Service Manual - Scrambler 1200 XE

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.**

Tampering with Noise Control System Prohibited

Owners are warned that the law may prohibit:

- 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
- 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.

Torque Tolerance

Torque	Tolerance
0 Nm to 25 Nm	+/- 10%

26 Nm to 100 Nm	+ 10% -0%
101 Nm to 200 Nm	+10% -0%

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.

Use of Crow Foot Spanner Adapters with Torque Wrenches

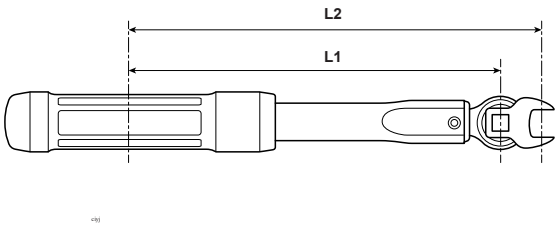
The use of a crow foot spanner adapter will effectively lengthen the lever arm of a torque wrench. The amount of torque applied to a fastener is increased as the torque wrench lever arm is extended, therefore the torque wrench setting must be adjusted in order to achieve the correct tightening torque.

Before tightening a fixing using a crow foot spanner adapter, measure the normal length of the torque wrench from the centre of the drive square to the centre of the handle (dimension L1). Fit the crow foot spanner adapter to the torque wrench as shown below. Measure the extended length of the torque wrench from the centre of the crow foot spanner head to the centre of the handle (dimension L2).

Use the following formula to calculate the correct torque wrench setting to achieve the required tightening torque.

Note

- **The example shown below is calculated using a crow foot spanner measuring 25 mm from the centre of the spanner head to the centre of the drive square.**



M1 = M2 x L1 / L2	Example
M2 is the required tightening torque to be applied	90 Nm
L1 is the normal length of the torque wrench, measured from the centre of the drive square to the centre of the handle	300 mm
L2 is the extended length of the torque wrench, measured from the centre of the crow foot spanner head to the centre of the handle	325 mm

M1 is the calculated torque wrench setting	83 Nm

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 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,

WARNING

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.

WARNING

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,

CAUTION

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

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.

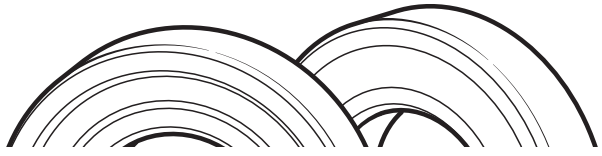
When lubricating a new bearing with grease the following steps should be taken:

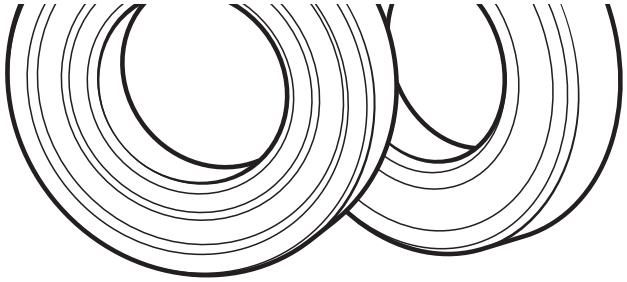
1. Do not clean off the oil preservative.
2. Grease must be forced between the roller elements and the roller cage.
3. Rotate the bearing to ensure that the grease is distributed over the entire circumference of the internal parts.
4. Any excess grease should be smeared on the outside of the rollers.

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:



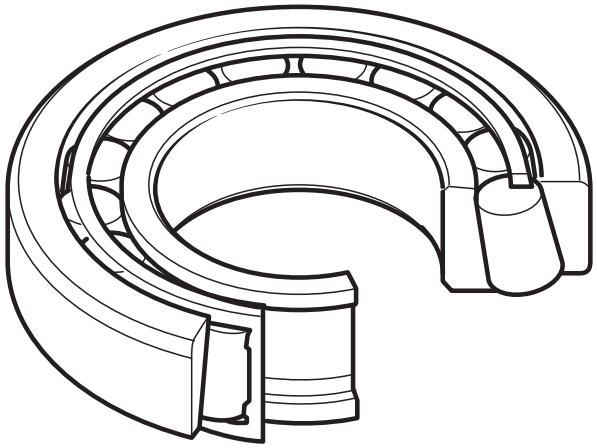


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Sealed Bearings

Note

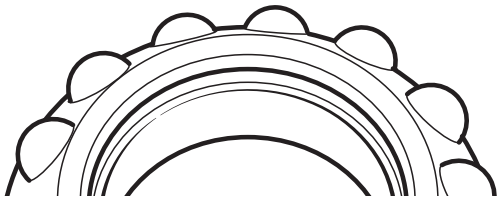
- **Sealed bearings can be identified by their integrated seals.**
- **Sealed bearings are lubricated for life by the manufacturer.**
- **Any attempt to change the grease in a sealed bearing will damage the integrated seals. If the seals are damaged, dirt and water will ingress and the life of the bearing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

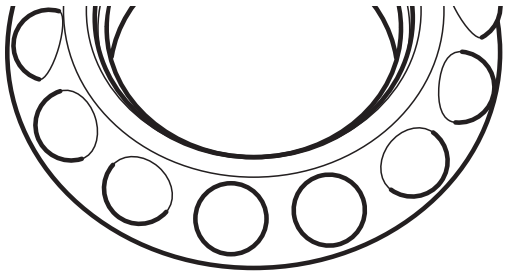


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Taper Bearings

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.

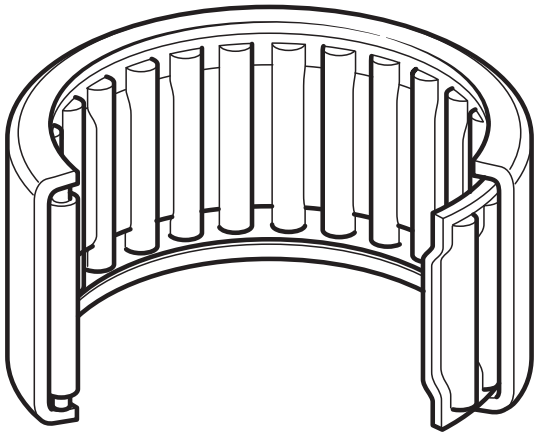




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Angular Contact and Ball Bearing

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.

WARNING

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

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 -

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

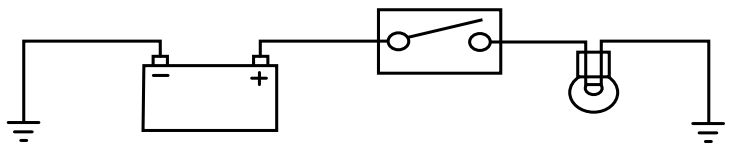
- the bulb resistance can be calculated by using -

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

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.

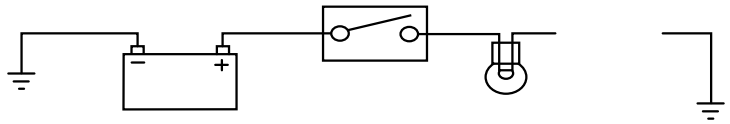
Both of these circuit diagrams use similar symbols to illustrate the various system components and will be accompanied by a key indicating circuit diagram components and wiring colour codes.

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.

Tracing Circuits

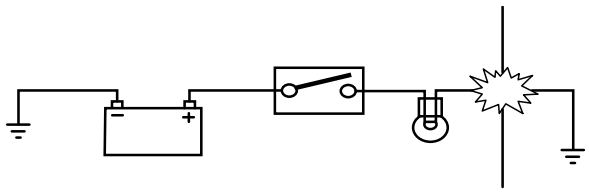
The following is a description of two types of common electrical failures, and some of the methods which may be used to find them.

