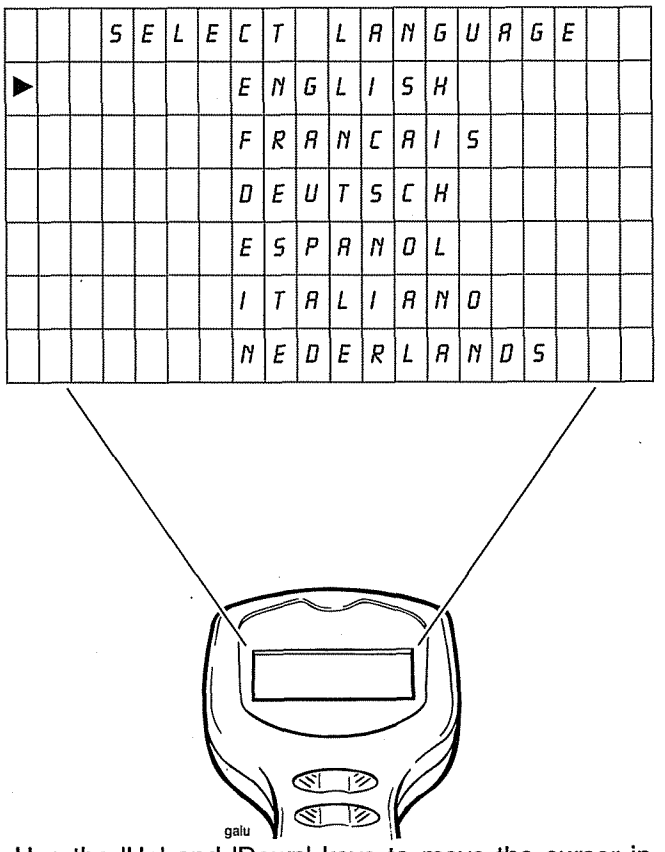
1. Connection to Main Harness (arrowed)

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



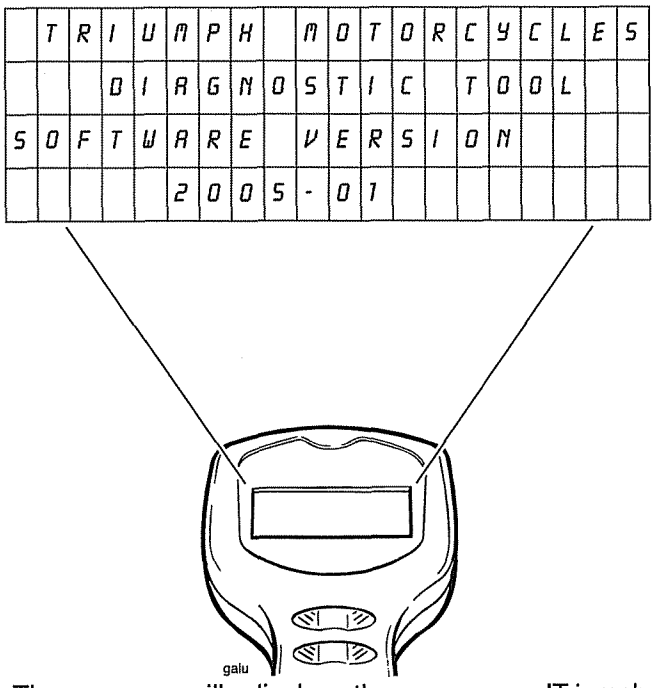
Use the 'Up' and 'Down' keys to move the cursor in column 1 and select the language required.

Note:

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

Press the validation key '*' to move on.

3. TRIUMPH MOTORCYCLES

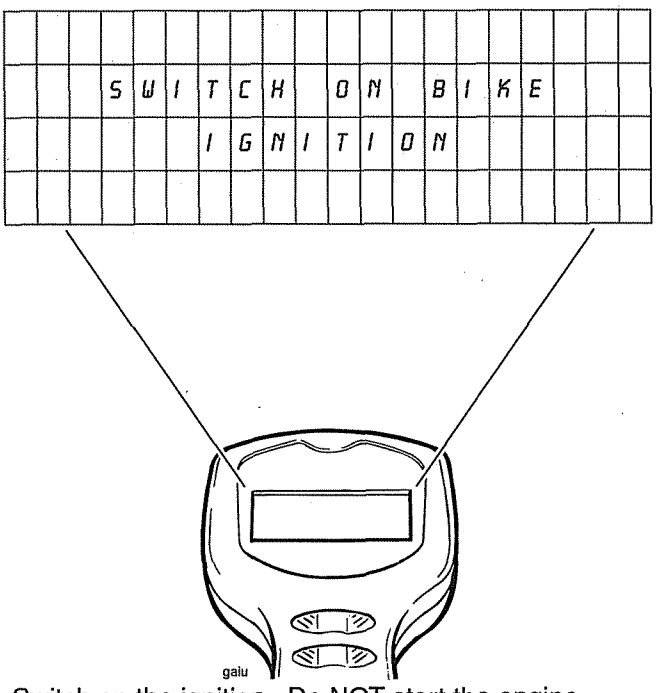


The screen will display the message 'Triumph Motorcycles Diagnostic Tool' and will also give the diagnostic software version and the software release year.

Press the validation key '*' to move on.

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

4. SWITCH ON BIKE IGNITION



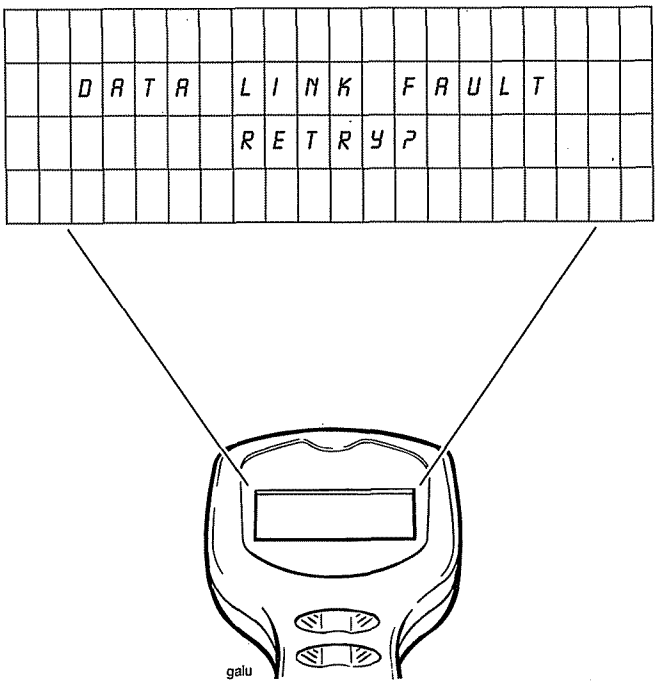
Switch on the ignition. Do NOT start the engine.

Press the validation key '*'. During a short delay period the tool will carry out certain validation checks.

If it detects a problem which will invalidate the test, **'DATA LINK FAULT RETRY?'** will be displayed.

If all is OK, **'SERVICE DATA'** will appear on the screen.

5. DATA LINK FAULT RETRY?



If the above is displayed, check that the ignition is switched on.

If the ignition is already on, the problem may be caused by bad connections, faulty ignition switch, cable break, faulty ECM, flat battery etc.

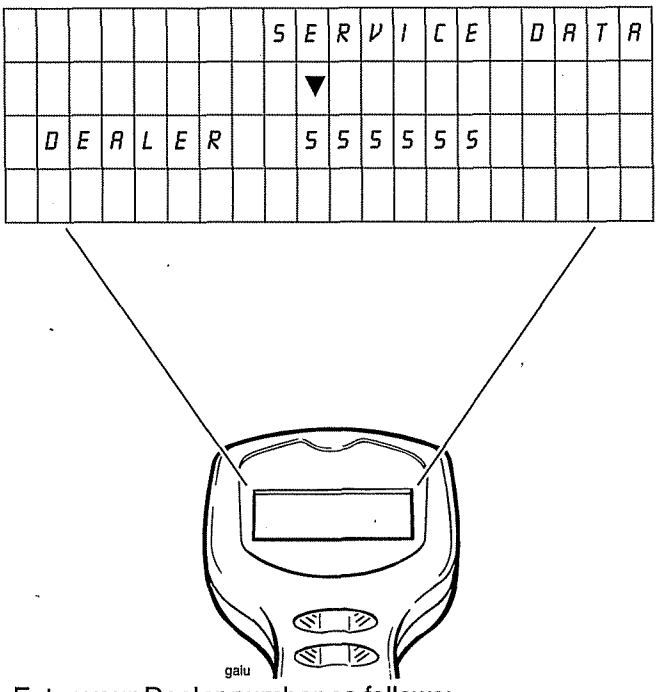
Press the **Help** key **'?'** for advice.

Rectify the problem and press the Validation key '*' to return to **'SWITCH ON BIKE IGNITION'**.

Press the Validation key '*' again. If the tool accepts that the problem has been rectified, **'SERVICE DATA'** will be displayed.

This is the first of 2 screens for which the operator has to input information, without which the testing cannot proceed further.

6. SERVICE DATA - DEALER



Enter your Dealer number as follows:

The number **'555555'** is displayed, with the cursor pointing down at the first digit.

Press the 'Up' or 'Down' keys to change this digit to the first digit of your dealer code.

Press the Validation key '*'.

The cursor will now re-position over the second digit '5'. Enter the 2nd digit of your Dealer number in the same way.

Continue until all 5 digits of your dealer code have been entered.

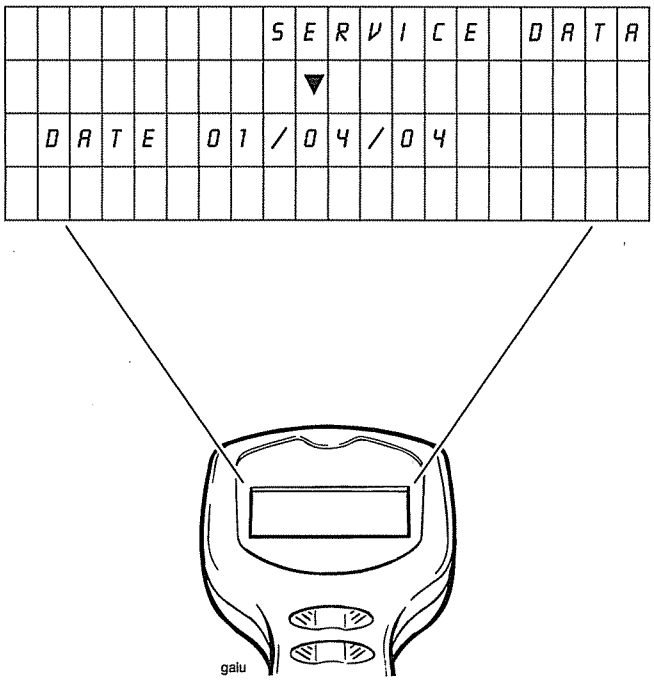
Note:

- **If any digit has been entered incorrectly, press the 'Return' key (↵) to start again.**

When all 5 digits have been entered correctly, press the Validation key '*'.

You must enter a valid Dealer Number to continue. If you do not know your dealer number, contact Triumph or your importer for advice.

7. SERVICE DATA - DATE



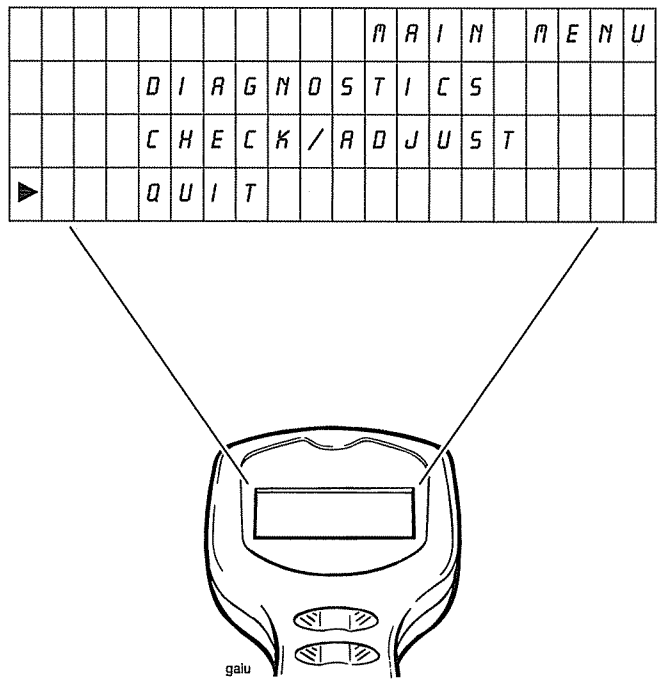
Enter the date using the 'Up' and 'Down' keys in the same way that the Dealer number was entered.

Note:

- **6 digits must always be entered, e.g. if it is the 7th month this must be entered as 07.**
- **The date must be entered in the order Day/ Month / Year.**

When complete, press the Validation key '*' to display **'MAIN MENU'.**

8. MAIN MENU



When this screen is displayed, you have to decide whether to proceed along one of two routes:

- 'DIAGNOSTICS'
- 'CHECK/ADJUST'

The **'DIAGNOSTICS'** menu provides access to:

Current data e.g. actual engine temperature, engine speed etc.

Diagnostic Trouble Codes (DTC's) i.e. access to codes stored in the motor cycle ECM which indicate a confirmed fault(s) in the system.

Function tests e.g. of tachometer, water temperature gauge, fuel pump etc.

The **'CHECK/ADJUST'** menu provides:

Checks i.e. build information, system data.

Adjustments e.g. adjustment of idle fuel/CO etc., and entry of software updates.

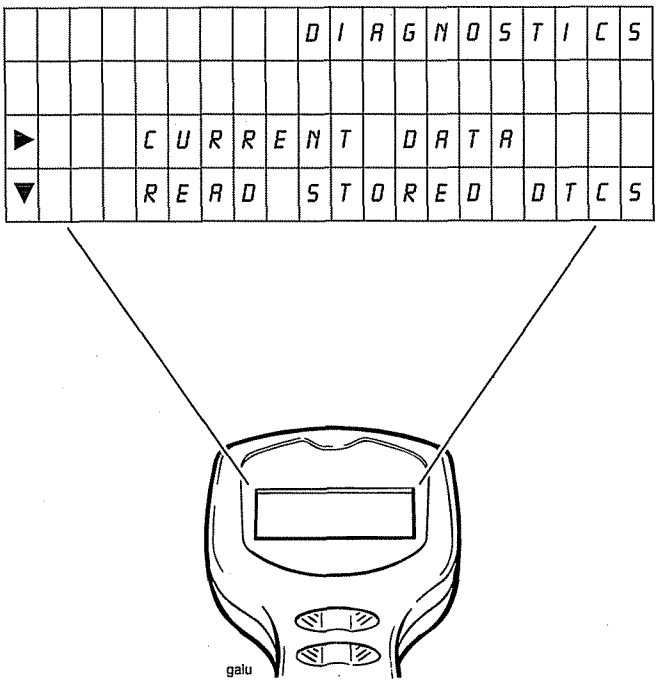
Use the `Up and Down' keys to position the cursor opposite the desired choice, and press the Validation key '*'.

Either **'DIAGNOSTICS'** (operation *9.*) or **'CHECK/ ADJUST'** (operation *27.*) will be displayed, dependent on the selection.

Note:

- **If 'QUIT' is selected and the validation key '*' pressed, the display will return to 'TRIUMPH MOTORCYCLES'.**

9. DIAGNOSTICS *(If 'DIAGNOSTICS' is selected)*



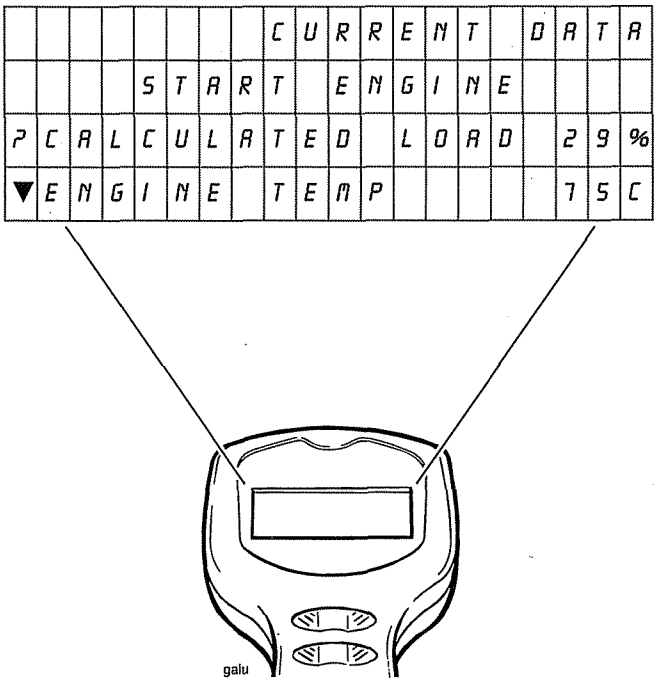
This display is the **'DIAGNOSTICS'** menu.

Use the 'Up' and 'Down' keys to scroll the text until the horizontal arrowhead is positioned opposite the desired choice, and press the Validation key '*'.

The choices are:

- **'CURRENT DATA'** (see operation *10.*)
- **'READ STORED DTCS'** (see operation *12.*)
- **'CLEAR DTCS'** (see operation *17.*)
- **'FUNCTION TESTS'** (see operation *18.*)
- If **'QUIT'** is selected, the display will return to **'TRIUMPH MOTORCYCLES'**.

10. CURRENT DATA



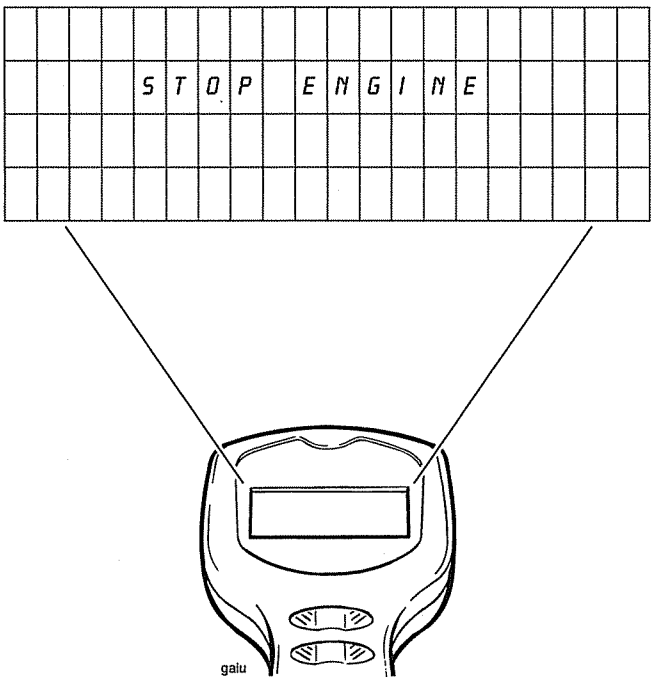
Start the engine. **'CURRENT DATA'** includes the information shown in the table below which can be accessed by scrolling, using the 'Up' and 'Down' keys. At the end of each line of text, the actual reading at that instant is provided to assist diagnosis e.g. **ENGINE TEMP - 75C.**

For a complete list of the items reported, see the table titled 'CURRENT DATA' earlier in this section.

If further clarification of any line of displayed text is required, scroll that line opposite the **'?'** symbol in the left hand column and press the **Help** key (**?**). Limited information on the selected topic will then be displayed.

Press any key to return to the **'CURRENT DATA'** text. When all information has been noted, press either the Validation '*' or Return (↵) keys.

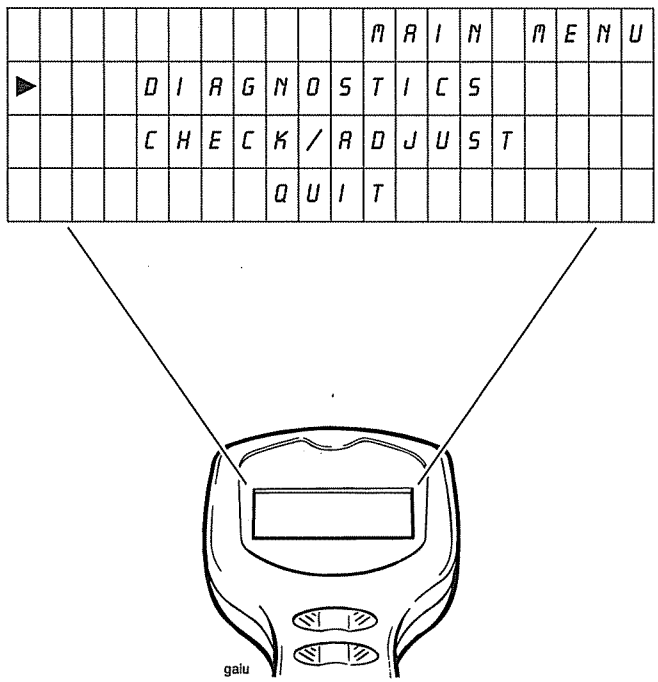
11. STOP ENGINE



Switch off the engine.

As the tool is powered from the motorcycle, this will end the diagnostic session. To continue, return to the power-up section and select tests as required.

12. To select 'READ STORED DTCS' (Diagnostic Trouble Codes) from the MAIN MENU:



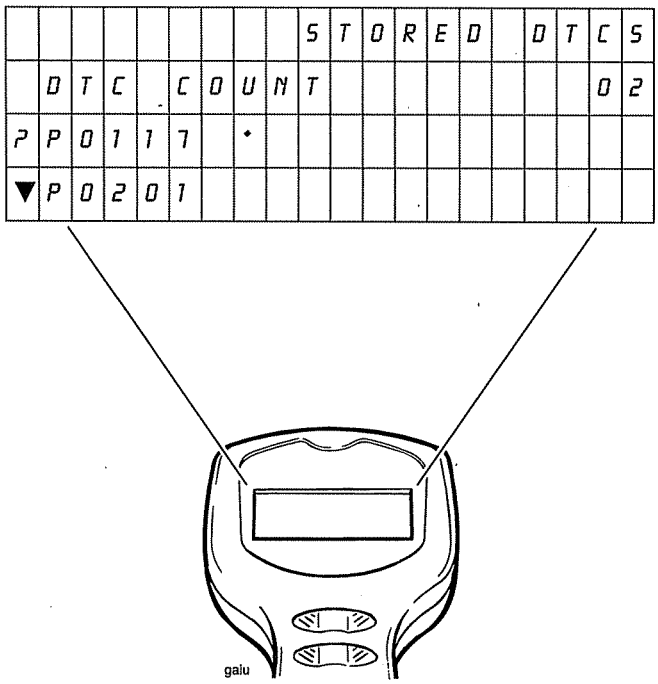
Use the 'Up' and 'Down' keys to position the cursor opposite **DIAGNOSTICS**.

Press the Validation key '⁎' to display **'DIAGNOSTICS'** menu.

Select **'READ STORED DTCS'**, and press the Validation key '⁎'.

'STORED DTCS' will be displayed.

13. STORED DTCS



The second line - **'DTC COUNT',** shows the number of DTC's stored in the ECM memory.

Lines 3 and 4 display up to two of the DTC'S stored (if any). If additional DTC'S are stored, this will be indicated by a downward pointing arrowhead, and it/ they can be accessed using the 'Up' and 'Down' keys.

If there are no DTC's shown, press the Return key (↵) to return to **MAIN MENU.**

(If DTC's are present when the Return key is pressed, display will read **'STORED DTCS, ERASE ALL DTC DATA YES/NO'**).

Information about each DTC can be obtained by scrolling the text until the appropriate code is opposite the **'?'** in line 3; then press the **Help** key (**?**).

DTC example: *P0117*

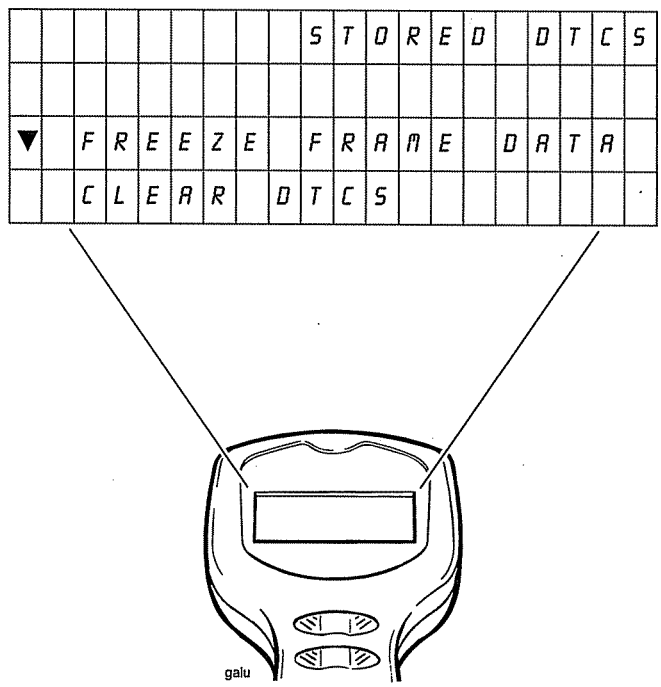
Help text *MAP SENSOR LOW VOLTAGE*

Press the Validation key '*' to continue (operation *14.*).

IMPORTANT:

If a DTC has an asterisk (*) to its right, this indicates that a snap shot of engine data at the time the DTC was stored is available to aid your fault diagnosis. To access this information, press the Validation key '*' to go to operation *14.* and open **'FREEZE FRAME DATA'.**

14. Three options are now available:

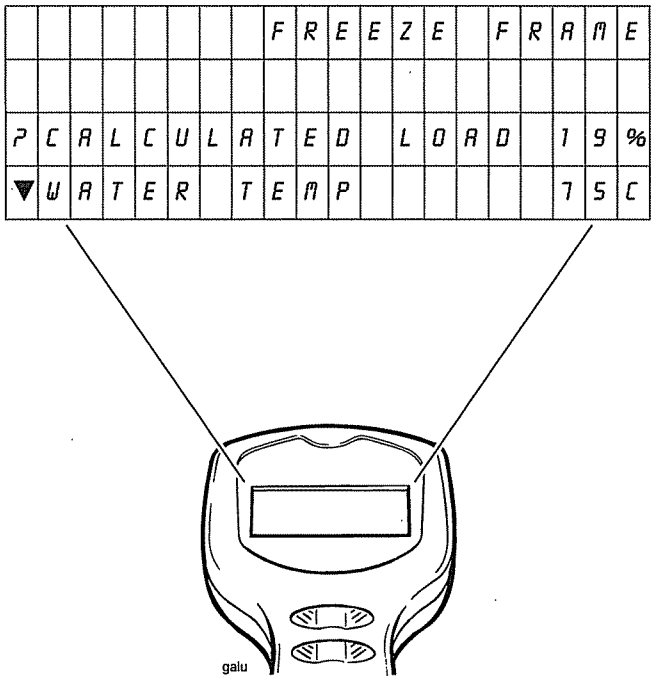


Align **'FREEZE FRAME DATA'** with the cursor, and press the validation key '*' to display **'FREEZE FRAME'** (see *15.*).

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

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

15. FREEZE FRAME

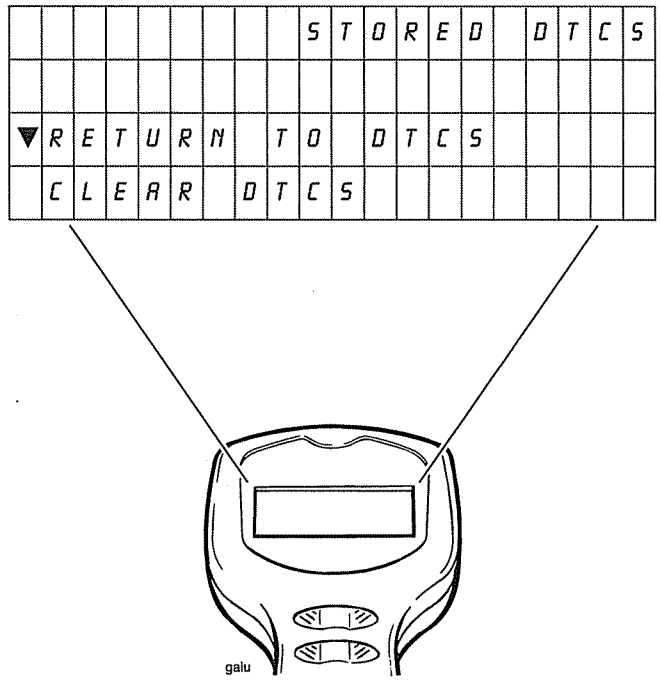


When a fault occurs which causes a DTC to be stored in the memory, the engine condition data at that instant is logged in the ECM. If another, more serious DTC is subsequently set, the original DTC data is automatically erased and new data associated with the latest DTC is logged in its place.

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

For a complete list of the items reported, see the table titled **'FREEZE FRAME DATA'** earlier in this section.

16. STORED DTCS



2 options are now available:

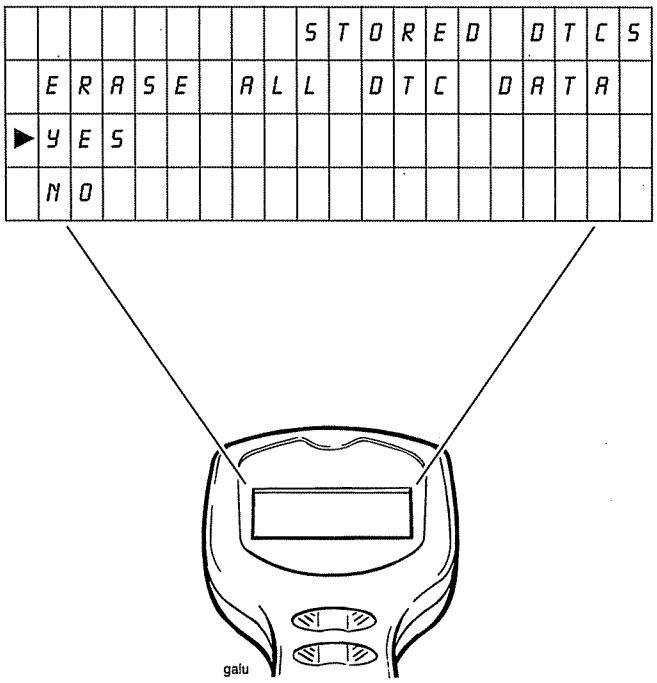
Scroll to **'RETURN TO DTCS'** and press the Validate key '*' to return to operation *13.*

Scroll to **'CLEAR DTCS'** and press the Validation key '*' to go on to operation *17.*

Note:

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

17. STORED DTCS, ERASE ALL DTC DATA



Scroll to position either **'YES'** or **'NO'** opposite the cursor.

If **'YES'** is selected, press the Validation key '⁎' to erase all DTC data from the memory. **'MAIN MENU'** will then be displayed.

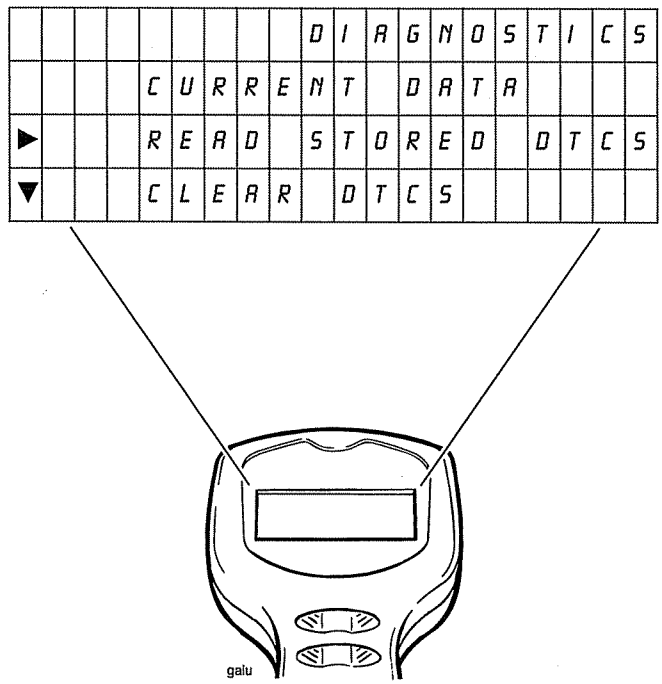
Note:

- **If you intend to examine the Function Tests, entry will be inhibited unless the DTC's have been erased.**

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

That completes the DTC cycle.

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



Use 'Up' and 'Down' keys to select **'DIAGNOSTICS'** menu.

The following choices are available.

Press the Validation key '⁎'. **'DIAGNOSTICS'** will be displayed.

Select **'FUNCTION TESTS'**, and press the Validation key '⁎'.

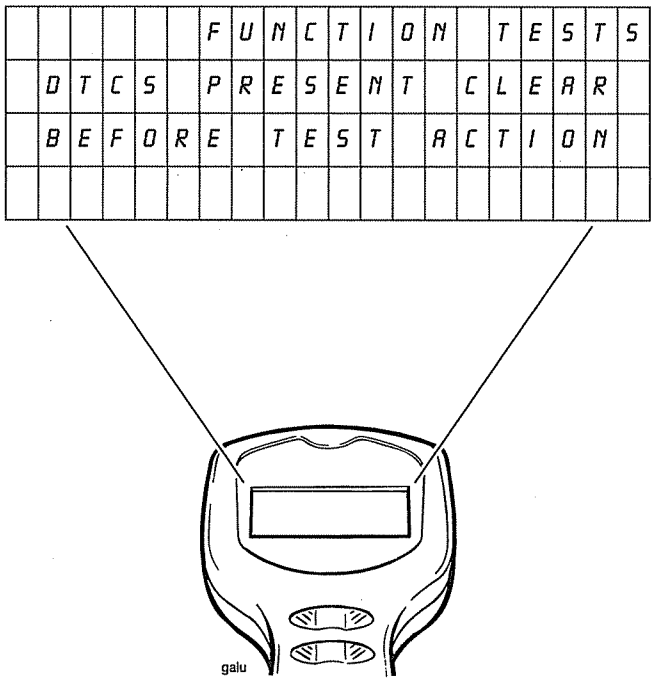
If no DTC'S are stored, `**FUNCTION TEST'** will be displayed (see operation *20.*).

If one or more DTC'S are stored, the message **'DTCS PRESENT CLEAR BEFORE TEST ACTION'** will be displayed (see operation *19.*).

Note:

- **The diagnostic tool will not allow Function Tests to be accessed until all DTC's in the memory are removed.**

19. FUNCTION TESTS



To clear the DTC's, press the Validation key '*'. **'STORED DTCS'** will be displayed (see operation *13.*).

Proceed as before via operations *14.* to *17.* Scroll to **'YES'** and press the Validation key '*' to erase all DTC data; the **MAIN MENU** will be displayed again.

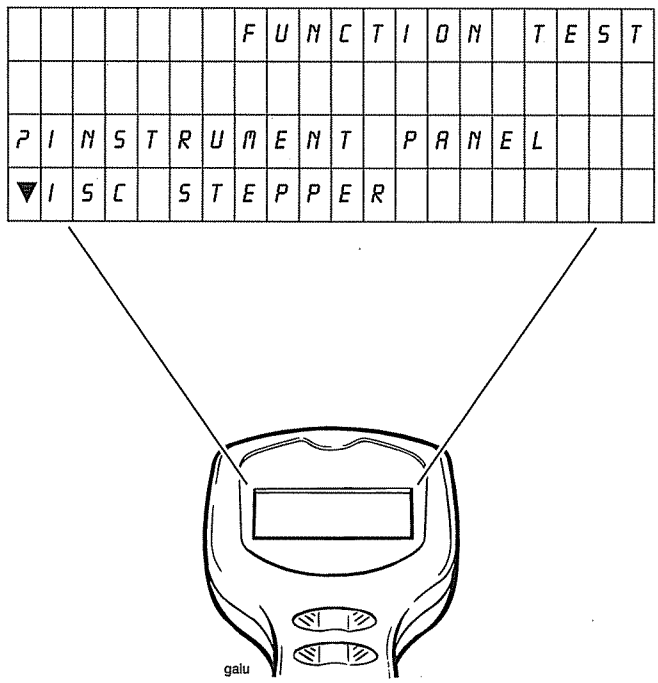
Note:

- **The fault(s) which caused the DTC's to be set must be rectified and cleared before continuing the Function Tests.**
- **A full list of all the possible DTCs can be found earlier in this section.**

Select **'DIAGNOSTICS'** menu and **'FUNCTION TESTS'** again pressing the Validation key '*' each time.

Because the DTC's have now been erased, **'FUNCTION' TEST'** (operation *20.*) will now be displayed.

20. FUNCTION TEST



The following can be tested:

a) Instrument panel.
b) Idle speed control stepper.
c) Purge valve.
d) Fuel pump prime.
e) Cooling fan operation.
f) Fuel pump operation.

If the fault is electrical, this will then be reported as a DTC.

Instrument Panel test: A signal is sent which should cause the tachometer to read approximately 7,500 RPM, the water temperature gauge to show 100°C* and the speedometer 100 km/h*, all for 10 seconds.

Idle speed control stepper: A signal is sent which should cause the stepper to be driven to the fully closed position, then to the fully open position, pausing briefly in each position. DTCs are set if a malfunction is found.

* Or the imperial equivalents.

Purge valve (California models only): This test allows you to check operation of the valve. To detect valve operation, use a stethoscope to listen for valve operation. DTCs are set if a malfunction is found.

Fuel pump prime: This test provides you with the means to physically check the pump and relay operation. DTCs are set if a malfunction is found.

Cooling fan test: A signal is sent which should cause the fan to operate for a 10 second period. DTCs are set if a malfunction is found.

Fuel pump operation: This test provides you with the means to physically check the pump operation. DTCs are set if a malfunction is found. The pump is energised when the test is confirmed and ended when the Validation key '⁎' is pressed for a second time.

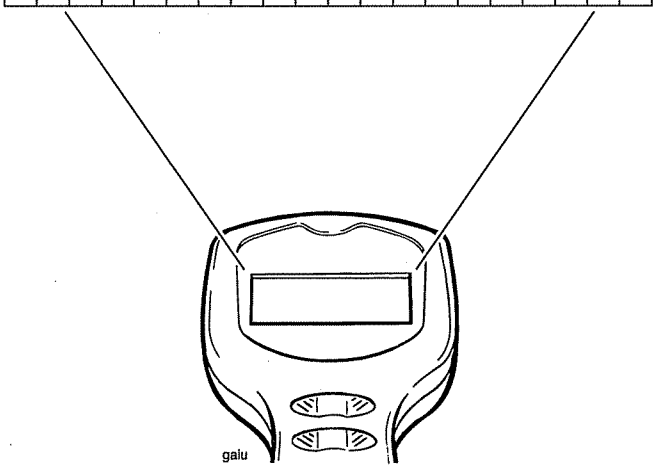
Press the **Help** key (**?**) for more information.

Note:

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

21. FUNCTION TEST

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



The function selected at operation *20.* will now show on line 2. To show an example of this, we have chosen the **'INSTRUMENT PANEL'** test.

If you press the **Help** key (**?**). help relating to the specific test will be given. In this example, the screen will now read

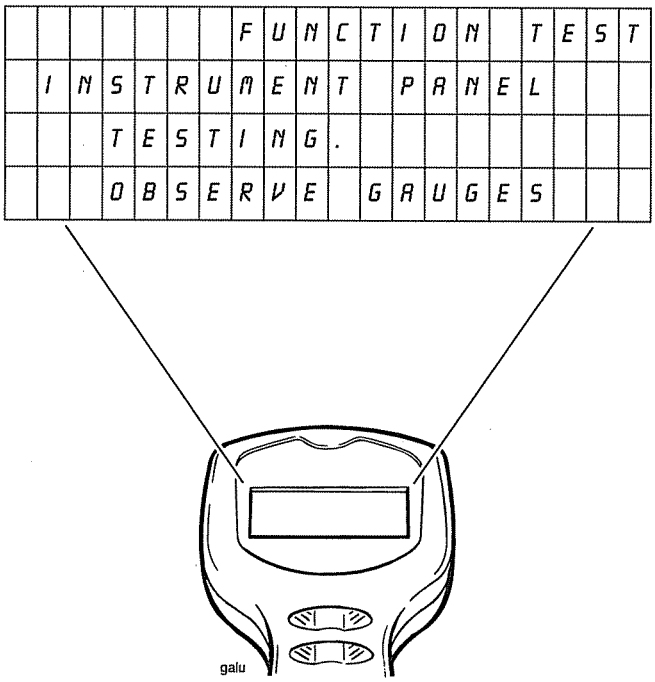
- TACHOMETER - 7500 RPM.
- TEMP GAUGE - not fitted, test will illuminate High Temp warning light.
- SPEEDOMETER - 100 km/h*.

* Or the imperial equivalents.

If you wish to cancel that selection, scroll to **'CANCEL'** and press the Validation key '⁎'. The display will return to operation *20.*

If you wish to test the component selected, scroll to **'PROCEED'** and press the Validation key '⁎'.

22. FUNCTION TEST

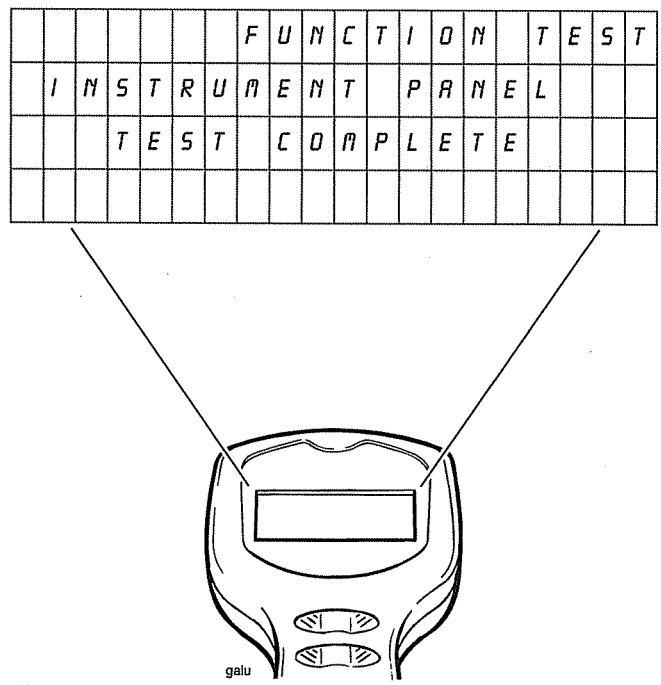


The screen now displayed will be specific to the component being tested:

In the example selected - **'INSTRUMENT PANEL'**, the instruction is to observe the gauges.

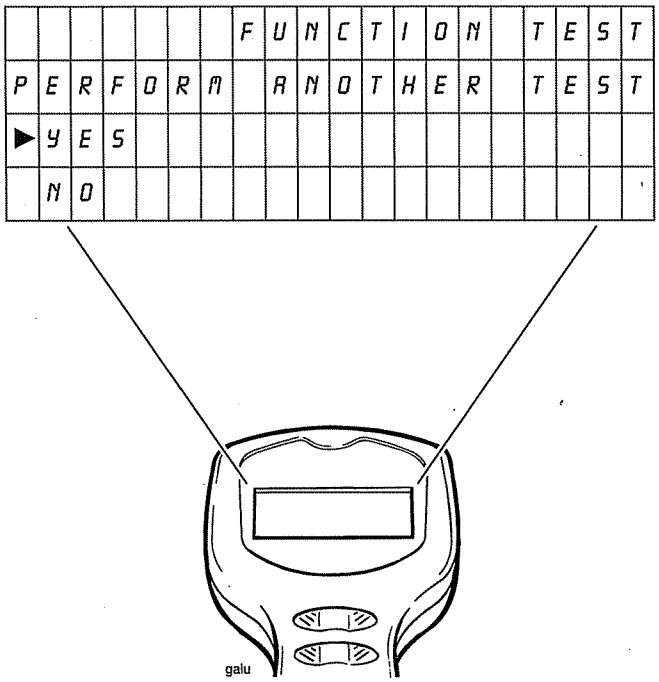
After a period of time, the screen will automatically change to either **'TEST COMPLETE'** (see operation *23.*) which will indicate a satisfactory completion, or to **'TEST FAILED'** (see operation *25.*) which will indicate failure.

23. FUNCTION TEST



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

24. FUNCTION TEST

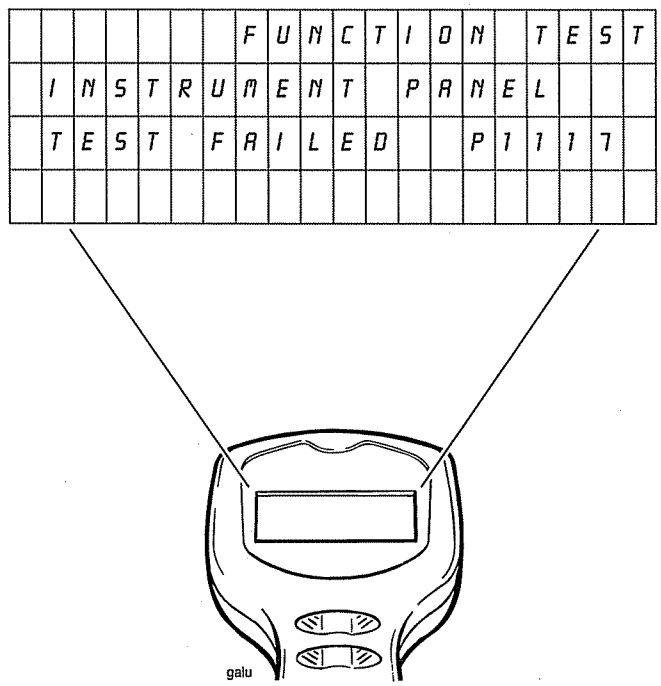


This display allows you to decide whether you wish to test another component.

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

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

25. FUNCTION TEST



If the test selected at operation *22.* is unsatisfactory, a DTC will be displayed on line 3 of this display.

Press the Help key (**?**) to access the diagnosis information associated with that code.

Press the Validation key '⁎' if you wish to test another component (operation *24.*).

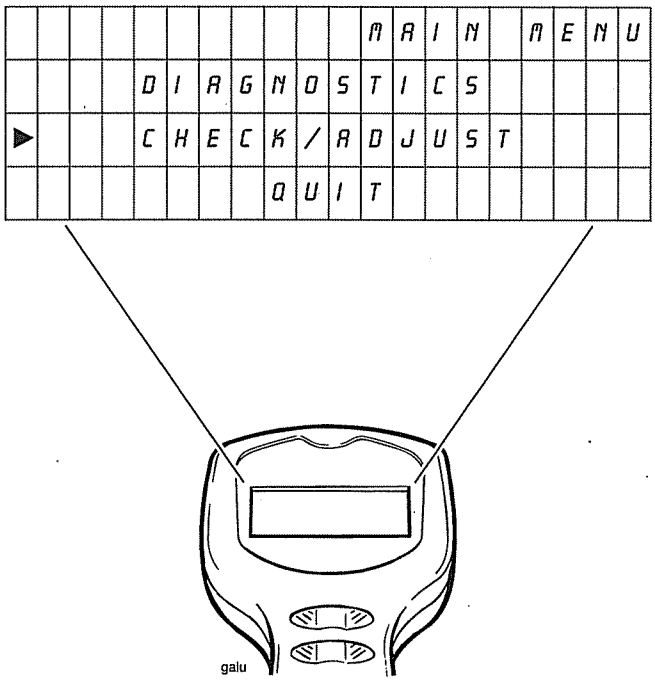
Note:

- **Any DTC's logged in the system will be automatically cleared at this point.**

To return to the **'DIAGNOSTICS'** menu, Select **'QUIT'** and press the Validation key '⁎' to return to the **'MAIN MENU'** (operation *8.*).

That completes the **FUNCTION TESTS** cycle.

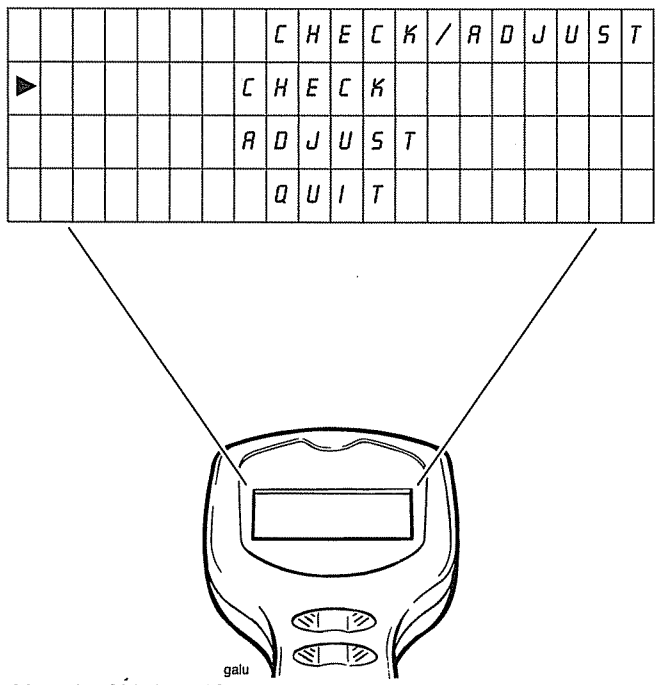
26. To select 'CHECKS/ADJUSTMENTS' from the MAIN MENU (operation *8.*):



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

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

27. CHECK/ADJUST



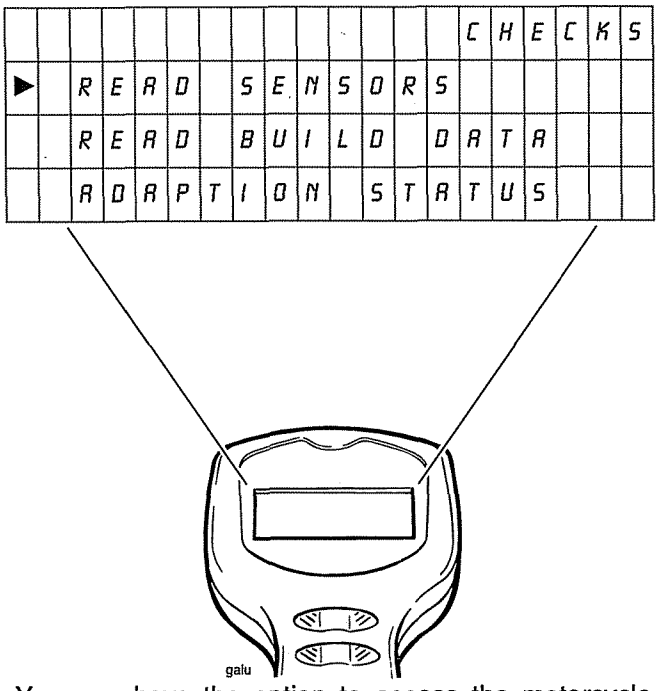
Use the `Up' and `Down' keys to position the cursor as follows, and then press the Validation key '*':

Opposite **'CHECK'** - **'CHECKS'** will be displayed (operation *28.*).

Opposite **'ADJUST'** - **'ADJUST'** will be displayed (operation *32.*).

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

28. CHECKS



You now have the option to access the motorcycle **'BUILD DATA'** or the **'SYSTEM DATA'**, or to quit.

Position the cursor as follows and then press the Validation key '*':

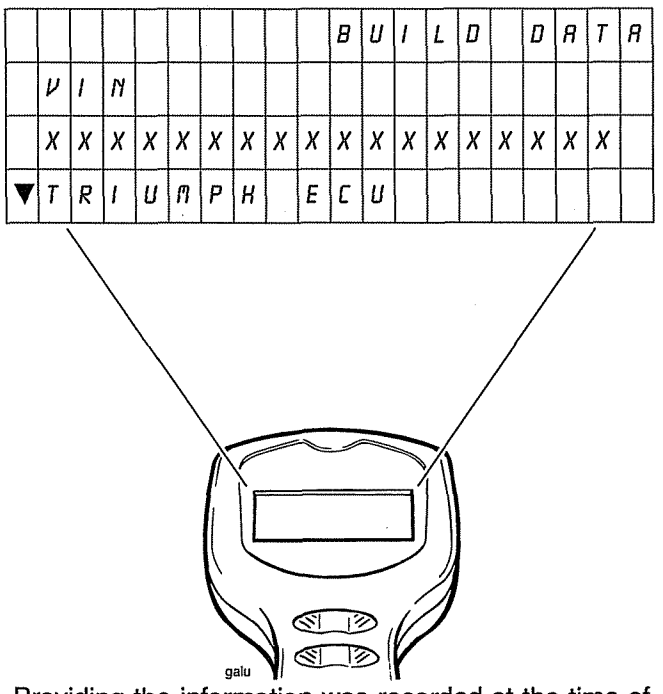
Opposite **'READ SENSORS'** - **'SENSOR DATA'** (operation *30.*) will be displayed.

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

Opposite **'ADAPTION STATUS'** - **'ADAPTION DATA'** (operation *31.*) will be displayed if the coolant temperature is higher than 90°C. If not, a holding screen will be displayed indicating the current temperature.

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

29. BUILD DATA

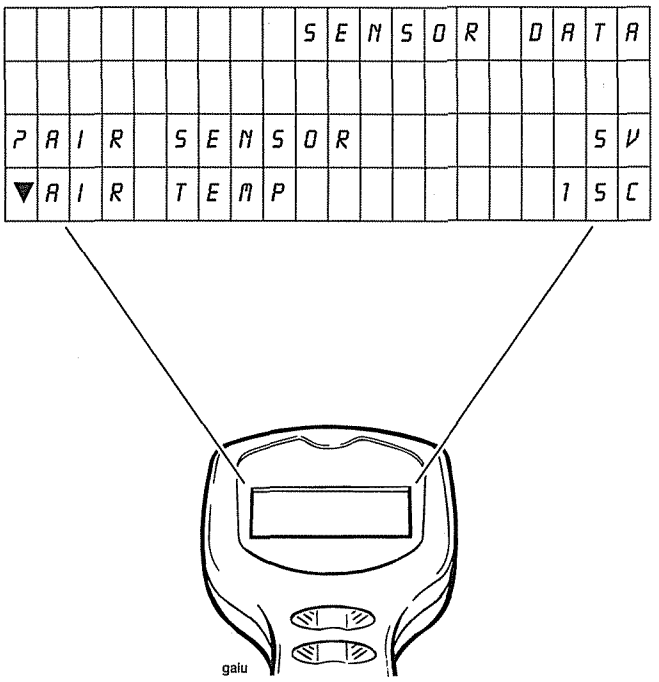


Providing the information was recorded at the time of build, the display will show the following information relating to the motorcycle under test by scrolling up and down. Before displaying the recorded information, the tool will briefly display the message, **'PLEASE WAIT, CHECKING BUILD DATA'.**

- Vehicle Identification Number (VIN)
- Triumph ECM part number
- Manufacturer's ECM part number
- ECM Serial number
- Tune Number

Press the Validation '*' keys to return to **'CHECK/ ADJUST'** menu (operation *27.*).

30. SENSOR DATA



The display can be scrolled to show:

The status of the various sensors and actuators

To obtain further data information, scroll the appropriate line to the help key mark (**?**) and press the Help key.

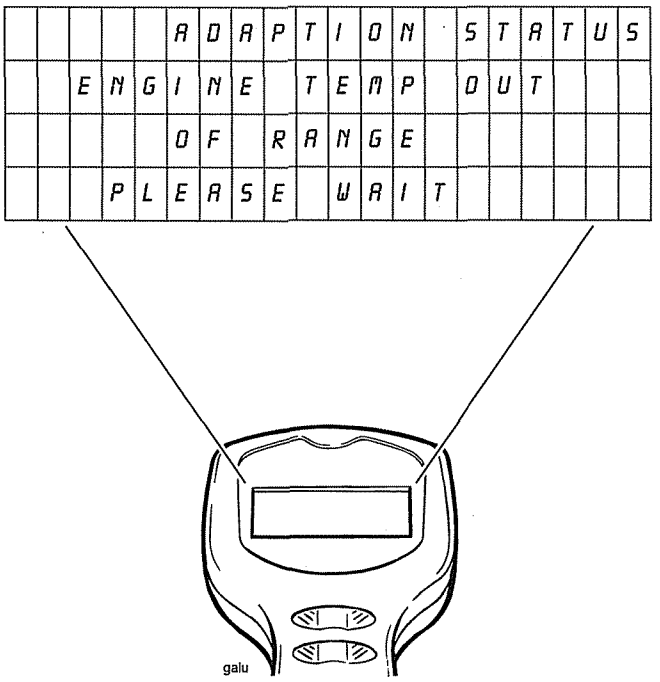
Note:

- **The help information shows the likely range of readings for a correctly functioning system at normal operating temperature.**

That completes examination of the Checks.

Press the Validation key '*' to return to **'CHECK/ ADJUST'** (operation *27.*).

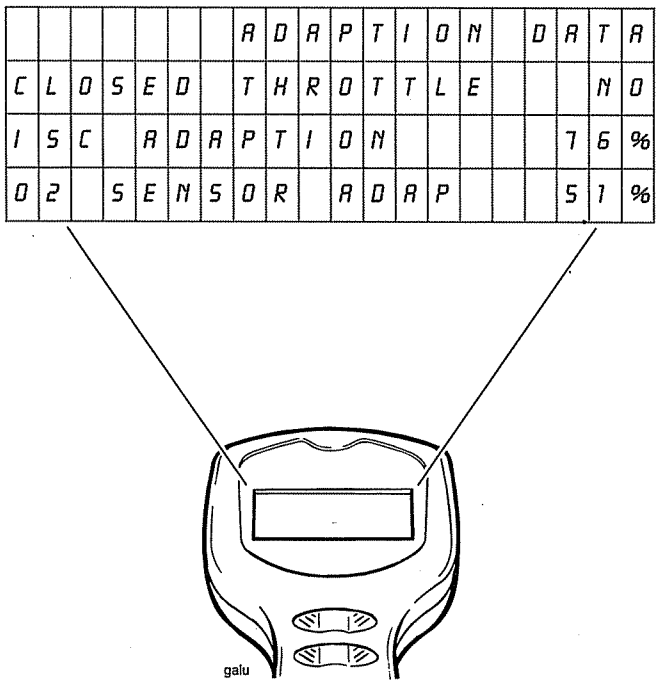
31. ADAPTION STATUS



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

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

Once the correct temperature range has been reached, the **ADAPTION STATUS** screen (operation *32.*) will automatically be displayed.



The display can be scrolled to show:

The adaption status of the various sensors and actuators involved in the adaption process will give an indication as to whether or not the vehicle is correctly adapted. If the readings show an incorrect adaption status, refer to the table of contents for the location of further information and the actions necessary to force correct adaption.

See page *10-24* for additional information on forcing adaption.

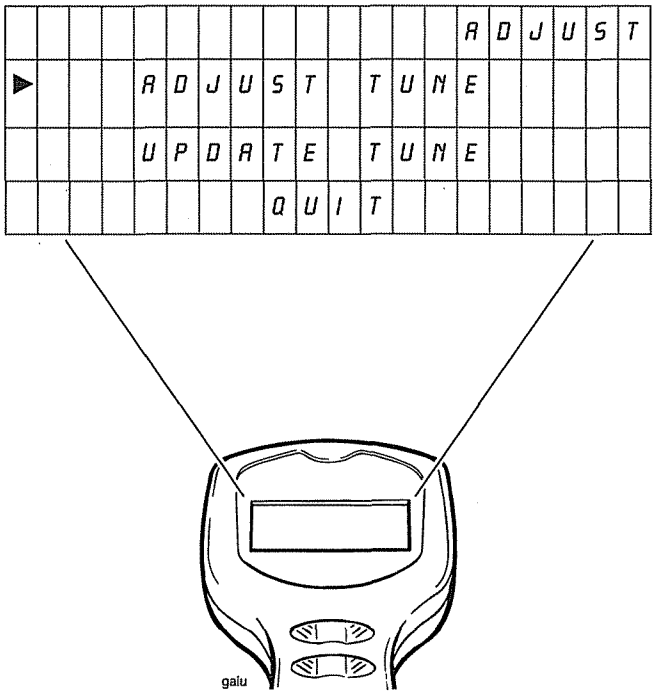
The data displayed under this option are:

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

Note:

- **Several forced adaptions may be needed to fully adapt an individual motorcycle.**

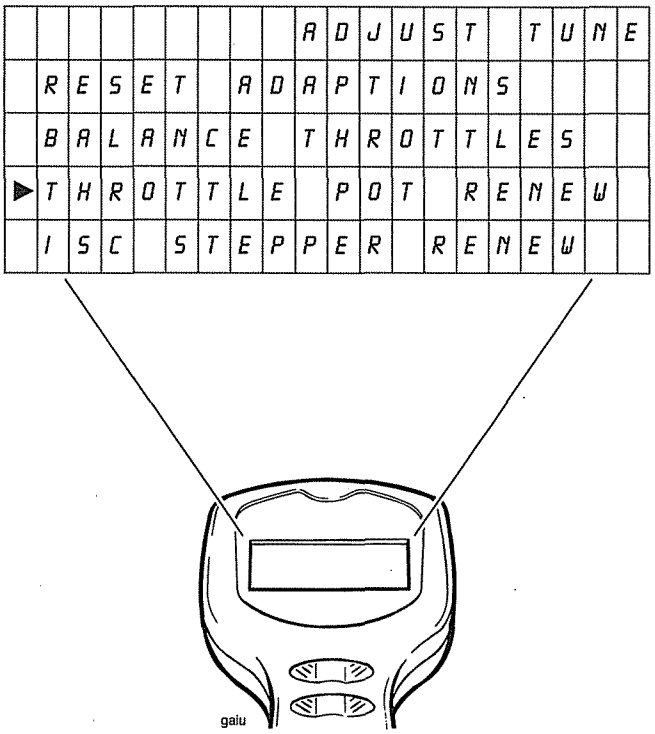
32. ADJUST



Position the cursor on line 2 '**ADJUST TUNE**' if you wish to check and/or adjust the values of certain tune items. Then press the Validation key '*' to display **ADJUST TUNE** (see operation *33.*).

