2016-2017
Triumph Tiger Explorer XR /XRX / XRT
Motorcycle Service Manual

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Introduction

Introduction

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

A basic knowledge of mechanics, including the proper use of tools and workshop procedures is necessary in order to carry out maintenance and repair work satisfactorily. Whenever the owner has insufficient experience or doubts regarding 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 electronic parts catalogue (EPC).
- 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.**

Noise Control System

Tampering with the noise control system is prohibited.

Owners are warned that the law may prohibit:

1. 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,
2. 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 parts 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 gas or oil leakage. Conversely, bolts, nuts, or screws, should all be loosened (in sequence if specified) by about a quarter of a turn and then removed.

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

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

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

General Information

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, antifreeze, 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 proprietary 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, degrease 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

CAUTION

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, spilled 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 antifreeze and corrosion inhibitors contains toxic chemicals which are harmful to the human body. Never swallow antifreeze, 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 antifreeze 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 antifreeze as specified in the Owner's Handbook. Never use a methanol based antifreeze as this does not contain the required corrosion inhibition properties.

CAUTION

Distilled water must be used with the antifreeze (see specification for antifreeze) 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 flashpoint solvent is recommended to reduce fire hazard.

Always follow container directions regarding the use of any solvent.

Always use the recommended cleaning agent or equivalent.

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

Lubrication

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

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

Joints and Joint Faces

Assemble joints dry unless otherwise specified in this manual.

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

Gaskets, O-rings

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

Liquid Gasket, Non-permanent Locking Agent

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

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

WARNING

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

Screw Threads

Metric threads to ISO standard are used.

Damaged nuts, bolts and screws must always be discarded.

Castellated nuts must not be loosened 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 over tightening 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 reuse 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 loosen 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 reused, provided resistance can be felt when the locking portion passes over the thread of the bolt or stud.

DO NOT reuse 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 reused, 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.

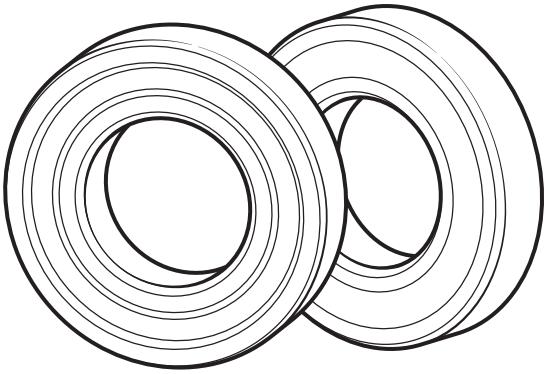
When lubricating a new bearing with grease the following steps should be taken:

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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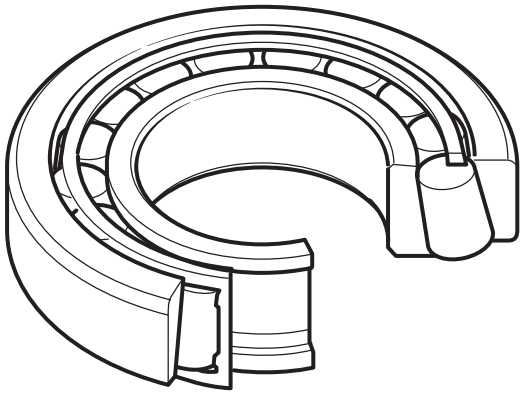
Sealed Bearings

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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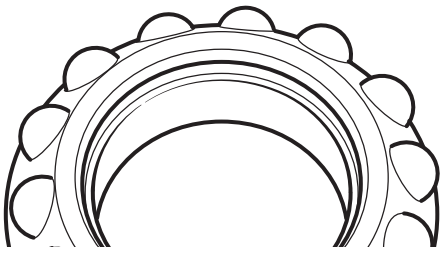
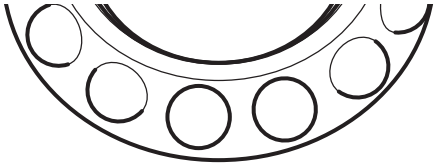
Taper Bearings

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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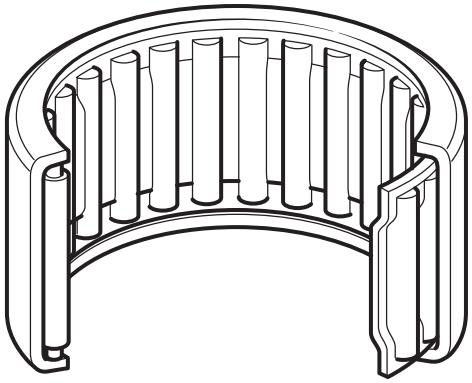
Angular Contact and Ball Bearing

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.
3. 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 to 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 (gasoline) 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 gases 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.

Ohm’s 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 12 V is connected to a bulb of 60 W:

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

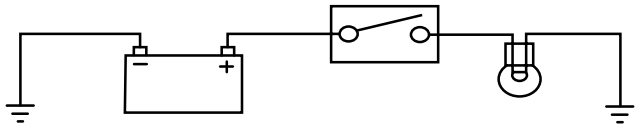
$$\frac{W}{V} = I \qquad \frac{60}{12} = 5$$

- 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 indicating circuit diagram components and wiring colour codes.

Circuit diagrams also depict the inner workings of a switch housing (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.

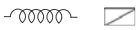
Connector

This illustration is used to show all multiplug 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

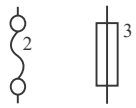
An electrical one-way valve. Diodes allow current to flow in one direction but will not allow it to return. The arrow, which forms part of the diode symbol, indicates the direction of current flow.

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

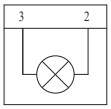


A fuse is a device which protects a circuit in the event of a fault. The fuse will 'blow' should a short circuit occur, protecting that circuit from further damage. The number next to the fuse on the circuit diagram indicates the position of the fuse in the fuse box.

Ground 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.

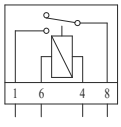
LED (Light Emitting Diode)

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.

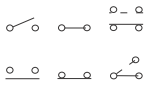
Resistor

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

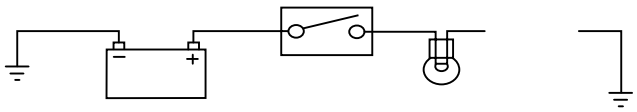


A mechanical device for completing or breaking a circuit. There are three common types of switch: normally open, normally closed and changeover.

Tracing Circuits

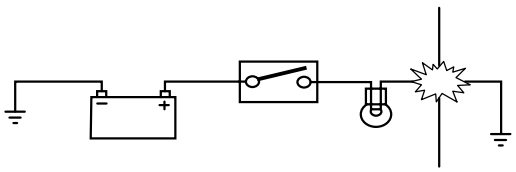
The following is a description of two types of common electrical failures, and some of the methods which may be used to find them.

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 bypasses the intended circuit, either to ground 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 battery Voltage.

A short to ground means that the current is going to ground 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 battery voltage (12 Volts) 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:

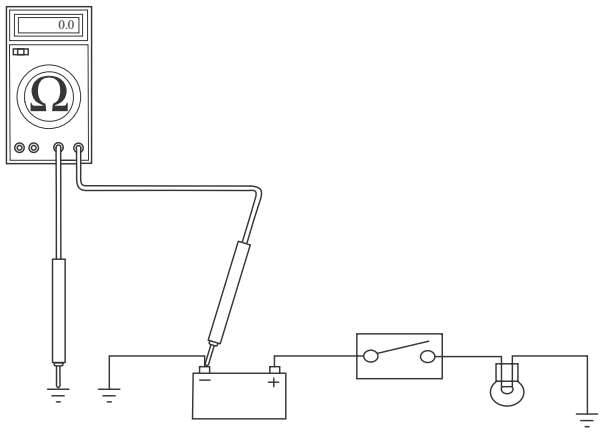
- a wire may diverge at a splice and go off to feed other circuits. If these circuits are working, check for wiring faults from the splice onwards.
- the circuit diagram is not an accurate guide to the actual location of the parts when fitted on the bike. It is a schematic diagram of the circuits.
- 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).

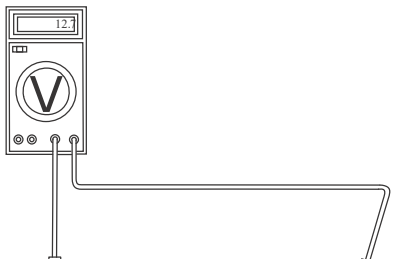
In the example below, the ground circuit continuity is being tested from the battery to the frame.

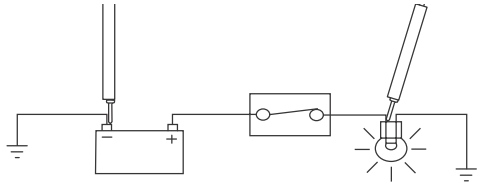


- Locate each end of the wire.
- Set the Digital Multi Meter (DMM) to resistance check Ohms.
- Probe each end of the wire.
- If there is continuity, the meter will usually bleep or register the resistance of the cable.
- A high resistance figure could indicate a dirty or corroded connection.
- If there 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.





- 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.

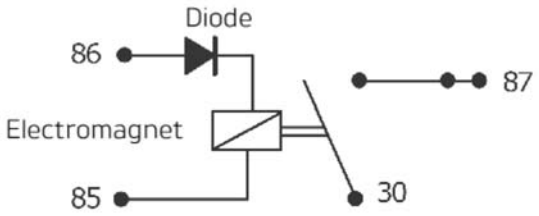
To locate a splice, it is necessary to peel back the insulation and examine the splice for its integrity. The most common fault is where one of the wires at the joint has come adrift usually causing the circuit it feeds or grounds to become 'dead'.

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

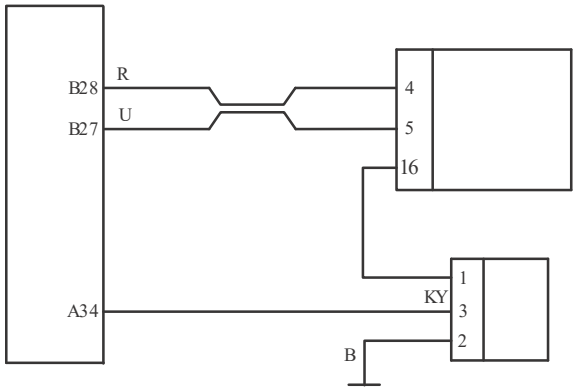
faulty relay.

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.



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 uses CAN for communication between the following ECMs:

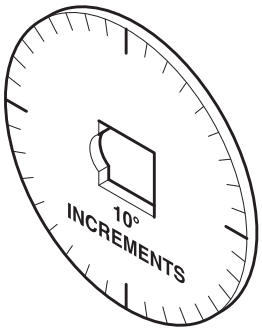
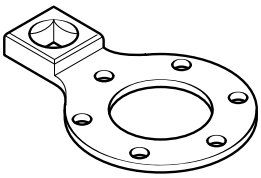
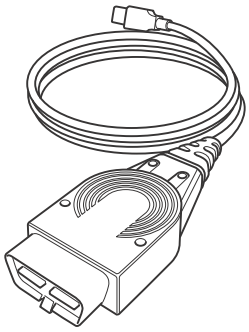
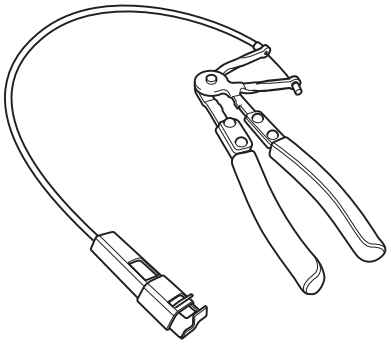
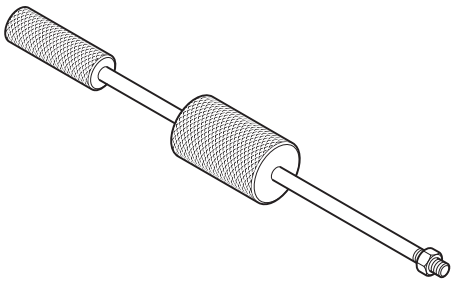
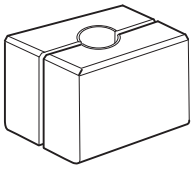
- Engine ECM
- Instruments
- ABS ECM
- Immobiliser or Chassis ECM
- Diagnostic connector
- Inertial Measurement Unit (if fitted)
- Audio system (if fitted)
- Electronic steering lock (if fitted)
- LED Headlights (if fitted).

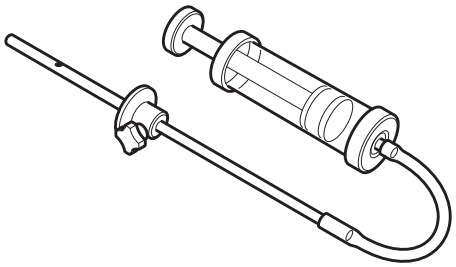
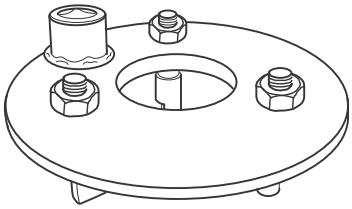
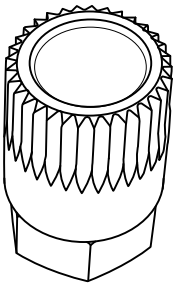
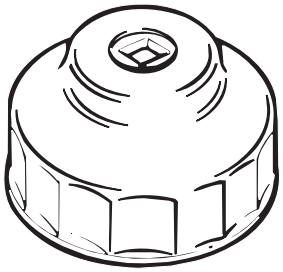
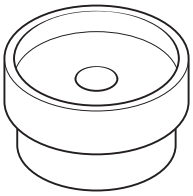
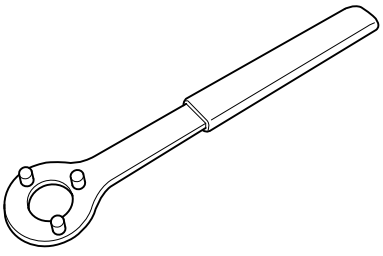
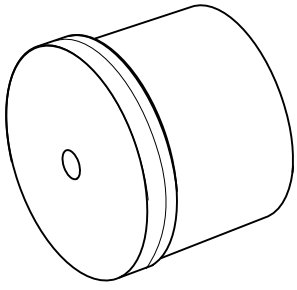
Service Tools

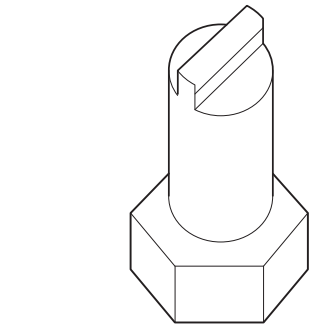
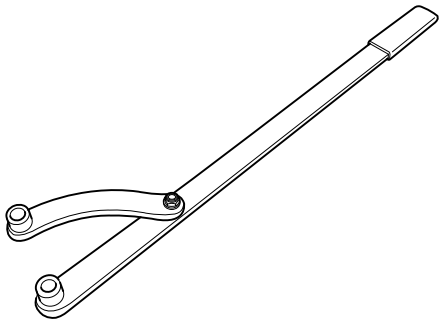
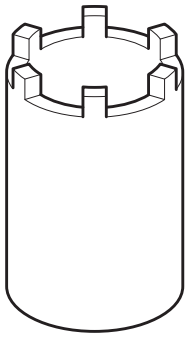
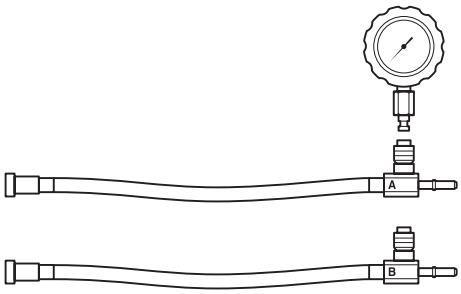
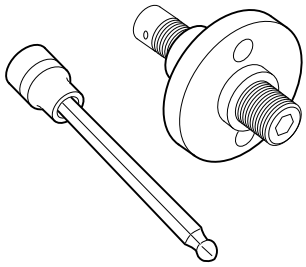
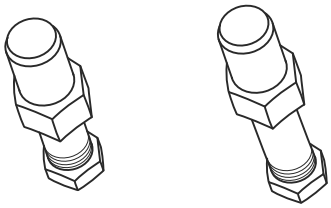
Service Tools and Garage Equipment

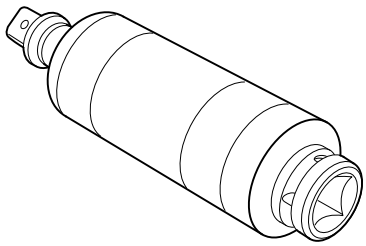
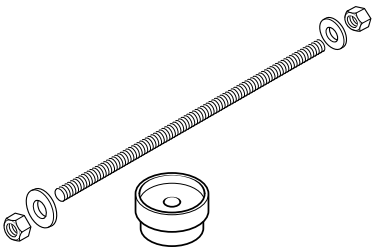
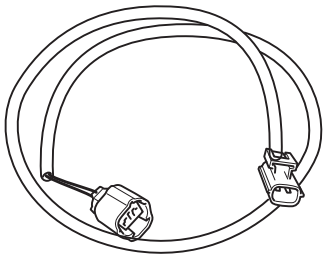
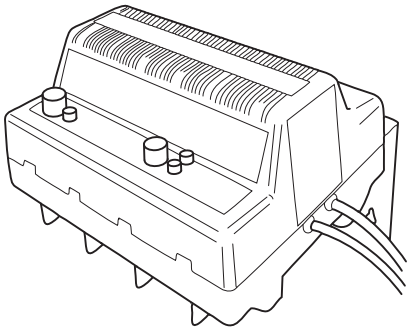
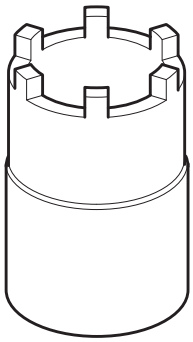
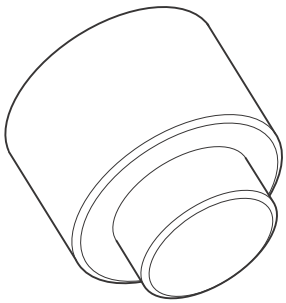
Special service tools have been developed to facilitate removal, dismantling and assembly of certain mechanical components in a practical manner without causing damage. Some operations in this service manual cannot be carried out without the aid of the relevant service tools. Where this is the case,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

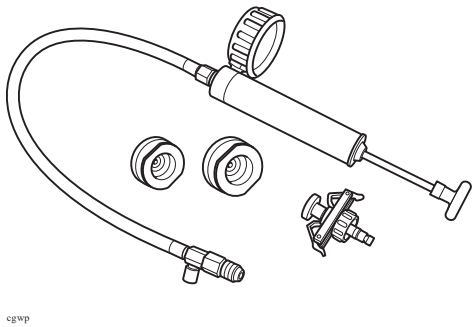
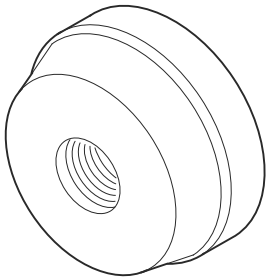
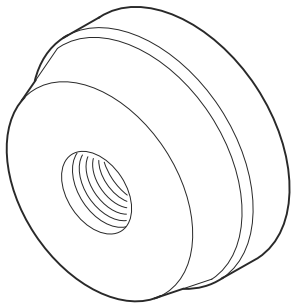
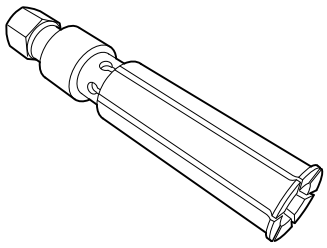
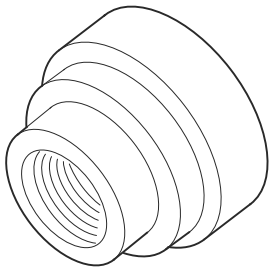
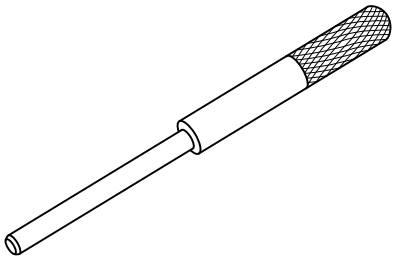
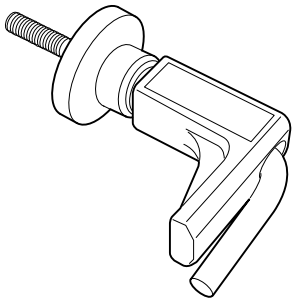
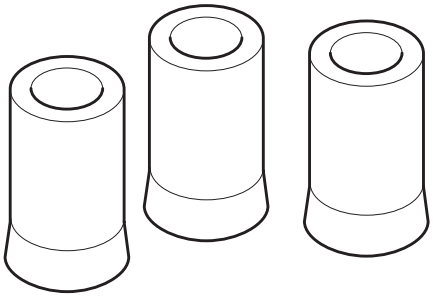
Special Service Tools

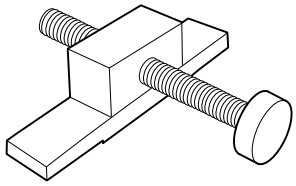
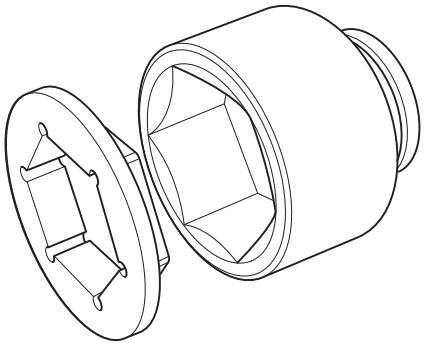
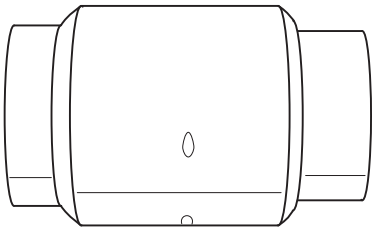
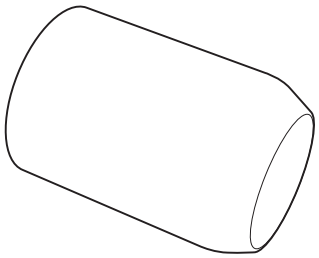
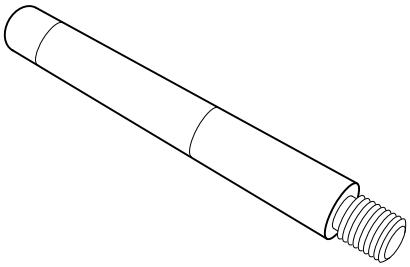
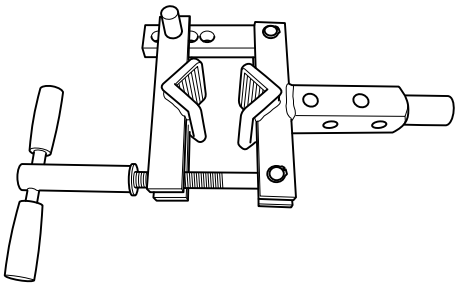
	
T3880105 - Angular Torque Gauge	T3880371 - Oil Pump Drive Gear Holder
	
T3880057 - Triumph Diagnostic Interface	T3880207 - Pliers, Hose Clip
	
T3880208 - Slide Hammer	T3880317 - Damper Tube Clamp

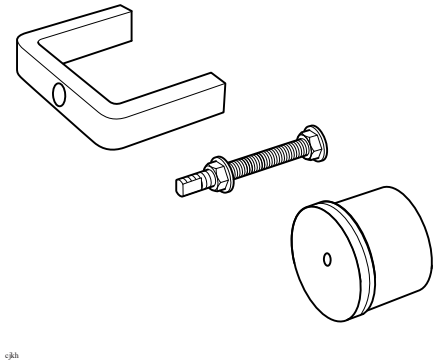
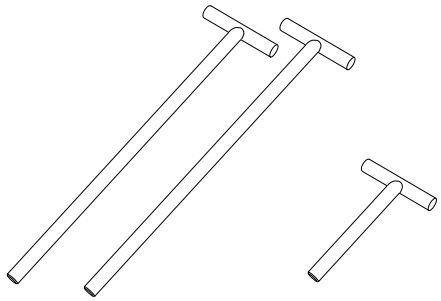
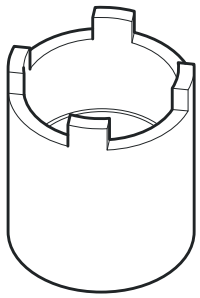
 ccha	
3880160 -T0301 - Fork Oil Filler/Evacuator	T3880660 - Clutch Restraint
	 gahc
T3880602 - Alternator Wrench	T3880313 - Oil Filter Wrench
	 cczh
3880070-T0301 - Bearing Installer	T3880365 - Alternator Housing Puller
	 cjkh

T3880603 - Oil Pump Restraint	T3880605 - Cylinder Liner Extractor (use with the frame from Cylinder Liner Extractor T3880315)
 cdoa2	
T3880377 - Engine Mounting Adjuster	T3880606 - Flywheel Restraint
	 A B cdgh
T3880023 - 50 mm Socket	T3880001 - Fuel Pressure Gauge
	
T3880607 - Camshaft Timing Tensioner	T3880608 - Flywheel Pin Set

	 cczb
T3880609 - Torque Limiter	T3880053 - Wheel Bearing Extraction Kit
	
T3880123 - Extension Cable	BatteryMate Battery Charger - See Latest Parts Catalogue for Part Number Information
	
T3880620 - Adjuster Socket, 48 mm	T3880624 - Housing Support

	
T3880147 - Radiator and Cap Tester Kit	T3880625 - Bearing Installer, 39 mm
	
T3880626 - Bearing Installer, 46 mm	T3880627 - Bearing Puller, 32-42 mm
	
T3880628 - Bearing Installer, 26 mm	T3880601 - Crankshaft Timing Pin
	

T3880630 - Fuel Hose Clamp	T3880631 - Blanking Cap
	
T3880640 - Camshaft Timing Plate	T3880643 - Fork Top Cap Socket
	
T3880661 - Fork Seal Installer	T3880662 - Fork Seal Guide
	
T3880629 - Bearing Installer Handle	T3880171 - Fork holding Tool

	
T3880315 - Cylinder Liner Extractor	T3880637 - Kit, Engine to Frame Alignment Bars
	
T3880062 - Lock Ring Wrench, 38 mm	

Specifications

Engine

Engine Configuration	3 cylinder 12 valve DOHC
Arrangement	Transverse in-line
Displacement	1215 cc
Bore x Stroke	85 x 71.4 mm
Compression Ratio	11:1
Cylinder Numbering	Left to right (no. 3 adjacent to camshaft drive chain)
Cylinder Sequence	Number 1 at left
Firing Order	1-2-3

Cylinder Head and Valves

Cylinder Head	Flatness Tolerance	0.030 mm
Valve Head Diameter	Inlet	35.600 mm
	Exhaust	28.600 mm
Valve Lift	Inlet	8.75 mm
	Exhaust	8.00 mm
Valve Stem Diameter	Inlet	4.975 - 4.990 mm (standard)
		4.965 mm (service limit)
	Exhaust	4.970 - 4.980 mm (standard)
		4.960 mm (service limit)
Valve Guide Bore Diameter	Inlet	5.000 - 5.012 mm (standard)
		5.040 mm (service limit)
	Exhaust	5.000 - 5.012 mm (standard)
		5.080 mm (service limit)
Valve Stem to Guide Clearance	Inlet	0.010 - 0.037 mm (standard)
		0.068 mm (service limit)
	Exhaust	0.020 - 0.042 mm (standard)
		0.128 mm (service limit)
Valve Seat Width (in head)	Inlet	1.0 mm (standard)
		1.5 mm (service limit)
	Exhaust	1.2 mm (standard)
		1.7 mm (service limit)
Valve Seat Width (valve)	Inlet	1.03 mm
	Exhaust	1.33 mm
Valve Seat Angle		45°
Inlet/Exhaust Valve Spring 'Load at Length '		580 N +/- 29 N at 26.8 mm

Valve Clearance	Inlet	0.10 - 0.15 mm
	Exhaust	0.275 - 0.325 mm
Valve Bucket Diameter	Inlet and Exhaust	28.476 - 28.490 mm (standard)
		28.468 mm (service limit)
Valve Bucket Bore Diameter	Inlet and Exhaust	28.507 - 28.527 mm
		28.541 mm (service limit)

Camshafts

Camshaft Timing	Inlet	Open 5.83° BTDC (@ 1.0 mm lift)
		Close 35.83° ABDC (@ 1.0 mm lift)
	Duration	221.7°
	Exhaust	Open 45.3° BBDC (@ 1.0 mm lift)
		Close 4.7° BTDC (@ 1.0 mm lift)
	Duration	220.6°
Camshaft Journal Diameter		23.93 - 23.96 mm
Camshaft Journal Clearance		0.040 - 0.091 mm (standard)
		0.13 mm (service limit)
Camshaft Journal Bore Diameter		24.000 - 24.021 mm
Camshaft End Float		0.03 - 0.13 mm (standard)
		0.20 mm (service limit)
Camshaft Run-out		0.05 mm max.

Clutch/Primary Drive

Primary Drive	Type	Gear
Reduction Ratio		(98/61)
Clutch	Type	Wet multiplate

No. of Friction Plates	9
Steel Plate Flatness	Within 0.15 mm (standard)
	0.20 mm (service limit)
Friction Plate Thickness (2 x inner and 1 x outer)	3.80 mm (standard)
	3.60 mm (service limit)
Friction Plate Thickness (all others)	3.80 mm (standard)
	3.60 mm (service limit)
Clutch Pack Height	50.2 mm +0.50/-0.50 mm
Clutch Actuation Method	Hydraulic
Clutch Fluid	DOT 4 brake and clutch

Pistons

Cylinder Bore Diameter (15 mm from top of bore)	Grade A	84.995 - 85.003 mm (standard)
	Grade B	84.985 - 94.994 mm (standard)
	Service Limit (all grades)	85.100 mm
Piston Diameter (at 90° to gudgeon pin, 12.5 from bottom of piston)	Grade A	84.981 - 84.984 mm (standard)
	Grade AB	84.972 - 84.980 mm (standard)
	Grade B	84.968 - 84.971 mm (standard)
	Service Limit (all grades)	84.928 mm
Piston Ring to Groove Clearance	Top	0.000 to 0.040 mm (standard)
		0.085 mm (service limit)
	Second	0.020 - 0.060 mm (standard)
		0.075 mm (service limit)
Piston Ring End Gap	Top	0.150 - 0.350 mm (standard)
		0.470 mm (service limit)

	Second	0.350 - 0.550 mm (standard)
		0.670 mm (service limit)
	Oil	0.200 - 0.700 mm (standard)
		0.84 mm (service limit)
Gudgeon Pin Bore Diameter in Piston		19.010 - 19.015 mm (standard)
		19.043 mm (service limit)
Gudgeon Pin Diameter		19.000 - 19.005 mm (standard)
		18.985 mm (service limit)

Connecting Rods

Connecting Rod Small End Diameter	19.035 - 19.048 mm (standard)
	19.058 mm (service limit)
Connecting Rod Big End Side Clearance	0.150 - 0.300 mm (standard)
	0.500 mm (service limit)

Crankshaft

Crankshaft Big End Journal Diameter	38.020 - 38.036 mm (standard)
	37.996 mm (service limit)
Crankshaft Big End Bearing Clearance	0.030 - 0.056 mm (standard)
	v0.061 mm (service limit)
Crankshaft Main Bearing Journal Clearance	0.029 mm (standard)
	0.061 mm (service limit)
Crankshaft Main Bearing Journal Diameter	37.960 - 37.976 mm (standard)
	37.936 mm (service limit)
Crankshaft End Float	0.075 - 0.175 mm (standard)
	0.375 mm (service limit)

Crankshaft Run-out	0.020 mm or less (standard)
	0.050 mm (service limit)

Transmission

Final Drive

Type		6 Speed, Constant Mesh
Gear Ratios	1st	2.846:1 (13/37)
	2nd	2.056:1 (18/37)
	3rd	1.583:1 (24/38)
	4th	1.2916:1 (24/31)
	5th	1.138:1 (29/33)
	6th	1.037:1 (27/28)
Gear Selector Fork Thickness	Input shaft	5.8 - 5.9 mm (standard)
		5.7 mm (service limit)
	Output shaft	6.3 - 6.4 mm (standard)
		6.2 mm (service limit)
Gear Selector Groove Width	Input shaft	6.0 - 6.1 mm (standard)
		6.2 mm (service limit)
	Output shaft	6.5 - 6.6 mm (standard)
		6.7 mm (service limit)
Gear Selector Fork to Groove Clearance		0.500 mm max

Final Drive	Shaft drive
Front Bevel Box	Bevel geared crown wheel and pinion
Rear Bevel Box	Bevel geared crown wheel and pinion
Final Drive Ratio	2.557:1

Front Bevel Box Ratio	1.042:1
Rear Bevel Box Ratio	2.455:1
Drive System	Universal-jointed shaft with torsional damper
Final Drive Oil	Castrol SAF-XO Fully Synthetic Hypoid Oil
Final Drive Oil Capacity	0.17 litres

Lubrication

Type	Pressure Lubrication, Wet Sump
Oil Capacity (dry fill)	3.9 litres
Oil Capacity (wet fill including filter)	3.8 litres
Oil Capacity (wet fill excluding filter)	3.75 litres
Oil Pressure (in main gallery)	2.76 bar (40 lb/in²) min. @ 80°C oil temperature @ 5,000 rpm
Oil Pump Rotor Tip Clearance	0.050 - 0.150 mm (standard)
	0.200 mm (service limit)
Oil Pump Body Clearance	0.050 - 0.139 mm (standard)
	0.35 mm (service limit)
Oil Pump Rotor End Float	0.040 - 0.090 mm (standard)
	0.170 mm (service limit)

Ignition System

Type	Digital Inductive
Electronic Rev Limiter	9,500 rpm
Primary Coil Resistance	0.56 Ohms +/- 10% @ 20°C
Ignition Coil Type	Plug-top
Spark Plug Type	NGK CR8EK

Spark Plug Gap	0.7 mm
Gap Tolerance	+0.05/-0.1 mm

Fuel System

Fuel Type	Unleaded, 91 RON (U.S. 87 CLC/AKI)
Fuel Tank Capacity	20.0 litres (motorcycle upright)
Low Level Warning Lamp	3.5 litres remaining
Fuel Pump Type	Submerged
Fuel Pressure (nominal)	3.5 bar
Purge Control System	Electronic, via fuel system ECM

Fuel Injection System

Type	Electronic, sequential
Idle Speed	1,000 rpm
Injector Type	Multi hole, solenoid operated plate valve
Throttle	Butterfly, electronically controlled
Control Sensors	Ambient air pressure, throttle position, accelerator position, coolant temperature, crankshaft position, oxygen sensor, intake air temperature, manifold absolute pressure (MAP), gear position, road speed (from ABS system)

Emissions Controls

Catalysts	1 in down pipe
Oxygen Sensor	Heated, in down pipe
Secondary Air Injection	Solenoid controlled, reed valve type
Evaporative Control	Activated carbon canister

Coolant System

Coolant Mixture	Pre-mixed

Anti-Freeze Type	Triumph HD4X Hybrid OAT coolantT
Cooling System Capacity	2.4 litres
Radiator Cap Opening Pressure	1.1 bar
Thermostat Opening Temperature	71°C (nominal)
Cooling Fan Switch On Temperature	103°C
Temperature Gauge Sensor Resistance	2.9 - 3.3 K/Ohms @ 15°C

Suspension

Front Fork Travel	190 mm
Recommended Fork Oil Grade	WP 4860-1166 SAE4
Oil Level (fork fully compressed with spring guide, upper spring preload spacers and spring removed)	105 mm
Oil Volume (dry fill)	700 cc
Front Fork Pull Through	Top of Fork Outer Tube Set Flush with the Upper Surface of the Upper Yoke
Rear Wheel Travel	193 mm

Brakes

Front Type	Two, four piston radial calipers acting on twin discs
Front Caliper Piston Diameter	32.0 mm
Front Disc Diameter	305.0 mm
Front Disc Thickness	4.5 mm (standard)
	4.0 mm (service limit)
Front Disc Run-out Max.	0.15 mm
Front Wheel Speed Sensor Air Gap	0.1 mm - 1.5 mm
Front Master Cylinder Diameter	15.87 mm
Recommended Fluid	DOT 4 brake and clutch

Rear Type	Twin piston sliding caliper acting on single disc
Rear Caliper Piston Diameter	27.0 mm
Rear Disc Diameter	255.0 mm
Rear Disc Thickness	6.0 mm (standard)
	5.0 mm (service limit)
Rear Disc Run-out Max.	0.5 mm
Rear Wheel Speed Sensor Air Gap	0.1 mm - 1.5 mm (Non adjustable)
Rear Master Cylinder Diameter	14.0 mm
Recommended Fluid	DOT 4 brake and clutch

Wheels and Tyres

Front Wheel Size		MT 3.0 x 19
Front Tyre Size		120/70 R19
Front Tyre Pressure		2.21 bar (32 lb/in²)
Front Tyre TPMS Warning Light On Pressure		1.93 bar (28 lb/in²)
Front Wheel Rim Axial Run-out		0.6 mm
Front Wheel Rim Radial Run-out		0.6 mm
Rear Wheel Size		MT 4.5 x 17
Rear Tyre Size		170/60 R17
Rear Tyre Pressure		2.69 bar (39 lb/in²)
Rear Tyre TPMS Warning Light On Pressure		2.27 bar (33 lb/in²)
Rear Wheel Rim Axial Run-out		0.6 mm
Rear Wheel Rim Radial Run-out		0.6 mm
Front Tyre Minimum Tread Depth	Under 80 mph (130km/h)	2mm (0.08in)
Rear Tyre Minimum Tread Depth	Under 80 mph	2mm (0.08in)

	(130km/h)	
Front Tyre Minimum Tread Depth	Over 80 mph (130km/h)	2mm (0.08in)
Rear Tyre Minimum Tread Depth	Over 80 mph (130km/h)	3 mm (0.12 in)

Frame

Frame Type	Steel trellis
Rake	23.1°
Trail	99 mm
Max. Payload (rider, passenger, luggage & accessories)	227 kg (500 lb)

Electrical Equipment

Battery Type	YTX20L-BS
Battery Rating	12 Volt - 18 Amp. Hour
Alternator Rating	70 Amp
Headlight	2 x 12 Volt, 55/60 Watt, H4 Halogen
Front Position Light	12 Volt, 5 Watt
Fog Lights (if fitted)	-
Tail/Brake Light	LED
Direction Indicators - Standard (if fitted)	RY10W, 12 Volt, 10 Watt, amber
Direction Indicators - LED (if fitted)	LED
Fuses	See Fuse Identification

Torque Wrench Settings

Engine Covers

Application	Torque (Nm)	Notes
Camshaft cover to cylinder head	**12 Nm**	Apply engine oil to seals See Camshaft Cover - Installation

Application	Torque (Nm)	Notes
Flywheel cover	**11 Nm**	
Crankcase cover to crankcase	**11 Nm**	
Balancer cover to crankcase	**11 Nm**	
Clutch cover to crankcase	**11 Nm**	
Breather cover to crankcase	**11 Nm**	Fit new fixing(s) if loosened or removed
Sump to crankcase	**12 Nm**	

Cylinder Head

Application	Torque (Nm)	Notes
Secondary air injection valve covers to camshaft cover	**9 Nm**	
Camshaft drive chain tensioner to crankcase	*	See Camshaft Drive Chain Tensioner - Installation
Camshaft bearing ladder to cylinder head	**10 Nm**	Apply clean engine oil to the thread(s)
Camshaft sproket to camshaft	*	See Camshaft Drive Chain Tensioner - Installation
Camshaft drive chain top pad to cylinder head	**10 Nm**	Apply clean engine oil to the thread(s)
Cylinder head to crankcase (M6 screws)	**10 Nm**	Fit new fixing(s) if loosened or removed
Cylinder head to crankcase bolts	*	See Cylinder Head - Installation
Cylinder head dry seal plug	**25 Nm**	Fit new fixing(s) if loosened or removed
Spark plugs	**12 Nm**	
Cylinder head exhaust stud	**10 Nm**	Fit new fixing(s) if loosened or removed
Electrical connector bracket to fuel transfer pipe bracket	**3 Nm**	

Clutch

Application	Torque (Nm)	Notes

Application	Torque (Nm)	Notes
Clutch centre nut	**160 Nm**	Fit new fixing(s) if loosened or removed Fit new Belleville washer
Clutch release plate to pressure plate	**10 Nm**	
Clutch master cylinder clamp bolts	**12 Nm**	
Clutch lever nut	**6 Nm**	
Clutch lever pivot bolt	**1 Nm**	
Clutch slave cylinder to clutch cover	**10 Nm**	
Clutch slave cylinder bleed screw	**5 Nm**	
Clutch hose union bolts	**25 Nm**	Fit new sealing washer(s)
Clutch hose P-clip	**5 Nm**	
Clutch master cylinder cover	**1.5 Nm**	
Clutch slave cylinder cover	**4 Nm**	Fit new fixing(s) if loosened or removed
Clutch switch to clutch master cylinder	**2 Nm**	

Crankshaft and Crankcases

Application	Torque (Nm)	Notes
Crankcase lower M8 bolts	*	See Crankcases - Assembly
Crankcase lower M6 bolts	*	See Crankcases - Assembly
Crankcase upper bolts	*	See Crankcases - Assembly
Balancer gear to crankshaft	**35 Nm**	
Big end bearings	*	See Connecting Rods - Installation
Crankcase coolant drain plug	**8 Nm**	Fit new sealing washer(s)
Breather plate to crankcase	**12 Nm**	Fit new fixing(s) if loosened or removed
Flywheel to crankshaft	*	See Flywheel, Starter Drive Gears and Sprag Clutch - Installation

Application	Torque (Nm)	Notes
Crankcase dry seal plug	**25 Nm**	Fit new fixing(s) if loosened or removed
Camshaft drive sprocket to crankshaft	**27 Nm**	Fit new fixing(s) if loosened or removed
Oil retainer plate	**12 Nm**	Fit new fixing(s) if loosened or removed
Face seal plug	**8 Nm**	
Crankcase cable tidy - right hand fixing	**6 Nm**	Fit new fixing(s) if loosened or removed

Transmission

Application	Torque (Nm)	Notes
Transmission housing to crankcase	**20 Nm**	Fit new fixing(s) if loosened or removed
Input shaft bearing retainer	**12 Nm**	Fit new fixing(s) if loosened or removed
Detent wheel to selector drum	**11 Nm**	Fit new fixing(s) if loosened or removed
Selector drum bearing retaining screw	**9 Nm**	Fit new fixing(s) if loosened or removed
Gear position sensor	**5 Nm**	Fit new fixing(s) if loosened or removed
Gear pedal crank pinch bolt	**9 Nm**	
Gear change rod lock nuts	**6 Nm**	
Gear pedal pinch bolt	**9 Nm**	Fit new fixing(s) if loosened or removed
Bevel box front cover bolts	**25 Nm**	Fit new fixing(s) if loosened or removed
Bevel box side cover bolts	**9 Nm**	Fit new fixing(s) if loosened or removed
Selector cover to crankcase - 28mm fixing	**11 Nm**	
Selector cover to crankcase - 90mm fixing	**11 Nm**	

Application	Torque (Nm)	Notes
Selector shaft retainer	**12 Nm**	Fit new fixing(s) if loosened or removed

Lubrication System

Application	Torque (Nm)	Notes
Sump plug	**25 Nm**	Fit new sealing washer(s)
Oil pressure relief valve	**15 Nm**	Apply ThreeBond 1305 to the threads
Low oil pressure warning light switch to crankcase	**13 Nm**	Fit new sealing washer(s)
Oil filter adapter to crankcase	**16 Nm**	Fit new fixing(s) if loosened or removed
Oil filter to adapter	**10 Nm**	Apply clean engine oil to the seal(s)
Oil pump to crankcase	**9 Nm**	Fit new fixing(s) if loosened or removed
Oil pump drive sprocket to pump shaft	**12 Nm**	Fit new fixing(s) if loosened or removed
Oil pump drive chain guide	**6 Nm**	Fit new fixing(s) if loosened or removed
Oil feed pipe casting	**8 Nm**	Fit new fixing(s) if loosened or removed
Heat exchanger to oil pump	**10 Nm**	Fit new fixing(s) if loosened or removed
Breather drain tube	**9 Nm**	Fit new fixing(s) if loosened or removed
Oil pump rotor housing fixings	**10 Nm**	
Sump blanking plug	**9 Nm**	

Fuel System, Exhaust System and Airbox

Application	Torque (Nm)	Notes
Fuel tank to frame	**12 Nm**	
Fuel cap to fuel tank	**4 Nm**	
Fuel pump mounting plate to fuel tank	**9 Nm**	

Application	Torque (Nm)	Notes
Throttle body transition piece to cylinder head	**9 Nm**	
Throttle body to transition piece clip	**1.5 Nm**	
Throttle balance blanking screw	**5 Nm**	
Fuel rail to throttle bodies	**3.5 Nm**	
Exhaust downpipe to cylinder head - Stage 1	**6 Nm**	See Exhaust System - Installation
Exhaust downpipe to cylinder head - Stage 2	**12 Nm**	See Exhaust System - Installation
Exhaust downpipe to cylinder head - Stage 3	**15 Nm**	See Exhaust System - Installation
Exhaust downpipe to frame	**15 Nm**	
Exhaust downpipe clamp to exhaust silencer	**10 Nm**	
Exhaust silencer to frame	**30 Nm**	
Exhaust silencer front and rear end cap fixings	**5 Nm**	Fit new fixing(s) if loosened or removed
Exhaust downpipe heatshield fixings	**5 Nm**	Fit new fixing(s) if loosened or removed
Exhaust silencer strap fixings	**5 Nm**	Fit new fixing(s) if loosened or removed
Oxygen sensor	**25 Nm**	
Secondary air injection solenoid fixings	**2 Nm**	
Air filter housing	**1.5 Nm**	
Airbox mounting bracket to throttle bodies	**5 Nm**	
Airbox to mounting bracket	**5 Nm**	
Intake air temperature sensor	**2 Nm**	
Ambient air temperature sensor	**1.5 Nm**	
Manifold absolute pressure sensor	**1.5 Nm**	
Ambient air pressure sensor	**1.5 Nm**	
Fall detection switch to mounting bracket	**3 Nm**	Fit new fixing(s) if loosened or removed

Application	Torque (Nm)	Notes
Crankshaft position sensor	**6 Nm**	Fit new fixing(s) if loosened or removed
Seat bridge to frame	**5 Nm**	
Evaporative cannister	**8 Nm**	
Purge valve	**3 Nm**	
Gear position sensor	**5 Nm**	
Sump cable tidy	**3 Nm**	Fit new fixing(s) if loosened or removed

Cooling System

Application	Torque (Nm)	Notes
Radiator upper mountings to frame	**9 Nm**	
Radiator lower mountings to brackets	**9 Nm**	
Radiator lower brackets to engine	**18 Nm**	
Radiator drain plug	**1.5 Nm**	Fit new sealing washer(s)
Thermostat housing to cylinder head	**9 Nm**	Fit new sealing washer(s)
Crankcase coolant drain plug	**8 Nm**	
Water temperature sensor	**18 Nm**	Apply ThreeBond 1374 to the threads
Radiator fan cowl fixings	**8 Nm**	
Expansion tank fixings	**3 Nm**	
Expansion tank cover upper fixing	**3 Nm**	Fit new fixing(s) if loosened or removed
Expansion tank cover lower fixing	**4 Nm**	
Right hand radiator shroud fixings	**1.5 Nm**	
Left hand radiator shroud fixings	**3 Nm**	
Radiator stone guard fixings	**7 Nm**	
Radiator top hose bleed screw	**1.5 Nm**	

Front Suspension

Application	Torque (Nm)	Notes
Upper yoke pinch bolt	**25 Nm**	
Lower yoke pinch bolt	**25 Nm**	
Fork top cap to fork outer tube	**40 Nm**	
Fork top cap to damping rod	**2.5 Nm**	
Fork top cap locknut	**25 Nm**	
Fork damping rod bolt	**22 Nm**	Fit new sealing washer(s)
Headstock upper nut	**90 Nm**	
Handlebar clamp base to upper yoke (M10 bolt)	**35 Nm**	
Handlebar upper clamp to lower clamp (M8 bolt)	**26 Nm**	
Handlebar grip, left hand side	**3 Nm**	
Handlebar end weights	**5 Nm**	Fit new fixing(s) if loosened or removed
Headstock adjuster nut - stage 1	**40 Nm**	See Headstock Bearing Check/Adjustment
Headstock adjuster nut - stage 2	**10 Nm**	See Headstock Bearing Check/Adjustment
Headstock lock nut	**40 Nm**	See Headstock Bearing Check/Adjustment
Left handlebar switch housing screws	**2.5 Nm**	
Right handlebar switch housing screws	**2.5 Nm**	
Cable guide, upper yoke	**7 Nm**	
Clutch switch	**2 Nm**	
Fog light/heated grips switch to bracket	**3 Nm**	
Fog lights/heated grips switch and bracket to clutch master cylinder clamp	**3 Nm**	
Handguard to bracket fixing	**6 Nm**	Fit new fixing(s) if loosened or removed

Rear Suspension

Application	Torque (Nm)	Notes
Swinging arm to frame, left hand pivot pin	**170 Nm**	See Swinging Arm - Installation
Swinging arm to frame, right hand pivot pin	**45 Nm**	See Swinging Arm - Installation
Swinging arm to frame pivot locking ring	**110 Nm**	See Swinging Arm - Installation
Rear suspension unit upper mounting bolt	**75 Nm**	See Rear Suspension Unit - InstallationFit new fixing(s) if loosened or removed
Rear suspension unit lower mounting bolt to drop link	**85 Nm**	See Rear Suspension Unit - InstallationFit new fixing(s) if loosened or removed
Drag link to frame	**85 Nm**	See Drag and Drop Links - InstallationFit new fixing(s) if loosened or removed
Drop links to swinging arm	**85 Nm**	See Drag and Drop Links - InstallationFit new fixing(s) if loosened or removed
Torque arms to rear bevel box	**48 Nm**	
Torque arms to frame	**48 Nm**	
Hose guide on torque arm	**3 Nm**	
Torque arm spacers	**12 Nm**	
Rear suspension unit stone guard fixings	**5 Nm**	
Rear suspension unit damping connector fixing	**1 Nm**	

Final Drive

Application	Torque (Nm)	Notes
Filler/level plug	**25 Nm**	Fit new sealing washer(s)
Drain plug	**25 Nm**	Fit new sealing washer(s)
Left hand pivot pin	**100 Nm**	See Rear Bevel Box - Installation
Right hand pivot pin	**48 Nm**	See Rear Bevel Box - Installation
Locking ring - right hand pivot pin	**110 Nm**	Apply a thin smear of proprietary high temperature copper based grease to the threads

Application	Torque (Nm)	Notes
		See Rear Bevel Box - Installation
Back plate to bevel box housing	**30 Nm**	
Rubber boot clip	**1.5 Nm**	

Front Brakes

Application	Torque (Nm)	Notes
Front brake caliper to fork	**50 Nm**	
Front brake pad retaining pin	**6 Nm**	
Front brake caliper bleed screw	**6 Nm**	
Front brake hose to caliper union	**25 Nm**	Fit new sealing washer(s)
Front brake master cylinder to handlebar	**12 Nm**	
Front brake hose to master cylinder union	**25 Nm**	Fit new sealing washer(s)
Front brake hose clamp on front fork	**3 Nm**	
Front brake master cylinder reservoir cover	**1.5 Nm**	
Front brake disc to wheel	**22 Nm**	Fit new fixing(s) if loosened or removed
Brake lever pivot bolt	**1 Nm**	
Brake lever pivot bolt lock nut	**6 Nm**	

Rear Brakes

Application	Torque (Nm)	Notes
Rear brake caliper	**40 Nm**	
Rear brake pad retaining pin	**17 Nm**	
Rear brake caliper bleed screw	**6 Nm**	
Rear brake hose to caliper union	**25 Nm**	Fit new sealing washer(s)
Rear brake master cylinder	**18 Nm**	
Rear brake master cylinder reservoir	**6 Nm**	

Application	Torque (Nm)	Notes
Rear brake hose to master cylinder union	**25 Nm**	Fit new sealing washer(s)
Brake pedal pivot bolt	**22 Nm**	Fit new fixing(s) if loosened or removed
Brake hose P-clip bolt	**7 Nm**	Fit new fixing(s) if loosened or removed
Rear brake disc	**22 Nm**	Fit new fixing(s) if loosened or removed
Lock nut, master cylinder push rod	**18 Nm**	

ABS

Application	Torque (Nm)	Notes
ABS modulator to sub bracket fixings	**9 Nm**	Fit new fixing(s) if loosened or removed
ABS modulator sub bracket to main bracket	**9 Nm**	Fit new fixing(s) if loosened or removed
ABS modulator to main bracket	**9 Nm**	Fit new fixing(s) if loosened or removed
ABS modulator bracket to frame lower fixing	**9 Nm**	
ABS rear pulser ring	**5 Nm**	Fit new fixing(s) if loosened or removed
ABS front and rear wheel speed sensors	**9 Nm**	
ABS lines to modulator	**25 Nm**	Fit new sealing washer(s)
Rear brake line to crankcase tidy	**8 Nm**	Fit new fixing(s) if loosened or removed
Rear brake master cylinder reservoir cover	**1.5 Nm**	
ABS modulator hose guide fixings	**3 Nm**	

Wheels

Application	Torque (Nm)	Notes
Front wheel spindle/axle bolt	**65 Nm**	
Fork to wheel spindle pinch bolts	**22 Nm**	

Application	Torque (Nm)	Notes
Rear wheel to final drive unit	**70 Nm**	
Tyre valve - models without tyre pressure monitoring system	**6 Nm**	Apply ThreeBond 1305 to the threads
Tyre valve - models with tyre pressure monitoring system	**4.5 Nm**	

Frame and Bodywork

Application	Torque (Nm)	Notes
Upper crankcase to frame	**100 Nm**	See Engine - Installation
Lower crankcase to frame	**100 Nm**	See Engine - Installation
Cylinder head rear mountings to frame	**85 Nm**	See Engine - Installation
Cylinder head front left hand mounting to frame - initial torque	**24 Nm**	See Engine - Installation
Cylinder head front left hand mounting to frame - final torque	**115 Nm**	See Engine - Installation
Cylinder head front right hand mounting to frame	**100 Nm**	See Engine - Installation
Upper and lower crankcase to frame adjusters	**5 Nm**	See Engine - Installation
Cylinder head front right hand mounting to frame adjuster	**3 Nm**	See
Headstock brace to frame - M6 lock nut	**12 Nm**	Fit new fixing(s) if loosened or removed
Headstock brace to frame - M6 x 20 bolt	**12 Nm**	
Fork protector and side reflector bracket to fork leg fixing	**3 Nm**	
Fork protector to front mudguard	**3 Nm**	
Front mudguard to fork leg	**7 Nm**	Fit new fixing(s) if loosened or removed
Front sub frame fixings	**30 Nm**	
Windscreen fixings	**4 Nm**	
Windscreen support to adjuster pivot bar fixings	**4 Nm**	

Application	Torque (Nm)	Notes
Windscreen support to motor fixing	**5 Nm**	
Windscreen motor infill fixings	**3 Nm**	
Wind deflector clear panel fixings	**3 Nm**	
Cockpit panel fixings	**3 Nm**	
High level mudguard to inner fixings	**1.2 Nm**	
Finisher to high level mudguard fixing	**1.2 Nm**	
Clear panel to high level mudguard finisher fixings	**3 Nm**	
Infill panel to high mudguard, finisher and clear panel assembly	**3 Nm**	
High level mudguard assembly to sub frame	**5 Nm**	
Fuel tank panels to radiator covers	**1.2 Nm**	
Radiator duct to radiator covers	**1.2 Nm**	
Fuel tank infill lower brackets to radiator covers	**1.2 Nm**	
Fuel tank upper infill brackets to radiator covers	**3 Nm**	
Side fairings to fuel tank fixings	**3 Nm**	
Side fuel tank infills	**3 Nm**	
Centre fuel tank infill	**3 Nm**	
Fuel tank panel badge fixings	**3 Nm**	
Fuel tank/seat infill locating slot fixing	**9 Nm**	
Seat Infill fixing	**3 Nm**	
Sump guard to engine fixings	**6 Nm**	Fit new fixing(s) if loosened or removed
Sump guard to bracket fixings (moulded sump guard)	**3 Nm**	Fit new fixing(s) if loosened or removed
Right hand engine protector bar to lower crancase lock nut	**100 Nm**	
Engine bar to radiator mounting bracket	**18 Nm**	

Application	Torque (Nm)	Notes
Engine bar centre mounting	**18 Nm**	
Engine bars link bar	**5 Nm**	
Rear panel to frame fixings	**7 Nm**	
Luggage rack fixings	**27 Nm**	
Luggage rack cover fixings	**7 Nm**	
Pannier rail fixings	**27 Nm**	
Rear mudguard upper fixings	**7 Nm**	Fit new fixing(s) if loosened or removed
Rear mudguard lower fixings	**5 Nm**	
Under seat tray fixings	**7 Nm**	Fit new fixing(s) if loosened or removed
Chassis electronic control module cover bolt and lock nut to under seat tray	**2 Nm**	
Centre stand mounting bolts	**50 Nm**	Fit new fixing(s) if loosened or removed
Centre stand spring upper mounting pin	**7 Nm**	
Centre stand spring lower mounting bracket	**20 Nm**	
Side stand mounting bolts	**70 Nm**	
Mirror boss	**25 Nm**	
Mirror lock nut	**25 Nm**	
Control plate fixings	**18 Nm**	
Right hand front heel guard fixings	**7 Nm**	
Rear footrest hangers	**27 Nm**	
Rear footrest heel guard fixings	**3 Nm**	
Aluminium pannier mounting frame fixings	**12 Nm**	
Aluminium pannier mounting frame link bar fixings	**20 Nm**	

Application	Torque (Nm)	Notes
Aluminium pannier mounting frame mechanism fixings	**20 Nm**	
Aluminium pannier mounting frame bobbin fixings	**9 Nm**	
Seat bridge moulding to frame	**5 Nm**	
Seat lock to frame	**9 Nm**	Fit new fixing(s) if loosened or removed
Side panel brackets to radiator	**7 Nm**	

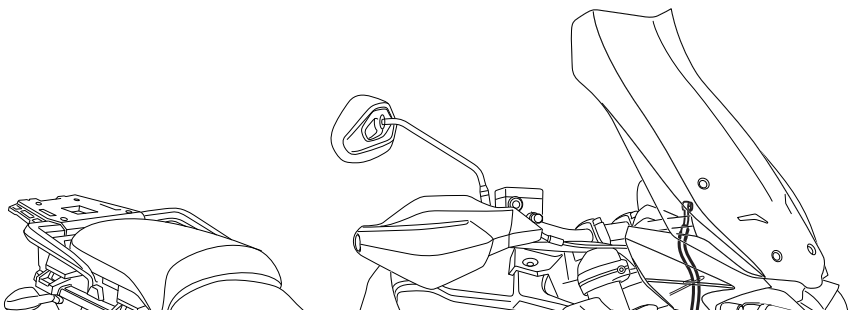
Electrical

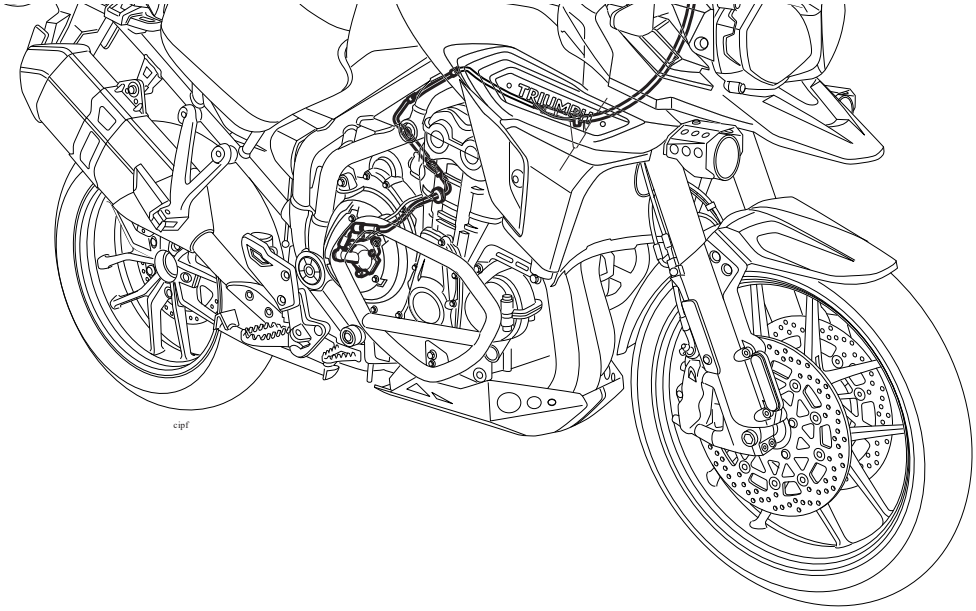
Application	Torque (Nm)	Notes
Battery terminals	**4.5 Nm**	See Warning - Battery terminals
Alternator to crankcase	**28 Nm**	
Alternator drive gear	**54 Nm**	Fit new fixing(s) if loosened or removed
Alternator decoupler to drive gear	**3 Nm**	
Alternator power lead connector	**10 Nm**	See Warning - Battery terminals
Starter motor to crankcase	**9 Nm**	
Starter motor power lead connection	**5 Nm**	See Warning - Battery terminals
Starter motor cover	**4 Nm**	Fit new fixing(s) if loosened or removed
Starter motor solenoid lead connector	**5 Nm**	See Warning - Battery terminals
Horn	**18 Nm**	
Ignition switch	**16 Nm**	Fit new fixing(s) if loosened or removed
Instruments	**3 Nm**	
Headlight surround	**3 Nm**	
Rear light	**4 Nm**	
Front and rear direction indicators	**5 Nm**	

Application	Torque (Nm)	Notes
Fog light bracket fixings	**5 Nm**	If fitted
Fog light shroud to bracket	**6 Nm**	If fitted
Fog light to shroud	**3 Nm**	If fitted Fit new fixing(s) if loosened or removed
Electrical accessory socket(s)	**2 Nm**	
Inertial measurement unit to bracket	**8 Nm**	See Inertial Measurement Unit (IMU) - Installation
Inertial measurement unit and bracket to front seat support	**1.5 Nm**	See Inertial Measurement Unit (IMU) - Installation
Chassis electronic control module cover wing nut	**1.25 Nm**	
Ambient air temperature sensor	**1.5 Nm**	
Swinging arm position sensor	**4 Nm**	
Position sensor drop link ball stud	**9 Nm**	Apply a smear of proprietary general purpose grease to NLGI 2 standard to the ball stud. Fit new fixing(s) if loosened or removed
Starter Motor cable P clip to sump	**6 Nm**	Fit new fixing(s) if loosened or removed
Side stand switch	**7 Nm**	Fit new fixing(s) if loosened or removed

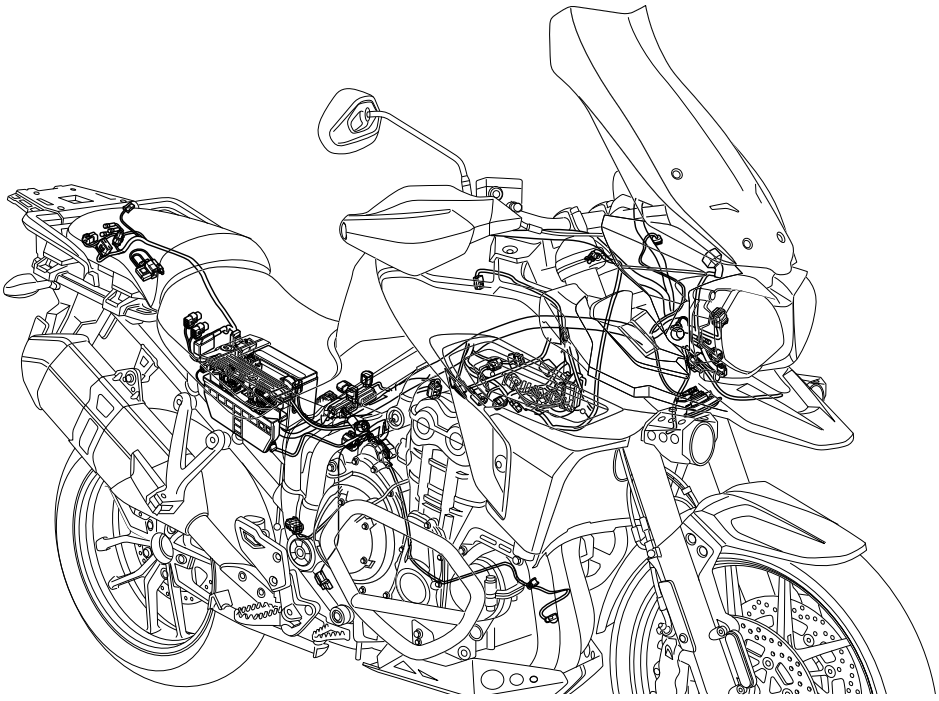
Routings

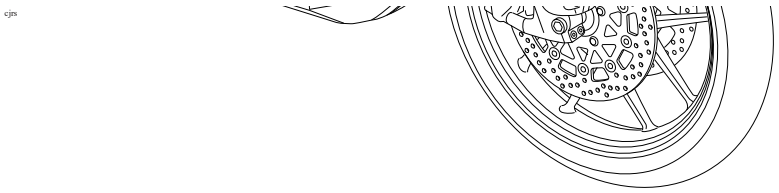
Clutch Hose Routing



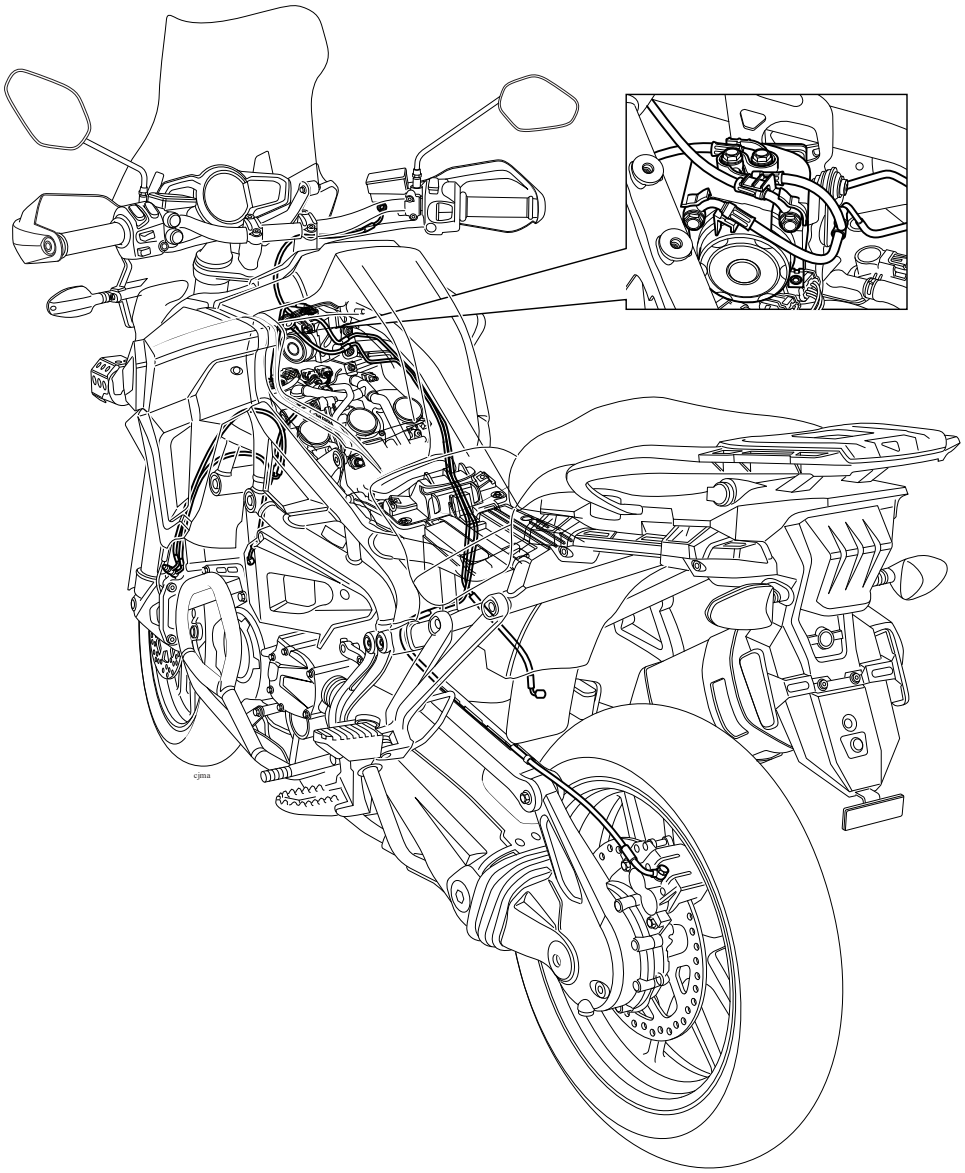


Main Wiring Harness Routing

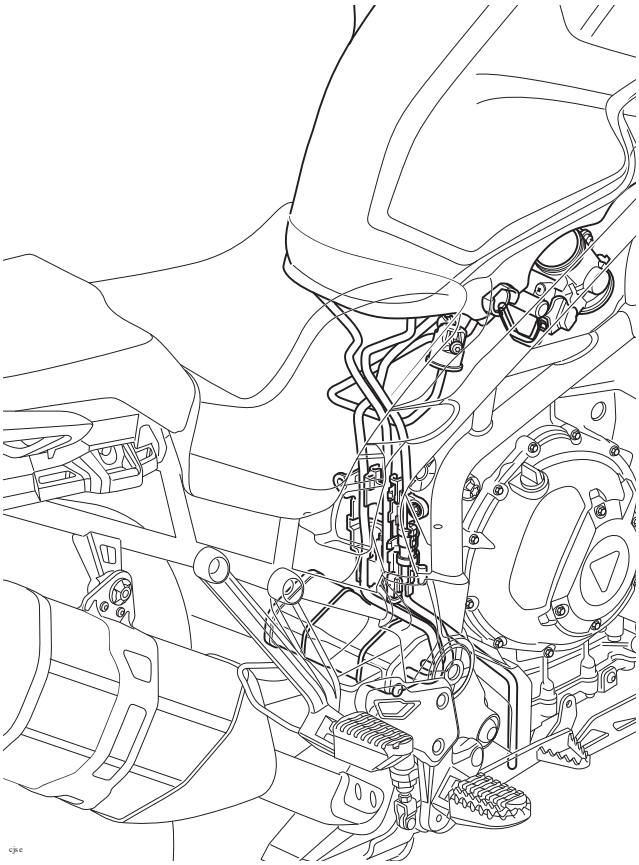




ABS and Brake Hose Routing



Fuel Tank Breather Hose Routing



Routine Maintenance

Routine Maintenance 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

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.

Scheduled maintenance may be carried out by your dealer in three ways; annual maintenance, mileage based maintenance or a combination of both, depending on the mileage the motorcycle travels each year.

- Motorcycles travelling less than 10,000 miles/ 16,000 km per year must be maintained annually. In addition to this, mileage based items require maintenance at their specified intervals, as the motorcycle reaches this mileage.
- Motorcycles travelling approximately 10,000 miles/ 16,000 km per year must have the annual maintenance and the specified mileage based items carried out together.
- Motorcycles travelling more than 10,000 miles/ 16,000 km per year must have the mileage based items maintained as the motorcycle reaches the specified mileage. In addition to this, annual based items will require maintenance at their specified annual intervals.

In all cases maintenance must be carried out at or before the specified maintenance intervals shown. Consult an authorised Triumph dealer for advice on which maintenance schedule is most suitable for your motorcycle.

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 (Km) or Time Period, whichever comes first**					
		First Service	**Annual Service**	**Mileage Based Service**		
	Every	**500 (800) 1 month**	**Year**	**10,000 and 30,000 (16,000 and 48,000)**	**20,000 (32,000)**	**40,000 (64,000)**
Lubrication						
Engine and oil cooler - check for leaks	Day	•	•	•	•	•
Engine oil - renew	-	•	•	•	•	•
Engine oil filter - renew	-	•	•	•	•	•

Operation Description	Odometer Reading in Miles (Km) or Time Period, whichever comes first					
		First Service	Annual Service	Mileage Based Service		
	Every	500 (800) 1 month	Year	10,000 and 30,000 (16,000 and 48,000)	20,000 (32,000)	40,000 (64,000)
Fuel System and Engine Management						
Autoscan - Carry out a full Autoscan using the Triumph Diagnostic Tool (print a customer copy)	-	•	•	•	•	•
Fuel system - check for leaks	Day	•	•	•	•	•
Fuel system - check fuel hoses for chafing, cracks or damage. Replace if necessary	-			•	•	•
Air cleaner - renew	-			•	•	•
Throttle body plate (butterfly) - check/clean				•	•	•
Throttle bodies - balance	-			•	•	•
Fuel hoses - renew	Every four years, regardless of mileage					
Evaporative loss hoses - renew	Every four years, regardless of mileage					
Ignition System						
Spark plugs - check	-			•		
Spark plugs - renew	-				•	•
Cooling System						
Cooling system - check for leaks	Day	•	•	•	•	•
Cooling system - check coolant hoses for chafing, cracks or damage. Replace if necessary	-			•	•	•
Coolant level - check/adjust	Day	•	•	•	•	•
Coolant - renew	Every 3 years regardless of mileage					
Engine						
Clutch master cylinder - check for leaks	-	•	•	•	•	•

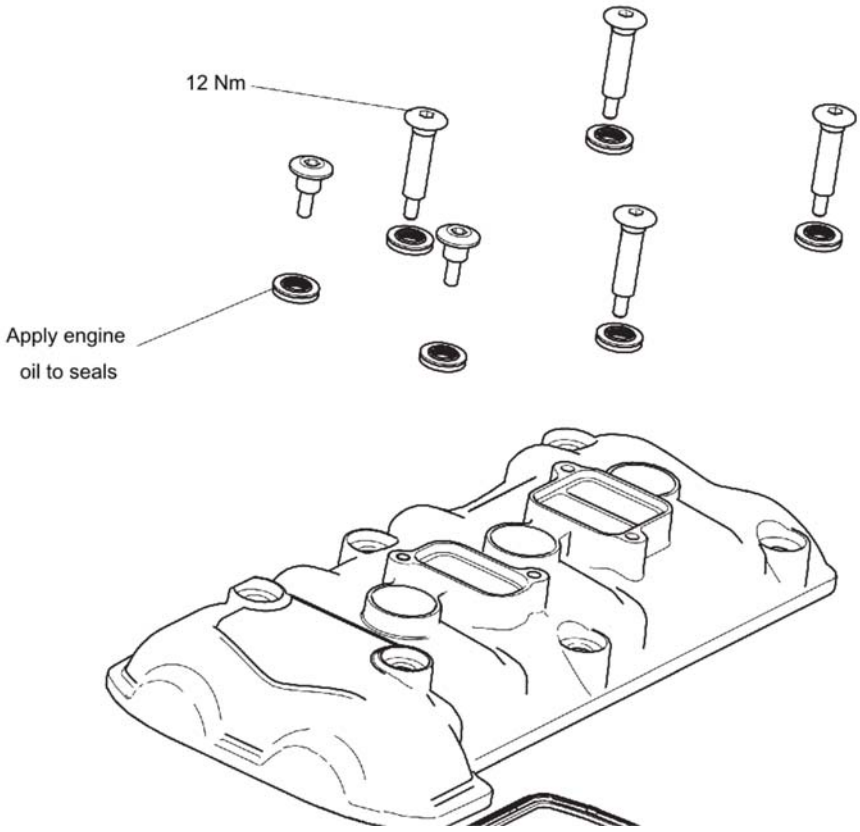
Operation Description	Odometer Reading in Miles (Km) or Time Period, whichever comes first					
		First Service	Annual Service	Mileage Based Service		
	Every	500 (800) 1 month	Year	10,000 and 30,000 (16,000 and 48,000)	20,000 (32,000)	40,000 (64,000)
Clutch fluid levels - check	Day	•	•	•	•	•
Clutch fluid - renew	Every 2 years, regardless of mileage					
Valve clearances - check	-				•	•
Camshaft timing - check/adjust	-				•	•
Wheels and Tyres						
Wheels - inspect for damage	Day	•	•	•	•	•
Wheel bearings - check for wear/smooth operation	-	•	•	•	•	•
Wheels - check wheels for broken or damaged spokes and check spoke tightness (models with spoked wheels only)	-	•	•	•	•	•
Tyre wear/tyre damage - check	Day	•	•	•	•	•
Tyre pressures - check/adjust	Day	•	•	•	•	•
Steering and Suspension						
Steering - check for free operation	Day	•	•	•	•	•
Front and rear suspension - check for damage/leaks/smooth operation	Day	•	•	•	•	•
Fork oil - renew	-					•
Headstock bearings - check/adjust	-		•	•	•	•
Headstock bearings - lubricate	-				•	•
Rear suspension linkage - check/lubricate	-				•	•
Brakes						
Brake pads - check wear levels	Day	•	•	•	•	•
Brake master cylinders - check for	Day	•	•	•	•	•

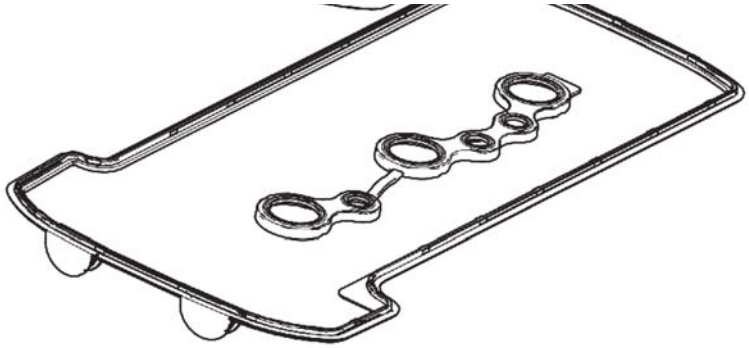
Operation Description	Odometer Reading in Miles (Km) or Time Period, whichever comes first					
		First Service	Annual Service	Mileage Based Service		
	Every	500 (800) 1 month	Year	10,000 and 30,000 (16,000 and 48,000)	20,000 (32,000)	40,000 (64,000)
fluid leaks						
Brake calipers - check for fluid leaks and seized pistons	Day	•	•	•	•	•
Brake fluid levels - check	Day	•	•	•	•	•
Brake fluid - renew	Every 2 years regardless of mileage					
Final Drive						
Final drive - check for oil leaks	Day	•	•	•	•	•
Final drive oil level - check	-		•	•	•	•
Final drive oil - renew - only first service	-	•				
Electrical						
All lights, instruments and electrical systems - check	Day	•	•	•	•	•
General						
Instruments, chassis ECM and engine ECM - check for latest calibration download using the Triumph diagnostic tool	-	•	•	•	•	•
Bank angle indicators - check for wear	Day	•	•	•	•	•
Fasteners - inspect visually for security	Day	•	•	•	•	•
Accessory rack sliding carriage - check for correct operation‡	-		•	•	•	•
Accessory pannier link bar - check for correct operation and adjustment‡	-		•	•	•	•
Side stand - check operation	Day	•	•	•	•	•
Centre stand - check operation	Day	•	•	•	•	•

Operation Description	Odometer Reading in Miles (Km) or Time Period, whichever comes first					
		First Service	Annual Service	Mileage Based Service		
	Every	500 (800) 1 month	Year	10,000 and 30,000 (16,000 and 48,000)	20,000 (32,000)	40,000 (64,000)
Centre stand flanged sleeves - check/clean/grease	-		•	•	•	•
Gear change pedal - clean bushes	-		•	•	•	•
Carry out all outstanding Service Bulletin and warranty work	-	•	•	•	•	•
Carry out road test	-	•	•	•	•	•
Complete the service record book and reset the service indicator	-	•	•	•	•	•
‡ Only if fitted						

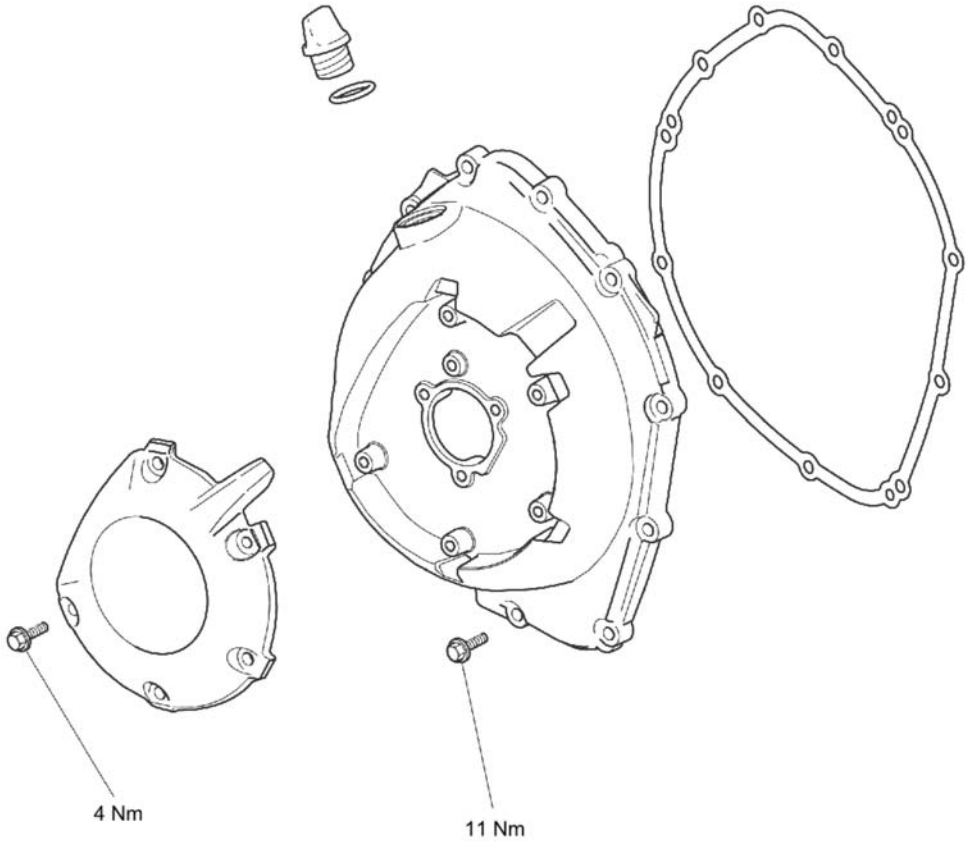
Engine Covers

Exploded View - Camshaft Cover

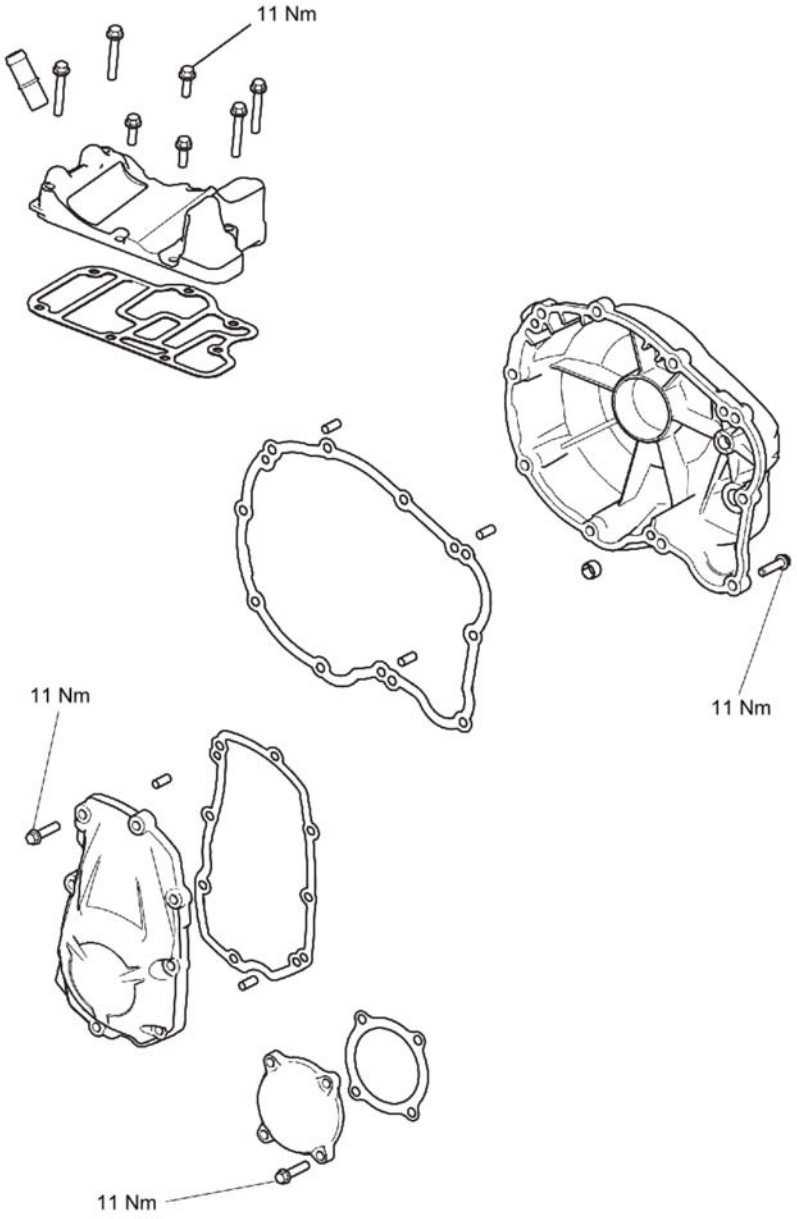




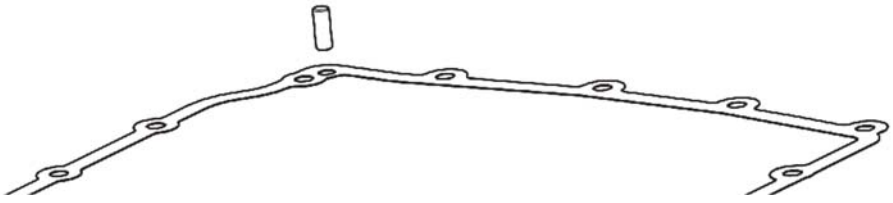
Exploded View – Clutch Cover

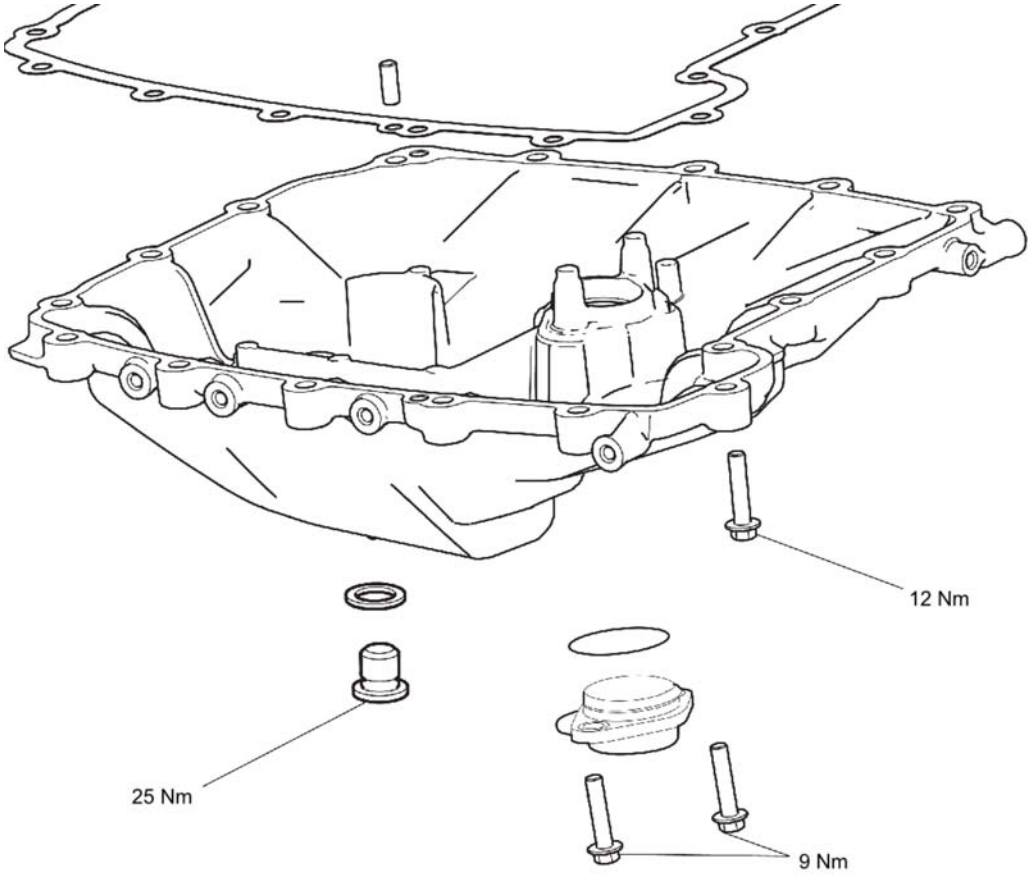


Exploded View – Engine Covers



Exploded View – Sump





Camshaft Cover - Removal

⚠ WARNING

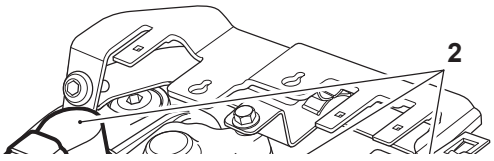
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

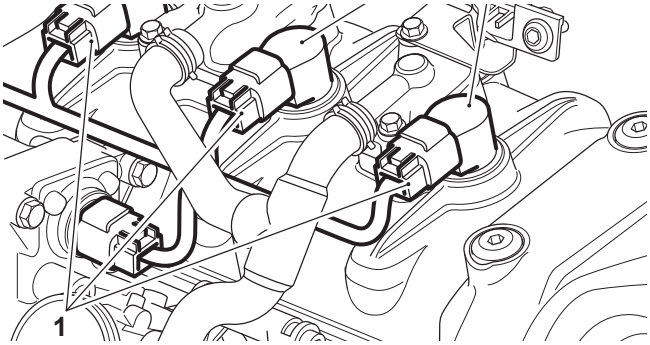
- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the fuel tank (see Fuel Tank - Removal).
- Remove the airbox (see Airbox - Removal).
- Remove the throttle bodies (see Throttle Bodies/Injectors - Removal).
- Drain the coolant (see Coolant Replacement).

Note

- **Note the position and routing of all hoses and electrical connections prior to removal.**

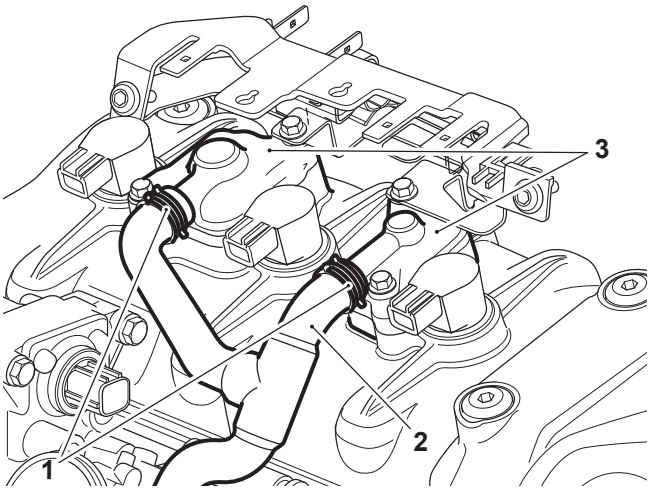
1. Disconnect the right hand coolant hose at the radiator and position aside.
2. Disconnect the electrical connections to the ignition coils and remove the coils.





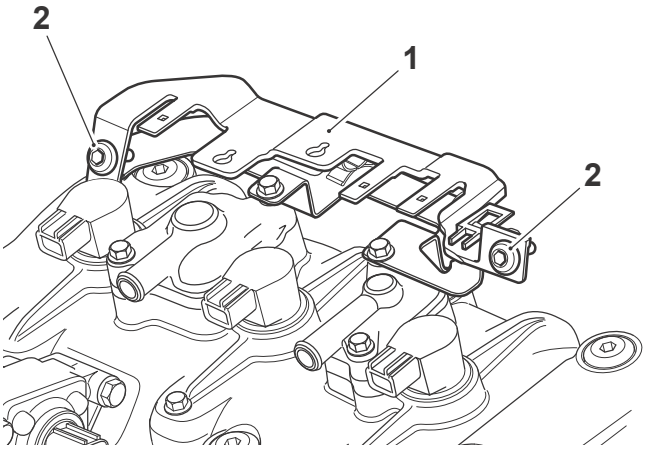
1. **Electrical connectors**
2. **Ignition coils**

3. Detach the secondary air injection hose from the reed valves on top of the camshaft cover.



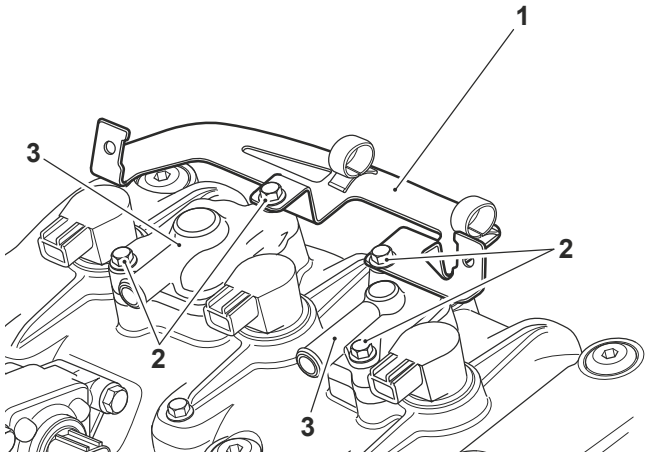
1. **Spring-close clip**
2. **Secondary air injection hose**
3. **Reed valve assemblies**

4. Detach the connectors from the connector bracket and position aside, then release the fixings and remove the connector bracket.



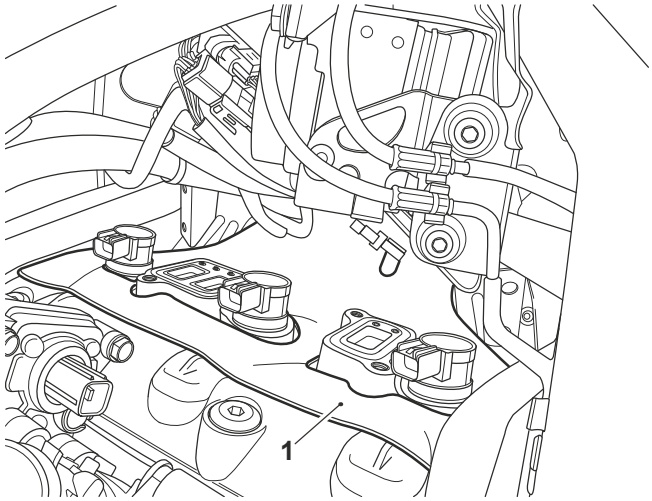
1. **Connector bracket**
2. **Fixings**

5. Noting the position of the fuel transfer pipe bracket, release the fixings securing the reed valve covers to the camshaft cover. Position the fuel transfer pipe bracket aside.



1. **Fuel transfer pipe bracket**
2. **Fixings**
3. **Reed valve covers**

6. Ease the reed valve covers from the valves.
7. Noting its position, move the air deflector towards the front of the motorcycle to allow access to the camshaft cover.

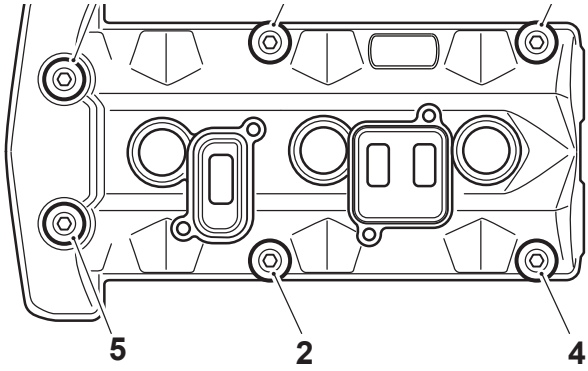


1. **Air deflector**

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

Note

- **Two shorter bolts are fitted at the end adjacent to the camshaft drive chain.**



Camshaft Cover Bolt Release Sequence

9. Carefully manoeuvre the camshaft cover towards the front of the motorcycle. Then manoeuvre the cover to the right to remove it from the motorcycle.

CAUTION

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

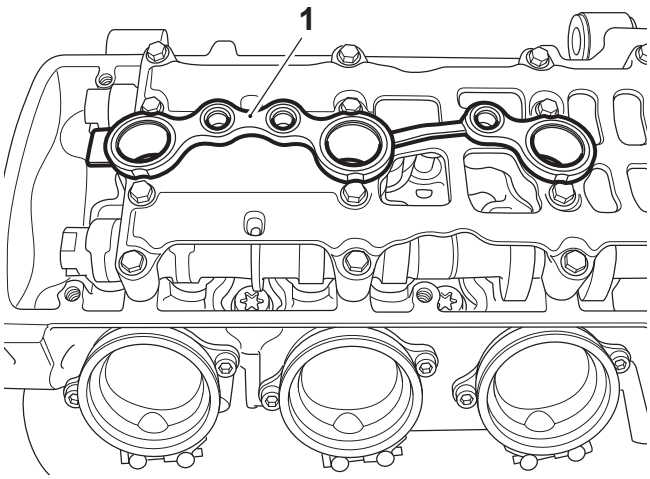
10. Remove the camshaft cover gasket and plug tower seals. If necessary, recover the dowels from the secondary air injection holes in the head (these may come away in the cover or gasket).
11. Discard the camshaft cover seal, bolt seals and the spark plug tower seals.
12. Remove any residual oil from the front of the cylinder head using a syringe or lint free cloth.

Camshaft Cover - Installation

WARNING

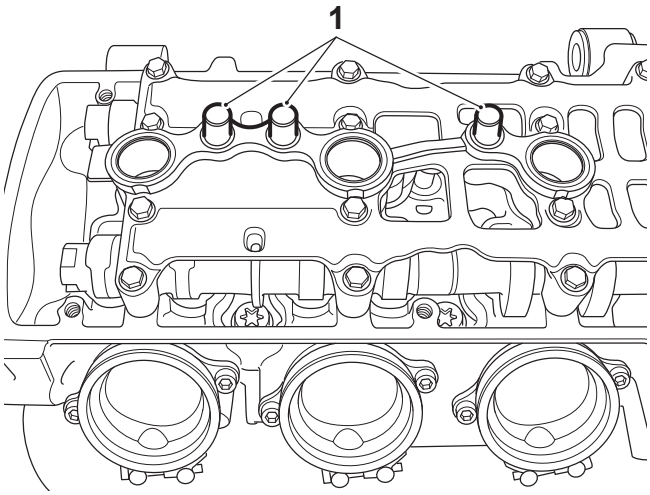
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Fit new plug tower seals to the camshaft cap ladder.



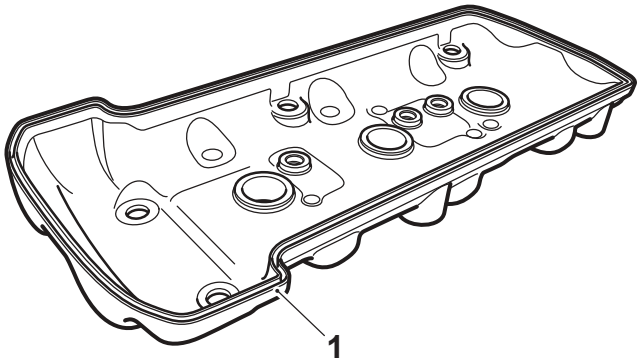
1. Plug tower seals

2. Refit the dowels to the cylinder head.



1. Dowels

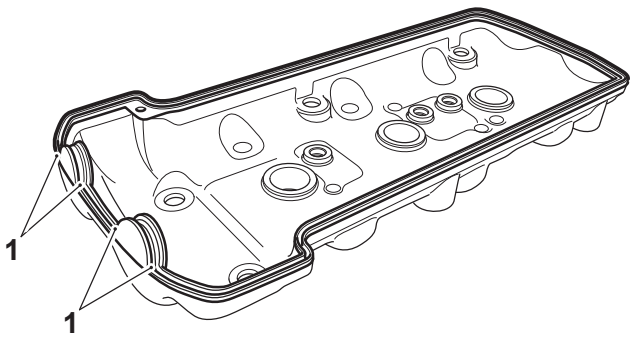
3. Fit a new camshaft cover seal to the groove in the camshaft cover.



chdk

1. Camshaft cover seal groove

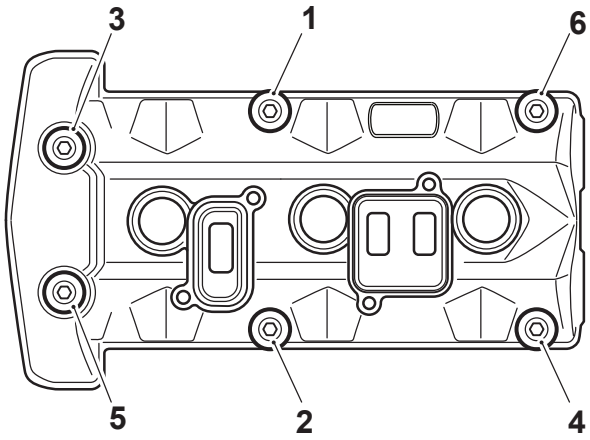
4. Apply silicone sealer to the areas shown in the diagram below (at the factory, ThreeBond 1215E is used).



chdk

1. **Silicone sealer areas**

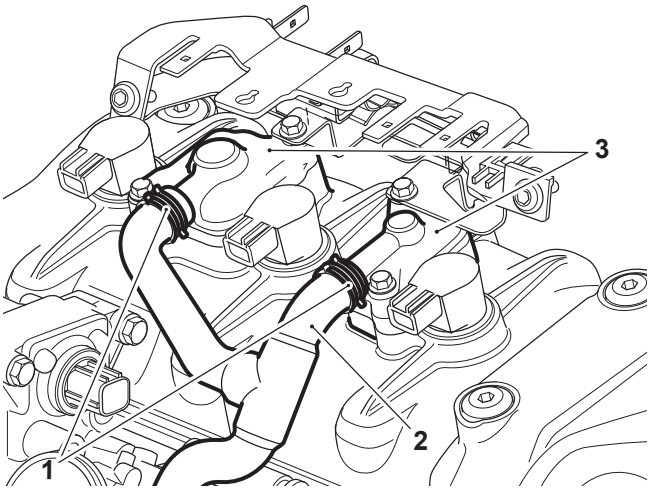
5. Fit the camshaft cover, ensuring that the dowels, gasket and seals remain in the correct positions.
6. Apply a thin film of engine oil to both sides of the new seals for the camshaft cover bolts.
7. Fit the camshaft cover screws and screw seals, then tighten until finger tight.
8. Finally, tighten the camshaft cover bolts to **12 Nm** in the sequence shown below.



Cam cover

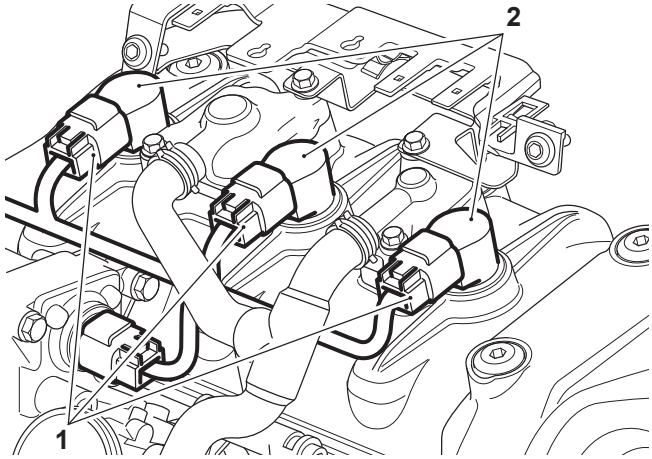
Camshaft Cover Bolts Tightening Sequence

9. Reposition the air deflector onto the camshaft cover as noted during removal.
10. Refit the reed valve covers and fuel transfer pipe bracket to the camshaft cover as noted during removal. Tighten the fixings to **9 Nm**.
11. Refit the connector bracket to the fuel transfer pipe bracket. Tighten the fixings to **3 Nm**.
12. Reattach the electrical connectors to the connector bracket as noted during removal.
13. Refit the secondary air injection hose to the reed valves.



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

14. Fit the ignition coils and reconnect.



1. **Electrical connectors**
2. **Ignition coils**

15. Reconnect the right hand coolant hose, refit the constant tension hose clamp.
    - Refill the cooling system (see Coolant Replacement).
    - Refit the throttle bodies (see Throttle Bodies/Injectors - Installation).
    - Refit the airbox (see Airbox - Installation).
    - Refit the fuel tank (see Fuel Tank - Installation).
    - Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
    - Refit the rider's seat (see Rider's Seat - Installation).

Clutch Cover - Removal

⚠ WARNING

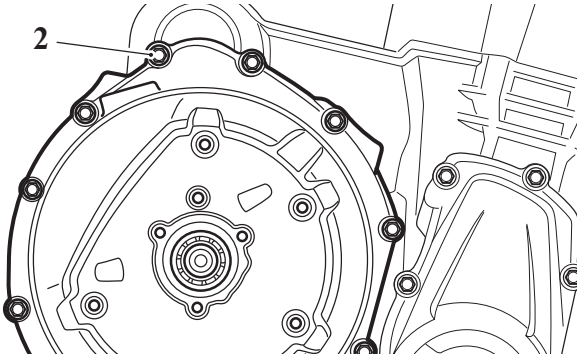
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

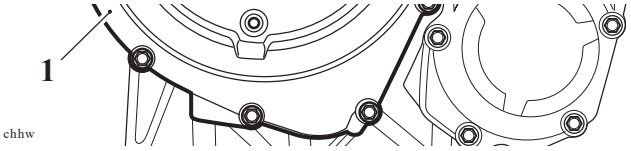
1. Remove the clutch slave cylinder (see Clutch Slave Cylinder - Removal). It is not necessary to drain the clutch cylinder fluid. Retain the piston to the slave cylinder using a rubber band or cable tie.

⚠ WARNING

Do not allow the clutch slave cylinder to hang on the clutch hose as this may damage the hose and could impair clutch operation leading to loss of motorcycle control and an accident.

2. Tie the clutch slave cylinder aside.
3. Noting the position of the encapsulated fixing, remove the fixings and remove the clutch cover. Discard the encapsulated fixing.





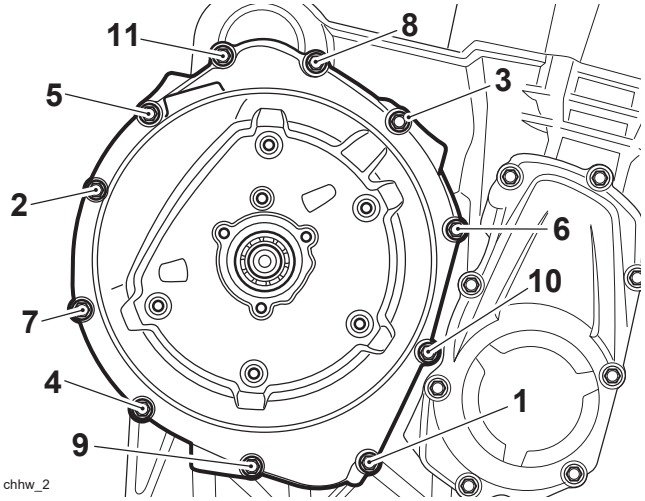
1. **Clutch cover**
2. **Encapsulated fixing position**

Clutch Cover - Installation

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. Clean and refit the clutch cover incorporating a new gasket.
2. Install a new encapsulated fixing at the position noted during removal.
3. Install the remaining fixings and tighten as described below:
   - Tighten fixings 1 to 10 only, in the sequence shown below to **11 Nm**.
   - Tighten fixings one and two again to **11 Nm**.
   - Tighten fixing 11 to **11 Nm**.



Clutch Cover Tightening Sequence

4. Remove the cable tie or rubber band from the clutch slave cylinder.

- Clean and refit the clutch slave cylinder incorporating a new gasket (see Clutch Slave Cylinder - Installation).
- Check and top up the engine oil level (see Oil Level Inspection).
- Check the clutch operation. Rectify as necessary.

Flywheel Cover - Removal

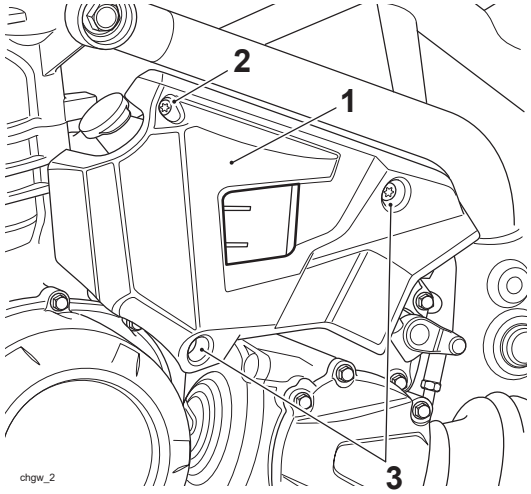
WARNING

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.

- Remove the rider’s seat (see Rider’s Seat - Removal).

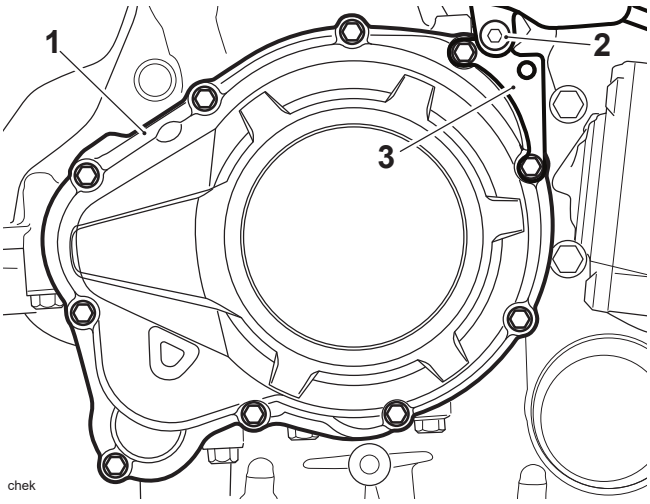
- Disconnect the battery, negative (black) lead first.

1. Remove the three fixings and remove the expansion tank cover. Discard the upper M5 fixing. Retain the lower M6 fixings for reuse.



1. **Expansion tank cover**
2. **Upper fixing (M5)**
3. **Lower fixings (M6)**

2. Remove the lower expansion tank fixing. It is not necessary to remove or drain the expansion tank.
3. Remove the fixings and remove the flywheel cover. Collect the expansion tank bracket. Discard the gasket.



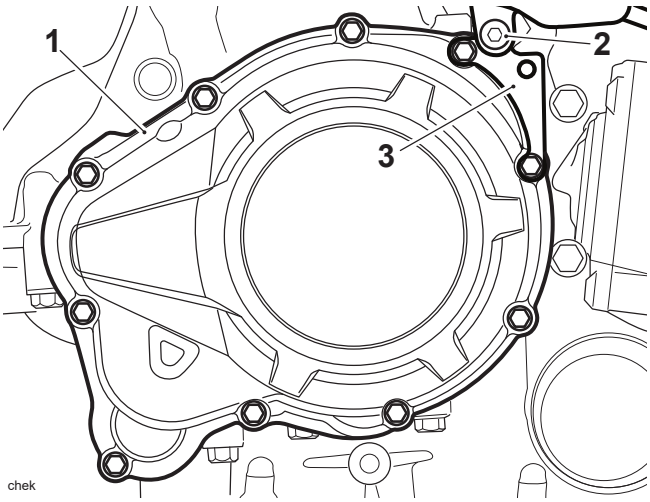
1. **Flywheel cover**
2. **Expansion tank fixing**
3. **Expansion tank bracket**

Flywheel Cover - Installation

⚠ WARNING

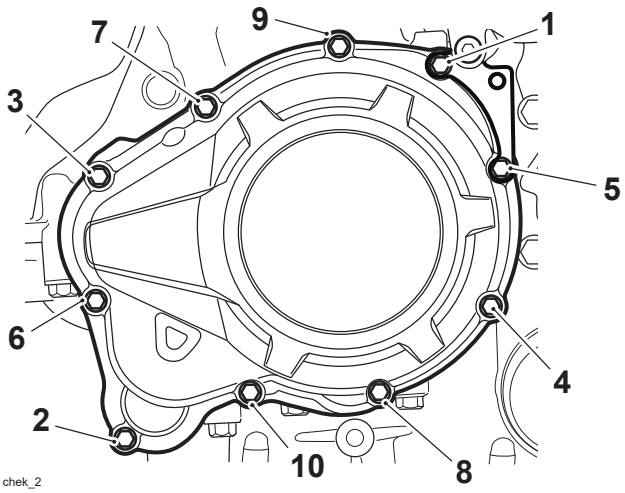
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Thoroughly clean the flywheel cover.
2. Position a new gasket to the crankcase dowels then refit the flywheel cover.
3. Refit the expansion tank bracket and secure the cover and bracket with the fixings.



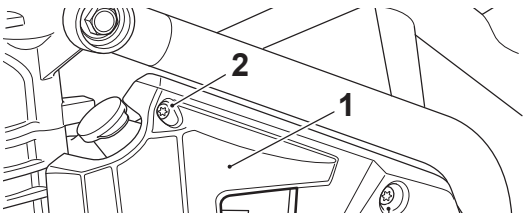
1. **Flywheel cover**
2. **Expansion tank fixing**
3. **Expansion tank bracket**

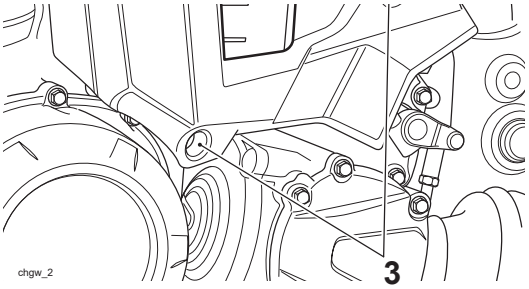
4. Tighten the cover fixings in the following sequence:
   - Tighten the fixings in the sequence shown below to **11 Nm**.
   - Tighten fixings one and two again to **11 Nm**.



Flywheel Cover Tightening Sequence

5. Refit the expansion tank lower fixing, tightening to **3 Nm**.
6. Refit the expansion tank cover. Secure the upper mounting with a new M5 encapsulated fixing. Secure the lower mountings with the two original fixings. Tighten the upper fixing to **3 Nm** and the lower fixings to **4 Nm**.





1. **Expansion tank cover**
2. **Upper fixing (M5)**
3. **Lower fixings (M6)**

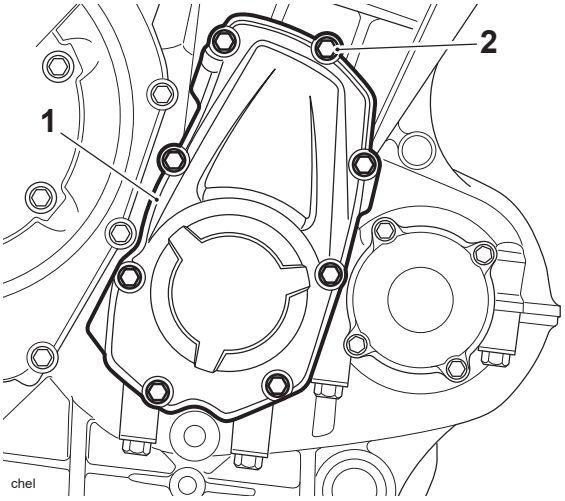
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

Crankshaft 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. Remove the seven fixings, noting the position of the encapsulated fixing.
2. Remove the crank cover. Discard the encapsulated fixing and gasket.



1. **Crankshaft cover**
2. **Encapsulated fixing**

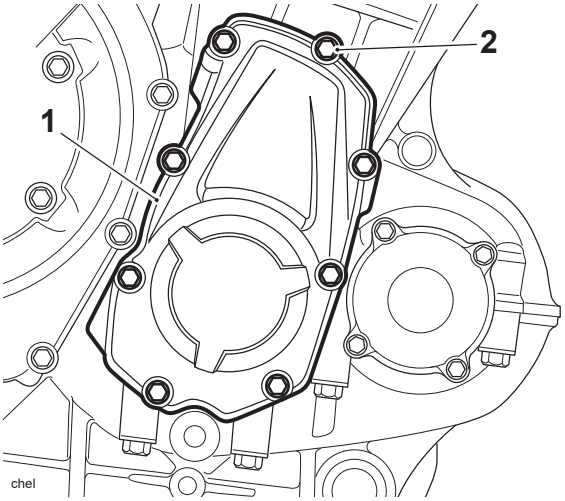
Crankshaft Cover - Installation

⚠ 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.

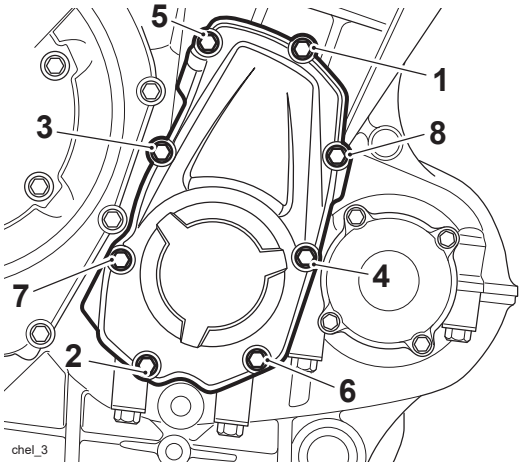
1. Thoroughly clean the crankshaft cover.

2. Position a new gasket to the crankcase dowels.
3. Refit the crankshaft cover, installing a new encapsulated fixing to the position shown below.



1. **Crankshaft cover**
2. **Encapsulated fixing**

4. Tighten the cover fixings in the following sequence:
   - Tighten the fixings in the sequence shown below to **11 Nm**
   - Tighten fixings one and two again to **11 Nm**.



Crankshaft Cover Tightening Sequence

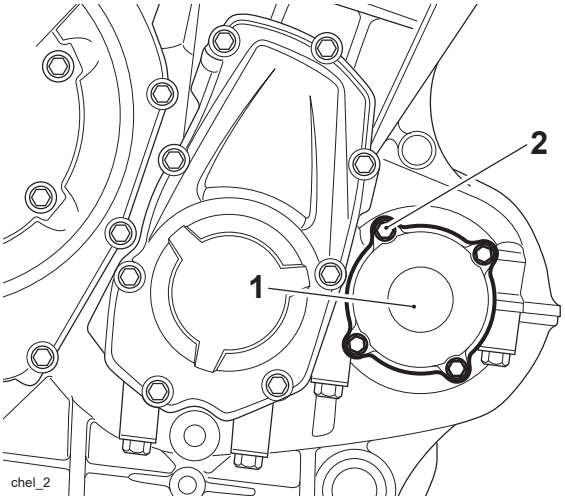
Balancer Shaft Cover - Removal

Balancer Shaft Cover - Installation

⚠ 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 four fixings.
2. Remove the balancer shaft cover. Discard the gasket.

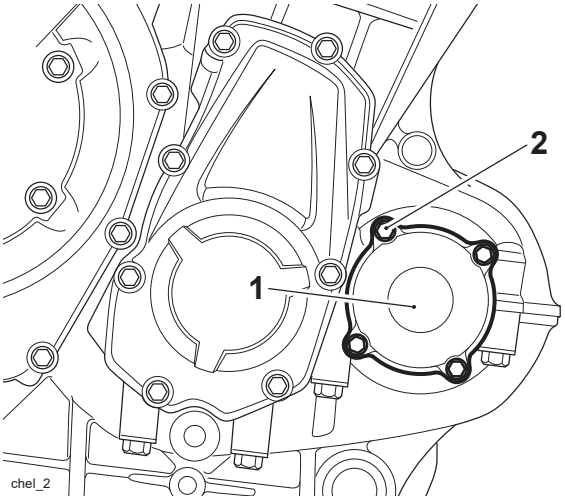


1. **Balancer cover**
2. **Fixings**

⚠ WARNING

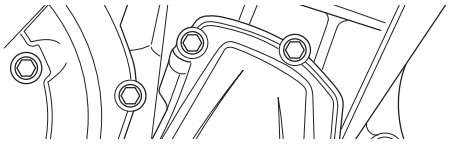
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

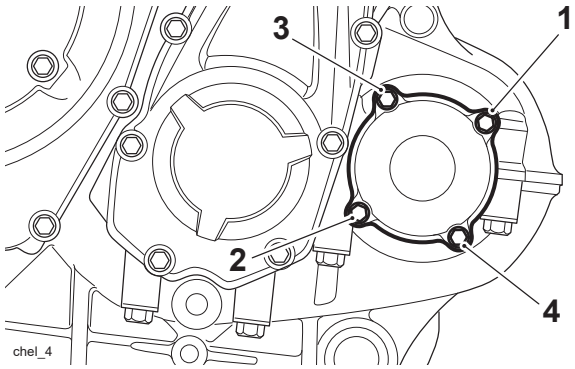
1. Thoroughly clean the balancer shaft cover.
2. Position a new gasket to the crankcase dowels.
3. Refit the balancer shaft cover.



1. **Balancer cover**
2. **Fixings**

4. Tighten the cover fixings in the following sequence:
   - Tighten the fixings in the sequence shown below to **11 Nm**.
   - Tighten fixings one and two again to **11 Nm**.





Balancer Cover Tightening Sequence

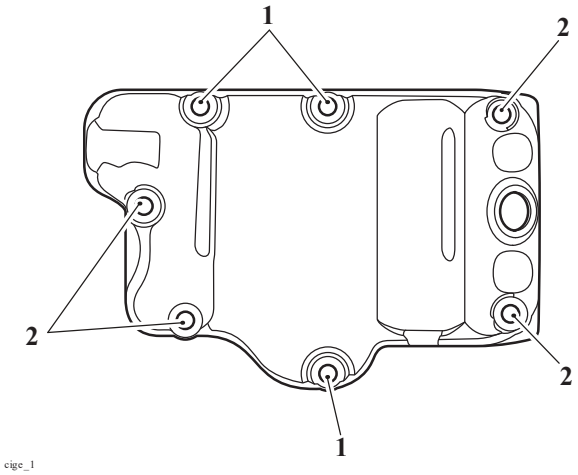
Breather Cover - Removal

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.

- Remove the alternator (see Alternator - Removal).

1. Remove the seven fixings, noting the position of the three M6 x 16 mm and four M6 x 35 mm fixings.



1. **M6 x 16 mm fixings**
2. **M6 x 35 mm fixings**

2. Remove the breather cover. Discard the fixings and gasket.

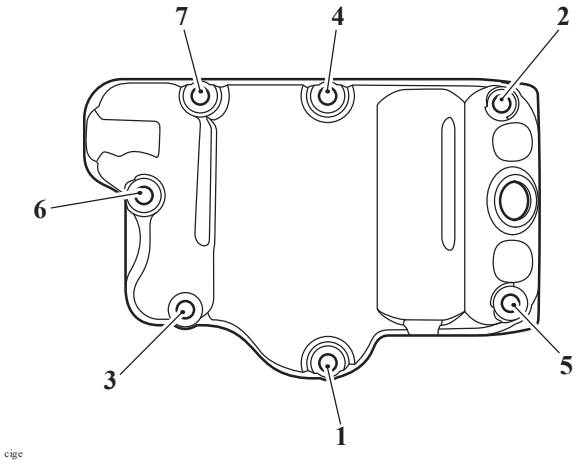
Breather Cover - Installation

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. Thoroughly clean the breather cover.
2. Position a new gasket to the crankcase.

3. Refit the breather cover, installing new M6 x 16 mm and M6 x 35 mm encapsulated fixings as noted during removal.
4. Tighten the new fixings in the sequence shown below to **11 Nm**.



Breather Cover Tightening Sequence

- Refit the alternator (see Alternator - Installation).

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.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.

WARNING

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

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

WARNING

If the engine has recently been running, the engine oil will be hot to the touch. Contact with the hot oils may cause damage to exposed skin. To avoid skin damage, do not touch hot oil.

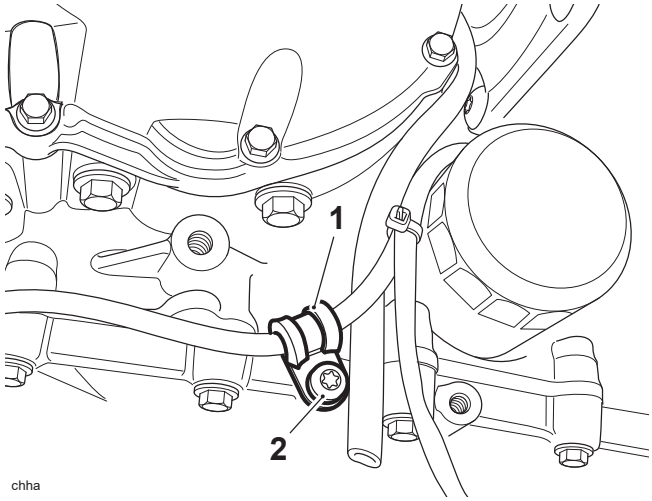
WARNING

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.

- Drain the engine oil (see Oil and Oil Filter Change).
- Remove the exhaust system (see Exhaust System - Removal).

- Remove the sump guard (see Sump Guard - Removal).

1. Remove the fixing and detach the starter motor cable P-clip from the sump.

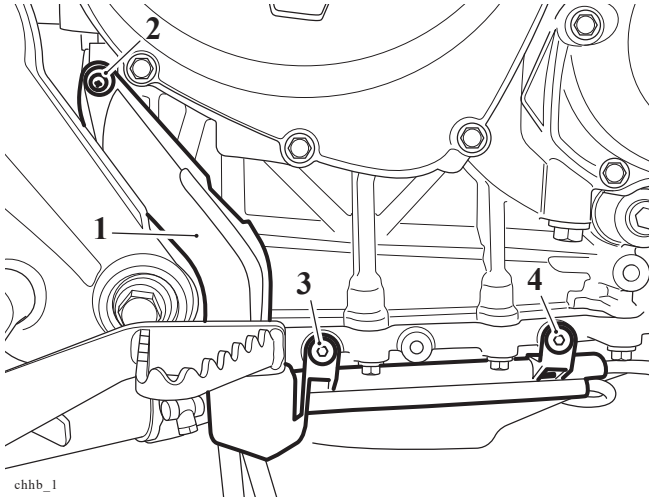


1. **Starter motor cable P-clip**
2. **Fixing**

Note

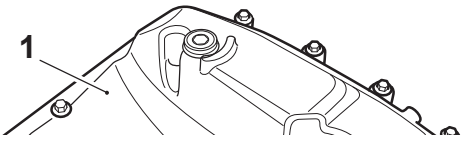
- **For models fitted with engine bars as standard, the lower front mounting point of the harness guide is secured with a fir tree clip instead of a bolt.**

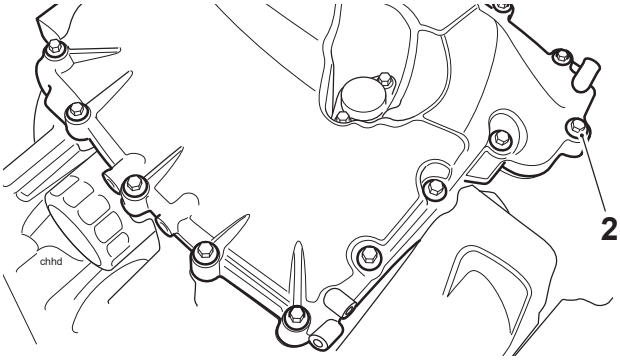
2. Remove the scrivet, bolt(s) and fir tree clip (if fitted) and remove the harness guide from the right hand side of the engine. Discard the bolt(s) and fir tree clip.



1. **Harness guide**
2. **Scrivet**
3. **Bolt**
4. **Bolt/fir tree clip**

3. Release the fixings securing the sump to the lower crankcase.



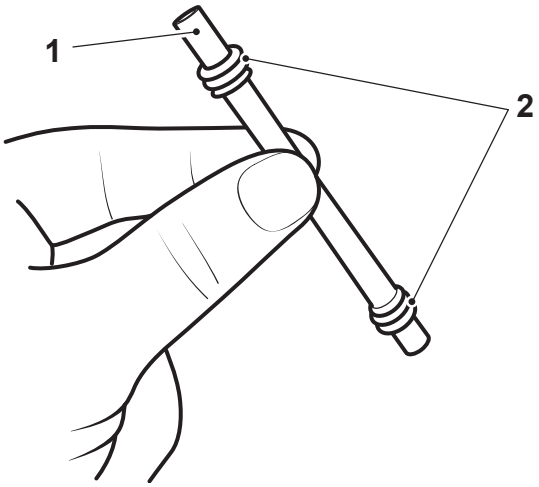


1. **Sump**
2. **Fixings**

4. Detach the sump 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.**



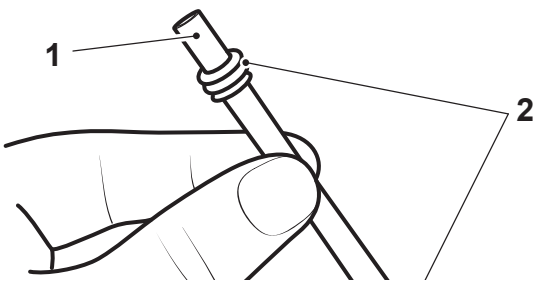
1. **Water pump drain tube**
2. **O-rings**

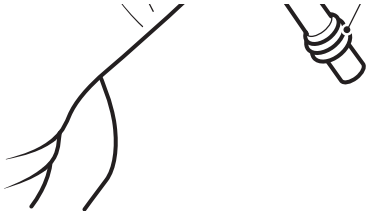
Sump - Inspection

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

Sump - Installation

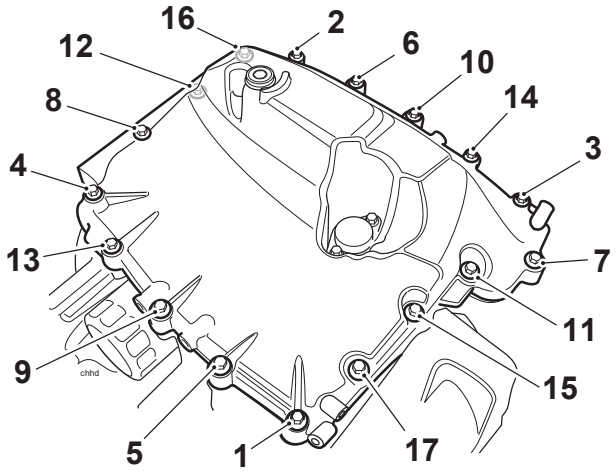
1. Incorporating new O-rings (two at each end of the tube), position the water pump drain tube to the oil pump.





1. **Water pump drain tube**
2. **O-rings**

2. Thoroughly clean the sump.
3. Incorporating a new sump gasket, position the sump to the lower crankcase.
4. Tighten the sump fixings in the following sequence:
   - Tighten the fixings in the sequence shown below to **12 Nm**.
   - Tighten fixings one, two, three and four again to **12 Nm**.



Sump Tightening Sequence

Note

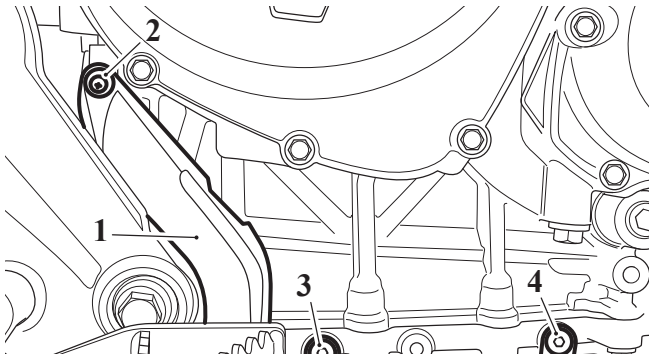
- **Use new exhaust gaskets at the downpipe connections with the cylinder head.**

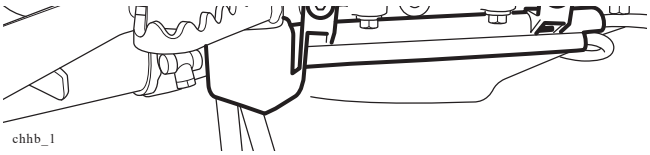
5. Refit the exhaust system (see Exhaust System - Removal).

Note

- **For models fitted with engine bars as standard, the lower front mounting point of the harness guide is secured with a fir tree clip instead of a bolt.**

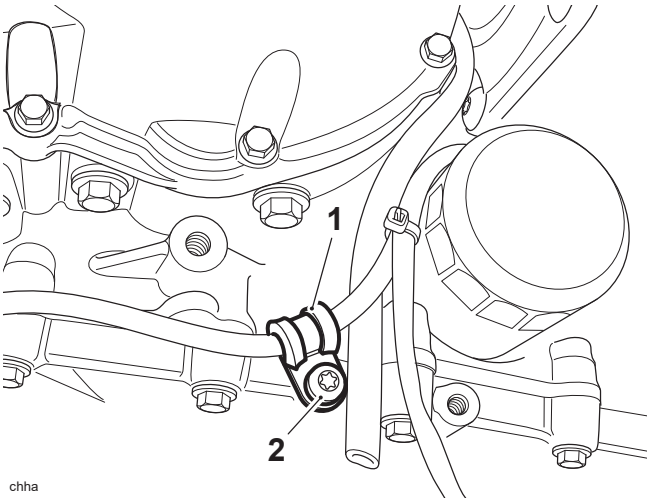
6. Refit the harness guide and secure with the scrivet, new bolt(s) and new fir tree clip (if fitted). Tighten the bolt(s) to **3 Nm**.





1. **Harness guide**
2. **Scrivet**
3. **Bolt**
4. **Bolt/fir tree clip**

7. Reposition the starter motor cable P-clip to the sump and secure with a new fixing. Tighten to **6 Nm**.

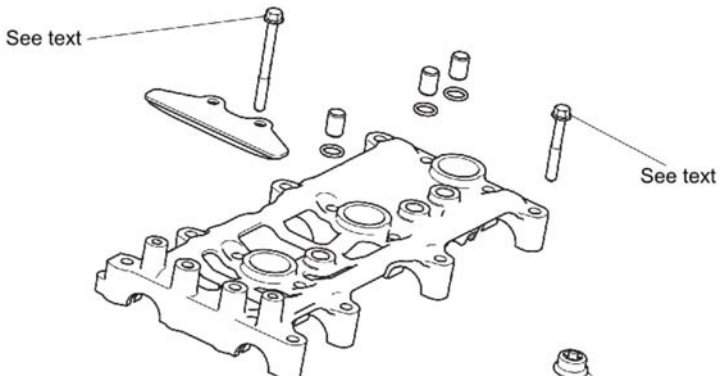


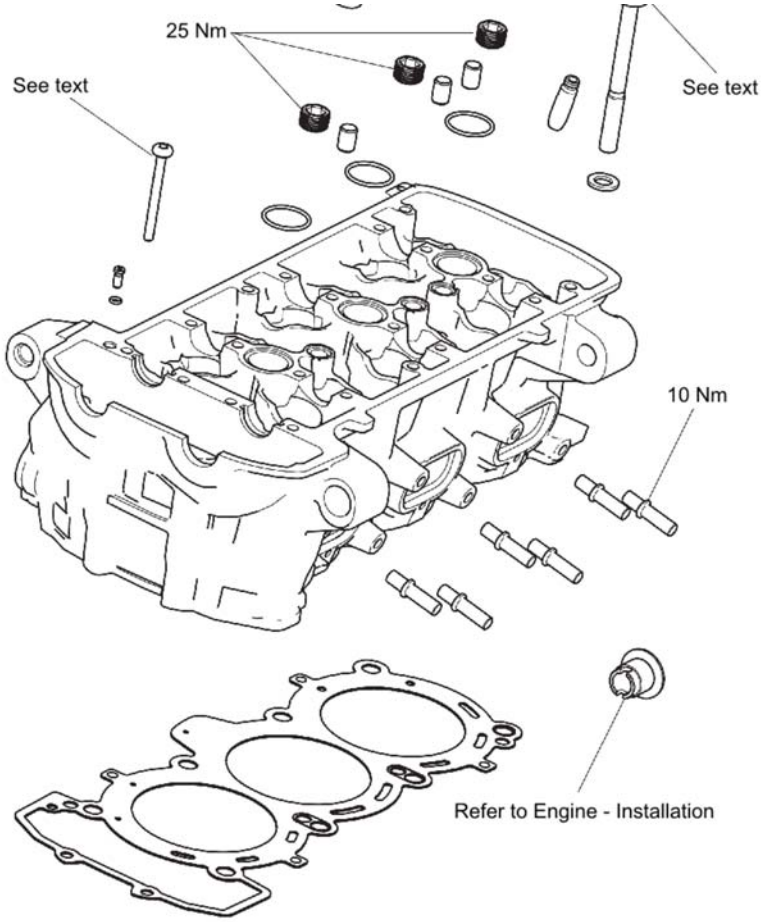
1. **P-clip**
2. **Fixing**

8. Refit the sump guard (see Sump Guard - Installation).
9. Fill the engine with the correct grade of engine oil (see Oil and Oil Filter Change).
10. Reconnect the battery, positive (red) lead first.
11. Start the engine and ensure that the low oil pressure warning light goes out shortly after starting.
12. Stop the engine and adjust the engine oil level (see Oil Level Inspection).
13. Refit the rider's seat (see Rider’s Seat - Installation).

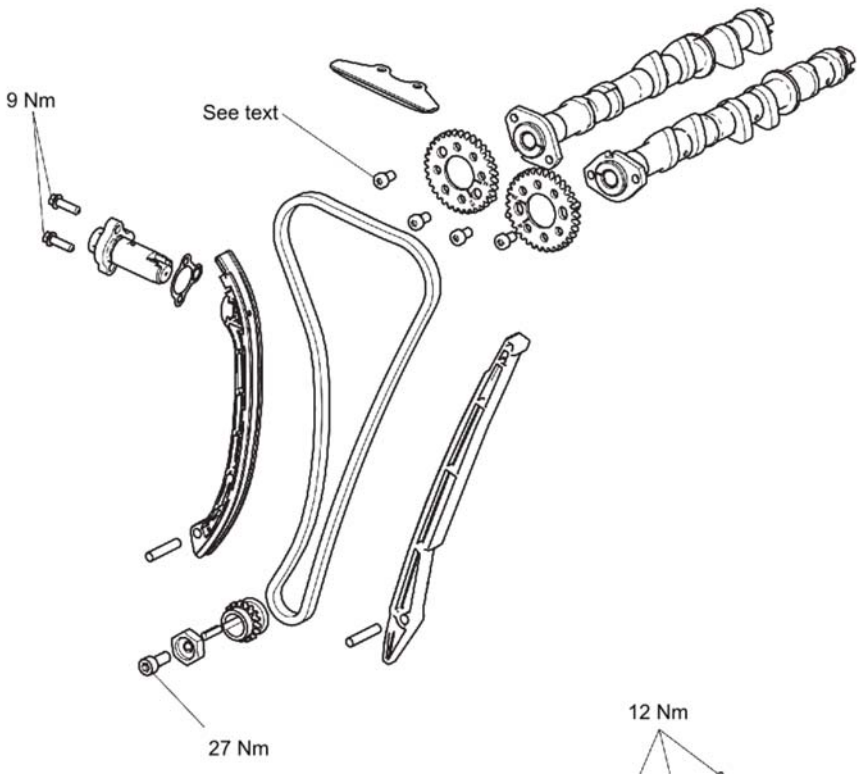
Cylinder Head

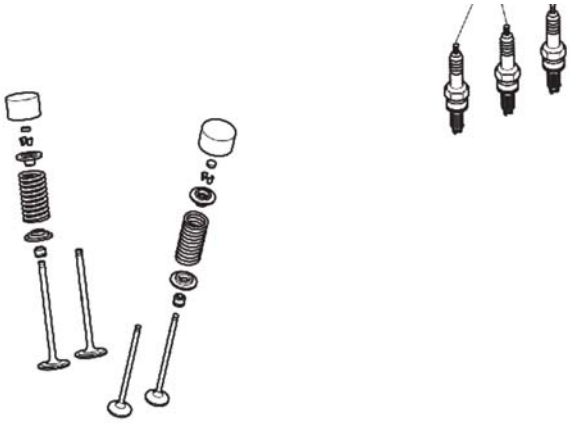
Exploded View - Cylinder Head





Exploded View - Camshaft, Camshaft Drive and Valves





Cylinder Head Description

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

The camshafts run directly in the cylinder head without separate bearings. Valve clearances are adjusted by changing variable thickness shims which sit between the valve tappet bucket and the valves.

The camshafts are driven by a silent-type drive chain, via a sprocket bolted to each of the camshafts, using slotted holes. The use of slotted holes allows the camshaft timing to be adjusted very accurately, to compensate for manufacturing tolerances in the camshaft drive system.

The chain is guided by two blades and is tensioned by a hydraulic tensioner.

The hydraulic tensioner is fed oil via a gallery in the cylinder head. 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 and when open sprays oil through a drilling in the tensioner blade onto the camshaft drive chain.

Oil is supplied to the cylinder head by a gallery in the crankcase. Once supplied to the head, the oil is distributed along internal drillings within the cylinder head casting and camshaft.

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

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

⚠ CAUTION

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

Camshaft Drive Chain Tensioner - Removal

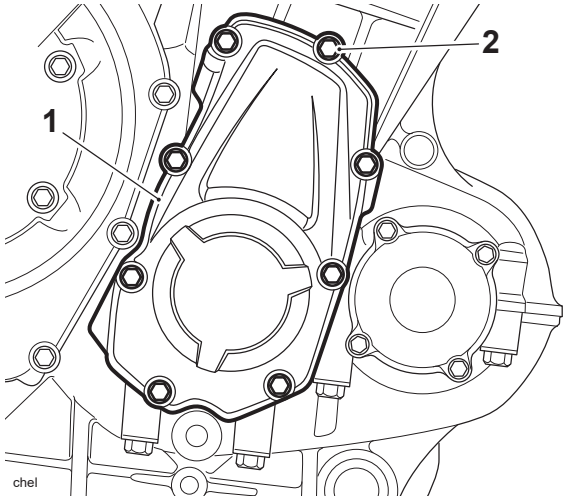
⚠ WARNING

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.

- Remove the camshaft cover (see Camshaft Cover - Removal).

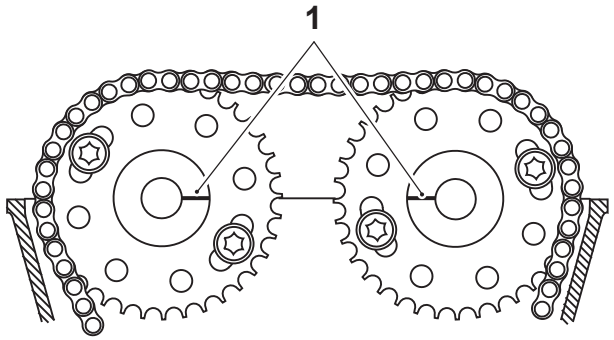
1. Remove the right hand crankshaft cover, noting the position of the encapsulated bolt. Discard the

encapsulated bolt.



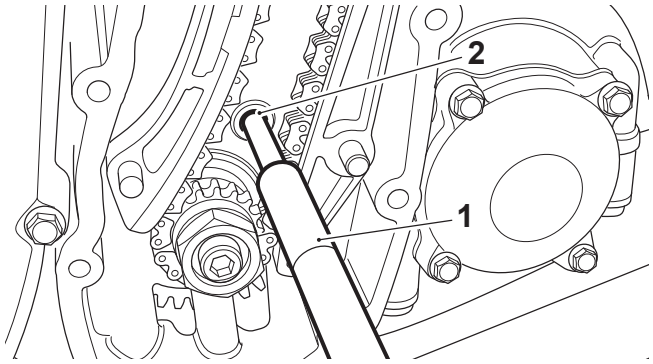
1. **Right hand crankshaft cover**
2. **Encapsulated bolt**

2. Rotate the crankshaft clockwise (the normal direction of rotation) using the bolt fitted to the end of the crankshaft. Stop rotation **just before** the marks on the camshaft bosses point inwards at a point level with the joint face.



1. **Alignment marks**

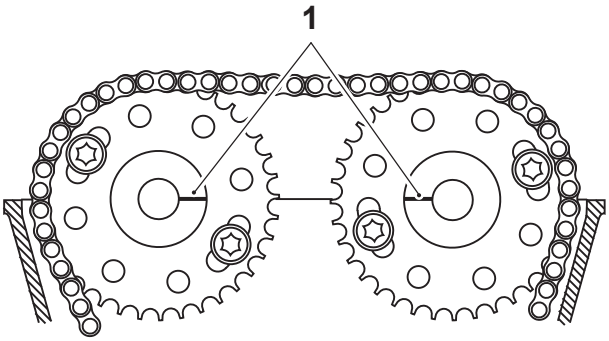
3. Insert T3880601 - Crankshaft Timing Pin into the timing hole in the crankcase.
4. Turn the engine clockwise until the pin can be inserted fully into the crankshaft.



1. **T3880601 - Crankshaft Timing Pin**
2. **Timing hole in crankcase**

Note

- **In addition to T3880601 - Crankshaft Timing Pin being installed in to the crankshaft at TDC, the alignment marks on the camshaft bosses will point inwards at a point level with the joint face.**



1. **Alignment marks**

5. Place a suitable wedge between the camshaft drive chain tensioner blade and crankcase, to hold the camshaft drive chain taut during removal of the tensioner.

WARNING

The hydraulic tensioner is under spring tension. Always wear hand, eye, and face protection when withdrawing the tensioner mounting bolts and take great care to minimise the risk of injury and loss of components.

Note

- **Note the orientation of the tensioner before removal.**

6. Evenly release the camshaft drive chain tensioner mounting bolts until the plunger spring tension has been released.
7. Remove the camshaft drive chain tensioner and discard the O-ring and gasket.

Camshaft Drive Chain Tensioner - 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.

Camshaft Drive Chain Tensioner - Installation

WARNING

WARNING

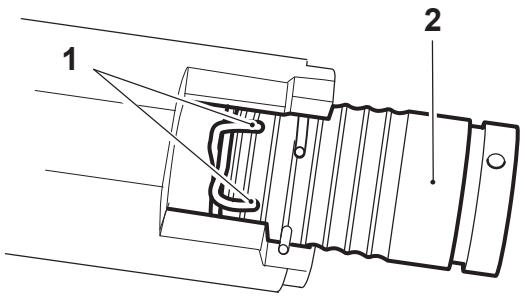
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

To set the camshaft drive chain tensioner onto the first tooth of the ratchet (i.e. minimum extension) carry out the following:

Note

- **If installing a new camshaft drive chain tensioner, do not release the plunger before fitting.**
- **If installing the original camshaft drive chain tensioner, the engine oil must be drained out of the tensioner to enable the plunger to be set onto the first tooth of the ratchet.**

1. Hold the resister ring ends together and pull out the plunger.



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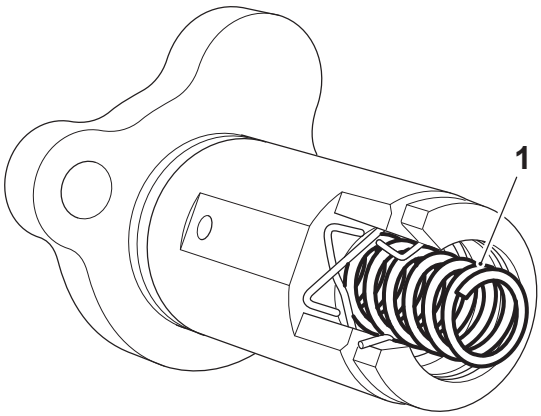
1. **Resister ring ends**
2. **Plunger**

2. Remove the spring.



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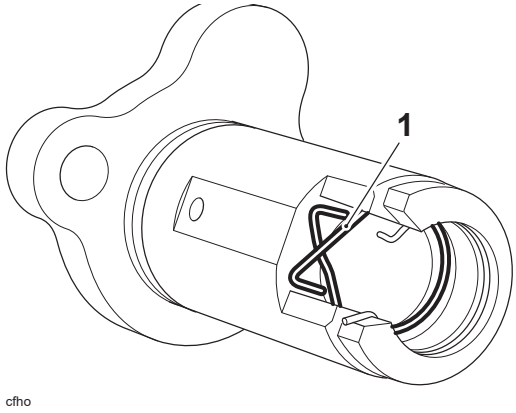
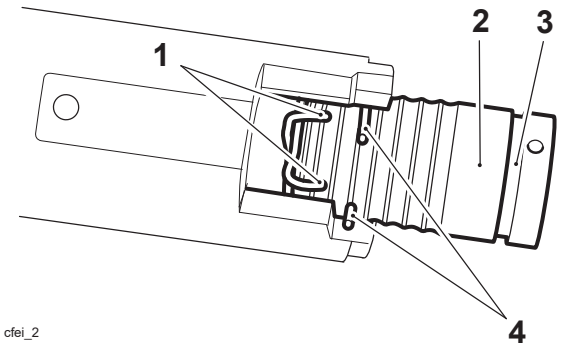
1. **Spring**

3. While holding the resister ring in place, pour out the engine oil into a suitable container.
4. Ensure the resister ring is correctly located as shown in the illustration below.



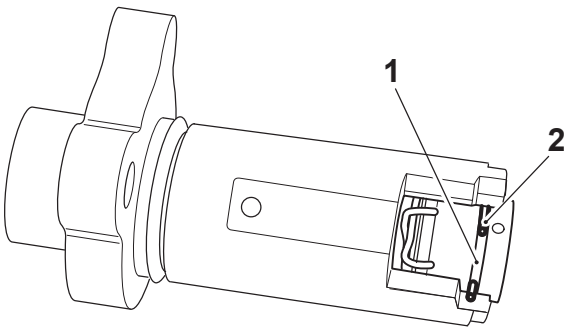
1. **Resister ring**

5. Refit the spring.
6. Hold the resister ends together and insert the plunger into the tensioner housing.
7. Place the tensioner in a soft jawed vice.
8. While holding the resister ends together, use the vice to push the plunger through the resister ring until the groove for the snap ring aligns with the snap ring.



1. **Resister ring**
2. **Plunger**
3. **Groove for snap ring**
4. **Snap ring**

9. When the groove aligns with the snap ring, release the resister ring and move one end of the snap ring into the groove. Slowly release the vice to ensure that the plunger is held in place.



cfej

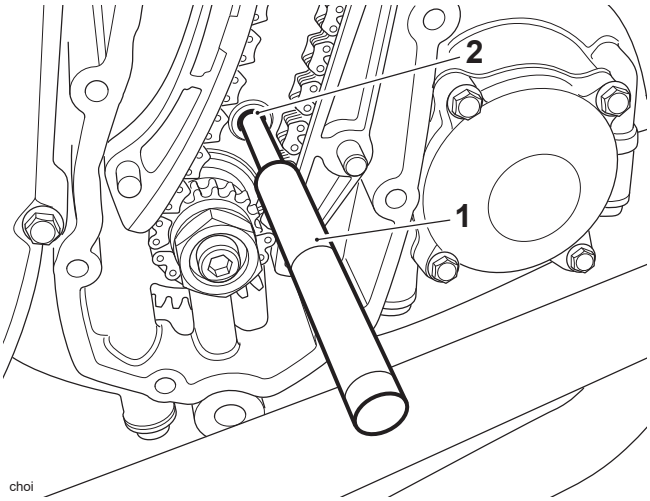
1. **Groove for snap ring**
2. **Snap ring**

10. Fit a new O-ring and gasket to the camshaft drive chain tensioner.
11. Fit the camshaft drive chain tensioner to the cylinder head as noted for removal. Tighten the bolts to **9 Nm**.
12. Remove the wedge, taking care not to move or damage the tensioner blade.
13. Remove T3880601 - Crankshaft Timing Pin.
14. To release the hydraulic tensioner, rotate the crankshaft 90° (¼ turn) anti-clockwise using the bolt fitted to the end of the crankshaft. Then rotate the crankshaft clockwise until T3880601 - Crankshaft Timing Pin can be inserted into the crankshaft.
15. Check that there is tension in the camshaft drive chain and the timing marks on the camshaft bosses are correctly aligned.

Note

- **After fitting to the engine, the hydraulic tensioner will be empty of engine oil. After starting the engine, the camshaft drive chain and tensioner blade will be noisy until full oil pressure is felt at the tensioner plunger. This could take up to five seconds.**

16. Check that the tensioner plunger is correctly located in the middle of the tensioner blade when viewed from above.
17. Rotate the engine through four full revolutions, and reset number 1 cylinder to TDC. Ensure that T3880601 - Crankshaft Timing Pin can be inserted fully into the timing hole in the crankcase and crankshaft.



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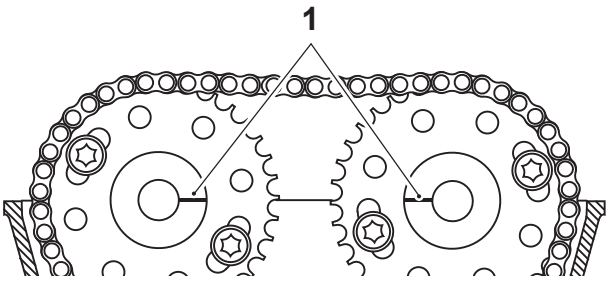
1. **T3880601 - Crankshaft Timing Pin**
2. **Timing hole in crankcase**

18. Check that the camshaft boss timing marks align as illustrated below.



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1. Camshaft Boss to Cylinder Head Alignment Marks

19. Re-check the tensioner plunger location against the tensioner blade.
20. Remove T3880601 - Crankshaft Timing Pin.
    - Refit the camshaft cover (see Camshaft Cover - Installation).
    - Refit the crankshaft cover (see Crankshaft Cover - Installation).

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.

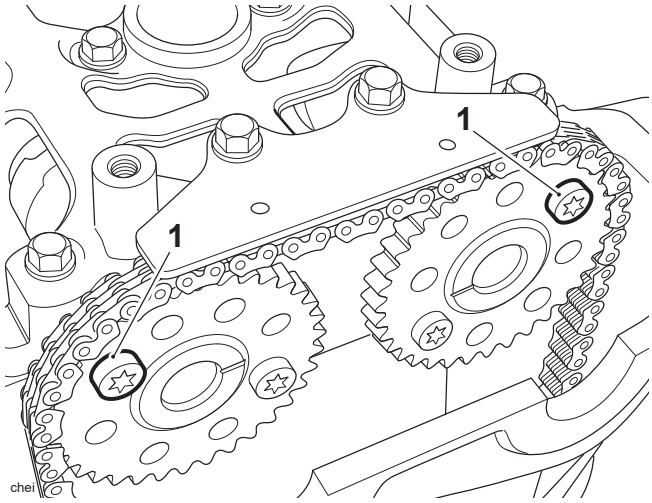
- Remove the camshaft cover (see Camshaft Cover - Removal).
- Remove the crankshaft cover (see Crankshaft Cover - Removal).

1. Remove the spark plugs to reduce compression resistance when turning the engine.
2. Rotate the engine using the 24 mm hexagon on the end of the crankshaft so any two camshaft sprocket fixings are accessible.

Note

- **The camshaft sprocket fixings need only be loosened sufficiently to allow the sprockets to rotate on the camshafts.**
- **The camshaft sprocket fixings are encapsulated and must never be reused if loosened or removed; however new fixings should only be installed during final tightening after the timing procedure has been completed.**
- **If the sprockets are to be removed from the camshafts, temporarily refit the sprockets for timing adjustment using the old fixings, and only install new fixings during final tightening.**

3. Loosen the two camshaft sprocket fixings. Do not remove the fixings at this stage.



1. Fixings

4. Rotate engine until the remaining two fixings are accessible.

CAUTION

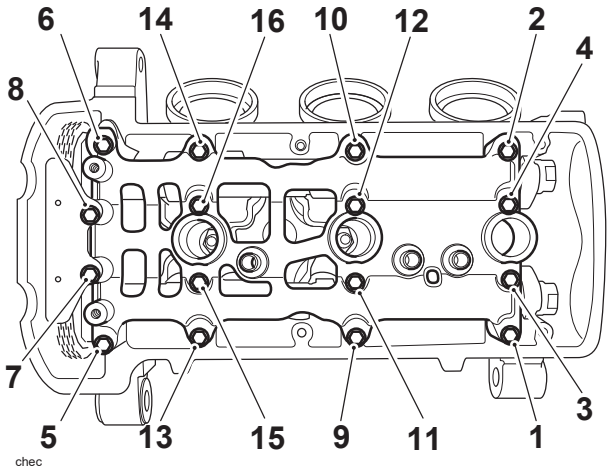
Do not rotate the engine further once the four camshaft sprocket bolts have been loosened. Rotation of the engine with the four sprocket bolts loose will result in valve to piston contact and serious engine damage.

5. Loosen the two remaining camshaft sprocket fixings. Do not remove the fixings at this stage.

Note

- **Note the orientation of the tensioner before removal.**

6. Evenly release the camshaft drive chain tensioner mounting bolts until the plunger spring tension has been released.
7. Remove the tensioner and discard the O-ring and gasket.
8. Note the orientation of the camshaft ladder in relation to the head.
9. Progressively release the bolts securing the camshaft ladder to the head in the sequence shown below.



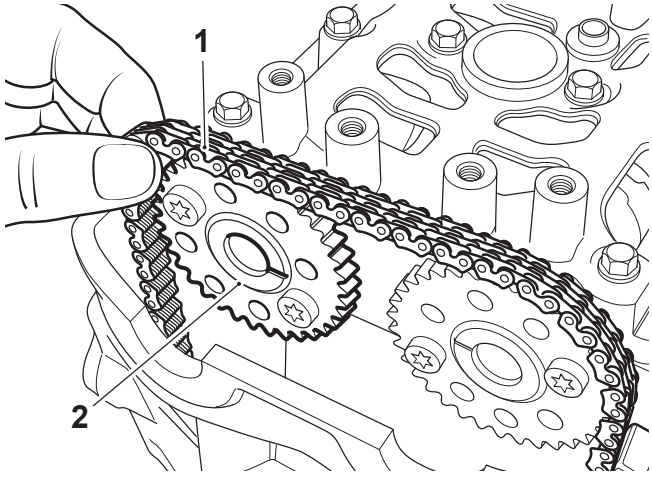
Camshaft Ladder Bolt Release Sequence

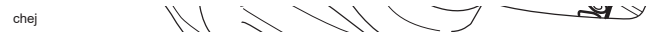
10. Remove the camshaft ladder and top pad, and collect the dowels (if loose) and spark plug tower O-rings.

Note

- **Each camshaft and sprocket is removed as an assembly.**

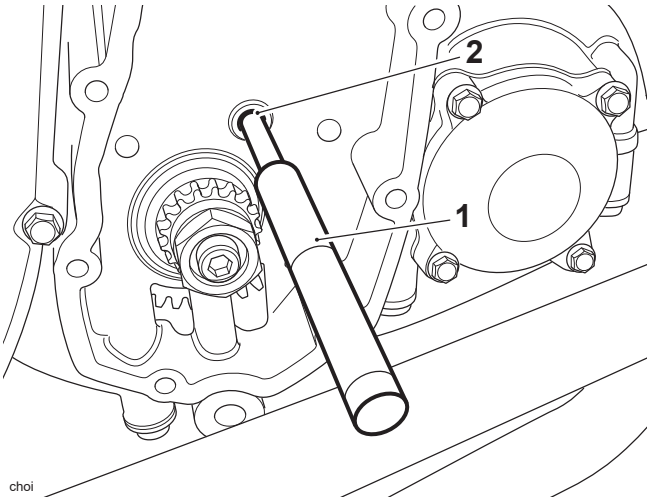
11. Lift the camshaft drive chain from the inlet camshaft sprocket and remove the inlet camshaft.
12. Lift the camshaft drive chain from the exhaust camshaft sprocket and remove the exhaust camshaft.





1. **Camshaft drive chain**
2. **Inlet camshaft**

13. Remove the camshaft drive chain and if necessary the tensioner blade and rubbing strip (see Camshaft Drive Chain, Tensioner Blade and Rubbing Strip - Removal).
14. Rotate the crankshaft and insert T3880601 - Crankshaft Timing Pin. Ensure the crankshaft can no longer rotate.



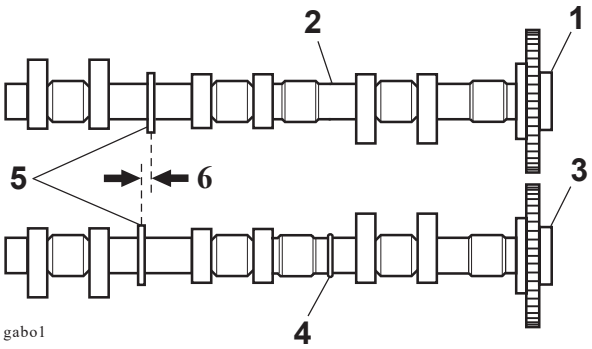
1. **T3880601 - Crankshaft Timing Pin**
2. **Timing hole in crankcase**

15. At this stage the camshafts and sprockets can be separated if required.

Camshaft and Sprocket Identification

Note

- **The inlet and exhaust camshafts are different. They can be identified by a raised section in the centre of the exhaust camshaft and a plain section in the same place on the inlet camshaft. In addition, the thrust faces on each camshaft are offset from each other, which prevents the camshafts being fitted incorrectly.**



1. **Inlet camshaft**
2. **Plain section**
3. **Exhaust camshaft**
4. **Raised section**
5. **Thrust faces**
6. **Offset**

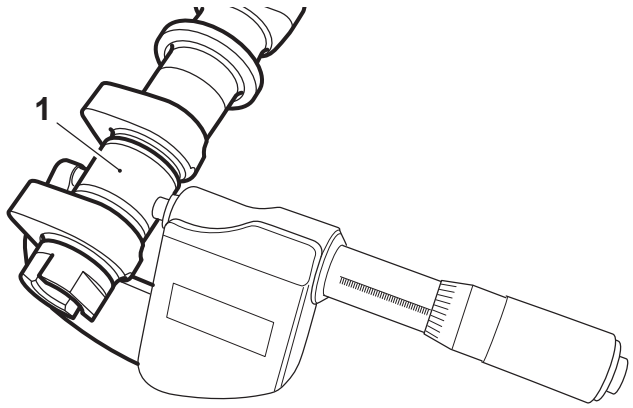
The same sprocket is used for both inlet and exhaust camshafts, and is attached to the camshaft using slotted bolt holes. The same holes are used when fitting the sprocket to either camshaft.

Note that the mark on the camshaft boss is not a timing mark, it is used as a visual aid during the timing adjustment procedure.

Accurate camshaft timing can only be obtained using the correct timing method and service tools (see Camshafts - Installation).

Camshaft and Bearing Cap Inspection

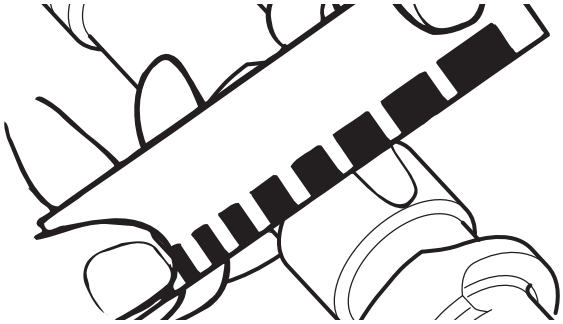
1. Inspect the camshaft sprockets for damaged and worn teeth. Replace as necessary.
2. Measure the camshaft journals with a micrometer. If any journal is outside the specified tolerance, replace the camshaft.
3. For specifications refer toCamshafts.



cheg

1. **Camshaft journal**

4. Examine all camshaft and camshaft bearing caps for excessive wear and damage.
5. Check the journal-to-head clearances, using 'Plastigauge' (Triumph part number 3880150-T0301) as follows:
   - Wipe the exposed areas of both the camshaft journal and a single cap or cap area of the ladder.
   - Apply a thin smear of grease to the journal and a small quantity of silicone release agent to the cap.
   - Size a length of the Plastigauge to fit across the camshaft journal. Fit the Plastigauge to the camshaft journal using the grease to hold the strip in place.
   - Ensuring that the camshaft sprocket alignment marking is located as for removal, refit the camshaft cap ladder then evenly and progressively tighten the ladder bolts to **10 Nm** in the correct sequence (see Camshafts - Installation).
   - Release the bolts and remove the ladder. Using the gauge provided with the Plastigauge kit, measure the width of the now compressed Plastigauge.



Measuring the Compressed Plastigauge

Note

- **The camshaft ladder is unique to each cylinder head and is, therefore, not available separately. If the camshaft ladder is worn or damaged, the complete cylinder head must be replaced.**

6. Calculate the journal clearance using the Plastigauge chart supplied with the Plastigauge kit.
7. For specifications refer toCamshafts.
8. If the clearance measured is within the specified tolerance, remove the cap/ladder and clean off all traces of Plastigauge. Assemble the camshafts (see Camshafts - Installation).

CAUTION

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

Camshafts - Installation

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

The camshaft sprockets are attached to the camshafts using slotted bolt holes. This allows for very accurate valve timing and therefore improved performance and fuel economy.

Never fit the camshaft sprockets without correctly setting the camshaft timing using the service tools and timing procedure described below. Severe engine damage will result from incorrect valve timing adjustment.

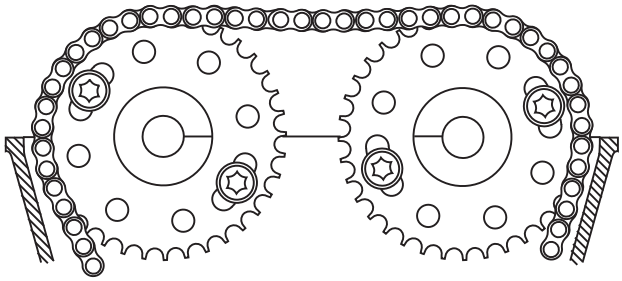
1. Check that T3880601 - Crankshaft Timing Pin is installed. Ensure the crankshaft cannot rotate.
2. Thoroughly clean the camshafts and journals. Inspect the ends of the camshafts for correct fitment of the sealing plugs. Lubricate the camshafts with clean engine oil before fitting to the cylinder head.
3. If removed, refit the camshaft sprockets noting their orientation, and secure using the original bolts. DO NOT tighten the fixings at this stage, the sprockets must be free to rotate.
4. Refit the camshaft drive chain and if removed the tensioner blade and rubbing strip (see Camshaft Drive Chain, Tensioner Blade and Rubbing Strip - Installation).

Note

- **Locate each camshaft to the head ensuring the camshafts are correctly identified (inlet and exhaust) and are also correctly located over their respective valve banks.**

5. Refit the exhaust camshaft to the cylinder head, hooking the camshaft drive chain over the sprocket as you do so.

6. Ensure there is no slack between the crankshaft and exhaust sprocket when the sprocket fixings are centrally located within the slotted holes.
7. Refit the inlet camshaft to the cylinder head, hooking the chain over the sprocket as you do so.
8. Ensure the fixings on the inlet sprocket are also centrally located within the slotted holes when there is no slack between the exhaust and inlet sprockets.
9. Check that the chain is correctly located around the crankshaft, and both camshaft sprockets.
10. Rotate the camshafts until the alignment marks on the end of the camshaft journals are pointing towards one another.



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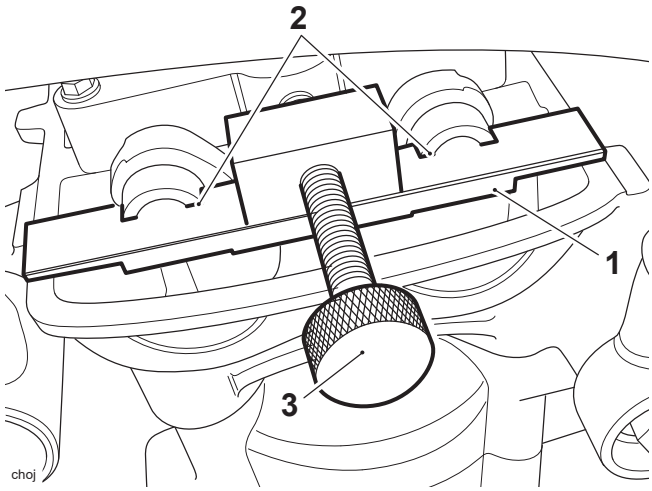
Camshaft Boss to Cylinder Head Alignment Marks

⚠ CAUTION

The T3880640 - Camshaft Timing Plate must be located centrally between the camshafts. Incorrect positioning of the tool may prevent the camshaft ladder locating correctly to the cylinder head during fixing tightening, resulting in incorrect valve timing being set. Severe engine damage will result from incorrect valve timing adjustment.

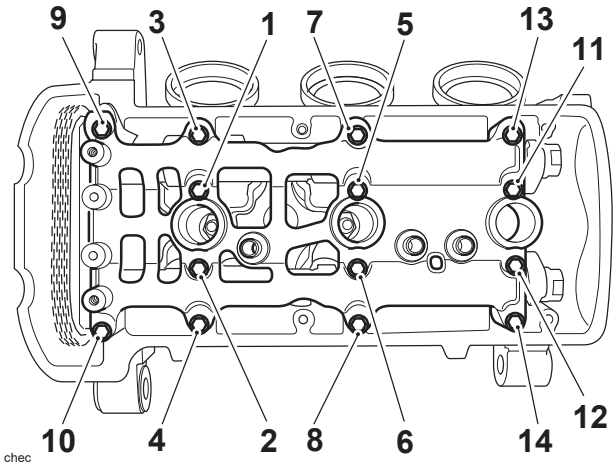
11. Insert T3880640 - Camshaft Timing Plate into the camshaft slots, ensuring the removal screw is unscrewed fully, as shown below. Ensure that the tool is centrally located between the camshafts.



1. **T3880640 - Camshaft Timing Plate**
2. **Camshaft slots**

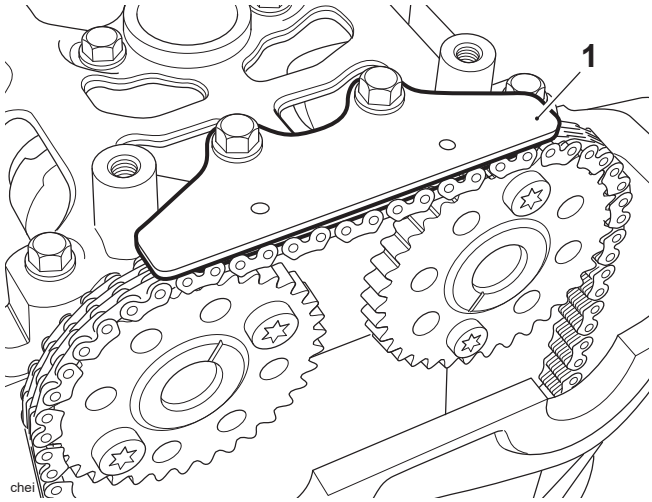
3. **Removal screw**

12. Assemble the camshaft ladder in the same location and orientation as prior to removal. Do not fit the top pad at this stage.
13. Fit and evenly tighten the camshaft ladder fixings to **10 Nm**, in the sequence shown below, ensuring that T3880640 - Camshaft Timing Plate remains centrally located between the camshafts.



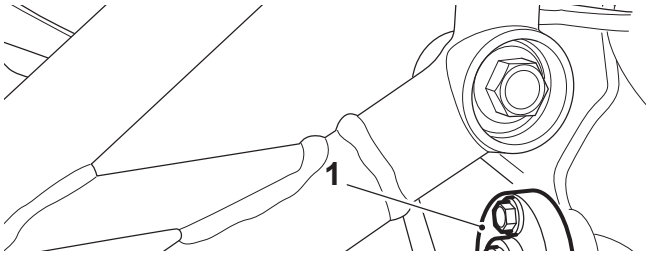
Camshaft Ladder Fixing Tightening Sequence

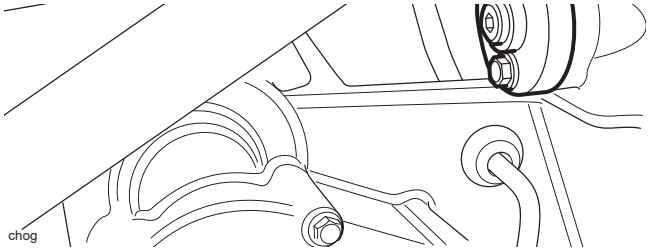
14. Refit the top pad and tighten the fixings to **10 Nm**.



1. **Camshaft drive chain top pad**

15. Remove and discard the fir tree clip, located on the cylinder head, on the camshaft drive chain tensioner mounting face.
16. Fit T3880607 - Camshaft Timing Tensioner using the original fixings and tighten to **9 Nm**.

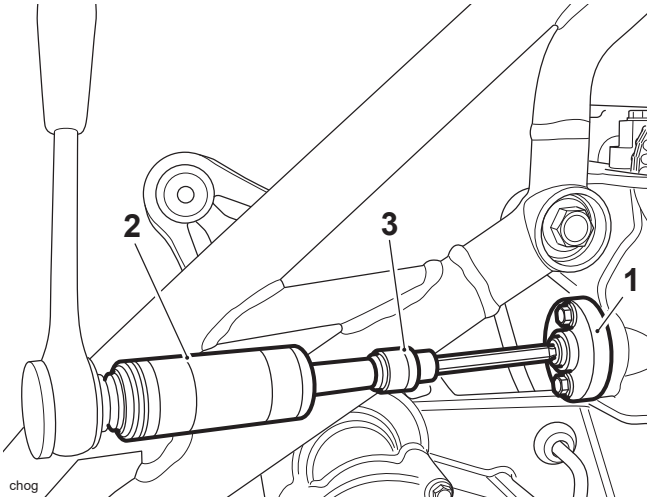




1. **T3880607 - Camshaft Timing Tensioner**

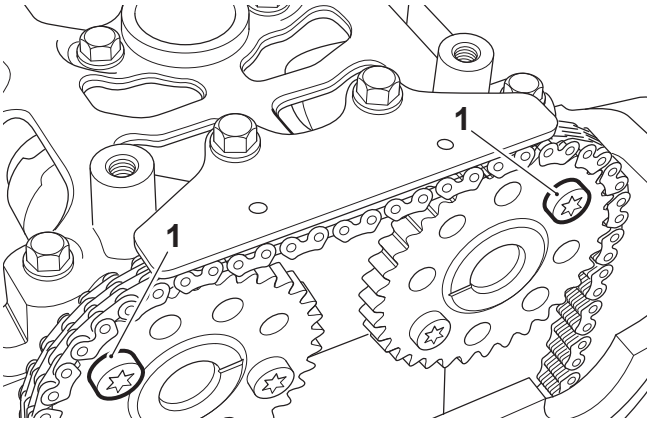
> **⚠ CAUTION**
>
> The torque value stated is very important to accurate timing. Always use the correct value of **0.6 Nm**, as set using the Torque Limiter T3880609. Using an incorrect torque value will result in incorrect valve timing being set, or damage to the tensioner blade or other valve train components. Either condition may result in serious damage to the engine, reduced engine performance, or reduced fuel economy.

17. Using T3880609 - Torque Limiter, and the 6 mm Ball Ended Allen Key supplied, tighten the Camshaft Timing Tensioner T3880607 to **0.6 Nm** preset by T3880609 - Torque Limiter.



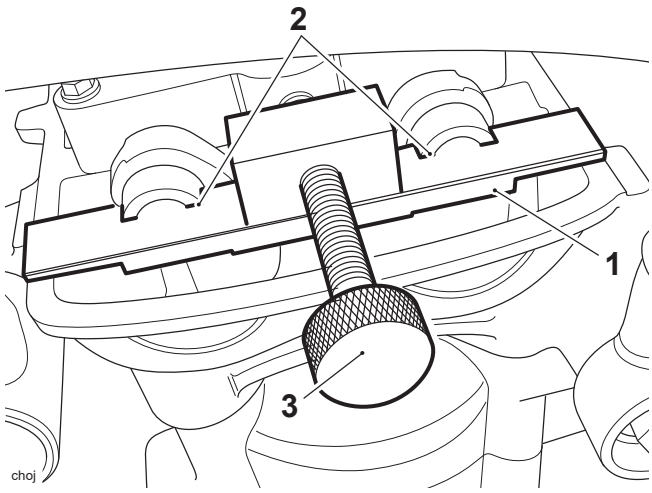
1. **T3880607 - Camshaft Timing Tensioner**
2. **T3880609 - Torque Limiter**
3. **6 mm Ball Ended Allen Key**

18. Remove and discard the two accessible (uppermost) camshaft sprocket fixings, and replace with new fixings. Tighten to **22 Nm**.



1. **Uppermost fixings**

19. Remove T3880640 - Camshaft Timing Plate by rotating the removal screw clockwise as shown below.



1. **T3880640 - Camshaft Timing Plate**
2. **Removal screw**

20. Remove T3880601 - Crankshaft Timing Pin.

⚠ CAUTION

Always check that T3880640 - Camshaft Timing Plate has been removed before rotating the engine. Severe damage will result to the camshafts or T3880640 - Camshaft Timing Plate if engine rotation is attempted with the tool installed.

21. Rotate the engine until the remaining two sprocket fixings are accessible.
22. Remove and discard the two remaining camshaft sprocket fixings, and replace with new fixings. Tighten to **22 Nm**.
23. Place a suitable wedge between the camshaft drive chain tensioner blade and crankcase, to hold the camshaft drive chain taut during removal of T3880607 - Camshaft Timing Tensioner.
24. Release the tension on T3880607 - Camshaft Timing Tensioner and remove it.
25. Refit the camshaft drive chain tensioner, incorporating a new gasket and O-ring (see Camshaft Drive Chain Tensioner - Installation).
26. Fit a new fir tree clip into the hole on the camshaft drive chain tensioner mounting face.
27. Rotate the engine until T3880601 - Crankshaft Timing Pin can be refitted.
28. Recheck that the timing marks are still approximately aligned (to check that the camshaft timing has not moved during the removal of T3880607 - Camshaft Timing Tensioner).
29. Remove T3880601 - Crankshaft Timing Pin.
30. Check the valve clearances (see Valve Clearance Measurement). Adjust as necessary (see Valve Clearance Adjustment).

Valve Clearances

Camshaft, valve, valve shim and valve seat wear affects the valve clearances. The effect of this wear is to change the gap between the camshaft and tappet bucket, causing engine noise and improper running. If the valve clearances become too small, permanent damage to the valve and valve seat will take place. If the valve

clearance becomes too great, the engine will become noisy and will not run correctly.

Valve Clearance Measurement

Note

- **Valve clearance measurement must be carried out with the engine cold.**
- Remove the camshaft cover (see Camshaft Cover - Removal).
- Remove the crankshaft cover (see Crankshaft Cover - Removal).

1. Remove the spark plugs to reduce compression resistance when turning the engine.
2. Rotate the engine using the 24 mm hexagon on the end of the crankshaft until a pair of camshaft lobes are positioned pointing away from the valves.
3. Using feeler gauges, measure and record the clearances for this pair of valves only.
4. Repeat the process until the valve clearances for all valves have been checked.

Note

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

5. For the inlet and exhaust valve clearances (see Cylinder Head and Valves).

⚠ CAUTION

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

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

Typical Valve Clearance Chart

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

5	as measured (mm)
6	as measured (mm)

Valve Clearance Adjustment

Note

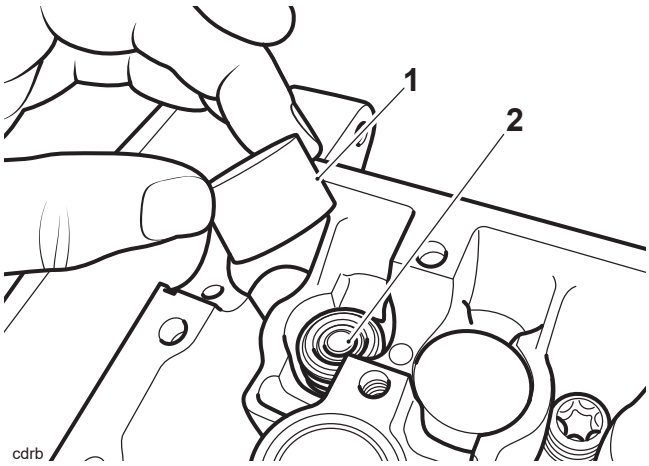
- **To adjust the valve clearances the camshafts must be removed.**

1. Remove the camshafts (see Camshafts - Removal).
2. Remove the tappet bucket from the cylinder head.

Note

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

3. Remove the shim from the valve head.



1. **Tappet bucket**
2. **Shim**

4. Measure the original shim using a micrometer and select the appropriate new shim as required.
   - **Clearance too small** - Fit a thinner shim.
   - **Clearance too large** - Fit a thicker shim.

Note

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

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

Camshaft Drive Chain, Tensioner Blade and Rubbing Strip - Removal

⚠ WARNING

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.

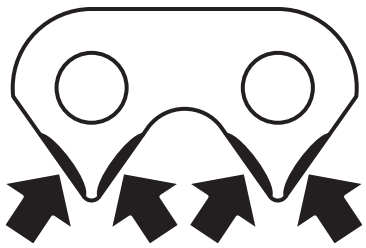
- Remove the camshafts (see Camshafts - Removal).

1. Remove the tensioner blade pin and remove the tensioner blade through the right hand crankshaft cover opening in the crankcase.
2. Remove the rubbing strip pin and allow the rubbing strip to drop. This will allow the camshaft drive chain to be unhooked from the crankshaft sprocket.
3. Unhook the camshaft drive chain from the crankshaft sprocket and remove it through the right hand crankshaft cover opening in the crankcase.
4. Remove the rubbing strip through the right hand crankshaft cover opening in the crankcase.

Camshaft Chain - Inspection

Visual in situ checks can also be made as follows:

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



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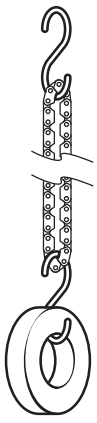
For a more thorough check, proceed as follows:

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



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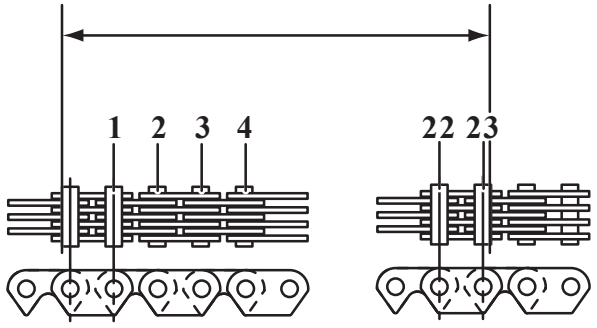
3. Measure across 23 links as shown in the diagram below. If the drive chain is within limits, the measurement should be no longer than 150.14 mm. Measurements beyond 150.14 mm indicate that the drive chain must be replaced.



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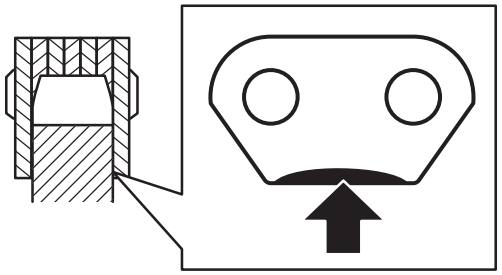
4. Check for severe wear of the inner surface of the outer plates at the side-contact points with the sprocket teeth.



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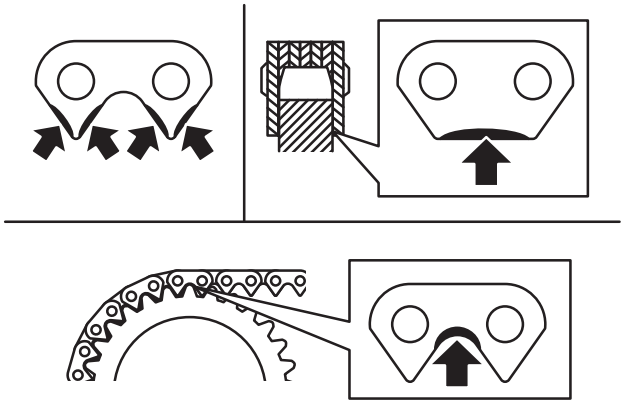
5. Check for signs of stiffness or kinking.
6. Check for severe wear of the plates in the area shown below.



caju

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

Camshaft Drive Chain Tensioner Blade and Rubbing Strip - Inspection

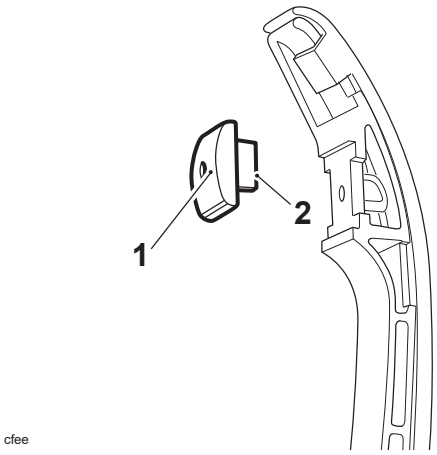
1. Check the camshaft drive chain tensioner blade and rubbing strip for wear or damage. Renew if worn or damaged.

Camshaft Drive Chain Tensioner Blade - Disassembly

Note

- **For the purpose of this instruction, the top of the tensioner blade is where the pad is located.**

1. Release the clips and remove the pad.



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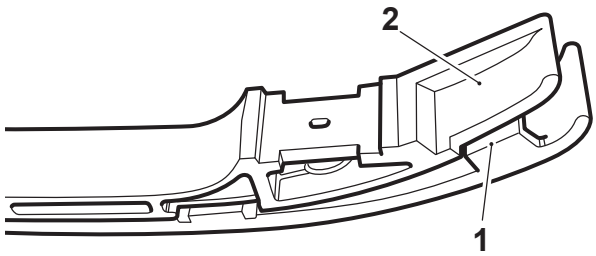
1. **Pad**
2. **Clip (one side shown)**

2. Detach the top hook from the tensioner blade.



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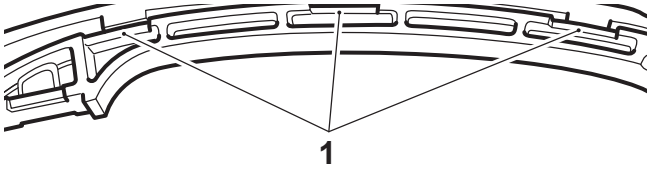
1. **Top hook**
2. **Tensioner blade**

3. Release the three side locating devices.



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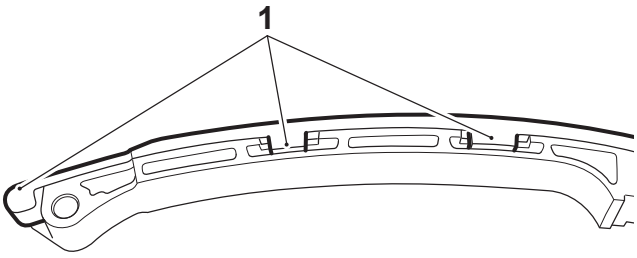
1. **Locating devices**
2. **Facing blade**

4. Release the three hooks and remove the facing blade.



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1. **Hooks**

Camshaft Drive Chain Tensioner Blade - Assembly

1. Assembly is the reverse of disassembly (see Camshaft Drive Chain Tensioner Blade - Disassembly).

Camshaft Drive Chain, Tensioner Blade and Rubbing Strip - Installation

⚠ 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. Loosely refit the rubbing blade. Do not fit the pin at this stage.
2. Lower the chain through the cylinder head opening and hook over the crankshaft sprocket. Support the chain at its upper end until the camshafts are refitted.
3. Refit the tensioner blade, ensuring that the camshaft drive chain is correctly seated on the facing blade and secure with the pin.
4. Reposition the rubbing blade, ensuring that the camshaft drive chain is correctly seated on the rubbing blade and secure with the pin.

- Refit the camshafts (see Camshafts - Installation).

Cylinder Head - Removal

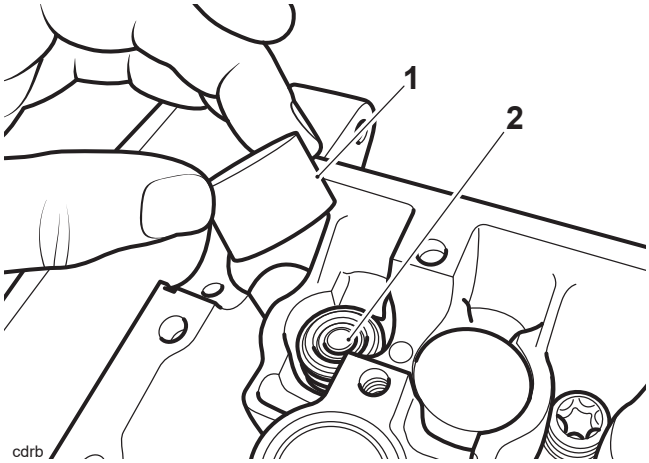
WARNING

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

Note

- **The cylinder liners must be resealed once the cylinder head has been removed.**
- Remove the engine from the frame (see Engine - Removal).
- Remove the camshafts (see Camshafts - Removal).
- Remove the camshaft drive chain, tensioner blade and rubbing strip (see Camshaft Drive Chain, Tensioner Blade and Rubbing Strip - Removal).

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

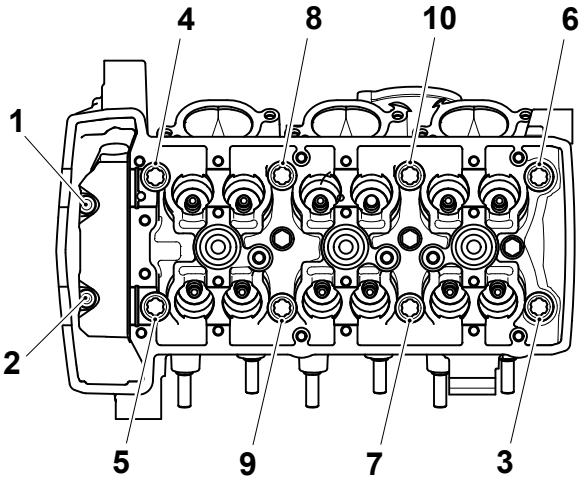


1. **Tappet bucket**
2. **Shim**

Note

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

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



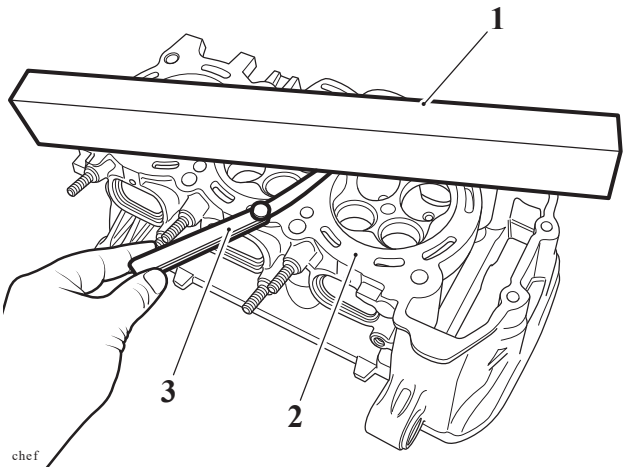
Cylinder Head Bolt Release Sequence

3. Lightly tap the cylinder head with a rubber mallet to break the seal of the gasket.
4. Lift the head directly upwards until clear of the camshaft drive chain rubbing blades.

Cylinder Head - Inspection

Cylinder Head - Installation

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



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

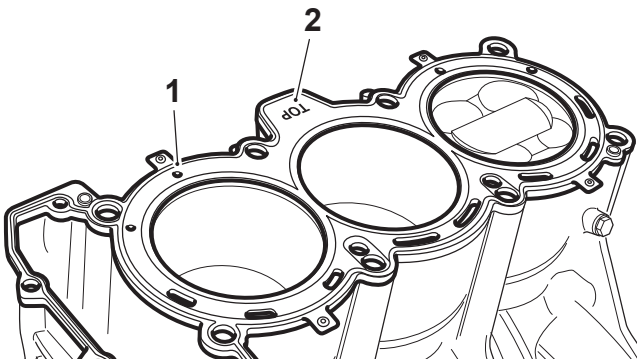
3. For specifications refer to Cylinder Head and Valves.

⚠ 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.

- Remove and re-seal the cylinder liners (see Cylinder Liners - Removal).

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



1. **Cylinder head gasket**
2. **TOP marking**

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

⚠ CAUTION

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

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

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

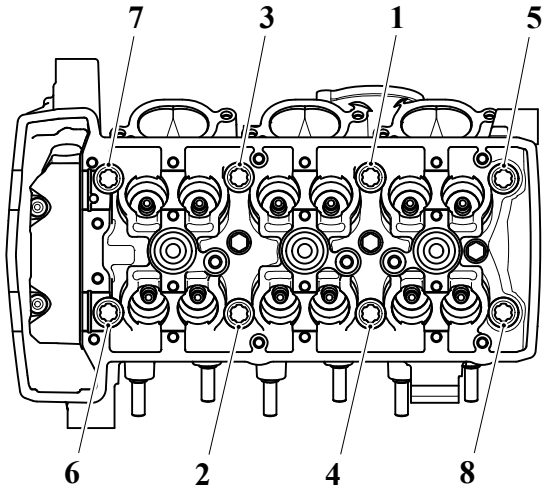
Tighten the bolts using the three-stage procedure given below.

Failure to observe these important items may damage the head gasket and lead to severe engine damage.

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

Note

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



Cylinder Head Bolt Tightening Sequence

6. **Stage A**
   - Tighten the head bolts in the sequence shown above to **20 Nm**.
7. **Stage B**
   - Tighten the head bolts in the sequence shown above to **40 Nm**.

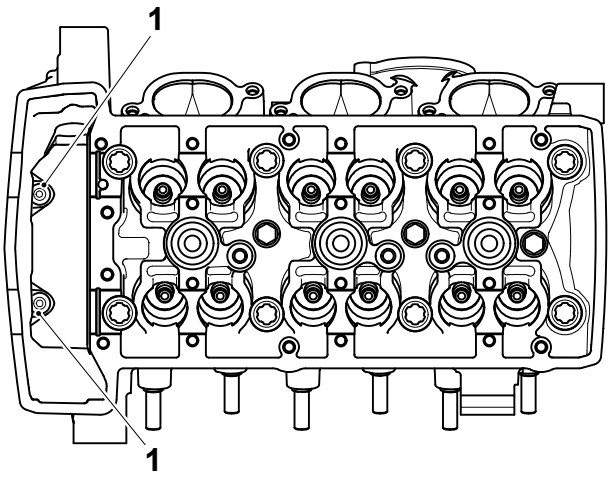
Note

- **For the final torque operation, which again is carried out in the sequence shown above, a 'torque**

Note

turn' method is used. The bolts must be turned by 90° to reach the final setting. To accurately gauge the 90° turn, use T3880105 - Angular Torque Gauge as follows:

8. **Stage C**
   - Fit the torque turn gauge between the Torx socket and the drive handle and locate the Torx drive to the head bolt. Pick an increment point on the torque turn gauge which aligns with a suitable reference point on the head. Tighten the bolts until nine of the 10° gauge increments have rotated past the chosen point on the head.
9. Fit the screws securing the side of the cylinder head to the crankcase and tighten to **10 Nm**.



