Triumph Thunderbird Motorcycle Service Manual

Part Number 3850700 issue 1, 07.2009

Introduction

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

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

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

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

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

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

For the duration of the warranty period, an authorised Triumph dealer must perform all repairs and scheduled maintenance.

To maximise the life of your Motorcycle:

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

How to use this manual

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

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

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

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

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

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

Warnings, Cautions and Notes

Particularly important information is presented in the following form:

⚠ 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 Substances

Warning

Many liquids and other substances used in motor vehicles are poisonous and should under no circumstances be consumed and should, as far as possible, be kept from contact with the skin. These substances among others include acid, anti-freeze, asbestos, brake fluid, fuel, lubricants, and various adhesives. Always pay close attention to the instructions printed on labels and obey the instructions contained within. These instructions are included for your safety and well-being.

NEVER DISREGARD THESE INSTRUCTIONS!

Third Party Products

Warning

Many propriety products, such as chemicals, solvents and cleaning agents, will cause damage to components if used incorrectly or inappropriately. Always follow the manufacturer's instructions printed on the product container's labels and obey the instructions given. These instructions are included for your safety and well-being. Damage to the motorcycle components caused by the incorrect or inappropriate use of chemicals, solvents and cleaning agents may reduce the components efficiency, resulting in loss of motorcycle control and an accident.

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

Warning

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

Health Protection Precautions

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

⚠ Warning

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

Environmental Protection Precautions

⚠ Caution

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

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

Dispose of used oil and used filters through authorised waste disposal contractors, to licensed waste disposal sites, or to the waste oil reclamation trade. If in doubt, contact 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 DOT 4 specification brake fluid as listed in the General Information section of this manual. The use of brake fluids other than those DOT 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.

Warning

Before installation, all internal brake components should be cleaned and lubricated with clean new DOT 4 brake fluid.

Never use solvents, petrol (gasoline), engine oil or any other petroleum distillate on internal brake components as this will cause deterioration of the hydraulic seals in the calipers and master cylinders.

A dangerous riding condition leading to loss of motorcycle control and an accident could result if this warning is ignored.

Safety Instructions

Jacking and Lifting

Warning

Always ensure that any lifting apparatus has adequate load and safety capacity for the weight to be lifted. Ensure the motorcycle is well supported to prevent any possibility of the machine falling prior to 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 re-assembly. Do not use a tool which will damage the joint faces and smooth out any scratches or burrs on the joint faces using an oil stone. Do not allow dirt or jointing material to enter any tapped holes.

Gaskets, O-rings

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

Liquid Gasket, Non-permanent Locking Agent

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

Prior to re-assembly, blow through any pipes, channels or crevices with compressed air.

⚠ Warning

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

Screw Threads

Metric threads to ISO standard are used.

Damaged nuts, bolts and screws must always be discarded.

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

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

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

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

Warning

Never lubricate a thread unless instructed to do so.

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

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

Locking Devices

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

Fitting a Split Pin

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

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.

With the sealing lip facing the lubricant, press or drift a seal to the depth of its housing, if the housing is shouldered, or flush with the face of the housing where no shoulder is provided.

Chassis Bearing Lubrication

Note:

- **This information relates only to bearing lubrication. For the procedures necessary to replace a bearing, always refer to the relevant section of this service manual.**
- **Bearings installed in engine and transmission applications are not covered by this information. Refer to the lubrication chapter or the relevant engine chapter for additional information.**

General

For a bearing to be serviceable for its anticipated life span it must be checked, adjusted and lubricated at regular intervals, as specified in the service schedules given in the owner's handbook and this service manual.

A correctly lubricated bearing will have a film of lubrication that separates the moving parts, disperses heat and protects the bearing surfaces from corrosion.

Note:

- **In all cases, use the lubricant recommended.**
- **Grease the bearing, not the cavity where it is located.**
- **A bearing that is not regularly checked and lubricated will have a reduced life span.**

New Bearings

New bearings are typically protected with an oil preservative to prevent corrosion etc. during storage. This is NOT the lubrication for the bearing but DOES NOT need to be washed off prior to assembly and in-service lubrication.

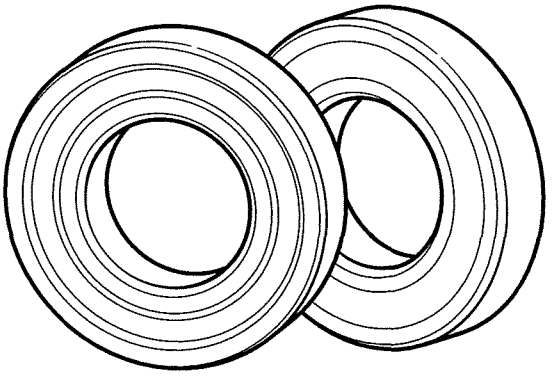
When lubricating a new bearing with grease the following steps should be taken:

1. Do not clean off the oil preservative.
2. Grease must be forced between the roller elements and the roller cage.
3. Rotate the bearing to ensure that the grease is distributed over the entire circumference of the internal parts.
4. Any excess grease should be smeared on the outside of the rollers.

Lubrication and Checks While Servicing a Bearing

1. Disassemble parts as necessary to access the bearing.
2. Inspect the old grease covering the bearing, looking for signs of bearing damage, i.e. flakes or specks of metal.
3. Remove the old grease.
4. Check the bearing for smooth operation and visually check for corrosion, dents and flaking in the bearing race, rollers or cage. Replace if necessary.

Below/overleaf several common bearing types and the lubrication procedures for each are identified:



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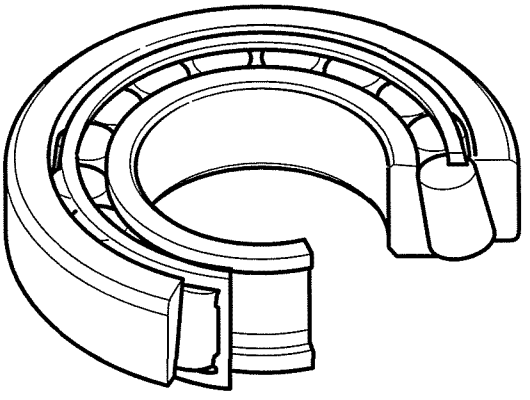
Sealed bearings

Note:

- **Sealed bearings can be identified by their integrated seals.**
- **Sealed bearings are lubricated for life by the manufacturer.**
- **Any attempt to change the grease in a sealed bearing will damage the integrated seals. If the seals are damaged dirt and water will ingress and the life of the bearing will be greatly reduced.**



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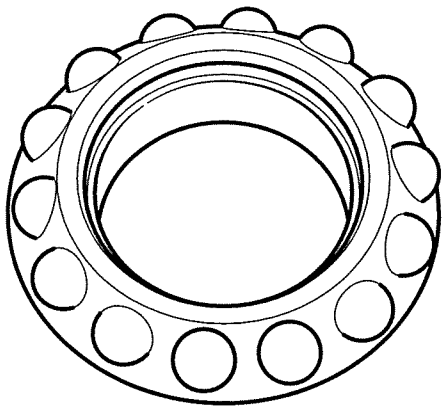
Taper bearings

1. Grease must be forced between the inner race and the roller carrier.
2. Rotate the bearing to ensure that the grease is distributed over the entire circumference of the internal parts.

3. Any excess grease should be smeared on the outside of the rollers.



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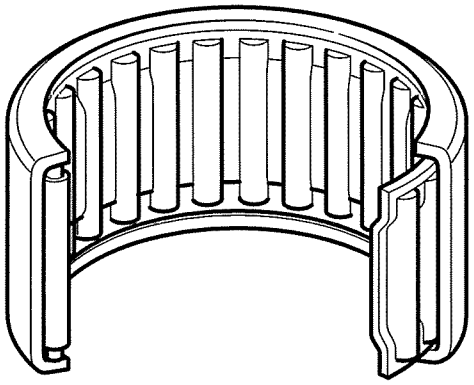
Angular contact and ball bearing

1. Grease the bearing races and the ball bearing carrier.
2. Rotate the bearing to ensure that the grease is distributed over the entire circumference of the internal parts.



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Needle roller bearings

1. Coat the needle rollers with grease.
2. Ensure the needle rollers turn so that the grease is distributed over the entire circumference of the internal parts.
3. Assemble the parts, adjust and check as necessary.

Metal bushes

1. Disassemble the parts as necessary to access the bush.
2. Remove the old grease.

Apply fresh grease to the metal bush.

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.

Electrical Testing

For any electrical system to work, electricity must be able to flow in a complete circuit from the power source (the battery) via the components and back to the battery. No circuit means no electrical flow. Once the power has left the positive side of the battery and run through the component it must then return to the battery on its negative side (this is called earth or ground). To save on wiring, connections and space, the negative side of the battery is connected directly to the frame or engine. Around the frame and engine will be various other ground points to which the wiring coming from components will be connected. In the case of the starter motor it bolts directly to the engine, which is bolted to the frame. Therefore the frame and engine also form part of the earth return path.

Ohm's Law

The relationship between voltage, current and resistance is defined by Ohm's Law.

- The potential of a battery is measured in Volts (V).
- The flow of current in a circuit (I) is measured in Amperes.
- The power rating of a consumer is measured in Watts (W).
- The resistance (R) of a circuit is measured in Ohms (Ω).

Ohms law, for practical work can be described as -

$$\frac{\text{Voltage}}{\text{Current}} = \text{Resistance}$$

Power is calculated by multiplying Volts x Amps -

$$\text{Watts} = \text{Volts} \times \text{Amps}$$

By transposing either of these formulae, the value of any unit can be calculated if the other two values are known.

For example, if a battery of 12V is connected to a bulb of 60W:

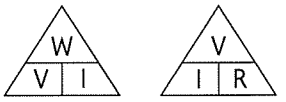
- the current flowing in the circuit can be calculated by using -

$$\frac{W}{V} = I \qquad \frac{60}{12} = 5$$

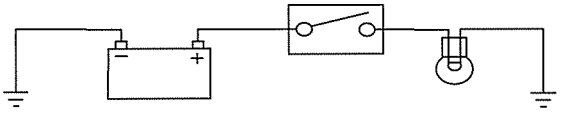
- the bulb resistance can be calculated by using -

$$\frac{V}{I} = R \qquad \frac{12}{5} = 2.4$$

To use either of the following triangles, put your finger over the value you want to find. Multiply the remaining values if side-by-side, or divide if one is over the other.



Basic Electrical Circuits



Basic Circuit Diagram

In the above circuit an electrical reservoir (the battery) is connected via a cable to a terminal on the controlling device (the switch) whose contacts are either open or closed. The other terminal on the switch is connected via a cable to the consumer (the bulb), and the other side of the bulb filament is connected to ground (earth) by another cable. The ground point is usually a part of the frame or engine, to which the battery negative terminal is also connected.

When the switch contacts are open (as shown in the diagram), the circuit is broken and no current flows. When the switch contacts are closed the circuit is made and current flows from the battery positive terminal through the switch contacts and bulb filament to ground. The frame completes the circuit to the battery negative terminal and the bulb illuminates.

Although some circuits on the circuit diagram may at first seem more complicated, it will generally be found that they can be broken down into sections which do not differ greatly from the basic circuit above.

Circuit Diagrams

Circuit diagrams are created to provide a 'picture' of the electrical system and to identify the route taken by each individual wire through the system, in order to identify which components it feeds and which connectors the wire runs through. Circuit diagrams are an essential tool for fault finding, as it is possible to locate start and finish points for a circuit without having to manually trace the wire through the motorcycle itself. Circuits diagrams may look confusing at first but when they are studied closely they soon become logical.

Due to the complex circuits and the number of individual wires, Triumph uses two types of circuit diagram in its service manuals.

- Within the manual conventional circuit diagrams are used to show the layout of the main circuits of the motorcycle. These are: Engine management/ignition, Lighting, Starting and Charging and Auxiliary and Accessory. In these diagrams no attempt is made to show the components of the system in any particular order or position in relation to the motorcycle.
- At the back of the service manual a full colour layout circuit diagram is used to show the main electrical components in a position similar to the actual position on the motorcycle.

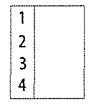
Both of these circuit diagrams use similar symbols to illustrate the various system components and will be accompanied by a key to circuit diagram components and wiring colour codes.

Circuit diagrams also depict the inner workings of a switch cube (I.E. which wire connects to which when a switch is turned from one position to another) so that a test of that switch can be made using the wire terminals in the connector instead of disassembling the switch itself.

Glossary of Circuit Diagram Symbols

The following is a description of the symbols found in the circuit diagrams used in all Triumph Service Manuals.

Connector

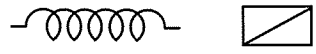


This illustration is used to show all multi-plug type electrical connectors on Triumph circuit diagrams. The numbers in the box relate to the terminal numbers of the connector pins. On ECMs with two connectors, the number would be prefixed with the letters 'A' or 'B' to identify each connector. An additional number outside the box will identify the component.

Diode

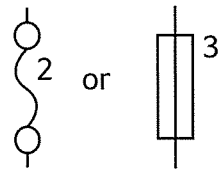
An electrical one-way valve. Diodes allow current to flow in one direction but will not allow it to return. The arrow, which forms part of the diode symbol, indicates the direction of current flow.

Electromagnetic Winding (solenoid)



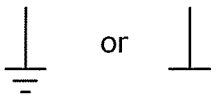
An electromagnetic winding (or solenoid) is used to convert an electrical current into a lateral movement. This can then be used to operate switches (as used in relays) or other components such as fuel injectors or secondary air injection solenoids.

Fuse



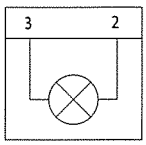
A fuse is a device which protects a circuit in the event of a fault. The fuse will 'blow' should a short circuit occur, protecting that circuit from further damage. The number next to the fuse on the circuit diagram indicates the position of the fuse in the fusebox.

Ground or Earth Point



This symbol is used to show ground points. This is the negative connection to either the frame or engine, and is a common cause of intermittent faults due to loose or corroded connections.

Lamp or Bulb

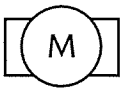


This symbol is used to show all types of light bulbs. The numbers in the box relate to the terminal numbers of the connector pins. An additional number outside the box will identify the component.

LED (Light Emitting Diode)

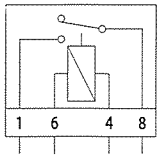
Triumph use LEDs for the alarm warning light, instrument illumination and warning lights, gear change lights and rear light/brake lights on various models.

Motor



An electric motor. This could be the starter motor or a motor within an actuator, for example within the ABS modulator.

Relay



A relay is effectively an electromagnetic switch. To close the relay contacts and complete the circuit, an electromagnet in the relay is energised which causes the relay contacts to close, making the circuit complete.

Relays are used when the electrical current is too great for a mechanical switch, usually when the switching must be done quickly to prevent arcing across the switch contacts. If a mechanical switch were used, the mechanical switch contacts would quickly burn away.

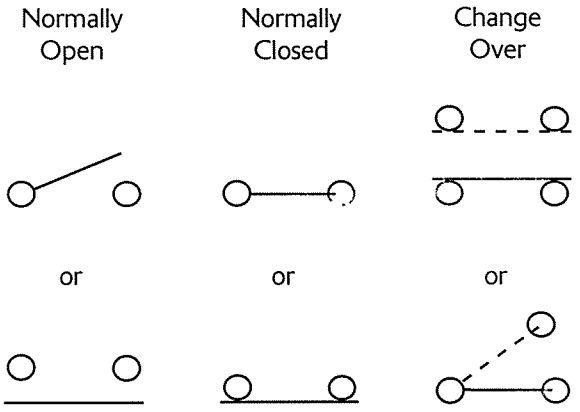
Resistor

A device placed in a cable to reduce a voltage or restrict the maximum current a device can draw.

Splice

A hard cable joint where two or more cables are joined in the wiring harness. A potential source of both open and short circuits.

Switches

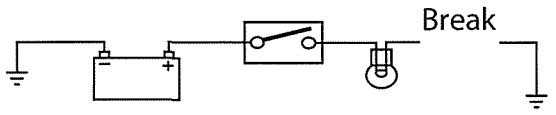


A mechanical device for completing or breaking a circuit. There are three common types of switch: Normally open, normally closed and change-over.

Tracing Circuits

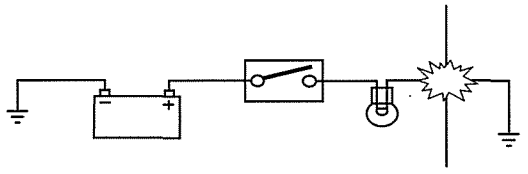
The following is a description of two types of common electrical failures, and some of the methods which may be used to find them.

Open circuit



A break in an electrical circuit - current cannot flow. Usually caused by a break in a wire or cable or by a loose connection. Open circuits can often be intermittent, making diagnosis difficult.

Short circuit



A 'short cut' in an electrical circuit - current by-passes the intended circuit, either to earth or to another, different circuit. Often caused by failure of the cable insulation due to chafing or trapping of the wire. There are two different types of short circuit - short to ground and short to Vbatt.

A short to ground means that the current is going to earth before it reaches the component it is supposed to feed. These are often caused by chafing of the harness to the frame or wires trapped between a bolted component, and will often blow the fuse on that circuit.

A short to Vbatt is a short to battery voltage (12 Volts) and is caused by a live power supply wire contacting an adjacent cable. Note that it is also possible for a 5 Volt sensor reference voltage to short to an adjacent circuit, which can also cause electrical failures and DTCs (Diagnostic Trouble Code) to be stored.

When tracing a wire that is suspect, carefully check the circuit diagram before starting. Remember

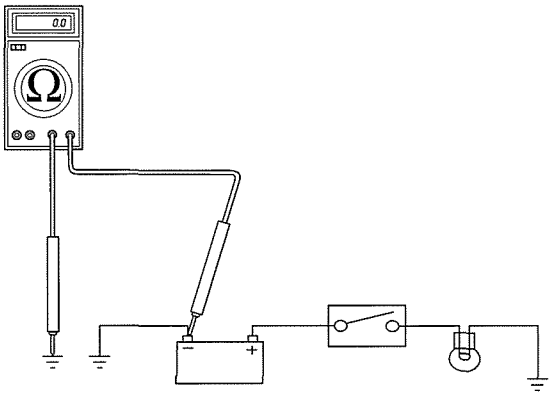
- a wire may diverge at a splice and go off to feed other circuits. If these circuits are working, check for wiring faults from the splice onwards.
- the circuit diagram is not an accurate guide to the actual location of the parts when fitted on the bike. It is a schematic diagram of the circuits.
- particularly where engine management items are concerned, the circuit is only completed by the ECM. If the ECM is not connected, the circuit may register as open.

To Check Continuity:

⚠ Caution

Ensure the circuit being tested is switched off before measuring continuity. Damage to the Digital Multi Meter (DMM) may result from testing a 'live' circuit with the meter set to resistance (Ω).

In the example below, the ground circuit continuity is being tested from the battery to the frame.

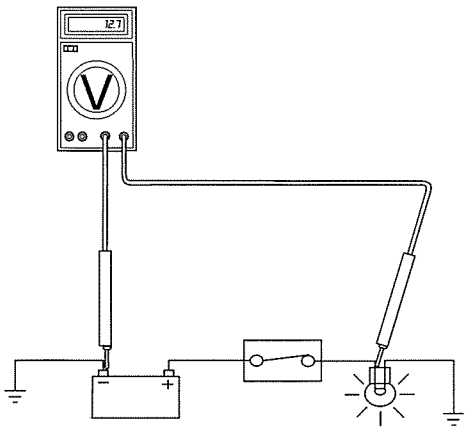


Continuity (resistance) Check

- Locate each end of the wire.
- Set the Digital Multi Meter (DMM) to resistance check (Ω).
- Probe each end of the wire.
- If there is continuity, the meter will usually bleep or register the resistance of the cable.
- A high resistance figure could indicate a dirty or corroded connection.
- If there is a break in the wire, the meter will not bleep or register a resistance.
- By probing the wire in various places, the position of a high resistance or break in the wire (open circuit) can be narrowed down until it is found.

To Measure Voltage:

In the example below, the circuit voltage is being measured at the bulb positive (+) terminal.



Voltage Check

- Turn the circuit to be tested 'ON'
- Set the Digital Multi Meter (DMM) to Voltage check (V). Ensure the multi meter is set to dc volts for direct current circuits (most circuits) or ac volts for alternating current circuits (typically alternator output voltage tests).
- Set the range of the DMM to the range best suited to the voltage of the circuit being tested (typically 20 volts for most DMMs). Refer to the DMM manufacturers instructions.
- Connect the black (ground) lead of the DMM to a reliable ground connection (usually the battery or frame ground).
- Locate the positive terminal of the wire or component to be tested.
- connect the red (positive) lead of the DMM to the positive terminal.
- Read the voltage from meter.

Splices

Splices are probably the most common cause of wiring faults after connectors. Splices are made where two or more wires come together and diverge in different directions, usually to feed a different circuit.

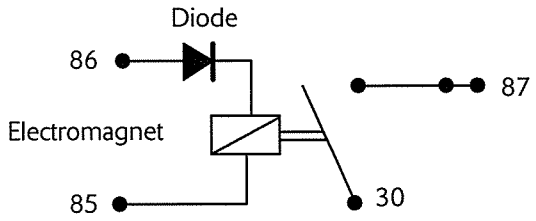
To locate a splice, it is necessary to peel back the insulation and examine the splice for its integrity. The most common fault is where one of the wires at the joint has come adrift usually causing the circuit it feeds or earths to become 'dead'.

Switches

To check a switch, set the multimeter to resistance/ continuity and probe the two pins that form a closed circuit when the switch is pushed. If the switch is working correctly, the resistance should register or the meter will bleep.

Relays

All relay cases have a circuit path engraved on them showing the circuit path across the electromagnet and the switch. Before making any checks, first note the pin designations, current paths, and whether or not there is a diode in either circuit path.



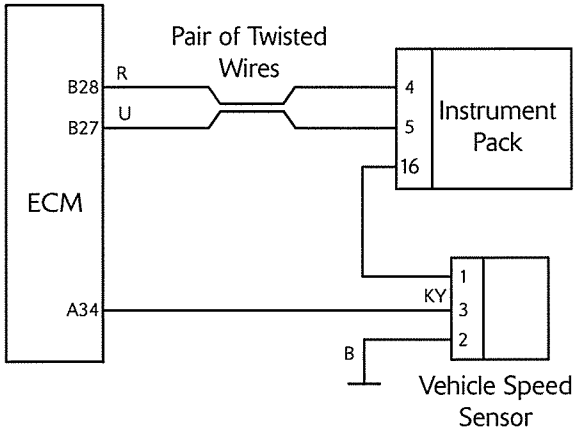
Make continuity checks across the electromagnet first, usually from pin 86 (positive) to pin 85 (negative). If a diode appears in the circuit use the diode check on the multimeter (volts scale) in the direction of current flow. If there is no diode, use the resistance check facility. An open circuit or unusually high resistance value indicates a faulty relay.

To check the switch side, apply a 12 volt supply between pins 86 and 85. With the supply connected the relay should be heard to click and there should be continuity between pins 30 and 87. An open circuit indicates a faulty relay.

CAN (Controller Area Networking)

CAN (sometimes called CANbus) is a protocol for data communication between Electronic Control Modules (ECMs). Each ECM on the network is connected by a single pair of twisted wires (or bus) which are used for the transmission of vehicle sensor data. By using CAN, the overall number of system sensors, and the amount of cabling required to allow ECMs to communicate with each other is greatly reduced.

This saves cost, weight and space, and makes the system more reliable, as the physical number of wires and connections is reduced.



Extract from the circuit diagram showing CAN connection between ECMs

CAN works by each ECM sending out 'packets' of information (such as engine speed or fuel consumption information) on to the network bus (note that the network must be free of data before any ECM is allowed to transmit). This data is given a priority according to its importance (for example 'engine speed' may have a higher priority than 'low fuel level'), so that even if two ECMs send data at the same time, high priority information is always sent first. Lower priority data is then resent after the high priority data has been received by all ECMs on the network.

The receiving ECM confirms the data has been received correctly and that the data is valid, and this information is then used by the ECM as necessary. Specific data not required by an ECM will still be received and acknowledged as correct but then disregarded (for example if an ECM does not require 'clutch switch position' information, this data packet would be ignored).

This allows for a very high speed system of communication, which is also very reliable. Should one ECM fail or transmit corrupted or otherwise incorrect messages, none of the other ECMs on the network will be affected, and after a certain time that ECM will be prevented from transmitting further messages until the fault is rectified. This stops the ECM from clogging the network with incorrect data and preventing other messages from getting through. The fault would then be reported by a DTC (Diagnostic Trouble Code).

Triumph currently use CAN for communication between the engine ECM and the instruments.

Alternator/Charging System

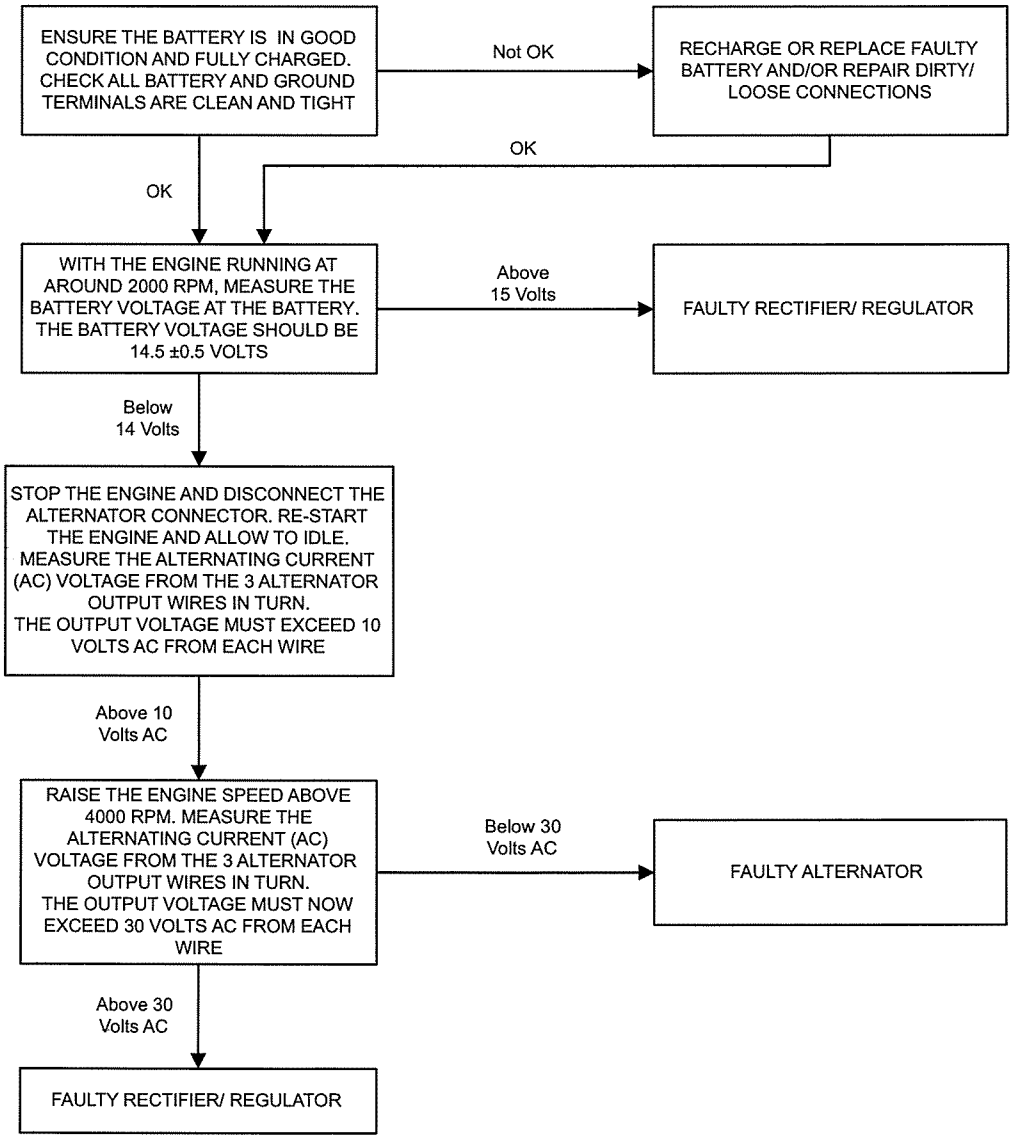
The charging system consists of an alternator, a rectifier/ regulator assembly and the battery. The alternator is made up of two parts, the stator, which is mounted to the crankcase or the engine cover, and the rotor, mounted to the end of the crankshaft. The stator is an assembly of 18 coils, arranged into 3 phases. The rotor is a series of magnets mounted in the engine flywheel, which are arranged so as to be positioned around the outside of the stator coils. As the engine rotates the alternator produces an AC (alternating current) voltage in each of the three phases of the alternator, typically of around 35 to 40 volts AC at 4000 - 5000 rpm, although this figure varies between models. As the battery requires DC (direct current) voltage for correct charging, this AC voltage must be first rectified to DC current, and then regulated to the correct voltage for the battery of 14.5 ± 0.5 volts. This is done by the rectifier/regulator, which uses diodes to convert the alternator output to DC volts and limit the resulting output to the correct figure required for optimal battery charging.

If the charging circuit does not operate correctly, the following basic checks must be carried out before further diagnosis is performed:

- Check the battery terminals are clean and tight.
- Check the frame and engine earth connections are clean, tight and free from corrosion.
- Ensure the battery is fully charged and in good condition.
- Check that any fuse in the circuit is not blown and is of the correct rating (see page *18-12*).

Rectify any defects as necessary.

Diagnosis - Charging Circuit



Starting Circuit

All Triumph models are equipped with an electric start system. This system consists of a starter relay, starter motor, starter switch, sidestand switch, engine stop switch, clutch switch and the sprag clutch. The starter motor is connected to the starter relay and the battery by heavy duty cables in order to supply the large currents required by the motor to start the engine. When the starter button is pressed the relay is energised, which then allows current to the starter motor. The starter motor will not operate unless the clutch lever is pulled in. Also, the starter will not operate if the sidestand is down, unless the transmission is in neutral. If the starter motor does not operate, the following basic checks must be carried out before further diagnosis is performed:

- Check the engine stop switch is in the 'RUN' position.
- Check the battery terminals are clean and tight.
- Check the frame and engine earth connections are clean, tight and free from corrosion.
- Ensure the battery is fully charged and in good condition.
- Check that any fuse in the circuit is not blown and is of the correct rating.
- Using the Triumph Diagnostic Tool, check the operation of the neutral switch or gear position sensor (if fitted), sidestand and clutch switches.

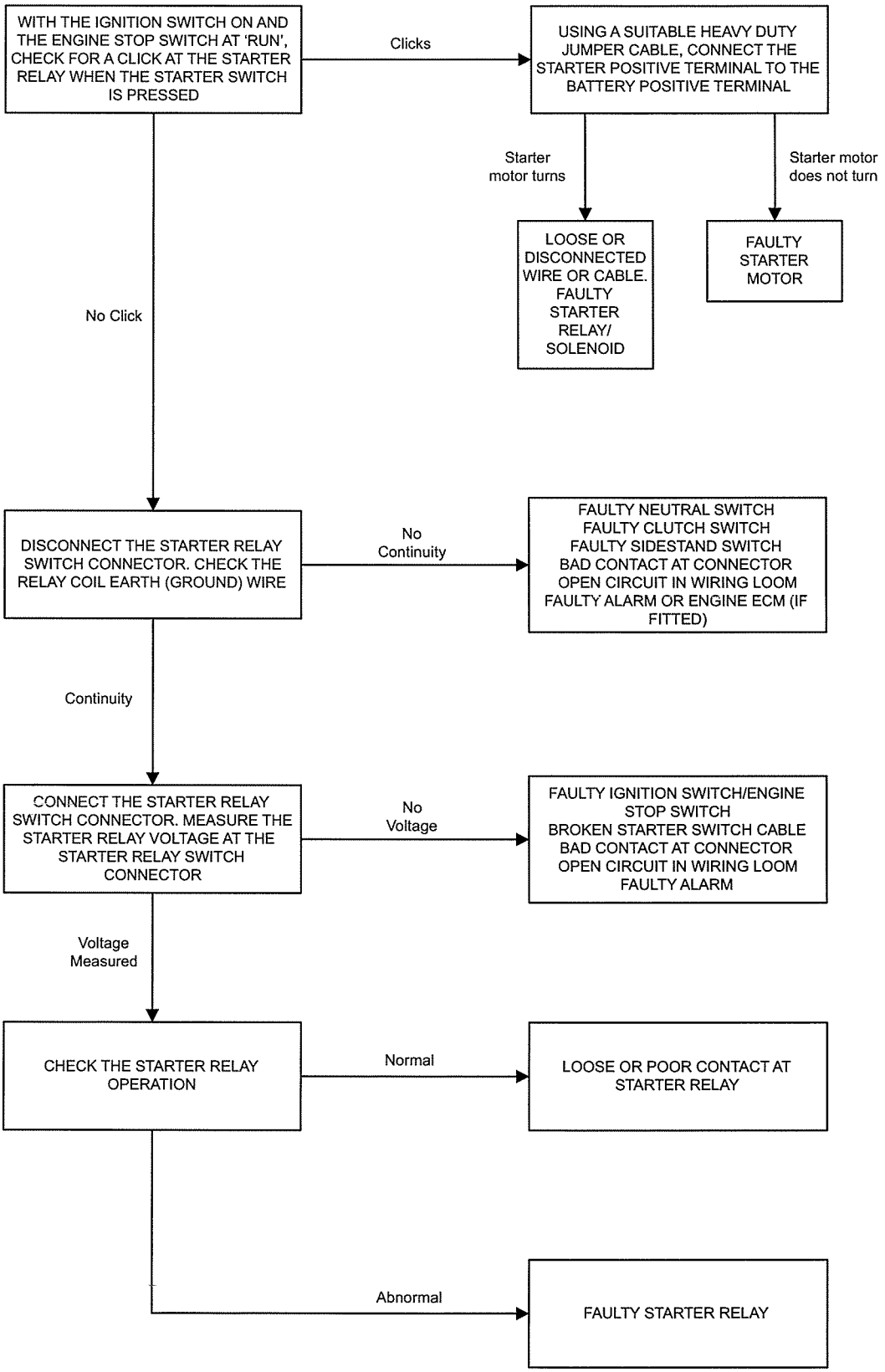
Note:

- **On all new models from Daytona 675 onwards, which use a CAN connection between the instruments and the ECM, the engine will not crank if the instruments are disconnected.**

Rectify any defects as necessary.

Symptom	Possible cause(s)
Starter relay does not click, starter motor does not turn	Battery discharged or defective
	Blown main or starter relay fuse
	Defective starter relay wiring or starter switch
	Check that the sidestand, transmission and clutch lever are positioned for engine starting I.E. transmission in neutral, clutch lever pulled in and the sidestand down
	Defective alarm system - ensure any alarm fitted is working correctly
Starter motor turns slowly	Battery discharged or defective
	Loose, corroded or dirty battery connections
	Loose, corroded or dirty starter motor or starter relay connections
	Defective starter motor
	Loose, corroded or dirty battery ground connections
Starter relay clicks but engine does turn over	Battery discharged or defective
	Crankshaft does not turn due to engine defect
	Defective starter motor
	Starter cable open circuit
	Defective starter relay
Starter motor turns but engine does not turn over	Starter motor or starter ring gear

Diagnosis - Starter Circuit



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.

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.

Inspection

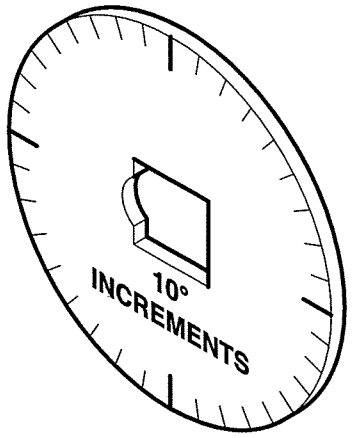
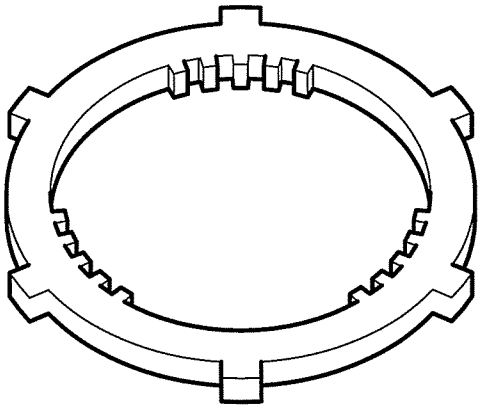
Disassembled parts should be visually inspected and replaced with new ones if there are any signs of the following:

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

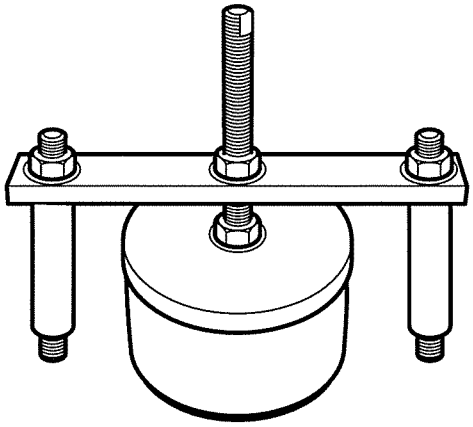
Service tools

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

Special service tools:

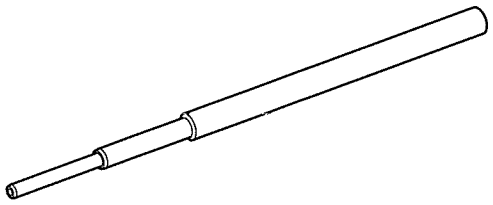
3880105-T0301 - Angular torque gauge	T3880038 - Clutch anti-rotation jig
 cbxt	 cchd

T3880061 - Extractor, liners



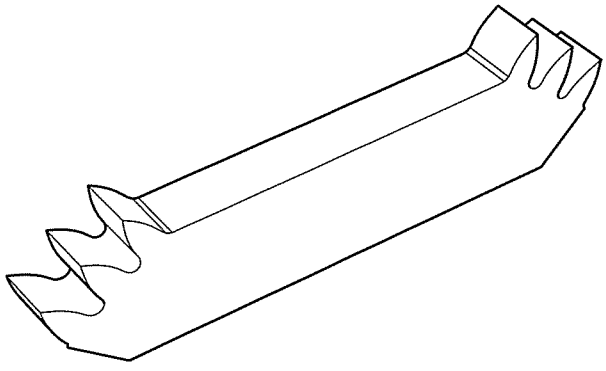
cchb

T3880039 - Timing pin



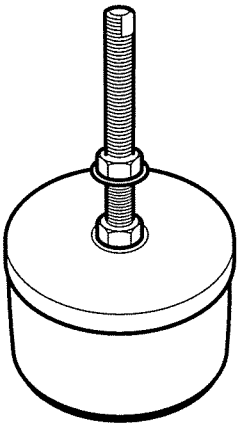
T3880039

T3880043 - Crank lock-up tool



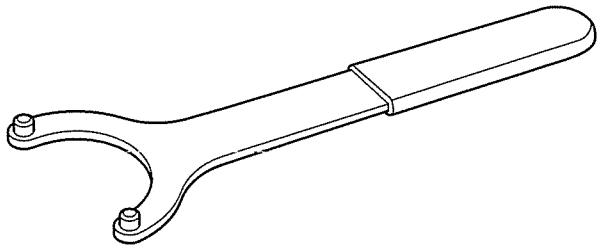
T3880043

T3880122 - Extractor, liners (use with accessory big bore kit)



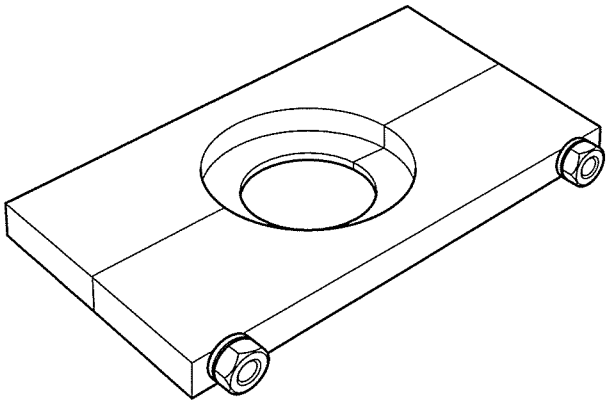
cchb

T3880041 - Idler gear pin spanner



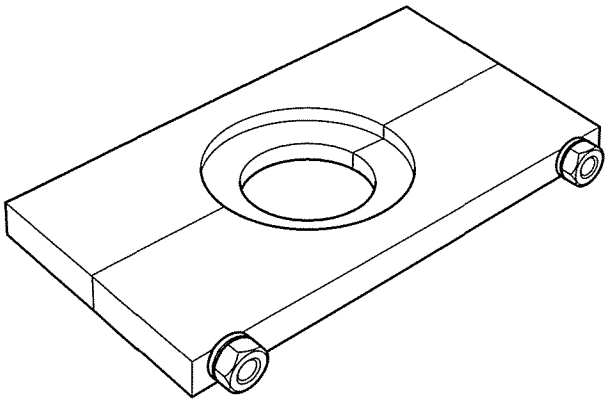
T3880041

T3880108 - Press plate, transmission



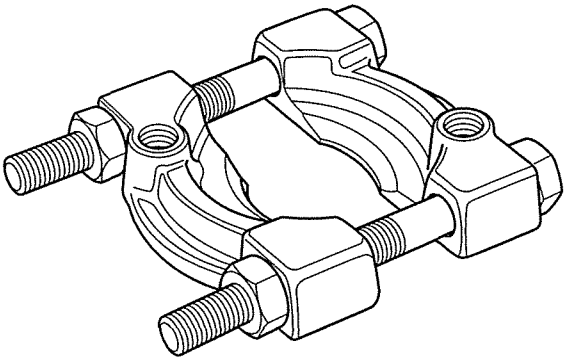
T3880108

T3880133 - Press plate, second gear



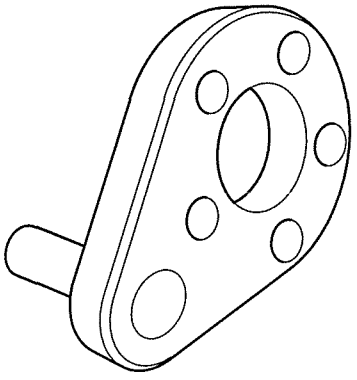
T3880133

T3880109 - Bearing separator



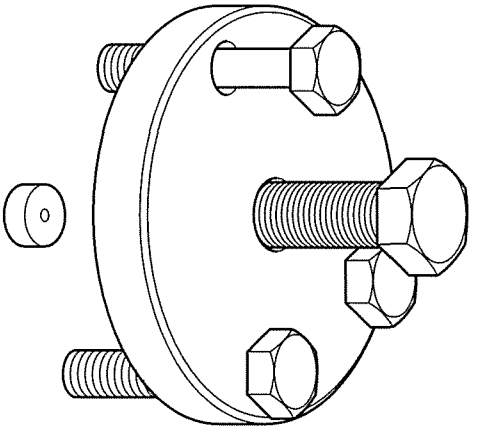
T3880109

T3880152 - Output pulley carrier holding tool



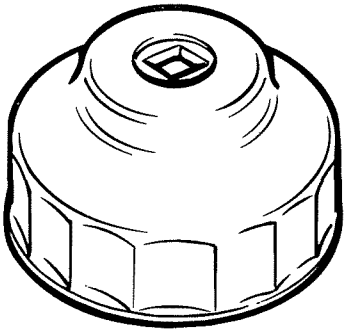
3880152

T3880054 - Output pulley carrier puller



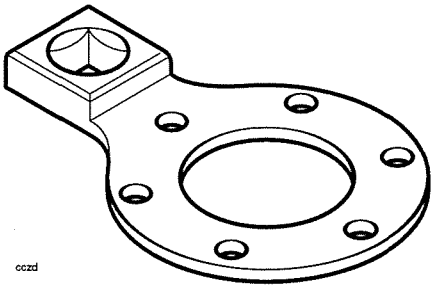
T3880054

T3880313 - Oil filter wrench



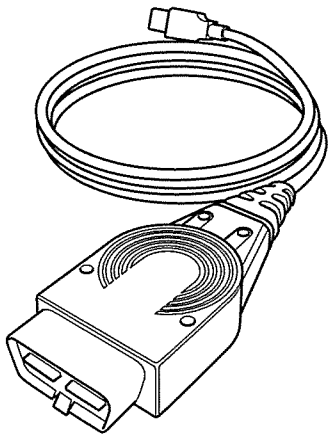
gahc

T3880121 - Holder, oil pump drive gear

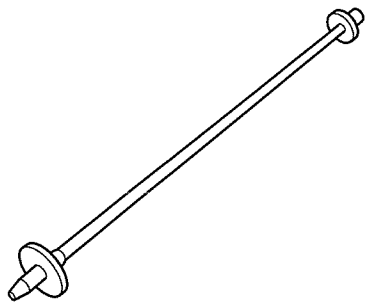


cczd

T3880057 - Triumph diagnostic tool

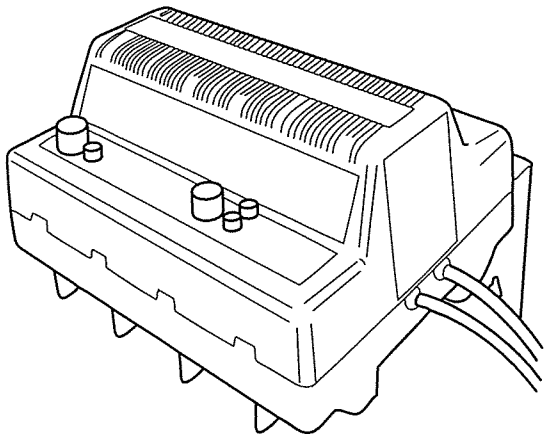


T3880806 - Fuel tank support

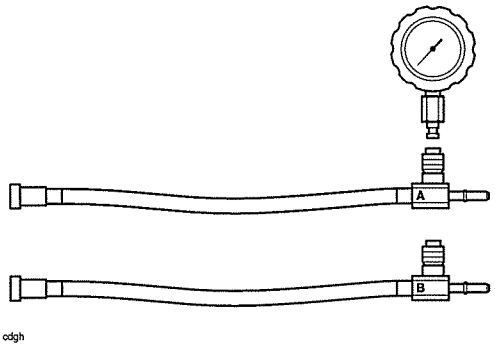


T3880806

BatteryMate battery charger - see latest parts catalogue for part number information

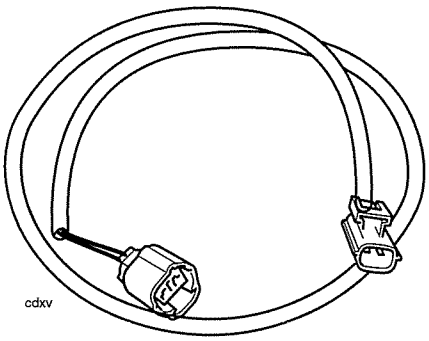


T3880001 - Fuel pressure gauge



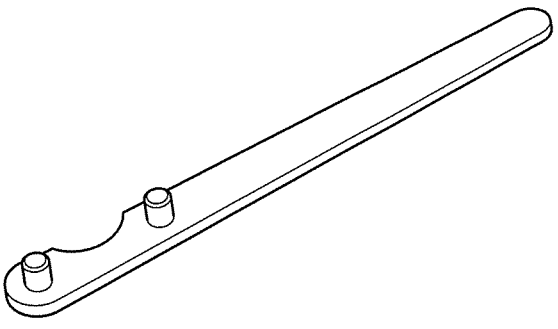
cdgh

T3880123 - Extension cable



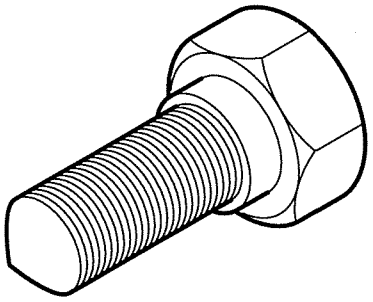
cdxv

T3880096 - Holding tool, alternator rotor



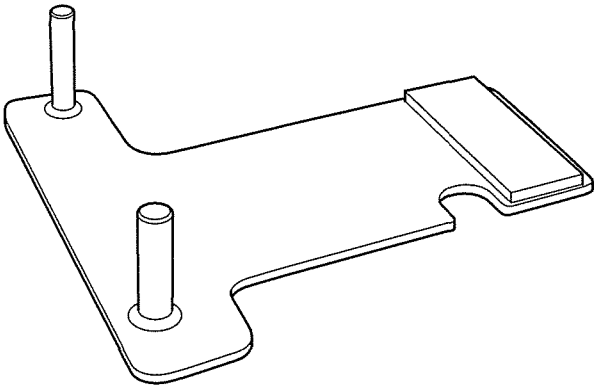
T3880096

T3880200 - Puller, alternator rotor



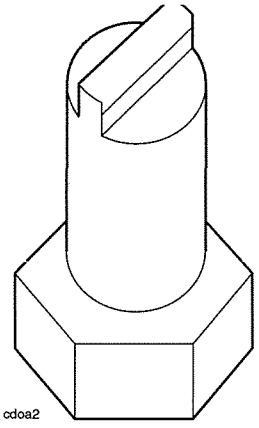
cche

T3880126 - Engine support frame



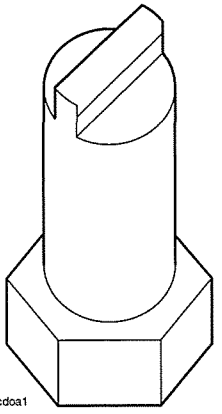
T3880126

T3880377 - Engine mounting adjuster



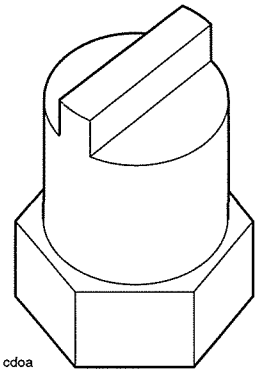
cdoa2

T3880103 - Engine mounting adjuster



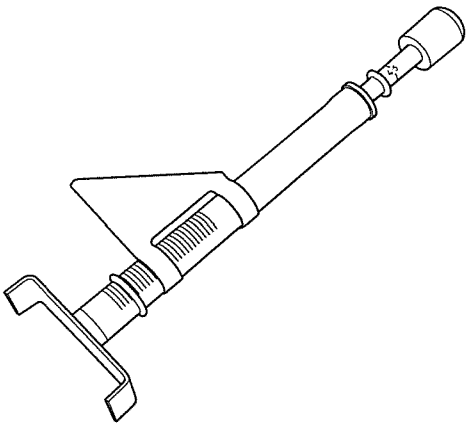
cdoa1

T3880104 - Swinging arm adjuster



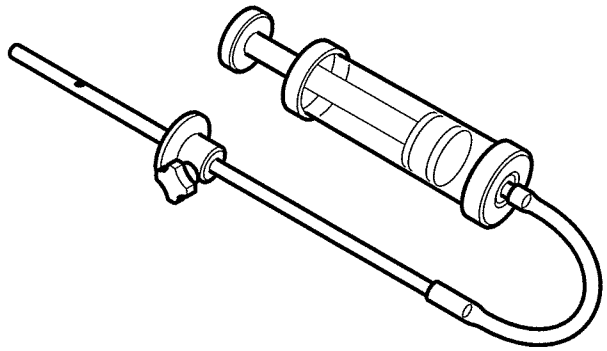
cdoa

T3880126 - Belt slack measurement tool



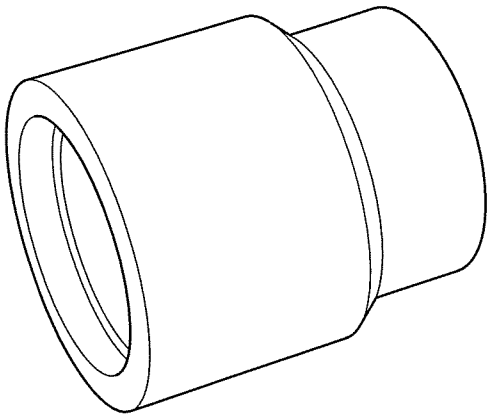
cfhc_1

3880160-T0301 - Fork filler evacuator

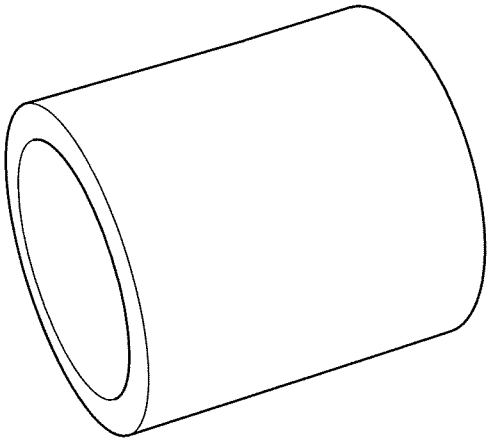


ccha

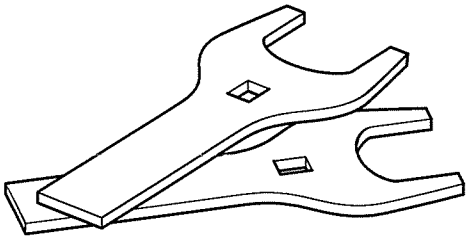
T3880131 - Fork seal & upper bearing installer



T3880132 - Fork seal chrome cap installer

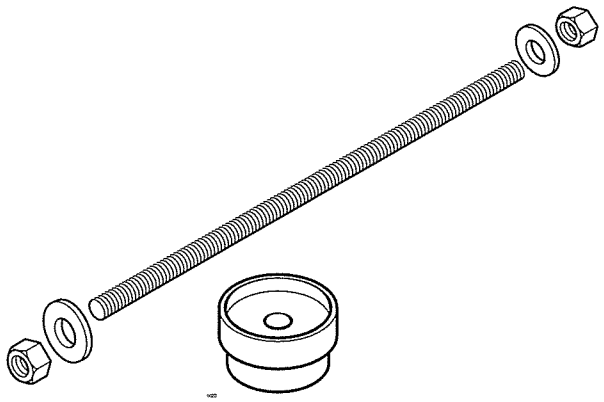


3880140-T0301 Head race adjusters

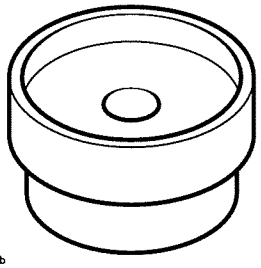


kagf1

T3880053 - Extraction kit, wheel bearing

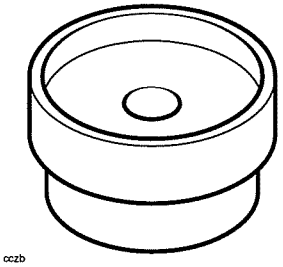


T3880070 – Bearing installer



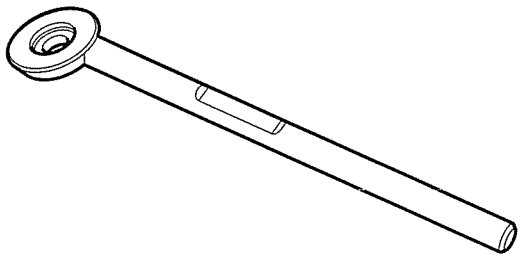
cczb

T3880075 – Bearing installer

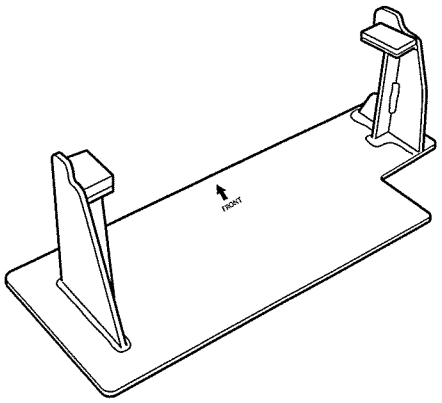


cczb

T3880007 - Mirror location fixture



T3880803 - Motorcycle support frame



T3880803

Specifications

Full Specification	Thunderbird
Engine	Liquid cooled parallel twin, 270° firing angle
Arrangement	In line, transverse,
Displacement	1596 cc (97.4 cu in)
Bore x Stroke	103.8 x 94.3 mm (4.08 x 3.73 in)
Compression Ratio	9.7:1
Cylinder numbering	Left to right
Firing order	1-2
Max. Power (DIN 70020)	84.5 PS at 4,800 rpm (83.3 hp at 4,800 rpm)
Max. Torque	149.5 Nm at 2,400 rpm (110 lb ft at 2,400 rpm)

Cylinder Head

Valve Head Dia	In	37.90 mm
	Ex	32.30 mm
Valve Lift	In	7.77 mm
	Ex	8.08 mm
Valve Stem Dia.	In	5.475 - 5.490 mm (std) 5.465 mm (service limit)
	Ex	5.455 - 5.470 mm (std) 5.445 mm (service limit)
Valve Guide Bore Dia.		5.500 - 5.515 mm (std) 5.543 (service limit)
Valve Seat Width (in head)		1.000 - 1.100 mm (std) 1.500 mm (service limit)
Valve Seat Width (valve)		1.98 - 2.26 mm (std)
Valve Seat Angle		90° inclusive
Valve Spring Length		43.2 mm (std)
Valve Spring 'Load at Length'	In	180 N +/- 10 N at 36.2 mm
	Ex	180 N +/- 10 N at 36.2 mm
Valve Clearance	In	0.10 - 0.15 mm
	Ex	0.15 - 0.20 mm
Valve Bucket Bore Dia.	In and Ex	28.015 - 28.035 mm 28.05 (service limit)
Valve Bucket Dia.	In and Ex	27.978 - 27.993 mm 27.97 (service limit)
Valve Timing (at 1 mm lift)		
Inlet	open	2.5° BTDC
	close	24.5° ABDC
	duration	207°
Exhaust	open	29.5° BBDC
	close	3.5° ATDC
	duration	213°

Cylinder Head (continued)

Camshaft Journal Dia.	22.955 - 22.975 mm (std)
Camshaft Journal Clearance	0.025 - 0.066 mm (std) 0.105 mm (service limit)
Camshaft Journal Bore Dia.	23.000 - 23.021 mm (std)
Camshaft End Float	0.03 - 0.13 mm (std)
Camshaft Run-out	0.015 mm (std)

Clutch/Primary Drive

Primary Drive Type	Gear
Reduction Ratio	1.440:1 (85/59)
Clutch Type	Wet, multi-plate
No. of Friction Plates	7
Steel Plate Flatness Limit	0.15 mm
Friction Plate Flatness Limit	0.20 mm
Friction Plate Thickness (new)	3.3 - 3.5 mm
Friction Plate Thickness (service limit)	3.2 mm
Clutch Actuation Method	Cable
Cable Free Play (at lever)	1 - 2 mm

Piston/Crankshaft

Cylinder Liner Dia.		103.791 – 103.809 mm (std)
		103.859 mm (service limit)
Piston Diameter		103.771 – 103.787 mm (std)
		103.721 mm (service limit)
Piston Ring to Groove Clearance	Top	0.02 – 0.06 mm (std)
		0.16 mm (service limit)
	Second	0.02 – 0.06 mm (std)
		0.16 mm (service limit)
Piston Ring Groove Width	Top	1.21 – 1.23 mm (std)
		1.31 mm (service limit)
	Second	1.21 – 1.23 mm (std)
		1.31 mm (service limit)
	Oil	2.51 – 2.53 mm (std & service limit)
Piston Ring End Gap	Top	0.30 – 0.45 mm (std)
		0.65 mm (service limit)
	Second	0.45 – 0.60 mm (std)
		0.775 mm (service limit)
	Oil	0.20 – 0.70 mm (std)
		0.875 mm (service limit)
Gudgeon Pin Bore Dia. In Piston		23.993 – 24.001 mm (std)
		24.011 mm (service limit)
Gudgeon Pin Dia.		23.982 – 23.987 mm (std)
		23.972 mm (service limit)

Piston/Crankshaft (continued)

Connecting Rod Small End Dia.	24.016 – 24.029 mm (std)
	24.039 mm (service limit)
Connecting Rod Big End Dia	55.500 – 55.018 mm (std)
Connecting Rod Big End Side Clearance	0.15 – 0.30 mm (std)
	0.50 mm (service limit)
Crankshaft Big End Journal Dia.	52.476 – 52.490 mm (std)
	52.452 mm (service limit)
Crankshaft Big End Bearing Clearance	0.035 – 0.066 mm (std)
	0.100 mm (service limit)
Crankshaft Main Journal Dia.	52.483 – 52.499 mm (std)
	52.459 mm (service limit)
Crankshaft Main Bearing Clearance	0.021 – 0.045 mm (std)
	0.10 mm (service limit)
Crankshaft End Float	0.05 – 0.20 mm (std)
	0.40 mm (service limit)
Crankshaft Run-out	0.02 mm (std)
	0.05 mm (service limit)

Transmission

Type		6 Speed Constant Mesh
Gear Ratios	Primary	1.440:1 (85/59)
	1st	2.875:1 (46/16)
	2nd	1.958:1 (47/24)
	3rd	1.536:1 (43/28)
	4th	1.219:1 (39/32)
	5th	1.029:1 (35/34)
	6th	0.909:1 (30/33)
Gear Selector Fork Thickness		4.35 – 4.45 mm (std)
		4.25 mm (service limit)
Gear Selector Groove Width		4.50 – 4.60 mm (std)
		4.75 (service limit)
Gear Selector Fork to Groove Clearance		0.05 – 0.25 mm (std)
		0.50 (service limit)

Final Drive

Final Drive Type	Toothed belt
Final Drive Ratio	2.214:1 (62/28)
Toothed Belt Slack	See Chapter 15

Full Specification	Thunderbird

Lubrication

Oil Capacity (incl. filter, dry fill)	6.0 litres
Oil and Filter Change	4.2 litres
Oil change only	4.0 litres
Recommended Oil Approval Rating	API SH (or higher) **and** JASO MA
Viscosity	10W/40 or 15W/50
Type	Semi or fully synthetic
Oil Pressure (in main gallery)	3.00 – 3.60 Bar at 3,500 rpm
Oil Pump Rotor Tip Clearance	0.15 mm (std)
	0.20 (service limit)
Oil Pump Body Clearance	0.15 – 0.239 mm (std)
	0.369 mm (service limits)
Oil Pump Rotor End Float	0.04 – 0.09 mm (std)
	0.12 mm (service limit)

Ignition System

Type	Digital electronic
Electronic Rev-Limiter	6,500 rpm
Pick up Coil Air Gap	Fixed, not adjustable
Pick up Coil Resistance	0.56 KΩ
Ignition Coil Type	Inductive, plug top
Spark Plug Type	NGK DPR6EA-9, 2 per cylinder
Spark Plug Gap	0.9 mm

Fuel System

Fuel Type	Unleaded, 91 RON (US - 87 RON/MON)
Fuel Tank Capacity	21.7 litres
Low Level Warning Lamp	4.5 litres remaining
Fuel Pump Type	Submerged, electric
Fuel Pressure (nominal)	3.5 Bar
Purge Control System	Modulated, vacuum

Fuel Injection System

Type	Multi point sequential
Idle Speed	850 rpm
Injector Type	Multi hole, solenoid operated plate valve
Throttle	Single butterfly
Idle Speed Control	Stepper motor
Control Sensors	Coolant temperature, manifold absolute pressure (both cylinders), intake air temperature, barometric pressure, gear position, road speed, throttle position, heated oxygen sensors.

Full Specification	Thunderbird

Cooling System

Coolant Mixture	Pre-mixed
Anti-Freeze Type	Triumph HD4X Hybrid OAT coolant
Cooling System Capacity	2.2 litres
Radiator Cap Opening Pressure	1.2 Bar
Thermostat Opening Temperature	82°C
Cooling Fan Switch On Temperature	103°C
Temperature Gauge Sensor Resistance	187Ω at 100°C

Suspension

Front Fork Travel	120 mm
Recommended Fork Oil Grade	Showa AHSS8 oil (SAE 10W)
Oil Level (fork fully compressed)	106 mm
Oil Volume (dry fill)	677 cm^3 ± 2.5 cm^3
Front Fork Pull Through	0 mm (top of the cap edge flush with top yoke)
Fork Spring Rate	K = 9 N/mm
Rear Wheel Travel	95 mm

Brakes

Front type	Two four piston calipers acting on twin discs
Front Caliper Piston Dia.	33.96 mm/30.23 mm
Front Disc Dia.	310 mm
Front Disc Thickness	5.0mm standard (4.5 mm service limit)
Front Disc Run-out Max.	0.25 mm
Front Master Cylinder Diameter	15.87 mm
Recommended Fluid	DOT 4
Rear Type	Twin piston sliding caliper acting on single disc
Rear Caliper Piston Dia.	32 mm
Rear Disc Dia.	310 mm
Rear Disc Thickness	6.0 mm standard (5.5 mm service limit)
Rear Disc Run-out Max.	0.25 mm
Rear Master Cylinder Diameter	12.7 mm
Recommended Fluid	DOT 4

Full Specification	Thunderbird

Wheels and Tyres

Front Wheel Size	MT 3.5 x 19
Front Wheel Rim Axial Run-out	0.5 mm
Front Wheel Rim Radial Run-out	0.5 mm
Front Tyre Size	120/70 R19
Front Tyre Pressure (cold)	2.48 Bar (36psi)
Front Tyre Tread Depth min.	Over 130 km/h – 2 mm (or minimum legal limit, whichever is greater)
	Under 130 km/h – 2 mm (or minimum legal limit, whichever is greater)
Rear Wheel Size	MT 6.0x 17
Rear Wheel Rim Axial Run-out	0.5 mm
Rear Wheel Rim Radial Run-out	0.5 mm
Rear Tyre Size	200/50 R17
Rear Tyre Pressure (cold)	2.62 Bar (38 psi)
Rear Tyre Tread Depth min	Over 130 km/h – 3 mm (or minimum legal limit, whichever is greater)
	Under 130 km/h – 2 mm (or minimum legal limit, whichever is greater)

Frame

Frame Type	Tubular steel
Overall Length	2360 mm
Overall Width	873 mm
Wheelbase	1637 mm
Seat Height	709 mm
Castor	31.2°
Trail	151 mm
Dry Weight	305 kg
Max. Payload (rider, passenger, luggage & accessories)	226 kg

Electrical Equipment

Battery Rating	12 volt, 18 amp hour
Alternator Rating	42 amps at 2,000 rpm
	45 amps at 6,000 rpm
Headlight	12 Volt, 60/55 watt H4 halogen
Tail/Brake Light	LED
Directional Indicator Lights	12 Volt, 10 Watt

Torque Wrench Settings

Cylinder Head Area

Application	Torque (Nm)	Notes
Camshaft cover to cylinder head	12	Apply engine oil to seals
Camshaft drive chain tensioner to crankcase	10	
Camshaft ladder to head	*	Refer to section 3
Camshaft drive chain tensioner blade to crankcase	10	Replace fixing(s) if removed
Camshaft drive chain top pad to head	*	Refer to section 3
Cylinder head to crankcase	*	Refer to section 3
Camshaft idler shaft bolt	10	Replace fixing(s) if removed
Cylinder head dryseal plug	22	
Cylinder head exhaust stud	10	
SAI reed valve cover to camshaft cover	9	Replace fixing(s) if removed

Clutch

Application	Torque (Nm)	Notes
Clutch cover to crankcase	9	
Clutch cover embellisher to cover	9	
Clutch centre nut	160	Fit new Belleville washer and plain washer if removed
Clutch pressure plate to basket	10	
Clutch lifter arm bolt	10	Replace fixing(s) if removed
Clutch lever nut	3	
Clutch lever clamp bolts	12	
Switch cube screws (left)	3	
Clutch cable bracket	7	

Crankshaft and Crankcases

Application	Torque (Nm)	Notes
Connecting rod big end bolts	*	Refer to section 5
Crankcase to crankcase bolts	*	Refer to section 5
Main bearing ladder bolts	*	Refer to section 5
Torque compensator bolt	120	Replace fixing(s) if removed
Lubrication main gallery threaded inserts	50	
Breather plate to crankcase	12	Replace fixing(s) if removed
Breather drain pipe	12	Replace fixing(s) if removed
Breather hose spout to crankcase	35	
Balancer dead shaft retainer bolt	10	Replace fixing(s) if removed
Coolant manifold to crankcase	*	Refer to section ??

Engine Covers

Application	Torque (Nm)	Notes
Clutch cover to crankcase	9	
Alternator cover to crankcase	9	
Drive belt cover	9	

Transmission

Application	Torque (Nm)	Notes
Detent wheel to selector drum	12	Replace fixing(s) if removed
Selector drum bearing retaining screw	12	Replace fixing(s) if removed
Gear change pedal pinch bolt	9	
Gear change pedal rubber pin	12	
Gear change actuating arm bolt	9	
Gear change rod locknuts6	6	
Input shaft bearing retainer to crankcase	12	Replace fixing(s) if removed
Output pulley to output pulley flange bolts	105	Replace fixing(s) if removed
Output pulley flange to output shaft nut	*	Refer to section 7

Lubrication System

Application	Torque (Nm)	Notes
Sump to crankcase	12	
Sump plug	25	
Oil pipes to crankcase bolt	9	Replace fixing(s) if removed
Alternator spray bar bolt	9	Replace fixing(s) if removed
Oil pressure relief valve to adaptor	15	Apply ThreeBond 1305 to threads
Oil pressure relief valve adaptor to crankcase	15	
Oil filter adapter	10	Apply ThreeBond 1305 to threads
Oil filter	10	
Oil pump to crankcase	12	Replace fixing(s) if removed
Oil pump sprocket to oil pump	10	Replace fixing(s) if removed
Oil pressure switch	13	
Oil cooling jets (balancer shaft thrust faces)	5	

Cooling System

Application	Torque (Nm)	Notes
Water pump to crankcase	10	Replace fixing(s) if removed
Radiator to frame upper fixings	6	
Radiator to frame lower fixings	4	
Thermostat housing to head	12	
Coolant tube bolt (in engine)	9	
Upper coolant tube bolt	7	Replace fixing(s) if removed
Cooling system bleed screw	9	
Radiator cap housing to frame	9	
Fan shroud to radiator	2.5	
Hose clips	2	
Expansion tank bracket locknut and bolts	3	Replace fixing(s) if removed
Expansion tank bracket studs	8	

Fuel System, Exhaust System and Airbox

Application	Torque (Nm)	Notes
Fuel tank to frame (pivot bolt)	9	Replace fixing(s) if removed (locknut)
Fuel tank to frame (front fixing)	8	
Fuel pump mounting plate to fuel tank	5	Replace fixing(s) if removed
Fuel pump mounting bracket to fuel pump plate	10	
Fuel pump clamp screw	3	
Fuel pressure regulator to pump plate	3	Replace fixing(s) if removed
Suction filter to pump hose clip	3	
Fuel hose to fuel pump banjo bolt	15	
Fuel level sensor to fuel tank	5	
Throttle body transition piece to cylinder head	9	
Throttle body adaptor clip	1.5	
Throttle body to cylinder head	12	
Throttle position switch	3.5	
Left hand throttle to right hand throttle body fixings	3.5	
Idle speed control stepper motor	3.5	
Throttle cable bracket to throttle body	3.5	
Fuel injectors to throttle body	3.5	
Exhaust headers to cylinder head	19	Replace fixing(s) if removed
Exhaust headers to catalyst box clamp bolt	22	
Exhaust catalyst box to frame	22	
Silencer mounting bracket to frame	28	
Silencer and header clamp bolts	22	
Catalyst box heatshield bolts	9	
Balance pipe clamp	9	
Oxygen sensor cover bolts	9	
Oxygen sensor to header pipe	25	
Air filter cover to airbox	3	
Airbox to bracket	9	
Air intake hose clips	1.5	
Evaporative canister to bracket	12	
Spark plugs	20	
Crankshaft sensor	6	Replace fixing(s) if removed
Coolant temperature sensor	18	
Road speed sensor	9	
Barometric pressure sensor	3	
MAP sensor	7	
Air temperature sensor	3	
Gear position sensor	5	

Rear Suspension

Application	Torque (Nm)	Notes
Swinging arm pivot nut	110	Refer to section 14
Swinging arm pivot bolt adjuster	6	Refer to section 14
Drive belt slack adjuster locknut	25	
Rear suspension unit upper mounting bolt	28	Replace fixing(s) if removed
Rear suspension unit lower mounting bolt	28	Replace fixing(s) if removed
Lower belt guard fixings	12	
Upper belt guard rear fixing bolt	10	
Upper belt guard front fixing nut	9	

Front Suspension

Application	Torque (Nm)	Notes
Upper yoke centre nut	65	
Upper yoke pinch bolt	20	
Lower yoke pinch bolt	27	
Upper yoke cable guide bolts	18	
Fork top cap to inner tube	22.5	
Damping cylinder bolt	45	Replace fixing(s) if removed
Handlebar clamp to top yoke bolts	48	Replace fixing(s) if removed
Handlebar clamp bolt	26	Tighten front bolts first then rear bolts
Handlebar end weights	8	
Switch cube screws (Right hand)	3	
Throttle cable screw and union to switch cube	3	
Throttle cable and harness guide bolt (under fuel tank)	7	

Wheels

Application	Torque (Nm)	Notes
Front wheel spindle/axle bolt	65	
Fork to wheel spindle pinch bolts	22	
Rear wheel spindle flanged locknut	110	
Drive belt pulley locknuts	68	
Drive belt pulley studs to wheel flange	30	

Front Brakes

Application	Torque (Nm)	Notes
Caliper to fork	50	
Pad retaining pin (hexagon drive)	18	
Caliper bleed screw	6	
Hose to caliper	25	Fit new sealing washers if removed
Caliper left half to caliper right half bolts	24	
Master cylinder to handlebar	12	
Hose to master cylinder	25	Fit new sealing washers if removed
Hose support to lower yoke	6	
Master cylinder reservoir cap screws	2	
Disc to wheel	22	Replace fixing(s) if removed
Brake lever pivot bolt	1	
Brake lever pivot bolt locknut	6	

Rear Brakes

Application	Torque (Nm)	Notes
Caliper bleed screw	8	
Hose to caliper	25	Fit new sealing washers if removed
Master cylinder to frame	27	
Master cylinder reservoir to frame	5	
Hose to master cylinder	25	Fit new sealing washers if removed
Hose to brake light switch	15	Fit new sealing washers if removed
Brake pedal pivot bolt	22	Replace fixing(s) if removed
Brake hose to P-clip bolt	7	
Brake hose to hard-line frame support	7	
Bracket (rear) hard-line support to frame bolt	7	
Bracket (front) hard-line support to frame bolt	5	Replace fixing(s) if removed
Brake disc to wheel	22	Replace fixing(s) if removed

ABS System

ABS main bracket to engine	30	
ABS modulator to bracket	9	
Modulator bracket to ABS main bracket	7	
Hard-line supports to frame	7	
Hard-line union to modulator	17	
Hard-line union to front brake hose	25	
Hard-line union to rear brake hose	17	
ABS sensor to bracket	7	
ABS sensor ring to wheel	5	Replace fixing(s) if removed
ABS wire guide bolt	18	

Footrests and Control Plates

Application	Torque (Nm)	Notes
Footrest mounting bracket to engine (left)	40	Replace fixing(s) if removed
Footrest mounting bracket to engine (right)	28	Replace fixing(s) if removed
Brake pedal shaft mount	60	
Gear change shaft mount	12	
Rear footrest to hanger	27	
Control plate to engine bracket	50	
Front footrest rubber fixings	4	
Bank angle peg to footrest	10	
Silencer and rear footrest hanger to frame	40	
Footrest bracket to Silencer and rear footrest hanger	40	
Rear footrest to hanger	36	
Side stand pivot bolt	25	
Side stand pivot locknut	25	
Side stand switch	7	

Frame and Bodywork

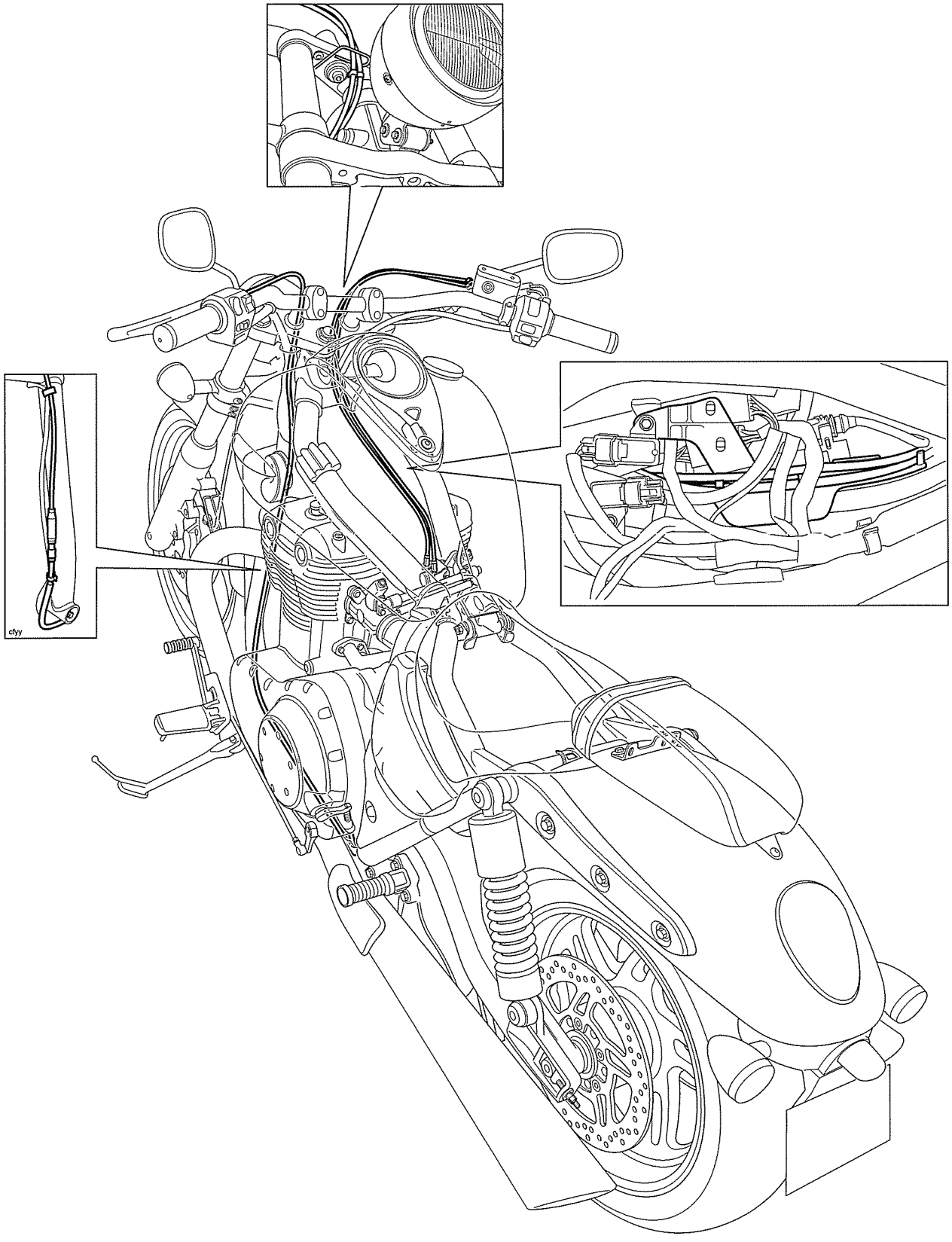
Application	Torque (Nm)	Notes
Engine to frame bolts	See text	
Front mudguard to forks	12	
Rear mudguard to frame M8 bolts	26	
Rear mudguard to frame M10 bolts	45	
Number plate moulding	7	
Harness cover moulding	3	
Front seat M12 bolt	40	
Front seat bolt	9	
Rear seat to mudguard	10	
Rear seat bracket to frame	10	
Rear seat strap to seat	10	
Mirror fixings	10	
Frame adjuster engine mounting (both sizes)	5	
Boss, RSU mount	110	
Engine mounting nuts M12	80	Replace fixing(s) if removed
Engine mounting nuts M10	48	Replace fixing(s) if removed
Headstock cover bolt	7	

Electrical

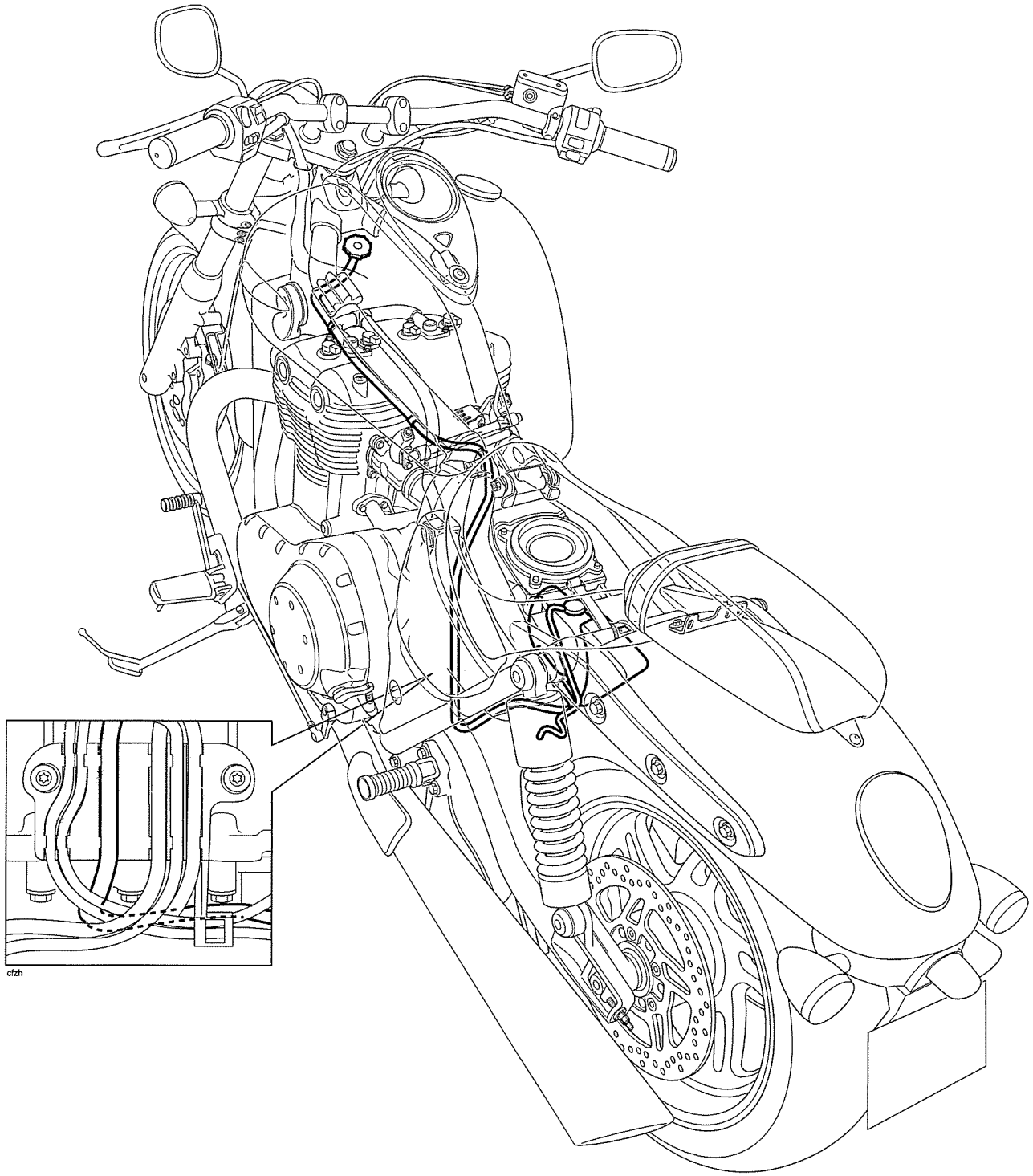
Application	Torque (Nm)	Notes
Starter motor to engine	28	
Starter motor power lead connection	7	
Alternator rotor to crank	165	
Alternator stator to crankcase	12	
Alternator rectifier to bracket	9	
Alternator cover to crankcase	9	
Alternator harness retainer	9	Replace fixing(s) if removed
Rear light to mudguard	3	Replace fixing(s) if removed (locknut)
Number plate light to bracket	2	
Front indicators to brackets	9	
Front indicators brackets to fork clamps	18	
Rear indicators to bracket nut	10	Replace fixing(s) if removed
Headlight horizontal adjuster	27	
Headlight vertical adjuster	9	Replace fixing(s) if removed (locknut)
Headlight rim screws	3	
Front sub harness bracket bolts (on lower crankcase)	7	
Moulding hose routing (three, fitted to the engine)	8	
Alternator cable guide	8	
Rectifier regulator bracket	7	
ECU retaining bracket	7	
Harness bracket, right hand	7	
Fall detection switch	3	Replace fixing(s) if removed
Horn mounting bolt	18	
Horn bracket mounting bolts	7	
Ignition switch locknuts	7	Replace fixing(s) if removed
Instrument cowl to fuel tank	7	
Instrument to cowl screws	3	
Main ground lead to cranckcase	7	

Routings

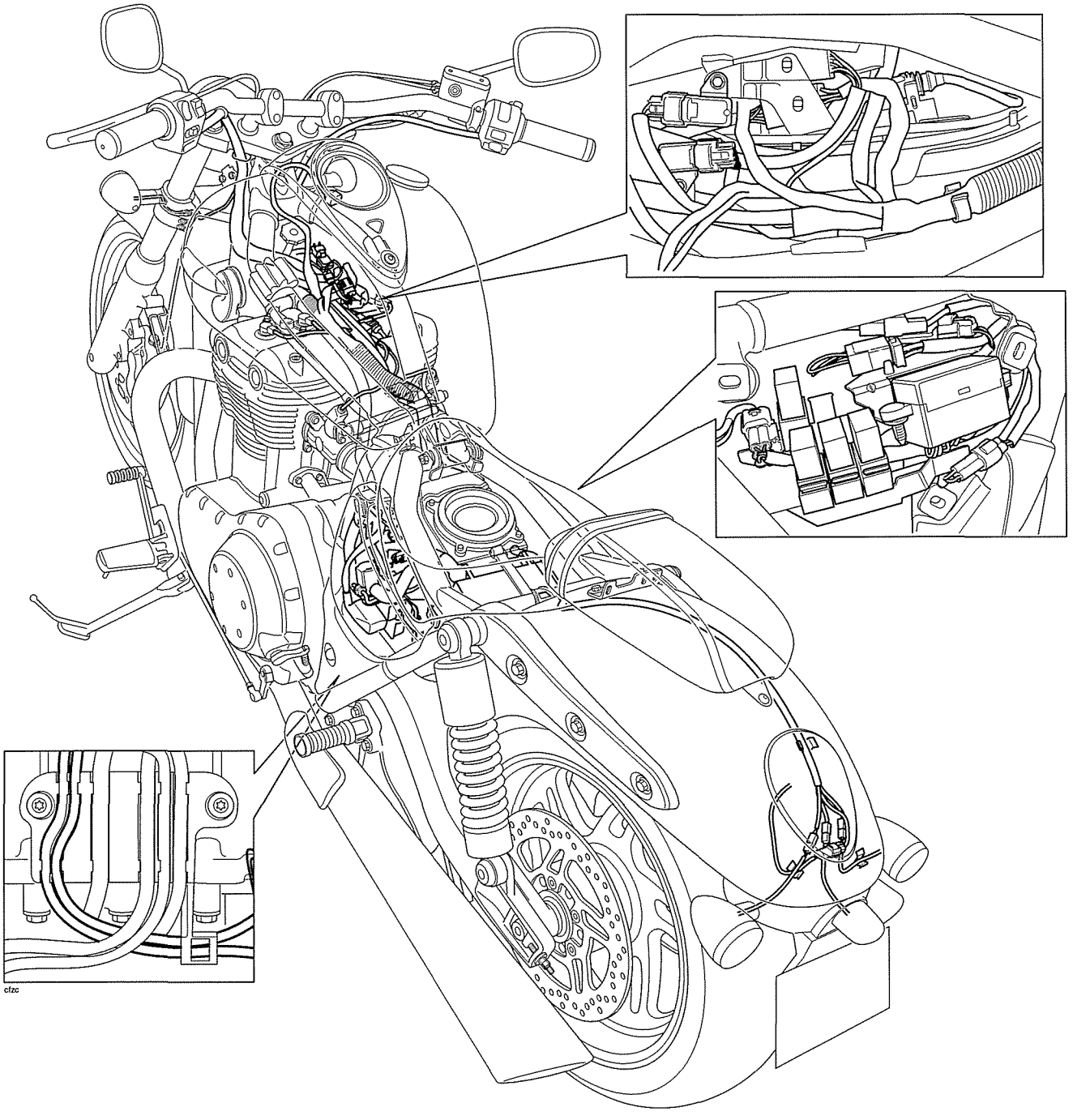
Clutch and Throttle Cable Routing



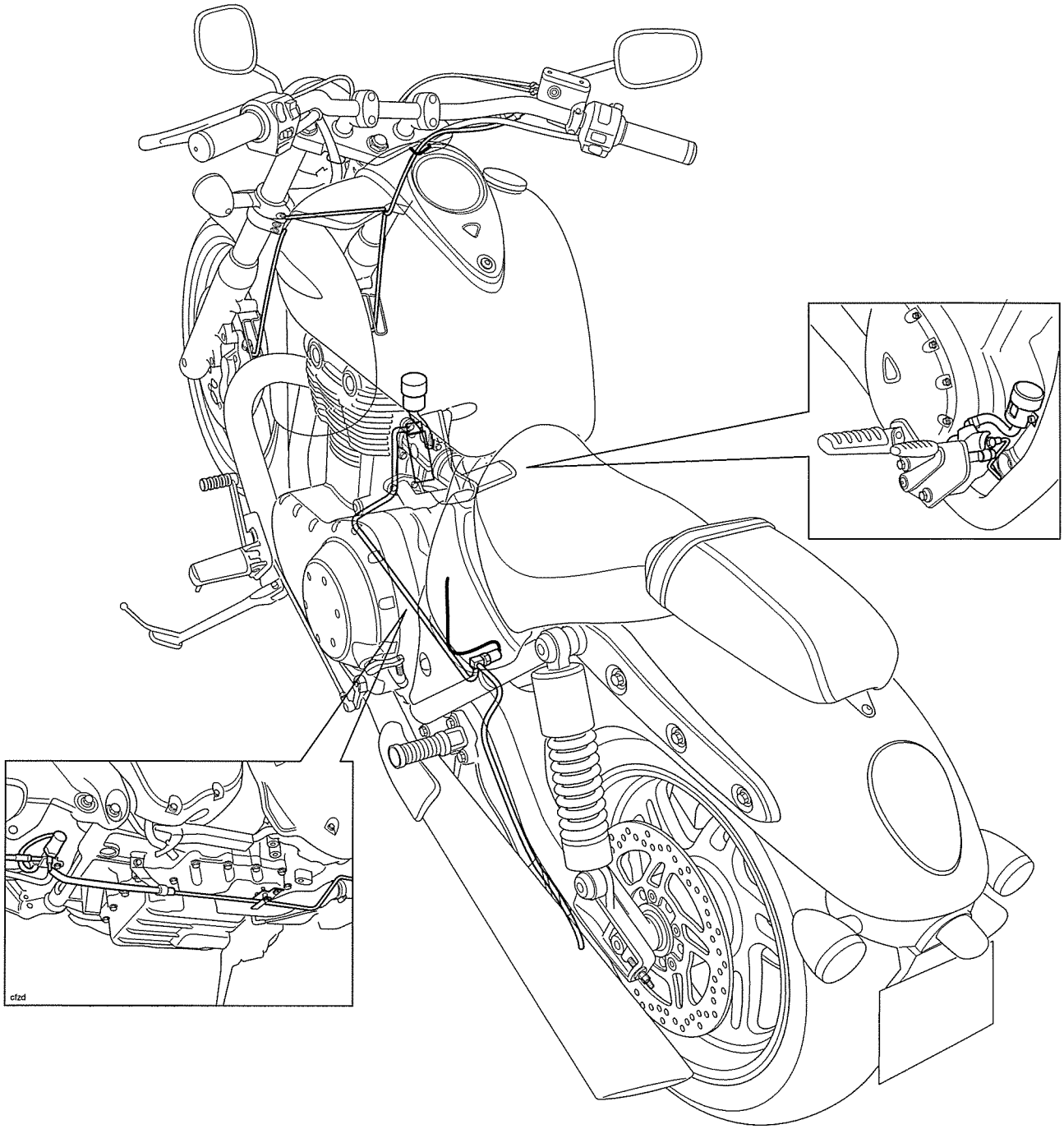
Coolant Expansion Tank Hose Routing



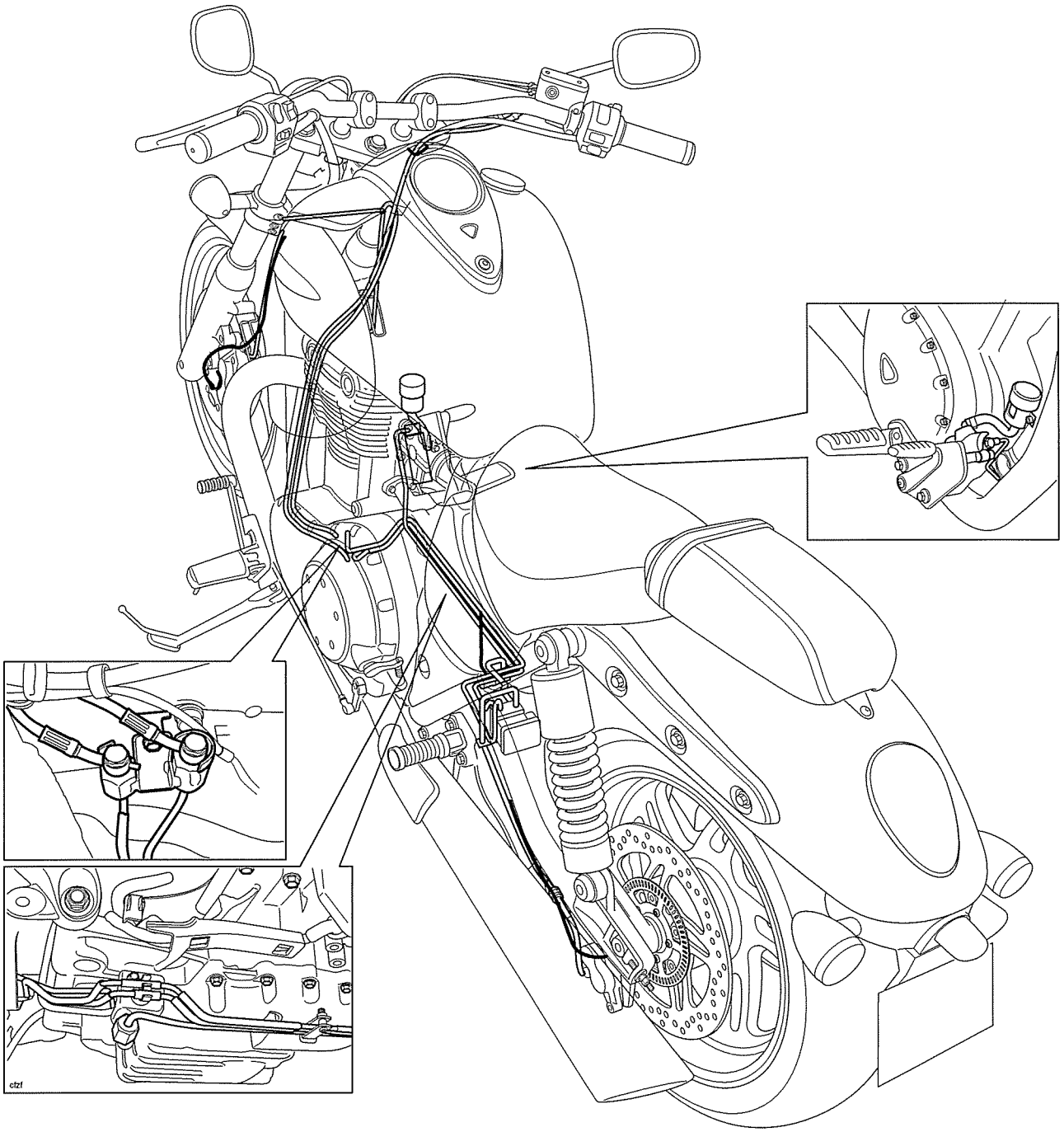
Main Wiring Harness Routing - Thunderbird



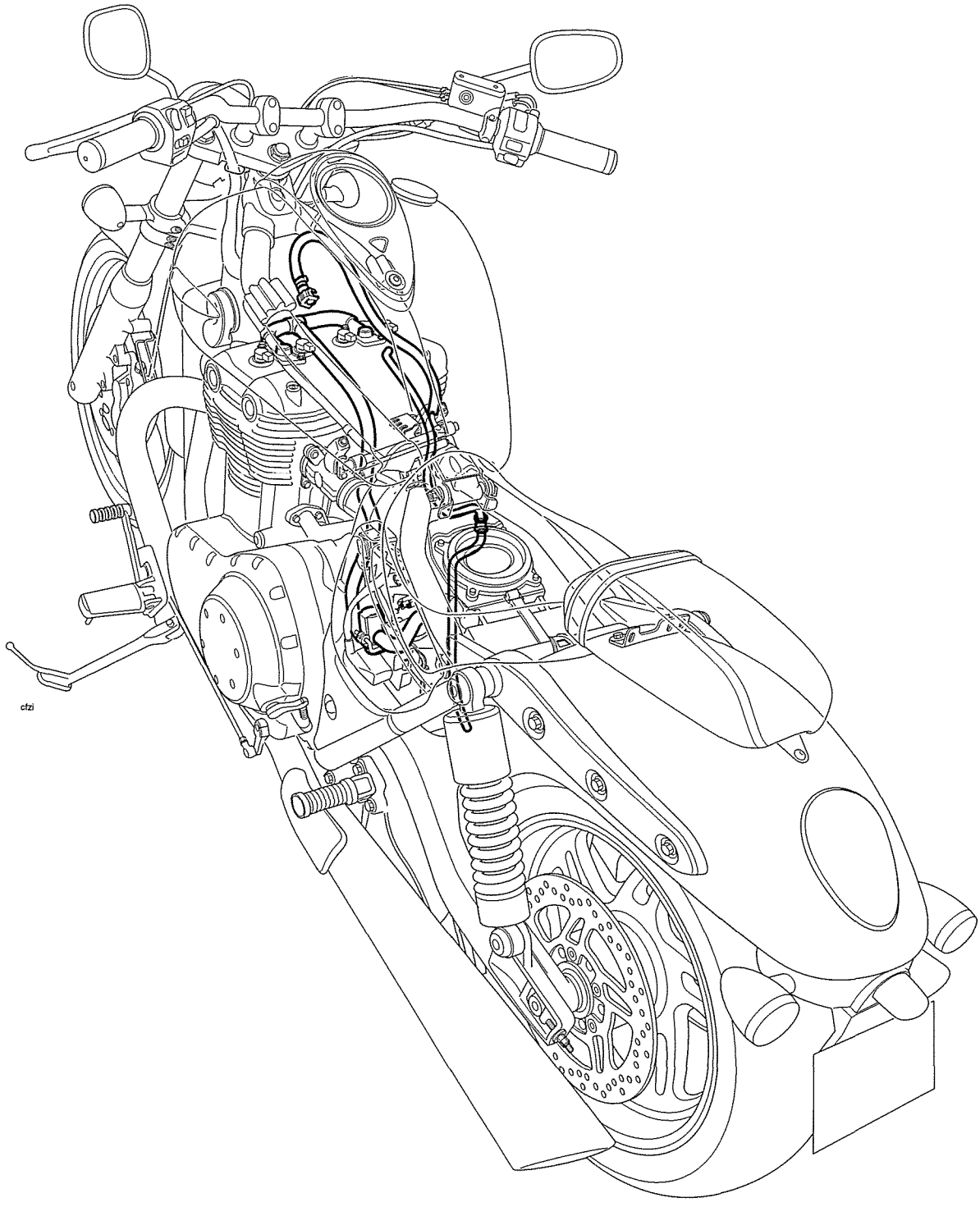
Brake Pipe and Hose Routing - Thunderbird without ABS



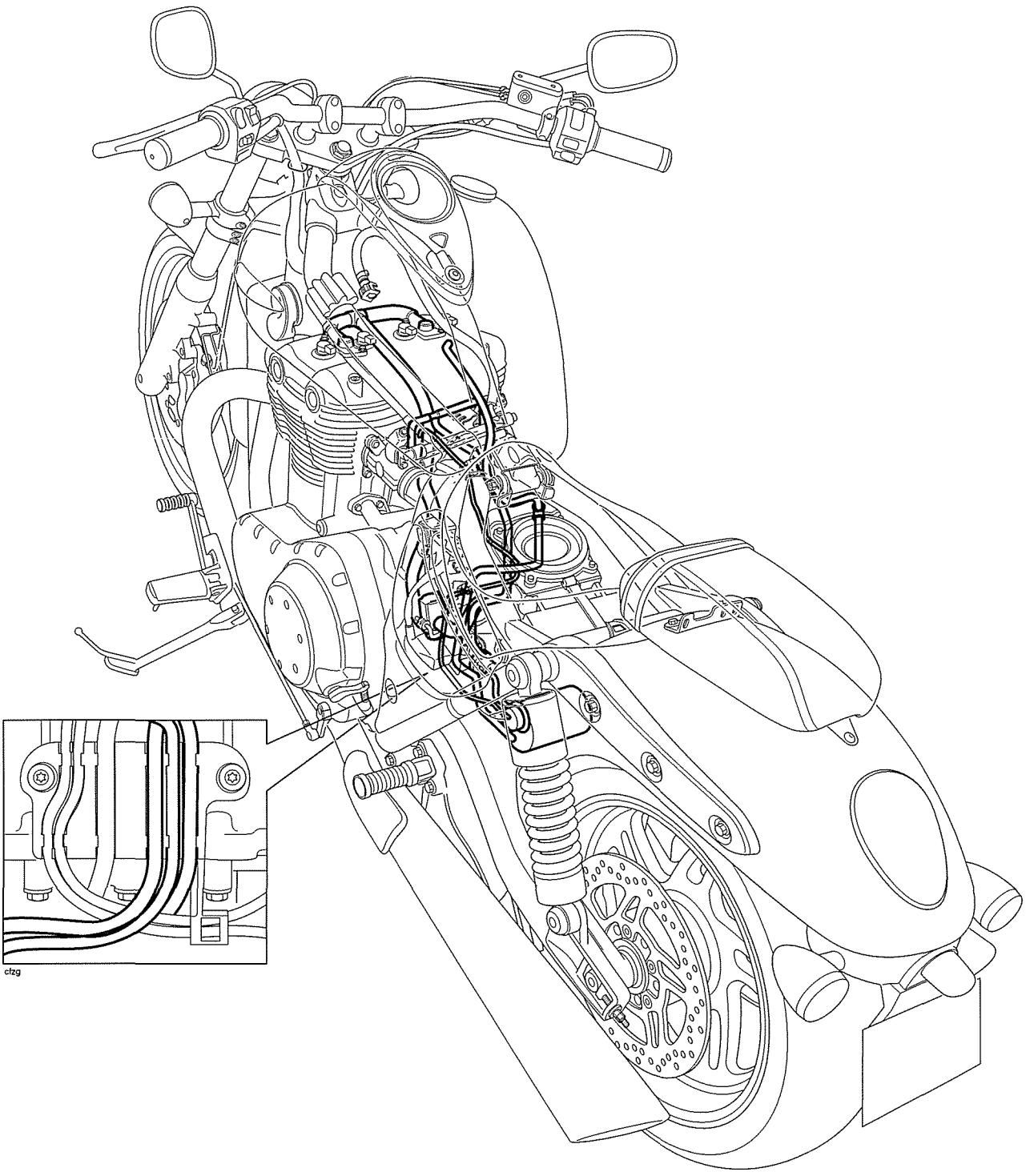
Brake Pipe and Hose Routing - Thunderbird with ABS



Fuel Hose and Fuel Tank Breather Hose Routing (non-evaporative emission control versions)



Fuel Hose and Evaporative/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	Odometer Reading in Miles (Kms) or Time Period, whichever comes first					
		First Service	A Service	B Service	C Service	D Service
	Every	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
Engine - check for leaks	Day	•	•	•	•	•
Engine oil - renew	-	•	•	•	•	•
Engine oil filter - renew	-	•	•	•	•	•
Valve clearances - check	-			•		•
Air cleaner - renew	-			•		•
Engine ECM - check for stored DTCs and latest calibration	-	•	•	•	•	•
Spark plugs - check	-		•		•	
Spark plugs - renew	-			•		•
Throttle bodies - balance	-		•	•	•	•
Throttle cables - check/adjust	Day	•	•	•	•	•
Cooling system - check for leaks	-	•	•	•	•	•
Coolant level - check/adjust	Day	•	•		•	
Coolant - renew	-			•		•
Fuel system - check for leaks, chafing etc.	Day	•	•	•	•	•
Fuel filter - renew	-			•		•
Lights, instruments & electrical systems - check	Day	•	•	•	•	•
Steering - check for free operation	Day	•	•	•	•	•
Headstock bearings - check/adjust	-	•	•	•	•	•
Headstock bearings - lubricate	-			•		•
Forks - check for leaks/smooth operation	Day	•	•	•	•	•
Fork oil - renew	-					•
Brake fluid levels - check	Day	•	•	•	•	•
Brake fluid - renew	Every 2 years					
Brake pads - check wear levels	Day	•	•	•	•	•
Brake calipers - check for fluid leaks and seized pistons	-	•	•	•	•	•
Brake master cylinders - check for fluid leaks	-	•	•	•	•	•
Drive belt tension - check and adjust	Day	•	Every 2,500 Miles (4,000 Km)			
Drive belt - inspect for wear or damage	Day	•	•	•	•	•
Wheels - inspect for damage	Day	•	•	•	•	•
Wheel and drive flange bearings - check for wear/smooth operation	-	•	•	•	•	•
Tyre wear/tyre damage - check	Day	•	•	•	•	•
Tyre pressures - check/adjust	Day	•	•	•	•	•

Operation Description	Odometer Reading in Miles (Kms) or Time Period, whichever comes first					
		First Service	A Service	B Service	C Service	D Service
	Every	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
Fasteners - inspect visually for security	Day	•	•	•	•	•
Clutch cable - check/adjust	Day	•	•	•	•	•
Side stand - check operation	Day	•	•	•	•	•
Fuel and evaporative loss* hoses - renew	-					•

*Evaporative system fitted to California models only.

3 Cylinder Head

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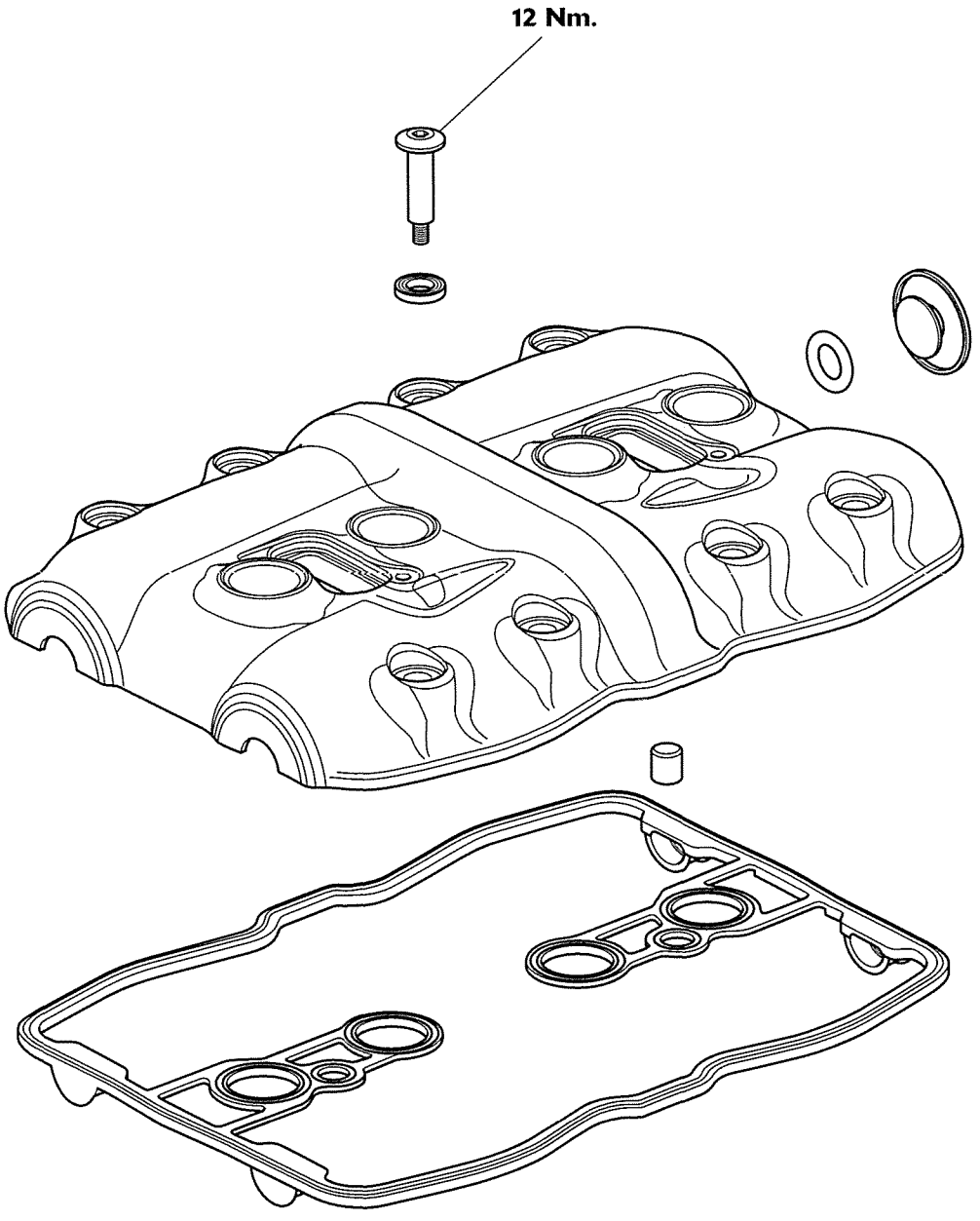
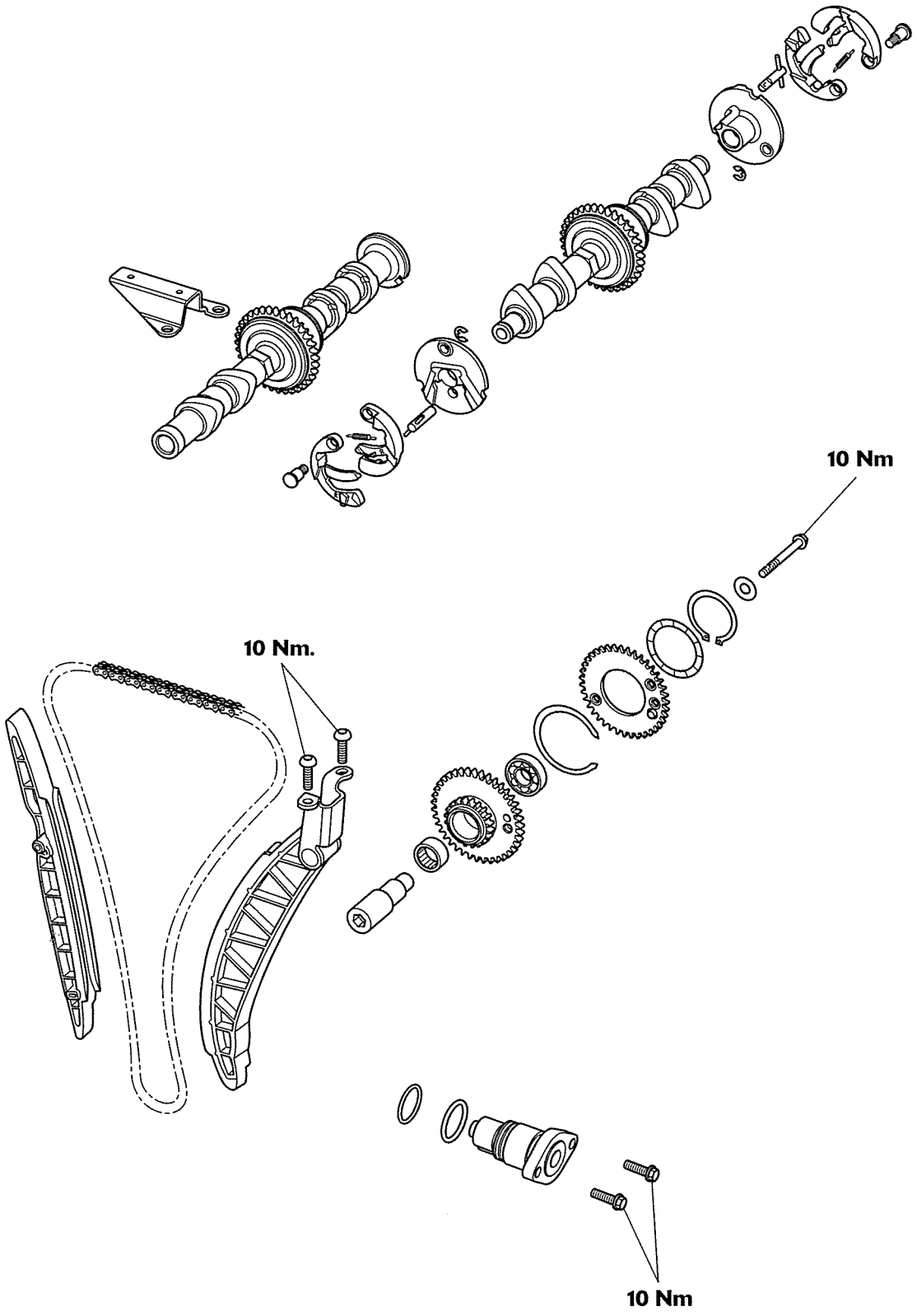
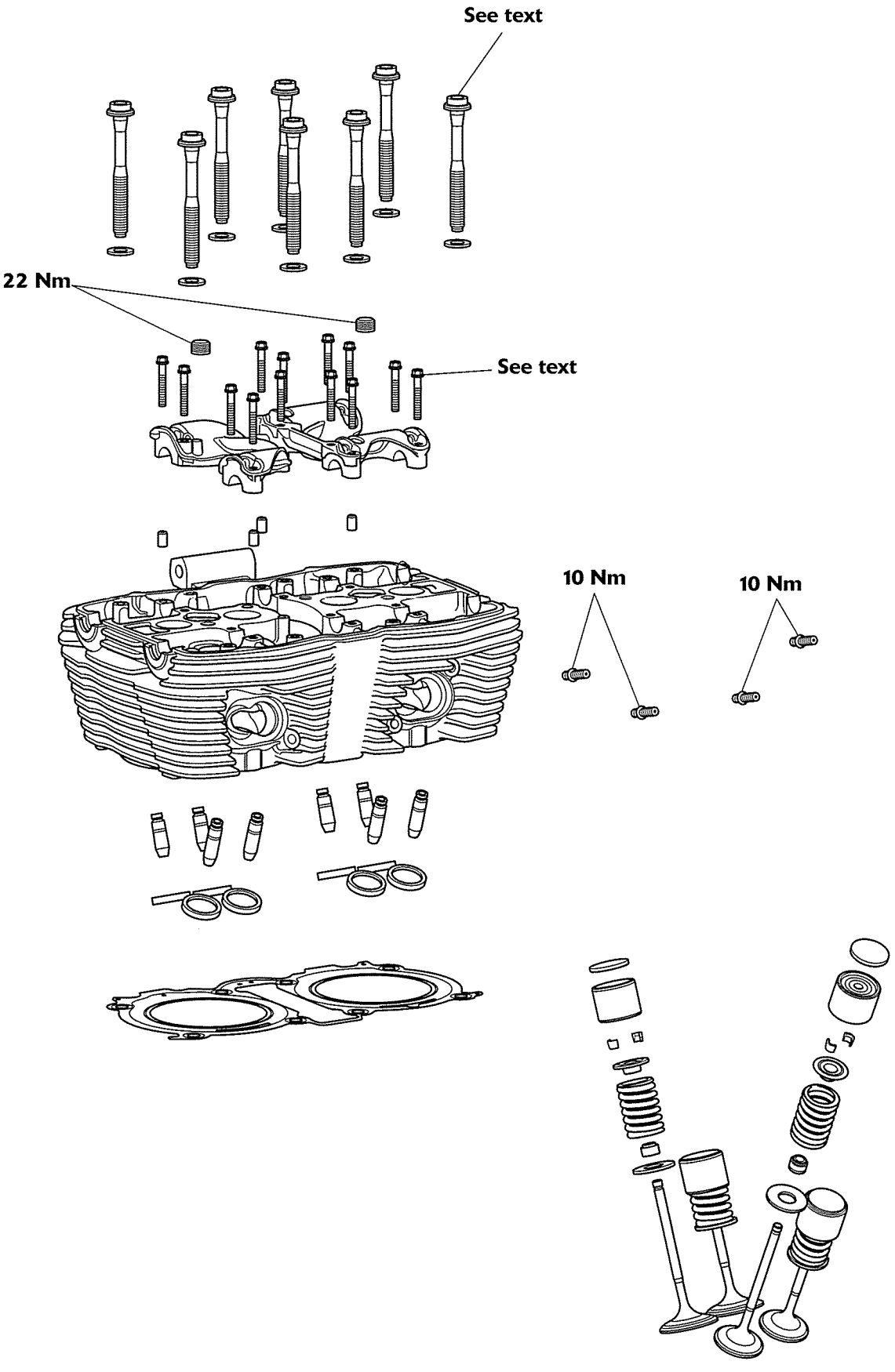
Exploded View - Camshaft Cover



Exploded View - Camshaft and Camshaft Drive



Exploded View - 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, to which various components are permanently added after machining.

A silent-running camshaft drive chain drives the twin-overhead camshafts, which run directly in the cylinder head without additional bearings. The crankshaft drives an idler gear, which in turn drives the camshaft drive chain. The idler gear, and therefore the camshafts, rotate in the opposite direction to the crankshaft.

The engine is fitted with a camshaft drive chain hydraulic tensioner. The tensioner is fed oil via a gallery in the crankcase. The combination of oil pressure and spring pressure pushes the plunger against the tensioner blade which tensions the camshaft drive chain. The hydraulic tensioner has an oil pressure relief valve located in the plunger that is set to open between 12 - 16 bar. The chain is guided by two nylon tensioner blades. The rubbing blade is located in the crankcase by lugs on the blade. The cylinder head must be removed to remove this blade. The tensioner blade is secured to the cylinder head by two bolts at its upper end, and its lower end rests on the tensioner plunger.

The exhaust camshaft is fitted with decompressors on each end. These decompressors use a small camshaft to open the outer exhaust valves at low engine speed to aid starting performance. Once the engine has started, fly weights on the decompressors are thrown outwards by centrifugal force, rotating the cams away from the exhaust valves. The engine will then operate in the normal way.

Valve clearances are adjusted by changing variable thickness shims that sit between the camshaft and valve tappet bucket. The valves are fitted with single, symmetrical valve springs. Both the tip and seat face of the valves are hardened to give a long service life. Due to the assembly methods used, the valve seats and valve guides cannot be replaced.

Oil is supplied to the cylinder head by an internal passageway inside the engine. Once it arrives at the cylinder head, it is passed through a restrictor, and is then delivered to the camshaft bearing journals along grooves in the camshaft ladders. The camshaft lobes are splash fed by oil coming from the camshaft journals.

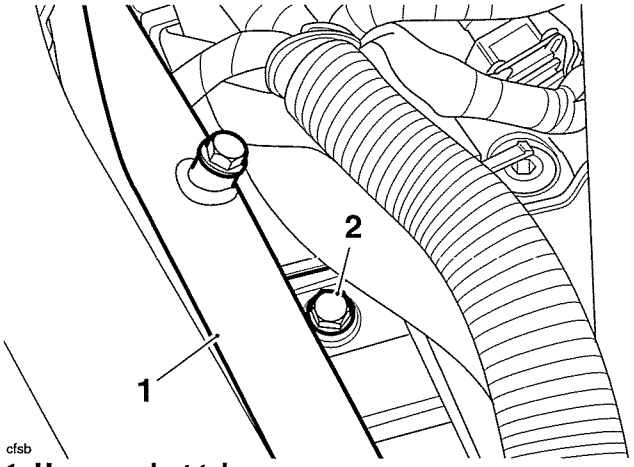
Camshaft Cover

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.

Removal

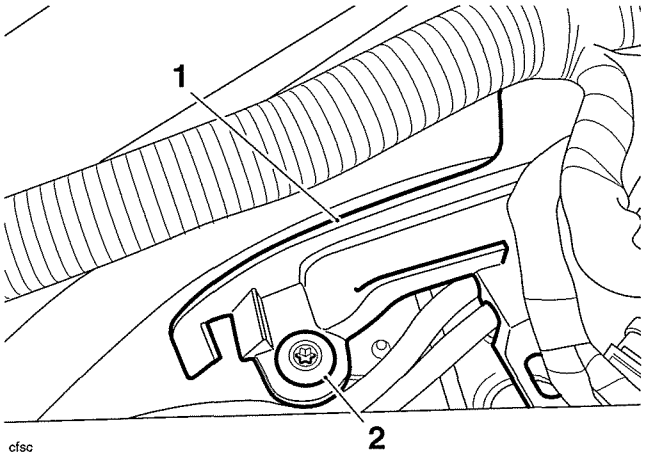
1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Remove the fuel tank (see page *10-86*).
4. Drain the cooling system (see page *11-6*).
5. Remove the upper coolant tube fixing bolt.



1. Upper coolant tube
2. Fixing

6. Release the hose clips securing the upper coolant tube to the thermostat housing hose, top hose and radiator cap housing hose.
7. Ease the upper coolant tube upwards at the rear to release it from the thermostat housing hose.
8. Release the coolant tube from the radiator top hose and then the radiator cap housing hose.
9. Remove the upper coolant tube upwards through the frame rails.
10. Remove both MAP sensors, noting the routing of the MAP sensor hoses and harnesses (see page *10-100*).

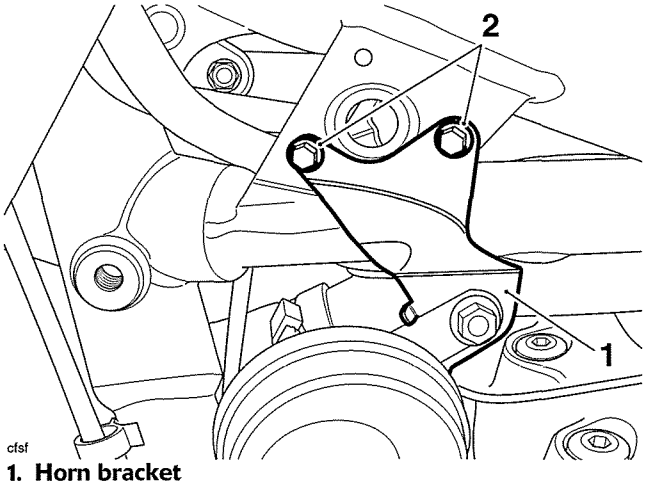
11. Remove the bolt securing the throttle cable and harness guide to the frame.



cfsc

1. Throttle cable and harness guide
2. Fixing

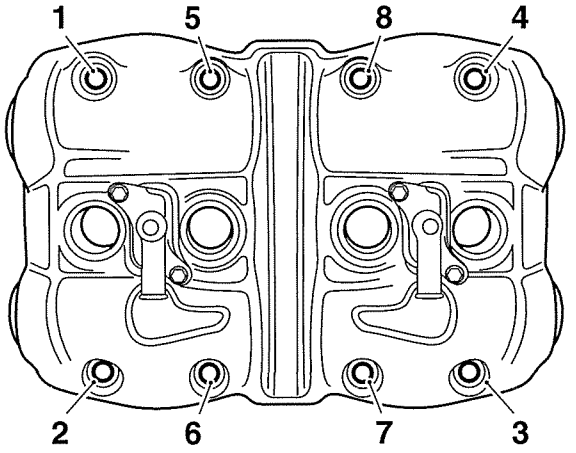
12. Disconnect the MAP sensor hoses at the throttle body.
13. Detach the throttle cables from the throttle cable and harness guide. It is not necessary to disconnect the throttle cable at either the throttle body or twistgrip.
14. Detach both switch cube connectors from the throttle cable and harness guide, and remove the guide ensuring the two MAP sensor hoses remain clipped into the underside.
15. Disconnect the electrical connectors and remove the four ignition coils from the camshaft cover.
16. Detach the secondary air injection hoses from the reed valves on top of the camshaft cover. Position the hoses aside.
17. Release the two fixings and detach the horn bracket from the frame. Position the horn and bracket aside. DO NOT allow the horn to hang unsupported on the horn wiring.



cfsf

1. Horn bracket
2. Fixings

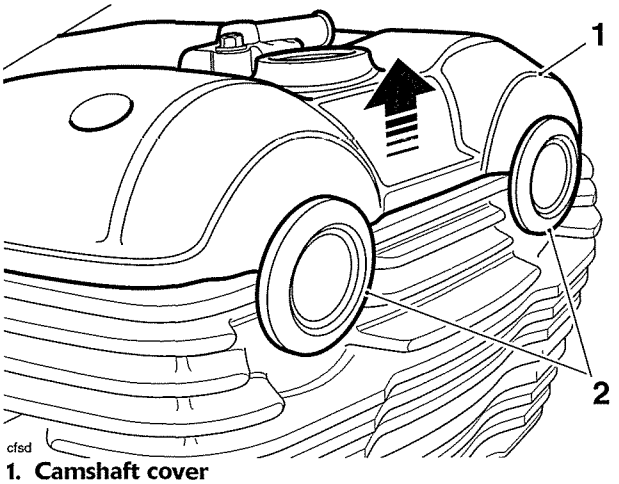
18. Progressively release the camshaft cover bolts in the sequence shown below.



cfsh

Camshaft Cover Bolt Release Sequence

19. Remove all the bolts and bolt seals from the camshaft cover.
20. Raise the camshaft cover and collect the four camshaft cover end caps.



cfsd

1. Camshaft cover
2. End caps (right hand shown)

21. Raise the camshaft cover and manoeuvre it towards the right hand side of the engine, where it can be removed.

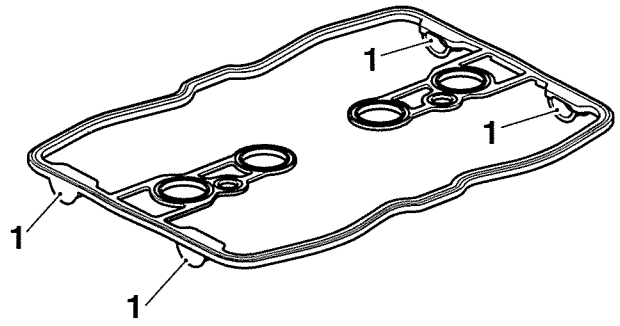
⚠ Caution

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

22. Collect the camshaft cover seal from the head.

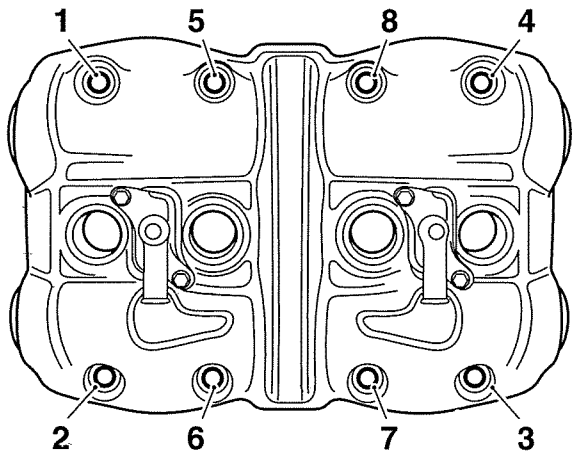
Installation

1. Check the condition of the camshaft cover seal and camshaft cover bolt seals. Replace as necessary.
2. Apply silicone sealant (we recommend ThreeBond 1215 or equivalent) to the cylinder head where the four 'D' sections of the camshaft cover seal fit.



1. 'D' sections

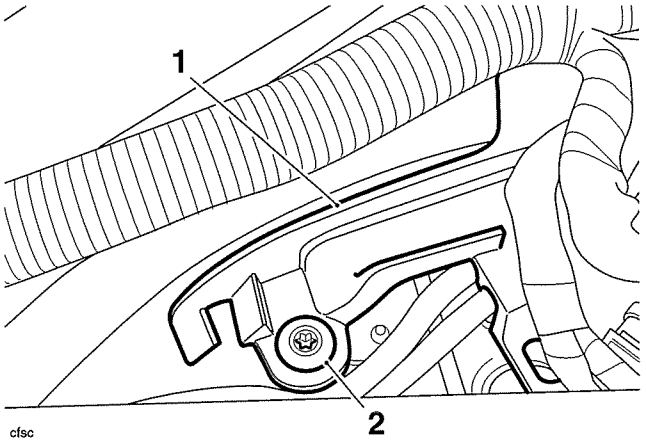
3. Fit the seal ensuring the four 'D' sections seat in the corresponding half-rounds in the cylinder head. Ensure the seal is fitted over the two camshaft cover dowels.
4. Position the camshaft cover to the cylinder head. Ensure that the seal remains in position, and align the camshaft cover to the two dowels.
5. Carefully raise the camshaft cover and fit the four camshaft cover end caps between the camshaft cover and the cylinder head. Ensure the seal is not disturbed during this operation.
6. Lubricate the camshaft cover screw seals with clean engine oil.
7. Fit the camshaft cover bolts, complete with their seals (steel ring side facing upwards) and tighten to finger tight.
8. Progressively and evenly tighten the camshaft cover bolts in the sequence shown below to **12 Nm**.



cfsh

Camshaft Cover Bolt Release Sequence

9. Refit the horn and bracket, tightening the fixings to **7 Nm**.
10. Refit the secondary air injection hose to the reed valves and secure with the clips.
11. Fit the four ignition coils and reconnect the electrical connectors.
12. Reposition the throttle cable and harness guide to the frame, connecting the two MAP sensor hoses as you do so. Ensure the hoses are routed as noted during removal, with the right hand hose (identified with red tape) connected to the right hand throttle.
13. Refit the throttle cable and harness guide fixing, tightening to **7 Nm**.



cfsc

1. Throttle cable and harness guide
2. Fixing

14. Refit the throttle cables to the throttle cable and harness guide.
15. Refit the two MAP sensors (see page *10-100*).
16. Ensure the hose clips are in position on the top hose, radiator cap housing and thermostat housing hose.
17. Position the upper coolant tube to the motorcycle, lowering it down between the frame rails. Connect the tube to the radiator cap housing, top hose then thermostat housing.
    Tighten the hose clips to **2 Nm**.
    Tighten the coolant tube fixing to **7 Nm**.
18. Refill the cooling system (see page *11-6*).
19. Refit the fuel tank (see page *10-98*).
20. Reconnect the battery, positive (identified with red tape) lead first.
21. Refit the rider's seat (see page *17-9*).

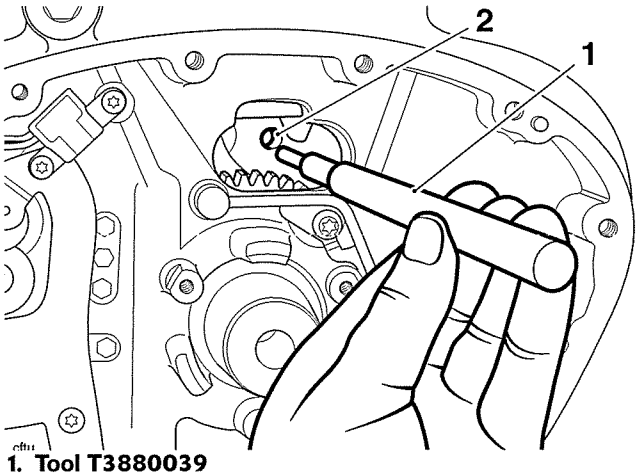
Camshaft Drive Chain Tensioner

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.

Removal

1. Remove the camshaft cover (see page *3-5*).
2. Remove the alternator rotor and stator (see page *18-16*).
3. Turn the engine until the timing pin T3880039 can be inserted through the hole in the crankcase and into the idler gear.



cftu

1. Tool T3880039
2. Timing hole in crankcase

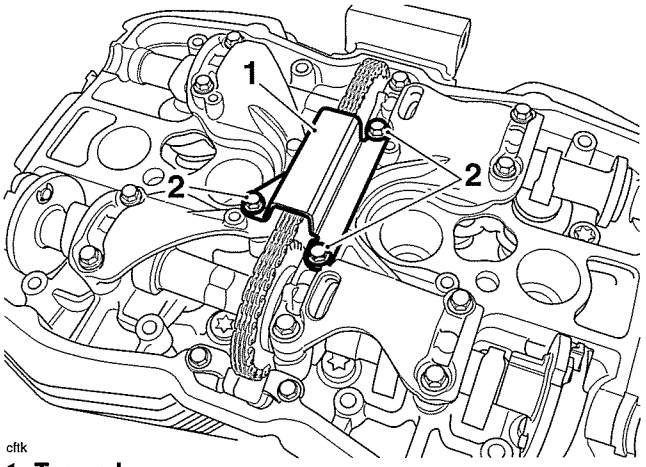
Warning

The plunger of the camshaft drive chain tensioner is under spring tension. Always wear hand, eye and facial protection when removing the tensioner as unprotected areas of the body can be injured if the spring tension is released in an unexpected or uncontrolled way.

Caution

The camshaft timing will be lost when the camshaft drive chain tensioner is removed. Do not refit the camshaft drive chain tensioner without first setting the camshaft timing. Rotating or attempting to start an engine with incorrectly adjusted camshaft timing will result in severe engine damage.

4. Remove the three fixings and remove the camshaft drive chain top pad.



cftk

1. Top pad
2. Fixings

5. Release the fixings and withdraw the camshaft drive chain tensioner from the crankcase.

Inspection

1. Inspect the camshaft drive chain tensioner spring for damage and deformation. Renew as necessary.
2. Inspect the tip of the camshaft drive chain tensioner plunger for wear and damage. Renew as necessary.

Installation

1. Fit new O-rings to the camshaft drive chain tensioner body.

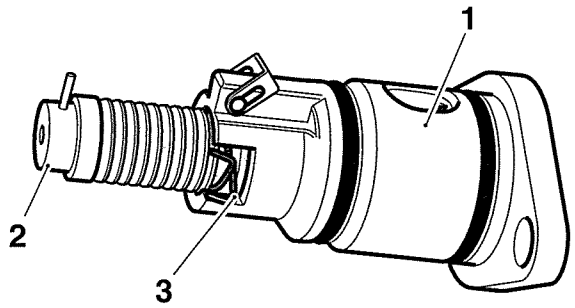
Note:

- **If installing a new camshaft drive chain tensioner, do not release the plunger from its fully compressed, locked condition before fitting.**
- **If installing the original camshaft drive chain tensioner, prior to assembly into the engine it is necessary to reset the plunger to its fully compressed, locked condition.**

Warning

The plunger of the camshaft drive chain tensioner is under spring tension. Always wear hand, eye and facial protection when removing the tensioner as unprotected areas of the body can be injured if the spring tension is released in an unexpected or uncontrolled way.

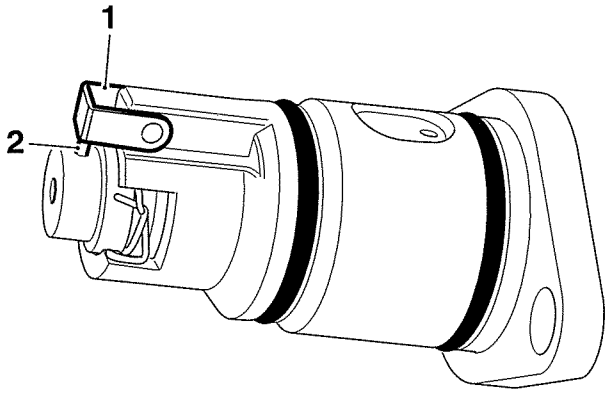
2. To set the camshaft drive chain tensioner plunger to its fully compressed, locked condition, hold the ends of the resister spring together and push the plunger into the tensioner body.



cfth

1. Tensioner
2. Tensioner plunger
3. Resister spring

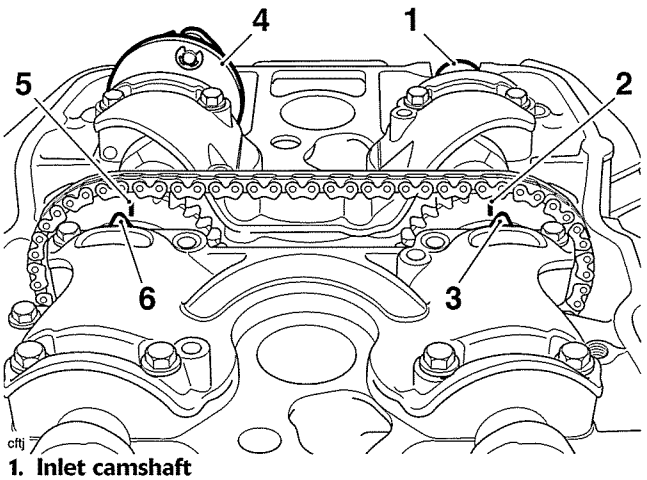
3. Once the plunger is fully compressed, rotate the latch over the pin on the plunger to lock the plunger in position.



cfth

1. Latch
2. Pin

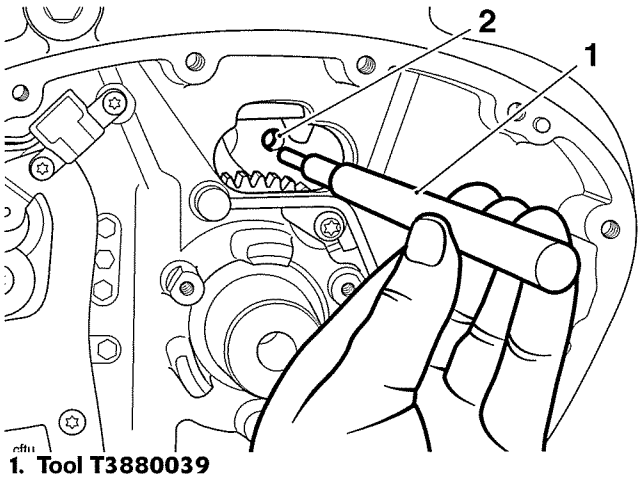
4. Using a suitable spanner on the flats on the camshaft, rotate each camshaft so that the timing marks on each camshaft sprocket points upwards and align with the cast marks on the camshaft ladder; also ensure that the chain slack is towards the camshaft drive chain tensioner (front of engine) side.



cftj

1. Inlet camshaft
2. Inlet camshaft timing mark
3. Camshaft ladder timing mark (inlet)
4. Exhaust camshaft
5. Exhaust camshaft timing marks
6. Camshaft ladder timing mark (exhaust)

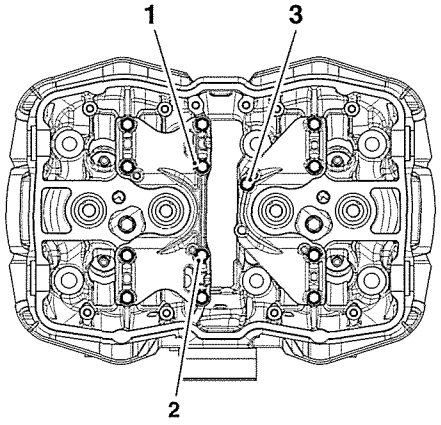
5. Hold the camshaft drive chain in position on the camshaft sprockets and fit the camshaft drive chain tensioner in to the crankcase. Secure with the two bolts and tighten to **10 Nm**.
6. Using the edge of the hand apply a sharp 'tap' to the top of the camshaft drive chain, between the two camshaft sprockets, to release the camshaft drive chain tensioner plunger latch. When the latch is released, the chain will become tight.
7. Remove tool T3880039 from the crankcase.
8. Turn the crankshaft clockwise (as viewed from the left of the engine) through four complete revolutions. Stop when the hole in the crankshaft idler gear realigns with the hole in the upper crankcase and the timing pin can be refitted. Refit the timing pin.



cftu

1. Tool T3880039
2. Timing hole in crankcase

9. Check that the camshaft timing marks align as described previously. Rectify as necessary.
10. When the timing checks have been satisfactorily completed, remove tool 3880039.
11. Refit the top pad. Tighten the fixings to **5 Nm,** and then **10 Nm**, in the sequence shown below.



Camshaft Drive Chain Top Pad Torque Sequence

12. Refit the alternator rotor and stator (see page *18-18*).
13. Refit the camshaft cover (see page *3-7*).

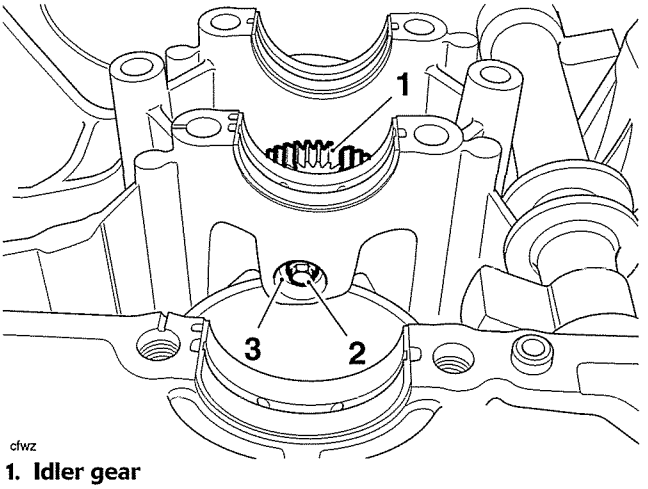
Camshaft Drive Chain and Idler Gear

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.

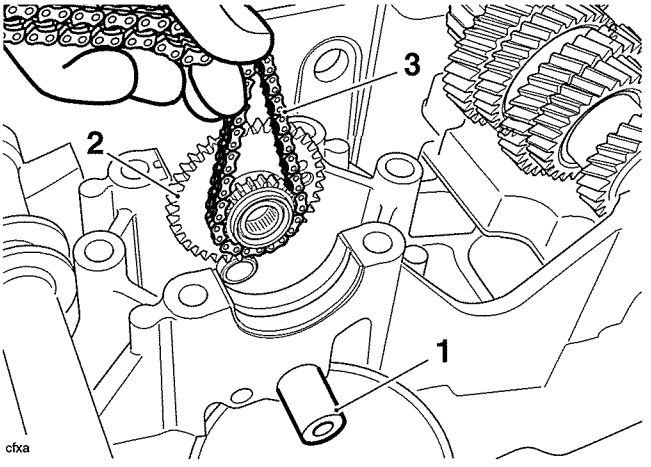
1. Remove the camshaft cover (see page *3-5*).
2. Remove the camshafts (see page *3-15*).
3. Remove the crankshaft (see page *5-9*).
4. Remove and discard the bolt from the idler gear shaft. Retain the washer for re-use.



cfwz

1. **Idler gear**
2. **Bolt**
3. **Washer**

5. Withdraw the idler gear shaft and collect the idler gear and camshaft drive chain from the upper crankcase.



cfxa

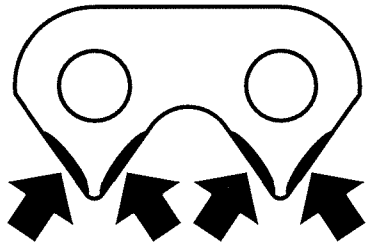
1. **Idler gear shaft**
2. **Idler gear**
3. **Camshaft drive chain**

6. Remove the camshaft drive chain from the idler gear.

Inspection

An in-situ check can be made as follows:

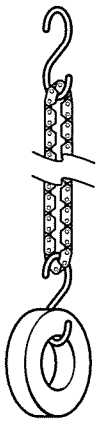
1. Check for significant blue discolouration of the chain plates indicating excessive heat build-up.
2. Examine all pins for signs of rotation.
3. Check for cracking or deep scratching of the chain plates.
4. Check for severe wear of the inner plates as indicated in the diagram below.



ccrv

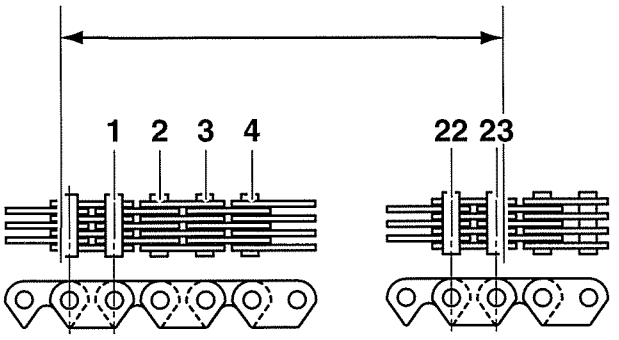
For a more thorough check, proceed as follows:

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



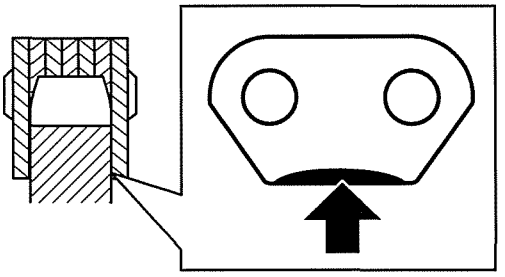
cajs

3. Measure across 23 links as shown in the diagram. If the chain is within limits, the measurement should be no longer than 149.48 mm. Measurements beyond 149.48 mm indicate that the chain must be replaced.