In special circumstances, Triumph will request you to introduce a completely new engine tune. Given this situation, select '**UPDATE TUNE**' and press the Validation key '*' (see operation *36.*).

33. ADJUST TUNE



The following allow adjustments to be made to items which affect the engine operation

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

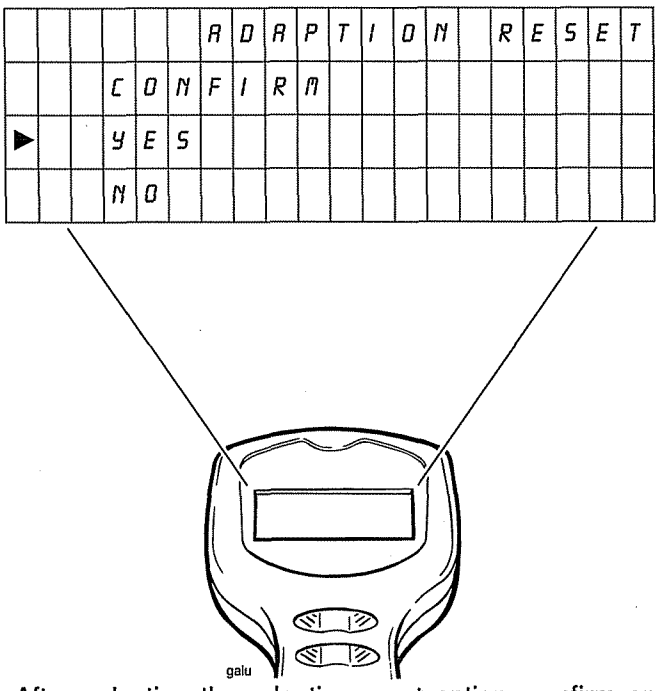
RESET ADAPTIONS. - See operation *34.*

BALANCE THROTTLES. - See operation *35.*

THROTTLE POT RENEW. - See page 8-102 for details on when and how to use this function.

IDLE SPEED CONTROL STEPPER RENEW - See page 8-106 for details on when and how to use this function.

34. ADJUST TUNE (adaption reset)



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

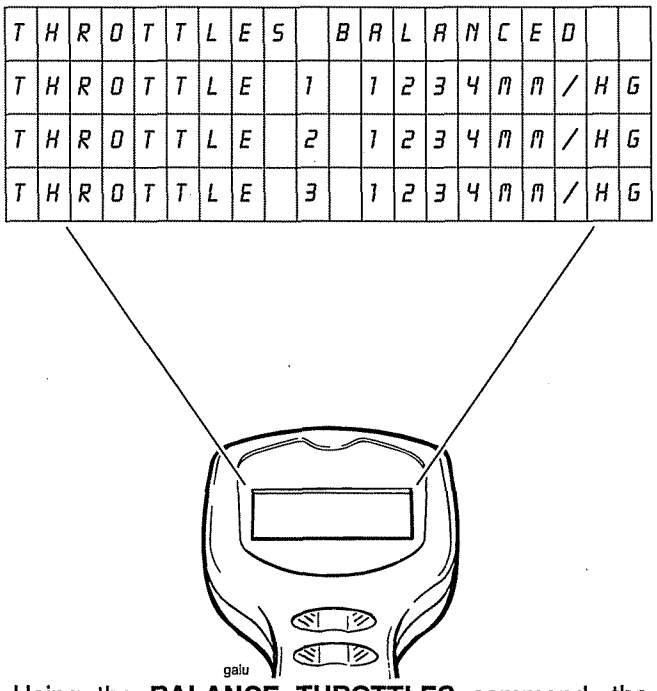
If YES is chosen, a screen will confirm that adaptions have been reset.

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

Note:

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

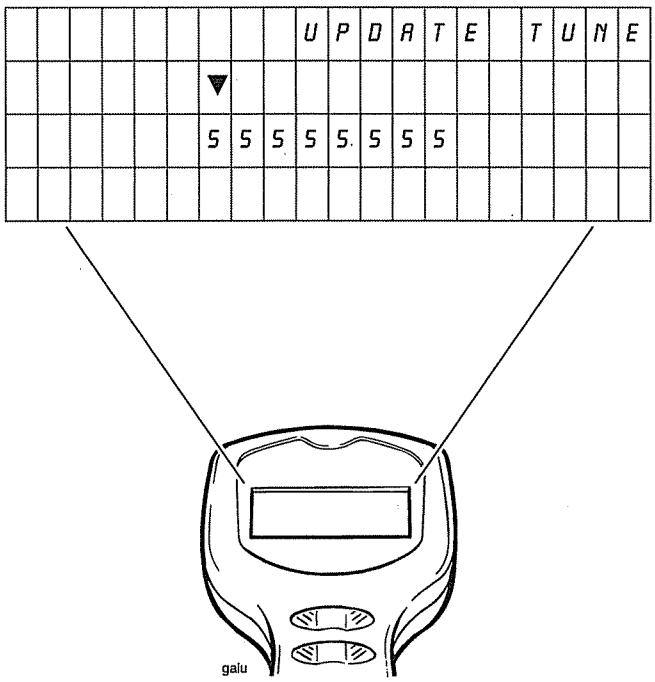
35. BALANCE THROTTLES



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.

36. UPDATE TUNE



(Accessed from operation *32.*). On receipt of special instructions from Triumph you may be asked to input a completely new engine tune.

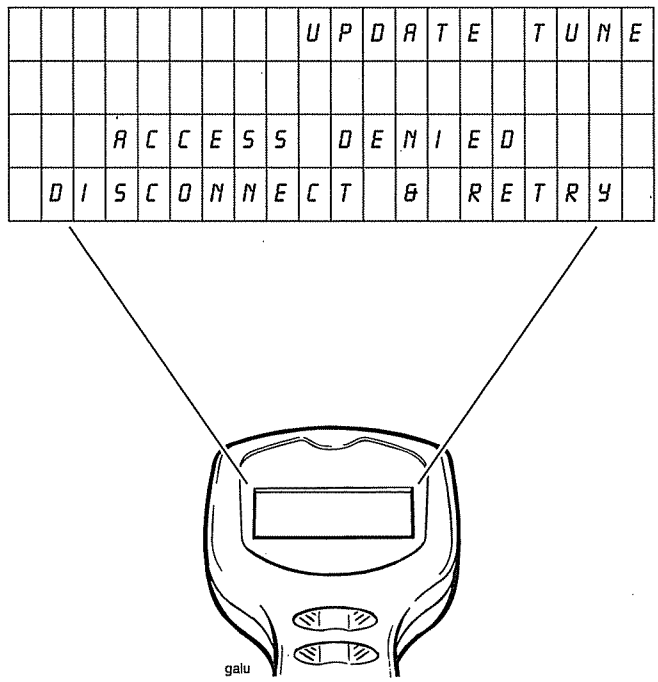
To do this, they will give you a password number which must be entered using the 'Up' and `Down' keys in the same way as was done to enter your dealer code number.

After entering the final digit, press the Validation key '*' again.

If the password number entered is invalid, the screen shown in operation *36.* will be displayed.

If the password number is valid, the tool will briefly display the message, **'PLEASE WAIT, CHECKING ECM TYPE'** then, **'UPDATE TUNE'** (operation *37.*) will be displayed.

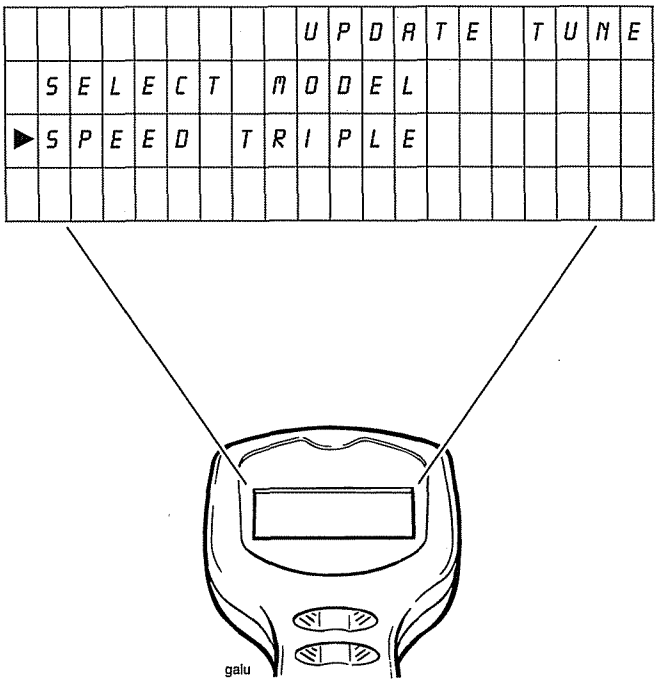
37. UPDATE TUNE



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

If after a second attempt the entry is still invalid, the screen will display **'ACCESS DENIED DISCONNECT AND RETRY'**. The diagnostic tool must be disconnected and the complete procedure re-started.

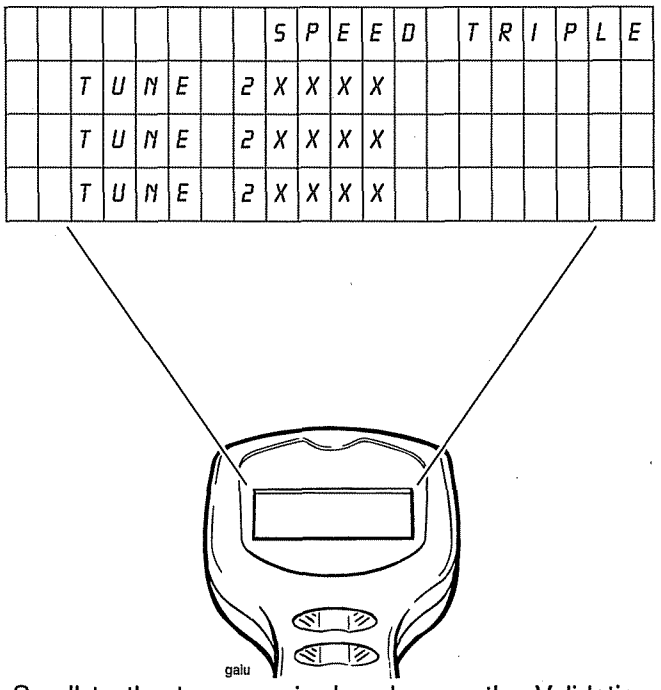
38. UPDATE TUNE



Align the cursor with the model to which a tune is to be downloaded and, when satisfied that the selection is correct, press the validation key '*'.

Once a model has been selected and the validation key pressed, screen *38.* will be displayed.

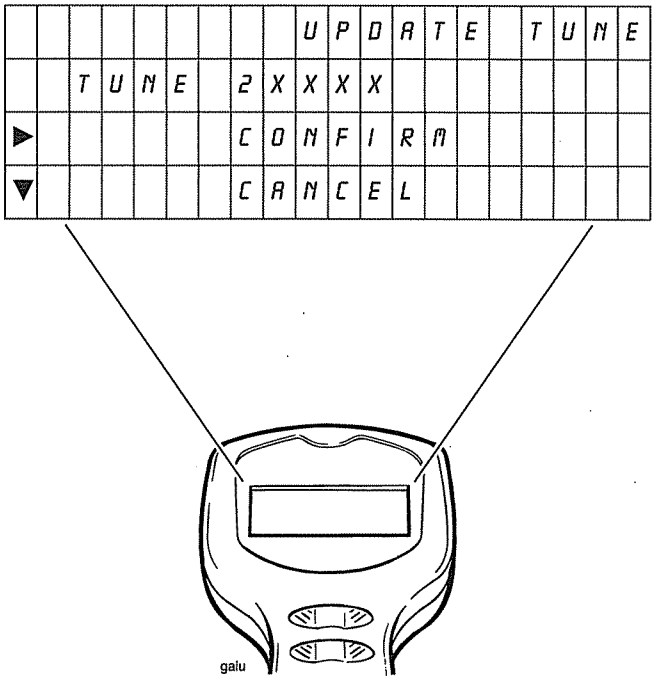
39. UPDATE TUNE



Scroll to the tune required and press the Validation key '*' to move on to operation *39.*

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

40. UPDATE TUNE



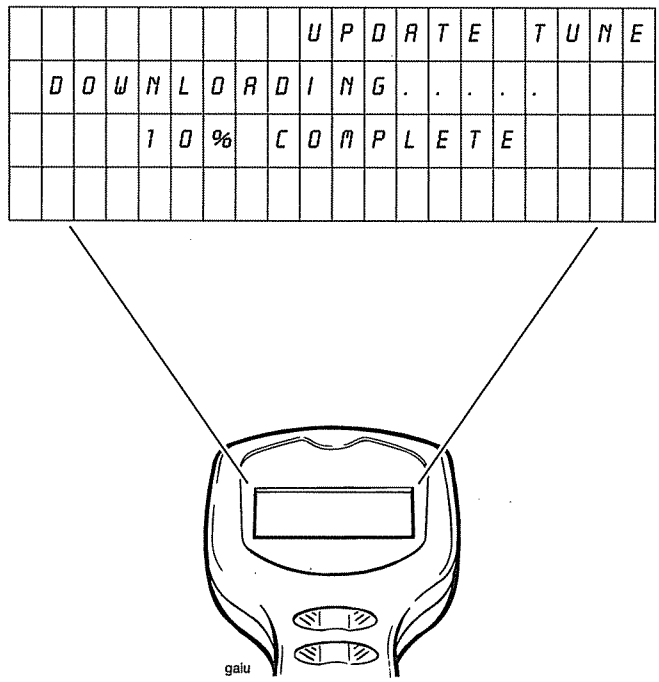
Scroll to either '**CONFIRM**', '**CANCEL**' or '**QUIT**' (quit option will not be visible until the text has been scrolled) then press the Validation key '⁎'.

If '**QUIT**' has been selected - this will return to **MAIN MENU** (operation *8.*)

If '**CANCEL**' has been selected - return to operation *38.*

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

41. UPDATE TUNE (confirm selected)



The screen will show '**DOWNLOADING**', and the selected software will be automatically downloaded into the ECM.

When complete, the screen will display '**DOWNLOAD COMPLETE**'.

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

If downloading has been unsuccessful the screen will display '**DOWNLOAD FAILED**'. Should this message appear, refer to *41.*, restarting tune download.

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

42. RESTARTING TUNE DOWNLOAD

⚠ Caution

If, for any reason downloading is interrupted, the ECM will not function and tune download cannot be restarted in the normal way. This is because the tool's operating system has been erased from the ECM's memory and has not yet been fully replaced.

Download interruption can occur for a variety of reasons such as, accidental disconnection of the tool, a flat battery, turning the ignition switch to OFF during download etc.

In these circumstances, a special-tool key-press-sequence must be followed which is described below

To restart download, switch the motorcycle ignition to OFF and disconnect the tool. Reconnect the tool, switch the motorcycle ignition to ON, and scroll through to the screen shown below.

	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								

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

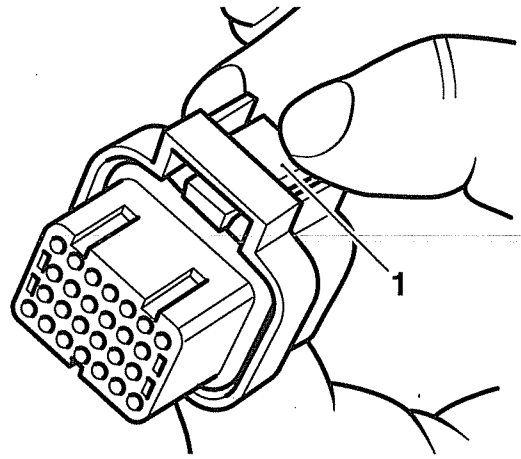
When disconnecting a connector, never pull directly on the wires as this may result in cable and connector damage.

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.



cddx

1. Locking device

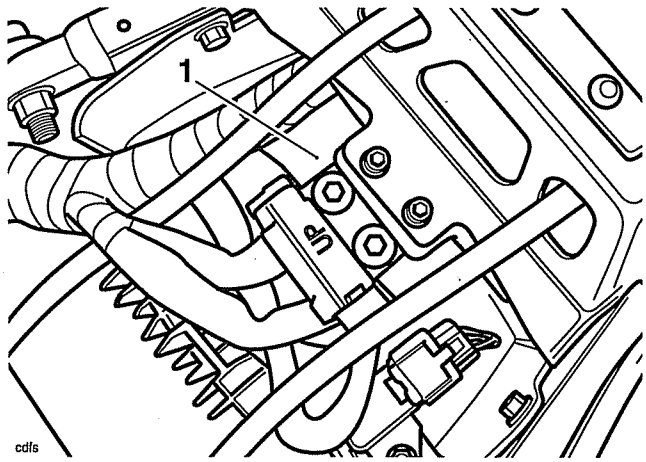
Note:

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

Reconnection of ECM connectors

Caution

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



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.

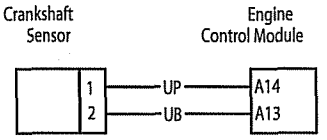
Crankshaft Sensor

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

Circuit Diagram



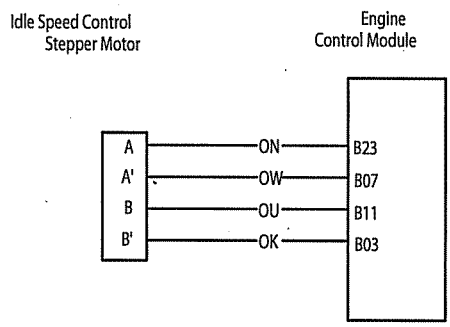
Idle Speed Conrol

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

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin B23 - ECM pin BO7 - ECM pin B11 - ECM pin B03	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 7
2	Check resistance value: - ECM pin B23 to ECM pin B07 - ECM pin B11 to ECM pin B03	4Ω to 12Ω	Disconnect stepper motor and proceed to test 3
		Open circuit	Proceed to test 4
		Short circuit	Disconnect stepper motor and proceed to test 5
3	Check cable for short circuit: - ECM pin B23 to earth - ECM pin B07 to earth - ECM pin B11 to earth - ECM pin B03 to earth	OK	Proceed to test 7
		Short circuit	Locate and rectify wiring fault, proceed to test 7
4	Check cable continuity: - ECM pin B23 to stepper motor pin A - ECM pin B07 to stepper motor pin A1 - ECM pin B11 to stepper motor pin B - ECM pin B03 to stepper motor pin B1	OK	Proceed to test 6
		Open circuit	Locate and rectify wiring fault, proceed to test 7
5	Check cable for short circuit: - ECM pin B23 to ECM pin B07 - ECM pin B11 to ECM pin B03	OK	Proceed to test 6
		Short circuit	Locate and rectify wiring fault, proceed to test 7
6	Check stepper motor resistance: - Motor pin A to motor pin A1 - Motor pin B to motor pin B1	4Ω to 12Ω	Proceed to test 7
		Faulty	Renew stepper motor, proceed to test 7
7	Reconnect harness, clear fault code and run diagnostic tool function test to visually verify operation of stepper motor	OK	Action complete - quit test
		Fault	Contact Triumph service

Circuit Diagram



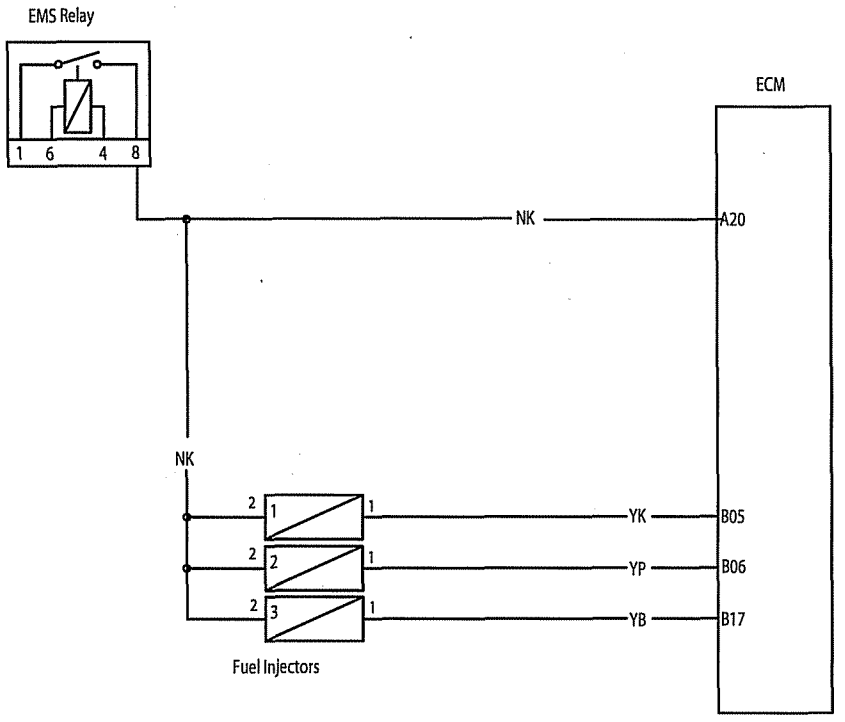
Fuel Injectors

Fault Code	Possible cause	Action
P0201/02/03	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

Circuit Diagram



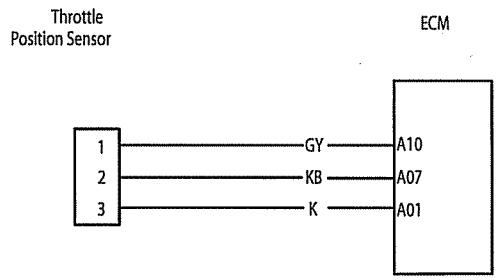
Throttle Position Sensor

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

Circuit Diagram



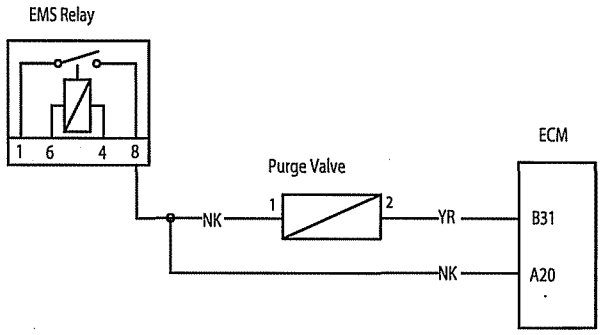
Purge Valve

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

Pinpoint Tests

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

Circuit Diagram



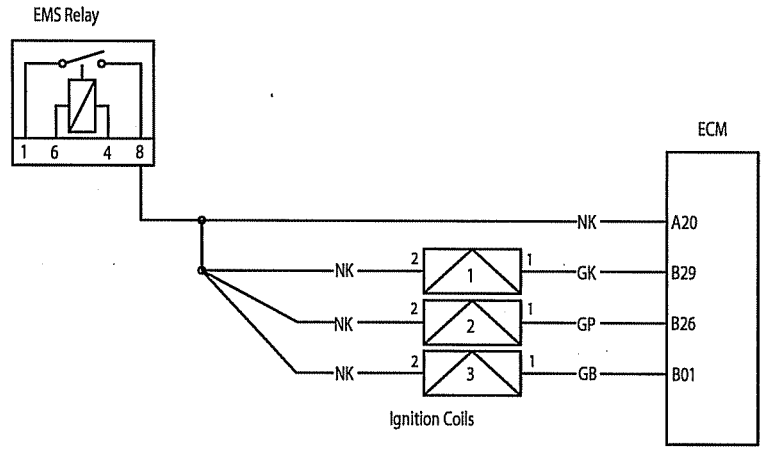
Ignition Coils

Fault Code	Possible cause	Action
P0351/52/53	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

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

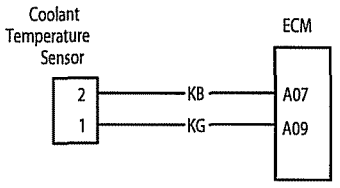
Pinpoint Tests

	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

Circuit Diagram

Resistance data under typical conditions:

Warm engine:	200 to 400Ω
Cold engine:	
20ºC ambient	2.35 to 2.65KΩ
-10ºC ambient	8.50 to 10.25KΩ



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

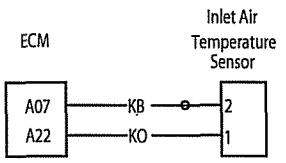
	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin A22 - ECM pin A07	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 7
2	Check resistance value: - ECM pin A22 to ECM pin A07 (Temperature dependent–see below)	OK	Disconnect temp sensor and proceed to test 6
		Open circuit	Disconnect 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

Circuit Diagram

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

Resistance data:

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



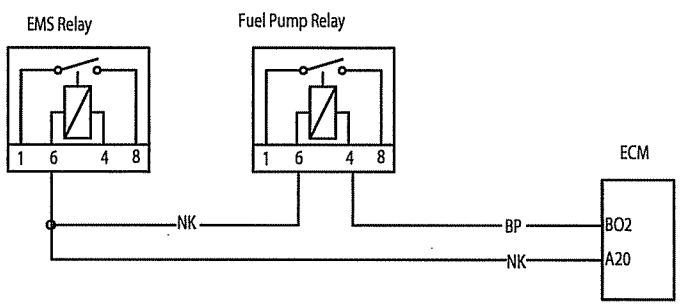
Fuel Pump Relay

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



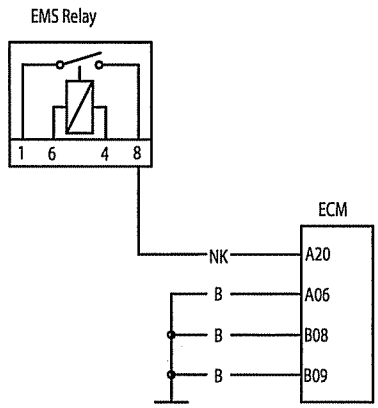
System Voltage

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



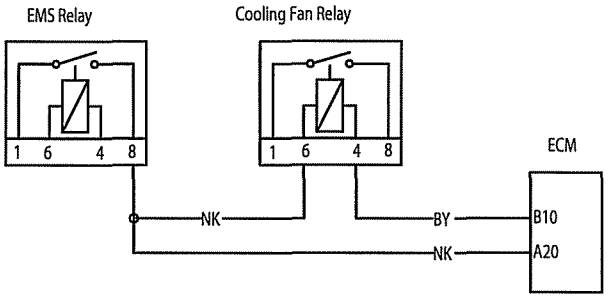
Cooling Fan Relay

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



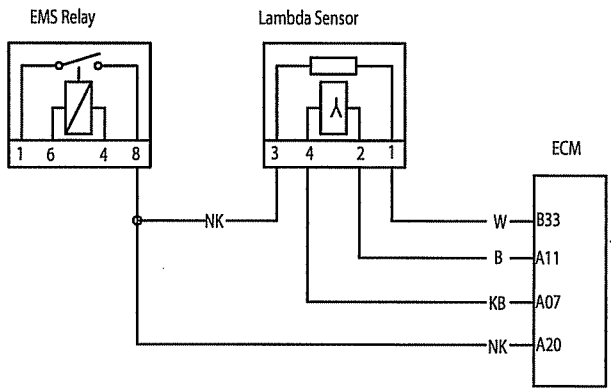
Lambda Sensor

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



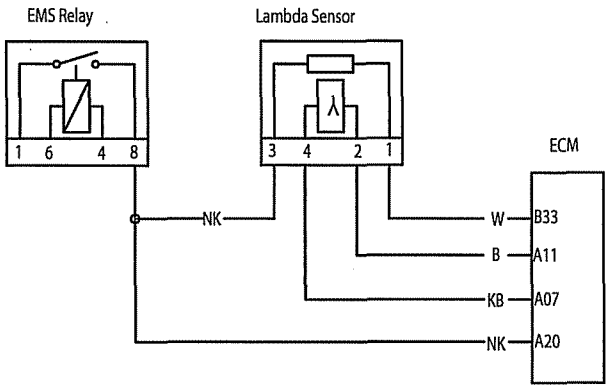
Lambda Sensor Heater

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



EEPROM Error

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

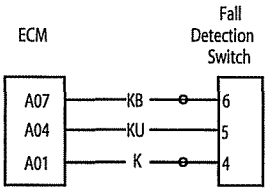
Fall Detection Switch

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:	OK	Disconnect sensor and proceed to test 2
	- ECM pin A04	Faulty	Rectify fault, proceed to test 6
2	Check cable for short circuit:	OK	Proceed to test 3
	- ECM pin A04 to ground - ECM pin A04 to ECM pin A20	Short circuit	Locate and rectify wiring fault, proceed to test 6
3	Check cable continuity:	OK	Proceed to test 4
	- ECM pin A01 to sensor pin 4 - ECM pin A04 to sensor pin 5 - ECM pin A07 to sensor pin 6	Open circuit	Locate and rectify wiring fault, proceed to test 6
4	Check cable for short circuit:	OK	Proceed to test 5
	- Sensor pin 4 to sensor pin 5 - Sensor pin 4 to sensor pin 6	Short circuit	Locate and rectify wiring fault, proceed to test 6
5	Check voltage (with ignition on):	5V	Renew fall detection switch and proceed to test 6
	- Sensor pin 4	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



2

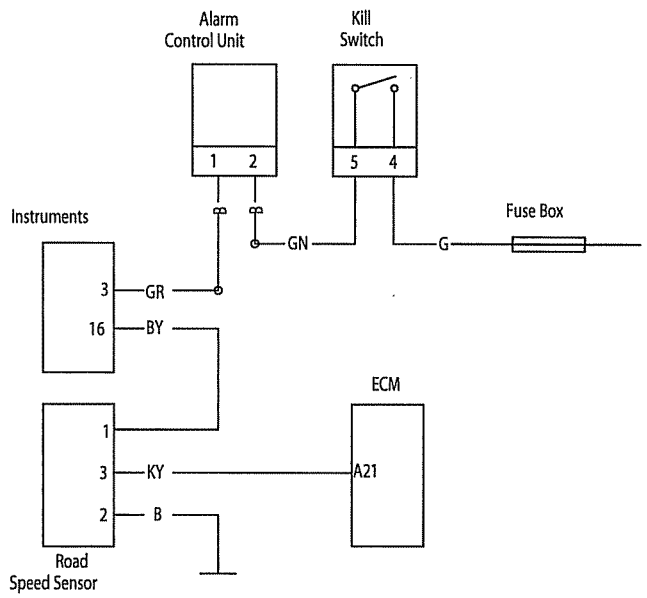
Vehicle Speed Sensor

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



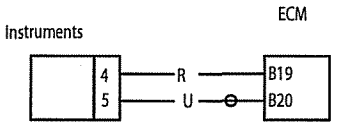
Instrument Communication (CAN)

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



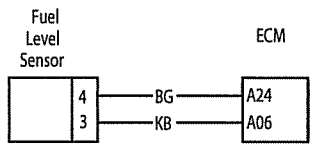
Fuel Level Sensor

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



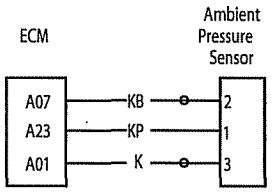
Ambient Pressure Sensor

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



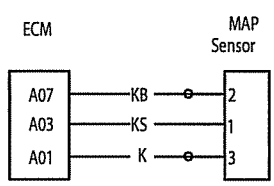
Manifold Absolute Pressure (Map) Sensor

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

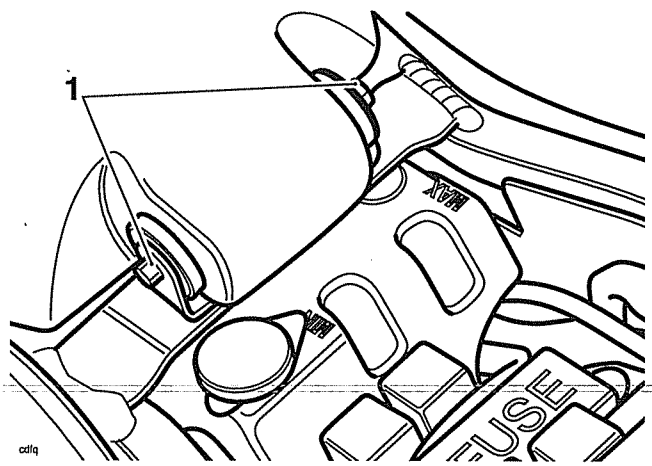
Removal

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.

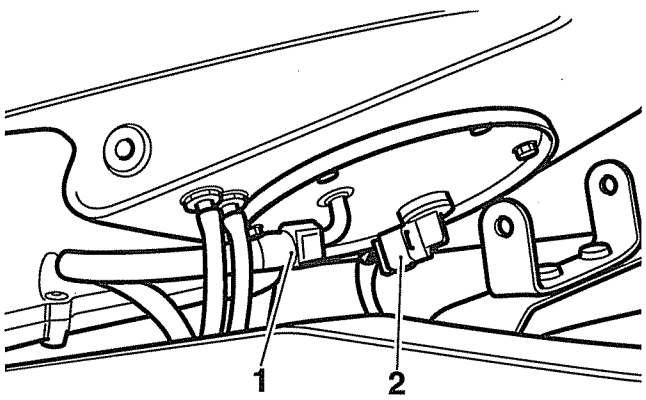
1. Remove the seat (see page *16-8*).
2. Disconnect the battery negative (black) lead first.
3. Remove the body side panels (see page *16-9*).
4. Release the bolts securing the fuel tank to the frame.



cdfq

1. Fuel tank to frame bolt (rear location shown)

5. Raise the fuel tank and disconnect the electrical connection to the fuel pump.
6. Disconnect the fuel hose by squeezing the sides of the connector and pulling the hose free from its spigot on the fuel pump plate.



cdgf

1. Fuel hose
2. Fuel pump electrical connection

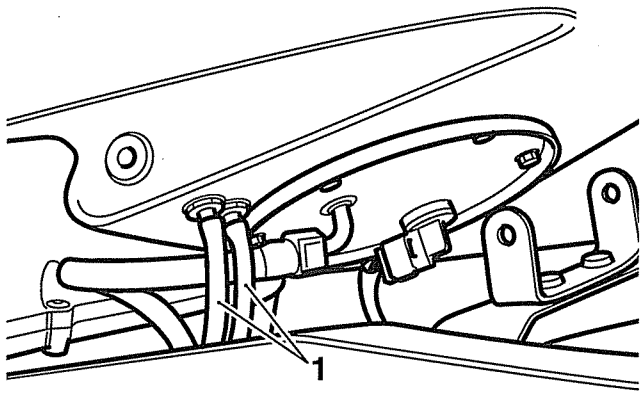
Note:

- **When disconnected, the fuel tank is self-sealing but a small amount of fuel may dribble from the hose.**

7. Disconnect the two breather hoses.

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.**



cdfr

1. Breather hoses

8. Remove the fuel tank from the frame.

Installation

1. Position the fuel tank to the frame.
2. Connect the two breather hoses as previously noted.
3. Reconnect the fuel feed hose by gently pushing inwards until the hose engages with a click.
4. Reconnect the fuel pump electrical connection.
5. Align the fuel tank to the mounting points. Fit and tighten the front mounting bolt to **8 Nm** and the rear to **9 Nm.**
6. Refit the body side panels (see page *16-9*).
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 *16-9*).

Fuel Pump, Fuel Filter and Fuel Level Sender

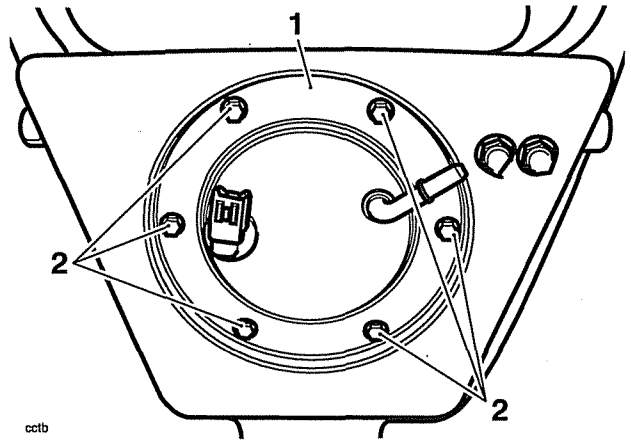
Removal

1. Remove the seat (see page *16-8*).
2. Disconnect the battery negative (black) lead first.
3. Remove the fuel tank (see page *10-88*).
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.



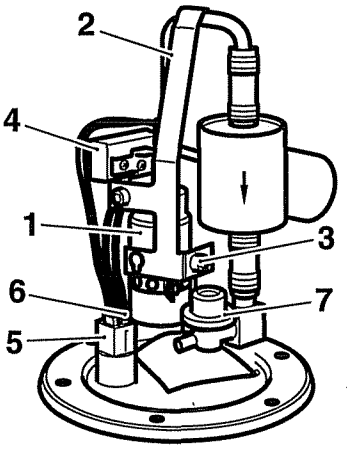
cctb

1. Mounting plate
2. Mounting plate fixings

7. Lift the fuel pump assembly and manoeuvre it from the tank aperture.
8. Check the condition of the 'O'-ring seal in the tank aperture and only remove if necessary.

Disassembly

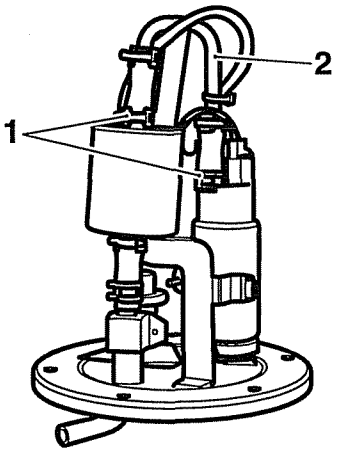
9. Disconnect the electrical connections to the fuel pump and fuel level sender.
10. Remove the fixing from the fuel pipe bracket.



cdfv

1. Fuel pump
2. Fuel pipe bracket
3. Fuel pipe bracket fixing
4. Fuel level sender
5. Fuel pump connection
6. Fuel level sender connection
7. Fuel pressure regulator

11. Release the hose clips from the pump and filter after first noting their positions.
12. Remove the fuel pipe bracket together with the hoses leading from the pump and to the filter.



cdfw

1. Hose clips
2. Bracket/hose assembly

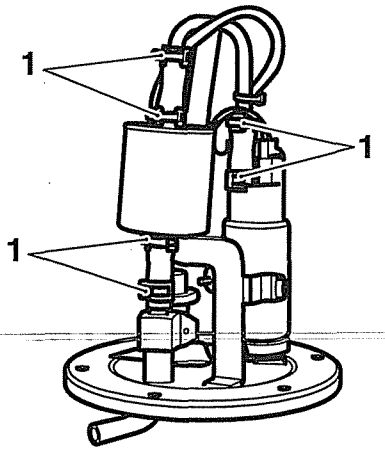
13. Remove the fixing from the pump clamp, release the clamp and collect the fuel pump.
14. To remove the fuel filter, release the clip after noting its position, then detach it from the upper part of its hose leading to the fuel pressure regulator.
15. To detach the fuel level sender, release the screw securing it to the fuel pipe bracket after noting its orientation.

Assembly

Note:

- **If the float unit has been removed, it must be fitted to the correct position on its bracket. If it is incorrectly fitted, the low level fuel warning light will come on at the wrong fuel level.**

1. Position the fuel filter to the hose leading to the pressure regulator. Ensure the filter is fitted with the arrow on its side pointing downwards.
2. Locate the fuel pump to its bracket.
3. Refit the fuel pump clamp then fit and tighten the fixing to **4Nm.**
4. Position the pipe bracket and hoses to the fuel pump and filter. Fully locate both hoses.
5. Secure the fuel pipe bracket with the fixing, tightening it to **4 Nm.**
6. Position the hose clips to ensure that both hoses are correctly retained.



cdfx

1. Hose clips (correctly positioned)

7. Connect both electrical connections (blue plug innermost) to the fuel pump mounting plate.

Installation

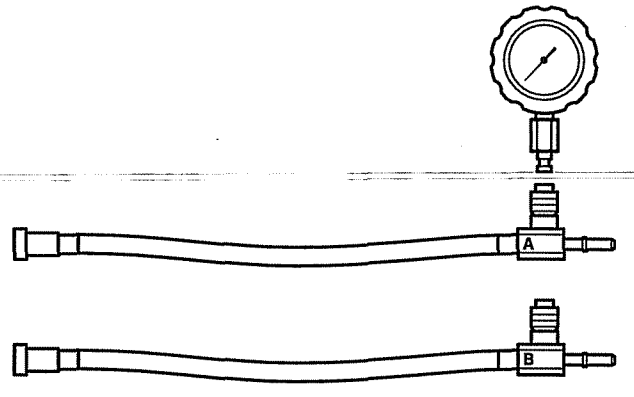
1. If removed, position a new 'O'-ring seal in the tank aperture and ensure that it is correctly seated.
2. Taking care to ensure the 'O'-ring is not damaged or dislodged, manoeuvre the fuel pump assembly into the tank aperture with the 'FRONT' arrow is facing towards the front of the fuel tank.
3. Tighten the mounting plate fixings to **5 Nm.**
4. Refit the fuel tank (see page *10-88*).
5. Reconnect the battery, positive (red) lead first.
6. Refit the seat (see page *16-9*).

Fuel Pressure Checking

Warning

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

Fuel pressure is checked using service tool T3880001.



cdgh

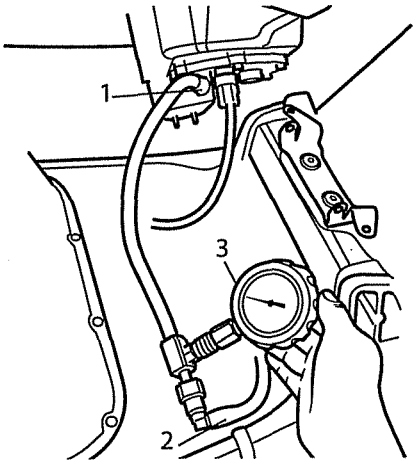
Tool T3880001

1. Release the fuel tank fixings and bodywork to gain access to the fuel pipe connections (see page *10-88*).
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 'A' from service tool T3880001.

⚠ Warning

Always us the correct fuel pressure gauge adapter **(adapter 'A' for 2005-ownards Speed Triple).** 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:

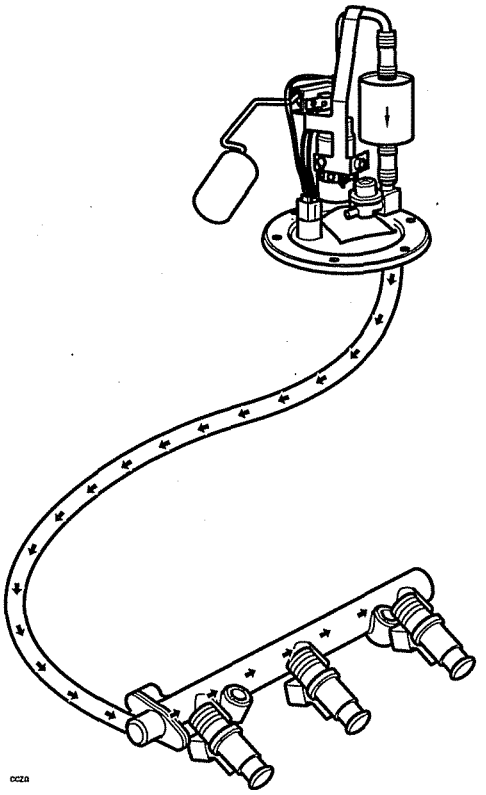
- **The fuel pressure should be 3.0 bar nominally.**

7. When fuel pressure checking is complete, have an assistant raise the fuel tank and disconnect the fuel pressure gauge adapter.
8. Reconnect the fuel hose and refit the fuel tank (see page *10-88*).

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.

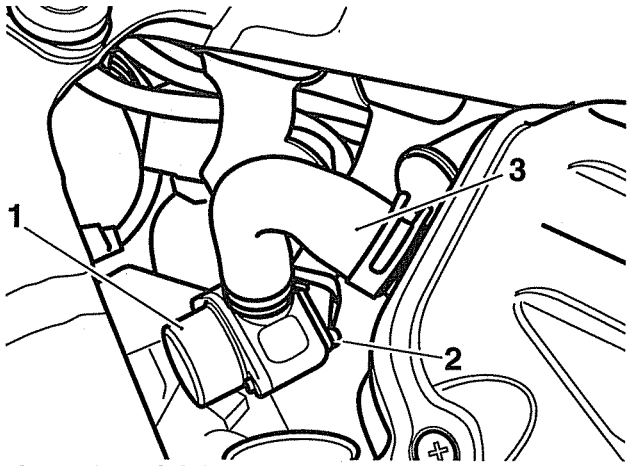
Incorporated in the system is a filter, a pressure regulator and a pick-up strainer.



Airbox

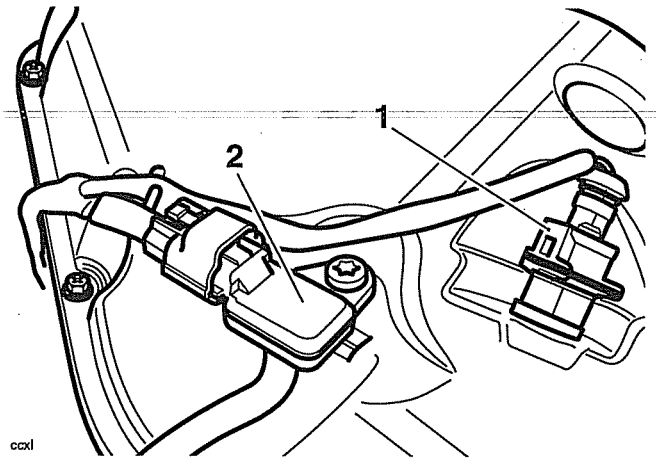
Removal

1. Remove the seat (see page *16-8*).
2. Disconnect the battery negative (black) lead first.
3. Remove the fuel tank (see page *10-88*).
4. Disconnect the secondary air injection hose at the airbox.



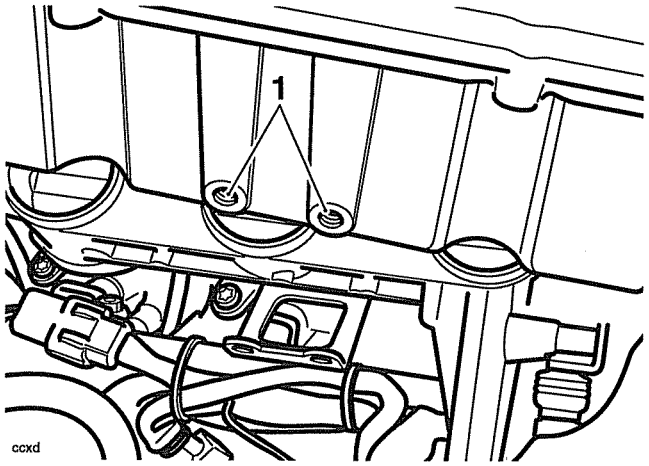
1. Secondary air injection control valve
2. Hose

5. Disconnect the air temperature and map sensor connectors.



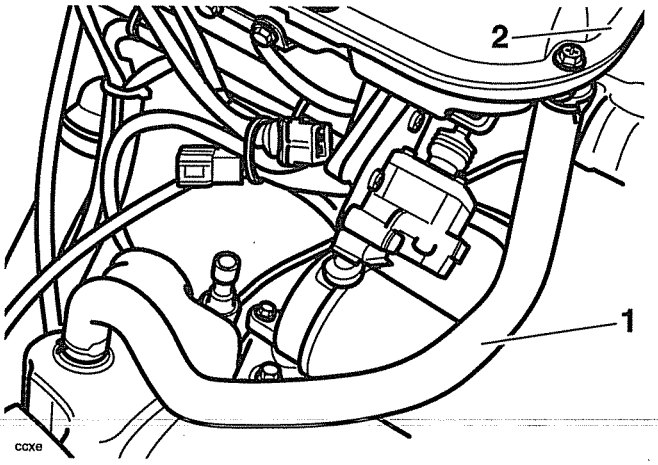
1. Intake air temperature connector
2. Map sensor connector

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



1. Airbox fixing locations

7. Disconnect the breather drain hose from the rear of the airbox.



1. Breather drain hose
2. Airbox

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

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

1. Airbox
2. Throttle bodies
3. Forward locating peg
4. Peg location point

Inspection

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

Installation

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

⚠ Caution

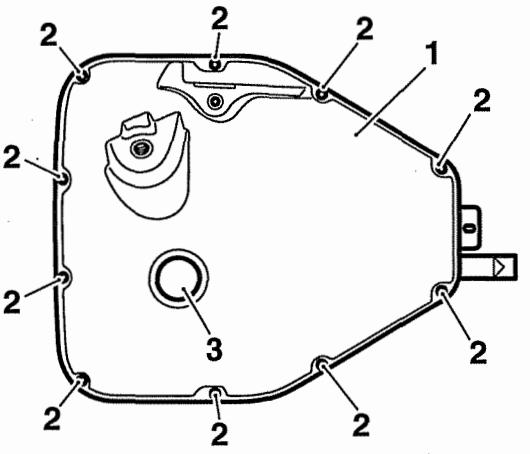
Always ensure that all 3 intake rubbers seal to the throttles through 360° as poor performance and lack of power can result from incorrect sealing.

3. Fit and tighten the airbox fixings to **5 Nm.**
4. Reconnect the air temperature and map sensor connectors.
5. Reconnect and secure the air hose airbox.
6. Reconnect the airbox breather hose.
7. Refit the fuel tank (see page *10-88*).
8. Reconnect the battery, positive (red) lead first.
9. Refit the seat (see page *16-9*).

Air Filter Element

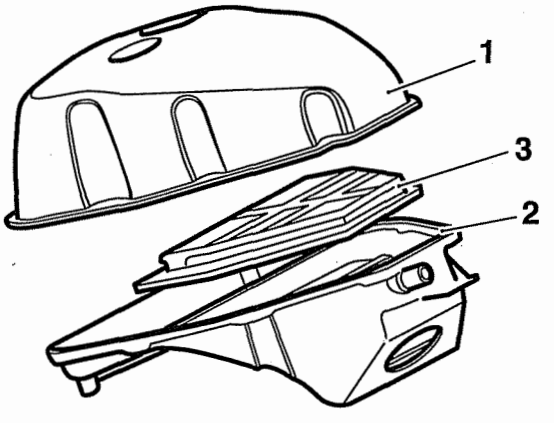
Removal

1. Remove the seat (see page *16-8*).
2. Disconnect the battery negative (black) lead first.
3. Remove the fuel tank (see page *10-88*).
4. Remove the airbox (see page *10-92*).
5. Release the ring of bolts securing the upper half of the airbox to its corresponding lower section.
6. Release the airbox centre fixing which is accessed through the centre hole in the airbox upper section.



1. Airbox
2. Ring of bolts
3. Centre fixing location

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



1. Airbox upper section
2. Airbox lower section
3. Air filter element

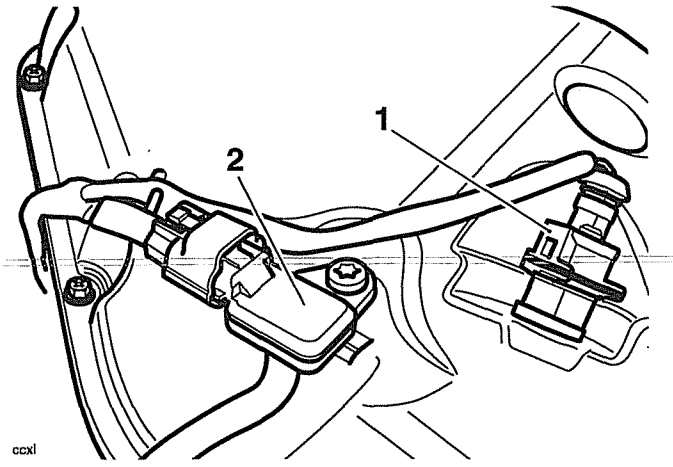
Installation

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 *16-9*).

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 *10-88*).
4. Disconnect the multiplug from the air temperature sensor.



ccxl

1. Intake air temperature connector
2. Map sensor

Note:

- **The intake air temperature sensor has a threaded base.**

5. Unscrew the sensor to remove it from the airbox.

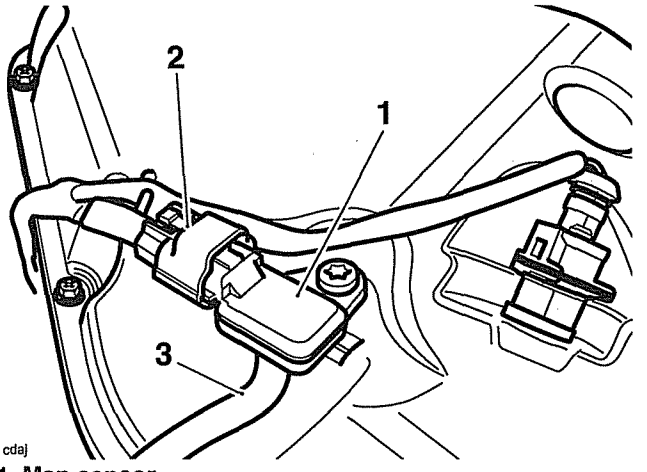
Assembly

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 *16-9*).

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 *10-88*).
4. Disconnect the multiplug from the map sensor.



cdaj

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.

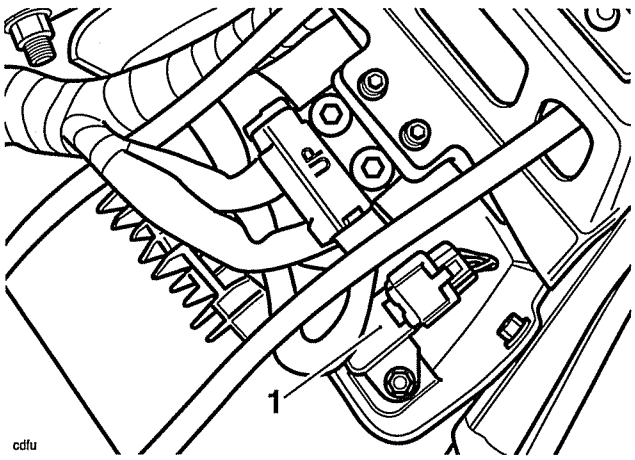
Installation

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 *16-9*).

Barometric Pressure Sensor

Note:

- **The barometric pressure sensor is located at the front of the rear mudguard. Remove as per the map sensor.**



1. Barometric pressure sensor

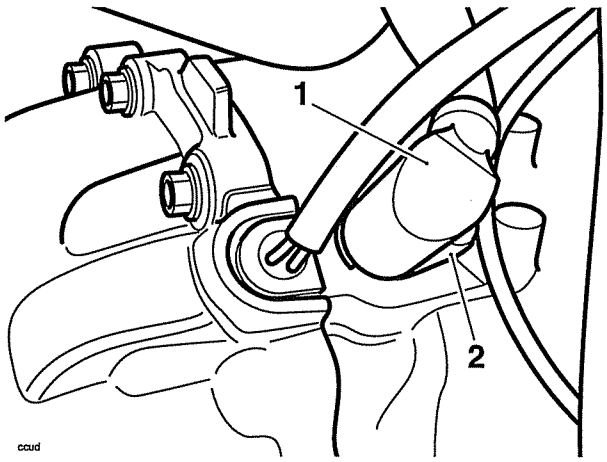
Crankshaft position sensor

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.

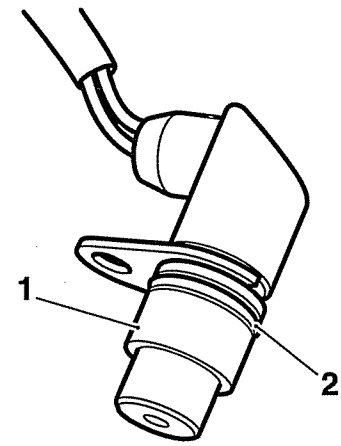


1. Sensor
2. Sensor bracket

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 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 *16-9*).

Throttle Cable

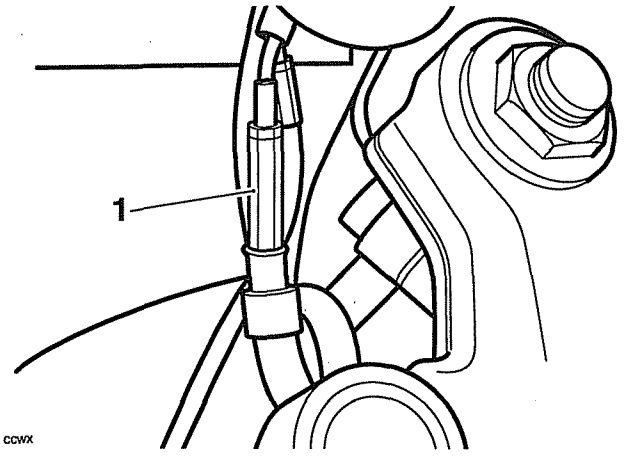
Adjustment

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.**

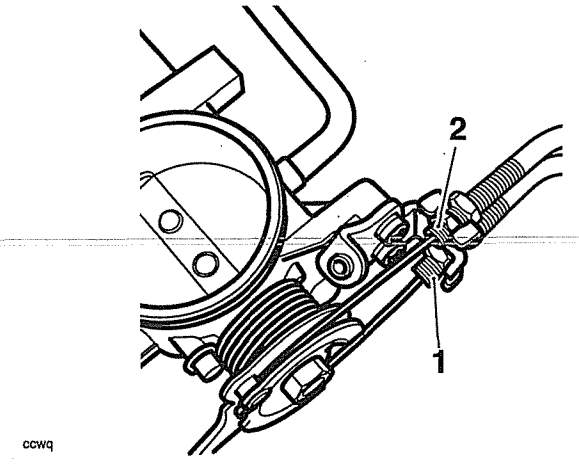
1. Remove the seat (see page *16-8*).
2. Disconnect the battery negative (black) lead first.

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 *10-88*).
5. Remove the airbox (see page *10-92*).
6. Set the `opening' cable adjuster at the throttle end to give 2-3 mm of play at the twist grip. Tighten the locknut.



1. 'Opening' Cable Adjuster (Throttle End)
2. 'Closing' Cable Adjuster (Throttle End)

7. 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.

8. Refit the airbox (see page *10-93*).
9. Refit the fuel tank (see page *10-88*).
10. Reconnect the battery, positive (red) lead first.
11. Refit the seat (see page *16-9*).

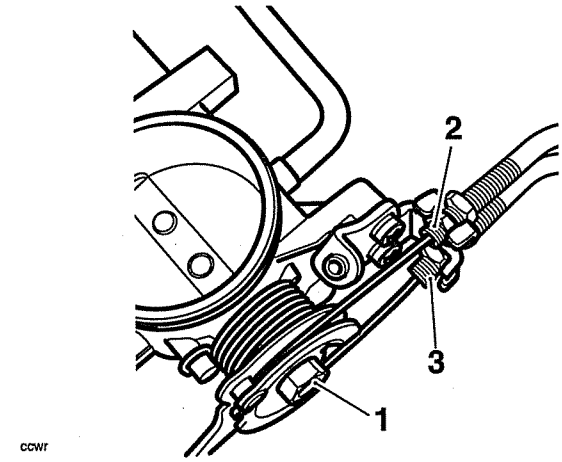
Removal

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.**

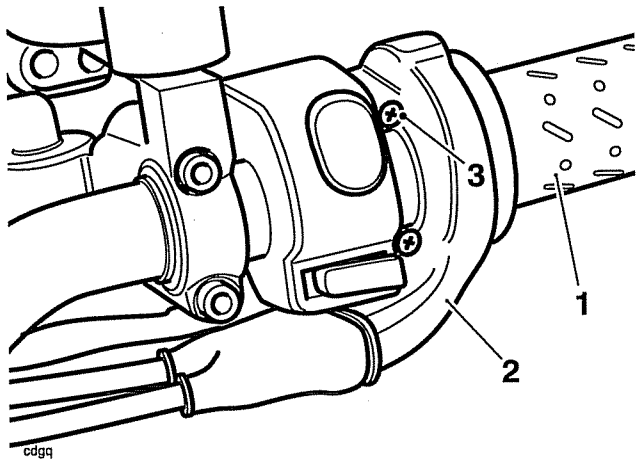
1. Remove the seat (see page *16-8*).
2. Disconnect the battery negative (black) lead first. (see page *17-7*).
3. Remove the fuel tank (see page *10-88*).
4. Remove the airbox (see page *10-92*).
5. Slacken the adjuster locknuts at the throttle body end of the cables such that they will allow the outer cables to be detached from the cable bracket.

6. Detach the inner portion of the cables from the throttle cam.



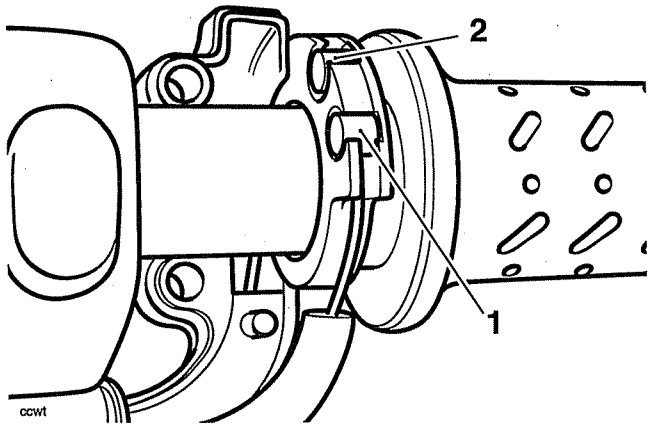
1. Throttle cam
2. Closing cable
3. Opening cable

7. At the twist grip end, slide off the rubber boot and release the screws which secure the two halves of the twist grip guide to each other.