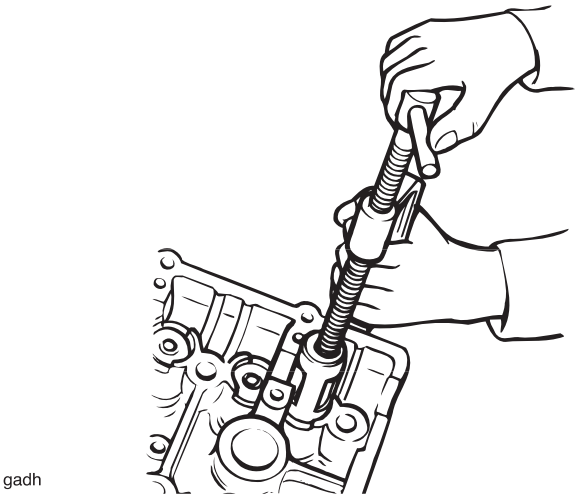
1. Cylinder head to upper crankcase screws

10. Clean and lubricate the tappet buckets with clean engine oil and refit the buckets and shims in the same locations from which they were removed.
- Refit the camshaft drive chain, tensioner blade and rubbing strip (see Camshaft Drive Chain, Tensioner Blade and Rubbing Strip - Installation).
- Refit the camshafts (see Camshafts - Installation).
- Install the engine to the frame (see Engine - Installation).

Valves and Valve Stem Seals - Removal from the Cylinder Head

Cylinder Head Valve Guide Wear Check

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



gadh

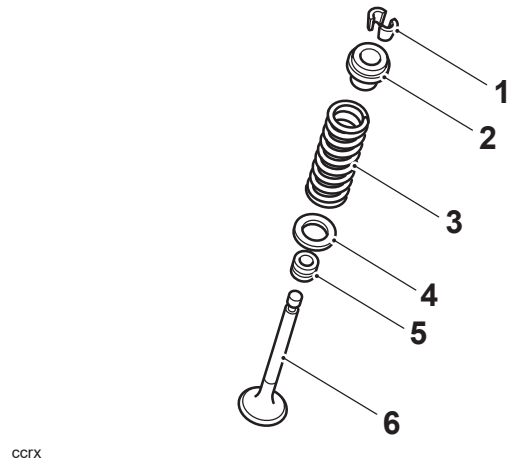
Valve Removal

2. Once the collets are released, remove the following items:
   - Collets
   - Valve spring retainer
   - Valve spring
   - Valve stem seal
   - Spring platform
   - Valve (de-burr before removal).

1. **Valve stem seal**

Note

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



1. **Collets**
2. **Valve spring retainer**
3. **Valve spring**
4. **Valve spring platform**
5. **Stem oil seal**
6. **Valve**

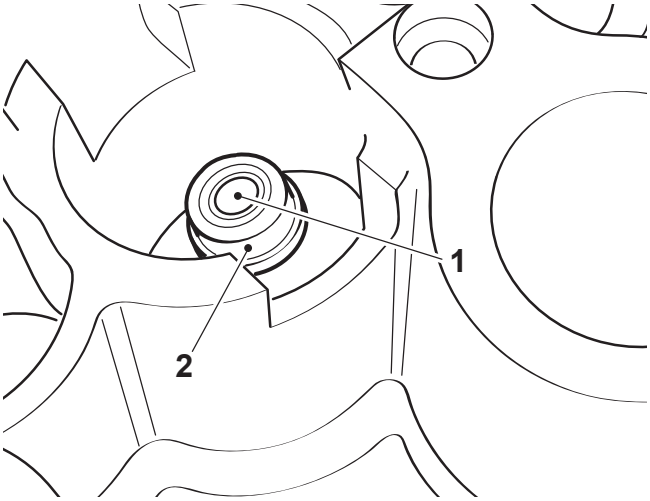
Perform the following operations:

- Remove the cylinder head, see Cylinder Head - Removal.
- Remove the cylinder head valve springs, see Valves and Valve Stem Seals - Removal from the Cylinder Head.

Note

- **Do not remove the valve or valve stem seal.**

1. Position the valve so that the valve stem end is level with the valve stem seal (the valve must remain in this position for the duration of the test).



1. **Valve stem end**
2. **Valve stem seal**

Note

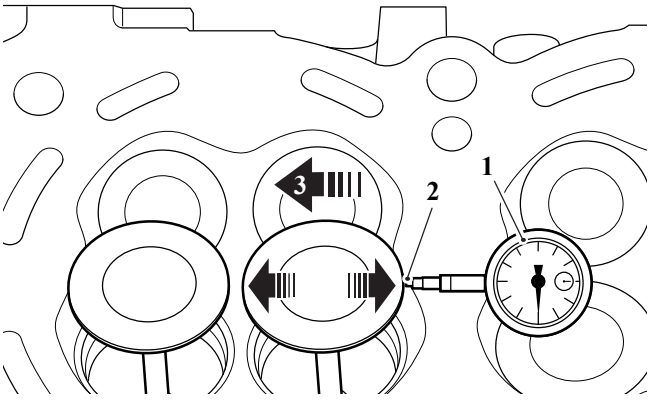
- **Excessive force must not be used when measuring the valve guide wear. Excessive force will bend the valve stem and give a false reading.**

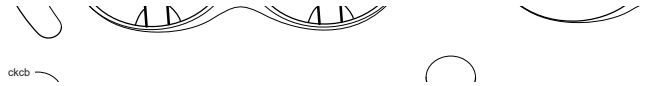
2. The valve should be gently rocked to one side of the valve guide in line with the camshaft.

Note

- **A flat ended contact point must be fitted to the dial gauge.**
- **Ensure the dial gauge is level and is in line with the directional movement of the valve being checked.**

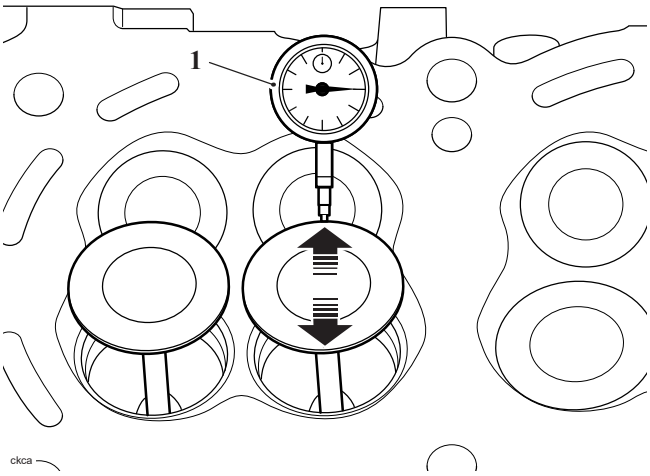
3. Secure a dial gauge to the cylinder head such that the clamping device will not damage any of the cylinder head surfaces.
4. Position the dial gauge to the valve head on the opposite side to where the valve has made contact to the valve guide, as shown in the illustration below.





1. **Dial gauge**
2. **Flat ended contact point**
3. **Direction valve rocked to valve guide**

5. Zero the dial gauge.
6. Gently rock the valve to the opposite side of the valve guide in line with the camshaft and note the reading on the dial gauge.
7. Repeat steps two to six but with the rocking of the valve head at 90° to the original measurement, as shown in image below. Note the reading on the dial.



1. **Dial gauge**

8. The maximum movement of the valve in either direction must be less than 0.5 mm.

Note

- **Due to the methods used to assemble the valve guides, these parts cannot be replaced. If the maximum movement of the valve exceeds 0.5 mm in either direction, the cylinder head must be replaced.**
- Install the cylinder head valve springs, see Valves and Valve Stem Seals - Installation.
- Install the cylinder head, see Cylinder Head - Installation.

Valve Face Inspection

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

Valves and Valve Stem Seals - Installation

1. Apply a thin coat of molybdenum disulphide grease to the valve stem.
2. Install the valve into the valve guide and refit the spring platform to the valve spring recess in the head.
3. Fit the valve stem seal over the valve stem and, using a suitable tool, press down fully until the seal is correctly seated over the valve guide.

Note

- **During fitment of the valve stem seal, two distinctly different degrees of resistance will be noted when the seal is correctly fitted.**
- **Firstly, press the seal down the valve stem until the lower side of the seal comes into contact with**

Note

the valve guide. Greater resistance is felt at this contact point and further gentle pressure is then required to locate the seal over the top end of the valve guide.

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

⚠ CAUTION

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

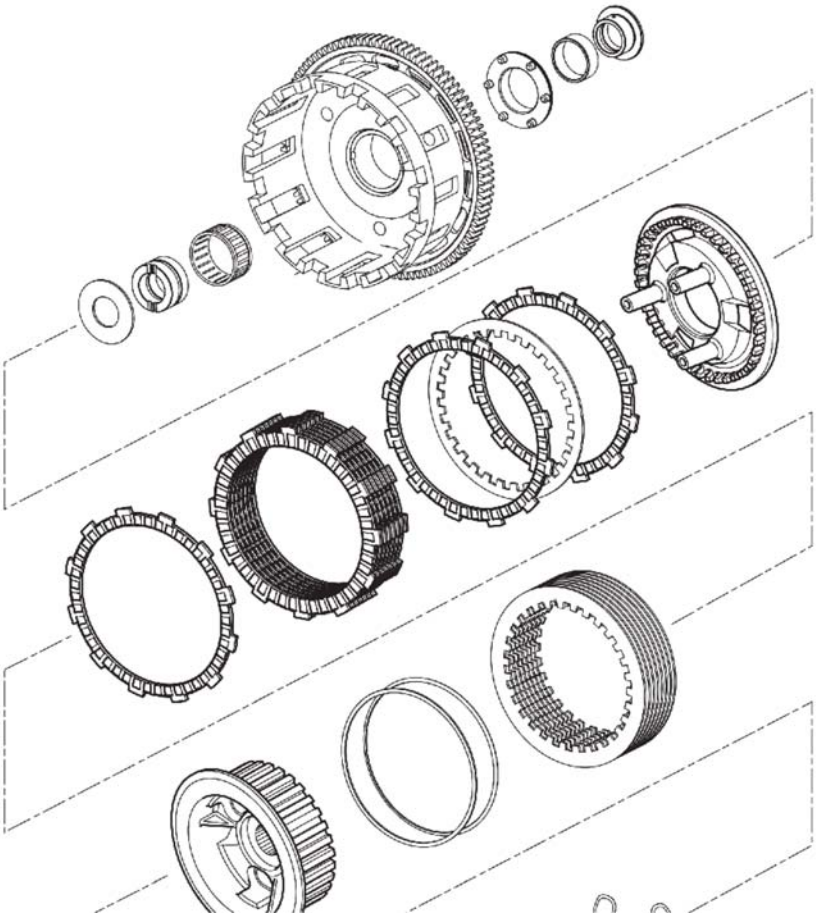
4. Install the valve spring over the valve stem.
5. Compress the valve spring ensuring that the spring is compressed squarely to prevent damage to the valve stem and cylinder head.
6. Fit the valve collets ensuring correct collet location in the spring retainer and valve as the spring compressor is released.

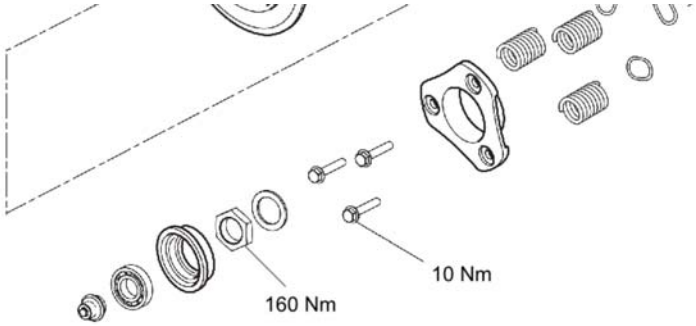
⚠ CAUTION

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

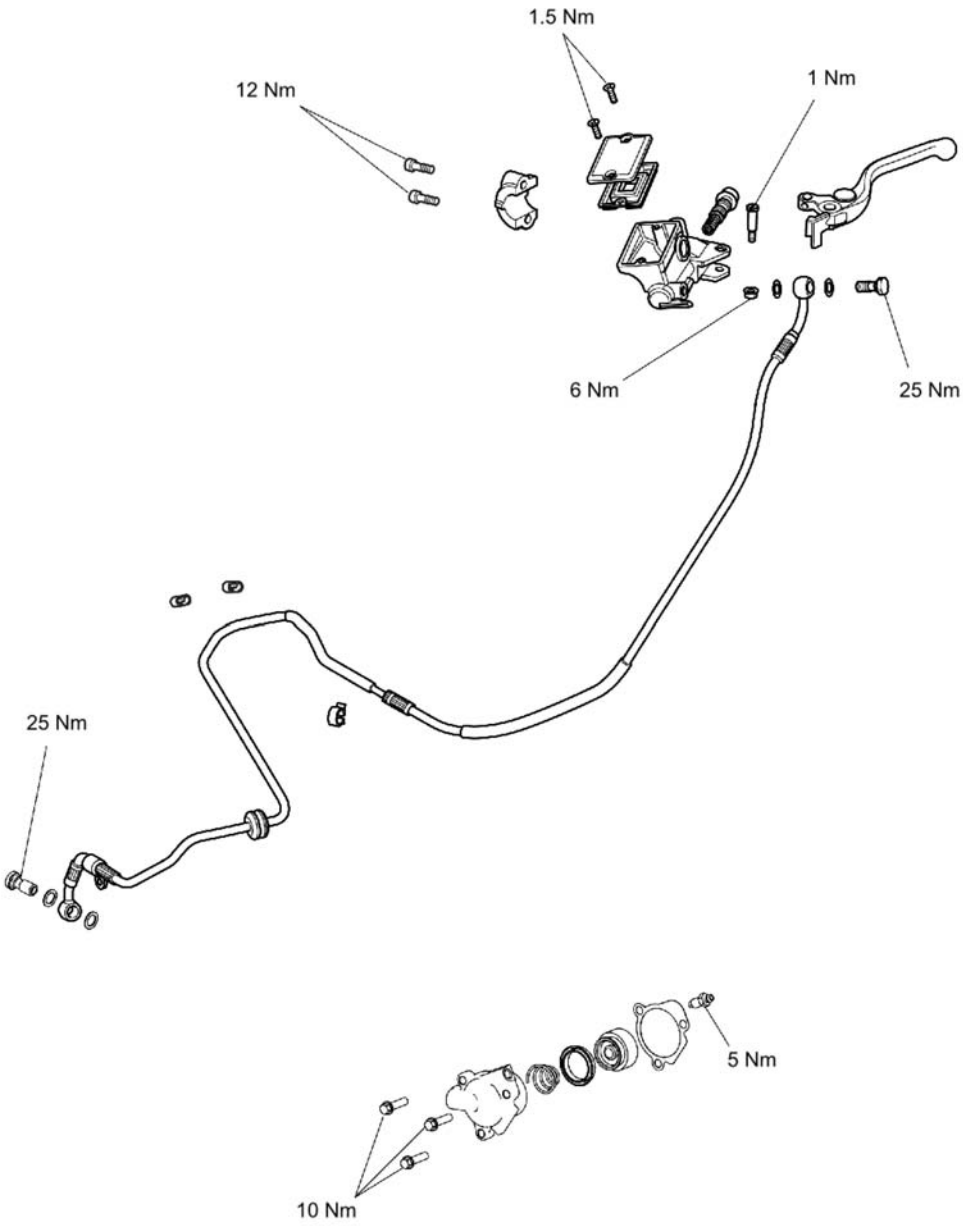
Clutch

Exploded View – Clutch Assembly





Exploded View – Clutch Controls



Clutch Description

This model is fitted with a hydraulically operated, wet plate, torque assist clutch. The clutch is operated by a hydraulic master cylinder, which in turn operates a slave cylinder mounted on the clutch cover.

The clutch has nine friction plates located between the inner and outer drums. An auxiliary gear train also drives the alternator, and a chain connected to the rear of the clutch drives the combined oil and water pump.

Clutch System Maintenance Safety Precautions

⚠ WARNING

Brake and clutch fluid is hygroscopic which means it will absorb moisture from the air. The absorbed moisture will greatly reduce the boiling point of the brake and clutch fluid causing a reduction in clutch efficiency.

Replace brake and clutch 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 and clutch fluid onto any area of the bodywork as this will damage any painted or plastic surface.

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

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

Check regularly for clutch hose damage.

FAILURE TO OBSERVE ANY OF THE ABOVE WARNINGS MAY IMPAIR CLUTCH OPERATION LEADING TO LOSS OF MOTORCYCLE CONTROL AND AN ACCIDENT.

⚠ WARNING

If there has been an appreciable drop in the level of the fluid in the clutch fluid reservoir, consult your authorised Triumph dealer for advice before riding.

If the clutch lever feels soft when it is applied, there may be air in the clutch line or the clutch 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 impair clutch operation leading to loss of motorcycle control and an accident.

⚠ WARNING

Use only DOT 4 specification brake and clutch fluid as listed in the General Information section of this manual. The use of brake and clutch fluids other than those DOT 4 fluids listed in the General Information section may reduce the efficiency of the clutch operation.

Failure to change the brake and clutch fluid at the interval specified in the scheduled maintenance chart may affect clutch operation resulting in an accident.

⚠ WARNING

Never use mineral based grease (such as lithium or copper based grease) in any area where contact with the clutch system hydraulic seals and dust seals is possible. Mineral based grease will damage the hydraulic seals and dust seals in the calipers and master cylinders. Damage caused by contact with mineral based grease may affect clutch operation resulting in an accident.

Clutch Switch

WARNING

The clutch switch is an integral part of the cruise control system. To ensure the clutch switch functions correctly after a replacement, the cruise control switch test must be carried out (see Cruise Control Switch Check).

Failure to carry out the cruise control switch check may result in loss of motorcycle control and an accident.

The clutch switch is an integral part of the left hand switch cube. If the clutch switch requires replacement, the left hand switch cube and clutch switch assembly must be replaced.

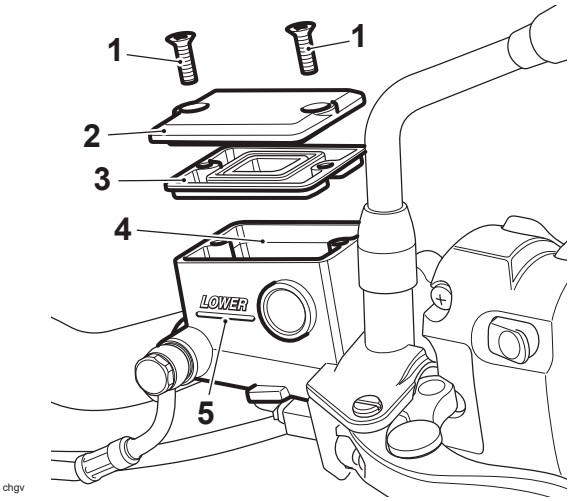
Clutch Fluid Level Inspection

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 clutch fluid level in the master cylinder reservoir.

1. Ensure that the clutch fluid level in the clutch fluid reservoir is between the upper and lower level lines (reservoir held horizontal).



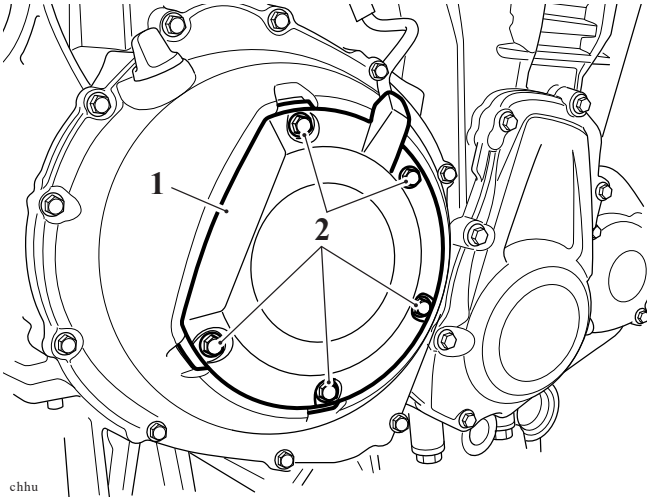
1. **Fixings**
2. **Cover**
3. **Diaphragm seal**
4. **Upper level line**
5. **Lower level line**

2. To inspect the fluid level, check the level of fluid visible in the window at the front of the reservoir body.
3. To adjust the fluid level:
   - Release the fixings and detach the cover noting the position of the sealing diaphragm.
   - Fill the reservoir to the upper level line using new DOT 4 brake and clutch fluid from a sealed container.
   - Refit the cover, ensuring that the diaphragm seal is correctly positioned between the cover and reservoir body. Secure with the fixings and tighten to **1.5 Nm**.

Bleeding the Clutch

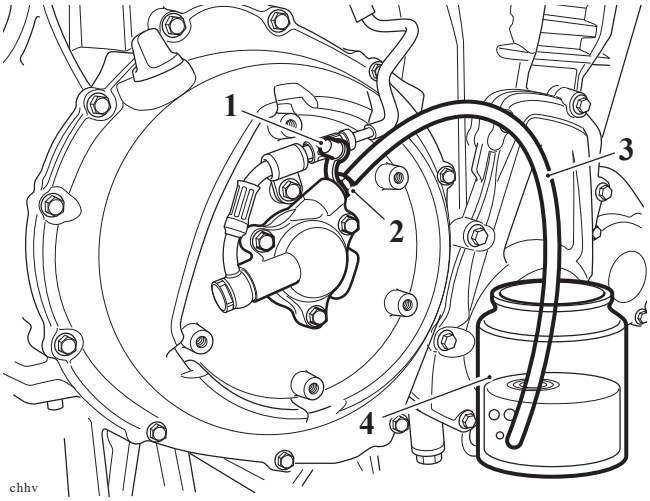
1. Note the original setting of the clutch lever adjuster in order that it can be returned to the same position when the bleeding operation is complete. Set the clutch lever adjuster to position No. 1.

2. Turn the handlebars to bring the fluid reservoir to a level position.
3. Remove the five fixings and remove the slave cylinder cover. Discard the fixings.



1. **Slave cylinder cover**
2. **Fixings**

4. Remove the dust cap from the bleed nipple on the slave cylinder.
5. Attach a transparent plastic tube to the bleed nipple.



1. **Bleed nipple dust cap**
2. **Bleed nipple**
3. **Bleed tube**
4. **Container**

6. Place the other end of the tube into a suitable receptacle containing new clutch fluid.
7. Loosen and remove the two fixings securing the clutch reservoir cover.

⚠ WARNING

Ensure absolute cleanliness when adding clutch fluid to the clutch fluid reservoir.
Do not allow moisture or debris to enter the cylinder as this will adversely affect the fluid properties.
Always use fluid from a sealed container and do not use fluid from a container which has been opened for

WARNING

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.

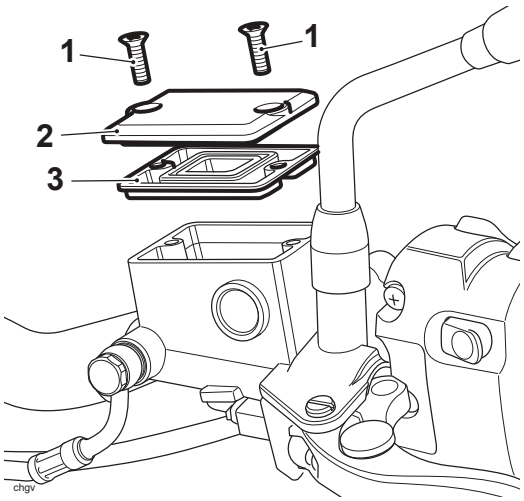
WARNING

Use only DOT 4 specification brake and clutch fluid as listed in the General Information section of this manual. The use of brake and clutch fluids other than those DOT 4 fluids listed in the General Information section may reduce the efficiency of the clutch system leading to an accident.

CAUTION

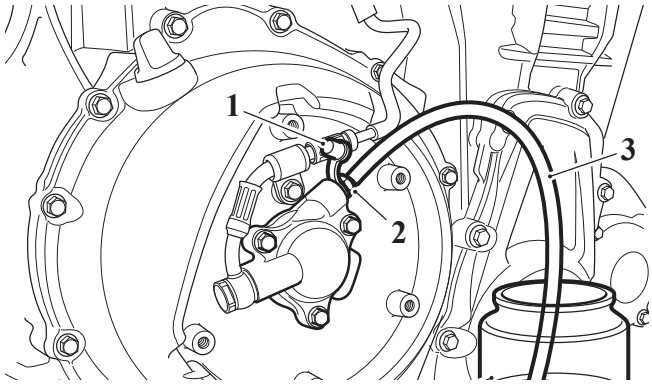
To prevent body damage, do not spill clutch fluid onto any area of the bodywork.

8. Carefully remove the cover taking care not to spill fluid.
9. Check the condition of the sealing diaphragm fitted beneath the cover. Replace the diaphragm if necessary.



1. **Fixings**
2. **Cover**
3. **Diaphragm seal**

10. Release the bleed nipple.
11. Slowly pull in and release the clutch lever several times until no more bubbles appear in the pipe.



1. **Bleed nipple dust cap**
2. **Bleed nipple**
3. **Bleed tube**
4. **Container**

Note

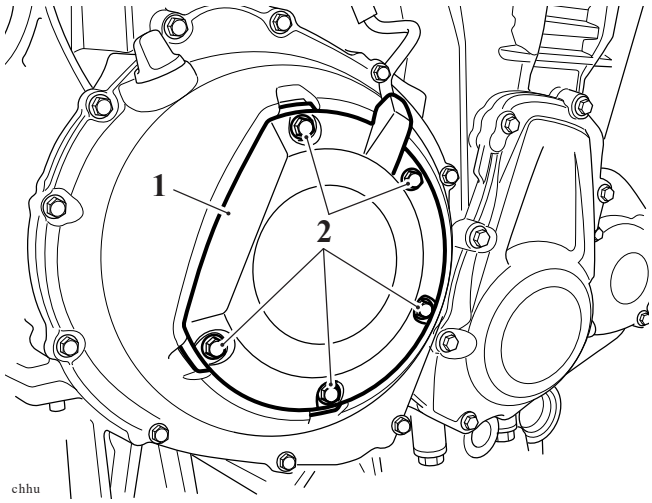
- **During bleeding, do not allow the fluid level to fall below the lower level mark in the reservoir. If the level is allowed to fall below this mark, air may enter the system and the sequence of bleeding must be repeated.**

12. Maintain the clutch fluid level between the upper and lower levels whilst bleeding is being carried out.
13. When all the air has been expelled from the system, hold in the clutch lever and close the bleed nipple. Tighten to **5 Nm**.
14. Fill the reservoir to the upper level.

⚠ WARNING

Use only DOT 4 specification brake and clutch fluid as listed in the General Information section of this manual. The use of clutch fluids other than those DOT 4 fluids listed in the General Information section may reduce the efficiency of the clutch system leading to an accident.

15. Replace the reservoir cover and diaphragm ensuring correct fitment of the diaphragm. Tighten the screws to **1.5 Nm**.
16. Remove the transparent bleed pipe.
17. Replace the bleed nipple dust cap.
18. Refit the slave cylinder cover. Tighten the new fixings to **4 Nm**.



1. **Slave cylinder cover**
2. **Fixings**

19. Reset the adjuster wheel on the clutch lever to the original setting.

⚠ WARNING

WARNING

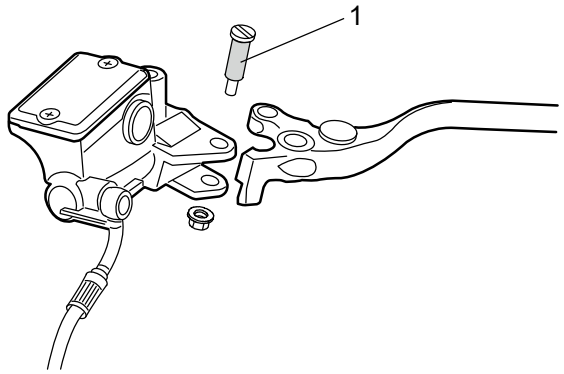
Always return the lever adjuster to the original setting as noted in step 1. Operating the motorcycle with lever settings which are unfamiliar may lead to loss of control or an accident.

Clutch Lever - Pivot Bolt Lubrication

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 nut and pivot bolt securing the clutch lever to the master cylinder.
2. Using Castrol Metal Parts Cleaner or an equivalent, clean the clutch lever pivot and the shank of the clutch lever pivot bolt.
3. Apply a smear of silicone grease to the shank of the clutch lever pivot bolt.



1. Lubrication area

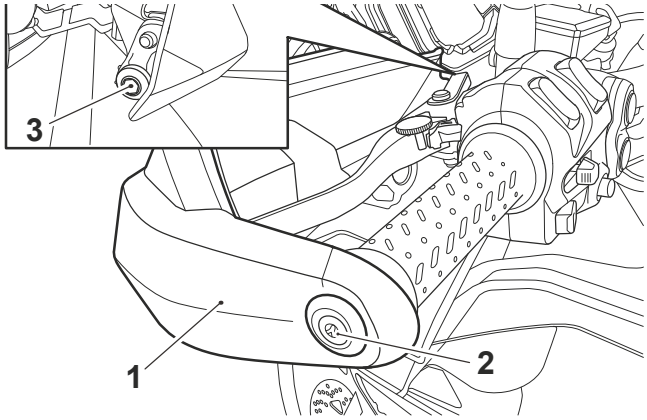
4. Position the clutch lever to the clutch master cylinder. Ensure that the pivot boss is correctly aligned and fitted to the push rod, and that the clutch switch actuation plate is correctly positioned to the clutch switch.
5. Secure with the pivot bolt and tighten to **1 Nm**.
6. Counter hold the pivot bolt, fit and tighten the lock nut to **6 Nm**.

Clutch Master Cylinder - Removal

WARNING

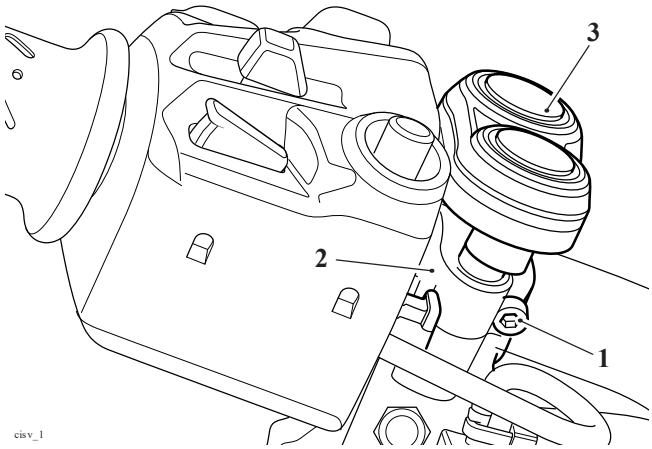
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

- Remove the reservoir cover. Drain the fluid from the master cylinder using the bleed process (see Bleeding the Clutch).
- Release the two fixings and remove the spacer, handguard and the handlebar end weight. Discard the fixings.



1. **Handguard (left hand shown)**
2. **Handlebar end fixing**
3. **Handguard to bracket fixing**

- Remove the fixing and remove the switch housing for the heated grips and fog lights from the clutch master cylinder clamp. Without disconnecting any wiring, lay the switch housing aside.



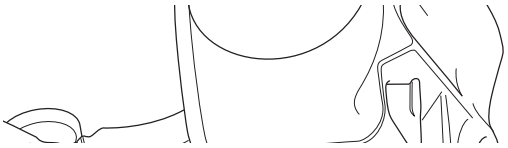
1. **Fixing**
2. **Clutch master cylinder clamp**
3. **Switch housing**

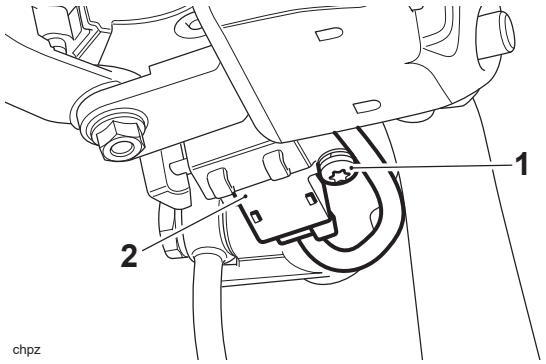
1. Remove the nut and pivot bolt securing the clutch lever to the master cylinder.
2. Remove the clutch lever from the master cylinder.
3. Release the union bolt securing the clutch hose to the master cylinder. Disconnect the clutch hose. Discard the sealing washers.

⚠ CAUTION

To prevent body damage, do not spill clutch fluid onto any area of the bodywork.

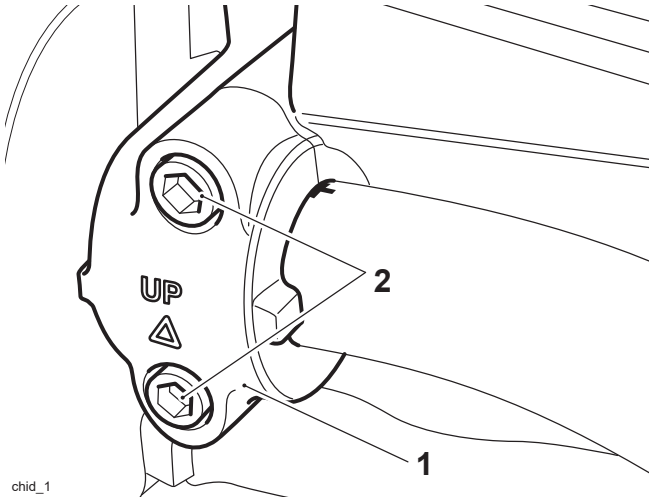
4. Release the fixing and detach the clutch switch from the master cylinder.





1. **Fixing**
2. **Clutch switch**

5. Release the clamp fixings and remove the clamp and master cylinder.



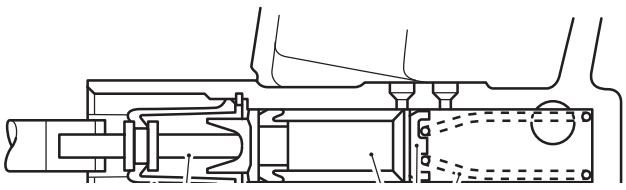
1. **Clamp**
2. **Fixings**

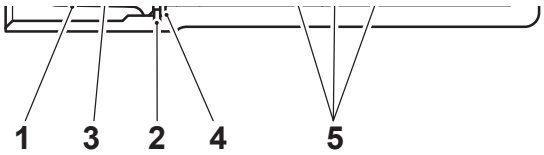
Clutch Master Cylinder - Disassembly

Note

- **Note the order and orientation of each component as it is removed. It is essential for correct clutch operation that each component is installed in the correct order and orientation during reassembly.**

1. Remove dust cover/boot (1) from the rear of the master cylinder body.
2. Remove the cylinder pushrod (3).
3. Remove the circlip (2) from the end of the master cylinder bore.
4. Remove the washer (4) from part way down the bore.
5. Remove the piston, seal and spring (5) noting the position of the seal lip in relation to the piston.





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1. **Dust cover/boot**
2. **Circlip**
3. **Pushrod**
4. **Washer**
5. **Piston, seal and spring**

Clutch Master Cylinder - Inspection

1. Check the following for wear, damage, cracks or signs of deterioration and replace as necessary:
   - Cylinder bore and piston
   - Seals
   - Dust cover
   - Spring.
2. Ensure that the fluid return and supply ports on cylinder are not blocked.

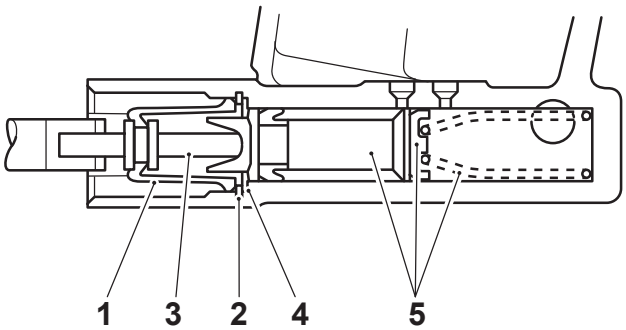
Clutch Master Cylinder - Assembly

1. Clean all disassembled parts with new DOT 4 brake and clutch fluid. Apply brake and clutch fluid to the bore of the cylinder.
2. Fit a new seal and piston set ensuring that the seal is fitted in the same position as noted during removal.

Note

- **It is essential for correct clutch operation that all components are installed in the correct order and orientation as noted during removal.**

3. Assemble all components to the master cylinder. When fitting the pushrod, ensure the rounded end of the pushrod is inserted into the master cylinder. Ensure that the dust cover is correctly located over both the pushrod and cylinder body.



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1. **Dust cover/boot**
2. **Circlip**

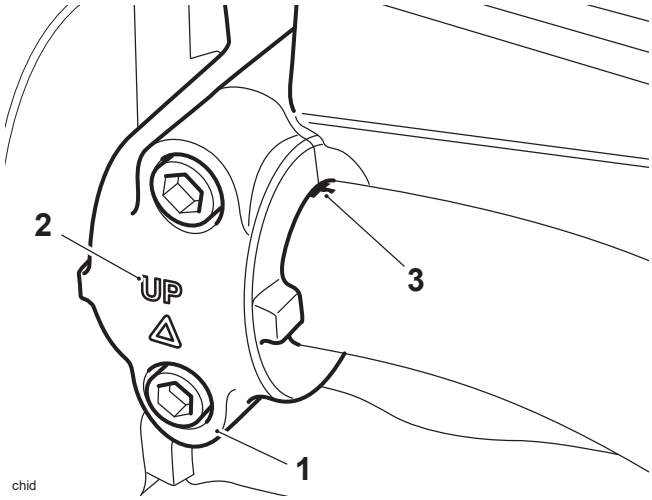
3. **Pushrod**
4. **Washer**
5. **Piston, seal and spring**

Clutch Master Cylinder - Installation

⚠ 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.

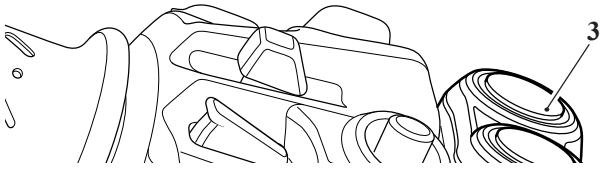
1. Locate the master cylinder to the handlebars and position the clamp with the 'UP' arrow pointing upwards. Align the master cylinder/clamp split line with the alignment mark on the handlebar.
2. Tighten the clamp bolts, upper first and then lower, to **12 Nm**.

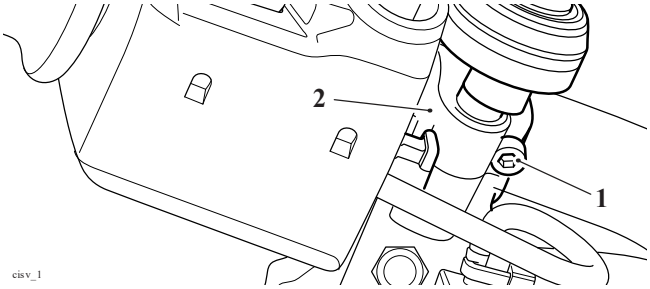


1. **Handlebar clamp**
2. **'UP' arrow**
3. **Alignment mark**

3. Refit the clutch switch to the master cylinder and secure with the fixing. Tighten the fixing to **2 Nm**.
4. Using Castrol Metal Parts Cleaner or an equivalent, clean the clutch lever pivot and the shank of the clutch lever pivot bolt.
5. Apply a smear of silicone grease to the shank of the clutch lever pivot bolt.
6. Position the clutch lever to the clutch master cylinder. Ensure that the pivot boss is correctly aligned and fitted to the push rod, and that the clutch switch actuation plate is correctly positioned to the clutch switch.
7. Secure with the pivot bolt and tighten to **1 Nm**.
8. Counter hold the pivot bolt, fit and tighten the lock nut to **6 Nm**.
9. Align and fit the union bolt to the clutch hose incorporating new sealing washers. Connect the hose to the master cylinder.
10. Tighten the union bolt to **25 Nm**.

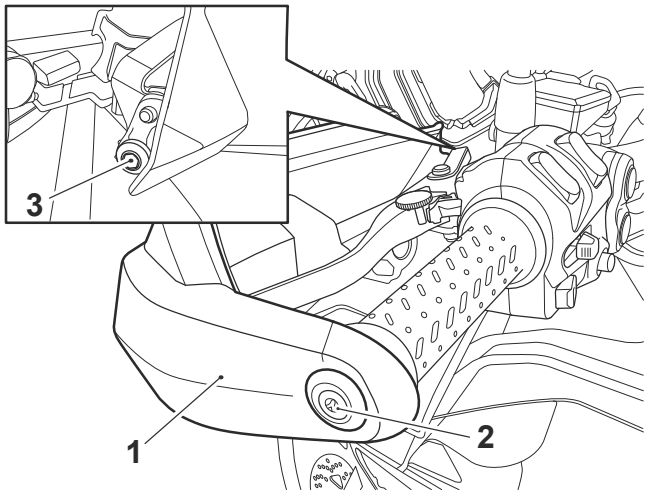
- Refit the switch housing and secure with the fixing. Tighten the fixing to **3 Nm**.





1. **Fixing**
2. **Clutch master cylinder clamp**
3. **Switch housing**

- Position the handlebar end weight, handguard and spacer to the handlebar and secure with new fixings.
- Tighten the new handguard to bracket fixing to **6 Nm**.
- Tighten the new handlebar end fixing to **5 Nm**



1. **Handguard**
2. **Handlebar end fixing**
3. **Handguard to bracket fixing**

- Bleed the clutch (see Bleeding the Clutch) and then examine the system for correct clutch operation and for any fluid leakage.

Clutch Slave Cylinder - Removal

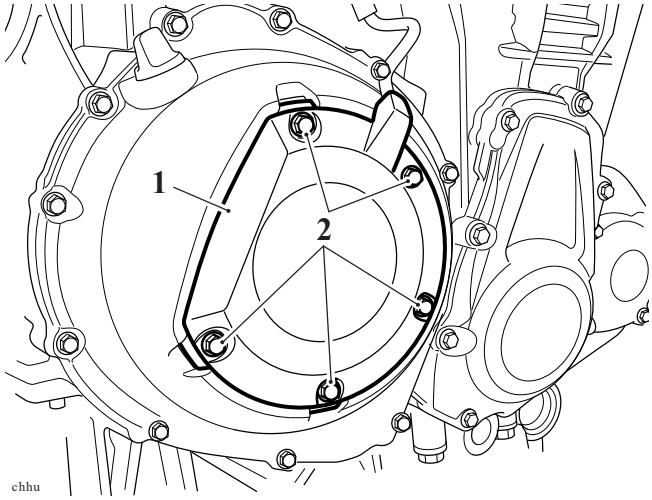
⚠ WARNING

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.

⚠ CAUTION

If the clutch slave cylinder is found to be leaking, the engine oil must be replaced after repairs to the clutch slave cylinder have been carried out. Contamination of the engine oil with brake and clutch fluid may result in damage to engine and clutch components.

1. Remove the five fixings and remove the slave cylinder cover. Discard the fixings.



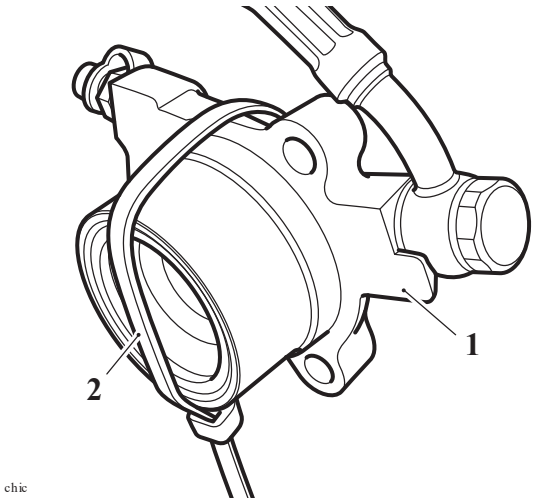
1. **Slave cylinder cover**
2. **Fixings**

2. Position a suitable container for the collection of brake and clutch fluid.

CAUTION

To prevent body damage, do not spill clutch fluid onto any area of the bodywork.

3. Release the union bolt from the clutch slave cylinder. Place the hose fitting into the container to collect the fluid.
4. Release the three bolts securing the clutch slave cylinder to the clutch cover.
5. Detach the cylinder taking care to ensure that the piston remains in the cylinder.
6. If the cylinder is not to be disassembled, retain the piston to the slave cylinder using a retaining tie such as a rubber band or cable tie.



1. **Clutch slave cylinder**
2. **Retaining tie**

Clutch Slave Cylinder - Inspection

⚠ WARNING

The clutch slave cylinder contains no user serviceable parts and replacement piston and dust seals are not available.

If disassembled, never attempt to reassemble the clutch slave cylinder using the original seals as this could cause a fluid leak.

The clutch slave cylinder must be replaced If disassembled for any reason.

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

1. Inspect the clutch slave cylinder carefully for fluid leaks, wear, damage, cracks or deterioration.
2. Replace the clutch slave cylinder if any of the above are evident.

Clutch Slave Cylinder - Installation

1. Remove the cable tie or rubber band from the slave cylinder.
2. Align and fit the union bolt to the clutch hose incorporating new sealing washers. Connect the hose to the slave cylinder.
3. Fit the slave cylinder to the clutch cover ensuring that the lifter piece locates correctly in the cylinder. Tighten the cylinder to clutch cover bolts to **10 Nm**.
4. Tighten the clutch hose union bolt to **25 Nm**.
5. Bleed the clutch (see Bleeding the Clutch) and then examine the system for:
   - Correct clutch operation
   - Fluid leakage.
6. Refit the slave cylinder cover. Tighten the new fixings to **4 Nm**.

Clutch - Removal

⚠ WARNING

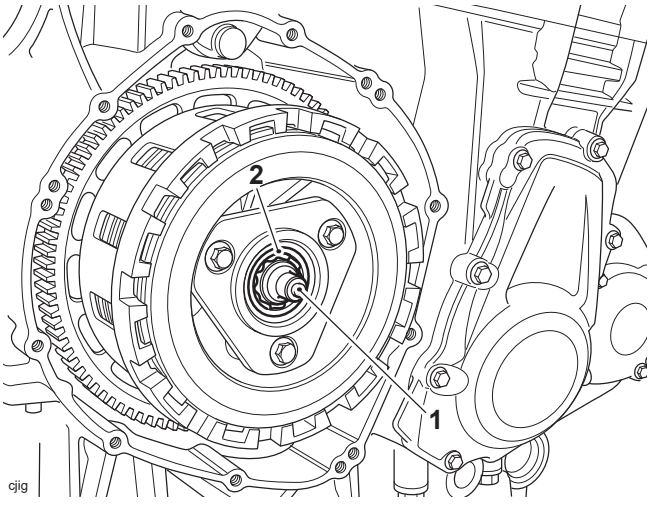
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

- Remove the clutch cover (see Clutch Cover - Removal).

Note

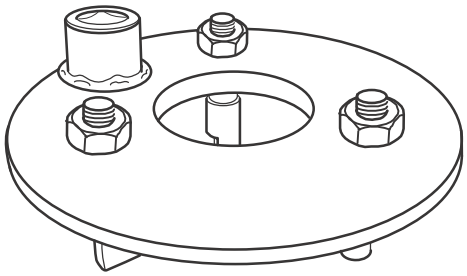
- **The lifter piece and bearing carrier can be removed by hand.**

1. Remove the lifter piece and bearing carrier.



1. **Lifter piece**
2. **Bearing carrier**

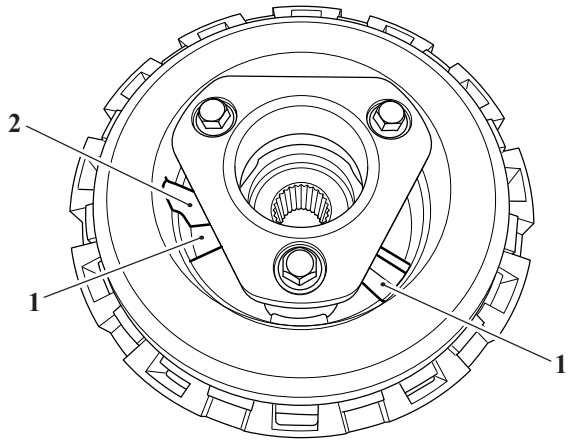
2. Carefully de-stake the clutch centre nut.
3. Loosen the locating pins of T3880660 - Clutch Restraint sufficiently to allow them to adjust on the tool's mounting plate.



T3880660 - Clutch Restraint

Note

- **When positioning T3880660 - Clutch Restraint to the clutch centre, ensure that the tool's locating pins are positioned into the openings for the clutch centre ramps. When correctly located, the tool's mounting plate will sit flush against the clutch centre.**
- **For clutch removal, the tool should be rotated clockwise until the rounded sides of the locating pins engage with the webbed side of the openings for the clutch centre ramps.**



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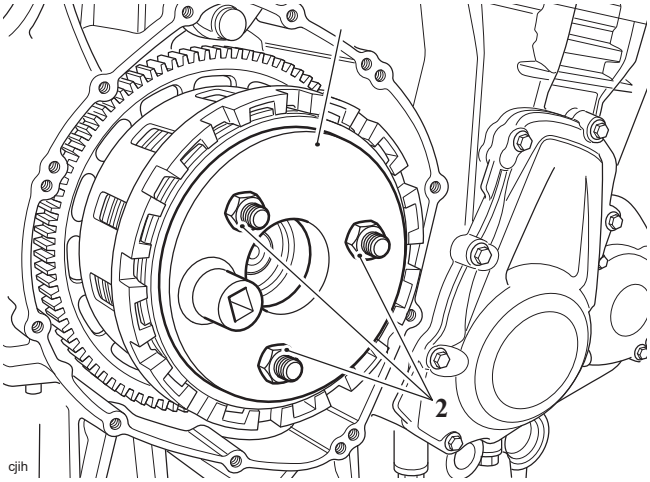
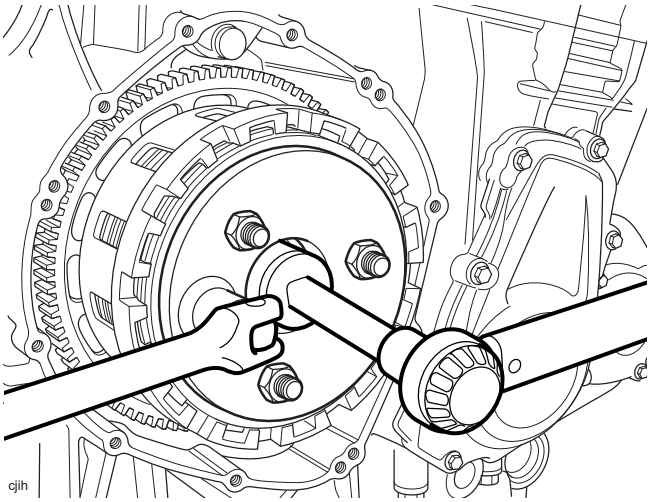
1. **Clutch centre ramp openings**
2. **Webbed side**

4. Position T3880660 - Clutch Restraint to the clutch centre. Rotate the tool clockwise until the locating pins engage with the webbed side of the openings for the clutch centre ramps.
5. Hand tighten the locating pin nuts.



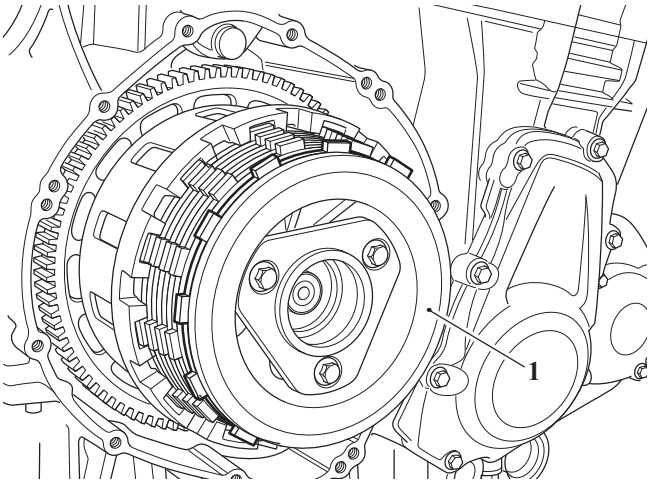
1. **T3880660 - Clutch Restraint**
2. **Locating pin nuts**

6. Hold the service tool to prevent clutch rotation then loosen and remove the centre nut and Belleville washer from the input shaft. Discard the nut and washer.



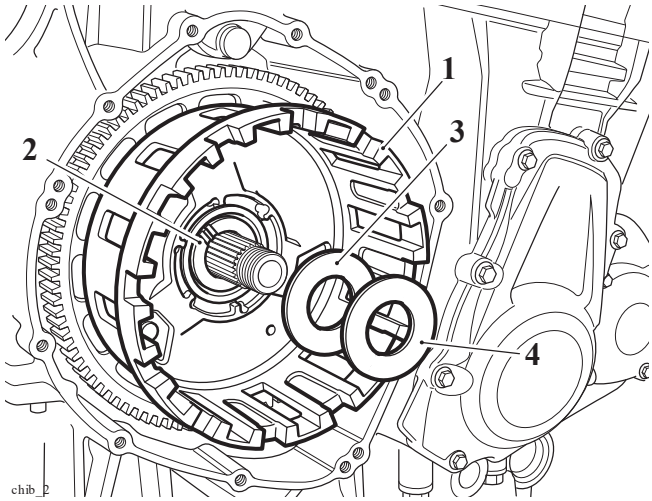
Hold the Service Tool and Loosen the Centre Nut

7. Remove T3880660 - Clutch Restraint.
8. Withdraw the clutch centre and pressure plate assembly.



1. **Clutch centre and pressure plate assembly**

9. Remove the thrust washer (and shim(s) if fitted) from the input shaft.
10. Slide the clutch outer drum assembly gently backwards and forwards to dislodge the inner bearing sleeve. Carefully remove the bearing sleeve while supporting the clutch drum.

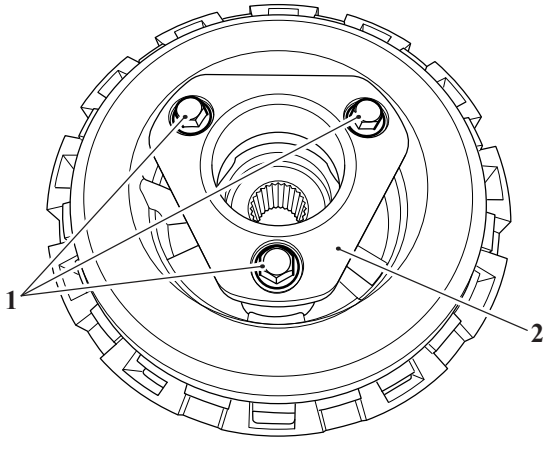


1. **Outer drum**
2. **Bearing sleeve**
3. **Shim (if fitted)**
4. **Thrust washer**

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

Clutch - Disassembly

1. Evenly and progressively loosen the three fixings securing the release plate to the clutch centre and pressure plate assembly.



1. **Fixings**
2. **Release plate**

2. Remove the fixings and lift off the release plate. Collect the springs.
3. Remove the clutch centre.

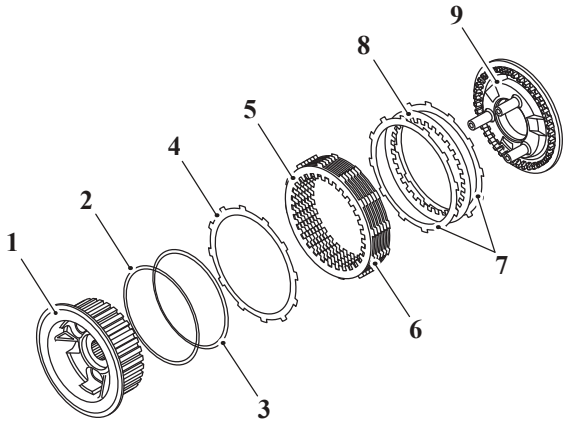
Note

- **The one outermost and two innermost friction plates differ from the six centre plates and must not be fitted in any other positions.**
- **The innermost steel plate differs from the seven other steel plates and cannot be fitted in any other position.**

4. Noting their orientation, remove all the clutch friction plates and steel plates together with the anti-judder spring and anti-judder seat washer.

Note

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

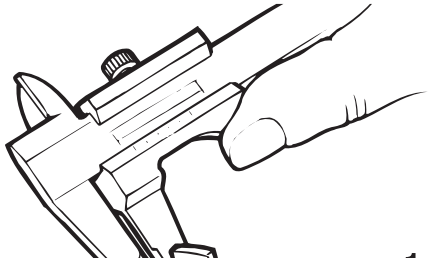


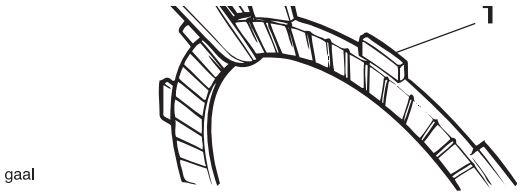
1. **Clutch Centre**
2. **Anti-judder seat washer**
3. **Anti-judder spring**
4. **Outer friction plate**
5. **7 x centre steel plates**
6. **6 x centre friction plates**
7. **Inner friction plates**
8. **Inner steel plate**
9. **Pressure plate**

Friction Plate Inspection

Thickness

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



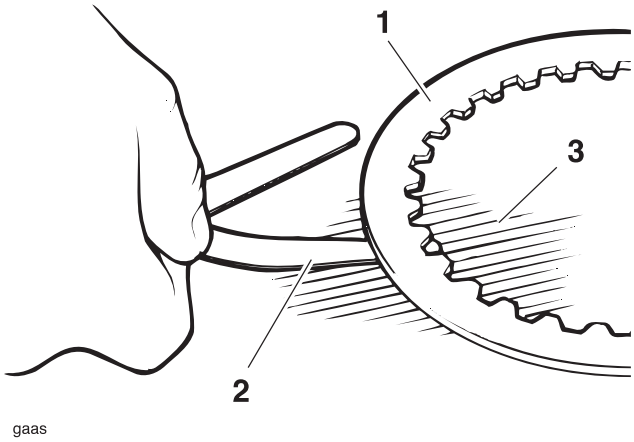


1. **Clutch friction plate**

Steel Plate Bend/Warp

Check all plates for bend and warp as follows:

1. Place the plate being checked on a clean surface plate and attempt to pass a feeler gauge of the maximum specified thickness between the steel plate and surface plate at several points around the plate. If the feeler gauge can be passed beneath the steel plate at any point, renew the plates as a set.



1. **Steel plate**
2. **Feeler gauge**
3. **Surface plate**

- For specifications refer toClutch/Primary Drive.

Clutch Pack Height

The clutch pack height should only be measured if the friction plates and the steel plates have been replaced.

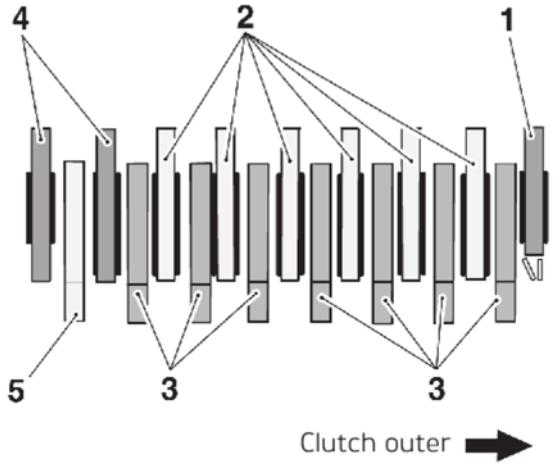
The clutch pack height is critical for a smooth operation of the transmission and must be measured prior to installation of new clutch plates.

If used clutch plates are being refitted, the clutch pack height measurement is not necessary, as the plates may not be worn to the service limit (and are therefore still serviceable), but could fall outside of the clutch pack height tolerance when measured.

If building a new clutch pack its height must be correct. To achieve this, build the new clutch pack with the following:

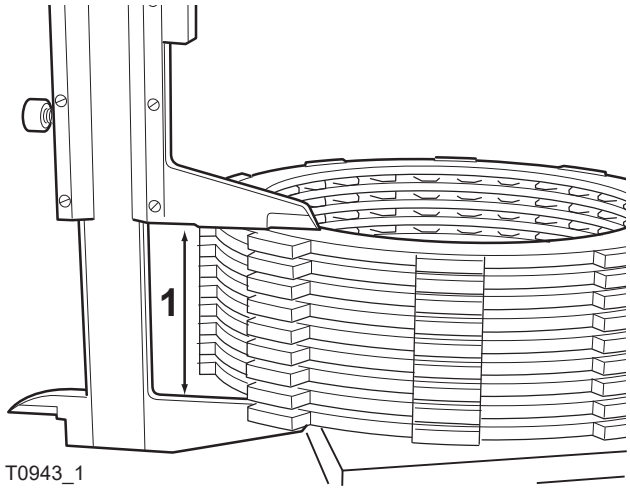
- 1 x new outer friction plate
- 6 x new friction plates
- 7 x steel plates, 2.0 mm thick
- 2 x new inner friction plates
- 1 x new inner steel plate, 2.0 mm thick.

1. Arrange the new friction and new steel plates in a stack as shown below.



1. **Outer friction plate**
2. **Friction plates**
3. **Steel plates, 2.0 mm thickness**
4. **Inner friction plates**
5. **Inner steel plate, 2.0 mm thickness**

2. Place the assembled clutch pack on a flat surface and measure its height as shown below.



1. **Clutch pack height**

3. The correct clutch pack height for this clutch assembly is shown in the specification table see Clutch/Primary Drive.
4. If the clutch pack height measurement is incorrect, proceed as described below:

Clutch Pack Height Too High

Note

- **No more than one 1.6 mm thick steel plate may be used in the clutch pack.**
- **The 1.6 mm steel plate cannot be used to replace the inner most steel plate.**

1. Replace one 2.0 mm steel plate with a 1.6 mm steel plate. The thinner plate can be installed in any position except the innermost position.
2. Recheck the clutch pack height as described earlier.

Clutch Pack Height Too Low

Note

- **No more than one 2.3 mm thick steel plate may be used in the clutch pack.**
- **The 2.3 mm steel plate cannot be used to replace the inner most steel plate.**

1. Replace one 2.0 mm steel plate with a 2.3 mm steel plate. The thicker plate can be installed in any position except the innermost position.
2. Recheck the clutch pack height as described earlier.

Clutch - Assembly

The outermost and two innermost friction plates differ from the six centre friction plates. Identification is as follows:

- The outermost and two innermost friction plates have a larger internal diameter to accommodate the anti-judder spring and pressure plate splines respectively.
- The outermost and two innermost friction plates also have more friction pads (60 pads) than the other plates (50 pads).
- The outermost and two innermost friction plates can also be identified by pink paint markings on the outer tabs.

The innermost steel plate differs from the other seven steel plates and can be identified by a larger internal diameter.

⚠ CAUTION

Do not use brake cleaner or any other similar cleaning fluids to clean the clutch plates. The use of brake cleaner or other similar cleaning fluids may adversely affect the operation of the clutch.

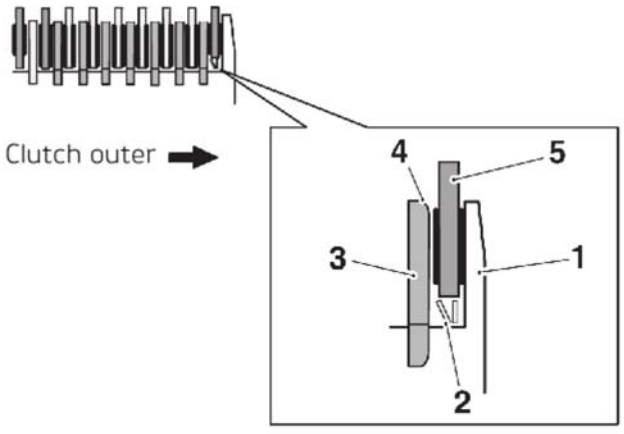
1. Remove any contamination or debris from the clutch plates using a soft dry cloth.
2. Coat all friction and steel plates in clean engine oil.

⚠ CAUTION

Ensure the clutch plates are all installed in the correct locations. Failure to do so will adversely affect the operation of the clutch.

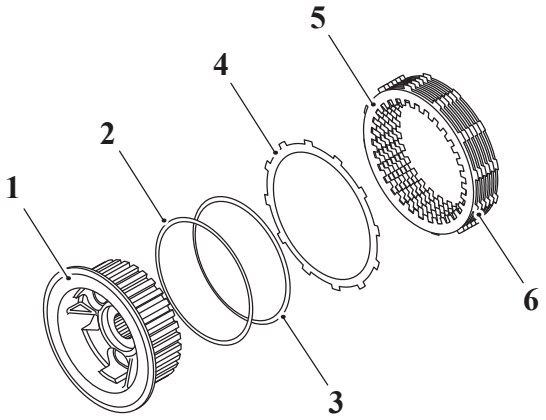
Note

- **During installation, ensure that the anti-judder spring is installed with its smaller (internal) diameter facing outwards towards the clutch centre.**
- **Also ensure that the steel plates are installed so that the face with the curved edges is facing outwards towards the clutch centre.**



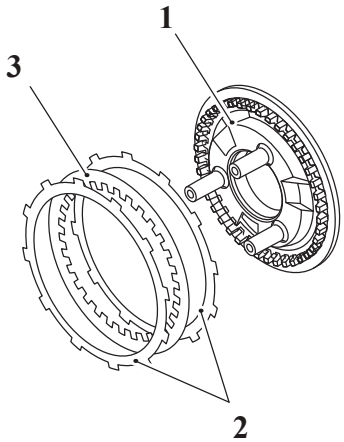
1. **Clutch centre**
2. **Anti-judder spring**
3. **Steel plate**
4. **Curved edge**
5. **Outer friction plate**

3. Assemble the following to the clutch centre in the same order and orientation as noted for removal:
   - Anti-judder washer
   - Anti-judder spring
   - Outer friction plate
   - 7 x steel plates
   - 6 x friction plates.



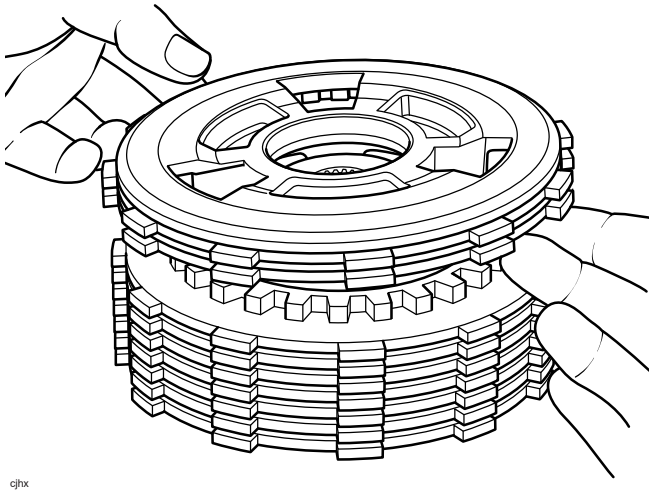
1. **Clutch centre**
2. **Anti-judder seat washer**
3. **Anti-judder spring**
4. **Outer friction plate**
5. **7 x steel plates**
6. **6 x friction plates**

4. Assemble the innermost friction and steel plates to the pressure plate in the same order and orientation as noted for removal.



1. **Pressure plate**
2. **Inner friction plates**
3. **Inner steel plate**

5. While holding the innermost friction and steel plates in position, invert the pressure plate and locate it onto the clutch centre.



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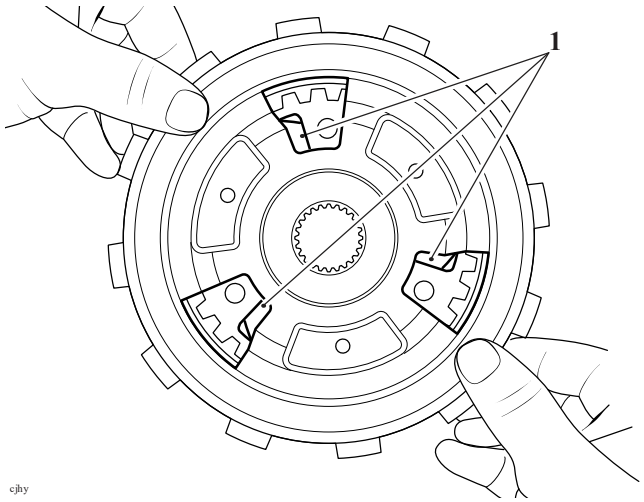
Locating the Pressure Plate

6. Ensure the pressure plate ramps engage correctly with the clutch centre.



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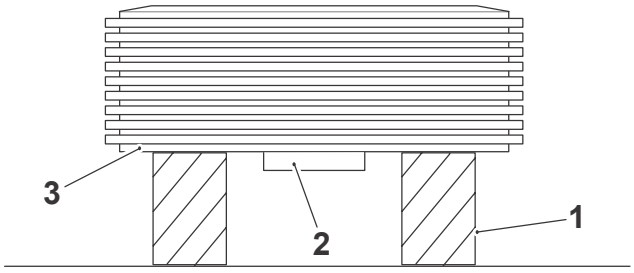
1. **Pressure plate ramps**

Note

- **Do not allow the clutch centre and pressure plate to separate at this point as this may cause the innermost steel plate to disengage from the pressure plate splines.**

7. Holding the clutch centre and pressure plate assembly together, invert the assembly and place on a suitable support. Ensure the assembly rests on the pressure plate and not on the under side of the clutch centre.

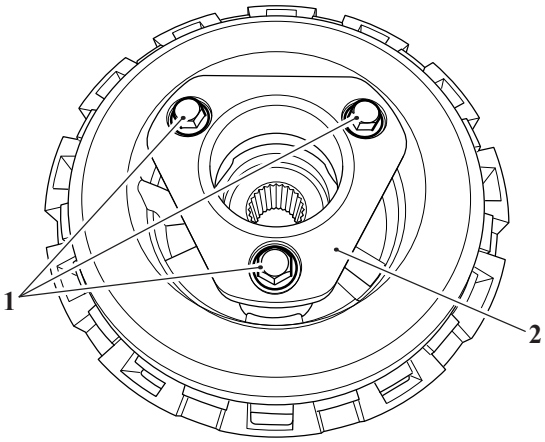


1. **Support**
2. **Clutch centre (underside)**
3. **Pressure plate**

Note

- **During the next instruction step, the release plate fixings should be tightened until a small amount of preload is applied to the springs. The amount of preload applied should be sufficient to prevent the clutch centre and pressure plate from separating, while allowing movement/rotation of the friction plates.**

8. Fit the springs and release plate to the clutch centre and pressure plate assembly and secure with the three fixings. Evenly and progressively tighten the release plate fixings until a small amount of spring preload is applied. Do not fully tighten the fixings.



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1. **Fixings**
2. **Release plate**

Clutch - Installation

⚠ 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.

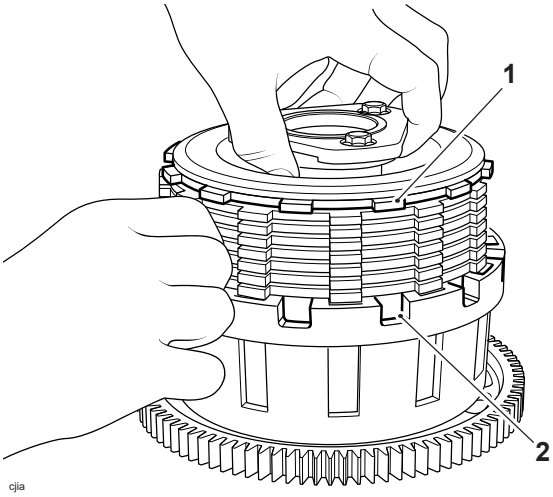
Note

- **To aid installation, the clutch centre and pressure plate assembly should be temporarily fitted to the**

Note

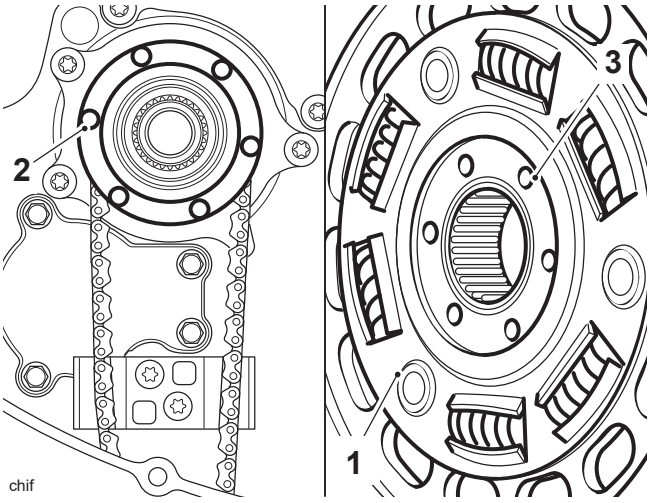
clutch outer drum while it is removed from the motorcycle. This allows alignment of the friction plate outer tabs prior to installation to the motorcycle.

1. With the clutch outer drum assembly removed from the motorcycle, fit the clutch centre and pressure plate assembly to the outer drum assembly. Align the friction plate tabs noting that the outermost friction plate engages in its own (shallow) slot.



1. **Outer most friction plate**
2. **Shallow slot**

2. Remove the clutch centre and pressure plate assembly from the outer drum assembly. Take care not to disturb the friction plate tabs.
3. Position the clutch outer drum assembly to the input shaft and align the oil pump drive pegs with the corresponding holes in the rear of the clutch outer drum.



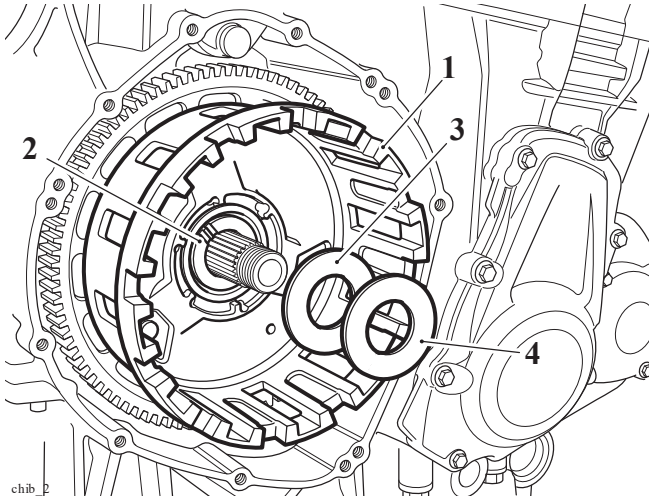
1. **Clutch outer drum**
2. **Oil pump sprocket drive pegs**
3. **Oil pump drive holes**

Note

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

4. While holding the clutch outer drum in position and ensuring correct engagement with the oil pump drive,

refit the bearing sleeve, shim(s) (if fitted) and thrust washer.

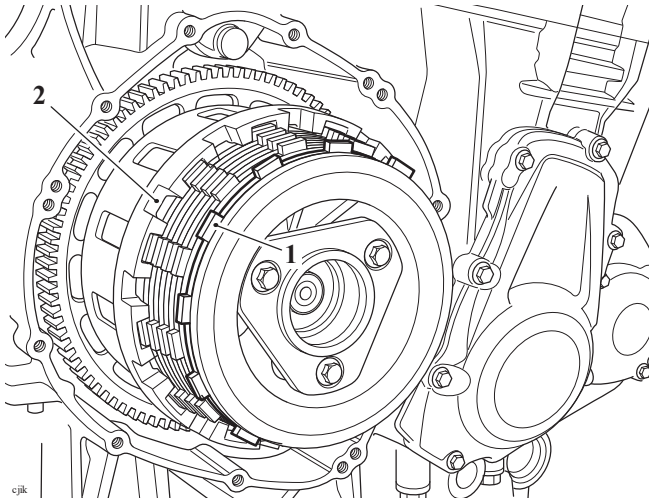


1. **Outer drum**
2. **Bearing sleeve**
3. **Shim (if fitted)**
4. **Thrust washer**

Note

- **To align the clutch centre splines with the input shaft splines, It may be necessary to rotate the input shaft.**

5. Fit the clutch centre and pressure plate assembly, aligning the friction plate tabs with the clutch drum slots, noting that the outermost friction plate engages in its own (shallow) slot. Align the clutch centre splines with those of the input shaft and slide the assembly fully into position.



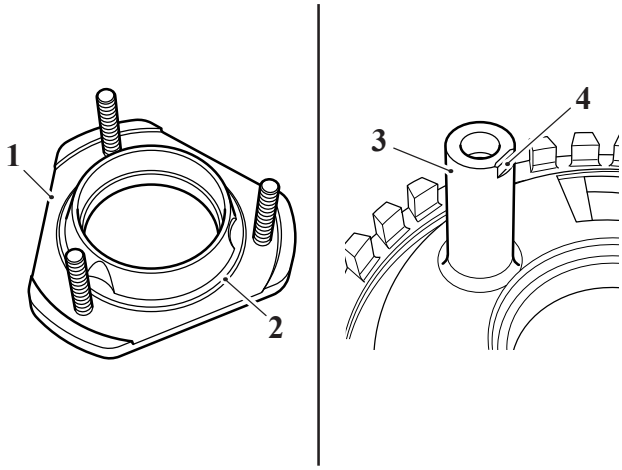
1. **Outer friction plate**
2. **Outer friction plate slot**

⚠ CAUTION

Ensure the clutch springs are all installed correctly under the release plate. Failure to do so will adversely affect the operation of the clutch.

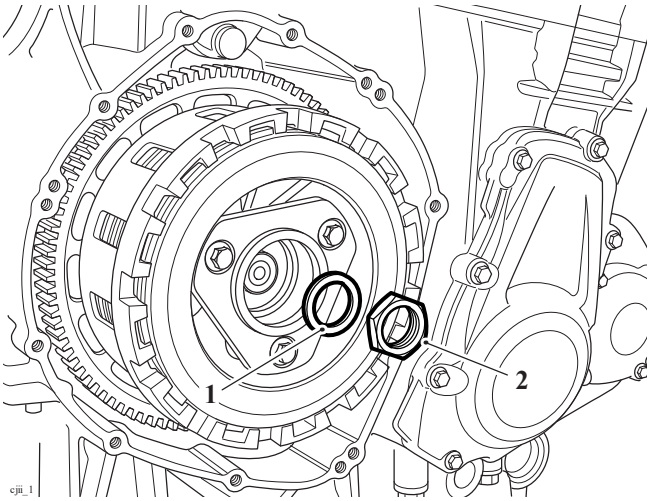
Note

- **When tightening the three release plate fixings, care must be taken to tighten the fixings evenly and progressively. This is to ensure that the chamfered edge on the underside of the release plate is correctly seated into the machined face on the inside edge of the pressure plate fixing towers.**
- **Failure to ensure that the release plate is correctly seated will cause the clutch friction plates to release and re-engage at an angle, resulting in severe clutch judder.**



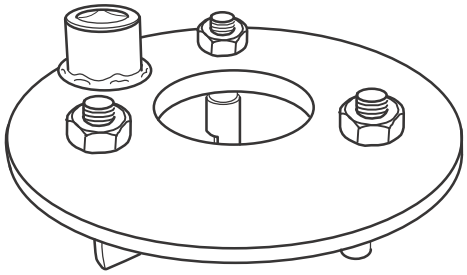
1. **Release plate**
2. **Chamfered edge**
3. **Fixing tower**
4. **Machined face**

6. Evenly and progressively tighten the release plate bolts to **10 Nm**, ensuring that the springs remain correctly located and that the release plate is correctly seated to the pressure plate fixing towers.
7. Fit a new Belleville washer with its OUT marking facing outwards.
8. Fit a new centre nut.



1. **Belleville washer**
2. **Centre nut**

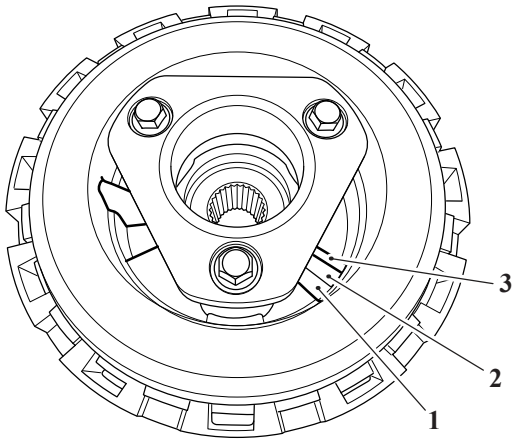
9. Loosen the locating pins of T3880660 - Clutch Restraint sufficiently to allow them to adjust on the tool's mounting plate.



T3880660 - Clutch Restraint

Note

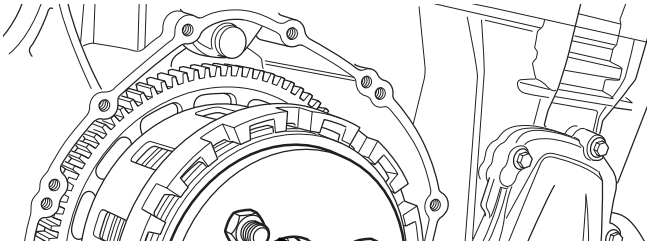
- **When positioning T3880660 - Clutch Restraint to the clutch centre, ensure that the tool's locating pins are positioned into the openings for the clutch centre ramps. When correctly located, the tool's mounting plate will sit flush against the clutch centre.**
- **For clutch installation, the tool should be rotated anticlockwise until the machined face of the locating pins engages with the flat face of the clutch centre ramps.**

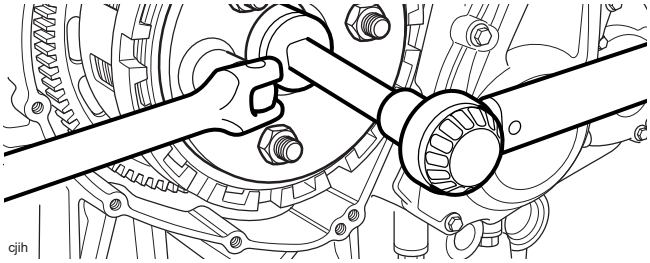


cjht_2

1. **Clutch centre ramp opening**
2. **Ramp**
3. **Flat face**

10. Position T3880660 - Clutch Restraint to the clutch centre and pressure plate assembly. Rotate the tool anticlockwise until the tool's locating pins engage with the flat face of clutch centre ramps.
11. Hand tighten the locating pin nuts.
12. Tighten the centre nut to **160 Nm** whilst holding the service tool to prevent rotation.



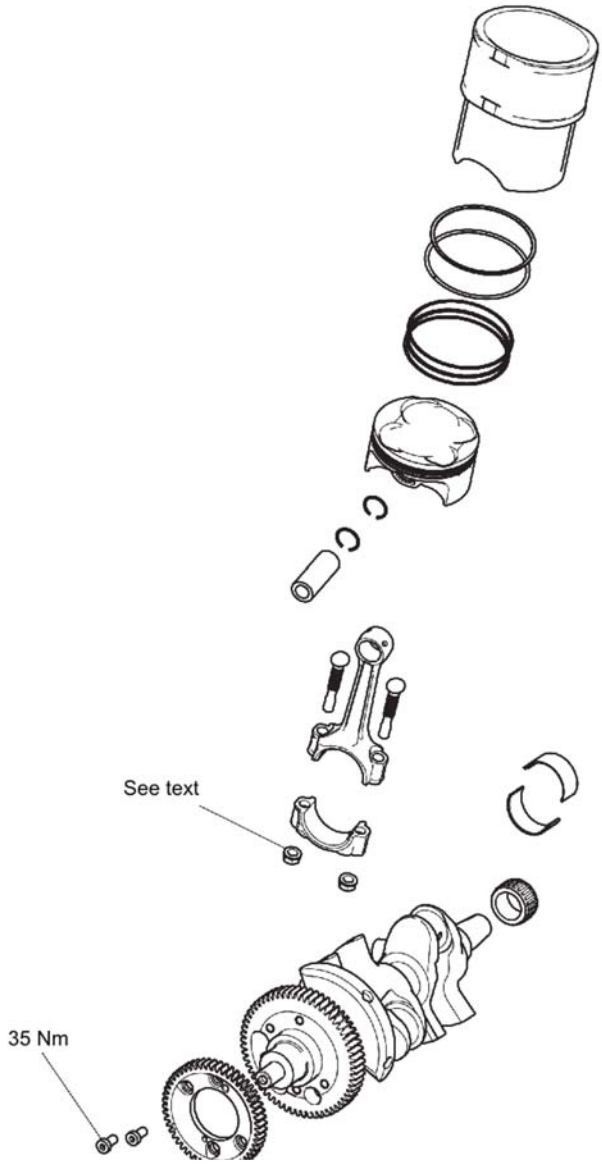


Retain the Service Tool and Tighten the Centre Nut

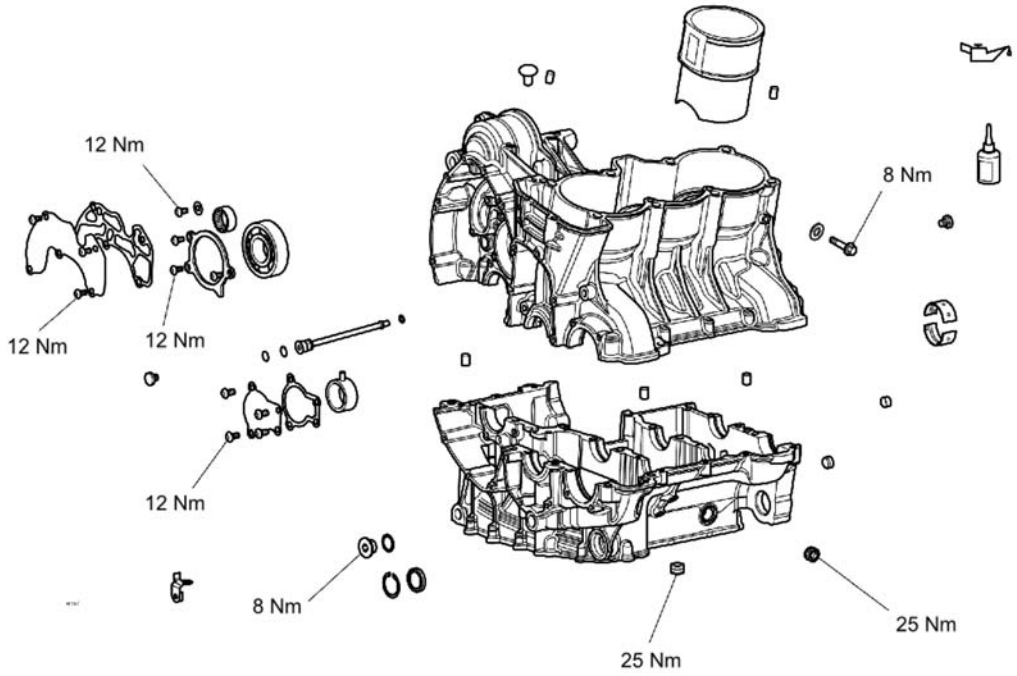
13. Remove T3880660 - Clutch Restraint from the pressure plate.
14. Stake the clutch centre nut to the shaft.
15. Fit the lifter piece and bearing carrier, ensuring they are correctly installed in the release plate.
    - Refit the clutch cover (see Clutch Cover - Installation).

Crankshaft, Connecting Rods and Pistons

Exploded View – Crankshaft, Connecting Rod, Piston and Liner



Exploded View – Crankcases



Crankcases - Disassembly

⚠ WARNING

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

CAUTION

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

- Remove the engine from the frame (see Engine - Removal).
- Remove the sump (see Sump - Removal).
- Remove the flywheel cover (see Flywheel Cover - Removal).
- Remove the crankshaft cover (see Crankshaft Cover - Removal).
- Remove the balancer shaft cover (see Balancer Shaft Cover - Removal).
- Remove the clutch (see Clutch - Removal).
- Remove the transmission assembly (see Transmission - Removal).
- Remove the oil pump (see Oil Pump - Removal).
- Remove the starter drive and flywheel (see Flywheel, Starter Drive Gears and Sprag Clutch - Removal).

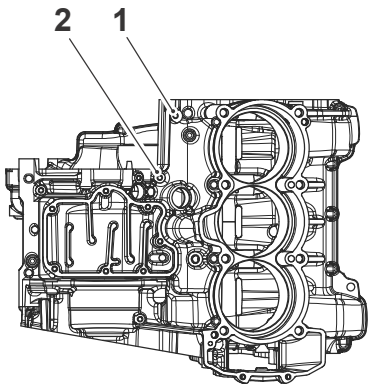
Note

- **If the crankshaft or connecting rods are to be removed, the cylinder head must also be removed.**

CAUTION

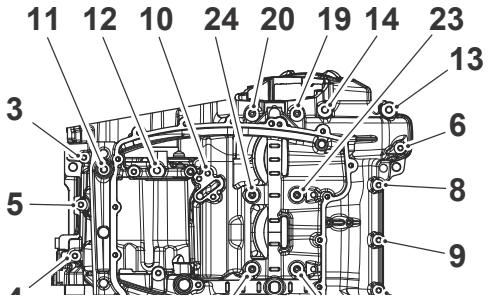
Failure to follow the correct screw release sequence may result in permanent crankcase damage.

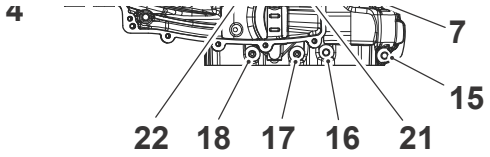
1. Working on the upper crankcase bolts first, release the bolts in the sequence shown below.



Upper Crankcase Bolt Release Sequence

2. Invert the engine to give access to the lower crankcase bolts.
3. Release the lower crankcase bolts in the sequence shown in the diagram below.





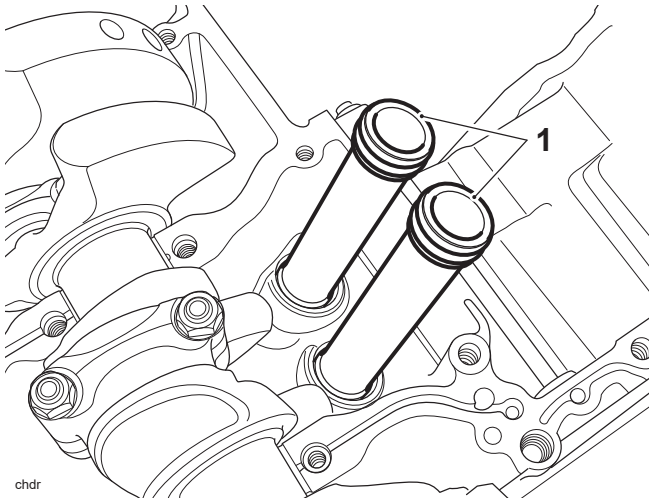
Lower Crankcase Bolt Release Sequence

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

⚠ CAUTION

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

5. Note the positions of the two coolant tubes in the upper crankcase.



1. Coolant tubes

Note

- **At this point the balancer shaft, crankshaft, bearings etc. can be removed.**

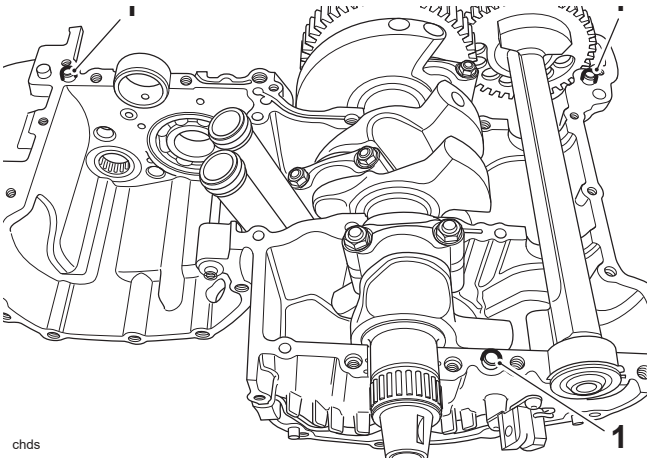
Crankcases - Assembly

Connecting Rods - Removal

⚠ WARNING

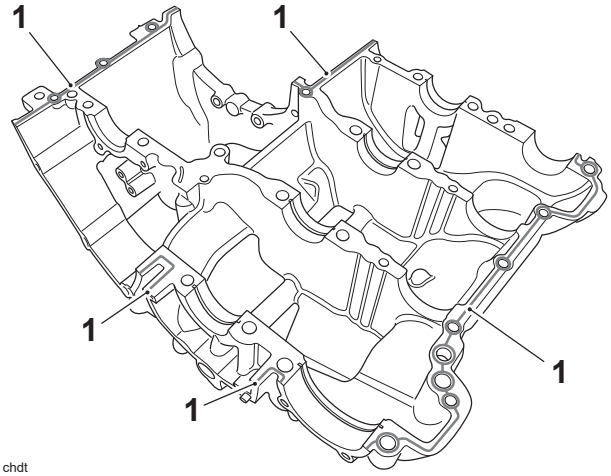
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

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



1. Locating dowels

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



1. Sealer areas

CAUTION

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

5. Install and lubricate the crankshaft bearing shells with clean engine oil (see bearing selection before proceeding).
6. Lubricate the crankshaft journals with clean engine oil.
7. Position the lower crankcase to the upper crankcase.
8. Fit the screws into the lower crankcase and hand tighten until the bolt heads are near contact with the crankcase.
9. Invert the engine.
10. Fit the screws into the upper crankcase and hand tighten until the bolt heads are near contact with the crankcase.

Note

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

CAUTION

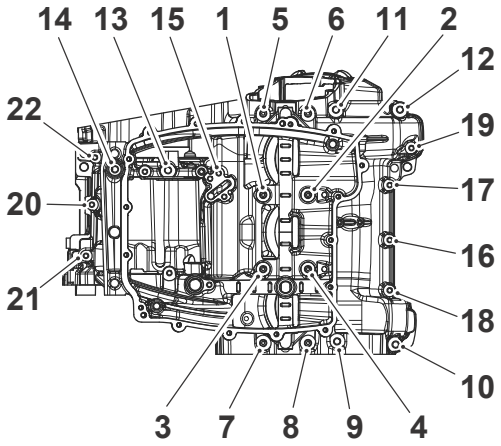
Failure to follow the correct screw tightening sequence may result in permanent crankcase damage.

Stage 1 - M8 screws only

11. Invert the engine.
12. In the correct sequence, tighten the M8 size lower crankcase screws (numbers 1 to 14) to **14 Nm**.

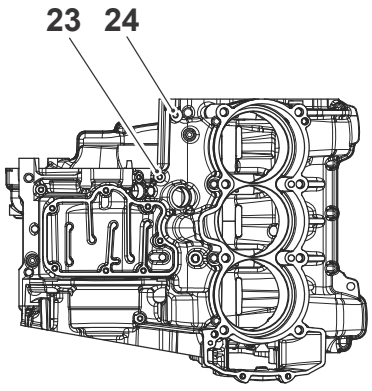
Stage 2 - M6 screws only

13. In the correct sequence, tighten the M6 size lower crankcase screws (numbers 15 to 22) to **12 Nm**.



Lower Crankcase Bolt Tightening Sequence

14. Invert the engine.
15. In the correct sequence, tighten the upper crankcase bolts (number 23 and 24) to **12 Nm**.



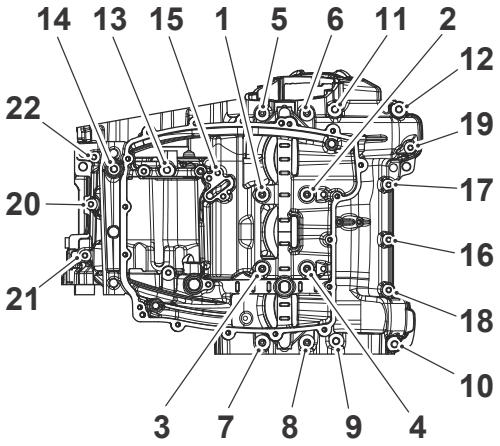
Upper Crankcase Bolt Tightening Sequence

Stage 3 - M8 screws only

16. Invert the engine.
17. In the correct sequence, tighten the M8 size lower crankcase screws (numbers 1 to 14) to **36 Nm**.

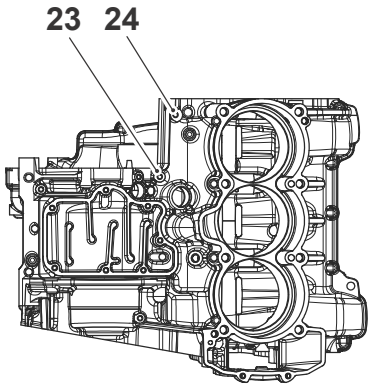
Stage 4 - M6 screws only

18. In the correct sequence, tighten the M6 size lower crankcase screws (number 15 to 22) to **12 Nm**.



Lower Crankcase Bolt Tightening Sequence

19. Invert the engine.
20. In the correct sequence, tighten the upper crankcase bolts (number 23 and 24) to **12 Nm**.



Upper Crankcase Bolt Tightening Sequence

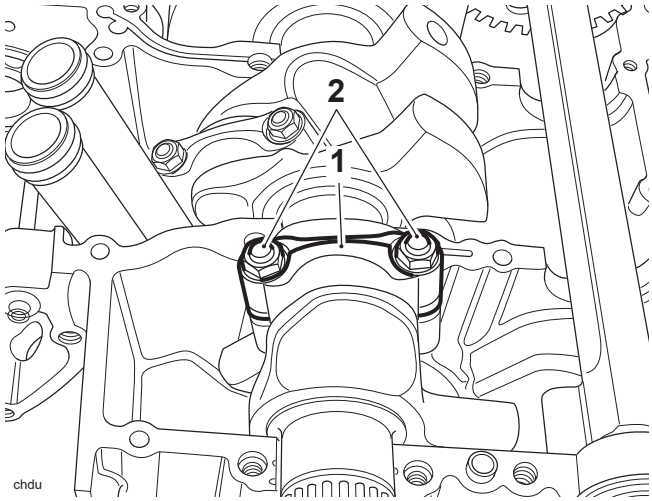
21. Rotate the crankshaft clockwise. Check for tight spots and rectify as necessary.
    - Refit the transmission assembly (see Transmission - Installation).
    - Refit the starter drive and flywheel (see Flywheel, Starter Drive Gears and Sprag Clutch - Installation).
    - Refit the oil pump (see Oil Pump - Installation).

- Refit the clutch (see Clutch - Installation).
- Refit the flywheel cover (see Flywheel Cover - Installation).
- Refit the crankshaft cover (see Crankshaft Cover - Installation).
- Refit the balancer shaft cover (see Balancer Shaft Cover - Installation).
- Refit the sump (see Sump - Installation).
- Install the engine in the frame (see Engine - Installation).

Connecting Rods - Installation

- Remove the engine from the frame (see Engine - Removal).
- Remove the cylinder head (see Cylinder Head - Removal).
- Remove the cylinder liners (see Cylinder Liners - Removal).
- Remove the pistons from the connecting rod (see Pistons - Disassembly).
- Separate the two halves of the crankcase (see Crankcases - Disassembly).

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



1. **Big end cap**
2. **Connecting rod nuts**

Note

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

3. Push the connecting rod up through the crankcase and collect the connecting rod from the top.
4. Label the assembly to identify the cylinder from which it was removed.
5. Remove and discard the connecting rod bolts.

⚠ CAUTION

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

Connecting Rod Bearing Selection/ Crankshaft Journal Wear Check

Crankshaft - Removal

Note

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

⚠ WARNING

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

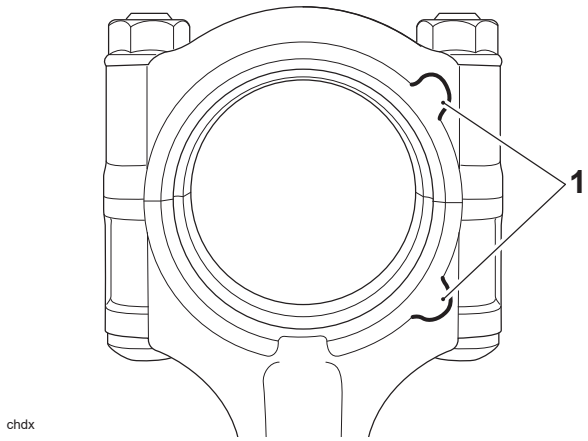
Reusing bolts can cause connecting rods and their caps to detach from the crankshaft causing severe engine damage, loss of motorcycle control and an accident.

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

Note

- **Ensure the piston is fitted correctly to the connecting rod.**
- **If a previously run engine is being rebuilt, always ensure that the piston and connecting rod are assembled in the same orientation as prior to strip-down.**
- **Connecting rods may be fitted to the pistons either way around. However, ensure all three are fitted facing the same way in relation to the piston. To aid correct assembly, the connecting rods have assembly markers cast in to them, as shown overleaf.**

2. Fit the pistons to the connecting rods (see Piston Assembly), ensuring the assembly markers will all be assembled on the same side, when the piston arrows face the front of the engine.

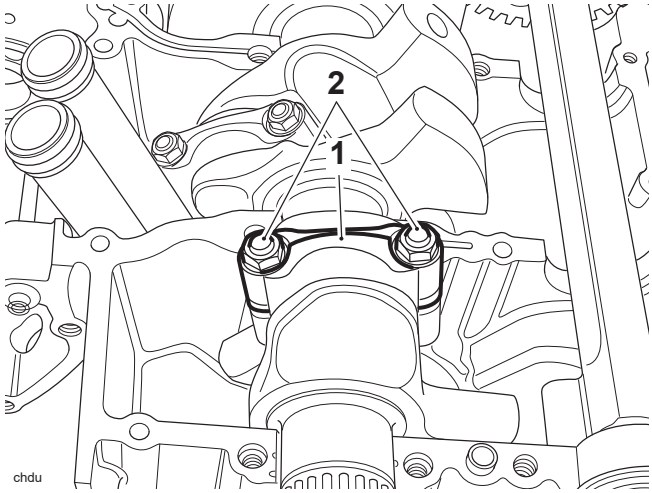


1. Assembly markers

⚠ WARNING

Avoid contact with the bearing surfaces of the bearing shells with engine components, tools, hands or fingers. Damage to the soft bearing surfaces may result, leading to reduced engine life or severe engine damage.

3. Select the correct big end bearing shells (see Connecting Rod Bearing Selection/ Crankshaft Journal Wear Check).
4. Fit the bearing shells as selected at step 3 to the connecting rod and big end cap and lubricate with a 50/50 solution of engine oil and molybdenum disulphide grease.
5. Align the connecting rod to the crankshaft and fit the big end cap. Ensure the assembly marker on the connecting rod and cap face the same direction.

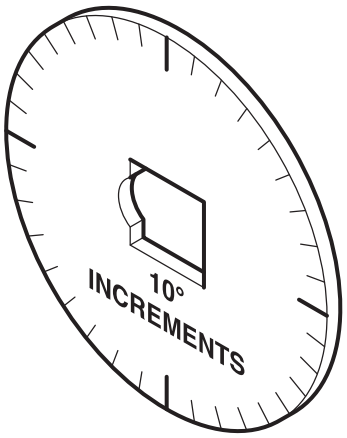


1. **Big end**
2. **Connecting rod nuts**

⚠ CAUTION

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

6. Lubricate the threads of the bolt and the face of the nut with molybdenum disulphide grease. Tighten the nuts progressively in two stages as follows:
   - Tighten to **14 Nm**.
   - Tighten through 180° of nut rotation as measured using T3880105 - Angular Torque Gauge.



T3880105 - Angular Torque Gauge

- Assemble the crankcases (see Crankcases - Assembly).
- Refit the cylinder liners (see Cylinder Liners - Installation).
- Refit the cylinder head (see Cylinder Head - Installation).
- Refit the engine to the frame (see Engine - Installation).

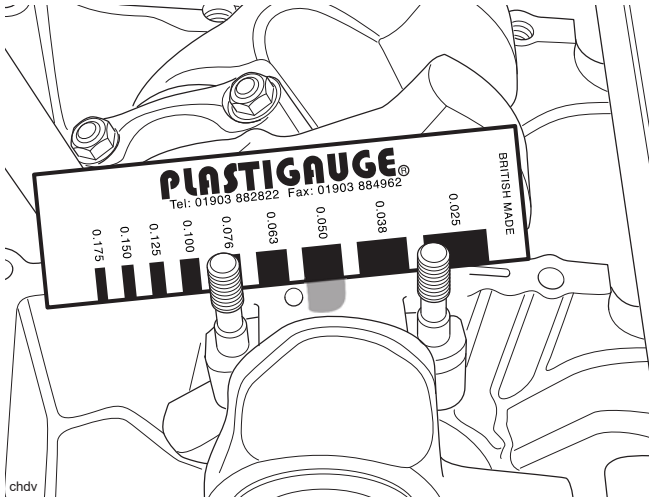
1. Measure the bearing and crankshaft journal clearance as follows:

Note

Note

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

2. Remove the big end cap from the journal to be checked.
3. Wipe the exposed areas of the crankshaft journal, and the bearing face inside the cap.
4. Apply a thin smear of grease to the journal and a small quantity of silicone release agent to the bearing.
5. Trim a length of the Plastigauge to fit across the journal. Fit the strip to the journal using the grease to hold the Plastigauge in place.
6. Lubricate the threads of the bolt and the face of the nut with molybdenum disulphide grease. Refit the bearing end cap and tighten the big end nuts (see Connecting Rods - Installation).
7. Release the nuts and remove the cap being measured. Using the gauge provided with the Plastigauge kit, measure the width of the compressed Plastigauge.



Checking the Measured Clearance

8. For specifications refer toCrankshaft.

Note

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

Connecting Rod Bearing Selection

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

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

Connecting Rod Bearing Selection Chart (all dimensions in mm)				
Shell Colour	White	Red	Red	Blue

Connecting Rod Marking	5	5	4	4
Connecting Rod Bore Dia.	41.000 41.008	41.000 41.008	41.009 41.018	41.009 41.018
Crankshaft Journal Dia.	38.029 38.036	38.020 38.028	38.029 38.036	38.020 38.028
Running Clearance	0.030 0.053	0.030 0.054	0.031 0.055	0.031 0.056

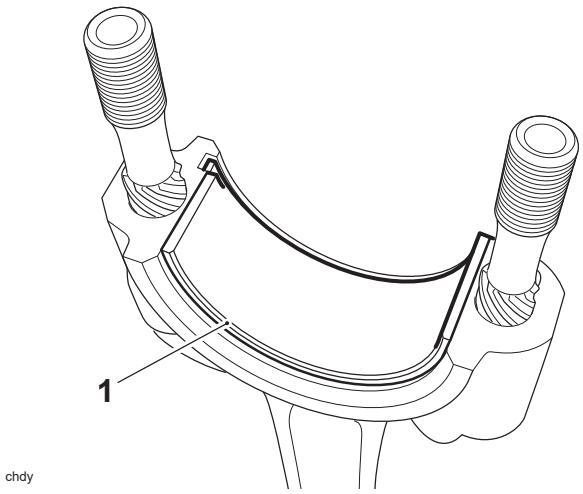
Connecting Rod Bearing Selection Example

Connecting Rod Mark	**5**
Connecting Rod Bore Diameter	**41.008**
Crankshaft Journal Diameter	**38.020**
Required Bearing	**Red**

Note

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

3. Install the new bearings in the connecting rod.



1. Connecting rod bearing

CAUTION

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

Crankshaft - Installation

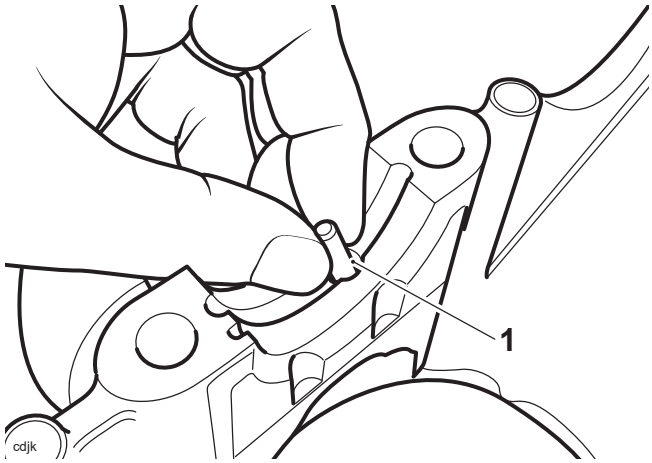
- Remove the engine from the frame (see Engine - Removal).
- Separate the two halves of the crankcase (see Crankcases - Disassembly).
- Remove the connecting rods (see Connecting Rods - Removal).
- Remove the camshaft drive chain (see Camshaft Drive Chain, Tensioner Blade and Rubbing Strip - Removal).

1. Release and remove the crankshaft from the upper crankcase.

Note

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

2. Collect the piston cooling jets from the crankcase oil ways beneath the crankshaft bearings.



1. Piston cooling jet (one of three)

⚠ CAUTION

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

3. Remove the balancer (see Balancer - Removal).

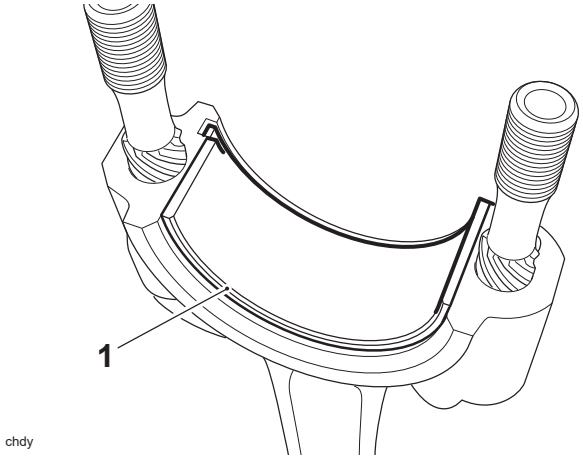
Crankshaft Main Bearing/Journal Wear

Pistons - Disassembly

⚠ CAUTION

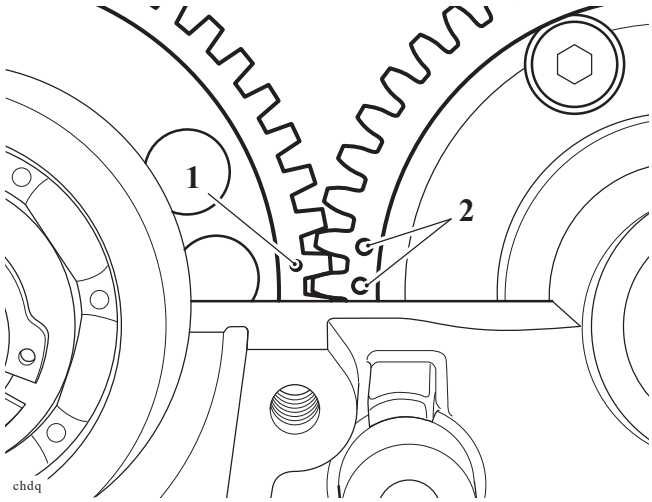
Always check the bearing journal clearance (see Crankshaft Main Bearing/Journal Wear), before final assembly of the crankshaft. Failure to correctly select crankshaft bearings will result in severe engine damage.

1. If removed, insert the three piston cooling jets into the main bearing housings in the upper crankcase.
2. Select and fit new main and big end shell bearings using the selection processes detailed in Connecting Rod Bearing Selection/ Crankshaft Journal Wear Check and Crankshaft Main Bearing/Journal Wear.



1. **Big end bearing**

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



1. **Balancer drive gear marking**
2. **Crankshaft markings**

- Refit the connecting rods (see Connecting Rods - Installation).
- Assemble the crankcases (see Crankcases - Assembly).
- Assemble the camshaft drive chain (see Camshaft Drive Chain, Tensioner Blade and Rubbing Strip - Installation).
- Refit the engine to the frame (see Engine - Installation).

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

Note

- **All four crankshaft main bearing/journal clearances must be measured at the same time.**

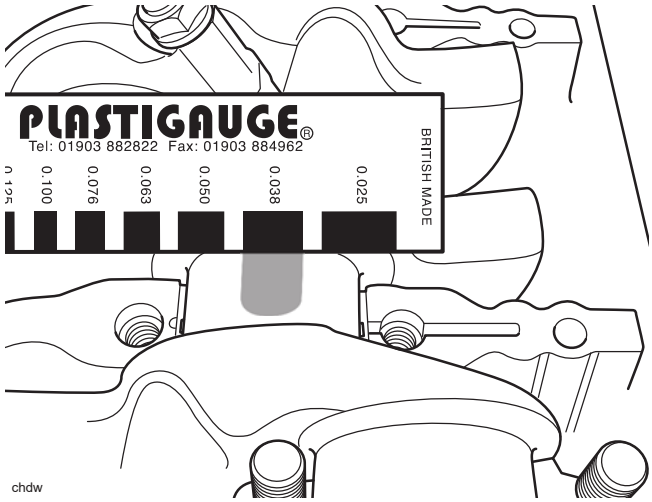
1. Separate the crankcase halves (see Crankcases - Disassembly).
2. Wipe the exposed areas of the crankshaft journals, and the bearing faces inside the lower crankcase half.

3. Apply a thin smear of grease to each journal and a small quantity of silicone release agent to each bearing.
4. Trim a length of the Plastigauge to fit across each journal. Fit the strips to each journal using the grease to hold the Plastigauge in place.

Note

- **Do not turn the crankshaft during crankcase assembly and disassembly as this will cause damage to the Plastigauge.**

5. Assemble the crankcase halves and tighten the fixings as described in Crankcases - Assembly.
6. Separate the crankcase halves (see Crankcases - Disassembly).
7. Using the gauge provided with the Plastigauge kit, measure the width of the compressed Plastigauge.



Checking Crankshaft Journal Clearance using Plastigauge

8. Record the clearance measurements for each crankshaft main bearing/journal.
9. For specifications refer toCrankshaft.

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

Note

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

Select bearings as follows:

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

Main Bearing Selection Chart (all dimensions in mm)			
Shell Colour	Crankcase Bore	Journal Diameter	Running Clearance
Red	41.125 to 41.116	37.976 to 37.969	0.046 to 0.020
Blue	41.125 to 41.116	37.968 to 37.960	0.045 to 0.020
Blue	41.134 to 41.126	37.976 to 37.969	0.045 to 0.022
Green	41.134 to 41.126	37.968 to 37.960	0.046 to 0.022

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

For example:

Crankshaft Journal diameter 37.962 mm

Crankcase Bore 41.125 mm

Bearing Required Blue

Note

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

⚠ CAUTION

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

Crankshaft End Float

For specifications refer toCrankshaft.

Note

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

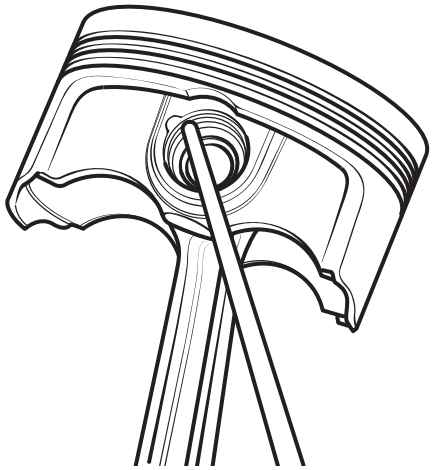
Piston Wear Check

Note

- **It is not necessary to remove the connecting rods from the crankshaft.**

- Remove the cylinder head (see Cylinder Head - Removal).
- Remove the cylinder liner (see Cylinder Liners - Removal).

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



cape

Removing the Gudgeon Pin Circlip

⚠ CAUTION

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

Note

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

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

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.**

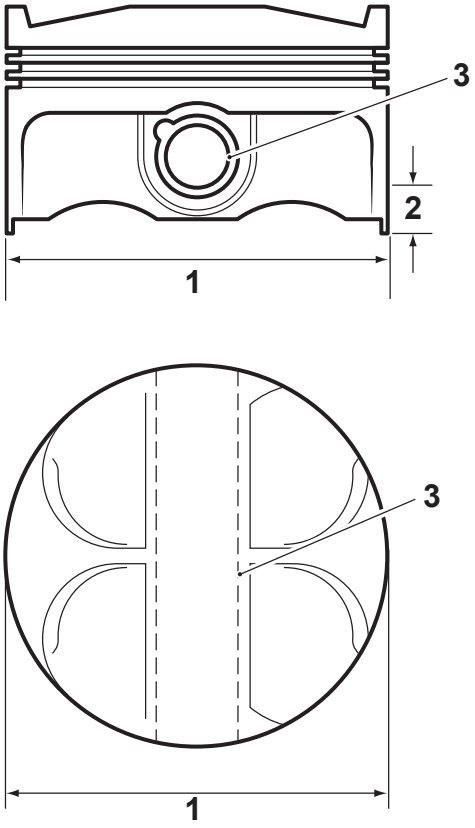
3. Remove the piston rings.

Piston Ring to Groove Clearance

Note

- **There are three grades of piston used during manufacture, these are grades A, AB and B. For spare parts use, only a grade AB piston will be supplied, which will fit all grades of cylinder liner.**
- **The piston is slightly oval in shape, therefore it is important to measure the diameter in the centre of the piston thrust faces, and at 90° to the direction of the gudgeon pin.**

1. Measure the piston outside diameter, 12.5 mm up from the bottom of the piston and at 90° to the direction of the gudgeon pin bore.



capf

1. **Piston outside diameter**
2. **Measurement point**
3. **Gudgeon pin bore**

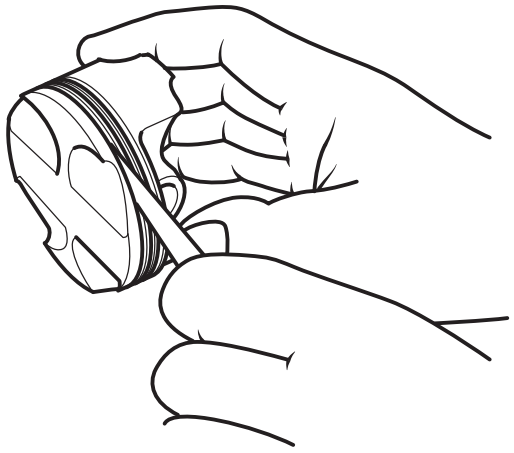
2. Always refer to the specifications table (see Pistons).
3. Replace the piston if the measured diameter falls outside the specified limit.

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

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

Clean the piston ring grooves.

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



capg

Piston Ring to Ring Groove Clearance Check

When checking the piston ring to groove clearance, always refer to the specifications table (see Pistons).

Note

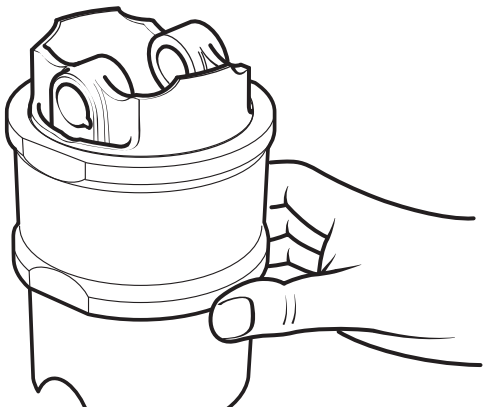
- **If the ring-to-groove clearance is too large, replace the piston rings with a new set.**
- **If the gap remains too large with new piston rings, the piston must also be replaced.**
- **If the gap is too small, check the piston ring grooves closely for distortion, replacing the piston as necessary. DO NOT FILE THE RING GROOVES.**

Piston Ring Gap

Note

- **Before final assembly the piston ring gap, when fitted in the liner, must first be checked.**

1. Place the piston ring inside the liner.
2. Push the ring into the top of the cylinder, using the piston to hold the ring square with the inside of the bore. Continue to push the ring into the bore until the third groove of the piston is level with the cylinder top, around the full circumference of the cylinder.



Aligning Piston Rings using the Piston

3. Remove the piston and measure the gap between the ends of the piston ring using feeler gauges.
4. When checking the piston ring end gap, always refer to the specification table (see Pistons).

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.**

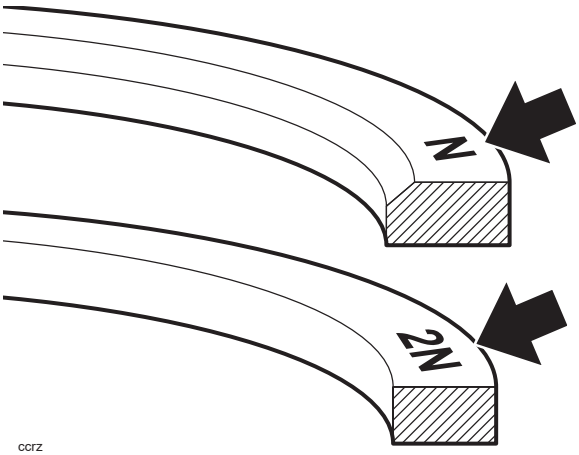
5. Repeat the procedure for the remaining piston rings.

Piston Assembly

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

Note

- **The top ring upper surface is marked 'N' and can be identified by a chamfer on the inside edge.**
- **The second ring upper surface is marked '2N' but is plain on the inside edge and has a bronze appearance.**
- **The oil control rings can be fitted with either face upward.**

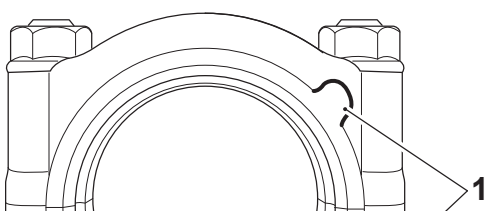


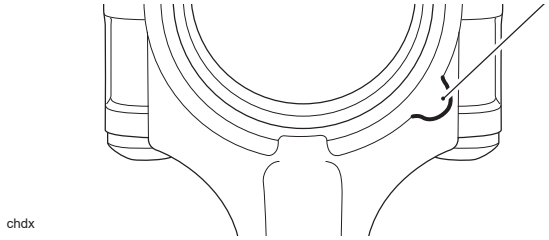
Piston Ring Identification

Note

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

2. Fit the piston to the connecting rod, ensuring the assembly markers in the cap and rod will all be assembled on the same side, when the piston arrows face the front of the engine.





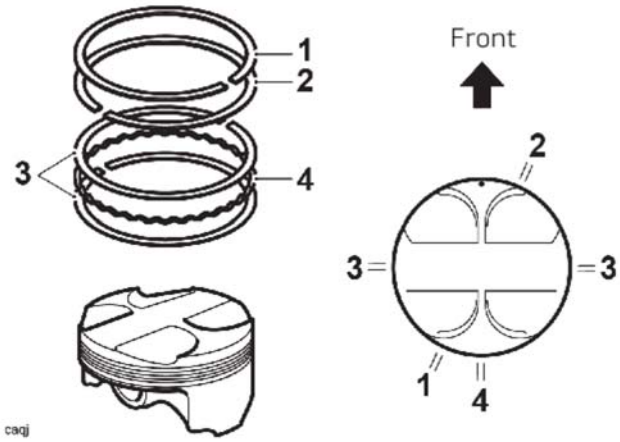
1. **Assembly markers**

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

WARNING

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

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



1. **Top ring**
2. **Second ring**
3. **Steel oil control rings**
4. **Oil control ring expander**

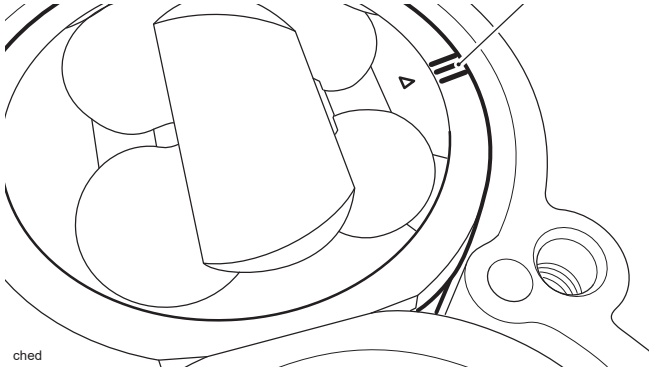
Note

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

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

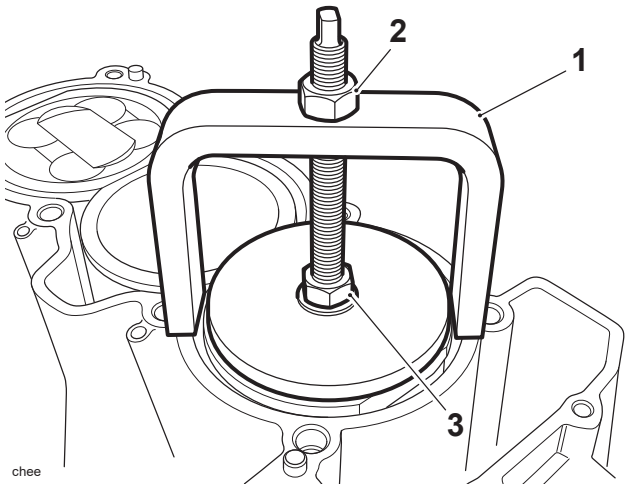
Cylinder Liners - Removal

1. Mark each liner to identify correct orientation and the cylinder number from which it has been removed.



1. **Paint mark**

2. Turn the crankshaft until the piston in the liner to be removed is at the bottom of its stroke.



1. **T3880315 - Extractor, Cylinder Liner**
2. **Extraction nut**
3. **Locking nut**

3. Check that the locking nut on T3880315 - Extractor, Cylinder Liner is loose, then fully unscrew the extraction nut.
4. Carefully fit the tool fully into the cylinder bore, positioning the tool legs on the crankcase. Turn the locking nut clockwise until the rubber sleeve on the tool tightly grips the bore of the liner.
5. Check that the tool legs are positioned to allow withdrawal of the liner, then turn the extraction nut clockwise to extract the liner. Take care to ensure that the piston/connecting rod is not allowed to fall against the inside of the crankcase.
6. Turn the locking nut anticlockwise to release the liner.

Note

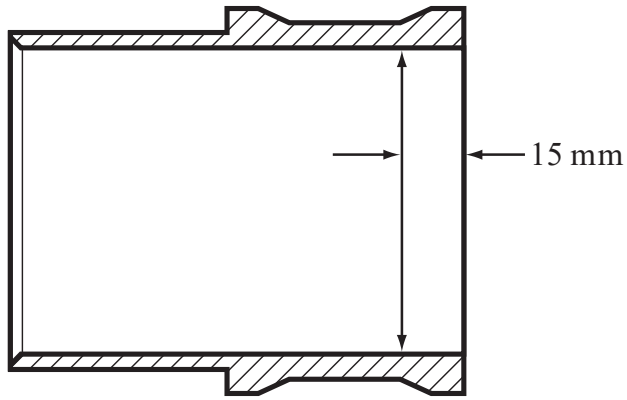
- **The tool must be used to release the seal between the liner and the crankcase.**
- **It is not intended that the tool is used to fully extract the liner. Once the seal is released, the tool must be removed and the liner extracted by hand.**

Cylinder Liner Wear

Note

- **There are two grades of liner used during manufacture, these are grades A and B. For spare parts use, only a grade A liner will be supplied, which will fit all grades of piston.**

1. Measure the inside diameter of each cylinder liner, 15 mm from the top, using an internal micrometer or similar accurate measuring equipment.



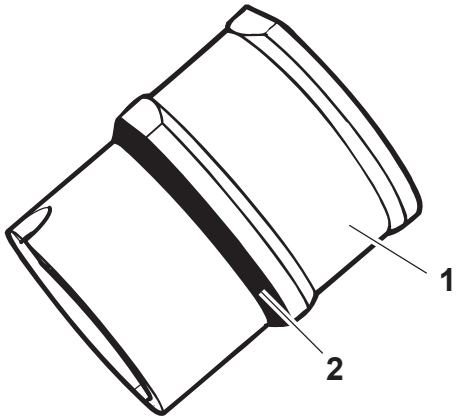
gaep

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

2. When measuring the cylinder liner internal diameter, always refer to the specifications table (see Pistons).
3. If any reading is outside the specified limits, replace the liner and piston as an assembly.

Cylinder Liners - Installation

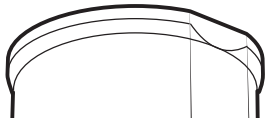
1. Thoroughly clean the liner removing all traces of old silicone sealer.
2. Remove all traces of sealer from the crankcase bores.
3. Apply silicone sealer to the liner to crankcase mating face.

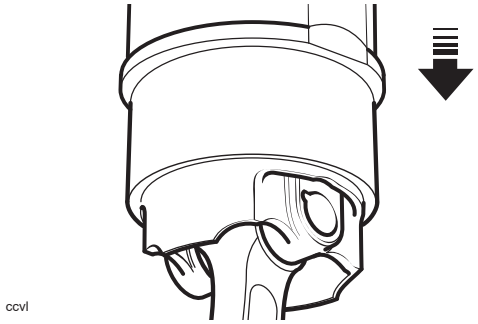


ccvk

1. **Liner**
2. **Sealer area**

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





Arrowed: Liner-Piston Fitment

Note

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

CAUTION

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

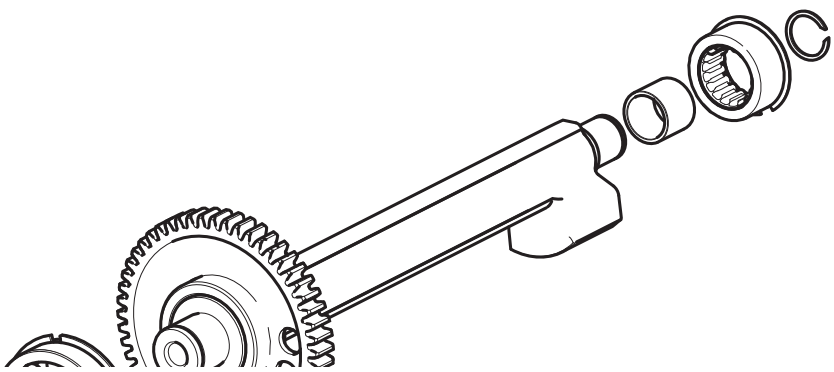
5. Continue fitting each liner in turn until all are fitted and sealed.

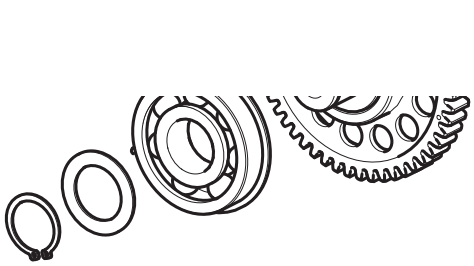
Note

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

Balancer

Exploded View – Balancer Shaft





Balancer

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

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

Balancer - Removal

- Separate the crankcase halves (see Crankcases - Disassembly).

1. With the crankcase halves separated, lift out the balancer shaft complete with the shaft bearings/circlips.
2. To remove the left hand bearing, slide the bearing, circlip and bearing sleeve from the balancer shaft.
3. To remove the right hand bearing, remove the circlip and slide the bearing race and thrust washer from the shaft.

Balancer - Inspection

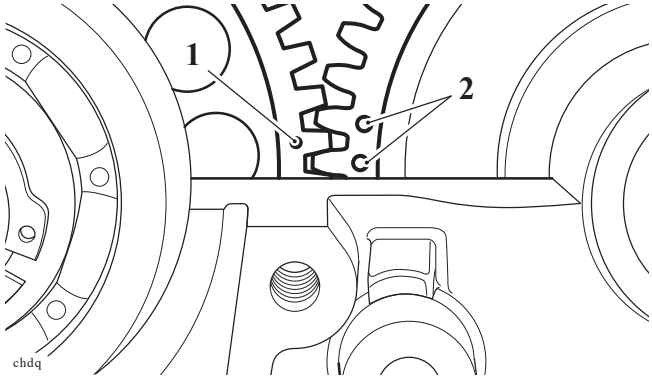
1. Inspect all gears for chipped or missing teeth.
2. Inspect all bearings for signs of overheating (blue discolouration), seized or damaged rollers, and any other damage.
3. Inspect the gear teeth for overheating (blue discolouration).

Note

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

Balancer - Installation

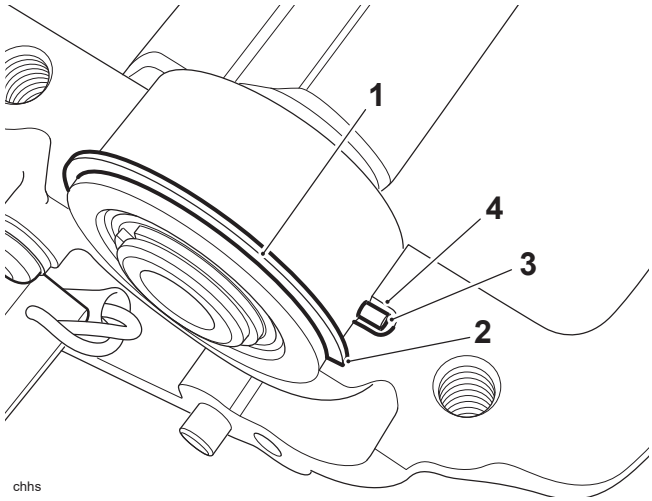
1. Lubricate and fit the right hand bearing and circlip to the shaft.
2. Lubricate and fit the left hand bearing and circlip.
3. Locate the balancer to the crankcase aligning the balancer gears and crankshaft as shown in the illustration below, while ensuring that the bearing circlips and pins locate correctly in their corresponding grooves in the crankcase.



1. **Balancer drive gear markings**
2. **Crankshaft markings**

CAUTION

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



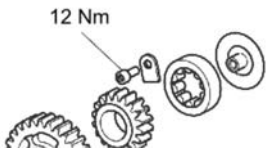
1. **Circlip (left hand shown)**
2. **Crankcase circlip groove**
3. **Pin**
4. **Pin groove**

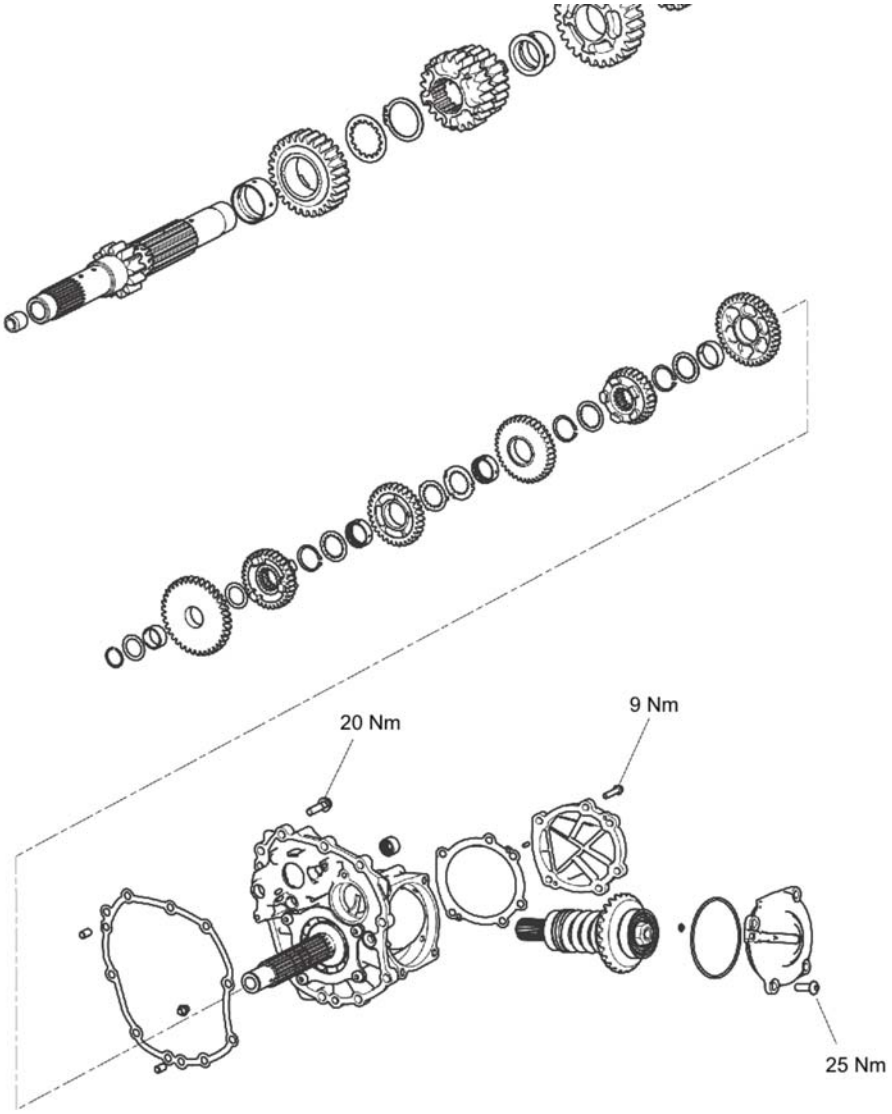
4. Check that the balancer and crankshaft are correctly aligned before continuing.

- Assemble the crankcase halves (see Crankcases - Assembly).

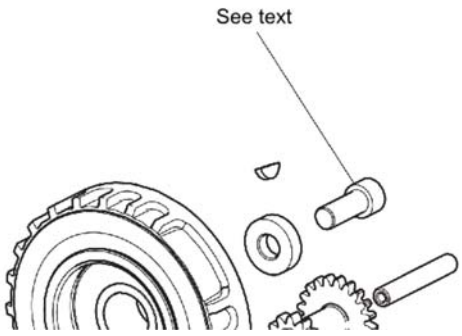
Transmission

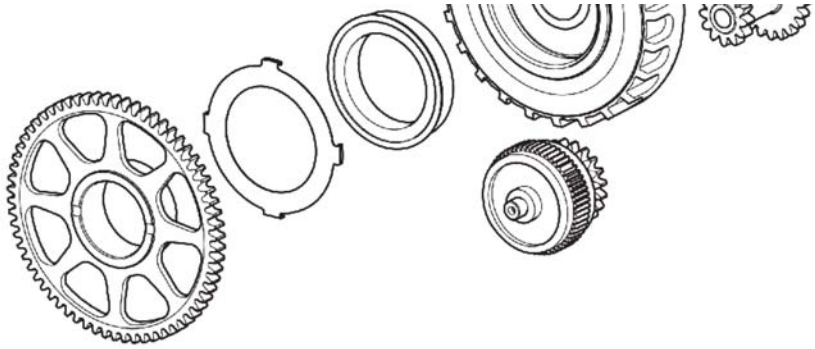
Exploded View – Input and Output Shafts



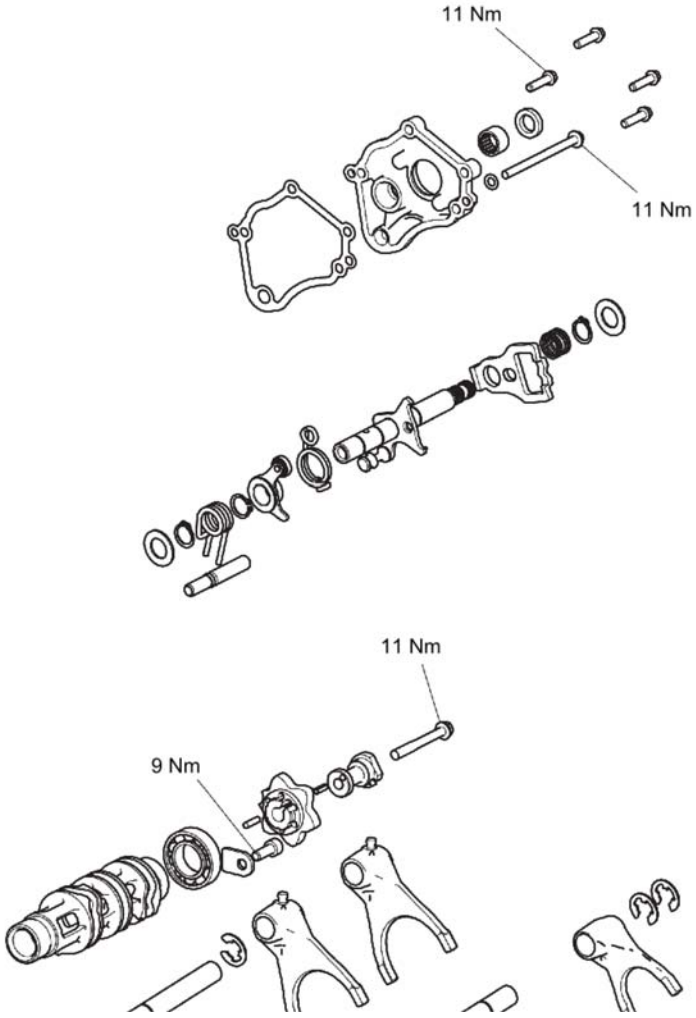


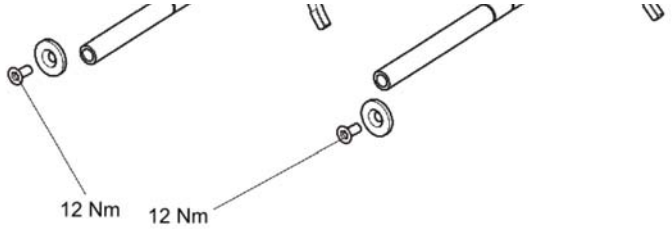
Exploded View – Flywheel, Sprag Clutch and Starter Gears



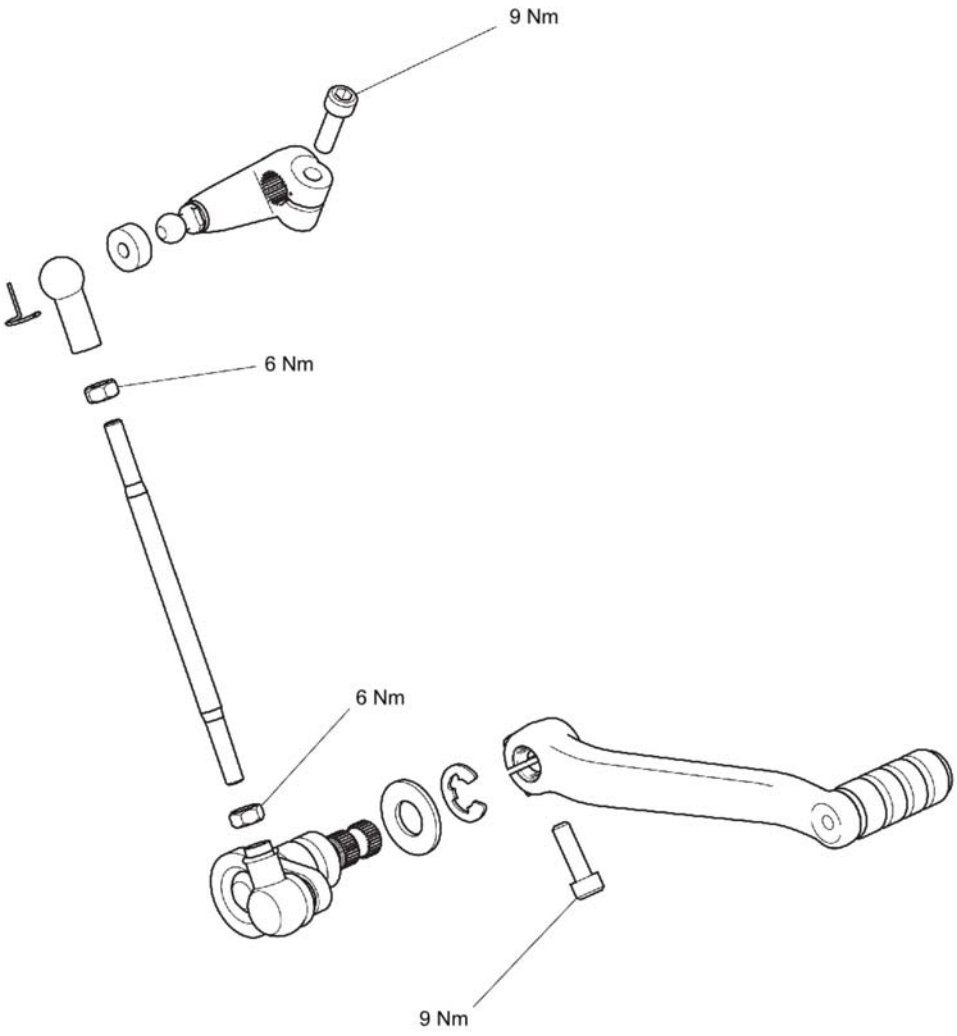


Exploded View – Gear Selectors and Drum





Exploded View – Gear Change Mechanism



Description

The transmission is of a cassette type design, which allows removal of the complete transmission as an assembly with the front bevel box, without separating the crankcase halves. Removal of the input shaft can be

achieved after first removing the output shaft first gear and its bearing. The output shaft is an integral part of the front bevel box assembly and cannot be removed.

The front bevel box assembly contains no user serviceable parts, and must be replaced if any wear or damage are found. It is permitted however to replace the damper shaft oil seal and the bevel box casing O-rings and gaskets.

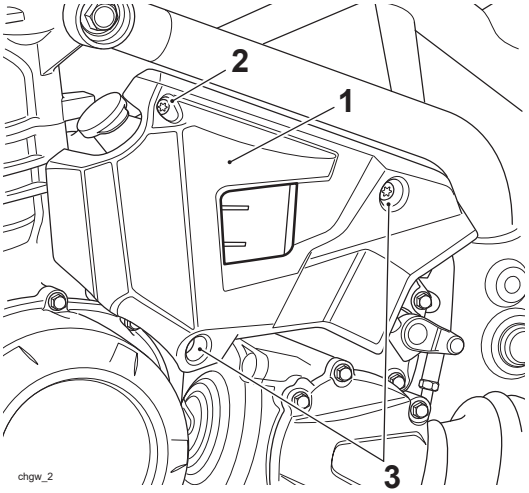
The gear selector shaft can be removed and installed without removal of the transmission, after first removing the selector cover and gear position sensor.

Gear Change Linkage - 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 three fixings and remove the expansion tank cover. Discard the upper M5 fixing. Retain the lower M6 fixings for reuse.



1. **Expansion tank cover**
2. **Upper fixings (M5)**
3. **Lower fixings (M6)**

Note

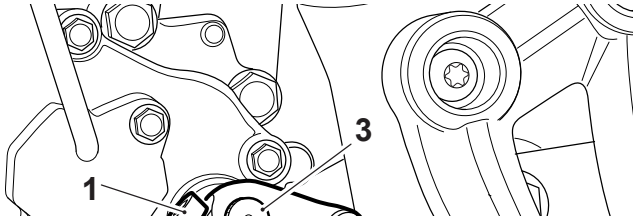
- **The upper ball joint and lock nut on the gear change linkage has a left hand thread. This is identified by a machined ring on the linkage and on the ball joint.**

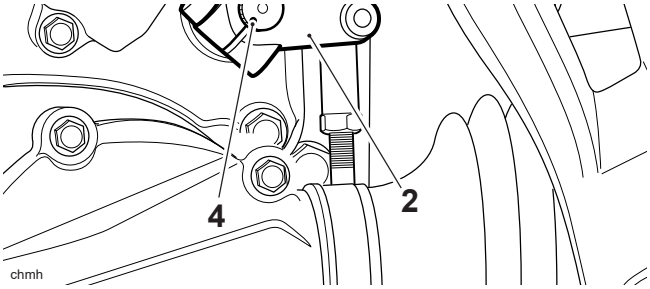
2. Loosen the two lock nuts on the gear change linkage.

Note

- **Note the position of the transmission linkage in relation to the punch mark on the gear change mechanism.**

3. Select neutral, remove the pinch bolt and disconnect the transmission linkage from the gear change mechanism.



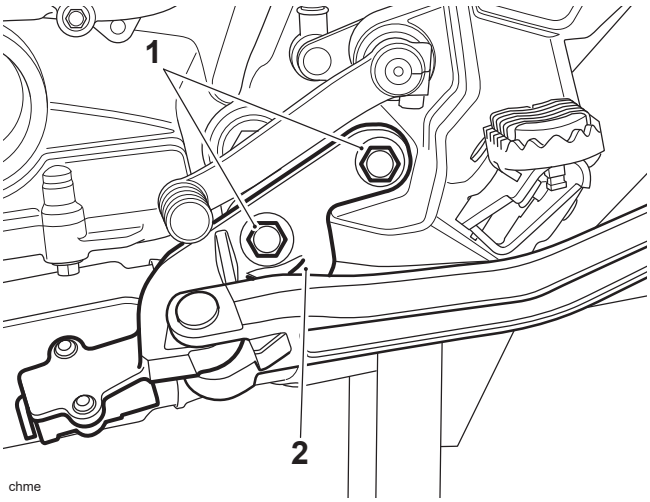


1. **Pinch bolt**
2. **Transmission linkage**
3. **Gear change mechanism**
4. **Punch mark**

Note

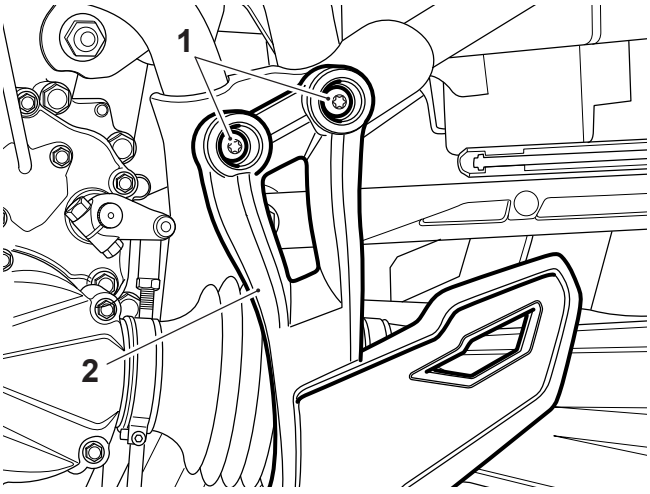
- **Do not allow the side stand to hang on the harness for the side stand switch.**
- **Note the routing of the harness for the side stand switch for installation.**

4. Release the fixings, detach the side stand and position aside.



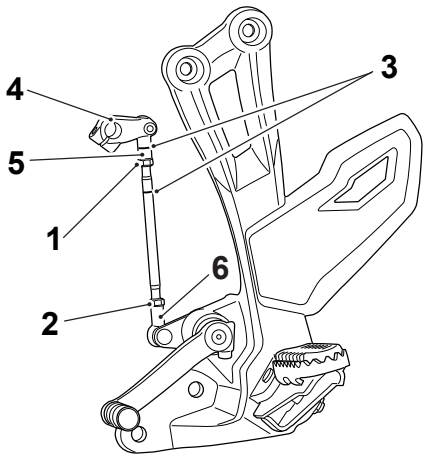
1. **Fixings**
2. **Side stand**

5. Release the fixings and remove the left hand control plate.



1. **Fixings**
2. **Control plate**

6. Remove the upper ball joint from the gear change linkage (left hand thread).
7. Remove the gear change linkage from the lower ball joint (right hand thread).



1. **Lock nut, left hand thread**
2. **Lock nut, right hand thread**
3. **Machined rings**
4. **Transmission linkage**
5. **Upper ball joint**
6. **Lower ball joint**

8. If necessary, remove the lock nuts from the gear change linkage.

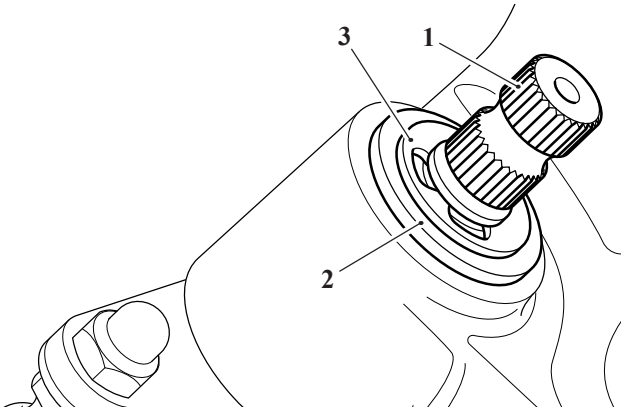
Gear Change Pedal - Cleaning and Inspection

1. Remove the pinch bolt and remove the gear pedal from the gear change shaft.

Note

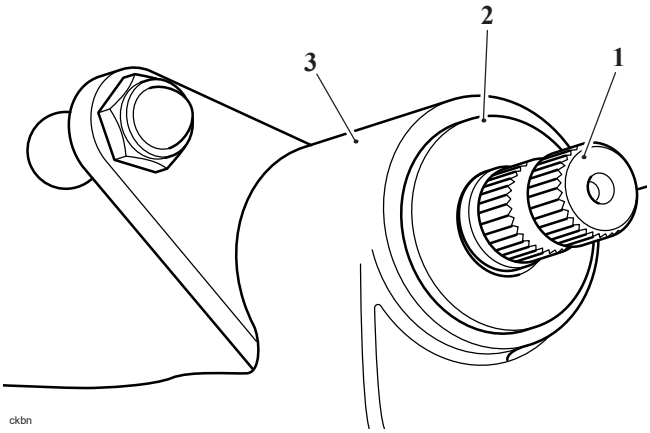
- **The gear change bushes are made of a metal backed, composite bearing material needing no additional lubrication.**
- **The bearings, shaft and washers are assembled dry (without lubrication) at the factory and must not be lubricated during service or repair.**

2. Remove the circlip.



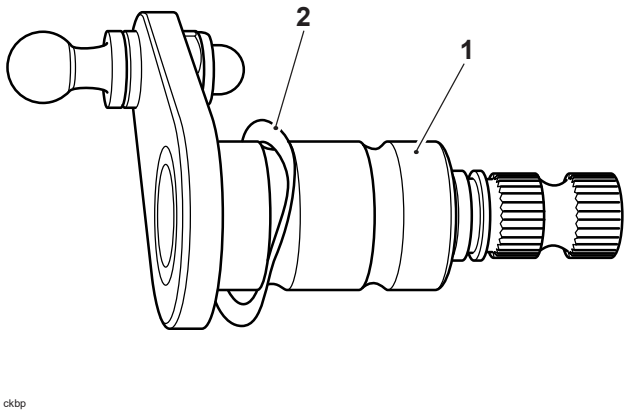
1. **Gear change shaft**
2. **Circlip**
3. **Flat washer**

3. Remove the flat washer.



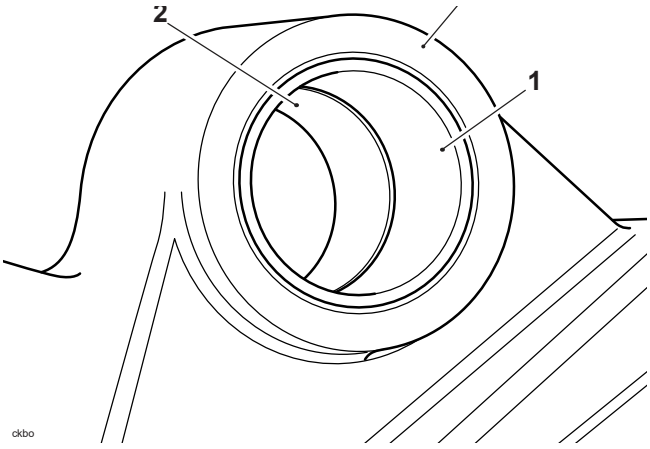
1. **Gear change shaft**
2. **Flat washer**
3. **Housing**

4. Remove the gear change shaft from the housing and remove the wavy washer.



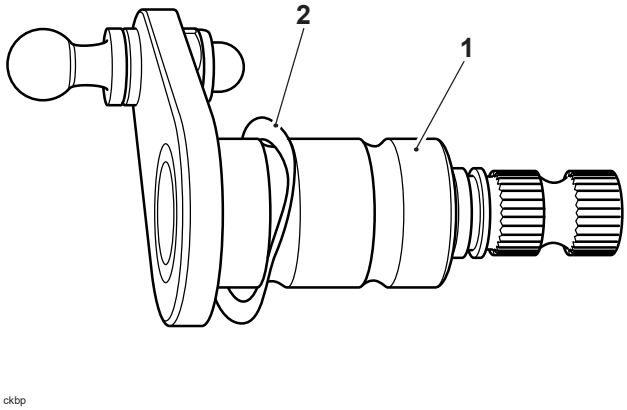
1. **Shaft**
2. **Wavy washer**

5. Using Castrol Metal Parts Cleaner or an equivalent, thoroughly clean the gear change bushes, shaft and washers and dry using a lint free cloth.



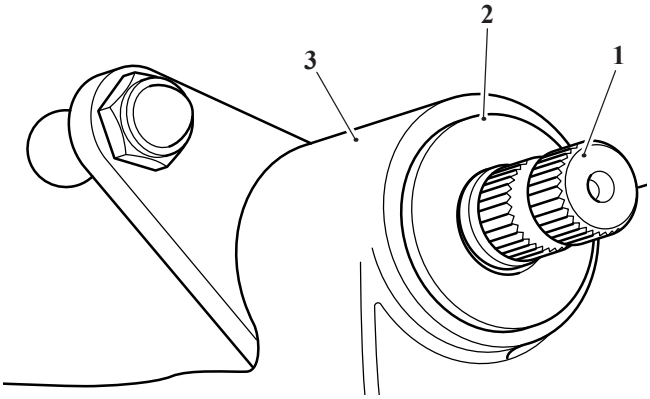
1. **Outer bush**
2. **Inner bush**
3. **Housing**

6. Inspect all parts for wear and replace as necessary.
7. Refit the wavy washer.



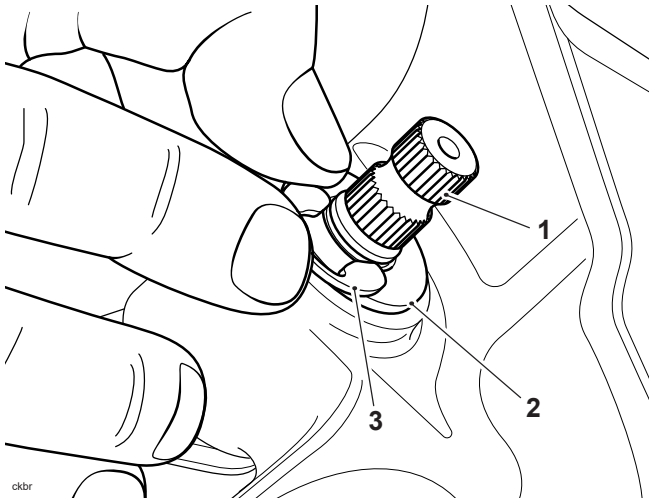
1. **Shaft**
2. **Wavy washer**

8. Fit the shaft into the housing and refit the flat washer as noted during removal.



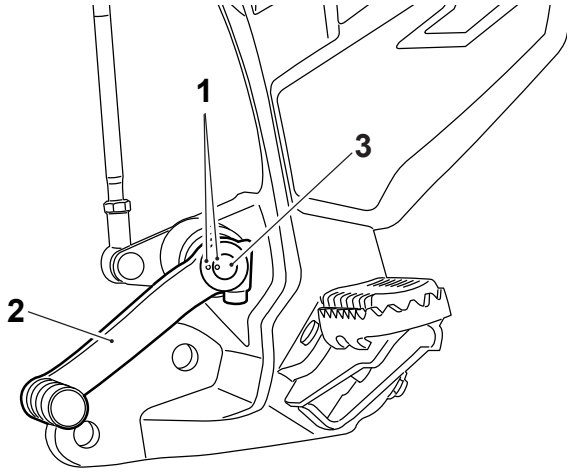
1. **Shaft**
2. **Flat washer**
3. **Housing**

9. Compress the components until the circlip groove is visible and then fit the circlip.



1. **Shaft**
2. **Flat washer**
3. **Circlip**

10. Refit the gear change pedal ensuring the punch mark on the pedal is aligned with the punch mark on the gear change shaft. Fit the pinch bolt and tighten to **9 Nm**.



1. **Punch marks**
2. **Gear change pedal**
3. **Gear change shaft**

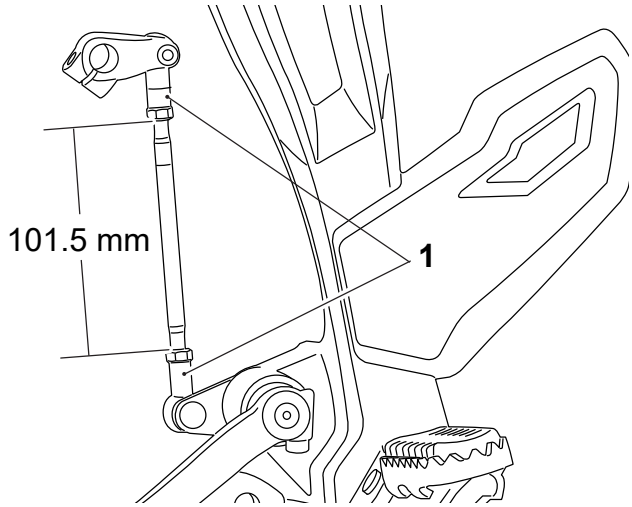
Gear Change Linkage - Installation

Selector Shaft - Removal

WARNING

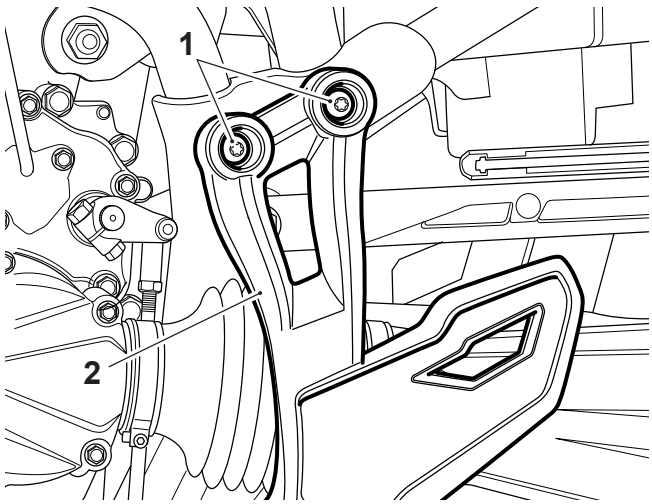
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. If removed, fit the lock nuts to the gear change linkage.
2. Screw the right hand threaded end of the gear change linkage into the lower ball joint by three complete turns.
3. Screw the upper ball joint and transmission linkage assembly to the left hand threaded end by three complete turns.
4. While holding the ball joint and transmission linkage assembly stationary, turn the gear change linkage to adjust the distance between the two ball joints to 101.5 mm.



1. **Ball joints**

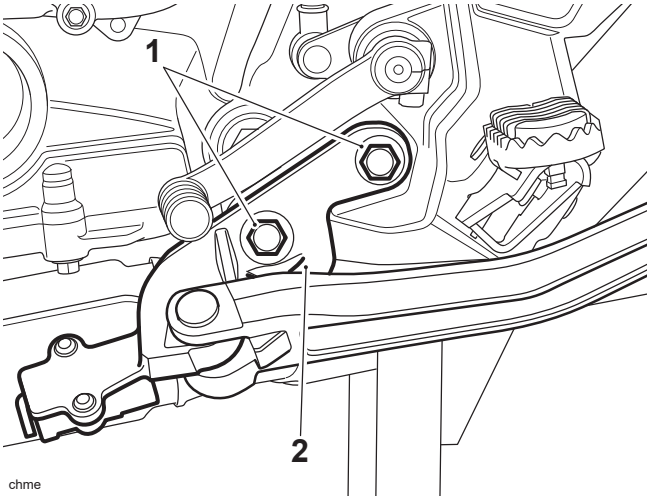
5. Move the lock nuts to the base of their ball joints and tighten the lock nut for the lower ball joint only to **6 Nm**. Do not fully tighten the upper lock nut at this stage.
6. Align the left hand control plate to the frame and fit the two upper fixings. Do not fully tighten at this stage.



1. **Fixings**
2. **Control plate**

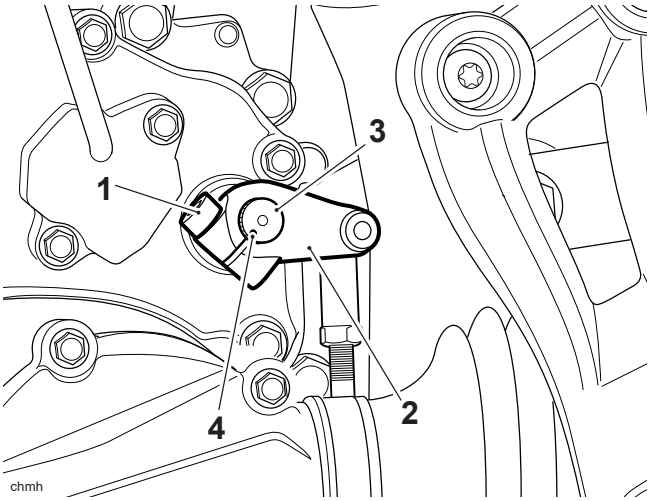
7. Route the harness for the side stand switch as noted for removal.

8. Fit the side stand and tighten its fixings to **70 Nm**.



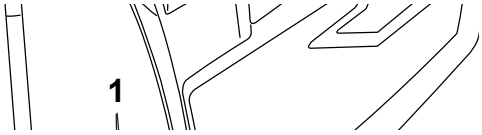
1. **Fixings**
2. **Side stand**

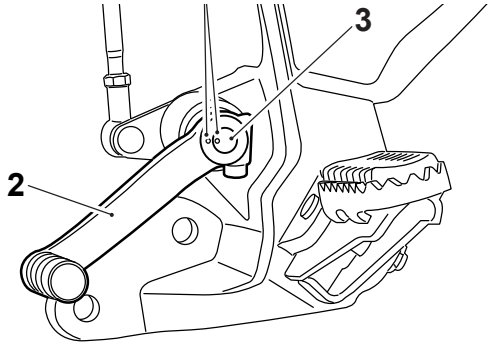
9. Tighten the upper fixings for the left hand control plate to **18 Nm**.
10. Fit the transmission linkage to the gear change mechanism as noted for removal.
11. Fit the pinch bolt and tighten it to **9 Nm**.



1. **Pinch bolt**
2. **Transmission linkage**
3. **Gear change mechanism**
4. **Punch mark**

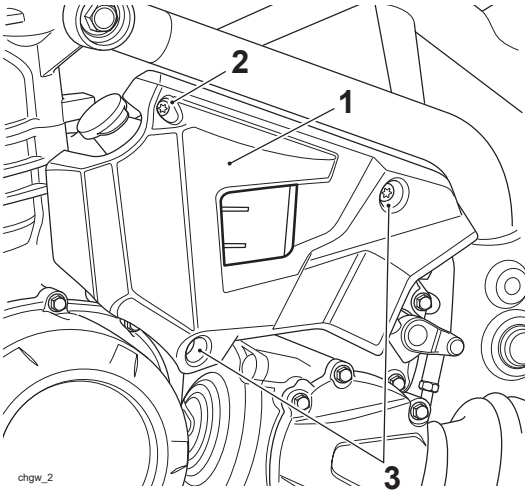
12. Tighten the upper lock nut (left hand thread) on the gear change linkage to **6 Nm**.
13. Check that the lower ball joint is facing the pivot for the gear change pedal and is not twisted to one side.
14. If the gear change pedal has been removed, align the punch mark on the pedal to the punch mark on the pivot for the gear change pedal.
15. Push the gear change pedal fully on, fit the pinch bolt and tighten to **9 Nm**.





1. **Punch marks**
2. **Gear change pedal**
3. **Pivot**

16. Refit the expansion tank cover. Secure the upper mounting with a new M5 encapsulated fixing. Secure the lower mounting with the two original fixings. Tighten the upper fixing to **3 Nm** and the lower fixings to **4 Nm**.



1. **Expansion tank cover**
2. **Upper fixing (M5)**
3. **Lower fixings (M6)**

⚠ WARNING

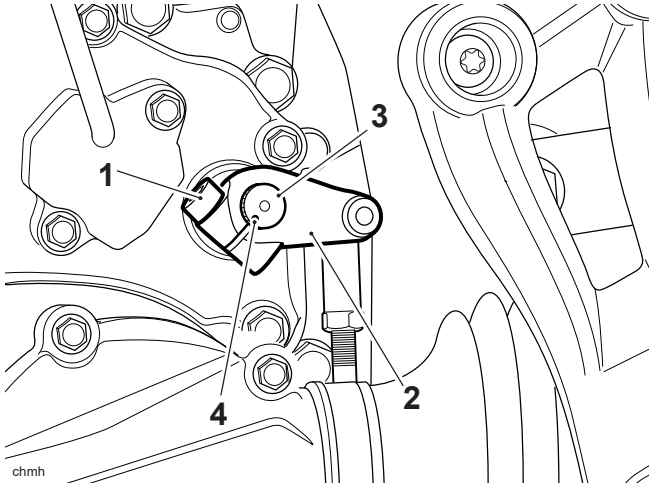
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

- Remove the rider’s seat (see Rider’s Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the coolant expansion tank (see Expansion Tank - Removal).

Note

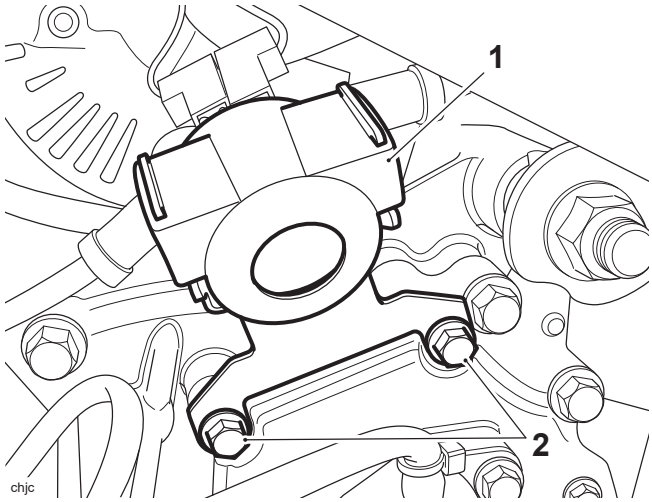
- **Note the position of the transmission linkage in relation to the punch mark on the gear change mechanism.**

1. Select neutral, remove the pinch bolt and disconnect the transmission linkage from the gear change mechanism.



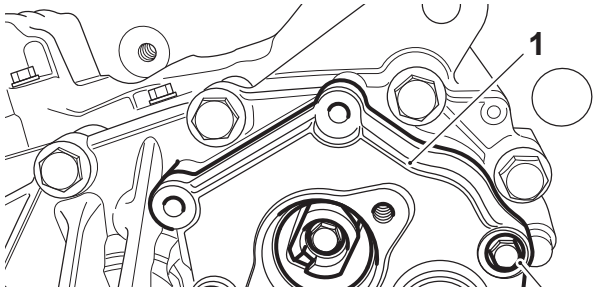
1. **Pinch bolt**
2. **Transmission linkage**
3. **Gear change mechanism**
4. **Punch mark**

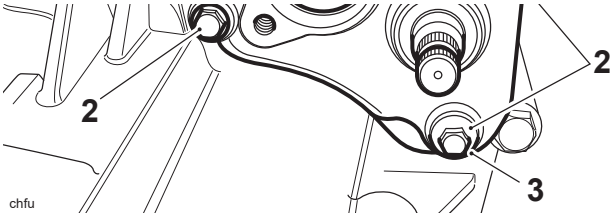
2. Remove the gear position sensor (see Gear Position Sensor - Removal).
3. Remove the two upper selector cover fixings and detach the starter solenoid and bracket. Position the starter solenoid aside.



1. **Starter solenoid**
2. **Fixings**

4. Remove the three remaining fixings and remove the selector shaft cover and gasket. Note the position of the two dowels.
5. Note that the 90 mm fixing is fitted with a copper washer.





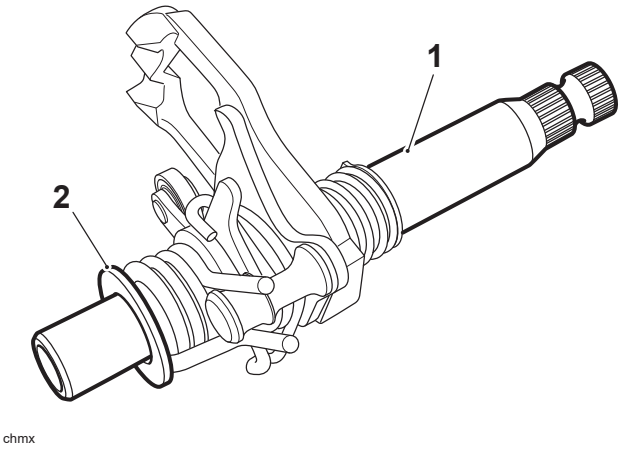
1. **Selector shaft cover**
2. **Fixings**
3. **Copper washer position**

6. Collect the washer from the outer end of the selector shaft.

CAUTION

Take care to ensure that the washer fitted to the inner end of the selector shaft remains in position during removal of the shaft. Should the washer become dislodged during removal, it is possible for it to drop in to the transmission housing. Should this happen, it will be necessary to remove the transmission and/or sump to recover the washer.

7. Remove the spring abutment sleeve.
8. Remove the selector shaft, along with the inner washer.



1. **Selector shaft**
2. **Inner washer**

Selector Shaft - Installation

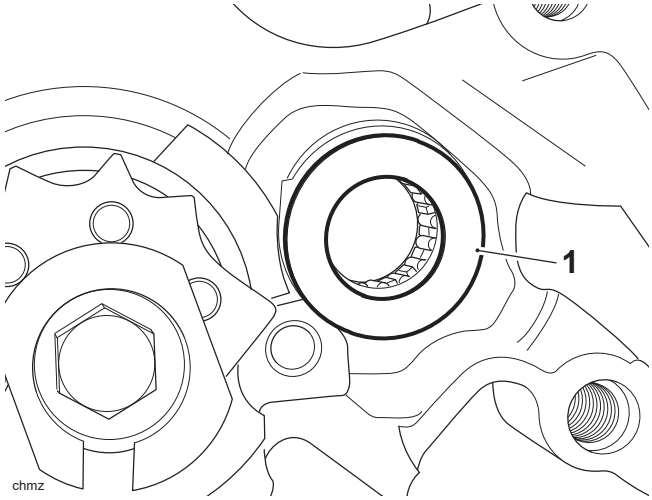
Transmission - Removal

Transmission - Installation

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 washer to the transmission housing, securing in position with a smear of multi-purpose grease.



1. **Washer**

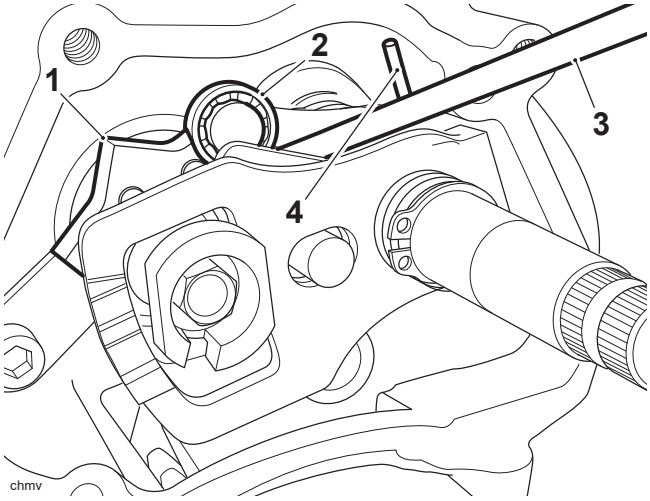
⚠ CAUTION

Take care to ensure that the washer remains in position during installation of the shaft. Should the washer become dislodged during installation, it is possible for it to drop in to the transmission housing. Should this happen, it will be necessary to remove the transmission and/or sump to recover the washer.

Note

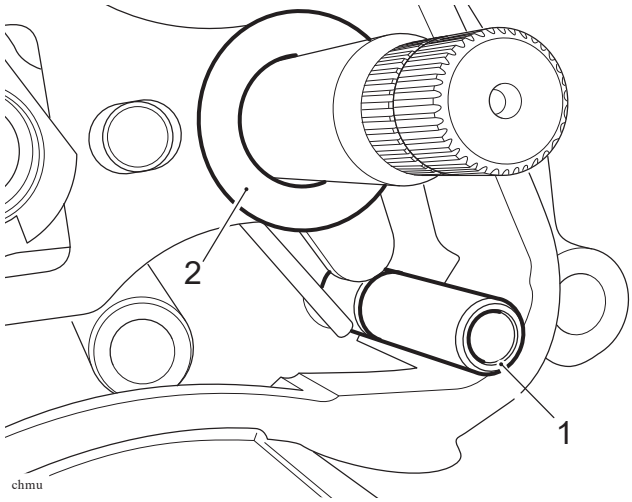
- **Prior to fitting the selector shaft, ensure that the long straight part of the detent spring is pointing up.**

2. Position the selector shaft to the transmission housing, aligning the shaft to the inner bearing. Ensure the inner washer remains in position as the shaft is installed.
3. Install the selector shaft until the detent arm lightly contacts the detent wheel.
4. Using a suitable tool, lift the detent arm roller onto the detent wheel, against the detent spring pressure, and install the selector shaft fully.



1. **Detent wheel**
2. **Detent arm roller**
3. **Lever**
4. **Detent spring**

5. Fit the abutment sleeve between the ends of the abutment spring and install fully in to the transmission casing.
6. Refit the washer to the outer end of the selector shaft.



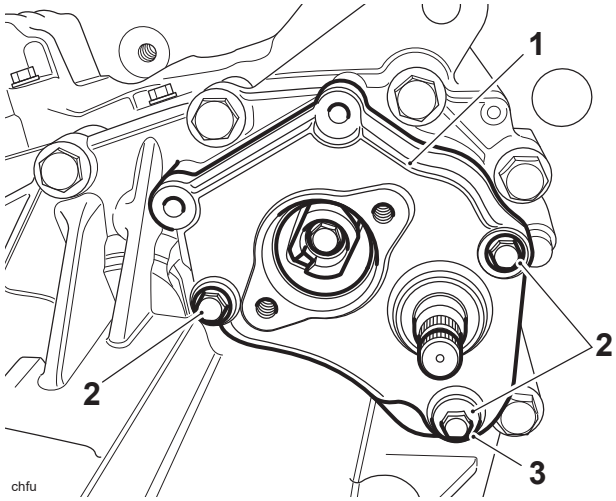
1. **Abutment sleeve**
2. **Washer**

7. Ensure that the two dowels are in position in the selector shaft cover.
8. Check the condition of the selector shaft seal; if necessary fit a new seal.

CAUTION

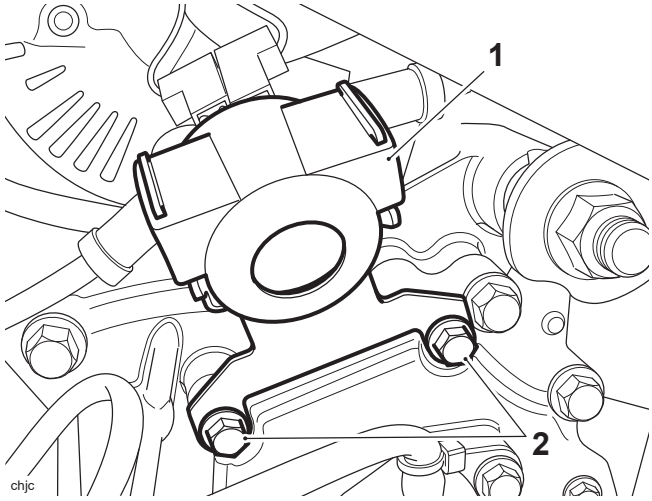
Take care to avoid damaging the lip of the seal when installing the selector shaft cover over the selector shaft. A damaged seal will lead to oil loss and could result in engine damage.

9. Fit a new gasket to the selector shaft cover, and refit the cover.
10. Fit a new copper washer to the 90 mm selector shaft cover fixing.
11. Secure the cover with the three fixings, noting that the 90 mm fixing passes through the abutment sleeve.



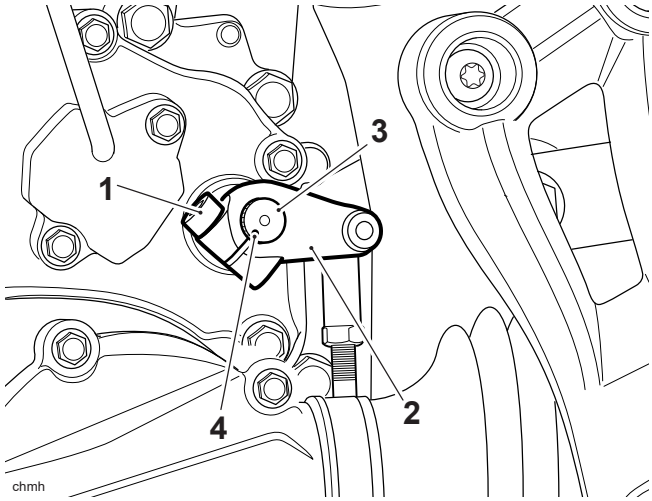
1. **Selector shaft cover**
2. **Fixings**
3. **Copper washer position**

12. Refit the starter solenoid and secure with the two remaining fixings.



1. **Starter solenoid**
2. **Fixings**

13. Tighten the four 28 mm fixings to **11 Nm**, and the 90 mm fixing to **11 Nm**.
14. Fit the transmission linkage to the gear change mechanism as noted for removal.
15. Fit the pinch bolt and tighten it to **9 Nm**.



1. **Pinch bolt**
2. **Transmission linkage**
3. **Gear change mechanism**
4. **Punch mark**

- Refit the coolant expansion tank (see Expansion Tank - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

Selector Drum and Selector Forks - Removal

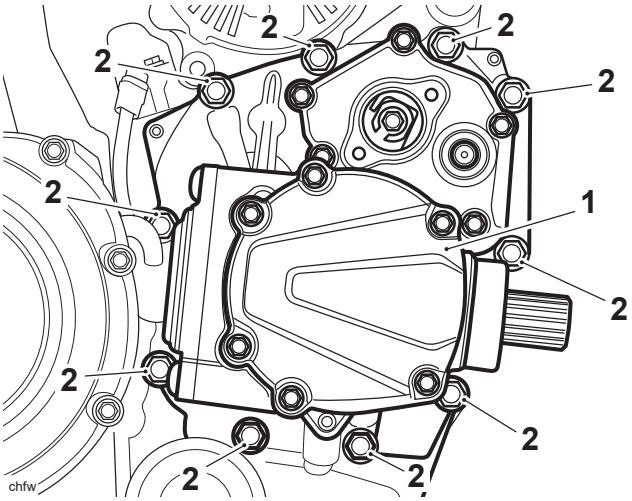
⚠ WARNING

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.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the coolant expansion tank (see Expansion Tank - Removal).
- Remove the clutch (see Clutch - Removal).
- Remove the rear bevel box (see Rear Bevel Box - Removal).

1. Remove and discard the 10 transmission fixings.



1. **Transmission assembly**
2. **Fixings**

2. Withdraw the transmission assembly from the crankcases, collecting the two dowels as you do so. Remove and discard the gasket.

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. Ensure the two dowels are in position in the transmission casing.
2. Position a new gasket to the transmission casing, aligning it to the dowels.
3. Carefully position the transmission to the crankcases, and align to the bolt holes. Take care not to damage or dislodge the gasket as you do so.
4. Install 10 new fixings, then evenly tighten to **20 Nm**.

- Refit the rear bevel box (see Rear Bevel Box - Installation).
- Refit the clutch (see Clutch - Installation).
- Refit the coolant expansion tank (see Expansion Tank - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

Selector Drum and Selector Forks - Inspection

WARNING

⚠ WARNING

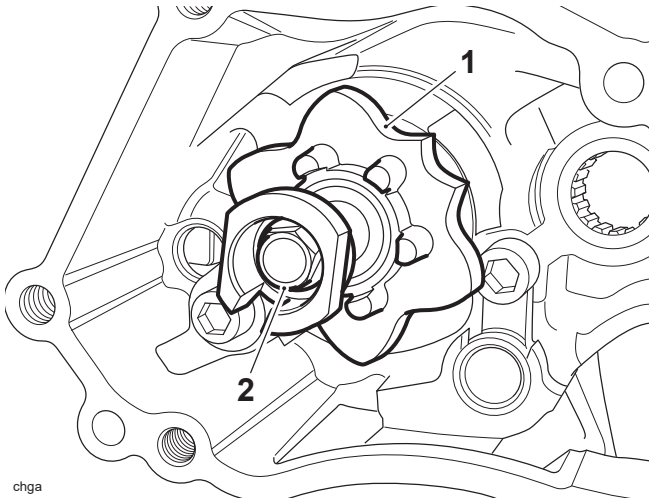
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

- Remove the transmission from the engine (see Transmission - Removal).
- Remove the selector shaft (see Selector Shaft - Removal).

Note

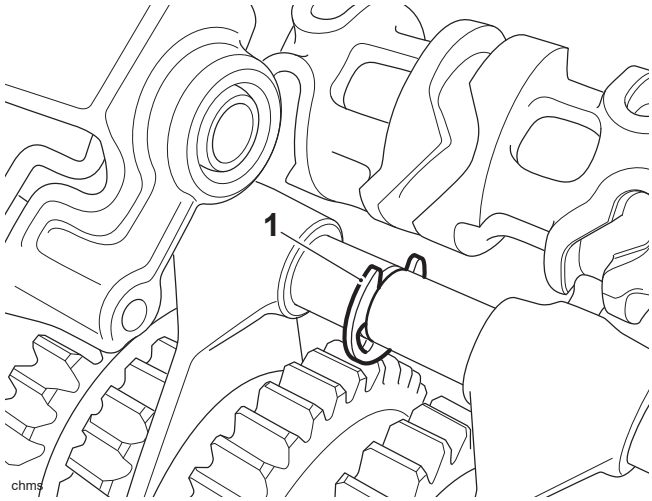
- **To prevent drum rotation, use a stout rod through one of the through-holes in the drum.**

1. Remove the fixing and remove the detent wheel from the selector drum. Discard the fixing. The detent wheel is a tight fit in the selector drum, and can be removed using a rocking motion.



1. **Detent wheel**
2. **Fixing**

2. Remove the selector drum from the transmission housing, lifting it to allow removal from the selector forks.
3. If necessary, remove the fixing (discard the fixing) and keeper plate, and remove the selector drum bearing from the transmission housing.
4. Remove the E-clip from the output shaft selector shaft. Discard the E-clip.



1. **E-clip**

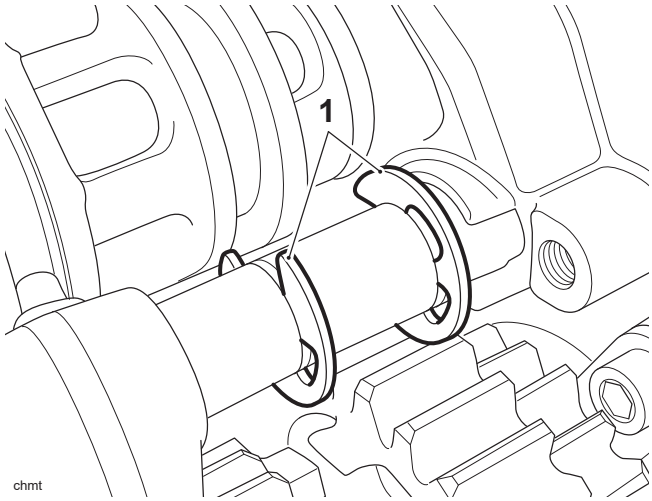
CAUTION

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

Note

- **The two output shaft selector forks are identical. If the selector forks are to be reused, note their respective positions prior to removal in order that the selector forks can be fitted in their original locations.**

5. Push the output shaft selector shaft out from the transmission housing in the direction of the output shaft. Collect each selector fork as they are released by the selector shaft, noting their orientation.
6. Remove the two E-clips from the input shaft selector shaft. Discard the E-clips.



1. E-clips

CAUTION

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

7. Push the input shaft selector shaft out from the transmission in the direction of the input shaft. Collect the selector fork as it is released by the selector shaft, noting its orientation.

Inspect all bearings for damage or wear. Renew as necessary.

Inspect the selector forks and selector grooves for wear beyond the service limits. Renew the components as necessary.

1. Refer to the specifications table (see Transmission).

Selector Drum and Selector Forks - Installation

WARNING

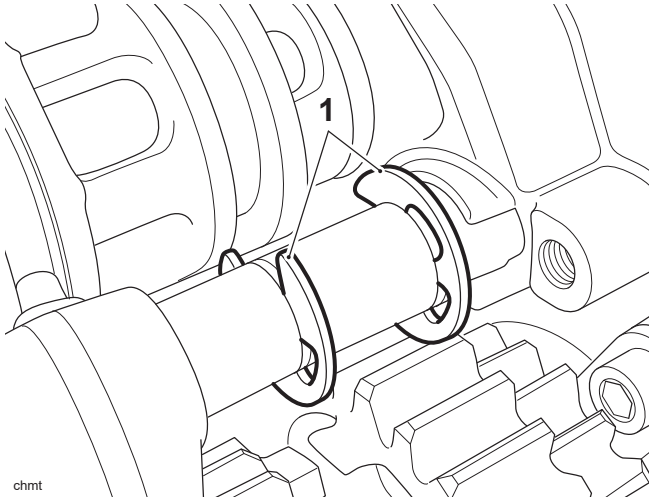
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

Note

Note

- **Prior to installation, lubricate both ends of each selector shaft, and their locating holes in the transmission housing, with a 50/50 solution of engine oil and molybdenum disulphide grease.**

1. Push the input shaft selector shaft into the transmission housing, with the two grooves facing towards the housing, from the input shaft side. As the shaft is inserted locate the selector fork. Ensure the fork is fitted in the position noted during removal.
2. Fit new E-clips to the grooves in the shaft between the selector fork and the transmission housing.

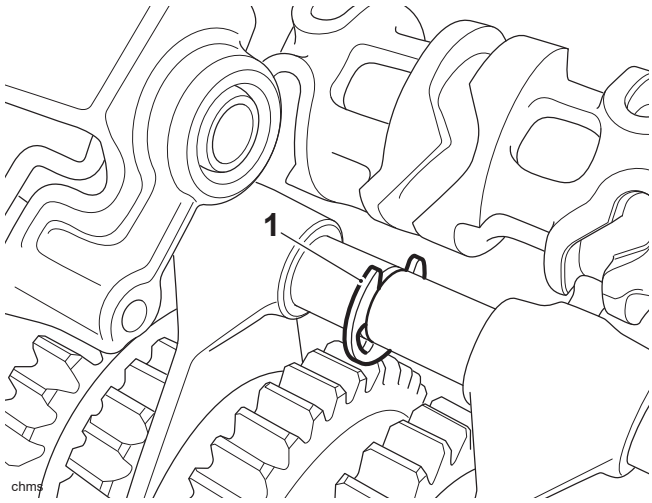


1. E-clips

⚠ CAUTION

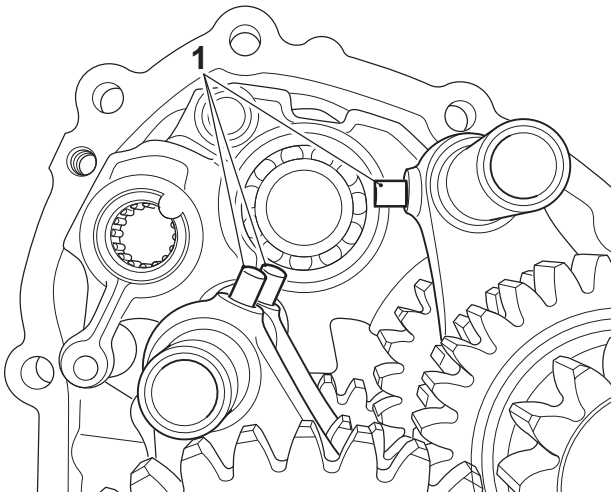
The selector forks can be fitted incorrectly. Ensure the position and orientation of the selector forks are marked prior to removal. Incorrect fitting of the selector forks will cause gearbox damage or incorrect operation.

3. Push the output shaft selector shaft into the transmission housing, with the single groove facing away from the housing, from the output shaft side. As the shaft is inserted locate the selector forks. Ensure the forks are fitted in the position noted during removal.
4. Fit a new E-clip to the groove in the shaft between the two selector forks.



1. E-clip

5. Check that the pins on each selector fork face inwards towards each other, as shown below.



1. Selector fork pins

6. If removed, refit the selector drum bearing to the transmission housing. Install the keeper plate and secure with a new fixing. Tighten to **9 Nm**.
7. Using clean engine oil, lubricate the selector drum bearing.
8. Set the transmission in neutral.
9. Engage the selector drum into the bearing and lower until the grooves on the drum engage with the three selector fork pins.
10. Check that the three selector fork pins are correctly engaged in the selector fork grooves. Rectify as necessary.

Note

- **To prevent drum rotation, use a stout rod through one of the through-holes in the drum.**

11. Fit the detent wheel, engaging the slot in the wheel with the locator pin in the selector drum. Install a new fixing and tighten to **11 Nm**.
- Refit the selector shaft (see Selector Shaft - Installation).
- Refit the transmission to the engine (see Transmission - Installation).

Input Shaft - 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.

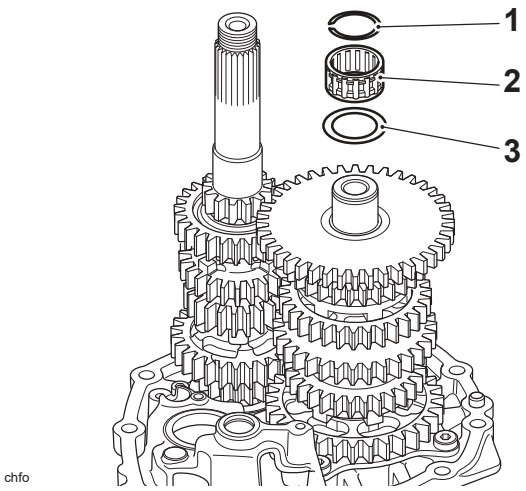
Note

- **Removal of the input shaft can be achieved after first removing the output shaft first gear and its bearing. The output shaft is an integral part of the front bevel box assembly and cannot be removed.**
- **If the transmission housing input shaft bearing is to be removed, the output shaft must first be disassembled. Remove the input shaft as described below, then see Output Shaft - Disassembly.**
- **The input shaft cannot be disassembled or assembled in service. If necessary, the complete input shaft assembly must be replaced.**

- Remove the transmission from the engine (see Transmission - Removal).
- Remove the selector drum and selector forks (see Selector Drum and Selector Forks - Removal).

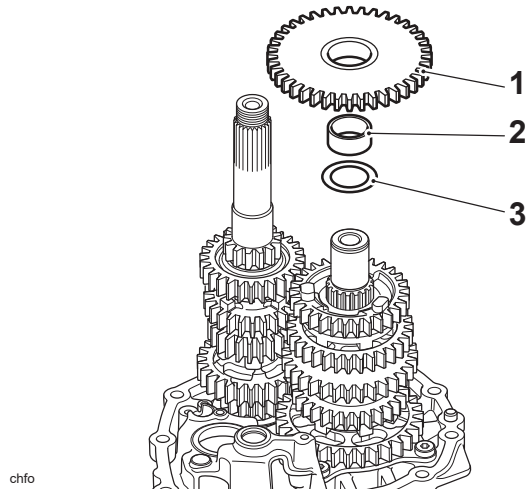
1. Place the transmission assembly on a clean surface, taking care to protect the transmission casing from damage.
2. Remove and discard the output shaft needle bearing snap ring.