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:

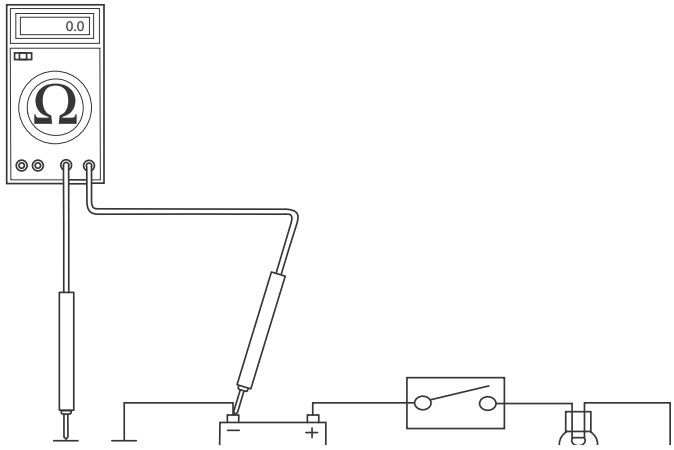
- a wire may diverge at a splice and go off to feed other circuits. If these circuits are working, check for wiring faults from the splice onwards.
- the circuit diagram is not an accurate guide to the actual location of the parts when fitted on the motorcycle. It is a schematic diagram of the circuits.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

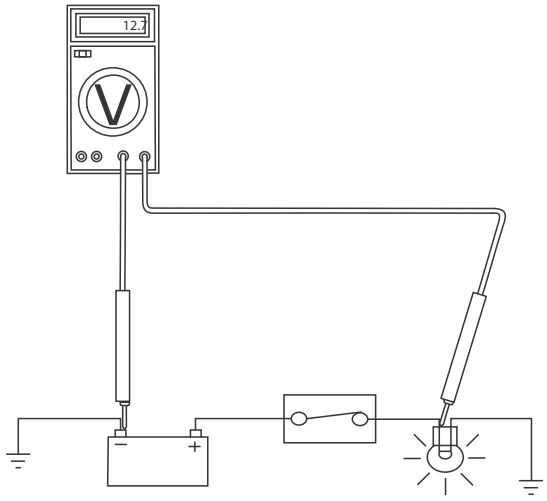
In the example below, the ground circuit continuity is being tested from the battery to the frame.



- 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.

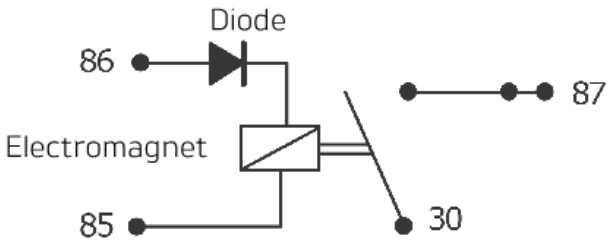
To locate a splice, it is necessary to peel back the insulation and examine the splice for its integrity. The most common fault is where one of the wires at the joint has come adrift usually causing the circuit it feeds or grounds to become 'dead'.

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.



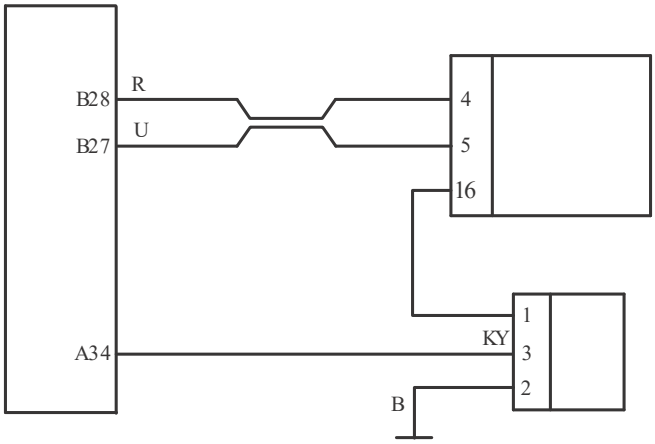
Make continuity checks across the electromagnet first, usually from pin 86 (positive) to pin 85 (negative). If a diode appears in the circuit use the diode check on the multimeter (Volts scale) in the direction of current flow. If there is no diode, use the resistance check facility. An open circuit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

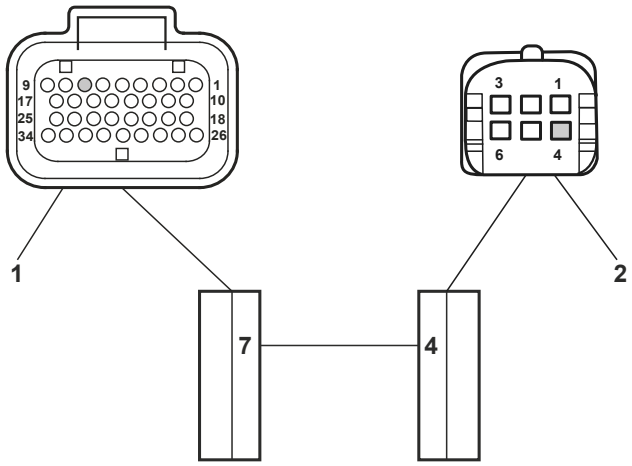
LIN (Local Interconnect Network)

LIN (Local Interconnect Network) is a serial network protocol used for communication between components in vehicles. The bus is a single master/multiple slave bus that uses a single wire to transmit data.

By using LIN, the amount of cabling required to allow components 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.

The instruments use some of this data internally and also broadcasts it on the CANbus (Controller Area Networking) for use on the motorcycle as necessary.

Information (such as headlight main beam) is being requested continuously by the Instruments, once a confirmation of the request is recognised the instruments will react accordingly.



1. **Instruments**
2. **Switch housing (left hand side)**

Example

- Pressing the headlight main beam button on the switch housing (left hand handlebar) confirms to the instruments that headlight main beam is required.
- The instruments confirm the data has been received correctly and that the data is valid.
- Once confirmed the headlight main beam is switched on.

Triumph currently uses LIN on certain models for communication between the instruments and the following components:

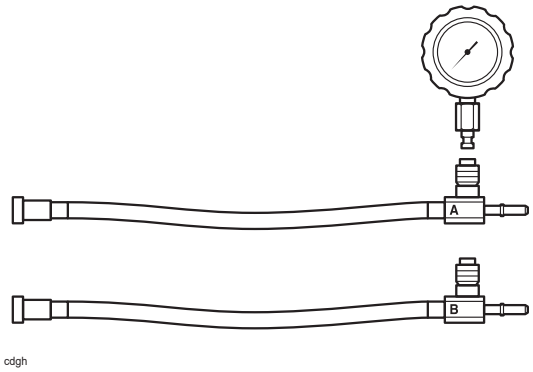
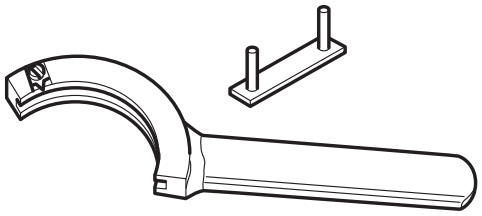
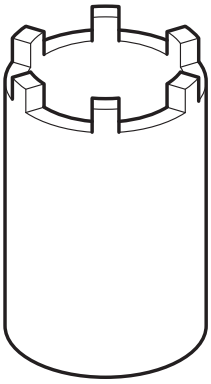
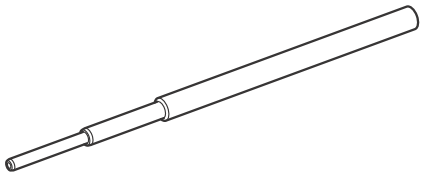
- Fog light button
- Heated seat
- Dip beam/Daytime running lights (DRL) switch (if equipped)
- Mode button
- Turn signal switch
- Joystick button
- Horn button
- High beam button