1. Twist grip
2. Twist grip guide
3. Screws

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



1. Closing cable
2. Opening cable

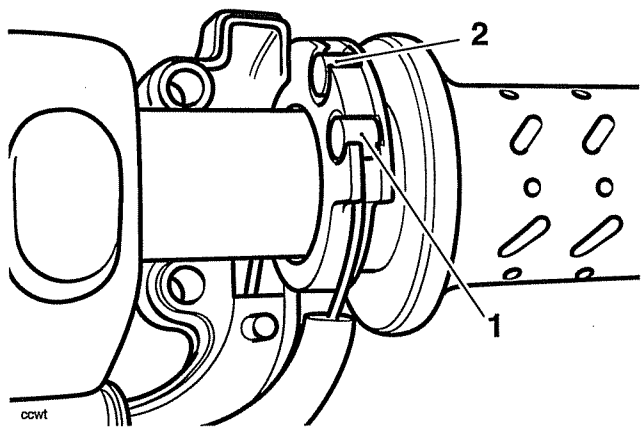
9. Detach the cables from the motorcycle.

Examination

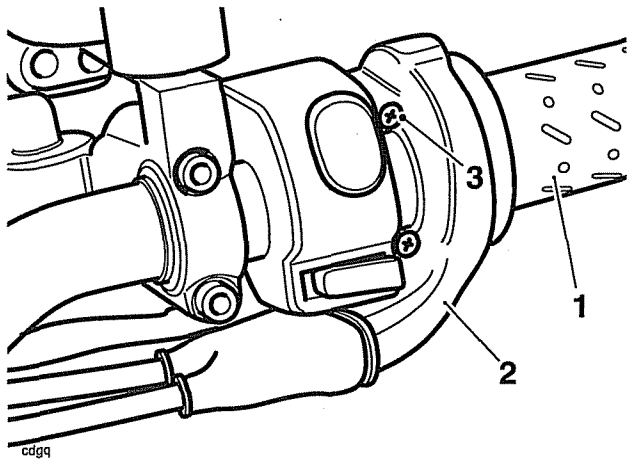
1. Check that both the throttle cables operate smoothly, without sticking or binding. Replace the cables if there is any doubt as to their correct operation.

Installation

1. Locate the cables to the frame following the routing noted during removal.
2. Engage the inner cable nipples to the twist grip.
3. 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.



1. Closing cable
2. Opening cable



1. Twist grip
2. Twist grip guide
3. Screws

4. Refit the boot.
5. Attach the other end of the inner cables to the throttle cam ensuring the opening cable is fitted to the bottom of the cam and the closing cable to the top.
6. Locate the outer cables to the bracket and secure with the adjuster and locknuts.
7. Set the cable adjustment (see page *10-95*).
8. Refit the airbox (see page *10-93*).
9. Refit the fuel tank (see page *10-88*).
10. Reconnect the battery, positive (red) lead first
11. Refit the seat (see page *16-9*).

Throttle Bodies/Injectors

Removal

Note:

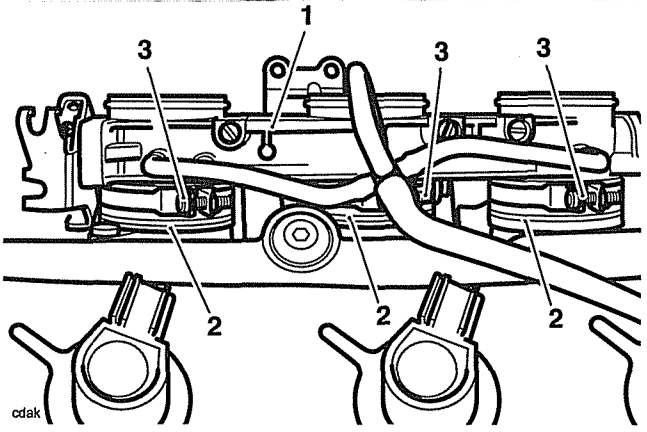
- **Because fuel stored in the fuel rail will be at 3 bar pressure, it is essential that the fuel pressure is reduced before any dismantling of the fuel rail takes place. To reduce pressure, briefly crank the engine with the fuel pump disconnected.**

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 repesent a serious fire hazard which could lead to burn injuries and damage to property.

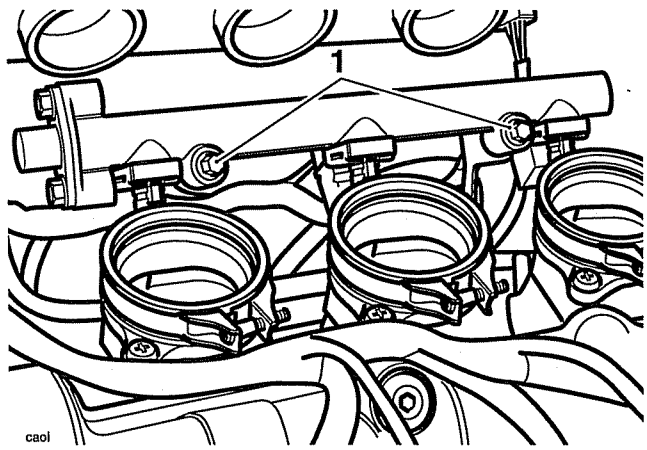
1. Remove the seat (see page *16-8*).
2. Disconnect the battery negative (black) lead first.
3. Remove the fuel tank (see page *10-88*).
4. Remove the airbox (see page *10-92*).
5. Disconnect the throttle position sensor.
6. Release both throttle cables from the throttle cam (see page *10-95*).
7. Release the clips securing the throttle bodies to the transition pieces.



1. Throttle body
2. Transition piece (one per cylinder)
3. Clip (one per cylinder)

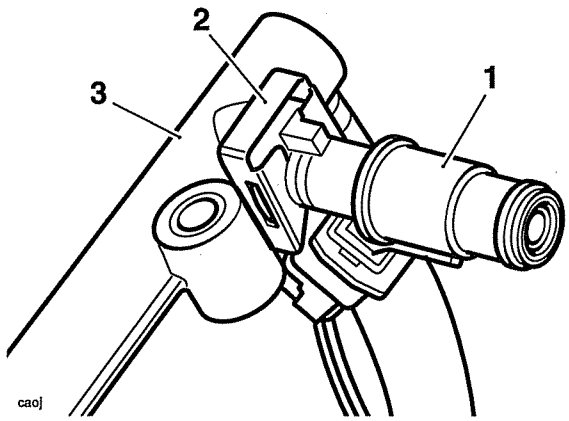
8. Ease the throttle bodies from the transition pieces and lay the assembly on the crankcase.

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



1. Fuel rail bolts

10. Ease the fuel rail and injectors from the cylinder head.
11. 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.



1. Injector
2. Clip
3. Fuel rail

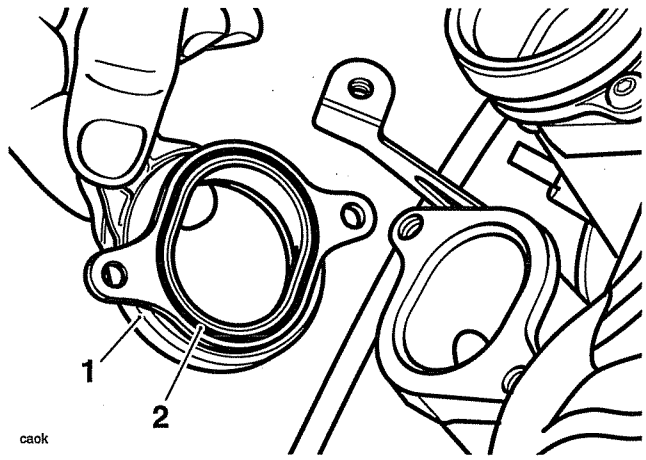
12. To detach the transition pieces from the head, release the screws, raise the transition pieces and collect the O rings.

Inspection

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

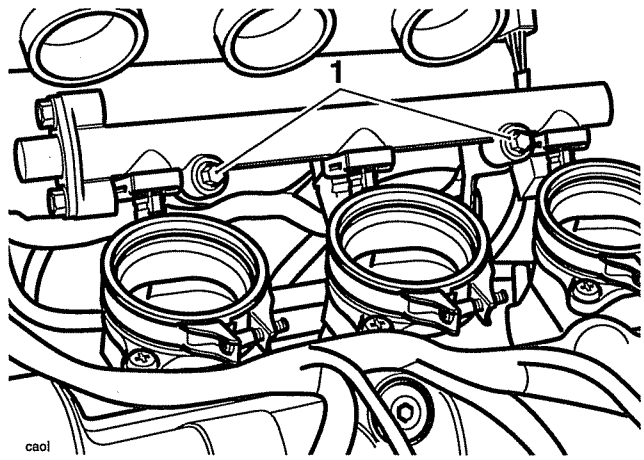
Installation

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.**



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.**



1. Fuel rail bolts

6. Refit the throttle bodies to the transition pieces and secure with clips.
7. Reattach and adjust the throttle cables (see page *10-95*).
8. Refit the airbox (see page *10-93*).
9. Refit the fuel tank (see page *10-88*).
10. Reconnect the battery, positive (red) lead first.
11. Refit the seat (see page *16-9*).

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 *10-88*).
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 *10-24*).
8. Select 'balance throttles'.

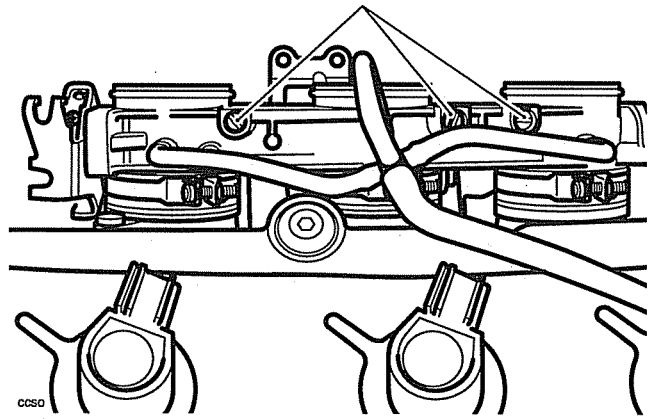
T	H	R	O	T	T	L	E	S		B	A	L	A	N	C	E	D		
T	H	R	O	T	T	L	E		1		1	2	3	4	M	M	/	H	G
T	H	R	O	T	T	L	E		2		1	2	3	4	M	M	/	H	G
T	H	R	O	T	T	L	E		3		1	2	3	4	M	M	/	H	G

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.**

9. Using the throttle adjusters, make adjustments until the word 'BALANCED' appears



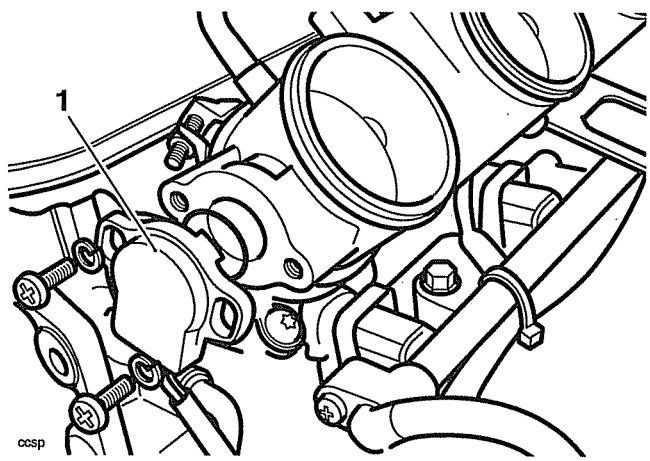
1. Adjusters

10. When balanced, stop the engine and disconnect the diagnostic tool.
11. Refit the airbox (see page *10-93*).
12. Refit the fuel tank (see page *10-102*).
13. Reconnect the battery, positive (red) lead first.
14. Refit the seat (see page *16-9*).

Throttle Position 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 *10-88*).
4. Remove the airbox (see page *10-92*).
5. Remove the throttle body assembly (see page *10-98*).
6. Remove the throttle position sensor from the left hand end of the throttle body. Collect the O ring on disassembly.



1. Throttle position sensor

Installation

1. Fit the replacement throttle position sensor ensuring the O ring is positioned correctly between the sensor and throttle body.
2. Engage the new screws and washers supplied and part tighten such that the sensor can still be rotated.
3. Position the throttle body assembly near to its fitted position and reconnect the sensor.
4. Reconnect the battery, positive (red) lead first.
5. Attach the Triumph service diagnostic tool to the dedicated plug
6. Turn the ignition to the on position.
7. Connect the diagnostic tool and scroll through to, and select the 'ADJUST TUNE' option.
8. At the next screen, align the cursor with THR0TTLE POT RENEW (see below) then press the validation key which is marked '*'.

								A	D	J	U	S	T		T	U	N	E
	R	E	S	E	T		A	D	A	P	T	I	O	N	S			
▶	T	H	R	O	T	T	L	E		P	O	T		R	E	N	E	W	
	I	S	C		S	T	E	P	P	E	R		R	E	N	E	W		

9. On pressing the validation key, the diagnostic tool will send a command, which drives the primary throttle to the fully closed position. The tool will also display the voltage reading coming from the throttle position sensor.

	R	E	P	L	A	C	E		P	R	I	M	A	R	Y		T	P	S
					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		O	.	5	6	V	

10. Gently rotate the new throttle position sensor until the voltage reading on the tool shows 0.6 volts +/- 0.02 volts.

Note:

- **This is a setting voltage only. Because of the adaptive nature of the engine management system, in-service voltage may vary from this setting figure.**

11. 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.
12. Press the validation key marked '*' to return the throttle to normal control and return the diagnostic tool to the ADJUST TUNE menu.
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

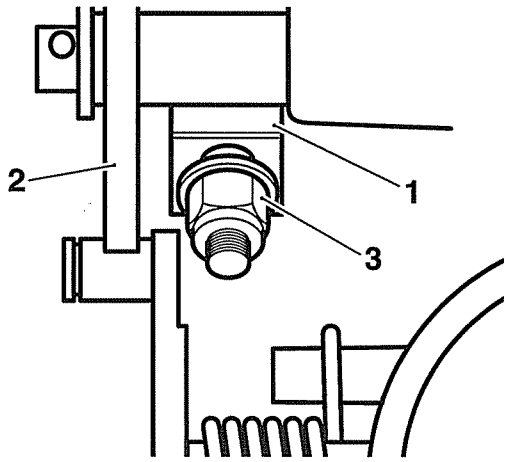
Operation of the motorcycle with an incorrectly adjusted, incorrectly routed or damaged throttle cable could interfere with the operation of the brakes, clutch or the throttle itself. Any of these conditions could result in loss of control of the motorcycle and an accident.

16. Disconnect the battery negative (black) lead first.
17. Refit the throttle body assembly (see page *10-99*).
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 *16-9*).

Idle Speed Control Stepper Motor

Removal

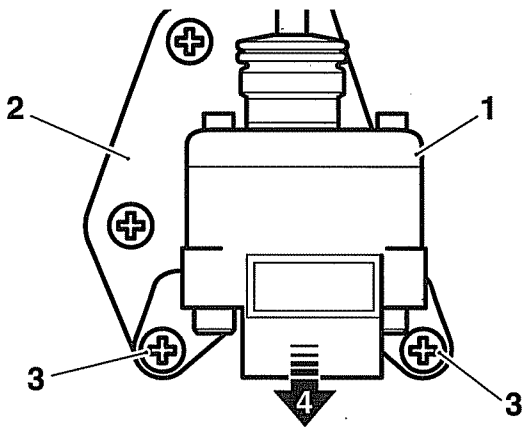
1. Remove the seat (see page *16-8*).
2. Disconnect the battery negative (black) lead first.
3. Remove the fuel tank (see page *10-88*).
4. Remove the airbox (see page *10-92*).
5. Remove the throttle bodies (see page *10-98*).
6. Remove the nylon nut, metal washer and plastic washer attaching the idle control stepper arm to the idle speed control lever



cdav

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

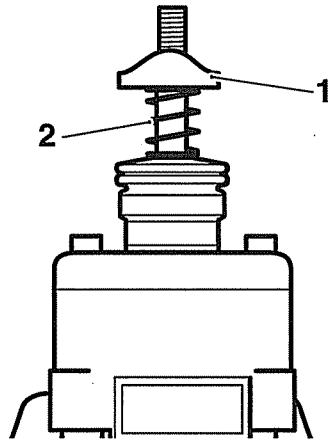
7. Remove the two screws securing the idle speed control stepper motor to its bracket, then remove the stepper motor in the direction shown.



cdaw

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

8. Leave the plastic collar and spring on the control stepper arm.

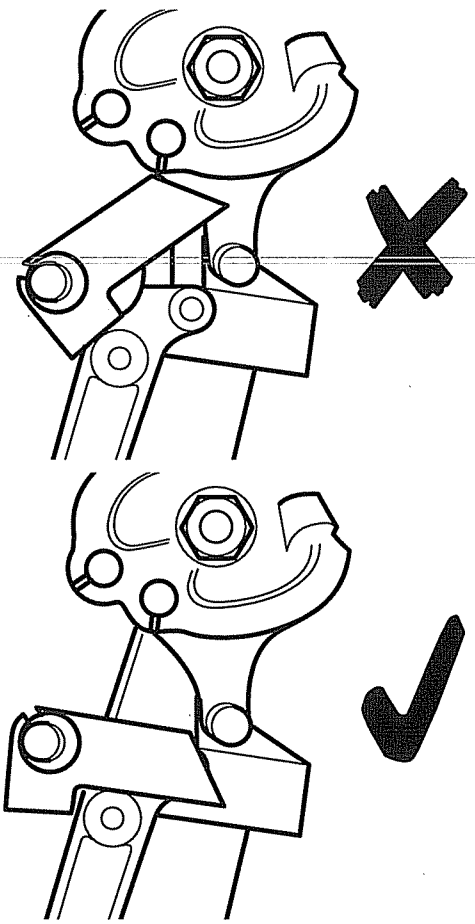


cdax

1. Collar
2. Spring

Installation

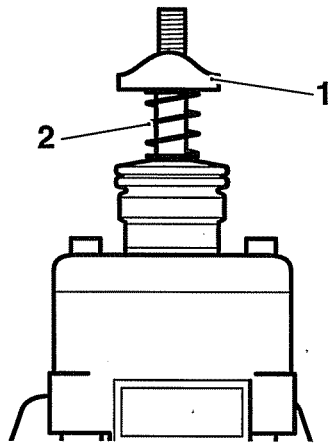
1. Ensure the Idle speed control lever is correctly positioned in relation to the throttle cam as shown.



cdgr

cdgs

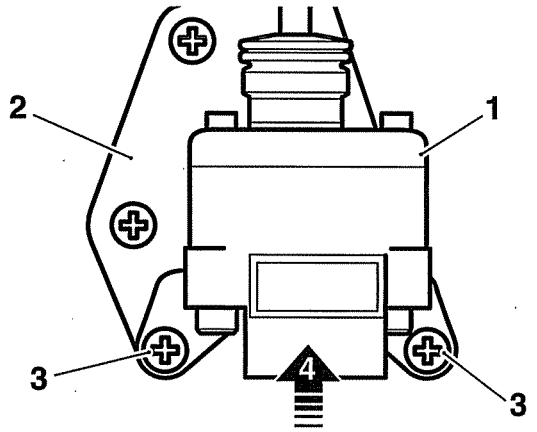
2. Loosely fit the spring and collar on the stepper arm.



cdax

1. Collar
2. Spring

3. Locate the stepper motor to its bracket and tighten the fixings to **3.5 Nm.**



cday

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

4. Fit the plastic washer through the lever then fit the metal washer and nut.
5. Mount the throttle body onto the engine.
6. Temporarily reconnect the battery, positive (red) lead first.
7. Turn the ignition to the ON position.
8. Connect the service diagnostic tool and scroll through to, and select the 'ADJUST TUNE' option.
9. At the next screen, align the cursor with ISC* STEPPER RENEW then press the validation key which is marked '*'.

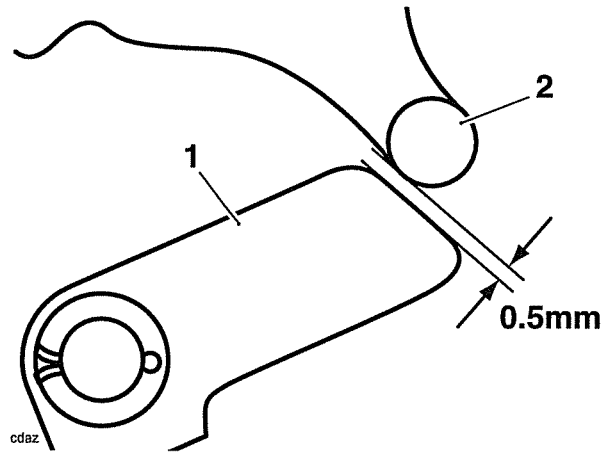
*ISC = Idle Speed Control

								A	D	J	U	S	T		T	U	N	E
	R	E	S	E	T		A	D	A	P	T	I	O	N	S			
	T	H	R	O	T	T	L	E		P	O	T		R	E	N	E	W	
▶	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			O	.	5	8	V

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.



cdaz

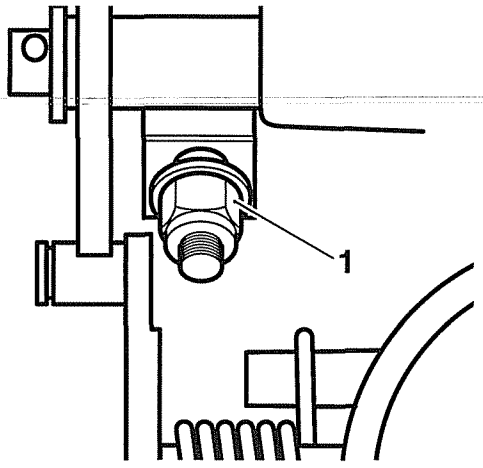
1. Idle speed control lever
2. Throttle roller

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			O	.	7	2	V

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.



cdba

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 *10-95*).

⚠ 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 *16-9*).

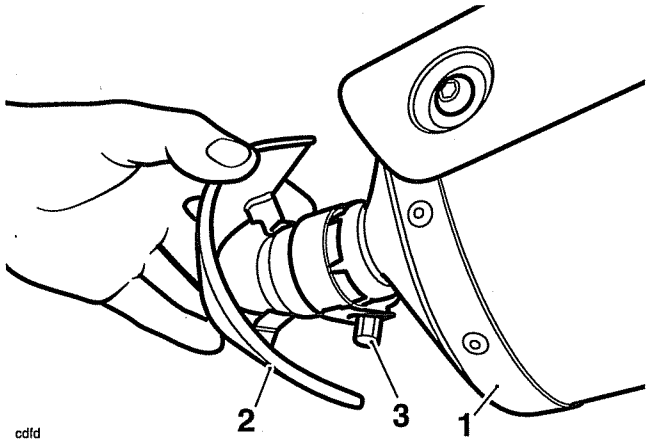
Exhaust System

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 oil cooler (see page *8-9*).
4. Remove the radiator (see page *11-8*).
5. Release the clamps securing the silencers and clamp covers to the intermediate pipe.

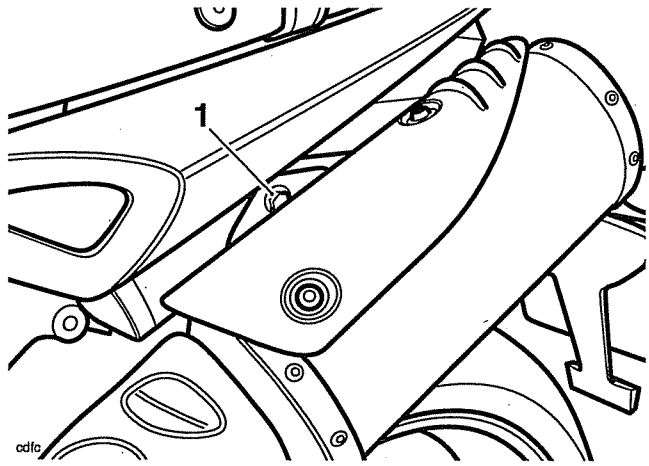


1. Silencer
2. Clamp covers
3. Clamp fixing

Note:

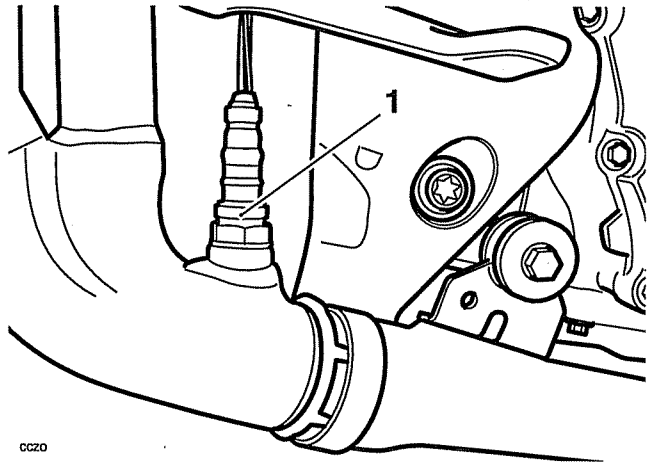
- **The clamp covers are retained by tags that slide out from the silencer clamps when the clamp screw is released.**

6. Release the bolts securing the silencer mounting brackets to the rear frame.



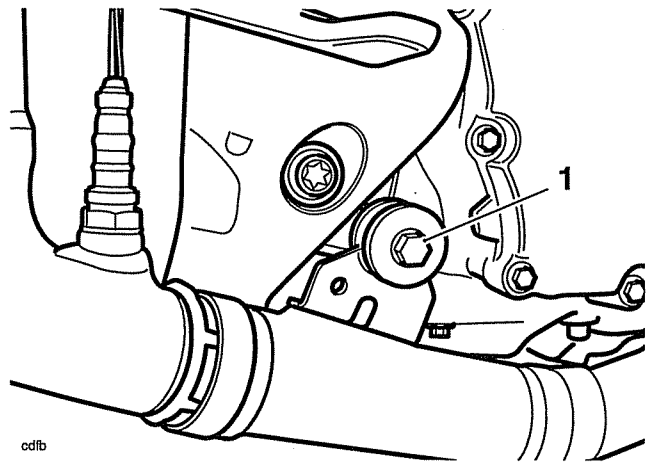
1. Silencer mounting bracket/fixing

7. Remove the silencers from each side.
8. Locate and disconnect the oxygen sensor multiplug and release it from the wiring harness.



1. Oxygen sensor

9. Release the clamp securing the intermediate pipe to the down-pipe.
10. Remove the bolt from the rear mounting point on the down-pipe.



1. Rear mounting point

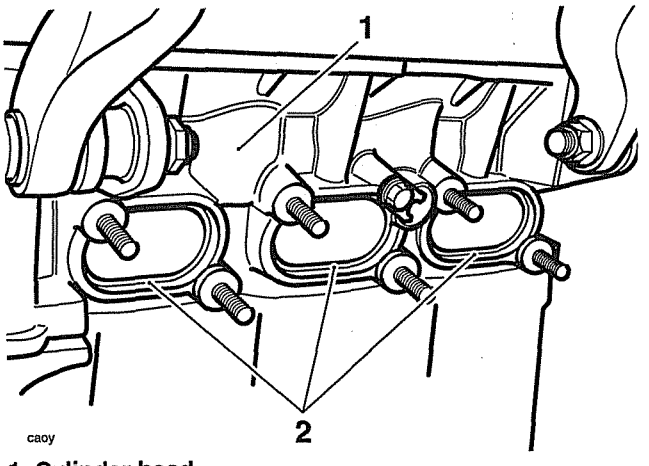
11. Release the down-pipe fixings at the cylinder head.
12. Detach the down-pipe assembly and collect the seals from the head ports.

Assembly

1. Fit new seals to the cylinder head.

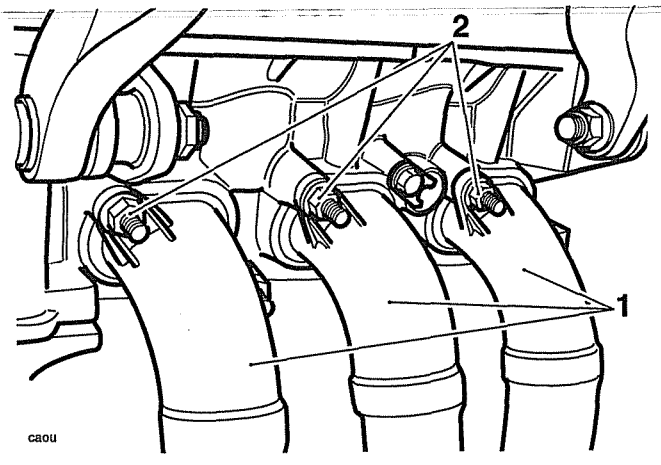
Note:

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



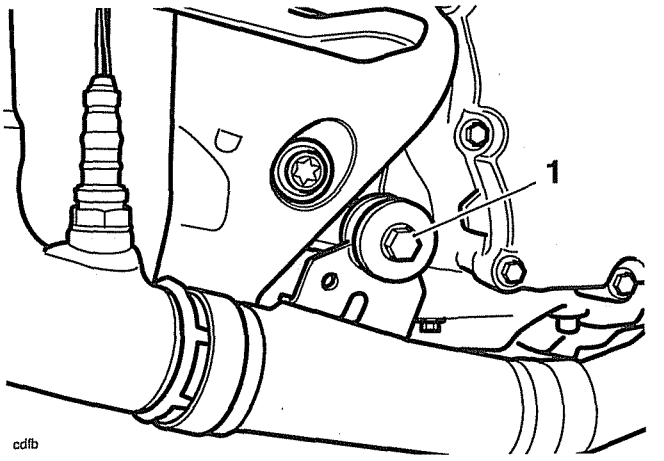
1. Cylinder head
2. Seals

2. Locate the down-pipe and align the flanges to the cylinder head.



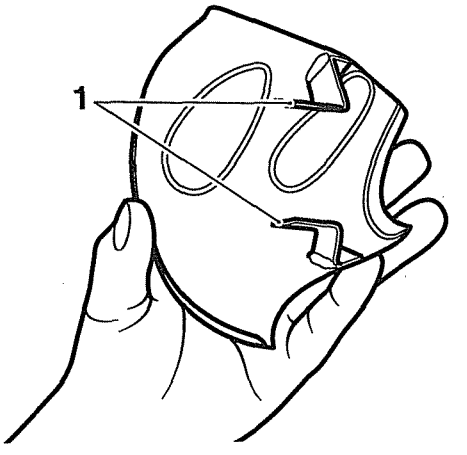
1. Down pipe
2. Clamp (upper row shown)

3. Assemble the rear mounting point fixings but do not tighten at this stage.
4. Tighten the downpipe 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.**



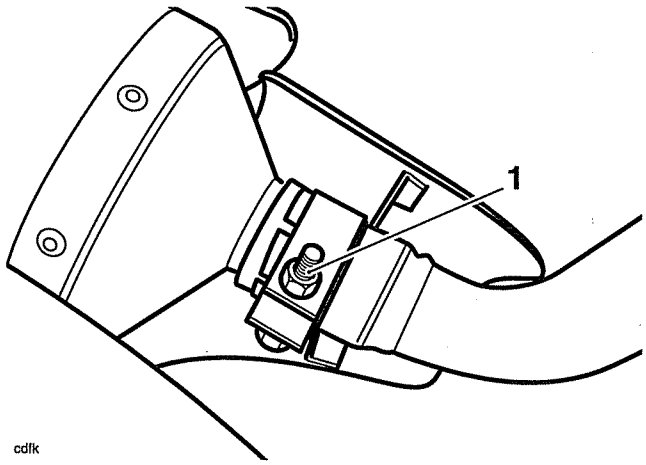
1. Rear mounting point

6. Position the clamp to the down-pipe before engaging the intermediate pipe to the outlet. Do not tighten the intermediate pipe clamp at this stage.
7. Position the silencer clamps to the intermediate pipe outlets. It is not necessary to fit the clamp covers at this stage.
8. Position and fully engage the silencers to the intermediate pipe outlets.
9. Fit but do not tighten the silencer mounting bolts.
10. Align the clamp covers such that they fully cover the clamps. Ensure that the tags on the covers both sit beneath the clamp.



1. Tags

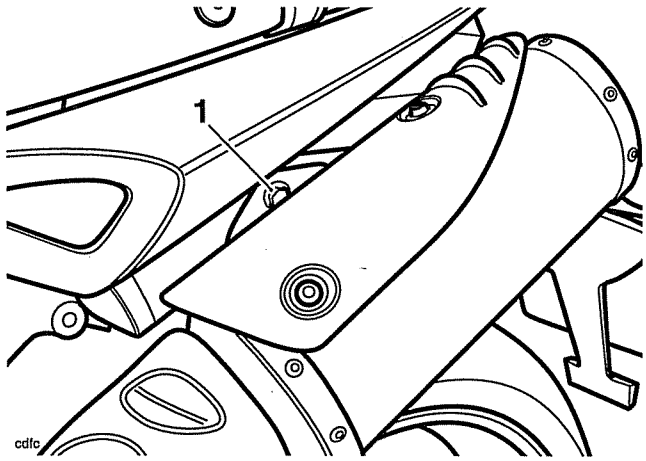
11. Tighten the intermediate pipe and silencer clamps to **15 Nm**.



cdfk

1. Clamp fixing

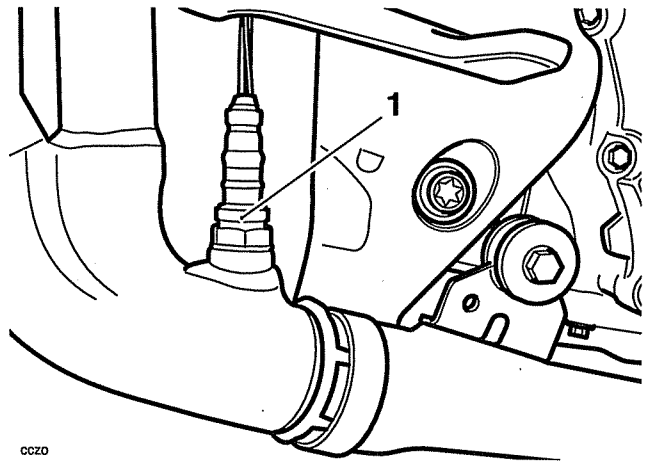
12. Tighten the silencer mounting bolts to **15 Nm**.



cdfc

1. Silencer mounting bracket/fixing

13. Refit and reconnect the oxygen sensor.



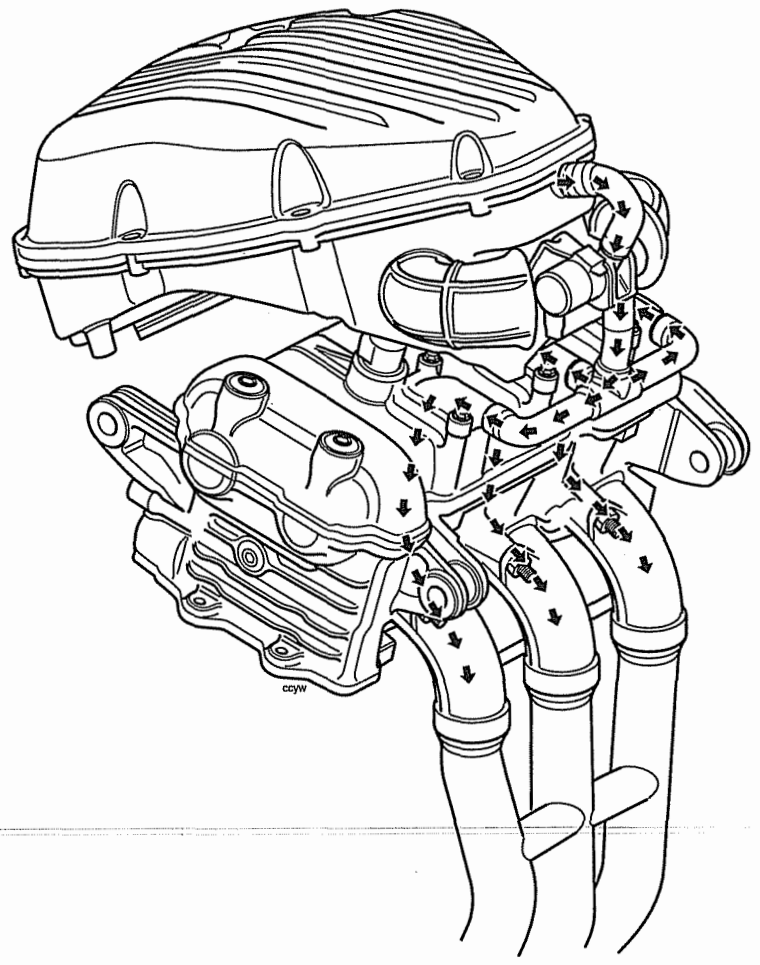
cczo

1. Oxygen sensor

14. Refit the radiator and refill the cooling system (see page *11-10*).
15. Refit the oil cooler (see page *8-14*).
16. Reconnect the battery, positive (red) lead first.
17. Refit the seat (see page *16-9*).
18. Start the engine and check for exhaust leaks. Rectify if necessary.

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.

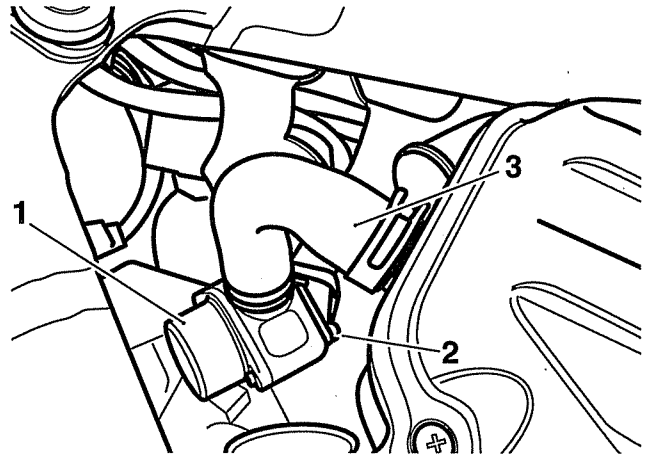
At certain specific engine speeds above idle (determined by the factory programming of engine management system), the secondary air injection control valve is opened by the ECM and allows an air feed into the secondary air system where, each time a pair of exhaust valves open, the exhaust gases in the 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 *10-88*).
4. Release the hoses attached to the valve.



1. Solenoid valve
2. Retainer
3. Hoses

5. Tilt the valve to detach from the retainer.

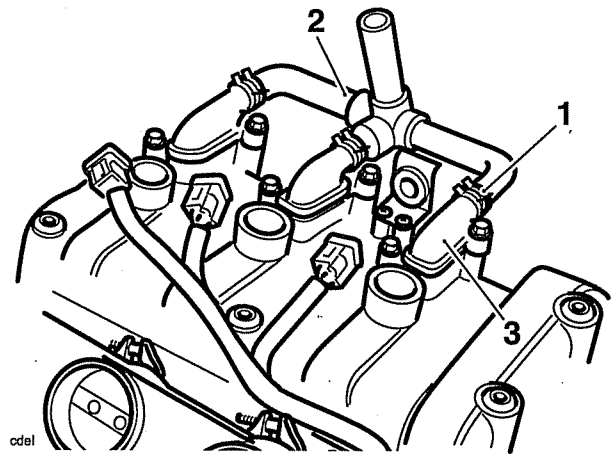
Installation

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 *16-9*).

Secondary Air Injection Reed Valves

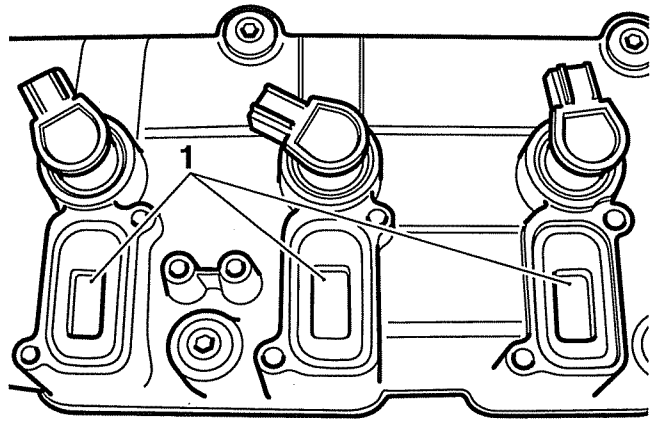
Removal

1. Remove the seat (see page *16-8*).
2. Disconnect the battery negative (black) lead first.
3. Remove the fuel tank (see page *10-88*).
4. Remove the airbox (see page *10-92*).
5. Disconnect the electrical connectons 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. Release the bolts securing the valve covers to the cam cover.
8. Ease the valve covers from the valves.
9. Detach the valves from the cam cover.



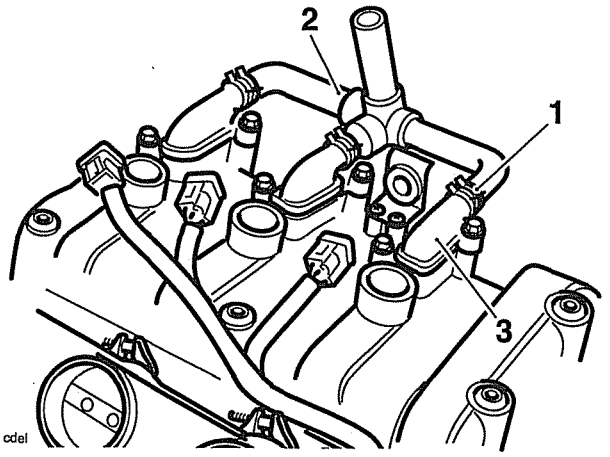
1. Valves

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.

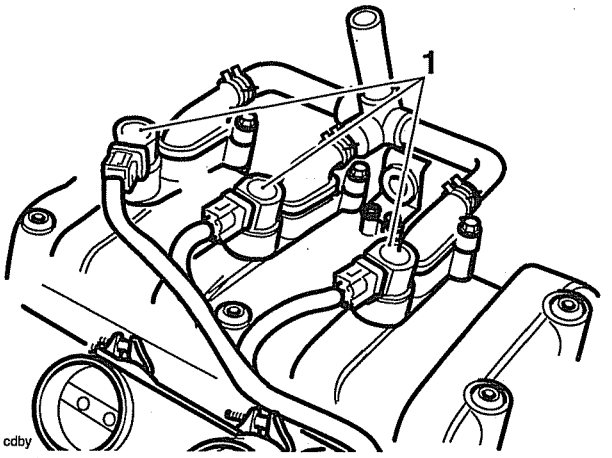
Installation

1. Fit the reed valves to the cam cover.
2. Refit the valve covers and tighten the fixings to **9 Nm.**
3. Refit the air hoses to the reed valves.



1. Spring-close hose clip
2. Secondary air injection hose
3. Reed valve assembly

4. Fit the ignition coils and reconnect.



1. Coils

5. Refit the airbox (see page *10-93*).
6. Refit the fuel tank (see page *10-88*).
7. Reconnect the battery, positive (red) lead first
8. Refit the seat (see page *16-9*).

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.

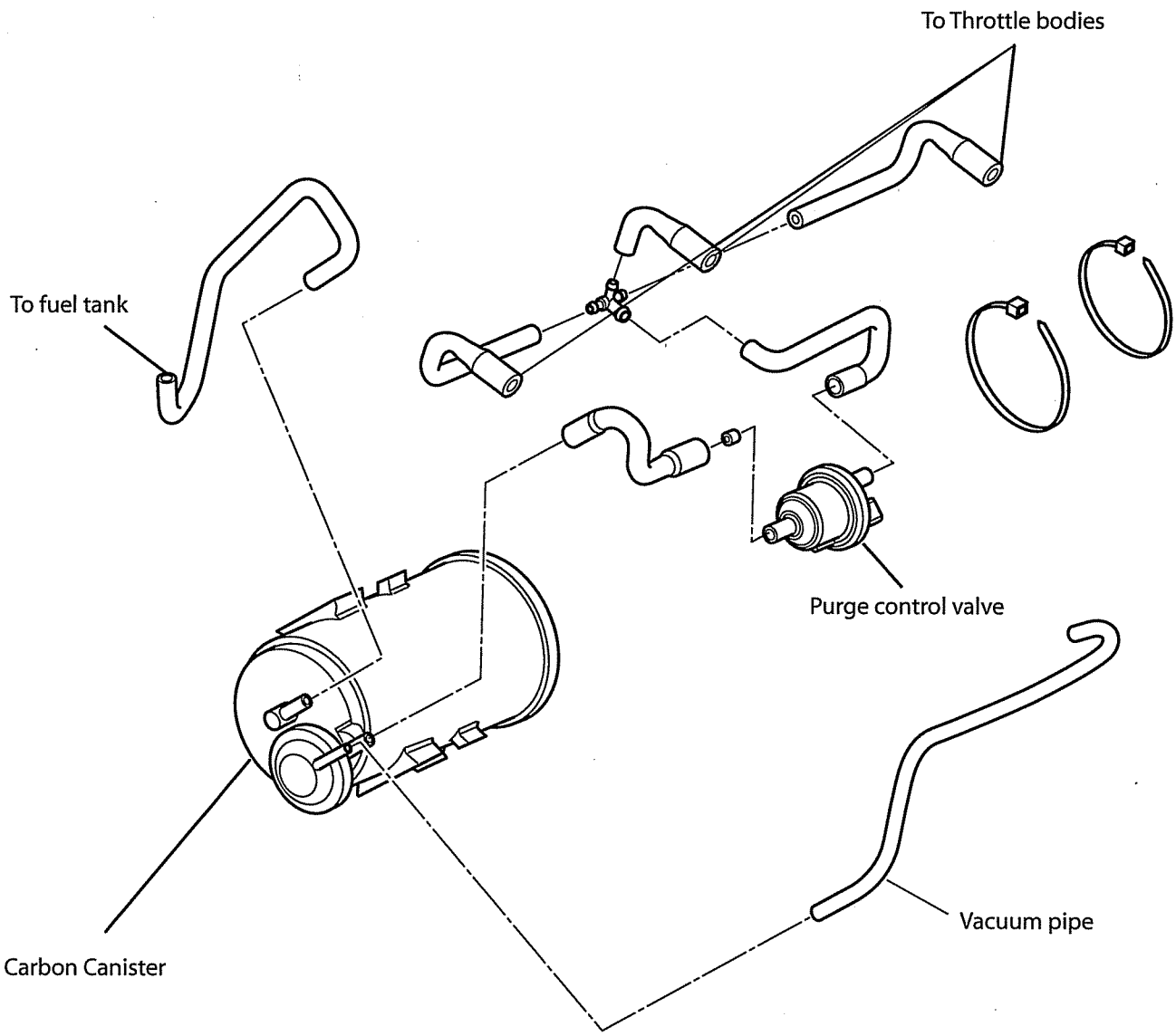
A carbon canister absorbs vapour while the engine is not running. When the engine is started, the vapour is returned to the engine and burnt.

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

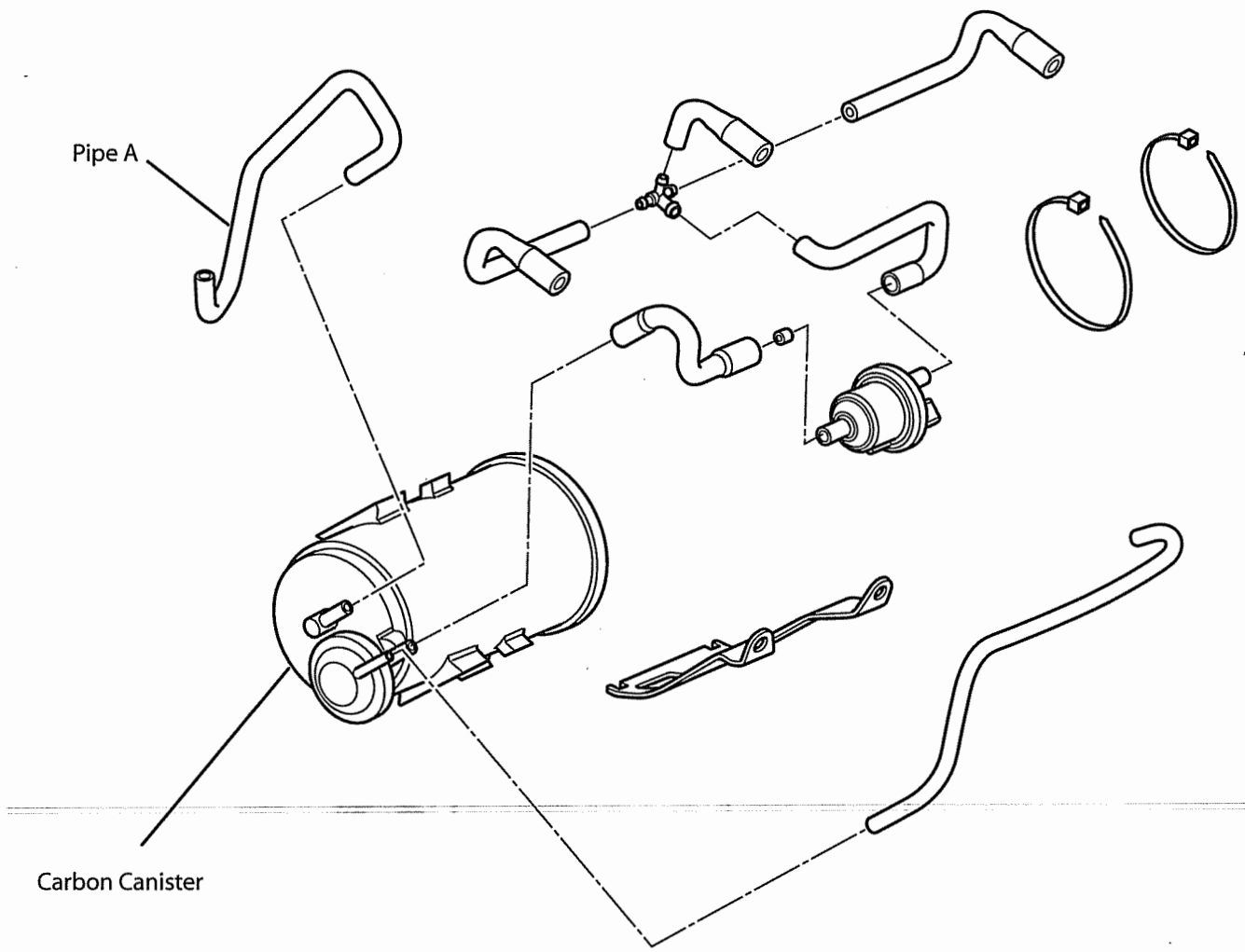
Purge Control Valve - adjacent to frame, left hand side (electronically controlled by the ECM)



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.

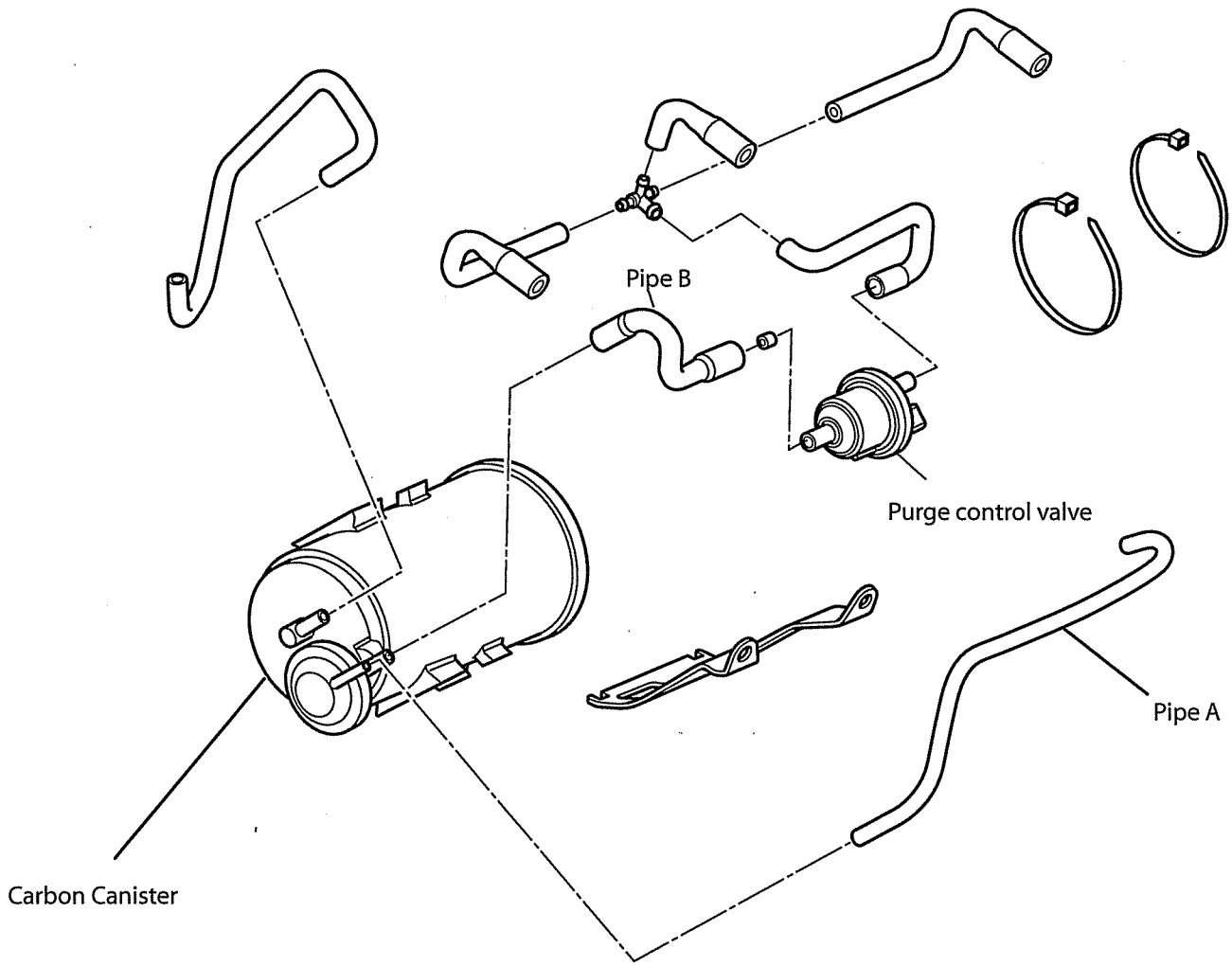


Evaporative Control System - Engine Running

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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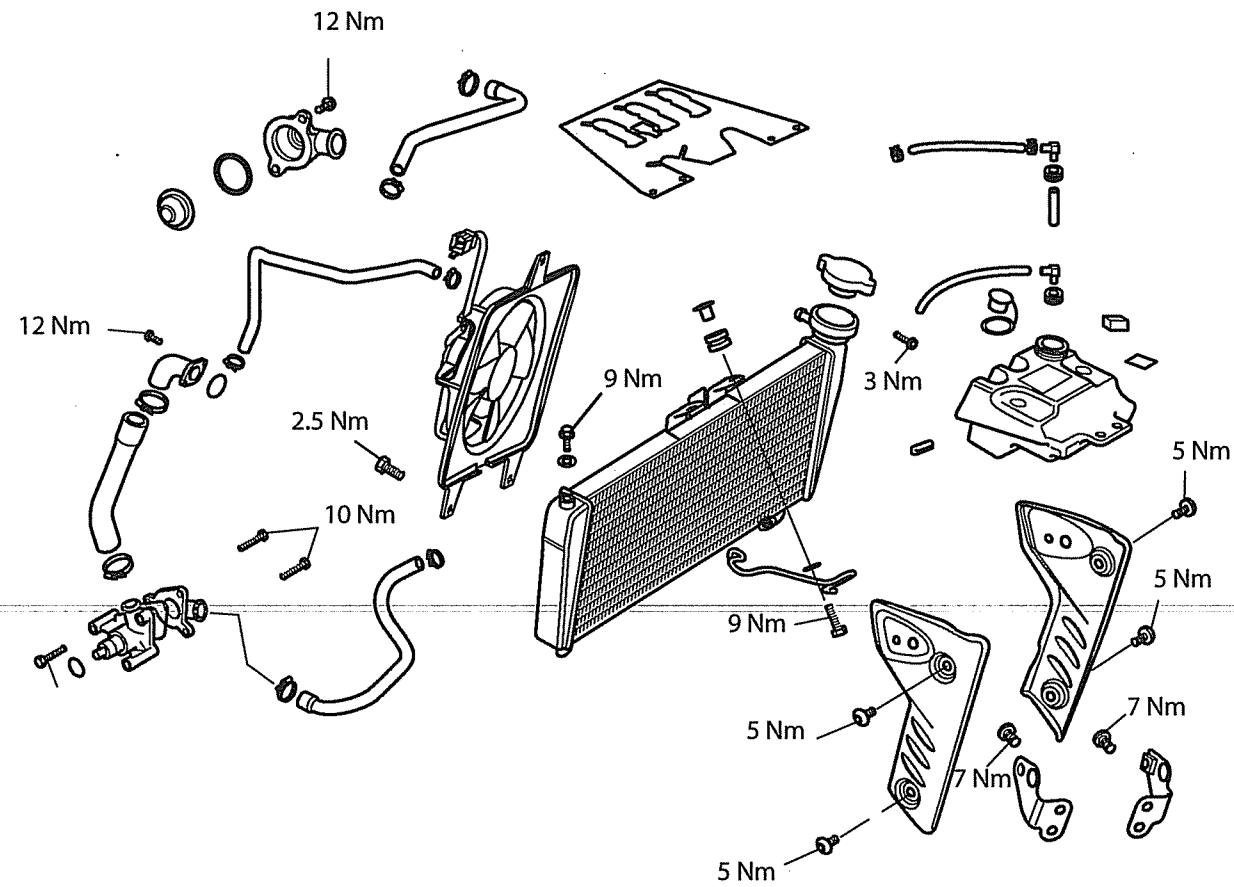
Exploded View - Cooling System



Coolant

A permanent type of anti-freeze is installed in the cooling system when the motorcycle leaves the factory.

It is coloured blue, contains a 50% solution of ethylene glycol, and has a freezing point of -35°C (-15°F).

Always change the coolant at the intervals specified in the scheduled maintenance chart.

⚠ Warning

Coolant mixture that 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.

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. To prevent injury, keep hands and clothing away from the fan blades at all times.

⚠ Caution

Using high-pressure water sprays can damage the radiator fins and impair the radiator's efficiency.

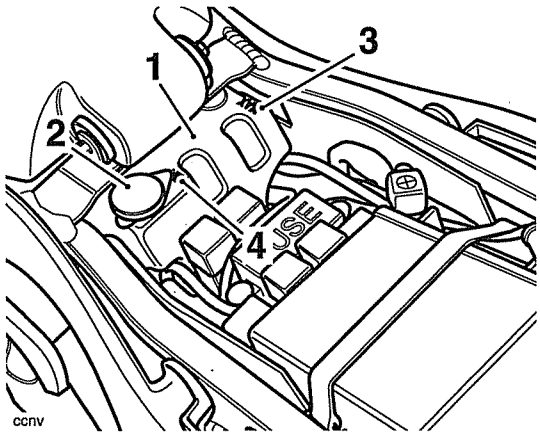
Do not obstruct or deflect airflow through the radiator by installing unauthorized accessories in front of the radiator or behind the cooling fan. Interference with the radiator airflow can lead to overheating and consequent engine damage.

Coolant 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. Remove the seat (see page *16-8*).
3. Check the coolant level in the expansion tank. The coolant level should be between the 'MAX and 'MIN.' marks.



1. Expansion Tank
2. Expansion Tank Filler Cap
3. 'Max' Mark
4. 'Min.' Mark

4. If the level of coolant is low, remove the cap from the expansion tank and add coolant mixture as necessary to bring the level up to the `MAX' mark. Refit the cap.

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.

Coolant Replacement

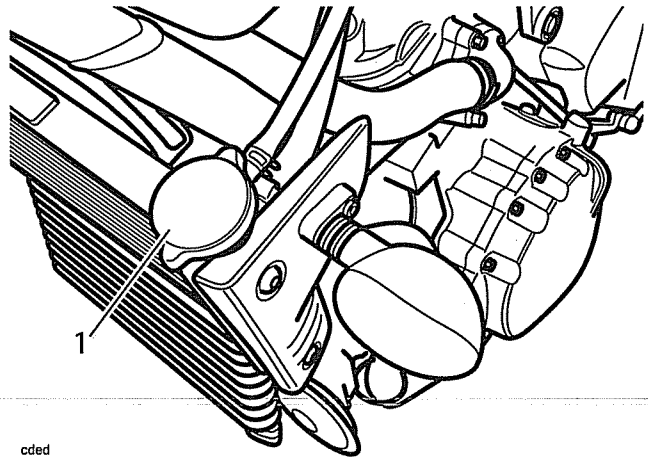
Drainage

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.