3. Remove the output shaft needle bearing and thrust washer.



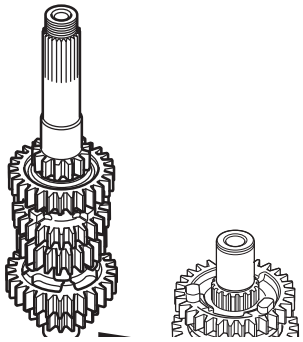
1. **Snap ring**
2. **Needle bearing**
3. **Thrust washer**

4. Remove the output shaft first gear, needle bearing and thrust washer.

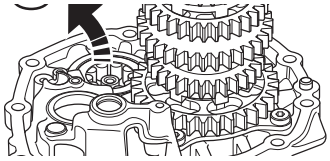


1. **First gear**
2. **Needle bearing**
3. **Thrust washer**

5. Withdraw the input shaft assembly from its bearing and remove from the transmission housing.



chfn



Input Shaft Removal

Input Shaft - Installation

⚠ WARNING

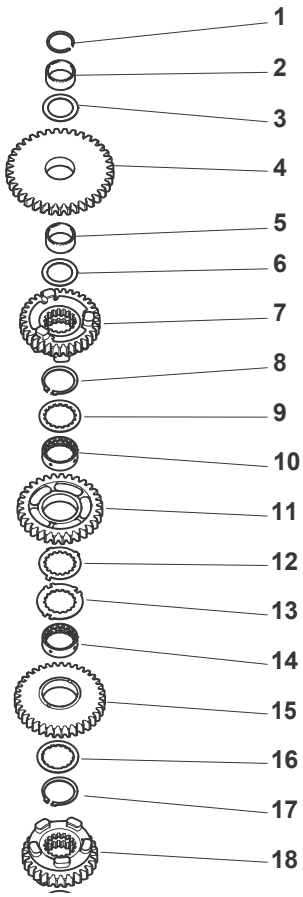
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

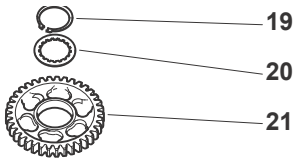
1. Place the input shaft in position in the transmission housing, and insert the shaft fully in to the bearing.
2. Refit the output shaft thrust washer, needle bearing and first gear.
3. Refit the output shaft thrust washer and needle bearing.
4. Secure the output shaft needle bearing with a new snap ring.

- Refit the selector drum and selector forks (see Selector Drum and Selector Forks - Installation).
- Refit the transmission to the engine (see Transmission - Installation).

Exploded View – Output Shaft

Output Shaft - Disassembly





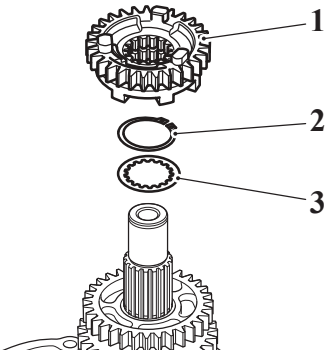
1. **Circlip**
2. **Needle roller bearing**
3. **Thrust washer**
4. **First gear**
5. **Needle roller bearing**
6. **Thrust washer**
7. **Fifth gear**
8. **Circlip**
9. **Thrust washer**
10. **Splined bush**
11. **Fourth gear**
12. **Lock washer**
13. **Splined washer**
14. **Splined bush**
15. **Third gear**
16. **Thrust washer**
17. **Circlip**
18. **Sixth gear**
19. **Circlip**
20. **Thrust washer**
21. **Second gear**

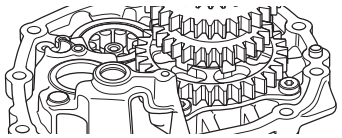
Note

- **The output shaft is an integral part of the front bevel box assembly and cannot be removed.**

- Remove the input shaft (see Input Shaft - Removal).

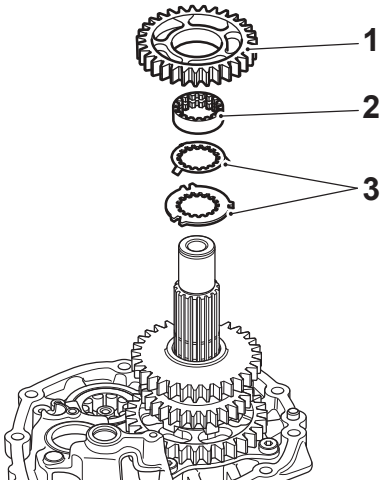
1. Slide fifth gear from the shaft.
2. Remove the circlip from in front of fourth gear.
3. Remove the splined thrust washer from the shaft.




chfm

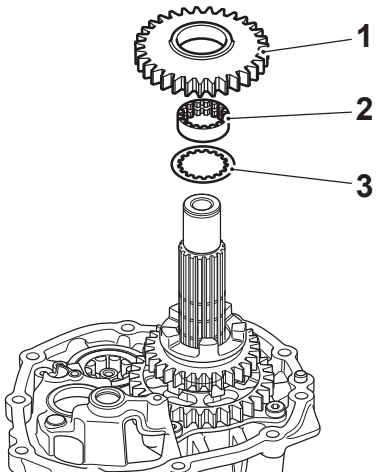
1. **Fifth gear**
2. **Circlip**
3. **Splined thrust washer**

4. Remove fourth gear.
5. Remove the splined bush.
6. Note their orientation and remove the splined lock washers. Note the 'UP' mark on the lower splined lock washer.



1. **Fourth gear**
2. **Splined bush**
3. **Splined lock washer**

7. Slide third gear off the shaft and also remove the splined bush and thrust washer.

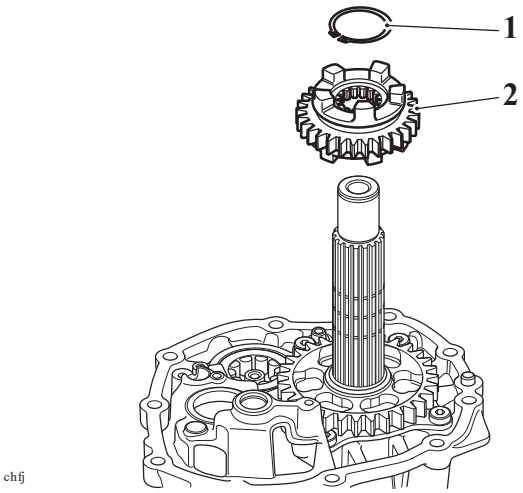


chfk

1. **Third gear**
2. **Splined bush**

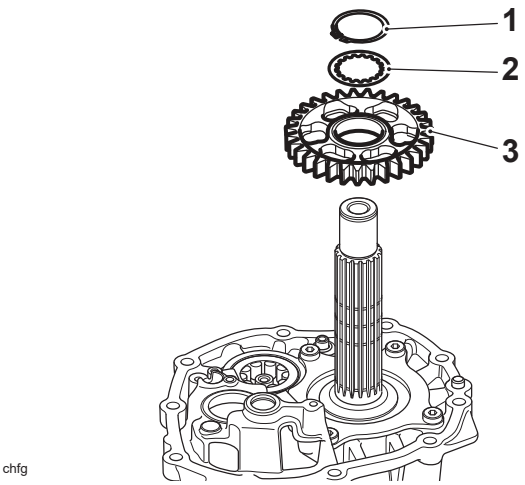
3. **Splined thrust washer**

8. Remove the circlip from in front of sixth gear.
9. Remove sixth gear.



1. **Circlip**
2. **Sixth gear**

10. Remove the circlip from in front of second gear.
11. Remove the thrust washer and slide off second gear.



1. **Circlip**
2. **Thrust washer**
3. **Second gear**

12. At this stage, the input shaft bearing can be removed from the transmission housing as follows:
    - Remove the fixing and collect the bearing keeper plate. Discard the fixing
    - Using a proprietary bearing puller, remove the bearing from the housing
    - Collect the oil restrictor plate.

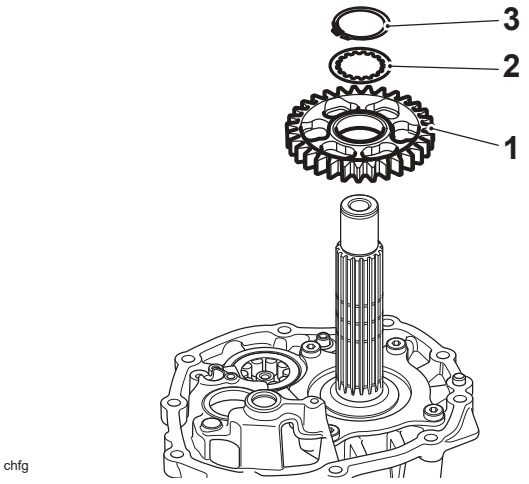
Output Shaft - Assembly

Bevel Box Damper Shaft Oil Seal - Removal

Note

- **Lubricate each gear and bush with clean engine oil during assembly.**
- **Examine all gears, bearings and sleeves for damage, chipped teeth and wear beyond the service limits. Replace all suspect components and always use new circlips to assemble the shaft.**
- **The splined thrust washer fitted next to second gear is different to the two other splined thrust washers fitted elsewhere on the output shaft. It can be identified by three sets of missing splines, equally spaced around the inner circumference.**

1. Locate second gear to the shaft with the dog slots facing away from the bevel box. Fit the splined thrust washer (see note above for thrust washer identification) and retain with a new circlip.



chfg

1. **Second gear**
2. **Thrust washer**
3. **Circlip**

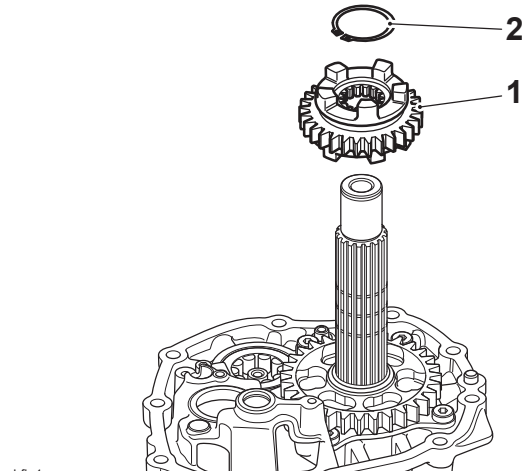
2. Fit sixth gear with the selector fork groove facing away from the bevel box. Ensure that the oil holes in the gear DO NOT align with the corresponding oil hole in the output shaft.

⚠ WARNING

If the oil holes in the sixth gear are aligned with the corresponding hole in the output shaft, engine oil pressure and gear lubrication will be reduced.

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

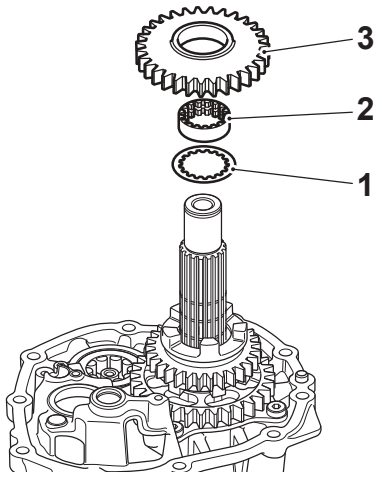
3. Fit a new circlip.



chtj_1

1. **Sixth gear**
2. **Circlip**

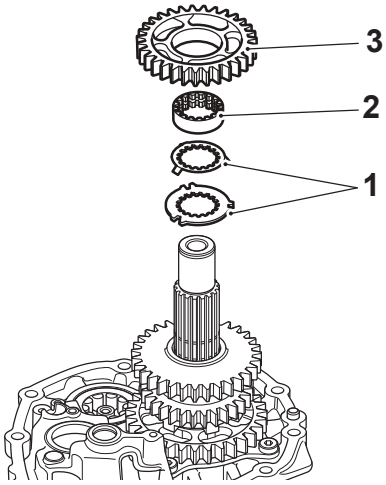
4. Fit the splined thrust washer.
5. Fit the splined bush for third gear, ensuring that the oil hole in the shaft DOES NOT align with the hole in the bush. Fit third gear to the shaft with the dog slots facing towards the bevel box.



chfk_1

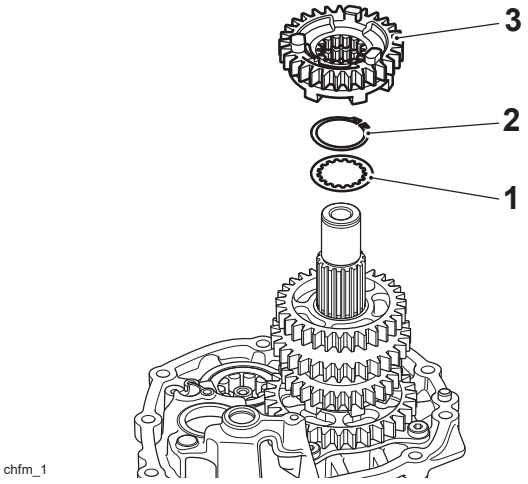
1. **Thrust washer**
2. **Splined bush**
3. **Third gear**

6. Fit the splined lock washer with the 'UP' mark visible. Fit the lock washer, ensuring the three tabs in the smaller washer locate in the three slots in the larger washer. Note the lock washer will only fit the splined lock washer in one position.
7. Fit the splined bush for fourth gear, ensuring that the oil hole in the shaft DOES NOT align with the hole in the bush. Fit fourth gear to the shaft with the dog slots facing away from the bevel box.



1. **Splined lock washer**
2. **Splined bush**
3. **Fourth gear**

8. Fit the thrust washer and retain with a new circlip.
9. Fit fifth gear.



1. **Thrust washer**
2. **Circlip**
3. **Fifth gear**

- Refit the input shaft (see Input Shaft - Installation).

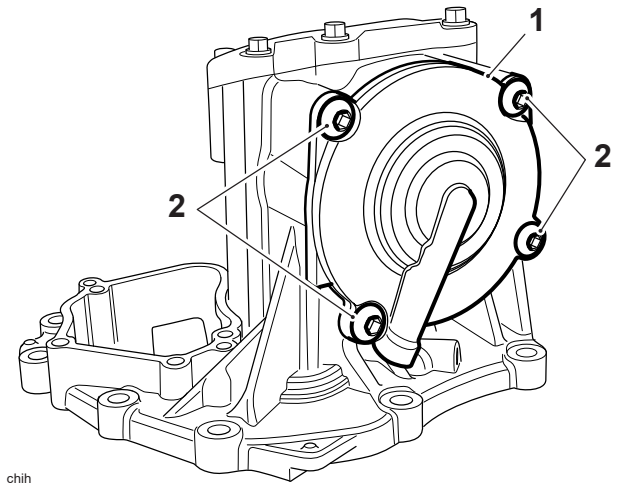
Bevel Box Damper Shaft Oil Seal - Installation

⚠ 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.

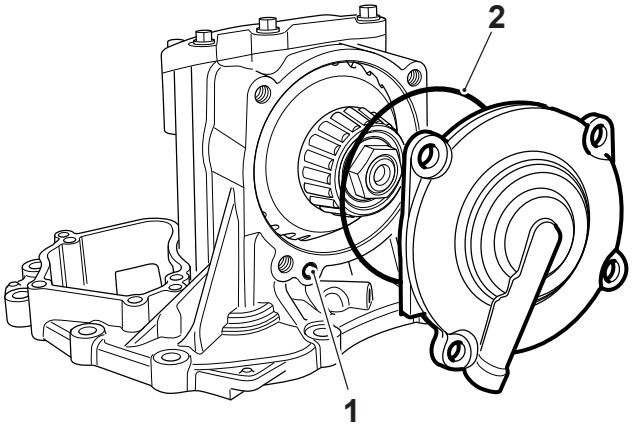
- Remove the transmission from the engine (see Transmission - Removal).

1. Release the four fixings and remove the bevel box front cover.



1. **Bevel box front cover**
2. **Fixings**

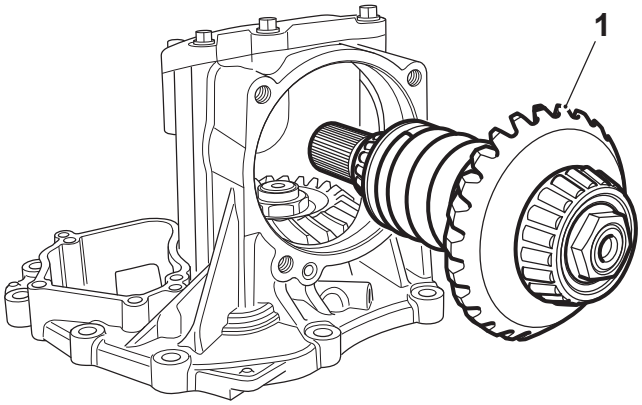
2. Remove and discard the front cover outer O-ring and oil feed O-ring.



chii

1. **Oil feed O-ring**
2. **Front cover O-ring**

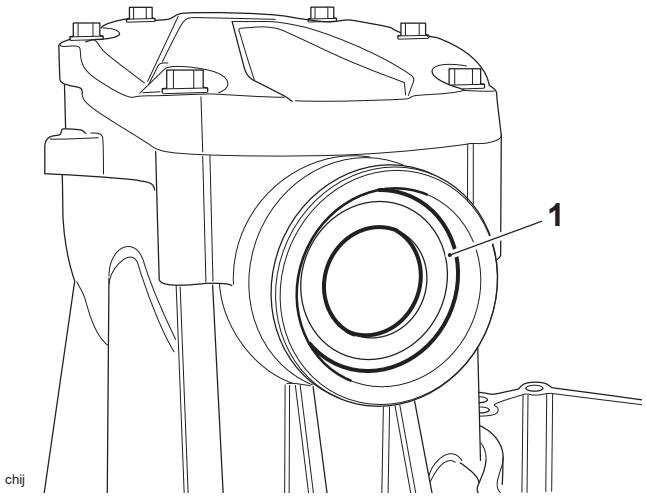
3. Withdraw the damper shaft from the bevel box.



chig

1. **Damper shaft**

4. Drift out the oil seal.



chij

1. **Oil seal**

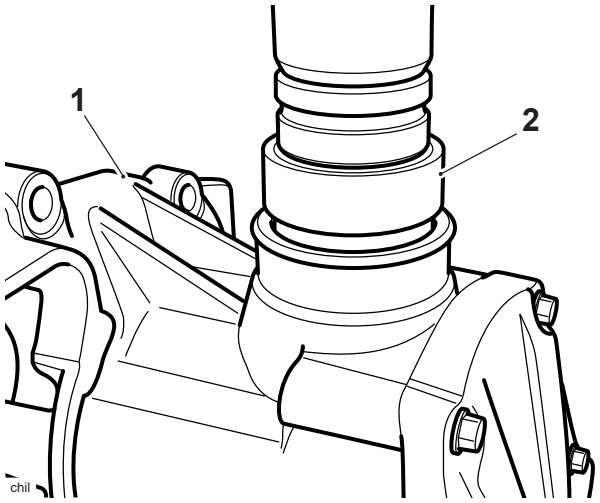
5. Thoroughly clean the seal housing.

Flywheel, Starter Drive Gears and Sprag 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. Protect the front cover mating face of the bevel box against damage and place it in a press.
2. Using the collar from T3880053 - Wheel Bearing Extraction Kit (smaller diameter positioned on the outer edge of the seal), carefully press in a new oil seal.

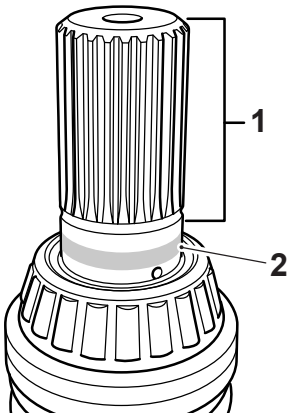


1. **Bevel box**
2. **Collar (part of T3880053 - Wheel Bearing Extraction Kit)**

CAUTION

Failure to protect the splines of the damper shaft will result in damage to the new oil seal.

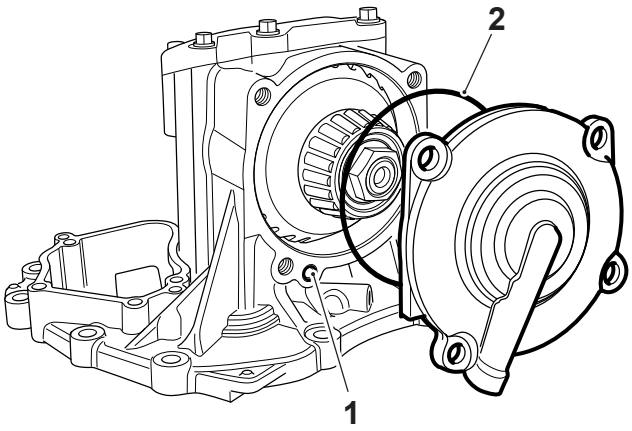
3. Protect the splines and the groove (as shown below) of the damper shaft with a suitable tape, such as electrical insulation tape. Do not apply tape to the seal running area, shown grey below.




chik

1. **Damper shaft splines and groove**
2. **Seal running area**

4. Refit the damper shaft to the bevel box, taking care not to damage the oil seal.
5. Remove the protective tape from the damper shaft splines.
6. Fit a new O-ring to the oil feed.
7. Fit a new O-ring to the front cover.



chii

1. **Oil feed O-ring**
2. **Front cover O-ring**

8. Refit the front cover, ensuring the oil feed O-ring is not dislodged as you do so.
9. Secure the cover with four new fixings and tighten to **25 Nm**.

- Refit the transmission to the engine (see Transmission - Installation).

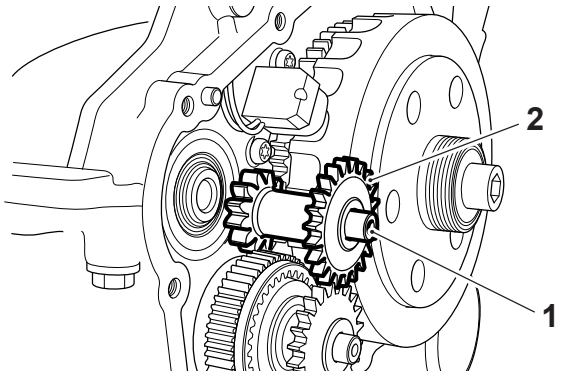
Flywheel, Starter Drive Gears and Sprag Clutch - Inspection

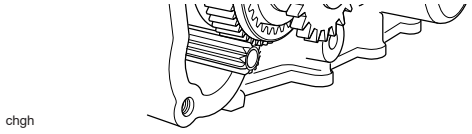
⚠ WARNING

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.

- Remove the flywheel cover (see Flywheel Cover - Removal).

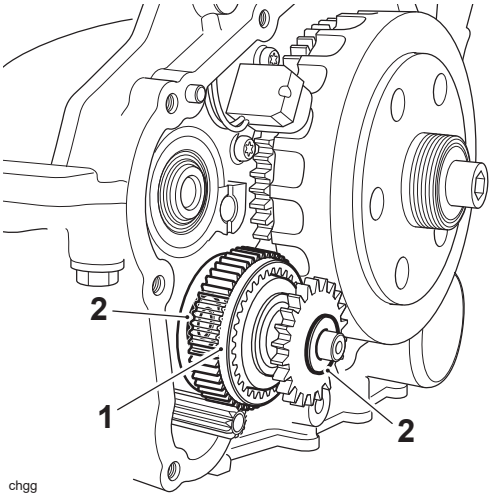
1. Withdraw the pin and remove the starter idler gear noting the orientation of the gear.




chgh

1. **Idler shaft**
2. **Idler gear**

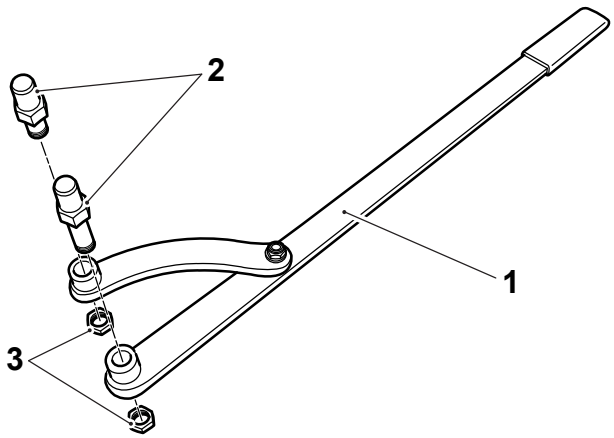
2. Withdraw the starter motor torque limiter from the crankcase, collecting the washers from each end of the shaft as you do so.



chgg

1. **Starter motor torque limiter**
2. **Flat washers (outer shown)**

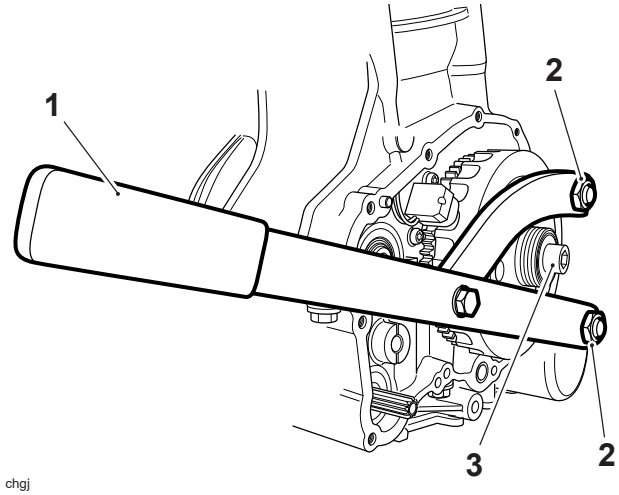
3. Assemble T3880608 - Flywheel Pin Set (flywheel pin set) to T3880606 - Flywheel Restraint (flywheel restraint), ensuring the shorter pin is fitted to the short arm of T3880606 - Flywheel Restraint. Fit the nuts and tighten to **10 Nm**.



1. **T3880606 - Flywheel Restraint**
2. **Pins (part of T3880608 - Flywheel Pin Set)**
3. **Nuts (part of T3880608 - Flywheel Pin Set)**

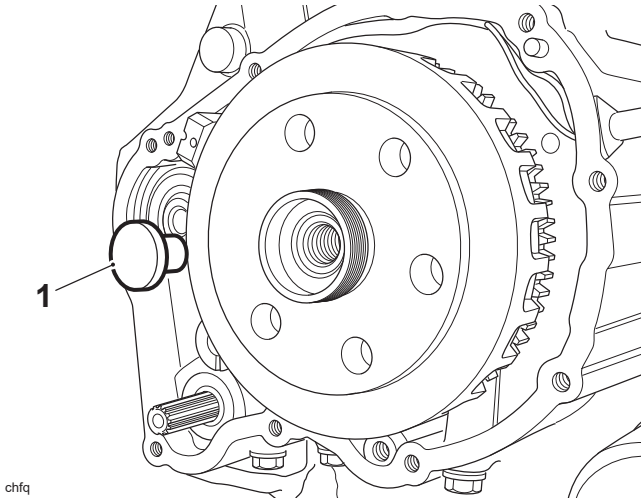
4. Using T3880606 - Flywheel Restraint and T3880608 - Flywheel Pin Set, prevent the flywheel from turning

and remove the flywheel fixing and washer from the end of the crankshaft.



1. **T3880606 - Flywheel Restraint**
2. **T3880608 - Flywheel Pin Set**
3. **Flywheel fixing**

5. Locate the spigot from the larger of the two thrust pads supplied with T3880365 - Alternator/Flywheel Rotor Puller to the crankshaft.



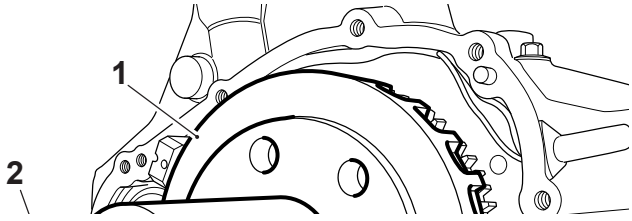
1. **Thrust pad**

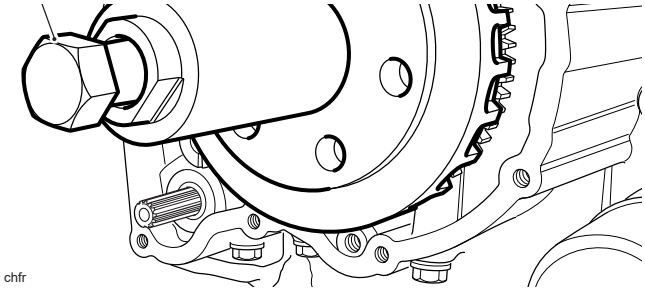
6. Assemble T3880365 - Alternator/Flywheel Rotor Puller to the threaded centre section of the flywheel.

Note

- **Ensure that the thrust pad does not fall out during assembly of the tool.**

7. Hold the outer of the tool to prevent rotation then tighten the draw-bolt in the centre of the tool to release the taper seating of the flywheel from the crankshaft.

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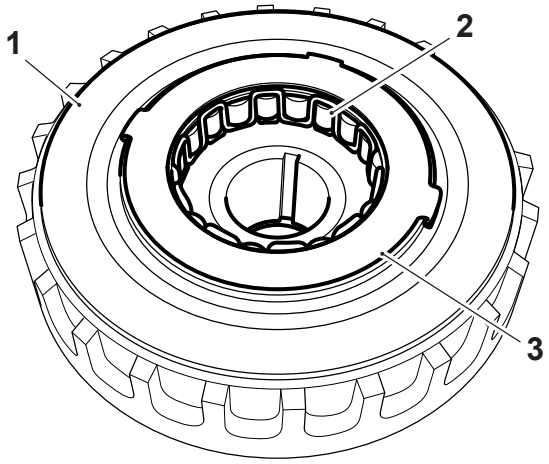
1. **Flywheel**
2. **T3880365 - Alternator/Flywheel Rotor Puller**

8. Withdraw the flywheel and tool as an assembly and then separate the tool from the flywheel. Collect the Woodruff Key and the tool thrust pad from the crankshaft.
9. Remove the starter gear from the flywheel.
10. Remove the sprag retaining clip and remove the sprag clutch. Discard the sprag retaining clip.



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1. **Flywheel**
2. **Sprag clutch**
3. **Sprag retaining clip**

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

Flywheel, Starter Drive Gears and Sprag Clutch - Installation

⚠ 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.

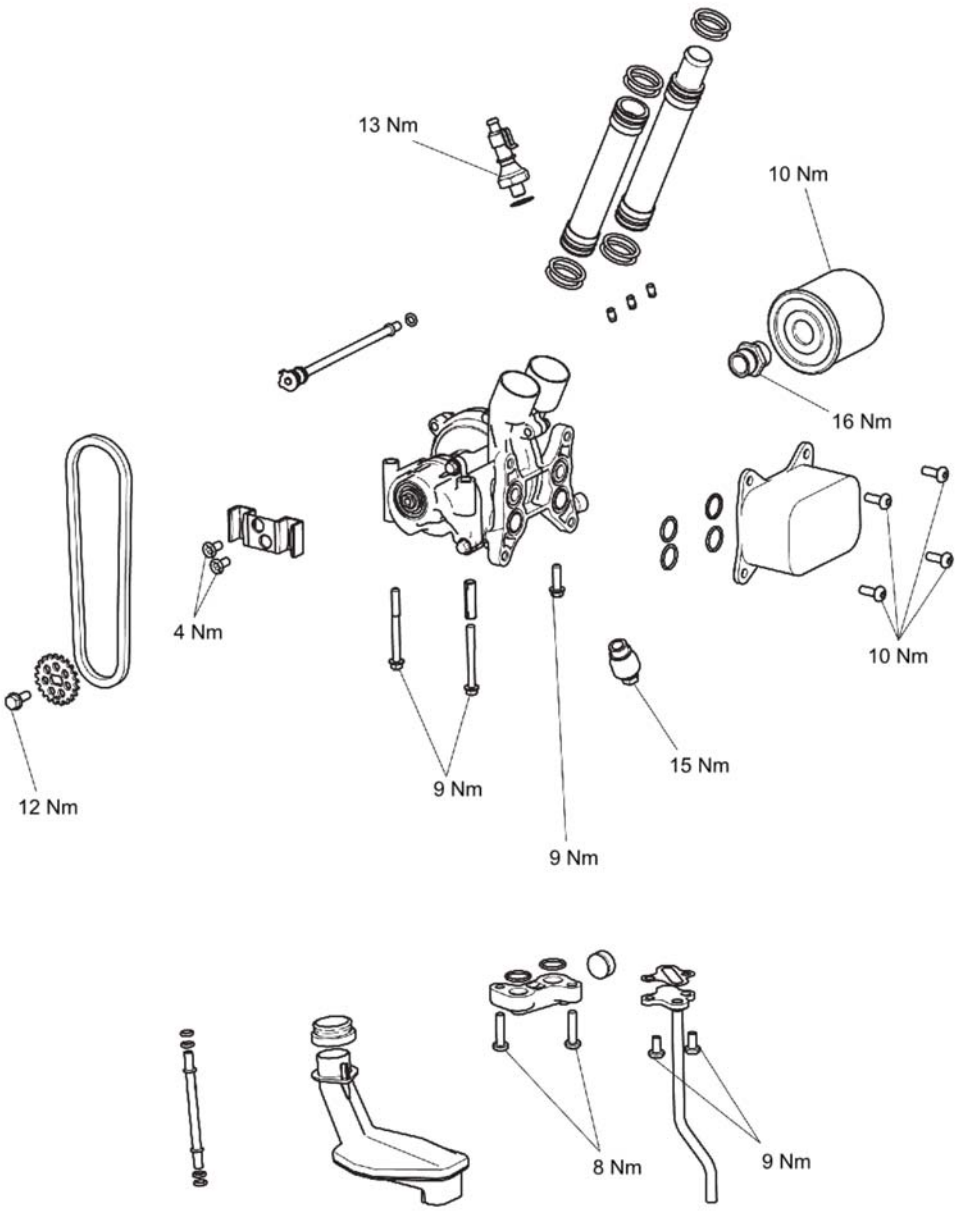
1. Assemble the needle roller bearing and starter gear to the flywheel.
2. Refit the Woodruff Key to the crankshaft slot.
3. Locate the flywheel to the crankshaft, ensuring the Woodruff Key remains in position on the crankshaft.
4. Prevent the flywheel from turning using T3880606 - Flywheel Restraint and T3880608 - Flywheel Pin Set then fit and tighten a new flywheel fixing and washer, first to **85 Nm**, then to **120 Nm**.

5. Check that the two flat washers are fitted to the starter motor torque limiter, one at each end.
6. Refit the starter motor torque limiter, engaging the gear teeth to the starter motor shaft.
7. Lubricate the idler gear shaft.
8. Fit the small idler gear and shaft to the crankcase.

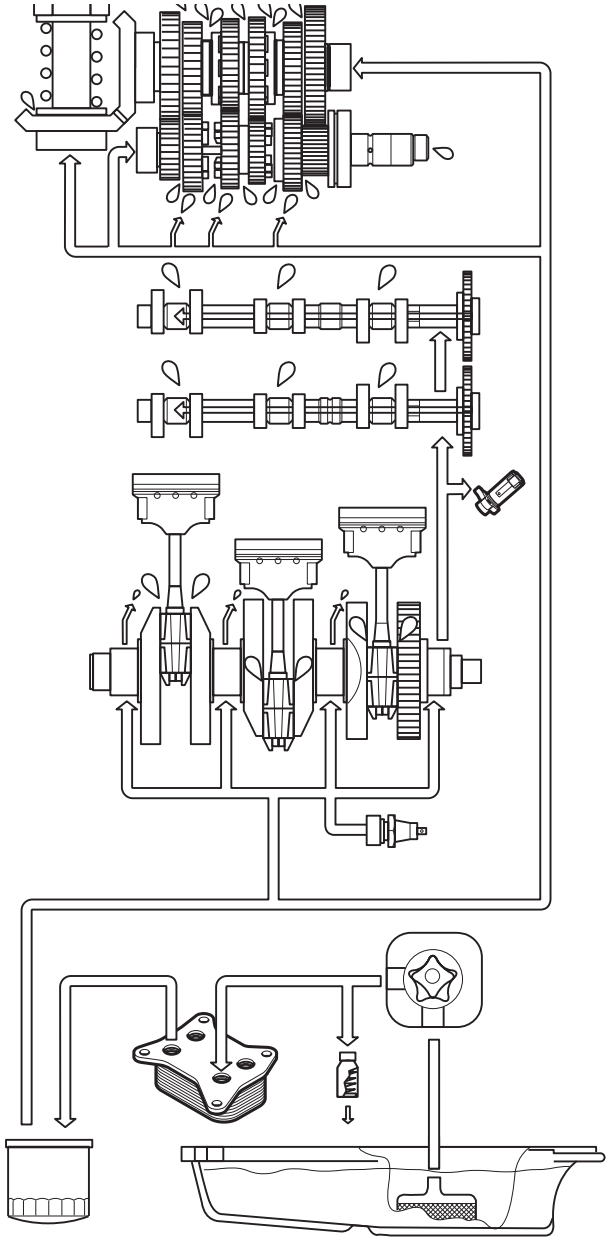
- Refit the flywheel cover (see Flywheel Cover - Installation).

Lubrication

Exploded View – Lubrication System



Engine Oil Circuit Diagram



Engine Oil Circuit Description

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

- Pressurised oil is delivered to the heat exchanger near to where the oil pressure relief valve is fitted. The relief valve is set to open at 5.2 bar (75 lb/in ^{2}) and when open, returns high pressure oil direct to the sump.
- Oil arrives at the heat exchanger (mounted on the oil pump) where it is cooled, and then it passes to the oil filter.
- Filtered oil is fed to the main gallery located under the crankshaft. Here it is delivered to the crankshaft main bearings and, via drillings in the crankshaft, to the big end bearings. Spray jets located in the upper crankcase, behind the main bearing shells, lubricate the pistons and connecting rod small ends. These jets are fed oil from the crankshaft oil feed.
- A low oil pressure warning light switch is connected to the main gallery.
- Some oil is sent directly to the timing chain tensioner and cylinder head via a drilling in the upper crankcase. Oil that arrives at the cylinder head is fed to both camshafts via a gallery in the cylinder head casting that delivers oil directly to the sprocket end camshaft bearings. Oil is then fed through the hollow camshafts to the other camshaft bearings, the tappet buckets and the valves.
- Oil is fed to the gearbox via a spray bar and drillings that supply oil directly to the end of the transmission

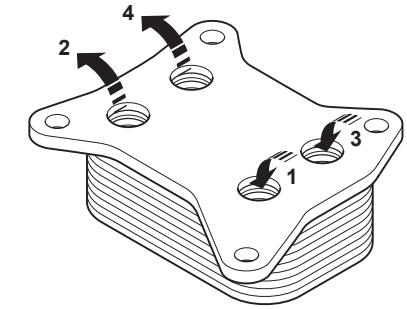
shafts. The spray bar also directs oil to the bevel box bearings and gears.

- Oil is circulated along the gearbox shafts to exit holes that feed directly to the bearings and gears.

Heat Exchanger

The heat exchanger is used to transfer heat from the engine oil into the coolant. Oil is delivered to the heat exchanger via an opening (1) after which it flows through the heat exchanger core, where it is circulated. Coolant is pumped through a similar opening (3) in to the heat exchanger core to cool the oil. The cooled oil then exits the heat exchanger (2) and flows to the oil filter. The coolant then flows out of the heat exchanger (4) and through the rest of system.

An additional benefit of the heat exchanger is that, as the engine coolant reaches its operating temperature more quickly than the engine oil, the oil is heated by the engine coolant at lower engine temperatures; this allows the engine oil to reach its optimum operating temperature more quickly, thereby helping to improve engine oil life, reduce exhaust emissions and reduce engine wear.



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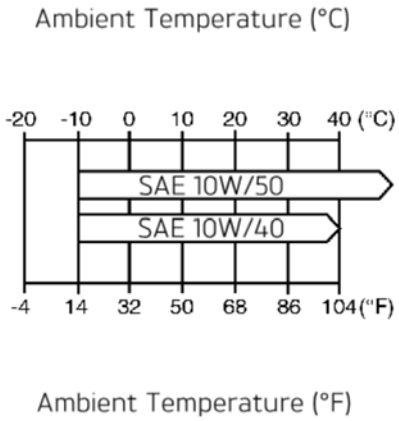
Engine Oil - Specification

Use semi or fully synthetic 10W/40 or 10W/50 motorcycle engine oil which meets specification API SH (or higher) **and** JASO MA, such as Castrol Power 1 Racing 4T, sold as Castrol Power RS Racing 4T in some countries.

Triumph recommends the fully synthetic 10W/40 motorcycle engine oil for most conditions. The oil viscosity may need to be changed to accommodate the ambient temperatures in your riding area.

Refer to the chart below for the correct oil viscosity (10W/40 or 10W/50) to be used in your riding area.



Oil Viscosity Temperature Range

CAUTION

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

CAUTION

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

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

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

Triumph Engine Oil

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

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.

Oil Level Inspection

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

WARNING

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

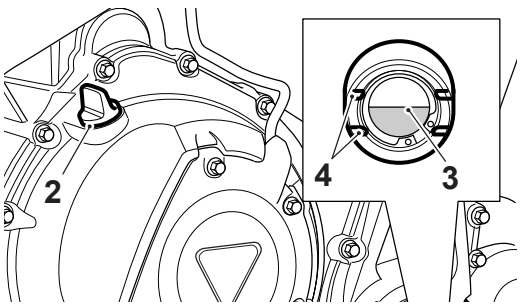
WARNING

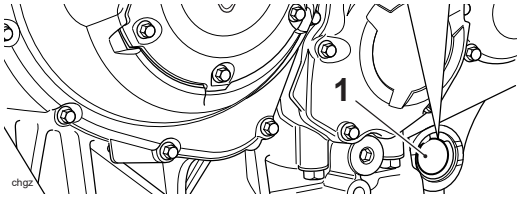
Never start the engine or run the engine in a confined area. Exhaust fumes are poisonous and can cause loss of consciousness and death within a short period of time. Always operate your motorcycle in the open-air or in an area with adequate ventilation.

CAUTION

Running the engine with insufficient oil will cause engine damage. If the low oil pressure indicator remains on, stop the engine immediately and investigate the cause.

1. With the motorcycle upright and off the side stand, check to see if oil is visible in the sight glass at a point mid-way between the upper (maximum) and lower (minimum) horizontal lines marked on the crankcase.
2. If it is necessary to top up the oil level, remove the filler plug and add oil, a little at a time, until the level registered in the sight glass is correct. Refit and tighten the filler plug.





1. **Sight glass**
2. **Filler plug**
3. **Oil level (correct level shown)**
4. **Crankcase oil level lines**

Note

- **An accurate indication of the level of oil in the engine is only shown when the engine is at normal operating temperature and the motorcycle is upright (not on the side stand).**

3. Start the engine and run at idle for approximately five minutes.
4. Stop the engine, then wait for at least three minutes for the oil to settle.
5. Note the oil level visible in the sight glass.
6. When correct, oil should be visible in the sight glass at a point mid-way between the upper (maximum) and lower (minimum) horizontal lines marked on the crankcase.
7. If necessary, top up the oil level as described earlier.
8. Once the correct level is reached, fit and tighten the filler plug.

Oil and Oil Filter Change

⚠ 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

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

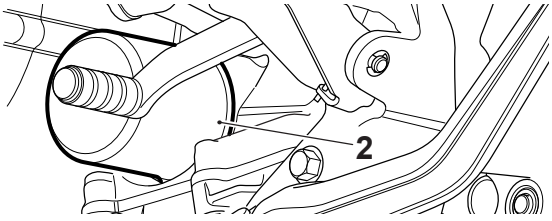
The engine oil and filter must be replaced in accordance with scheduled maintenance requirements.

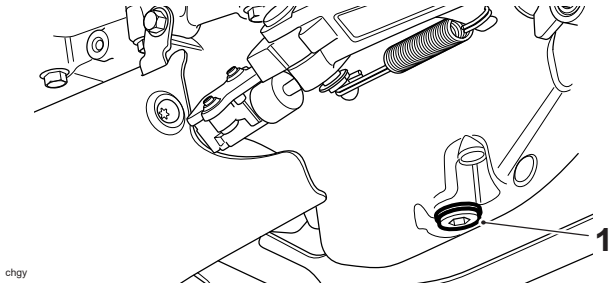
1. Warm up the engine thoroughly, and then stop the engine and secure the motorcycle in an upright position on level ground.
2. Place an oil pan beneath the engine.

⚠ WARNING

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

3. Remove the oil drain plug.





1. **Oil drain plug**
2. **Oil filter**

4. Unscrew and remove the oil filter using T3880313 - Oil Filter Wrench.
5. Dispose of the old oil filter in an environmentally friendly way.
6. Pre-fill a new oil filter with clean engine oil.
7. Apply a smear of clean engine oil to the sealing ring of the new oil filter.
8. Fit the oil filter and tighten to **10 Nm**.
9. After the oil has completely drained out, fit a new sealing washer to the drain plug. Fit and tighten the plug to **25 Nm**.
10. Fill the engine with new oil of the type and grade listed previously and in the specification section.
11. Start the engine and allow to idle.

CAUTION

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

12. Ensure that the oil pressure warning light extinguishes shortly after starting and the message WARNING - OIL PRESSURE LOW is not shown in the instrument display screen.

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.

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

Low Oil Pressure Warning Light Switch - Removal

WARNING

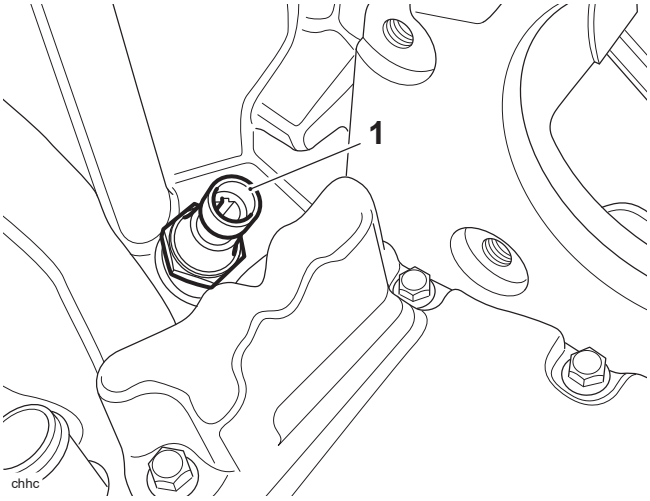
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

Note

- **The low oil pressure warning light switch is located in the upper crankcase, behind the cylinder head.**

- Remove the rider’s seat (see Rider’s Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the throttle bodies (see Throttle Bodies/Injectors - Removal).
- Remove the alternator (see Alternator - Removal).

1. Disconnect the electrical connection to the switch.
2. Remove the switch and collect the copper washer.



1. Low oil pressure warning light switch

Low Oil Pressure Warning Light Switch - Installation

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. Incorporating a new copper washer, fit the switch and tighten to **13 Nm**.
2. Refit the electrical connection.

- Refit the alternator (see Alternator - Installation).
- Refit the throttle bodies (see Throttle Bodies/Injectors - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).
- Start the engine and ensure that the low oil pressure warning light goes out shortly after starting.

Oil 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.

WARNING

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

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

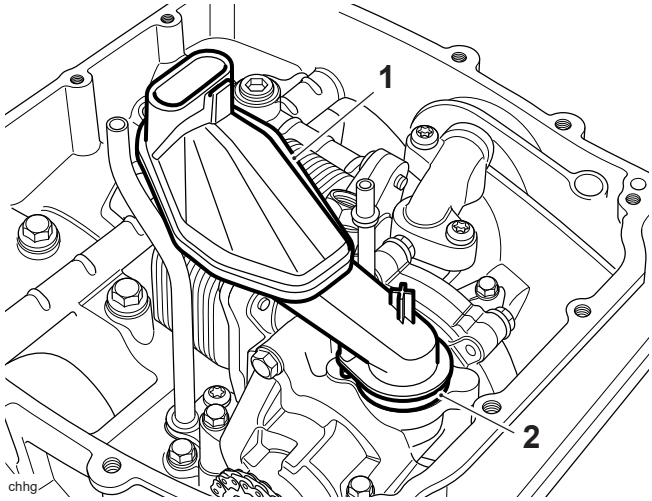
CAUTION

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

- Remove the rider's seat (see Rider's Seat - Removal).

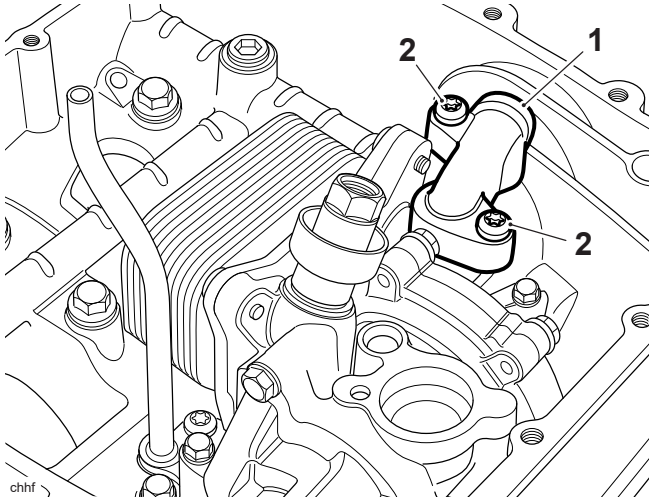
- Disconnect the battery, negative (black) lead first.
- Drain the coolant (see Coolant Replacement).
- Remove the clutch (see Clutch - Removal).
- Remove the sump (see Sump - Removal).

1. Remove the oil pick-up and seal.



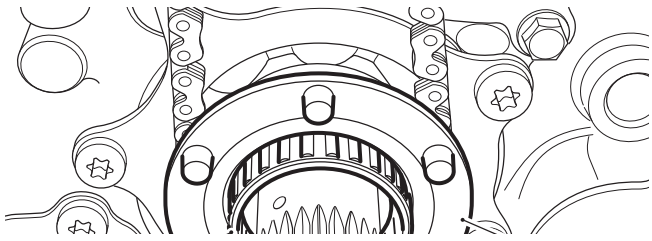
1. **Oil pick-up**
2. **Seal**

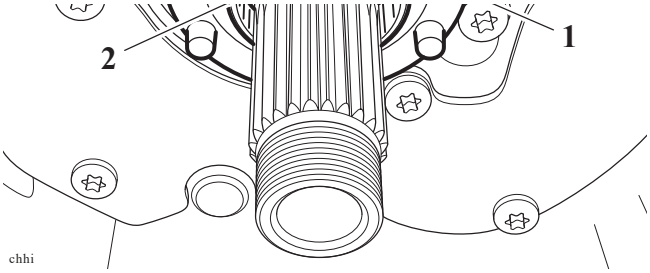
2. Release and discard the two fixings and remove the oil feed pipe. Remove and discard the two O-ring seals.



1. **Oil feed pipe**
2. **Fixings**

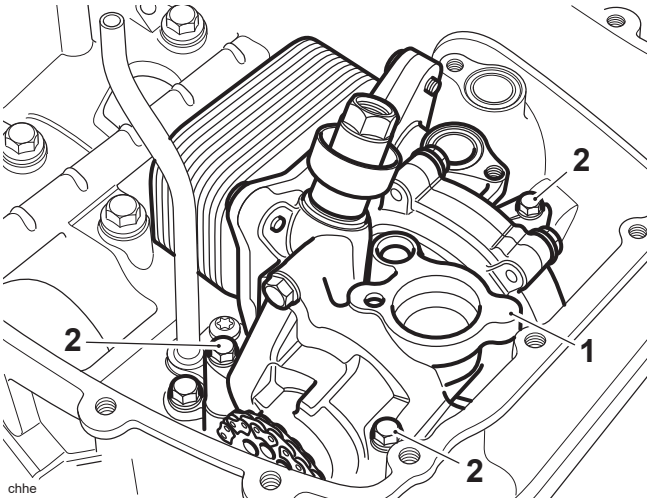
3. Slide the oil pump drive sprocket gently backwards and forwards to dislodge the inner needle roller bearing.
4. Carefully remove the bearing while supporting the oil pump drive sprocket.





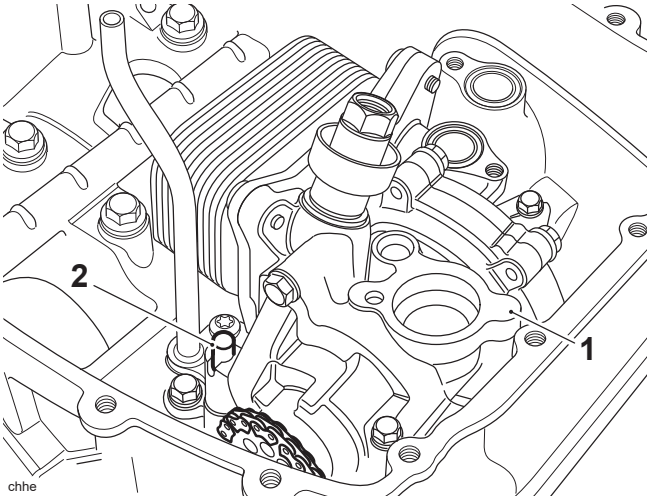
1. **Oil pump drive sprocket**
2. **Needle roller bearing**

5. Detach the drive chain from the oil pump.
6. Release the three oil pump fixings.



1. **Oil pump**
2. **Fixings**

7. Using a suitable tool, slide the dowel upwards to release the oil pump from the crankcase. It is not necessary to remove the dowel completely from the oil pump.

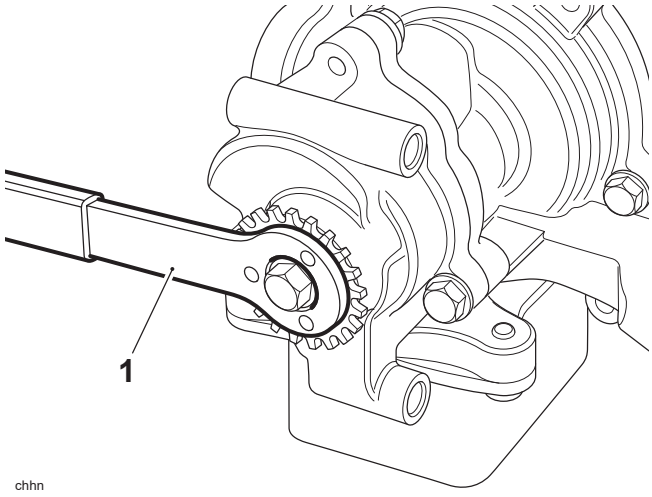


1. **Oil pump**
2. **Dowel**

8. Detach the oil pump from the coolant inlet and outlet tubes.
9. Carefully withdraw the oil pump from the crankcase.

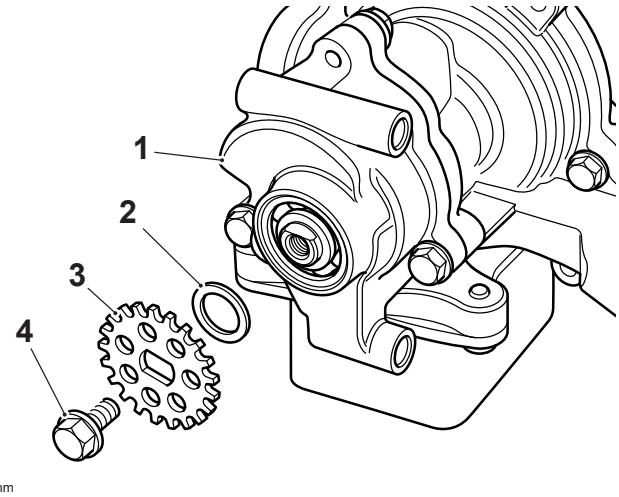
Oil Pump - Inspection

1. Prevent the oil pump sprocket from turning using T3880603 - Oil Pump Restraint and remove the centre fixing. Discard the fixing.



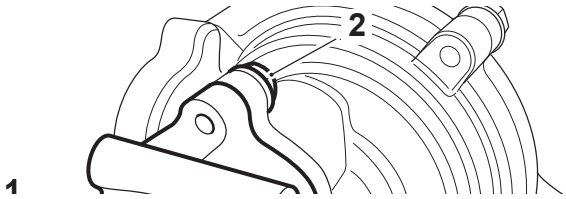
1. T3880603 - Oil Pump Restraint

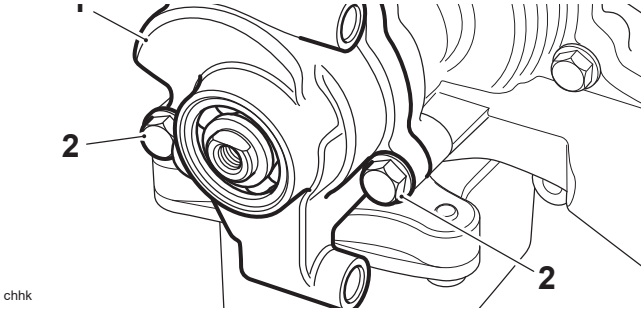
2. Remove the drive sprocket and spacer washer.



1. **Oil pump**
2. **Spacer washer**
3. **Drive sprocket**
4. **Fixing**

3. Release the three fixings and withdraw the oil pump rotor housing. Discard the fixings.



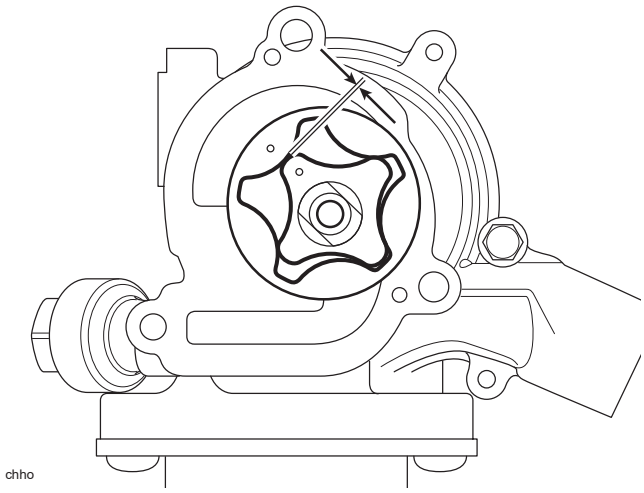


1. **Oil pump rotor housing**
2. **Fixings**

CAUTION

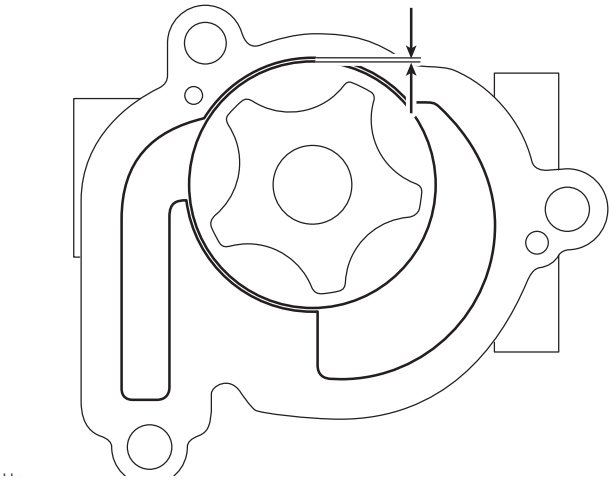
If any part of the oil pump is found to be outside the service limit, the complete pump must be replaced. Severe engine damage may result from the continued use of a faulty oil pump.

4. Measure the rotor tip clearance using feeler gauges.
5. For specifications refer toLubrication.



Rotor Tip Clearance

6. Measure the pump body clearance using feeler gauges.



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Pump Body Clearance

7. For specifications refer toLubrication.
8. Measure the pump end clearance.
9. If any clearance measured is outside the service limits, renew the complete pump.
10. For specifications refer toLubrication.
11. If all clearances are within service limits, liberally apply clean engine oil to all internal components. Refit the oil pump rotor housing to the oil pump body and secure with new fixings. Tighten the fixings to **10 Nm**.
12. Inspect the sprocket and chain for wear and/or damage. Replace the sprocket and chain if wear and/or damage is found.
13. Refit the spacer washer and oil pump sprocket and secure with a new fixing. Using T3880603 - Oil Pump Restraint to prevent rotation, tighten the fixing to **12 Nm**.

Oil Pump - Installation

Heat Exchanger - Removal

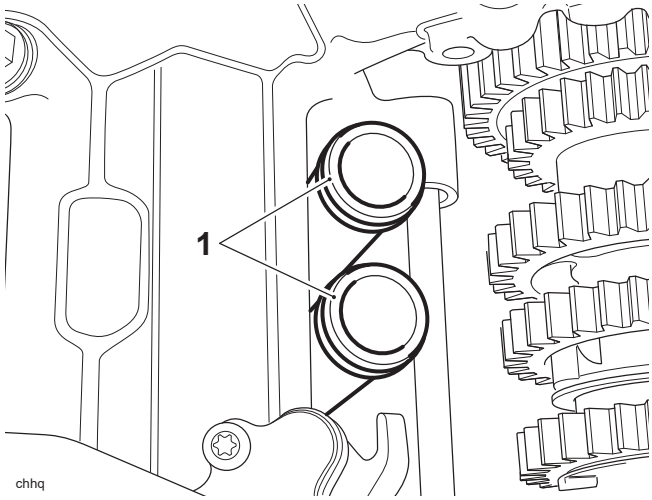
WARNING

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

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. Install new O-rings to the coolant inlet and outlet tubes.



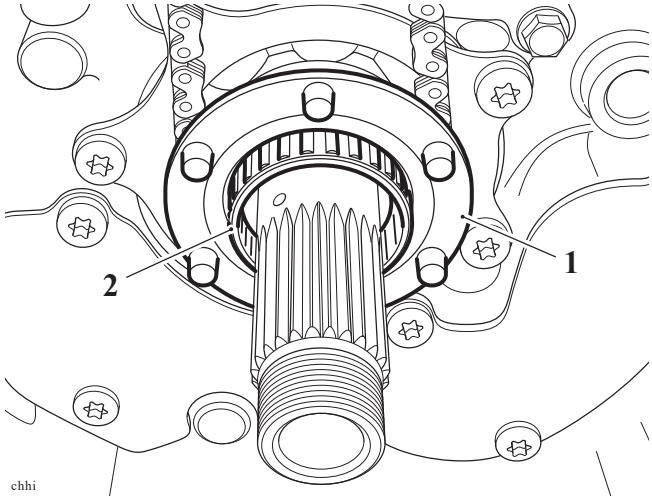
1. Coolant tubes

2. Fill the oil pump with new engine oil, turning the pump rotor as the oil is poured in to ensure all surfaces are coated with oil.
3. Position the oil pump to the crankcase and push the openings in the water pump over the coolant inlet and outlet tubes.
4. Align the oil pump to the crankcase, and ensure the oil pump dowel correctly locates over the bolt hole.

CAUTION

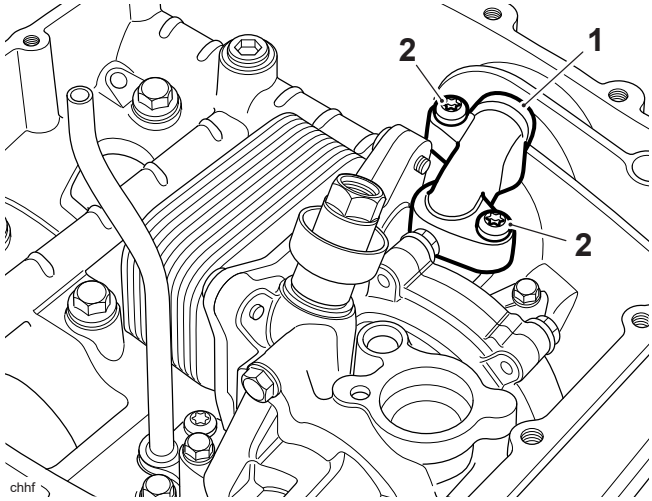
Do not use excessive force to insert the dowel into the crankcase. Severe dowel or crankcase damage may result from the use of excessive force.

5. Using a suitable pin punch, gently tap the dowel downwards into the crankcase until it seats.
6. Secure the oil pump with new bolts. Tighten the bolts to **9 Nm**.
7. Feed the drive chain over the transmission input shaft and fit to the sprocket.
8. Fit the drive chain to the oil pump sprocket.
9. Support the oil pump drive sprocket and carefully refit the needle roller bearing.



1. **Oil pump drive sprocket**
2. **Needle roller bearing**

10. Install two new oil feed pipe O-rings to the crankcase.
11. Refit the oil feed pipe. Fit new bolts and tighten to **8 Nm**.



1. **Oil feed pipe**
2. **Fixings**

12. Install a new O-ring to the oil pick-up and refit the oil pick-up.
- Refit the clutch (see Clutch - Installation).

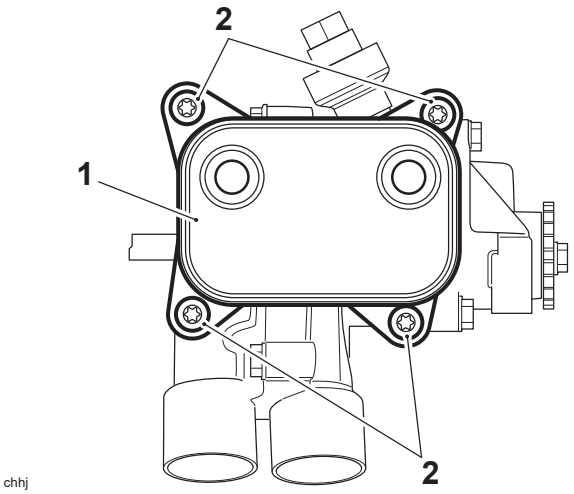
- Refit the sump, ensuring the water pump drain tube is correctly installed (see Sump - Installation).
- Refill the engine with oil (see Oil and Oil Filter Change).
- Refill the cooling system (see Coolant Replacement).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

⚠ 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.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the sump (see Sump - Removal).
- Remove the oil pump (see Oil Pump - Removal).

1. Release the heat exchanger fixings.



1. **Heat exchanger**
2. **Fixings**

2. Detach the heat exchanger.
3. Collect the four O-rings from the oil pump.

Heat Exchanger - Inspection

1. Inspect the heat exchanger for fractures and signs of oil leakage or coolant leakage.

Heat Exchanger - Installation

⚠ 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. Fit new O-rings to the oil pump.
2. Position the heat exchanger to the oil pump, noting that it will only fit one way.
3. Secure with new fixings and tighten to **10 Nm**.
4. Refit the oil pump (see Oil Pump - Installation).

5. Refit the sump, ensuring the water pump drain tube is correctly installed (see Sump - Installation).
6. Refill the engine with oil (see Oil and Oil Filter Change).
7. Reconnect the battery, positive (red) lead first.
8. Start the engine and check for oil leaks. Once a leak check has been made, stop the engine and allow to stand for 10 minutes.
9. Adjust the engine oil level (see Oil Level Inspection).
10. Refit the rider's seat (see Rider's Seat - Installation).

Engine Removal and Installation

Engine - Removal

⚠ WARNING

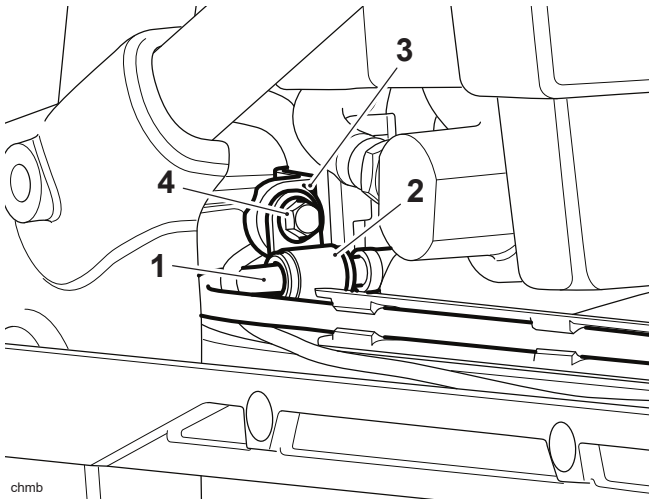
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

- Raise and securely support the motorcycle.
- Remove the rider's seat (see Rider's Seat - Removal).
- Remove the battery (see Battery Removal).
- Remove the engine bars (see Engine Bars - Removal).
- Remove the fuel tank (see Fuel Tank - Removal).
- Remove the airbox (see Airbox - Removal).
- Remove the throttle bodies (see Throttle Bodies/Injectors - Removal).
- Drain the engine oil (see Oil and Oil Filter Change).
- Remove the radiator (see Radiator - Removal).
- Remove the radiator mounting brackets from the engine.
- Remove the exhaust system (see Exhaust System - Removal).
- Remove the rear bevel box (see Rear Bevel Box - Removal).
- Remove the coolant expansion tank (see Expansion Tank - Removal).

Note

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

1. Drain the clutch fluid and detach the clutch hose from the master cylinder (see Clutch Master Cylinder - Removal).
2. Detach the rear brake line and its bracket from the crankcase tidy moulding.



1. **Rear brake line**
2. **Bracket**
3. **Crankcase tidy**
4. **Fixing**

3. Disconnect all electrical connections to the engine, noting the connection locations and the position of cable ties securing the harnesses in position.
4. Place a support beneath the engine and ensure that the frame is still adequately and securely supported.

Note

- **The washers and a spacer are only fitted to the right hand side of the frame.**
- **Note the position for each of the mounting bolts, washers and the spacer for installation.**

5. Remove the engine mounting bolts, lock nuts and washer from the front of the cylinder head. Discard the lock nuts.

Note

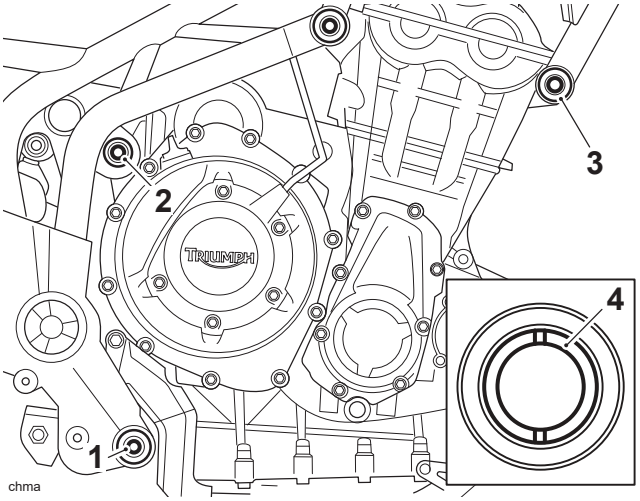
- **The cylinder head rear mounting on the right hand side has a spacer between it and the frame. Note the spacer's position for installation.**

6. Remove the engine mounting bolts and a spacer from the rear of the cylinder head. Discard the mounting bolts.
7. Remove the engine mounting bolts, washers and lock nuts from the crankcase mountings. Discard the lock nuts.

Note

- **There are three frame adjuster sleeves for this model. They are located as follows:**
- **Two of the frame adjuster sleeves are located on the right hand side of the frame.**
- **The third frame adjuster sleeve is located in the front right hand mounting of the cylinder head.**

8. Using T3880377 - Engine Mounting Adjuster, loosen the frame adjuster sleeves.



1. **Lower crankcase adjuster**
2. **Upper crankcase adjuster**
3. **Cylinder head front right hand adjuster**
4. **Adjuster**

CAUTION

To prevent body damage, do not allow clutch and brake fluid to contact any area of the bodywork.

CAUTION

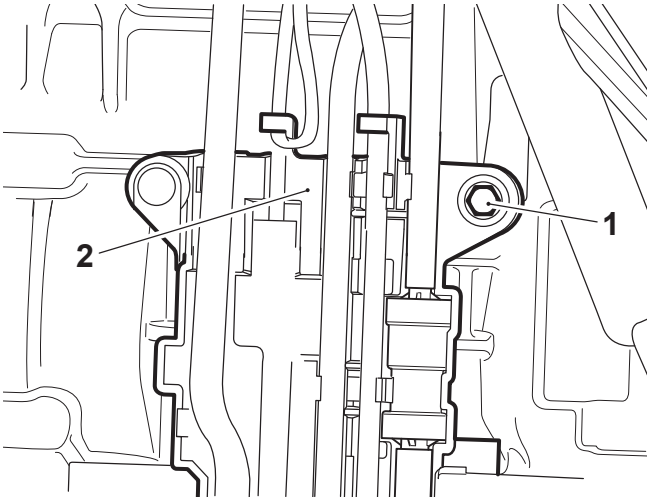
To prevent damage to components, lower the engine very carefully.

9. Temporarily refit the mounting bolts to the front mountings of the cylinder head and frame.

Note

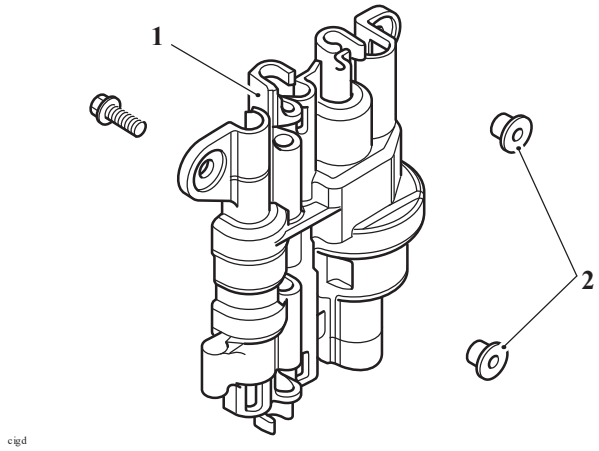
- **If fitted, note the routing of the evaporative canister hoses for installation.**

10. Carefully partially lower the rear of the engine to gain access to the rear cable tidy on the crankcase.
11. Release the fixing and detach the cable tidy from the crankcase. Discard the fixing.



1. **Fixing**
2. **Cable tidy**

12. Collect the two flanged sleeves from the cable tidy.

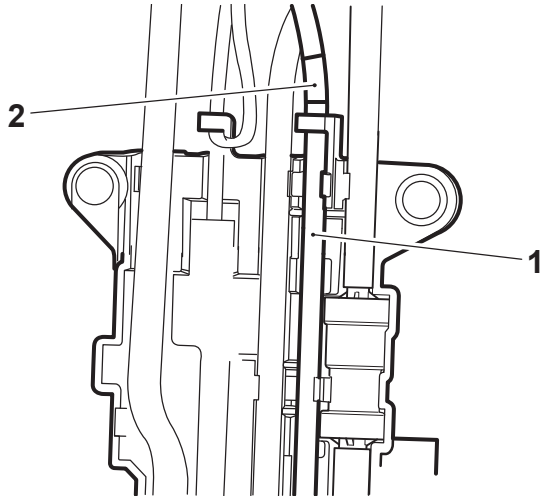


1. **Cable tidy**
2. **Flanged sleeves**

Note

- **Note the position of the blue tape on the oxygen sensor in relation to the cable tidy for installation.**

13. Detach the oxygen sensor harness from the cable tidy.



1. **Oxygen sensor harness**
2. **Blue tape**

14. Support the engine and remove the front mounting bolts for the cylinder head. Discard the mounting bolts.

Note

- **Note the routing of the clutch hose for installation.**

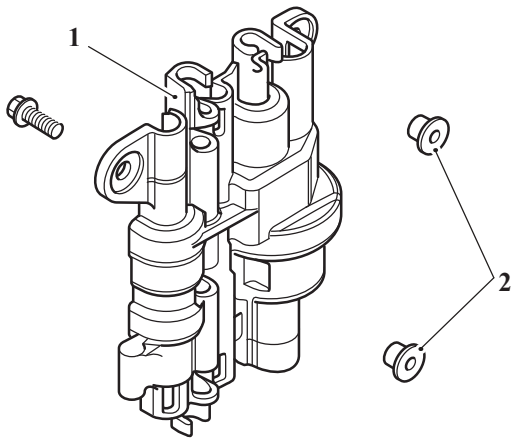
15. Lower the engine while feeding the clutch hose around the frame and remove the engine.

Engine - Installation

⚠ 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 engine beneath the frame.
2. Raise the engine, while routing the clutch hose as noted for removal.
3. Temporarily fit the mounting bolts to the front mountings of the cylinder head and frame.
4. Lower the rear of the engine to gain access to the rear cable tidy on the crankcase.
5. Fit the flanged sleeves to the cable tidy.



cigd

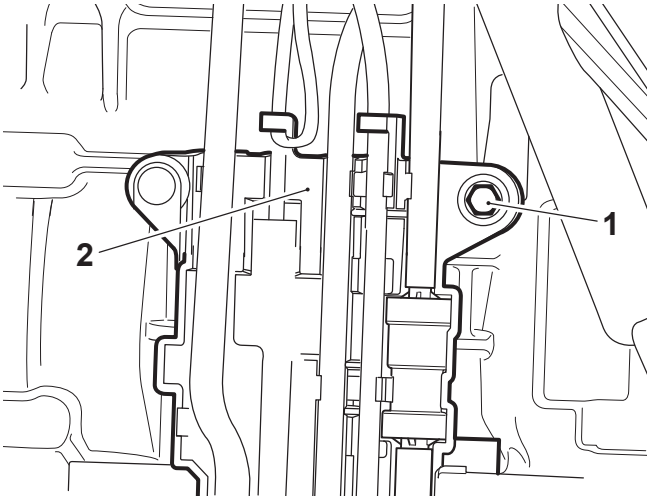
1. **Cable tidy**
2. **Flanged sleeves**

6. Fit the oxygen sensor harness to the cable tidy. Ensure that the blue tape on the oxygen sensor harness is positioned as noted for removal.

Note

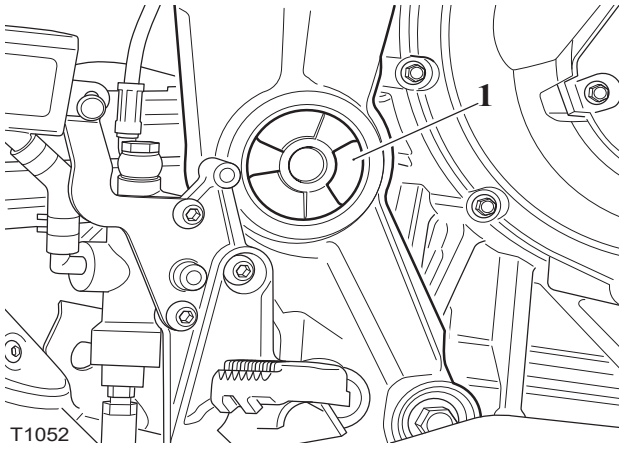
- **When fitting the cable tidy, ensure its left hand mounting is aligned correctly to its threaded hole for the brake line clip.**

7. Attach the cable tidy to the crankcase and tighten its new fixing to **6 Nm**.



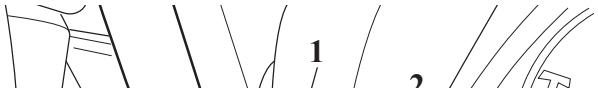
1. **Fixing**
2. **Cable tidy**

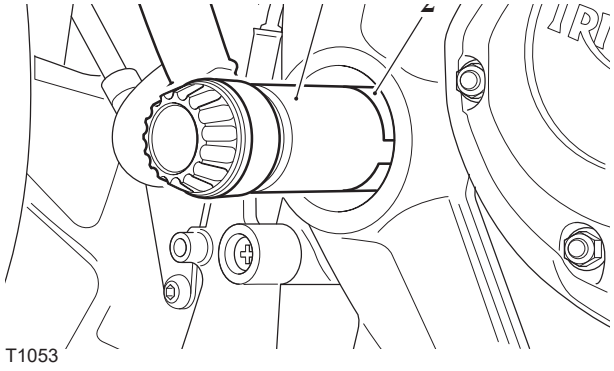
8. Carefully remove the cover from the swinging arm's right hand pivot pin.



1. **Cover**

9. Using T3880062 - Lock Ring Wrench, 38 mm, remove the locking ring from the right hand pivot pin.





1. **T3880062 - Lock Ring Wrench, 38 mm**
2. **Locking ring**

10. Loosen the right hand pivot pin but do not fully remove.

Note

- **If fitted, ensure that the evaporative canister hoses are routed as noted for removal while raising the rear of the engine.**

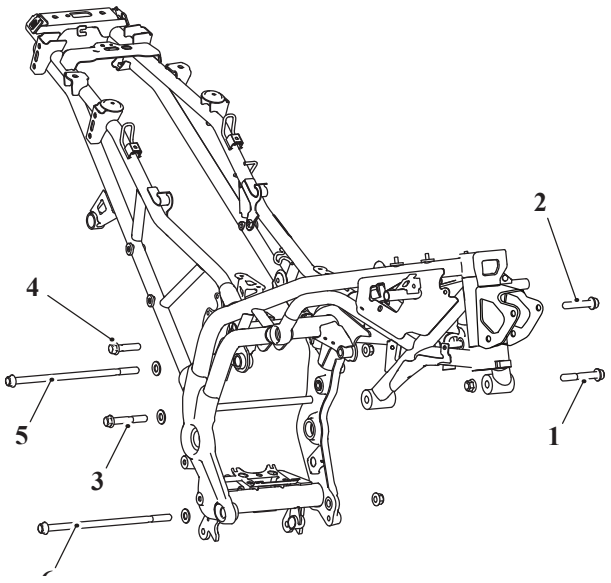
11. Raise the rear of the engine and align the engine to the frame.

⚠ CAUTION

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

The engine MUST be cold prior to starting the frame bolt tightening sequence.

Frame Bolts Exploded View

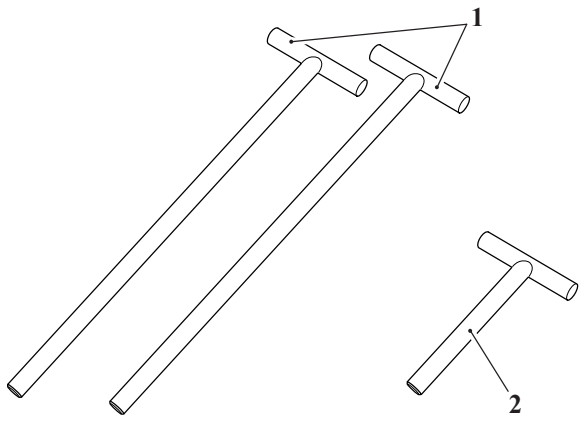


6

1. **Left hand front cylinder head bolt**
2. **Left hand rear cylinder head bolt**
3. **Right hand front cylinder head bolt**
4. **Right hand rear cylinder head bolt**
5. **Upper crankcase bolt**
6. **Lower crankcase bolt**

Note

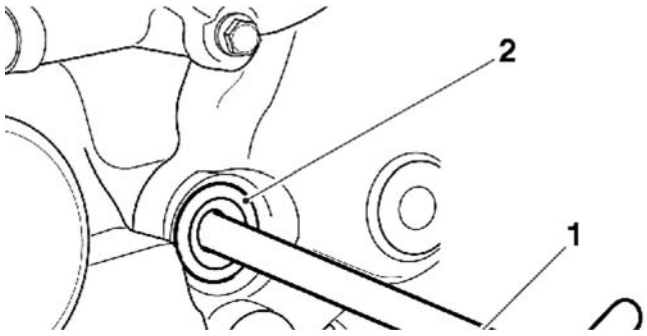
- **The T3880637 - Kit, Engine to Frame Alignment Bars is required to correctly align the engine to the frame for the following tightening sequence.**
- **Adjust the engine position as necessary to allow the engine to frame alignment bars to be inserted and removed freely.**

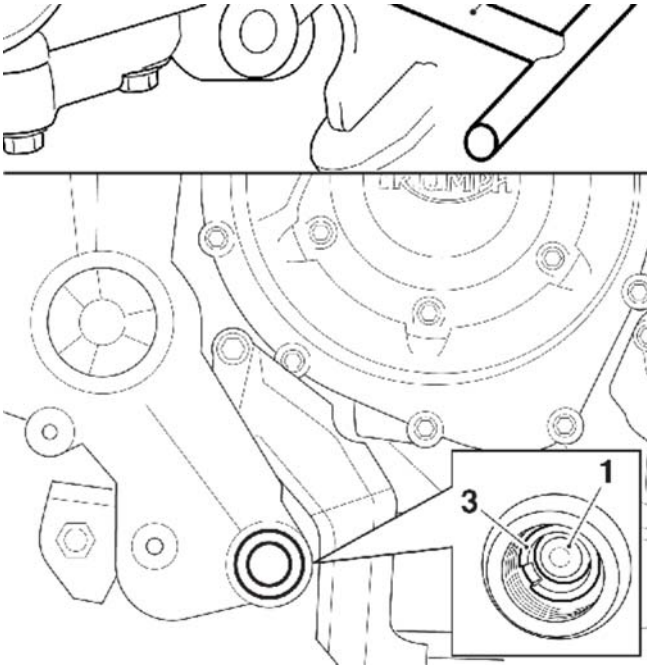


T3880637 - Kit, Engine to Frame Alignment Bars

1. **Crankcase alignment bars**
2. **Cylinder head alignment bar**

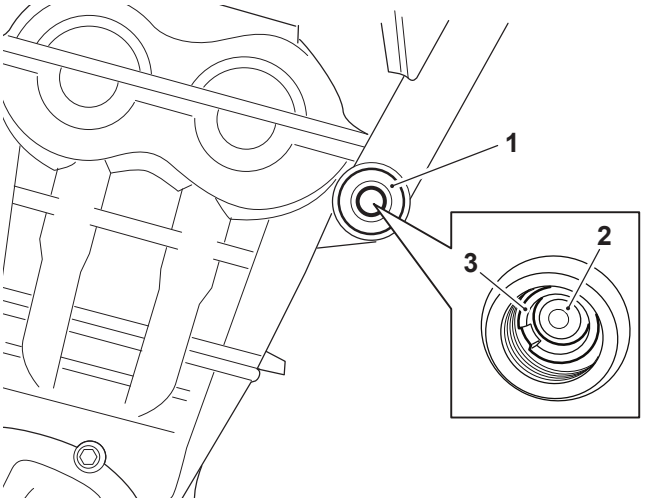
12. Insert the crankcase alignment bars into the upper and lower crankcase mountings from the left hand side of the frame. Ensure the alignment bars are located through the engine and into the crankcase adjusters on the right hand side of the frame. Allow enough clearance on the right hand side of the frame to enable the threaded adjusters to be adjusted.





1. **Crankcase alignment bar**
2. **Frame to crankcase mounting (lower mounting shown - left hand side of frame)**
3. **Crankcase adjuster (lower mounting shown - right hand side of frame)**

13. Remove the right hand front cylinder head bolt that was temporarily fitted earlier in this procedure.
14. Insert the cylinder head alignment bar into the left hand side of the right hand front cylinder head mounting point. Allow enough clearance on the right hand side of the frame to enable the threaded adjuster to be adjusted.



1. **Right hand front cylinder head mounting point**
2. **Cylinder head alignment bar (end of bar shown)**
3. **Cylinder head adjuster**

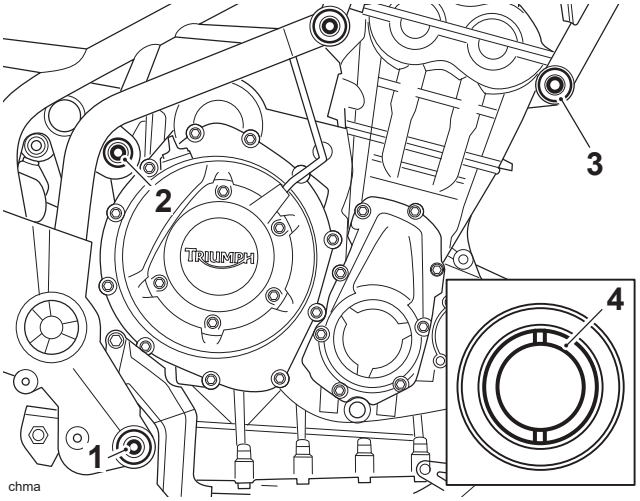
15. Lubricate the threads of the rear cylinder head bolts only with a smear of proprietary high temperature copper-based grease.
16. Fit the right hand rear cylinder head bolt ensuring that the spacer is fitted between the cylinder head and frame. Do not fully tighten at this stage.

17. Fit the left hand rear cylinder head bolt. Do not fully tighten at this stage.
18. Fit a new lock nut to the left hand front cylinder head bolt and tighten to **24 Nm**.
19. Tighten the left hand rear cylinder head bolt to **85 Nm**.

Note

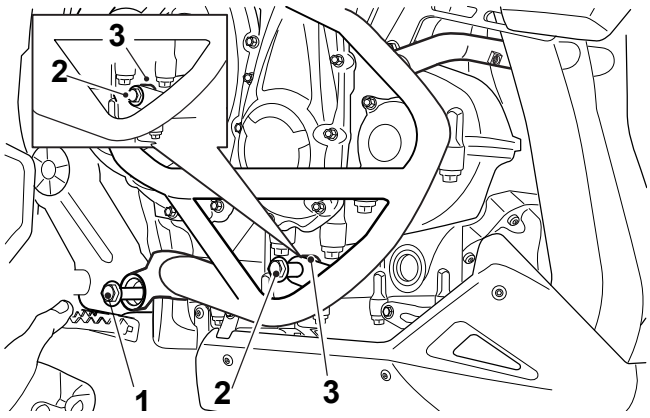
- **If, after tightening each adjuster and frame fixing, any of the engine to frame alignment bars and frame fixings cannot be removed and inserted freely, check that the engine is still adequately supported, loosen all tightened adjusters and frame fixings and restart the tightening sequence from step 18.**

20. Using T3880377 - Engine Mounting Adjuster, tighten the three adjusters in the following sequence.
    - Tighten the lower crankcase adjuster to **5 Nm**.
    - Tighten the upper crankcase adjuster to **5 Nm**.
    - Tighten the cylinder head front right hand adjuster to **3 Nm**.



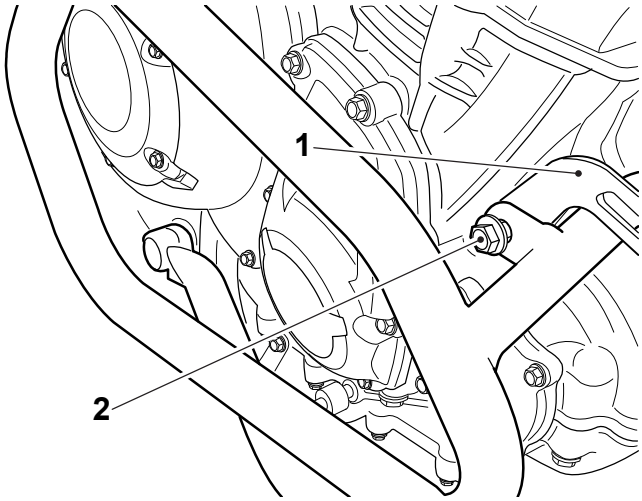
1. **Lower crankcase adjuster**
2. **Upper crankcase adjuster**
3. **Cylinder head right hand front adjuster**
4. **Adjuster**

21. Remove the upper crankcase alignment bar and fit the upper crankcase bolt and washer from the right hand side. Holding the bolt to prevent rotation, fit a new lock nut and tighten to **100 Nm**.
22. Remove the lower crankcase alignment bar.
23. Align the right hand engine protection bar and link bar assembly to the engine. Fit the lower crankcase mounting bolt through the rear mounting of the engine protection bar, frame and lower crankcase. Loosely fit a new locknut.
24. Position the 13 mm spacer between the engine protection bar centre mounting and the engine as noted for removal. Fit the M8 x 33 mm bolt, do not fully tighten at this stage.



1. **Lower crankcase mounting bolt**
2. **Bolt, M8 x 33 mm**
3. **Spacer, 13 mm**

25. Ensure that the radiator mounting bracket is located between the upper mounting for the engine protection bar and the engine as noted for removal. Fit an M8 x 25 mm bolt, do not fully tighten at this stage.



1. **Radiator mounting bracket**
2. **Bolt, M8 x 25 mm**

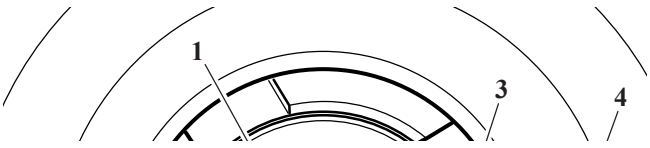
26. Hold the lower crankcase mounting bolt to prevent rotation and tighten its locknut to **100 Nm**.
27. Tighten the remaining frame bolts in the following sequence:
    - Tighten the right hand rear cylinder head bolt to **85 Nm**.
    - Tighten the left hand front cylinder head bolt to **115 Nm**.
    - Using T3880377 - Engine Mounting Adjuster, re-tighten the right hand front cylinder head adjuster to **3 Nm**.
    - Remove the cylinder head alignment bar from the right hand front cylinder head mounting and fit the bolt and washer. Fit a new locknut and tighten to **100 Nm**.
28. Tighten the right hand engine protection bar centre mounting bolt to **18 Nm**.
29. Tighten the right hand engine protection bar upper mounting bolt to **18 Nm**.
30. Tighten the swinging arm right hand pivot pin to **45 Nm**.

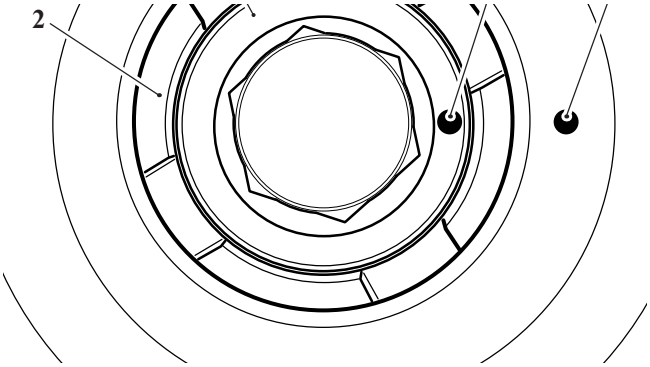
⚠ CAUTION

If the right hand pivot pin moves during the tightening of the locking ring, both the locking ring and pivot pin must be loosened and re-tightened as described in steps 30 to 34 of this procedure.

Failure to tighten the swinging arm pivot pin and locking ring correctly may lead to severe frame damage.

31. Lubricate the threads of the locking ring with a smear of proprietary high temperature copper-based grease.
32. Fit the locking ring to the swinging arm right hand pivot pin.
33. Using a non permanent marker, temporarily mark the pivot pin alignment in relation to the frame.





1. **Swinging arm pivot pin**
2. **Locking ring**
3. **Pivot pin alignment mark**
4. **Frame alignment mark**

Note

- **If the pivot pin and frame markings do not align after final tightening of the locking ring, loosen the locking ring and right hand pivot pin and repeat steps 30 to 34 of this procedure.**

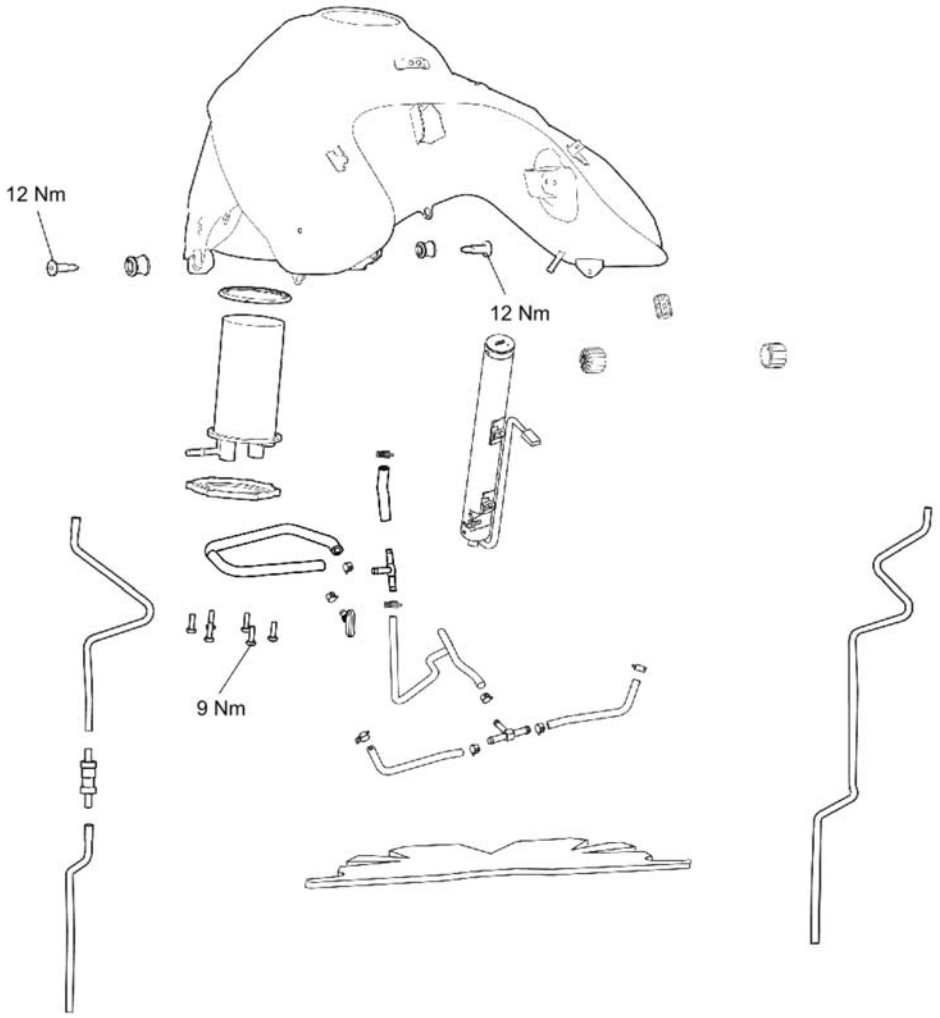
34. Using T3880062 - Lock Ring Wrench, 38 mm, tighten the locking ring to **110 Nm**.
35. Refit the cover to the swinging arm right hand pivot pin.
36. Remove the support from beneath the engine.
37. Refit the throttle bodies to the cylinder head (see Throttle Bodies/Injectors - Installation).
38. Reconnect all electrical connections to the engine and ensure they are secured as noted for removal.
39. Attach the brake line and its bracket to the crankcase and tighten the new fixing to **8 Nm**.

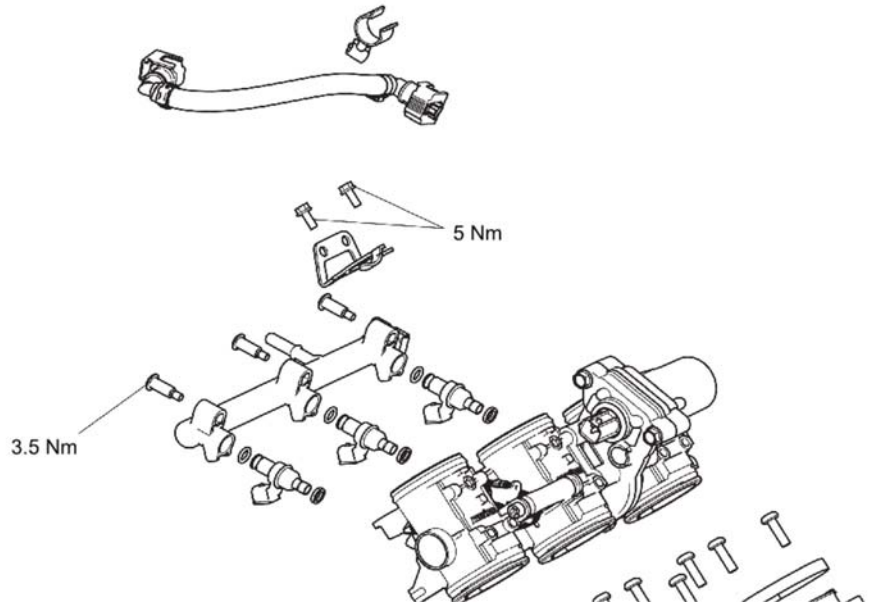
- Refit the rear bevel box (see Rear Bevel Box - Installation).
- Refit the clutch hose to the clutch master cylinder (see Clutch Master Cylinder - Installation).
- Fill and bleed the clutch system (see Bleeding the Clutch).
- Refit the coolant expansion tank (see Expansion Tank - Installation).
- Refit the exhaust system (see Exhaust System - Installation).
- Refit the left hand engine bar (see Engine Bars - Installation).
- Refit the radiator (see Radiator - Installation).
- Refill the cooling system (see Coolant Replacement).
- Fill the engine with oil of the correct grade and viscosity (see Oil and Oil Filter Change).
- Refit the airbox (see Airbox - Installation).
- Refit the fuel tank (see Fuel Tank - Installation).
- Remove the motorcycle from its support and place on the side stand.
- Refit and connect the battery (see Battery Installation).
- Refit the rider's seat (see Rider’s Seat - Installation).

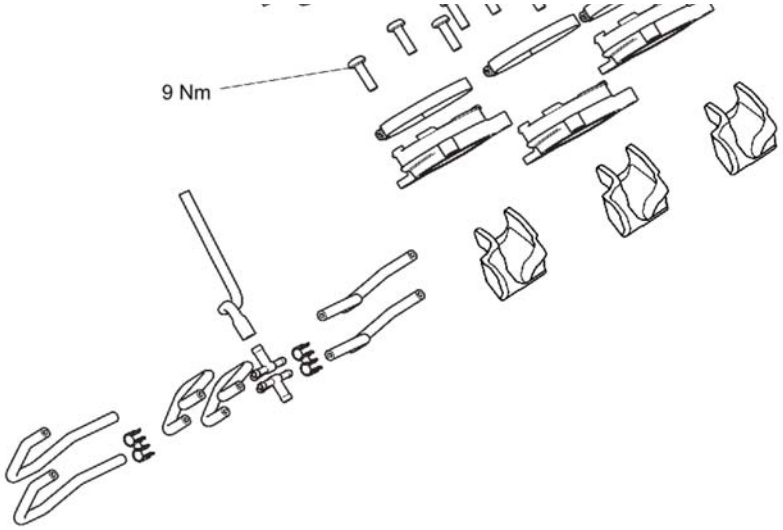
Fuel System and Engine Management

Exploded View – Fuel Tank and Fuel Pump

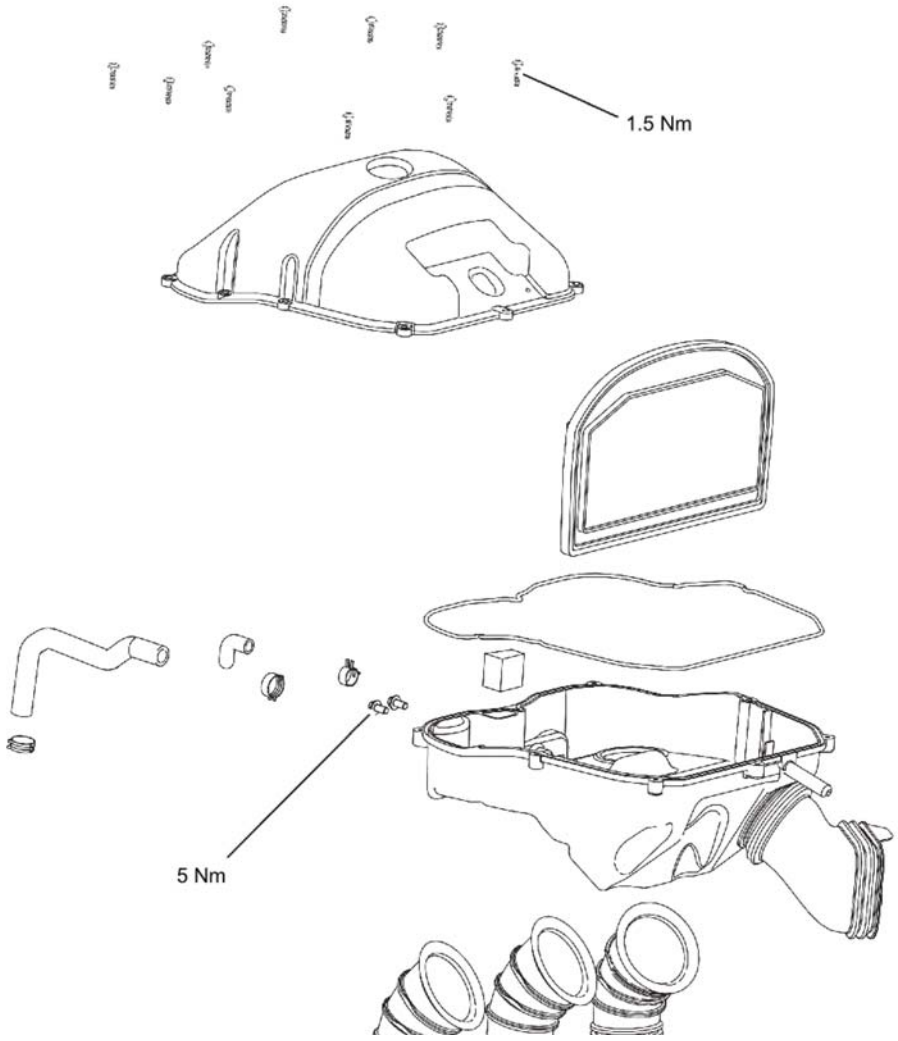
Exploded View – Fuel Rail, Throttles and Injectors


12 Nm
12 Nm
9 Nm

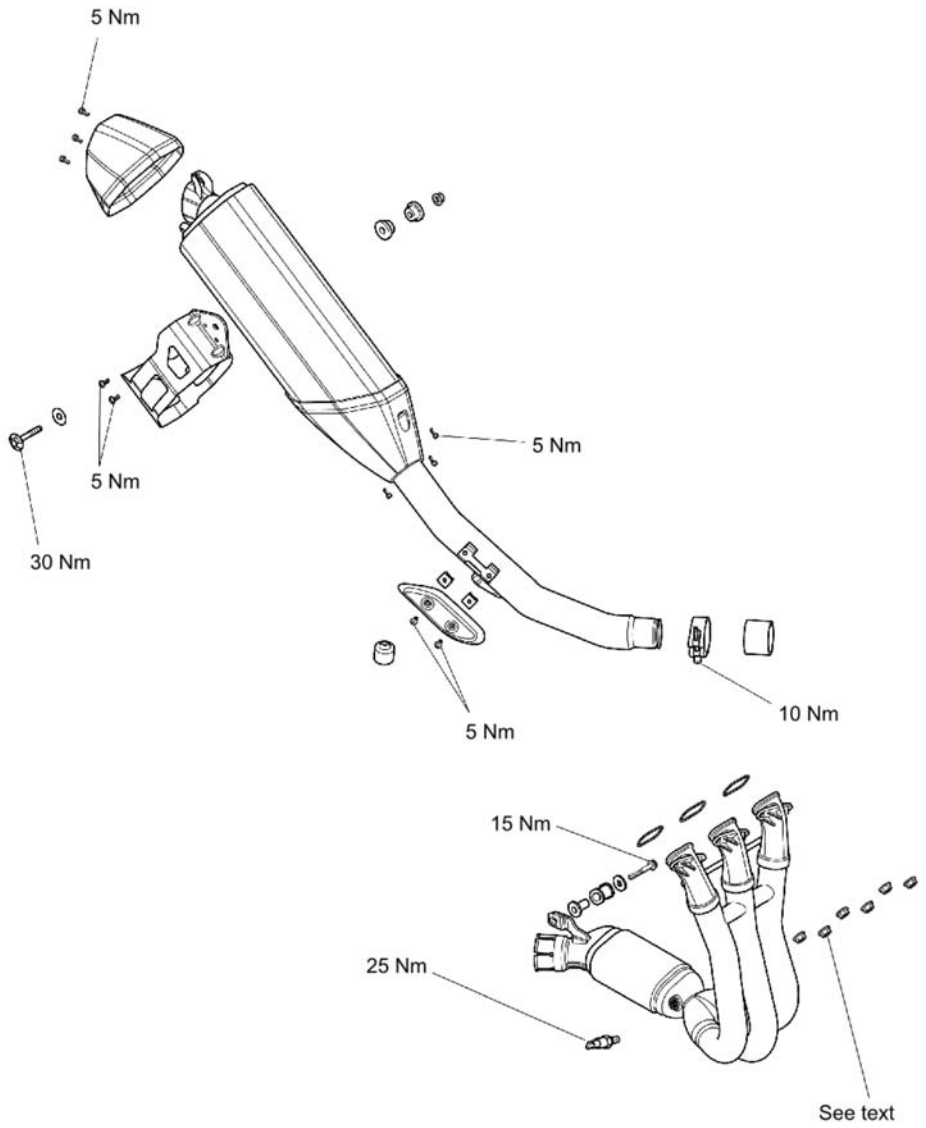

5 Nm
3.5 Nm



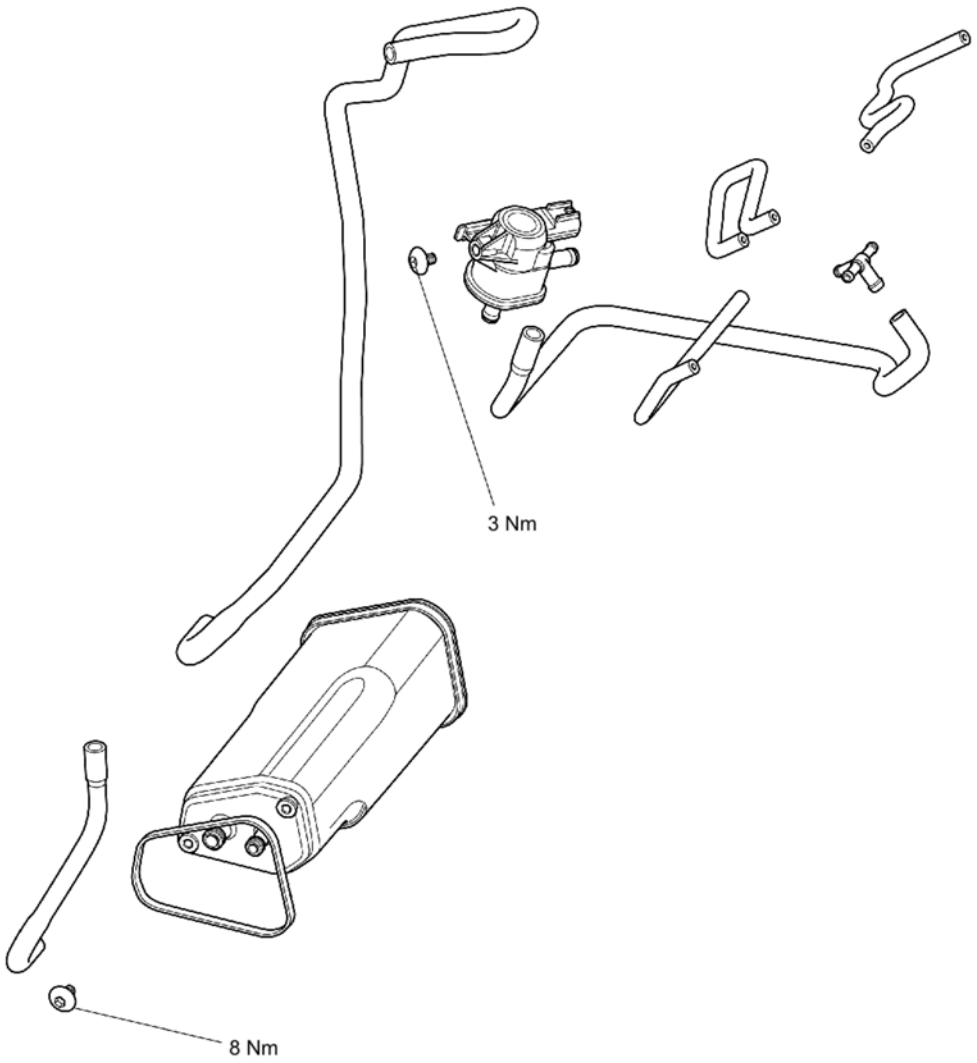
Exploded View – Airbox



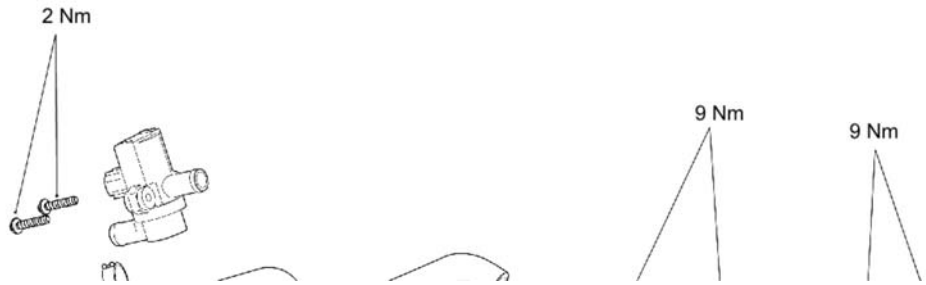
Exploded View – Exhaust System

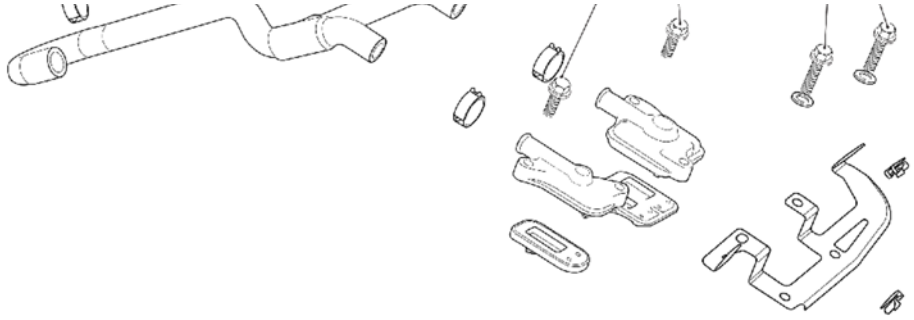


Exploded View – Evaporative System



Exploded View – Secondary Air Injection





Fuel Requirements

Fuel Requirements - all countries except USA

This model 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:

This model 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. This model will give best performance when using unleaded gasoline. However, the following should be used as a guide to the use of oxygenated fuels.

⚠ CAUTION

Because of the generally higher volatility of oxygenated fuels, starting, engine response and fuel

CAUTION

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

Engine Management System Description

Engine Management System Sensors

Engine Management System Sensor Locations

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

Air temperature sensors

A sensor located in the airbox to detect the temperature of the incoming air.
Another sensor is located on the underside of he high level mudguard to detect the ambient air temperature.

Ambient air pressure

Pressure of the air in the atmosphere.

Ambient air temperature

Temperature of the air in the atmosphere.

ATDC

After Top Dead Centre (TDC).

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.

Chassis ECM

Chassis Electronic Control Module.

Closed throttle position

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

Cruise control cancel switch

A switch located in the twist grip housing, used to cancel the cruise control. The switch is operated by 'over-closing' of the twist grip.

DTC

Diagnostic Trouble Code.

Engine ECM

Engine Electronic 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.

Gear position sensor

Gearbox mounted sensor which delivers information to the ECM. This is converted to the gear position value that is displayed on the instrument’s gear position indicator and neutral light.

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'.

IMU

Inertial Measurement Unit.

Injector pulse time

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

Intake air temperature

The air temperature in the airbox and intake system.

MAP sensor

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

MIL

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

Neutral switch status

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

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.

Oxygen sensor

The oxygen sensor measures the oxygen levels in the exhaust gases and feeds this information to the ECM. Based on this information, adjustments to air/fuel ratio are made.

Purge valve duty cycle

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

Secondary air injection

A small amount of air injected into the exhaust port to reduce the levels of pollutants in the exhaust gases.

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 (either to earth (ground), 5 Volt sensor reference Voltage or Vbatt).

Side stand status

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

Target dwell time

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

TDC

Top Dead Centre.

Throttle actuator motor

Motor used to open/close the throttle.

Throttle position

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

Throttle position sensor

Sensor for the primary throttle position.

Throttle Voltage

Voltage at the throttle potentiometer.

TPMS

Tyre Pressure Monitoring System.

Transponder

A transmitter-responder chip located in the ignition key. The transponder is activated by a radio signal sent out by the immobiliser and TPMS control module, via an antenna located around the ignition switch. If the immobiliser and TPMS control module does not receive the correct code signal from the transponder, the immobiliser will remain active and the engine will not start.

Twist grip position sensor

The twist grip position sensor is used to relay twist grip position information to the ECM. The ECM uses this information to drive the throttle actuator motor to the correct position.

Vbatt

Battery Voltage.

This model is fitted with an electronic engine management system which encompasses control of both ignition and fuel delivery. The engine ECM is electronically paired to the chassis ECM to help prevent theft of the motorcycle (see Immobiliser System). The engine ECM also draws information from sensors positioned around the engine, cooling and air intake systems and precisely calculates ignition advance and fuelling requirements for all engine speeds and loads.

In addition, the system has an on-board diagnostic function. This ensures that, should a malfunction occur in the engine management system, the malfunction type, and engine data at the time the malfunction occurred, are stored in the engine ECM memory. This stored data can then be recovered using a special service tool which is mandatory for all Triumph dealers. In this way, precise diagnosis of a fault can be made and the fault quickly rectified.

Intake air temperature sensor - situated in the top of the airbox. As the density of the air (and therefore the amount of oxygen available to ignite the fuel) changes with temperature, an intake air temperature sensor is fitted. Changes in air temperature (and therefore air density) are compensated for by adjusting the amount of fuel injected to a level consistent with clean combustion and low emissions.

Ambient air pressure sensor - situated on the right hand side of the rear mudguard, beneath the seat. The ambient air pressure sensor measures atmospheric air pressure. With this information, the amount of fuel per

injection is adjusted to suit the prevailing conditions.

Manifold Absolute Pressure (MAP) sensor - situated to the left side of the airbox, connected to each of the three throttle bodies by equal length tubes. The MAP sensor provides information to the engine ECM which is used at shallow throttle angles (very small throttle openings) to provide accurate engine load indications to the engine ECM. This degree of engine load accuracy allows the engine 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. With the cruise control on and active, the operation of the clutch will cancel cruise control.

Crankshaft position sensor - situated in the crankcase, near the flywheel cover. The crankshaft position sensor detects movement of a toothed wheel attached to the flywheel rotor. The toothed wheel gives a reference point from which the actual crankshaft position is calculated. The crankshaft position sensor information is used by the engine ECM to determine engine speed and crankshaft position in relation to the point where fuel is injected and ignition of the fuel occurs.

Engine coolant temperature sensor - situated at the rear of the cylinder head, on the left hand side. Coolant temperature information, received by the engine ECM, is used to optimise fuelling at all engine temperatures and to calculate hot and cold start fueling requirements.

Throttle position sensors 1 and 2 - the two sensors are located in the same housing which is situated at the left end of the throttle body. Used to relay throttle position information back to the engine ECM.

Oxygen sensor - situated in the exhaust header system upstream of the catalyst. The oxygen sensor constantly feeds information to the engine ECM on the content of the exhaust gases. Based on this information, adjustments to air/fuel ratio are made.

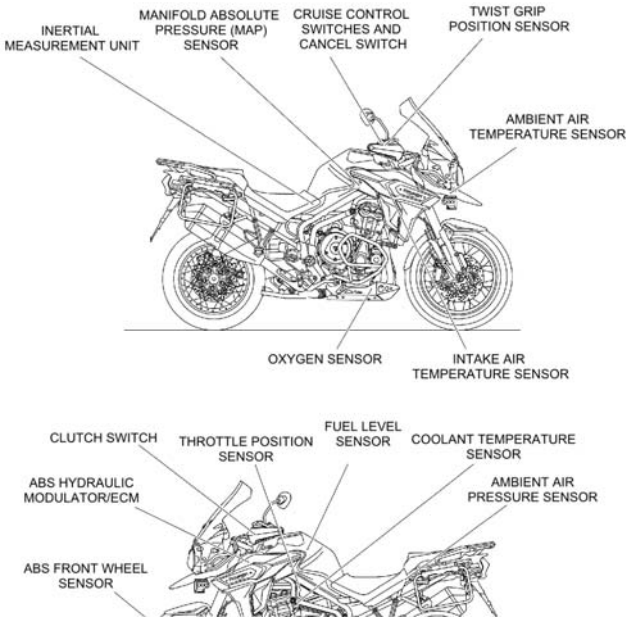
Side stand switch - situated at the top of the side stand leg. If the side stand is in the down position, the engine will not run unless the transmission is in neutral.

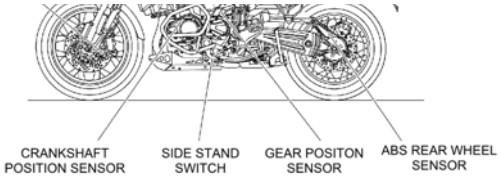
Inertial Measurement Unit (IMU) - situated beneath the front seat support, the IMU consists of a 3-axis gyroscope and a 3-axis accelerometer, and is used to calculate the motorcycle's lean angle. Data provided by the IMU is constantly monitored by the optimised cornering traction control system, optimised cornering ABS and Triumph Semi Active Suspension (TSAS). The IMU also provides fall detection. Power to the ignition and fuel delivery systems is cut if the IMU detects that the motorcycle is on its side. This prevents the engine from running and the fuel pump from delivering fuel. In the event of a fall, the fall detection system is reset by returning the motorcycle to an upright position and switching the ignition off then back on again.

Twist grip position sensors 1 and 2 - the two sensors are located in the same housing which is situated in the right hand switch cube. The twist grip position sensor is used to relay twist grip position information to the engine ECM. The engine ECM uses this information to drive the throttle actuator motor to the correct position.

Gear position sensor - situated in the transmission cover, behind the coolant expansion tank. The gear position sensor provides the engine 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 gear position indicator and the neutral light in the instruments.

Brake switches - incorporated in the ABS hydraulic modulator/ECM. With the cruise control on and active, the operation of the front or rear brakes will cancel cruise control.





Engine Management System Actuators

Engine Management System Actuator Locations

Immobiliser System

In response to signals received from the sensors, the engine 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 actuator motor - situated at the left end of the throttle bodies. The throttle actuator motor opens and closes the throttle plates in the throttle bodies, in response to commands from the engine ECM. The throttle actuator motor is an integral part of the throttle bodies.

Canister purge valve - 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 engine ECM to give control over the rate at which the canister is purged.

Injectors - located in the cylinder head. The engine is fitted with three injectors. The spray pattern of the injectors is fixed but the length of time each injector can remain open is variable according to operating conditions. The duration of each injection is calculated by the engine ECM using data received from the various sensors in the system.

Ignition coils - plug-top coils are located in the camshaft cover. There are three coils fitted, one for each spark plug. The engine ECM controls the point at which the coils are switched on and off. In calculating the switch-on time, the engine 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 under the seat. When the ignition is switched on, the main power relay is powered up to provide a stable Voltage supply for the engine ECM.

Fuel pump - located inside the fuel tank. The electric pump delivers fuel into the fuel system, via a pressure regulator, at a constant 3.5 bar pressure. The pump is run continuously when the engine is operating and is also run briefly when the ignition is first switched on to ensure that 3.5 bar is available to the system as soon as the engine is cranked. Fuel pressure is controlled by a regulator also situated inside the fuel tank.

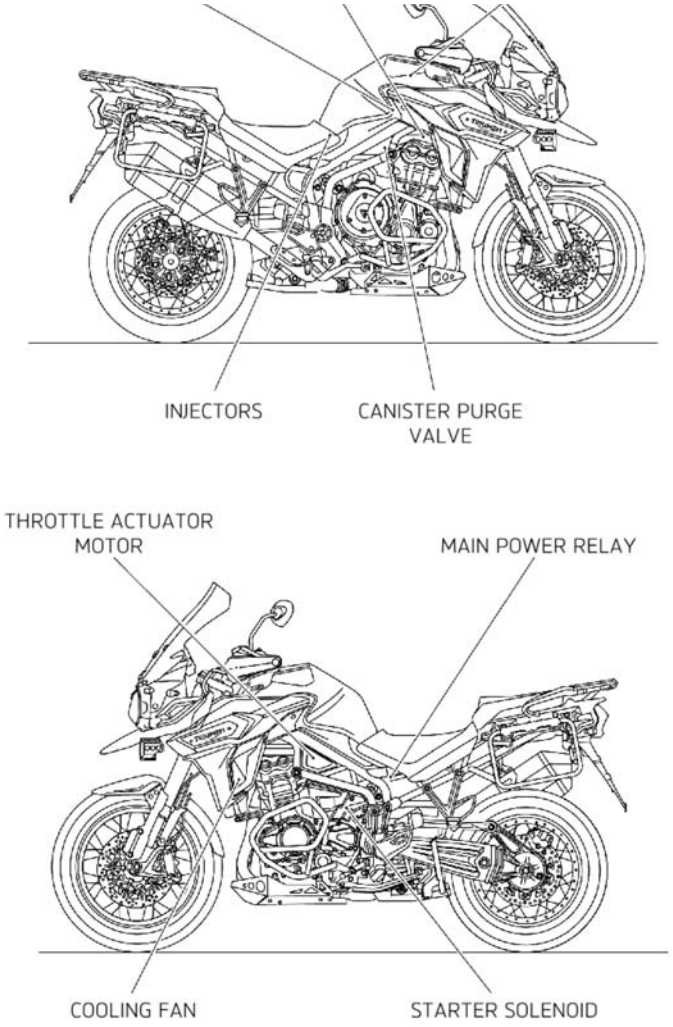
Cooling fan - located behind the radiator. The cooling fan is turned on or off by the chassis ECM, in response to a request sent by the engine ECM. The request from the engine ECM to turn the cooling fan on or off is sent to the chassis ECM in response to a signal received from the coolant temperature sensor. When the coolant temperature rises to a level where the cooling effect of natural airflow is insufficient, the engine ECM sends a request to the chassis ECM to turn the cooling fan on. When the coolant temperature falls sufficiently, the engine ECM sends a request to the chassis ECM to turn the cooling fan off. The fan only becomes operational when the engine is running. It will not operate at any other time.

Secondary air injection solenoid - located on the rear of the airbox. The secondary air injection solenoid controls airflow through the secondary air injection system.

Note

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

Immobiliser System Components Location



System Description

This model is fitted with an electronic immobiliser system to help protect it against theft. This system has to be paired with the engine ECM and the ignition key which contains a transponder chip. If all the components are correctly paired, the immobiliser will allow the engine to start. The Triumph diagnostic tool is the only way these components can be paired.

In addition, the system has an on-board diagnostic function. This ensures that, should a malfunction occur in the immobiliser system, a malfunction code is stored in the chassis ECM memory. This stored data can then be recovered using the Triumph diagnostic tool (see Triumph Diagnostic Software - Chassis ECM).

System Components and Operation

- **Transponder chip** - situated inside the ignition key. The chip is activated by the antenna coil when the ignition switch is turned to the ON position.
- **Antenna coil** - situated around the ignition switch. When the ignition switch is turned to the ON position, and the transponder chip is activated, the signal from the chip is sent to the immobiliser/TPMS control module.
- **Chassis ECM** - situated beneath the rider’s seat. This control module communicates with the transponder chip in the key and the engine ECM and will only allow the engine to start if a matching signal is received.
- **Alarm/immobiliser warning indicator light** - situated in the instrument pack. The light will flash on and off for 24 hours to show that the engine immobiliser is on. When the ignition switch is turned to the ON position the immobiliser and the indicator light will be off. If the indicator light remains on it indicates that the immobiliser has a malfunction that requires investigation. If an accessory alarm is fitted, the immobiliser

indicator light will only illuminate when the conditions described in the accessory alarm instructions are met.

Keys

When the motorcycle is delivered from the factory it is supplied with two keys. Keys can be deleted or added to the immobiliser system using the Triumph diagnostic tool. A maximum of four keys can be added to the system.

To ensure the immobiliser system functions correctly note the following:

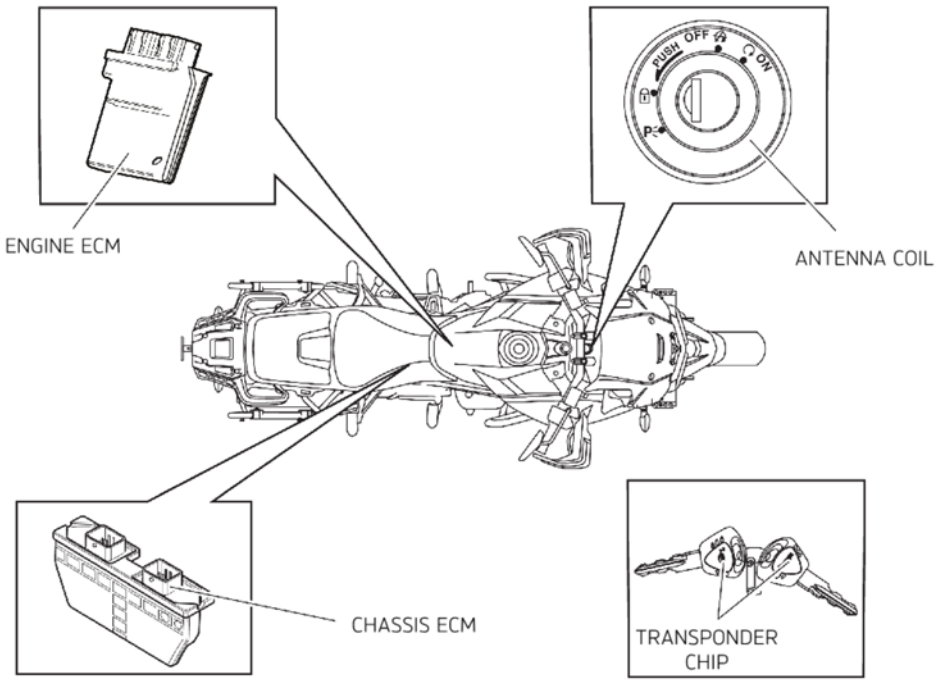
- Do not put any magnetic materials on the same key ring as the motorcycle key.
- Do not put any other ignition key with a transponder chip fitted near the motorcycle key when in use.
- Do not modify the immobiliser system.
- Do not submerge the key in water or any other fluid.
- Do not drop or strike the key against hard material.

Diagnostics

To fully diagnose the immobiliser system it is necessary to check for fault codes in the chassis ECM using the Triumph diagnostic tool (see System Diagnosis).

Further Diagnosis

The diagnostic trouble code tables, if used correctly, help to pinpoint a fault in the system once a diagnostic trouble code has been stored (see Chassis ECM Diagnostic Trouble Codes).



Tyre Pressure Monitoring System (TPMS)

System Description

This model can be fitted with the accessory Tyre Pressure Monitoring System (TPMS).

When fitted, the tyre pressures shown on the instrument panel indicate the actual tyre pressure at the time of selecting the display. This may differ from the inflation pressure set when the tyres are cold because tyres become warmer during riding, causing the air in the tyre to expand and the pressure to increase. The cold inflation pressures specified by Triumph take account of this.

In addition, the system has an on-board diagnostic function. This ensures that, should a malfunction occur in the immobiliser system, a malfunction code is stored in the chassis ECM memory. This stored data can then be recovered using the Triumph diagnostic tool (see Triumph Diagnostic Software - Chassis ECM).

Owners must only adjust tyre pressures when the tyres are cold using an accurate tyre pressure gauge and

must not use the tyre pressure display on the instruments.

⚠ WARNING

The tyre pressure monitoring system is not to be used as a tyre pressure gauge when adjusting the tyre pressures. For correct tyre pressures, always check the tyre pressures when the tyres are cold and using an accurate tyre pressure gauge.

Use of the TPMS system to set inflation pressures may lead to incorrect tyre pressures leading to loss of motorcycle control and an accident.

When fitting the TPMS, the installation flow-chart detailed in the Triumph Diagnostic Tool User Guide must be followed.

System Components and Operation

- **Instruments** - used to display the tyre pressure value, the tyre symbol and the TPMS warning light.
- **Chassis ECM** - receives the data from the tyre pressure sensors and sends the information to the instrument pack.
- **Tyre pressure sensor** - situated inside the front and rear wheel. Each sensor has its own unique ID number and must be recorded in the spaces provided in the Owner's Handbook. These sensors measure the air pressure inside the tyre and transmit pressure data to the instruments. These sensors will not transmit the data until the motorcycle is travelling at a speed of approximately 12 mph (20 km/h). Two dashes will be visible in the display area until the tyre pressure signal is received. The wheel sensor is a sealed unit and must not be opened. The battery inside the sensor is not replaceable and a new sensor must be fitted when the battery Voltage becomes too low.

Compliance

This device complies with part 15 of the FCC Rules.

Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications to the device could void the user's authority to operate the equipment.

Diagnostics

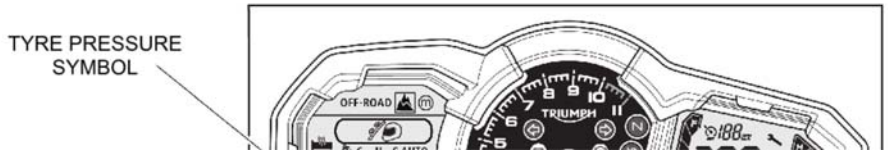
When a fault condition with the TPMS is detected, the red warning light in the instrument pack will illuminate and a warning message may be displayed on the instrument's display screen.

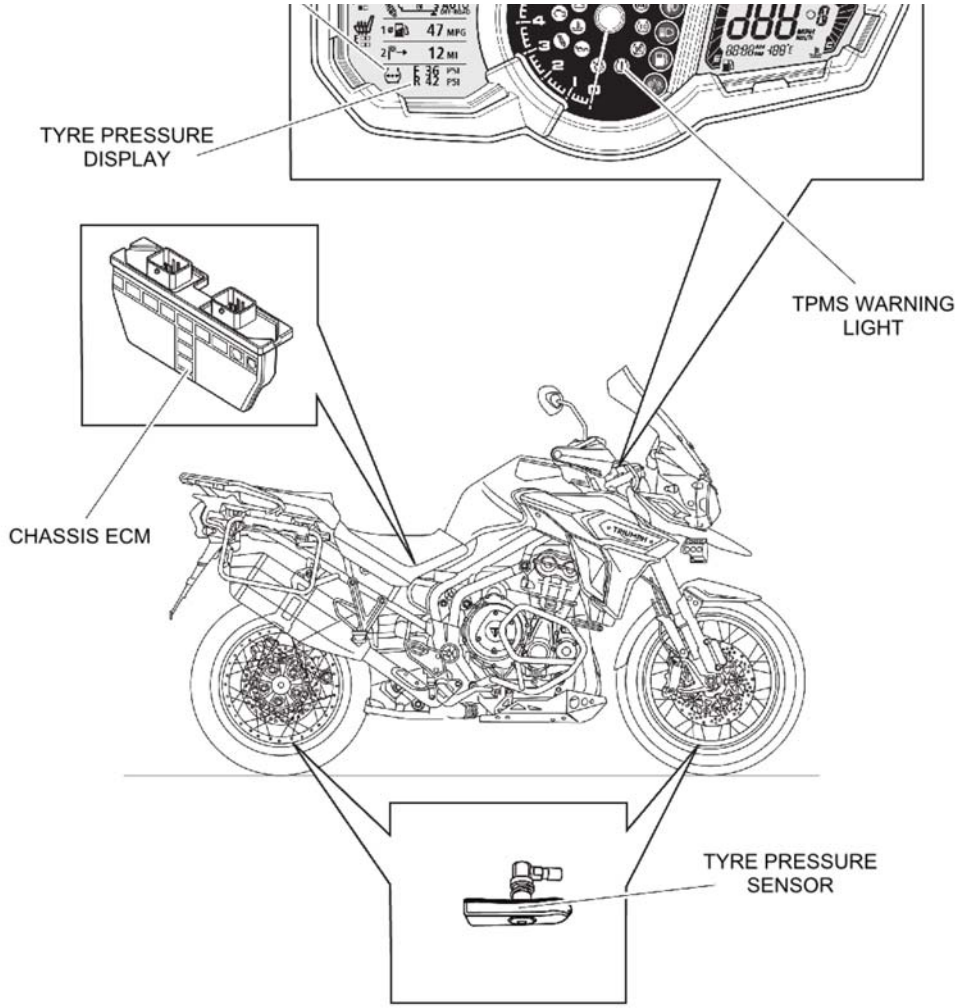
The red warning light and flashing symbol will also occur if the TPMS has been enabled in the instrument pack but not in the chassis ECM. Before proceeding to the diagnostics, check that the motorcycle has wheel sensors fitted and that the option for the TPMS has been enabled in the chassis ECM.

Further Diagnosis

The diagnostic trouble code tables, if used correctly, help to pinpoint a fault in the system once a diagnostic trouble code has been stored (see Chassis ECM Diagnostic Trouble Codes

TPMS Components Locations





Key to Engine Management Circuit Diagram

Key	Item Description
1	Engine Control Module
2	Manifold Absolute Pressure Sensor
3	Ambient Air Pressure Sensor
4	Gear Position Sensor
5	Throttle Position Sensor
6	Accelerator Position Sensor
7	Diagnostic Connector
8	Fuel Level Sender

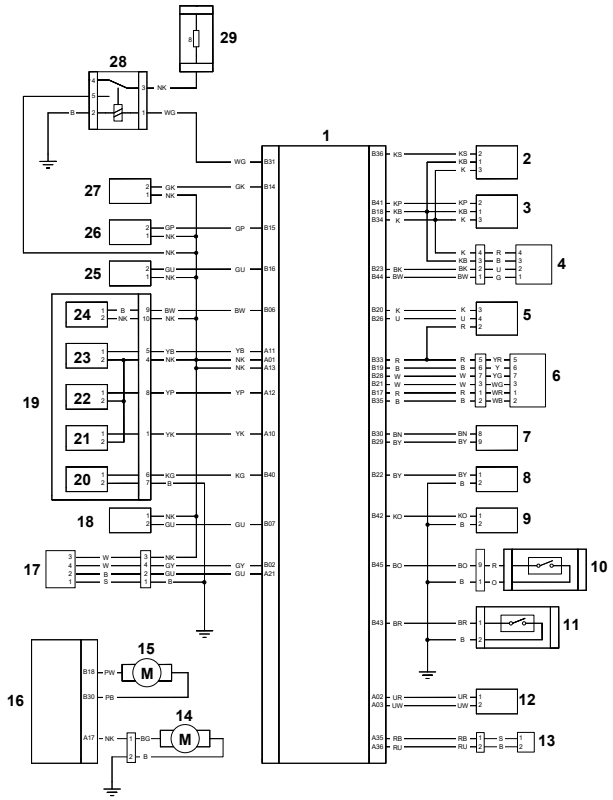
Key	Item Description
9	Intake Air Temperature Sensor
10	Clutch Switch
11	Side Stand Switch
12	Throttle Actuator Motor
13	Crankshaft Position Sensor
14	Cooling Fan
15	Fuel Pump
16	Chassis ECM
17	Oxygen Sensor
18	Secondary Air Injection Solenoid
19	Engine Sub Harness
20	Coolant Temperature Sensor
21	Injector 1
22	Injector 3
23	Injector 2
24	Purge Valve
25	Coil 3
26	Coil 2
27	Coil 1
28	Engine Management Relay
29	Main Fuse Box

Key To Wiring Colour Codes

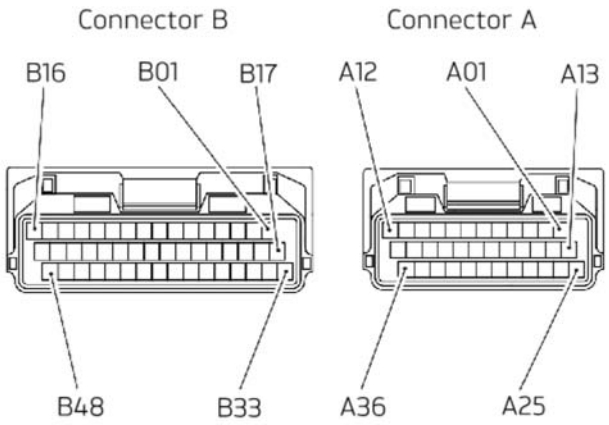
Code	Wiring Colour
B	Black

Code	Wiring Colour
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

Engine Management Circuit Diagram



ECM Connector Pin Numbering



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

The smaller connector's pins are prefixed A and the larger 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.

Triumph Diagnostic Software - Engine ECM

Cruise Control Switch Check

Described on the following pages is the range of information which can be retrieved from the engine 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 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 Engine ECM (ECM Locked, Unlocked or Not Applicable).

Current Data

The data available under Current Data is:

Function Examined	Result Reported (Scale)
Fuel system status	open or closed loop operation

Calculated load value	%
Engine coolant temperature	°C
Short term fuel trim	%
Intake manifold absolute pressure	mmHg
Engine speed	rpm
Vehicle speed	km/h
Ignition timing advance	degrees
Intake air temperature	°C
Absolute throttle position	%
Oxygen sensor	Volts

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 engine ECM	Volts
Air temperature sensor Voltage	Volts
Coolant temperature sensor Voltage	Volts
Atmospheric pressure sensor Voltage	Volts
Manifold absolute pressure sensor Voltage	Volts
Throttle position sensor Voltage	Volts
Fuel level sensor Voltage	Volts
Oxygen sensor output Voltage	Volts

Throttle position sensor 1 Voltage	Volts
Throttle position sensor 2 Voltage	Volts
Twist grip position sensor 1 Voltage	Volts
Twist grip position sensor 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 short term fuel trim	%
Oxygen sensor 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
Injector 3 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

Ignition timing cyl 3	degrees BTDC
Coil 1 dwell time	milliseconds
Coil 2 dwell time	milliseconds
Coil 3 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 1	% open
Throttle position 2	% open
Secondary air injection status	SAI on/off
Twist grip position	%

Inputs

The data available under Inputs is:

Function Examined	Result Unit
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
Vehicle speed	km/h
Calculated load	%

Brake switch 1 status	on/off
Brake switch 2 status	on/off
Cruise control accelerate switch status	on/off
Cruise control deccelerate switch status	on/off
Cruise control ON/OFF switch status	on/off
Twist grip cruise control cancel switch status	on/off
Cruise control status	on/off

Outputs

The data available under Outputs is:

Function Examined	Result Unit
EMS Main relay status	relay on/off
Fuel pump relay status	on/off
Starter relay status	starter on/off
Malfunction indicator light status	MIL on/off
Cooling fan status	fan on/off
Purge valve duty cycle	%
Throttle actuator motor internal relay	on/off

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 fuel quality, 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
Twist grip adapted	yes/no
Oxygen sensor adaption range (off idle)	%
Oxygen sensor adaption range (idle)	%

Oxygen sensor adaption status (off idle)	%
Oxygen sensor 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
Idle air control stepper motor	Observe throttle position/Stored fault code*
Purge valve	Listen for valve operation/Stored fault code*
Secondary air injection	Listen for valve operation/Stored fault code*
Ride by wire motor open/closed	Observe throttle position/Stored fault code*
Cruise control switch check	Operate the cruise control switches as instructed. Observe the relevant switch response and rectify as necessary

* If a fault is detected.

Adjust Tune

Using the Triumph diagnostic software, it is possible to:

- Reset the adaptions
- Balance the throttle bodies.

To reset the adaptions, see Engine Management Adaption.

To balance the throttles, see Throttle Body Balancing.

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	Report Method
DTC	Diagnostic Trouble Code (DTC) number
Fuel system status	open or closed loop operation
Calculated load	%

Coolant temperature	°C
Short term fuel trim	%
Intake manifold absolute pressure	mmHg
Engine speed	RPM
Vehicle speed	km/h
Ignition advance	degrees
Intake air temperature	°C
Throttle position	%
Oxygen sensor output Voltage	Volts
Oxygen sensor short term fuel trim	%

The cruise control switch check is required after certain DTCs or defects have been repaired which relate to the ride by wire system or cruise control system, or after the adaptions have been reset. The switch check requires the user to operate the switches in order, following the instructions on screen.

The following switches will be checked:

- Front brake switch
- Rear brake switch
- Clutch switch
- Twist grip cruise cancel switch (operated by holding the twistgrip in the fully closed position)
- Cruise control accelerate switch
- Cruise control decelerate switch.

A malfunction of any switch will not necessarily cause a DTC to be stored and may prevent the cruise control from operating correctly.

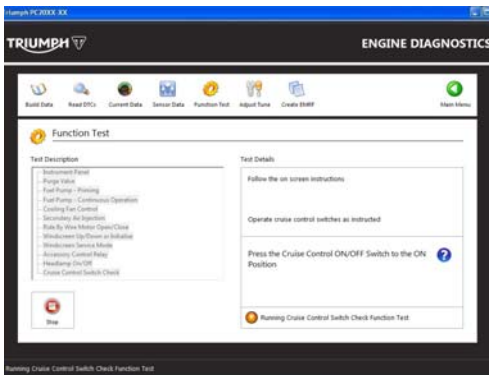
Note

- **If the cruise control switch check is not carried out, the green cruise control warning light will illuminate when the ignition is turned to the ON position but the cruise function will be disabled.**

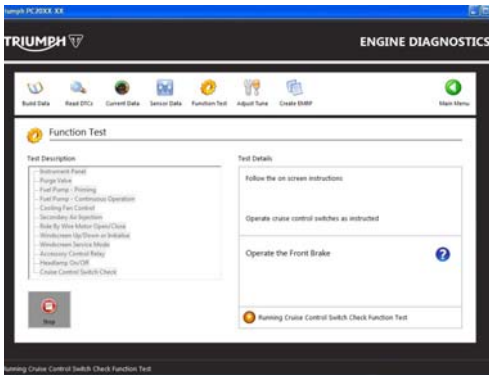
Cruise Control Switch Check Function

If the engine is running you will be prompted to turn it off before the test will start.

If the cruise control is turned on you will be prompted to turn it off before the test will start.



Follow the on-screen instructions to operate and then release each switch in turn.



System Diagnostics

Tool Connection

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 seat. 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 predetermined 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 predetermined 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

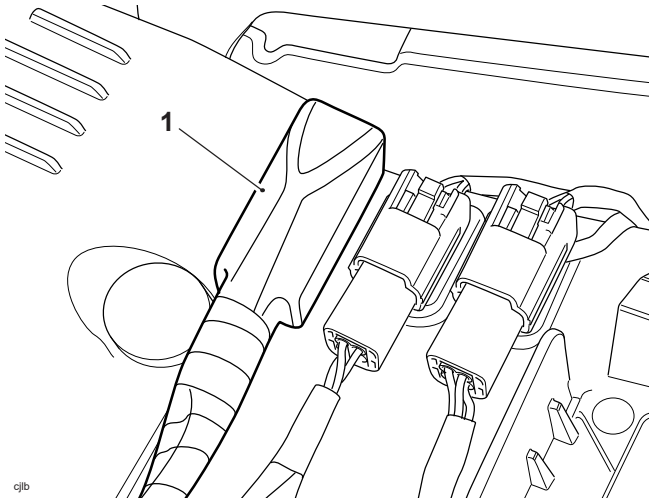
- **When a fault has been rectified, the MIL will remain illuminated until sufficient non-fault warm-up cycles have taken place to turn it off. The MIL will be immediately extinguished if, after first rectifying the fault, the DTC (diagnostic trouble code) that caused the MIL illumination is erased from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

Note

- **In some 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.**

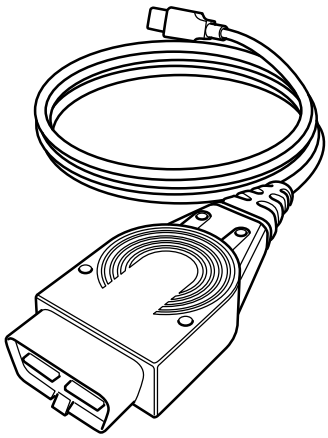
Diagnostic Trouble Codes

1. To connect the Triumph diagnostic interface to the motorcycle, remove the rider's seat (see Rider's Seat - Removal) and release the diagnostic connector from its locating tang.



1. Diagnostic connector

2. Plug the Triumph diagnostic interface directly into the diagnostic connector.



3. When the diagnostic session is completed, disconnect the Triumph diagnostic interface.
4. Refit the diagnostic connector to its locating tang and refit the rider's seat (see Rider's Seat - Installation).

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	Fault Description	Number of no-fault	Number of no-	MIL illuminated	Pinpoint test page number

Code (DTC)		cycles before turning off MIL	fault cycles before DTC is erased	when fault is logged	
P0030	Oxygen sensor 1 heater open circuit or short to ground	3	40	Yes	Oxygen Sensor
P0032	Oxygen sensor 1 heater short circuit to vBatt	3	40	Yes	Oxygen Sensor
P0105	Manifold absolute pressure sensor 1 open circuit or short circuit to 5 Volt sensor supply	3	40	Yes	Manifold Absolute Pressure (MAP) Sensor
P0107	Manifold absolute pressure sensor 1 short circuit to ground	3	40	Yes	Manifold Absolute Pressure (MAP) Sensor
P0110	Intake air temperature sensor open circuit or short circuit to 5 Volt sensor supply	3	40	Yes	Inlet Air Temperature Sensor
P0112	Intake air temperature sensor short circuit to ground	3	40	Yes	Inlet Air Temperature Sensor
P0115	Engine coolant temperature sensor open circuit or short circuit to 5 Volt sensor supply	3	40	Yes	Coolant Temperature Sensor
P0117	Engine coolant temperature sensor short circuit to ground	3	40	Yes	Coolant Temperature Sensor
P0120	Throttle position sensor 1 short circuit or open circuit	3	40	Yes	Throttle Position Sensors 1 and 2

P0122	Throttle position sensor 1 short circuit to ground or open circuit	3	40	Yes	Throttle Position Sensors 1 and 2
P0130	Oxygen sensor 1 open circuit or short circuit to vBatt	3	40	Yes	Oxygen Sensor
P0131	Oxygen sensor 1 short circuit to ground	3	40	Yes	Oxygen Sensor
P0201	Injector 1 circuit malfunction	3	40	Yes	Fuel Injectors
P0202	Injector 2 circuit malfunction	3	40	Yes	Fuel Injectors
P0203	Injector 3 circuit malfunction	3	40	Yes	Fuel Injectors
P0220	Throttle position sensor 2 short circuit to vBatt or open circuit	3	40	Yes	Throttle Position Sensors 1 and 2
P0222	Throttle position sensor 2 short circuit to ground	3	40	Yes	Throttle Position Sensors 1 and 2
P0335	Crankshaft sensor circuit malfunction	3	40	Yes	Crankshaft Sensor
P0351	Ignition coil 1 malfunction	3	40	Yes	Ignition Coils
P0352	Ignition coil 2 malfunction	3	40	Yes	Ignition Coils
P0353	Ignition coil 3 malfunction	3	40	Yes	Ignition Coils
P0412	Secondary air injection short circuit to ground or open circuit	3	40	Yes	Secondary Air Injection Solenoid
P044F	Secondary air injection short circuit to vBatt	3	40	Yes	Secondary Air Injection Solenoid

P0443	Purge valve short circuit to ground or open circuit	3	40	Yes	Purge Valve
P0459	Purge valve short circuit to vBatt	3	40	Yes	Purge Valve
P0460	Fuel level sensor circuit malfunction	0	40	No	Fuel Level Sensor Circuit Malfunction
P0500	Vehicle speed sensor malfunction	3	40	Yes	Vehicle Speed Sensor
P0510	Twist grip cruise cancel switch malfunction	3	40	Yes	Twist Grip – Cruise Cancel Switch
P0560	System voltage - battery circuit malfunction	3	40	Yes	System Voltage
P0571	Brake switch malfunction	3	40	Yes	Brake Switches
P0603	EEPROM Error	0	0	Yes	EEPROM Error
P0606	ECM internal error	3	40	Yes	Engine ECM Internal Error
P0914	Gear position sensor short circuit to ground or open circuit	3	40	Yes	Gear Position Sensor
P0917	Gear position sensor short circuit to 5 Volt sensor supply	3	40	Yes	Gear Position Sensor
P1105	Manifold absolute pressure sensor 1 pipe malfunction	3	40	Yes	Manifold Absolute Pressure (MAP) Sensor
P1135	Traction Control prevented due to malfunction	0	0	No	Traction Control Prevented Due to Malfunction
P1136	Cornering Traction Control	0	0	No	Cornering Traction Control and Roll-over Detection Disabled

	disabled due to Inertial Measurement Unit (IMU) malfunction				
P1508	Unmatched Immobiliser ECM	0	0	Flashing	Immobiliser and TPMS Control Module ID Incompatable
P1520	Unmatched ABS module	0	0	Flashing	ABS Modulator ID Incompatible
P1521	CAN fault - lost communication with ABS module or ABS system status error	3	40	Yes	ABS Modulator Communication
P1574	Cruise control prevented due to other malfunction condition	0	0	No	Cruise Control Prevented Due to Other Malfunction
P1575	Cruise control disabled until button press sequence completed	0	0	No	Cruise Control Disabled Until Button Press Sequence Completed
P1604	ECM tamper detected - return to Triumph	0	0	No	Engine ECM Tamper Detected
P1605	ECM locked by the tune lock function	Only if tune lock is unlocked		Flashing	Tune Lock
P1607	ECM ride by wire internal error	3	40	Yes	Engine ECM Internal Error
P1608	ECM ride by wire internal error	3	40	Yes	Engine ECM Internal Error
P1614	Instrument ID incompatible	Only if Instrument ID Matching		Flashing	Instrument ID Incompatible
P1640	Roll-over detection disabled due to Inertial Measurement Unit (IMU) malfunction	0	0	Yes	Cornering Traction Control and Roll-over Detection Disabled

P1650	CAN fault - lost communication with Immobiliser ECM	3	40	Yes	Chassis ECM Communication Error/Malfunction
P1659	Ignition power supply malfunction	3	40	Yes	EMS Ignition Voltage Input Circuit
P1685	Main relay circuit malfunction	3	40	Yes	EMS Main Relay Circuit
P1690	CAN Fault	3	40	Yes	CAN Communication
P1695	CAN fault - lost communication with instrument panel	3	40	Yes	Instrument Communication (CAN)
P1698	5 Volt sensor supply malfunction	3	40	Yes	5 Volt Sensor Supply Circuit
P16A0	Engine ECM detects Inertial Measurement Unit (IMU) present but ID incompatible	0	0	No	Inertial Measurement Unit (IMU) Incompatible
P16A1	Engine ECM detects Inertial Measurement Unit (IMU) circuit malfunction	0	40	No	Inertial Measurement Unit (IMU) Circuit Malfunction
P16A2	Engine ECM detects Inertial Measurement Unit (IMU) present but with signal error	0	40	No	Cornering Traction Control and Roll-over Detection Disabled
P16A3	Chassis ECM communication error	3	40	Yes	Chassis ECM Communication Error/Malfunction
P16A4	Chassis ECM malfunction - check Chassis ECM diagnostics	3	40	Yes	Chassis ECM Communication Error/Malfunction
P2100	Throttle actuator control motor open circuit	3	40	Yes	Throttle Actuator Motor Circuit

P2102	Throttle actuator control internal motor relay does not operate	3	40	Yes	Throttle Valve Drive Error
P2103	Throttle actuator control internal motor relay operates continually	3	40	Yes	Throttle Valve Drive Error
P2111	Throttle valve drive error (stuck open)	3	40	Yes	Throttle Valve Drive Error
P2119	Throttle valve drive error	3	40	Yes	Throttle Valve Drive Error
P2120	Twist grip position sensor 1 short circuit to ground or open circuit	3	40	Yes	Twist Grip Position Sensor 1
P2123	Twist grip position sensor 1 short circuit to vBatt	3	40	Yes	Twist Grip Position Sensor 1
P2125	Twist grip position sensor 2 short circuit to ground or open circuit	3	40	Yes	Twist Grip Position Sensor 2
P2128	Twist grip position sensor 2 short circuit to vBatt	3	40	Yes	Twist Grip Position Sensor 2
P2135	Throttle position sensor 1 correlation error with throttle position sensor 2	3	40	Yes	Throttle Position Sensors 1 and 2
P2138	Twist grip position sensor 1 correlation error with twist grip position 2	3	40	Yes	Twist Grip Position Sensor 1 Correlation Error with Twist Grip Position 2
P2226	Ambient air pressure sensor circuit open circuit or short circuit to 5 Volt	3	40	Yes	Ambient Air Pressure Sensor

	sensor supply				
P2228	Ambient air pressure sensor circuit short circuit to ground	3	40	Yes	Ambient Air Pressure Sensor

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**
-

For example, the engine electronic control module (engine 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 engine 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.

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 the Engine ECM Connectors

⚠ 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.

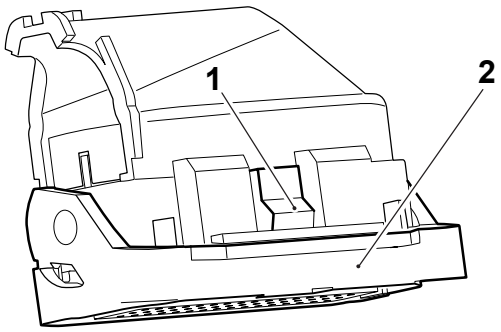
Always disconnect an ECM after disconnecting the battery negative (black) lead first.

1. Turn the ignition to the OFF position and wait at least 1 minute for the engine ECM to complete its power down sequence.
2. Detach the engine ECM from it's location under the front seat support (see Engine Electronic Control Module (ECM) - Removal).

Note

- **Two different sized connectors are used in the engine ECM, which ensures correct connection is always made. The connectors are coloured black and correspond with identical connectors on the main harness.**

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



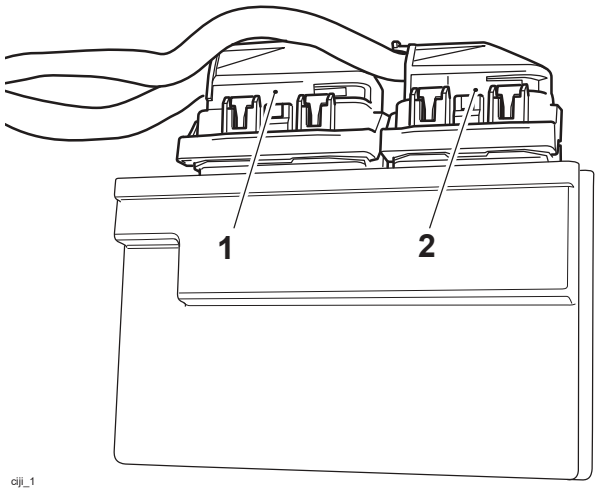
1. **Locking device**
2. **Locking lever**

Reconnection of Engine ECM Connectors

CAUTION

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

1. Fit the connector into its socket. When the locking lever starts to move, stop pushing the connector and use the locking lever to fully insert the connector home and lock it.



1. **Connector B (large)**
2. **Connector A (small)**

2. Refit the engine ECM (see Engine Electronic Control Module (ECM) - Installation).

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

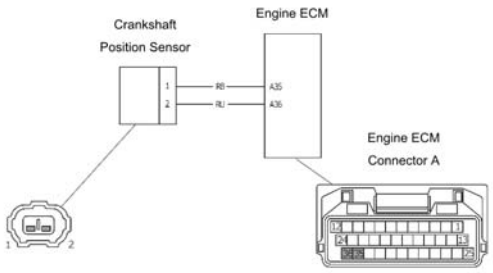
Fault Code	Possible Cause	Action
P0335	Crankshaft sensor circuit malfunction	View and note diagnostic tool 'freeze frame' data if available Ensure sensor is fitted correctly and connector is secure Disconnect Engine ECM and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check terminal and cable integrity: - Engine ECM pin A35 - Engine ECM pin A36	OK	Disconnect crankshaft sensor and proceed to test 2
		Faulty	Rectify fault, proceed to test 6
2	Check cable for short circuit: - Engine ECM pin A35 to ground - Engine ECM pin A36 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 6
3	Check cable continuity: - Engine ECM pin A35 to sensor pin 1 - Engine ECM pin A36 to sensor pin 2	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 6
4	Check cable for short circuit: - Engine ECM pin A35 to Engine ECM pin A36	OK	Renew crankshaft sensor, proceed to test 5
		Short circuit	Locate and rectify wiring fault, proceed to test 6
5	Check crank toothed wheel: - Damage to teeth - magnetic debris contamination	OK	Proceed to test 6
		Faulty	Clean/renew toothed wheel, proceed to test 6
6	Reconnect harness, clear fault code	OK	Action complete - quit test

Test	Result	Action
and run engine to verify fault cleared		
	Fault still present	Contact Triumph service

Circuit Diagram



Fuel Injectors

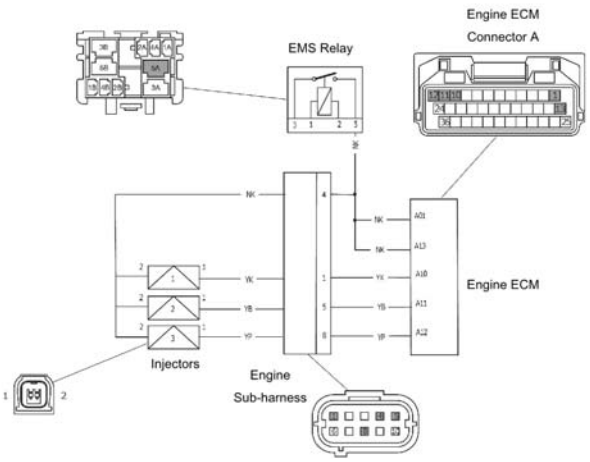
Fault Code	Possible Cause	Action
P0201/02/03	Injector 1/2/3 circuit malfunction - Misfire indicates open circuit - Flooding indicates short circuit	View and note diagnostic tool 'freeze frame' data if available Ensure relevant injector connector is secure Disconnect Engine ECM and proceed to pinpoint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

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin A12 - Engine ECM pin A11 - Engine ECM pin A10 - EMS relay pin 5	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 7
2	Check resistance value: - Engine ECM pin A01 to Engine ECM pin A10 (injector 1) - Engine ECM pin A01 to Engine ECM pin A11 (injector 2) - Engine ECM pin A01 to Engine ECM pin A12 (injector 3)	9 to 12 Ohms	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:	OK	Proceed to test 7

Test	Result	Action
- Engine ECM pin A10 to ground - Engine ECM pin A11 to ground - Engine ECM pin A12 to ground		
	Short circuit	Locate and rectify wiring fault, proceed to test 7
4 Check cable continuity: - EMS relay pin 5 to relevant injector pin 2 - Engine ECM pin A10 to injector 1 pin 1 - Engine ECM pin A11 to injector 2 pin 1 - Engine ECM pin A12 to injector 3 pin 1	OK	Proceed to test 6
	Open circuit	Locate and rectify wiring fault, proceed to test 7
5 Check cable for short circuit: - Engine ECM pin A01 to Engine ECM pin A10 (injector 1) - Engine ECM pin A01 to Engine ECM pin A11 (injector 2) - Engine ECM pin A01 to Engine ECM pin A12 (injector 3)	OK	Proceed to test 6
	Short circuit	Locate and rectify wiring fault, proceed to test 7
6 Check relevant injector resistance: - Injector pin 1 to injector pin 2	9 to 12 Ohms	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 Sensors 1 and 2

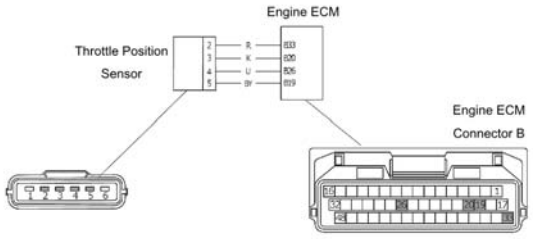
Fault Code	Possible Cause	Action
P0120	Throttle position sensor 1 short circuit or open circuit	View and note diagnostic tool 'freeze frame' data if available

Fault Code	Possible Cause	Action
		View and note diagnostic tool 'sensor' data Ensure sensor connector is secure Disconnect Engine ECM and proceed to pinpoint test 1:
P0122	Throttle position sensor 1 short circuit to ground or open circuit	
P0220	Throttle position sensor 2 short circuit to vBatt or open circuit	
P0222	Throttle position sensor 2 short circuit to ground	
P2135	Throttle position sensor 1 correlation error with throttle position sensor 2	

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin B19 - Engine ECM pin B33 - Engine ECM pin B20 - Engine ECM pin B26	OK	Disconnect sensor and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - Engine ECM pin B20 to ground - Engine ECM pin B26 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable continuity: - Engine ECM pin B20 to sensor pin 3 - Engine ECM pin B26 to sensor pin 4 - Engine ECM pin B19 to sensor pin 5 - Engine ECM pin B33 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: - Engine ECM pin B33 to Engine ECM pin B20 - Engine ECM pin B33 to Engine ECM pin B26	OK	Contact Triumph service
		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



Twist Grip Position Sensor 1

Twist Grip Position Sensor 2

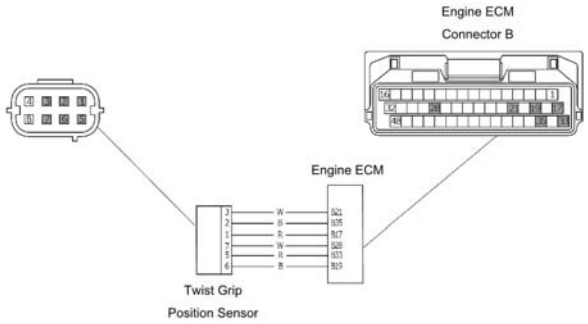
Fault Code	Possible Cause	Action
P2120	Twist grip position sensor 1 short circuit to ground or open circuit	View and note diagnostic tool 'freeze frame' data if available View and note diagnostic tool 'sensor' data Ensure accelerator position sensor connector is secure Disconnect Engine ECM and proceed to pinpoint test 1:
P2123	Twist grip position sensor 1 short circuit to battery voltage	

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin B17 - Engine ECM pin B21 - Engine ECM pin B35	OK	Disconnect accelerator position sensor and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - Engine 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: - Engine ECM pin B17 to sensor pin 1 - Engine ECM pin B21 to sensor pin 3 - Engine ECM pin B35 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: - Engine ECM pin B21 to Engine ECM pin B17 - Engine ECM pin B21 to Engine ECM pin B35	OK	Renew twist grip position sensor, 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

Test	Result	Action
and run engine to verify fault cleared		
	Fault still present	Contact Triumph service

Circuit Diagram



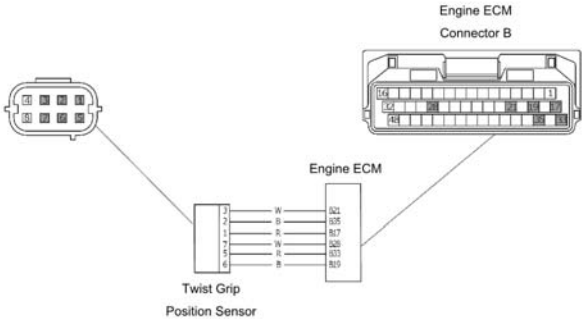
Fault Code	Possible Cause	Action
P2125	Twist grip position sensor 2 short circuit to ground or open circuit	View and note diagnostic tool 'freeze frame' data if available View and note diagnostic tool 'sensor' data Ensure twist grip position sensor connector is secure Disconnect Engine ECM and proceed to pinpoint test 1:
P2128	Twist grip position sensor 2 short circuit to battery voltage	

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin B19 - Engine ECM pin B28 - Engine ECM pin B33	OK	Disconnect twist grip position sensor and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - Engine 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: - Engine ECM pin B19 to sensor pin 6 - Engine ECM pin B28 to sensor pin 7 - Engine ECM pin B33 to sensor pin 5	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable for short circuit:	OK	Renew twist grip position sensor,

Test		Result	Action
	- Engine ECM pin B28 to Engine ECM pin B19 - Engine ECM pin B28 to Engine ECM pin B33		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



Twist Grip Position Sensor 1 Correlation Error with Twist Grip Position 2

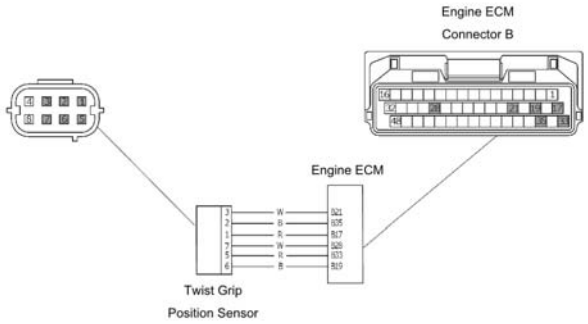
Fault Code	Possible Cause	Action
P2138	Twist grip position sensor 1 correlation error with twist grip position sensor 2	View and note diagnostic tool 'freeze frame' data if available View and note diagnostic tool 'sensor' data Disconnect twist grip position sensor and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Turn the ignition on and measure the Voltage between: - Engine ECM pin B33 and Engine ECM pin B19 - Engine ECM pin B17 and Engine ECM pin B35	5 V DC	Proceed to test 2
		Faulty	Rectify fault, proceed to test 2
2	Check cable continuity: Engine ECM pin B21 to sensor pin 3	OK	Replace twist grip position sensor and proceed to test 2

Test		Result	Action
	Engine ECM pin B28 to sensor pin 7		
		Open circuit	Rectify fault, proceed to test 3
3	Reconnect harness, clear fault code and run engine to verify fault cleared	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



Throttle Actuator Motor Circuit

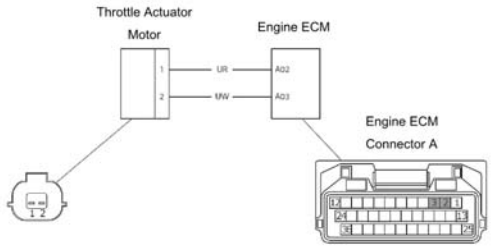
Fault Code	Possible Cause	Action
P2100	Throttle actuator control motor open circuit	View and note diagnostic tool 'freeze frame' data if available Ensure throttle actuator connector is secure Disconnect Engine ECM and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin A02 - Engine ECM pin A03 - Throttle actuator connector pin 1 - Throttle actuator connector pin 2	OK	Disconnect throttle actuator and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - Engine ECM pin A02 to ground - Engine ECM pin A03 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable continuity:	OK	Proceed to test 4

Test	Result	Action
- Engine ECM pin A02 to throttle actuator pin 1 - Engine ECM pin A03 to throttle actuator pin 2		
	Open circuit	Locate and rectify wiring fault, proceed to test 5
4 Check cable for short circuit: - Engine ECM pin A02 to Engine ECM pin A01 - Engine ECM pin A03 to Engine ECM pin A01	OK	Renew twist grip 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



Throttle Valve Drive Error

Fault Code	Possible cause	Action
P2111	Throttle valve drive error (stuck open)	View and note 'freeze-frame' data if available. View and note 'sensor' data. Check throttle body for mechanical malfunctions. Clear fault code and contact Triumph service if fault is still present.
P2119	Throttle valve drive error	
P2102	Throttle actuator control internal motor relay does not operate	
P2103	Throttle actuator control internal motor relay operates continually	

Purge Valve

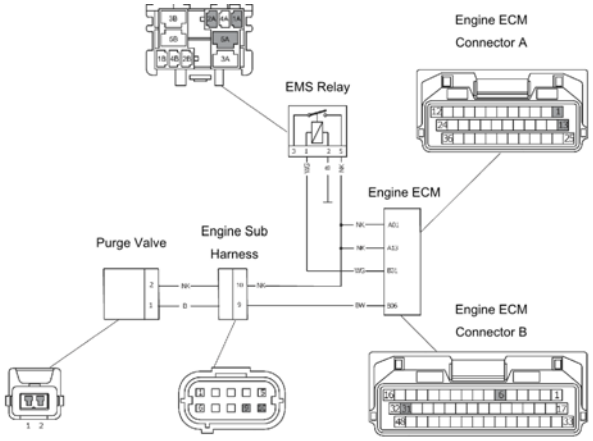
Fault Code	Possible Cause	Action
P0443	Purge valve short circuit to ground	View and note diagnostic tool

Fault Code	Possible Cause	Action
	or open circuit	'sensor' data Ensure purge valve connector is secure Disconnect ECM and proceed to pinpoint test 1:
P0459	Purge valve short circuit to Vbatt	Disconnect purge valve and proceed to pinpoint test 5:

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - ECM pin B06 - EMS relay pin 5	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 7
2	Check resistance value: - ECM pin A01 to ECM pin B06	22 to 30 Ohms	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 B06 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 valve pin 2 - ECM pin B06 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 A01 to ECM pin B06	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	22 to 30 Ohms	Proceed to test 7
		Faulty	Renew purge valve, proceed to test 7
7	Reconnect harness, clear fault code and run diagnostic tool function test to visually verify operation of purge valve	OK	Action complete - quit test
		Fault	Contact Triumph service

Circuit Diagram



Gear Position Sensor

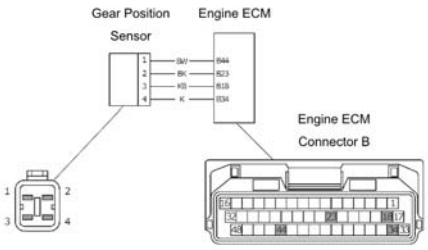
Fault Code	Possible Cause	Action
P0914	Gear position sensor short circuit to ground or open circuit	View and note 'freeze frame' data if available View and note 'sensor' data Ensure gear position sensor connector is secure Disconnect Engine ECM and proceed to pinpoint test 1:
P0917	Gear position sensor short circuit to 5 Volt sensor supply	Disconnect sensor and proceed to pinpoint test 4.

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin B23 - Engine ECM pin B44	OK	Disconnect gear position sensor and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - Engine ECM pin B23 to ground - Engine ECM pin B34 to ground - Engine ECM pin B44 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable continuity: - Engine ECM pin B23 to gear position sensor pin 2 - Engine ECM pin B18 to gear position sensor pin 3 - Engine ECM pin B34 to gear position sensor 4 - Engine ECM pin B44 to gear position sensor pin 1	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 5

Test		Result	Action
4	Check cable for short circuit: - Engine ECM pin B23 to Engine ECM pin B44 - Engine ECM pin B23 to Engine ECM pin B34	OK	Renew gear 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	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



Ignition Coils

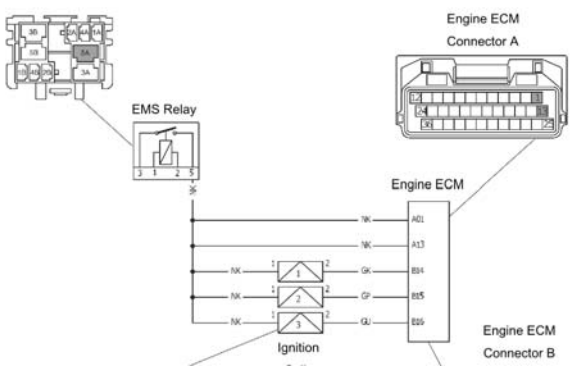
Fault Code	Possible Cause	Action
P0351	Ignition coil 1 malfunction	View and note diagnostic tool 'freeze frame' data if available Ensure relevant ignition coil connector is secure Disconnect Engine ECM and proceed to pinpoint test 1:
P0352	Ignition coil 2 malfunction	
P0353	Ignition coil 3 malfunction	

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin B14 - Engine ECM pin B15 - Engine ECM pin B16 - EMS relay pin 5	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 7
2	Check resistance value:	1.5 to 1.6 Ohms	Proceed to test 3

Test	Result	Action
- Engine ECM pin A01 to Engine ECM pin B14 (coil 1) - Engine ECM pin A01 to Engine ECM pin B15 (coil 2) - Engine ECM pin A01 to Engine ECM pin B16 (coil 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: - Engine ECM pin B14 to ground - Engine ECM pin B15 to ground - Engine ECM pin B16 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 relevant ign coil pin 1 - Engine ECM pin B14 to ignition coil 1 pin 2 - Engine ECM pin B15 to ignition coil 2 pin 2 - Engine ECM pin B16 to ignition coil 3 pin 2	OK	Proceed to test 5
	Open circuit	Locate and rectify wiring fault, proceed to test 7
5 Check cable for short circuit: - Engine ECM pin A01 to Engine ECM pin B14 (coil 1) - Engine ECM pin A01 to Engine ECM pin B15 (coil 2) - Engine ECM pin A01 to Engine ECM pin B16 (coil 3)	OK	Proceed to test 6
	Short circuit	Locate and rectify wiring fault, proceed to test 7
6 Check relevant ignition coil resistance: - Ignition coil pin 1 to ignition coil pin 2	1.2 to 1.6 Ohms	Proceed to test 7
	Faulty	Renew relevant ignition coil, proceed to test 7
7 Reconnect harness, clear fault code and run engine to verify fault cleared	OK	Action complete - quit test
	Fault still present	Contact Triumph service

Circuit Diagram



Coolant Temperature Sensor

Inlet Air Temperature Sensor

System Voltage

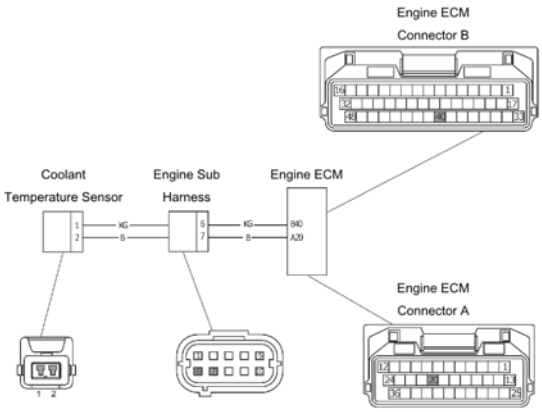
Fault Code	Possible Cause	Action
P0115	Engine coolant temperature sensor open circuit or short circuit to 5 Volt sensor supply	View and note diagnostic tool 'freeze frame' data if available View and note diagnostic tool 'sensor' data Ensure sensor connector is secure. Disconnect Engine ECM and proceed to pinpoint test 1:
P0117	Engine coolant temperature sensor short circuit to ground	Disconnect sensor and proceed to test 6:

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin B40 - Coolant temperature sensor pin 1 - Coolant temperature sensor pin 2	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 7
2	Check resistance value: - Engine ECM pin B40 to ground (temperature dependant - see circuit diagram resistance data)	OK	Proceed to test 6
		Open circuit	Disconnect coolant temperature sensor and proceed to test 3
		Short circuit	Disconnect coolant temperature sensor and proceed to test 4
3	Check cable continuity: - Engine ECM pin B40 to sensor pin 1 - Ground 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: - Engine ECM pin B40 to Engine ECM pin A01	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 circuit diagram resistance data)	OK	Proceed to test 7
		Faulty	Renew temp sensor, proceed to test 7

Circuit Diagram

Resistance data under typical conditions:
Warm engine: 200 to 400Ω
Cold engine:
20°C ambient 2.22 to 2.71 KΩ
-10°C ambient 8.50 to 10.25 KΩ



Oxygen Sensor

Fault Code	Possible Cause	Action
P0110	Intake air temperature sensor open circuit or short circuit to 5 Volt sensor supply	View and note diagnostic tool 'freeze frame' data if available View and note diagnostic tool 'sensor' data Ensure sensor connector is secure Disconnect Engine ECM and proceed to pinpoint test 1:
P0112	Intake air temperature sensor short circuit to ground	Disconnect sensor and proceed to pinpoint test 4:

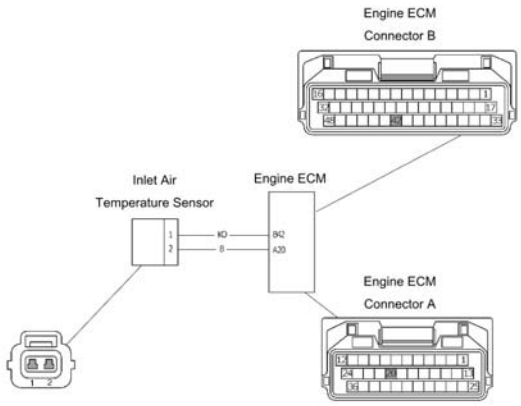
Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin B42	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 6
2	Check resistance value: - Engine ECM pin B42 to ground(temperature dependent - see circuit diagram resistance data)	OK	Proceed to test 6
		Open circuit	Disconnect air temperature sensor and proceed to test 3
		Short circuit	Disconnect air temperature sensor and proceed to test 4

Test	Result	Action
3 Check cable continuity: - Engine ECM pin B42 to sensor pin 1 - Ground to sensor pin 2	OK	Proceed to test 5
	Open circuit	Locate and rectify wiring fault, proceed to test 6
4 Check cable for short circuit: - Engine ECM pin B42 to ground	OK	Proceed to test 5
	Short circuit	Locate and rectify wiring fault, proceed to test 6
5 Check sensor resistance: - sensor pin 1 to sensor pin 2(temperature dependent - see circuit diagram resistance data)	OK	Proceed to test 6
	Faulty	Renew air temperature sensor and 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

If engine is warm, remove sensor and allow time to cool to ambient prior to test.
Resistance data:
Ambient temp Resistance value
80°C 200 to 400 Ohms
20°C 2.35 to 2.65 K Ohms
-10°C 8.50 to 10.25 K Ohms

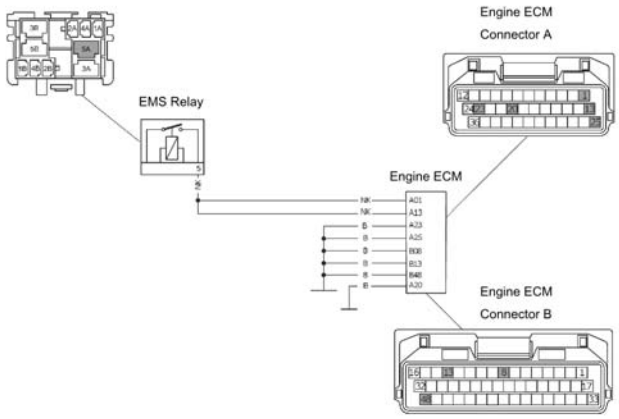


Fault Code	Possible Cause	Action
P0560	System Voltage - battery circuit malfunction	View and note diagnostic tool 'sensor' data Ensure Voltage across battery is acceptable, note Voltage Disconnect Engine ECM and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin A01 - Engine ECM pin A13 - EMS relay pin 5	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 3
2	With Ignition 'ON', check Voltage at: - Engine ECM pin A01 - Engine ECM pin A13	Same as 'across battery' Voltage	Proceed to test 3
		Less than 'across battery' Voltage	Locate and rectify wiring fault, proceed to test 3
3	Reconnect harness, clear fault code and run engine to verify fault cleared	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



Cornering Traction Control and Roll-over Detection Disabled

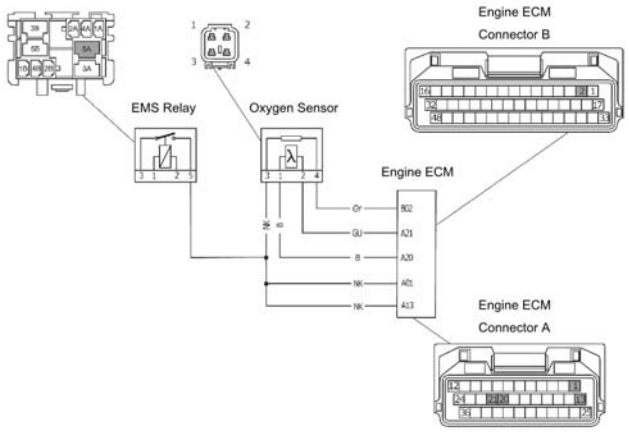
Vehicle Speed Sensor

Fault Code	Possible Cause	Action
P0030	Oxygen sensor heater open circuit or short to ground	View and note 'freeze frame' data if available View and note 'sensor' data Ensure oxygen sensor connector is secure Disconnect Engine ECM and proceed to pinpoint test 1:
P0032	Oxygen sensor heater short circuit to Vbatt	
P0130	Oxygen sensor open circuit or short circuit to vBatt	
P0131	Oxygen sensor short circuit to ground	

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin A21 - Engine ECM pin B02	OK	Disconnect oxygen sensor and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - Engine ECM pin A21 to ground - Engine 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: - Engine ECM pin B02 to oxygen sensor pin 4 - Engine ECM pin A21 to oxygen sensor pin 2	OK	Proceed to test 5
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable for short circuit: - Engine ECM pin A01 to Engine ECM pin A21 - Engine ECM pin A01 to Engine ECM pin B02	OK	Renew 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



CAN Communication

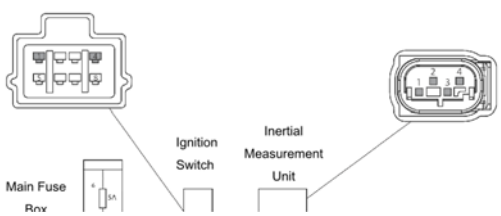
Fault Code	Possible Cause	Action
P1136	Cornering Traction Control disabled due to Inertial Measurement Unit (IMU)	View and note 'freeze frame' data if available Ensure IMU connector is secure

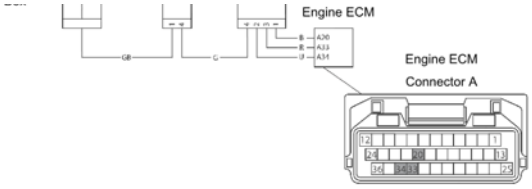
Fault Code	Possible Cause	Action
	malfunction	Disconnect Engine ECM and proceed to pinpoint test 1:
P1640	Roll-over detection disabled due to Inertial Measurement Unit (IMU) malfunction	
P16A2	Engine ECM detects Inertial Measurement Unit (IMU) present but with signal error	

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin A33 - Engine ECM pin A34 - IMU pin 3 - IMU pin 2 - IMU pin 4 - IMU pin 1	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - Engine ECM pin A33 to ground - Engine ECM pin A34 to ground - IMU pin 4 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable continuity: - Engine ECM pin A33 to IMU pin 3 - Engine ECM pin A34 to IMU pin 2 - IMU pin 4 to main fuse box, Fuse 6 (with the ignition switch and engine stop switch in the RUN position)	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable for short circuit: - Engine ECM pin A34 to Engine ECM pin A33	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 to verify fault cleared	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram





Instrument Communication (CAN)

Fault Code	Possible Cause	Action
P0500	Vehicle speed sensor malfunction	Refer to the following ABS diagnostic trouble codes C1611 (see Front Wheel Sensor Open Circuit/Short Circuit) C1612 (see Front Wheel Sensor Incorrect or Missing Signal) C1613 (see Rear Wheel Sensor Open Circuit/Short Circuit) C1614 (see Rear Wheel Sensor Incorrect or Missing Signal)

Fuel Level Sensor Circuit Malfunction

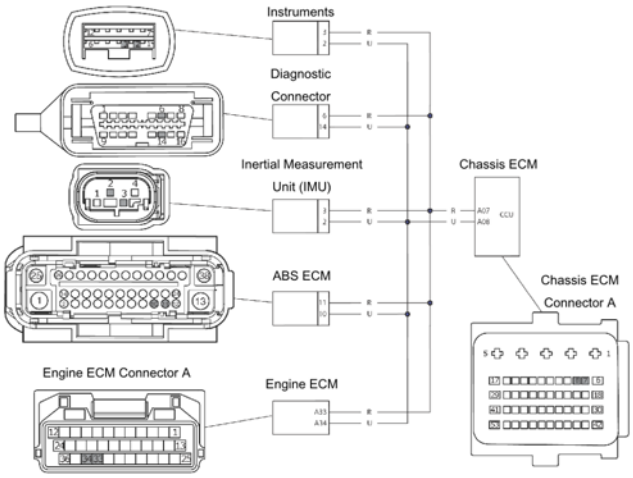
Fault Code	Possible Cause	Action
P1690	CAN Fault	View and note 'freeze frame' data if available Disconnect Engine ECM and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - ABS ECM pin 11 - ABS ECM pin 10 - Chassis ECM pin A07 - Chassis ECM pin A08 - Instruments pin 2 - Instruments pin 3 - IMU pin 3 - IMU pin 2 - Diagnostic connector pin 6 - Diagnostic connector pin 14 - Engine ECM pin A33 - Engine ECM pin A34	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit:	OK	Proceed to test 3

Test	Result	Action
- Engine ECM pin A33 to ground - Engine ECM pin A34 to ground		
	Short circuit	Locate and rectify wiring fault, proceed to test 5
3 Check cable continuity: - Engine ECM pin A33 to instruments pin 3 - Engine ECM pin A34 to instruments pin 2 - Engine ECM pin A33 to Chassis ECM pin A07 - Engine ECM pin A34 to Chassis ECM pin A08 - Engine ECM pin A33 to IMU pin 3 - Engine ECM pin A34 to IMU pin 2 - Engine ECM pin A33 to diagnostic connector pin 6 - Engine ECM pin A34 to diagnostic pin 14 - Engine ECM pin A33 to ABS ECM pin 11 - Engine ECM pin A34 to ABS ECM pin 10	OK	Proceed to test 4
	Open circuit	Locate and rectify wiring fault, proceed to test 5
4 Check cable for short circuit: - ECM pin A33 to ECM pin A34	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



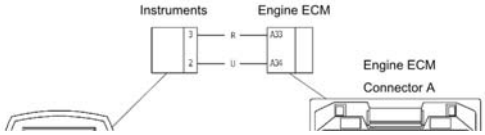
Ambient Air Pressure Sensor

Fault Code	Possible Cause	Action
P1695	CAN fault - lost communication with Instrument panel	View and note 'freeze frame' data if available Disconnect Engine ECM and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Verify instrument pack is operating. Turn on Ignition.	OK	Proceed to test 2
		Faulty	Check main fuse box, Fuse 9. Replace if blown. Proceed to test 2
2	Check cable and terminal integrity: - Engine ECM pin A33 - Engine ECM pin A34 - Instruments pin 3 - Instruments pin 2	OK	Disconnect instruments and proceed to test 3
		Faulty	Rectify fault, proceed to test 6
3	Check cable for short circuit: - Engine ECM pin A33 to ground - Engine ECM pin A34 to ground	OK	Proceed to test 4
		Faulty	Locate and rectify wiring fault, proceed to test 6
4	Check cable continuity: - Engine ECM pin A33 to instruments pin 3 - Engine ECM pin A34 to instruments pin 2	OK	Proceed to test 5
		Open circuit	Locate and rectify wiring fault, proceed to test 6
5	Check cable for short circuit: - Engine ECM pin A33 to Engine ECM pin A34	OK	Proceed to test 6
		Short 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

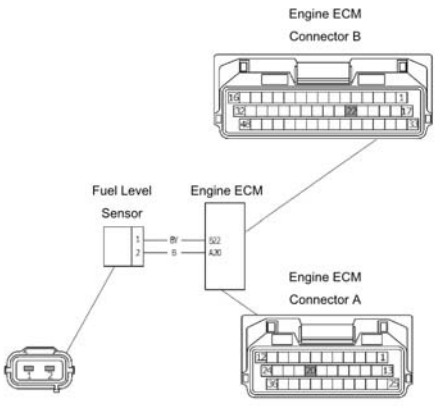


Fault Code	Possible Cause	Action
P0460	Fuel level sensor circuit malfunction	View and note 'freeze frame' data if available View and note 'sensor' data Ensure fuel level sensor connector is secure Disconnect Engine ECM and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin B22 - Fuel level sensor pin 1 - Fuel level sensor pin 2	OK	Disconnect fuel level sensor and proceed to test 2
		Faulty	Rectify fault, proceed to test 4
2	Check cable for short circuit: - Engine ECM pin B22 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 4
3	Check cable continuity: - Engine ECM pin B22 to sensor pin 1 - Ground to sensor pin 2	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 4
4	Reconnect harness, clear fault code	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



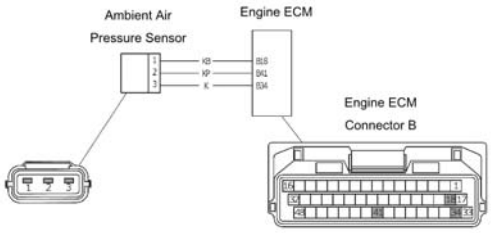
Manifold Absolute Pressure (MAP) Sensor

Fault Code	Possible Cause	Action
P2228	Ambient air pressure sensor circuit short circuit to ground	View and note 'freeze frame' data if available View and note 'sensor' data Ensure ambient pressure sensor connector is secure Disconnect Engine ECM and proceed to pinpoint test 1:
P2226	Ambient air pressure sensor circuit open circuit or short circuit to 5 Volt sensor supply	

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin B18 - Engine ECM pin B34 - Engine ECM pin B41 - Sensor pin 1, 2, 3	OK	Disconnect ambient air pressure sensor and proceed to test 2
		Faulty	Rectify fault, proceed to test 4
2	Check cable for short circuit: - Engine ECM pin B41 to Engine ECM pin B18 - Engine ECM pin B41 to Engine ECM pin B34	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 4
3	Check cable for continuity: - Engine ECM pin B34 to sensor pin 3 - Engine ECM pin B18 to sensor pin 1 - Engine ECM pin B41 to sensor pin 2	OK	Renew ambient air pressure sensor and proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 4
4	Reconnect harness, clear fault code and run engine	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



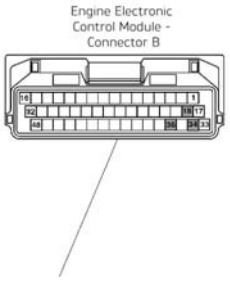
Secondary Air Injection Solenoid

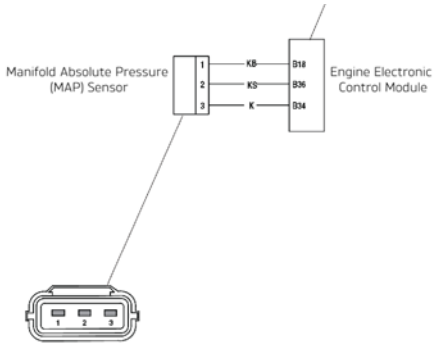
Fault Code	Possible cause	Action
P0107	Manifold absolute pressure sensor 1 short circuit to ground	View and note 'freeze-frame' data if available. View and note 'sensor' data. Ensure sensor connector is secure. Disconnect the engine ECM and proceed to pinpoint test 1:
P0105	Manifold absolute pressure sensor 1 open circuit or short circuit to 5 Volt sensor supply	
P1105	Manifold absolute pressure sensor 1 pipe malfunction	Check connection/condition of pipes from MAP sensors to throttle body.