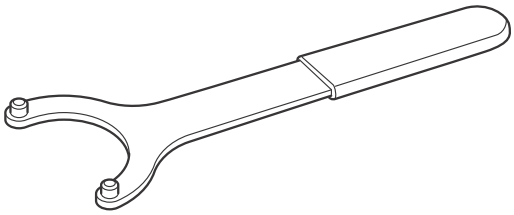
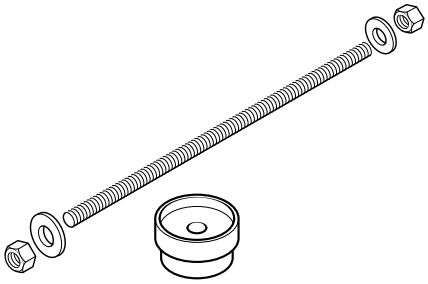
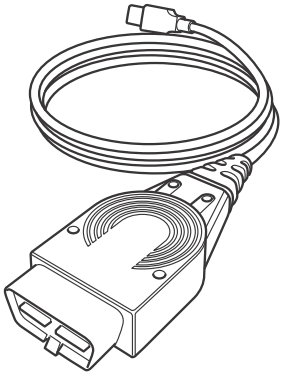
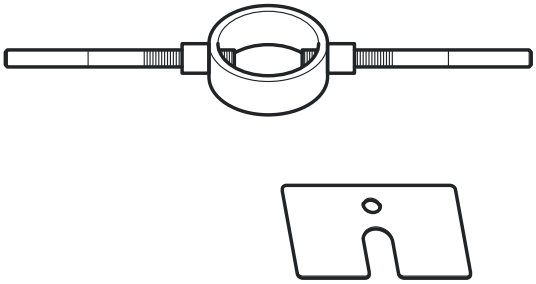
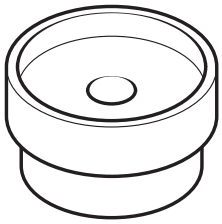
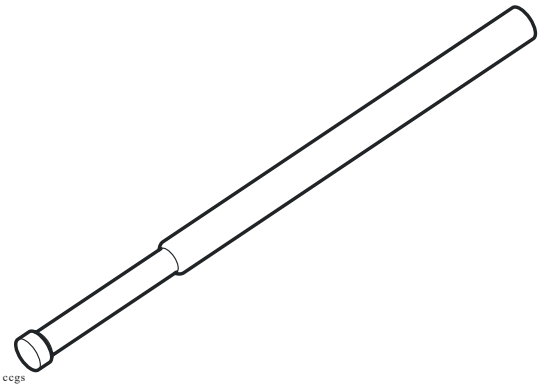
Service Tools

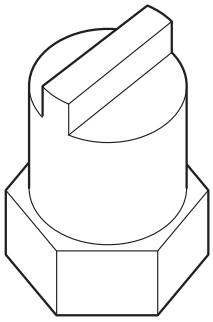
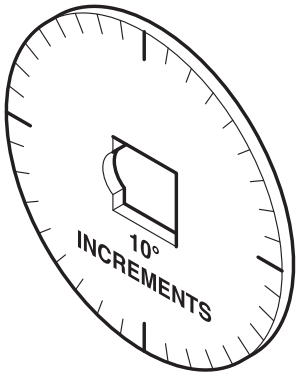
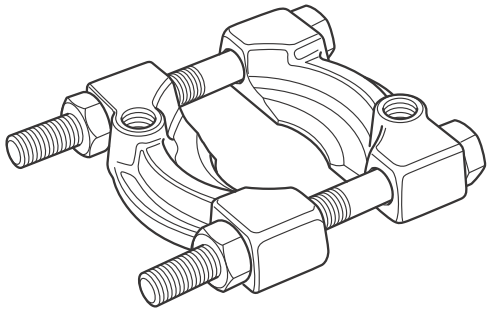
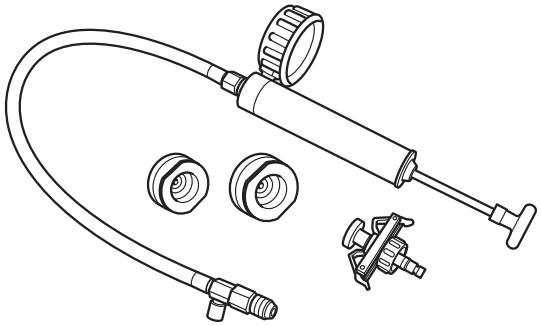
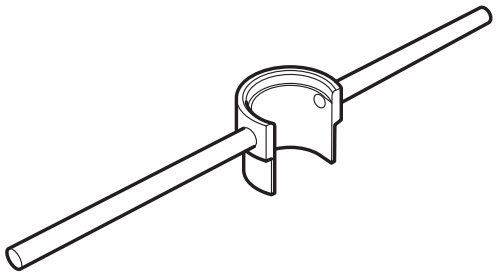
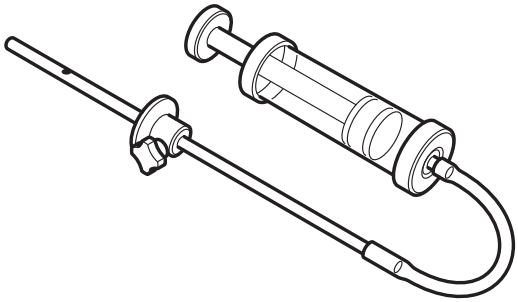
Service Tools

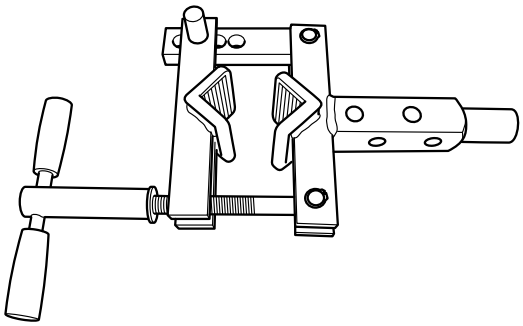
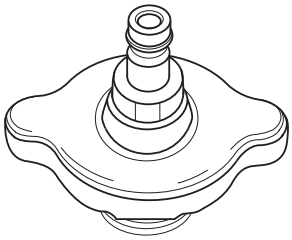
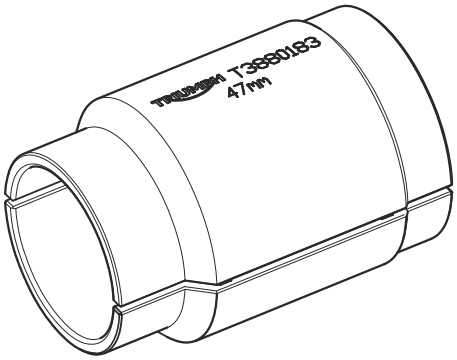
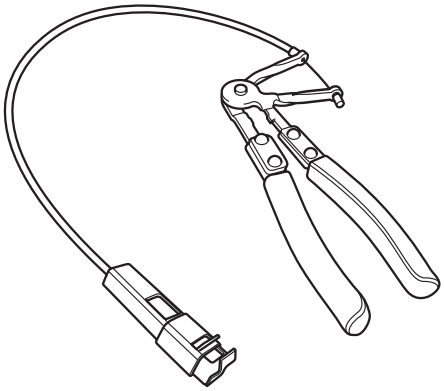
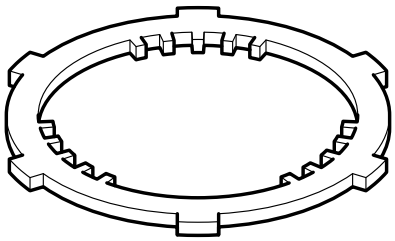
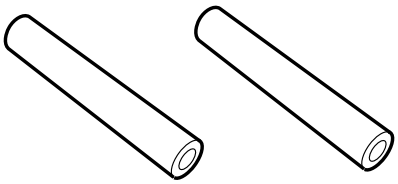
Special service tools have been developed to facilitate removal, dismantling and assembly of certain mechanical components in a practical manner without causing damage. Some operations in this Service Manual cannot be carried out without the aid of the relevant service tools. Where this is the case,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