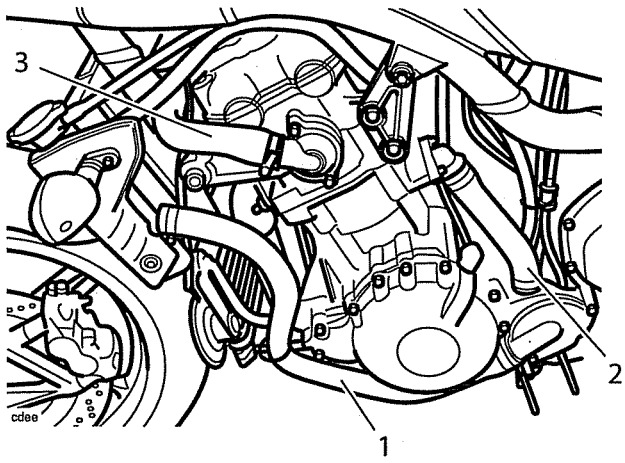
3. Remove the coolant pressure cap on the radiator after first releasing the screw retaining it to the radioator.



1. Radiator cap

4. Position a container to collect the displaced coolant.

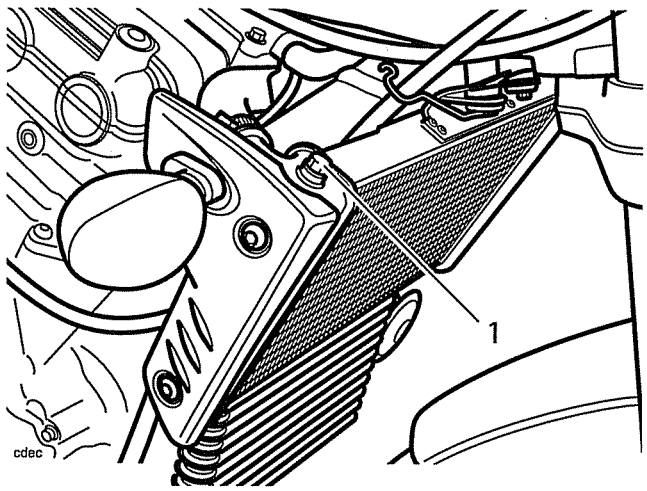
5. Slacken the clip then release the bottom hose from the water pump.



1. Bottom hose
2. Bypass hose
3. Top hose

Filling

1. Reconnect the bottom hose and tighten the hose clip.
2. Remove the bleed screw from the left hand side of the radiator.



1. Bleed screw

3. 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.
4. 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.**

5. If necessary, top up the system through the filler and refit the pressure cap.
6. Fit and tighten the bleed screw to **9 Nm**.
7. Refit the coolant pressure cap. Tighten its screw to **3 Nm**.
8. Reconnect the battery positive (red) lead first.
9. 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.

10. Stop the engine and top up the coolant level as necessary.
11. Fit the coolant pressure cap and tighten its screw to **3 Nm**.
12. Check the expansion tank level and top up if necessary.
13. Refit the seat (see page *16-9*).

Water Pump

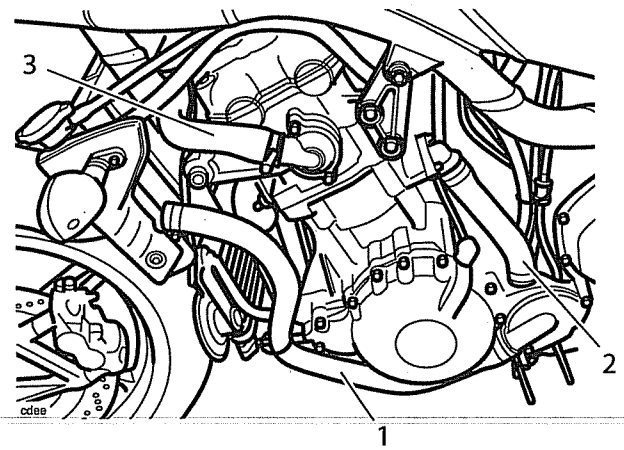
Removal

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

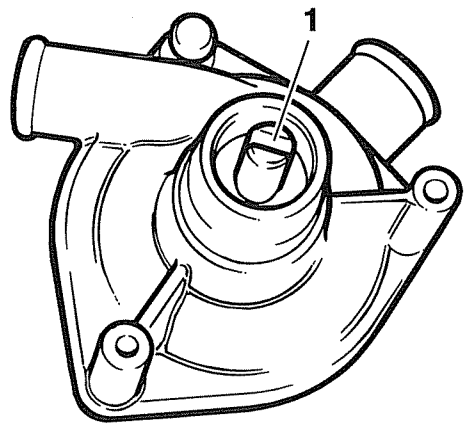
1. Check the water pump shaft and shaft bearings for side and end float. Renew if necessary
2. Check for corrosion and scale build-up around the impellor and in the pump body. Renew if necessary.

Installation

1. Replace the water pump 'O' ring seal.
2. Align the drive slot in the water pump with the drive slot on the oil pump (inside the crankcase)

Note:

- **The water pump will not engage fully into the crankcase unless the drive slots are engaged.**



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 *11-5*).

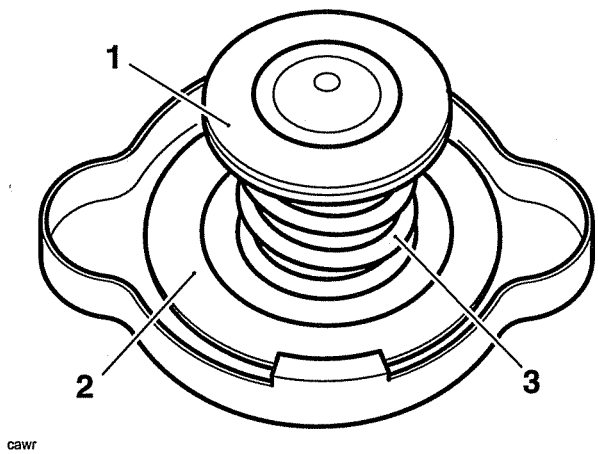
Coolant Pressure Cap

Inspection

Warning

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

1. Check condition of the upper and lower seals of the coolant pressure cap.



1. Lower Seal
2. Upper Seal
3. Spring

Note:

- **If there is any sign of damage or deterioration replace the cap.**

2. Pressure test the cap to the blow off pressure of 1.1 bar. If the cap opens at a lower pressure or fails to open at 1.1 bar, replace the cap.

Thermostat

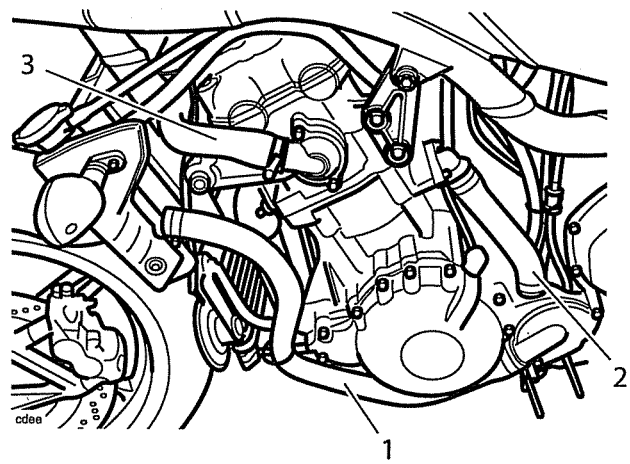
Removal

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

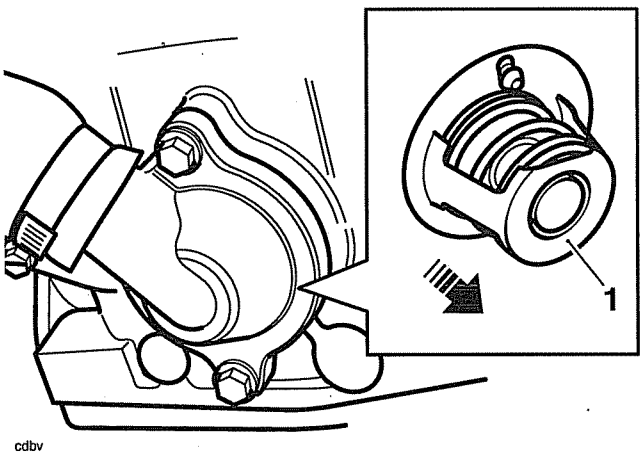
5. Release the fixings securing the thermostat elbow to the cylinder head.
6. Remove the thermostat housing. Discard the 'O'-ring.
7. Remove the thermostat from the cylinder head.

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.
3. If the temperature at which thermostat opening takes place is incorrect, replace the thermostat.

Installation

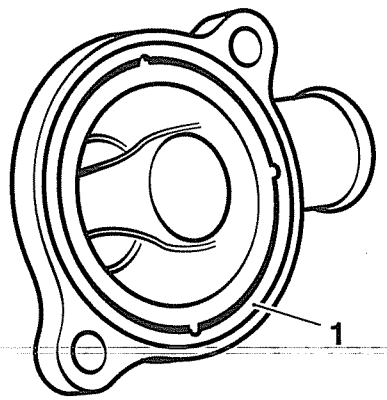
1. Locate the thermostat into the cylinder head.



cdbv

1. Thermostat (face shown inserted into the head)

2. Fit a new 'O'-ring to the thermostat elbow.



cash

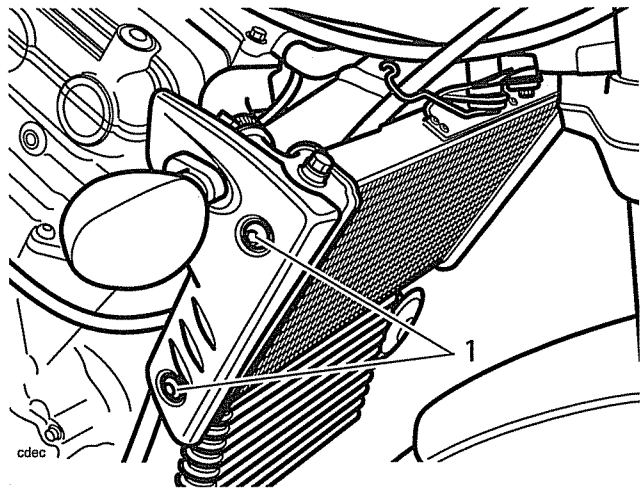
1. O-ring/groove

3. Tighten the bolts to **12 Nm.**
4. Reconnect the top hose and tighten the clips.
5. Refill the cooling system (see page *11-5*).

Radiator

Removal

1. Remove the seats (see page *16-8*).
2. Disconnect the battery negative (black) lead first.
3. Remove the radiator end finishers, complete with the front indicators.



cdec

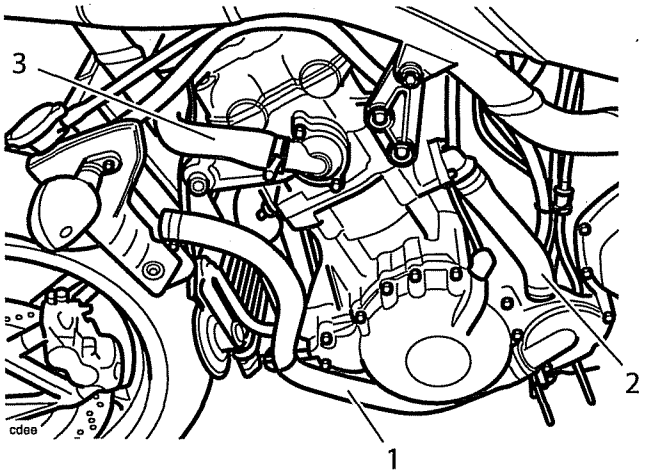
1. End finisher fixings

Warning

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

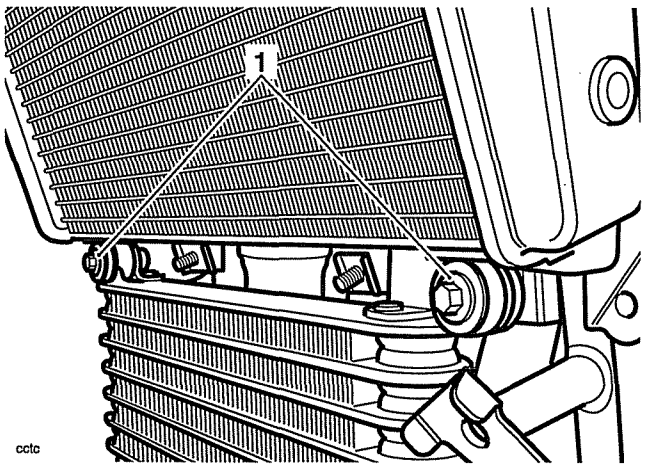
4. Drain the coolant (see page *11-4*).

5. Disconnect the top and bottom hoses at the radiator.



1. Bottom hose
2. Bypass hose
3. Top hose

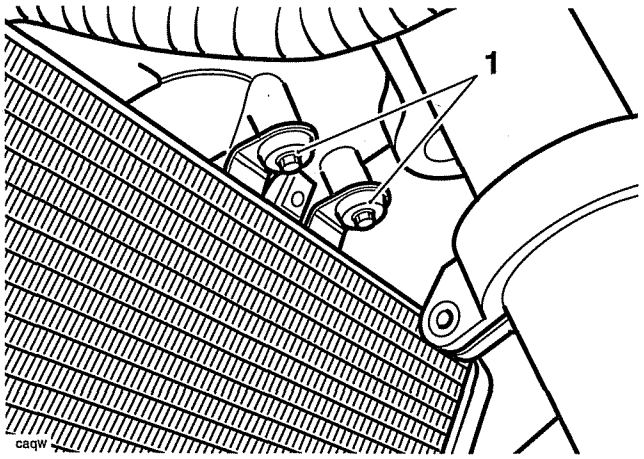
6. Release the oil cooler fixings from the radiator lower mountings.



1. Oil cooler fixings

7. Disconnect the cooling fan connection from above the cam cover.

8. Release the bolts securing the radiator to the frame.



1. Radiator to frame bolts

9. 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 lower mountings. Fit and tighten the upper mounting bolts to **9 Nm**.
2. Reconnect the cooling fan.
3. Align the oil cooler to the radiator. Fit the lower mounting bolts, tightening to **9 Nm**.
4. Reconnect the top and bottom hoses. Tighten the hose clips.
5. Align the end finishers to the radiator, refit the bolts and tighten them to **5 Nm**.
6. Refill the cooling system (see page *11-5*).
7. Reconnect the battery positive (red) lead first.
8. Fill the cooling system (see page *11-5*).

12 Rear Suspension

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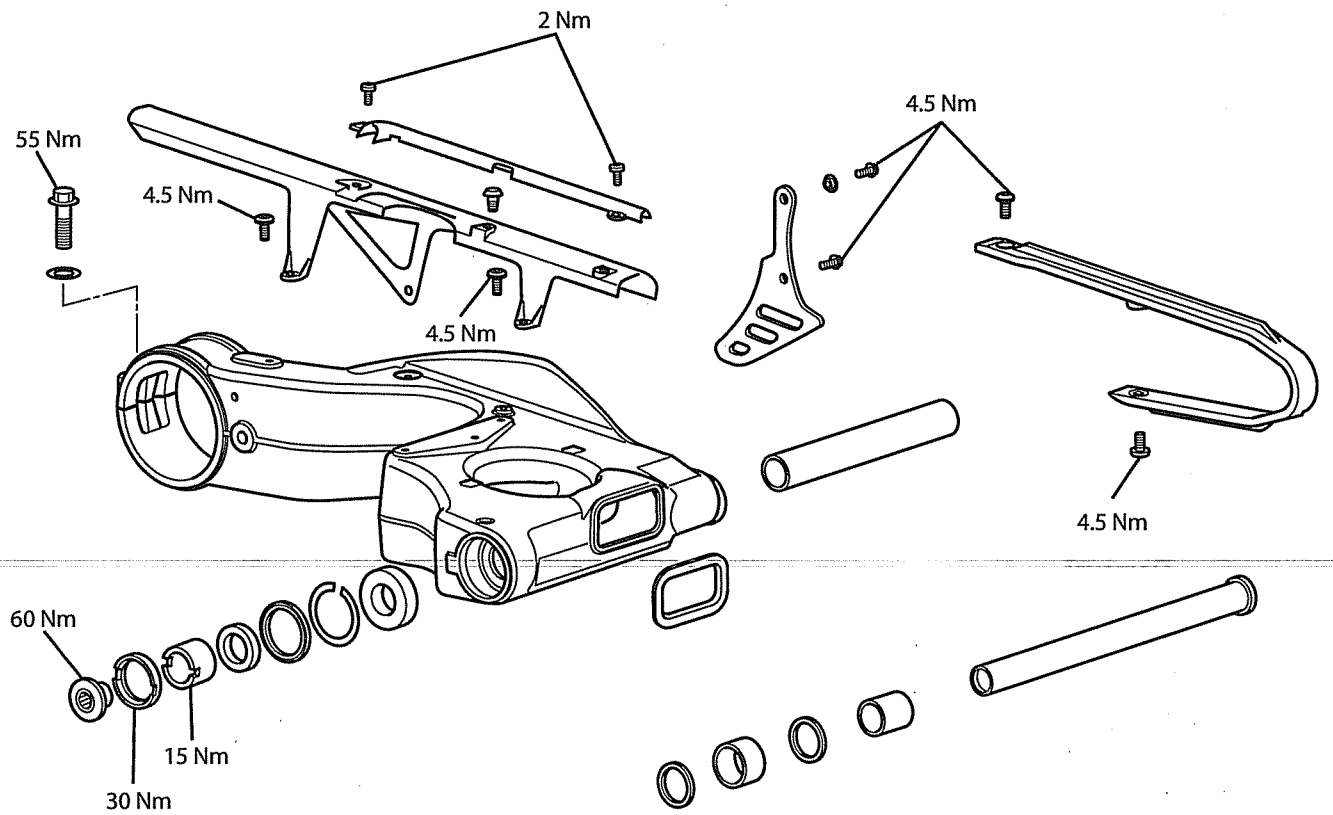
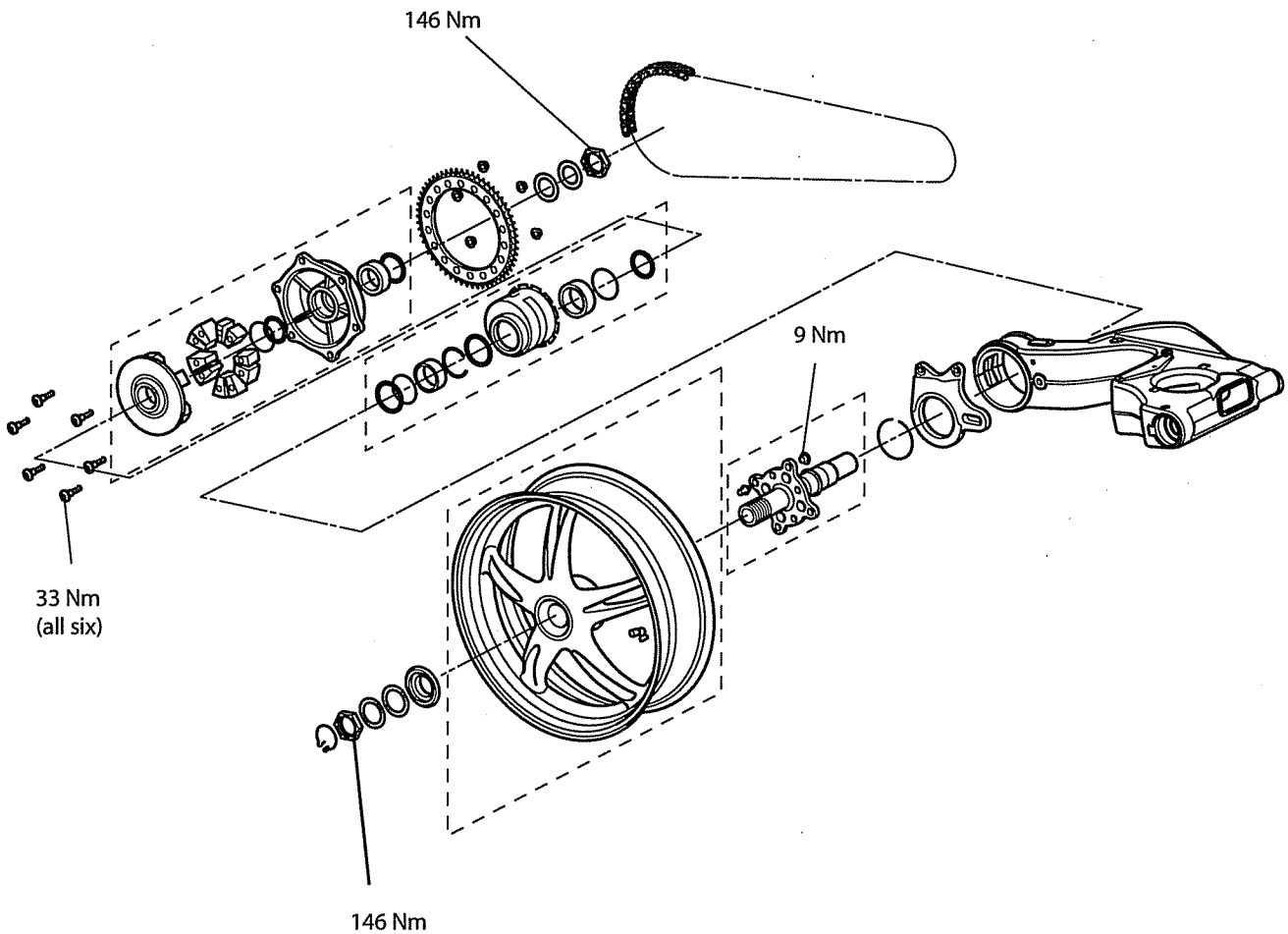
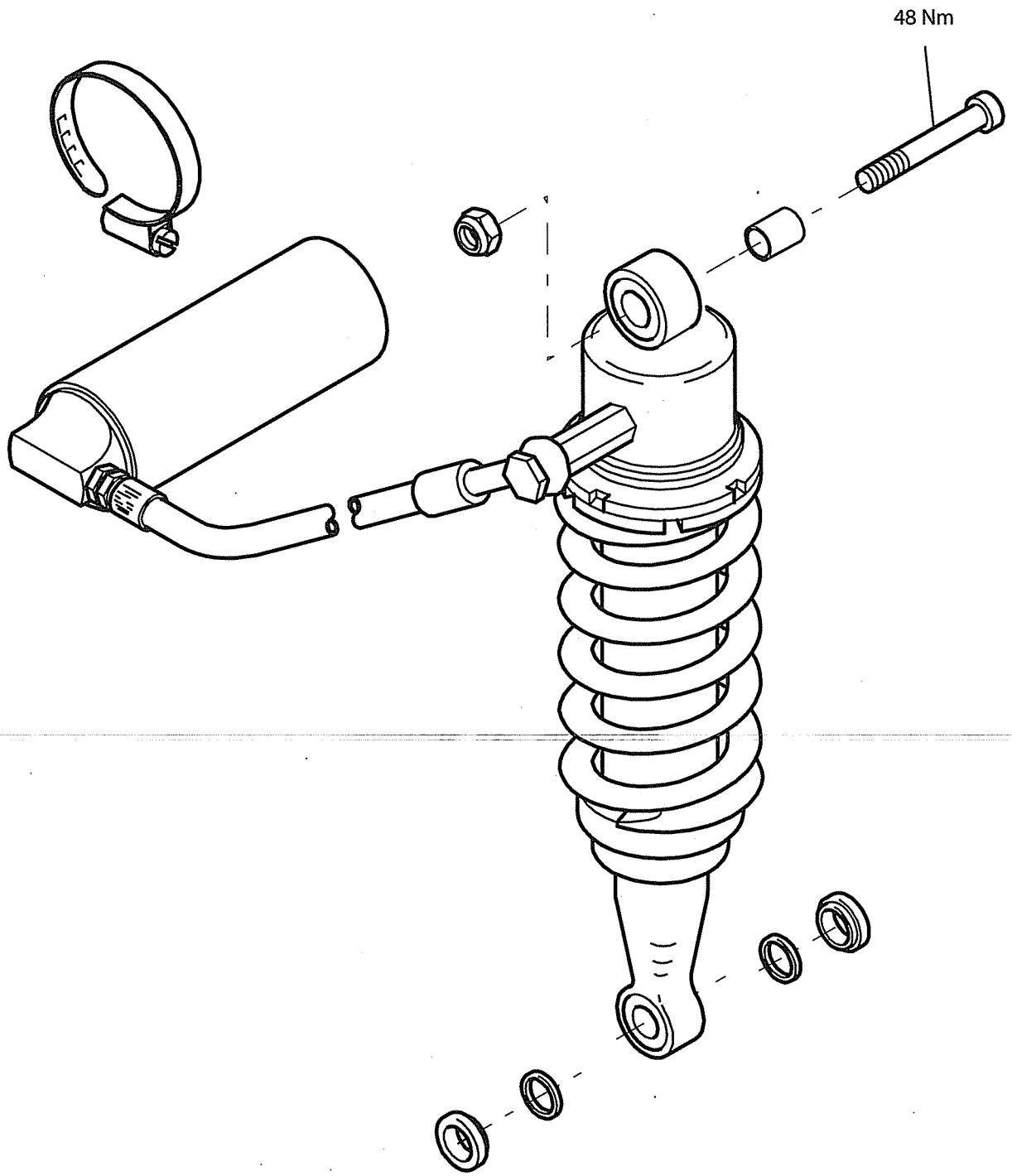
Exploded View - Swinging Arm



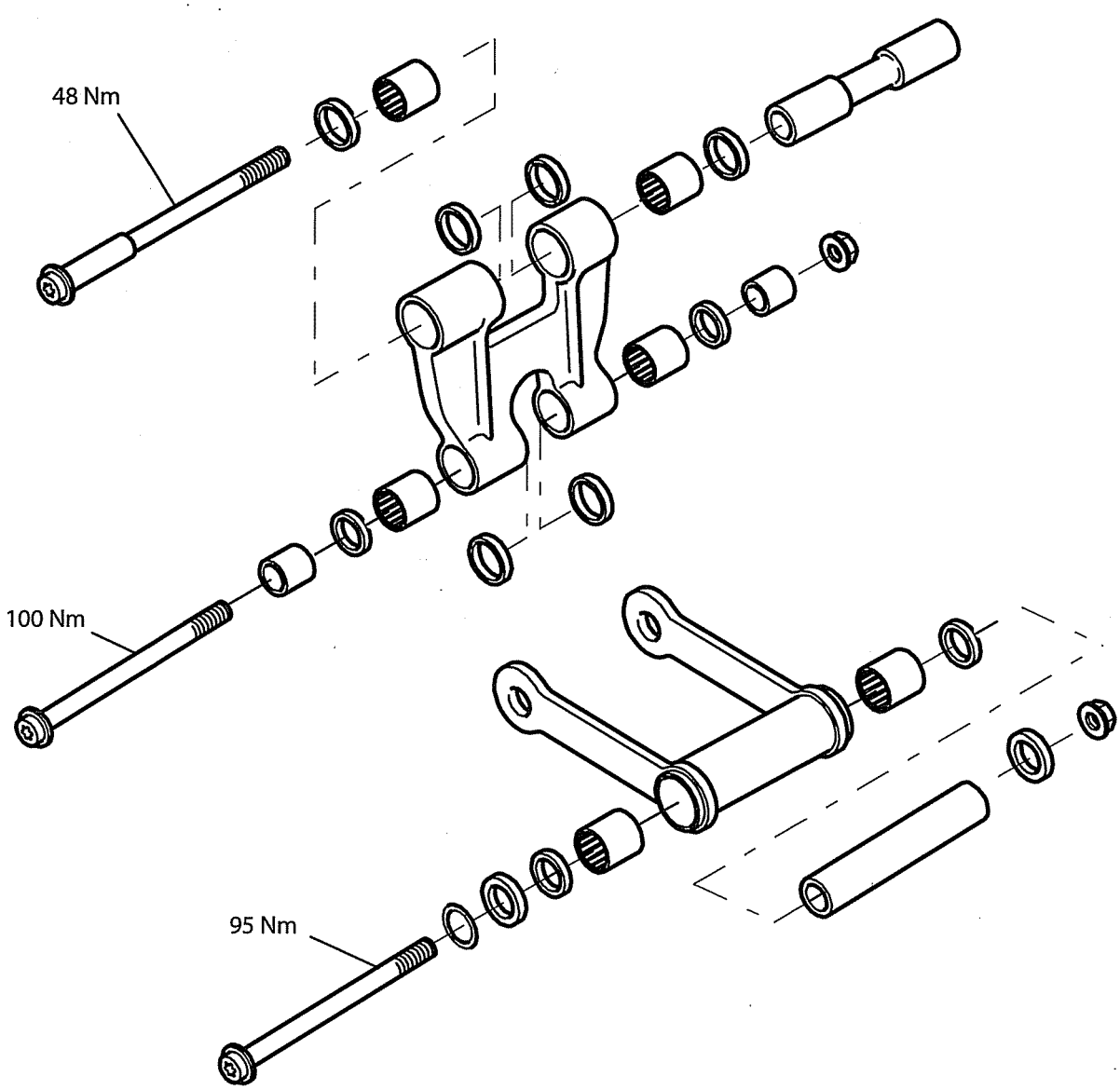
Exploded View - Rear Hub and Wheel



Exploded View - Rear Suspension Unit



Exploded View - Drop/Drag Link



Drive Chain

For safety and to prevent excessive wear, the drive chain must be checked, adjusted, and lubricated in accordance with scheduled maintenance chart. Checking, adjustment and lubrication must be carried out more frequently for extreme conditions such as salty or heavily gritted roads.

If the chain is badly worn or incorrectly adjusted (either too loose or too tight) the chain could jump off the sprockets or break.

⚠ Warning

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 an accident. Never neglect chain maintenance.

Note:

- **Checking, adjustment and lubrication of the drive chain must ideally be carried out with the motorcycle set up so that the rear suspension hangs free. Alternatively, the chain may be adjusted with the motorcycle parked on the side stand**

Chain Lubrication

Lubrication is necessary every 500 miles and also after riding in wet weather, on wet roads, or any time that the chain appears dry.

Use the special chain lubricant as recommended in the specification section.

Correct application method is critical for chain lubricant. Apply the lubricant for one full chain revolution only, then leave for eight hours before riding. This allows the lubricant's solvent (used to thin the oil) to evaporate and the oil to 'soak' into all parts of the chain. If the lubricant is applied and the motorcycle is ridden shortly afterwards, the lubricant is unlikely to reach all parts and the majority will be flung off and wasted. Applying excessive amounts is not helpful under any circumstances.

It should be noted that the lubricant is applied to the chain to lubricate its action across the sprockets. In an 'O' ring chain, external lubrication does not penetrate to the bushes and rollers as the 'O' ring seal prevents this from happening.

⚠ Caution

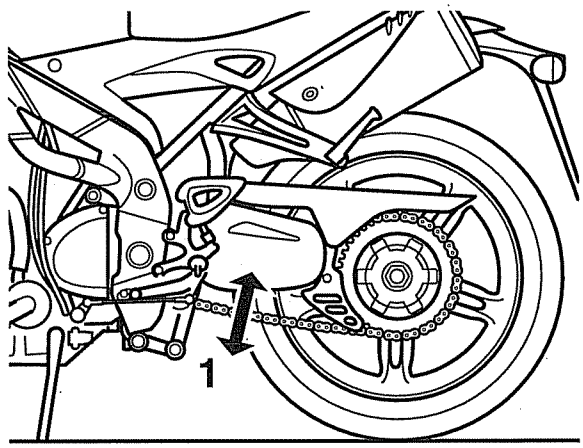
Do not use a power `jet' wash to clean the chain as this may cause damage to the chain components.

Chain Adjustment

Note:

- **The correct adjustment setting is 35-40 mm.**

Chain Free-movement Inspection



1. Maximum movement position

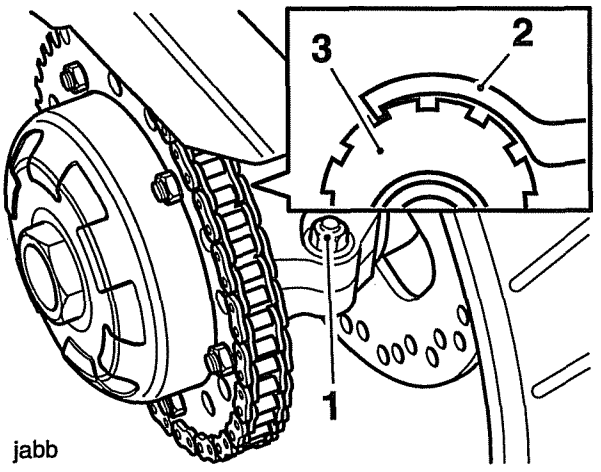
⚠ Warning

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. Set the motorcycle up on the side stand.
2. Rotate the rear wheel to find the position where the chain has least slack. Measure the chain's vertical movement, mid-way between sprockets.
3. If correct, the vertical movement of the drive chain midway between the sprockets should be 35-40 mm.

Chain Free-movement 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.

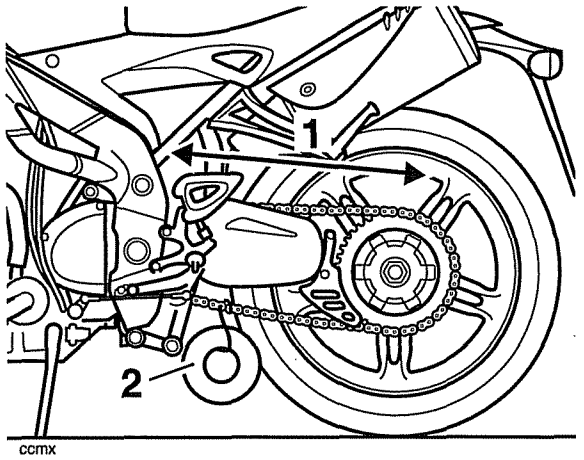


jabb

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 Wear Inspection



ccmx

1. Measurement across 20 links
2. 10-20kg Weight

Warning

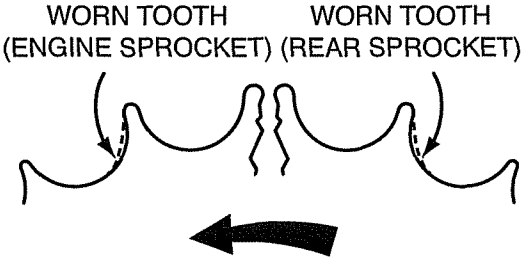
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Remove the chain guard from the swinging arm.
2. Stretch the chain taut by hanging a 10-20 kg (20-40 lb) weight on the chain.
3. Measure a length of 20 links on the straight part of the chain from pin centre of the 1st pin to pin centre of the 21st pin. Repeat the test at various sections of the chain to establish an average reading. This is because the chain may wear unevenly.
4. If the length exceeds the service limit of 321 mm, the chain must be replaced.

Warning

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 control and an accident.

5. Examine the whole length of the chain. If there are any excessively tight or loose sections, loose pins or damaged rollers, the chain should be replaced.
6. Inspect sprockets for unevenly or excessively worn teeth. Also examine the sprockets for damaged teeth.



(Sprocket wear exagerated for illustrative purposes)

ccol

Note:

- **Sprocket wear is exaggerated for illustration.**

Warning

The use of non-approved chains may result in a broken chain or may cause the chain to jump off the sprockets.

Use a genuine Triumph supplied chain as specified in the Triumph Parts Catalogue.

Never neglect chain maintenance and always have chains installed by an authorised Triumph dealer.

7. If there is any irregularity found in any of the components, replace the drive chain and/or any other damaged components.
8. Refit the chain guard tightening the fixings to **4.5 Nm.**

Rear Suspension Unit

Removal

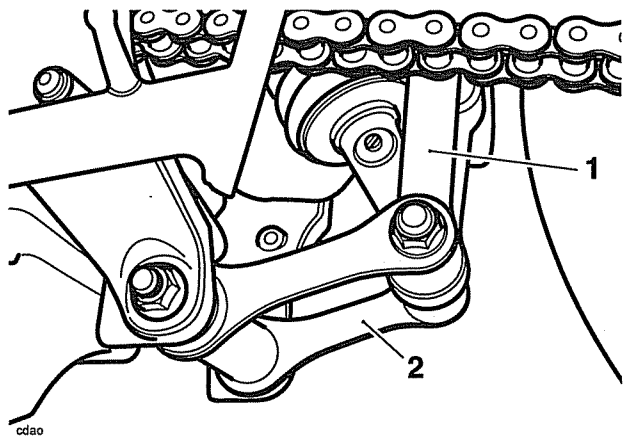
Warning

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

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. 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 and the rear body panels (see page *16-8*).
3. Disconnect the battery, negative (black) lead first.
4. Remove the nut and bolt securing the rear suspension unit lower mounting to the drop link and drag link. Pivot the links clear and capture the two sleeves.



1. Drop link
2. Drag link

Warning

Never disconnect the reservoir from the rear suspension unit. It contains fluid under pressure and serious injury could result if any part of the system is disturbed.

5. Detach the rear suspension unit reservoir from the rear mudguard by releasing it from the re-usable clip.
6. Remove the rear suspension unit upper mounting nut, spacer and bolt, and lower the unit clear of the motorcycle.

Note:

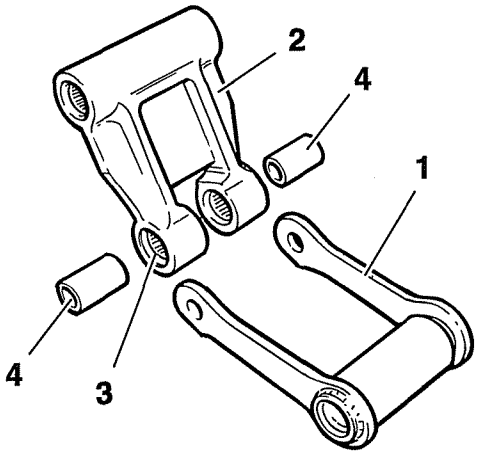
- **During removal, the reservoir must be carefully manoeuvered from its mounted position to prevent the hose from being damaged.**

Inspection

1. Clean all components and inspect for damage / wear to:
   - rear suspension unit upper and lower mountings,
   - lower mounting spacers and 'O' rings,
   - drop link bearings, sleeves and seals.
2. Renew as necessary.
3. Check the drop link upper bearings for wear. Overhaul as necessary (see page *12-10*).
4. Check the drag link bearings for wear. Overhaul as necessary (see page *12-12*).

Installation

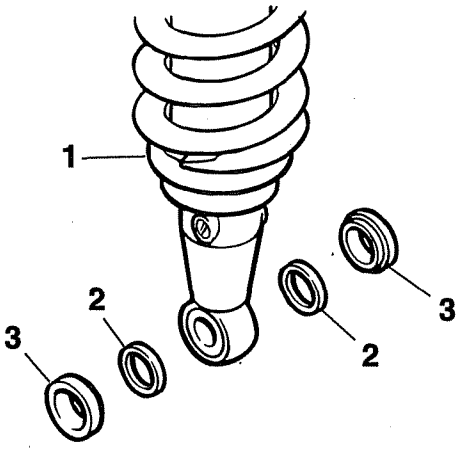
1. Locate the rear suspension unit and loosely fit the upper mounting bolt, spacer and nut.
2. Position the rear suspension unit reservoir to the mudguard and secure with the clip.
3. Pack the drop link bearings with grease and fit the sleeves.



gael

1. Drag Link
2. Drop Link
3. Drop Link Bearings
4. Sleeves

4. Position the spacers on either side of the rear suspension unit lower mounting with their smaller outside diameters towards the mounting.



gagk

1. Rear suspension unit
2. `O' rings*
3. Spacers
*** `O' rings are permanently attached to the RSU but shown detached for identification**

5. Pivot the drag link and drop link into position and loosely fit the securing bolt / nut.
6. With the weight of the motorcycle on its wheels, tighten the rear suspension unit upper mounting to **48 Nm**.
7. Tighten the rear suspension unit lower mounting to **100 Nm**.
8. Connect the battery, red (positive) lead first.
9. Fit the seat and rear panels. (see page *16-9*).

Drop Link

Removal

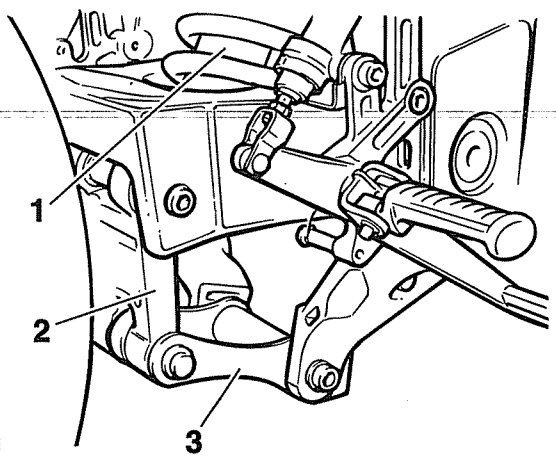
Warning

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

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. 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 and the rear panels (see page *16-8*).
3. Disconnect the battery, negative (black) lead first.



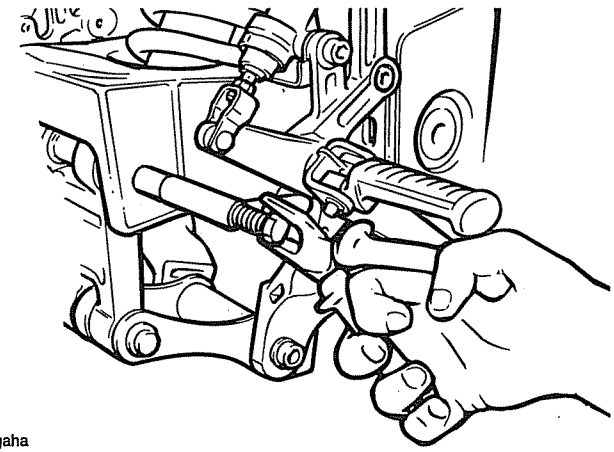
gaej

1. Rear suspension unit
2. Drop link
3. Drag link

4. Remove the nut and bolt securing the drop link and drag link to the rear suspension unit lower mounting. Pivot the links clear and capture the 2 spacers on either side of the rear suspension unit mounting.
5. Remove the bolt securing the drop link to the swinging arm.
6. Detach the drop link by pulling out its mounting spindle from the swinging arm.

Note:

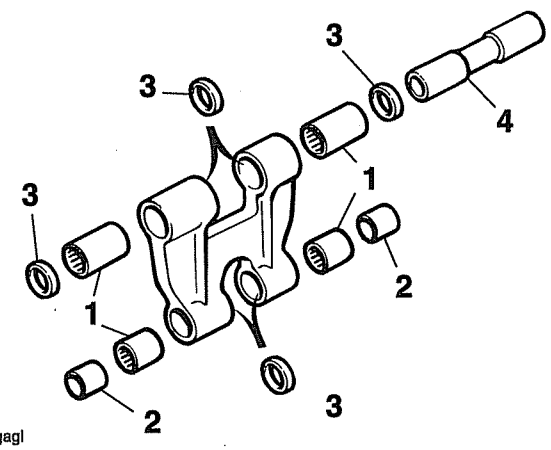
- **If tight, an M14 (1.5mm thread pitch) bolt can be threaded into the spindle to assist extraction.**


gaha

Removing drop link spindle

Inspection

1. Clean all components and inspect for damage / wear:
   - drop link bearings, sleeves and seals,
   - drop link spindle,
   - rear suspension unit lower mounting bush, spacers and 'O' rings.
2. Renew as necessary.



gagl

1. Drop link bearings
2. Drop link sleeves
3. Drop link seals
4. Drop link spindle

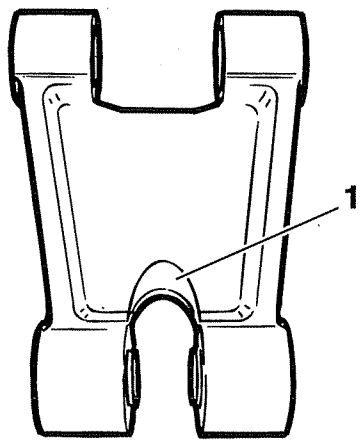
3. Check the drag link bearings for wear. Replace as necessary.

Installation

1. Pack all the drop link bearings with grease.

Note:

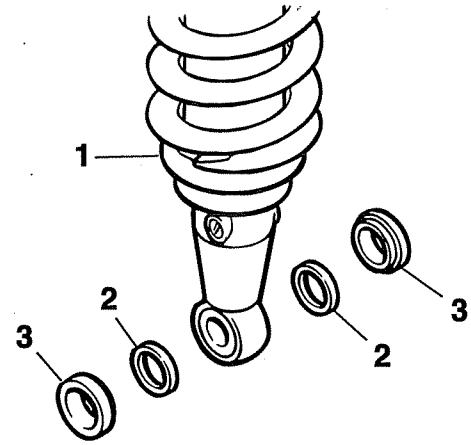
- **The drop link must be fitted the correct way round, and its spindle MUST be fitted with its internally threaded end towards the right hand side.**



gafd

1. Cut-away area

2. Position the drop link to the swinging arm with its cut-away central area towards the rear suspension unit. Push the spindle fully into position, internally threaded end to the right hand side of the motorcycle.
3. Fit the drop link to swinging arm bolt and tighten to **48 Nm**.
4. Check the drop link for freedom of movement; rectify as necessary.
5. Lubricate with grease, the 2 sleeves and locate in the drop link.
6. Position the spacers on either side of the rear suspension unit lower mounting with their smaller outside diameters towards the lower mounting.



gagk

1. Rear suspension unit
2. `O' rings*
3. Spacers
*** 'O' rings are permanently attached to the RSU but shown detached for identification)**

7. Pivot the drag link and drop link into position and fit the rear suspension unit lower securing bolt / nut. Tighten to **100 Nm**.
8. Connect the battery, red (positive) lead first.
9. Fit the seat and rear panels. (see page *16-9*).

Drag Link

Removal

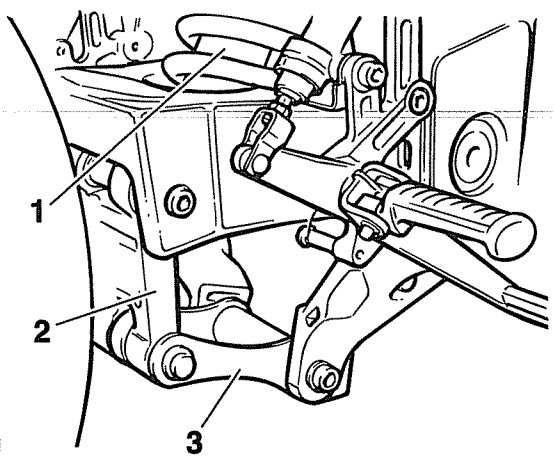
Warning

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

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. Raise and support the rear of the motorcycle beneath the frame or engine. Position a block to support the rear wheel.
2. Remove the seat and the rear panels (see page *16-8*).
3. Disconnect the battery, negative (black) lead first.



1. Rear suspension unit
2. Drop link
3. Drag link

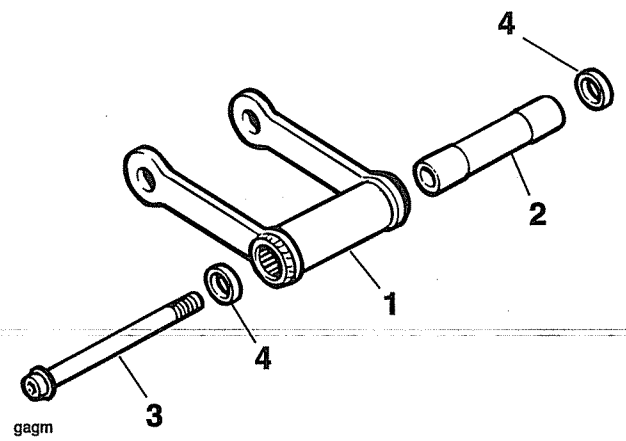
4. Remove the nut and bolt securing the drop link and drag link to the rear suspension unit lower mounting. Pivot the links clear and capture the two spacers on either side of the mounting.
5. Remove the nut and bolt securing the drag link front mounting and remove the drag link (if necessary, slacken the engine lower mounting bolts to assist removal).
6. Collect the drag link spacers from either side of the link.

Inspection

1. Clean all components and inspect for damage / wear:
   - drag link and bearings,
   - drag link spindle,
   - rear suspension unit lower mounting bush, spacers and 'O' rings,
   - drop link bearings, seals and sleeves.
2. Renew as necessary.
3. Check the drop link upper bearings for wear.

Installation

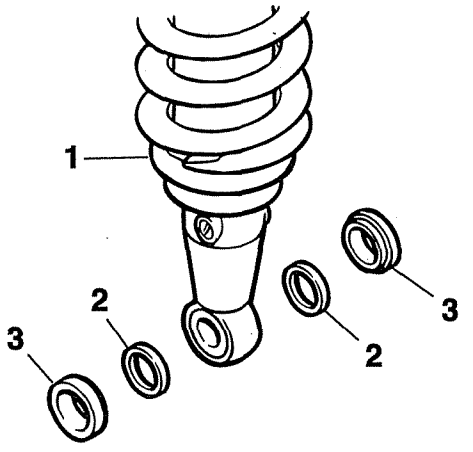
1. Pack the drag link bearings with grease, position the drag link and spacers to the frame and fit the spindle. Fit the securing bolt (hardened washer under the bolt head) and nut, and tighten to **95 Nm**.



1. Drag link
2. Spindle
3. Spindle securing bolt
4. Spacers

2. If slackened during removal, tighten the engine lower mounting bolts to **80 Nm**. Check the drag link for freedom of movement; rectify as necessary.

3. Position the spacers on either side of the rear suspension unit lower mounting with their smaller outside diameters towards the mounting.



gagk

1. Rear suspension unit
2. 'O' rings*
3. Spacers
*** 'O' rings are permanently attached to the RSU but shown detached for identification)**

4. Pivot the drag link and drop link into position and fit the rear suspension unit lower securing bolt / nut. Tighten to **100 Nm**.
5. Connect the battery, red (positive) lead first.
6. Fit the seat and the side panels. (see page *16-9*).

Swinging Arm/Drive Chain

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.

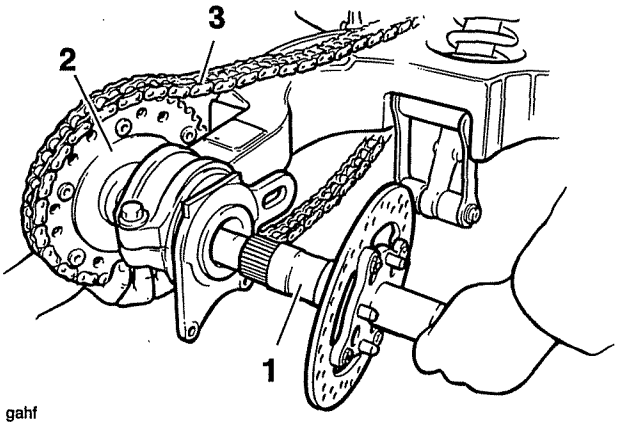
Warning

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

1. Remove the seat and the rear panels (see page *16-8*).
2. Disconnect the battery, negative (black) lead first.
3. Remove the rear wheel (see page *15-8*).
4. Remove the axle shaft and the final drive unit disconnecting the chain at the same time (see page *12-18*).

Note:

- **Collect the spacer fitted between the final drive and the hub.**
- **Support the chain while the final drive is being removed to prevent it dragging through the dirt.**

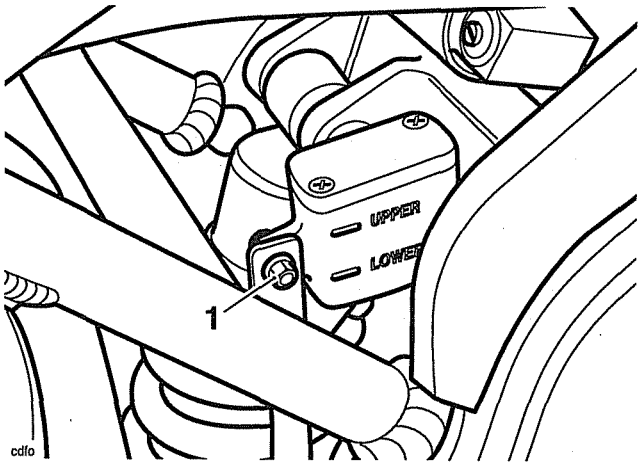


gahf

1. Axle shaft
2. Final drive
3. Chain

5. Place the axle shaft/brake disc assembly to one side.

6. Release the brake fluid reservoir from the frame and move it to one side.



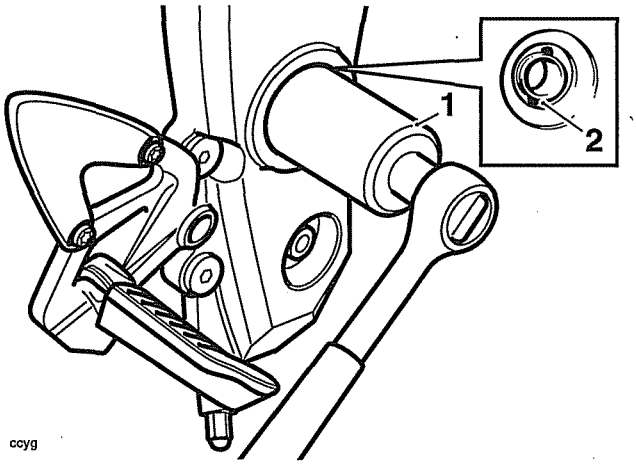
1. Rear reservoir fixing

Caution

The brake fluid reservoir has an air hole in the cap through which brake fluid could escape if the reservoir became inverted.

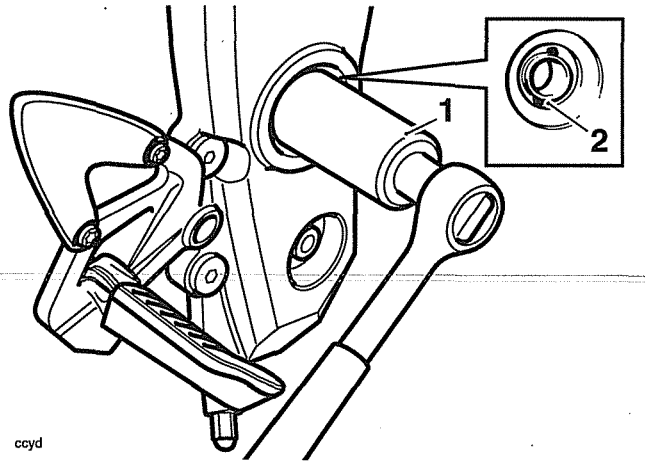
To prevent body damage from leaking brake fluid, always keep the reservoir upright.

7. Support the swinging arm and remove the rear suspension unit upper bolt, spacer and nut. Allow the swinging arm to pivot downwards after removing the bolt.
8. Release the clip securing the rear suspension unit reservoir to the rear mudguard. Detach the reservoir but leave the clip in place around the rear mudguard.
9. Detach the drop link (see page *12-10*).
10. Release the swinging arm spindle bolts from both sides of the motorcycle.
11. Using tool T3880295, remove the locking ring from the right hand side of the swinging arm spindle.



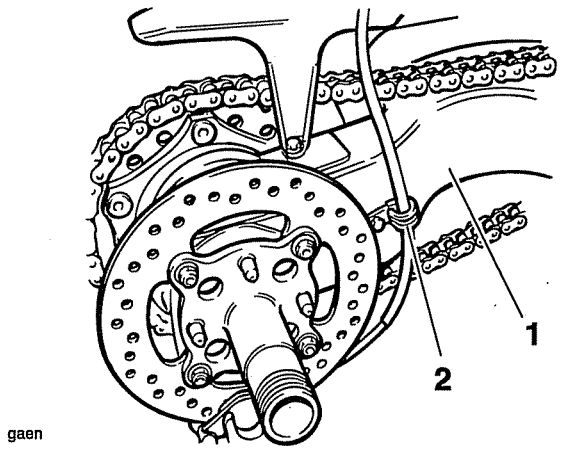
1. Tool T3880295
2. Locking ring

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



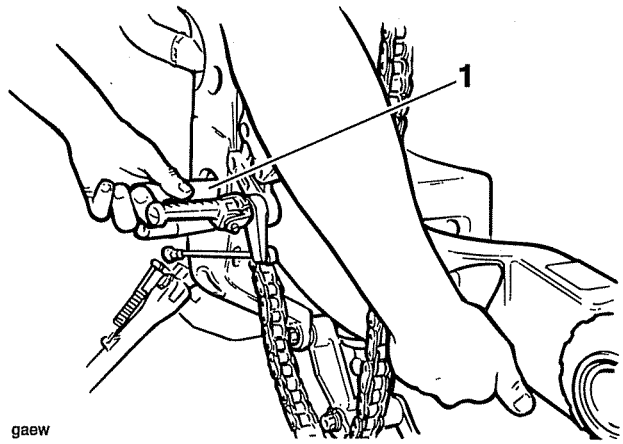
1. Tool T3880290
2. Clamping ring

13. Release the brake pipe clip from the right hand rear of the arm.



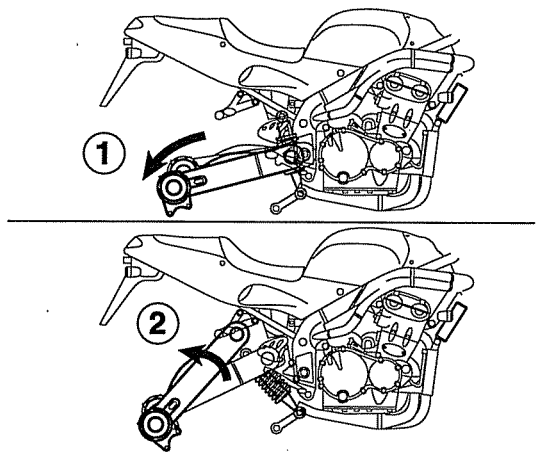
1. Swinging arm
2. Brake pipe clip

14. Support the swinging arm and remove the swinging arm spindle.



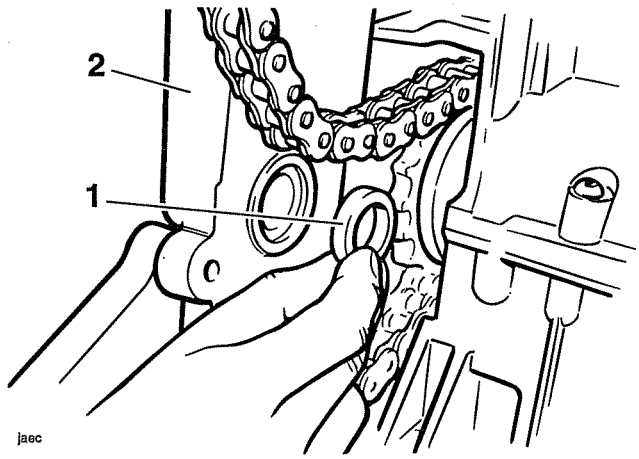
1. Swinging arm spindle

15. Carefully detach the arm from the frame and feed the rear suspension unit upper section and reservoir through the hole in the swinging arm.



Removing the swinging arm

16. Collect the spacer from the recess inside the left hand frame outrigger.

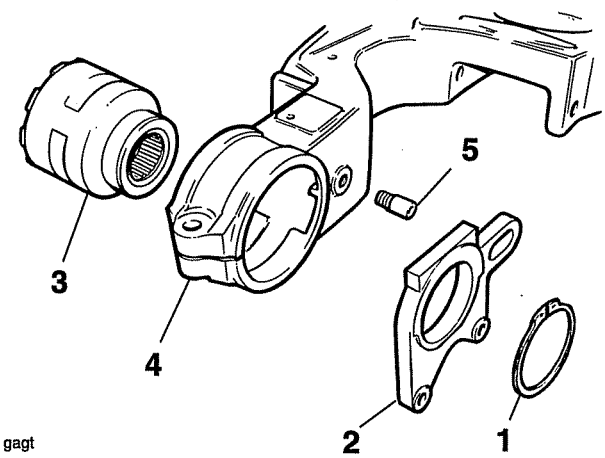


1. Spacer
2. Frame outrigger

Note:

- **If the swinging arm is to be replaced see page *12-16*.**

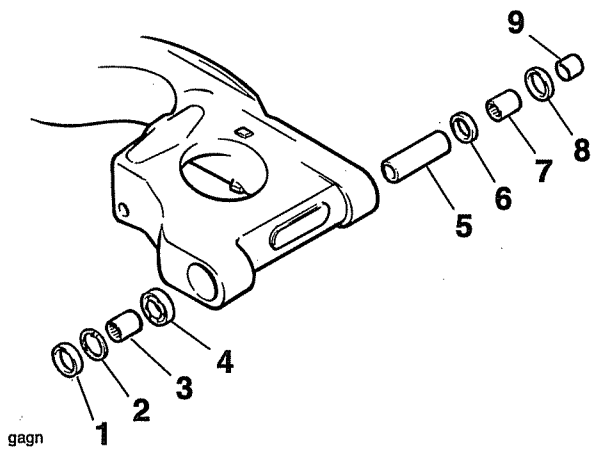
17. Remove the large circlip securing the caliper carrier to the hub and detach the carrier.
18. Remove the wheel bearing/hub from the left hand side of the swinging arm.
19. Remove the caliper carrier positioning stud.



1. Circlip
2. Caliper carrier
3. Hub
4. Swinging arm
5. Caliper carrier positioning stud

20. Remove the bearing sleeves from both sides.
21. Remove the right hand bearing by drifting through from the left.

22. Collect the spacer tube.



1. Seal
2. Circlip
3. Bearing sleeve
4. Ball bearing
5. Sleeve
6. Seal
7. Needle roller bearing
8. Seal
9. 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 *12-6*.**

23. Remove the drive chain rubbing strip.
24. Remove the sprocket cover.
25. Detach the chain from the output sprocket and remove the chain.