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - ECM pin B18 - ECM pin B34 - ECM pin B36 - Sensor pin 1, 2, 3	OK	Disconnect MAP sensors and proceed to test 2
		Faulty	Rectify fault, proceed to test 4
2	Check cable for short circuit: - ECM pin B36 to ECM pin B18 - ECM pin B36 to ECM pin B34	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 4
3	Check cable for continuity: - ECM pin B34 to MAP sensor pin 3 - ECM pin B18 to MAP sensor pin 1 - ECM pin B36 to MAP sensor pin 2	OK	Renew relevant MAP pressure sensor, proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 4
4	Reconnect harness, clear fault code and run engine.	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram





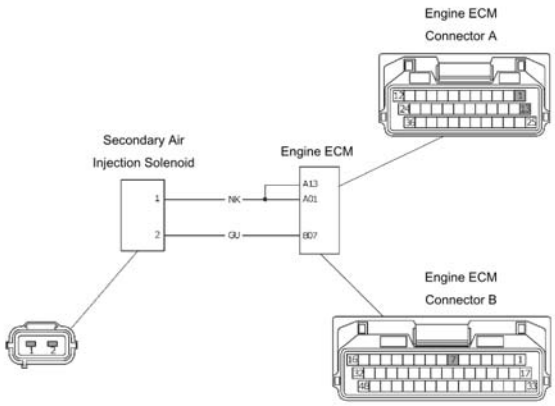
Fault Code	Possible Cause	Action
P044F	Secondary air injection short circuit to Vbatt	View and note diagnostic software 'freeze- frame' data if available. Ensure secondary air solenoid connector is secure Disconnect Engine ECM and proceed to pinpoint test 1:
P0412	Secondary air injection short circuit to ground or open circuit	

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin B07 - Engine ECM pin A01 - Engine ECM pin A13 - Secondary air injection solenoid pin 1 - Secondary air injection solenoid pin 2	OK	Disconnect the secondary air injection solenoid and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - Engine ECM pin B07 to ground - Engine ECM pin A01 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable continuity: - Engine ECM pin B07 to secondary air injection solenoid pin 1 - Engine ECM pin A01 to secondary air injection solenoid 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 B07 to ECM pin A01	OK	Proceed to test 5
		Short circuit	Locate and rectify wiring fault, proceed to test 5

Test		Result	Action
5	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



EMS Main Relay Circuit

EEPROM Error

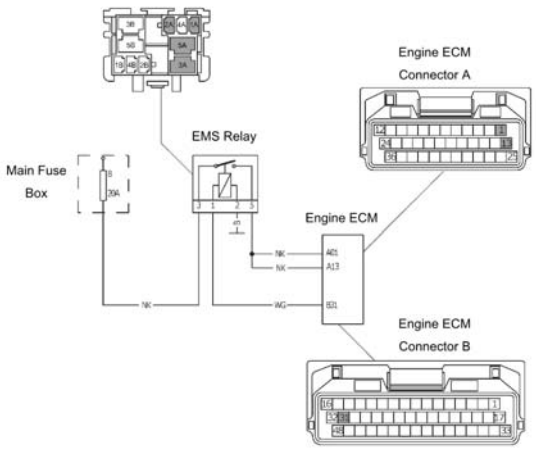
Fault Code	Possible Cause	Action
P1685	Main relay circuit malfunction	Note that the Starter Motor cannot be powered if a Main Relay fault exists Ensure the EMS Main Relay connector is secure Proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Ensure ignition has been switched off for longer than 90 seconds. Identify EMS Main Relay on the harness Check that relay operates when the ignition is switched on	OK	Proceed to test 4
		Faulty	Disconnect main relay and Engine ECM and proceed to test 2
2	Check cable for short circuit: - Engine ECM pin B31 to ground - Engine ECM pin A01 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 6
3	Check cable and terminal integrity: - Engine ECM pin B31	OK	Proceed to test 4

Test	Result	Action
- EMS main relay pin 1 - EMS main relay pin 2 - EMS main relay pin 3 - EMS main relay pin 5		
	Faulty	Rectify fault, proceed to test 5
4 Check main fuse box, Fuse 8 integrity	OK	Proceed to test 5
	Faulty	Replace fuse and proceed to test 5
5 Check cable continuity: - Engine ECM pin A01 to EMS main relay pin 5 - Engine ECM pin B31 to EMS relay pin 1 - EMS main relay pin 2 to ground - EMS main relay pin 3 to main fuse box, fuse 8	OK	Replace EMS main relay and proceed to test 6
	Open circuit	Locate and rectify wiring fault, proceed to test 6
6 Reconnect harness, clear fault code. Switch ignition off for longer than 90 seconds. 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



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

EMS Ignition Voltage Input Circuit

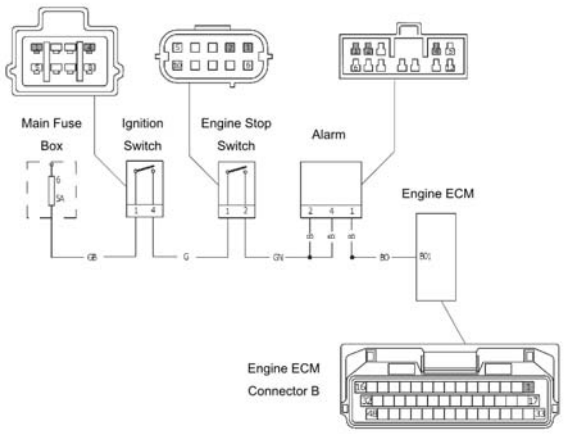
Fault Code	Possible Cause	Action

Fault Code	Possible Cause	Action
P1659	Ignition power supply malfunction	Disconnect engine ECM and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check main fuse box fuse 6 integrity	OK	Proceed to test 3
		Faulty	Proceed to test 2
2	Check cable for short circuit: - ECM pin B01 to ground	OK	Replace fuse 6 and proceed to test 5
		Short circuit	Locate and rectify wiring fault, replace fuse 6 and proceed to test 5
3	Check cable and terminal integrity: - ECM pin B01 - Alarm connector pin 1 - Alarm connector pin 2 - Right hand switch housing (10-way connector) pin 1 - Right hand switch housing (10-way connector) pin 2	OK	Proceed to test 4
		Faulty	Rectify fault, proceed to test 5
4	Check cable continuity: - ECM pin B01 to main fuse box, fuse 6 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, alarm 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



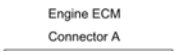
5 Volt Sensor Supply Circuit

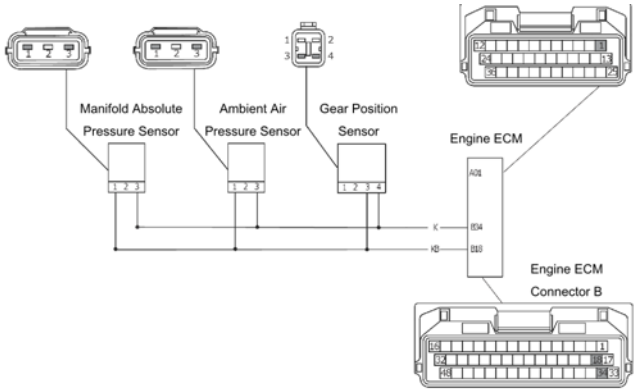
Fault Code	Possible Cause	Action
P1698	5 V sensor supply malfunction	View and note 'sensor' data Note Engine ECM sensors requiring a power supply will not be active Disconnect Engine ECM and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin B18 - Engine ECM pin B34	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit - Engine ECM pin B18 to Engine ECM pin B34	OK	Proceed to test 4
		Faulty	Proceed to test 3
3	Disconnect the following sensors in turn: - MAP sensor - Ambient pressure sensor - Gear position sensor And retest for short circuit: - Engine ECM pin B18 to Engine ECM pin B34	OK	Replace sensor last removed and proceed to test 5
		Faulty	Proceed to test 4
4	Check cable for short circuit: - Engine ECM pin B18 to ground - Engine ECM pin B34 to ground - Engine ECM pin B18 to Engine ECM pin A01 - Engine ECM pin B34 to Engine ECM pin A01 - Engine ECM pin B18 to battery positive - Engine ECM pin B34 to battery positive	OK	Proceed to test 5
		Short circuit	Locate and rectify wiring fault, proceed to test 5
5	Reconnect harness, clear fault code and use service tool to check for correct sensor outputs and 5 V sensor supply Voltage level	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram





Inertial Measurement Unit (IMU) Incompatible

Fault Code	Possible Cause	Action
P16A0	Engine ECM detects Inertial Measurement Unit (IMU) present but ID incompatible	Proceed to pinpoint test 1:

Pinpoint Tests

Inertial Measurement Unit (IMU) Circuit Malfunction

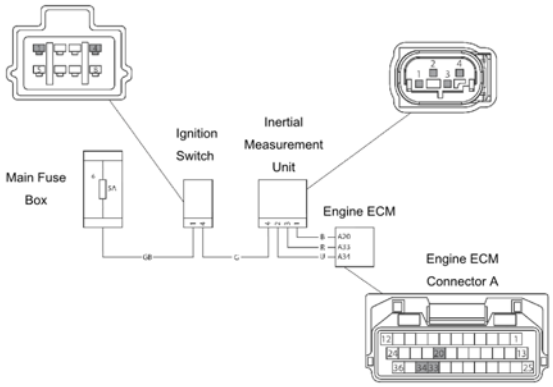
Fault Code	Possible Cause	Action
P16A1	Engine ECM detects Inertial Measurement Unit (IMU) circuit malfunction	View and note 'freeze-frame' data if available. View and note 'sensor' data. Ensure sensor connector is secure. Disconnect Engine ECM and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin A33 - Engine ECM pin A34	OK	Disconnect IMU and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - Engine ECM pin A33 to ground - Engine ECM pin A34 to ground - IMU pin 4 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable continuity: - Engine ECM pin A33 to IMU pin 3 - Engine ECM pin A34 to IMU pin 2 - IMU pin 4 to main fuse box, Fuse 6 (with the ignition switch and engine stop switch in the RUN position)	OK	Proceed to test 5
		Open circuit	Locate and rectify wiring fault, proceed to test 5

Test	Result	Action
- IMU pin 1 to ground		
4 Check cable for short circuit: - Engine ECM pin A33 to Engine ECM pin A34	OK	Renew IMU 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



Chassis ECM Communication Error/Malfunction

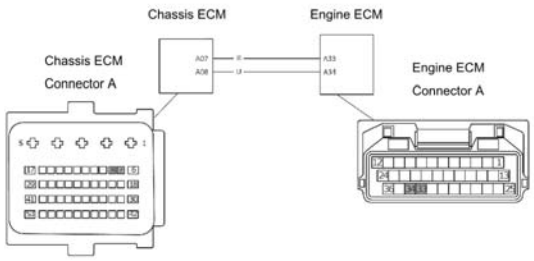
Fault Code	Possible Cause	Action
P16A3	Chassis ECM communication error	View and note 'freeze-frame' data if available. Ensure Chassis ECM connectors are secure. Check Chassis ECM diagnostic trouble codes. Disconnect Engine ECM and proceed to pinpoint test 1:
P16A4	Chassis ECM malfunction - check Chassis ECM diagnostics	
P1650	CAN fault - lost communication with Immobiliser ECM	

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin A33 - Engine ECM pin A34 - Chassis ECM pin A07 - Chassis ECM pin A08	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 5

Test	Result	Action
2 Check cable for short circuit: - Engine ECM pin A33 to ground - Engine ECM pin A34 to ground	OK	Proceed to test 3
	Short circuit	Locate and rectify wiring fault, proceed to test 5
3 Check cable continuity: - Engine ECM pin A33 to Chassis ECM pin A07 - Engine ECM pin A34 to Chassis ECM pin A08	OK	Proceed to test 4
	Open circuit	Locate and rectify wiring fault, proceed to test 5
4 Check cable for short circuit: - Engine ECM pin A33 to Engine ECM pin A34	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



Tune Lock

Fault Code	Possible cause	Action
P1605	Engine ECM locked by the tune lock function	This is also identified by a fast flashing MIL indication, and a disabled engine management system. Unlock the engine ECM using the diagnostic software and supplied unlock code from Triumph service.

Instrument ID Incompatible

Fault Code	Possible cause	Action

Fault Code	Possible cause	Action
P1614	Instrument ID incompatible	This is also identified by a fast flashing MIL indication, and a disabled engine management system.

Pinpoint Tests

Test		Result	Action
1	Check engine ECM part number is correct for the motorcycle.	OK	Proceed to test 2
		Incorrect	Replace engine ECM with correct part and proceed to test 3
2	Check that the calibration is correct for the motorcycle, using the diagnostic software.	OK	Proceed to test 3
		Incorrect	Update calibration 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

Immobiliser and TPMS Control Module ID Incompatable

Fault Code	Possible cause	Action
P1508	Unmatched Immobiliser/chassis ECM, causing the engine 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	Follow the Pair ECM and Immobiliser procedure as described in the Triumph Diagnostic Tool user guide	OK	Action complete - quit test
		Fault still present	Contact Triumph service

ABS Modulator ID Incompatible

Fault Code	Possible cause	Action
P1520	Unmatched ABS module	This is also identified by ABS warning light indication. Proceed to pinpoint test 1:

Pinpoint Tests

	Test	Result	Action

	Test	Result	Action
1	Check ABS modulator part number is correct for the motorcycle.	OK	Proceed to test 2
		Incorrect	Replace ABS modulator with correct part and proceed to test 3
2	Check that the engine ECM calibration is correct for the motorcycle, using the diagnostic tool.	OK	Proceed to test 3
		Incorrect	Update calibration using service tool, proceed to test 3
3	Clear fault code, check for normal operation.	OK	Action complete - quit test
		Fault still present	Contact Triumph service

ABS Modulator Communication

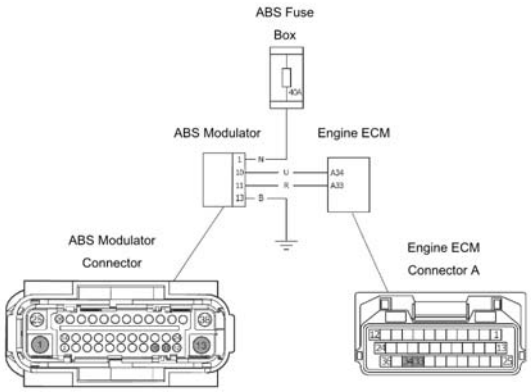
Fault Code	Possible Cause	Action
P1521	CAN fault - lost communication with ABS module or ABS system status error	View and note 'freeze frame' data if available Ensure ABS modulator connector is secure Proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin A33 - Engine ECM pin A34 - ABS modulator pin 10 - ABS modulator pin 11 - ABS modulator pin 1 - ABS modulator pin 13 - ABS modulator pin 6	OK	Disconnect Engine ECM and proceed to test 2
		Faulty	Rectify fault, proceed to test 6
2	Check cable for short circuit: - Engine ECM pin A33 to ground - Engine ECM pin A34 to ground	OK	Disconnect ABS modulator and proceed to test 3
		Faulty	Locate and rectify wiring fault, proceed to test 6
3	Check main fuse box Fuse 6 and ABS fuse box fuse integrity.	OK	Proceed to test 5
		Faulty	Proceed to test 4
4	Check cable for short circuit:	OK	Proceed to test 5

Test	Result	Action
- ABS modulator pin 10 to ground - ABS modulator pin 11 to ground		
	Faulty	Locate and rectify wiring fault, replace relevant fuse, proceed to test 6
5 Check cable continuity: - Engine ECM pin A33 to ABS modulator pin 11 - Engine ECM pin A34 to ABS modulator pin 10 Turn ignition switch to the ON position and check cable continuity: - ABS fuse box to ABS modulator pin 1 - Main fuse box to ABS modulator pin 6	OK	Proceed to test 6
	Fault still present	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



Brake Switches

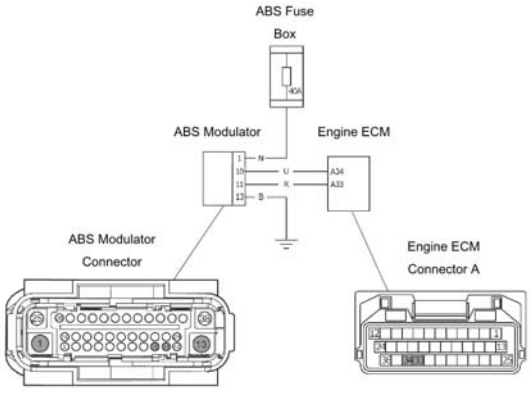
Fault Code	Possible Cause	Action
P0571	Brake switch malfunction	View and note 'freeze frame' data if available Ensure ABS modulator connector is secure Disconnect Engine ECM and proceed to pinpoint test 1:

Pinpoint Tests

Test	Result	Action

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin A33 - Engine ECM pin A34 - ABS modulator pin 11 - ABS modulator pin 10	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - Engine ECM pin A33 to ground - Engine ECM pin A34 to ground	OK	Reconnect ABS modulator connector, proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable continuity: - Engine ECM pin A33 to ABS modulator pin 11 - Engine ECM pin A34 to ABS modulator pin 10	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable for short circuit: - Engine ECM pin A34 to Engine ECM pin A33	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



Twist Grip – Cruise Cancel Switch

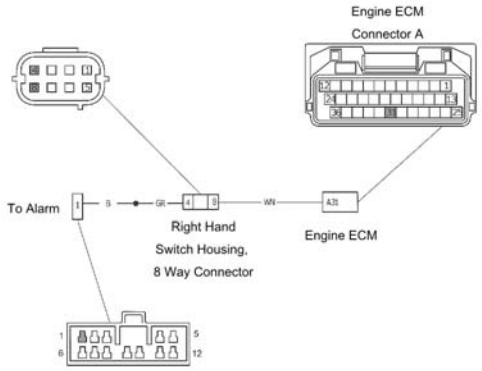
Fault Code	Possible Cause	Action
P0510	Twist grip cruise cancel switch malfunction	View and note 'freeze frame' data if available Ensure right hand switch housing 8 way connector is secure

Fault Code	Possible Cause	Action
		Disconnect Engine ECM and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin A31	OK	Disconnect right hand switch housing 8 way connector and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - Engine ECM pin A31 to ground - Right hand switch housing 8 way connector pin 4 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable continuity: - Engine ECM pin A31 to right hand switch housing 8 way connector pin 8 - Alarm pin 1 to right hand switch housing 8 way connector pin 4	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cruise cancel switch: - With the twist grip at the throttle closed position, measure continuity: - Right hand switch housing 8 way connector pin 8 to 8 way connector pin 4	OK	Proceed to test 5
		Faulty	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



Cruise Control Prevented Due to Other Malfunction

Fault Code	Possible Cause	Action
P1574	Cruise control prevented due to other malfunction condition	Check that there is no other DTC linked to the engine management system stored Check front and rear brake switches, cruise control cancel switch and the rear wheel speed sensor

Cruise Control Disabled Until Button Press Sequence Completed

Fault Code	Possible Cause	Action
P1575	Cruise control disabled until button press sequence completed After certain DTCs have been stored and subsequently repaired, the cruise control will be disabled until a test of the systems various switches has been performed	Carry out the button press sequence (see Cruise Control Switch Check).

Traction Control Prevented Due to Malfunction

Fault Code	Possible cause	Action
P1135	Traction Control prevented due to malfunction	Check that there is no other DTC linked to the ABS system or CAN communication stored. Contact Triumph service.

Engine ECM Internal Error

Fault Code	Possible cause	Action
P0606	Engine ECM internal error	Contact Triumph service.
P1607 P1608	Engine ECM ride by wire internal error	

Engine ECM Tamper Detected

Fault Code	Possible cause	Action
P1604	Engine ECM tamper detected - return to Triumph	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
Cutting out at idle	Throttle bodies out of balance

Symptom	Possible Cause(s)
	Low fuel pressure
	Weak mixture caused by air leak at the throttle body/transition piece to cylinder head face
Idle speed too low/high	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
Motorcycle will start but cuts out immediately	Low fuel pressure caused by filter blockage/leaks
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
Motorcycle will not start	Check the immobiliser system for faults
	Ensure that the keys, Engine ECM and Chassis ECM are all correctly paired

Fuel Tank - 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

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.

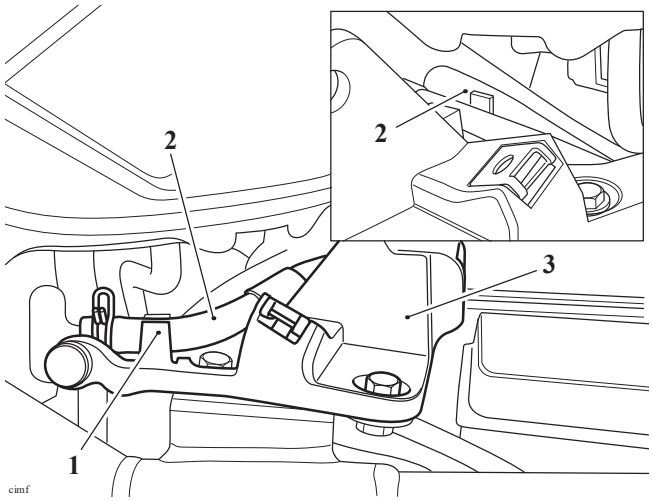
- Remove the rider's seat (see Rider’s Seat - Removal).
- Remove the fuel tank infill panels (see Fuel Tank Infill Panels - Removal).
- Remove the side fairings (see Side Fairings - Removal).

- Remove the seat infill panels (see Seat Infill Panel - Removal).

Note

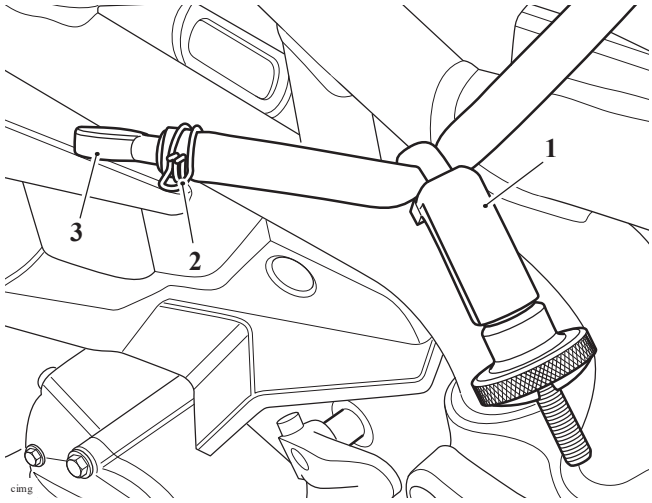
- **Due to the shape of the fuel tank, a small amount of fuel may remain in the fuel tank after draining.**
- **Note the routing of the fuel tank's drain hose for installation.**

1. Detach the fuel drain hose from its retaining clips on the seat bridge and gently pull out the drain hose.



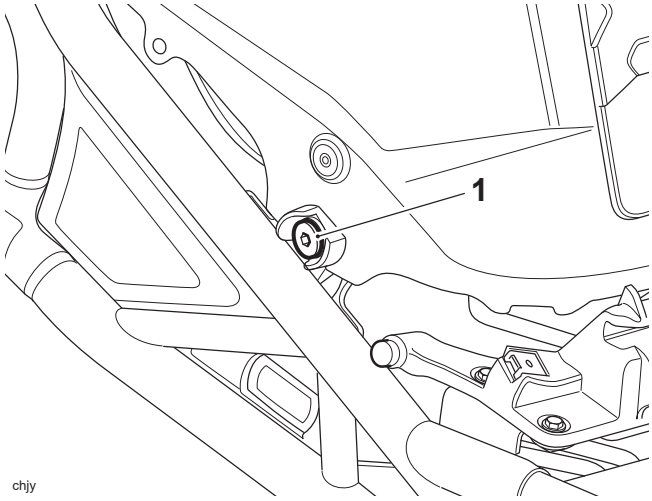
1. **Retaining clip**
2. **Fuel drain hose**
3. **Seat bridge**

2. Using one of the fuel clamps from T3880630 - Fuel Hose Clamp, clamp the fuel drain hose. Ensure there is enough space to move the clip securing the plug to the hose.



1. **T3880630 - Fuel Hose Clamp**
2. **Clip**
3. **Plug**

3. Remove the plug from the drain hose and attach the hose to proprietary professional automotive workshop equipment approved for fuel handling.
4. Release the fuel hose clamp and drain the fuel from the fuel tank.
5. When all of the fuel has drained from the fuel tank, refit the plug to the drain hose and secure with its clip.
6. Remove the fixings securing the rear of the fuel tank to the frame.



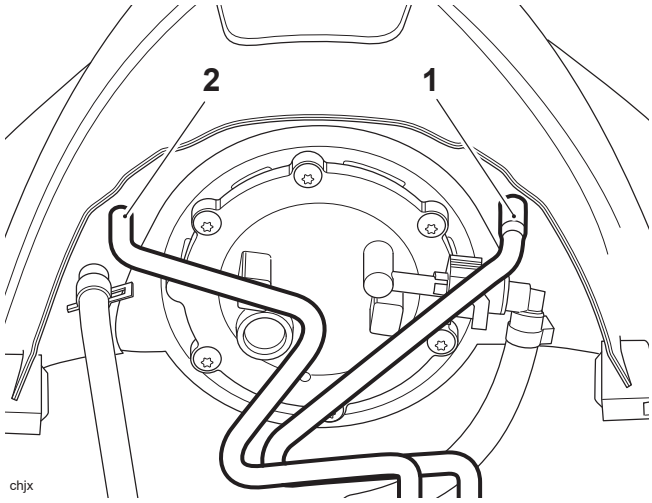
1. **Fixing, left hand shown**

7. Raise the rear of the fuel tank to access the fuel lines and electrical connectors to the fuel pump.

Note

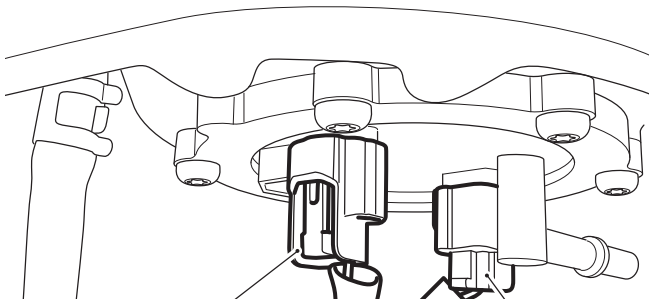
- **Before disconnection, note that the right hand breather hose has a larger diameter than the left hand hose. Ensure they are returned to the same locations when refitting the tank.**

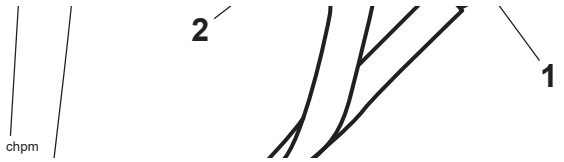
8. Disconnect the two breather hoses.



1. **Right hand breather hose**
2. **Left hand breather hose**

9. Disconnect the electrical connections to the fuel level sender and the fuel pump.





1. **Fuel pump connection**
2. **Fuel gauge connection**

⚠ WARNING

If the fuel rail is dismantled without first reducing pressure, fuel may escape causing clothing and components to be coated with fuel.

This would represent a serious fire hazard which could lead to burn injuries and damage to property.

Note

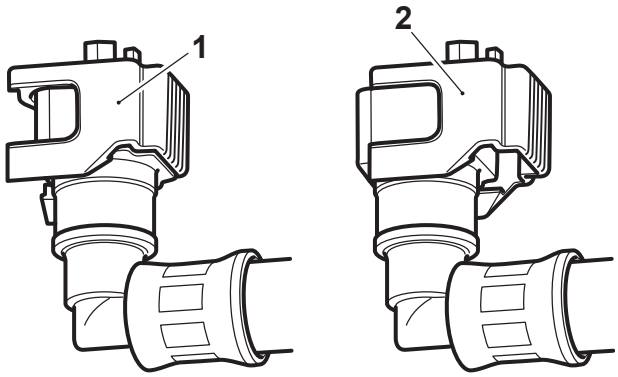
- **Because fuel stored in the fuel rail will be at 3.5 bar pressure, it is essential that the fuel pressure is reduced before any dismantling of the fuel rail takes place. To reduce pressure, briefly crank the engine with the fuel pump disconnected.**

10. Briefly crank the engine to reduce the fuel pressure in the fuel rail.
11. Disconnect the battery, negative (black) lead first.

Note

- **When disconnected, the fuel tank is self-sealing but a small amount of fuel may dribble from the hose.**
- **To protect the components under the fuel tank, place suitable material over the components to absorb the small amount of fuel that may come from the fuel tank and its fuel lines.**

12. Ease the latch away from the fuel connector until the release buttons are exposed.



1. **Locked position**
2. **Unlocked position**

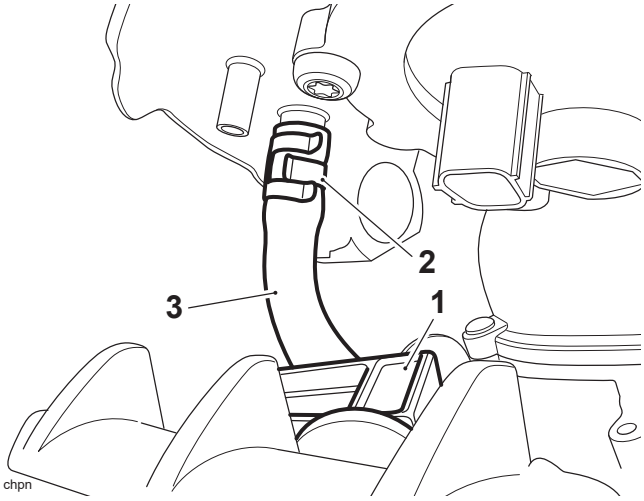
13. Disconnect the fuel hose by squeezing the sides of the connector and pulling the hose free from the spigot.

Note

- **Use a suitable wooden block to support the rear of the fuel tank when fitting a fuel clamp to the rear transfer pipe and removing/fitting the transfer pipe to the fuel tank.**

14. Raise the rear of the fuel tank and using one of the fuel clamps from T3880630 - Fuel Hose Clamp, clamp

the fuel transfer pipe. Ensure there is enough space to move the clip off the spigot.



1. **T3880630 - Fuel Hose Clamp**
2. **Clip**
3. **Fuel transfer pipe**

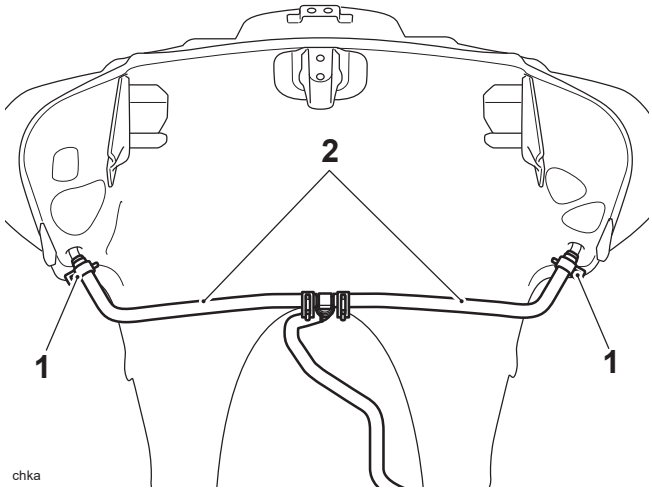
15. Release the clip and detach the transfer pipe from the spigot. At the same time fit a cap, from T3880631 - Blanking Cap, to the fuel tank spigot.

CAUTION

To prevent damage to the radiator fins, ensure that the fuel line clamp is positioned such that it will not contact the radiator while fitting/removing the clamp or removing/fitting the fuel transfer pipes.

Damaged radiator fins may impair the radiator's cooling efficiency.

16. Using the clamps from T3880630 - Fuel Hose Clamp, clamp the transfer pipe at the two front spigots. Ensure there is enough space to move the clip off the spigot.
17. Release the clip and detach one of the transfer pipes from the front spigot. At the same time fit a cap, from T3880631 - Blanking Cap, to the fuel tank spigot.
18. Repeat step 17 for the other front spigot.



1. **Clips**
2. **Fuel transfer pipe**

19. Raise the rear of the fuel tank and carefully slide the fuel tank rearwards to release its front mountings. Place the fuel tank onto a clean flat surface ensuring that the spigots and their caps do not make contact with the flat surface.

CAUTION

When the fuel tank has been removed from the motorcycle, the fuel clamps must be removed from the transfer pipe and the fuel drained into a suitable fuel container.

Keeping the fuel clamps on the transfer pipe for long periods of time may deform the fuel transfer pipe.

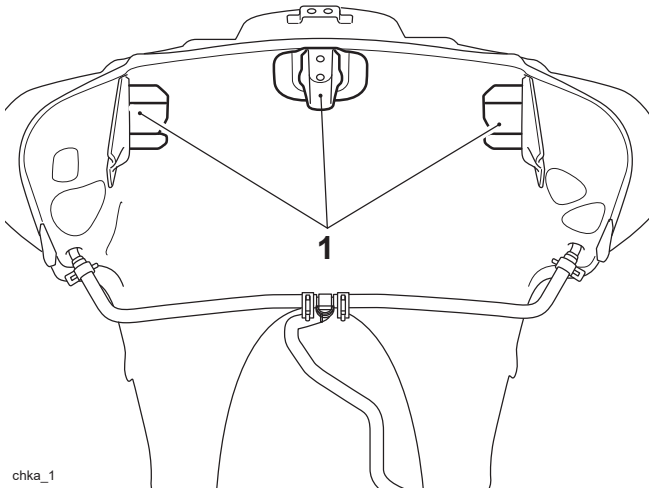
20. Remove the fuel line clamps from the transfer pipe and drain any fuel into an approved fuel container.

Fuel Tank - Installation

Note

- **Due to the shape of the fuel tank, a small amount of fuel may remain in the fuel tank after draining.**

1. Prior to fitting the fuel tank, drain any remaining fuel that may be in the fuel tank using proprietary professional automotive workshop equipment approved for fuel handling.
2. Refit the fuel line clamps to the three ends of the fuel transfer pipe.
3. Align the three front mountings on the fuel tank to their rubber mountings on the frame and push forward until fully engaged.

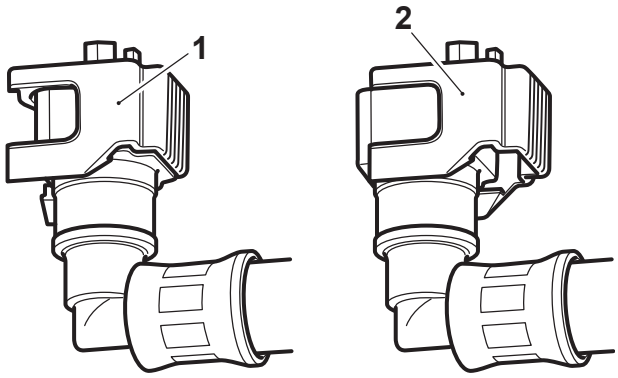


1. Front mountings

4. Remove the blanking cap from one of the front spigots. At the same time, refit the front fuel transfer pipe to the spigot and secure with its clip.
5. Repeat step 4 for the other front fuel transfer pipe.
6. Remove the fuel line clamps from the two front transfer pipes.
7. Pivot the fuel tank upwards at the rear and carry out the following:
   - Remove the blanking cap from the rear spigot. At the same time, refit the rear fuel transfer pipe to the spigot and secure with its clip.
   - Remove the fuel line clamp from the rear fuel transfer pipe.
   - Route the drain hose as noted for removal and secure it to its retaining clips on the rider's seat front mounting.
   - Fit the two breather pipes as noted for removal.
   - Fit the fuel pump and fuel level sensor electrical connectors.
   - Reconnect the fuel feed hose by gently pushing inwards until the hose engages with a click.
8. Slide the double check-latch down (i.e. towards the spigot) until the release buttons of the fuel connector 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.

9. Remove the covering used to cover the components under the rear of the fuel tank.
10. Lower the rear of the fuel tank onto the frame, fit the two fixings and tighten to **12 Nm**.
11. Check to ensure that the latch on the connector to the fuel pump is in the locked position.



1. **Locked position**
2. **Unlocked position**

12. Using proprietary professional automotive workshop equipment approved for fuel handling, refill the fuel tank.

- Check carefully for fuel leaks around the fuel transfer pipes.
- Reconnect the battery, positive (red) lead first.
- Start the engine and check carefully for fuel leaks. Rectify as necessary.
- Refit the seat infill panels (see Seat Infill Panel - Installation).
- Refit the side fairings (see Side Fairings - Installation).
- Refit the fuel tank infill panels (see Fuel Tank Infill Panels - Installation).
- Refit the rider's seat (see Rider's Seat - Installation).

Fuel Pump and Filter Assembly - Removal

Note

- **The fuel pump and filter assembly is a sealed for life unit and must be replaced as a complete assembly.**
- **The fuel tank must be drained of fuel prior to its removal from the motorcycle.**

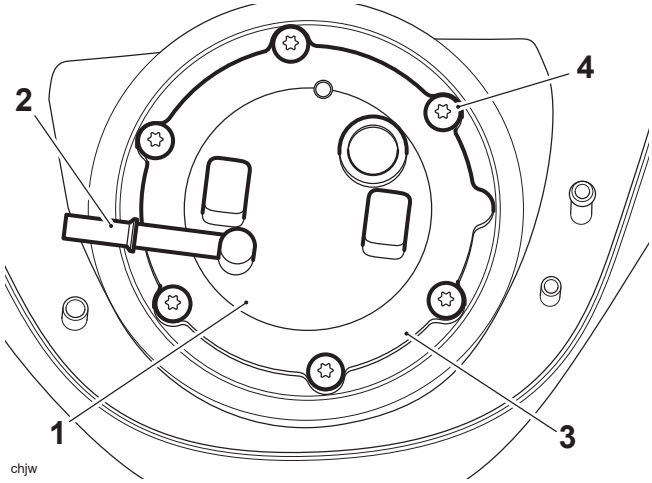
- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the fuel tank (see Fuel Tank - Removal).

⚠ WARNING

Observe the warning advice given in the General Information section on the safe handling of fuel and fuel containers.

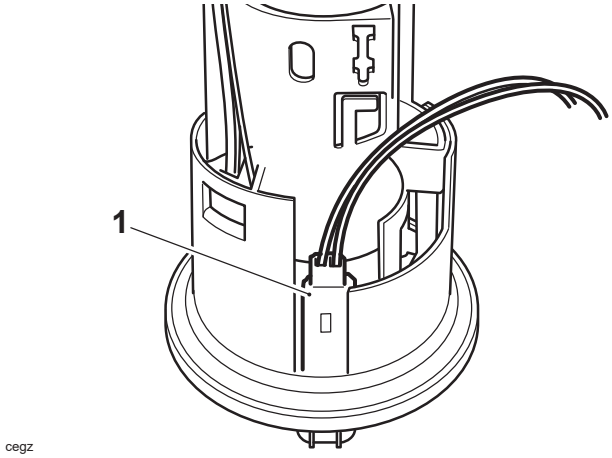
A fire, causing personal injury and damage to property could result from spilled fuel or fuel not handled or stored correctly.

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



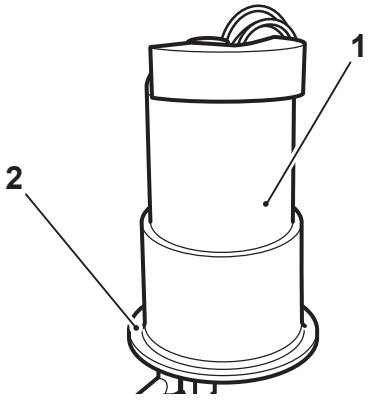
1. **Fuel pump**
2. **Fuel pump spigot**
3. **Mounting plate**
4. **Mounting plate fixings**

3. Lift the fuel pump and filter assembly and manoeuvre it from the fuel tank aperture.
4. Disconnect the fuel level sensor electrical connector and remove the fuel pump and filter assembly.



1. **Fuel level sensor electrical connector**

5. Noting its orientation, remove and discard the sealing ring from the fuel pump assembly.

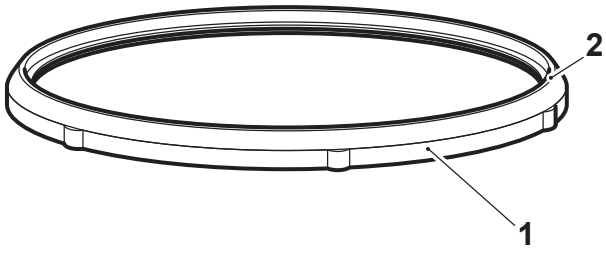


ccxh

1. **Fuel pump and filter assembly**
2. **Sealing ring location**

Fuel Pump and Filter Assembly - Installation

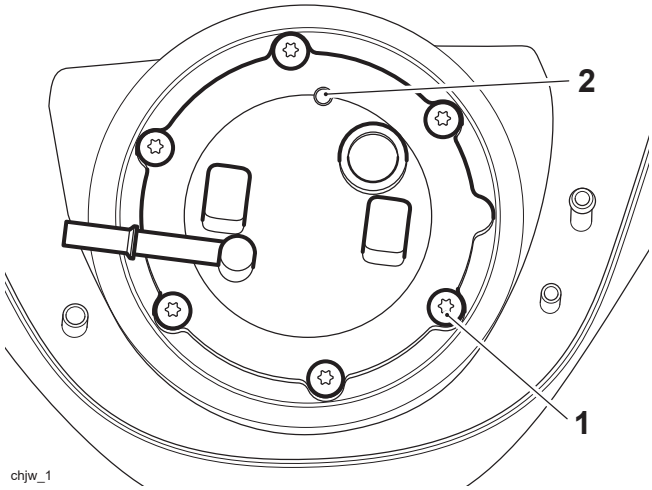
1. Install a new sealing ring into the fuel pump assembly, with the seal lip facing uppermost, and ensure that it is correctly seated.



cdva

1. **Sealing ring**
2. **Seal lip**

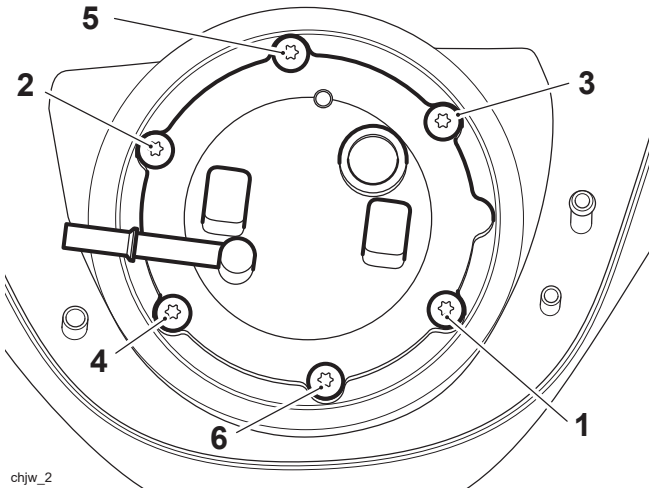
2. Taking care to ensure the sealing ring is not damaged or dislodged, manoeuvre the fuel pump assembly into the tank aperture.
3. Reconnect the fuel level sensor electrical connector and locate the fuel pump and filter assembly.
4. Ensure the locating peg on the fuel pump assembly is located in the cut out on the mounting plate and the offset hole is positioned as shown below.



chjw_1

1. **Offset hole position**
2. **Locating peg**

5. Tighten the fixings in the sequence shown below to **9 Nm**.



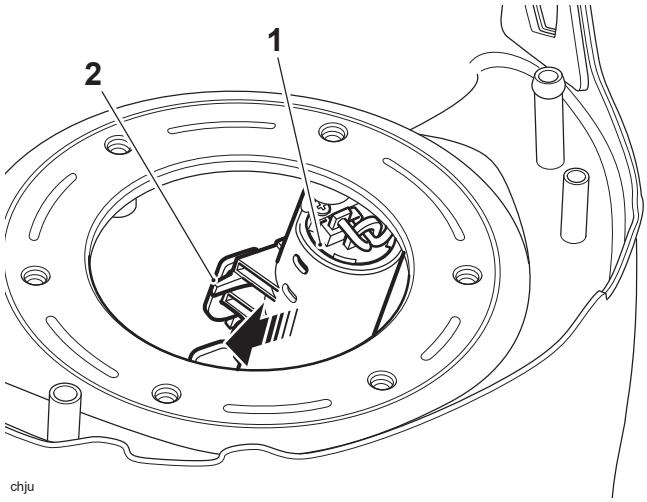
Pump Mounting Plate Tightening Sequence

- Refit the fuel tank (see Fuel Tank - Installation).
- Reconnect the battery, positive (red) lead first.
- Start the engine and check carefully for fuel leaks. Rectify as necessary.
- Refit the rider's seat (see Rider's Seat - Installation).

Fuel Level Sender Assembly - Removal

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the fuel pump and filter assembly (see Fuel Pump and Filter Assembly - Removal).

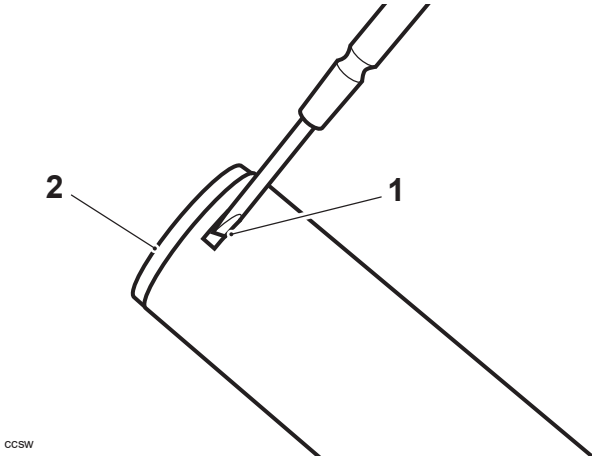
1. Release the locking device and slide the bottom of the level sender to the fuel tank opening. Withdraw from the tank and allow any remaining fuel to drain into a suitable container.



1. **Fuel level sensor**
2. **Locking device**

Fuel Level Sender Assembly - Float Replacement

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

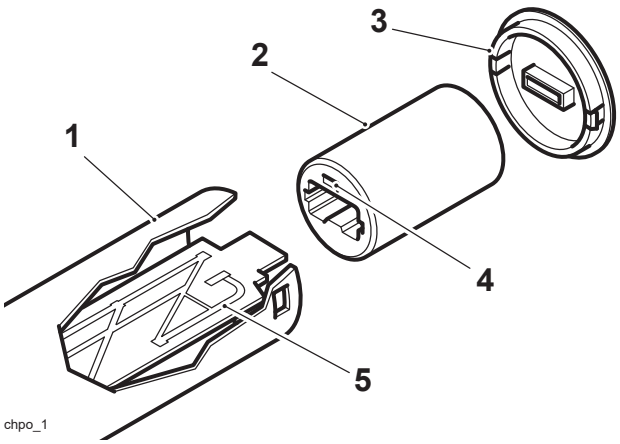


1. **Tab**
2. **Lid**

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

Note

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



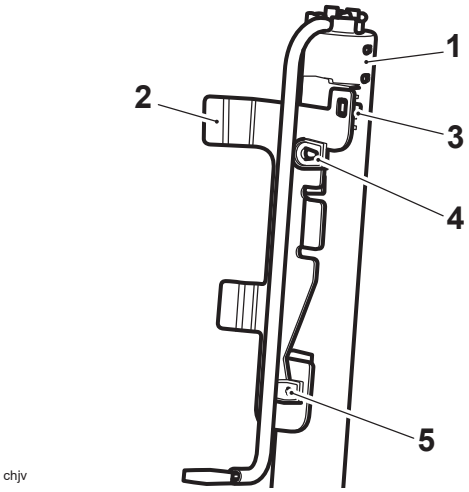
1. **Support tube**
2. **Float unit**
3. **Lid**
4. **Magnet cover**
5. **Slider**

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

Fuel Level Sender Assembly - Installation

Fuel Pressure Checking

1. Align the lower lug first to the bracket then the upper lug. Ensure that the locking device is fully engaged to the bracket and is secure.



1. **Level sender**
2. **Bracket, inside fuel tank**
3. **Locking device**
4. **Upper lug**
5. **Lower lugs**

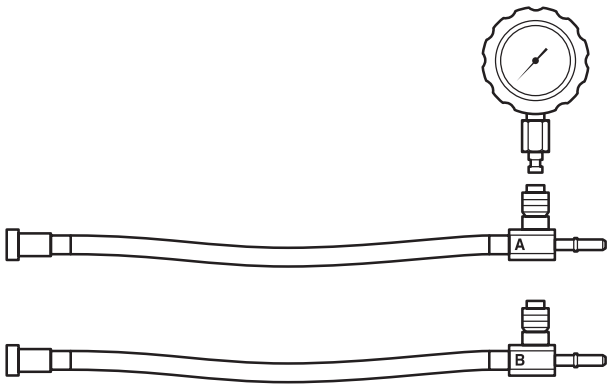
- Refit the fuel pump and filter assembly (see Fuel Pump and Filter Assembly - Installation).
- Refit the fuel tank (see Fuel Tank - Installation).
- Reconnect the battery, positive (red) lead first.
- Start the engine and check carefully for fuel leaks. Rectify as necessary.
- Refit the rider's seat (see Rider’s Seat - Installation).

⚠ 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 pressure is checked using T3880001 - Fuel Pressure Gauge.



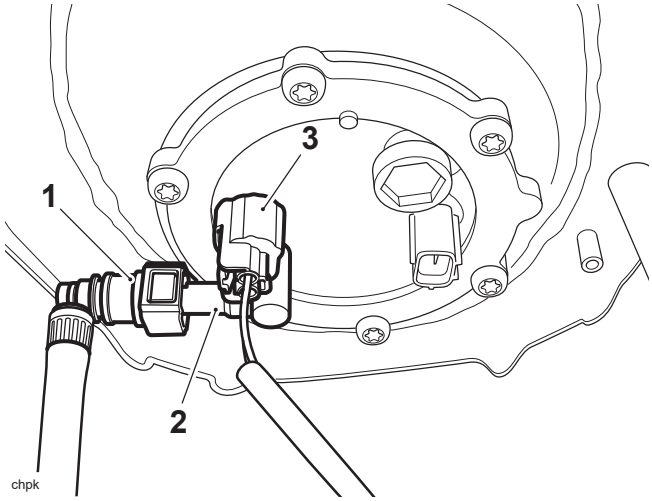
T3880001 - Fuel Pressure Gauge

1. Remove the fuel tank (see Fuel Tank - Removal) and place on a suitable support, close to the motorcycle.
2. Using T3880123 - Extension Cable, carefully connect the fuel pump connection on the main harness to the fuel tank. Connect the other end of the extension cable to the motorcycle main harness.
3. Select the fuel pressure gauge adapter marked 'B' from T3880001 - Fuel Pressure Gauge.

⚠ WARNING

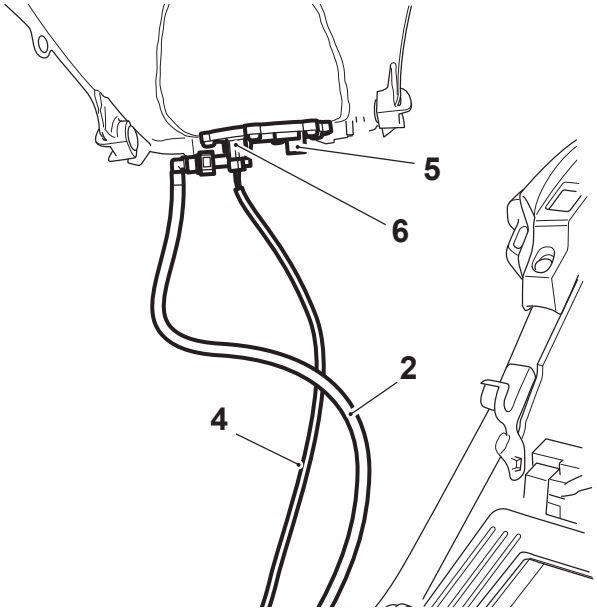
Always use the correct fuel pressure gauge adapter **(adapter 'B' for Explorer models)**. Use of an incorrect adapter will result in a fuel leak. A fuel leak can result in a fire causing damage to property and injury to persons.

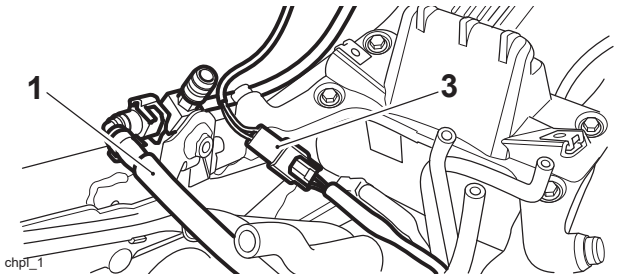
4. Connect the adapter hose to the fuel pump plate outlet as shown in the illustration below.



1. **Adaptor hose 'B'**
2. **Fuel pump plate outlet**
3. **T3880123 - Extension Cable**

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





1. **Motorcycle fuel hose**
2. **Adaptor hose 'B'**
3. **Fuel pump connection**
4. **T3880123 - Extension Cable**
5. **Fuel pump connection**
6. **Fuel pump plate outlet**

Note

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

6. Ensure the gauge is visible to the side of the motorcycle.
7. Using proprietary professional automotive workshop equipment approved for fuel handling, partially refill the fuel tank with the fuel removed earlier.
8. Reconnect the battery, positive (red) lead first.
9. Start the engine and observe the fuel pressure reading on the gauge.

Note

- **The fuel pressure should be 3.5 bar nominally.**

10. When fuel pressure checking is complete, turn the ignition to the OFF position, disconnect the fuel pressure gauge adapter and wiring extension.
11. Using proprietary professional automotive workshop equipment approved for fuel handling, drain any remaining fuel from the fuel tank.
12. Disconnect the battery, negative (black) lead first.
13. Refit the fuel tank (see Fuel Tank - Installation).

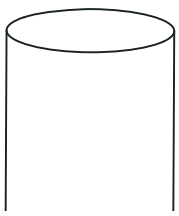
Fuel Delivery System

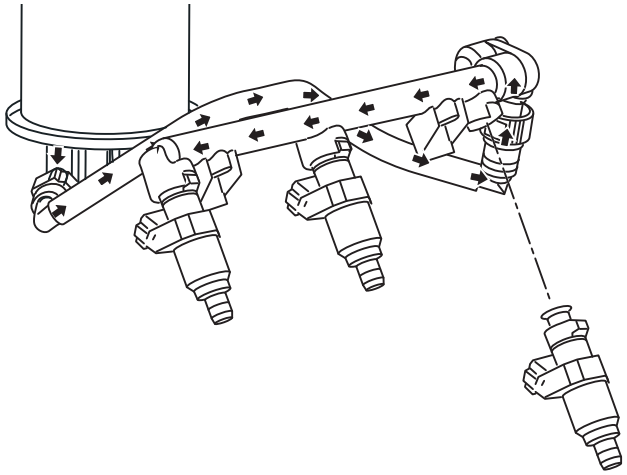
Airbox - Removal

Airbox - Inspection

Fuel is delivered to the injectors by a pump located inside the fuel tank. Fuel flows in the direction of the arrows shown in the diagram below.

Incorporated in the fuel pump assembly is a filter, a pressure regulator and a pick-up strainer.





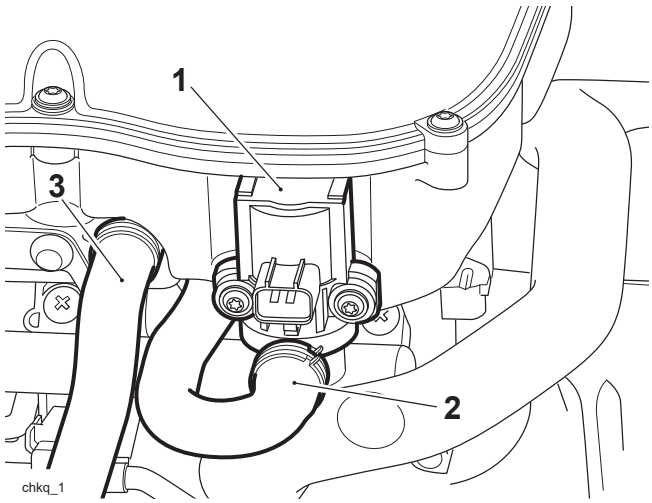
Direction of Fuel Flow

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.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the fuel tank (see Fuel Tank - Removal).

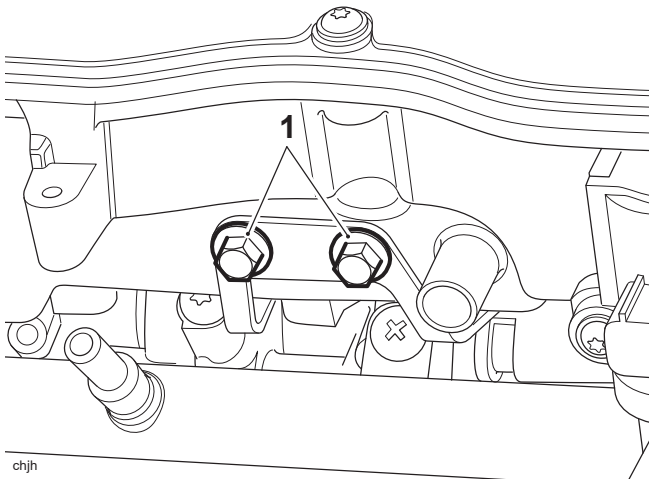
1. Disconnect the multiplugs from the following:
   - Air temperature sensor
   - Secondary air injection control valve.
2. Disconnect the hose from the secondary air injection control valve.
3. Disconnect the breather drain hose from the rear of the airbox.



1. Secondary air injection control valve

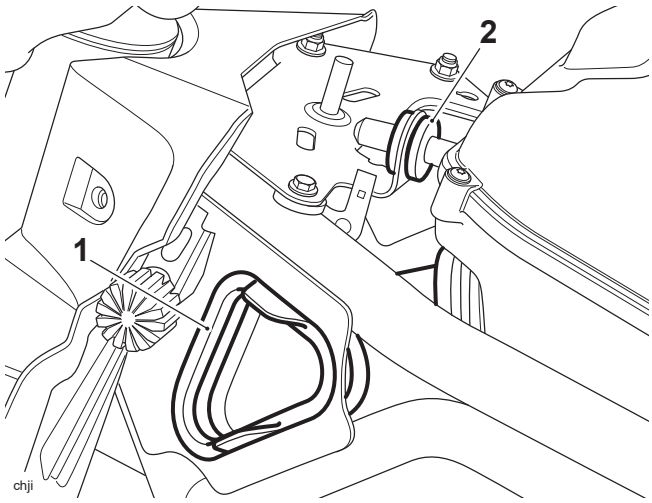
2. **Hose**
3. **Breather drain hose**

4. Remove the MAP sensor (see Manifold Absolute Pressure (MAP) Sensor - Removal).
5. Remove the rear fixings of the airbox.



1. **Fixings**

6. Gently lift the rear of the airbox to release it from the throttle bodies.
7. Detach the air intake duct from the frame and slide the airbox rearwards to release it from its front mounting for complete removal.



1. **Air intake duct**
2. **Front mounting**

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

Airbox - Installation

WARNING

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 airbox to its forward mounting and push home.
2. Refit the air intake duct to the frame.
3. Press down on the rear of the airbox to locate the intake rubbers to the throttle bodies.

CAUTION

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

4. Fit and tighten the airbox rear fixings to **5 Nm**.
5. Fit the breather drain hose to the rear of the airbox.
6. Reconnect the hose to the secondary air injection control valve.
7. Connect the multiplugs to the following:
   - Air temperature sensor
   - Secondary air injection control valve.
- Refit the MAP sensor (see Manifold Absolute Pressure (MAP) Sensor - Installation).
- Refit the fuel tank (see Fuel Tank - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

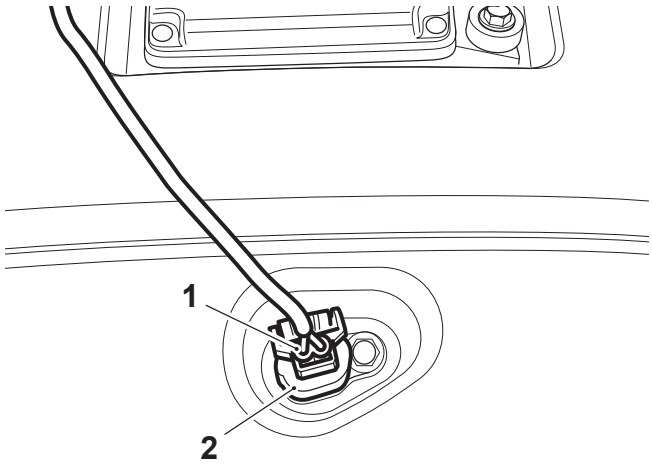
Air Filter Element - Removal

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.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the fuel tank (see Fuel Tank - Removal).

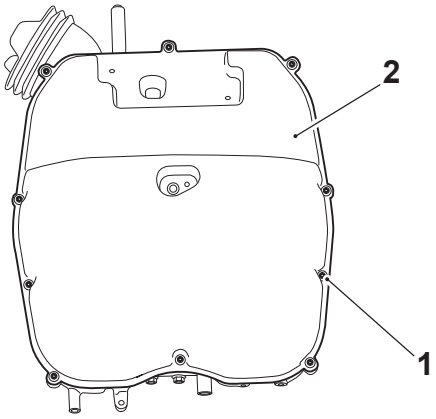
1. Disconnect the multiplug from the air temperature sensor.



chkb_1

1. **Multiplug**
2. **Air temperature sensor**

2. Release the ten fixings and remove the airbox upper section.

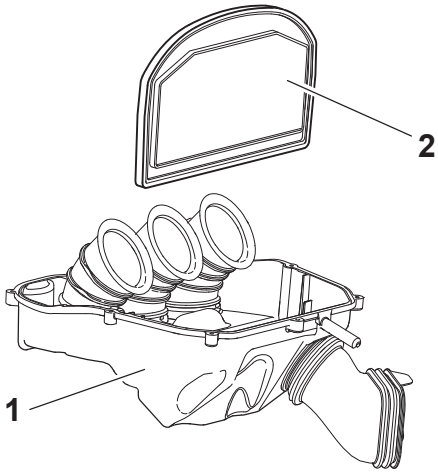


1. **Fixings**
2. **Airbox upper section**

Note

- **Note the orientation of the air filter for installation.**

3. Lift the air filter out of the airbox lower section.



1. **Airbox lower section**
2. **Air filter element**

Air Filter Element - Installation

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. Thoroughly clean the inside and outside of the airbox.

Note

- **The air filter will only fit one way, do not force fit the air filter element.**

2. Fit the air filter element into the airbox lower section as noted for removal.
3. Refit the airbox upper section and tighten the fixings to **1.5 Nm**.
4. Reconnect the multiplug to the air temperature sensor.

- Refit the fuel tank (see Fuel Tank - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

Engine Electronic Control Module (ECM) - 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.

Turn the ignition to the OFF position and wait at least 1 minute for the engine ECM to complete its power down sequence.

- Remove the rider's seat (see Rider's Seat - Removal).
- Remove the battery (see Battery Removal).
- Remove the fuel tank (see Fuel Tank - Removal).
- Remove the seat bridge (see Seat Bridge - Removal).
- Remove the engine ECM from its housing and disconnect the two electrical connectors (see Electrical Connectors).

Engine Electronic Control Module (ECM) - Installation

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.

- Fit the ECM into the under seat tray and reconnect the two connectors (see Electrical Connectors).
- Refit the seat bridge (see Seat Bridge - Installation).
- Refit the fuel tank (see Fuel Tank - Installation).
- Refit and connect the battery (see Battery Installation).
- Refit the rider's seat (see Rider's Seat - Installation).

Note

- **If a new Engine ECM is fitted it will need to be paired with the Chassis ECM as described in the Safety/Security section of the Triumph diagnostic software.**

Intake Air Temperature Sensor - Removal

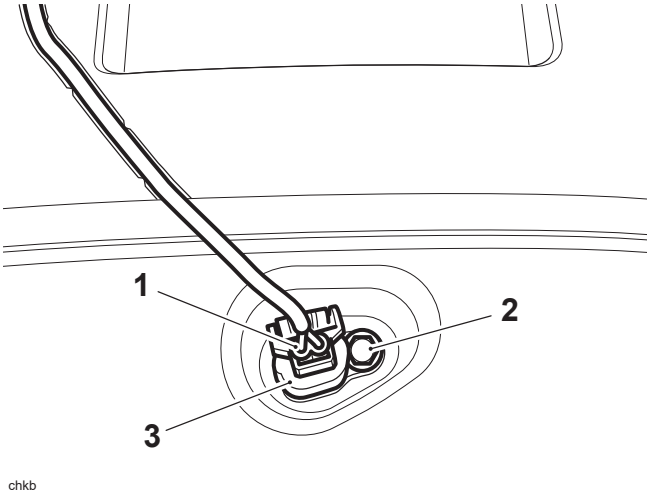
WARNING

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.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.

- Remove the fuel tank (see Fuel Tank - Removal).

1. Disconnect the multiplug from the air temperature sensor.



1. **Multiplug**
2. **Fixing**
3. **Air temperature sensor**

2. Release the fixing and remove the sensor from the airbox.

Intake Air Temperature Sensor - Installation

⚠ 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. Fit the air temperature sensor to the airbox and tighten its fixing to **2 Nm**.
2. Connect the air temperature sensor multiplug.

- Refit the fuel tank (see Fuel Tank - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

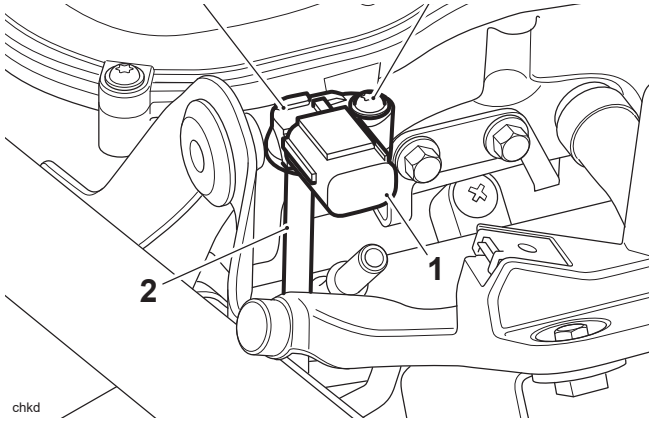
Manifold Absolute Pressure (MAP) Sensor - Removal

⚠ 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.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the fuel tank (see Fuel Tank - Removal).

1. Disconnect the multiplug from the MAP sensor.
2. Release the fixing securing the sensor to the airbox.
3. Raise the sensor, disconnect the air hose and remove the sensor.



1. **Multiplug**
2. **Air hose**
3. **MAP sensor**
4. **Fixing**

Manifold Absolute Pressure (MAP) Sensor - Installation

⚠ 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. Refit the air hose.
2. Fit the sensor to the airbox and tighten its fixing to **1.5 Nm**.
3. Reconnect the multiplug.

- Refit the fuel tank (see Fuel Tank - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

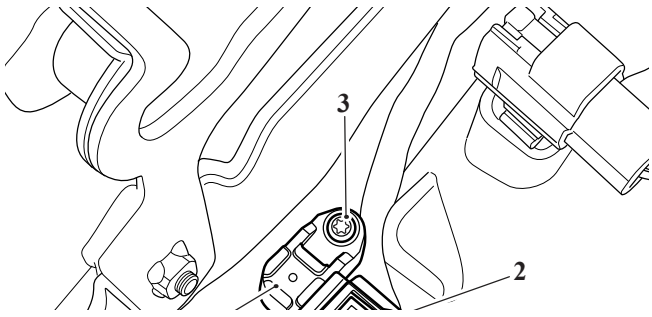
Ambient Air Pressure Sensor - Removal

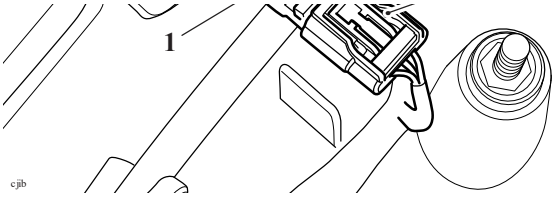
⚠ WARNING

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.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.

1. Disconnect the multiplug from the ambient air pressure sensor.
2. Release the fixing and remove the sensor.





1. **Ambient air pressure sensor**
2. **Multiplug**
3. **Fixing**

Ambient Air Pressure Sensor - Installation

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. Fit the sensor and tighten its fixing to **1.5 Nm**.
2. Reconnect the multiplug.

- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

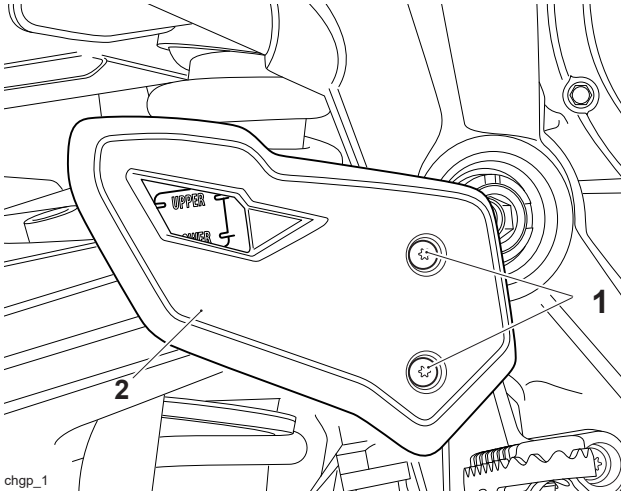
Roll Over Valve - Removal

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.

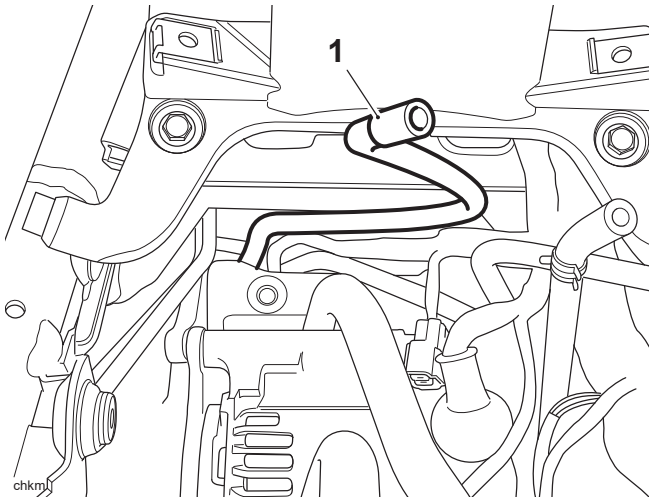
- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the fuel tank (see Fuel Tank - Removal).

1. Release the fixings and remove the right hand heel guard.



1. **Fixings**
2. **Heel guard**

2. From the top of the motorcycle, follow the route of the hose to the roll over until near the top of the crankcase tidy. Then gently push the hose towards the rear of the motorcycle to release the roll over valve from the crankcase tidy.

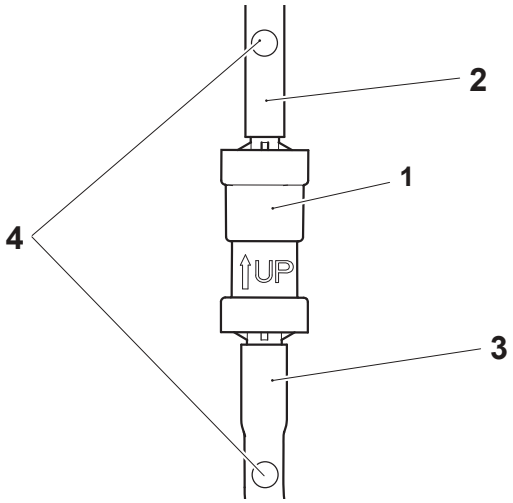


1. **Hose to roll over valve**

Note

- **The hoses connected to the roll over valve are marked with a white spot. When correctly fitted and in the crankcase tidy, these spots will face the rear of the motorcycle.**

3. From the right hand side of the motorcycle, manoeuvre the roll over valve out, disconnect the two hoses and remove the roll over valve.



1. **Roll over valve**
2. **Hose, from fuel tank**
3. **Hose, to atmosphere**
4. **White spots**

Roll Over Valve - Installation

WARNING

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.

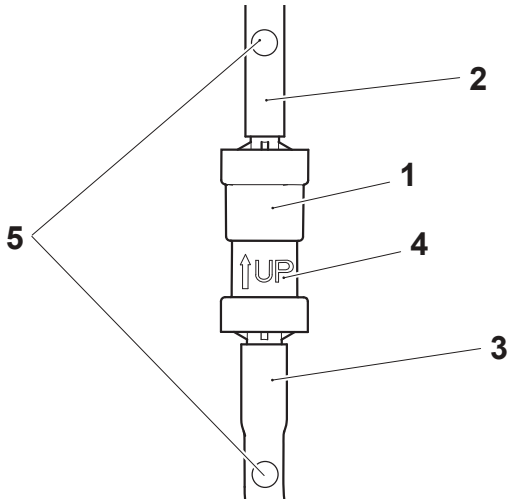
CAUTION

The roll over valve must be fitted in the correct orientation. An inverted roll over valve will prevent the fuel tank from breathing causing engine running problems and possible fuel tank damage.

Note

- **To ensure that the roll over valve is correctly orientated when fitted, ensure that the arrow and 'UP' embossed on it is pointing upwards.**

1. Reconnect the hoses to the roll over valve as noted for removal. Ensure the arrow is pointing upwards.



1. **Roll over valve**
2. **Hose, from fuel tank**
3. **Hose, to atmosphere**
4. **Arrow and 'UP'**
5. **White spots**

2. Carefully attach the roll over valve to the crankcase tidy. Ensure that the hoses are also secured by the crankcase tidy and the white spots are facing the rear of the motorcycle.
3. Refit the heel guard and tighten its fixings to **7 Nm**.

- Refit the fuel tank (see Fuel Tank - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

Crankshaft Position Sensor - Removal

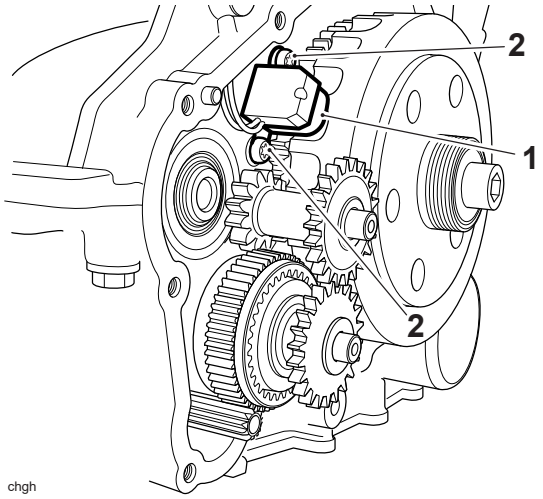
WARNING

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.

- Remove the rider's seat (see Rider's Seat - Removal).

- Disconnect the battery, negative (black) lead first.
- Remove the coolant expansion tank (see Expansion Tank - Removal).
- Remove the flywheel cover (see Flywheel Cover - Removal).

1. Remove and discard the two fixings securing the sensor to the crankcase.



1. **Sensor**
2. **Fixings**

2. Disconnect the sensor multiplug.
3. Detach the harness grommet from the opening in the crankcase.
4. Remove the crankshaft position sensor, detaching the harness from the crankcase retaining pegs as you do so.

Crankshaft Position Sensor - Installation

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. Refit the crankshaft position sensor. Fit and tighten new fixings to **6 Nm**.
2. Reconnect the sensor multiplug.
3. Refit the harness grommet to the crankcase opening.
4. Refit the harness to the retaining pegs on the crankcase.

- Refit the flywheel cover (see Flywheel Cover - Installation).
- Refit the coolant expansion tank (see Expansion Tank - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

Gear Position Sensor - Removal

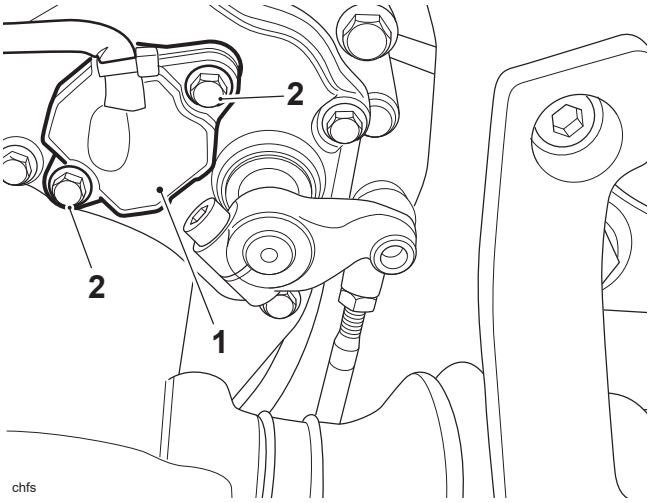
WARNING

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.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.

- Remove the coolant expansion tank (see Expansion Tank - Removal).

1. Set the transmission in neutral.
2. Disconnect the gear position sensor electrical connector.
3. Remove the two fixings and remove the gear position sensor.



1. **Gear position sensor**
2. **Fixings**

Gear Position Sensor - Installation

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. Install a new O-ring to the gear position sensor.
2. Position the gear position sensor to the selector cover, ensuring the pin on the sensor engages with the slot on the selector drum shaft.
3. Fit two new fixings and tighten to **5 Nm**.
4. Reconnect the electrical connector.

- Refit the coolant expansion tank (see Expansion Tank - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

Throttle Bodies/Injectors - 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.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the fuel tank (see Fuel Tank - Removal).
- Remove the airbox (see Airbox - Removal).
- Remove the coolant expansion tank (see Expansion Tank - Removal).

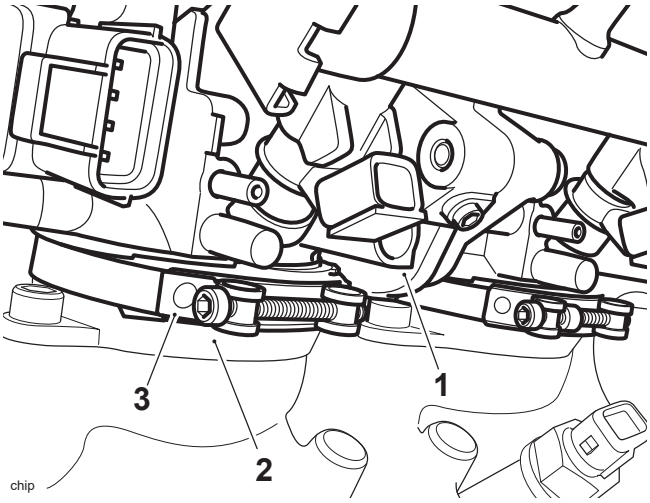
1. Disconnect the throttle position sensor multiplug.

2. Disconnect the throttle actuator motor multiplug.
3. Disconnect the electrical connector from each injector.

Note

- **Before disconnection, note the position of the MAP sensor and evaporative emissions control system hoses. Ensure they are returned to the same locations when refitting the throttle bodies.**

4. Detach the MAP sensor and evaporative emissions control system hoses from the throttle bodies.
5. Release the clips securing the throttle bodies to the transition pieces.

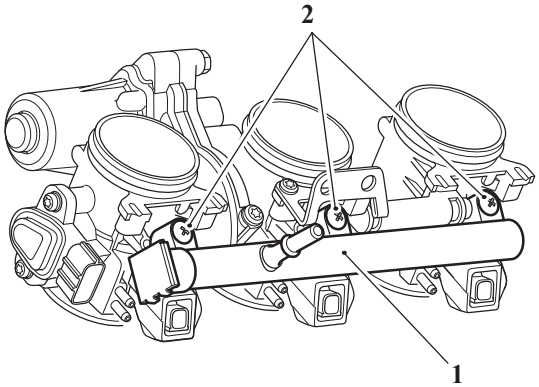


1. **Throttle body**
2. **Transition piece (one per cylinder)**
3. **Clip (one per cylinder)**

6. Remove the throttle bodies.
7. Collect the rubber covers from the fuel injectors.

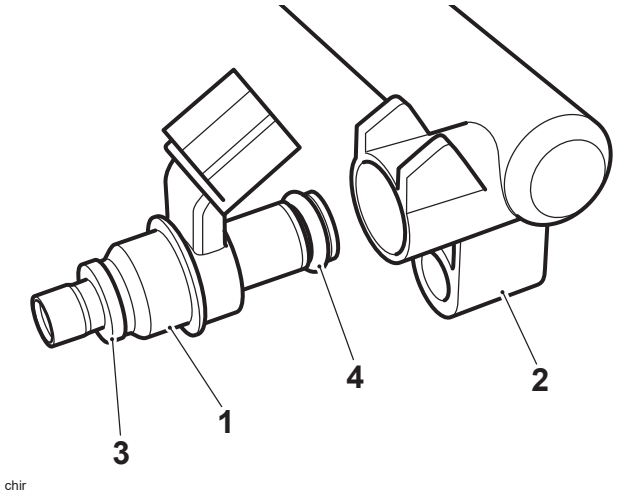
Throttle Bodies/Injectors - Disassembly

1. Release the fixings securing the fuel rail to the throttle bodies.



1. **Fuel rail**
2. **Fixings**

2. Ease the fuel rail and injectors from the throttle bodies.
3. To detach the injectors from the fuel rail, gently pull the injector out of the fuel rail using a twisting action.



1. **Injector**
2. **Fuel rail**
3. **Injector front seal**
4. **Injector rear seal**

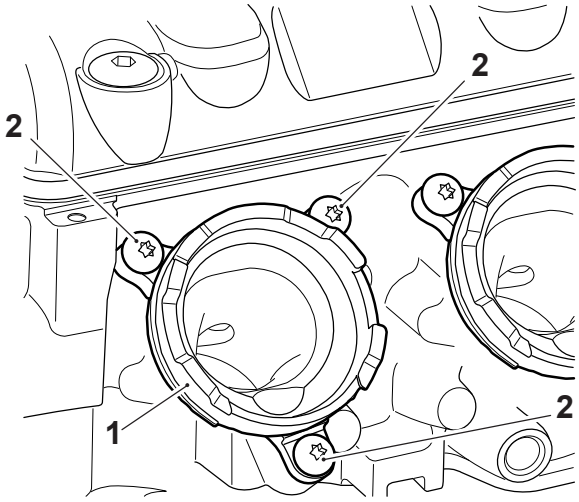
4. Discard the injector seals.
5. Release the fixings and remove the transition pieces.

Throttle Bodies/Injectors - Inspection

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

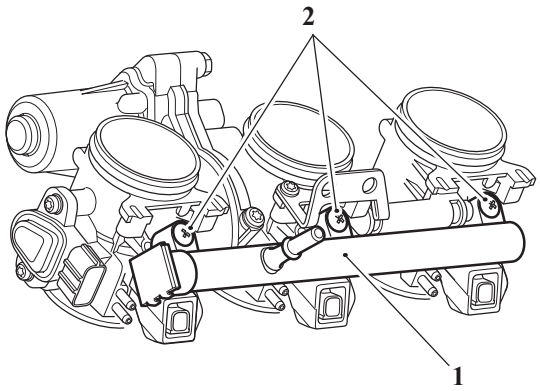
Throttle Bodies/Injectors - Assembly

1. Thoroughly clean the transition piece to cylinder head mating faces.
2. Refit the transition pieces to the head and tighten the fixings to **9 Nm**.



1. **Transition piece**
2. **Fixings**

3. Fit a new injector O-ring and seal to each injector.
4. Refit the injectors to the fuel rail using a twisting action.
5. Refit the injectors and fuel rail to the throttle bodies. Tighten the fuel rail fixings to **3.5 Nm**.



1. **Fuel rail**
2. **Fixings**

Throttle Bodies/Injectors - Installation

Throttle Body Balancing

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. Refit the rubber covers to the fuel injectors.
2. Refit the throttle bodies to the transition pieces and secure with clips. Tighten the clips to **1.5 Nm**.
3. Reconnect the electrical connector to each injector.
4. Reconnect the throttle control stepper motor.
5. Reconnect the throttle position sensor multiplug.
6. Reconnect the MAP sensor and evaporative emissions control hoses as noted during removal.

- Refit the airbox (see Airbox - Installation).
- Refit the fuel tank (see Fuel Tank - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

WARNING

Never start the engine or run the engine in a confined area. Exhaust fumes are poisonous and can cause loss of consciousness and death within a short period of time. Always operate your 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, leading to 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.**

Start the engine and allow to idle until the motorcycle has adapted (see Engine Management Adaption).

Throttle Position Sensor

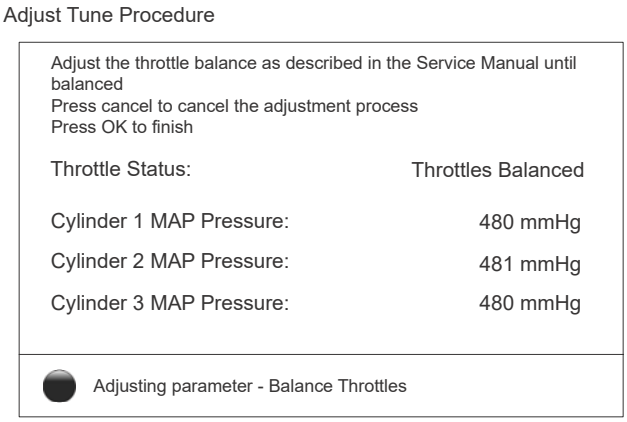
Note

- **The throttles cannot be balanced using equipment to measure vacuum in each throttle. Instead, the Triumph diagnostic tool must be used.**
- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the fuel tank (see Fuel Tank - Removal).
- Remove the airbox (see Airbox - Removal).

⚠ WARNING

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

1. Temporarily refit the fuel tank and reconnect the fuel supply and fuel pump connection using T3880001 - Fuel Pressure Gauge (minus the fuel pressure gauge) and T3880123 - Extension Cable (see Fuel Pressure Checking).
2. Using proprietary professional automotive workshop equipment approved for fuel handling, partially refill the fuel tank with the fuel removed earlier.
3. Temporarily reconnect the battery, positive (red) lead first.
4. Attach exhaust extraction hoses to the silencers.
5. Attach the Triumph diagnostic tool, start the engine and navigate to ADJUST TUNE (see Triumph Diagnostic Software - Engine ECM).
6. Select BALANCE THROTTLES.



Balance Throttles Screen

Note

- **The balance throttles screen shows the vacuum value of each throttle in mmHg. In addition, when the throttles are balanced to an acceptable range of each other the words '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 words 'THROTTLES UNBALANCED' in red text will appear on the right of the screen. At this point adjustment will be necessary.**
- **The adjusters operate on the outer cylinders only (cylinders 1 and 3). The centre throttle (cylinder 2) adjustment is fixed, this being controlled by the throttle control motor. Note that the centre reading may alter slightly as the two outer cylinders are adjusted.**
- **DO NOT attempt to adjust the throttle stop screws, located below the fuel rail. The stop screws are**

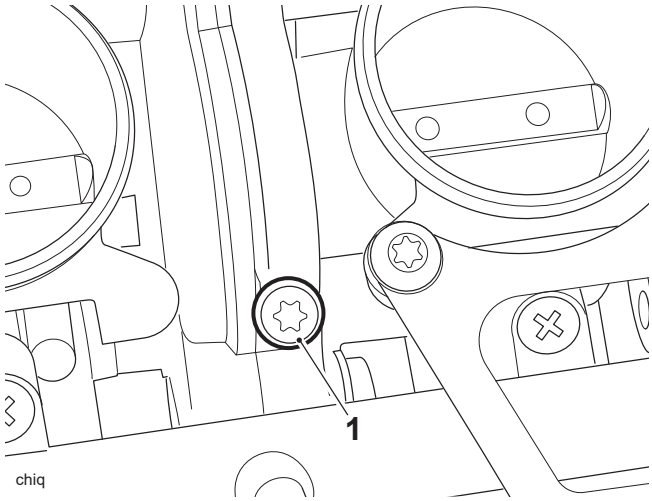
Note

set at the factory during manufacture, and must not be adjusted.

⚠ WARNING

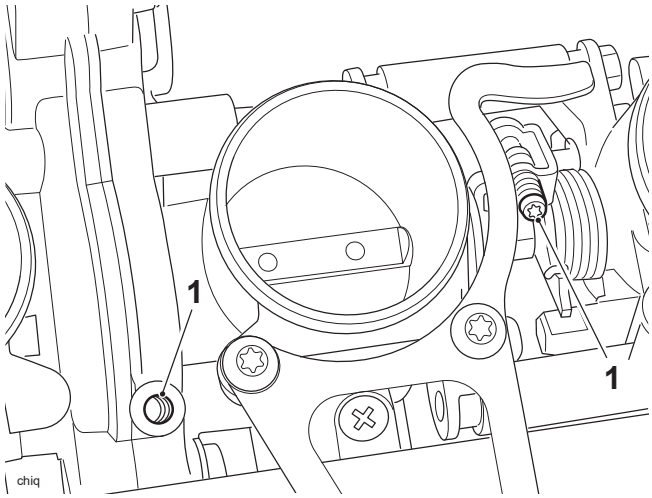
Total cleanliness must be observed at all times whilst the throttle balance blanking screw is removed, and adjustment must take place in a dirt/dust-free environment. Dirt or dust ingress to the throttle motor housing will cause the throttles to stick, leading to loss of motorcycle control and an accident.

7. Remove the Torx T30 blanking screw from the throttle control motor housing, located between cylinders one and two.



1. Throttle balance blanking screw

8. Using a suitable Torx T20 screwdriver adjust the throttle adjusters until the words 'THROTTLES BALANCED' appear on the diagnostic tool.



1. Adjusters

9. When balanced, stop the engine and disconnect the diagnostic tool.
10. Refit the Torx T30 blanking screw to the throttle control motor housing and tighten to **5 Nm**.
11. Disconnect the battery, negative (black) lead first.
12. Using proprietary professional automotive workshop equipment approved for fuel handling, drain any remaining fuel from the fuel tank.

- Refit the airbox (see Airbox - Installation).
- Refit the fuel tank (see Fuel Tank - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

Throttle Actuator Motor

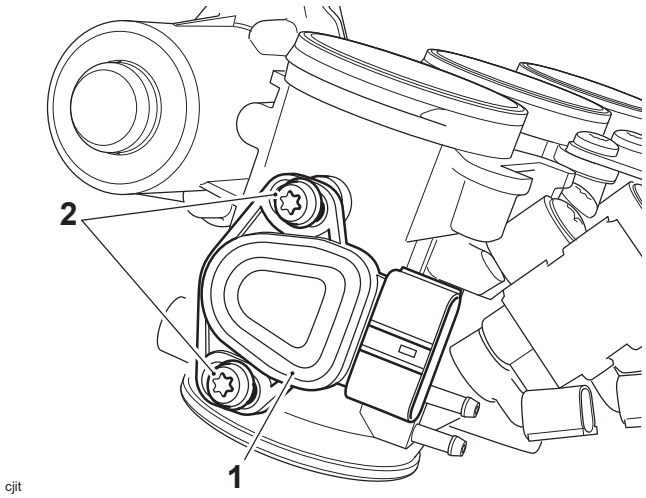
⚠ CAUTION

The fixings for the throttle position sensor must not be loosened or removed.

If the throttle position sensor fixings have been loosened or removed, the throttle body assembly must be replaced as there are no means to reset throttle position sensor to its correct position.

Note

- **If the throttle position sensor fixings have been loosened or removed, any warranty claims for the throttle bodies will be rejected.**



1. **Throttle position sensor**
2. **Fixings**

The throttle position sensor can not be removed, replaced or adjusted in service. If necessary, the throttle bodies and throttle position sensor must be replaced as an assembly.

Engine Management Adaption

The throttle actuator motor is an integral part of the throttle bodies and cannot be replaced separately.

Exhaust System - Removal

Note

- **After the engine management adaption has been reset on this model, the Cruise Control Switch Check Function Test must be performed (see Cruise Control Switch Check). After the adaptions have been reset, DTC 1575 (cruise control disabled until button press sequence completed) will be stored, and the cruise control disabled, until the function test is completed.**

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

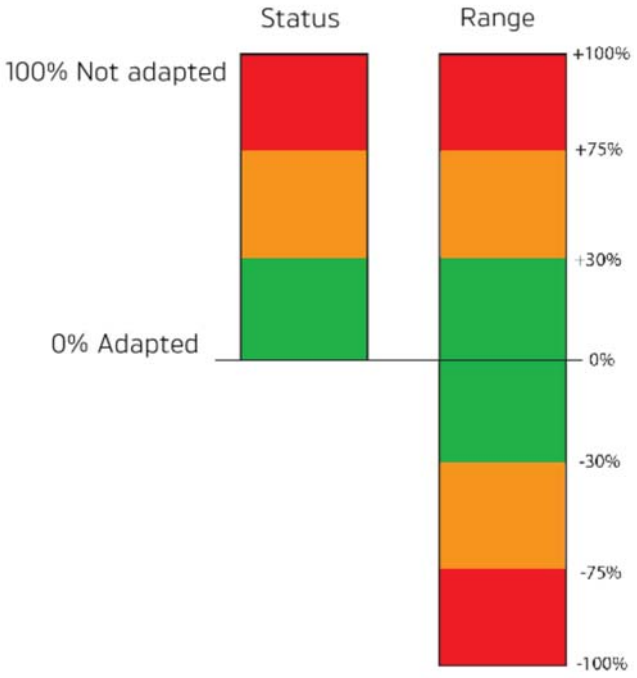
To see if a motorcycle has fully adapted, a facility named 'ADAPTION STATUS' is provided on the diagnostic tool. The following adaption details can be examined:

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 five 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 - Installation

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

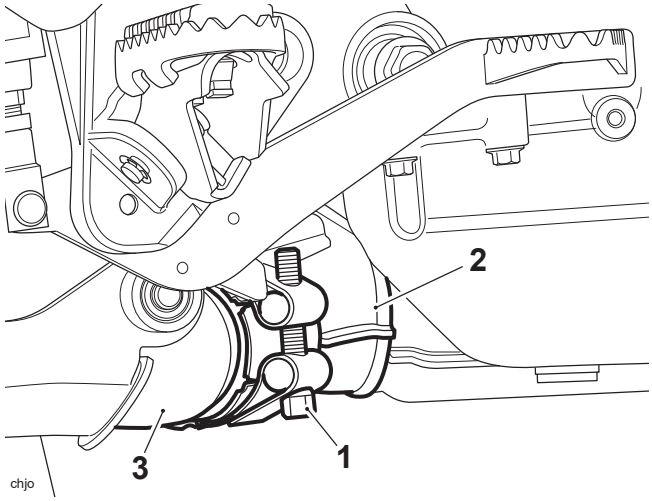
If the engine has recently been running, the exhaust components may be hot to the touch. Contact with the hot components may cause damage to exposed skin. To avoid skin damage, always allow the hot parts to cool before working on the exhaust system.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the sump guard (see Sump Guard - Removal).
- Remove the radiator (see Radiator - Removal).

Note

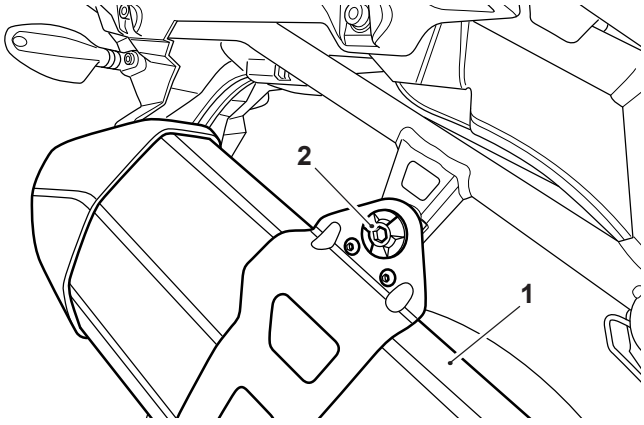
- **Note the position and orientation of the exhaust clamp for installation.**

1. Release the clamp securing the silencer to the intermediate pipe.



1. **Clamp fixing**
2. **Silencer**
3. **Header pipe**

2. Release the bolt securing the silencer to the frame.



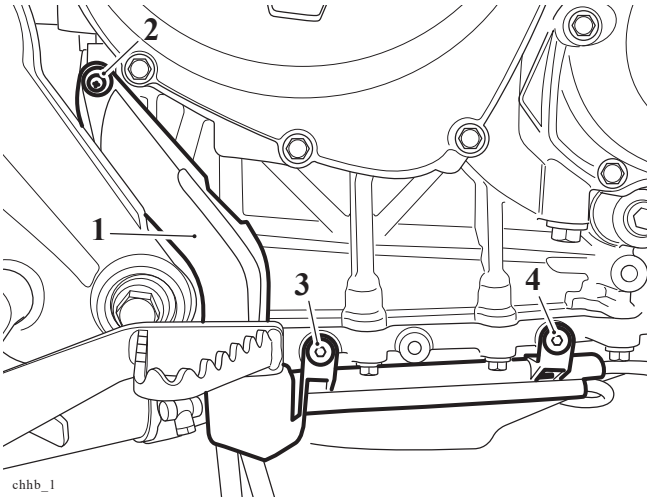
1. **Silencer**
2. **Bolt**

3. Remove the silencer and collect its gaskets.

Note

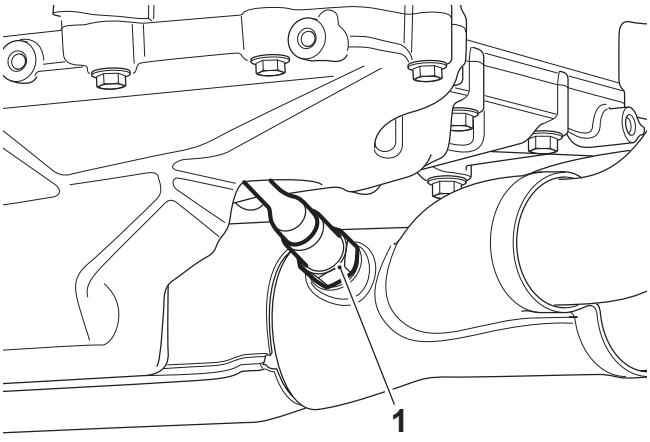
- **Note the routing of the harnesses and drain pipes for installation.**

4. Remove the scrivet, bolt(s) and fir tree clip (if fitted) and remove the harness guide from the right hand side of the engine. Discard the bolt(s) and fir tree clip.



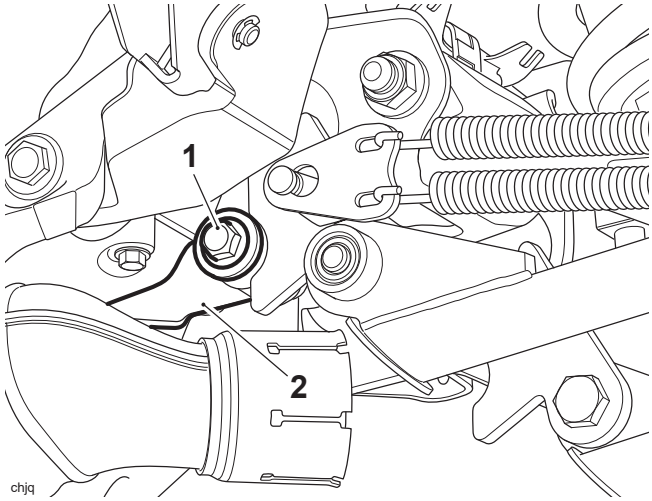
1. **Harness guide**
2. **Scrivet**
3. **Bolt**
4. **Bolt/fir tree clip**

5. Detach the oxygen sensor harness from the cable tidy.
6. Locate and disconnect the oxygen sensor multiplug and release it from the wiring harness.
7. Remove the oxygen sensor if necessary.



1. **Oxygen sensor**

8. Remove the bolt from the rear mounting point on the header pipe.



1. **Bolt**
2. **Header pipe**

9. Release the header pipe fixings at the cylinder head.
10. Detach the header pipe assembly and collect the seals from the cylinder head ports.

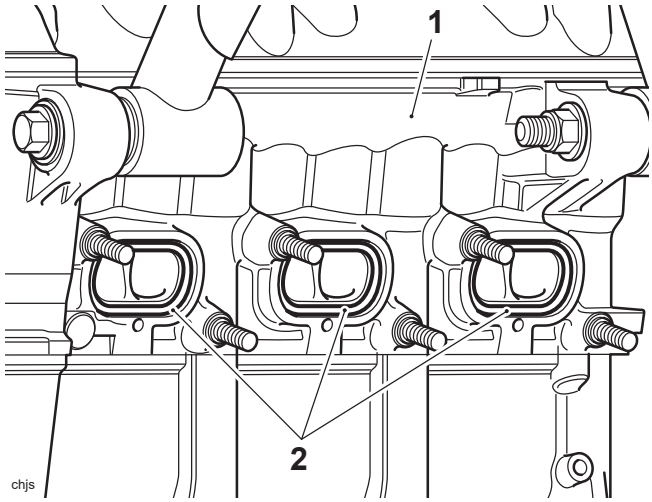
WARNING

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. Fit new seals to the cylinder head.

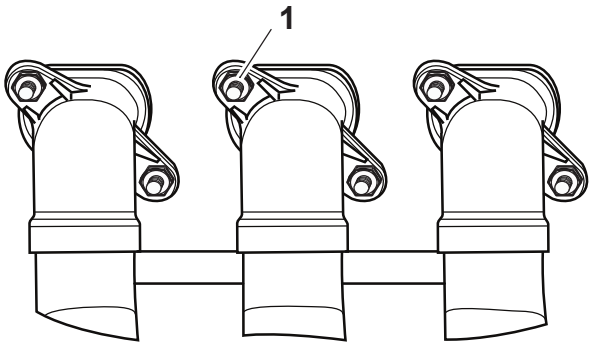
Note

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



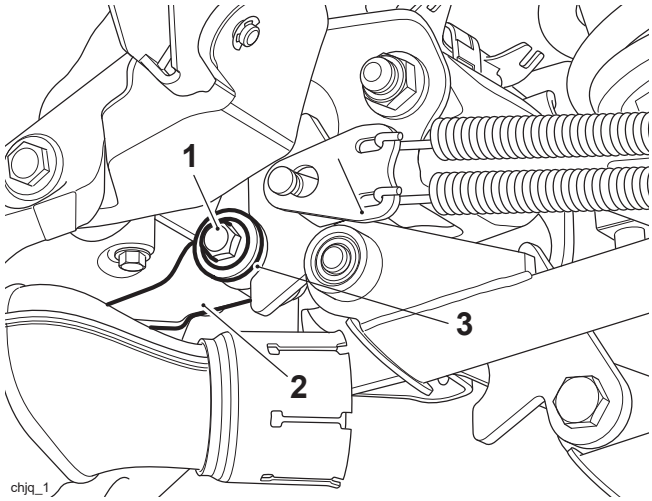
1. **Cylinder head**
2. **Seals**

2. Locate the header pipe and align the flanges to the cylinder head.
3. Fit the header pipe nuts loosely, then tighten the top centre nut hand tight to retain the header pipes in position.



1. **Top centre nut**

4. Fit the rear mounting point bolt such that it is positioned to the front of the mounting lug. Do not fully tighten at this stage.

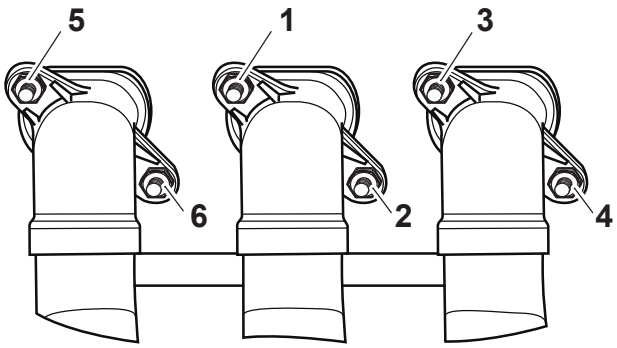


1. **Bolt**
2. **Header pipe**
3. **Mounting lug**

Note

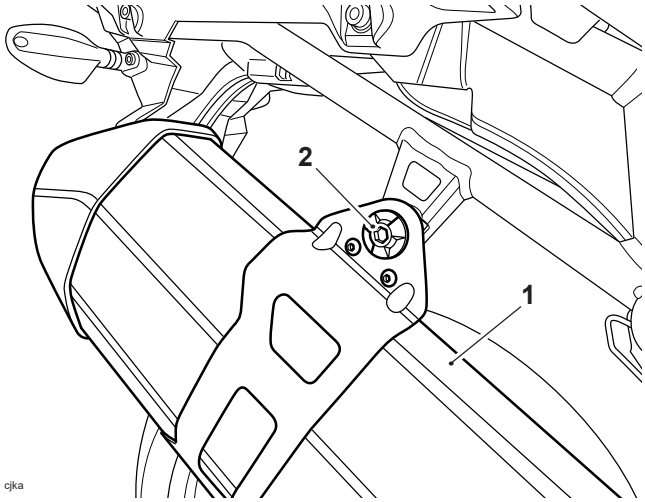
- **The header pipe nuts are tightened in stages in order to progressively and evenly compress the seals.**

5. Tighten the header pipe nuts in three stages as follows:
   - Stage 1 - Tighten the nuts to **6 Nm** in the sequence shown below.
   - Stage 2 - Tighten the nuts to **12 Nm** in the sequence shown below.
   - Stage 3 - Tighten the nuts to **15 Nm** in the sequence shown below.



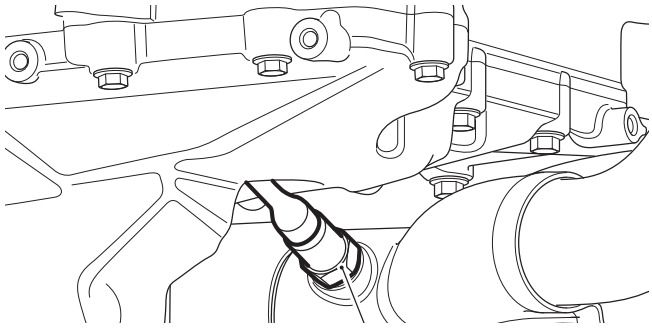
Exhaust to Cylinder Head Tightening Sequence

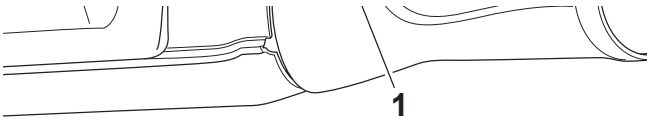
6. Ensure that the rear mounting point bolt is positioned to the front of the mounting lug, then tighten the bolt to **15 Nm**.
7. Check the condition of the exhaust gasket for the silencer, replace if necessary, and fit it to the header pipe.
8. Position the silencer clamp to the header pipe.
9. Engage the silencer to the header outlet, align its mounting to the frame and fit the mounting bolt. Do not fully tighten the bolt or the clamp at this stage.
10. Orientate the clamps for the silencer as noted for removal.
11. Tighten the silencer clamp to **10 Nm**.
12. Tighten the silencer mounting bolt to **30 Nm**.



1. **Silencer**
2. **Bolt**

13. Refit and tighten the oxygen sensor to **25 Nm**.





chjr

1. **Oxygen sensor**

14. Attach the harness for the oxygen sensor to the cable tidy for the sump as noted for removal.
15. Connect oxygen sensor electrical connector to the main harness.
16. Secure the cable tidy to the sump with its fixings and tighten the bolt(s) to **3 Nm**. Ensure that the routing of the harnesses and drain hoses are as noted for removal.

- Refit the radiator and refill the cooling system (see Radiator - Installation).
- Refit the sump guard (see Sump Guard - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

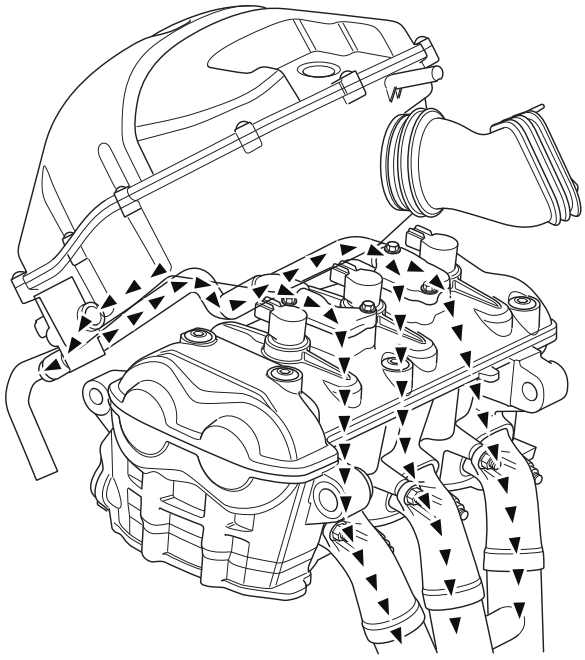
⚠ WARNING

Never start the engine or run the engine in a confined area. Exhaust fumes are poisonous and can cause loss of consciousness and death within a short period of time. Always operate your motorcycle in the open-air or in an area with adequate ventilation.

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

Secondary Air Injection

System Purpose and Operation



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

At certain specific engine speeds above idle (determined by the factory programming of the engine management system), the secondary air injection control valve is opened by the engine ECM and allows an air feed into the

secondary air system where, each time a pair of exhaust valves open, the exhaust gases in the exhaust port create a depression which causes reed valves in the secondary air injection system to open. When open, the depression in the exhaust port draws air from the control valve, through the open reed valves, into the exhaust port. This air promotes secondary combustion of the exhaust gases in the ports and the header system.

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

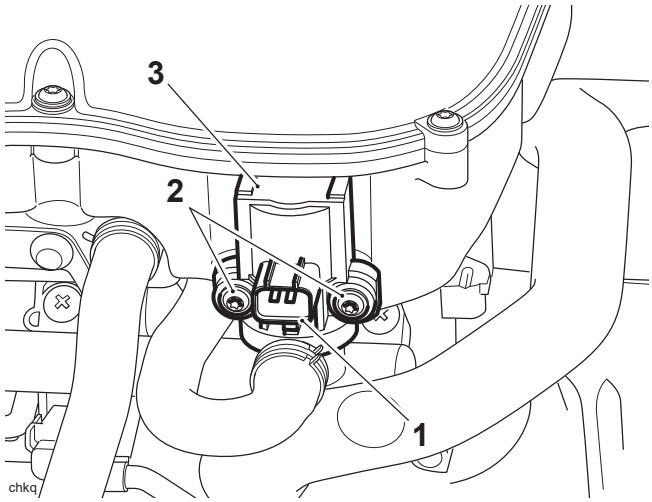
Secondary Air Injection Solenoid Valve - Removal

⚠ 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.

- Remove the rider’s seat (see Rider’s Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the fuel tank (see Fuel Tank - Removal).

1. Release the hose attached to the valve.
2. Disconnect the electrical connector, release the fixings and remove the valve.



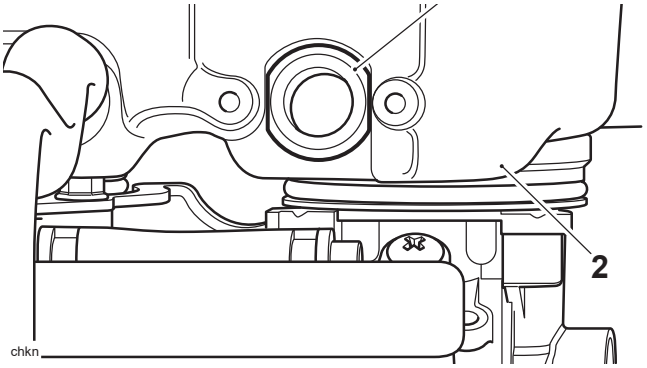
1. **Electrical connector**
2. **Fixings**
3. **Valve**

Secondary Air Injection Solenoid Valve - Installation

⚠ 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. Carefully fit the solenoid valve to the airbox, ensure that its seal remains fitted to the airbox.



1. **Seal**
2. **Airbox**

2. Fit the screws and tighten to **2 Nm**.
3. Reconnect the electrical connector and the hose to the valve.

- Refit the fuel tank (see Fuel Tank - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

Secondary Air Injection Reed Valves - Removal

⚠ WARNING

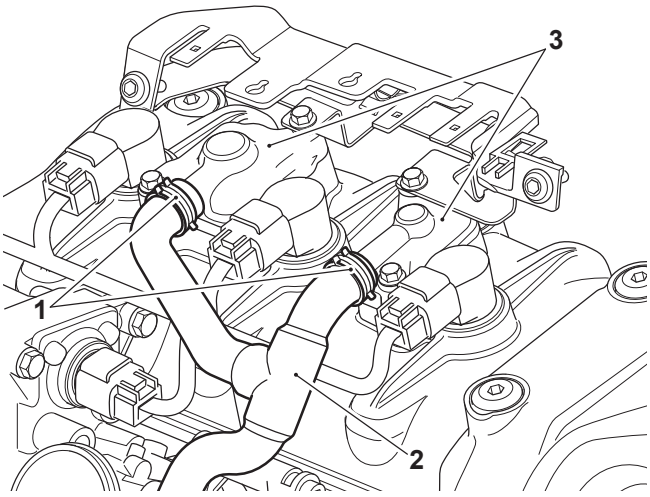
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the fuel tank (see Fuel Tank - Removal).
- Remove the airbox (see Airbox - Removal).

Note

- **Note the routing of the secondary air injection hoses for installation.**

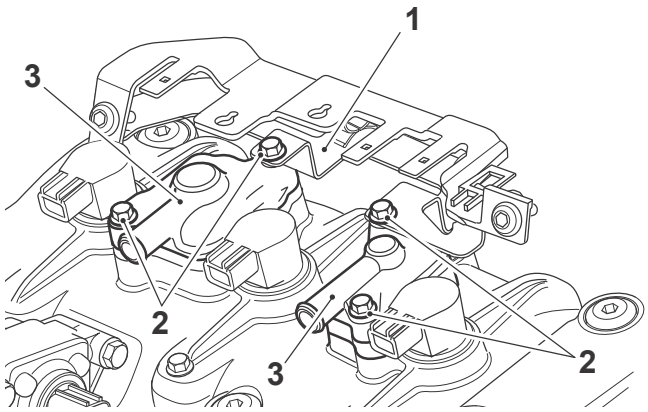
1. Detach the secondary air injection feed hoses from the reed valves on the camshaft cover.



1. **Spring-close clip**

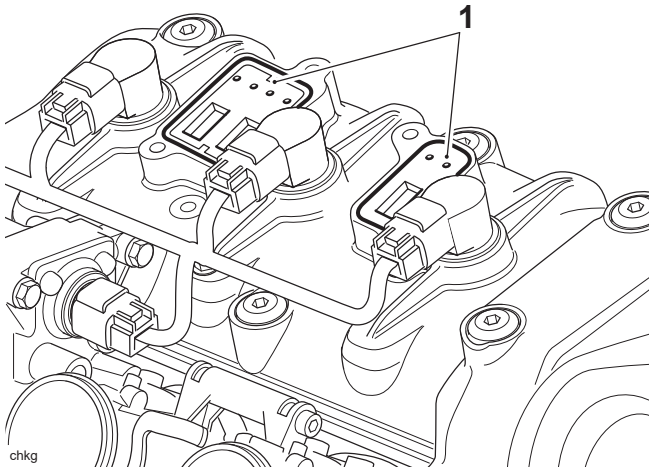
2. **Secondary air injection hose**
3. **Reed valve assemblies**

2. Note the position of the connector bracket and release the fixings securing the valve covers to the camshaft cover.



1. **Connector bracket**
2. **Fixings**
3. **Reed valve assemblies**

3. Ease the valve covers from the valves.
4. Note the orientation of the valves and remove them from the camshaft cover.



1. **Valves**

Secondary Air Injection Reed Valves - Inspection

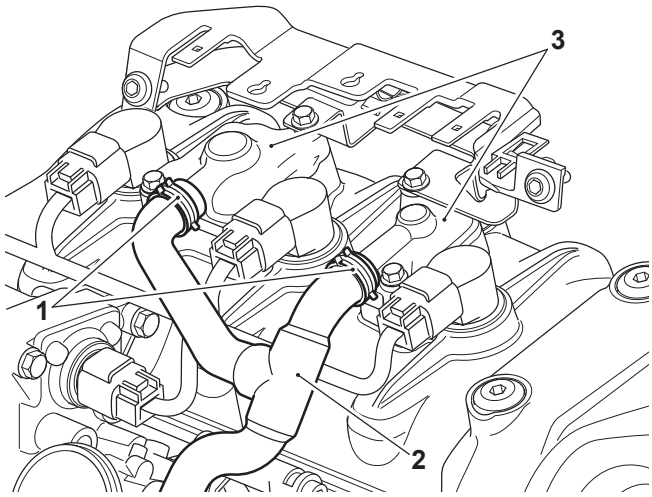
1. Check for cracks, bending or other damage to the valve flaps. Replace as necessary.
2. Check for damage to the seal areas. Replace as necessary.
3. Check the valve body to cylinder head seal for damage.

Secondary Air Injection Reed Valves - Installation

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. Fit the reed valves to the camshaft cover as noted for removal.
2. Refit the valve covers and the connector bracket as noted for removal. Tighten the fixings to **9 Nm**.
3. Refit the air hoses to the reed valves as noted for removal.



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

- Refit the airbox (see Airbox - Installation).
- Refit the fuel tank (see Fuel Tank - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

Evaporative Canister - Removal

WARNING

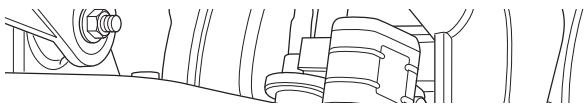
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

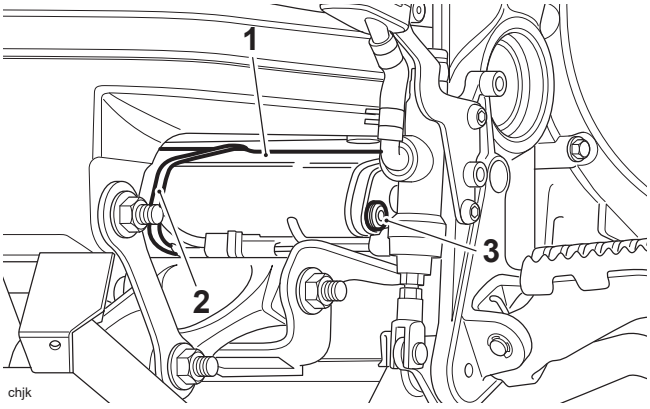
- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the exhaust silencer (see Exhaust System - Removal).
- Remove the rear suspension unit (see Rear Suspension Unit - Removal).

Note

- **Note the routing of the cable tie for installation.**

1. Cut the cable tie securing the canister to its bracket.
2. Remove the fixing from the right hand side of the canister.



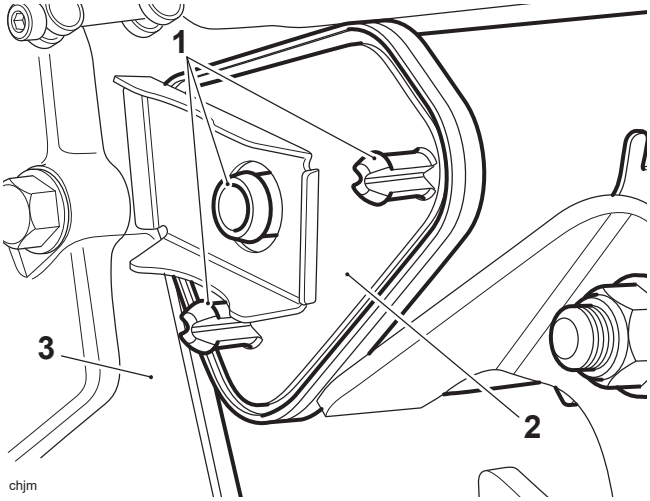


1. **Canister**
2. **Cable tie**
3. **Fixing**

Note

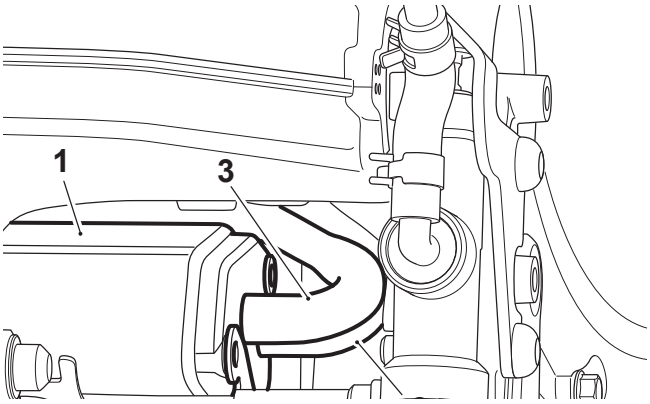
- **Note the orientation of the canister for installation.**

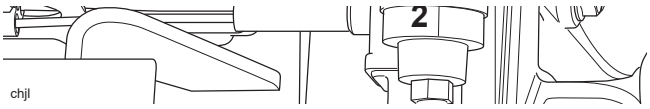
3. Slide the canister to the right to disengage its locating lugs from the frame.



1. **Lugs**
2. **Canister**
3. **Frame, left hand side**

4. Disconnect the vacuum and purge hoses from the canister.





1. **Canister**
2. **Vacuum hose**
3. **Purge hose**

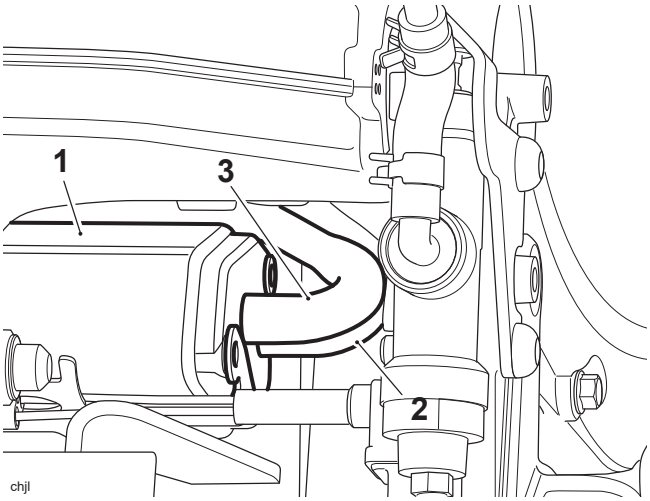
5. Remove the canister from the right hand side of the motorcycle.

Evaporative Canister - Installation

WARNING

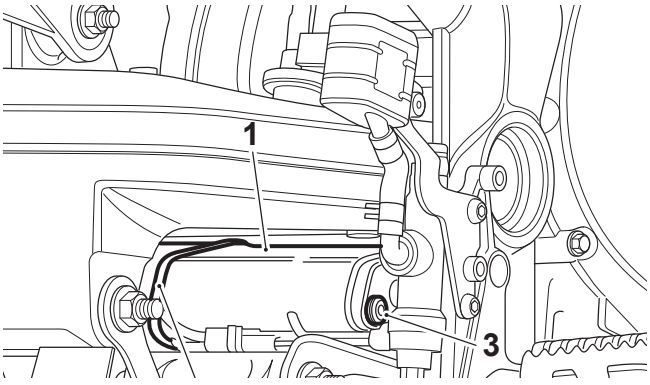
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

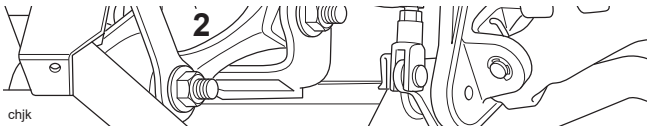
1. Fit the new cable ties to the mounting bracket for the canister, as noted at removal.
2. Refit the vacuum and purge hoses to the canister.



1. **Canister**
2. **Vacuum hose**
3. **Purge hose**

3. Fit the canister to its bracket in the orientation noted for removal. Ensure the locating lugs on the canister locate into their respective positions on the right hand frame.
4. Refit the fixing and tighten to **8 Nm**.





1. **Canister**
2. **Cable tie**
3. **Fixing**

5. Secure the canister in place with the cable tie and trim off any excess cable tie.

- Refit the rear suspension unit (see Rear Suspension Unit - Installation).
- Refit the exhaust silencer (see Exhaust System - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

Purge Control Valve - Removal

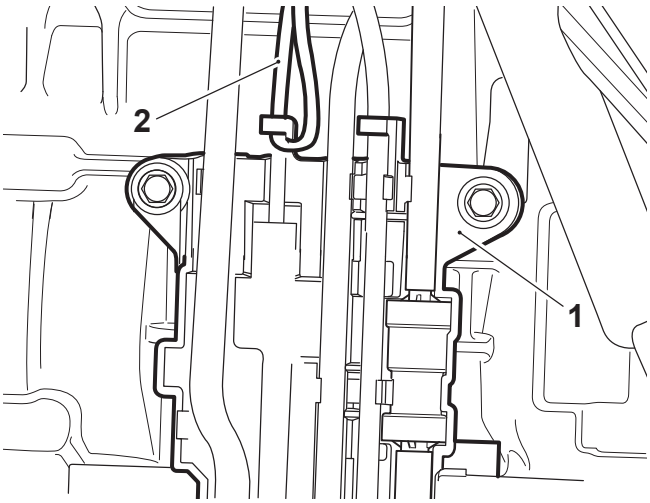
⚠ WARNING

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.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the fuel tank (see Fuel Tank - Removal).
- Disconnect the swinging arm position sensor push rod from the swinging arm and position aside.

Note

- **The electrical connector for the purge control valve is located above the crankcase tidy. Note the position of the electrical connector for installation.**
- **The main harness for the purge valve electrical connector is looped over the hook at the top of the crankcase tidy. Note the routing of the main harness for the purge valve electrical connector, and the purge valve fly lead for installation.**



1. **Crankcase tidy**
2. **Main harness to purge valve electrical connector**

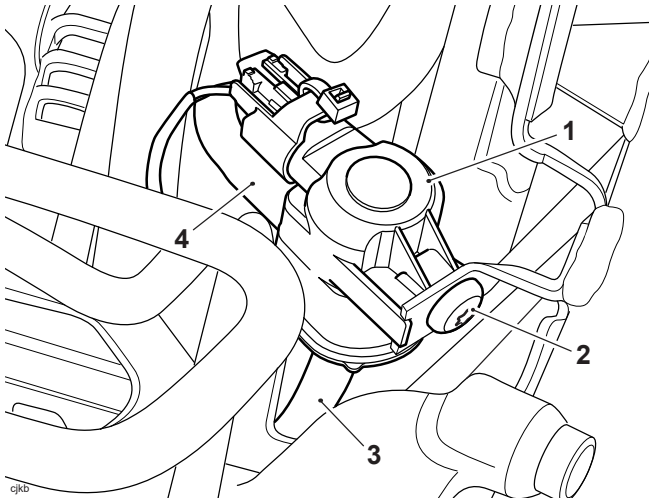
1. Carefully unhook the main harness for the purge valve electrical connector from the crankcase tidy.

2. Carefully feed the electrical connector and harness upwards and out from beneath the front edge of the battery tray. Press the wire locking device fully in and disconnect the electrical connector.
3. Release the fixing securing the purge control valve to the frame.

Note

- **Note the position of the purge control valve hoses for installation.**

4. Disconnect the hoses and remove the purge control valve from the motorcycle.



1. **Purge control valve**
2. **Fixing**
3. **Hose to throttle bodies**
4. **Hose to evaporative canister**

Purge Control Valve - Installation

⚠ 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. Reconnect the purge control valve electrical connector. Route the connector and main harness and position to the crankcase tidy as noted during removal.
2. Reconnect the hoses to the purge control valve as noted during removal.
3. Fit the purge control valve to the frame and tighten the fixing to **3 Nm**.

- Apply a smear of proprietary general purpose grease to NLGI 2 standard to the ball stud and reconnect the swinging arm position sensor linkage to the swinging arm.
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).
- Calibrate the rear suspension unit preload motor (see Rear Suspension Unit Preload Motor Calibration).
- Calibrate the swinging arm position sensor (see Swinging Arm Position Sensor - Calibration).

Evaporative Emissions Control System

Evaporative Emissions Control System - Engine Off

All Explorer models are fitted with a system to control the evaporation of fuel vapour to the atmosphere.

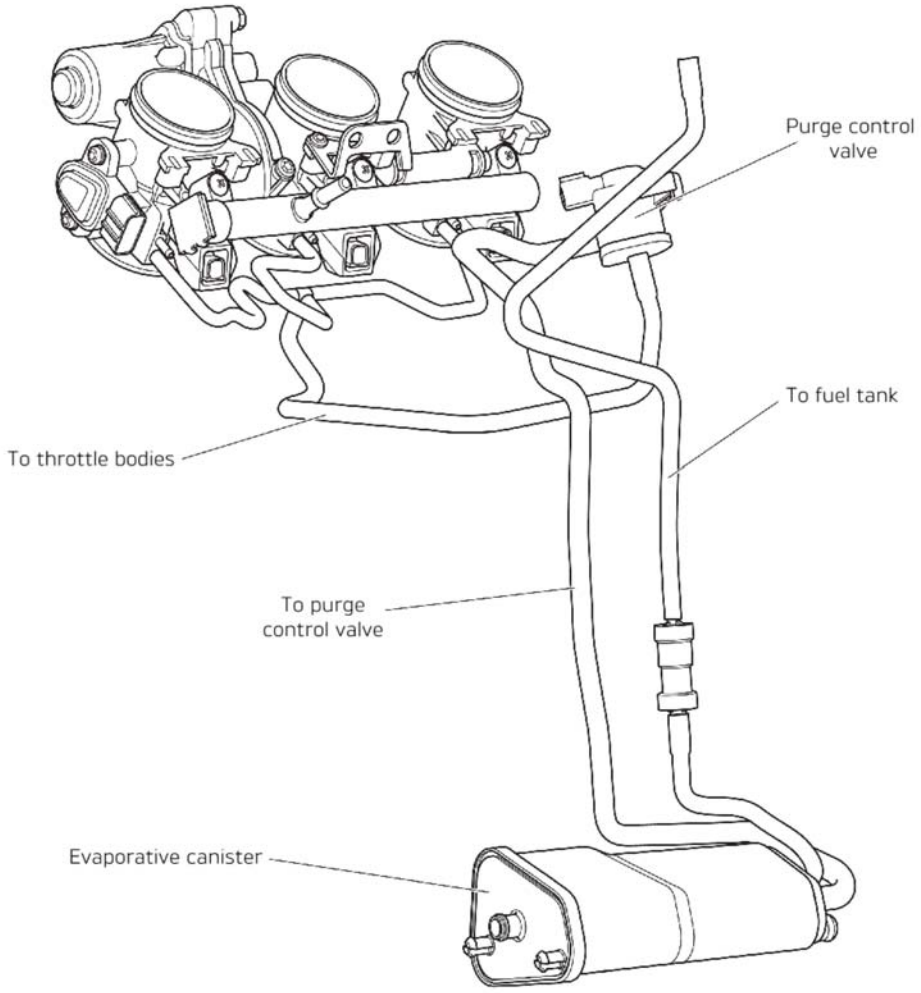
A carbon filled evaporative canister absorbs vapour while the engine is not running. When the engine is started, the vapour is returned to the engine and burnt.

There are two distinct phases to the system's operation, engine off and engine running. See Evaporative Emissions Control System - Engine Off and Evaporative Emissions Control System - Engine Running.

Component Locations

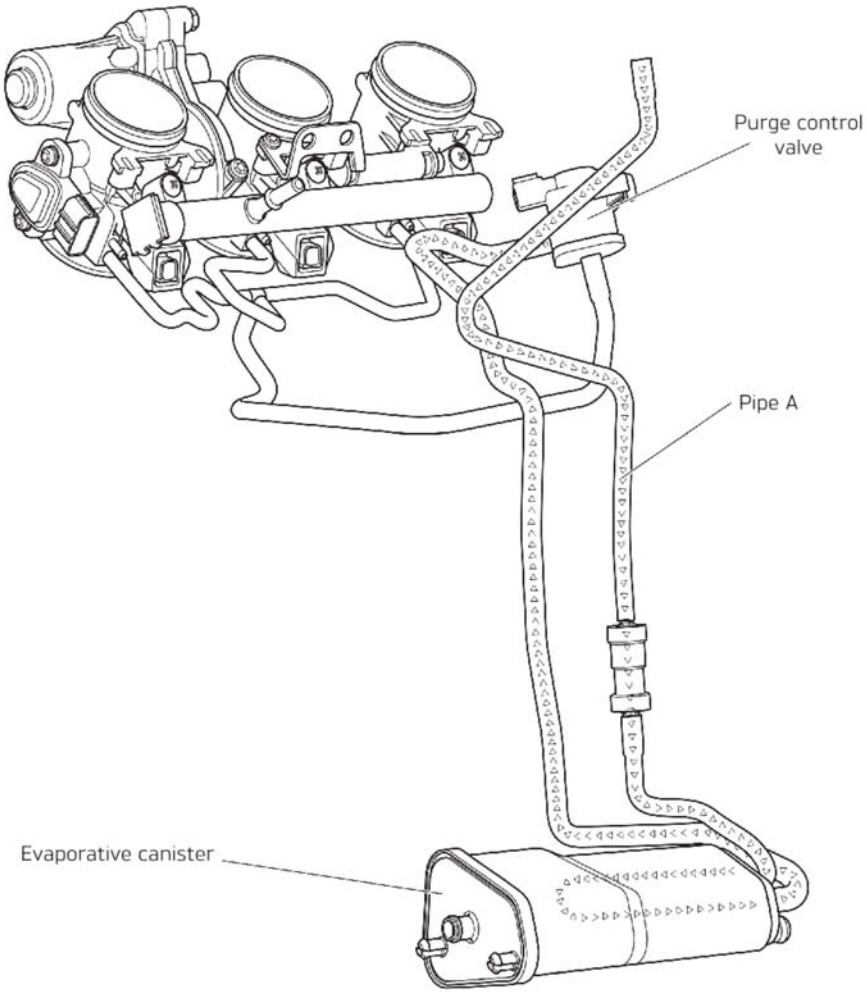
Carbon Canister - on the frame above the centre stand.

Purge Control Valve - (electronically controlled by the Engine ECM) mounted beneath the fuel tank, to the right hand side of the frame.



When the engine is stationary any pressure increase in the fuel tank due to a rise in ambient temperature will cause the fuel vapour to pass down the breather pipe A to a carbon filled evaporative canister which stores the vapour.

Once in the canister, vapour cannot return to the fuel tank because the purge valve is closed.



Evaporative Emissions Control System - Engine Running

Cooling

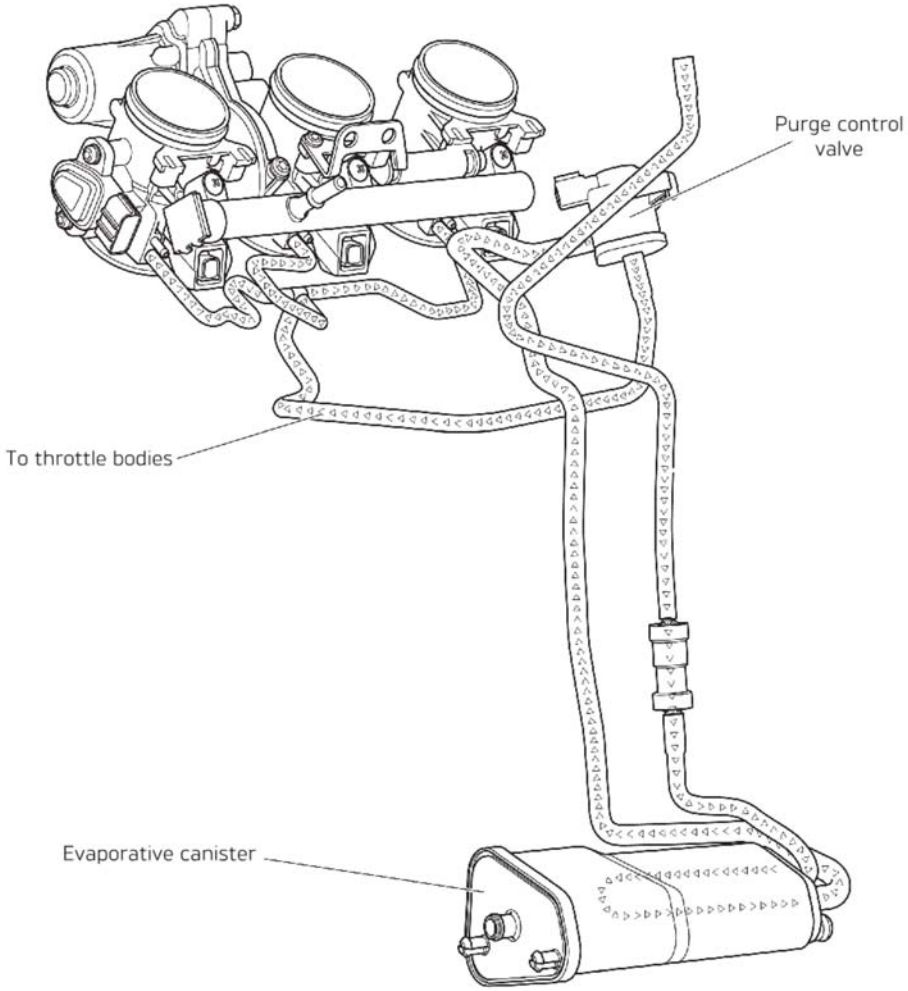
Exploded View – Cooling System

Evaporative Control System – Engine Running

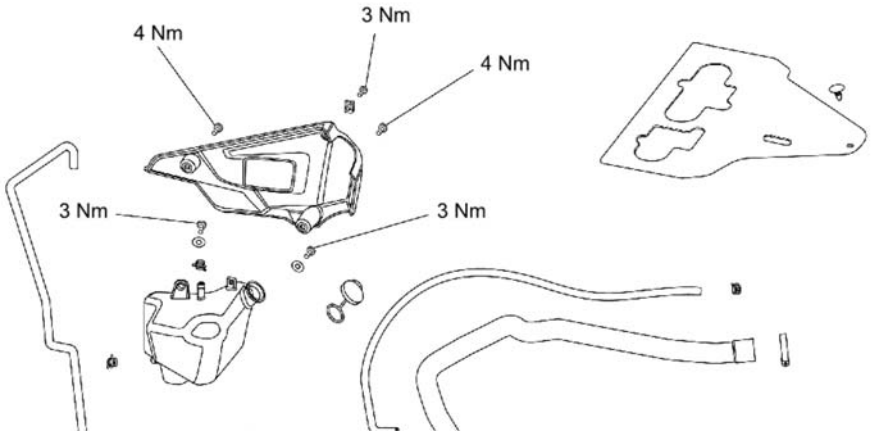
When the engine is started, a vacuum is applied to the purge hose from the throttle bodies.

At certain times, the Engine ECM opens the purge valve. The vacuum applied to the purge valve now begins to draw stored vapour from the carbon filled evaporative canister and returns it to the throttle bodies for burning in the engine.

In order to control the speed at which vapour is purged from the canister, the engine management system regularly shuttles the purge control valve between open and closed positions.


Purge control valve
To throttle bodies
Evaporative canister

Coolant


4 Nm
3 Nm
4 Nm
3 Nm
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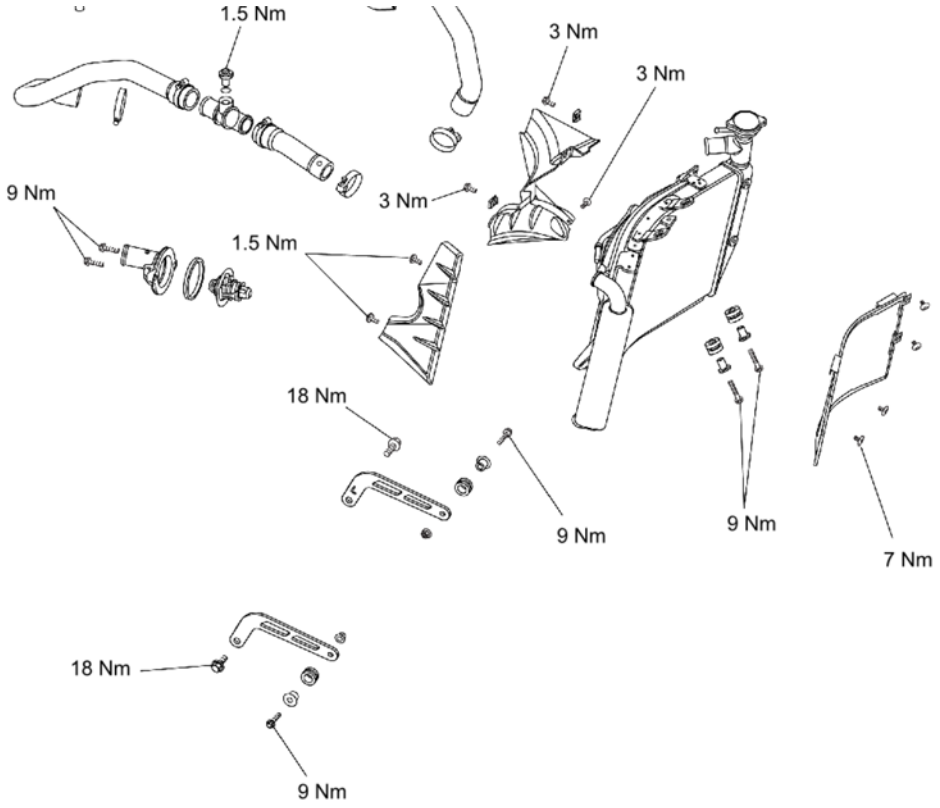


Radiator Hoses

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 antifreeze or any of the coolant mixture.

⚠ CAUTION

The antifreeze 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 antifreeze listed in the Specification section and never use a methanol based antifreeze as this does not contain the required corrosion inhibition properties.

Note

- **HD4X Hybrid OAT coolant, as supplied by Triumph, is premixed and does not need to be diluted prior to filling or topping up the cooling system.**

⚠ CAUTION

If hard water is used in the cooling system, it will cause scale accumulation in the engine and radiator and considerably reduce the efficiency of the cooling system. Reduced cooling system efficiency may cause the

CAUTION

engine to overheat and suffer severe damage.

Check the radiator hoses for cracks or deterioration, and hose clamps for tightness in accordance with scheduled maintenance requirements.

Radiator and Cooling Fan Inspection

Radiator

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.

1. Check the radiator for stone damage.
2. Check the radiator core for damage to fins or obstructions to air flow.
3. Clean off any obstructions with a stream of low-pressure water.

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. Rectify any damage.

Cooling Fan

WARNING

The cooling fan is turned on or off by the chassis ECM, in response to a request sent by the engine ECM. The request from the engine ECM to turn the cooling fan on or off, is sent to the chassis ECM in response to a signal received from the coolant temperature sensor.

To prevent injury, never place loose clothing, fingers or hands near the cooling fan, until the engine is stopped. Loose clothing, fingers or the hands could become trapped during cooling fan operation and cause crushing injury to the fingers, hands or other parts of the anatomy.

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.

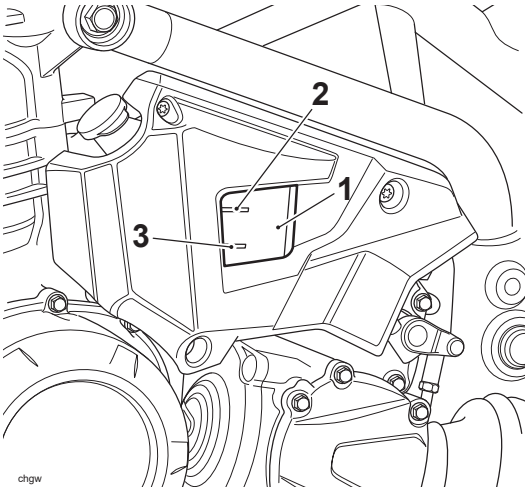
1. Check that the cooling fan spins freely and without tight spots.
2. Check the cooling fan blades for signs of heat distortion.
3. Rectify as necessary.

Coolant Level Inspection

WARNING

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

1. Position the motorcycle on level ground and in an upright position.
2. The coolant level within the expansion tank can be inspected on the left hand side of the motorcycle without removing any covers.
3. Check the coolant level in the expansion tank. The coolant level must be between the MAX and MIN level marks moulded into the expansion tank cover. If the coolant is below the minimum level, the coolant level must be adjusted.



1. **Expansion tank**
2. **MAX mark**
3. **MIN mark**

CAUTION

If the coolant level is found to be low, or if coolant has to be added regularly, inspect the cooling system for coolant leaks. If necessary, pressure test the system to locate the source of the leak and rectify as necessary. Loss of coolant may cause the engine to overheat and suffer severe damage.

Coolant Level Adjustment

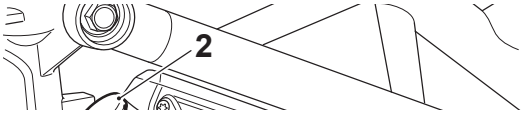
WARNING

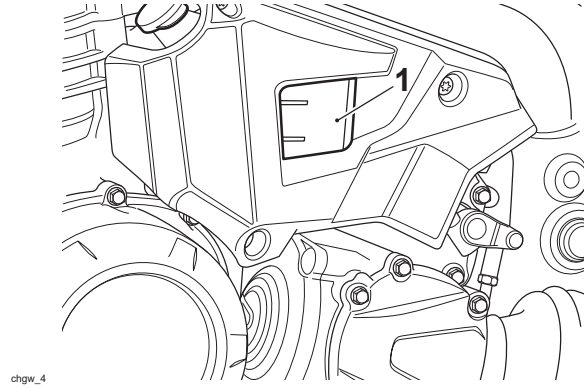
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

WARNING

Do not remove the 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.

1. Allow the engine to cool.
2. The coolant within the expansion tank can be topped up on the left hand side of the motorcycle without removing any covers.
3. Remove the cap from the expansion tank and add coolant mixture through the filler opening until the level reaches the MAX mark on the expansion tank cover.





1. **Expansion tank**
2. **Expansion tank cap**

4. 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.**

⚠ CAUTION

If hard water is used in the cooling system, it will cause scale accumulation in the engine and radiator and will considerably reduce the efficiency of the cooling system. Reduced cooling system efficiency may cause the engine to overheat and suffer severe damage.

Coolant Replacement

⚠ 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 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.

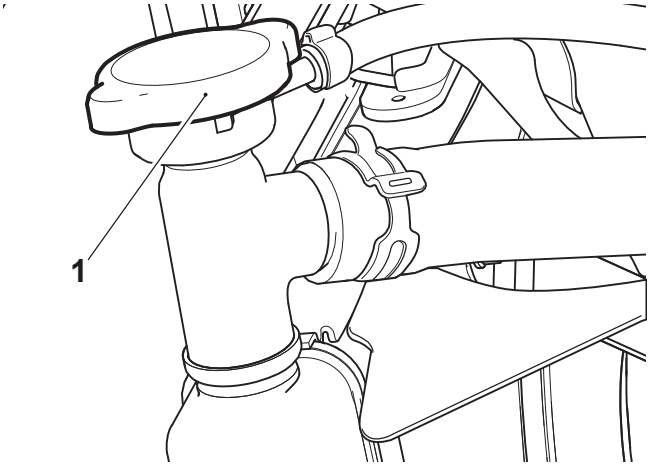
- Remove the rider’s seat (see Rider’s Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the fuel tank (see Fuel Tank - Removal).

Drainage

Note

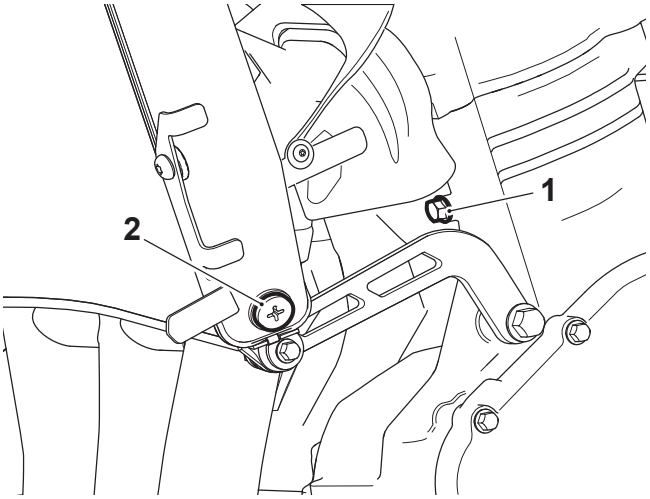
- **Prior to disassembly of the coolant hoses, note the orientation and position of the hose clips to help ensure that they are returned to the same positions and orientation on assembly.**

1. Remove the coolant pressure cap on the radiator.



1. **Coolant pressure cap**

2. Position a container to collect the displaced coolant.
3. Remove the drain screw located on the left hand side of the radiator and allow the coolant to drain.
4. To drain the crankcase, remove the drain screw shown in the illustration below. Discard the washer.



1. **Crankcase coolant drain screw**
2. **Radiator coolant drain screw**

Note

- **It is not possible to completely drain all of the coolant, a small amount may remain in the water pump or heat exchanger.**

Filling

⚠ CAUTION

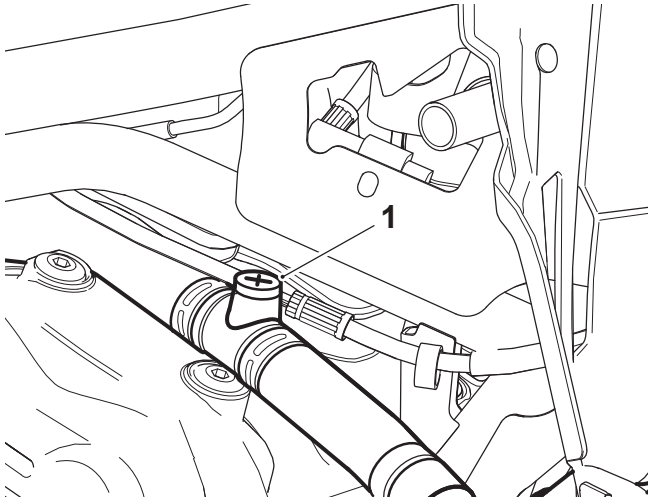
Filling the cooling system with the motorcycle positioned on the centre stand will cause an airlock, reducing the cooling system efficiency

Always place the motorcycle on the side stand when filling the cooling system.

Reduced cooling system efficiency may cause the engine to overheat and suffer severe damage.

1. Refit the radiator drain screw and tighten to **1.5 Nm**.

2. Fit a new washer to the drain screw and refit to the crankcase. Tighten to **8 Nm**.
3. Remove the bleed screw from the right hand hose.



1. Bleed screw

4. With the motorcycle positioned on its side stand, slowly add coolant mixture to the system, through the filler opening in the radiator, until the system is full.
5. If the system has filled correctly and fully, there should be coolant visible through the:
   - Right hand hose bleed screw opening
   - Radiator filler opening.
6. If there is no coolant visible through the right hand hose bleed screw opening, but the filler side appears to be full, attach a length of clear tubing to the bleed screw spigot and syphon coolant into the bleed screw side of the radiator.

Note

- **A hand-operated vacuum pump or similar should be used to syphon the coolant through the system.**

7. If necessary, top up the system through the filler and refit the pressure cap.
8. Install the right hand hose bleed screw and tighten to **1.5 Nm**.
9. With the aid of an assistant, lean the motorcycle fully over to the right hand side, and then the left hand side, to release air trapped in the cooling system.
10. Remove the radiator cap and top up the coolant.
11. Refit the cap and repeat as necessary.
12. Reconnect the battery, positive (red) lead first.

⚠ WARNING

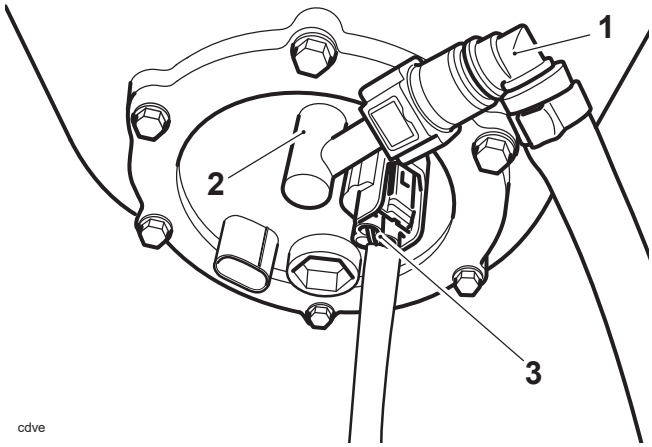
Observe the fuel handling precautions given in the General Information section.

13. Place the fuel tank on a suitable support, close to the motorcycle.
14. Using T3880123 - Extension Cable, carefully connect the fuel pump connection to the fuel tank. Connect the other end of the extension cable to the motorcycle main harness.
15. Select the fuel pressure gauge adapter marked 'B' from T3880001 - Fuel Pressure Gauge.

⚠ WARNING

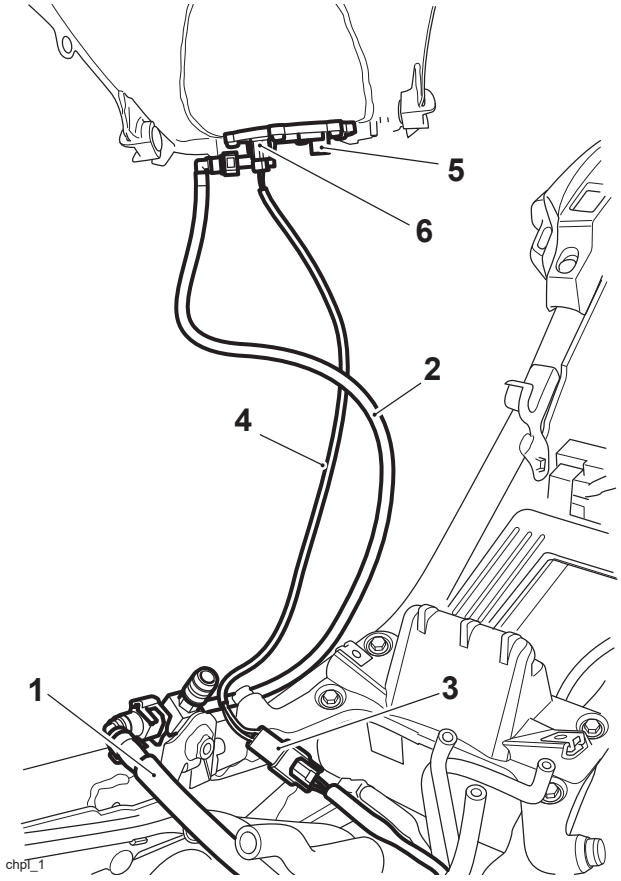
Always use the correct fuel pressure gauge adapter **(adapter 'B' for Explorer models)**. Use of an incorrect adapter will result in a fuel leak. A fuel leak can result in a fire causing damage to property and injury to persons.

16. Connect the adapter hose to the fuel pump plate outlet as shown in the illustration below.



1. **Adaptor hose 'B'**
2. **Fuel pump plate outlet**
3. **T3880123 - Extension Cable**

17. Connect the fuel hose to the adaptor hose as shown in the illustration below.



1. **Motorcycle fuel hose**
2. **Adaptor hose 'B'**
3. **Fuel pump connection**
4. **T3880123 - Extension Cable**

5. **Fuel pump connection**
6. **Fuel pump plate outlet**

18. Start the motorcycle and allow to run for approximately 20 to 30 seconds. Briefly raise the engine speed several times to allow any air to be expelled from the system.
19. Stop the engine. Remove the radiator cap and check and top up the coolant level as necessary.
20. Refit the radiator cap.
21. Disconnect the fuel tank adaptor hose and extension harness.
22. With the aid of an assistant, lean the motorcycle fully over to the right hand side, and then the left hand side, to release air trapped in the cooling system.
23. Refit the fuel tank (see Fuel Tank - Installation).
24. Start the motorcycle. Briefly raise the engine speed several times to allow any air to be expelled from the system.
25. Allow the engine to run until the cooling fan operates.
26. Stop the motorcycle and allow the engine to cool.

⚠ WARNING

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

27. Check the expansion tank level and top up if necessary (see Coolant Level Adjustment).
28. Refit the rider's seat (see Rider's Seat - Installation).

Water Pump

Note

- **The oil pump and water pump are supplied as an assembly and cannot be separated. For additional information, refer to Oil Pump (see Oil Pump - Removal for removal and Oil Pump - Installation for installation).**

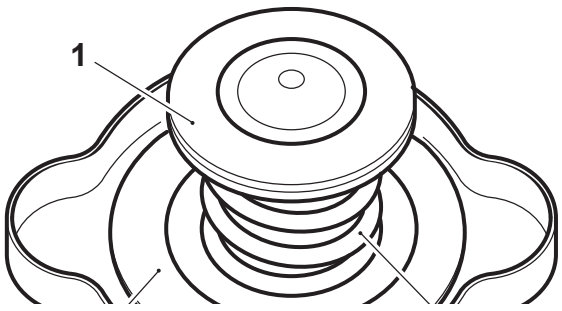
Coolant Pressure Cap and Coolant System Testing

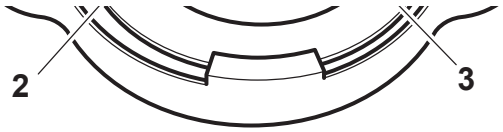
⚠ WARNING

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.

Inspection and Testing

1. Allow the engine temperature to cool for at least 30 minutes.
2. Remove the coolant pressure cap.
3. Check the condition of the upper and lower seals of the coolant pressure cap.





cdbu

1. **Lower seal**
2. **Upper seal**
3. **Spring**

Note

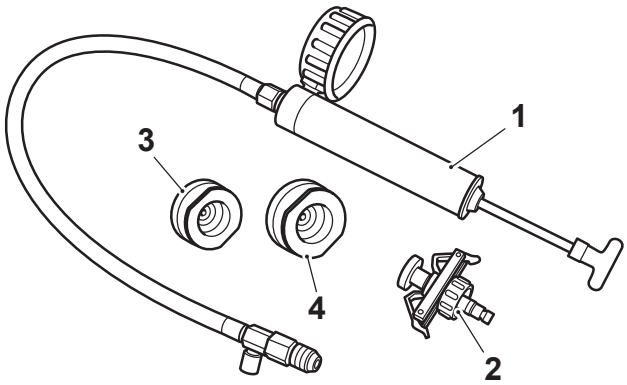
- **If there is any sign of damage or deterioration replace the cap.**

4. Pressure test the cap and cooling system to the blow off pressure of 1.1 bar as described below using T3880147 - Radiator and Cap Tester Kit. If the cap opens at a lower pressure or fails to open at 1.1 bar, replace the cap.

Note

- **It is recommended to carry out coolant pressure cap and cooling system pressure tests consecutively.**

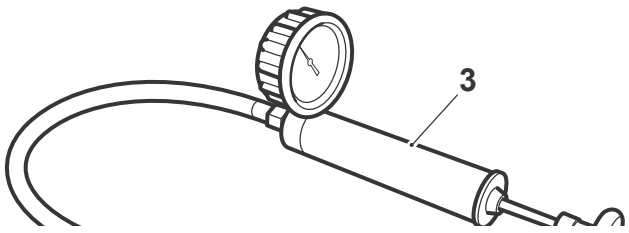
Coolant Pressure Cap Test

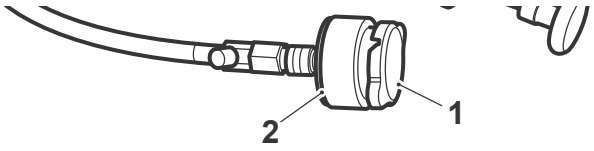


cgwp

1. **Hand held pump**
2. **Bayonet type connector**
3. **Pressure cap test adaptor, 44 mm**
4. **Pressure cap test adaptor, 46 mm**

1. Select the correct test adaptor and securely fasten to the pressure cap.
2. Carefully connect the hand pump to the adaptor ensuring an air tight seal is maintained.





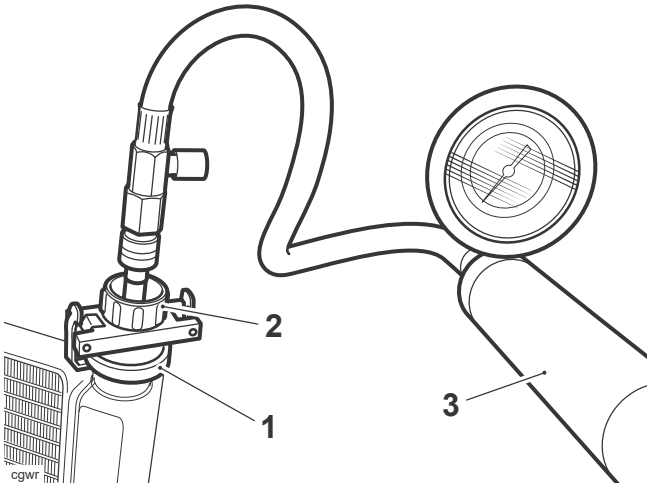
cgwq

1. **Pressure cap**
2. **Test adaptor**
3. **Hand held pump**

3. Pressure test the coolant cap to the blow off pressure. If the coolant cap opens at a lower pressure, fails to open at the correct pressure or the seal leaks, replace the cap.

Coolant System Pressure Test

1. Select the bayonet type adaptor and securely fasten to the radiator.
2. Carefully connect the hand pump to the bayonet connector ensuring an air tight seal is maintained.



cgwr

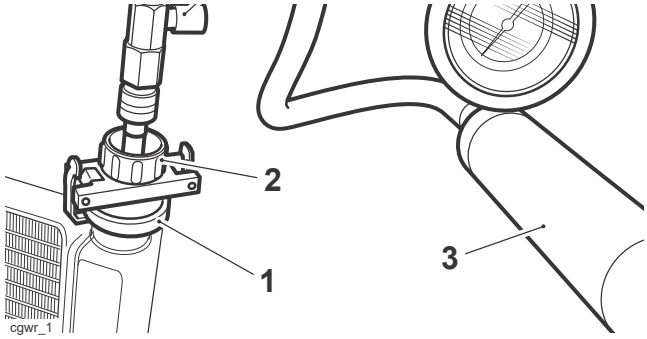
1. **Radiator filler**
2. **Bayonet type connector**
3. **Hand held pump**

3. Pressurise the cooling system to the operating pressure, using the hand pump taking care not to exceed the maximum cap pressure.
4. Hold the pressure for a minimum of 10 minutes, whilst visually inspecting the external components of the coolant system for leaks.
5. Remove the engine oil filler cap/dipstick and check for contamination of the engine oil caused by coolant escaping into the engine sump.

Note

- **If the engine oil is contaminated further exploratory investigation will be required.**
- **If the engine oil is contaminated rectify the cause of the problem and then renew the oil and filter.**

6. Depressurise the coolant test kit using the pressure release valve.



1. **Radiator filler**
2. **Bayonet type connector**
3. **Hand held pump**
4. **Pressure release valve**

7. Refit the coolant cap.
8. Fill the coolant to the maximum mark (see Coolant Level Adjustment).

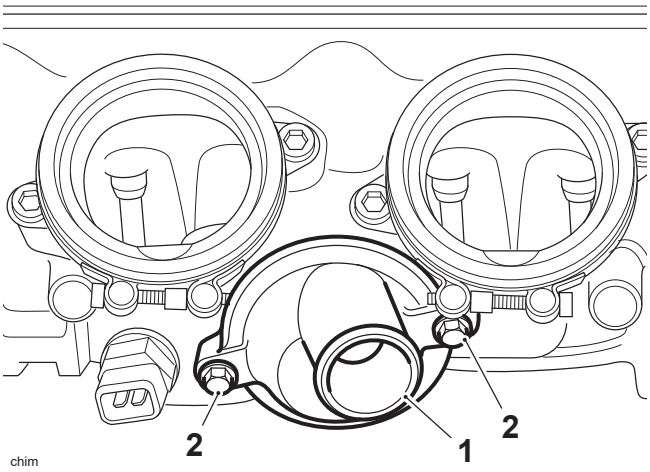
Thermostat - Removal

⚠ 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.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Drain the coolant (see Coolant Replacement).
- Remove the throttle bodies (see Throttle Bodies/Injectors - Removal).

1. Detach the top hose from the thermostat elbow.
2. Release the fixings securing the thermostat housing to the cylinder head.
3. Remove the thermostat housing.



1. **Thermostat housing**
2. **Fixings**

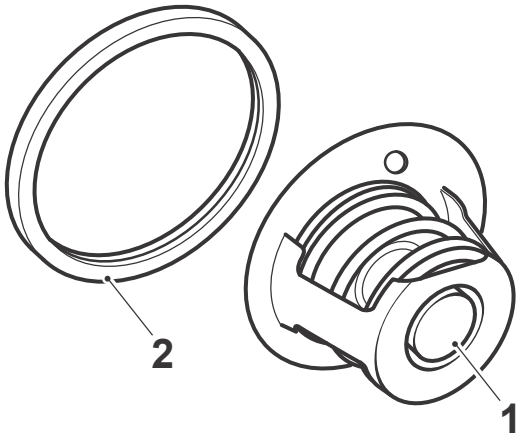
4. Remove the thermostat from the cylinder head. Discard the seal.

Thermostat - Inspection

1. Inspect the thermostat at room temperature. If the valve is open, the thermostat must be replaced.
2. To check the valve opening temperature, suspend the thermostat in a container of water and raise the temperature of the water until the thermostat opens. The thermostat should start to open at 88°C +/-5°C.
3. If the temperature at which thermostat opening takes place is incorrect, replace the thermostat.

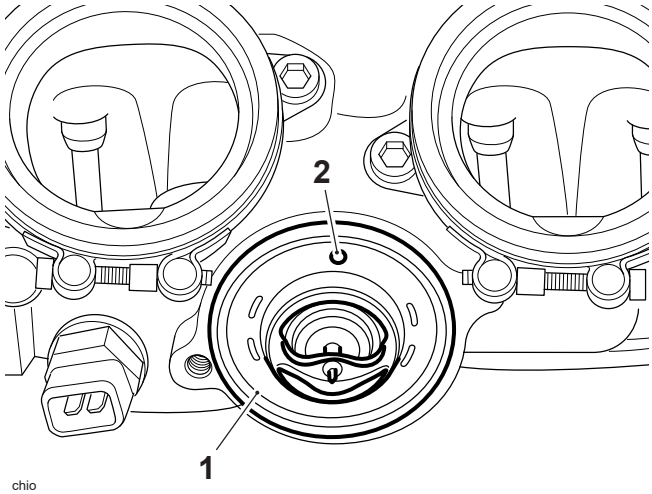
Thermostat - Installation

1. Fit a new seal to the thermostat.



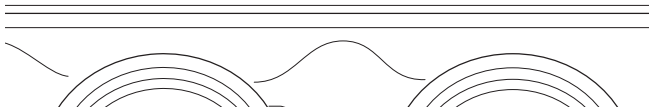
1. **Thermostat**
2. **Seal**

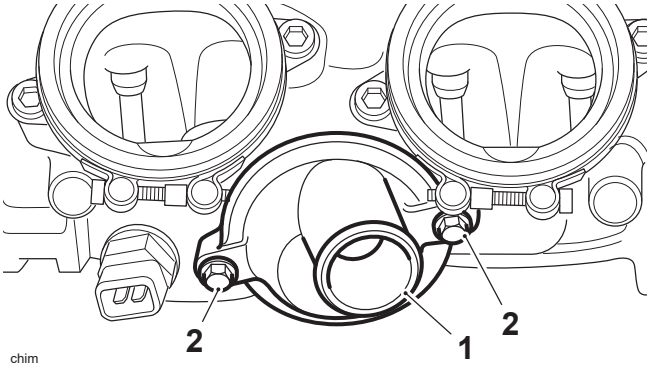
2. Locate the thermostat into the cylinder head, with the bleed hole uppermost.



1. **Thermostat**
2. **Bleed hole**

3. Refit the thermostat housing and secure with the two fixings.





1. **Thermostat housing**
2. **Fixings**

4. Tighten the fixings to **9 Nm**.
5. Reconnect the top hose and refit the hose clip using T3880207 - Pliers, Hose Clip.

- Refit the throttle bodies (see Throttle Bodies/Injectors - Installation).
- Refill the cooling system (see Coolant Replacement).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

Radiator - Removal

Radiator - Inspection

⚠ WARNING

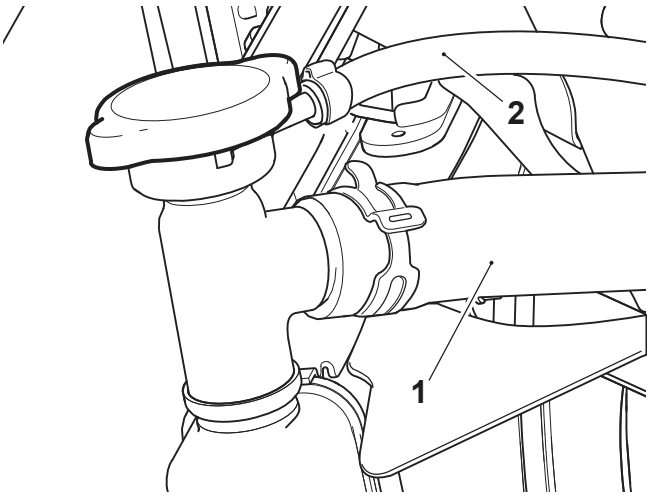
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the fuel tank (see Fuel Tank - Removal).
- Drain the coolant (see Coolant Replacement).

Note

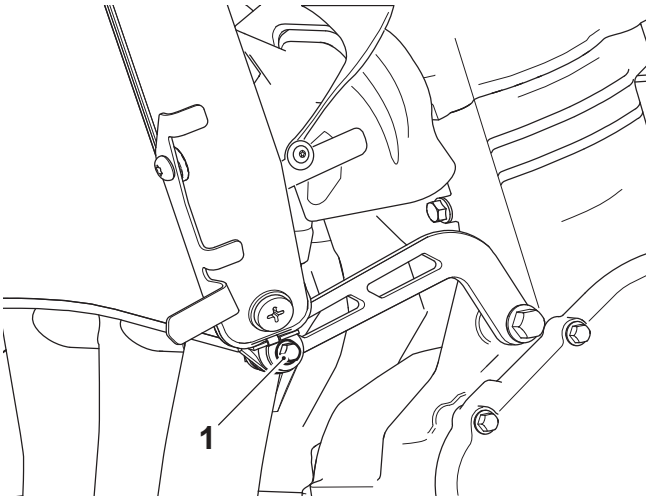
- **Note the orientation of the clips for installation.**

1. Disconnect the expansion tank, right hand and left hand hoses at the radiator.



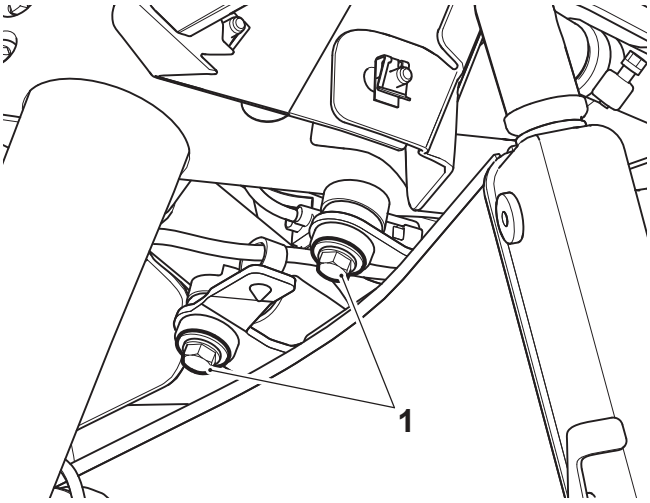
1. **Left hand hose**
2. **Expansion tank hose**

2. Remove the two fixings securing the radiator to the lower radiator brackets.



1. **Fixing (left hand shown)**

3. Remove the air deflector firtree clip.
4. Release the two upper bolts securing the radiator to the frame.



1. **Fixings**

5. Lower the radiator and disconnect the cooling fan connection, located below the headstock.
6. Remove the radiator.

Radiator - Installation

1. Check the radiator for stone damage.
2. Check the radiator core for damage to fins or obstructions to air flow.
3. Repair any damage and clear all obstructions.

⚠ CAUTION

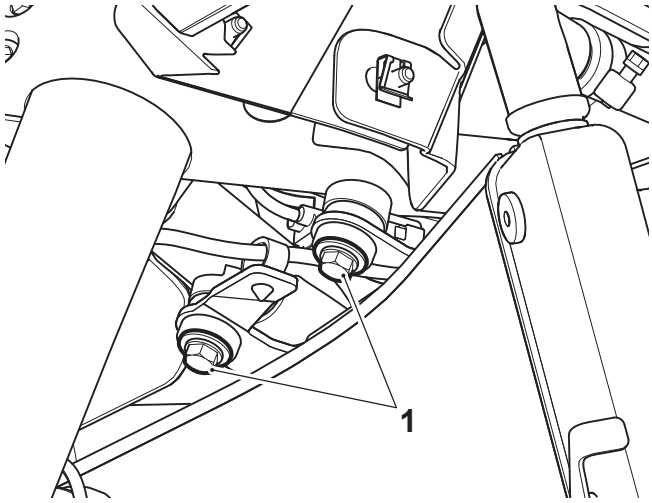
CAUTION

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.

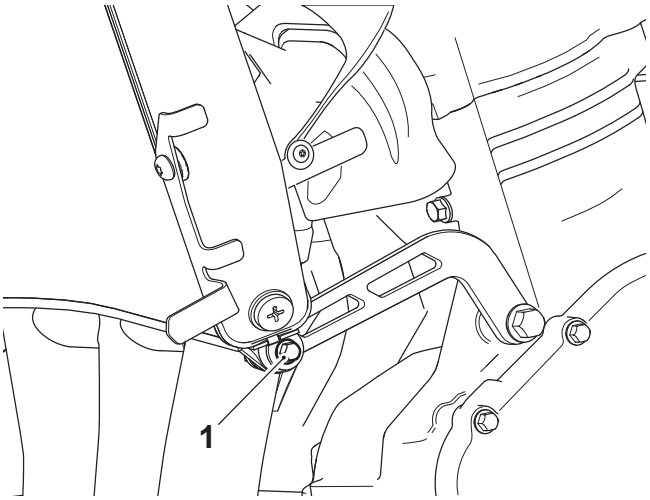
Expansion Tank - Removal

1. Position the radiator to the frame and connect the fan connector.
2. Align the radiator upper mounting to the frame. Fit the two fixings but do not fully tighten at this stage.



1. Fixings

3. Fit the two lower mounting fixings and tighten to **9 Nm**.



1. Fixing (left hand shown)

4. Tighten the upper fixings to **9 Nm**.
5. Reconnect the expansion tank, left hand and right hand hoses. Align the hoses clips as noted during disassembly.

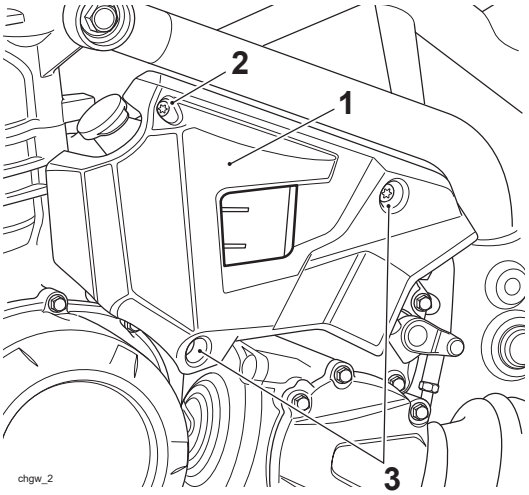
- Refill the cooling system (see Coolant Replacement).

- Refit the fuel tank (see Fuel Tank - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

Expansion Tank - Installation

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.

1. Remove the three fixings and remove the expansion tank cover. Discard the upper M5 fixing. Retain the lower M6 fixings for reuse.



1. **Expansion tank cover**
2. **Upper fixings (M5)**
3. **Lower fixings (M6)**

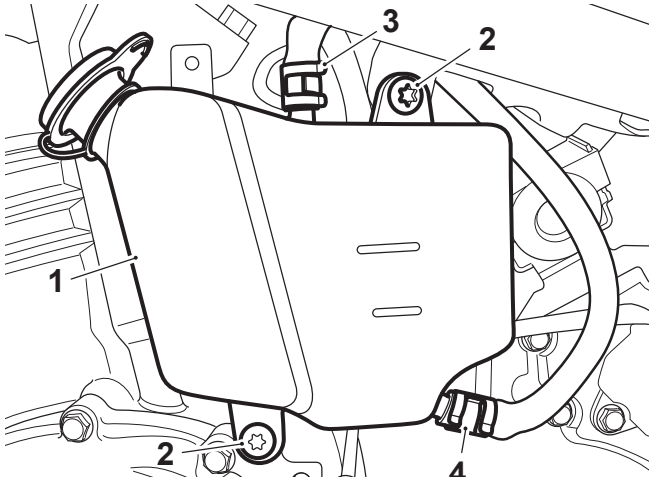
2. Position a container to collect the displaced coolant.

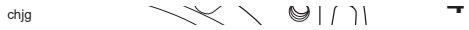
⚠ WARNING

Do not disconnect the two coolant hoses from the expansion tank when the engine is hot. When the engine is hot the coolant in the expansion tank will be hot.

Contact with hot coolant will cause scalds and skin damage.

3. Disconnect the upper hose from the expansion tank.
4. Release the two fixings and manoeuvre the expansion tank away from the frame. Collect the washers.





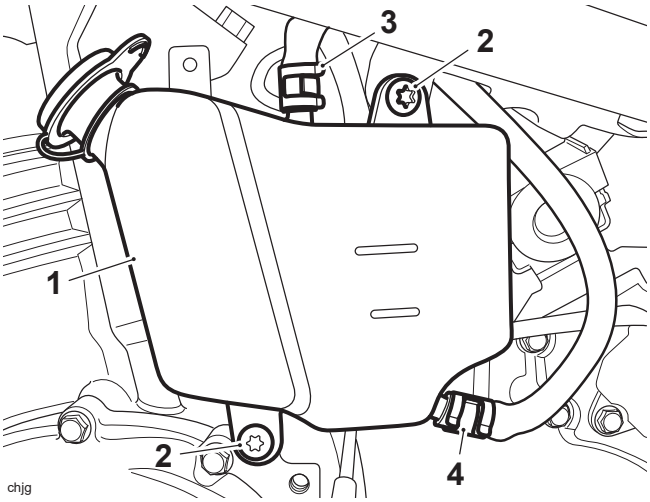
1. **Expansion tank**
2. **Fixings**
3. **Upper hose**
4. **Lower hose**

5. Release the clip, disconnect the lower hose and remove the expansion tank.

Front Suspension

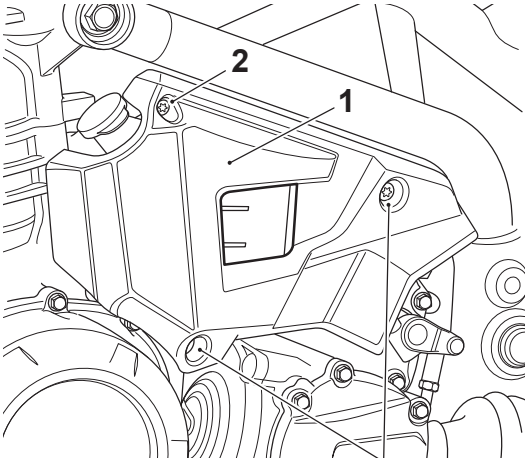
Exploded View - Front Fork

1. Align the expansion tank to the frame, fit the lower hose and secure in position with its clip.
2. Position the expansion tank to the engine and secure with the two washers and fixings. Tighten to **3 Nm**.



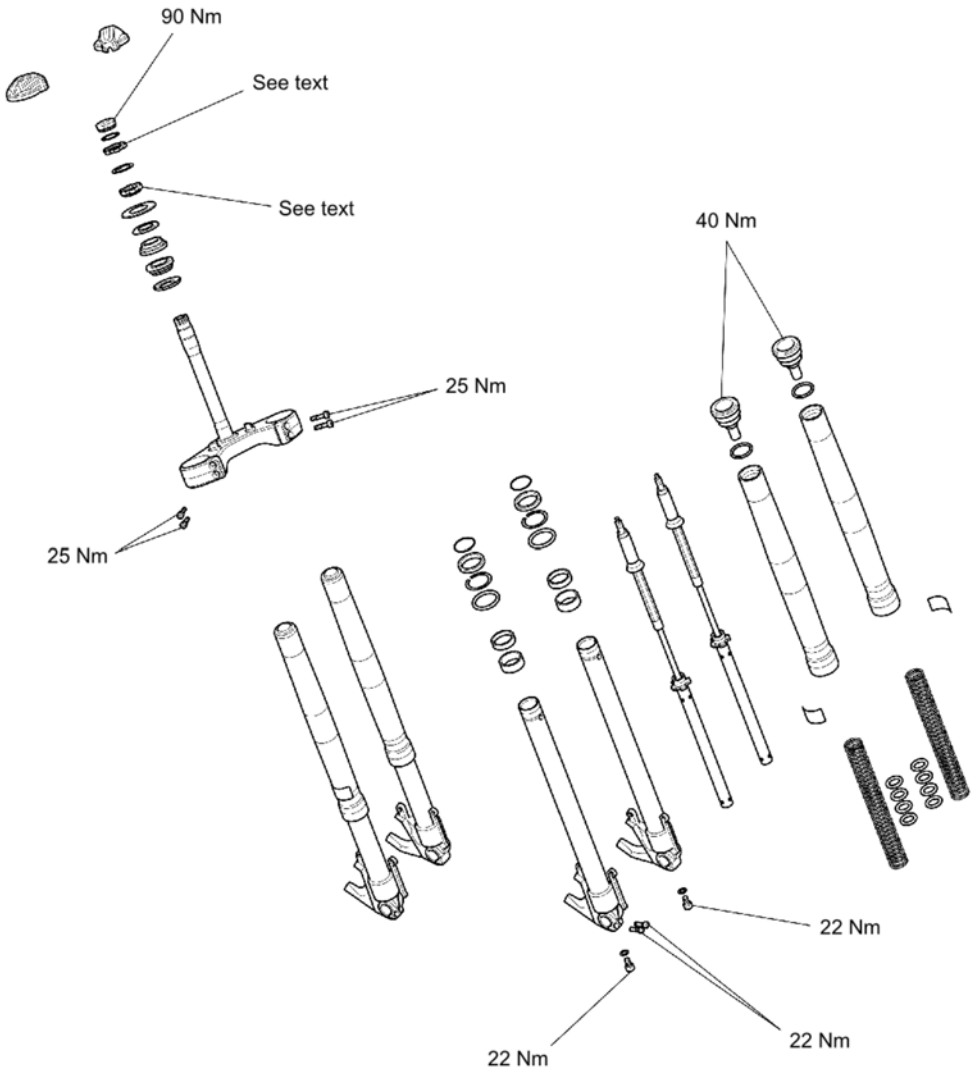
1. **Expansion tank**
2. **Fixings**
3. **Upper hose**
4. **Lower hose**

3. Refit the upper hose and secure in position with its clip.
4. Check and adjust the coolant level as necessary (see Coolant Replacement).
5. Refit the expansion tank cover. Secure the upper mounting with a new M5 encapsulated fixing. Secure the lower mountings with the two original fixings. Tighten the upper fixing to **3 Nm** and the lower fixings to **4 Nm**.

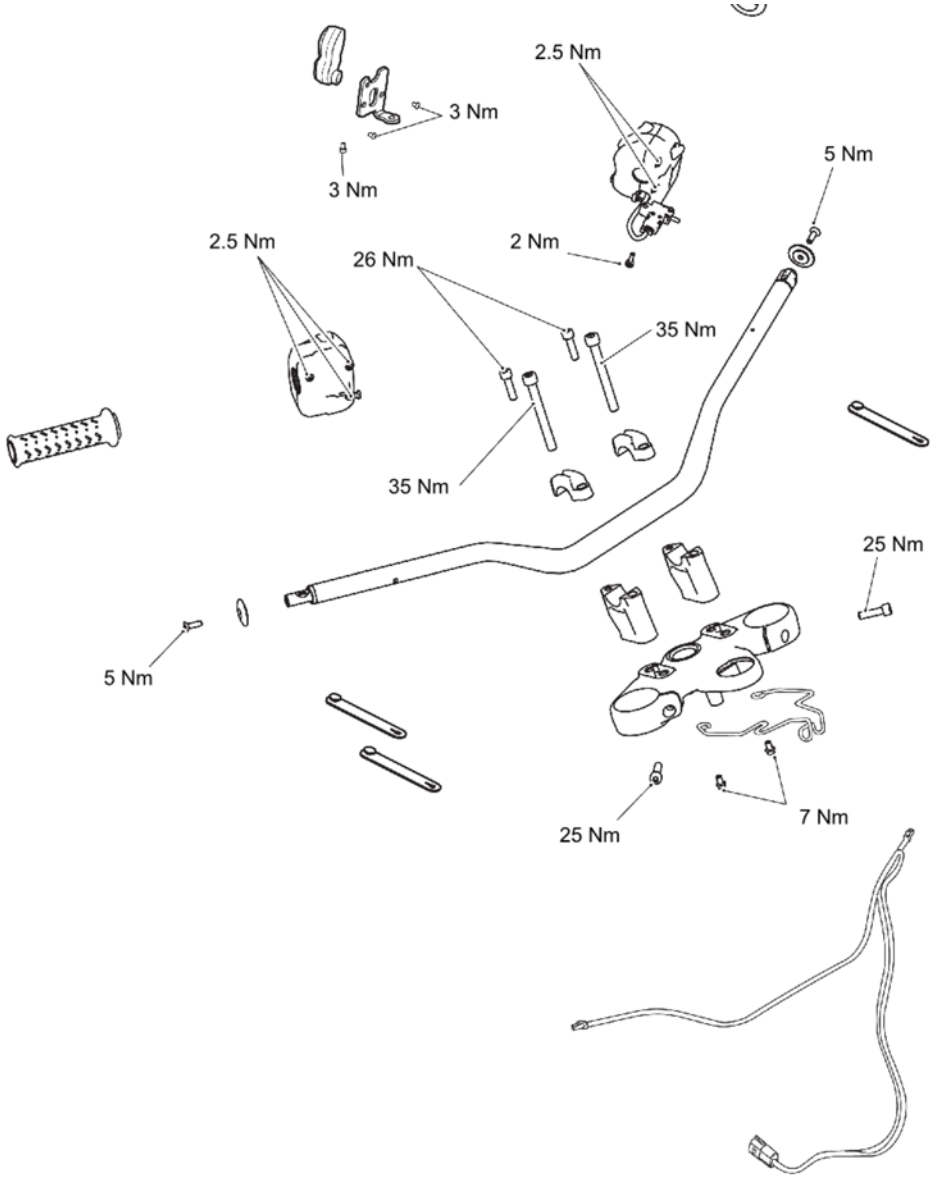


1. **Expansion tank cover**
2. **Upper fixing (M5)**
3. **Lower fixings (M6)**

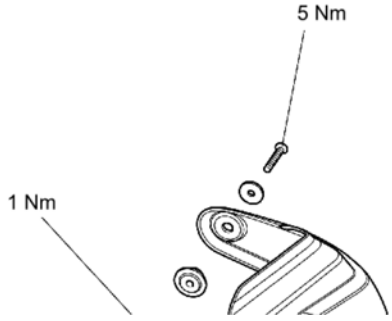
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

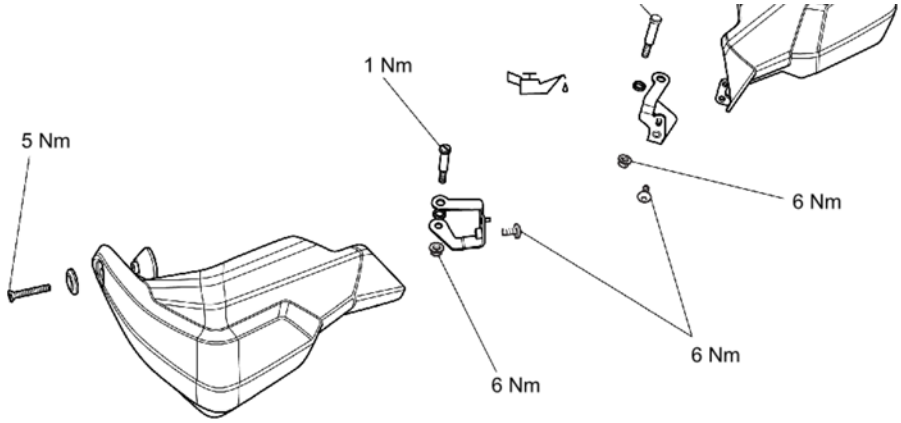


Exploded View – Handlebars



Exploded View – Hand Guards





Front Suspension

This model is equipped with hydraulic, telescopic front forks. The front suspension has electronic adjustment of compression and rebound damping (TSAS). Adjustment is carried out using instrument menus.

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

Fork Inspection

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

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

Check for smooth operation of the forks as follows:

- Place the motorcycle on level ground
- While holding the handlebars and applying the front brake, pump the forks up and down several times.

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

⚠ WARNING

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

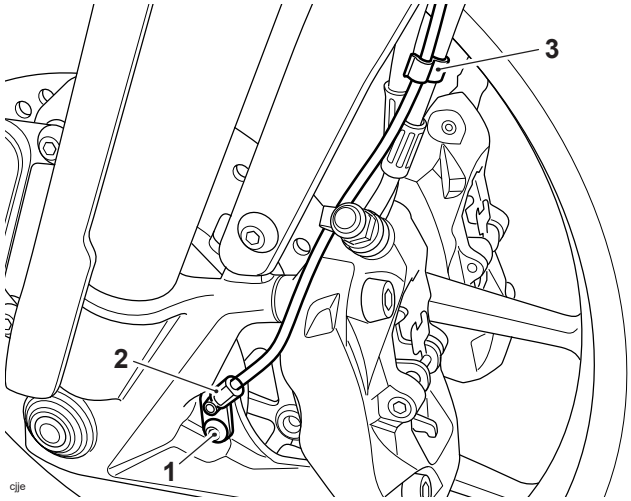
Front Fork - Removal

⚠ WARNING

Before 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.

- Remove the rider’s seat (see Rider’s Seat - Removal).
- Disconnect the battery, negative (black) lead first.

1. Raise and support the front of the motorcycle.
2. Release the fixing and detach the front wheel sensor from the left hand fork leg. Collect the shim from between the sensor and fork leg and discard the fixing.



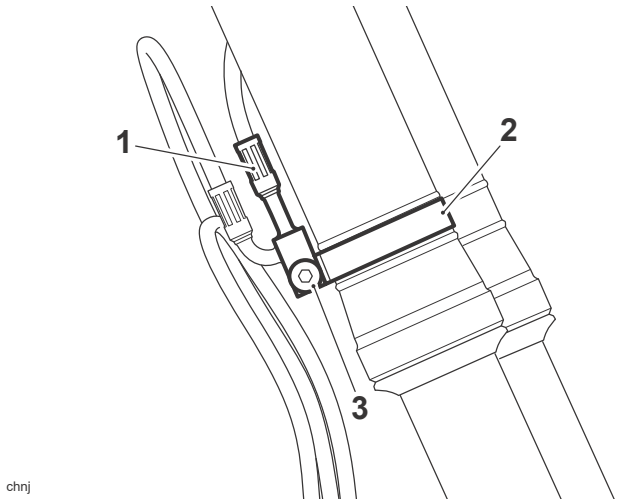
1. **Fixing**
2. **Front ABS wheel speed sensor**
3. **Clip**

3. Remove the front brake calipers (see Front Brake Caliper - Removal).
4. Remove the front wheel (see Front Wheel - Removal).
5. Remove the front mudguard (see Front Mudguard - Removal).

Note

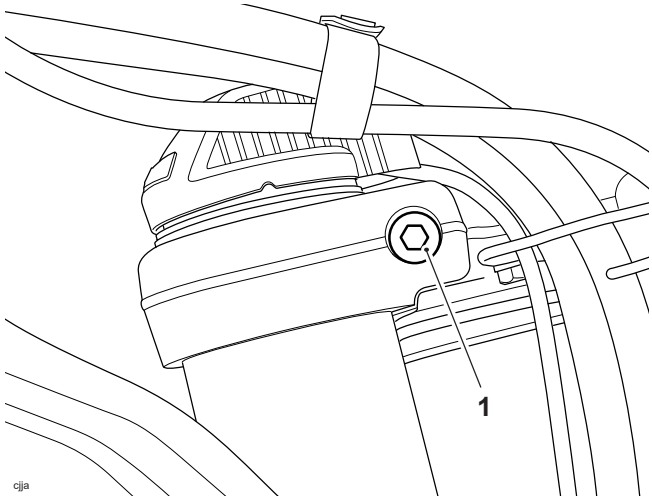
- **The brake hose clip on the right hand fork leg is angled outwards by 20°. Note its orientation for installation.**

6. Remove the fixing and detach the brake hose from the clip on the right hand fork leg. Discard the fixing.



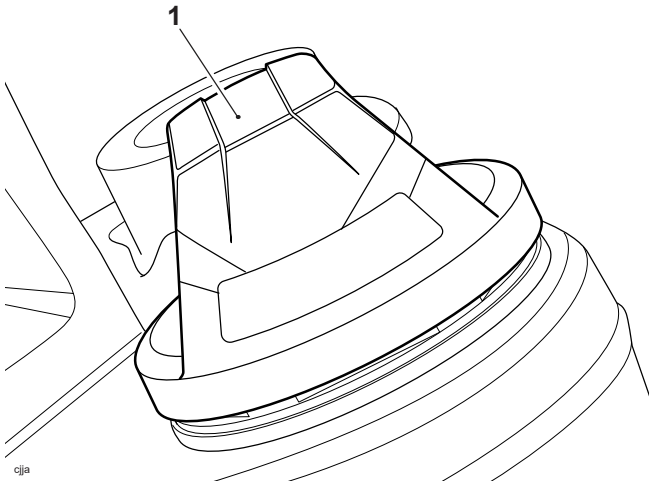
1. **Brake hose**
2. **Brake hose clip**
3. **Fixing**

7. Loosen the upper yoke clamp bolt.



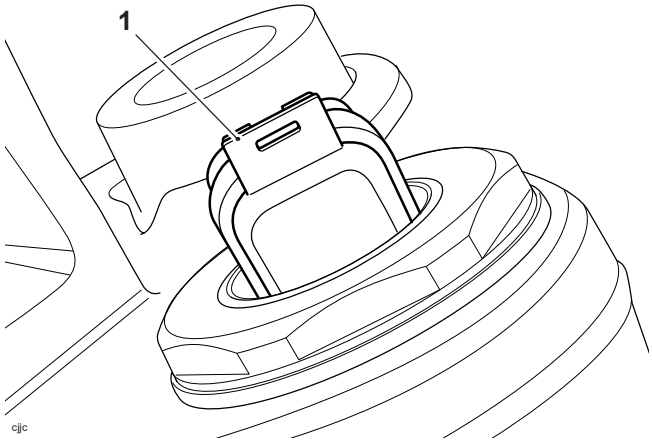
1. Upper yoke clamp bolt

8. Remove the TSAS damping motor connector cover.



1. TSAS damping motor connector cover

9. Disconnect the TSAS damping motor connector.



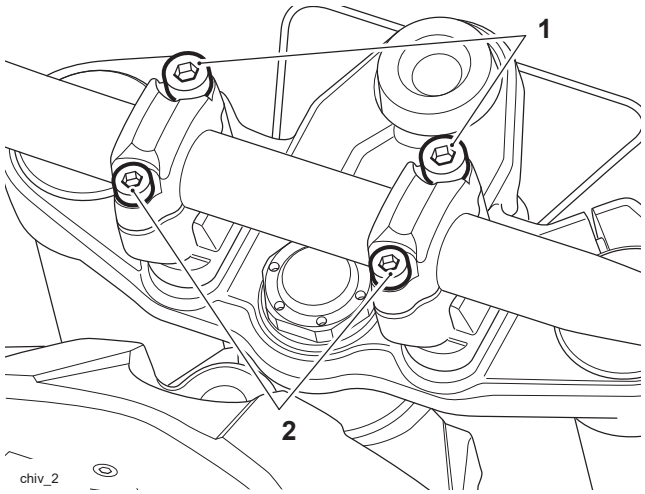
1. TSAS damping motor connector (rebound shown)

10. If the fork is to be dismantled carry out the following:
    - Note the orientation of the adjustable handlebar risers, in order that they can be returned to the same position when the repair operation is complete.