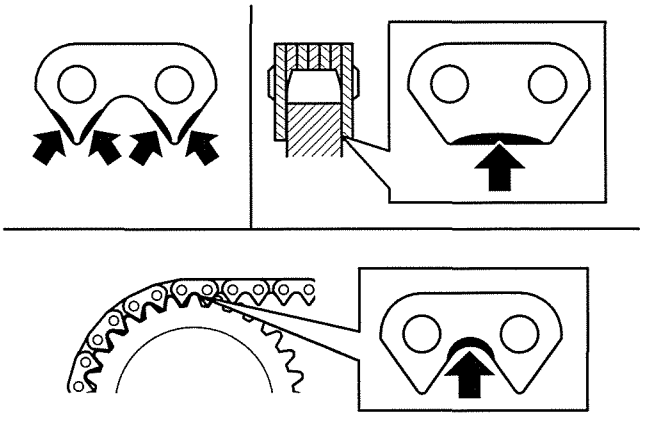
cajt

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.

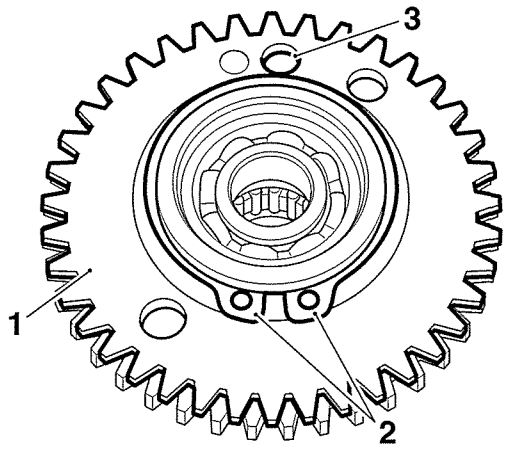


caju

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

Installation

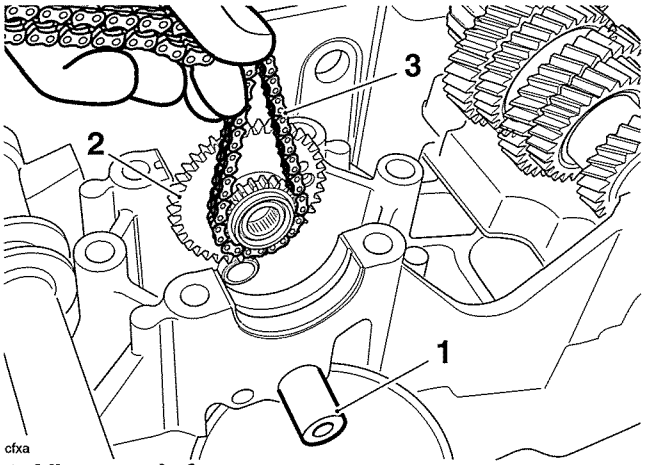
1. Check that the circlip ends are facing away from the timing pin hole in the backlash gear as shown below. This will prevent the circlip from fouling the idler gear pin spanner T3880041 during adjustment of the backlash gear.



cfvz

1. Idler gear
2. Circlip ends
3. Timing pin hole

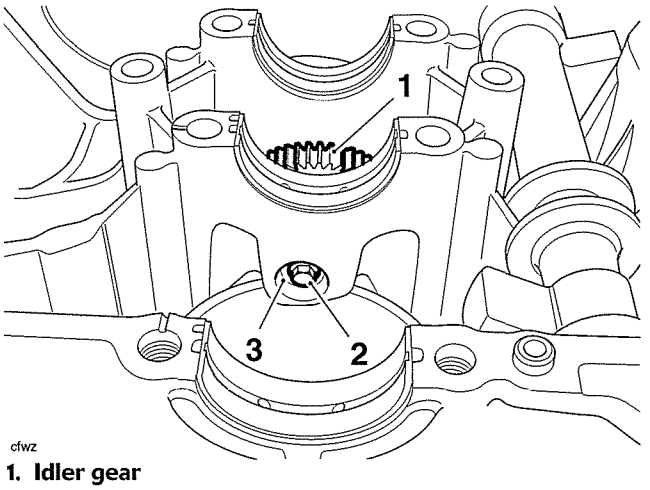
2. Install the camshaft drive chain to the idler gear.
3. Refit the idler gear to the upper crankcase and install the idler gear shaft.



cfxa

1. Idler gear shaft
2. Idler gear
3. Camshaft drive chain

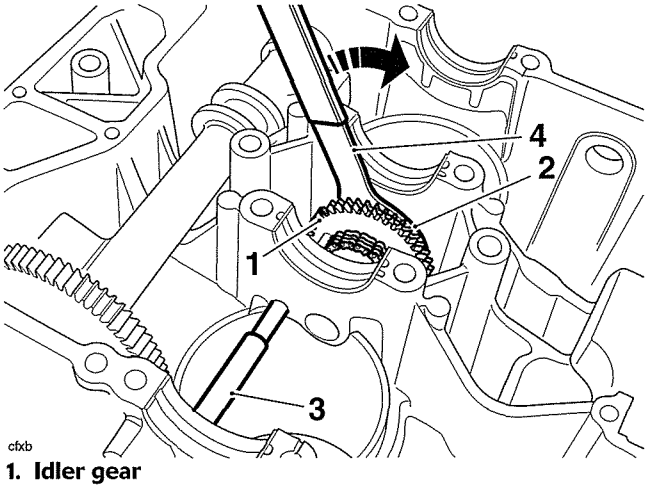
4. Install the washer to a new bolt and fit them to the idler gear shaft. Tighten to **10 Nm**.



cfwz

1. Idler gear
2. Bolt
3. Washer

5. Install the timing pin T3880039 through the hole in the upper crankcase (alternator side) and into the smaller hole in the idler gear. Note that the pin cannot be fully inserted until the backlash gear has been aligned to the idler gear as described below:
6. Engage the pins of service tool T3880041 to the two holes in the backlash gear. Gently rotate the backlash gear against the spring tension until the timing pin T3880039 can be fully inserted through the backlash gear. Remove the idler gear pin spanner T3880041.



cfxb

1. Idler gear
2. Backlash gear
3. Timing pin T3880039
4. Pin spanner T3880041

7. Refit the crankshaft (see page *5-9*).
8. Refit the camshafts (see page *3-15*).
9. Refit the camshaft cover (see page *3-7*).

Camshaft Drive Chain Blades

Removal

Warning

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

Note:

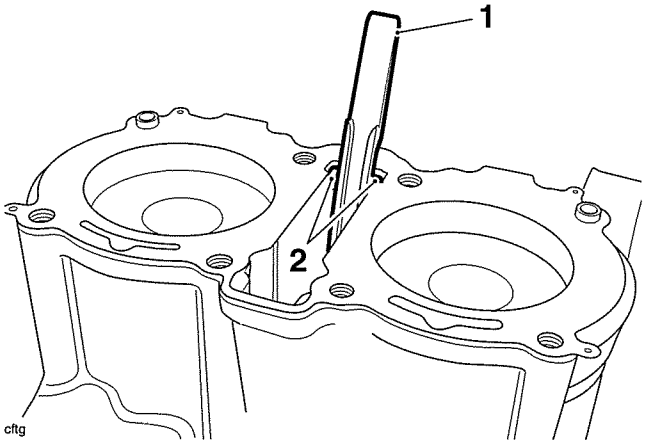
- **The camshaft drive chain rubbing blade can only be removed after the cylinder head has been removed. The camshaft drive chain tensioner blade can be removed after the exhaust camshaft has been removed. This procedure assumes removal of both blades.**

1. Remove the cylinder head (see page *3-20*).

Note:

- **Note the position of the camshaft drive chain rubbing blade upper mounting for installation.**

2. Lift the camshaft drive chain tensioner rubbing blade out of the crankcase.



cftg

1. Camshaft drive chain tensioner rubbing blade
2. Mounting lugs

Inspection

1. Inspect the camshaft drive chain blades for wear or damage. Renew as necessary.

Installation

1. Refit the camshaft drive chain rubbing blade. Ensure the upper mounting lugs are correctly located in the upper crankcase as noted during removal.
2. Refit the cylinder head (see page *3-21*).

Exhaust Decompressors

Disassembly

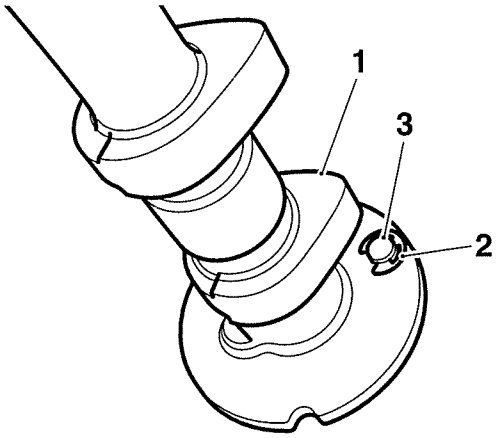
Caution

The decompressor flyweights, and camshafts are handed, and must be installed to the correct side of the exhaust camshaft. Incorrect installation of the flyweights or camshafts may result in poor starting, engine malfunction or engine damage.

Note:

- **It is not necessary to remove the exhaust camshaft from the engine to overhaul the decompressors, however it is recommended to do so to help avoid the loss of components. This procedure shows the exhaust camshaft removed for clarity.**

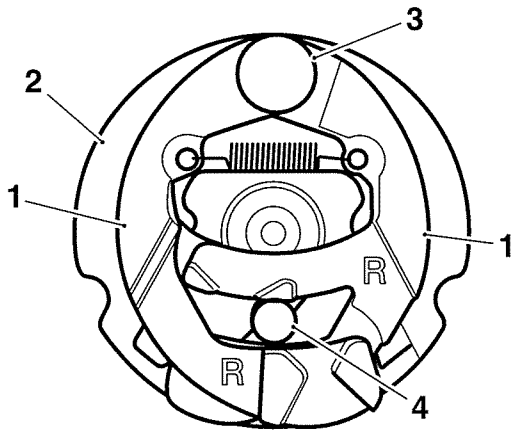
1. Remove and discard the E-clip from the rear of the decompressor boss.



cfto

1. Exhaust camshaft
2. E-clip
3. Pivot pin

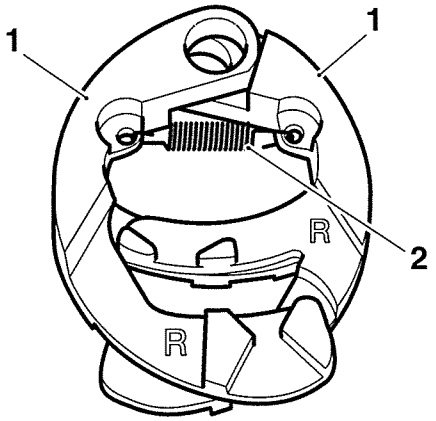
2. Withdraw the pivot pin and both decompressor flyweights. The decompressor camshaft will remain in the decompressor boss.



cftp

1. Flyweights (right hand shown)
2. Decompressor boss
3. Pivot pin
4. Decompressor camshaft

3. Remove the decompressor camshaft from the boss.
4. If necessary remove the spring and separate the two flyweights.



cftm

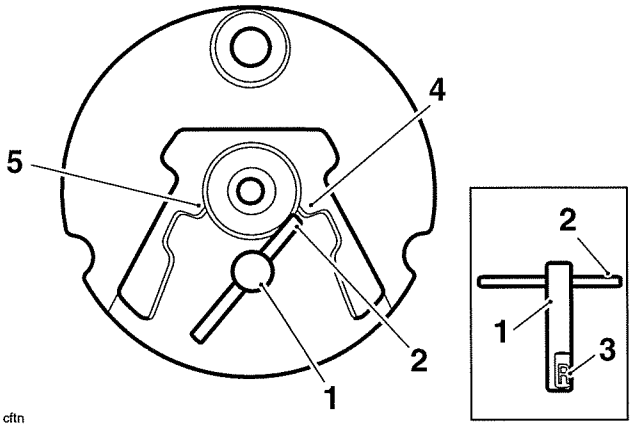
1. Flyweights
2. Spring

Inspection

1. Inspect the decompressor camshafts, flyweights and spring for wear or damage. Rectify as necessary.

Assembly

1. Align the two flyweights and carefully refit the spring. Refit the pivot pin.
2. Refit the decompressor camshaft to the decompressor boss, ensuring the decompressor camshaft marked L is fitted to the left hand camshaft end and the decompressor camshaft marked R is fitted to the right hand camshaft end.
3. Rotate the decompressor camshaft so that the shorter end of the pin is aligned with the left hand (for the left hand decompressor) or right hand (for the right hand decompressor) feature on the decompressor boss as shown below.



cftn

1. Decompressor camshaft (right hand shown)
2. Pin (shorter end shown)
3. Decompressor camshaft marking (right hand shown)
4. Right hand camshaft alignment feature
5. Left hand camshaft alignment feature

4. Refit the flyweight assembly to the decompressor boss, ensuring the flyweights marked L are fitted to the left hand camshaft end and the flyweights marked R are fitted to the right hand camshaft end.
5. Check that the decompressor camshaft rotates when the flyweights are opened. Check that the flyweights close when released.
6. Secure the flyweight pivot pin with a new E-clip.

Camshafts

Removal

Warning

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

Note:

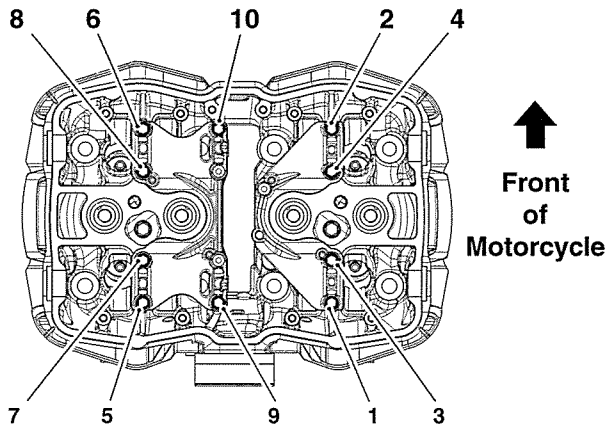
- **Either camshaft can be removed from the cylinder head without complete removal of the camshaft drive chain. However, the camshaft drive chain must first be detached from the camshafts.**

1. Remove the camshaft cover (see page *3-5*).
2. Remove the camshaft drive chain tensioner (see page *3-8*).

Caution

To avoid damage to the camshaft ladders, always ensure as many camshaft lobes as possible are facing away from the valves. This will reduce stress on the camshaft ladders during removal. Damage to the camshaft ladders will result in replacement of the complete cylinder head.

3. Evenly and progressively release the camshaft ladder fixings in the sequence shown below.

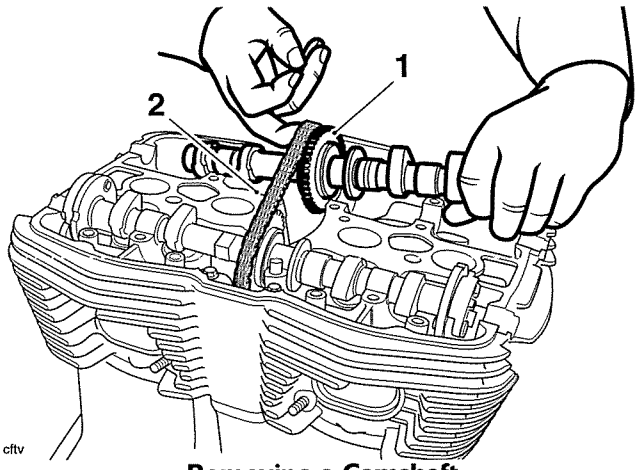


Camshaft ladder release sequence

Caution

Failure to release the camshaft ladder fixings progressively and evenly may result in damage to the camshaft ladder, the camshafts or the cylinder head itself. A damaged camshaft ladder cannot be replaced as an individual item. It can only be obtained as part of a new cylinder head.

4. Once all the upward force on the camshaft ladders have been progressively released, collect all of the bolts and remove the ladders.
5. Secure the camshaft drive chain to prevent it from falling into the crankcase.
6. Lift the camshaft drive chain from one of the camshafts to allow removal of the camshaft from the cylinder head.



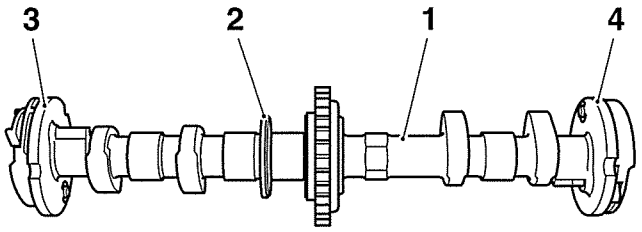
Removing a Camshaft

1. Inlet camshaft
2. Camshaft drive chain

7. Repeat for the second camshaft.

Camshaft identification

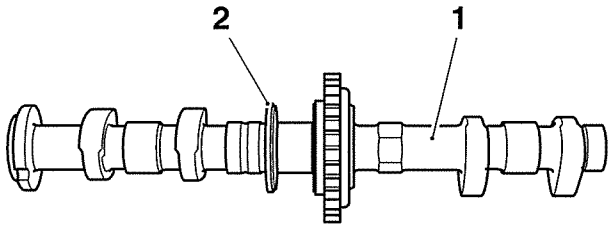
The exhaust camshaft can be identified by the decompressor fitted to each end. The inlet camshaft has no decompressors fitted.



cftq

Camshaft Identification (Exhaust - viewed from the rear of the engine)

1. **Exhaust camshaft**
2. **Thrust face**
3. **Left hand decompressor**
4. **Right hand decompressor**



cfue

Camshaft Identification (Inlet - viewed from the rear of the engine)

1. **Inlet camshaft**
2. **Thrust face**

Inspection

1. Inspect the camshaft sprockets for damage and worn or broken teeth.
2. Inspect the bearing surfaces in the cylinder head and camshaft ladder. If wear or damage is found, the cylinder head must be replaced.
3. Inspect the camshaft drive chain (see page *3-11*).
4. Inspect the decompressors for damaged or missing flyweights or worn or broken springs. Carefully inspect the cam on each decompressor for damage or wear.
5. Check camshaft journal to camshaft ladder clearance using Plastigage (Triumph part number 3880150-T0301) as follows:

⚠ Caution

During the following procedure, the engine must not be rotated. Damage to valves, pistons and the cylinder head can result from rotating the engine.

a) Position a camshaft to the cylinder head in its correct location, (inlet camshaft to inlet valves, exhaust camshaft to exhaust valves). Ensure that the timing marks on the camshaft sprocket are positioned as for removal.

b) Wipe the exposed areas of one of the camshaft journals and the corresponding position on the camshaft ladder.

c) Apply a thin smear of grease to the wiped camshaft journal and a small quantity of silicone release agent to the corresponding position on the camshaft ladder.

d) Size a piece of Plastigage to fit across the wiped camshaft journal.

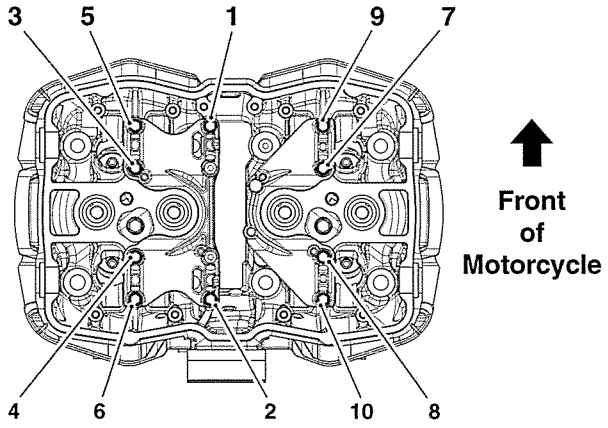
e) Fit the Plastigage to the camshaft journal using the grease to hold it in place.

f) Position the camshaft ladder to the cylinder head, aligning bearing areas with camshaft journals. At this stage, it is not necessary to fit the camshaft drive chain top pad.

g) Finger-tighten the camshaft ladder bolts until the under-head areas are in contact with the camshaft ladder.

h) In the sequence shown below evenly and progressively tighten the camshaft ladder bolts, approximately half a turn each, until the camshaft ladder is in full contact with the

cylinder head. Further tighten the camshaft ladder bolts to **5 Nm**.

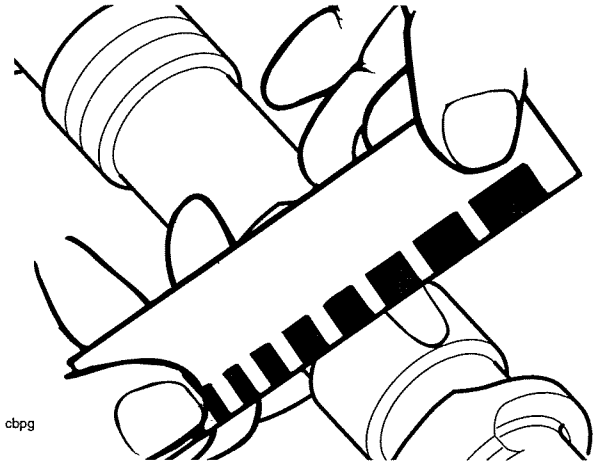


Camshaft Ladder Tightening Sequence

i) In the same sequence, torque each camshaft ladder bolt to **10 Nm**.

j) Release and remove the camshaft ladder as previously described.

k) Utilising the gauge provided with the Plastigage kit, measure the width of the now compressed Plastigage.



Taking a Plastigage Measurement

6. Calculate the camshaft journal clearance using the chart provided with the Plastigage kit.
7. If the journal to camshaft ladder clearance is within the specified tolerances (see table below), remove the camshaft ladder and clean off all traces of Plastigage, silicone release agent and grease.

Standard	0.025 - 0.066 mm
Service limit	0.105 mm

8. Check the diameter of the camshaft journals.

Standard	22.955 - 22.975

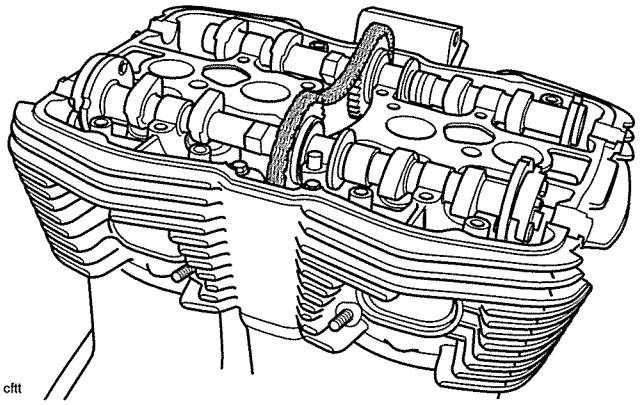
9. If any of the journal to camshaft ladder clearances are outside the specified tolerances, but the camshaft journals are within their specified tolerances, the cylinder head must be replaced.

Installation

1. Correctly identify the inlet and exhaust camshafts as previously described (see page *3-16*).
2. Position the camshafts to the two banks of valves ensuring that the inlet camshaft is located to the inlet valves and the exhaust camshaft to the exhaust valves.
3. Working on one camshaft at a time, locate the camshaft drive chain over the camshaft sprockets.
4. Ease the camshaft drive chain away from the sprockets then turn each camshaft until as many lobes as possible are facing away from the valves. Allow the chain to drop back onto the camshafts.

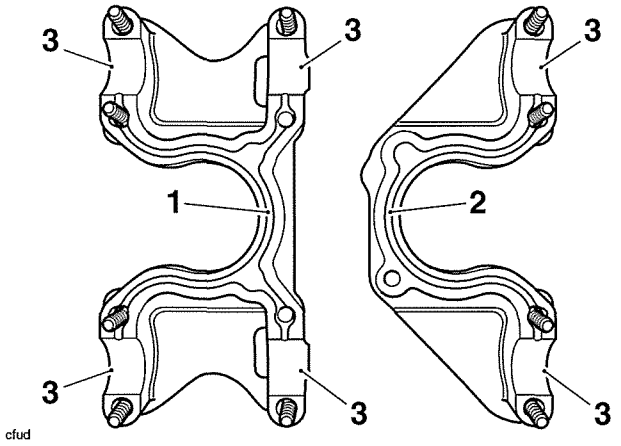
⚠ Caution

To avoid damage to the camshaft ladder, always ensure as many camshaft lobes as possible are facing away from the valves. This will reduce stress on the camshaft ladder during assembly. Damage to the camshaft ladder will result in replacement of the complete head.



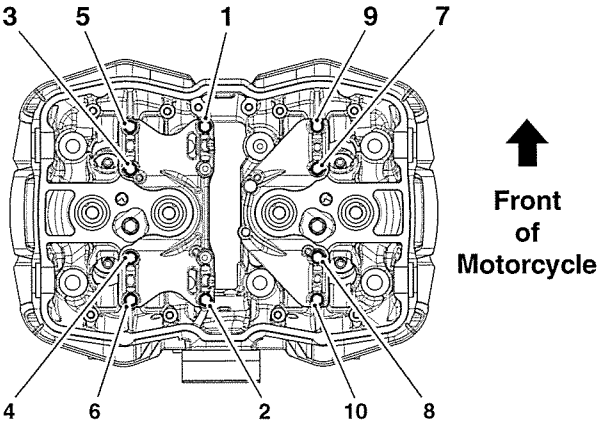
Located Camshafts

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



1. Left hand camshaft ladder
2. Right hand camshaft ladder
3. Camshaft bearing areas

6. Lubricate the threads of the camshaft ladder bolts with clean engine oil.
7. Position the camshaft ladder to the cylinder head, aligning the bearing areas with the camshaft journals.
8. Finger-tighten the camshaft ladder bolts until the bolt under-head areas are in contact with the camshaft ladder.
9. In the sequence shown below evenly and progressively tighten the camshaft ladder bolts, approximately half a turn each, until the camshaft ladder is in full contact with the head. Further tighten the camshaft ladder bolts to **5 Nm**.



Camshaft Ladder Tightening Sequence

10. In the same sequence, torque each camshaft ladder bolt to **10 Nm**.
11. Refit the camshaft drive chain tensioner (see page *3-7*).
12. Check all valve clearances (see page *3-19*). Adjust as necessary to give the correct clearances.
13. Refit the camshaft cover (see page *3-7*).

Valve Clearances

Camshaft, valve, valve shim and valve seat wear affect the valve clearances. The effect of this wear is to change the clearance between the camshaft and the adjustment shim, causing engine noise and/or improper running. If the valve clearances are incorrect, permanent damage to components in the valve-train will take place and engine performance will be affected.

Correct valve clearances are in the range given in the table below.

Inlet	0.10 to 0.15 mm
Exhaust	0.15 to 0.20 mm

Note:

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

1. Remove the camshaft cover (see page *3-5*).
2. Remove a spark plug from each cylinder to reduce compression resistance when turning the engine.
3. Select a high gear and, using the rear wheel, turn the engine over until a pair of camshaft lobes are positioned pointing directly away from the valves.
4. Using feeler gauges, measure and record the clearances for this pair of valves only.
5. Repeat the process until the clearances for all valves have been checked.

   If any of the recorded clearances fall outside the specified range, adjustments must be made. If all measured clearances are within tolerance, refit the camshaft cover (see page *3-7*).

Valve Clearance Adjustment

Note:

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

1. Measure and record all valve clearances as described previously.
2. Remove the camshafts (see page *3-15*).
3. Remove a shim from one of the valves whose clearance required adjustment.
4. Measure the original shim, using a micrometer.
5. Calculate the shim thickness required to give the correct clearance. Clearance too small; fit a thinner shim. Clearance too large; fit a thicker shim.

Note:

- **Shims are available ranging from 2.00 mm to 3.20 mm in increments of 0.025 mm.**

6. Fit the selected shim to the tappet bucket.
7. Repeat the procedure until all valves requiring adjustment have been correctly set.
8. Refit the camshafts (see page *3-7*).
9. Rotate the engine several times to fully seat the shims.
10. Repeat the clearance checks on all valves, adjust as necessary.
11. Refit the camshaft cover (see page *3-7*).

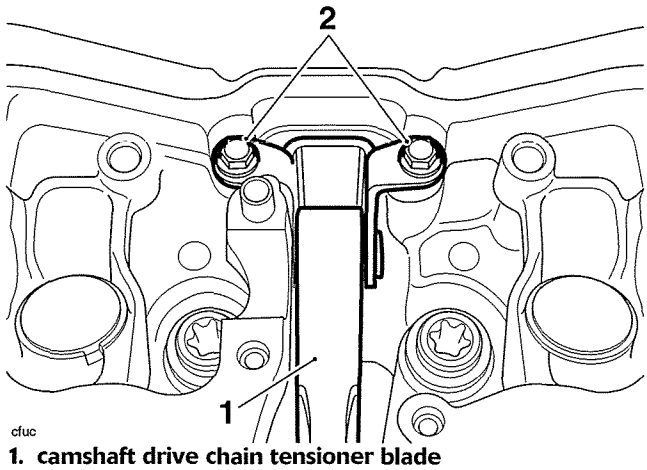
Cylinder Head

Removal

Warning

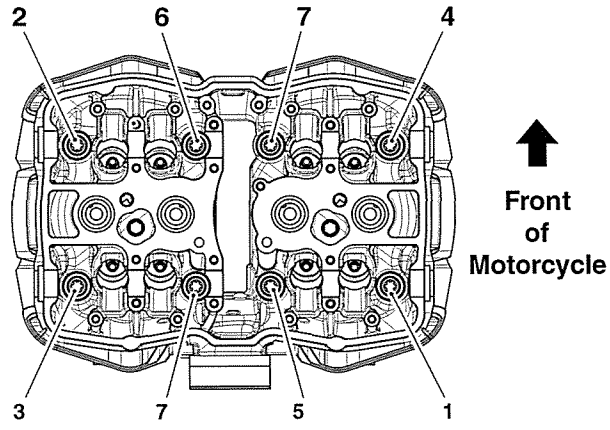
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Remove the fuel tank (see page *10-86*).
2. Remove the radiator (see page *11-10*).
3. Remove the exhaust header system (see page *10-118*).
4. Remove the throttle bodies (see page *10-103*).
5. Remove the camshafts (see page *3-15*).
6. Release the two bolts and remove the camshaft drive chain tensioner blade.



1. camshaft drive chain tensioner blade
2. Bolts

7. Disconnect the coolant temperature sensor connection.
8. Identify the position of each of the tappet buckets and shims before removing them from the head.
9. Progressively release the cylinder head bolts in the order shown below.



Head Bolt Release Sequence

10. Remove and discard the cylinder head bolts.
11. Remove the cylinder head from the crankcase.

Note:

- **If necessary, lightly tap the head with a soft-faced mallet to break the gasket seal.**

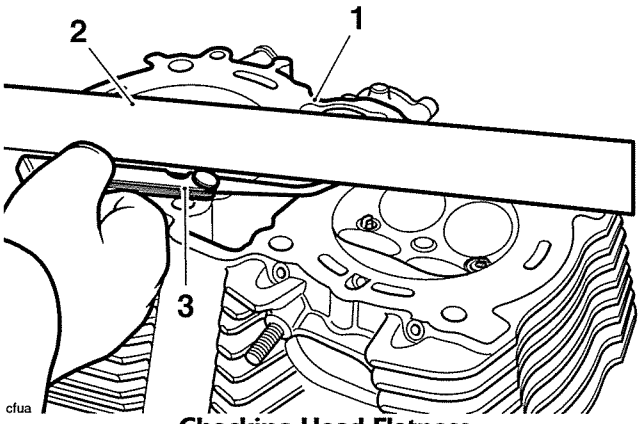
12. Remove and discard the head gasket.
13. Remove the cylinder liners (see page *5-18*).

Note:

- **Cylinder liners must be re-sealed if the head is removed.**

Inspection

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



Checking Head Flatness

1. **Cylinder head gasket face**
2. **Straight edge**
3. **Feeler gauges**

Cylinder head flatness tolerance	0.030 mm

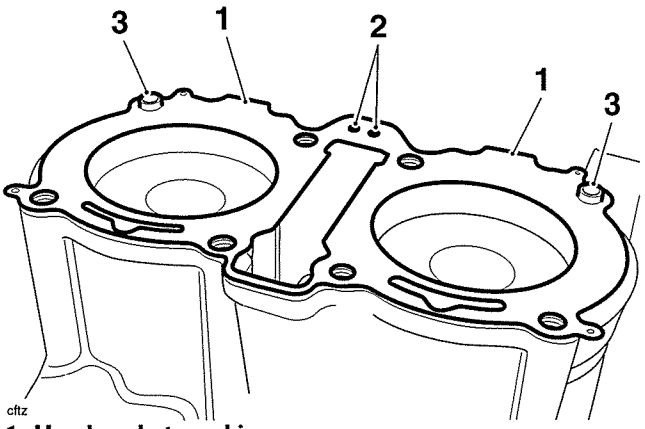
3. Check the camshaft drive chain rubbing blades. Renew if worn or damaged.

Caution

Ensure all traces of fluid (coolant, oil etc.) are removed from the threaded holes in the crankcase. Should any fluid remain in any of the threaded holes, severe crankcase damage could result from hydraulic locking of head bolts on assembly of the engine.

Installation

1. Thoroughly clean the upper faces of the crankcase and liners. Also clean the liner to crankcase mating faces.
2. Fit the cylinder liners (see page *5-19*).
3. Refit the camshaft drive chain rubbing blade (see page *3-13*).
4. Ensure that both head dowels remain in position in the crankcase.
5. Position a new cylinder head gasket to the crankcase, ensuring the gasket is fitted with the lettering uppermost and the oil restrictor holes to the rear.



1. **Head gasket markings**
2. **Oil restrictor holes**
3. **Dowels**

6. Lower the cylinder head over the camshaft drive chain rubbing blade and locate it onto the dowels.

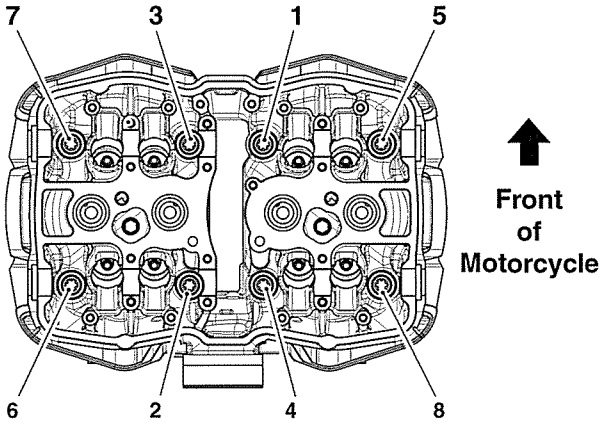
Caution

Cylinder head bolts must never be reused and must always be replaced if removed or loosened.

Use the correct procedure to tighten the cylinder head bolts carefully following the three-stage procedure below. This will ensure the long-term reliability of the cylinder head gasket.

Failure to follow the correct tightening procedure or reuse of old head bolts may lead to engine damage and premature failure of the cylinder head gasket.

7. In the sequence shown below, tighten the cylinder head bolts in four stages as follows:



Cylinder Head Bolt Tightening Sequence

8. In the sequence shown above, tighten the bolts to **20 Nm**.
9. In the sequence shown above, tighten the bolts to **50 Nm**.
10. In the sequence shown above, tighten the bolts to **70 Nm**.
11. In the sequence shown above, tighten the bolts through a further 90° using tool 3880105-T0301 or similar to measure the torque-angle.
12. Lubricate the tappet buckets with a 50/50 solution of molybdenum disulphide grease and engine oil, then refit them and the valve shims to their original locations in the head.
13. Refit the camshafts (see page *3-15*).
14. Check and adjust the valve clearances (see page *3-19*).
15. Reconnect the coolant temperature sensor.
16. Refit the throttle bodies (see page *10-105*).
17. Refit the exhaust system (see page *10-101*).
18. Refit the radiator (see page *11-11*).
19. Refit the fuel tank (see page *10-98*).
20. Start the engine and allow it to idle while checking for air, oil, coolant and exhaust leaks. Rectify as necessary.
21. Check and top up the cooling system (see page *11-5*).
22. Check and top up the engine oil level (see page *8-6*).

4 Clutch

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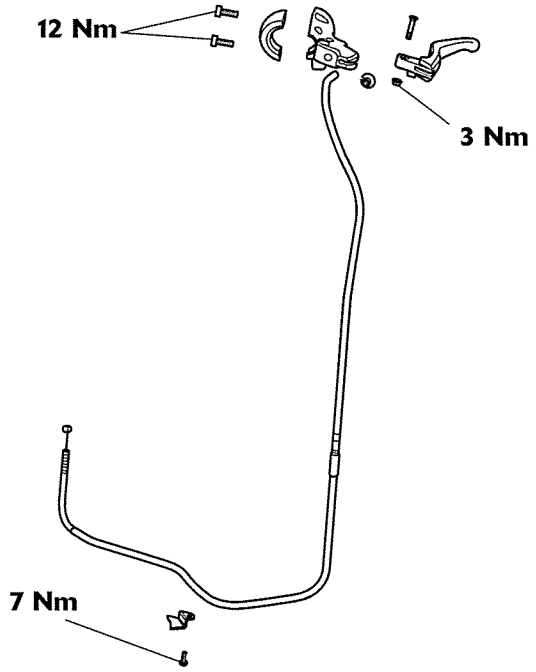
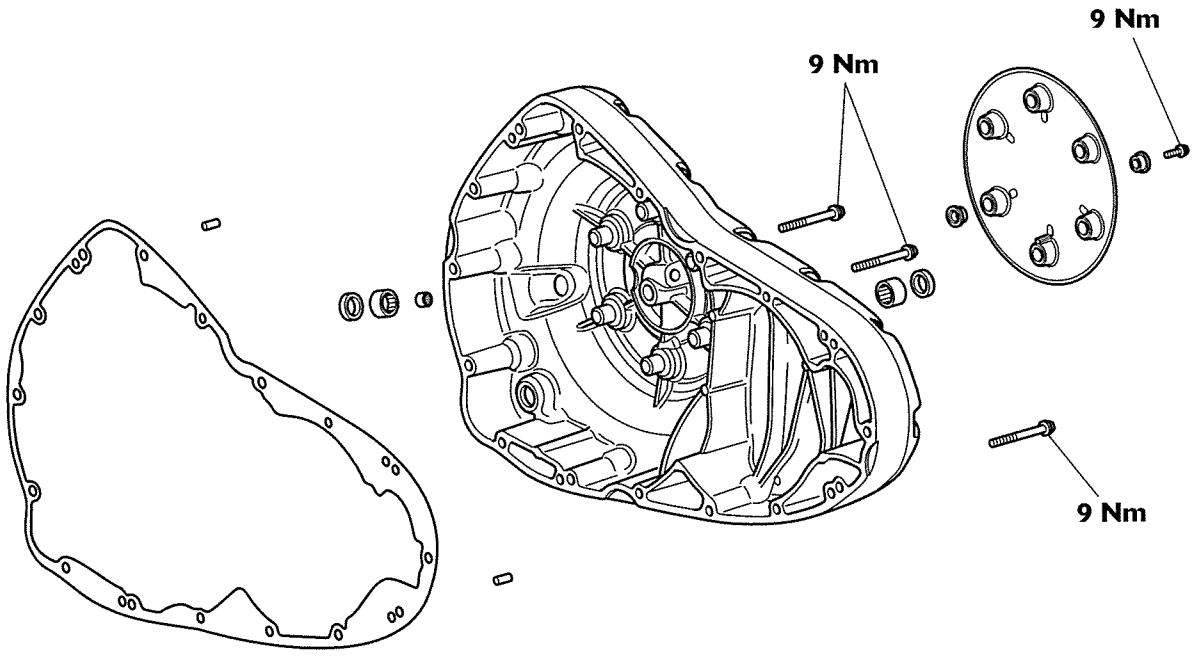
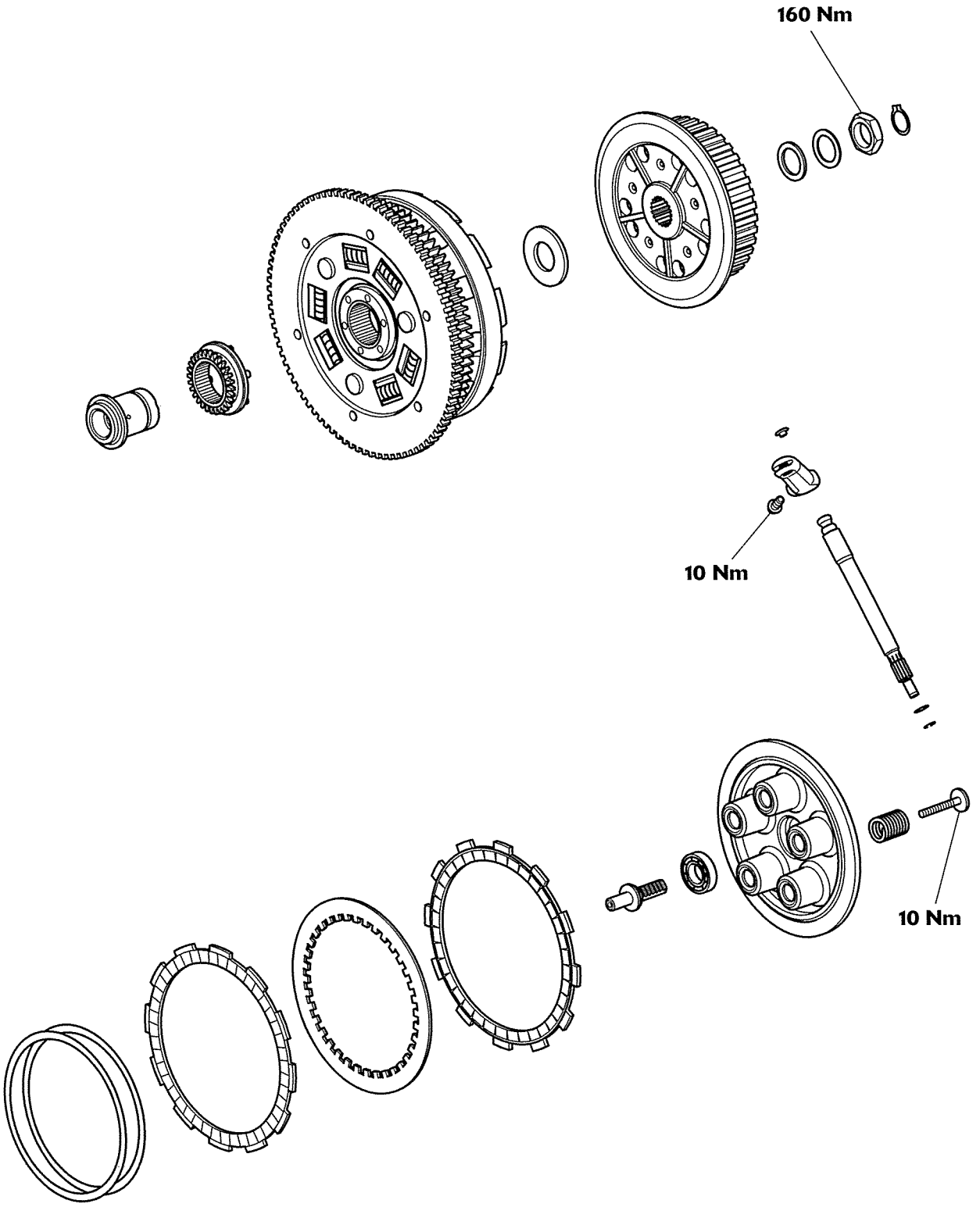
Exploded View - Clutch Controls



Exploded View - Clutch Cover



Exploded View - Clutch



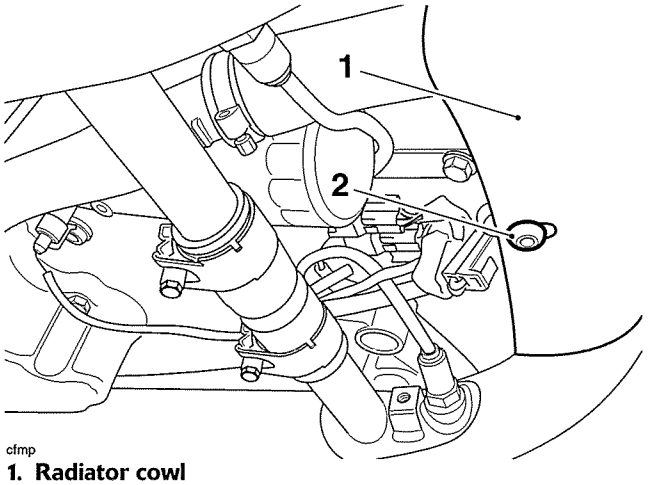
Clutch Cable

Removal

Warning

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

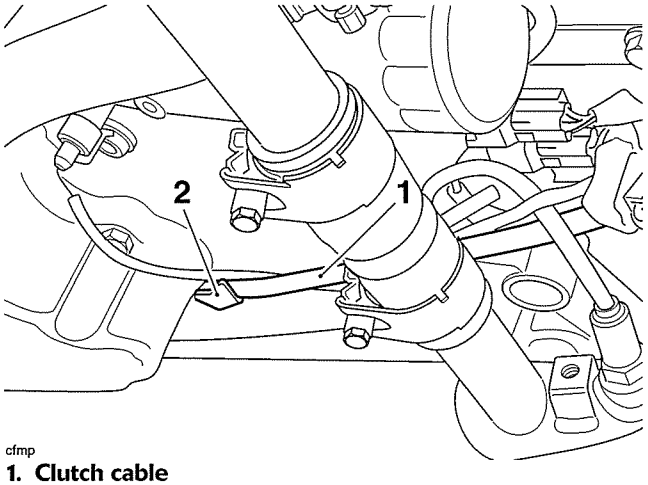
1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Release the fixing and remove the radiator cowl.



cfmp

1. Radiator cowl
2. Fixing

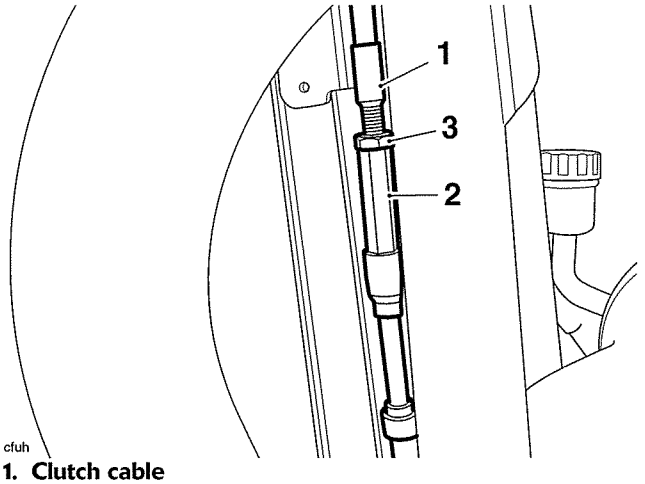
4. Release the fixing and remove the cable retaining bracket from the lower crankcase, located to the left of the sump.



cfmp

1. Clutch cable
2. Cable retaining bracket

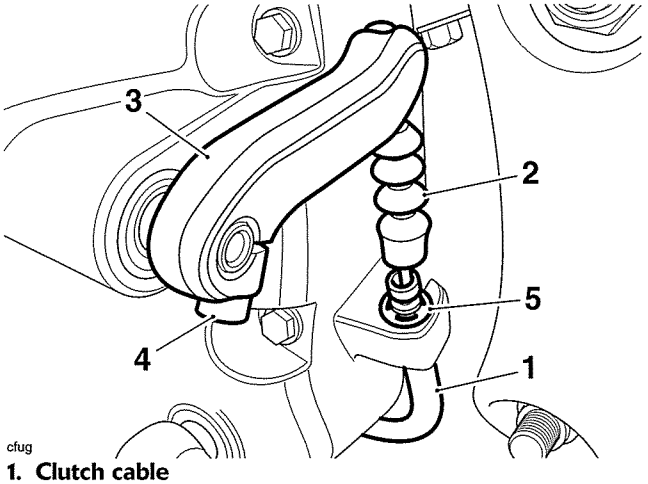
5. Slacken the cable locknut and release the adjuster adjacent to the radiator to give maximum play in the cable.



cfuh

1. Clutch cable
2. Adjuster
3. Locknut

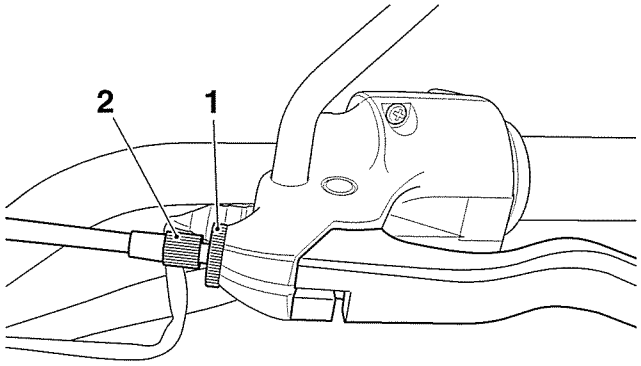
6. Detach the clutch cable boot and slide it up the inner cable to allow access to the E-clip on the clutch cable outer. Remove the E-clip.
7. Release the fixing and detach the clutch actuating arm from the clutch shaft. Rotate the arm to remove it from the clutch cable.
8. Release the clutch cable from the boss on the clutch cover.



cfug

1. Clutch cable
2. Boot
3. Actuating arm
4. Fixing
5. E-clip

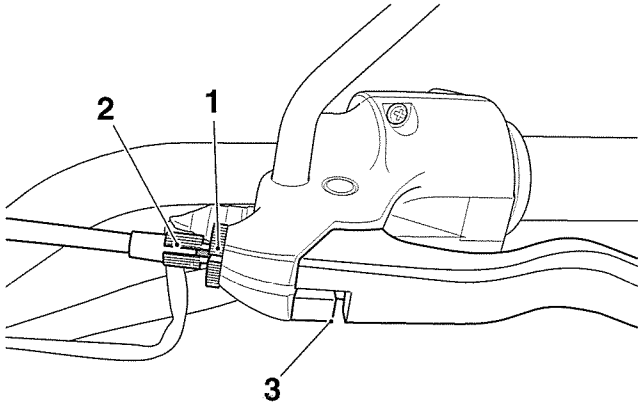
9. Align the slots in the lever adjuster and locknut.



cfgp

1. Locknut
2. Lever adjuster

10. 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.



cfgp

1. Nut slot
2. Locknut slot
3. Cable release point

11. Remove the cable from the motorcycle noting the cable routing, particularly where it passes through the steering area.

Note:

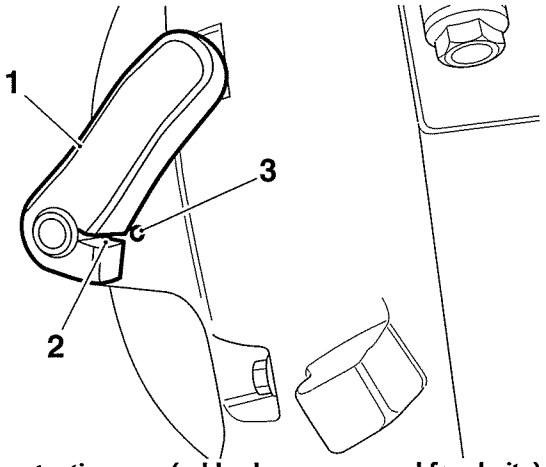
- **To ensure the same route can be followed on installation, tie a length of string to one end while pulling the cable through from the other. When installing the new cable, tie the string to one end of the cable and use it to guide the new cable into position.**

Examination

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

Installation

1. Position the cable to the motorcycle following 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 clutch actuating arm to the clutch shaft, noting that the split line on the arm must align with the dot mark on the clutch cover.

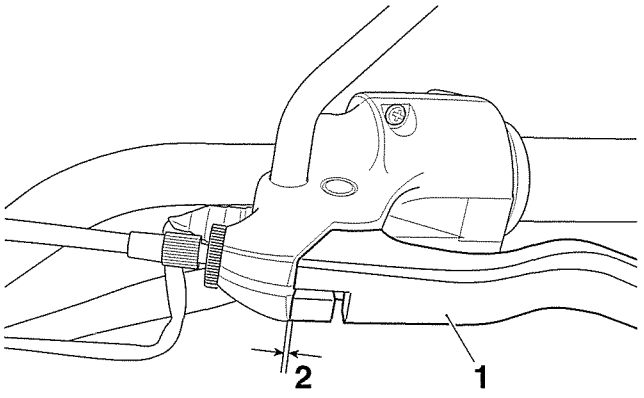


cfts

1. Clutch actuating arm (cable shown removed for clarity)
2. Split line
3. Dot marking

4. Tighten the clutch arm fixing to **10 Nm**.
5. Tighten the clutch cable clamp fixing to **7 Nm**.
6. Refit the outer cable to the adjuster bracket at the engine end.
7. Set the lever adjuster to a point where an equal adjustment is possible in both directions.
8. Set the adjuster adjacent to the radiator to give a preliminary setting of 2 - 3 mm of free play as measured at the lever.
9. Operate the clutch lever several times and re-check the amount of free play present.

10. Set the final adjustment of the cable to give 1 - 2 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.



clgp

1. Clutch lever

2. Correct setting, 1 - 2 mm

11. Refit the radiator cowl and tighten the fixing to **4 Nm.**
12. Reconnect the battery, positive (identified with red tape) lead first.
13. Refit the rider's seat (see page *17-9*).

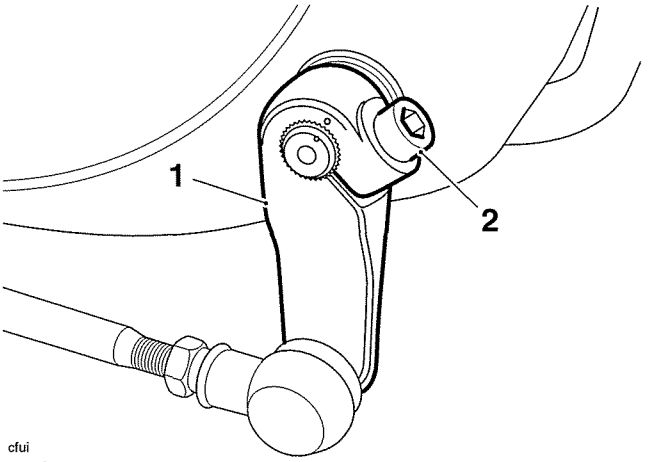
Clutch Cover

Removal

Warning

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

1. Disconnect the clutch cable at the clutch cover (see page *4-4*).
2. Release the fixing and disconnect the gear change actuator arm at the clutch cover.

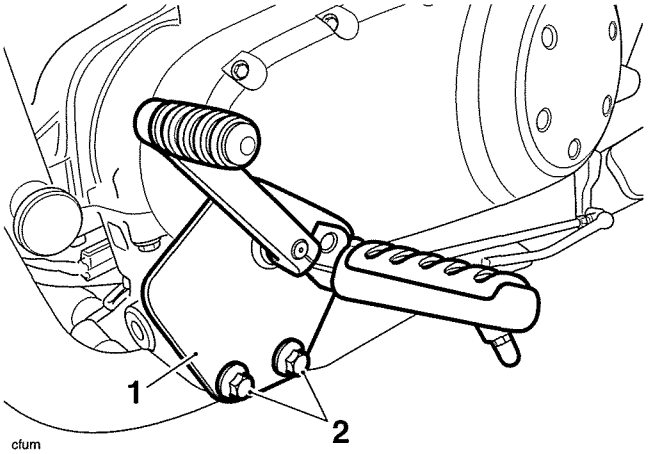


cfui

1. Gear change actuator arm

2. Fixing

3. Release the two bolts and remove the left hand control plate assembly.

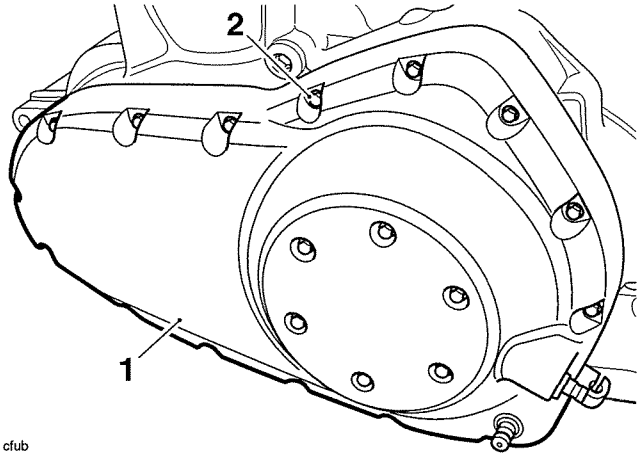


cfum

1. Control plate assembly

2. Bolts

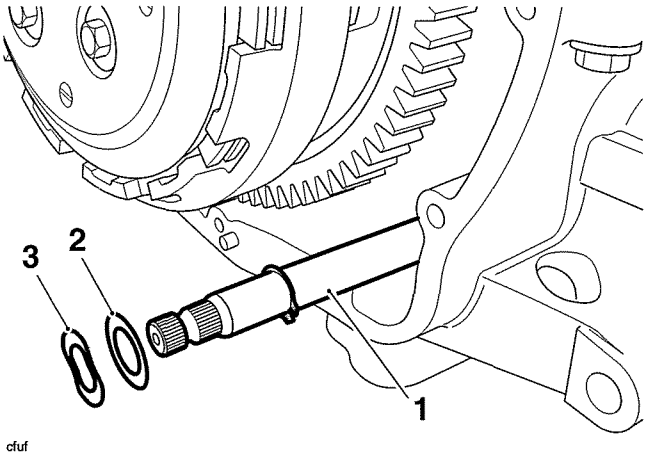
4. Release the ring of bolts securing the clutch cover to the crankcases.



cfub

1. Clutch cover
2. Bolt

5. Place an oil catch tray beneath the clutch cover to collect any oil that may spill out on removal.
6. Carefully withdraw the cover.
7. Note the position of the wavy washer and flat washer on the gear change shaft.

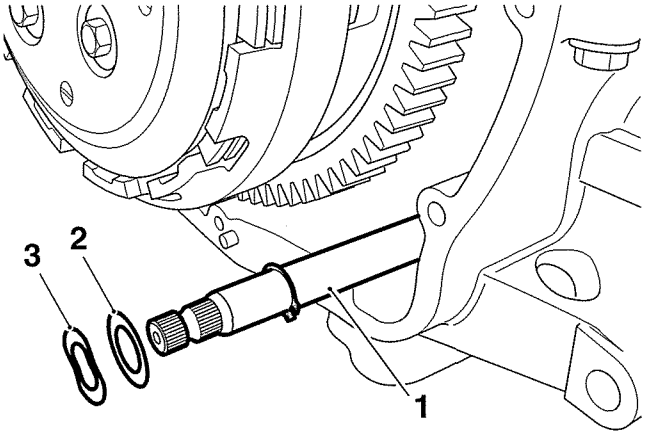


cfuf

1. Gear change shaft
2. Flat washer
3. Wavy washer

Installation

1. Ensure the wavy washer and flat washer are correctly positioned on the gear change shaft.



cfuf

1. Gear change shaft
2. Flat washer
3. Wavy washer

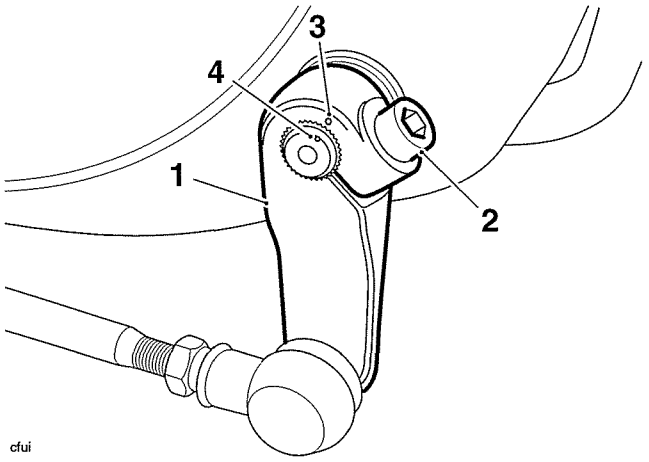
2. Thoroughly clean the cover and crankcase mating faces.
3. Position a new gasket to the crankcase.
4. Refit the cover ensuring that the gasket does not become dislodged.

Note:

- **Ensure that the lifter piece rack engages correctly with the lifter arm pinion during assembly. It may be necessary to rotate the lifter piece rack to allow assembly to take place.**

5. Fit and tighten the bolts to **9 Nm**. Tighten the bolts in a diagonal sequence.
6. Refit the control plate assembly, tightening the bolts to **50 Nm**.

7. Align the dot on the gear change actuator arm with the dot on the gear change shaft and fit the actuator arm to the spline. Fit the bolt and tighten to **9 Nm**.



cfui

1. Gear change actuator arm
2. Fixing
3. Actuator arm dot mark
4. Gear change shaft dot mark

8. Refit and adjust the clutch cable (see page *4-5*).

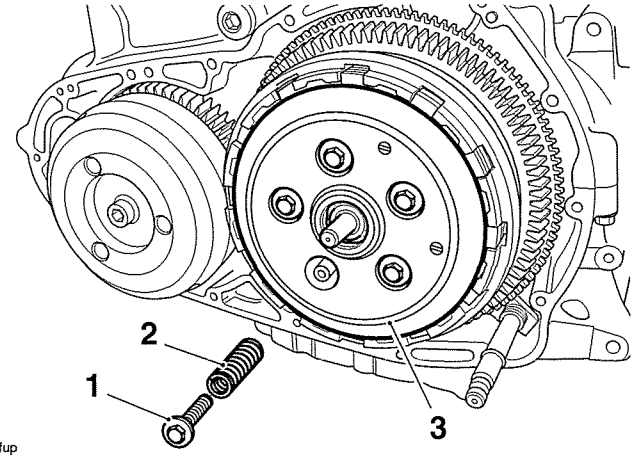
Clutch

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.

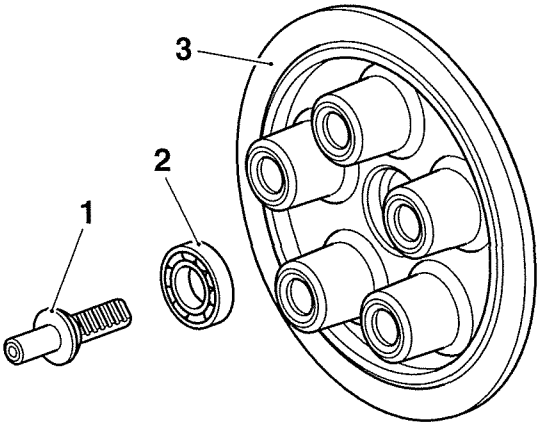
1. Remove the clutch cover (see page *4-6*).
2. Undo the bolts, withdraw the springs and remove the clutch pressure plate.



fup

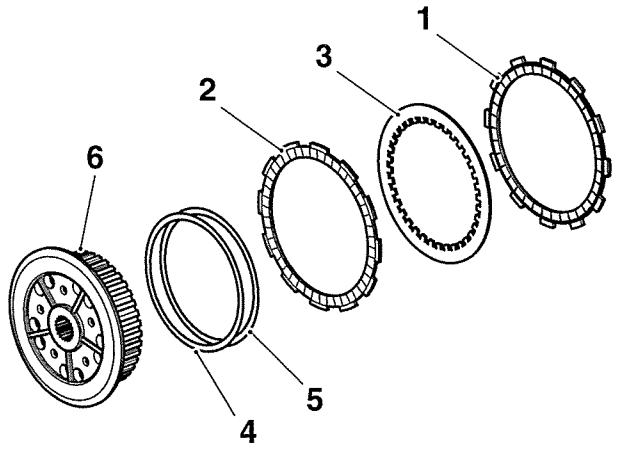
1. Pressure plate bolt
2. Spring
3. Pressure plate

3. Remove the lifter piece and roller bearing from the clutch pressure plate.



1. Lifter piece
2. Roller bearing
3. Clutch pressure plate

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

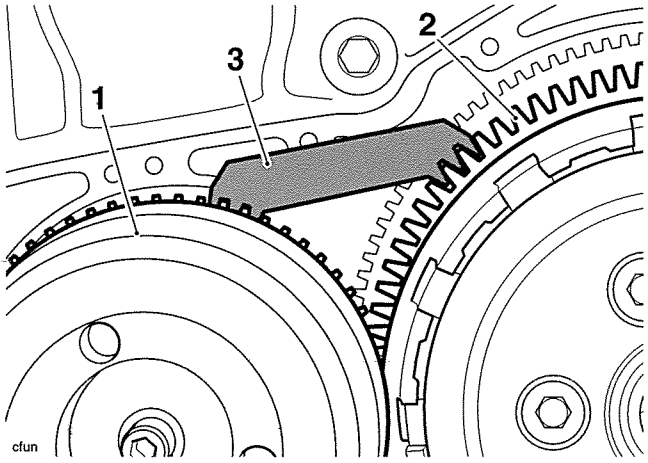


1. **Outer friction plate**
2. **Friction plates**
3. **Steel plate**
4. **Anti-judder seat washer**
5. **Anti-judder spring**
6. **Clutch inner drum (shown for reference only)**

Note:

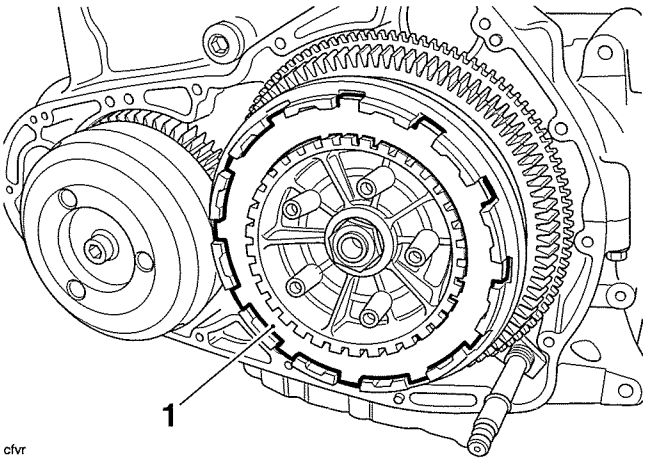
- **The outermost friction plate is different to the remainder. It must not be fitted in any other position.**
- **Refer to the following page of this section for details of clutch friction plate inspection.**
- **It is not normally necessary to disassemble the clutch further, but if the clutch inner and outer drums are to be removed, proceed as follows:**

5. Remove and discard the circlip from the gearbox input shaft.
6. Lock the clutch to the torque compensator, using service tool T3880043 located **above** the clutch as shown below.



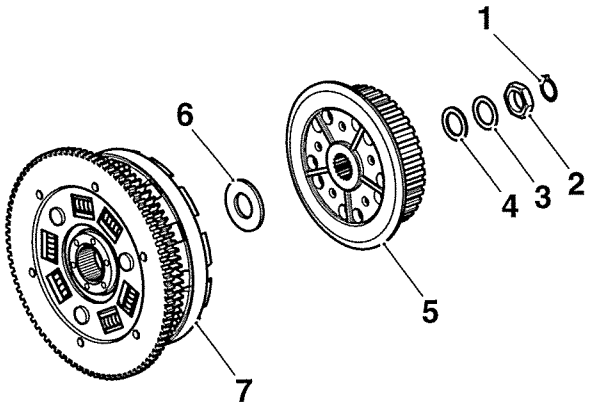
1. **Torque compensator**
2. **Clutch primary gear**
3. **Service tool T3880043**

7. Lock the inner and outer clutch drums together using service tool T3880038.



1. **Service tool T3880043**

8. Release the clutch centre nut.
9. Remove the centre nut, Belleville washer, plain washer, clutch inner drum and thrust washer.



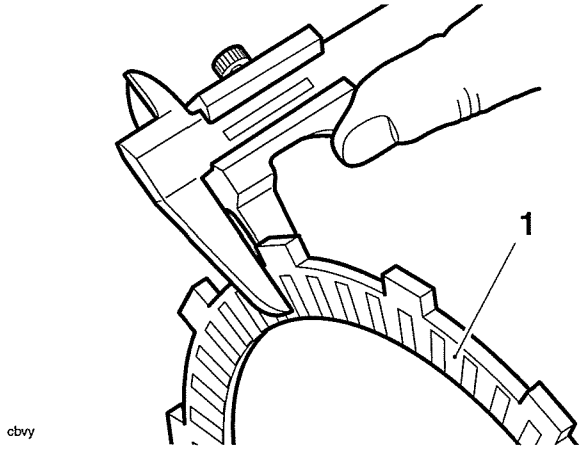
1. **Circlip**
2. **Centre nut**
3. **Belleville washer**
4. **Plain washer**
5. **Inner drum**
6. **Thrust washer**
7. **Outer drum**

10. Discard the Belleville washer and the plain washer.
11. Remove the torque compensator (see page *5-20*).
12. Slide the clutch outer drum off the gearbox input shaft.

Friction Plate Inspection

Thickness

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

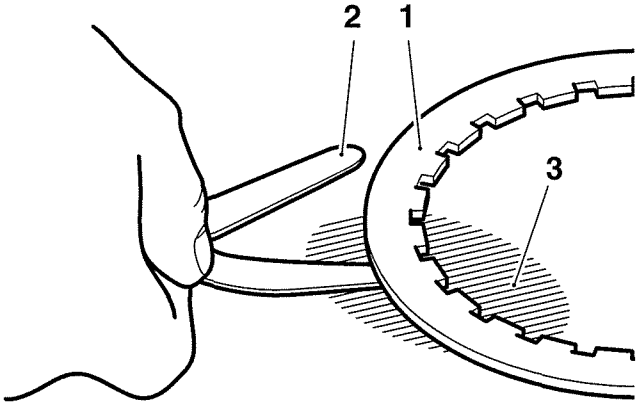


cbvy

1. Clutch friction plate

Friction plate thickness - all plates	
Standard	3.72 – 3.88 mm
Service limit	3.5 mm

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

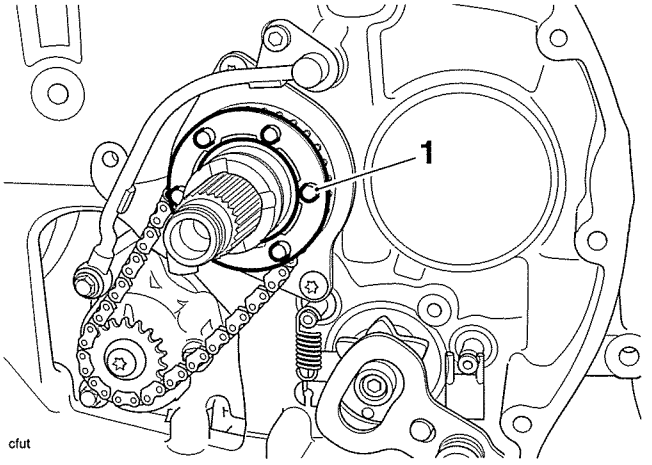


1. Friction plate
2. Feeler gauge
3. Surface plate

Friction plate bend/warp	
Service limit	0.30 mm

Installation

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



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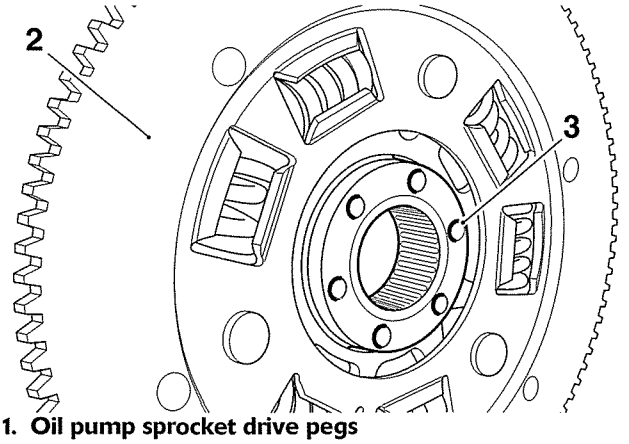
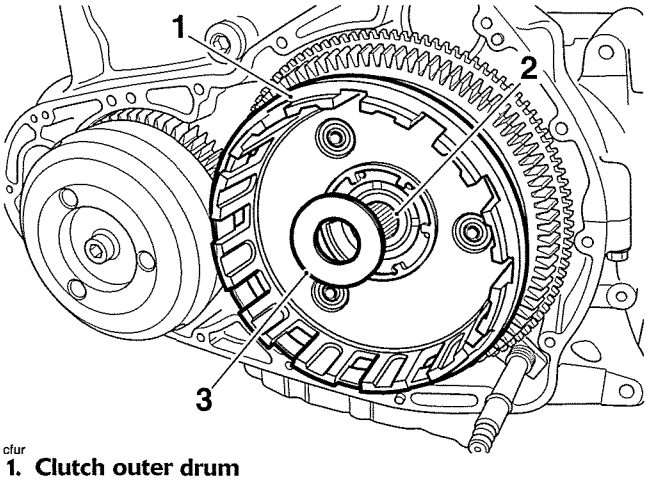


1. Oil pump sprocket drive pegs
2. Clutch outer drum
3. Oil pump drive holes

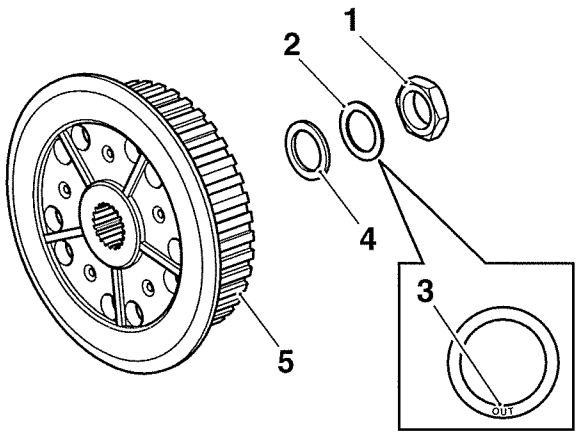
3. Refit the torque compensator (see page *5-20*).
4. Fit the thrust washer to the input shaft.



cfur

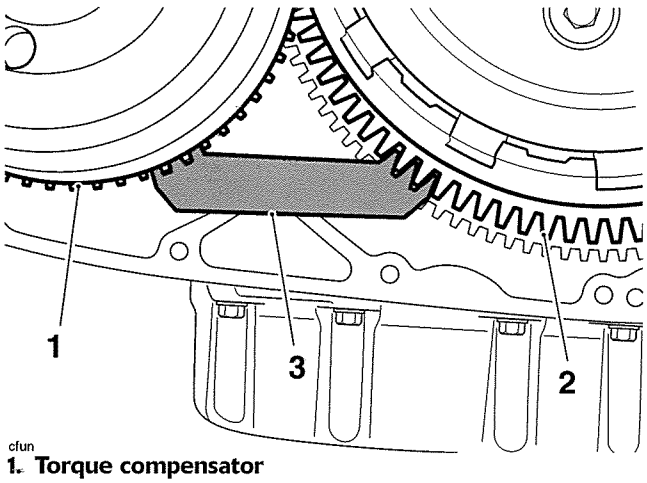
1. Clutch outer drum
2. Input shaft
3. Thrust washer

5. Fit the clutch inner drum.
6. Fit a new plain washer and a new Belleville washer (OUT mark facing outwards), and refit the centre nut.



1. Centre nut
2. Belleville washer
3. Belleville washer OUT mark
4. Washer
5. Clutch inner drum

7. Lock the inner and outer drums together using service tool T3880038.
8. Lock the clutch to the torque compensator, using service tool T3880043 located **below** the clutch as shown below.



cfun
1. Torque compensator
2. Clutch primary gear
3. Tool T3880043

9. Tighten the clutch centre nut to **160 Nm**.
10. Fit a new circlip to the input shaft.
11. Remove the service tools and check for free rotation of the clutch inner drum.
12. Coat all clutch friction plates in clean engine oil.
13. Fit the friction plates, steel plates, anti-judder seat and spring to the clutch basket, in the same order as noted during removal.

Note:

- **The outermost friction plates is different to the remainder. It must not be fitted in any other position.**

14. Refit the clutch pull lifter.
15. Refit the clutch pressure plate together with the springs and bolts. Tighten the bolts to **10 Nm**.
16. Fit the clutch cover (see page *4-7*).

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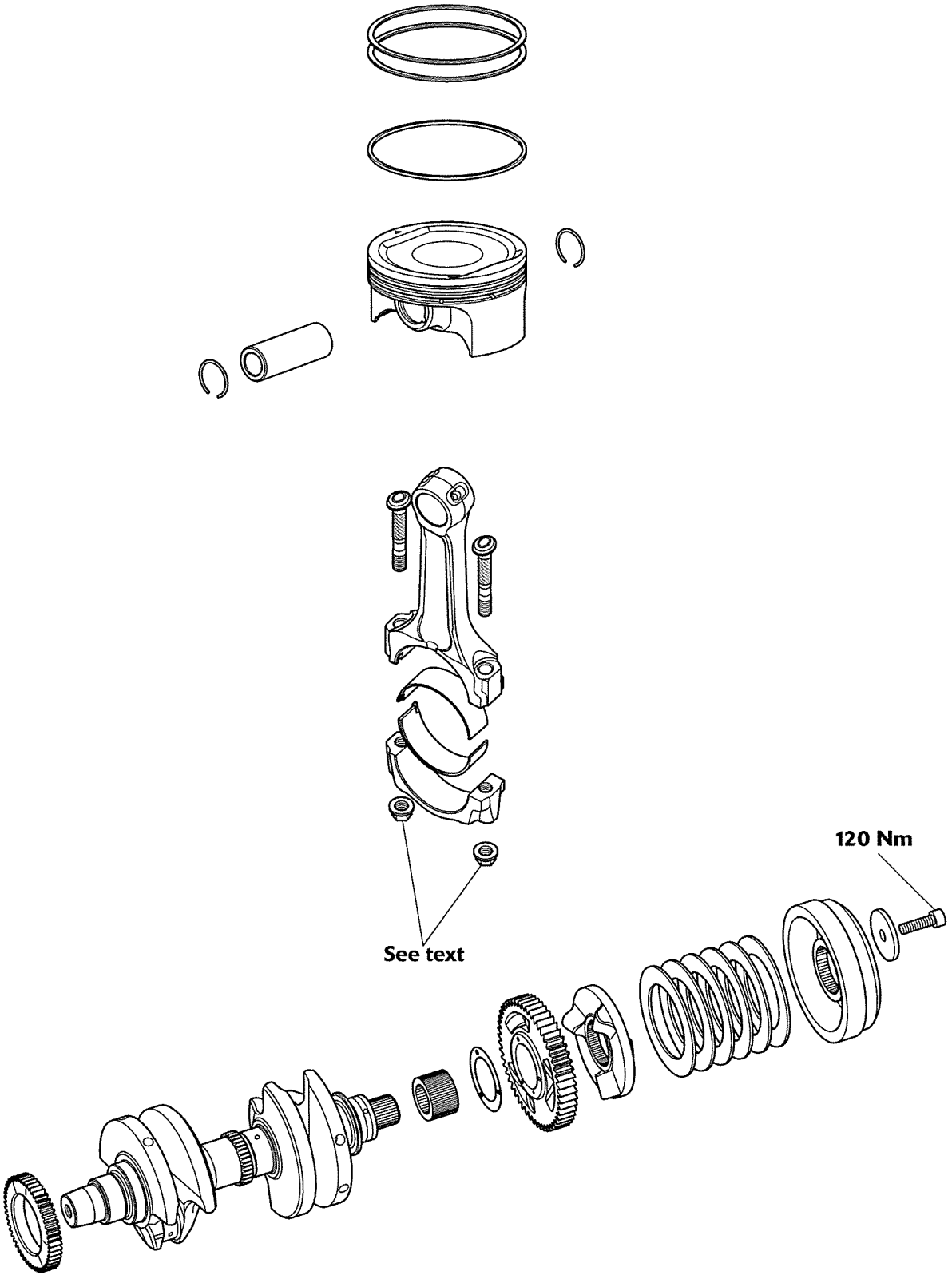
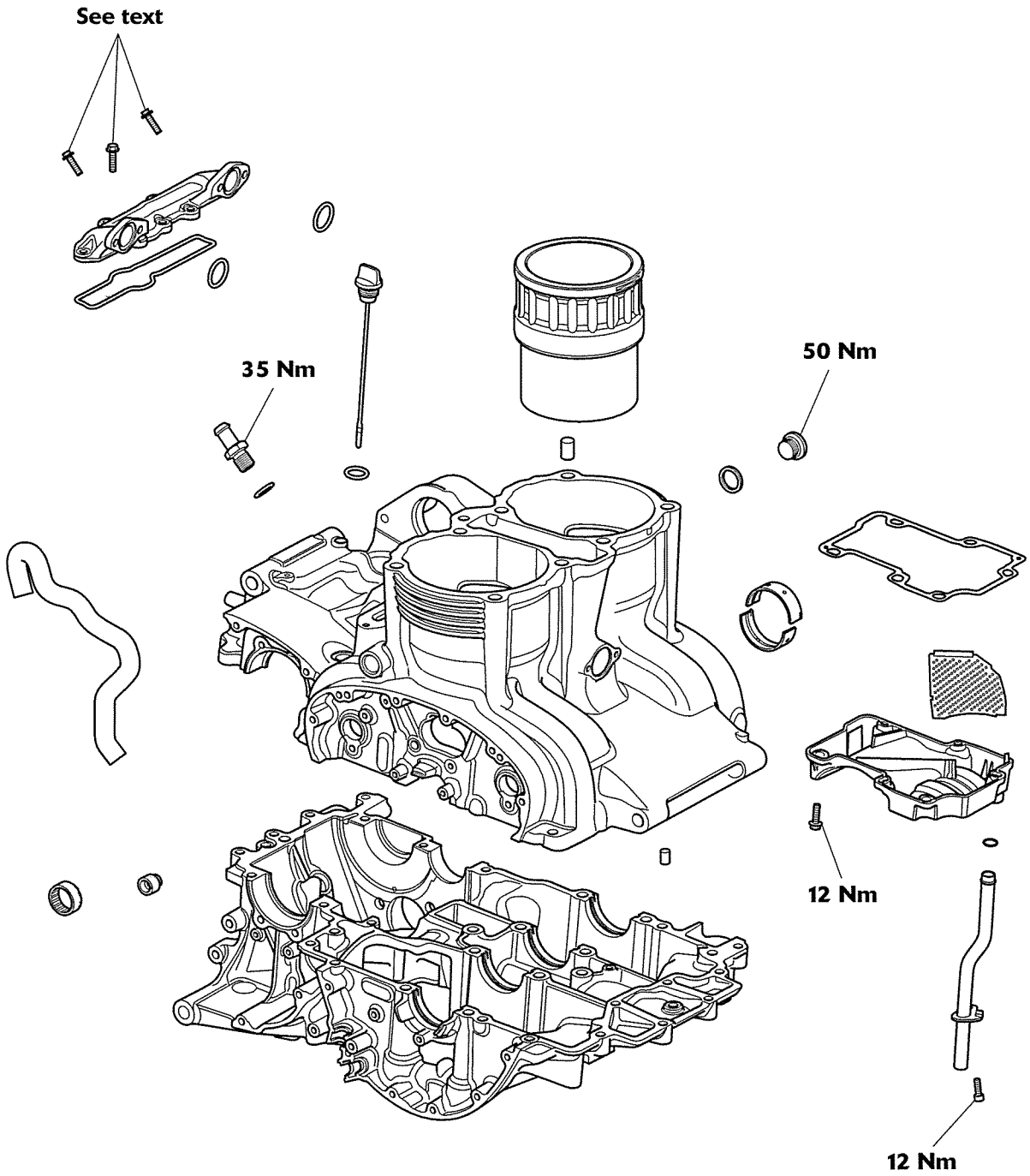
5 Crankshaft, Connecting Rods and Pistons

Table of Contents

Exploded View - Crankshaft, Connecting Rod and Piston



Exploded View - Crankcase and Liners



Crankcases

Warning

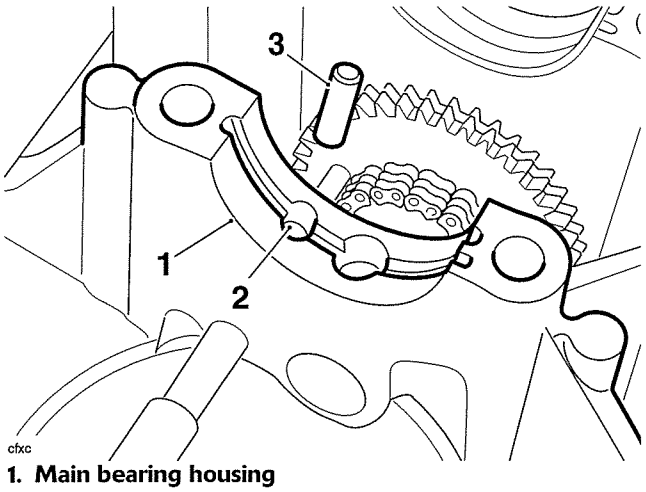
The following procedures often require lifting of heavy components. To avoid injury, always lift heavy components with a hoist or block and tackle and never attempt to manually lift items that are too heavy. Injury may result from failure to use the correct lifting equipment.

Caution

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

Note:

- **The crankcase halves may be separated with the cylinder head fitted.**
- **If the crankshaft main bearing shells are removed from the crankcase, remove and collect the three loose-fitting piston cooling jets from the upper crankcase.**



1. Main bearing housing
2. Oil gallery
3. Piston cooling jet

If the big end bolts have been loosened or removed, new bolts must be installed.

Caution

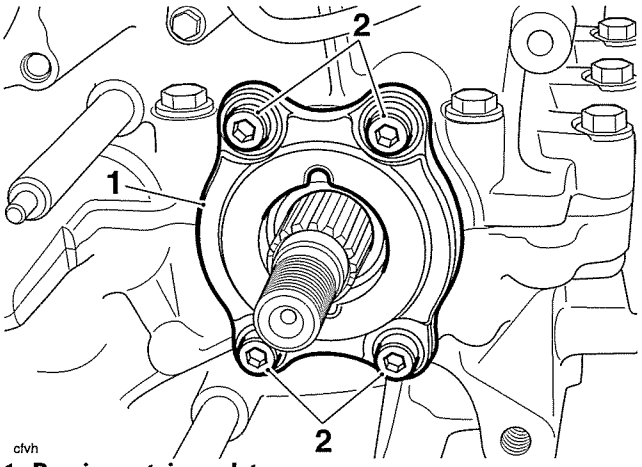
During crankcase assembly, ensure the two piston cooling jets are re-installed. If the piston cooling jets are omitted, oil pressure will be reduced. Running the engine with low oil pressure will cause severe engine damage.

Removal

1. Remove the engine from the frame (see page *9-2*).
2. Remove the clutch (see page *4-8*).
3. Remove the alternator (see page *18-16*).
4. Remove the oil pump drive and oil pump (see page *8-11*).
5. Remove the torque compensator (see page *5.20*).
6. Remove the sump (see page *8-10*).
7. Remove the water pump (see page *11-7*).
8. Remove the gear position sensor (see page *10-101*).

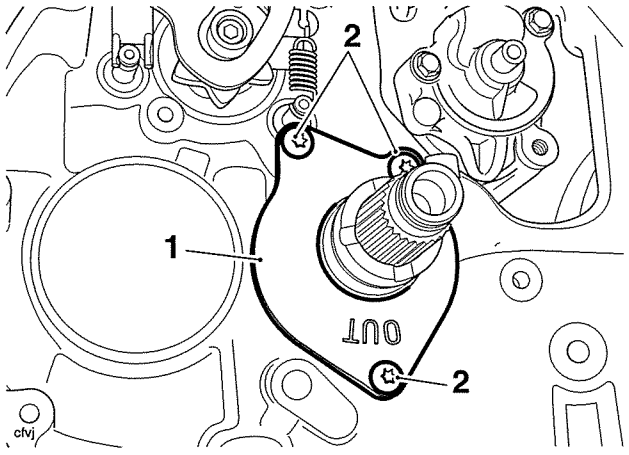
Disassembly

1. Remove the output shaft bearing retainer plate.



1. Bearing retainer plate
2. Fixings

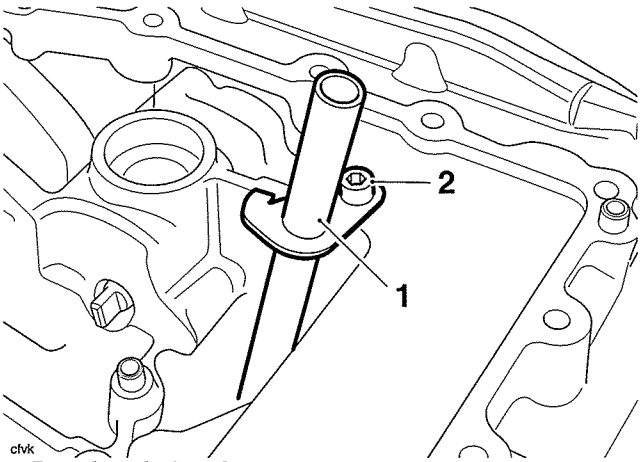
2. Remove the input shaft bearing retainer plate.



1. Bearing retainer plate
2. Fixings

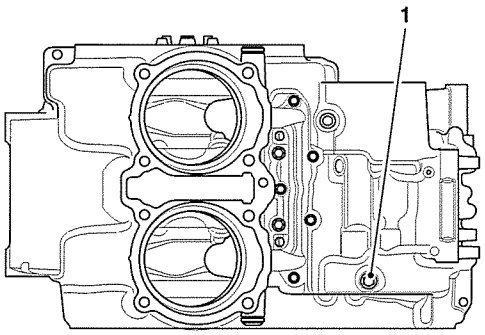
3. Remove the oil filter (see page *8-7*).
4. Remove the fixings and remove both control plate mounting brackets from the crankcase.

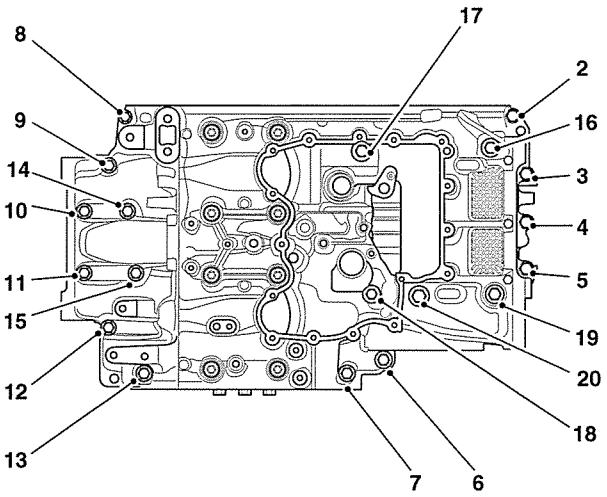
5. Release the fixing and remove the crankcase breather drain tube. Check that the breather housing O-ring is removed with the breather tube.



1. Breather drain tube
2. Fixing

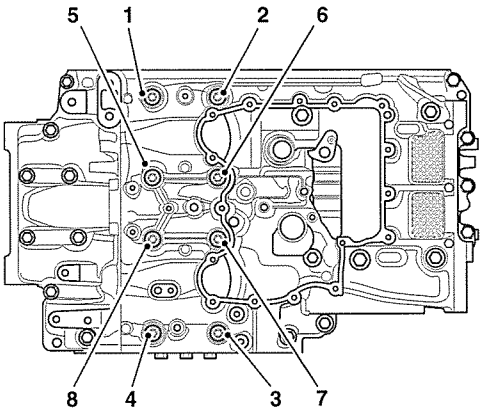
6. Release the lower crankcase bolts in the sequence shown in the diagram below. Remove and discard the bolts.





Crankcase Bolt Release Sequence

7. In the sequence shown below, release the crankcase main bearing bolts.



Main Bearing Bolt Release Sequence

8. Remove and discard the bolts.

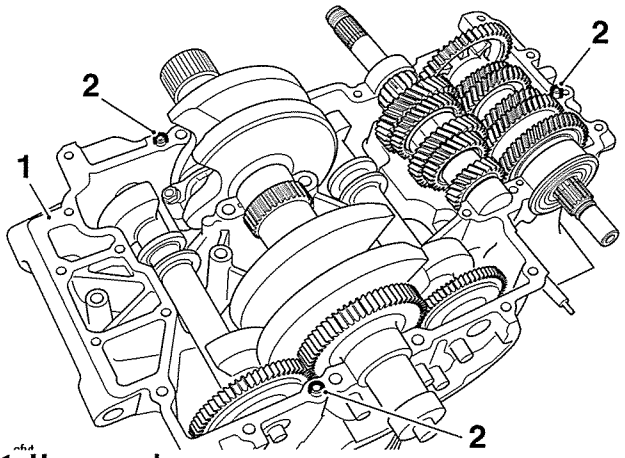
⚠ Caution

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

Note:

- **Always check that all bolts have been released before attempting to separate the cases. Bolts are fitted in discreet locations such as under the oil pump and inside hollow bosses.**

9. Separate the lower and upper crankcases noting the position of the three location dowels, which should be removed for safe-keeping.

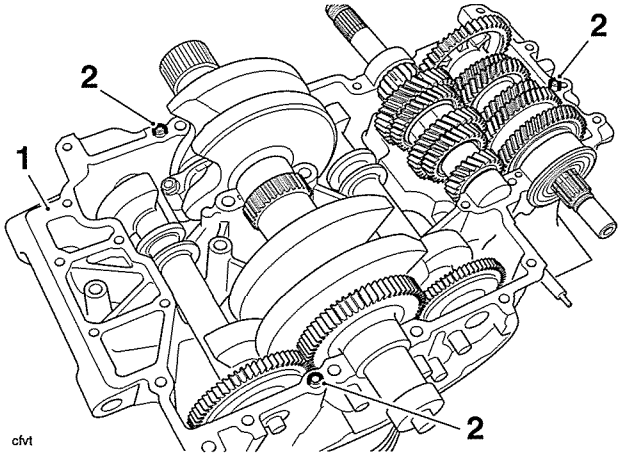


1. Upper crankcase
2. Dowels

10. At this point, the balancer shafts (see page *6-3*), transmission shafts (see page *7-6*) and selector drum (see page *7-5*) may be removed. To detach the crankshaft, the big end caps must also be removed (see page *5-10*).

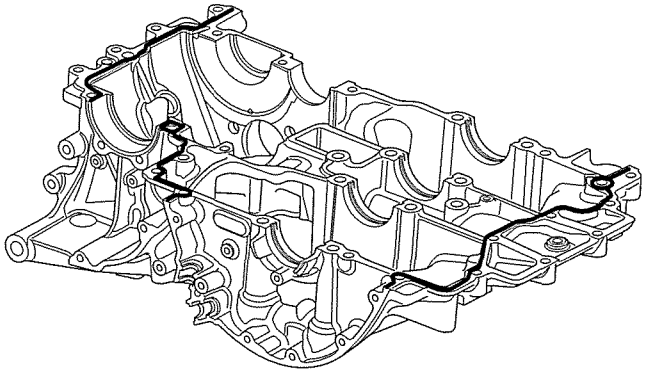
Assembly

1. Use high flash-point solvent to clean the crankcase mating faces. Wipe the surfaces clean with a lint-free cloth.
2. If removed, install the camshaft drive chain and idler gear to the crankcase. Lock the idler gear in position using service tool T3880039 and pre-load the backlash gear using service tool T3880041 (see page *3-13*).
3. Position the transmission shafts and the selector drum in the neutral position.
4. Ensure that the three locating dowels are in position in the upper crankcase.



1. Upper crankcase
2. Dowels

5. Apply a thin bead of silicone sealant to the lower crankcase mating faces (at the factory, ThreeBond 1215J is used).

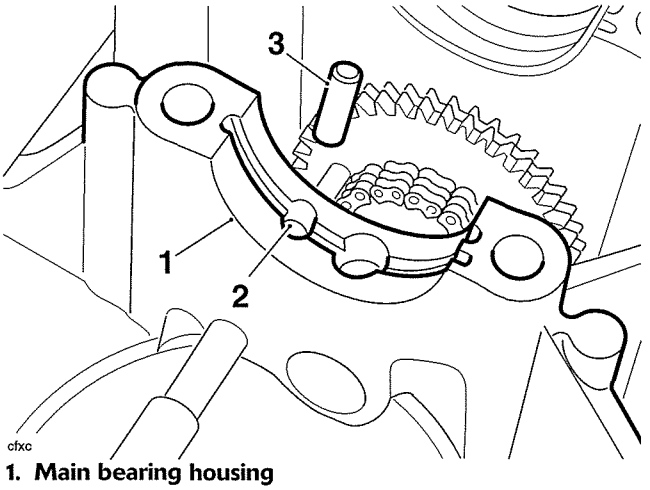


Sealer Areas

⚠ 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. If removed, insert the two piston cooling jets into the main bearing housings in the upper crankcase.



1. Main bearing housing
2. Oil gallery
3. Piston cooling jet

⚠ Caution

Ensure the two piston cooling jets are installed. If the piston cooling jets are omitted, oil pressure will be reduced. Running the engine with low oil pressure will cause severe engine damage.

7. Install and lubricate the crankshaft main bearing shells with clean engine oil (see bearing selection on page *5-13* before proceeding).
8. Install the crankshaft ensuring the crankshaft to idler gear timing is correct (see page *5-9*).
9. Fit the big end caps and tighten them (see page *5-10* for the tightening sequence and torque).
10. Install and lubricate the balancer shafts ensuring they are timed to the crankshaft correctly (see page *6-4*).
11. Lubricate the crankshaft journals with clean engine oil.
12. Position the lower crankcase to the upper. An assistant may be required to support the crankcase during alignment.
13. Fit the screws into the lower crankcase and hand tighten them.
14. Tighten the crankcase screws as follows:

Note:

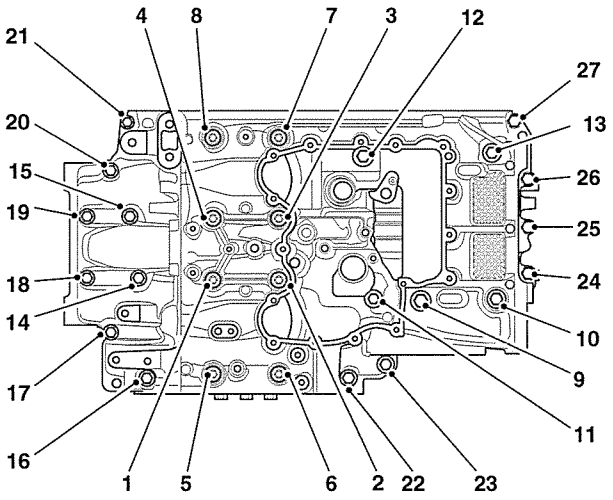
- **The crankcase screws are tightened in stages.**

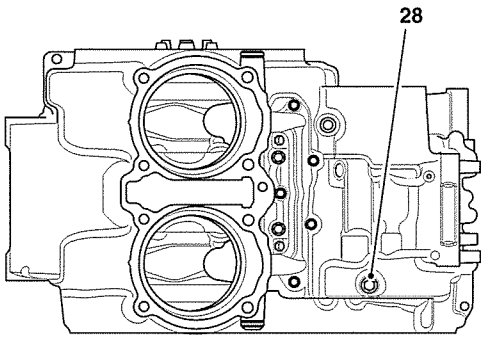
⚠ Caution

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

Stage 1 - all screws

In the sequence shown below, tighten all crankcase fixings to **10 Nm**.



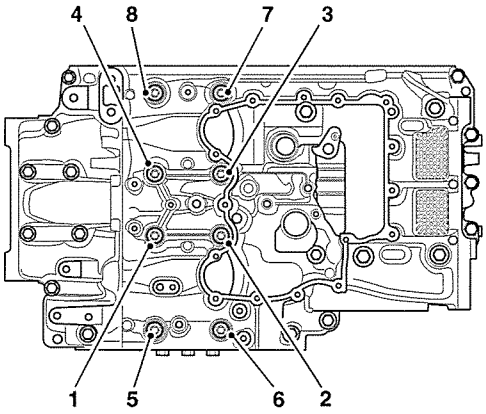


Crankcase Fixing Tightening Sequence, all fixings

Stage 2

In the sequence shown below, loosen bolts 1 to 8.

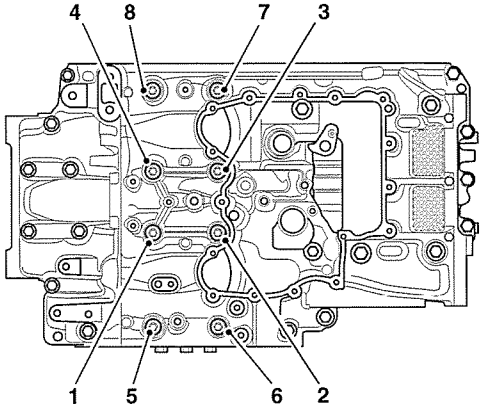
In the sequence shown below, tighten fixings 1 to 8 to **35 Nm**.



Crankcase Bolt Tightening Sequence, fixings 1 to 8

Stage 3

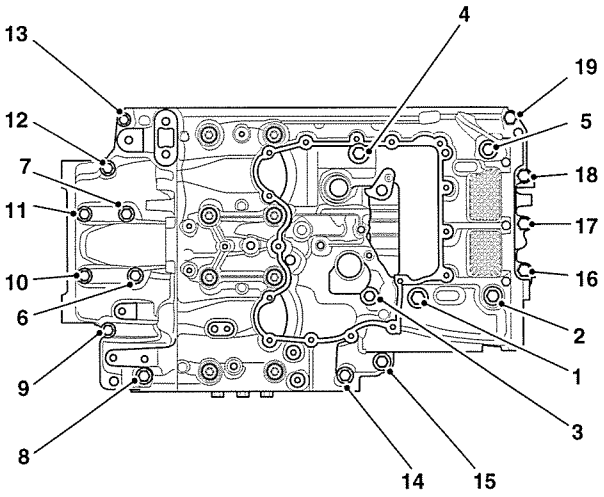
In the sequence shown below, tighten bolts 1 to 8 through a further 90° using tool 3880105-T0301 or similar to measure the torque-angle.

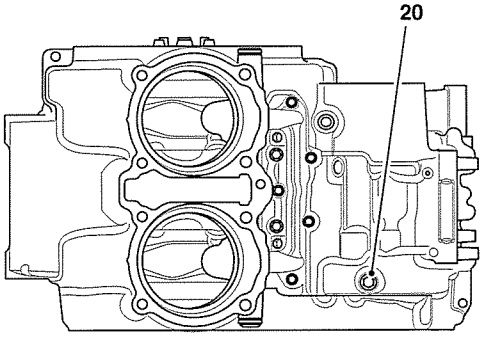


Crankcase Bolt Tightening Sequence, fixings 1 to 8

Stage 4

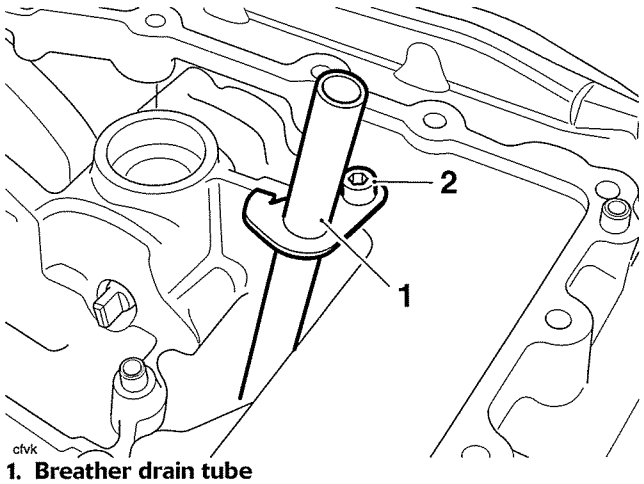
In the correct sequence, tighten fixings 1 to 20 to **32 Nm**.





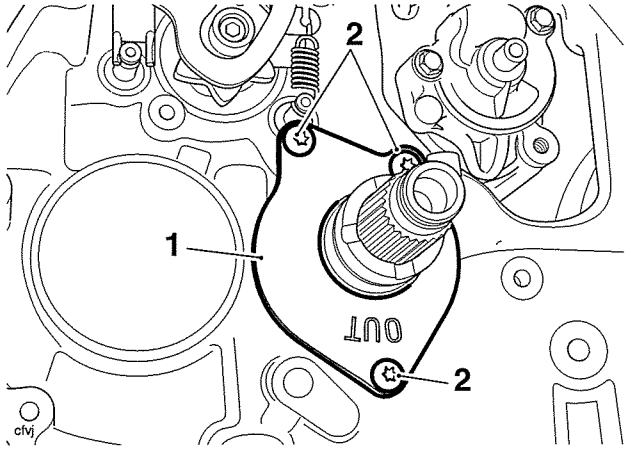
Crankcase Fixing Tightening Sequence, fixings 1 to 20

15. Fit a new O-ring and install the breather drain tube to the crankcase. Ensure the tube is correctly installed in the breather housing.
16. Install a new fixing and tighten to **12 Nm**.



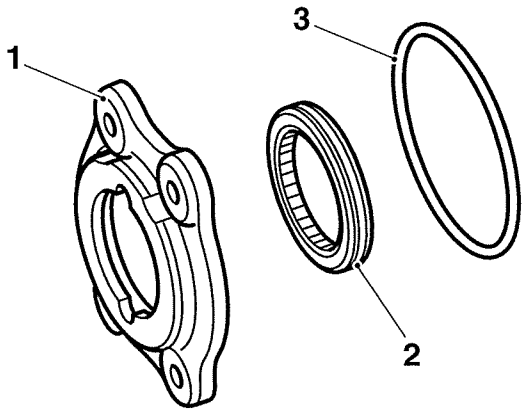
1. Breather drain tube
2. Fixing

17. Refit both control plate mounting brackets to the lower crankcase. Tighten the left hand fixings to **40 Nm**, and the right hand fixings to **28 Nm**.
18. Fit a new oil filter (see page *8-7*).
19. Refit the input shaft bearing retainer plate.
20. Install new fixings and tighten to **12 Nm**.



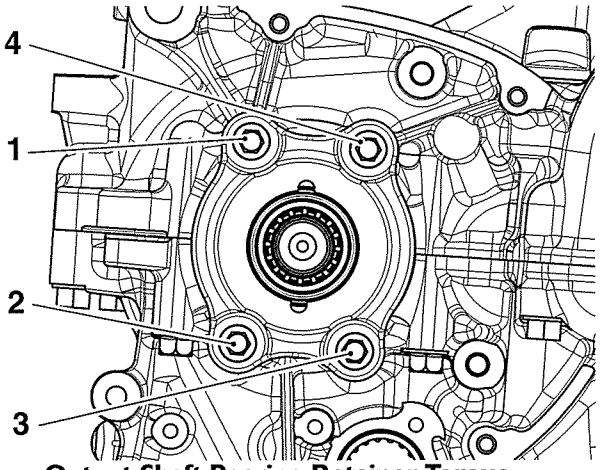
1. Bearing retainer plate
2. Fixings

21. Install a new oil seal in the output shaft bearing retainer plate.
22. Fit a new output shaft bearing retainer plate O-ring to the groove in the crankcase.



1. Output shaft bearing retainer
2. Seal
3. O-ring

23. Refit the output shaft bearing retainer plate.
24. Install new fixings and tighten in two stages in the sequence shown below.
    - Tighten the fixings to **3 Nm**.
    - Tighten the fixings to **10 Nm**.



Output Shaft Bearing Retainer Torque Sequence

25. Refit the oil pump (see page *8-14*).
26. Refit the water pump (see page *11-7*).
27. Refit the sump (see page *8-11*).
28. Refit the alternator (see page *18-18*).
29. Refit the clutch (see page *4-10*).
30. Refit the torque compensator (see page *5.20*).
31. Refit the gear position sensor (see page *10-101*).
32. Refit the engine to the frame (see page *9-5*).

Crankshaft

Removal

1. Remove the engine from the frame (see page *9-2*).
2. Separate the lower and upper crankcases (see page *5-4*).
3. Remove the balancer shafts (see page *6-3*).
4. Remove the connecting rod big end caps (see page *5-10*). Discard the bolts after removal.
5. Lift the crankshaft from the upper crankcase. Support the connecting rods during crankshaft removal to prevent damage to the rods, liners and upper crankcase.

Installation

⚠ Caution

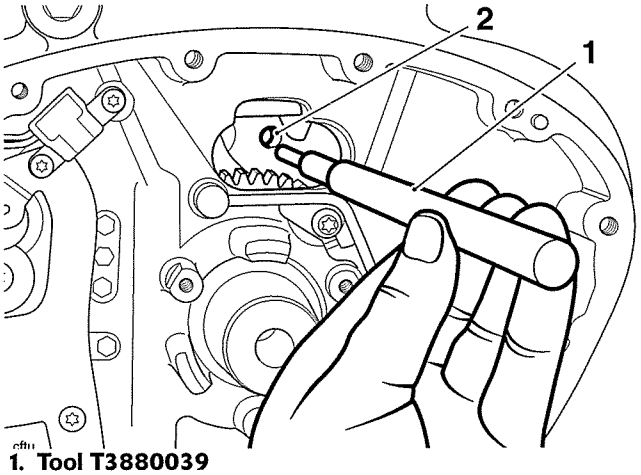
Always check the main bearing journal clearance (see page *5-13*), before final assembly of the crankshaft. Failure to correctly select crankshaft bearings will result in severe engine damage.

1. Select and fit new main and big end bearing shells using the selection processes detailed on pages *5-12* and *5-13*.
2. Lubricate all bearings with engine oil.
3. Ensure that the crankshaft is clean, and that the oil ways within the crankshaft are clean and free from blockages and debris.

⚠ Caution

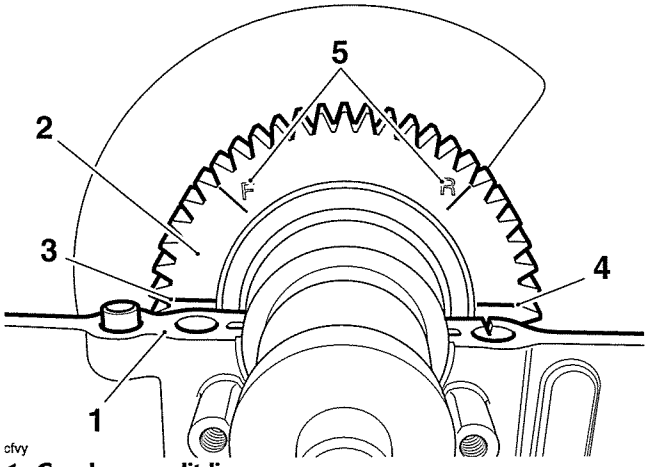
The crankshaft to idler gear timing will be lost when the crankshaft is removed. Do not refit the crankshaft without first setting the crankshaft to idler gear timing. Incorrect idler gear timing will result in incorrect camshaft timing. Rotating or attempting to start an engine with incorrectly adjusted camshaft timing will result in severe engine damage.

4. Install the crankshaft to the upper crankcase, ensuring the crankshaft drive gear is correctly timed to the idler gear as follows:
   - Check that the timing pin T3880039 is fully installed in the idler gear, ensuring the pin passes through both the idler gear and the backlash gear and into the crankcase web (see page *3-13*).



1. Tool T3880039
2. Timing hole in crankcase

   - Carefully lower the crankshaft in to the crankcase, ensuring that the crankpins align with the corresponding big ends and that the two timing marks on the balancer drive gear line up with the crankcase split line, as shown below. Make sure that two balancer shaft timing marks are visible as shown below.



1. Crankcase split line
2. Crankshaft balancer gear
3. Front timing mark
4. Rear timing mark
5. Balancer shaft timing marks

5. Align the connecting rod big ends to the crankpins.
6. Fit the big end caps and tighten them (see page *5-10* for the tightening sequence and torque).
7. Install the balancer shafts (see page *6-4*).
8. Assemble the crankcases (see page *5-6*).

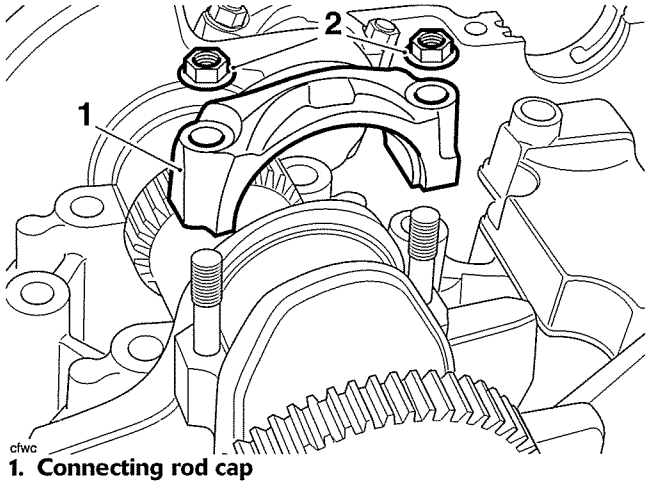
Connecting Rods

Removal

Note:

- **The connecting rods and caps are etch-marked on one side to identify their correct orientation. However, the cylinder from which they are individually removed should also be identified, using a paint marker or similar.**

1. Remove the engine from the frame (see page *9-2*).
2. Remove the cylinder head (see page *3-20*).
3. Separate the lower and upper crankcases (see page *5-4*).
4. Remove and discard the connecting rod nuts.



cfwc

1. Connecting rod cap
2. Connecting rod nuts

5. Collect the big end caps.
6. Push the connecting rod up through the liner and collect the piston and connecting rod from the liner top.
7. Label the assembly to identify the cylinder from which it was removed.
8. Remove the cylinder liners using tool T3880061, (see page *5-18*).

Installation

Note:

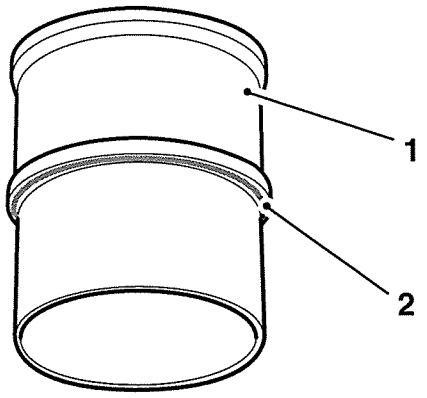
- **Connecting rod bolts and nuts are treated with an anti-rust solution, which must not be removed.**

1. Clean the connecting rod with high flash-point solvent.
2. Select new big end bearings (see page *5-12*).
3. Fit the selected big end shells to the connecting rods and big end caps.

Warning

Always renew the big end bolts and nuts. The bolts are torqued near to their yield point when first installed and are severely weakened if re-used. Re-using the original bolts may cause bolt breakage resulting in engine damage, loss of motorcycle control and an accident.

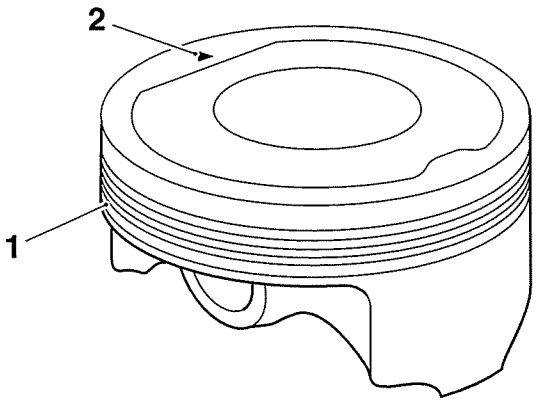
4. Fit new bolts to the connecting rods.
5. Fit the piston and connecting rod assemblies into the liners (see page *5-17*).
6. Thoroughly clean the liner removing all traces of old sealer.
7. Remove all traces of sealer from the crankcase bores.
8. Apply a thin bead of silicone sealer (at the factory, ThreeBond TB1215J is used) to the liner to crankcase mating face.



ccvl

1. Liner
2. Sealer area

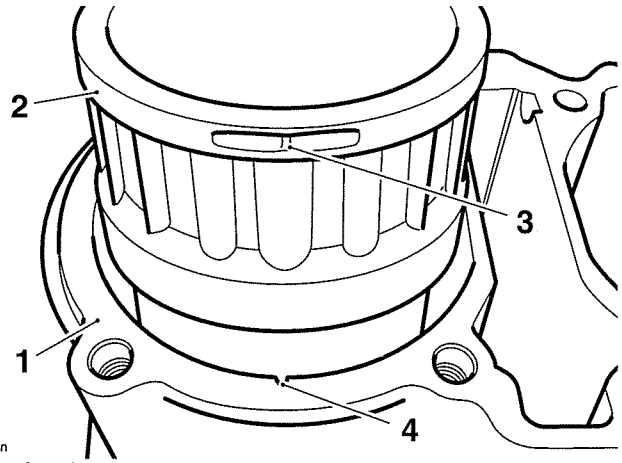
9. Fit the liner into the crankcase ensuring that the arrow on the piston faces to the front of the engine.



caqj

1. Piston
2. Arrow

10. Align the cylinder liner alignment mark with the corresponding mark on the front edge of the crankcase.



:fvn

1. **Crankcase**
2. **Cylinder liner**
3. **Liner alignment mark**
4. **Crankcase alignment mark**

Note:

- **Ensure that the piston/liner/connecting rod assemblies align correctly with the crankpins during assembly into the crankcase.**

Warning

Always renew the big end bolts and nuts. The bolts are torqued near to their yield point when first installed and are severely weakened if re-used. Re-using the original bolts may cause bolt breakage resulting in engine damage, loss of motorcycle control and an accident.

11. Align the connecting rod to the crankshaft and fit the big end cap. Tighten the NEW cap nuts as follows:

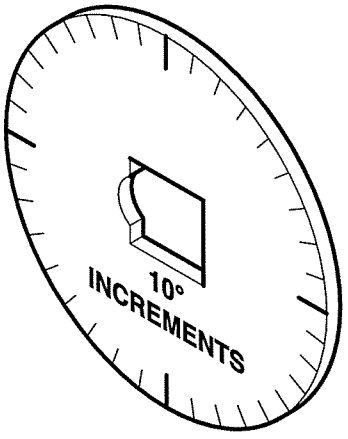
Warning

The torque characteristics of the connecting rod bolts are sensitive to the rate at which they are tightened. If all the torque is applied in one action, the bolts will be stretched beyond their yield point. This may cause bolt breakage resulting in engine damage, loss of motorcycle control and an accident.

Lubricate the under-head and thread areas of the bolts with undiluted molybdenum disulphide grease. Tighten the bolts, in two stages as follows:-

a) Tighten to **14 Nm**.

b) Tighten through 120° of bolt rotation as measured using the Triumph torque turn gauge 3880105-T0301.



cbxt

Service Tool 3880105-T0301

12. Refit the cylinder head (see page *3-21*).
13. Assemble the crankcases (see page *5-6*).
14. Refit the engine to frame (see page *9-5*).

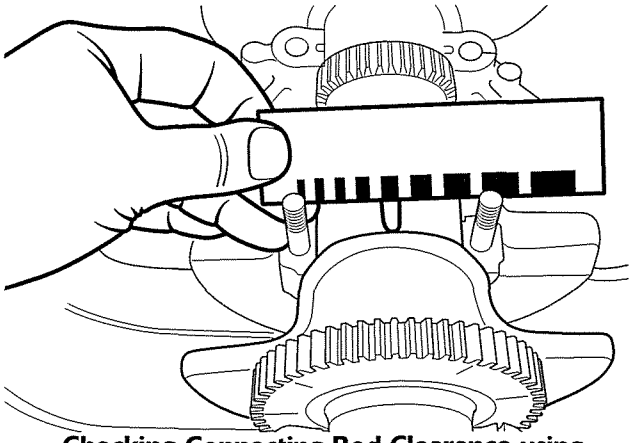
Connecting Rod Big End Bearing Selection/ Crankpin Wear Check

1. Measure the bearing and crankpin clearance as follows.

Note:

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

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. Lubricate the threads of the bolt and under-head area with undiluted molybdenum disulphide grease. Refit the bearing and cap and tighten the big end bolts as described earlier.
7. Release the bolts and remove the cap being measured. Using the gauge provided with the Plastigage kit, measure the width of the compressed Plastigage.



Checking Connecting Rod Clearance using Plastigage

Con rod big end bearing/crankpin clearance	
Standard	0.035 - 0.066 mm
Service Limit	0.100 mm

Note:

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

Crankpin diameter	
Standard	52.476 – 52.490 mm
Service limit	52.452 mm

Note:

- **If any crankpin has worn beyond the service limit, the crankshaft must be replaced. Due to the advanced techniques used during manufacture, the crankshaft cannot be re-ground and oversize bearings are not available.**

Connecting Rod Bearing Selection

Note:

- **Optimum running clearance is achieved by using selective big end bearings. For further information on bearing part number to colour cross-references, refer to the parts information system.**

Select the correct big end bearing shell as follows:

1. Measure each crankpin diameter.
2. Measure each connecting rod bore diameter
3. Select the correct bearings by matching the information found with the chart below.

Connecting Rod Bearing Selection Chart

Crankpin diameter	Connecting rod bore diameter	Shell Colour
52.490 to 52.484 mm	55.507 to 55.500 mm	WHITE
52.483 to 52.476 mm	55.507 to 55.500 mm	GREEN
52.490 to 52.484 mm	55.518 to 55.510 mm	GREEN
52.483 to 52.476 mm	55.518 to 55.510 mm	RED

For instance:

- Crankpin diameter = 52.490 mm
- Connecting rod bore diameter = 55.518 mm
- Required Bearing = GREEN

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.**

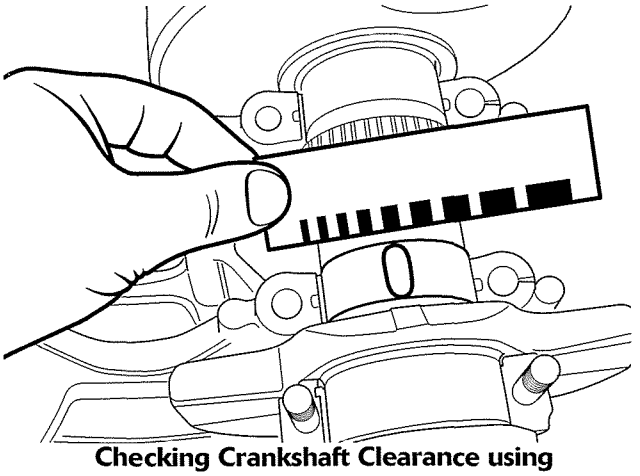
Warning

Always confirm, using the Plastigage method, that the running clearance is correct before final assembly. Severe engine damage could result from incorrect clearance, resulting in loss of motorcycle control and an accident.

Crankshaft Main Bearing/Journal Wear Check

Using selective bearings compensates for minor differences in crankshaft main bearing journal and crankcase dimensions. For further information on bearing part number to colour cross-references, refer to the parts information system.

1. Measure the bearing to crankshaft main journal clearance using Plastigage (Triumph part number 3880150-T0301). Use the same method as described in connecting rod clearance measurement (see page *5-12*).



Checking Crankshaft Clearance using Plastigage

Crankshaft main bearing/journal clearance	
Standard	0.021- 0.045 mm
Service limit	0.100 mm

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

Crankshaft main bearing journal diameter	
Standard	52.483 - 52.499 mm
Service limit	52.459 mm

Note:

- **If any journal has worn beyond the service limit, the crankshaft must be replaced. Due to the techniques used during manufacture, the crankshaft cannot be re-ground and oversize bearings are not 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 but all crankcase bolts fully torqued) (see page *5-7*).

Note:

- **The original crankcase bolts may be reused for bearing selection. Do not use new bolts as they may only be used once, even if the single use is related to bearing selection.**

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

Crankcase bore diameter	Crankshaft journal diameter	Shell Colour
55.502 to 55.511 mm	52.491 to 52.499 mm	WHITE
55.502 to 55.511 mm	52.483 to 52.491 mm	RED
55.511 to 55.519 mm	52.491 to 52.499 mm	RED
55.511 to 55.519 mm	52.483 to 52.491 mm	BLUE
55.519 to 55.528 mm	52.491 to 52.499 mm	BLUE
55.519 to 55.528 mm	52.483 to 52.491 mm	GREEN

For example:

Crankcase Bore	55.511 mm
Crankshaft Journal diameter	52.483 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 that gives the greater running clearance.

Warning

Always confirm, using the Plastigage method, that the running clearance is correct before final assembly. Severe engine damage could result from incorrect clearance resulting in loss of motorcycle control and an accident.

Crankshaft End Float

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. Thrust washers are not used. If crankshaft end float is outside the specified limit, the crankshaft and/or the crankcases must be replaced.**

Pistons

Disassembly

1. Remove the cylinder head and liners (see page *3-20*).

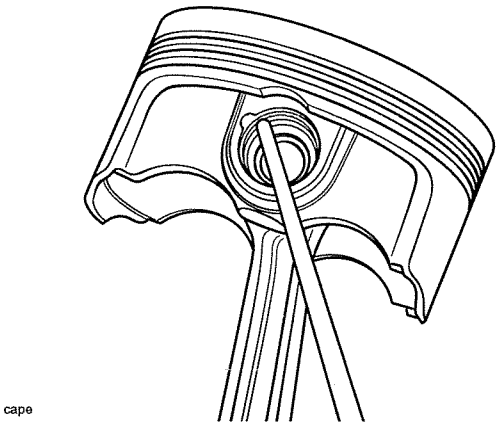
⚠ Caution

The cylinder liners and pistons are made of aluminium alloy and can therefore be easily damaged. Handle the cylinder liner and piston with care, ensuring the internal bore of the liner and the piston skirt are not scratched.

Note:

- **It is not necessary to remove the connecting rods from the crankshaft, but the piston should be at the top of its stroke.**

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



cape

Gudgeon Pin Circlip Removal

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

Note:

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

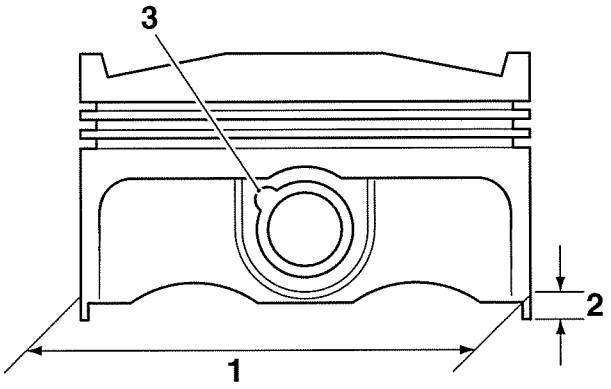
4. With the gudgeon pin removed, the piston can be detached from the connecting rod.
5. Remove the piston rings.

Note:

- **The rings may be removed using a proprietary piston ring expander tool or, if a tool is not available, carefully spread the ring opening using thumb pressure then push up on the opposite side of the ring to remove it from the piston.**

Piston Wear Check

1. Measure the piston outside diameter, 10 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 (10 mm up the piston skirt)
3. Gudgeon pin

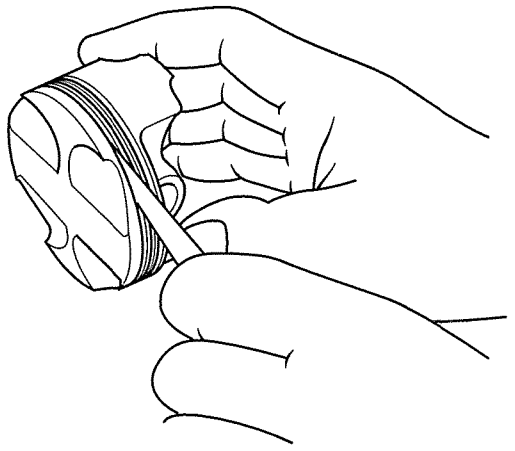
Piston outside diameter at 90° to gudgeon pin	
All cylinders	103.771 – 103.787 mm
Service limit	103.721 mm

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

Piston Rings/Ring Grooves

1. Check the pistons for uneven groove wear by visually inspecting the ring grooves.
2. Clean the piston ring grooves.

3. 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

Checking Piston Ring to Groove Clearances

Piston ring/groove clearance	
Top - standard	0.02 - 0.06 mm
Top - service limit	0.16 mm
Second - standard	0.02 - 0.06 mm
Second - service limit	0.16 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 top of the liner around its full circumference.

ccvj

Aligning Piston Rings using the Piston

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

Piston ring end gap tolerances	
Top - standard	0.30 - 0.45 mm
Top - service limit	0.65 mm
Second - standard	0.45 - 0.60 mm
Second - service limit	0.775 mm
Oil control - standard	0.20 - 0.70 mm
Oil control - service limit	0.875 mm

Note:

- **If the end gap is too large, replace the piston rings with a new set.**
- **If the gap remains too large with new piston rings, both the pistons and liners must be replaced.**
- **If the gap is too small, check the cylinder bore for distortion, replacing as necessary. Do not file piston rings!**

Piston Assembly

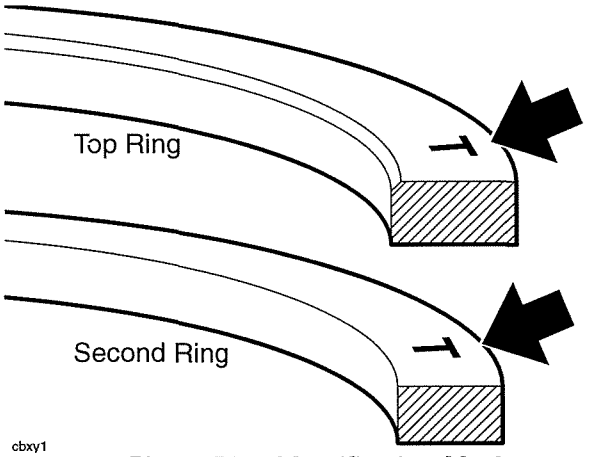
1. Clean the piston ring grooves and fit the piston rings to the piston.

Note:

- **The top ring upper surface is marked 'T' and can be identified by a small chamfer on the inside edge.**

The second ring upper surface is also marked 'T' but is plain on the inside edge and has a bronze appearance.

All oil control rings can be fitted with either face upward.



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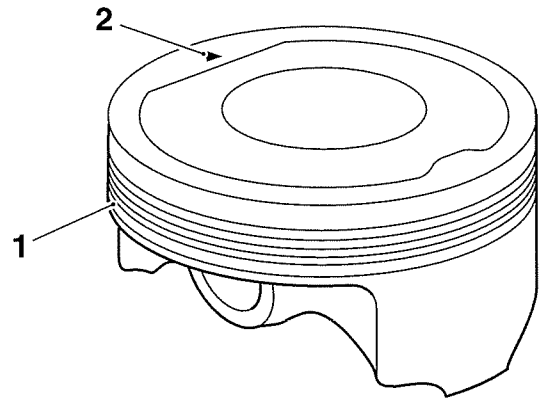
Piston Ring Identification Marks

2. Install a new circlip to one side of the piston.

3. Locate the piston to the connecting rod ensuring that the piston direction arrow points to the right hand (exhaust) side of the engine.



caqj

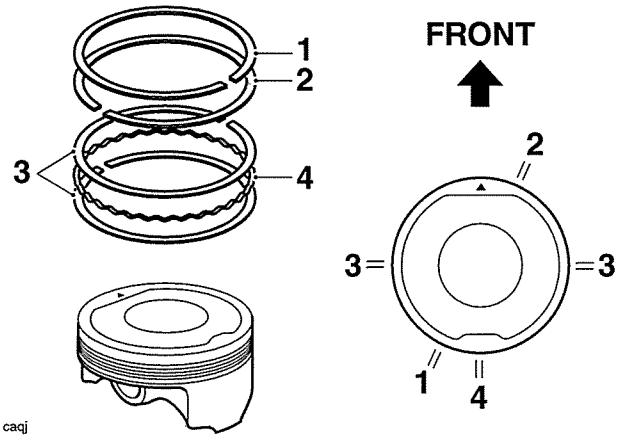
1. Piston
2. Direction arrow

4. Align the small end in the connecting rod with the gudgeon pin hole in the piston.
5. Lubricate the piston, small end and gudgeon pin with clean engine oil and fit the gudgeon pin from the opposite side to the installed circlip.
6. Fit a new circlip to the remaining location in the piston then check that both are correctly installed. Rectify if necessary.

⚠ Warning

Re-using the original circlips may cause gudgeon pin detachment resulting in engine seizure, loss of motorcycle control and an accident.

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



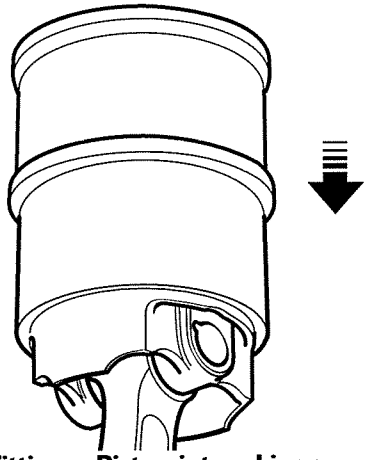
caqj

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).**

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



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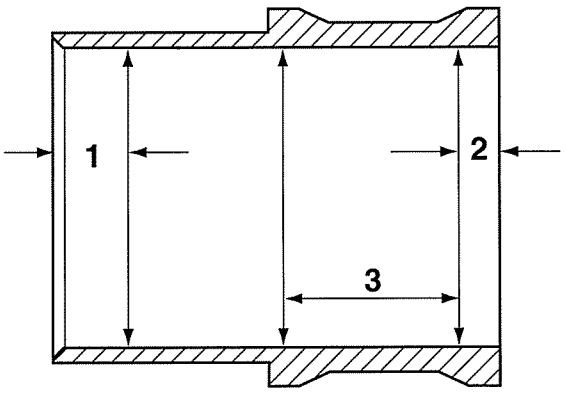
Fitting a Piston into a Liner

Cylinder Wear

1. Measure the internal diameter of each cylinder liner using an internal micrometer or Mercer gauge. Always check in two places, at 90° to each other, as well as at three heights in the liner.

Cylinder liner internal diameter	
Standard	103.791 – 103.809 mm
Service limit	103.859 mm

Check the diameter at points 1, 2 and 3.



gaep

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

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

Cylinder Liners

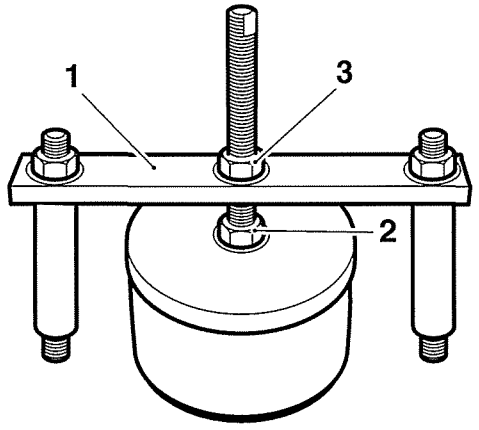
Removal

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.

Note:

- **If an accessory big bore kit is fitted, replace the centre section of tool T3880061 with tool T3880121. The removal procedure is identical for either size cylinder liners.**

3. Check that the locking nut on tool T3880061 is loose, then fully unscrew the extraction nut.

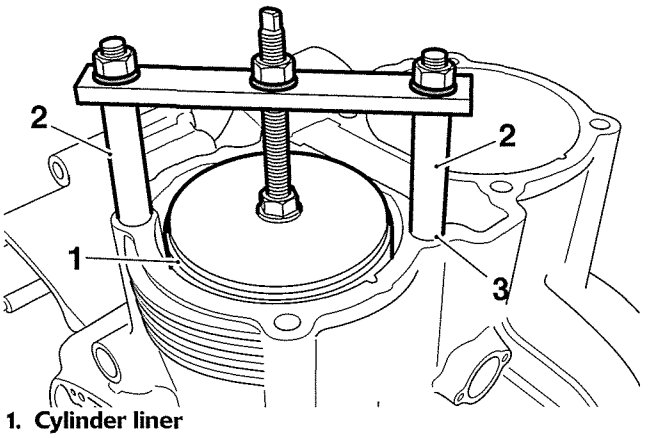


1. Tool T3880061
2. Locking nut
3. Extraction nut

⚠ Caution

The cylinder liners and pistons are made of aluminium alloy and can therefore be easily damaged. Handle the cylinder liner and piston with care, ensuring the internal bore of the liner and the piston skirt are not scratched.

4. Carefully fit the rubber section of the tool fully into the cylinder liner, positioning the studs supplied with the tool diagonally across a pair of head bolt-holes.



1. Cylinder liner
2. Studs
3. Head-bolt holes

5. Fully engage the bolt threads in the head bolt holes. It is not necessary to fully tighten the bolts.
6. Turn the locking nut clockwise until the rubber sleeve on the tool tightly grips the bore of the liner.
7. Turn the extraction nut clockwise sufficient to raise the liner and break the seal between the liner and crankcase.

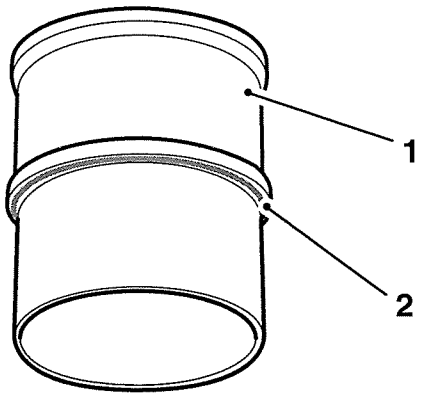
Note:

- **It is not necessary (or possible) to fully extract the liner using this tool. Once the seal is broken, the tool must be removed and the liner extracted by hand.**

8. Turn the locking nut anti clockwise to release the liner.
9. Once the seal on the liner is released, remove the tool and manually remove the liner.

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 a thin bead of silicone sealer (at the factory, ThreeBond TB1215J is used) to the liner to crankcase mating face.

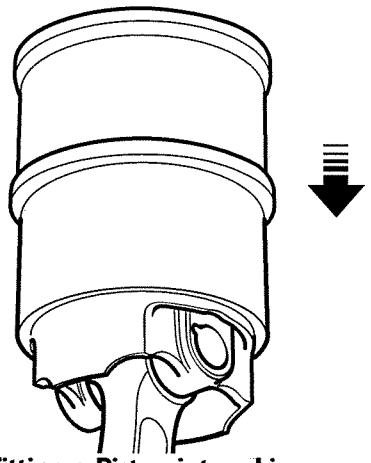


ccvl

1. Liner

2. Sealer area

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



ccvl

Fitting a Piston into a Liner

Caution

Care must be taken when installing liners such that the silicone sealer is not forced out, blocking passageways in the crankcase.

Note:

- **The liners have a large chamfer at the bottom of the bore, enabling fitting of the piston without the 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.

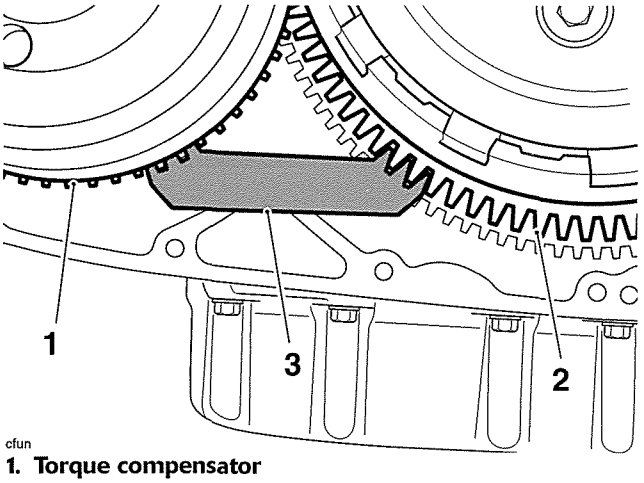
Note:

- **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.**

Torque Compensator

Removal

1. Remove the clutch cover (see page *4-6*).
2. Lock the torque compensator to the clutch, using service tool T3880043 located **below** the clutch as shown below.



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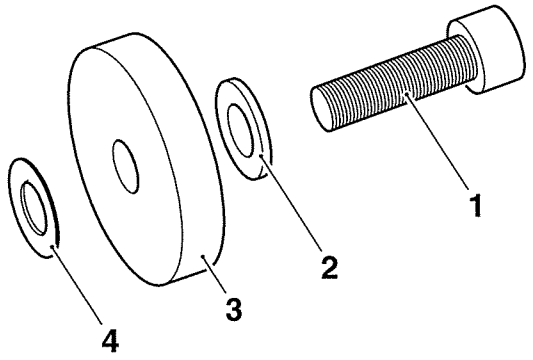
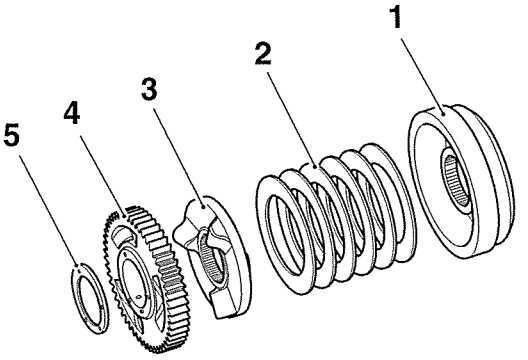
1. Torque compensator
2. Clutch Primary gear
3. Tool T3880043

3. Remove the torque compensator fixing. Collect the large washer and (if fitted) the shim and plain washer. Discard the fixing.



1. Fixing
2. Plain washer
3. Large washer (12mm thick)
4. Shim

4. Remove the torque compensator spring retainer and noting their orientation, collect the six Belleville washers.
5. Remove the torque compensator cam follower from the crankshaft spline.
6. Remove the primary gear and collect the thrust washer.



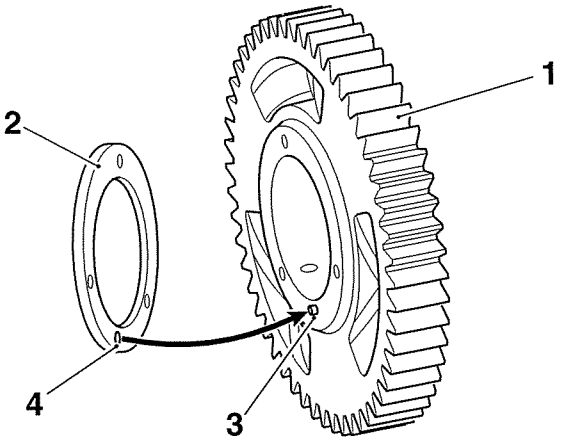
1. Spring retainer
2. Belleville washers
3. Cam follower
4. Primary gear
5. Thrust washer

Inspection

1. Inspect the Belleville washers for wear or damage.
2. Inspect the cam follower and primary gear for wear or damage.
3. Rectify as necessary.

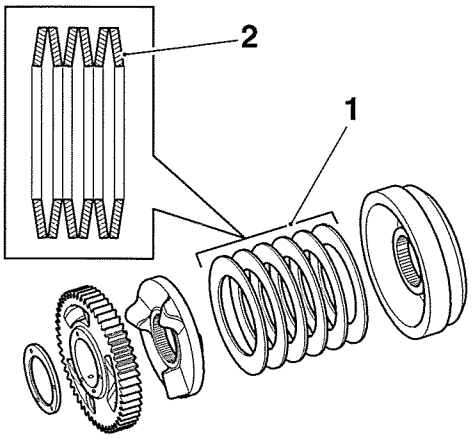
Installation

1. Fit the thrust washer to the primary gear, ensuring the peg on the gear aligns with the corresponding hole in the washer, and that the thrust side of the washer, which can be identified by its copper coloured surface, faces away from the primary gear.