Inspection

1. Check all swinging arm bearing for damage, pitting, and cracks. Replace as necessary.
2. Check the swinging arm for damage. Replace as necessary.
3. Check the wheel/hub 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.
7. Check the drive chain rubbing strip for wear and damage. Replace as necessary.

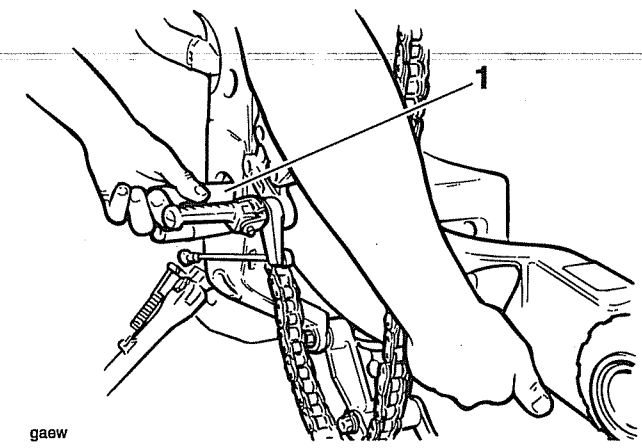
Assembly

1. Fit the drive chain to the output sprocket.
2. Refit the sprocket cover and tighten the bolts to **9 Nm.**
3. Install the bearings (marked faces outwards), sleeves etc. into the swinging arm in the order shown on the previous page. Use new seals throughout.
4. Refit the caliper carrier positioning stud and tighten to **40 Nm.**
5. Fit the drive chain rubbing strip and tighten the fixing to **4.5 Nm.**
6. Refit the hub with the circlip groove facing towards the right hand side.
7. Refit the caliper carrier (logo side facing to the right) and retain with the circlip.
8. Fit the spacer to the recess on the inside of the left hand frame outrigger.

Note:

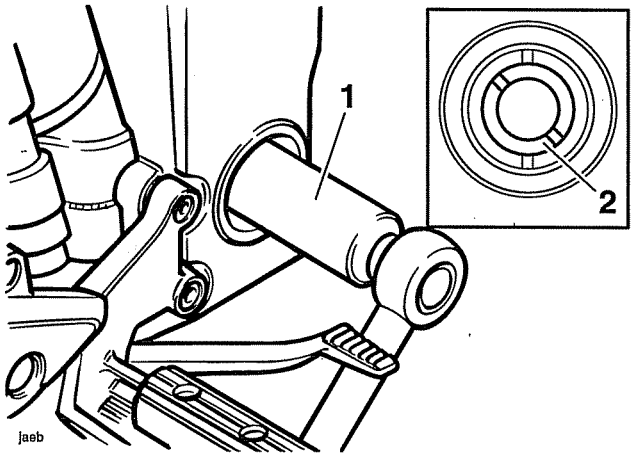
- **A smear of grease will help to retain the spacer while the swinging arm is being positioned.**

9. Position the swinging arm to the frame feeding the rear suspension unit reservoir and upper mounting point through the hole in the centre of the arm.
10. Refit the swinging arm spindle.



1. Swinging arm spindle

11. Using tool T3880290, tighten the swinging arm spindle inner adjustment ring to **15 Nm.**



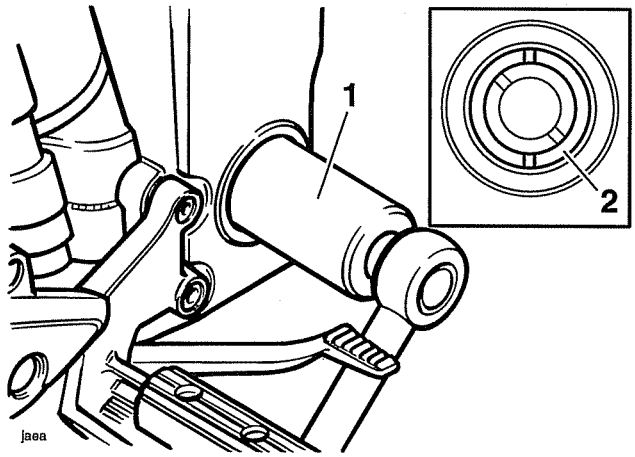
1. Tool T3880290
2. Clamping ring

Caution

Incorrect adjustment of the swinging arm clamping ring will damage the bearings, seals and swinging arm.

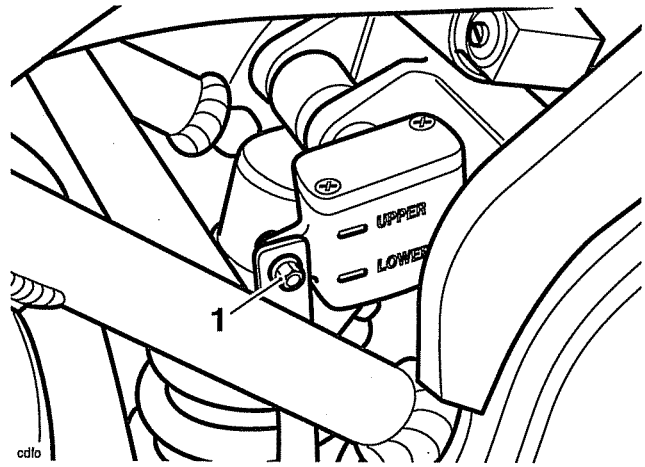
Never overtighten the clamping ring or set the adjustment to allow excessive sideways movement.

12. Fit the locking ring and tighten to **30 Nm** using tool T3880295.



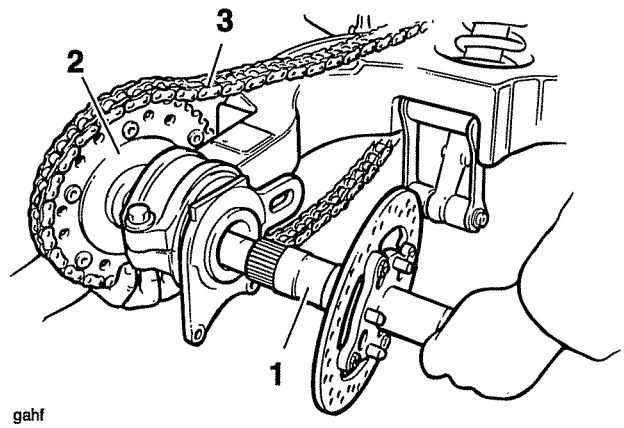
1. Tool T3880295
2. Locking ring

13. Check that the clamping ring adjustment has not changed, re-adjust if necessary.
14. Tighten both swinging arm bolts to **60 Nm.**
15. Refit the drop link (see page *12-11*).
16. Align the rear suspension unit upper mounting to the frame and fit the upper mounting bolt and spacer. Tighten the bolt to **48 Nm.**
17. Position the rear suspension unit reservoir to the mudguard and secure with the clip.
18. Refit the rear brake fluid reservoir to the frame, tightening the fixing to **7 Nm.**



1. Rear reservoir fixing

19. Refit the axle shaft/rear disc assembly (see page *12-20*).
20. Refit the final drive assembly (see page *12-20*).



1. Axle shaft
2. Final drive
3. Chain

21. Align the rear brake pipe and clip to the right hand side of the swinging arm and tighten the clip fixing to **9 Nm.**
22. Refit the upper and lower chain guards. Tighten the fixings to **4.5 Nm.**
23. Align the rear brake hose to the chain guard and refit the hose cover. Tighten the hose cover fixings to **2 Nm.**
24. Refit the rear wheel (see page *15-8*).
25. Lower the motorcycle to the ground and place on the side stand.
26. Refit the side bodywork (see page *16-9*).
27. Reconnect the battery positive (red) lead first.

28. Refit the seat (see page *16-9*).
29. Pump the rear brake pedal several times to position the brake pads in the caliper. Rectify as necessary if correct brake operation is not restored (see page *14-22*).

Final Drive/Rear Hub and Bearings

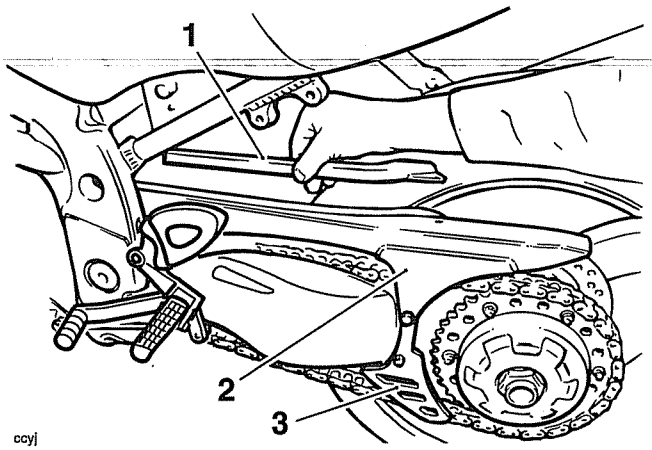
Removal

1. Remove the seat (see page *16-8*).
2. Disconnect the battery, negative (black) lead first (see page *17-7*).
3. Raise and support the rear of the motorcycle under the frame or engine.

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.

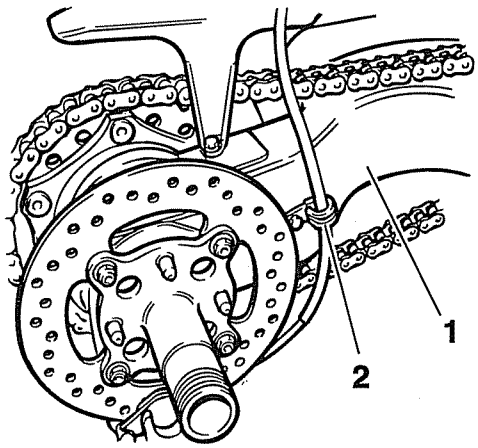
4. Remove the rear wheel (see page *15-8*).
5. Remove the rear brake hose cover from the upper chain guard, then remove the upper chain guard.



ccyj

1. Brake hose cover
2. Upper chain guard
3. Lower chain guard

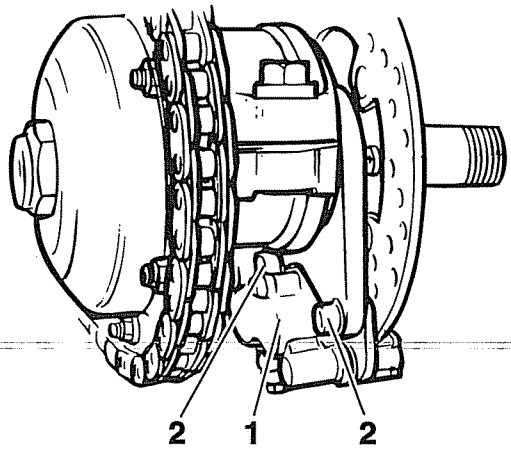
6. Remove the lower chain guard.
7. Release the bolt securing the brake pipe clip to the right hand side of the swinging arm.



gaen

1. Swinging arm
2. Brake pipe clip

8. Without disconnecting the brake hose, detach then support the rear brake caliper.



gaek

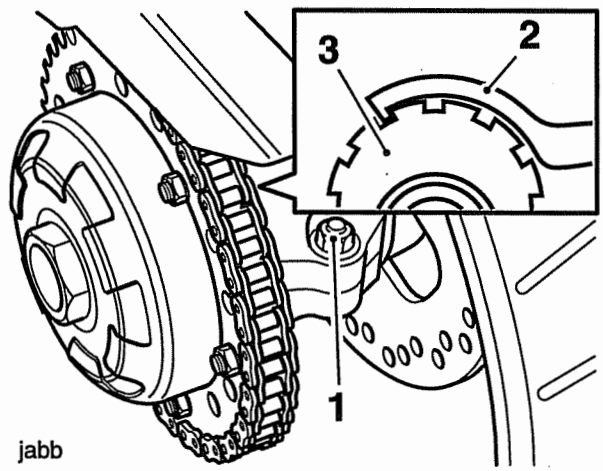
1. Rear brake caliper
2. Caliper mounting bolts

Caution

To prevent damage to the brake pipe and caliper, do not allow the caliper to hang on the brake pipe.

9. Slacken the swinging arm / hub pinch bolt.

10. Use the 'C' spanner from the motorcycle tool kit to turn the hub and slacken the drive chain.



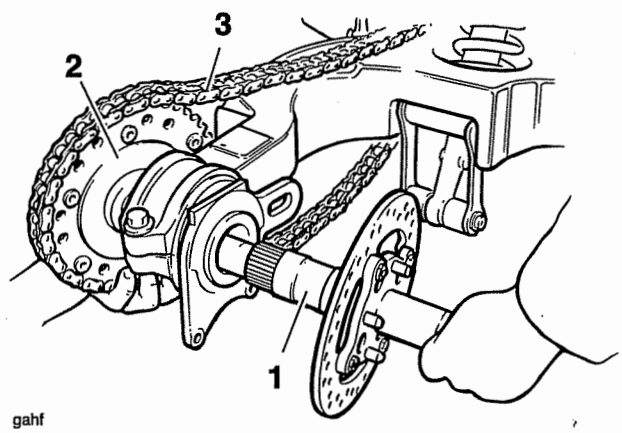
jabb

1. Pinch bolt
2. 'C' spanner
3. Adjuster

11. De-stake then slacken the nut securing the final drive unit to the axle shaft.
12. Remove the staked nut (discard the nut), belleville washer and stepped washer from the axle shaft.
13. Pull the axle shaft through the hub to the right hand side such that the shaft clears the final drive assembly. Remove the final drive unit disconnecting the chain at the same time.

Note:

- **Collect the spacer fitted between the final drive and the hub.**



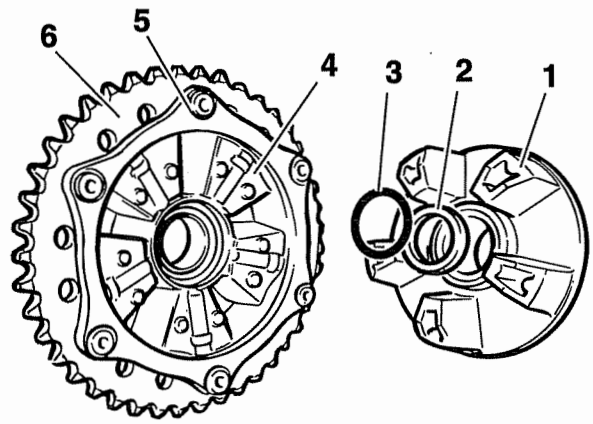
gahf

1. Axle shaft
2. Final drive
3. Chain

Note:

- **Support the chain while the hub is removed to prevent it from becoming contaminated.**
- **If necessary, the brake disc can be removed at this point.**

14. Ease off the final drive hub, and capture the spacer.

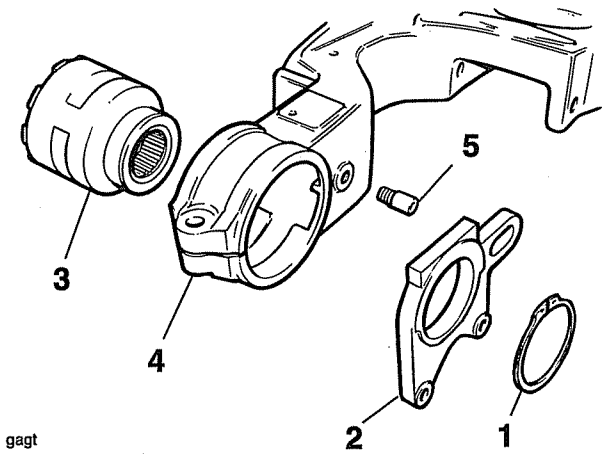


gaes

1. Cush drive hub
2. Spacer
3. 'O' ring
4. Cush drive rubbers
5. Cush drive housing
6. Sprocket

15. Remove the cush drive rubbers.
16. If required, remove the securing nuts to release the chain sprocket.
17. To detach the rear hub and bearings, remove the large circlip securing the caliper carrier to the hub and detach the carrier.

18. Remove the wheel bearing hub from the left hand side of the swinging arm.



gagt

1. Circlip
2. Caliper carrier
3. Hub
4. Swinging arm
5. Caliper carrier positioning stud

Note:

- **Rear wheel bearing replacement procedure can be found in section 15.**

Inspection - All Parts

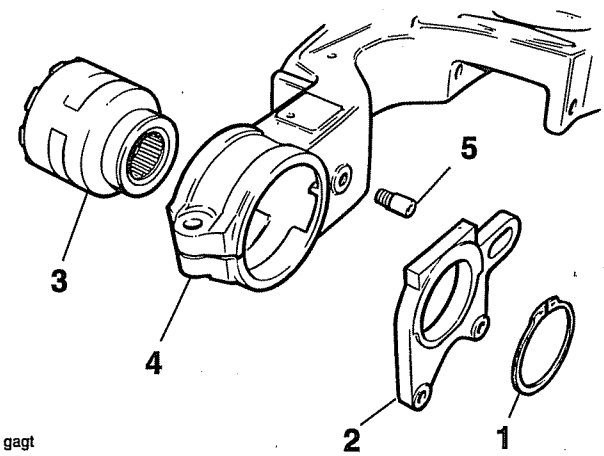
1. Thoroughly clean all components and inspect for damage, wear etc. Renew as necessary.
2. Pay particular attention to the condition of the cush rubbers, examining for splits, damage, softness etc.
3. Check the final drive bearing for wear or rough running, and the seal for damage.
4. Inspect the 'O' ring in the cush drive hub for damage.
5. Inspect the sprocket teeth for wear, damage and chips.
6. Check the wheel/hub bearings for damage, pitting, and cracks. Replace as necessary.
7. Check all bearing seals for damage, splits etc. Replace as necessary.

Assembly - Final Drive

1. Position the sprocket, fit the bolts from the inside face of the cush drive housing and secure with nuts tightened to **33 Nm**.
2. Fit the 'O' ring to the cush drive hub.
3. Fit the cush rubbers.
4. Locate the spacer in the cush drive housing and fit the hub.

Installation - All Parts

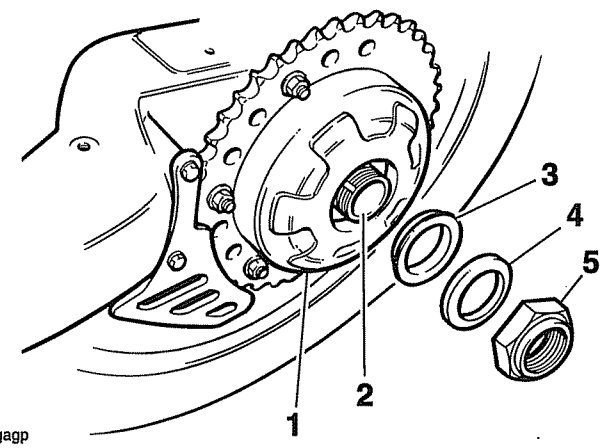
1. Refit the wheel bearing hub to the swinging arm, with the circlip groove to the right hand side.
2. Refit the caliper carrier (logo side facing to the right) and retain with the circlip.



gagt

1. Circlip
2. Caliper carrier
3. Hub
4. Swinging arm
5. Caliper carrier positioning stud

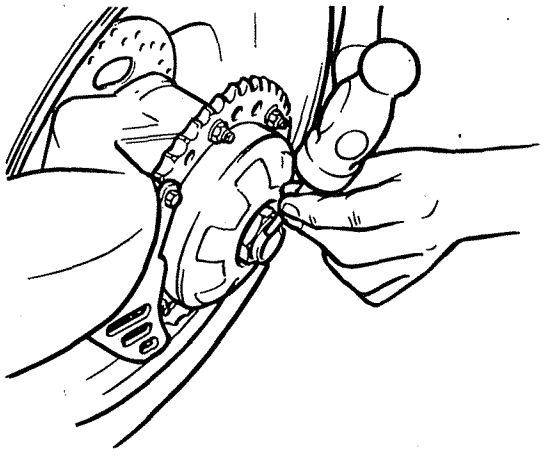
3. Refit the axle shaft and align the spacer to the final drive side.
4. Locate the final drive on the shaft and refit the chain to the sprocket.
5. Fit:
   - collar, stepped side inwards,
   - belleville washer, dished side out,
   - a new stake nut.



gagp

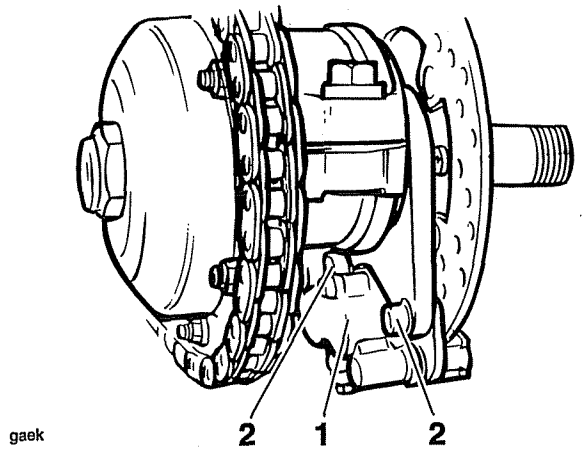
1. Final drive unit
2. Axle shaft
3. Stepped washer
4. Belleville washer
5. Stake-nut

6. Tighten the nut to **146 Nm**, and stake to secure.



Staking the nut

7. Adjust the chain tension to give 35-40 mm of slack by turning the hub with the 'C' spanner
8. Tighten the swinging arm / hub pinch bolt to **55 Nm.**
9. Refit the rear brake caliper. Tighten the caliper bolts to **40 Nm.**



1. Caliper
2. Caliper bolts

10. Align the rear brake pipe and clip to the right hand side of the swinging arm and tighten the clip fixing to **9 Nm.**
11. Refit the upper and lower chain guards. Tighten the fixings to **4.5 Nm.**
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 *15-8*).
14. Lower the motorcycle to the ground and place on the side stand.
15. Reconnect the battery positive (red) lead first.
16. Refit the seat (see page *16-9*).
17. Pump the rear brake pedal several times to position the brake pads in the caliper. Rectify as necessary if correct brake operation is not restored (see page *14-22*).

Drive Chain Replacement

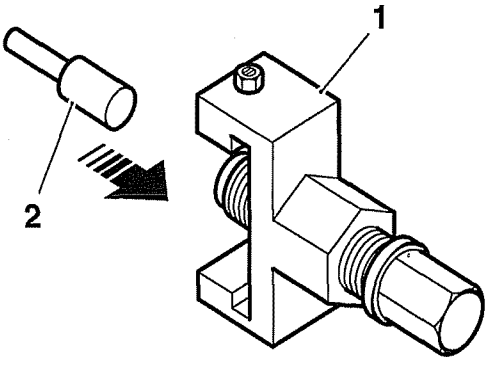
Rivet link type

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.

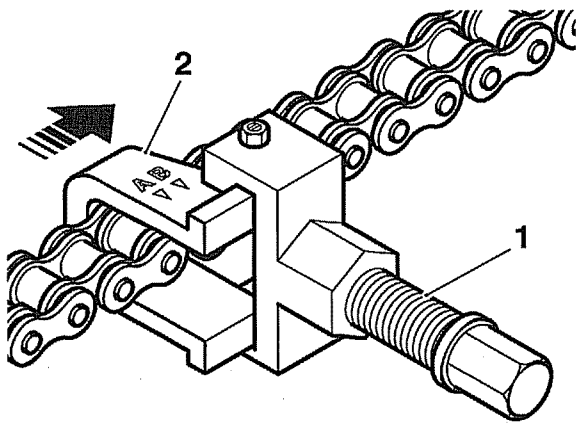
1. Support the motorcycle on a stand so the rear wheel is clear of the ground.
2. Insert the pin into the pin holder so its smaller diameter end (cutting point) is facing away from the holder as shown.



1. Tool body and pin holder
2. Pin

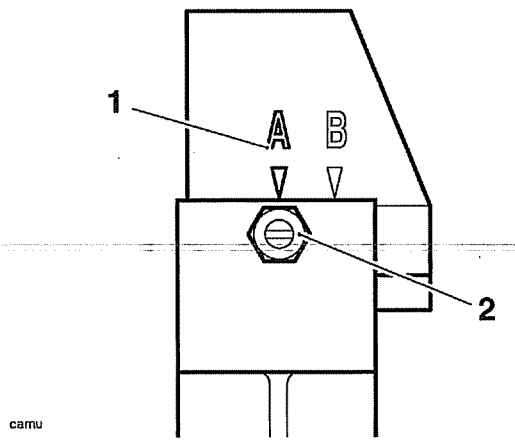
3. Position the 'U' shaped holder behind the chain ensuring its A and B marks are uppermost.

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

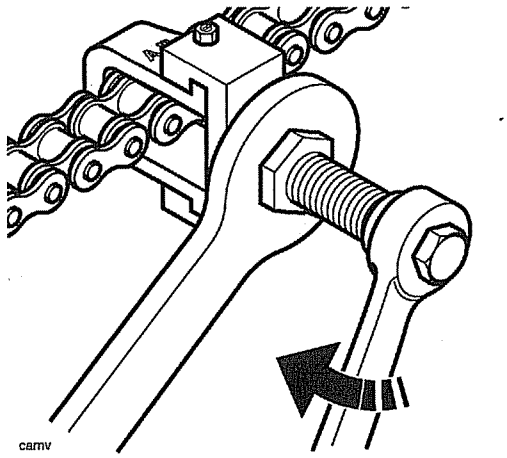
5. Align the A mark on the 'U' shaped holder with the tool body adjustment screw ensuring the adjustment screw spring-loaded ball locates correctly in the holder indent.



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

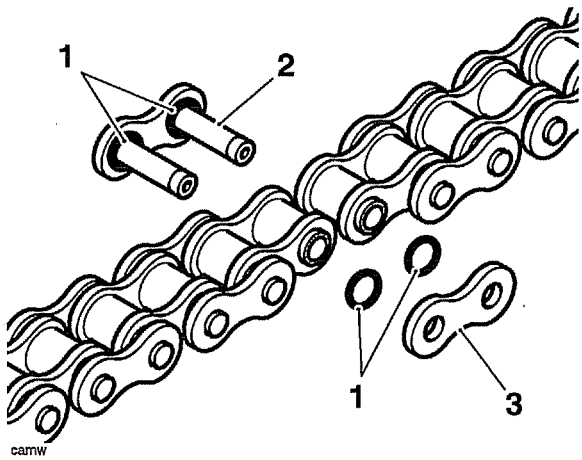
The component parts of the new link kit are coated with a special grease which must not be removed. Removal of this special grease will severely reduce the service life of the chain.

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.**

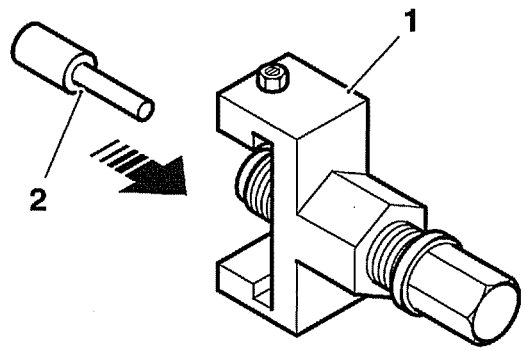
10. Using the new link supplied with the chain kit, join the two ends of the chain. Ensure that the 'O' rings are positioned as shown below and the link plate is fitted with its markings facing outwards.



camw

1. 'O' rings
2. Link
3. Link plate

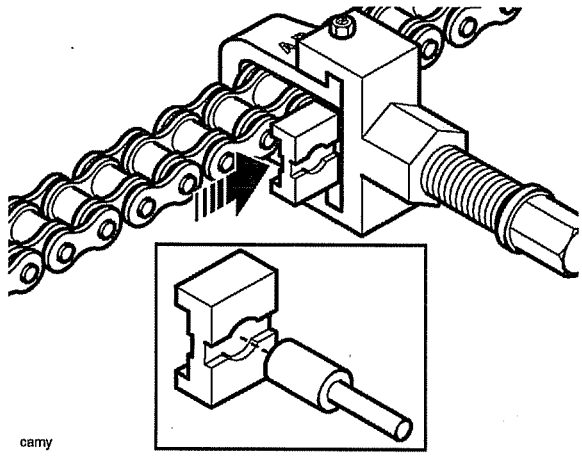
11. Insert the pin into the pin holder so its larger diameter end (riveting point) is facing away from holder as shown.



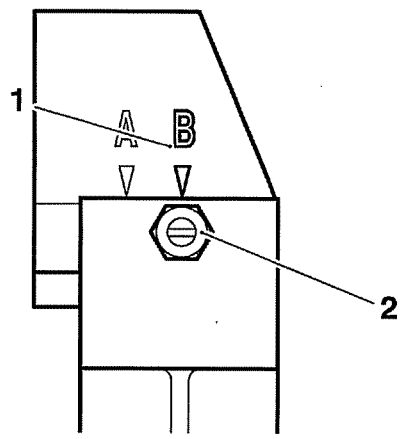
camx

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.**


camy

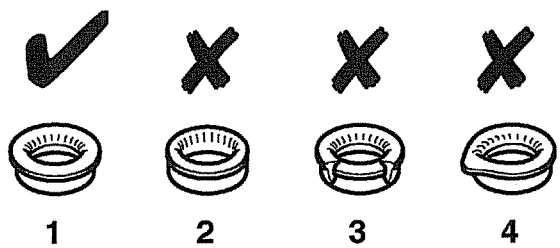
16. Locate both the split link pins in the circular cutouts in the 'U' shaped holder then screw the pin holder in until the plate holder contacts the link plate.**Ensure both the split link and link plate are correctly located in their holders**
17. Retain the tool body with a wrench then tighten the 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.



camz

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

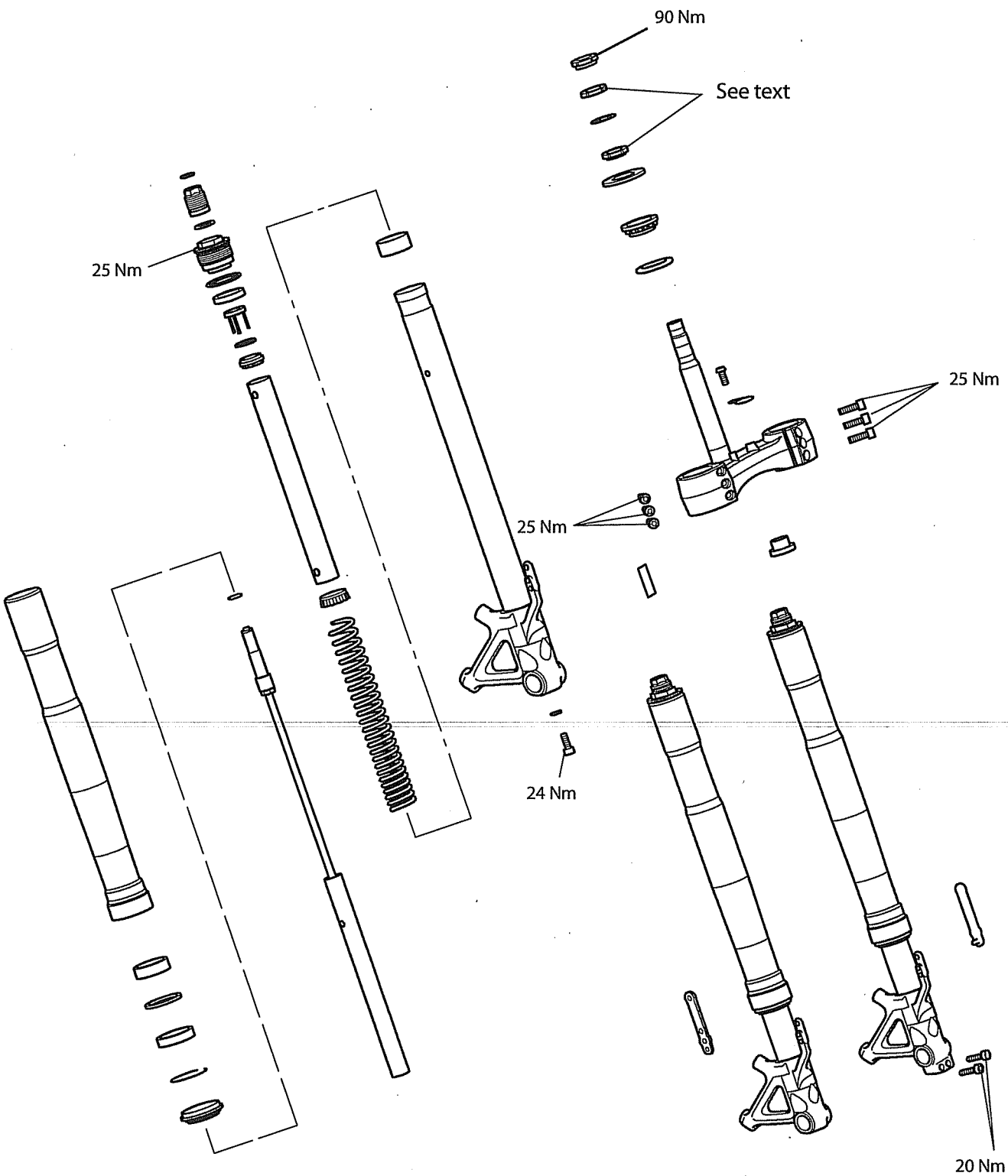
⚠ Warning

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.

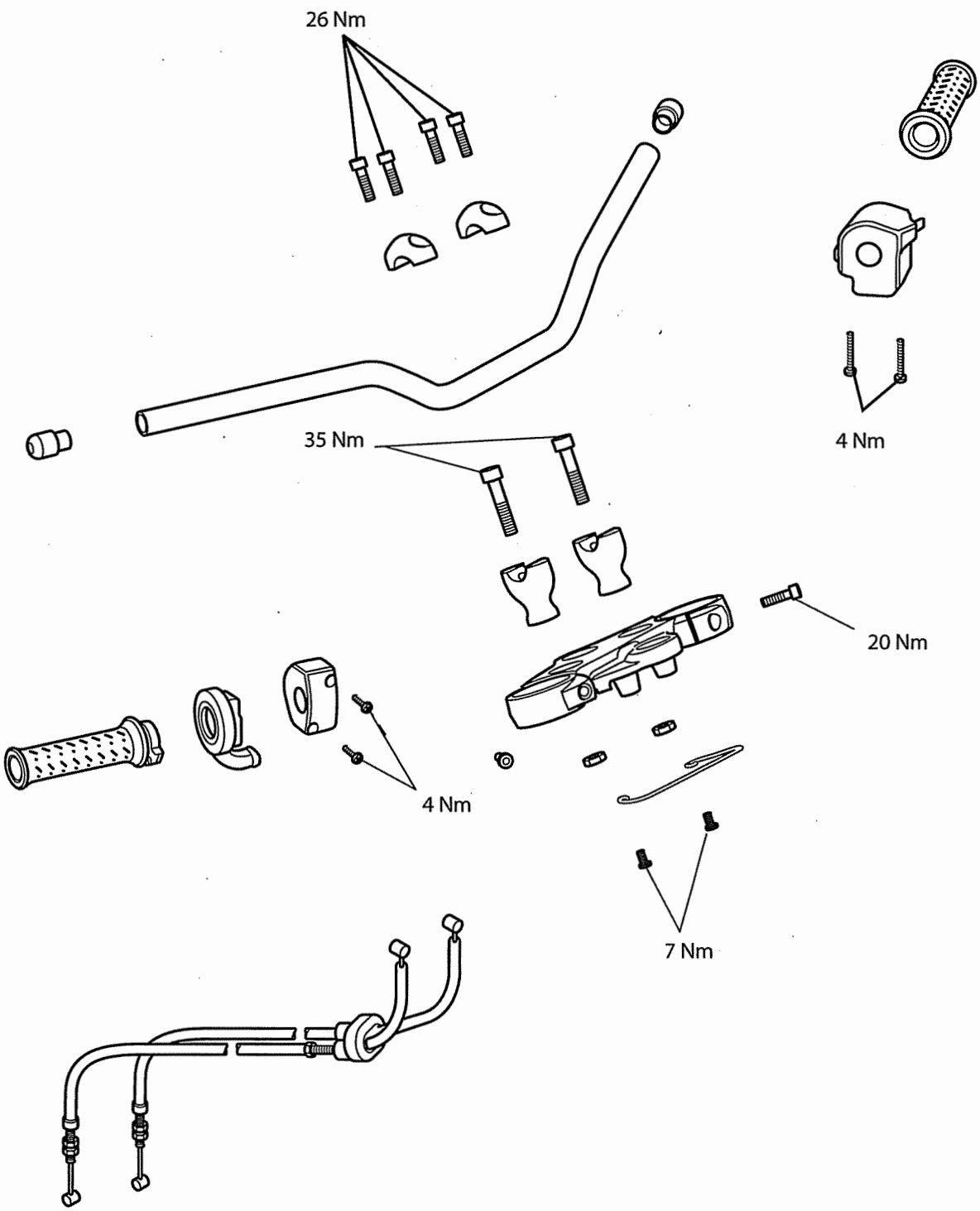
13 Front Suspension

Table of Contents

Exploded View - Front Fork



Exploded View - Handlebars



Front Suspension

Speed Triple is equipped with hydraulic, adjustable, telescopic front forks. Both forks are adjustable for spring pre-load; the right hand fork is adjustable for compression damping and the left hand fork for rebound damping.

Periodic inspection for damage and fluid leaks is essential for safe riding. Always follow the inspection instructions at the intervals stated in the scheduled maintenance chart.

Fork Inspection

Examine each fork for any sign of damage or scratching of the slider surface or for oil leaks.

If any damage or oil leakage is found, strip and repair as described in this section or consult an authorised Triumph dealer.

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.

If roughness or excessive stiffness is detected, repair as described in this section or consult an authorised Triumph dealer.

⚠ Warning

Riding the motorcycle with defective or damaged suspension can cause loss of motorcycle control and an accident. Never ride with damaged or defective suspension.

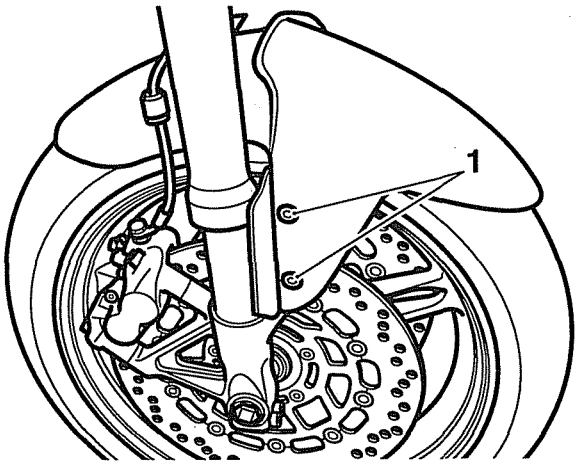
Front Fork

Removal

⚠ Warning

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

1. Raise and support the front of the motorcycle.
2. Remove the front wheel (see page *15-6*).
3. Remove the front mudguard (see page *16-10*).



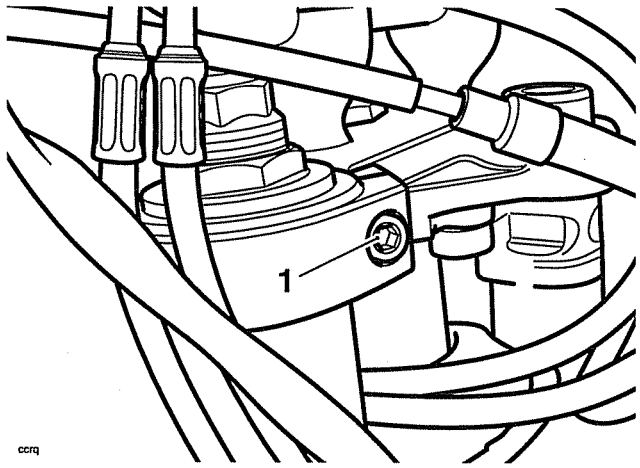
*
1. Mudguard fixings

4. Detach and the support the front brake callipers (see page *14-12*).

⚠ Warning

Never allow the brake callipers to hang on the brake hoses as this may damage the hoses. A damaged brake hose can cause a reduction in braking efficiency leading to loss of motorcycle control and an accident.

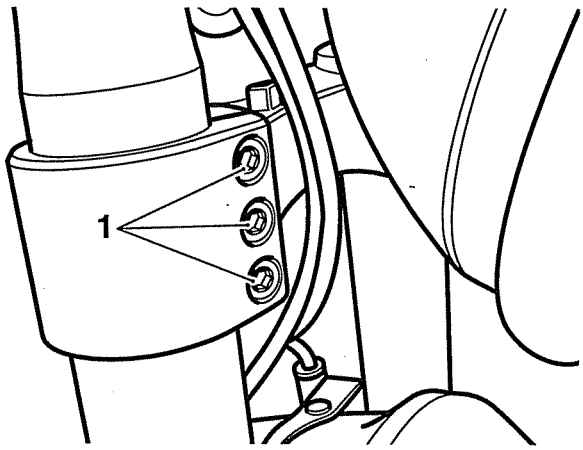
5. Slacken the top yoke clamp bolts.



1. Top yoke clamp bolt

> **⚠ Caution**
>
> Care must be taken when removing the forks, to ensure that the outer surfaces do not become scratched.

6. Slacken the bottom yoke clamp bolts.

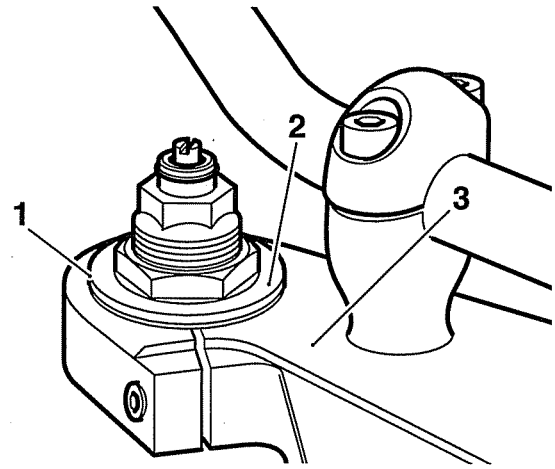


1. Bottom yoke clamp bolt

7. Using a downward, twisting action, withdraw the forks from between the yokes.

Installation

1. Position the fork within the yokes so that the lip of the outer tube, not the top cap, is flush with the upper surface of the top yoke.



1. Outer tube
2. Top cap
3. Top yoke

2. Tighten the bottom yoke clamp bolts to **25 Nm**.
3. Tighten the top yoke clamp bolts to **20 Nm**.
4. Refit the front mudguard (see page *16-10*).
5. Install the front wheel (see page *15-7*).
6. Refit the front brake callipers (see page *14-13*).
7. Lower the motorcycle to the ground and park it on the side stand.

Fork Oil Change

Draining

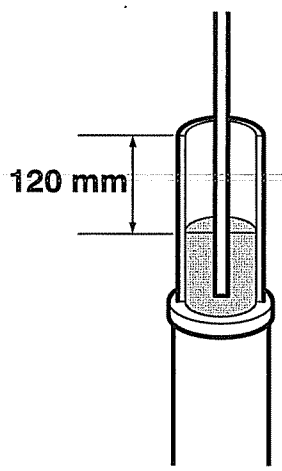
Warning

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

1. Remove the fork (see page *13-4*).
2. Remove the top cap assembly (see page *13-7*).
3. Remove the fork spring (see page *13-7*).
4. Holding the inner and outer tubes together, invert the fork and pour out the fork oil into a suitable container. Pump the damper rod to remove all the oil.

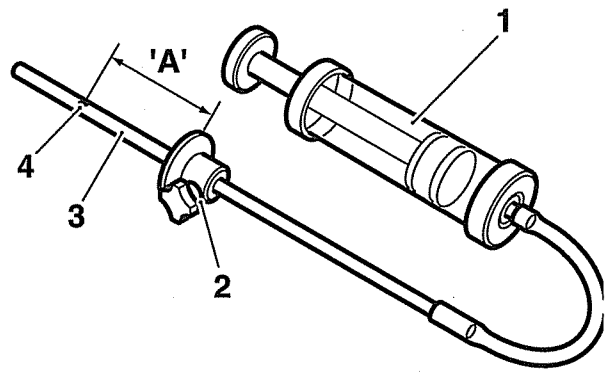
Oil Refilling

The oil level is measured from the upper surface of the fork outer tube, with the fork fully compressed and the spring removed.



Fork oil level (fully compressed)

1. Fill the fork with the grade of oil specified in the fork oil table, to a level above that which will finally be required.
2. Pump the fork assembly and damper several times to expel any trapped air then fully compress the fork and support it in an upright position. Leave the fork for a few minutes to allow the oil to stabilise.
3. Set the scale on tool 3880160-T0301 to the level specified for the model being worked on (see the fork oil table or illustration opposite for the correct level setting).



cbyg

1. Tool 3880160-T0301
2. Adjustment Plate
3. Scale Area
4. Hole (zero position)

Note:

- **Zero level on the tool is set at the small exit hole in the side of the scale tube, NOT AT THE END TIP. Do not attempt to block this side hole as this will cause the final fluid level to be incorrect.**

4. Insert the scale end of the tool into the fork inner tube.
5. 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).
6. 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.

Warning

Incorrect fork oil levels could result in an unsafe riding condition leading to loss of control and an accident.

7. Assemble for fork (see page *13-10*).
8. Refit the fork (see page *13-5*).

Fork Oil Level Chart

Oil Level*	Oil Volume	Oil Grade	Fork Pull Through
120 mm	469 cc	Showa SS8	Top of the inner tube flush with upper face of the top yoke

Front Fork

Disassembly

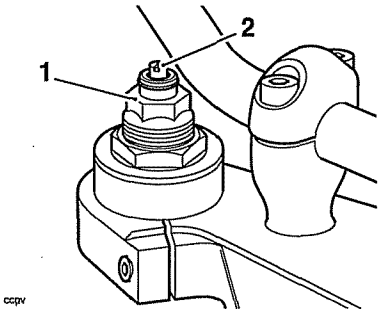
Warning

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

Note:

- **Before removing the forks, slacken the top cap a little to allow easier removal during strip-down.**

1. Remove the forks (see page *13-4*).
2. Note the position of the preload adjuster relative to the fork cap to ensure the setting is retained on re-assembly.



1. Preload adjuster marks
2. Compression/rebound adjuster

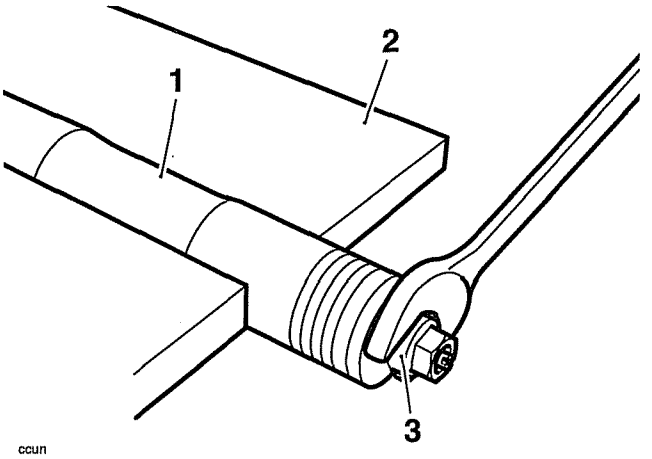
Warning

Do not change the fork adjustment settings. If they are changed, this will change the handling of the motorcycle from those which the rider is used to. Riding with unfamiliar fork settings may cause unexpected handling characteristics leading to loss of control and an accident.

Note:

- **The fork seals can be renewed without removal of the damping cylinder. Unless removal of the damping cylinder is necessary, omit items 16 and 17 of this procedure.**

3. **Very gently** clamp the fork in the soft jawed vice to prevent it from turning, hold the outer tube, then unscrew the top cap from the outer tube.



1. Fork
2. Soft jaws
3. Top cap

Caution

Never tightly clamp the outer tube as this will cause the tube to permanently distort. A distorted tube is not serviceable and must be replaced.

Note:

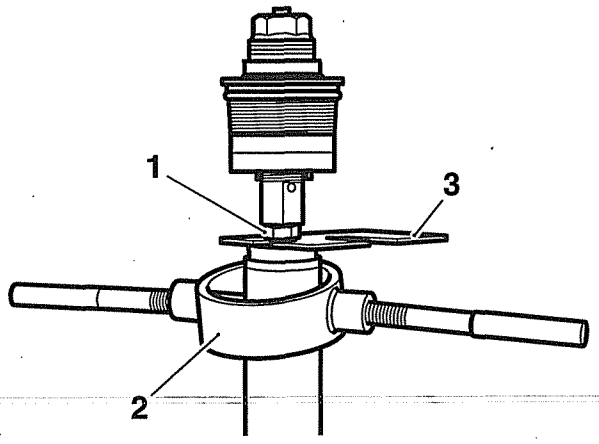
- **The top cap is not under spring tension and will not spring upwards when the threads disengage.**

4. Holding the inner and outer tubes together, invert the fork and pour out the fork oil into a suitable container. Pump the damper rod to remove all the oil.
5. Return the fork to the soft jawed vice.
6. Allow the outer tube to fall into the inner.

Warning

While compressing the fork spring and while the spring holder is in place always wear protective equipment for the face and eyes and never stand directly above or look directly down on the fork. If the spring compressor or holder should dislodge or detach, the resulting release of spring tension could cause parts to fly off resulting in injury to the user.

7. Fit tool T3880067 over the top cap. Position the two adjustable arms to the holes in the spring spacer. Screw in the arms until they positively engage in the spring spacer holes.
8. Using tool T3880067, manually compress the fork spring and insert the spring holder as shown, below the damper locknut.



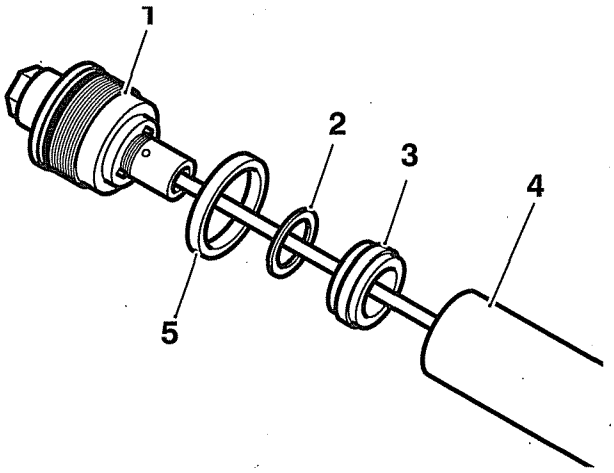
1. Damper locknut
2. Tool T3880067
3. Spring holder (part of T3880067)

9. Slacken the locknut, unscrew and remove the top cap and damper rod. If necessary, remove the O-ring seal from the top cap assembly. The top cap assembly cannot be dismantled.
10. Recompress the fork spring to remove the holder.

Warning

While compressing the fork spring and while the spring holder is in place always wear protective equipment for the face and eyes and never stand directly above or look directly down on the fork. If the spring compressor or holder should dislodge or detach, the resulting release of spring tension could cause parts to fly off resulting in injury to the user.

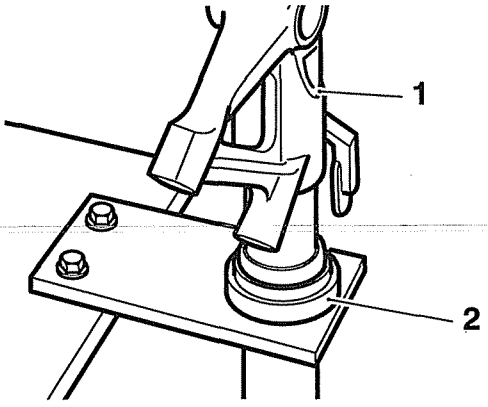
11. Remove the washer, nylon spacer, spring cap and spring. It is not necessary to remove the bump rubber if still attached to the top cap.



wz

1. Top cap
2. Washer
3. Nylon spacer
4. Spring cap
5. Bump rubber

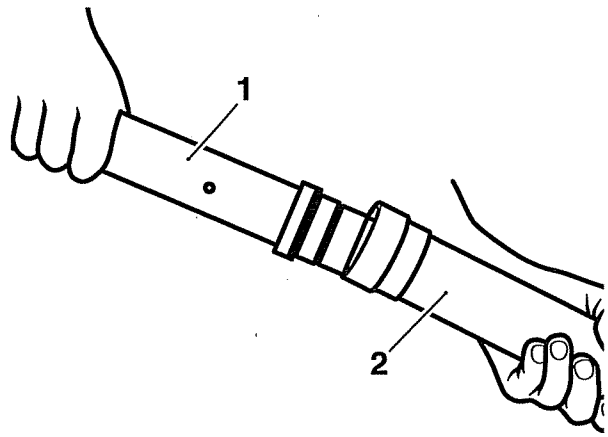
12. Invert and mount the fork assembly to tool T3880002.



1. Fork
2. Tool T3880002

13. Raise the inner tube and remove the dust seal and circlip from the outer tube.

14. Remove the fork from the tool and, using a slide hammer action to release the oil seal and bushes from the outer tube, separate the inner and outer tubes leaving the seals and bushes in place on the inner tube. Note the relative positions of all bushes and seals before removal.

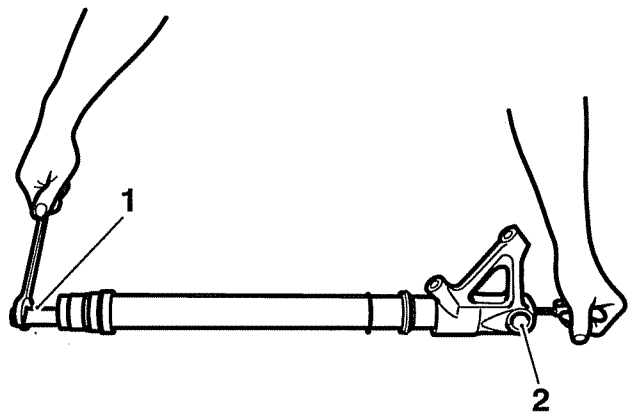


1. Inner tube
2. Outer tube

15. Insert the slotted end of tool T3880004 over the damper rod and locknut, engage the slots in the tool to corresponding slots in the damping cylinder inside the fork. Hold the flats of the tool to prevent the cylinder from turning while removing the damper bolt from the bottom of the fork.

Note:

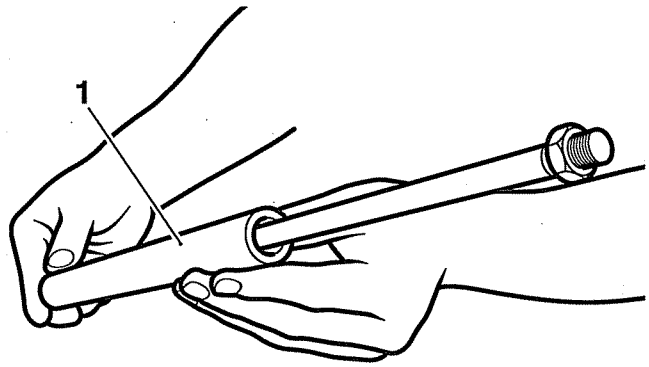
- **Tool T3880004 is designed to fit over the top of the damper rod locknut.**



ccux

1. Tool T3880004
2. Damping cylinder bolt location

16. Remove the tool, then the damping cylinder from the inner tube.



ccuy

1. Damping cylinder

Inspection

1. Inspect the inner tube for stone chips, scoring, scratches, excessive wear and any other damage. Renew as necessary.

Note:

- **Small inclusions in the inner tube may be removed using a fine grade stone or similar.**

2. Inspect the spring for damage, cracks and deformation. Renew the spring if necessary.
3. Inspect all the bushes and seals for damage. Renew any damaged items if necessary.

Assembly

Warning

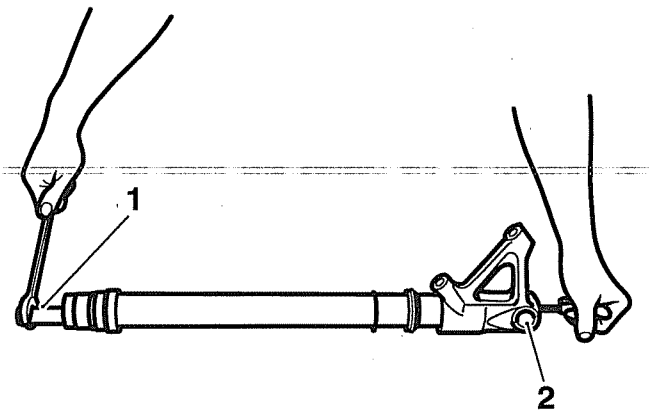
The front forks comprise many precision machined parts. Total cleanliness must be observed at all times and assembly must take place in a dirt/dust-free environment.

Dirt ingress may cause damage to the fork parts, leading to incorrect operation, instability, loss of control or an accident.

Note:

- **If the damper has not been removed, omit operations 1 and 2.**

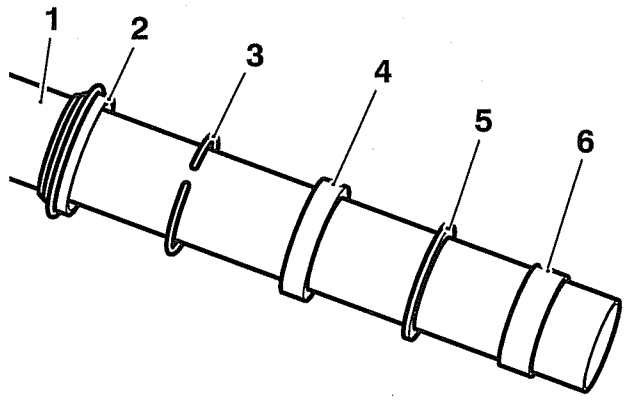
1. Fit the damping cylinder to the inner tube and engage tool T3880004 as during removal.
2. Clean the threads of the damping cylinder bolt and fit a new sealing washer. Apply a drop of three-bond 1342 to the threads then install the bolt. Prevent the cylinder from turning by holding the flats at the end of tool T3880004 while tightening the damping cylinder securing bolt to **24 Nm**.



ccux

1. Tool T3880004
2. Damping cylinder bolt location

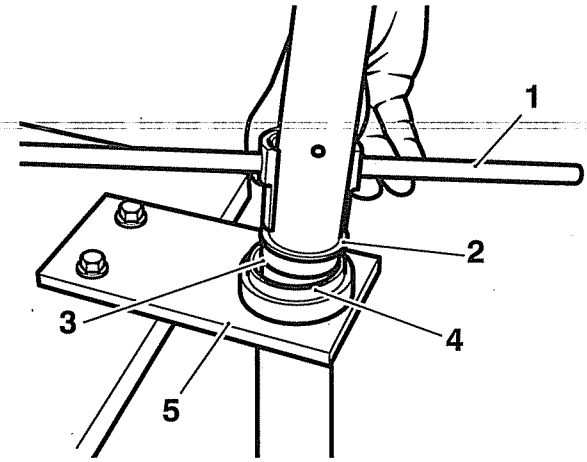
3. Invert and position the fork tube outer to tool T3880002.
4. Apply a smear of fork oil to the bushes and seals.
5. Position the seals and bushes to the inner tube as noted prior to removal.



ccup

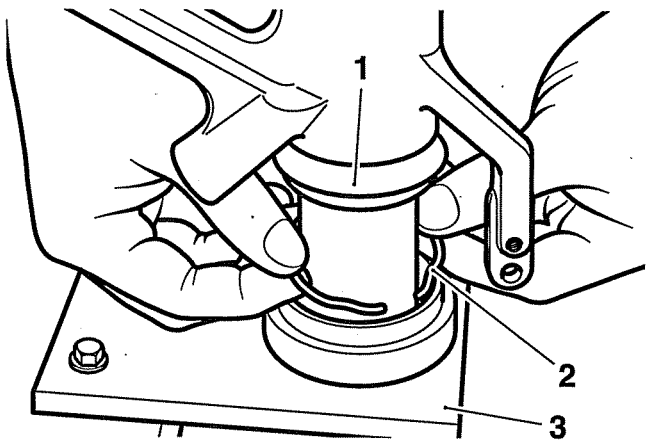
1. Inner tube
2. Dust seal
3. Circlip
4. Seal
5. Washer
6. Bush

6. Position the inner tube assembly to the outer, ensuring that the oil and dust seal lips do not become damaged.
7. Using the narrow end of tool T3880003, push/tap the bush, washer and seal into place.



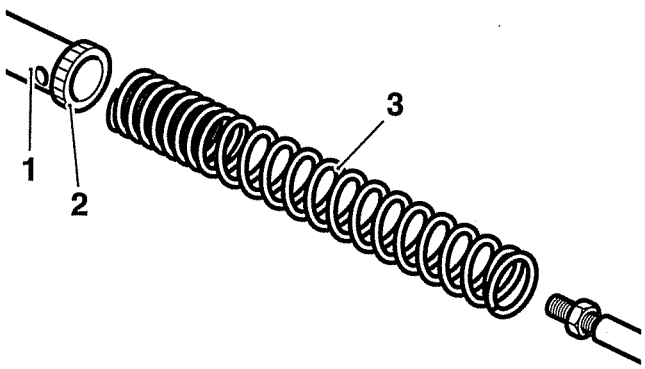
1. Tool T3880003l
2. Seal
3. Washer
4. Bush
5. Tool T3880002

8. Retain the bush, washer and seal with a new circlip.



1. Dust seal
2. Circlip
3. Tool T3880002

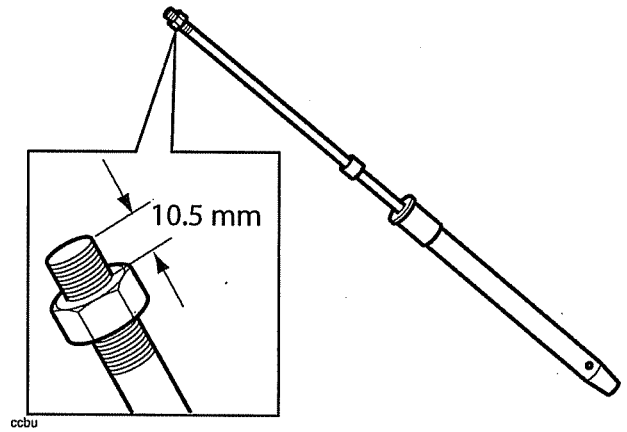
9. Position the dust seal to the outer tube.
10. Invert tool T3880003 and, using hand pressure only, push the dust seal squarely into the outer tube.
11. Fill the fork with oil (see page *13-7*).
12. Position the fork assembly as for compression of the fork spring during strip down.
13. Refit the fork spring, close wound end uppermost, spring cap, nylon spacer and washer.