Note

- **The bolt positions shown below are in the standard position, as delivered from the factory. If the handlebars have been adjusted, the bolt positions will be reversed.**

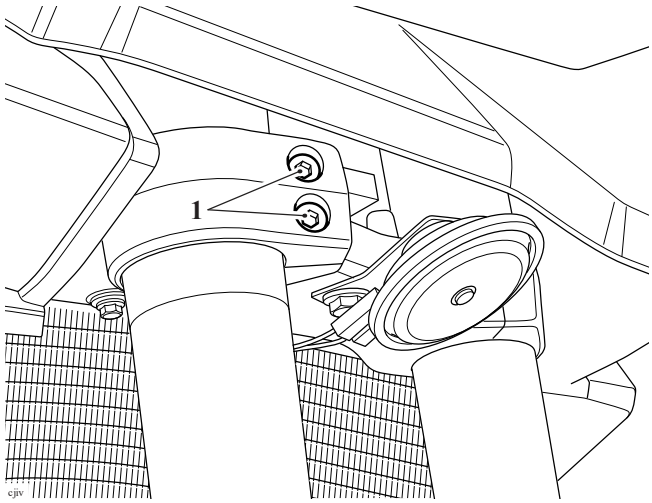
- Remove the handlebar rear (8 mm threaded) clamp bolts, and then the front (10 mm threaded) clamp and riser bolts.



1. 10 mm bolts
2. 8 mm bolts

- As an assembly, raise the handlebars until clear of the top yoke. Rest the assembly forward of the steering stem such that access to the fork top caps is unrestricted. Ensure the clutch and front brake master cylinders remain in an upright position.
- Using T3880643 - Fork Top Cap Socket, loosen the fork top cap a little to aid disassembly.
- Temporarily refit the handlebars and secure with the clamps. Tighten the M10 fixings first to **35 Nm**, then the M8 fixings to **26 Nm**.
- If the damping cylinder is to be removed, loosen the lower damping cylinder bolt a little to aid disassembly.

11. Loosen the lower yoke clamp bolts.



1. **Lower yoke clamp bolts**

CAUTION

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

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

Front Fork - Installation

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.

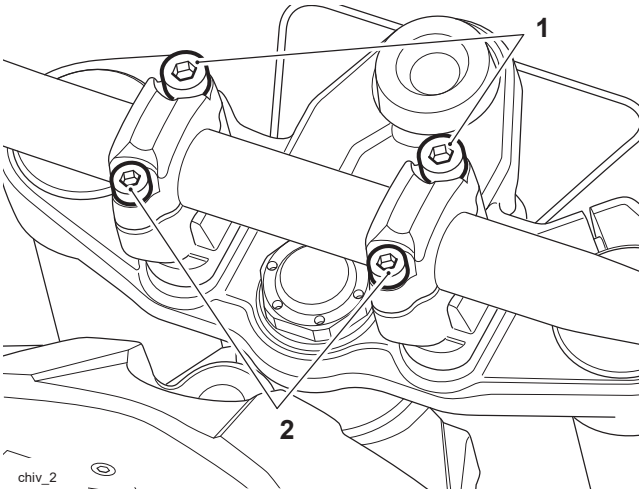
1. Position the forks within the yokes so that the top of the fork outer tube is level with the upper surface of the upper yoke. Ensure that the TSAS damping motor connector is aligned with the clamp slip line in the upper yoke.
2. Tighten the lower yoke clamp bolts to **25 Nm**.
3. If the forks have been dismantled, carry out the following:

- Note the orientation of the adjustable handlebar risers, in order that they can be returned to the same position when the repair operation is complete.

Note

- **The bolt positions shown below are in the standard position, as delivered from the factory. If the handlebars have been adjusted, the bolt positions will be reversed.**

- Remove the handlebar rear (8 mm threaded) clamp bolts, and then the front (10 mm threaded) clamp and riser bolts.



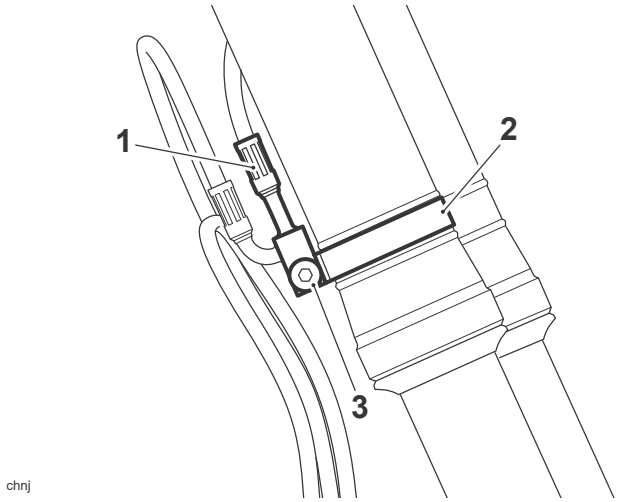
1. **10 mm bolts**
2. **8 mm bolts**

- As an assembly, raise the handlebars until clear of the top yoke. Rest the assembly forward of the steering stem such that access to the fork top caps is unrestricted. Ensure the clutch and front brake master cylinders remain in an upright position.
- Using T3880643 - Fork Top Cap Socket, tighten the fork top cap to **40 Nm**.
- If necessary, loosen the lower yoke clamp bolts and realign the TSAS damping motor connection with the clamp split line in the upper yoke. Ensure the top of the fork outer tube remains level with the upper surface

of the upper yoke. Retighten the lower yoke clamp bolts to **25 Nm**.

- Refit the handlebars and secure with the clamps. Tighten the M10 fixings first to **35 Nm**, then the M8 fixings to **26 Nm**.
- If removed, tighten the lower damping cylinder bolt to **22 Nm**.

4. Tighten the upper yoke clamp bolts to **25 Nm**.
5. Reconnect the TSAS damping motor connector.
6. Refit the TSAS damping motor connector cover.
7. Refit the front mudguard (see Front Mudguard - Installation).
8. Position the brake hose to the clip on the right hand fork leg as noted for removal. Secure with a new fixing and tighten to **3 Nm**.



1. **Brake hose**
2. **Brake hose clip**
3. **Fixing**

9. Install the front wheel (see Front Wheel - Installation).
10. Refit the front brake calipers (see Front Brake Caliper - Installation).

Note

- **Check the condition of the shim before use. Do not use a shim which is bent or damaged.**

11. Position the wheel speed sensor to the left hand fork leg with its shim between the sensor and fork leg. Temporarily fit the original fixing and tighten to **9 Nm**.
12. Check and adjust the wheel speed sensor air gap as described in Air Gap Measurement (see Front Wheel Speed Sensor Air Gap Measurement).
13. Secure the harness for the front wheel speed sensor to its clips on the front brake hose.
14. Lower the motorcycle to the ground and park it on the side stand.

- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider’s seat (see Rider’s Seat - Installation).

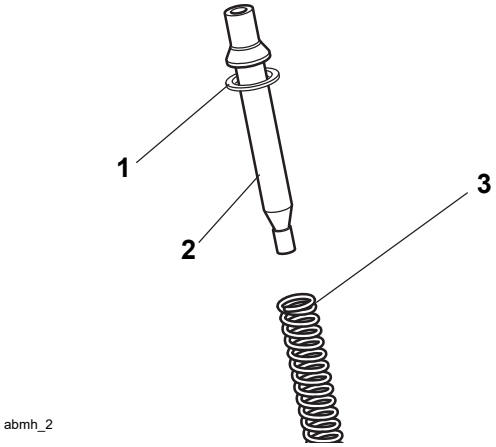
Fork Oil Change - Oil Draining

Fork Oil Change - Oil Refilling

⚠ 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 (see Front Fork - Removal).
2. Remove the top cap assembly from the fork outer tube (see Front Fork - Disassembly).
3. Holding the inner and outer tubes together, invert the fork and pour out the fork oil into a suitable container.
4. Remove the top cap assembly from the damping rod and remove the spring guide, upper spring preload spacer(s) and spring (see Front Fork - Disassembly).



1. **Upper preload spacer(s)**
2. **Spring guide**
3. **Spring**

Note

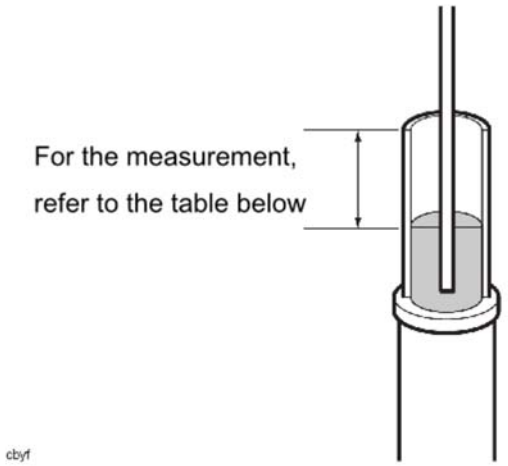
- **Ensure that the lower spring seat and lower spring preload spacer(s) (if fitted) are left in position on the damper assembly.**

5. Holding the inner and outer tubes together, invert the fork and pour out any remaining fork oil into a suitable container. Pump the damper rod to remove all the oil.

⚠ 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.

The oil level is measured from the upper surface of the fork outer tube, with the fork fully compressed and with the spring guide, upper spring preload spacer(s) and spring removed.



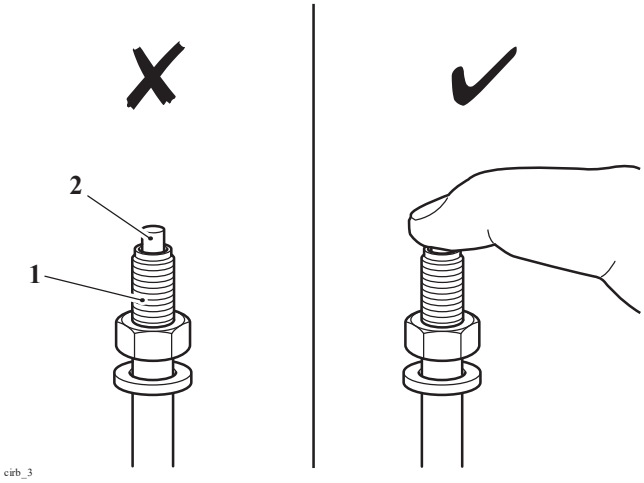
Fork Oil Level (fork fully compressed with spring guide, upper spring preload spacer(s) and spring removed)

Fork Oil Level	105 mm

1. Fill the fork with the grade of oil specified in the fork oil table, to a level above that which will finally be required.

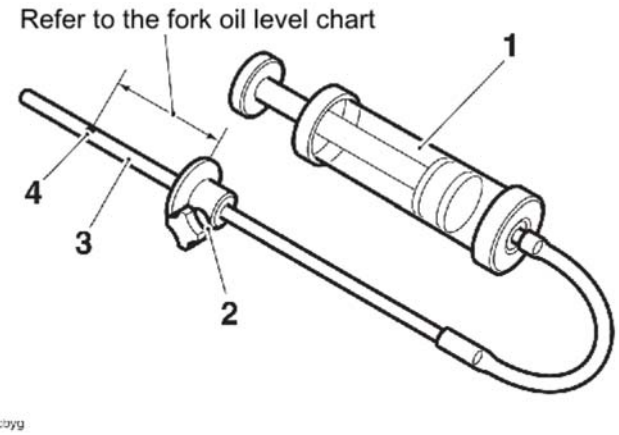
Note

- **There are holes near the top of the fork inner tube to allow any oil between the fork inner and outer tubes to go into the inner tube.**
- **While pumping the fork assembly to expel any trapped air, keep the inner damper rod pressed down into the main damper rod assembly using one finger.**



1. **Main damper rod assembly**
2. **Inner damper rod**

2. Pump the fork and damper 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 to stabilise.
3. Raise the outer tube to the top of the inner tube and hold there for a couple of seconds then fully lower the outer tube.
4. Set the scale on 3880160 -T0301 - Fork Oil Filler/Evacuator to 105 mm, as shown below.



1. **3880160 -T0301 - Fork Oil Filler/Evacuator**
2. **Adjustment plate**
3. **Scale area**
4. **Hole (zero position)**

Note

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

5. Insert the scale end of the tool into the fork inner tube.
6. Hold the tool adjuster plate level with the upper surface of the fork outer tube and draw fluid into the syringe until fluid flow ceases (empty the syringe if the body becomes full before fluid flow stops).
7. The fluid level in the fork is now set to the height set on the tool scale. Check the tool scale setting and repeat the process if incorrectly set.

⚠ WARNING

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

8. Assemble the fork (see Front Fork - Assembly).
9. Refit the fork (see Front Fork - Installation).

Fork Oil Level Chart

Oil Level*	Oil Volume	Oil Grade
105 mm	700 cc	WP 4860-1166 SAE4

*Fork fully compressed with spring guide, upper spring preload spacer(s) and spring removed.

Front Fork - Disassembly

⚠ WARNING

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

⚠ WARNING

If the damping cylinder is to be removed, we recommend that one fork is disassembled and assembled prior to starting work on the other. The damping cylinder in the left hand fork is for compression damping while the damping cylinder in the right hand fork is for rebound damping. Should these damping components get fitted to the wrong fork, the front suspension will not function correctly and may lead to loss of motorcycle control and an accident.

- Turn the ignition on and note the instrument TSAS mode and damping setting so that the system can be restored to its original setting upon re-assembly.
- Set the TSAS damping to its softest (comfort) setting as described in the Owner’s Handbook.

Note

- **When removing the forks, ensure the top cap is loosened as described in Front Fork - Removal.**
- **The fork seals can be renewed without removal of the damping cylinder. Unless removal of the damping cylinder is necessary, omit step 24 of this procedure.**
- **If the damping cylinder is to be removed, ensure the lower damping cylinder bolt is loosened as**

Note

described in Front Fork - Removal.

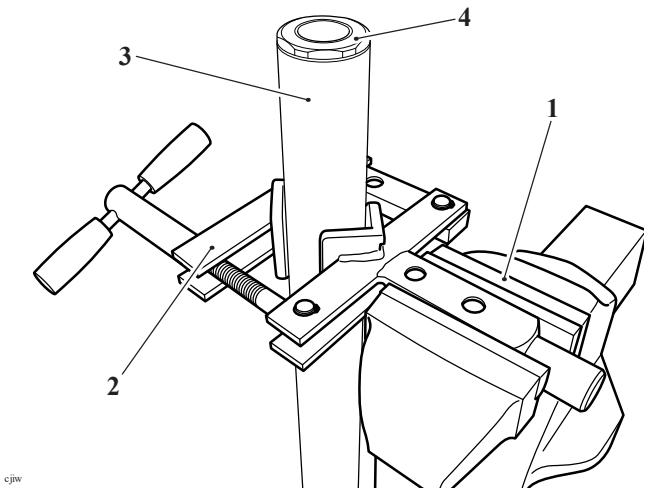
- Remove the front forks (see Front Fork - Removal).

1. Using a soft jawed vice, clamp T3880171 - Fork Holding Tool such that the fork can be mounted vertically.
2. With the top cap facing upwards, very gently clamp the fork outer tube into T3880171 - Fork Holding Tool.

Note

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

3. Unscrew the top cap from the outer tube.

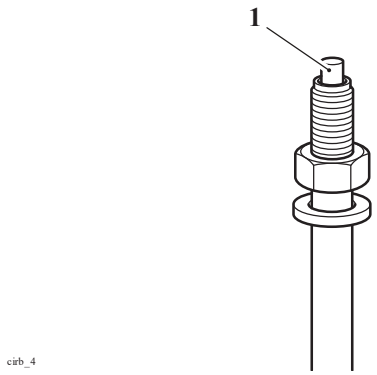


1. **Soft jawed vice**
2. **T3880171 - Fork Holding Tool**
3. **Fork**
4. **Top cap**

4. Remove the fork from the fork holding tool.

Note

- **Ensure that the inner damping rod is retained in position when inverting the fork assembly.**



1. **Inner damping rod**

5. Holding the inner and outer tubes together, invert the fork and pour out the fork oil into a suitable container.
6. Return the fork to the fork holding tool.
7. Counterhold the top cap to prevent it from turning and loosen the top cap lock nut.
8. Remove the top cap.
9. Fit a suitable ring spanner over the spring guide and seat it onto the taper section of the spring guide.

⚠ WARNING

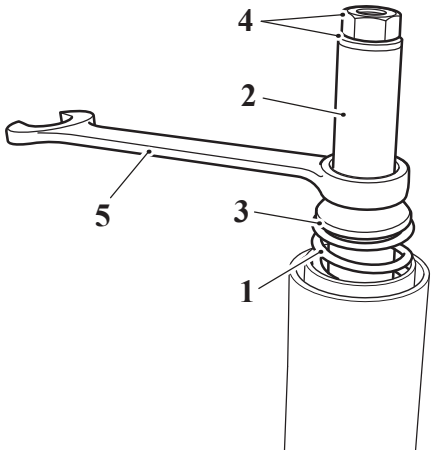
While compressing the fork spring always wear protective equipment for the face and eyes and never look directly down on the fork. If the spring compressor should dislodge or detach, the resulting release of spring tension could cause parts to fly off resulting in injury to the user.

10. While supporting the fork inner tube, press down on the spanner to compress the spring and remove the nut and washer.
11. Remove the spanner used to compress the spring.

Note

- **Between the spring and the spring guide there could be one or more spacers fitted.**

12. Remove the spring guide, collecting the spring preload spacer(s) as you do so.



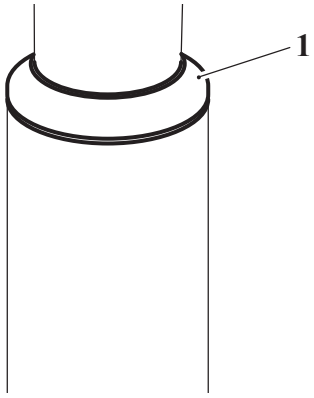
1. **Spring**
2. **Spring guide**
3. **Spring preload spacer(s)**
4. **Nut and washer**
5. **Spanner**

13. Remove the spring.
14. Remove the fork from the fork holding tool.

Note

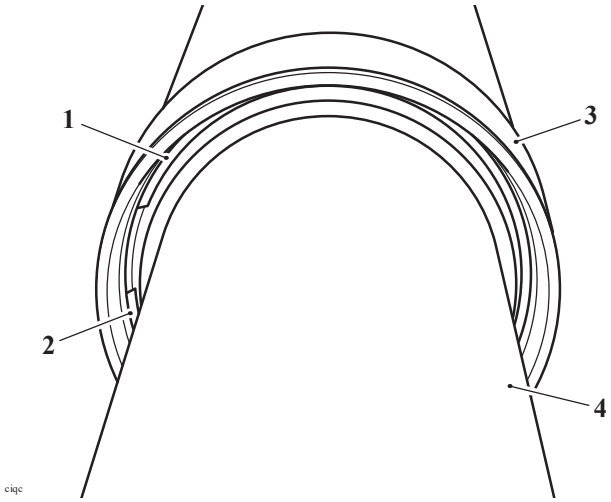
- **Ensure that the inner damping rod is retained in position when inverting the fork assembly.**

15. Holding the inner and outer tubes together, invert the fork and pour out any remaining fork oil into a suitable container. Pump the damper rod to remove all the oil.
16. Ensuring that the inner damping rod is retained, invert the fork and return it to the fork holding tool.
17. Raise the inner tube and remove the dust seal from the outer tube.



1. **Dust seal**

18. Remove and discard the circlip.



1. **Circlip**
2. **Cut out**
3. **Fork outer tube**
4. **Fork inner tube**

19. Remove the fork from the fork holding tool.

⚠ WARNING

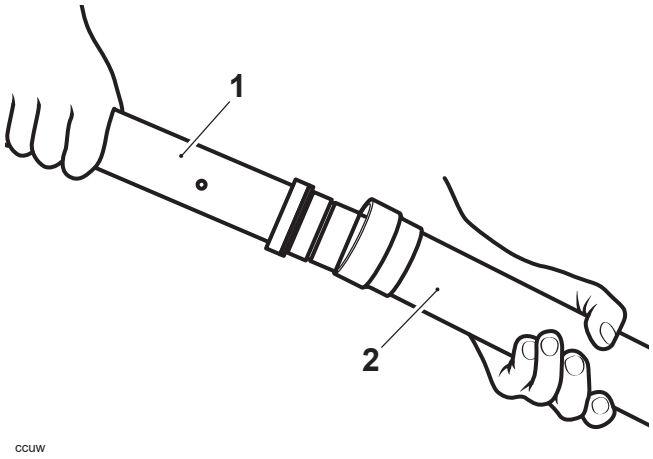
The air from a heat gun, and the heat gun itself, are very hot. Wear suitable protective clothing and gloves and do not point the heat gun at any part of your body as serious burns to the skin may result.

20. Using a suitable heat gun, heat the outer tube in the area of the lower bush and oil seal, to 50°C (122°F). Use a suitable heat sensitive marker or thermometer to accurately measure the temperature.

⚠ WARNING

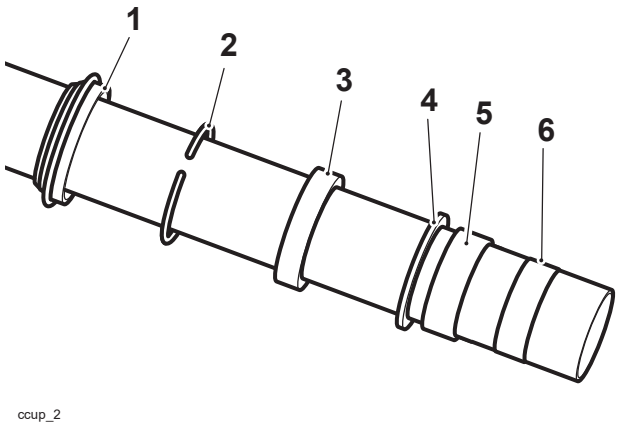
The fork outer tube will be hot to the touch. Avoid contact with the hot outer tube by wearing suitable protective clothing and gloves. Contact with hot components may cause the skin to be burned.

21. Using a slide hammer action to release the oil seal and lower bush from the outer tube, separate the fork inner and outer tubes leaving the seals and bushes in place on the fork inner tube. Note the relative positions and orientation of all bushes and seals before removal.



1. **Inner tube**
2. **Outer tube**

22. To allow the removal of the seals and bushes, carefully remove the upper bush from the inner tube.
23. Discard the circlip, seal, washer and dust cap. Once removed, these components must not be reused.



1. **Dust seal**
2. **Circlip**
3. **Seal**
4. **Washer**
5. **Upper bush**
6. **Lower bush**

24. If removal of the damping cylinder is required, remove the damper bolt from the bottom of the fork. Discard the washer from the damper bolt. Remove the damping cylinder from the fork inner tube.
25. Clean the inner and outer tubes using Castrol Metal Parts Cleaner.

⚠ WARNING

Always wear eye, hand and face protection when using compressed air. Eye face and skin damage will result from direct contact with compressed air.

26. Using compressed air, remove the Castrol Metal Parts Cleaner from the inner and outer tubes.

Front Fork - Inspection

Front Fork - Assembly

Headstock Bearing Check/Adjustment

Headstock Bearing - Removal

1. Inspect the inner tube for stone chips, scoring, scratches, excessive wear and any other damage. Renew as necessary.

Note

- **Small inclusions in the inner tube may be removed using a fine grade stone or similar.**

2. Inspect the spring for damage, cracks and deformation. Renew the spring if necessary.
3. Inspect the bushes for damage. Renew if necessary.
4. Always renew the oil seal, washer, circlip and dust cap every time the fork is dismantled. Once removed, these components must not be reused.
5. If the damping cylinder has been removed, always renew the damper bolt washer upon reassembly.

⚠ 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.

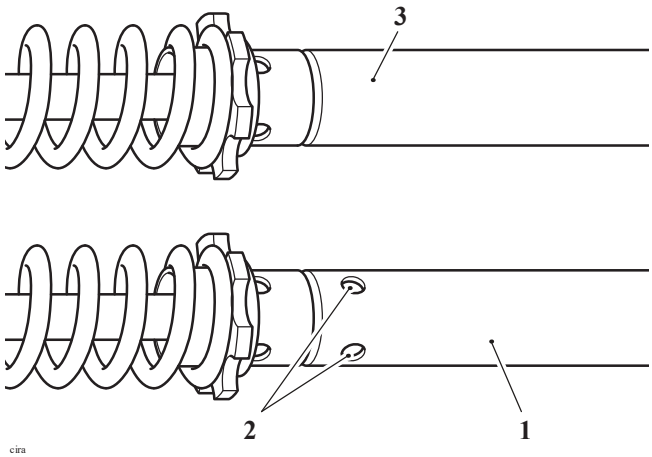
Dirt ingress may cause damage to the fork parts, leading to incorrect operation, instability, loss of motorcycle control or an accident.

⚠ WARNING

The damping cylinder in the left hand fork is for compression damping while the damping cylinder in the right hand fork is for rebound damping. Should these damping components get fitted to the wrong fork, the front suspension will not function correctly and may lead to loss of motorcycle control and an accident.

Note

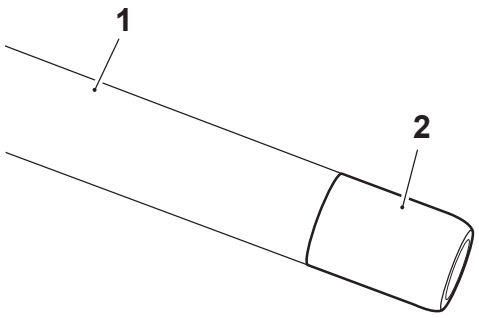
- **If removed, ensure the correct damper is fitted to its correct front fork assembly.**
- **The compression damper tube has four holes in its casing.**
- **The rebound damper tube does not have the additional holes.**
- **If the damping cylinder has not been removed, omit steps 1 and 2.**



1. **Compression damper - left hand fork**

2. **Holes (compression damper only)**
3. **Rebound damper - right hand fork**

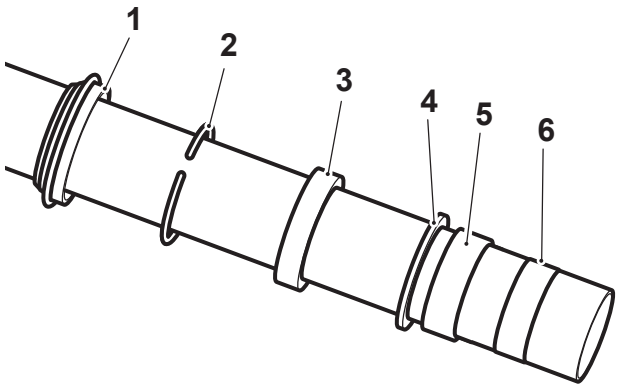
1. Fit the damping cylinder to the inner tube.
2. Fit a new damping cylinder bolt and a new sealing washer. Tighten the damping cylinder bolt to **22 Nm**.
3. Invert the fork outer tube and very gently clamp it into T3880171 - Fork Holding Tool.
4. Install T3880662 - Fork Seal Guide to the fork inner tube. Ensure the tool is not damaged and that it covers the bush groove fully.



ccup_4

1. **Fork inner tube**
2. **T3880662 - Fork Seal Guide**

5. Apply a smear of fork oil to the upper and lower bushes and the new fork seal and dust cover.
6. Slide the dust seal, circlip and seal over T3880662 - Fork Seal Guide and position to the inner tube as noted prior to removal. Ensure the seal (item 3) is positioned with the text end facing the circlip. Use a new circlip.
7. Remove the service tool and install the washer, lower bush and upper bush.

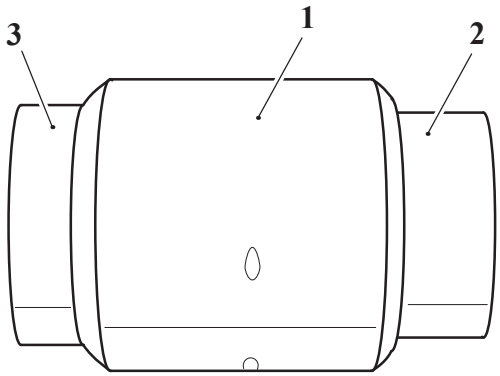


ccup_2

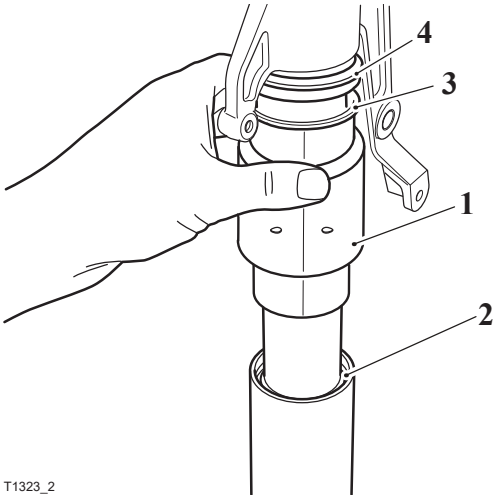
1. **Dust seal**
2. **Circlip**
3. **Seal**
4. **Washer**
5. **Lower bush**

6. **Upper bush**

8. Position the fork inner tube assembly to the fork outer tube.
9. Using the long (small diameter) end of T3880661 - Fork Seal Installer, drive the lower bush into the fork outer tube.

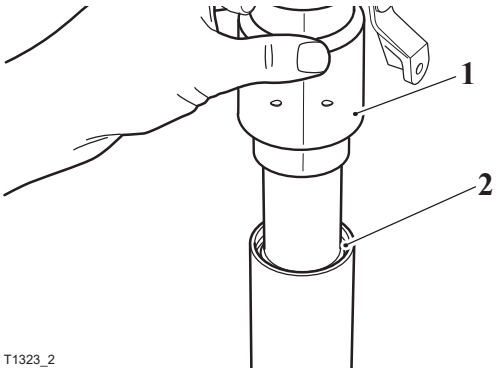


1. **T3880661 - Fork Seal Installer**
2. **Long (small diameter) end**
3. **Short (large diameter) end**



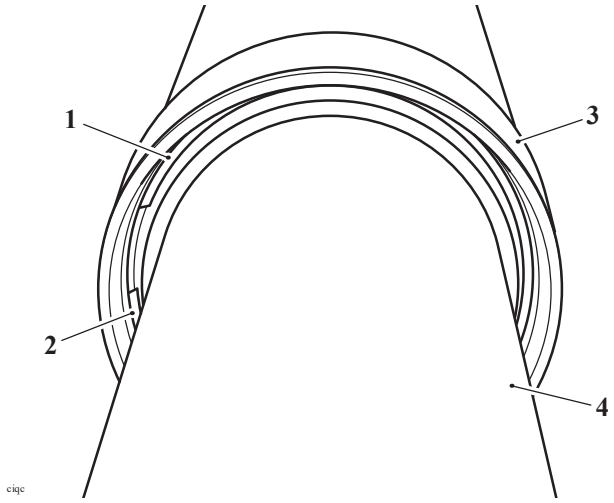
1. **T3880661 - Fork Seal Installer**
2. **Bush**
3. **Circlip**
4. **Seal and dust seal**

10. Reposition the washer into the fork outer tube.
11. Remove T3880661 - Fork Seal Installer and reverse it, so the short (large diameter) end is in contact with the seal and drive the seal in to place.



1. **T3880661 - Fork Seal Installer**
2. **Seal**
3. **Dust seal**

12. Remove T3880661 - Fork Seal Installer.
13. Retain the bush, washer and seal with a new circlip.



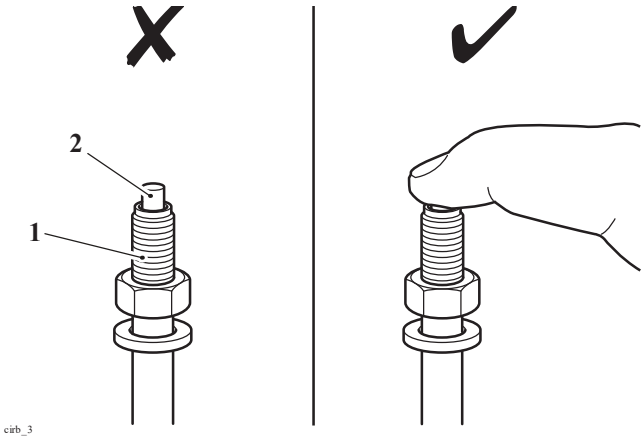
1. **Circlip**
2. **Cut out**
3. **Fork outer tube**
4. **Fork inner tube**

14. Position the dust seal to the fork outer tube.
15. Using hand pressure only, push the dust seal squarely into the fork outer tube.
16. Fill the fork with oil (see Fork Oil Change - Oil Refilling).

⚠ WARNING

While performing steps 17 to 25, If for any reason the main damper rod assembly needs to be moved up or down inside the fork assembly, keep the inner damping rod pressed down into the main damper rod assembly using one finger. Failure to do so may allow oil to flow into the main damper rod assembly, resulting in an incorrect fork oil level.

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

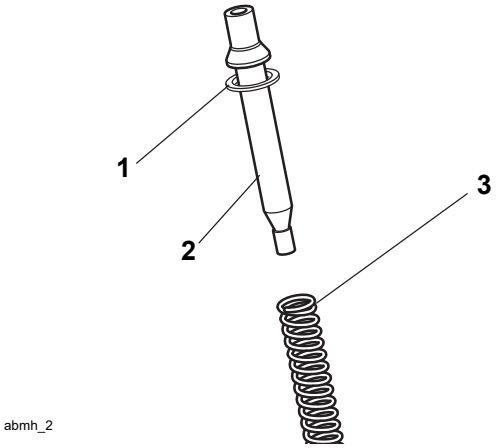


1. **Main damper rod assembly**
2. **Inner damper rod**

Note

- **A new spring may be supplied with or without spacer(s) to maintain the correct spring length.**
- **New springs must be fitted only with any spacers supplied with it.**
- **Spacers removed with an original spring must not be used with a replacement spring.**

17. Refit the fork spring, ensuring the spring seats correctly on the damping cylinder.
18. Ensure the spacer(s), if required, is/are in position on the spring guide.



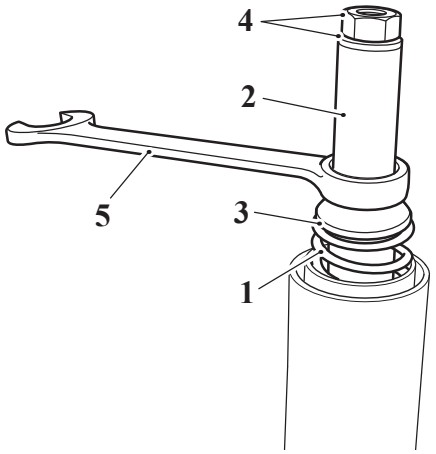
1. **Spacer**
2. **Spring guide**
3. **Spring**

19. Refit the spring guide.
20. Fit a suitable ring spanner over the spring guide and seat it onto the taper section of the spring guide.

⚠ WARNING

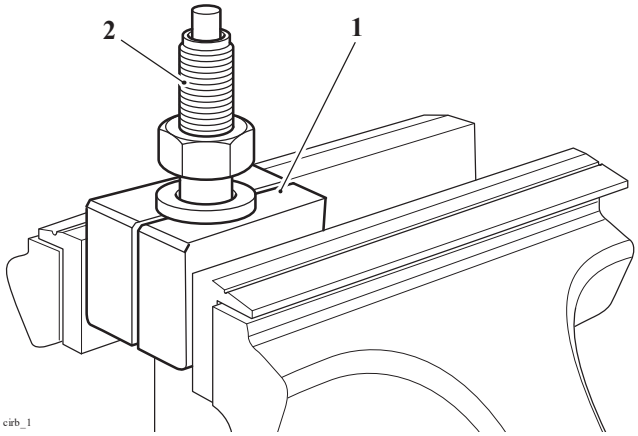
While compressing the fork spring always wear protective equipment for the face and eyes and never stand directly above or look directly down on the fork. If the spring compressor should dislodge or detach, the resulting release of spring tension could cause parts to fly off resulting in injury to the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

21. Compress the spring using the spanner and fit the washer and nut. While continuing to compress the spring, thread the nut fully on to the damper rod.



1. **Spring**
2. **Spring guide**
3. **Spacer(s)**
4. **Nut and washer**
5. **Spanner**

22. Remove the spanner used to compress the spring.
23. Fit a new O-ring to the top cap.
24. Remove the fork from the fork holding tool.
25. With the aid of an assistant, compress the spring and fit T3880317 - Damper Tube Clamp to the damper rod, then secure in a soft jawed vice.



1. **T3880317 - Damper Tube Clamp**
2. **Damper rod**

26. Fit the top cap to the damper rod and tighten to **2.5 Nm**.
27. Hold the top cap while tightening the damper rod lock nut to **25 Nm**.
28. With the aid of an assistant, remove T3880317 - Damper Tube Clamp and the front fork from the vice, compress the spring and remove T3880317 - Damper Tube Clamp.
29. Lubricate the O-ring on the top cap with a smear of fork oil then screw the top cap fully into the fork outer tube.

Note

Note

- **It is much easier to tighten the top cap when the fork has been refitted.**
- **When refitting the fork, tighten the top cap as described in Front Fork - Installation.**

30. Refit the front fork (see Front Fork - Installation).
- Turn the ignition on and allow the Triumph Semi Active Suspension (TSAS) system to calibrate.

WARNING

Always return the TSAS system to its original settings as noted prior to disassembly. Riding the motorcycle with unfamiliar suspension settings may cause unexpected handling characteristics leading to loss of motorcycle control and an accident.

- Ensure that the instrument TSAS mode and damping settings are returned to the settings noted prior to disassembly.
- Turn the ignition off.

Check

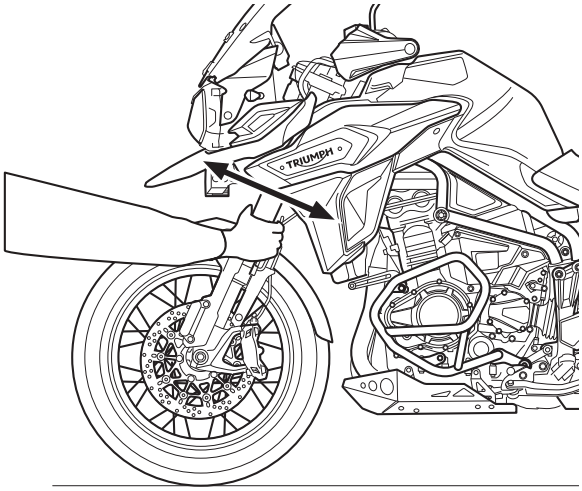
WARNING

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

- **When checking the headstock free play, hold the lower end of the outer tube when carrying out the free play check.**

1. Raise and support the front of the motorcycle.
2. Hold the lower end of the outer tube of the front forks as illustrated and 'rock' with a front-to-rear motion. If free play can be detected, the headstock bearings require adjustment.



Headstock Bearing Adjustment Check

Adjustment

WARNING

WARNING

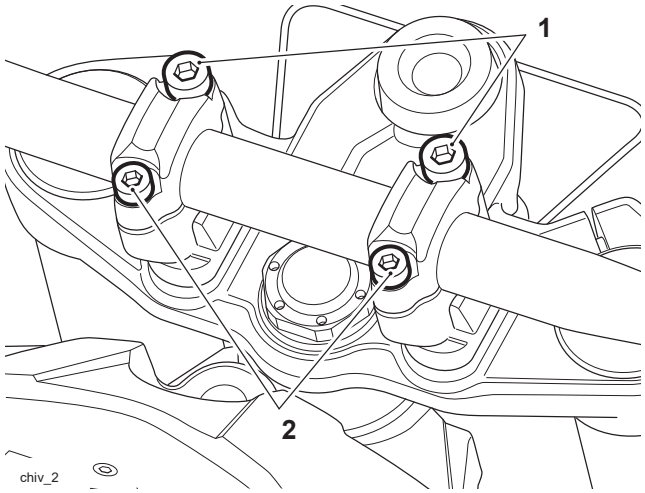
Always return the handlebars and risers to their original position. Operating the motorcycle with a handlebar position that is unfamiliar may lead to loss of control or an accident.

1. Note the orientation of the adjustable risers, in order that they can be returned to the same position when the repair operation is complete.
2. Raise and support the front of the motorcycle.

Note

- **The bolt positions shown below are in the standard position, as delivered from the factory. If the handlebars have been adjusted, the bolt positions will be reversed.**

3. Remove the handlebar rear (8 mm threaded) clamp bolts, and then the front (10 mm threaded) clamp and riser bolts.



1. **10 mm bolts**
2. **8 mm bolts**

4. As an assembly, raise the handlebars until clear of the top yoke. Rest the assembly forward of the steering stem such that access to the headstock top nut and the adjustment nuts is unrestricted. Ensure the master cylinder remains in an upright position.
5. Loosen the top yoke clamp bolts.

WARNING

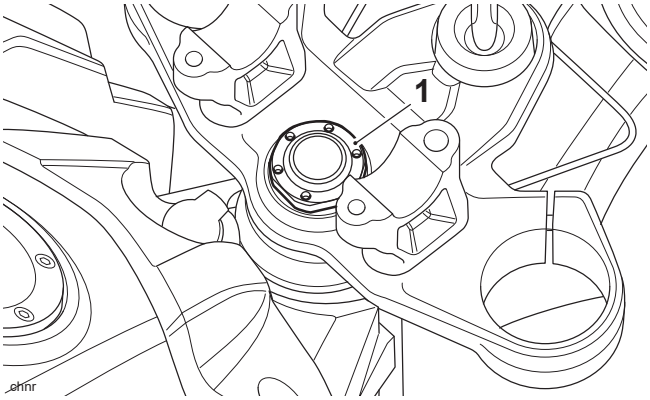
If the lower yoke fixings are also loosened, the forks will no longer support the weight of the motorcycle.

Do not loosen the lower yoke fixings as, in this condition, the motorcycle could topple over causing damage and/or risk of injury.

CAUTION

Care must be taken when removing the headstock top nut, to ensure that the top nut and top yoke do not become scratched. Protect the surfaces with a suitable cloth or tape to prevent scratching.

6. Remove the headstock upper nut and its washer. Discard the washer.



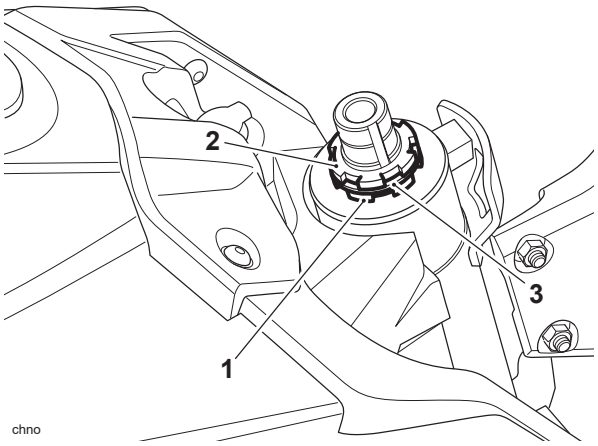
1. **Headstock upper nut**

7. Ease the top yoke from the forks and support while detached.
8. Adjust the bearing free play as follows, all using T3880620 - Adjuster Socket, 48 mm:
   - Ensure that the threads are free from grease.
   - Remove the lock nut and tab washer.
   - Loosen the adjuster nut then tighten to **40 Nm**.
   - Loosen the adjuster nut, then re-tighten to **10 Nm**.
   - Fit the tab washer and lock nut.

⚠ WARNING

It is essential that the adjuster nut is not over-tightened. If the adjuster is over-tightened it will cause a preload on the headstock bearings. This will introduce tight steering, which could cause loss of motorcycle control and an accident.

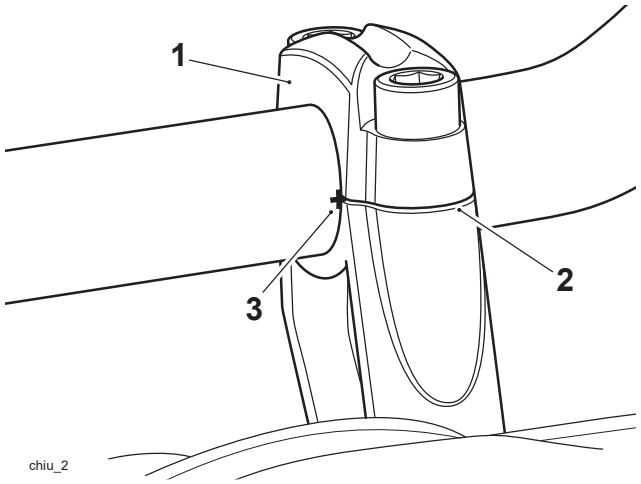
   - Hold the adjuster nut in position while tightening the lock nut to **40 Nm**.



1. **Adjuster nut**
2. **Lock nut**
3. **Tab washer**

9. Refit the top yoke assembly to the forks.
10. Fit a new washer and the original top nut. Tighten the top nut to **90 Nm**.
11. Tighten the top yoke clamp bolts to **25 Nm**.
12. Ensure that the risers are in the same orientation as noted for removal.

13. Locate the handlebar assembly in the risers. Fit the upper clamps and the 10 mm bolts.
14. Rotate the handlebar so that the alignment marking on the handlebar aligns with the front left hand split line of the clamp riser.



1. **Upper clamp**
2. **Clamp split line**
3. **Alignment marking**

15. Tighten the 10 mm bolts to **35 Nm**.
16. Fit the 8 mm bolts and tighten to **26 Nm**.
17. Recheck the bearing adjustment.

⚠ WARNING

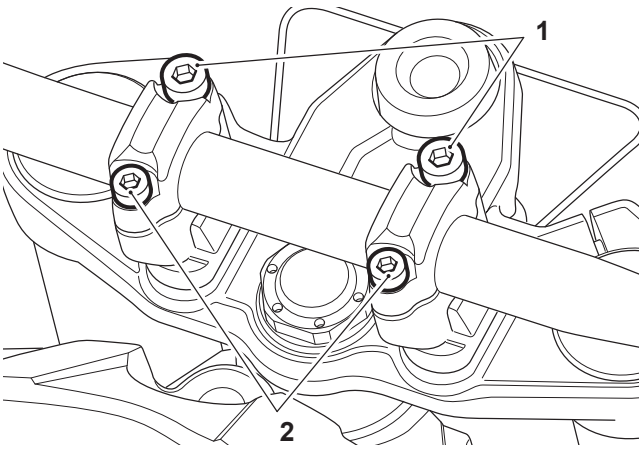
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Remove both forks (see Front Fork - Removal).
2. Note the orientation of the adjustable risers, in order that they can be returned to the same position when the repair operation is complete.

Note

- **The bolt positions shown below are in the standard position, as delivered from the factory. If the handlebars have been adjusted, the bolt positions will be reversed.**

3. Remove the handlebar rear (8 mm threaded) clamp bolts, and then the front (10 mm threaded) clamp and riser bolts.



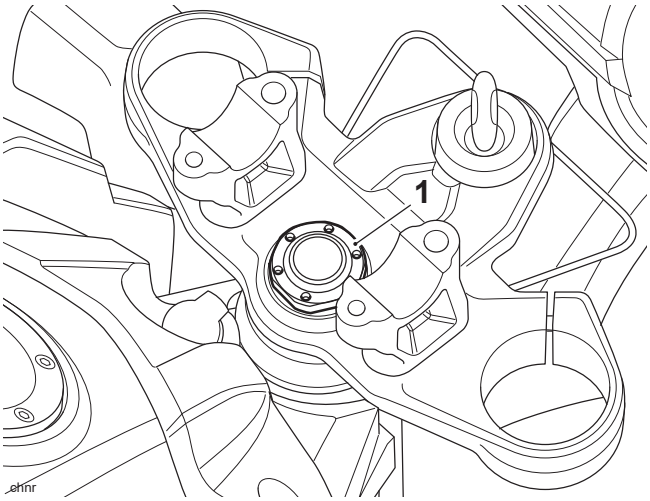
1. **10 mm bolts**
2. **8 mm bolts**

4. As an assembly, raise the handlebars until clear of the top yoke. Rest the assembly forward of the steering stem such that access to the headstock top nut and the adjustment nuts is unrestricted. Ensure the master cylinder remains in an upright position.
5. Loosen the top yoke clamp bolts.

CAUTION

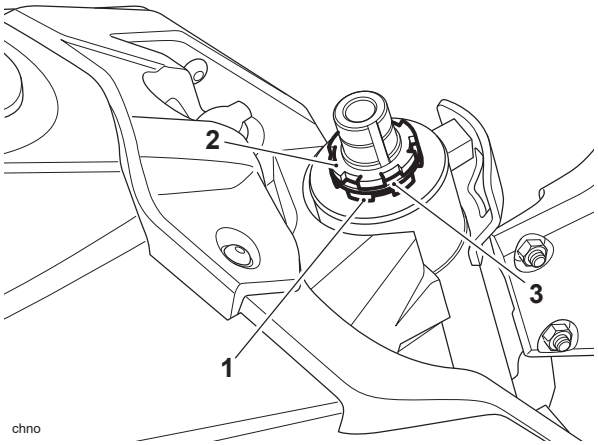
Care must be taken when removing the headstock top nut, to ensure that the top nut and top yoke do not become scratched. Protect the surfaces with a suitable cloth or tape to prevent scratching.

6. Remove the headstock upper nut.



1. **Headstock upper nut**

7. Remove the top yoke and support while detached.
8. Using T3880620 - Adjuster Socket, 48 mm remove the lock nut and tab washer. Discard the tab washer.



1. **Adjuster nut**
2. **Lock nut**
3. **Tab washer**

9. Using the same tool, remove the adjuster nut.
10. Remove the bearing cover and dust seal.
11. Remove the bottom yoke from below the frame headstock.

WARNING

Always wear eye, hand and face protection when using a hammer and drift. Use of a hammer and drift can cause bearings to fragment. Pieces of fragmented bearing could cause eye and soft tissue injuries if suitable protective apparel is not worn.

12. Using a suitable drift, evenly and progressively drive the bearing races from the frame headstock.
13. Remove the inner race and dust seal from the bottom yoke using a press or puller.

Headstock Bearing - Inspection

Headstock Bearing - Installation

Handlebars - Removal

Handlebars - Installation

Rear Suspension

Exploded View – Swinging Arm

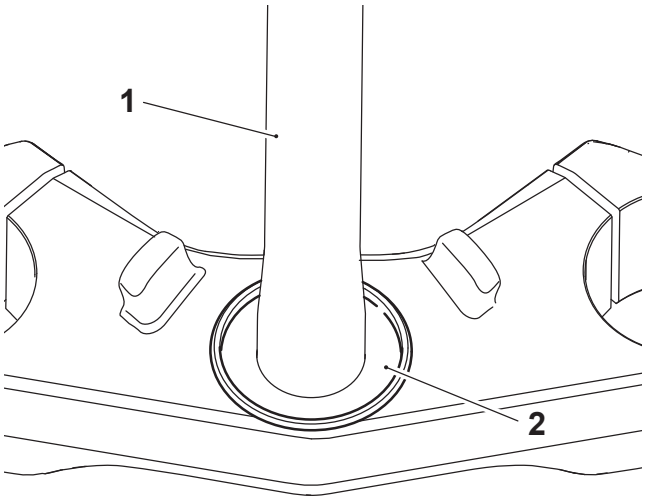
Exploded View – Rear Suspension Unit

WARNING

Only remove raised witness marks from within the frame. Removal of material below any raised areas will reduce the level of interference between the frame and the bearings. Loss of interference could cause the bearing to become loose in the frame leading to loss of motorcycle control and an accident.

1. Examine the frame for any raised witness marks caused by the removal process. Remove any such marks with fine emery paper or a gentle file.

1. Fit a new dust seal to the steering stem on the bottom yoke.

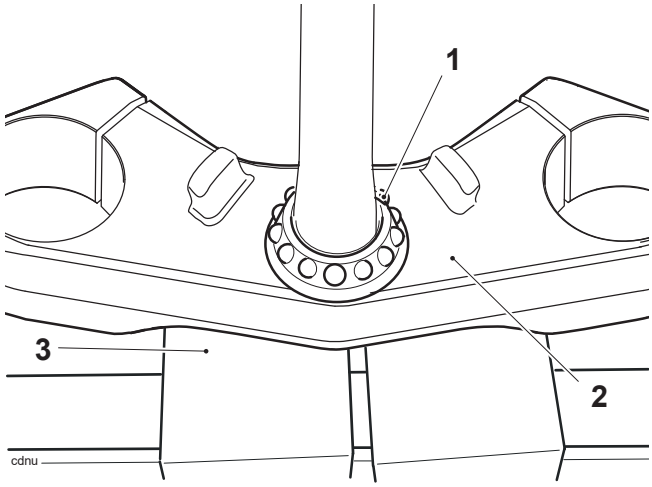


1. **Steering stem**
2. **Dust seal**

CAUTION

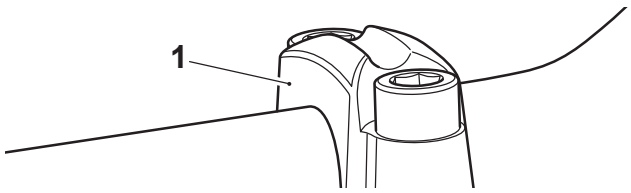
Protect the threads of the bottom yoke when using a press or puller as damaged threads may mean replacing the yoke completely.

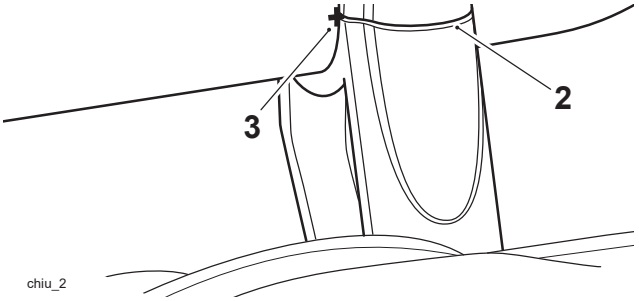
2. Press a new lower bearing inner race onto the steering stem of the bottom yoke.



1. **Bearing**
2. **Bottom yoke**
3. **Press bed**

3. Evenly and progressively drive a new complete upper bearing into the frame headstock.
4. Lubricate the lower bearing using multipurpose grease.
5. Drive a new lower outer bearing into the frame headstock.
6. Lubricate the upper bearing using multipurpose grease.
7. Insert the lower yoke to the frame, fit the upper bearing and race.
8. Fit a new upper dust seal and bearing cover, and retain with the adjuster nut.
9. Adjust the headstock bearings (see Headstock Bearing Check/Adjustment).
10. Locate the upper yoke to the steering stem. Install but do not fully tighten the headstock top nut at this stage.
11. Fit the forks (see Front Fork - Installation).
12. Tighten the headstock upper nut to **90 Nm**.
13. Check that no free play exists in the headstock bearings. Adjust as necessary (see Headstock Bearing Check/Adjustment).
14. Ensure that the risers are in the same orientation as noted for removal.
15. Locate the handlebar assembly in the risers. Fit the upper clamps and the 10 mm bolts.
16. Rotate the handlebar so that the alignment marking on the handlebar aligns with the front left hand split line of the clamp riser.





1. **Upper clamp**
2. **Clamp split line**
3. **Alignment marking**

17. Tighten the 10 mm bolts to **35 Nm**.
18. Fit the 8 mm bolts and tighten to **26 Nm**.
19. Recheck the bearing adjustment.

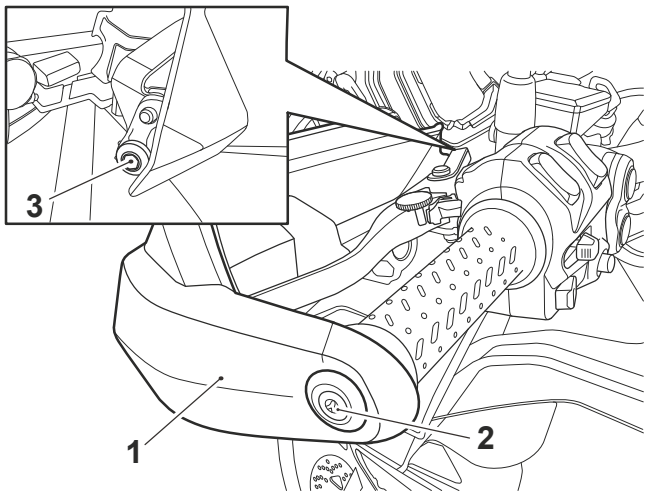
Exploded View – Drop/Drag Link

⚠ 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.

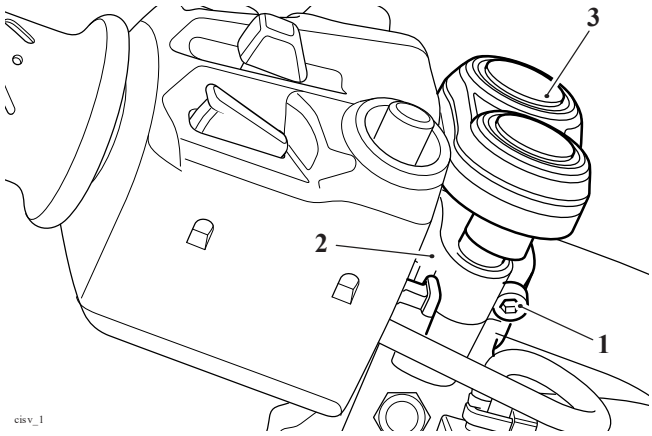
- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.

1. Release the two fixings and remove the spacer, handguard and the handlebar end weight. Discard the fixings.



1. **Handguard (left hand shown)**
2. **Handlebar end fixing**
3. **Handguard to bracket fixing**

2. Remove the fixing and remove the switch housing for the heated grips and fog lights from the clutch master cylinder clamp. Without disconnecting any wiring, lay the switch housing aside.

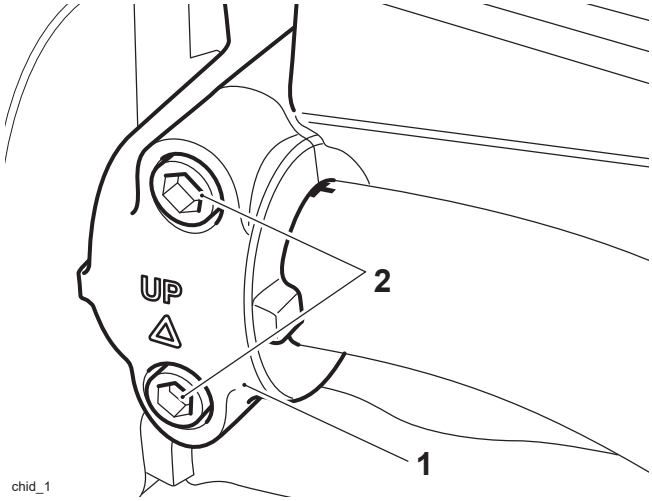


1. **Fixing**
2. **Clutch master cylinder clamp**
3. **Switch housing**

⚠ CAUTION

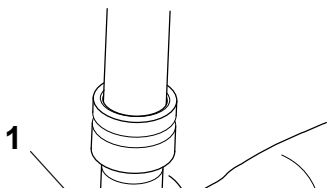
To prevent paint damage, do not spill brake and clutch fluid onto any area of the bodywork. Spilled brake and clutch fluid will damage paintwork.

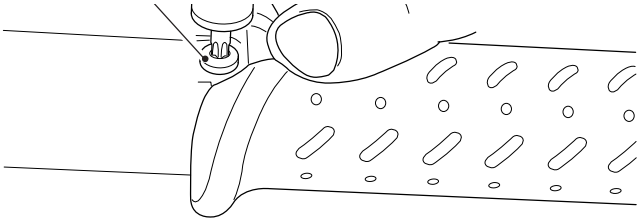
3. Release the handlebar clamp screws and remove the clamp from the clutch master cylinder. Taking care to not invert the clutch fluid reservoir, lay the assembly aside.



1. **Clamp**
2. **Screws**

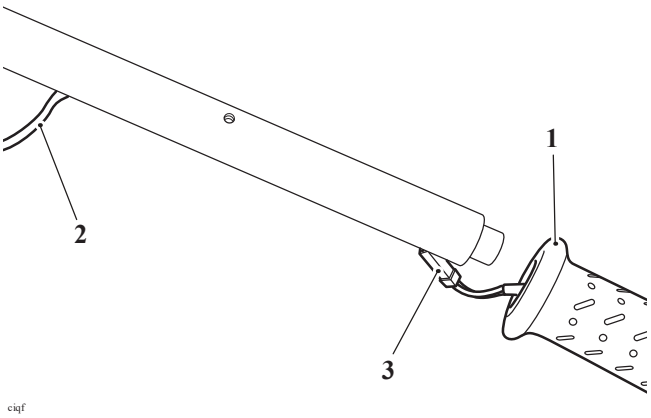
4. Release the screws and free the left switch housing from the handlebar. Without disconnecting any wiring, lay the switch housing aside.
5. Release the two fixings securing the left hand grip to the handlebar and collect the two washers.





1. **Fixing (one of two shown)**

6. Slide the heated grip off the handlebar while carefully feeding the harness into the handlebar.
7. Disconnect the electrical connector and remove the heated grip.



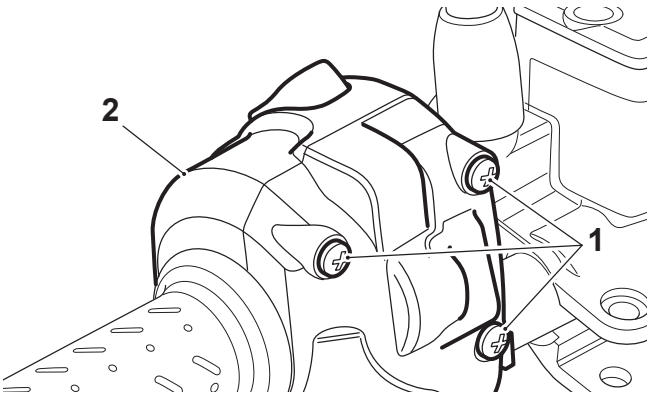
1. **Heated grip (left hand)**
2. **Harness**
3. **Electrical connector**

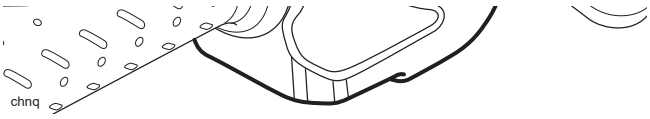
8. Note the setting of the brake lever adjuster to ensure it is returned to the same position for installation.
9. Remove the pivot lock nut and bolt securing the brake lever to the master cylinder, and remove the lever. Discard the lock nut.

Note

- **The front of the right hand switch housing can not be removed from the handlebar until the handlebar is released from its clamps.**

10. Release the three fixings and free the rear of the right hand switch housing from the handlebar. Without disconnecting any wiring, lay it aside.



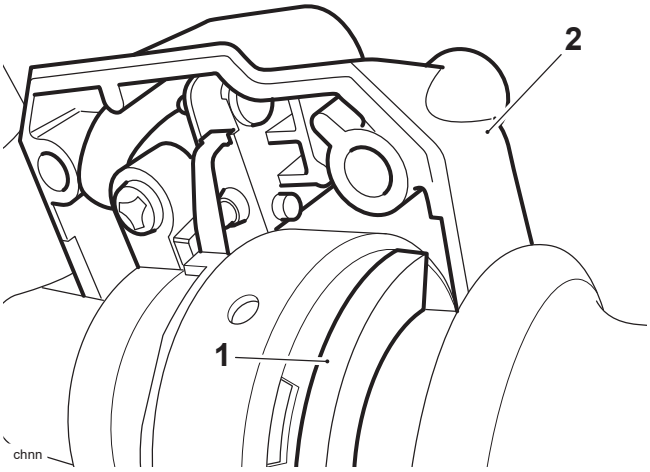


1. **Fixings**
2. **Rear of switch cube**

Note

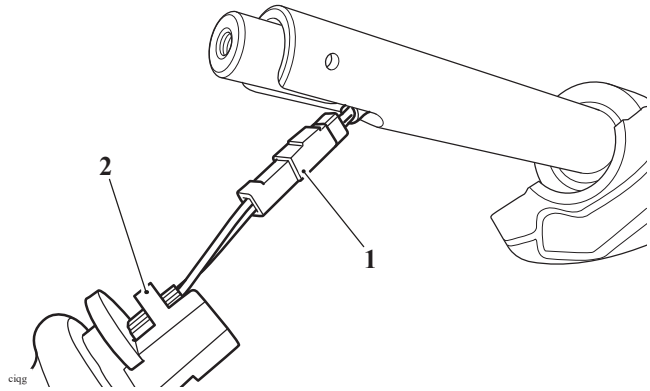
- **Note the position and orientation of the twist grip to the switch cube for installation.**

11. Slightly roll the twist grip rearwards until its guide is clear of the switch housing.



1. **Guide, twist grip**
2. **Switch housing**

12. Slide the heated twist grip off the handlebar while carefully feeding the harness into the left hand side of the handlebar.
13. Disconnect the electrical connector and remove the heated twist grip.



1. **Electrical connector**
2. **Heated twist grip**

14. Release the bolts and remove the clamp from the front brake master cylinder. Taking care to not invert the

brake fluid reservoir, lay the assembly aside.

15. Note the routing of the heated grips harness, then carefully remove the harness from the handle bars and lay aside.

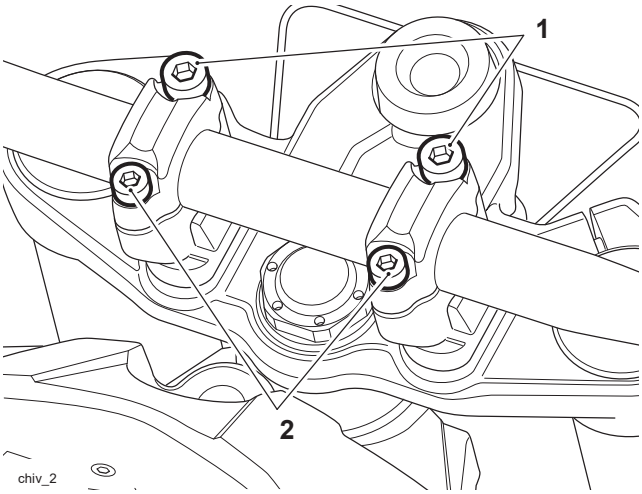
WARNING

Always return the risers to their original position. Operating the motorcycle with a handlebar position that is unfamiliar may lead to loss of control or an accident.

Note

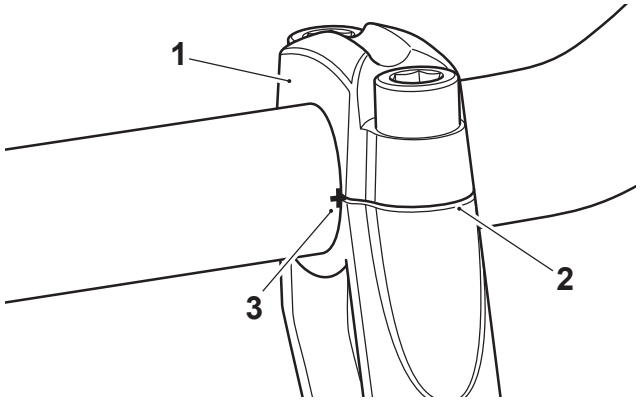
- **The bolt positions shown are in the standard position, as delivered from the factory. If the handlebars have been adjusted, the bolt positions will be reversed.**
- **Note the orientation of the risers for installation, in order that they can be returned to the same position when the repair operation is complete.**
- **Note the position of the 8 mm and 10 mm bolts for installation.**

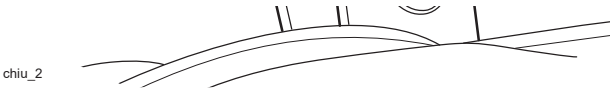
16. Remove the handlebar rear (8 mm threaded) clamp bolts, and then the front (10 mm threaded) clamp and riser bolts. Remove the handlebars while removing the front of the right hand switch cube from the handlebar.



1. **10 mm bolts**
2. **8 mm bolts**

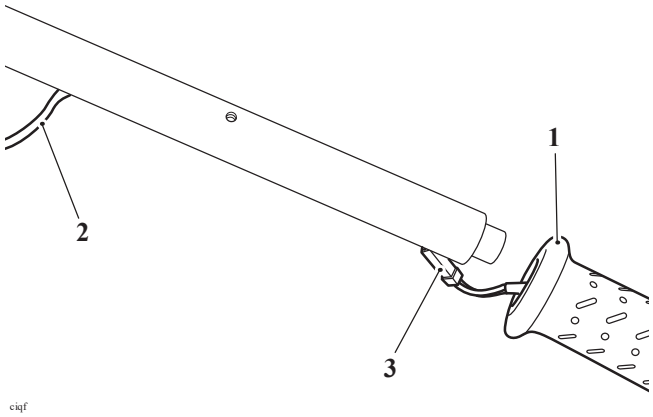
1. Ensure that the risers are in the same orientation as noted for removal.
2. Fit the front of the right hand switch housing to the right hand side of the handlebar.
3. Locate the handlebar assembly into the risers. Fit the upper clamps and the 10 mm bolts.
4. Rotate the handlebar so that the alignment mark on the handlebar aligns with the front left hand split line of the clamp riser.





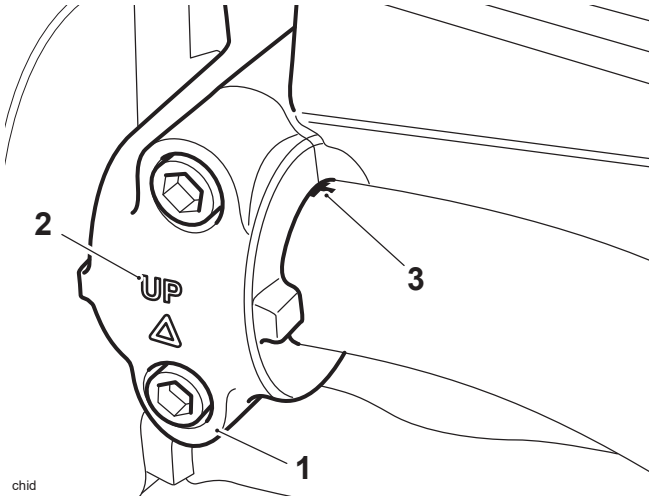
1. **Upper clamp**
2. **Clamp split line**
3. **Alignment marking**

5. Tighten the 10 mm bolts to **35 Nm**.
6. Fit the 8 mm bolts and tighten to **26 Nm**.
7. Feed the heated grips harness into the handlebar as noted during removal.
8. Connect the electrical connector of the left hand heated grip to the main harness.
9. Carefully fit the left hand heated grip while pulling the harness out of the handlebar. Secure with the two fixings and washers. Tighten the fixings to **3 Nm**.



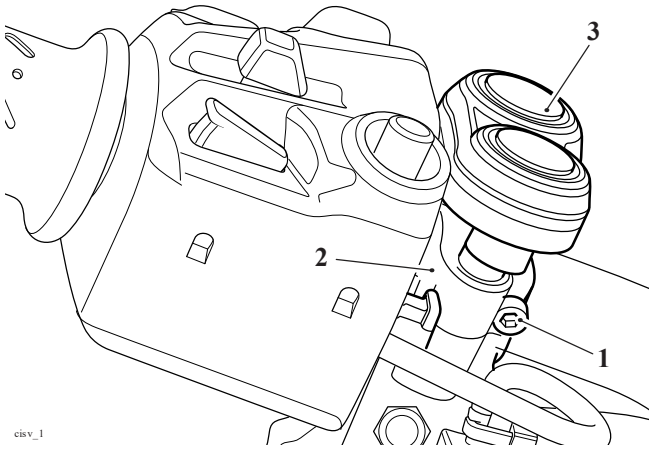
1. **Heated grip (left hand)**
2. **Harness**
3. **Electrical connector**

10. Align the left hand switch housing to the handlebar and secure with the screws. Tighten the screws to **2.5 Nm**.
11. Locate the clutch master cylinder to the handlebars and position the clamp with the 'UP' arrow pointing upwards. Align the clutch master cylinder/clamp split line with the alignment mark on the handlebar.
12. Tighten the clamp fixings, upper first and then lower to **12 Nm**.



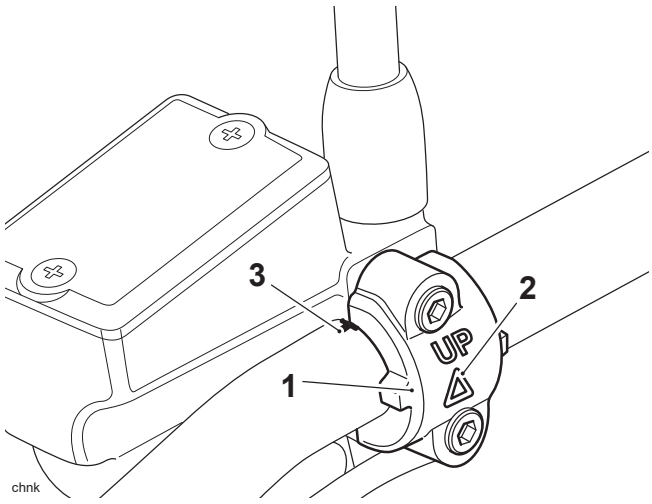
1. **Handlebar clamp**
2. **'UP' arrow**
3. **Alignment mark**

13. Refit the heated grips and fog lights switch housing and secure with the fixing. Tighten the fixing to **3 Nm**.



1. **Fixing**
2. **Clutch master cylinder clamp**
3. **Switch housing**

14. Position the front brake master cylinder assembly to the handlebar. Fit the clamp ('UP' arrow pointing upwards) and clamp fixings.
15. Align the split line of the master cylinder clamp to the alignment mark on the upper surface of the handlebar.
16. Tighten the clamp fixings, upper first and then lower to **12 Nm**.

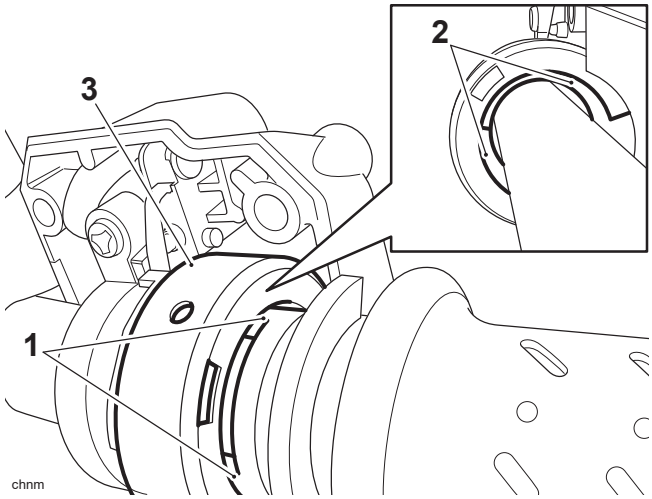


1. **Handlebar clamp**
2. **'UP' arrow**
3. **Alignment mark**

Note

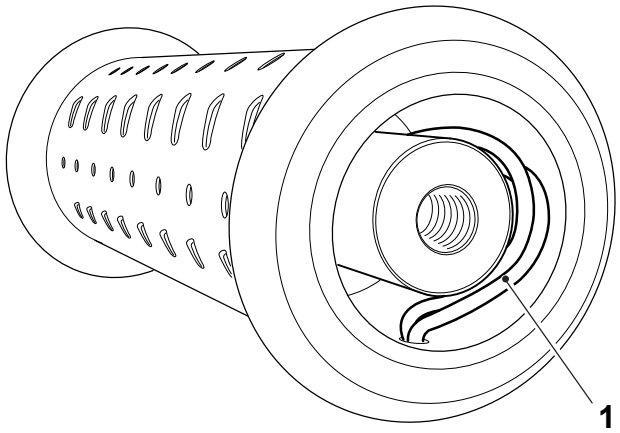
- **The twist grip will only fit in one position to the switch housing. Do not force the twist grip to fit.**

17. Connect the electrical connector of the heated twist grip to the main harness.
18. Carefully fit the heated twist grip while pulling the harness out of the left hand side of the handlebar.
19. Partially engage the locating lugs on the twist grip into their slots in the spring housing.



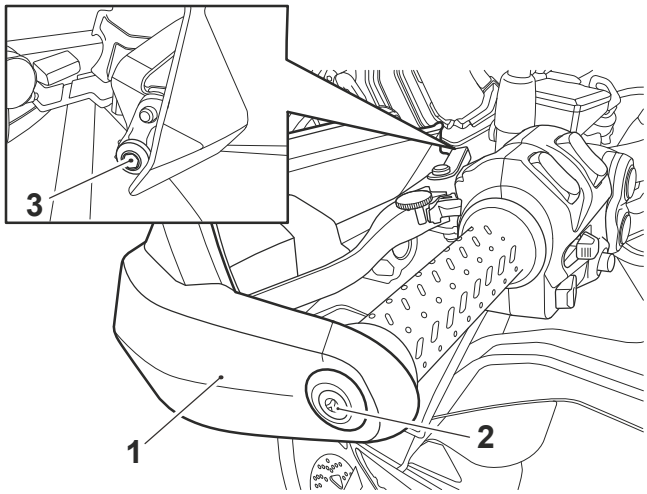
1. **Locating lugs**
2. **Slots**
3. **Spring housing**

20. To fully engage the twist grip, rotate it rearwards and gently push fully in.
21. Carefully feed the cable back through the hole in the left hand side of the handlebar until the loop of the cables is just inside the end of the heated twist grip, as shown below.



1. **Cable position (throttle off)**

22. Fit the rear of the switch housing and tighten its fixings to **2.5 Nm**.
23. Apply a smear of silicone grease to the shank of the brake lever pivot bolt.
24. Position the brake lever ensuring that the pivot boss is correctly aligned to the push rod. Fit and tighten the pivot bolt to **1 Nm**.
25. Counter hold the pivot bolt, fit and tighten the lock nut to **6 Nm**.
26. Position the handlebar end weight, handguard and spacer to the handlebar and secure with new fixings. tighten the:
    - new handlebar end fixing to **5 Nm**.
    - new handguard to bracket fixing to **6 Nm**.



1. **Handguard**
2. **Handlebar end fixing**
3. **Handguard to bracket fixing**

- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

Note

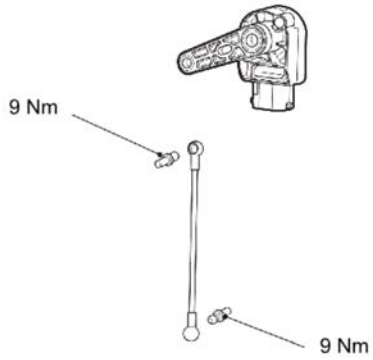
- **Check for correct operation of the front brake and clutch. Check that the throttle opens and closes without sticking. Rectify as necessary.**

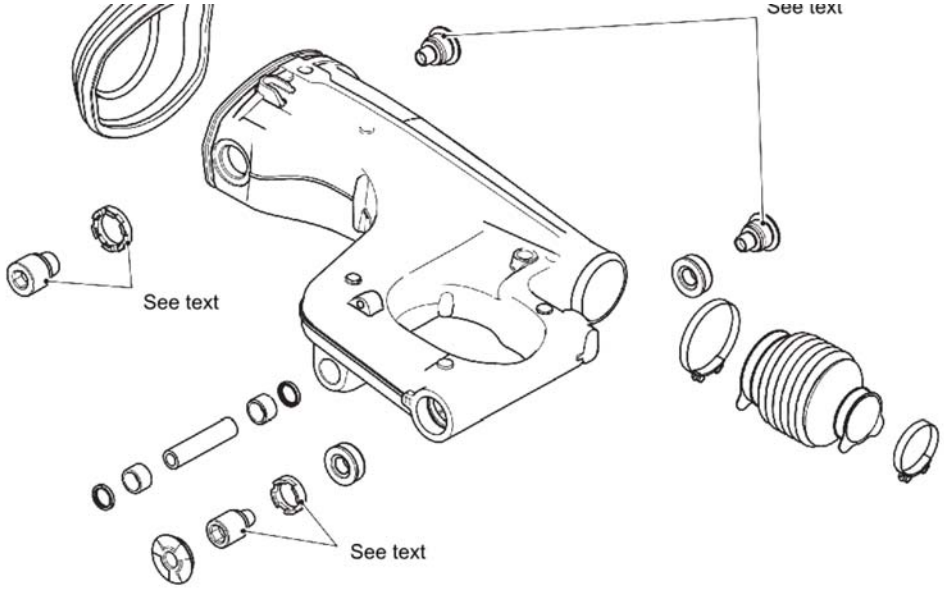
⚠ WARNING

Operation of the motorcycle with incorrect throttle operation may result in loss of motorcycle control 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.

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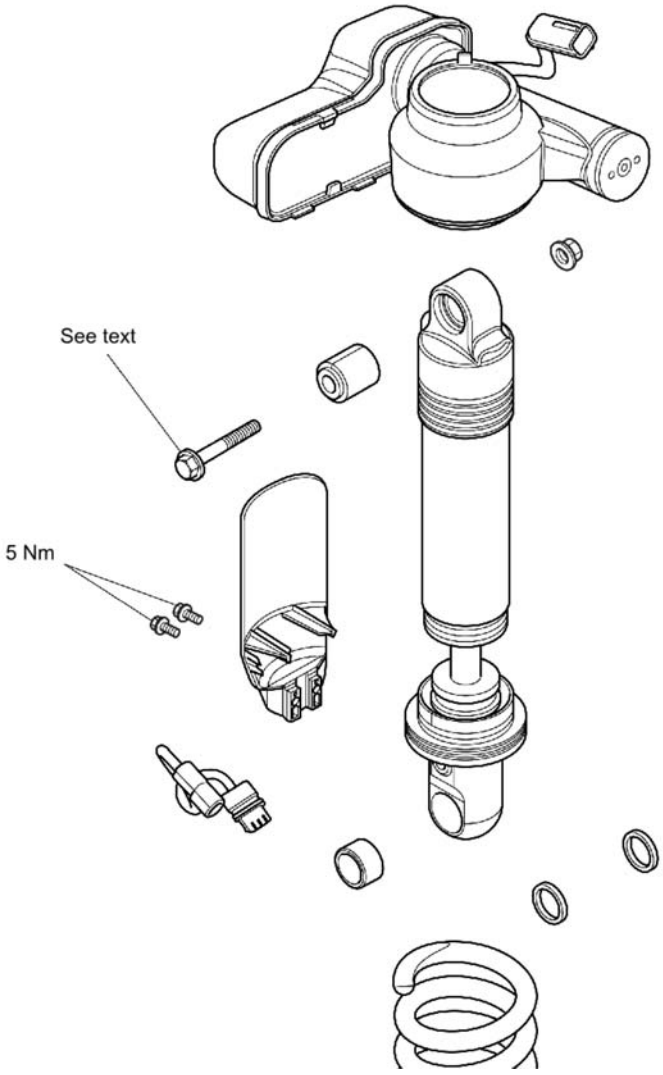
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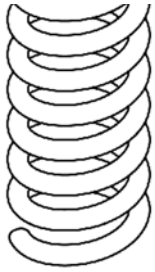
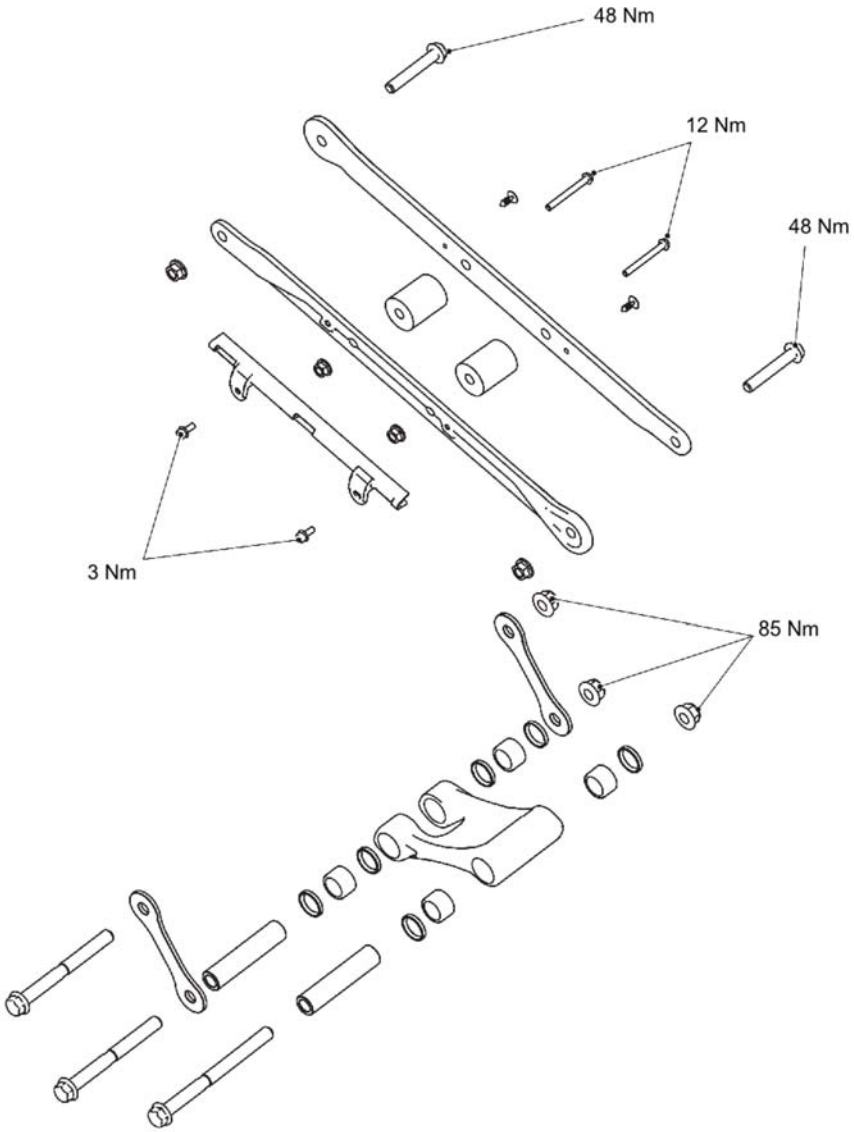
5 Nm



Drag and Drop Links - Removal

Drag and Drop Links - Inspection

Drag and Drop Links - Installation



Rear Suspension Unit - Removal

WARNING

If the engine has recently been running, the exhaust components may be hot to the touch. Contact with the hot components may cause damage to exposed skin. To avoid skin damage, always allow the hot parts to cool before working on the exhaust system.

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.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.

1. Raise and support the rear of the motorcycle beneath the frame or engine. Position a block to support the rear wheel, or if the rear wheel has been removed, position a suitable strap to support the swinging arm.

Note

- **The bolt securing the drag link to the frame is longer than the two bolts securing the drop links to the rear suspension unit and the swinging arm.**

2. Remove the fixings securing the drop links to the swinging arm. Discard the lock nut.
3. Remove the fixings securing the drag link and drop links to the rear suspension unit and remove the drop links. Discard the lock nut.
4. Remove the bearing sleeve from the drag link and rear suspension unit lower mounting.

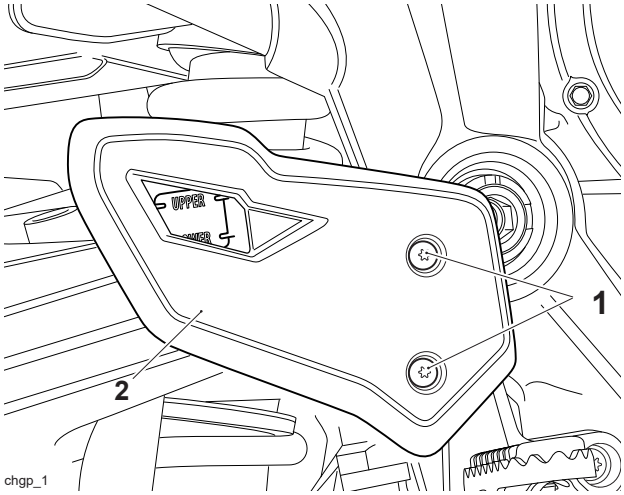
WARNING

Do not allow the right hand control plate to hang on the brake hose as this may damage the hose and could lead to loss of motorcycle control and an accident.

Note

- **Note the orientation of the drag link for installation.**

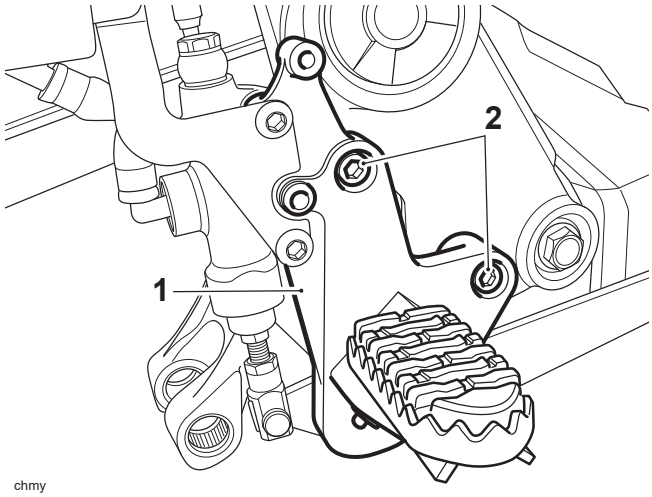
5. Release the fixings and remove the right hand heel guard.



1. Fixings

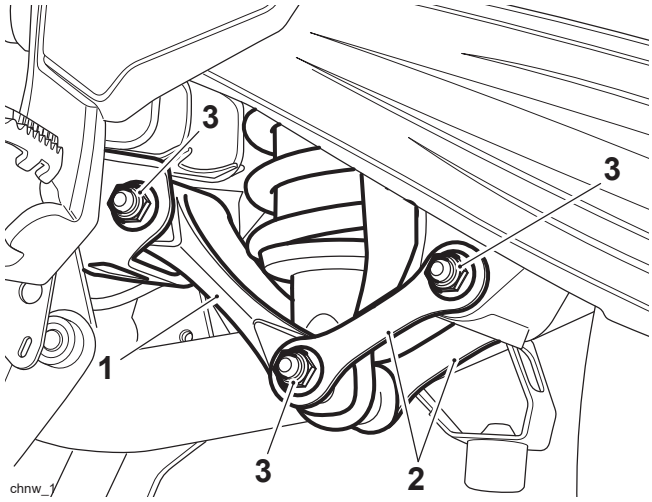
2. **Heel guard**

6. Temporarily detach the right hand control plate from the frame.



1. **Control plate**
2. **Fixings**

7. Remove the fixings securing the drag link to the frame and remove the drag link. Discard the lock nut.



1. **Drag link**
2. **Drop links**
3. **Lock nuts**

Rear Suspension Unit - Disassembly

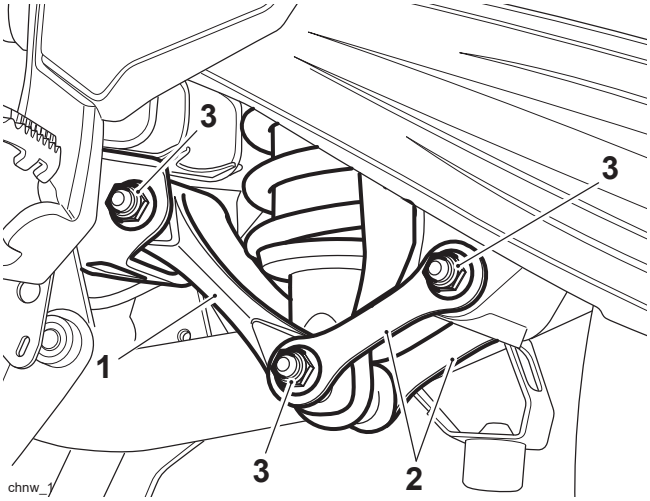
1. Clean all components and inspect the drag link and bearings for damage/wear.
2. Check the rear suspension unit lower bearings for wear.
3. Check the drop link bearings for wear.
4. Renew as necessary.

Rear Suspension Unit - Spring Assembly

1. Remove the drag link sleeves and pack the bearings with fresh grease (NLGI 2 specification grease). Refit

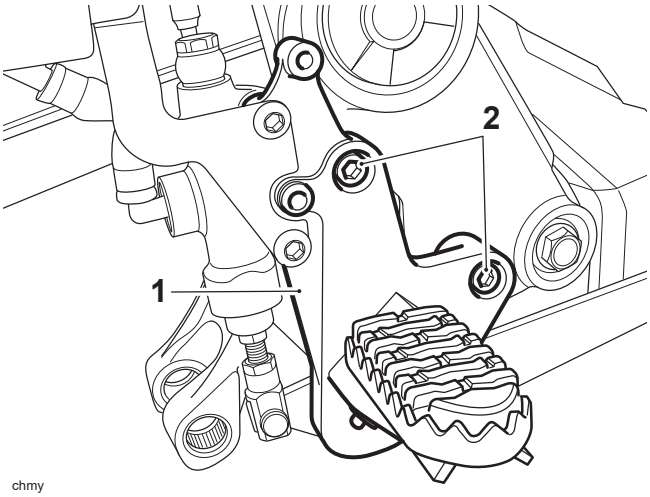
the sleeves.

2. Remove the swinging arm drop link sleeve and pack the bearings with fresh grease (NLGI 2 specification grease). Refit the sleeve.
3. Refit the drag link to the frame. Fit the bolt and a new lock nut from the right hand side. Do not fully tighten at this stage.
4. Pack the rear suspension unit bearing with fresh grease (NLGI 2 specification grease).
5. Locate the drag link to the rear suspension unit and fit the drag link bearing sleeve.
6. Refit the drop link plates and fit the bolts and new lock nuts from the right hand side. Do not fully tighten them at this stage.
7. With the weight of the motorcycle on its wheels:
   - Hold the rear suspension unit lower mounting bolt and tighten the lock nut to **85 Nm**.
   - Hold the drop link to swinging arm bolt and tighten the lock nut to **85 Nm**.
   - Hold the drag link to frame bolt and tighten the lock nut to **85 Nm**.



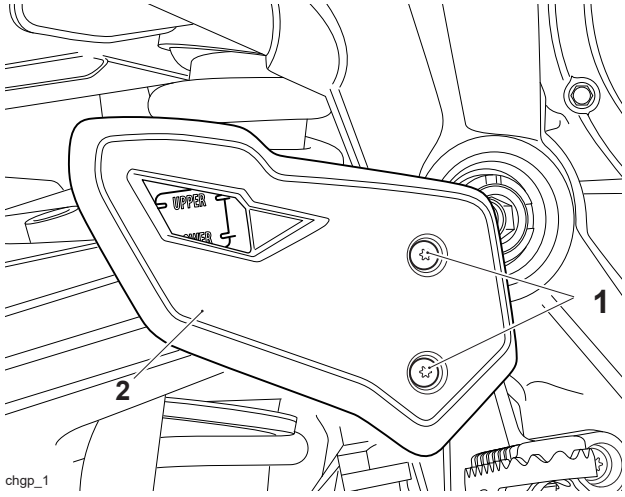
1. **Drag link**
2. **Drop links**
3. **Lock nuts**

8. Refit the right hand control plate and tighten its fixings to **18 Nm**.



1. **Control plate**
2. **Fixings**

9. Refit the heel guard and tighten its fixings to **7 Nm**.



1. **Fixings**
2. **Heel guard**

- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

Rear Suspension Unit - Installation

Rear Suspension Unit Preload Motor Calibration

WARNING

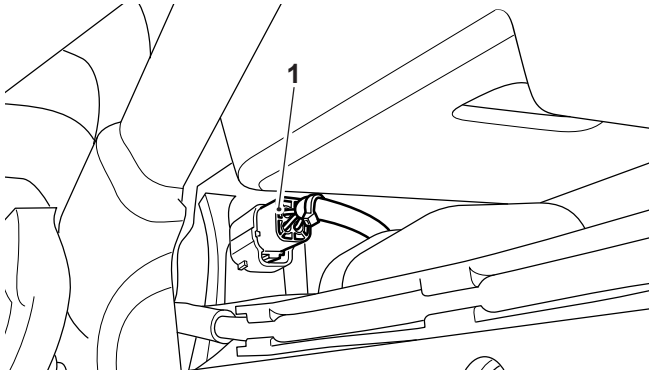
If the engine has recently been running, the exhaust components may be hot to the touch. Contact with the hot components may cause damage to exposed skin. To avoid skin damage, always allow the hot parts to cool before working on the exhaust system.

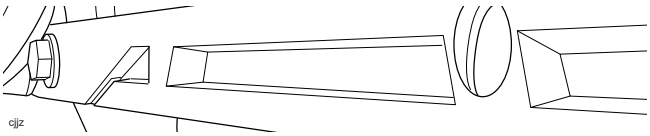
WARNING

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.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the swinging arm (see Swinging Arm - Removal).

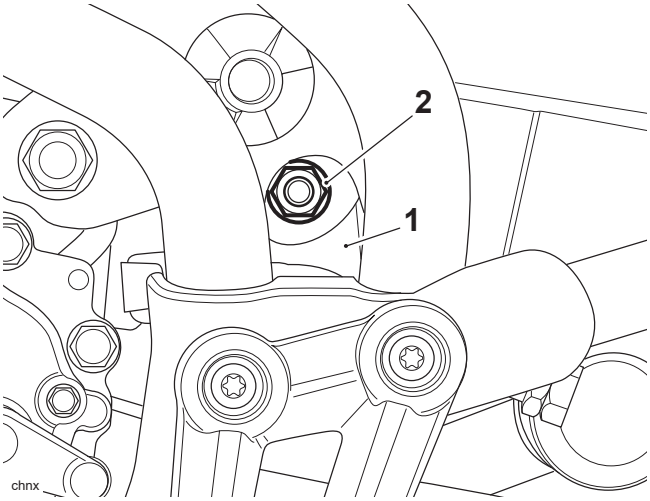
1. Disconnect the electrical connector for the rear suspension unit preload motor.





1. **Electrical connector**

2. Remove the bolt securing the rear suspension unit to its upper mounting and remove the unit. Discard the lock nut.



1. **Rear suspension unit**
2. **Lock nut**

Rear Preload Motor Up/Down Function Tests

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.

WARNING

When using a spring compressor, always wear overalls, eye, face and hand protection.

Do not leave a compressed spring unattended.

Ensure the jaws and the body of the compressor are correctly aligned at all times during spring compression.

Do not compress the spring to an extent where the coil windings touch.

Do not operate the spring compressor if parts are damaged or missing.

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

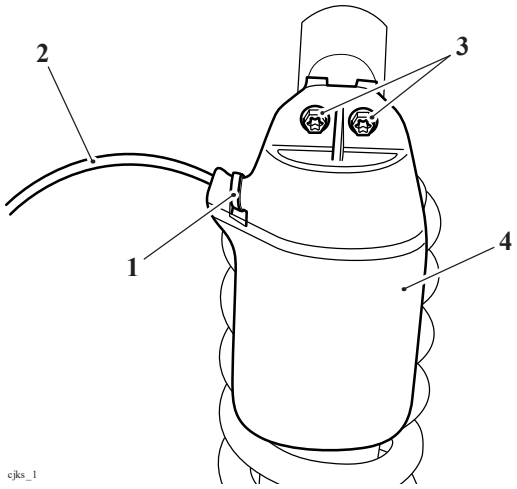
- Remove the rear suspension unit (see Rear Suspension Unit - Removal).

Note

- **Note the position of the cable tie securing the fly lead to the stone protector.**

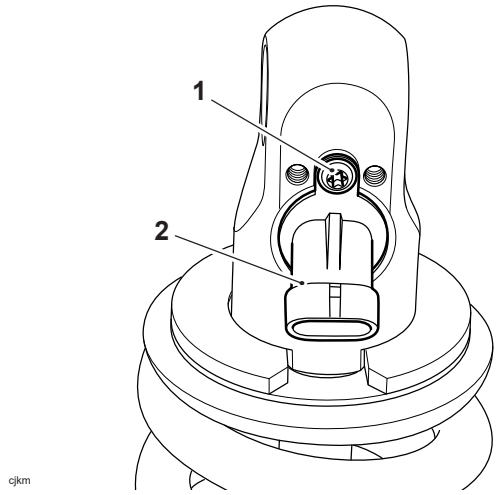
1. Remove the cable tie securing the fly lead to the stone protector.

2. Release the two fixings and remove the stone protector.



1. **Cable tie**
2. **Fly lead**
3. **Fixings**
4. **Stone protector**

3. Disconnect the fly lead from damping solenoid electrical connector.
4. Release the fixing from the damping solenoid electrical connector.



1. **Fixing**
2. **Electrical connector**

Note

- **The electrical connector is a push fit and is sealed with an o-ring.**
- **When releasing the electrical connector the wires are hidden and could become detached if the electrical connector is not removed carefully.**

5. Remove the electrical connector, noting the orientation of the wires.
6. Using a proprietary spring compressor, secure the rear suspension unit in such a way that the split collar is accessible.

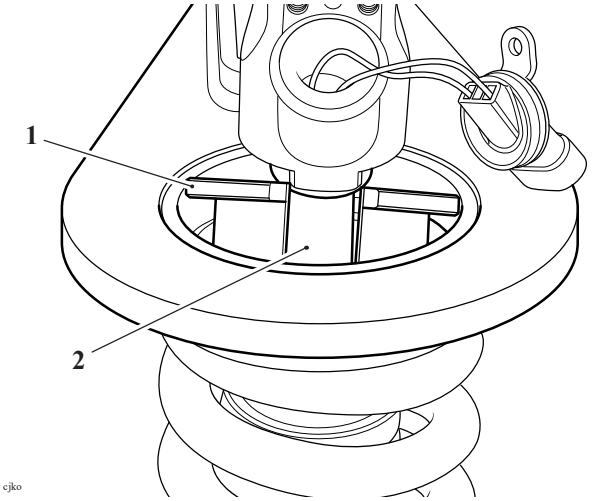
Note

- **Do not compress the spring to an extent where the coil windings touch.**

Note

- **The split collar is positioned in such a way to allow for the correct fitment of the electrical connector.**

7. Noting the orientation of the split collar, compress the spring until the split collar is accessible.
8. Taking care not to damage the split collar slide it from the damper rod.



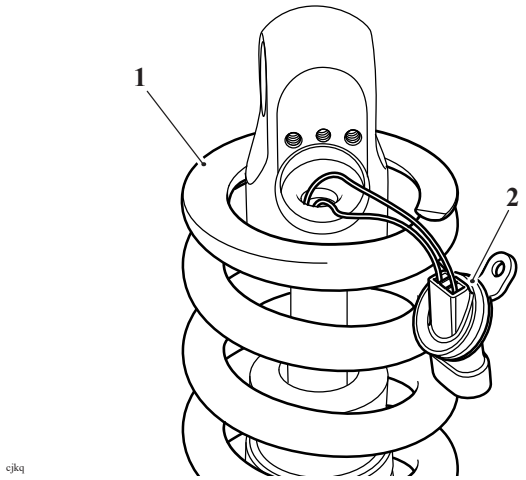
1. **Split collar**
2. **Damper rod**

9. Slowly release the tension from the spring and remove the assembly from the spring compressor.

Note

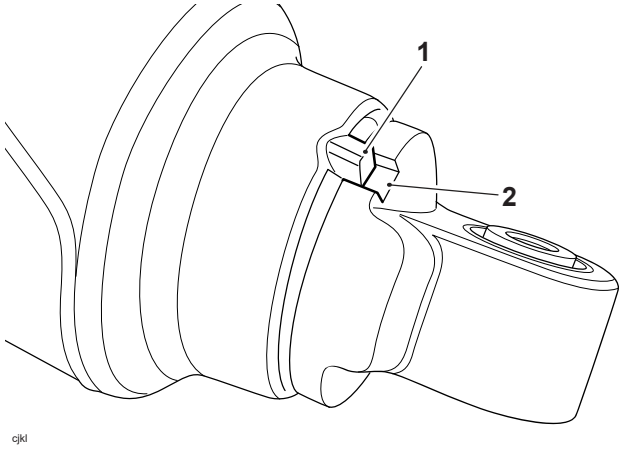
- **Manufacturing tolerances of the spring require spacers to be placed at both ends of the spring.**
- **If for any reason the spring is replaced. the original spacers must be discarded and the new spacers supplied with the spring must be used.**

10. Noting their position and orientation, remove the spring, flanged sleeve and spacers. Take care not to damage the electrical connector and wires when removing the components.



1. **Spring**
2. **Electrical connector**

11. Noting its orientation, remove the preload adjuster from the damper assembly.



1. **Preload adjuster**
2. **Damper assembly**

⚠ 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

When using a spring compressor, always wear overalls, eye, face and hand protection.

Do not leave a compressed spring unattended.

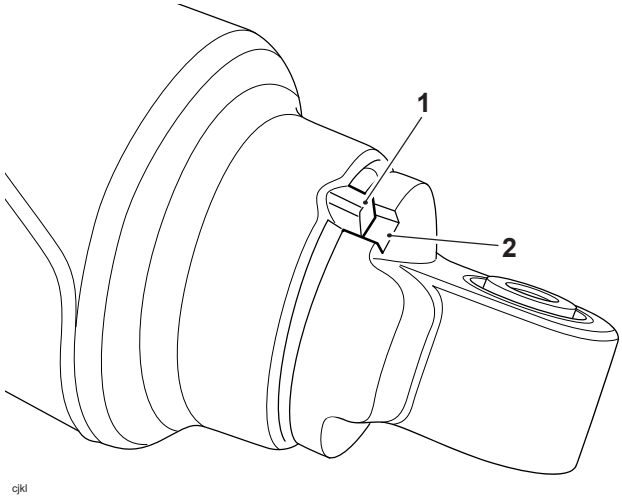
Ensure the jaws and the body of the compressor are correctly aligned at all times during spring compression.

Do not compress the spring to an extent where the coil windings touch.

Do not operate the spring compressor if parts are damaged or missing.

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

1. Position the tag on the preload adjuster to the slot on the damper assembly as noted during removal.

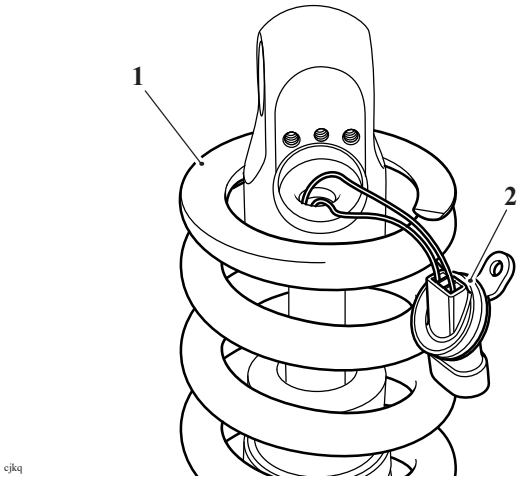


1. **Preload adjuster**
2. **Damper assembly**

Note

- **Manufacturing tolerances of the spring require spacers to be placed at both ends of the spring.**
- **If for any reason the spring is replaced. the original spacers must be discarded and the new spacers supplied with the spring must be used.**

2. Refit the flanged sleeve and spacers as noted during removal.
3. Refit the spring in the orientation noted during removal.

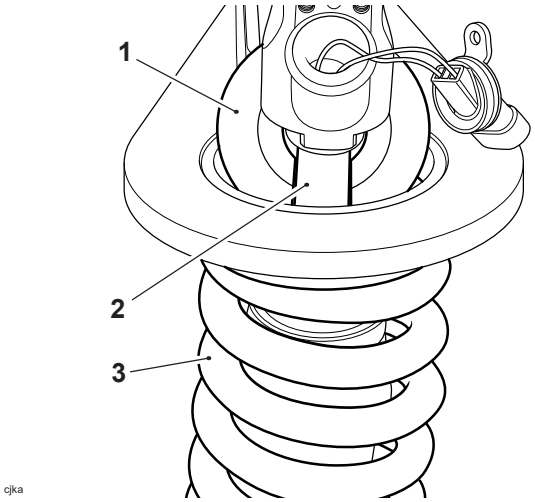


1. **Spring**
2. **Electrical connector**

Note

- **Do not compress the spring to an extent where the coil windings touch.**
- **The split collar is positioned in such a way to allow for the correct fitment of the electrical connector.**

4. Using a proprietary spring compressor, compress the spring until the split collar can be positioned onto the damper rod as noted during removal.



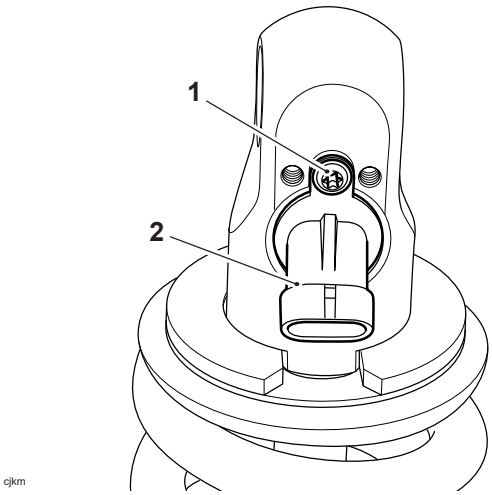
1. **Split collar**
2. **Damper rod**
3. **Spring**

5. Slowly release the tension from the spring ensuring the split collar is positioned as noted during removal.
6. Remove the rear suspension unit assembly from the spring compressor.

Note

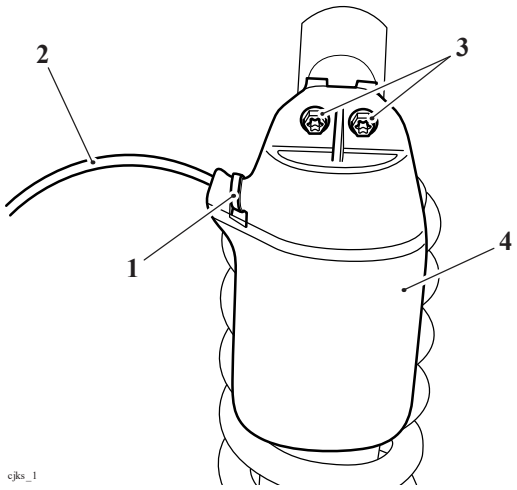
- **The electrical connector is a push fit and sealed with an o-ring.**

7. Locate the electrical connector to the rear suspension unit and tighten the fixing to **1 Nm**.



1. **Fixings**
2. **Electrical connector**

8. Reconnect the fly lead.
9. Refit the stone protector and tighten the fixings to **5 Nm**.
10. Secure the fly lead to the stone protector with a new cable tie as noted during removal.



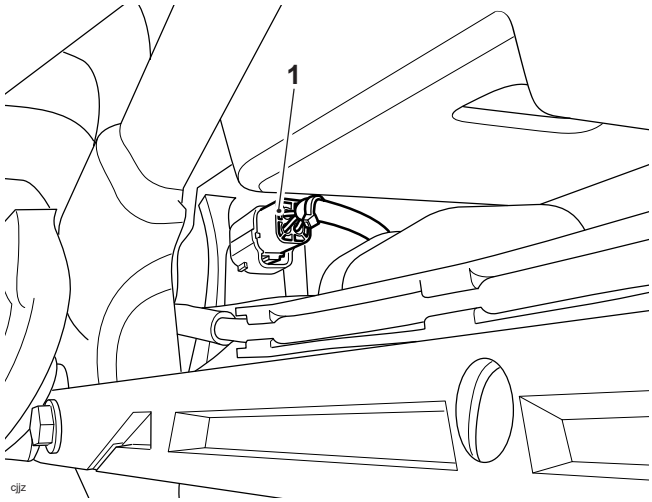
1. **Cable tie**
2. **Fly lead**
3. **Fixings**
4. **Stone protector**

- Refit the rear suspension unit (see Rear Suspension Unit - Installation).

⚠ 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. Locate the rear suspension unit and fit the upper mounting bolt and a new lock nut from the right hand side. Do not fully tighten at this stage.
2. Connect the electrical connector for the rear suspension unit preload motor.



1. Electrical connector

- Refit the swinging arm (see Swinging Arm - Installation).

⚠ 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.

Conditions Requiring Rear Suspension Unit Preload Motor Calibration

The Rear Suspension Unit (RSU) preload motor must be calibrated:

- After installation and setup of a new chassis ECM.
- After performing the Rear Preload Motor Up/Down function tests using the Triumph Diagnostic Tool.
- After removal/installation of the RSU.
- Before calibration of the swinging arm position sensor.

Note

- **The RSU preload motor calibration is started automatically the first time the ignition is switched on If a new chassis ECM has been installed, or the Rear Preload Motor Up/Down function tests have been performed. In these cases, omit steps 1 to 4 of the following procedure.**
- **For all other conditions listed above, the RSU preload motor calibration must be started manually using the Triumph Diagnostic Tool.**

Procedure

Note

- **During calibration, the RSU preload motor is driven to its maximum and minimum preload settings. Check that the battery is fully charged before starting the calibration.**

1. Remove the rider’s seat (see Rider’s Seat - Removal).
2. Connect the Triumph Diagnostic Tool (see System Diagnosis) and turn the ignition switch On.
3. Navigate to CHASSIS - CHASSIS DIAGNOSTICS - FUNCTION TESTS and select CALIBRATE REAR PRELOAD MOTOR. The message 'Refer to Service Manual' is displayed.

Note

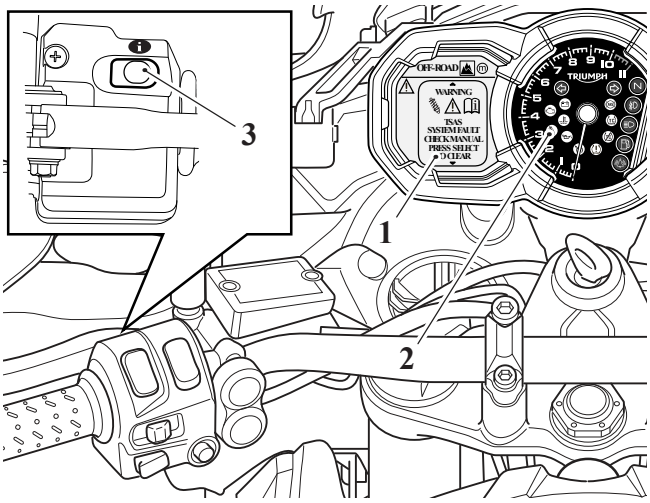
Note

- **Upon clicking START, the diagnostic tool will send a command to the chassis ECM to perform an RSU preload motor calibration the next time the ignition is switched On.**

4. Click start, then disconnect the Triumph Diagnostic Tool from the motorcycle.
5. Turn the ignition switch Off and allow the chassis ECM to power down. This should take approximately 10 seconds.
6. Turn the ignition switch On. The RSU preload motor calibration will start automatically. Do not start the engine at this stage.

Note

- **The motorcycle must remain stationary during calibration. If the motorcycle is moved or ridden, this will halt the calibration and cause the TSAS warning light to become illuminated. In this situation, calibration will be restarted the next time the ignition switch is turned Off then On again.**
- **During calibration, the TSAS warning light will flash and the message WARNING - TSAS SYSTEM FAULT will be displayed in the instrument's multifunction display.**
- **This warning message can be cleared by pressing the SELECT button on the left handlebar switch housing.**
- **Upon clearing the warning message, the information message TSAS SYSTEM CALIBRATING - PLEASE WAIT will be displayed.**
- **Calibration is complete when the instrument messages clear and the TSAS warning light stops flashing.**



1. **Instrument message**
2. **TSAS warning light**
3. **SELECT button**

7. Wait for the TSAS warning light to stop flashing, indicating that the RSU preload motor calibration is complete.

⚠ 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.

8. Start the engine and check that the TSAS warning light remains off. If the warning light resumes flashing, the RSU preload motor is being recalibrated due to low battery voltage. Wait for the warning light to stop flashing before turning the engine off.
9. When the calibration has successfully completed, reconnect the Triumph Diagnostic Tool and check for any stored DTCs. Rectify as necessary.

10. Disconnect the Triumph Diagnostic Tool.
11. Refit the rider's seat (see Rider's Seat - Installation).

Swinging Arm - Inspection

The Rear Preload Motor Up/Down function tests provided in the Triumph Diagnostic Tool may be used as follows:

- Test rear preload motor operation.
- Free the rear preload motor if it is stuck at an end stop.

Test Rear Preload Motor Operation

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. Connect the Triumph diagnostic tool and switch the ignition on.
2. Navigate to CHASSIS DIAGNOSTICS - CHASSIS ECM DIAGNOSTICS and select FUNCTION TESTS.

CAUTION

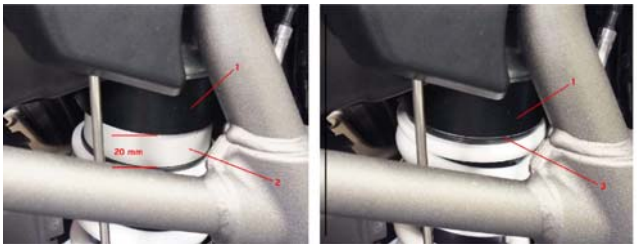
If the rear preload motor adjustment position reaches its maximum or minimum adjustment end stop, do not continue to drive the motor towards the end stop.

Select the test direction that will drive motor away from the end stop as described later in this procedure.

Repeatedly driving the rear preload motor against an end stop may cause the motor to overheat, which can result in permanent damage.

Note

- **The position of the rear preload motor adjustment can be checked visually as follows:**
- **At the maximum preload end stop, the preload adjustment collar is fully extended from the base of the motor housing. Approximately 20 mm of the adjustment collar is visible as shown below.**
- **At intermediate preload adjustment positions, less of the adjustment collar will be visible as the adjustment position moves closer to the minimum preload end stop.**
- **At the minimum preload end stop, the preload adjustment collar is fully retracted into the motor housing.**



1. **Rear preload motor housing**
2. **Adjustment collar (maximum preload position - fully extended)**
3. **Adjustment collar (minimum preload position - fully retracted)**

3. Visually Check the position of the rear preload motor.

Note

- **If the rear preload motor is positioned at or near the minimum or maximum adjustment end stop, the**

Note

motor must first be driven away from the end stop, before testing the motor in the opposite direction.

- **Motor at or near maximum preload - select the rear preload motor** down **test first.**
- **Motor at or near minimum preload - select the rear preload motor** up **test first.**
- **Motor at intermediate position - select either test direction.**

4. Select the appropriate rear preload motor test direction.

WARNING

Never start the engine or run the engine in a confined area. Exhaust fumes are poisonous and can cause loss of consciousness and death within a short period of time. Always operate your motorcycle in the open-air or in an area with adequate ventilation.

5. Start the engine.

Note

- **Upon clicking start, the rear preload motor adjustment collar will move approximately 0.5 mm in the selected direction.**
- **It will take approximately 38 repeated tests to operate the preload motor through its full adjustment range from end stop to end stop, however It is not necessary to do this to verify correct motor operation. Three to five repeated tests are sufficient to verify motor operation.**
- **If the preload motor is operated through its full adjustment range (38 repeated tests), allow the motor to cool for five minutes before running further tests.**

6. Click start and observe the rear preload motor adjustment collar movement. Repeat the test as necessary to verify correct motor operation.
7. Repeat the test in the opposite direction to verify correct motor operation in both directions.

Note

- **If no adjustment collar movement can be observed, check for any stored DTCs, rectify as necessary and repeat the rear preload motor test. If the rear preload motor still doesn't function correctly, contact Triumph service.**

8. Turn the ignition off and disconnect the Triumph diagnostic tool. Allow 15 seconds for the chassis ECM to power down.

Note

- **With the ignition switch turned off, the Triumph diagnostic tool will prevent the chassis ECM from powering down if it is left connected to the motorcycle.**
- **To enable the chassis ECM to power down, disconnect the diagnostic tool from the motorcycle.**
- **After running the rear preload motor up/down tests, the rear preload motor will automatically recalibrate the next time the ignition switch is turned on, provided the chassis ECM is first allowed to power down.**

9. Turn the ignition switch On and allow the rear preload motor to calibrate, see Rear Suspension Unit Preload Motor Calibration.

Free the Rear Preload Motor

If the rear preload motor appears to be stuck at the maximum or minimum adjustment end stop, the rear preload motor up/down function tests can be used to attempt to free the motor as follows.

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. Connect the Triumph diagnostic tool as described in the Service Manual and switch the ignition on.
2. Navigate to CHASSIS DIAGNOSTICS - CHASSIS ECM DIAGNOSTICS and select FUNCTION TESTS.

CAUTION

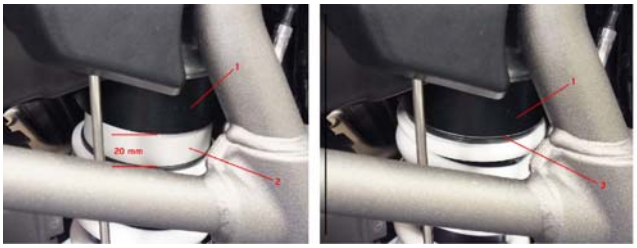
If the rear preload motor adjustment position reaches its maximum or minimum adjustment end stop, do not continue to drive the motor towards the end stop.

Select the test direction that will drive motor away from the end stop as described later in this procedure.

Repeatedly driving the rear preload motor against an end stop may cause the motor to overheat, which can result in permanent damage.

Note

- **The position of the rear preload motor adjustment can be checked visually as follows:**
- **At the maximum preload end stop, the preload adjustment collar is fully extended from the base of the motor housing. Approximately 20 mm of the adjustment collar is visible as shown below.**
- **At the minimum preload end stop, the preload adjustment collar is fully retracted into the motor housing.**



1. **Rear preload motor housing**
2. **Adjustment collar (maximum preload position - fully extended)**
3. **Adjustment collar (minimum preload position - fully retracted)**

3. Visually Check the position of the rear preload motor.

Note

- **If the rear preload motor appears to be stuck at the minimum or maximum adjustment end stop, drive the motor away from the end stop using the appropriate test direction as follows.**
- **Motor stuck at maximum preload - select the rear preload motor down test.**
- **Motor stuck at minimum preload - select the rear preload motor up test.**

4. Select the appropriate rear preload motor test direction.

WARNING

Never start the engine or run the engine in a confined area. Exhaust fumes are poisonous and can cause loss of consciousness and death within a short period of time. Always operate your motorcycle in the open-air or in an area with adequate ventilation.

5. Start the engine.

CAUTION

Do not make more than three attempts to free the rear preload motor.

Making more than three attempts to free the rear preload motor may cause the motor to overheat, which can result in permanent damage.

Note

- **Upon clicking start, the rear preload motor adjustment collar will move approximately 0.5 mm in the**

Note

selected direction.

6. Click start and check for rear preload motor adjustment collar movement. A maximum of three attempts may be made to free the motor from an end stop. The attempt to free the motor is successful if adjustment collar movement is observed.

Note

- **If after three attempts to free the motor no adjustment collar movement can be observed, check for any stored DTCs, rectify as necessary and repeat the rear preload motor test. If the rear preload motor still doesn't function correctly, contact Triumph service.**

7. Turn the ignition off and disconnect the Triumph diagnostic tool. Allow 15 seconds for the chassis ECM to power down.

Note

- **With the ignition switch turned off, the Triumph diagnostic tool will prevent the chassis ECM from powering down if it is left connected to the motorcycle.**
- **To enable the chassis ECM to power down, disconnect the diagnostic tool from the motorcycle.**
- **After running the rear preload motor up/down tests, the rear preload motor will automatically recalibrate the next time the ignition switch is turned on, provided the chassis ECM is first allowed to power down.**

8. Turn the ignition switch on and allow the rear preload motor to calibrate, see Rear Suspension Unit Preload Motor Calibration. During calibration, observe the rear preload motor adjustment collar moving through its full adjustment range to verify correct motor operation.

Swinging Arm - Disassembly

WARNING

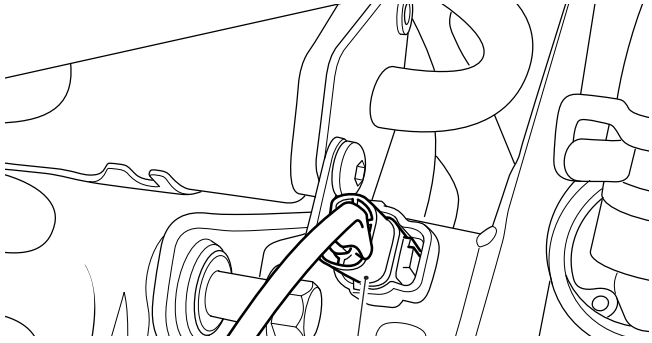
If the engine has recently been running, the exhaust components may be hot to the touch. Contact with the hot components may cause damage to exposed skin. To avoid skin damage, always allow the hot parts to cool before working on the exhaust system.

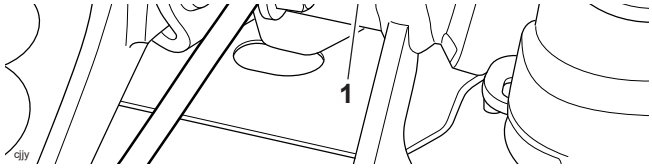
WARNING

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.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the exhaust silencer (see Exhaust System - Removal).
- Remove the rear wheel (see Rear Wheel - Removal).
- Remove the rear bevel box (see Rear Bevel Box - Removal).

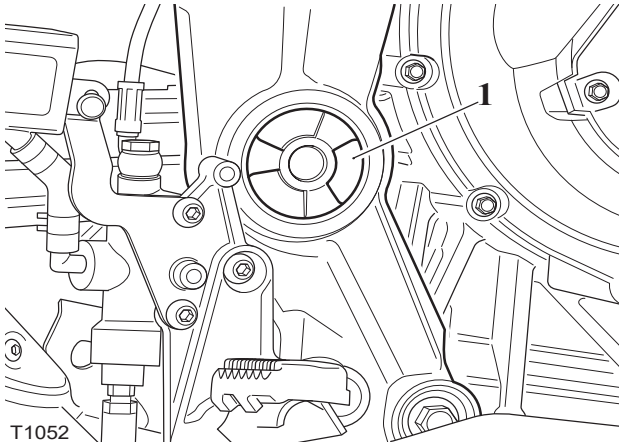
1. Disconnect the swinging arm position sensor linkage from the swinging arm.
2. Disconnect the electrical connector for the rear suspension unit damping solenoid.





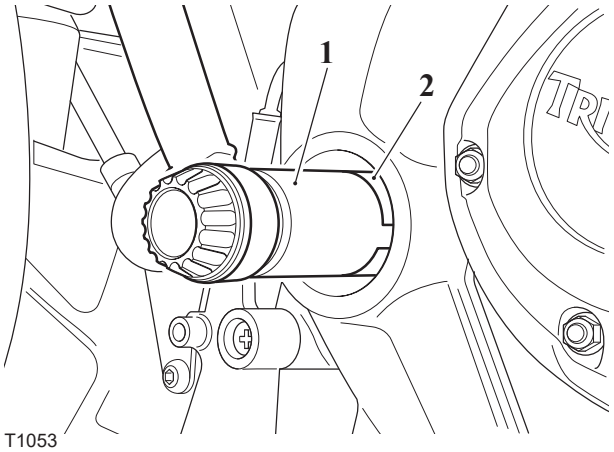
1. **Electrical connector**

3. Remove the drag and drop links (see Drag and Drop Links - Removal).
4. Carefully remove the cover from the swinging arm's right hand pivot pin.



1. **Cover**

5. Using the T3880062 - Lock Ring Wrench, 38 mm, remove the locking ring from the right hand pivot pin.



1. **T3880062 - Lock Ring Wrench, 38 mm**
2. **Locking ring**

6. While supporting the swinging arm, remove the left and right hand pivot pins.

CAUTION

When removing the swinging arm, care must be taken not to the damage swinging arm and rear suspension

CAUTION

unit.

Use a soft cloth or other suitable material to protect the swinging arm and rear suspension unit while the swinging arm is being removed.

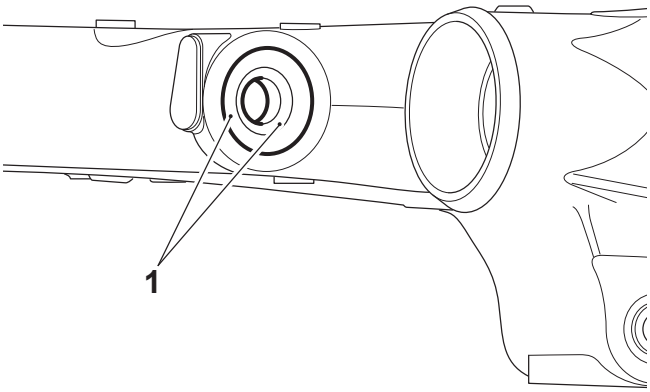
7. Remove the swinging arm from the motorcycle, carefully passing the rear suspension unit through the opening in the swinging arm as you do so.

1. Check the swinging arm bearings for damage, pitting, and cracks. Replace as necessary.
2. Inspect the swinging arm pivots for damage and deformation. Replace as necessary.
3. Check the swinging arm for damage. Replace as necessary.
4. Check all bearing seals for damage, splits etc. Replace as necessary.
5. Check the swinging arm gaiters for splits and other damage. Replace as necessary.

Swinging Arm - Assembly

Pivot Bearings

1. Remove the seal and inner bearing assembly for the pivot bearings on both sides of the swinging arm.



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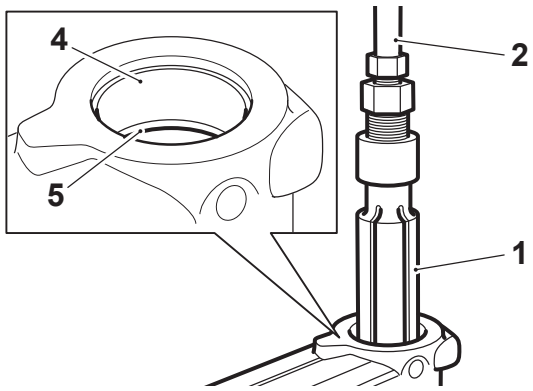
1. Seal and inner race assembly

Note

- **When removing the bearing outer race, the cap will separate from the outer race.**

2. Fit the bearing puller such that the lugs of the tool are between the bearing outer race and its cap.
3. Assemble the T3880627 - Bearing Puller, 32-42 mm to T3880208 - Slide Hammer, fully engaging the threads. Draw back the slide part of the hammer swiftly to facilitate the removal of the bearing outer race.

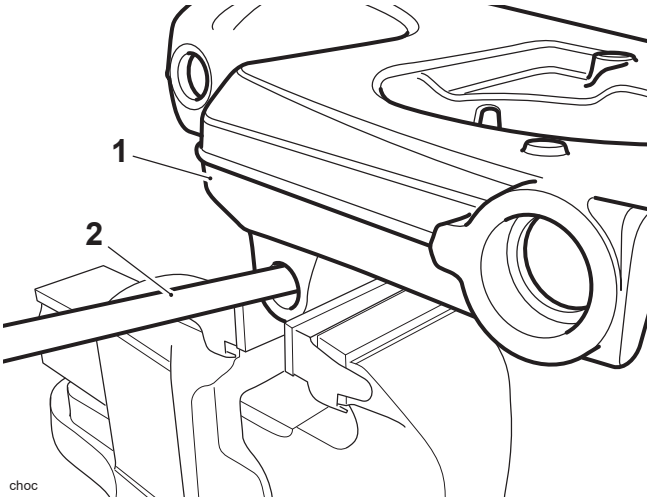


1. **T3880627 - Bearing Puller, 32-42 mm**
2. **T3880208 - Slide Hammer**
3. **Swinging arm**
4. **Bearing outer race**
5. **Cap**

4. Remove the bearing end cap from the swinging arm.
5. Repeat steps 3 and 4 for the other side.

Drop Link Bearings

1. Remove the bearing sleeve for the drop links from the swinging arm.
2. Secure the swinging arm in a soft jawed vice as shown below.
3. Working from the opposite side of the arm to the bearing being removed, drift out the drop arm bearing and seal.



1. **Swinging arm**
2. **Drift**

Swinging Arm - Installation

Pivot Pin Bearings

⚠ WARNING

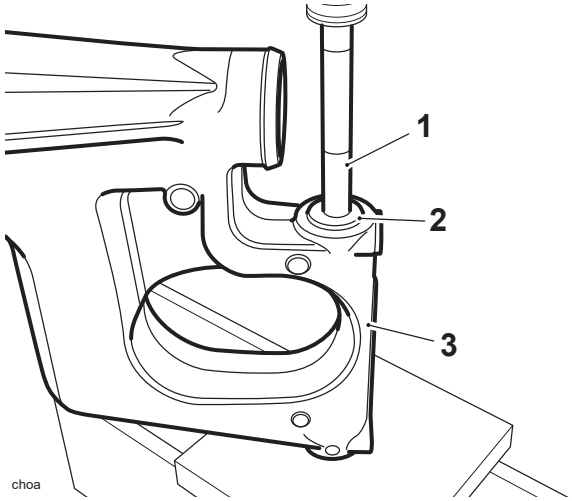
When using a press, always wear overalls, eye, face and hand protection. Objects such as bearings frequently break-up under load and the debris caused during break-up may cause damage and injury to unprotected parts of the body.

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

1. Ensure T3880625 - Bearing Installer, 39 mm is clean.
2. Assemble T3880629 - Bearing Installer Handle to T3880625 - Bearing Installer, 39 mm, fully engaging the

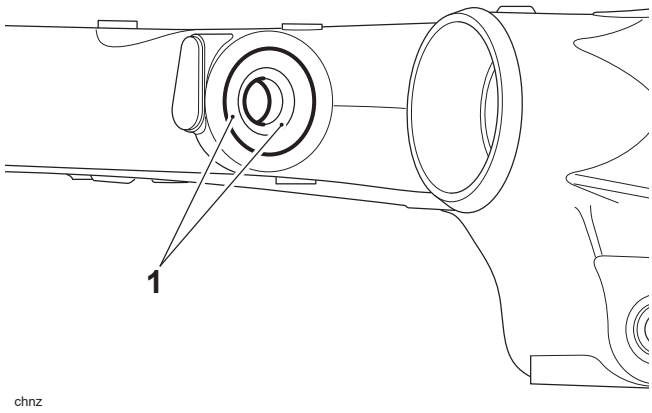
threads.

3. Press in the new bearing fully onto its locating shoulder.



1. **T3880629 - Bearing Installer Handle**
2. **T3880625 - Bearing Installer, 39 mm**
3. **Swinging arm**

4. Repeat for the other side.
5. Fit the seal and inner race assembly to their bearings outer race on both sides of the swinging arm.



1. **Seal and inner race assembly**

Drop Link Bearings

WARNING

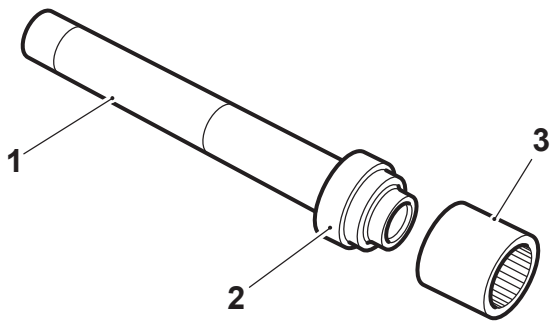
The bearings must be installed with the marked side of the bearing facing towards T3880628 - Bearing Installer, 26 mm.

Failure to follow this instruction will result in damage to the bearing.

1. Ensure T3880628 - Bearing Installer, 26 mm is clean.
2. Assemble T3880629 - Bearing Installer Handle to T3880628 - Bearing Installer, 26 mm, fully engaging the

threads.

3. Position a new bearing to T3880628 - Bearing Installer, 26 mm, with the marked side of the bearing facing towards the tool.



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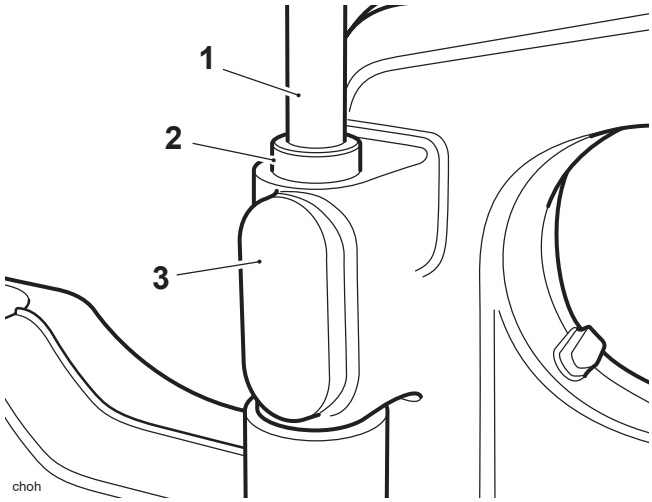
1. **T3880629 - Bearing Installer Handle**
2. **T3880628 - Bearing Installer, 26 mm**
3. **Bearing**

4. Position the service tools and bearing to the swinging arm on a press.
5. Press in the new bearing until the tool contacts the swinging arm.



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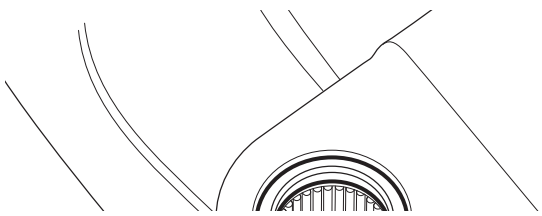
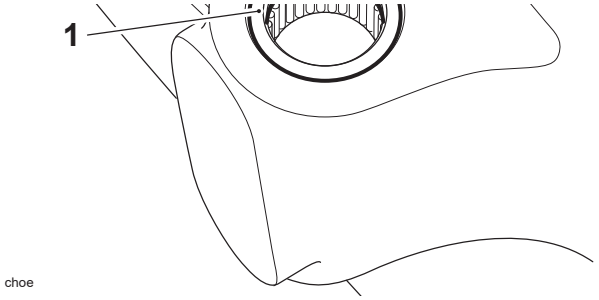
1. **T3880629 - Bearing Installer Handle**
2. **T3880628 - Bearing Installer, 26 mm**
3. **Swinging arm**

6. Repeat for the other side.
7. Install new seals, with the marked edge of the seal facing outwards, until they stop against the bearing.





1. **Seal**

8. Lubricate the bearings with grease to NLGI 2 specification and fit the bearing sleeve.

Rear Bevel Box and Drive Shaft

Exploded View – Rear Bevel Box and Drive Shaft

⚠ 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.

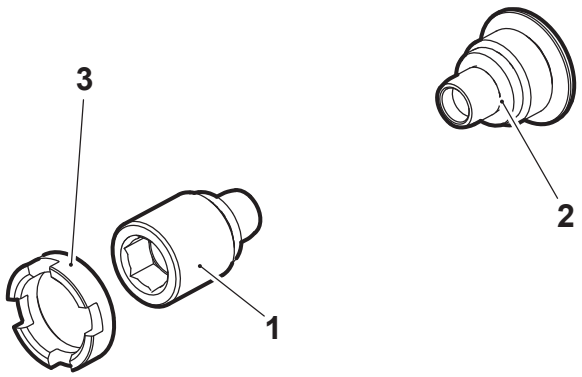
1. Lubricate the threads of both pivot pins with a smear of proprietary high temperature copper-based grease.

⚠ CAUTION

When installing the swinging arm, care must be taken not to the damage swinging arm and rear suspension unit.

Use a soft cloth or other suitable material to protect the swinging arm and rear suspension unit while the swinging arm is being positioned to the frame.

2. Position the swinging arm to the frame, carefully passing the rear suspension unit through the opening in the swinging arm as you do so.
3. Fit the left and right hand pivot pins to the frame. Do not fully tighten them at this stage.



1. **Right hand pivot pin**
2. **Left hand pivot pin**

3. **Locking ring, right hand side only**

CAUTION

Do not allow the swinging arm to drop as this may cause damage to the swinging arm and rear suspension unit.

Position a suitable strap to support the swinging arm during the installation procedure.

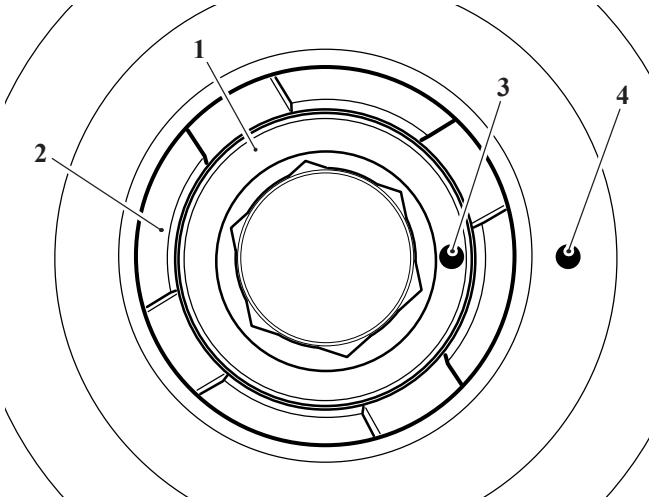
4. Tighten the left hand pivot pin to **170 Nm**.
5. Tighten the swinging arm right hand pivot pin to **45 Nm**.

CAUTION

If the right hand pivot pin moves during the tightening of the locking ring, both the locking ring and pivot pin must be loosened and re-tightened as described in steps 5 to 9 of this procedure.

Failure to tighten the swinging arm pivot pin and locking ring correctly may lead to severe frame damage.

6. Lubricate the threads of the locking ring with a smear of proprietary high temperature copper-based grease.
7. Fit the locking ring to the swinging arm right hand pivot pin.
8. Using a non permanent marker, temporarily mark the pivot pin alignment in relation to the frame.

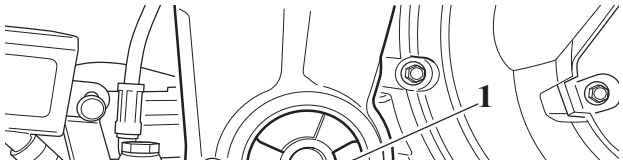


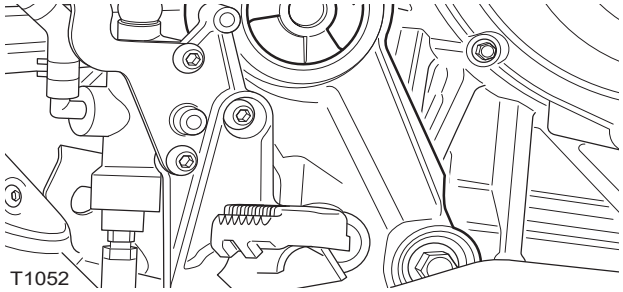
1. **Swinging arm pivot pin**
2. **Locking ring**
3. **Pivot pin alignment mark**
4. **Frame alignment mark**

Note

- **If the pivot pin and frame markings do not align after final tightening of the locking ring, loosen the locking ring and right hand pivot pin and repeat steps 5 to 9 of this procedure.**

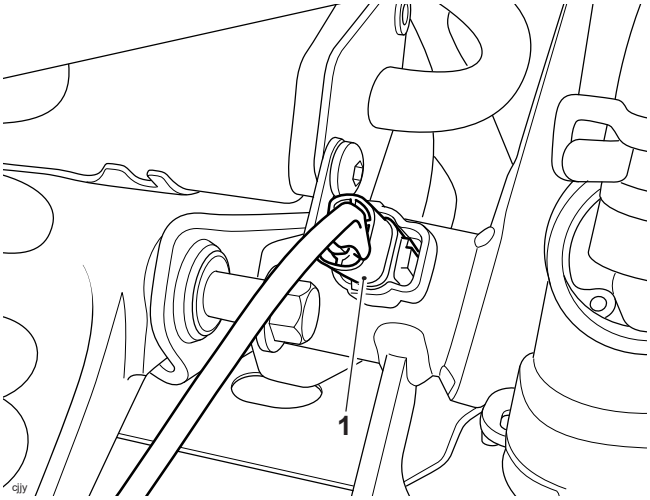
9. Using T3880062 - Lock Ring Wrench, 38 mm, tighten the locking ring to **110 Nm**.
10. Refit the cover to the swinging arm's right hand pivot pin.





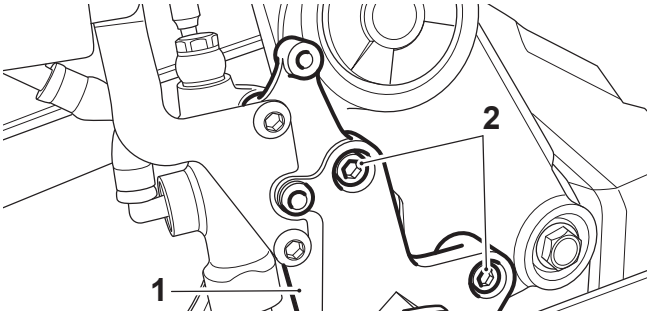
1. Cover

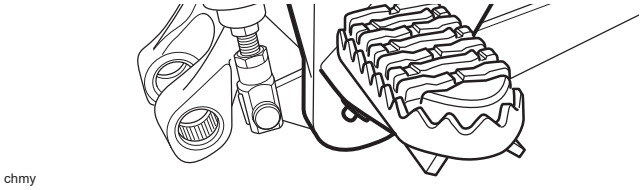
11. Remove and discard the rear suspension unit upper mounting lock nut. Fit a new nut but do not fully tighten at this stage.
12. Refit the drag and drop links (see Drag and Drop Links - Installation). Do not fully tighten the linkage fixings at this stage.
13. Reconnect the electrical connector for the rear suspension unit damping solenoid.



1. Electrical connector

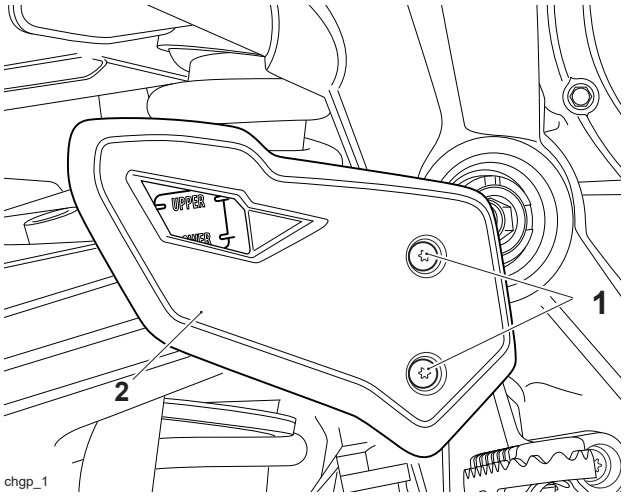
14. Refit the rear bevel box (see page Rear Bevel Box - Installation).
15. Refit the rear wheel (see Rear Wheel - Installation).
16. Refit the exhaust silencer (see Exhaust System - Installation).
17. With the weight of the motorcycle on its wheels:
    - Hold the rear suspension unit lower mounting bolt and tighten the new lock nut to **85 Nm**.
    - Hold the drop link to swinging arm bolt and tighten the new lock nut to **85 Nm**.
    - Hold the drag link to frame bolt and tighten the new lock nut to **85 Nm**.
    - If removed, hold the rear suspension unit upper mounting bolt and tighten the new lock nut to **75 Nm**.
18. Refit the right hand control plate and tighten its fixings to **18 Nm**.





1. **Control plate**
2. **Fixings**

19. Refit the heel guard and tighten its fixings to **7 Nm**.



1. **Fixings**
2. **Heel guard**

- Apply a smear of proprietary general purpose grease to NLGI 2 standard to the ball stud and reconnect the swinging arm position sensor linkage to the swinging arm.
- Reconnect the battery, positive (red) lead first and tighten the terminals to **4.5 Nm**.
- Calibrate the rear suspension unit preload motor (see Rear Suspension Unit Preload Motor Calibration).
- Calibrate the swinging arm position sensor (see Swinging Arm Position Sensor - Calibration).

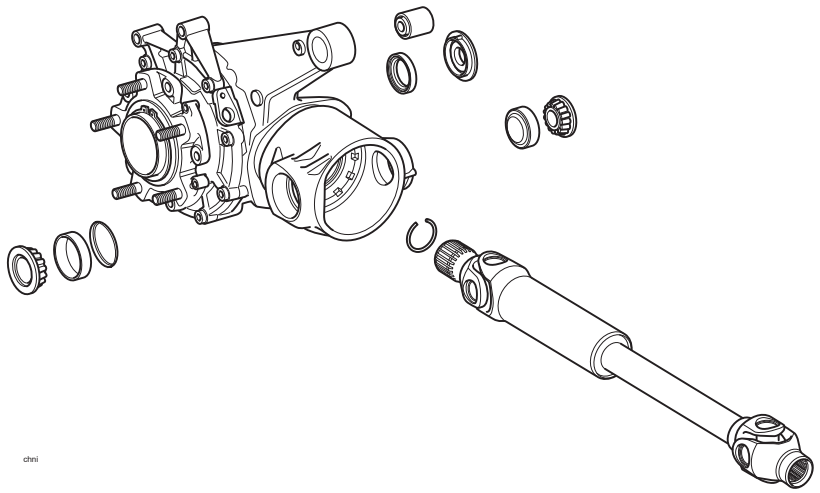
Pump the rear brake pedal several times to position the brake pads in the caliper. Rectify as necessary if correct brake operation is not restored.

⚠ WARNING

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

- Refit the rider’s seat (see Rider’s Seat - Installation).

Rear Bevel Box and Drive Shaft Specification



Rear Bevel Box Oil Specification

This model is fitted with a drive shaft coupling the transmission to the rear bevel box. The drive shaft is fitted with single Hookes universal joints which require no maintenance.

The rear bevel box consists of a crown wheel and pinion arrangement that has no dealer serviceable parts.

Maintenance of the rear bevel box consists solely of the following:

- Oil change - at the first 500 mile (800 km) service only
- Oil level checks
- Pivot pin bearings
- Oil seal.

⚠ WARNING

Under no circumstance should the rear bevel box be disassembled beyond what is described in this section of the Service Manual.

WARNING

Failure to observe the above warning could lead to a malfunction of the rear bevel box causing lock-up of the rear wheel leading to loss of motorcycle control and an accident.

Rear Bevel Box Oil Level Check

The rear bevel box must be filled and topped up with 75W/90 fully synthetic hypoid oil that meets specification API Service Level GL5, such as Castrol SAF-XO fully synthetic hypoid oil.

WARNING

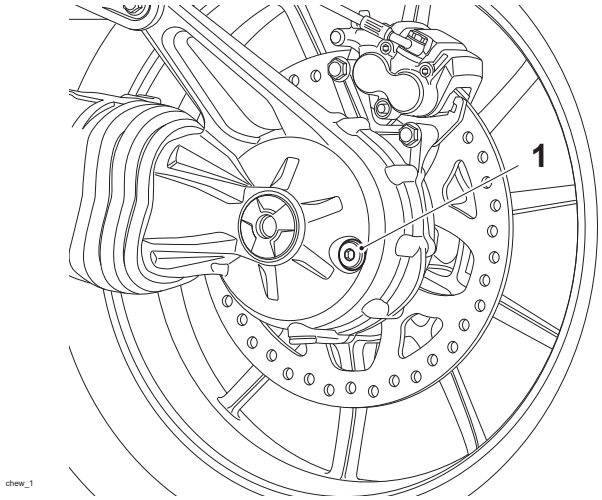
Use of incorrect bevel box lubricant could result in a malfunction of the final drive unit causing lock-up of the rear wheel leading to loss of motorcycle control and an accident.

Rear Bevel Box Oil Change

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. Have an assistant stand the motorcycle upright.
2. Clean the area around the filler then remove the filler level plug. Discard the washer.



1. Filler/level plug

3. Fill with 75W/90 fully synthetic hypoid oil that meets specification API Service Level GL5, such as Castrol SAF-XO fully synthetic hypoid oil, until the level of oil inside the unit is level with the bottom of the filler.
4. Incorporating a new washer, refit the plug and tighten to **25 Nm**.

Rear Bevel Box - Removal

Note

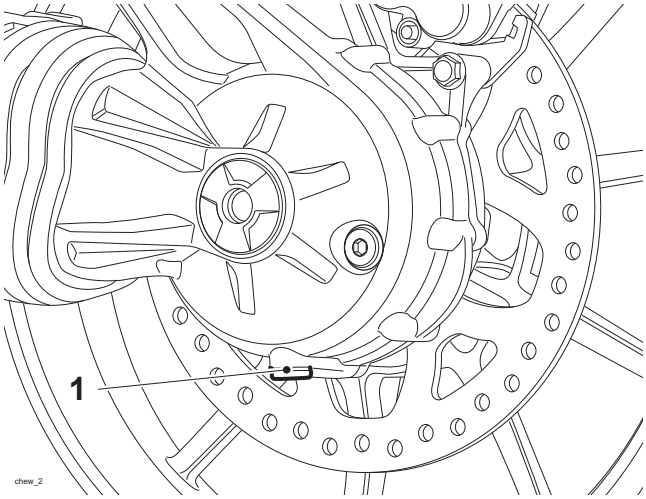
- **Change the rear bevel box oil at the 500 mile (800 km) service only. At subsequent services check the oil level and top up if necessary.**

WARNING

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 a container beneath the rear bevel box oil drain plug.



1. Drain plug

2. Remove the drain plug and allow all the oil to fully drain out. Discard the sealing washer.
3. Wipe the drain plug clean, fit a new sealing washer then refit to the final drive and tighten to **25 Nm**.

Note

- **The drain plug is magnetic. It is normal for metallic deposits to be attached to the drain plug magnet.**

4. Have an assistant stand the motorcycle upright.
5. Remove the filler level plug.
6. Fill with 75W/90 fully synthetic hypoid oil that meets specification API Service Level GL5, such as Castrol SAF-XO fully synthetic hypoid oil, until the level of oil inside the unit is level with the bottom of the filler.
7. Incorporating a new washer, refit the plug and tighten to **25 Nm**.

Rear Bevel Box - 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.

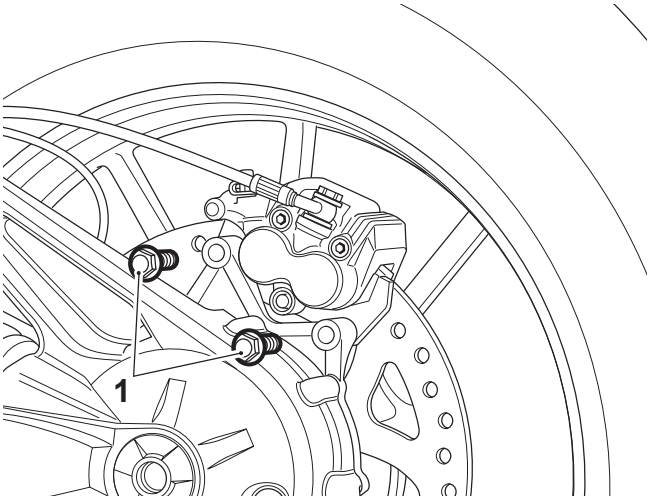
- Remove the rider’s seat (see Rider’s Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Support the motorcycle so that the rear wheel is clear of the ground.
- Remove the rear wheel (see Rear Wheel - Removal).

WARNING

Do not allow the caliper to hang on the brake hose as this may damage the hose and could lead to loss of motorcycle control and an accident.

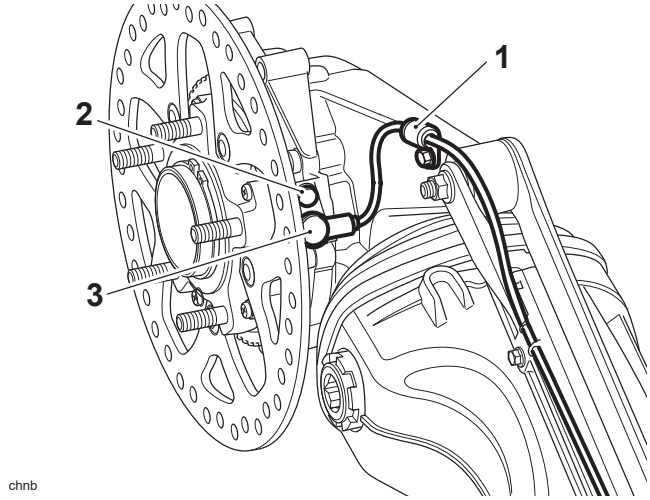
1. Detach and support the rear brake caliper such that the weight of the caliper is not supported by the brake

hose.



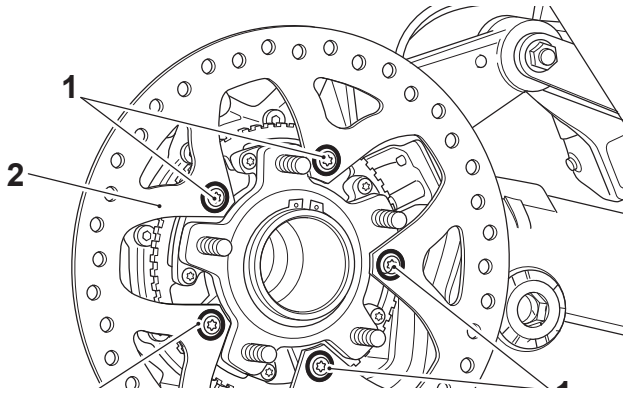
1. **Caliper mounting bolts**

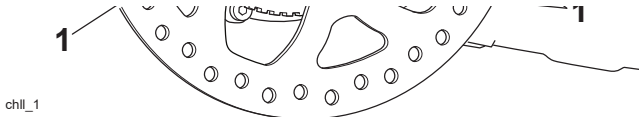
2. Detach the P-clip securing the harness for the rear wheel speed sensor to the rear bevel box.
3. Release the fixing, detach the rear wheel speed sensor and position it aside. Discard the fixing.



1. **P-clip**
2. **Fixing**
3. **Wheel speed sensor**

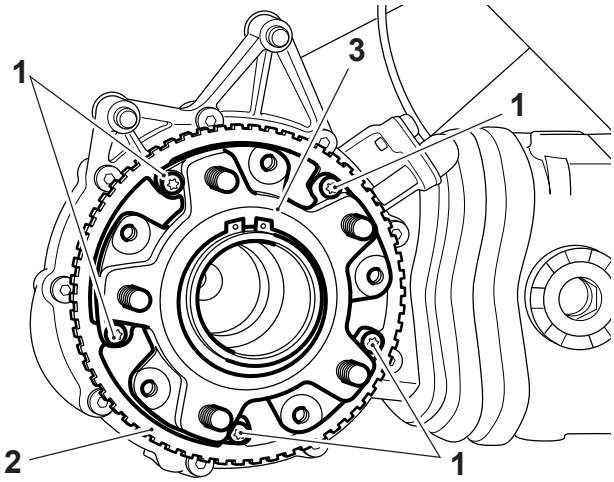
4. Remove and discard the five fixings and remove the brake disc.





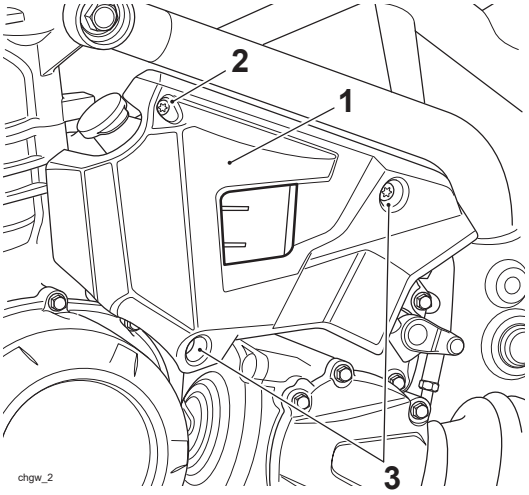
1. **Fixings**
2. **Brake disc**

5. Remove and discard the five fixings and remove the pulser ring.



1. **Fixings**
2. **Pulser ring**
3. **Hub**

6. Remove the three fixings and remove the expansion tank cover. Discard the upper M5 fixing. Retain the lower M6 fixings for reuse.



1. **Expansion tank cover**
2. **Upper fixings (M5)**
3. **Lower fixings (M6)**

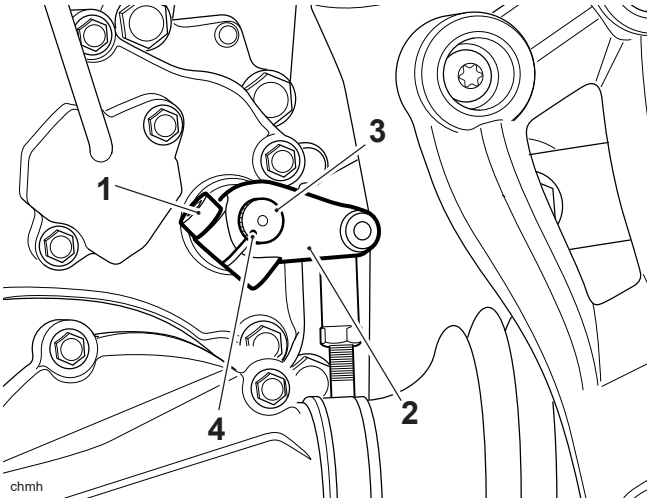
Note

- **Note the position of the transmission linkage in relation to the punch mark on the gear change**

Note

mechanism.

7. Select neutral, remove the pinch bolt and disconnect the transmission linkage from the gear change mechanism.

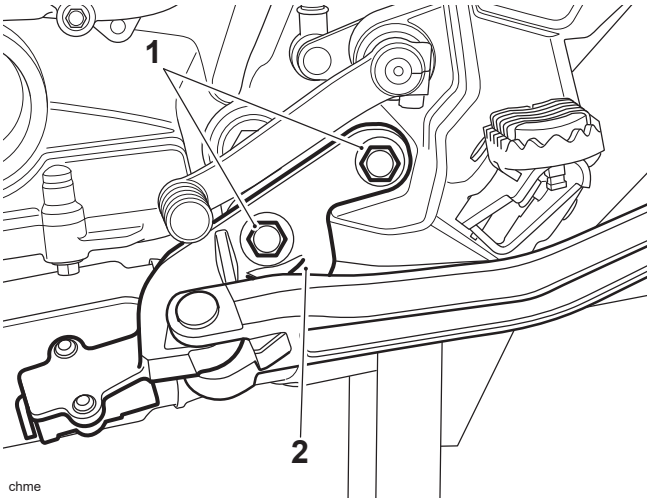


1. **Pinch bolt**
2. **Transmission linkage**
3. **Gear change mechanism**
4. **Punch mark**

Note

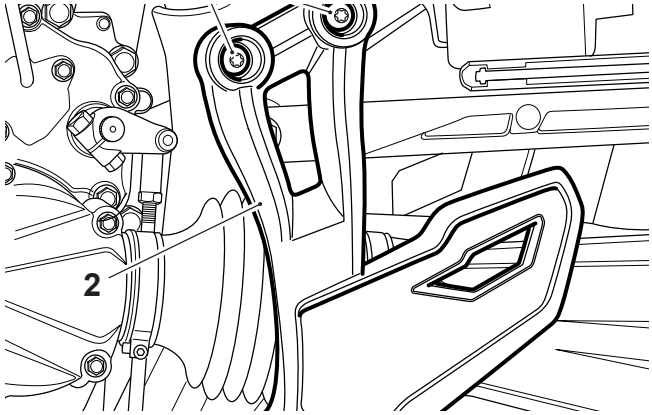
- **Do not allow the side stand to hang on the harness for the side stand switch.**
- **Note the routing of the harness for the side stand switch for installation.**

8. Release the fixings, detach the side stand and position aside.



1. **Fixings**
2. **Side stand**

9. Release the fixings and remove the left hand control plate.

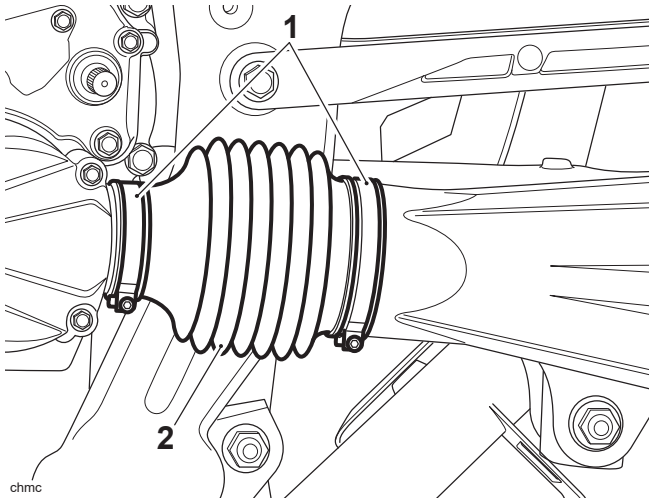


1. **Fixings**
2. **Control plate**

Note

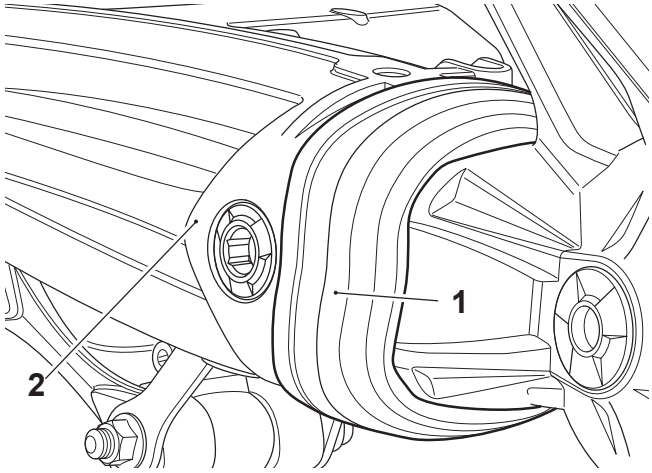
- **Note the position and orientation of the clamps for installation.**

10. Release the two clamps and detach the rubber boot from the front of the swinging arm and the transmission.



1. **Clamps**
2. **Boot**

11. Detach the rubber boot from the rear of the swinging arm.

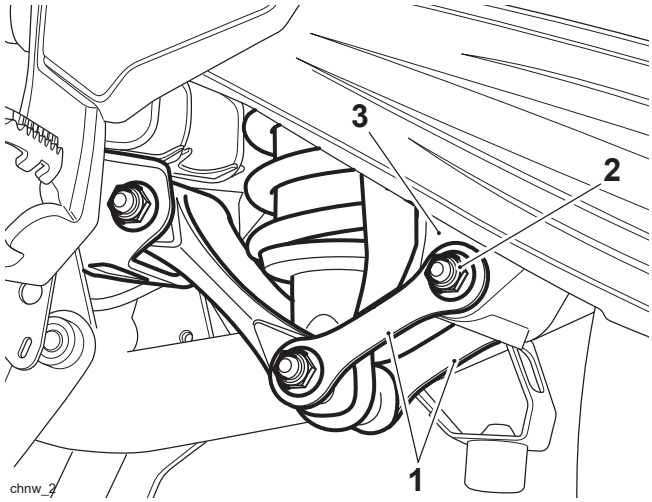


1. **Boot**
2. **Swinging arm**

Note

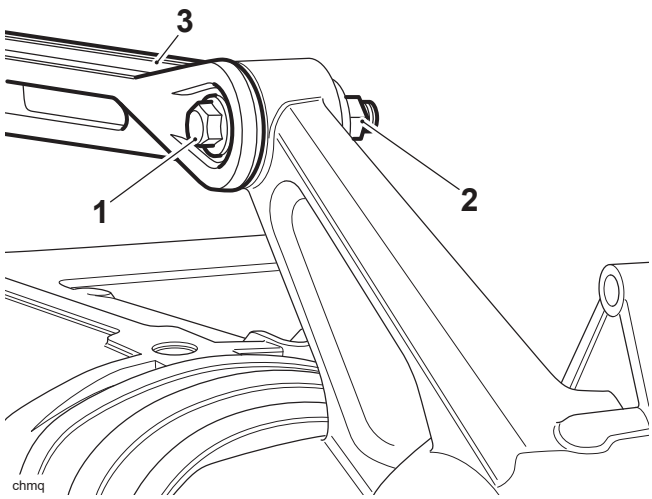
- **It is possible that the swinging arm may obstruct the drive shaft detaching from the transmission.**

12. To allow for movement of the swinging arm, position a suitable strap to support the swinging arm then remove the lock nut and bolt securing the drop links to the swinging arm. Discard the lock nut.



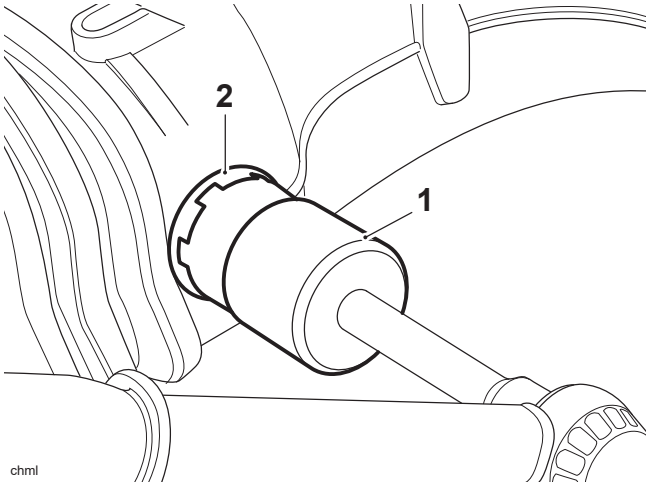
1. **Drop links**
2. **Lock nut**
3. **Swinging arm**

13. Remove the bolt and lock nut securing the rear bevel box to the torque arms. Discard the lock nut.



1. **Bolt**
2. **Lock nut**
3. **Torque arms**

14. Using T3880620 - Adjuster Socket, 48 mm loosen the locking ring for the right hand pivot pin.

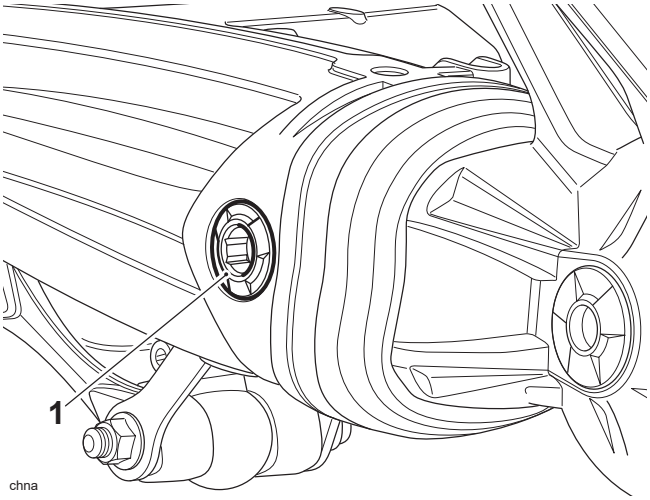


1. **T3880620 - Adjuster Socket, 48 mm**
2. **Locking ring**

Note

- **The drive shaft is secured to the rear bevel box by a spring clip and will also be removed with the bevel box.**

15. While supporting the rear bevel box, remove both pivot pins and move the bevel box rearwards to disengage the drive shaft from the transmission.



1. **Pivot pin, left hand shown**

16. While supporting the drive shaft, continue to move the bevel box and drive shaft assembly rearwards for complete removal.

1. Inspect the rear bevel box bearings and the bearings outer race for damage, cracks and signs of bearing rollers indenting the outer race. Renew the bearings if damage is present in either bearing (see Rear Bevel Box Bearings - Removal).
2. Inspect the pivot pins for damage and deformation. Renew as necessary.
3. Inspect the rubber boot for splits and other damage. Replace as necessary.
4. Inspect the drive shaft and its universal joints for damage. Renew as necessary.

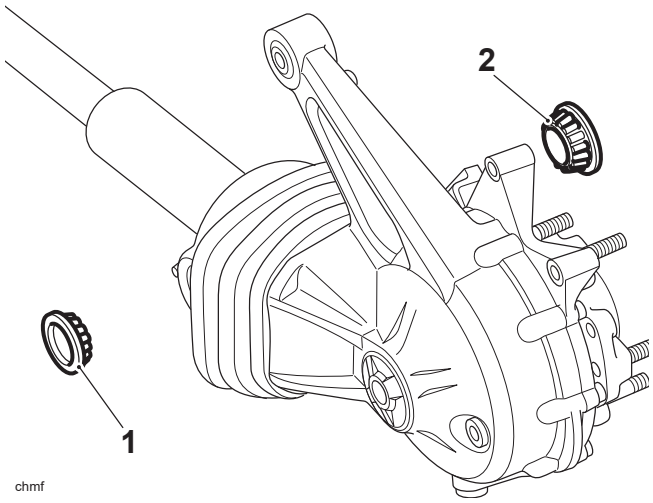
Rear Bevel Box - Installation

⚠ WARNING

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. Apply a smear of grease, to NLGI 2 specification, to the splines of the drive shaft and the transmission output shaft.
2. Lubricate the threads of both pivot pins with a smear of proprietary high temperature copper-based grease.
3. Thoroughly lubricate the pivot pin bearings with grease, to NLGI 2 specification, and fit them to the rear bevel box.

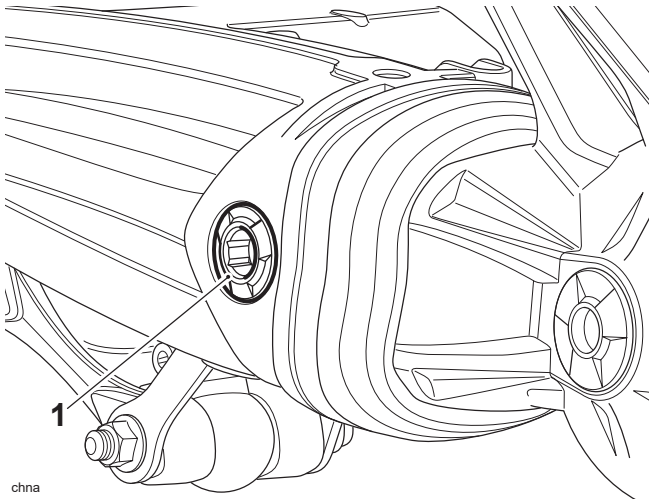


1. **Left hand bearing**
2. **Right hand bearing**

Note

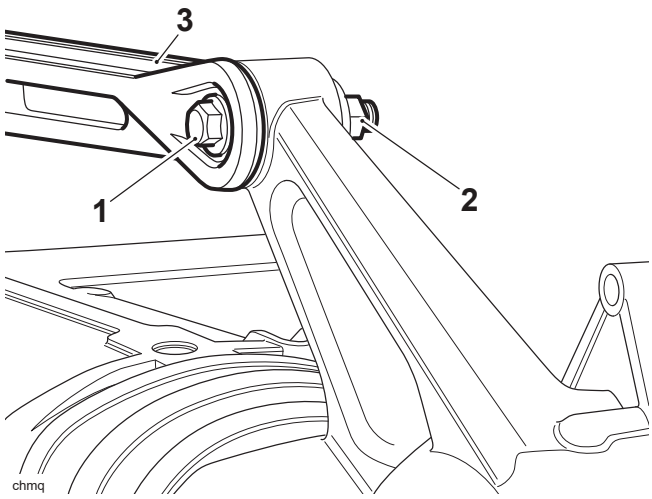
- **It may be necessary to raise the rear of the swinging arm to align the drive shaft on to the transmission shaft.**

4. With the aid of an assistant, position the drive shaft through the swinging arm and fit it onto the transmission output shaft.
5. Align the rear bevel box to the swinging arm and fit the pivot pins. Do not fully tighten at this stage.



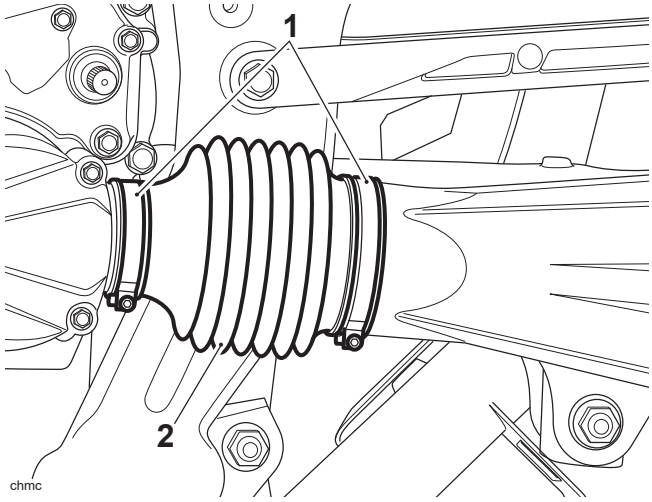
1. **Pivot pin, left hand shown**

6. Attach the torque arms to the rear bevel box. Fit the bolt and new lock nut but do not fully tighten at this stage.
7. Attach the drop links to the swinging arm with the original bolt and a new lock nut. Do not fully tighten at this stage.
8. Tighten the pivot pins in the sequence described below:
   - Tighten the left hand pivot pin to **100 Nm**
   - Tighten the right hand pivot pin to **48 Nm**
   - Fit the locking ring to the right hand pivot pin and tighten to **110 Nm**.
9. Hold the nut while tightening the torque arms bolt to **48 Nm**.



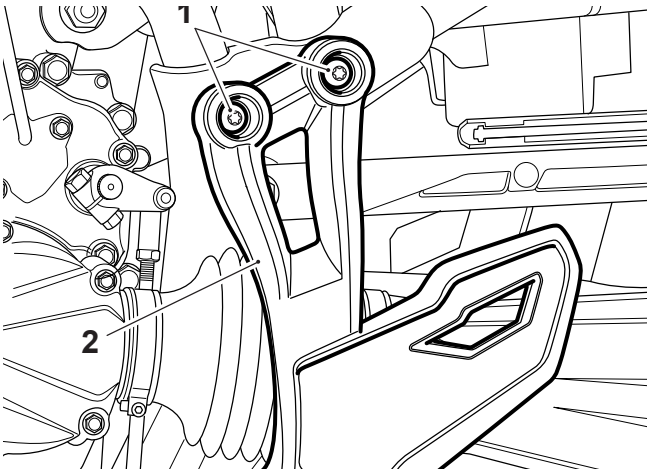
1. **Bolt**
2. **Lock nut**
3. **Torque arms**

10. Attach the rubber boot to the rear of the swinging arm.
11. Attach the rubber boot to the front of the swinging arm and the transmission. Position the clips as noted for removal and tighten to **1.5 Nm**.



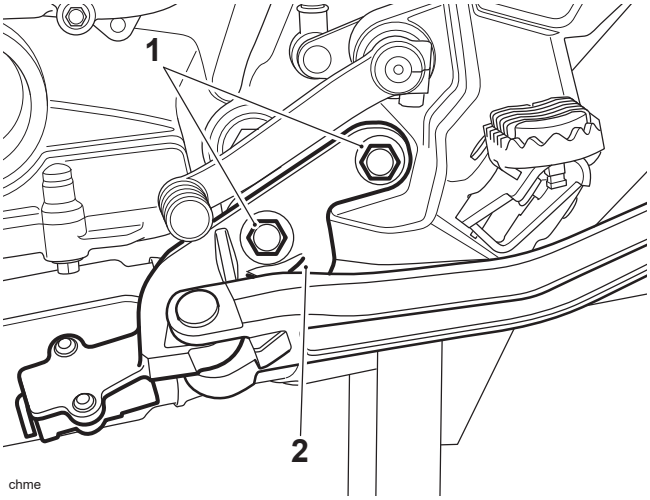
1. **Clamps**
2. **Boot**

12. Align the left hand control plate to the frame and fit the two upper fixings. Do not fully tighten at this stage.



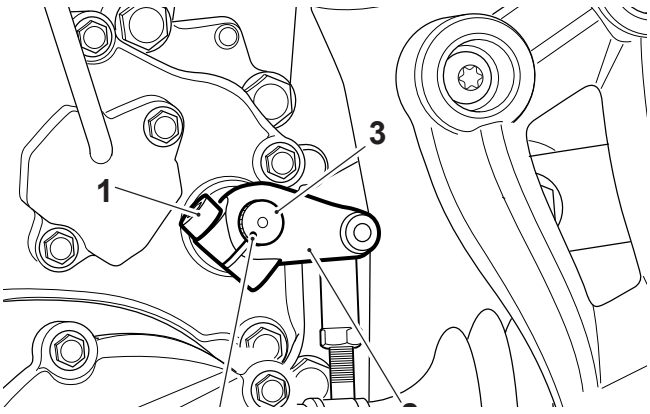
1. **Fixings**
2. **Control plate**

13. Route the harness for the side stand switch as noted for removal.
14. Fit the side stand and tighten its fixings to **70 Nm**.



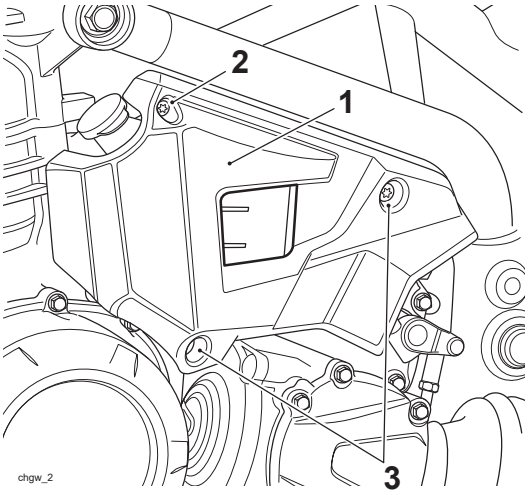
1. **Fixings**
2. **Side stand**

15. Tighten the upper fixings for the left hand control plate to **18 Nm**.
16. Fit the transmission linkage to the gear change mechanism as noted for removal.
17. Fit the pinch bolt and tighten it to **9 Nm**.



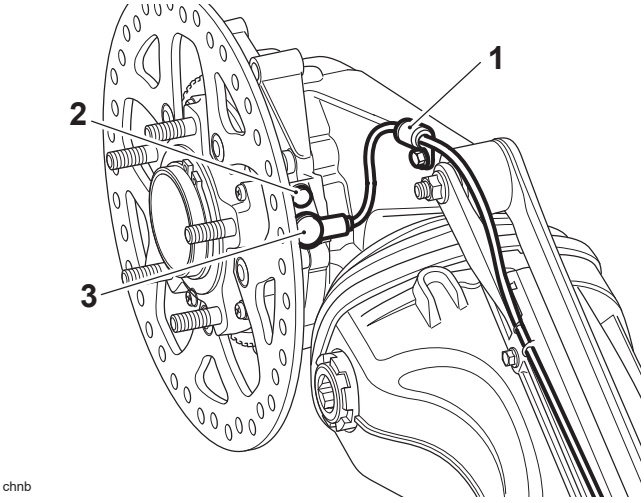
1. **Pinch bolt**
2. **Transmission linkage**
3. **Gear change mechanism**
4. **Punch mark**

18. Refit the expansion tank cover. Secure the upper mounting with a new M5 encapsulated fixing. Secure the lower mounting with the two original fixings. Tighten the upper fixing to **3 Nm** and the lower fixings to **4 Nm**.



1. **Expansion tank cover**
2. **Upper fixing (M5)**
3. **Lower fixings (M6)**

19. Align the pulser ring to the hub. Fit new fixings and tighten to **5 Nm**.
20. Align the brake disc to the hub. Fit new fixings and tighten to **22 Nm**.
21. Fit the rear wheel speed sensor and tighten the new fixing to **9 Nm**.
22. Secure the harness for the rear wheel speed sensor and its P-clip to the rear bevel box.



1. **P-clip**

2. **Fixing**
3. **Wheel speed sensor**

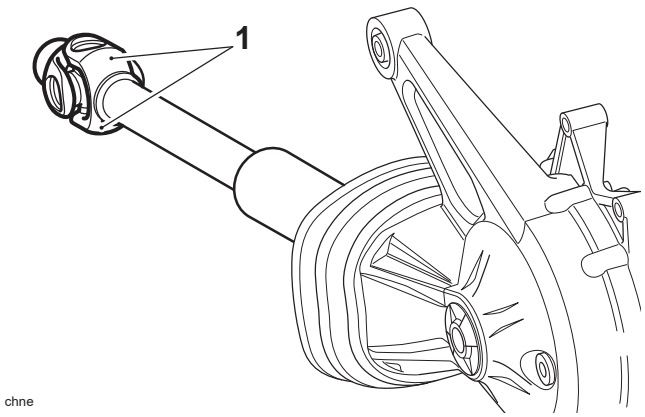
23. Position the caliper over the disc ensuring the pads are correctly aligned on both sides of the disc.
24. Fit the caliper retaining bolts and tighten to **40 Nm**.
25. Fit the rear wheel (see Rear Wheel - Installation).
26. With the weight of the motorcycle on its wheels, hold the drop link to swinging arm bolt while tightening the nut to **85 Nm**.
27. Check and, if necessary, adjust the oil level in the rear bevel box (see Rear Bevel Box Oil Level Check).
28. Reconnect the battery, positive (red) lead first.
29. Fit the rider's seat (see Rider's Seat - Installation).
30. Check for correct brake operation. Rectify as necessary.

Rear Bevel Box 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 rear bevel box (see Rear Bevel Box - Removal).
2. With the aid of an assistant holding the rear bevel box, align the drive shaft such that it is straight.
3. Using a soft faced mallet, give a sharp tap to one of the universal joint yokes on the drive shaft, indicated below, to release the snap ring securing the drive shaft to the bevel box.



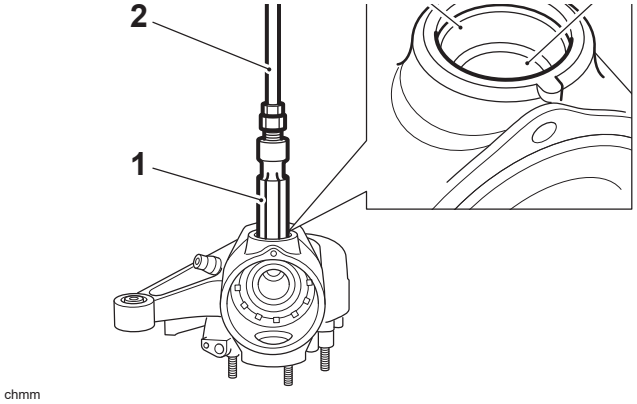
1. **Universal joint yoke**

4. Remove the drive shaft.

Note

- **When removing the bearing outer race, the cap will separate from the outer race.**

5. Fit T3880627 - Bearing Puller, 32-42 mm such that the lugs of the tool are between the bearing outer race and its cap.
6. Assemble T3880627 - Bearing Puller, 32-42 mm to T3880208 - Slide Hammer, fully engaging the threads.
7. Draw back the slide part of the hammer swiftly to facilitate the removal of the bearing outer race.



1. **T3880627 - Bearing Puller, 32-42 mm**
2. **T3880208 - Slide Hammer**
3. **Bearing outer race**
4. **Cap**

8. Repeat for the other bearing race.

Rear Bevel Box Bearings - Installation

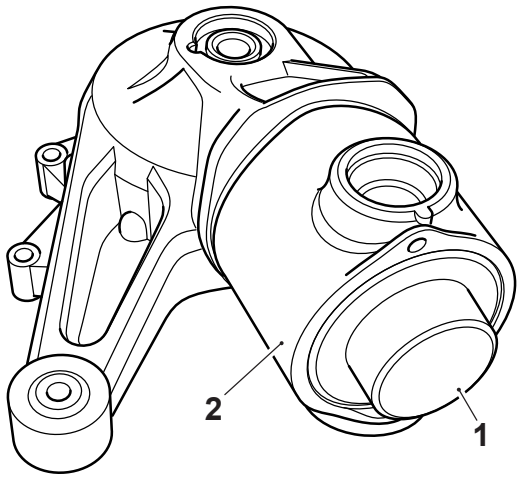
Note

- **The left hand replacement bearing is supplied with the cap attached to the outer race by means of an adhesive.**
- **The right hand replacement bearing is supplied with the cap detached from the bearing race.**

CAUTION

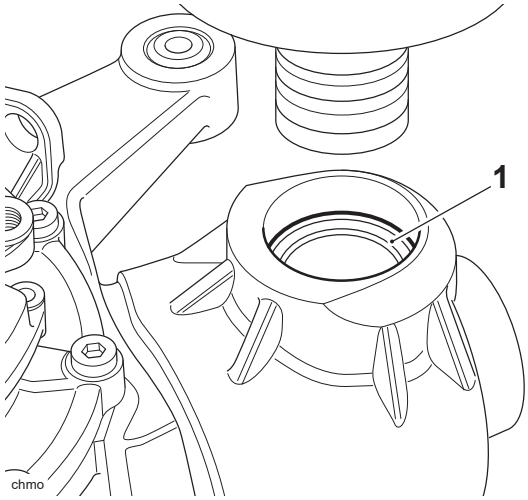
T3880624 - Housing Support must be used when pressing in the bearing outer race. Failure to use this service tool may result in damage to the bevel box housing.

1. Fit T3880624 - Housing Support into the bevel box housing, as shown below.



1. **T3880624 - Housing Support**
2. **Bevel box**

2. If not attached to the bearing race, fit the cap into the bearing housing, ensuring that it is central, as shown below.



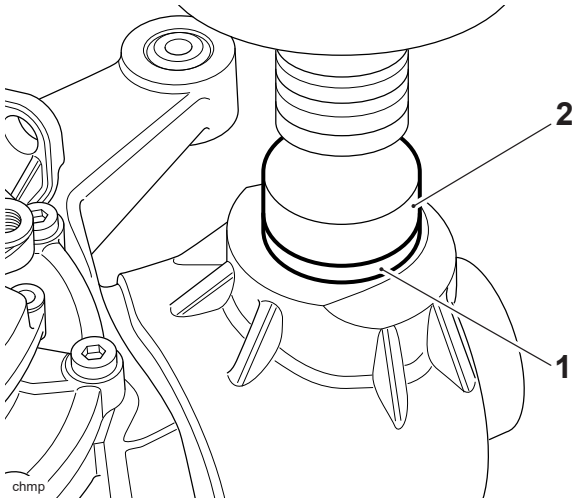
1. **Cap**

⚠ 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.

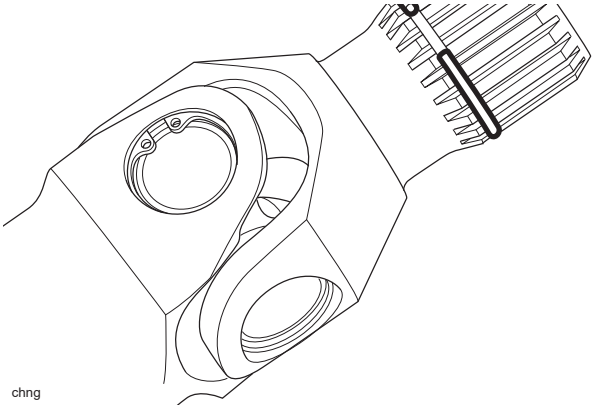
Never wear loose clothing which could become trapped in the press and cause a crushing injury to the hand, arms or other parts of the anatomy.

3. Using T3880625 - Bearing Installer, 39 mm, press the new bearing race to the left hand side of the rear bevel box until it is pressed fully to the locating shoulder in the bevel box.
4. Using T3880626 - Bearing Installer, 46 mm, press the new bearing race to the right hand side of the rear bevel box until it is pressed fully to the locating shoulder in the bevel box.



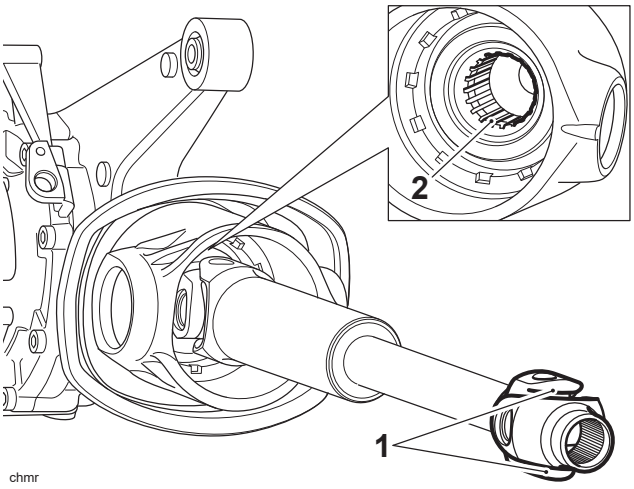
1. **Bearing race, right hand**
2. **T3880626 - Bearing Installer, 46 mm**

5. Remove the service tools.
6. Using a suitable tool, remove the snap ring on the drive shaft and fit a new snap ring.



1. **Snap ring**

7. Apply a smear of grease, to NLGI 2 specification, to the splines of the drive shaft.
8. With the aid of an assistant holding the rear bevel box, align the drive shaft to the bevel box such that it is straight.
9. Using a soft faced mallet, give a sharp tap to one of the universal joint yokes on the drive shaft, indicated below, to locate the snap ring into its groove in the bevel box.



1. **Universal joint yoke**
2. **Groove, for snap ring**

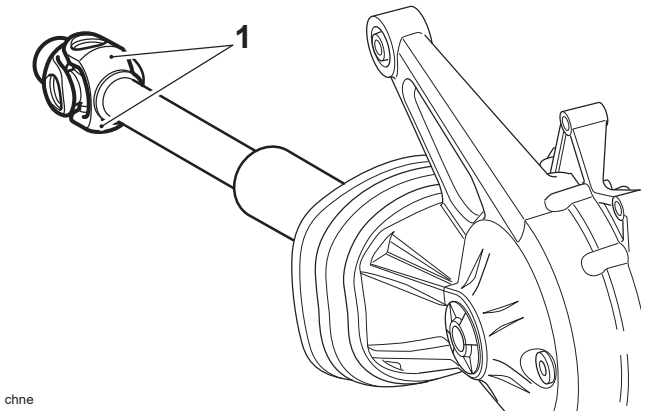
10. Thoroughly lubricate the bearings with grease, to NLGI 2 specification, and fit them to the rear bevel box.
11. Fit the bevel box to the motorcycle (see Rear Bevel Box - Installation).

Rear Bevel Box Oil Seal - Removal

⚠ WARNING

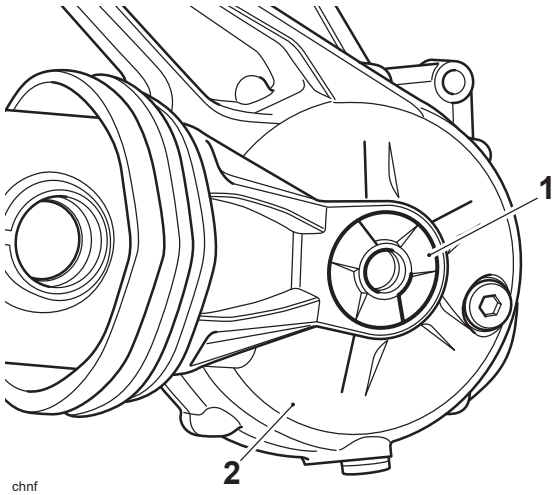
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Drain the oil from the rear bevel box (see Rear Bevel Box Oil Change).
2. Remove the rear bevel box (see Rear Bevel Box - Removal).
3. With the aid of an assistant holding the rear bevel box, align the drive shaft such that it is straight.
4. Using a soft faced mallet, give a sharp tap to one of the universal joint yokes on the drive shaft, indicated below, to release the snap ring securing it to the bevel box.



1. **Universal joint yoke**

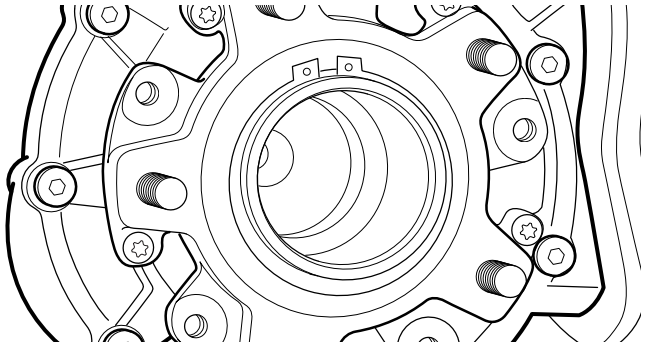
5. Remove the drive shaft.
6. Remove the cap from the bevel box housing.