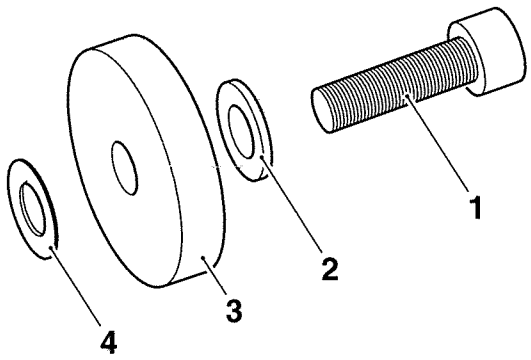
1. Primary gear
2. Thrust washer
3. Peg
4. Alignment hole

2. Align the primary gear and slide it over the crankshaft. Check that the thrust washer does not become dislodged during installation.
3. Refit the cam follower.
4. Fit the six Belleville washers in their correct orientation as noted during disassembly.



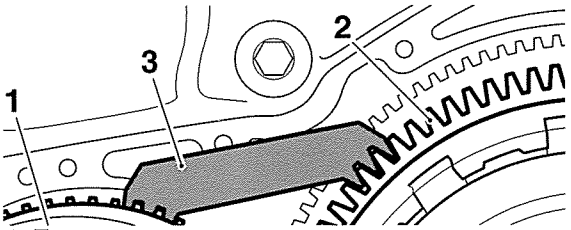
1. Belleville washers
2. Correct orientation

5. Refit the spring retainer.
6. Fit the plain washer, large washer and shim to a new fixing.



1. Fixing
2. Plain washer
3. Large washer (12mm thick)
4. Shim

7. Secure the spring retainer with the fixing and washers, and hand tighten.
8. Lock the torque compensator to the clutch, using service tool T3880043 located **above** the clutch as shown below.



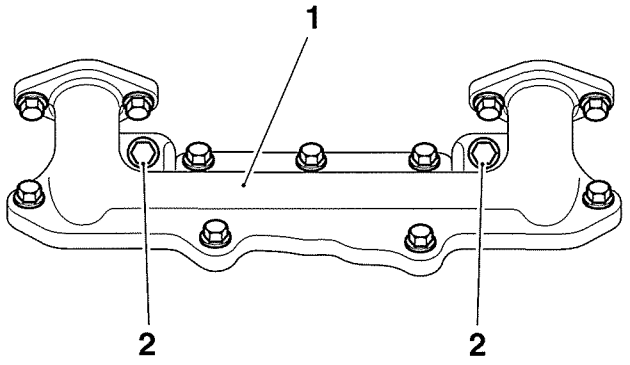
1. Torque compensator
2. Tool T3880043
3. Clutch Primary gear

9. Tighten the torque compensator fixing to **120 Nm**.

Coolant Manifold

Removal

1. Remove the fixings and remove the manifold from the rear of the crankcase.
2. Remove and discard the manifold seals.
3. Discard the two encapsulated bolts from positions 1 and 2 as shown below.

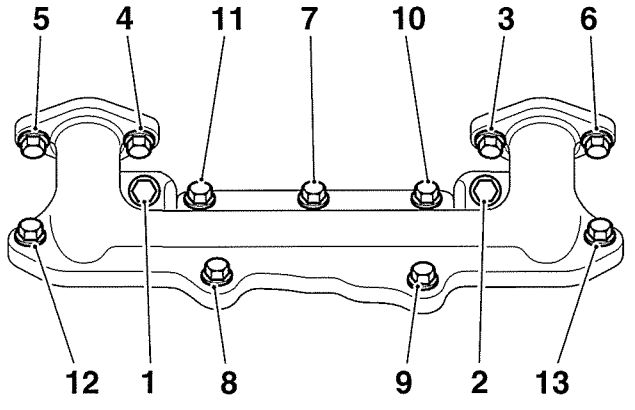


cfze

1. Coolant manifold
2. Encapsulated bolts

Installation

1. Fit new seals to the manifold.
2. Position the manifold to the crankcase, ensuring the seals are not dislodged during assembly.
3. Fit new bolts to positions 1 and 2 as shown below and tighten to **3 Nm**.
4. Fit the remaining bolts to positions 3 to 13 and tighten to **9 Nm**.



cfze

Coolant Manifold Tightening Sequence

6 Balancer

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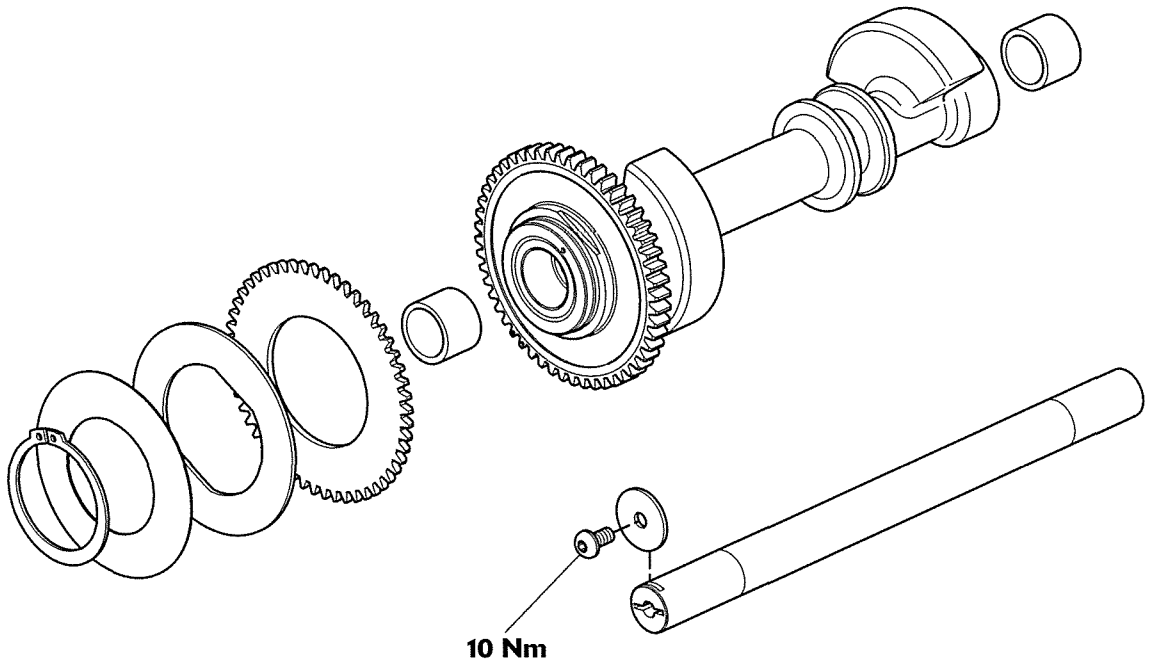
Exploded View - Balancer



Introduction

The Thunderbird is fitted with two balancer shafts, one forward of the crankshaft and one behind it. Each 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 drive gear is fitted with a backlash gear, to reduce backlash between the gear teeth and therefore reduce noise. The backlash gear uses a hunting tooth design, which means it has one less tooth than the balancer shaft driven gear. The balancer shaft driven gear has 55 teeth, the backlash gear has 54 teeth. This design has the effect of eliminating any backlash between the two gears. However it also means that the timing marks located on the backlash gear will only align with the timing marks on the balancer shaft driven gear once every 55 revolutions of the balancer shaft. Therefore it is essential to correctly align the backlash gear with the balancer shaft driven gear as described in the following instructions.

Removal

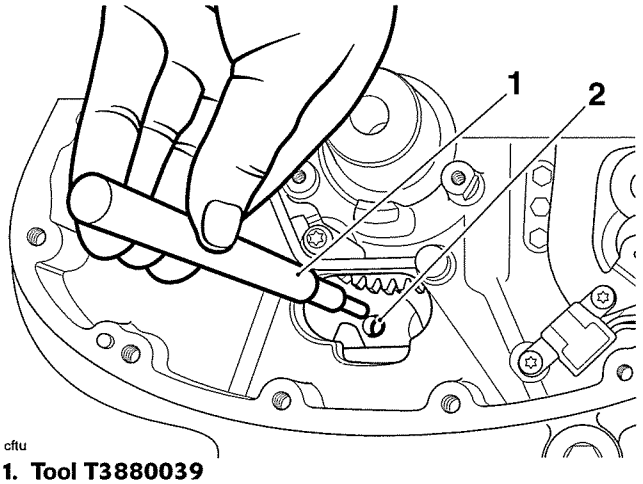
Warning

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

Note:

- **The removal and installation procedure for either balancer shaft is the same. This procedure describes the replacement of the front balancer shaft.**

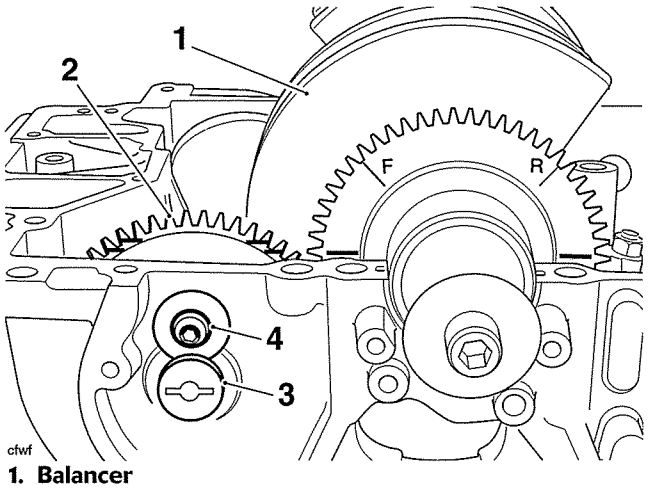
1. Remove the engine (see page *9-2*).
2. Separate the crankcase halves (see page *5-4*).
3. Turn the crankshaft until the timing pin T3880039 can be inserted through the hole in the upper crankcase and into the idler gear.



cftu

1. Tool T3880039
2. Timing hole in crankcase

4. Release the dead shaft screw and washer and slide out the dead shaft, supporting the balancer shaft as you do so.



cfwf

1. Balancer
2. Crankshaft
3. Dead shaft
4. Screw and washer

5. Remove the balancer shaft.
6. Discard the dead shaft screw and retain the washer for re-use.

Inspection

1. Inspect all gears for chipped or missing teeth and for overheating (blue discolouration).
2. Inspect all bearings for signs of overheating (blue discolouration), seizure and any other damage. Check that all bearings rotate smoothly and without tight spots.

Assembly/Installation

Note:

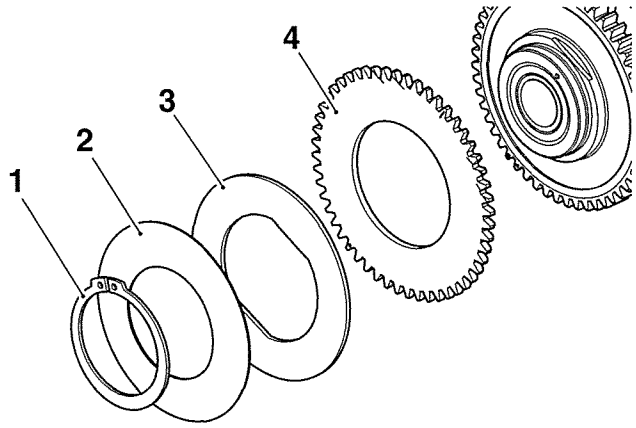
- **To ensure a correct relationship, the balancer shaft must be installed in a specific orientation relative to the crankshaft.**
- **Before the balancer shaft is installed, it is necessary to reposition the backlash gear on the balancer shaft in relation to the driven gear. The timing marks on the two gears will not align once the engine has been rotated away from its initial timed position.**

1. Check that the timing pin T3880039 is still fully inserted in to the idler gear, and that the crankshaft to idler gear timing is correct (see page *5-9*).

Note:

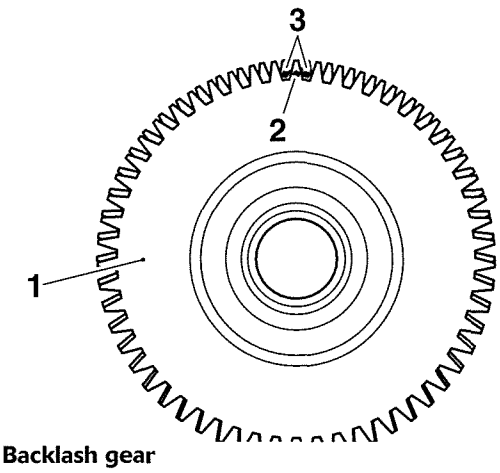
- **Note the orientation of the Belleville washer before disassembly.**

2. Remove the circlip, Belleville washer and thrust washer from the balancer shaft.



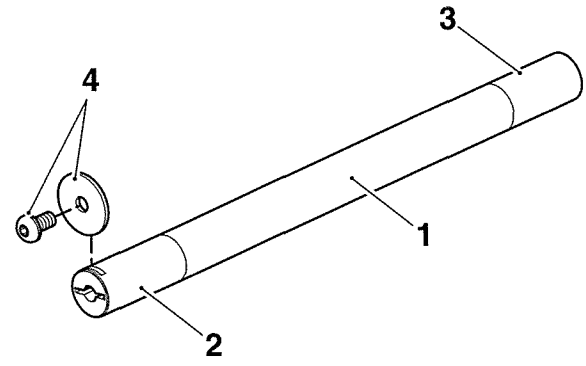
1. Circlip
2. Belleville washer
3. Thrust washer
4. Backlash gear

3. Rotate the backlash gear until the dot aligns with the two dots on the balancer shaft driven gear.



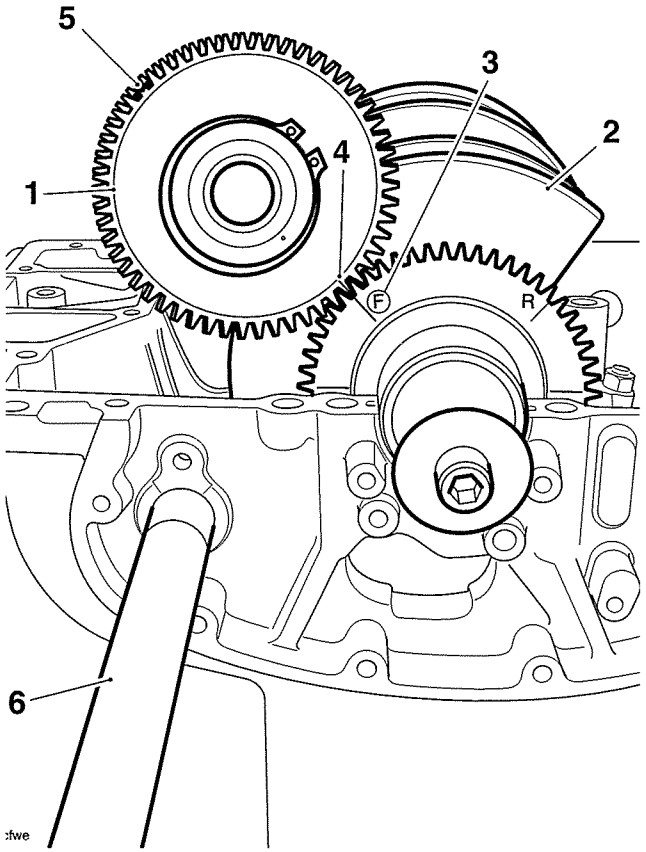
1. Backlash gear
2. Backlash gear dot mark
3. Balancer shaft driven gear dot marks

4. Refit the thrust washer, Belleville washer (concave side facing the balancer shaft) and secure with a new circlip. Ensure that the circlip is fully seated in the groove on the balancer shaft.
5. Lubricate the balancer shaft needle roller bearings with clean engine oil.
6. Position the plain end of the dead shaft in to the crankcase. Do not fully insert the dead shaft at this stage.



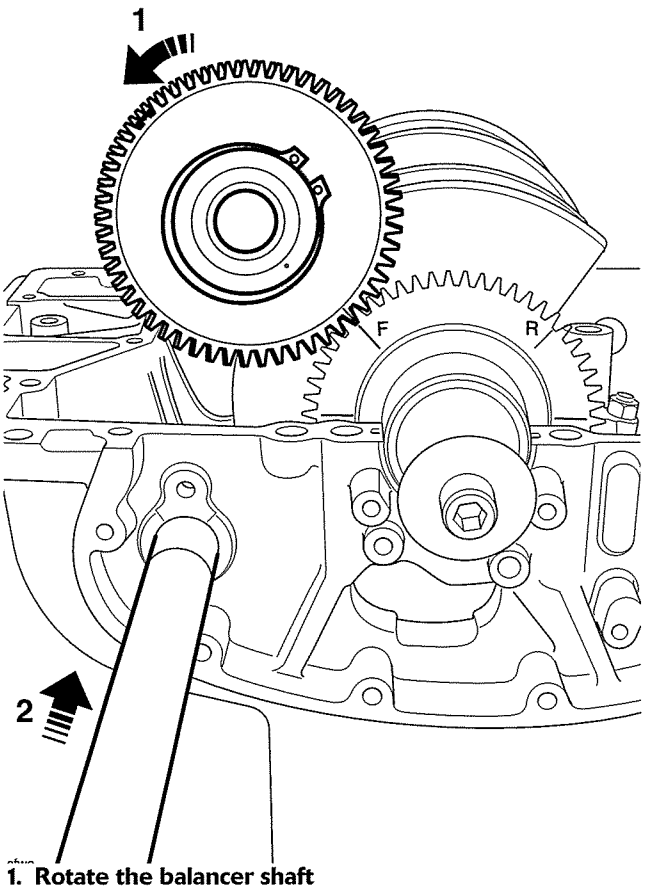
1. Dead shaft
2. Slotted end
3. Plain end
4. Screw and washer

7. Position the balancer shaft to the crankshaft, aligning the mark on the driven gear with the 'F' (front) mark on the crankshaft drive gear.



1. **Balancer shaft**
2. **Crankshaft**
3. **Crankshaft 'F' (front) mark**
4. **Balancer shaft timing mark**
5. **Balancer shaft dot marks**
6. **Dead shaft**

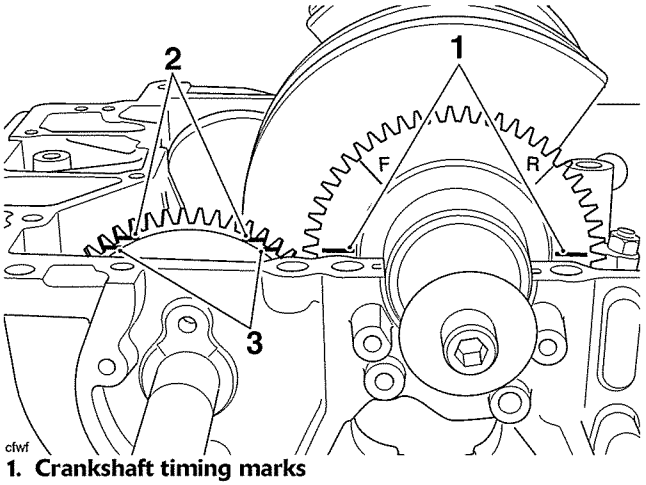
8. **Without disengaging the balancer shaft driven gear from the crank shaft drive gear**, rotate the balancer shaft downwards until the balancer is in its fitted position and insert the dead shaft. Do not fit the screw or washer at this stage.



1. **Rotate the balancer shaft**
2. **Install the dead shaft**

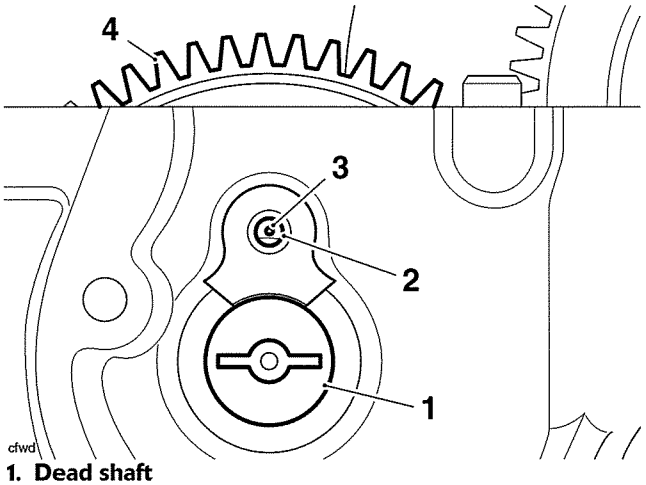
9. To check that the balancer shaft is correctly timed to the crankshaft proceed as follows:
   - Check that the two lower horizontal lines on the balancer shaft backlash gear align with the crankcase split line.

- Check that the two upper horizontal lines on the balancer shaft backlash gear align with the corresponding lines on the crankshaft drive gear.



1. Crankshaft timing marks
2. Balancer gear to crankshaft timing marks
3. Balancer gear to crankcase split line marks

- Check that the dot mark on the balancer shaft is visible through the dead shaft screw hole in the crankcase.



1. Dead shaft
2. Screw hole
3. Dot mark
4. Balancer shaft

Note:

- **If the timing is not correct, the procedure must be restarted from the beginning.**
- **The timing marks on the backlash gear will no longer align with the marks on the balancer shaft driven gear once the balancer shaft has been rotated around the crankshaft, therefore the backlash gear must be removed and reset as described at step one above.**

10. Fit a new screw to the washer and install the screw and washer to the dead shaft, ensuring the washer engages in the slot in the shaft. Tighten to **10 Nm**.
11. Install the rear balancer in the same way, noting that the rear balancer shaft uses the 'R' mark on the crankshaft gear and not the 'F' mark.
12. Assemble the crankcase halves (see page *5-6*).
13. Refit the engine to the frame (see page *9-5*).

7 Transmission

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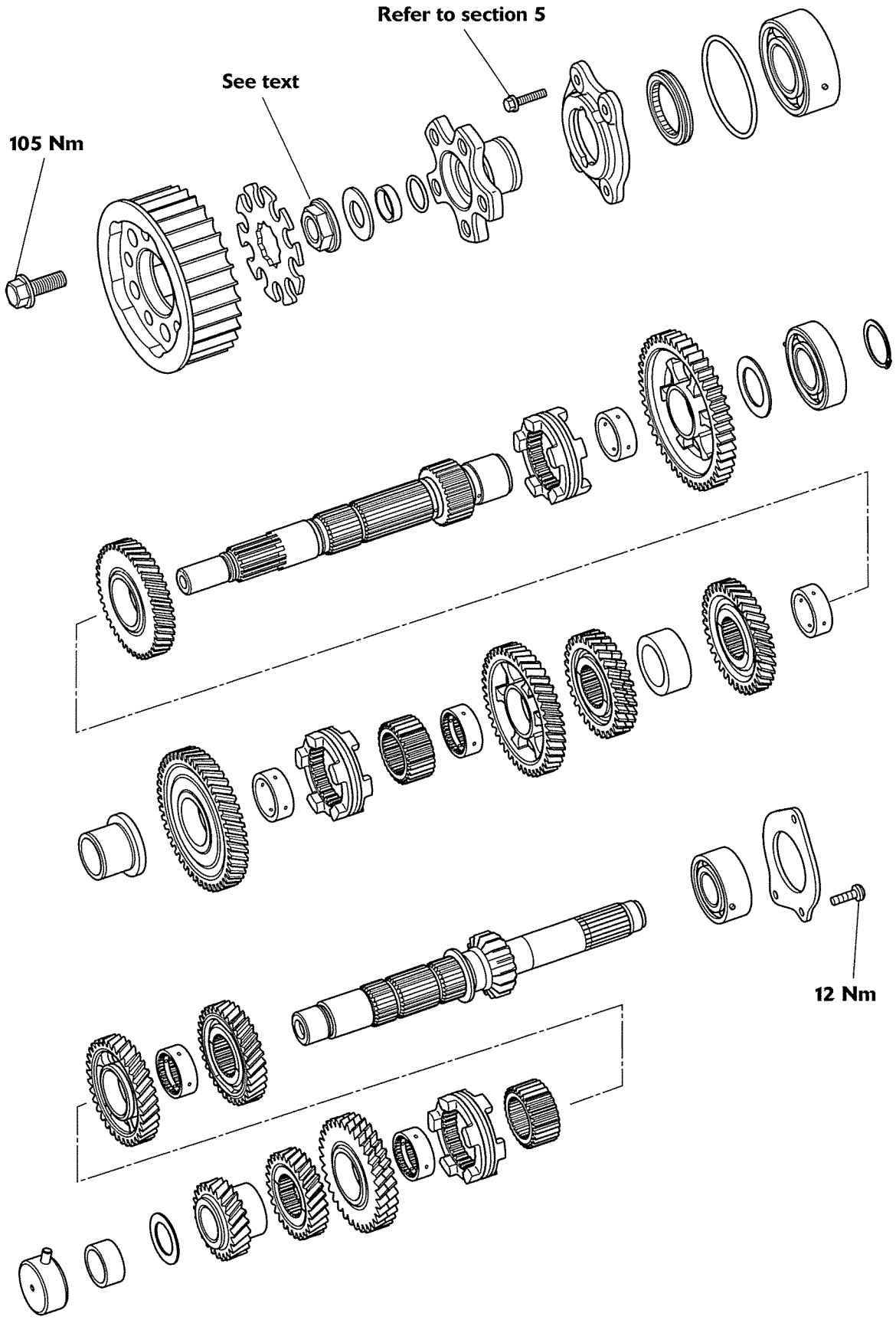
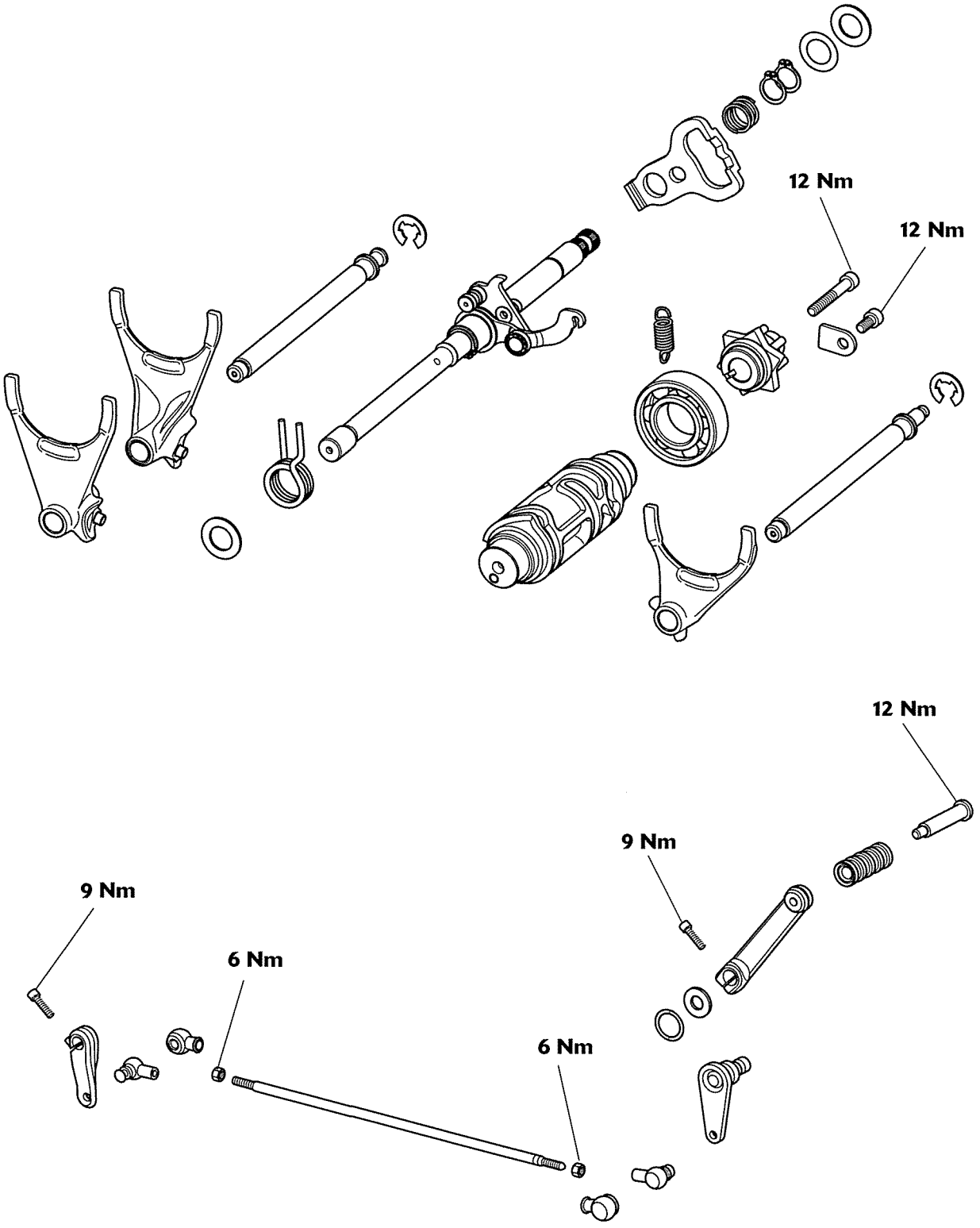
Exploded View - Input and Output Shafts



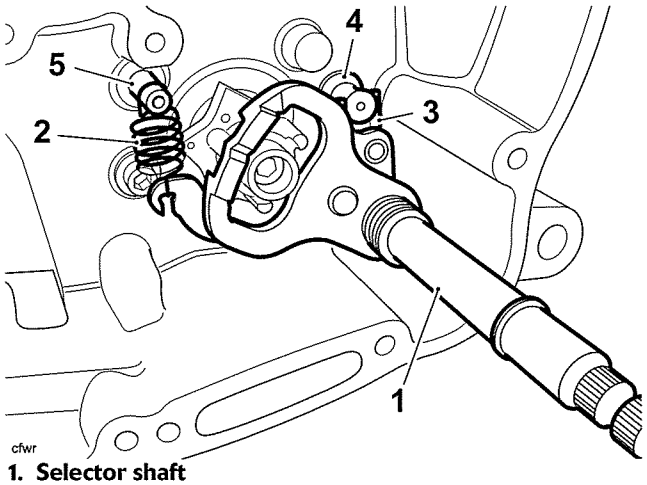
Exploded View - Gear Selector and Gear Change Mechanisms



Selector Shaft

Removal

1. Remove the clutch (see page *4-8*).
2. Release the detent arm spring.
3. Withdraw the selector shaft as an assembly. Note the position of the selector shaft spring over the rear selector fork shaft.



1. Selector shaft
2. Detent spring
3. Selector shaft spring
4. Rear selector fork shaft
5. Front selector fork shaft

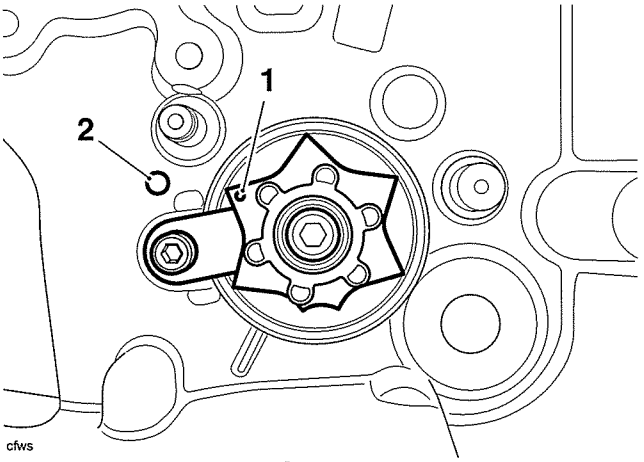
4. Collect the washer from the selector shaft.

Inspection

1. Inspect all springs for over-extension (i.e. abnormal gaps between coils). Replace as necessary.
2. Check the selector shaft for wear or damage. Renew components as necessary.

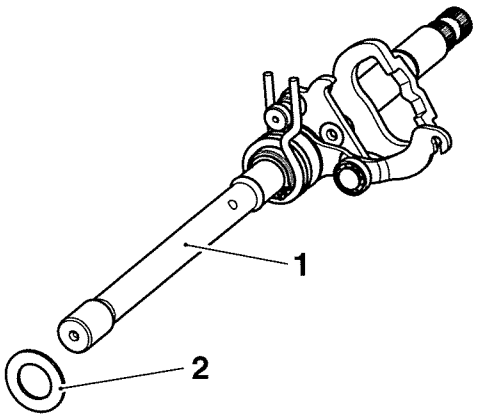
Installation

1. Set the transmission in neutral. Rotate the selector drum until the dot mark on the drum aligns with the mark on the crankcase, as shown below.



1. Selector drum dot mark
2. Crankcase mark

2. Check that the washer is in position on the selector shaft.



1. Selector shaft
2. Washer

3. Install the shaft to the crankcase, ensuring the selector shaft spring passes over the end of the rear selector fork shaft.
4. Refit the detent spring.
5. Refit the clutch (see page *4-10*).

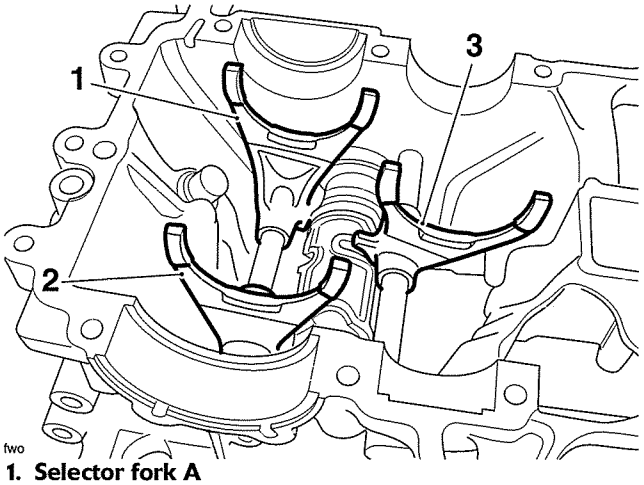
Selector Forks and Drum

Removal

Note:

- **Prior to removal, mark, or make a note of the relative positions of each selector fork in the selector drum.**

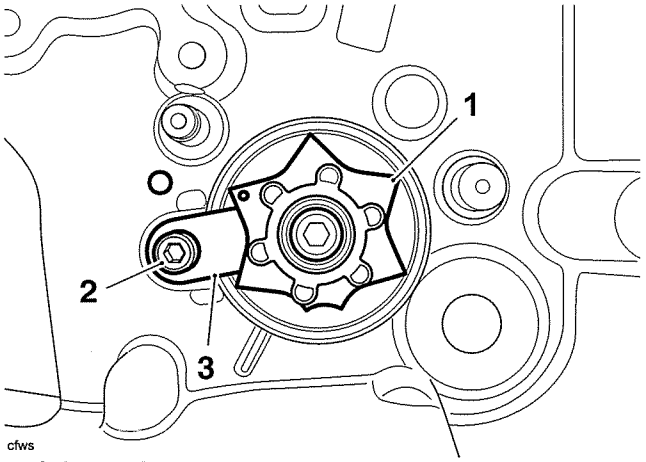
1. Remove the engine from the frame (see page *9-2*).
2. Separate the lower crankcase from the upper (see page *5-4*).
3. Remove the selector shaft (see page *7-4*).
4. Remove and discard the E-clips securing the two selector forks shafts in to the crankcase.
5. Withdraw the front selector fork shaft and collect the selector fork (marked C).
6. Withdraw the rear selector fork shaft and collect the two selector forks (marked A and B).



two

1. Selector fork A
2. Selector fork B
3. Selector fork C

7. Remove and discard the fixing and remove the selector drum bearing keeper plate.
8. Remove the selector drum.



cfws

1. Selector drum
2. Fixing
3. Bearing keeper plate

9. If required, remove the fixing and remove the detent wheel from the selector drum.

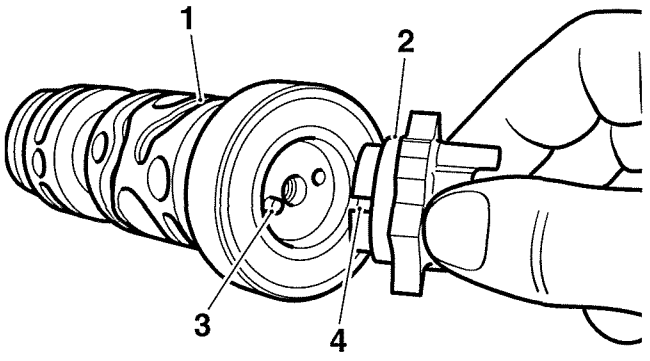
Inspection

1. Inspect all bearings for damage and wear. Renew as necessary.
2. Check the selector forks and selector grooves for wear beyond the service limits. Renew components as necessary.

Item	Standard	Service Limit
Selector fork thickness	4.35 - 4.45 mm	4.25 mm
Selector groove width	4.50 - 4.60 mm	4.75 mm
Fork to groove clearance	0.05 - 0.25 mm	0.50 mm

Installation

1. If removed, refit the detent wheel to the selector drum, ensuring the pin on the drum locates in the slot in the detent wheel. Prevent the drum from turning and tighten the fixing to **12 Nm**.



cfwy

1. Selector drum
2. Detent wheel
3. Pin
4. Slot

2. Refit the selector drum, ensuring it is pushed fully home in the crankcase.
3. Fit the bearing keeper plate and retain the plate using a new fixing. Tighten the fixing to **12 Nm**.
4. Position the rear selector fork shaft to the crankcase, and refit the selector fork A (A marking facing towards the clutch) and then B (B marking facing away from the clutch).
5. Position the front selector fork shaft to the crankcase, and refit selector fork C (C marking facing away from the clutch).
6. Fit new E-clips to both selector fork shafts.
7. Refit the selector shaft (see page *7-4*).
8. Assemble the crankcases (see page *5-6*).
9. Refit the engine (see page *9-5*).

Input and Output Shaft Assemblies

Removal

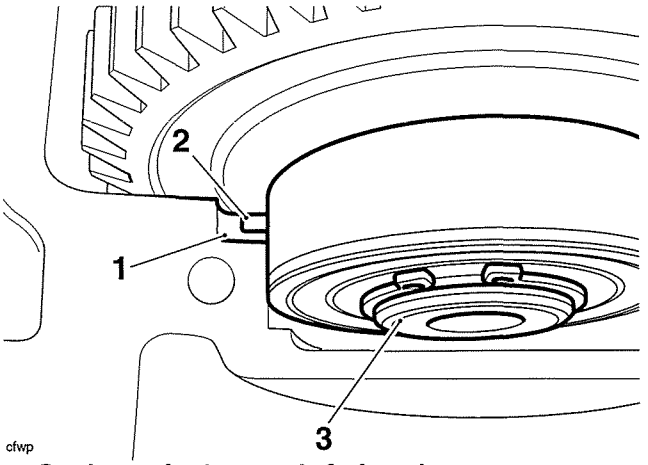
Note:

- **The input and output shafts may be removed from the upper crankcase after first separating the lower crankcase from the upper.**

1. Remove the engine from the frame (see page *9-2*).
2. Separate the lower crankcase from the upper (see page *5-4*).
3. Lift the input shaft from the upper crankcase noting the orientation of each bearing.
4. Lift the output shaft from the upper crankcase noting the orientation of each bearing.

Installation

1. Refit the input shaft to the crankcase ensuring the pins fitted to the outer bearing races locate correctly in the holes in the crankcase.
2. Refit the output shaft to the crankcase ensuring the pins fitted to the outer bearing races locate correctly in the slots in the crankcase.

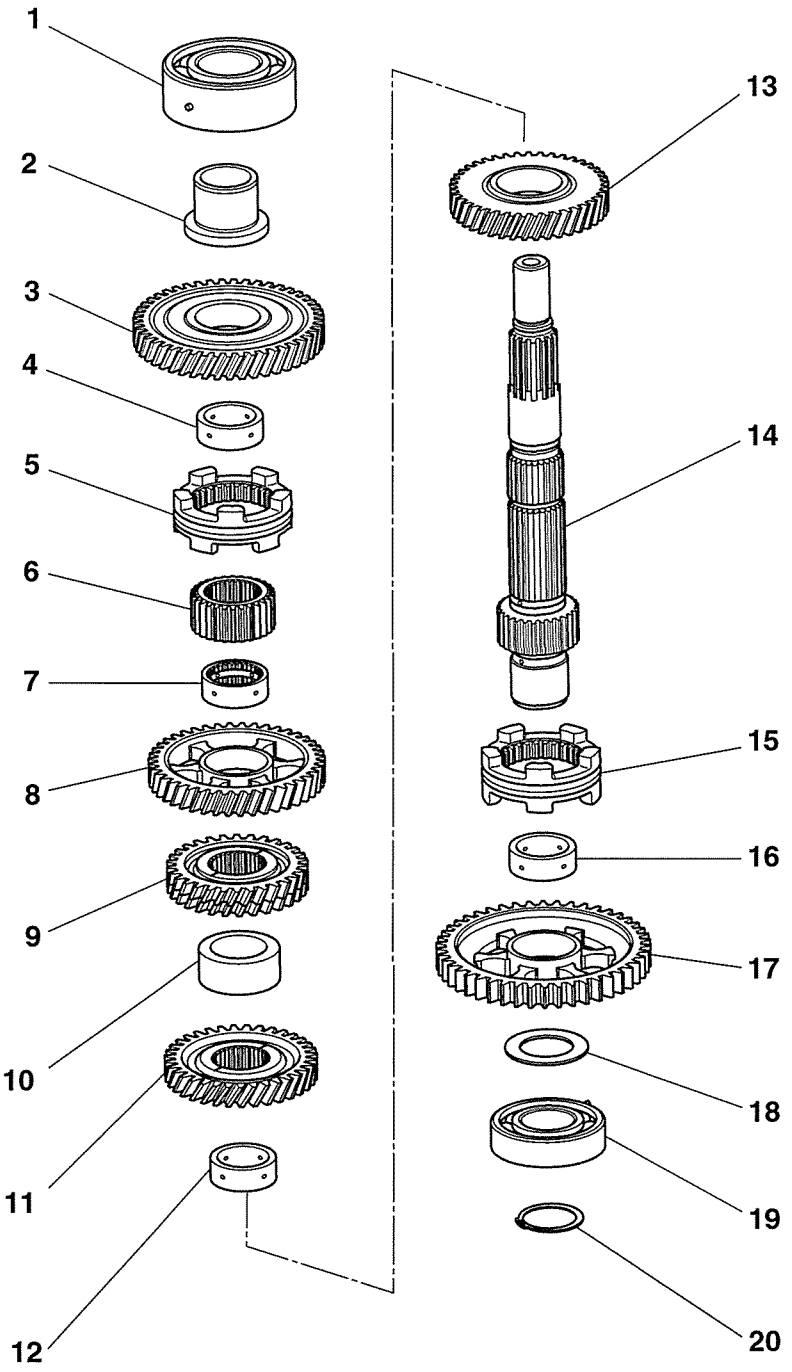


cfwp

1. Crankcase slot (output shaft shown)
2. Bearing pin
3. Bearing

3. Assemble the crankcases (see page *5-6*).
4. Refit the engine to the frame (see page *9-5*).

Output Shaft



1. Ball bearing
2. Bearing sleeve
3. Second gear
4. Plain bush
5. Dog ring
6. Splined spacer
7. Splined bush
8. Third gear
9. Sixth gear
10. Plain spacer
11. Fifth gear
12. Plain bush
13. Fourth gear
14. Output shaft
15. Dog ring
16. Plain bush
17. First gear
18. Thrust washer
19. Bearing
20. Circlip

Disassembly

Note:

- **All numbers given within brackets in the procedure below refer directly to the numbered items in the diagram on page *7*.**

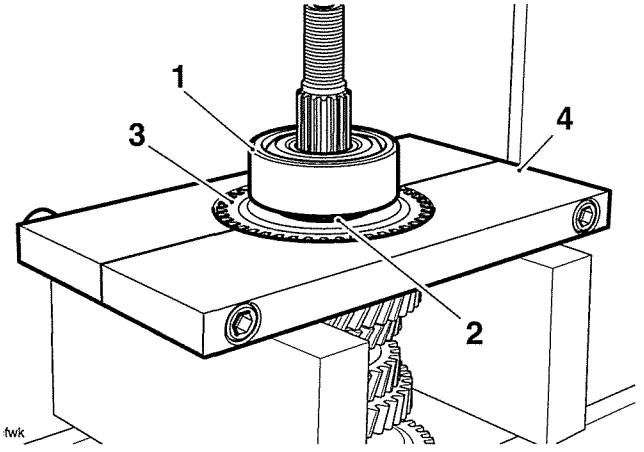
Make a note or mark the orientation of all parts prior to removal.

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.

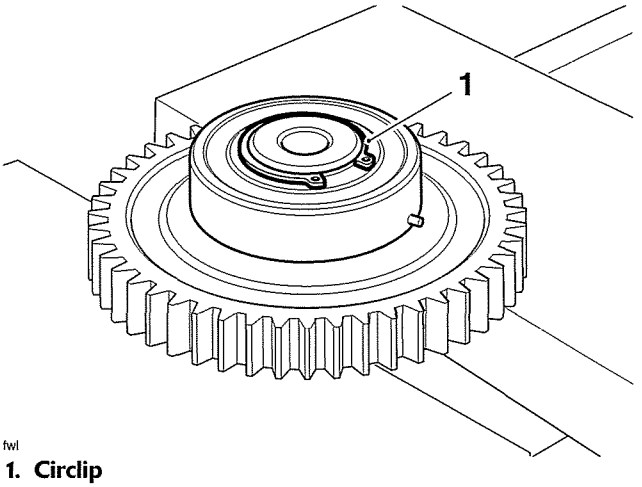
Never wear loose clothing, which could become trapped in the press and cause crushing injury to the hand, arms or other parts of the anatomy.

1. Attach service tool T3880133 to second gear (3) as shown below, and using a press, remove second gear and the outer bearing (1) and its sleeve (2).



1. Bearing
2. Sleeve
3. Second gear
4. Tool T3880133

2. If the bearing is to be renewed, noting the orientation of the bearing, press the bearing sleeve (2) out of the bearing using a press.
3. Remove the second gear plain bearing sleeve (4).
4. Noting its orientation, remove the second and third gear dog ring (5) and the splined spacer (6).
5. Noting its orientation, remove third gear (8).
6. Remove the splined bush (7).
7. Remove sixth gear (9).
8. Remove the plain spacer (10).
9. Remove fifth gear (11).
10. Noting its orientation, remove fourth gear (13) and its plain bush (12).
11. Noting its orientation, remove the fourth gear and first gear dog ring (15).
12. Working on the opposite end of the shaft, remove the circlip (20).



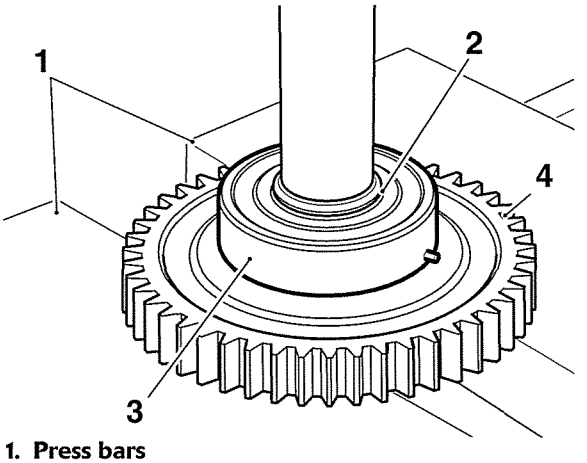
1. Circlip

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.

Place the shaft (14) in a press with the threaded end of the shaft facing away from the press ram. Support first gear (17) on press bars.



1. Press bars
2. Output shaft
3. Inner bearing
4. First gear

13. Press the shaft (14) through the bearing (19) and first gear (17). Collect the thrust washer (18) from between the gear and bearing. Collect the plain bush (16) from the shaft.

Inspection

1. Examine all gears, bearings and bushes and thrust washers for damage, distortion, chipped teeth and wear beyond the service limits. Replace all suspect components and always use a new circlip to assemble the shaft.

Assembly

Note:

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

⚠ Caution

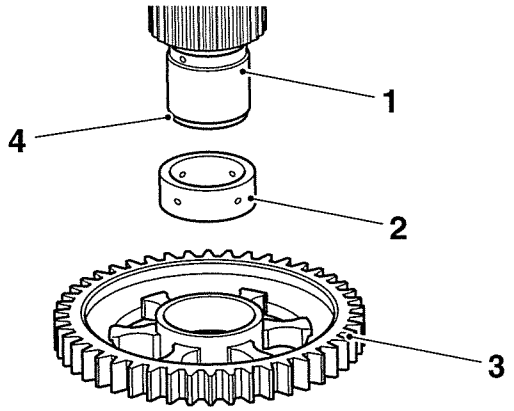
Bushes with oil holes must always be **MISALIGNED** with the corresponding oil holes in the output shaft. Reduced oil pressure and gear lubrication may result from alignment of the oil holes, which would cause premature wear of engine and transmission components.

⚠ 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.

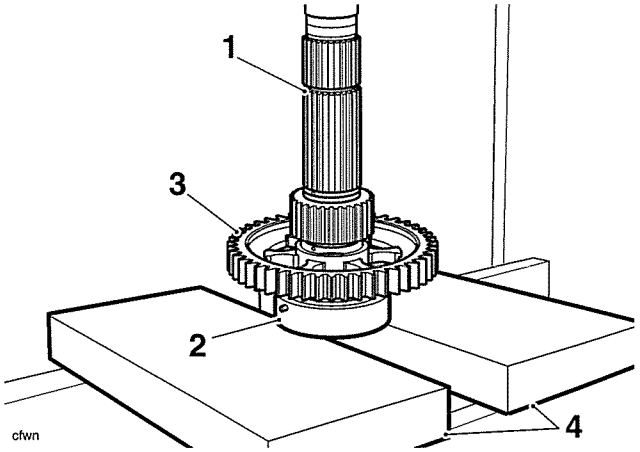
Never wear loose clothing, which could become trapped in the press and cause crushing injury to the hand, arms or other parts of the anatomy.

1. Assemble the plain bush (16) and first gear (17), with the dog ring slots facing away from the circlip groove, to the output shaft (14).



1. Output shaft
2. Plain bush
3. First gear
4. Circlip groove

2. Fit the thrust washer (18).
3. Place the output shaft inner bearing (19) on press bars, ensuring that the press bars support the inner race of the bearing and the locating pin on the outer race will be facing towards first gear when fitted to the shaft.



1. Output shaft
2. Bearing
3. First gear
4. Press bars

4. Locate the output shaft (19) to the bearing, with the circlip groove pointing through the bearing (i.e. away from the press).
5. Press the output shaft through the bearing until the thrust washer contacts the bearing face.
6. Fit a new circlip (20).
7. Working from the opposite end of the shaft, slide on the fourth gear and first gear dog ring (15). Ensure that the larger dogs face towards first gear (17).
8. Fit the plain bush (12) and fourth gear, ensuring the dog ring slots face the dog ring.
9. Fit fifth gear (11), and the plain spacer (10).
10. Fit sixth gear (9).
11. Fit the splined bush (7) and third gear (8), with the dog ring slot facing away from sixth gear.
12. Fit the splined spacer (6) and the second and third gear dog ring (5).
13. Fit the plain bush (4) and second gear (3) with the dog ring slots facing towards the dog ring (5).

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.

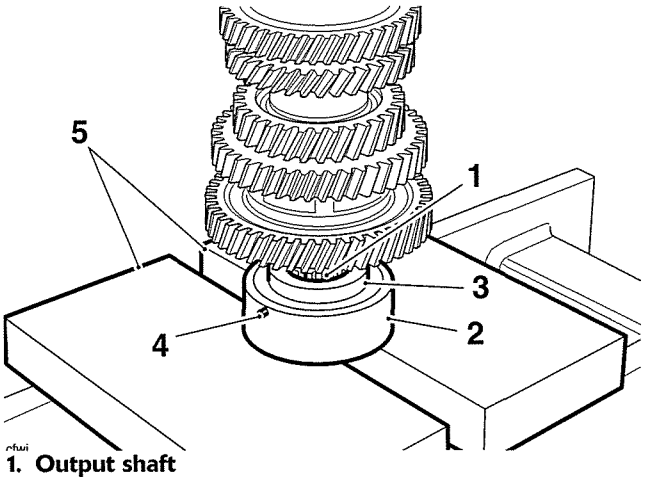
14. If the bearing (1) has been removed from the bearing sleeve (2), press a new bearing on to the sleeve using a press. Ensure the pin in the outer bearing race is fitted facing towards the flange on the sleeve.

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.

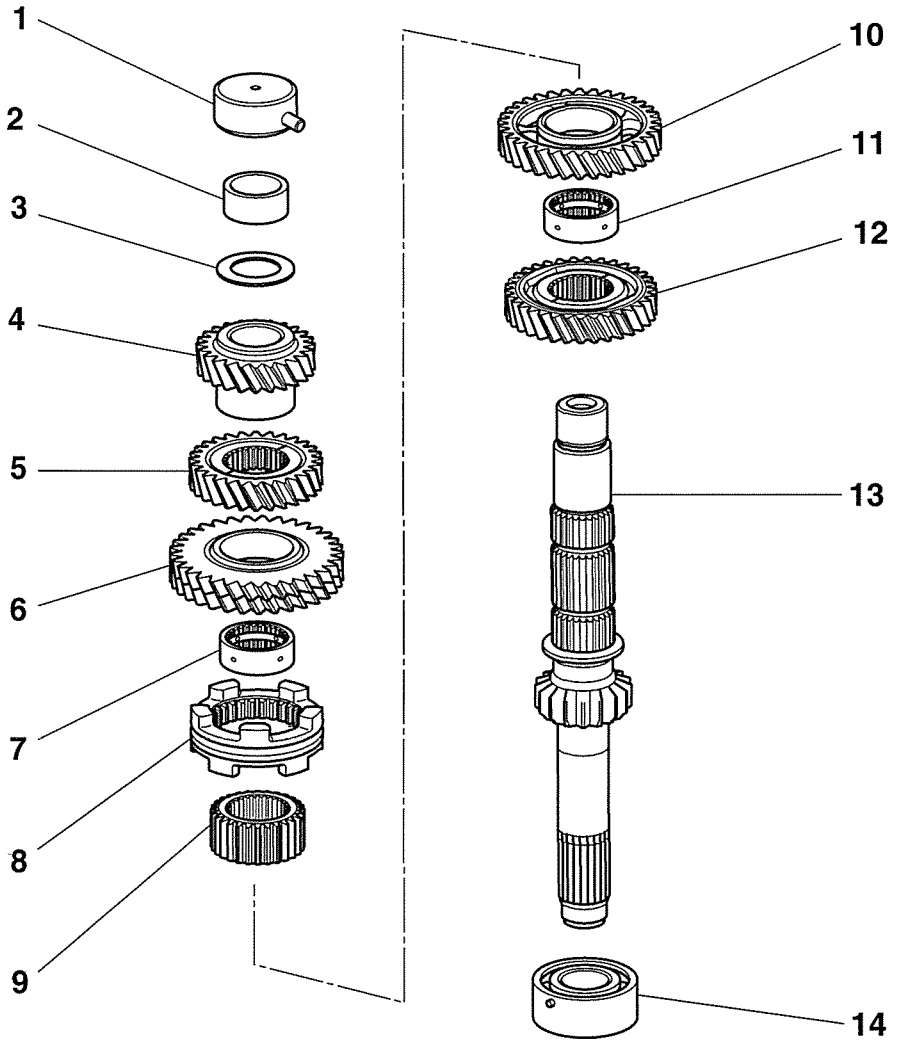
Never wear loose clothing, which could become trapped in the press and cause crushing injury to the hand, arms or other parts of the anatomy.

15. Return the output shaft to the press, and press on the outer bearing and sleeve as an assembly.



1. **Output shaft**
2. **Bearing**
3. **Bearing sleeve**
4. **Bearing pin**
5. **Press plates**

Input Shaft



1. Bearing cup
2. Bearing inner race
3. Thrust washer
4. Second gear
5. Third gear
6. Sixth gear
7. Splined bush
8. Dog ring
9. Splined spacer
10. Fifth gear
11. Splined bush
12. Fourth gear
13. Input shaft
14. Bearing

Disassembly

Note:

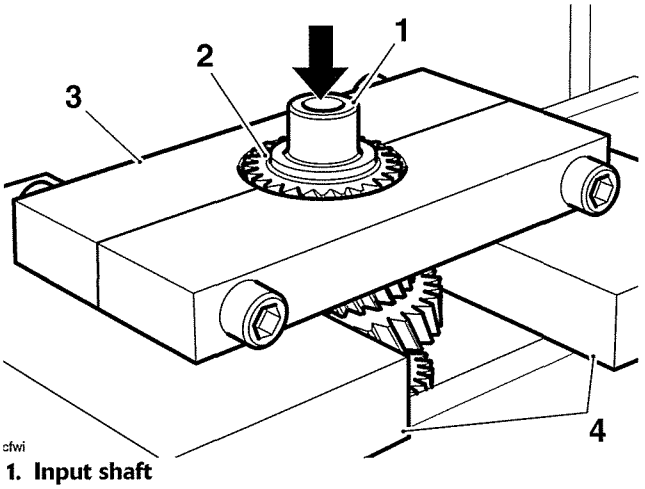
1. **All numbers given within brackets in the procedure below refer directly to the numbered items in the diagram on page *11*.**
2. Remove the bearing cup (1), bearing race (2) and thrust washer (3).
3. Attach service tool T3880108 to second gear (4) as shown below, hand tighten the fixings to secure the press plates in position.

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.

4. Using a press, remove second gear (4).



cfwi

1. Input shaft
2. Second gear
3. Tool T3880108
4. Press plates

5. Remove third gear (5).
6. Noting its orientation, remove sixth gear (6) and its splined bush (7).
7. Noting its orientation, remove the fifth and sixth gear dog ring (8) and the splined spacer (9).
8. Remove fourth gear (12) and its splined bush (11).

Note:

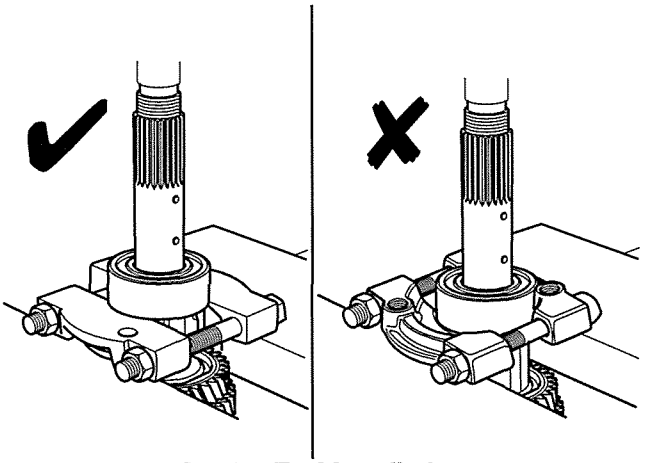
- **Unless the bearing (14) at the clutch end of the input shaft is damaged or worn, it is not normally necessary to remove it from the shaft. The bearing is pressed onto the shaft.**

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.

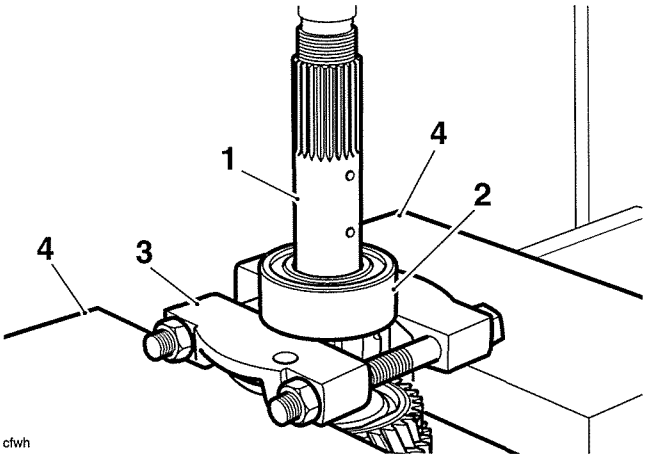
Never wear loose clothing, which could become trapped in the press and cause crushing injury to the hand, arms or other parts of the anatomy.

9. Attach service tool T3880108 to the bearing, **ensuring the flat side of the tool's jaws are in contact with the bearing.**



Service Tool Installation

10. Support the service tool on press bars, then press the shaft through the bearing as shown below.



cfwh

1. Input shaft
2. Bearing
3. Service tool T3880108
4. Press bars

Inspection

1. Examine all gears, bearings and bushes and thrust washers for damage, distortion, chipped teeth and

wear beyond the service limits. Replace all defective components.

Assembly

Note:

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

Warning

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

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

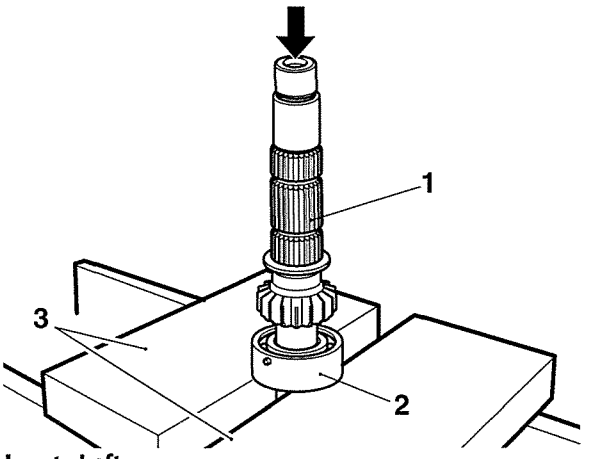
Caution

Bushes with oil holes must always be **MISALIGNED** with the corresponding oil holes in the output shaft. Reduced oil pressure and gear lubrication may result from alignment of the oil holes, which would cause premature wear of engine and transmission components.

Caution

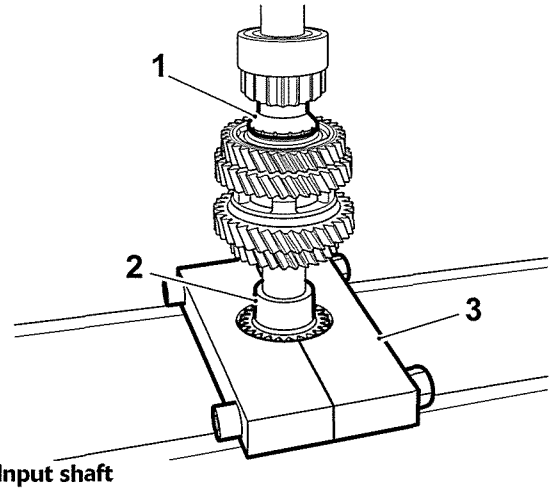
Removing the input shaft bearing from the shaft will damage the bearing. Never re-use removed bearings as use of damaged or weakened components could lead to engine and transmission damage.

1. Position a new bearing (14) to the input shaft.
2. Support the bearing on press bars as shown below, ensuring that the press bars support the inner race of the bearing.
3. Press the bearing fully on to the shaft.



1. Input shaft
2. Bearing
3. Press plates

4. Working now on the opposite end to the bearing, slide on fourth gear (12).
5. Fit the splined bush (11) then fit fifth gear (12), ensuring the dog ring slots face away from the bearing (14).
6. Fit the splined spacer (9) and the fifth and sixth dog ring (8). Ensure that the smaller dogs face towards fifth gear (12).
7. Fit the splined bush (7).
8. Fit sixth gear (6), ensuring the dog ring slots face towards the dog ring (8).
9. Fit third gear (5).
10. Position second gear (4) to the shaft, ensuring the plain section of the gear faces towards third gear (5).
11. Position the input shaft assembly to service tool T3880108 and return to the press. Press second gear on to the input shaft.

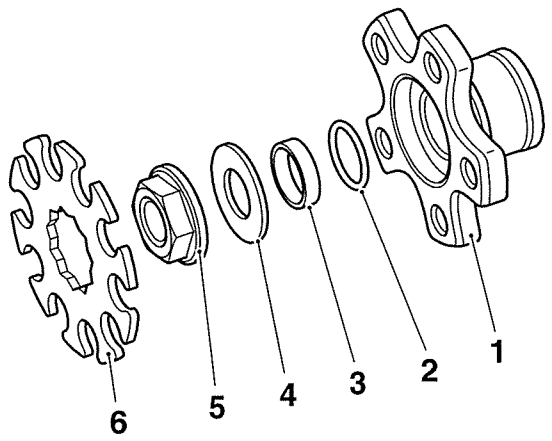


cfwq

1. Input shaft
2. Second gear
3. Tool T3880108

12. Refit the thrust washer (3), bearing race (2) and bearing cup (1).

Output Shaft Drive Belt Pulley Flange



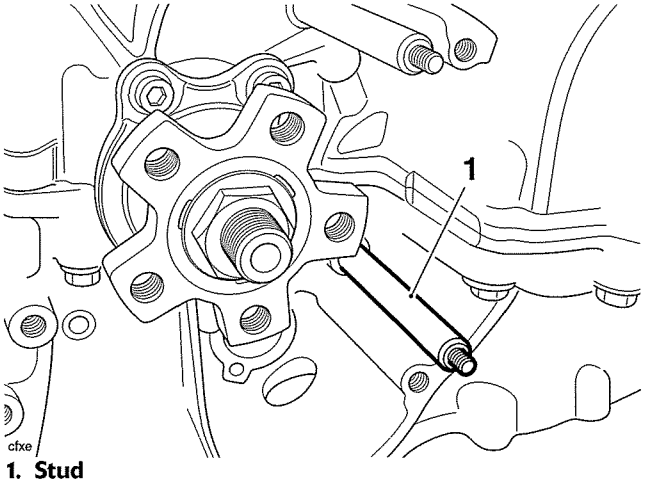
1. **Pulley flange**
2. **O-ring**
3. **Plastic spacer**
4. **Washer**
5. **Nut**
6. **Locking ring**

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 final drive belt (see page *15-8*).
2. Remove the gear position sensor (see page *10-101*).
3. Remove the locking ring.
4. Remove the expansion tank bracket lower stud.

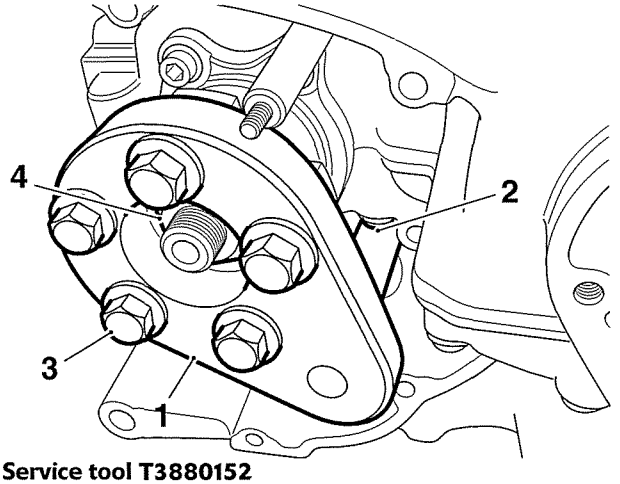


1. **Stud**

Caution

Do not rest the pin of tool T3880152 on any part of the crankcase, always position the tool's pin on the bolt head as shown below. Use of the tool with the pin resting on any part of the crankcase will result in severe damage to the crankcases.

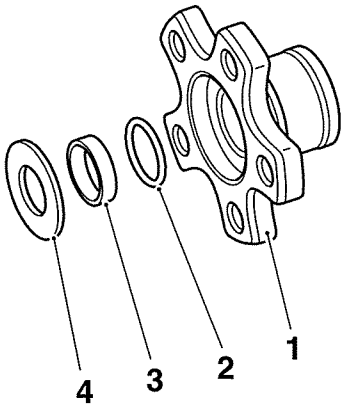
5. Install service tool T3880152 to the pulley flange, ensuring the pin on the tool rests on the head of the crankcase bolt as shown below, and secure with the five bolts removed from the final drive belt pulley.



1. **Service tool T3880152**
2. **Crankcase bolt head**
3. **Bolt**
4. **Pulley flange nut**

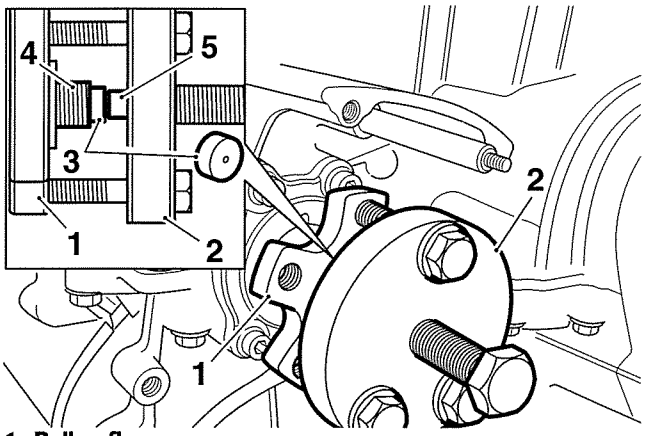
6. Remove the pulley flange nut. Retain the nut for use during the assembly process.

7. Remove the washer, plastic spacer and O-ring.



1. Pulley flange
2. O-ring
3. Plastic spacer
4. Washer

8. Assemble service tool T3880054 to the pulley flange as shown below. Ensure the thread protection button is positioned on the end of the output shaft and retained by the tool's forcing screw.
9. Using the service tool remove the pulley flange from the output shaft.



1. Pulley flange
2. Service tool T3880054
3. Thread protection button
4. Output shaft
5. Forcing screw

10. Collect the thread protection button and remove the service tool from the pulley flange.

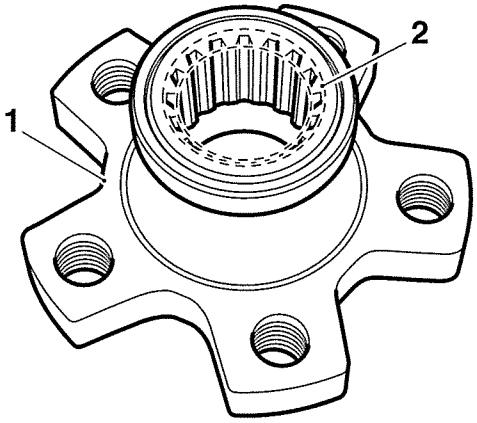
Installation

1. Clean all traces of locking compound from the splines of the output shaft and pulley flange.

⚠ Caution

Only apply ThreeBond 1375B to the area shown below. Ensure the locking compound does not contact the output shaft sealing surface, damage to the oil seal will result from contact with the locking compound.

2. Apply a bead of ThreeBond 1375B to the pulley flange as shown below.



cfxf

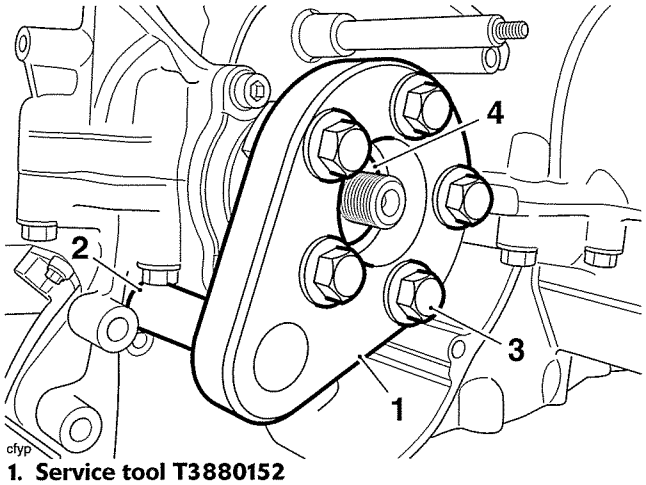
1. Pulley flange
2. ThreeBond 1375B application area

3. Fit the pulley flange to the output shaft. Do not fit the O-ring, plastic spacer or washer at this stage.

⚠ Caution

Do not rest the pin of tool T3880152 on any part of the crankcase, always position the tool's pin on the bolt head as shown below. Use of the tool with the pin resting on any part of the crankcase will result in severe damage to the crankcases.

4. Install service tool T3880152 to the pulley flange, ensuring the pin on the tool rests on the head of the crankcase bolt as shown below, and secure with the five bolts removed from the final drive belt pulley.



1. Service tool T3880152
2. Crankcase bolt head
3. Bolt
4. Pulley flange nut

5. Refit the original nut removed during disassembly, and tighten to **165 Nm**.
6. Remove and discard the original nut.
7. Fit a new O-ring, plastic spacer and washer.
8. Fit a new nut, and tighten to **350 Nm**.
9. Refit the locking ring over the nut, ensuring the holes in the ring align with the bolt holes in the pulley flange.
10. Refit the gear position sensor (see page *10-101*).
11. Refit the final drive belt (see page *15-10*).

8 Lubrication

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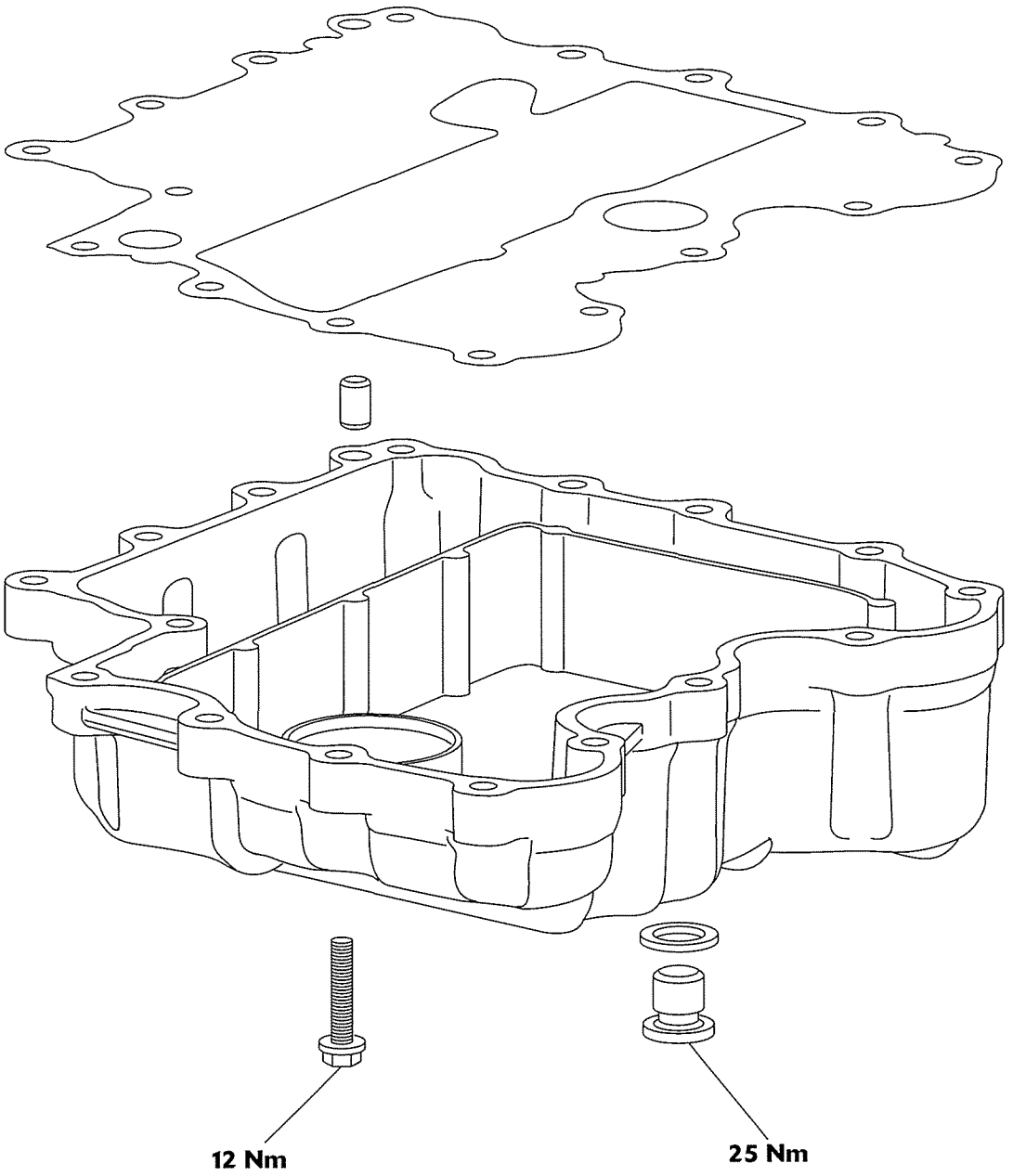
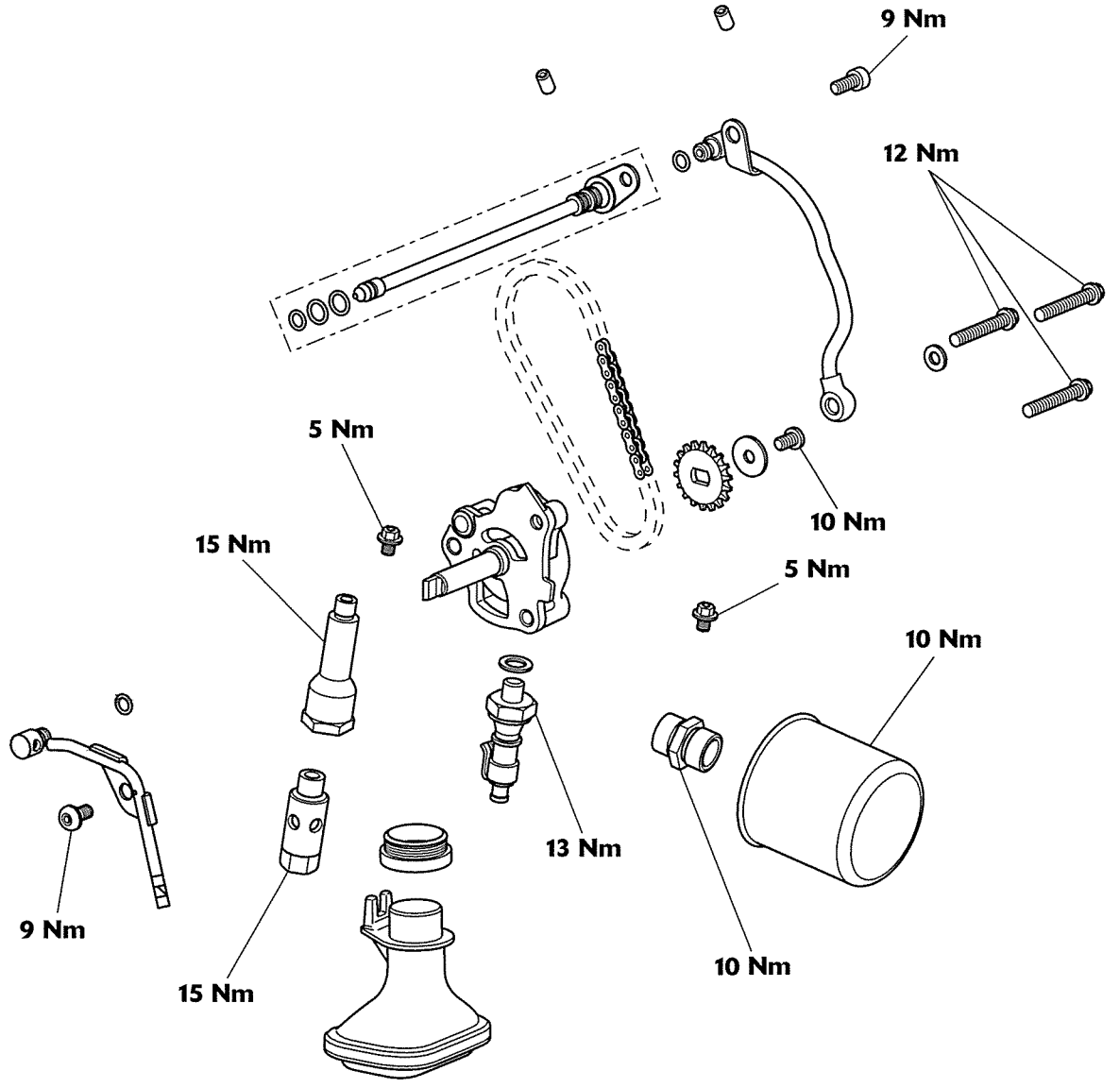
Exploded View – Sump



Exploded View – Oil Filter and Pump



Oil Circuit

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. The oil circuit is split into two parts - the Main circuit and the Transmission circuit.

Main Circuit

Pressurised oil flows past the oil pressure relief valve, which controls the maximum pressure in the oil circuit. The relief valve is set to open at 5.1 bar (74 lb/in^2) and when open, returns high pressure oil directly to the sump.

From the main oil circuit, some oil is fed to the balancer shaft thrust face spray jets. The oil in the main circuit then flows through the oil filter, after which another branch supplies oil to the hydraulic camshaft drive chain tensioner.

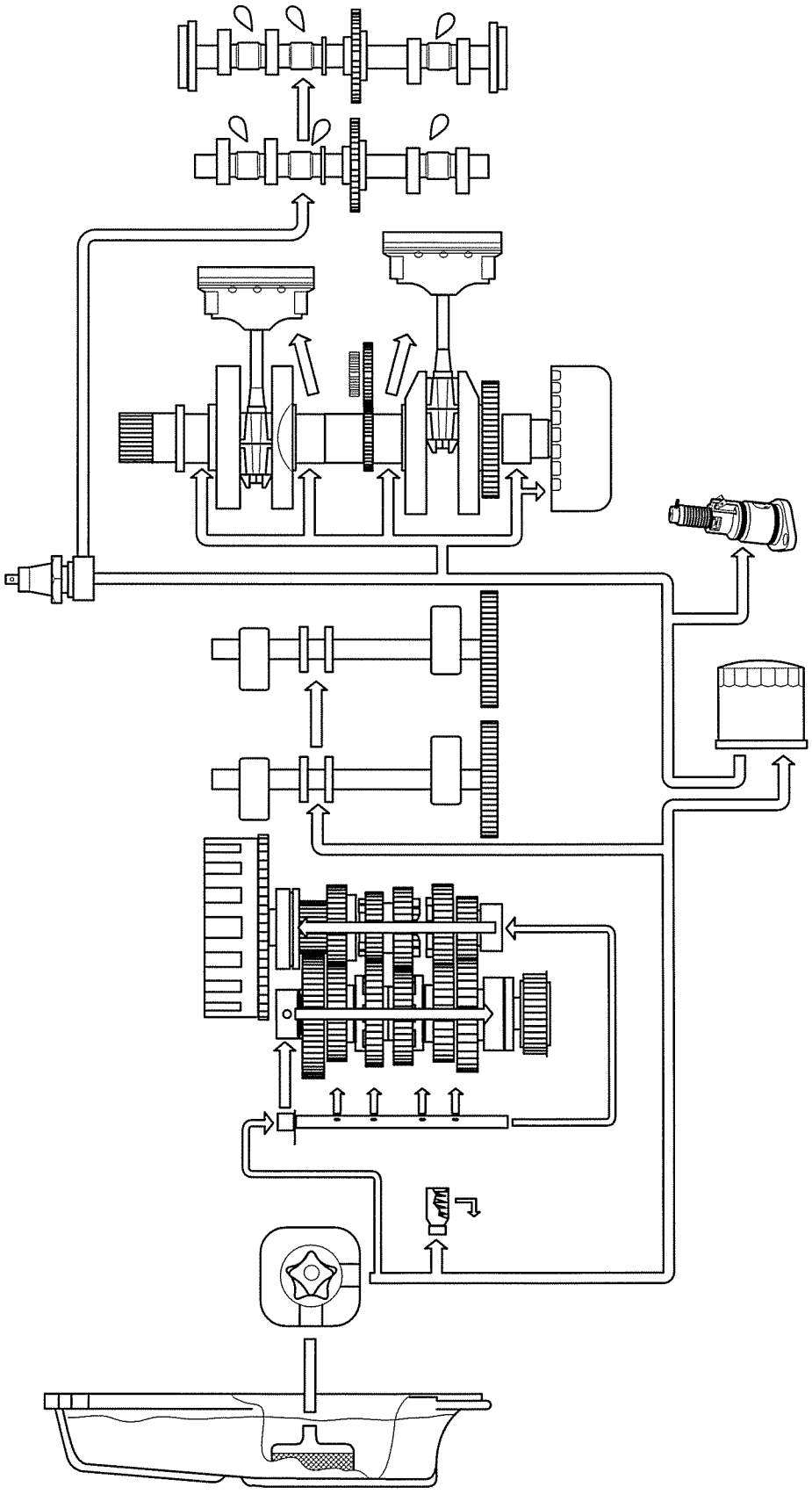
Filtered oil is then fed into the lower crankcase gallery. The low oil pressure switch is located in this gallery. From here oil is distributed around the engine:

- Some oil is sent directly to the cylinder head via a drilling in the upper crankcase. Oil that arrives at the cylinder head is fed to both camshafts via galleries in the camshaft ladder castings that deliver oil directly to the camshaft bearings. This oil also lubricates the tappet buckets and the valves.
  Oil from the cylinder head area lubricates the camshaft drive chain before draining back to the sump.
- The remaining oil is sent directly to the main gallery located to the rear of the cylinders. 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 also fed to the alternator spray bar to aid cooling of the alternator. The oil is taken from the crankshaft oil feed and directed to the alternator stator and rotor.

Transmission Circuit

- Pressurised oil is fed via a pipe from the oil pump to the gearbox spray bar, where oil is directed via drillings to the input and output shafts and the clutch. Oil is circulated along the gearbox shafts to exit holes that feed directly to the bearings, gears and selectors. The gearbox spray bar also lubricates the gears and selector forks and selector drum.

Oil Circuit Diagram



Engine Oil

Specification

Use a 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 (fully synthetic) or Mobil Extra 4T (semi synthetic).

⚠ Caution

Triumph high performance fuel injected engines are designed to use semi or fully synthetic motorcycle engine oil that meet 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 oil tank during an oil change or top-up.

Triumph Engine Oil

Your Triumph Motorcycle is a high-quality 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.

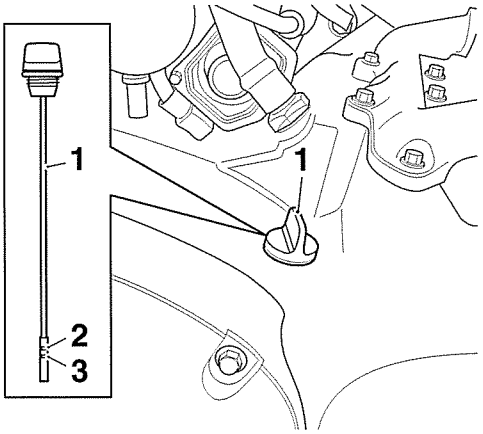
Mobil 1 Racing 4T, specially filled for Triumph, is available from your authorised Triumph dealer.

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 sudden loss of control and an accident.



1. **Filler cap/dipstick**
2. **Maximum mark**
3. **Minimum mark**

⚠ Caution

Ensure no foreign matter or contamination enters the engine during an oil change or top-up. Contamination entering the engine may lead to engine damage.

1. Stop the engine.
2. Carefully clean the area around the filler cap/dipstick before removal.
3. Remove the filler cap/dipstick from the crankcase, wipe the dipstick clean and refit the filler cap/dipstick, screwing it fully home.

Note:

- **The actual level is indicated when the motorcycle is upright, (not on the side stand) and when the filler cap/dipstick has been pushed fully home.**

4. Remove the filler cap/dipstick.
5. The maximum oil level is indicated by a mark on the filler cap/dipstick. When the oil level is correct, the indicated oil level must be between the maximum and minimum lines on the dipstick.

6. If the oil level is too low, add oil a little at a time until the correct level is reached.
7. Once the correct level is reached, fit the filler cap/ dipstick.

Oil and Oil Filter Change

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

To change the engine oil and filter, follow the instructions below/overleaf.

Warning

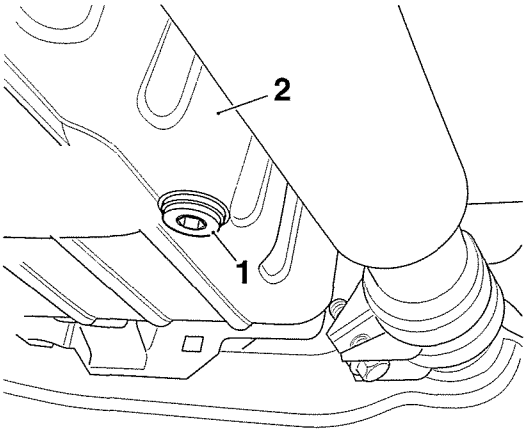
Prolonged or repeated contact with engine oil can lead to skin dryness, irritation and dermatitis. In addition, used engine oil contains harmful contamination that can lead to skin cancer. Always wear suitable protective clothing and avoid skin contact with used oil.

1. Warm up the engine thoroughly then stop the engine and secure the motorcycle in an upright position.
2. Allow the oil to settle for 5 minutes before draining.

Warning

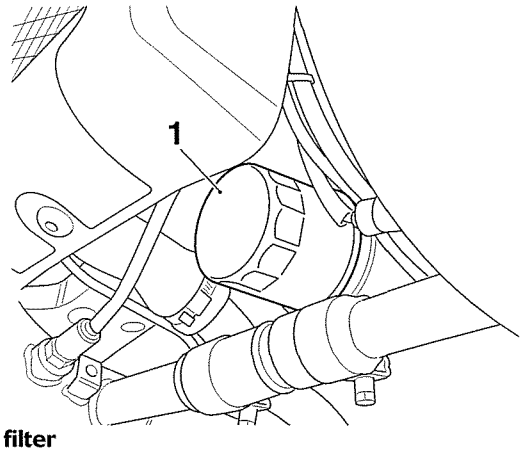
The oil and filter may be hot to the touch. Contact with hot oil may cause the skin to be scalded or burned.

3. Place an oil drain pan beneath the engine.
4. Remove the sump plug from the bottom of the sump and allow the oil to drain.



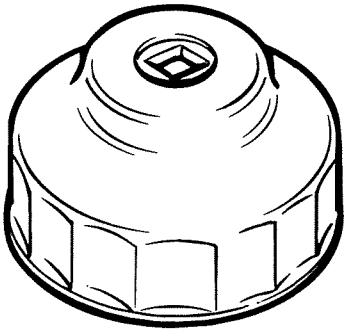
1. Sump plug
2. Engine sump

5. Incorporating a new washer, refit the sump plug, tightening it to **25 Nm**.



1. Oil filter

6. Position the oil drain pan beneath the oil filter.
7. Unscrew and remove the oil filter using Triumph service tool T3880313. Dispose of the old filter in an environmentally friendly way.



gahc

Tool T3880313

8. Apply a thin smear of clean engine oil to the sealing ring of the new oil filter. Fit the oil filter and tighten to **10 Nm**.
9. Fill the engine to the maximum mark with a 10W/40 or 15W/50 semi or fully synthetic motorcycle engine oil that meets specification API SH (or higher) AND JASO MA.
10. Start the engine and allow it to idle for a minimum of 30 seconds.

Caution

Raising the engine speed above idle, before the oil reaches all parts of the engine can cause engine damage or seizure. Only raise engine speed after running the engine for 30 seconds to allow the oil to circulate fully.

⚠ 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.

11. Ensure that the low oil pressure warning light extinguishes shortly after starting.
12. Turn off the ignition, check the oil level using the method previously described, and top up to between the minimum and maximum level lines on the dipstick.

Disposal of Used Engine Oil and Oil Filters

To protect the environment, do not pour oil on the ground, down sewers or drains, or into watercourses. Do not place used oil filters in with general waste. If in doubt contact your local authority.

Low Oil Pressure Warning Light Switch

Warning

Prolonged or repeated contact with engine oil can lead to skin dryness, irritation and dermatitis. Furthermore, used engine oil contains potentially harmful contaminants that 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 watercourses. To prevent pollution of watercourses etc., dispose of used oil sensibly. If in doubt contact your local authority.

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.

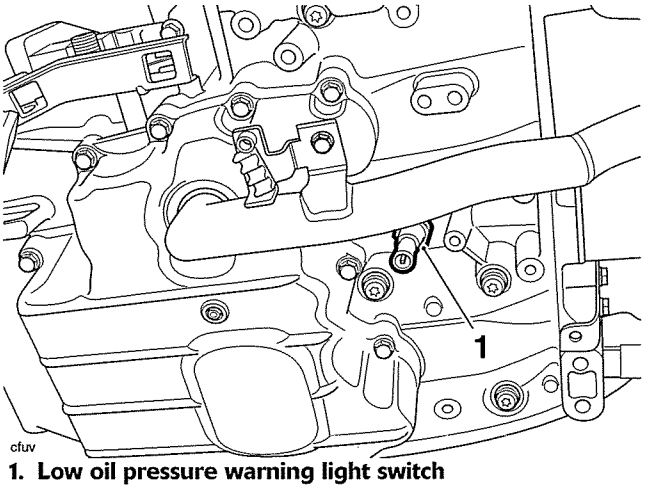
Removal

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Disconnect the electrical connection.

Note:

- **A small amount of oil will drain from the oil gallery when the switch is removed.**

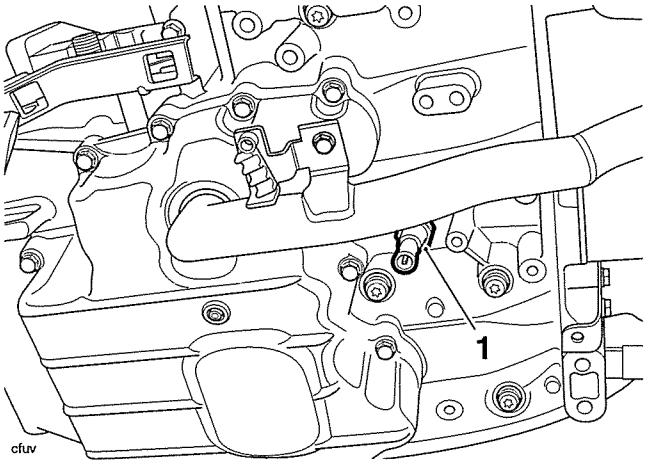
4. Position a suitable receptacle to collect any displaced oil from the oil gallery.
5. Unscrew and remove the switch.



1. Low oil pressure warning light switch

Installation

1. Incorporating a new sealing washer, fit the low oil pressure light switch, tightening it to **13 Nm**.



1. Low oil pressure warning light switch

2. Reconnect the electrical connector.
3. Reconnect the battery, positive (identified with red tape) lead first.
4. Refit the rider's seat (see page *17-9*).

Sump

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 rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.

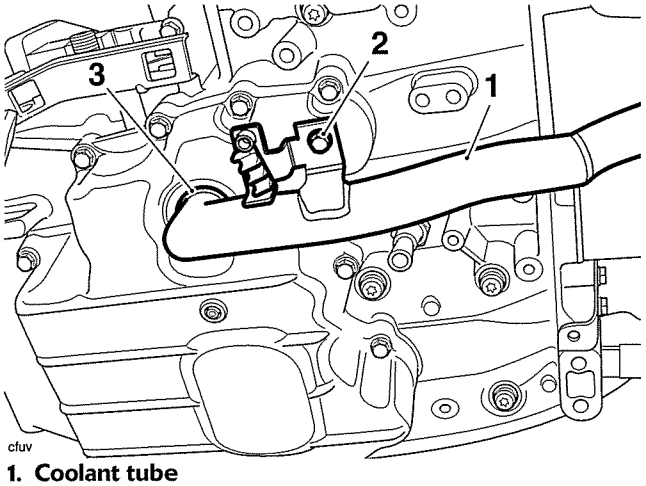
Warning

Prolonged or repeated contact with engine oil can lead to skin dryness, irritation and dermatitis. Furthermore, used engine oil contains potentially harmful contaminants that can cause cancer. When handling used engine oil, always wear protective clothing and avoid any skin contact with the oil.

Caution

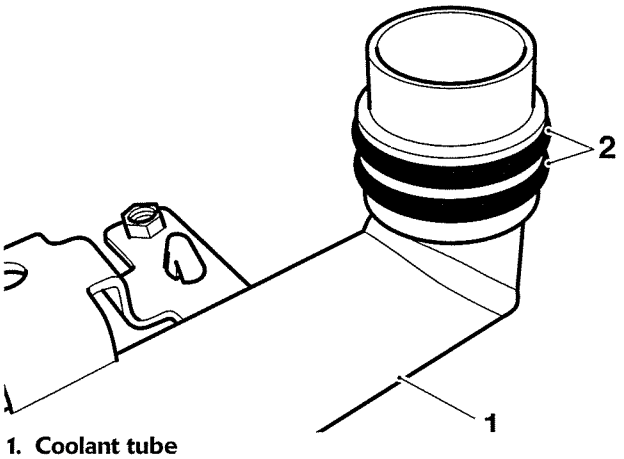
Do not pour engine oil on the ground, down sewers or drains, or into watercourses. To prevent pollution of watercourses etc., dispose of used oil sensibly. If in doubt contact your local authority.

3. Drain the engine oil (see page *8-7*).
4. Drain the coolant (see page *11-6*).
5. Release the fixing from the lower coolant tube.
6. Carefully ease the coolant tube out of the water pump inlet. Unclip the rear brake pipes from the clip on the coolant tube bracket as it is released.



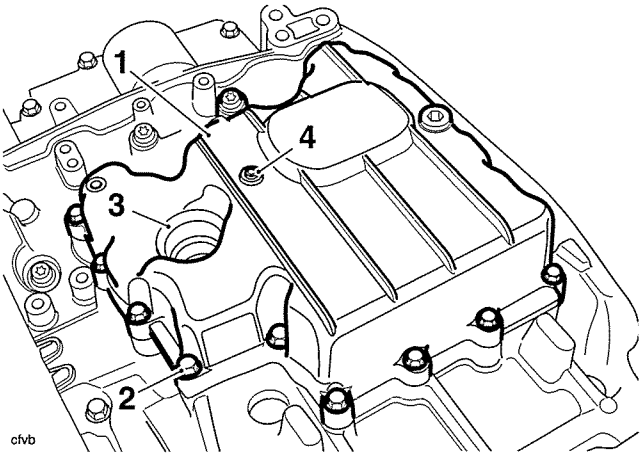
1. Coolant tube
2. Fixing
3. Water pump inlet

7. Remove the discard the two coolant tube O-rings.



1. Coolant tube
2. O-rings

8. Remove the sump bolts.



1. Sump
2. Sump bolt
3. Water pump inlet
4. Water pump drain tube

9. Detach the sump noting the position of the dowel, and collect the water pump drain tube. Remove and discard the four drain tube O-rings.

Note:

- **The water pump drain tube may remain attached to the water pump or become detached with the sump.**

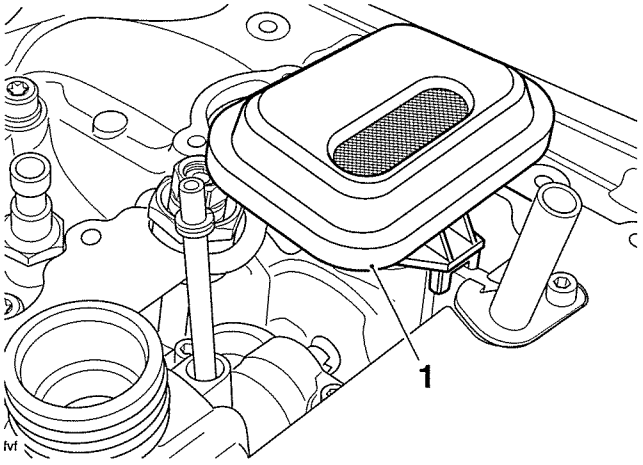
10. Discard the sump gasket and two water pump O-rings.

Inspection

Warning

Ensure the oil pick-up is clean and free of blockages or restrictions. If the oil flow is restricted, oil pressure will be reduced and may cause severe engine damage.

1. Check the oil pick-up for blockages or restrictions. Remove and clean if found to be blocked or restricted.



1. Oil pick-up

Installation

1. Position new O-rings to the water pump and water pump drain tube.
2. Refit the water pump drain tube to the water pump.
3. Position a new sump gasket to the crankcase.
4. Refit the oil pick-up.
5. Refit the sump, fit the bolts and evenly and progressively tighten them to **12 Nm**.
6. Fit new O-rings to the lower coolant tube.
7. Insert the coolant tube in to the water pump inlet. Refit the rear brake pipes to the clip on the coolant tube bracket.
8. Secure the coolant tube with the bolt, tightening to **9 Nm**.
9. Reconnect the battery, positive (identified with red tape) lead first.
10. Refill the engine with clean engine oil (see page *8-6*)
11. Refill the cooling system (see page *11-6*).
12. Start the engine and check for oil and coolant leaks.
13. Refit the rider's seat (see page *17-9*).

Oil Pump

Warning

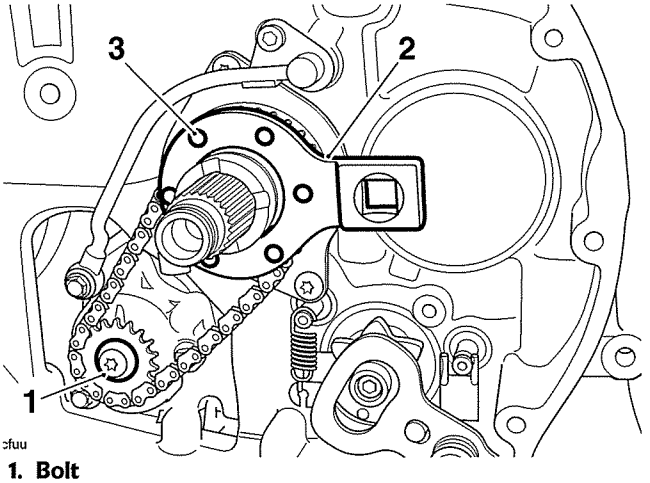
Prolonged or repeated contact with engine oil can lead to skin dryness, irritation and dermatitis. Furthermore, used engine oil contains potentially harmful contaminants that can cause cancer. When handling used engine oil, always wear protective clothing and avoid any skin contact with the oil.

Caution

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

Removal

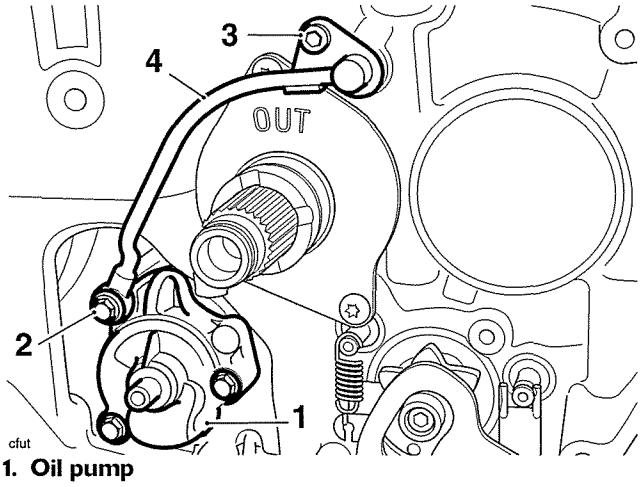
1. Remove the clutch assembly (see page *4-8*).
2. Fit service tool T3880121 to the drive pegs of the oil pump drive sprocket to prevent the sprocket from turning.
3. Remove the bolt and washer from the oil pump shaft. Discard the bolt.



1. Bolt
2. Tool T3880121
3. Drive pegs

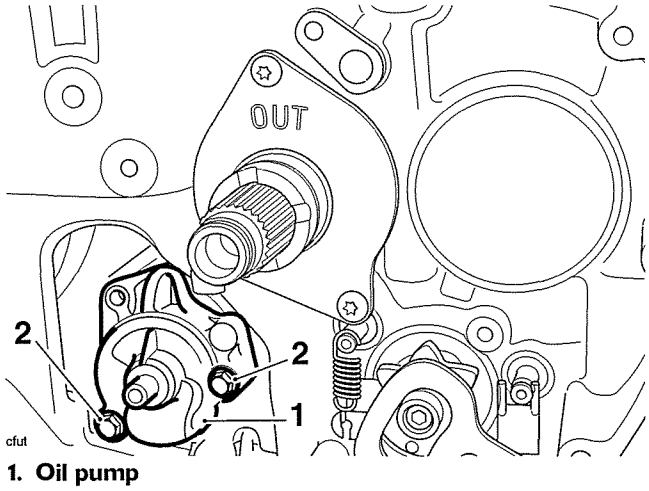
4. Remove service tool T3880121.
5. Remove the oil pump sprocket, drive sprocket and chain as one item by sliding them off the oil pump shaft and input shaft.

6. Remove the transmission oil feed pipe screw and oil pump upper bolt, noting the position of the washer under the bolt head.
7. Remove the transmission oil feed pipe from the transmission spray bar. Discard the O-ring.



1. Oil pump
2. Oil pump upper bolt
3. Screw
4. Transmission oil pipe

8. Remove the remaining two oil pump bolts and remove the oil pump.

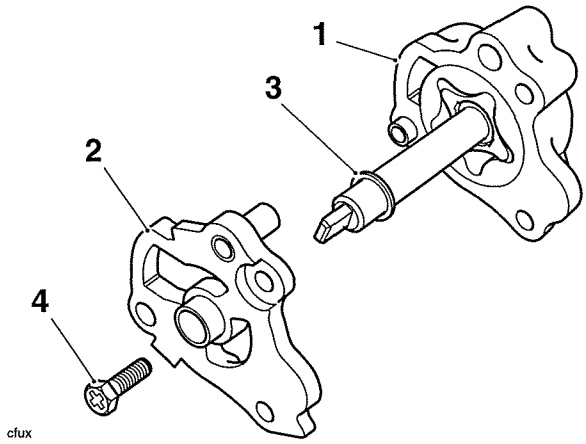


1. Oil pump
2. Bolts

9. Retain the washer from the upper oil pump fixing for re-use, and discard the oil pump and transmission oil feed pipe fixings.

Disassembly

1. Remove the bolt and withdraw the oil pump back plate.
2. Collect the shim from oil pump shaft.



1. Oil pump body
2. Back plate
3. Shim
4. Bolt

Inspection

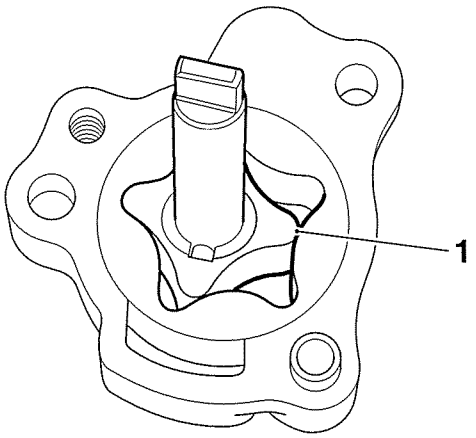
Caution

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.

Clearances

Item	Standard	Service limit
Oil pump rotor tip clearance	0.15 mm	0.30 mm
Oil pump body clearance	0.15 – 0.22 mm	0.35 mm
Oil pump rotor end float	0.02 – 0.07 mm	0.10 mm

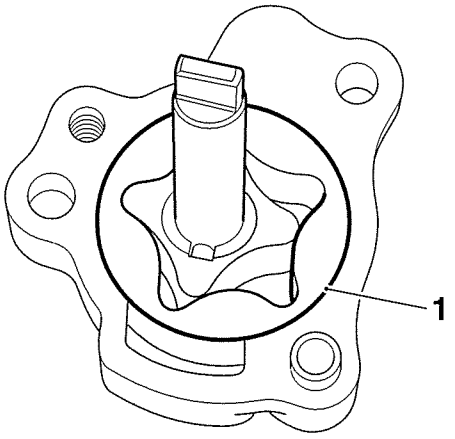
1. Measure the oil pump rotor tip clearance using feeler gauges.



cfuz

1. Rotor tip clearance

2. Measure the oil pump body clearance using feeler gauges.



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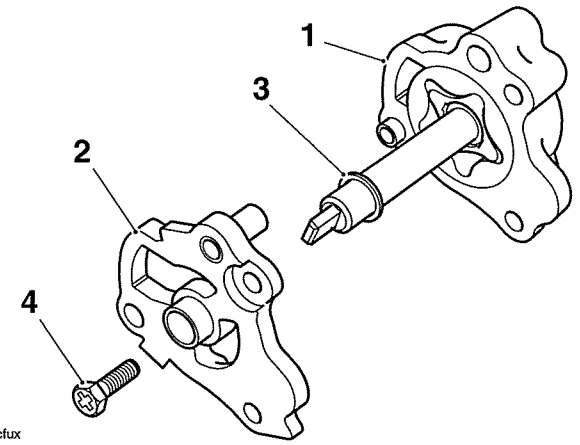
1. Pump body clearance

3. Measure the oil pump rotor end float.
4. Clearances:
   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.
5. Inspect the sprockets and chain for wear and/or damage. Replace the sprocket and chain if wear and/or damage is found.

Assembly

1. If the pump is serviceable, refit the shim to the shaft and install the backplate. Tighten the backplate bolt to **12 Nm**.



cfux

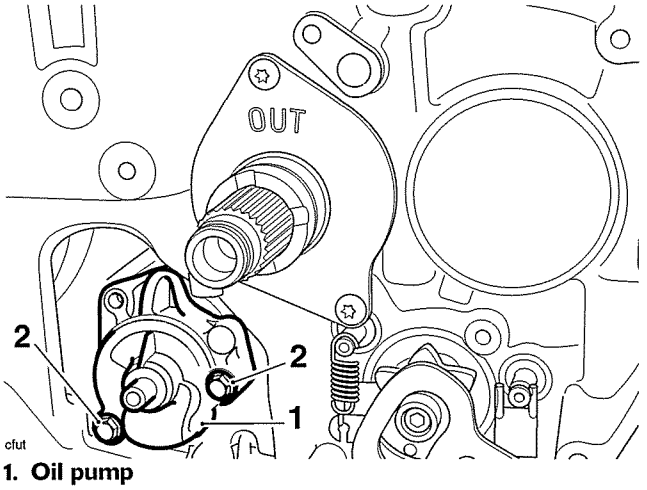
1. Oil pump body
2. Back plate
3. Shim
4. Bolt

Installation

Caution

As a precaution, 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.

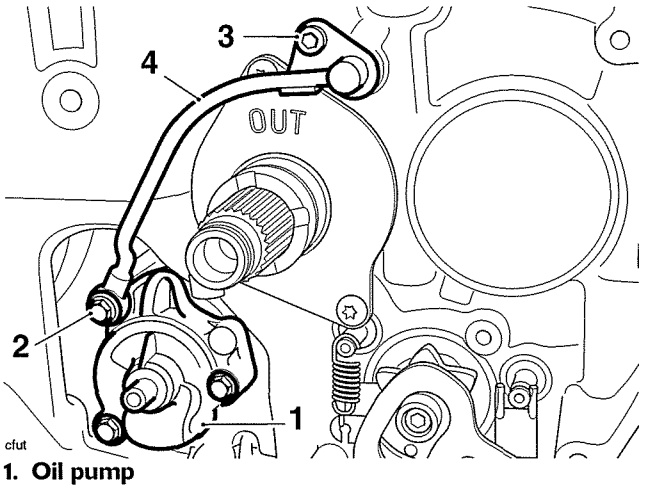
1. Fill the oil pump with new engine oil, turning the pump rotor as the oil is poured in. Ensure all internal surfaces of the pump are coated in oil.
2. Position the oil pump to the crankcase. Rotate the oil pump until the water pump drive shaft can be felt to engage with the water pump.
3. Fit two new bolts to the lower oil pump fixing holes. Tighten to **12 Nm.**



cfut

1. Oil pump
2. Bolts

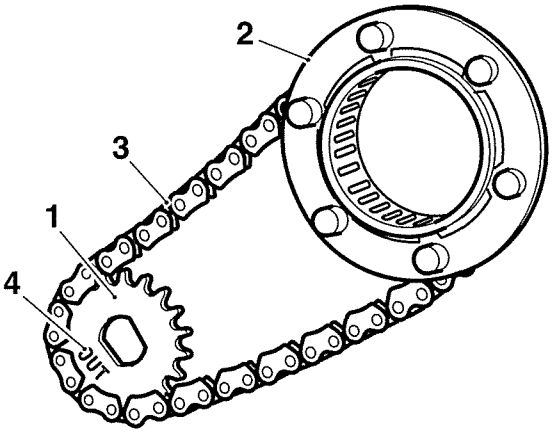
4. Fit a new O-ring to the transmission oil feed pipe.
5. Refit the transmission oil feed pipe, ensuring the upper end of the pipe is fully seated in the transmission spray bar.
6. Secure the lower end of the pipe with a new bolt, through the oil pump body. Ensure the washer is located under the upper oil pump bolt head as noted during removal. Tighten to **12 Nm**.
7. Fit a new screw to the transmission oil feed pipe upper fixing. Tighten to **9 Nm**.



cfut

1. Oil pump
2. Oil pump upper bolt
3. Screw
4. Transmission oil pipe

8. Assemble the oil pump sprocket and input shaft drive sprocket to the chain ensuring the 'OUT' mark on the oil pump sprocket is facing outwards.

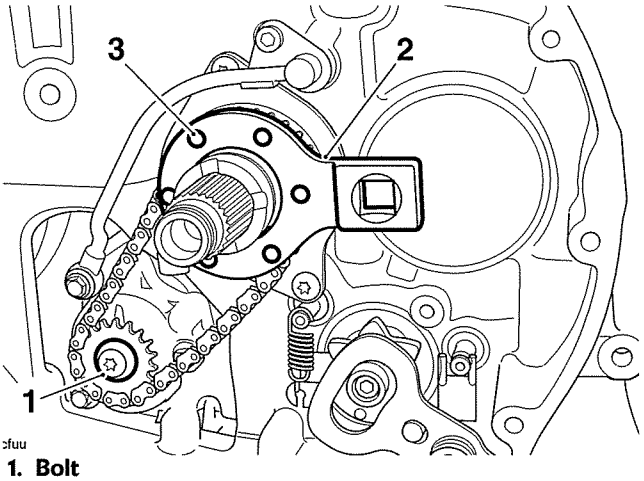


cfva

1. Pump sprocket
2. Drive sprocket
3. Chain
4. 'OUT' mark

9. Secure the oil pump sprocket to the pump shaft with a new bolt. Ensure the washer is fitted to the bolt as noted during removal.

10. Fit service tool T3880121 to the drive pegs of the oil pump drive sprocket to prevent the sprocket from turning and tighten the bolt to **10 Nm**.



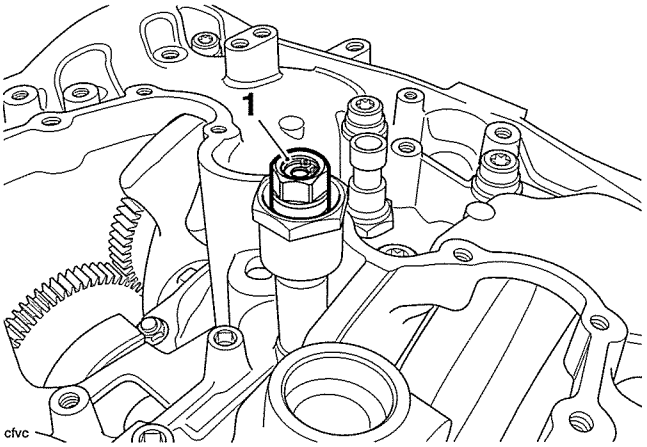
cfuu

1. Bolt
2. Tool T3880121
3. Drive pegs

11. Refit the clutch assembly (see page *4-10*).

Oil Pressure Relief Valve

The oil pressure relief valve is located in the lower crankcase. It is a threaded fit in the crankcase.



cfvc

1. Oil pressure relief valve

When refitting the valve, tighten it to **15 Nm**. If removed, tighten the oil pressure relief valve adaptor to **15 Nm**.

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9 Engine Removal and Refit

Table of Contents

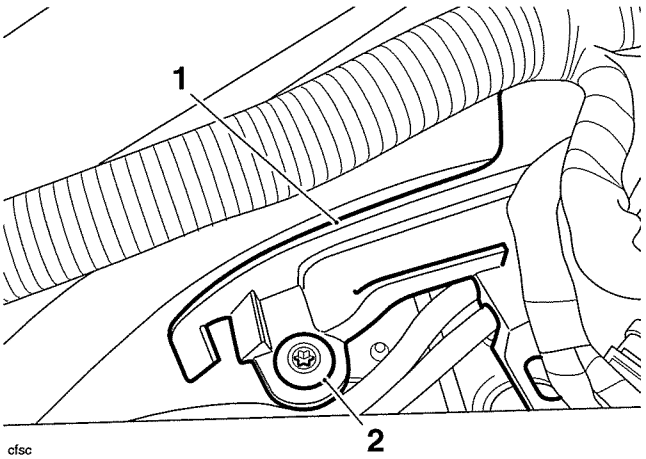
Removal

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.

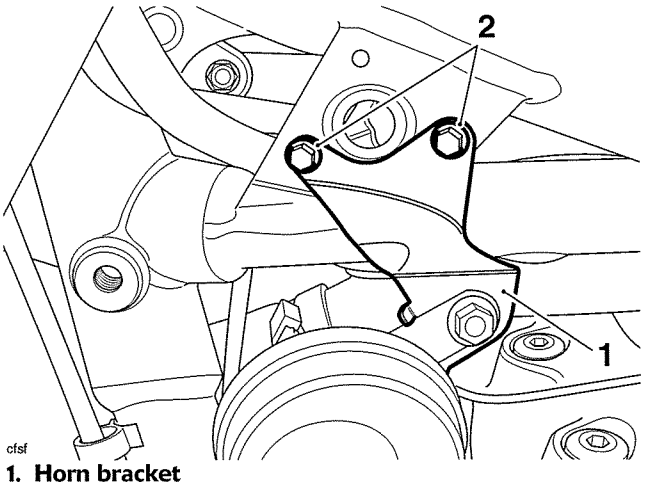
To gain access to the engine for removal:

1. Raise and securely support the motorcycle and engine.
2. Remove the rider's seat (see page *17-8*).
3. Disconnect the battery, negative (black) lead first.
4. Remove the left and right side panels (see page *17-9*).
5. Drain the engine oil (see page *8-7*).
6. Remove the fuel tank (see page *10-86*).
7. Remove the throttle body (see page *10-103*).
8. Remove the exhaust system (see page *10-118*).
9. Drain the cooling system (see page *11-6*).
10. Remove the radiator (see page *11-10*).
11. Release the hose clips securing the upper coolant tube to the thermostat housing hose, top hose and radiator cap housing hose.
12. Ease the upper coolant tube upwards at the rear to release it from the thermostat housing hose.
13. Release the coolant tube from the radiator top hose and then the radiator cap housing hose.
14. Remove the upper coolant tube upwards through the frame rails.
15. Remove both MAP sensors, noting the routing of the MAP sensor hoses and harnesses (see page *10-100*).
16. Remove the bolt securing the throttle cable and harness guide to the frame.



1. Throttle cable and harness guide
2. Fixing

17. Disconnect the MAP sensor hoses at the throttle body.
18. Detach both switch cube connectors from the throttle cable and harness guide, and remove the guide ensuring the two MAP sensor hoses remain clipped into the underside.
19. Disconnect the electrical connectors and remove the four ignition coils from the camshaft cover.
20. If fitted detach the secondary air injection hoses from the reed valves on top of the camshaft cover. Position the hoses aside.
21. Noting their respective positions, disconnect the spark plug leads from the spark plug coils.
22. Release the two fixings and detach the horn bracket from the frame. Disconnect the horn and bracket and position aside.

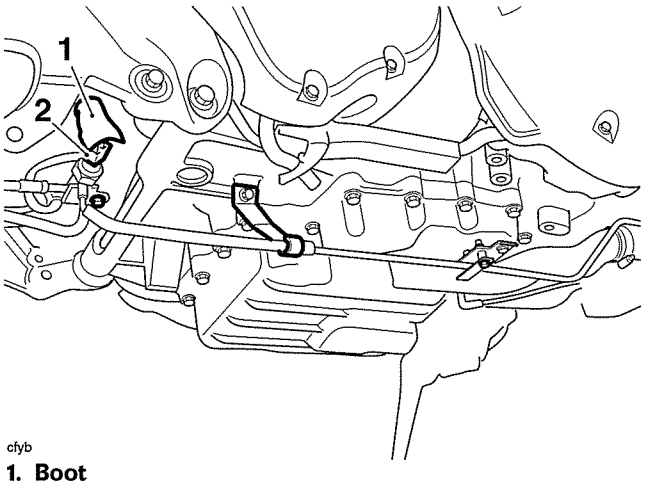


1. Horn bracket
2. Fixings

23. Detach the final drive belt front pulley (see page *15-8*). It is not necessary to completely remove the drive belt from the motorcycle.
24. Disconnect the clutch cable (see page *4-4*).

Models without ABS

25. Reposition the rubber boot and disconnect the brake light switch electrical connector.

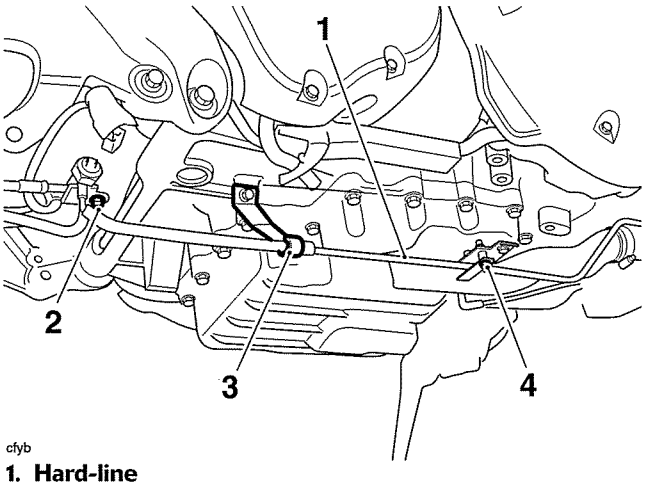


cfyb

1. Boot

2. Brake light switch connector

26. Remove the two bolts securing the rear brake hard-line to the engine and un-hook the hard-line from the bracket at the rear of the engine.



cfyb

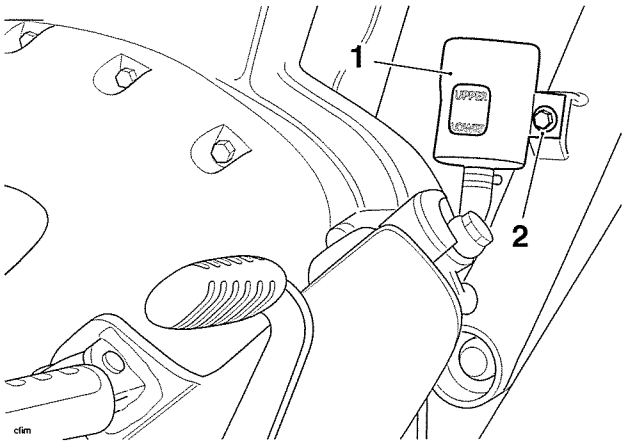
1. Hard-line

2. Bolt

3. Bracket

4. Clamp bolt

27. Remove the fixing and remove the reservoir cover and rear brake reservoir.



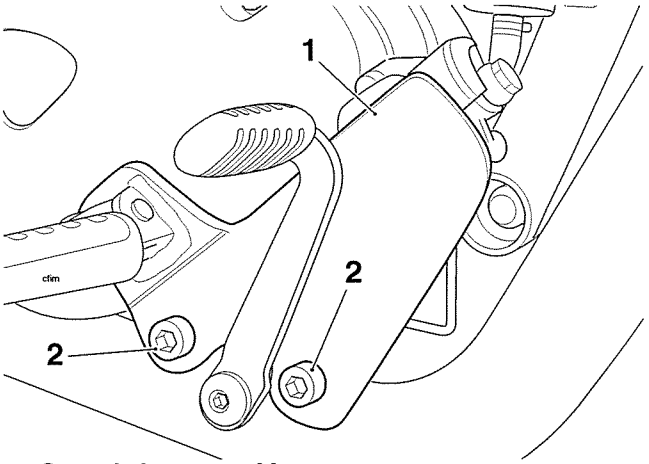
1. Reservoir cover

2. Fixing

28. Release the bolt securing the brake pedal to the engine bracket.

29. Release the bolts securing the control plate assembly to the engine bracket.

30. Noting the position of the brake pedal return spring, detach the control plate assembly, brake pedal, reservoir and master cylinder as an assembly. Collect the brake pedal return spring.



1. Control plate assembly

2. Bolts

Caution

When repositioning the rear brake master cylinder, take care to prevent the steel brake pipe from becoming distorted.

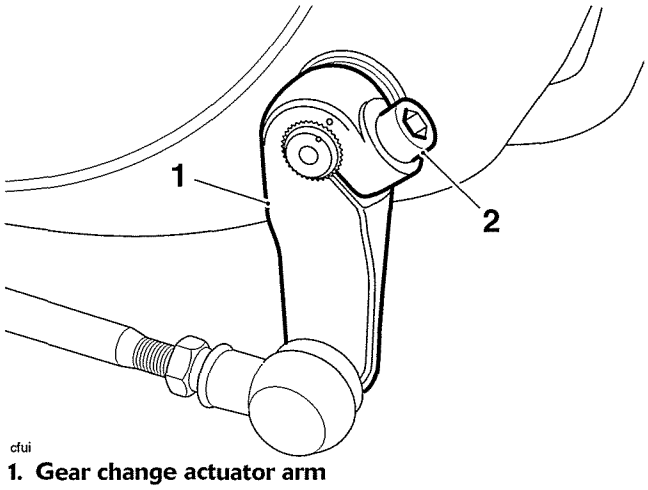
31. Without disconnecting the rear brake hard-line, tie the rear master cylinder and reservoir aside, preventing the brake fluid reservoir from becoming inverted.

Models with ABS

32. Remove the rear master cylinder (see page *12-26*).
33. Remove the ABS modulator (see page *12-34*).

All models

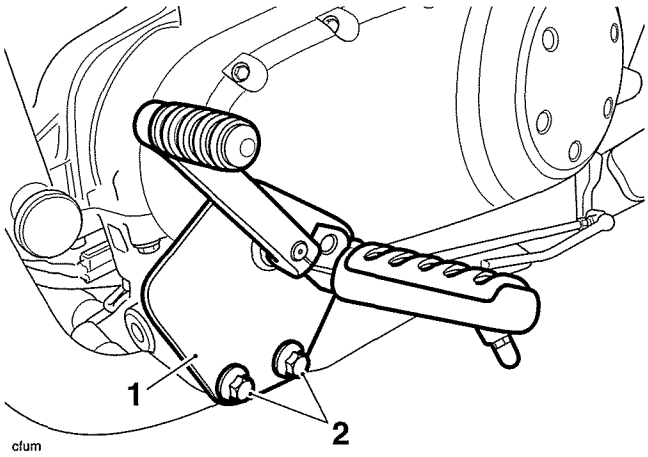
34. Release the fixing and disconnect the gear change actuator arm at the clutch cover.



cfui

1. Gear change actuator arm
2. Fixing

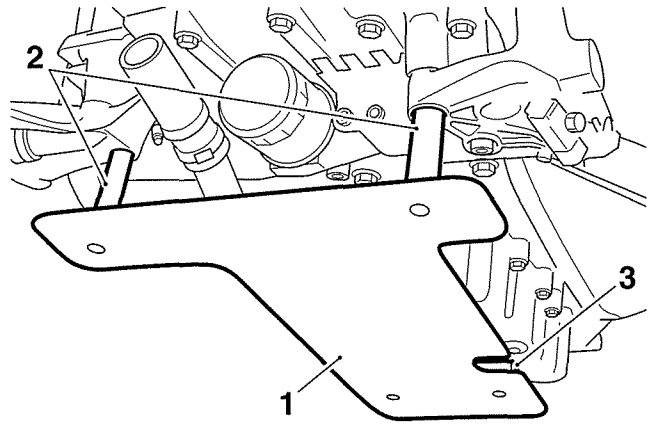
35. Release the two bolts and remove the left hand control plate assembly.



cfum

1. Control plate assembly
2. Bolts

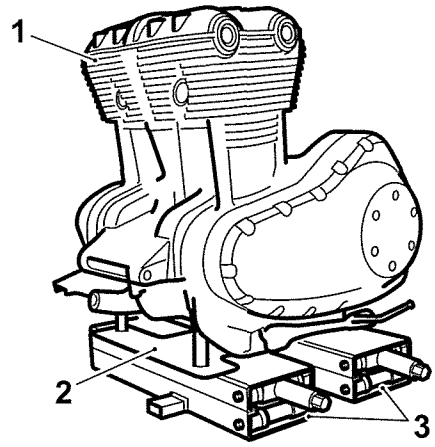
36. Disconnect the side stand switch.
37. Disconnect all electrical connections to the engine. These include:
    - Low oil pressure warning light switch;
    - Crankshaft position sensor;
    - Gear position sensor;
    - Road speed sensor;
    - Coolant temperature sensor;
    - Battery earth;
    - Alternator.
38. Support the engine using service tool T3880134. Position the tool the to the engine control plate brackets, locating the two pins to the corresponding bolts on the bracket. The pins rest on the bolt heads.
39. Check that the plastic pad on the rear of the tool is aligned with the sump, and that no pipes, hoses or electrical connectors/harnesses are trapped between the plate and the engine.



cfyc

1. Tool T3000134
2. Pin locations
3. Plastic pad

40. Support the engine support stand and engine on propriety lifting jacks, at the front and rear, as shown below.

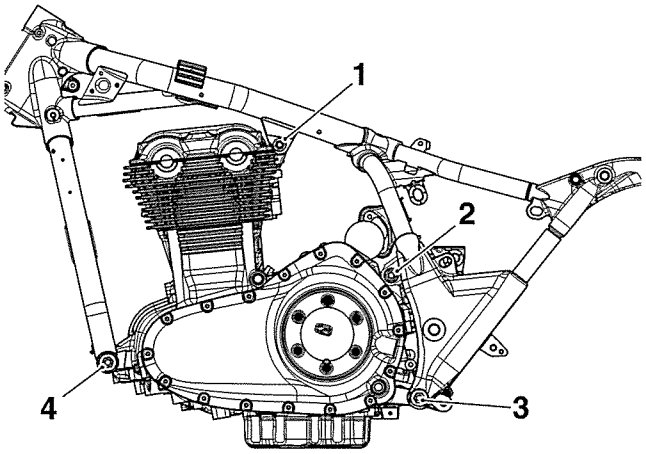


cfyd

1. Engine
2. Engine support stand T388 0134
3. Propriety lifting jacks

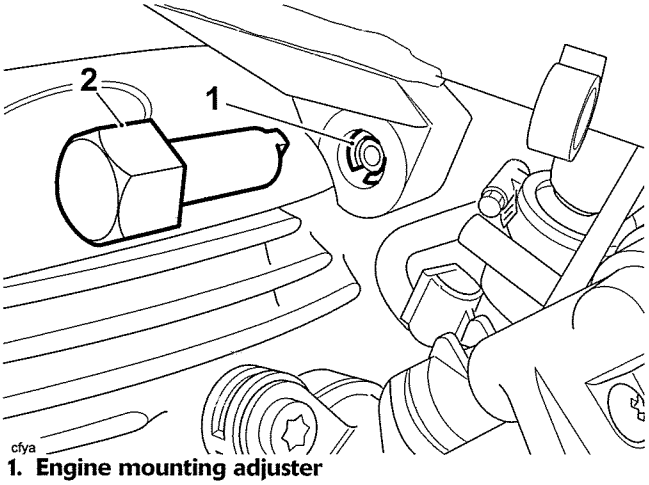
41. Check that the engine is still securely supported.

42. In the sequence shown below, undo all engine mounting bolts and nuts, leaving the bolts in place. Collect the washers under the nuts at positions 1 to 3 as shown below.



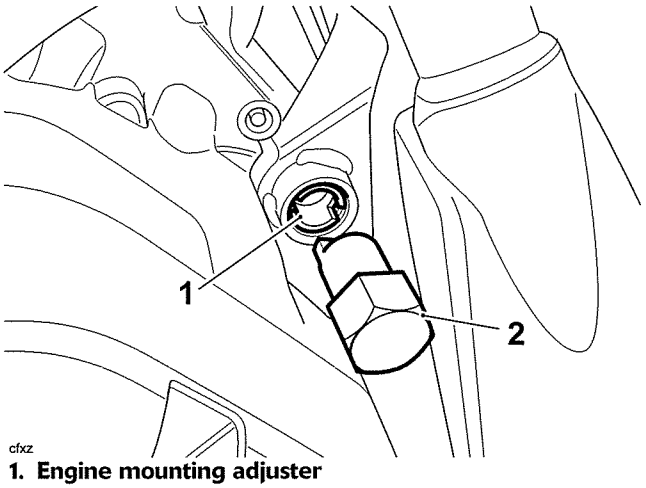
1. Cylinder head engine mounting
2. Upper rear engine mounting
3. Lower rear engine mounting
4. Front engine mounting

43. Partially withdraw the bolt and release the cylinder head engine mounting adjuster on the left side of the frame using service tool T3880103.



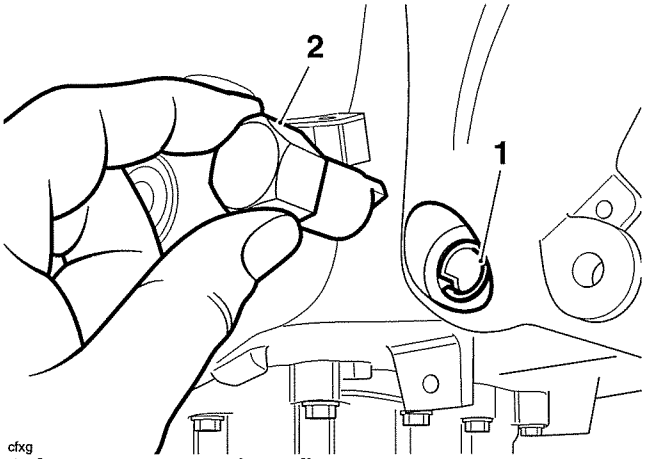
1. Engine mounting adjuster
2. Tool T3880103

44. Partially withdraw the bolt and release the upper rear engine mounting adjuster on the left side of the frame using service tool T3880377.



1. Engine mounting adjuster
2. Tool T3880377

45. Partially withdraw the bolt and release the lower rear engine mounting adjuster on the left side of the frame using service tool T3880377.



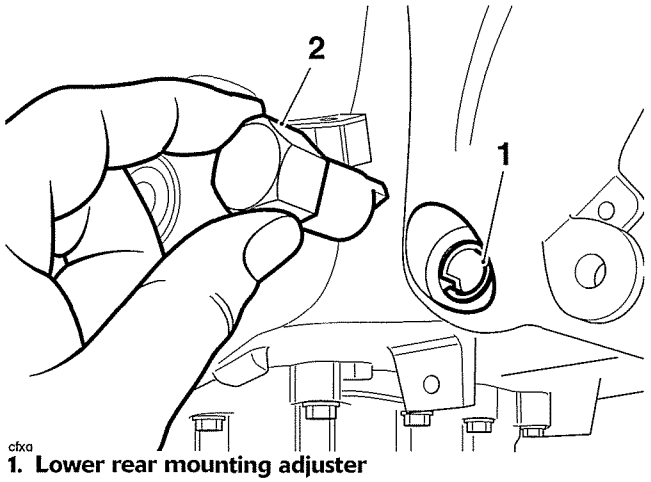
1. Lower rear mounting adjuster
2. Tool T3880377

46. Protect the left hand lower frame area, to the rear of the clutch housing, using a suitable heavy duty adhesive tape.
47. Remove the engine mounting bolts and lower the engine evenly out of the frame, taking care to avoid damage to components.

Installation

1. Locate the engine to the frame aligning the engine mounting points with the corresponding positions on the frame.
2. Install the engine mounting bolts, but do not fit the nuts or washers at this stage.
3. Tighten the engine mounting bolts, nuts and adjusters in the following sequence:

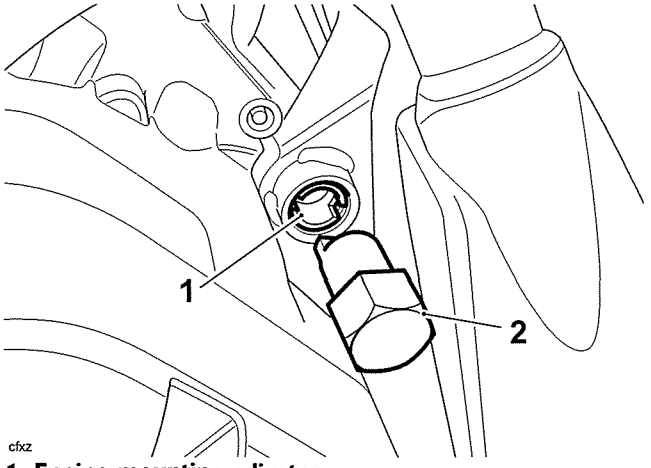
- Partially withdraw the lower rear engine mounting bolt and tighten the frame adjuster to **5 Nm** using service tool T3880103. Refit the bolt and washer.



cfxa

1. Lower rear mounting adjuster
2. Tool T3880377

- Partially withdraw the upper rear engine mounting bolt and tighten the frame adjuster to **5 Nm** using service tool T3880103. Refit the bolt and washer.



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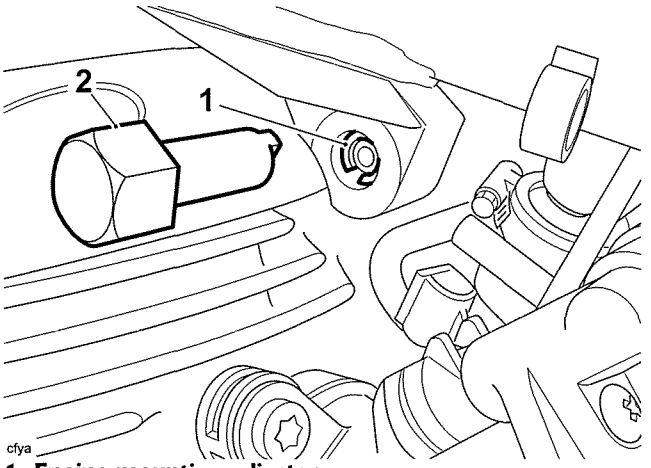
1. Engine mounting adjuster
2. Tool T3880103

- Partially withdraw the cylinder head engine mounting bolt and tighten the frame adjuster to **5 Nm** using service tool T3880103. Refit the bolt and washer.



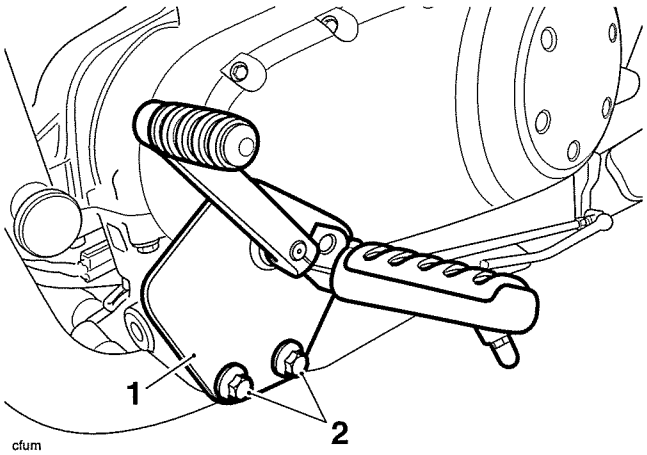
cfya

1. Engine mounting adjuster
2. Tool T3880103

- Fit new nuts to all four engine mounting bolts.
- Tighten the cylinder head engine mounting bolt and nut to **48 Nm**.
- Tighten the upper rear engine mounting bolt and nut to **80 Nm**.
- Tighten the upper rear engine mounting bolt and nut to **80 Nm**.
- Tighten the front engine mounting bolt and nut to **80 Nm**.

4. Reconnect the remaining electrical connections to the engine. These include:
   - Low oil pressure warning light switch;
   - Crankshaft position sensor;
   - Gear position sensor;
   - Road speed sensor;
   - Coolant temperature sensor;
   - Battery earth;
   - Alternator.

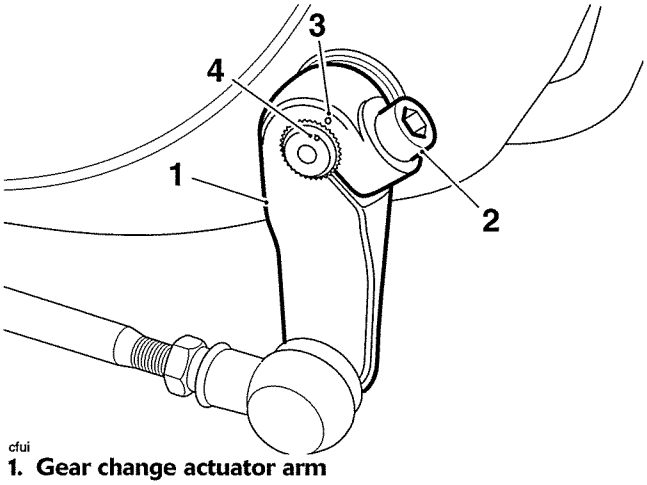
5. Refit the control plate assembly, tightening the bolts to **50 Nm**.



cfum

1. Control plate assembly
2. Bolts

6. Reconnect the side stand switch.
7. Align the dot on the gear change actuator arm with the dot on the gear change shaft and fit the actuator arm to the spline. Fit the bolt and tighten to **9 Nm**.

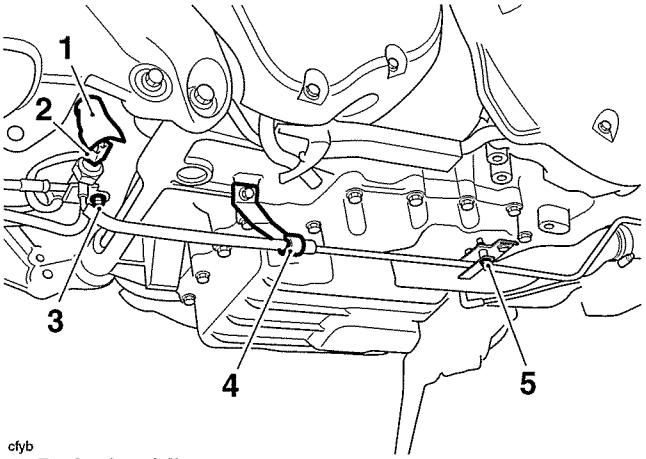


cfui

1. Gear change actuator arm
2. Fixing
3. Actuator arm dot mark
4. Gear change shaft dot mark

Models without ABS

8. Lubricate the brake pedal shaft with a thin smear of grease conforming to NLGI 2 specification (we recommend Mobil HP222).
9. Position the brake pedal return spring to the brake pedal shaft as noted during removal.
10. Align the brake pedal to its shaft and refit the master cylinder and control plate assembly to the engine bracket. Ensure the end of brake pedal return spring engages in the hole in the brake pedal.
    Tighten the control plate fixings to fixings to **50 Nm**.
    Tighten the brake pedal fixing to **22 Nm**.
11. Refit the brake fluid reservoir to the frame, position the cover and secure with the fixing. Tighten to **5 Nm**.
12. Refit the brake hard-line to its clips and refit the two fixings. Tighten the rear brake pipe fixing to **7 Nm** and the front brake pipe fixing to **5 Nm**.



cfyb

1. Brake hard-line
2. Bolt
3. Bracket
4. Clamp bolt

13. Reconnect the brake light switch connector and cover with the rubber boot.

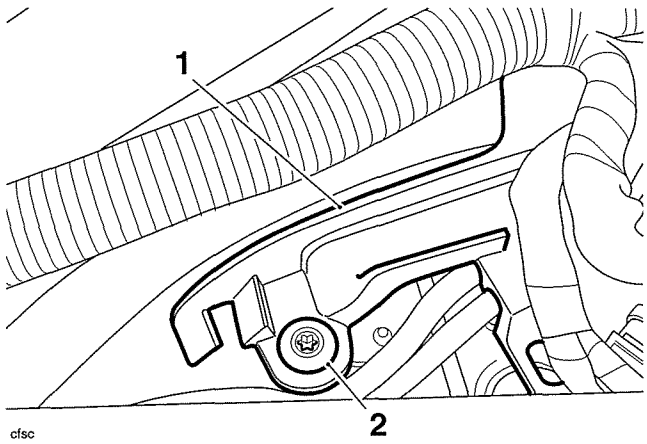
Models with ABS

14. Refit the ABS modulator (see page *12-28*).
15. Refit the rear master cylinder (see page *12-28*).

All models

16. Refit the final drive belt front pulley (see page *15-8*) but DO NOT adjust the drive belt tension at this stage.
17. Reconnect the spark plug leads.
18. Refit the horn and bracket, tightening the fixings to **7 Nm**. Reconnect the electrical connector.
19. If fitted, refit the secondary air injection hose to the reed valves and secure with the clips.
20. Fit the four ignition coils and reconnect the electrical connectors.
21. Reposition the throttle cable and harness guide to the frame, connecting the two MAP sensor hoses as you do so. Ensure the hoses are routed as noted during removal, with the right hand hose (identified with red tape) connected to the right hand throttle.