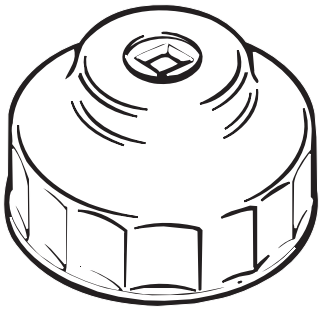
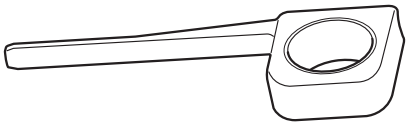
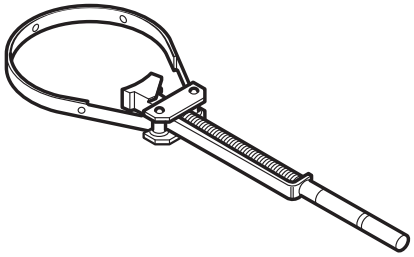
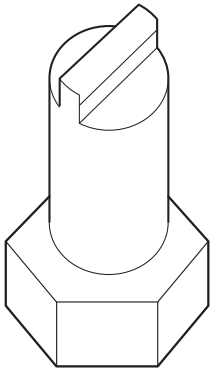
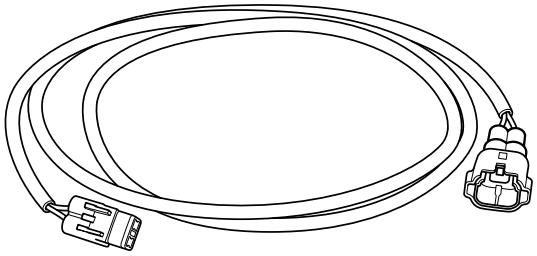
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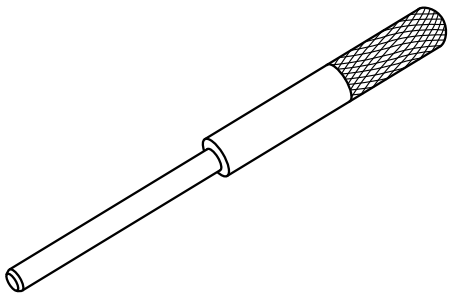
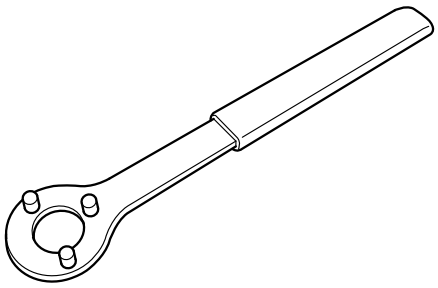
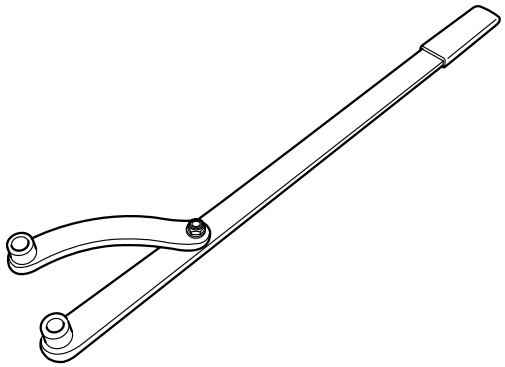
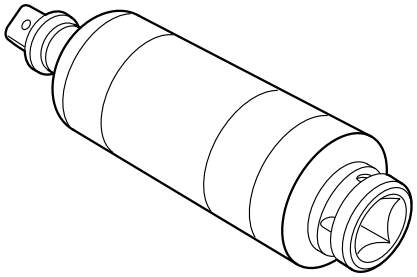
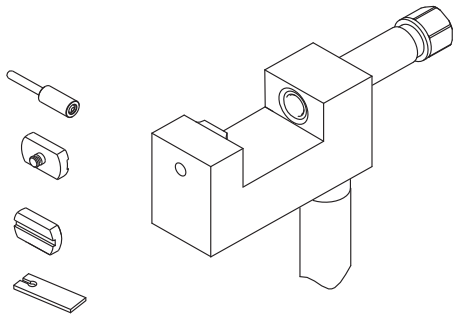
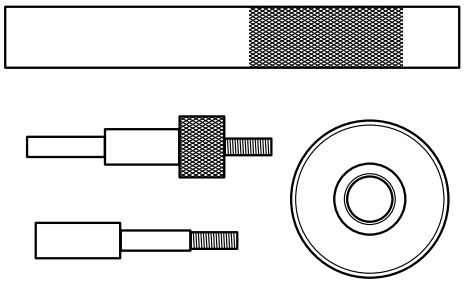
	
T3880001 - Fuel Pressure Gauge	T3880016 - Balancer Gear C-Spanner
	
T3880023 - 50 mm Socket	T3880039 - Idler Gear Timing Pin

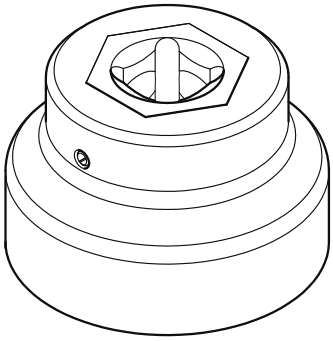
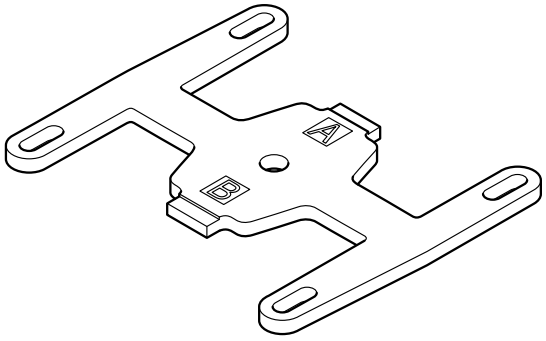
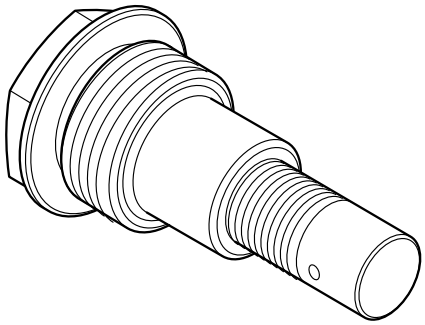
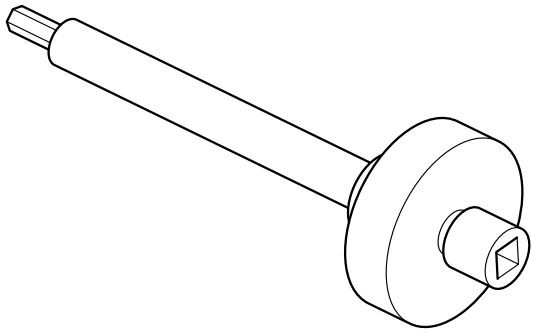
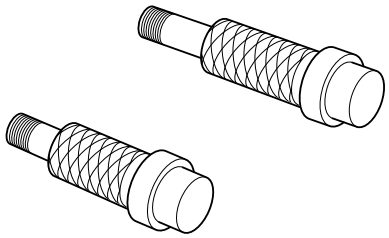
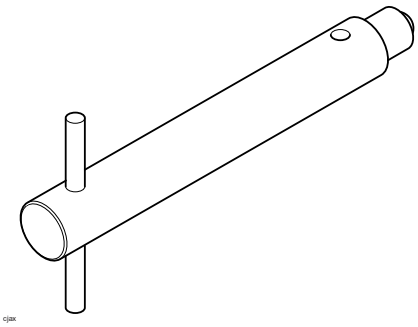
 T3880041	 cczb
T3880041 - Idler Gear Timing Wrench	T3880053 - Wheel Bearing Extraction Kit
	