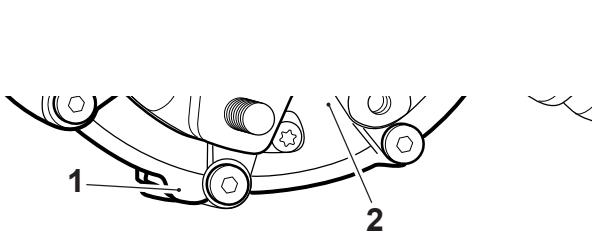


1. **Cap**
2. **Housing**

Note

- **A shim or shims are fitted between the back plate assembly and the bevel box housing. Ensure the shims are kept clean when removed from the bevel box.**
- **The shims and back plate assembly will only fit the bevel box housing in one position. Note the position of the boss lug on the backing plate, shim(s) and housing for installation.**





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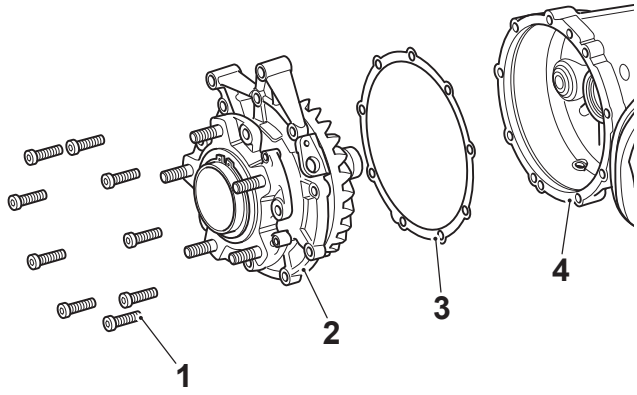
1. **Boss**
2. **Back plate assembly**

7. Release the nine fixings and remove the back plate assembly. Collect the shim(s) and ensure they are kept clean.



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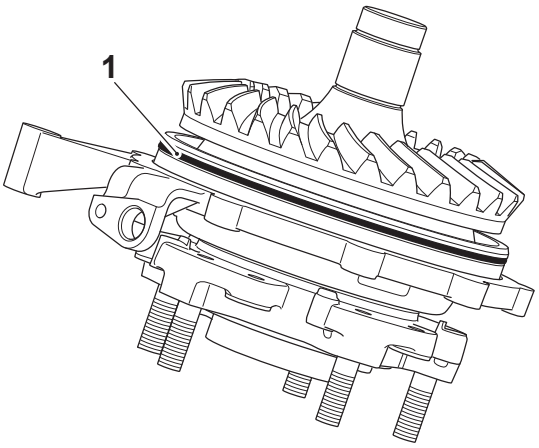
1. **Fixings**
2. **Back plate assembly**
3. **Shim (one shown)**
4. **Housing**

8. Remove and discard the O-ring.



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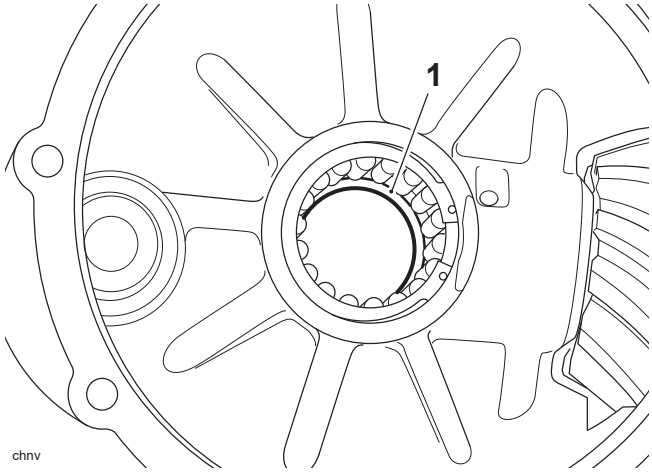
1. **O-ring**

9. Working from the opposite side of the housing to the seal, drift out the oil seal.



1. **Seal**

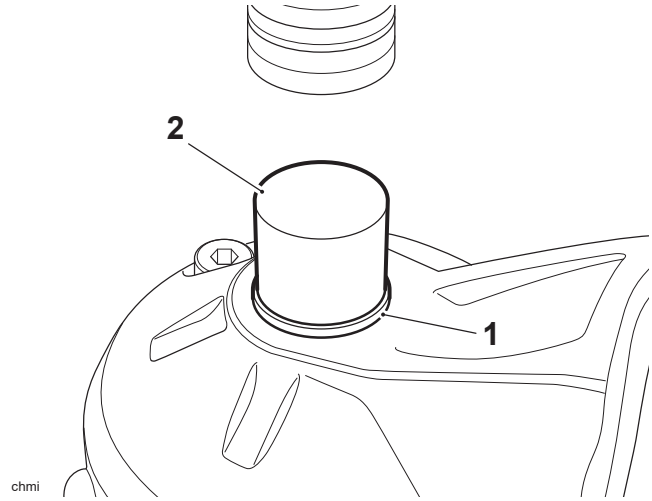
Rear Bevel Box Oil Seal - Installation

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.

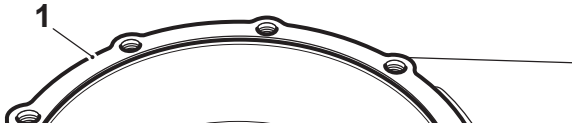
Never wear loose clothing, which could become trapped in the press and cause crushing injury to the hand, arms or other parts of the anatomy.

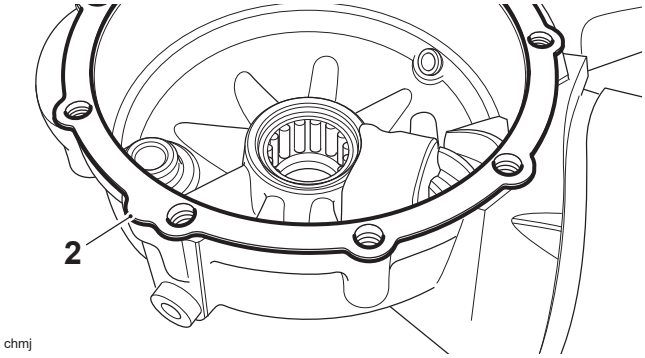
1. Using a suitable drift, press in the new seal until it is against the bearing with the manufacturer's marks facing outwards.



1. **Seal**
2. **Drift**

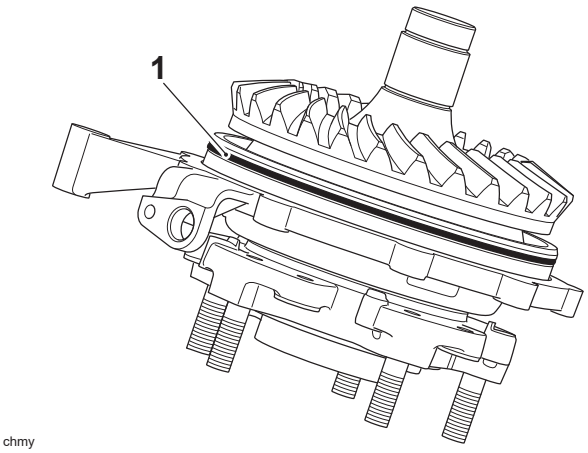
2. Align the shim(s) to the rear bevel box housing as noted for removal.





1. **Shim(s)**
2. **Boss**

3. Lubricate a new O-ring with clean oil for the rear bevel box and fit it to the back plate assembly.



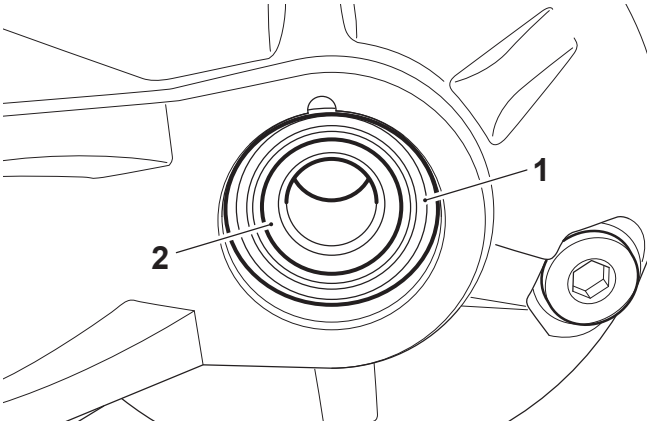
1. **O-ring**

4. Lubricate the sealing lips of the new seal with clean oil for the rear bevel box.
5. Align the back plate to the bevel box housing and shim(s) as noted for removal.

Note

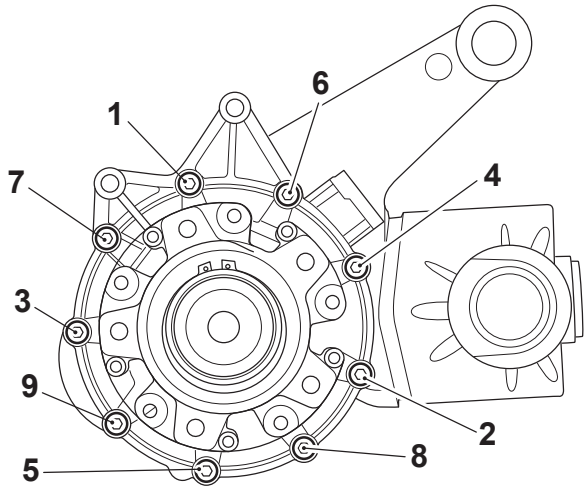
- **When fitting the back plate to the bevel box housing, ensure that the sealing lips of the seal fit evenly around the shaft for the hub.**

6. Carefully press the back plate and bevel box housing together ensuring that the seal fits around the shaft for the hub evenly.



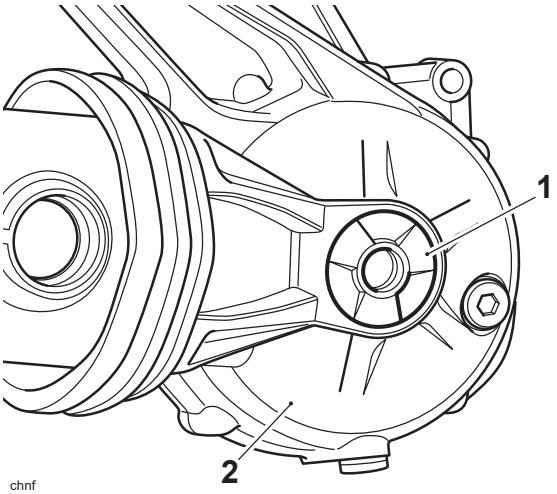
1. **Seal**
2. **Shaft**

7. Fit the fixings and tighten in the sequence shown below to **30 Nm**.



Tightening Sequence

8. Refit the cap to the bevel box housing.

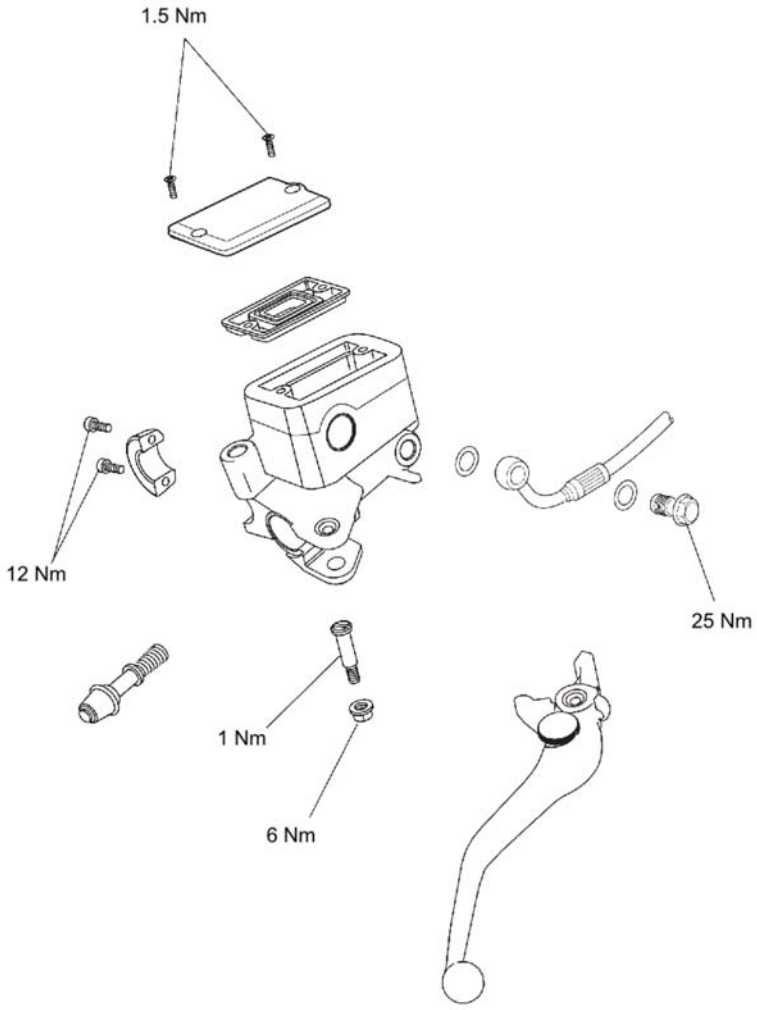


1. **Cap**
2. **Housing**

9. Fit the rear bevel box to the motorcycle (see Rear Bevel Box - Installation).
10. Fill the rear bevel box with 75W/90 fully synthetic hypoid oil that meets specification API Service Level GL5, such as Castrol SAF-XO fully synthetic hypoid oil (see Rear Bevel Box Oil Change).
11. Operate the motorcycle then check the rear bevel box for oil leaks. Rectify if necessary.

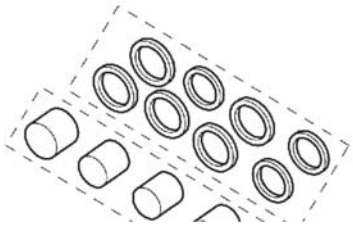
Brakes

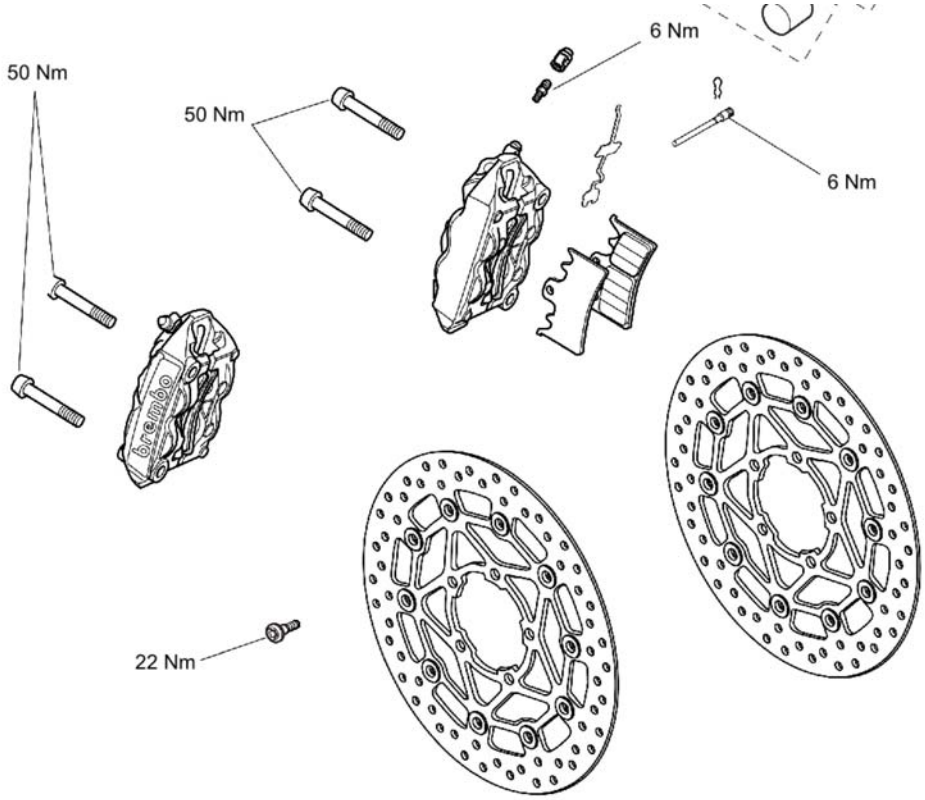
Exploded View – Front Brake Master Cylinder

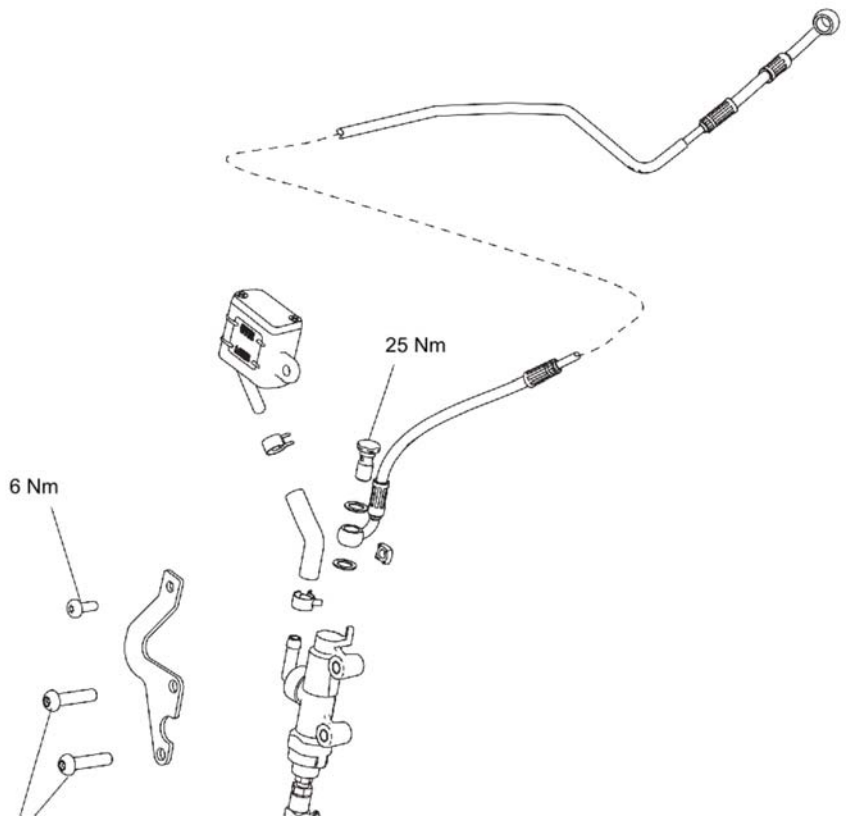


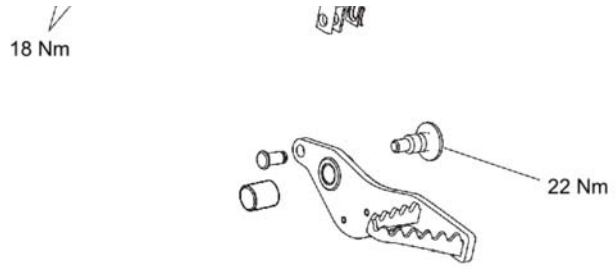
Exploded View – Front Brake Caliper

Exploded View – Rear Brake Master Cylinder

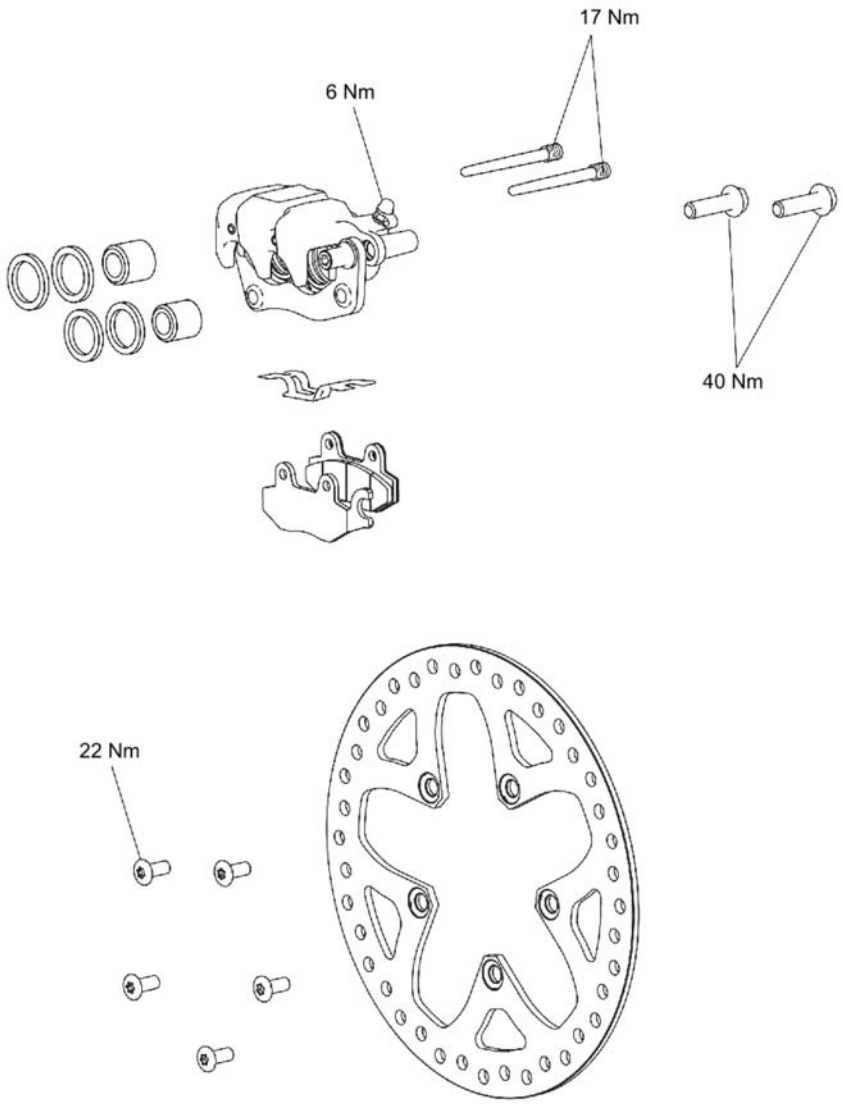



6 Nm
50 Nm
50 Nm
6 Nm
22 Nm

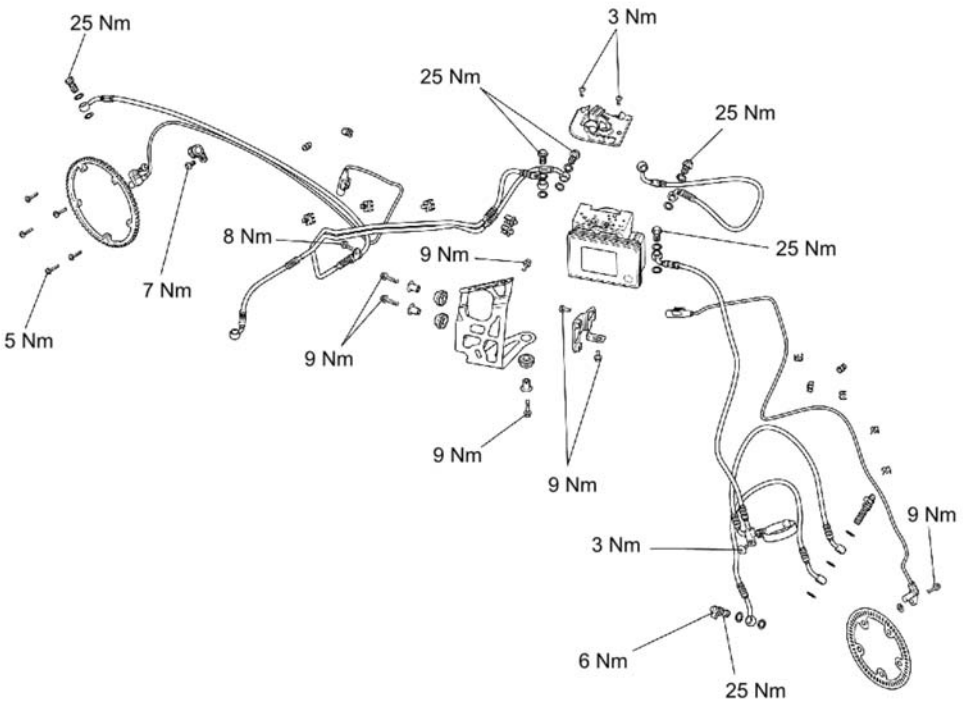

25 Nm
6 Nm



Exploded View – Rear Brake Caliper



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

WARNING

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.

WARNING

A magnetised brake disc and/or a magnetised ABS pulser ring may cause problems with the ABS sensor which will illuminate the ABS warning light and disable the ABS.

To prevent these parts becoming magnetised, we strongly recommend that magnets, and items that contain magnets, must not be stored near or placed on brake discs or ABS pulser rings.

This includes parts fitted to motorcycles, parts removed during motorcycle service and new parts in dealer stores.

Examples of items that may contain magnets, are listed below:

WARNING

·Alternator rotor

·Magnetic fuel tank bags

·Audio speakers

·Magnetic dial test indicator stand

·Magnetic parts tray.

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.

Front Brake Fluid Level Inspection

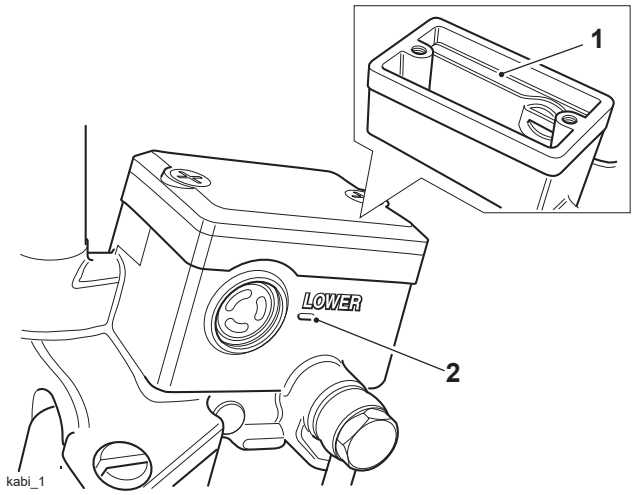
Rear Brake Fluid Level Inspection

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. To inspect the fluid level, check the level of fluid visible in the window at the front of the reservoir body.



1. **Front reservoir upper level**
2. **Front reservoir lower level**

2. Ensure that the brake fluid level in the front brake fluid reservoir is between the upper and lower level lines (reservoir held horizontal).
3. To adjust the fluid level:

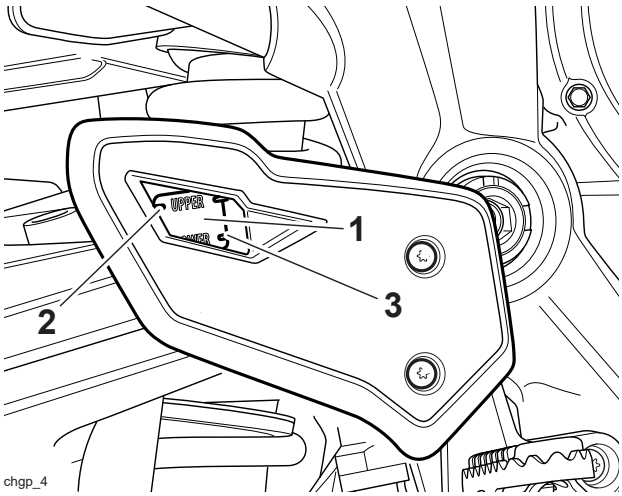
- Remove the two fixings.
- Remove the reservoir cap and the diaphragm seal.
- Fill the reservoir to the upper level line using new DOT 4 fluid from a sealed container.
- Refit the reservoir cap, ensuring that the diaphragm seal is correctly positioned between the cap and reservoir body.
- Refit the two fixings and tighten to **1.5 Nm**.

⚠ 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 rear brake fluid reservoir is between the upper and lower level lines (reservoir held horizontal).



1. **Rear brake fluid reservoir**
2. **Rear reservoir upper level**
3. **Rear reservoir lower level**

2. To adjust the fluid level:
   - Remove the two fixings.
   - Remove the reservoir cap and the diaphragm seal.
   - Fill the reservoir to the upper level line using new DOT 4 fluid from a sealed container.
   - Refit the reservoir cap, ensuring that the diaphragm seal is correctly positioned between the cap and reservoir body.
   - Refit the two fixings and tighten to **1.5 Nm**.

Changing Brake Fluid

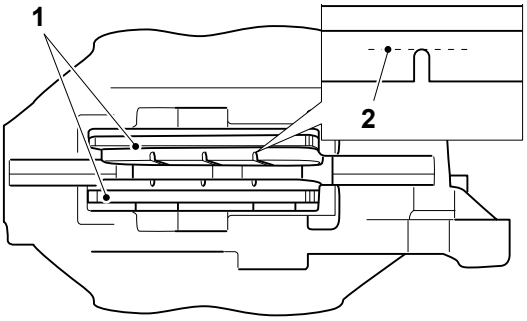
Brake fluid must be changed every two calendar years, irrespective of the mileage the motorcycle has covered in that time.

Brake Pads Wear

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.



cbmz_1

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.

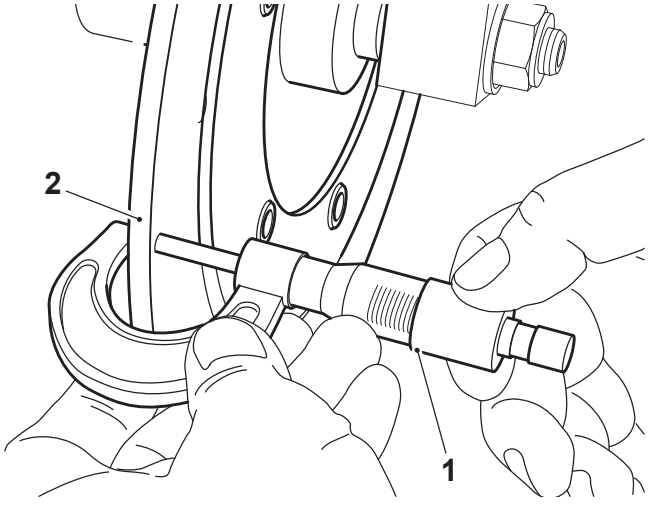
Brake Disc -Thickness Check

Brake Disc - Run-out Check

WARNING

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

1. Support the motorcycle on a stand so the wheel is raised clear of the ground.
2. Using a micrometer, measure the brake disc at several points.



1. **Micrometer**
2. **Brake disc**

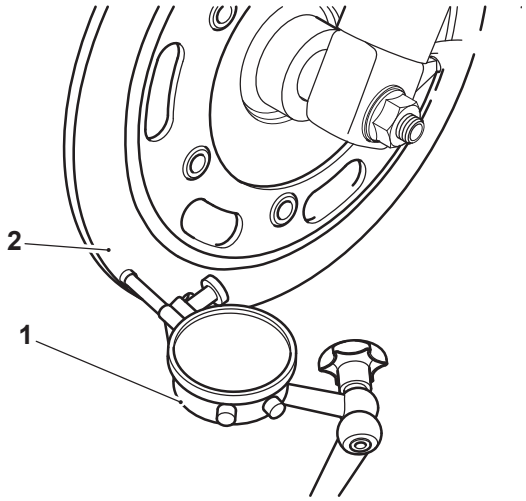
3. Replace any brake disc if worn beyond the service limit.

For specifications refer toBrakes.

WARNING

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

1. Support the motorcycle on a stand so the wheel is raised clear of the ground.
2. Measure disc run-out using an accurate dial gauge mounted on a surface plate.



1. **Dial gauge**
2. **Brake disc**

3. Replace any brake disc that exceeds the disc run-out limit.

For specifications refer toBrakes.

Breaking-in New Brake Pads and Discs

After replacement brake discs and/or pads have been fitted to the motorcycle, we recommend a period of careful breaking-in that will optimise the performance and longevity of the discs and pads. The recommended distance for breaking in new pads and discs is 200 miles (300 km).

After fitting new brake discs and/or pads avoid extreme braking, ride with caution and allow for greater braking distances during the breaking-in period.

Bleeding the Front Brakes, Renewing Brake Fluid

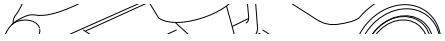
Front Brake Pads - Removal

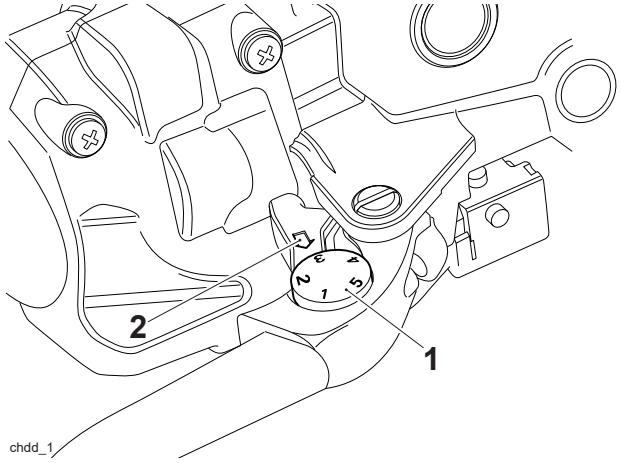
WARNING

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.

Preliminary Steps

- Note the original setting of the brake lever adjuster in order that it can be returned to the same position when the bleeding operation is complete. Set the brake lever adjuster to position No. 1.





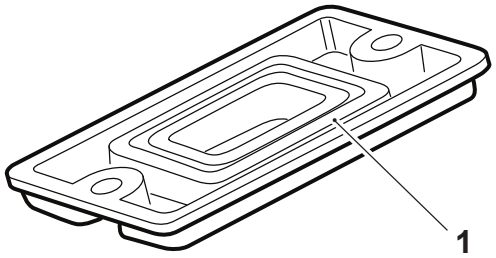
1. **Adjuster wheel**
2. **Arrow mark**

- Turn the handlebars to bring the fluid reservoir to a level position.

⚠ CAUTION

To prevent paint damage, do not spill brake and clutch fluid onto any area of the bodywork. Spilled brake and clutch fluid will damage paintwork.

- Remove the screws from the reservoir cover and remove the cover and sealing diaphragm.
- Check the condition of the reservoir sealing diaphragm. Replace if necessary.



1. **Sealing diaphragm**

Core Activity

⚠ WARNING

Ensure absolute cleanliness when adding brake and clutch 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

WARNING

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 and clutch fluid onto any area of the bodywork. Spilled brake and clutch fluid will damage paintwork.

To correctly bleed the front brake system, both manual and ABS system bleed procedures must be completed then repeated in the following sequence:

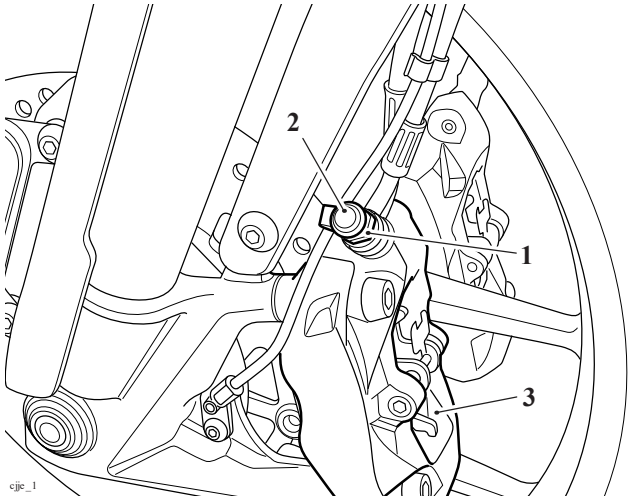
- Complete the manual bleed procedure for the left and right front calipers.
- Complete the ABS system bleed procedure.
- Repeat the manual bleed procedure.
- Repeat the ABS system bleed procedure.
- Repeat the manual bleed procedure.

Manual Bleed Procedure

Note

- **The left hand caliper should be bled first, followed by the right hand caliper.**

1. Working on the left hand caliper first, remove the rubber cap from the bleed nipple on the brake hose union.



1. **Bleed nipple**
2. **Rubber cap**
3. **Brake caliper (left hand shown)**

2. 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.
3. 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.**

4. Get an assistant to slowly pull the brake lever to the handlebar.
5. With the lever held fully against the handlebar, close the bleed nipple. Once the bleed nipple is closed,

release the brake lever.

6. Repeat steps 3 to 5 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.**

7. When all air has been expelled from the system, hold the lever fully against the handlebar and close the bleed nipple.
8. Tighten the bleed nipple to **6 Nm**.
9. Repeat the procedure for the right hand caliper.

Note

- **If the manual bleed procedure is to be followed by an ABS system bleed, leave the transparent tube and receptacle in place on the right hand caliper.**

ABS System Bleed Procedure

1. Connect the Triumph diagnostic tool (see System Diagnostics).
2. Follow the on screen menu to ABS Diagnostics. From the menu, select 'BLEED SYSTEM' (see the Triumph Diagnostic Tool User Guide).

Note

- **On pressing the Start button, the diagnostic software will send a command to the ABS ECM to begin the ABS bleed sequence.**
- **The bleed sequence lasts for 140 seconds and consists of three stages; Flush stage, Bleed stage 1 and Bleed stage 2.**
- **The bleed sequence can be stopped at any time by pressing the Stop button on the diagnostic software.**

3. Press the Start button to activate the bleed sequence on the diagnostic tool.

Note

- **The flush stage lasts for 20 seconds. The ABS modulator can be heard operating during the flush stage and will become silent when flush stage has completed.**

4. With bleed nipples closed, repeatedly operate the front brake lever for the duration of the flush stage.

Note

- **Bleed stage 1 will start when the flush stage has completed and will be automatically followed by bleed stage 2.**
- **Bleed stages 1 and 2 last for 60 seconds each. The ABS modulator will remain silent during bleed stage 1 but can be heard operating during bleed stage 2.**

5. Release the right hand caliper 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.**

6. Get an assistant to slowly pull the brake lever to the handlebar.
7. With the lever held fully against the handlebar, close the bleed nipple. Once the bleed nipple is closed, release the brake lever.
8. Repeat steps 5 to 7 for the duration of bleed stages 1 and 2.

Note

- **Maintain the brake fluid level between the upper and lower reservoir levels whilst bleeding is being carried out.**

9. Once the bleed sequence has completed the diagnostic tool will display a message **'ABS system bleed complete'**. Note that this message may take a few seconds to appear after the ABS modulator has become

silent.

10. Tighten the bleed nipple to **6 Nm**.

Final Steps

WARNING

Use only DOT 4 specification brake and clutch fluid as listed in the General Information section of this manual. The use of brake and clutch 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 and clutch fluid handling warnings given earlier in this section of the manual.

CAUTION

To prevent paint damage, do not spill brake and clutch fluid onto any area of the bodywork. Spilled brake and clutch fluid will damage paintwork.

WARNING

Always return the lever adjuster to the original setting as noted during the preliminary steps. Operating the motorcycle with lever settings that are unfamiliar may lead to loss of motorcycle control and an accident.

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.

- Ensure both manual and ABS system bleed procedures have been completed and repeated in the sequence described at the beginning of the Core Activity section.
- In the Triumph diagnostic software, navigate to ENGINE DIAGNOSTICS - FUNCTION TEST and perform the cruise control switch check (see Cruise Control Switch Check) to ensure correct brake switch operation.
- Disconnect the Triumph diagnostic tool.
- 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.
- Remove the bleed tube.
- Replace the bleed nipple cap.
- Fill the reservoir to the upper level with new DOT 4 fluid.
- Refit the diaphragm and reservoir cover. Refit the screws and tighten to **1.5 Nm**.
- Reset the brake lever adjuster to the original setting.
- Check the operation of the front brake. Rectify as necessary.

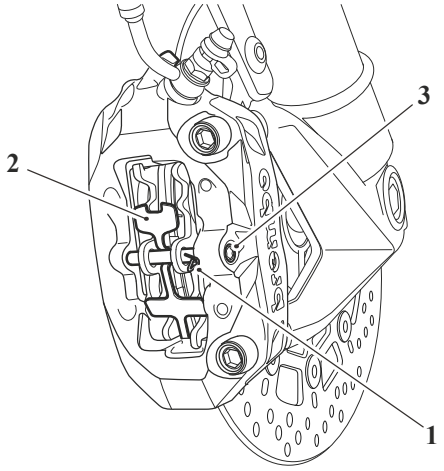
WARNING

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

- **Note the position and orientation of the pad retaining pin clip, anti-rattle spring and brake pads prior to removal.**

1. Remove the clip from the brake pad retaining pin.
2. While pressing down on the anti-rattle spring, remove the brake pad retaining pin.



1. **Clip**
2. **Anti-rattle spring**
3. **Brake pad retaining pin**

3. Collect the anti-rattle spring.

⚠ CAUTION

In the following operation, never lever directly against the disc, caliper or pad lining material. Always use a levering tool made from a soft material that will not cause damage to the load bearing surfaces.

Brake fluid will be displaced 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.

4. Carefully push the brake pads apart to force the caliper pistons back to allow withdrawal of the pads.

Note

- **Complete the installation of the brake pads to one caliper (see Front Brake Pads - Installation) before removing the pads from the other caliper.**

Front Brake Pads - Inspection

Front Brake Pads - Installation

1. Check the brake pad retaining pin, retaining pin clip and anti-rattle spring. Renew any component which shows signs of damage and corrosion.
2. Inspect the brake pads for wear (see Brake Wear Inspection).

⚠ WARNING

Never use mineral-based grease (such as lithium or copper based grease) in any area where contact with the braking system hydraulic seals and dust seals is possible. Mineral-based grease will damage the hydraulic seals and dust 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.

WARNING

Do not apply more than a minimum coating of grease to the brake 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 brake pad retaining pins using a minimum amount of proprietary high temperature brake grease.
3. Fit the anti-rattle spring over the brake pads as noted during removal and push down to allow the brake pad retaining pin to slide across the top of the spring.
4. Fit the brake pad retaining pin as noted during removal and tighten to **6 Nm**.
5. Fit the brake pad retaining pin clip.
6. 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 in the General Information section (see Brakes).

CAUTION

To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

7. Check the front brake fluid level and top up as required with new DOT 4 fluid.
8. Check for correct brake operation. 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

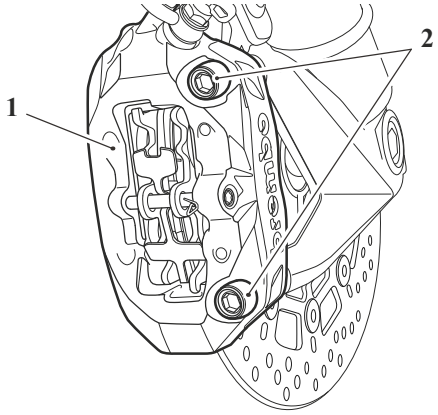
WARNING

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. Remove the brake pads (see Front Brake Pads - Removal).
2. Disconnect the brake hose at the caliper (two hoses on left hand caliper), and place the free end of the hose(s) in a suitable container to collect the brake fluid. Discard the sealing washers.
3. Remove the two caliper bolts.



1. **Caliper**
2. **Bolts**

4. Manoeuvre the caliper clear of the disc, taking care not to damage the wheel.

Front Brake Caliper - Disassembly

Front Brake Caliper - Inspection

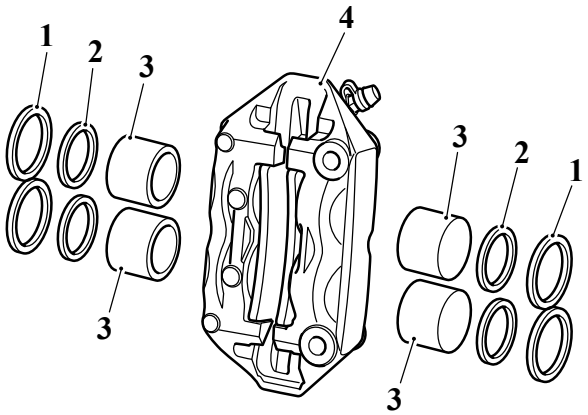
⚠ WARNING

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.

⚠ WARNING

Ensure the seal grooves in the caliper bores 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.

1. Cover the caliper opening with a clean heavy cloth and using either compressed air or by reconnecting the master cylinder and pumping the brake lever, remove the pistons one at a time.



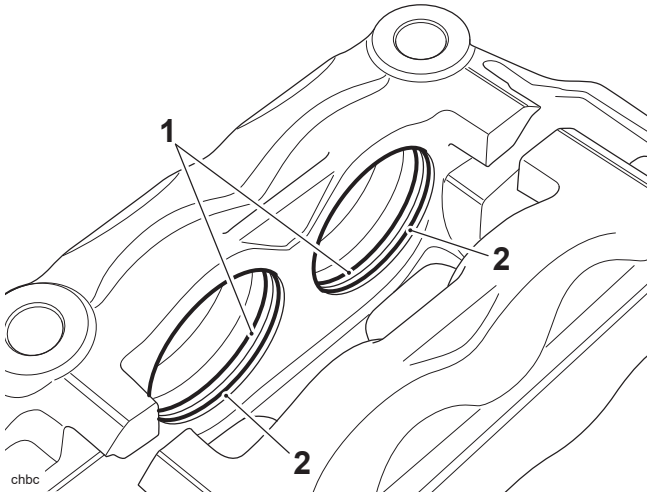
chbd

1. **Dust seal**
2. **Piston seal**
3. **Pistons**
4. **Caliper**

2. Extract the dust seals and piston seals, taking care not to damage the caliper bores. Discard the old seals, these must not be re-used.

Note

- **The piston seals are slightly thicker than the dust seals.**



1. **Piston seals**
2. **Dust seals**

3. Check the pistons, caliper and mounting bracket for signs of damage, paying particular attention to the caliper bores and pistons. If damage is present, renew the worn component or the complete caliper assembly.

⚠ 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 loss of control of the motorcycle or an accident could result if this warning is ignored.

1. Check the pistons and caliper bores for corrosion, scoring and damage. Renew as necessary.
2. Inspect the brake pads for damage and wear beyond the service limit. Renew as necessary.

Front Brake Caliper - Assembly

Front Brake Caliper - Installation

⚠ WARNING

Never use mineral-based grease (such as lithium or copper based grease) in any area where contact with the braking system hydraulic seals and dust seals is possible. Mineral-based grease will damage the hydraulic seals and dust seals in the calipers and master cylinders.

Damage caused by contact with mineral-based grease may reduce braking efficiency resulting in loss of

WARNING

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.

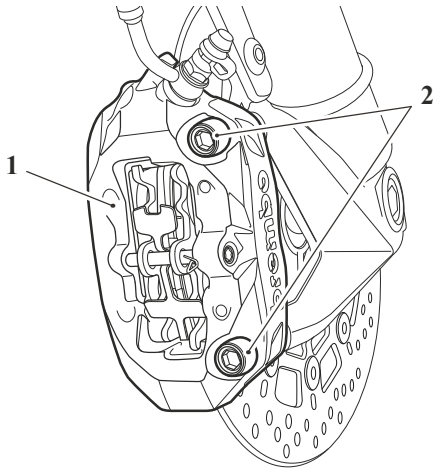
If all components are serviceable, obtain a piston seal kit and reassemble the caliper as follows:

1. Ensure all components are clean, then fit the new seals to their grooves in the caliper bores.
2. Lubricate the fluid seals, caliper bore and the outside of the pistons with clean DOT 4 brake fluid.
3. Ease the pistons squarely back into the bores, taking care not to displace the seals.

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. Thoroughly clean the threaded fixing holes for the front fork brake caliper fixings.
2. Thoroughly clean the threaded part of the brake caliper fixings and smear the first four threads with a proprietary copper based grease.
3. Position the brake caliper over the disc.
4. Secure the brake caliper with the fixings and tighten sufficiently to bring the caliper into contact with its mounting points, while allowing a small amount of lateral movement. Do not fully tighten at this stage.

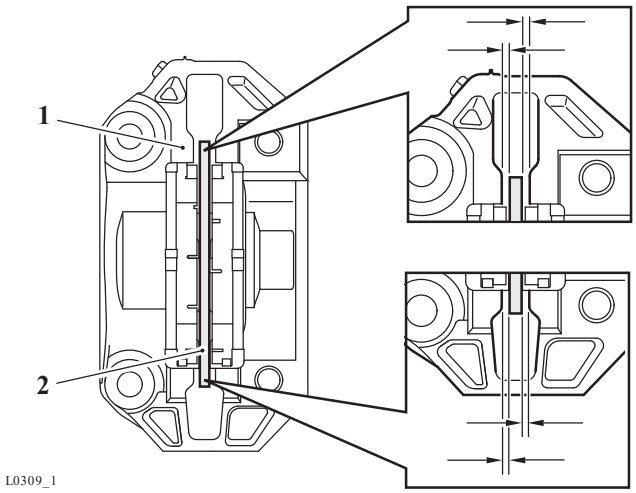


1. **Caliper**
2. **Fixings**

Note

- **Before tightening, the brake caliper should be positioned such that it is aligned as centrally as possible over the brake disc.**

5. Visually check the clearances between the caliper body and brake disc in the four locations shown below.



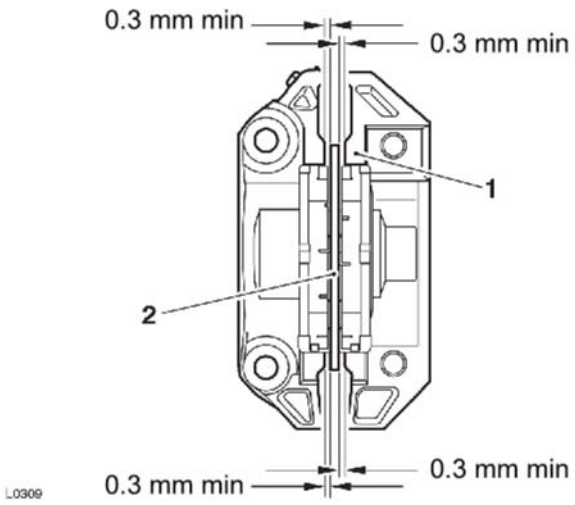
1. **Caliper body**
2. **Brake disc**

6. Slide the caliper body inwards or outwards against its fixings as required to achieve the most equal clearances possible on either side of the brake disc.
7. Holding the caliper in position against its mounting fixings, tighten the fixings to **50 Nm**.

Note

- **When the brake caliper is fitted, there must be a minimum gap of 0.3 mm between the caliper and brake disc.**

8. Using feeler gauges, measure the gap between the brake disc and the caliper at the four measurement points shown in the following illustration. Minimum gap to be 0.3 mm.



1. **Caliper**
2. **Brake disk**

9. If necessary, loosen the caliper fixings and adjust the caliper alignment to achieve the minimum gap of 0.3 mm on all four measurement points. Re-tighten the bolts to **50 Nm**.
10. If removed, refit the brake pads (see Front Brake Pads - Installation).

11. Connect the brake hose(s) to the caliper incorporating new sealing washers on each side of the union(s). Ensure that the brake hose is located into its retaining lug on the mudguard.
12. 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 paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

- Fill the master cylinder with new, DOT 4 brake fluid from a sealed container.
- Bleed the front brakes (see Bleeding the Front Brakes, Renewing Brake Fluid).
- Check the brakes for correct operation. Rectify any faults 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 - Removal

WARNING

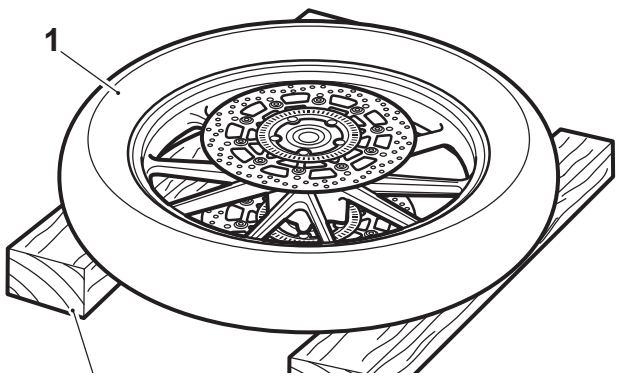
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

WARNING

Do not renew front brake discs individually. Discs must always be renewed in pairs even if one of a pair is serviceable.

A dangerous riding condition leading to an accident could result if this warning is ignored.

1. Remove the front wheel (see Front Wheel - Removal).
2. Support the wheel on blocks as illustrated to avoid damage to the wheel centre.



1. **Wheel**
2. **Support blocks**

3. Remove and discard the bolts.
4. Detach the disc. Collect the ABS pulser ring from the left hand disc.
5. Repeat for the other disc.

Front Discs - Installation

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. Locate the left hand brake disc and ABS pulser ring to the wheel.
2. Fit new bolts and tighten to **22 Nm**.
3. Fit the right hand brake disc in the same way.
4. Refit the front wheel (see Front Wheel - Installation).
5. Check for correct brake operation. 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.

WARNING

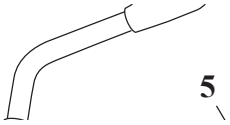
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

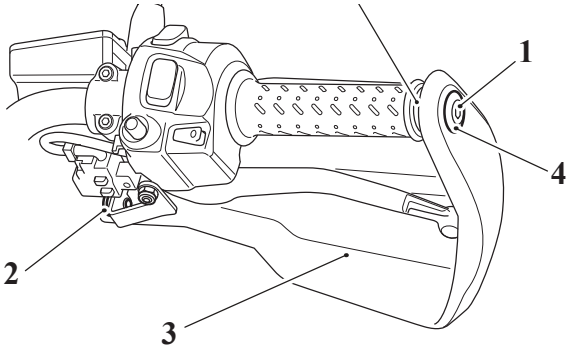
CAUTION

To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

- Remove the rider’s seat (see Rider’s Seat - Removal).
- Disconnect the battery, negative (black) lead first.

1. To drain the fluid from the master cylinder, attach a tube to the right hand caliper bleed nipple, loosen the nipple and allow the fluid to drain into a suitable container. Operate the brake lever until all fluid has been expelled.
2. **For motorcycles with handguards fitted only:** Release the two fixings and remove the handguard, spacer and handlebar end weight. Discard the fixings.



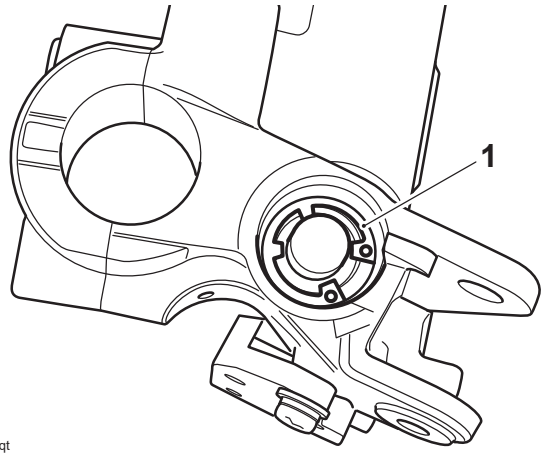


1. **Handguard end fixing**
2. **Handguard to bracket fixing**
3. **Handguard (right hand shown)**
4. **Spacer**
5. **Handlebar end weight**

3. Note the setting of the brake lever adjuster to ensure it is returned to the same position when the overhaul operation is complete. If fitted, Note the position of the handguard bracket for installation.
4. Remove the pivot lock nut and bolt securing the brake lever to the master cylinder, and remove the lever. Collect the handguard bracket if fitted.
5. Disconnect the brake hose from the master cylinder. Discard the two sealing washers.
6. Release the clamp bolts from the handlebar and remove the master cylinder.

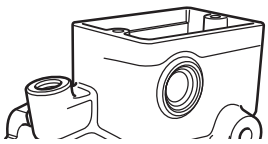
Front Brake Master Cylinder - Disassembly

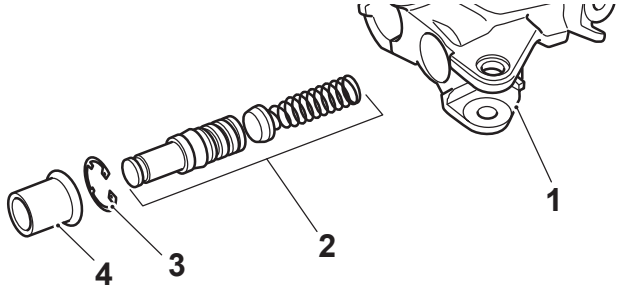
1. Detach the rubber boot from the lever end of the cylinder.
2. Remove the circlip from beneath the boot.



1. **Circlip**

3. Remove the piston set from the master cylinder bore noting the relative position of the seals and piston components.





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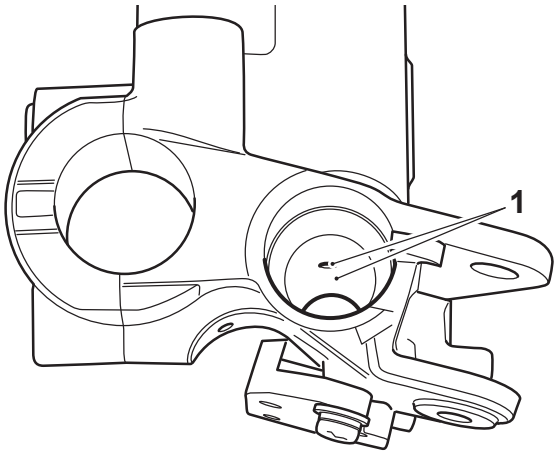
1. **Master cylinder**
2. **Spring and piston assembly**
3. **Circlip**
4. **Rubber boot**

Front Brake Master Cylinder - Inspection

1. Check the following for wear, damage, cracks or deterioration:
   - Cylinder bore
   - Rubber boot
   - Spring
   - Piston
   - Pivot bolt.
2. Always renew the piston and seal set if the cylinder is dismantled.
3. Check that the two ports in the master cylinder bore are not blocked.



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1. **Ports**

Front Brake Master Cylinder - Assembly

⚠ WARNING

Never use mineral-based grease (such as lithium or copper based grease) in any area where contact with the braking system hydraulic seals and dust seals is possible. Mineral-based grease will damage the hydraulic seals and dust seals in the calipers and master cylinders.

Damage caused by contact with mineral-based grease may reduce braking efficiency resulting in loss of

WARNING

motorcycle control and an accident.

WARNING

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

1. Lubricate the piston and cylinder with new, clean brake and clutch fluid.

WARNING

Ensure that the piston and piston seal are fitted facing the same way as noted during removal. A dangerous riding condition leading to an accident could result from incorrect assembly of the master cylinder.

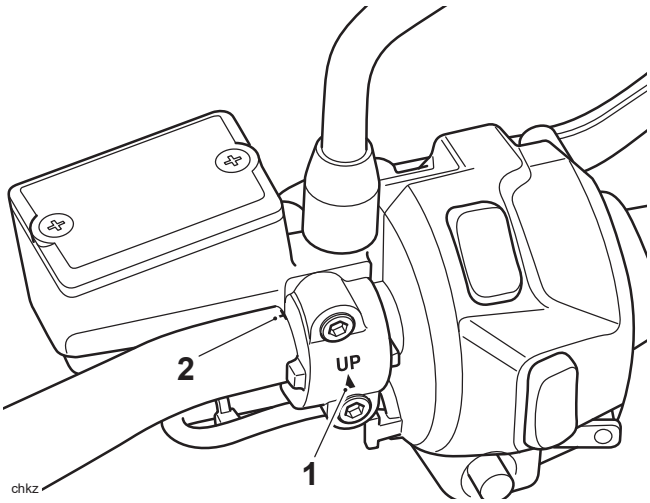
2. Fit the new piston set into the master cylinder and retain with a new circlip.
3. Refit the master cylinder boot.

Front Brake Master Cylinder - Installation

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. Locate the master cylinder to the handlebars and position the clamp with the 'UP' arrow pointing upwards.



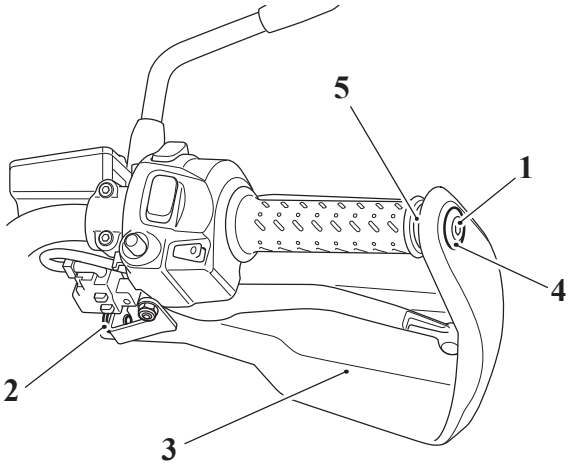
1. **'UP' Arrow**
2. **Alignment mark**

2. Align the master cylinder/clamp split line with the alignment mark on the handlebar.
3. Tighten the clamp bolts, upper first and then the lower to **12 Nm**.
4. Connect the brake hose to the master cylinder incorporating new sealing washers. Tighten the banjo bolt to

25 Nm.

5. Position the brake lever ensuring that the pivot boss is correctly aligned to the push rod. If fitted, position the handguard bracket as noted during removal.
6. Apply a smear of silicone grease to the shank of the brake lever pivot bolt.
7. Fit and tighten the pivot bolt to **1 Nm**.
8. Counter hold the pivot bolt, fit and tighten the lock nut to **6 Nm**.
9. **For motorcycles with handguards fitted only:** Position the handlebar end weight, handguard and spacer to the handlebar and secure with new fixings. tighten the:

- new handguard to bracket fixing to **6 Nm**.
- new handlebar end fixing to **5 Nm**.



1. **Handlebar end fixing**
2. **Handguard to bracket fixing**
3. **Handguard**
4. **Spacer**
5. **Handlebar end weight**

⚠ WARNING

Use only DOT 4 specification brake and clutch 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. Connect the battery, positive (red) lead first.
11. Fill and bleed the front brakes (see Bleeding the Front Brakes, Renewing Brake Fluid).

⚠ WARNING

Always return the lever adjuster to the original setting noted during removal. Operating the motorcycle with lever settings which are unfamiliar may lead to loss of control or an accident.

12. Reset the brake lever adjuster to the original setting.
13. Examine the system for correct operation and fluid leaks. Rectify as necessary.
14. Refit the rider’s seat (see Rider’s Seat - Installation).
15. Check for correct brake operation. Rectify as necessary.

⚠ WARNING

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.

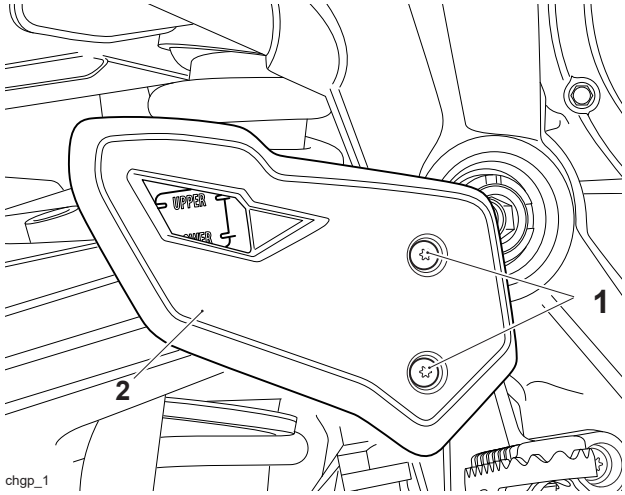
Bleeding the Rear Brakes, Renewing Brake Fluid

WARNING

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

Preliminary Steps

- Release the fixings and remove the right hand heel guard.

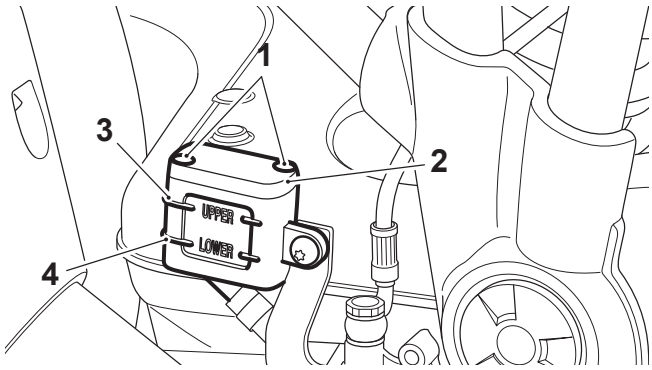


1. **Fixings**
2. **Heel guard**

CAUTION

To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

- Unscrew and remove the rear brake reservoir cover and diaphragm, taking care not to spill any fluid.



1. **Fixings**
2. **Rear reservoir cap**
3. **Upper level**
4. **Lower level**

- Check the condition of the sealing diaphragm. Replace the diaphragm as necessary.

Core Activity

WARNING

Ensure absolute cleanliness when adding brake fluid to the brake fluid reservoir. Do not allow moisture or debris to enter the cylinder as this will adversely affect the fluid properties. Always use fluid from a sealed container and do not use fluid from a container which has been opened for any period of time. Always check for fluid leakage around hydraulic fittings and for damage to hoses.

A dangerous riding condition leading to an accident could result if this warning is ignored.

CAUTION

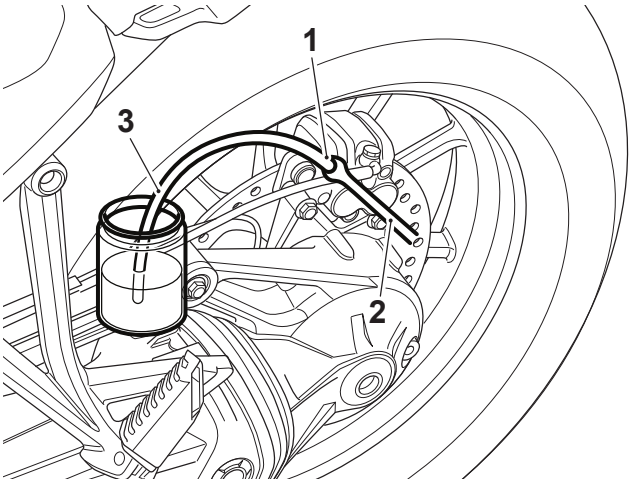
To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

To correctly bleed the rear brake system, both manual and ABS system bleed procedures must be completed then repeated in the following sequence:

- Complete the manual bleed procedure for rear caliper.
- Complete the ABS system bleed procedure.
- Repeat the manual bleed procedure.
- Repeat the ABS system bleed procedure.
- Repeat the manual bleed procedure.

Manual Bleed Procedure

1. Remove the cap from the rear bleed nipple.
2. Attach a transparent tube to the bleed nipple.



1. **Bleed nipple**
2. **Spanner**
3. **Bleed tube**

3. Place the other end of the tube in a suitable receptacle containing new brake fluid.
4. 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.**

5. Slowly depress the brake pedal and, holding the pedal fully down, close the bleed nipple.
6. Repeat steps 4 and 5 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.**

7. When all air has been expelled from the system, hold down the brake pedal and close the bleed nipple. Tighten the nipple to **6 Nm**.

Note

- **If the manual bleed procedure is to be followed by an ABS system bleed, leave the transparent tube and receptacle in place on the rear caliper.**

ABS System Bleed Procedure

1. Connect the Triumph diagnostic tool (see System Diagnostics).
2. Follow the on screen menu to ABS Diagnostics. From the menu, select BLEED SYSTEM (see the Triumph Diagnostic Tool User Guide).

Note

- **On pressing the Start button, the diagnostic software will send a command to the ABS ECM to begin the ABS bleed sequence.**
- **The bleed sequence lasts for 140 seconds and consists of three stages; Flush stage, Bleed stage 1 and Bleed stage 2.**
- **The bleed sequence can be stopped at any time by pressing the Stop button on the diagnostic software.**

3. Press the Start button to activate the bleed sequence on the diagnostic tool.

Note

- **The flush stage lasts for 20 seconds. The ABS modulator can be heard operating during the flush stage and will become silent when the flush stage has completed.**

4. With bleed nipple closed, repeatedly operate the rear brake pedal for the duration of the flush stage.

Note

- **Bleed stage 1 will start when the flush stage has completed and will be automatically followed by bleed stage 2.**
- **Bleed stages 1 and 2 last for 60 seconds each. The ABS modulator will remain silent during bleed stage 1 but can be heard operating during bleed stage 2.**

5. 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**

Note

be repeated.

6. Slowly depress the brake pedal and, holding the pedal fully down, close the bleed nipple.
7. Repeat steps 5 and 6 for the duration of bleed stages 1 and 2.

Note

- **Maintain the brake fluid level between the upper and lower reservoir levels whilst bleeding is being carried out.**

8. Once the bleed sequence has completed the diagnostic tool will display a message **'ABS system bleed complete'**. Note that this message may take a few seconds to appear after the ABS modulator has become silent.
9. Apply pressure to the brake lever and close the bleed nipple. Tighten the nipple to **6 Nm**.

Final Steps

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.

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.

CAUTION

To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

- Ensure both manual and ABS system bleed procedures have been completed and repeated in the sequence described at the beginning of the Core Activity section.
- In the Triumph diagnostic software, navigate to ENGINE DIAGNOSTICS - FUNCTION TEST and perform the cruise control switch check (see Cruise Control Switch Check) to ensure correct brake switch operation.
- Disconnect the Triumph diagnostic tool.
- Fill the reservoir to the maximum level with new DOT 4 fluid.
- Fit the reservoir cover and diaphragm. Check for correct diaphragm fitment before final tightening of the cover.
- Remove the bleed tube from the nipple.
- Replace the bleed nipple cap.
- Refit the heel guard and tighten its fixings to **7 Nm**.
- Check for correct brake operation. Rectify as necessary.

Rear 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.

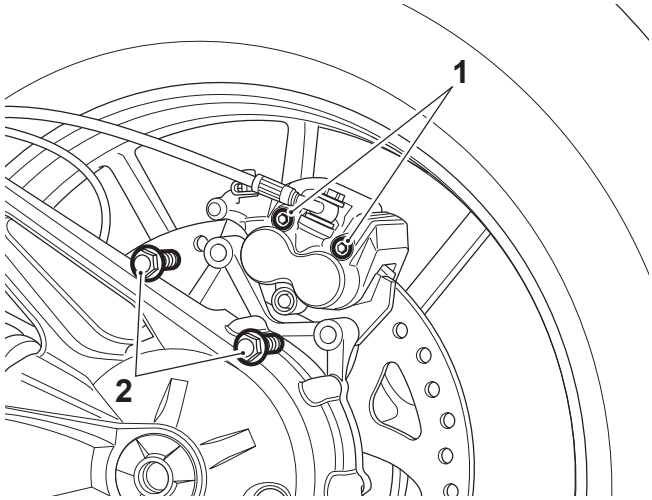
WARNING

Do not allow a brake component to hang unsupported on the brake hose or line.

Brake hoses or lines that are not supported may become damaged or bent.

Bent or damaged brake hoses or lines lead to reduced braking efficiency causing loss of motorcycle control and an accident.

1. Loosen the brake pad retaining pins.
2. Remove the caliper mounting bolts and position the caliper to allow withdrawl of the pad retaining pins.

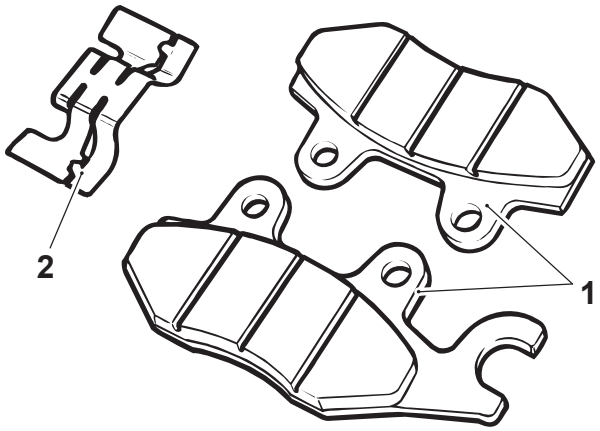


1. **Pad retaining pins**
2. **Caliper mounting bolts**

WARNING

Before removing the brake pads, note the relationship of the pads to the caliper and ensure that, on assembly, they are fitted in the same way.

3. Press downwards on both pads and remove the pad retaining pins.
4. Remove the brake pads and inspect for damage or wear beyond the service limit. Replace if necessary.
5. Remove the anti-rattle spring and inspect for damage. Replace if necessary.



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1. **Brake pads**
2. **Anti-rattle spring**

Rear Brake Pads - Installation

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

Never use mineral-based grease (such as lithium or copper based grease) in any area where contact with the braking system hydraulic seals and dust seals is possible. Mineral-based grease will damage the hydraulic seals and dust 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.

CAUTION

To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

1. If fitting new pads, use hand pressure to compress the caliper piston fully into its bore.
2. Fit the anti-rattle spring into the caliper.
3. Renew the brake pads as a pair or, if both pads are in a serviceable condition, clean the pad grooves before fitting them.
4. Fit the brake pads to the caliper in the positions noted during removal.

WARNING

Do not apply more than a minimum coating of grease to the brake pad retaining pins. Excess grease may contaminate the brake pads, hydraulic seals and discs causing reduced braking efficiency and an accident.

5. Lubricate the brake pad retaining pin using a minimum amount of proprietary high temperature copper based grease. Press down on both pads and fit the retaining pins.
6. Position the caliper over the disc ensuring both pads are correctly fitted.
7. Fit the caliper bolts and tighten to **40 Nm**.
8. Tighten the brake pad retaining pin to **17 Nm**.
9. Pump the brake pedal to correctly position the caliper pistons.
10. Check the brake fluid level in the rear reservoir and top-up as required 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.

11. Check for correct brake operation. Rectify as necessary.

WARNING

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 Caliper - Removal

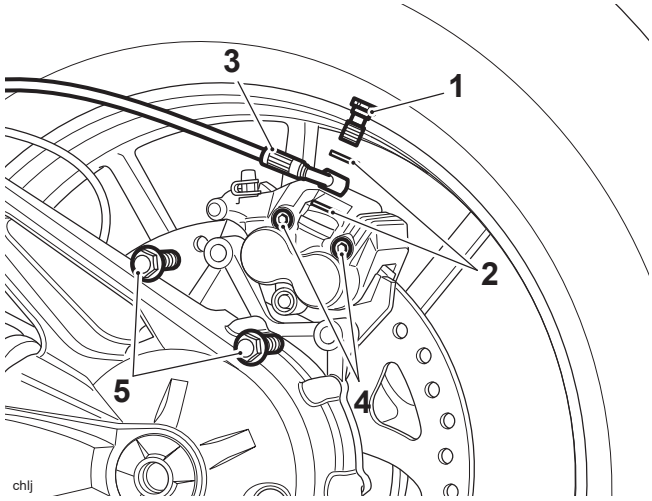
WARNING

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 rear brake hose at the caliper and place the free end of the hose in a suitable container to collect the brake fluid. Discard the sealing washers.
2. Loosen the pad retaining pins.
3. Remove the caliper mounting bolts.
4. Remove the brake caliper assembly.



1. **Banjo bolt**
2. **Sealing washers**
3. **Brake hose**
4. **Pad retaining pins**
5. **Caliper mounting bolts**

Rear Brake Caliper - Disassembly

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

WARNING

direct contact with compressed air.

1. Remove the brake pads and anti-rattle spring (see Rear Brake Pads - Removal).
2. Cover the caliper opening with a clean, heavy cloth and, using either compressed air or by reconnecting the master cylinder and pumping the brake lever, remove the piston.

Rear Brake Caliper - Inspection

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 loss of control of the motorcycle or an accident could result if this warning is ignored.

1. Check the piston and caliper bore for corrosion, scoring and damage. Renew as necessary.
2. Inspect the brake pads for damage and wear beyond the service limit. Renew as necessary.

Rear Brake Caliper - Assembly

WARNING

Never use mineral-based grease (such as lithium or copper based grease) in any area where contact with the braking system hydraulic seals and dust seals is possible. Mineral-based grease will damage the hydraulic seals and dust 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

Ensure that the caliper bores do not become scratched during removal and assembly.

A dangerous riding condition leading to an accident could result if this warning is ignored.

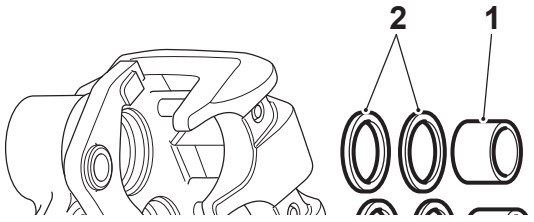
WARNING

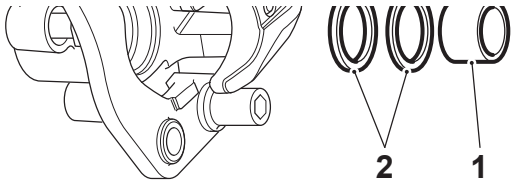
Before installation, all internal brake components should be cleaned and lubricated with clean new DOT 4 brake fluid.

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.

1. Fit new fluid seals to the caliper. Apply brake fluid to the outside of the caliper pistons and fluid seal.





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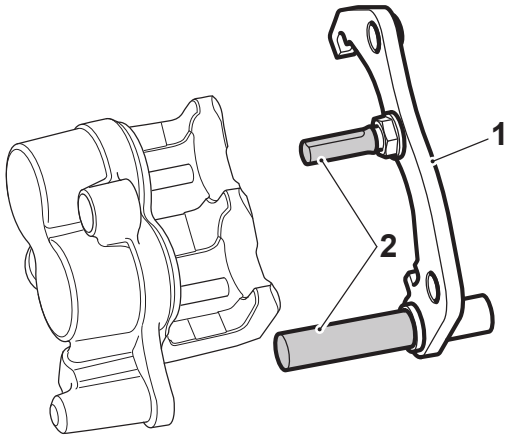
1. **Pistons**
2. **Seals**

⚠ WARNING

Ensure that the piston does not tip during assembly as this could damage the caliper.
A dangerous riding condition leading to an accident could result if this warning is ignored.

2. Carefully push the piston into the caliper by hand.
3. Lubricate the mounting bracket pins with silicone based grease (such as T2022021 supplied by Triumph) then reassemble the bracket and caliper. Ensure the pin gaiters are correctly located on both the bracket and caliper.



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1. **Mounting bracket**
2. **Sliding pins**

⚠ 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. Fit the brake pads (see Rear Brake Pads - Installation).

Rear Brake Caliper - Installation

Rear Brake Disc - Removal

Rear Brake Disc - Installation

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 caliper over the disc ensuring the pads are correctly aligned on both sides of the disc.
2. Fit the caliper retaining bolts and tighten to **40 Nm**.
3. Connect the brake hose to the caliper incorporating new washers on each side of the banjo bolt.
4. Tighten the banjo bolt to **25 Nm**.

WARNING

Use only 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.

5. Fill the master cylinder with new, DOT 4 brake fluid from a sealed container.
6. Bleed the rear brake (see Bleeding the Rear Brakes, Renewing Brake Fluid).
7. Check for correct brake operation. 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.

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.

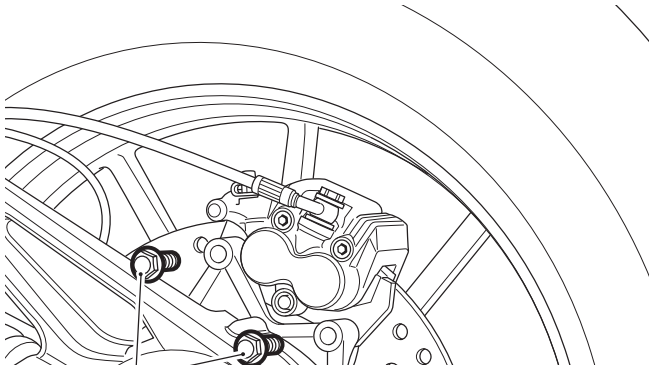
WARNING

Do not allow a brake component to hang unsupported on the brake hose or line.

Brake hoses or lines that are not supported may become damaged or bent.

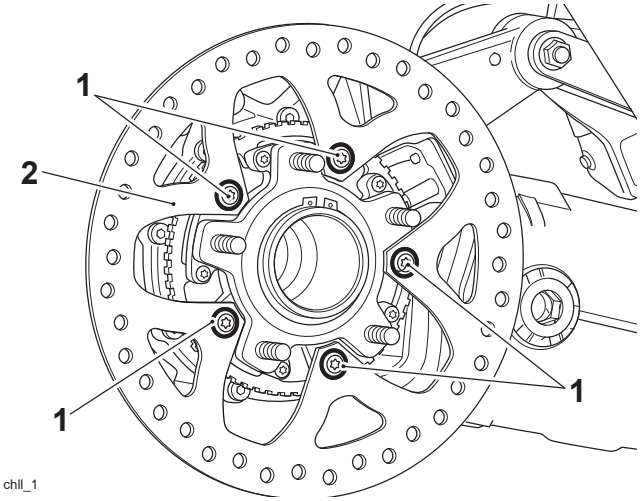
Bent or damaged brake hoses or lines lead to reduced braking efficiency causing loss of motorcycle control and an accident.

1. Remove the rear wheel (see Rear Wheel - Removal).
2. Detach and support the rear brake calipers such that the weight of the caliper is not supported by the brake hose.



1. **Caliper mounting bolts**

3. Remove and discard the fixings securing the brake disc, remove the disc.



1. **Fixings**
2. **Brake disc**

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. Align the brake disc to the hub.
2. Fit new fixings and tighten to **22 Nm**.
3. Position the caliper over the disc ensuring the pads are correctly aligned on both sides of the disc.
4. Fit the caliper retaining bolts and tighten to **40 Nm**.
5. Refit the rear wheel (see Rear Wheel - Installation).
6. Check for correct brake operation. 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

Rear Master Cylinder - Disassembly

WARNING

Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it

WARNING

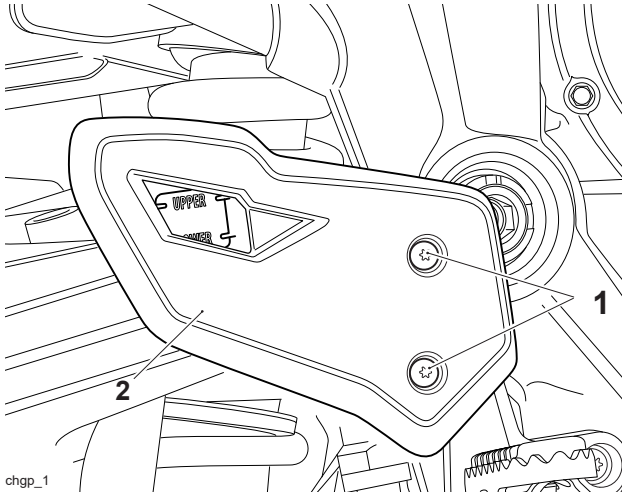
from falling and causing injury to the operator or damage to the motorcycle.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.

CAUTION

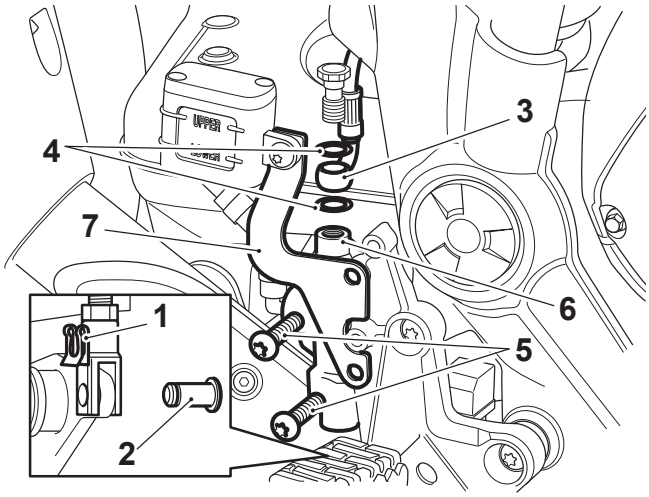
To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

1. Release the fixings and remove the right hand heel guard.



1. **Fixings**
2. **Heel guard**

2. Drain the fluid from the master cylinder by bleeding the system at the rear caliper until all fluid has been expelled (see Bleeding the Front Brakes, Renewing Brake Fluid).
3. Detach the brake fluid reservoir from its bracket.
4. Remove the clip from the clevis pin at the lower end of the brake pushrod and remove the clevis pin.
5. Disconnect the rear brake hose from the master cylinder, noting its orientation. Discard the two sealing washers.
6. Remove the fixings and remove the master cylinder and reservoir bracket assembly.



1. **Clip**
2. **Clevis pin**
3. **Brake hose**
4. **Sealing washers**
5. **Fixings**
6. **Master cylinder**
7. **Reservoir bracket**

7. Disconnect the reservoir hose from the master cylinder.

Rear Master Cylinder - Inspection

1. Remove the boot from the cylinder and pushrod.
2. Remove the circlip retaining the pushrod to the cylinder. Discard the circlip.
3. Remove the pushrod and piston set from the master cylinder bore, noting the relative position of the seals and piston components.

Rear Master Cylinder - Assembly

1. Visually inspect the master cylinder bore for wear, scratches or corrosion. Replace as necessary.
2. Check the piston and cylinder bore for damage, wear or deterioration. Replace as necessary.
3. Always renew the piston and seal set if the cylinder is dismantled.
4. Examine the pushrod for bends and damage. Replace as necessary.

Rear Master Cylinder - Installation

⚠ WARNING

Never use mineral-based grease (such as lithium or copper based grease) in any area where contact with the braking system hydraulic seals and dust seals is possible. Mineral-based grease will damage the hydraulic seals and dust 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.

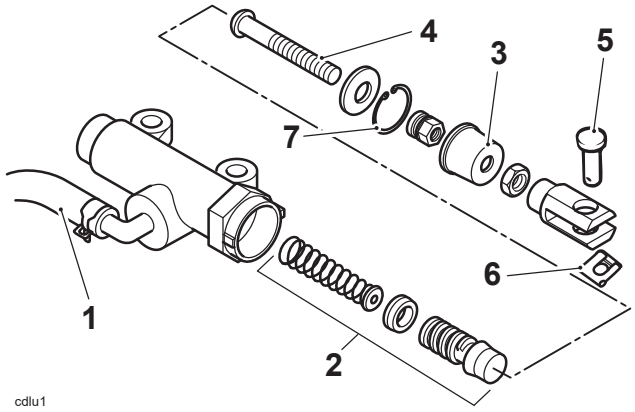
1. Clean the master cylinder bore, piston and seals, with new brake fluid.
2. Ensure all ports are clear of obstruction.

⚠ WARNING

Ensure that the piston and piston seal are fitted facing the same way as noted during removal. A dangerous riding condition leading to an accident could result from incorrect assembly of the master cylinder.

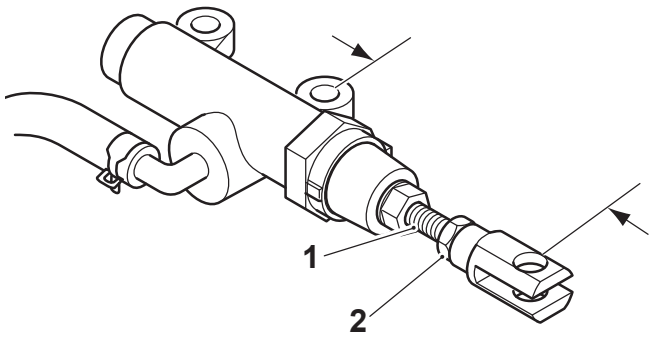
3. Install the spring and piston set together.

4. Apply a small amount of brake grease to the pushrod.
5. Install the pushrod in the master cylinder and retain with a new circlip.
6. Refit the boot.



1. **Reservoir hose**
2. **Piston set**
3. **Dust boot**
4. **Push rod**
5. **Clevis pin**
6. **Clip**
7. **Circlip**

7. If the pushrod has been disassembled, set the pushrod free length to 73.5 mm, as shown below:



1. **Pushrod**
2. **Lock nut**

8. Tighten the lock nut to **18 Nm**.

Front ABS Wheel Speed Sensor - Removal

⚠ WARNING

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. Fit the reservoir hose to the master cylinder.
2. Fit the master cylinder and reservoir bracket assembly to the frame and tighten the fixings to **18 Nm**.
3. Connect the push rod to the brake pedal using a new clevis pin and clip.
4. Incorporating new washers, fit the brake hose to the master cylinder. Ensuring correct orientation of the brake hose, tighten the banjo bolt to **25 Nm**.
5. Refit the brake fluid reservoir to its mounting bracket and tighten the fixing to **6 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.

6. Fill and bleed the rear brake system (see page Bleeding the Rear Brakes, Renewing Brake Fluid).
7. Refit the right hand heel guard, tightening the fixings to **7 Nm**.

- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).
- Check for correct brake operation. 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 ABS Wheel Speed Sensor - Installation

WARNING

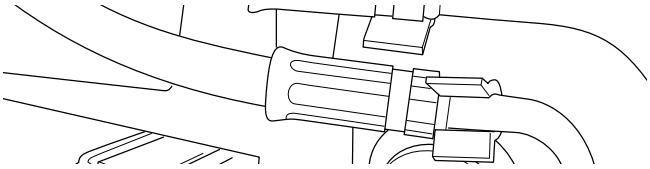
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

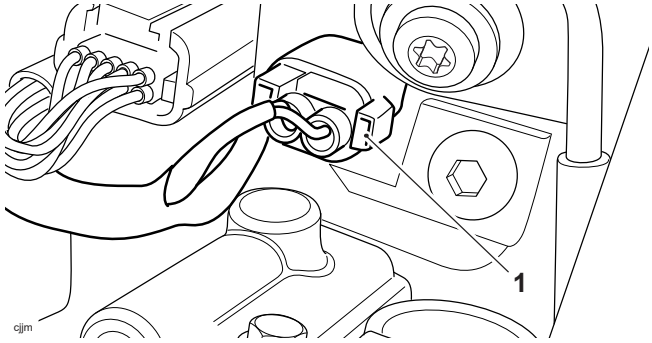
- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the fuel tank (see Fuel Tank - Removal).
- Remove the airbox (see Airbox - Removal).

Note

- **Note the routing of the front ABS wheel speed sensor harness and its retaining clips for installation.**
- **The front ABS wheel speed sensor multiplug is identified as the white connector located on the bracket mounted to the camshaft cover.**

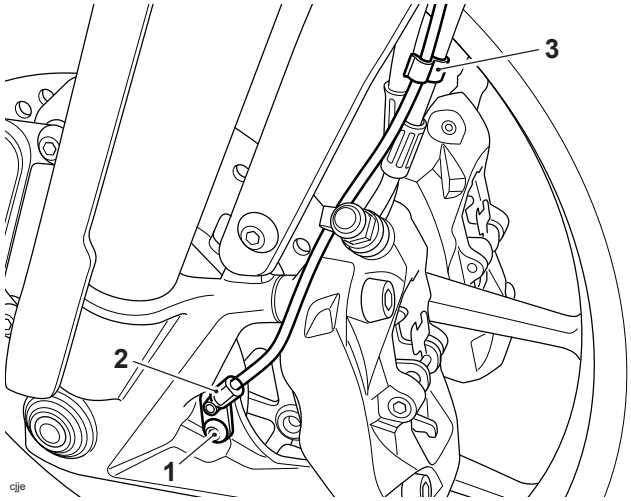
1. Detatch the wheel speed sensor multiplug from its bracket on the camshaft cover and disconnect.





1. **Wheel speed sensor multiplug**

2. Release the wheel speed sensor harness from its clips on the upper radiator mounting and front brake hoses.
3. Release the fixing and remove the sensor. Collect the shim from between the sensor and fork leg and discard fixing.



1. **Fixing**
2. **Front ABS wheel speed sensor**
3. **Clip**

Front Wheel Speed Sensor Air Gap Measurement

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

Check the condition of the shim before use. Do not use a shim which is bent or damaged.

1. Position the wheel speed sensor to the fork leg with its shim between the sensor and fork leg. Temporarily fit the original bolt and tighten to **9 Nm**.
2. Check and adjust the wheel speed sensor air gap (see Front Wheel Speed Sensor Air Gap Measurement).
3. Route the harness and secure to it's clips on the upper radiator mounting and front brake hoses, as noted

during removal.

4. Connect the wheel speed sensor multiplug to the main harness. Fit the multiplug to it's mounting bracket on the camshaft cover.

- Refit the airbox (see Airbox - Installation).
- Refit the fuel tank (see Fuel Tank - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).
- Check that the brakes operate correctly.

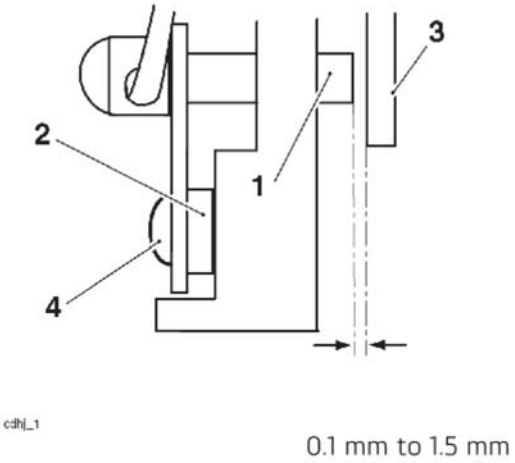
WARNING

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.

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. Using feeler gauges, measure the air gap between the front wheel speed sensor and its pulser ring.



1. **ABS sensor**
2. **Shim**
3. **Pulser ring**
4. **Fixing**

2. Rotate the wheel and repeat the measurement in several places to ensure the pulser ring is not distorted or bent. Renew a damaged pulser ring.
3. Adjust the air gap using the correct shim(s) to achieve an air gap between 0.1 mm to 1.5 mm.

WARNING

Shims are available in the following sizes, 0.5 mm, 1.0 mm, 1.5 mm and 2.0 mm.

Do not install more than two shims. If the required air gap cannot be achieved using two shims, investigate and rectify the cause before proceeding.

4. If necessary, remove the wheel speed sensor, fit the correct thickness shim(s) and refit the wheel speed

sensor.

5. If removed, install a new fixing and tighten to **9 Nm**.
6. Repeat the air gap measurement. Re-adjust as necessary.
7. Once the wheel speed sensor air gap measurement is correct, install a new bolt (if not already replaced during air gap adjustment) and tighten to **9 Nm**.

Front ABS Pulser Ring - Removal

WARNING

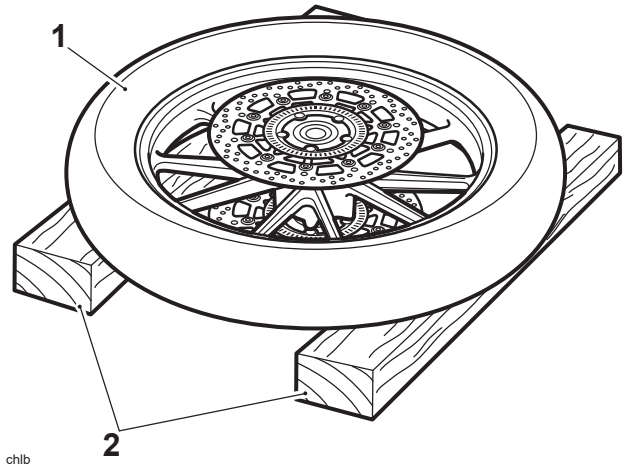
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Remove the front wheel (see Front Wheel - Removal).

WARNING

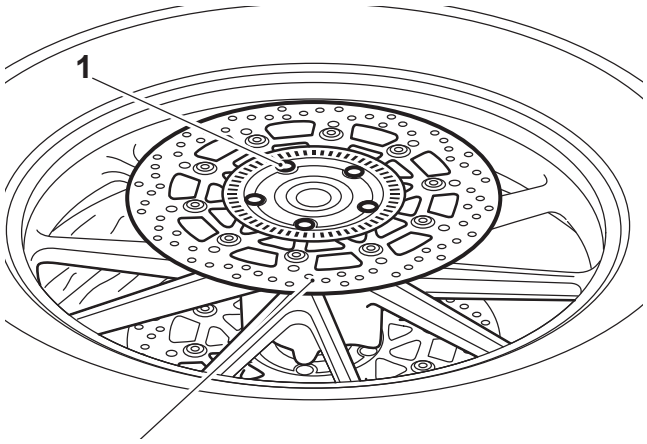
Damage to the wheel centre could cause misalignment of the wheel when refitted. A dangerous riding condition leading to an accident could result if this warning is ignored.

2. Support the wheel on blocks as illustrated below.



1. **Wheel**
2. **Support block**

3. Remove and discard the five disc bolts and remove the pulser ring from the brake disc.



1. **Disc bolt**
2. **Pulser ring**

Front ABS Pulser Ring - Inspection

1. Check the pulser ring for damaged, missing or cracked teeth or distortion. Renew the pulser ring as necessary.

Front ABS Pulser Ring - Installation

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. Locate the brake disc and pulser ring onto the wheel, fit new disc bolts and tighten to **22 Nm**.
2. Refit the front wheel (see Front Wheel - Installation).
3. Check, and if necessary, adjust the air gap between the front wheel speed sensor and the pulser ring (see Front Wheel Speed Sensor Air Gap Measurement).
4. Check for correct brake operation. Rectify as necessary.

WARNING

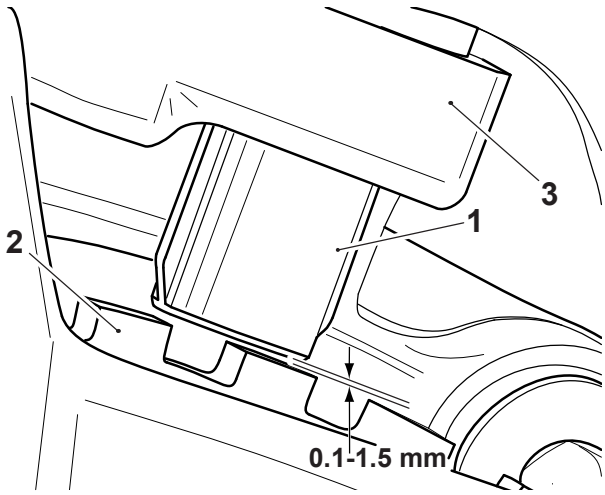
It is dangerous to operate the motorcycle with defective brakes; you must have your authorised Triumph dealer take remedial action before you attempt to ride the motorcycle again. Failure to take remedial action may reduce braking efficiency leading to loss of motorcycle control and an accident.

Rear Wheel Speed Sensor Air Gap Measurement

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. Inspect the rear bevel box hub bearings for signs of wear. (See Rear Bevel Box - Inspection).
2. Using feeler gauges, measure the air gap between the rear wheel speed sensor and its pulser ring.



1. **ABS sensor**
2. **Pulser ring**
3. **Bevel box**

⚠ CAUTION

Do not install shims. If the specified air gap cannot be achieved, investigate and rectify the cause before proceeding.

3. If the rear wheel speed sensor has been removed, install a new fixing and tighten to **9 Nm**.
4. Re-check the air gap measurement.
5. For specifications refer toBrakes.

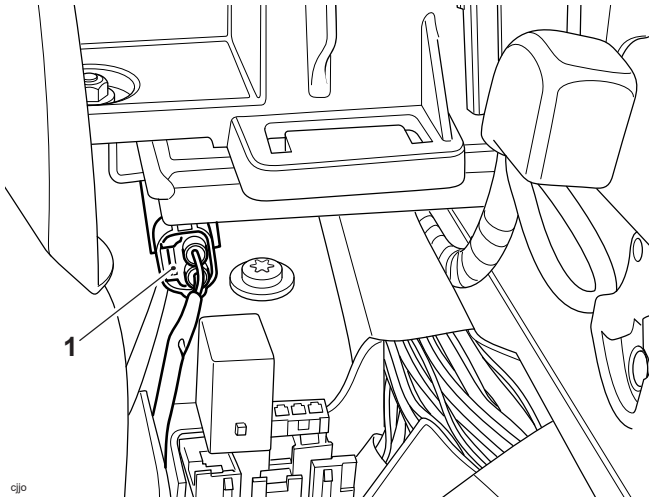
Rear ABS Wheel Speed Sensor - Removal

⚠ 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.

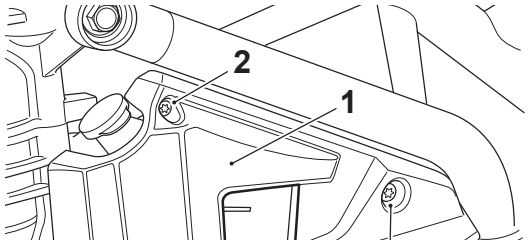
- Remove the rider’s seat (see Rider’s Seat - Removal).
- Remove the battery (see Battery Removal).

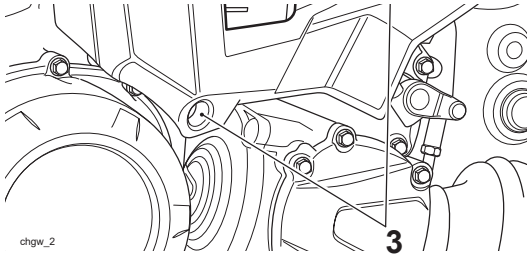
1. Disconnect the wheel speed sensor multiplug, identified as the white connector, located in the left hand side of the battery tray, under the seat bridge.



1. **Wheel speed sensor multiplug**

2. Remove the three fixings and remove the expansion tank cover. Discard the upper M5 fixing. Retain the lower M6 fixings for reuse.



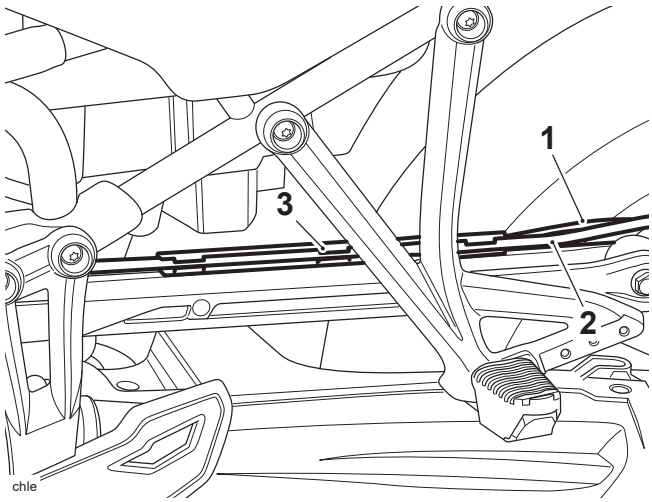


1. **Expansion tank cover**
2. **Upper fixings (M5)**
3. **Lower fixings (M6)**

Note

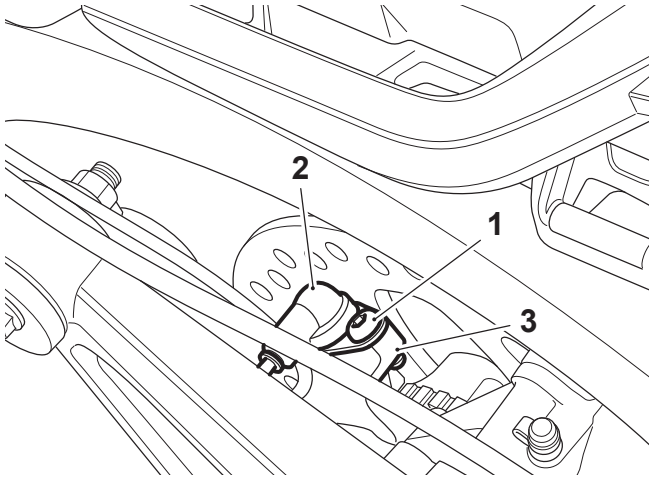
- **Note the routing of the harness and its retaining clips for installation.**

3. Detach the brake line and the harness for the rear wheel speed sensor from the cable guide.



1. **Harness**
2. **Brake line**
3. **Cable guide**

4. Detach the harness from its clip on the final drive unit.
5. Release the fixing securing the wheel speed sensor to the final drive unit and remove the sensor. Discard the fixing.



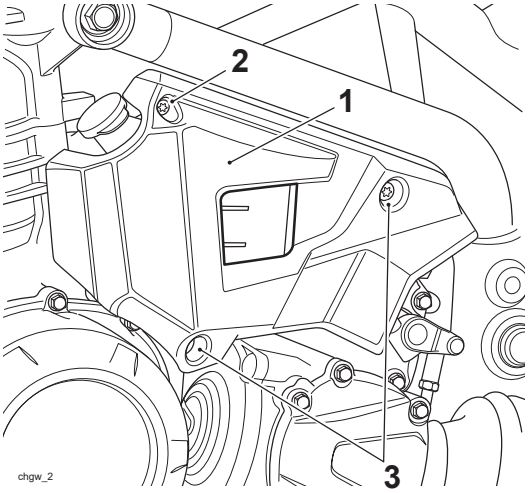
1. **Fixing**
2. **Rear ABS wheel speed sensor**
3. **Final drive unit**

Rear ABS Wheel Speed Sensor - Installation

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. Fit the wheel speed sensor to the brake caliper carrier as noted during removal.
2. Install a new fixing and tighten to **9 Nm**.
3. Route the ABS sensor harness as noted for removal.
4. Connect the wheel speed sensor multiplug.
5. Refit the expansion tank cover. Secure the upper mounting with a new M5 encapsulated fixing. Secure the lower mounting with the two original fixings. Tighten the upper fixing to **3 Nm** and the lower fixings to **4 Nm**.



1. **Expansion tank cover**
2. **Upper fixing (M5)**
3. **Lower fixings (M6)**

- Refit and connect the battery (see Battery Installation).
- Refit the rider's seat (see Rider’s Seat - Installation).
- Check for correct brake operation. Rectify as necessary.

WARNING

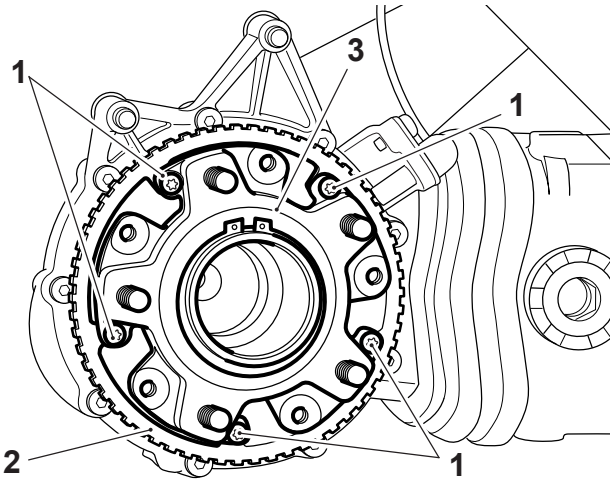
It is dangerous to operate the motorcycle with defective brakes; you must have your authorised Triumph dealer take remedial action before you attempt to ride the motorcycle again. Failure to take remedial action may reduce braking efficiency leading to loss of motorcycle control and an accident.

Rear ABS Pulser 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 rear wheel (see Rear Wheel - Removal).
2. Remove the rear brake disc (see Rear Brake Disc - Removal).
3. Remove and discard the five fixings and remove the pulser ring.



1. **Fixings**
2. **Pulser ring**
3. **Hub**

Rear ABS Pulser Ring - Inspection

1. Check the pulser ring for damaged, missing or cracked teeth or distortion. Renew the pulser ring as necessary.

Rear ABS Pulser Ring - Installation

1. Locate the pulser ring to the hub.
2. Install new fixings and tighten to **5 Nm**.

- Refit the rear brake disc (see Rear Brake Disc - Installation).
- Refit the rear wheel (see Rear Wheel - Installation).
- Check that the brakes operate correctly.

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.

ABS Hydraulic Modulator/ECM - Removal

ABS Hydraulic Modulator/ECM - Installation

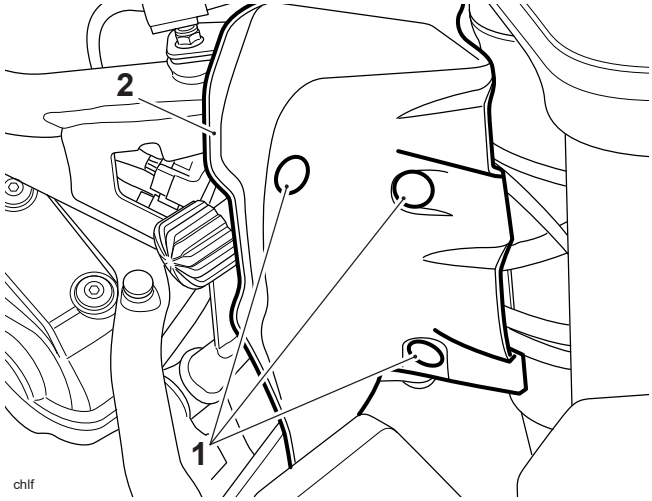
WARNING

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.

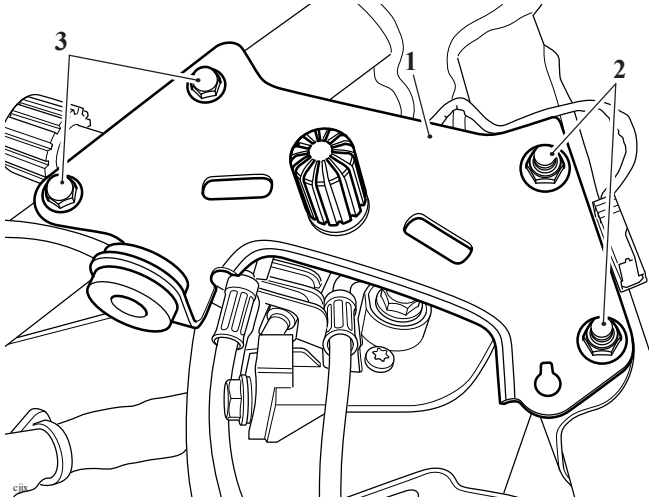
- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the fuel tank (see Fuel Tank - Removal).
- Remove the airbox (see Airbox - Removal).

1. Remove the fir-trees and detach the headstock infill panel from the frame.



1. **Scrivets**
2. **Infill panel**

2. Remove the lock nuts and bolts and remove the headstock brace. Discard the two lock nuts.



1. **Headstock brace**
2. **Lock nuts**
3. **Bolts**

CAUTION

CAUTION

To prevent body damage, do not spill brake fluid onto any area of the bodywork or wheels.

3. Drain the brake fluid from the front and rear master cylinders (for front brake master cylinder see Front Brake Master Cylinder - Removal, and for rear brake master cylinder see Rear Master Cylinder - Removal).
4. Disconnect the ABS modulator multiplug (see ABS Electrical Connectors).

WARNING

Before the disassembly of any brake lines in the ABS hydraulic circuit, always mark their position so that they can be returned to the same position when assembled.

If the brake lines are incorrectly assembled the performance of the ABS system will be seriously compromised, leading to loss of motorcycle control and an accident.

WARNING

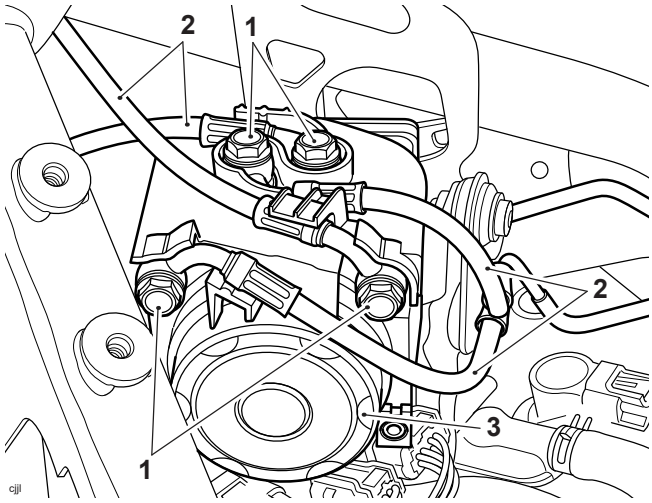
Do not allow the brake hard lines to become bent or kinked during ABS modulator removal.

If the brake lines are bent or kinked the performance of the ABS system will be seriously compromised, leading to loss of motorcycle control and an accident.

CAUTION

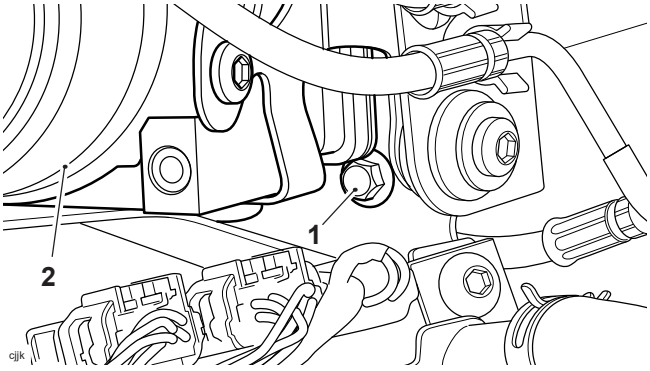
To prevent body damage, do not spill brake fluid onto any area of the bodywork or engine covers.

5. Remove the union bolts and carefully disconnect the four brake lines from the ABS modulator. Discard the sealing washers.



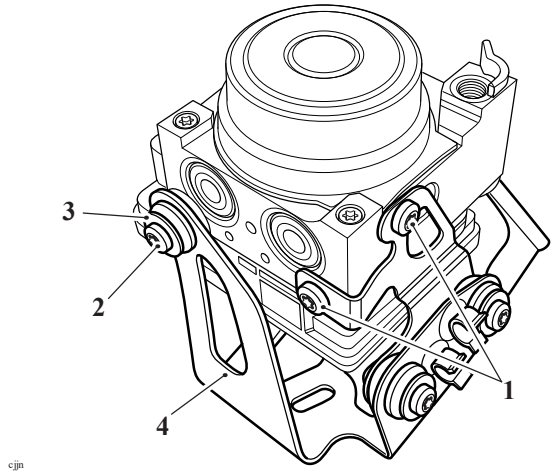
1. **Union bolts**
2. **Brake lines**
3. **ABS modulator**

6. Remove the lower ABS modulator fixing.



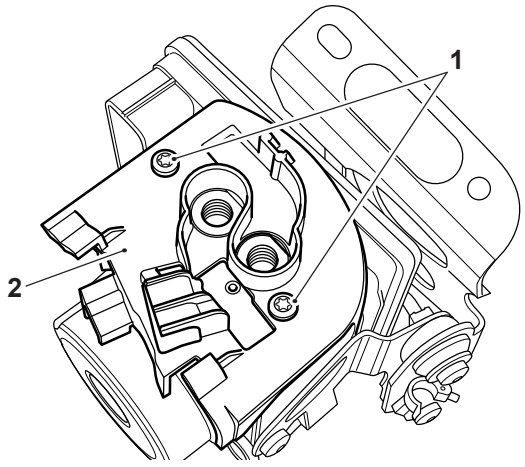
1. **Lower fixing**
2. **ABS modulator**

7. Carefully remove the ABS modulator and bracket assembly from the motorcycle.
8. If removal of the mounting brackets is required, release the fixings shown below, collect the flanged sleeve and remove the mounting bracket from the ABS modulator. Discard the fixings.



1. **M6 x 10 fixings**
2. **M6 x 25 fixing**
3. **Flanged sleeve**
4. **Bracket**

9. Release the fixings and remove the brake hose guide from the ABS modulator.



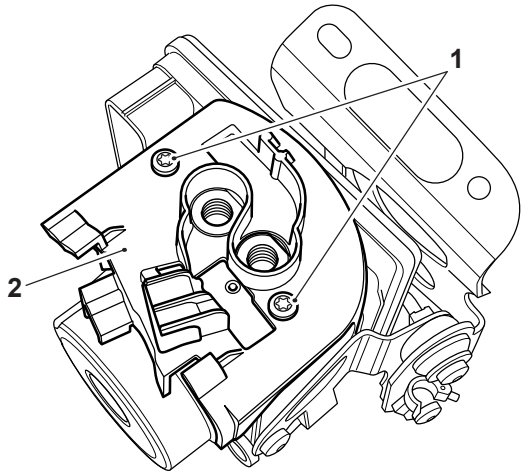
cjjj

1. **Fixings**
2. **Brake hose guide**

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.

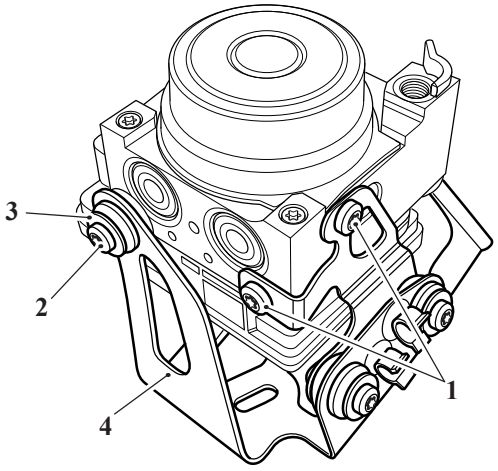
1. If removed, refit the brake hose guide to the ABS modulator. Tighten the fixings to **3 Nm**.



cjjj

1. **Fixings**
2. **Brake hose guide**

2. Align the ABS modulator to its bracket and secure with two new M6 x 10 mm fixings. Do not fully tighten at this stage.
3. Fit the flanged sleeve to the grommet on the bracket and fit a new M6 x 25 mm fixing. Tighten the fixing to **9 Nm**.
4. Tighten the two M6 x 10 mm fixings to **9 Nm**.

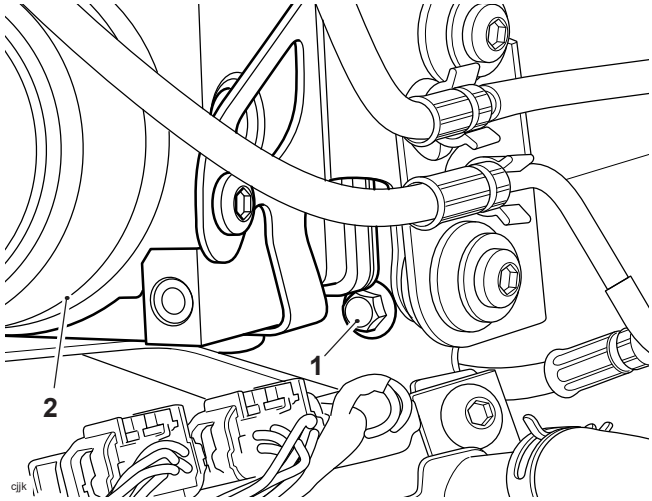


cjjn

1. **M6 x 10 fixings**

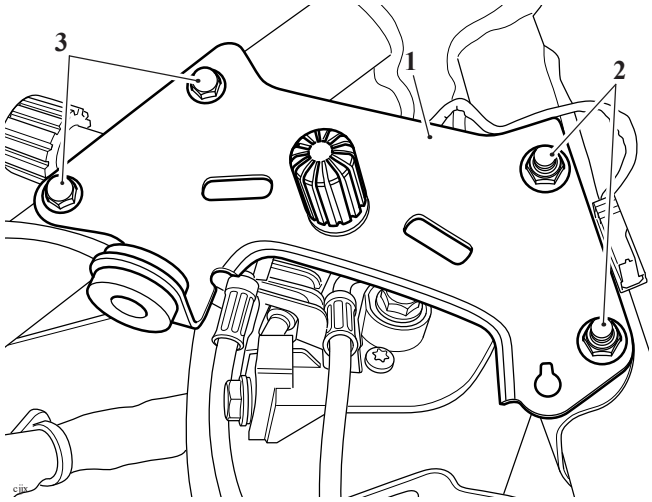
2. **M6 x 25 fixing**
3. **Flanged sleeve**
4. **Bracket**

5. Carefully manoeuvre the ABS modulator and bracket assembly to its fitted position on the frame.
6. Fit the lower fixing and tighten to **9 Nm**.



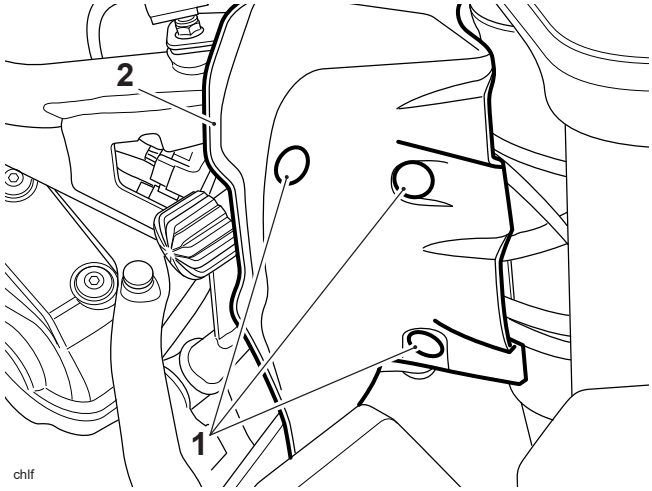
1. **Lower fixing**
2. **ABS modulator**

7. Incorporating new sealing washers to either side of the unions, refit the brake lines to the ABS module as marked for removal.
8. Tighten the four unions to **25 Nm**, taking care to ensure the brake lines do not twist during tightening.
9. Reconnect the ABS modulator multiplug (see ABS Electrical Connectors).
10. Refit the headstock brace and secure with the bolts and new lock nuts. Tighten the new lock nuts to **12 Nm**. Tighten the bolts to **12 Nm**.



1. **Headstock brace**
2. **Lock nuts**
3. **Bolts**

11. Refit the headstock infill panel and secure with the Scrivets.



1. **Scrivets**
2. **Infill panel**

- Refit the airbox (see Airbox - Installation).
- Refit the fuel tank (see Fuel Tank - Installation).
- Reconnect the battery, positive (red) lead first.

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 earlier in this section of the manual.

- Fill and bleed the front brakes (see Bleeding the Front Brakes, Renewing Brake Fluid).
- Fill and bleed the rear brakes (see Bleeding the Rear Brakes, Renewing Brake Fluid).
- Refit the rider's seat (see Rider's Seat - Installation).
- Check for correct brake operation. 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.

ABS - System Description

This model is fitted with an electronic, partially integrated, Optimised Cornering Anti-lock Brake System (OCABS) which is designed to prevent the wheels from locking or skidding by reducing braking effort to the front or rear brake caliper when wheel-lock is detected.

The system consists of a hydraulic modulator and ABS ECM assembly mounted to a bracket to the right hand side of the frame near the headstock, a front wheel speed sensor mounted to the front fork, a rear wheel speed sensor mounted to the rear bevel box and an Inertial Measurement Unit (IMU) mounted beneath the seat bridge.

The front pulser ring is mounted to the left hand brake disc and the rear pulser ring is mounted to the rear bevel box hub.

The front and rear master cylinders are connected by lines to the modulator and from the modulator the pipes connect to the brake calipers.

The front and rear brakes are partially integrated electronically by the ABS ECM. When the front brake is applied, the ABS ECM will also apply a small amount of rear brake for balanced braking. The amount of rear

brake application is related to the level of braking force applied by the rider through the front brake lever. Use of the rear brake pedal alone will only apply the rear brake.

The front and rear brake hydraulic circuits are separate and are not connected in any way inside the modulator.

The ABS ECM continuously calculates the front and rear wheel speeds, and from these inputs the ABS 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 determined to be skidding.

Under braking, if the ABS ECM 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 ABS ECM very rapidly releases and re-applies the brake pressure to prevent the wheel from skidding.

This is felt through the brake pedal or lever as a rapid 'pulsing'.

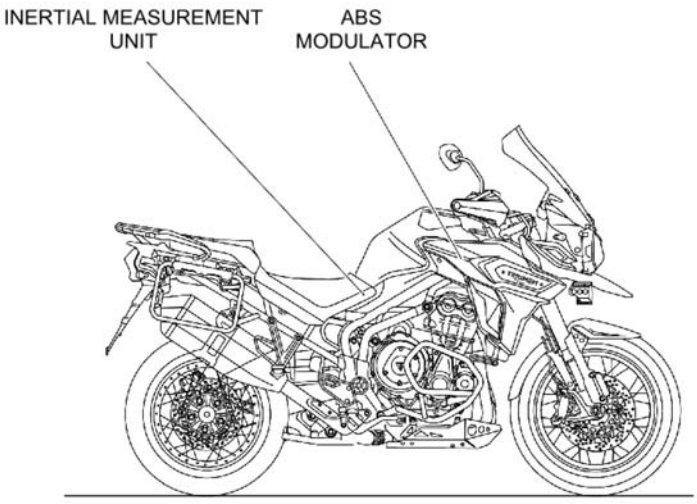
The ABS ECM also continuously monitors the motorcycle lean angle measurements provided by the IMU. If the motorcycle is leaning in a corner and ABS is activated, the ABS ECM uses the lean angle measurements to continually adapt the level of ABS intervention in a manner most suitable to help the rider maintain motorcycle control.

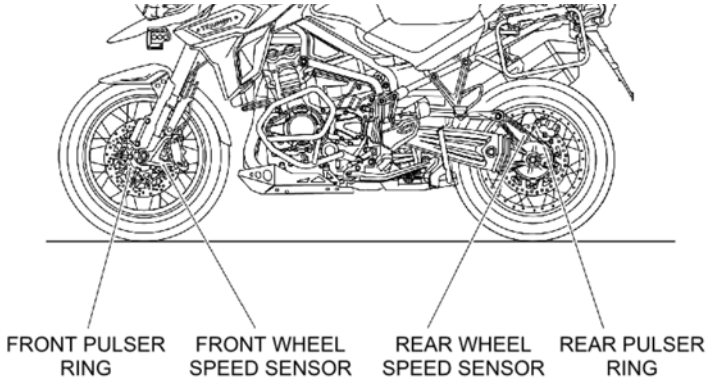
If the rider reduces braking effort, or traction increases (so that traction exceeds braking force, the wheel will rotate once more) the wheel will no longer lock up. The ABS system will detect this and stop controlling brake pressure, and return to its monitoring state.

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 ABS ECM functions. In the event of a malfunction being detected, the ABS ECM will illuminate the ABS warning light, and store a diagnostic trouble code in the system memory. This stored data can then be recovered using a special service tool which is mandatory for all Triumph dealers. In this way, precise diagnosis of a fault can be made and the fault quickly rectified.

Under normal operation, the ABS warning light will flash on and off after ignition on until the vehicle speed exceeds 3mph (5 km/h). If a trouble code is stored the ABS warning light will stay illuminated and the ABS will not function, however the brakes will continue to operate as a non-ABS braking system. If the ABS warning light does not extinguish, or illuminates whilst the motorcycle is being ridden, refer to the ABS system diagnostics (see System Diagnostics).

ABS - Component Location





Key to ABS System Circuit Diagram

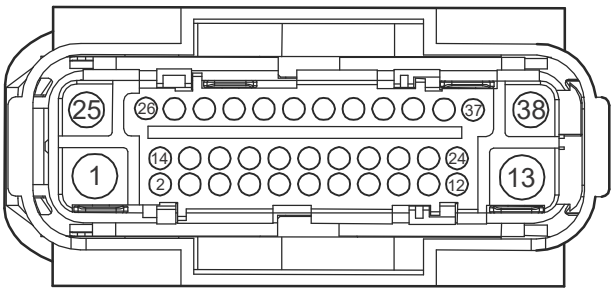
Key	Item Description
1	ABS Modulator
2	Diagnostic Connector
3	Rear Wheel Speed Sensor
4	Front Wheel Speed Sensor
5	Engine ECM
6	ABS Fuse Box

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

Code	Wiring Colour
P	Purple
W	White
Y	Yellow
LG	Light Green
LU	Light Blue

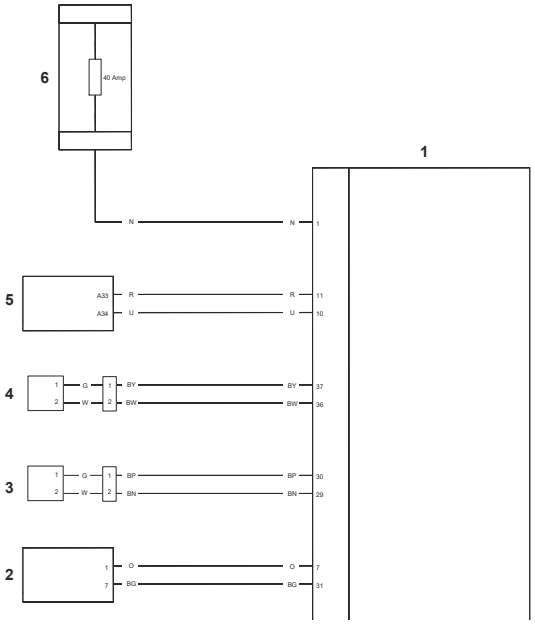
ABS ECM Connector Pin Numbering

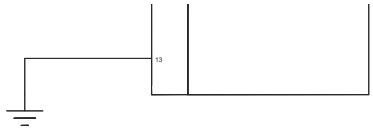


The above illustration shows the pin numbering system used in the ABS circuit diagram.

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 seat. 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

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.

Triumph Diagnostic Software - ABS

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 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	km/h

Function Examined	Result Reported (Scale)
Rear wheel speed	km/h
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 Bleeding the Front Brakes, Renewing Brake Fluid for front brakes or page Bleeding the Rear Brakes, Renewing Brake Fluid for rear brakes.

Diagnostic Trouble Codes

ABS Electrical Connectors

Further Diagnosis

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	Pinpoint Test
Front wheel sensor short circuit to ground or open circuit	Front wheel sensor short circuit to ground or open circuit	Front Wheel Sensor Open Circuit/Short Circuit
Front wheel sensor incorrect or missing signal	Front wheel sensor incorrect or missing signal	Front Wheel Sensor Incorrect or Missing Signal
Rear wheel sensor short circuit to ground or open circuit	Rear wheel sensor short circuit to ground or open circuit	Rear Wheel Sensor Open Circuit/Short Circuit
Rear wheel sensor incorrect or missing signal	Rear wheel sensor incorrect or missing signal	Rear Wheel Sensor Incorrect or Missing Signal
Front wheel pulser ring missing teeth	Front wheel pulser ring missing teeth	Front Wheel Pulser Ring Missing Teeth

Rear wheel pulser ring missing teeth	Rear wheel pulser ring missing teeth	Rear Wheel Pulser Ring Missing Teeth
Front wheel input solenoid short circuit to ground or open circuit	Front wheel input solenoid short circuit to ground or open circuit	Front or Rear Input/Output Solenoid Open/Short Circuit
Front wheel output solenoid short circuit to ground or open circuit	Front wheel output solenoid short circuit to ground or open circuit	Front or Rear Input/Output Solenoid Open/Short Circuit
Rear wheel input solenoid short circuit to ground or open circuit	Rear wheel input solenoid short circuit to ground or open circuit	Front or Rear Input/Output Solenoid Open/Short Circuit
Rear wheel output solenoid short circuit to ground or open circuit	Rear wheel output solenoid short circuit to ground or open circuit	Front or Rear Input/Output Solenoid Open/Short Circuit
Master cylinder isolation valve short circuit to ground or open circuit	Master cylinder isolation valve short circuit to ground or open circuit	Front or Rear Input/Output Solenoid Open/Short Circuit
Low pressure feed valve short circuit to ground or open circuit	Low pressure feed valve short circuit to ground or open circuit	Front or Rear Input/Output Solenoid Open/Short Circuit
Front wheel Actuator (Hydraulic control) wheel lock	Front wheel Actuator (Hydraulic control) wheel lock	Front or Rear Wheel Actuator (Hydraulic Control) Wheel Lock
Rear wheel Actuator (Hydraulic control) wheel lock	Rear wheel Actuator (Hydraulic control) wheel lock	Front or Rear Wheel Actuator (Hydraulic Control) Wheel Lock
Motor circuit fault	Motor circuit fault	Motor - Lock; Motor Does Not

		Run; Motor Runs Continually
Motor - does not run	Motor - does not run	Motor - Lock; Motor Does Not Run; Motor Runs Continually
Motor - runs continually	Motor - runs continually	Motor - Lock; Motor Does Not Run; Motor Runs Continually
Solenoid relay does not operate or operates continually	Solenoid relay does not operate or operates continually	Front or Rear Input/Output Solenoid Open/Short Circuit
Power source voltage too low	Power source voltage too low	Power Source Voltage Drop/Voltage Rise
Power source voltage too high	Power source voltage too high	Power Source Voltage Drop/Voltage Rise
Power source - short term under-voltage detected	Power source - short term under-voltage detected	Power Source Voltage Drop/Voltage Rise
Power source - long term Under-voltage detected	Power source - long term Under-voltage detected	Power Source Voltage Drop/Voltage Rise
Incorrect tyre size detected	Incorrect tyre size detected	Incorrect Tyre Size Detected
ABS ECM internal error	ABS ECM internal error	ABS ECM Internal Error
CAN fault - lost communication with engine ECM	CAN fault - lost communication with engine ECM	ECM Communication (CAN)
CAN fault - lost communication with instrument panel	CAN fault - lost communication with instrument panel	Instrument Communication (CAN)
CAN fault - all communication lost	CAN fault - all communication lost	All Communication Lost (CAN)

Modulator - active pressure control malfunction	Modulator - active pressure control malfunction	ABS Modulator Malfunction
Modulator input (master cylinder) pressure sensor malfunction	Modulator input (master cylinder) pressure sensor malfunction	ABS Modulator Malfunction
Modulator output (wheel) pressure sensor malfunction	Modulator output (wheel) pressure sensor malfunction	ABS Modulator Malfunction
ABS variant coding error	ABS variant coding error	ABS Variant Coding Error
Inertial Measurement Unit (IMU) ID incompatible	Inertial Measurement Unit (IMU) ID incompatible	Inertial Measurement Unit (IMU) Incompatible
CAN fault - lost communication with Inertial Measurement Unit (IMU)	CAN fault - lost communication with Inertial Measurement Unit (IMU)	Inertial Measurement Unit (IMU) Communication
Inertial Measurement Unit (IMU) signal error	Inertial Measurement Unit (IMU) signal error	Inertial Measurement Unit (IMU) Communication
Inertial Measurement Unit (IMU) voltage too high or voltage too low	Inertial Measurement Unit (IMU) voltage too high or voltage too low	Inertial Measurement Unit (IMU) Voltage Too High or Too Low
Inertial Measurement Unit (IMU) signal error prior to ABS initialisation	Inertial Measurement Unit (IMU) signal error prior to ABS initialisation	Inertial Measurement Unit (IMU) Signal Error Prior to ABS Initialisation

ABS System Actions

Dependant on the DTC stored, the ABS ECM will act in one of two ways when a fault is detected:

1. Inhibit ABS operation immediately, irrespective of the ABS operating state.
2. Allow an ABS manoeuvre to complete before inhibiting ABS operation.

Note

- **ABS manoeuvre means that the ABS system is in its active state and is controlling brake pressure to prevent the wheel(s) from slipping (skidding).**

Once ABS operation has been inhibited, the ABS ECM will act in one of three ways:

1. Allow the ABS to resume operation immediately if the fault clears.
2. Allow the ABS to resume operation after an ignition cycle if the fault clears.
3. 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 table:

Note

- **When vehicle speed has exceeded 6 mph (10 km/h) and the flashing ABS warning light has been extinguished, the ABS has initialised.**

Fault code and description	**ABS warning light Illuminated when fault is logged**	**ABS operation is inhibited immediately when fault is logged**	**ABS continues to operate if performing an ABS manouevre when fault is logged** **Operation is inhibited when ABS manouevre is completed**	**ABS will automatically resume operation if fault clears(DTC still stored for 40 cycles)**
Front wheel sensor short circuit to ground or open circuit Front wheel sensor short circuit to ground or open circuit	Yes	Yes		No DTC stored for 40 cycles.
Front wheel sensor incorrect or missing signal Front wheel sensor incorrect or missing signal	Yes		Yes	Yes, if after ignition cycle, no fault is detected and ABS has initialised. DTC stored for 40 cycles.
Rear wheel sensor short circuit to ground or open circuit Rear wheel sensor short circuit to ground or open circuit	Yes	Yes		No DTC stored for 40 cycles.
Rear wheel sensor incorrect or missing signal Rear wheel sensor incorrect or missing signal	Yes		Yes	Yes, if after ignition cycle, no fault is detected and ABS has initialised. DTC stored for 40 cycles.
Front wheel pulser ring missing teeth	Yes		Yes	Yes, if after ignition cycle, no fault is

Fault code and description	ABS warning light Illuminated when fault is logged	ABS operation is inhibited immediately when fault is logged	ABS continues to operate if performing an ABS manouevre when fault is logged Operation is inhibited when ABS manouevre is completed	ABS will automatically resume operation if fault clears(DTC still stored for 40 cycles)
Front wheel pulser ring missing teeth				detected and ABS has initialised. DTC stored for 40 cycles.
Rear wheel pulser ring missing teeth Rear wheel pulser ring missing teeth	Yes		Yes	Yes, if after ignition cycle, no fault is detected and ABS has initialised. DTC stored for 40 cycles.
Front wheel input solenoid short circuit to ground or open circuit Front wheel input solenoid short circuit to ground or open circuit	Yes	Yes		No
Front wheel output solenoid short circuit to ground or open circuit Front wheel output solenoid short circuit to ground or open circuit	Yes		Yes	No
Rear wheel input solenoid short circuit to ground or open circuit Rear wheel input solenoid short circuit to ground or open circuit	Yes	Yes		No
Rear wheel output solenoid short circuit to ground or open circuit Rear wheel output solenoid short circuit to ground or open circuit	Yes		Yes	No
Master cylinder isolation valve short circuit to ground or open circuit Master cylinder isolation	Yes	Yes		No

Fault code and description	ABS warning light Illuminated when fault is logged	ABS operation is inhibited immediately when fault is logged	ABS continues to operate if performing an ABS manouevre when fault is logged Operation is inhibited when ABS manouevre is completed	ABS will automatically resume operation if fault clears(DTC still stored for 40 cycles)
valve short circuit to ground or open circuit				
Low pressure feed valve short circuit to ground or open circuit Low pressure feed valve short circuit to ground or open circuit	Yes	Yes		No
Front wheel Actuator (Hydraulic control) wheel lock Front wheel Actuator (Hydraulic control) wheel lock	Yes		Yes	Yes, if after ignition cycle, no fault is detected and ABS has initialised. DTC stored for 40 cycles.
Rear wheel Actuator (Hydraulic control) wheel lock Rear wheel Actuator (Hydraulic control) wheel lock	Yes		Yes	Yes, if after ignition cycle, no fault is detected and ABS has initialised. DTC stored for 40 cycles.
Motor circuit fault Motor circuit fault	Yes		Yes	No
Motor - does not run Motor - does not run	Yes		Yes	No
Motor - runs continually Motor - runs continually	Yes		Yes	No
Solenoid relay does not operate or operates continually Solenoid relay does not operate or operates continually	Yes	Yes		No
Power source voltage too low Power source voltage too	Yes	Yes		Yes, if voltage rises above a preset threshold.

Fault code and description	ABS warning light Illuminated when fault is logged	ABS operation is inhibited immediately when fault is logged	ABS continues to operate if performing an ABS manouevre when fault is logged Operation is inhibited when ABS manouevre is completed	ABS will automatically resume operation if fault clears(DTC still stored for 40 cycles)
low				
Power source voltage too high Power source voltage too high	Yes	Yes		Yes, if voltage drops below a preset threshold.
Power source - short term under-voltage detected Power source - short term under-voltage detected	Yes	Yes		Yes, if voltage rises above a preset threshold.
Power source - long term Under-voltage detected Power source - long term Under-voltage detected	Yes	Yes		No DTC stored for 40 cycles.
Incorrect tyre size detected Incorrect tyre size detected	Yes	Yes		Yes, if after ignition cycle, no fault is detected and ABS has initialised. DTC stored for 40 cycles.
ABS ECM internal error ABS ECM internal error	Yes	Yes		No
CAN fault - lost communication with engine ECM CAN fault - lost communication with engine ECM				DTC stored for 40 cycles.
CAN fault - lost communication with instrument panel CAN fault - lost communication with instrument panel				DTC stored for 40 cycles.
CAN fault - all communication lost				DTC stored for 40 cycles.

Fault code and description	ABS warning light Illuminated when fault is logged	ABS operation is inhibited immediately when fault is logged	ABS continues to operate if performing an ABS manouevre when fault is logged Operation is inhibited when ABS manouevre is completed	ABS will automatically resume operation if fault clears(DTC still stored for 40 cycles)
CAN fault - all communication lost				
Modulator - active pressure control malfunction Modulator - active pressure control malfunction	Yes	Optimised Cornering ABS (OCABS) is inhibited only. Standard ABS remains operational		No DTC stored for 40 cycles.
Modulator input (master cylinder) pressure sensor malfunction Modulator input (master cylinder) pressure sensor malfunction	Yes	Partially intergrated braking and hill hold (If Fitted) are inhibited Standard ABS remains operational		No DTC stored for 40 cycles.
Modulator output (wheel) pressure sensor malfunction Modulator output (wheel) pressure sensor malfunction	Yes	Partially intergrated braking and hill hold (If Fitted) are inhibited Standard ABS remains operational		No DTC stored for 40 cycles.
ABS variant coding error ABS variant coding error	Yes	Yes	Not applicable	Not applicable
Inertial Measurement Unit (IMU) ID incompatible Inertial Measurement Unit (IMU) ID incompatible	Yes	Not applicable	Not applicable	Motorcycle will not start when this fault is present DTC stored for 40 cycles.
CAN fault - lost communication with Inertial Measurement Unit (IMU) CAN fault - lost communication with Inertial Measurement Unit (IMU)	Yes	Optimised Cornering ABS (OCABS) is inhibited only. Standard ABS remains operational		No DTC stored for 40 cycles.

Fault code and description	ABS warning light Illuminated when fault is logged	ABS operation is inhibited immediately when fault is logged	ABS continues to operate if performing an ABS manouevre when fault is logged Operation is inhibited when ABS manouevre is completed	ABS will automatically resume operation if fault clears(DTC still stored for 40 cycles)
Inertial Measurement Unit (IMU) signal error Inertial Measurement Unit (IMU) signal error	Yes	Optimised Cornering ABS (OCABS) is inhibited only. Standard ABS remains operational		No DTC stored for 40 cycles.
Inertial Measurement Unit (IMU) voltage too high or voltage too low Inertial Measurement Unit (IMU) voltage too high or voltage too low	Yes	Optimised Cornering ABS (OCABS) is inhibited only. Standard ABS remains operational		No DTC stored for 40 cycles.
Inertial Measurement Unit (IMU) signal error prior to ABS initialisation Inertial Measurement Unit (IMU) signal error prior to ABS initialisation	Yes	Not applicable Fault code is logged before ABS is initialised After ABS has initialisedOptimised Cornering ABS (OCABS) is inhibited only. Standard ABS remains operational		No DTC stored for 40 cycles.

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

Note

- **A major cause of hidden electrical faults can be traced to faulty electrical connectors.**

For example:

- Dirty/corroded terminals
- Damp terminals
- Broken or bent cable pins within multiplugs.

For example, the 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

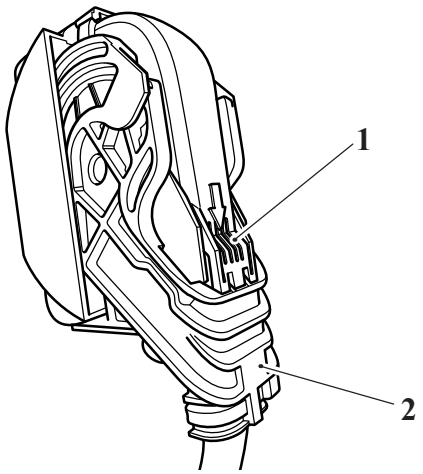
When disconnecting a connector, never pull directly on the wires as this may result in cable and connector damage.

⚠ 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. Press the locking device and move the lever to the top of the connector while disconnecting it from the ABS ECM.
2. When disconnected, ensure the lever is fully to the top of the connector. An audible click can be heard when it is locked in position.



1. **Locking device**
2. **Lever**

⚠ CAUTION

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 the ABS ECM Connector

⚠ CAUTION

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

1. Ensure the lever is fully to the top of the connector.
2. Align the connector to its socket on the ABS modulator.

⚠ CAUTION

If the lever is not moved fully down into it's locked position, it is possible that the connector may not fully engage into its socket.

3. Release the lever by pushing it downwards. At the same time, push the connector into its socket until the lever is fully down and locked in position. An audible click can be heard when locked.

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 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.

Front Wheel Sensor Open Circuit/Short Circuit

Rear Wheel Sensor Open Circuit/Short Circuit

Fault Code	Possible Cause	Action
Front wheel sensor short circuit to ground or open circuit	Front wheel sensor short circuit to ground or open circuit	Ensure wheel speed sensor connector is secure Disconnect ABS ECM connector and proceed to pinpoint test 1:

Pinpoint Tests

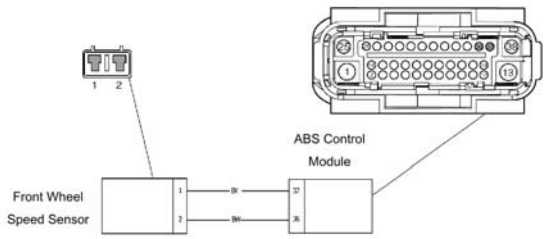
Test		Result	Action
1	Check cable and terminal integrity: - ABS ECM connector pin 36 and ABS ECM connector pin 37	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 9
2	Check cable for short circuit: - ABS ECM connector pin 37 and Ground	OK	Proceed to test 4
		Short circuit	Proceed to test 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 36 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 36 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 37 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:	1.8 mA to 16.8 mA	Proceed to test 9

Test		Result	Action
	- Connect a suitable voltage supply between 10 V and 16 V between ABS ECM connector pin 36 (positive) and pin 37 (negative), and measure the current consumption of the wheel speed sensor		
		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:

Supply Voltage	Min	Typical	Max
10 - 16 V	5.9 mA	7.0 mA	16.8 mA



Fault Code	Possible Cause	Action
Rear wheel sensor short circuit to ground or open circuit	Rear wheel sensor short circuit to ground or open circuit	Ensure wheel speed sensor connector is secure Disconnect ABS ECM connector and proceed to pinpoint test 1:

Pinpoint Tests

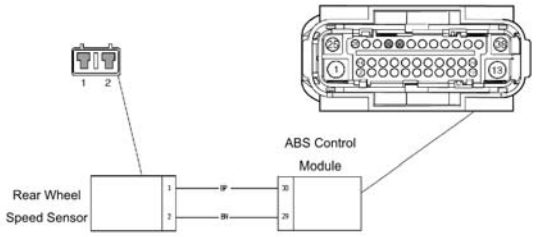
Test		Result	Action
1	Check cable and terminal integrity: - ABS ECM connector pin 29 and ABS ECM connector pin 30	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 9
2	Check cable for short circuit:	OK	Proceed to test 4

Test	Result	Action
- ABS ECM connector pin 29 and Ground		
	Short circuit	Proceed to test 3
3 Disconnect the rear wheel speed sensor connector. Check cable for short circuit: - Wheel speed sensor connector pin 29 (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 30 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 29 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 30 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 rear wheel speed sensor connector. Check the wheel speed sensor operation: - Connect a suitable voltage supply between 10 V and 16 V between ABS ECM connector pin 29 (positive) and pin 30 (negative), and measure the current consumption of the wheel speed sensor	1.8 mA to 16.8 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:

Supply Voltage	Min	Typical	Max
10 - 16 V	5.9 mA	7.0 mA	16.8 mA



Front Wheel Sensor Incorrect or Missing Signal

Fault Code	Possible cause	Action
Front wheel sensor incorrect or missing signal	Front wheel sensor incorrect or missing 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 Front Wheel Sensor Open Circuit/Short Circuit)	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 Incorrect or Missing Signal

Front Wheel Pulser Ring Missing Teeth

Fault Code	Possible Cause	Action
Rear wheel sensor incorrect or missing signal	Rear wheel sensor incorrect or missing 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 rear 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 Rear Wheel Sensor Open Circuit/Short Circuit)	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 Pulser Ring Missing Teeth

Fault Code	Possible Cause	Action
Front wheel pulser ring missing teeth	Front wheel pulser ring missing teeth Incorrect Wheel speed sensor air gap 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 2
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 3
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	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
Rear wheel pulser ring missing teeth	Rear wheel pulser ring missing teeth Incorrect Wheel speed sensor air gap 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 rear 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 2
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 3
3	Check the wheel speed sensors for	OK	Proceed to test 4

Test		Result	Action
	correct installation, and the fixings for correct torque		
		Faulty	Rectify the fault and proceed to test 4
4	Check the motorcycle wheel for damage/incorrect size	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

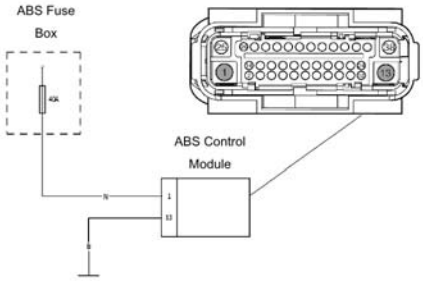
Fault Code	Possible Cause	Action
Front wheel input solenoid short circuit to ground or open circuit	Front wheel input solenoid short circuit to ground or open circuit	Ensure ABS ECM connector is secure Disconnect ABS ECM connector and proceed to pinpoint test 1:
Front wheel output solenoid short circuit to ground or open circuit	Front wheel output solenoid short circuit to ground or open circuit	
Rear wheel input solenoid short circuit to ground or open circuit	Rear wheel input solenoid short circuit to ground or open circuit	
Rear wheel output solenoid short circuit to ground or open circuit	Rear wheel output solenoid short circuit to ground or open circuit	
Master cylinder isolation valve short circuit to ground or open circuit	Master cylinder isolation valve short circuit to ground or open circuit	
Low pressure feed valve short circuit to ground or open circuit	Low pressure feed valve short circuit to ground or open circuit	
Solenoid relay does not operate or operates continually	Solenoid relay does not operate or operates continually	

Pinpoint Tests

Test		Result	Action
1	Check the ABS fuse	OK	Proceed to test 3
		Faulty	Rectify fault, proceed to test 2
2	Check cable and terminal integrity: - ABS ECM connector pin 1 and ground pin 13	OK	Replace fuse, proceed to test 5
		Faulty	Rectify fault, replace fuse, proceed to test 5
3	Check cable continuity: With Ignition 'ON', check voltage between:	Voltage greater than 11 V	Proceed to test 4

Test		Result	Action
	- ABS ECM connector pin 1 and ground pin 13		
		Voltage less than 11 V	Locate and rectify wiring fault, proceed to test 5
4	Check cable for continuity: - ABS ECM connector pin 13 and Ground	OK	Proceed to test 5
		Faulty	Locate and rectify wiring 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
Front wheel Actuator (Hydraulic control) wheel lock	Front wheel Actuator (Hydraulic control) wheel lock	Ensure ABS ECM connector is secure Proceed to pinpoint test 1:
Rear wheel Actuator (Hydraulic control) wheel lock	Rear wheel Actuator (Hydraulic control) wheel lock	

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	OK	Proceed to test 3

Test		Result	Action
	speed sensor between the sensor and the pulser ring: - Air gap between 0.1 mm to 1.5 mm		
		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

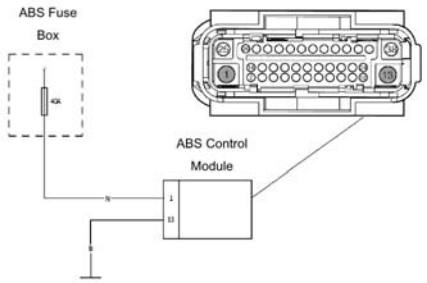
Motor - Lock; Motor Does Not Run; Motor Runs Continually

Fault Code	Possible Cause	Action
Motor circuit fault	Motor circuit fault	Ensure ABS ECM connector is secure Turn the ignition 'ON' Proceed to pinpoint test 1:
Motor - does not run	Motor - does not run	
Motor - runs continually	Motor - runs continually	

Pinpoint Tests

Test		Result	Action
1	Check ABS fuse integrity	OK	Proceed to test 2
		Faulty	Replace fuse and proceed to test 5
2	Check the motor function: Check that with the motorcycle stationary and the ABS ECM modulator connected, the motor does not operate	OK	Proceed to test 3
		Motor runs continually	Contact Triumph service
3	Check cable continuity: With Ignition 'ON', check voltage between: - ABS ECM connector pin 1 and ground pin 13	Voltage greater than 10 V	Proceed to test 4
		Voltage less than 10 V	Locate and rectify wiring fault, proceed to test 5
4	Check cable for continuity: - ABS ECM connector pin 13 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



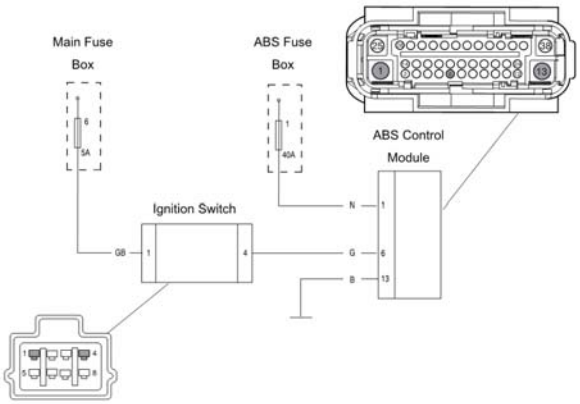
Power Source Voltage Drop/Voltage Rise

Fault Code	Possible Cause	Action
Power source voltage too low	Power source voltage too low	Ensure ABS ECM connector is secure Disconnect ABS ECM connector and proceed to pinpoint test 1:
Power source voltage too high	Power source voltage too high	
Power source - short term under-voltage detected	Power source - short term under-voltage detected	
Power source - long term Under-voltage detected	Power source - long term Under-voltage detected	

Pinpoint Tests

Test		Result	Action
1	Check ABS fuse integrity	OK	Proceed to test 2
		Faulty	Replace fuse and proceed to test 6
2	Check cable and terminal integrity: - ABS ECM connector pin 6 - ABS ECM connector pin 13 - ABS ECM connector pin 1	OK	Proceed to test 3
		Faulty	Rectify fault, proceed to test 6
3	Check the cable for continuity: - ABS ECM connector pin 13 and Ground	OK	Proceed to test 4
		Faulty	Rectify wiring harness fault, proceed to test 6
4	Check battery voltage: With ignition 'ON', check the voltage between: - ABS ECM connector pin 6 and Ground pin 13	Voltage greater than 10 V	Proceed to test 5
		Voltage less than 10 V	Locate and rectify fault, proceed to test 6

Circuit Diagram



Incorrect Tyre Size Detected

Fault Code	Possible Cause	Action
Incorrect tyre size detected	Incorrect tyre size detected 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 wheel speed sensor between the sensor and the pulser ring: - Air gap between 0.1 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

ABS ECM Internal Error

Fault Code	Possible Cause	Action
ABS ECM internal error	ABS ECM internal error	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 0.1 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

ECM Communication (CAN)

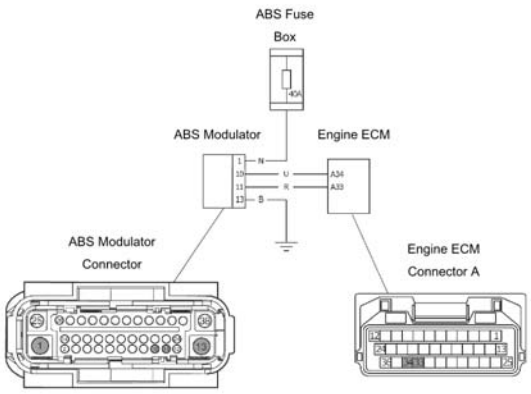
Fault Code	Possible Cause	Action
CAN fault - lost communication with engine ECM	CAN fault - lost communication with engine ECM	View and note ‘freeze-frame’ data if available Disconnect Engine ECM and ABS ECM connectors and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check that the engine stop switch is in the RUN position	RUN	Proceed to test 2
		STOP	Turn the engine stop switch to the RUN position
2	Verify Engine ECM is powered, Turn on Ignition and measure the voltage between: - Engine ECM pin B01 and Engine	10 - 14 V	Proceed to test 3
		Faulty	Check main fuse box, fuse 8. Replace if blown. Proceed to test 3

Test	Result	Action
ECM pin B08		
3 Check cable and terminal integrity: - ABS ECM pin 11 - ABS ECM pin 10 - Engine ECM pin A33 - Engine ECM pin A34	OK	Proceed to test 4
	Faulty	Rectify fault, proceed to test 7
4 Check cable for short circuit: - ABS ECM pin 11 to ground - ABS ECM pin 10 to ground	OK	Proceed to test 5
	Short Circuit	Locate and rectify wiring fault, proceed to test 7
5 Check cable continuity: - ABS ECM pin 11 to Engine ECM pin A33 - ABS ECM pin 10 to Engine ECM pin A34	OK	Proceed to test 6
	Open circuit	Locate and rectify wiring fault, proceed to test 7
6 Check cable for short circuit: - ABS ECM pin 11 to ABS ECM pin 10	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	OK	Action complete - quit test
	Fault still present	Contact Triumph service

Circuit Diagram



Instrument Communication (CAN)

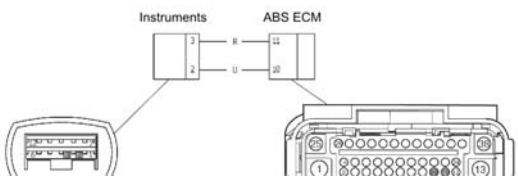
Fault Code	Possible Cause	Action
CAN fault - lost communication with instrument panel	CAN fault - lost communication with instrument panel	View and note ‘freeze-frame’ data if available

Fault Code	Possible Cause	Action
		Ensure instrument connector is secure. Disconnect ABS ECM connector and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Verify instrument pack is operating, Turn on Ignition:	OK	Proceed to test 2
		Faulty	Check fuse 9. Replace if blown. Proceed to test 2
2	Check cable and terminal integrity: - ABS ECM pin 11 - ABS ECM pin 10 - Instruments pin 3 - Instruments pin 2	OK	Disconnect instruments and proceed to test 3
		Faulty	Rectify fault, proceed to test 6
3	Check cable for short circuit: - ABS ECM pin 11 to ground - ABS ECM pin 10 to ground	OK	Proceed to test 4
		Short Circuit	Locate and rectify wiring fault, proceed to test 6
4	Check cable continuity: - ABS ECM pin 11 to instruments pin 3 - ABS ECM pin 10 to instruments pin 2	OK	Proceed to test 5
		Open circuit	Locate and rectify wiring fault, proceed to test 6
5	Check cable for short circuit: - ABS pin 11 to ABS pin 10	OK	Proceed to test 6
		Short 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



All Communication Lost (CAN)

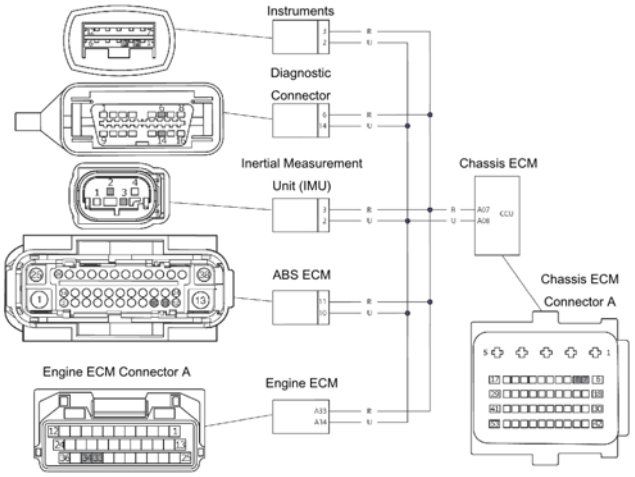
Fault Code	Possible Cause	Action
CAN fault - all communication lost	CAN fault - all communication lost	View and note ‘freeze-frame’ data if available Disconnect Chassis ECM and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - ABS ECM pin 11 - ABS ECM pin 10 - Chassis ECM pin A07 - Chassis ECM pin A08 - Instruments pin 3 - Instruments pin 2 - IMU pin 3 - IMU pin 2 - Diagnostic connector pin 6 - Diagnostic connector pin 14 - Engine ECM pin A33 - Engine ECM pin A34	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - ABS ECM pin 11 to ground - ABS ECM pin 10 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable continuity: - ABS ECM pin 11 to instruments pin 3 - ABS ECM pin 10 to instruments pin 2 - ABS ECM pin 11 to Chassis ECM pin A07 - ABS ECM pin 10 to Chassis ECM pin A08 - ABS ECM pin 11 to IMU pin 3 - ABS ECM pin 10 to IMU pin 2 - ABS ECM pin 11 to Diagnostic Connector pin 6 - ABS ECM pin 10 to Diagnostic Connector pin 14 - ABS ECM pin 11 to Engine ECM pin A33 - ABS ECM pin 10 to Engine ECM pin	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 5

Test	Result	Action
A34		
4 Check cable for short circuit: - ABS ECM pin 11 to Chassis ECM pin A08	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



ABS Modulator Malfunction

Fault Code	Possible Cause	Action
Modulator - active pressure control malfunction	Modulator - active pressure control malfunction	Contact Triumph service
Modulator input (master cylinder) pressure sensor malfunction	Modulator input (master cylinder) pressure sensor malfunction	
Modulator output (wheel) pressure sensor malfunction	Modulator output (wheel) pressure sensor malfunction	

ABS Variant Coding Error

Fault Code	Possible cause	Action
ABS variant coding error	ABS variant coding error	Note the ABS build data. Proceed to pinpoint test 1:

Pinpoint Tests

	Test	Result	Action

	Test	Result	Action
1	Check ABS modulator part number is correct for the motorcycle.	OK	Proceed to test 2
		Incorrect	Replace ABS modulator with correct part and proceed to test 2
2	Clear fault code, check for normal operation.	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Inertial Measurement Unit (IMU) Incompatible

Fault Code	Possible Cause	Action
Inertial Measurement Unit (IMU) ID incompatible	Inertial Measurement Unit (IMU) ID incompatible	Proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check IMU part number is correct for the motorcycle	OK	Proceed to test 2
		Incorrect	Replace IMU with correct part and proceed to test 3
2	Check that the engine ECM calibration is correct for the motorcycle using the diagnostic tool	OK	Proceed to test 3
		Incorrect	Download the correct calibration using diagnostic tool, proceed to test 3
3	Clear fault code and check for normal operation	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Inertial Measurement Unit (IMU) Communication

Inertial Measurement Unit (IMU) Voltage Too High or Too Low

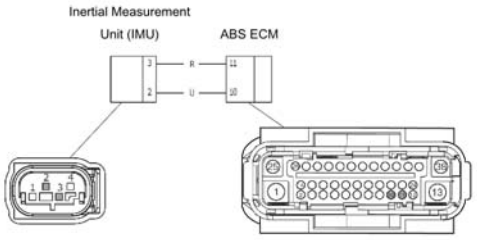
Fault Code	Possible Cause	Action
CAN fault - lost communication with Inertial Measurement Unit (IMU)	CAN fault - lost communication with Inertial Measurement Unit (IMU)	View and note ‘freeze-frame’ data if available Disconnect ABS ECM and IMU. Proceed to pinpoint test 1:
Inertial Measurement Unit (IMU) signal error	Inertial Measurement Unit (IMU) signal error	

Pinpoint Tests

Test	Result	Action

Test		Result	Action
1	Verify IMU is powered. Turn on Ignition. Measure voltage between: - IMU pin 4 and IMU pin 1	10 V - 14 V	Proceed to test 2
		Faulty	Check fuse 6. Replace if blown. Proceed to test 2
2	Check cable and terminal integrity: - ABS ECM pin 11 - ABS ECM pin 10 - IMU pin 3 - IMU pin 2	OK	Proceed to test 3
		Faulty	Rectify fault, proceed to test 6
3	Check cable for short circuit: - ABS ECM pin 11 to ground - ABS ECM pin 10 to ground	OK	Proceed to test 4
		Short circuit	Locate and rectify wiring fault, proceed to test 6
4	Check cable continuity: - ABS ECM pin 11 to IMU pin 3 - ABS ECM pin 10 to IMU pin 2	OK	Proceed to test 5
		Open circuit	Locate and rectify wiring fault, proceed to test 6
5	Check cable for short circuit: - ABS pin 11 to ABS pin 10	OK	Proceed to test 6
		Short 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

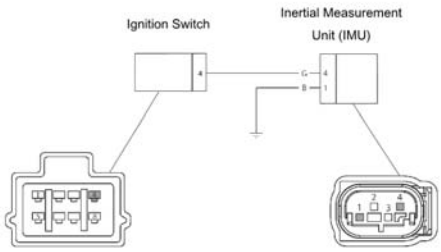


Fault Code	Possible Cause	Action
Inertial Measurement Unit (IMU) voltage too high or voltage too low	Inertial Measurement Unit (IMU) voltage too high or voltage too low	View and note ‘freeze-frame’ data if available

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - IMU pin 1 - IMU pin 4	OK	Disconnect IMU and proceed to test 2
		Faulty	Rectify fault, proceed to test 4
2	Check cable for short circuit: - IMU pin 4 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 4
3	Check cable continuity: - IMU pin 1 to ground Turn ignition switch to the ON position and check cable continuity: - Ignition switch pin 4 to IMU pin 4	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 4
4	Reconnect harness, clear fault code and run engine	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



Inertial Measurement Unit (IMU) Signal Error Prior to ABS Initialisation

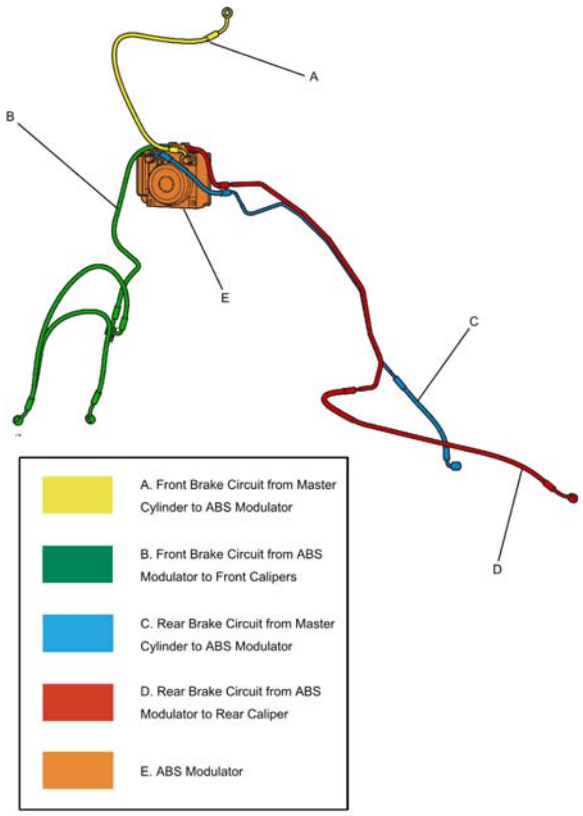
Fault Code	Possible Cause	Action
Inertial Measurement Unit (IMU) signal error prior to ABS initialisation	Inertial Measurement Unit (IMU) signal error prior to ABS initialisation	Proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check IMU part number is correct for	OK	Proceed to test 2

Test		Result	Action
	the motorcycle.		
		Incorrect	Replace IMU with correct part and proceed to test 3
2	Check the IMU and its mounting arrangement for correct installation: - Check all components are correctly assembled. - Check all fixings are tightened to the correct torque. - Check the IMU electrical connector is securely connected.	OK	Proceed to test 3
		Incorrect	Rectify fault Proceed to test 3
3	Clear fault code and check for normal operation.	OK	Action complete - quit test
		Fault still present	Contact Triumph service

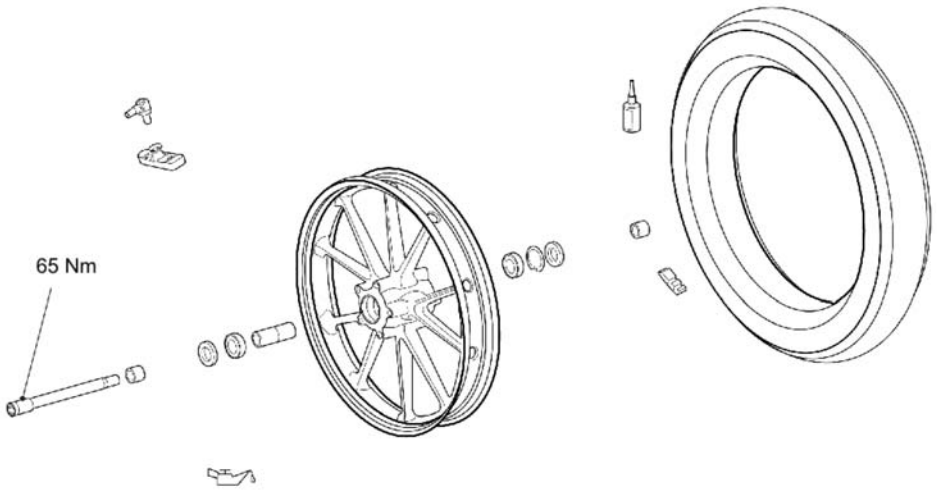
ABS Hydraulic Circuit Layout

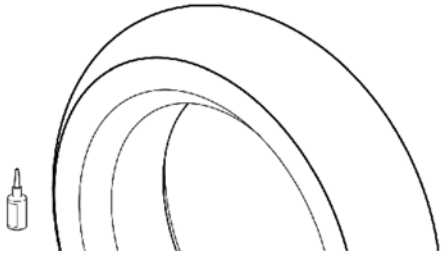


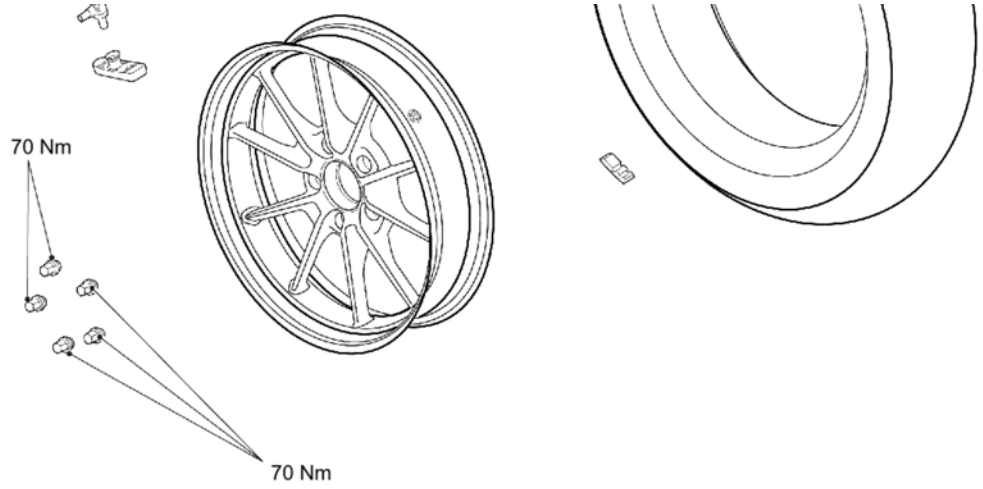
Wheels and Tyres

Exploded View – Front Wheel

Exploded View – Rear Wheel

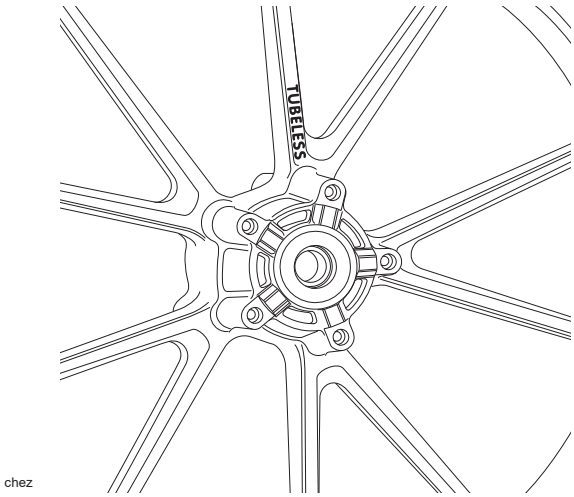

65 Nm





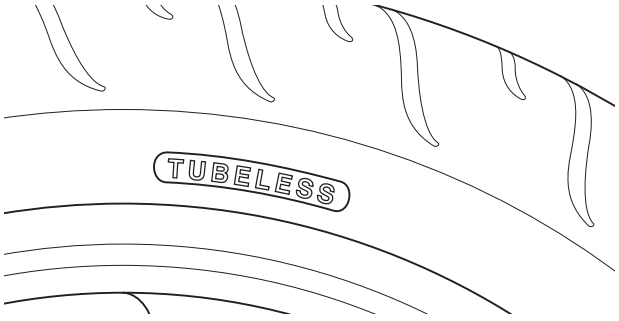
Tyres

This model is equipped with tubeless tyres, valves and wheel rims. Use only tyres marked 'TUBELESS' and tubeless valves on rims marked 'SUITABLE FOR TUBELESS TYRES'.



chez

Typical Wheel Marking



Typical Tyre Marking

⚠ WARNING

Tyres that have been used on a rolling road dynamometer may become damaged. In some cases, the damage may not be visible on the external surface of the tyre.

Tyres must be replaced after such use as continued use of a damaged tyre may lead to instability, loss of control and an accident.

Tyre Pressures

Correct inflation pressure will provide maximum stability, rider comfort and tyre life.

Always check tyre pressures before riding when the tyres are cold. Check tyre pressures daily and adjust if necessary.

For details of the correct tyre inflation pressures (see Wheels and Tyres).

⚠ WARNING

Incorrect tyre inflation will cause abnormal tread wear and instability problems which may lead to loss of control and an accident.

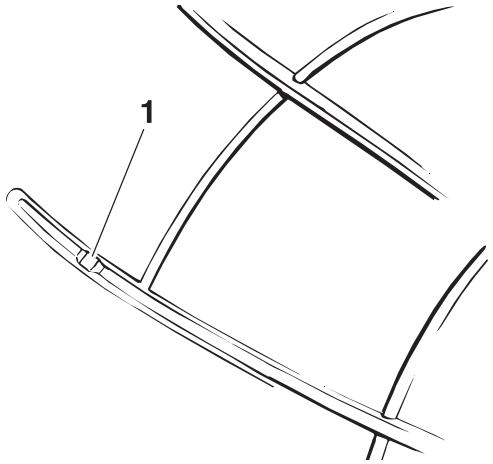
Under-inflation may result in the tyre slipping on, or coming off the rim. Over-inflation will cause instability and accelerated tread wear.

Both conditions are dangerous as they may cause loss of control leading to an accident.

Tyre Wear/Wheel Inspection

As the tyre tread wears down, the tyre becomes more susceptible to puncture and failure. It is estimated that 90% of all tyre failures occur during the last 10% of tread life (90% worn). It is false economy and unsafe to use tyres until they are worn to their minimum.

All tyres are fitted with tread wear indicators. When the tyre becomes worn down as far as the top of a tread wear indicator, the tyre is worn beyond its service life and must be replaced.



1. **Tread wear indicator**

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 control and an accident.

When tubeless tyres, used without a tube, 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. Operation with punctured or damaged tyres will adversely affect motorcycle stability and handling which may lead to loss of control or an accident.

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 authorised 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 (see Wheels and Tyres).

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 racetracks. 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. A list of approved tyres specific to this model is available from your authorised Triumph dealer, or on the internet at www.triumph.co.uk.

WARNING

The ABS computer operates by comparing the relative speed of the front and rear wheels. Use of non-recommended tyres can affect wheel speed and cause the ABS function not to operate, potentially leading to loss of motorcycle control and an accident in conditions where the ABS would normally function.

WARNING

Always check tyre pressures before riding when the tyres are cold. Operation with incorrectly inflated tyres may affect handling leading to loss of control and an accident.

WARNING

Operation with excessively worn or damaged tyres will adversely affect handling and control leading to loss of control or an accident.

WARNING

Inner tubes must only be used on motorcycles fitted with spoked wheels and with tyres marked 'TUBE-TYPE' unless marked otherwise.

Use of an inner tube with a tyre marked 'TUBELESS' without appropriate marking and/or on an alloy wheel can lead to loss of motorcycle control and an accident.

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. A list of approved tyres specific to this model is available from your authorised Triumph dealer, or on the internet at www.triumph.co.uk.

WARNING

If a tyre or inner tube sustains a puncture, the tyre and inner tube must be replaced together. Failure to replace a punctured tyre and inner tube together, or operation with a repaired tyre or inner tube can lead to instability, loss of motorcycle control or an accident.

If tyre or inner tube damage is suspected, such as after striking the kerb, ask your authorised Triumph dealer to inspect the tyre both internally and externally and to also inspect the inner tube. Remember, tyre damage may not always be visible from the outside. Operation of the motorcycle with damaged tyres could lead to loss of motorcycle control and an accident.

When replacing a 'TUBE-TYPE' tyre on a spoked wheel, always inspect the rim tape (rim protection band) to ensure that it is correctly protecting the tube from the spoke threads. A damaged rim tape may lead to rapid tyre deflation causing loss of 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.

Do not install an inner tube inside a tubeless tyre unless it is clearly marked on the side wall that you can do so. This may cause instability and excessive heat build-up may cause the tube to burst resulting in rapid tyre deflation, loss of vehicle control and an accident.

WARNING

The use of tyres other than those listed at your authorised Triumph dealer, or on the internet, at www.triumph.co.uk, may adversely affect handling leading to loss of motorcycle control or an accident. Use the recommended tyre options only in the combinations listed at your authorised Triumph dealer, or on the internet at www.triumph.co.uk. Do not mix tyres from different manufacturers or tyres from the same manufacturer but from another option.

WARNING

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 manufacturer's 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/160 km) to become accustomed to the new handling characteristics.

After both 24 hours and 100 miles (160 km), 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

Front Wheel 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. Position the motorcycle on a paddock stand.
2. Raise and support the front of the motorcycle.

WARNING

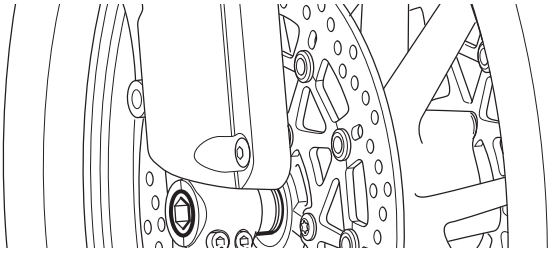
Do not allow the calipers to hang on the brake hoses as this may damage the hoses.

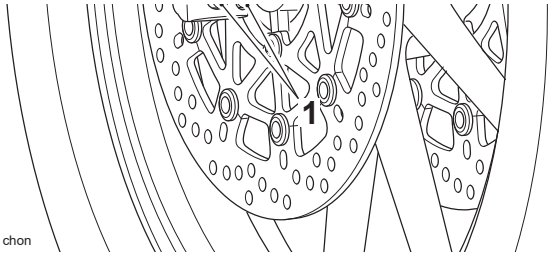
Damaged hoses could cause brake failure leading to loss of control and an accident.

Note

- **It is not necessary to disconnect the brake hoses.**

3. Detach and support the front brake calipers such that the weight of the caliper is not supported by the brake hose (see Front Brake Caliper - Removal).
4. Loosen both pinch bolts at the lower end of the right hand fork.





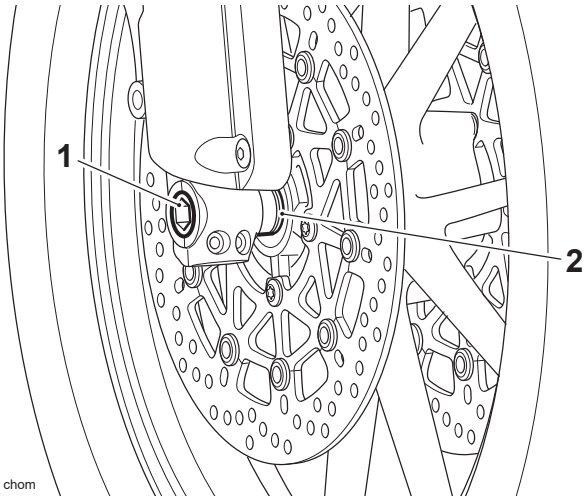
1. **Fork pinch bolts**

5. Release and remove the wheel spindle, which is threaded into the left hand fork.

Note

- **The right hand spacer is longer than the left. To identify the spacers, the right hand spacer has two machined rings while the left has a single machined ring.**
- **Note the position of the spacers.**

6. Remove the wheel and the wheel spacers.



1. **Wheel spindle**
2. **Wheel spacer (right hand shown)**

7. Place the wheel on wooden blocks.

WARNING

Do not allow the wheel to rest on either brake disc as this may damage the disc and could lead to an accident.

CAUTION

To prevent wheel and bearing damage, observe absolute cleanliness and ensure there is no dirt ingress to the wheel bearings while the wheel is removed.

8. Thoroughly clean all components and inspect for wear or damage.

1. Remove the front wheel (see Front Wheel - Removal).

CAUTION

CAUTION

Do not allow the wheel to rest on the brake discs, as this may damage the discs. Support the wheel on wooden blocks, equally spaced around the rim, such that the brake discs are raised above the ground.

2. Place the wheel on wooden blocks to prevent damage to the brake discs.
3. Remove and discard the seals and the bearing circlip.

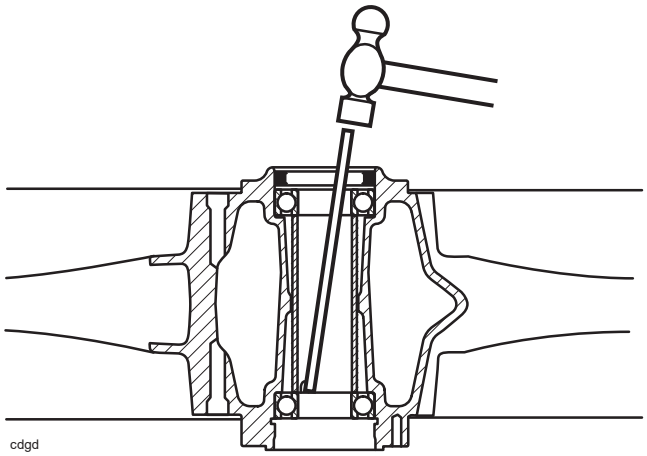
WARNING

Always wear eye, hand and face protection when using a hammer and drift. Use of a hammer and drift can cause bearings to fragment. Pieces of fragmented bearing could cause eye and soft tissue injuries if suitable protective apparel is not worn.

CAUTION

To prevent wheel damage and to aid bearing removal, always apply force evenly on both sides of the bearing to prevent it from 'tipping' and becoming stuck. Application of uneven force will lead to difficulty in removing the bearing and to a damaged wheel.

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 - Wheels

Front Wheel Bearings - Installation

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.

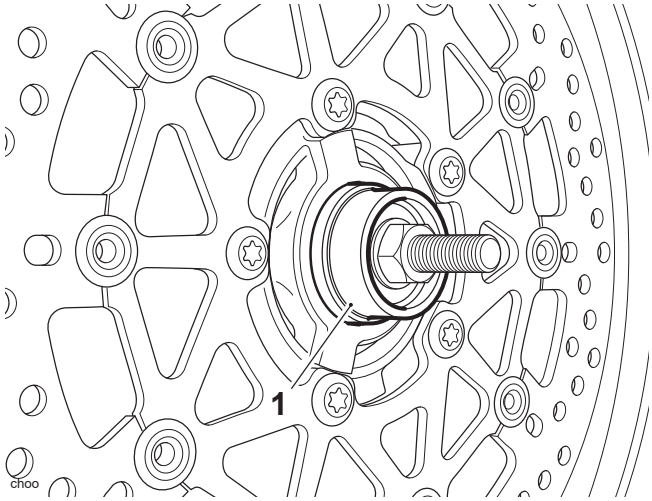
Front Wheel - Installation

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 into the wheel.**
- **Insert bearings with the marked or shielded side facing outwards and always fit a new bearing circlip and seals.**

	Bearing Insertion Tool	Support Tool
Left Bearing	T3880053 - Wheel Bearing Extraction Kit Large face to bearing	3880070-T0301 - Bearing Installer Large face to wheel
Right Bearing	T3880053 - Wheel Bearing Extraction Kit Large face to bearing	3880070-T0301 - Bearing Installer Large face to wheel

1. Fit the wheel bearing to the left hand side of the wheel using the method described above.
2. Fit the wheel bearings and centre sleeve using the method described opposite.



1. T3880053 - Wheel Bearing Extraction Kit

3. Fit a new circlip.
4. Lubricate and fit new seals to the front wheel. Lubricate the seal's knife-edge with grease to NLGI 2 specification.
5. Fit the front wheel (see Front Wheel - Installation).

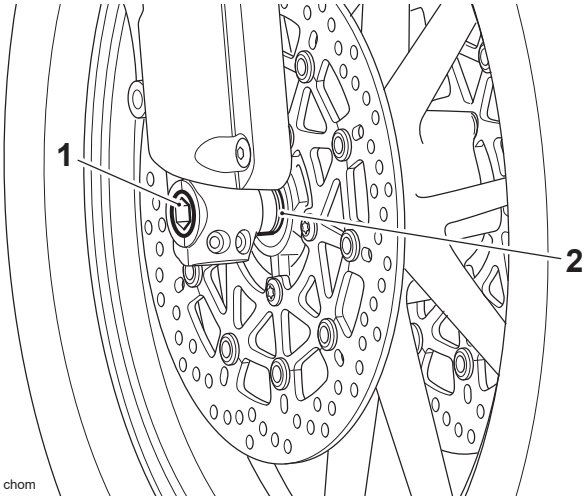
Rear Wheel - Removal

⚠ 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.

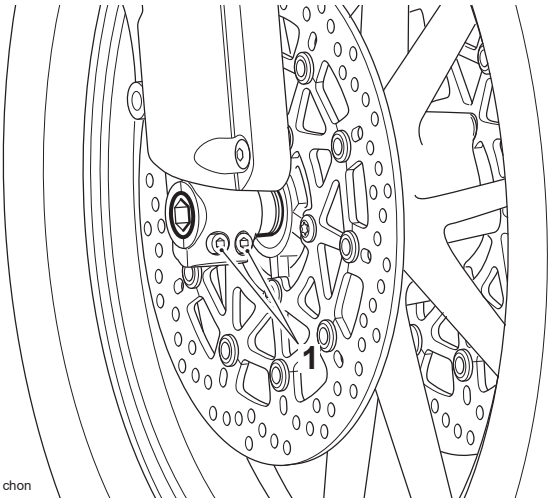
1. Lightly smear the wheel spacers with grease and locate in the hubs as noted for removal.
2. Position the wheel between the forks ensuring the spacers remain in position on both sides.

3. Refit the wheel spindle from the right hand side and tighten to **65 Nm**.



1. **Wheel spindle**
2. **Wheel spacer (right hand shown)**

4. Lower the motorcycle to the ground and pump the front suspension to allow the left hand fork to 'float' to its natural position on the wheel spindle.
5. Tighten the fork pinch bolts to **22 Nm**.



1. **Fork pinch bolts**

6. Thoroughly clean and degrease the brake discs.
7. Refit the front brake calipers, see Front Brake Caliper - Installation.

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.

8. Check the air gap between the wheel speed sensor and the pulser ring (see Front Wheel Speed Sensor Air Gap Measurement).
9. Check the operation of the front brake.

Rear Wheel - Installation

WARNING

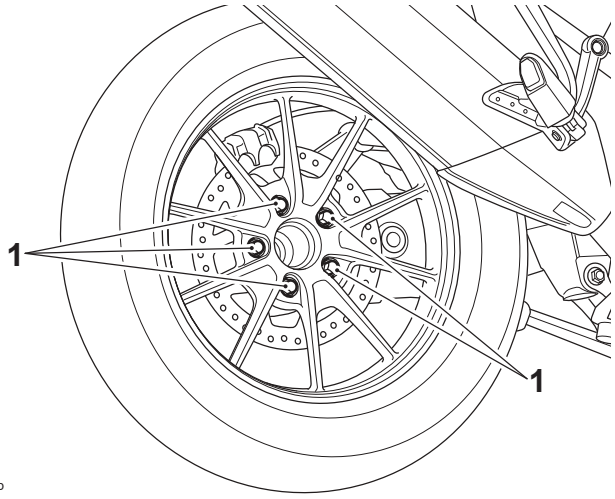
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Raise and support the rear of the motorcycle to allow removal of the rear wheel.

WARNING

If the engine has recently been running, the exhaust system will be hot. Before working on or near the exhaust system, allow sufficient time for the exhaust system to cool as touching any part of a hot exhaust system could cause burn injuries.

2. Release the five nuts and remove the rear wheel.



1. **Rear wheel nuts**

3. The rear brake disk and caliper will remain in position on the final drive unit when the wheel is removed.

Frame and Bodywork

Exploded View – Frame

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. Lift the rear wheel into position, aligning the wheel, onto the five studs on the final drive unit.
2. Fit and tighten the nuts to **70 Nm**.
3. Lower the motorcycle to the ground.

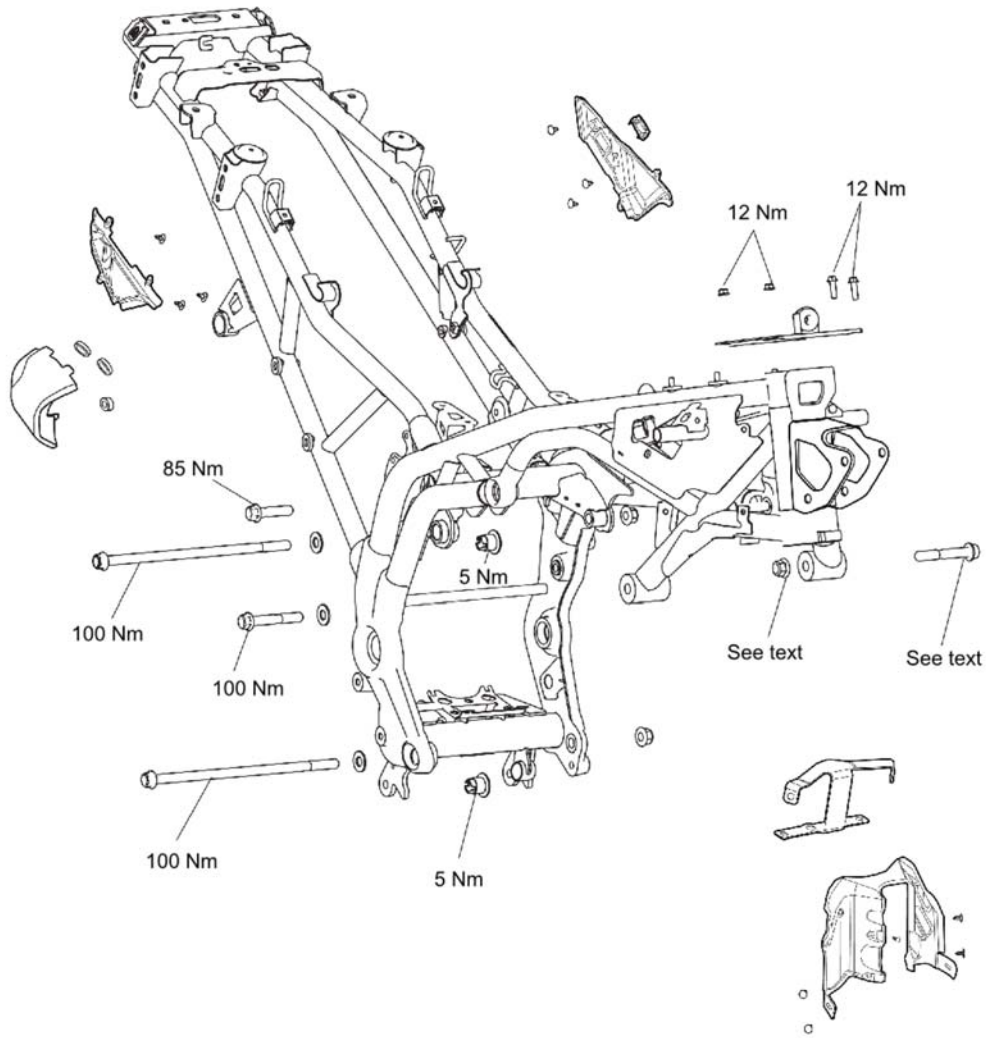
WARNING

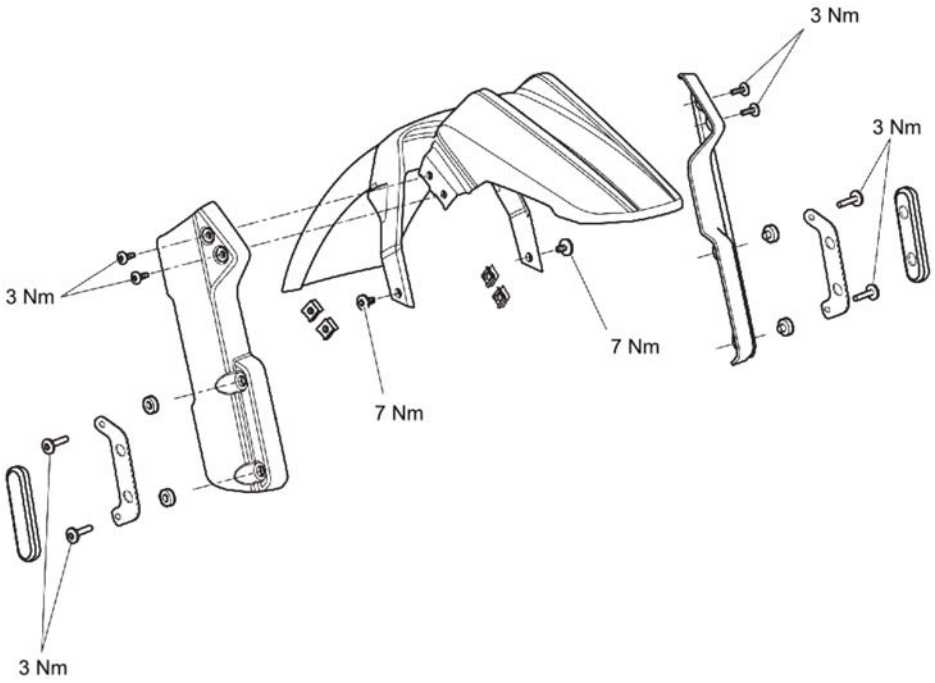
It is dangerous to operate the motorcycle with defective brakes; you must have your authorised Triumph dealer take remedial action before you attempt to ride the motorcycle again. Failure to take remedial action

⚠ WARNING
may reduce braking efficiency leading to loss of motorcycle control and an accident.

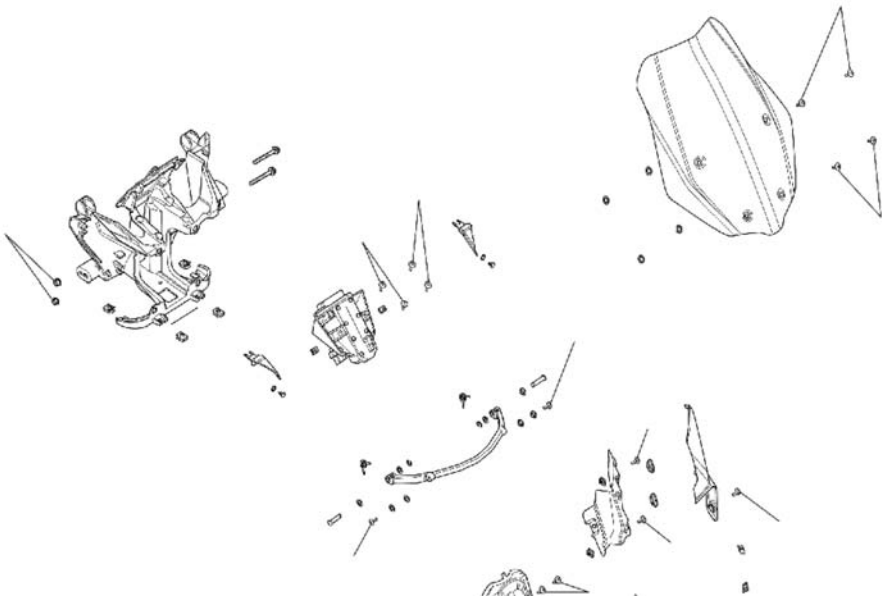
4. Check the operation of the rear brake.
5. Inform the owner to check and, if necessary, tighten the rear wheel nuts to **70 Nm**.