22. Refit the throttle cable and harness guide fixing, tightening to **7 Nm**.



1. Throttle cable and harness guide
2. Fixing

23. Refit the throttle cables to the throttle cable and harness guide.
24. Refit the two MAP sensors (see page *10-100*).
25. Ensure the hose clips are in position on the top hose, radiator cap housing and thermostat housing hose.
26. Position the upper coolant tube to the motorcycle, lowering it down between the frame rails. Connect the tube to the radiator cap housing, top hose then thermostat housing.
    Tighten the hose clips to **2 Nm**.
    Tighten the coolant tube fixing to **7 Nm**.
27. Refill the cooling system (see page *11-6*).
28. Refit the radiator (see page *11-11*).
29. Refit the throttle bodies (see page *10-105*).
30. Refit the exhaust system (see page *10-101*).
31. Refit the fuel tank (see page *10-98*).
32. Refill the engine with oil (see page *8-7*).
33. Refit the left and right side panels (see page *17-9*).
34. Adjust the final drive belt tension as described below:

Warning

Before adjusting the final drive belt tension, the belt must be over-tensioned to settle the engine position as described below. Failure to do so may result in the drive belt becoming loose when the motorcycle is first ridden. Riding the motorcycle with a loose drive belt may result in loss of control of the motorcycle and an accident, or damage to the drive belt or other motorcycle components.

Note:

- **Over-tensioning of the drive belt is only required when the engine or swinging arm has been removed.**

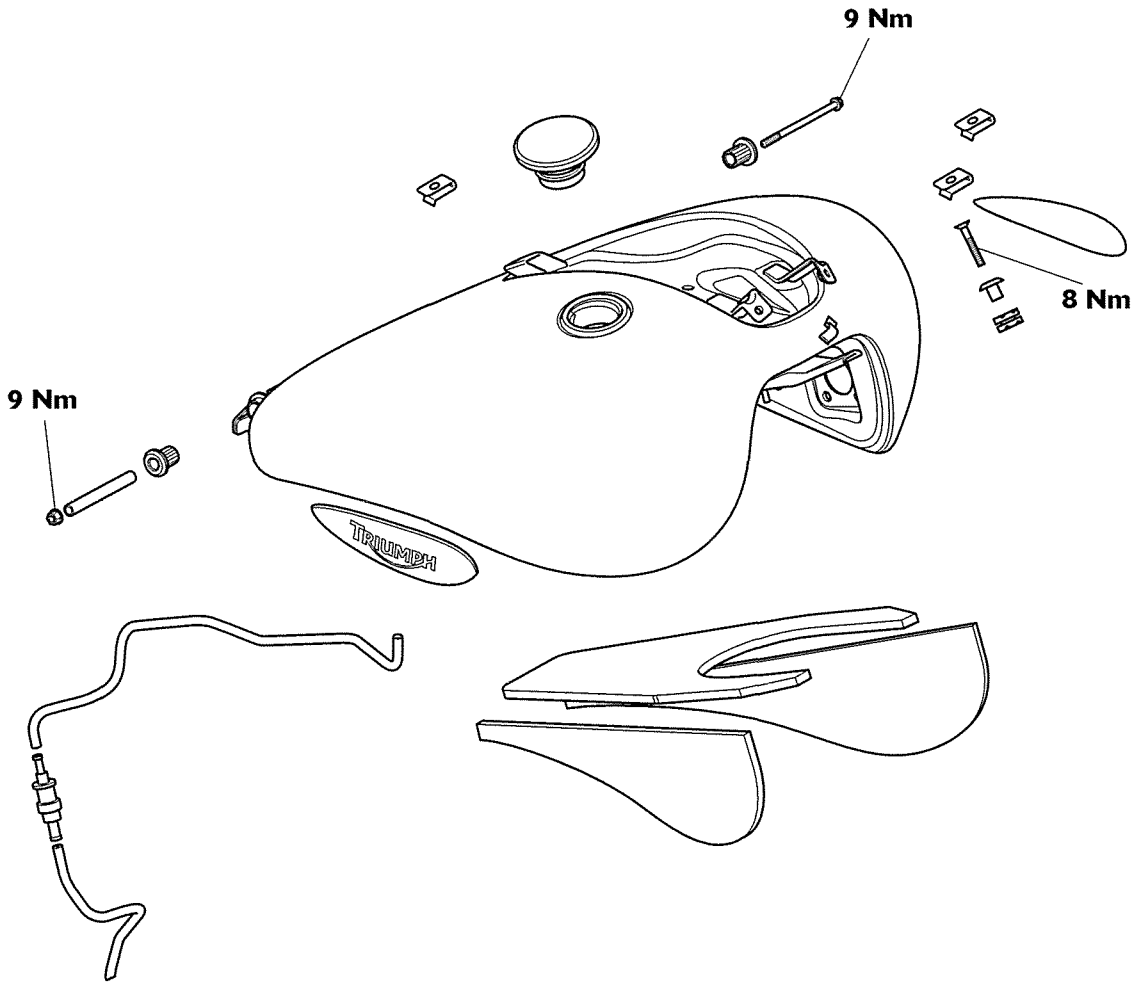
35. With the wheel spindle loose, tighten the right hand drive belt adjuster to **25 Nm**.
36. Slacken off the right hand adjuster and check that the belt is now loose.
37. Adjust the drive belt tension (see page *15-8*).
38. Reconnect the battery, positive (identified with red tape) lead first.
39. Refit the rider's seat (see page *17-9*).
40. Lower the motorcycle to the ground and place it on the side stand.
41. Start the engine and check for oil, coolant and any other leaks.
42. Check and adjust the engine oil level (see page *8-6*).
43. Check the operation of the rear brake. Rectify as necessary.

Warning

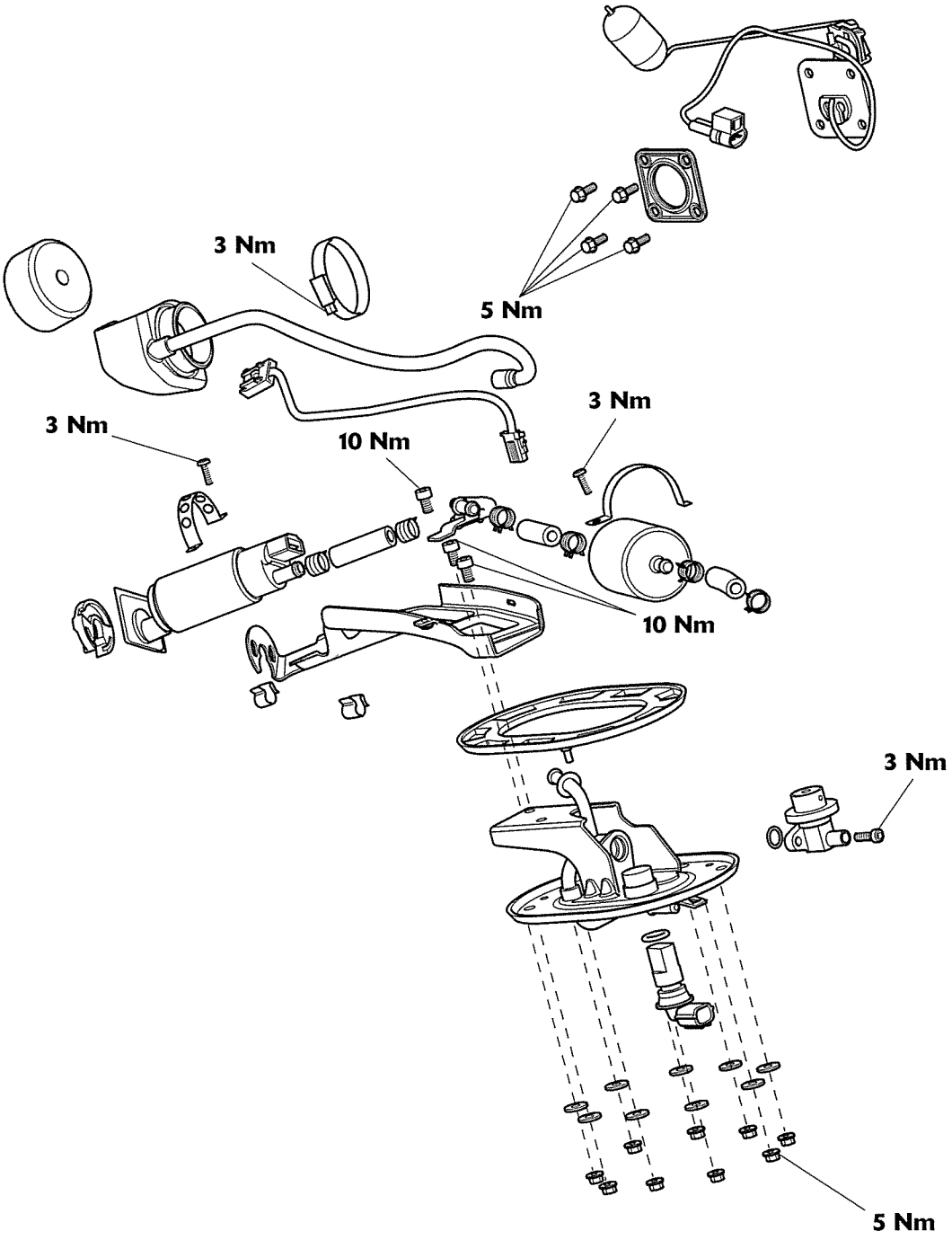
It is dangerous to operate the motorcycle with defective brakes; you must have your authorised Triumph dealer take remedial action before you attempt to ride the motorcycle again. Failure to take remedial action may reduce braking efficiency leading to loss of motorcycle control and an accident.

10 Fuel System/Engine Management

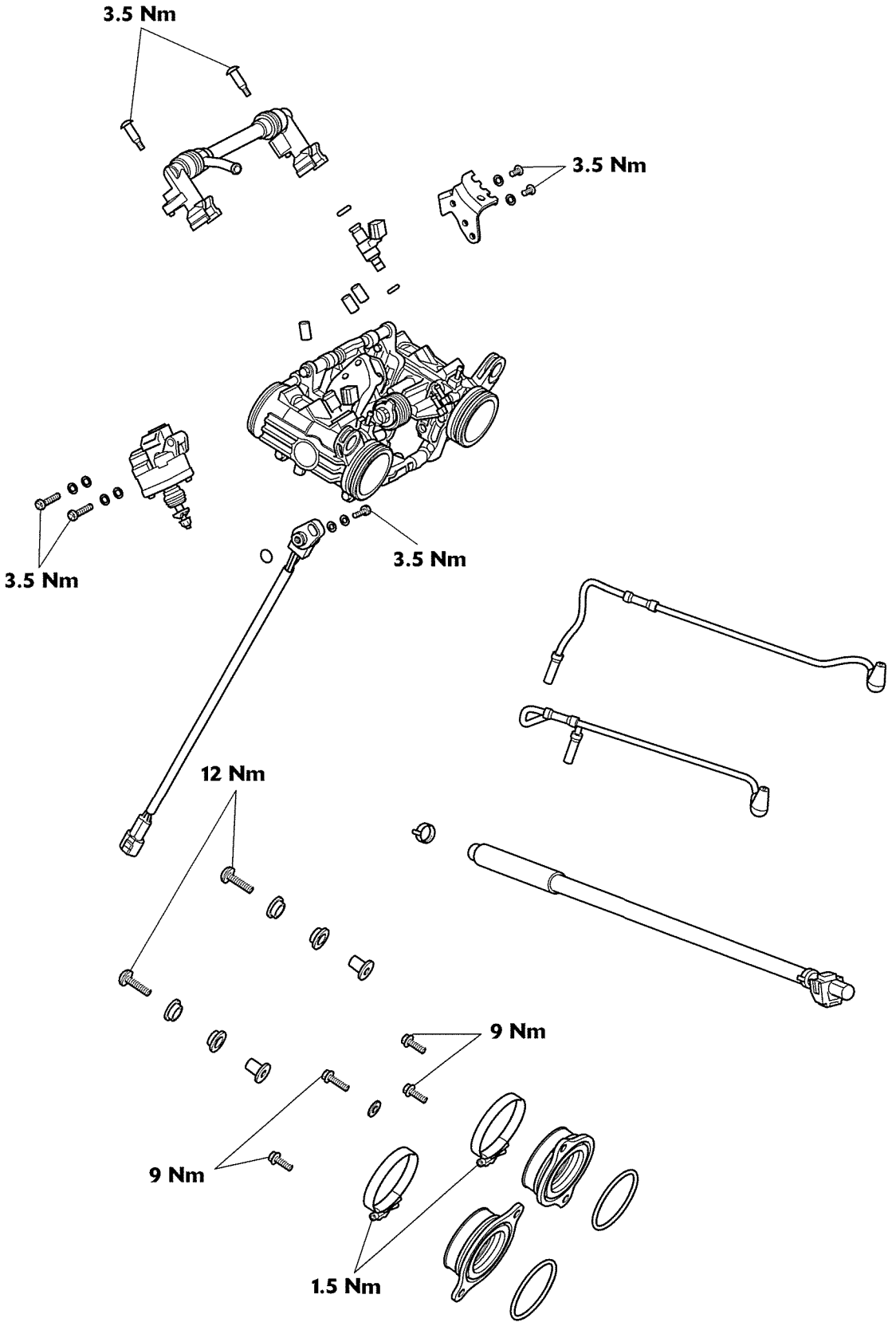
Exploded View - Fuel Tank



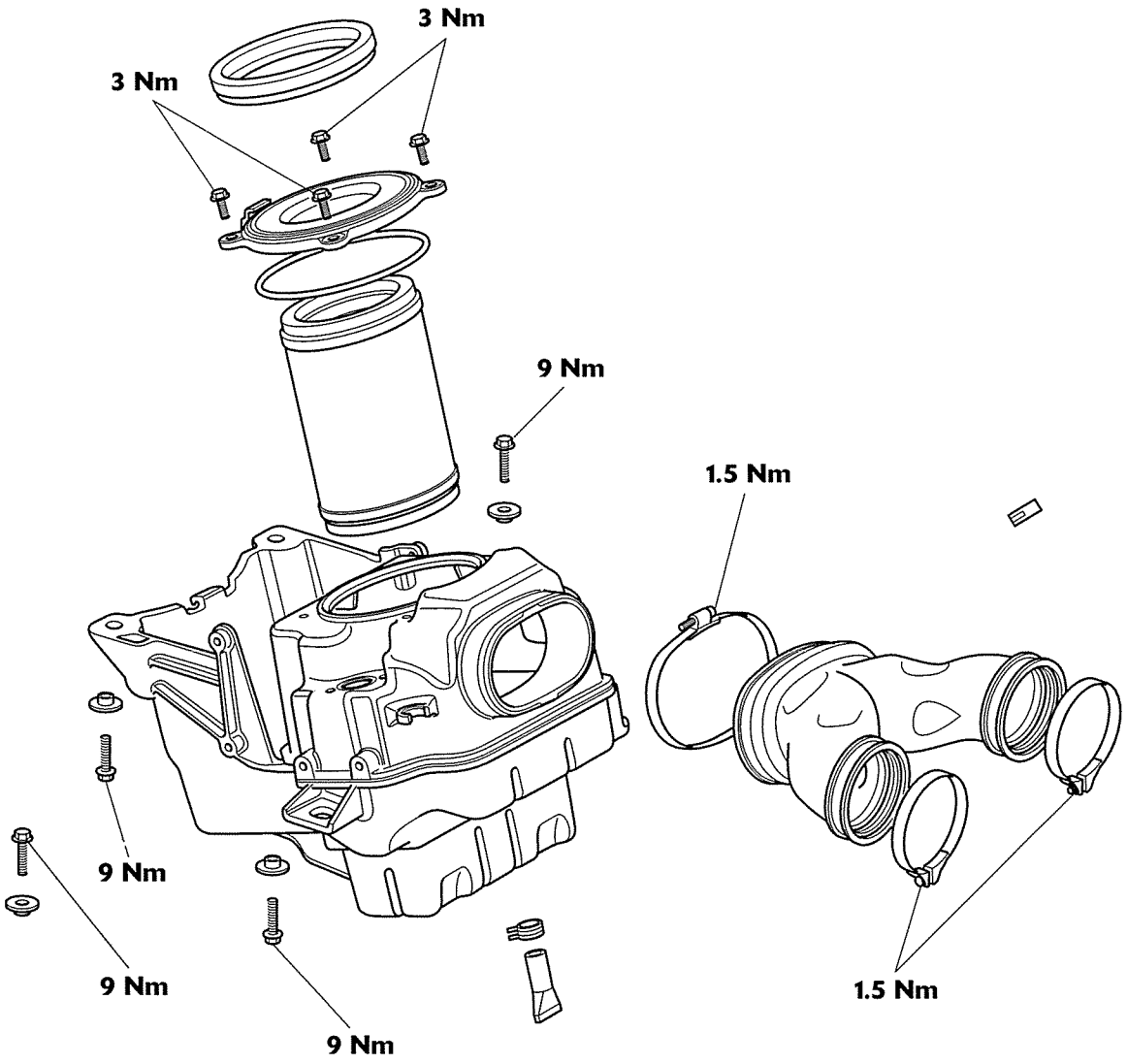
Exploded View - Fuel Pump



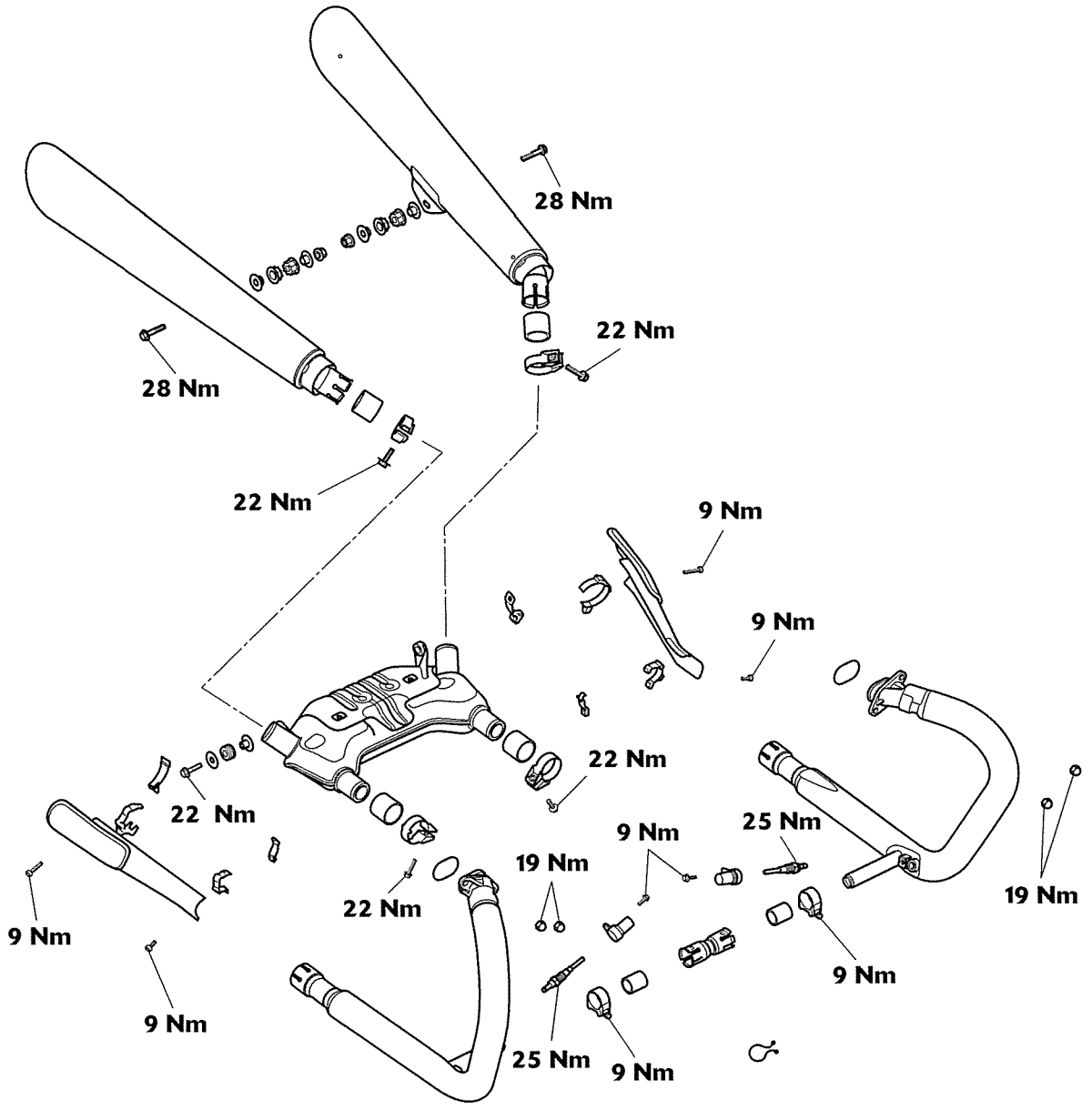
Exploded View - Fuel Rail, Throttles and Injectors



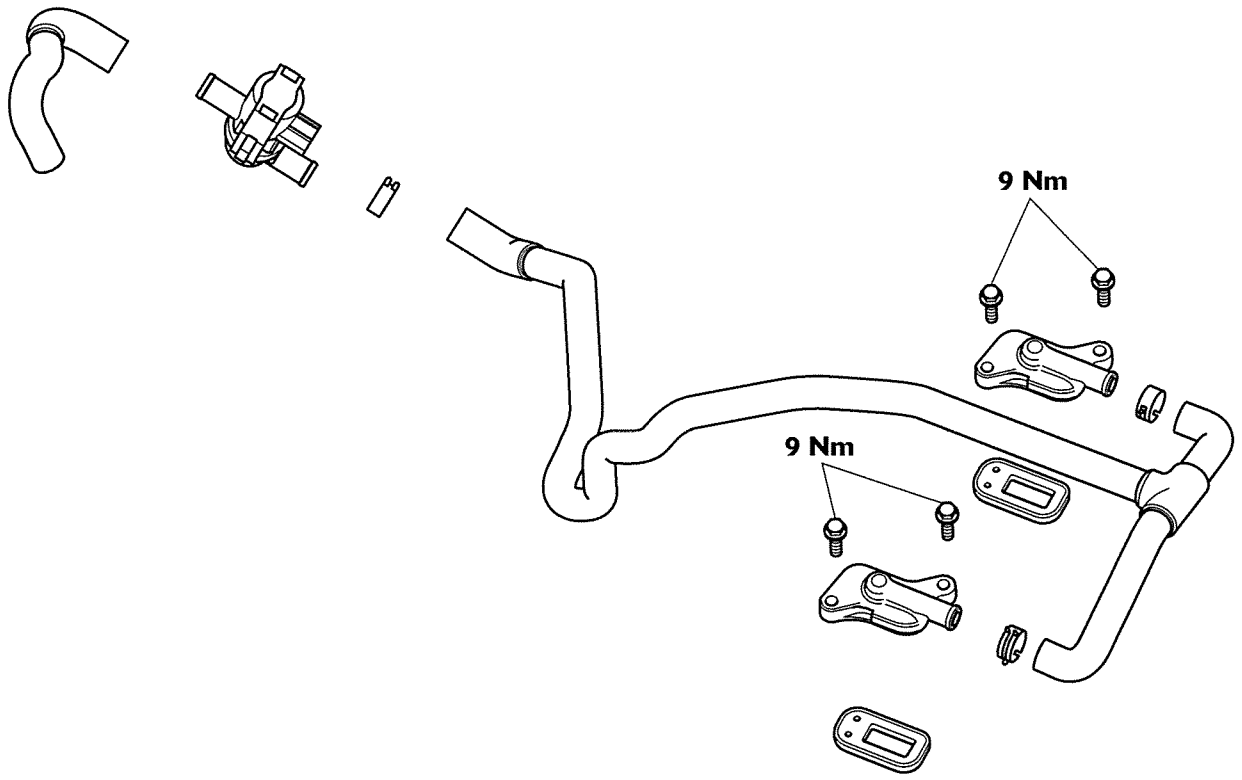
Exploded View - Airbox



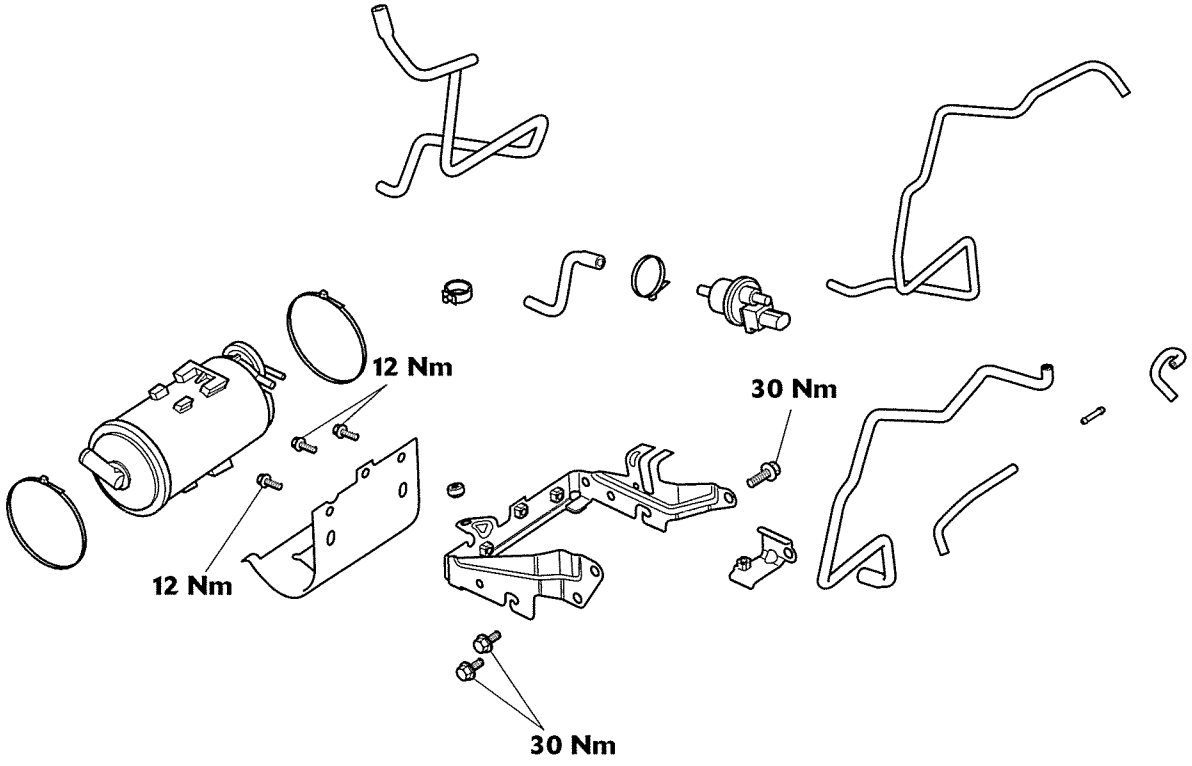
Exploded View - Exhaust System



Exploded View - Secondary Air System



Exploded View - Evaporative system and Secondary Air System



Fuel Requirements

Fuel Requirements - all countries except USA

Outside America, the Thunderbird must be run on 91 RON or higher 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: the Thunderbird is designed to run on unleaded gasoline with a CLC or AKI octane rating (R+M)/2 of 87 or higher.

Note:

- **If 'Knocking' or 'Pinking' occurs at a steady engine speed under normal load, use a different brand of gasoline or a higher octane rating.**

⚠ 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. The Thunderbird 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 hose.

Air temperature sensor

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

ATDC

After Top Dead Centre (TDC).

Barometric pressure

Pressure of the air in the airbox.

Battery Voltage

The Voltage at the input to the Engine Control Module (ECM).

BTDC

Before Top Dead Centre (TDC).

Catalyst

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

Closed throttle position

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

Coolant temperature

The coolant temperature in the cylinder head.

Coolant temperature sensor

Sensor which detects coolant temperature.

Cooling fan status

The ON or OFF condition of the cooling fan.

DTC

Diagnostic Trouble Code.

ECM

Engine Control Module.

Engine speed

The crankshaft revolutions per minute.

Freeze frame

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

Idle fuel trim

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

Idle fueling

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

Idle reference speed

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

Ignition advance

The timing of ignition at the spark plug relative to Top Dead Centre.

Ignition switch position

The ON or OFF position of either or both the ignition switch and the engine stop switch.

Ignition timing

Same as ignition advance.

Injector pulse time

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

Long term fuel trim

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

MAP sensor

Manifold Absolute Pressure (the air pressure in the intake system).

MIL

Malfunction Indicator Lamp.

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

Neutral switch status

The NEUTRAL or IN GEAR status of the transmission.

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 Engine Control Module (ECM) caused by an internal or external failure.

Throttle position sensor

Sensor for the throttle position.

Throttle stepper motor

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

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, which is then 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 diagnostic software, 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

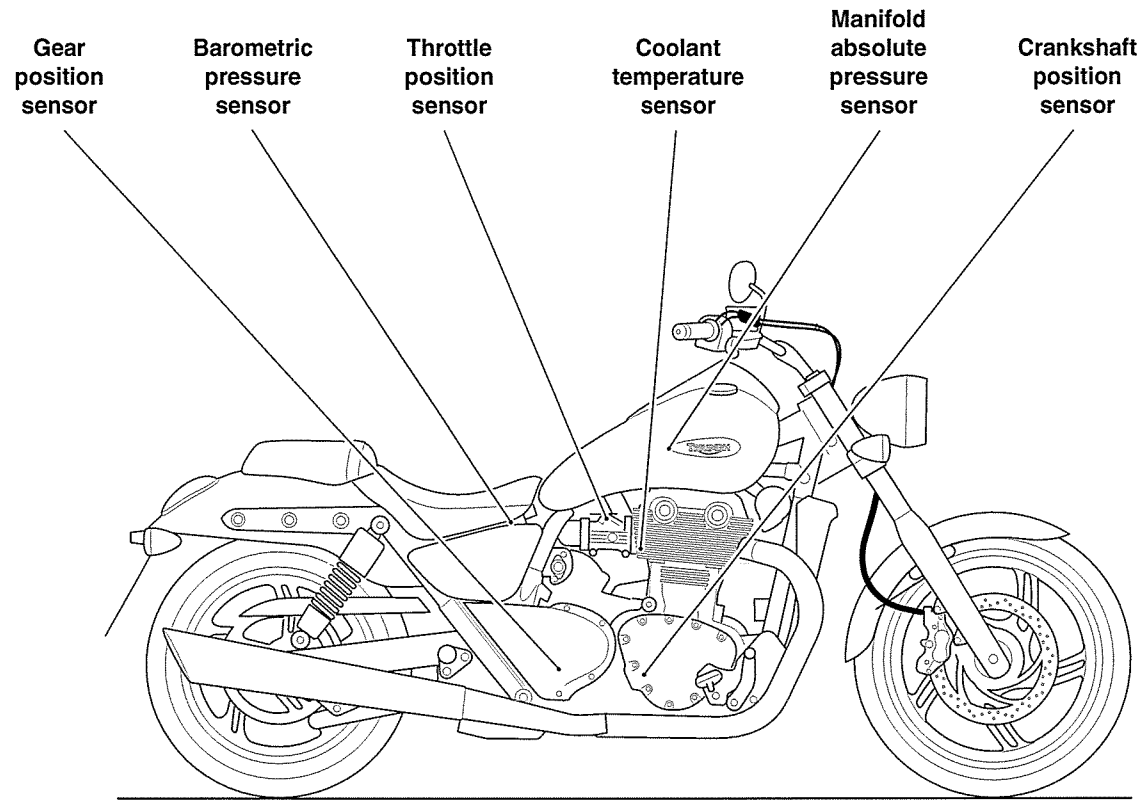
The Thunderbird is fitted with an electronic engine management system which encompasses control of both ignition and fuel delivery. The electronic control module (ECM) draws information from sensors positioned around the engine, cooling and air intake systems and precisely calculates ignition advance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

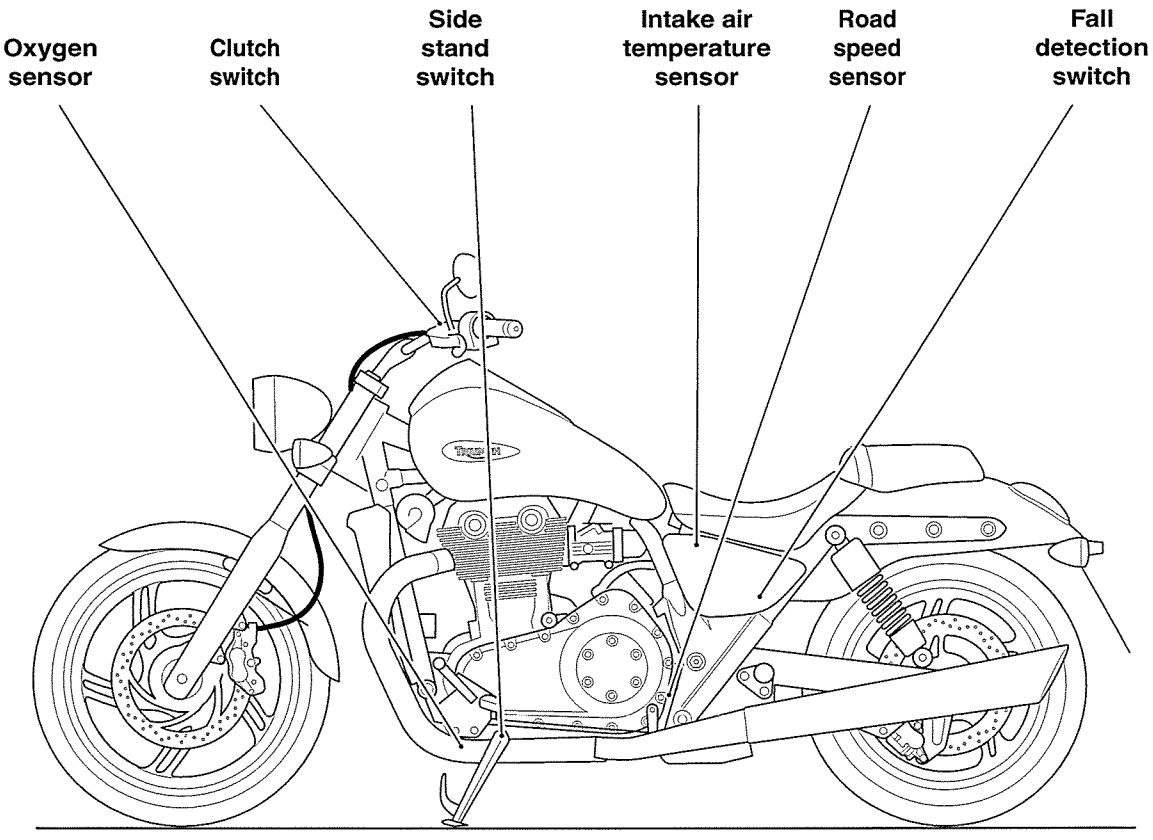
In addition, the system has an on-board diagnostic function. For additional information, see page *10-22*.

System Sensors

- **Intake air temperature sensor** - situated in the left hand side of the airbox. As the density of the air changes with temperature (therefore the amount of oxygen available to ignite the fuel), an intake air temperature sensor is fitted. Changes in air temperature are compensated for by adjusting the amount of fuel injected to a level consistent with clean combustion and low emissions.
- **Barometric pressure sensor** - situated beneath the motorcycle seat, in the top of the airbox. The barometric pressure sensor measures atmospheric air pressure. With this information, the amount of fuel per injection is adjusted to suit the prevailing conditions.
- **Manifold Absolute Pressure (MAP) sensor** - situated below the fuel tank, connected to each of the throttles 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 alternator cover. The crankshaft position sensor detects movement of teeth attached to the alternator rotor.
  The teeth give 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 towards the rear of the cylinder head, on the right hand side, below the throttle bodies. 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 between the throttle bodies. 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 lower crankcase, at the rear of the engine. 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.
- **Oxygen sensors** - situated in the exhaust header system upstream of the catalyst box. The oxygen sensors constantly feed 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.
- **Fall detection switch** - situated under the battery. 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.
- **Gear position sensor** - situated in the lower crankcase, below the final drive belt pulley. The gear position sensor provides the ECM with selected gear information. This is used to prevent the engine from starting if the transmission is in gear. The sensor also provides information to the neutral lamp in the instruments.

Sensor Locations





System Actuators

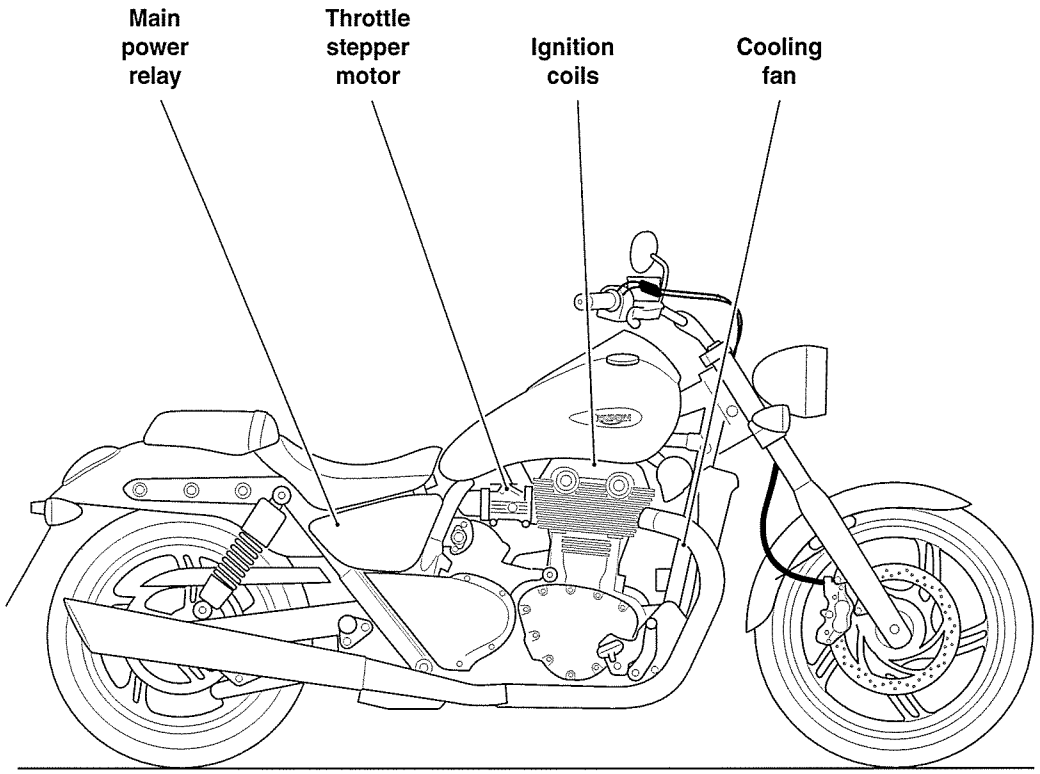
In response to signals received from the sensors, the ECM controls and directs messages to a series of electronic and electro-mechanical actuators. The function and location of the actuators is given below.

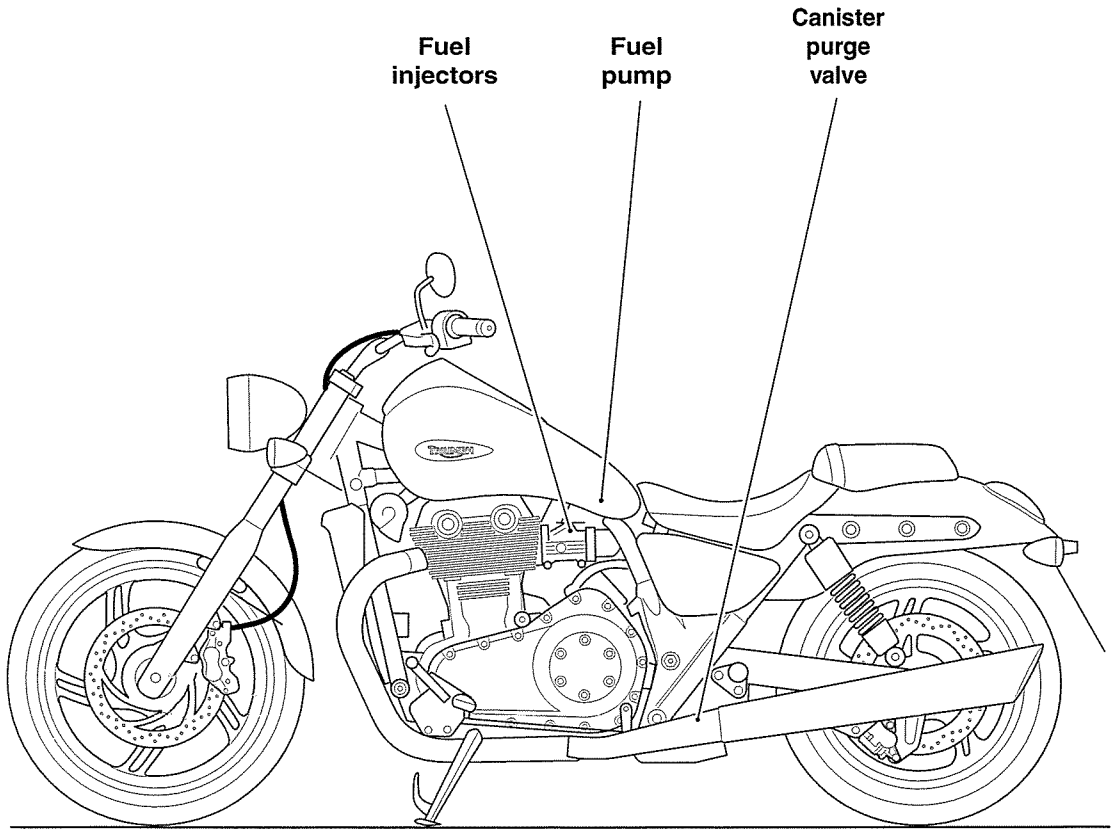
- **Throttle stepper motor** - situated at the front of the throttle bodies. The throttle stepper motor actuates a cam/lever which causes variations in the closed throttle position. Although used primarily to ensure target idle speed is maintained, it also increases throttle opening when the engine is 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 throttle bodies. The engine is fitted with two 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 camshaft cover. There are four coils fitted, one for each of the spark plugs. The ECM controls the point at which the coils are switched on and off. In calculating the switch-on time, the ECM allows sufficient time for the coils to charge to a level where a spark can be produced. The coils are switched off at the point of ignition, the timing of which is optimised for good engine performance.
- **Main power relay** - situated behind the right hand side panel. 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 three 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 fuel at three bar pressure 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.

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

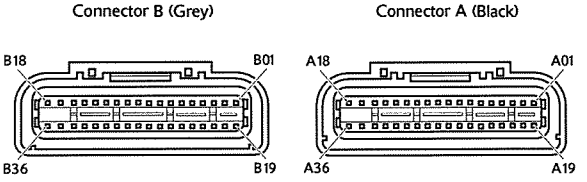
Key To Wiring Circuit Diagram

Key	Item Description
1	Engine Control Module
2	Diagnostic Connector
3	Instrument Assembly
4	Starter Relay
5	Clutch Switch
6	Intake Air Temperature Sensor
7	Gear Position Sensor
8	Vehicle Speed Sensor
9	Throttle Position Sensor
10	Fall Detection Switch
11	Ambient Pressure Sensor
12	MAP Sensor RH
13	MAP Sensor LH
14	Coolant Temperature Sensor
15	Fuel Level Sensor
16	Lambda Sensor RH
17	Lambda Sensor LH
18	Sidestand Switch
19	Idle Speed Control Stepper Motor
20	Idle Speed Control Sub-Harness
21	Alarm Unit
22	Engine Stop Switch
23	Fuel Pump
24	Fuel Pump Relay
25	Fuse Box (fuse 10)
26	Ignition Coils
27	Fuel Injectors
28	Cooling Fan
29	Cooling Fan Relay
30	Crankshaft Sensor
31	SAI Valve
32	Purge Valve
33	Engine Management System Relay
34	Fuse Box (fuse 4)

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

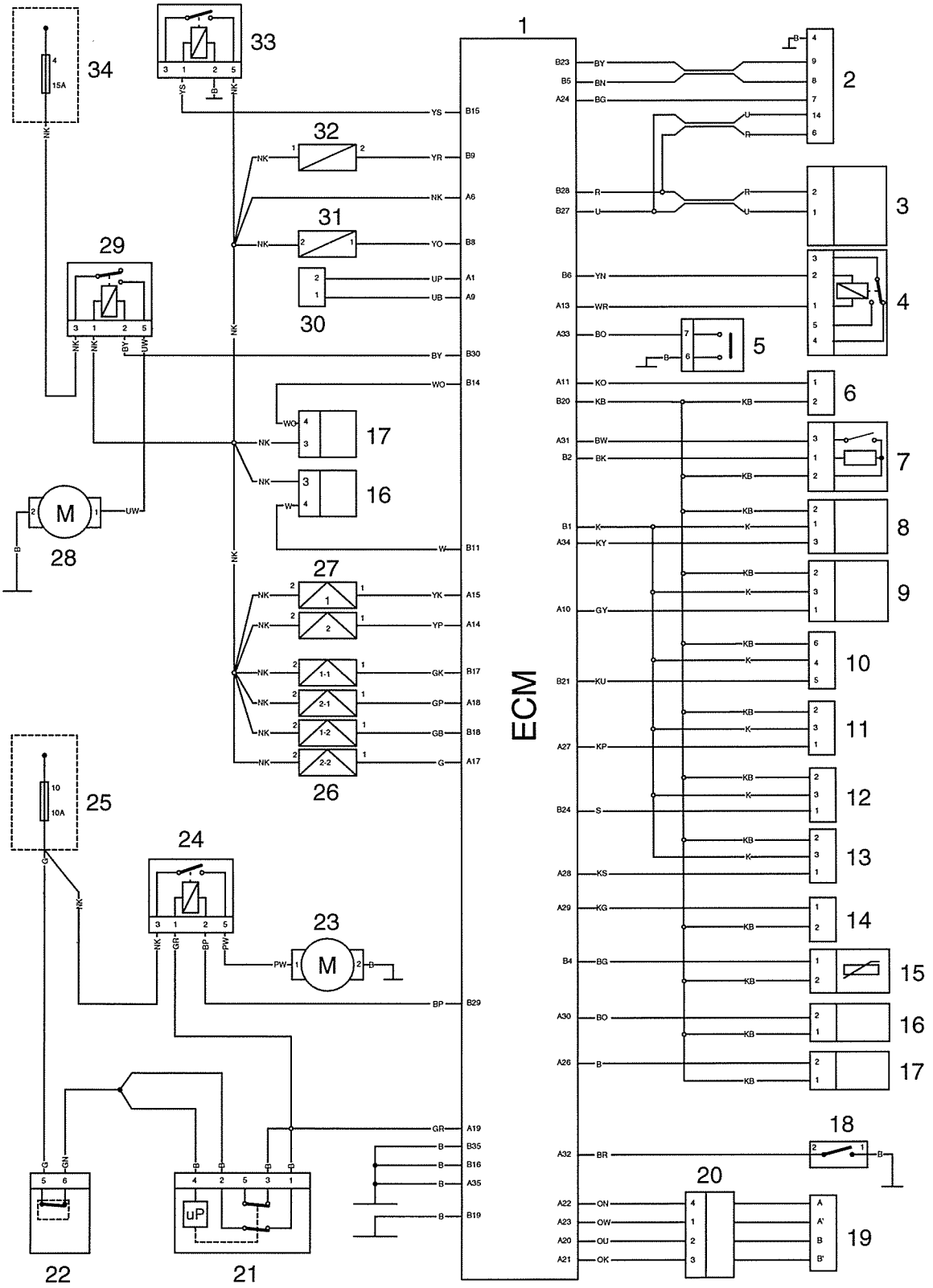
ECM Connector Pin Numbering



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

The black connector pins are prefixed A and the grey connector 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



System Diagnostics

The engine management system has an on-board diagnostics feature which allows service technicians to retrieve stored data from the ECM using Triumph diagnostic software. **Full details of the Triumph diagnostic software operation and how to interpret the results are given in the Triumph Diagnostic Tool User Guide.**

The software is connected, via an interface cable, to the motorcycle using a dedicated diagnostic plug situated beneath the left hand side panel. By using a dedicated plug, no electrical connectors associated with the system are disturbed, reducing potential connector damage.

The software 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:

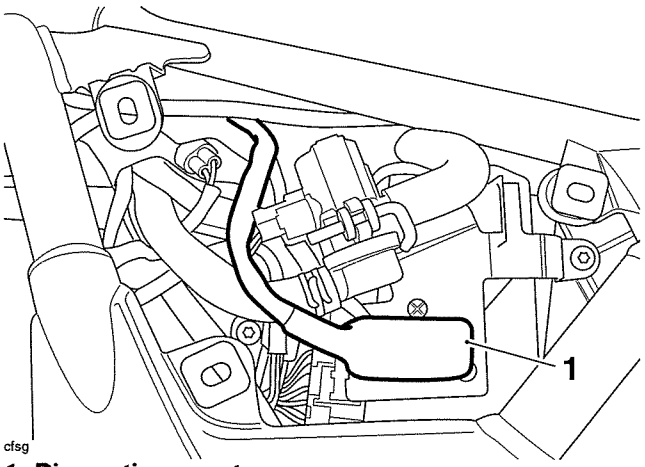
- **When a fault has been rectified, the MIL will remain illuminated until sufficient non-fault warm-up cycles have taken place to turn it off. The MIL will be immediately extinguished if, after first rectifying the fault, the DTC (diagnostic trouble code) that caused the MIL illumination is erased from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

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.**

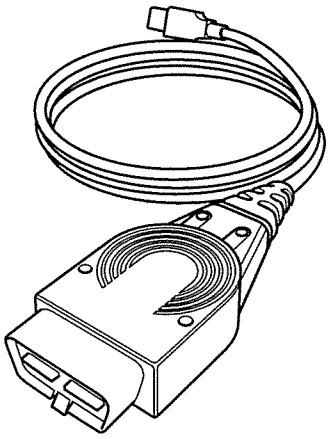
Diagnostic Tool Connection

1. To connect the Triumph diagnostic interface to the motorcycle, remove the left hand side panel (see page *17-9*) and release the diagnostic connector from its locating tang.



1. Diagnostic connector

2. Plug the diagnostic interface directly in to the diagnostic connector.



Diagnostic Interface

3. When the diagnostic session is completed, disconnect the Triumph diagnostic interface.
4. Refit the diagnostic connector to its locating tang and refit the side panel (see page *17-9*).

Triumph Diagnostic Software

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 diagnostic software.

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

Note:

- **Full details of how to operate the software and how to interpret the data can be found in the Triumph Diagnostic Tool User Guide, which can be downloaded by authorised Triumph dealers from www.triumphonline.net.**

Build Data

The **Build Data** screen will display the following information:

- Motorcycle model;
- Vehicle Identification Number (VIN);
- ECM type;
- ECM ID;
- ECM serial number;
- Tune number;
- Date of last tune download;
- Total tune downloads since manufacture;
- The lock status of the ECM (ECM Locked, Unlocked or Not Applicable).

Current Data

The data available under Current Data is:

Function Examined	Result Reported (Scale)
Fuel system status 1	open or closed loop operation
Fuel system status 2	open or closed loop operation/engine not running
Calculated load value	%
Engine coolant temperature	°C
Short term fuel trim - Bank 1	%
Short term fuel trim - Bank 2	%
Intake manifold absolute pressure	mm/hg
Engine speed	RPM
Vehicle speed	km/h
Ignition timing advance - cylinder 1	degrees
Intake air temperature	°C
Absolute throttle position	%
Bank 1 - oxygen sensor 1	Volts
Bank 1 - oxygen sensor 1 - short term fuel trim	%
Bank 2 - oxygen sensor 2	Volts
Bank 2 - oxygen sensor 2 - short term fuel trim	%

Sensor Data

When using this function it is possible to check the status of various sensors and actuators.

The data sets are divided into seven groups - Sensor Voltages; Sensor Readings; Injector Data; Ignition Data; Idle Speed, Throttle Data and Inputs and Adaption Status. Each of these screens is described on the following pages.

Sensor Voltages

The data available under Sensor Voltages is:

Item Checked	Result Unit
Battery voltage	Volts
Voltage from ignition switch to ECU	Volts
Air temperature sensor voltage	Volts
Coolant temperature sensor voltage	Volts
Atmospheric pressure sensor voltage	Volts
Manifold absolute pressure sensor 1 voltage	Volts
Manifold absolute pressure sensor 2 voltage	Volts
Throttle position sensor voltage	Volts
Fuel level sensor voltage	Volts
Oxygen sensor output 1 voltage	Volts
Oxygen sensor output 2 voltage	Volts

Sensor Readings

The data available under Sensor Readings is:

Item Checked	Result Unit
Air temperature	°C
Coolant temperature	°C
Atmospheric (barometric) pressure	mmHg
Manifold absolute pressure (one reading per cylinder)	mmHg
Low fuel light	on/off
Oxygen sensor 1 heater status	on/off
Oxygen sensor 2 heater status	on/off

Injector Data

The data available under Injector Data is:

Item Checked	Result Unit
Injector 1 pulse time	milliseconds
Injector 2 pulse time	milliseconds

Ignition Data

The data available under Ignition Data is:

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

Idle Speed and Throttle Data

The data available under Idle Speed and Throttle Data is:

Item Checked	Result Unit
Engine speed	RPM
Idle reference speed	RPM
Idle speed control current steps	numeric
Idle speed control target steps	numeric
Throttle position	% open
Secondary air injection status	SAI on/off

Inputs

The data available under Inputs is:

Item Checked	Result Unit
EMS Main relay status	relay on/off
Fuel pump relay status	on/off
Starter relay status	starter on/off
Starter switch status	switch on/off
Side stand status	up/down
Fall detection status	normal/over
Clutch switch status	release/grip
Neutral switch	gear/neutral
Gear position	numeric value or neutral
Vehicle speed	km/h
Malfunction indicator light status	MIL on/off
Cooling fan status	fan on/off
Calculated load	%
Purge valve duty cycle	%

Adaption status

Because the fuel system is adaptive, the engine management system is able to automatically adjust to new working conditions, such as changes in altitude, component wear, air leaks etc. This screen displays information on the adaption status of the vehicle which will show if it has adapted or not.

Function Examined	Report Method
Closed Throttle Position Adapted	adapted/not adapted
Idle speed control adaption status	%
Oxygen sensor 1 adaption range (off idle)	%
Oxygen sensor 1 adaption range (idle)	%
Oxygen sensor 1 adaption status (off idle)	%
Oxygen sensor 1 adaption status (idle)	%
Oxygen sensor 2 adaption range (off idle)	%
Oxygen sensor 2 adaption range (idle)	%
Oxygen sensor 2 adaption status (off idle)	%
Oxygen sensor 2 adaption status (idle)	%

Function Tests

The system allows the diagnostic software 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 others, if faults are present, DTCs will be logged.

The Function Tests available are:

Function Examined	Report Method
Instrument Panel	Observe instrument panel, refer to service manual
Purge Valve	Listen for valve operation/Stored fault code*
Fuel Pump - Priming	Listen for fuel pump operation/Stored fault code*
Fuel Pump - Continuous Operation	Fuel pressure test/Listen for fuel pump operation/Stored fault code*
Cooling Fan Control	Observe the cooling fan/Stored fault code*
Secondary Air Injection	Listen for valve operation/Stored fault code*

* If a fault is detected.

Adjust Tune

Using the Triumph diagnostic software, it is possible to:

- reset the adaptions;
- balance the throttle bodies.

Further functions are provided to allow correct replacement and adjustment of the:

- throttle position sensor;
- idle speed control stepper motor.

These functions are needed as, after replacement of the parts concerned, adjustments have to be made to specific Voltage settings, with the throttles set in a specific position.

To reset the adaptions, see page *10-116*.

To replace and adjust the throttle position sensor, see page *10-111*.

To replace and adjust the ISC stepper motor, see page *10-114*.

To balance the throttles, see page *10-109*.

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)**
DTC	Diagnostic Trouble Code (DTC) number
Fuel system status 1	open or closed loop operation
Fuel system status 2	open or closed loop operation
Calculated load	%
Coolant temperature	°C
Short term fuel trim - bank 1	%
Short term fuel trim - bank 2	%
Intake manifold absolute pressure	mm/hg
Engine speed	RPM
Vehicle speed	km/h
Ignition advance	degrees
Intake air temperature	°C
Throttle position	%
Oxygen sensor 1 output Voltage	Volts
Oxygen sensor 1 short term fuel trim	%
Oxygen sensor 2 output Voltage	Volts
Oxygen sensor 2 short term fuel trim	%

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 software 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 software.

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
P1201	Injector 1 open circuit/short to ground	3	40	Yes
P1202	Injector 2 open circuit/short to ground	3	40	Yes
P0335	Crankshaft sensor circuit malfunction	3	40	Yes
P0032	Oxygen sensor 1 heater short circuit to battery	3	40	Yes
P0031	Oxygen sensor 1 heater open circuit/short to ground	3	40	Yes
P0130	Oxygen sensor 1 circuit malfunction	3	40	Yes
P0052	Oxygen sensor 2 heater short circuit to battery	3	40	Yes
P0051	Oxygen sensor 2 heater open circuit/short to ground	3	40	Yes
P0150	Oxygen sensor 2 circuit malfunction	3	40	Yes
P1131	Oxygen sensor reverse connection	3	40	Yes
P0122	Throttle position sensor low input	3	40	Yes
P0123	Throttle Position sensor high input	3	40	Yes
P0351	Ignition coil 1 circuit malfunction	3	40	Yes
P0352	Ignition coil 2 circuit malfunction	3	40	Yes
P0353	Ignition coil 3 circuit malfunction	3	40	Yes
P0354	Ignition coil 4 circuit malfunction	3	40	Yes
P0107	Manifold absolute pressure sensor 1 low voltage	3	40	Yes
P0108	Manifold absolute pressure sensor 1 high voltage	3	40	Yes
P1105	Manifold absolute pressure sensor 1 pipe malfunction	3	40	Yes
P1687	Manifold absolute pressure sensor 2 low voltage	3	40	Yes
P1688	Manifold absolute pressure sensor 2 high voltage	3	40	Yes
P1106	Manifold absolute pressure sensor 2 pipe malfunction	3	40	Yes
P1111	Manifold absolute pressure sensor reverse connection	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
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
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
P0460	Fuel level sensor circuit malfunction	0	40	No
P0705	Gear position sensor circuit malfunction	0	40	No
P0603	EEPROM fault	0	40	No
P1690	CAN communication fault	0	40	No
P1696	Voltage control circuit short to ground	3	40	Yes
P1697	Voltage control circuit short to Vbatt	3	40	Yes
P1698	Voltage control circuit malfunction	3	40	Yes
P1602	Tunelock	Only if Tunelock is unlocked		Flashing

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
P1614	ECM or tune ID Incorrect	Only if Instrument ID Matching		Flashing
P1685	EMS main relay circuit	3	40	Yes
P1659	EMS ignition Voltage input circuit	3	40	Yes

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 coloured and shaped connectors are used in the ECM, which ensures correct connection is always made. The connectors on the ECM are coloured black and grey, and correspond with identical coloured connectors on the main harness.**

⚠ Caution

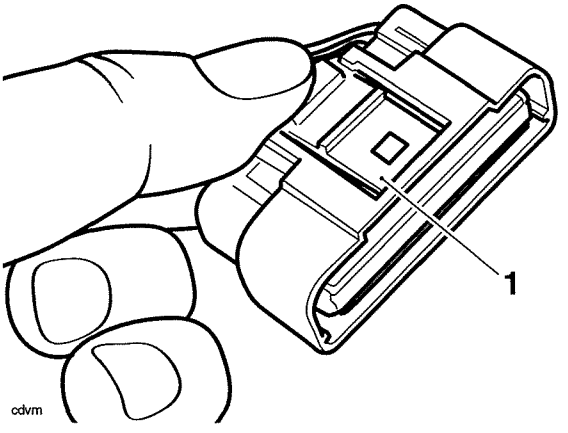
When disconnecting a connector, never pull directly on the wires as this may result in cable and connector damage.

⚠ 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. Turn the ignition to the OFF position and wait at least 1 minute for the ECM to complete its power down sequence.
2. Press down on the locking device and gently pull back on the connector to release it from the ECM.

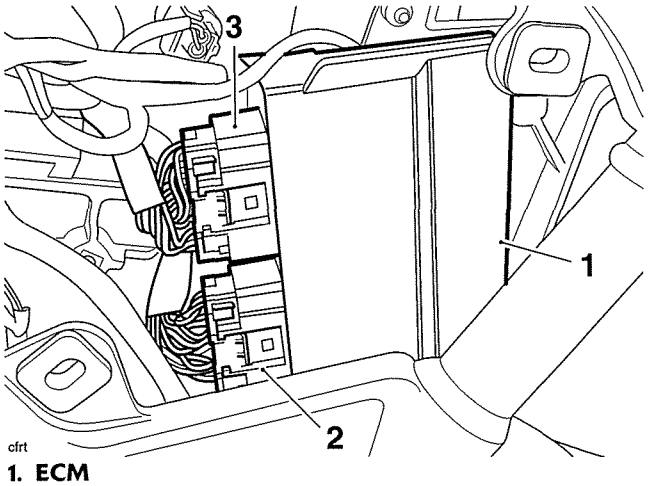


1. Locking device

Reconnection of ECM connectors

Caution

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



1. ECM
2. Grey connector
3. Black connector

1. 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.

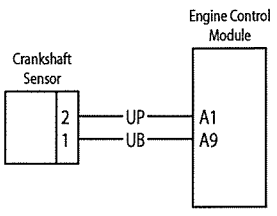
Crankshaft Sensor

Fault Code	Possible cause	Action
P0335	Crankshaft sensor system fault	View & note diagnostic software '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 A01 - ECM pin A09	OK	Disconnect sensor and proceed to test 2
		Faulty	Rectify fault, proceed to test 6
2	Check cable for short circuit: - ECM pin A01 to earth - ECM pin A09 to earth	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 6
3	Check cable continuity: - ECM pin A01 to sensor pin 2 - ECM pin A09 to sensor pin 1	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 6
4	Check cable for short circuit: - ECM pin A01 to ECM pin A09	OK	Renew crankshaft sensor, proceed to test 6
		Short circuit	Locate and rectify wiring fault, proceed to test 6
5	Check crankshaft 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 Control

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

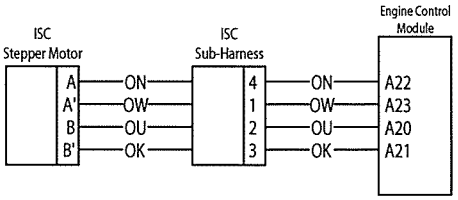
Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin A22 - ECM pin A23 - ECM pin A20 - ECM pin A21	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 7
2	Check resistance value: - ECM pin A22 to ECM pin A23 - ECM pin A20 to ECM pin A21	6Ω to 10Ω	Proceed to test 3
		Open circuit	Disconnect stepper motor and proceed to test 4
		Short circuit	Disconnect stepper motor and proceed to test 5
3	Check cable for short circuit: - ECM pin A22 to earth - ECM pin A23 to earth - ECM pin A20 to earth - ECM pin A21 to earth	OK	Proceed to test 7
		Short circuit	Locate and rectify wiring fault, proceed to test 7
4	Check cable continuity: - ECM pin A22 to stepper motor pin 4 - ECM pin A23 to stepper motor pin 1 - ECM pin A20 to stepper motor pin 2 - ECM pin A21 to stepper motor pin 3	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 A21 - ECM pin A20 to ECM pin A22 - ECM pin A20 to ECM pin A23 - ECM pin A21 to ECM pin A22 - ECM pin A21 to ECM pin A23 - ECM pin A22 to ECM pin A23	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	6Ω to 10Ω	Proceed to test 7
		Faulty	Renew stepper motor, proceed to test 7

Pinpoint Tests (continued)

	Test	Result	Action
7	Reconnect harness, clear fault code and run diagnostic software function test to visually verify operation of stepper motor	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



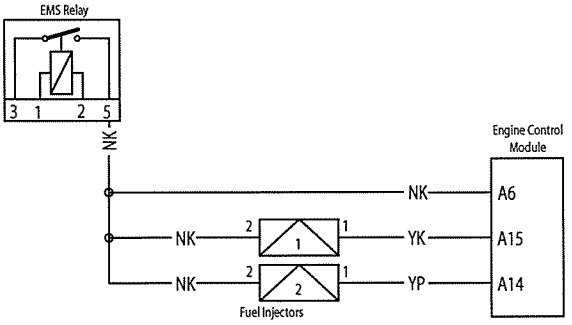
Fuel Injectors

Fault Code	Possible cause	Action
P0201/02	Injection system fault - Injector 1/2 - Misfire indicates open circuit - Flooding indicates short circuit	View & note diagnostic software '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 A15 - ECM pin A14 - EMS relay pin 5	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 7
2	Check resistance value: - ECM pin A06 to ECM pin A15 (injector 1) - ECM pin A06 to ECM pin A14 (injector 2)	9Ω to 12Ω	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 A15 to earth - ECM pin A14 to earth	OK	Proceed to test 7
		Short circuit	Locate and rectify wiring fault, proceed to test 7
4	Check cable continuity: - EMS relay pin A06 to relevant injector pin 2 - ECM pin A15 to injector 1 pin 1 - ECM pin A14 to injector 2 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 A06 to ECM pin A15 (inj 1) - ECM pin A06 to ECM pin A14 (inj 2)	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



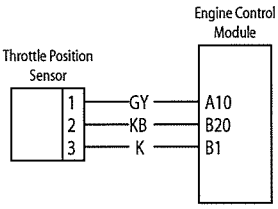
Throttle Position Sensor

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 software 'freeze frame' data if available. View & note diagnostic software '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 A10 - ECM pin B01 - ECM pin B20	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 B01 to sensor pin 3 - ECM pin B20 to sensor pin 2 - ECM pin A10 to sensor pin 1	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable for short circuit: - ECM pin A10 to ECM pin B01 - ECM pin A10 to ECM pin B20	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



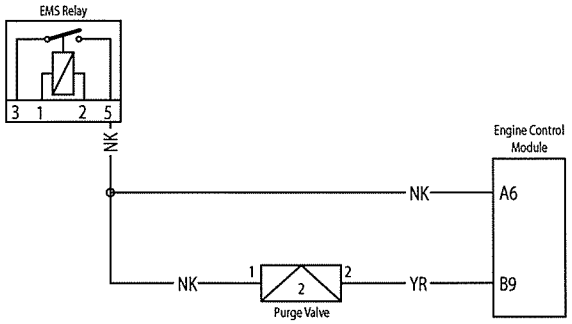
Purge Valve

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

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin B09 - EMS relay pin 5	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 7
2	Check resistance value: - ECM pin A06 to ECM pin B09	22Ω to 30Ω	Proceed to test 3
		Open circuit	Disconnect purge valve and proceed to test 4
		Short circuit	Disconnect purge valve and proceed to test 5
3	Check cable for short circuit: - ECM pin B09 to earth	OK	Proceed to test 7
		Short circuit	Locate and rectify wiring fault, proceed to test 7
4	Check cable continuity: - ECM pin B09 to valve pin 2 - EMS relay pin 5 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 A06 to ECM pin B09	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	22Ω to 30Ω	Proceed to test 7
		Faulty	Renew purge valve, proceed to test 7
7	Reconnect harness, clear fault code and run diagnostic software function test to visually verify operation of purge valve	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



Ignition Coils

Fault Code	Possible cause	Action
P0351/52/53/54	Ignition system fault - Ign coil 1/2/3/4	View & note diagnostic software 'freeze frame' data if available. Ensure relevant ign coil connector is secure. Disconnect ECM and proceed to pinpoint test 1:

Pinpoint Tests

Note:

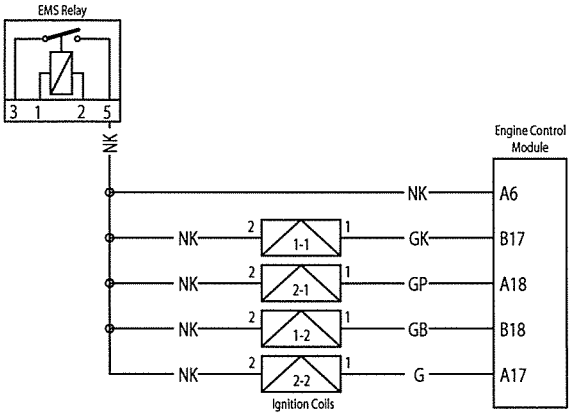
- **Thunderbird has 4 ignition coils, two per cylinder. Ignition coils are numbered 1 to 4 from the left hand (cylinder 1) side.**

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin B17 - ECM pin A18 - ECM pin B18 - ECM pin A17 - EMS relay pin 5	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 7
2	Check resistance value: ECM pin A06 to - ECM pin (ign coil 1) B17 - ECM pin (ign coil 2) A18 - ECM pin (ign coil 3) B18 - ECM pin ign coil 4) A17	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 B17 - ECM pin to earth A18 - ECM pin to earth B18 - ECM pin to earth A17	OK	Proceed to test 7
		Short circuit	Locate and rectify wiring fault, proceed to test 7
4	Check cable continuity: EMS relay pin 5 to relevant ignition coil pin 2 - ECM pin B17 to ign coil 1 pin 1 - ECM pin A18 to ign coil 2 pin 1 - ECM pin B18 to ign coil 3 pin 1 - ECM pin A17 to ign coil 4 pin 1	OK	Proceed to test 6
		Open circuit	Locate and rectify wiring fault, proceed to test 7
5	Check cable for short circuit: ECM pin A06 to - ECM pin (ign coil 1) B17 - ECM pin (ign coil 2) A18 - ECM pin (ign coil 3) B18 - ECM pin (ign coil 4) A17	OK	Proceed to test 6
		Short circuit	Locate and rectify wiring fault, proceed to test 7

Pinpoint Tests (continued)

	Test	Result	Action
6	Check relevant ign coil resistance:	0.8Ω to 1.2Ω	Proceed to test 7
	- Ign coil pin 1 to ign coil pin 2	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 positive	View & note diagnostic software 'freeze frame' data if available. View & note diagnostic software '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

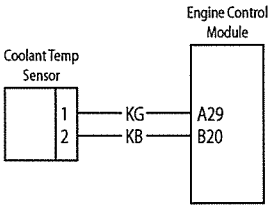
	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin A29 - ECM pin B20	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 7
2	Check resistance value: - ECM pin A29 to ECM pin B20 (Temperature dependent – see overleaf)	OK	Proceed to test 6
		Open circuit	Disconnect sensor and proceed to test 3
		Short circuit	Disconnect temp sensor and proceed to test 4
3	Check cable continuity: - ECM pin A29 to sensor pin 1 - ECM pin B20 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 A29 to ECM pin B20	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 overleaf)	OK	Proceed to test 7
		Faulty	Renew temp sensor, proceed to test 7
6	Check cable for short circuit: - ECM pin A29 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 still present	Contact Triumph service

Resistance data under typical conditions:

Cold engine:	
Temperature	
20°C ambient	2.35 to 2.65KΩ
-10°C ambient	8.50 to 10.25KΩ

Warm engine:	
Temperature	
-	200 to 400Ω

Circuit Diagram



Inlet Air Temperature Sensor

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

Pinpoint Tests

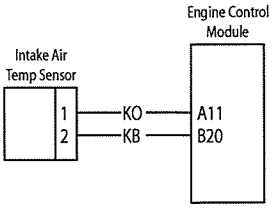
	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin A11 - ECM pin B20	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 7
2	Check resistance value: - ECM pin A11 to ECM pin B20 (Temperature dependent – see below)	OK	Proceed to test 6
		Open circuit	Disconnect temp sensor and proceed to test 3
		Short circuit	Disconnect temp sensor and proceed to test 4
3	Check cable continuity: - ECM pin A11 to sensor pin 1 - ECM pin B20 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 A11 to ECM pin B20	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 air temperature sensor, proceed to test 7
6	Check cable for short circuit: - ECM pin A11 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 still present	Contact Triumph service

Resistance data:

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

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

Circuit Diagram



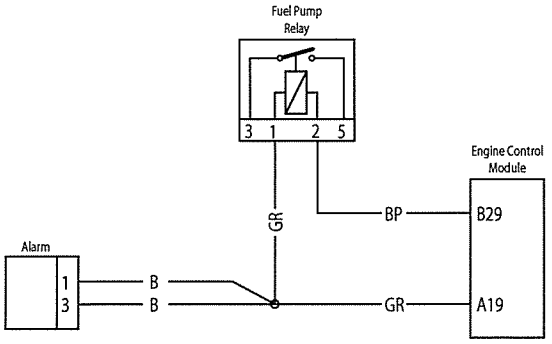
Fuel Pump Relay

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 positive	Disconnect ECM and fuel pump relay and proceed to pinpoint test 4:

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin B29 - Alarm pin 1 - Alarm pin 3	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 B29 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable continuity: - ECM pin B29 to fuel pump relay pin 2 - Alarm pin 1 or 3 to fuel pump relay pin 1	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable for short circuit: - ECM pin B29 to ECM pin A19	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 software 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 software '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 - EMS relay pin 5	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 3
2	With Ignition 'on', check Voltage at: - ECM pin A06	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

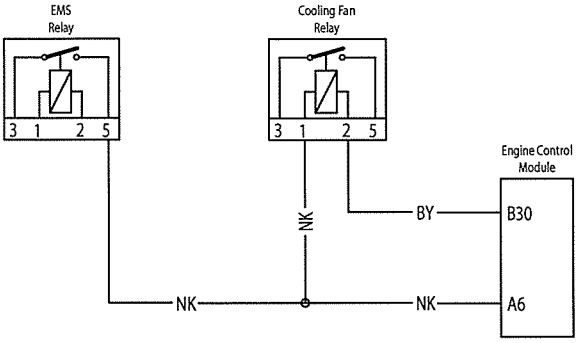
Cooling Fan Relay

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

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin B30 - EMS relay pin 5	OK	Disconnect fan relay and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - ECM pin B30 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable continuity: - ECM pin B30 to fan relay pin 2 - EMS relay pin 05 to fan relay pin 1	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable for short circuit: - ECM pin B30 to ECM pin A06	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 software function test to visually verify operation of cooling fan	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



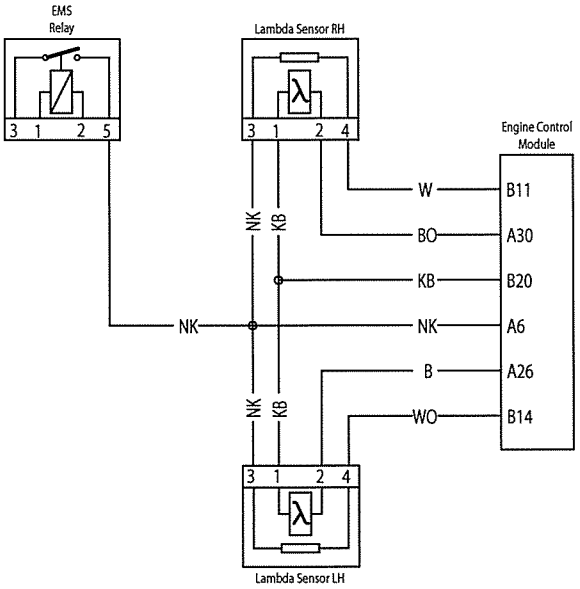
Oxygen Sensor

Fault Code	Possible cause	Action
P0130 (left) P0150 (right)	Oxygen sensor circuit fault. Oxygen sensor left hand and right hand	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 A26 - ECM pin A30 - ECM pin B20	OK	Disconnect oxygen sensors and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - ECM pin A26 to earth - ECM pin A30 to earth	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 4
3	Check cable continuity: - ECM pin A26 to left hand oxygen sensor pin 2 - ECM pin A30 to right hand oxygen sensor pin 2 - ECM pin B20 to relevant oxygen sensor pin 1	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 4
4	check cable for short circuit: - ECM pin B20 to ECM pin A26 (left hand oxygen sensor) - ECM pin B20 to ECM pin A30 (right hand oxygen sensor)	OK	Renew relevant oxygen 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. Check adaptation status	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



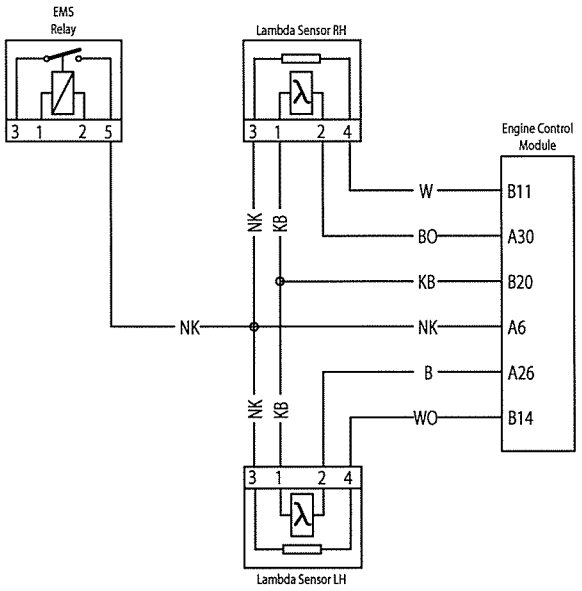
Oxygen Sensor Heater

Fault Code	Possible cause	Action
P0031 (left) P0051 (right)	Oxygen sensor heater circuit short circuit to ground or open circuit. Oxygen sensor left hand and right hand	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 (left) P0052 (right)	Oxygen sensor heater circuit, short circuit to battery positive. Oxygen sensor left hand and right hand	Disconnect oxygen sensor and proceed to pinpoint test 4:

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin B14 - ECM pin B11 - EMS relay pin 5	OK	Disconnect oxygen sensors and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - ECM pin B14 to ground - ECM pin B11 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable continuity: - ECM pin B14 to left hand oxygen sensor pin 4 - ECM pin B11 to right hand oxygen sensor pin 4 - EMS relay pin 5 to relevant oxygen 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 A6 to ECM pin B14 (left hand oxygen sensor) - ECM pin A6 to ECM pin B11 (right hand oxygen sensor)	OK	Renew relevant oxygen 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



Oxygen Sensor Reverse Connection

Fault Code	Possible cause	Action
P1131	Oxygen sensor cylinder 1 connector is plugged into cylinder 2 sensor and vice versa	Check oxygen sensor connections and swap cylinder number 1 and cylinder number 2 connections if incorrect.

EEPROM Error

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

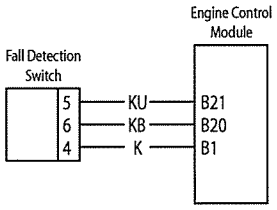
Fall Detection Switch

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

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin B21 - ECM pin B20 - ECM pin B1	OK	Disconnect sensor and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - ECM pin B21 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable continuity: - ECM pin B01 to sensor pin 4 - ECM pin B21 to sensor pin 5 - ECM pin B20 to sensor pin 6	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable for short circuit: - ECM pin B21 to ECM pin B1 - ECM pin B21 to ECM pin B20	OK	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



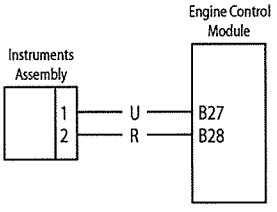
Instrument Communication (CAN)

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 B27 - ECM pin B28 - Instrument pin 1 - Instrument pin 2	OK	Disconnect instruments and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - ECM pin B27 to ground - ECM pin B28 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable continuity: - ECM pin B27 to Instrument pin 1 - ECM pin B28 to Instrument pin 2	OK	Contact Triumph service
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable for short circuit: - ECM pin B27 to ECM pin B28	OK	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



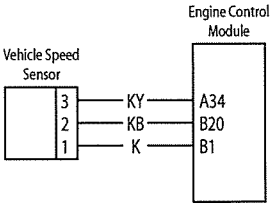
Vehicle Speed Sensor

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 test 1:

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin A34 - ECM pin B20 - ECM pin B01	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 A34 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable for continuity: - ECM pin B1 to sensor pin 1 - ECM pin B20 to sensor pin 2 - ECM pin A34 to sensor pin 3	OK	Renew vehicle speed sensor and proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 4
4	Check cable for short circuit: - ECM pin A34 to ECM pin B1 - ECM pin A34 to ECM pin B20	OK	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



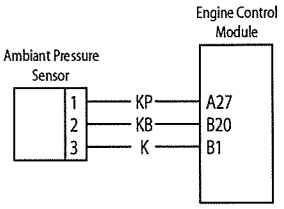
Barometric Pressure Sensor

Fault Code	Possible cause	Action
P1107	Barometric 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 test 1:
P1108	Barometric pressure sensor circuit, short circuit to supply or open circuit	Disconnect barometric pressure sensor and proceed to pinpoint test 4:

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin A27 - ECM pin B20 - ECM pin B01	OK	Disconnect barometric pressure sensor and proceed to test 2
		Faulty	Rectify fault, proceed to test 6
2	Check cable for short circuit: - ECM pin A27 to earth - ECM pin A27 to ECM B20	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 6
3	Check cable for continuity: - ECM pin B01 to sensor pin 3	OK	Renew barometric pressure sensor and proceed to test 6
		Open circuit	Locate and rectify wiring fault, proceed to test 6
4	Check cable for short circuit: - ECM pin A27 to ECM pin B01	OK	Proceed to test 5
		Short circuit	Locate and rectify wiring fault, proceed to test 6
5	Check cable continuity: - ECM pin A27 to sensor pin 1 - ECM pin B20 to sensor pin 2	OK	Renew ambient pressure sensor, proceed to test 6
		Open circuit	Locate and rectify wiring fault, proceed to test 6
6	Reconnect harness, clear fault code and run engine	OK	Action complete, quit test
		Fault still present	Contact Triumph service

Circuit Diagram



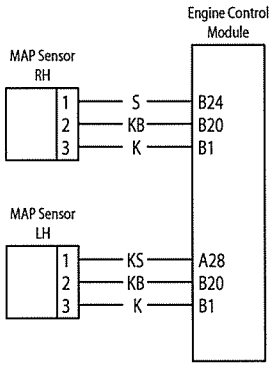
Manifold Absolute Pressure (MAP) Sensor

Fault Code	Possible cause	Action
P0107 (left) P1687 (right)	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 (left) P1688 (right)	MAP sensor circuit, short circuit to supply or open circuit	Disconnect ECM and MAP sensor and proceed to test 4:
P1105 (left) P1106 (right)	MAP sensor pipe fault	Check connection/condition of pipes from MAP sensors to throttle body

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin A28 - ECM pin B24 - ECM pin B20 - ECM pin B01	OK	Disconnect MAP sensors and proceed to test 2
		Faulty	Rectify fault, proceed to test 6
2	Check cable for short circuit: - ECM pin A28 to earth - ECM pin B24 to earth - ECM pin A28 to ECM pin B20 - ECM pin B24 to ECM pin B20	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 6
3	Check cable for continuity: - ECM pin B01 to relevant MAP sensor pin 3	OK	Renew relevant MAP pressure sensor, proceed to test 6
		Open circuit	Locate and rectify wiring fault, proceed to test 6
4	Check cable for short circuit: - ECM pin A28 to ECM pin B01 - ECM pin B24 to ECM pin B01	OK	Proceed to test 5
		Short circuit	Locate and rectify wiring fault, proceed to test 6
5	check cable continuity: - ECM pin A28 to left hand MAP sensor pin 1 - ECM pin B24 to right hand MAP sensor pin 1 - ECM pin B20 to relevant MAP sensor pin 2	OK	Renew relevant MAP pressure sensor, proceed to test 6
		Open circuit	Locate and rectify wiring fault, proceed to test 6
6	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 Reverse Connection

Fault Code	Possible cause	Action
P1111	MAP sensor pipes connected incorrectly; I.E. left hand sensor connected to right hand pipe and vice versa	Check MAP sensor pipes and swap left hand and right hand pipes around.

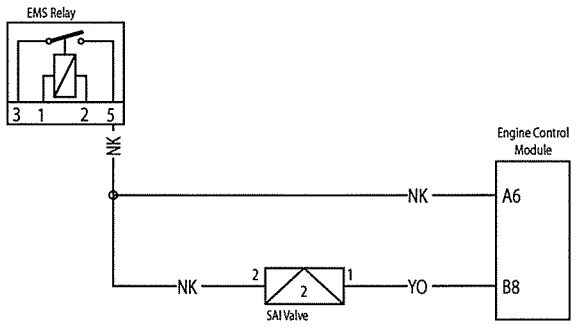
SAI Valve

Fault Code	Possible cause	Action
P0413	EMS Main Relay circuit fault	View & note diagnostic tool 'sensor' data. Ensure SAI valve connector is secure. Disconnect ECM and proceed to pinpoint test 1:
P0414	Short circuit to battery positive	Disconnect ECM and SAI valve and proceed to pinpoint test 5:

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin B08 - EMS relay pin 5	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 7
2	Check resistance value: - ECM pin A6 to ECM pin B8	18Ω to 22Ω	Proceed to test 3
		Open circuit	Disconnect SAI valve and proceed to test 4
		Short circuit	Disconnect SAI valve and proceed to test 5
3	Check cable for short circuit: - ECM pin B08 to ground	OK	Proceed to test 7
		Short circuit	Locate and rectify wiring fault, proceed to test 7
4	Check cable continuity: - EMS relay pin 5 to SAI valve pin 2 - ECM pin B08 to SAI valve pin 1	OK	Disconnect Main Relay and proceed to test 5
		Faulty	Rectify fault, proceed to test 7
5	Check cable for short circuit: - ECM pin A6 to ECM pin B8	OK	Proceed to test 6
		Short circuit	Locate and rectify wiring fault, proceed to test 7
6	Check SAI valve resistance: - Valve pin 1 to valve pin 2	18Ω to 22Ω	Proceed to test 7
		Open circuit	Renew SAI valve, proceed to test 7
7	Reconnect harness, clear fault code and run diagnostic tool function test to visually verify operation of SAI valve	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



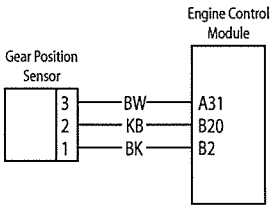
Gear Position Sensor

Fault Code	Possible cause	Action
P0705	Gear position 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 A31 - ECM pin B02 - ECM pin B20	OK	Disconnect sensor and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - ECM pin A31 to ground - ECM pin B02 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable continuity: - ECM pin B02 to sensor pin 1 - ECM pin B20 to sensor pin 2 - ECM pin A31 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 A31 to ECM pin B2 - ECM pin A31 to ECM pin B20 - ECM pin B02 to ECM pin B20	OK	Renew gear position sensor and contact pin 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



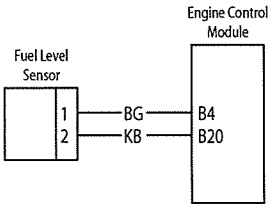
Fuel Level Sensor Circuit

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 test 1:

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin B04 - ECM pin B20	OK	Disconnect sensor and proceed to test 2
		Faulty	Rectify fault, proceed to test 6
2	Check cable for short circuit: - ECM pin B04 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable continuity: - ECM pin B04 to sensor pin 1 - ECM pin B20 to sensor pin 2	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable for short circuit: - ECM pin B04 to ECM pin B20	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



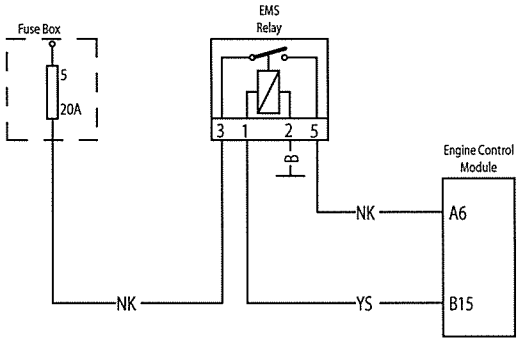
EMS Main Relay Circuit

Fault Code	Possible cause	Action
P1685	EMS Main Relay circuit fault	Note that the starter motor cannot be powered if a main relay fault exists. Ensure the EMS main relay connector is secure. Proceed to pinpoint test 1:

Pinpoint Tests

	Test	Result	Action
1	Ensure ignition has been switched off for greater than one minute. Identify EMS Main Relay on the harness. Check that relay operates when the ignition is switched ON.	OK	Proceed to test 2
		Faulty	Disconnect ECM and proceed to test 4
2	Check fuse box Fuse 5 integrity	OK	Disconnect ECM and proceed to test 4
		Faulty	Disconnect ECM and proceed to test 3
3	Check cable for short circuit: - ECM pin A06 to ground - EMS Main relay pin 3 to ground	OK	Replace Fuse 6 and proceed to test 4
		Short circuit	Locate and rectify wiring fault, replace Fuse 6 and proceed to test 7
4	Check cable and terminal integrity: - ECM pin A06 - ECM pin B15 - EMS Main Relay pin 1 - EMS Main Relay pin 2 - EMS Main Relay pin 3 - EMS Main Relay pin 5	OK	Disconnect Main Relay and proceed to test 5
		Faulty	Rectify fault, proceed to test 7
5	Check cable for short circuit: - ECM pin B15 to ground	OK	Disconnect instruments and proceed to test 6
		Short circuit	Locate and rectify wiring fault, proceed to test 7
6	Check cable continuity: - ECM pin A06 to EMS main relay pin 5 - ECM pin B15 to EMS relay pin 1 - EMS main relay pin 2 to earth - EMS main relay pin 3 to fuse box fuse 5	OK	Replace EMS Main Relay and proceed to test 7
		Open circuit	Locate and rectify wiring fault, proceed to test 7
7	Reconnect harness, clear fault code. Switch ignition off for longer than one minute. Switch ignition on and check that the EMS main relay operates. Start engine as final check	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



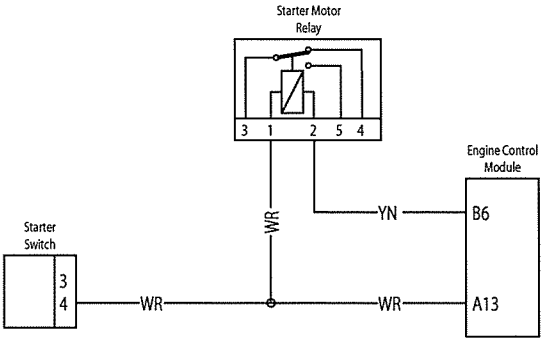
Starter Motor Relay

Fault Code	Possible cause	Action
P0616	Starter motor relay open circuit, or short circuit to earth	Ensure starter motor relay connector is secure. Disconnect ECM and proceed to pinpoint test 1:

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin B06 - R.H. switch cube pin 4	OK	Disconnect starter motor relay and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - ECM pin B06 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault and proceed to test 5
3	Check cable continuity: - ECM pin B6 to starter motor relay pin 2 - R.H. switch cube pin 4 to starter motor relay pin 1	OK	Renew starter motor relay, proceed to test 5
		Faulty	Locate and rectify wiring fault, proceed to test 5
4	With starter switch ON, check cable for short circuit: - ECM pin B06 to ECM pin A13	OK	Renew starter motor relay, 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



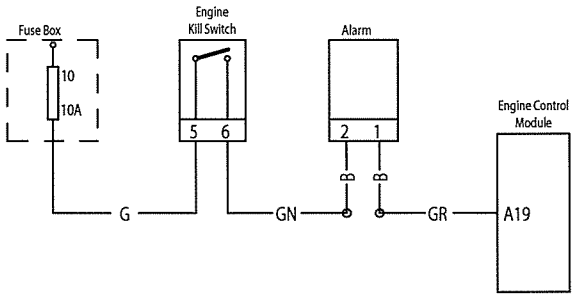
EMS Ignition Voltage Input Circuit

Fault Code	Possible cause	Action
P1659	EMS Ignition Voltage input circuit fault	Disconnect ECM and proceed to pinpoint test 1:

Pinpoint Tests

	Test	Result	Action
1	Check Fuse box Fuse 10 integrity	OK	Proceed to test 3
		Faulty	Proceed to test 2
2	Check cable for short circuit: - ECM pin A19 to ground	OK	Replace Fuse 2 and proceed to test 3
		Short circuit	Locate and rectify wiring fault, replace Fuse 2 and proceed to test 5
3	Check cable and terminal integrity: - ECM pin A19 - Alarm Connector pin 1 - Alarm Connector pin 2 - Right hand switch cube pin 5 - Right hand switch cube pin 6	OK	Proceed to test 4
		Faulty	Rectify fault, proceed to test 5
4	Check cable continuity: - ECM pin A19 to fuse box Fuse 10, note that the engine stop switch must be in the 'RUN' position and any alarm fitted must be disarmed	OK	Proceed to test 5
		Open circuit	Locate and rectify wiring, immobiliser or engine stop switch 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



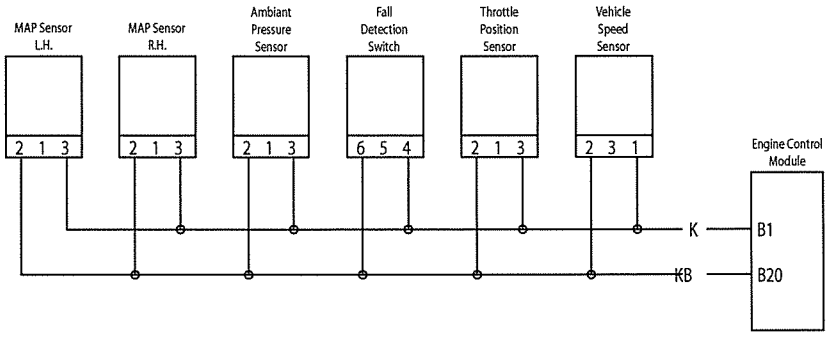
5 Volt Sensor Supply Circuit

Fault Code	Possible cause	Action
P1696/P1697/P1698	Sensor supply circuit shorted to ground Sensor supply circuit shorted to battery positive	View & note 'sensor' data. Note ECM sensors requiring a power supply will not be active. Disconnect ECM and proceed to pinpoint test 1:

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ECM pin B01 - ECM pin B20	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit - ECM pin B01 to ECM pin B20	OK	Proceed to test 4
		Faulty	Proceed to test 3
3	Disconnect the following sensors in turn: - MAP sensors (left hand and right hand) - Ambient pressure sensor - Throttle position sensor - Throttle position sensor - Vehicle speed sensor - Fall detection sensor and retest for short circuit - ECM pin B01 to ECM pin B20	OK	Replace sensor last removed and proceed to test 5
		Faulty	Proceed to test 4
4	Check cable for short circuit: - ECM pin B01 to ground - ECM pin B20 to ground - ECM pin B01 to A06 - ECM pin B20 to A06 - ECM pin B01 to battery positive - ECM pin B20 to battery positive	OK	Proceed to test 5
		Short circuit	Locate and rectify wiring fault, proceed to test 5
7	Reconnect harness, clear fault code and use diagnostic software to check for correct sensor outputs and 5 Volt sensor supply Voltage level	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



Tune Lock

Fault Code	Possible cause	Action
P1602	ECM is locked to prevent the motorcycle from being operated	This is also identified by a fast flashing MIL indication, and a disabled engine management system. Unlock the ECM using the diagnostic software and supplied unlock code from Triumph service.

ECM or Tune ID Incorrect

Fault Code	Possible cause	Action
P1614	ECM or Tune is incorrect, causing the ECM to be disabled to prevent the motorcycle from being operated	This is also identified by a fast flashing MIL indication, and a disabled engine management system.

Pinpoint Tests

	Test	Result	Action
1	Check ECM part number is correct for the motorcycle	OK	Proceed to test 2
		Incorrect	Replace ECM with correct part and proceed to test 3
2	Check that the tune is correct for the motorcycle, using the diagnostic software	OK	Proceed to test 3
		Incorrect	Update tune using diagnostic software, proceed to test 3
3	Clear fault code, check for normal operation	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Fault Finding - Non Electrical

Symptom	Possible cause(s)
Poor throttle response at low rpm	Low fuel pressure caused by filter blockage/leaks
	Low fuel pressure caused by loose fuel pipes to the fuel pump and filter
Cutting out at idle	Throttle bodies out of balance
	ISC (Idle Speed Control) actuator inoperative
	Low fuel pressure caused by loose fuel pipes to the fuel pump and filter
	Low fuel pressure
	Weak mixture caused by air leak at the throttle body/ transition piece to cylinder head face
Idle speed too low/high	ISC (Idle Speed Control) actuator sticking
	Incorrect closed throttle position setting
	Mechanical fault with the throttle linkage
Diagnostic software malfunctions during tune download procedure	Low battery Voltage
Throttle hang-up	Incorrect closed throttle position setting
Bike will start but cuts out immediately	Low fuel pressure caused by loose fuel pipes to the fuel pump and filter
	Low fuel pressure due to split fuel filter
	ISC motor stuck
Abnormally high fuel pressure	Fuel pressure regulator inoperative
Temperature gauge reads cooler than normal	Cooling system air–locked resulting in coolant temperature sensor operating in air instead of coolant Thermostat fault

Fuel Tank

Note:

- **The fuel tank may be raised without being removed completely, for access to the top of the engine, cooling system pressure cap and cooling system bleed screw etc.**

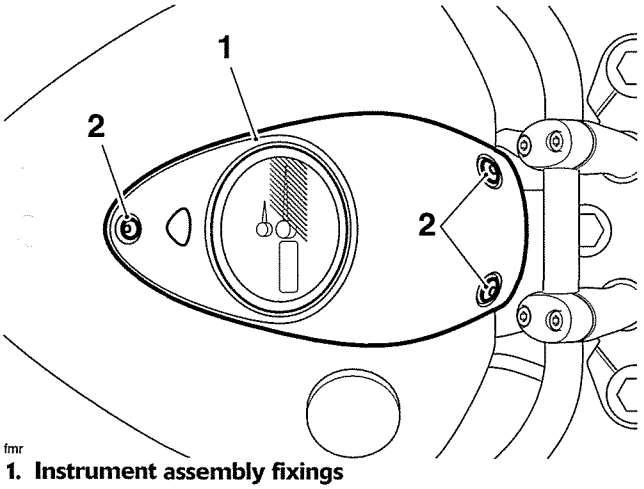
⚠ Warning

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.

Fuel Tank - Raising

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery negative (black) lead first.
3. Release the three fixings securing the instrument assembly to the fuel tank.



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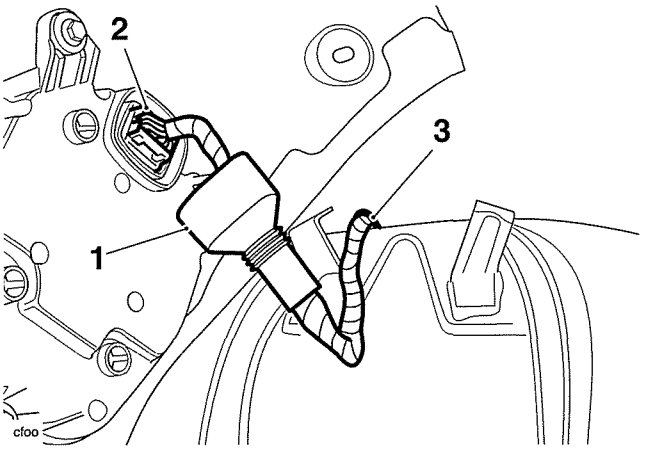
1. Instrument assembly fixings

4. Lift the instrument assembly to access its underside.
5. Slide the protective cover down the harness and disconnect the electrical connector. Place the instrument assembly to one side.



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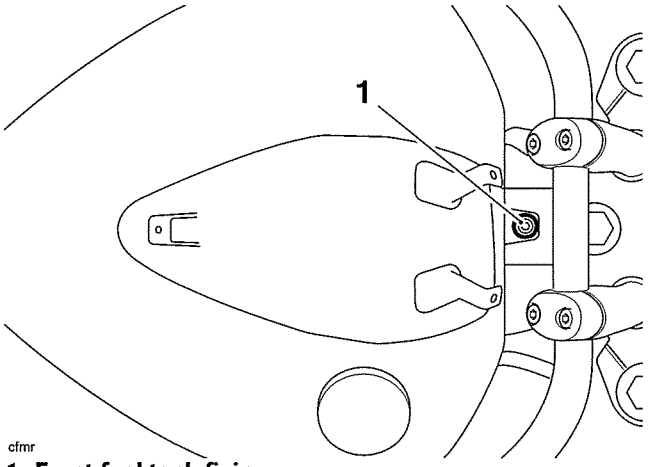
1. Protective cover
2. Electrical connector
3. Instrument harness clip

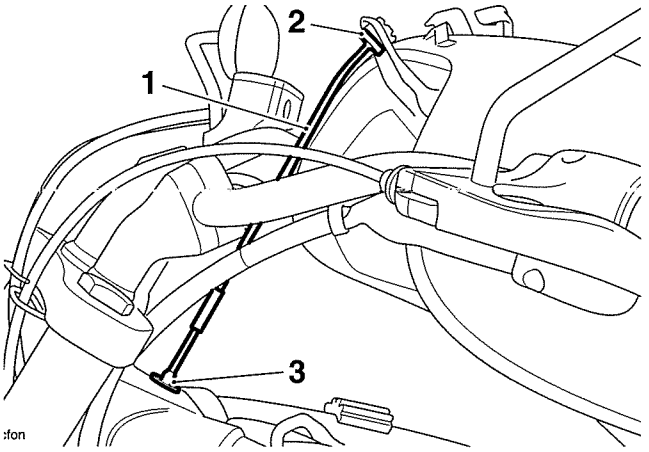
6. Detach the instrument harness from the clip at the front of the fuel tank.

7. Release the fixing from the front of the fuel tank.



1. Front fuel tank fixing

8. Pivot the fuel tank upwards at the front and support the fuel tank using service tool T3880806.
   Locate the narrow end of the prop in the fuel tank fixing hole and the wide end in the fixing bracket on the tank.



1. Service tool T3880806
2. Fuel tank front fixing
3. Frame fixing

Fuel Tank - Lowering and Securing

1. Support the tank and remove the tank support.
2. Lower the tank into position and secure with the forward fixing. Tighten the fixing to **8 Nm**.
3. Ensure the electrical connector gasket is in place and connect the electrical connector to the instrument assembly. Slide the protective cover over the connector.
4. Refit the instrument assembly and tighten the fixings to **7 Nm**.
5. Reconnect the battery, positive (identified with red tape) lead first.
6. Refit the rider's seat (see page *17-9*).

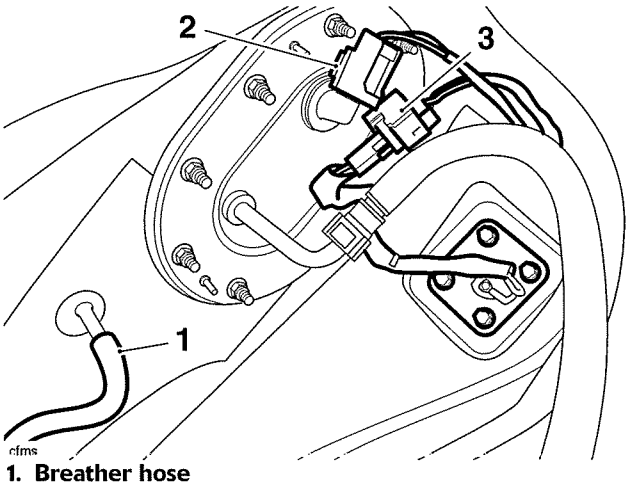
Fuel Tank – Removal

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery negative (black) lead first.
3. Raise and support the fuel tank (see page *10-85*).

Note:

- **Make a note of, or mark the position of the breather hose and the wiring harness on the underside side of the tank.**

4. Disconnect the breather hose and the electrical connectors to the fuel pump and the fuel level sensor.



1. Breather hose
2. Fuel pump electrical connector
3. Fuel level sensor electrical connector

5. Detach the breather hose and the harness from the clips beneath the fuel tank.

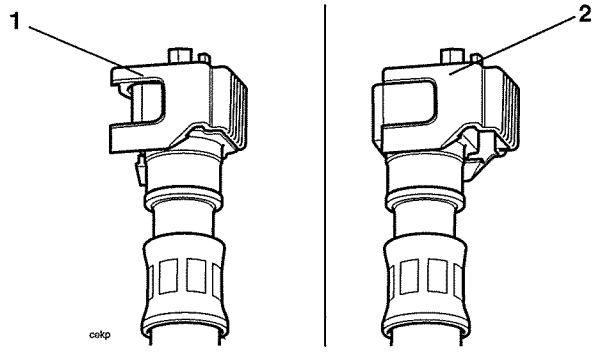
Warning

The fuel hose will contain fuel under pressure. When releasing the fuel hose, wear eye protection and protective clothing and ensure that the pressurised fuel is not exposed to naked flames, light bulbs, etc. A fire, causing personal injury and damage to property, may result from fuel exposure to naked flames, light bulbs and any other source of ignition.

Note:

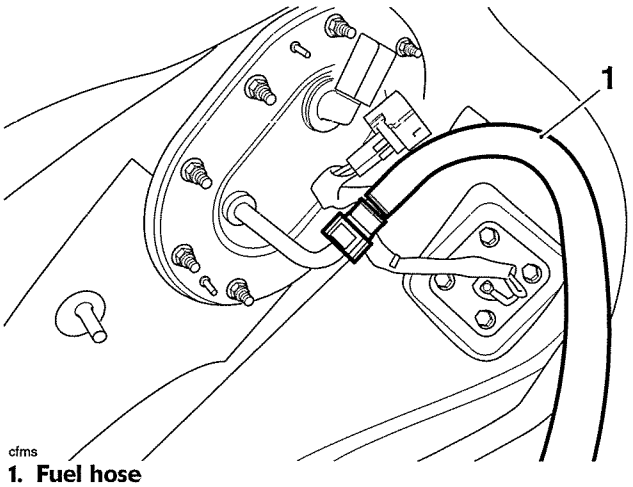
- **The fuel supply system is fitted with a check valve to prevent fuel flow from the tank when the hose is disconnected. It is not necessary to plug the connection.**

6. To release the double check clip, ease the latch away from the connector until the release buttons are exposed.



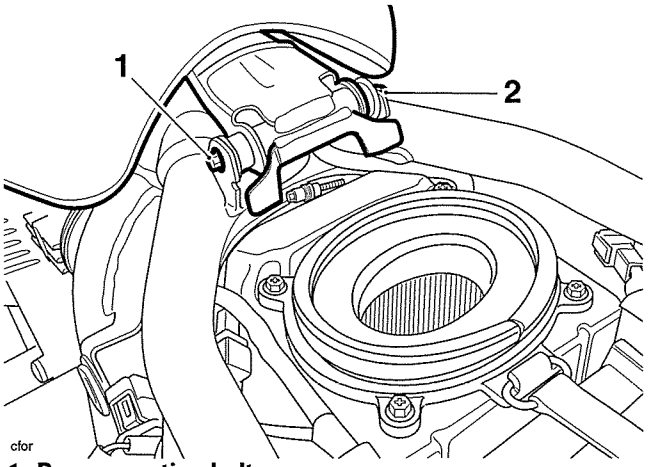
1. Locked Position
2. Unlocked Position

7. Disconnect the fuel hose by squeezing the sides of the connector and pulling the hose free from its spigot on the fuel pump plate. Collect any fuel remaining in the hose in a suitable container.



1. Fuel hose

8. Support the fuel tank while removing the rear mounting bolt and nut.

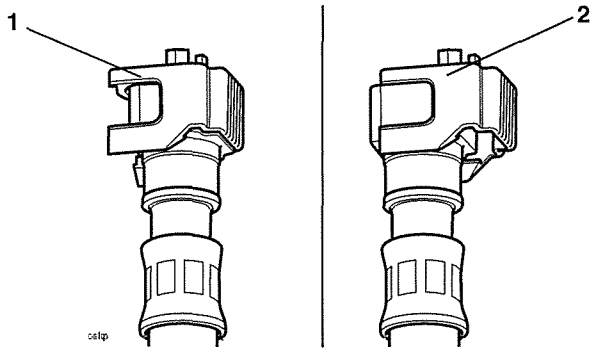


1. Rear mounting bolt
2. Nut

9. Raise the tank from the frame and have a assistant collect the fuel tank support T3880806.
10. Place the fuel tank in a safe place.

Fuel tank - installation

1. Position the fuel tank to the frame and install the rear mounting bolt.
2. Pivot the front of the tank upwards and refit the tank support T3880806 to the frame and tank (see page *10-85*).
3. Tighten the rear fuel tank mounting bolt to **9 Nm**.
4. Reconnect the fuel feed hose by gently pushing inwards until the hose engages with a click.
5. Slide the double check latch to the locked position until the release buttons are covered. If the latch will not slide into position, then the fuel hose is not fully home on its spigot and must therefore be refitted correctly.



1. Locked Position
2. Unlocked Position

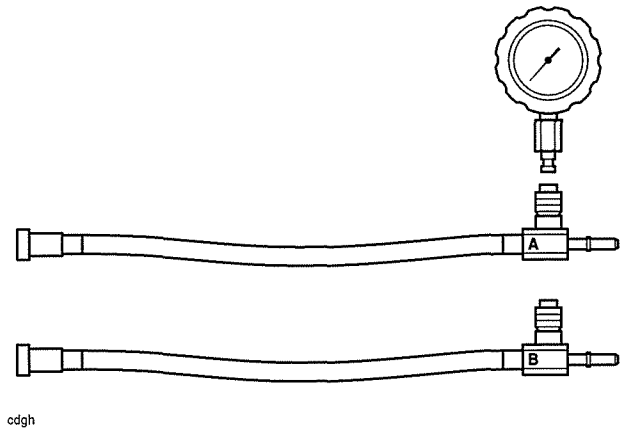
6. Attach and connect the breather pipe and harnesses to the fuel tank as noted/marked prior to removal.
7. Lower and secure the fuel tank (see page *10-86*).
8. Reconnect the battery, positive (identified with red tape) lead first.
9. Refit the rider's seat (see page *17-9*).

Fuel Pressure Checking

Warning

Observe the fuel handling precautions given in the General Information section.

Fuel pressure is checked using service tool T3880001.



Tool T3880001

1. Raise and support the fuel tank (see page *10-85*).

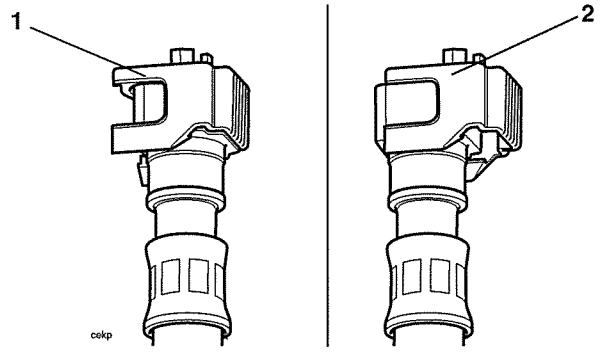
Warning

The fuel hose will contain fuel under pressure. When releasing the fuel hose, wear eye protection and protective clothing and ensure that the pressurised fuel is not exposed to naked flames, light bulbs, etc. A fire, causing personal injury and damage to property, may result from fuel exposure to naked flames, light bulbs and any other source of ignition.

Note:

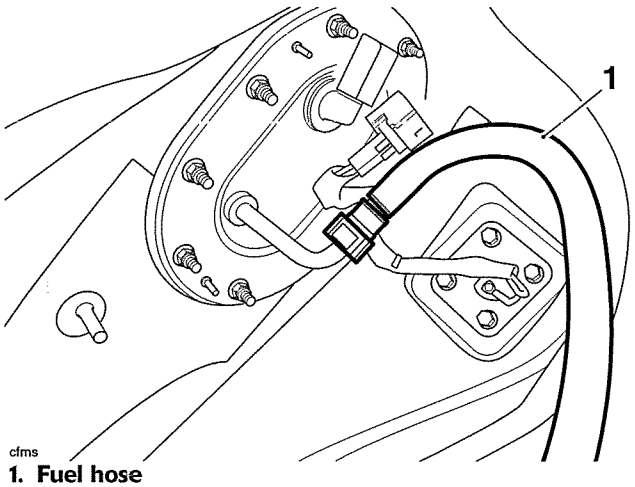
- **The fuel supply system is fitted with a check valve to prevent fuel flow from the tank when the hose is disconnected. It is not necessary to plug the connection.**

2. To release the double check clip, ease the latch away from the connector until the release buttons are exposed.



1. Locked Position
2. Unlocked Position

3. Disconnect the fuel hose by squeezing the sides of the connector and pulling the hose free from its spigot on the fuel pump plate. Collect any fuel remaining in the hose in a suitable container.



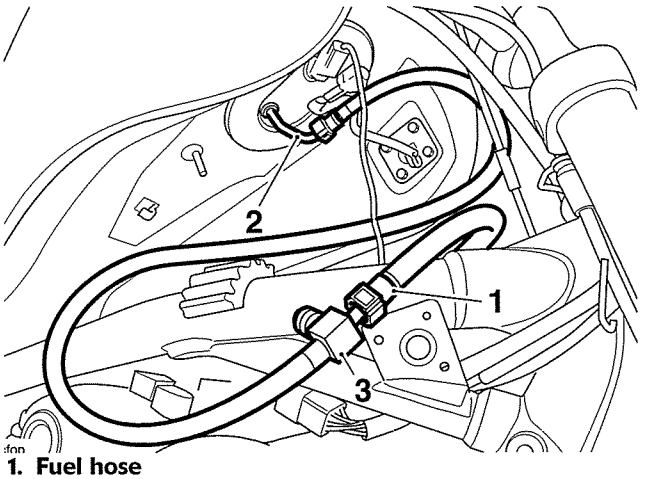
1. Fuel hose

4. Select the fuel pressure gauge adapter marked 'A' from service tool T3880001.

Warning

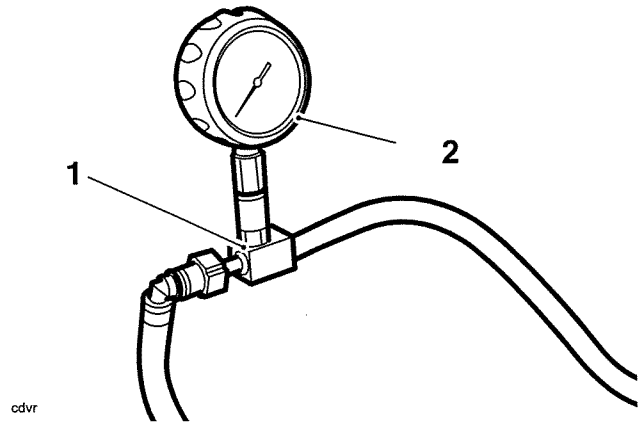
Always us the correct fuel pressure gauge adapter **(adapter 'A' for Thunderbird)**. Use of an incorrect adapter will result in a fuel leak. A fuel leak can result in a fire causing damage to property and injury to persons.

5. Connect the adapter hose to the fuel pump plate outlet and fuel hose as shown in the illustration below.



1. Fuel hose
2. Fuel pump plate outlet
3. Adaptor hose 'A'

6. Connect the fuel pressure gauge to the adaptor hose as shown below by pushing the gauge spigot in to the adapter until a click can be heard.



1. Adaptor hose
2. Fuel pressure gauge

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.**

7. Ensure the gauge is visible to the side of the motorcycle.

Note:

- **The engine can be run with the fuel tank in the raised position.**

8. Start the engine and observe the fuel pressure reading on the gauge.

Note:

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

9. When fuel pressure checking is complete, disconnect the fuel pressure gauge adapter, taking care to collect any fuel in the hose in a suitable container.
10. Reconnect the fuel hose and lower and secure the fuel tank (see page *10-86*).

Fuel Pump, Filter and Pressure Regulator Assembly

Removal

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery negative (black) lead first.
3. Remove the fuel tank (see page *10-86*).
4. Detach the fuel level sensor harness from its clip on the fuel pump plate.

Warning

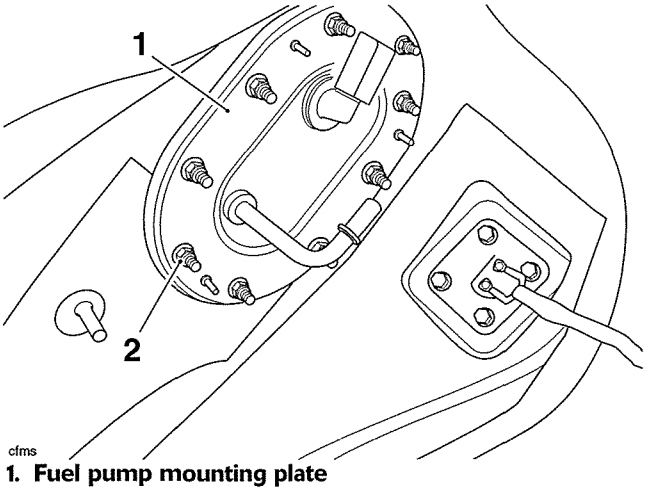
Observe the warning advice given in the General Information section on the safe handling of fuel and fuel containers.

A fire, causing personal injury and damage to property could result from spilled fuel or fuel not handled or stored correctly.

Warning

Never drain fuel from the tank using non-approved, non-professional standard fuel handling equipment. A fire causing destruction of property and injury to persons may result from use of non-approved fuel handling equipment.

5. Using proprietary professional automotive workshop equipment approved for fuel handling, drain all fuel from the fuel tank.
6. Invert the fuel tank and place on a protective surface to prevent paint damage.
7. Release the ring of nuts securing the fuel pump mounting plate to the tank.



cfms

1. Fuel pump mounting plate
2. Nut

8. Separate the pump/filter/regulator assembly from the fuel tank. Discard the pump plate seal.

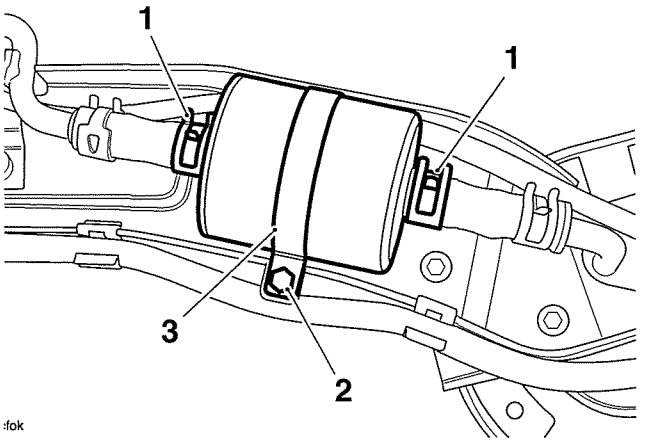
Installation

1. Position a new O-ring seal to the fuel tank opening.
2. Refit the fuel pump assembly to the tank. Fit and tighten the nuts to **5 Nm** working on diagonally opposite nuts to spread the clamping load evenly.
3. Refit the fuel level sensor harness to the clip on the fuel pump plate.
4. Refit the fuel tank (see page *10-98*).
5. Refill the fuel tank with the fuel drained during removal, and check carefully for fuel leaks.
6. Reconnect the battery, positive (identified with red tape) lead first.
7. Refit the rider's seat (see page *17-9*).

Fuel Filter

Removal

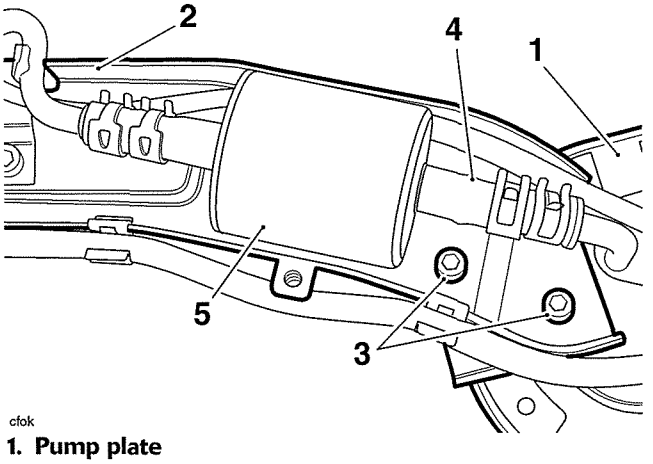
1. Remove the fuel pump, filter and pressure regulator assembly (see page *10-90*).
2. Release the two fuel hose clips from either side of the fuel filter.
3. Remove the fuel filter securing bolt and strap.



:fok

1. Clips
2. Bolt
3. Strap

4. Remove the two screws securing the pump plate to the fuel pump bracket.
5. Ease the two brackets apart, disconnecting the hose from the filter as you do so.



cfok

1. Pump plate
2. Fuel pump bracket
3. Screws
4. Hose
5. Fuel filter

Note:

- **Prior to removing the filter, note the direction of the arrow on the side of the filter. The arrow should point away from the fuel pump, towards the pressure regulator.**

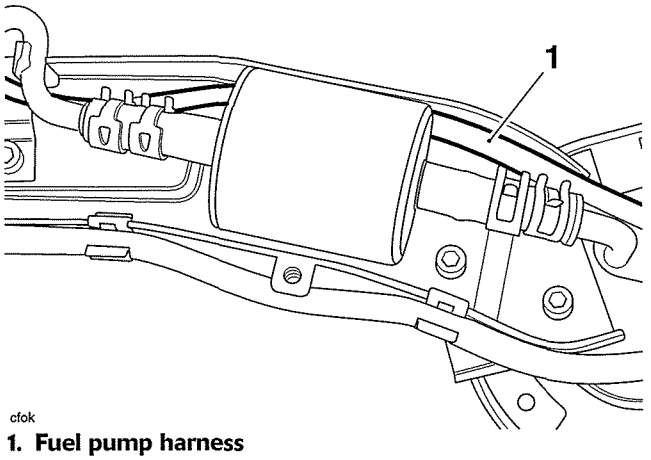
6. Remove the filter from the remaining hose.

Inspection

1. Inspect all hoses for cracks, splits, fraying and other damage. Replace as necessary.
2. Check all hose clips for cracks and signs of distortion. Replace as necessary.

Installation

1. Install the fuel filter to the fuel pump hose, ensuring the arrow on the filter points away from the pump.
2. Align the pump plate to the fuel pump bracket, engaging the fuel filter outlet in to the pressure regulator hose as you do so.
3. Secure the pump plate to the fuel pump bracket with new screws. Tighten to **10 Nm**.
4. Ensure the fuel pump harness is routed so that it will be retained under the fuel filter strap when it is installed. Ensure the harness will not be trapped by the filter or strap.



cfok

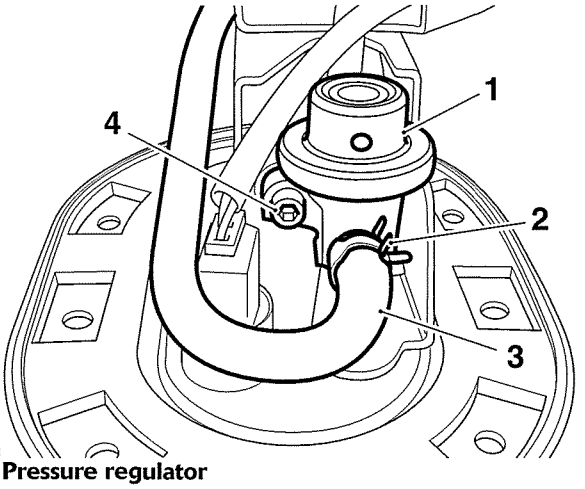
1. Fuel pump harness

5. Secure the fuel filter with the strap and fit the screw. Tighten to 3 **Nm**.
6. Refit the two hose clips.
7. Refit the fuel pump, filter and pressure regulator assembly (see page *10-98*).

Fuel Pressure Regulator

Removal

1. Remove the fuel pump, filter and pressure regulator assembly (see page *10-90*).
2. Release the hose clip and detach the hose from the fuel pressure regulator.
3. Release the screw securing the fuel pressure regulator to the fuel pump plate.



cfoq

1. Pressure regulator
2. Hose clip
3. Hose
4. Screw

4. Remove the fuel pressure regulator from the fuel pump plate. Discard the O-ring from the fuel pressure regulator spigot.

Inspection

1. Inspect all hoses for cracks, splits, fraying and other damage. Replace as necessary.
2. Check all hose clips for cracks and signs of distortion. Replace as necessary.

Installation

1. Install a new O-ring to the fuel pressure regulator spigot.
2. Position the fuel pressure regulator to the fuel pump plate.
3. Secure the fuel pressure regulator with the screw and tighten to **3 Nm**.
4. Refit the hose and secure with the hose clip.
5. Refit the fuel pump, filter and pressure regulator assembly (see page *10-98*).

Fuel pump

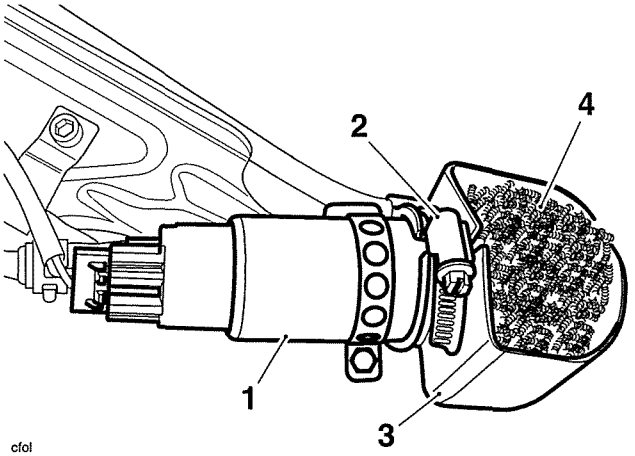
Removal

1. Remove the fuel filter (see page *10-91*).
2. Release the hose clip securing the baffle housing to the fuel pump.
3. Reposition the hose clip and carefully slide the baffle housing off the fuel pump body.

Note:

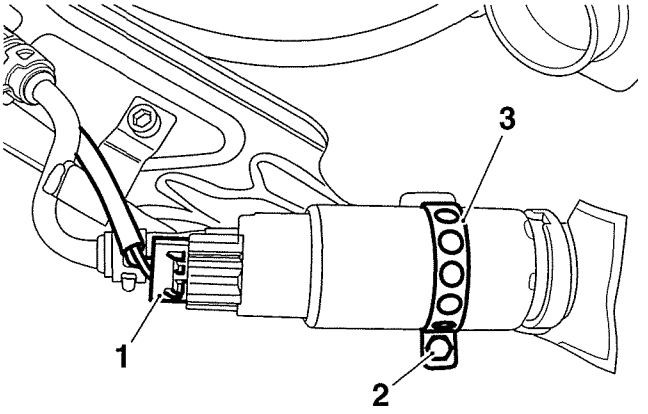
- **It is not necessary to disconnect the baffle housing hose from the fuel pressure regulator unless it is to be removed at the same time as the fuel pump.**

4. Carefully remove the baffle material from the fuel pump, easing it over the inlet filter.



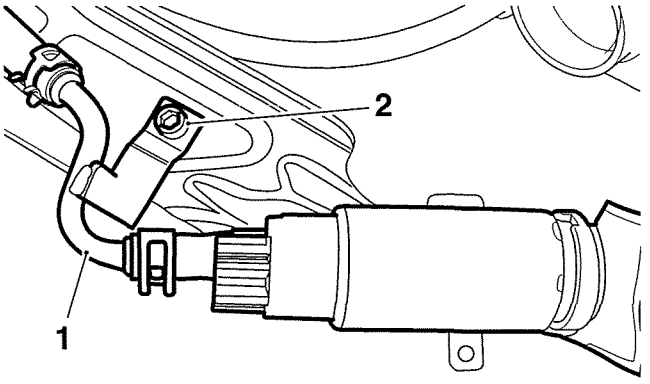
cfol
1. Fuel pump
2. Hose clip
3. Baffle housing
4. Baffle material

5. Remove the baffle housing hose clip over the inlet filter.
6. Disconnect the fuel pump electrical connector.
7. Remove the fuel pump securing bolt and strap.



cfom
1. Fuel pump electrical connector
2. Bolt
3. Strap

8. Remove the bolt securing the steel outlet pipe to the the fuel pump bracket. Discard the bolt.
9. Detach the fuel pump, connector hose and steel outlet pipe from the fuel pump bracket as an assembly.



cfom
1. Steel outlet pipe
2. Bolt
3. Hose clip

10. If necessary, release the hose clip and remove the connector hose and steel outlet pipe from the pump.

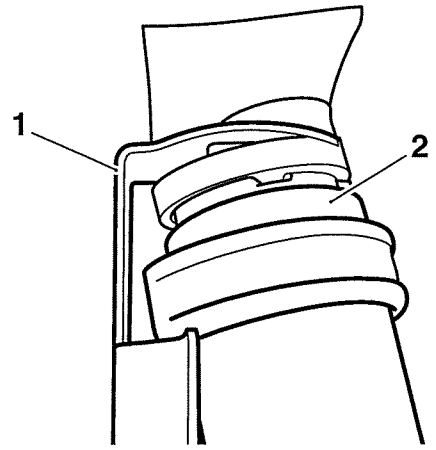
Inspection

1. Inspect all hoses for cracks, splits, fraying and other damage. Replace as necessary.
2. Check all hose clips for cracks and signs of distortion. Replace as necessary.

Assembly

1. If removed, refit the connector hose and steel outlet pipe to the fuel pump. Secure with the hose clip.

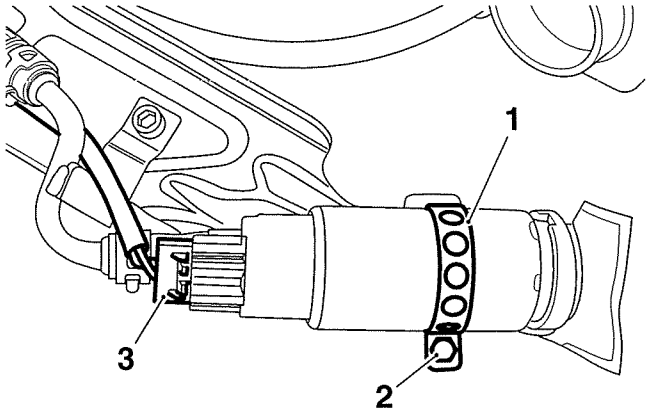
2. Position the fuel pump to the bracket, ensuring the feet of the rubber isolator engage correctly in the fork.



cevu

1. Fork
2. Isolator feet

3. Align the steel outlet pipe bracket to the fuel pump bracket and fit a new bolt. Tighten to **10 Nm**.
4. Refit the fuel pump strap and secure with a new bolt. Tighten to **3 Nm**.
5. Reconnect the fuel pump electrical connector.



cfom

1. Fuel pump clamp
2. Bolt
3. Electrical connector

6. Position the baffle housing hose clip loosely over the fuel pump body.
7. Carefully refit the baffle material over the inlet filter, ensuring the filter is completely covered.
8. Refit the baffle housing over the fuel pump, ensuring the cut out in the housing aligns with the fuel pump bracket. Refit the hose clip and tighten to **3 Nm**.
9. Refit the fuel filter, ensuring the fuel pump harness is routed under the fuel filter strap to retain it (see page *10-98*).

Fuel Level Sensor

Removal

Note:

- **The fuel level sensor is located at the front left hand edge on the underside of the fuel tank.**

1. Remove the fuel tank (see page *10-86*).

Warning

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

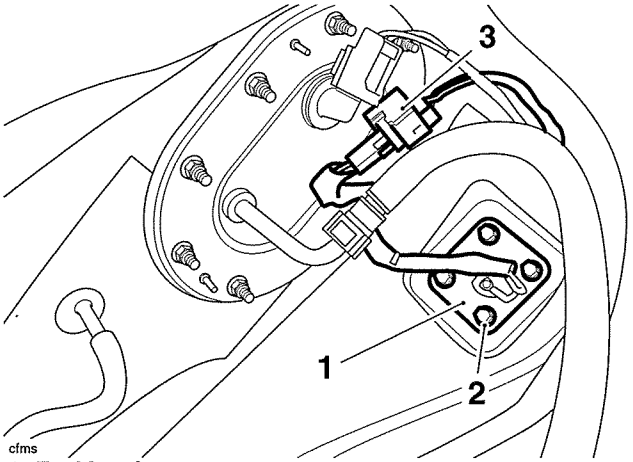
A fire, causing personal injury and damage to property could result from spilled fuel or fuel not handled or stored correctly.

Warning

Never drain fuel from the tank using non-approved, non-professional standard fuel handling equipment. A fire causing destruction of property and injury to persons may result from use of non-approved fuel handling equipment.

2. Using proprietary professional automotive workshop equipment approved for fuel handling, drain all fuel from the fuel tank.
3. Invert the fuel tank and place on a protective surface to prevent paint damage.
4. Disconnect the fuel level sensor electrical connector from the harness.
5. Detach the fuel level sensor harness from the fuel pump plate.

6. Release the bolts securing the fuel level sensor to the fuel tank.



1. Fuel level sensor
2. Bolts
3. Electrical connector

7. Carefully manoeuvre the fuel level sensor out of the fuel tank. Discard the seal.

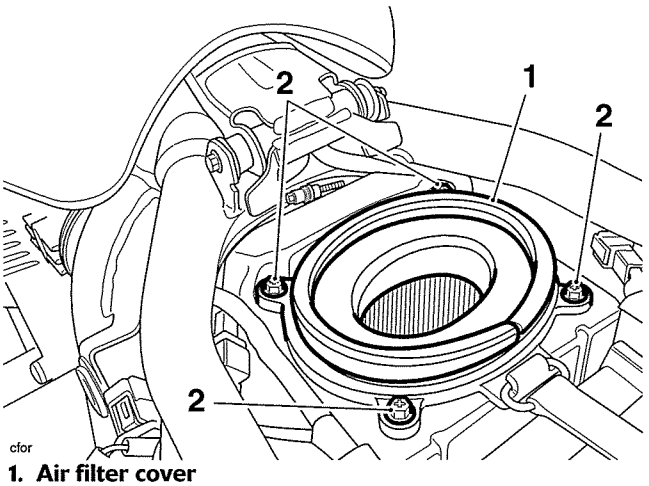
Installation

1. Position a new seal on to the fuel level sensor.
2. Carefully refit the fuel level sender to the fuel tank. Fit and tighten the bolts to **5 Nm**.
3. Reconnect the fuel level sensor electrical connector and secure to the fuel pump plate.
4. Refit the fuel tank (see page *10-86*).

Air Filter Element

Removal

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Release the four screws securing the air filter cover to the airbox.



1. Air filter cover
2. Screws

4. Raise the filter cover and remove the air filter element from the housing.
5. Inspect the cover seal for damage.

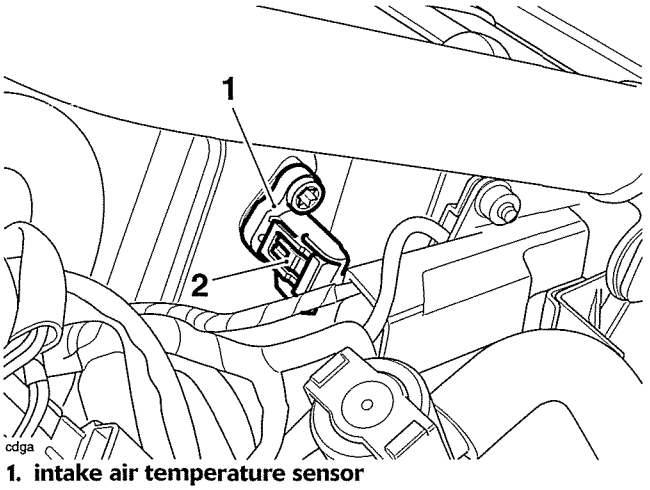
Assembly

1. Clean the air filter cover and interior of the airbox.
2. Locate the new filter element to the airbox.
3. Refit (or replace if necessary) the cover seal, fit the filter cover and tighten the screws to **3 Nm**.
4. Reconnect the battery, positive (identified with red tape) lead first.
5. Refit the rider's seat (see page *17-9*).

Airbox and Intake Duct

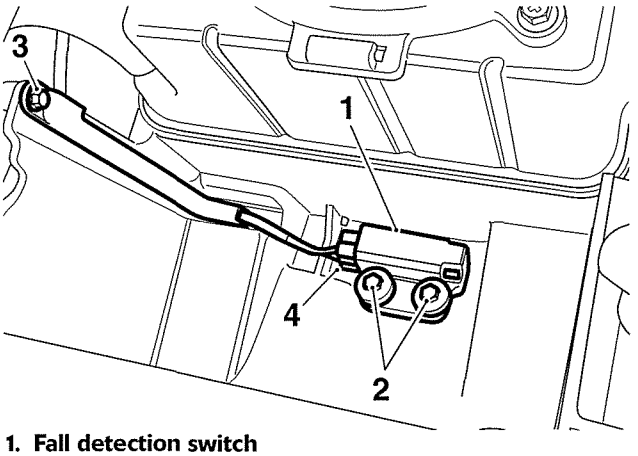
Removal

1. Remove the rider's seat (see page *17-8*).
2. Disconnect and remove the battery (see page *18-9*).
3. Remove the fuel tank (see page *10-86*).
4. Remove both side panels (see page *17-9*).
5. Remove the rear wheel (see page *16-8*).
6. Remove the rear mudguard (see page *17-10*).
7. Remove the air filter element (see page *10-95*).
8. Disconnect the engine breather hose from the airbox.
9. Before the disconnection of any wiring, note the routing of all wiring and wiring connectors on both sides of the airbox.
10. If fitted, disconnect the SAI hose and slide the SAI valve off its bracket.
11. Remove the ECM (see page *10-98*).
12. Disconnect the intake air temperature sensor connector.



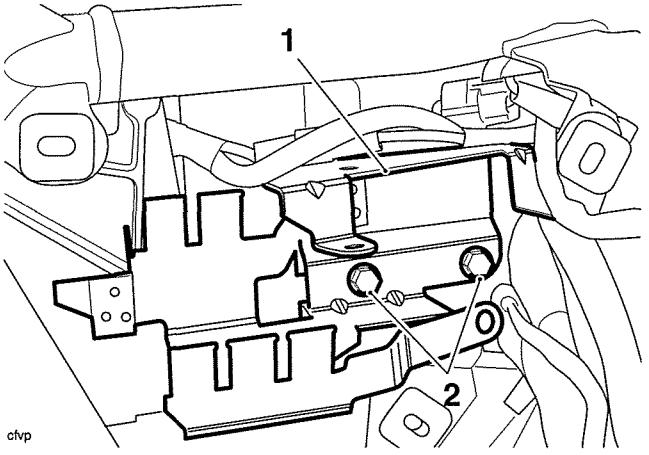
1. intake air temperature sensor
2. Connector

13. Remove the fir tree clip and remove the fall detection switch cable guide.
14. Disconnect the fall detection switch connector.



1. Fall detection switch
2. Cable guide
3. Fir-tree clip
4. Connector

15. Disconnect the barometric pressure sensor connector.
16. Release the fir-tree plugs securing the fuse box to the relay bracket.
17. Noting their position, detach the four relays from the relay bracket, remove the two fixings and remove the bracket.



1. Relay bracket
2. Fixings

18. Loosen the intake hose clamp.
19. Remove both rear suspension units (see page *14-3*) and lower the swinging arm clear of the airbox.
20. Remove the three airbox fixings - two at the rear and one on the right hand side.
21. Noting the harness and hose routings, remove the airbox to the rear of the motorcycle, unclipping the roll over valve from the right of the airbox as you do so.
22. To remove the intake duct, release the two clips securing the duct to the throttle bodies and remove the duct to the rear.

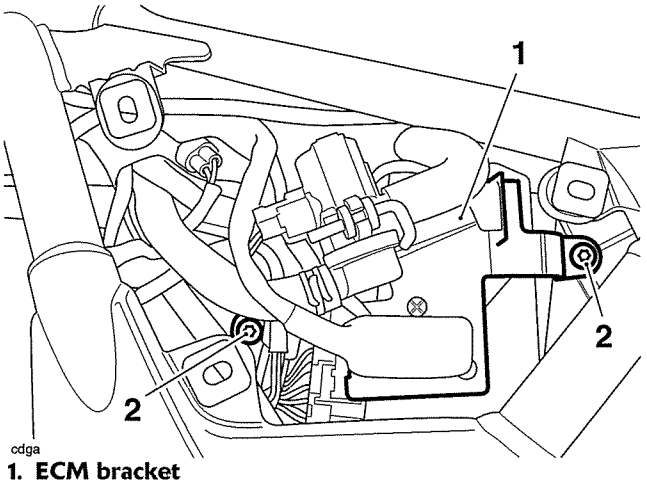
Installation

1. If removed, refit the intake duct. Tighten the hose clips to **1.5 Nm**.
2. Position the airbox to the air intake duct, ensuring the duct is correctly aligned to the airbox. Clip the roll over valve to the right hand side of the airbox.
3. Check that the harnesses and hoses are routed as noted on disassembly
4. Secure the airbox with the four fixings and tighten to **9 Nm**.
5. Tighten the intake duct clip to **1.5 Nm**.
6. Refit both rear suspension units (see page *14-4*).
7. Refit the relay bracket, ensuring the harness is not trapped, and secure with the two fixings. Tighten to **7 Nm**.
8. Refit the relays to the relay bracket, in the position noted during removal.
9. Reposition the fuse box to the relay bracket, and secure with new fir-tree clips.
10. Reconnect the barometric pressure sensor connector.
11. Reconnect the fall detection switch connector.
12. Ensuring the wiring is not trapped, refit the fall detection harness cover and secure with a new fir-tree clip.
13. Reconnect the intake air temperature sensor connector.
14. Refit the ECM (see page *10-97*).
15. If fitted, refit the SAI valve to its bracket and reconnect the SAI hose to the airbox.
16. Ensure the wiring to both sides of the airbox is routed as noted during removal.
17. Reconnect the engine breather hose to the airbox.
18. Refit the air filter element (see page *10-95*).
19. Refit the rear mudguard (see page *17-10*).
20. Refit the rear wheel (see page *16-8*).
21. Refit both side panels (see page *17-9*).
22. Refit the fuel tank (see page *10-98*).
23. Refit the battery (see page *18-9*).
24. Refit the rider's seat (see page *17-9*).

ECM

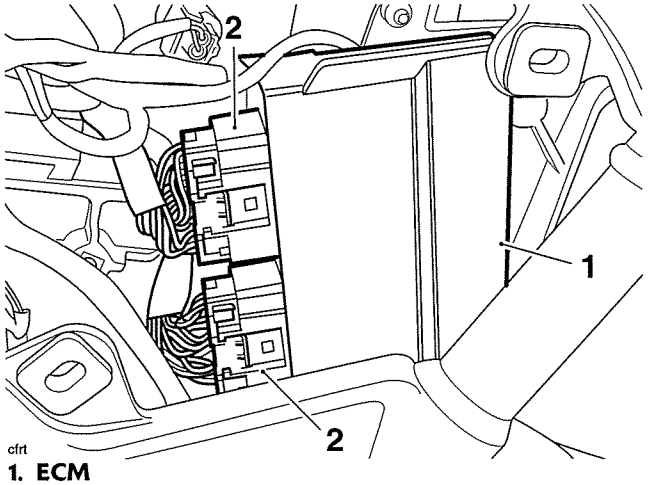
Removal

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Remove the left hand side panel (see page *17-9*).
4. If fitted, disconnect the secondary air injection (SAI) hose from the SAI valve.
5. Remove the two fixings and detach the ECM bracket.