1. Spring cap
2. Nylon spacer (lower)
3. Spring

14. Attach tool 3880085-T0301 to the threads of the damper rod and pull the damper upwards.

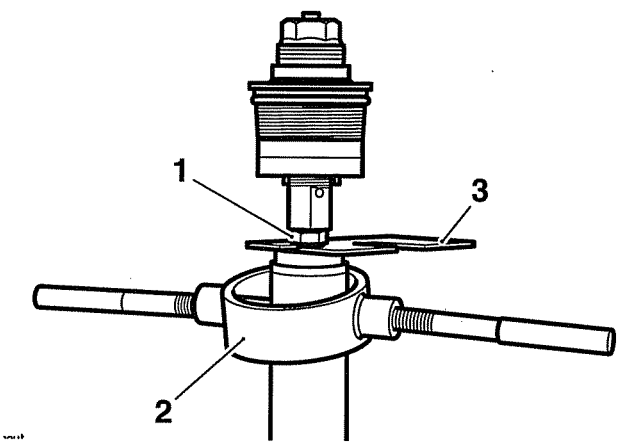
15. Rethread the damping rod locknut leaving 10.5 mm of thread exposed above the nut.



Warning

While re-compressing the fork spring and while the spring holder is in place always wear protective equipment for the face and eyes and never stand directly above or look directly down on the fork. If the spring compressor or holder should dislodge or detach, the resulting release of spring tension could cause parts to fly off resulting in injury to the user.

16. Refit tool T3880067 as previously described, compress the fork spring and refit the spring holder.



1. Damper locknut
2. Tool T3880067
3. Spring holder (part of T3880067)

Caution

If removed, the damping rod locknut must be fitted with the flat face facing to the top of the fork. The slightly tapered face must face the fork spring. Incorrect orientation may lead to a loosening of the locknut.

17. If removed, fit a new O-ring to the top cap.
18. Refit the top cap and the damper rod, turning the damping rod down to the pre-load adjuster mark noted prior to dismantling.
19. Hold the top cap while tightening while tightening the damper rod locknut to **22 Nm**.

Warning

While compressing the fork spring and while the spring holder is in place always wear protective equipment for the face and eyes and never stand directly above or look directly down on the fork. If the spring compressor or holder should dislodge or detach, the resulting release of spring tension could cause parts to fly off resulting in injury to the user.

20. Recompress the spring to remove the spring holder.
21. Lubricate the O-ring on the top cap with a smear of fork oil then screw the top cap fully into the inner tube.
22. Tighten the top cap to **25 Nm**.

Note:

- **It is much easier to tighten the top cap when the fork has been refitted.**

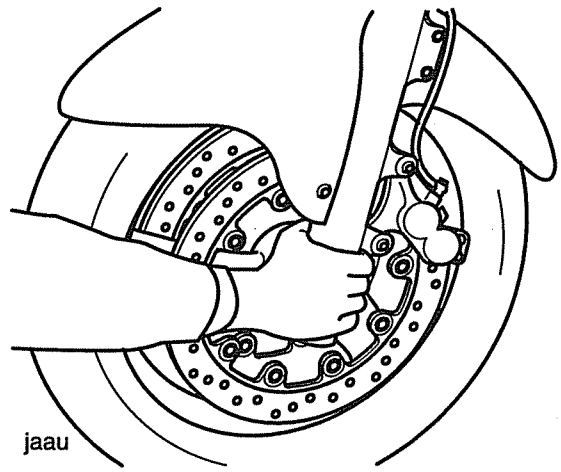
Headstock Bearing Check/ Adjustment

Check

1. Raise and support the front of the motorcycle.

Warning

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



Checking headstock bearing adjustment

2. Hold the lower end of the front forks as illustrated and 'rock' with a front-to-rear motion. If free play can be detected, the headstock bearings require adjustment.

Adjustment

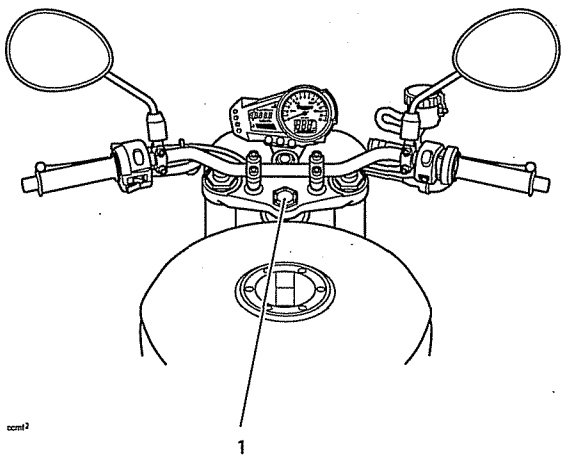
1. Raise and support the front of the motorcycle.
2. Slacken the top yoke clamp bolts.

Warning

If the lower yoke fixings are also slackened, the forks will no longer support the weight of the motorcycle.

Do not slacken the lower yoke fixings as, in this condition, the motorcycle could topple over causing damage and/or risk of injury.

3. Slacken the headstock top nut.

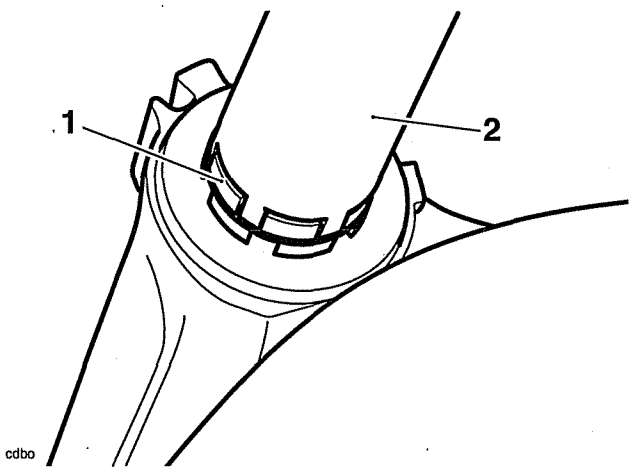


1. Headstock top nut

4. Ease the top yoke and handlebars from the forks and support while detached.
5. Adjust the bearing free-play as follows, all using tool T3880024:-
   - Remove the locknut and tab washer.
   - Slacken the adjuster nut then tighten to **40 Nm.**
   - Slacken the adjuster nut, then retighten to **15 Nm.**
   - Fit the tab washer and adjuster nut.
   - Hold the adjuster nut in position while tightening the locknut to **40 Nm.**

⚠ Warning

It is essential that the adjuster nut is not over-tightened. If the adjuster is over-tightened it will cause a pre-load on the headstock bearings. This will introduce tight steering, which could cause loss of control and an accident.



1. Adjuster nut
2. Locknut
3. Tool T3880024

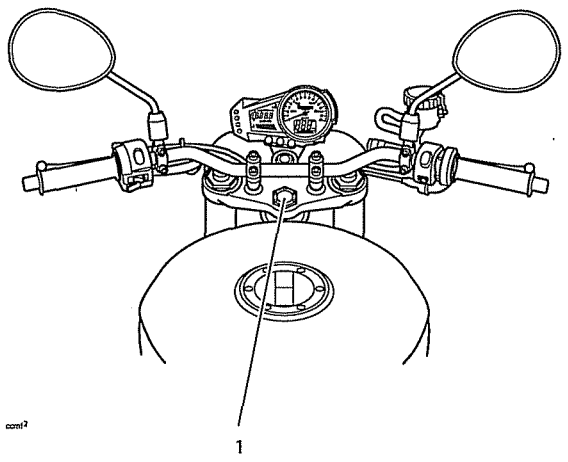
6. Refit the top yoke/handlebar assembly to the forks.
7. Tighten the top nut to **90 Nm.**
8. Tighten the top yoke clamp bolts to **20 Nm.**
9. Recheck the bearing adjustment(see page *13-12*).

Headstock Bearing Removal

Warning

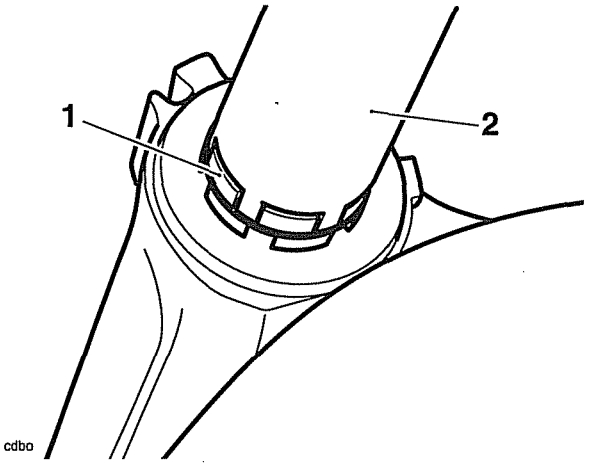
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help to prevent it falling and causing injury to the operator or damage to the motorcycle.

1. Remove both forks (see page *13-4*).
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 T3880024, remove the locknut and tab washer. Discard the tab washer.



1. Locknut
2. Adjuster nut

5. Using the same tool, remove the adjuster nut.
6. Remove the bottom yoke from below the frame headstock.

Warning

Always wear eye, hand and face protection when using a hammer and drift. Use of a hammer and drift can cause bearings to fragment. Pieces of fragmented bearing could cause eye and soft tissue injuries if suitable protective apparel is not worn.

7. Using a suitable drift, evenly and progressively drive the bearing races from the frame headstock.
8. Remove the inner race and dust seal from the bottom yoke using a press or puller.

Inspection

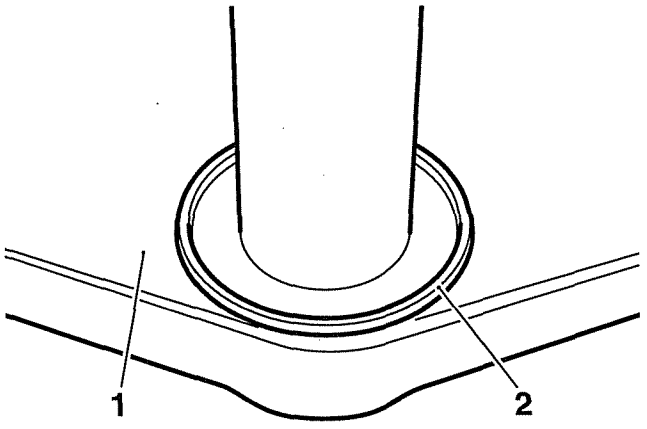
Warning

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 wheel 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.

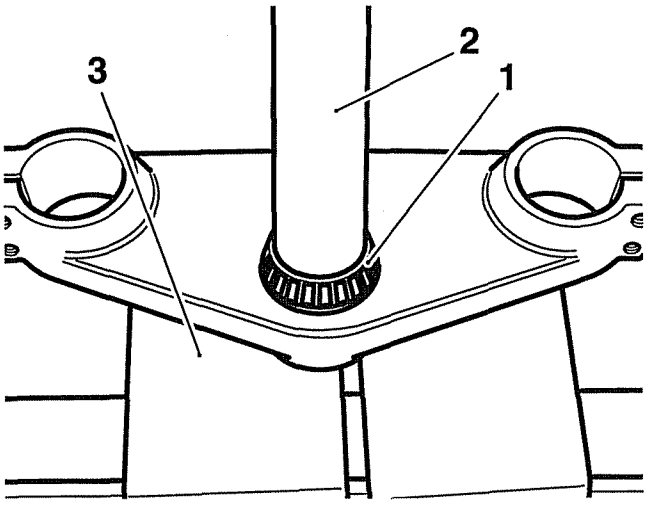


cdgo

1. Steering stem
2. Dust shield

> **⚠ Caution**
>
> Protect the threads of the bottom yoke when using a press or puller as damaged threads may mean replacing the yoke completely.

2. Press a new lower bearing inner race onto the steering stem of the bottom yoke.



1. Bearing
2. Bottom Yoke
3. Press bed

3. Evenly and progressively drive a new complete upper bearing into the frame headstock.
4. Lubricate the lower bearing using multi-purpose grease.
5. Drive a new lower outer bearing into the frame headstock.
6. Insert the lower yoke to the frame, fit the upper bearing and race, and retain with the adjuster nut.
7. Adjust the headstock bearings (see page *13-12*).
8. Locate the upper yoke to the steering stem. Install but do not fully tighten the headstock top nut at this stage.
9. Fit the forks (see page *13-5*).
10. Tighten the headstock top nut to **90 Nm**.
11. Check that no freeplay exists in the headstock bearings. Adjust as necessary (see page *13-12*).

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14 Brakes

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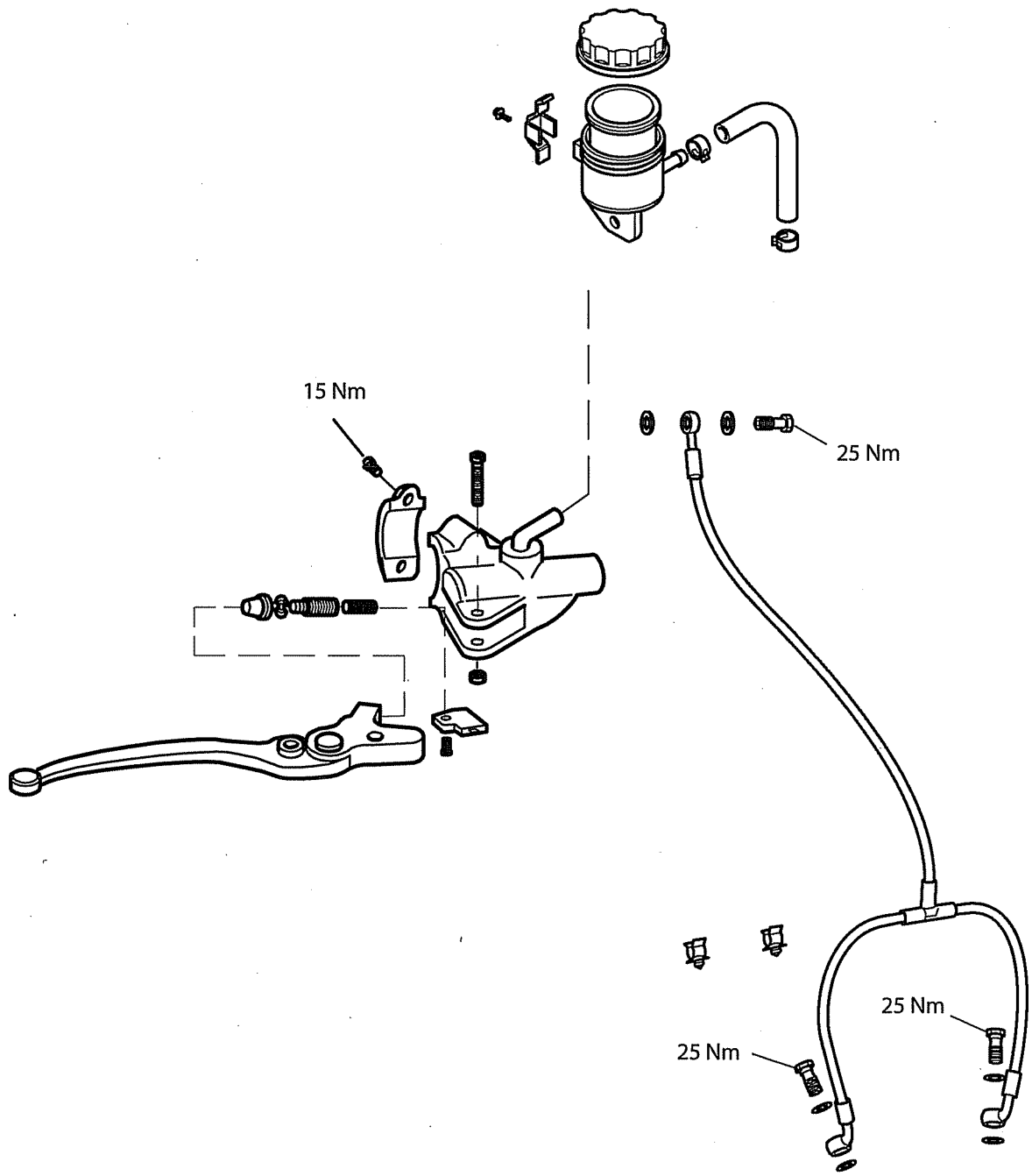
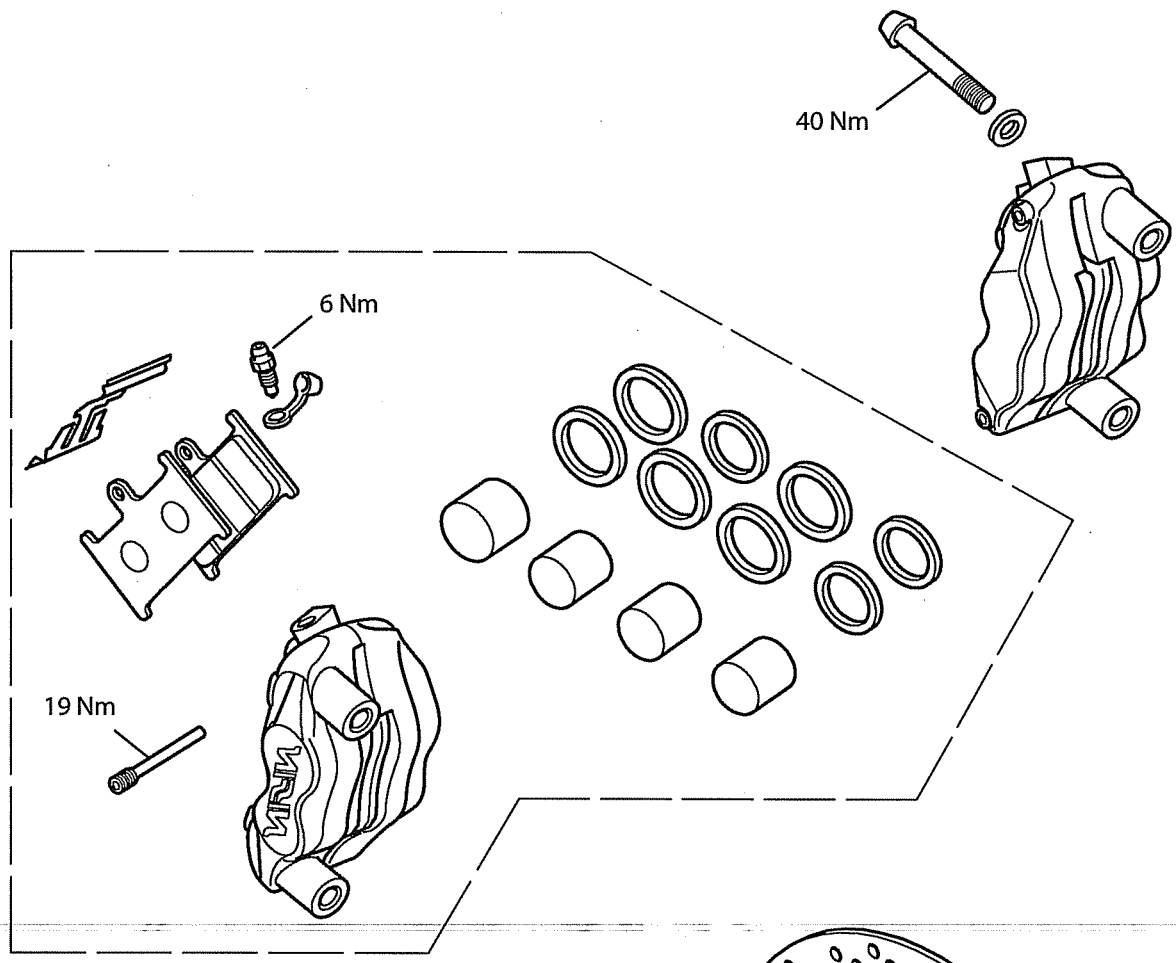
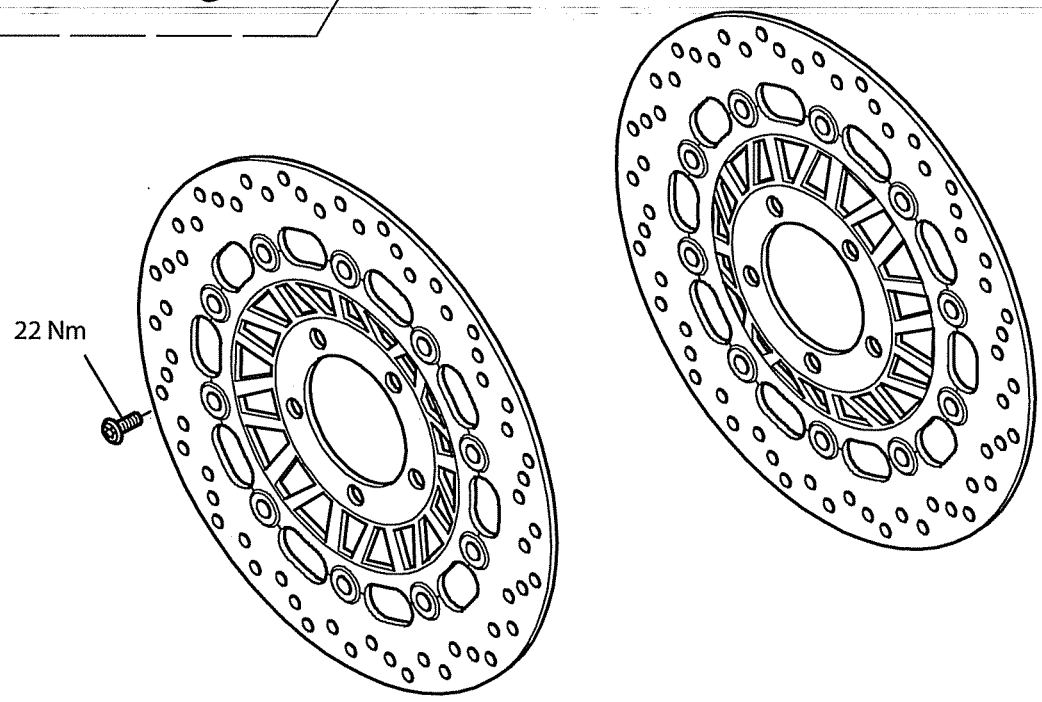
Exploded View - Front Brake Master Cylinder

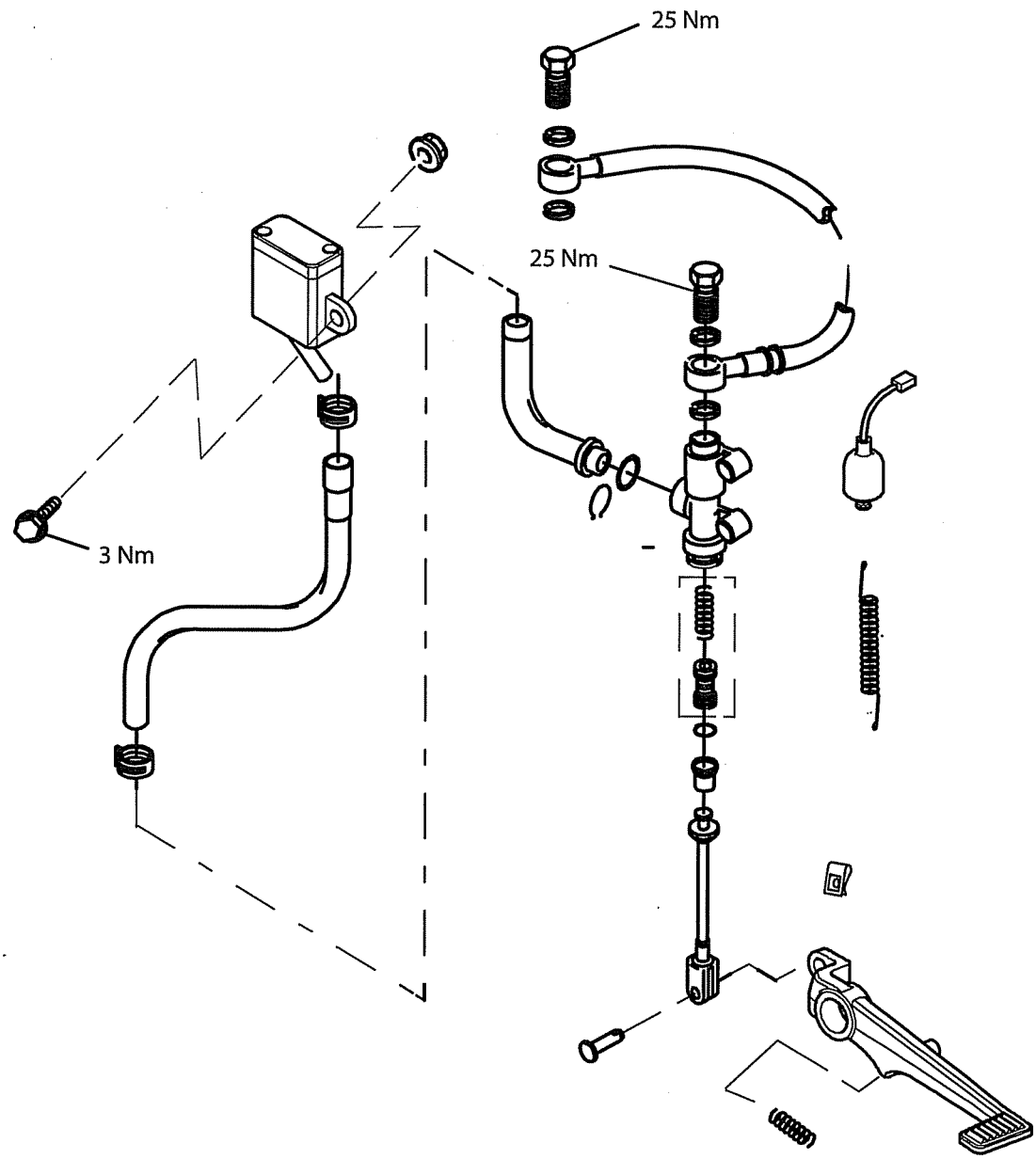


Exploded View - Front Brake Caliper

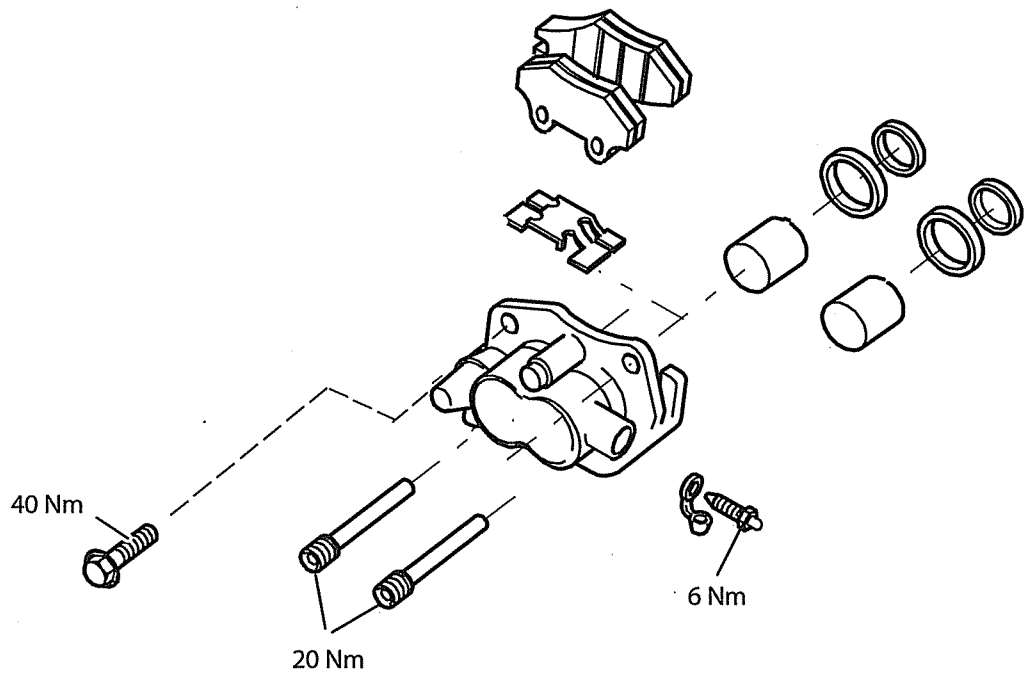


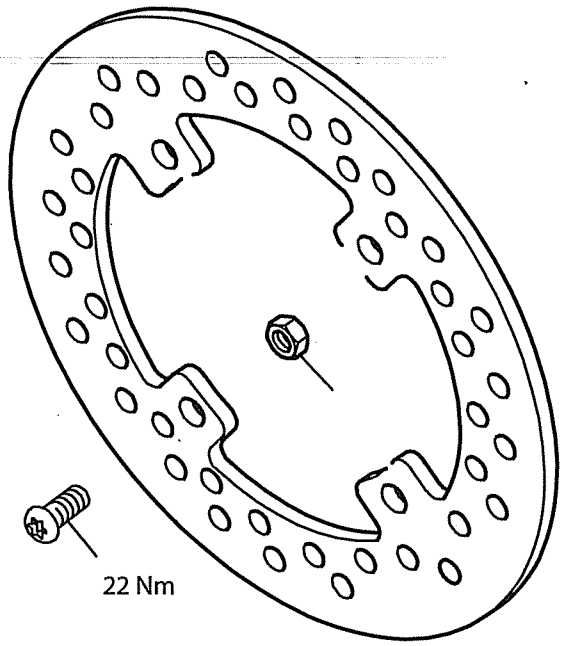


Exploded View - Rear Brake Master Cylinders



Exploded View - Rear Brake Caliper





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 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 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.

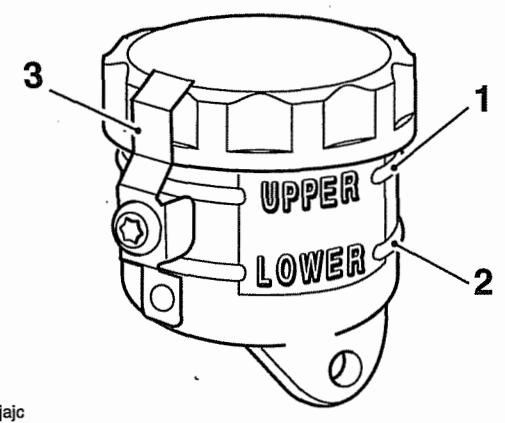
Fluid Level Inspection

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.

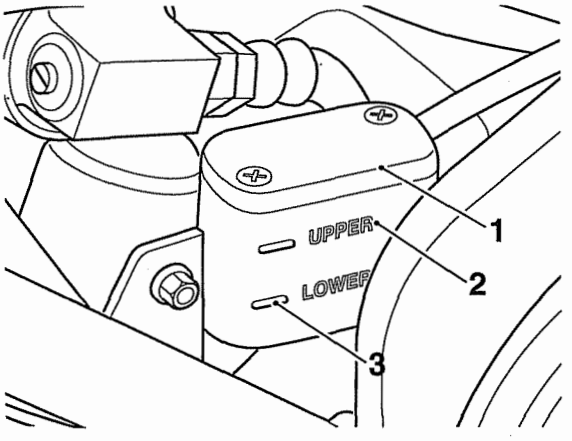
In accordance with the scheduled maintenance chart, inspect the brake fluid level in the front and rear master cylinder reservoirs.

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).



jajc

1. Front reservoir lower level
2. Front reservoir upper level
3. Safety clip



1. Rear reservoir
2. Rear reservoir upper level
3. Rear reservoir lower level

Changing Brake Fluid

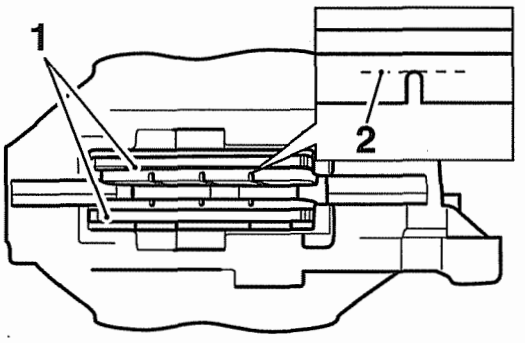
Brake fluid should be changed at the interval specified in the scheduled maintenance chart.

Brake Pads

Front and rear pad wear is automatically compensated for and has no effect on brake lever or pedal action.

Brake Wear Inspection

In accordance with the scheduled maintenance chart, inspect the brake pads for wear. The minimum thickness of lining material for any front or rear brake pad is 1.5mm. If any pad has worn to the bottom of the groove in the pad centre, replace all the brake pads on that wheel.



cbmz

1. Lining material thickness
2. Centre groove

Warning

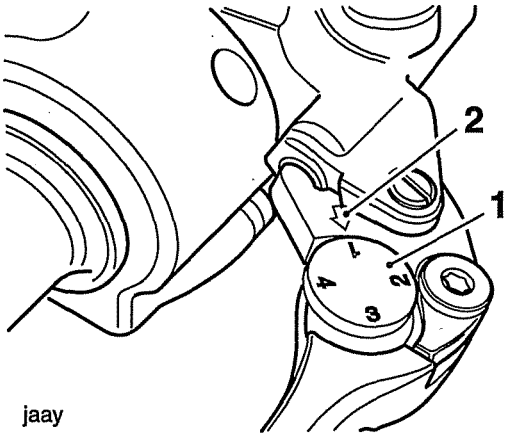
Do not replace individual brake pads, replace both pads in the brake caliper. On the front where two calipers are mounted on the same wheel, all the pads in both calipers must be replaced together. Replacing individual pads will reduce braking efficiency and may cause an accident.

Bleeding the Front Brakes, Renewing Brake Fluid

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.

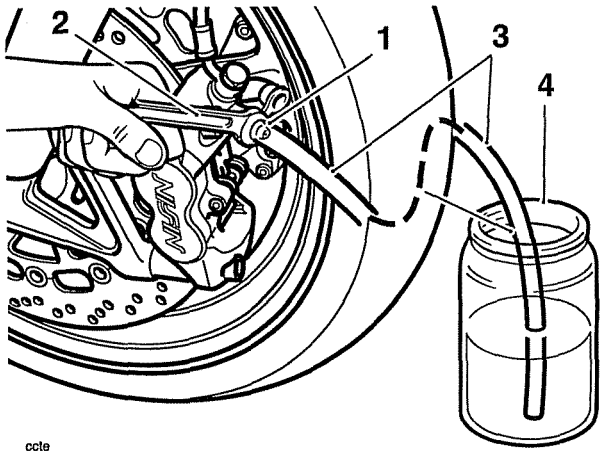
1. Note the original setting of the brake lever adjuster in order that it can be returned to the same position when the bleeding operation is complete. Set the brake lever adjuster to position No.1.



jaay

1. Adjuster

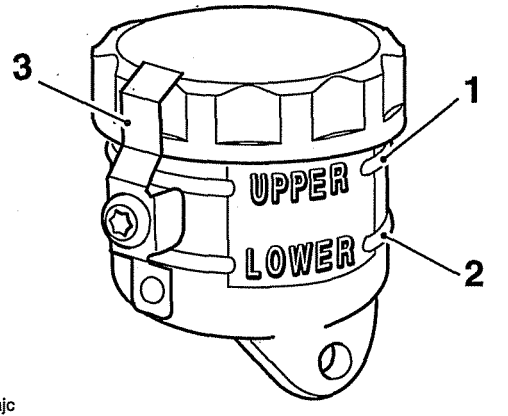
2. Remove the rubber cap from the bleed nipple on the right hand caliper.
3. Attach a transparent tube to the bleed nipple.



ccte

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.



jajc

1. Front reservoir lower level
2. Front reservoir upper level
3. 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 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.

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.
11. Repeat steps 9 and 10 until no more air appears in the bleed tube.
12. Maintain the brake fluid level between the upper and lower reservoir levels whilst bleeding is being carried out.
13. When all air has been expelled from the system, hold the lever in and close the bleed nipple. Tighten the nipple to **6 Nm.**
14. Fill the reservoir to the upper level with new 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.

15. Remove the transparent bleed tube.
16. Replace the bleed nipple cap.
17. Repeat the procedure for the left-hand caliper.
18. Refit the reservoir cover and diaphragm. Refit the safety clip and screw.

Warning

Always return the lever adjuster to the original setting. Operating the motorcycle with lever settings which are unfamiliar may lead to loss of control or an accident.

19. Reset the brake lever adjuster to the original setting.
20. Check that the brake operates correctly. Rectify as necessarary.

Warning

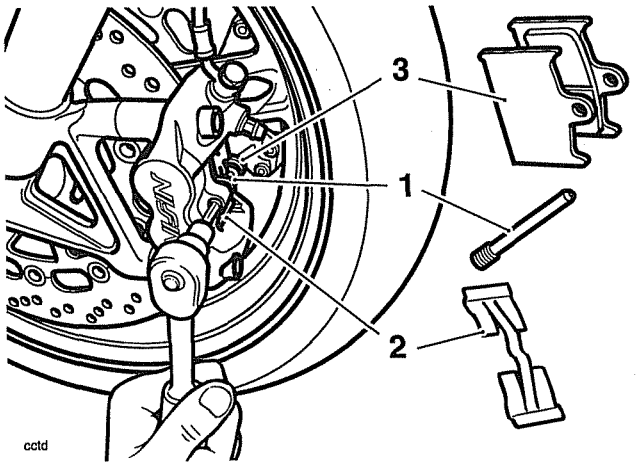
It is dangerous to operate the motorcycle with defective brakes and you must have your authorised Triumph dealer take remedial action before you ride the motorcycle again. Failure to take remedial action may result in reduced braking efficiency leading to loss of motorcycle control and an accident.

Front Brake Pads

Removal

Warning

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



1. Retaining Pin
2. Anti-rattle Spring
3. Brake Pads

1. Remove the brake pad retaining pin after removing the 'R' clip from its inner end. Inspect the pad retaining pin for damage.
2. Remove the anti-rattle spring and inspect the spring for damage.

⚠ 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. Ease 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.

Note:

- **Complete the assembly of the brake pads to one caliper (see assembly for details) before removing the pads from the other caliper.**

Installation

⚠ Warning

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

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

1. Fit new brake pads as an axle set or, if all the pads are in a serviceable condition, clean the pad grooves before refitting all pads in their original positions.

⚠ Warning

Do not apply more than a minimum coating of grease to the pad retaining pins. Excess grease may contaminate the brake pads, hydraulic seals and discs causing reduced braking efficiency and an accident.

2. Lubricate the pad retaining pins using a minimum amount of proprietary high temperature 'Copperslip' type grease.
3. Fit the anti-rattle spring over the pads and push down in the centre to allow the pad retaining pin to slide across the top of the spring.
4. Tighten the pad retaining pins to **19 Nm**, and secure with the 'R' clip.
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.
7. Check for correct brake operation. 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 before you ride the motorcycle again. Failure to take remedial action may result in reduced braking efficiency leading to loss of motorcycle control and an accident.

Front Brake Caliper

Removal

Warning

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

Caution

To prevent body damage, do not spill brake fluid onto any area of the bodywork.

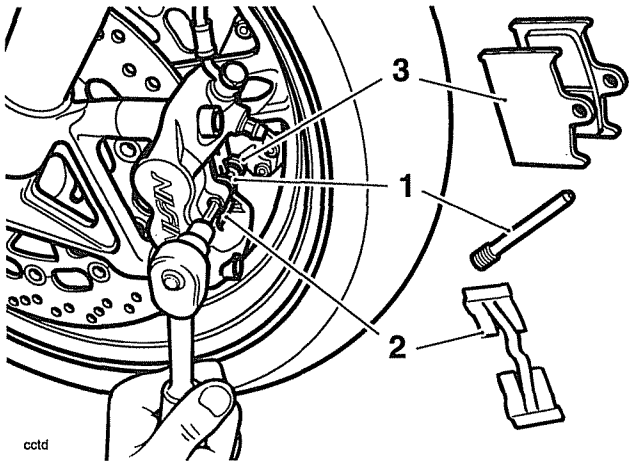
1. Disconnect the brake hose at the caliper (two hoses on right hand caliper), and place the free end of the hose(s) in a suitable container to collect brake fluid.
2. Remove the 'R' clip and slacken the pad retaining pin.

Caution

Never lever directly against the disc, caliper or the pad lining material. Always use a levering tool made from a soft material that will not cause damage to the load bearing surfaces.

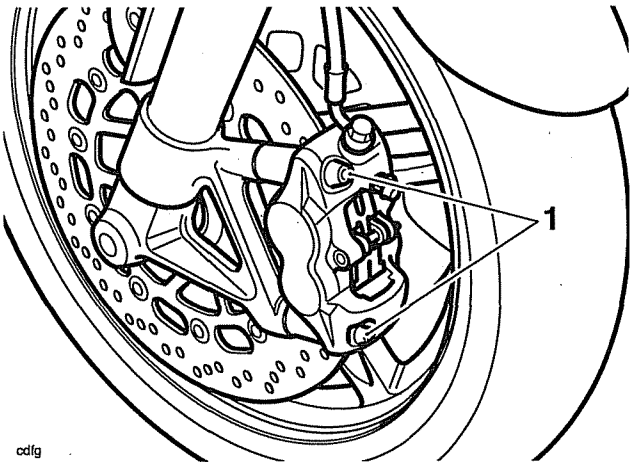
Brake fluid will be displaced from the hose joint as the caliper pistons are compressed. To prevent body damage, ensure that the displaced fluid does not come into contact with any part of the bodywork.

3. Remove the brake pads.



1. Retaining Pin
2. Anti-rattle Spring
3. Brake Pads

4. Remove the two caliper bolts.



1. Caliper bolts

5. 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.

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.

1. Cover the caliper opening with a clean, heavy cloth and, using either compressed air or by reconnecting the master cylinder and pumping the brake lever, remove the pistons one at a time.

Inspection

1. Check the pistons and caliper bores for corrosion, scoring and damage. Renew as necessary.

Warning

Always renew caliper seals and pistons after removal from the caliper. An effective hydraulic seal can only be made if new components are used.

A dangerous riding condition leading to an accident could result if this warning is ignored.

2. Inspect the brake pads for damage and wear beyond the service limit. Renew as necessary.

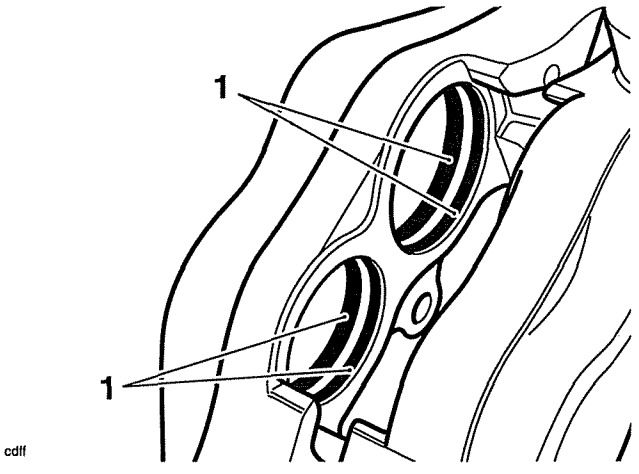
Assembly

Warning

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

A dangerous riding condition leading to an accident could result if this warning is ignored.

1. Fit new fluid seals.



1. Piston seals

Warning

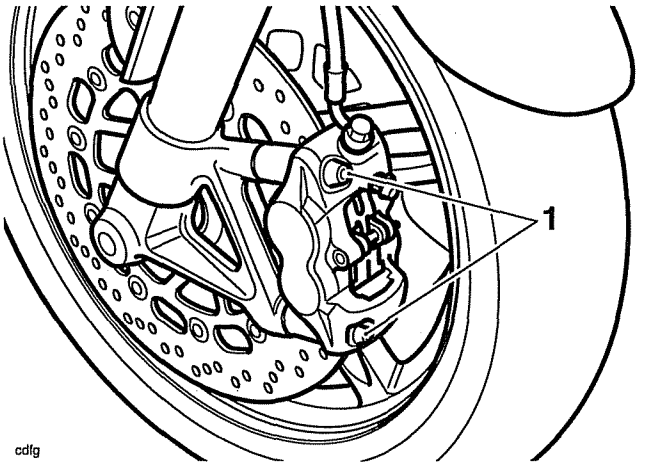
Ensure that the caliper bores do not become scratched during piston removal and assembly. Ensure that the pistons remain square to their bores during fitment otherwise damage to the caliper could result.

A dangerous riding condition leading to an accident could result if this warning is ignored.

2. Apply brake fluid to the outside of the caliper pistons and fluid seals 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**.



1. Caliper bolts

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**. Refit the 'R' clip.

5. Connect the brake hose(s) to the caliper using new sealing washers on each side of all hose connections.
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 (see page *14-9*).
9. Check for correct brake operation.

Warning

It is dangerous to operate the motorcycle with defective brakes and you must have your authorised Triumph dealer take remedial action before you ride the motorcycle again. Failure to take remedial action may result in reduced braking efficiency leading to loss of motorcycle control and an accident.

Front Discs

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.

Wear

1. Replace any brake disc if worn beyond the service limit or exceeds the disc run-out limit.

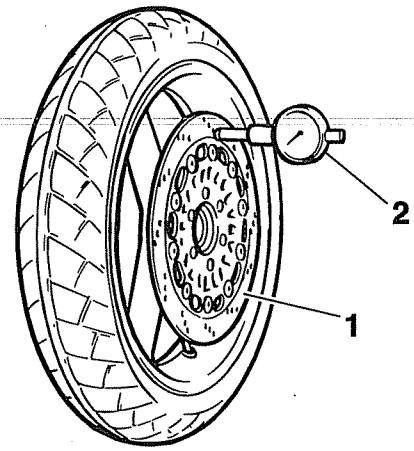
Front Disc Thickness

Standard:	4.5 mm
Service Limit:	4.0 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.



gaeb

1. Disc
2. Dial Gauge

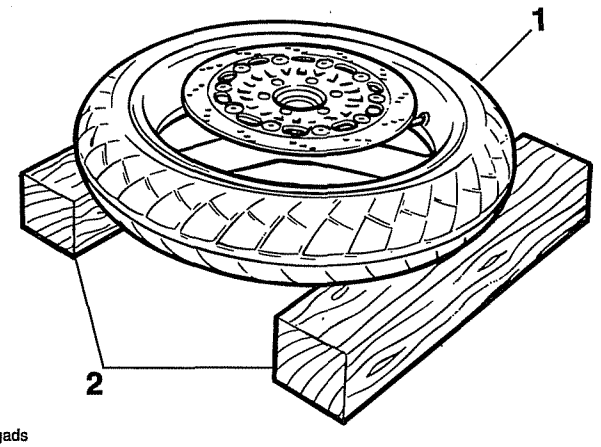
Removal

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.

2. Remove the front wheel (see page *15-6*).
3. 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.**

4. Remove and discard the bolts.
5. Detach the disc.
6. Repeat for the other disc.

Installation

1. Locate the first disc on the correct side of the wheel (offset of disc outwards) as noted during removal.
2. Fit new bolts and tighten to **22 Nm.**
3. Fit the other disc in the same way.
4. Refit the wheel (see page *15-7*).
5. Check for correct brake operation. 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 before you ride the motorcycle again. Failure to take remedial action may result in reduced braking efficiency leading to loss of motorcycle control and an accident.

Front Brake Master Cylinder

Removal

Warning

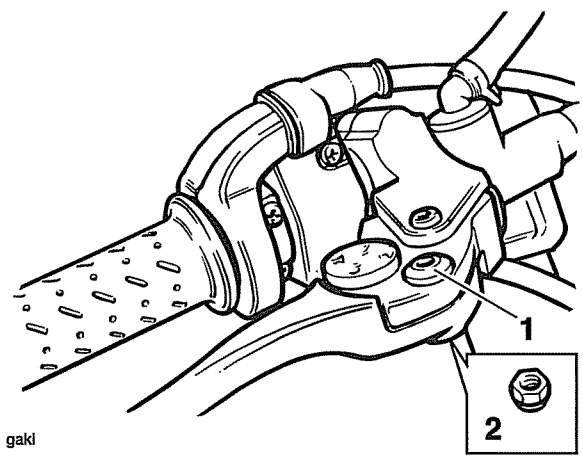
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Remove the seat and disconnect the battery negative (black) lead first.

Caution

To prevent body damage, do not spill brake fluid onto any area of the bodywork.

2. To drain the fluid from the master cylinder, attach a tube to the right hand caliper bleed nipple, slacken the nipple and allow the fluid to drain into a suitable container. Operate the brake lever until all fluid has been expelled.
3. Note the setting of the brake lever adjuster to ensure it is returned to the same position when the overhaul operation is complete.
4. Remove the pivot locknut and bolt securing the brake lever to the master cylinder, and remove the lever.

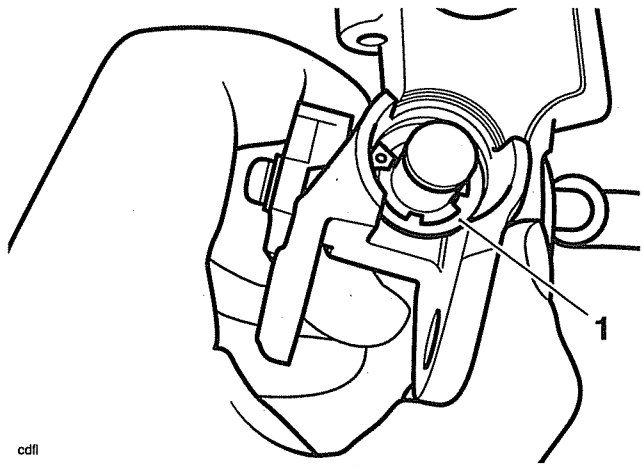


1. Pivot bolt
2. Nut

5. Disconnect from the master cylinder:
   - brake hoses,
   - brake light switch connections.
6. Release the clamp screws from the handlebar to remove the master cylinder.

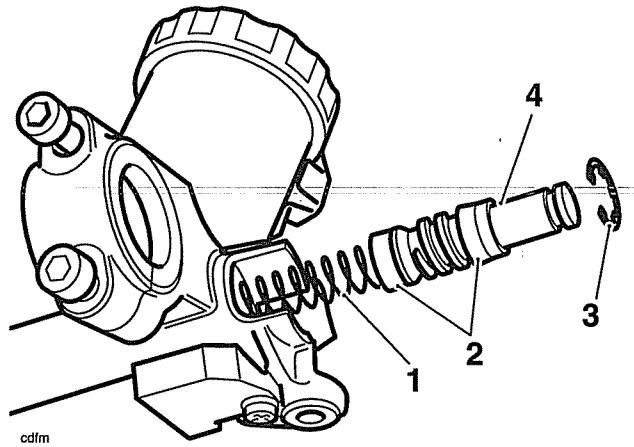
Disassembly

1. Support or remove the reservoir.
2. Detach the boot from the lever end of the cylinder.
3. Remove the circlip from beneath the boot.



1. Circlip

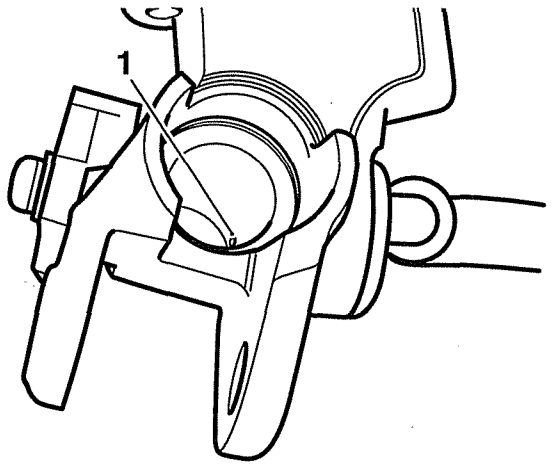
4. Remove the piston set from the master cylinder bore noting the relative position of the seals and piston components.



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 ports in the cylinder are not blocked.



cdfn

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.

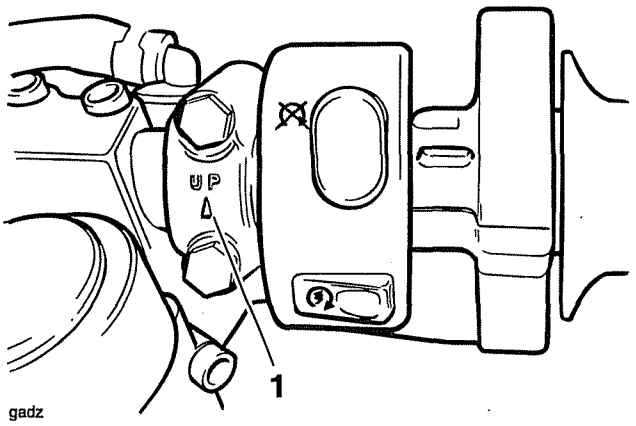
1. Lubricate the piston and cylinder with new, clean brake fluid.

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



gadz

1. 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 banjo bolt to **25 Nm**.

Warning

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

Observe the brake fluid handling warnings given earlier in this section of the manual.

6. Fill and bleed the front brakes (see page *0.0*).

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.
9. Connect the battery positive, (red) lead first.
10. Refit the seat (see page *0.0*).
11. Check for correct brake operation. Rectify as necessary.

Warning

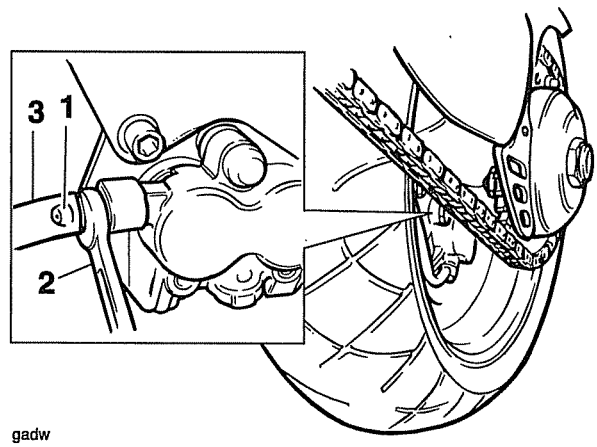
It is dangerous to operate the motorcycle with defective brakes and you must have your authorised Triumph dealer take remedial action before you ride the motorcycle again. Failure to take remedial action may result in reduced braking efficiency leading to loss of motorcycle control and an accident.

Bleeding the Rear Brakes, Renewing Brake Fluid

Warning

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

1. Remove the body side panel assembly (see page *16-9*).
2. Remove the cap from the rear bleed nipple.
3. Attach a transparent tube to the bleed nipple.



gadw

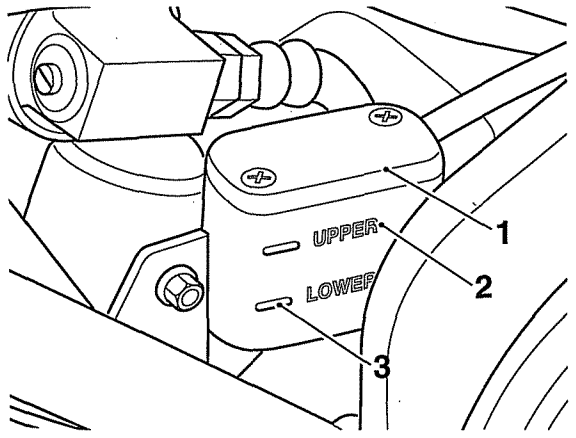
1. Bleed Nipple
2. Spanner
3. Bleed Tube

4. Place the other end of the tube in a suitable receptacle containing new brake fluid.

Warning

To prevent body damage, do not spill brake fluid onto any area of the bodywork.

5. Unscrew and remove the rear brake reservoir cover taking care not to spill any fluid.



ccoz2

1. Rear reservoir
2. Rear reservoir upper level
3. Rear reservoir lower level

Warning

Ensure absolute cleanliness when adding brake fluid to the brake fluid reservoir. Do not allow moisture or debris to enter the cylinder as this will adversely affect the fluid properties. Always use fluid from a sealed container and do not use fluid from a container which has been opened for any period of time. Always check for fluid leakage around hydraulic fittings and for damage to hoses.

A dangerous riding condition leading to an accident could result if this warning is ignored.

6. Check the condition of the sealing diaphragm. Replace the diaphragm as necessary.
7. Release the bleed nipple.

Note:

- **During bleeding, do not allow the fluid level to fall below the lower level mark in the reservoir. If the level is allowed to fall below this mark, air may enter the system and the sequence of bleeding must be repeated.**

8. Slowly depress the brake pedal and, holding the pedal fully down, close the bleed nipple
9. Repeat steps 7 and 8 until no more air appears in the bleed tube.
10. Maintain the brake fluid level between the upper and lower reservoir levels whilst bleeding is being carried out.
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. Remove the bleed tube from the nipple.
15. Replace the bleed nipple dust cap.
16. Check for correct brake operation. Rectify as necessary.

Warning

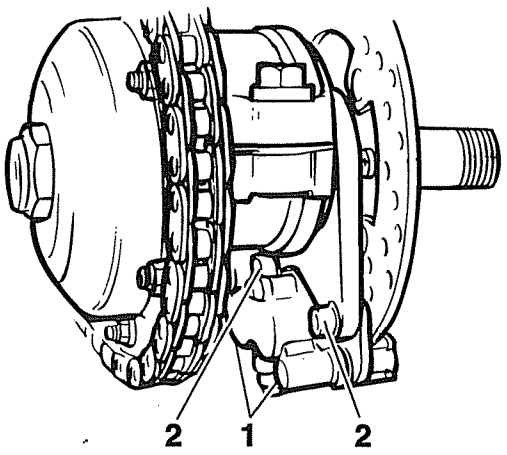
It is dangerous to operate the motorcycle with defective brakes and you must have your authorised Triumph dealer take remedial action before you ride the motorcycle again. Failure to take remedial action may result in reduced braking efficiency leading to loss of motorcycle control and an accident.

Rear Brake Pads

Warning

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

1. Remove the rear wheel (see page *15-8*).



gaix

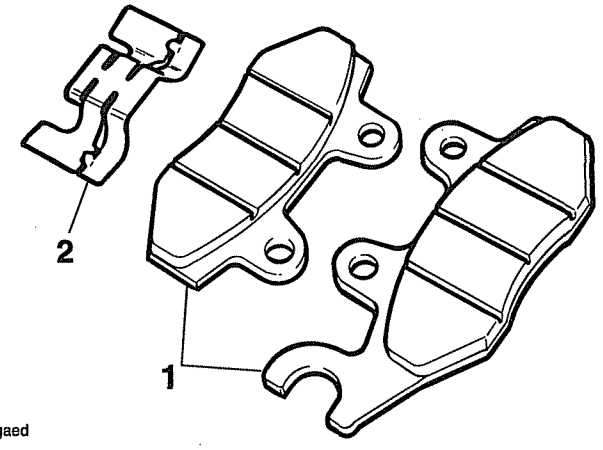
1. Pad Retaining Pins
2. Caliper Mounting Bolts

2. Slacken the brake pad retaining pins.

Warning

Do not allow the calliper to hang on the brake hoses as this may damage the hoses and could lead to an accident.

3. Remove the calliper mounting bolts and position the calliper 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.



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1. Brake Pads
2. Anti Rattle Spring

6. Remove the anti rattle spring and inspect for damage.

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 callipers and master cylinders.

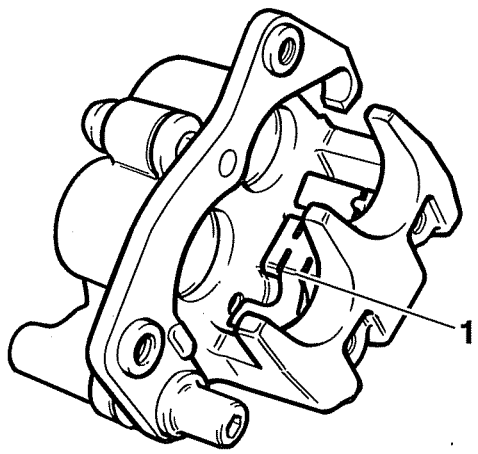
Damage caused by mineral based grease may reduce braking efficiency resulting in an accident.

Caution

Brake fluid will be displaced as the calliper 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 calliper pistons fully into their bores.

2. Install the anti rattle spring into the calliper.



1. Anti Rattle Spring

3. Renew the brake pads as a pair or, if both pads are in serviceable condition, clean the pad grooves before fitting them.

Warning

Do not apply more than a minimum coating of grease to the pad retaining pins. Excess grease may contaminate the brake pads, hydraulic seals and discs causing reduced braking efficiency and an accident.

4. Lubricate the pad retaining pins using a minimum amount of proprietary high temperature 'Copperslip' type grease.
5. Position the caliper over the disc ensuring both pads are correctly aligned.
6. Fit the calliper retaining bolts, and tighten to **40 Nm.**
7. Tighten the brake pad retaining pins to **20 Nm.**
8. Pump the brake pedal to correctly position the calliper 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.

9. Check the brake fluid level and top-up as required with new DOT 4 fluid.
10. Refit the rear wheel (see page *15-8*).
11. Check for correct brake operation. 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 before you ride the motorcycle again. Failure to take remedial action may result in reduced braking efficiency leading to loss of motorcycle control and an accident.