Exploded View – Front Mudguard

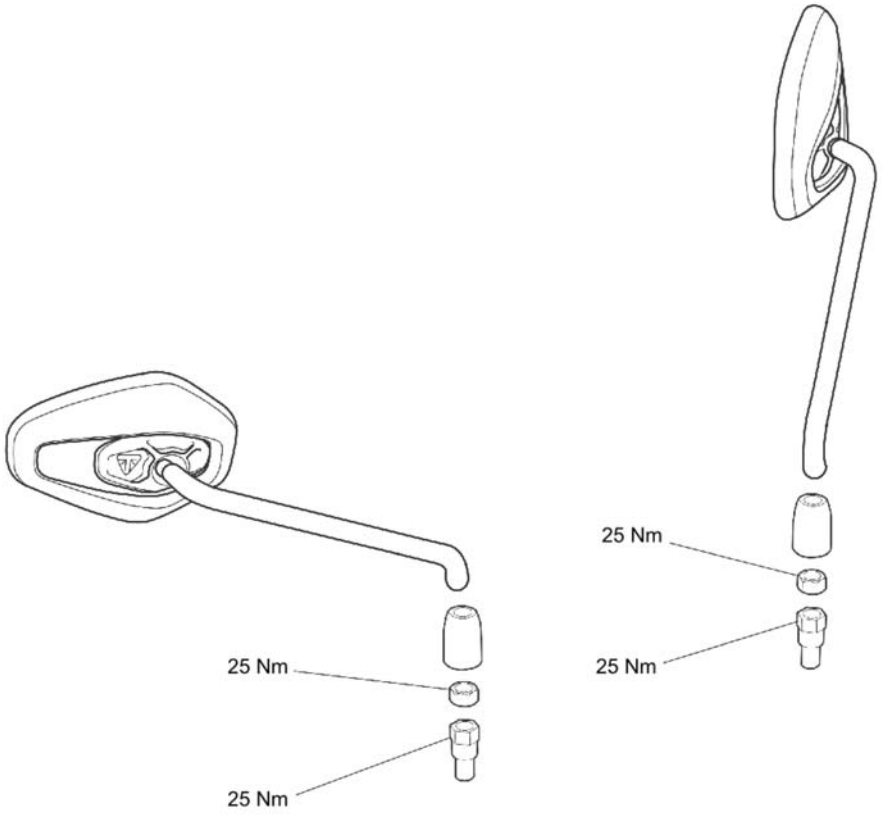




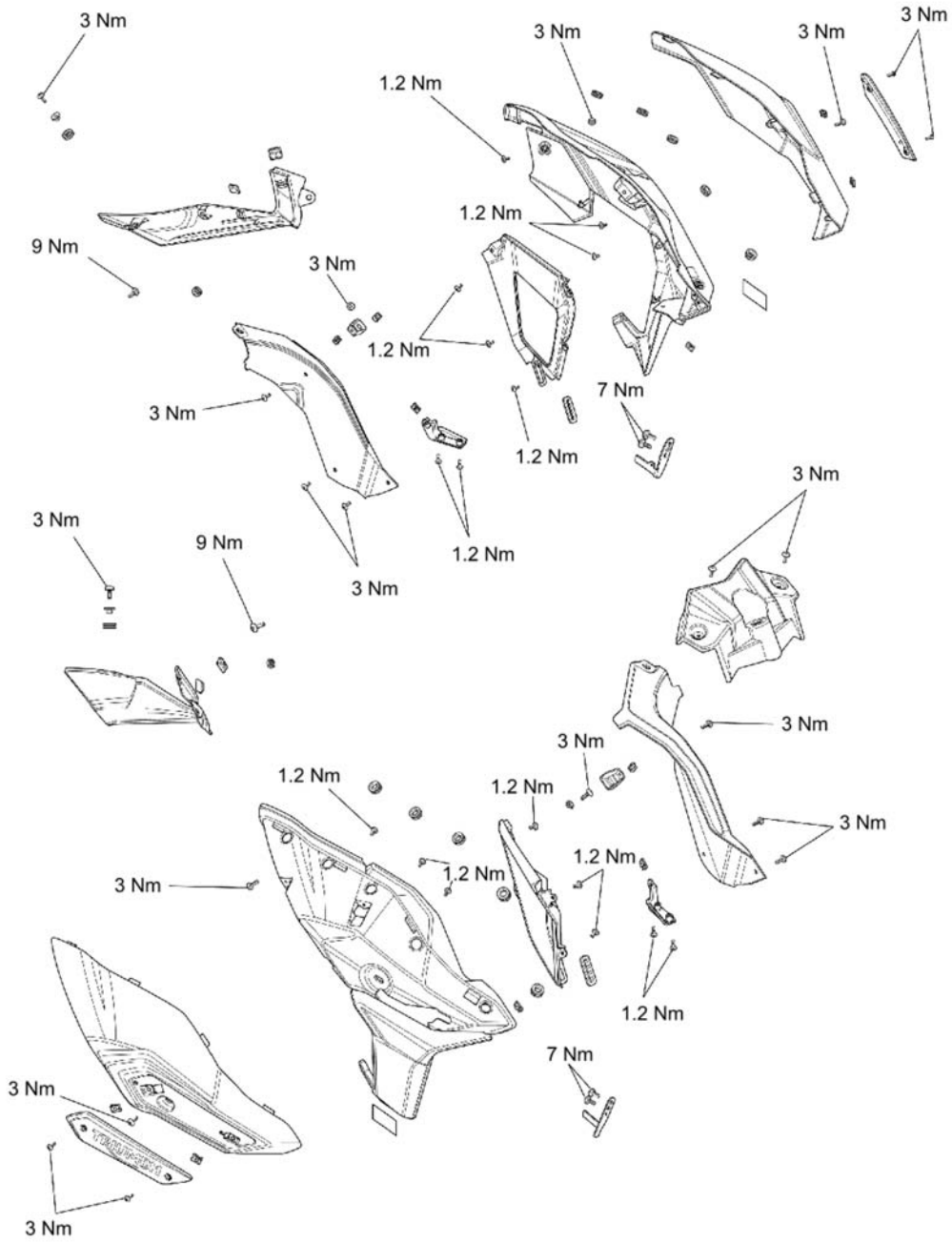
Exploded View – Cockpit and Mountings



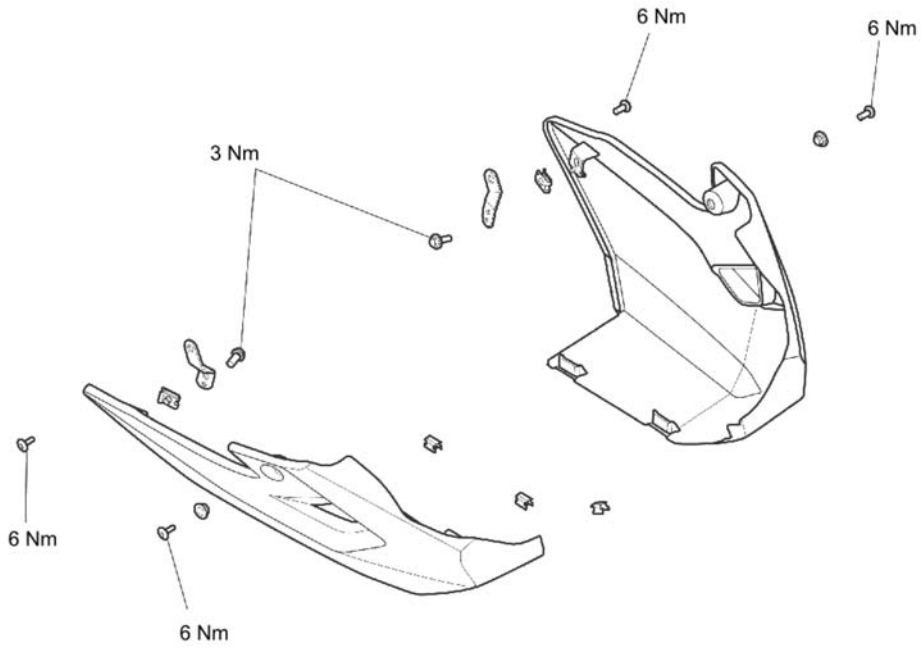
Exploded View - Mirrors



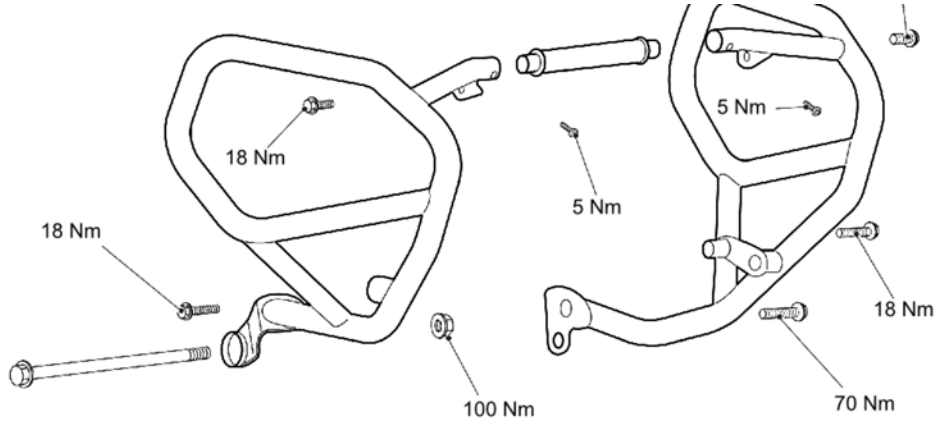
Exploded View – Side Fairings



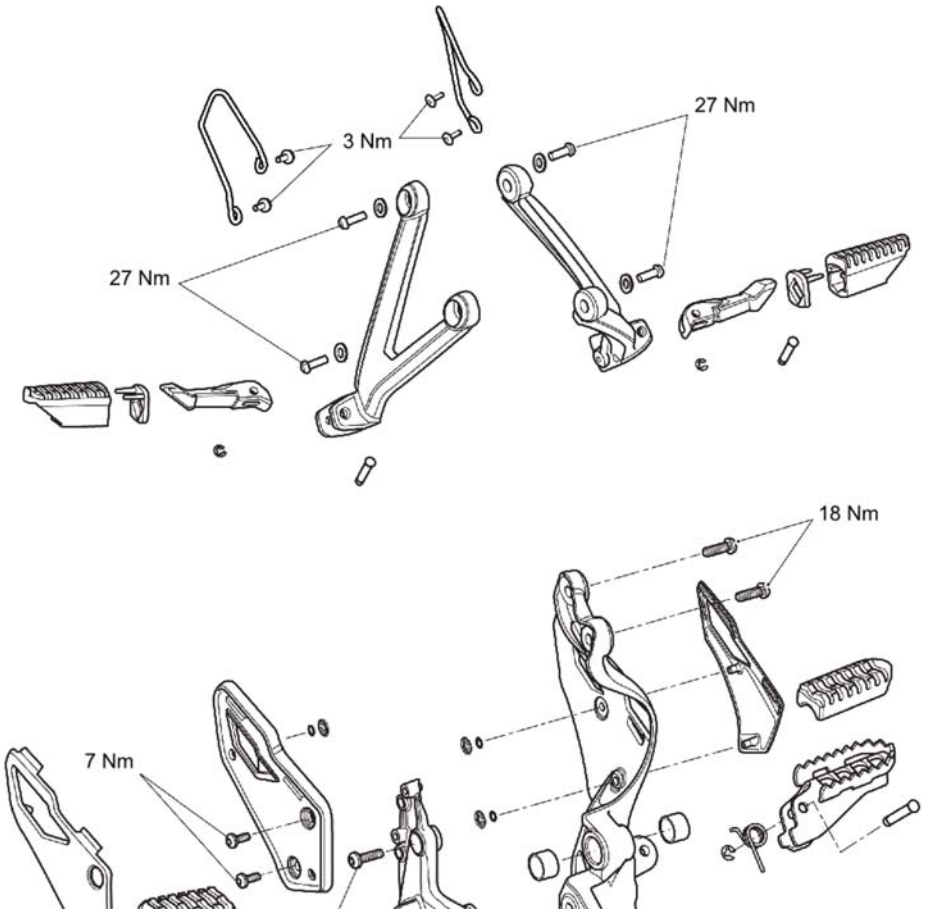
Exploded View – Sump Guard

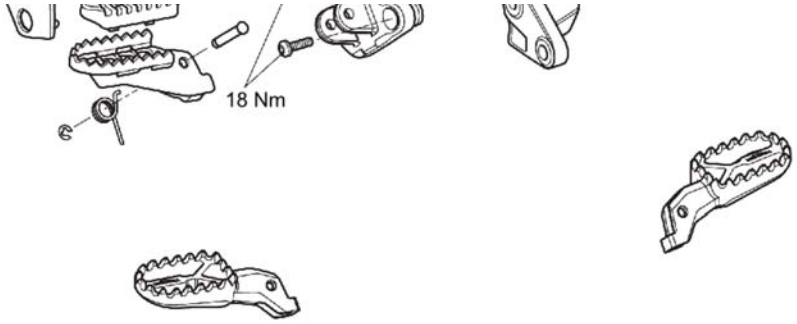


Exploded View – Engine Protection Bars

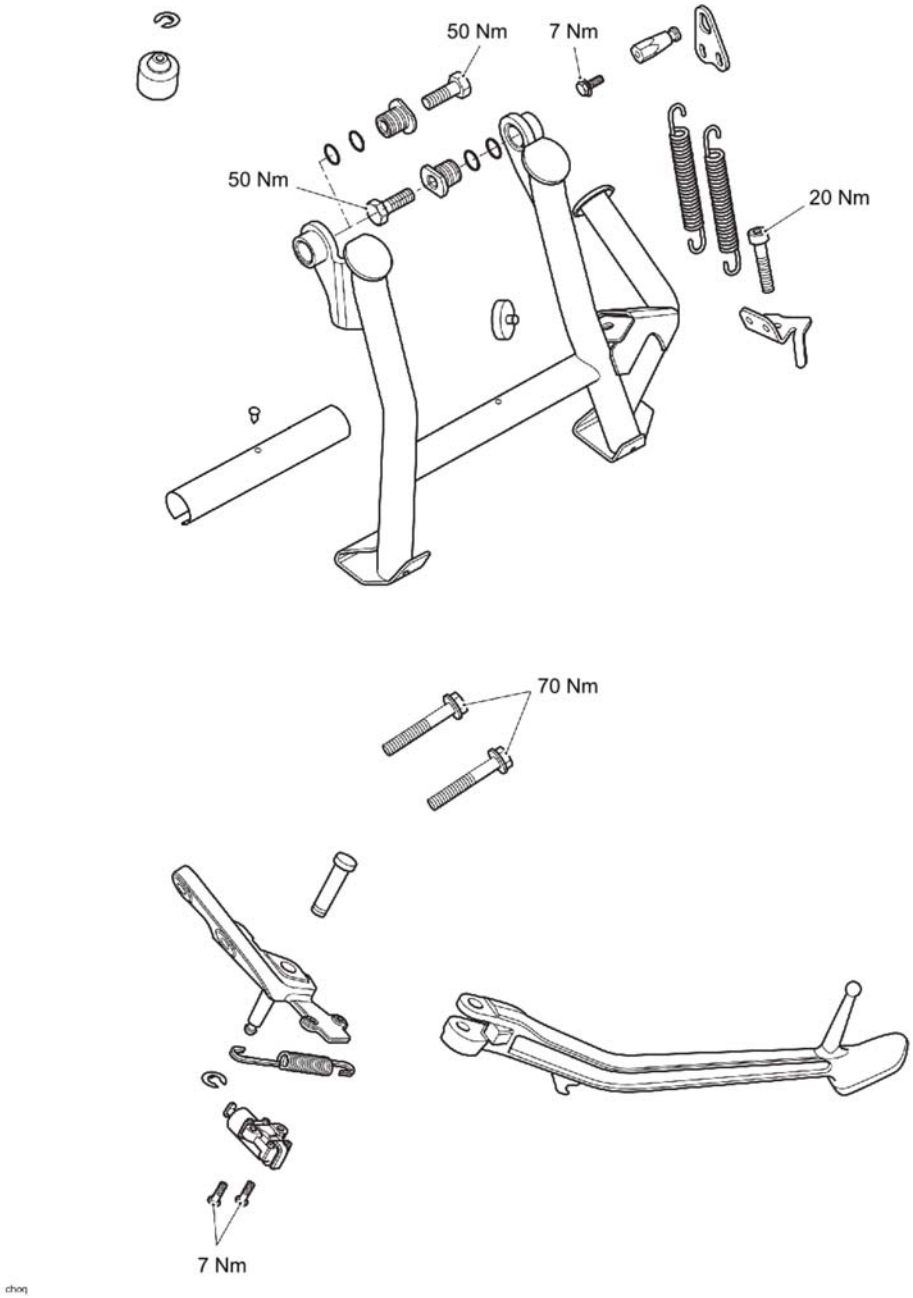


Exploded View - Front and Rear Footrests

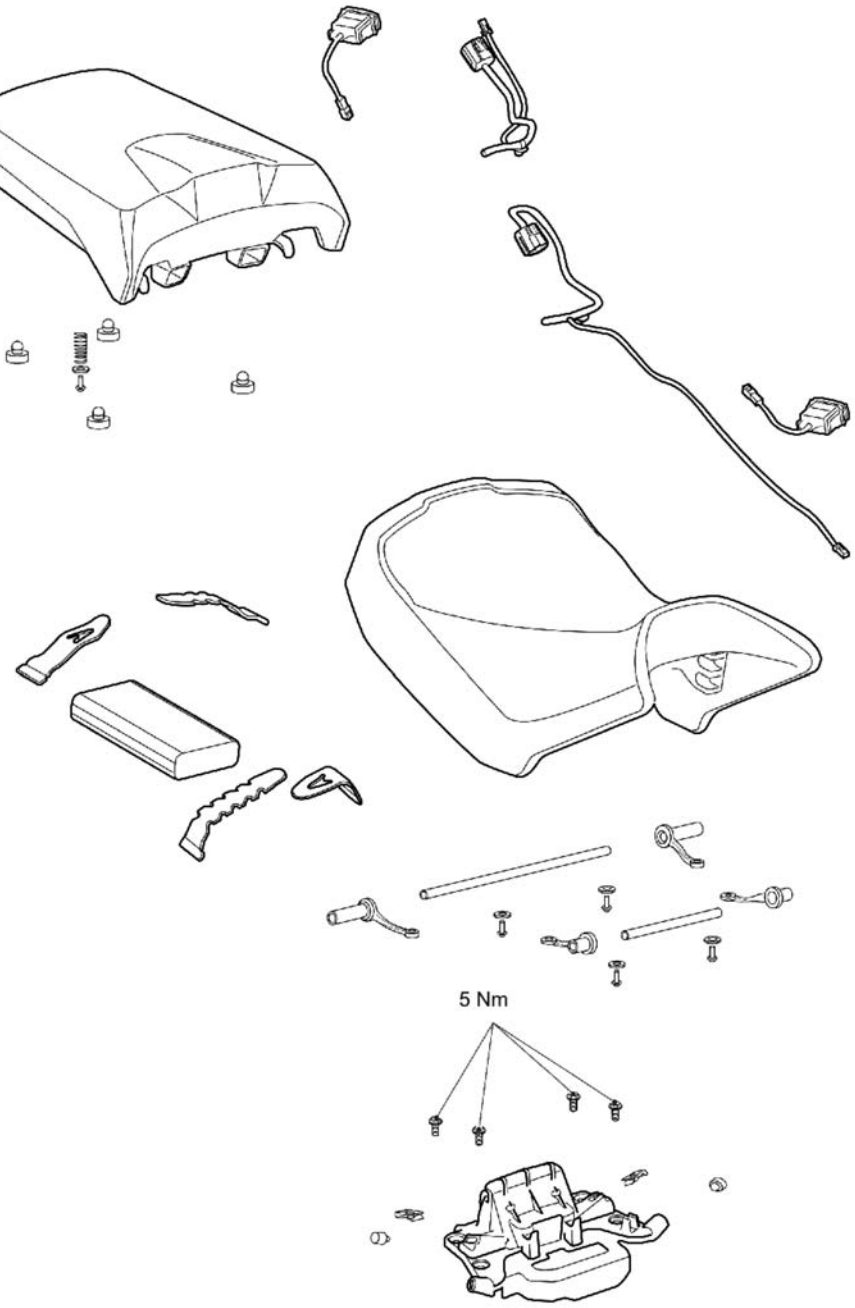




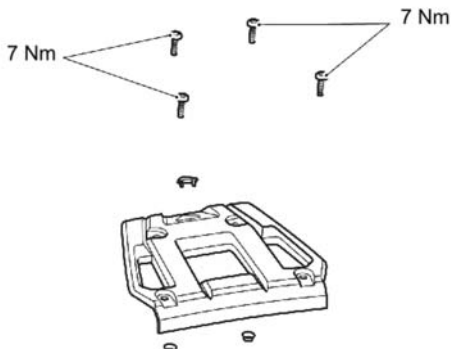
Exploded View – Side Stand and Centre Stand

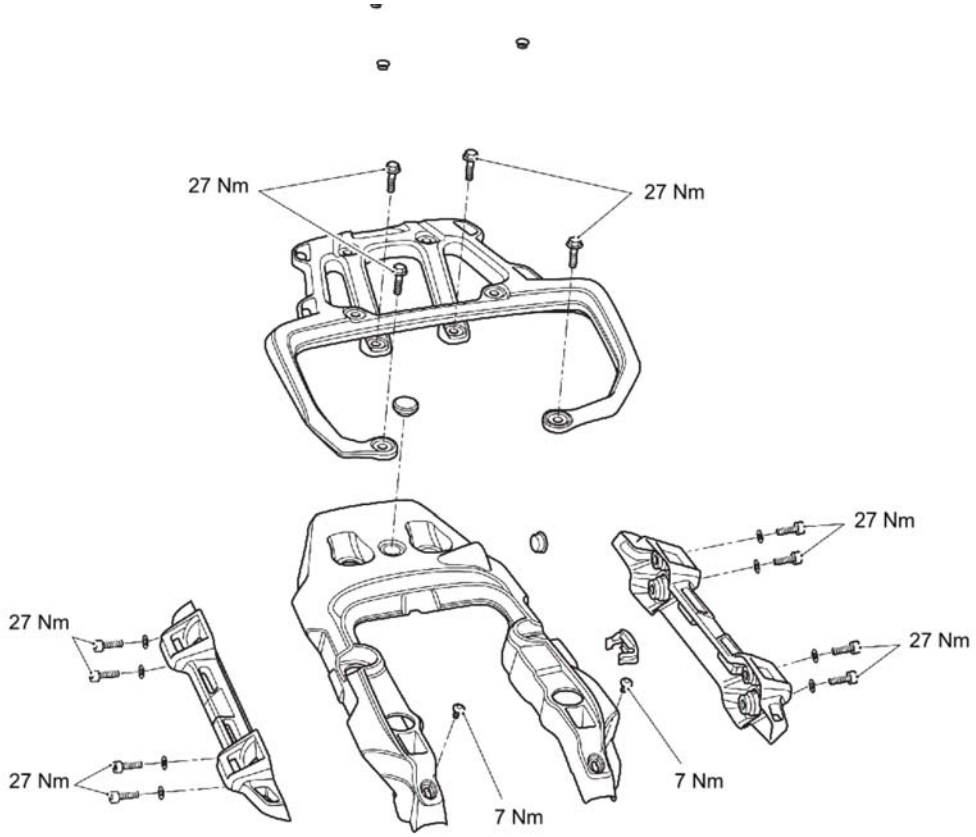


Exploded View - Seat and Tool Kit



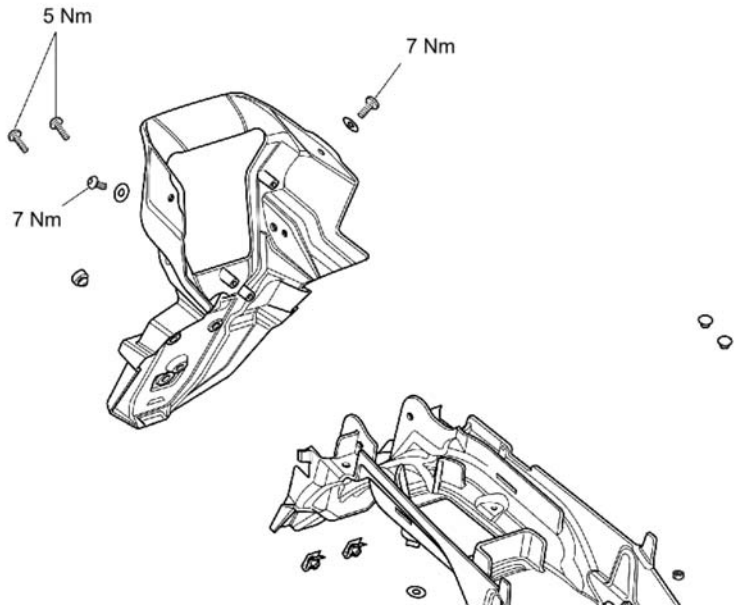
Exploded View – Rear Panels and Luggage Rack

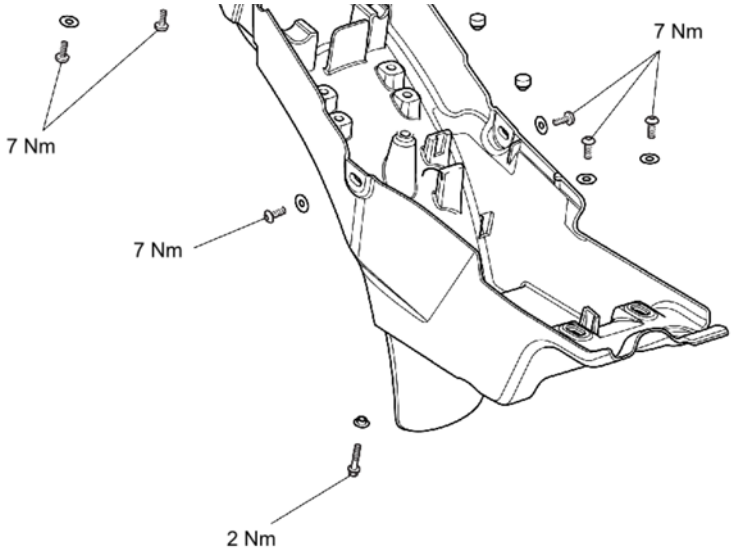


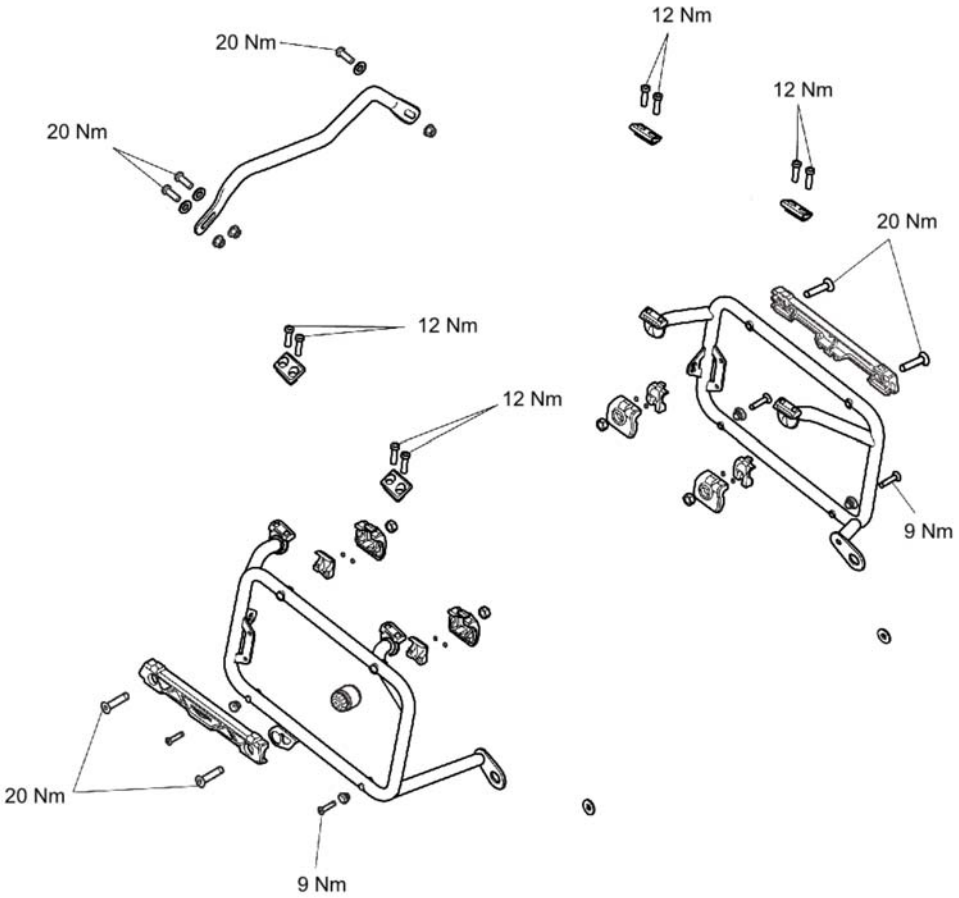


Exploded View – Rear Mudguard and Battery Tray

Exploded View - Pannier Mounting Frames




7 Nm
7 Nm
7 Nm
2 Nm


20 Nm
20 Nm
12 Nm
12 Nm
20 Nm
12 Nm
12 Nm
9 Nm
20 Nm
9 Nm

General Frame Inspection

Passenger Seat - Removal

Passenger Seat - Installation

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 motorcycle 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.

3. If fitted, check the operation of the centre stand to make sure it is securely held in the retracted position by the spring. Rectify any faults

WARNING

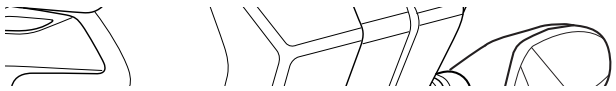
If the return spring is faulty, the centre stand will not be held in the retracted position whilst the motorcycle is being ridden. This will cause an unsafe riding condition, which could lead to loss of motorcycle control and an accident.

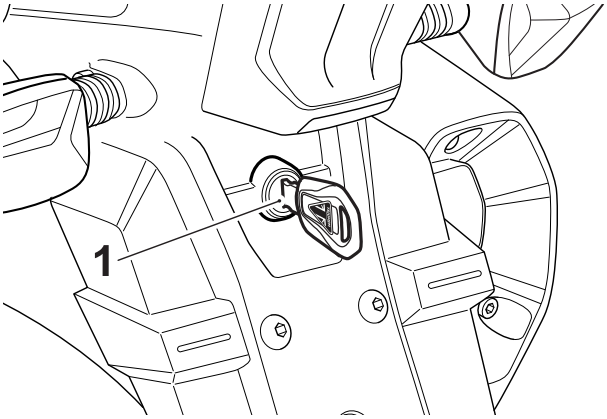
CAUTION

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.

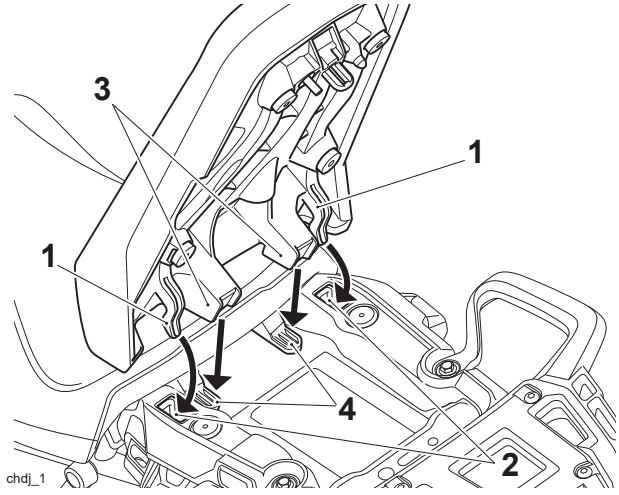
1. The passenger seat lock is located on the rear mudguard, below the rear light unit. To remove the seat, insert the ignition key into the seat lock and turn it anticlockwise while pressing down on the rear of the seat. This will release the seat from its lock and allow it to be slid rearwards. If equipped with heated seats, disconnect the heated seat's electrical connector for complete removal from the motorcycle.





1. **Seat lock**

1. To refit the passenger seat, reconnect the heated seat’s electrical connector (if equipped), engage the seat's two outer brackets under the loops on the subframe and the two inner brackets to the brackets on the rider's seat. Gently push the seat forwards and press down at the rear to engage in the seat lock.



1. **Rear seat outer brackets**
2. **Subframe loops**
3. **Rear seat inner brackets**
4. **Rider seat brackets**

⚠ 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 will detach from the lock. A loose or detached seat could cause loss of motorcycle control and an accident.

Rider’s Seat - Removal

Rider’s Seat - Installation

⚠ CAUTION

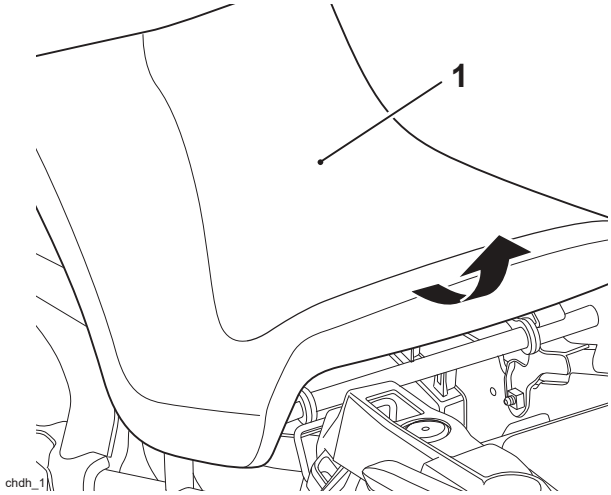
To prevent damage to the seats or seat covers, care must be taken not to drop the seats. Do not lean the

CAUTION

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.

1. To remove the rider's seat, remove the passenger seat (see Passenger Seat - Removal).
2. Grasp the rider's seat on either side, and slide it rearwards and upwards. If equipped with heated seats, disconnect the heated seats electrical connector for complete removal from the motorcycle.



1. Rider's seat

1. To refit the seat, reconnect the heated seat's electrical connector (if equipped). Engage the seat's front rail into the bracket at the rear of the fuel tank and lower the rear rail in to the rear brackets. Push down firmly on the rear of the seat. Refit the passenger seat (see Passenger Seat - Installation).

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 will detach from the lock. A loose or detached seat could cause loss of motorcycle control and an accident.

Front Mudguard - Removal

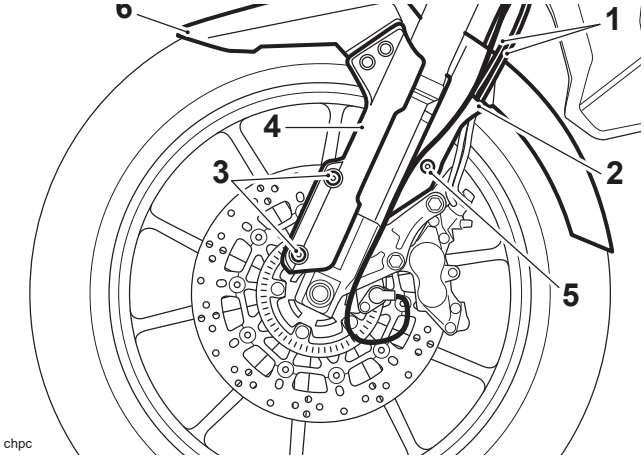
WARNING

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.

Note

- **Note the position of the front brake hoses for installation.**

1. Detach the front brake hose(s) from their locating lugs on either side of the front mudguard.
2. Remove the shouldered bolts securing the front fork protectors to the front forks. Collect the side reflector brackets.
3. While supporting the front mudguard and fork protector assembly, remove the fixings securing the front mudguard to the forks. Discard the fixings



1. **Brake hoses**
2. **Locating lug**
3. **Shouldered bolts**
4. **Front fork protector (left hand shown)**
5. **Fixing (left hand shown)**
6. **Front mudguard**

Note

- **Note the routing of the front brake hoses for installation.**

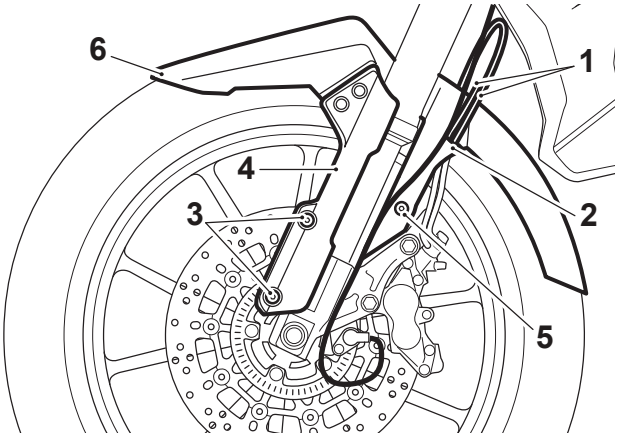
4. Carefully manoeuvre the mudguard and fork protector assembly towards the front to remove it from the motorcycle.

Front Mudguard - Installation

⚠ 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 front mudguard and fork protector assembly to the front forks. Ensure that the front brake hoses are routed as noted for removal.
2. Fit the side reflector brackets and shouldered bolts to secure the fork protectors to the fork. Do not tighten the bolts at this stage.
3. Fit new fixings to secure the front mudguard to the front forks. Tighten the fixings to **7 Nm**.
4. Tighten the shouldered bolts to **3 Nm**.
5. Position the front brake hose(s) to their locating lugs on the mudguard as noted for removal.



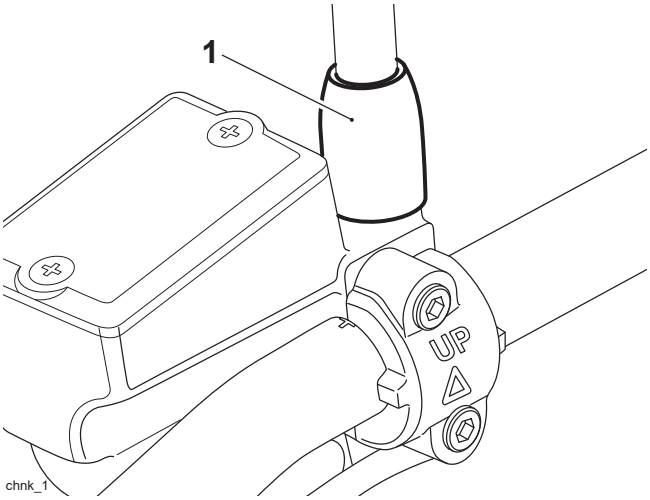
1. **Brake hoses**
2. **Locating lugs**
3. **Shouldered bolts**
4. **Front fork protector (left hand shown)**
5. **Fixing**
6. **Front mudguard**

Mirror - 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. Slide the rubber cover off the mirror boss and lock nut.



1. **Rubber cover**

Note

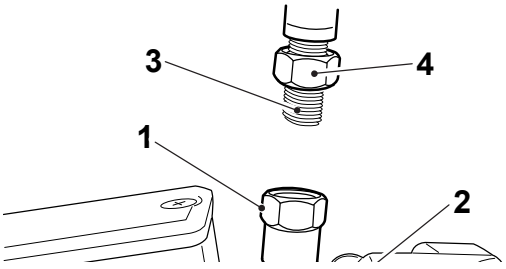
- **The mirror arm and its lock nut has a left hand thread.**

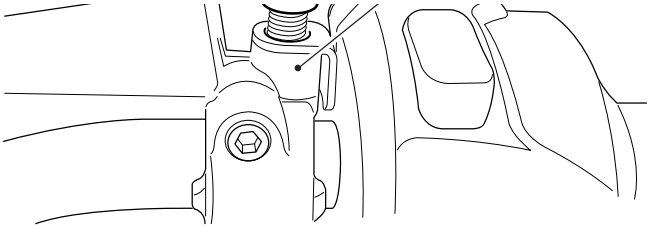
2. Loosen the lock nut and remove the mirror from the mirror boss.

Note

- **The external thread on the mirror boss is a right hand thread.**

3. If necessary, remove the mirror boss from the master cylinder housing.





1. **Mirror boss (external right hand thread)**
2. **Master cylinder housing**
3. **Mirror arm (left hand thread)**
4. **Lock nut (left hand thread)**

4. Repeat the procedure for the other mirror.

Mirror - Installation

⚠ 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 mirror fixing is too loose, the mirror may blow back at speed. This will result in a loss of vision to the rear of the motorcycle. It is dangerous to ride a motorcycle without sufficient rearward vision.

Note

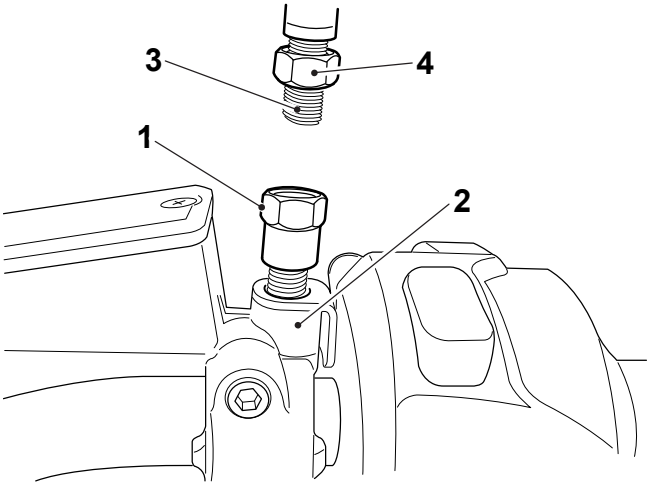
- **The external thread on the mirror boss is a right hand thread.**

1. If removed, fit the mirror boss to the master cylinder housing and tighten to **25 Nm**.

Note

- **The mirror arm and its lock nut has a left hand thread.**

2. Fit the mirror arm to the mirror boss, tighten by hand until the lock nut makes contact with the mirror boss. Do not fully tighten at this stage.



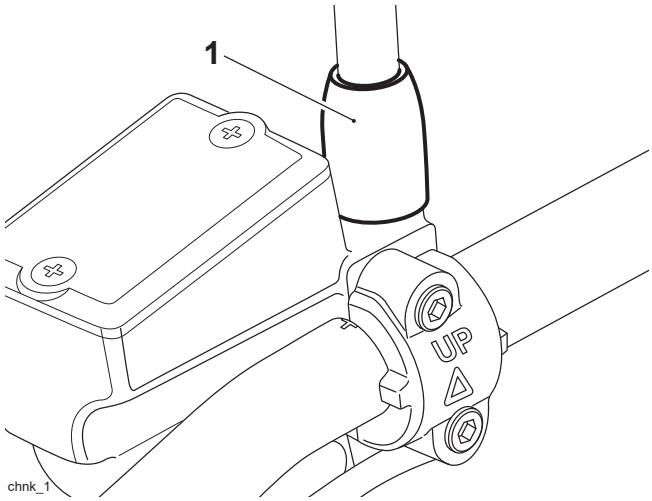
1. **Mirror boss**
2. **Master cylinder housing**
3. **Mirror arm (left hand thread)**
4. **Lock nut (left hand thread)**

3. Loosen the mirror arm by one complete turn.
4. Position the mirror arm to give rear visibility in the riding position.

CAUTION

Use an open ended spanner to counter-hold the mirror boss as the mirror lock nut is tightened. Failure to counter-hold the boss will cause damage to the thread and the mirror to become loose.

5. Counter-hold the mirror boss and tighten the lock nut to **25 Nm**.
6. Slide the rubber cover over the lock nut and mirror boss.



1. **Rubber cover**

7. Repeat the procedure for the other mirror.

Windscreen - Removal

Windscreen - Installation

Cockpit Panels - Removal

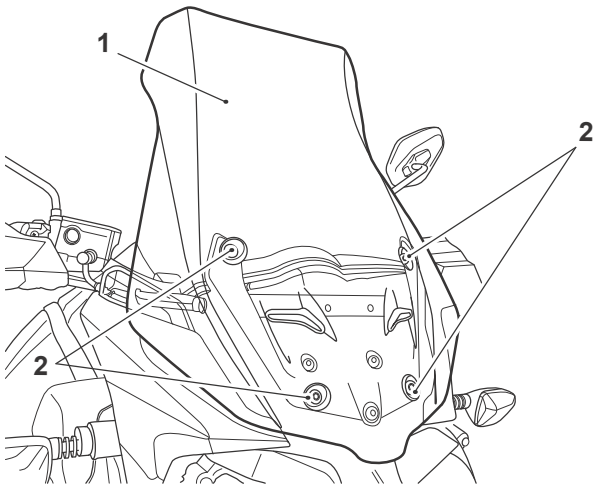
WARNING

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.

CAUTION

Care must be taken when removing or installing the windscreen. Damage to the windscreen surfaces could result from inadequate care during the removal or installation process.

1. Release the four fixings, remove the windscreen and place it on a clean soft surface.



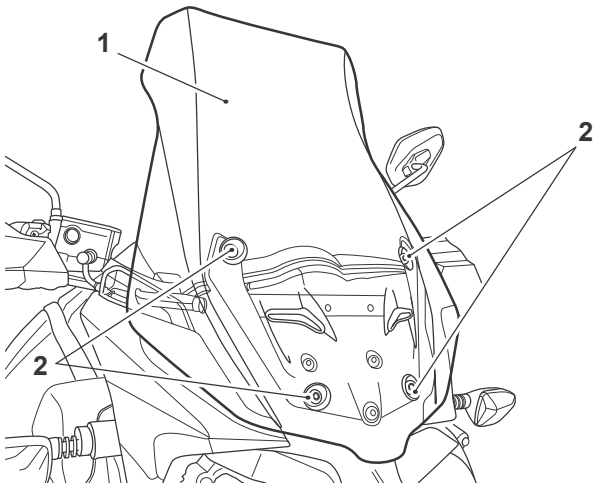
1. **Windscreen**
2. **Fixings**

Cockpit Panels - Installation

⚠ 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. Fit the windscreen to its mounting frame and tighten its fixings to **4 Nm**.



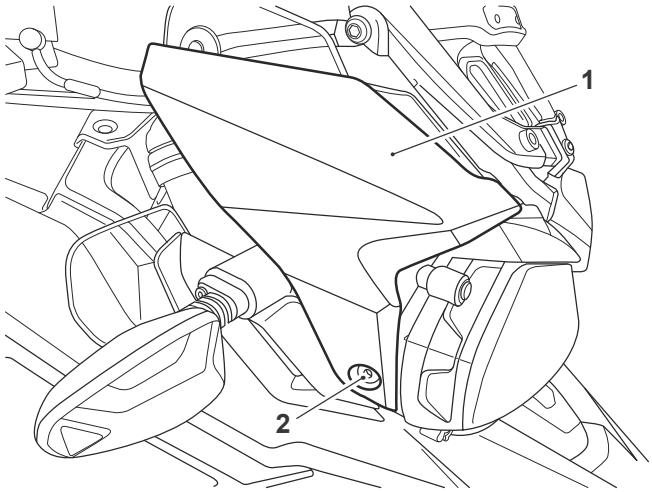
1. **Windscreen**
2. **Fixings**

⚠ 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.

- Remove the windscreen (see Windscreen - Removal).

1. Remove the fixing securing the cockpit panel to the headlight.



1. **Cockpit panel (right hand shown)**
2. **Fixing**

2. Carefully move the cockpit panel outwards to disengage its locating lugs and remove from the motorcycle.

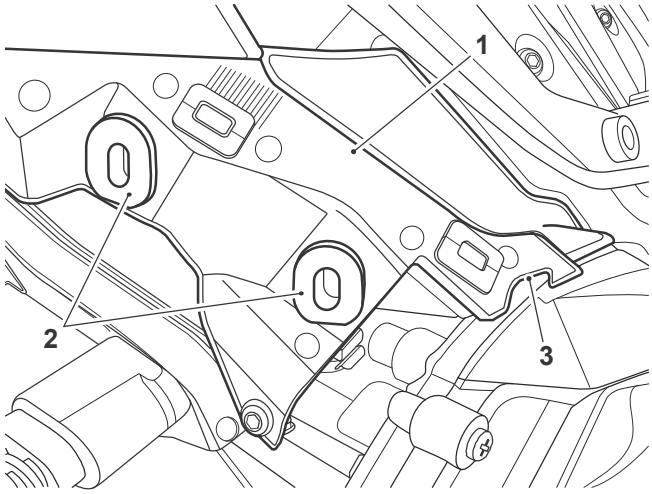
High Level Mudguard - Removal

High Level Mudguard - Installation

⚠ WARNING

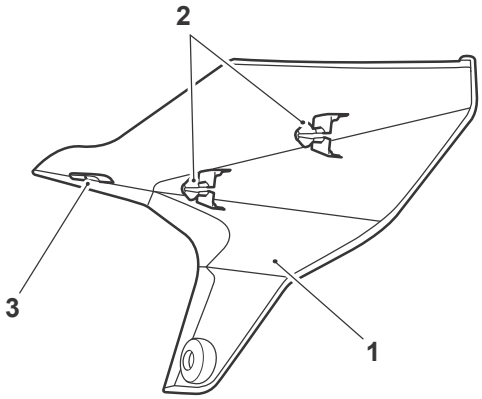
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Ensure that the rubber grommets are fitted to the wind deflector panel.



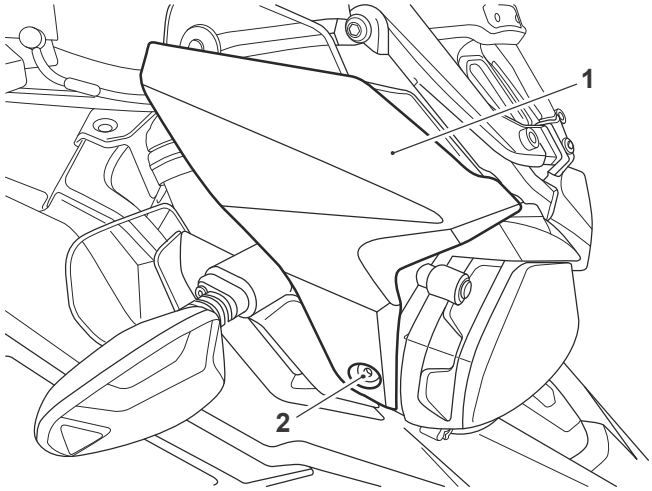
1. **Wind deflector panel**
2. **Grommets**
3. **Locating slot**

2. Carefully align the cockpit panel's locating lugs to the grommets on the wind deflector panel.
3. Push the cockpit panel inwards to engage its locating lugs, ensuring that the tab on the cockpit panel locates correctly into the slot on the front edge of the wind deflector panel,



1. **Cockpit panel (inside of right hand panel shown)**
2. **Locating lugs**
3. **Tab**

4. Fit the fixing and tighten to **3 Nm**.



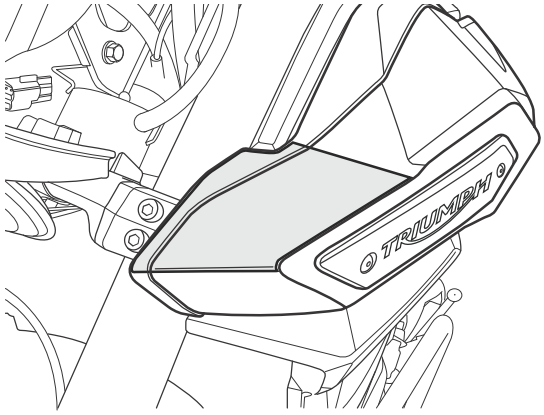
1. **Cockpit panel (right hand shown)**
2. **Fixing**

- Refit the windscreen (see Windscreen - Installation).

⚠ WARNING

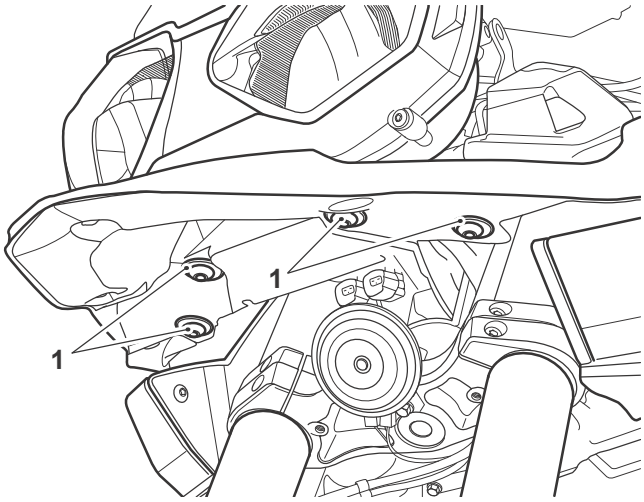
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

- Remove the rider’s seat (see Rider’s Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the cockpit panels (see Cockpit Panels - Removal).
- Protect the side fairings from damage by applying masking tape to the area shown below.



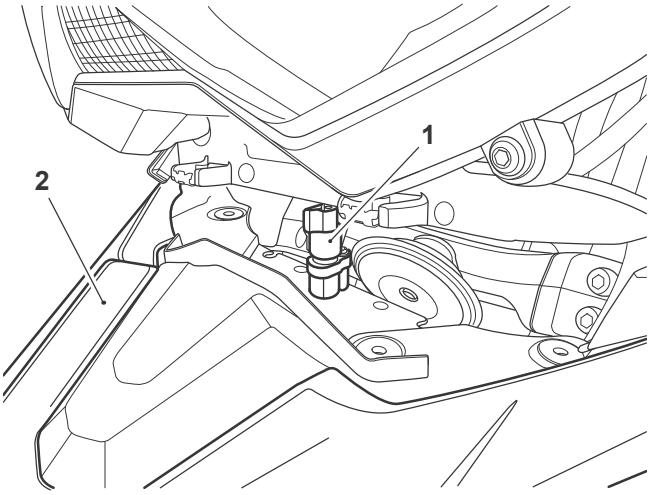
Masked Area (Left Hand Side Fairing Shown with High Level Mudguard Removed for Clarity)

1. Remove the four fixings securing high level mudguard to the cockpit sub-frame.



1. Fixings

2. Lower the high level mudguard and disconnect the ambient air temperature sensor’s electrical connection.



1. Ambient air temperature sensor

2. **High level mudguard**

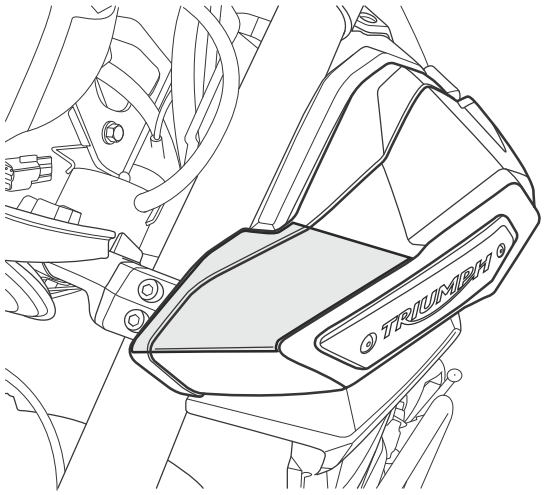
3. With the high level mudguard lowered sufficiently to allow the ambient air temperature sensor to pass below the cockpit subframe, carefully remove the high level mudguard towards the front of the motorcycle.
4. Noting their position and orientation, collect the four flanged sleeves from the high level mudguard.

Fuel Tank Infill Panels - Removal

WARNING

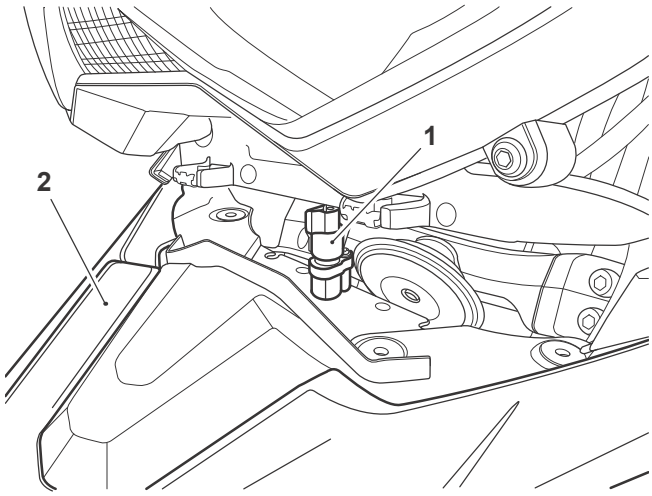
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

- Protect the side fairings from damage by applying masking tape to the area shown below.



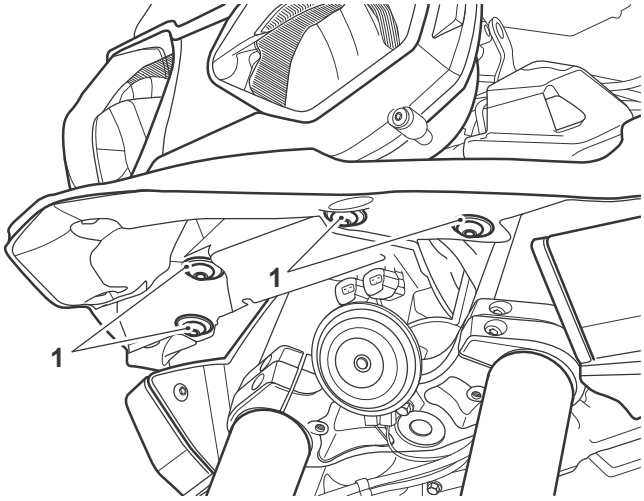
Masked Area (Left Hand Side Fairing Shown)

1. Fit the four flanged sleeves to the high level mudguard as noted during removal.
2. Carefully position the high level mudguard to the motorcycle and connect the ambient air temperature sensor's electrical connector.



1. **Ambient air temperature sensor**
2. **High level mudguard**

3. Secure the high level mudguard with the four fixings and tighten to **5 Nm**.



1. **Fixings**

4. Carefully remove the masking tape from the side fairings.
- Refit the cockpit panels (see Cockpit Panels - Installation).

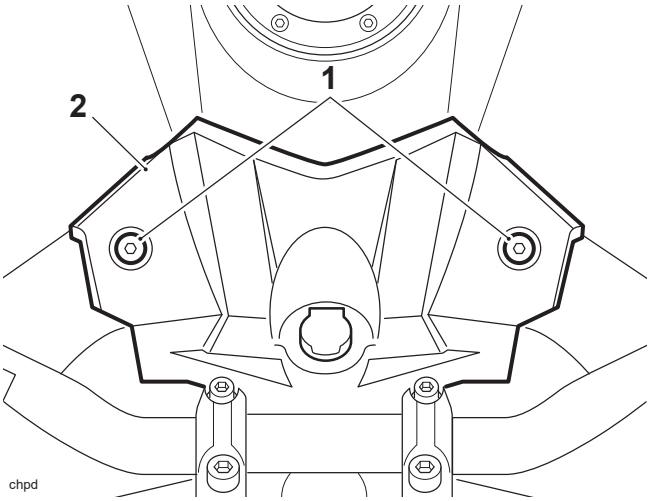
Fuel Tank Infill Panels - Installation

⚠ 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.

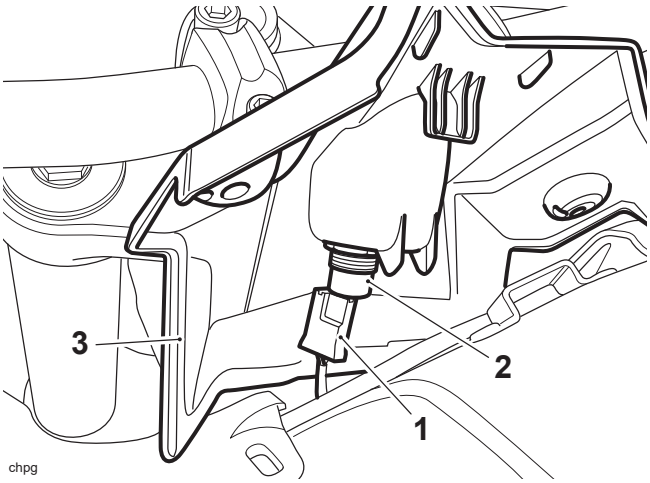
- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.

1. Release the fixings and lift the front panel upwards to detach it from the fuel tank.



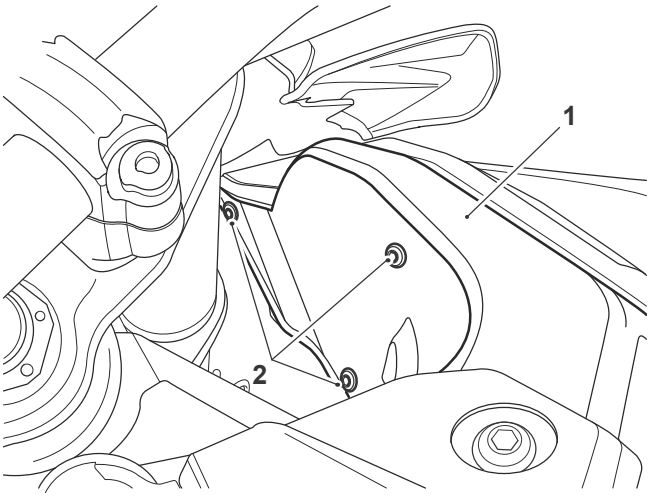
1. **Fixings**
2. **Front panel**

2. Disconnect the electrical connector from the auxiliary socket and remove the front panel.



1. **Electrical connector**
2. **Auxiliary socket**
3. **Front panel**

3. Release the three fixings and remove the fuel tank infill panel.



1. **Infill panel (right hand shown)**
2. **Fixings**

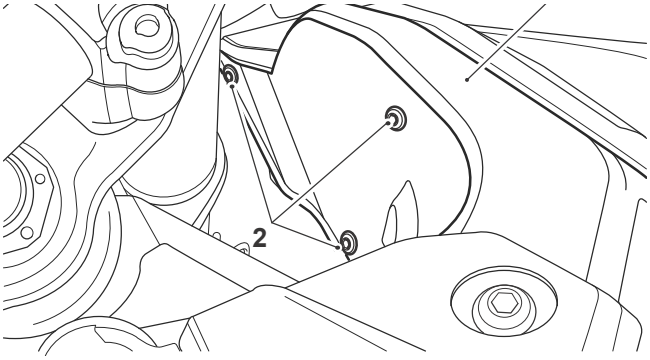
4. Repeat step 3 for the other infill panel.

Side Fairings - Removal

⚠ WARNING

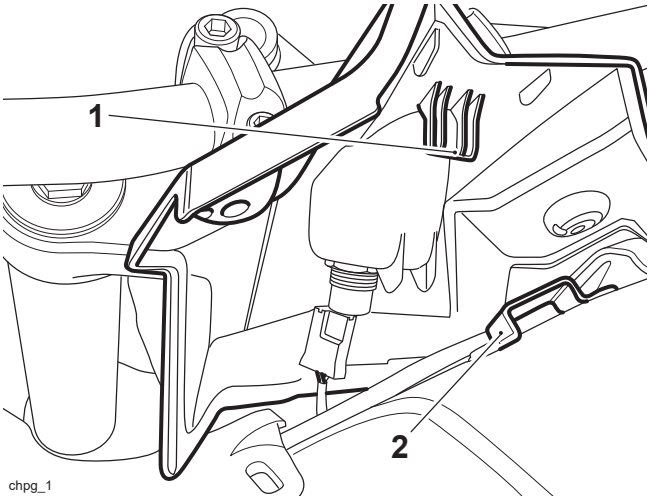
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Position the fuel tank infill panel to the fuel tank and tighten its fixings to **3 Nm**.



1. **Fuel tank infill panel (right hand shown)**
2. **Fixings**

2. Repeat step 1 for the other infill panel.
3. Connect the electrical connector to the auxiliary socket on the front panel.
4. Position the front panel onto the fuel tank, ensuring that its locating lug fits into its bracket on the fuel tank.



1. **Locating lug**
2. **Bracket**

5. Fit the fixings for the front panel and tighten them to **3 Nm**.

- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

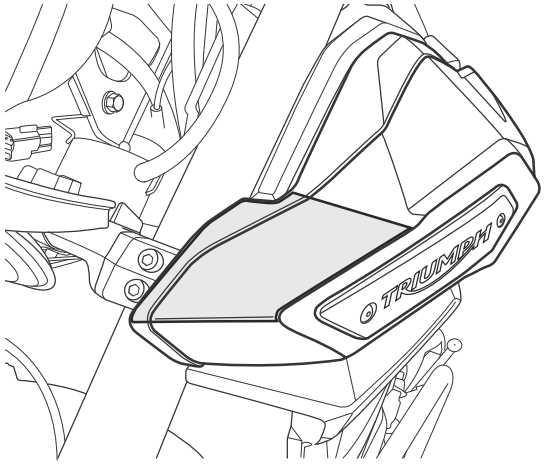
Side Fairings - Installation

⚠ 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.

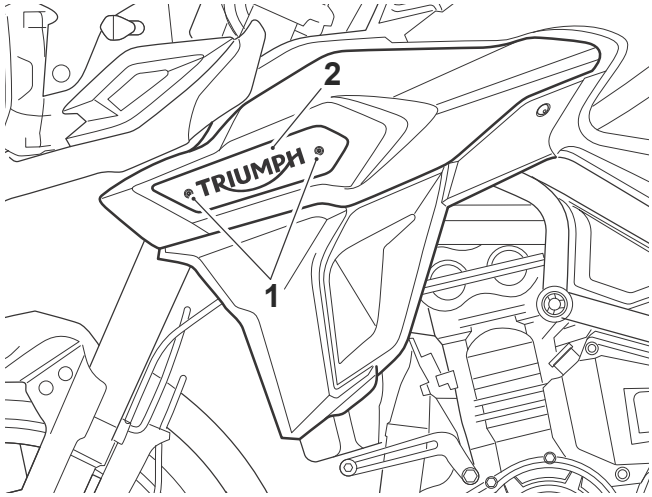
- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the fuel tank infill panels (see Fuel Tank Infill Panels - Removal).

1. Protect the side fairings from damage by applying masking tape to the area shown below.



Masked Area (Left Hand Side Fairing Shown with High Level Mudguard Removed for Clarity)

2. Remove the fixings and remove the badge from the side fairings.

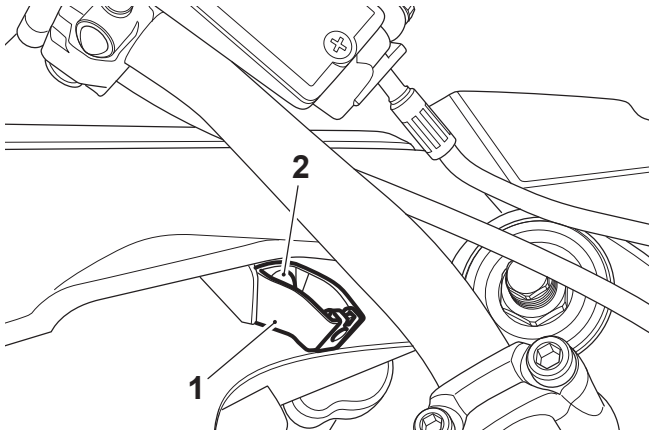


1. **Fixings**
2. **Badge (left hand shown)**

Note

- **Note the orientation of the mounting bracket for the fuel tank infill panels for installation.**

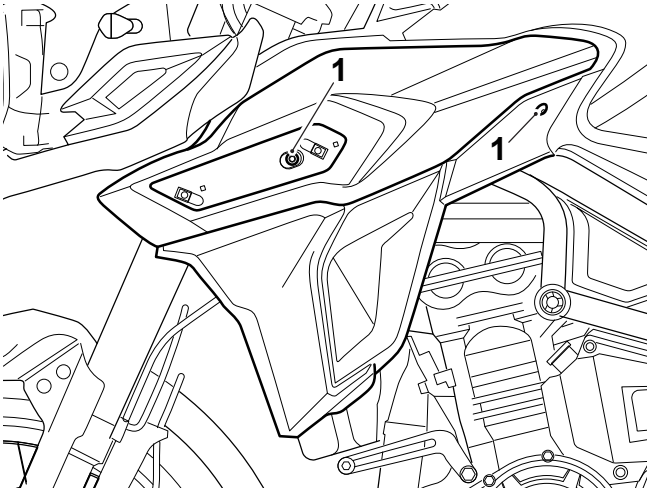
3. Release the fixing and remove mounting bracket for the fuel tank infill panel.



chpp

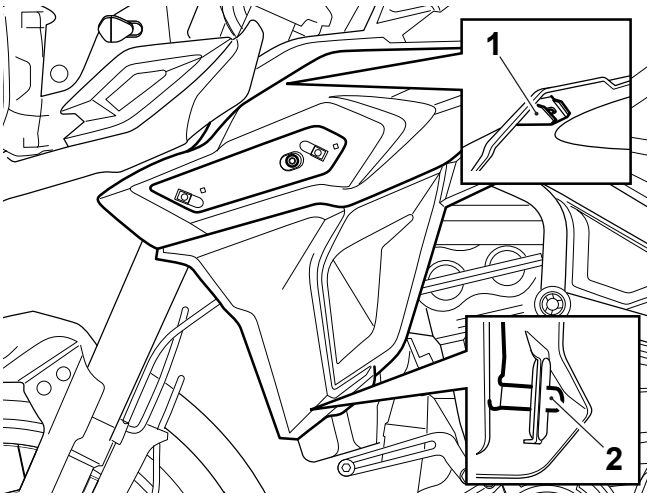
1. **Mounting bracket**
2. **Fixing**

4. Release the two fixings.



1. **Fixings**

5. Raise the upper edge of the side fairing to release its upper mounting from the fuel tank.
6. Release the side panel from the lower locating lug on the radiator and remove the side panel.



1. **Upper mounting**
2. **Lower locating lug**

Seat Infill Panel - Removal

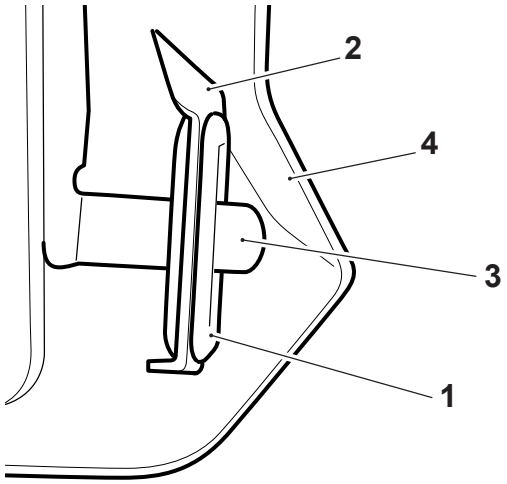
⚠ WARNING

Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it

WARNING

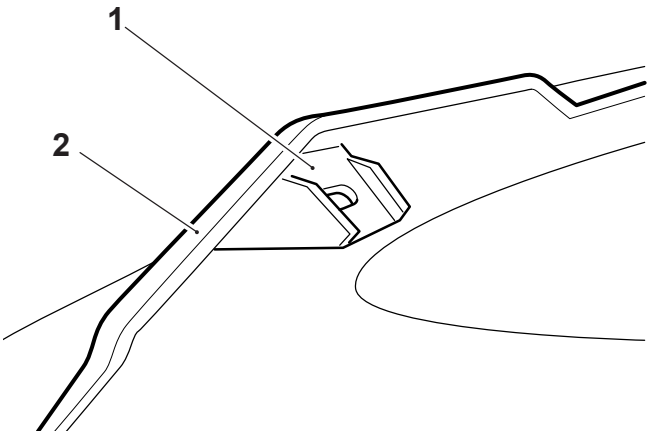
from falling and causing injury to the operator or damage to the motorcycle.

1. Ensure that the rubber grommet is fitted to its bracket on the lower fairing.
2. Align the slot with the rubber grommet in the lower fairing to its locating lug on the radiator mounting bracket.



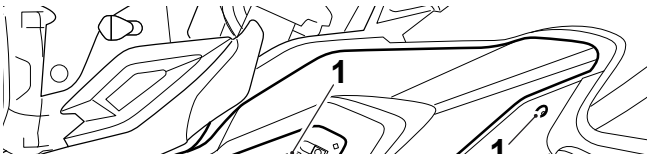
1. **Rubber grommet**
2. **Bracket**
3. **Locating lug**
4. **Lower fairing**

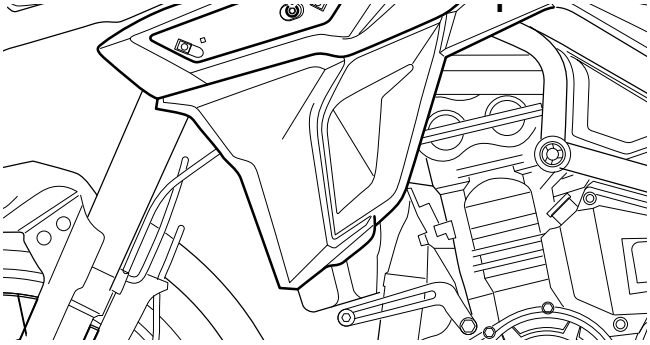
3. Position the upper fairing's mounting to its mounting bracket on the fuel tank.



1. **Mounting**
2. **Upper fairing**

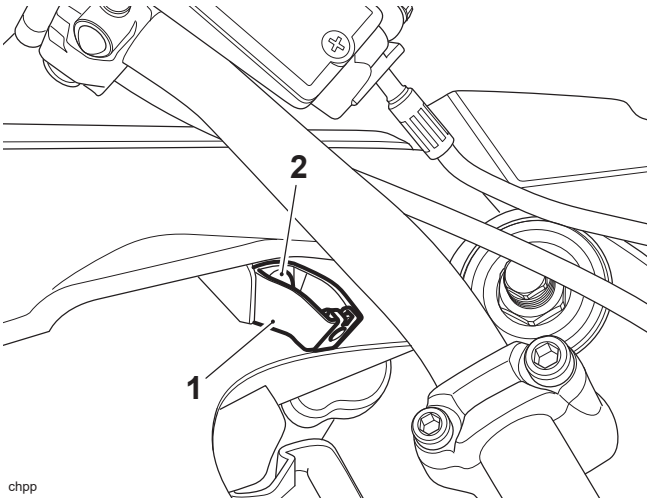
4. Fit the front and rear fixings and tighten to **3 Nm**.





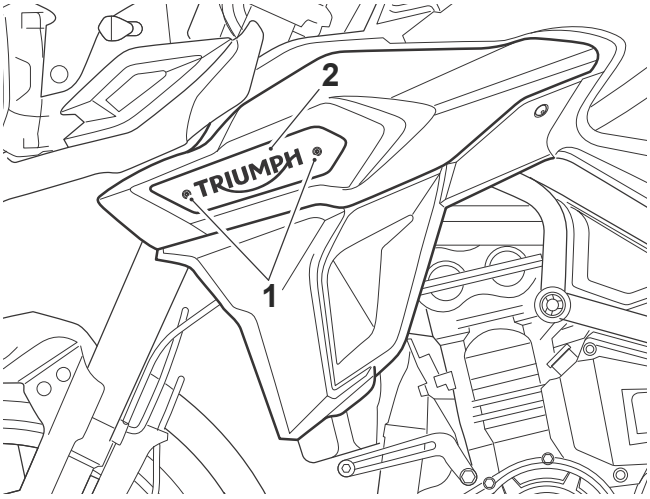
1. **Fixings**

5. Fit the mounting bracket for the fuel tank infill panel as noted for removal and tighten the fixing to **3 Nm**.



1. **Mounting bracket (left hand shown)**
2. **Fixing**

6. Fit the badge to the side fairing and tighten the fixings to **3 Nm**.



1. **Fixings**
2. **Badge (left hand shown)**

- Refit the fuel tank infill panels (see Fuel Tank Infill Panels - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

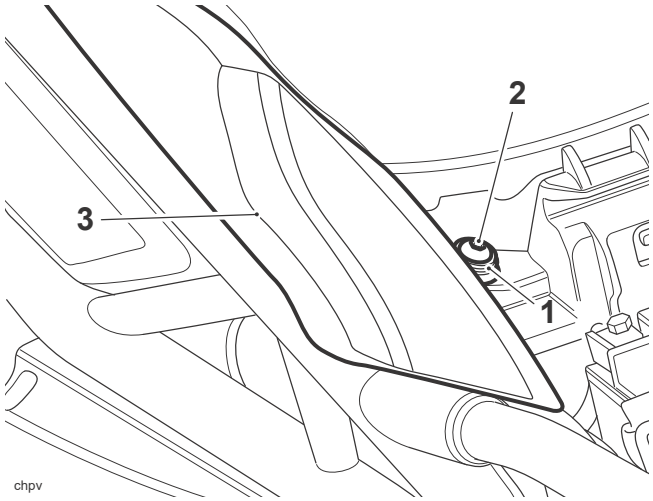
Seat Infill Panel - Installation

⚠ 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.

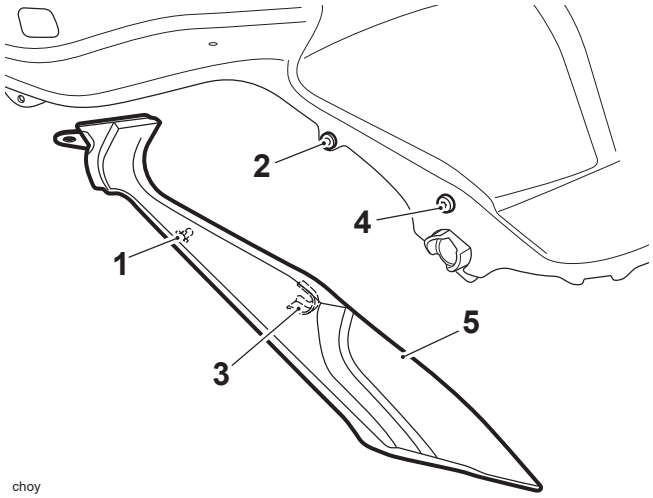
- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the side fairings (see Side Fairings - Removal).

1. Release the fixing securing the rear of the seat infill panel to the frame. Remove the flanged sleeve.



1. **Flanged sleeve**
2. **Fixing**
3. **Seat infill panel (left hand shown)**

2. Carefully pull the front of the infill panel away from the fuel tank to release its front locating lug from its rubber grommet on the fuel tank.
3. Slide the infill panel rearwards to release the centre locating lug from its mounting screw on the fuel tank and remove the panel.



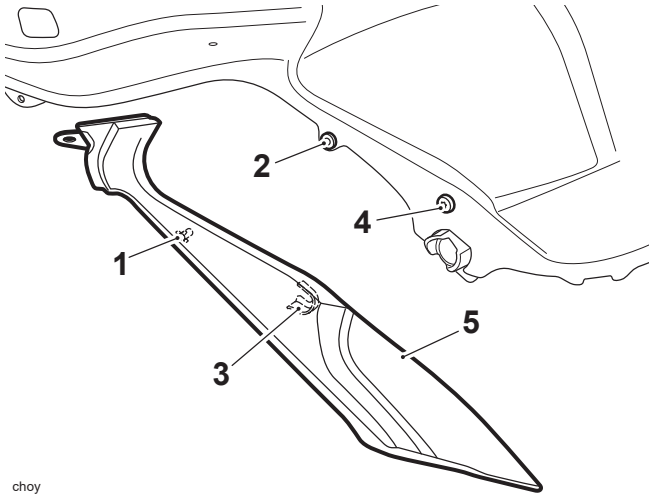
1. **Front locating lug**
2. **Rubber grommet**
3. **Centre locating lug**
4. **Mounting screw**
5. **Seat infill panel (left hand shown)**

Seat Bridge - Removal

⚠ WARNING

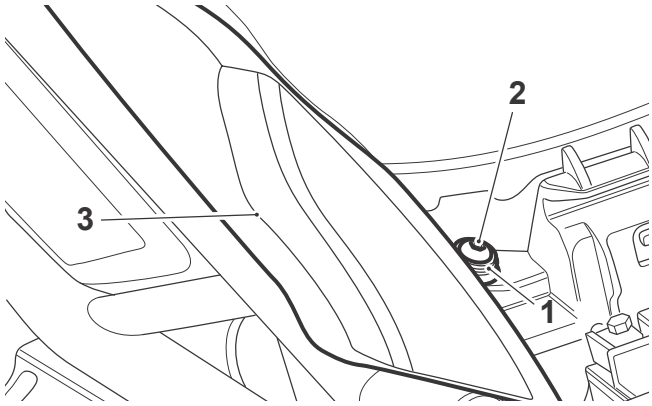
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Align the centre locating lug on the infill panel to the rear of its mounting screw on the fuel tank. Move the infill panel forward to fully engage the centre lug to the mounting screw.
2. Align the front locating lug to its rubber grommet on the fuel tank and push it fully in.



1. **Front locating lug**
2. **Rubber grommet**
3. **Centre locating lug**
4. **Mounting screw**
5. **Seat infill panel (left hand shown)**

3. Fit the flanged sleeve and fixing to the rear of the seat infill panel and tighten to **3 Nm**.



1. **Flanged sleeve**
2. **Fixing**
3. **Seat infill panel (left hand shown)**

- Fit the side fairings (see Side Fairings - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

Seat Bridge - Installation

⚠ 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.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the fuel tank (see Fuel Tank - Removal).

1. Detach the main fuse from the seat bridge.
2. Note the routing of the fuel drain hose and release it from its clips on the seat bridge.

⚠ CAUTION

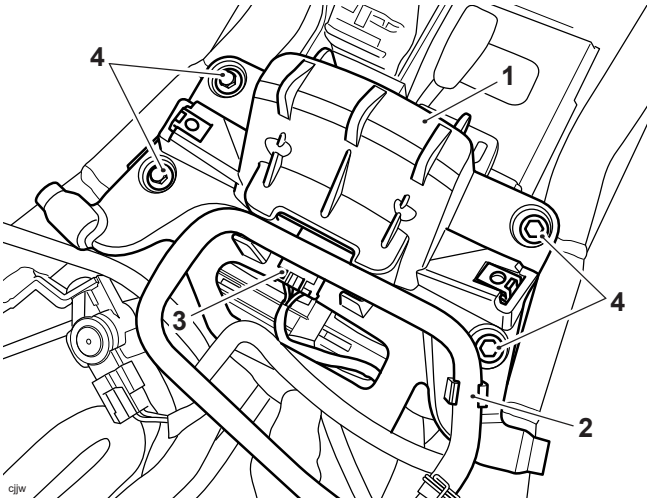
The Inertial Measurement Unit (IMU) located beneath the seat bridge is a highly sensitive device. Exposure to excessive shock and vibration can cause permanent damage to IMU internal components.

Care must be taken when removing or installing the seat bridge, not to expose the IMU to excessive shock or vibration. When releasing or tightening the fixings, use suitable hand tools only. Do not use air or battery powered tools.

When removed from the motorcycle, place the seat bridge and IMU assembly on a flat surface, in a location that is isolated from shock and vibrations caused by other workshop processes.

Do not drop the IMU. An IMU that has been dropped will be irreparably damaged and must be replaced.

3. Disconnect the multiplug for the Inertial Measurement Unit (IMU).
4. Using a suitable hand tool, remove the four fixings and remove the seat bridge and IMU assembly from the motorcycle.



1. **Rider’s seat front mounting**
2. **Fuel drain hose**
3. **Multiplug**
4. **Fixings**

5. Place the seat mounting and IMU assembly on a flat surface, in a location that is isolated from shock and vibrations caused by other workshop processes.

Sump Guard - 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.

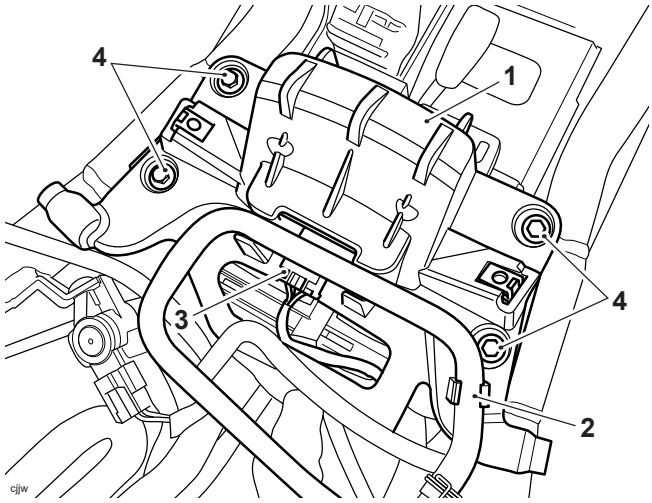
CAUTION

The Inertial Measurement Unit (IMU) located beneath the seat bridge is a highly sensitive device. Exposure to excessive shock and vibration can cause permanent damage to IMU internal components.

Care must be taken when removing or installing the seat bridge, not to expose the IMU to excessive shock or vibration. When releasing or tightening the fixings, use suitable hand tools only. Do not use air or battery powered tools.

Do not drop the IMU. An IMU that has been dropped will be irreparably damaged and must be replaced.

1. Position the seat bridge to the frame and secure with the four fixings. Using a suitable hand tool, tighten the fixings to **5 Nm**.
2. Reconnect the multiplug for the IMU.
3. Attach the fuel drain pipe to its clips on the seat bridge as noted during removal.



1. **Seat bridge**
2. **Fuel drain hose**
3. **Multiplug**
4. **Fixings**

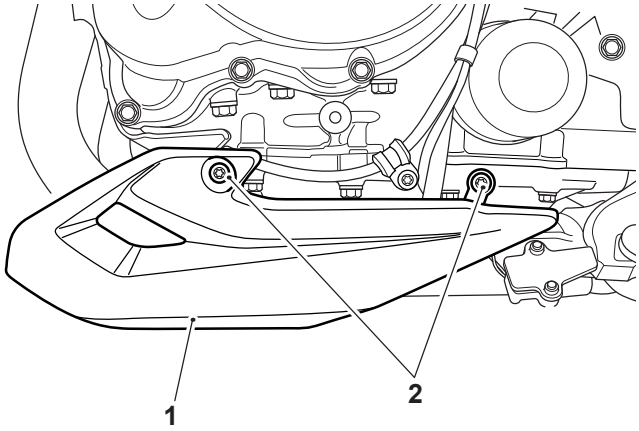
- Refit the fuel tank (see Fuel Tank - Installation).

Sump Guard - Installation

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 four fixings securing the sump guard to the engine and remove the sump guard.
2. Collect the flanged sleeves from the front fixings. Discard the front and rear fixings.



cjlq

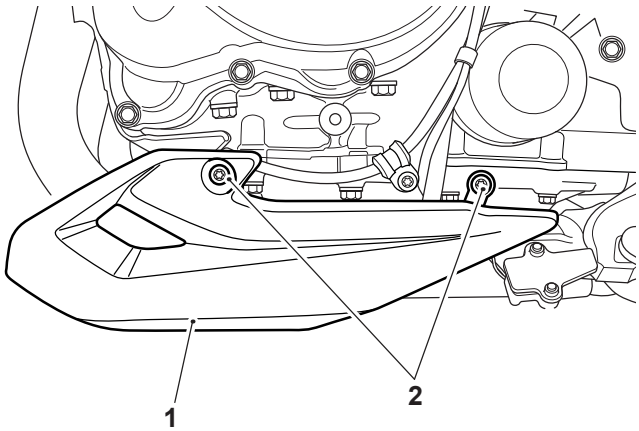
1. **Sump guard**
2. **Fixings (left hand shown)**

Engine Bars - 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. Align the sump guard assembly to the motorcycle, secure the front mountings with the top hats and two new fixings. Do not fully tighten at this stage.
2. Secure the rear mountings with two new fixings.
3. Tighten all fixings to **6 Nm**.



cjlq

1. **Fixings (left hand shown)**
2. **Sump guard**

Engine Bars - Installation

⚠ 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.

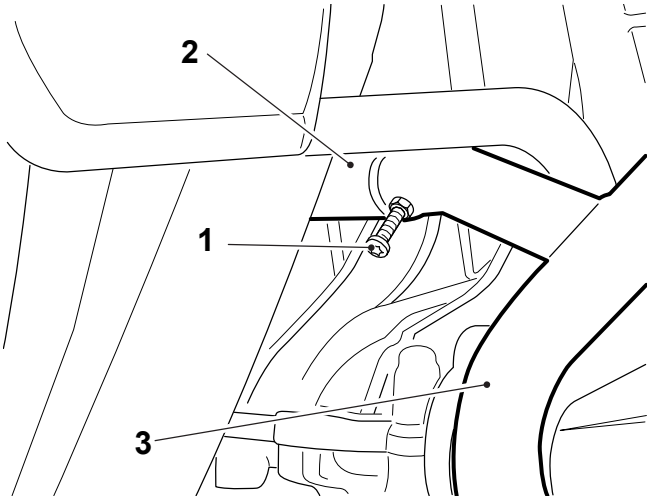
- Remove the rider's seat (see Rider's Seat - Removal).
- Remove the battery (see Battery Removal).

Note

- **If the right hand engine bar is to be removed, the left hand engine bar must be removed first. This will allow access to the lock nut for the lower crankcase mounting bolt.**

Left Hand Engine Bar

1. Release the fixing securing the link bar to the left hand engine bar.

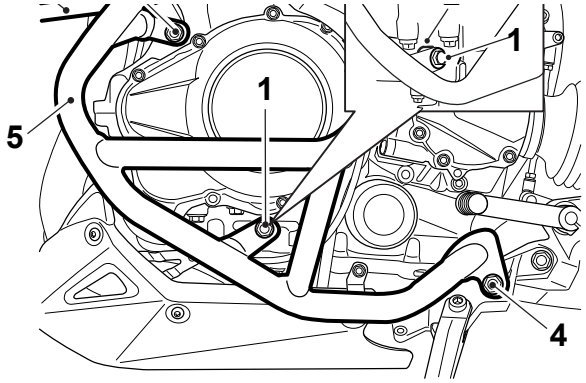


1. **Fixing**
2. **Link bar**
3. **Engine bar, left hand side**

Note

- **Note that there is a 25 mm spacer between the left hand engine bar's centre mounting and the engine for installation.**
- **Note that the radiator mounting bracket is positioned between the engine bar and the engine for installation.**

2. Release the three mounting bolts and remove the left hand engine bar. Collect the 25 mm spacer from the centre mounting.



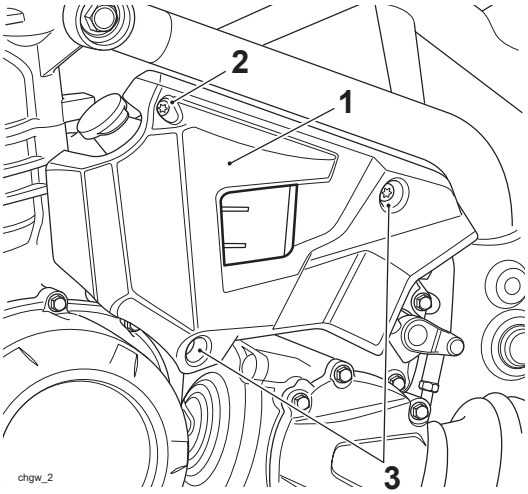
1. **Centre mounting bolt**
2. **Spacer, 25 mm**
3. **Upper mounting bolt**
4. **Side stand bolt**
5. **Engine bar, left hand side**
6. **Radiator mounting bracket**

Right Hand Engine Bar

Note

- **To access the lock nut for the lower crankcase mounting bolt, the left hand control plate must be removed.**

3. Remove the three fixings and remove the expansion tank cover. Discard the upper M5 fixing. Retain the lower M6 fixings for reuse.

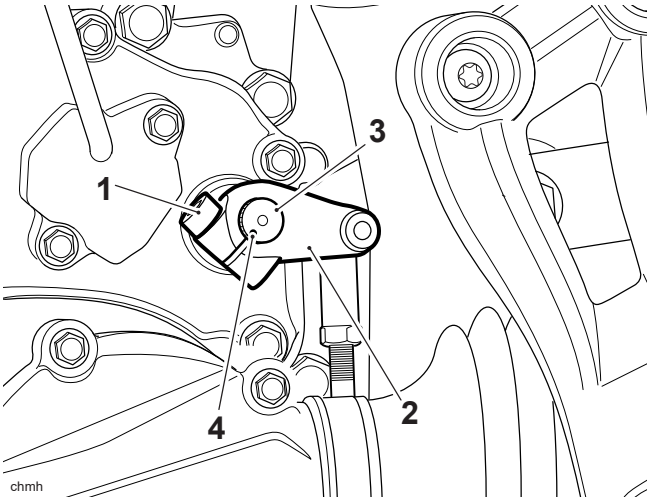


1. **Expansion tank cover**
2. **Upper fixings (M5)**
3. **Lower fixings (M6)**

Note

- **Note the position of the transmission linkage in relation to the punch mark on the gear change mechanism.**

4. Select neutral, remove the pinch bolt and disconnect the transmission linkage from the gear change mechanism.

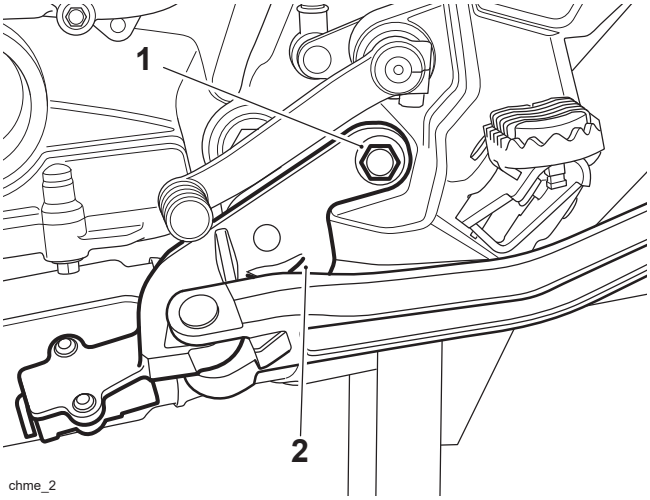


1. **Pinch bolt**
2. **Transmission linkage**
3. **Gear change mechanism**
4. **Punch mark**

Note

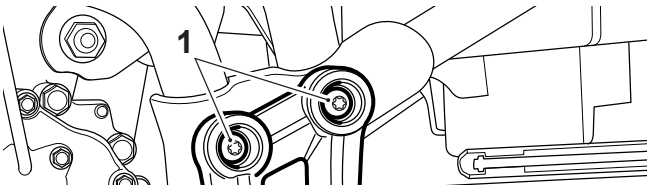
- **Do not allow the side stand to hang on the harness for the side stand switch.**
- **Note the routing of the harness for the side stand switch for installation.**

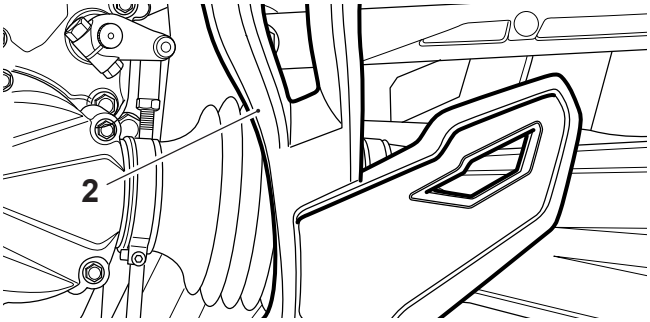
5. Release the remaining fixing, detach the side stand and position aside.



1. **Fixing**
2. **Side stand**

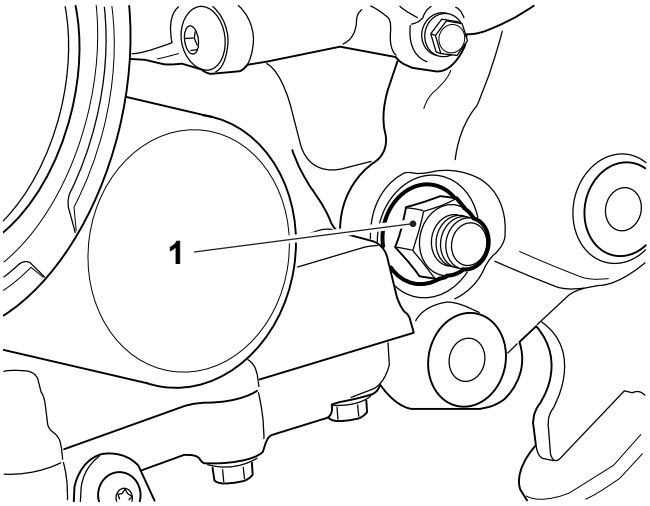
6. Release the fixings and remove the left hand control plate.





1. **Fixings**
2. **Control plate**

7. Remove and discard the lock nut for the lower crankcase mounting bolt.



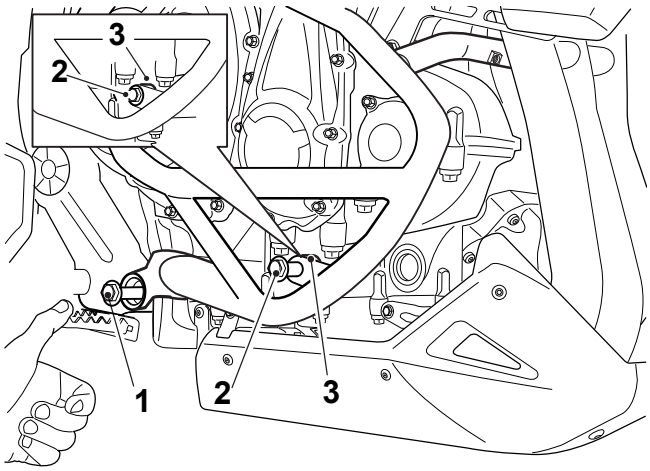
1. **Lock nut**

8. While holding down the rear brake pedal, remove the lower crankcase mounting bolt.

Note

- **Note that there is a 13 mm spacer between the right hand engine bar's centre mounting and the engine for installation.**

9. Remove the centre mounting bolt and collect the 13 mm spacer from the centre mounting.

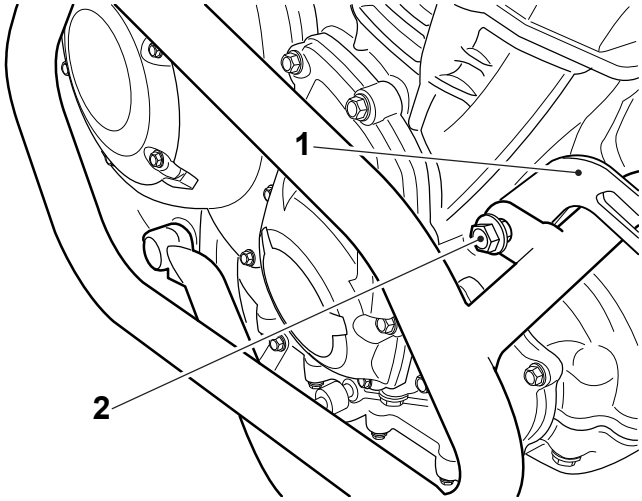


1. **Lower crankcase mounting bolt**
2. **Centre mounting bolt**
3. **Spacer, 13 mm**

Note

- **Note that the radiator mounting bracket is positioned between the engine bar and the engine for installation.**

10. Release the upper mounting bolt and remove the right hand engine bar and link bar assembly.



1. **Radiator mounting bracket**
2. **Upper mounting bolt**

Pannier Mounting Frames - 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.

Right Hand Engine Bar

WARNING

During installation of the right hand engine bar it is necessary to loosen various engine to frame and rear suspension mounting fixings. The engine to frame alignment must then be reset using T3880637 - Kit, Engine to Frame Alignment Bars and the mounting fixings re-tightened in a specific sequence. Failure to follow these instructions precisely will affect handling, stability and other aspects of the motorcycle's operation which may result in loss of motorcycle control and an accident.

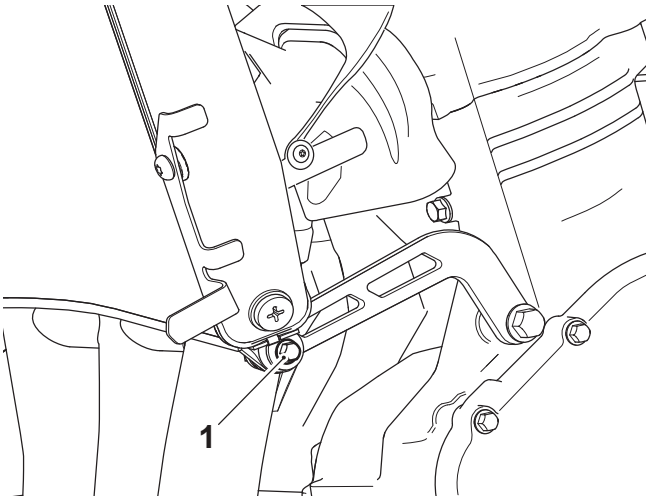
- Remove the side fairings (see Side Fairings - Removal).
- Remove the sump guard (see Sump Guard - Removal).

1. Raise and securely support the motorcycle.
2. Place a support beneath the engine and ensure the frame is adequately and securely supported.

Note

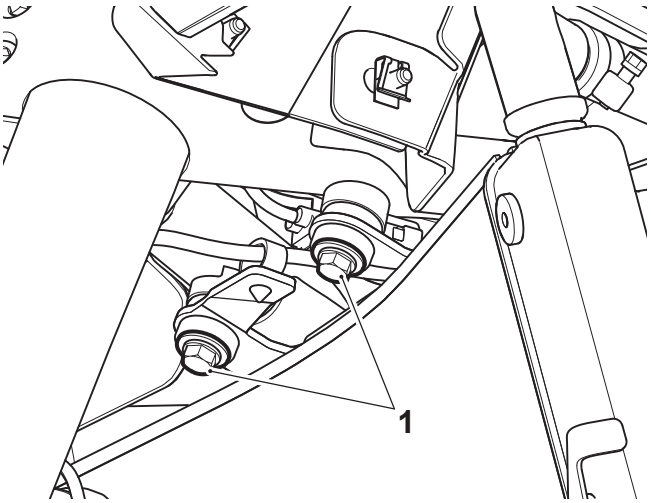
- **It is necessary to loosen the radiator so that it can be positioned to allow access to the front cylinder head mountings and lock nuts.**

3. Remove the two fixings securing the radiator to the lower radiator brackets. Discard the lock nuts.



1. Fixing (left hand side shown)

4. Loosen the two upper fixings securing the radiator to the frame. Do not fully remove.



1. Fixings

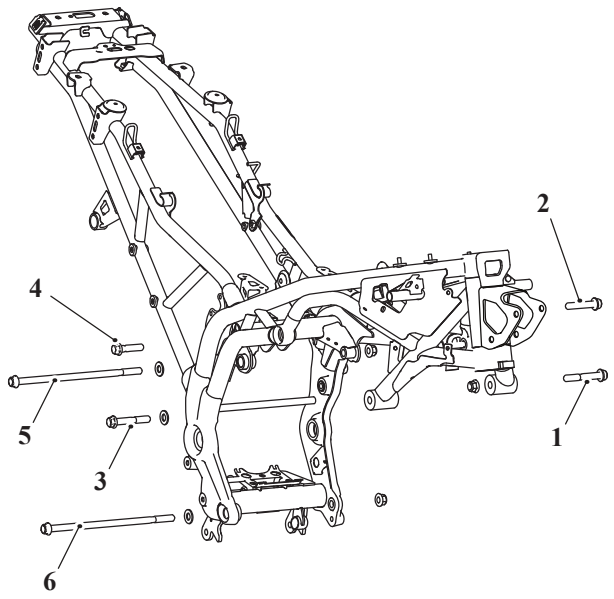
5. Position the lower end of the radiator forwards to allow access to the front cylinder head frame mountings.

⚠ CAUTION

Care must be taken not to damage the radiator when working on the front frame mountings.

Damaged radiator fins can impair the radiator's efficiency leading to overheating and consequent engine damage.

Frame Bolts Exploded View



1. **Left hand front cylinder head bolt**
2. **Left hand rear cylinder head bolt**
3. **Right hand front cylinder head bolt**
4. **Right hand rear cylinder head bolt**
5. **Upper crankcase bolt**
6. **Lower crankcase bolt**

Note

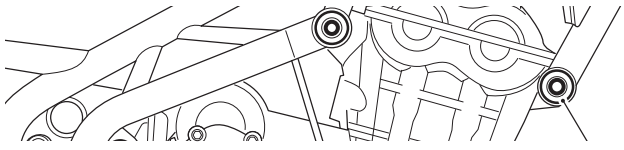
- **Make sure the engine is still adequately supported.**

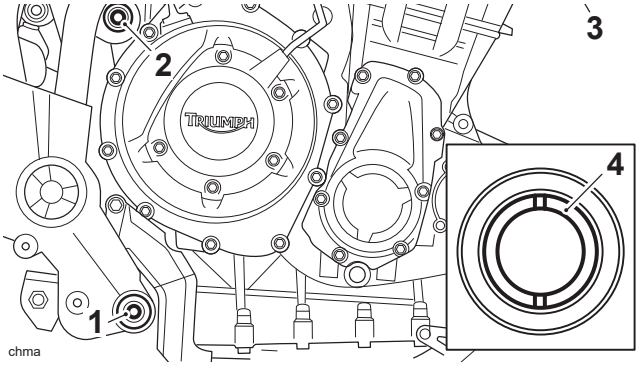
6. Remove and discard the lock nuts from the front cylinder head bolts.
7. Loosen the rear cylinder head bolts. Do not fully remove.
8. Remove the upper crankcase mounting bolt, washer and lock nut. Discard the lock nut.
9. Remove the bolt and washer from the right hand front cylinder head mounting.

Note

- **There are three frame adjuster sleeves for this model. They are located as follows:**
- **Two of the frame adjuster sleeves are located on the right hand side of the frame.**
- **The third frame adjuster sleeve is located in the front right hand mounting of the cylinder head.**

10. Using T3880377 - Engine Mounting Adjuster, loosen the frame adjuster sleeves.



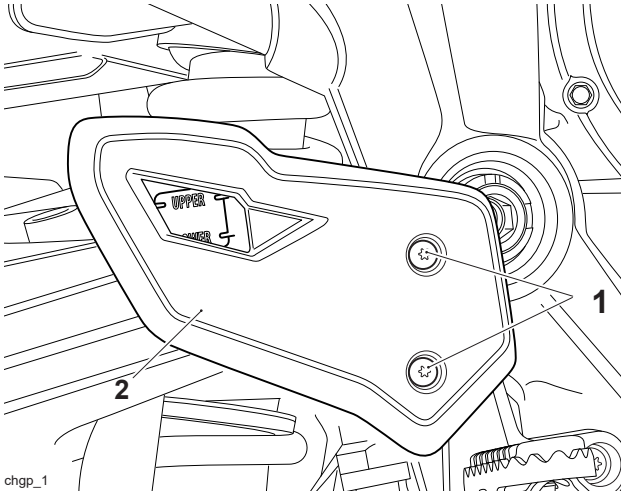


1. **Lower crankcase adjuster**
2. **Upper crankcase adjuster**
3. **Cylinder head front right hand adjuster**
4. **Adjuster**

Note

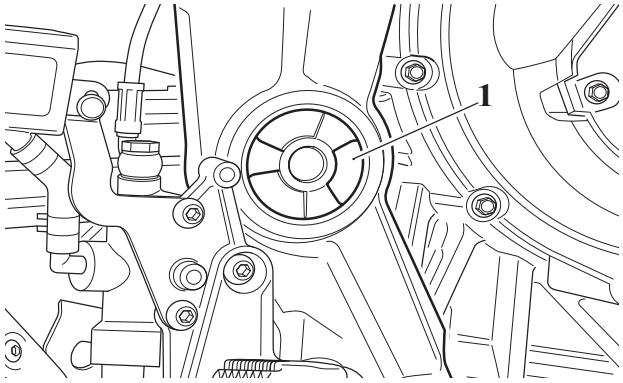
- **The right hand swinging arm pivot pin must be loosened before the frame bolts can be tightened.**
-

11. Release the fixings and remove the right hand heel guard.



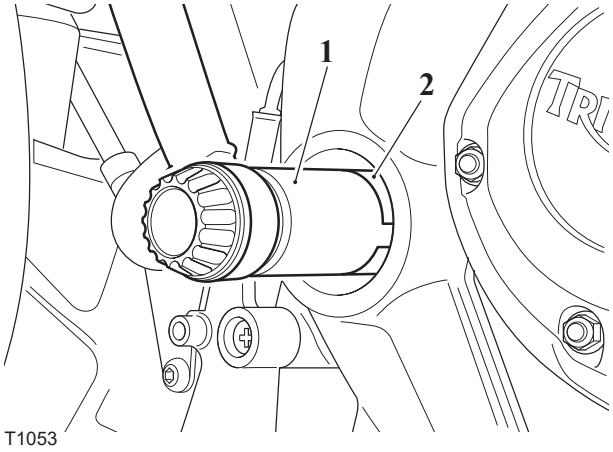
1. **Fixings**
2. **Heel guard**

12. Carefully remove the cover from the right hand swinging arm pivot pin.



1. **Cover**

13. Using T3880062 - Lock Ring Wrench, 38 mm, remove the locking ring from the right hand swinging arm pivot pin.



1. **T3880062 - Lock Ring Wrench, 38 mm**
2. **Locking ring**

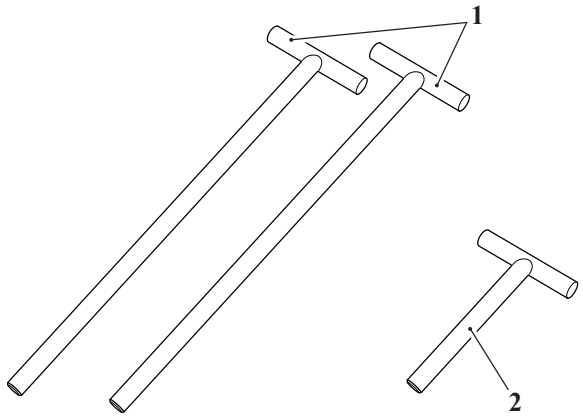
14. Loosen the right hand swinging arm pivot pin but do not fully remove.

CAUTION

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

Note

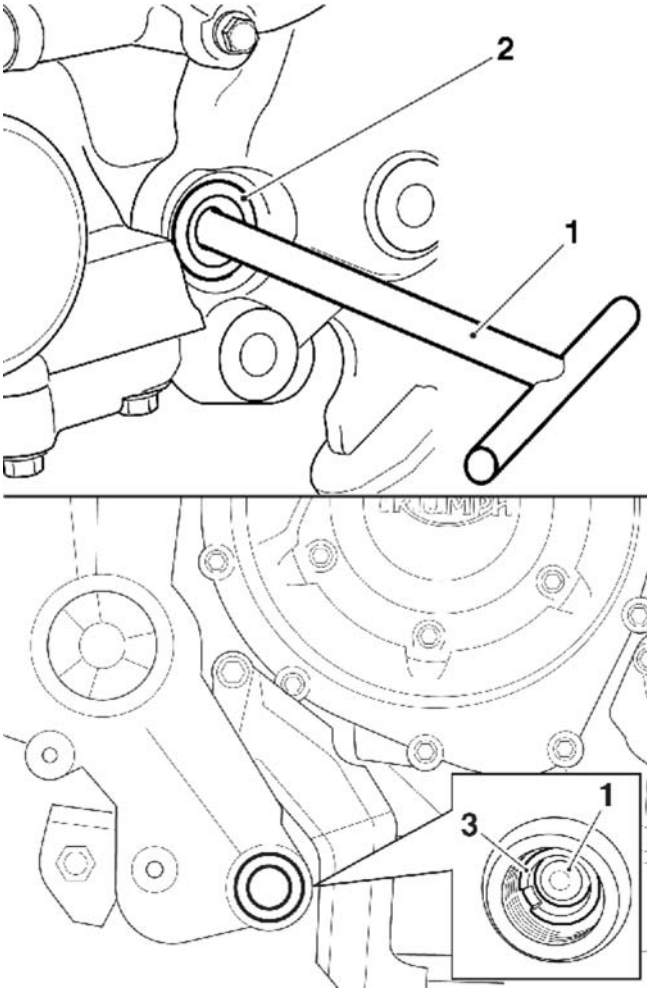
- **The engine MUST be cold prior to starting the frame bolt tightening sequence.**
- **The T3880637 - Kit, Engine to Frame Alignment Bars is required to correctly align the engine to the frame for the following tightening sequence.**
- **Adjust the engine position as necessary to allow the engine to frame alignment bars to be inserted and removed freely.**



T3880637 - Kit, Engine to Frame Alignment Bars

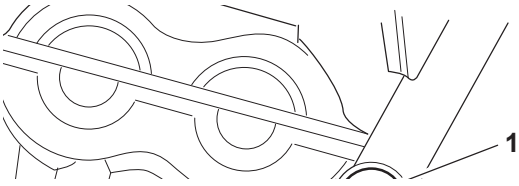
1. **Crankcase alignment bars**
2. **Cylinder head alignment bar**

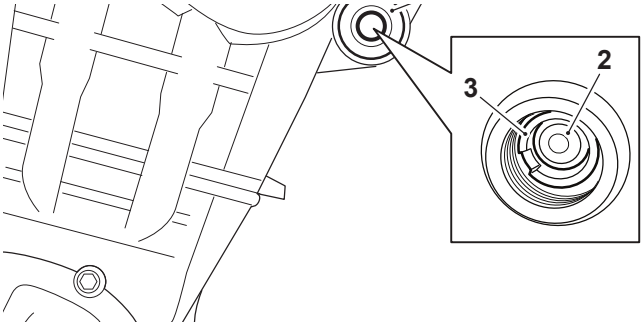
15. Insert the crankcase alignment bars into the upper and lower crankcase mountings from the left hand side of the frame. Ensure the alignment bars are located through the engine and into the crankcase adjusters on the right hand side of the frame. Allow enough clearance on the right hand side of the frame to enable the threaded adjusters to be adjusted.



1. **Crankcase alignment bar**
2. **Frame to crankcase mounting (lower mounting shown - left hand side of frame)**
3. **Crankcase adjuster (lower mounting shown - right hand side of frame)**

16. Fit the cylinder head alignment bar into the left hand side of the right hand front cylinder head mounting point. Allow enough clearance on the right hand side of the frame to enable the threaded adjuster to be adjusted.





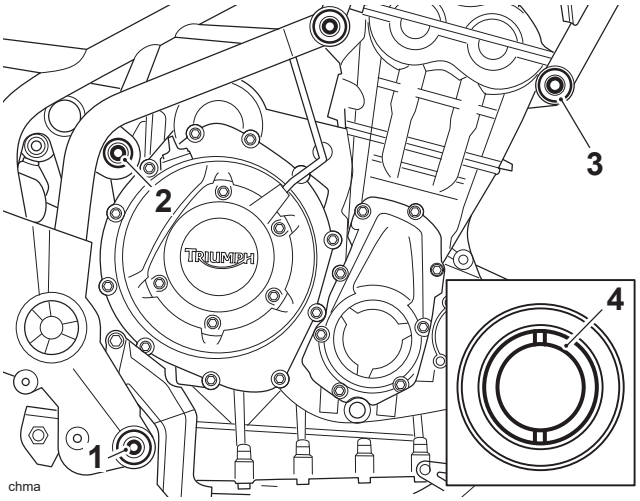
1. **Right hand front cylinder head mounting point**
2. **Cylinder head alignment bar (end of bar shown)**
3. **Cylinder head adjuster**

17. Fit a new lock nut to the left hand front cylinder head bolt and tighten to **24 Nm**.
18. Tighten the left hand rear cylinder head bolt to **85 Nm**.

Note

- **If, after tightening each adjuster and frame fixing, any of the engine to frame alignment bars and frame fixings cannot be removed and inserted freely, check that the engine is still adequately supported, loosen all tightened adjusters and frame fixings and restart the tightening sequence from step 17.**

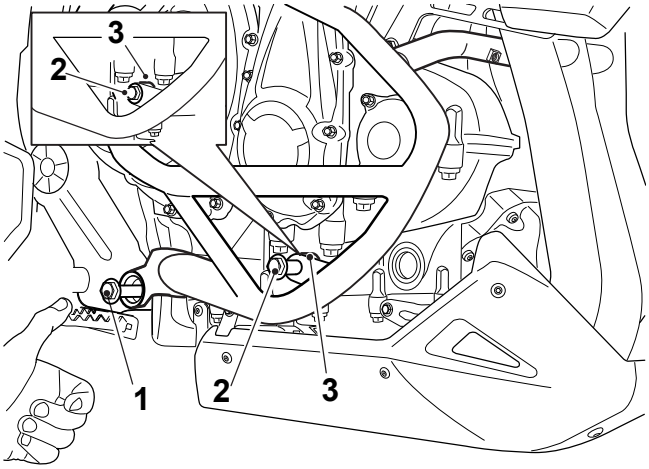
19. Using T3880377 - Engine Mounting Adjuster, tighten the three adjusters in the following sequence.
    - Tighten the lower crankcase adjuster to **5 Nm**.
    - Tighten the upper crankcase adjuster to **5 Nm**.
    - Tighten the right hand front cylinder head adjuster to **3 Nm**.



1. **Lower crankcase adjuster**
2. **Upper crankcase adjuster**
3. **Right hand front cylinder head adjuster**
4. **Adjuster**

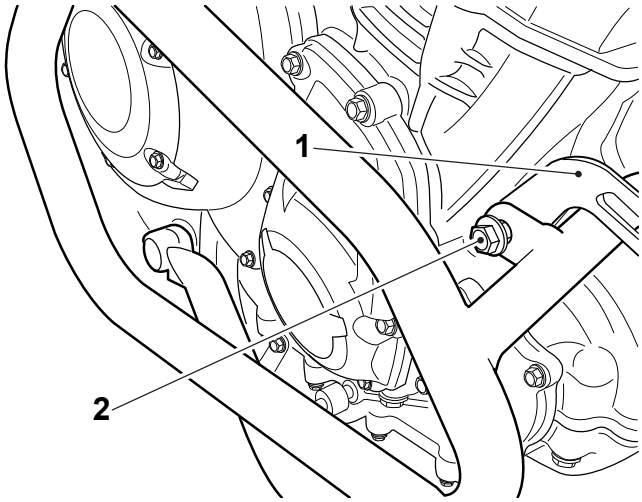
20. Remove the upper crankcase alignment bar and fit the upper crankcase bolt and washer from the right hand side. Holding the bolt to prevent rotation, fit a new lock nut and tighten to **100 Nm**.
21. Align the right hand engine protection bar and link bar assembly to the engine.
22. Remove the lower crankcase alignment bar and fit the lower crankcase mounting bolt through the rear mounting of the engine protection bar, frame and lower crankcase. Loosely fit a new locknut.
23. Position the 13 mm spacer between the centre mounting and the engine as noted for removal. Fit the M8 x

33 mm bolt, do not fully tighten at this stage.



1. **Lower crankcase mounting bolt**
2. **Bolt, M8 x 33 mm**
3. **Spacer, 13 mm**

24. Ensure that the radiator mounting bracket is located between the upper mounting for the engine protection bar and the engine as noted for removal. Fit an M8 x 25 mm bolt, do not fully tighten at this stage.



1. **Radiator mounting bracket**
2. **Bolt, M8 x 25 mm**

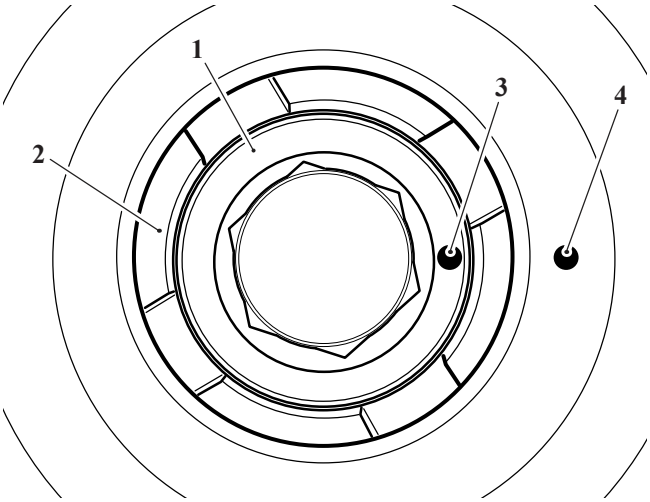
25. Holding the lower crankcase mounting bolt to prevent rotation, tighten the locknut to **100 Nm**.
26. Tighten the remaining frame bolts in the following sequence:
    - Tighten the right hand rear cylinder head bolt to **85 Nm**.
    - Tighten the left hand front cylinder head bolt to **115 Nm**.
    - Using T3880377 - Engine Mounting Adjuster, re-tighten the right hand front cylinder head adjuster to **3 Nm**.
    - Remove the cylinder head alignment bar from the right hand front cylinder head mounting and fit the bolt and washer. Fit a new locknut and tighten to **100 Nm**.
27. Tighten the right hand engine protection bar centre mounting bolt to **18 Nm**.
28. Tighten the right hand engine protection bar upper mounting bolt to **18 Nm**.
29. Tighten the swinging arm right hand pivot pin to **45 Nm**.

CAUTION

If the right hand pivot pin moves during the tightening of the locking ring, both the locking ring and pivot pin must be loosened and re-tightened as described in steps 29 to 33 of this procedure.

Failure to tighten the swinging arm pivot pin and locking ring correctly may lead to severe frame damage.

30. Lubricate the threads of the locking ring with a smear of proprietary high temperature copper-based grease.
31. Fit the locking ring to the swinging arm right hand pivot pin.
32. Using a non permanent marker, temporarily mark the pivot pin alignment in relation to the frame.

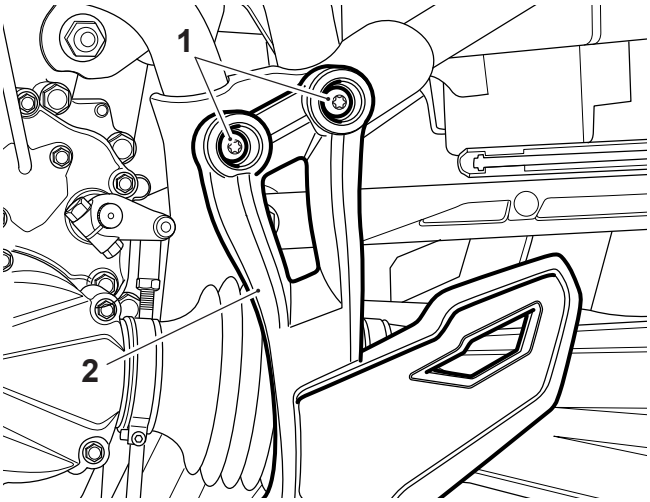


1. **Swinging arm pivot pin**
2. **Locking ring**
3. **Pivot pin alignment mark**
4. **Frame alignment mark**

Note

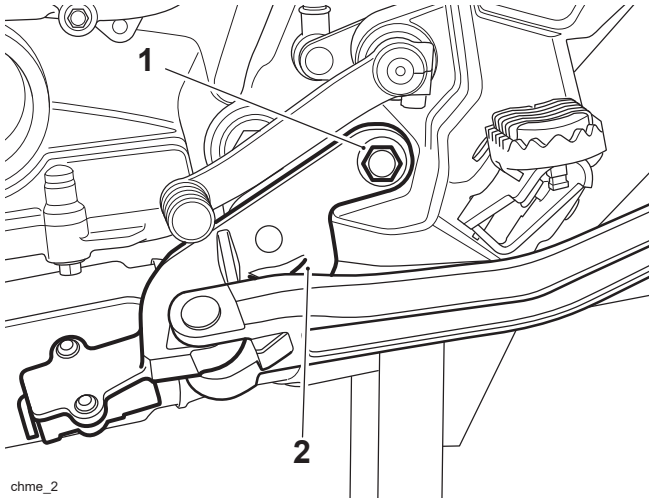
- **If the pivot pin and frame markings do not align after final tightening of the locking ring, loosen the locking ring and right hand pivot pin and repeat steps 29 to 33 of this procedure.**

33. Using T3880062 - Lock Ring Wrench, 38 mm, tighten the locking ring to **110 Nm**.
34. Refit the cover to the swinging arm right hand pivot pin.
35. Refit the right hand heel guard and tighten its fixings to **7 Nm**.
36. Align the left hand control plate to the frame and fit the two upper fixings. Do not fully tighten at this stage.



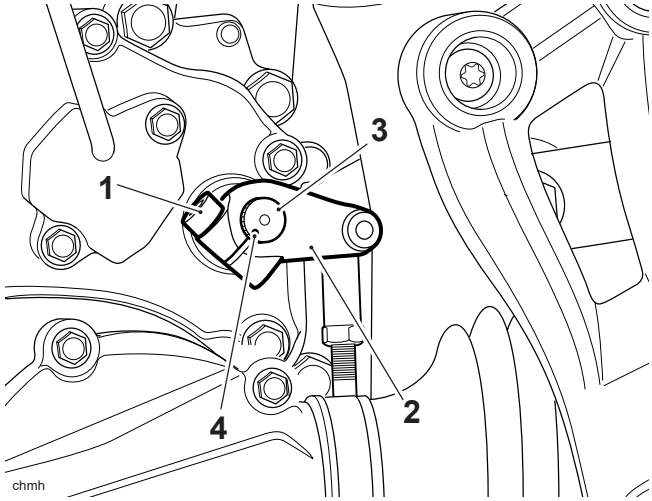
1. **Fixings**
2. **Control plate**

37. Route the harness for the side stand switch as noted for removal.
38. Align the side stand to the frame and fit its rear fixing only. Do not fully tighten at this stage.



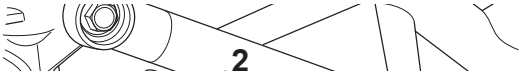
1. **Rear fixing**
2. **Side stand**

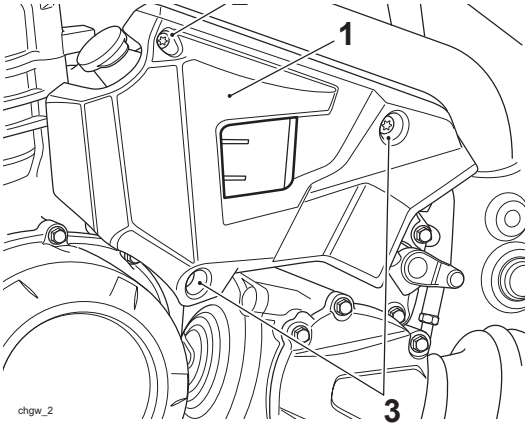
39. Tighten the upper fixings for the left hand control plate to **18 Nm**.
40. Fit the transmission linkage to the gear change mechanism as noted for removal.
41. Fit the pinch bolt and tighten it to **9 Nm**.



1. **Pinch bolt**
2. **Transmission linkage**
3. **Gear change mechanism**
4. **Punch mark**

42. Refit the expansion tank cover. Secure the upper mounting with a new M5 encapsulated fixing. Secure the lower mounting with the two original fixings. Tighten the upper fixing to **3 Nm** and the lower fixings to **4 Nm**.



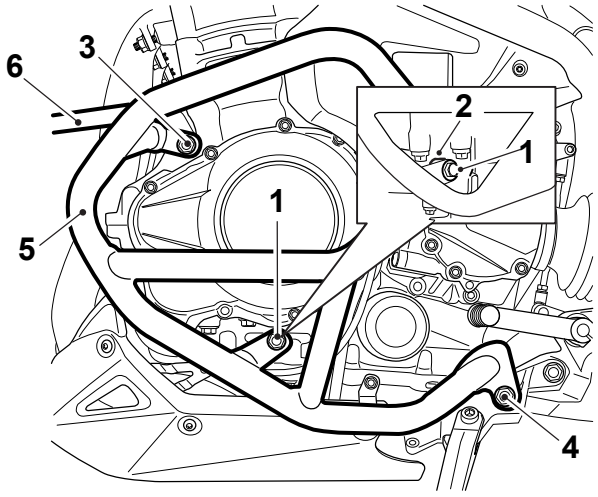


1. **Expansion tank cover**
2. **Upper fixing (M5)**
3. **Lower fixings (M6)**

43. Refit the two fixings securing the radiator to the lower radiator brackets and secure with new lock nuts. Tighten to **9 Nm**.
44. Tighten the radiator upper fixings to **9 Nm**.
45. Remove the support from beneath the engine.
46. Refit the sump guard (see Sump Guard - Installation).
47. Refit the side fairings (see Side Fairings - Installation).

Left Hand Engine Bar

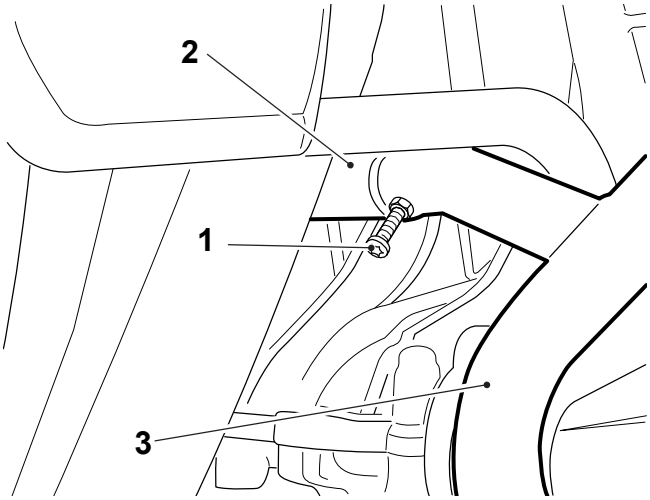
48. Align the left hand engine bar to the link bar and engine.
49. Ensure that the radiator mounting bracket is between the upper mounting for the engine bar and the engine. Fit the M8 x 25 mm bolt, do not fully tighten at this stage.
50. Position the 25 mm spacer between the centre mounting and the engine as noted for removal. Fit the M8 x 45 mm bolt, do not fully tighten at this stage.
51. Fit the side stand bolt to the lower mounting for the engine bar. Do not fully tighten at this stage.



1. **Bolt, M8 x 45 mm**
2. **Spacer, 25 mm**
3. **Bolt, M8 x 25 mm**

4. **Side stand bolt**
5. **Engine bar, left hand**
6. **Radiator mounting bracket**

52. Refit the fixing securing the left hand engine bar to the link bar. Do not fully tighten at this stage.



1. **Fixing**
2. **Link bar**
3. **Engine bar, left hand side**

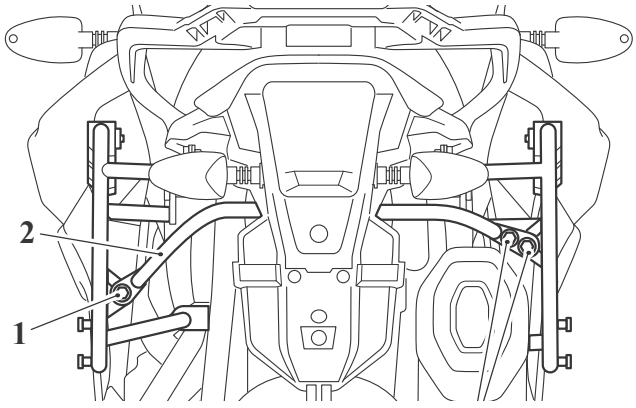
53. Loosen the fixing securing the right hand engine bar to the link bar.
54. Tighten the side stand bolts to **70 Nm**.
55. Tighten the engine bar upper mounting bolt to **18 Nm**.
56. Tighten the engine bar centre mounting bolt to **18 Nm**.
57. Position the link bar equally between the left hand and right hand engine bars. Tighten the fixings to **5 Nm**.
58. Lower the motorcycle and park on the side stand.

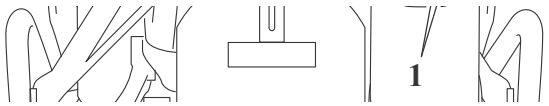
Pannier Mounting Frames - Installation

⚠ 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.

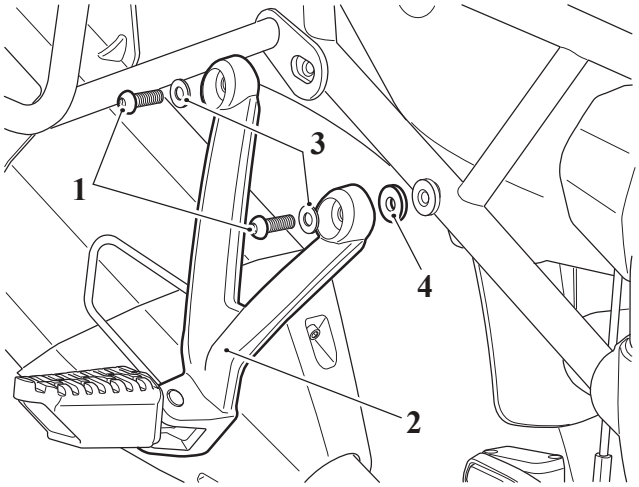
1. If fitted, remove the panniers as described in the Owner's Handbook.
2. Remove the three fixings and remove the pannier link bar.





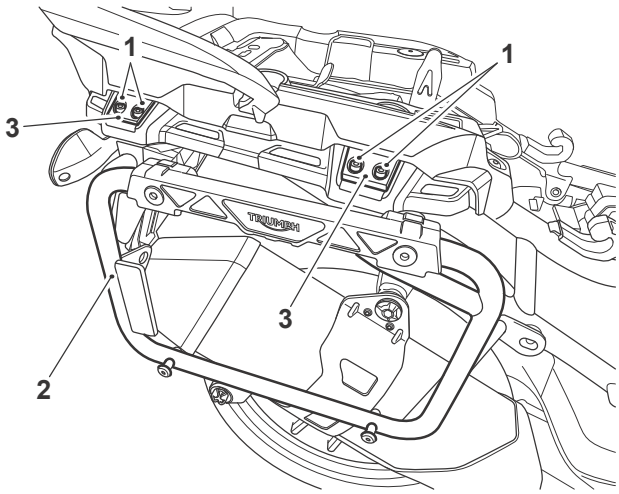
1. **Fixings**
2. **Pannier link bar**

3. Noting the position of the spacer, remove the fixings and washers and remove the right hand rear footrest hanger. Collect the spacer from the front fixing.



1. **Fixings**
2. **Rear footrest hanger (right hand shown)**
3. **Washers**
4. **Spacer**

4. Repeat step 3 for the left hand side.
5. Remove the four fixings and remove the right hand pannier mounting frame.
6. Repeat step 5 for the left hand side.
7. If required remove the pannier mounting frame’s upper clamps from the motorcycle.



1. **Fixings**
2. **Pannier mounting frame (right hand shown)**

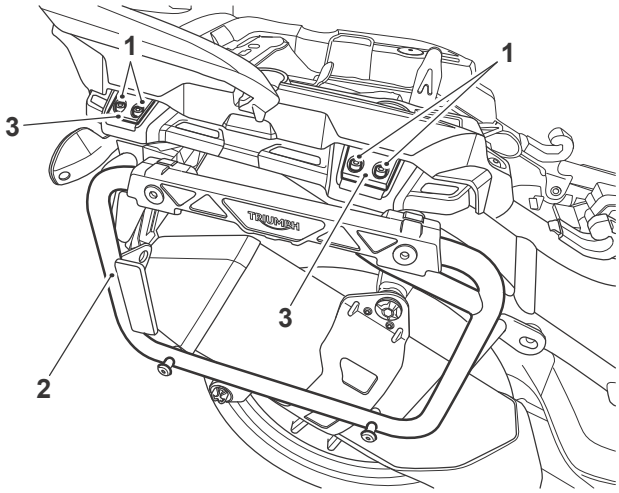
3. **Upper clamps**

Pannier Rails - Removal

WARNING

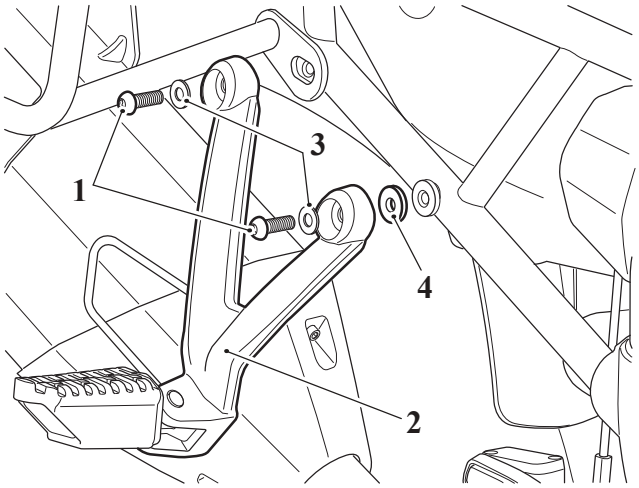
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. If removed, fit the pannier mounting frame's upper clamps to the motorcycle.
2. Position the right hand pannier mounting frame to the motorcycle and secure with the four fixings. Do not tighten the fixings at this stage.



1. **Fixings**
2. **Pannier mounting frame (right hand shown)**
3. **Upper clamps**

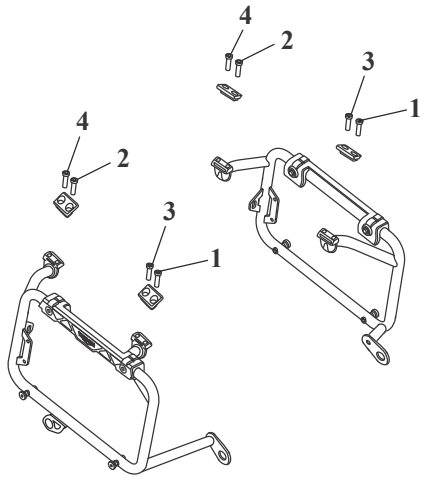
3. Repeat step 2 for the left hand side.
4. Fit the right hand rear footrest hanger and spacer to the motorcycle as noted during removal and secure with the two fixings and washers. Do not tighten the fixings at this stage.



1. **Fixings**

2. **Rear footrest hanger (right hand shown)**
3. **Washers**
4. **Spacer**

5. Repeat step 4 for the left hand side.
6. Tighten the pannier mounting frame fixings in the following sequence:
   - Tighten the fixings in the sequence shown below to **12 Nm**.
   - Tighten fixing 1 again to **12 Nm**.



Pannier Frame Tightening Sequence

7. Tighten the rear foot rest hanger fixings to **27 Nm**.
8. Position the pannier link bar to the pannier mounting frames and secure with the three fixings.
9. While holding the lock nuts to prevent rotation, tighten the two right hand pannier link bar fixings to **20 Nm**.
10. While holding the lock nut to prevent rotation, tighten the left hand pannier link fixing to **20 Nm**.
11. If fitted, fit the panniers as described in the Owner's Handbook.

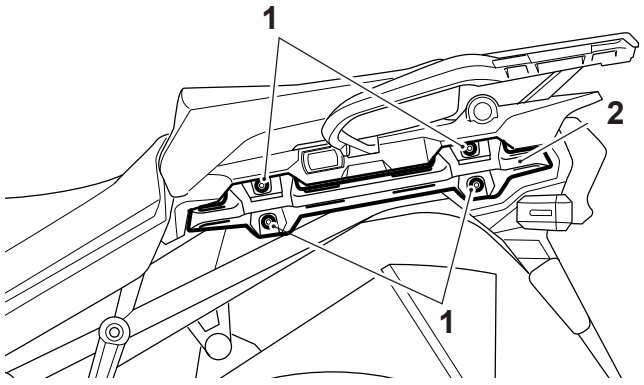
Pannier Rails - Installation

⚠ 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.

- If fitted, remove the pannier mounting frames (see Pannier Mounting Frames - Removal).

1. Remove the fixings and their washers then remove the pannier rail.



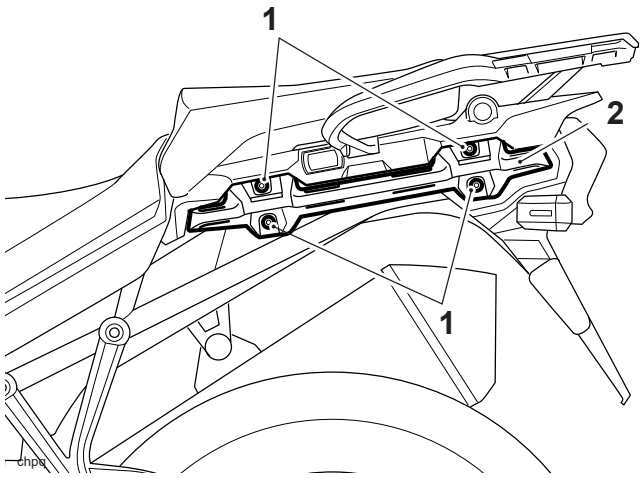
1. **Fixings**
2. **Pannier rail**

Luggage Rack - 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. Align the pannier rail to the frame.
2. Fit the fixings with their washers and tighten to **27 Nm**.



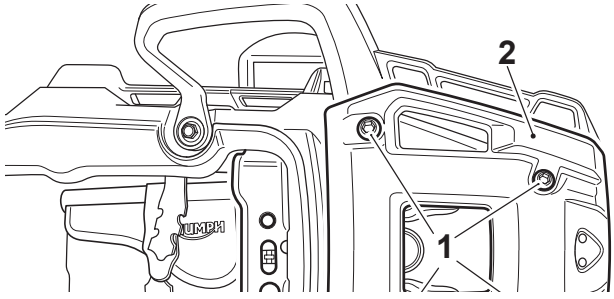
1. **Fixings**
2. **Pannier rail**

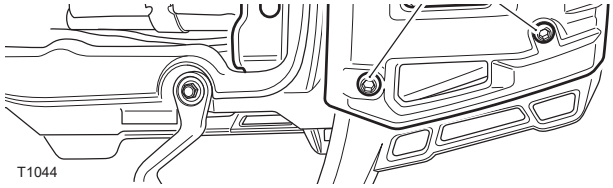
- If fitted, fit the pannier mounting frames (see Pannier Mounting Frames - Installation).

⚠ 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.

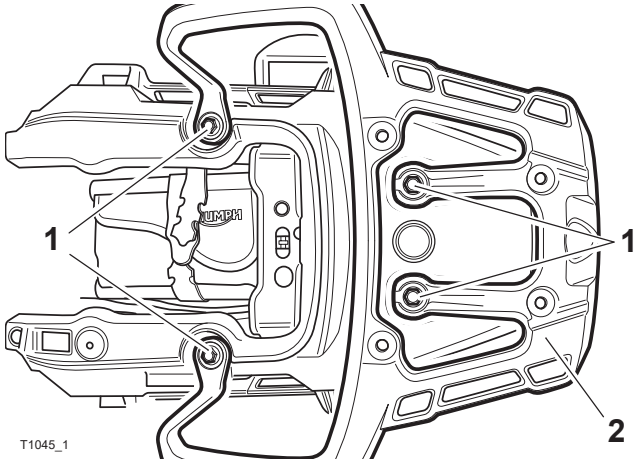
1. Remove the passenger seat (see Passenger Seat - Removal).
2. Remove the four bolts and lock nuts and remove the luggage rack cover. Discard the lock nuts.





1. **Fixings**
2. **Rack cover**

3. Release the four fixings and remove the luggage rack.



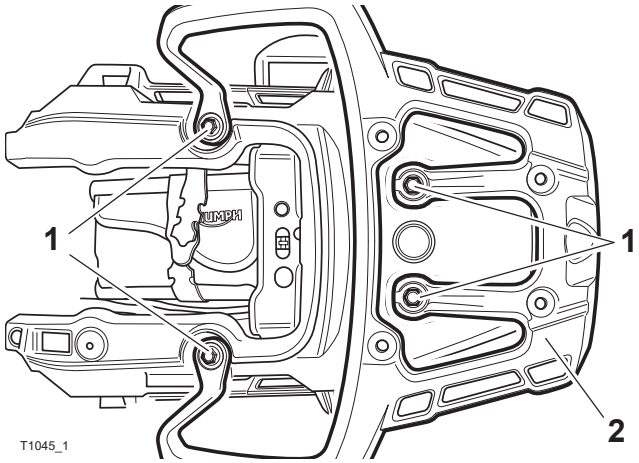
1. **Fixings**
2. **Luggage rack**

Luggage Rack - Installation

⚠ WARNING

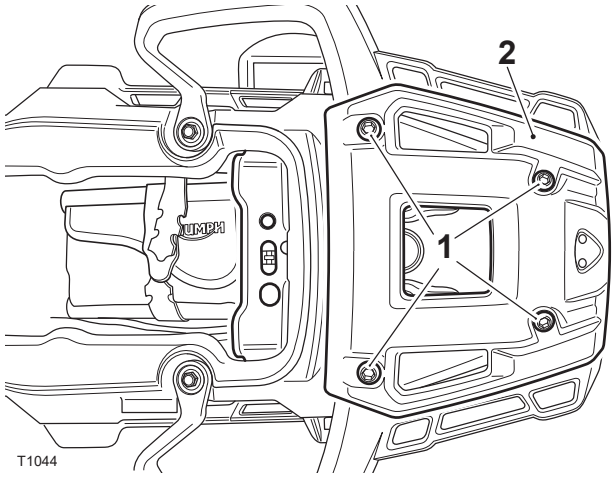
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Position the luggage rack to the motorcycle.
2. Refit the four fixings and tighten to **27 Nm**.



1. **Fixings**
2. **Luggage rack**

3. Position the cover to the luggage rack. Fit the bolts and new lock nuts and tighten to **7 Nm**.



1. **Fixings**
2. **Rack cover**

4. Refit the passenger seat (see Passenger Seat - Installation).

Rear Panel - Removal

WARNING

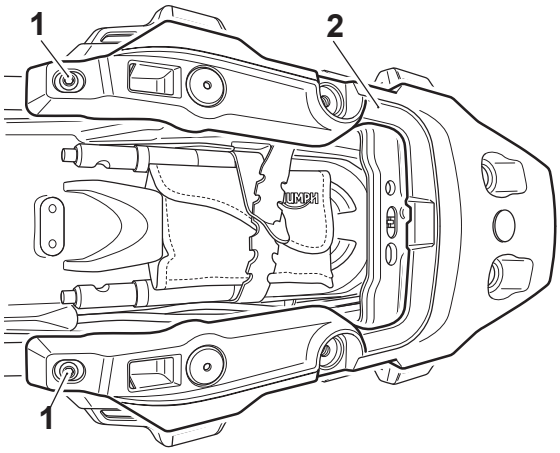
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the luggage rack (see Luggage Rack - Removal).

1. Remove the fixings at the front of the rear panel then slide the rear panel rearwards for complete removal.

Note

- **If fitted, disconnect the electrical connectors for the rear heated seat switch and rear electrical accessory socket.**



1. **Fixings**
2. **Rear panel**

Rear Panel - Installation

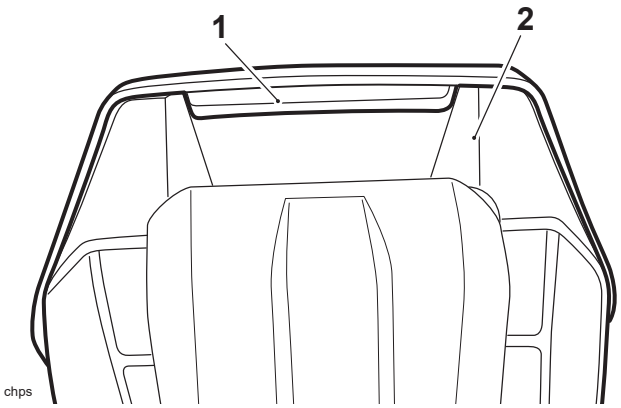
WARNING

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

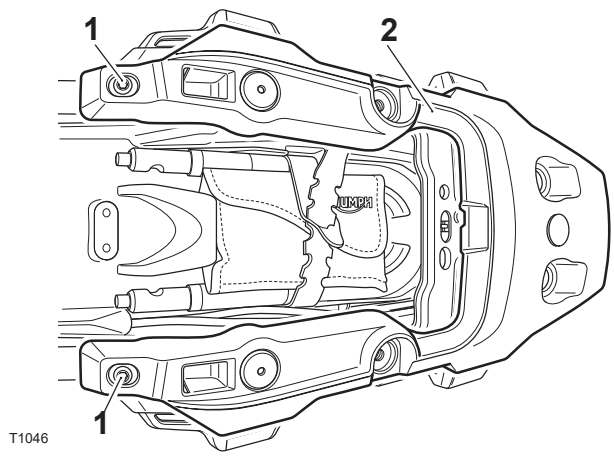
- **If fitted, reconnect the electrical connectors for the rear heated seat switch and rear electrical accessory socket.**

1. Fit the rear panel to the motorcycle. Ensure that the lip at the rear of the panel is located over the rear mudguard, as shown below.



1. **Lip, rear panel**
2. **Rear mudguard**

2. Tighten the front fixings to **7 Nm**.



1. **Fixings**

2. **Rear panel**

- Refit the luggage rack (see Luggage Rack - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

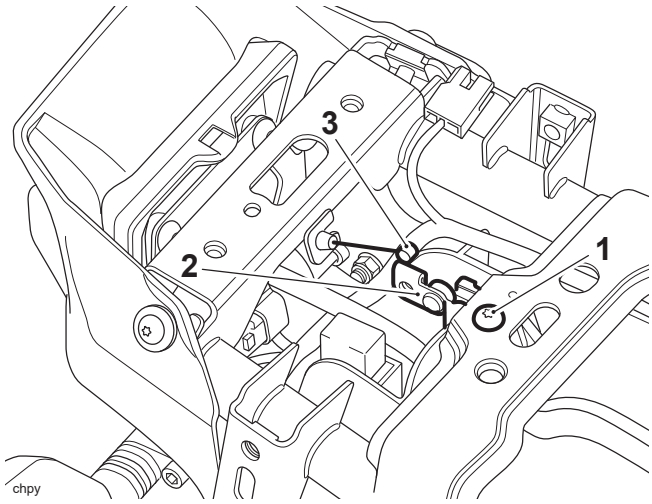
Rear Mudguard - Removal

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.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the pannier rails (see Pannier Rails - Removal).
- Remove the rear panel (see Rear Panel - Removal).

1. Release the fixing and detach the seat latch from the frame. Discard the fixing.
2. Detach the seat latch cable from the seat's latch.



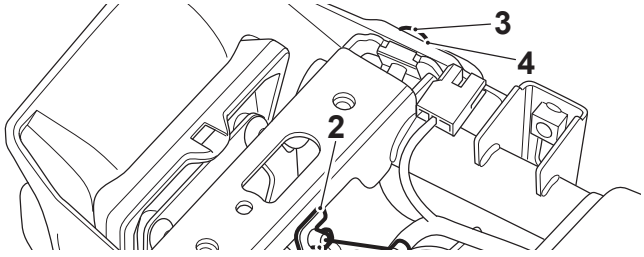
1. **Fixing**
2. **Seat latch**
3. **Cable**

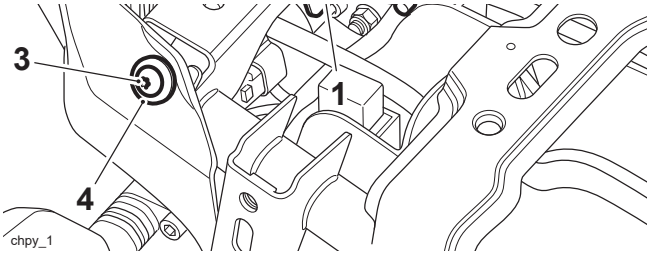
3. Detach the seat latch outer cable from the subframe.

Note

- **Note that the fixings for the top of the rear mudguard are fitted with washers. The lower two fixings are not fitted with washers.**

4. Remove the two fixings and washers from the top of the rear mudguard. Discard the fixings.



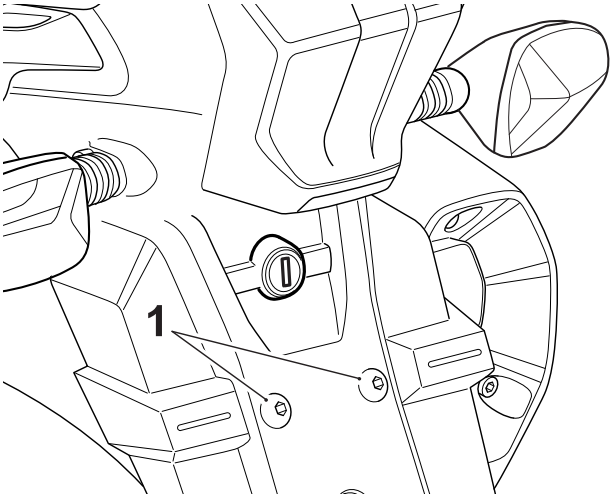


1. **Outer cable**
2. **Subframe**
3. **Fixings**
4. **Washers**

Note

- **Note the position of the adjustable bracket for the rear reflector. It may have the under seat tray between it and the rear mudguard.**

5. Remove the two fixings shown below and detach the rear mudguard from the frame. Collect the side reflectors bracket if fitted. Do not allow the rear mudguard to hang from the rear light and direction indicator harnesses.

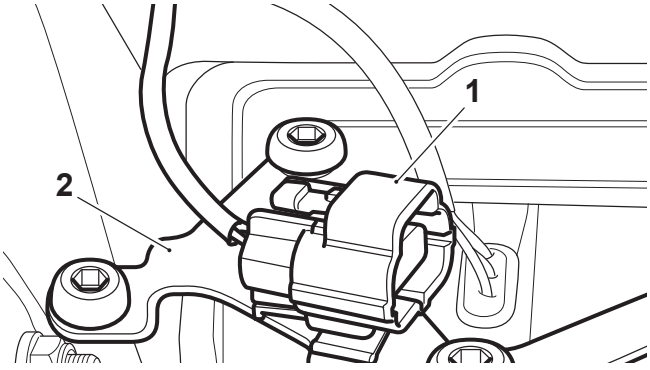


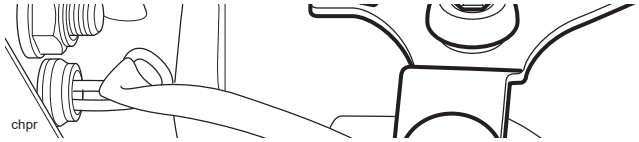
1. **Fixings**

Note

- **The right hand indicator wiring is identified by a red tape on it.**

6. Disconnect the electrical connectors for the rear light and direction indicators.
7. Detach the rear light connector block from the rear light bracket and remove the rear mudguard.





1. **Connector block**
2. **Bracket**

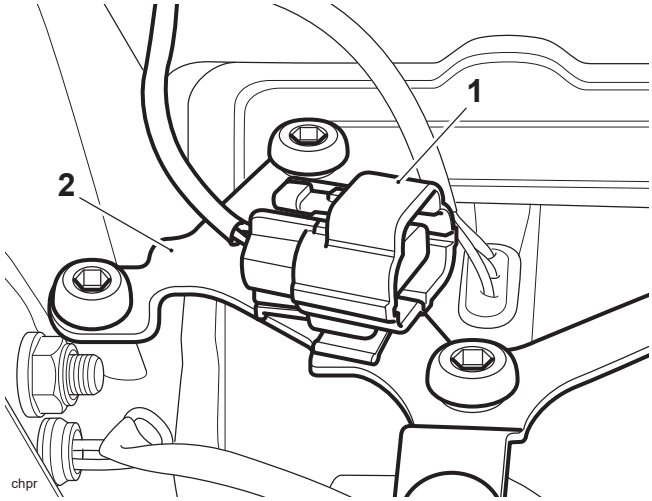
Rear Mudguard - Installation

Battery Tray - Removal

WARNING

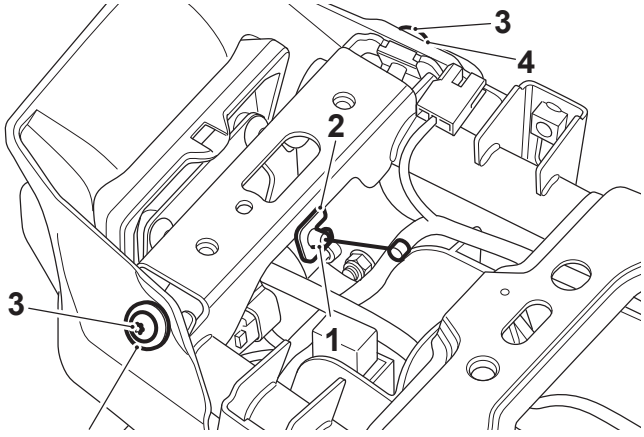
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Attach the rear light connector block to the rear light bracket.



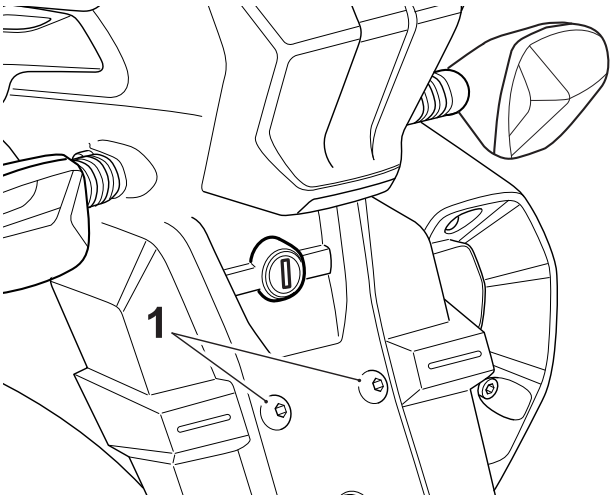
1. **Connector block**
2. **Bracket**

2. Connect the electrical connectors for the rear light and indicators as noted for removal.
3. Align the rear mudguard to the subframe while routing the seat latch cable as noted for removal.
4. Fit new fixings with the original washers to the top of the rear mudguard. Do not fully tighten at this stage.



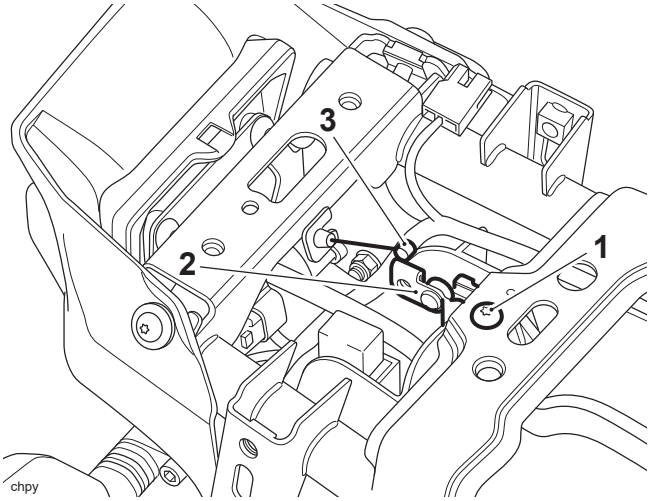
1. **Outer cable**
2. **Subframe**
3. **Fixings**
4. **Washers**

5. Fit the lower fixings (and side reflectors bracket if fitted) and tighten to **5 Nm**.



1. **Fixings**

6. Tighten the fixings at the top of the rear mudguard to **7 Nm**.
7. Attach the seat latch outer cable to the subframe.
8. Attach the seat latch inner cable to the seat's latch.
9. Fit the seat latch to the frame and tighten its new fixing to **9 Nm**.



1. **Fixing**
2. **Seat latch**
3. **Cable**

- Fit the rear panel (see Rear Panel - Installation).

- Fit the pannier rails (see Pannier Rails - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

Battery Tray - Installation

WARNING

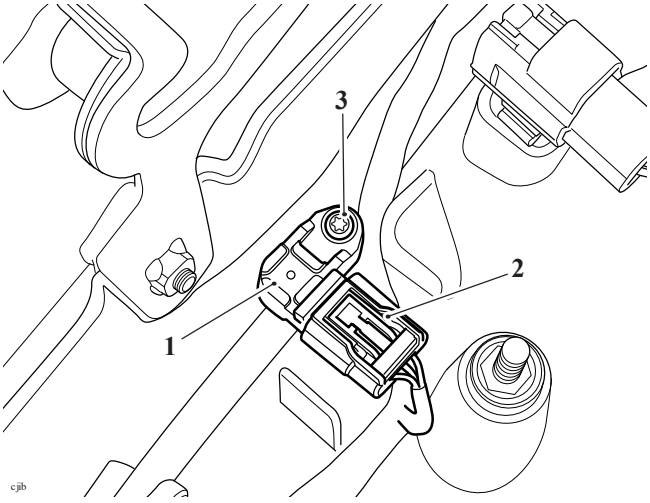
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

- Remove the rider's seat (see Rider's Seat - Removal).
- Remove the battery (see Battery Removal).
- Remove the fuel tank (see Fuel Tank - Removal).
- Remove the chassis ECM (see Chassis Electronic Control Module (ECM) - Removal).
- Remove the engine ECM (see Engine Electronic Control Module (ECM) - Removal).
- Remove the rear mudguard (see Rear Mudguard - Removal).
- Remove the rear wheel (see Rear Wheel - Removal).

Note

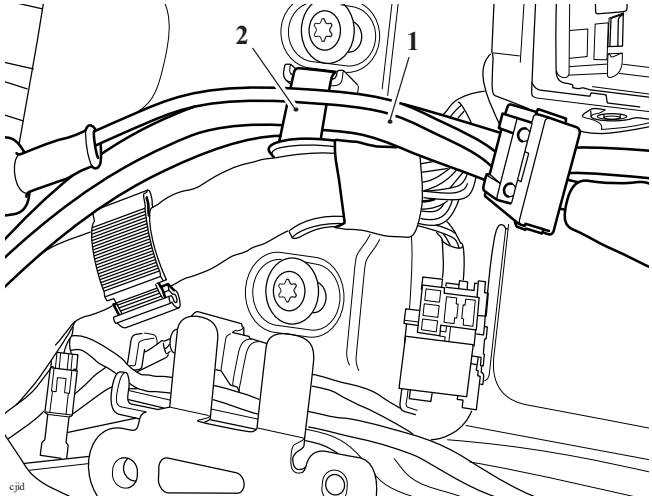
- **Note the routing of the rear section of the harness and the positions of its electrical connections prior to removal.**

1. Disconnect the following:
   - Alarm electrical connector
   - Heated seats sub harness to main harness electrical connectors (if fitted)
   - Front heated seat switch electrical connector (if fitted)
   - Rear wheel speed sensor electrical connector.
2. Detach the following from the battery tray:
   - Powered top box electrical connector
   - USB socket
   - Heated seats main harness electrical connectors
   - ABS fuse box
   - Main fuse box.
3. Remove the fixing securing the ambient air pressure sensor to the battery tray.



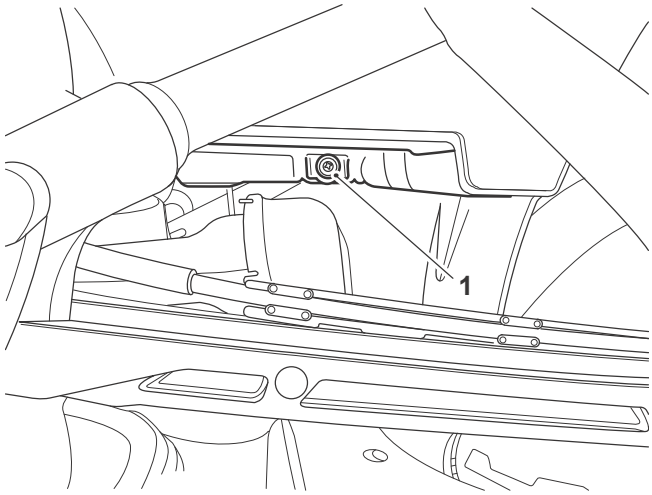
1. **Ambient air pressure sensor**
2. **Fixing**

4. Detach the battery leads from their channel on the main harness and position aside.



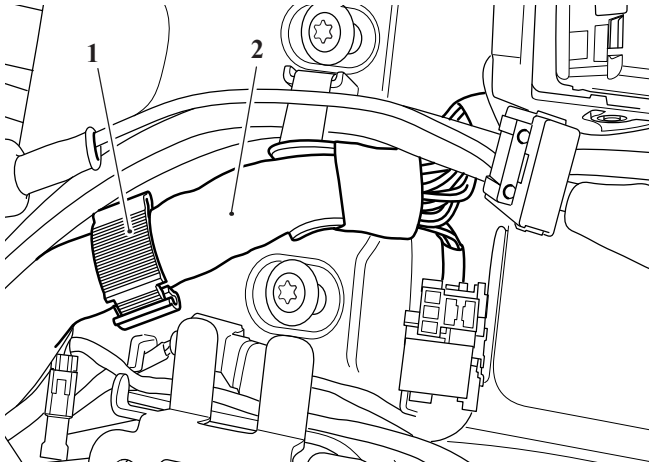
1. **Battery leads**
2. **Channel**

5. Remove the scrivet securing the harness channel to the battery tray.



1. **Scrivet**

6. Release the harness clip.



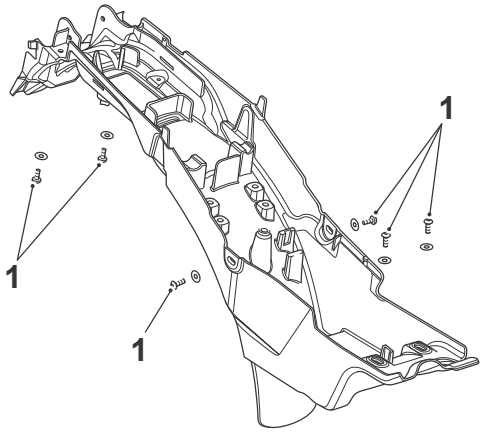
1. **Clip**
2. **Harness**

7. Carefully withdraw the rear section of the harness from the battery tray and position aside.

Note

- **If fitted, the heated seats sub harness may remain attached to the battery tray during removal.**

8. Remove the six fixings and washers. Discard the fixings.



1. **Fixings**

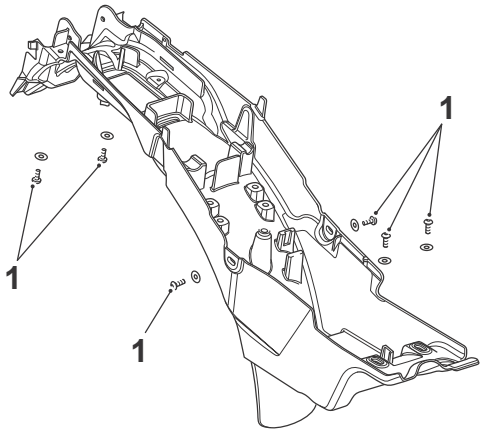
9. Lower the battery tray and remove towards the rear of the motorcycle.

Side Stand - Removal

WARNING

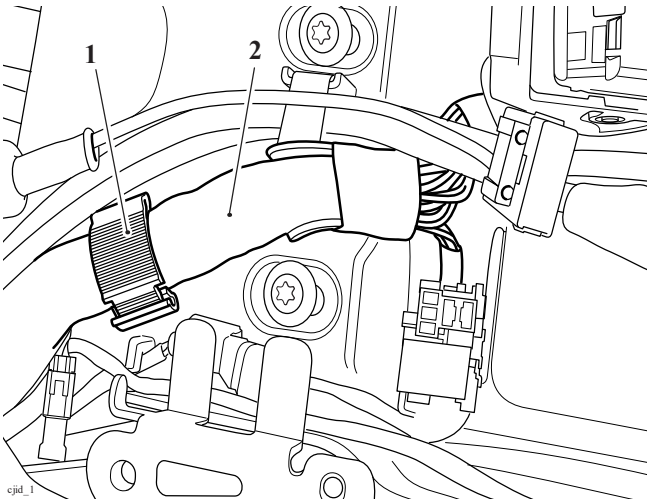
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Position the battery tray to the motorcycle and secure with the washers and six new fixings. Tighten the fixings to **7 Nm**.



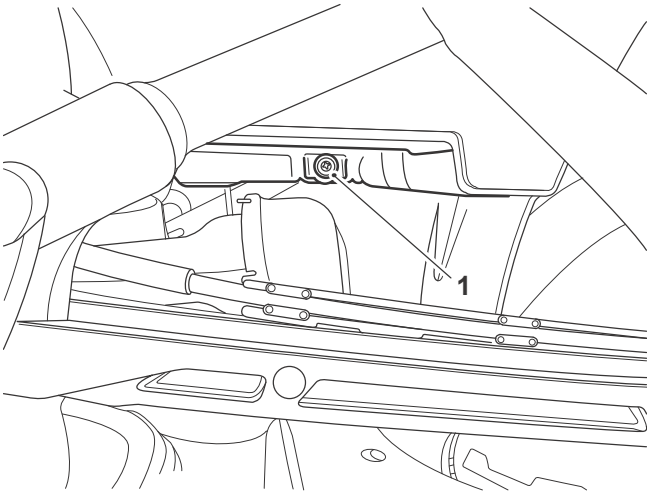
1. **Fixings**

2. Position the rear section of the harness to the battery tray as noted during removal and secure with the clip.



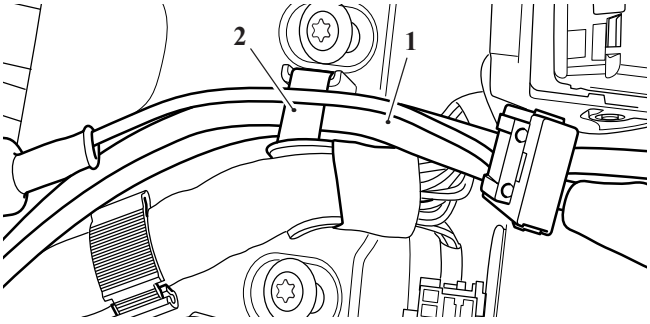
1. **Clip**
2. **Harness**

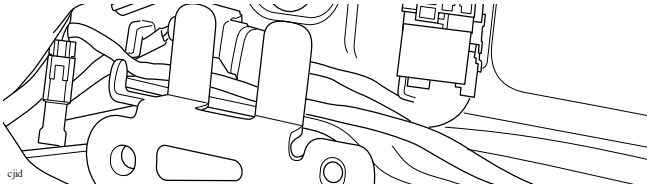
3. Ensure that the harness channel is located correctly to the battery tray and secure with a new scrivet.



1. **Scrivet**

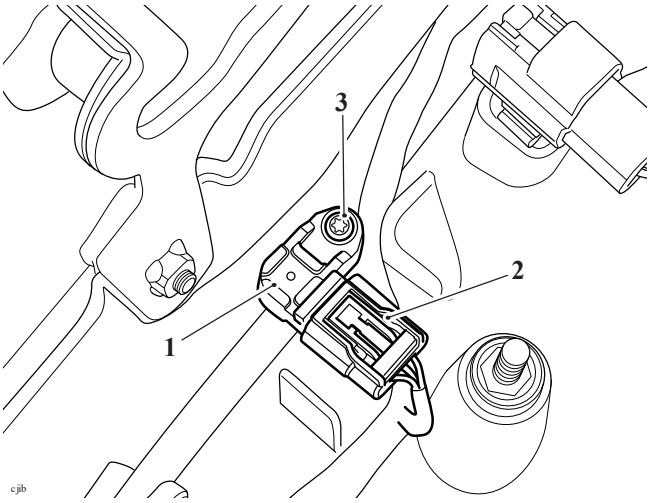
4. Route the battery leads into their channel on the main harness as noted during removal.





1. **Battery leads**
2. **Channel**

5. Position the ambient air pressure sensor to its mounting on the battery tray and secure with the fixing. Tighten the fixing to **1.5 Nm**.



1. **Ambient air pressure sensor**
2. **Fixing**

6. Route and attach the following to the battery tray as noted during removal:
   - Main fuse box
   - ABS fuse box
   - Heated seats main harness electrical connectors
   - USB socket
   - Powered top box electrical connector.
7. Route and connect the following as noted during removal:
   - Rear wheel speed sensor electrical connection
   - Front heated seat switch electrical connector (if fitted)
   - Heated seats sub harness to main harness electrical connectors (if fitted)
   - Alarm electrical connector.

- Fit the rear mudguard (see Rear Mudguard - Installation).
- Fit the engine ECM (see Engine Electronic Control Module (ECM) - Installation).
- Fit the chassis ECM (see Chassis Electronic Control Module (ECM) - Installation).
- Fit the rear wheel (see Rear Wheel - Removal).
- Refit the fuel tank (see Fuel Tank - Installation).
- Refit and connect the battery (see Battery Installation).
- Refit the rider's seat (see Rider’s Seat - Installation).

Side Stand - Lubrication

WARNING

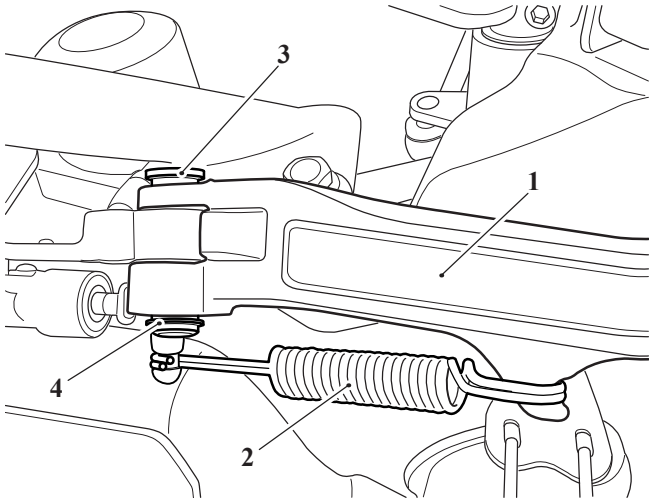
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Raise and support the motorcycle.

WARNING

Wear hand, eye and face protection when unhooking the stand spring. Take great care to minimise the risk of personal injury and loss of components.

2. With the side stand in the up position, unhook the spring from the side stand and remove it from the motorcycle.
3. Remove and discard the E-clip securing the pivot pin.
4. Remove the pivot pin and remove the side stand.



1. **Side stand**
2. **Spring**
3. **Pivot pin**
4. **E-clip**

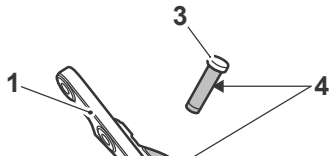
Side Stand - Installation

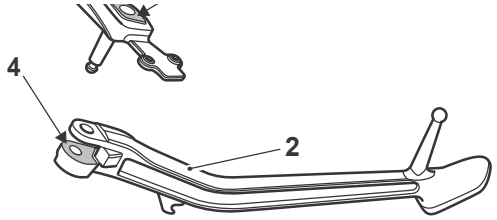
1. Smear the upper and lower contact surfaces of the side stand and side stand carrier bracket with Castrol High Temperature Grease.

Note

- **The side stand leg pivot holes may be fitted with dry lubrication bushes on some later models. Where this is the case, it is not necessary to lubricate the shank of the side stand pivot pin.**

2. Check if bushes are fitted to the side stand leg pivot holes. If no bushes are fitted, smear the shank of the side stand pivot pin with Castrol High Temperature Grease.





1. **Side stand carrier bracket**
2. **Side stand**
3. **Pivot pin**
4. **Lubrication areas**

Electrical

Exploded View - Battery, Horn and Wiring

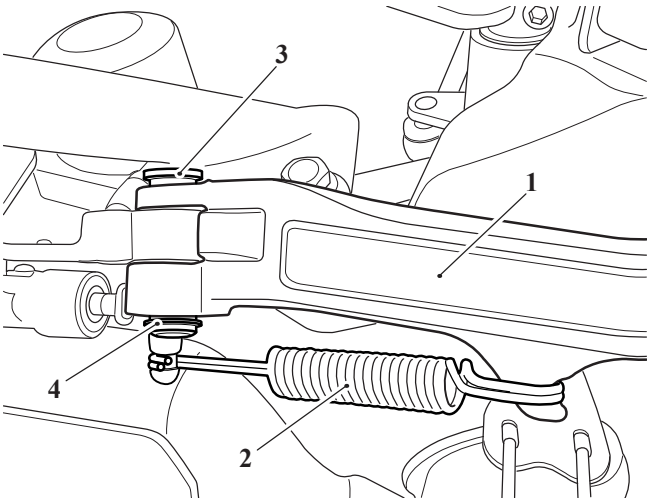
⚠ WARNING

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.

Perform the following operations:

- Side Stand - Lubrication

1. Fit the side stand to the motorcycle and insert the pivot pin.
2. Fit a new E-clip to secure the pivot pin.



1. **Side stand**
2. **Spring**
3. **Pivot pin**
4. **E-clip**

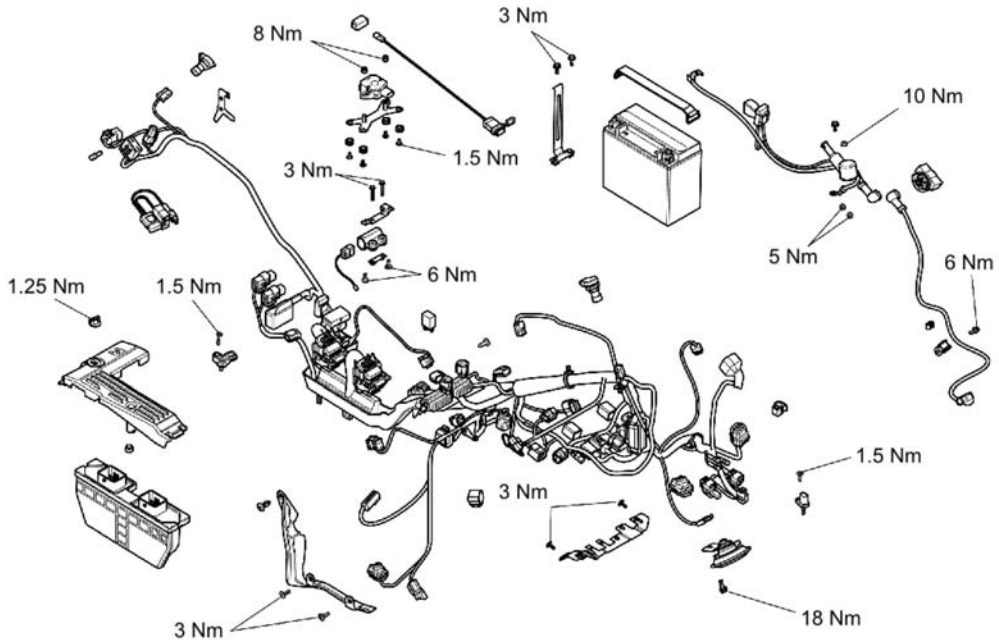
⚠ WARNING

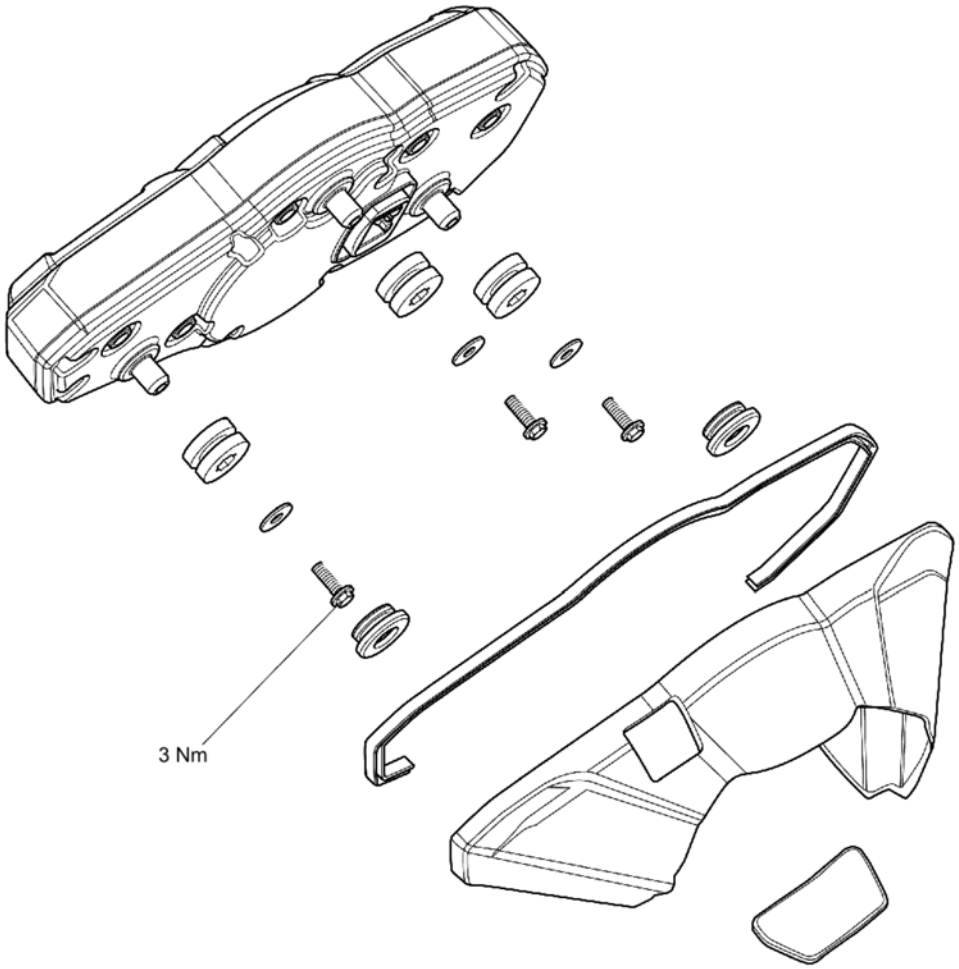
⚠ WARNING

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.

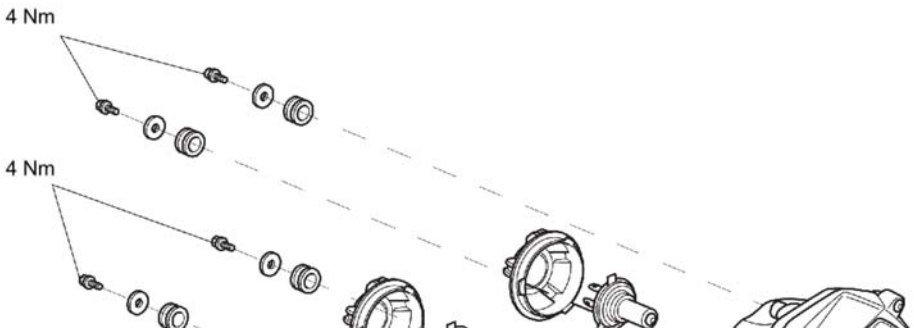
3. With the side stand in the up position, hook the spring onto its frame lug then carefully hook it onto the side stand lug.
4. Check the operation of the side stand before riding the motorcycle. Ensure the spring holds the stand securely in the retracted position.

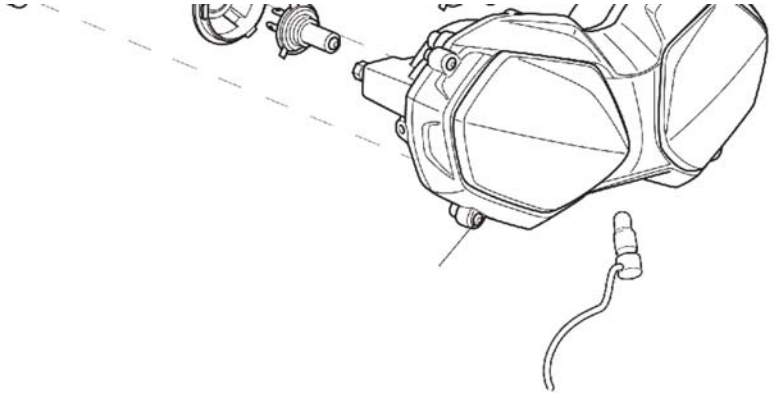
Exploded View – Instruments



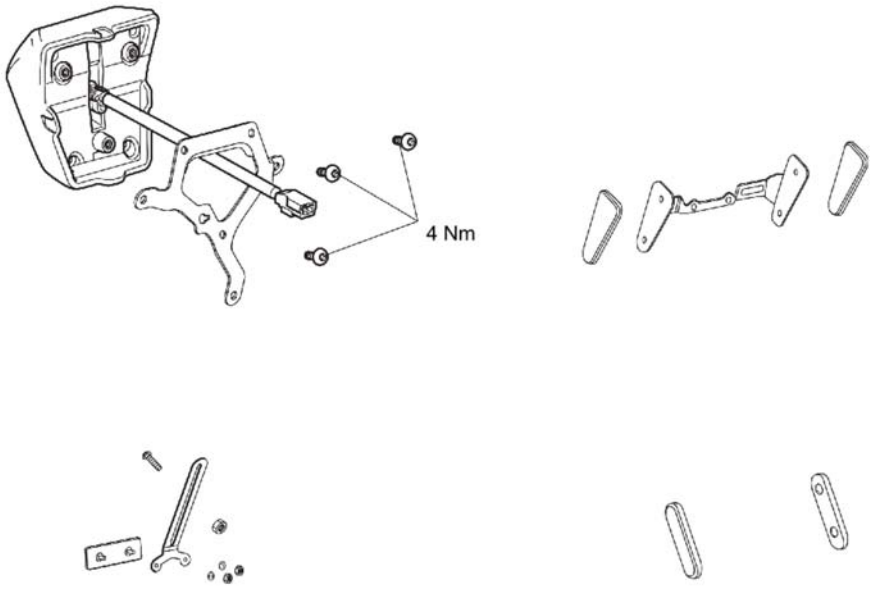


Exploded View – Headlight

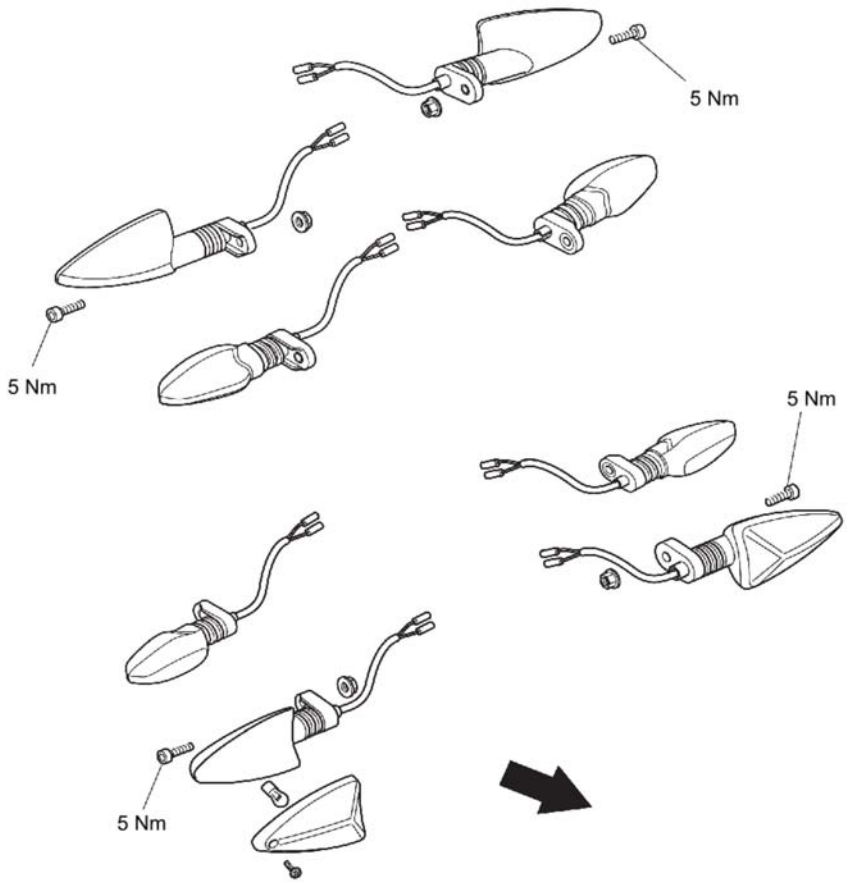




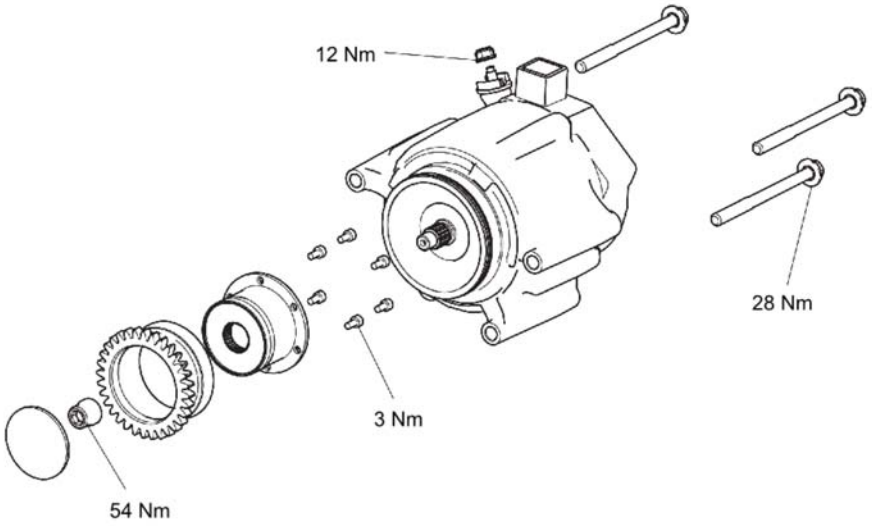
Exploded View – Rear Light and Reflectors

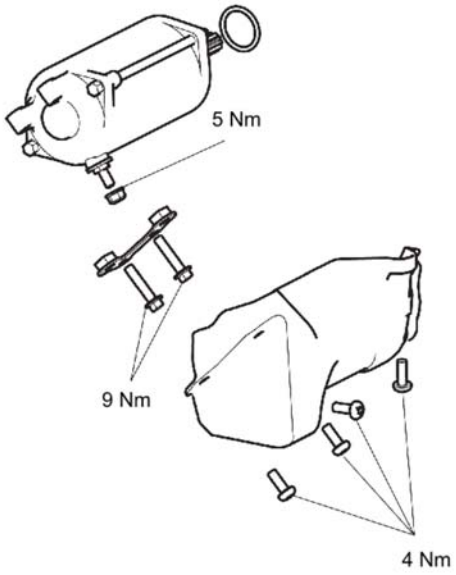


Exploded View – Direction Indicators



Exploded View – Alternator and Starter Motor





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 Removal

WARNING

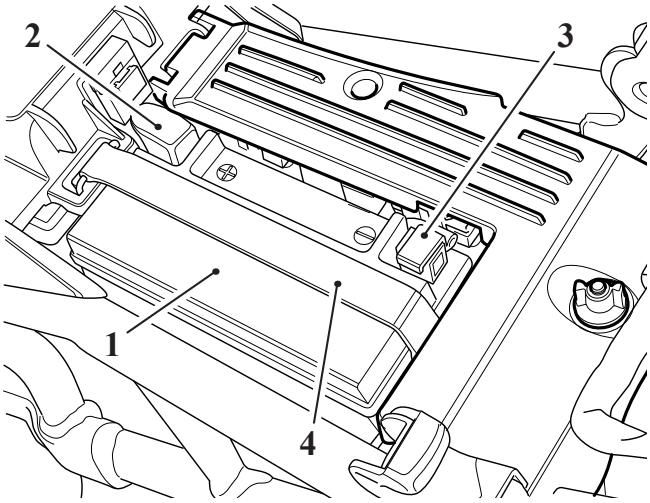
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

WARNING

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.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.

1. Remove the battery strap.
2. Take the battery out of the under seat tray.



1. **Battery**
2. **Positive (+) terminal**
3. **Negative (-) terminal**
4. **Battery strap**

Battery Installation

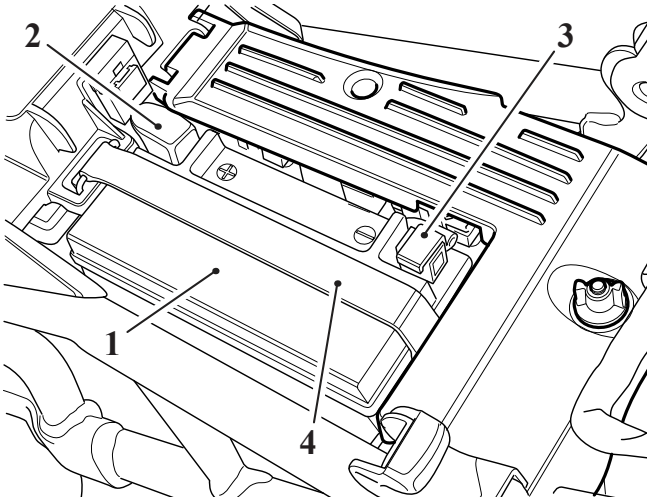
WARNING

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

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 underseat tray.
2. Reconnect the battery, positive (red) lead first.
3. Apply a light coat of grease to the terminals to prevent corrosion.
4. Cover the terminals with the protective caps.
5. Refit the battery strap.



1. **Battery**
2. **Positive (+) terminal**
3. **Negative (-) terminal**
4. **Battery strap**

6. Refit the rider's seat (see Rider's Seat - Installation).

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 Commissioning and Charging

Battery Maintenance

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

WARNING

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. Check the battery carefully for damage.

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.

3. Read the instructions and warnings delivered with the battery.
4. Place the battery on a flat level surface and remove the sealing foil.
5. Remove the battery sealing strip from the electrolyte container 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.
6. Place the electrolyte container on the battery and fill the battery according to the manufacturers instructions.
7. After starting to fill the battery with electrolyte, allow the battery to stand for 30 minutes with the filling container in place.
8. 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.
9. After the electrolyte has drained into the battery, allow the battery to stand with the electrolyte container in place for a further 2 hours.
10. Remove the electrolyte container carefully, and dispose of immediately.
11. Place the sealing cap strip LOOSELY over the filling holes of the battery.
12. Charge the battery using the BatteryMate Battery Charger - See Latest Parts Catalogue for Part Number Information. Refer to the instructions supplied with the BatteryMate Battery Charger - See Latest Parts Catalogue for Part Number Information.

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.

13. After charging is complete, press down firmly with both hands to seat the caps (do not use tools or force the caps into position).
14. Disconnect the charger and allow the battery to stand for 1 hour before fitting to the motorcycle.
15. Fit the battery to the motorcycle, positive (red) lead first.

Battery Already in Service

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 12.8 V, charge the battery using the BatteryMate Battery Charger - see latest Parts Catalogue for part number information. Refer to the instructions supplied with the BatteryMate Battery charger.

For extended periods of storage (beyond two weeks) the battery should be removed and the battery voltage checked regularly and charged when below 12.8 V.

Note

- **Before carrying out the following procedure the battery must be disconnected and removed from the motorcycle.**

Use the guidelines in the table below 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%	12.8 V - 13.0 V	None. Check at 6 months from date of manufacture	None required
75% - 100%	12.5 V - 12.8 V	May need slight charge. If no charge given, check in 3 - 4 months	3 - 6 hours
50% - 75%	12.0 V - 12.5 V	Needs charge	5 - 11 hours
25% - 50%	11.5 V - 12.0 V	Needs charge	At least 13 hours
0% - 25%	11.5 V or less	Needs recovery using BatteryMate 150-9. Retest after recovery	20 hours

Relays

Fuses

Fuse Identification

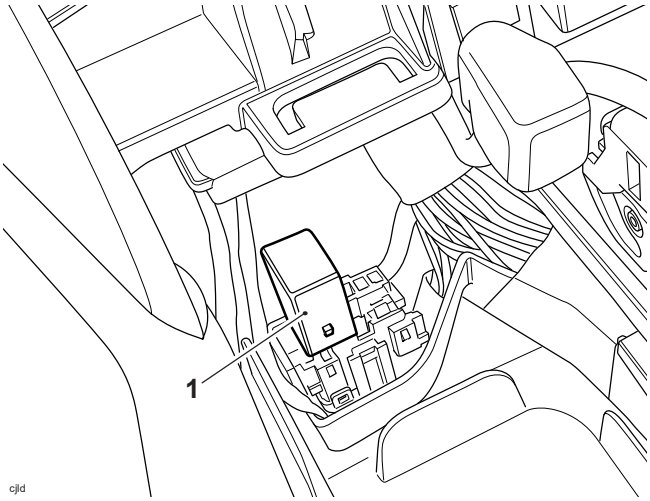
Note

Note

- **This model is equipped with an Engine Management System (EMS) relay only.**
- **The starter, fuel pump, cooling fan, lighting, windscreen adjustment motor, Triumph Semi Active Suspension (if fitted), and accessory systems are all controlled by the chassis ECM.**

The EMS relay is located beneath the rider's seat, forward of the battery. To gain access to the relay:

- Remove the rider's seat (see Rider's Seat - Removal).
- Remove the battery (see Battery Removal).