1. ECM bracket
2. Fixings

6. Detach the ECM from the airbox and disconnect the two electrical connectors (see page *10-33*).



1. ECM
2. ECM connectors

7. Remove the ECM.

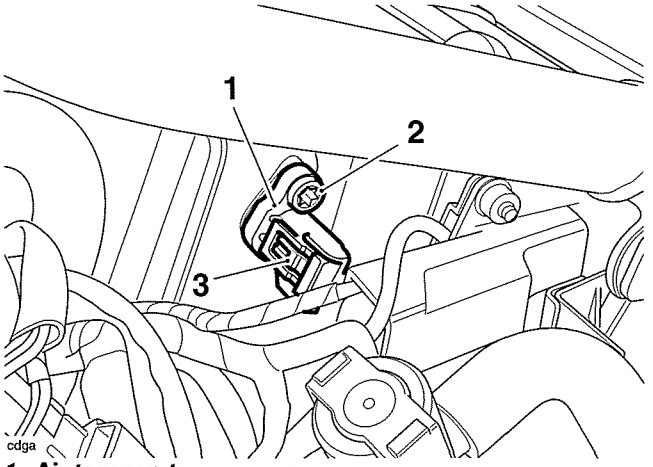
Installation

1. Reconnect the ECM connectors (see page *10-34*).
2. Position the ECM to the airbox.
3. Refit the ECM bracket, ensuring the harness is not trapped, and secure with the two fixings. Tighten to **7 Nm**.
4. If fitted, reconnect the SAI hose to the SAI valve.
5. Refit the left hand side panel (see page *17-9*).
6. Reconnect the battery, positive (identified with red tape) lead first.
7. Refit the rider's seat (see page *17-9*).

Intake Air Temperature Sensor

Removal

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Remove the left hand side panel (see page *17-9*).
4. Disconnect the electrical multi-plug from the sensor.



1. Air temperature sensor
2. Fixing
3. Multi-plug

5. Release the fixing and remove the sensor from the airbox.

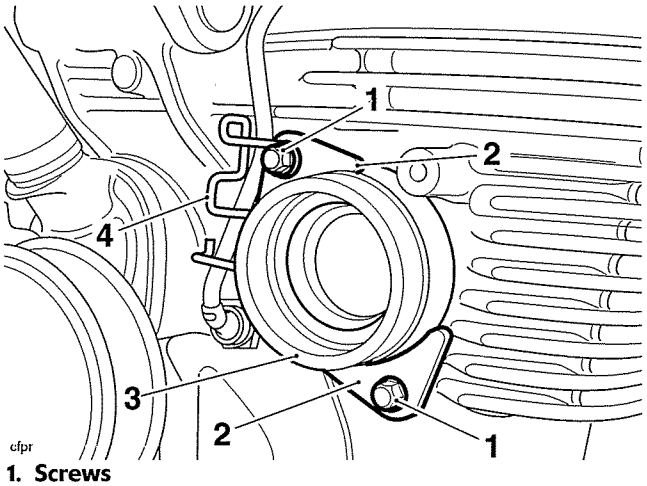
Installation

1. Fit the sensor the airbox and secure with the fixing. Tighten to **3 Nm**.
2. Reconnect the multi-plug.
3. Refit the left hand side panel (see page *17-9*).
4. Reconnect the battery, positive (identified with red tape) lead first.
5. Refit the rider's seat (see page *17-9*).

Coolant Temperature Sensor

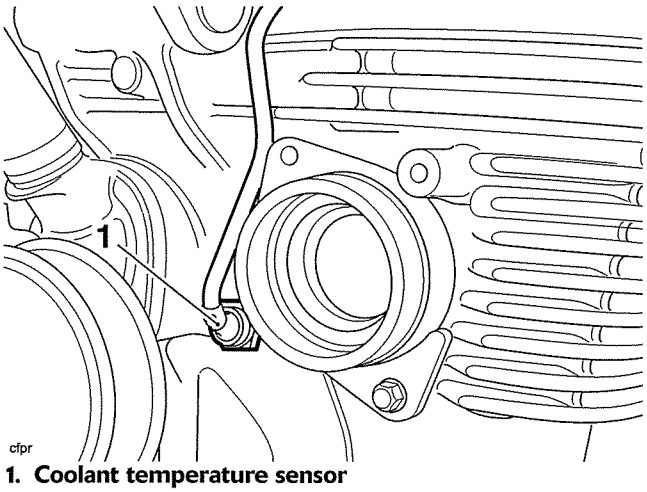
Removal

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Drain the cooling system (see page *11-6*).
4. Remove the throttle bodies (see page *10-103*).
5. Remove the inner screw and clamping plate securing the cylinder number to transition piece to the cylinder head. Recover the coolant temperature sensor cable guide from the fixing.



1. Screws
2. Clamping plates
3. Transition piece
4. Cable guide

6. Unscrew the coolant temperature sensor from the cylinder head.



1. Coolant temperature sensor

7. Noting its routing, trace the sensor wiring back to the connector. Disconnect the sensor and remove it from the motorcycle.

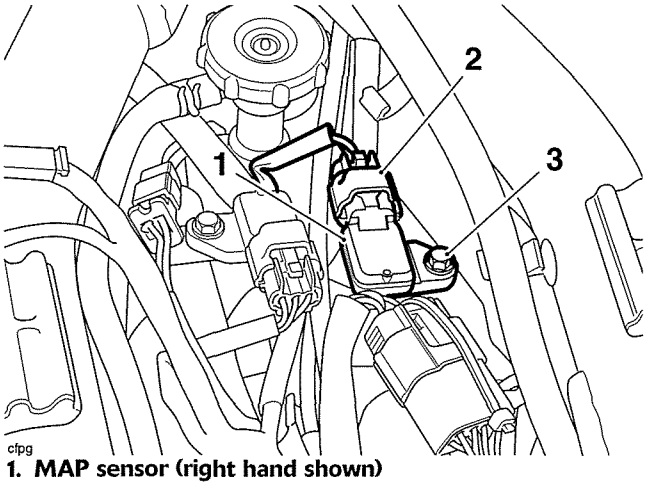
Installation

1. Refit the sensor in to the cylinder head. Tighten to **18 Nm**.
2. Route the wiring as noted prior to removal and reconnect the sensor.
3. Refit the clamping plate and cable guide, and secure with the screw. Tighten to **9 Nm**.
4. Refit the throttle bodies (see page *10-105*).
5. Refill the cooling system (see page *11-6*).
6. Reconnect the battery, positive (identified with red tape) lead first.
7. Refit the rider's seat (see page *17-9*).

Manifold Absolute Pressure (MAP) Sensor

Removal

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Raise and support the fuel tank (see page *10-85*).
4. Disconnect the electrical multi-plug from the sensor.



1. MAP sensor (right hand shown)
2. Multi-plug
3. Bolt

5. Unscrew the bolt securing the sensor to the intake duct.
6. Raise the sensor in order to disconnect the hose from below it.

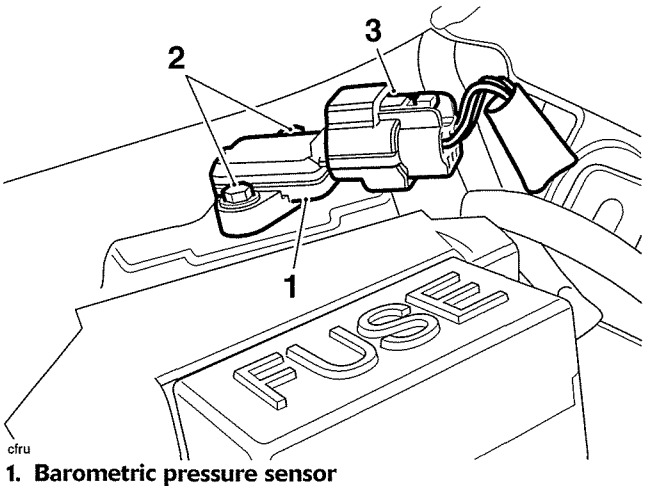
Installation

1. Fit the sensor to the intake duct, reconnect the hose and tighten the bolt to **7 Nm**.
2. Reconnect the multi-plug.
3. Lower and secure the fuel tank (see page *10-86*).
4. Reconnect the battery, positive (identified with red tape) lead first.
5. Refit the rider's seat (see page *17-9*).

Barometric Pressure Sensor

Removal

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Remove the right hand side cover (see page *17-9*).
4. Disconnect the electrical multi-plug from the sensor.



1. Barometric pressure sensor
2. Screws
3. Multi-plug

5. Release the two screws securing the sensor to the airbox.
6. Raise the sensor to remove it from the airbox and collect the O-ring.

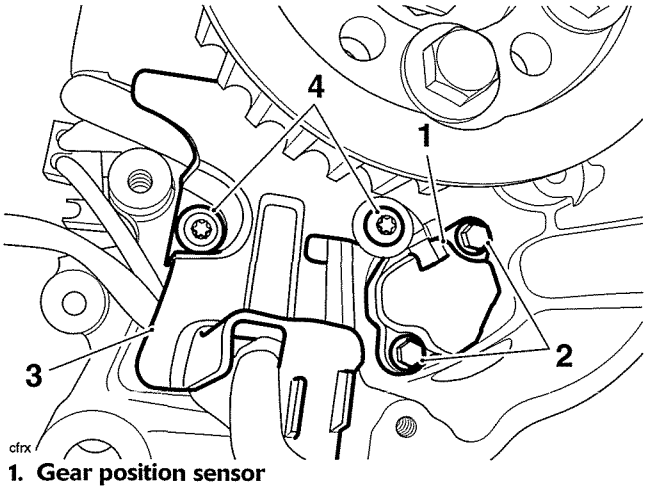
Installation

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 two screws to **3 Nm**.
2. Reconnect the multi-plug.
3. Refit the right hand side cover (see page *17-9*).
4. Reconnect the battery, positive (identified with red tape) lead first.
5. Refit the rider's seat (see page *17-9*).

Gear Position Sensor

Removal

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Remove the left hand side panel (see page *17-9*).
4. Remove the swinging arm (see page *14-4*).
5. Remove the three nuts and remove the coolant expansion tank bracket.
6. Remove the fixings and remove the hose guide.
7. Release the two screws securing the sensor to the lower crankcase, below the output shaft.



1. Gear position sensor
2. Gear position sensor fixings
3. Hose guide
4. Hose guide fixings

8. Ease the sensor out of the crankcase. Discard the sensor O-ring.
9. Noting its routing, trace the sensor wiring back to the connector. Disconnect the sensor and remove it from the motorcycle.

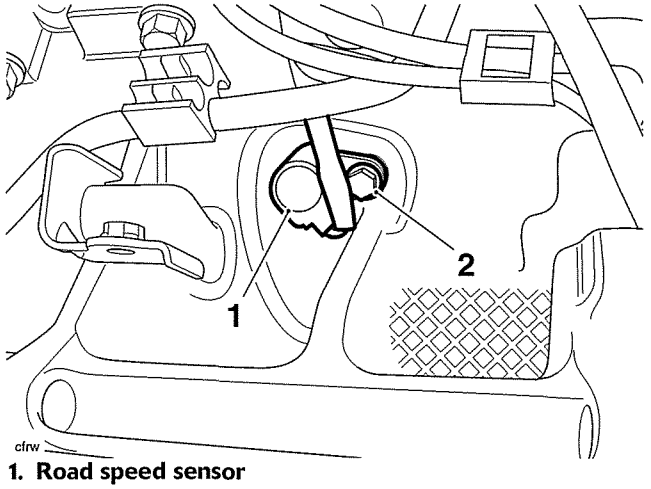
Installation

1. Fit a new O-ring to the sensor. Lubricate the O-ring with a smear of petroleum jelly.
2. Position the sensor to the engine and secure with the two screws. Tighten to **5 Nm.**
3. Re-route the harness as noted during disassembly, and reconnect the sensor electrical connector to the harness.
4. Refit the hose guide. Tighten the fixings to **8 Nm**.
5. Refit the coolant expansion tank bracket and secure with new nuts. Tighten to **3 Nm**.
6. Refit the swinging arm (see page *14-6*).
7. Refit the left hand side panel (see page *17-9*).
8. Reconnect the battery, positive (identified with red tape) lead first.
9. Refit the rider's seat (see page *17-9*).

Road Speed Sensor

Removal

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Remove the left hand side panel (see page *17-9*).
4. Remove the swinging arm (see page *14-4*).
5. Release the screw securing the sensor to the lower crankcase, at the rear of the engine.



1. Road speed sensor
2. Fixing

6. Ease the sensor out of the crankcase. Discard the sensor O-ring.
7. Noting its routing, trace the sensor wiring back to the connector. Disconnect the sensor and detach it from the motorcycle.

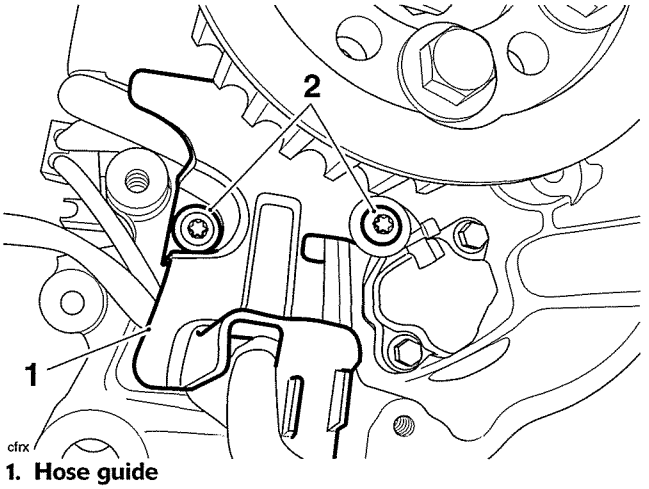
Installation

1. Fit a new O-ring to the sensor. Lubricate the O-ring with a smear of petroleum jelly.
2. Position the sensor to the engine and secure with the screw. Tighten to **9 Nm.**
3. Re-route the harness as noted during disassembly, and reconnect the sensor electrical connector to the harness.
4. Refit the swinging arm (see page *14-6*).
5. Refit the left hand side panel (see page *17-9*).
6. Reconnect the battery, positive (identified with red tape) lead first.
7. Refit the rider's seat (see page *17-9*).

Crankshaft Position Sensor

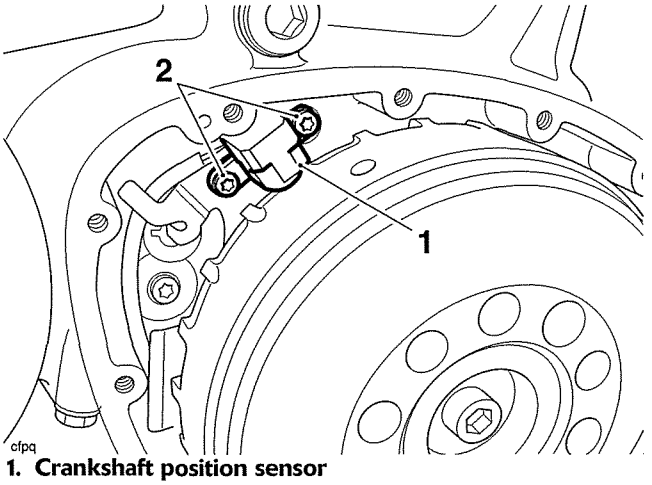
Removal

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Remove the left hand side panel (see page *17-9*).
4. Remove the swinging arm (see page *14-4*).
5. Remove the alternator cover (see page *18-16*).
6. Remove the three nuts and remove the coolant expansion tank bracket.
7. Remove the fixings and remove the hose guide.



1. Hose guide
2. Fixings

8. Remove and discard the fixings and detach the sensor from the crankcase.



1. Crankshaft position sensor
2. Fixings

9. Noting its routing, trace the sensor wiring back to the connector. Disconnect the sensor and detach it from the motorcycle.

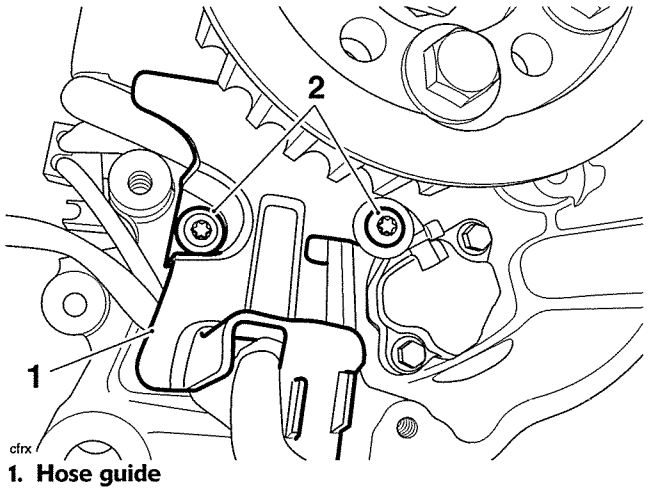
Installation

1. Position the sensor to the engine and route the wiring as noted prior to removal.

Note:

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

2. Retain the sensor with the two fixings. Tighten to **6 Nm.**
3. Refit the hose guide and secure with the fixings. Tighten to **8 Nm**.



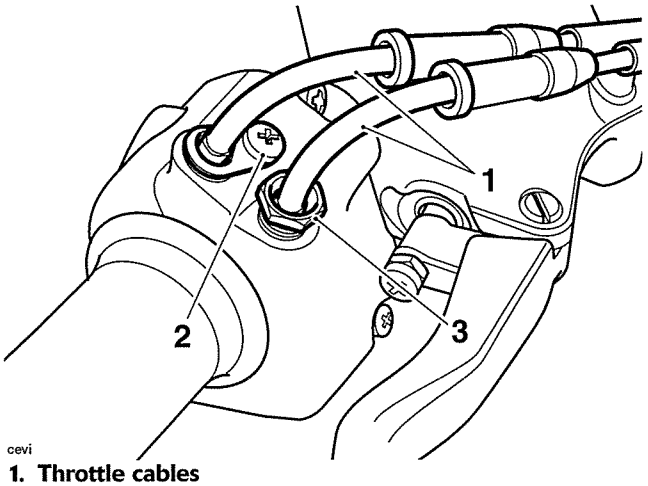
1. Hose guide
2. Fixings

4. Refit the coolant expansion tank bracket and secure with the three nuts. Tighten to **3 Nm**.
5. Re-route the harness as noted during disassembly, and reconnect the sensor to the main wiring harness.
6. Refit the alternator cover (see page *18-18*).
7. Refit the swinging arm (see page *14-6*).
8. Refit the left hand side panel (see page *17-9*).
9. Reconnect the battery, positive (identified with red tape) lead first.
10. Refit the rider's seat (see page *17-9*).

Throttle Body

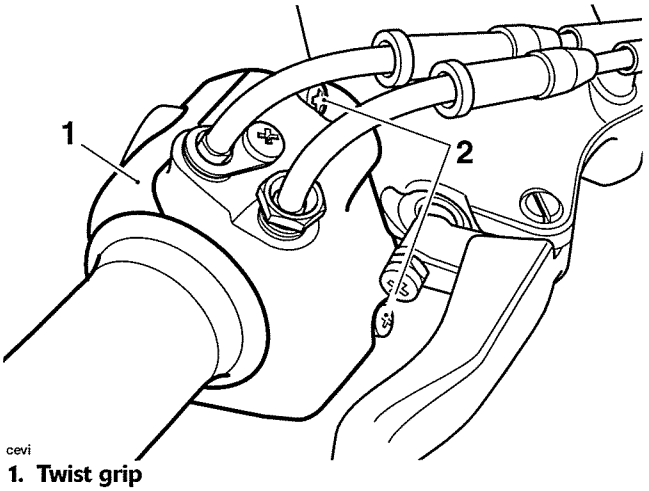
Removal

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Remove the fuel tank (see page *10-86*).
4. Remove the starter motor (see page *18-19*).
5. Remove the left hand side panel (see page *17-9*).
6. At the twist grip end, release the screw and union securing the throttle cables to the switch cube.



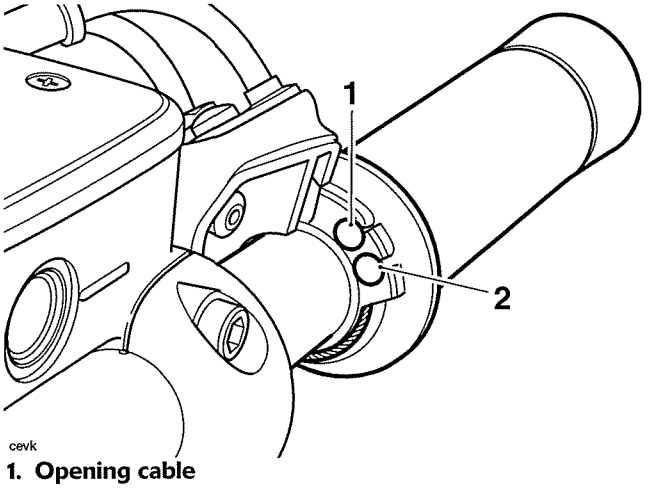
1. Throttle cables
2. Screw
3. Union

7. Remove the screws securing the right hand switch cube.



1. Twist grip
2. Screws

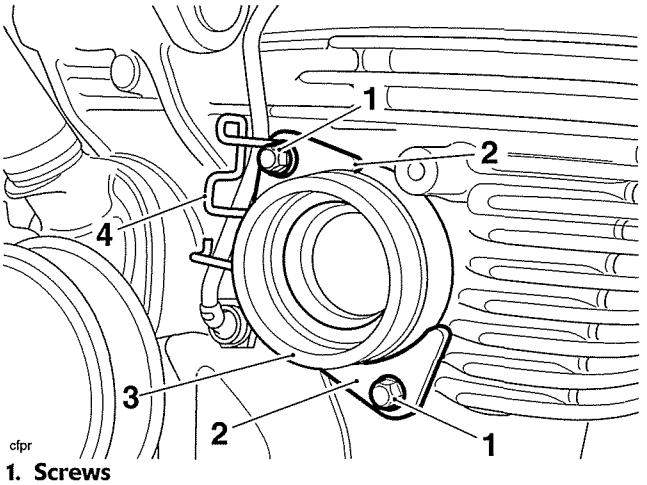
8. Detach the switch cube then release the inner cables from the twist grip.



cevk

1. Opening cable
2. Closing cable

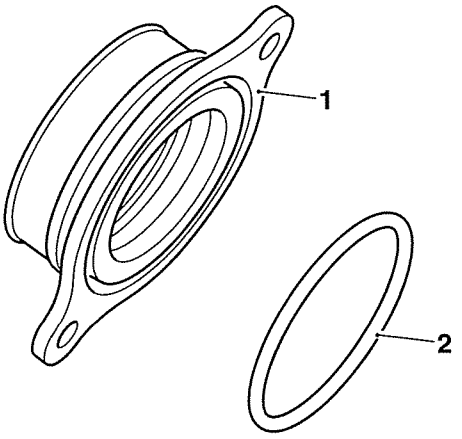
9. Detach the throttle cables from the throttle cable guide and harness under the fuel tank.
10. Noting their orientation, disconnect the MAP hoses from the throttle body.
11. Noting their orientation, disconnect the evaporative return hoses from the throttle body (if fitted).
12. Disconnect the throttle position switch (TPS) connector, located behind the left hand side panel.
13. Remove the two throttle to cylinder head fixings.
14. Loosen the four throttle body hose clips.
15. Carefully move the throttle body to the rear of the motorcycle and release from the transition pieces on the cylinder head.
16. Rotate the throttle body downwards to release it from the intake duct.
17. Withdraw the throttle body to the right of the motorcycle, disconnecting the idle speed control (ISC) stepper motor connector as you do so.
18. Remove the throttle body from the motorcycle, complete with the throttle cables, noting the routing of the throttle cables, fuel hose and TPS harness.
19. Remove the screws and clamping plates securing each transition piece to the cylinder head. Recover the coolant temperature sensor cable guide from the inner, longer, fixing of cylinder number two.



cfpr

1. Screws
2. Clamping plates
3. Transition piece
4. Cable guide

20. Remove the transition pieces and discard the O-ring seals.



1. Transition piece
2. O-ring

21. Cover the inlet ports to prevent the ingress of dirt and other objects.

Installation

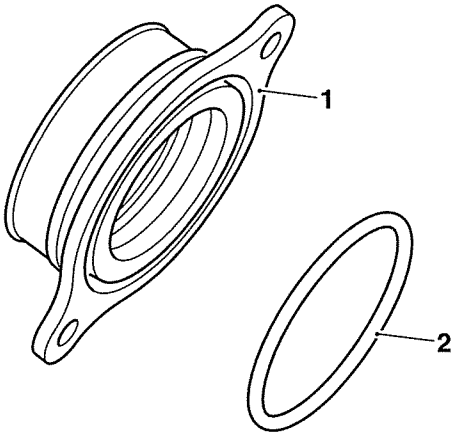
1. If removed, refit the throttle cables to the throttle body. Ensure the opening cable (identified with an adjuster midway down its length) and closing cable are located to the correct cams then fit the cable locknuts. Tighten to **2 Nm**.

Warning

Ensure that all the locknuts of both cables are correctly seated and tightened as a sticking throttle could result from a loose locknut.

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

2. If the throttle position switch has been removed, carry out the adjustment procedure before installing the throttle body (see page *10-101*).
3. Remove the covers from the inlet ports and ensure that the mating faces are clean.
4. Locate new O-ring seals to the transition pieces.



1. Transition piece
2. O-ring

5. Position each transition piece to the cylinder head, together with the cable guide for the coolant temperature sensor on the inner, longer, fixing of cylinder number two. Secure with the screws and clamping plates and tighten to **9 Nm**.
6. Ensure the throttle body clips are in position on the transition pieces and intake duct, with the screw heads positioned so that they are under the throttle body and will face outwards when tightened.
7. Reconnect the ISC stepper motor connector and position the throttle body assembly to the motorcycle, feeding the throttle cables, fuel hose and TPS harness through the frame.

Caution

Ensure the throttle body is positively located to the intake duct and is retained by the clip through its full circumference. Rectify if necessary as poor engine performance and engine damage may result from poor throttle body to intake duct sealing.

8. Push the throttle body into the intake duct and then the transition pieces. Ensure that each throttle body is fully seated, and seals each throttle through 360°.
9. Tighten the four throttle body clips, with the screw heads all facing outwards, to **1.5 Nm**.
10. Refit the two throttle to cylinder head fixings. Tighten to **12 Nm**.
11. If fitted, reconnect the evaporative return hoses to each throttle body.

Note:

- **The MAP sensor hoses must not be swapped between cylinders. If either of the hoses are swapped over, engine malfunctions will occur.**
- **The right hand MAP (Cylinder 2) sensor hose is marked with a red tape.**

12. Refit the MAP sensor hoses to each throttle, ensuring the right hand MAP sensor hose is connected to the right hand throttle.
13. Connect the multi-plugs to:
    - the throttle position sensor;
    - each injector, repositioning the boot over each connector.
14. Locate the throttles cables to the frame, following the routing noted during removal. Ensure the cables are secured in the throttle cable and harness guide.
15. Feed the outer throttle cables through the openings in the switch cube.
16. Engage the nipples of the inner cables to the twist grip.
17. Assemble the switch cube, tightening the two screws to **3 Nm**.
18. Attach the cable retainer screw and union to the switch cube, tightening both to **3 Nm**.

Warning

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

Warning

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

19. Refit the starter motor (see page *18-20*).
20. Refit the fuel tank (see page *10-86*).
21. Refit the left hand side panel (see page *17-9*).
22. Reconnect the battery, positive (identified with red tape) lead first.
23. Refit the rider's seat (see page *17-9*).

Throttle Cables

Warning

The throttle grip controls the throttle valves in the throttle bodies. If the throttle cables are incorrectly adjusted, either too tight or too loose, the throttle may be difficult to control and performance will be adversely affected.

Check the throttle grip free play in accordance with the scheduled maintenance requirements and make adjustments as necessary.

Always be alert for changes in the 'feel' of the throttle and have the throttle system checked by an authorised Triumph dealer if any changes are detected. Changes can be due to wear in the mechanism, which could lead to a sticking throttle.

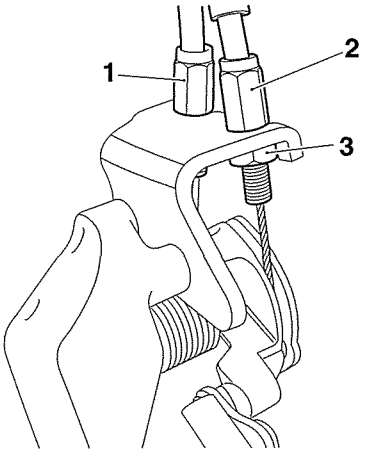
An incorrectly adjusted, sticking or stuck throttle will lead to loss of motorcycle control and an accident.

Removal

Note:

- **Prior to removal, clearly identify the opening and closing cables so that they may be refitted in the correct positions.**

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Remove the throttle bodies (see page *10-103*).
4. Slacken the adjuster locknuts at the throttle body such that they will allow the outer cables to be detached from the cable brackets.



cfhu

1. Opening cable adjuster
2. Closing cable adjuster
3. Locknuts

5. Detach the inner cables from the throttle cam to remove them from the throttle body.

Inspection

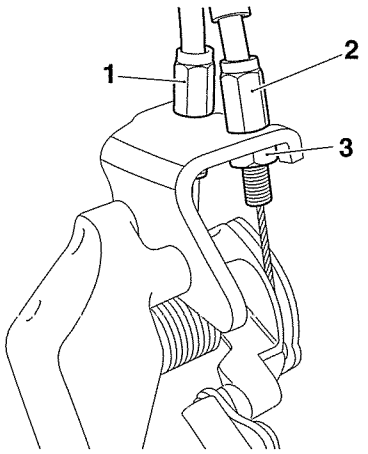
1. Check that the throttle cables operate smoothly, without sticking or binding. Replace the cable if there is any doubt as to its correct operation.

Installation

Note:

- **The opening and closing cables must be correctly identified and fitted to the correct positions as noted prior to removal.**

2. Attach the inner cables to the throttle cam and locate the outer cables to the cable bracket. Ensure the opening and closing cables are located to the correct cams then fit the cable locknuts and tighten to **2 Nm**.



cfhu

1. Opening cable
2. Closing cable
3. Locknuts (Closing cable locknut shown only)

Warning

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

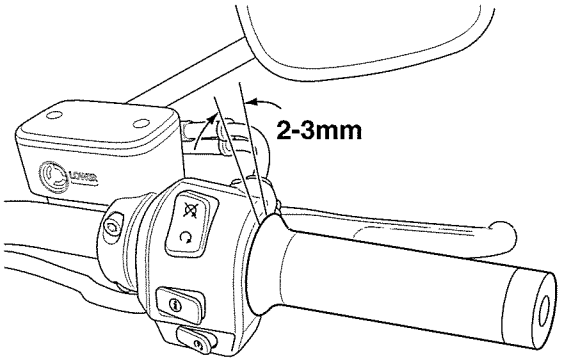
Warning

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

3. Refit the throttle bodies (see page *10-105*).
4. Reconnect the battery, positive (identified with red tape) lead first.
5. Refit the rider's seat (see page *17-9*).
6. Set the cable adjustment (see page *10-108*).

Throttle cable adjustment

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



cfcd

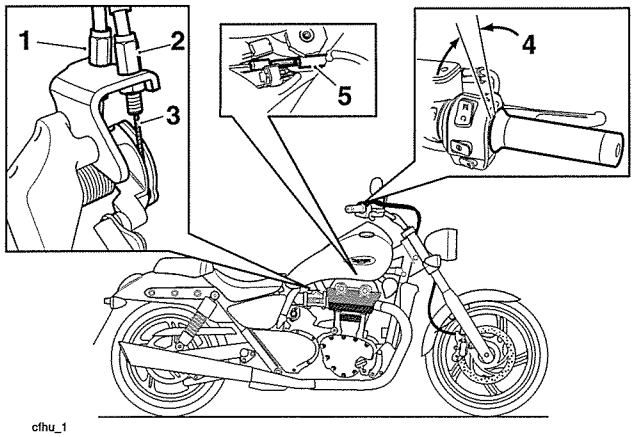
1. Throttle twist grip
2. 2 - 3 mm

2. If there is an incorrect amount of free play, adjustment may be made as follows:

Warning

Use of the motorcycle with incorrectly adjusted, incorrectly routed, sticking or damaged throttle cables will interfere with the throttle function resulting in loss of motorcycle control and an accident.

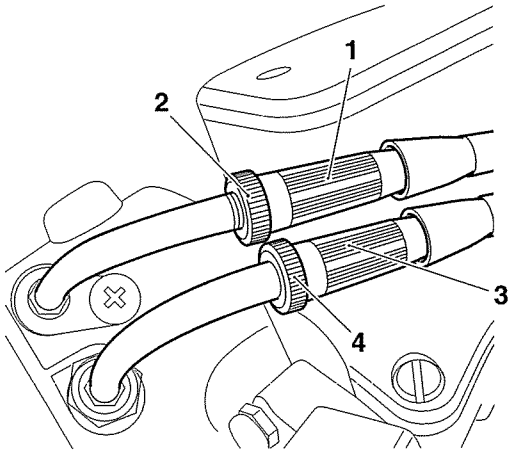
To avoid incorrect adjustment, incorrect routing, or continued use of a sticking or damaged throttle, always have your throttle checked and adjusted by your authorised Triumph dealer.



cfhu_1

1. Opening cable
2. Closing cable
3. Closing cable - free play measurement point
4. Opening cable - free play measurement point
5. Opening cable in-line adjuster

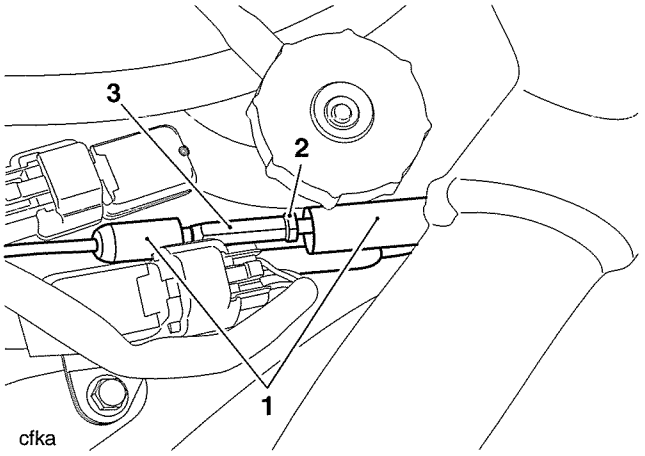
3. Rotate both cable adjusters such that there is an equal amount of adjustment in each direction.



cfde_1

1. Opening cable adjuster
2. Opening cable locknut
3. Closing cable adjuster
4. Closing cable Locknut

4. Rotate the in-line adjuster on the 'opening' cable to give 2 - 3 mm of play at the twist grip. Tighten the locknut.

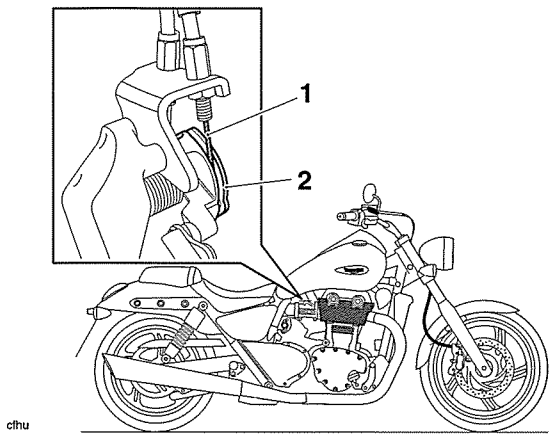


cfka

1. Covers
2. Locknut
3. Adjuster

5. Refit the adjuster covers.
6. Make any minor adjustments to the 'opening' cable as necessary to give 2 - 3 mm of play using the adjuster near the twist grip end of the cable. Tighten the locknut.

7. With the throttle fully closed, ensure that there is 2 - 3 mm of free play in the 'closing' cable at the throttle cam. If necessary, rotate the adjuster for the 'closing' cable near the twist grip end until 2 - 3 mm of play is present. Tighten the locknut.



1. Closing cable
2. Throttle cam

Warning

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

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

8. Check that the throttle opens smoothly, without undue force and that it closes without sticking. Rectify as necessary.

Warning

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

Warning

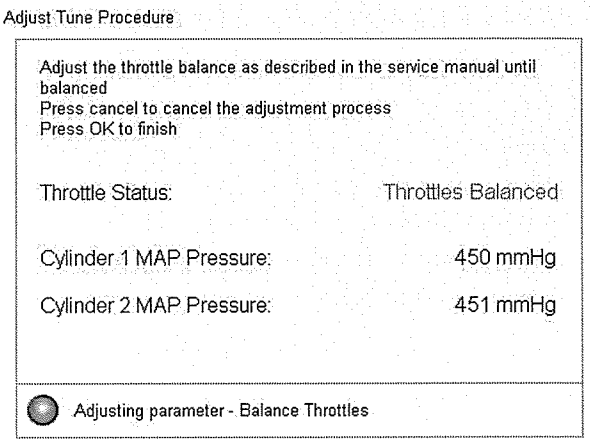
Move the handlebars to left and right full lock while checking that cables and harnesses do not bind. A cable or harness that binds will restrict the steering and may cause loss of control and an accident.

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 left hand side panel (see page *17-9*).
2. Connect the diagnostic tool, start the engine and navigate to 'ADJUST TUNE' (see page *10-22*).
3. Select 'BALANCE THROTTLES'.



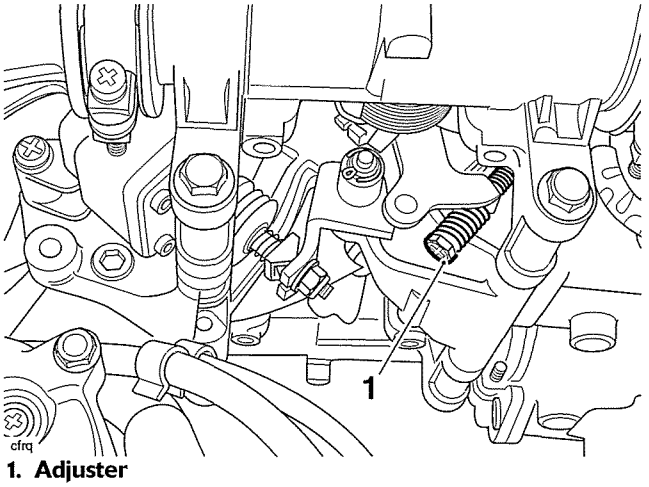
Balance Throttles Screen

Note:

- **The balance throttle screen will show the vacuum value of each throttle in mm/hg. In addition, when the throttles are balanced to an acceptable range of each other the word 'THROTTLES BALANCED' in green text will appear on the right of the screen. At this point, no further adjustment is necessary or productive.**
- **If the throttles are not balanced to each other the word 'THROTTLES UNBALANCED' in red text will appear on the right of the screen. At this point adjustment will be necessary.**

4. The adjuster is located beneath the throttle bodies, and is easily accessible from the right hand side of the motorcycle.

5. Make adjustments until the word 'THROTTLES BALANCED' appears on the right hand side of the screen.



cfrq

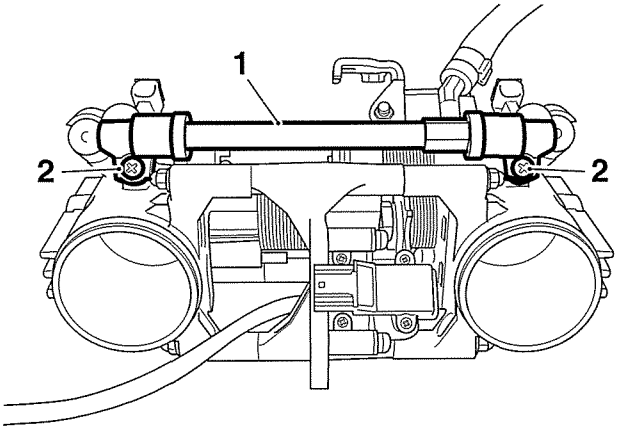
1. Adjuster

6. When balanced, stop the engine and disconnect the diagnostic tool.
7. Refit the diagnostic connector to its clip.
8. Refit the left side panel (see page *17-9*).

Fuel Injectors and Fuel Rail

Removal

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Remove the throttle bodies (see page *10-103*).
4. Remove the two screws securing the fuel rail and fuel hose to the throttle body assembly.



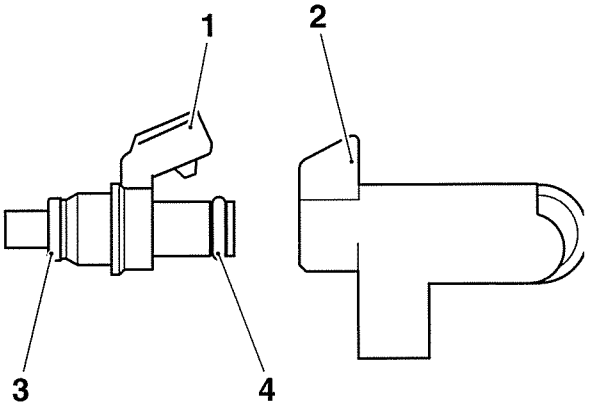
cfon

1. Fuel rail
2. Screws

Note:

- **The fuel rail and injectors are removed from the throttle bodies together.**

5. Gently ease the fuel rail and injectors upwards to release them from the throttles.
6. Ease each injector from the fuel rail.
7. Recover the upper and lower O-rings from each injector.



cemf

1. Injectors
2. Fuel rail
3. Lower O-ring
4. Upper O-ring

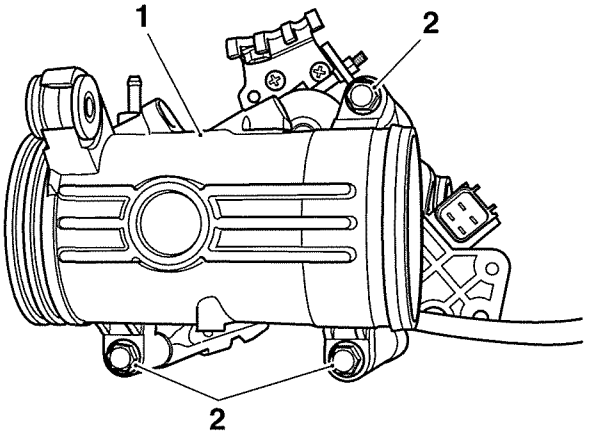
installation

1. Fit new O-rings to each injector.
2. Locate each injector to the fuel rail.
3. Fit the injector/fuel rail assembly to the throttle body, orientating each injector such that the electrical connection is facing upwards.
4. Fit and tighten the fuel rail screws to **3.5 Nm**.
5. Refit the throttle bodies (see page *10-105*).
6. Reconnect the battery, positive (identified with red tape) lead first.
7. Refit the rider's seat (see page *17-9*).

Throttle Position Switch

Removal

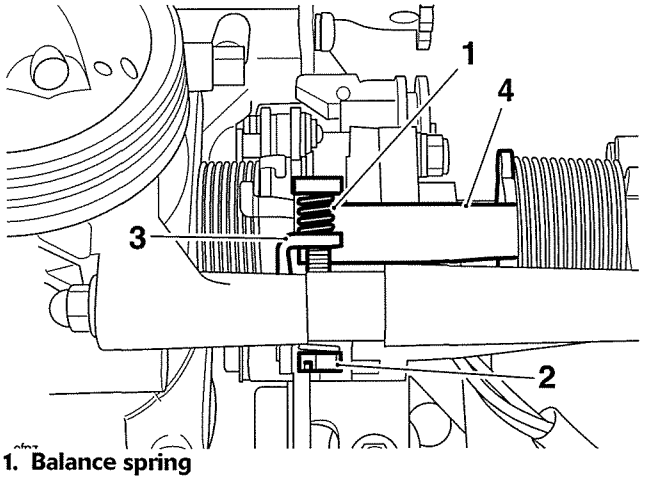
1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Remove the throttle bodies (see page *10-103*).
4. Remove the fuel injectors and fuel rail (see page *10-110*).
5. From the left hand side, remove the three nuts securing the two halves of the throttle body together.



clpo

1. Throttle body
2. Nuts

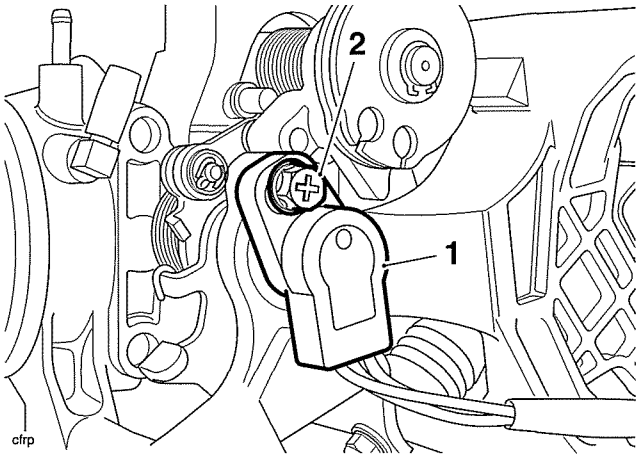
6. Carefully separate the two halves of the throttle body, collecting the balance spring from the throttle linkage as you do so.



1. Balance spring
2. Throttle balance adjuster screw
3. Left hand throttle linkage
4. Right hand throttle linkage

7. Position the left hand throttle aside.

8. Remove the screw securing the throttle position sensor to the throttle body.

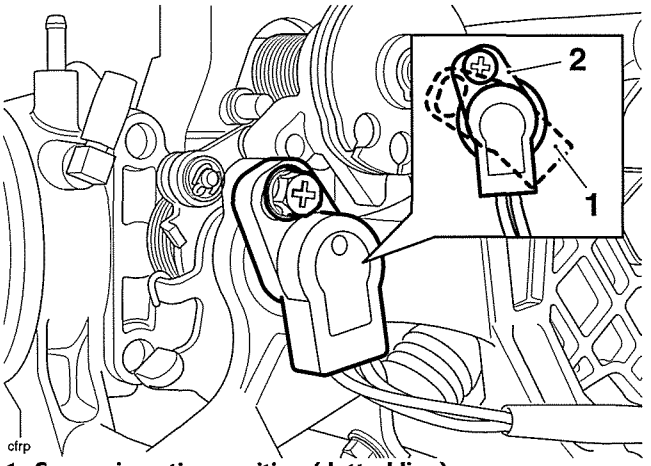


1. Throttle position sensor
2. Screw

9. Turn the sensor anti clockwise and detach it from the throttle body by gently pulling outwards.

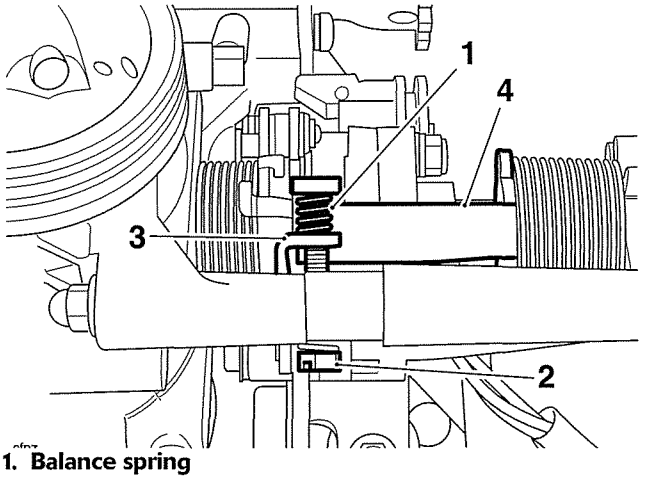
Installation

1. Lubricate the sensor O-ring with a few drops of engine oil.
2. Insert the sensor to the throttle body at the angle shown below then turn it anti clockwise until the screw hole aligns with the thread in the throttle body.



1. Sensor insertion position (dotted line)
2. Sensor initial fitted position (solid line)

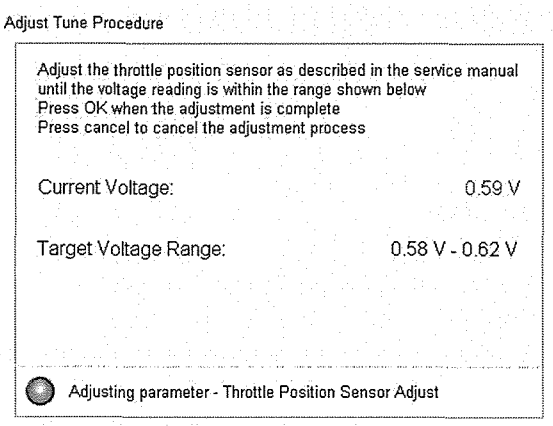
3. Insert the screw to secure the throttle position sensor, but do not fully tighten the screw yet.
4. Position the left hand throttle to the right hand throttle, ensuring the left hand linkage correctly engages in the right hand linkage.
5. Refit the throttle balance spring.



1. Balance spring
2. Throttle balance adjuster screw
3. Left hand throttle linkage
4. Right hand throttle linkage

6. Refit the three fixings and tighten to **3.5 Nm**.
7. Carefully insulate the positive starter motor cable to ensure it cannot cause a short circuit.
8. Temporarily reconnect the throttle position sensor and idle speed control valve connectors. DO NOT allow the throttle body to hang on the throttle position sensor and idle speed control valve harnesses.

9. Temporarily reconnect the battery, positive (identified with red tape) lead first.
10. Attach the Triumph diagnostic tool to the dedicated plug, refer to the Triumph Diagnostic Tool User Guide for additional information.
11. Turn the ignition to the **ON** position.
12. On the diagnostic tool navigate to and select the **Adjust Tune** option.
13. At the next screen, select Throttle Position Sensor Renew (see below) then press the **Adjust button**.
14. On pressing the **Adjust** button, the diagnostic tool will send a command which drives the throttle to the fully closed position. The tool will also display the Voltage reading coming from the throttle position sensor.



15. Gently rotate the throttle position sensor until the Voltage reading on the tool shows 0.6 Volts ±0.02 Volts. The reading on the screen will turn green, indicating that the reading is correct.

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.**

16. Tighten the sensor retaining screw to **3.5 Nm** and re-check the Voltage reading shown on the tool. Repeat the adjustment if the reading is outside the specified range.
17. Press the **OK** button to return the throttle to normal control and return the diagnostic tool to the **Adjust Tune** menu.
18. Disconnect the diagnostic tool.
19. Disconnect the battery negative (black) lead first.
20. Refit the throttle body (see page *10-105*).
21. 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.

Warning

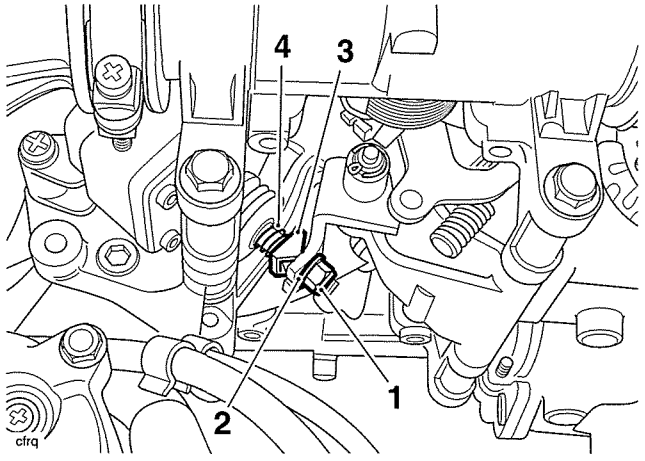
Move the handlebars to left and right full lock while checking that cables and harnesses do not bind. A cable or harness that binds will restrict the steering and may cause loss of control and an accident.

22. Reconnect the battery, positive (identified with red tape) lead first.
23. Refit the rider's seat (see page *17-9*).

Idle Speed Control Stepper Motor

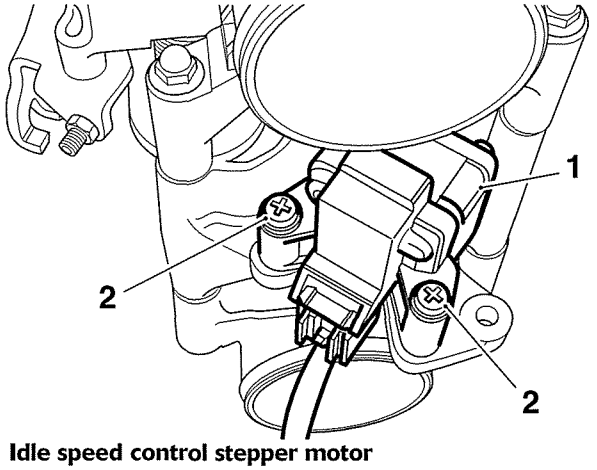
Removal

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Remove the throttle bodies (see page *10-111*).
4. Remove the nut, metal washer and plastic washer attaching the idle control stepper arm to the idle speed control lever.



1. Nut
2. Washers
3. Plastic collar
4. Spring

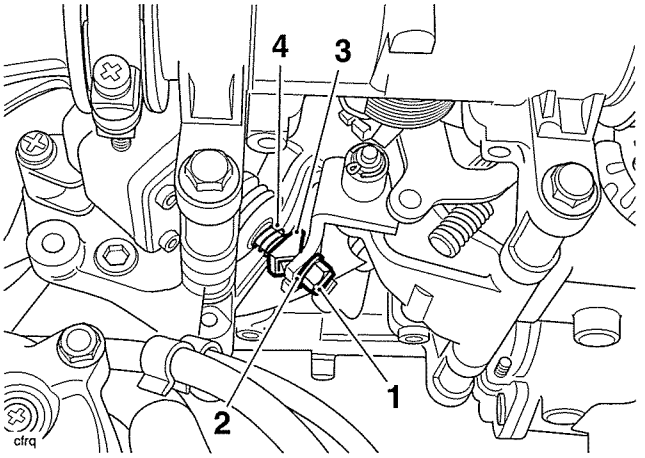
5. Remove the two screws securing the idle speed control stepper motor to its bracket, then remove the stepper motor. Collect the plastic collar and spring.



1. Idle speed control stepper motor
2. Fixings

Installation

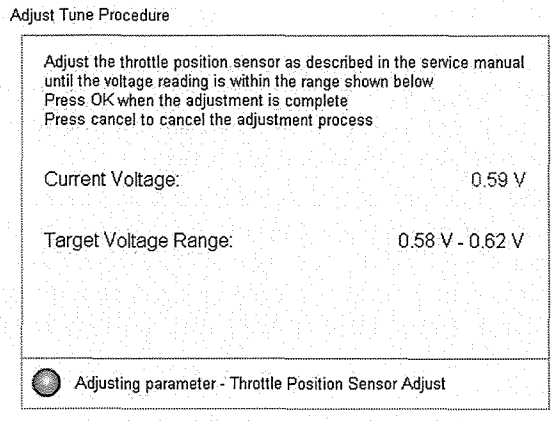
1. Locate the spring and plastic collar to the stepper motor shaft.
2. Locate the stepper motor to its bracket and tighten the fixings to **3.5 Nm.**



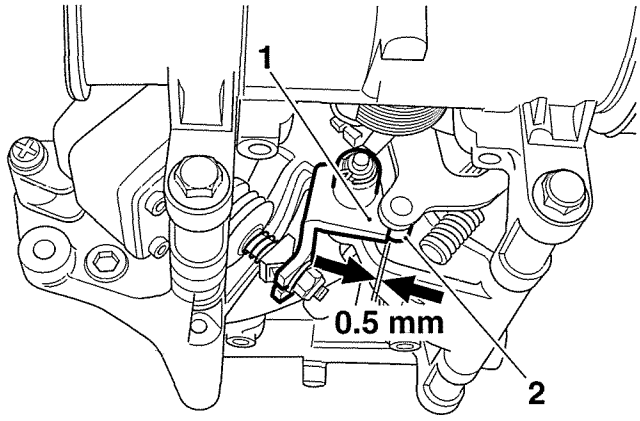
1. Nut
2. Washers
3. Plastic collar
4. Spring

3. Fit the plastic washer then fit the metal washer and nut.
4. Carefully insulate the positive starter motor cable to ensure it cannot cause a short circuit.
5. Temporarily reconnect the throttle position sensor and idle speed control valve connectors. DO NOT allow the throttle body to hang on the throttle position sensor and idle speed control valve harnesses.
6. Temporarily reconnect the battery, positive (identified with red tape) lead first.
7. Attach the Triumph diagnostic tool to the dedicated plug; refer to the Triumph Diagnostic Tool User Guide for additional information.
8. Turn the ignition to the **ON** position.
9. On the diagnostic tool navigate to **Engine Diagnostics** and select the **Adjust Tune** button.
10. Select **Idle Speed Control Stepper Renew** then press the **Adjust** button.
11. On pressing the **Adjust** button, 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 should be between the target voltage range of 0.58 Volts and 0.62 Volts.



12. Tighten the stepper arm nut on the idle speed stepper motor until a clearance of 0.5 mm can be measured between the idle speed control cam and the throttle roller (see the diagram below).



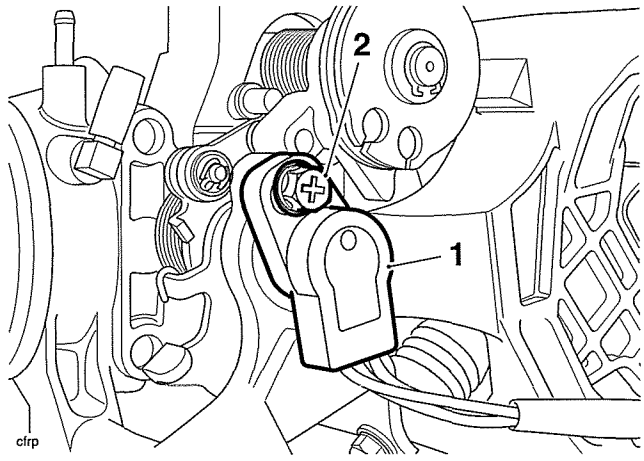
cfrq

1. Idle speed control cam

2. Throttle roller

13. Check the voltage reading shown on the software. If the reading is between the target voltage range, then proceed to step *19*. If the reading is not within this range, adjustment must be made as described in steps *14* to *16*.

14. Slacken the screw securing the throttle position sensor to the throttle body.



1. Throttle position sensor

2. Screw

15. Gently turn the throttle position sensor until the voltage reading shown on the software is between the target voltage range.

16. Tighten the sensor retaining screw to **3.5 Nm** and recheck the voltage reading shown on the software. Repeat the adjustment if the reading is outside the specified range.

17. Press the **OK** button to progress to the next adjustment.

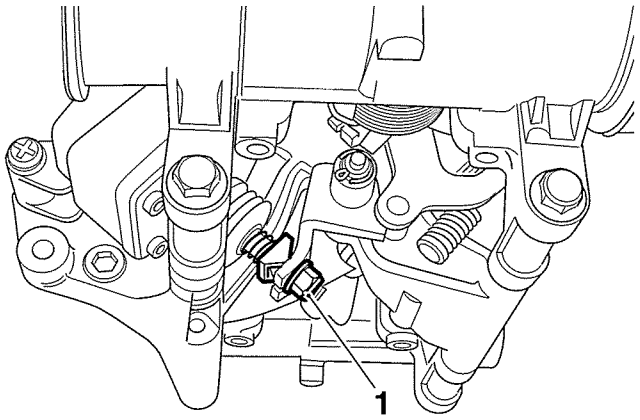
Note:

- **The diagnostic software will calculate the target voltage range for when the throttle is in the fully open position.**

18. On pressing the **OK** button, 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 which should be between the target voltage range calculated by the software and shown on the screen.

19. With the stepper fully opened, check the voltage shown on the software and, if necessary, adjust the nut on the top of the stepper arm until the software shows a voltage within the target voltage range

shown on the screen. The reading on the screen will change from red to green, indicating that the reading is correct.



cfrq

1. Adjustment nut

20. Press the **Adjust** button to fully close the idle speed control stepper motor. After a minimum of 15 seconds (the tool will show 'Adapting' and not allow further actions to take place during this period), press the **OK** button 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.

21. Turn the ignition to the **OFF** position.
22. Disconnect the diagnostic tool.
23. Disconnect the battery, negative (black) lead first.
24. Refit the throttle bodies (see page *10-105*).
25. Reconnect the battery, positive (identified with red tape) lead first.
26. Refit the rider's seat (see page *17-9*).

Engine Management Adaption

General Information

The engine management system fitted to this model is adaptive. This means that the system is able to learn about new or changing operating conditions and continuously adapt itself without needing to constantly make major adjustments from a fixed baseline setting.

Adaptive changes can become necessary because of changing rider behaviour, changes in the region in which the bike is operated (i.e. operation at high altitude where it was previously used at sea level) or because a new part may have been fitted which has slightly different characteristics to the old part. All adaptive changes are automatic and require no intervention by rider or dealer.

Adaption Status

To see if a motorcycle has fully adapted, a facility named 'ADAPTION STATUS' is provided on the diagnostic tool. The following adaption details can be examined:

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

Terminology

Where the term 'status' is used, this indicates how far the present operating parameter is from the stored (baseline) value. The nearer these figures are to zero the better as it indicates the motorcycle has adapted to its current operating conditions.

The term 'range' indicates how much (in percentage terms) of the adjustment range has been used to reach the current operating status.

Typical Values

In a correctly adapted motorcycle, the following will be typical:

Function Examined	Read Out
Closed throttle position reference status	Adapted
Idle speed control adaption status	Between +100 and -100%
Oxygen sensor adaption status (off idle)	0% +/- 10%
Oxygen sensor adaption range (off idle)	Between +100 and -100%
Oxygen sensor adaption status (idle)	0% +/- 10%
Oxygen sensor adaption range (idle)	Between +100 and -100%

Forcing adaption to take place

If the read out indicates that the motorcycle is not adapted, the following will force the system to make adaptions:

Warning

Never start the engine or let it run for any length of time in a closed area. The exhaust fumes are poisonous and may cause loss of consciousness and death within a short time. Always operate the motorcycle in the open-air or in an area with adequate ventilation.

Note:

- **Resetting adaptions with the motorcycle connected to an exhaust extraction system may cause incorrect values to be set, causing poor engine running. Always reset the adaptions with the engine disconnected from any exhaust extraction system whilst ensuring the motorcycle is positioned in a well ventilated area.**

1. Ensure the engine is cold.
2. WITHOUT TOUCHING THE THROTTLE, start the engine and allow it to warm up until the cooling fan comes on.
3. Leave the engine to idle for a further 12 minutes.

Note:

- **As an alternative to the above process, connect the diagnostic tool, select ADJUST TUNE (see the Triumph Diagnostic Tool User Guide) and select RESET ADAPTIONS. This will force a fast adaption routine to take place in around 5 seconds. For this to happen, the engine MUST be running, it must be at normal operating temperature and in closed loop control mode. Under any other conditions fast adaption will not take place and may cause default values to be loaded, which may then require a normal 12 minute adaption routine to be run.**

Fault Indications

If 'range' figures at 100% are seen, then the adjustment has reached maximum indicating a mechanical fault exists on the motorcycle. This can be due to a number of faults but the most likely causes will be low/high fuel pressure, faulty injectors or air leaks at the throttle bodies or airbox.

In these circumstances, locate and rectify the fault, and reset the adaptions as described above.

Exhaust System

Removal

Warning

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

Warning

If the engine has recently been running, the exhaust components may be hot to the touch. Contact with the hot components may cause damage to exposed skin. To avoid skin damage, always allow the hot parts to cool before working on the exhaust system.

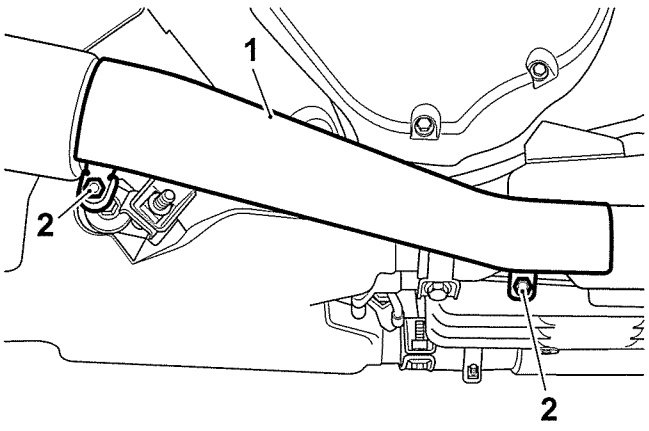
Note:

- **In the following procedures, the term catalyst box refers to the rectangular chamber to which the silencers are attached. In many countries, catalytic converters are fitted inside this component. However, in certain countries (depending on their exhaust emission regulation) no catalyst will be fitted.**

Note:

- **Always note the position and orientation of exhaust clamps prior to releasing them, and return them to the noted position and orientation on assembly.**

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Remove the catalyst box/silencer heat shields.



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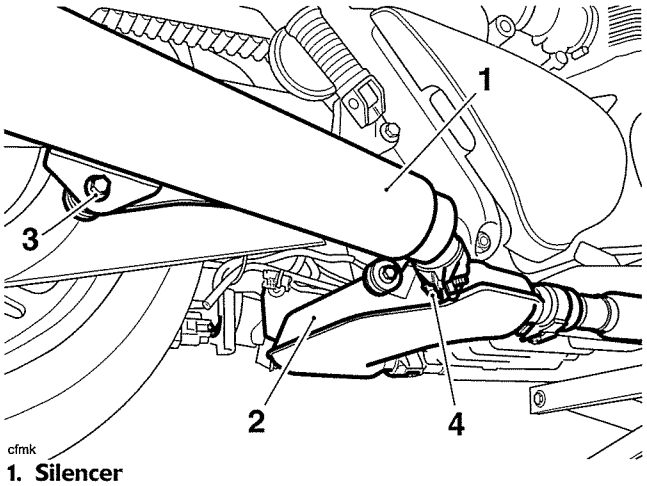
1. Heat shield
2. Heat shield fixings

4. Release the clamps securing the silencers to the catalyst box.
5. Release the fixing securing the silencers to their brackets.



cfmk

1. Silencer
2. Catalyst box
3. Silencer fixing
4. Silencer clamp fixings

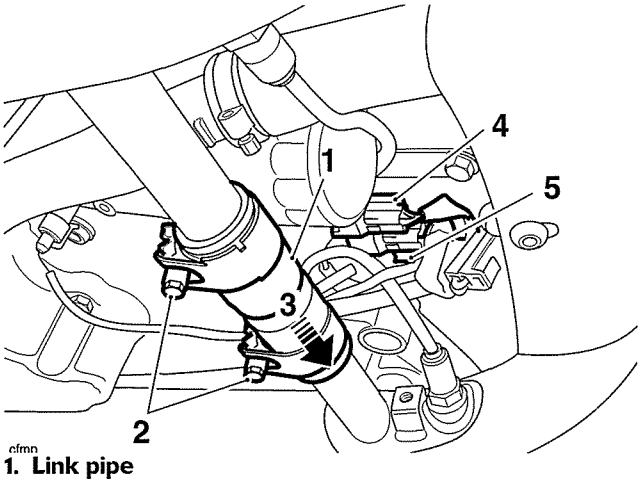
6. Detach the silencers from the catalyst box.
7. Remove the silencer gaskets.

Note:

- **The oxygen sensor electrical connections must not be swapped between cylinders. If the connections are swapped over, engine malfunctions will occur.**
- **The right hand (Cylinder 2) oxygen sensor connector on the main harness is marked with red tape.**
- **The oxygen sensors are NOT marked, always ensure the right hand oxygen sensor harness is connected to the main harness connector identified with red tape.**

8. Disconnect the two oxygen sensor connections from the wiring harness.
9. Release the link pipe clamps.

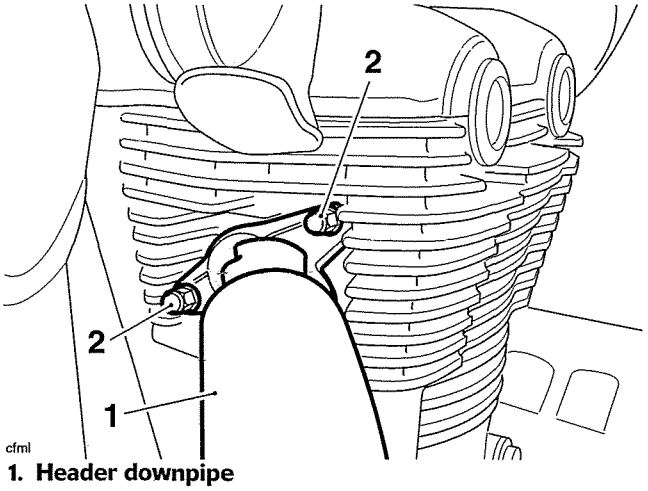
10. Slide the link pipe on to the left hand header pipe.



cfmn

1. Link pipe
2. Link pipe clamps
3. Link pipe removal direction
4. Right hand oxygen sensor connection (marked with red tape)
5. Left hand oxygen sensor connection

11. Release the clamps securing the headers to the catalyst box.
12. At the cylinder head, release the nuts securing the header pipes to the head.



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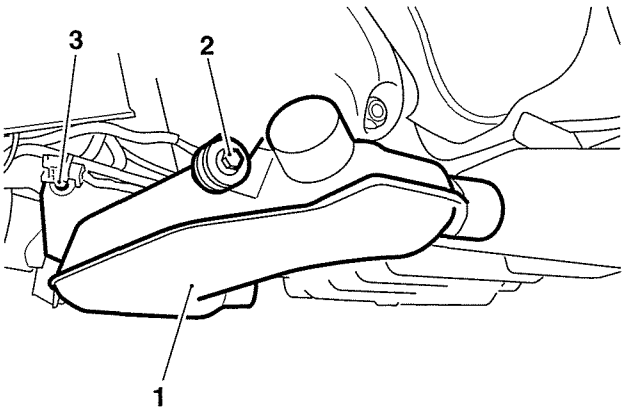
1. Header downpipe
2. Fixings

13. With the aid of an assistant, detach and remove both header pipes.
14. Collect the header gaskets from the head. Remove the header pipe to catalyst box gaskets from the headers.

Note:

- **The catalyst box is secured to the frame by a single fixing on the right hand side, and is located on a stud and grommet on the left hand side.**

15. Release the fixing securing the catalyst box to the frame.



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1. Catalyst box
2. Fixing
3. Left hand mounting

16. Detach the catalyst box from its mounting by easing it to the right hand side of the motorcycle.

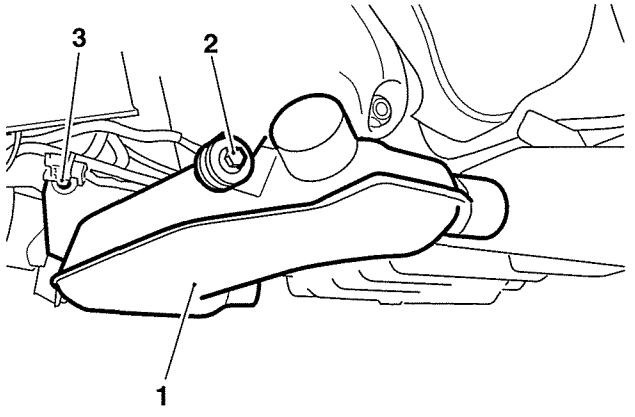
Note:

- **The catalyst box mounting grommet may remain in the catalyst box or may adhere to the mounting stud on removal of the catalyst box.**

17. Collect the catalyst box mounting grommet.

Installation

1. Check and if necessary renew the catalyst mounting box grommet. Fit the mounting grommet to the mounting point on the catalyst box.
2. Locate the catalyst box to the mounting stud on the left hand side. Insert the flanged sleeve into the right hand grommet and then fit the bolt and washer to retain the assembly.



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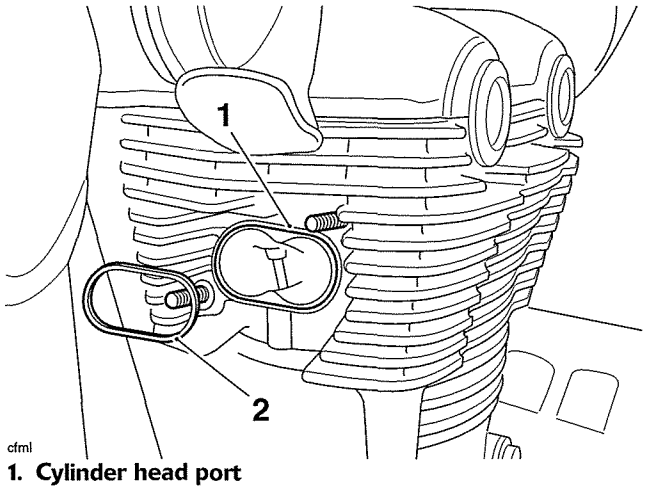
1. Catalyst box
2. Left hand mounting
3. Bolt/washer

3. Fit new gaskets to the cylinder head ports.



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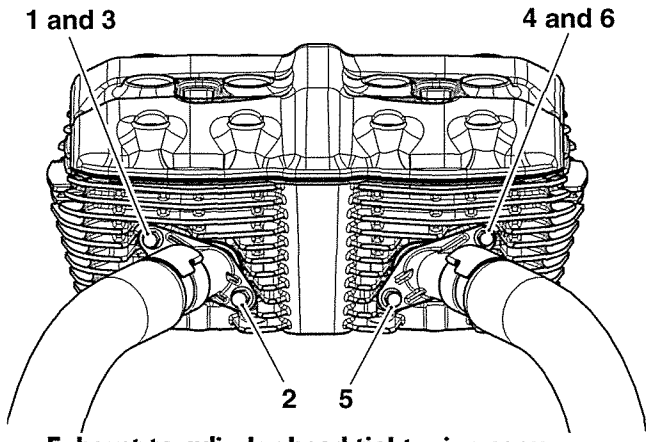
1. Cylinder head port
2. Gasket

Note:

- **To retain the gaskets during assembly, apply a smear of grease or petroleum jelly to the gasket faces in the head.**

4. Apply a proprietary high temperature grease to the header studs on the cylinder head.
5. Fit new gaskets to the header pipes and position the clamps over the joints.
6. If removed, fit the oxygen sensors and tighten to **25 Nm.**
7. If removed, fit the oxygen sensor covers and tighten the fixings to **9 Nm**.
8. Locate both headers to the catalyst box, then align to the cylinder head. Ensure the gaskets do not become displaced during assembly.
9. Slide the link pipe from the right hand header pipe and connect to the left hand header pipe. Do not tighten the clamp bolts at this stage.
10. Tighten the header pipe fixings to the cylinder head in the following sequence:



Exhaust to cylinder head tightening sequence

a) Tighten the right hand header pipe nuts 1 to 3 to **19 Nm** in the order shown.
b) Tighten the left hand header pipe nuts 4 to 6 to **19 Nm** in the order shown.

11. Tighten the catalyst box mounting bolt to **22 Nm.**
12. Tighten the header to catalyst box clamp bolts to **22 Nm.**
13. Tighten the link pipe clamp bolts to **9 Nm**.

Note:

- **The oxygen sensor electrical connections must not be swapped between cylinders. If the connections are swapped over, engine malfunctions will occur.**
- **The right hand (Cylinder 2) oxygen sensor connector on the main harness is marked with red tape.**
- **The oxygen sensors are NOT marked, always ensure the right hand oxygen sensor harness is connected to the main harness connector identified with red tape.**

14. Reconnect the oxygen sensors to the main wiring harness.
15. Fit new gaskets to each silencer.
16. Position the silencer clamps to each silencer joint.
17. Fit each silencer to the catalyst box and position to the silencer brackets.
18. Engage the mounting bracket fixings, finger tight.
19. Tighten each silencer bracket fixing to **28 Nm.**
20. Tighten each silencer clamp to **22 Nm.**
21. Position the heat shields to the silencers and catalyst box.
22. Fit the heat shield clamps and screws, then tighten the screws to **9 Nm.**
23. Reconnect the battery, positive (identified with red tape) lead first.
24. Fit the seat (see page *17-9*).

Evaporative Loss Control System - California Models Only

California Models Only

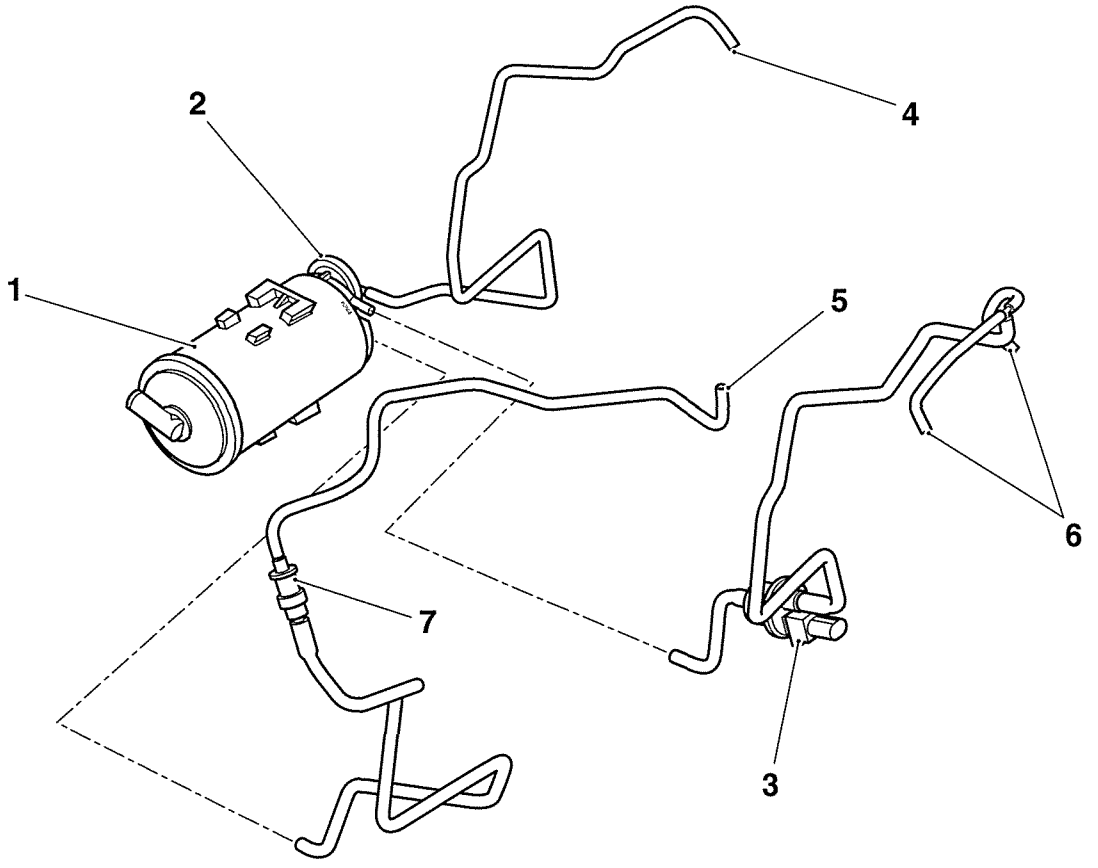
All California models are fitted with an evaporative emissions control system to prevent the exhausting of fuel vapour into the atmosphere.

A canister containing activated charcoal, located beneath the swinging arm, absorbs hydrocarbon vapour given off by the fuel in the fuel tank. Vapour delivery to the canister occurs at all times, but is particularly high after riding, when the motorcycle is parked in direct sunlight or in high temperatures. This causes the fuel temperature in the fuel tank to rise, resulting in a rise in the vapour pressure inside the tank. Normally this vapour would be vented to atmosphere but on California models, it is stored in the charcoal canister.

When the engine is started, the vapour is returned to the throttle body by means of induction vacuum, and is burnt in the engine.

There are two distinct phases to the system's operation, engine off and engine running. These two conditions are explained overleaf.

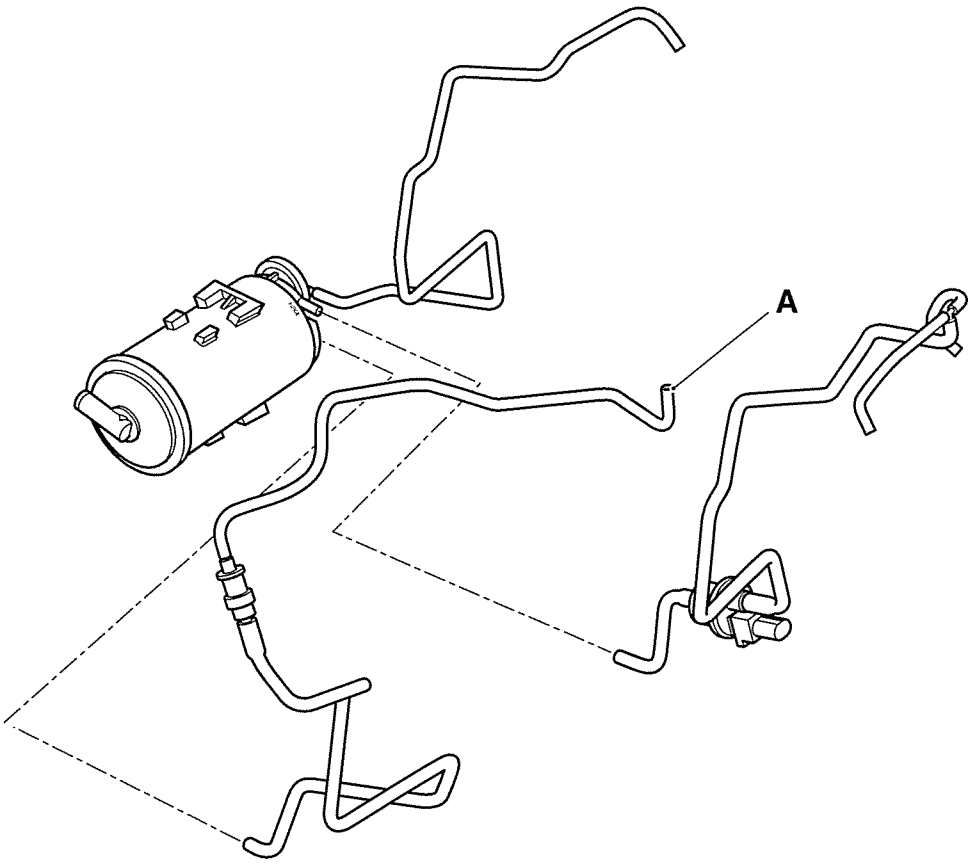
Component Locations



1. **Carbon canister**
2. **Purge valve**
3. **Purge control valve**
4. **Vacuum signal hose**
5. **Fuel tank vent hose**
6. **Purge hose connection to throttle bodies**
7. **Roll-over valve**

Evaporative Control System - Engine Off

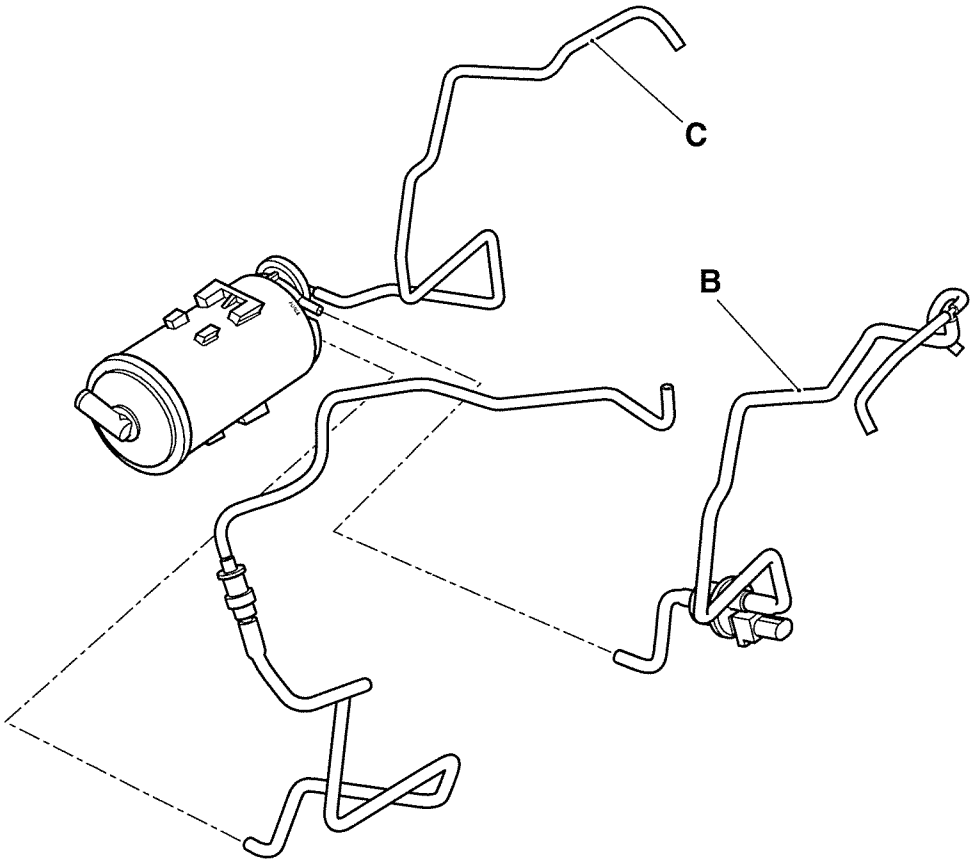
When the engine is switched off, hydrocarbon fuel vapour passes down the breather pipe A, through the roll-over valve to the canister. Vapour is then stored in charcoal layers within the canister.



Evaporative Control System - Engine Running

When the engine is started, vacuum from the engine is applied through pipe C to the vacuum switch on the canister, causing the canister return valve to open. Direct return of vapour, along pipe B, to the throttle bodies is prevented by the purge control valve which is governed by the engine management system. When open, the valve allows stored vapour to return to the throttle bodies where it enters the engine and is burnt in the cylinders.

The purge control valve is shuttled between the open and closed position during purging to prevent transient rich mixture and high emissions.



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11 Cooling

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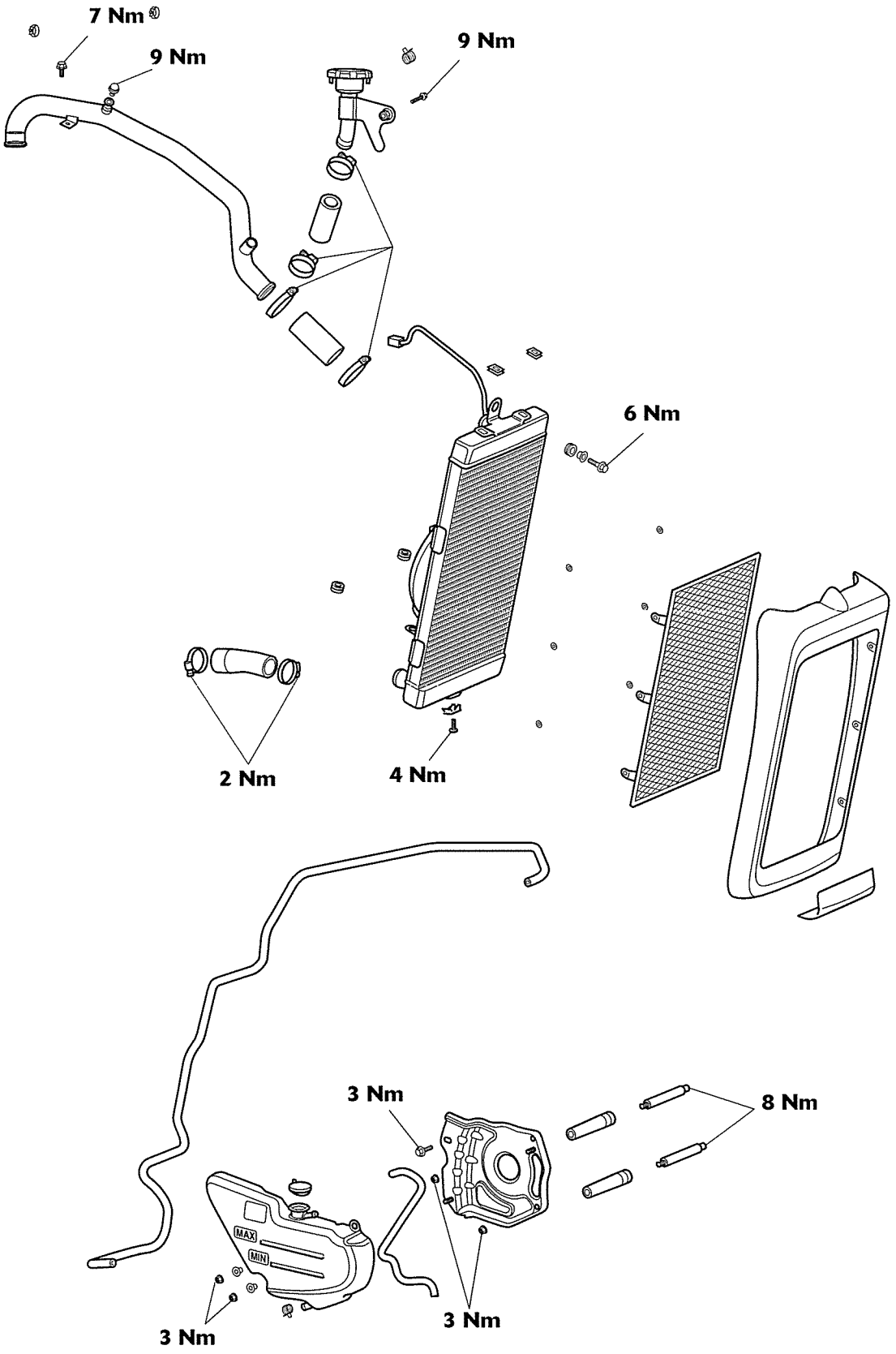
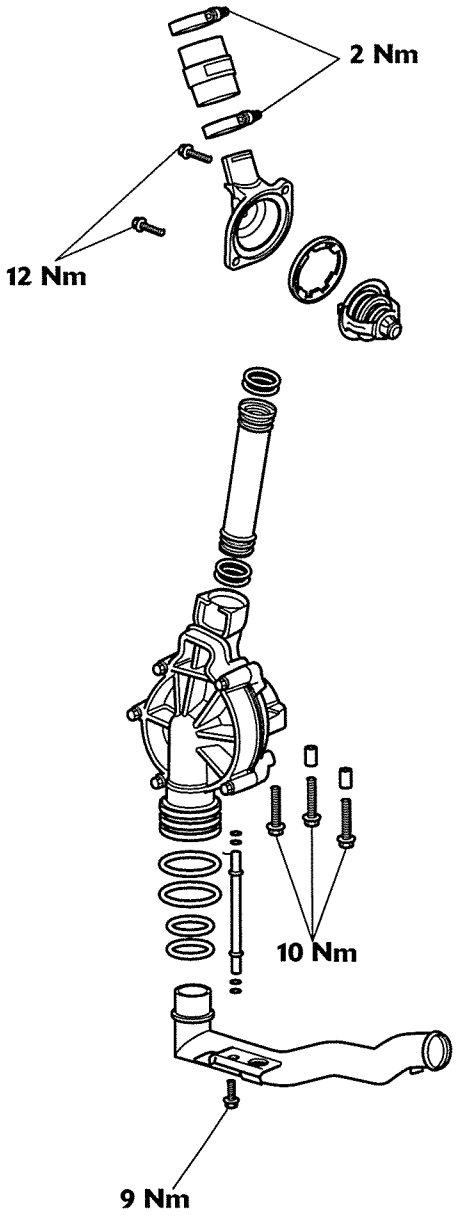
Exploded View - Radiator, Expansion Tank and Hoses



Exploded View - Water Pump



Coolant

A year-round, Hybrid Organic Acid Technology (known as Hybrid OAT or HOAT) coolant is installed in the cooling system when the motorcycle leaves the factory. It is coloured green, contains a 50% solution of ethylene glycol based antifreeze, and has a freezing point of -35°C (-31°F).

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

⚠ Warning

The standard coolant mixture contains toxic chemicals that are harmful to the human body. Never swallow neat anti-freeze or any of the coolant mixture.

⚠ Caution

The anti-freeze incorporated in the coolant mixture contains a corrosion inhibitor that helps prevent damage to the cooling system and engine. 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 anti-freeze listed in the Specification section and never use a methanol based anti-freeze as this does not contain the required corrosion inhibition properties.

Note:

- **HD4X Hybrid OAT coolant, as supplied by Triumph, is pre-mixed and does not need to be diluted prior to filling or topping up the cooling system.**

Radiator Hoses

Regularly check all radiator hoses and hose clips for cracks, leaks or deterioration.

Radiator and Cooling Fan

The motorcycle is fitted with a thermostatically controlled electric fan situated behind the radiator. When the fan operates with the motorcycle stationary or at slow speed, cool air is drawn through the radiator from the front of the motorcycle.

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.

⚠ Caution

Using high-pressure water, such as from a pressure-washer, can damage the radiator fins and impair the radiator's efficiency.

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

Coolant Level Inspection

Warning

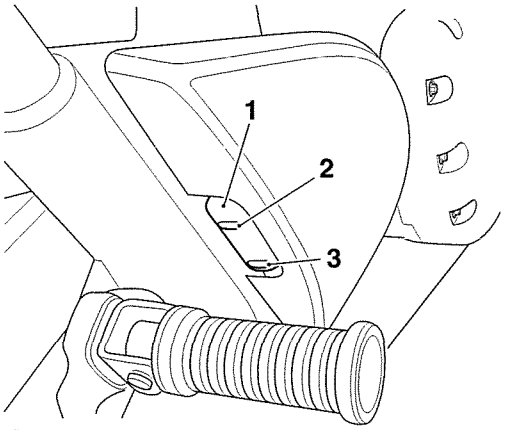
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Position the motorcycle on level ground and in an upright position.

Note:

- **The coolant level within the expansion tank can be inspected without removing any covers. The expansion tank can be viewed from the right hand of the motorcycle, through a window in the rear of the final drive belt cover. Always inspect the coolant level with the engine cold.**

2. The coolant level must be between the MAX (upper line) and MIN (lower line) marks in the expansion tank.



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1. Expansion tank
2. MAX mark
3. MIN mark
4. Fluid level

3. If the coolant is below the minimum level, or exceeds the maximum, the coolant level must be adjusted.

Coolant Level Adjustment

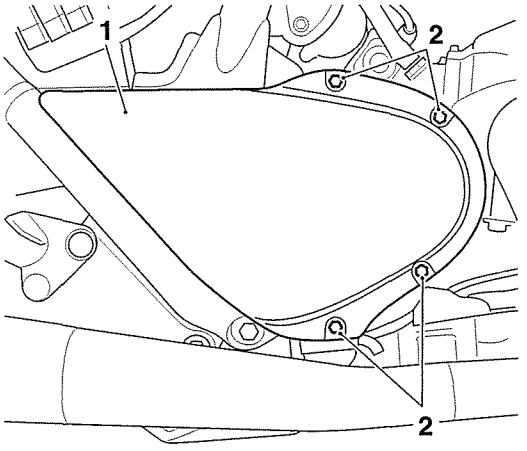
Warning

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

Warning

Do not remove the expansion tank or radiator pressure cap when the engine is hot. When the engine is hot, the coolant inside the cooling system will be hot and may also be under pressure. Contact with hot coolant will cause scalds and skin damage.

1. Allow the engine to cool for at least 30 minutes.
2. Release the four screws and remove the final drive belt cover.



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1. Final drive belt cover
2. Final drive belt cover screws

3. Remove the cap from the expansion tank, and add coolant mixture through the filler opening until the level reaches the MAX mark. Refit the cap.

Note:

- **If the coolant level is being checked because the coolant has overheated, also check the level in the radiator and top-up if necessary.**
- **In an emergency, distilled water can be added to the cooling system. However, the coolant must then be drained and replenished with HD4X Hybrid OAT coolant as soon as possible.**

4. Align the final drive belt cover to the crankcase. Fit and tighten the four screws to **9 Nm**.

Coolant Replacement

Drainage

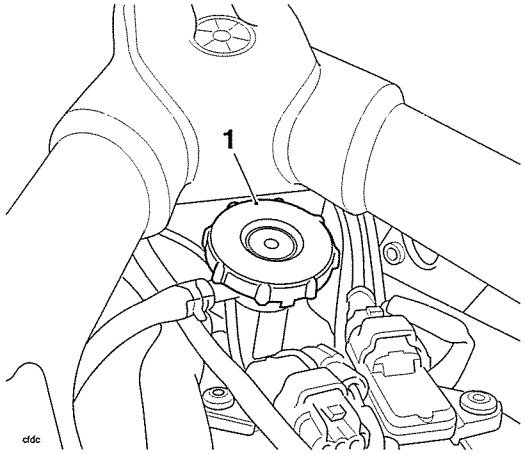
Warning

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

Warning

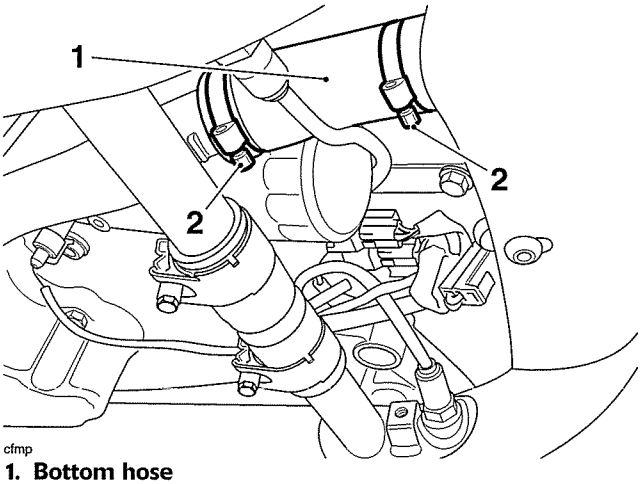
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Raise and support the fuel tank (see page *10-85*).
2. Remove the coolant pressure cap on the upper coolant tube.



1. Radiator cap

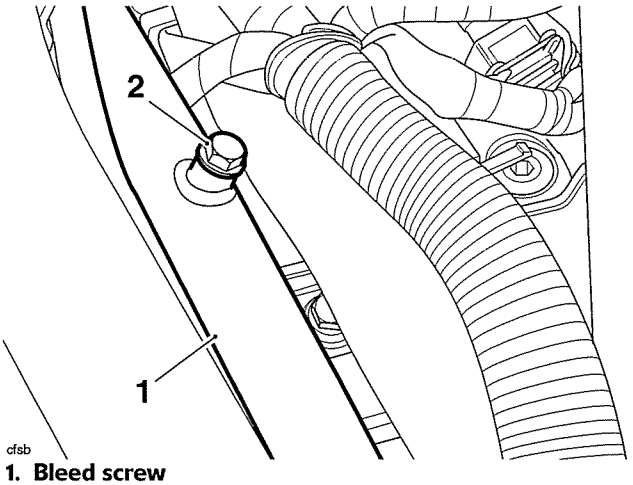
3. Position a container beneath the radiator to collect the displaced coolant.
4. Release the hose clips, detach the bottom hose from the radiator and allow the coolant to drain out.



1. Bottom hose
2. Hose clips

Filling

5. Reconnect the bottom hose and tighten the clips to **2 Nm**.
6. Open the cooling system bleed screw, located below the fuel tank.



1. Bleed screw

7. Slowly add coolant mixture to the system, through the filler opening below the fuel tank, until coolant escapes from the bleed screw. Close the bleed screw, tightening it to **9 Nm**.
8. If necessary, top up the system through the radiator filler.
9. Refit the pressure cap.
10. Start the motorcycle and allow the engine to idle for a short period of time to allow any air to be expelled from the system.

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 hot coolant will cause scalds and skin damage.

11. Stop the engine and allow it to cool. Top up the coolant level as necessary.
12. Refit the coolant pressure cap.
13. Lower and secure the fuel tank (see page *10-86*).
14. Check the expansion tank level and top up if necessary (see page *11-5*).

Water Pump

Removal

Warning

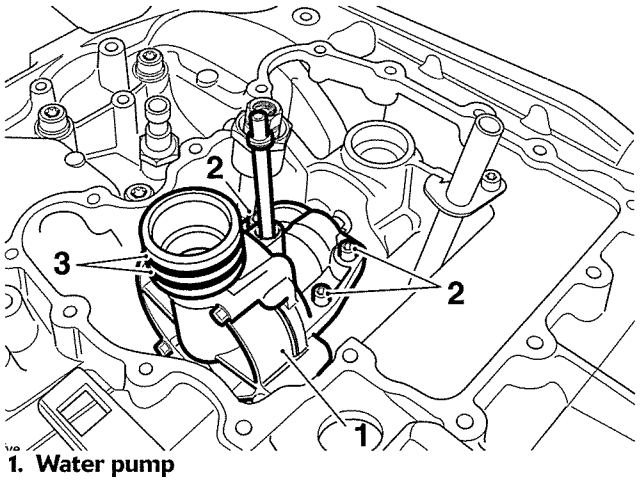
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Remove the rider's seat (see page *17-8*).
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 hot coolant will cause scalds and skin damage.

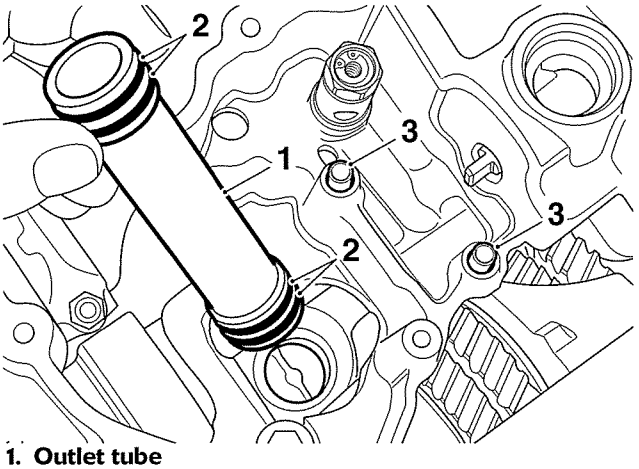
3. Drain the coolant (see page *11-6*).
4. Remove the sump (see page *8-10*).
5. Release the three bolts securing the water pump to the crankcase.



1. Water pump
2. Fixings
3. O-rings

6. Withdraw the water pump, collecting the two locating dowels as you do so.

7. Withdraw the water pump outlet tube from the crankcase. Remove and discard the O-rings from the tube.



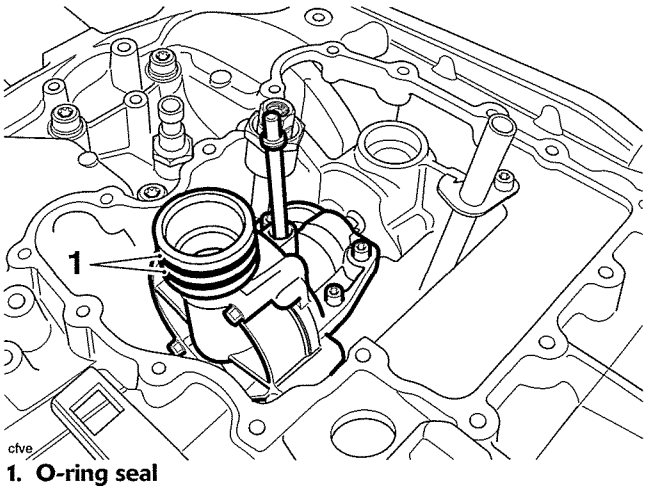
1. Outlet tube
2. O-rings
3. Water pump dowels

Inspection

1. Remove the pump outer cover to check for corrosion and scale build-up around the impeller and in the pump body. Renew if necessary.
2. Check the water pump shaft and shaft bearings for side and end float. Clean or renew if necessary.
3. Check the water pump gland for signs of leakage. Renew the pump if leakage is evident.

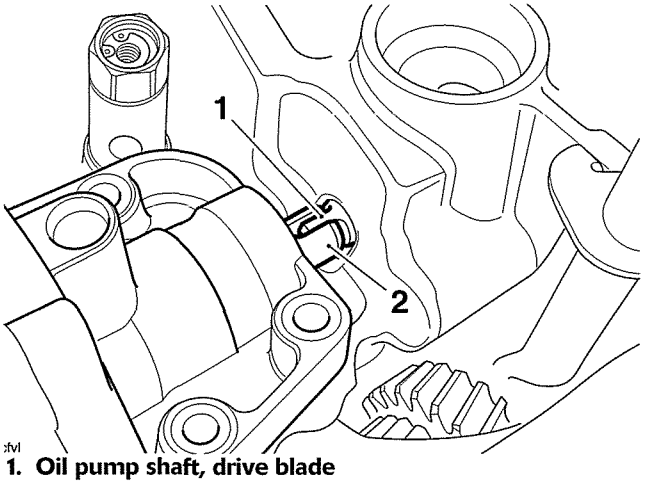
Installation

1. Fit new O-rings to the water pump outlet tube and refit the tube to the upper crankcase.
2. Replace the water pump O-ring seals.



1. O-ring seal

3. Position the water pump to the crankcase, aligning the drive slot in the water pump with the drive blade on the oil pump shaft.



1. Oil pump shaft, drive blade
2. Water pump slot

Note:

- **The water pump will not engage fully into the crankcase unless the drive slot and blade are aligned and engaged.**

4. Fit the pump ensuring it correctly locates on the two dowels and tighten the fixings to **10 Nm**.
5. Refit the sump (see page *8-11*).
6. Reconnect the battery, positive (identified with red tape) lead first.
7. Refit the rider's seat (see page *17-9*).
8. Refill the cooling system (see page *11-6*).

Coolant Pressure Cap

Inspection

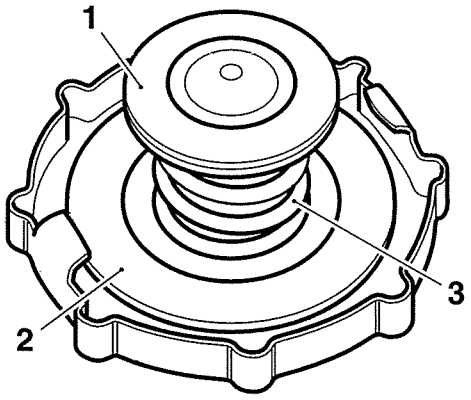
Warning

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 hot coolant will cause scalds and skin damage.

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 pressure cap as described in the Coolant Drain section on page *11-6*.
2. Check the condition of the upper and lower seals of the coolant pressure cap.



ccer

1. Lower Seal
2. Upper Seal
3. Spring

Note:

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

3. Pressure test the cap to the blow off pressure of 1.2 bar using proprietary tools. If the cap opens at a lower pressure or fails to open at 1.2 bar, replace the cap.
4. Refit the pressure cap as described in the Coolant Fill section on page *11-6*.

Thermostat

Removal

Warning

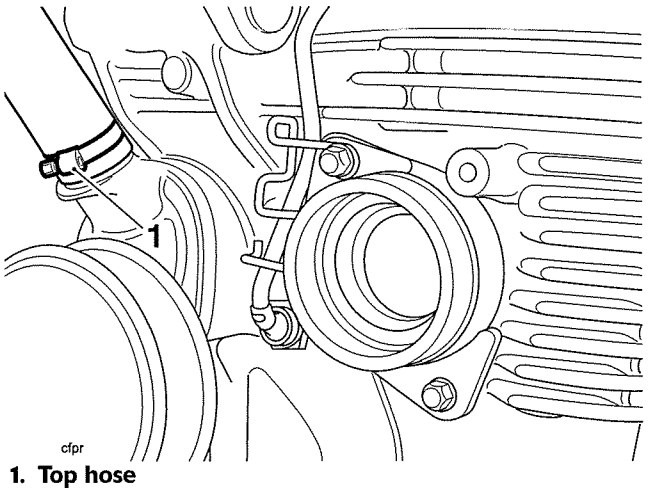
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Drain the coolant (see page *11-6*).
4. Remove the throttle body (see page *10-103*).

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 hot coolant will cause scalds and skin damage.

5. Release the top hose clip at the thermostat housing.



cfpr

1. Top hose

6. Release the fixings securing the thermostat housing to the cylinder head, and withdraw the housing downwards, detaching it from the top hose as you do so.
7. Remove the housing and collect the thermostat.

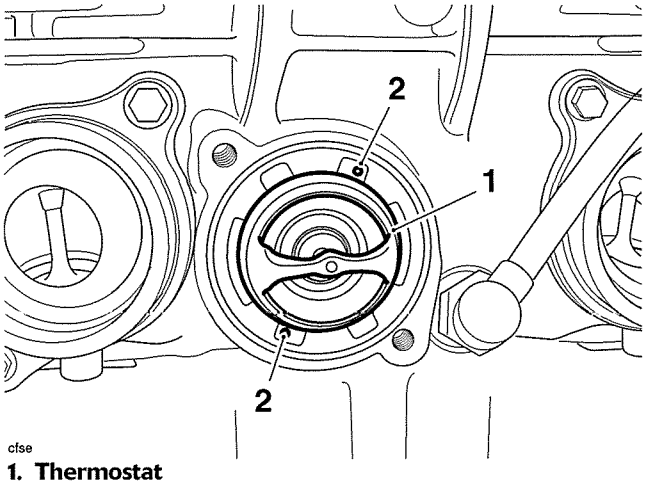
Inspection

1. Inspect the thermostat at room temperature. If the valve is open, the thermostat must be replaced.

2. To check the valve opening temperature, suspend the thermostat in a container of water together with a thermometer. Raise the temperature of the water until the thermostat opens. The thermostat should start to open at 82°C ± 5°C.
3. If the temperature at which thermostat opening takes place is incorrect, replace the thermostat.

Installation

1. Clean the mating surfaces of the cylinder head and thermostat housing.
2. Position a new seal to the thermostat, seating the thermostat into the groove in the seal.
3. Locate the thermostat into the head with the centre bars of the thermostat in a horizontal position, and one of the two bypass holes positioned uppermost.



cfse
1. Thermostat
2. Bypass holes

4. Ensure the top hose clip is in position on the top hose.
5. Locate the thermostat housing to the head, ensuring that the top hose is fully seated on to the thermostat outlet. Tighten the fixings to **12 Nm**.
6. Tighten the hose clip to **2 Nm**.
7. Refit the throttle bodies (see page *10-105*).
8. Reconnect the battery, positive (identified with red tape) lead first.
9. Refit the rider's seat (see page *17-9*).
10. Refill the cooling system (see page *11-6*).

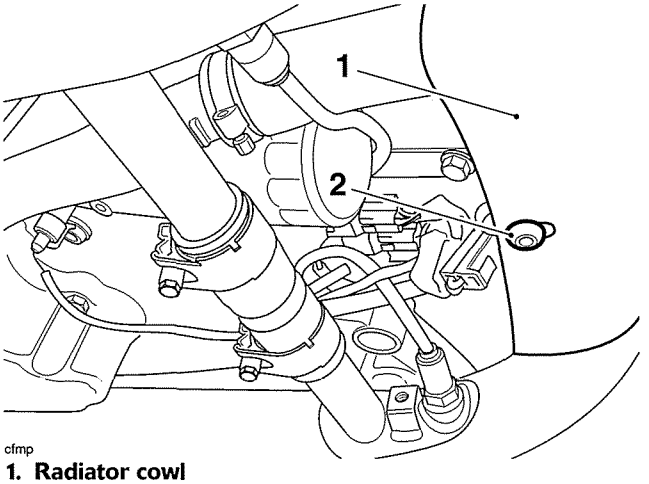
Radiator

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 rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Release the fixing and remove the radiator cowl.



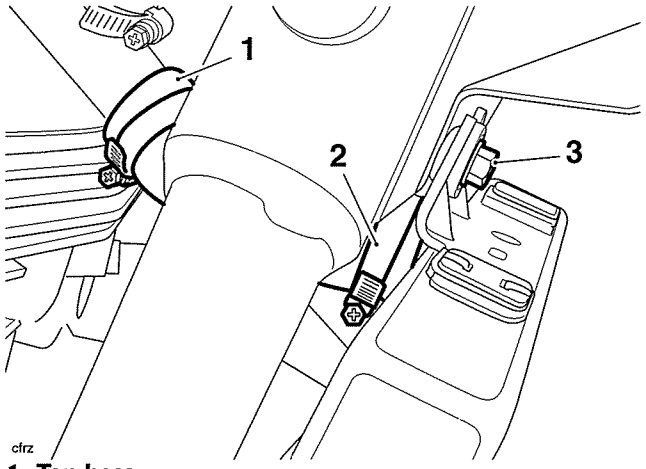
cfmp
1. Radiator cowl
2. Fixing

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 hot coolant will cause scalds and skin damage.

4. Drain the coolant (see page *11-6*).
5. Loosen the top hose clip at the radiator.

6. Remove the radiator fixing bolt.



1. Top hose
2. Top hose clip
3. Radiator fixing

7. Raise the radiator off the lower mounting studs and carefully ease towards the front of the motorcycle to disconnect the top hose.
8. Disconnect the cooling fan connector.
9. Remove the radiator from the motorcycle, taking care not to damage the radiator or front mudguard.

Inspection

1. Check the radiator for stone damage.
2. Check the radiator core, for damage to fins or obstructions to air flow.
3. Rectify 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. Ensure the hose clips are in position on the top and bottom hoses.
2. Position the radiator to the motorcycle and connect the cooling fan connector.
3. Connect the radiator to the bottom hose and align to the lower mounting studs.
4. Connect the radiator to the top hose and align to the upper fixing.
5. Refit the radiator fixing bolt. Tighten to **6 Nm**.
6. Tighten the top and bottom hose clips to **2 Nm**.
7. Refit the radiator cowl and tighten the fixing to **4 Nm.**
8. Reconnect the battery, positive (identified with red tape) lead first.
9. Refit the rider's seat (see page *17-9*).
10. Refill the cooling system (see page *11-6*).

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12 Brakes

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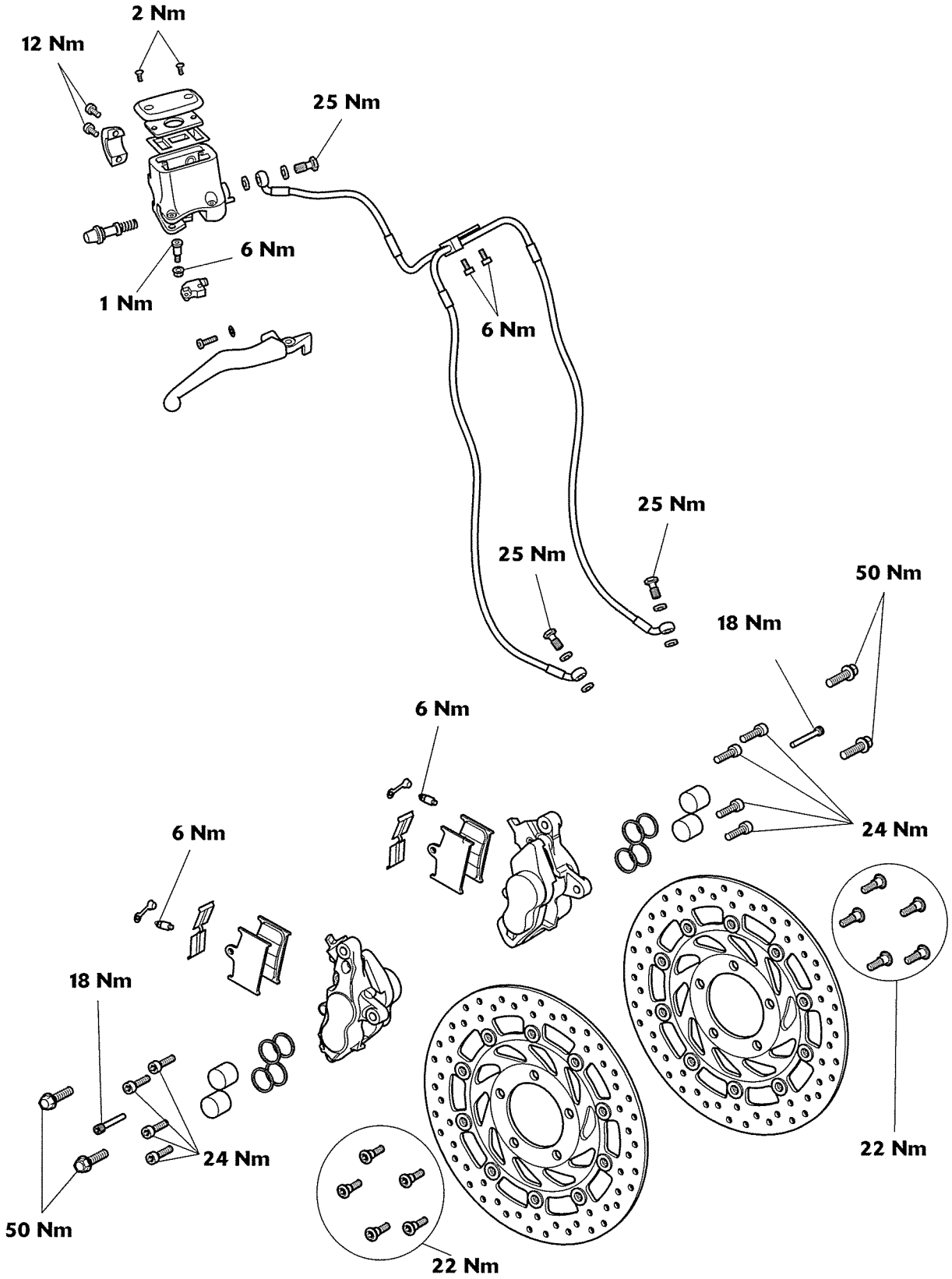
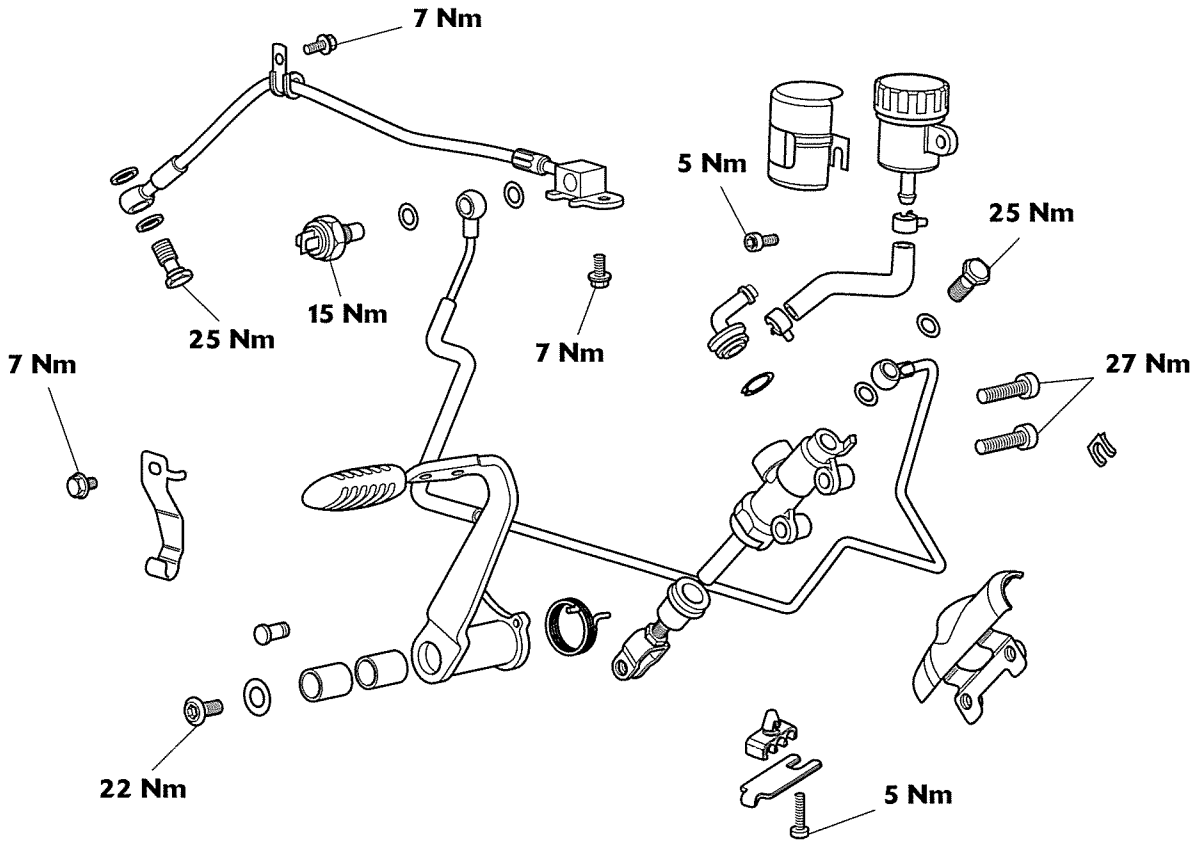
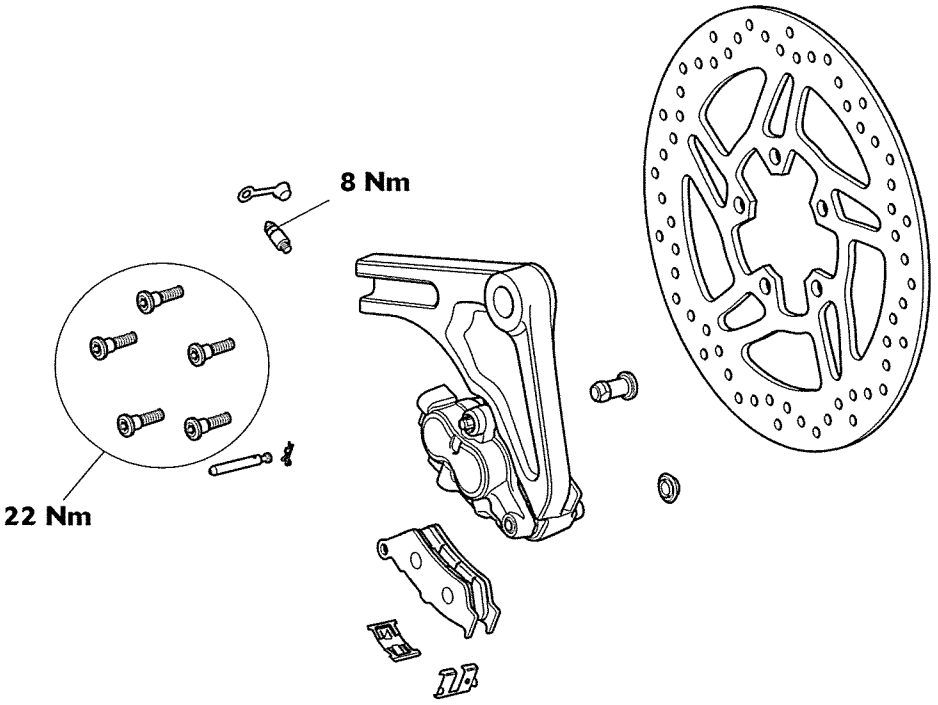
Exploded View - Front Brake Master Cylinder, Caliper and Disc

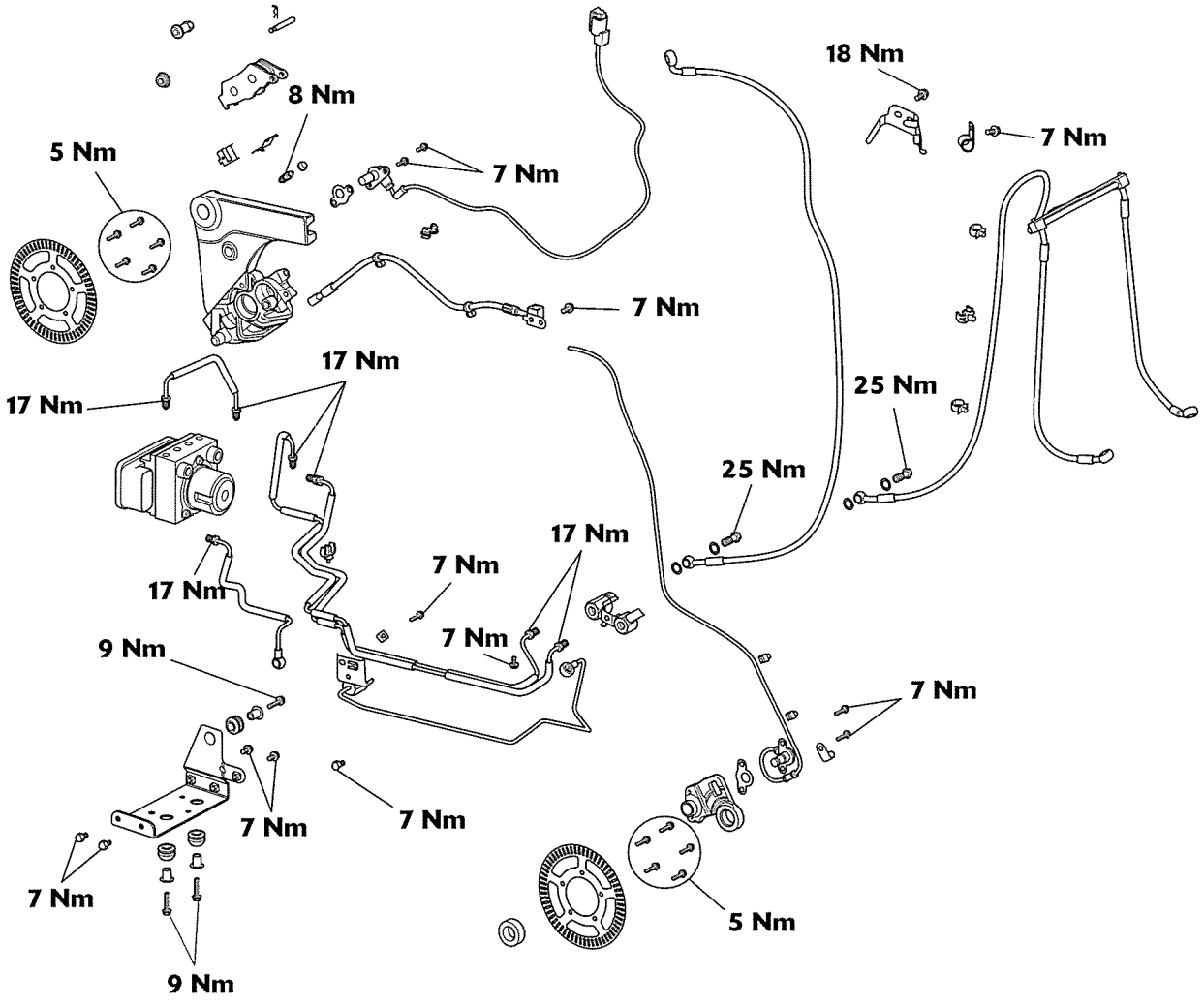


Exploded View - Rear Brake Master Cylinder, Caliper and Disc





Exploded View - ABS system



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 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 LOSS OF MOTORCYCLE CONTROL AND 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 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 you must have your authorised Triumph dealer take remedial action before you attempt to ride the motorcycle again. Failure to take remedial action may reduce braking efficiency leading to loss of motorcycle control and an accident.

Warning

Use only DOT 4 specification brake fluid as listed in the General Information section of this manual. The use of brake fluids other than those DOT 4 fluids listed in the General Information section may reduce the efficiency of the braking system leading to loss of motorcycle control and an accident.

Failure to change the brake fluid at the interval specified in the scheduled maintenance chart may reduce braking efficiency resulting in loss of motorcycle control and 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 loss of motorcycle control and an accident.

Warning

Before installation, all internal brake components should be cleaned and lubricated with clean new DOT 4 brake fluid.

Never use solvents, petrol (gasoline), engine oil or any other petroleum distillate on internal brake components as this will cause deterioration of the hydraulic seals in the calipers and master cylinders.

A dangerous riding condition leading to loss of motorcycle control and an accident could result if this warning is ignored.

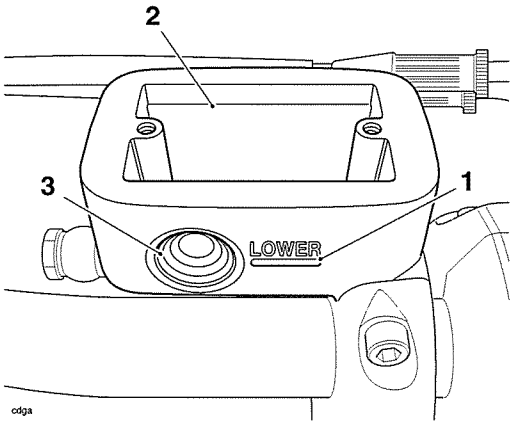
Brake Fluid Level Inspection

Warning

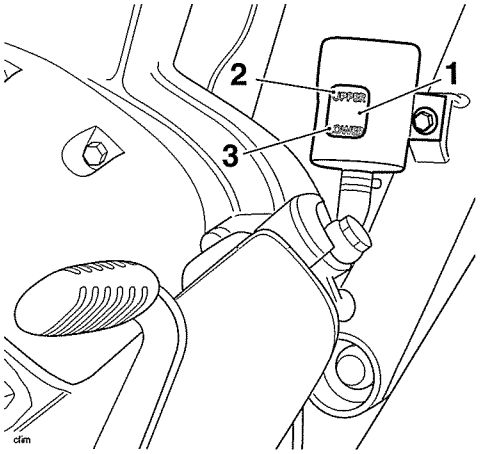
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

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).



1. Front brake fluid reservoir, lower level line
2. Upper level line
3. Fluid level window



1. Rear brake fluid reservoir, fluid level window
2. Upper level line
3. Lower level line

Changing Brake Fluid

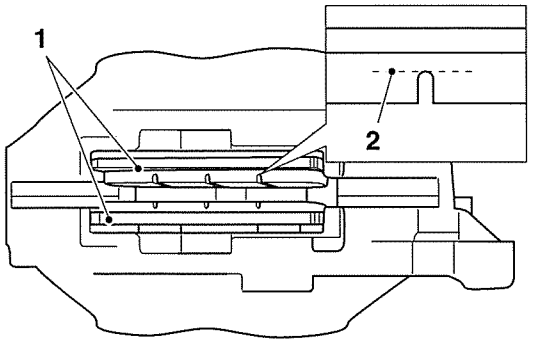
Brake fluid must be changed every two calendar years, irrespective of the mileage the motorcycle has covered in that time.

Brake Pads

Front and rear brake pad wear is automatically compensated for and has no effect on brake lever or pedal action.

Brake Wear Inspection

In accordance with the scheduled maintenance chart, inspect the brake pads for wear. The minimum thickness of lining material for any front or rear brake pad is 1.5 mm. If any pad has worn to the bottom of the groove in the pad centre, replace all the brake pads on that wheel.



1. Brake pads
2. Minimum thickness line

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 simultaneously. Replacing individual pads will reduce braking efficiency and may cause loss of motorcycle control and an accident.

Bleeding the Front Brakes, Renewing Brake Fluid

Note:

- **Models with ABS brakes: Refer to bleeding ABS brakes later in this section (see page *12-29*)**

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. Turn the handlebars to bring the fluid reservoir to a level position.
2. Remove the screws from the reservoir cover.

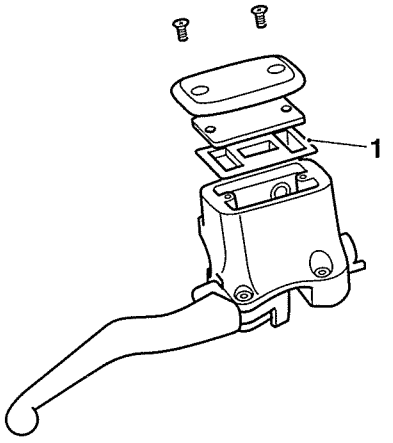
Warning

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 that 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 loss of motorcycle control and an accident could result if this warning is ignored.

Caution

To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

3. Carefully remove the reservoir cover taking care not to spill any fluid.
4. Check the condition of the reservoir sealing diaphragm. Replace if necessary.



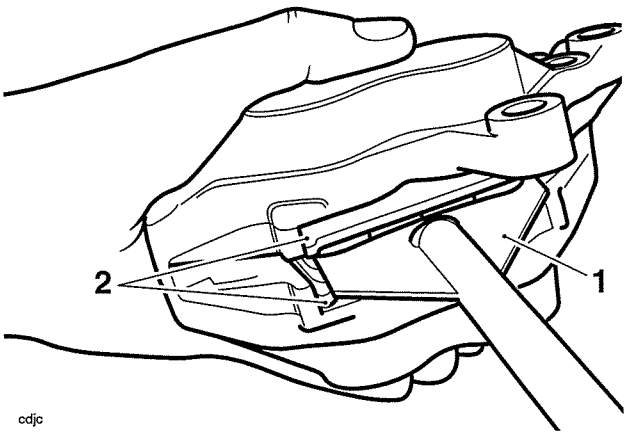
1. Diaphragm

5. Undo and remove the bolts securing the right hand front brake caliper to the fork and manoeuvre the caliper clear of the brake disc. Do not remove the brake hose connected to the caliper.

Warning

Do not allow the caliper to hang on the brake hose as this may damage the hose and could lead to an accident.

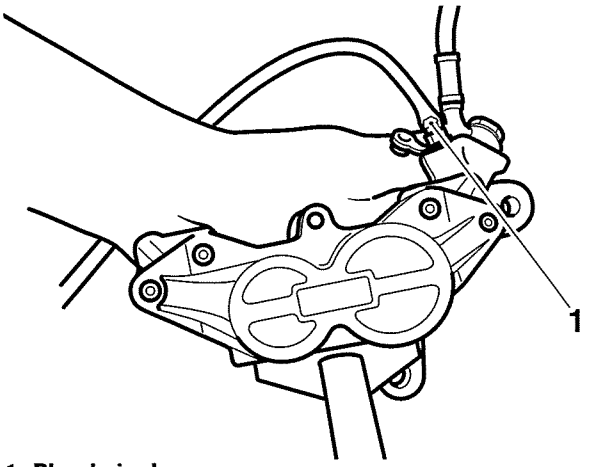
6. Obtain a suitable, wide, flat metal plate which is approximately 2 mm thick and place it between the brake pads. Pump the front brake lever a few times until the metal plate is held in place by the brake pads.



cdjc

1. Plate
2. Brake pads

7. Remove the rubber cap from the bleed nipple on the caliper.
8. Whilst supporting the front brake caliper, attach a transparent tube to the bleed nipple and place the other end of the tube in a suitable receptacle containing new brake fluid. Keep the tube end below the level of fluid.
9. Support the caliper so that the bleed nipple is uppermost.



1. Bleed nipple

10. 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 fluid level is allowed to fall below this mark, air may enter the system and the sequence of bleeding must be repeated.**

11. Get an assistant to slowly pull the brake lever to the handlebar.
12. With the lever held fully against the handlebar, close the bleed nipple. Once the bleed nipple is closed, release the brake lever.
13. Repeat steps 11 and 12 until no more air appears in the bleed tube.
14. When all air has been expelled from the system, hold the lever fully against the handlebar and close the bleed nipple.
15. Remove the transparent bleed tube.
16. Using the flat metal plate, gently push the brake pads apart to allow clearance for the brake disc when the caliper is refitted.

⚠ Caution

Brake fluid may be displaced as the caliper pistons are compressed. To prevent bodywork damage, ensure that the displaced fluid does not come into contact with any part of the bodywork or wheel.

17. Secure the caliper to the front fork using the original fixings. Tighten the fixings to **50 Nm**.
18. Refit the transparent bleed tube and repeat steps 12 to 13 until no more air appears in the bleed tube.

Note:

- **Maintain the brake fluid level between the upper and lower reservoir levels whilst bleeding is being carried out.**

19. Tighten the bleed nipple to **6 Nm**.
20. Remove the bleed tube.
21. Replace the bleed nipple cap.
22. Fill the reservoir to the upper level with new DOT 4 fluid.

⚠ Warning

Use only DOT 4 specification brake fluid as listed in the General Information section of this manual. The use of brake fluids other than those DOT 4 fluids listed in the General Information section may reduce the efficiency of the braking system leading to loss of motorcycle control and an accident.

Observe the brake fluid handling warnings given earlier in this section of the manual.

⚠ Caution

To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

23. Repeat the procedure for the left hand caliper.

24. When both calipers have been bled, ensure the brake lever operation has a firm resistive feel to it, does not feel spongy and that the lever cannot be pulled directly back to the handlebar. Take remedial action as necessary.
25. Refit the diaphragm and reservoir cover. Tighten the screws to **2 Nm**.

Warning

Always return the lever adjuster to the original setting as noted in paragraph 1. Operating the motorcycle with lever settings that are unfamiliar may lead to loss of control or an accident.

26. Check the operation of the front brake. Rectify as necessary.

Warning

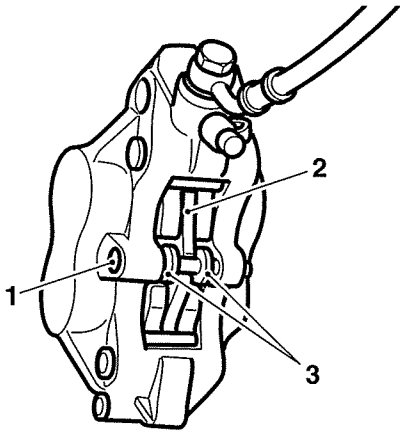
It is dangerous to operate the motorcycle with defective brakes; you must have your authorised Triumph dealer take remedial action before you attempt to ride the motorcycle again. Failure to take remedial action may reduce braking efficiency leading to loss of motorcycle control and an accident.

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.



cbza

1. Retaining pin
2. Anti-rattle spring
3. Brake pads

1. Remove the brake pad retaining pin after removing and discarding its split pin. Inspect the retaining pin for damage.
2. Remove the anti-rattle spring and inspect the spring for damage.

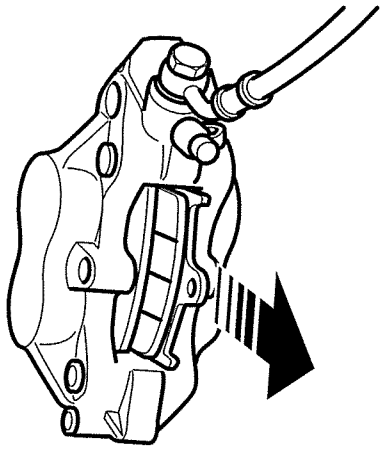
Caution

In the following operation, 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 that will not cause damage to the load bearing surfaces.

Brake fluid will be displaced as the caliper pistons are compressed. To prevent paint damage, ensure that the displaced fluid does not come into contact with any part of the bodywork.

3. Carefully push the brake pads apart to force the caliper pistons back and allow withdrawal of the pads.

4. Remove both brake pads and inspect for damage and wear beyond the service limit.



cbzb

Brake Pad Removal

Note:

- **Complete the assembly of the brake pads to one caliper (see assembly for details) before removing the pads from the other caliper.**

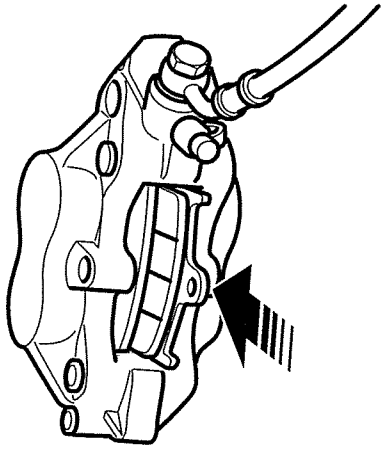
Installation

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 loss of motorcycle control and 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.



cbzc

Installing Brake 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 leading to loss of motorcycle control and an accident.

2. Lubricate the pad retaining pins using a minimum amount of proprietary high temperature brake grease.
3. Fit the anti-rattle spring over the pads and push down in the centre to allow the pad retaining pin to slide across the top of the spring.
4. Tighten the pad retaining pin to **18 Nm**, and secure with a new split pin.
5. Pump the brake lever to correctly position the caliper pistons.

Warning

Use only DOT 4 specification brake fluid as listed in the General Information section of this manual. The use of brake fluids other than those DOT 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 on page *1.4*.

Caution

To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

6. Check the front brake fluid level and top up as required with new DOT 4 fluid.
7. Check the operation of the front brake. Rectify as necessary.

Warning

It is dangerous to operate the motorcycle with defective brakes; you must have your authorised Triumph dealer take remedial action before you attempt to ride the motorcycle again. Failure to take remedial action may reduce braking efficiency leading to loss of motorcycle control and an accident.

Front Brake Caliper

Removal

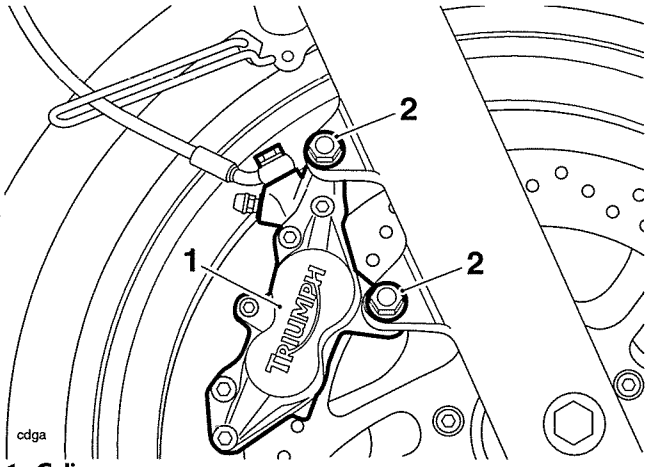
Warning

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 paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

1. Disconnect the brake hose at the caliper and place the free end of the hose in a suitable container to collect any displaced brake fluid.
2. Remove the brake pads (see page *12-11*).
3. Remove the two caliper bolts.

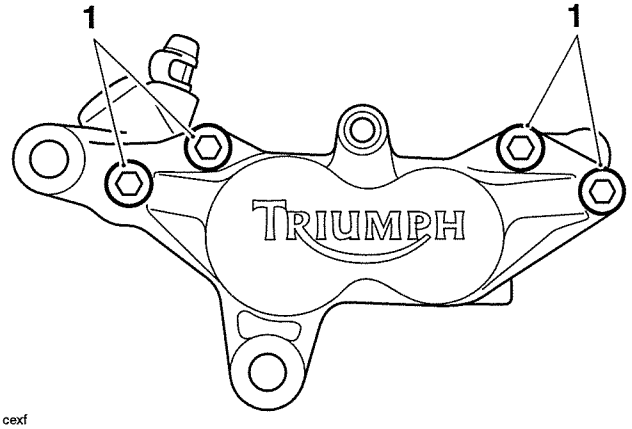


1. Caliper
2. Fixings

4. Manoeuvre the caliper clear of the disc, taking care not to damage the wheel.

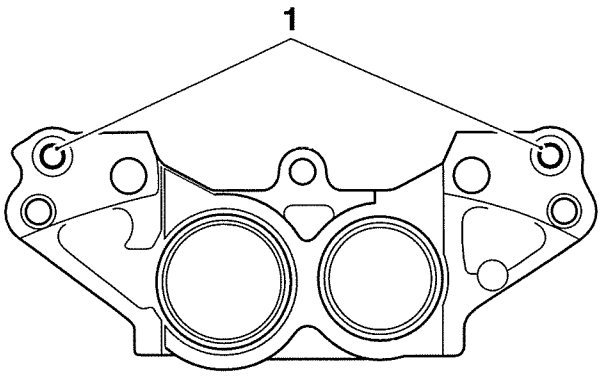
Disassembly

1. Remove the four bolts which secure the two halves of the brake caliper together. Discard the bolts.



1. Bolts

2. Carefully split the two halves of the caliper then remove and discard the two joint seals.



1. Joint seals

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 or brake fluid.

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.

3. Cover the caliper half with a clean, heavy cloth and, using compressed air, remove the pistons, one at a time.

Warning

Ensure the seal grooves in the caliper are not damaged during the removal of the seals. Damage to the seal grooves may allow brake fluid to leak past the seals resulting in a dangerous riding condition leading to loss of motorcycle control and an accident.

4. Remove the old piston seals and the dust seals then thoroughly clean and dry the caliper bores. Discard the old seals.

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

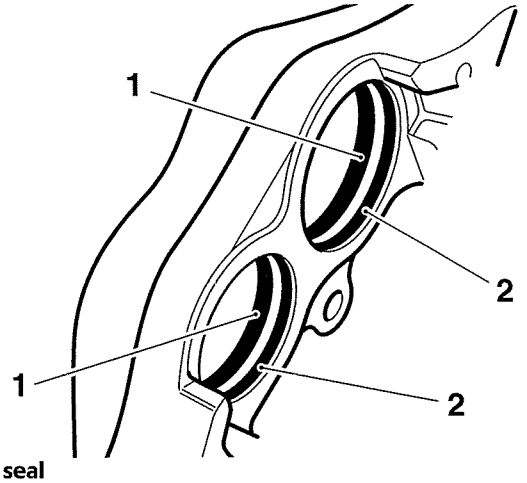
Warning

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 loss of motorcycle control and an accident could result from use of mineral grease.