Rear Brake Caliper

Removal

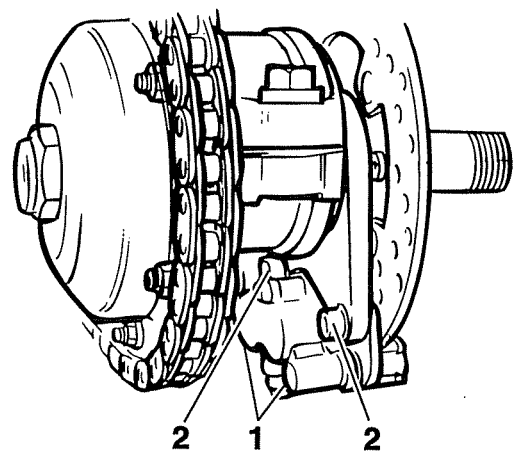
Warning

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

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 wheel (see page *0.0*).
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 two pad retaining pins.
4. Remove the caliper mounting bolts.
5. Remove the brake caliper assembly.



1. Pad Retaining Pins
2. Caliper Mounting Bolts

Disassembly

1. Press downwards on both pads and remove the retaining pins. Remove the brake pads.

Warning

To prevent injury, never place fingers or hands inside the caliper opening when removing the pistons. Always wear eye, hand and face protection when using compressed air. Eye, face and skin damage will result from direct contact with compressed air.

2. Cover the caliper opening with a clean, heavy cloth and, using either compressed air or by reconnecting the master cylinder and pumping the brake lever, remove the pistons one at a time.

Inspection

1. Check the piston and caliper bore for corrosion, scoring and damage. Renew as necessary.

Warning

Always renew caliper seals and pistons after removal from the caliper. An effective hydraulic seal can only be made if new components are used.

A dangerous riding condition leading to an accident could result if this warning is ignored.

2. Inspect the brake pads for damage and wear beyond the service limit. Renew as necessary.

Assembly

Warning

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

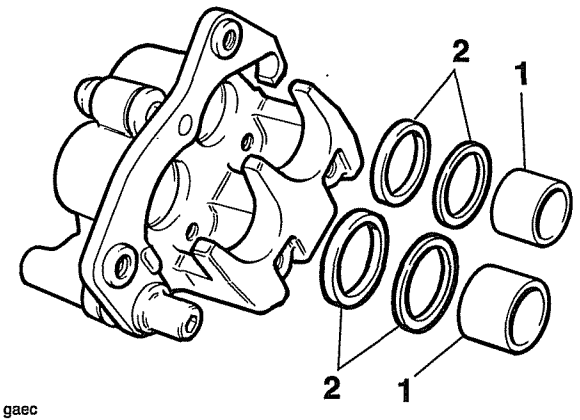
A dangerous riding condition leading to an accident could result if this warning is ignored.

Warning

Ensure that the caliper bores do not become scratched during removal and assembly.

A dangerous riding condition leading to an accident could result if this warning is ignored.

1. Fit new fluid seals to the caliper. Apply brake fluid to the outside of the caliper piston and fluid seal.



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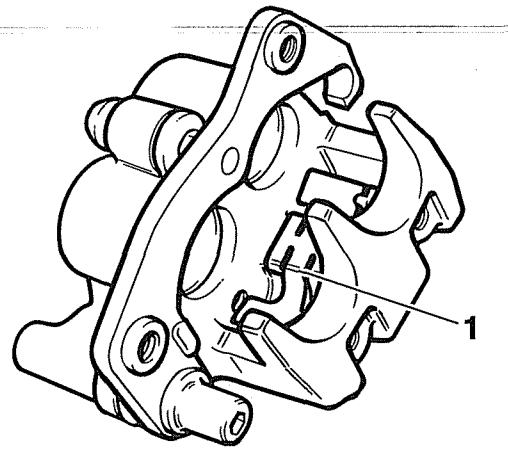
1. Pistons
2. Seals

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.



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1. Anti Rattle Spring

Warning

Do not apply more than a minimum coating of grease to the pad retaining pins. Excess grease may contaminate the brake pads, hydraulic seals and discs causing reduced braking efficiency and an accident.

4. Position the brake pads in the caliper. Lubricate the pad retaining pins using a minimum amount of proprietary high temperature 'Copperslip' type grease. Press down on both pads and fit the pad retaining pins.

Installation

1. Position the caliper over the disc ensuring the pads are correctly aligned on both sides of the disc.
2. Fit the caliper retaining bolts, and tighten to **40 Nm**.
3. Tighten the brake pad retaining pins to **20 Nm**.
4. Connect the brake hose to the caliper using new washers on each side of the banjo bolt.
5. Tighten the banjo bolt to **25 Nm**.

Warning

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

Observe the brake fluid handling warnings given earlier in this section of the manual.

6. Fill the master cylinder with new, DOT 4 brake fluid from a sealed container.
7. Bleed the rear brake (see page *0.0*).
8. Refit the rear wheel (see page *15-8*).
9. Check for correct brake operation. 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 before you ride the motorcycle again. Failure to take remedial action may result in reduced braking efficiency leading to loss of motorcycle control and an accident.

Rear Brake Disc

Wear

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. Replace any brake disc if worn beyond the service limit or exceeds the disc run-out limit (see page *0.0*).

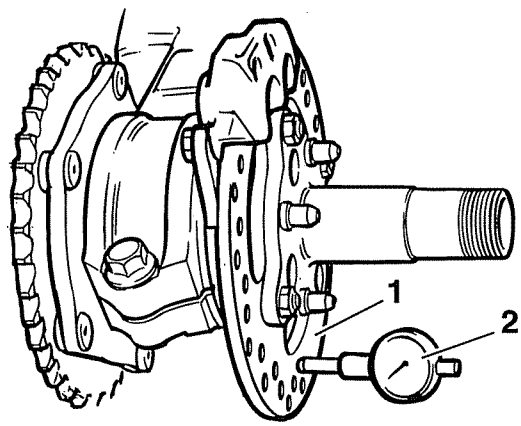
Rear Disc Thickness

Standard:	5.0 mm
Service Limit:	4.5 mm

Disc Run-out

Service Limit:	0.15 mm

Measure disc run out using an accurate dial gauge mounted on a surface plate.



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1. Disc
2. Dial Gauge

Rear Master Cylinder

Removal

Warning

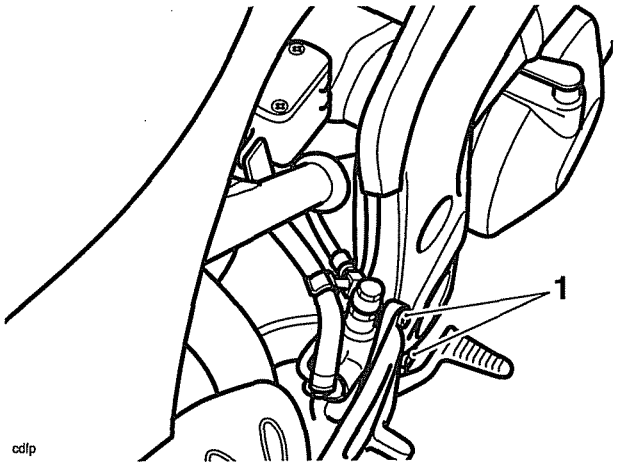
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Remove the seat.
2. Disconnect the battery negative (black) lead first.
3. Remove the rear body panels.

Caution

To prevent body damage, do not spill brake fluid onto any area of the bodywork or wheels.

4. Drain the fluid from the master cylinder by bleeding the system at the rear caliper until all fluid has been expelled.
5. Remove the clip and washer from the clevis pin at the lower end of the brake pushrod .
6. Remove the clevis pin.
7. Disconnect from the master cylinder:
   - the rear brake hose (noting orientation),
   - the reservoir hose.



1. Master cylinder fixings

8. Remove the screws securing the master cylinder and heel guard to the frame to release the master cylinder.

Note:

- **During removal of the master cylinder, note the position of the brake light switch bracket and spacing washer between the cylinder and frame. Ensure both parts are refitted in the same positions.**

Disassembly

1. Remove the boot from the cylinder and pushrod.
2. Remove the circlip retaining the pushrod to the cylinder.
3. Remove the pushrod and piston set from the master cylinder bore noting the relative position of the seals and piston components.

Inspection

1. Visually inspect the master cylinder bore for wear, scratches or corrosion. Replace as necessary.
2. Check the piston and cylinder bore for damage, wear or deterioration. Replace as necessary. Always renew the piston seals if the cylinder has been dismantled.
3. Examine the pushrod for bends and damage. Replace as necessary.

Assembly

Warning

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

A dangerous riding condition leading to an accident could result if this warning is ignored.

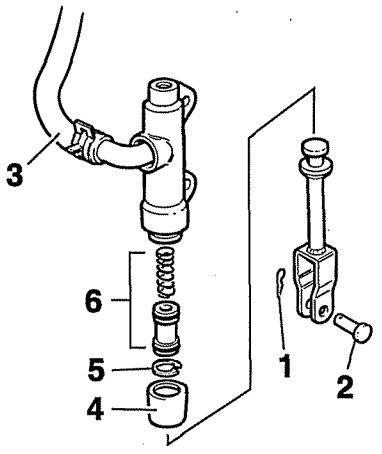
1. Clean the master cylinder bore, piston and seals, with new brake fluid.
2. Ensure all ports are clear of obstruction.

Warning

Ensure that the piston and piston seal are fitted facing the same way as noted during removal. A dangerous riding condition leading to an accident could result from incorrect assembly of the master cylinder.

3. Install the spring and piston set together.

4. Apply a small amount of brake grease to the pushrod.
5. Install the pushrod in the master cylinder and retain with a new circlip.
6. Refit the boot.



1. Clip
2. Clevis pin
3. Reservoir hose
4. Dust boot
5. Circlip
6. Piston set

Installation

1. Fit the reservoir hose to the master cylinder.
2. Secure the master cylinder and cover to the frame. Tighten the securing screws to **30 Nm**.
3. Connect the push rod to the brake pedal using a new clevis pin and split pin.
4. Using new washers, fit the brake hose to the master cylinder. Ensuring correct orientation of the brake hose, tighten the banjo bolt to **25 Nm**.
5. If removed, fit the brake light switch to the control plate.

⚠ Warning

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

Observe the brake fluid handling warnings given earlier in this section of the manual.

6. Fill and bleed the rear brake system as described earlier.
7. Reconnect the battery positive, (red) lead first.
8. Fit the body rear panels
9. Refit the seat.
10. Check for correct brake operation. 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 before you ride the motorcycle again. Failure to take remedial action may result in reduced braking efficiency leading to loss of motorcycle control and an accident.

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15 Wheels/Tyres

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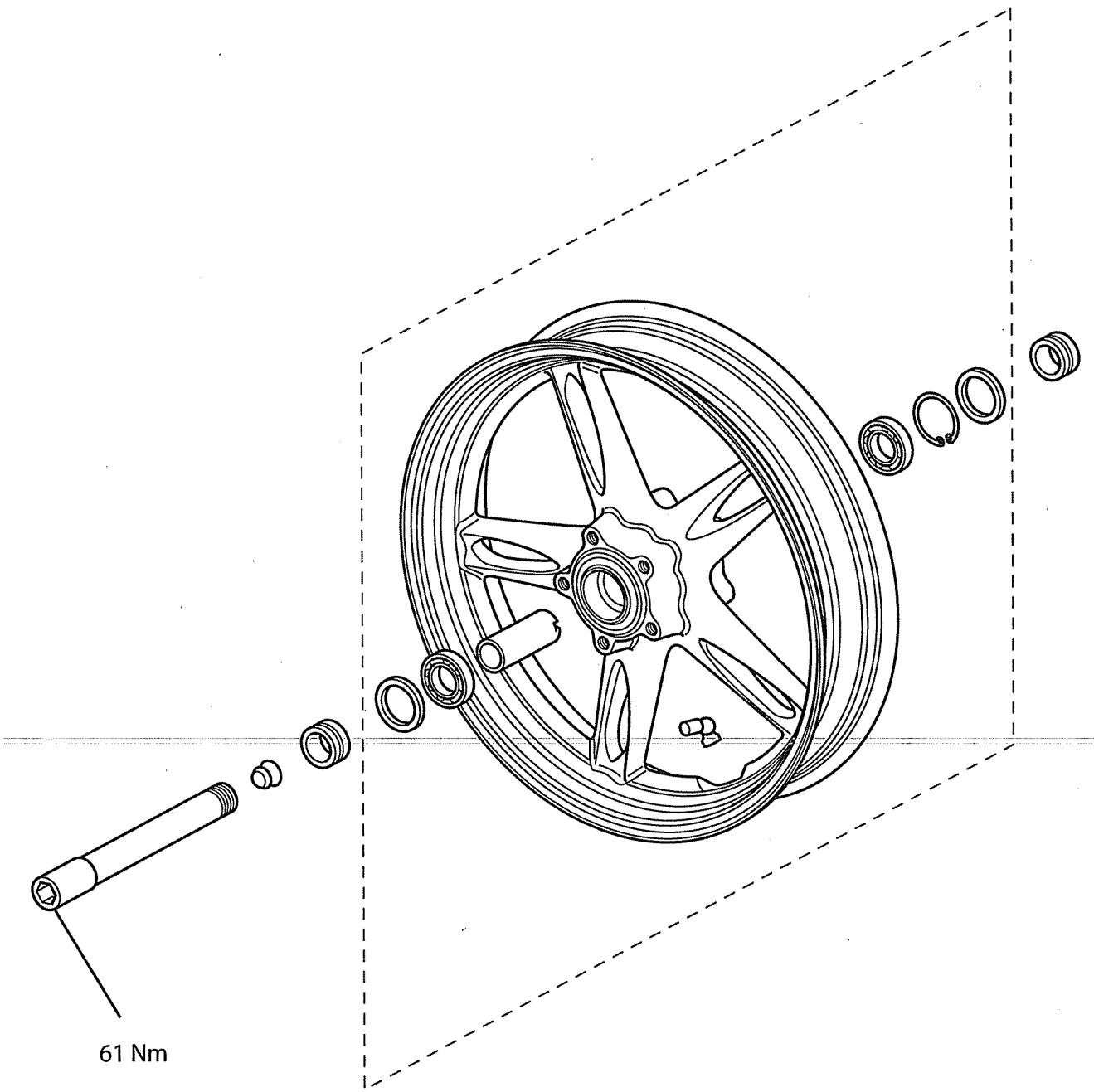
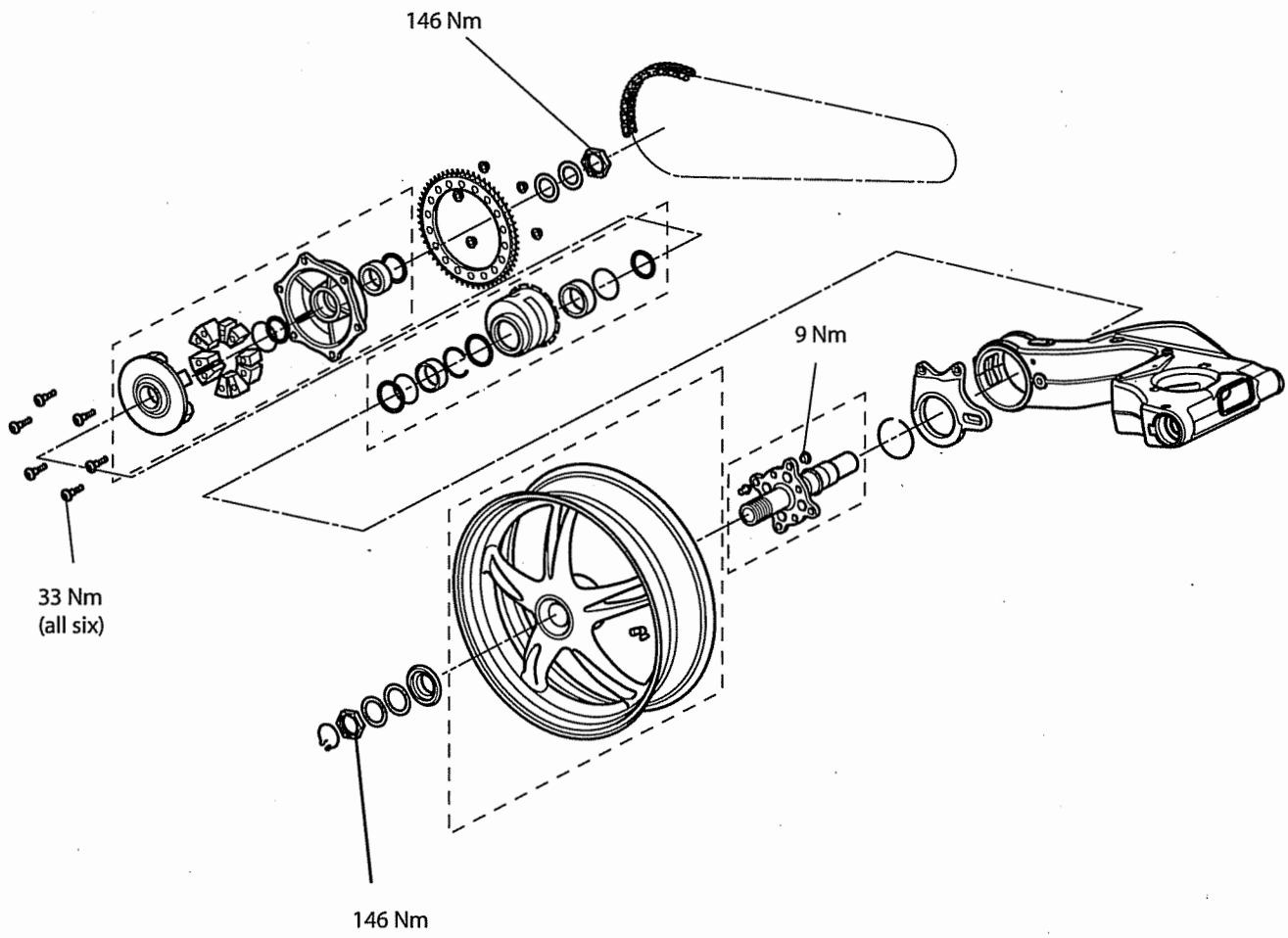
Exploded view - Front Wheel

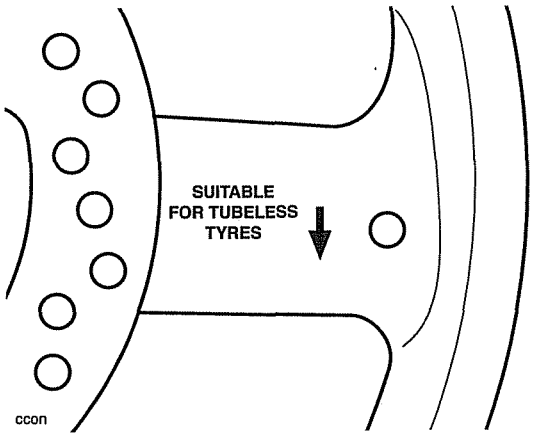


Exploded View – Rear Wheel & Final Drive

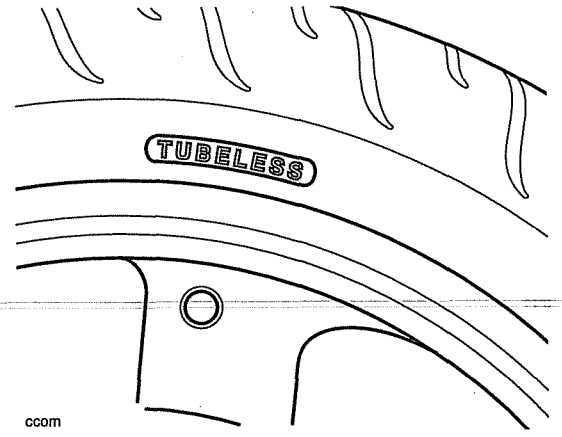


Tyres

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.

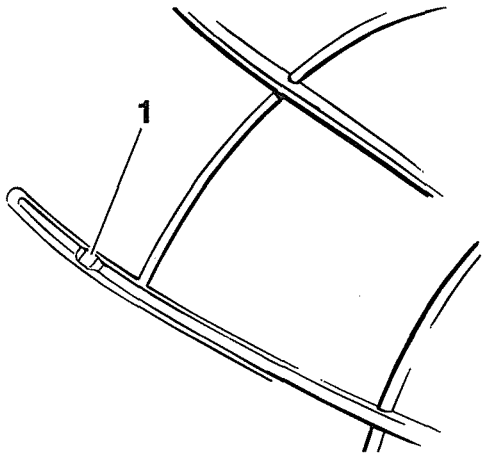
Under-inflation may result in the tyre slipping on, or coming off the rim. Over-inflation will cause instability and accelerated tread wear.

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, imbedded nails or other sharp objects.

Check the rims for dents or deformation. Operation with damaged or defective wheels or tyres is dangerous and loss of control or an accident could result.

Always consult your Triumph dealer for tyre replacement, or for a safety inspection of the tyres.

Minimum Recommended Tread Depth

The following chart can be used as a guide to the minimum safe tread depth.

Under 130 km/h (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

Warning

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

1. Position the motorcycle on a paddock stand.
2. Detach both brake callipers (see page *14-12*).

Note:

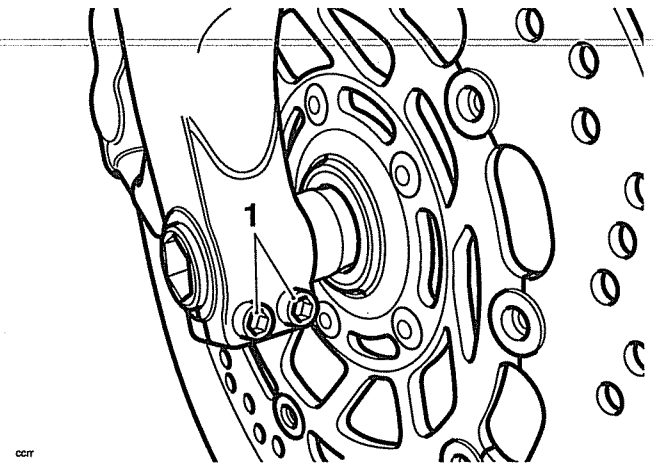
- **It is not necessary to disconnect the brake hoses.**

Warning

Do not allow the calipers to hang on the brake hoses as this may damage the hoses.

Damaged hoses could cause brake failure leading to loss of control and an accident.

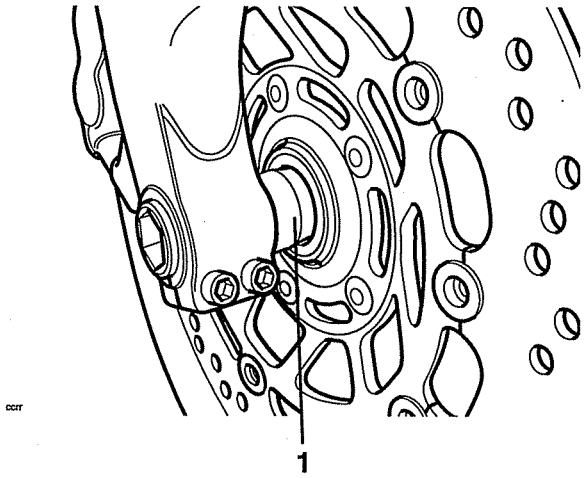
3. Raise and support the front of the motorcycle.
4. Slacken both pinch bolts at the lower end of the right hand fork.



1. Fork pinch bolts

5. Release and remove the wheel spindle, which is threaded into the left hand fork.

6. Remove the wheel and the wheel spacers.



1. Wheel spacers (right hand shown)

7. Place the wheel on wooden blocks.

Warning

Do not allow the wheel to rest on either brake disc as this may damage the disc and could lead to an accident.

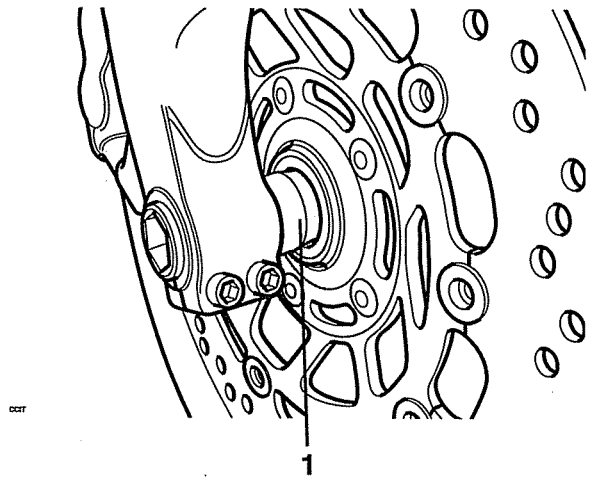
Caution

To prevent wheel and bearing damage, observe absolute cleanliness and ensure there is no dirt ingress to the wheel bearings while the wheel is removed.

8. Thoroughly clean all components and inspect for wear or damage.

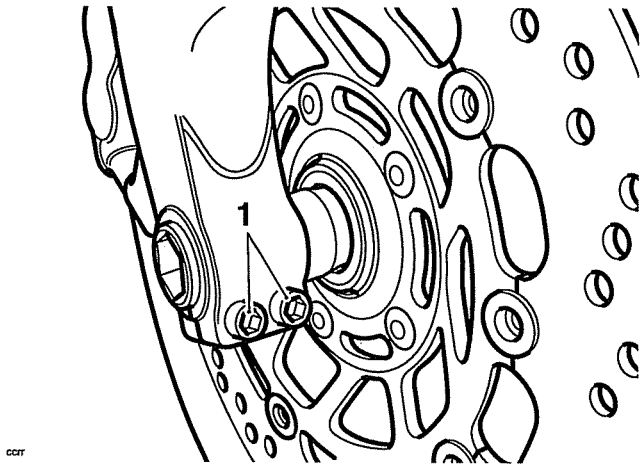
Installation

1. Lightly smear the wheel spacers with grease and locate in the hubs.
2. Position the wheel between the forks ensuring the spacers remain in position on both sides.



1. Wheel spacers

3. Refit the wheel spindle from the right hand side and tighten to **110 Nm**.
4. 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.
5. Tighten the fork pinch bolts to **20 Nm**.



1. Fork pinch bolts

6. Thoroughly clean and degrease the brake discs.
7. Fit the brake callipers (see page *14-13*).

Rear Wheel

Removal

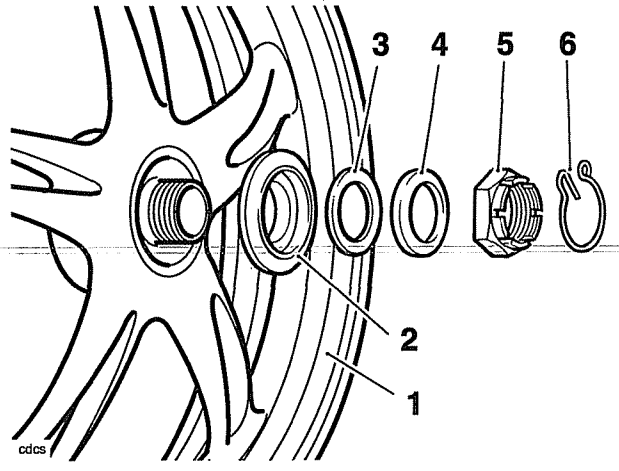
Warning

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

1. Raise and support the rear of the motorcycle to allow removal of the rear wheel.

Warning

If the engine has recently been running, the exhaust system will be hot. Before working on or near the exhaust system, allow sufficient time for the exhaust system to cool as touching any part of a hot exhaust system could cause burn injuries.



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 (at a slight angle to avoid contact with the rear footrest).

Installation

1. Fit the wheel, aligning with the 4 location dowels.
2. Hold the wheel squarely in position while fitting:
   - conical spacer
   - plain washer
   - belleville washer, dished face outwards
   - nut
3. Tighten the wheel retaining nut to **146 Nm**, and fit the clip.

Front Wheel Bearing

Removal

1. Remove the front wheel (see page *15-6*).

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.

Lay the wheel on its side while supporting the wheel on wooden blocks to prevent damage to the brake disc.

2. Remove and discard the seals and the bearing circlip.

Warning

Always wear eye, hand and face protection when using a hammer and drift. Use of a hammer and drift can cause bearings to fragment. Pieces of fragmented bearing could cause eye and soft tissue injuries if suitable protective apparel is not worn.

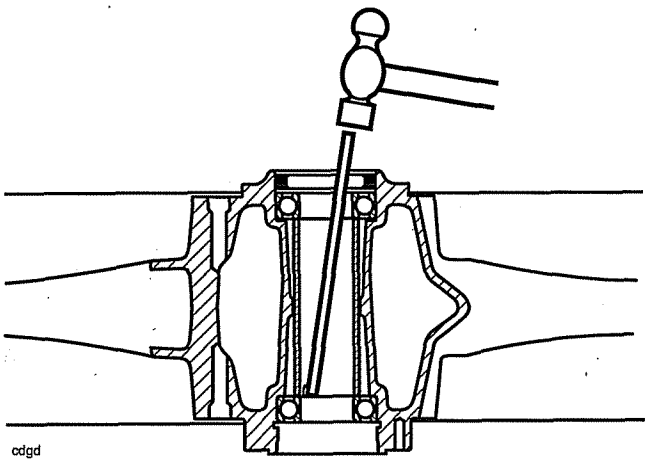
Caution

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.**

3. 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. Loos 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.

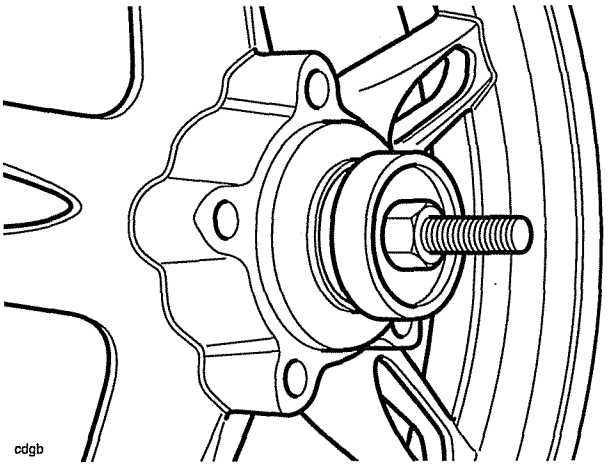
Installation

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 - T0301 Small face to bearing	3880075 - T0301 Large face to Wheel
Right bearing	3880070 - T0301 Small face to bearing	3880075 - T0301 Large face to wheel

1. Fit the wheel bearings and centre sleeve using the method described above.



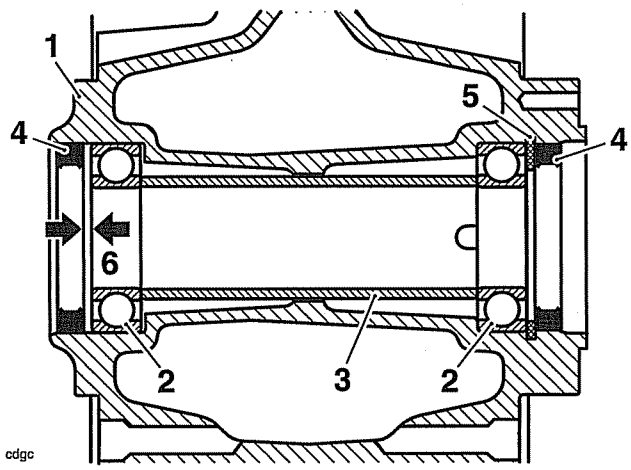
Tool 3880070 in position on wheel

2. 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.

3. 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.



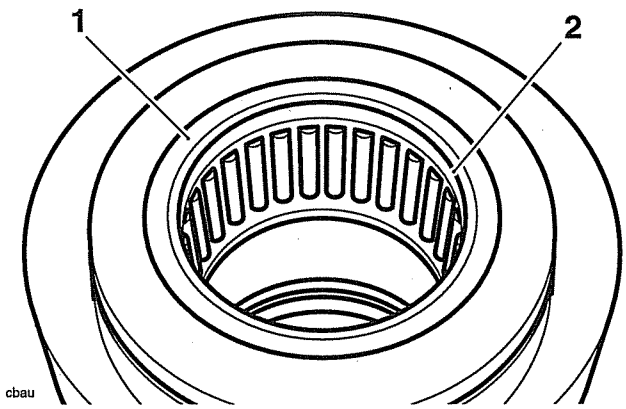
1. Front wheel
2. Wheel bearings
3. Centre Sleeve
4. Oil Seals
5. Circlip
6. Left hand oil seal postion

4. Fit the front wheel (see page *15-7*).

Rear Wheel Bearing

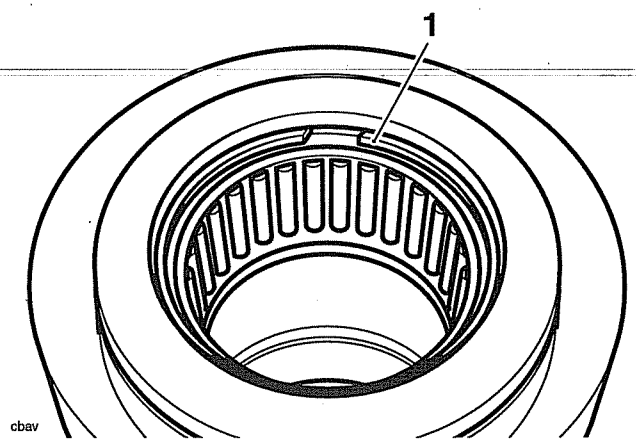
Removal

1. Remove the rear hub (see page *12-18*).
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.



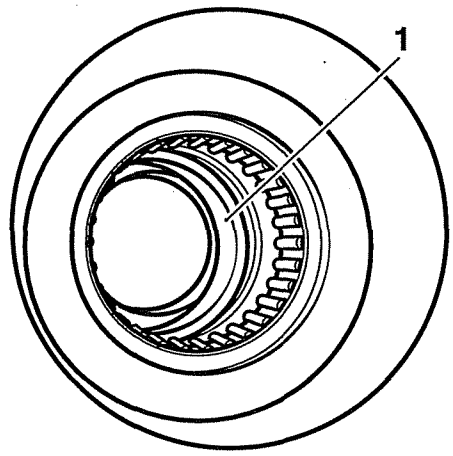
1. Seal
2. Knife-edge

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.



cbaw

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.

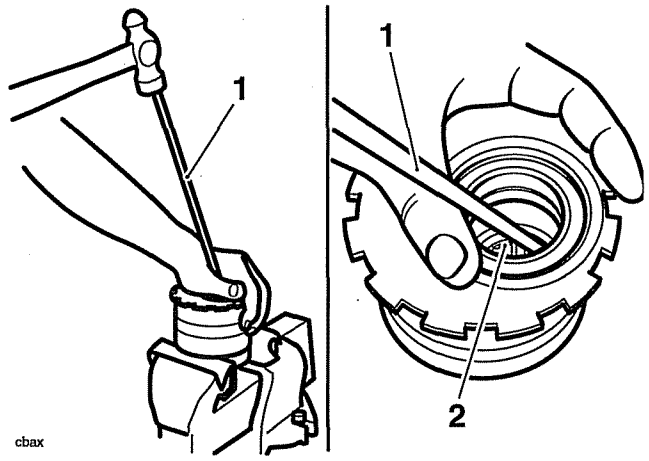
⚠ Warning

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.

⚠ 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.

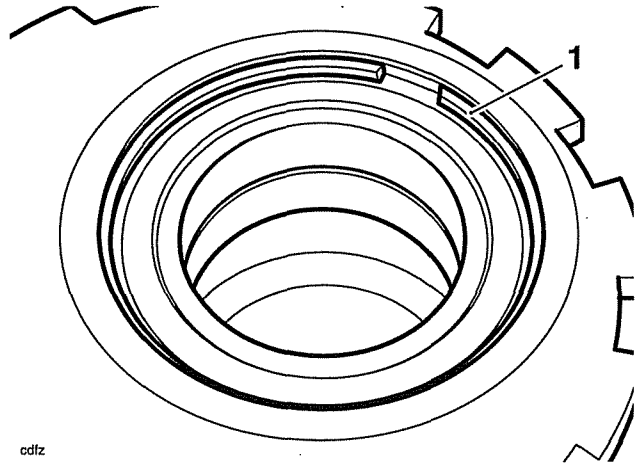
7. Working through the hole in the centre of the left hand bearing, use a pin punch to drift out the right hand bearing.



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.



cdfz

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

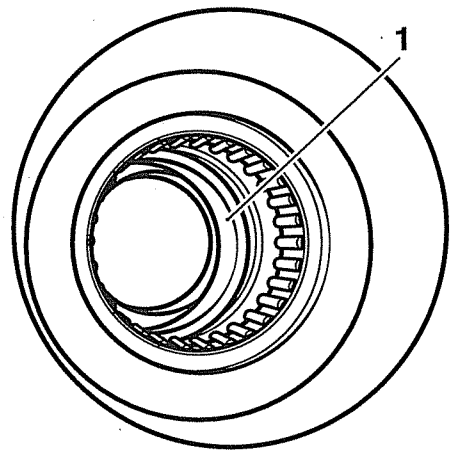
Warning

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.

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

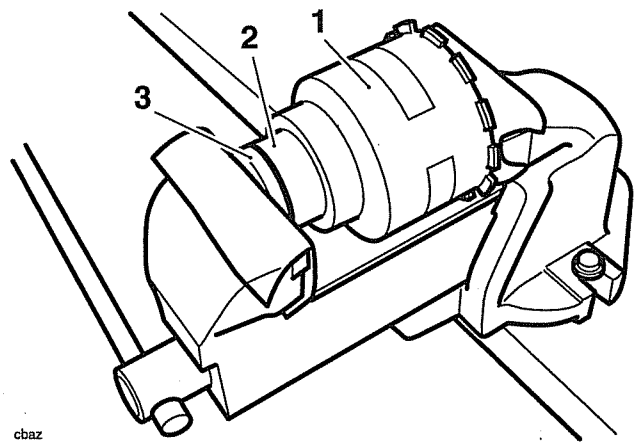
1. Lubricate and place a new inner hub seal within the hub. Lubricate the seal's knife-edge with grease to NLGI 2 specification (we recommend Mobil grease HP222).
2. Fit a new inner circlip. Ensure the circlip is retained in the groove through its entire circumference.



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

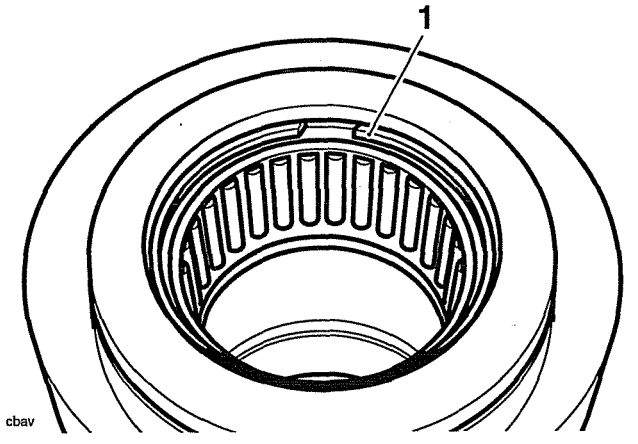
1. Hub
2. Right hand bearing
3. Service Tool 3880065-T0301

5. Progressively close the vice until 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

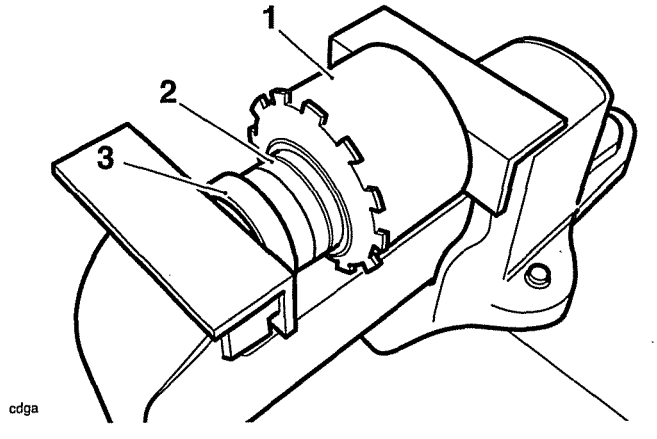
Ensure the hub, new bearing and tool remain in alignment throughout the assembly process. Misalignment of any of these items could cause damage to the bearing and/or the hub.

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.



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.



1. Hub
2. Left hand bearing
3. Service Tool 3880065-T0301

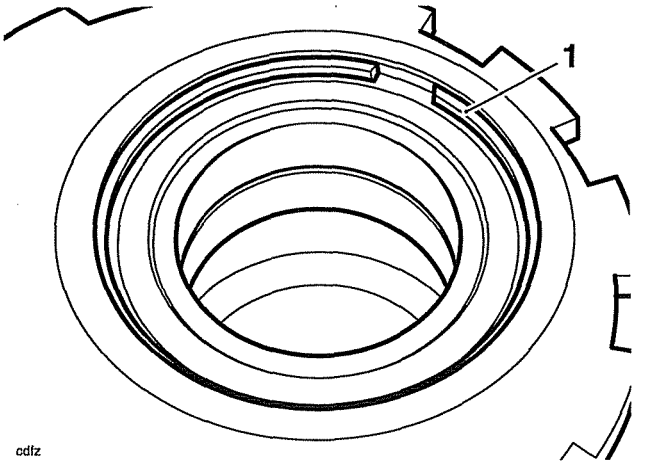
9. Progressively close the vice until outer race of the left hand new bearing is pushed fully up to the inner flange inside the hub. Open the vice and collect the hub and tool then place the tool aside.

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.

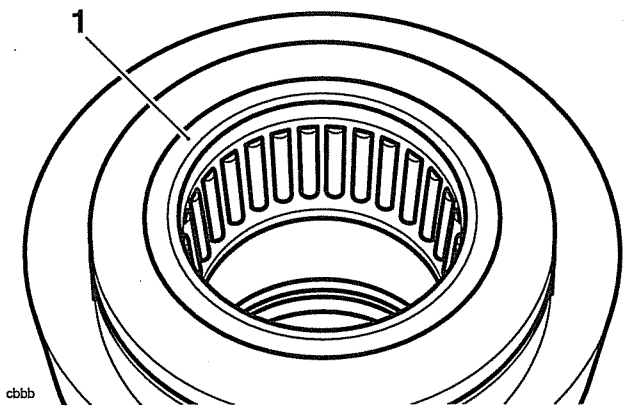
Should misalignment occur at any point, remove the components, check and rectify any damage and then repeat the bearing installation process.

10. 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

11. 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

12. Lubricate the new bearing with 5 grammes of grease to NLGI 2 specification (we recommend Mobil grease HP222).
13. Thoroughly clean the hub-bore in the swinging arm.
14. Refit the hub (see page *12-15*).

16 Frame and Bodywork

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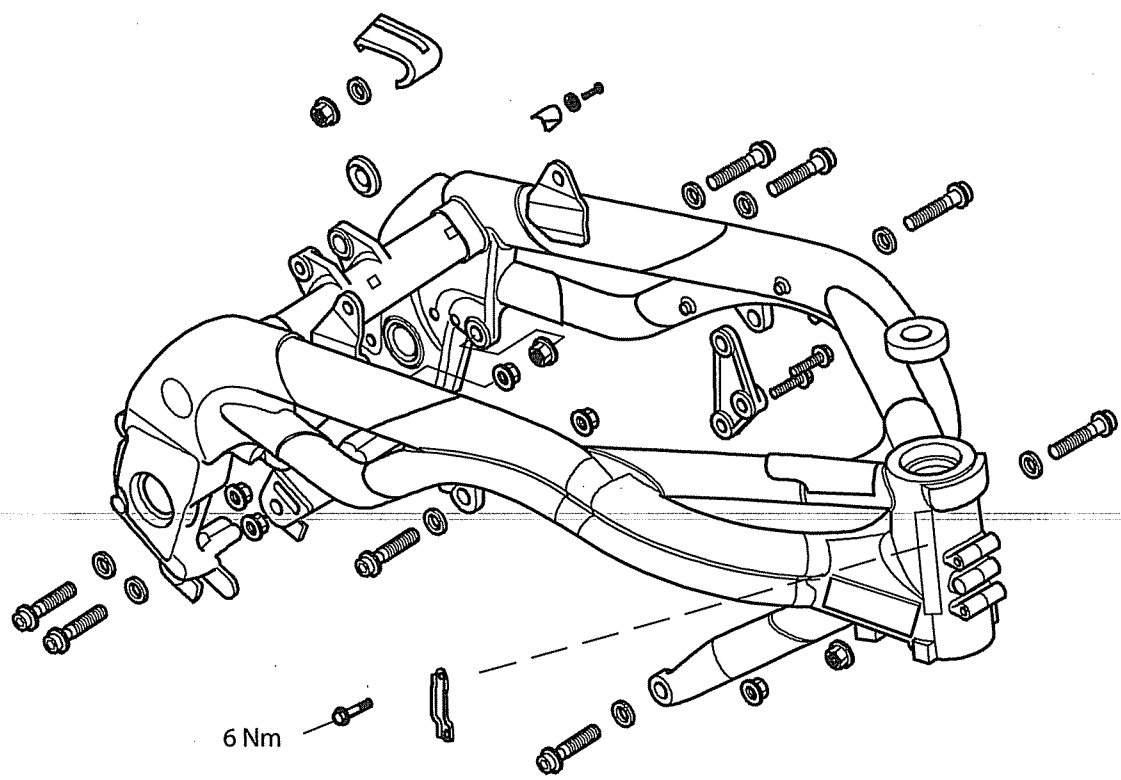
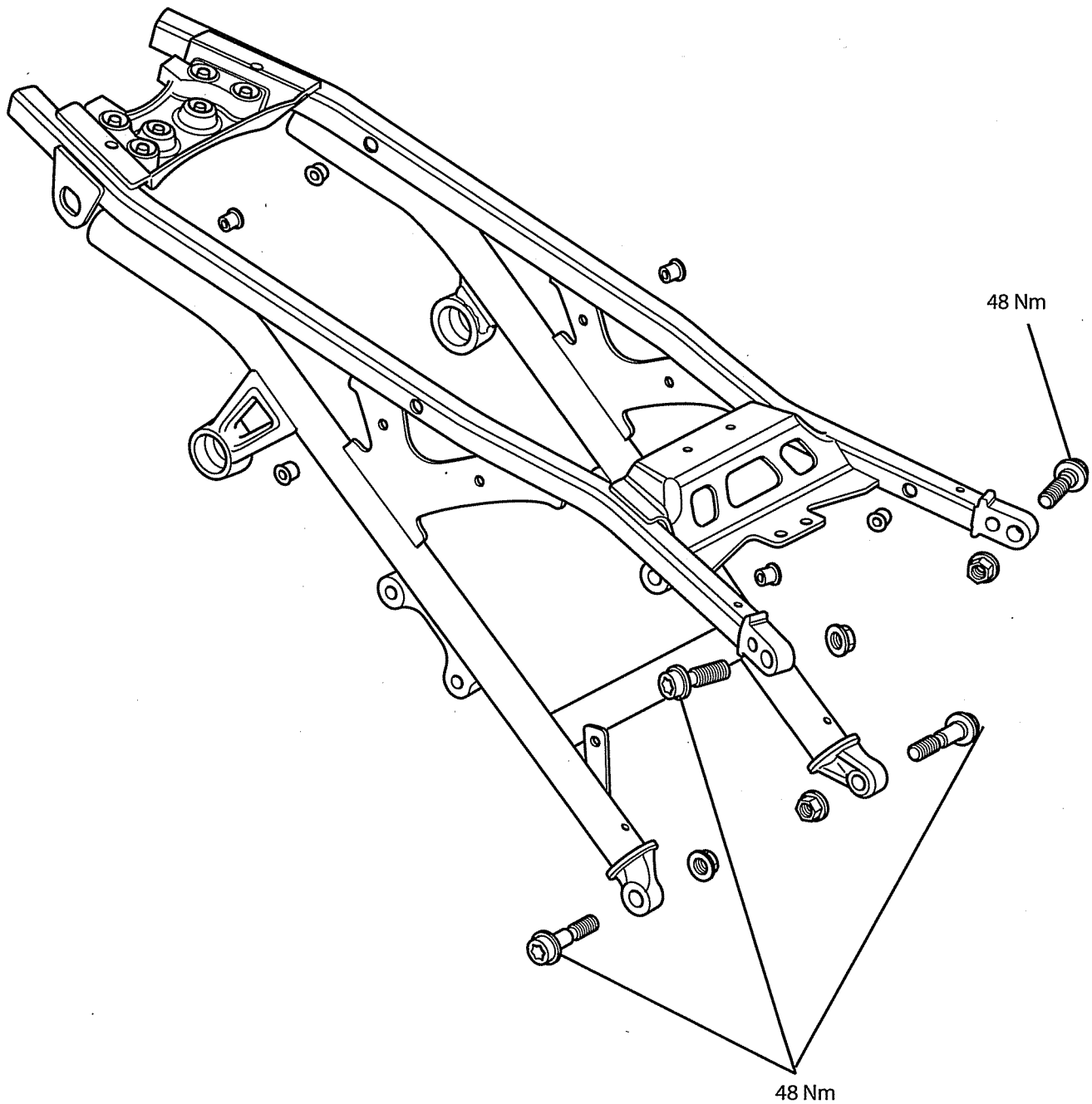
Exploded View - Frame

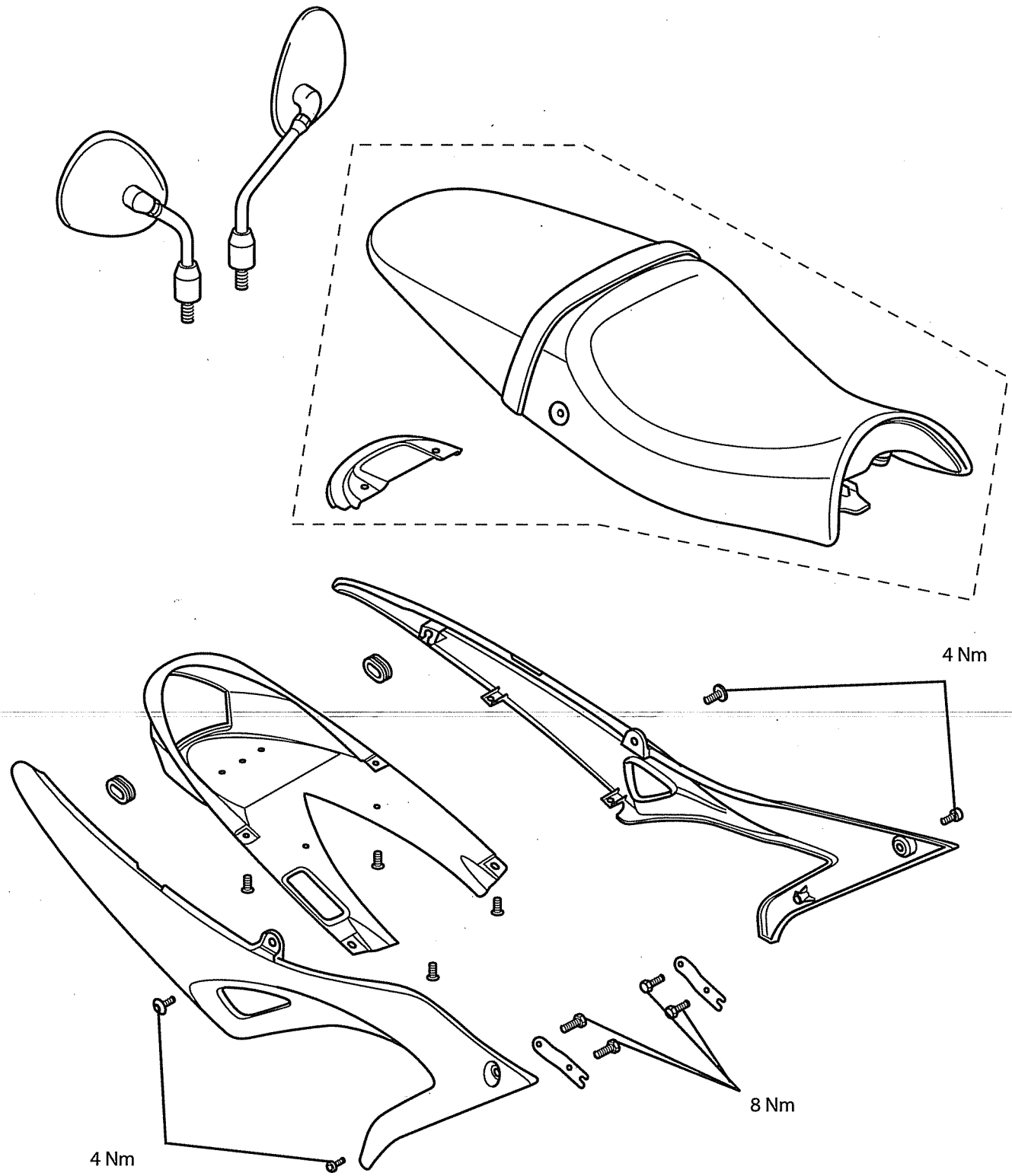
All engine mountings - see section 9



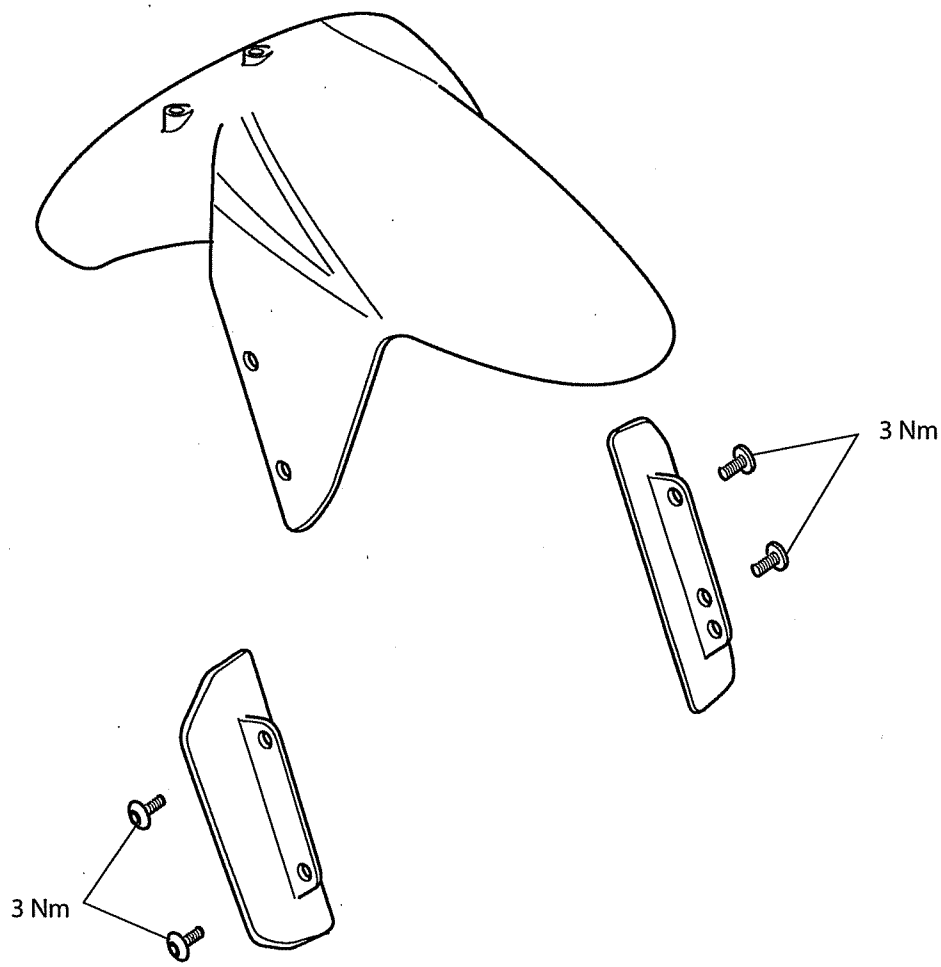
Exploded View - Seat Rails



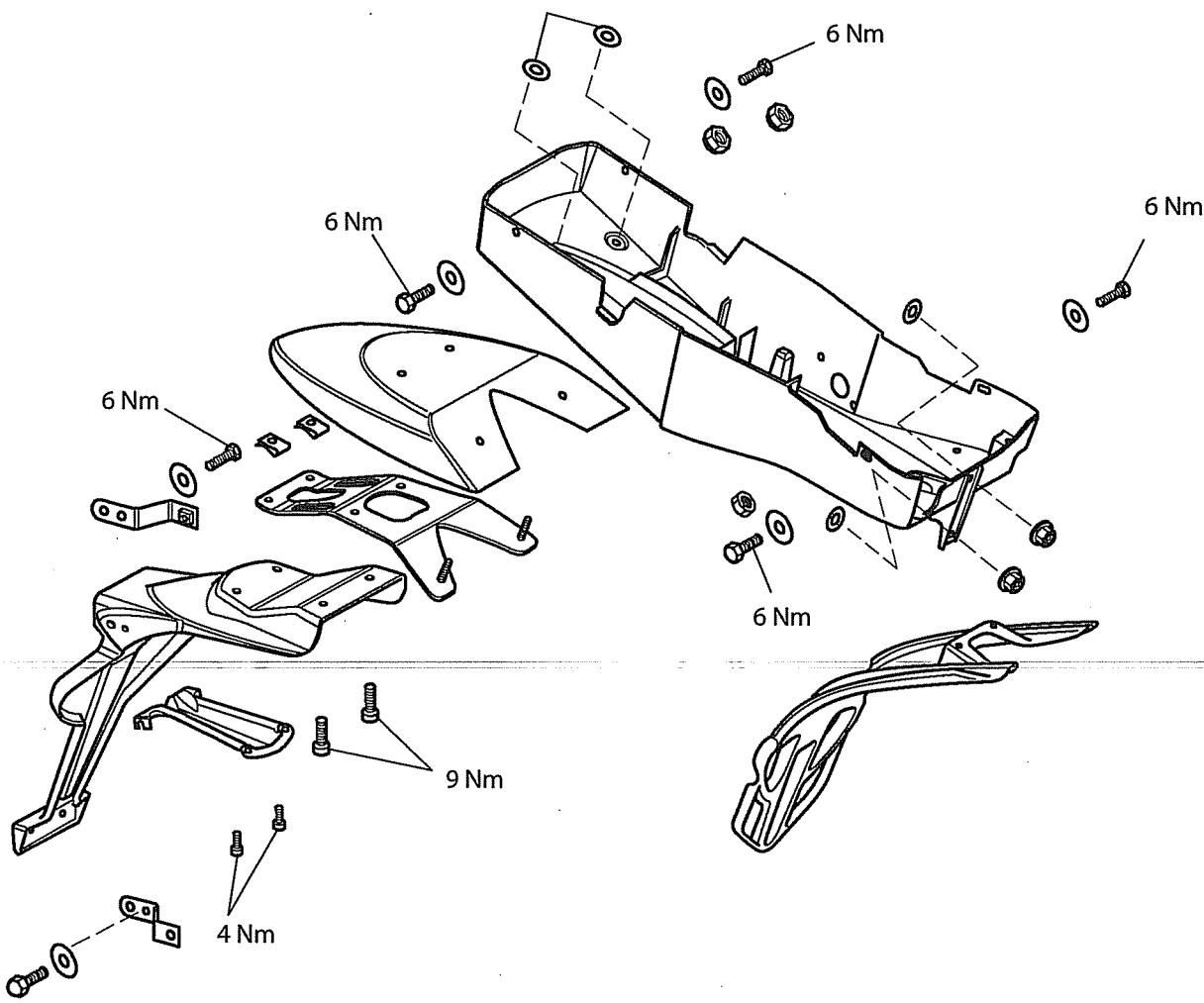
Exploded View - Side Panels



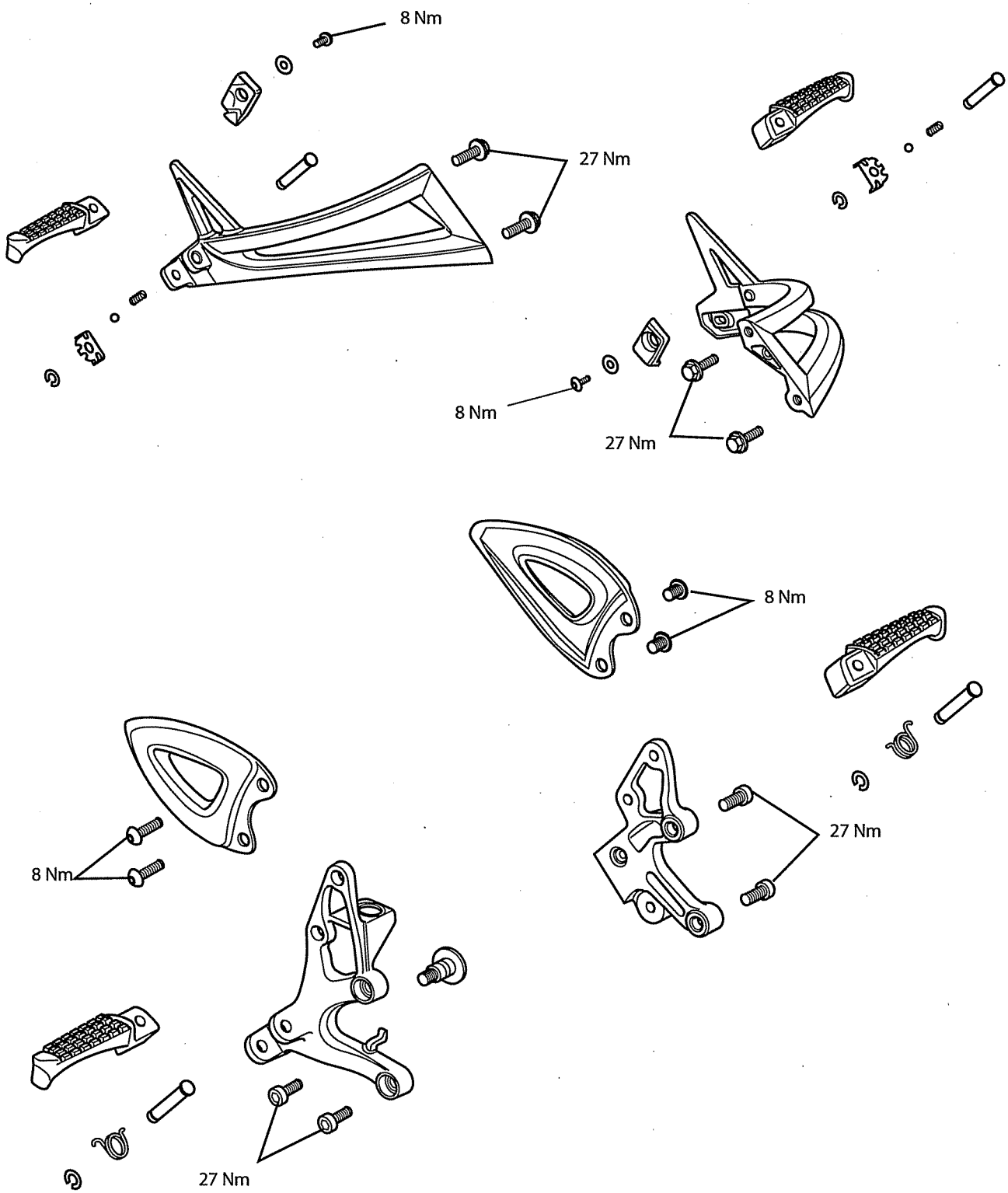
Exploded View - Front Mudguard



Exploded View - Rear Mudguard



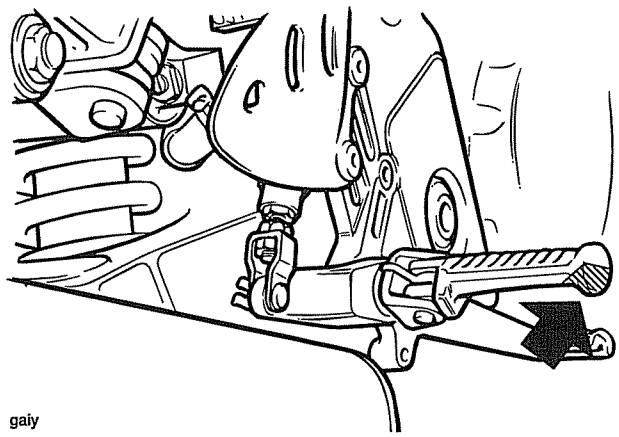
Exploded View - Footrests and Mountings



Frame, Footrests and Fixings

Inspection

1. Inspect the frame footrests and fairings for damage, cracks, chafing and other dangerous conditions. Check fairing and frame fixings for security.
2. Inspect the footrests for wear. If more than 50% of the radiused end is worn away, the footrest must be replaced.