1. Engine Management System (EMS) relay

If a fuse fails during operation, inspect the electrical system to determine the cause, and then replace it with a new fuse of the correct current rating.

A blown fuse is indicated when all of the systems protected by that fuse become inoperative. When checking for a blown fuse, refer to Fuse Identification to establish which fuse has blown.

⚠ WARNING

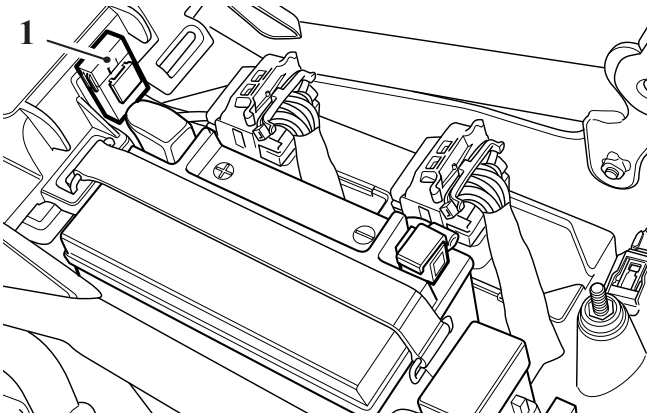
Always replace blown fuses with new ones of the correct current rating (as specified on the fuse box cover) and never use a fuse of higher rating.

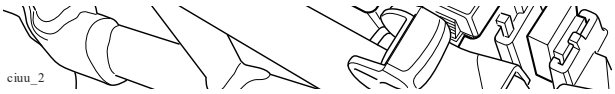
Use of an incorrect fuse could lead to an electrical problem, resulting in motorcycle damage, loss of motorcycle control and an accident.

Main Fuse

The 40 Amp main fuse is located beneath the rider's seat and behind the seat bridge.

To allow access to the main fuse, the rider's seat must be removed.

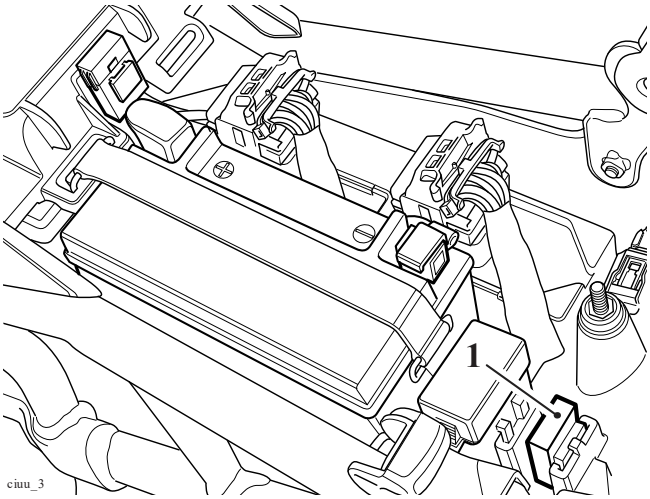




1. 40 Amp main fuse

ABS Fuse Box

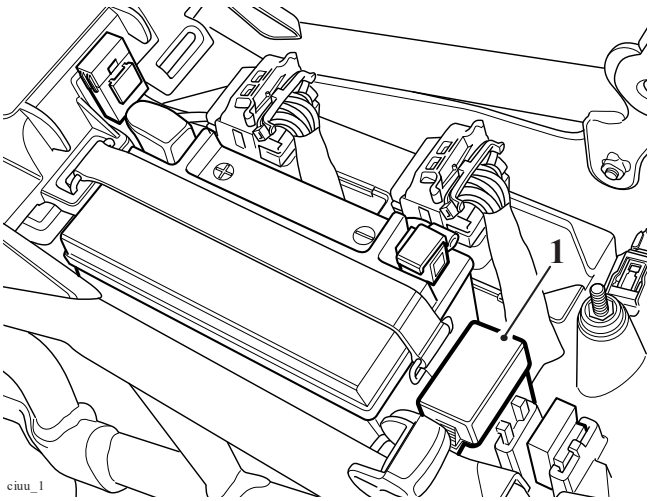
The 40 Amp ABS fuse is located beneath the rider's seat and behind the main fuse box.
To allow access to the ABS fuse box the rider’s seat and chassis ECM cover must be removed.



1. ABS fuse box

Main Fuse Box

The main fuse box is located beneath the rider’s seat.
To allow access to the main fuse box the rider’s seat and chassis ECM cover must be removed.



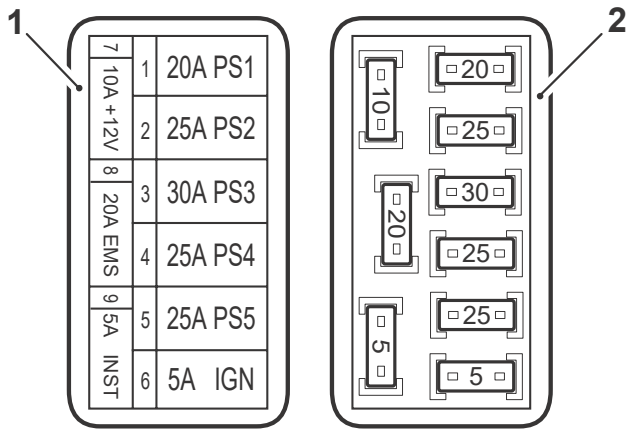
1. Main fuse box

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 to establish which fuse has blown.
The fuse identification numbers listed in the tables correspond with those printed on the fuse box cover, as

shown below. Spare fuses are located on the inside of the fuse box cover and should be replaced if used.

Note

- **See Chassis Electronic Control Module (Chassis ECM) for details of the systems protected by fuses PS1 to PS5.**



1. **Cover**
2. **Fuse box**

Circuits Protected	Fuse No.	Rating (Amps)
PS1	1	20
PS2	2	25
PS3	3	30
PS4	4	25
PS5	5	25
Ignition	6	5
Front accessory socket	7	10
Engine management	8	20
Instruments	9	5

Chassis Electronic Control Module (Chassis ECM)

System Diagnosis

Many of the motorcycle's electrical systems (such as lighting, TSAS if fitted, horn, cooling fan, fuel pump, and accessories such as heated grips or seats) are controlled by the chassis Electronic Control Module (chassis ECM).

The chassis ECM provides a primary level of protection to the electrical systems it controls. If a fault is detected,

the chassis ECM will automatically cut power to the affected system.

The chassis ECM can be reset by turning the Ignition off then on again. Power will be restored to the inoperative system, providing that the condition that caused the fault has been rectified.

The systems controlled by the chassis ECM are also provided with a secondary level of protection, by fuses PS1 to PS5 in the main fuse box (see Fuse Identification). A blown fuse is likely when all of the systems protected by that fuse become inoperative.

Refer to the following table for full details of the chassis ECM controlled systems, and their corresponding fuses.

Electrical System	Fuse
Left headlight main beam	PS1
Left headlight dipped beam	
Left front direction indicator	
Left rear direction indicator	
Rear position light	
RSU position sensor (models with TSAS only)	
Right headlight main beam	PS2
Right headlight dipped beam	
Right front direction indicator	
Right rear direction indicator	
Front position light	
Brake light	
Windscreen adjustment motor	PS3
RSU pre-load adjustment motor (models with TSAS only)	
RSU damping solenoid (models with TSAS only)	
Front suspension compression damping adjuster (models with TSAS only)	
Front suspension rebound damping adjustment motor (models with TSAS only)	
Fog lights (if fitted)	
USB connector	
Heated seats (if fitted)	PS4
Heated grips (if fitted)	

Electrical System	Fuse
Rear electrical accessory socket (if fitted)	
Top box electrical accessory socket (if fitted)	
Cooling fan	PS5
Fuel pump	
Starter solenoid	
Horn	

⚠ 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.

If after resetting the automatic software protection system or replacing a blown fuse, a fault still persists, investigate the cause and take remedial action as necessary.

Triumph Diagnostic Software - Chassis ECM

The chassis ECM has an on-board diagnostics feature which allows service technicians to retrieve stored data using the 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 seat. By using a dedicated plug, no electrical connectors associated with the system are disturbed, reducing potential connector damage.

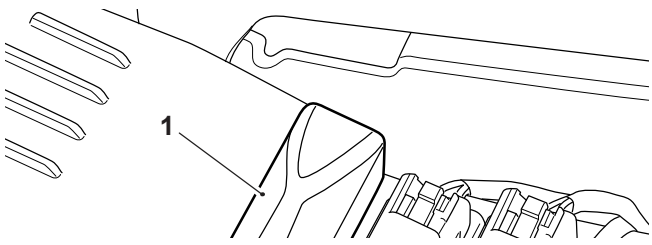
The software allows the user to retrieve data associated with the system sensors and actuators, test various component functions, read build data and make minor adjustments to the set-up of the system. The data and tests available are described on the following pages.

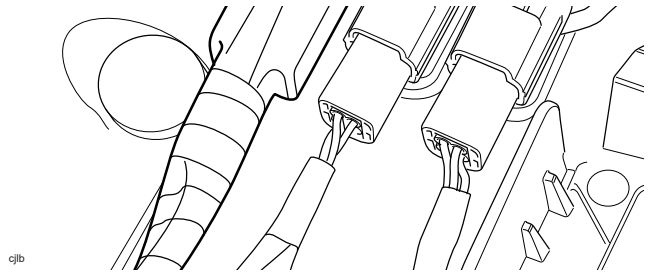
On-board Fault Detection System

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.

When the count begins, the fault is detected but not confirmed. If the fault continues to be detected and the count reaches a predetermined threshold, the fault becomes confirmed and a DTC (Diagnostic Trouble Code) will be logged in the ECM's memory. A confirmed fault may be indicated by the effected system(s) simply becoming inoperative, or by the illumination of a system warning light and/or instrument warning message. Once a fault is confirmed, the number of ignition switch cycles made is counted. If the fault clears, the ignition switch cycle counter will restore operation to the affected system(s) and extinguish any warning lights or instrument messages at a predetermined count. DTCs are then erased from the ECM memory at another (higher) count.

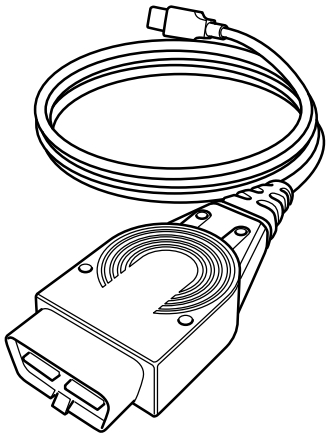
1. To connect the Triumph diagnostic interface to the motorcycle, remove the rider’s seat (see Rider’s Seat - Removal) and release the diagnostic connector from its locating tang.





1. Diagnostic connector

2. Plug the Triumph diagnostic interface directly into the diagnostic connector.



T3880057 - Triumph 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 rider's seat (see Rider's Seat - Installation).

Chassis ECM Diagnostic Trouble Codes

Described below is the range of information which can be retrieved from the Chassis 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 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:

- VIN
- Chassis ECM Part Number
- Chassis ECM Serial Number
- Boot Software ID
- Application Software ID
- Configuration ID
- Date of Last Application Download

- Total Application Downloads Since Manufacture
- TSAS Calibration Name
- TSAS Calibration Version
- Date of last TSAS Calibration Download
- Total TSAS Calibration Downloads since Manufacture.

Sensor Data

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

The data sets are divided into four groups - Sensor Voltages, Lighting, Direction Indicators, Inputs/Outputs, Switches, Heating and Pulse Width Modulation (PWM) Data. 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
Front Accessory Power Socket	Volts
Top Box Accessory Power Socket	Volts
Passenger Accessory Power Socket	Volts
Ambient Temperature Sensor	Volts
Swinging Arm Position	Volts

Lighting

The data available under Lighting is:

Item Checked	Result Unit
Main/Dipped Beam Switch	On/Off
Main Beam Left	On/Off
Main Beam Right	On/Off
Dipped Beam Left	On/Off
Dipped Beam Right	On/Off
Pass Switch	On/Off
Fog Lights Switch	On/Off

Fog Lights	On/Off
Brake Light	On/Off
Front Position Light	On/Off
Rear Position Light	On/Off

Direction Indicators

The data available under Direction Indicators is:

Function Examined	Result Unit
Direction Indicators Cancel Switch	On/Off
Direction Indicators Left Switch	On/Off
Direction Indicator Left Front	On/Off
Direction Indicator Left Rear	On/Off
Direction Indicators Right Switch	On/Off
Direction Indicator Right Front	On/Off
Direction Indicator Right Rear	On/Off

Inputs/Outputs

The data available under Inputs/Outputs is:

Function Examined	Result Unit
Alarm Input	On/Off
Cooling Fan	On/Off
Fuel Pump Positive	On/Off
Fuel Pump Negative	On/Off
Horn	On/Off
Horn Switch	On/Off
Ignition Status	On/Off
Engine Stop Switch	On/Off

Rear Preload Motor Down	On/Off
Rear Preload Motor Up	On/Off
Starter Solenoid	On/Off
Starter Switch	On/Off
Windscreen Motor Down	On/Off
Windscreen Motor Up	On/Off

Switches

The data available under Switches is:

Function Examined	Result Unit
Instruments Select Switch	On/Off
Instruments Scroll Up Switch	On/Off
Instruments Scroll Down Switch	On/Off
Mode Switch	On/Off

Heating

The data available under Heating is:

Function Examined	Result Unit
Heated Grips Switch	On/Off
Heated Grip Left	On/Off
Heated Grip Right	On/Off
Rider Heated Seat - Hot	On/Off
Rider Heated Seat - Warm	On/Off
Passenger Heated Seat - Hot	On/Off
Passenger Heated Seat - Warm	On/Off

Pulse Width Modulation (PWM) Data

The data available under Pulse Width Modulation (PWM) Data is:

Function Examined	Result Unit
Suspension Solenoid (Rear Rebound Damping)	% (10000 Hz)

Function Tests

The system allows the diagnostic software to perform a series of function tests on various systems controlled by the Chassis ECM. 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
Rear Preload Motor Up	See Rear Preload Motor Up/Down Function Tests Rear preload motor must be calibrated after running this test, see Rear Suspension Unit Preload Motor Calibration
Rear Preload Motor Down	See Rear Preload Motor Up/Down Function Tests Rear preload motor must be calibrated after running this test, see Rear Suspension Unit Preload Motor Calibration
Cooling Fan	Observe the cooling fan/Stored fault code*
Horn	Listen for operation/Stored fault code*
Windscreen Motor Down	Observe the windscreen/Stored fault code*
Windscreen Motor Up	Observe the cooling fan/Stored fault code*
Calibrate Swinging Arm Position Sensor	See Swinging Arm Position Sensor - Calibration
Calibrate Rear Preload Motor	See Rear Suspension Unit Preload Motor Calibration

*If a fault is detected

Electrical Connectors

Diagnostic Trouble Codes (DTCs) are logged in the chassis ECM memory when there is a confirmed fault in the system.

The codes are reported to the Triumph diagnostic tool as a four digit code.

As mentioned earlier, when the system detects a fault, it begins to count the number of times the fault occurs before confirming the fault and storing a fault code. A confirmed fault may be indicated by the effected system(s) simply becoming inoperative, or by the illumination of a system warning light and/or instrument warning message.

Similarly, if a fault clears, the chassis ECM also records this fact and will extinguish any warning lights or instrument messages and restore normal operation to the affected system, when sufficient no-fault ignition switch cycles have taken place. Any fault codes will remain in the chassis ECM memory until the required number of no-fault ignition switch cycles have taken place. The number of ignition switch cycles required to restore normal operation will always be less than the number required to remove a DTC from the chassis ECM memory. DTCs can be removed at any time using the Triumph diagnostic tool.

The system will log the diagnostic trouble codes listed below:

Diagnostic	Fault	Ignition	Ignition	Warning	Pinpoint Test

Trouble Code (DTC)	Description	Switch Cycles Before Clearing Fault	Switch Cycles Before DTC is Erased	Light/Instrument Message/Visual Indication	
C1001	Main power supply overvoltage	1	20	-	Power Supply Rail Overvoltage/Undervoltage
C1002	Main power supply undervoltage	1	20	-	Power Supply Rail Overvoltage/Undervoltage
C1009	Ambient temperature sensor signal under temperature	1	20	Blank or incorrect air temperature display	Ambient Air Temperature Sensor
C1010	Ambient temperature sensor signal over temperature	1	20	Blank or incorrect air temperature display	Ambient Air Temperature Sensor
C1011	Swinging arm position sensor signal low	1	40	TSAS light/warning message	Swinging Arm Position Sensor Signal
C1012	Swinging arm position sensor signal high	1	40	TSAS light/warning message	Swinging Arm Position Sensor Signal
C1013	Swinging arm position sensor signal implausible	1	40	TSAS light/warning message	Swinging Arm Position Sensor Signal
C1017	Instrument wake-up signal overcurrent	1	40	-	Instrument Wake-up Signal Overcurrent
C1022	Rear rebound damping solenoid undercurrent	1	40	TSAS light/warning message	Rear Suspension Unit Damping Solenoid Undercurrent/Overcurrent
C1023	Rear rebound damping solenoid overcurrent	1	40	TSAS light/warning message	Rear Suspension Unit Damping Solenoid Undercurrent/Overcurrent
C1024	Windscreen motor undercurrent	1	20	-	Windscreen Motor Undercurrent/Overcurrent

C1025	Windscreen motor overcurrent	1	20	-	Windscreen Motor Undercurrent/Overcurrent
C1027	5V sensor supply malfunction	1	40	TSAS light/warning message	5 Volt Sensor Supply
C1028	Preload motor undercurrent	1	40	TSAS light/warning message	Rear Suspension Unit (RSU) Preload Motor
C1029	Preload motor overcurrent	1	40	TSAS light/warning message	Rear Suspension Unit (RSU) Preload Motor
C1031	Left headlight (high beam) undercurrent	1	40	-	Headlight Undercurrent/Overcurrent
C1032	Left headlight (high beam) overcurrent	1	40	-	Headlight Undercurrent/Overcurrent
C1033	Right headlight (high beam) undercurrent	1	40	-	Headlight Undercurrent/Overcurrent
C1034	Right headlight (high beam) overcurrent	1	40	-	Headlight Undercurrent/Overcurrent
C1035	Left headlight (low beam) undercurrent	1	40	-	Headlight Undercurrent/Overcurrent
C1036	Left headlight (low beam) overcurrent	1	40	-	Headlight Undercurrent/Overcurrent
C1037	Right headlight (low beam) undercurrent	1	40	-	Headlight Undercurrent/Overcurrent
C1038	Right headlight (low beam) overcurrent	1	40	-	Headlight Undercurrent/Overcurrent
C1042	Fog lights undercurrent	1	40	-	Fog Lights Undercurrent/Overcurrent
C1043	Left and right fog light overcurrent	1	40	-	Fog Lights Undercurrent/Overcurrent

C1044	Front position light undercurrent	1	40	-	Headlight Undercurrent/Overcurrent
C1045	Front position light overcurrent	1	40	-	Headlight Undercurrent/Overcurrent
C1046	Rear light undercurrent	1	40	-	Rear Light Undercurrent/Overcurrent
C1047	Rear light overcurrent	1	40	-	Rear Light Undercurrent/Overcurrent
C1050	Brake light undercurrent	1	40	-	Brake Light Undercurrent/Overcurrent
C1051	Brake light overcurrent	1	40	-	Brake Light Undercurrent/Overcurrent
C1052	Left front direction indicator undercurrent	1	40	Remaining direction indicators flash at a faster rate	Direction Indicators Undercurrent/Overcurrent
C1053	Left front direction indicator overcurrent	1	40	Remaining direction indicators flash at a faster rate	Direction Indicators Undercurrent/Overcurrent
C1054	Left rear direction indicator undercurrent	1	40	Remaining direction indicators flash at a faster rate	Direction Indicators Undercurrent/Overcurrent
C1055	Left rear direction indicator overcurrent	1	40	Remaining direction indicators flash at a faster rate	Direction Indicators Undercurrent/Overcurrent
C1056	Right front direction indicator undercurrent	1	40	Remaining direction indicators flash at a faster rate	Direction Indicators Undercurrent/Overcurrent
C1057	Right front direction indicator overcurrent	1	40	Remaining direction indicators flash at a faster rate	Direction Indicators Undercurrent/Overcurrent
C1058	Right rear direction indicator undercurrent	1	40	Remaining direction indicators flash at a faster rate	Direction Indicators Undercurrent/Overcurrent

C1059	Right rear direction indicator overcurrent	1	40	Remaining direction indicators flash at a faster rate	Direction Indicators Undercurrent/Overcurrent
C1060	Horn undercurrent	1	40	-	Horn Undercurrent/Overcurrent
C1061	Horn overcurrent	1	40	-	Horn Undercurrent/Overcurrent
C1062	Rider heated seat undercurrent	1	40	Heated seat symbol displayed on instruments but heat level indicators empty	Rider Heated Seat Undercurrent/Overcurrent
C1063	Rider heated seat overcurrent	1	40	Heated seat symbol displayed on instruments but heat level indicators empty	Rider Heated Seat Undercurrent/Overcurrent
C1064	Passenger heated seat undercurrent	1	40	Heated seat symbol displayed on instruments but heat level indicators empty	Passenger Heated Seat Undercurrent/Overcurrent
C1065	Passenger heated seat overcurrent	1	40	Heated seat symbol displayed on instruments but heat level indicators empty	Passenger Heated Seat Undercurrent/Overcurrent
C1066	Right heated grip undercurrent	1	40	Heated grip symbol displayed on instruments but heat level indicators empty	Heated Grips Undercurrent/Overcurrent
C1067	Right heated grip overcurrent	1	40	Heated grip symbol displayed on instruments but heat level indicators empty	Heated Grips Undercurrent/Overcurrent
C1068	Left heated grip undercurrent	1	40	Heated grip symbol displayed on instruments but heat level indicators empty	Heated Grips Undercurrent/Overcurrent
C1069	Left heated grip overcurrent	1	40	Heated grip symbol displayed on instruments but heat level	Heated Grips Undercurrent/Overcurrent

				indicators empty	
C1070	Cooling fan undercurrent	1	40	MIL* (and coolant temperature warning light if fault long term)	Cooling Fan Undercurrent/Overcurrent
C1071	Cooling fan overcurrent	1	40	MIL* (and coolant temperature warning light if fault long term)	Cooling Fan Undercurrent/Overcurrent
C1072	Fuel pump undercurrent	1	40	MIL*	Fuel Pump Undercurrent/Overcurrent
C1073	Fuel pump overcurrent	1	40	MIL*	Fuel Pump Undercurrent/Overcurrent
C1074	Universal Serial Bus (USB) power socket overcurrent	1	40	-	Universal Serial Bus (USB) Power Socket Overcurrent
C1075	Passenger accessory power socket overcurrent	1	40	-	Passenger Accessory Power Socket Overcurrent
C1076	Top box accessory power socket overcurrent	1	40	-	Top Box Accessory Power Socket Overcurrent
C1077	Starter motor solenoid undercurrent	1	40	MIL*	Starter Motor Solenoid Undercurrent/Overcurrent
C1078	Starter motor solenoid overcurrent	1	40	MIL*	Starter Motor Solenoid Undercurrent/Overcurrent
C1079	TSAS - Solenoid valves implausible signal	1	40	TSAS light/warning message	TSAS Error
C1081	Rear preload motor circuit malfunction	1	40	TSAS light/warning message	Rear Suspension Unit (RSU) Preload Motor
C1082	Rear preload motor adjustment prevented due to low battery voltage	1	40	-	Rear Suspension Unit (RSU) Preload Motor

C1083	Rear preload motor position error - motor travel during initialisation procedure was outside normal limits	1	40	TSAS light/warning message	Rear Suspension Unit (RSU) Preload Motor
C1084	Rear preload motor position error - motor end of travel position error	1	40	TSAS light/warning message	Rear Suspension Unit (RSU) Preload Motor
C1085	Rear preload motor initialisation interrupted by user	1	40	TSAS light/warning message	Rear Suspension Unit (RSU) Preload Motor
C1086	Rear preload motor initialisation completed	1	40	-	Rear Suspension Unit (RSU) Preload Motor
C1087	CAN fault - lost communication with instruments	1	40	-	Instrument Communication (CAN)
C1088	CAN fault - lost communication with ABS module	1	40	-	ABS Communication (CAN)
C1089	Inertial Measurement Unit (IMU) ID incompatible	1	40	TSAS light/warning message	Inertial Measurement Unit (IMU) ID Incompatible
C1090	CAN fault - lost communication with Inertial Measurement Unit (IMU)	1	40	TSAS light/warning message	Inertial Measurement Unit (IMU) Signal (CAN)
C1091	CAN fault - lost communication with Engine ECM	1	40	TSAS light/warning message	Engine ECM Communication (CAN)
C1092	Inertial Measurement Unit (IMU)	1	40	TSAS light/warning message	Inertial Measurement Unit (IMU) Signal (CAN)

C1095	Chassis ECM internal error	-	40	Bike continues to run when fault logged but will not start after first ignition cycle. Other DTCs will be stored	Chassis ECM Internal Error
C1097	Front wheel sensor unit battery alert	1	20	Information message	Tyre Pressure Monitoring System (TPMS) Wheel Sensors
C1098	Rear wheel sensor unit battery alert	1	20	Information message	Tyre Pressure Monitoring System (TPMS) Wheel Sensors
C1099	Front wheel sensor unit fault	1	20	TPMS light/warning message	Tyre Pressure Monitoring System (TPMS) Wheel Sensors
C1100	Rear wheel sensor unit fault	1	20	TPMS light/warning message	Tyre Pressure Monitoring System (TPMS) Wheel Sensors
C1101	Front wheel sensor unit loss of communication error	1	20	TPMS light/warning message	Tyre Pressure Monitoring System (TPMS) Wheel Sensors
C1102	Rear wheel sensor unit loss of communication error	1	20	TPMS light/warning message	Tyre Pressure Monitoring System (TPMS) Wheel Sensors
C1103	Immobiliser antenna - loss of communication with key	1	20	Alarm/immobiliser light	Immobiliser Antenna
C1104	Invalid key: key authentication unsuccessful	1	20	Alarm/immobiliser light	Immobiliser Antenna
C1105	Immobiliser antenna internal error	1	20	Alarm/immobiliser light	Immobiliser Antenna
C1106	No engine ECM immobiliser communication	1	20	Alarm/immobiliser light	Engine ECM Communication (CAN)
C1107	TSAS - Inertial Measurement	1	40	TSAS light/warning	Inertial Measurement Unit (IMU) Signal (CAN)

	Unit (IMU) implausible signal			message	
C1108	TSAS - ABS implausible signal	1	40	TSAS light/warning message	ABS Communication (CAN)
C1109	TSAS - engine ECM implausible signal	1	40	TSAS light/warning message	Engine ECM Communication (CAN)
C1110	TSAS general error	-	40	TSAS light/warning message	TSAS Error
C1111	Rider heated seat switch malfunction	1	40	Heated seat symbol displayed on instruments but heat level indicators empty	Rider Heated Seat Switch
C1112	Rider heated seat switch position one malfunction	1	40	Heated seat symbol displayed on instruments but heat level indicators empty	Rider Heated Seat Switch
C1113	Rider heated seat switch position two malfunction	1	40	Heated seat symbol displayed on instruments but heat level indicators empty	Rider Heated Seat Switch
C1114	Passenger heated seat switch malfunction	1	40	Heated seat symbol displayed on instruments but heat level indicators empty	Passenger Heated Seat Switch
C1115	Passenger heated seat switch position one malfunction	1	40	Heated seat symbol displayed on instruments but heat level indicators empty	Passenger Heated Seat Switch
C1116	Passenger heated seat switch position two malfunction	1	40	Heated seat symbol displayed on instruments but heat level indicators empty	Passenger Heated Seat Switch
C1117	Left fork stepper motor undercurrent	1	40	TSAS light/warning message	Left Fork Stepper Motor (Compression Damping)

C1118	Left fork stepper motor (compression) driver error	1	40	TSAS light/warning message	Left Fork Stepper Motor (Compression Damping)
C1119	Left fork stepper motor overcurrent	1	40	TSAS light/warning message	Left Fork Stepper Motor (Compression Damping)
C1120	Right fork stepper motor undercurrent	1	40	TSAS light/warning message	Right Fork Stepper Motor (Rebound Damping)
C1121	Right fork stepper motor (rebound) driver error	1	40	TSAS light/warning message	Right Fork Stepper Motor (Rebound Damping)
C1122	Right fork stepper motor overcurrent	1	40	TSAS light/warning message	Right Fork Stepper Motor (Rebound Damping)
C1124	Chassis ECM restarted due to process time out during normal operation	1	40	-	Chassis ECM Restarted Due to Process Time Out During Normal Operation
C1125	Chassis ECM restarted due to process time out during normal operation	1	40	-	Chassis ECM Restarted Due to Process Time Out During Normal Operation
C1126	Chassis ECM restarted due to process time out during normal operation	1	40	-	Chassis ECM Restarted Due to Process Time Out During Normal Operation
C1127	Chassis ECM restarted due to calibration download	1	40	-	Chassis ECM Restarted due to Calibration Download
C1128	Unexpected chassis ECM restart	1	40	-	Unexpected Chassis ECM Restart
C1129	Power supply interrupted	1	40	-	Chassis ECM Power Supply Interrupted
C1130	Chassis ECM	1	40	-	Chassis ECM Parameters Reset

	parameters reset to default				to Default
C1131	Rear preload motor minimum end stop detection error. Preload motor not inhibited.	1	40	-	Rear Preload Motor Maximum/Minimum End Stop Detection Error
C1132	Rear preload motor minimum end stop detection error. Preload motor inhibited.	1	40	TSAS light/warning message	Rear Preload Motor Maximum/Minimum End Stop Detection Error
C1133	Rear preload motor Maximum end stop detection error. Preload motor not inhibited.	1	40	-	Rear Preload Motor Maximum/Minimum End Stop Detection Error
C1134	Rear preload motor Maximum end stop detection error. Preload motor inhibited.	1	40	TSAS light/warning message	Rear Preload Motor Maximum/Minimum End Stop Detection Error

* MIL illuminated by engine ECM in response to chassis ECM DTC being stored.

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**
-

For example, the chassis Electronic Control Module (chassis ECM) relies on the supply of accurate information to enable it to monitor and control its various systems. One dirty terminal will cause an excessive voltage drop resulting in an incorrect signal to the chassis 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.

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.

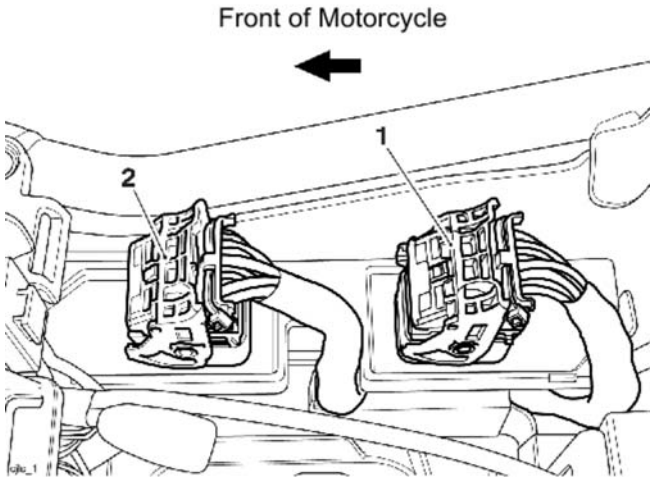
When Connecting a Connector:

- 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.

Chassis ECM Connectors

Identification of the Chassis ECM connectors

Chassis ECM connectors A and B can be identified as shown below:



1. **Connector A**
2. **Connector B**

Disconnection of the Chassis ECM Connectors

CAUTION

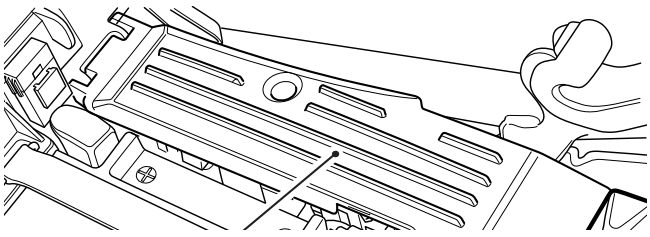
When disconnecting a connector, never pull directly on the wires as this may result in cable and connector damage.

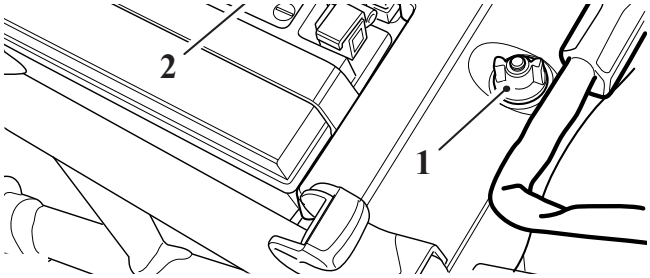
CAUTION

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.

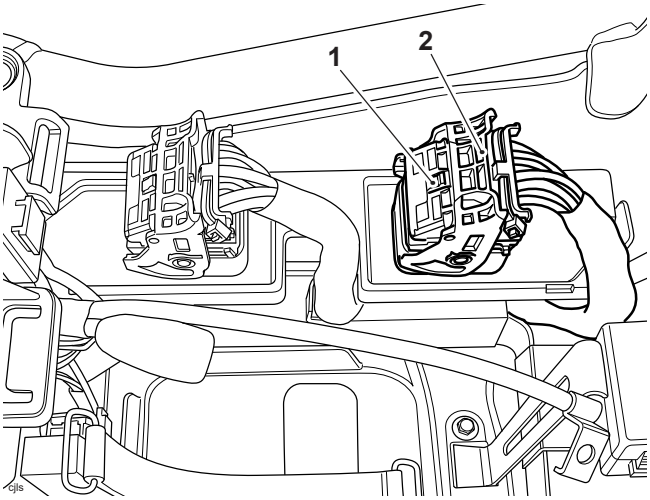
1. Turn the ignition to the OFF position and wait at least one minute for the chassis ECM to complete its power down sequence.
2. Access to the chassis ECM can be gained by releasing the wing nut and removing the chassis ECM cover.





1. **Wing nut**
2. **Chassis ECM cover**

3. Press down on the locking device and gently pull back on the connector's lever to release it from the chassis ECM.



1. **Locking device**
2. **Lever**

Reconnection of the Chassis ECM Connectors

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

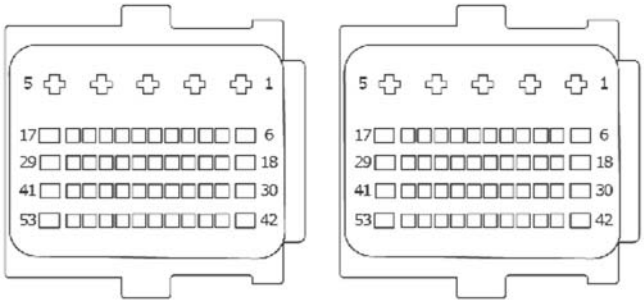
Note

- **Two identical connectors are used for the chassis ECM. Ensure that the chassis ECM is in its fitted position on the motorcycle before reconnecting the connectors. This will ensure that the correct connector aligns with its corresponding socket on the chassis ECM.**

1. Fit the connector into its socket. When the locking lever starts to move, stop pushing the connector and use the locking lever to fully insert the connector home and lock it.
2. Refit the chassis ECM cover and secure with the wing nut.

Chassis ECM Connector Pin Numbering

Connector B Connector A



Chassis ECM Pin Numbering

The above illustration shows the pin numbering system used for the chassis ECM

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

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.

Power Supply Rail Overvoltage/Undervoltage

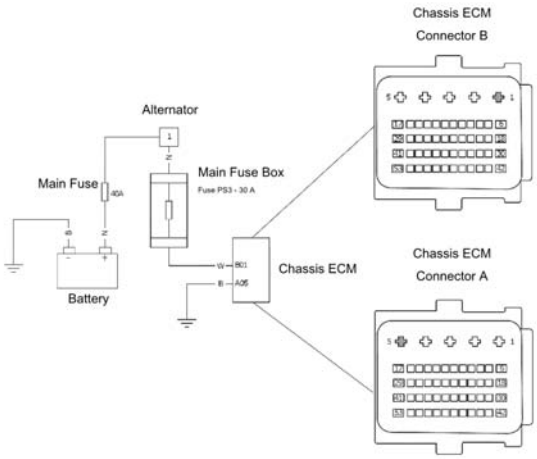
Fault Code	Possible Cause	Action
C1001; C1002	Main power supply overvoltage Main power supply undervoltage Blown fuse Short circuit to ground or open circuit Charging system fault	Disconnect chassis ECM connectors and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check fuse integrity: - Main fusebox, fuse 3 (PS3): - Main 40 Amp fuse	OK	Proceed to test 2
		Faulty	Replace blown fuse(s), proceed to test 5
2	Check cable and terminal integrity: - Chassis ECM pin B01 - Alternator output terminal - Battery positive terminal - Battery negative terminal	OK	Proceed to test 3
		Faulty	Rectify fault, proceed to test 5
3	Check cable for short circuit: - Chassis ECM pin B01 to ground	OK	Proceed to test 4
		Short circuit	Locate and rectify wiring fault, proceed to test 5

Test		Result	Action
4	Check cable continuity: - Battery positive terminal to Chassis ECM pin B01	OK	Reconnect harness and proceed to test 5
		Open circuit	Locate and rectify wiring fault, proceed to test 5
5	Reconnect harness, clear fault code and run engine. Measure the battery voltage while the engine is running	Greater than 14.6 V or Less than 13.9 V	Contact Triumph service
		13.9 V - 14.6 V	Action complete - quit test

Circuit Diagram



Ambient Air Temperature Sensor

Fault Code	Possible Cause	Action
C1009	Ambient temperature sensor signal under temperature	Check sensor is clean and clear of dirt Ensure sensor connector is secure Disconnect Chassis ECM and proceed to pinpoint test 1:
C1010	Ambient temperature sensor signal over temperature	Check sensor is clean and clear of dirt Ensure sensor connector is secure Disconnect Chassis ECM and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check fuse integrity:	OK	Proceed to test 2

Test		Result	Action
	- Main fusebox, fuse 1 (PS1)		
		Faulty	Replace fuse, proceed to test 6
2	Check cable and terminal integrity: - Chassis ECM pin A28 - Chassis ECM pin A01 - Temperature sensor pin 1 - Temperature sensor pin 2	OK	Disconnect temperature sensor connector. Proceed to test 3
		Faulty	Rectify fault, proceed to test 6
3	Check cable for short circuit: - Chassis ECM pin A28 to ground	OK	Proceed to test 4
		Short circuit	Locate and rectify wiring fault, proceed to test 6
4	Check cable continuity: - Chassis ECM pin A28 to temperature sensor pin 1 - Temperature sensor pin 2 to ground	OK	Proceed to test 5
		Open circuit	Locate and rectify wiring fault, proceed to test 6
5	Check sensor resistance: - Sensor pin 1 to sensor pin 2(temperature dependent - see circuit diagram resistance data)	OK	Proceed to test 6
		Faulty	Replace temperature sensor, 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

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

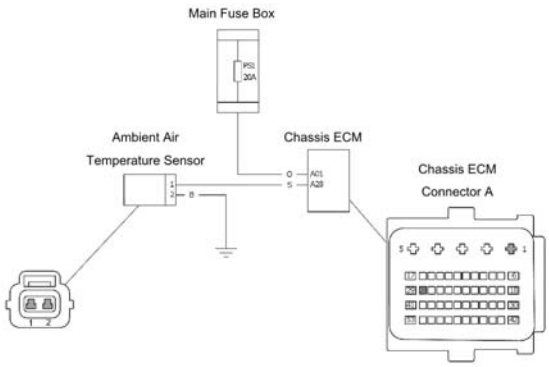
Resistance data:

Ambient temperature resistance value

80°C - 200 to 400 Ohms

20°C - 2.35 to 2.65 K Ohms

-10°C - 8.50 to 10.25 K Ohms



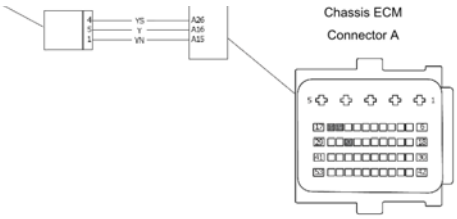
Swinging Arm Position Sensor Signal

Fault Code	Possible Cause	Action
C1011	Swinging arm position sensor signal low	Proceed to pinpoint test 1:
C1012	Swinging arm position sensor signal high	
C1013	Swinging arm position sensor signal implausible	

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Chassis ECM pin A26 - Chassis ECM pin A16 - Chassis ECM pin A15	OK	Disconnect swinging arm position sensor and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - Chassis ECM pin A16 to ground - Chassis ECM pin A15 to ground - Chassis ECM pin A26 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable continuity: - Chassis ECM pin A26 to sensor pin 4 - Chassis ECM pin A16 to sensor pin 5 - Chassis ECM pin A15 to sensor pin 1	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Disconnect swing arm position sensor, Reconnect Chassis ECM, turn ignition to ON position and measure voltage across swinging arm position sensor pin 5 harness side and ground	4.9 V - 5.1 V	Replace swinging arm position sensor, proceed to test 5
		Faulty	Refer to DTC 1027 (see 5 Volt Sensor Supply)
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



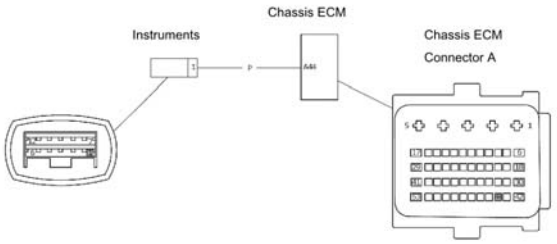
Instrument Wake-up Signal Overcurrent

Fault Code	Possible Cause	Action
C1017	Instrument wake-up signal overcurrent	Disconnect chassis ECM and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Chassis ECM pin A44	OK	Disconnect instruments connector and proceed to test 2
		Faulty	Rectify fault, proceed to test 4
2	Check cable for short circuit: - Chassis ECM pin A44 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 4
3	Check cable continuity: - Chassis ECM pin A44 to instrument pin 1	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 4
4	Reconnect harness, clear fault code and run engine to verify fault cleared	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



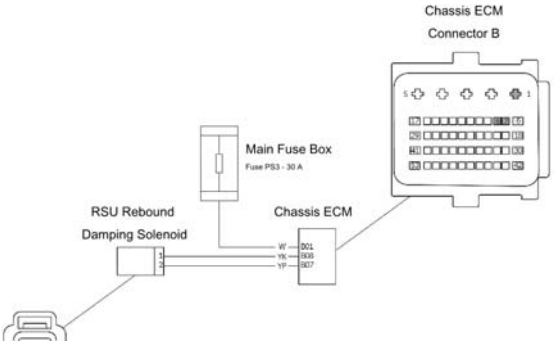
Rear Suspension Unit Damping Solenoid Undercurrent/Overcurrent

Fault Code	Possible Cause	Action
C1022	Rear rebound damping solenoid undercurrent	Disconnect chassis ECM and proceed to pinpoint test 1:
C1023	Rear rebound damping solenoid overcurrent	Disconnect chassis ECM and rear rebound damping solenoid Proceed to pinpoint test 2:

Pinpoint Tests

Test		Result	Action
1	Check fuse integrity: - Main fuse box, fuse 3 (PS3)	OK	Proceed to test 2
		Faulty	Replace fuse, proceed to test 5
2	Check cable and terminal integrity: - Chassis ECM pin B07 - Chassis ECM pin B08 - Chassis ECM pin B01	OK	Disconnect rear rebound damping solenoid and proceed to test 3
		Faulty	Rectify fault, proceed to test 5
3	Check cable continuity: - Chassis ECM pin B07 to solenoid pin 2 - Chassis ECM pin B08 to solenoid pin 1	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable for short circuit: - Chassis ECM pin B07 to ground - Chassis ECM pin B08 to ground - Chassis ECM pin B07 to Chassis ECM pin B08	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 to verify fault cleared	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



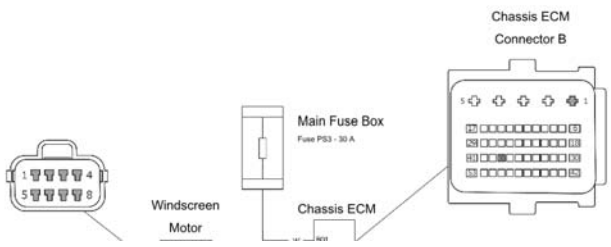
Windscreen Motor Undercurrent/Overcurrent

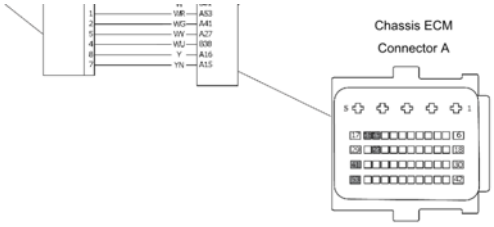
Fault Code	Possible Cause	Action
C1024	Windscreen motor undercurrent	Disconnect chassis ECM and proceed to pinpoint test 1:
C1025	Windscreen motor overcurrent	Disconnect chassis ECM and proceed to pinpoint test 2:

Pinpoint Tests

Test		Result	Action
1	Check fuse integrity: - Main fusebox, fuse 3 (PS3)	OK	Disconnect windscreen motor connector and proceed to test 2
		Faulty	Replace fuse, proceed to test 5
2	Check cable and terminal integrity: - Chassis ECM pin A53 - Chassis ECM pin A41 - Chassis ECM pin B01	OK	Proceed to test 3
		Faulty	Rectify fault, proceed to test 5
3	Check cable for short circuit: - Chassis ECM pin A53 to ground - Chassis ECM pin A41 to ground	OK	Proceed to test 4
		Short circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable continuity: - Chassis ECM pin A53 to windscreen pin 1 - chassis ECM pin A41 to windscreen pin 2 - Main fusebox, fuse 3 (PS3) to Chassis ECM pin B01	OK	Proceed to test 5
		Open 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





5 Volt Sensor Supply

Rear Suspension Unit (RSU) Preload Motor

Headlight Undercurrent/Overcurrent

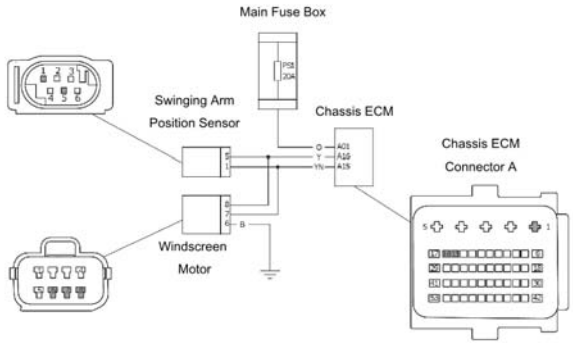
Fault Code	Possible Cause	Action
C1027	5V sensor supply malfunction	Disconnect Chassis ECM connectors and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check fuse integrity: - Main fusebox, fuse 1 (PS1)	Ok	Proceed to test 2
		Faulty	Replace blown fuse, proceed to test 8
2	Check cable and terminal integrity: - Chassis ECM pin A16 - Chassis ECM pin A15 - Windscreen connector pin 6	Ok	Disconnect windscreen and swinging arm position sensor connectors. Proceed to test 3
		Faulty	Rectify fault, proceed to test 8
3	Check cable for short circuit: - Chassis ECM pin A16 to ground - Chassis ECM pin A15 to ground	Ok	Proceed to test 4
		Short circuit	Locate and rectify wiring fault, proceed to test 8
4	Check cable continuity: - Chassis ECM pin A16 to swinging arm position sensor pin 5 - Chassis ECM pin A15 to swinging arm position sensor pin 1 - Chassis ECM pin A16 to windscreen motor pin 8 - Chassis ECM pin A15 to windscreen motor pin 7 - Windscreen motor pin 6 to ground	OK	Reconnect harness and proceed to test 5
		Open circuit	Locate and rectify wiring fault, proceed to test 8
5	Reconnect Chassis ECM, turn ignition to ON position and measure the voltage between windscreen connector pins 8 and 7 (harness side)	4.9 - 5.1 V	Proceed to test 6
		Faulty	Contact Triumph service

Test	Result	Action
6 Reconnect windscreen connector. With ignition in the ON position measure the voltage between the swinging arm position sensor pins 5 and 1(harness side)	4.9 - 5.1 V	Proceed to test 7
	Faulty	Replace windscreen motor, proceed to test 8
7 Disconnect windscreen connector, reconnect swinging arm position sensor. With ignition in the ON position measure the voltage between the windscreen connector pins 8 and 7 (harness side)	4.9 - 5.1 V	Proceed to test 8
	Faulty	Replace swinging arm position sensor, proceed to test 8
8 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



Fault Code	Possible Cause	Action
C1028	Preload motor undercurrent	Disconnect Chassis ECM Proceed to pinpoint test 1:
C1029	Preload motor overcurrent	Disconnect Chassis ECM and RSU preload motor connectors Proceed to pinpoint test 2:
C1081	Rear preload motor circuit malfunction	Check preload system mechanism Disconnect Chassis ECM and proceed to pinpoint test 1:
C1082	Rear preload motor adjustment prevented due to low battery voltage	Ensure battery voltage is acceptable, note voltage Disconnect Chassis ECM and proceed to pinpoint test 1:

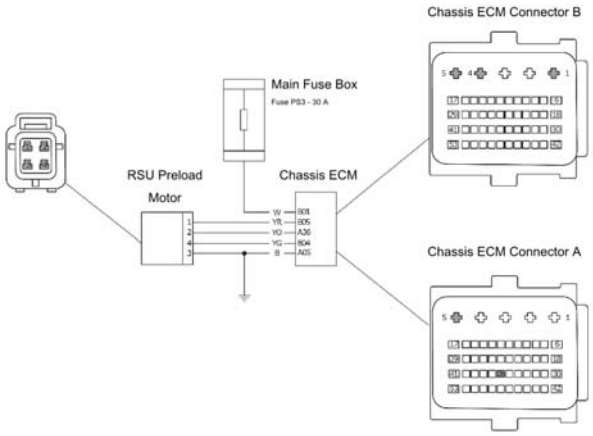
Fault Code	Possible Cause	Action
C1083	Rear preload motor position error - motor travel during initialisation procedure was outside normal limits	Allow rear preload motor to calibrate, see Rear Suspension Unit Preload Motor Calibration If fault still occurs, disconnect Chassis ECM and proceed to pinpoint test 1:
C1084	Rear preload motor position error - motor end of travel position error	Check preload system mechanism for obstructions Disconnect Chassis ECM and proceed to pinpoint test 1:
C1085	Rear preload motor initialisation interrupted by user	Allow rear preload motor to calibrate, see Rear Suspension Unit Preload Motor Calibration
C1086	Rear preload motor initialisation completed	System ok Erase DTC No further action required

Pinpoint Tests

Test		Result	Action
1	Check fuse integrity: - Main fuse box, fuse 3 (PS3)	OK	Proceed to test 2
		Faulty	Replace fuse, proceed to test 6
2	Check cable and terminal integrity: - Chassis ECM pin B05 - Chassis ECM pin B04 - Chassis ECM pin A36 - Chassis ECM pin B01 - Chassis ECM pin A05 - RSU preload motor pin 1 - RSU preload motor pin 2 - RSU preload motor pin 3 - RSU preload motor pin 4	OK	Disconnect RSU preload motor and proceed to test 3
		Faulty	Rectify fault, proceed to test 6
3	Check cable for short circuit: - Chassis ECM pin B05 to ground - Chassis ECM pin B04 to ground - Chassis ECM pin A36 to ground	OK	Proceed to test 4
		Short circuit	Locate and rectify wiring fault, proceed to test 6
4	Check cable continuity: - Chassis ECM pin A36 to RSU preload motor pin 2 - Chassis ECM pin B05 to RSU preload motor pin 1 - Chassis ECM pin B04 to RSU	OK	Proceed to test 5
		Open circuit	Locate and rectify wiring fault, proceed to test 6

Test	Result	Action
preload motor pin 4 - Main fusebox fuse 3 to Chassis ECM pin B01 - RSU preload motor pin 3 to ground		
5 Check cable for short circuit: - Chassis ECM pin B04 to Chassis ECM pin B05	OK	Proceed to test 6
	Short circuit	Locate and rectify wiring fault, 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



Fog Lights Undercurrent/Overcurrent

Fault Code	Possible Cause	Action
C1031	Left headlight (high beam) undercurrent	Ensure all connectors are secure Proceed to pinpoint test 1:
C1033	Right headlight (high beam) undercurrent	
C1035	Left headlight (low beam) undercurrent	
C1037	Right headlight (low beam) undercurrent	
C1044	Front position light undercurrent	
C1032	Left headlight (high beam) overcurrent	Disconnect chassis ECM and proceed to pinpoint test 4:

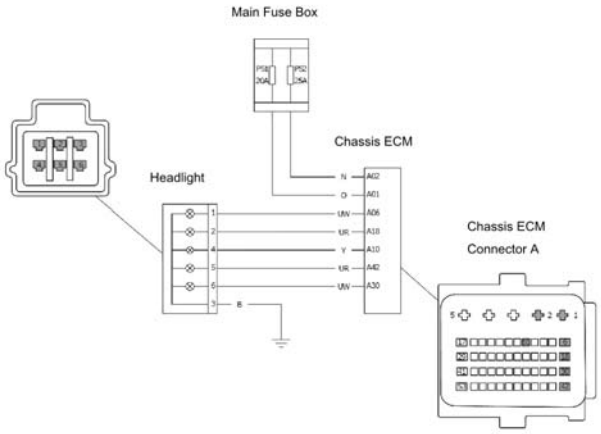
Fault Code	Possible Cause	Action
C1034	Right headlight (high beam) overcurrent	
C1036	Left headlight (low beam) overcurrent	
C1038	Right headlight (low beam) overcurrent	
C1045	Front position light overcurrent	

Pinpoint Tests

Test		Result	Action
1	Check bulb integrity, Left/Right /Position	OK	Proceed to test 2
		Faulty	Replace bulb, proceed to test 6
2	Check fuse integrity: - Main fusebox, fuse 1 (PS1) - Main Fusebox, fuse 2 (PS2)	OK	Disconnect headlight and chassis ECM connectors, proceed to test 3
		Faulty	Replace fuse, proceed to test 6
3	Check cable continuity: - Chassis ECM pin A06 to headlight connector pin 1 - Chassis ECM pin A18 to headlight connector pin 2 - Chassis ECM pin A10 to headlight connector pin 4 - Chassis ECM pin A42 to headlight connector pin 5 - Chassis ECM pin A30 to headlight connector pin 6 - Headlight connector pin 3 to ground - Main fusebox fuse 1 (PS1) to Chassis ECM pin A01 - Main fusebox fuse 2 (PS2) to Chassis ECM pin A02	OK	Proceed to test 4
		Faulty	Rectify fault, proceed to test 6
4	Check cable and terminal integrity: - Chassis ECM pin A06 - Chassis ECM pin A18 - Chassis ECM pin A10 - Chassis ECM pin A42 - Chassis ECM pin A30 - Chassis ECM pin A01 - Chassis ECM pin A02 - Headlight connector (all pins)	OK	Proceed to test 5
		Faulty	Rectify fault, proceed to test 6

Test		Result	Action
5	Check cable for short circuit: - Chassis ECM pin A06 to ground - Chassis ECM pin A18 to ground - Chassis ECM pin A10 to ground - Chassis ECM pin A42 to ground - Chassis ECM pin A30 to ground	OK	Proceed to test 6
		Short circuit	Locate and rectify wiring fault, 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



Rear Light Undercurrent/Overcurrent

Brake Light Undercurrent/Overcurrent

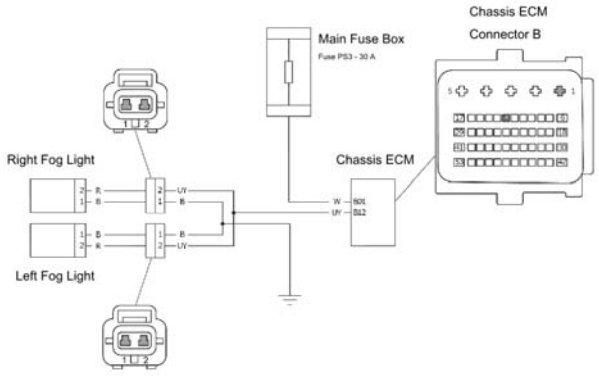
Fault Code	Possible Cause	Action
C1042	Fog lights undercurrent	Disconnect chassis ECM and fog light connectors Proceed to pinpoint test 1:
C1043	Left and right fog light overcurrent	Disconnect chassis ECM and fog light connectors Proceed to pinpoint test 2:

Pinpoint Tests

Test		Result	Action
1	Check fuse integrity: - Main fusebox, fuse 3 (PS3)	OK	Proceed to test 2
		Faulty	Replace fuse, proceed to test 5
2	Check cable and terminal integrity:	OK	Proceed to test 3

Test	Result	Action
- Chassis ECM pin B12 - Chassis ECM pin B01 - Left/Right fog light connector pin 1 - Left/Right fog light connector pin 2		
	Faulty	Rectify fault, proceed to test 5
3 Check cable for short circuit: - Chassis ECM pin B12 to ground	OK	Proceed to test 4
	Short circuit	Locate and rectify wiring fault, proceed to test 5
4 Check cable continuity: - Chassis ECM pin B12 to left fog light connector pin 2 - Chassis ECM pin B12 to right fog light connector pin 2 - Left fog light connector pin 1 to ground - Right fog light connector pin 1 to ground - Main fusebox fuse 3 (PS3) to Chassis ECM pin B01	OK	Proceed to test 5
	Open 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	Replace fog lights If fault still present, contact Triumph service

Circuit Diagram



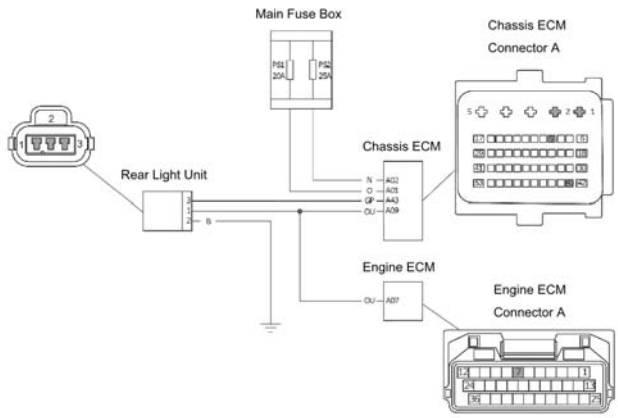
Fault Code	Possible Cause	Action
C1046	Rear light undercurrent	Disconnect chassis ECM and rear light connectors Proceed to pinpoint test 1:

Fault Code	Possible Cause	Action
C1047	Rear light overcurrent	Disconnect chassis ECM and rear light connectors Proceed to pinpoint test 2:

Pinpoint Tests

Test		Result	Action
1	Check fuse integrity: - Main fusebox, fuse 1 (PS1)	OK	Proceed to test 2
		Faulty	Replace fuse, proceed to test 5
2	Check cable and terminal integrity: - Chassis ECM pin A43 - Chassis ECM pin A01 - Rear light connector pin 3 - Rear light connector pin 2	OK	Proceed to test 3
		Faulty	Rectify fault, proceed to test 5
3	Check cable for short circuit: - Chassis ECM pin A43 to ground	OK	Proceed to test 4
		Short circuit	Rectify fault, proceed to test 5
4	Check cable continuity: - Chassis ECM pin A43 to rear light connector pin 3 - Rear light connector pin 2 to ground	OK	Proceed to test 5
		Open 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



Direction Indicators Undercurrent/Overcurrent

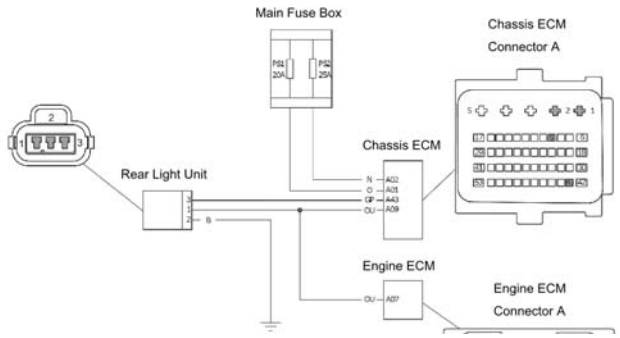
Fault Code	Possible Cause	Action

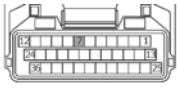
Fault Code	Possible Cause	Action
C1050	Brake light undercurrent	Ensure all connectors are secure Proceed to pinpoint test 1:
C1051	Brake light overcurrent	Disconnect chassis ECM and rear light connectors Proceed to pinpoint test 2:

Pinpoint Tests

Test		Result	Action
1	Check fuse integrity: - Main fusebox, fuse 2 (PS2)	OK	Disconnect chassis ECM and rear light connectors. Proceed to test 2
		Faulty	Replace fuse, proceed to test 5
2	Check cable and terminal integrity: - Chassis ECM pin A09 - Chassis ECM pin A02 - Rear light connector pin 1 - Rear light connector pin 2	OK	Proceed to test 3
		Faulty	Rectify fault, proceed to test 5
3	Check cable for short circuit: - Chassis ECM pin A09 to ground	OK	Proceed to test 4
		Short circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable continuity: - Chassis ECM pin A09 to rear light connector pin 1 - Main fusebox fuse 2 (PS2) to Chassis ECM pin A02 - Rear light connector pin 2 to ground	OK	Proceed to test 5
		Open 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





Horn Undercurrent/Overcurrent

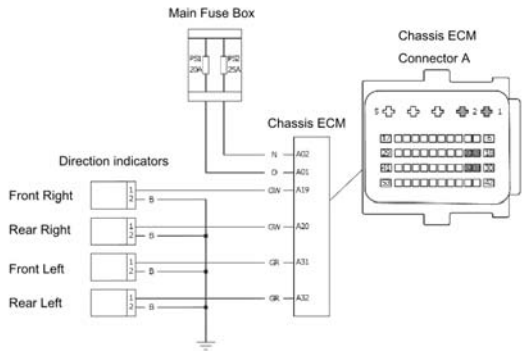
Fault Code	Possible Cause	Action
C1052	Left front direction indicator undercurrent	Ensure direction indicator connectors are secure Proceed to pinpoint test 1:
C1056	Right front direction indicator undercurrent	
C1054	Left rear direction indicator undercurrent	
C1058	Right rear direction indicator undercurrent	
C1053	Left front direction indicator overcurrent	Disconnect chassis ECM and relevant direction indicator connectors Proceed to pinpoint test 3:
C1057	Right front direction indicator overcurrent	
C1055	Left rear direction indicator overcurrent	
C1059	Right rear direction indicator overcurrent	

Pinpoint Tests

Test		Result	Action
1	Check relevant direction indicator bulb integrity (non LED direction indicators only)	OK	Proceed to test 2
		Faulty	Replace bulb, proceed to test 6
2	Check fuse integrity: - Main fusebox, fuse 1 (PS1) - Main Fusebox, fuse 2 (PS2)	OK	Disconnect relevant direction indicator and chassis ECM connectors Proceed to test 3
		Faulty	Replace fuse, proceed to test 6
3	Check cable continuity: - Chassis ECM pin A19 to right front indicator positive connector - Chassis ECM pin A20 to right rear indicator positive connector - Chassis ECM pin A31 to left front indicator positive connector - Chassis ECM pin A32 to left rear	OK	Proceed to test 4

Test	Result	Action
indicator positive connector - Right front indicator ground to battery negative terminal - Right rear indicator ground to battery negative terminal - left front indicator ground to battery negative terminal - left rear indicator ground to battery negative terminal - Main fusebox fuse 1 to Chassis ECM pin A01 - Main Fusebox fuse 2 to Chassis ECM pin A02		
	Faulty	Rectify fault, proceed to test 6
4 Check cable and terminal integrity: - Chassis ECM pin A19 - Chassis ECM pin A20 - Chassis ECM pin A31 - Chassis ECM pin A32 - Chassis ECM pin A01 - Chassis ECM pin A02 - All relevant direction indicator terminals	OK	Proceed to test 5
	Faulty	Rectify fault, proceed to test 6
5 Check cable for short circuit: - Chassis ECM pin A19 to ground - Chassis ECM pin A20 to ground - Chassis ECM pin A31 to ground - Chassis ECM pin A32 to ground	OK	Proceed to test 6
	Short circuit	Locate and rectify wiring fault, 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



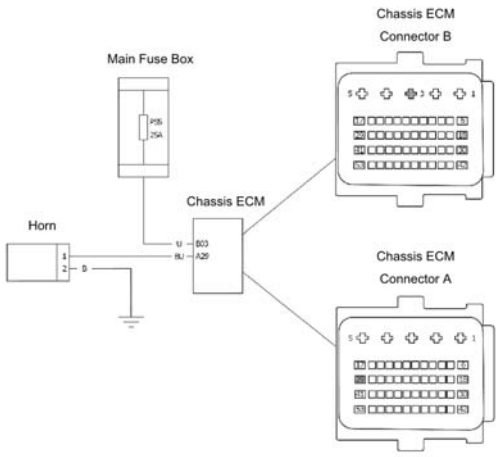
Rider Heated Seat Undercurrent/Overcurrent

Fault Code	Possible Cause	Action
C1060	Horn undercurrent	Ensure all connectors are secure Proceed to pinpoint test 1:
C1061	Horn overcurrent	

Pinpoint Tests

Test		Result	Action
1	Check fuse integrity: - Main fusebox, fuse 5 (PS5)	OK	Disconnect chassis ECM and horn connectors, proceed to test 2
		Faulty	Replace fuse, proceed to test 5
2	Check cable and terminal integrity: - Chassis ECM pin A29 - Chassis ECM pin B03 - Horn terminals	OK	Proceed to test 3
		Faulty	Rectify fault, proceed to test 5
3	Check cable for short circuit: - Chassis ECM pin A29 to ground	OK	Proceed to test 4
		Short circuit	Rectify fault, proceed to test 5
4	Check cable continuity: - Chassis ECM pin A29 to horn positive connector - Horn negative connector to ground - Main fusebox fuse 5 (PS5) to Chassis ECM pin B03	OK	Proceed to test 5
		Open 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



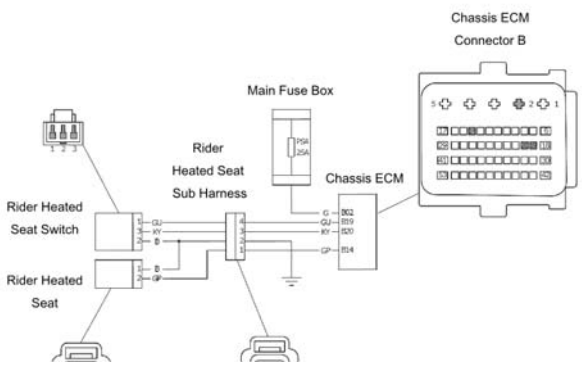
Rider Heated Seat Switch

Fault Code	Possible Cause	Action
C1062	Rider heated seat undercurrent	Proceed to pinpoint test 1:
C1063	Rider heated seat overcurrent	

Pinpoint Tests

Test		Result	Action
1	Check fuse integrity: - Main fusebox, fuse 4 (PS4)	OK	Disconnect chassis ECM and rider heated seat connectors, proceed to test 2
		Faulty	Replace fuse, proceed to test 5
2	Check cable and terminal integrity: - Chassis ECM pin B14 - Chassis ECM pin B02 - Rider heated seat sub harness connector pin 1 - Rider heated seat connector pin 2	OK	Proceed to test 3
		Faulty	Rectify fault, proceed to test 5
3	Check cable for short circuit: - Chassis ECM pin B14 to ground	OK	Proceed to test 4
		Short circuit	Rectify fault, proceed to test 5
4	Check cable continuity: - Chassis ECM pin B14 to rider heated seat pin 2 - Rider heated seat pin 1 to ground - Main fusebox fuse 4 (PS4) to Chassis ECM pin B02	OK	Proceed to test 5
		Open 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



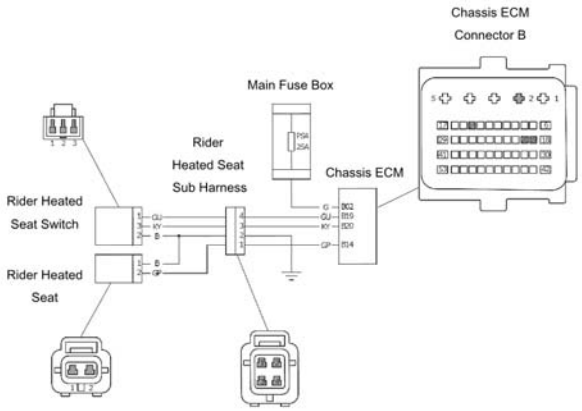

Passenger Heated Seat Undercurrent/Overcurrent

Fault Code	Possible Cause	Action
C1111	Rider heated seat switch malfunction	Disconnect chassis ECM connectors and proceed to pinpoint test 1:
C1112	Rider heated seat switch position one malfunction	
C1113	Rider heated seat switch position two malfunction	

Pinpoint Tests

Test		Result	Action
1	Check switch integrity: - Check the switch for sticking	OK	Proceed to test 2
		Faulty	Rectify fault/replace switch unit as necessary, proceed to test 6
2	Check cable and terminal integrity: - Chassis ECM pin B19 - Chassis ECM pin B20 - Switch pin 1 - Switch pin 2 - Switch pin 3	OK	Disconnect Rider heated seat switch connector and proceed to test 3
		Faulty	Rectify fault, proceed to test 6
3	Check cable for short circuit: - Chassis ECM pin B19 to ground - Chassis ECM pin B20 to ground	OK	Proceed to test 4
		Short circuit	Locate and rectify wiring fault, proceed to test 6
4	Check cable continuity: - Chassis ECM pin B19 to switch pin 1 - Chassis ECM pin B20 to switch pin 3 - Switch pin 2 to ground	OK	Proceed to test 5
		Open circuit	Locate and rectify wiring fault, proceed to test 6
5	Check cable for short circuit: - Chassis ECM pin B19 to Chassis ECM pin B20	OK	Proceed to test 6
		Short circuit	Locate and rectify wiring fault, 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



Passenger Heated Seat Switch

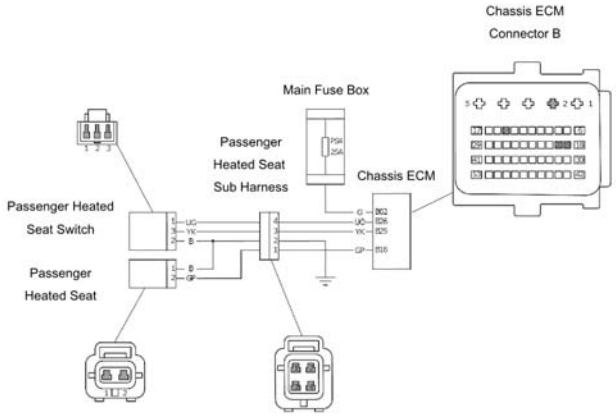
Fault Code	Possible Cause	Action
C1064	Passenger heated seat undercurrent	Proceed to pinpoint test 1:
C1065	Passenger heated seat overcurrent	

Pinpoint Tests

Test		Result	Action
1	Check fuse integrity: - Main fusebox, fuse 4 (PS4)	OK	Disconnect chassis ECM and passenger heated seat connectors, proceed to test 2
		Faulty	Replace fuse, proceed to test 5
2	Check cable and terminal integrity: - Chassis ECM pin B16 - Chassis ECM pin B02 - Passenger heated seat sub harness connector pin 1 - Passenger heated seat connector pin 2	OK	Proceed to test 3
		Faulty	Rectify fault, proceed to test 5
3	Check cable for short circuit: - Chassis ECM pin B16 to ground	OK	Proceed to test 4
		Short circuit	Rectify fault, proceed to test 5
4	Check cable continuity: - Chassis ECM pin B16 to passenger heated seat pin 2 - Passenger heated seat pin 1 to ground - Main fusebox fuse 4 (PS4) to Chassis ECM pin B02	OK	Proceed to test 5
		Open circuit	Locate and rectify wiring fault, proceed to test 5

Test		Result	Action
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



Heated Grips Undercurrent/Overcurrent

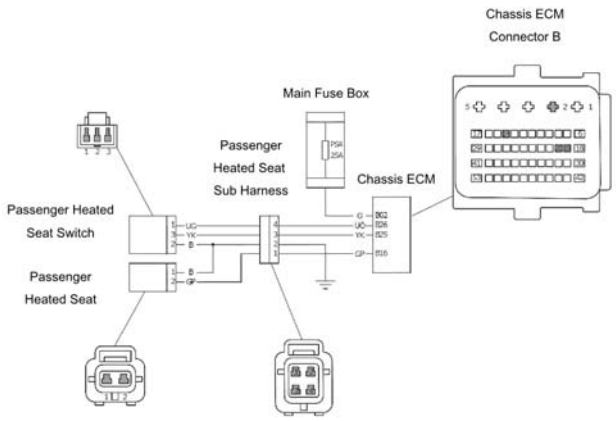
Fault Code	Possible Cause	Action
C1114	Passenger heated seat switch malfunction	Disconnect chassis ECM connectors and proceed to pinpoint test 1:
C1115	Passenger heated seat switch position one malfunction	
C1116	Passenger heated seat switch position two malfunction	

Pinpoint Tests

Test		Result	Action
1	Check switch integrity: - Check the switch for sticking	OK	Proceed to test 2
		Faulty	Rectify fault/replace switch unit as necessary, proceed to test 6
2	Check cable and terminal integrity: - Chassis ECM pin B25 - Chassis ECM pin B26 - Switch pin 1 - Switch pin 2 - Switch pin 3	OK	Disconnect passenger heated seat switch connector and proceed to test 3
		Faulty	Rectify fault, proceed to test 6
3	Check cable for short circuit:	OK	Proceed to test 4

Test	Result	Action
- Chassis ECM pin B25 to ground - Chassis ECM pin B26 to ground		
	Short Circuit	Locate and rectify wiring fault, proceed to test 6
4 Check cable continuity: - Chassis ECM pin B25 to switch pin 3 - Chassis ECM pin B26 to switch pin 1 - Switch pin 2 to ground	OK	Proceed to test 5
	Open circuit	Locate and rectify wiring fault, proceed to test 6
5 Check cable for short circuit: - Chassis ECM pin B25 to Chassis ECM pin B26	OK	Proceed to test 6
	Short circuit	Locate and rectify wiring fault, 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



Cooling Fan Undercurrent/Overcurrent

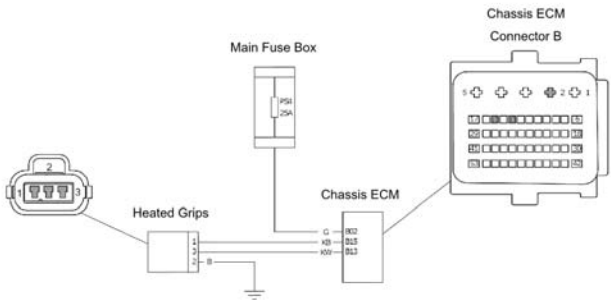
Fault Code	Possible Cause	Action
C1066	Right heated grip undercurrent	Ensure all connectors are secure Proceed to pinpoint test 1:
C1068	Left heated grip undercurrent	
C1067	Right heated grip overcurrent	Disconnect chassis ECM and heated grip connectors Proceed to pinpoint test 2:
C1069	Left heated grip overcurrent	

Pinpoint Tests

Test	Result	Action

Test		Result	Action
1	Check fuse integrity: - Main fusebox, fuse 4 (PS4)	OK	Disconnect chassis ECM and heated grip connectors, proceed to test 2
		Faulty	Replace fuse, proceed to test 5
2	Check cable and terminal integrity: - Chassis ECM pin B13 - Chassis ECM pin B15 - Chassis ECM pin B02 - Heated grip connector pin 1 - Heated grip connector pin 2 - Heated grip connector pin 3	OK	Proceed to test 3
		Faulty	Rectify fault, proceed to test 5
3	Check cable for short circuit: - Chassis ECM pin B13 to ground - Chassis ECM pin B15 to ground	OK	Proceed to test 4
		Short circuit	Rectify fault, proceed to test 5
4	Check cable continuity: - Chassis ECM pin B13 to heated grip pin 3 - Chassis ECM pin B15 to heated grip pin 1 - Heated grip pin 2 to ground - Main fusebox fuse 4 (PS4) to Chassis ECM pin B02	OK	Proceed to test 5
		Open 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



Fuel Pump Undercurrent/Overcurrent

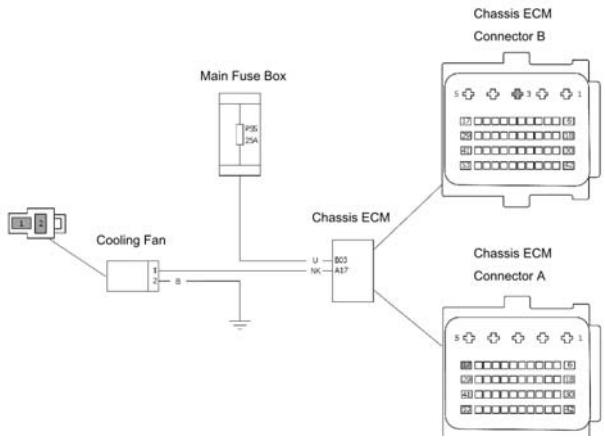
Fault Code	Possible Cause	Action

Fault Code	Possible Cause	Action
C1070	Cooling fan undercurrent	Proceed to pinpoint test 1:
C1071	Cooling fan overcurrent	Disconnect chassis ECM and cooling fan connectors Proceed to pinpoint test 2:

Pinpoint Tests

Test		Result	Action
1	Check fuse integrity: - Main fusebox, fuse 5 (PS5)	OK	Disconnect chassis ECM and cooling fan connectors, proceed to test 2
		Faulty	Replace fuse, proceed to test 5
2	Check cable and terminal integrity: - Chassis ECM pin A17 - Chassis ECM pin B03 - Cooling fan connector pin 1 - Cooling fan connector pin 2	OK	Proceed to test 3
		Faulty	Rectify fault, proceed to test 5
3	Check cable for short circuit: - Chassis ECM pin A17 to ground	OK	Proceed to test 4
		Short circuit	Rectify fault, proceed to test 5
4	Check cable continuity: - Chassis ECM pin A17 to cooling fan pin 1 - Cooling fan pin 2 to ground - Main fusebox fuse 5 (PS5) to Chassis ECM pin B03	OK	Proceed to test 5
		Open 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



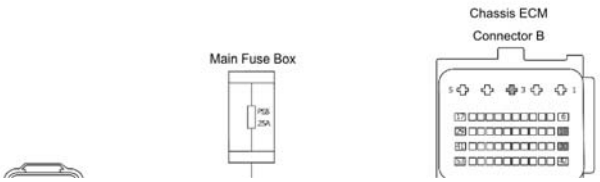
Universal Serial Bus (USB) Power Socket Overcurrent

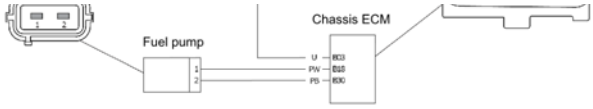
Fault Code	Possible Cause	Action
C1072	Fuel pump undercurrent	Proceed to pinpoint test 1
C1073	Fuel pump overcurrent	Disconnect chassis ECM and fuel pump connectors Proceed to pinpoint test 2

Pinpoint Tests

Test		Result	Action
1	Check fuse integrity: - Main fusebox, fuse 5 (PS5)	OK	Disconnect chassis ECM and fuel pump connectors, proceed to test 2
		Faulty	Replace fuse, proceed to test 5
2	Check cable and terminal integrity: - Chassis ECM pin B18 - Chassis ECM pin B30 - Chassis ECM pin B03 - Fuel pump connector pin 1 - Fuel pump connector pin 2	OK	Proceed to test 3
		Faulty	Rectify fault, proceed to test 5
3	Check cable for short circuit: - Chassis ECM pin B18 to ground - Chassis ECM pin B30 to ground	OK	Proceed to test 4
		Short circuit	Rectify fault, proceed to test 5
4	Check cable continuity: - Chassis ECM pin B18 to fuel pump pin 1 - Chassis ECM pin B30 to fuel pump pin 2 - Main fusebox fuse 5 (PS5) to Chassis ECM pin B03	OK	Proceed to test 5
		Open 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





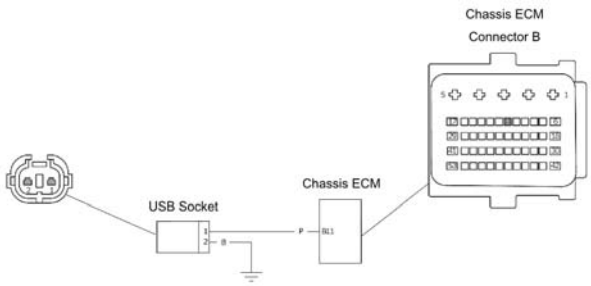
Passenger Accessory Power Socket Overcurrent

Fault Code	Possible Cause	Action
C1074	Universal Serial Bus (USB) power socket overcurrent	Remove any device connected Disconnect chassis ECM and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check cable for short circuit: - Chassis ECM pin B11 to ground	OK	Proceed to test 2
		Short circuit	Locate and rectify wiring fault, proceed to test 3
2	Check cable continuity: - Chassis ECM pin B11 to USB socket pin 1 - USB socket pin 2 to ground	OK	Replace USB socket, proceed to test 3
		Open circuit	Locate and rectify wiring fault, proceed to test 3
3	Reconnect harness, clear fault code and run engine to verify fault cleared	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



Top Box Accessory Power Socket Overcurrent

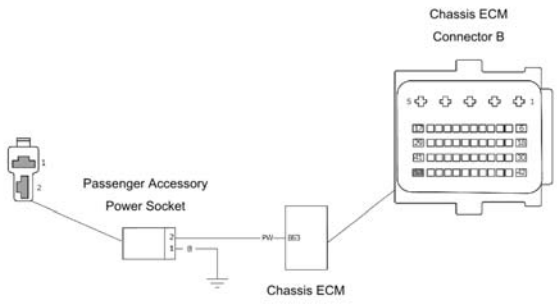
Fault Code	Possible Cause	Action

Fault Code	Possible Cause	Action
C1075	Passenger accessory power socket overcurrent	Remove any device connected Disconnect chassis ECM and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check cable for short circuit: - Chassis ECM pin B53 to ground	OK	Proceed to test 2
		Short circuit	Locate and rectify wiring fault, proceed to test 3
2	Check cable continuity: - Chassis ECM pin B53 to power socket pin 2 - Power socket pin 1 to ground	OK	Replace power socket, proceed to test 3
		Open circuit	Locate and rectify wiring fault, proceed to test 3
3	Reconnect harness, clear fault code and run engine to verify fault cleared	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



Starter Motor Solenoid Undercurrent/Overcurrent

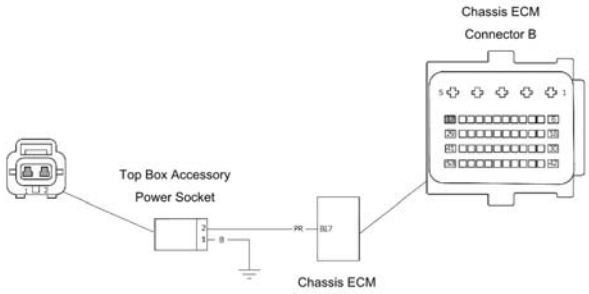
Fault Code	Possible Cause	Action
C1076	Top box accessory power socket overcurrent	Remove any device connected Disconnect chassis ECM and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check cable for short circuit:	OK	Proceed to test 2

Test		Result	Action
	- Chassis ECM pin B17 to ground		
		Short circuit	Locate and rectify wiring fault, proceed to test 3
2	Check cable continuity: - Chassis ECM pin B17 to power socket pin 2 - Top box power socket pin 1 to ground	OK	Replace power socket, proceed to test 3
		Open circuit	Locate and rectify wiring fault, proceed to test 3
3	Reconnect harness, clear fault code and run engine to verify fault cleared	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



TSAS Error

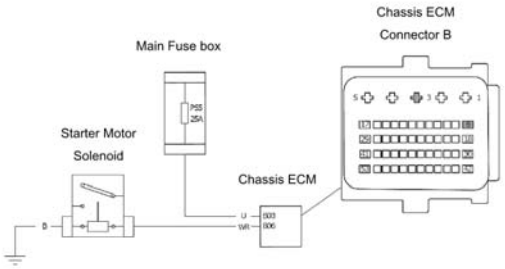
Fault Code	Possible Cause	Action
C1077	Starter motor solenoid undercurrent	Proceed to pinpoint test 1:
C1078	Starter motor solenoid overcurrent	Disconnect chassis ECM and proceed to pinpoint test 2:

Pinpoint Tests

Test		Result	Action
1	Check fuse integrity: - Main fusebox, fuse 5 (PS5)	OK	Disconnect chassis ECM and proceed to test 2
		Faulty	Replace fuse, proceed to test 5
2	Check cable and terminal integrity: - Chassis ECM pin B06	OK	Disconnect starter solenoid connectors and proceed to test 3

Test	Result	Action
- Chassis ECM pin B03 - Starter solenoid pin 2 - Starter solenoid pin 1		
	Faulty	Rectify fault, proceed to test 5
3 Check cable for short circuit: - Chassis ECM pin B06 to ground	OK	Proceed to test 4
	Short circuit	Rectify fault, proceed to test 5
4 Check cable continuity: - Chassis ECM pin B06 to starter solenoid pin 1 - Starter solenoid pin 2 to ground - Main fusebox fuse 5 (PS5) to Chassis ECM pin B03	OK	Replace starter solenoid, proceed to test 5
	Open 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



Instrument Communication (CAN)

Fault Code	Possible Cause	Action
C1079	TSAS - Solenoid valves implausible signal	Contact Triumph service
C1110	TSAS general error	Download latest chassis ECM software If fault still present, contact Triumph service

ABS Communication (CAN)

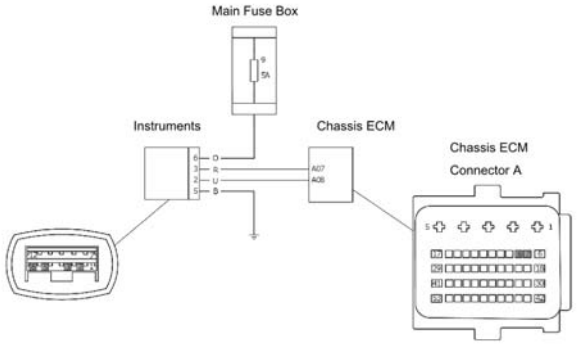
Fault Code	Possible Cause	Action

Fault Code	Possible Cause	Action
C1087	CAN fault - lost communication with instruments	Proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Verify instrument panel is operating. Turn the ignition to the ON position	OK	Disconnect chassis ECM and instrument connectors and proceed to test 3
		Faulty	Proceed to test 2
2	Check fuse integrity: - Main fusebox, fuse 9	OK	Disconnect chassis ECM and instrument connectors and proceed to test 3
		Faulty	Replace blown fuse, proceed to test 8
3	Check cable continuity: - Instruments pin 6 to battery positive terminal - Instruments pin 5 to ground	OK	Proceed to test 4
		Faulty	Rectify fault, proceed to test 8
4	Check cable and terminal integrity: - Chassis ECM pin A07 - Chassis ECM pin A08 - Instruments pin 3 - Instruments pin 2	OK	Proceed to test 5
		Faulty	Rectify fault, proceed to test 8
5	Check cable for short circuit: - Chassis ECM pin A07 to ground - Chassis ECM pin A08 to ground	OK	Proceed to test 6
		Short circuit	Locate and rectify wiring fault, proceed to test 8
6	Check cable continuity: - Chassis ECM pin A07 to instrument pin 3 - Chassis ECM pin A08 to instrument pin 2	OK	Proceed to test 7
		Open circuit	Locate and rectify wiring fault, proceed to test 8
7	Check cable for short circuit: - Chassis ECM pin A07 to Chassis ECM pin A08	OK	Proceed to test 8
		Short circuit	Locate and rectify wiring fault, proceed to test 8
8	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



Inertial Measurement Unit (IMU) ID Incompatible

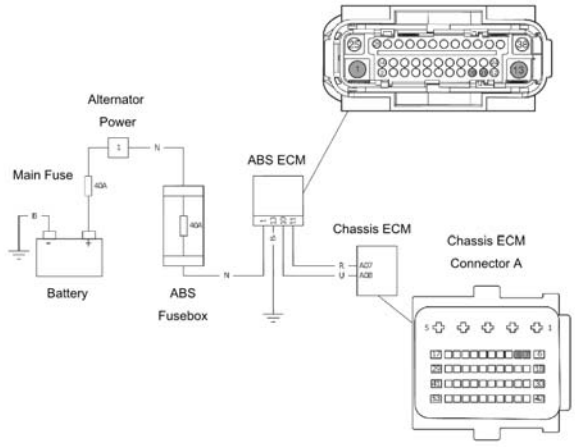
Fault Code	Possible cause	Action
C1088	CAN fault - lost communication with ABS module	Disconnect Chassis ECM connectors and proceed to pinpoint test 1:
C1108	TSAS - ABS implausible signal	Disconnect Chassis ECM connectors and proceed to pinpoint test 3:

Pinpoint Tests

Test		Result	Action
1	Check ABS fuse integrity:	OK	Proceed to test 2
		Faulty	Replace blown fuse, proceed to test 7
2	Check cable continuity: - ABS ECM pin 1 to battery positive terminal - ABS ECM pin 13 to ground	OK	Proceed to test 3
		Open circuit	Locate and rectify wiring fault, proceed to test 7
3	Check cable and terminal integrity: - Chassis ECM pin A07 - Chassis ECM pin A08 - ABS ECM pin 10 - ABS ECM pin 11	OK	Disconnect ABS ECM connector, proceed to test 4
		Faulty	Locate and rectify wiring fault, proceed to test 7
4	Check cable for short circuit: - Chassis ECM pin A07 to ground - Chassis ECM pin A08 to ground	OK	Proceed to test 5
		Short circuit	Locate and rectify wiring fault, proceed to test 7
5	Check cable continuity:	OK	Proceed to test 6

Test		Result	Action
	- Chassis ECM pin A07 to ABS ECM pin 11 - Chassis ECM pin A08 to ABS ECM pin 10		
		Open circuit	Locate and rectify wiring fault, proceed to test 7
6	Check cable for short circuit: - Chassis ECM pin A07 to Chassis ECM pin A08	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

Circuit Diagram



Inertial Measurement Unit (IMU) Signal (CAN)

Fault Code	Possible Cause	Action
C1089	Inertial Measurement Unit (IMU) ID incompatible	Proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check IMU part number is correct for the motorcycle	OK	Proceed to test 2
		Incorrect	Replace IMU with correct part and proceed to test 3
2	Check that the engine ECM and chassis ECM tunes are correct for the motorcycle, using the diagnostic software	OK	Proceed to test 3
		Incorrect	Update the tunes using the diagnostic software, proceed to test 3

Test	Result	Action
3 Clear fault code, check for normal operation	OK	Action complete - quit test
	Fault still present	Contact Triumph service

Engine ECM Communication (CAN)

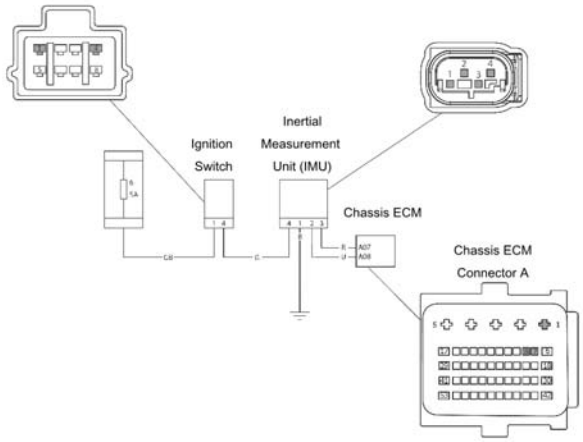
Fault Code	Possible Cause	Action
C1107	TSAS - Inertial Measurement Unit (IMU) implausible signal	Ensure IMU is fixed in its proper location Disconnect chassis ECM and proceed to pinpoint test 1:
C1090	CAN fault - lost communication with Inertial Measurement Unit (IMU)	
C1092	Inertial Measurement Unit (IMU) malfunction	

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Chassis ECM pin A07 - Chassis ECM pin A08 - IMU pin 3 - IMU pin 2 - IMU pin 4 - IMU pin 1	OK	Disconnect IMU connector and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - Chassis ECM pin A07 to ground - Chassis ECM pin A08 to ground - IMU pin 4 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable continuity: - Chassis ECM pin A07 to IMU pin 3 - Chassis ECM pin A08 to IMU pin 2 - IMU pin 1 to ground Turn ignition switch to the ON position and check cable continuity: - IMU pin 4 to battery positive terminal	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable for short circuit: - Chassis ECM pin A07 to pin A08	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

Test	Result	Action
and run engine to verify fault cleared		
	Fault still present	Replace IMU If fault still present, contact Triumph service

Circuit Diagram



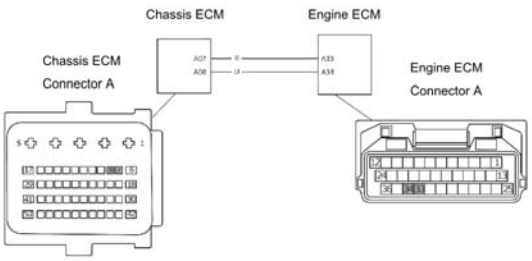
Fault Code	Possible cause	Action
C1091	CAN fault - lost communication with Engine ECM	Disconnect Chassis ECM and Engine ECM connectors and proceed to pinpoint test 1:
C1106	No Engine ECM immobiliser communication	
C1109	TSAS - Engine ECM implausible signal	

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin A33 - Engine ECM pin A34 - Chassis ECM pin A07 - Chassis ECM pin A08	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - Engine ECM pin A33 to ground - Engine ECM pin A34 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	Check cable continuity:	OK	Proceed to test 4

Test	Result	Action
- Engine ECM pin A33 to Chassis ECM pin A07 - Engine ECM pin A34 to Chassis ECM pin A08		
	Open circuit	Locate and rectify wiring fault, proceed to test 5
4 Check cable for short circuit: - Engine ECM pin A33 to Engine ECM pin A34	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



Tyre Pressure Monitoring System (TPMS) Wheel Sensors

Immobiliser Antenna

Fault Code	Possible cause	Action
C1097	Front wheel sensor unit battery alert	Replace the relevant wheel pressure sensor following the procedure described in the Triumph Diagnostic Tool User Guide Record the new sensor's ID number into the Owner Handbook before fitting
C1098	Rear wheel sensor unit battery alert	
C1099	Front wheel sensor unit fault alert	If the problem persists: Replace the relevant wheel pressure sensor following the procedure described in the Triumph diagnostic tool user guide Record the new sensor's ID number into the owner handbook before fitting
C1100	Rear wheel sensor unit fault alert	

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Chassis ECM pin B52	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 2
2	Reconnect harness, clear fault code and run engine to verify fault cleared	Ok	Action complete - quit test
		Fault still present	Contact Triumph service

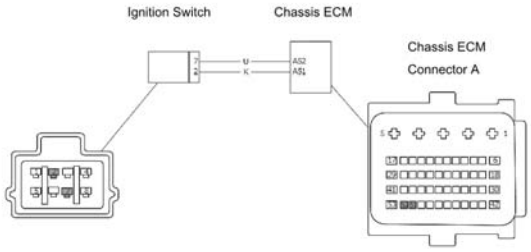
Fault Code	Possible Cause	Action
C1103	Immobiliser antenna - loss of communication with key	Check that the key has been registered with the chassis ECM, if it is a new key or an additional key Check that there are no additional keys with a transponder chip fitted close to the ignition key and proceed to pinpoint test 1:
C1104	Invalid key: Key authentication unsuccessful	
C1105	Immobiliser antenna internal error	

Pinpoint Tests

Test		Result	Action
1	If available, try to start the motorcycle with the second registered key	OK	Transponder chip in the key not functioning correctly Register a new key using the Triumph Diagnostic Tool, proceed to test 7
		Faulty	Proceed to test 2
2	Check cable and terminal integrity: - Chassis ECM pin A51 - Chassis ECM pin A52 - Chassis ECM pin A50 - Ignition switch pin 2 - Ignition switch pin 7	OK	Proceed to test 3
		Faulty	Rectify fault, proceed to test 7
3	Check cable for short cirucuit: - Chassis ECM pin A51 to ground - Chassis ECM pin A52 to ground	OK	Proceed to test 4
		Short circuit	Locate and rectify wiring fault, proceed to test 7
4	Check antenna coil resistance: - Ignition switch pin 2 to ignition switch pin 7	7 to 13 Ohms	Proceed to test 5
		Faulty	Replace the ignition switch, register new keys and proceed to test 7
5	Check cable continuity:	OK	Proceed to test 6

Test		Result	Action
	- Chassis ECM pin A51 to ignition switch pin 2 - Chassis ECM pin A52 to ignition switch pin 7		
		Open circuit	Locate and rectify wiring fault, proceed to test 7
6	Check cable for short circuit: - Chassis ECM pin A51 to Chassis ECM ping A52	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

Circuit Diagram



Left Fork Stepper Motor (Compression Damping)

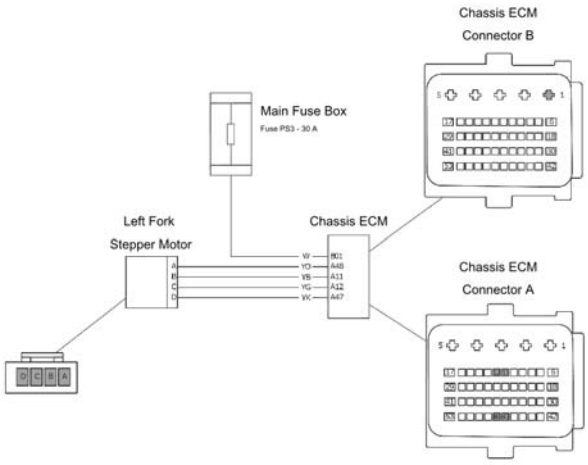
Fault Code	Possible Cause	Action
C1117	Left fork stepper motor undercurrent	Disconnect chassis ECM and proceed to pinpoint test 1:
C1119	Left fork stepper motor (compression) driver error	
C1118	Left fork stepper motor overcurrent	Disconnect chassis ECM and proceed to pinpoint test 2:

Pinpoint Tests

Test		Result	Action
1	Check fuse integrity: - Main fuse box, fuse 3 (PS3)	OK	Proceed to test 2
		Faulty	Replace fuse, proceed to test 5

Test	Result	Action
2 Check cable and terminal integrity: - Chassis ECM pin A11 - Chassis ECM pin A12 - Chassis ECM pin A47 - Chassis ECM pin A48 - Chassis ECM pin B01	OK	Disconnect left fork stepper motor. Proceed to test 3
	Faulty	Rectify fault, proceed to test 5
3 Check cable for short circuit: - Chassis ECM pin A11 to ground - Chassis ECM pin A12 to ground - Chassis ECM pin A47 to ground - Chassis ECM pin A48 to ground	OK	Proceed to test 4
	Short circuit	Locate and rectify wiring fault, proceed to test 5
4 Check cable continuity: - Chassis ECM pin A11 to left fork stepper motor pin B - Chassis ECM pin A12 to left fork stepper motor pin C - Chassis ECM pin A47 to left fork stepper motor pin D - Chassis ECM pin A48 to left fork stepper motor pin A	OK	Proceed to test 5
	Open 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



Right Fork Stepper Motor (Rebound Damping)

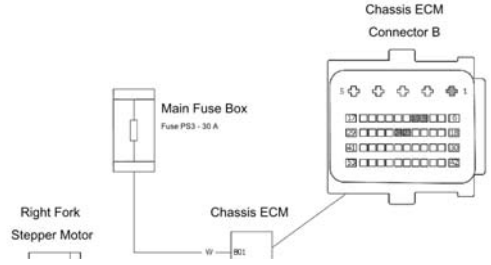
Fault Code	Possible Cause	Action
C1120	Right fork stepper motor undercurrent	Disconnect chassis ECM and proceed to pinpoint test 1:

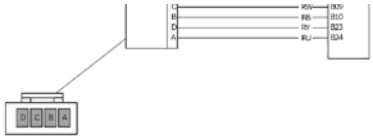
Fault Code	Possible Cause	Action
C1122	Right fork stepper motor (rebound) driver error	
C1121	Right fork stepper motor overcurrent	Disconnect chassis ECM and proceed to pinpoint test 2:

Pinpoint Tests

Test		Result	Action
1	Check fuse integrity: - Main fuse box, fuse 3 (PS3)	OK	Proceed to test 2
		Faulty	Replace fuse, proceed to test 5
2	Check cable and terminal integrity: - Chassis ECM pin B09 - Chassis ECM pin B10 - Chassis ECM pin B23 - Chassis ECM pin B24 - Chassis ECM pin B01	OK	Disconnect right fork stepper motor. Proceed to test 3
		Faulty	Rectify fault, proceed to test 5
3	Check cable for short circuit: - Chassis ECM pin B09 to ground - Chassis ECM pin B10 to ground - Chassis ECM pin B23 to ground - Chassis ECM pin B24 to ground	OK	Proceed to test 4
		Short circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable continuity: - Chassis ECM pin B09 to right fork stepper motor pin C - Chassis ECM pin B10 to right fork stepper motor pin B - Chassis ECM pin B23 to right fork stepper motor pin D - Chassis ECM pin B24 to right fork stepper motor pin A	OK	Proceed to test 5
		Open 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





Chassis ECM Internal Error

Chassis ECM Restarted Due to Process Time Out During Normal Operation

Fault Code	Possible Cause	Action
C1095	Chassis ECM internal error	Note and investigate any other stored DTCs Erase DTC and monitor for further issues If the fault fails to clear, contact Triumph service

Chassis ECM Restarted due to Calibration Download

Fault Code	Possible Cause	Action
C1124	Chassis ECM restarted due to process time out during normal operation	Note and investigate any other stored DTCs Contact Triumph service
C1125		
C1126		

Fault Code	Possible Cause	Action
C1127	Chassis ECM restarted due to calibration download	Erase DTC No further action required

Unexpected Chassis ECM Restart

Chassis ECM Power Supply Interrupted

Chassis ECM Parameters Reset to Default

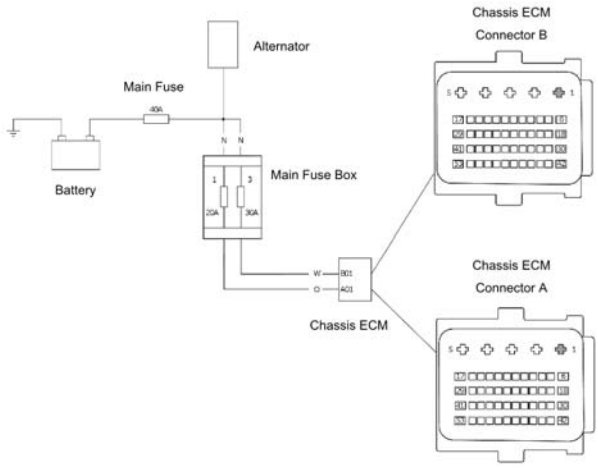
Fault Code	Possible Cause	Action
C1128	Unexpected chassis ECM restart	Note and investigate any other stored DTCs Erase DTC and monitor for further issues If the fault fails to clear or reoccurs, contact Triumph service

Fault Code	Possible Cause	Action
C1129	Chassis ECM power supply interrupted	Ensure voltage across battery is acceptable. Note Voltage

Pinpoint Tests

Test		Result	Action
1	Has the battery been disconnected?	Yes	Proceed to test 5
		No	Disconnect Chassis ECM and proceed to test 2
2	Check cable and terminal integrity: - Battery terminals - Chassis ECM pin A01 - Chassis ECM pin B01 - Alternator cable	OK	Proceed to test 3
		Faulty	Rectify fault, proceed to test 5
3	Check fuse integrity - Main fusebox, fuse 1 (PS1) - Main fuse box, fuse 3 (PS3)	OK	Proceed to test 4
		Faulty	Replace fuse(s), proceed to test 4
4	With Ignition 'ON', check Voltage at: - Chassis ECM pin A01 - Chassis ECM pin B01	Same as 'across battery' Voltage	Proceed to test 5
		Less than 'across battery' Voltage	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



Rear Preload Motor Maximum/Minimum End Stop Detection Error

Fault Code	Possible Cause	Action
C1130	Chassis ECM parameters reset to default	Download the latest chassis ECM calibration to ensure correct model specific configuration

Fault Code	Possible Cause	Action
		Erase stored DTCs from all ECMs

Fault Code	Possible Cause	Action
C1131	Rear preload motor minimum end stop detection error. Preload motor not inhibited.	Rear preload motor calibration is started automatically after next ignition cycle Allow rear preload motor to calibrate, see Rear Suspension Unit Preload Motor Calibration
C1132	Rear preload motor minimum end stop detection error. Preload motor inhibited.	
C1133	Rear preload motor Maximum end stop detection error. Preload motor not inhibited.	
C1134	Rear preload motor Maximum end stop detection error. Preload motor inhibited.	

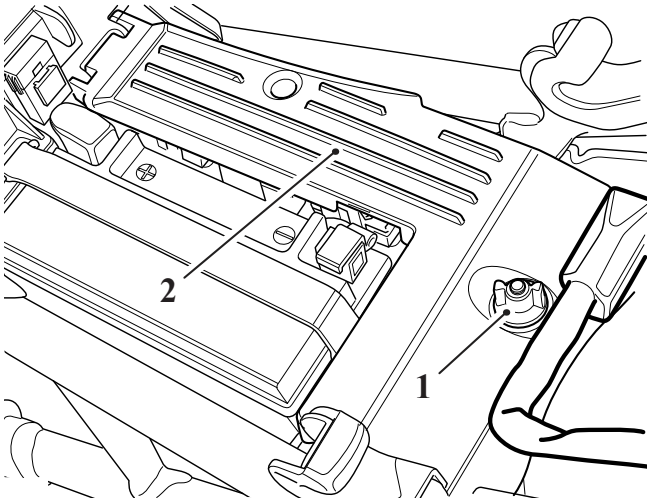
Chassis Electronic Control Module (ECM) - Removal

⚠ 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.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.

1. Release the wing nut and remove the chassis ECM cover.



1. **Wing nut**
2. **Chassis ECM cover**

2. Disconnect the chassis ECM connectors (see Chassis ECM Connectors).
3. Remove the chassis ECM from the under seat tray.

Chassis Electronic Control Module (ECM) - Installation

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. Refit the chassis ECM to the under seat tray.
2. Reconnect the chassis ECM connectors (see Chassis ECM Connectors).
3. Refit the chassis ECM cover and secure with the wing nut.

Note

- **If a new chassis ECM is fitted it will need to be set up as described in Chassis Electronic Control Module (ECM) - Setup.**

Chassis Electronic Control Module (ECM) - Setup

Inertial Measurement Unit (IMU) - 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.

When installing a new chassis ECM, it is necessary to perform the following operations in order, as described in the Chassis Diagnostics section of the Triumph Diagnostic Tool User Guide:

1. Register all keys;
2. Pair the chassis ECM with the engine ECM;
3. Download the latest chassis ECM calibration;
4. Register the tyre pressure sensor ID numbers, activate TPMS and enable the TPMS instrument display (if TPMS is fitted).

For models fitted with Triumph Semi-Active Suspension (TSAS), it its also necessary to complete the following operations in order:

1. Calibrate the rear suspension unit preload motor (see Rear Suspension Unit Preload Motor Calibration).
2. Calibrate the swinging arm position sensor (see Swinging Arm Position Sensor - Calibration).

Inertial Measurement Unit (IMU) - Installation

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.

- Remove the rider’s seat (see Rider’s Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the fuel tank (see Fuel Tank - Removal).
- Remove the seat bridge (see Seat Bridge - Removal).

CAUTION

The Inertial Measurement Unit (IMU) is a highly sensitive device. Exposure to excessive shock and vibration can cause permanent damage to IMU internal components.

Care must be taken when removing or installing the IMU, not to expose it to excessive shock or vibration.

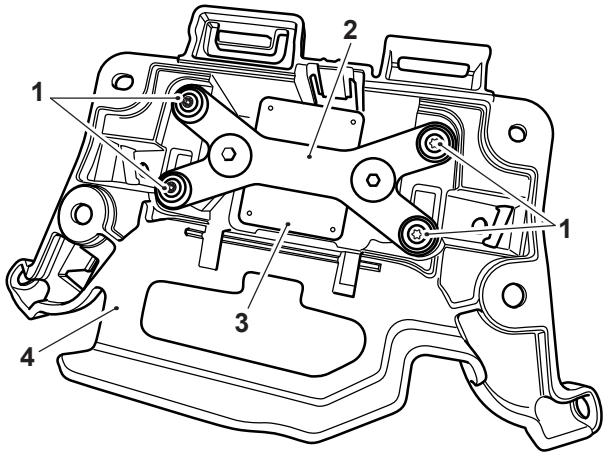
CAUTION

When releasing or tightening fixings, use suitable hand tools only. Do not use air or battery powered tools.

When removed from the motorcycle, place the IMU on a flat surface in a location that is isolated from shock and vibrations caused by other workshop processes.

Do not drop the IMU. An IMU that has been dropped will be irreparably damaged and must be replaced.

1. Using a suitable hand tool, release the fixings and remove the IMU and bracket assembly from the seat bridge.



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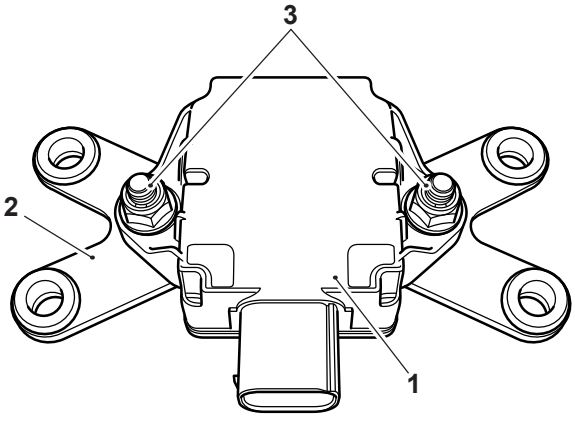
1. **Fixings**
2. **Bracket**
3. **Inertial measurement unit (IMU)**
4. **Seat bridge**

2. Release the fixings and remove the bracket from the IMU.



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1. **Inertial measurement unit (IMU)**
2. **Bracket**
3. **Fixings**

Swinging Arm Position Sensor - 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

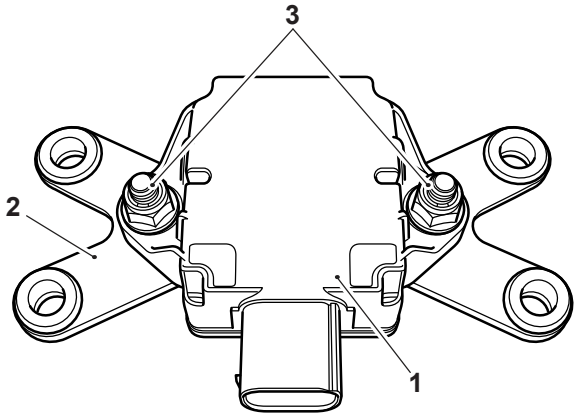
The Inertial Measurement Unit (IMU) is a highly sensitive device. Exposure to excessive shock and vibration can cause permanent damage to IMU internal components.

Care must be taken when removing or installing the IMU, not to expose it to excessive shock or vibration. When releasing or tightening fixings, use suitable hand tools only. Do not use air or battery powered tools.

When removed from the motorcycle, place the IMU on a flat surface in a location that is isolated from shock and vibrations caused by other workshop processes.

Do not drop the IMU. An IMU that has been dropped will be irreparably damaged and must be replaced.

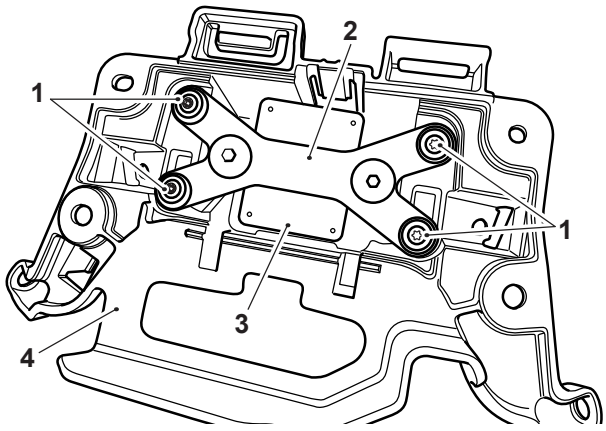
1. Refit the bracket to the Inertial Measurement Unit (IMU) and secure with the fixings. Using a suitable hand tool, tighten the fixings to **8 Nm**.



cjlv

1. **Inertial measurement unit (IMU)**
2. **Bracket**
3. **Fixings**

2. Carefully position the IMU and bracket assembly to the seat bridge, ensuring that the grommets on the IMU bracket locate correctly onto the mountings on the seat bridge.
3. Secure with the fixings and using a suitable hand tool, tighten to **1.5 Nm**.



1. **Fixings**
2. **Bracket**
3. **Inertial measurement unit (IMU)**
4. **Seat bridge**

- Refit the seat bridge (see Seat Bridge - Installation).
- Refit the fuel tank (see Fuel Tank - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

Swinging Arm Position Sensor - Installation

WARNING

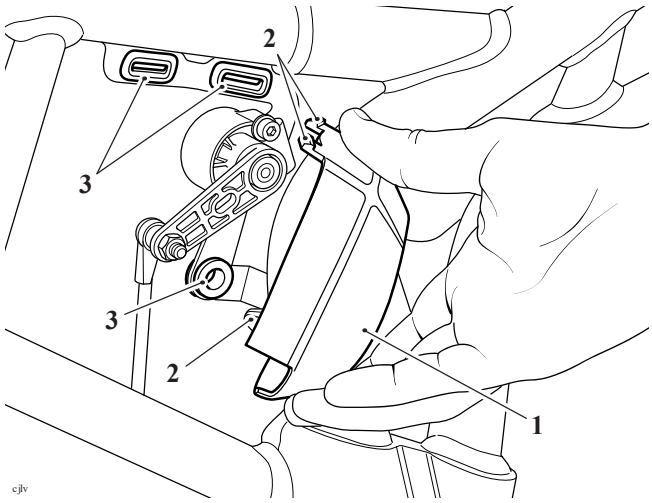
If the engine has recently been running, the exhaust components may be hot to the touch. Contact with the hot components may cause damage to exposed skin. To avoid skin damage, always allow the hot parts to cool before working on the exhaust system.

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.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.

1. Release the tangs from the grommets and remove the sensor cover.



1. **Sensor cover**
2. **Tangs**
3. **Grommets**

CAUTION

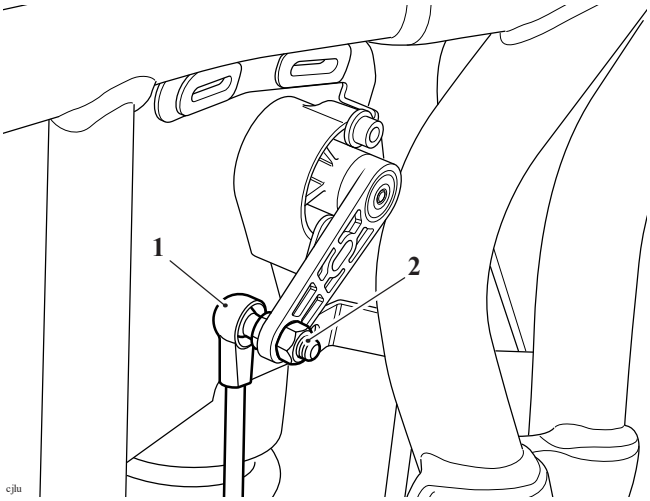
CAUTION

The swinging arm position sensor's actuator arm operates vertically.

Do not allow the actuator arm to twist or bend during removal of the ball stud.

Twisting or bending the actuator arm may cause damage to the actuator arm or the internal components of the swinging arm position sensor.

2. Release the link rod from the ball stud.

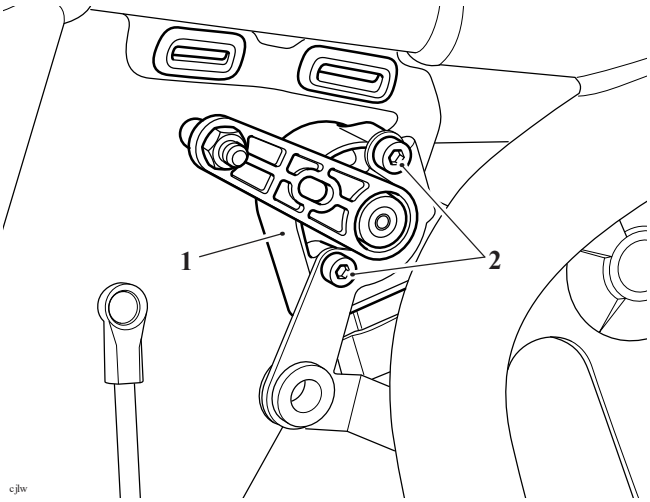


1. **Link rod**
2. **Ball stud**

Note

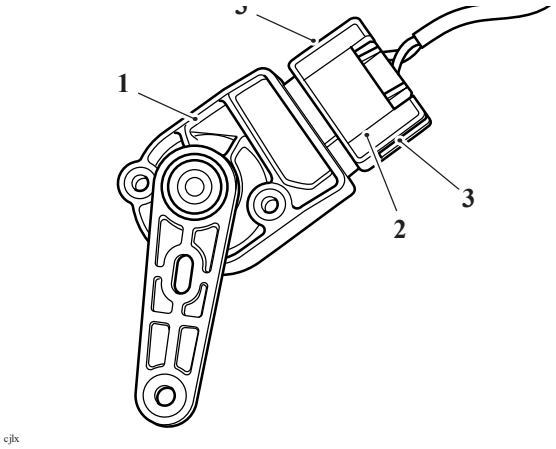
- **To gain access to the electrical connector the position sensor must first be released from its fixings.**

3. Release the fixings and remove the position sensor.



1. **Position sensor**
2. **Fixings**

4. Release the tangs and disconnect the position sensor from its electrical connector.



cjlx

1. **Position sensor**
2. **Electrical connector**
3. **Tangs**

Swinging Arm Position Sensor - Calibration

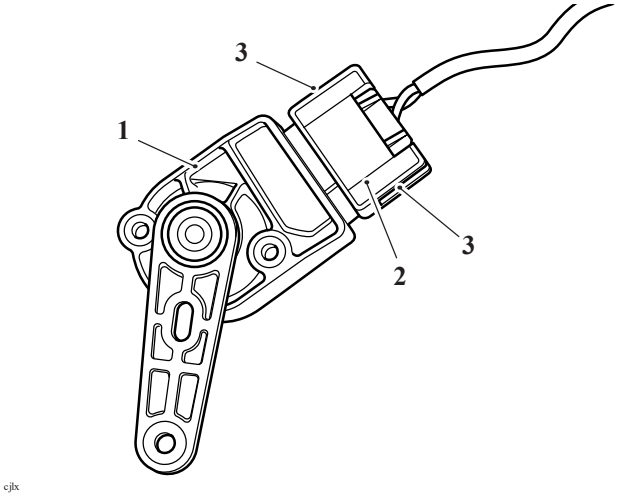
⚠ WARNING

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

- **Prior to installing the position sensor the electrical connector must first be connected.**

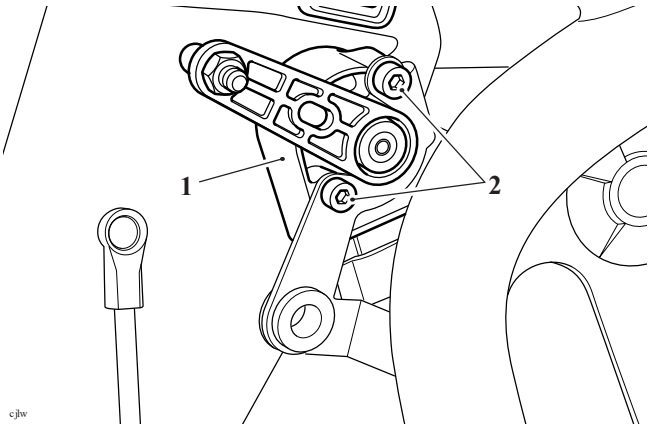
1. Connect the position sensor to its electrical connector.



cjlx

1. **Position sensor**
2. **Electrical connector**
3. **Tangs**

2. Align the position sensor to the frame and tighten the fixings to **4 Nm**.



1. **Position sensor**
2. **Fixings**

CAUTION

The swinging arm position sensor's actuator arm operates vertically.

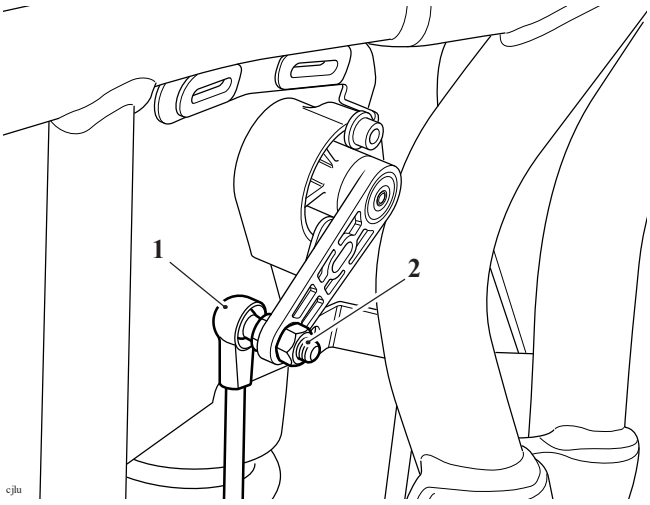
Care should be taken to not allow the actuator arm to twist or bend during removal of the ball stud.

Twisting or bending the actuator arm may cause damage to the actuator arm or the internal components of the swinging arm position sensor.

Note

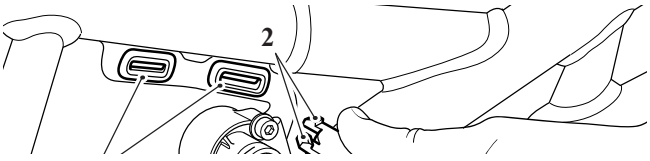
- **Apply a smear of proprietary general purpose grease to NLGI 2 standard to the ball stud.**
- **If the ball stud is removed from the sensor for any reason a new ball stud must be fitted.**

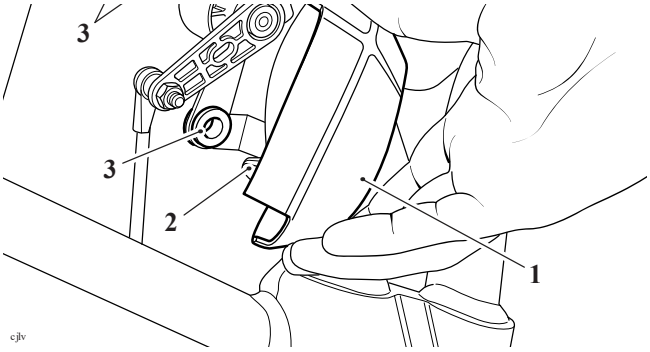
3. Position the ball stud to the link rod socket as noted during removal.



1. **Link rod socket**
2. **Ball stud**

4. Refit the sensor cover.





1. **Sensor cover**
2. **Tangs**
3. **Grommets**

- Reconnect the battery, positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Calibrate the rear suspension unit preload motor (see Rear Suspension Unit Preload Motor Calibration).
- Calibrate the swinging arm position sensor (see Swinging Arm Position Sensor - Calibration).
- Refit the rider's seat (see Rider's Seat - Installation).

⚠ 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.

Conditions Requiring Swinging Arm Position Sensor Calibration

The swinging arm position sensor must be calibrated after:

- Installation and setup of a new chassis ECM.
- Installation of a new swinging arm position sensor.
- Removal of the swinging arm position sensor or any disconnection of its mechanical linkage.

Procedure

1. Remove the rider's seat (see Rider's Seat - Removal).

⚠ WARNING

The rear suspension unit preload motor MUST be calibrated before attempting to calibrate the swinging arm position sensor. Failure to calibrate the rear suspension unit preload motor first, may result in incorrect calibration of the swinging arm position sensor.

Before calibrating the swinging arm position sensor, first calibrate the rear suspension unit preload motor as described in Rear Suspension Unit Preload Motor Calibration.

Incorrect calibration of the swinging arm position sensor may cause an unsafe riding condition resulting in loss of motorcycle control and an accident.

2. Calibrate the rear suspension unit preload motor (see Rear Suspension Unit Preload Motor Calibration).

⚠ WARNING

Before calibrating the swinging arm position sensor, the motorcycle must be raised and supported such that the rear wheel is off the ground and the rear suspension is allowed to hang freely.

Failure to raise and support the motorcycle as described above will result in incorrect calibration of the

WARNING

swinging arm position sensor.

Incorrect calibration of the swinging arm position sensor may cause an unsafe riding condition resulting in loss of motorcycle control and an accident.

3. Raise and support the rear of the motorcycle so that the rear wheel is off the ground and the rear suspension is allowed to hang freely.
4. Connect the Triumph Diagnostic Tool (see System Diagnosis) and turn the ignition On.
5. Navigate to CHASSIS DIAGNOSTICS - CHASSIS ECM DIAGNOSTICS - FUNCTION TEST and select CALIBRATE SWINGING ARM POSITION SENSOR. The message 'Refer to Service Manual' will be displayed.

Note

- **Upon clicking start, a command will be sent to the chassis ECM to read the output from the swinging arm position sensor and register this reading as position zero (rear suspension at full extension). This calibration occurs instantaneously.**

6. Click start. The calibration will be completed instantaneously as described above.
7. Disconnect the Triumph Diagnostic Tool and turn the ignition Off.
8. Lower the motorcycle and park on its stand.
9. Refit the rider's seat (see Rider's Seat - Installation).

Ambient Air Temperature Sensor - Removal

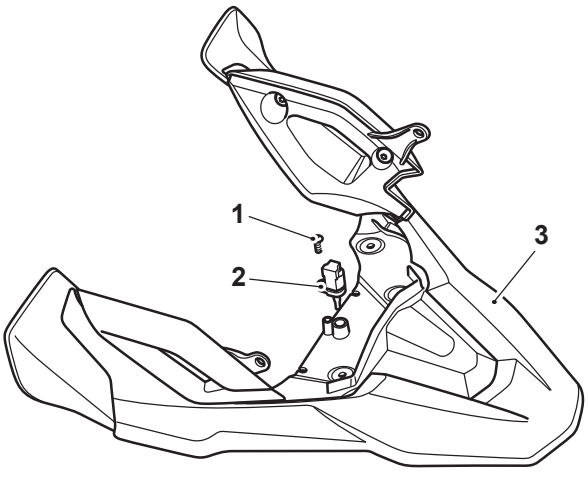
Ambient Air Temperature Sensor - Installation

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.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the high level mudguard (see High Level Mudguard - Removal).

1. Remove the fixing and remove the ambient air temperature sensor from the high level mudguard assembly.



1. **Fixing**
2. **Ambient air temperature sensor**

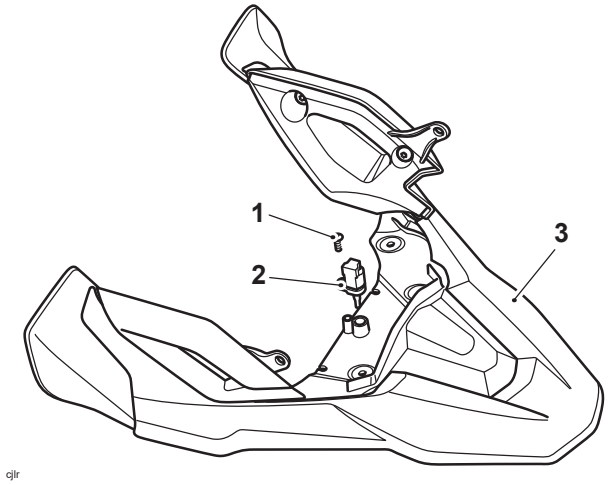
3. **High level mudguard assembly**

Windscreen Motor - 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. Refit the ambient air temperature sensor to the high level mudguard assembly and tighten its fixing to **1.5 Nm**.



1. **Fixing**
2. **Ambient air temperature sensor**
3. **High level mudguard assembly**

- Refit the high level mudguard (see High Level Mudguard - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider’s seat (see Rider’s Seat - Installation).

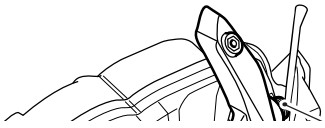
Windscreen Motor - Installation

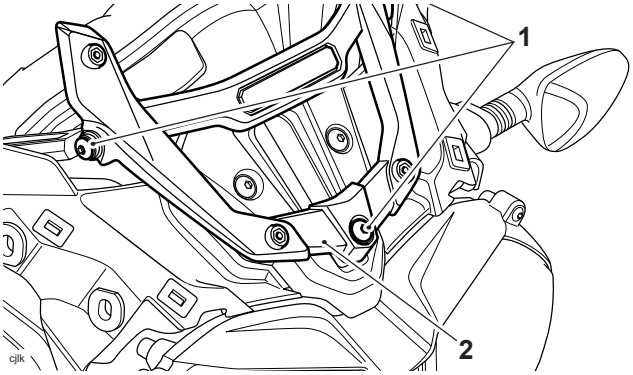
WARNING

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.

- Remove the rider’s seat (see Rider’s Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the windscreen (see Windscreen - Removal).
- Remove the cockpit panels (see Cockpit Panels - Removal).

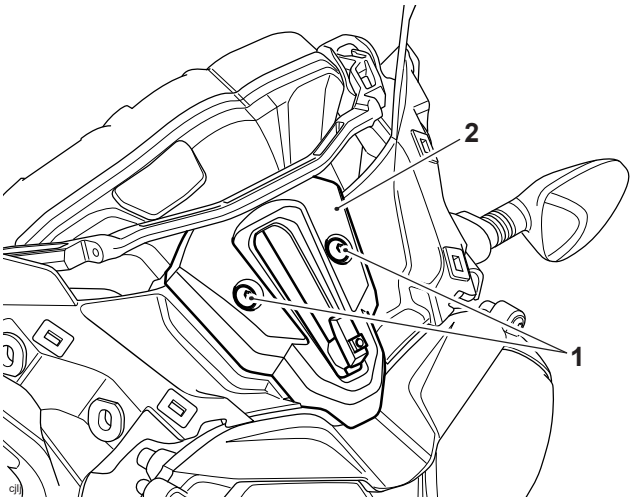
1. Release the three fixings and remove the windscreen support bracket. Collect the flanged sleeves from the upper fixings.





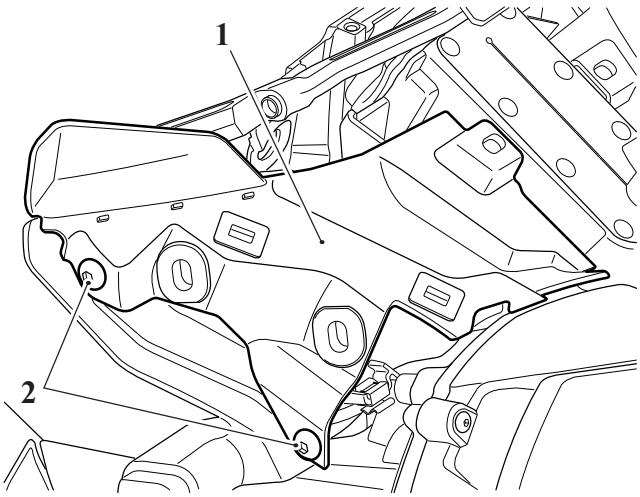
1. **Fixings**
2. **Windscreen support bracket**

2. Release the fixings and remove the windscreen motor cover.



1. **Fixings**
2. **Windscreen motor cover**

3. Release the fixings and remove the clear wind deflector panels.



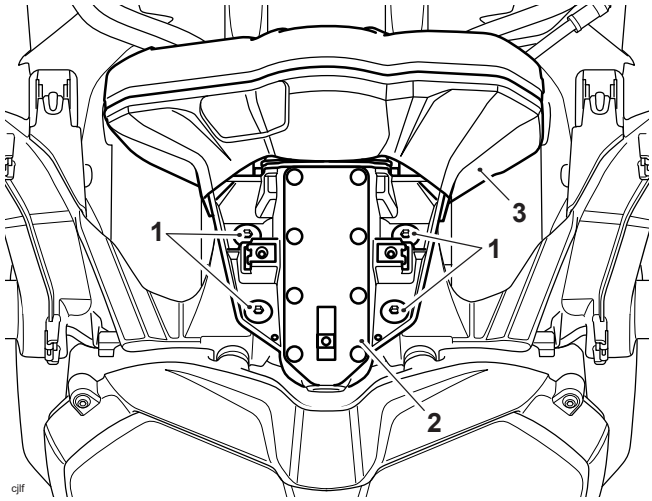
1. **Wind deflector panel (right hand shown)**

2. **Fixings**

Note

- **The instrument cover is held in place by a bayonet type fixing. Gently pull on the cover to release it.**

4. Remove the cover attached to the rear of the instruments.
5. Release the four windscreen motor fixings.



1. **Fixings**
2. **Windscreen motor**
3. **Instrument cover (shown with the windscreen pivot bar removed for clarity)**

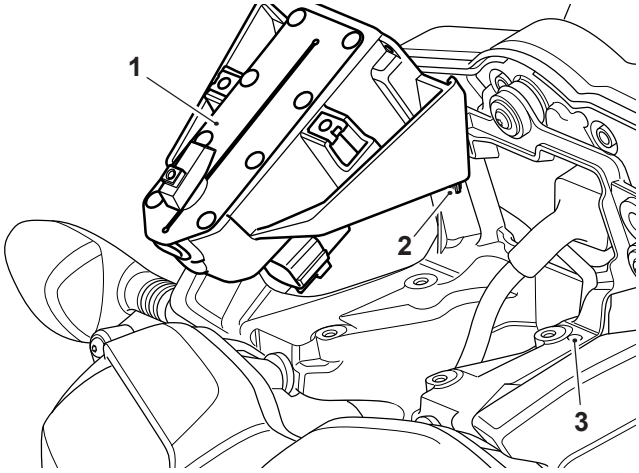
6. Carefully lift the windscreen motor away from the front subframe. Disconnect the electrical connector and remove the motor.

Instruments - Removal

⚠ WARNING

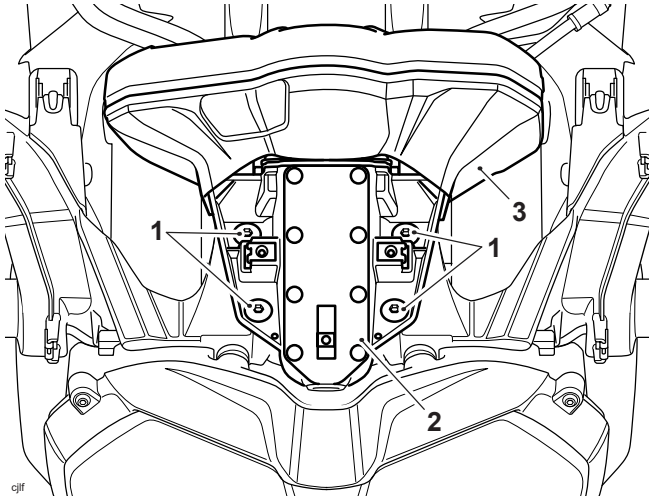
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Position the windscreen motor to the front subframe and reconnect the electrical connector. Ensure the lugs on the underside of the motor locate into the holes on the front subframe.



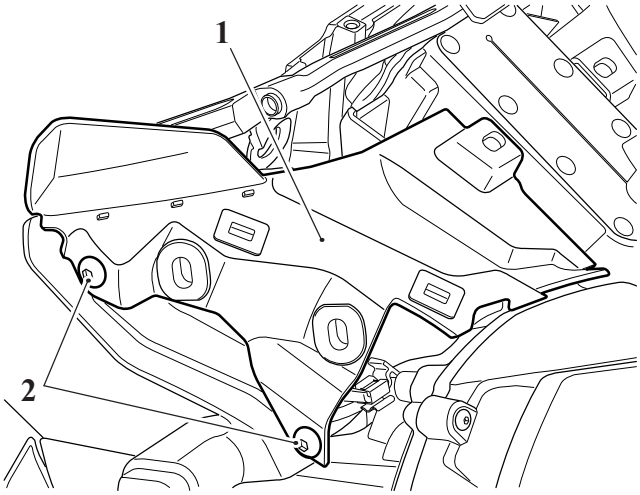
1. **Windscreen motor**
2. **Locating lug (left hand shown, right hand similar)**
3. **Front subframe holes**

2. Refit the four windscreen motor fixings and tighten to **12 Nm**.
3. Refit the instrument cover and gasket to the rear of the instruments, ensuring the bayonet fixings are fully inserted into the grommets on the front subframe.



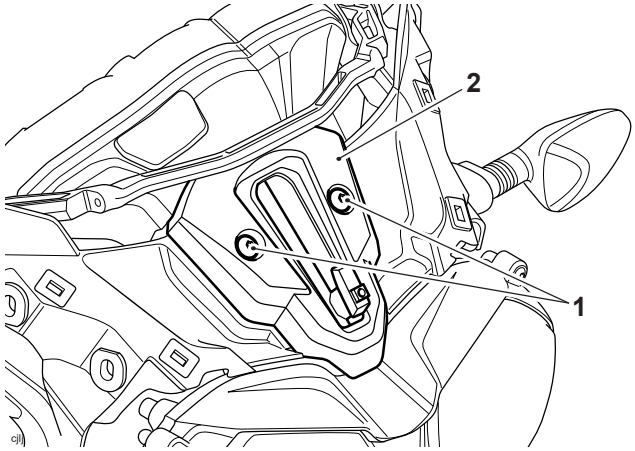
1. **Fixings**
2. **Windscreen motor**
3. **Instrument cover**

4. Refit the wind deflector panels and tighten the fixings to **3 Nm**.



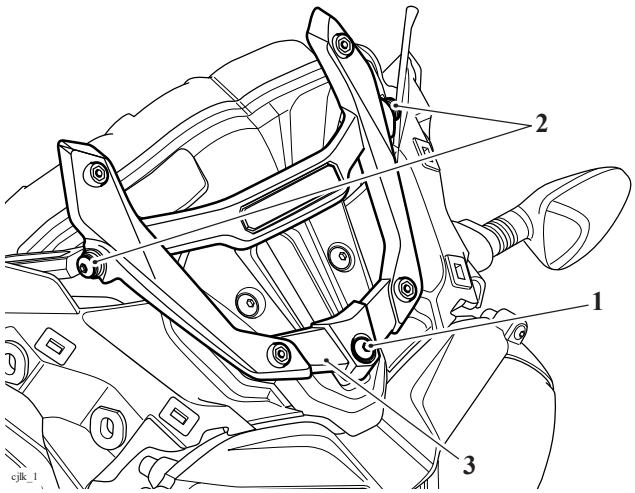
1. **Wind deflector panel (right hand shown)**
2. **Fixings**

5. Refit the windscreen motor cover ensuring that the upper and lower locating tangs locate correctly into their slots on the instrument cover and windscreen motor. Tighten the fixings to **3 Nm**.



1. **Fixings**
2. **Windscreen motor cover**

6. Position the windscreen support bracket upper mountings to the windscreen pivot bar and secure with the two fixings and flanged sleeves. Do not fully tighten at this stage.
7. Position the windscreen support bracket lower mounting to the windscreen motor and secure with the fixing. Tighten the fixing to **5 Nm**.
8. Tighten the windscreen support upper mountings to **4 Nm**.



1. **Lower mounting fixing**
2. **Upper mounting fixings**
3. **Windscreen support bracket**

- Refit the cockpit panels (see Cockpit Panels - Installation).
- Refit the windscreen (see Windscreen - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

Instruments - Installation

Headlight

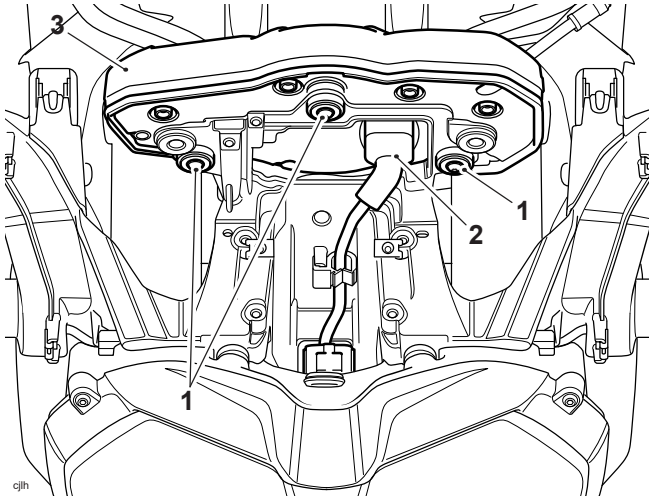
⚠ WARNING

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.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.

1. Remove the windscreen motor (see Windscreen Motor - Removal).
2. Disconnect the electrical connector from the instruments.
3. Remove the three fixings and release the instruments from the bracket bayonet fixings. Collect the washers.



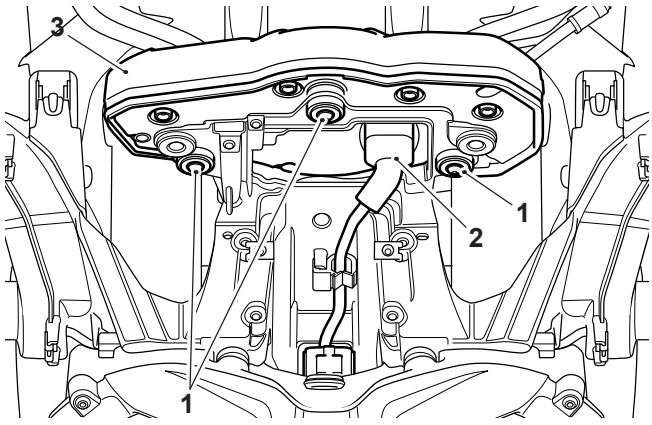
1. **Fixings**
2. **Electrical connector**
3. **Instruments**

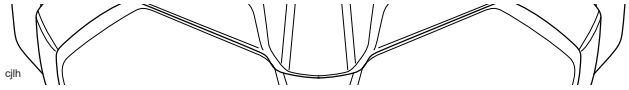
Headlight Adjustment

WARNING

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

1. Position the instruments to the bracket.
2. Insert the bayonet fixings into the grommets. Fit the washers and fixings and tighten to **3 Nm**.
3. Connect the electrical connector to the instruments.





1. **Fixings**
2. **Electrical connector**
3. **Instruments**

- Refit the windscreen motor (see Windscreen Motor - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

Headlight Bulb Replacement

Position Light Bulb Replacement

WARNING

Adjust road speed to suit the visibility and weather conditions in which the motorcycle is being operated.

Make sure that the head light beam is adjusted to illuminate the road surface sufficiently far ahead without dazzling oncoming traffic. An incorrectly adjusted headlight may impair visibility causing an accident.

WARNING

Never attempt to adjust a headlight beam when the motorcycle is in motion.

Any attempt to adjust a headlight beam when the motorcycle is in motion may result in loss of control and an accident.

CAUTION

Do not cover the headlight or lens with any item likely to obstruct air flow to, or prevent heat escaping from, the headlight lens.

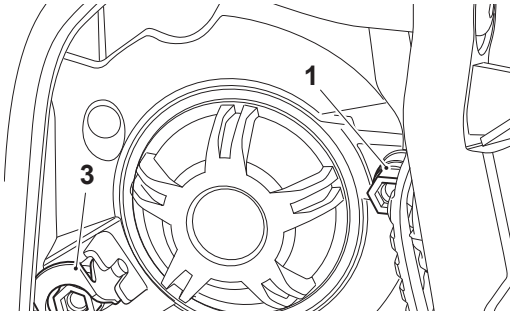
Covering the headlight lens during operation with items of clothing, luggage, adhesive tape, devices intended to alter or adjust the headlight beam or non genuine headlight lens covers will cause the headlight lens to overheat and distort, causing irreparable damage to the headlight assembly.

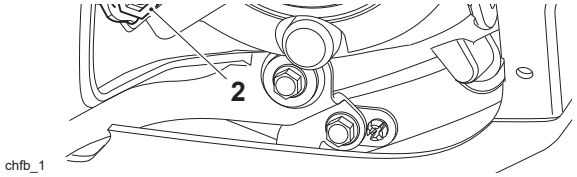
Damage caused by overheating is not considered a manufacturing defect and will not be covered under warranty.

If the headlight must be covered during use - such as taping of the headlight lens required during closed-course conditions - the headlight must be disconnected.

Note

- **The headlight can be adjusted by means of vertical and horizontal adjustment screws located on the rear of the headlight.**





1. **Horizontal adjustment screw**
2. **Vertical adjustment screw**
3. **Headlight adjuster lever for loaded conditions**

1. Switch the headlight dipped beam on.
2. Turn the vertical adjustment screw on the headlight clockwise to raise the beam or anti-clockwise to lower the beam.
3. Turn the horizontal adjustment screw clockwise to move the beam to the right or anti-clockwise to move the beam to the left.
4. Switch the headlights off when the beam settings are satisfactory.

Headlight Assembly - 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.

Each headlight bulb can be replaced as follows:

WARNING

The bulb becomes hot during use. Always allow sufficient time for the bulb to cool before handling.

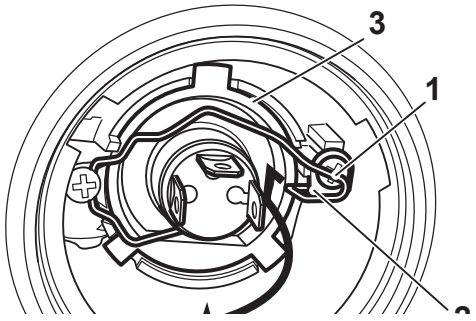
Avoid touching the glass part of the bulb. If the glass is touched or gets dirty, clean with alcohol before re-use.

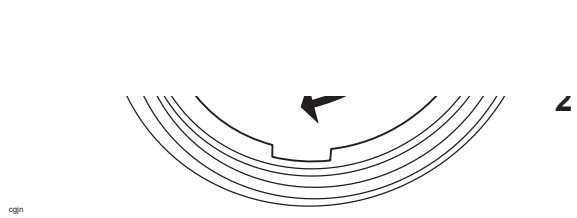
WARNING

Do not reconnect the battery until the assembly process has been completed. Premature battery reconnection could result in ignition of the battery gases causing risk of injury.

- Remove the rider’s seat (see Rider’s Seat - Removal).
- Disconnect the battery, negative (black) lead first.

1. Remove the bulb cover from the bulb to be replaced by rotating it anti-clockwise.
2. Disconnect the multiplug from the bulb.
3. Detach the bulb retainer from the hook on the headlight assembly and rotate it away from the bulb as shown.





1. **Bulb retainer (right hand shown)**
2. **Bulb retainer hook**
3. **Bulb**

4. Remove the bulb from the bulb retainer.

Installation

1. Installation is the reverse of removal.

Note

- **When reconnecting the battery, connect the positive (red) lead first.**

Headlight Assembly - Installation

⚠ WARNING

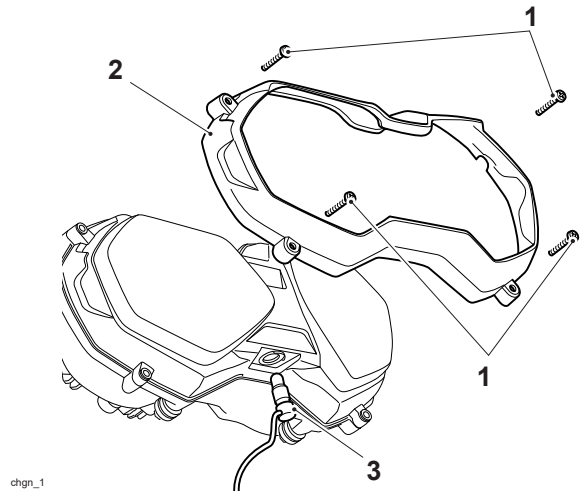
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.

Note

- **The position light is fitted to the centre of the headlight.**

1. Remove the four fixings and remove the headlight surround.
2. Detach the rubber retainer from the headlight and pull out the bulb.



1. **Fixings**
2. **Headlight surround**
3. **Position light bulb**

Installation

1. Installation is the reverse of removal, noting the following:

Note

- **Tighten the headlight surround fixings to 3 Nm.**
- **Reconnect the battery, positive (red) lead first.**

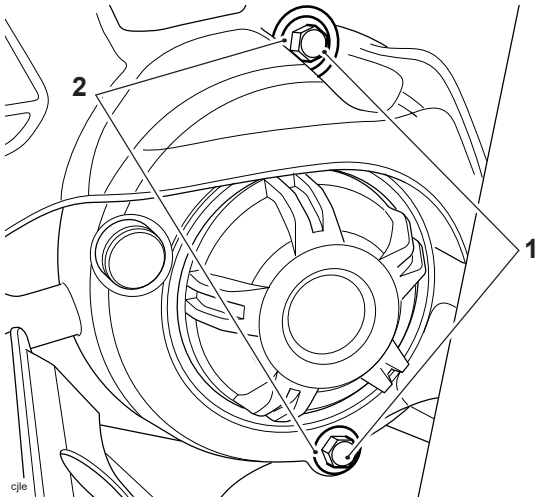
Rear Light - Removal

⚠ 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.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the cockpit panels (see Cockpit Panels - Removal).
- Remove the high level mudguard (High Level Mudguard - Removal).

1. Release the four fixings and washers securing the headlight to the front subframe.



1. **Fixings (left hand shown)**
2. **Washers**

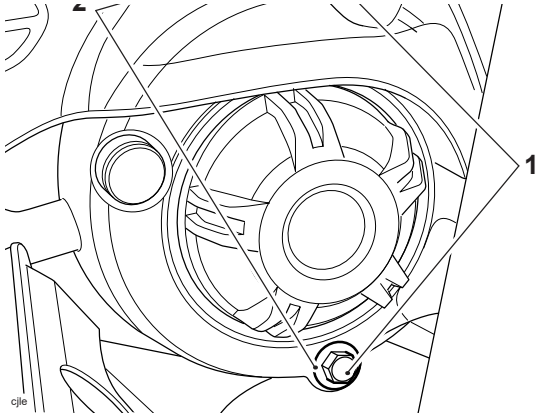
2. Ease the headlight away from the cockpit subframe and disconnect the electrical connector for complete removal.

Rear Light - Installation

⚠ 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. Connect the electrical connector and align the four mountings on the headlight to their rubber grommets on the cockpit subframe.
2. Carefully and evenly, push the headlight into its four mounting grommets. Fit the fixings and washers and tighten to **4 Nm**.



1. **Fixings (left hand shown)**
2. **Washers**

- Refit the high level mudguard (see High Level Mudguard - Installation).
- Refit the cockpit panels (see Cockpit Panels - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

Direction Indicators - Bulb Replacement

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.

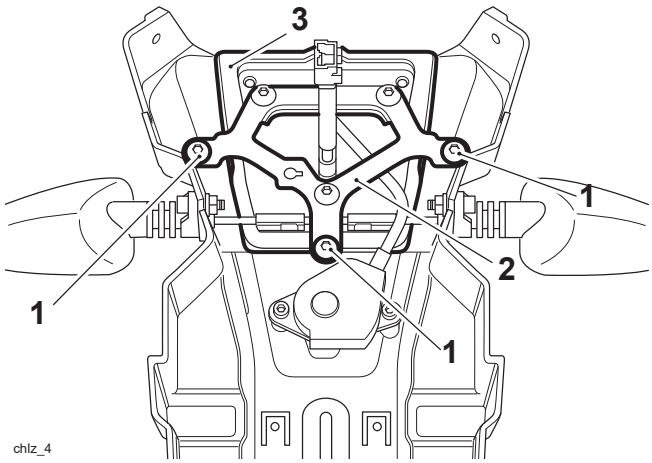
Note

- **The rear light is a sealed for life unit and must be replaced in the event of a failure.**
- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the rear mudguard (see Rear Mudguard - Removal).

Note

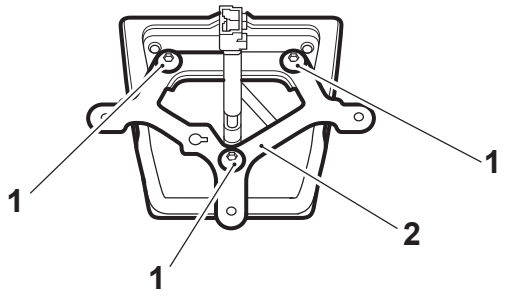
- **Note the routing of the seat lock cable for installation.**

1. Release the three fixings shown below and remove the rear light and bracket assembly.



1. **Fixings**
2. **Bracket**
3. **Rear light**

2. If necessary, release the fixings and remove the bracket.



chlz_2

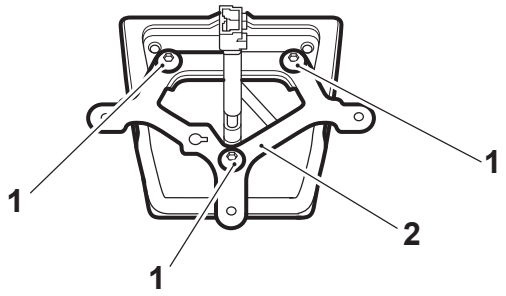
1. **Fixings**
2. **Bracket**

LED Direction Indicators

⚠ 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. Refit the bracket to the rear light and tighten the fixings to **4 Nm**.

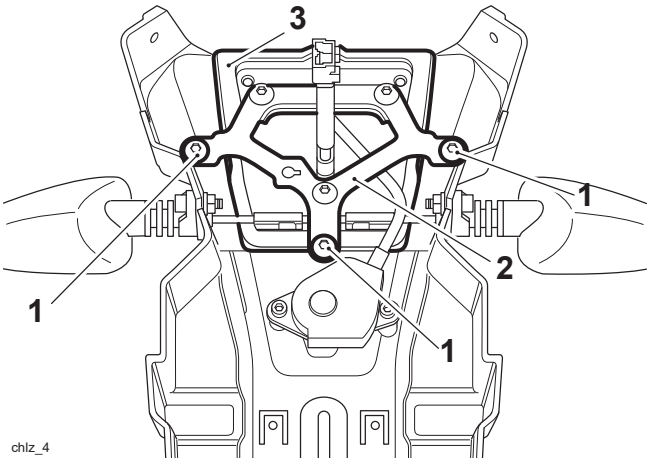


chlz_2

1. **Fixings**
2. **Bracket**

2. Refit the bracket and rear light assembly to the rear mudguard ensuring that the seat lock cable is routed as

noted during removal. Tighten the fixings to **4 Nm**.



1. **Fixings**
2. **Bracket**
3. **Rear light**

- Refit the rear mudguard (see Rear Mudguard - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

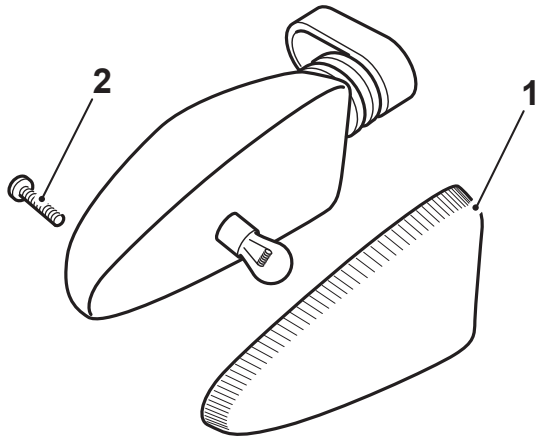
Front Direction Indicator - Removal

Front Direction Indicator - Installation

⚠ 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.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.



1. **Direction indicator lens**

2. **Fixing**

1. Release the fixing and remove the lens to gain access to the bulb for replacement.

Rear Direction Indicator - Removal

The LED direction indicators are sealed for life units and must be replaced in the event of a failure.

Rear Direction Indicator - Installation

Starter Motor - Removal

⚠ WARNING

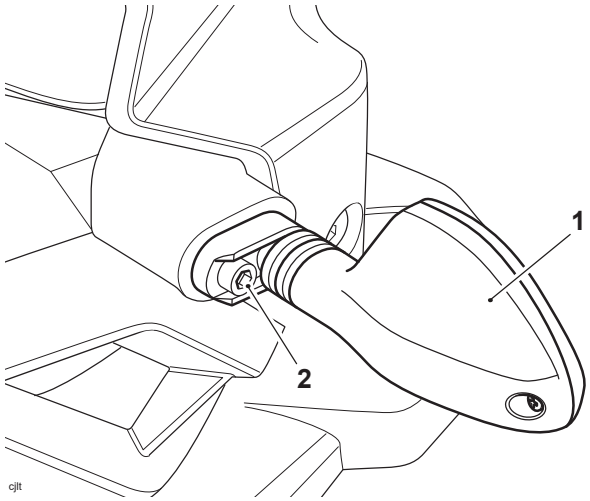
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the headlight (see Headlight Assembly - Removal

Note

- **Note the routing of the indicator harness prior to removal.**

1. Disconnect the indicator and release its harness from the clips on the cockpit subframe.
2. Release the fixing securing the direction indicator to the cockpit subframe and remove the unit.



1. **Direction indicator (right hand shown)**
2. **Fixing**

Starter Motor - Inspection

Starter Motor - Installation

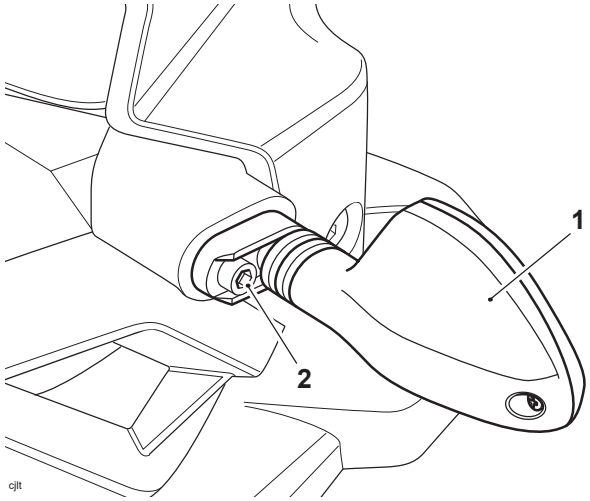
⚠ WARNING

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

- **Ensure that the drain hole in the indicator lens is at the bottom.**

1. Position the direction indicator to the cockpit subframe and secure with the fixing. Tighten the fixing to **5 Nm**.



1. **Direction indicator (right hand shown)**
2. **Fixing**

2. Route the direction indicator harness as noted during removal and secure into the clips on the cockpit subframe.

Note

- **The main harness for the right hand direction indicator is marked with red tape to aid correct connection.**

3. Connect the direction indicator to the main harness.
- Refit the headlight assembly (see Headlight Assembly - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).
- Check the operation of the direction indicators, rectify as necessary.

Starting Circuit

Diagnosis – Starter Circuit

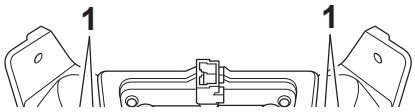
Alternator

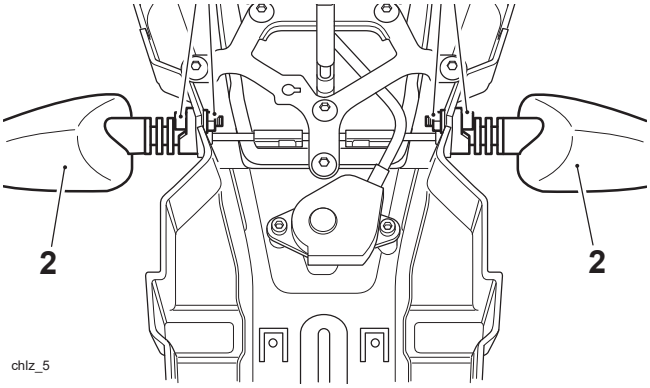
⚠ WARNING

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.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the rear mudguard (see Rear Mudguard - Removal).

1. Release the fixings securing direction indicators to the rear mudguard.





1. **Fixings**
2. **Direction indicators**

2. Remove the direction indicators.

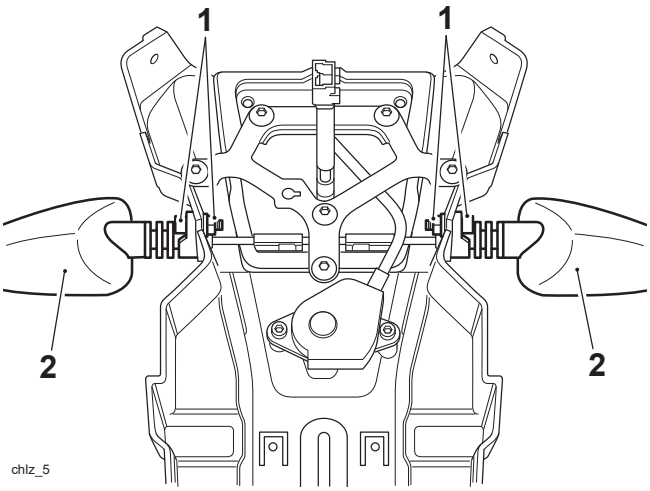
WARNING

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

- **Ensure that the drain hole in the indicator lens is at the bottom.**

1. Refit the direction indicators to the rear mudguard.
2. Secure with the fixings and tighten to **5 Nm**.



1. **Fixings**
2. **Direction indicators**

- Refit the rear mudguard (see Rear Mudguard - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.
- Refit the rider's seat (see Rider's Seat - Installation).

Alternator - Removal

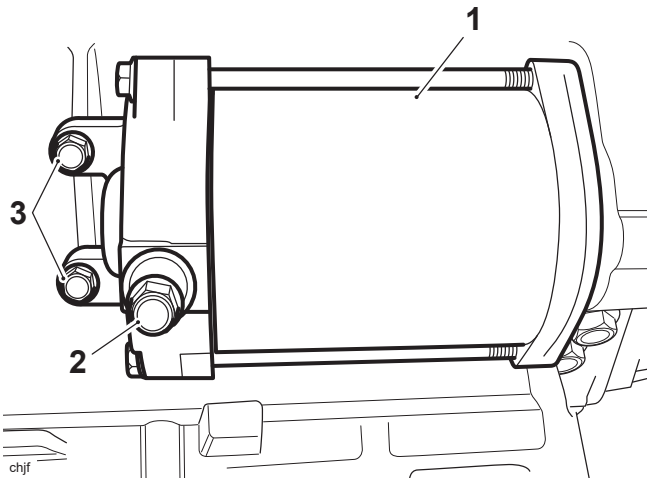
WARNING

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.

- Remove the rider's seat (see Rider's Seat - Removal).
- Disconnect the battery, negative (black) lead first.
- Remove the sump guard (see Sump Guard - Removal).

1. Remove the fixings and remove the starter motor cover, located at the front of the engine.
2. Ease the boot from the starter cable terminal and then release the cable nut.
3. Detach the cable.
4. Release the fixings securing the starter motor to the crankcase.



1. **Starter motor**
2. **Starter cable fixing**
3. **Fixings**

5. Ease the starter motor from the lower crankcase.
1. Ensure the starter turns freely and without binding.
2. Check the starter O-ring for damage and deterioration. Replace as necessary.

Alternator - Disassembly

WARNING

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

1. Lubricate the starter motor O-ring with a small amount of petroleum jelly.
2. Fit the starter motor to the lower crankcase ensuring that the O-ring does not become damaged during installation.
3. Fit and tighten the starter bolts to **9 Nm**.
4. Refit the starter cable and secure with the nut. Tighten to **5 Nm**.
5. Refit the starter cable boot.
6. Refit the starter motor cover and secure with the four fixings. Tighten to **4 Nm**.

- Refit the sump guard (see Sump Guard - Installation).
- Reconnect the battery positive, (red) lead first and tighten the terminals to **4.5 Nm**.

- Refit the rider’s seat (see Rider’s Seat - Installation).

All Triumph models are equipped with an electric start system. This system consists of a starter relay, starter motor, starter switch, side stand 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 side stand 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), side stand and clutch switches.

Note

- **The engine will not crank if the instruments, ABS ECM, or immobiliser/chassis ECM (if fitted) are disconnected.**

Rectify any defects as necessary.

General Fault Finding – Starter Motor and Relay

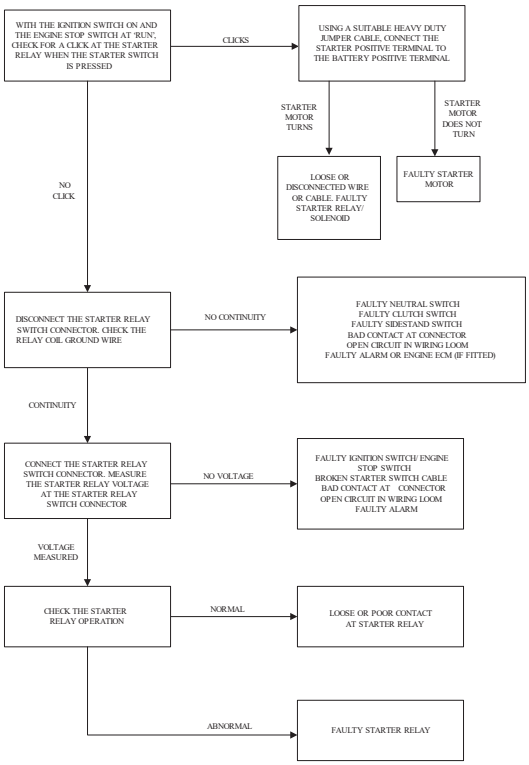
Symptom	Possible cause(s)
Starter relay does not click, starter motor does not turn	Battery discharged or defective
	Blown main or starter relay fuse
	Defective starter relay wiring or starter switch
	Check that the side stand, transmission and clutch lever are positioned for engine starting i.e. transmission in neutral, clutch lever pulled in and the side stand 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 not turn over	Battery discharged or defective
	Crankshaft does not turn due to engine defect

Symptom	Possible cause(s)
	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

Alternator - Assembly

Note

- **Prior to carrying out the diagnosis, ensure the battery voltage is 12 - 13.5 V, the immobiliser system (if fitted) is functioning correctly, the transmission is in neutral and the clutch lever is pulled fully to the handlebar.**



The high output alternator is externally mounted to the engine, and is gear driven from the clutch primary gear. The regulator/rectifier is integral to the alternator and does not contain any serviceable parts.

The alternator features a decoupler mounted to the drive gear, which disengages the alternator from the engine in certain conditions. This removes shock loading from the alternator which would otherwise cause premature wear or damage to various alternator components.

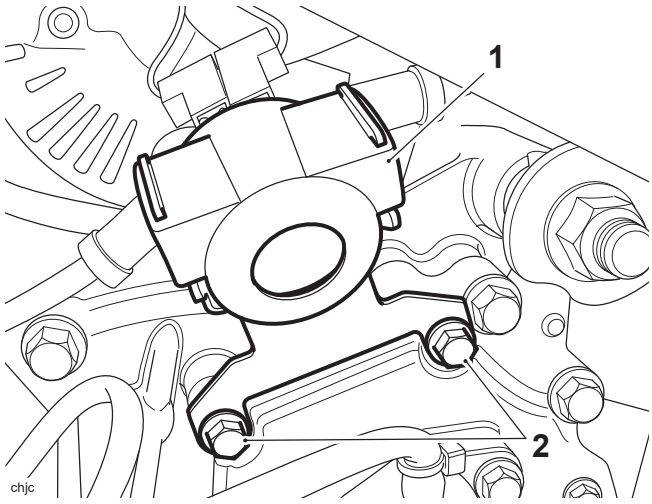
Alternator - Installation

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.

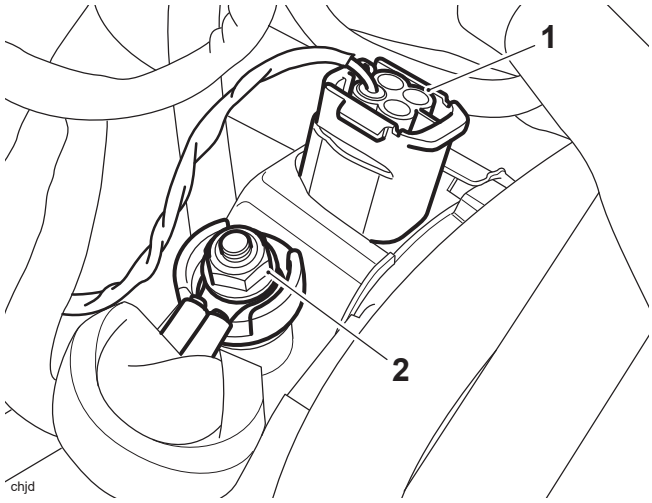
- Remove the rider’s seat (see Rider’s Seat - Removal).
- Remove the battery (see Battery Removal).
- Remove the coolant expansion tank (see Expansion Tank - Removal).
- Remove the throttle bodies (see Throttle Bodies/Injectors - Removal).
- Remove the battery tray (see Battery Tray - Removal).

1. Remove the two upper selector cover fixings and detach the starter solenoid and bracket. Position the starter solenoid aside.



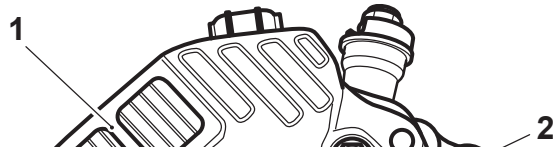
1. **Starter solenoid**
2. **Fixings**

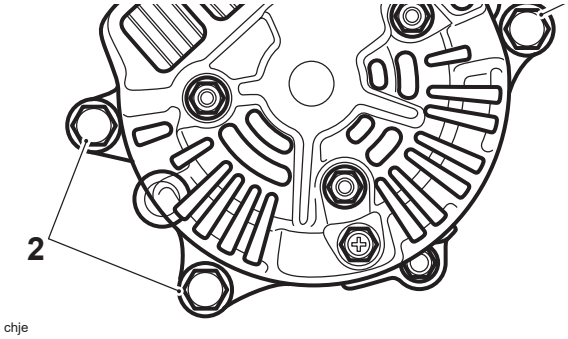
2. Disconnect the alternator multiplug.
3. Ease the boot from the alternator cable terminal and then release the cable nut.



1. **Alternator multiplug**
2. **Cable nut**

4. Release the fixings securing the alternator to the crankcase.



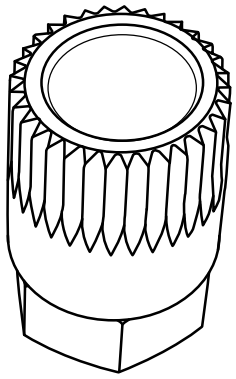


1. **Alternator**
2. **Fixings**

5. Withdraw the alternator from the crankcase and remove from the motorcycle in an upwards direction.

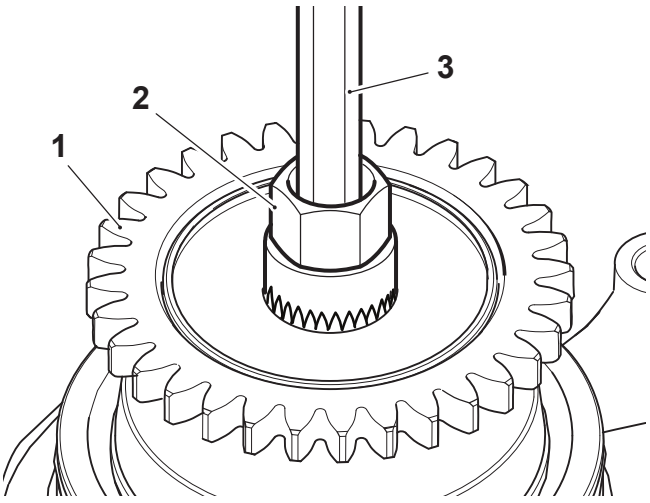
Alternator Diagnosis

1. Remove and discard the rubber cap from the alternator decoupler and drive gear assembly.
2. Fit T3880602 - Alternator Wrench to the splines of the alternator decoupler and drive gear assembly.



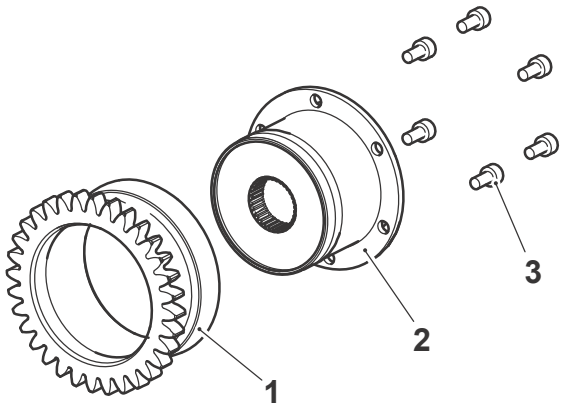
T3880602 - Alternator Wrench

3. Prevent the alternator from turning using a spanner on T3880602 - Alternator Wrench, and loosen the decoupler and drive gear assembly nut using an 8 mm Allen key.



1. **Alternator decoupler**
2. **T3880602 - Alternator Wrench**
3. **8 mm Allen key**

4. Remove T3880602 - Alternator Wrench and fully remove the nut. Discard the nut.
5. Remove the decoupler and drive gear assembly from the alternator spline.
6. Release the fixings and remove the drive gear from the decoupler.



1. **Drive gear**
2. **De-coupler**
3. **Fixings**

Assembly is the reverse of Alternator - Disassembly, noting the following:

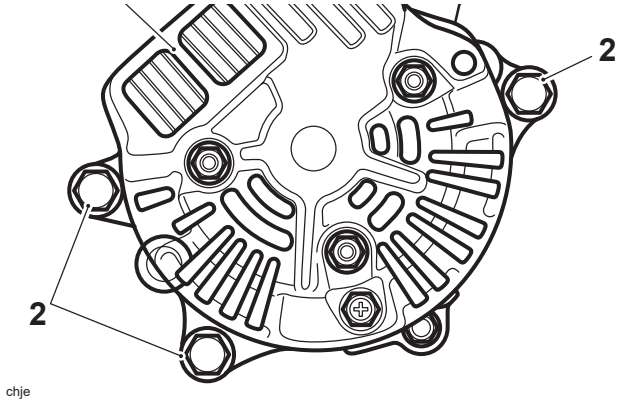
Note

- **Tighten the drive gear to decoupler fixings to 3 Nm.**
- **Always fit a new nut when refitting the decoupler and drive gear assembly.**
- **Tighten the decoupler and drive gear assembly nut to 54 Nm.**

⚠ WARNING

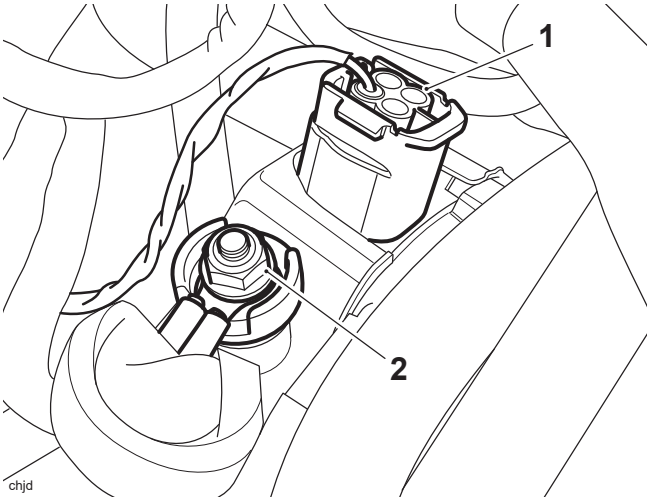
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Fit a new O-ring to the alternator body.
2. Refit the alternator to the crankcase and align the three fixing holes. Fit and tighten the fixings to **28 Nm**.



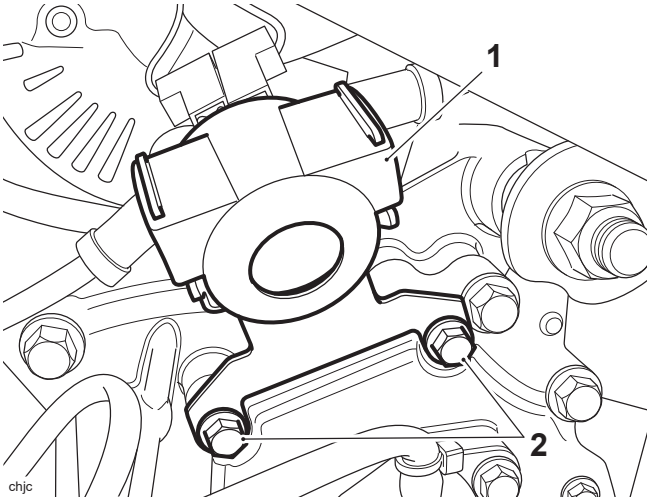
1. **Alternator**
2. **Fixings**

3. Refit the alternator cable and secure with the nut. Tighten to **10 Nm**.
4. Refit the alternator cable boot.
5. Reconnect the alternator multiplug.



1. **Alternator multiplug**
2. **Cable nut**

6. Reposition the starter solenoid to the selector cover and secure with the two fixings. Tighten to **11 Nm**.



1. **Starter solenoid**
2. **Fixings**

- Refit the battery tray (see Battery Tray - Installation
- Refit the throttle bodies (see Throttle Bodies/Injectors - Installation).
- Refit the coolant expansion tank (see Expansion Tank - Installation).
- Refit and connect the battery (see Battery Installation).
- Refit the rider's seat (see Rider's Seat - Installation).

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 Fuses).

Rectify any defects as necessary.

To check the alternator output carry out the alternator pinpoint tests as described below.

Note

- **The alternator is located under the fuel tank. It does not contain any serviceable parts and must be replaced if faulty.**
- **The alternator and regulator/rectifier are integrated in the same unit. It is not possible to check for continuity and short circuit through the coils and to ground.**
- **Do not attempt to open the alternator.**
- **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.**

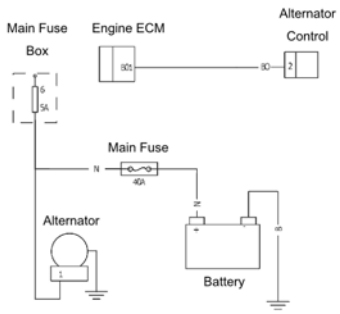
Fault	Possible Cause	Action
Battery not charging	Battery	Check the condition of the battery Test the battery using the BatteryMate 150-9. Refer to the instructions supplied with the BatteryMate 150-9 Ensure the battery is serviceable
	Alternator/Rectifier/Regulator	Proceed to pinpoint test 1

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Battery positive (+) - Battery negative (-) - Alternator control connector pin 2 - Regulator/Rectifier terminal - Battery positive connector	OK	Disconnect the battery leads, negative (black) lead first and proceed to test 2
		Faulty	Rectify fault, proceed to test 4

Test	Result	Action
2 Check fuses: - Main fuse 40 A - Fuse No 6, main fuse box Check cable continuity: - Battery positive (+) to Regulator/Rectifier terminal - Battery negative (-) to engine ground	OK	Reconnect the battery leads, positive (red) lead first and proceed to test 3
	Open circuit	Locate and rectify wiring fault, proceed to test 4
3 Check alternator control Voltage: - Disconnect alternator control connector - Turn ignition on - Measure the Voltage through alternator control pin 2 and battery negative (-)	Same as battery Voltage (~12.5 V)	Turn the ignition off, reconnect the alternator control connector. Proceed to test 4
	Faulty	Rectify fault Reconnect the alternator control connector Proceed to test 4
4 Ensure the alternator control connector is plugged and secured. Run the engine. Check the charging Voltage at 2,000 rpm: - Through the regulator/rectifier terminal and the engine ground	13 V - 15 V	Proceed to test 5
	Fault still present	Contact Triumph service
5 Ensure the alternator control connector is plugged and secured. Run the engine. Check the charging Voltage at 2,000 rpm: - Through the battery positive (+) and the battery negative (-)	13 V - 15 V	Action complete - quit test
	Fault still present	Contact Triumph service

Circuit Diagrams



Key to TSAS Circuit Diagram

Key to Circuit Diagram

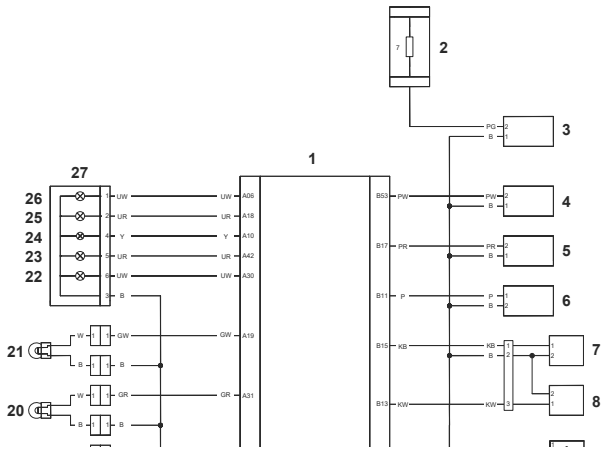
Key	Item Description

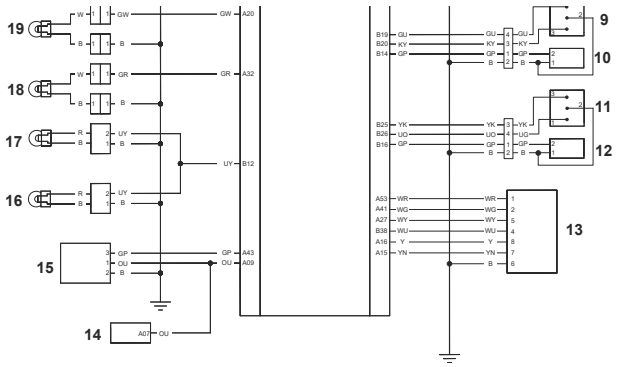
Key	Item Description
1	Chassis ECM
2	Main Fuse Box
3	Front Electrical Accessory Socket
4	Rear Electrical Accessory Socket
5	Top Box Power
6	USB Socket
7	Right Heated Grip
8	Left Heated Grip
9	Heated Seat Switch - Rider
10	Heated Seat - Rider
11	Heated Seat Switch - Passenger
12	Heated Seat - Passenger
13	Windscreen Motor
14	Engine ECM
15	Rear Light
16	Left Fog Light
17	Right Fog Light
18	Left Rear Indicator
19	Right Rear Indicator
20	Left Front Indicator
21	Right Front Indicator
22	Main Beam - Left
23	Dipped Beam - Left
24	Front Position Light

Key	Item Description
25	Dipped Beam - Right
26	Main Beam - Right
27	Front Light Unit

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





TSAS Circuit Diagram

Key to Circuit Diagram

Key	Item Description
1	Battery
2	Starter Solenoid
3	Starter Motor
4	Chassis ECM
5	Engine Control Module - Connector B
6	Alternator Control
7	Alarm
8	Right Hand Switch Housing
9	Starter Switch
10	Engine Stop Switch
11	Inertial Measurement Unit (IMU) - if fitted
12	Instruments
13	ABS ECM
14	Blueooth Module Connector
15	Ignition Switch
16	Main Fuse Box
17	Alternator

Key To Wiring Colour Codes

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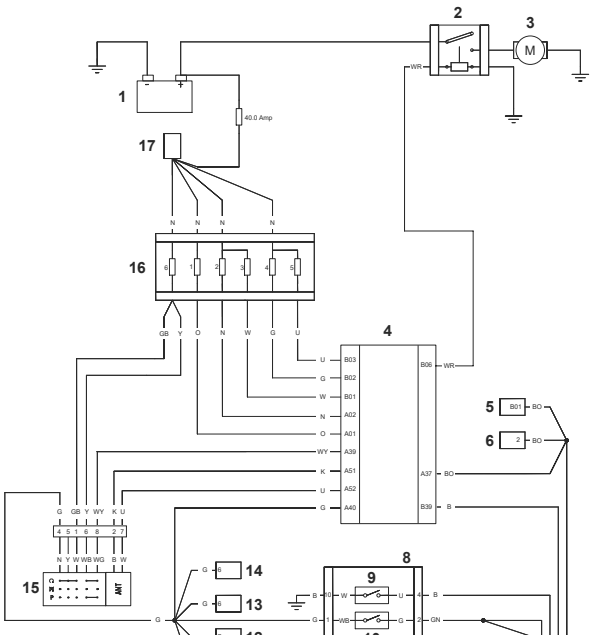
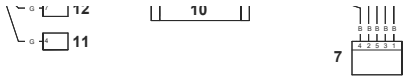
R	Red
P	Purple
W	White
Y	Yellow
LG	Light Green
LU	Light Blue

Key to Engine Management Circuit Diagram





Engine Management Circuit Diagram

Key	Item Description
1	Chassis ECM
2	Left Hand Switch Housing
3	Left Direction Indicator Switch
4	Right Direction Indicator Switch
5	Direction Indicator Cancel Switch
6	Scroll Up Switch
7	Scroll Down Switch
8	Select Switch
9	Main/Dipped Beam Switch
10	Pass Switch
11	Mode Switch
12	Horn Switch
13	Right Hand Switch Housing
14	Hazard Lights Switch
15	Cruise Control RES/+ Switch
16	Cruise Control SET/- Switch
17	Engine ECM
18	Cruise Control Cancel Switch (Twist Grip)
19	Heated Grips/Fog Lights Switch Housing
20	Fog Lights Switch
21	Heated Grips Switch

Key	Item Description
22	Horn
23	Ambient Air Temperature Sensor
24	Alarm
25	Oil Pressure Switch
26	Instruments
27	Bluetooth Module Connector
28	Diagnostic Connector
29	Main Fuse Box

Key To Wiring Colour Codes

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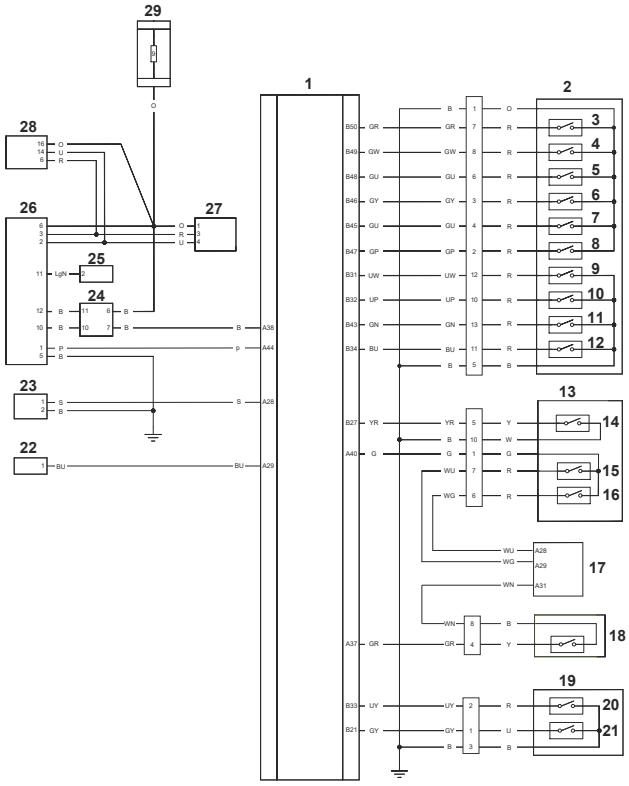
O	Orange
K	Pink
R	Red
P	Purple
W	White
Y	Yellow
LG	Light Green
LU	Light Blue

Key to Complete System Circuit Diagram



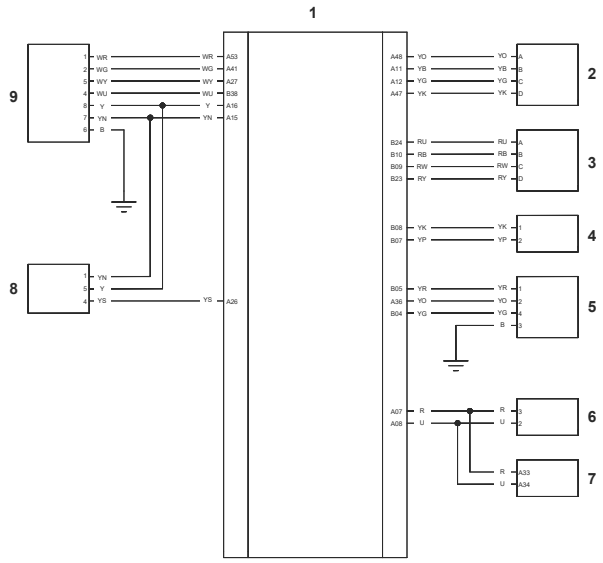
Complete System Circuit Diagram

Key	Item Description
1	Chassis ECM
2	Left Hand Fork - Compression Damping Motor
3	Right Hand Fork - Rebound Damping Motor
4	Rear Suspension Unit Damping Valve
5	Rear Suspension Unit Preload Motor
6	Inertial Measurement Unit
7	Engine ECM
8	Swinging Arm Position Sensor
9	Windscreen Motor

Key To Wiring Colour Codes

Code	Wiring Colour
B	Black

Code	Wiring Colour
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



Key	Item Description
1	Engine Control Module
2	Manifold Absolute Pressure Sensor
3	Ambient Air Pressure Sensor
4	Gear Position Sensor
5	Throttle Position Sensor
6	Accelerator Position Sensor
7	Diagnostic Connector
8	Fuel Level Sender
9	Intake Air Temperature Sensor
10	Clutch Switch
11	Side Stand Switch
12	Throttle Actuator Motor
13	Crankshaft Position Sensor
14	Cooling Fan
15	Fuel Pump
16	Chassis ECM
17	Oxygen Sensor
18	Secondary Air Injection Solenoid
19	Engine Sub Harness
20	Coolant Temperature Sensor
21	Injector 1
22	Injector 3
23	Injector 2
24	Purge Valve

Key	Item Description
25	Coil 3
26	Coil 2
27	Coil 1
28	Engine Management Relay
29	Main Fuse Box

Key To Wiring Colour Codes

Code	Wiring Colour
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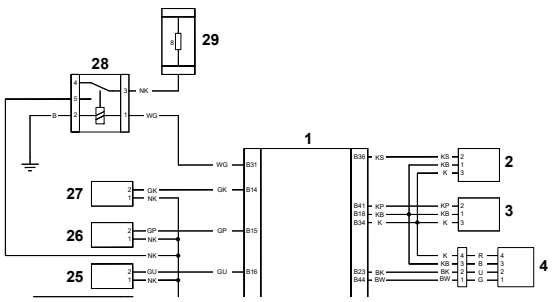

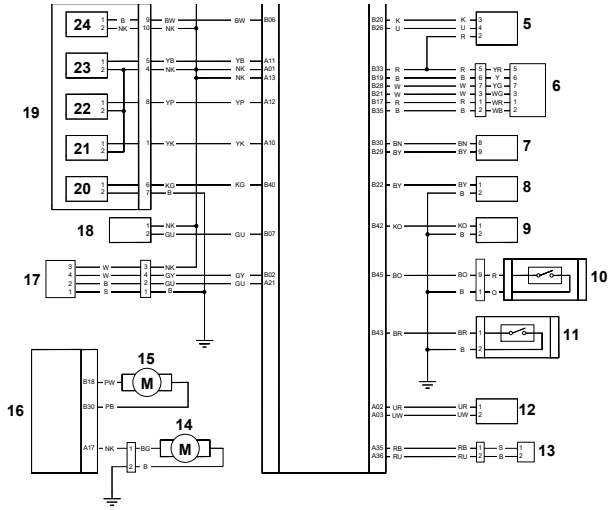

Key	Item Description
1	Chassis ECM
2	Rear Suspension Unit Damping Valve
3	Right Hand Front Fork Rebound Damping Motor
4	Left Hand Front Fork Compression Damping Motor
5	Swinging Arm Position Sensor
6	Windscreen Motor
7	Heated Seat Switch - Passenger
8	Heated Seat - Passenger
9	Heated Seat Switch - Rider
10	Heated Seat - Rider
11	Left Heated Grip
12	Right Heated Grip
13	USB Socket
14	Top Box Power
15	Rear Suspension Unit Preload Motor
16	Ambient Air Temperature Sensor
17	Rear Electrical Accessory Socket

Key	Item Description
18	Cooling Fan
19	Fuel Pump
20	Front Electrical Accessory Socket
21	Fusebox 1
22	Rear Light
23	Left Rear Indicator
24	Right Rear Indicator
25	Alternator Control
26	Alternator Power
27	Starter Motor
28	Starter Solenoid
29	Battery
30	40 Amp Main Fuse
31	Fuse Box 2
32	Fog Light Switch
33	Heated Grips Switch
34	Fog Light/Heated Grips Connector
35	Horn Switch
36	Function Switch
37	Main Beam Switch
38	Pass Switch
39	Select Switch
40	Indicator Cancel Switch
41	Right Indicator Switch

Key	Item Description
42	Left Indicator Switch
43	Scroll Down Button
44	Scroll Up Button
45	Clutch Switch
46	Left Handlebar Switch Housing
47	Ignition Switch
48	Hazard Switch
49	Start Switch
50	Cruise Control Switch
51	Engine Stop Switch
52	Right Handlebar Switch Housing
53	Cruise Control Cancel Switch
54	Accelerator Position Sensor
55	Throttle Position Sensor
56	Inertial Measurement Unit
57	Alarm Connector
58	Diagnostic Connector
59	Bluetooth Module
60	Instruments
61	Rear Wheel Speed Sensor
62	Front Wheel Speed Sensor
63	ABS Modulator
64	Right Fog Light
65	Left Fog Light

Key	Item Description
66	Front Light Unit
67	Main Beam - Left
68	Dipped Beam - Left
69	Front Position Light
70	Dipped Beam - Right
71	Main Beam - Right
72	Right Front Indicator
73	Left Front Indicator
74	Horn
75	Heated Oxygen Sensor
76	Coolant Temperature Sensor
77	Oil Pressure Sensor
78	Injector 1
79	Injector 2
80	Injector 3
81	Purge Valve
82	Engine Subharness Connector
83	Coil 3
84	Coil 2
85	Coil 1
86	Manifold Absolute Pressure Sensor
87	Ambient Pressure Sensor
88	Gear Position Sensor
89	Crank Position Sensor

Key	Item Description
90	Side Stand Switch
91	Fuel Level Sender
92	Intake Air Temperature Sensor
93	Secondary Air Injection Solenoid
94	Throttle Control
95	Engine ECM
96	Engine Management System Relay