Note:

- **The piston seals are slightly thicker than the dust seals.**

1. Fit new piston seals and dust seals to the caliper bores.



cdff1

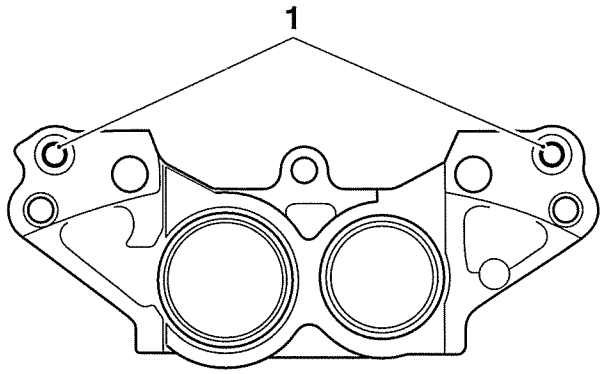
1. Piston seal
2. Dust seal

Warning

Ensure that the bores do not become scratched during piston removal and assembly. Ensure that the pistons remain square to their bores during fitment, as incorrect fitment can lead to seal and bore damage. A dangerous riding condition leading to loss of motorcycle control and an accident could result from damaged seals and/or bores.

2. Apply brake fluid to the outside of the caliper pistons and fluid seals.
3. Carefully push the pistons fully and squarely into the caliper bores by hand.
4. Once all seals and pistons have been fitted, carefully clean the mating faces of both sides of the caliper.

5. Fit new joint seals to the recess in one half of the caliper.



1. Joint seals

Warning

Ensure the mating surfaces of the caliper halves are clean and free from dust prior to assembly. Failure to ensure that the mating faces are clean and free from dust will result in a dangerous riding condition leading to loss of motorcycle control and an accident.

6. Apply a small drop of threadlocking solution (ThreeBond 1305 or equivalent) to the threads of the new caliper bolts and secure the two halves of the caliper together. Tighten the caliper bolts to **24 Nm**.

Installation

1. Position the caliper over the disc taking care not to damage the wheel.
2. Tighten the caliper bolts to **50 Nm**.
3. Refit the brake pads (see page *12-11*).
4. Connect the brake hose to the caliper incorporating new sealing washers on each side of the union.
5. Tighten the brake hose union bolt to **25 Nm**.

Warning

Use only DOT 4 specification brake fluid as listed in the General Information section of this manual. The use of brake fluids other than those DOT 4 fluids listed in the General Information section may reduce the efficiency of the braking system leading to loss of motorcycle control and an accident.

Observe the brake fluid handling warnings given earlier in this section of the manual.

Caution

To prevent body damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

6. Fill the master cylinder with new, DOT 4 brake fluid from a sealed container.
7. Bleed the front brake (see page *12-9*).
8. Check the operation of the front brake. Rectify as necessary.

Warning

It is dangerous to operate the motorcycle with defective brakes; you must have your authorised Triumph dealer take remedial action before you attempt to ride the motorcycle again. Failure to take remedial action may reduce 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.

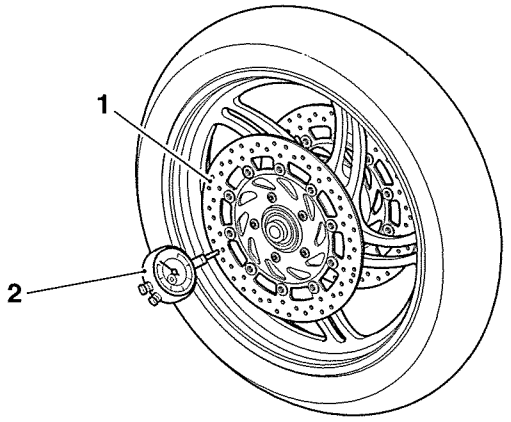
Wear

1. Replace any brake disc worn beyond the service limit or exceeding the disc run-out limit.

Front Disc Thickness	
Standard	5.0 mm
Service limit	4.5 mm

Disc Run-out	
Service limit	0.25 mm

Measure disc run out using an accurate dial gauge mounted on a surface plate.



1. Disc
2. Dial gauge

Removal

Warning

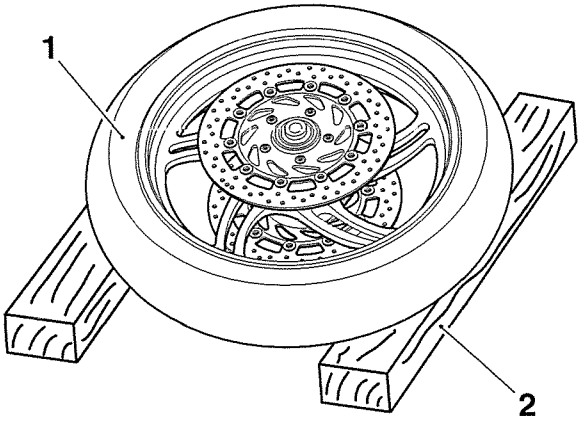
Do not renew front brake discs individually. Discs must always be renewed in pairs even if one of a pair is serviceable. A dangerous riding condition leading to loss of motorcycle control and an accident could result if this warning is ignored.

1. Remove the front wheel (see page *16-6*).
2. **Motorcycles with ABS:** Remove the ABS pulser ring (see page *12-31*).

Warning

To avoid wheel damage, always support the wheel as instructed below. A dangerous riding condition leading to loss of motorcycle control and an accident could result if this warning is ignored.

3. Support the wheel on blocks as illustrated.



1. Wheel
2. Support block

4. Remove and discard the disc securing bolts.

Note:

- **The discs are different on either side. Note the position and orientation of each disc before removal.**

5. Detach the disc.
6. Repeat operations 3, 4 and 5 to remove the disc on the opposite side.

Installation

1. Locate the first disc on the correct side of the wheel (offset of disc outwards) as noted during removal.
2. Fit new disc bolts and tighten to **22 Nm**.
3. Fit the remaining disc in the same way.
4. **Motorcycles with ABS:** Refit the ABS pulser ring (see page *12-28*)
5. Refit the wheel (see page *16-7*).
6. Check the operation of the front brake. Rectify as necessary.

Warning

It is dangerous to operate the motorcycle with defective brakes; you must have your authorised Triumph dealer take remedial action before you attempt to ride the motorcycle again. Failure to take remedial action may reduce braking efficiency leading to loss of motorcycle control and an accident.

Front Brake Master Cylinder

Removal

Warning

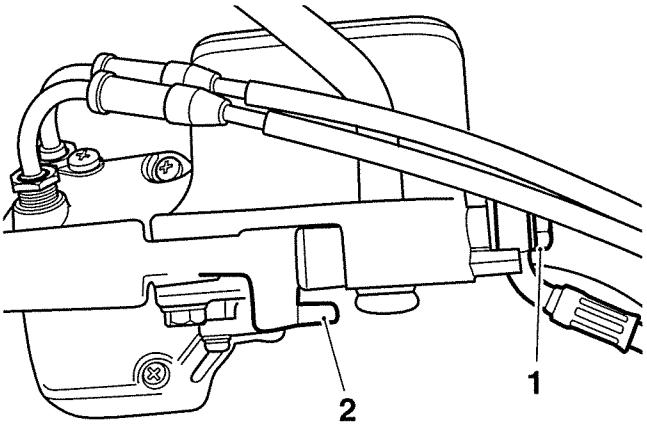
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery negative (black) lead first.

Caution

To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

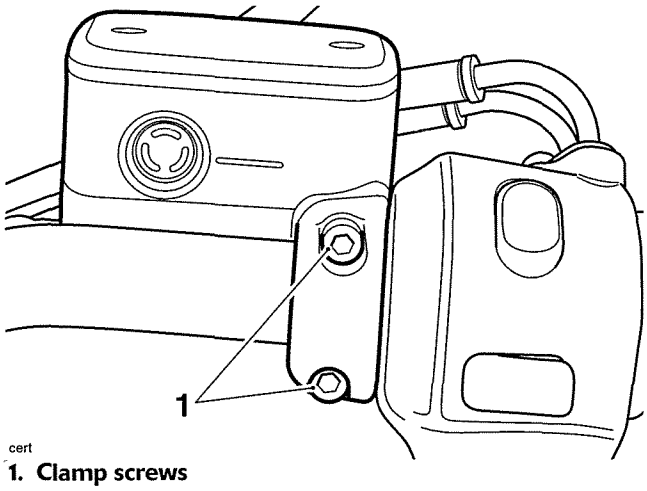
3. To drain the fluid from the master cylinder, attach a tube to the right hand caliper bleed nipple, slacken the nipple and operate the brake lever until all fluid has been expelled into a suitable container.
4. Disconnect the brake hose and brake light switch connections to the master cylinder.



cers

1. Brake hose connection
2. Brake light switch connection

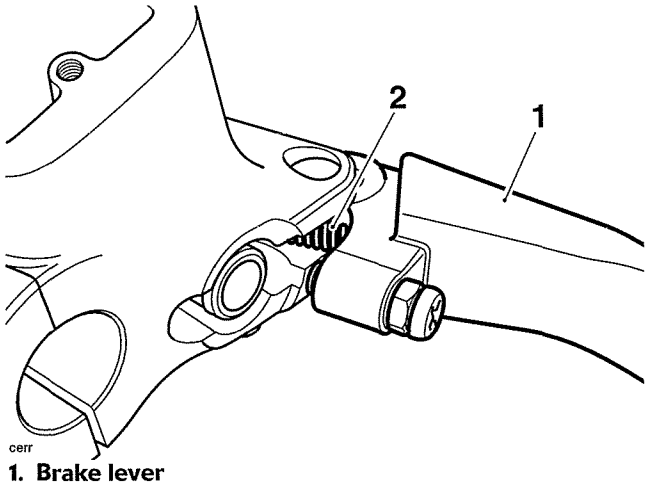
5. Release the clamp screws from the handlebar to remove the master cylinder.



cert
1. Clamp screws

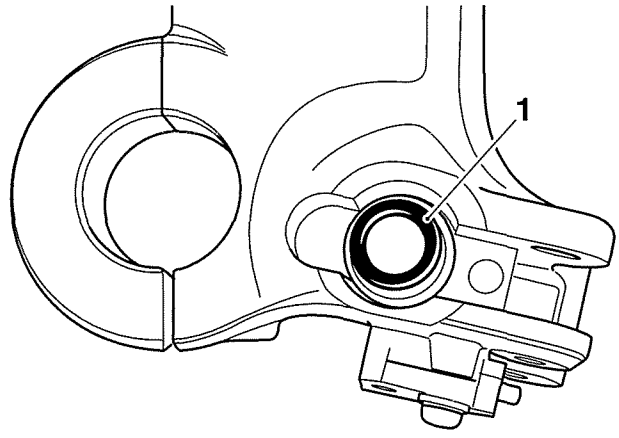
Disassembly

1. Remove the pivot locknut and bolt securing the brake lever to the master cylinder.
2. Remove the brake lever and spring.



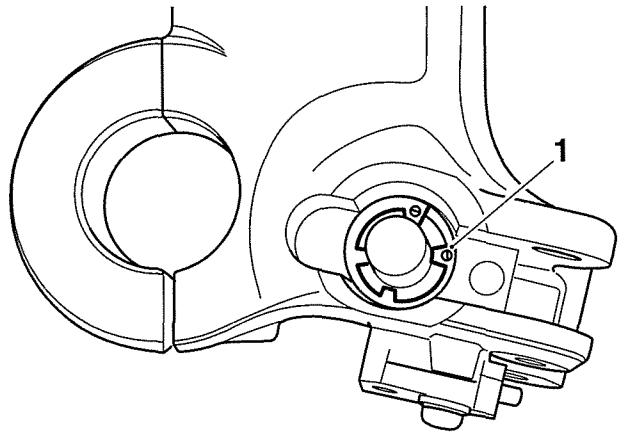
cerr
1. Brake lever
2. Spring

3. Detach the dust cover from the lever end of the cylinder.



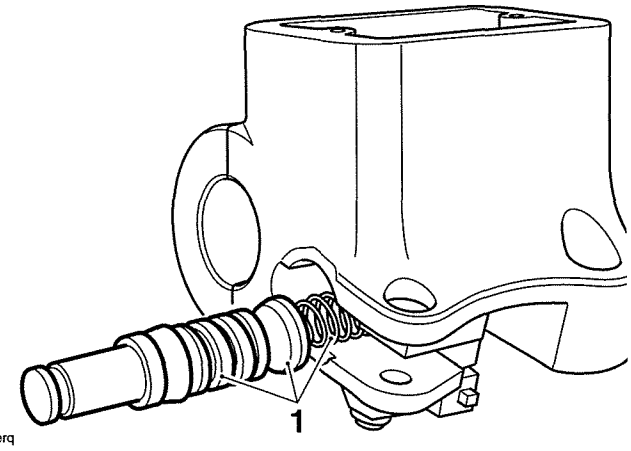
ceqx
1. Dust cover

4. Remove the circlip from beneath the dust cover.



ceax
1. Circlip

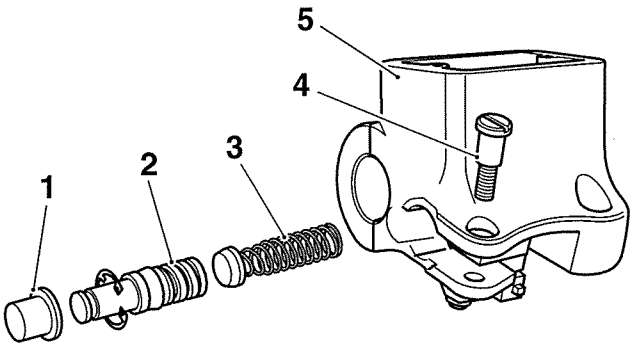
5. Remove the piston set from the master cylinder bore noting the relative position of the seals and piston components.



cerq
1. Piston Set

Inspection

1. Check the following for wear, damage, cracks or deterioration:



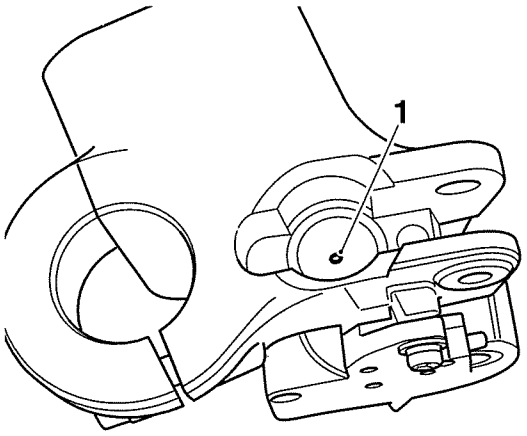
ceru

1. Pivot bolt
2. Dust cover
3. Piston
4. Spring
5. Cylinder bore

Note:

- **Always renew the piston and seal set if the cylinder is dismantled.**

2. Check that the relief and supply ports on the cylinder are not blocked.



1. Ports

Assembly

Warning

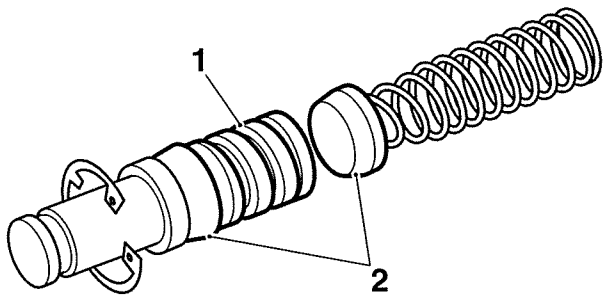
Never use mineral based grease in any part of the braking system or in any area where contact with the braking system is possible. Mineral based grease will damage the hydraulic seals in the calipers and master cylinders. A dangerous riding condition leading to loss of motorcycle control and an accident 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 loss of motorcycle control and 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.



ceqw

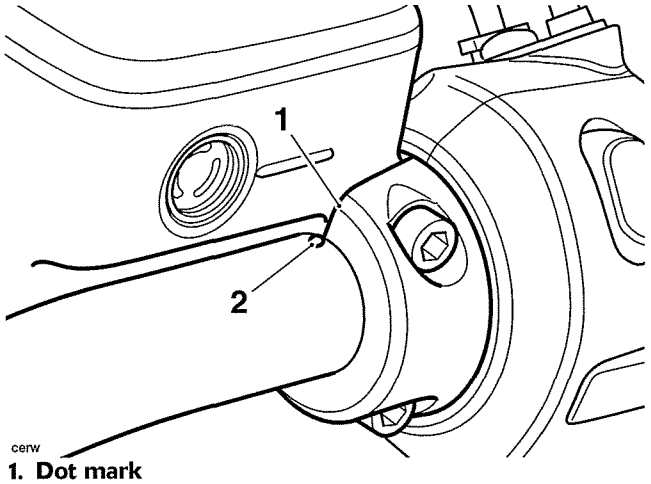
1. Piston
2. Seals (in correct orientation)

3. Refit the master cylinder dust cover.

Installation

1. Locate the master cylinder to the handlebars.
2. Position the clamp to the rear side of the handlebars.

3. Align the master cylinder/clamp split line with the dot mark on the upper side of the handlebar.



1. Dot mark
2. Split line

4. Tighten the clamp bolts, upper first and then the lower to **12 Nm.**
5. Connect the brake light switch.
6. Position the brake lever and spring ensuring that the pivot boss is correctly aligned to the push rod.
7. Fit and tighten the pivot bolt to **1 Nm**, and the locknut to **6 Nm**.
8. Connect the brake hose to the master cylinder incorporating new sealing washers to each side of the union. Tighten the union bolt to **25 Nm.**

⚠ Warning

Use only DOT 4 specification brake fluid as listed in the general information section of this manual. The use of brake fluids other than those DOT 4 fluids listed in the general information section may reduce the efficiency of the braking system leading to loss of motorcycle control and an accident.

Observe the brake fluid handling warnings given earlier in this section of the manual.

⚠ Caution

To prevent body damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

9. Fill and bleed the front brakes (see page *12-9*).
10. Examine the system for correct operation and fluid leaks. Rectify as necessary.
11. Check the operation of the front brake. Rectify as necessary.

⚠ Warning

It is dangerous to operate the motorcycle with defective brakes; you must have your authorised Triumph dealer take remedial action before you attempt to ride the motorcycle again. Failure to take remedial action may reduce braking efficiency leading to loss of motorcycle control and an accident.

12. Reconnect the battery, positive (identified with red tape) lead first.
13. Refit the rider's seat (see page *17-9*).

Bleeding the Rear Brakes, Renewing Brake Fluid

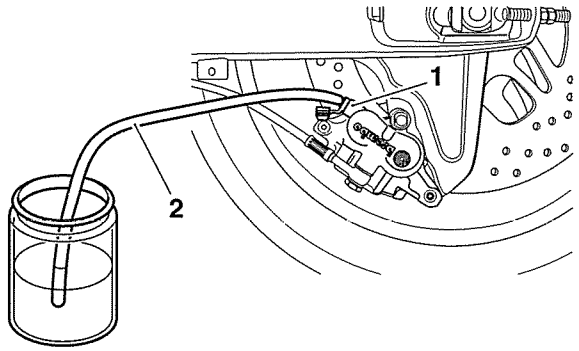
Note:

- **Models with ABS brakes: Refer to bleeding ABS brakes later in this section (see page *12-32*).**

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 cap from the rear bleed nipple.
2. Attach a transparent tube to the bleed nipple.



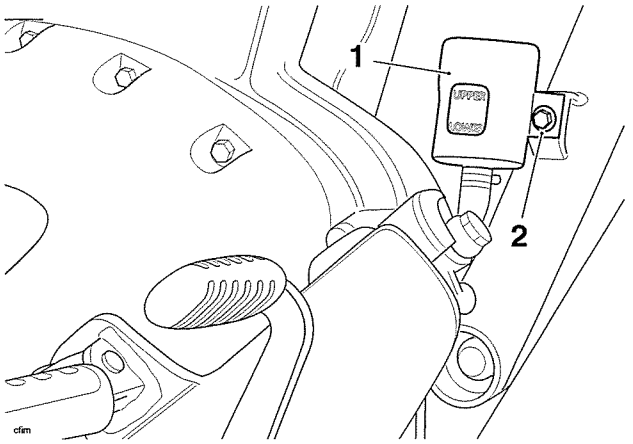
1. Bleed nipple
2. Bleed tube

3. Place the other end of the tube in a suitable receptacle containing new brake fluid.

Caution

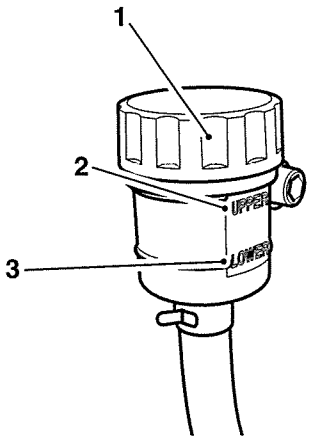
To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

4. Remove the fixing and remove the reservoir cover, noting that the reservoir is secured on the same fixing. Temporarily refit the reservoir.



1. Reservoir cover
2. Fixing

5. Remove the rear brake reservoir cap taking care not to spill any fluid.



1. Reservoir cap
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 that 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 loss of motorcycle control and an accident could result if this warning is ignored.

Caution

To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

6. Check the condition of the sealing diaphragm. Replace the diaphragm as necessary.
7. Release the bleed nipple.

Note:

- **During bleeding, do not allow the fluid level to fall below the lower level mark in the reservoir. If the level is allowed to fall below this mark, air may enter the system and the sequence of bleeding must be repeated.**

8. Slowly depress the brake pedal and, holding the pedal fully down, close the bleed nipple. Repeat steps 7 and 8 until no more air appears in the bleed tube, maintaining the brake fluid level between the upper and lower reservoir levels whilst bleeding is being carried out.
9. When all air has been expelled from the system, hold down the brake pedal and close the bleed nipple. Tighten the nipple to **8 Nm.**
10. Fill the reservoir to the maximum level with new DOT 4 fluid.

Warning

Use only DOT 4 specification brake fluid as listed in the general information section of this manual. The use of brake fluids other than those DOT 4 fluids listed in the general information section may reduce the efficiency of the braking system leading to loss of motorcycle control and an accident. Observe the brake fluid handling warnings given earlier in this section of the manual.

Caution

To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

11. Fit the reservoir cap and diaphragm.
12. Remove the fixing and support the reservoir. Refit the reservoir cover, and tighten the fixings to **5 Nm.**
13. Remove the bleed tube from the nipple.
14. Replace the bleed nipple dust cap.
15. Ensure the brake pedal operation has a firm resistive feel to it, does not feel spongy and that the pedal cannot be depressed through its full range of travel. Rectify as necessary.
16. Check the operation of the rear brake. Rectify as necessary.

Warning

It is dangerous to operate the motorcycle with defective brakes; you must have your authorised Triumph dealer take remedial action before you attempt to ride the motorcycle again. Failure to take remedial action may reduce braking efficiency leading to loss of motorcycle control and an accident.

Rear Brake Pads, Rear Brake Caliper

Note:

- **The seals and pistons of the rear caliper are not serviceable items. Should a fault occur in the caliper, the complete caliper must be renewed.**

Removal

Warning

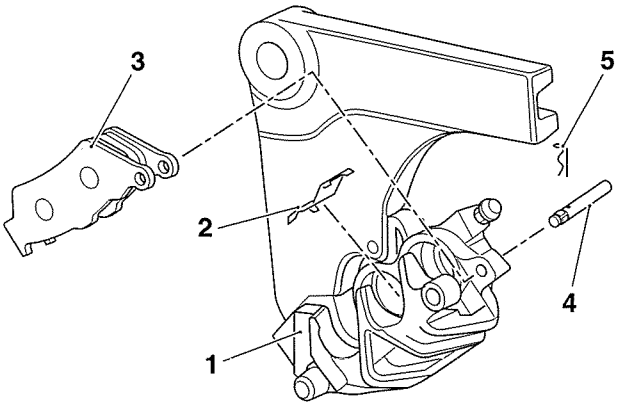
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Raise and support the rear of the motorcycle.
2. Remove the rear wheel (see page *16-8*).
3. If removing the caliper completely, disconnect the brake hose at the caliper and place the free end of the hose in a suitable container to collect any displaced brake fluid. If only the brake pads are to be renewed, leave the hose attached.
4. **Motorcycles with ABS:** If removing the caliper completely, remove the ABS wheel speed sensor (see page *12-33*).

Warning

Do not allow the caliper to hang on the brake hose as this may damage the hose and could lead to reduced brake efficiency causing loss of motorcycle control and an accident.

5. Remove the R-clip from the pad retaining pin, and carefully drift the pin out of the caliper using a suitable pin punch.
6. Remove the brake pads and inspect for damage or wear beyond the service limit.
7. Remove the anti-rattle spring and inspect for damage.



1. **Rear caliper and carrier assembly**
2. **Anti-rattle spring**
3. **Brake pads**
4. **Pad retaining pin**
5. **R-clip**

Installation

Warning

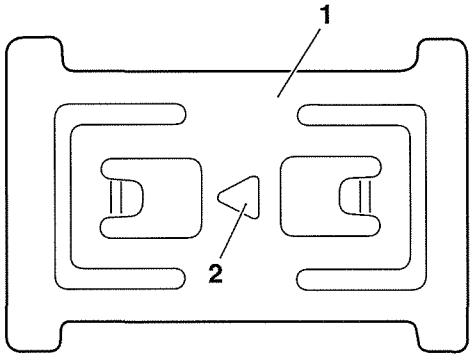
Never use mineral based grease in any part of the braking system or in any area where contact with the braking system is possible. Mineral based grease will damage the hydraulic seals in the calipers and master cylinders. Damage caused by mineral based grease may reduce braking efficiency resulting in loss of motorcycle control and an accident.

Caution

Brake fluid will be displaced as the caliper pistons are compressed. To prevent body damage, ensure that the displaced fluid does not come into contact with any part of the bodywork or the rear wheel.

1. If fitting new pads, use hand pressure to compress the caliper pistons fully into their bores.

2. Install the anti-rattle spring into the caliper, ensuring the direction arrow on the spring points in the direction of disc rotation.



1. Anti-rattle spring
2. Direction arrow

3. Renew the brake pads as a pair or, if both pads are in a serviceable condition, clean the pad grooves before fitting them.

Warning

Do not apply more than a minimum coating of grease to the pad retaining pins. Excess grease may contaminate the brake pads, hydraulic seals and discs causing reduced braking efficiency and an accident.

4. Inspect the R-clip and pad retaining pin for damage. Renew as necessary.
5. Lubricate the pad retaining pin using a minimum amount of proprietary high temperature brake grease. Refit the pin and retain with the R-clip. Ensure the bent portion of the R-clip is facing away from the brake disc.
6. Refit the rear wheel (see page *16-8*).
7. **Motorcycles with ABS:** If removed, refit the ABS wheel speed sensor (see page *12-28*).
8. If previously disconnected, incorporating new washers to each side of the union, fit and tighten the brake union bolt to **25 Nm.**
9. If the brake hose has been disconnected, bleed the rear brake (see page *12-21*).
10. Pump the brake pedal to correctly position the caliper pistons.

Warning

Use only DOT 4 specification brake fluid as listed in the general information section of this manual. The use of brake fluids other than those DOT 4 fluids listed in the general information section may reduce the efficiency of the braking system leading to loss of motorcycle control and an accident.

Observe the brake fluid handling warnings given earlier in this section of the manual.

11. Check the brake fluid level and top-up as required with new DOT 4 fluid.
12. Check the operation of the rear brake. Rectify as necessary.

Warning

It is dangerous to operate the motorcycle with defective brakes; you must have your authorised Triumph dealer take remedial action before you attempt to ride the motorcycle again. Failure to take remedial action may reduce braking efficiency leading to loss of motorcycle control and an accident.

Rear Brake Disc

Wear

Warning

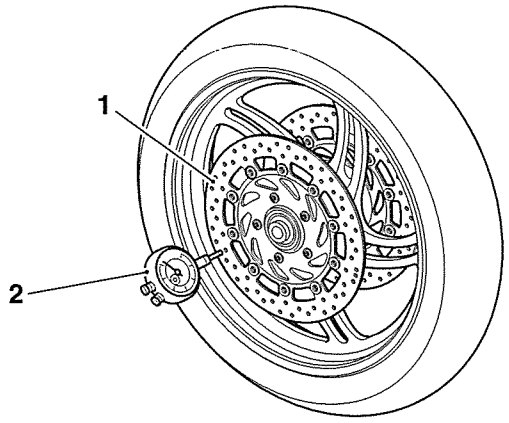
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Replace any brake disc worn beyond the service limit or exceeding the disc run-out limit.

Rear Disc Thickness	
Standard	6.0 mm
Service limit	5.5 mm

Disc Run-out	
Service limit	0.25 mm

Measure disc run-out using an accurate dial gauge mounted on a surface plate.



1. Disc (front wheel shown)
2. Dial gauge

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 rear wheel (see page *16-8*).
2. Support the wheel on blocks to avoid damage to the wheel centre.
3. **Motorcycles with ABS:** Remove the ABS pulser ring (see page *12-33*).
4. Remove and discard the disc securing bolts. Noting its orientation, detach the disc.

Installation

1. Locate the disc to the wheel as noted during removal.
2. Fit new securing bolts and tighten to **22 Nm.**
3. Refit the rear wheel (see page *16-8*).
4. Check the operation of the rear brake. Rectify as necessary.

Warning

It is dangerous to operate the motorcycle with defective brakes; you must have your authorised Triumph dealer take remedial action before you attempt to ride the motorcycle again. Failure to take remedial action may reduce braking efficiency leading to loss of motorcycle control and an accident.

Rear Master Cylinder

Removal

Warning

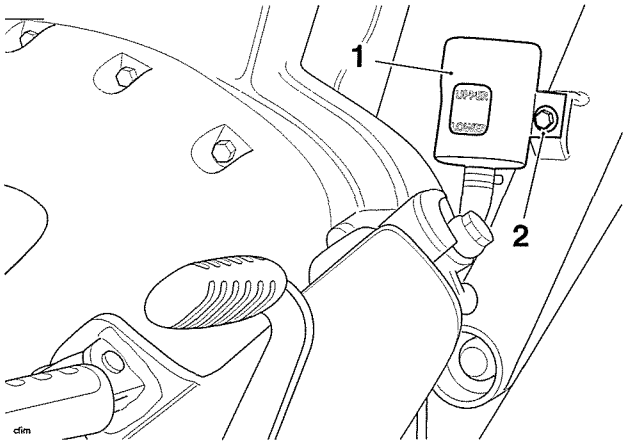
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.

Caution

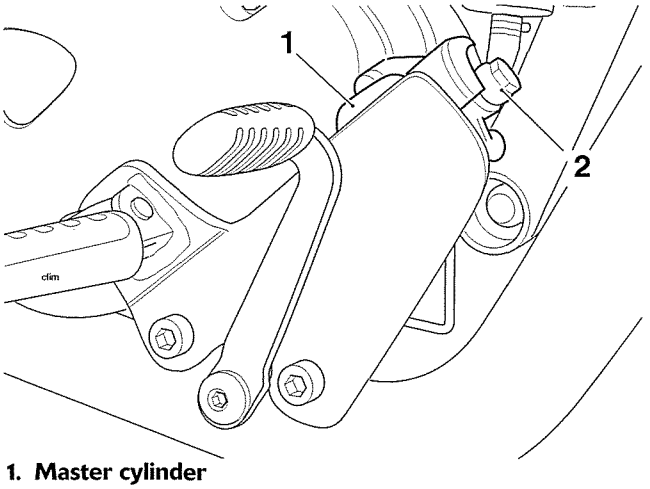
To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

3. Drain the fluid from the master cylinder by bleeding the system at the rear caliper until all fluid has been expelled.
4. Remove the fixing and remove the reservoir cover and rear brake reservoir.



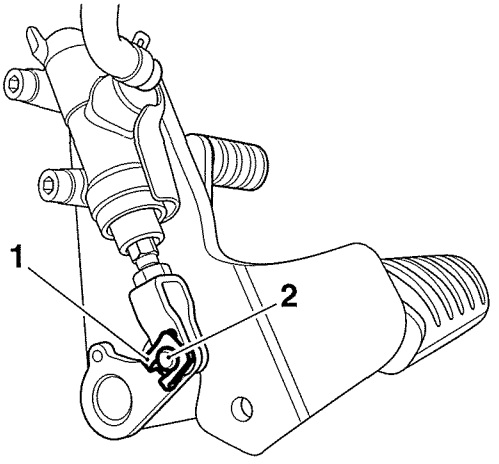
1. Reservoir cover
2. Fixing

5. Disconnect the hard-line from the rear master cylinder (discard the sealing washers).



1. Master cylinder
2. Hard-line union bolt

6. Release the bolt securing the brake pedal to the engine bracket.
7. Release the bolts securing the control plate assembly to the engine bracket.
8. Noting the position of the brake pedal return spring, detach the control plate assembly, brake pedal, reservoir and master cylinder as an assembly. Collect the brake pedal return spring.
9. Remove the clip from the brake pedal clevis pin. Remove the clevis pin.

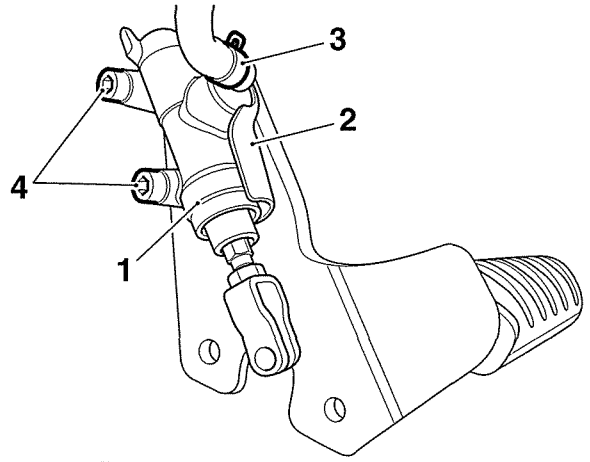


cfmq

1. Clip
2. Clevis pin

10. Remove the brake pedal from the master cylinder.
11. Release the clip, and noting its orientation, remove the brake fluid reservoir and hose from the master cylinder.

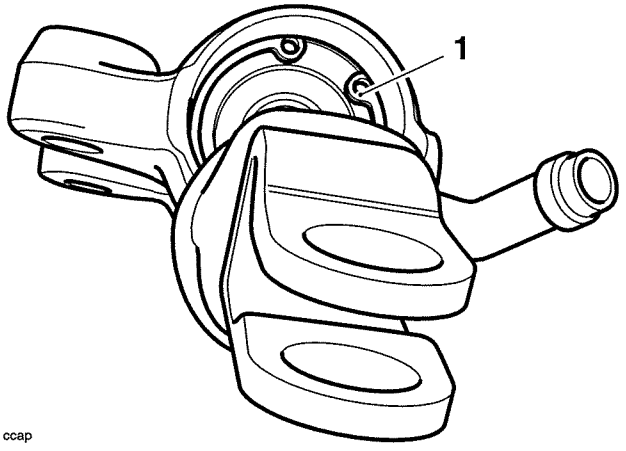
12. Release the bolts securing the master cylinder to the control plate assembly. Remove the master cylinder. and its cover.



cfmq
1. Master cylinder
2. Master cylinder cover
3. Hose clip
4. Master cylinder bolts

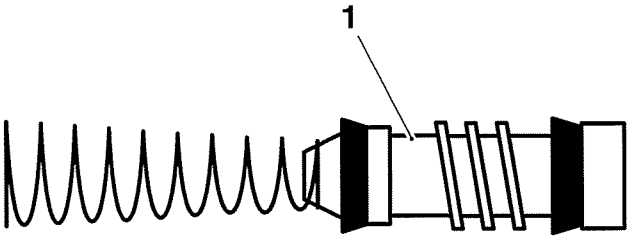
Disassembly

1. Remove the dust cover from the cylinder and pushrod.
2. Remove the circlip retaining the pushrod to the cylinder.



ccap
1. Circlip

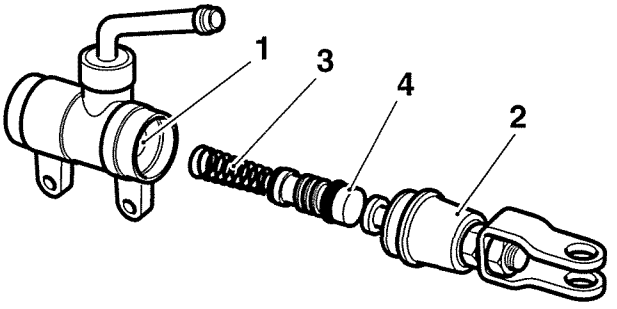
3. Remove the pushrod and piston set from the master cylinder bore noting the relative position of the seals and piston components.



ccaq
1. Piston

Inspection

1. Check the following for wear, damage, cracks or deterioration:



ccad
1. Cylinder bore
2. Dust cover
3. Spring
4. Piston

2. Examine the pushrod for distortion and other damage. Replace as necessary.

Assembly

Warning

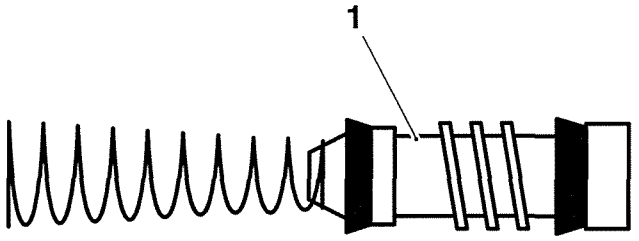
Never use mineral based grease in any part of the braking system or in any area where contact with the braking system is possible. Mineral based grease will damage the hydraulic seals in the calipers and master cylinders. A dangerous riding condition leading to loss of motorcycle control and an accident could result from use of mineral grease.

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 loss of motorcycle control and an accident could result from incorrect assembly of the master cylinder.

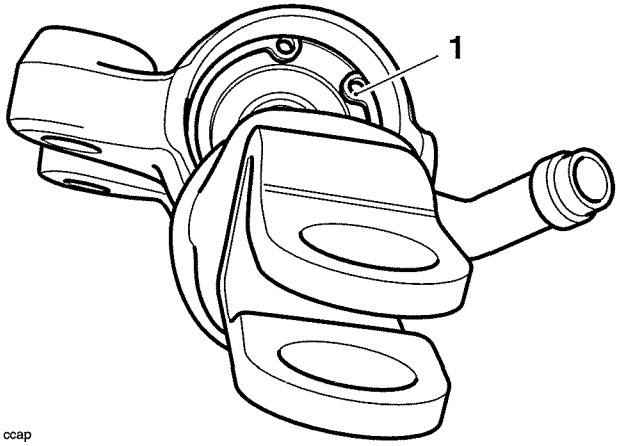
2. Fit the new piston and seal set into the master cylinder.



ccan
1. Piston
2. Seals (in correct orientation)

3. Apply a small amount of brake grease to the pushrod.

4. Install the pushrod in the master cylinder, compress the spring and retain the assembly with a new circlip.

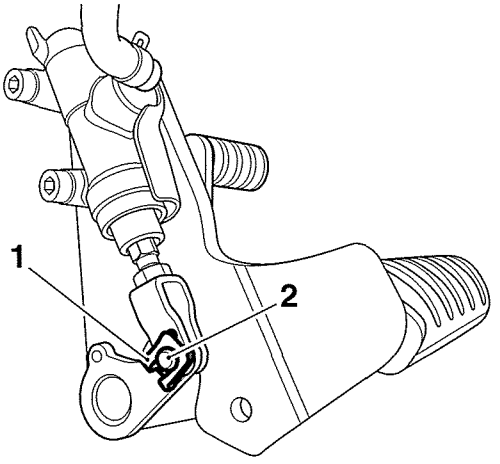


ccap
1. Pushrod
2. Circlip

5. Refit the master cylinder boot.

Installation

1. Position the master cylinder and its cover to the control plate assembly.
2. Secure with two new bolts, tightening to **27 Nm.**
3. Refit the brake fluid reservoir and its hose to the master cylinder, and position as noted on disassembly. Secure with the clip.
4. Position the brake pedal to the pushrod, engage the clevis and retain it with the clip. Ensure the clip is fitted as shown below.



cfmq
1. Clip
2. Clevis pin

5. Lubricate the brake pedal shaft with a thin smear of grease conforming to NLGI 2 specification (we recommend Mobil HP222).
6. Position the brake pedal return spring to the brake pedal shaft as noted during removal.

7. Align the brake pedal to its shaft and refit the master cylinder and control plate assembly to the engine bracket. Ensure the end of brake pedal return spring engages in the hole in the brake pedal.
   Tighten the control plate fixings to fixings to **50 Nm**.
   Tighten the brake pedal fixing to **22 Nm**.
8. Refit the brake fluid reservoir to the frame, position the cover and secure with the fixing. Tighten to **5 Nm**.
9. Incorporating new washers to either side of the union, fit the hard-line. Tighten the union bolt to **25 Nm.**

Warning

Use only DOT 4 specification brake fluid as listed in the general information section of this manual. The use of brake fluids other than those DOT 4 fluids listed in the general information section may reduce the efficiency of the braking system leading to loss of motorcycle control and an accident. Observe the brake fluid handling warnings given earlier in this section of the manual.

10. Fill and bleed the rear brake system (see page *12-21*).
11. Reconnect the battery, positive (identified with red tape) lead first.
12. Refit the rider's seat (see page *17-9*).
13. Check the operation of the rear brake. Rectify as necessary.

Warning

It is dangerous to operate the motorcycle with defective brakes; you must have your authorised Triumph dealer take remedial action before you attempt to ride the motorcycle again. Failure to take remedial action may reduce braking efficiency leading to loss of motorcycle control and an accident.

Bleeding the Front Brakes, Renewing Brake Fluid, Motorcycles with ABS

1. Complete the brake bleed procedure as for models without ABS brakes (see page *12-9*). Do not remove the bleed tube from the bleed nipple.
2. Connect the Triumph diagnostic tool (see page *12-42*).
3. Follow the on screen menu to ABS Diagnostics. From the menu, select **BLEED SYSTEM** (see page *12-43*).

Note:

- **On pressing the Start button, the diagnostic software will send a command to the ABS ECM to open the 2nd circuit solenoid.**
- **When the ABS modulator 2nd circuit is activated by the bleed command, the front brake lever travel will increase as the ABS modulator solenoids are opened and will then decrease as the solenoids are automatically closed.**
- **Pressure must be applied to the front brake lever before operating the bleed sequence on the diagnostic tool. An assistant will be required to open the bleed nipple while pressure is applied to the brake lever.**

4. Apply pressure to the front brake lever, press the **Start** button to activate the bleed sequence on the diagnostic tool, and with assistance, release one of the bleed nipples.
5. Get an assistant to slowly pull the brake lever to the handlebar.
6. With the lever held fully against the handlebar, close the bleed nipple. Once the bleed nipple is closed, release the brake lever.
7. Repeat steps 5 and 6 until no more air appears in the bleed tube, maintaining the brake fluid level between the upper and lower reservoir levels whilst bleeding is being carried out.

8. The bleed sequence will run for a maximum of 90 seconds. Press the **Stop** button to end the bleed sequence at any time. Once the bleed sequence has completed the diagnostic tool will display a message **ABS system bleed complete**.

⚠ Caution

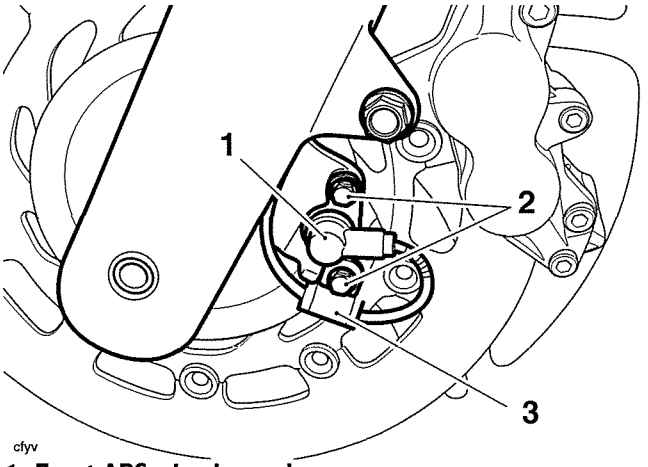
The ABS module must be allowed to cool between bleeding operations. Always allow the ABS module to cool for 5 minutes before starting the bleed procedure again. Failure to follow this instruction may result in damage to the ABS module.

9. Repeat the above procedure as necessary until all air is expelled from the system.
10. When all air has been expelled from the system, apply pressure to the brake lever and close the bleed nipple. Tighten the nipple to **6 Nm**.
11. Repeat the brake bleed procedure as for models without ABS brakes (see page *12-9*).

Front ABS Wheel Speed Sensor

Removal

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Remove the headlight and clamp from the headlight body (see page *18-14*).
4. Disconnect the wheel speed sensor multiplug, located inside the headlight.
5. Release the wheel speed sensor harness from the brake hose clips.
6. Release the bolts securing the wheel speed sensor to the fork leg, and remove the sensor, along with the P-clip.



cfyv

1. Front ABS wheel speed sensor
2. Fixings
3. P-clip

Installation

1. Position the wheel speed sensor to the fork leg and tighten the fixings to **7 Nm**.
2. Secure the wheel speed sensor harness to the fork leg and tighten the fixing to **9 Nm**.
3. Secure the wheel speed sensor harness to the brake hose clips.
4. Connect the wheel speed sensor multiplug.
5. Refit the headlight and clamp to the headlight body (see page *18-14*).
6. Reconnect the battery, positive (identified with red tape) lead first.
7. Fit the rider's seat (see page *17-9*).

Front ABS Pulser Ring

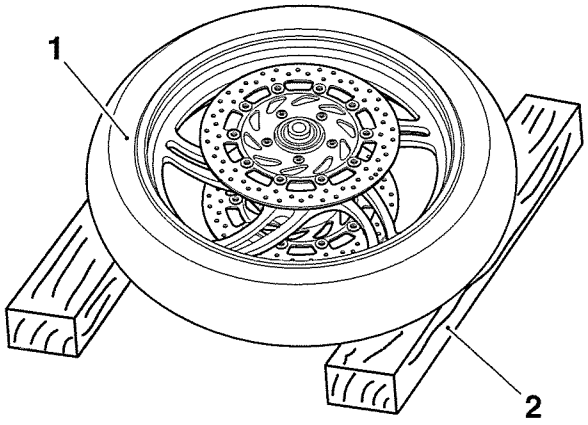
Removal

1. Remove the front wheel (see page *16-6*).

Warning

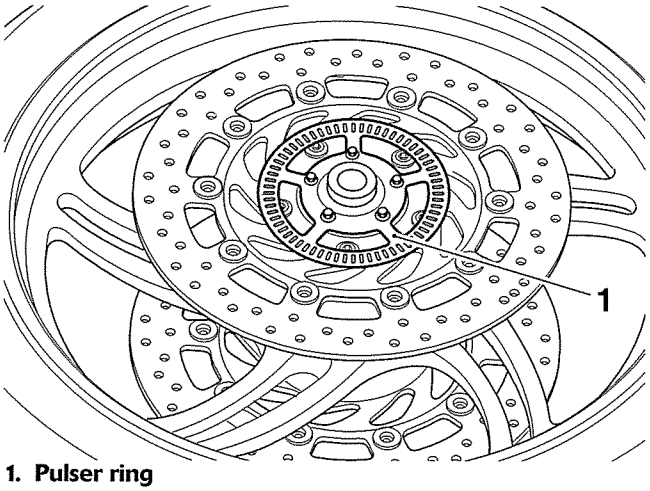
Damage to the wheel centre could cause misalignment of the wheel when refitted. A dangerous riding condition leading to an accident could result if this warning is ignored.

2. Support the wheel on blocks as illustrated to avoid damage to the wheel centre.



1. Wheel
2. Support block

3. Remove the five bolts to detach the pulser ring.



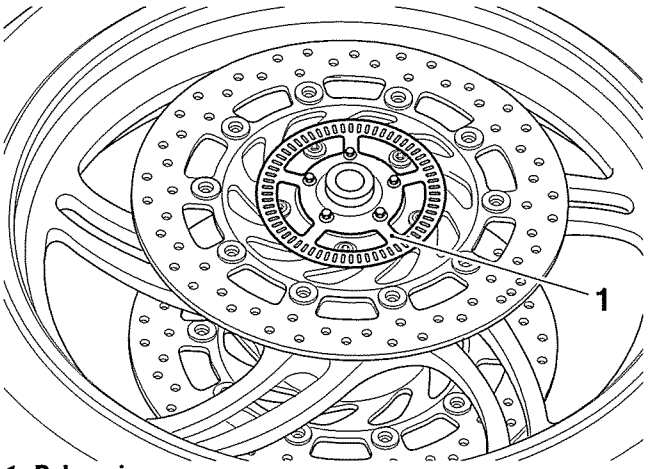
1. Pulser ring

Inspection

1. Check the pulser ring for damaged, missing or cracked teeth or distortion. Renew the pulser ring as necessary.

Installation

1. Locate the pulser ring on the wheel. Tighten the fixings to **5 Nm.**



1. Pulser ring

2. Refit the front wheel (see page *16-7*).

Bleeding the Rear Brakes, Renewing Brake Fluid, Motorcycles with ABS

1. Complete the brake bleed procedure as for models without ABS brakes (see page *12-21*).
2. Connect the Triumph diagnostic tool (see page *12-42*).
3. Follow the on screen menu to ABS Diagnostics. From the menu, select **BLEED SYSTEM** (see page *12-43*).

Note:

- **On pressing the Start button, the diagnostic software will send a command to the ABS ECM to open the 2nd circuit solenoid.**
- **When the ABS modulator 2nd circuit is activated by the bleed command, the rear brake pedal travel will increase as the ABS modulator solenoids are opened and will then decrease as the solenoids are automatically closed.**
- **Pressure must be applied to the rear brake pedal before operating the bleed sequence on the diagnostic tool. An assistant will be required to open the bleed nipple while pressure is applied to the brake pedal.**

4. Apply pressure to the rear brake pedal, press the **Start** button to activate the bleed sequence on the diagnostic tool, and with assistance, release the bleed nipple.
5. Slowly depress the brake pedal and, holding the pedal fully down, close the bleed nipple. Repeat until no more air appears in the bleed tube, maintaining the brake fluid level between the upper and lower reservoir levels whilst bleeding is being carried out.
6. When all air has been expelled from the system, hold down the brake pedal and close the bleed nipple. Tighten the nipple to **8 Nm.**
7. The bleed sequence will run for a maximum of 90 seconds. Press the **Stop** button to end the bleed sequence at any time. Once the bleed sequence has completed the diagnostic tool will display a message **ABS system bleed complete**.

⚠ Caution

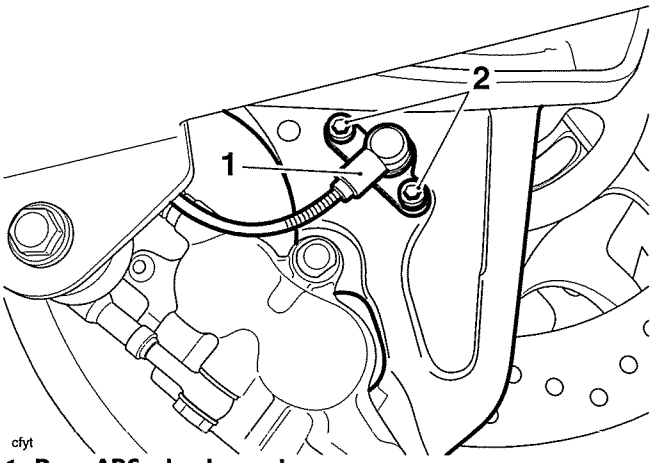
The ABS module must be allowed to cool between bleeding operations. Always allow the ABS module to cool for 5 minutes before starting the bleed procedure again. Failure to follow this instruction may result in damage to the ABS module.

8. Repeat the above procedure as necessary until all air is expelled from the system.
9. When all air has been expelled from the system, hold down the brake pedal and close the bleed nipple. Tighten the nipple to **8 Nm**.
10. Repeat the brake bleed procedure as for models without ABS brakes (see page *12-21*).

Rear ABS Wheel Speed Sensor

Removal

1. Remove the seat (see page *16-9*).
2. Disconnect the battery, negative (black) lead first.
3. Remove the left hand side panel (see page *16-10*).
4. Disconnect the wheel speed sensor multiplug.
5. Release the wheel speed sensor harness from its retaining P-clips.
6. Release the bolts securing the wheel speed sensor to the rear brake caliper carrier, and remove the sensor.



cfyt

1. Rear ABS wheel speed sensor
2. Fixings

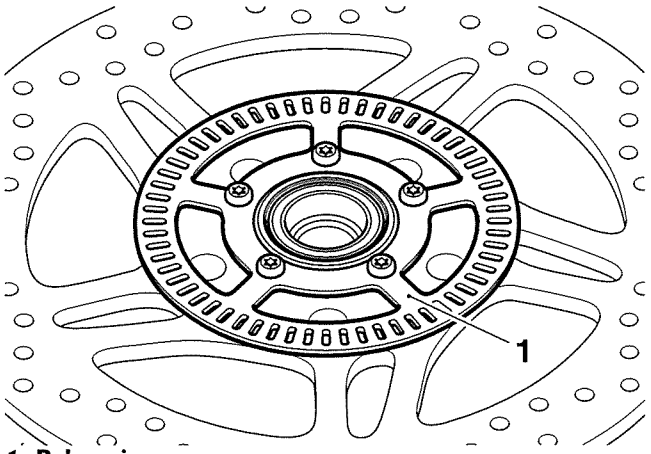
Installation

1. Position the wheel speed sensor to the brake caliper carrier and tighten the fixings to **9 Nm.**
2. Secure the wheel speed sensor harness to its retaining clips. Tighten the P-clip fixings to **4.5 Nm.**
3. Connect the wheel speed sensor multiplug.
4. Refit the left hand side panel (see page *16-10*).
5. Connect the battery, (red) lead first.
6. Fit the seat (see page *16-9*).

Rear ABS Pulser Ring

Removal

1. Remove the rear wheel (see page *15-9*).
2. Remove the five bolts and detach the pulser ring from the rear brake disc.



1. Pulser ring

Inspection

1. Check the pulser ring for damaged, missing or cracked teeth or distortion. Renew the pulser ring as necessary.

Installation

1. Locate the pulser ring on to the rear brake disc and tighten the fixings to **5 Nm.**
2. Refit the rear wheel (see page *15-10*).

ABS Hydraulic Modulator/ECM

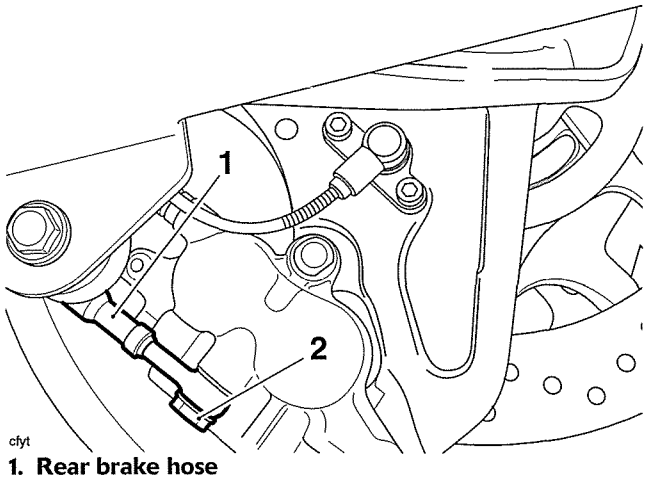
Removal

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Remove the exhaust system (see page *10-86*).

⚠ Caution

To prevent body damage, do not spill brake fluid onto any area of the bodywork or wheels.

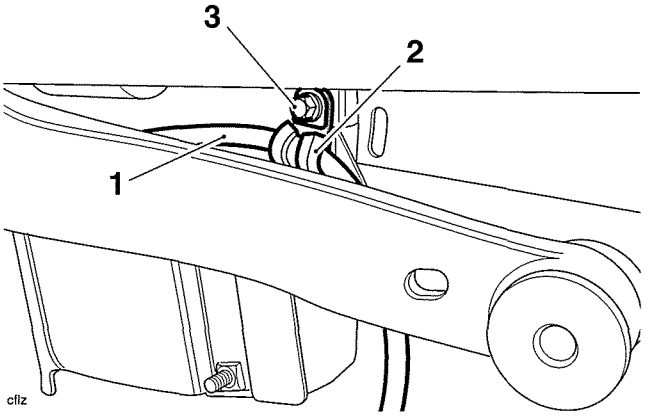
4. Drain the fluid from the front master cylinder, attach a tube to the right hand caliper bleed nipple, slacken the nipple and allow the fluid to drain into a suitable container. Operate the brake lever until all fluid has been expelled (see page *12-9*).
5. Drain the fluid from the rear master cylinder by bleeding the system at the rear caliper until all fluid has been expelled (see page *12-21*).
6. Disconnect the rear brake hose at the rear caliper. Discard the sealing washers.



cfyt

1. Rear brake hose
2. Union

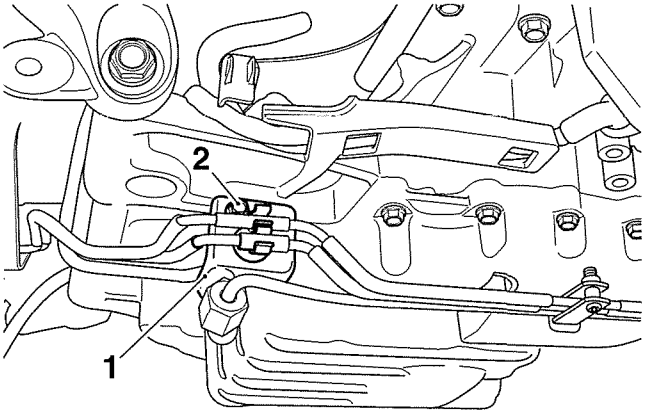
7. Remove the fixing and detach the brake hose P-clip from the left hand side of the swinging arm.



cflz

1. Brake hose
2. Clip
3. Fixing

8. Reposition the rubber boot and disconnect the brake light switch.
9. Remove the fixing and detach the brake light switch boss from the crankcase.

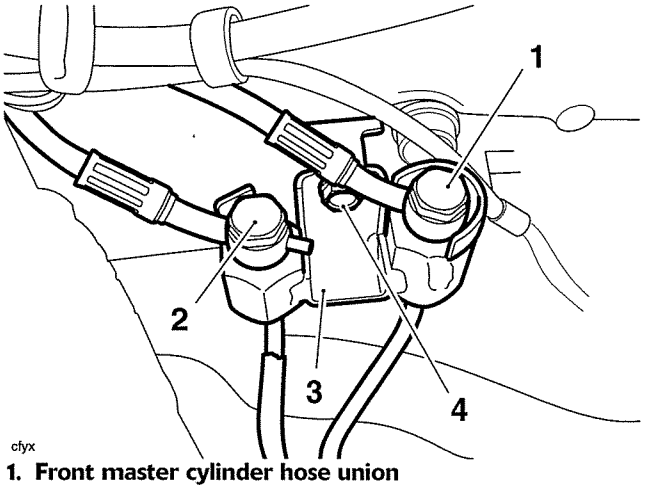


cfyu

1. Brake light switch boss
2. Fixing

10. Noting their positions and orientation, disconnect the two front brake hoses at the union under the front of the engine. Discard the sealing washers.

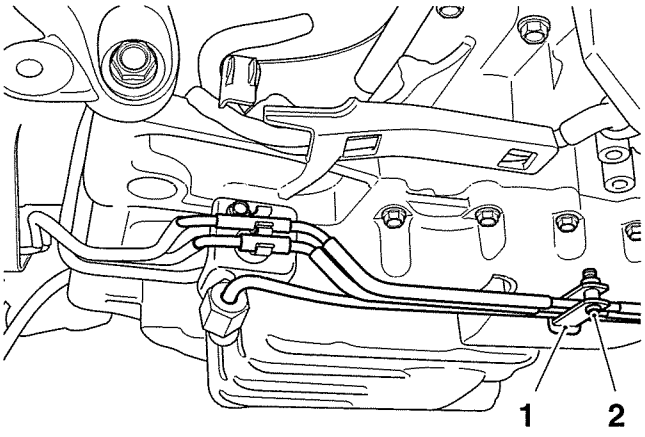
11. Remove the front brake hard-line union block fixing from the crankcase.



cfyx

1. Front master cylinder hose union
2. Front brake caliper hose union
3. Front brake hard-line union block
4. Fixing

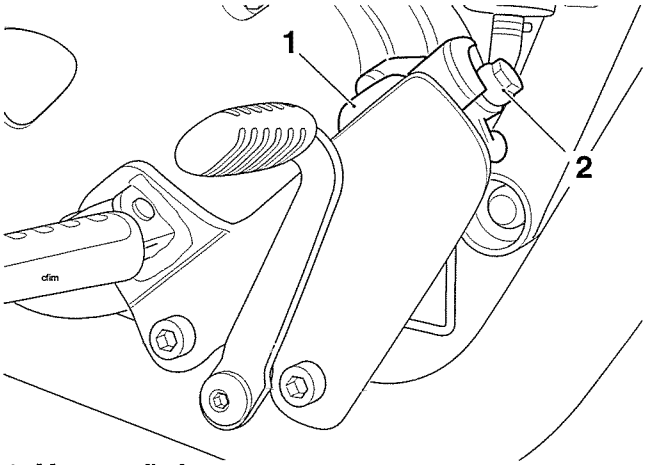
12. Remove the centre hard-line fixing.



cfyu

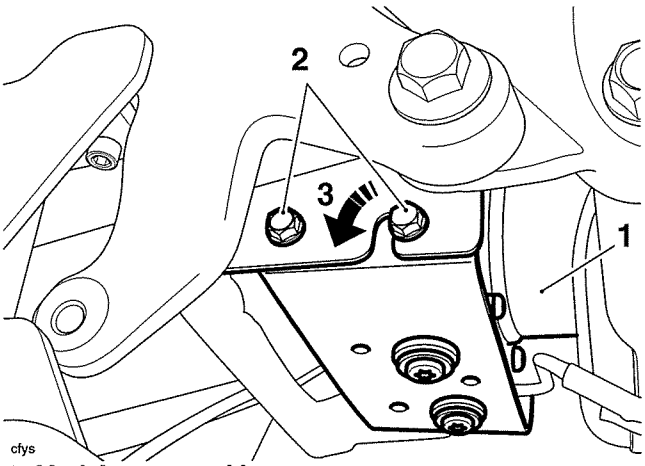
1. Centre hard hard-line clamp
2. Fixing

13. Disconnect the hard-line from the rear master cylinder (discard the sealing washers).



1. Master cylinder
2. Hard-line union bolt

14. Remove the two rearmost bolts on the ABS modulator bracket, and loosen the two remaining bolts.
15. Slide the modulator and brake hard-lines rearwards as an assembly to release it from the bracket, and then lower the assembly downwards through the bracket.



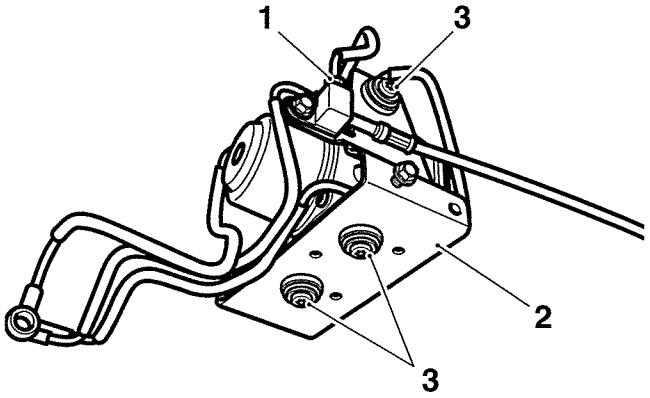
cfys

1. Modulator assembly
2. Fixings
3. Removal direction

16. Disconnect the ABS modulator multiplug (see page *12-47*).
17. Feed the rear brake hose through the bracket and remove the modulator assembly from the motorcycle.

Disassembly

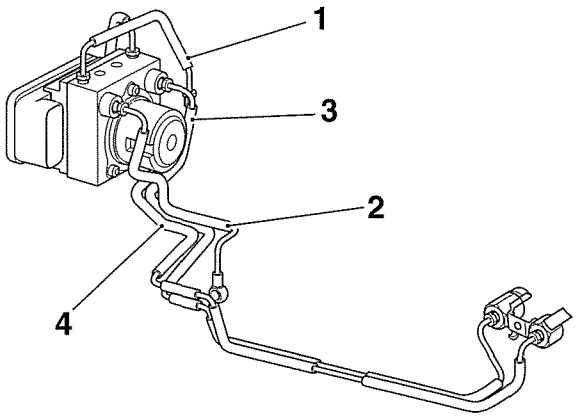
1. Release the rear brake hose union on the side of the modulator assembly.
2. Release the three fixings and remove the bracket from the modulator.



cfyq

1. Rear brake hose union
2. Bracket
3. Fixings

3. Noting their position and orientation, remove the four hard-lines from the modulator.



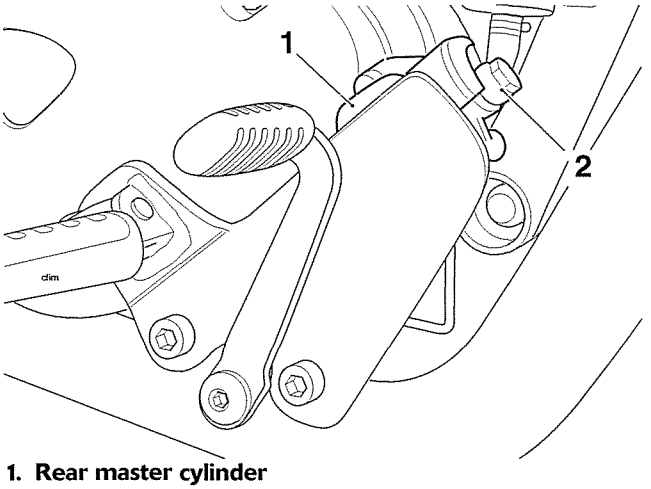
1. Rear hard-line to caliper
2. Rear hard-line from master cylinder
3. Front hard-line from master cylinder
4. Front hard-line to caliper

Assembly

1. Refit the hard-lines to the modulator in the positions noted during disassembly. Tighten the four unions to **17 Nm**.
2. Position the modulator bracket to the modulator, aligning the rear brake hose to the rear brake hard-line from the modulator. Tighen the bracket fixings to **9 Nm**, and the rear brake union to **17 Nm**.

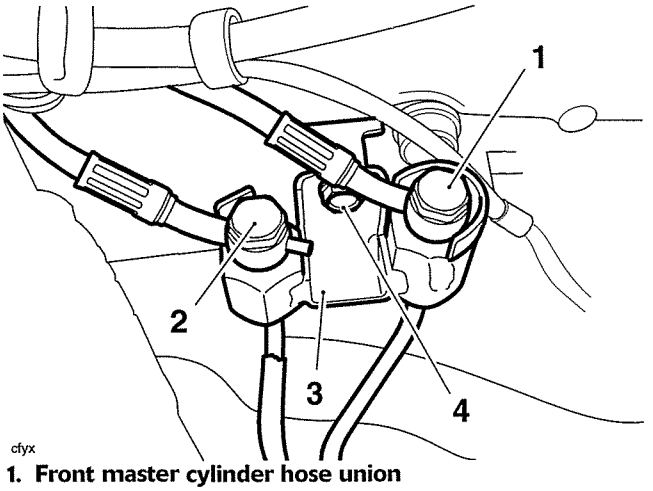
Installation

1. Position the rear brake hose upwards through the bracket below the swinging arm.
2. Connect the ABS modulator multiplug (see page *12-47*).
3. Position the ABS modulator and brake hard-lines to the bracket below the swinging arm and align the two front bolts to the slot in the bracket. Ensure the rear brake master cylinder hard-line aligns correctly with the rear master cylinder as the ABS modulator is installed.
4. Refit the two rear fixings and tighten all fixings to **7 Nm**.
5. Incorporating new washers to either side of the union, fit the rear brake hard-line. Tighten the union bolt to **25 Nm.**



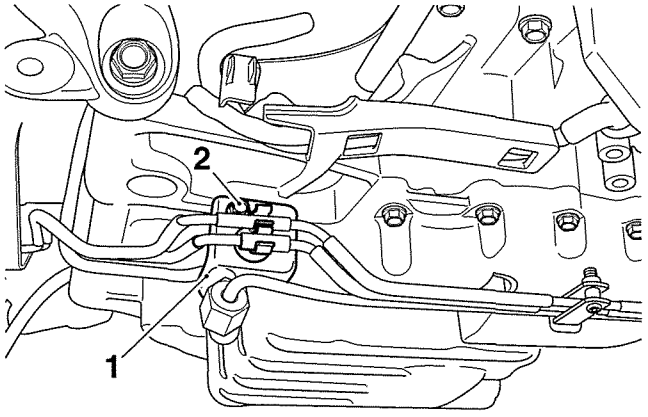
1. Rear master cylinder
2. Hard-line union bolt

6. Refit the front brake hard-line union block fixing to the crankcase, tightening the bolt to **7 Nm**.
7. Incorporating new washers to either side of the unions, reconnect the two front brake hoses in the positions noted on disassembly. Counter hould each union block in turn with a spanner and tighten the union bolts to **25 Nm.**



1. Front master cylinder hose union
2. Front brake caliper hose union
3. Front brake hard-line assembly
4. Fixing

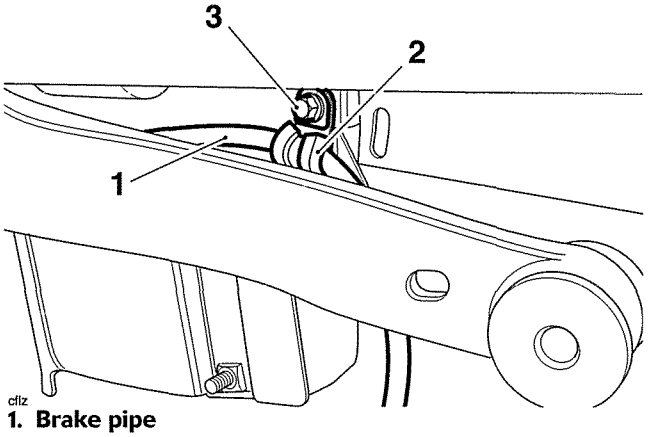
8. Secure the brake light switch boss to the crankcase and tighten the fixing to **7 Nm**.



cfyu

1. Brake light switch boss
2. Fixing

9. Reconnect the brake light switch connector and cover with the rubber boot.
10. Align the brake pipe clip to the left hand side of the swinging arm. Tighten the clip fixing to **7 Nm**.



cflz

1. Brake pipe
2. Clip
3. Fixing

11. Bleed the front brakes (see page *12-29*).
12. Bleed the rear brakes (see page *12-32*).
13. Refit the fuel tank (see page *10-98*).
14. Reconnect the battery, positive (identified with red tape) lead first.

Warning

It is dangerous to operate the motorcycle with defective brakes; you must have your authorised Triumph Dealer take remedial action. Failure to take remedial action may reduce braking efficiency leading to loss of motorcycle control and an accident.

15. Refit the rider's seat (see page *17-9*).
16. Check that the brakes operate correctly.

Anti-lock Brake System (ABS)

System Description

The ABS versions of the Thunderbird are fitted with an electronic anti-lock brake system which is designed to prevent the wheels from locking or skidding by reducing braking effort to the front or rear brake caliper as required.

The system consists of a hydraulic modulator and ECM assembly mounted to a bracket beneath the swinging arm, a front wheel speed sensor mounted to the front fork, and a rear wheel speed sensor mounted to the rear brake caliper carrier.

Both front and rear wheels have a pulser ring mounted on to the wheel hub.

The front and rear master cylinders are connected via lines to the modulator and from the modulator the lines connect to the brake calipers. The calipers and master cylinders are identical to the non-ABS equipped motorcycle.

The front and rear brake circuits operate as separate systems. The front and rear brakes are not connected in any way inside the modulator.

The modulator ECM continuously calculates the front and rear wheel speeds, and from these inputs the ECM calculates the estimated motorcycle speed, wheel deceleration/acceleration, the wheel speed difference and the wheel slip (skid) rate. This is calculated by comparing the calculated wheel speeds with the calculated vehicle speed, so that if one wheel speed deviates significantly from the other two readings, this wheel is calculated to be slipping (skidding).

Under braking, if the modulator detects that either wheel is about to slip, due to the brake force exceeding the available traction between the tyre and road surface (the wheel will begin to slip or 'skid'), the ECM very rapidly releases and re-applies the brake pressure to prevent the wheel from slipping.

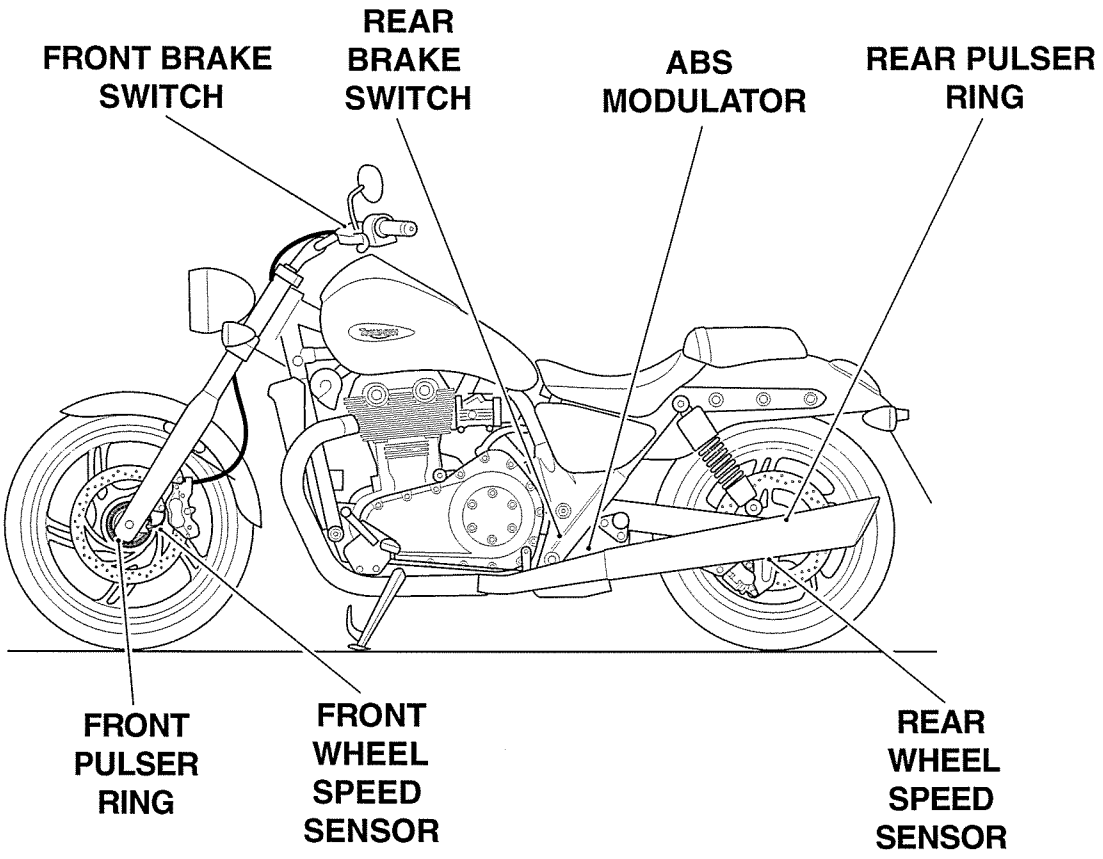
This is felt through the brake pedal or lever as a rapid 'pulsing'.

If the rider reduces braking effort, or traction increases (so that traction exceeds braking force, the wheel will rotate once more) the wheel will no longer lock up. The ABS system will detect this and stop controlling brake pressure, and return to its monitoring state.

The system has a self diagnostic function built-in which monitors the fail safe relay, solenoid valves, motor relay, wheel speed sensors, power supply and ground, as well as internal ECM functions. In the event of a malfunction being detected, the ECM will illuminate the ABS warning light, and store a diagnostic trouble code in the system memory. This stored data can then be recovered using the Triumph diagnostic tool which is mandatory for all Triumph dealers. In this way, precise diagnosis of a fault can be made and the fault quickly rectified.

Under normal operation, the ABS warning light will stay illuminated after ignition on until the vehicle speed exceeds 6 mph (10 km/h). The ABS performs a self check and if no faults are found the light is extinguished. If a trouble code is stored the ABS warning light will stay illuminated and the ABS will not function, however the brakes will operate normally. If the ABS warning light does not extinguish, or illuminates whilst the motorcycle is being ridden, refer to the ABS system diagnostics (see page *12.42*).

Component Locations



ABS System Circuit Diagram

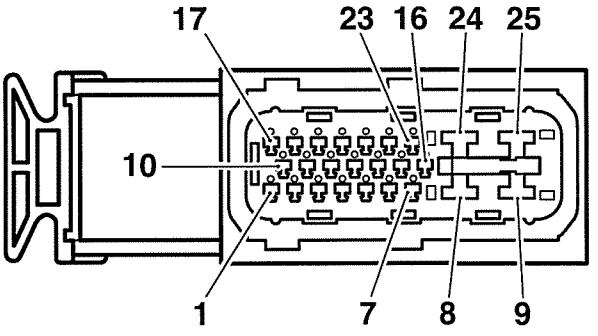
Key To Wiring Circuit Diagram

Key	Item Description
1	Fuse box (fuse 2, 8 and 10)
2	ABS Module
3	Diagnostic Connector
4	Engine Control Module
5	Front Wheel Speed Sensor
6	Rear Wheel Speed Sensor
7	Instruments
8	Front Brake Light Switch
9	Rear Brake Light Switch
10	Rear Lighting Sub-harness
11	Brake Light

Key To Wiring Colour Codes

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

ABS ECM Connector Pin Numbering

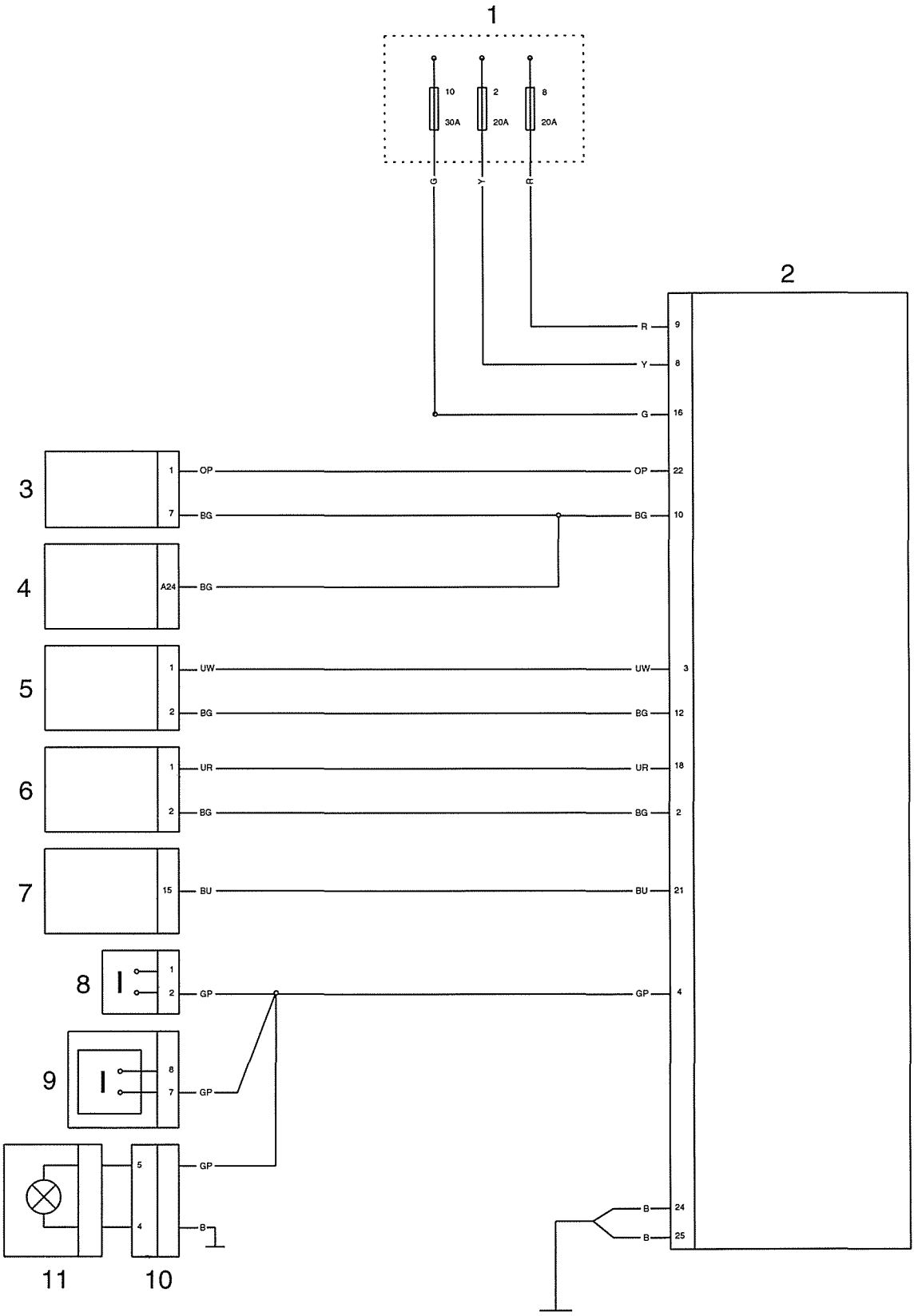


cdhg

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

As viewed on the mating face with the ABS ECM (as per the illustration), pins are numbered from left to right with number one in the bottom left hand corner.

ABS System Circuit Diagram



System Diagnostics

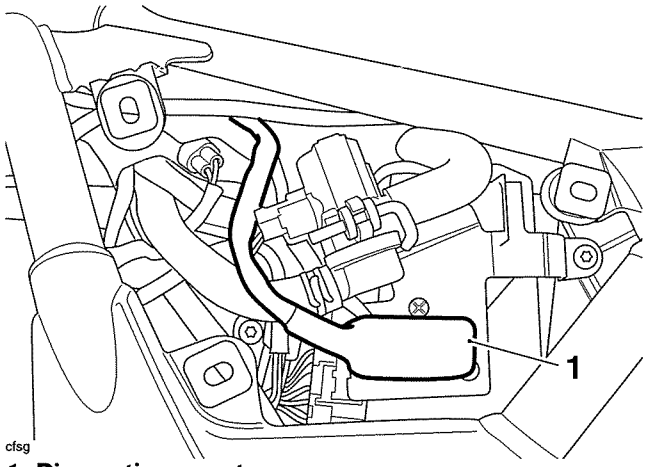
The ABS system has an on-board diagnostics feature which allows service technicians to retrieve stored data from the ECM using Triumph diagnostic software. **Full details of the Triumph diagnostic software operation and how to interpret the results are given in the Triumph Diagnostic Tool User Guide.**

The software is connected, via an interface cable, to the motorcycle using a dedicated diagnostic plug situated beneath the left hand side panel. By using a dedicated plug, no electrical connectors associated with the system are disturbed, reducing potential connector damage.

The software 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.

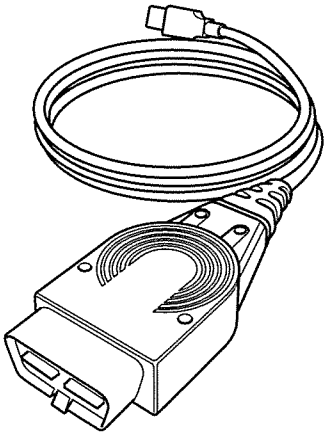
Diagnostic Tool Connection

1. To connect the Triumph diagnostic interface to the motorcycle, remove the left hand side panel (see page *17-9*) and release the diagnostic connector from its locating tang.



1. Diagnostic connector

2. Plug the diagnostic interface directly in to the diagnostic connector.



Diagnostic Interface

3. When the diagnostic session is completed, disconnect the Triumph diagnostic interface.
4. Refit the diagnostic connector to its locating tang and refit the side panel (see page *17-9*).

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 diagnostic software.

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

Note:

- **Full details of how to operate the software and how to interpret the data can be found in the Triumph Diagnostic Tool User Guide, which can be downloaded by authorised Triumph dealers from www.triumphonline.net.**

Build data

The **Build Data** screen will display the following information:

Function Examined
ECM type
ECM ID number
Software version number

Current Data

The **Current Data** screen will display the following information:

Function Examined	Result Reported (Scale)
Front wheel speed	Kph
Rear wheel speed	Kph
Brake switch status	On/Off
ABS warning light status	On/Off

Bleed System

Using the Triumph diagnostic tool, it is possible to bleed the ABS modulator of trapped air. This is necessary when the hydraulic brake system has been dismantled, or the ABS modulator renewed.

Full details of this procedure are provided on page *12-29* for front brakes or page *12-32* for rear brakes.

Diagnostic Trouble Codes

Diagnostic trouble codes (DTCs) are logged in the ABS ECM memory when there is a confirmed fault in the system.
The codes are reported to the Triumph diagnostic tool as a four digit code.
DTCs can be removed at any time using the Triumph diagnostic tool.
The system will log the diagnostic trouble codes listed below:

Diagnostic Trouble Code (DTC)	Fault Description
C1611	Front Wheel Sensor Open Circuit/Short Circuit
C1612	Front Wheel Sensor Abnormal Input/Losing Contact
C1613	Rear Wheel Sensor Open Circuit/Short Circuit
C1614	Rear Wheel Sensor Abnormal Input/Losing Contact
C1621	Front Wheel Pulser Gear Missing Teeth
C1623	Rear Wheel Pulser Gear Missing Teeth
C1631	Front Wheel Input Solenoid Open/Short Circuit
C1632	Front Wheel Output Solenoid Open/Short Circuit
C1633	Rear Wheel Input Solenoid Open/Short Circuit
C1634	Rear Wheel Output Solenoid Open/Short Circuit
C1641	Front Wheel Actuator (Hydraulic Control) Wheel Lock
C1643	Rear Wheel Actuator (Hydraulic Control) Wheel Lock
C1651	Motor - Lock
C1652	Motor - Stuck OFF
C1653	Motor - Stuck ON
C1654	Solenoid Relay - Stuck OFF/ON
C1661	Power Source Voltage Drop
C1662	Power Source Voltage Rise
C1671	Different Tyre Diameter
C1681	Abnormal ECU

Diagnostic Trouble Codes

Dependant on the DTC stored, the ABS ECM will act in one of two ways:

- Inhibit ABS operation immediately, irrespective of the ABS operating mode;

or

- Allow the ABS operation to complete before inhibiting the ABS.

Once the ABS ECM has inhibited ABS function, the ECM will act in one of three ways:

- Allow the ABS to resume operation if the fault clears;

or

- Allow ABS operation after an ignition cycle if the fault clears;

or

- Inhibit the ABS function until the fault is rectified and the DTC erased.

The ABS system will act on the DTC stored according to the following table:

Fault Description	**ABS warning light illuminated when fault is logged**	**ABS operation is inhibited when fault is logged**	**ABS continues to operate when fault is logged (Only when ABS is Active. When ABS is no longer active, operation is inhibited)**	**ABS will resume operation if fault clears**
Front Wheel Sensor Open Circuit/Short Circuit	Yes	Yes		No
Front Wheel Sensor Abnormal Input/Losing Contact	Yes	Yes	Yes	Yes, if after ignition cycle, no fault is detected. DTC remains stored
Rear Wheel Sensor Open Circuit/Short Circuit	Yes	Yes		No
Rear Wheel Sensor Abnormal Input/Losing Contact	Yes	Yes	Yes	Yes, if after ignition cycle, no fault is detected. DTC remains stored
Front Wheel Pulser Gear Missing Teeth	Yes		Yes	Yes, if after ignition cycle, no fault is detected for 1 second and speed exceeds 30 km/h. DTC remains stored
Rear Wheel Pulser Gear Missing Teeth	Yes		Yes	Yes, if after ignition cycle, no fault is detected for 1 second and speed exceeds 30 km/h. DTC remains stored
Front Wheel Input Solenoid Open/Short Circuit	Yes	Yes		No
Front Wheel Output Solenoid Open/Short Circuit	Yes		Yes	No

Fault Description	**ABS warning light illuminated when fault is logged**	**ABS operation is inhibited when fault is logged**	**ABS continues to operate when fault is logged** (Only when ABS is Active. When ABS is no longer active, operation is inhibited)	**ABS will resume operation if fault clears**
Rear Wheel Input Solenoid Open/Short Circuit	Yes	Yes		No
Rear Wheel Output Solenoid Open/Short Circuit	Yes		Yes	No
Front Wheel Actuator (Hydraulic Control) Wheel Lock	Yes		Yes	Yes, if after ignition cycle, no fault is detected. DTC remains stored
Rear Wheel Actuator (Hydraulic Control) Wheel Lock	Yes		Yes	Yes, if after ignition cycle, no fault is detected. DTC remains stored
Motor - Lock	Yes		Yes	No
Motor - Stuck OFF	Yes		Yes	No
Motor - Stuck ON	Yes		Yes	No
Solenoid Relay - Stuck OFF/ ON	Yes	Yes		No
Power Source Voltage Drop	Yes, Light will extinguish if fault clears	Yes		Yes, if voltage rises above a preset threshold for more than 10 seconds
Power Source Voltage Rise	Yes, Light will extinguish if fault clears	Yes		Yes, if voltage drops below a preset threshold for more than 10 seconds
Different Tyre Diameter	Yes	Yes		No
Abnormal ECU	Yes	Yes		No

Electrical Connectors

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

Note:

- **A major cause of hidden electrical faults can be traced to faulty electrical connectors.**

For example:

- Dirty/corroded terminals.
- Damp terminals.
- Broken or bent cable pins within multi-plugs.

For example, the ABS electronic control module (ABS ECM) relies on the supply of accurate information to enable it to monitor and control the brake system. One dirty terminal will cause an excessive voltage drop resulting in an incorrect signal to the ECM.

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

Before Disconnection:

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

When Disconnecting a Connector:

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

When Inspecting a Connector:

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

When Connecting a Connector.

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

Disconnection of ABS ECM connector

Caution

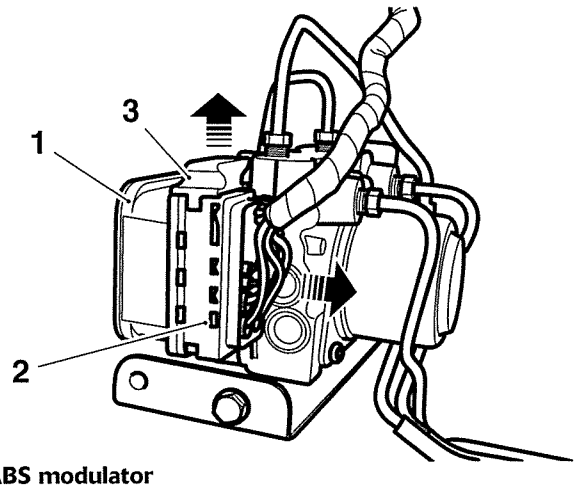
When disconnecting a connector, never pull directly on the wires as this may result in cable and connector damage.

Caution

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

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

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



cfyr

1. ABS modulator
2. Connector
3. Locking device

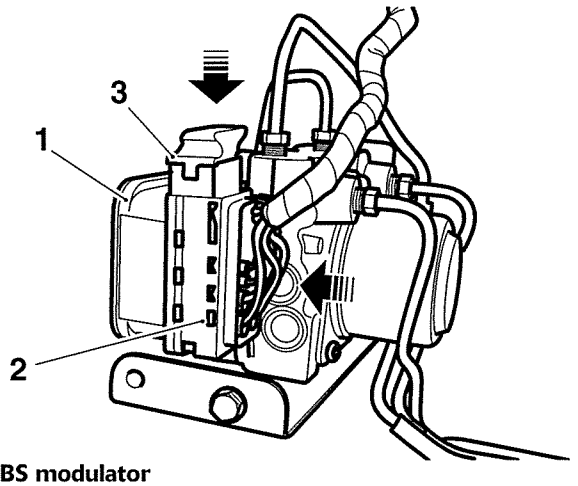
Note:

- **The ABS ECM is an integral part of the ABS modulator. Under no circumstances should the ECM be removed from the ABS modulator. If a new ECM is required, repair is by replacement of the ABS modulator and ECM as an assembly only.**

Reconnection of ABS ECM connector

Caution

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



cfyr

1. ABS modulator
2. Connector
3. Locking device

2. Fit the connector into its socket and, whilst holding the connector in place, push down gently on the locking device until it locks.

Further Diagnosis

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

Pinpoint Tests

Before starting pinpoint tests:

1. Delete the stored DTCs.
2. Switch the ignition OFF and ON.

Warning

If the ABS is not functioning, the brake system will continue to function as a non-ABS braking system. Do not continue to ride for longer than is necessary with the indicator light illuminated. Ride with extreme caution when performing diagnostic troubleshooting on a non-functioning ABS system. In this situation braking too hard will cause the wheels to lock resulting in loss of motorcycle control and an accident.

3. Ride the motorcycle at a road speed in excess of 30 Km/h. If the DTC is repeated proceed to the relevant pinpoint test.
4. If the DTC is not repeated this indicates the DTC may have been stored due to external influences such as bad road surfaces or electrical interference.

After completion of the pinpoint tests:

1. Delete the stored DTCs.
2. Switch the ignition OFF and ON.
3. Ride the motorcycle at a road speed in excess of 30 Km/h. If the DTC is repeated proceed to the relevant pinpoint test.
4. If a DTC is stored there is a further fault. Read the stored DTC and refer to the relevant pinpoint test.

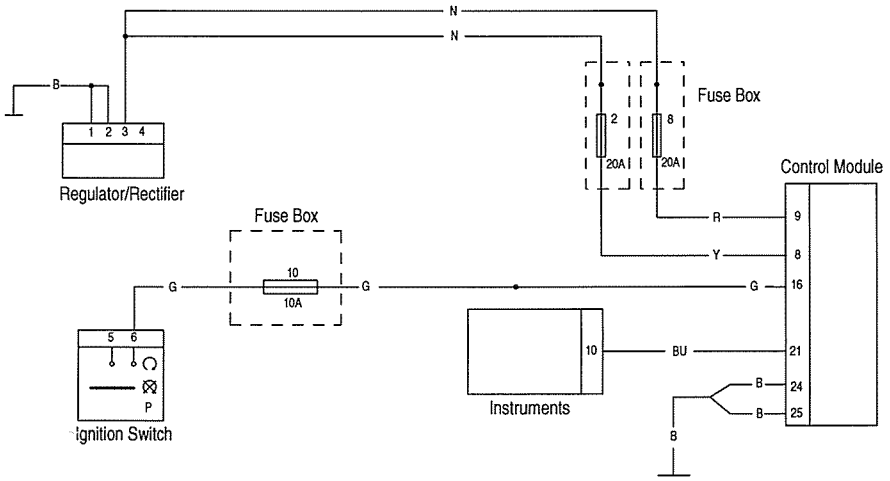
ABS Warning Light ON (No DTCs Stored)

Fault Code	Possible cause	Action
ABS Warning Light ON (No DTCs Stored)	ABS Ignition supply fuse/circuit fault ABS Warning light circuit fault	Ensure ABS ECM connector is secure. Disconnect ABS ECM connector and proceed to pinpoint test 1:

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ABS ECM connector pin 16 and Ground pin 24	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable continuity of the ABS ignition supply circuit: With the Ignition 'ON', check voltage between: - ABS ECM connector pin 16 and Ground	Same as 'across battery' voltage	Proceed to test 3
		Less than 'across battery' voltage	Locate and rectify wiring fault, proceed to test 5
3	Check cable continuity of the ABS warning light circuit: Check voltage between: - ABS ECM connector pin 21 and Ground	Voltage greater than 1.5 V	Proceed to test 4
		Voltage less than 1.5 V	Locate and rectify fault, proceed to test 5
4	Check cable continuity of the ABS warning light circuit: - Short ABS ECM connector pin 21 and Ground pin 24 together: Turn Ignition 'ON'	ABS warning light 'OFF'	Proceed to test 5
		ABS warning light 'ON'	Locate and rectify fault, proceed to test 5
5	Reconnect ABS ECM harness, clear fault code and test ABS to verify fault cleared	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



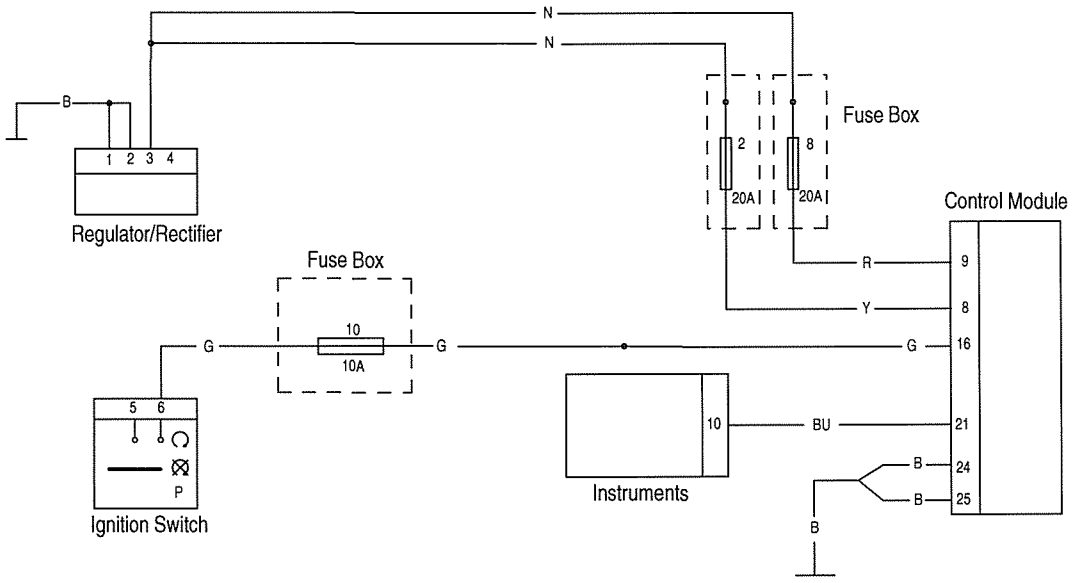
ABS Warning Light Does not Illuminate (No DTCs Stored)

Fault Code	Possible cause	Action
ABS Warning Light OFF (No DTCs Stored)	Warning light circuit fault ABS ECM ground circuit fault	Ensure ABS ECM connector is secure. Ensure ABS ECM ground connection is secure. Disconnect ABS ECM connector and proceed to pinpoint test 1:

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ABS ECM connector pin 16 and Ground	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 6
2	Check the ABS warning light circuit fuse (fuse 10):	OK	Proceed to test 3
		Faulty	Replace fuse, proceed to test 6
3	Check cable for short to voltage: With Ignition 'OFF', check voltage between: - ABS ECM connector pin 16 and Ground	0 V	Proceed to test 4
		Above 3 V	Locate and rectify wiring fault, proceed to test 6
4	Check cable for short to ground: With ignition 'ON', Check the ABS warning light circuit voltage between: - ABS ECM connector pin 21 and Ground	Voltage greater than 1.5 V	Proceed to test 5
		Voltage less than 1.5 V	Locate and rectify fault, proceed to test 6
5	Check cable for continuity: ABS ECM connector pin 24 and Ground: Turn Ignition 'ON'	OK	Proceed to test 6
		Faulty	Locate and rectify fault, proceed to test 6
6	Reconnect ABS ECM harness, clear fault code and test ABS to verify fault cleared	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



Front Wheel Sensor Open Circuit/Short Circuit

Fault Code	Possible cause	Action
C1611	Front wheel speed sensor circuit fault	Ensure ABS ECM connector is secure. Ensure wheel speed sensor connector is secure. Disconnect ABS ECM connector and proceed to pinpoint test 1:

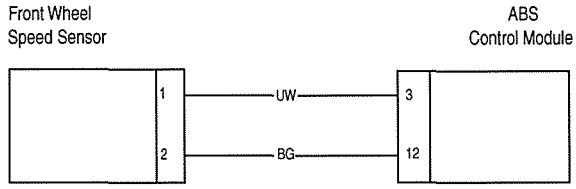
Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ABS ECM connector pin 3 and ABS ECM connector pin 12	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 9
2	Check cable for short circuit: - ABS ECM connector pin 12 and Ground	OK	Proceed to test 4
		Short circuit	Proceed to test 3
3	Disconnect the front wheel speed sensor connector. Check cable for short circuit: Wheel speed sensor connector pin 2 (motorcycle harness side) and Ground	OK	Replace the wheel speed sensor, proceed to test 9
		Short circuit	Locate and rectify wiring harness fault, proceed to test 9
4	Check cable for short circuit: - ABS ECM connector pin 3 and Ground	OK	Proceed to test 6
		Short circuit	Proceed to test 5
5	Check cable for short circuit: - Wheel speed sensor connector pin 1 (motorcycle harness side) and Ground	OK	Replace the wheel speed sensor, proceed to test 9
		Short circuit	Locate and rectify wiring harness fault, proceed to test 9
6	Check cable continuity: - ABS ECM connector pin 12 and Wheel speed sensor connector pin 2 (motorcycle harness side)	OK	Proceed to test 7
		Open circuit	Locate and rectify wiring harness fault, proceed to test 9
7	Check cable continuity: - ABS ECM connector pin 3 and Wheel speed sensor connector pin 1 (motorcycle harness side)	OK	Proceed to test 8
		Open circuit	Locate and rectify wiring harness fault, proceed to test 9
8	Reconnect the front wheel speed sensor connector. Check the wheel speed sensor operation: - Connect a suitable voltage supply between 4.5 V and 16 v between ABS ECM connector pin 12 (positive) and pin 3 (negative), and measure the current consumption of the wheel speed sensor	3 mA to 14 mA	Proceed to test 9
		Faulty	Replace the wheel speed sensor, proceed to test 9
9	Reconnect ABS ECM harness, clear fault code and test ABS to verify fault cleared	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram

Wheel speed sensor current consumption data under typical conditions:

Voltage	Min	Typical	Max
Low (4.5 V)	3.1 mA	4.1 mA	5.3 mA
High (16V)	8.1 mA	10.5 mA	13.6 mA



Front Wheel Sensor Abnormal Input/Losing Contact

Fault Code	Possible cause	Action
C1612	Front wheel speed sensor poor signal Incorrect Wheel speed sensor air gap Damaged or dirty pulser ring Loose or incorrectly installed wheel speed sensor	Ensure ABS ECM connector is secure. Ensure wheel speed sensor connector is secure. Proceed to pinpoint test 1:

Pinpoint Tests

	Test	Result	Action
1	Measure the air gap of the front wheel speed sensor between the sensor and the pulser ring: - Air gap between 0.1 mm to 1.5 mm	OK	Proceed to test 2
		Faulty	Rectify the fault and proceed to test 5
2	Check the pulser ring for damage or contamination by road grime or ferrous metal filings	OK	Proceed to test 3
		Faulty	Clean or replace the ABS pulser ring, proceed to test 5
3	Check the wheel speed sensors for correct installation, and the fixings for correct torque	OK	Proceed to test 4
		Faulty	Rectify the fault and proceed to test 5
4	Check the wheel speed sensor circuit (see page *12.52*)	OK	Contact Triumph service
		Faulty	Rectify the fault and proceed to test 5
5	Clear fault code and test ABS to verify fault cleared	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Rear Wheel Sensor Open Circuit/Short Circuit

Fault Code	Possible cause	Action
C1613	Rear wheel speed sensor circuit fault	Ensure ABS ECM connector is secure. Ensure wheel speed sensor connector is secure. Disconnect ABS ECM connector and proceed to pinpoint test 1:

Pinpoint Tests

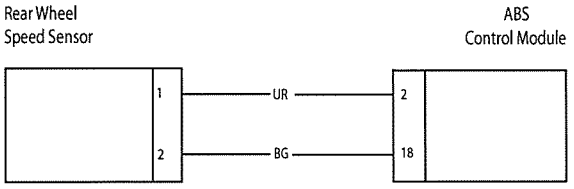
	Test	Result	Action
1	Check cable and terminal integrity: - ABS ECM connector pin 2 and ABS ECM connector pin 18	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 9
2	Check cable for short circuit: - ABS ECM connector pin 2 and Ground	OK	Proceed to test 4
		Short circuit	Proceed to test 3
3	Disconnect the front wheel speed sensor connector. Check cable for short circuit: - Wheel speed sensor connector pin 2 (motorcycle harness side) and Ground	OK	Replace the wheel speed sensor, proceed to test 9
		Short circuit	Locate and rectify wiring harness fault, proceed to test 9
4	Check cable for short circuit: - ABS ECM connector pin 18 and Ground	OK	Proceed to test 6
		Short circuit	Proceed to test 5
5	Check cable for short circuit: - Wheel speed sensor connector pin 1 (motorcycle harness side) and Ground	OK	Replace the wheel speed sensor, proceed to test 9
		Short circuit	Locate and rectify wiring harness fault, proceed to test 9
6	Check cable continuity: - ABS ECM connector pin 2 and Wheel speed sensor connector pin 2 (motorcycle harness side)	OK	Proceed to test 7
		Open circuit	Locate and rectify wiring harness fault, proceed to test 9
7	Check cable continuity: - ABS ECM connector pin 18 and Wheel speed sensor connector pin 1 (motorcycle harness side)	OK	Proceed to test 8
		Open circuit	Locate and rectify wiring harness fault, proceed to test 9
8	Reconnect the front wheel speed sensor connector. Check the wheel speed sensor operation: - Connect a suitable voltage supply between 4.5 V and 16 v between ABS ECM connector pin 2 (positive) and pin 18 (negative), and measure the current consumption of the wheel speed sensor	3 mA to 14 mA	Proceed to test 9
		Faulty	Replace the wheel speed sensor, proceed to test 9
Test continued overleaf			

	Test	Result	Action
9	Reconnect ABS ECM harness, clear fault code and test ABS to verify fault cleared	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram

Wheel speed sensor current consumption data under typical conditions:

Voltage	Min	Typical	Max
Low (4.5 V)	3.1 mA	4.1 mA	5.3 mA
High (16V)	8.1 mA	10.5 mA	13.6 mA



Rear Wheel Sensor Abnormal Input/Losing Contact

Fault Code	Possible cause	Action
C1614	Rear wheel speed sensor poor signal Incorrect Wheel speed sensor air gap Damaged or dirty pulser ring Loose or incorrectly installed wheel speed sensor	Ensure ABS ECM connector is secure. Proceed to pinpoint test 1:

Pinpoint Tests

	Test	Result	Action
1	Measure the air gap of the front wheel speed sensor between the sensor and the pulser ring: - Air gap between 0.1 mm to 1.5 mm	OK	Proceed to test 2
		Faulty	Rectify the fault and proceed to test 5
2	Check the pulser ring for damage or contamination by road grime or ferrous metal filings	OK	Proceed to test 3
		Faulty	Clean or replace the ABS pulser ring, proceed to test 5
3	Check the wheel speed sensors for correct installation, and the fixings for correct torque:	OK	Proceed to test 4
		Faulty	Rectify the fault and proceed to test 5
4	Check the wheel speed sensor circuit (see page *12.55*)	OK	Contact Triumph service
		Faulty	Rectify the fault and proceed to test 5
5	Clear fault code and test ABS to verify fault cleared	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Front Wheel Pulser Gear Missing Teeth

Fault Code	Possible cause	Action
C1621	Incorrect Wheel speed sensor air gap Damaged or dirty pulser ring Loose or incorrectly installed wheel speed sensor Damaged/incorrect wheels	Ensure ABS ECM connector is secure. Proceed to pinpoint test 1:

Pinpoint Tests

	Test	Result	Action
1	Measure the air gap of the front wheel speed sensor between the sensor and the pulser ring: - Air gap between 0.1 mm to 1.5 mm	OK	Proceed to test 2
		Faulty	Rectify the fault and proceed to test 5
2	Check the pulser ring for damage or contamination by road grime or ferrous metal filings	OK	Proceed to test 3
		Faulty	Clean or replace the ABS pulser ring, proceed to test 5
3	Check the wheel speed sensors for correct installation, and the fixings for correct torque:	OK	Proceed to test 4
		Faulty	Rectify the fault and proceed to test 5
4	Check the motorcycle wheel for damage/ incorrect size	OK	Proceed to test 4
		Faulty	Rectify the fault and proceed to test 5
5	Clear fault code and test ABS to verify fault cleared	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Rear Wheel Pulser Gear Missing Teeth

Fault Code	Possible cause	Action
C1623	Incorrect Wheel speed sensor air gap Damaged or dirty pulser ring Loose or incorrectly installed wheel speed sensor Damaged/incorrect wheels	Ensure ABS ECM connector is secure. Proceed to pinpoint test 1:

Pinpoint Tests

	Test	Result	Action
1	Measure the air gap of the front wheel speed sensor between the sensor and the pulser ring: - Air gap between 0.1 mm to 1.5 mm	OK	Proceed to test 2
		Faulty	Rectify the fault and proceed to test 5
2	Check the pulser ring for damage or contamination by road grime or ferrous metal filings	OK	Proceed to test 3
		Faulty	Clean or replace the ABS pulser ring, proceed to test 5
3	Check the wheel speed sensors for correct installation, and the fixings for correct torque:	OK	Proceed to test 4
		Faulty	Rectify the fault and proceed to test 5
4	Check the motorcycle wheel for damage/ incorrect size	OK	Proceed to test 4
		Faulty	Rectify the fault and proceed to test 5
5	Clear fault code and test ABS to verify fault cleared.	OK	Action complete - quit test
		Fault still present	Contact Triumph service

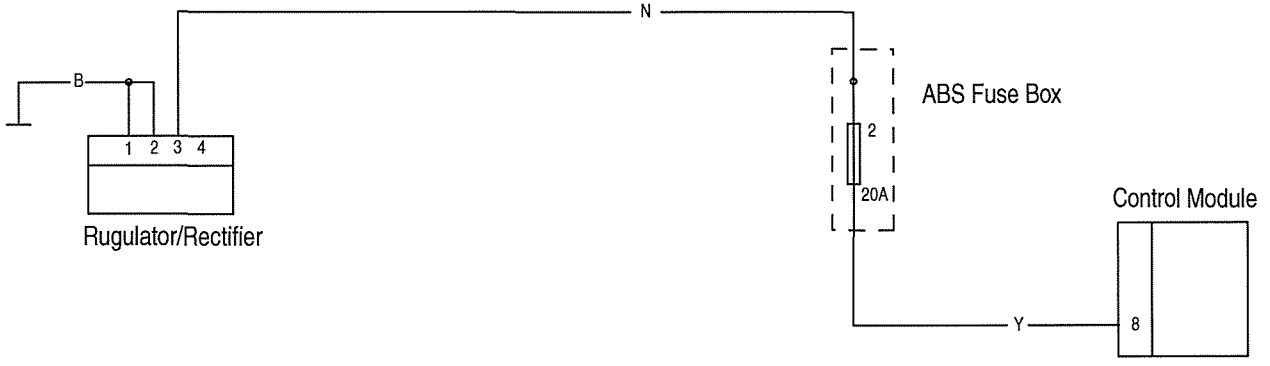
Front or Rear Input/output solenoid Open/Short Circuit

Fault Code	Possible cause	Action
Front: C1631; C1632 Rear: C1633; C1634 C1654	ABS solenoid circuit fault	Ensure ABS ECM connector is secure. Disconnect ABS ECM connector and proceed to pinpoint test 1:

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ABS ECM connector pin 8 and Ground	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check the ABS solenoid fuse (fuse 2):	OK	Proceed to test 3
		Faulty	Replace fuse, proceed to test 5
3	Check cable continuity: With Ignition 'ON', check voltage between - ABS ECM connector pin 8 and Ground	Same as 'across battery' voltage	Proceed to test 4
		Less than 'across battery' voltage	Locate and rectify wiring fault, proceed to test 5
4	Check cable for continuity: - ABS ECM connector pin 24 and Ground	OK	Proceed to test 5
		Faulty	Locate and rectify fault, proceed to test 5
5	Clear fault code and test ABS to verify fault cleared	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



Front or Rear Wheel Actuator (Hydraulic Control) Wheel Lock

Fault Code	Possible cause	Action
C1641; C1643	Binding brake Incorrect Wheel speed sensor air gap Loose or incorrectly installed wheel speed sensor	Ensure ABS ECM connector is secure. Proceed to pinpoint test 1:

Pinpoint Tests

	Test	Result	Action
1	Check the relevant wheel for brake bind caused by caliper or master cylinder faults, or other mechanical causes	OK	Proceed to test 2
		Faulty	Rectify the fault and proceed to test 4
2	Measure the air gap of the wheel speed sensor between the sensor and the pulser ring: - Air gap between 0.1 mm to 1.5 mm	OK	Proceed to test 3
		Faulty	Rectify the fault and proceed to test 4
3	Check the wheel speed sensors for correct installation, and the fixings for correct torque	OK	Proceed to test 4
		Faulty	Rectify the fault and proceed to test 4
4	Clear fault code and test ABS to verify fault cleared	OK	Action complete - quit test
		Fault still present	Contact Triumph service

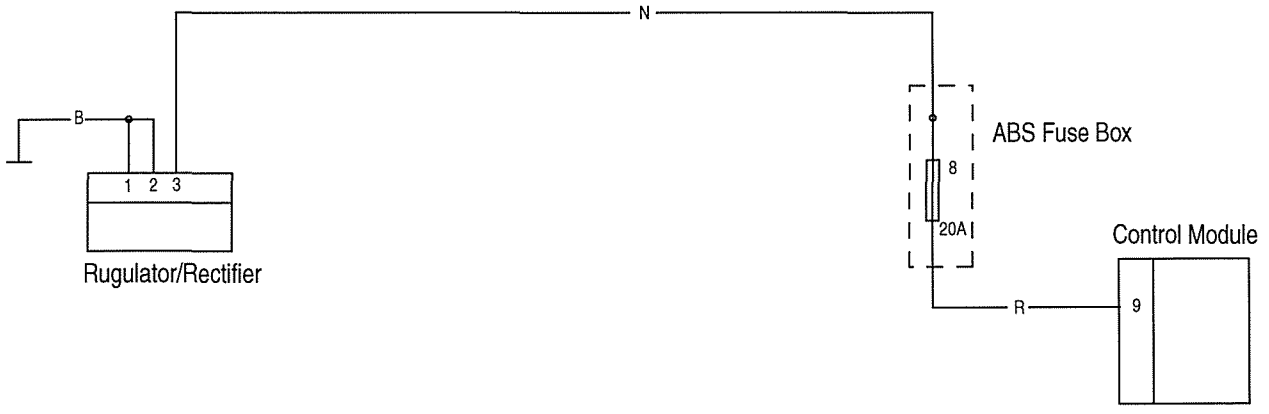
Motor - Lock; Motor Stuck OFF; Motor stuck ON

Fault Code	Possible cause	Action
C1651; C1652; C1653	Motor circuit fault Motor runs continually Motor does not run at all	Ensure ABS ECM connector is secure. Turn the ignition 'ON'. Proceed to pinpoint test 1:

Pinpoint Tests

	Test	Result	Action
1	Check the motor function: Check that with the motorcycle stationary and the ABS ACM modulator connected, the motor does not operate.	OK	Proceed to test 2
		Motor runs continually.	Contact Triumph service
2	Check the ABS motor circuit fuse (fuse 8 in ABS fuse box)	OK	Proceed to test 3
		Faulty	Replace fuse and proceed to test 5
3	Check cable continuity: With Ignition 'ON', check voltage between: - ABS ECM connector pin 9 and Ground	Same as 'across battery' voltage	Proceed to test 4
		Less than 'across battery' voltage	Locate and rectify wiring fault, proceed to test 5
4	Check cable for continuity: - ABS ECM connector pin 25 and Ground	OK	Proceed to test 5
		Faulty	Locate and rectify fault, proceed to test 5
5	Reconnect ABS ECM harness, clear fault code and test ABS to verify fault cleared	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



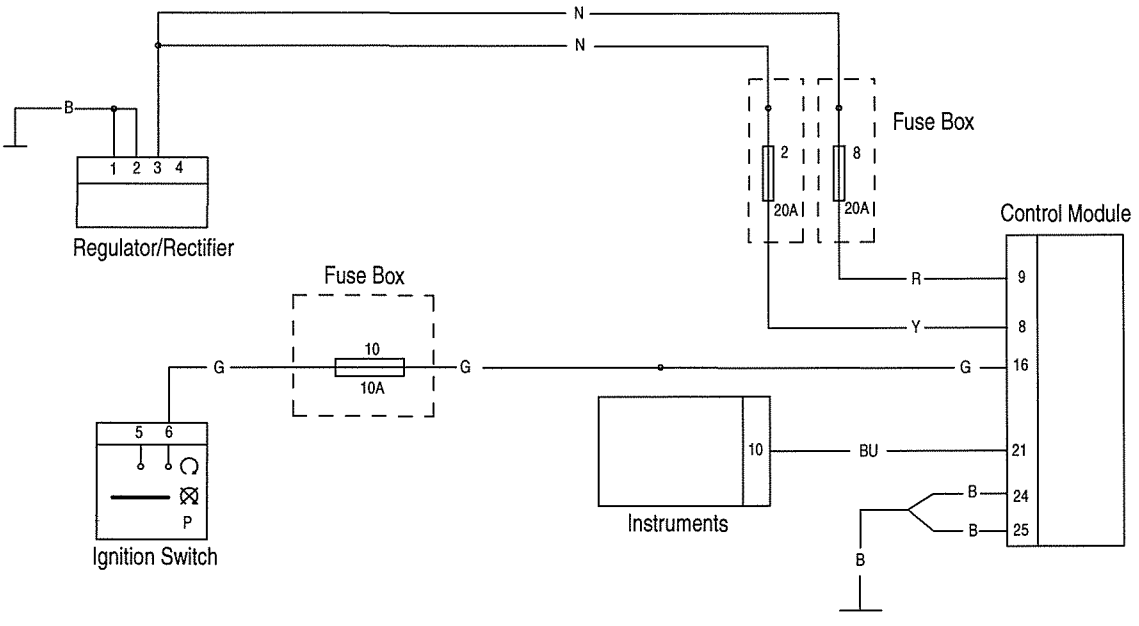
Power Source Voltage Drop/Voltage Rise

Fault Code	Possible cause	Action
C1661; C1662	Power supply circuit fault Battery charging circuit fault	Ensure ABS ECM connector is secure. Disconnect ABS ECM connector and proceed to pinpoint test 1:

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - ABS ECM connector pin 16 and Ground pin 24	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check the cable for continuity: - ABS ECM connector pin 24 and Ground	OK	Proceed to test 3
		Faulty	Rectify wiring harness fault, proceed to test 5
3	Check battery voltage: With ignition 'ON', Check the voltage between: - ABS ECM connector pin 16 and Ground pin 24	Voltage greater than 10 V	Proceed to test 4
		Voltage less than 10V	Locate and rectify fault, proceed to test 5
4	Check battery voltage: Reconnect ABS ECM connector and start the engine, Check the voltage between: - Battery positive (red) terminal and negative (black) terminal	Voltage between 10 V and 16 V	Proceed to test 4
		Voltage greater than 16V	Check the battery charging circuit. Locate and rectify fault, proceed to test 5
5	Clear fault code and test ABS to verify fault cleared.	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



Different Tyre Diameter

Fault Code	Possible cause	Action
C1671	Incorrect diameter wheels installed Incorrect tyre pressures Incorrect Wheel speed sensor air gap Damaged or dirty pulser ring	Ensure ABS ECM connector is secure. Proceed to pinpoint test 1:

Pinpoint Tests

	Test	Result	Action
1	Check for installation of wheels and tyres of the correct size	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check the tyre pressures	OK	Proceed to test 3
		Faulty	Rectify fault, proceed to test 5
3	Check the pulser ring for damage or contamination by road grime or ferrous metal filings	OK	Proceed to test 4
		Faulty	Clean or replace the ABS pulser ring, proceed to test 5
4	Measure the air gap of the front wheel speed sensor between the sensor and the pulser ring: - Air gap between 0 mm to 1.5 mm	OK	Proceed to test 5
		Faulty	Rectify the fault and proceed to test 5
5	Clear fault code and test ABS to verify fault cleared	OK	Action complete - quit test
		Fault still present	Contact Triumph service

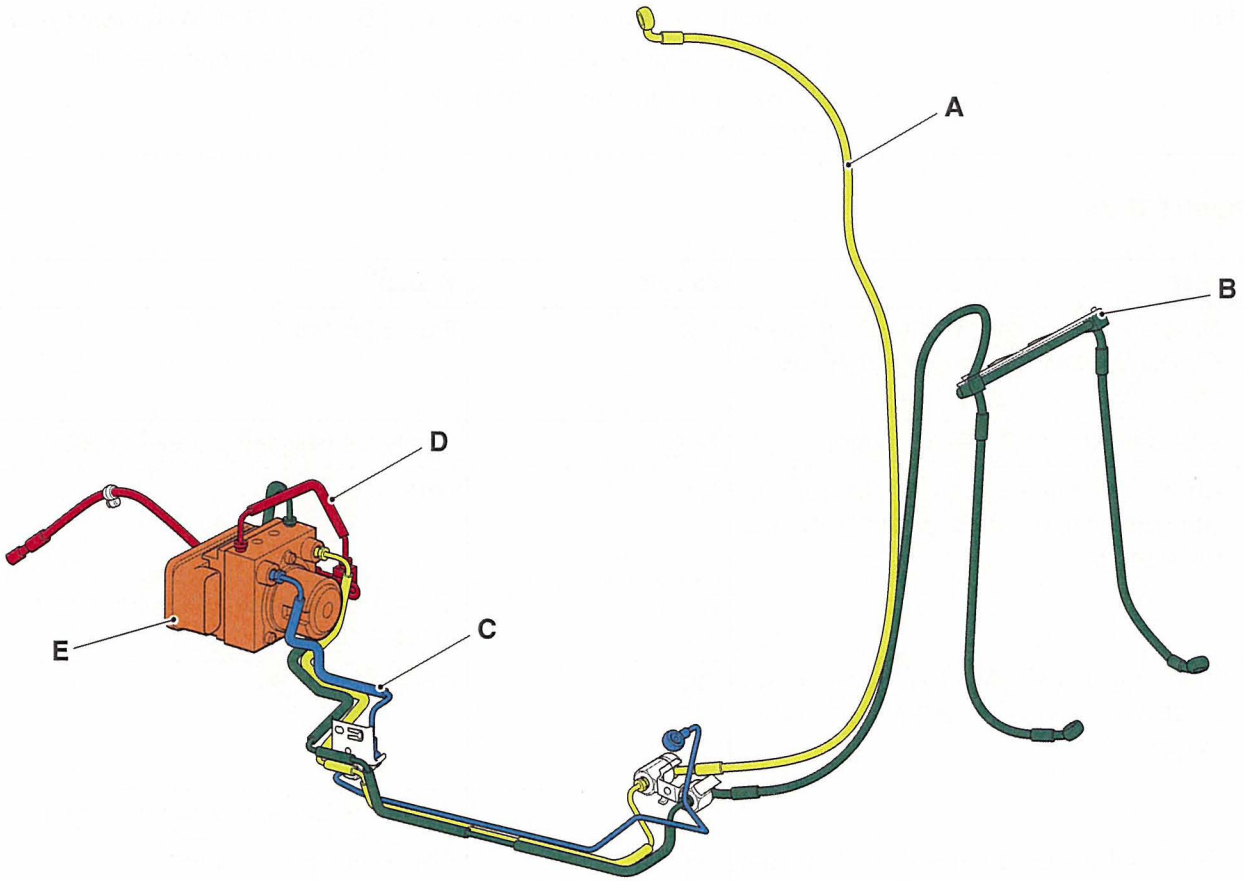
Abnormal ECU

Fault Code	Possible cause	Action
C1681	Incorrect Wheel speed sensor air gap Damaged or dirty pulser ring Loose or incorrectly installed wheel speed sensor	Ensure ABS ECM connector is secure. Proceed to pinpoint test 1:

Pinpoint Tests

	Test	Result	Action
1	Measure the air gap of the wheel speed sensors between the sensor and the pulser ring: - Air gap between 0 mm to 1.5 mm	OK	Proceed to test 1
		Faulty	Rectify the fault and proceed to test 4
2	Check the pulser rings for damage or contamination by road grime or ferrous metal filings	OK	Proceed to test 2
		Faulty	Clean or replace the ABS pulser ring, proceed to test 4
3	Check the wheel speed sensors for correct installation, and the fixings for correct torque	OK	Proceed to test 4
		Faulty	Rectify the fault and proceed to test 4
4	Clear fault code and test ABS to verify fault cleared.	OK	Action complete - quit test
		Fault still present	Contact Triumph service

ABS Hydraulic Circuit Layout



A. Front Brake Circuit from Master Cylinder to ABS Modulator

B. Front Brake Circuit from ABS Modulator to Front Calipers

C. Rear Brake Circuit from Master Cylinder to Modulator

D. Rear Brake Circuit from ABS Modulator to Rear Caliper

E. ABS Modulator

13 Front Suspension

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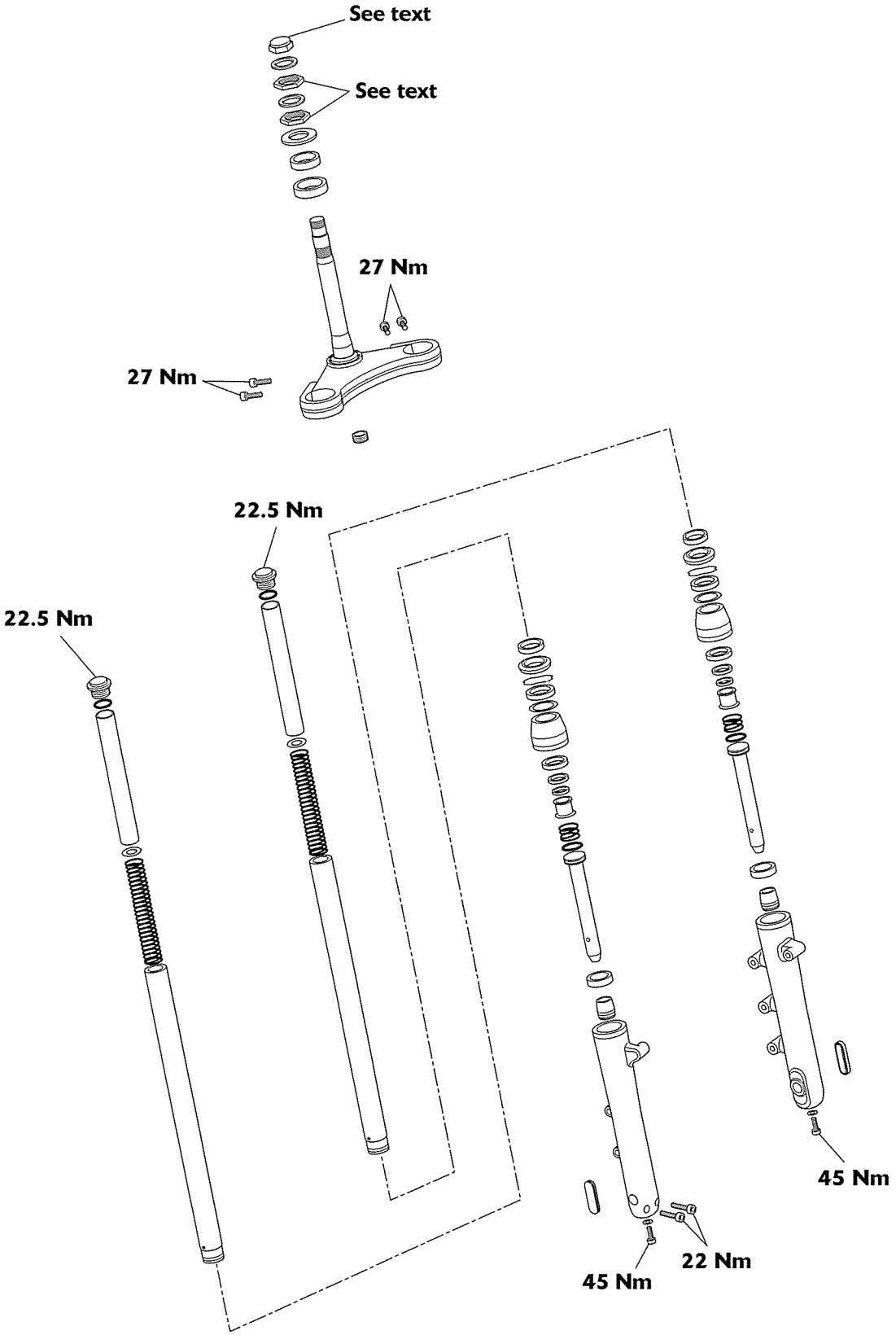
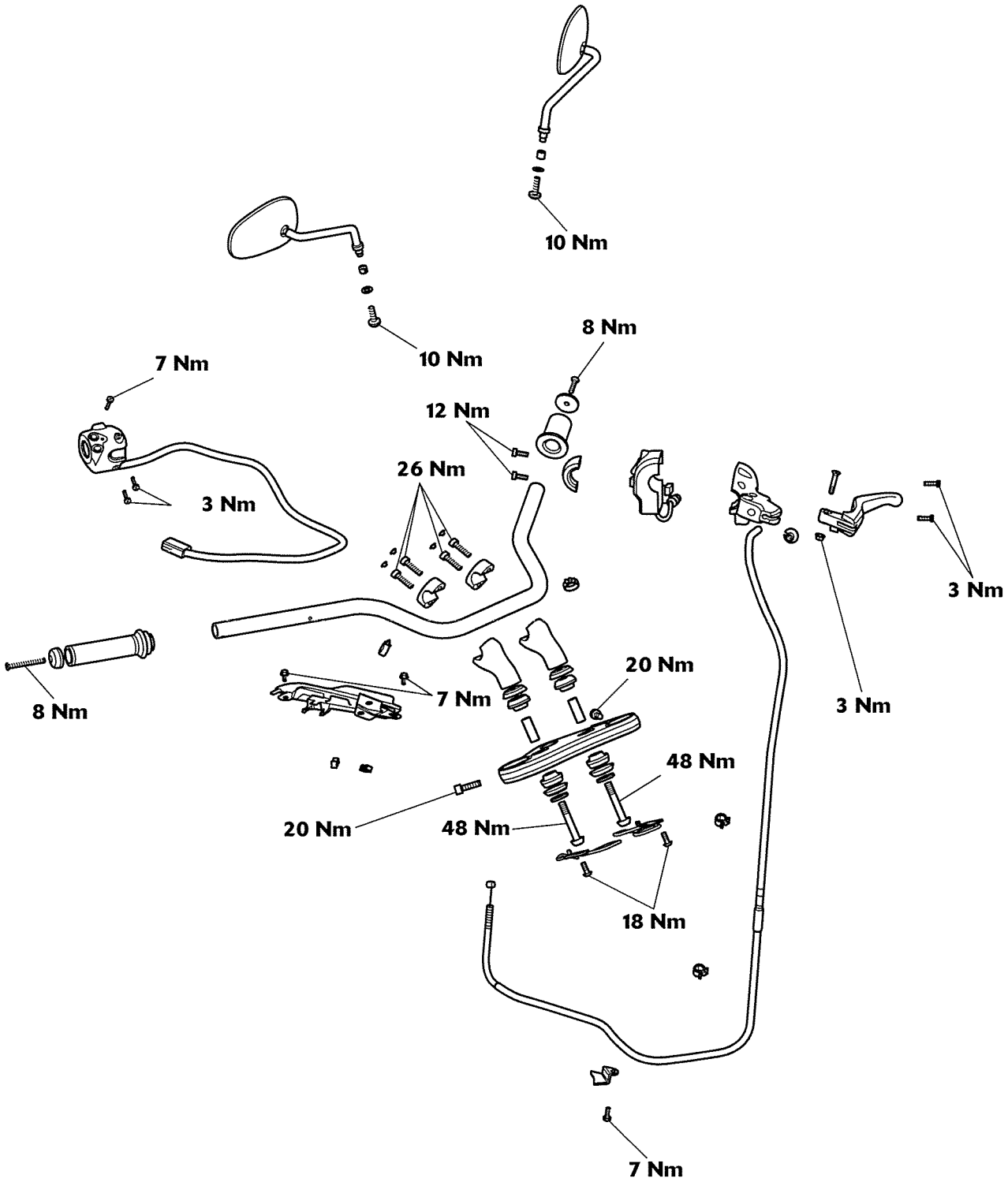
Exploded View - Front Fork, Top and Bottom Yokes and Steering Head Bearings



Exploded View - Handlebars and Top Yoke



Fork Inspection

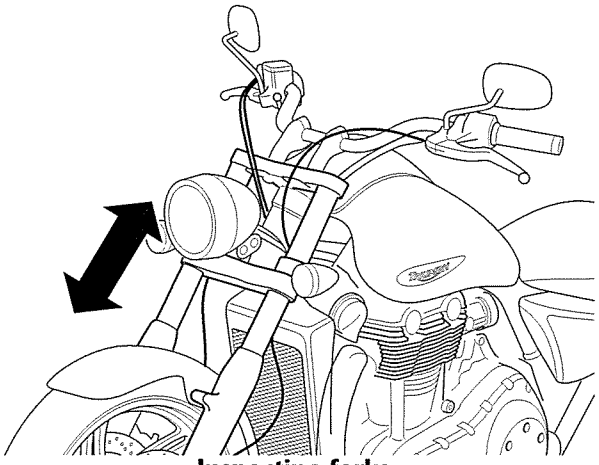
Examine each fork for any sign of damage, scratching of the slider surface, or for oil leaks.

If any damage or oil leakage is found consult an authorised Triumph dealer.

Check that the forks operate smoothly as follows:

Position the motorcycle on level ground.

While holding the handlebars and applying the front brake, pump the forks up and down several times.



Inspecting forks

If roughness or excessive stiffness is detected, consult your authorised Triumph dealer.

Warning

Riding the motorcycle with defective or damaged suspension is dangerous and may lead to loss of motorcycle control and an accident.

Front Fork

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 front of the motorcycle.
2. Remove the rider's seat (see page *17-8*).
3. Disconnect the battery, negative (black) lead first.
4. Remove the front wheel (see page *16-6*).

Warning

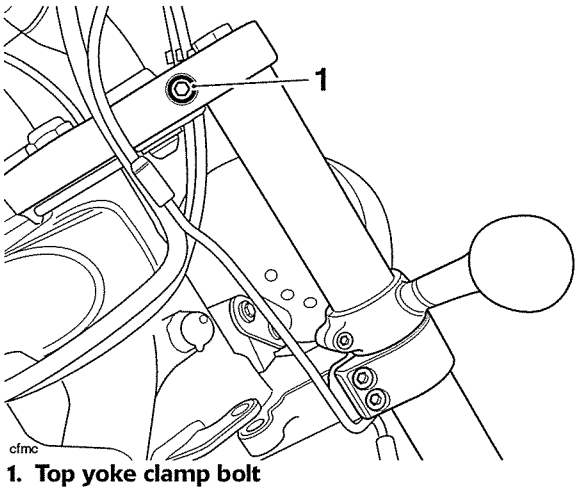
Never allow the brake calipers to hang on the brake hoses as this may damage the hoses. A damaged brake hose can cause a reduction in braking efficiency leading to loss of motorcycle control and an accident.

5. Remove the front mudguard (see page *17-10*).

Note:

- **If the forks are to be dismantled, slacken the fork top caps.**

6. Slacken the top yoke clamp bolts.



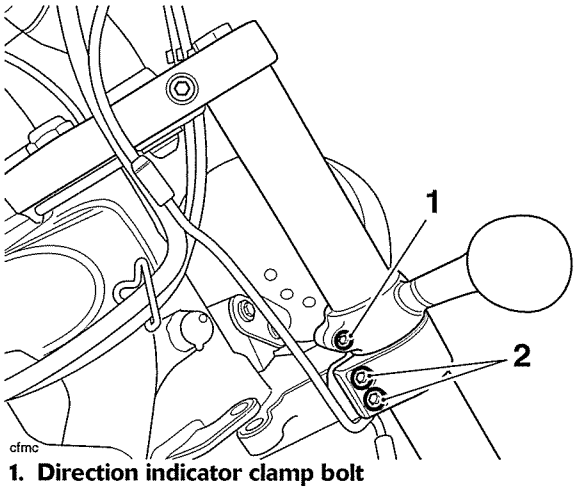
1. Top yoke clamp bolt

7. Note the orientation and position of the direction indicators on the forks, and slacken both direction indicator bracket clamp bolts.

⚠ Caution

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

8. Slacken the bottom yoke clamp bolts and slide the forks down through the yokes.

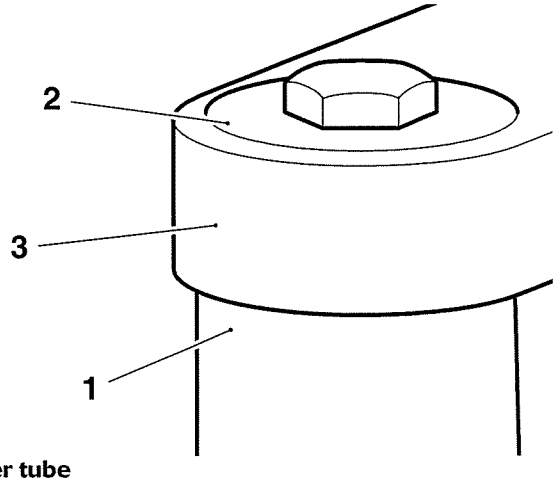


1. Direction indicator clamp bolt
2. Bottom yoke clamp bolts

9. As the forks are released, slide the direction indicator brackets off the forks and tie aside. Do not allow the direction indicators to hang on the wiring harnesses.
10. Remove the forks from the bottom yoke.

Installation

1. Install the each fork through the bottom yoke, and slide the direction indicator bracket on to the forks.
2. Position the fork through the top yoke so that the flat upper surface of the top cap is flush with the upper surface of the top yoke.



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

3. Tighten the bottom yoke clamp bolts to **27 Nm**.
4. Tighten the top yoke clamp bolts to **20 Nm**.
5. Reposition the direction indicator brackets as noted during disassembly. Ensure the direction indicator harness is correctly routed in the groove in the bracket, and that the wiring is not trapped by the bracket.
6. Refit the front mudguard (see page *17-10*).
7. Install the front wheel (see page *16-7*).
8. Reconnect the battery, positive (identified with red tape) lead first.
9. Refit the rider's seat (see page *17-9*).
10. Lower the motorcycle to the ground and park it on the side stand.

Fork Oil Change

Oil draining

1. Remove the fork assembly (see page *13-4*).
2. Secure the fork inner tube upright in a soft jawed vice.

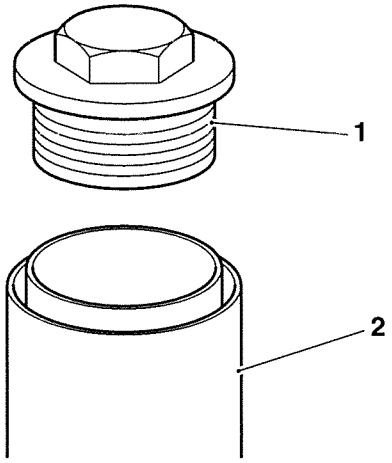
Caution

When securing the fork in a vice, take great care not to overtighten the vice as this will cause the fork tube to distort beyond repair.

3. Carefully unscrew the top cap from the inner tube.

Warning

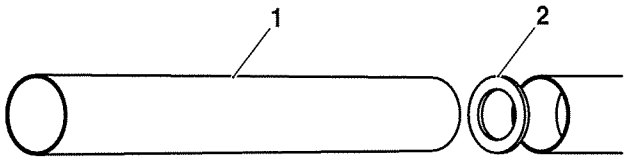
The top cap is under pressure from the fork spring. As the last few threads of the cap are unscrewed, keep the cap pushed firmly into the tube to prevent it being forcibly expelled as the threads release. To prevent injury, always wear eye, face and hand protection when removing the top cap.



T908.11.05

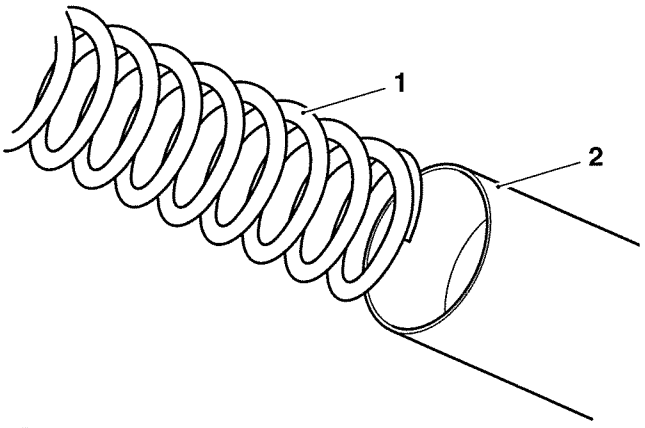
1. Top cap
2. Fork tube

4. Remove the spacer and spring seat.



1. Spacer
2. Spring seat

5. Lift out the spring.



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1. Spring
2. Fork tube

6. Invert the fork and pour out the fork oil into a suitable container. Pump the fork assembly to remove all oil.

Fork Oil Level Chart

Oil Level	Oil Volume	Oil Grade	Fork Pull Through
106 mm	677 cc	Showa AHSS8 SAE 10W	Upper surface of top cap flush with upper surface of top yoke

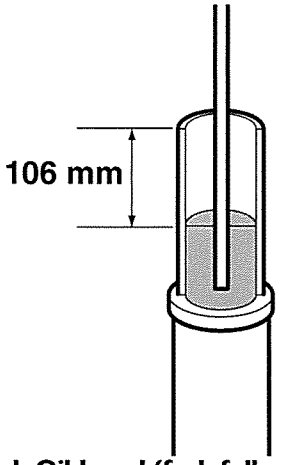
Oil refilling

Note:

- **The oil level specified for Thunderbird models is 106 mm from the upper surface of the fork inner tube, with the spring removed and the fork fully compressed.**

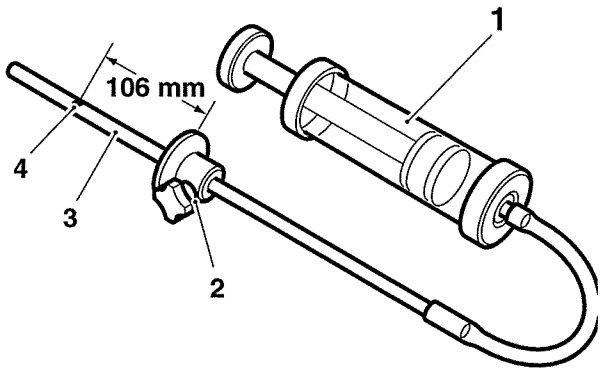
Warning

Any variation from the figures quoted above could result in an unsafe riding condition leading to loss of motorcycle control and an accident.



Fork Oil Level (fork fully compressed)

7. Return the fork to an upright position and fill the fork with Showa AHSS8 (SAE 10W) fork oil until the oil level is slightly above the recommended level.
8. Pump the fork assembly 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 level to stabilise.
9. Set the scale on tool 3880160–T0301 to the specified level.

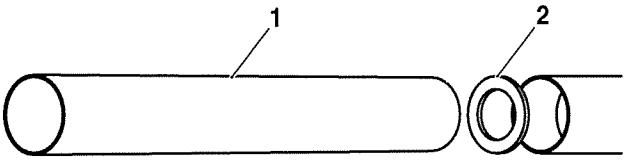


1. Tool 3880160–T0301
2. Adjuster plate
3. Scale area
4. Hole (zero position)

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.**

10. Insert the scale end of the tool into the fork inner tube.
11. 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).
12. 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.
13. Extend the inner tube and insert the fork spring.
14. Fit the spring seat and spacer.



1. Spacer
2. Spring seat

15. Lubricate the O-ring with a smear of fork oil then screw the top cap fully into the inner tube.

Warning

Keep the top cap under pressure until you are sure it is fully engaged with the inner tube threads. To prevent injury, always wear eye, face and hand protection when refitting the top cap.