T3880057 - Triumph Diagnostic Interface	T3880067 - Fork Spring Compressor
 cczb	 ccgs
T3880075 - Bearing Installer	T3880085 - Fork Piston Holder

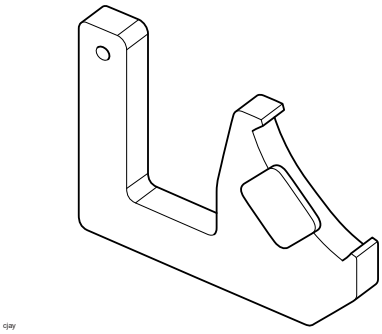
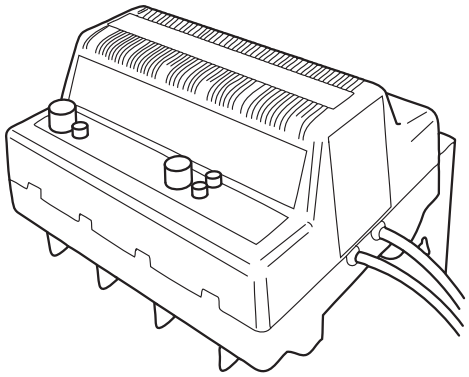
 cdoa	
T3880104 - Swinging Arm Adjuster Wrench	T3880105 - Torque Angle Gauge
 T3880109	 cgwp
T3880109 - Bearing Separator	T3880147 - Radiator and Cap Tester Kit
	 ccha
T3880157 - Fork Seal Installer	T3880160 - Fork Oil Filler/Evacuator

 cjix	
T3880171 - Fork Holding Tool	T3880176 - Radiator Pressure Test (use with T3880147)
	
T3880183 - Fork Seal Tool, 47 mm	T3880207 - Hose Clip Pliers
 ccmi	
T3880307 - Clutch Anti-rotation Jig	T3880308 - Cylinder Barrel Clamps

 gahc	 cczh
T3880313 - Oil Filter Wrench	T3880365 - Alternator Housing Puller
	
T3880369 - Switch Housing Removal Tool	T3880375 - Alternator Rotor Holder
 cdoa2	 cjgu
T3880377 - Engine Mounting Adjuster	T3880391 - Fuel Pump Extension Cable

	
T3880601 - Camshaft Timing Pin	T3880603 - Oil Pump Restraint
	
T3880606 - Flywheel Restraint Handle	T3880609 - Timing Torque Limiter
	
T3880635 - Final Drive Chain Cut and Rivet	T3880636 - Kit, Brake Lever Pivot Sleeve

	
T3880649 - Timing Chain Tensioner Socket	T3880650 - Camshaft Timing Plate
	
T3880651 - Timing Chain Tensioner	T3880652 - Dead Shaft Key Tool
	
T3880656 - Pulley Wrench Pin Set	T3880809 - Rear Balancer Timing Tool

	
T3880811 - Front Balancer Timing Tool	BatteryMate Battery Charger - See Latest Parts Catalogue for Part Number Information

Specifications

Engine

Engine Configuration	Liquid cooled parallel twin, 270° firing angle
Arrangement	Transverse in-line
Displacement	1200 cc
Bore x Stroke	97.6 x 80 mm
Compression Ratio	11.00:1
Cylinder numbering	Left to right
Firing Order	1-2

Cylinder Head and Valves

Cylinder head	Flatness tolerance	0.030 mm
Valve Head Diameter	Inlet	35.60 mm

	Exhaust	29.70 mm
Valve Lift	Inlet	10.3 mm
	Exhaust	9.2 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 - 5.015 mm (standard)
		5.043 mm (service limit)
	Exhaust	5.000 - 5.015 mm (standard)
		5.043 mm (service limit)
Valve Stem to Guide Clearance	Inlet	0.010 - 0.040 mm (standard)
		0.078 mm (service limit)
	Exhaust	0.020 - 0.045 mm (standard)
		0.083 mm (service limit)
Valve Seat Width (in head)	Inlet	1.000 - 1.100 mm (standard)
		1.500 mm (service limit)
	Exhaust	1.200 - 1.300 mm (standard)
		1.700 mm (service limit)
Valve Seat Width (valve)		1.50 - 1.85 mm
Valve Seat Angle		90° inclusive

Valve Spring Length		49.9 mm
Inlet/Exhaust Valve Spring 'Load at Length'		214 N +/- 10 at 39.5 mm
Valve Clearance	Inlet	0.05 - 0.13 mm
	Exhaust	0.12 - 0.22 mm

Camshafts

Camshaft Timing (at 1 mm lift)	Inlet	Open 5.0° ATDC
		Close 41.0° ABDC
		Duration 216°
	Exhaust	Open 39.0° BBDC
		Close 4.0° BTDC
		Duration 215°
Camshaft Journal Diameter		22.930 - 22.960 mm
Camshaft Journal Clearance		0.040 - 0.091 mm (standard)
		0.130 mm (service limit)
Camshaft Journal Bore Diameter		23.000 - 23.021 mm
Camshaft End Float		0.05 - 0.20 mm (standard)
Camshaft Run-out		0.015 mm (standard)

Clutch and Primary Drive

Primary Drive Type	Gear
Reduction Ratio	1.26:1 (93/74)

Clutch Type	Wet multi-plate
No. of Friction Plates	8
Steel Plate Flatness Limit	0.15 mm
Friction Plate Flatness Limit	0.20 mm
Friction Plate Thickness (new)	2.90 - 3.10 mm
Friction Plate Thickness (service limit)	2.80 mm
Clutch Pack Height	38.00 mm + 0.34/-0.66 mm
Clutch Actuation Method	Cable
Cable Free Play (at lever)	2.0 - 3.0 mm

Piston

Cylinder Barrel Diameter - 10 mm from the top of the barrel		97.585 - 97.601 mm (standard)
Cylinder Barrel Diameter - 97 mm from the top of the barrel		97.600 - 97.615 mm (standard)
Piston Diameter		97.570 - 97.580 mm (standard)
		97.530 mm (service limit)
Piston Ring to Groove Clearance	Top	0.02 - 0.07 mm (standard)
		0.085 mm (service limit)
	Second	0.02 - 0.06 mm (standard)
		0.075 mm (service limit)
Piston Ring Groove Width	Top	1.21 - 1.24 mm (standard)