1. Footrest Wear Limit

Warning

Use of a motorcycle with footrests worn beyond the maximum limit will allow the motorcycle to be banked to an unsafe angle.

Banking to an unsafe angle may cause instability, loss of motorcycle control and an accident.

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 loss of motorcycle control and an accident.

Warning

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

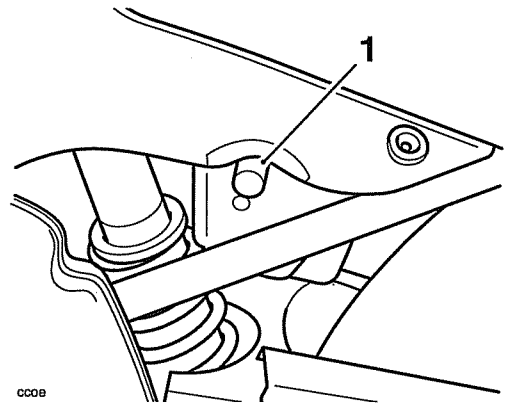
Seat

Removal

Note:

- **The seat lock is situated on the battery tray, in line with the footrest mounting rail, on the left hand side of the motorcycle.**

1. Insert the ignition key into the seat lock and turn the key anti-clockwise while pressing down on the rear part of the seat.

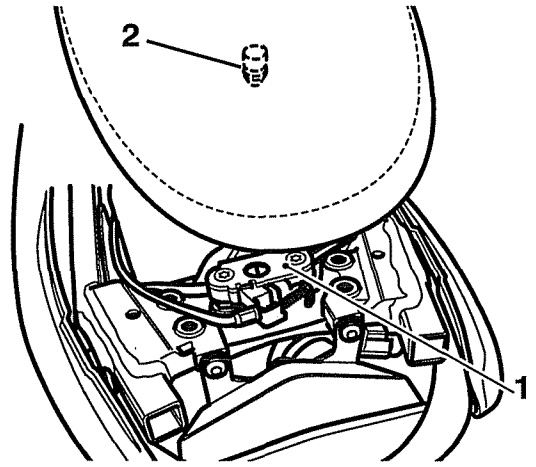


1. Seat Lock

2. To detach the seat, lift the rear and disengage the front lip from below the fuel tank.

Installation

1. Position the seat to the fuel tank and engage the front lip.
2. Position it to the seat lock and press down at the rear to engage it in the lock.



cczn

1. Seat Lock
2. Seat Engagement Point

3. Grasp the seat and ensure that it is securely retained.

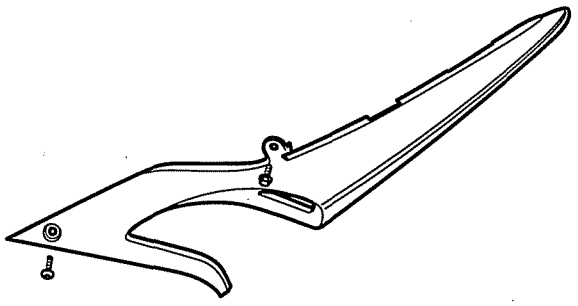
Note:

- **An audible 'click' can be heard when the seat/seat cover is correctly engaged in the lock.**

Side Panel

Removal

1. Remove the seat (see page *16-8*).
2. Disconnect the battery, negative (black) lead first.



ccqd

Side panel fixings

3. To release the side panel assembly, remove the fixings shown in the illustration above.
4. Detach the panel from its studs towards the rear and remove from the bike.

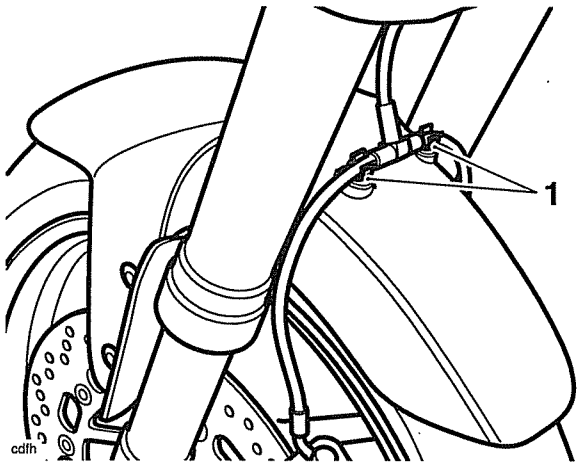
Installation

1. Installation is the reverse of removal except reconnect the battery, positive (red) lead first.
2. Tighten the bodywork fixings to **4 Nm**.
3. Ensure the panel engages correctly in the studs/ grommet.

Front Mudguard

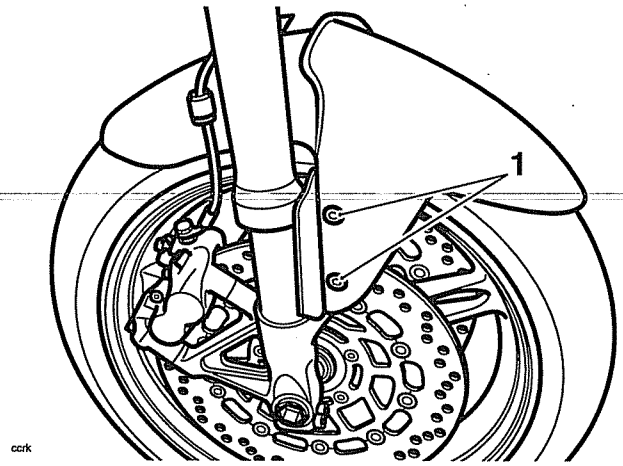
Removal

1. Release the brake hose from its clips on the centre-upper surface.



1. Brake pipe clips

2. Release the four fixings that secure the mudguard to the fork leg.



1. Mudguard fixings

3. Capture the fork protector panels from each slide before sliding the mudguard forward to remove it.

Installation

1. Position the mudguard to the forks, locating the fork protector panels at the same time.
2. Fit and tighten the mudguard fixings to **3 Nm**.
3. Attach the brake pipe to the clips on the upper surface.

17 Electrical

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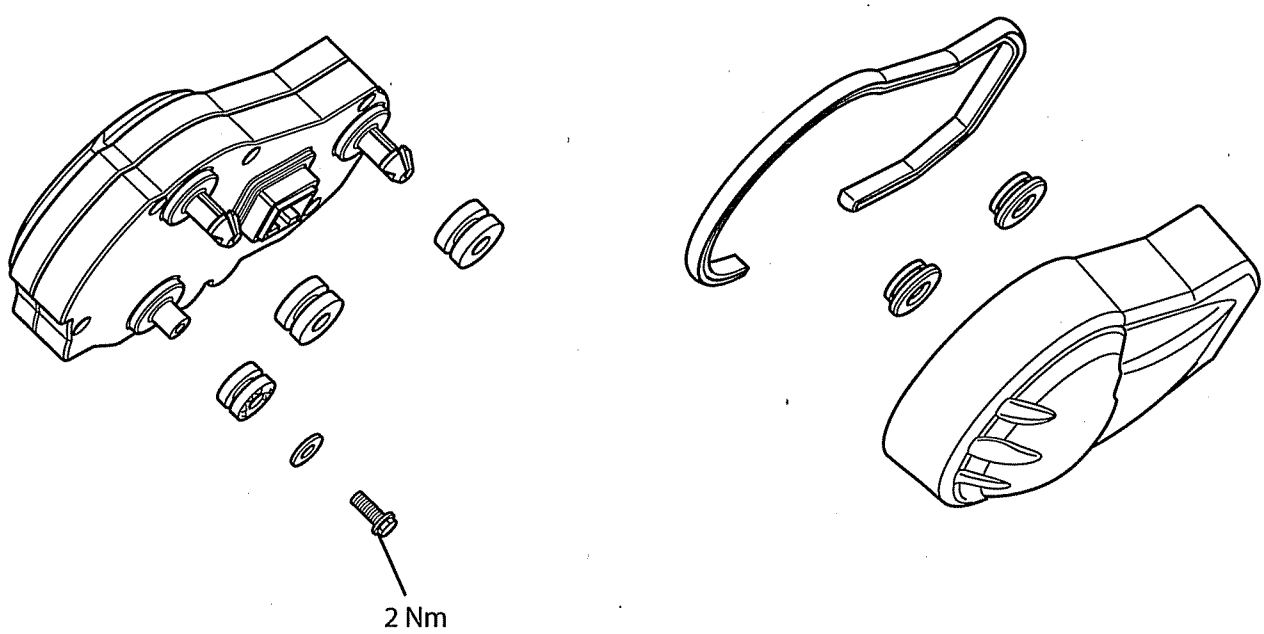
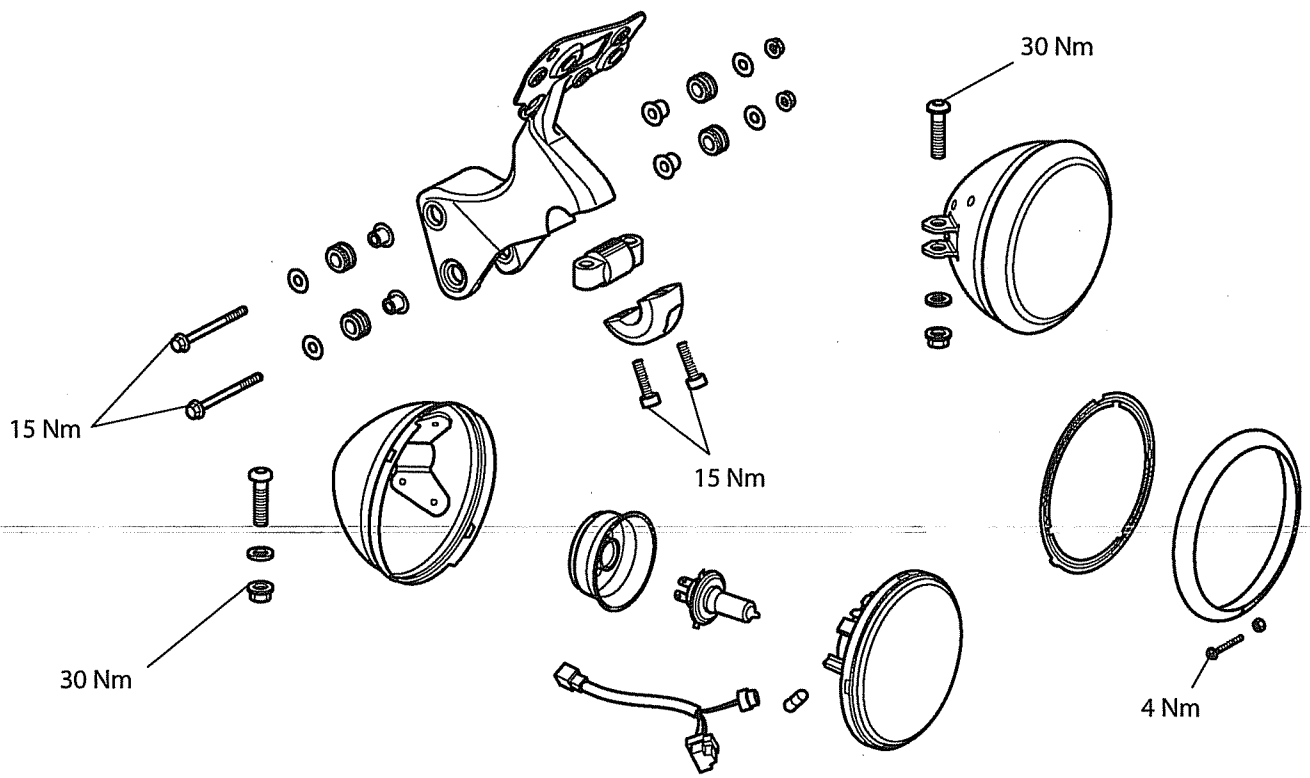
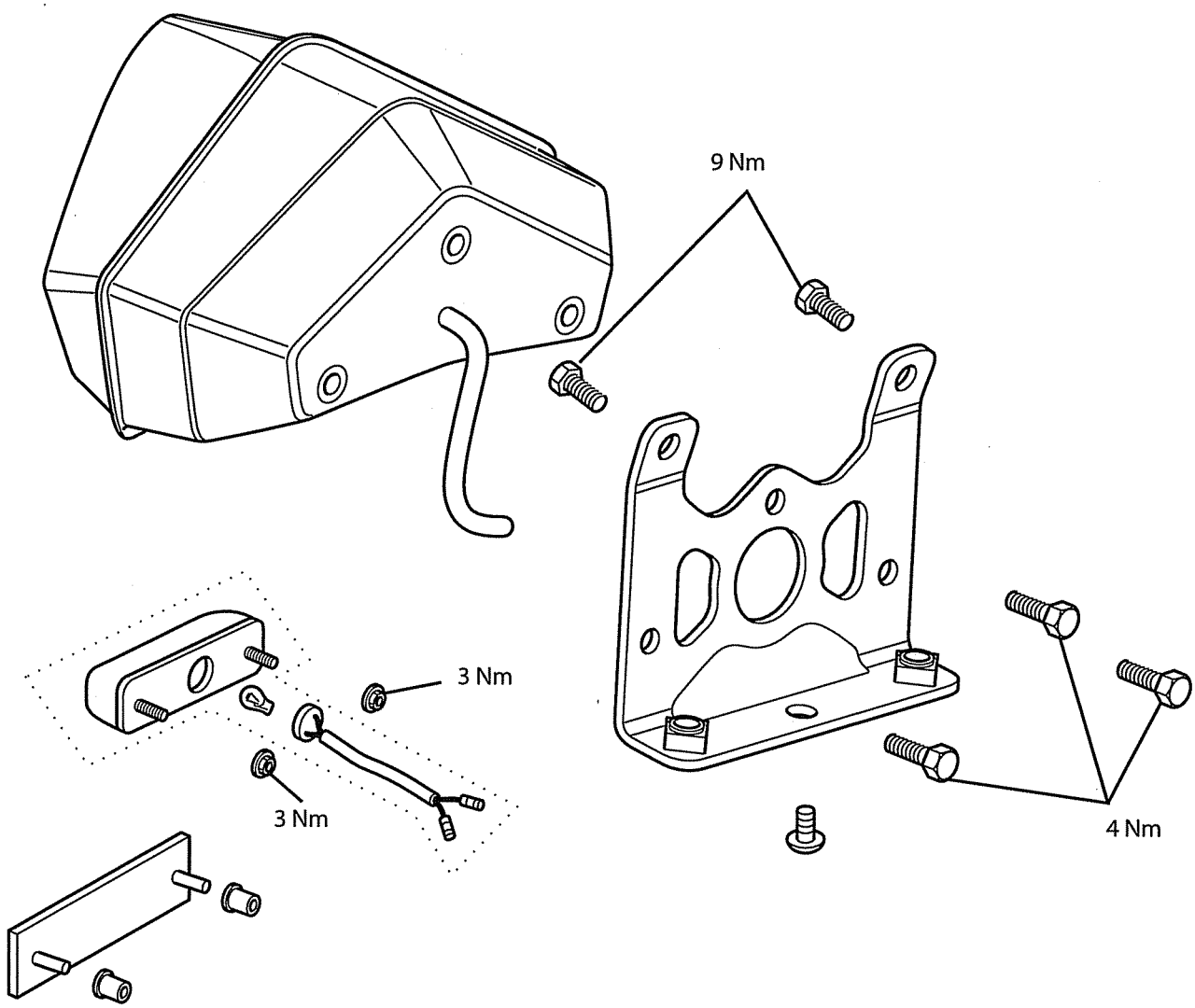
Exploded View - Instruments



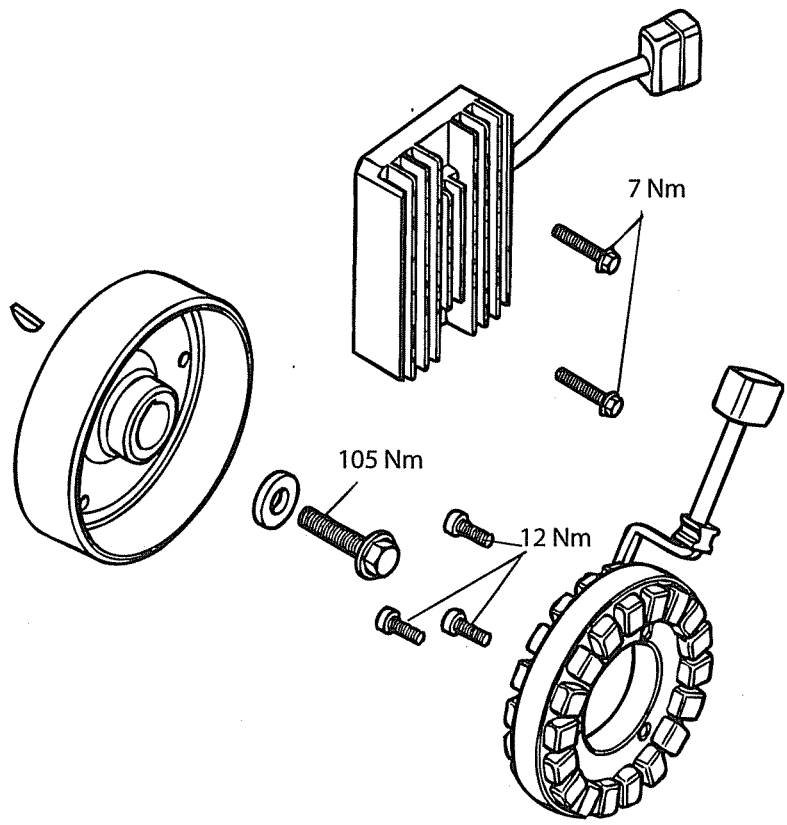
Exploded View - Headlight

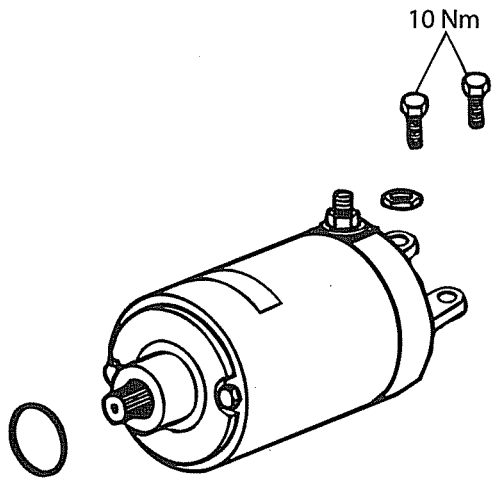


Exploded View - Rear Light



Exploded View - Alternator and Starter





Battery

Warning

The battery gives off explosive gases; keep sparks, flames and cigarettes away. Provide adequate ventilation when charging or using the battery in an enclosed space.

The battery contains sulphuric acid (electrolyte). Contact with skin or eyes may cause severe burns. Wear protective clothing and a face shield.

- If electrolyte gets on your skin, flush with water immediately.
- If electrolyte gets in your eyes, flush with water for at least 15 minutes and SEEK MEDICAL ATTENTION IMMEDIATELY.
- If electrolyte is swallowed, drink large quantities of water and SEEK MEDICAL ATTENTION IMMEDIATELY.

KEEP ELECTROLYTE OUT OF THE REACH OF CHILDREN.

Warning

The battery contains harmful materials. Always keep children away from the battery whether or not it is fitted in the motorcycle.

Do not jump start the battery, touch the battery cables together or reverse the polarity of the cables as any of these actions may cause a spark which would ignite battery gasses causing a risk of personal injury.

Warning

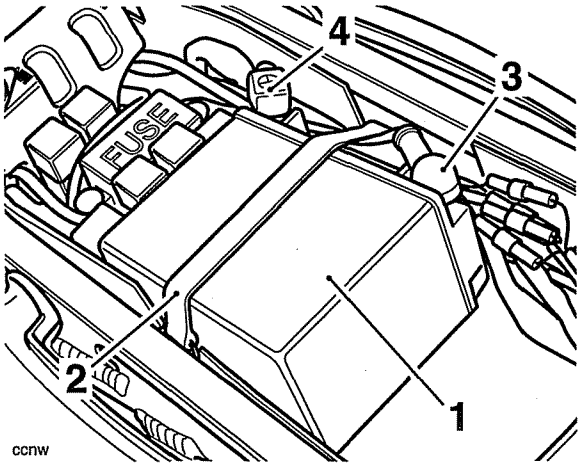
The battery electrolyte is corrosive and poisonous. Never swallow battery electrolyte or allow to come into contact with the skin. Always wear eye and skin protection when adjusting the electrolyte level.

Battery Removal

1. Unlock and remove the seat (see page *16-8*).
2. Disconnect the battery, negative (black) lead first.
3. Remove the battery strap.
4. Take the battery out of the case.

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. Battery
2. Battery strap
3. Negative (-) terminal
4. Positive (+) terminal

Battery Refit

Warning

Ensure that the battery terminals do not touch the motorcycle frame as this may cause a short circuit or spark which would ignite battery gases causing a risk of personal injury.

1. Place the battery in the battery case.
2. Reconnect the battery, positive (red) lead first.
3. Apply a light coat of grease to the terminals to prevent corrosion.
4. Cover the terminals with the protective caps.
5. Refit the battery strap.
6. Refit the seats (see page *16-9*).

Battery Commissioning and Charging

New Battery

To ensure that a new battery is correctly commissioned and will deliver maximum capacity for starting, the following procedure must be followed.

In order to correctly and safely commission a new battery, the battery commissioning procedure listed below must be carefully followed. This is the only battery commissioning procedure that Triumph recommends. The procedure is designed to ensure that the battery is at its best when fitted to the motorcycle, and will provide the best possible performance and reliability.

Failure to comply with this procedure may lead to reduced battery performance and/or shorten the life of the battery.

Warning

The electrolyte solution is SULPHURIC ACID. Ensure that you read all the warnings supplied with the battery and are familiar with the necessary safety precautions and remedial actions should a spillage or contamination occur.

1. Read the instructions and warnings delivered with the battery.
2. Place the battery on a flat level surface and remove the sealing foil.
3. Remove the battery sealing strip from the electrolyte container (if applicable) and save for later in this procedure. Do not break the seal on the electrolyte container.
4. Place the electrolyte container and adapter (if applicable) on the battery and fill the battery according to the manufacturers instructions.
5. After starting to fill the battery with electrolyte, allow the battery to stand for 30 minutes with the filling container in place.
6. Check that all of the electrolyte has drained from the container. Do not remove container at this point. If the container has not completely drained, tap the sides of the container to start the electrolyte flowing again.
7. After the electrolyte has drained into the battery, allow the battery to stand with the electrolyte container in place, for a further 30 minutes for batteries 3Ah - 12Ah or 1 hour for batteries greater than 12Ah.
8. Remove the electrolyte container and adapter carefully, and dispose of immediately.
9. Fit the sealing caps to the battery according to the manufacturers instructions.
10. Measure the terminal voltage on the battery to assess the battery condition and charge the battery as necessary using a suitable charger (i.e. a charger with a suitably controlled charging current and appropriate cut off voltage). Charging current should be controlled to 10% of the nominal capacity (i.e. for a 10Ah battery charging current I = 0.1 x 10 = 1Ah)

Table of charging times

Terminal Voltage	Charge Time	Charger Cut-off Voltage
>12.8 V	2 hours	14.5 V
>12.7 V	3 hours	14.5 V
>12.6 V	4 hours	14.5 V
>12.5 V	6 hours	14.5 V
>12.5 V	8 – 10 hours	14.5 V

11. Disconnect the charger and allow the battery to stand for 1 hour before fitting to the motorcycle.
12. Fit the battery to the motorcycle, positive (Red) lead first.

Battery Already in Service

When re-charging a battery in service, the following precautions must be taken to avoid damage to the battery.

1. The charging rate must not exceed 1.0 A except for a boost charge where a maximum charge rate of 6 A (for no longer than 1 hour) is allowed.

Battery Maintenance

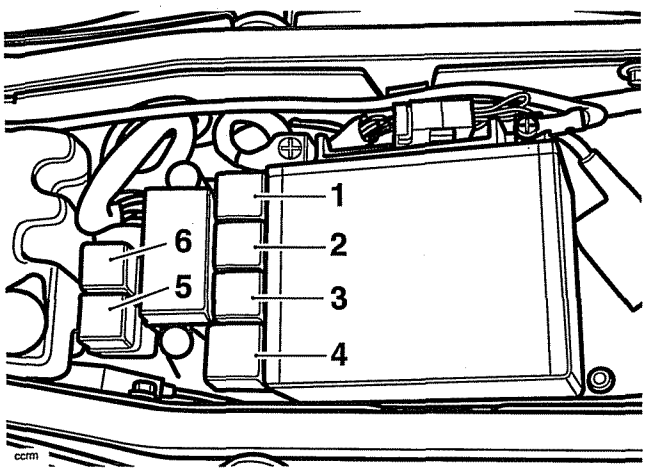
The battery is a sealed type and does not require any maintenance other than routine recharging such as during storage.

It is not possible to adjust the electrolyte level in the battery.

Relays

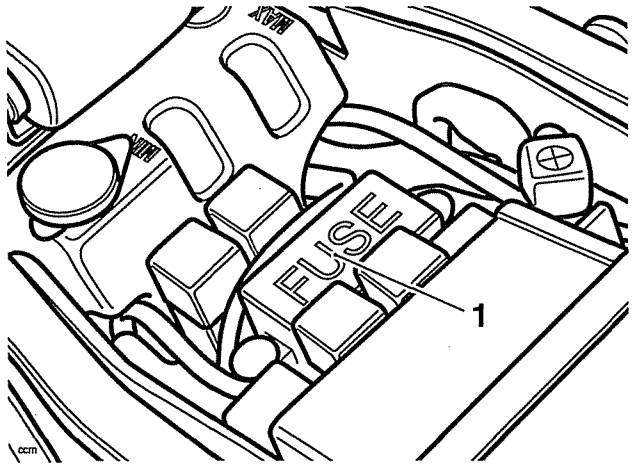
The relay pack is located beneath the seat, adjacent to the battery. To gain access to the relays, remove the seat (*16-8*).

Relay identification



1. Starter relay
2. Headlight relay
3. Engine management system relay
4. Direction indicator unit
5. Cooling fan relay
6. Fuel pump relay

Fuses



1. Fuse Box

Fuses are arranged in the fuse box located under the front seat.

If a fuse fails during operation, inspect the electrical system to determine the cause, and then replace it with a new fuse of correct current rating.

⚠ Warning

Always replace blown fuses with new ones of the correct current rating (as specified on the fuse box cover) and never use a fuse of higher rating. Although no spare 5 Amp. fuse is supplied in the fuse box, it is strongly recommended that a spare 5 Amp. fuse be carried.

Fuse Identification

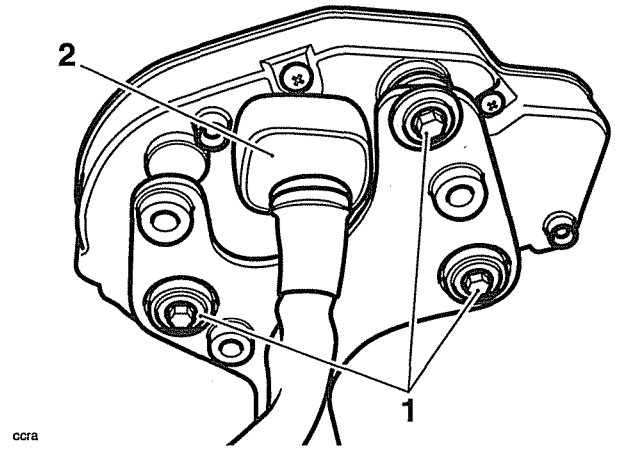
A blown fuse is indicated when all of the systems protected by that fuse become inoperative. When checking for a blown fuse, use the table below to establish which fuse has blown.

Fuse No.	Circuits Protected	Fuse Rating
1	Instruments, fuel pump relay, EMS relay, starter relay	10
2	Ignition switch.	30
3	Indicators, brake light, horn	10
4	Alarm, diagnostic connector, instruments, fuel pump	10
5	Blank	-
6	Engine management system.	20
7	Cooling fan.	15
8	Dip and main beam headlights, horn	20
9	Tail light, number plate light, side lights	5
10	Blank	-
11	Main fuse	30

Instrument Pack

Removal

1. Remove the seat (see page *16-8*).
2. Disconnect the battery negative (black) lead first.
3. Release the fixings securing the instrument pack to the headlamp mounting bracket.



1. Instrument pack fixings
2. Electrical connection

4. Raise the instrument pack and disconnect the electrical connection to the main harness.
5. The pack can now be removed.

Installation

1. Connect the instruments to the harness.
2. Place the pack in position on its barcket.
3. Tighten the pack fixings to **7 Nm**.
4. Reconnect the battery positive (red) lead first.
5. Refit the seat (see page *16-9*).

Headlights

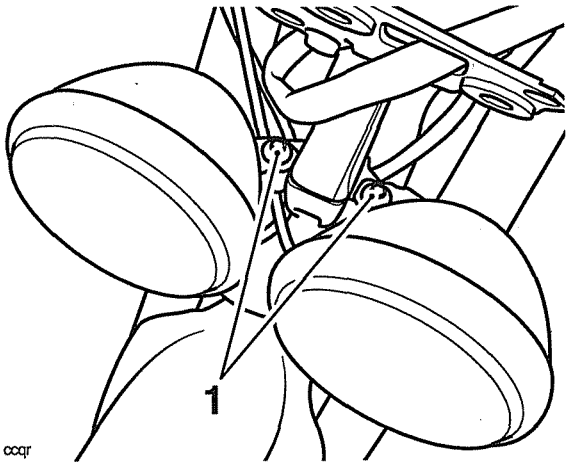
Headlight Adjustment

Note:

- **The vertical beams of the left hand and right hand headlights can only be adjusted together. Independent adjustment is not possible.**

1. Vertical Adjuster Fixings

1. Switch the headlight dipped beam on.
2. Remove the adjuster cover
3. Slacken the clamp bolt sufficient to allow restricted movement of the headlights.
4. Adjust the position of the headlights to give the required beam setting.
5. Tighten the clamp bolt to **15 Nm**.
6. Re-check the headlight beam settings.
7. Switch the headlights off when both beam settings are satisfactorily set.
8. Refit the adjuster cover.



1. Horizontal Beam Adjusters

Note:

- **The horizontal beams of both headlights can be adjusted individually. The same procedure is used to adjust either headlight.**

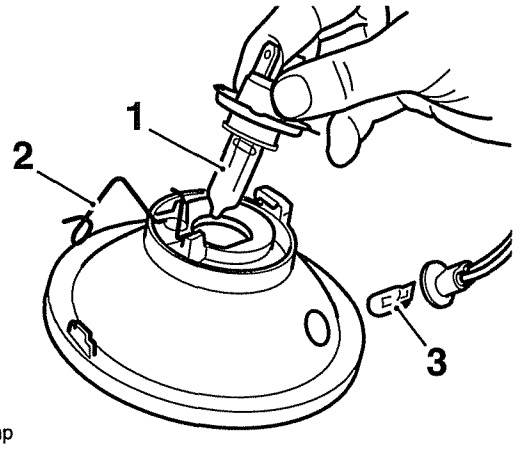
9. Switch the headlight dipped beam on.
10. Slacken the headlight bowl fixing.
11. Adjust the horizontal position of the headlight to give the required beam setting.
12. Tighten the clamp bolt to **15 Nm**.
13. Repeat for the second headlight.
14. Re-check the headlight beam settings.
15. Switch the headlights off when both beam settings are satisfactorily set.

⚠ Warning

Adjust road speed to suit the visibility and weather conditions in which the motorcycle is being operated.

Ensure that the beam is adjusted to illuminate the road surface sufficiently far ahead without dazzling oncoming traffic. An incorrectly adjusted headlight may impair visibility causing an accident.

Headlight Bulb Replacement



cbnp

1. Headlight bulb
2. Bulb clip
3. Position lamp

Each headlight bulb can be replaced as follows:

⚠ Warning

The bulb becomes hot during use. Always allow sufficient time for the bulb to cool before handling.

Avoid touching the glass part of the bulb. If the glass is touched or gets dirty, clean with alcohol before re-use.

⚠ Warning

Do not reconnect the battery until the assembly process has been completed. Premature battery reconnection could result in ignition of the battery gases causing risk of injury.

1. Disconnect the battery, negative (black) lead first.
2. Release the clamp screw for the headlight bezel.
3. Support the headlight and remove the bezel. Ease the headlight from the headlight bowl.
4. Disconnect the multi-pin electrical connector from the headlight bulb, then remove the rubber cover.
5. Unhook the wire retaining clip from behind the bulb.
6. Remove the bulb from the headlight unit.
7. Installation is the reverse of the removal procedure. Tighten the clamp screw to **4 Nm**.

Note:

- **When reconnecting the battery, connect the positive (red) lead first.**

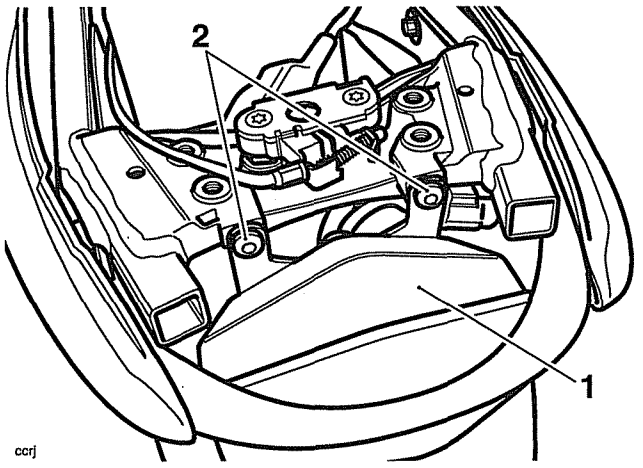
Position Lamp Bulb Replacement

Position lamp bulbs are fitted to both headlight units. To replace a position light bulb, remove the headlight unit from the headlight bowl to gain access for position light bulb replacement.

Rear Light

Note:

- **The rear light is a sealed for life and must be replaced in the event of a failure.**



1. Rear Light Unit
2. Rear Light Bracket Fixings

Rear Light Unit Replacement

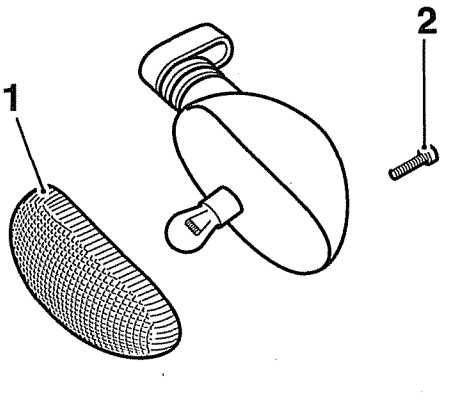
1. Remove the seat (see page *16-8*).
2. Disconnect the battery negative (black) lead first.
3. Remove the side panels (see page *16-9*).
4. Release the fixings securing the light unit
5. Disconnect the multi-plug.
6. Withdraw the unit on its bracket.
7. Separate the light from its bracket.
8. Installation is the reverse of the removal procedure.

Note:

- **Tighten the rear light bracket fixings to 9 Nm.**
- **Tighten the rear light to bracket fixings to 4 Nm.**
- **Reconnect the battery positive (red) lead first.**

Indicator Light

Bulb Replacement



1. Indicator Lens
2. Screw

The lens on each indicator light is held in place by a securing screw located in the body of the light.

Release the screw and remove the amber lens to gain access to the bulb for replacement.

Licence Plate Light

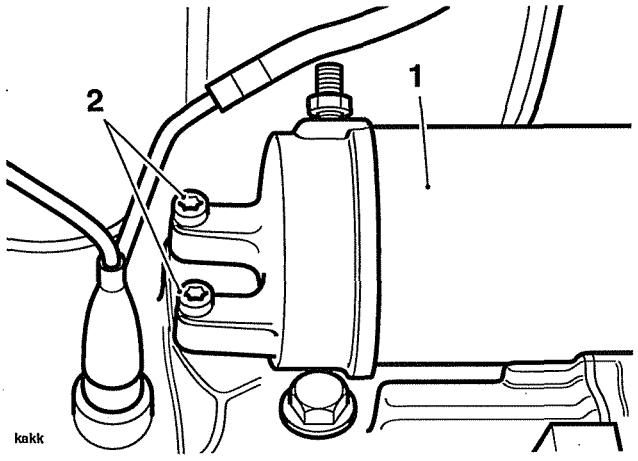
Bulb Replacement

1. Remove the cover.
2. Carefully remove the rubber bulb holder from the back of the light unit and detach the bulb.
3. Installation is the reverse of the removal procedure.

Starter Motor

Removal

1. Remove the seats (see page *16-8*).
2. Disconnect the battery negative (black) lead first.
3. Remove the fuel tank (se page *10-88*).
4. Remove the low oil pressure warning light switch (see page *8-11*).
5. Ease the boot from the starter cable and then release the cable nut.
6. Detach the cable.
7. Release the bolts securing the starter to the crankcase.



1. Starter motor
2. Bolts

8. 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 starter turns freely and without binding.
2. Check the starter 'O' ring for damage and deterioration. Replace as necessary.

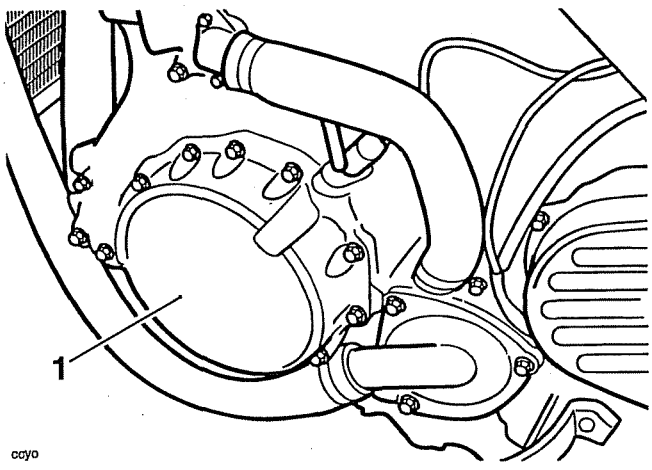
Installation

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 lead boot.
5. Refit the low oil pressure warning light switch (see page *8-11*).
6. Refit the fuel tank.
7. Reconnect the battery positive (red) lead first.
8. Refit the seat (see page *16-9*).

Alternator

Removal

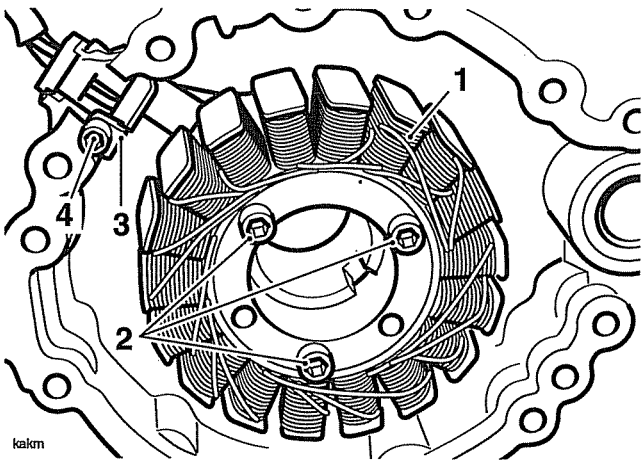
1. Remove the seats (see page *16-8*).
2. Disconnect the battery negative (black) lead first.
3. Release the bolts securing the left hand crankshaft cover to the engine.



1. Left hand engine cover

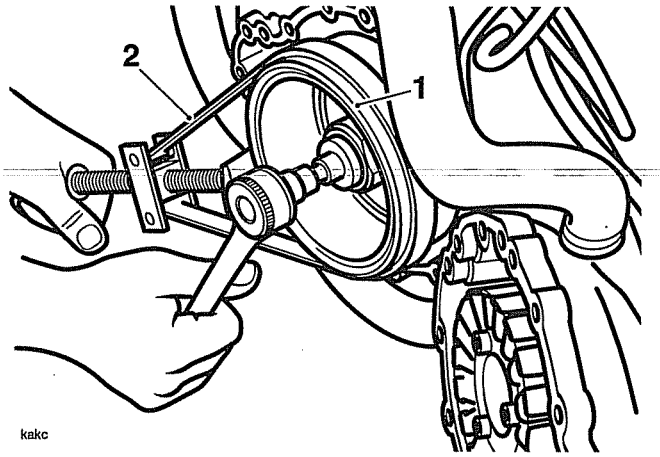
4. Withdraw the cover from the crankcase against the pull of the alternator magnet.

5. 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.



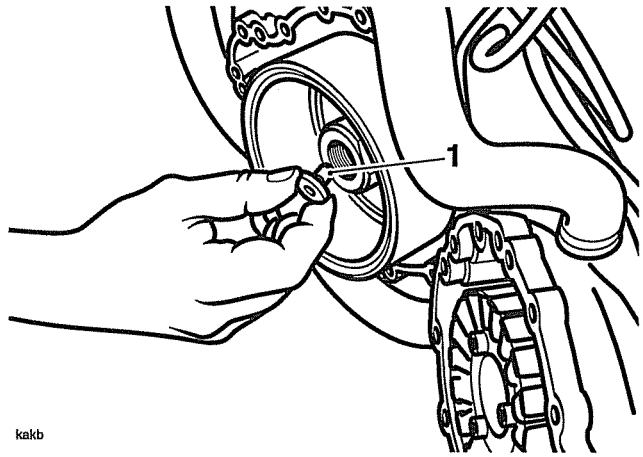
1. Stator
2. Stator bolts
3. Cable bracket
4. Cable bracket bolt

6. Withdraw the stator.
7. To remove the rotor, prevent the crankshaft from rotating using tool T3880375, and remove the centre bolt from the crankshaft.



1. Rotor
2. Tool T3880375

8. With the bolt removed, locate the spigot from the larger of the two thrust pads supplied with tool T3880365 to the crankshaft.



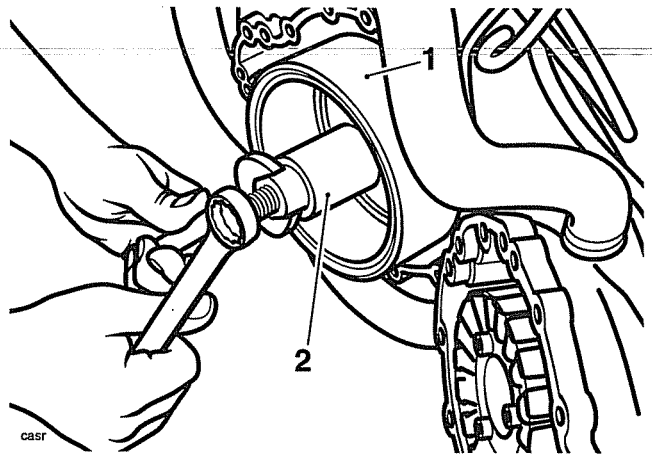
1. Thrust pad

9. 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.**

10. 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.

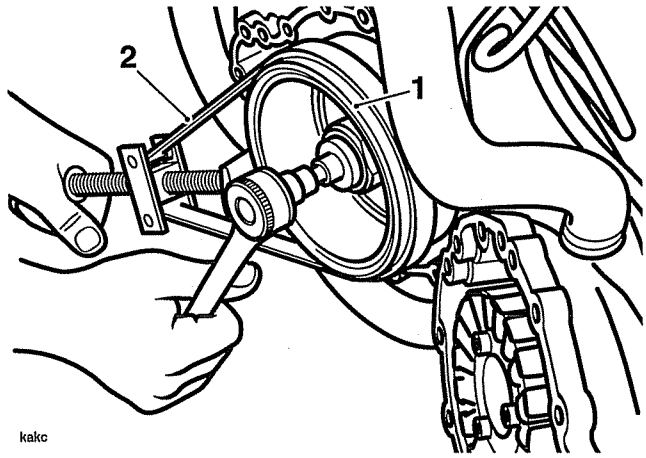


1. Rotor
2. Tool T3880365

11. Withdraw the rotor and tool as an assembly and then separate the tool from the rotor.

Assembly

1. Assemble the rotor to the keyway on the crankshaft.
2. Refit tool T3880375 to prevent the crankshaft from rotating.
3. Tighten the rotor retaining bolt to **105 Nm**.



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**.
8. Tighten the stator bolts to **12 Nm**.
9. Refit the left hand engine cover incorporating a new gasket. Tighten the cover fixings to **9 Nm**.
10. Reconnect the battery positive (red) lead first.
11. Refit the seat (see page *16-9*).

Alternator Rectifier

Note:

- **The alternator rectifier is located beneath the seat, near to the front of the battery tray. To access the rectifier, remove the fuel tank (see page *10-88*). The rectifier does not contain any serviceable parts and must be replaced if faulty.**

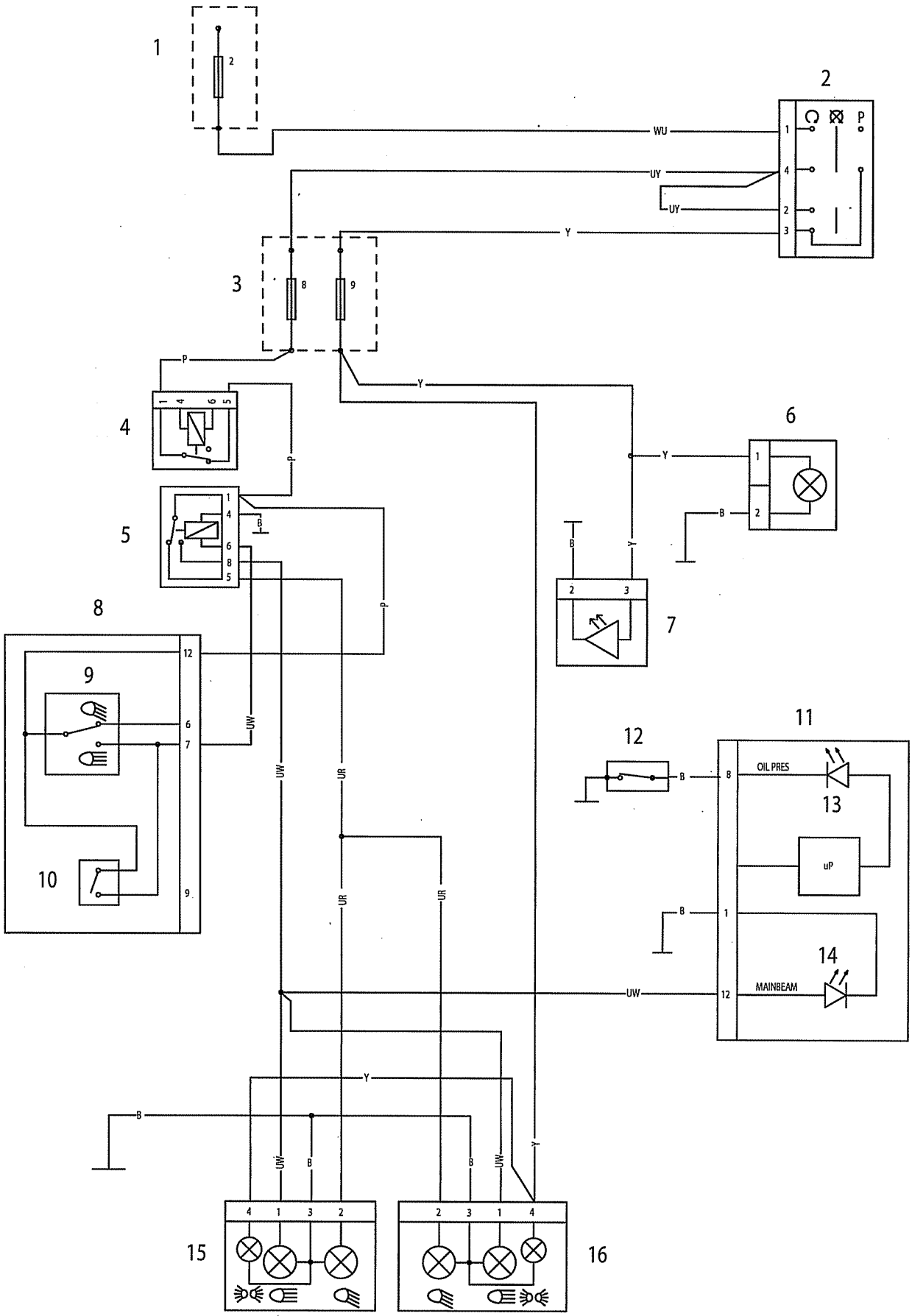
Lighting circuit

Key to circuit diagram

Key	Item Description
1	Fuse Box (Fuse 2)
2	Ignition Switch
3	Fuse Box (Fuses 8 & 9)
4	Starter Relay
5	Headlamp Dip/Main Relay
6	Number Plate Lamp
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 1
16	Headlight 2

Key to wiring colours

Key	Wiring Colour
B	Black
U	Blue
N	Brown
G	Green
S	Slate / Grey
O	Orange
K	Pink
R	Red
P	Purple
W	White
Y	Yellow
LG	Light Green
LU	Light Blue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MAINBEAM
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16

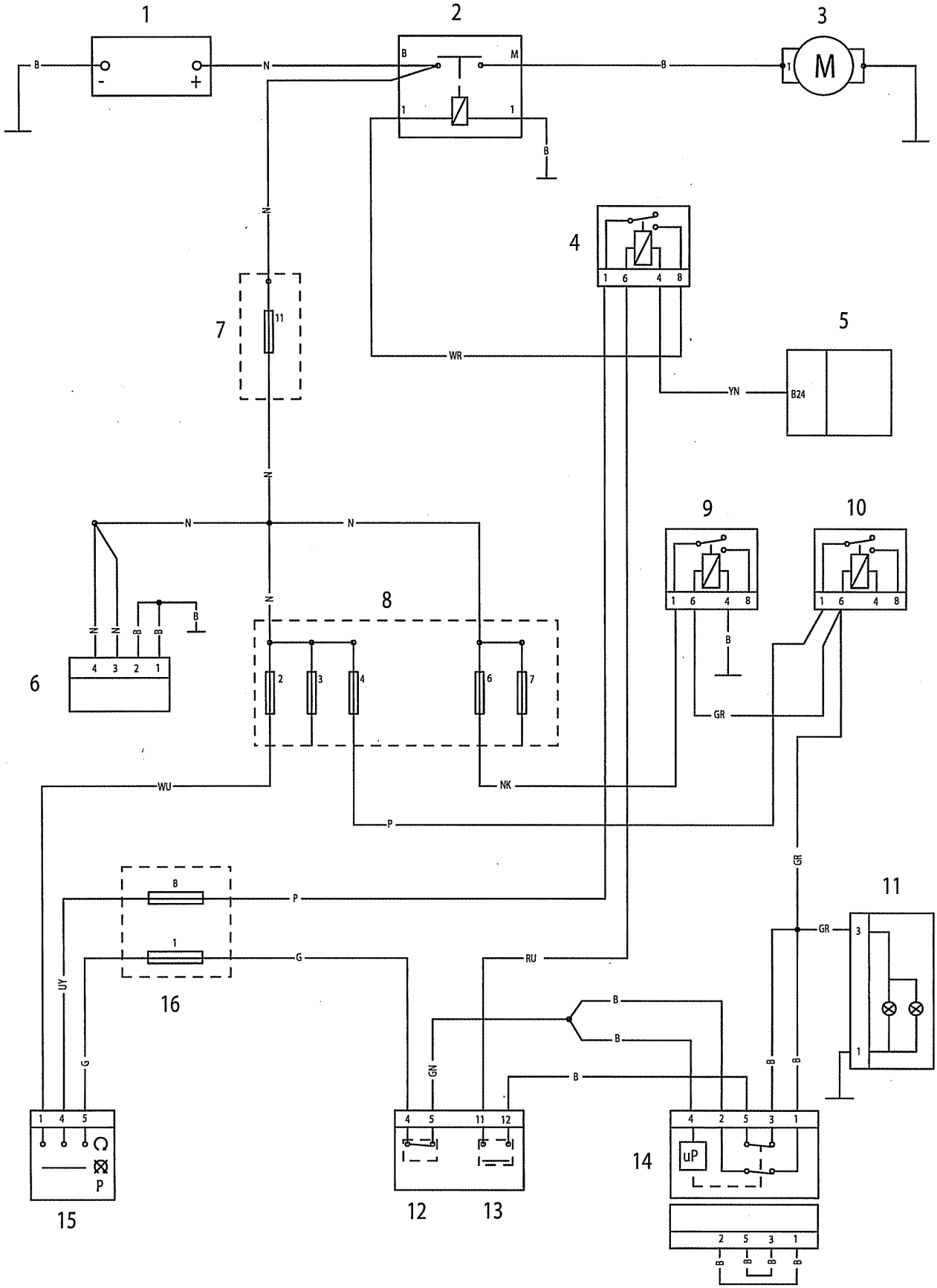
Starting and Charging Circuit

Key to circuit diagram

Key	Item Description
1	Battery
2	Starter Solenoid
3	Starter Motor
4	Starter Relay
5	Engine Control Module
6	Regulator / Rectifier
7	Fuse box (Fuse 11)
8	Fuse Box (Fuses 2, 3, 4, 6 & 7)
9	Engine Control Module Relay
10	Fuel Pump Module
11	Instrument Assembly
12	Engine Kill Switch
13	Starter Switch
14	Alarm
15	Ignition Switch
16	Fuse Box (Fuses 1 & 8)

Key to wiring colours

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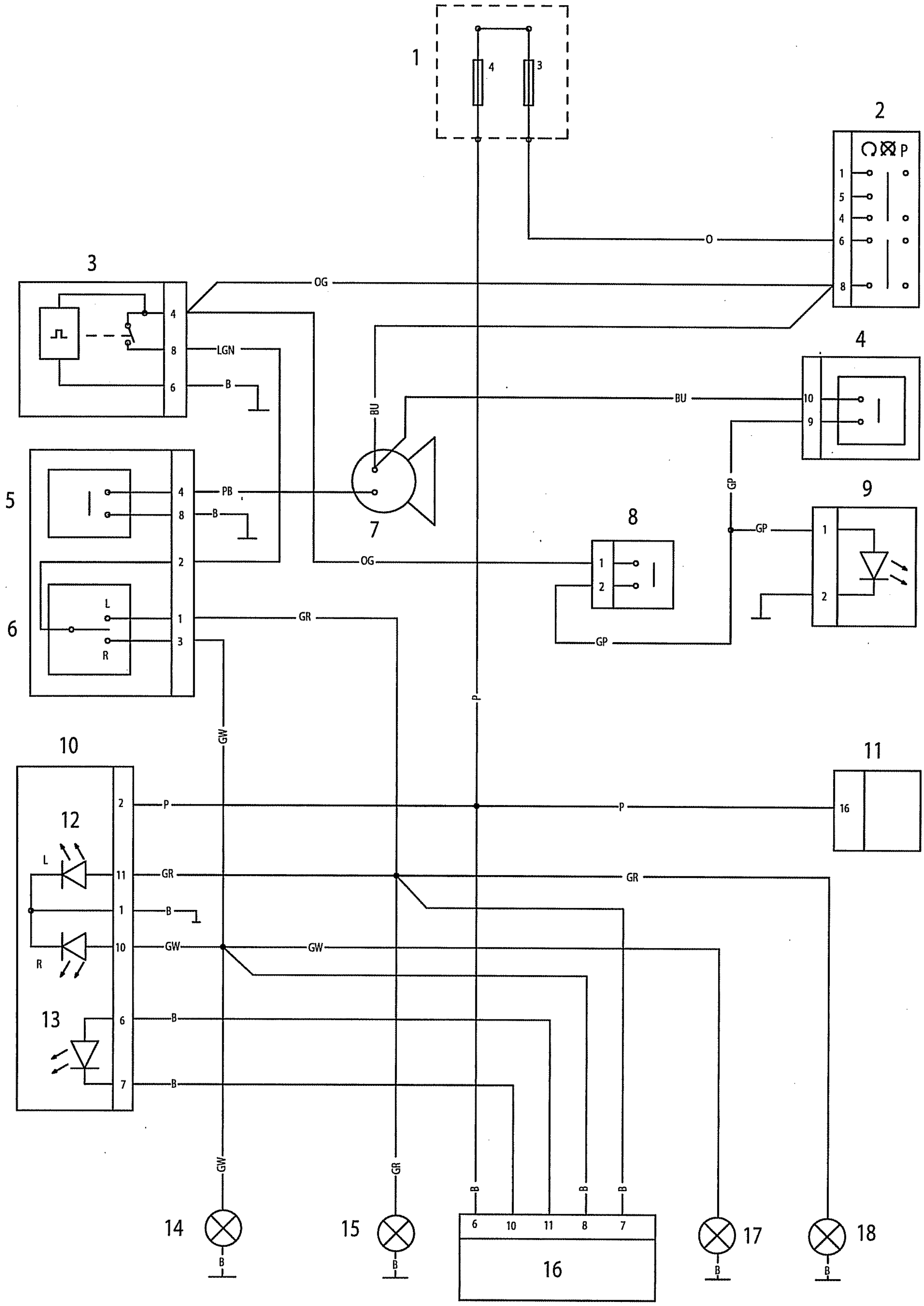
Auxiliary and Accessory Circuit

Key to circuit diagram

Key	Item Description
1	Fuse Box (Fuses 3 & 4)
2	Ignition Switch
3	Indicator Relay
4	Front Brake Light Switch
5	Horn Switch
6	Direction Indicator Switch
7	Horn
8	Rear brake light switch
9	Brake light
10	Instrument Assembly
11	Diagnostic connector
12	Direction indicator (Instruments)
13	Alarm LED
14	Front right direction Indicator
15	Front left direction Indicator
16	Alarm unit
17	Rear right direction indicator
18	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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Complete System

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 Pump & 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	Sidestand Switch
28	Engine Management Relay
29	Fuel Pump Relay
30	Cooling Fan Relay
31	Cooling Fan
32	Engine Earth
33	Crankshaft Sensor
34	Rear Break Lever Switch
35	RH Rear Indicator
36	Rear Light
37	Number Plate Light
38	LH Rear Indicator
39	Alarm Connector (Accessory)
40	Starter Motor
41	Starter Solenoid
42	Battery
43	Starter Relay
44	Rectifier / Regulator
45	Alternator
46	Fuse Box
47	Ignition Switch
48	Headlight Dip / Main Relay
49	Clutch Lever Switch
50	Horn Button
51	Direction Indicator Switch
52	Headlamp Dip Switch
53	Direction Indicator Unit
54	LH Front Indicator
55	Position Light #1
56	Headlamp #1
57	Position Light #2
58	Headlamp #2
59	Horn
60	RH Front Indicator

Key to wiring colours

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

Circuit Diagram - Complete System