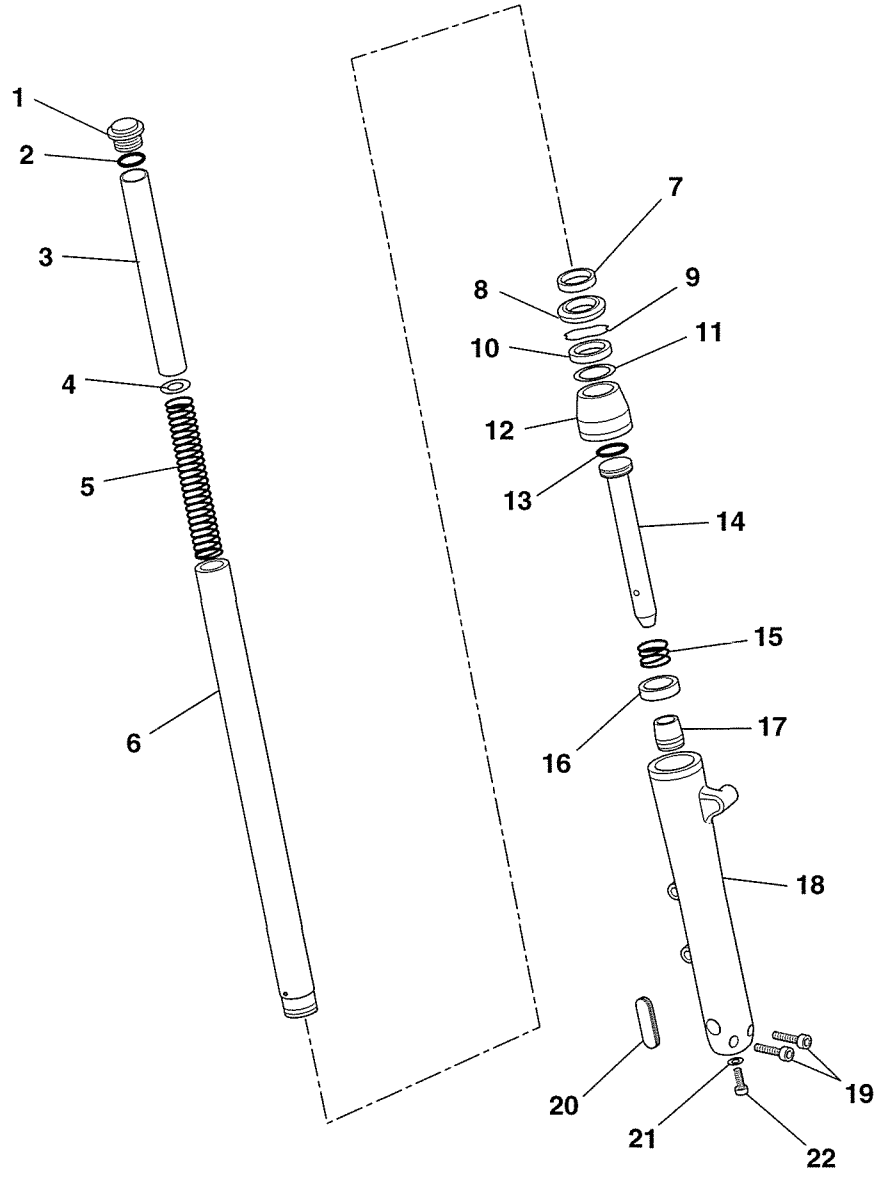
16. Refit the fork (see page *13-5*) and tighten the top cap to **30 Nm**.

Note:

- **It is much easier to tighten the top cap when the fork is securely clamped in the top yoke.**

Front Fork

Disassembly



Fork components

1. Top cap
2. O-ring
3. Spacer
4. Spring seat
5. Spring
6. Inner tube
7. Bush (upper)
8. Dust seal
9. Circlip
10. Oil seal
11. Washer
12. Chrome cap
13. Damper seal
14. Damper rod
15. Rebound spring
16. Bush (lower)
17. Oil lock
18. Outer tube
19. Axle pinch bolts
20. Reflector (if fitted)
21. Sealing washer
22. Damper cylinder bolt

Warning

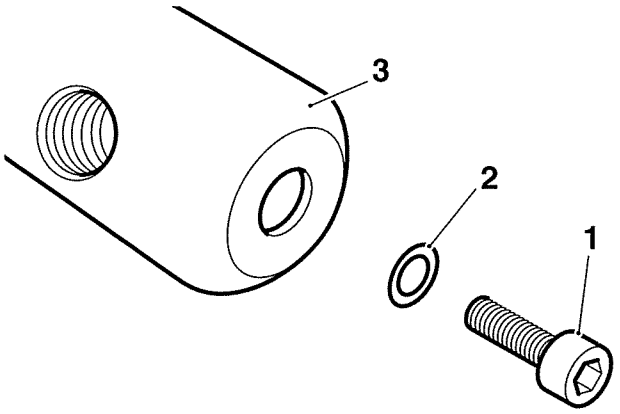
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Remove the fork assembly (see page *13-4*).
2. If not already done, release the torque on the damping cylinder bolt, then lightly re-tighten it to prevent fluid loss.

Caution

When securing the fork in a vice, take great care not to overtighten the vice as this will cause the fork tube to distort beyond repair.

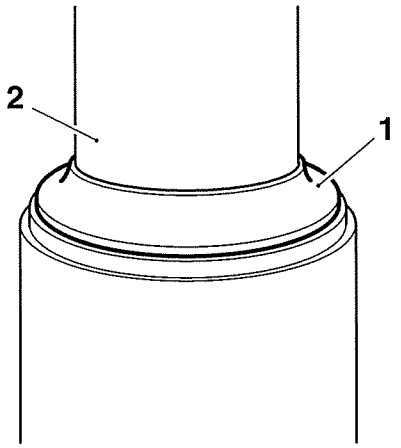
3. Drain the fork oil (see page *13-6*).
4. Carefully remove the chrome cap from the fork outer tube (18), using a suitable pin punch.
   Locate the pin punch in the recess in the fork leg, located above the front mudguard mountings.
5. Remove the damper rod bolt and sealing washer from the base of the outer tube. Discard the sealing washer.



cetp

1. Damper rod bolt
2. Sealing washer
3. Outer tube

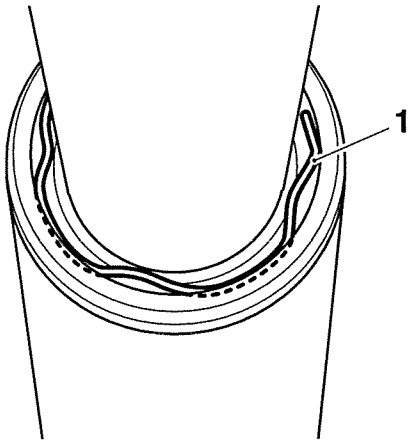
6. Invert the fork and tip out the damper rod and rebound spring.
7. Ease the dust seal out of position and slide it off the inner tube.



ceto

1. Dust seal
2. Inner tube

8. Carefully ease the circlip out from the top of the outer tube.



cetn

1. Circlip

Caution

Keep the fork fully compressed whilst removing the circlip. Any accidental damage to the inner tube will then be confined to the area which is normally above the oil seal.

9. Compress the fork then pull the inner tube sharply out of the outer tube. Repeat this procedure until the top bush and seal are forced out of position and the inner and outer tube can be separated.
10. Invert the outer tube and tip out the damper rod seat.
11. Slide the oil seal, washer and upper bush off the top of the inner tube.
12. Carefully slide the lower bush off the inner tube.

Inspection

1. Thoroughly clean and examine all components for damage, wear, scoring, corrosion etc., paying particular attention to the bushes and damper rod piston ring. Renew as necessary.
2. Always renew the oil seal, dust seal and the damper rod bolt sealing washer every time the fork is dismantled.

Assembly

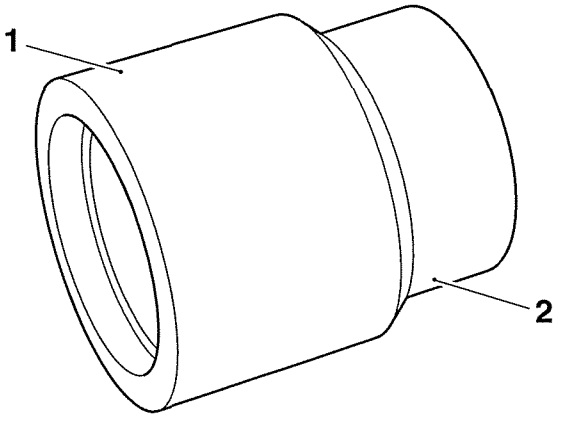
Warning

The front forks comprise many precision machined parts. Total cleanliness must be observed at all times and, assembly must take place in a dirt/dust-free environment.

Dirt ingress may cause damage to the fork parts, leading to incorrect operation, instability, loss of control or an accident.

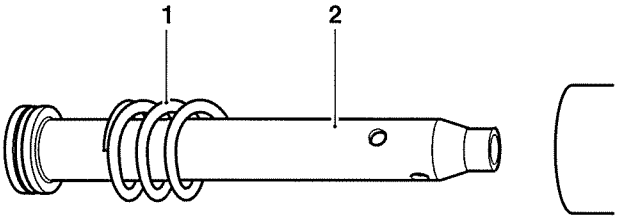
Note:

- **During assembly of the fork, tool T3880131 will be used extensively. In the text, reference to a plain end and a stepped end will be made. This describes the two ends of the tool as shown in the diagram below.**



1. Plain end
2. Stepped end

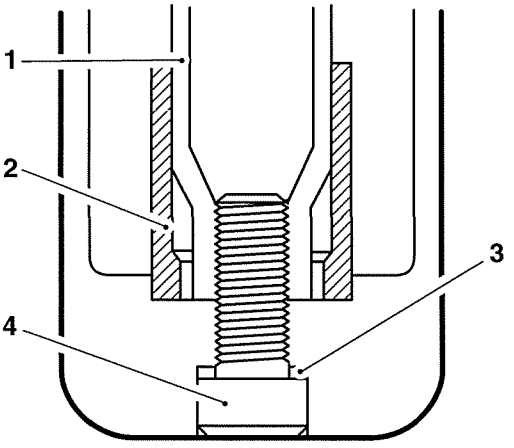
1. If removed, refit the lower bush to the inner tube.
2. Lubricate the damper rod piston ring and the upper and lower bushes with clean fork oil.
3. Fit the rebound spring to the damper rod then insert the assembly into the inner tube.



T908.11.13

1. Rebound spring
2. Damper rod

4. Fit the seat securely to the end of the damper rod then insert the inner tube assembly into the outer tube.
5. Fit a new sealing washer to the damper rod bolt then apply locking compound (ThreeBond 1342) to the bolt threads.
6. Ensure the damper rod and seat are correctly located in the outer tube then fit the damper rod.



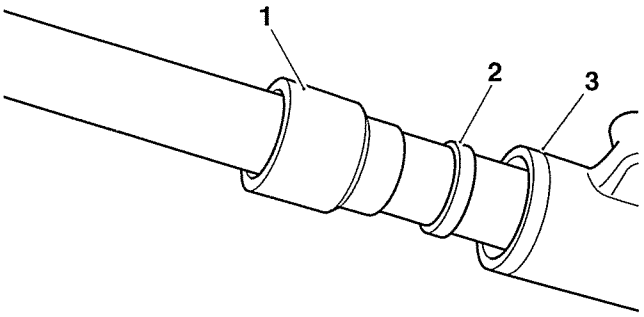
kagj

1. Damper rod
2. Seat
3. Sealing washer
4. Bolt

7. Slide the top bush along the inner tube and locate it in the outer tube. Drift the bush into position using the stepped end of tool T3880131.

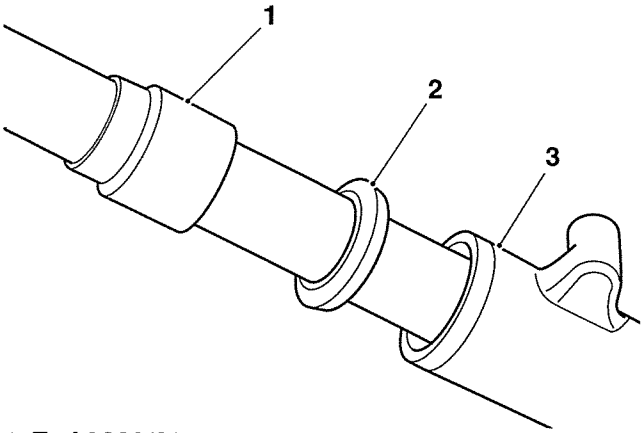
⚠ Caution

Keep the fork fully compressed whilst installing the bush, oil seal and circlip. Any accidental damage to the inner tube will then be confined to the area which is normally above the oil seal.



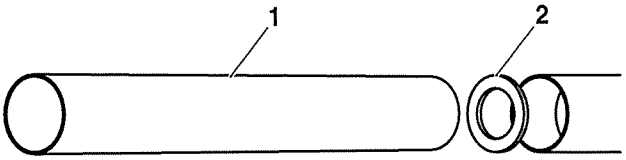
1. Tool 3880131
2. Top bush
3. Outer tube

8. Slide the washer along the inner tube and locate it in the outer tube.
9. Lubricate the lip of the new oil seal with fork oil. Ensure the seal is the correct way around then ease it onto the inner tube. Drift the seal into position in the outer tube using the stepped end of tool T3880131.
10. Secure the oil seal in position with the circlip, ensuring it is correctly located in its groove.
11. Fit the new dust seal onto the inner tube and drift it into position in the outer tube using the plain end of tool T3880131.



1. Tool 3880131
2. Dust seal

12. Refill the fork with new oil (see page *13-6*).
13. Extend the inner tube and insert the fork spring.
14. Fit the spring seat and spacer.



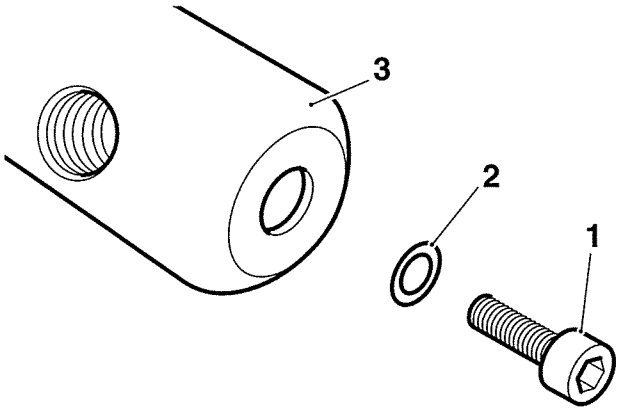
1. Spacer
2. Spring seat

15. Lubricate the O-ring with a smear of fork oil then screw the top cap fully into the inner tube.

⚠ Warning

Keep the top cap under pressure until you are sure it is fully engaged with the inner tube threads. To prevent injury, always wear eye, face and hand protection when refitting the top cap.

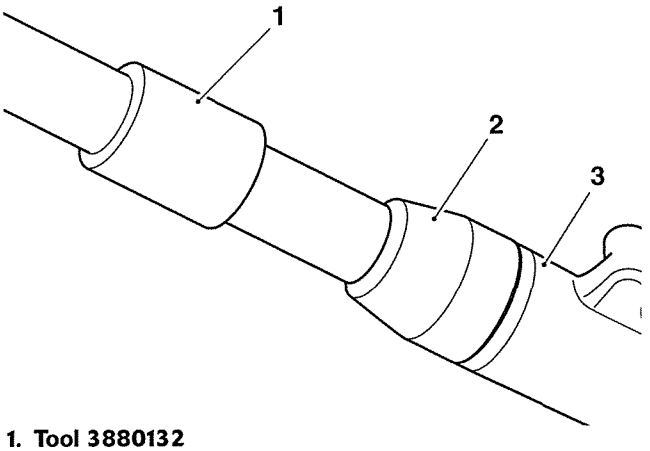
16. Tighten the damper rod bolt to **45 Nm**.



cetp

1. Damper rod bolt
2. Sealing washer
3. Fork leg

17. Inspect the chrome cap for damage caused during removal, and renew if necessary. Position the chrome cap to the fork and drift in to position using tool T3880132.



1. Tool 3880132
2. Chrome cap
3. Outer tube

18. Refit the fork (see page *13-5*) and tighten the top cap to **22.5 Nm**.

Note:

- **It is much easier to tighten the top cap when the fork is securely clamped in the bottom yoke.**

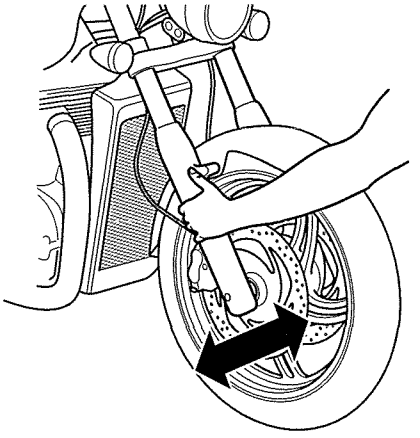
Steering Head Bearing Check and Adjustment

Warning

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

Check

1. Raise and support the motorcycle so that the front wheel is clear of the ground.
2. Move the handlebars from lock-to-lock whilst checking for signs of tight spots or notchiness (bearings over-tightened).
3. Hold the lower end of the front forks and try to move them forward and backward to check for signs of free play in the bearings (bearings insufficiently tightened or worn).



cfgt

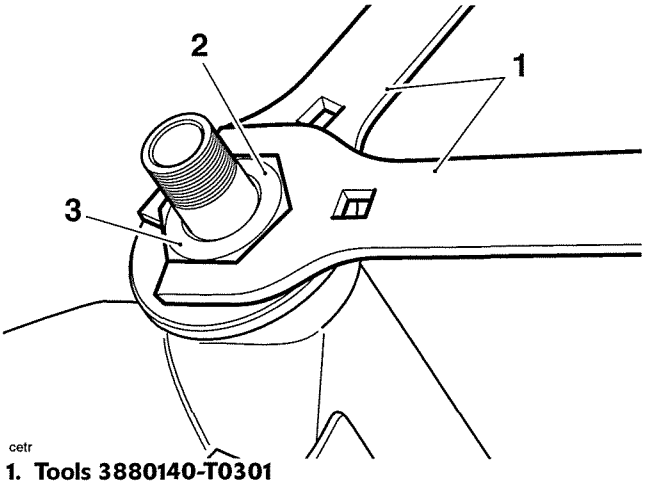
Checking for Free Play in Steering Head Bearings

4. Adjust as described below then lower the motorcycle to the ground.

Adjustment

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Remove the top yoke (see page *13-16*).

4. Slacken the locknut and adjuster nut.



cetr

1. Tools 3880140-T0301
2. Locknut

5. Adjust the bearing free play as follows:
   a) Tighten the adjuster nut to **40 Nm**.
   b) Slacken the adjuster nut fully.
   c) Re-tighten the adjuster nut to **6 Nm**.
   d) Loosen the adjuster nut by 45°. Note that there will now be free play present.
6. With the bearing free play correctly set, hold the adjuster nut stationary then tighten the locknut to **40 Nm** using tools 3880140–T0301.

Note:

- **Ensure the adjuster nut does not move as the locknut is tightened.**

7. Refit the top yoke (see page *13-16*).
8. Check that the free play has been eliminated and that the steering can be turned freely from lock to lock without any sign of tightness. Re-adjust if necessary.

Warning

Operation of the motorcycle with incorrectly adjusted steering head bearings, either too loose or too tight, may cause a dangerous riding condition leading to loss of motorcycle control and an accident.

9. Reconnect the battery, positive (identified with red tape) lead first.
10. Refit the rider's seat (see page *17-9*).

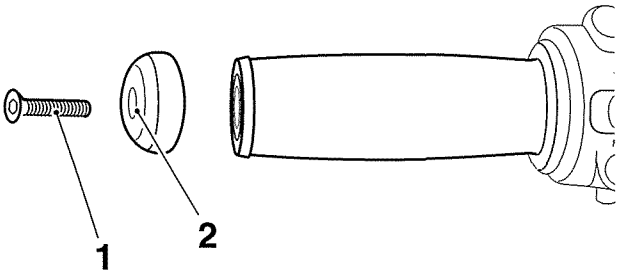
Handlebars

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.

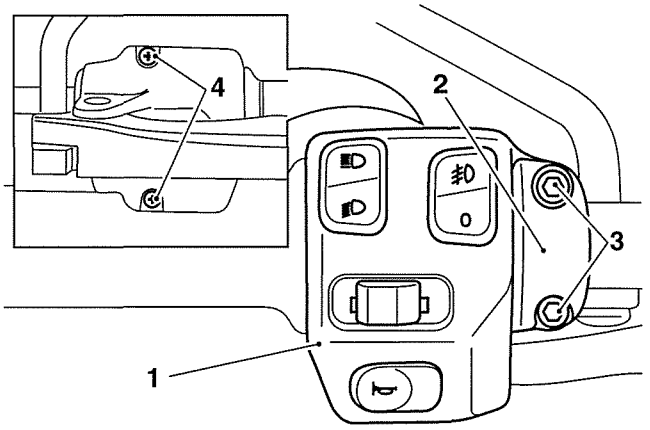
Removal

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Remove the right hand handlebar end weight.



1. Fixing screw
2. End weight

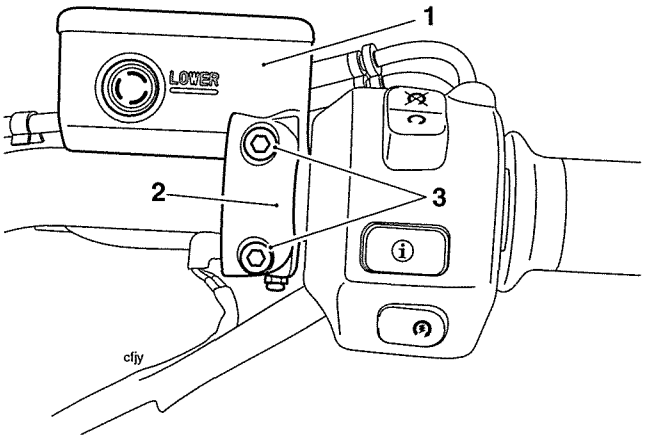
4. Release the wiring and brake hose from their clips on either side of the handlebars.
5. Undo the screws and free the left switchgear assembly from the handlebars.
6. Unscrew the screws and remove the clamp from the clutch lever assembly.



cfki

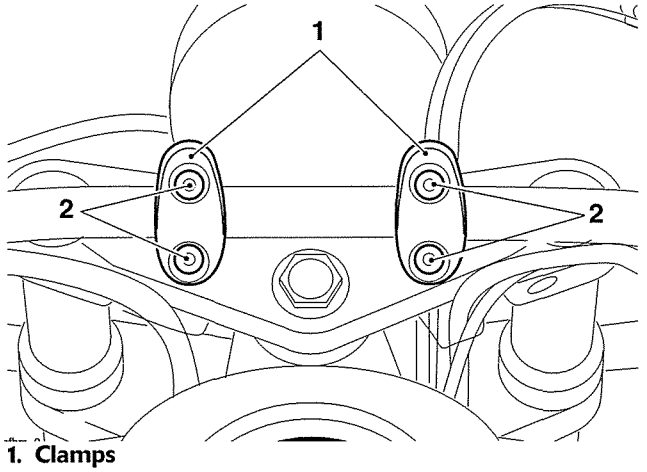
1. Left hand switchgear
2. Clamp
3. Screws
4. Screws

7. Undo the screws and free the right hand switchgear assembly from the front brake master cylinder. Free the switch wiring from the handlebars.
8. Unscrew the screws and remove the clamp from the master cylinder.



1. Front brake master cylinder
2. Clamp
3. Screws

9. Remove the screw covers from the handlebar clamps bolts. Retain the screw covers for reuse.
10. Support the handlebars then unscrew the screws and lift off the handlebar clamp.s.

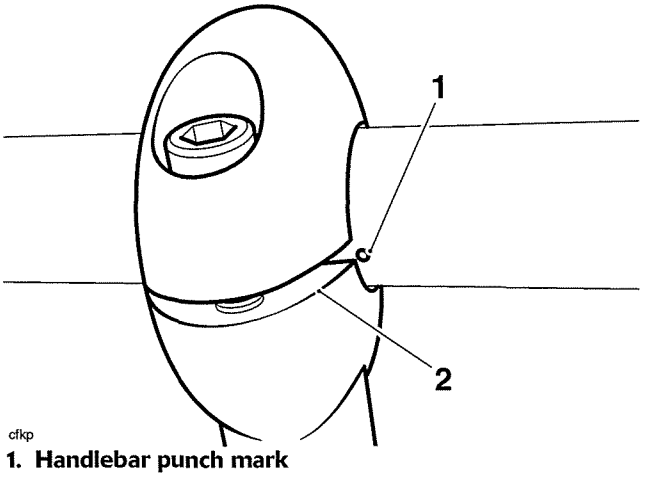


1. Clamps
2. Screws

11. Free the handlebars from the twist-grip/master cylinder assembly and remove them from the motorcycle. Support the master cylinder in an upright position.

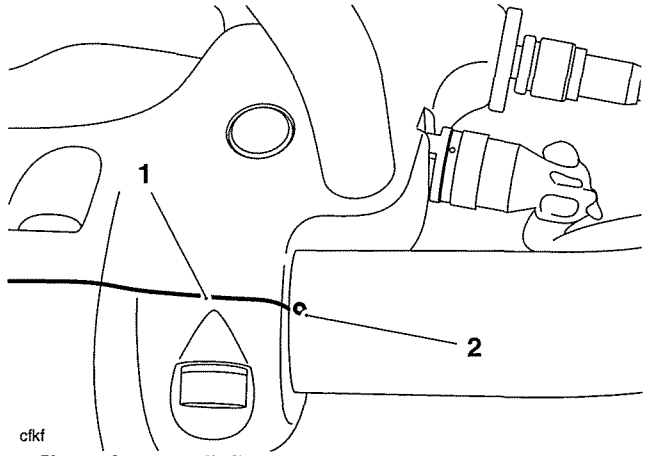
Installation

1. Fit the throttle twist-grip assembly then locate the handlebars in the lower halves of the clamp. Fit the clamp and secure with the fixings.
2. Align the handlebar punch mark with the lower-rear inner left hand split line of the clamp.



1. Handlebar punch mark
2. Clamp split line

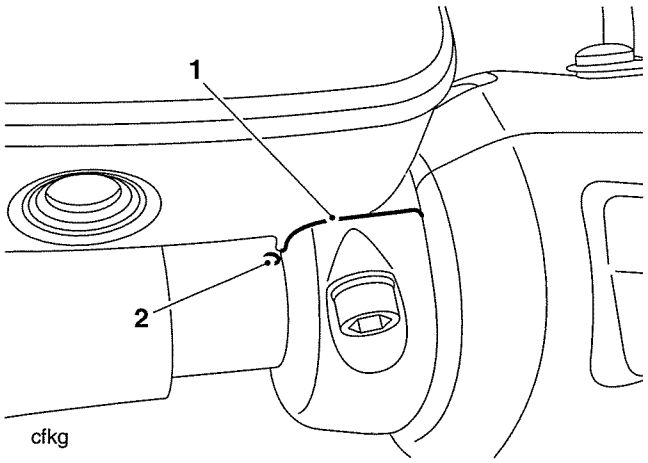
3. Tighten the front clamp screws to **26 Nm,** then the rears.
4. Locate the clutch lever assembly to the handlebar and fit the clamp.
5. Align the clamp lower split line with the punch mark on the handlebar then tighten the clamp screws to **12 Nm**.



1. Clamp lower split line
2. Handlebar dot mark

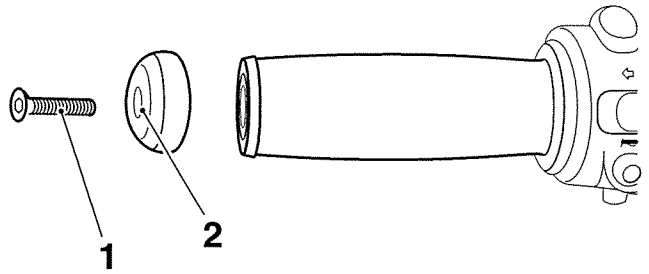
6. Fit the clamp to the front brake master cylinder.

7. Align the clamp lower split line with the punch mark on the handlebar then evenly tighten the clamp screws to **12 Nm**.



1. Clamp lower split line
2. Handlebar dot mark

8. Refit the both switchgear assemblies, tightening the screws to **3 Nm**.
9. Assemble the handlebar end weights into the handlebar ends, and tighten the fixings to **8 Nm**.



1. Fixing
2. End weight assembly

10. Renew any damaged clips and secure the left hand and right hand switchgear wiring to the handlebars.
11. Check that the throttle opens and closes smoothly without sticking. Rectify as necessary.

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.

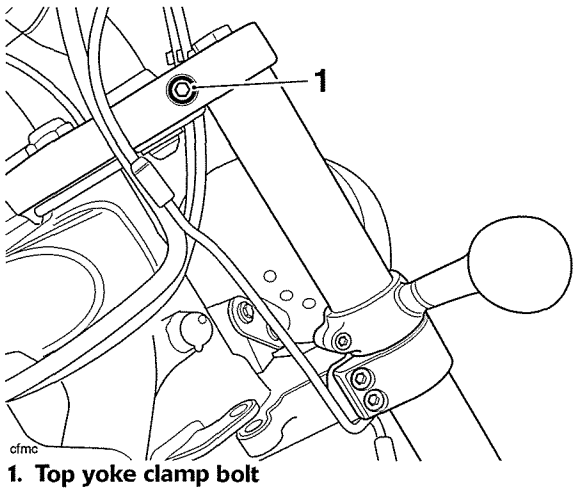
Warning

Move the handlebars to left and right full lock while checking that cables and harnesses do not bind or that the steering feels tight or difficult to turn. A cable or harness that binds, or steering that is tight/difficult to turn will restrict the steering and may cause loss of control and an accident.

Top Yoke

Removal

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Remove the handlebars (see page *13-13*).
4. Slacken the top yoke clamp bolts.

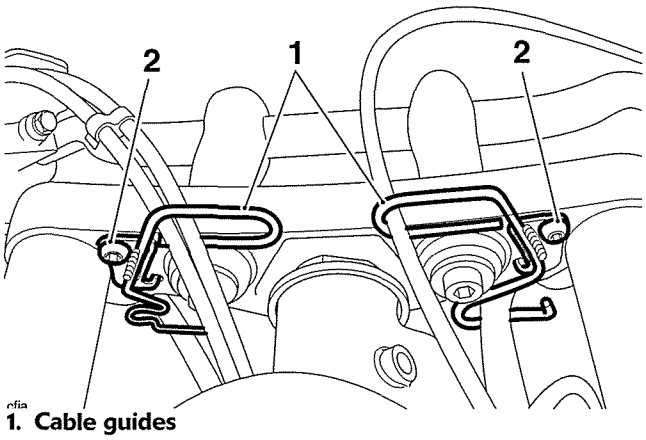


1. Top yoke clamp bolt

Note:

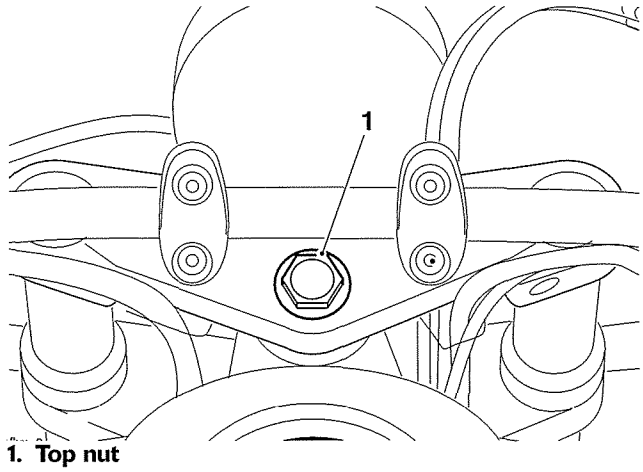
- **Make a note of the cable routings behind the cable guide.**

5. Release the screws and detach the two cable guides.



1. Cable guides
2. Cable guide fixings

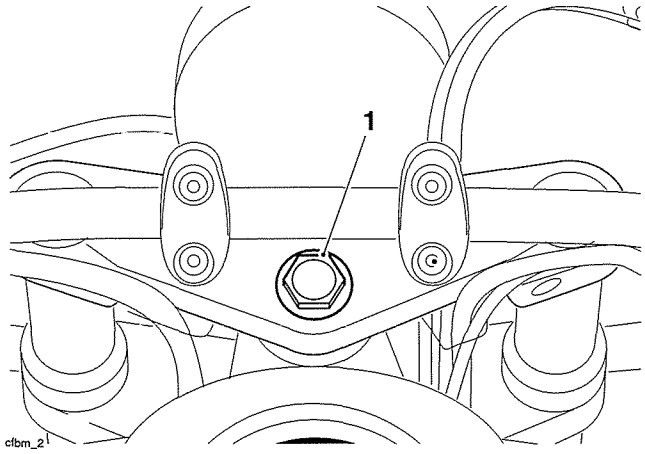
6. Slacken and remove the top nut and washer. Lift and remove the top yoke.



1. Top nut

Installation

1. Seat the top yoke in to position.
2. Refit the washer and top nut, tightening it to **65 Nm**.



1. Top nut

3. Tighten the top yoke clamp bolts to **20 Nm**.
4. Install the handlebars (see page *13-14*).
5. Refit the cable guides and tighten the fixings to **18 Nm**.
6. Reconnect the battery, positive (identified with red tape) lead first.
7. Refit the rider's seat (see page *17-9*).

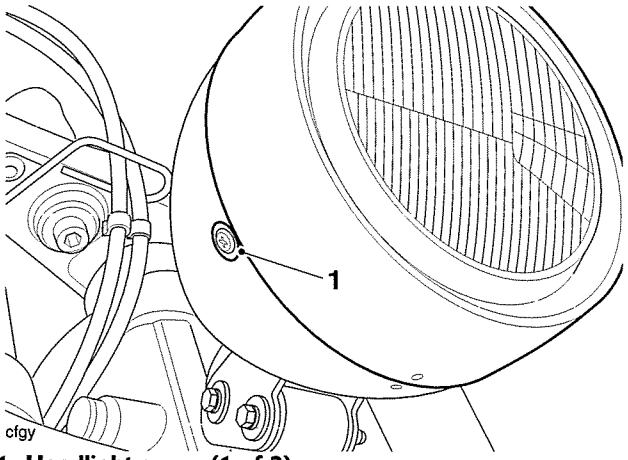
Bottom Yoke and Headstock Bearings

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 rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Remove both front forks (see page *13-4*).
4. Remove the top yoke (see page *13-16*).
5. Release the two screws and detach the headlight from the headlight bowl.

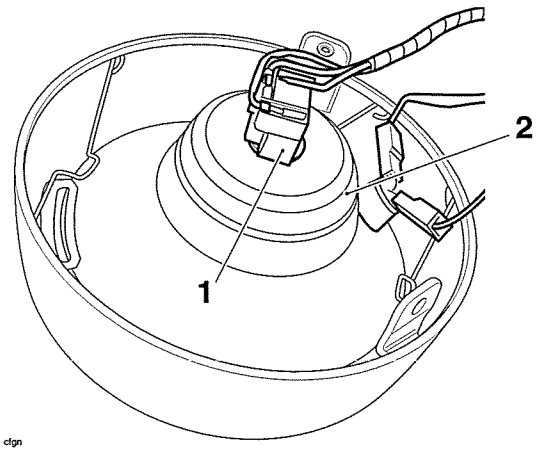


1. Headlight screw (1 of 2)

Note:

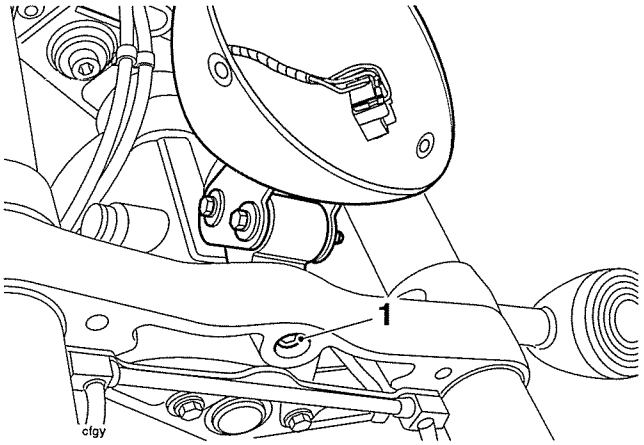
- **Make a note of the direction indicator harness routing and the wiring harness routing inside the headlight bowl before disconnection.**

6. Disconnect the electrical connector from the headlight bulb, detach the position light and remove the headlight.



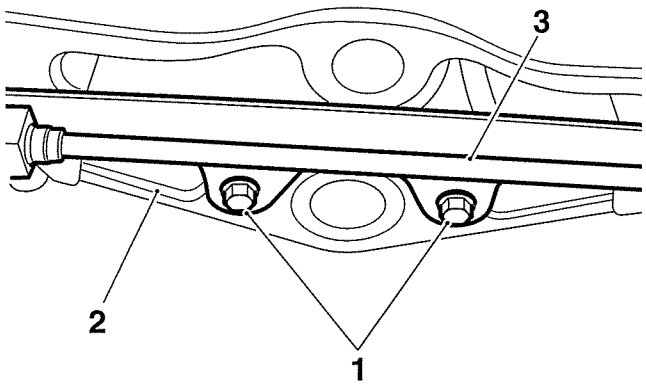
1. Electrical connector
2. Position light

7. Disconnect the two direction indicator electrical connectors.
8. Release the headlight horizontal adjustment bolt and remove the headlight assembly while feeding the harnesses out of the headlight bowl.



1. Headlight horizontal adjustment bolt

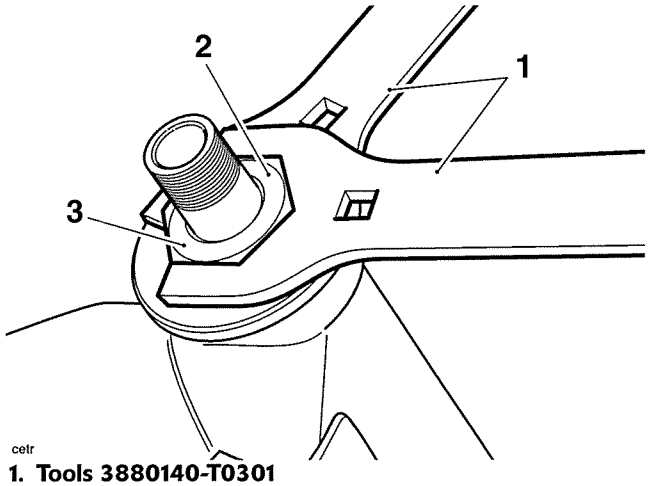
9. Release the two bolts, detach the brake hose from the bottom yoke and tie aside.



cfkn

1. Bolts
2. Indicator harnesses
3. Brake hose

10. Thread the two direction indicator harnesses through the hole in the bottom yoke and remove the direction indicators from the motorcycle.
11. Remove the locknut, adjuster nut and bearing cover.



cetr

1. Tools 3880140-T0301
2. Locknut
3. Bearing cover

12. Remove the bottom yoke from below the frame headstock.

Bearing removal

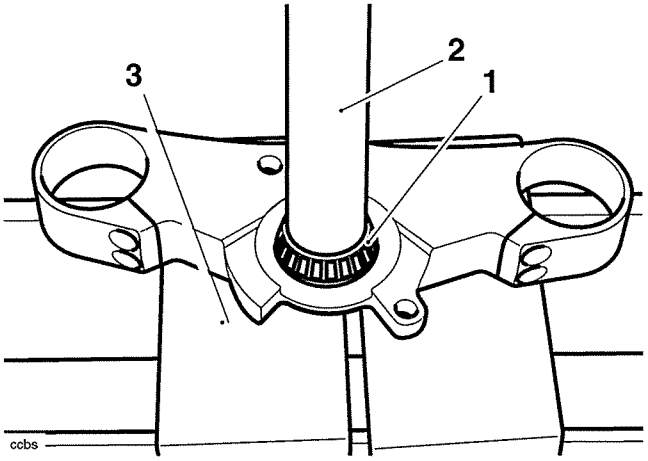
1. Using a suitable drift, evenly and progressively drive the bearing outer races from the frame headstock.
2. Remove the bearing from the bottom yoke using a press or puller.

⚠ Caution

Protect the threads of the bottom yoke when using a press or puller as damaged threads may mean replacing the yoke completely.

Installation

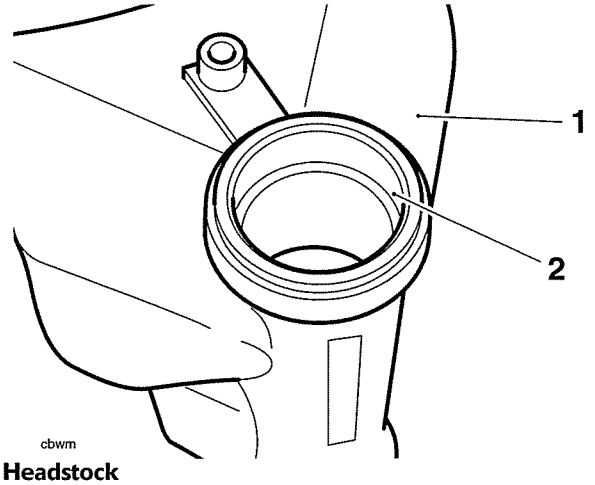
1. Press a new bearing onto the steering stem of the bottom yoke.



ccbs

1. Bearing
2. Press
3. Press bed

2. Evenly and progressively drive new bearing outer races into the frame headstock.



cbwm

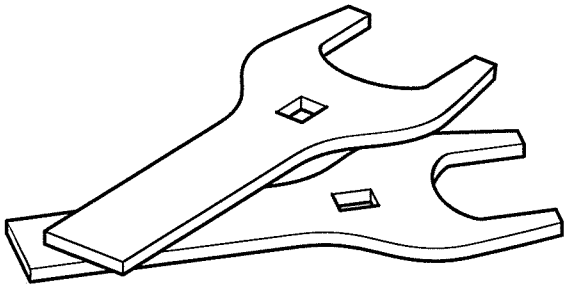
1. Headstock
2. Bearing outer race

3. Lubricate the headstock bearings using multi-purpose grease conforming to NLGI 2 specification (we recommend Mobil HP222).

4. Insert the lower yoke to the frame headstock, fit the upper bearing and retain with the bearing cover, adjuster nut and locknut.
5. Adjust the bearing free play as follows:
   a) Tighten the adjuster nut to **40 Nm**.
   b) Slacken the adjuster nut fully.
   c) Re-tighten the adjuster nut to **6 Nm**.
   d) Loosen the adjuster nut by 45°. Note that there will now be free play present.
   e) Hold the adjuster nut in that position while tightening the locknut to **40 Nm**.

Note:

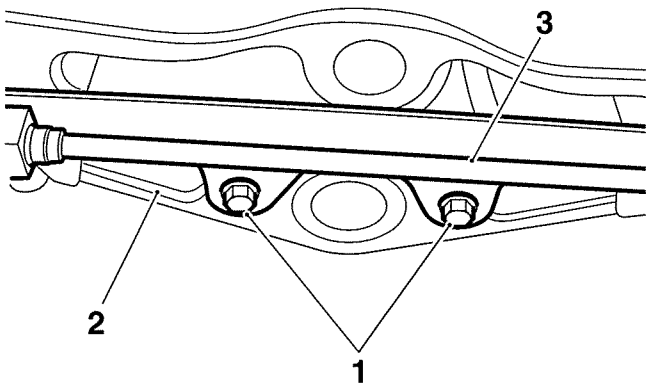
- **Ensure the adjuster nut does not move as the locknut is tightened.**



kagf1

Tools 3880140-T0301

6. Feed the indicator harnesses up through the bottom yoke and secure temporarily until the front forks are refitted. Do not allow the indicators to hang on the harnesses.
7. Refit the brake hose to the bottom yoke, ensuring the direction indicator harnesses are routed as noted during removal, and not trapped by the brake hose. Tighten the bolts to **6 Nm**.



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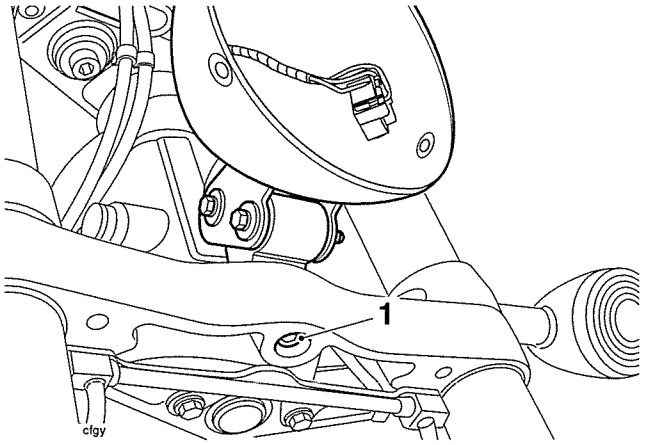
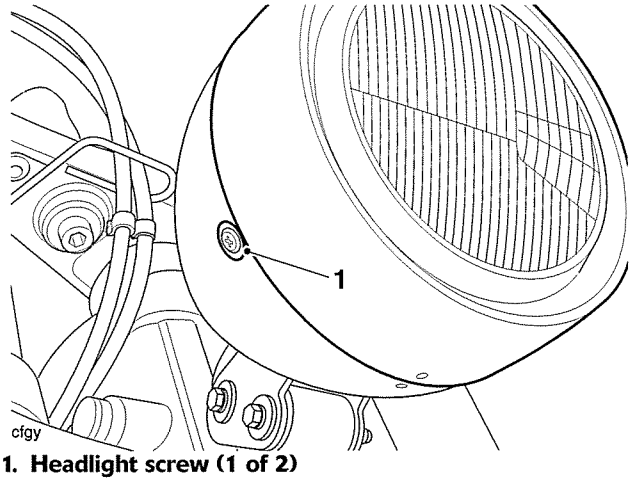
1. Brake hose bolt

8. Refit headlight bowl and bracket assembly. Tighten the bolt to **27 Nm**.



1. Headlight horizontal adjustment bolt

9. Refit the wiring harnesses in to the headlight bowl as noted during removal.
10. Reconnect the direction indicator electrical connectors as noted during removal. The right hand direction indicator harness and the main harness are both marked with red tape to aid correct connection.
11. Reconnect the headlight electrical connector and refit the position light.
12. Refit the headlight, tightening the screws to **3 Nm**.



1. Headlight screw (1 of 2)

13. Refit the top yoke (see page *13-16*).
14. Install the front forks (see page *13-4*).
15. Reconnect the battery, positive (identified with red tape) lead first.
16. Check and if necessary correct the headlight adjustment (see page *18-13*).
17. Refit the rider's seat (see page *17-9*).
18. Check that the free play has been eliminated and that the steering can be turned freely from lock to lock without any sign of tightness. Re-adjust if necessary.

⚠ Warning

Operation of the motorcycle with incorrectly adjusted steering head bearings, either too loose or too tight, may cause a dangerous riding condition leading to loss of motorcycle control and an accident.

14 Rear Suspension

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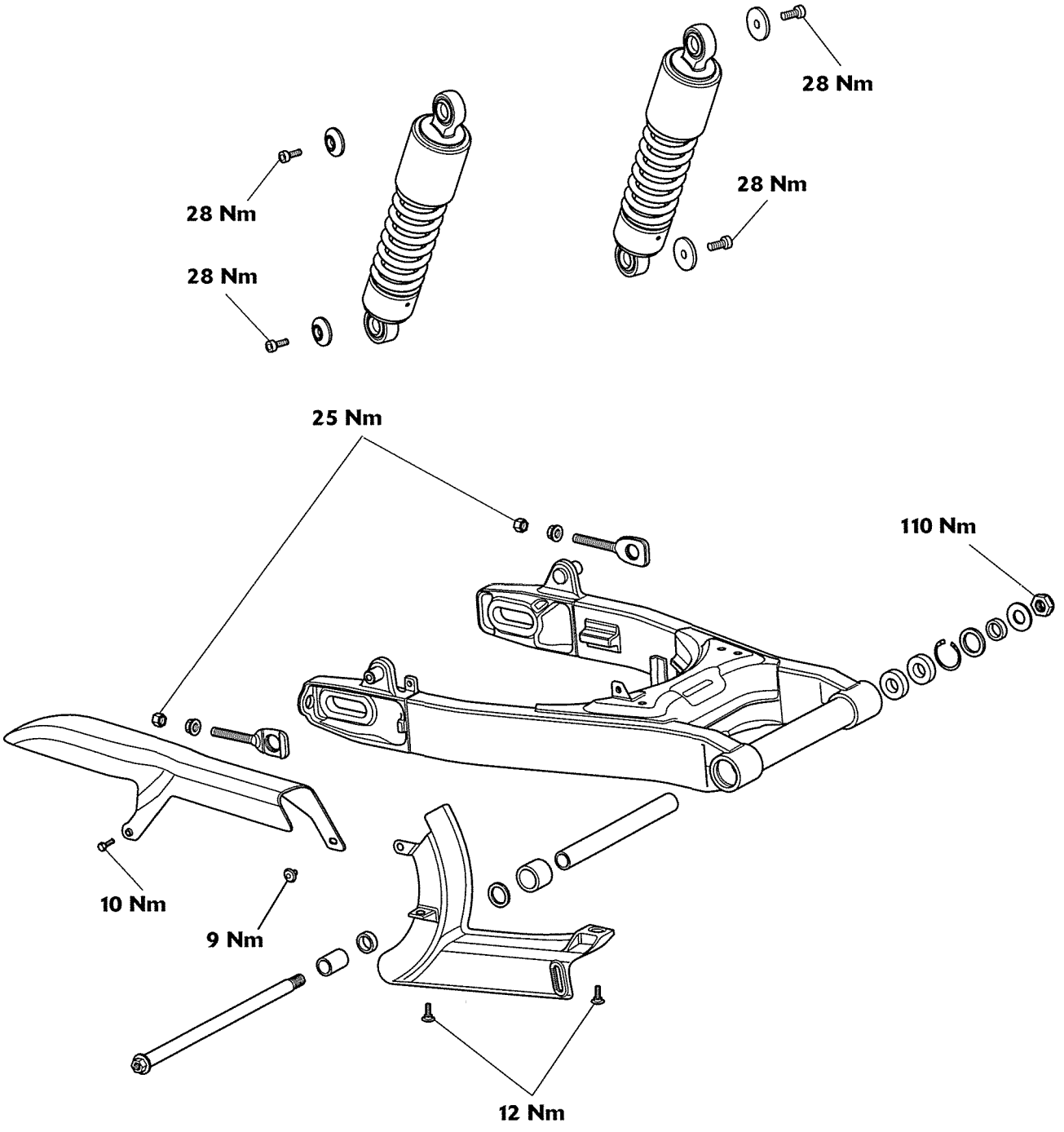
Exploded View - Rear Suspension and Swinging Arm

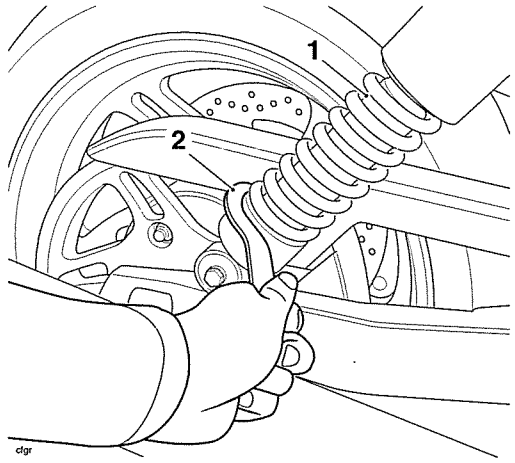


Rear Suspension Units

Adjustment

The rear suspension is adjustable for pre-load only.

To change the rear suspension spring pre-load setting, insert the adjustment tool supplied in the tool kit into the hole provided in the adjuster ring.



1. Rear Suspension Unit
2. Tool

Turn the adjuster ring clockwise to increase spring pre-load, and anti clockwise to decrease spring pre-load. When delivered from the factory, the pre-load adjuster will be set at position 1.

Warning

Ensure that the adjusters are set to the same setting on both rear suspension units. Settings that vary from left to right may affect handling and stability resulting in loss of motorcycle control, and an accident.

Suggested Suspension Settings

Adjuster settings are counted from one with position one being with the adjuster turned fully anti clockwise. There are five positions in total. Position one gives the minimum amount of spring pre-load.

Riding Condition	Suspension Preload Setting
Rider only	Position 1
Rider and passenger	Position 5
Rider, passenger and luggage	Position 5

Note:

- **The details given in the table are only a guide. Setting requirements may vary for rider and passenger weight and personal preferences.**

Removal

Warning

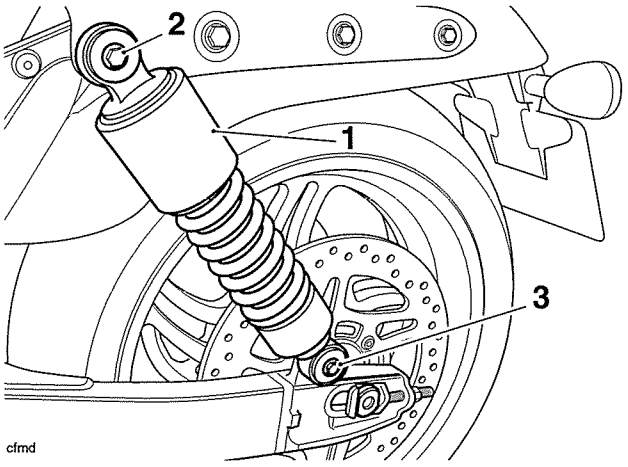
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Raise and support the motorcycle so that the rear wheel is clear of the ground.

Note:

- **If both suspension units are to be removed, place a block beneath the rear wheel to prevent it dropping when the second unit is removed.**

2. Slacken and remove the upper and lower mounting bolts and washers then remove the suspension unit from its mounting spigots. Discard the bolts.



1. Rear suspension unit
2. Upper mounting bolts
3. Lower mounting bolts

3. Repeat operations 1 and 2 for the other rear suspension unit (if required).

Inspection

1. Remove all traces of dirt and inspect for damage/ wear to the mountings and springs.
2. Inspect the unit closely for fluid leaks from all parts of the unit and for cracks and damage to the springs. If there is any damage, or any leaks are evident, both rear suspension units must be renewed as a matched pair.
3. Check the mounting rubbers for cracks and signs of elongation. Replace as necessary.

Warning

Always renew both rear suspension units as a pair, even if only one appears to be faulty. If only one suspension unit is replaced, the handling of the motorcycle could be adversely affected. This could result in an unsafe riding condition leading to a loss of motorcycle control and an accident.

Installation

1. Locate the suspension units to the mounting spigots, articulating the swinging arm until the distance between the upper and lower spigots allows the units to fit.
2. Fit the original washers to new mounting bolts. Install the bolts then tighten them to **28 Nm**.
3. Repeat operations 1 and 2 for the other rear suspension unit (if removed).
4. Remove the wheel support (if fitted), lower the motorcycle to the ground and park it on the side stand.

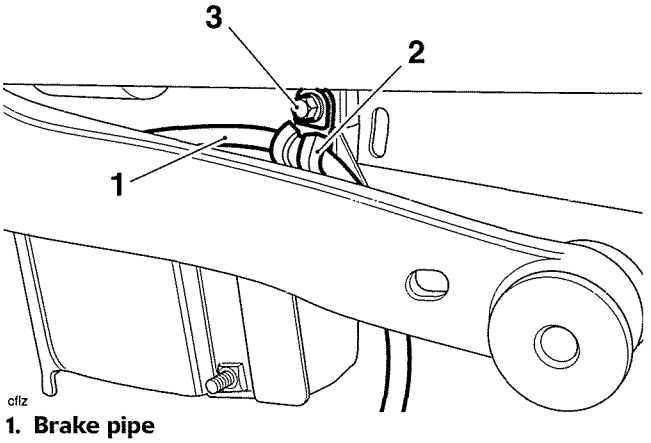
Swinging Arm

Removal

Warning

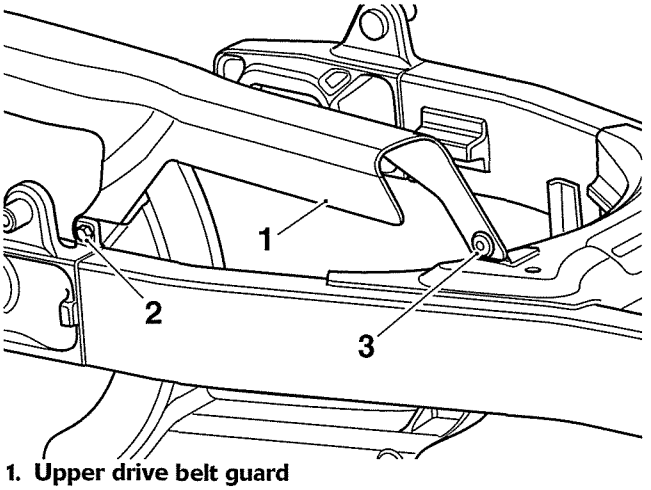
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Support the motorcycle so that the rear wheel is clear of the ground, with no weight on the swinging arm and suspension units.
2. Remove the rear wheel (see page *16.8*).
3. Remove the rear suspension units (see page *14.3*).
4. Remove the fixing and detach the brake hose P-clip from the left hand side of the swinging arm.



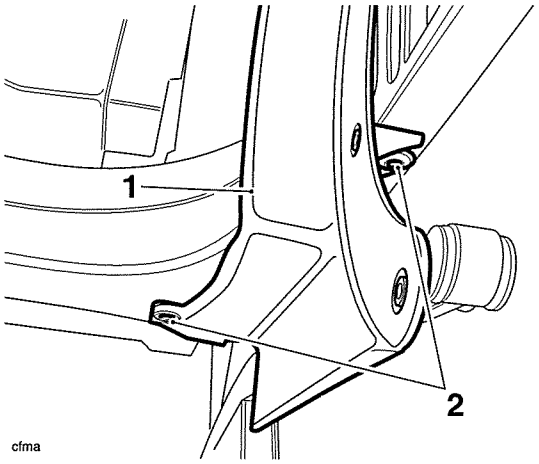
1. Brake pipe
2. Clip
3. Fixing

5. Remove the upper drive belt guard.



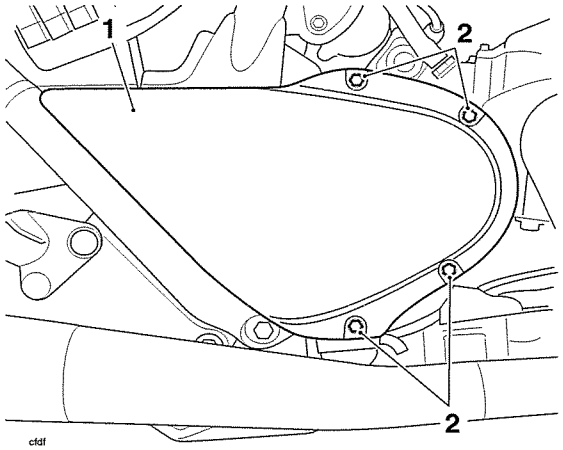
1. Upper drive belt guard
2. Rear fixing
3. Front fixing

6. Remove the lower drive belt guard.



1. Lower belt guard
2. Fixings

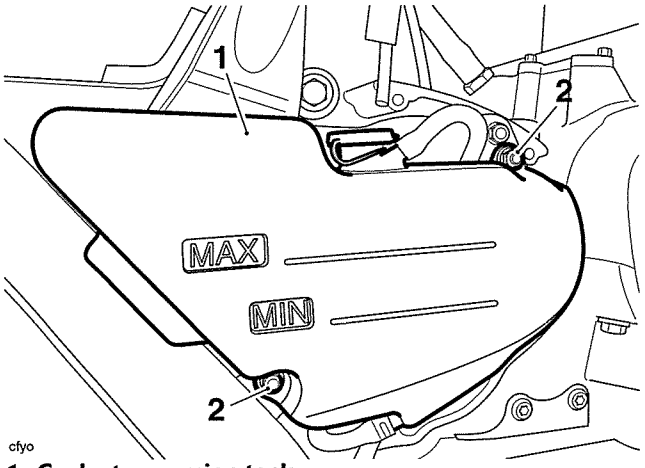
7. Remove the drive belt pulley cover fixings and remove the cover.



1. Final drive belt cover
2. Final drive belt cover screws

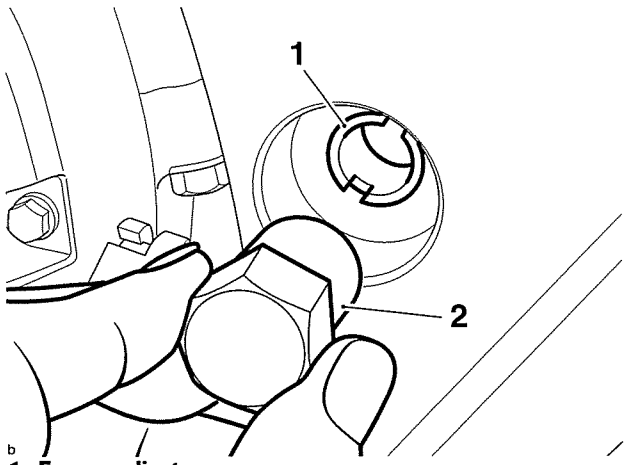
8. Remove the two nuts securing the expansion tank to its bracket and collect the two flanged sleeves from under the nuts.

9. Detach the expansion tank and position aside. Do not allow the expansion tank to hang unsupported from its hoses. It is not necessary to drain the expansion tank or cooling system.



1. Coolant expansion tank
2. Nuts

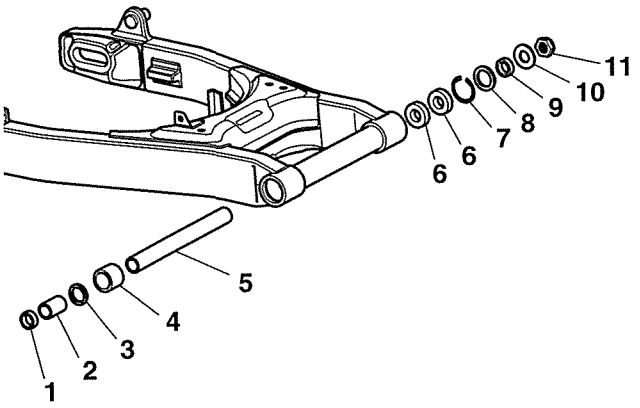
10. Remove the swinging arm pivot nut and collect the washer.
11. Partially withdraw the swinging arm spindle from the right hand side, to allow access to the frame adjuster sleeve located on the left hand side of the frame.
12. Engage tool T3880104 in the slots of the frame adjuster sleeve and rotate anti-clockwise to slacken the sleeve fully.



1. Frame adjuster
2. Tool 3880104

13. Support the swinging arm and withdraw the swinging arm spindle from the right hand side.
14. Carefully manoeuvre the swinging arm rearwards and remove from the frame.
15. Collect the bearing sleeves from both sides.
16. Remove the right hand bearing by drifting through from the left.

17. Collect the spacer tube.



1. **Spacer**
2. **Sleeve**
3. **Seal**
4. **Needle roller bearing**
5. **Spacer tube**
6. **Ball Bearing**
7. **Circlip**
8. **Seal**
9. **Spacer**
10. **Washer**
11. **Nut**

Note:

- **The needle roller bearing in the left hand side of the arm cannot be removed undamaged.**

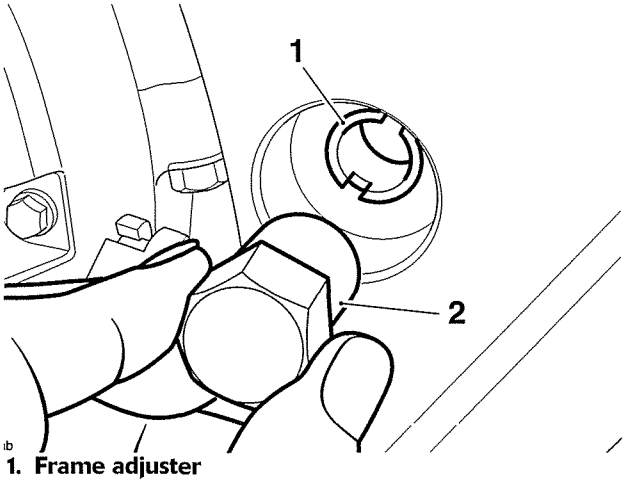
18. If required, renew the drive belt (see page *15-8*).

Inspection

1. Check all swinging arm bearings for damage, pitting, and cracks. Replace as necessary.
2. Check the swinging arm for damage. Replace as necessary.
3. Check the wheel bearings for damage, pitting, and cracks. Replace as necessary.
4. Check all bearing seals for damage, splits etc. Replace as necessary.
5. Check the drive belt for wear, damage etc. Replace as necessary.
6. Check both drive belt pulleys for wear, damage etc. Replace as necessary.

Installation

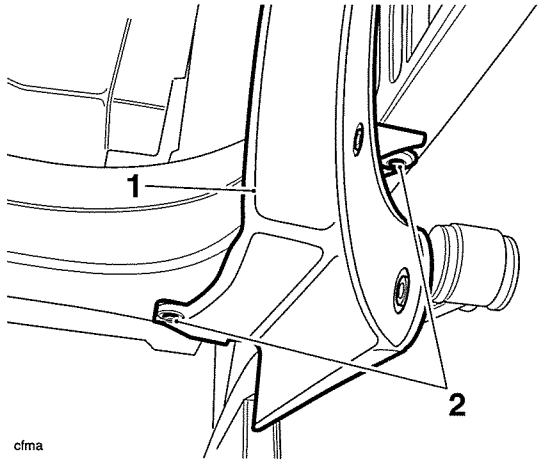
1. Install the bearings (marked faces outwards), sleeves and seals etc. into the swinging arm in the order shown on the previous page. Use new seals throughout.
2. Position the swinging arm to the frame.
3. Refit the swinging arm spindle from the right hand side such that it will support the swinging arm, but not pass all the way through the frame adjuster sleeve. This will allow tool T3880104 to engage in the slot in the frame adjuster sleeve.
4. Using tool T3880104, tighten the frame adjuster sleeve to **6 Nm**.



1. **Frame adjuster**
2. **Tool 3880104**

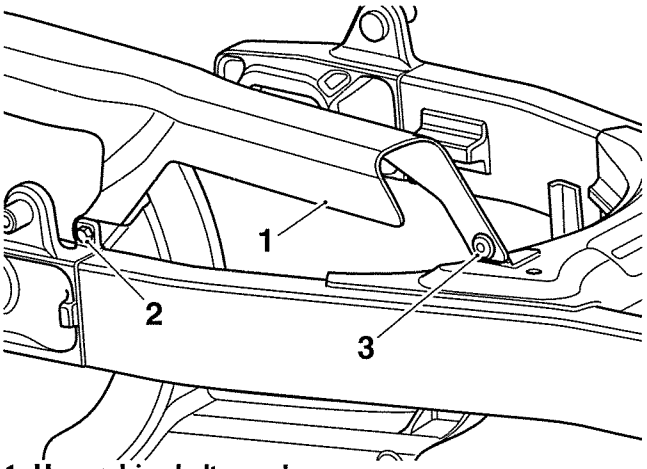
5. Fully insert the swinging arm spindle.
6. Fit the washer and a new swinging arm spindle nut, tighten the nut to **110 Nm**.
7. Refit the coolant expansion tank to its bracket.
8. Refit the two flanged sleeves and secure with new nuts, tighten the nuts to **3 Nm**.
9. Check and if necessary top up the coolant level (see page *11-5*).
10. Refit the drive belt pulley cover and secure with the four fixings. Tighten to **9 Nm.**

11. Refit the lower drive belt guard and tighten the two lower fixings to **12 Nm**.



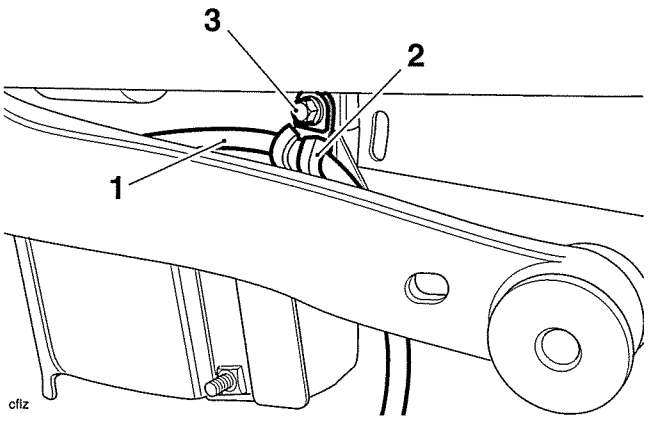
1. Lower drive belt guard
2. Fixings

12. Refit the upper drive belt guard. Tighten the rear fixing to **10 Nm** and the front fixing to **9 Nm**.



1. Upper drive belt guard
2. Rear fixing
3. Front fixing

13. Align the brake pipe clip to the left hand side of the swinging arm. Tighten the clip fixing to **7 Nm**.



1. Brake pipe
2. Clip
3. Fixing

14. Refit the rear suspension units (see page *14.4*).
15. Refit the rear wheel (see page *16.8*), but DO NOT adjust the drive belt tension at this stage.

Warning

Before adjusting the final drive belt tension, the belt must be over-tensioned to settle the swinging arm position as described below. Failure to do so may result in the drive belt becoming loose when the motorcycle is first ridden. Riding the motorcycle with a loose drive belt may result in loss of control of the motorcycle and an accident, or damage to the drive belt or other motorcycle components.

Note:

- **Over-tensioning of the drive belt is only required when the engine or swinging arm has been removed.**

16. With the wheel spindle loose, tighten the right hand drive belt adjuster to **25 Nm**.
17. Slacken off the right hand adjuster and check that the belt is now loose.
18. Adjust the drive belt tension (see page *15-8*).
19. Lower the motorcycle to the ground and park it on the side stand.
20. Pump the rear brake pedal to position the rear brake pads.

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15 Final Drive

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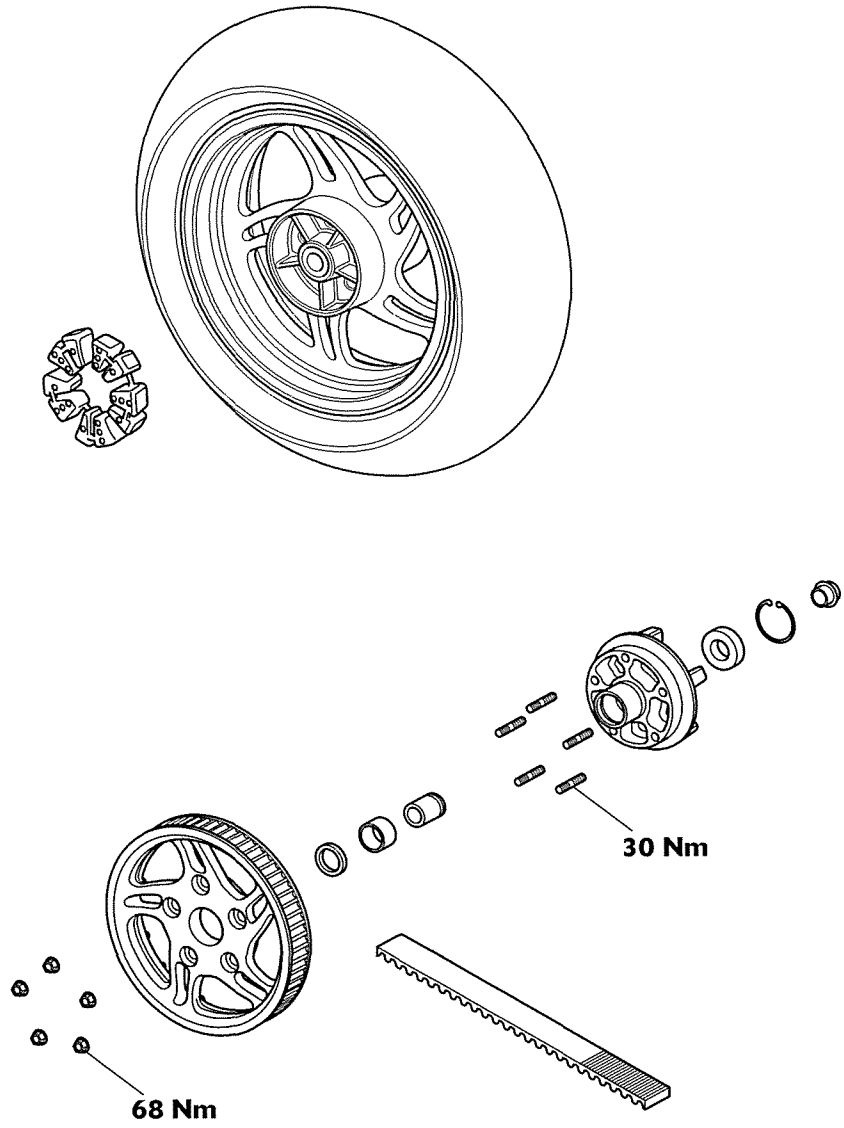
Exploded View - Final Drive

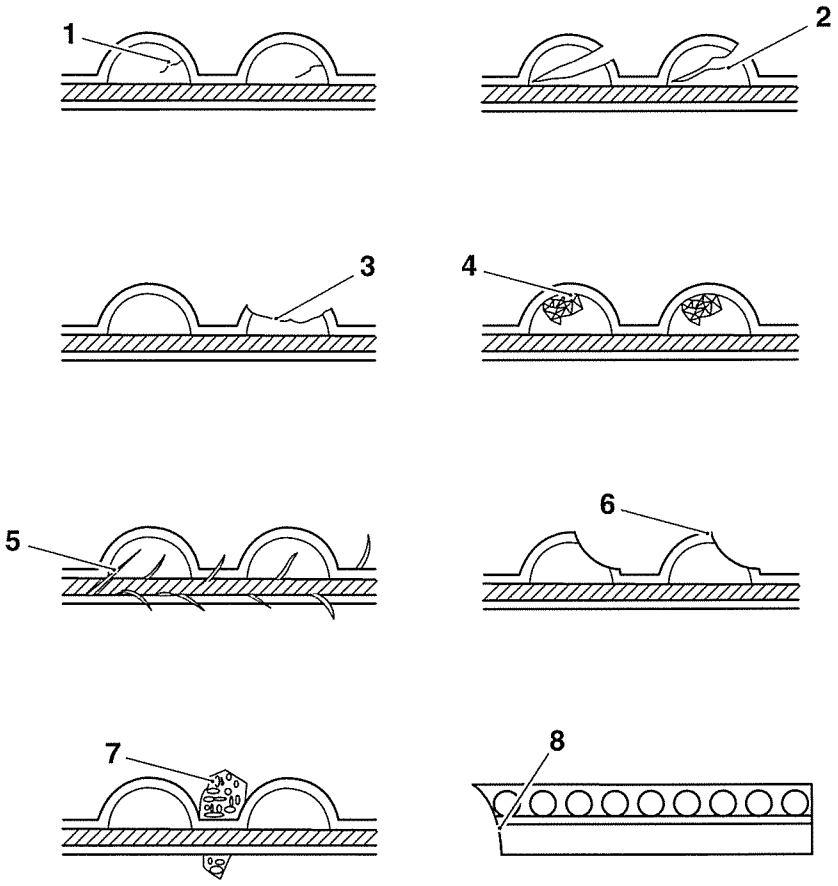


Final Drive Belt

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

If the drive belt is badly worn or incorrectly adjusted (either too loose or too tight) the belt could jump off the drive belt pulleys or break. Therefore, always replace worn or damaged drive belts using genuine Triumph parts supplied by an authorised Triumph dealer. The drive belt requires no lubrication.

Final Drive Belt Wear and pulley Inspection



Item	Condition	Required Action
1.	Internal tooth cracks (hairline)	OK to use but monitor condition
2.	External tooth cracks	Replace belt immediately
3.	Missing teeth	Replace belt immediately
4.	Cracked teeth edges (minor)	OK to use but monitor condition
5.	Frayed belt edge cords	OK to use but monitor condition
6.	Hooked teeth	Replace belt immediately
7.	Stone damage	Replace belt if the damage is on the edge of the belt
8.	Belt edge wear (outboard edge only	OK to use but monitor condition

Drive belt

Inspect the drive belt for:

- cuts or unusual wear patterns;
- wear (bevelling) to the outside edge of the belt. Some wear is common, but it can indicate the drive pulleys are misaligned;
- punctures to the outside (ribbed) surface of the belt. If cracks or damage are evident near to the edge of the belt, replace it immediately. Minor damage to the centre of the belt will require belt replacement eventually, but when cracks extend to the edge of the belt, failure is imminent.
- exposed tensile cords on the inside (toothed) surface of the belt. The teeth are normally covered in nylon and polyethylene layers, and damage to these layers will result in belt failure. This condition usually indicates worn drive pulley teeth; replace the drive belt and pulleys.
- signs of puncture or cracking at the base of the drive belt teeth. Replace the belt if either condition exists.
- replace the belt if external tooth cracks, missing teeth, hooked wear or punctures to the edge of the belt exist.

Note:

- **Internal cracks to the belt teeth may develop into external cracks or missing teeth over time. Internal cracks are not grounds for immediate belt replacement, but should be monitored closely before external cracks develop, which will require immediate belt replacement.**

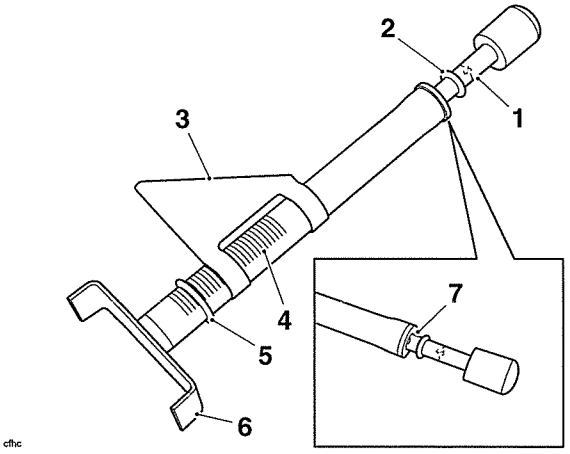
Drive pulleys

Inspect each pulley tooth visually for:

- severe tooth wear or damage to either pulley;
- damage caused by hard object (such as stones);
- damage or flaking to the hard coating of the rear pulley.

Final Drive Belt Tension Inspection

Drive belt tension must be measured using Triumph service tool T3880126, which is available from your Triumph dealer.



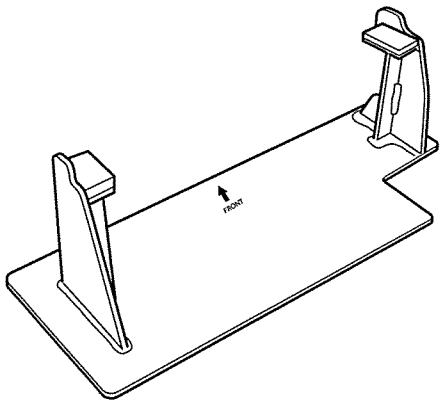
Service Tool T3880126

1. **Load scale - 4.5 kgf (10 lbf) mark**
2. **O-ring**
3. **Deflection slider**
4. **Deflection scale (0.5 mm (0.020 in) increments)**
5. **O-ring**
6. **Belt cradle**
7. **Load scale (zero position)**

Drive belt tension can be measured with the motorcycle on the side stand, or if available, on support stand T3880803 (available from your Triumph dealer). The method of measurement and adjustment is identical, but the belt tension specification for each method is different.

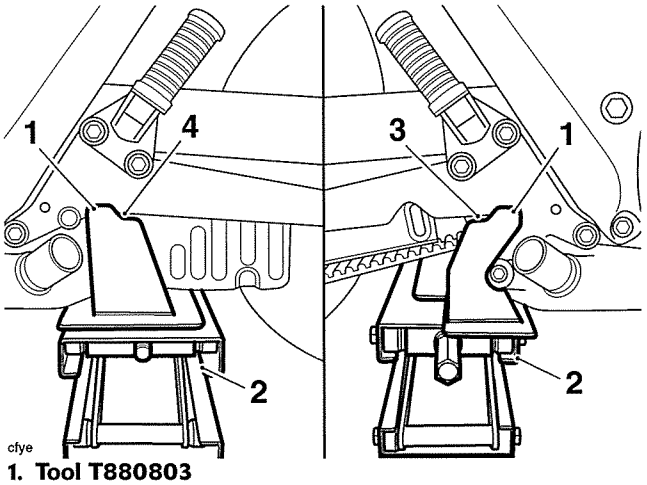
Drive belt tension must be measured with the drive belt cold (at ambient temperature).

Position the motorcycle either on the sidestand or on the motorcycle support stand (service tool T3880803) as shown below.



Tool T3880803

The stand should be positioned with the arrow facing the front of the motorcycle, with the plastic pads located under each rear footrest bracket as shown below.



1. **Tool T880803**
2. **Propriety motorcycle lifting jack**
3. **Plastic pad - right hand**
4. **Plastic pad - left hand**

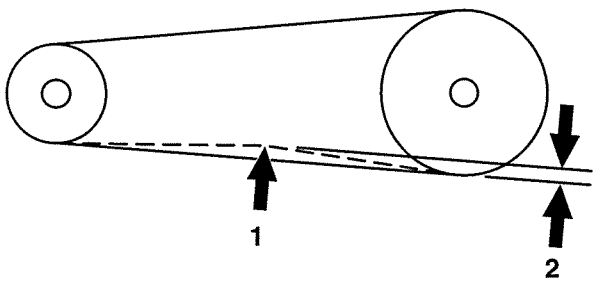
Raise the motorcycle so that the rear wheel is clear of the ground using a propriety motorcycle lifting jack.

Refer to the chart below for the correct drive belt tension specification for the method of motorcycle support you are using.

Drive Belt Tension Specification

Motorcycle on sidestand	5.5 to 7.0 mm (0.20 to 0.27 in)
Motorcycle on Support stand T3880803	7.5 to 9.0 mm (0.30 to 0.35 in)

Drive belt tension is measured by applying a 4.5 kilogram-force (kgf) (10 pound-force (lbf)) load to the plunger on service tool T3880126, once it has been positioned to the lower run of drive belt; this load then deflects the belt. The belt deflection can then be measured using a scale on the tool.



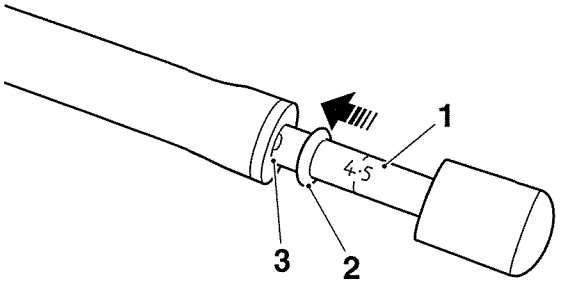
1. **4.5 kilogram-force (10 pound-force) applied to belt**
2. **Amount of deflection**

Measure the drive belt tension as follows:

Note:

- **During the following procedure the exhaust is shown removed for clarity, however it is not necessary to remove the exhaust to check or adjust the drive belt tension.**

1. Slide the small O-ring on tool T3880126 along the tool to the zero position on the load scale.



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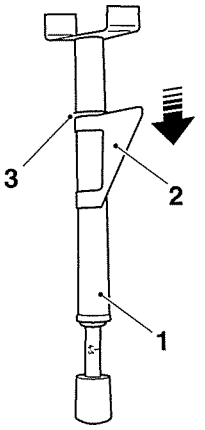
1. Load scale
2. O-ring
3. Zero position

2. Push the deflection slider and its O-ring down the tool, so that it will not touch the drive belt lower cover when the tool is positioned to the drive belt.

3. Rotate the deflection slider so that it will contact the lower belt cover when the tool is positioned to the motorcycle.



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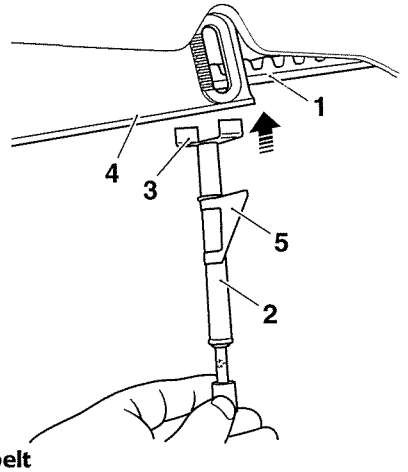
1. Service tool T3880126
2. Deflection slider
3. O-ring

4. Gently position the tool's belt cradle to the centre of the lower drive belt run, ensuring the deflection slider on the tool body is **NOT** in contact with the drive belt cover at this stage.



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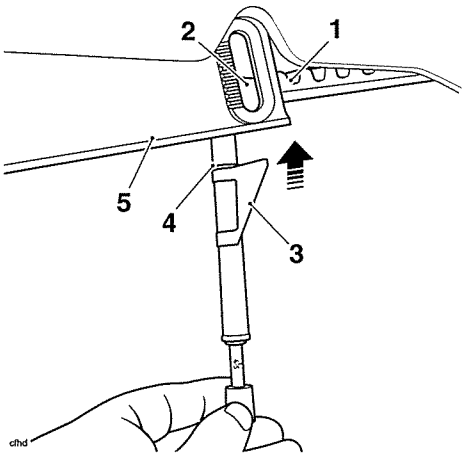
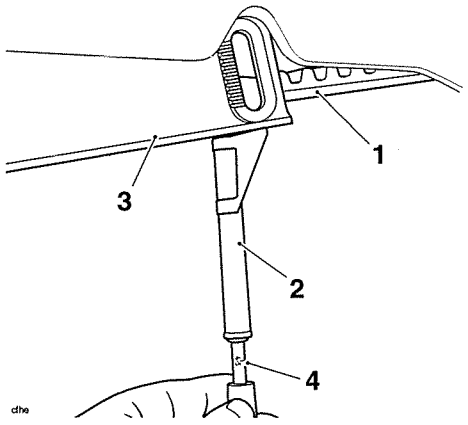
1. Drive belt
2. Service tool T3880126
3. Belt cradle
4. Drive belt lower cover
5. Deflection slider

5. Taking care not to deflect the belt, slide the deflection slider and its O-ring upwards until the slider just touches the belt cover.



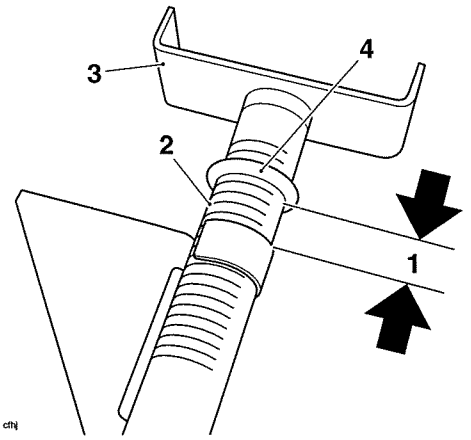
1. **Drive belt**
2. **Belt cradle**
3. **Deflection slider**
4. **O-ring**
5. **Drive belt lower cover**

6. Apply force to the belt tension gauge in an upwards direction, until the 4.5 kgf (10lbf) mark on the load scale is reached. The deflection slider must remain stationary against the belt cover while the force is applied.



1. **Drive belt**
2. **Scale**
3. **Drive belt lower cover**
4. **Load scale**

7. Remove the tool, taking care not to move the O-ring or deflection slider, and read the belt deflection on the scale on the tool.
8. The belt deflection is the gap between the top of deflection slider and the lower edge of the O-ring. The increments on the scale are 0.5 mm (0.020 in) apart.



1. **Belt deflection**
2. **Scale**
3. **Deflection slider**
4. **O-ring**

9. Repeat the measurement at several points around the drive belt to locate its tightest point. Always adjust drive belt tension at the tightest point in the drive belt.

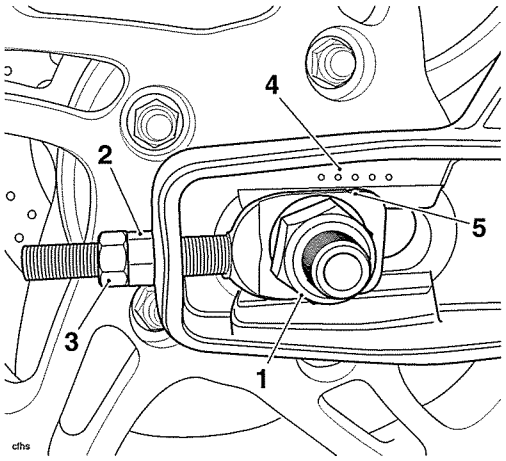
If the drive belt deflection is outside the limits given below, the drive belt must be adjusted (see page *8*).

Drive Belt Tension Specification	
Motorcycle on sidestand	5.5 to 7.0 mm (0.20 to 0.27 in)
Motorcycle on Support stand T3880803	7.5 to 9.0 mm (0.30 to 0.35 in)

Final Drive Belt Tension Adjustment

Note:

- **Always adjust drive belt tension at the tightest point in the drive belt.**
- **Always adjust drive belt tension with the motorcycle engine and drive belt cold.**



1. Wheel spindle nut
2. Adjuster nut
3. Adjuster locknut
4. Adjuster markings
5. Axle adjuster marking

1. Loosen the wheel spindle nut.
2. Release the locknuts on both the left hand and right hand adjusters.
3. Moving both adjusters by an equal amount, turn the adjuster nuts clockwise to increase drive belt tension and counter clockwise to decrease drive belt tension.
4. When the correct drive belt tension has been set, push the wheel into firm contact with the adjuster. Ensure the axle adjuster marking is aligned with the same adjuster marking on both sides of the swinging arm.
5. Tighten both adjuster locknuts to **25 Nm** and the rear wheel spindle nut to **110 Nm**.
6. Repeat the drive belt tension check (see page *15-5*). Re-adjust if necessary.

Warning

Operation of the motorcycle with insecure adjuster locknuts or a loose wheel spindle may result in impaired stability and handling of the motorcycle. This impaired stability and handling may lead to loss of control or an accident.

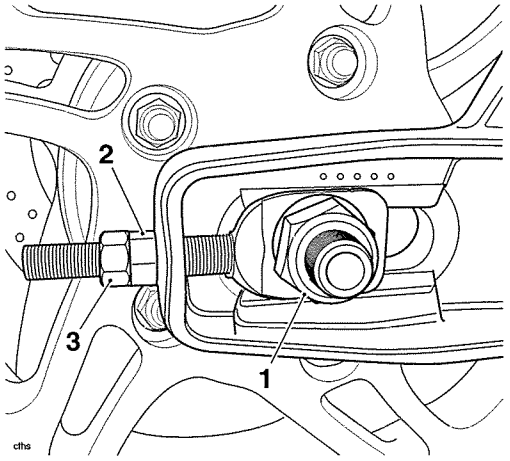
Final Drive Belt Replacement

Removal

Warning

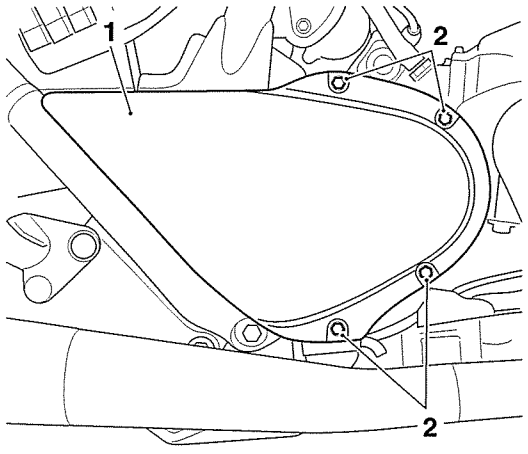
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Loosen the wheel spindle nut.
4. Release the locknuts on both the left hand and right hand adjusters.
5. Release both adjusters and release the final drive belt tension.



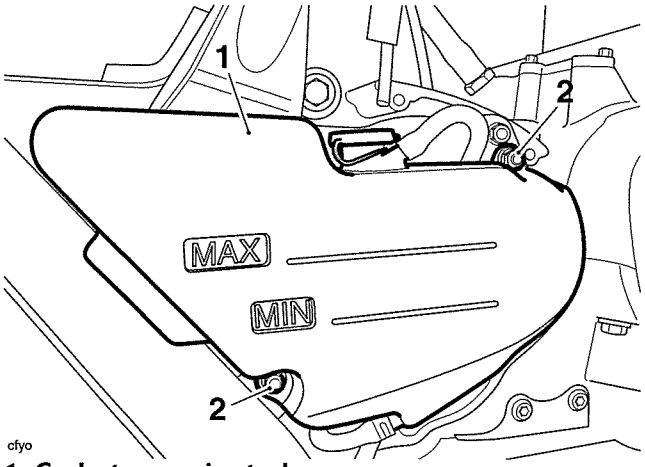
1. Wheel spindle nut
2. Adjuster nut
3. Adjuster locknut

6. Release the four screws and remove the final drive belt cover.



1. Final drive belt cover
2. Final drive belt cover screws

7. Detach the expansion tank and position aside. Do not allow the expansion tank to hang unsupported from its hoses. It is not necessary to drain the expansion tank or cooling system.



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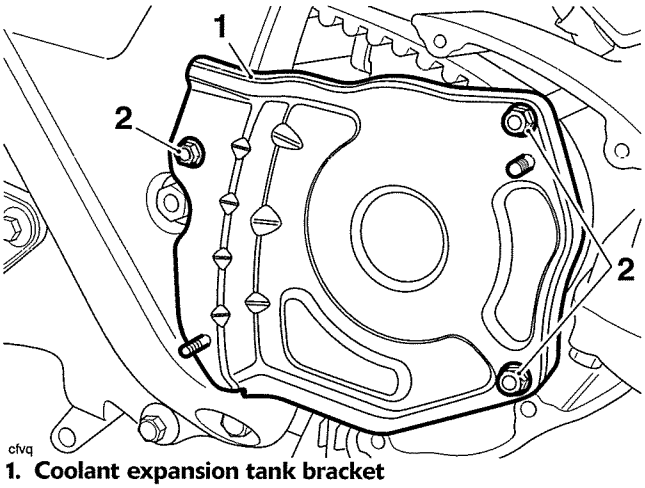
1. Coolant expansion tank
2. Nuts

8. Remove the three nuts and remove the coolant expansion tank bracket.

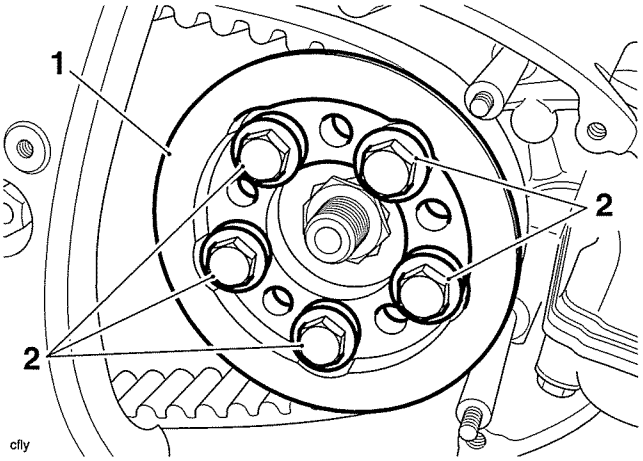


cfvq

1. Coolant expansion tank bracket
2. Nuts

9. Prevent the rear wheel from turning by applying the rear brake.

10. Remove the five bolts and remove the front drive belt pulley. If the drive belt pulley flange (see page *7-14*) is to be removed, retain the bolts for use during the removal procedure, otherwise, discard the bolts.



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1. Drive belt pulley
2. Fixings

11. Remove the swinging arm (see page *14-4*).
12. Note the direction of rotation of the fitted belt. If the belt is to be re-used, it must be refitted in the same direction of rotation.
13. Manoeuvre the belt out from between the frame and the output shaft pulley, taking care to avoid damage to the motorcycle or drive belt, and remove to the rear of the motorcycle.

Inspection

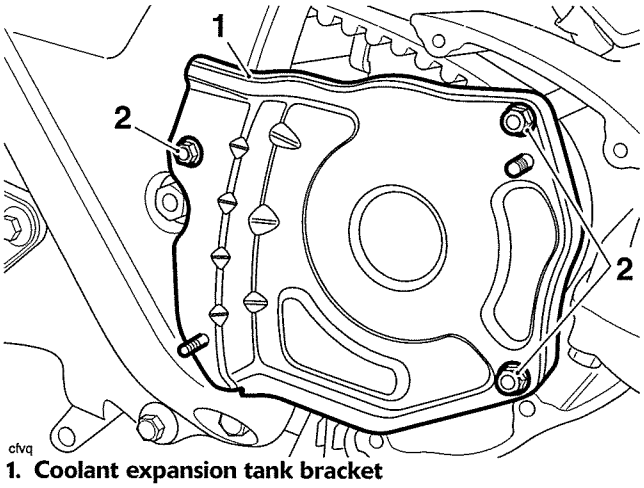
Note:

- **If the drive belt is to be renewed, always check and if necessary replace the rear belt pulley drive flange bearings.**

1. Inspect the drive belt for wear, cracks in the teeth, frayed edges or damage (see page *15-3*). Renew if necessary.
2. Inspect the drive belt pulleys for wear or damage (see page *15-4*). Renew if necessary.

Installation

1. Position the belt to the motorcycle, and align to the front drive pulley flange. If a previously used belt is to be refitted, fit the belt in its original direction of rotation as noted during removal.
2. Refit the front drive belt pulley and secure with new bolts. Do not fully tighten the bolts at this stage.
3. Refit the swinging arm (see page *14-6*), but DO NOT adjust the final drive belt tension at this stage.
4. Lower the motorcycle to the ground and prevent the rear wheel from turning by applying the rear brake.
5. Tighten the front drive belt pulley bolts to **105 Nm**.
6. Refit the coolant expansion tank bracket and secure with new nuts. Tighten to **3 Nm**.



1. Coolant expansion tank bracket
2. Nuts

7. Refit the coolant expansion tank to its bracket.
8. Refit the two flanged sleeves and secure with new nuts, tighten the nuts to **3 Nm**.
9. Align the final drive belt cover to the crankcase. Fit and tighten the four screws to **9 Nm**.
10. Adjust the final drive belt tension as described for swinging removal (see page *14-7*).
11. Reconnect the battery, positive (identified with red tape) lead first.
12. Refit the rider's seat (se page *17-9*).

Cush Drive

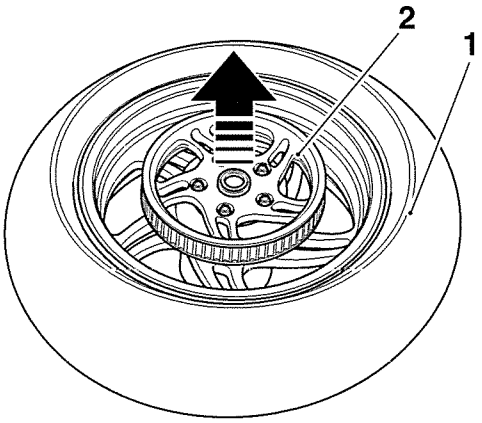
Removal

1. Remove the rear wheel (see page *16-8*).

⚠ Caution

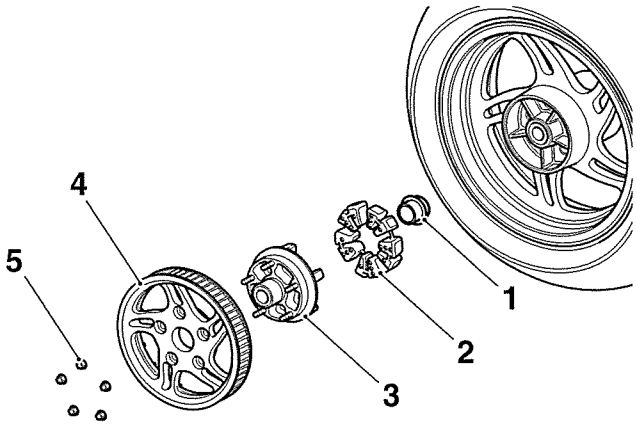
Do not allow the wheel to rest on the brake disc, as this may damage the disc. Support the wheel on wooden blocks, equally spaced around the rim, such that the brake disc is raised above the ground.

2. Place the wheel on wooden blocks with the drive belt pulley uppermost.
3. Gently lever the drive belt pulley and flange from the wheel hub.



1. Rear wheel
2. Drive flange

4. Remove the spacer and cush drive rubbers.



1. Spacer
2. Cush drive rubbers
3. Drive flange
4. Drive belt pulley
5. Drive belt pulley nuts

5. If the drive belt pulley is to be removed, remove and discard the nuts and remove the pulley from the flange.

Inspection

1. Check the cush drive rubbers for deterioration, cracks etc.
2. Inspect the drive belt pulley teeth for wear, damage and chips.
3. Check the wheel and drive flange for wear, cracks and damage.
4. Check the rear belt pulley drive flange bearings spin smoothly with no signs of play. If not, renew the bearings.

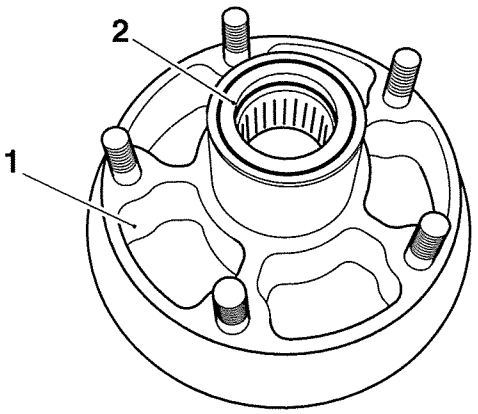
Installation

1. If removed, refit the drive belt pulley to the drive flange. Fit new nuts and tighten to **68 Nm**.
2. Install the cush drive rubbers to the wheel.
3. Check the drive flange bearing spacer is correctly installed in the drive flange bearing.
4. Refit the drive flange to the wheel.
5. Refit the rear wheel (see page *16-8*).

Drive Pulley Flange Bearings

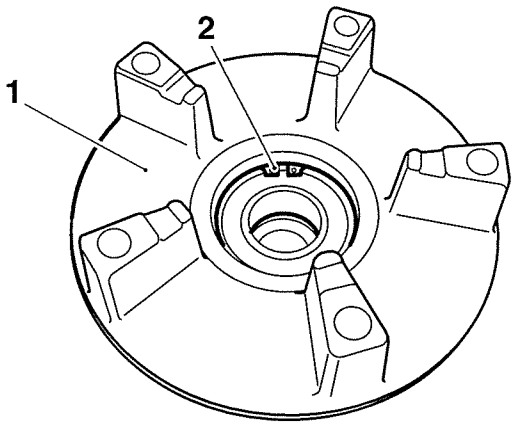
Disassembly

1. Remove the cush drive (see page *15-10*).
2. Remove the drive pulley from the drive flange. Discard the nuts.
3. Remove and discard the seal.



1. Drive flange
2. Seal

4. Working from the opposite side of the drive flange, remove and discard the bearing circlip.



1. Drive flange
2. Circlip

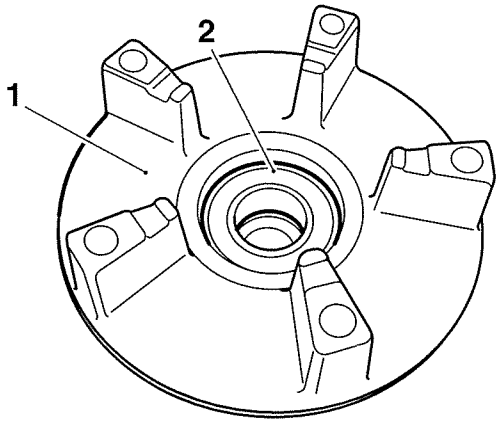
Warning

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

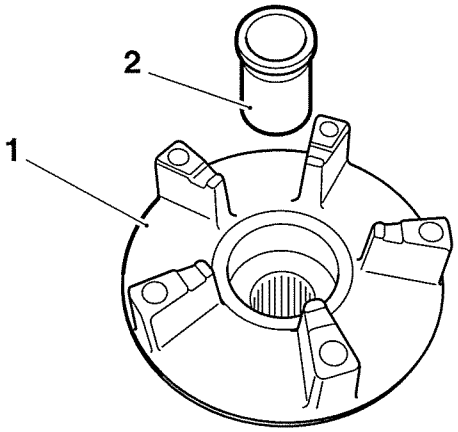
To prevent drive flange damage and to aid bearing removal, always apply force evenly on both sides of the bearing to prevent it from 'tipping' and becoming stuck. Application of uneven force will lead to difficulty in removing the bearing and to a damaged drive flange.

5. Working through the hole in the centre of the needle roller bearing, use a pin punch to drift out the ball bearing.



1. Drive flange
2. Ball bearing

6. Collect the inner bearing sleeve from the needle roller bearing.

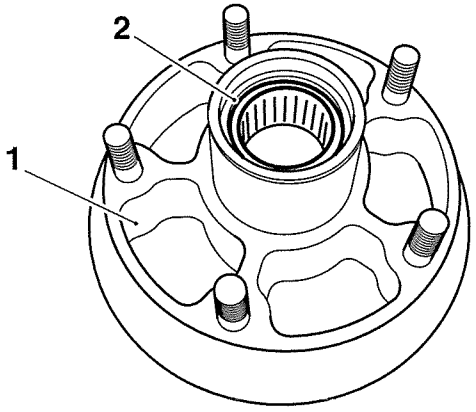


1. Drive flange
2. Inner bearing sleeve

⚠ 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. Working through the hole in the centre of the drive flange, use a pin punch to drift out the needle roller bearing.



1. Drive flange
2. Needle roller bearing

Inspection

1. Inspect the bearings and bearing sleeve for wear or damage. Renew if necessary.

Assembly

1. Position the needle roller bearing, marked side facing outwards, to the drive flange.

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.

2. Using a suitable press, fully insert the needle roller bearing in to the drive flange.
3. Lubricate the bearing with grease to NLGI 2 specification (we recommend Mobil HP222).
4. Install a new seal, marked side facing outwards, to the drive flange.
5. Lubricate the seal's knife-edge with grease to NLGI 2 specification (we recommend Mobil HP222).
6. Working from the opposite side of the drive flange, install the inner bearing sleeve to the needle roller bearing.
7. Position the inner ball bearing, marked side facing outwards, to the drive flange.

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.

8. Using a suitable press, fully insert the ball bearing in to the drive flange.
9. Fit a new circlip.
10. Refit the drive pulley to the drive flange. Fit new nuts and tighten to **68 Nm**.
11. Refit the cush drive (see page *15-11*).

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16 Wheels & Tyres

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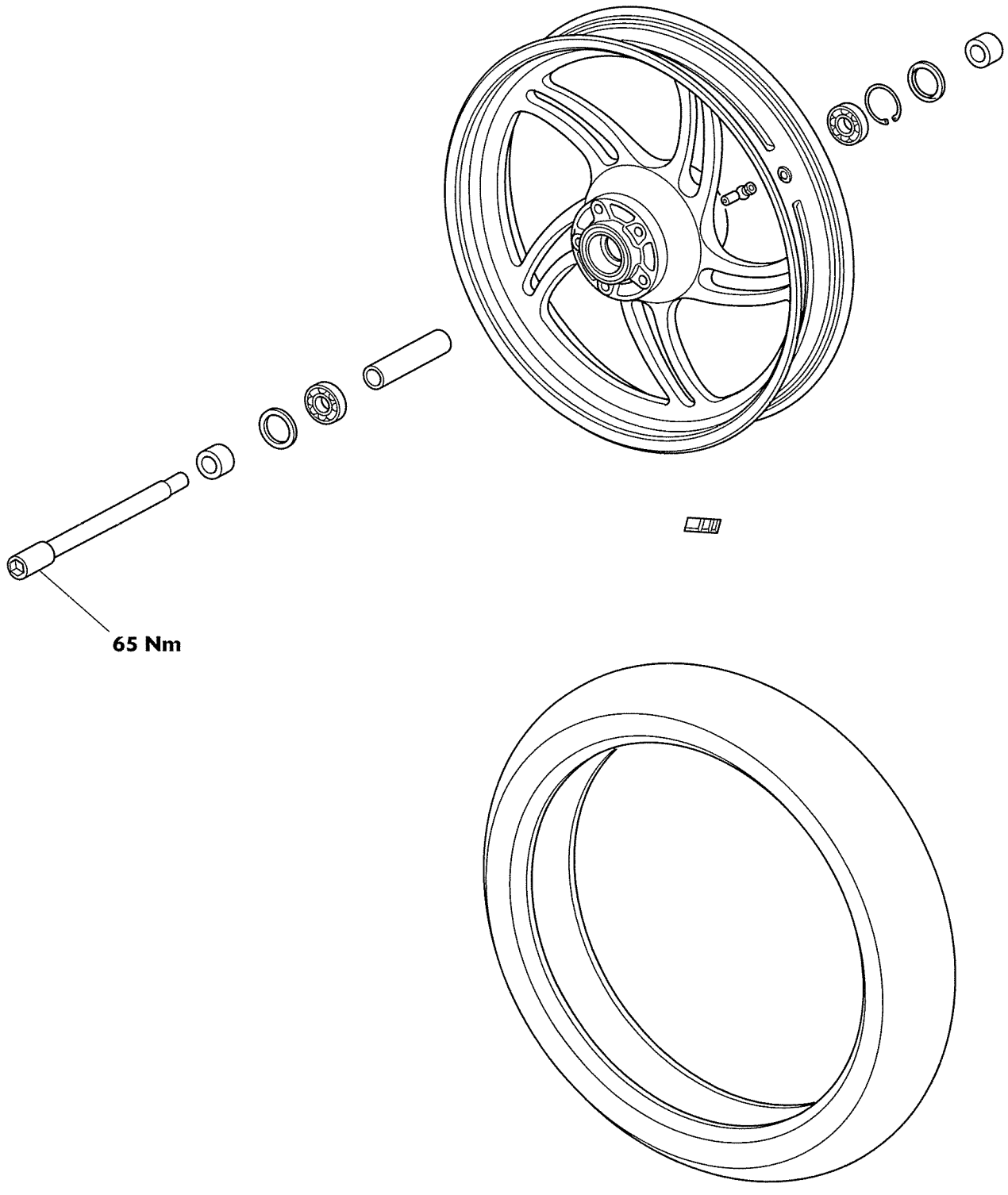
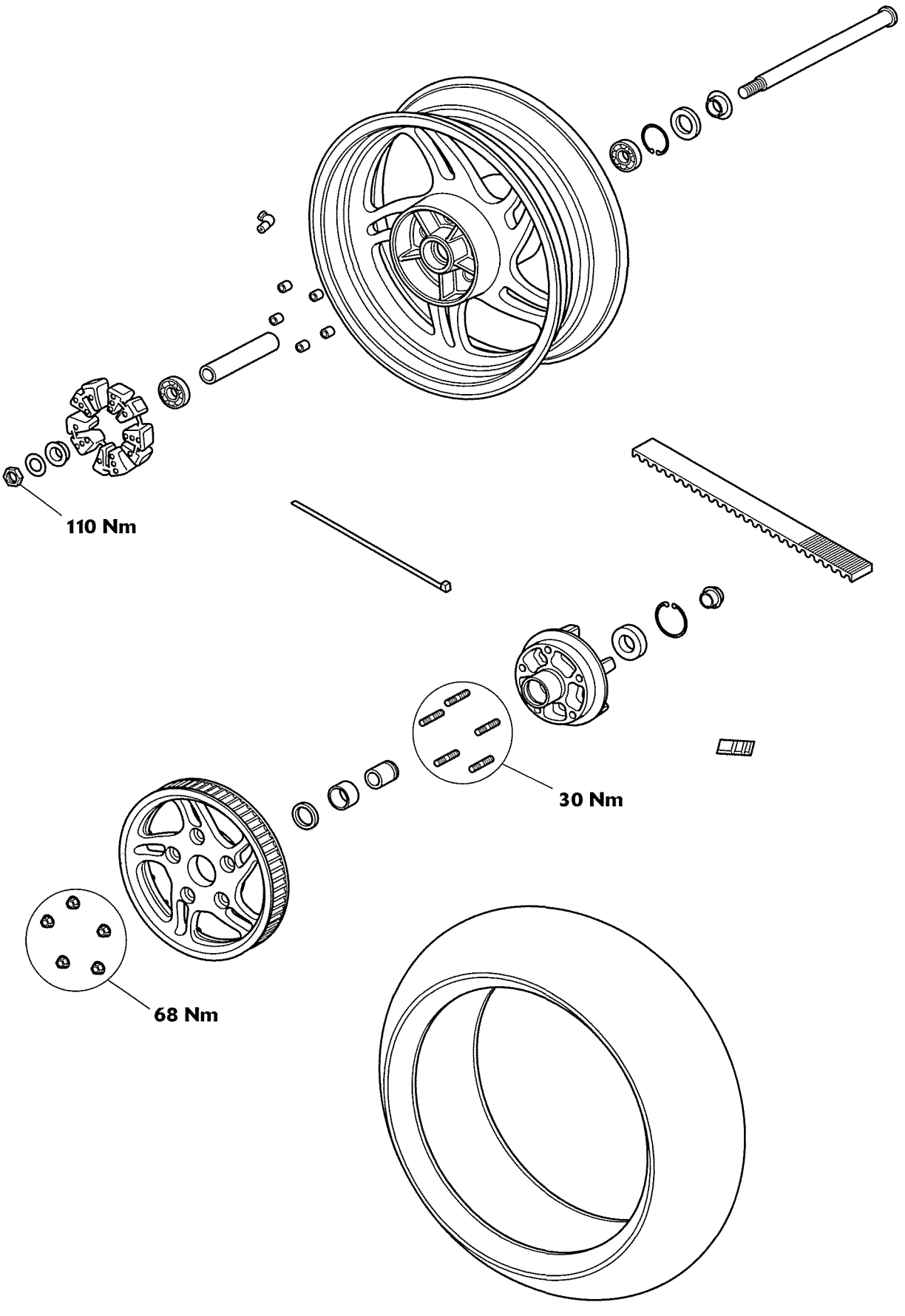
Exploded view - Front Wheel

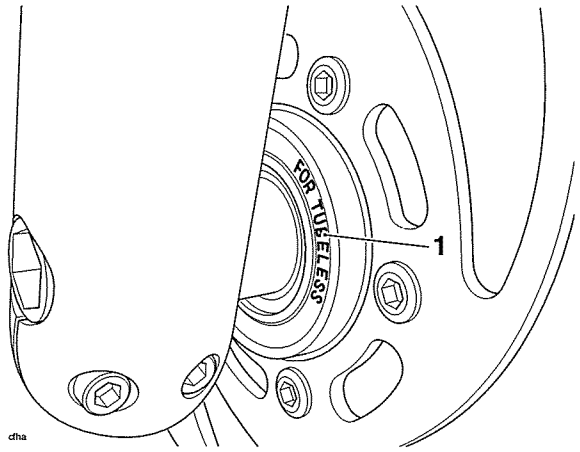


Exploded View - Rear Wheel and Cush Drive

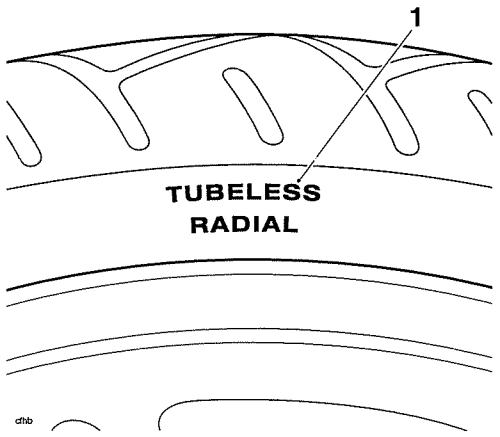


Tyres

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' or 'FOR TUBELESS' can be used.



1. Wheel marking



1. 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 motorcycle control and an accident.

Tyre Pressures

The correct tyre pressures are shown in the table below. The tyre pressures must always be checked and adjusted when the tyres are cold.

Loading condition	Front	Rear
Rider only	2.48 bar (36 lb/in^2)	2.62 bar (38 lb/in^2)
Rider, passenger and luggage	2.48 bar (36 lb/in^2)	2.62 bar (38 lb/in^2)

Warning

Correct tyre inflation pressures will provide maximum stability, rider comfort and tyre life. Tyre pressures must be checked according to the scheduled maintenance chart, when the tyres are cold, and adjusted as necessary.

Incorrect tyre inflation pressures will cause abnormal tread wear and instability problems that may lead to loss of motorcycle 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 motorcycle control and 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. Attention must also be paid to the legal limits for tread wear, which differ from country to country. Tyres that have worn to the legal limit in the country or region in which the motorcycle is operated must be replaced, even if tread wear has not yet reached the level of the tread wear indicators.

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 motorcycle control or an accident.

When tubeless tyres become punctured, leakage is often very slow. Always inspect tyres very closely for punctures. Check the tyres for cuts, embedded nails or other sharp objects. Check the rims for dents or deformation. Operation with damaged or defective wheels or tyres is dangerous and loss of motorcycle 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

In accordance with the periodic maintenance chart, measure the depth of the tread with a depth gauge, and replace any tyre that has worn to, or beyond the minimum legally allowable tread depth specified below:

Speed	Minimum Tread Depth
Under 130 km/h (80 mph)	2 mm (0.08 in)
Over 130 km/h (80 mph)	Rear 3 mm (0.12 in) Front 2 mm (0.08 in)

Warning

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

Warning

Only operate this Triumph motorcycle at high speed in closed-course on-road competition or on closed-course race tracks. High-speed operation should only then be attempted by riders who have been instructed in the techniques necessary for high speed riding and are familiar with the motorcycle's characteristics in all conditions. High-speed operation in any other circumstances is dangerous and may lead to loss of motorcycle control and an accident.

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.

Warning

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 motorcycle control and 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 motorcycle 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 motorcycle 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

Accurate wheel balance is important 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 motorcycle 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 potentially resulting in tyre deflation, loss of motorcycle 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 motorcycle 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, with incorrect tyre pressures or an incorrectly seated tyre is dangerous and may lead to loss of motorcycle 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. Raise and support the front of the motorcycle.
2. Detach and support both brake calipers.

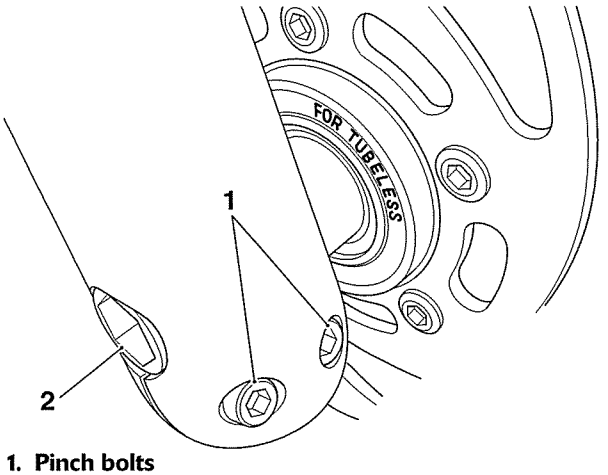
Note:

- **It is not necessary to disconnect the brake hoses.**

Warning

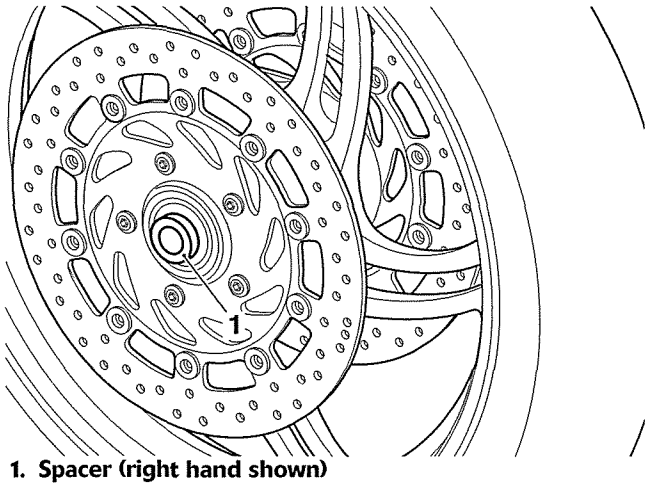
Do not allow the calipers to hang on the brake hoses as this may damage the hoses. Damaged hoses could cause brake failure leading to loss of control and an accident.

3. Slacken both pinch bolts at the lower end of the right hand fork.
4. Working from the right hand side, release and remove the wheel spindle which is threaded into the left hand fork.



1. Pinch bolts
2. Wheel spindle

5. Remove the wheel, recovering the spacers from both sides.



1. Spacer (right hand shown)

6. Place the wheel on wooden blocks to prevent damage to the brake discs.

Warning

Do not allow the wheel to rest on either brake disc as this may damage the disc leading to loss of motorcycle control and an accident.

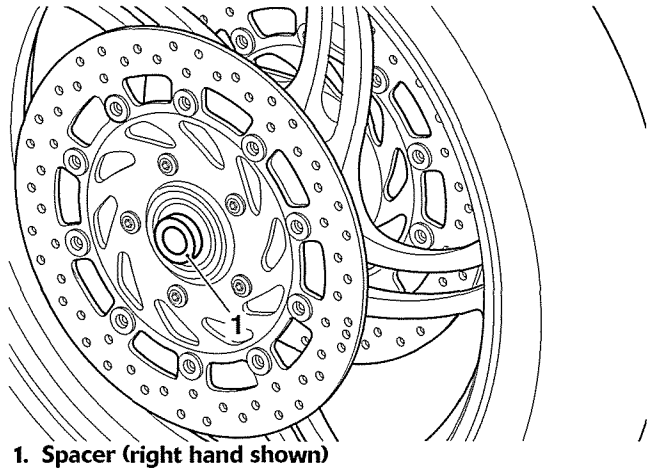
Caution

To prevent wheel and wheel bearing damage, ensure dirt and debris are not allowed to enter the wheel bearings.

7. Thoroughly clean all components and inspect for wear or damage.

Installation

1. Lightly smear the spacers with grease and locate in to the left hand and right hand sides of the hub.



1. Spacer (right hand shown)

2. Position the wheel between the forks.
3. Raise the wheel until it is in alignment with the spindle holes in both forks. Take care to not dislodge the spacers.
4. Refit the wheel spindle from the right hand side and tighten to **65 Nm**.
5. Thoroughly clean and degrease the brake discs.
6. Fit the brake calipers, tightening the mounting bolts to **50 Nm**.
7. Check that the brake disc is centrally located to the caliper on the right hand side. If not, apply gentle pressure to the fork to ensure the disc is centred with the caliper.
8. Maintaining the above position, tighten the fork pinch bolts to **22 Nm**.
9. Check the operation of the front brake. Rectify as necessary.

Warning

It is dangerous to operate the motorcycle with defective brakes; you must have your authorised Triumph dealer take remedial action before you attempt to ride the motorcycle again. Failure to take remedial action may reduce braking efficiency leading to loss of motorcycle control and an accident.

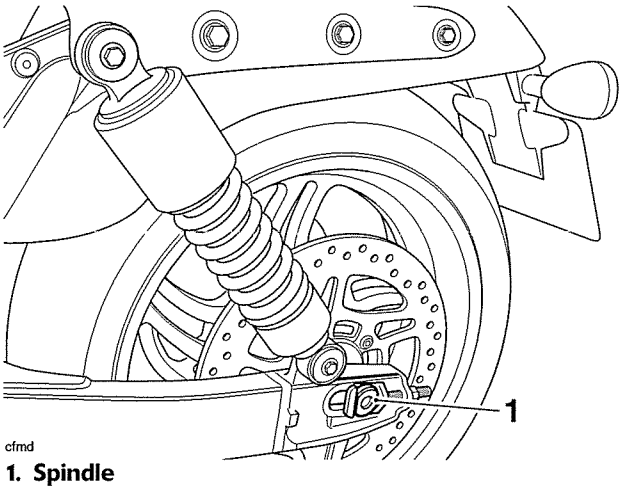
Rear Wheel

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. Support the motorcycle so the rear wheel is raised clear of the ground.
2. Remove both silencers (see page *10-118*).
3. Slacken the rear wheel spindle nut.
4. Slacken both drive belt adjusters.
5. Remove the spindle nut and washer then support the wheel and withdraw the spindle.



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1. Spindle

6. Lower the wheel to the ground, and noting its position, release the brake caliper and carrier from the slot on the swinging arm.

Warning

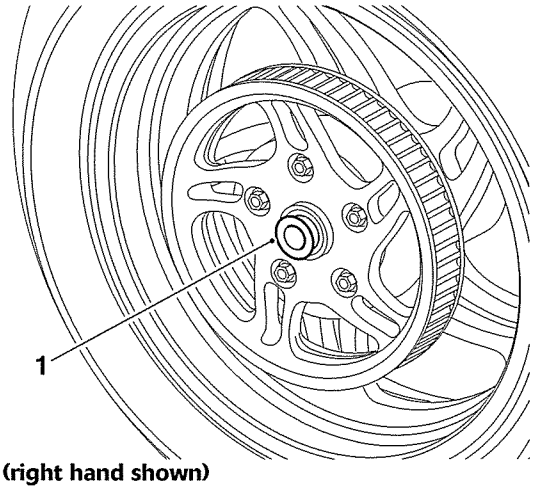
Do not allow the caliper to hang on the brake hose as this may damage the hose.

Damaged hoses could cause brake failure leading to loss of control and an accident.

7. Roll the wheel forward until the drive belt can be detached from the rear pulley.
8. Disengage the drive belt from the rear pulley and tie aside.
9. Manoeuvre the wheel out of position and recover the spacers from the hub and drive flange.

Caution

Do not allow the wheel to rest on the brake disc as this could damage the disc. To prevent bearing damage, ensure no dirt enters the wheel bearings whilst the wheel is removed.



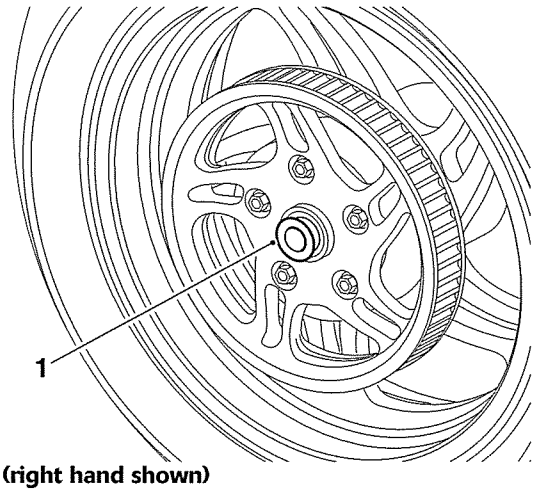
1. Spacer (right hand shown)

Inspection

1. Check the wheel bearings spin smoothly with no signs of play. If not, renew the bearings.

Installation

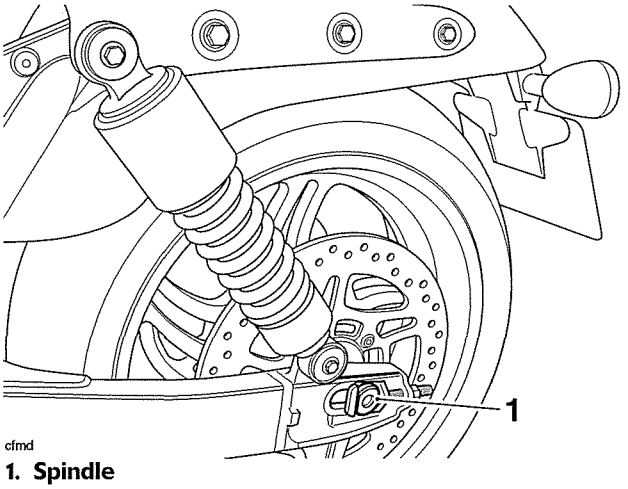
1. Lubricate the lips of the wheel bearing seals with a smear of multi-purpose grease.
2. Fit the spacer to the hub and drive flange.



1. Spacer (right hand shown)

3. Position the wheel in between the swinging arm and engage the drive belt with the pulley.
4. Fit the brake caliper mounting plate, locating its slot on the swinging arm lug.

5. Lift the wheel into position, ensuring the spacers and caliper mounting plate remain correctly positioned, and insert the spindle from the left hand side.



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1. Spindle

6. Fit the washer and a new nut to the spindle and hand tighten.
7. Lower the motorcycle to the ground and adjust the drive belt tension (see final drive section), then tighten the spindle nut to **110 Nm**.
8. Operate the brake pedal a few times to ensure the brake pads are in firm contact with the disc.
9. Install the silencers (see page *10-118*).
10. Check the operation of the rear brake. Rectify as necessary.

⚠ Warning

It is dangerous to operate the motorcycle with defective brakes; you must have your authorised Triumph dealer take remedial action before you attempt to ride the motorcycle again. Failure to take remedial action may reduce braking efficiency leading to loss of motorcycle control and an accident.

Front and Rear Wheel Bearings

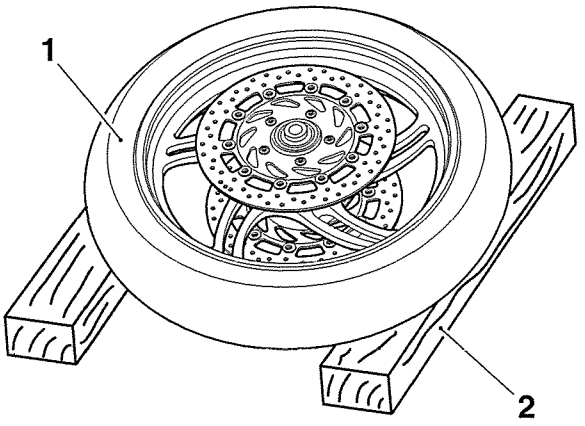
Removal

1. Remove the wheel (see page *16-6* for the front wheel, of page *16-8* for the rear wheel).

⚠ Warning

To avoid wheel damage, always support the wheel as instructed below. A dangerous riding condition leading to loss of motorcycle control and an accident could result if this warning is ignored.

2. Support the wheel on blocks as illustrated.



1. Wheel (front shown)
2. Support block

3. Remove and discard the seal (two on the front wheel, one on the rear) and the bearing circlip.

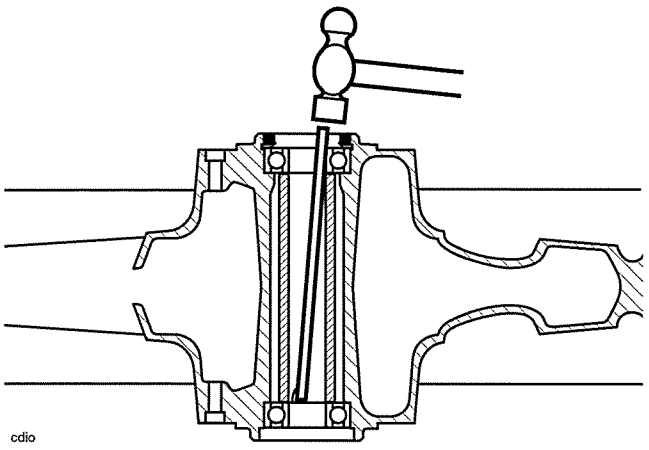
⚠ Warning

Always wear eye, hand and face protection when using a drift as use of a hammer and drift can cause bearings to fragment. Pieces of fragmented bearing could cause eye and hand injuries if suitable protective apparel is not worn.

⚠ Caution

To prevent wheel damage and to aid bearing removal, always apply force evenly on both sides of the bearing to prevent it from 'tipping' and becoming stuck. Application of uneven force will lead to difficulty in removing the bearing and to a damaged wheel.

4. Using a suitable pin punch, through the centre of the wheel, drift out the wheel bearings. Collect the centre sleeve.



Wheel Bearing Removal

Inspection

Warning

Only remove raised witness marks from within the wheel. Removal of material below any raised areas will reduce the level of interference between the wheel and the bearings. Loss of interference could cause the bearing to become loose in the wheel leading to loss of motorcycle control and an accident.

1. Examine the wheel for any raised witness marks caused by the removal process. Remove any such marks with fine emery paper or a gentle file.

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.**

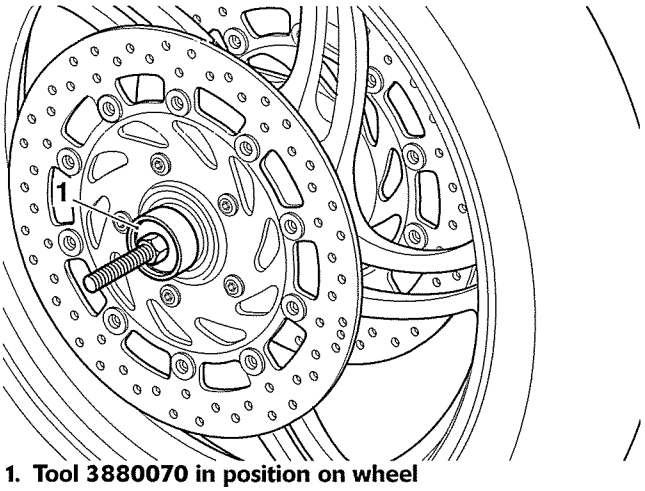
Front Wheel Bearing Tool Selection Chart

	Bearing insertion tool	Support tool
Left bearing	3880070-T0310 Small face to bearing	3880075-T0310 Large face to wheel
Right bearing	3880070-T0310 Small face to bearing	3880075-T0310 Large face to wheel

Rear Wheel Bearing Tool Selection Chart

	Bearing insertion tool	Support tool
Left bearing	T3880053 Large face to bearing	3880075-T0310 Small face to wheel
Right bearing	T3880053 Large face to bearing	3880075-T0310 Small face to wheel

1. Fit the wheel bearings and centre sleeve using the method described above.



1. Tool 3880070 in position on wheel

2. Fit a new circlip.
3. Lubricate and fit new seal(s) to the wheel. Lubricate the seal's knife-edge with grease to NLGI 2 specification (we recommend Mobil HP222).
4. Fit the wheel (see page *16-7* for the front wheel, of page *16-8* for the rear wheel).

17 Frame and Bodywork

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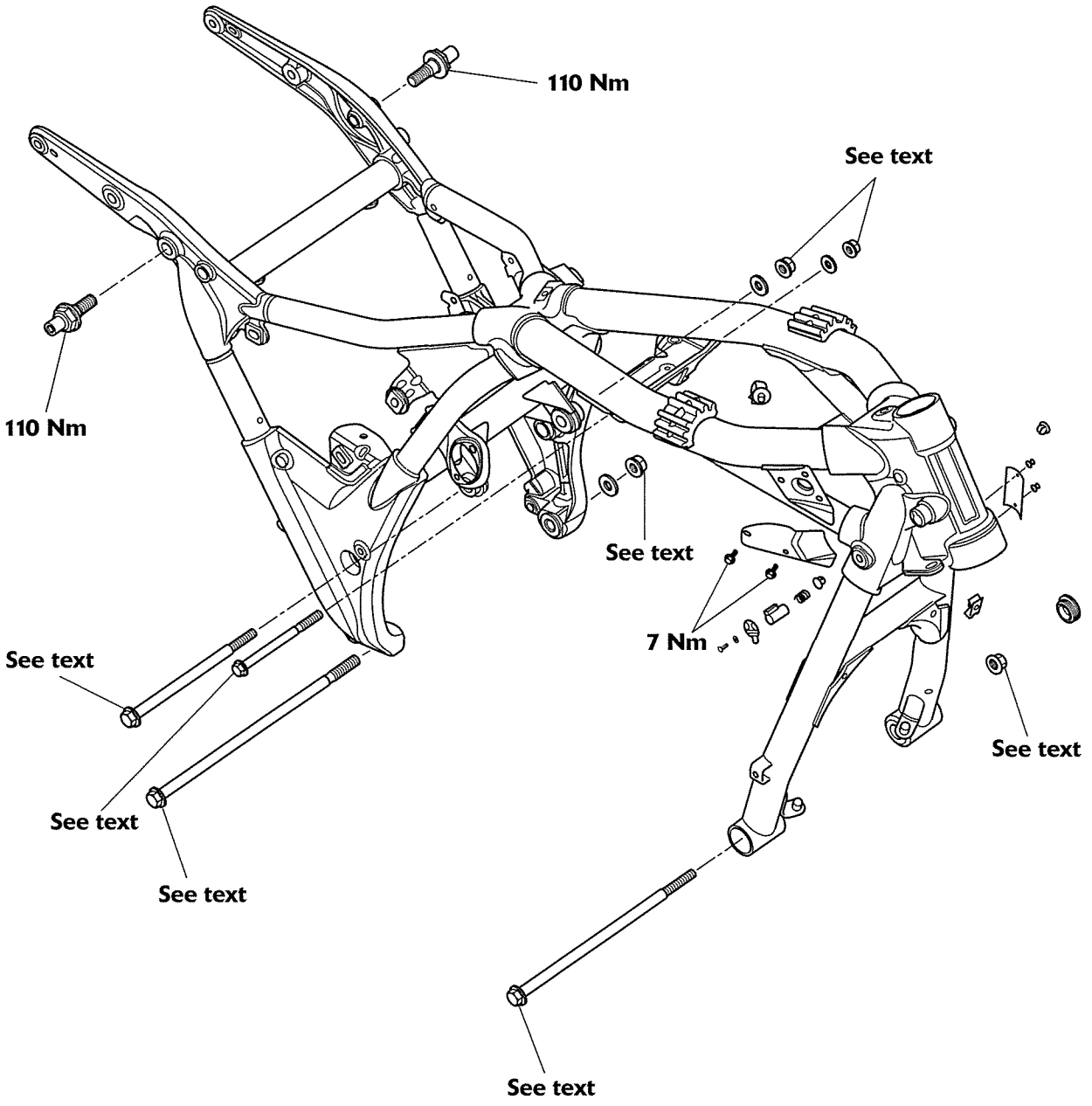
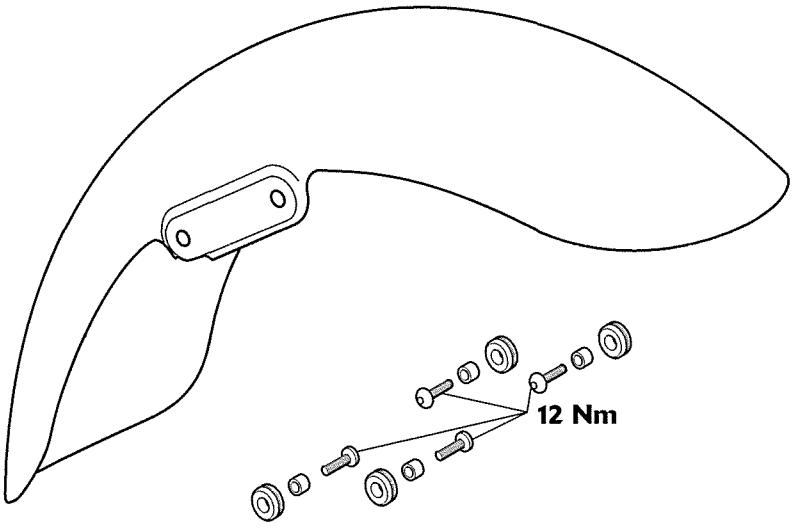
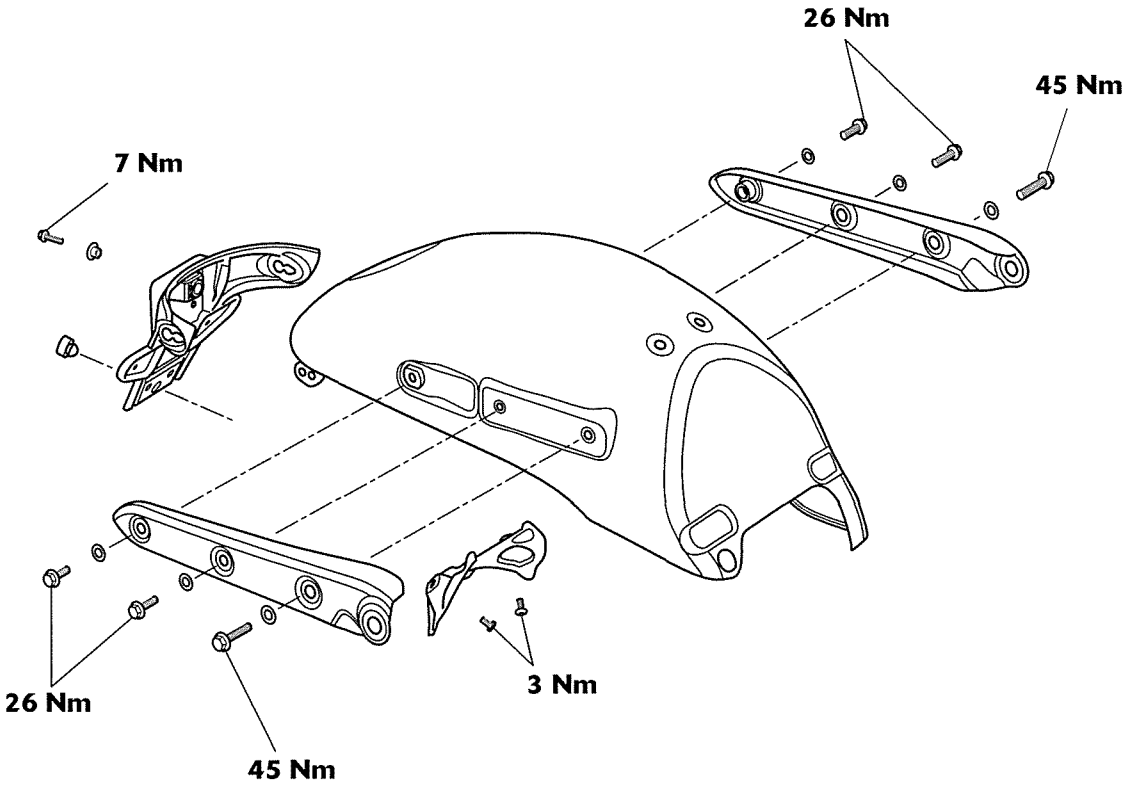
Exploded View - Frame and Fixings

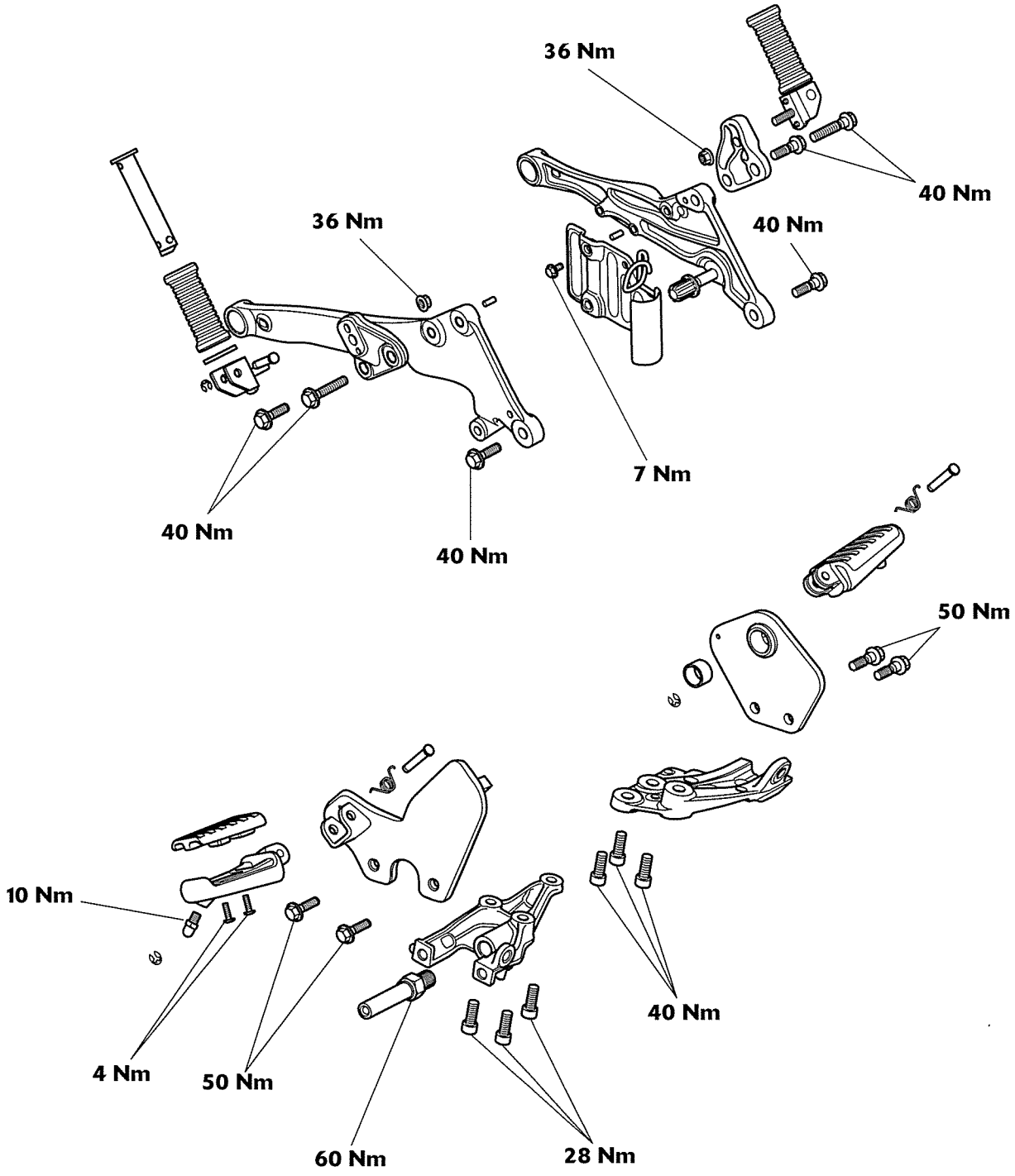


Exploded View - Front and Rear Mudguards

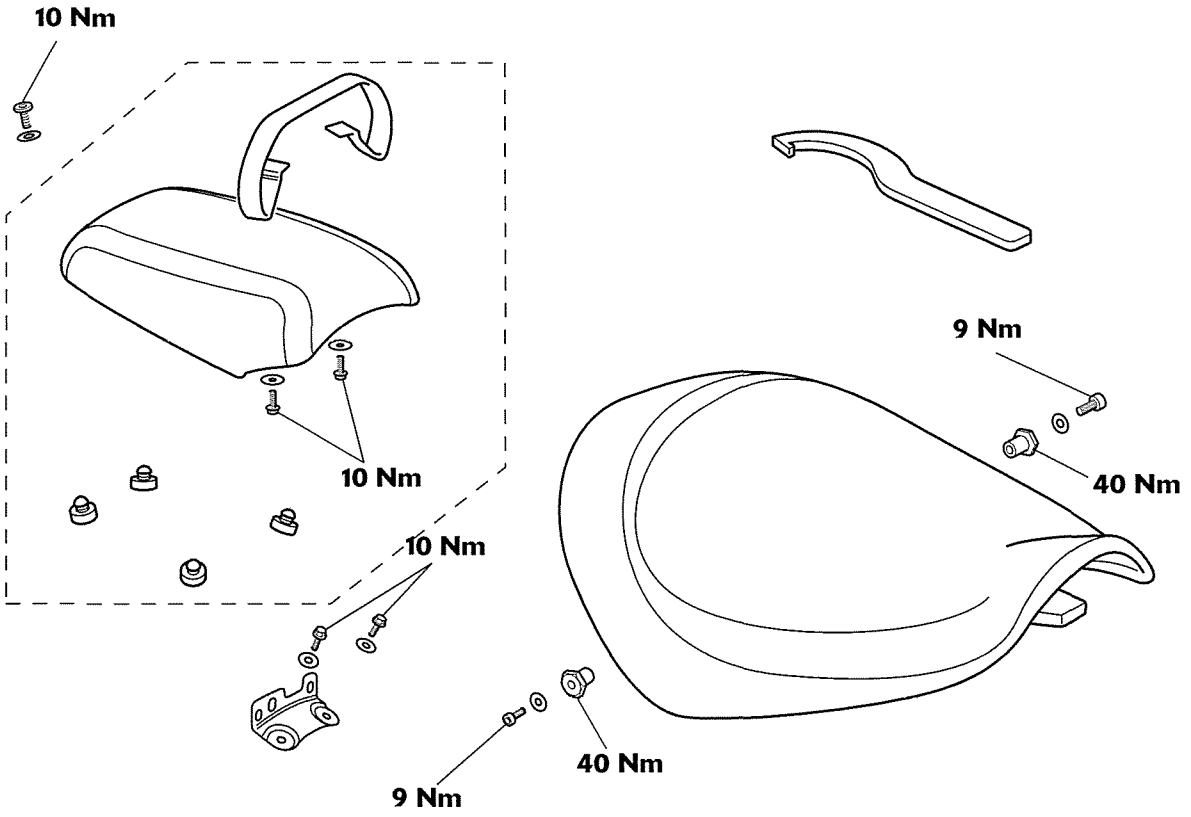




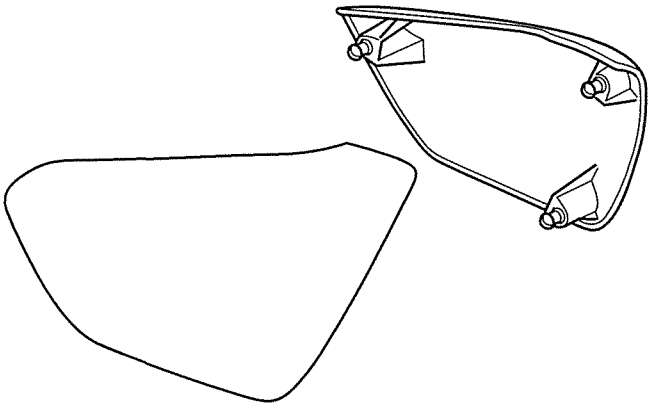
Exploded View - Front and Rear Footrests



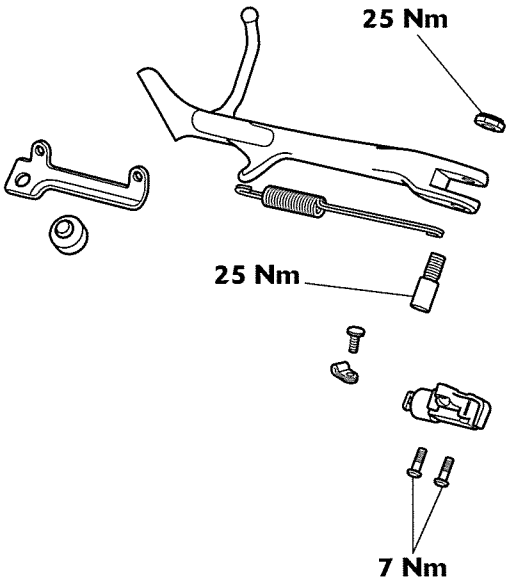
Exploded View - Seat and Tool Kit



Exploded View - Side Panels



Exploded View - Side Stand



General Frame Inspection

1. Inspect the frame, bodywork and footrests for accident and other damage, cracks, splits and general dilapidation. Check all fixings for security. If any faults are found, rectify as necessary. If any faults with the frame are found, the frame must be replaced; repairs to the frame are not permitted.