	Second	1.01 - 1.03 mm (standard)
	Oil	2.51 - 2.53 mm (standard and service limit)
Piston Ring End Gap	Top	0.183 - 0.383 mm (standard)
		0.503 mm (service limit)
	Second	0.353 - 0.553 mm (standard)
		0.673 mm (service limit)
	Oil	0.153 - 0.703 mm (standard)
		0.843 mm (service limit)
Gudgeon Pin Bore Diameter In Piston		21.004 - 21.012 mm (standard)
		21.040 mm (service limit)
Gudgeon Pin Diameter		20.995 - 21.000 mm (standard)
		20.985 mm (service limit)
Connecting Rod Small End Diameter		21.016 - 21.029 mm (standard)
		21.039 mm (service limit)
Connecting Rod Big End Diameter		41.000 - 41.009 mm (standard)
Connecting Rod Big End Side Clearance		0.15 - 0.30 mm (standard)
		0.50 mm (service limit)

Crankshaft

Crankshaft Big End Journal Diameter	38.000 - 37.984 mm (standard)
	37.9469 mm (service limit)

Crankshaft Big End Bearing Clearance	0.036 - 0.061 mm (standard)
	0.100 mm (service limit)
Crankshaft Main Journal Diameter	43.108 - 43.092 mm (standard)
	43.052 mm (service limit)
Crankshaft Main Bearing Clearance	0.018 - 0.042 mm (standard)
	0.100 mm (service limit)
Crankshaft End Float	0.05 - 0.20 mm (standard)
	0.50 mm (service limit)
Crankshaft Run-out	0.02 mm (standard)
	0.035 mm (service limit)

Transmission

Type	6 Speed, Constant Mesh
Gear Ratios Primary	1.26:1 (93/74)
1st	3.50:1 (49/14)
2nd	2.50:1 (45/18)
3rd	1.85:1 (37/20)
4th	1.48:1 (37/25)
5th	1.30:1 (35/27)
6th	1.17:1 (34/29)
Gear Selector Fork Thickness	5.90 - 6.00 mm (standard)

	5.80 mm (service limit)
Gear Selector Groove Width	6.10 - 6.20 mm (standard)
	6.30 mm (service limit)
Gear Selector Fork to Groove Clearance	0.1 - 0.3 mm (standard)
	0.50 mm (service limit)

Final Drive

Final Drive Type	Chain - EK525ZVX3, 114 links
Final Drive Ratio	2.75:1 (44/16)
Drive Chain Slack	See Final Drive Chain Adjustment
Drive Chain Lubrication	Chain spray suitable for X-ring chains

Lubrication

Oil Capacity (including filter, dry fill)	3.80 litres
Oil and Filter Change	3.40 litres
Oil Change only	3.20 litres
Recommended Oil Approval Rating	API SH (or higher) and JASO MA
Viscosity	10W/40 or 10W/50
Type	Semi or fully synthetic
Oil Pressure (in main gallery)	3.00 - 3.60 bar at 3,500 rpm
Oil Pump Rotor Tip	0.15 mm (standard)

Clearance	
	0.20 mm (service limit)
Oil Pump Body Clearance	0.15 - 0.239 mm (standard)
	0.369 mm (service limits)
Oil Pump Rotor End Float	0.04 - 0.09 mm (standard)
	0.12 mm (service limit)

Ignition System

Type	Digital electronic
Electronic Rev-Limiter	7,500 rpm
Pick up Coil Air Gap	Fixed, not adjustable
Primary Coil Resistance	0.185 Kohms
Ignition Coil Type	Inductive, plug top
Spark Plug Type	NGK LMAR8A-9
Spark Plug Gap	0.9 mm +0.0/-0.1 mm

Fuel System

Fuel Type	Unleaded, 91 RON (CLC or AKI octane rating (R+M)/2 of 87 or higher)
Fuel Tank Capacity	16 litres
Low Level Warning Light	3.25 litres
Fuel Pump Type	Submerged, electric
Fuel Pressure (nominal)	3.5 bar

Purge Control System	Modulated, vacuum

Emissions Control System

Type	Digital electronic
Idle Speed	1,000 rpm
Injector Type	Multi hole, solenoid operated plate valve
Throttle	Electronically controlled throttle bodies
Idle Speed Control	Electronic
Control Sensors	Atmospheric air pressure, throttle position, twist grip position, coolant temperature, crankshaft position, oxygen sensor, intake air temperature, gear position, MAP, vehicle speed (from ABS)
Catalysts	One, in the catalytic converter box
Oxygen Sensor	One per cylinder, heated, in header pipe
Evaporative Control	Activated carbon canister (certain markets only)

Cooling System

Coolant Mixture	Premixed
Antifreeze Type	Triumph HD4X Hybrid OAT coolant
Cooling System Capacity	1.89 litres
Radiator Cap Opening Pressure	1.2 bar
Thermostat Opening Temperature	88°C
Cooling Fan Switch On Temperature	103°C

Temperature Gauge Sensor Resistance	173 Ohms (+/- 10%) at 100°C

Suspension

Front Fork Travel	250 mm
Recommended Fork Oil Grade	Showa SS47
Oil Level (spring, spring seat and spacer removed and fork fully compressed)	160 mm
Oil Volume (dry fill)	591cc
Front Fork Pull Through	45.7 mm +/- 0.5 mm from lower edge of top yoke to the top of the inner tube (not the top cap)
Fork Spring Rate	4.5 N/mm
Rear Wheel Travel	250 mm

Brakes

Front Type	Four piston monobloc calipers acting on twin discs
Front Caliper Piston Diameter	28mm
Front Disc Diameter	320mm
Front Disc Thickness	4.5mm
	4.0mm
Front Disc Run-out Max.	0.25mm
Front Master Cylinder Diameter	18 mm
Recommended Fluid	DOT 4

Rear Type	Twin piston sliding caliper acting on single disc
Rear Caliper Piston Diameter	28mm
Rear Disc Diameter	255mm
Rear Disc Thickness	5.5mm
	5mm
Rear Disc Run-out Max.	0.25mm
Rear Master Cylinder Diameter	14mm
Recommended Fluid	DOT 4

Frame

Frame Type	Tubular steel
Rake	26.9°
Trail	129.2mm
Maximum. Payload (rider, passenger, luggage and accessories)	210 kg

Wheels and Tyres

Front Wheel Size	
Front Tyre Size	
Front Tyre Pressure	
Front Wheel Rim Axial run-out	
Front Wheel Rim Radial Run-	

out	
Rear Wheel Size	
Rear Tyre Size	
Rear Tyre Pressure	
Rear Wheel Rim Axial run-out	
Rear Wheel Rim Radial Run-out	
Approved Tyres	

Electrical Equipment

Battery Type	YTZ10S
Battery Rating	12 V - 8.6 Amp. Hour
Alternator Rating	18 Amps at 1000 rpm
	33 Amps at 6000 rpm
Headlight	LED
Rear Light/Brake Light	LED
Licence Plate Light	LED
Directional Indicator Lights	LED

Torque Wrench Settings

Cylinder Head

Application	Torque (Nm)	Notes
Camshaft cover to cylinder head	*	See Camshaft Cover - Installation

Clutch

Application	Torque (Nm)	Notes
Clutch cable lower lock nut	**3 Nm**	
Clutch centre nut	**98 Nm**	Fit new fixing(s) if loosened or removed Fit new Belleville washer
Clutch lever clamp bolts	**12 Nm**	
Clutch lever nut	**3.4 Nm**	
Clutch pressure plate to centre	**10 Nm**	
Clutch switch cover	**1 Nm**	