⚠ Warning

If the motorcycle is involved in an accident or collision it must be taken to an authorised Triumph dealer for inspection and repair before it is ridden again.

⚠ Warning

The frame must not be modified in any way. Any modification to the frame, such as welding or drilling, may weaken the structure causing an unsafe riding condition leading to loss of control and an accident.

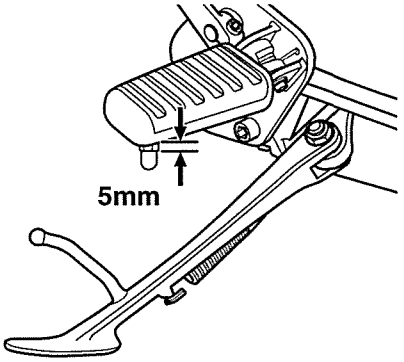
2. Check the operation of the side stand to make sure it is securely held in the retracted position by the spring. Rectify any faults.

⚠ Warning

If the return spring is faulty, the side stand could extend whilst the motorcycle is being ridden. This will cause an unsafe riding condition, which could lead to loss of motorcycle control and an accident.

Bank Angle Indicators

1. Inspect the bank angle indicators on the rider's footrests for wear. The bank angle indicators are worn out when 5 mm of the bank angle peg remains.



cfcb

Bank Angle Indicators

⚠ Warning

Use of a motorcycle with bank angle indicators worn beyond the maximum limit (when the bank angle indicator is worn to a minimum 5 mm in length) will allow the motorcycle to be banked to an unsafe angle. Therefore, always replace the bank angle indicator pegs when they are worn to 5 mm in length.

Banking to an unsafe angle may cause instability, loss of motorcycle control and an accident.

⚠ Warning

The bank angle pegs must not be used as a guide to how far the motorcycle may be safely banked. This depends on many various conditions including, but not limited to, road surface, tyre condition and weather. Banking to an unsafe angle will lead to loss of motorcycle control and an accident.

Seats

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 damage to the seats or seat covers, care must be taken not to drop the seats. Do not lean the seats against the motorcycle or any surface which may damage the seats or seat covers. Instead, place the seats, with the seat cover facing upwards, on a clean, flat surface which is covered with a soft cloth.

Do not place any item on the seats which may cause damage or staining to the seat covers.

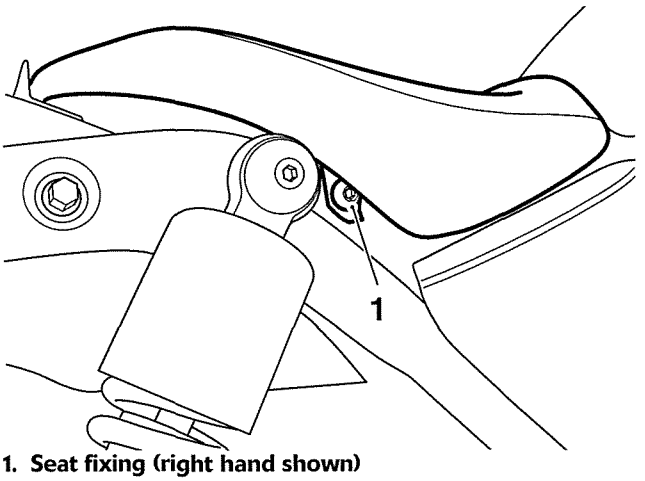
Rider's Seat

Removal

To remove the rider's seat, remove the two side fixings using the Allen key provided in the tool kit. Lift the seat up at the back for complete removal from the motorcycle.

Installation

To refit the seat, engage the seat's tongue under the fuel tank, fit and tighten the side fixings to **9 Nm**.



1. Seat fixing (right hand shown)

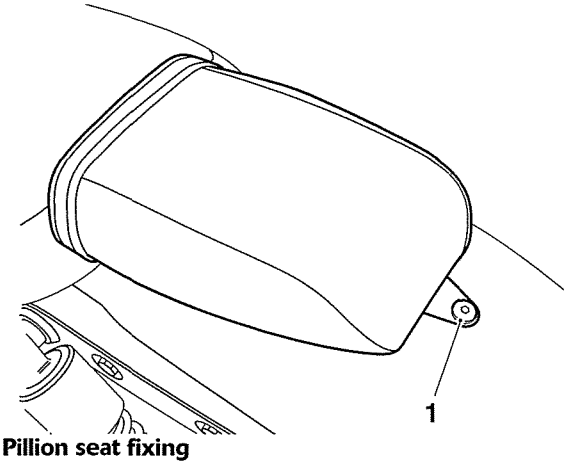
Warning

To prevent detachment of the seat during riding, after fitting always grasp the seat and pull firmly upwards. If the seat is not correctly secured it may detach from the motorcycle. A loose or detached seat could cause loss of motorcycle control and an accident.

Pillion Seat

Removal

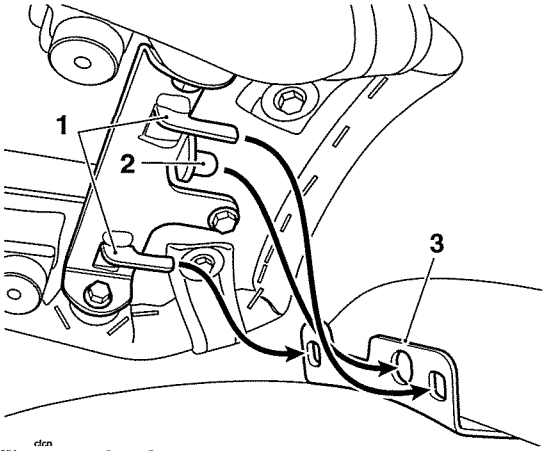
1. Remove the rear fixing using the Allen key provided in the tool kit. Lift the seat up at the back for complete removal from the motorcycle.



1. Pillion seat fixing

Installation

2. Engage the seat's two hooks and location pin into the bracket behind the rider's seat.
3. Fit and tighten the rear fixing to **10 Nm**.



1. Pillion seat hooks
2. Location peg
3. Pillion seat bracket

Warning

To prevent detachment of the seat during riding, after fitting always grasp the seat and pull firmly upwards. If the seat is not correctly secured in the lock it will detach from the rear frame. A loose or detached seat could cause loss of motorcycle control and an accident.

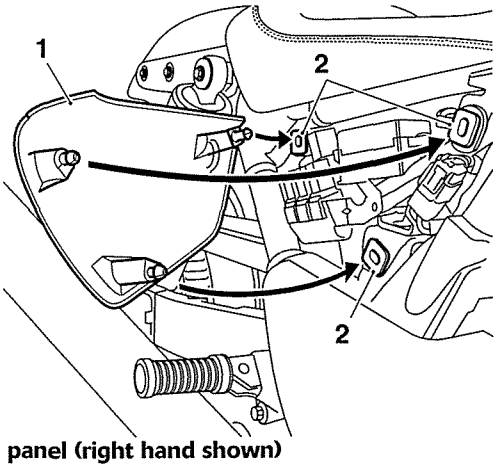
Side Panels

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. To remove either side panel, grasp the panel firmly in both hands pull the panel away from the motorcycle until it clears the three retaining grommets (leaving the grommets in place).



1. Side panel (right hand shown)
2. Grommets

Installation

1. Check that the three side panel grommets are correctly located in the frame.
2. Position the three locating dowels to the grommets, then press firmly to secure the panel.
3. Ensure the panel is correctly located over the upper and lower locating dowels.
4. Finally, grasp the panel and ensure that it is fully retained.

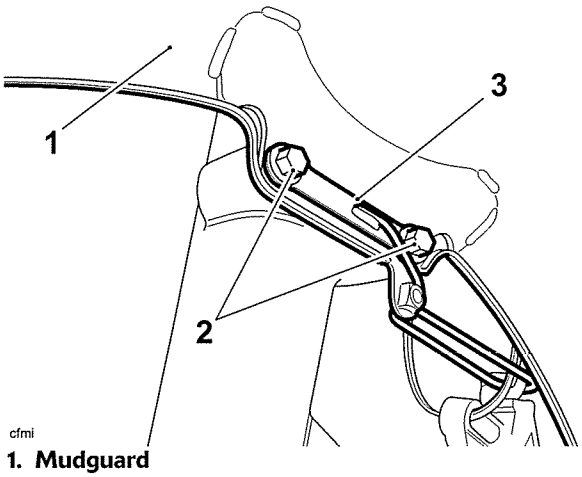
Front Mudguard

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 front wheel (see page *16-6*).
2. Release the mudguard fixings and detach the mudguard. Detach the two brake hose cable guides as the fixings are removed and position aside.



cfmi

1. Mudguard
2. Mudguard fixings
3. Brake hose cable guide

3. Carefully remove the mudguard.

Installation

1. Carefully manoeuvre the mudguard into position between the forks.
2. Fit the mudguard fixings, securing both brake hose cable guides as the fixings are installed. Tighten to **12 Nm**.
3. Refit the front wheel (see page *16-7*).

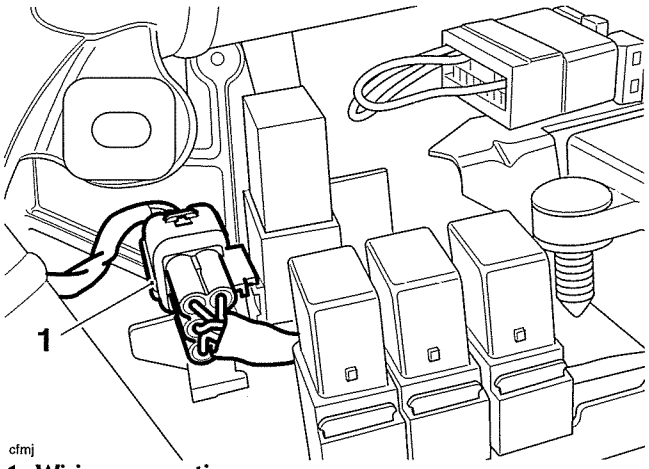
Rear Mudguard

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 rider's seat (see page *17-8*) and pillion seat (see page *17-9*).
2. Disconnect the battery, negative (black) lead first.
3. Remove both side covers (see page *17-9*).
4. Trace the wiring back from the number plate light, rear indicators and rear light assembly and disconnect the wiring connector from the main harness. The connection is to the rear of the fuse box on the right hand side of the motorcycle.



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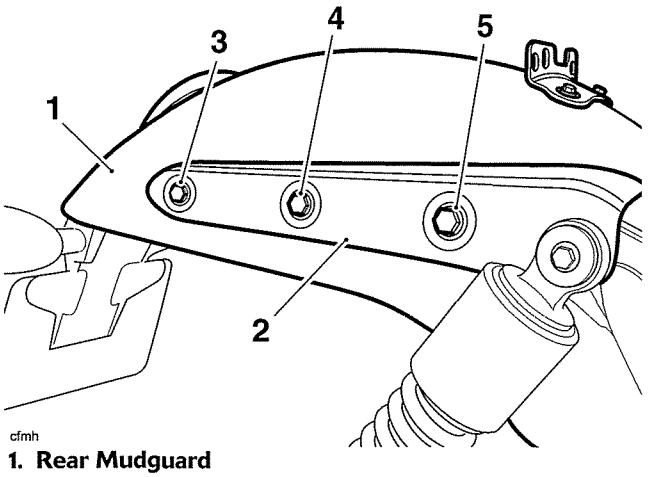
1. Wiring connection

5. Support the rear mudguard then remove the six fixings that secure the rear mudguard to the frame and frame covers. Note the different lengths of each pair of bolts.



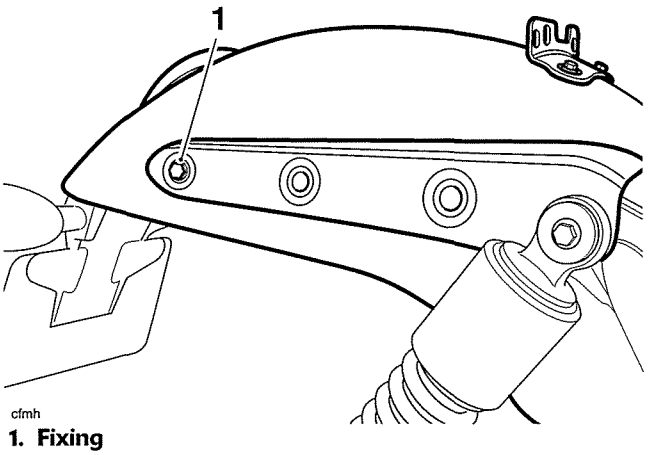
cfmh

1. Rear Mudguard
2. Frame cover
3. M8 x 25 mm fixings
4. M8 x 33 mm fixings
5. M10 x 45 mm fixings

6. Carefully lower the rear mudguard downwards to clear the two rear frame tubes, taking care not to damage the mudguard or frame painted surfaces.
7. Once the mudguard is clear of the frame, carefully remove it towards the rear of the motorcycle.

Installation

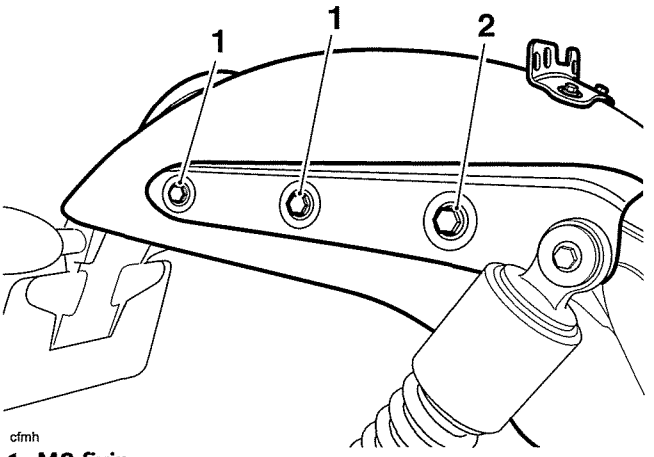
1. Carefully locate the mudguard to the frame, positioning the locating holes to the holes in the frame and frame covers.
2. Support the mudguard with the two M8 x 25 mm fixings through the rearmost holes in the frame and into the mudguard. Do not fully tighten the fixings at this stage.



cfmh

1. Fixing

3. Insert the M10 x 45 mm fixings to the front holes in the mudguard, and the M8 x 33 mm fixings to the centre holes.
4. Tighten the four M8 fixings to **26 Nm** and the two M10 fixings to **45 Nm**.



cfmh

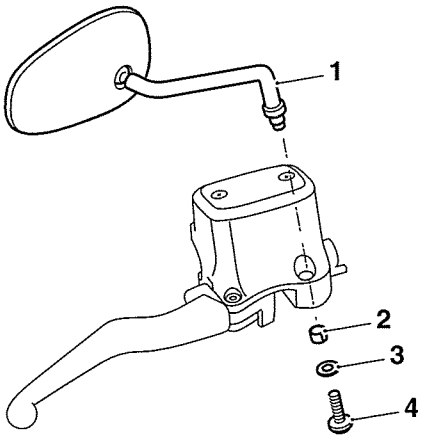
1. M8 fixings
2. M10 fixing

5. Reconnect the rear light, number plate light and indicator connector.
6. Reconnect the battery, positive (identified with red tape) lead first.
7. Check that the rear light, number plate light and indicators all function correctly.
8. Refit the side panels (see page *17-9*).
9. Refit the rider's seat (see page *17-9*) and pillion seat (see page *17-9*).

Mirrors

Removal

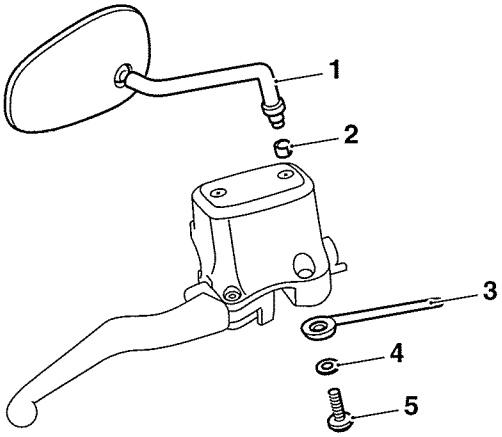
1. Remove the mirror screw and collect the wavy washer.
2. Using a twisting action, remove the mirror in an upwards direction.
3. Remove and discard the tolerance ring.



1. **Mirror**
2. **Tolerance ring**
3. **Wavy washer**
4. **Mirror screw**

Installation

1. Push a new tolerance ring into the recess in the mirror mounting location.
2. Insert the mirror into the tolerance ring.
3. Working from below the mirror, carefully position Triumph service tool T3880007 centrally over the mirror stem bore with the handle of the tool angled downwards.



1. **Tolerance ring**
2. **Mirror mounting location**
3. **Tool T3880007**
4. **Wavy washer**
5. **Mirror screw**

4. Fit and tighten the mirror screw to **10 Nm** whilst ensuring that the tolerance ring is drawn evenly into the hole in the mirror stem bore.
5. Remove the screw and tool. Ensure that the mirror stem has approximately 1.5 mm pull through visible underneath the mirror stem bore.
6. Fit the wavy washer and re-tighten the mirror screw to **10 Nm**.

Side Stand

Removal

Warning

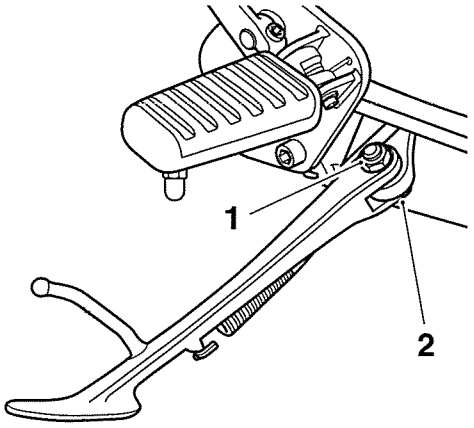
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Raise and support the motorcycle.
2. Un-hook the spring from the side stand and remove it from the motorcycle.

Warning

Wear hand, eye and face protection when un-hooking the stand spring. Take great care to minimise the risk of personal injury and loss of components.

3. Unscrew the nut from the side stand pivot bolt.
4. Unscrew the pivot bolt and remove the stand from the bike.



1. Nut
2. Pivot bolt

Installation

1. Lubricate the pivot bolt shoulder and side stand pivot with multi-purpose grease.
2. Fit the stand to the bike and insert the pivot bolt, tightening it to **25 Nm**.
3. Fit the locknut to the pivot bolt and tighten it to **25 Nm**.
4. Hook the spring onto its frame lug then carefully hook it onto the stand lug.

Warning

Wear hand, eye and face protection when fitting the stand spring. Take great care to minimise the risk of personal injury and loss of components.

5. Check the operation of the side stand before riding the motorcycle. Ensure the spring holds the stand securely in the retracted position.

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18 Electrical System

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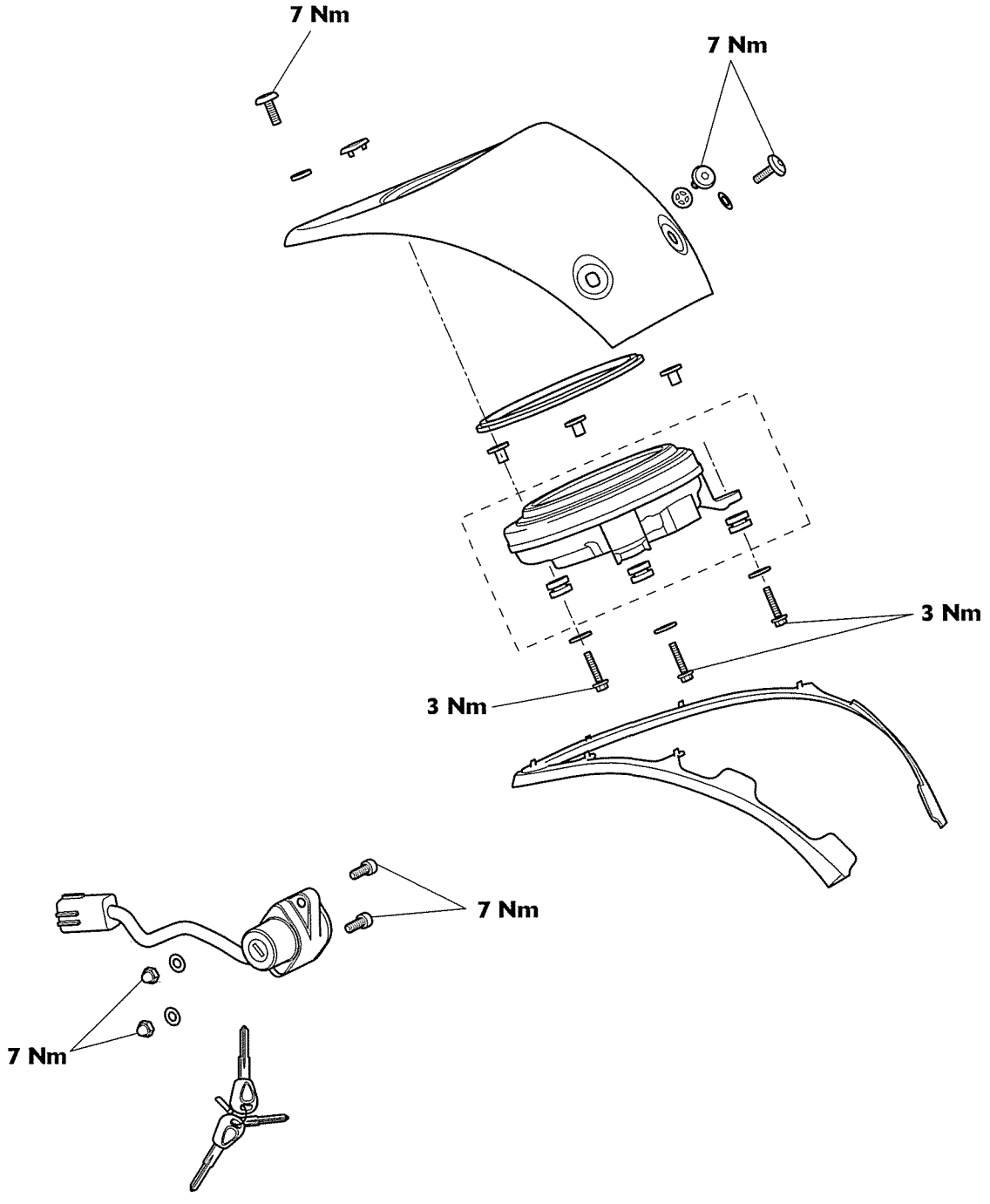
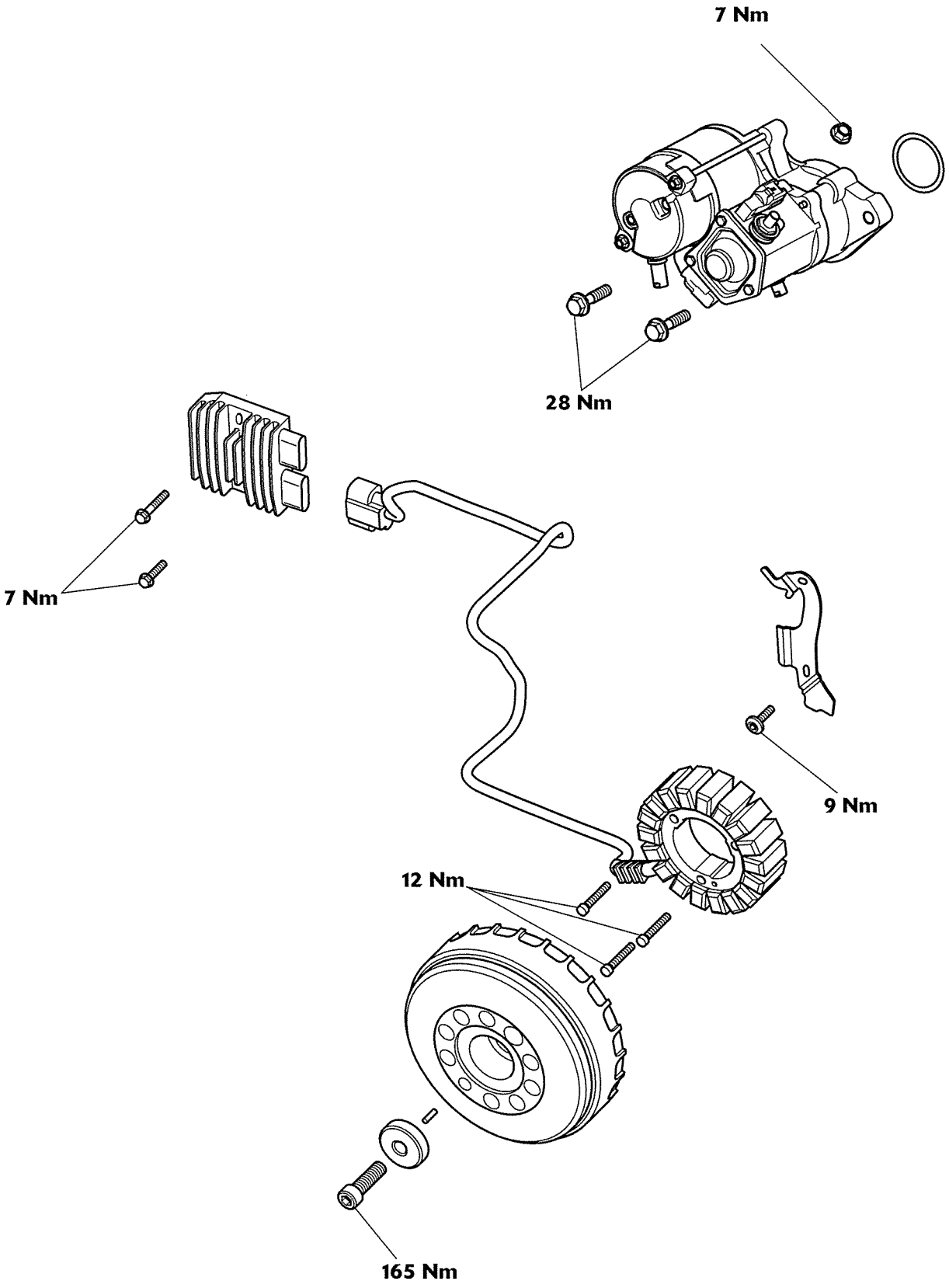
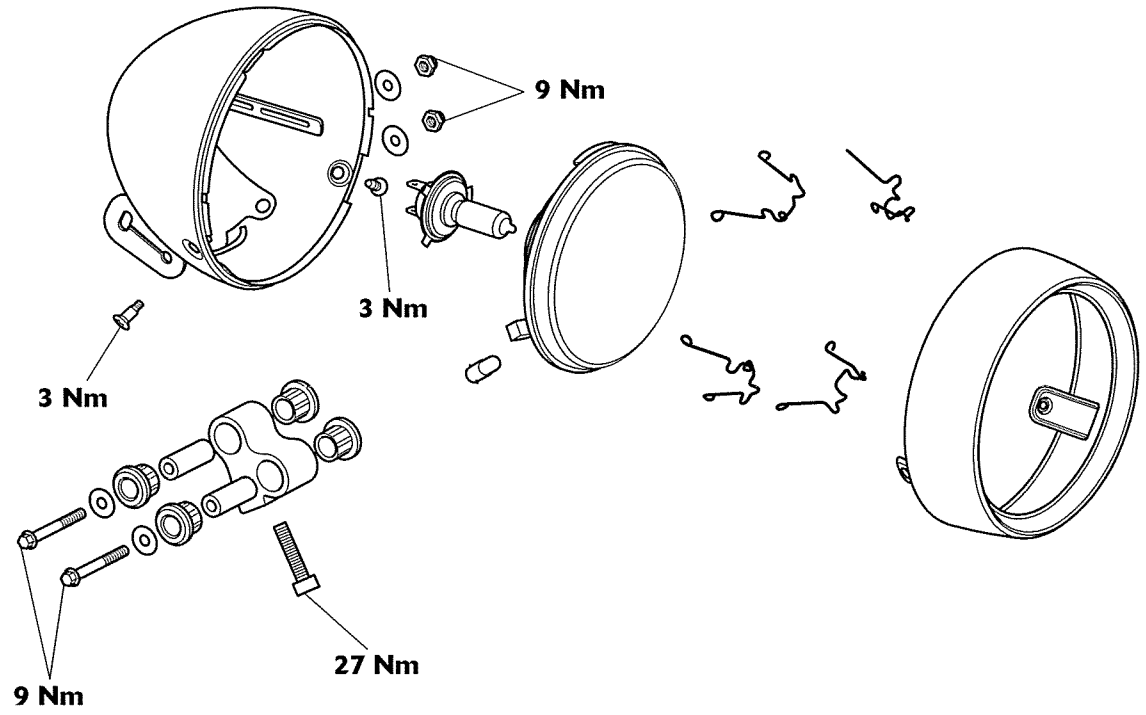
Exploded View - Instruments and Ignition Switch



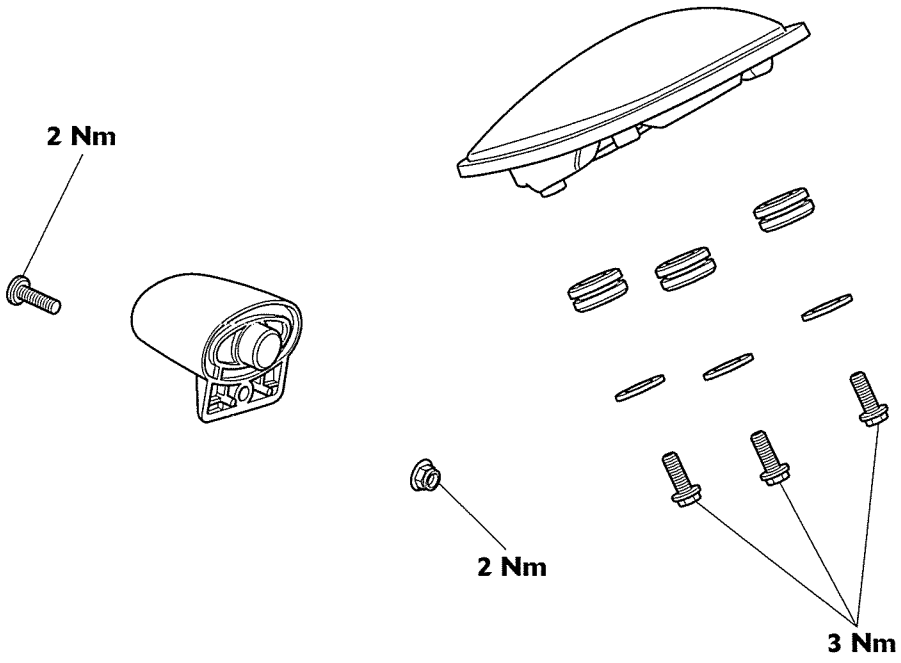
Exploded View - Alternator and Starter Motor



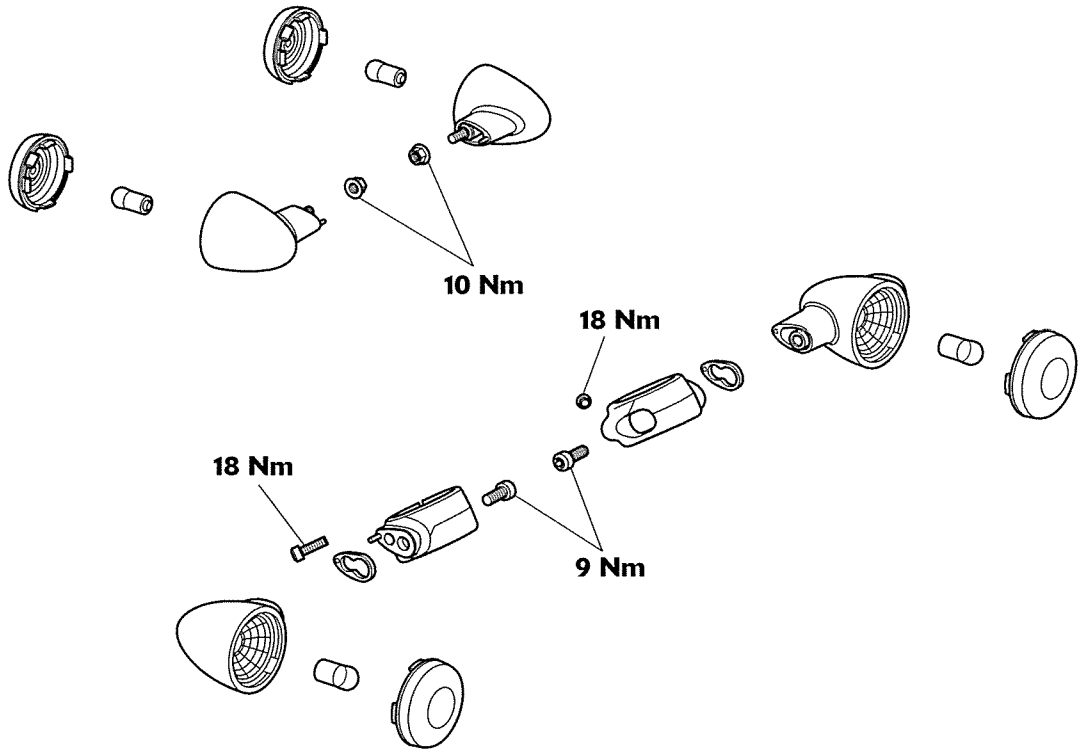
Exploded View - Headlight



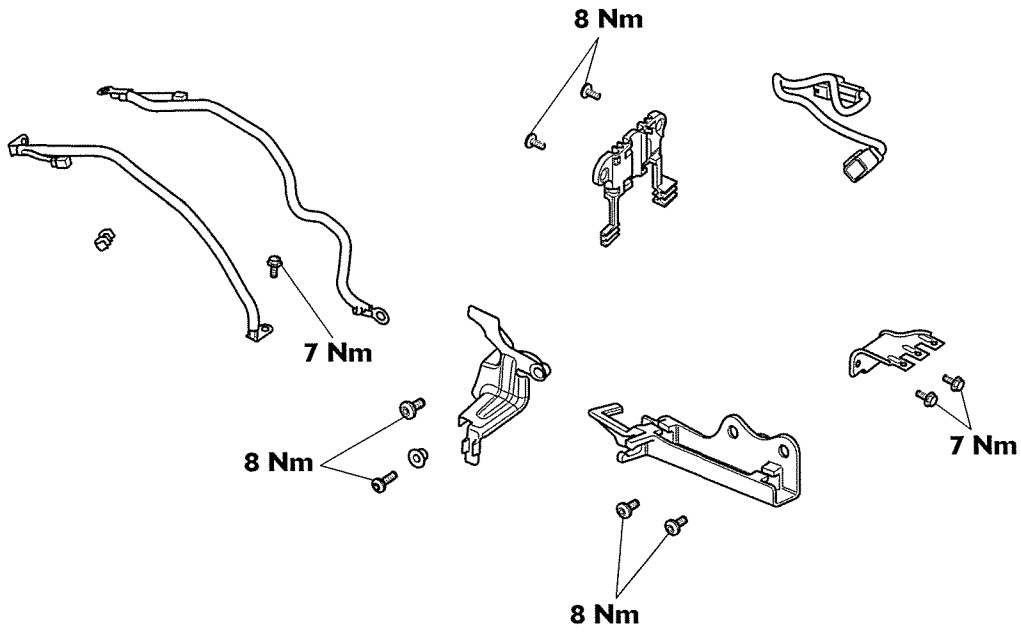
Exploded View - Rear Lights

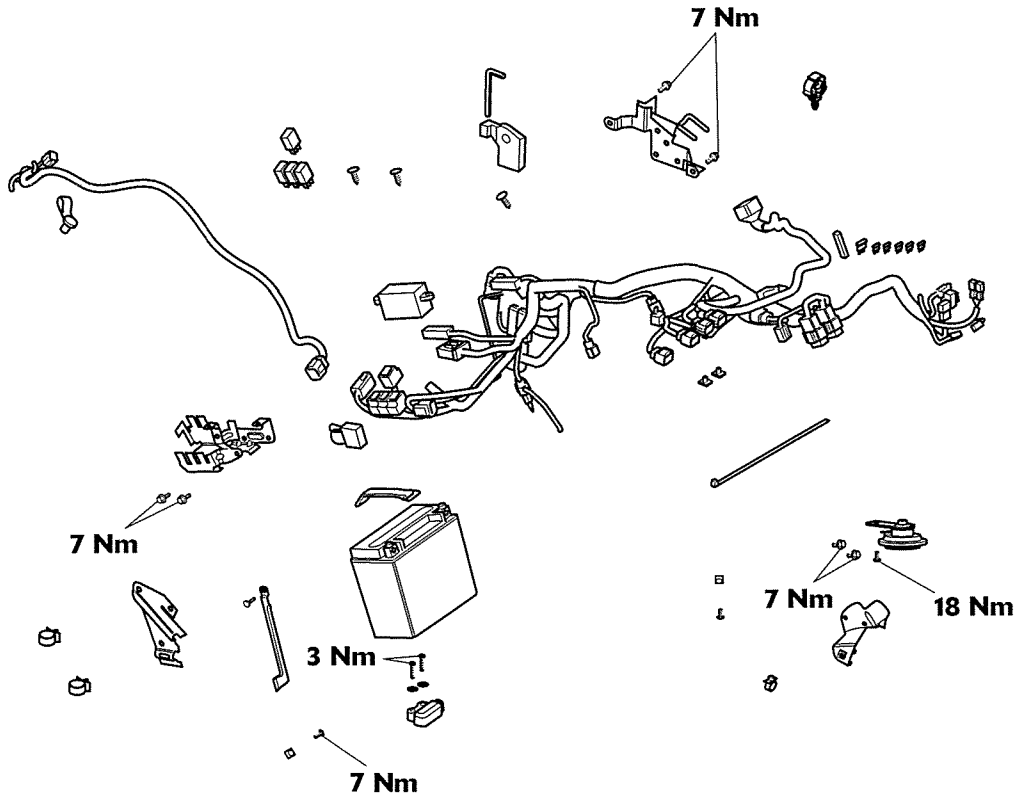


Exploded View - Indicators



Exploded View - Battery, Horn and Wiring





Battery

Warning

Under some circumstances, the battery can give 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 attach jump leads to 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 gases causing a risk of personal injury.

Battery Disposal

Should the battery ever require replacement, the original battery must be handed to a recycling agent who will ensure that the dangerous substances from which the battery is manufactured do not pollute the environment.

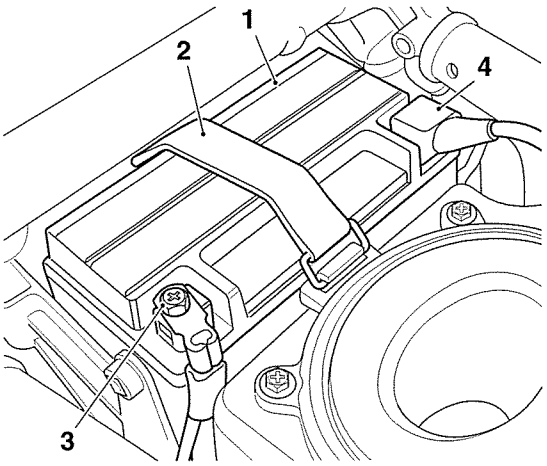
Battery Removal

1. Remove the rider's seat (see page *17-8*).
2. Remove the battery strap.
3. Disconnect the battery leads, negative (black) lead first.

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.

4. Take the battery out of the case.



1. Battery
2. Battery strap
3. Negative terminal
4. Positive terminal (identified with red tape on the lead)

Battery Installation

Warning

Ensure that the battery terminals do not touch the motorcycle frame as this may cause a short circuit or spark, which would ignite battery gases causing a risk of personal injury.

1. Place the battery in the battery case.
2. Reconnect the battery, positive (identified with red tape) lead first.
3. Apply a light coat of grease to the terminals to prevent corrosion.
4. Cover the positive terminal with the protective cap.
5. Refit the battery strap.
6. Refit the rider's seat (see page *17-9*).

Battery Commissioning and Charging

New Battery

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 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.

1. Ensure the VIN number printed on the anti-tamper label attached to the battery matches the motorcycle VIN.
2. Read the instructions and warnings delivered with the battery.
3. Place the battery on a flat level surface and remove the sealing foil.

⚠ Caution

Ensure the electrolyte container part number matches the battery part number to be filled. Battery life will be greatly reduced if the incorrect volume (either too little or too much) of acid is added to the battery.

4. Remove the battery sealing strip from the electrolyte container (if applicable) and save for later in this procedure. Place the sealing strip on a clean surface, with the upper side facing downwards to avoid contamination of the sealing strip. Do not break the seal on the electrolyte container.
5. Place the electrolyte container and adapter (if applicable) on the battery and fill the battery according to the manufacturers instructions.
6. After starting to fill the battery with electrolyte, allow the battery to stand for 30 minutes with the filling container in place.
7. Check that all of the electrolyte has drained from the container. Do not remove the container at this point. If the container has not completely drained, tap the sides of the container to start the electrolyte flowing again.
8. 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 3 Ah - 12 Ah or 1 hour for batteries greater than 12 Ah.
9. Remove the electrolyte container and adapter carefully, and dispose of immediately.
10. Place the sealing cap strip LOOSELY over the filling holes of the battery.
11. Charge the battery using the BatteryMate 150-9. Refer to the instructions supplied with the BatteryMate 150-9.

⚠ Caution

The caps must be fitted (after charging) within two hours of filling the battery with acid. Leaving the battery open to the atmosphere for longer than is necessary will start to reverse the chemical reaction which takes place within the battery, greatly reducing the battery's service life.

12. After charging is complete, press down firmly with both hands to seat the caps (do not use tools or force the caps into position).
13. Disconnect the charger and allow the battery to stand for 1 hour before fitting to the motorcycle.
14. Fit the battery to the motorcycle, positive (red) lead first.

Battery Maintenance

The battery is a sealed type and does not require any maintenance other than checking the Voltage and routine recharging such as during storage.

It is not possible to adjust the electrolyte level in the battery.

Note:

- **The charge level in the battery must be maintained to maximise the battery life.**

With normal use of the motorcycle, the charging system will keep the battery charged. If the motorcycle is unused the battery will gradually discharge due to battery self discharge and the continuous current drain for the clock and the engine control module memory.

The rate of battery discharge can be greatly increased by the addition of electrical security systems or other accessories.

Allowing a battery to discharge, or leaving it discharged over a period of time, causes sulphation of the lead plates within the battery.

Sulphation is a normal chemical reaction inside the battery and over a period of time sulphate will crystallise on to the lead plates making charging difficult or impossible. The result is a permanently damaged battery, which would not be covered by the motorcycle warranty.

Keeping a battery at full charge reduces the chance of it freezing in cold conditions. Allowing a battery to freeze can cause serious internal damage to the battery.

When leaving the motorcycle standing for more than a few days, regularly check the battery Voltage using a digital multimeter. Should the battery Voltage fall below 12.8V, charge the battery using the BatteryMate 150-9. Refer to the instructions supplied with the BatteryMate 150-9.

For extended periods of storage (beyond two weeks) the battery should be removed and the battery Voltage checked regularly and charged when below 12.8V.

Battery Already in Service

Use the guidelines in the table on the following page for charging. Always verify the battery condition before charging, and 30 minutes after charging.

Note:

- **A fully charged battery should read 12.8 Volts or higher after the battery has been off the charger for 30 minutes or more.**

Table of Battery Charging Times

State of charge	Voltage	Action	Charge time (using BatteryMate 150-9)
100%	12.8V - 13.0V	None. Check at 6 months from date of manufacture	None required
75% - 100%	12.5V - 12.8V	May need slight charge. If no charge given, check in 3 - 4 months	3 - 6 hours
50% - 75%	12.0V - 12.5V	Needs charge	5 - 11 hours
25% - 50% V	11.5V - 12.0V	Needs charge	At least 13 hours
0% - 25%	11.5V or less	Needs recovery using BatteryMate 150-9. Re-test after recovery.	20 hours

Fuses

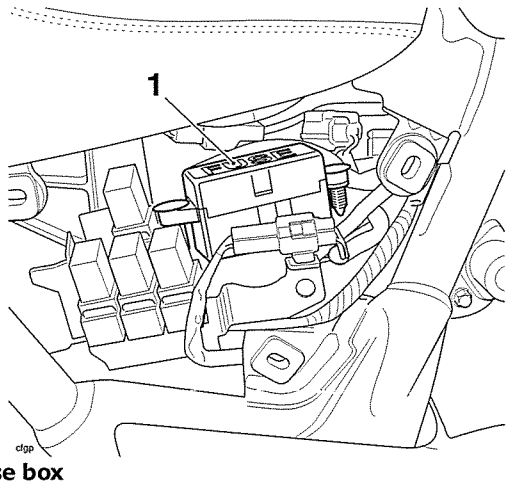
The fuse box is located behind the right hand side panel.

To allow access to the fuse box, the right hand side panel must be removed (see page *17-9*).

Warning

Always replace blown fuses with new ones of the correct rating (as specified on the fuse box cover) and never use a fuse of higher rating. Use of an incorrect fuse could lead to an electrical problem, resulting in motorcycle damage, loss of motorcycle control and an accident.

Fuse Box



1. Fuse box

Note:

- **Numbers shown in the diagram correspond to the fuse position numbers in the following tables.**

Fuse Identification

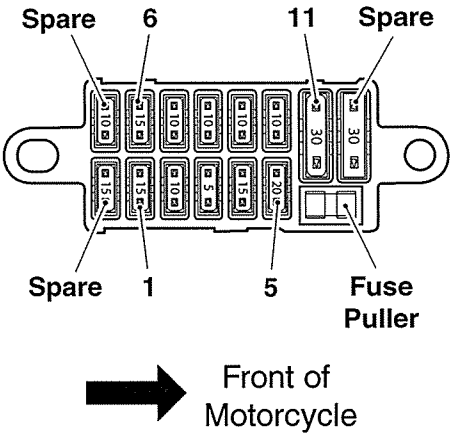
A blown fuse is indicated when all of the systems protected by that fuse become inoperative. When checking for a blown fuse, use the table below to establish which fuse has blown.

Models without ABS:

Position	Circuit Protected	Rating (Amps)
1	Dip and main headlight beams, starter solenoid	15
2	Spare	10
3	Auxiliary lights	5
4	Cooling fan	15
5	Engine management system	20
6	Accessory socket, heated grips	15
7	Alarm, instruments	10
8	Accessory lights, fog lights	10* or 15*
9	Horn, brake Switch	10
10	Ignition, starter circuit	10
11	Main fuse	30
* Refer to the label in the fuse box cover		

Note:

- **Numbers shown in the diagram correspond to the fuse position numbers in the following table.**

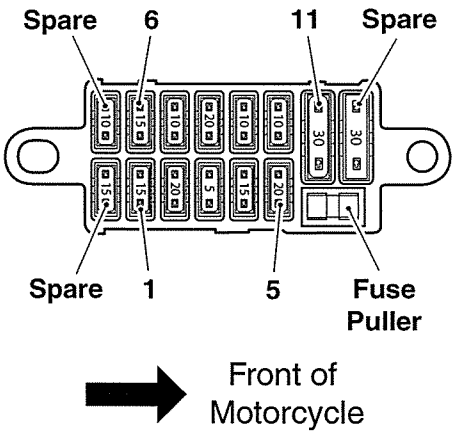


Models fitted with ABS:

Position	Circuit Protected	Rating (Amps)
1	Dip and main headlight beams, starter solenoid	15
2	ABS	20
3	Auxiliary lights	5
4	Cooling fan	15
5	Engine management system	20
6	Accessory socket, heated grips‡, accessory lights, fog lights	15* or 20*
7	Alarm, instruments, heated grips‡	10
8	ABS	20
9	Horn, brake Switch	10
10	Ignition, starter circuit	10
11	Main fuse	30
* Refer to the label in the fuse box cover		
‡If the fuse fitted at position 6 is 15 Amps, the heated grips will be powered from this fuse. If the fuse fitted at position 6 is 20 Amps, the heated grips will be powered from fuse 7.		

Note:

- **Numbers shown in the diagram correspond to the fuse position numbers in the following table.**



Headlights

Warning

Adjust road speed to suit the visibility and weather conditions in which the motorcycle is being operated.

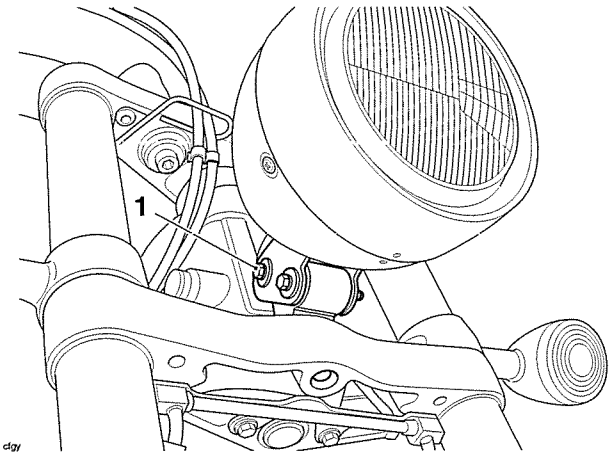
Ensure that the beams are adjusted to illuminate the road surface sufficiently far ahead without dazzling oncoming traffic. An incorrectly adjusted headlight may impair visibility causing an accident.

Warning

Never attempt to adjust a headlamp beam when the motorcycle is in motion.

Any attempt to adjust a headlamp beam when the motorcycle is in motion may result in loss of control and an accident.

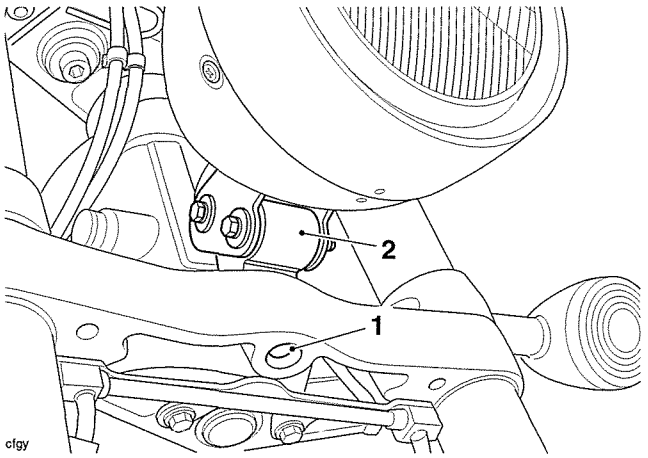
Headlight Vertical Adjustment



1. Vertical beam adjuster

1. Switch the headlight dipped beam on.
2. Slacken the clamp bolt sufficient to allow restricted movement of the headlight.
3. Adjust the position of the headlight to give the required beam setting.
4. Tighten the clamp bolt to **9 Nm**.
5. Re-check the headlight beam setting.
6. Switch the headlight off when the beam setting is satisfactorily set. Turn the ignition off when both beam settings are satisfactorily set.

Headlight Horizontal Adjustment



1. Horizontal beam adjuster
2. Headlight mounting bracket

1. Switch the headlight dipped beam on.
2. Slacken the headlight mounting bracket fixing.
3. Adjust the horizontal position of the headlight and mounting bracket to give the required beam setting.
4. Tighten the headlight mounting bracket fixing to **27 Nm**.
5. Re-check the headlight beam settings.
6. Switch the headlight off when the beam setting is satisfactorily set.

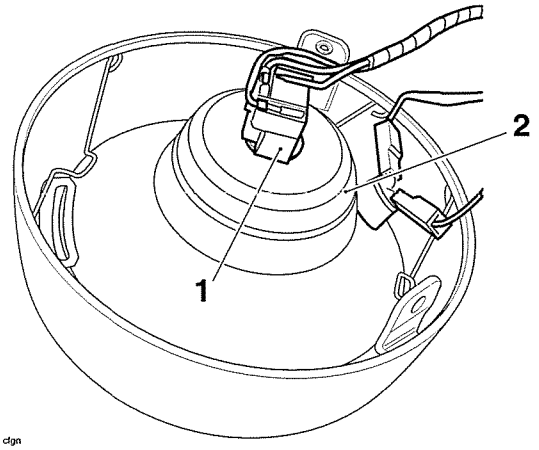
Headlight Bulb Replacement

It is necessary to remove the headlight from the headlight bowl to gain access to the bulbs.

Warning

The bulbs become hot during use. Always allow sufficient time for the bulbs 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.

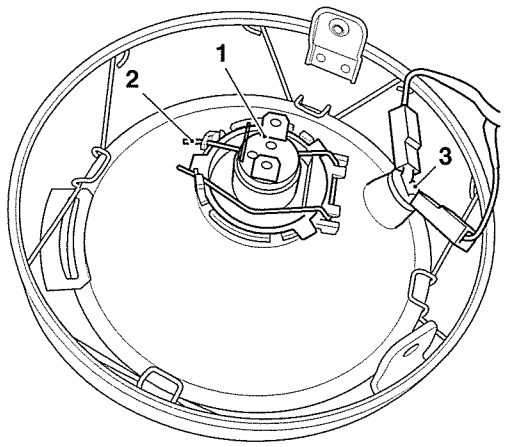
1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Undo the fixings securing the headlight clamp to the headlight body.
4. Support the headlight while removing the clamp.
5. Remove the headlight from its bowl while supporting it to prevent the cables from being over extended.
6. Disconnect the multi-pin electrical connector from the headlight bulb and remove the rubber cover.



1. Multi-pin electrical connector
2. Rubber cover

7. Detach the wire retainer from its clip then remove the bulb from the light unit.

8. **To remove the position light bulb:** Without pulling on the wires, ease the bulb holder from its socket. The bulb is removed from its holder by pulling gently upwards.



cfgo

1. Headlight bulb
2. Bulb clip
3. Position light bulb

9. Installation for both bulbs is the reverse of the removal procedure. Tighten the headlight clamp to **3 Nm**.

Warning

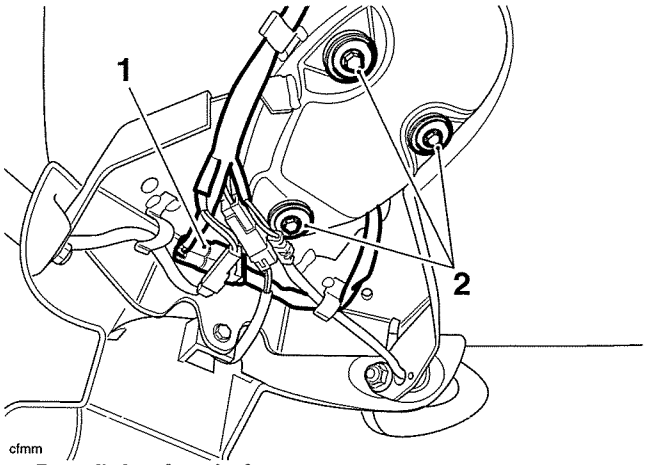
Do not reconnect the battery until the assembly process has been completed. Premature battery reconnection could result in ignition of the battery gases causing risk of injury.

10. Reconnect the battery, positive (identified with red tape) lead first.
11. Refit the rider's seat (see page *17-9*).

Rear Light

Removal

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Remove the rear wheel (see page *16-8*).
4. Release the fixings and remove the harness cover below the rear mudguard.
5. Disconnect the rear light electrical connector, and release the rear light harness from its clip on the mudguard.
6. Release the three fixings and remove the rear light.



cfmm

1. Rear light electrical connector
2. Fixings

Bulb Replacement

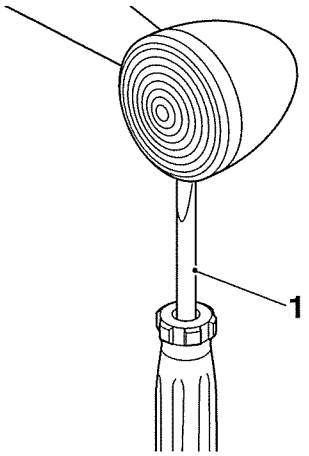
The rear light unit is a sealed, maintenance free LED unit.

Installation

1. Installation is the reverse of the removal, noting the following:
   - Tighten the rear light fixings to **3 Nm**.
   - Tighten the harness cover fixings to **3 Nm**.
   - Reconnect the battery, positive (identified with red tape) lead first.

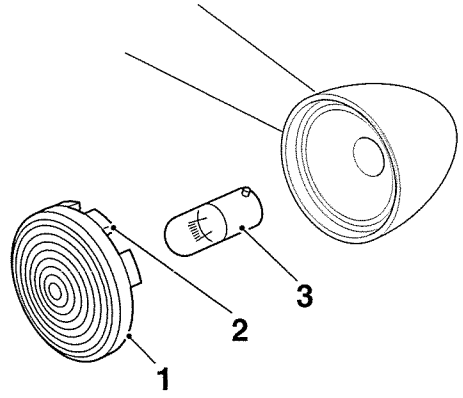
Indicator Lights

Bulb Replacement



cfhh

1. Screwdriver



cfhi

1. Lens
2. Locating tang
3. Bulb

Use a flat bladed screwdriver to carefully remove the lens from the indicator to gain access to the bulb for replacement.

Warning

The bulb becomes hot during use. Always allow sufficient time for the bulb to cool before handling. Avoid touching the glass part of the bulb. If the glass is touched or gets dirty, clean with alcohol before re-use.

Caution

When installing the lens, ensure that the locating tang is correctly aligned to the indicator body.

To install the indicator lens, align the locating tang with the indicator body and push the lens until the retaining clips secure the lens.

Alternator

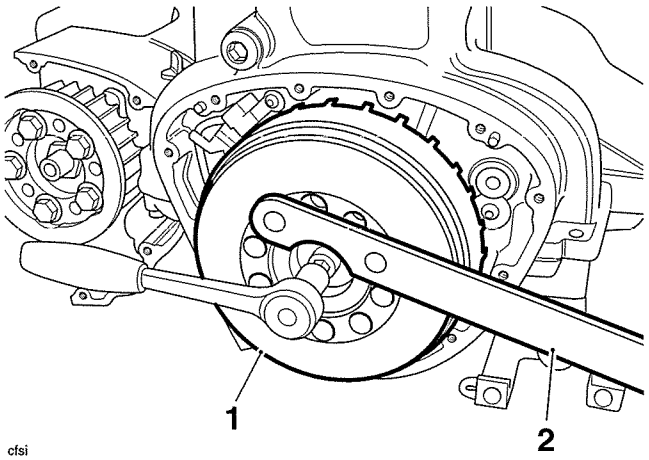
Removal

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Remove the rear brake master cylinder (see page *12-26*).
4. Release the bolts securing the alternator cover to the engine.
5. Withdraw the alternator cover from the crankcase.

Note:

- **To use tool T3880096, insert the tool pegs into a pair of rotor holes. However, tool T3880096 will not engage with every pair of holes in the rotor. One of the holes is larger and so the tool will only engage with certain pairs of holes.**

6. To remove the rotor, prevent the crankshaft from rotating using tool T3880096, and remove the centre bolt and washer from the end of the crankshaft.

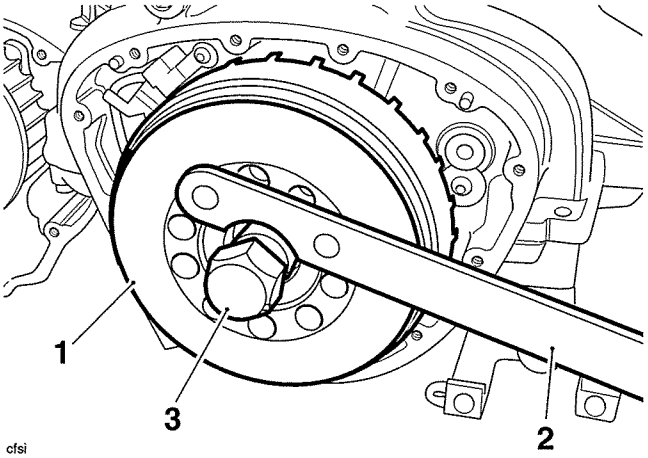


cfsi

1. Rotor
2. Tool T3880096

7. Screw tool T3880200 into the rotor centre.

8. Prevent the rotor from turning using tool T3880096 while tightening tool T3880200. This will release the taper seating of the rotor to the crankshaft.



cfsi

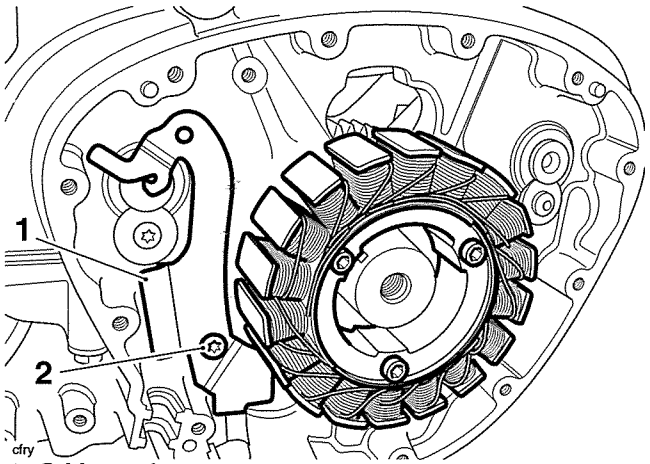
1. Rotor
2. Tool T3880096
3. Tool T3880200

9. Withdraw the rotor and tool as an assembly and then separate the tool from the rotor.

Note:

- **If removing the stator, make a note of the cable routing before removing the cable retainer.**

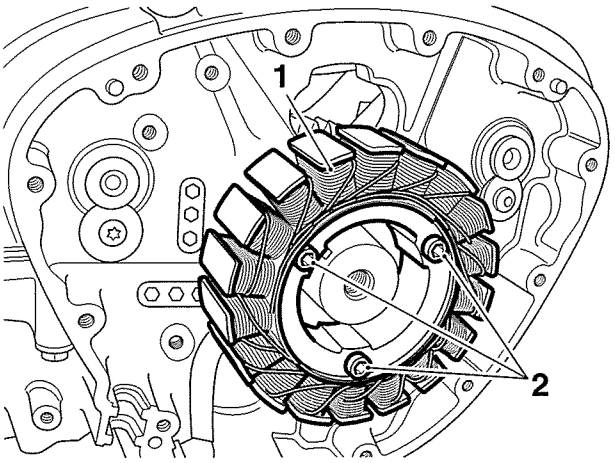
10. Remove the crankshaft sensor (see page *10-102*).
11. To remove the stator, release the bolt securing the cable retainer to the crankcase.



cfry

1. Cable retainer
2. Bolt

12. Release the three bolts securing the stator to the crankcase.



1. Stator
2. Stator bolts

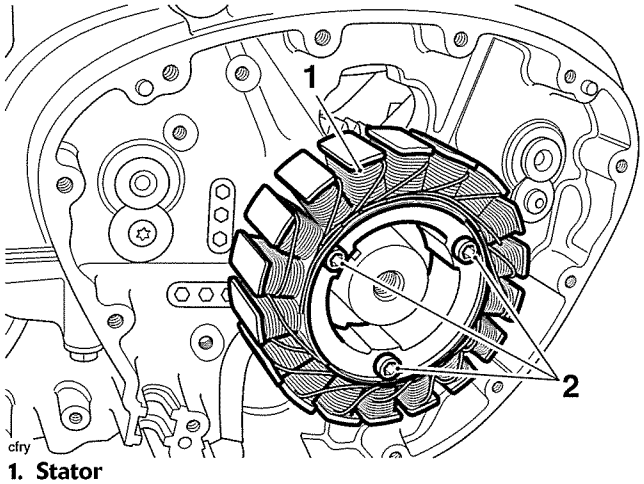
13. Withdraw the stator from the crankcase. Noting its routing, trace the stator wiring back to its electrical connector and disconnect the stator.

Inspection

1. Inspect the key in the crankshaft for damage and distortion. Replace the key if necessary.
2. Inspect the rotor for damage and high spots to the taper centre. Replace the rotor if necessary.
3. Inspect the stator for signs of overheating and short/ open circuits. Replace as necessary.

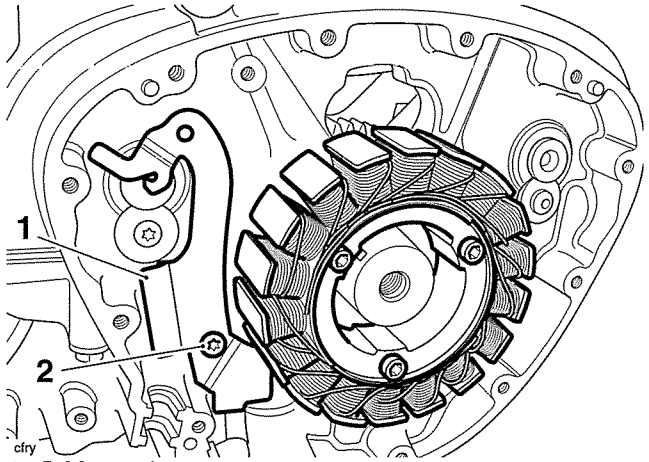
Installation

1. Locate the stator to the crankcase and secure with the three screws.



1. Stator
2. Fixings

2. Apply silicone sealer to the cable grommet and align the cable to the crankcase exit slot.
3. Fit the cable retainer bracket, routing the cable as noted on disassembly. Tighten the retainer bolt to **9 Nm**. Reconnect the electrical connector.



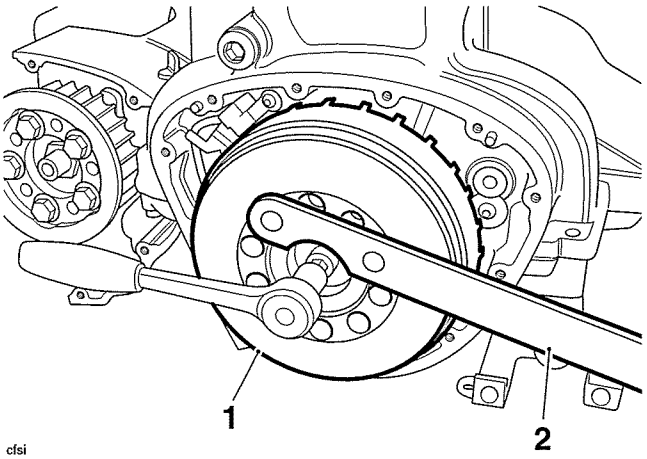
1. Cable retainer
2. Bolt

4. Tighten the stator screws to **12 Nm**.

Warning

The rotor magnets are very strong. During rotor installation the magnets may 'grab' the rotor, causing injury to the hands or fingers. When installing the rotor, wear suitable gloves and only grip the rotor by the outside circumference; always keep hands and fingers clear of the rear of the rotor.

5. Assemble the rotor to the keyway on the crankshaft, taking care to ensure the Woodruff key is correctly installed.
6. Fit the bolt and washer to the threaded hole in the crankshaft.
7. Refit tool T3880096 to prevent the crankshaft from rotating.
8. Tighten the rotor bolt to **165 Nm**.



1. Rotor
2. Rotor bolt
3. Tool T3880201

9. Remove tool T3880096.
10. Incorporating a new gasket, refit the alternator cover to the engine.
11. Tighten the alternator cover bolts to **9 Nm**.
12. Reconnect the battery, positive (identified with red tape) lead first.
13. Refit the rider's seat (see page *17-9*).

Alternator Rectifier

Note:

- **The alternator rectifier is attached to a bracket below the swinging arm. The rectifier does not contain any serviceable parts and must be replaced if faulty.**

Removal

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Disconnect both multi-plugs from the alternator rectifier.
4. Release the two screws securing the rectifier its bracket and withdraw the rectifier.

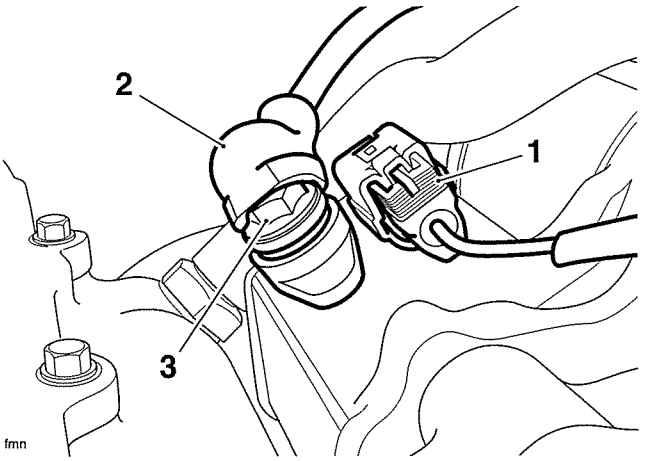
Installation

1. Position the rectifier to the bracket and secure with the two screws. Tighten the screws to **9 Nm**.
2. Reconnect the two multi-plugs to the rectifier.
3. Reconnect the battery, positive (identified with red tape) lead first.
4. Refit the rider's seat (see page *17-9*).

Starter Motor

Removal

1. Remove the rider's seat (see page *17-8*).
2. Disconnect the battery, negative (black) lead first.
3. Disconnect the solenoid connection from the main wiring harness.
4. Ease the rubber boot from the starter cable, release the nut and disconnect the cable.

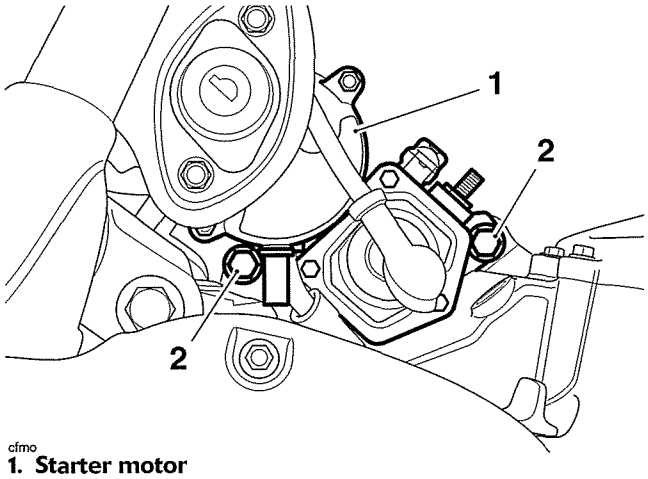


fmn

1. Solenoid connection
2. Boot
3. Nut

5. Remove the bolt, detach the main engine ground cable from the crankcase and position aside.
6. Detach the engine breather hose from the breather spout.
7. Remove the engine breather spout from the crankcase, collecting the copper washer as it is removed. Discard the washer.
8. Loosen the right hand throttle body hose clip and rotate it upwards to allow clearance for the starter motor.
9. Protect the crankcase painted surfaces from damage, using a suitable self adhesive tape such as masking tape.

10. Release the two bolts securing the starter motor to the crankcase.



cfmo
1. Starter motor
2. Bolts

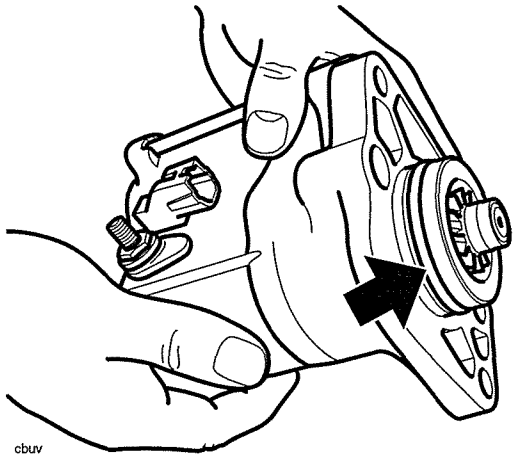
Caution

Damage to painted surfaces could result from inadequate care during removal or installation of the starter motor. Always protect the crankcase from damage during removal or installation.

11. Carefully manoeuvre the starter motor out to the right hand side of the motorcycle.

Installation

1. Fit a new O-ring to the starter motor.



cbuv
Arrowed - O-ring

Caution

Damage to painted surfaces could result from inadequate care during removal or installation of the starter motor. Always protect the crankcase from damage during removal or installation.

2. Carefully position the starter to the crankcase and retain with the two bolts. Tighten the bolts to **28 Nm**.
3. Remove any self adhesive tape used to protect the crankcase.
4. Reposition the throttle body hose clip and tighten to **1.5 Nm**.
5. Incorporating a new copper washer, refit the breather spout and tighten to **35 Nm**.
6. Align the main engine ground cable to the crankcase and secure with the bolt. Tighten to **7 Nm**.
7. Locate the starter cable to its connection pole. Fit the nut and tighten it to **7 Nm**.
8. Refit the boot.
9. Reconnect the solenoid to the main harness.
10. Reconnect the battery, positive (identified with red tape) lead first.
11. Refit the rider's seat (see page *17-9*).

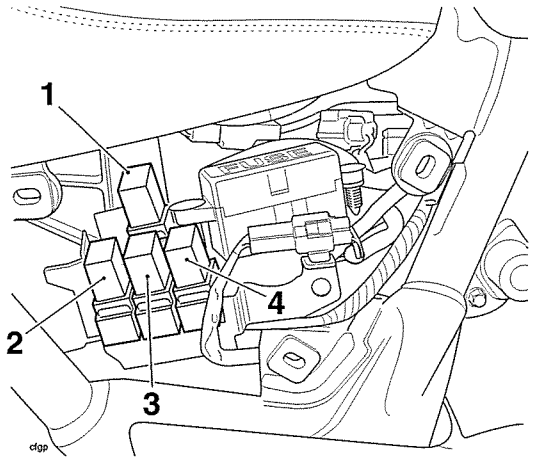
Relays

Identification and Location

Note:

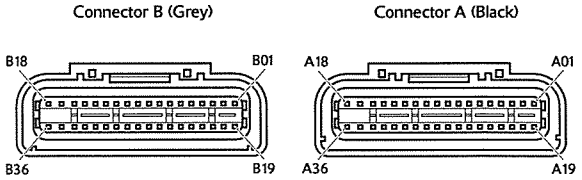
- **Relays can be found beneath the right hand side cover.**

Relay identification



1. **Starter Relay**
2. **Fuel pump relay**
3. **EMS relay**
4. **Cooling fan relay**

ECM Connector Pin Numbering



The above illustration shows the pin numbering system used in the engine management and other electrical circuit diagrams.

The black connector pins are prefixed A and the grey connector 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.

Alternator Stator

The stator is an assembly of 18 coils, arranged in to three phases. It is possible to check for continuity and short circuits through the coils and to earth.

Note:

- **Only repair the stator harness between the rectifier and where the harness goes into the crankcase.**
- **Do not attempt to repair the stator coils.**
- **If the battery is not fully charged, the charging Voltage may be lower than specified when checking at 2,000 rpm.**
- **Ensure all additional accessories (auxiliary lights, heated grips etc.) are switched off.**

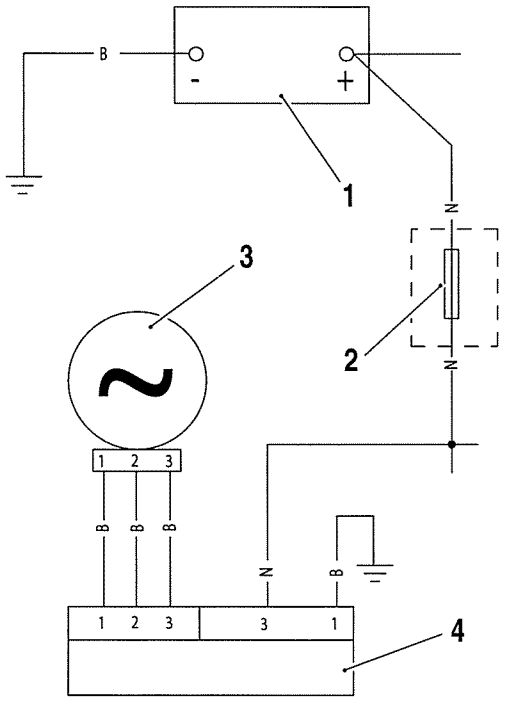
Fault	Possible cause	Action
Battery not charging	Fuse 11	Check the condition of fuse 11:-
	Battery	Check the condition of the battery. Test the battery using the BatteryMate 150-9. Refer to the instructions supplied with the BatteryMate 150-9. Ensure the battery is serviceable:-
	Alternator	Proceed to pinpoint test 1:-
	Rectifier/Regulator	Test the rectifier/regulator (see page *18-24*)

Pinpoint Tests

	Test	Result	Action
1	Check cable and terminal integrity: - Battery positive (+) - Battery negative (-) - rectifier/regulator black connector pin 1 - rectifier/regulator black connector pin 3 - rectifier/regulator grey connector pin 1 - rectifier/regulator grey connector pin 2 - rectifier/regulator grey connector pin 3	OK	Disconnect the battery leads, negative (black) lead first. Disconnect rectifier/regulator black connector and proceed to test 2
		Faulty	Rectify fault, proceed to test 4
2	Check cable continuity - rectifier/regulator black connector pin 1 to battery lead negative connector - rectifier/regulator black connector pin 3 to battery lead positive connector	OK	Reconnect the battery leads, positive (red) lead first. Reconnect the rectifier/regulator black connector. Disconnect the rectifier/ regulator grey connector and proceed to test 3
		Open circuit	Locate and rectify wiring fault, proceed to test 4
3	Check resistance through the coils: - Alternator pin 1 to pin 2 - Alternator pin 2 to pin 3 - Alternator pin 3 to pin 1	0.14Ω to 0.18Ω	Proceed to test 4
		Open circuit or short circuit	If the fault is between the rectifier and the crankcase, repair the harness. Proceed to test 4 If the fault is after the crankcase, replace the unit. Proceed to test 5
4	Reconnect the harness and run the engine. Check the charging Voltage at 2,000 rpm:	13.5V - 15V	Action complete - quit test
		Fault still present	Disconnect the rectifier/regulator grey connector and proceed to test 5

	Test	Result	Action
5	Check the alternator AC output Voltage at 850 rpm by probing the 3-pin stator connector as follows: - Positive (+) probe to pin 1 negative (-) probe to pin 2 - Positive (+) probe to pin 2 negative (-) probe to pin 3 - Positive (+) probe to pin 3 negative (-) probe to pin 1	15V AC to 25V AC	Test rectifier/regulator (see page *18-24*)
		Less than 15V AC	Replace unit. Proceed to test 6
6	Reconnect the harness and run the engine. Check the charging Voltage at 2,000 rpm:	13.5V - 15V	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



1. **Battery**
2. **Fuse Box (Fuse 11)**
3. **Alternator**
4. **Rectifier/Regulator**

Rectifier/Regulator

Internally the rectifier/regulator consists of three diodes, one between each input and the positive terminal, and three Field Effect Transistors (FETs), one between each input and the ground terminal.

As the Voltage of the AC signal from the generator rises, the Voltage controller switches the FETs to avoid over Voltage on the output.

The diodes and FETs can be checked using a multimeter on DIODE setting. Disconnect the two electrical connectors from the rectifier/regulator and check the readings as indicated below.

Note:

- **This test does not check for Voltage regulation.**

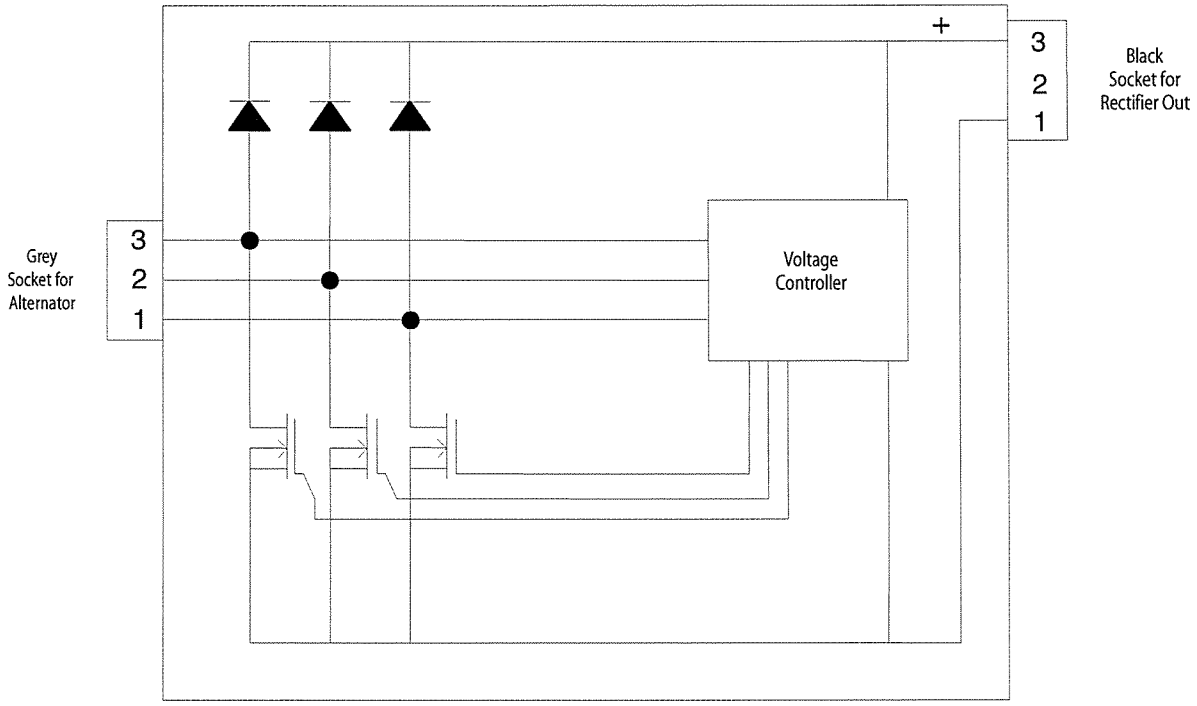
Fault	Possible cause	Action
Battery not charging	Fuse 11	Check the condition of fuse 11:-
	Battery	Check the condition of the battery. Test the battery using the BatteryMate 150-9. Refer to the instructions supplied with the BatteryMate 150-9. Ensure the battery is serviceable:-
	Rectifier/Regulator	Disconnect the black and the grey connectors from the rectifier/ regulator and proceed to pinpoint test 1:-
	Alternator	Test the alternator stator (see page *18-22*)

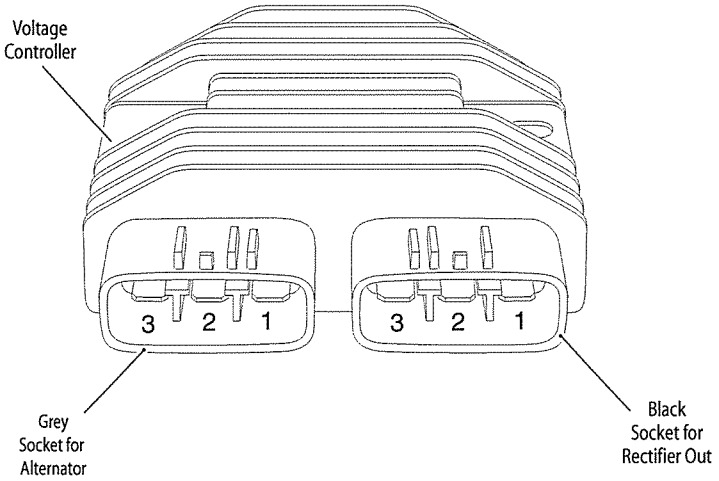
Pinpoint Tests

Test	Result	Action
1 Check diodes forward bias: - Positive (+) probe to rectifier black socket pin 1 to: Negative (-) probe to rectifier grey socket pin 1 Negative (-) probe to rectifier grey socket pin 2 Negative (-) probe to rectifier grey socket pin 3	0.4V to 0.7V	Proceed to test 2
	Open circuit or short circuit	Replace the unit. Proceed to test 4
2 Check FET function forward bias: - Negative (-) probe to rectifier black socket pin 3 to: Positive (+) probe to rectifier grey socket pin 1 Positive (+) probe to rectifier grey socket pin 2 Positive (+) probe to rectifier grey socket pin 3	0.1V to 0.3V	Proceed to test 3
	Open circuit or short circuit	Replace the unit. Proceed to test 4
3 Check diodes reverse bias: - Negative (-) probe to rectifier black socket pin 1 to: Positive (+) probe to rectifier grey socket pin 1 Positive (+) probe to rectifier grey socket pin 2 Positive (+) probe to rectifier grey socket pin 3 - Positive (+) probe to rectifier black socket pin 3 to: Negative (-) probe to rectifier grey socket pin 1 Negative (-) probe to rectifier grey socket pin 2 Negative (-) probe to rectifier grey socket pin 3	More than 1.4V or OL on meter	Proceed to test 4
	Less than 1.4V or short circuit	Replace the unit. Proceed to test 4

4 Reconnect the harness and run the engine. Check the charging Voltage at 2,000 rpm:	13V - 15V	Action complete - quit test
	Fault still present	Test alternator stator (see page *18-22*)
		If alternator stator is serviceable, contact Triumph service

Circuit Diagram





Lighting Circuit

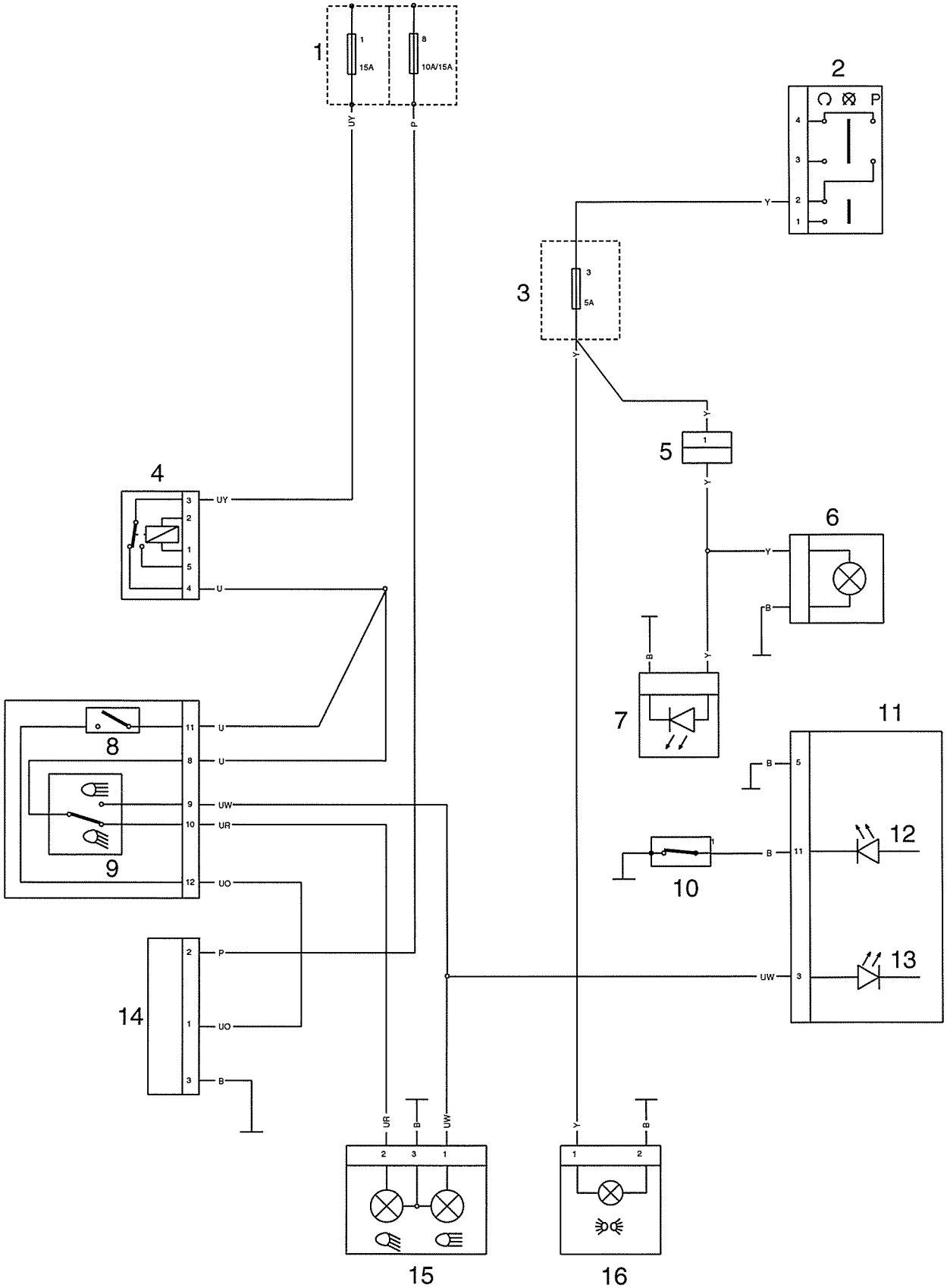
Key to Circuit Diagram

Key	Item Description
1	Fuse Box (Fuses 1 and 8*)
2	Ignition Switch
3	Fuse Box (Fuse 3)
4	Starter Relay
5	Rear Lighting Sub-harness
6	Number Plate Lamp
7	Tail Lamp
8	Accessory Light Switch
9	Headlamp Dip Switch
10	Oil Pressure Switch
11	Instrument Assembly
12	Oil Pressure Warning Lamp
13	Main Beam Warning Lamp
14	Accessory Light
15	Main/Dip Beam
16	Front Parking Lamp
* For fuse 8 value refer to the label in the fuse box cover	

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

Circuit Diagram - Lighting - Models without ABS



Note: For fuse 8 value, refer to the label in the fuse box cover

Lighting Circuit

Key to Circuit Diagram

Key	Item Description
1	Fuse Box (Fuses 1 and 8)
2	Ignition Switch
3	Fuse Box (Fuse 3)
4	Starter Relay
5	Rear Lighting Sub-harness
6	Number Plate Lamp
7	Tail Lamp
8	Accessory Light Switch
9	Headlamp Dip Switch
10	Oil Pressure Switch
11	Instrument Assembly
12	Oil Pressure Warning Lamp
13	Main Beam Warning Lamp
14	Accessory Light
15	Main/Dip Beam
16	Front Parking Lamp

Key To Wiring Colour Codes

Code	Wiring Colour
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G	Green
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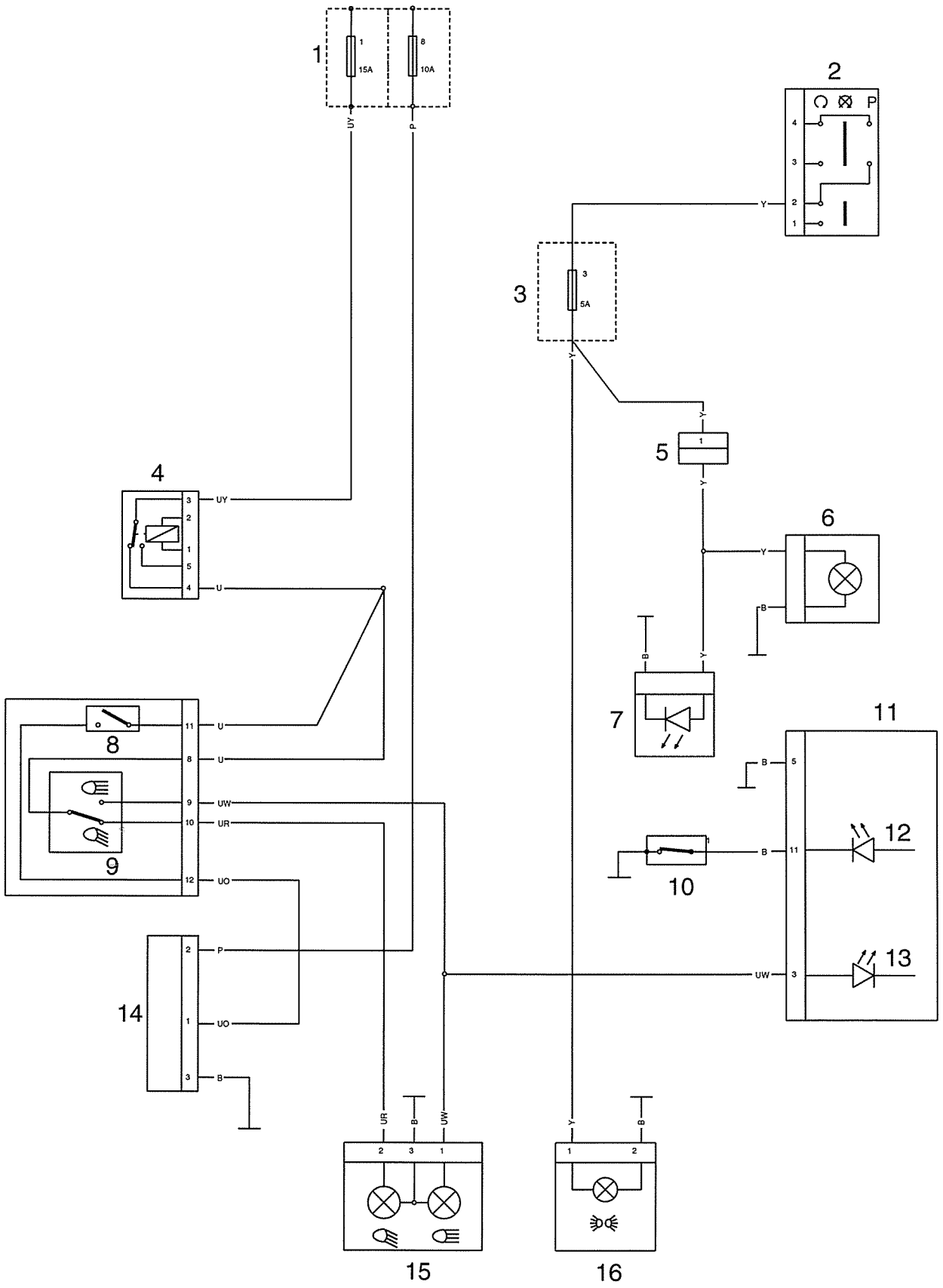
O	Orange
K	Pink
R	Red
P	Purple
W	White
Y	Yellow
LG	Light Green
LU	Light Blue

Circuit Diagram - Lighting - Models with ABS



Starting and Charging Circuit

Key to Circuit Diagram

Key	Item Description
1	Battery
2	Starter Motor
3	Battery Connector
4	Regulator / Rectifier
5	Starter Relay
6	Ignition Switch
7	Fuse Box
8	Engine Control Module
9	Engine Management System Relay
10	Engine Stop Switch
11	Scroll Switch
12	Starter Switch
13	Alarm Control Unit Or Harness Link Connector
14	Instrument Assembly

Key To Wiring Colour Codes

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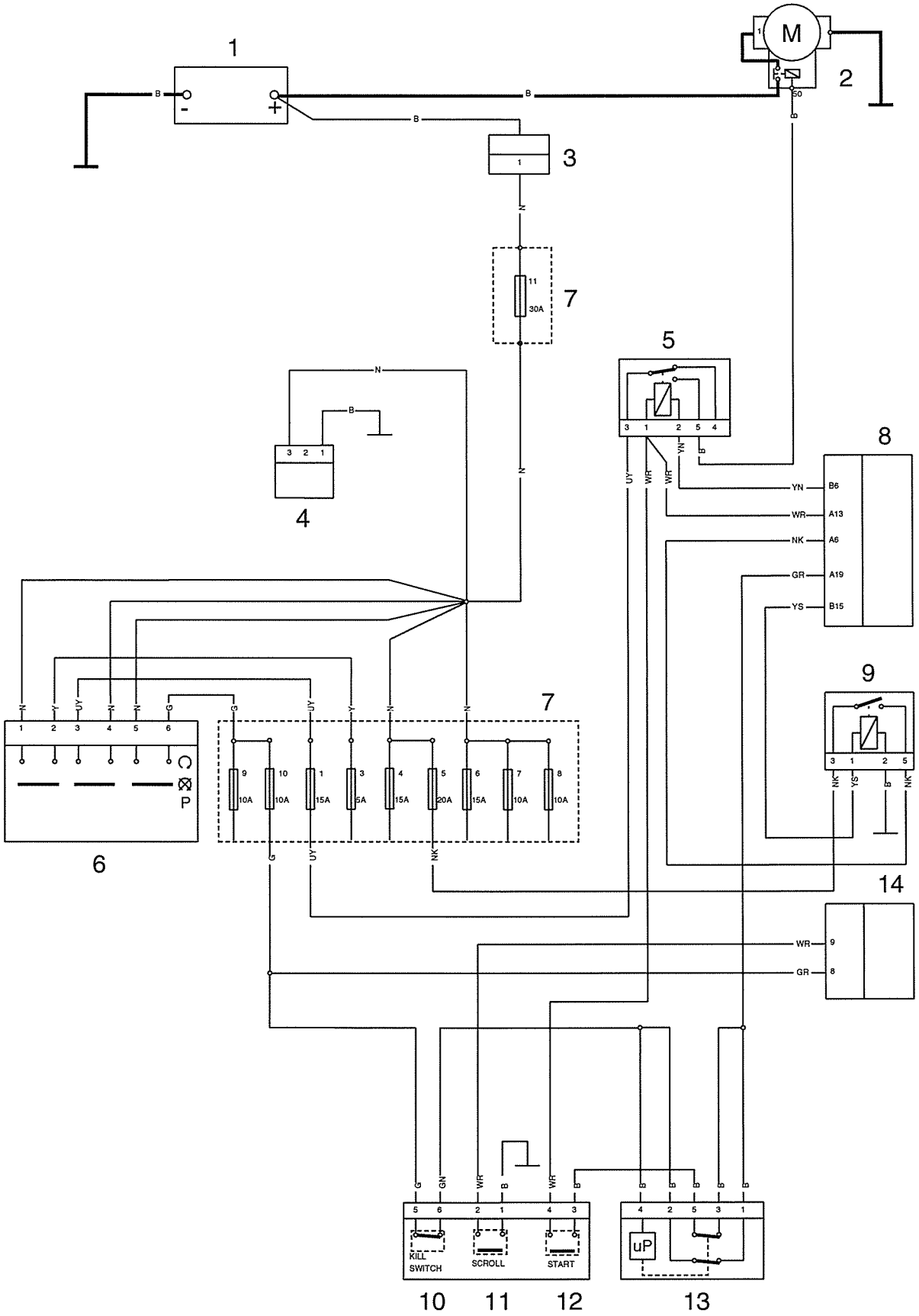
N	Brown
G	Green
S	Slate/Grey
O	Orange
K	Pink
R	Red
P	Purple
W	White
Y	Yellow
LG	Light Green
LU	Light Blue

Circuit Diagram - Starting and Charging



Auxiliary and Accessory Circuit - Models without ABS

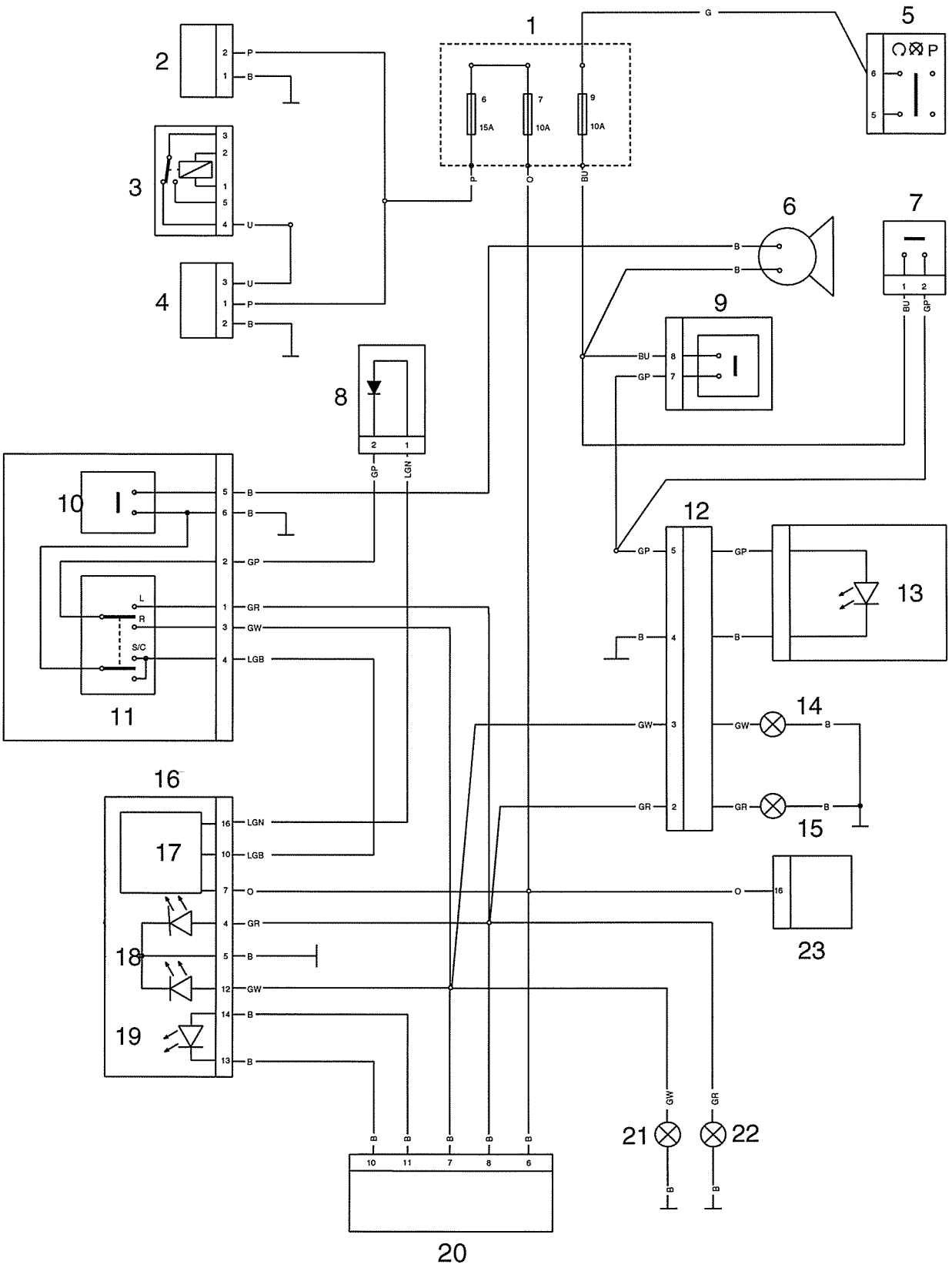
Key to Circuit Diagram

Key	Item Description
1	Fuse Box (6, 7 and 9)
2	Accessory Socket
3	Starter Relay
4	Accessory Heated Handlebar Grips
5	Ignition Switch
6	Horn
7	Rear Brake Light Switch
8	Diode Pack
9	Front Brake Light Switch
10	Horn Switch
11	Direction Indicator Switch
12	Rear Lighting Sub-harness
13	Brake Lamp
14	Rear Right Direction Indicator
15	Rear Left Direction Indicator
16	Instrument Assembly
17	Indicator Relay
18	Direction Indicator (Instrument)
19	Alarm LED
20	Accessory Alarm Control Unit
21	Front Right Direction Indicator
22	Front Left Direction Indicator
23	Diagnostic Connector

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

Circuit Diagram - Auxiliary and Accessory - Models without ABS



Auxiliary and Accessory Circuit - Models with ABS

Key to Circuit Diagram

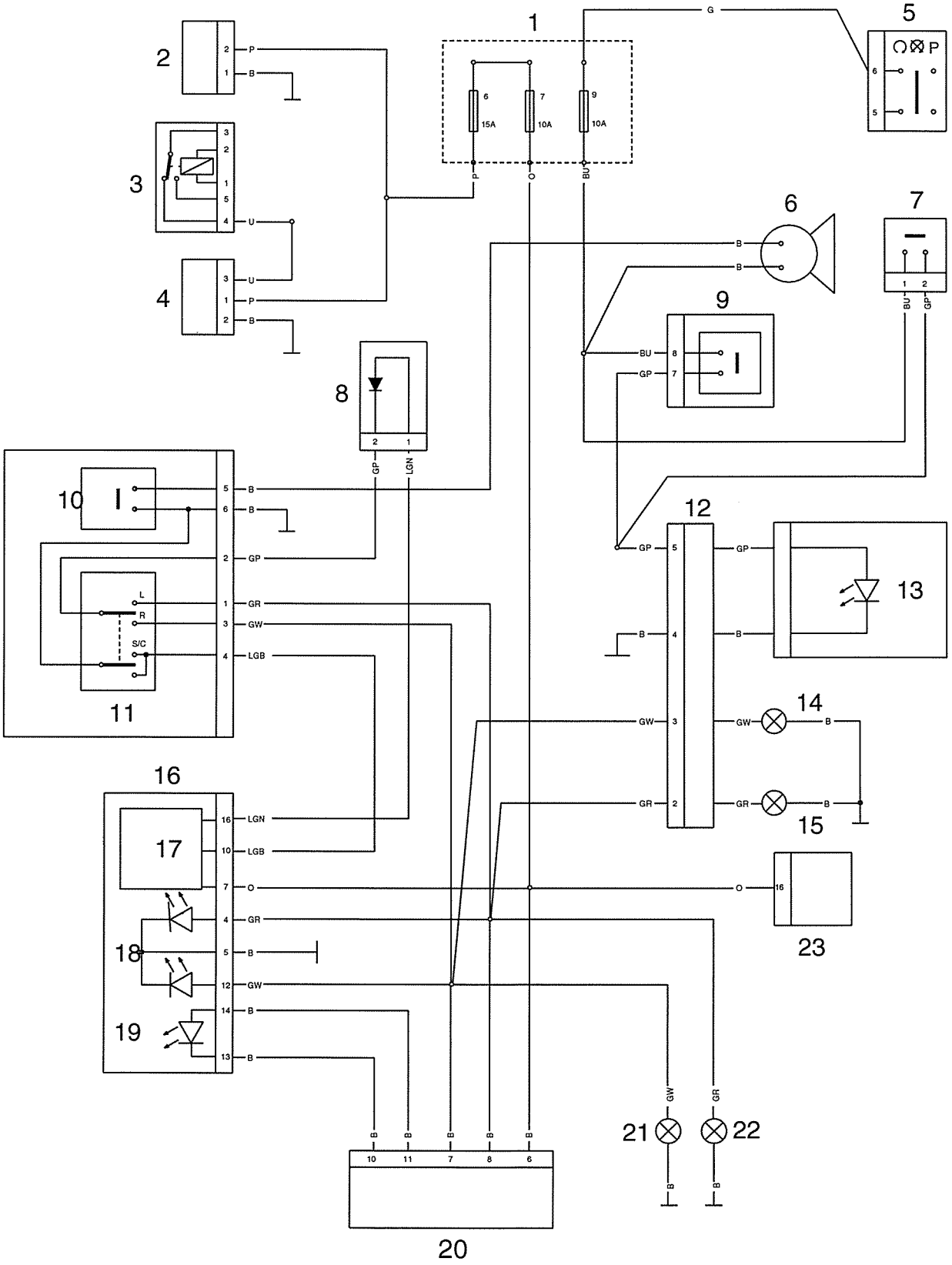
Key	Item Description
1	Fuse Box (6, 7 and 9)
2	Accessory Socket
3	Starter Relay
4	Accessory Heated Handlebar Grips
5	Ignition Switch
6	Horn
7	Rear Brake Light Switch
8	Diode Pack
9	Front Brake Light Switch
10	Horn Switch
11	Direction Indicator Switch
12	Rear Lighting Sub-harness
13	Brake Lamp
14	Rear Right Direction Indicator
15	Rear Left Direction Indicator
16	Instrument Assembly
17	Indicator Relay
18	Direction Indicator (Instrument)
19	Alarm LED
20	Accessory Alarm Control Unit
21	Front Right Direction Indicator
22	Front Left Direction Indicator
23	Diagnostic Connector

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

Circuit Diagram - Auxiliary and Accessory - Models with ABS

Motorcycles fitted with a 15 Amp fuse at position number 6



Auxiliary and Accessory Circuit - Models with ABS

Key to Circuit Diagram

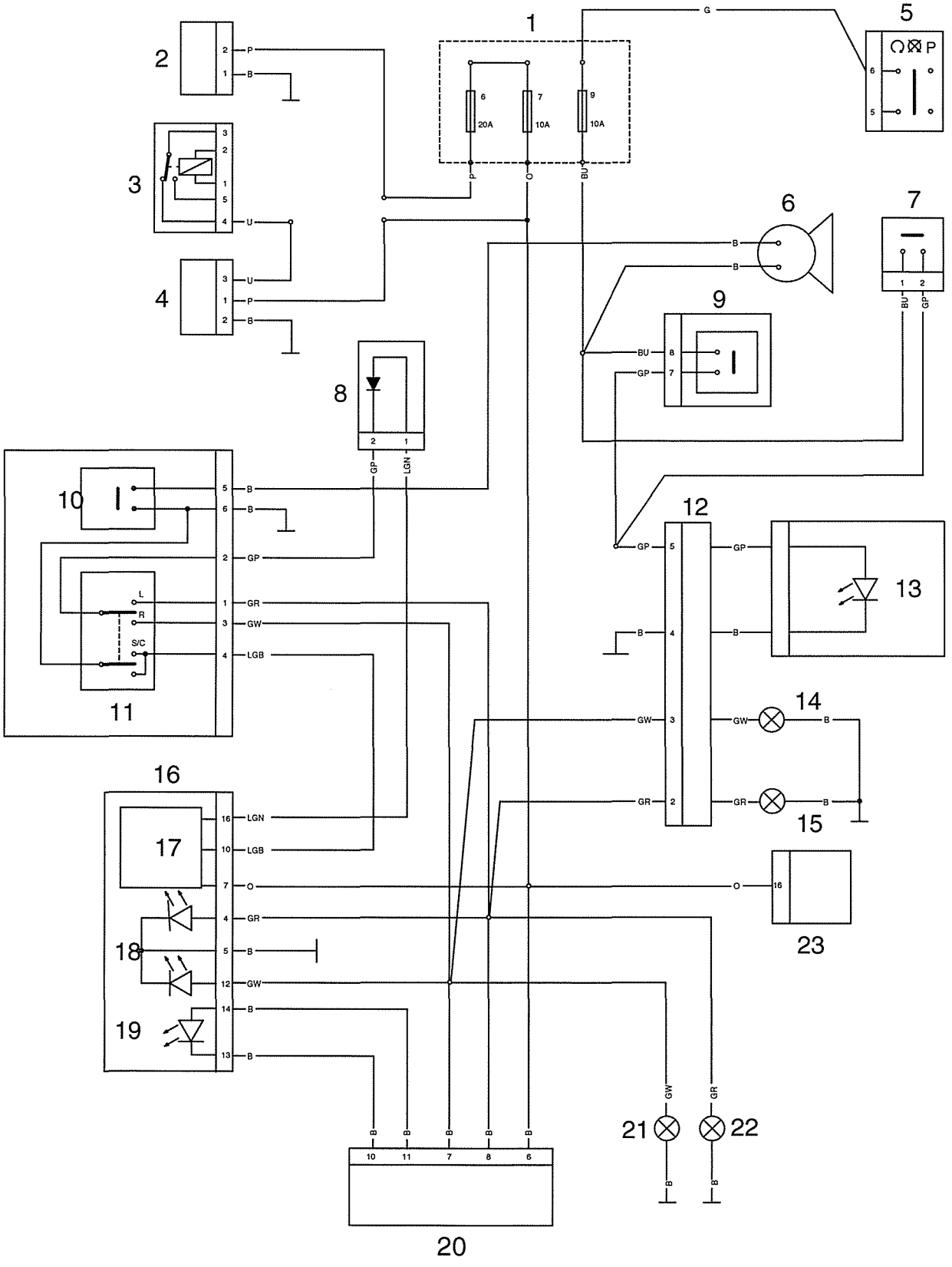
Key	Item Description
1	Fuse Box (6, 7 and 9)
2	Accessory Socket
3	Starter Relay
4	Accessory Heated Handlebar Grips
5	Ignition Switch
6	Horn
7	Rear Brake Light Switch
8	Diode Pack
9	Front Brake Light Switch
10	Horn Switch
11	Direction Indicator Switch
12	Rear Lighting Sub-harness
13	Brake Lamp
14	Rear Right Direction Indicator
15	Rear Left Direction Indicator
16	Instrument Assembly
17	Indicator Relay
18	Direction Indicator (Instrument)
19	Alarm LED
20	Accessory Alarm Control Unit
21	Front Right Direction Indicator
22	Front Left Direction Indicator
23	Diagnostic Connector

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

Circuit Diagram - Auxiliary and Accessory - Models with ABS

Motorcycles fitted with a 20 Amp fuse at position number 6



Engine Management Circuit

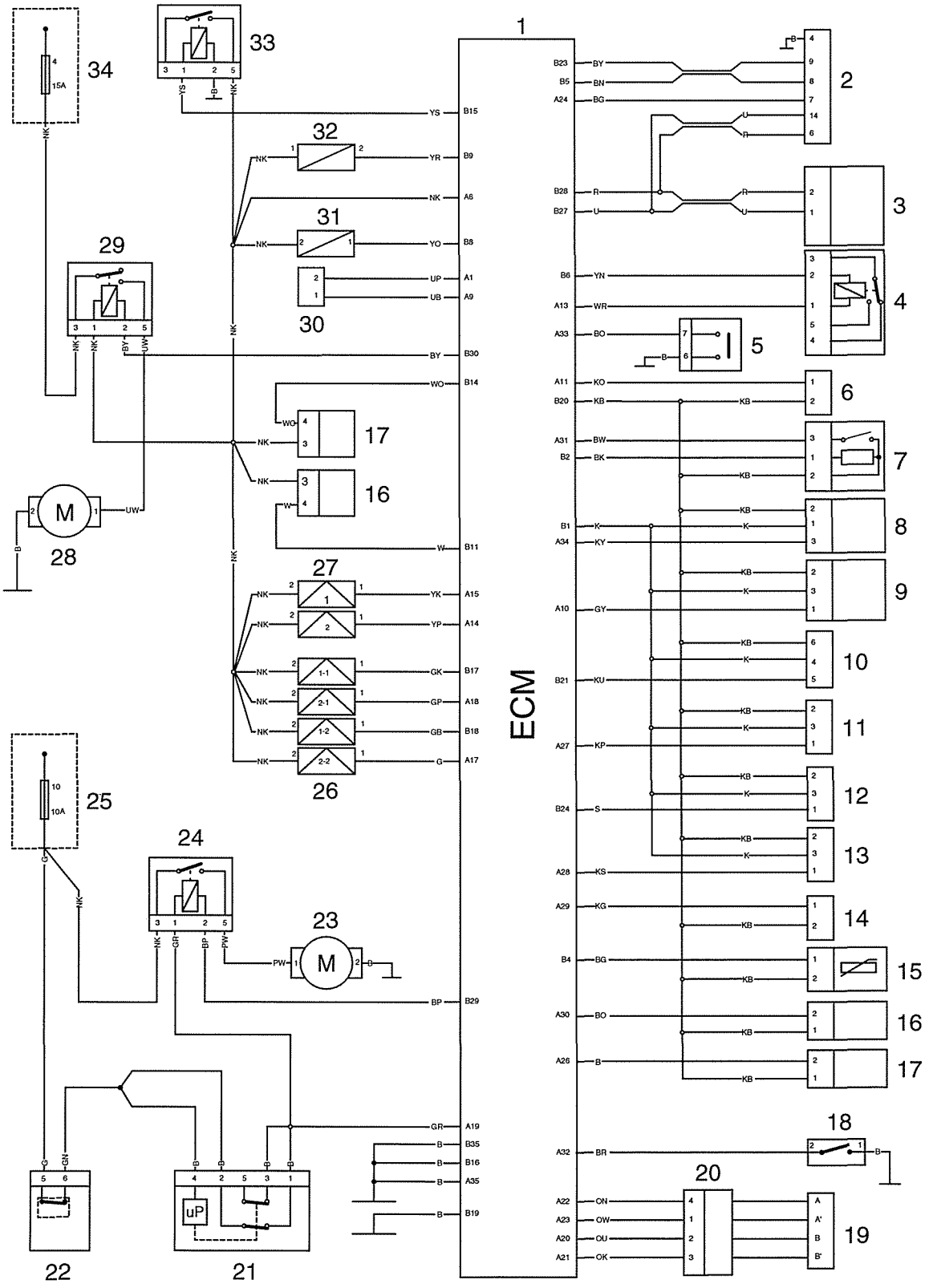
Key to Circuit Diagram

Key	Item Description
1	Engine Control Module
2	Diagnostic Connector
3	Instrument Assembly
4	Starter Relay
5	Clutch Switch
6	Intake Air Temperature Sensor
7	Gear Position Sensor
8	Vehicle Speed Sensor
9	Throttle Position Sensor
10	Fall Detection Switch
11	Ambient Pressure Sensor
12	MAP Sensor RH
13	MAP Sensor LH
14	Coolant Temperature Sensor
15	Fuel Level Sensor
16	Lambda Sensor RH
17	Lambda Sensor LH
18	Sidestand Switch
19	Idle Speed Control Stepper Motor
20	Idle Speed Control Sub-Harness
21	Alarm Unit
22	Engine Stop Switch
23	Fuel Pump
24	Fuel Pump Relay
25	Fuse Box (fuse 10)
26	Ignition Coils
27	Fuel Injectors
28	Cooling Fan
29	Cooling Fan Relay
30	Crankshaft Sensor
31	SAI Valve
32	Purge Valve
33	Engine Management System Relay
34	Fuse Box (fuse 4)

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

Circuit Diagram - Engine Management System



ABS Circuit

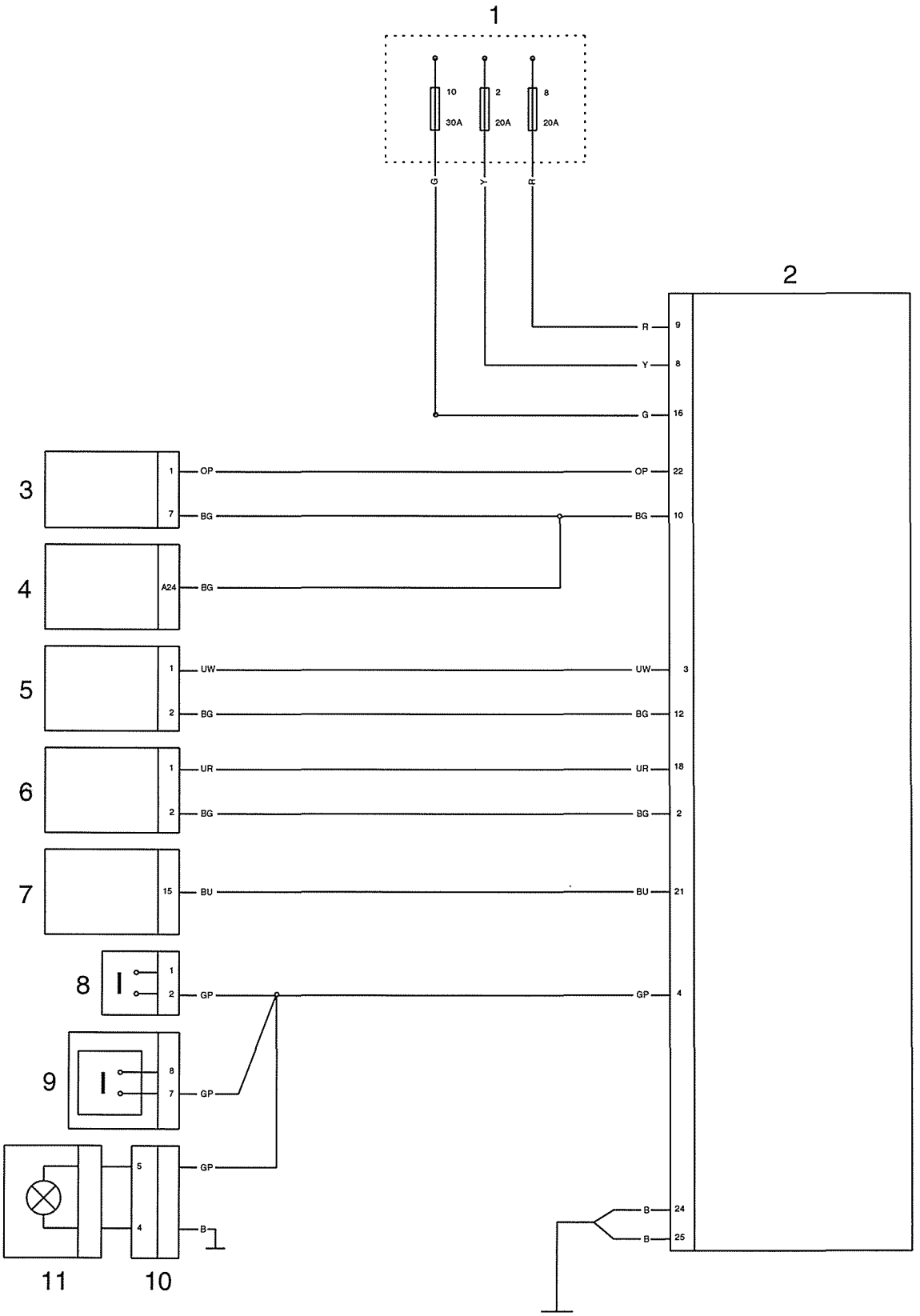
Key to Circuit Diagram

Key	Item Description
1	Fuse Box (fuse 2,8 and 10)
2	ABS Module
3	Diagnostic Connector
4	Engine Control Module
5	Front Wheel Speed Sensor
6	Rear Wheel Speed Sensor
7	Instrument Assembly
8	Rear Brake Light Switch
9	Front Wheel Speed Sensor
10	Rear Lighting Sub-harness
11	Brake Lamp

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

Circuit Diagram - ABS System

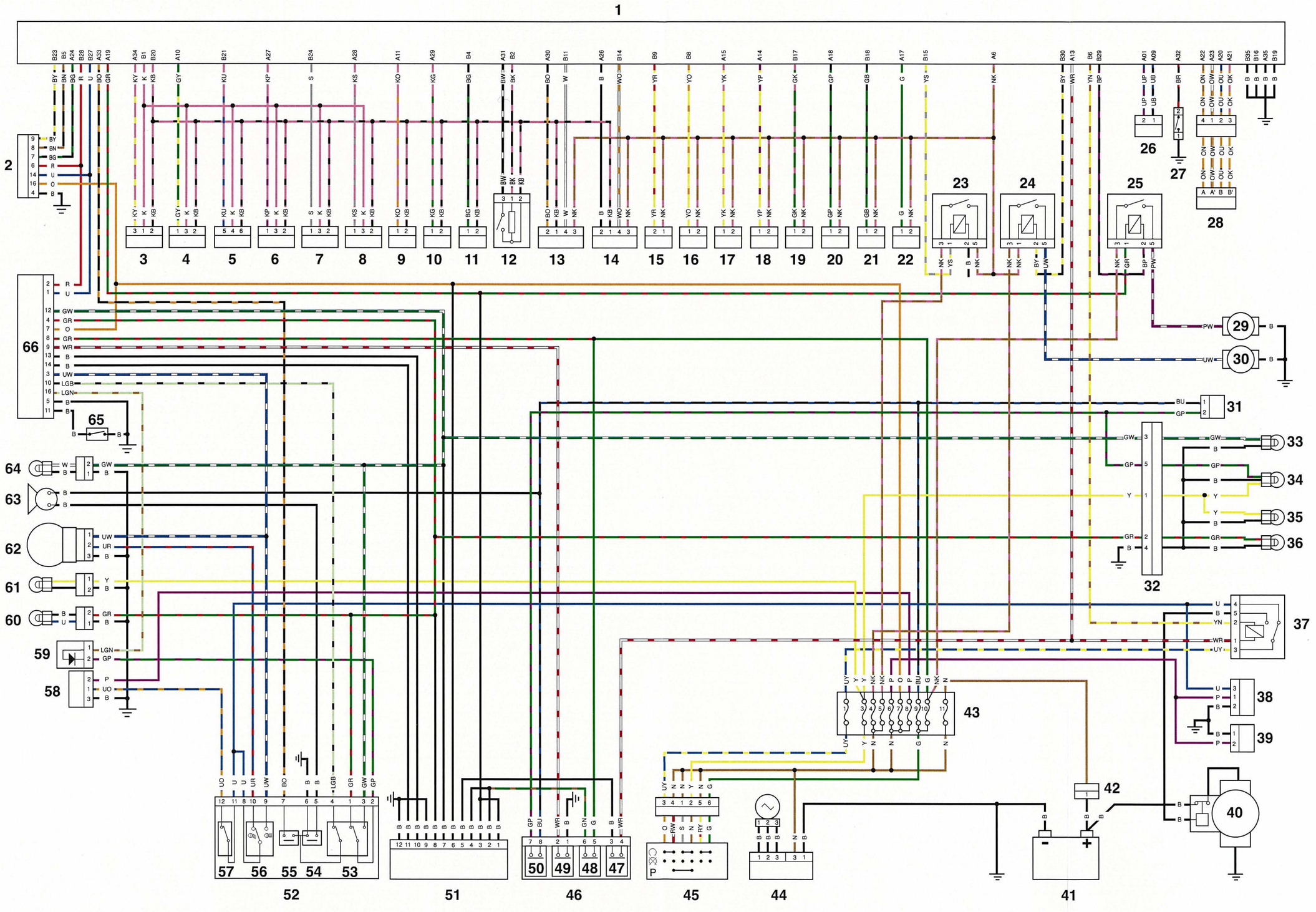


Complete System Thunderbird without ABS

Key to Circuit Diagram

Key	Item Description
1	Engine Control Module
2	Diagnostic Connector
3	Vehicle Speed Sensor
4	Throttle Position Sensor
5	Fall Detection Switch
6	Ambient Pressure Sensor
7	MAP Sensor Right Hand
8	MAP Sensor Left Hand
9	Inlet Air Temperature Sensor
10	Coolant Temperature Sensor
11	Fuel Level Sensor
12	Gear Position Sensor
13	Lambda Sensor Right Hand
14	Lambda Sensor Left Hand
15	Purge Valve
16	SAI Valve
17	Fuel Injector 1
18	Fuel Injector 2
19	Ignition Coil 1
20	Ignition Coil 2
21	Ignition Coil 3
22	Ignition Coil 4
23	Engine Management System Relay
24	Cooling Fan Relay
25	Fuel Pump Relay
26	Crankshaft Sensor
27	Sidestand Switch
28	Idle Speed Control Actuator
29	Fuel Pump
30	Cooling Fan
31	Rear Brake Lever Switch
32	Rear Lighting Sub-harness
33	RH Rear Indicator
34	Tail/Brake Lamp
35	Number Plate Light
36	LH Rear Indicator
37	Starter Relay
38	Heated Handlebar Grips (Accessory)
39	Accessory Socket
40	Starter Motor
41	Battery
42	Battery Connector
43	Fuse Box
44	Rectifier/Regulator
45	Ignition Switch
46	Right Hand Switch Cube
47	Starter Switch
48	Engine Stop Switch
49	Scroll Switch
50	Front Brake Lever Switch
51	Alarm Unit
52	Left Hand Switch Cube
53	Direction Indicator Switch
54	Horn Switch
55	Clutch Lever Switch
56	Headlamp Dip Switch
57	Accessory Light Switch
58	Accessory Light
59	Diode Pack
60	LH Front Indicator
61	Position Light
62	Headlamp
63	Horn
64	RH Front Indicator
65	Oil Pressure Switch
66	Instrument Assembly

Circuit Diagram - Complete System - Thunderbird without ABS



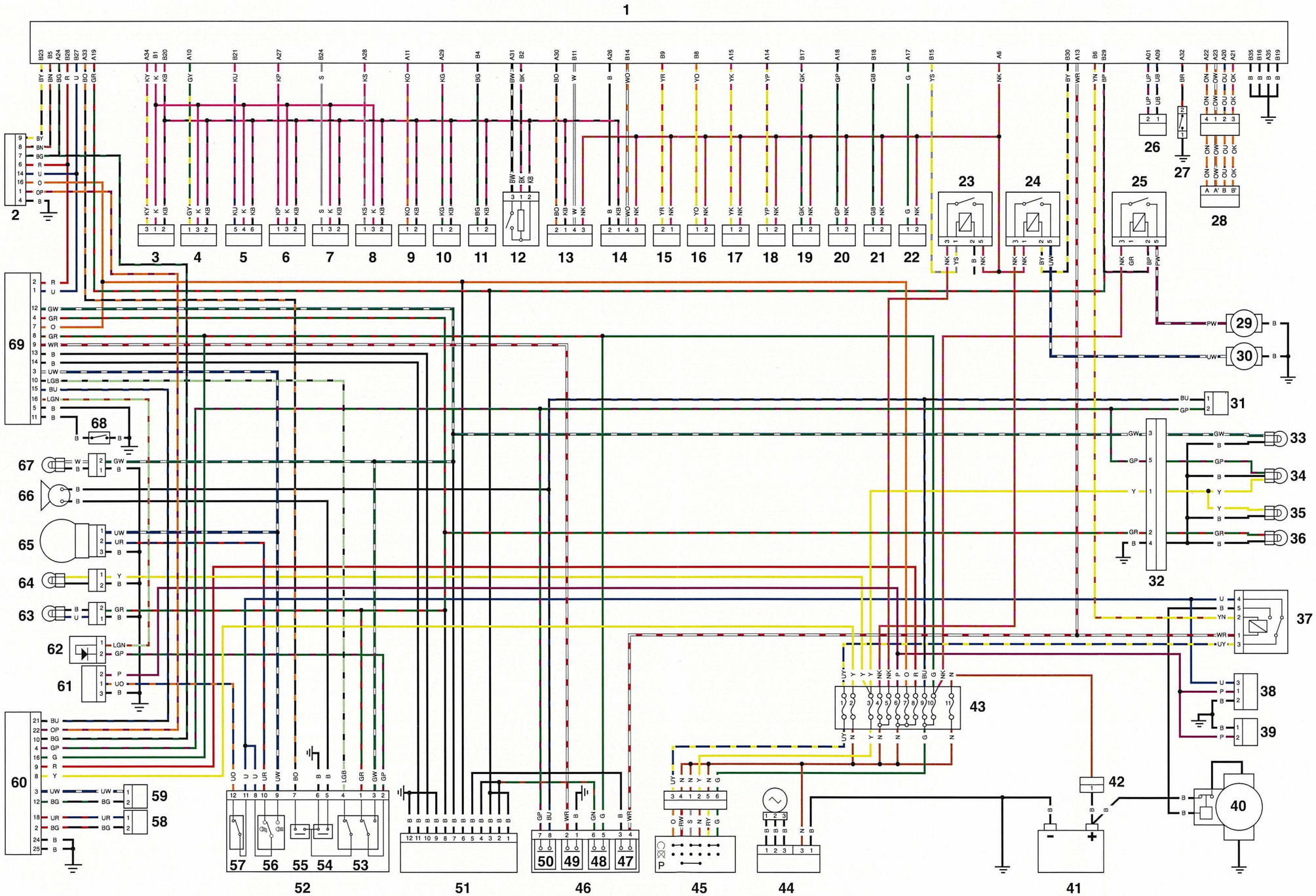
Complete System Thunderbird with ABS

Key to Circuit Diagram

Key	Item Description
1	Engine Control Module
2	Diagnostic Connector
3	Vehicle Speed Sensor
4	Throttle Position Sensor
5	Fall Detection Switch
6	Ambient Pressure Sensor
7	MAP Sensor Right Hand
8	MAP Sensor Left Hand
9	Inlet Air Temperature Sensor
10	Coolant Temperature Sensor
11	Fuel Level Sensor
12	Gear Position Sensor
13	Lambda Sensor Right Hand
14	Lambda Sensor Left Hand
15	Purge Valve
16	SAI Valve
17	Fuel Injector 1
18	Fuel Injector 2
19	Ignition Coil 1
20	Ignition Coil 2
21	Ignition Coil 3
22	Ignition Coil 4
23	Engine Management System Relay
24	Cooling Fan Relay
25	Fuel Pump Relay
26	Crankshaft Sensor
27	Sidestand Switch
28	Idle Speed Control Actuator
29	Fuel Pump
30	Cooling Fan
31	Rear Brake Lever Switch
32	Rear Lighting Sub-harness
33	RH Rear Indicator
34	Tail/Brake Lamp
35	Number Plate Light
36	LH Rear Indicator
37	Starter Relay
38	Heated Handlebar Grips (Accessory)
39	Accessory Socket
40	Starter Motor
41	Battery
42	Battery Connector
43	Fuse Box
44	Rectifier/Regulator
45	Ignition Switch
46	Right Hand Switch Cube
47	Starter Switch
48	Engine Stop Switch
49	Scroll Switch
50	Front Brake Lever Switch
51	Alarm Unit
52	Left Hand Switch Cube
53	Direction Indicator Switch
54	Horn Switch
55	Clutch Lever Switch
56	Headlamp Dip Switch
57	Accessory Light Switch
58	Rear Wheel Speed Sensor
59	Front Wheel Speed Sensor
60	ABS Module
61	Accessory Light
62	Diode Pack
63	LH Front Indicator
64	Position Light
65	Headlamp
66	Horn
67	RH Front Indicator
68	Oil Pressure Switch
69	Instrument Assembly

Circuit Diagram - Complete System - Thunderbird with ABS

Motorcycles fitted with a 15 Amp fuse at position number 6



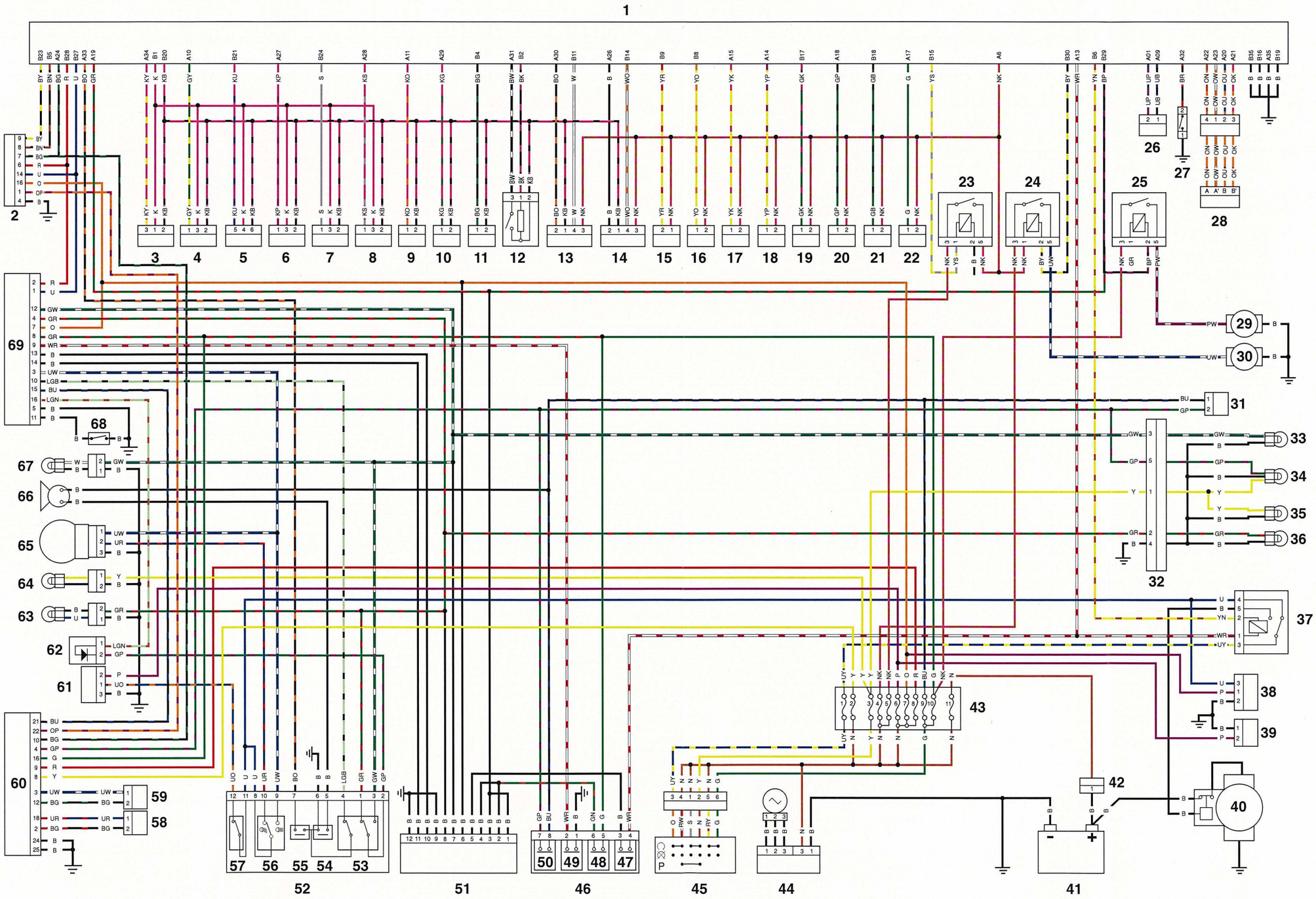
Complete System Thunderbird with ABS

Key to Circuit Diagram

Key	Item Description
1	Engine Control Module
2	Diagnostic Connector
3	Vehicle Speed Sensor
4	Throttle Position Sensor
5	Fall Detection Switch
6	Ambient Pressure Sensor
7	MAP Sensor Right Hand
8	MAP Sensor Left Hand
9	Inlet Air Temperature Sensor
10	Coolant Temperature Sensor
11	Fuel Level Sensor
12	Gear Position Sensor
13	Lambda Sensor Right Hand
14	Lambda Sensor Left Hand
15	Purge Valve
16	SAI Valve
17	Fuel Injector 1
18	Fuel Injector 2
19	Ignition Coil 1
20	Ignition Coil 2
21	Ignition Coil 3
22	Ignition Coil 4
23	Engine Management System Relay
24	Cooling Fan Relay
25	Fuel Pump Relay
26	Crankshaft Sensor
27	Sidestand Switch
28	Idle Speed Control Actuator
29	Fuel Pump
30	Cooling Fan
31	Rear Brake Lever Switch
32	Rear Lighting Sub-harness
33	RH Rear Indicator
34	Tail/Brake Lamp
35	Number Plate Light
36	LH Rear Indicator
37	Starter Relay
38	Heated Handlebar Grips (Accessory)
39	Accessory Socket
40	Starter Motor
41	Battery
42	Battery Connector
43	Fuse Box
44	Rectifier/Regulator
45	Ignition Switch
46	Right Hand Switch Cube
47	Starter Switch
48	Engine Stop Switch
49	Scroll Switch
50	Front Brake Lever Switch
51	Alarm Unit
52	Left Hand Switch Cube
53	Direction Indicator Switch
54	Horn Switch
55	Clutch Lever Switch
56	Headlamp Dip Switch
57	Accessory Light Switch
58	Rear Wheel Speed Sensor
59	Front Wheel Speed Sensor
60	ABS Module
61	Accessory Light
62	Diode Pack
63	LH Front Indicator
64	Position Light
65	Headlamp
66	Horn
67	RH Front Indicator
68	Oil Pressure Switch
69	Instrument Assembly

Circuit Diagram - Complete System - Thunderbird with ABS

Motorcycles fitted with a 20 Amp fuse at position number 6



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