Balancer, Crankshaft and Crankcase

Application	Torque (Nm)	Notes
Breather plate to crankcase	**9 Nm**	Fit new fixing(s) if loosened or removed
Connecting rod big end bolts	*	See Connecting Rod - Installation
Crankcase breather pipes to crankcase	**9 Nm**	Fit new fixing(s) if loosened or removed
Crankcase to crankcase bolts	*	See Crankcase - Assembly
Dead shaft clamp pinch bolt	**10 Nm**	
Dead shaft clamp retaining bolt	**10 Nm**	Fit new fixing(s) if loosened or removed
Dead shaft preload	*	See Balancer Shafts Dynamic Adjustment

Application	Torque (Nm)	Notes
Dry seal plug	**23 Nm**	Fit new fixing(s) if loosened or removed
Flanged plug	**10 Nm**	Fit new fixing(s) if loosened or removed
Oil filler cap	**3 Nm**	
Plug, front balancer shaft adjuster clamp	**23 Nm**	
Rear dead shaft retaining washer	**12 Nm**	Fit new fixing(s) if loosened or removed
Sprag clutch housing fixings	*	Fit new fixing(s) if loosened or removed See Starter Drive/Sprag Clutch - Installation
Sprag thrust washer fixings	**12 Nm**	Fit new fixing(s) if loosened or removed

Engine Covers

Application	Torque (Nm)	Notes
Alternator cover embellisher to cover	**4 Nm**	Fit new fixing(s) if loosened or removed
Alternator cover to crankcase	**10 Nm**	
Baffle to sump	**6 Nm**	
Cable cover to alternator cover	**6 Nm**	Fit new fixing(s) if loosened or removed
Camshaft cover	*	Camshaft Cover - Installation
Clutch cover embellisher to clutch cover	**4 Nm**	Fit new fixing(s) if loosened or removed

Application	Torque (Nm)	Notes
Clutch cover plug	**10 Nm**	
Clutch cover to crankcase	*	Fit new fixing(s) if loosened or removed See Clutch Cover - Installation
Front sprocket cover - outer to inner	**9 Nm**	
Front sprocket cover - inner to crankcase	**3 Nm**	
Sump plate	**6 Nm**	Fit new fixing(s) if loosened or removed
Sump plug	**25 Nm**	Fit new sealing washer(s)
Sump to crankcase	**10 Nm**	

Transmission

Application	Torque (Nm)	Notes
Detent arm fixing	**12 Nm**	Fit new fixing(s) if loosened or removed
Detent arm spring fixing	**12 Nm**	Fit new fixing(s) if loosened or removed
Detent wheel to selector drum	**12 Nm**	Fit new fixing(s) if loosened or removed
Front sprocket to output shaft nut	**180 Nm**	Fit new fixing(s) if loosened or removed
Gear change pedal pinch bolt	**8 Nm**	
Input selector fork plug	**22 Nm**	Fit new fixing(s) if loosened or removed
Input shaft bearing retainer	**7 Nm**	Fit new fixing(s) if

Application	Torque (Nm)	Notes
		loosened or removed
Output selector shaft retainer	**12 Nm**	Fit new fixing(s) if loosened or removed
Selector drum bearing retaining screw	**12 Nm**	Fit new fixing(s) if loosened or removed
Starter drive flywheel	*	See Starter Drive/Sprag Clutch - Installation

Lubrication System

Application	Torque (Nm)	Notes
Oil cooling jet (pistons)	**9 Nm**	Fit new fixing(s) if loosened or removed
Oil filter	**10 Nm**	Apply clean engine oil to the seal(s)
Oil filter adapter	**10 Nm**	Fit new fixing(s) if loosened or removed
Oil pressure relief valve plug	**10 Nm**	
Oil pressure switch	**15 Nm**	Fit new sealing washer(s)
Oil pump drive chain guide fixings	**7 Nm**	Fit new fixing(s) if loosened or removed
Oil pump drive sprocket to oil pump	**12 Nm**	
Oil pump rotor cover to oil pump body	**10 Nm**	
Oil pump to crankcase	**10 Nm**	Fit new fixing(s) if loosened or removed
Sump baffle plate to sump	**6 Nm**	

Fuel System, Exhaust System and Airbox

Application	Torque (Nm)	Notes
Air filter cover to airbox	**1 Nm**	
Air intake duct clip	**1.5 Nm**	
Air intake finisher	**1.5 Nm**	Fit new fixing(s) if loosened or removed
Air intake finisher mounting	**3 Nm**	Fit new fixing(s) if loosened or removed
Air temperature sensor	**1.5 Nm**	
Airbox to frame	**6 Nm**	
Ambient air pressure sensor	**2 Nm**	
Crankshaft position sensor	**6 Nm**	Fit new fixing(s) if loosened or removed
Engine ECM bracket	**4 Nm**	
Exhaust centre cover assembly	**6 Nm**	
Exhaust headers to cylinder head	*	Left Hand Header Pipe - Installation Exhaust Catalytic Converter - Installation
Exhaust rear cover and bracket	**6 Nm**	
Exhaust silencer bracket to frame	**19 Nm**	Fit new fixing(s) if loosened or removed
Fuel hose bracket to fuel pump mounting bracket	**4 Nm**	
Fuel hose to fuel pump	**15 Nm**	Fit new sealing washer(s)

Application	Torque (Nm)	Notes
Fuel pump baffle clamp	**3 Nm**	
Fuel pump clamp	**4 Nm**	
Fuel pump mounting bracket to fuel pump plate	**7 Nm**	Fit new fixing(s) if loosened or removed
Fuel pump mounting plate to fuel tank	*	Fit new sealing washer(s). See Fuel Pump - Installation
Fuel rail to cylinder head	**6 Nm**	
Fuel tank strap	**5 Nm**	
Fuel tank strap boss	**1.5 Nm**	Fit new fixing(s) if loosened or removed
Fuel tank to frame	**8 Nm**	
Gear position sensor	**5 Nm**	Fit new fixing(s) if loosened or removed
Heatshield to exhaust silencer	**6 Nm**	
Ignition coil assembly fixings	**3 Nm**	Fit new fixing(s) if loosened or removed
Inertial Measurement Unit (IMU)	**8 Nm**	
Inertial Measurement Unit (IMU) bracket	**4 Nm**	Fit new fixing(s) if loosened or removed
Inlet manifold to cylinder head	**9 Nm**	
MAP sensor	**2 Nm**	
Oxygen sensor	**25 Nm**	
Oxygen sensor connector bracket	**3 Nm**	

Application	Torque (Nm)	Notes
Purge valve bracket	**4 Nm**	
Relay bracket	**1.5 Nm**	
Single throttle body to inlet manifold	**9 Nm**	
Twist grip position sensor	**2.5 Nm**	Fit new fixing(s) if loosened or removed

Cooling System

Application	Torque (Nm)	Notes
Coolant expansion tank	**3 Nm**	Fit new fixing(s) if loosened or removed
Coolant expansion tank mounting	**19 Nm**	
Coolant filler neck	**3 Nm**	
Coolant manifold to crankcase	**9 Nm**	Fit new fixing(s) if loosened or removed
Coolant temperature sensor	**18 Nm**	Apply ThreeBond 1374 to the threads
Radiator Grille	**5 Nm**	
Radiator to frame upper	**6 Nm**	
Thermostat housing to cylinder head	**9 Nm**	

Front Suspension

Application	Torque (Nm)	Notes
Upper yoke centre nut	**120 Nm**	
Upper yoke pinch bolt	**25 Nm**	

Application	Torque (Nm)	Notes
Lower yoke pinch bolt	**25 Nm**	
Instrument bracket to upper yoke	**5 Nm**	
Damping cylinder bolt	**20 Nm**	Fit new sealing washer(s)
Damping rod to top cap lock nut	**20 Nm**	
Handlebar to riser clamp bolt	**24 Nm**	
Handlebar end weights	**5 Nm**	Fit new fixing(s) if loosened or removed
Headstock bearing adjuster and lock nut	*	See Steering Head Bearing - Adjustment
Left hand heated grip	**2 Nm**	
Left hand heated grip switch housing fixings	**0.5 Nm**	
Handlebar riser to front fork clamp bolt	**38 Nm**	
Twist grip housing	**2.5 Nm**	
Fork top cap	**35 Nm**	

Rear Suspension

Application	Torque (Nm)	Notes
Brake hose bracket	**4 Nm**	
Drive chain upper guard front fixing	**4 Nm**	
Drive chain upper guard rear fixing	**9 Nm**	
Drive chain guard, lower	**4 Nm**	
Drive chain slack adjuster lock nut	**20 Nm**	

Application	Torque (Nm)	Notes
Drive chain rubbing strip	**9 Nm**	
Rear suspension unit lower mounting bolt	**48 Nm**	
Rear suspension unit upper mounting bolt	**30 Nm**	Fit new fixing(s) if loosened or removed
Rear suspension unit shroud	**4 Nm**	
Swinging arm pivot bolt adjuster	*	See Swinging Arm - Installation
Swinging arm pivot nut	*	See Swinging Arm - Installation

Wheels

Application	Torque (Nm)	Notes
Fork to wheel spindle pinch bolts	**22 Nm**	
Front wheel spindle/axle bolt	**65 Nm**	
Rear sprocket to sprocket carrier	**55 Nm**	Fit new fixing(s) if loosened or removed
Rear wheel spindle lock nut	**110 Nm**	
Sprocket carrier stud	*	See Rear Sprocket - Installation
Tyre valve	**4 Nm**	Apply ThreeBond 1305 to the threads

Final Drive

Application	Torque (Nm)	Notes
Rear sprocket to cush drive	*	See Rear Sprocket - Installation

Front Brakes

Application	Torque (Nm)	Notes
Brake caliper to front fork	**55 Nm**	
Brake disc to wheel	**22 Nm**	Fit new fixing(s) if loosened or removed
Brake hose to front caliper	**25 Nm**	Fit new sealing washer(s)
Brake hose to master cylinder	**25 Nm**	Fit new sealing washer(s)
Brake lever pivot bolt	**1 Nm**	
Brake lever pivot bolt lock nut	**6 Nm**	
Front brake fluid reservoir to bracket	**7 Nm**	
Caliper bleed screw	**8 Nm**	
Front brake master cylinder to handlebar	**8 Nm**	Apply torque to the top fixing first

Rear Brakes

Application	Torque (Nm)	Notes
Brake disc to wheel	**22 Nm**	Fit new fixing(s) if loosened or removed
Brake hose P-clip to engine	**5 Nm**	
Brake hose to master cylinder	**25 Nm**	Fit new sealing washer(s)
Brake hose to rear caliper	**25 Nm**	Fit new sealing washer(s)
Brake master cylinder reservoir to frame	**3Nm**	Fit new sealing washer(s)
Brake master cylinder to right hand control plate	**18 Nm**	

Application	Torque (Nm)	Notes
Brake pedal pivot bolt	**22 Nm**	Fit new fixing(s) if loosened or removed
Master cylinder reservoir cap screws	**1 Nm**	
Rear brake caliper bleed screw	**6 Nm**	
Rear brake pressure switch	**15 Nm**	

ABS System

Application	Torque (Nm)	Notes
ABS modulator bracket to frame	**9 Nm**	Fit new fixing(s) if loosened or removed
ABS modulator to bracket	**9 Nm**	Fit new fixing(s) if loosened or removed
ABS pulser ring to wheel	**5 Nm**	Fit new fixing(s) if loosened or removed
ABS wheel speed sensor	**9 Nm**	
Anti-rotation moulding to ABS modulator	**5 Nm**	Fit new fixing(s) if loosened or removed
Brake line union block to headstock	**8 Nm**	Fit new fixing(s) if loosened or removed
Brake line union to modulator	**25 Nm**	Fit new sealing washer(s)
Brake pressure switch	**15 Nm**	
Hose guide to swinging arm	**5 Nm**	
Rear brake line to modulator P-clip	**5 Nm**	

Frame, Footrests, Control Plates and Engine Mountings

Application	Torque (Nm)	Notes
Bank angle indicator	**9 Nm**	Fit new fixing(s) if loosened or removed
Control plate, left hand, front bolt	**40 Nm**	
Control plate, left hand, rear bolt	**25 Nm**	
Control plate, right hand, bottom bolt	**40 Nm**	
Control plate, right hand, top bolt	**25 Nm**	
Cradle mounting bolts	*	See Engine - Installation
Cradle to crankcase mounting bolts	*	See Engine - Installation
Cradle to frame mounting bolts	**40 Nm**	
Cylinder head front left hand bolt to frame	*	See Engine - Installation
Cylinder head rear mounting to frame	*	See Engine - Installation
Cylinder head to rear mounting	*	See Engine - Installation
Drive chain roller	**3 Nm**	
Drive chain rubbing block	**6 Nm**	
Engine rear lower mounting lock nuts	*	See Engine - Installation
Engine upper rear mounting lock nuts	*	See Engine - Installation
Frame adjuster	*	See Engine - Installation
Front left hand cylinder head bolt to frame	*	See Engine - Installation
Front licence plate bracket	**3 Nm**	
Front mudguard	**4 Nm**	
Front mudguard brackets to forks	**6 Nm**	Fit new fixing(s) if

Application	Torque (Nm)	Notes
		loosened or removed
Front mudguard stay to mudguard brackets	**6 Nm**	
Front mudguard stay to mudguard	**4 Nm**	
Front mudguard support to mudguard brackets	**8 Nm**	
Front right hand cylinder head bolt to frame (stage one)	*	See Engine - Installation
Front right hand cylinder head bolt to frame (stage two)	*	See Engine - Installation
Front sprocket inner cover	**3 Nm**	
Front sprocket middle cover and rear brake reservoir	**3 Nm**	
Front sprocket outer cover	**9 Nm**	
Fuel tank infill panel	**3 Nm**	
Grab rail front fixings	**28 Nm**	
Grab rail mounting to frame	**10 Nm**	Fit new fixing(s) if loosened or removed
Grab rail rear fixings	**28 Nm**	
Hand guard bracket pinch bolt	**4.5 Nm**	Fit new fixing(s) if loosened or removed
Hand guard bracket to handlebar end	**5 Nm**	Fit new fixing(s) if loosened or removed
Hand guard moulding to hand guard bracket	**3 Nm**	Fit new fixing(s) if loosened or removed
Hand guard to mirror bracket	**5 Nm**	Fit new fixing(s) if loosened or removed

Application	Torque (Nm)	Notes
Heel guard	**7 Nm**	
Instrument adjustment handle pinch bolts	**1.5 Nm**	
Instrument connector cover	**3 Nm**	
Instrument mount adjustment bearing	**5.5 Nm**	
Instrument mount to top yoke	**5 Nm**	See Engine - Installation
Licence plate hanger lower moulding to mudguard support bracket	**3 Nm**	
Licence plate hanger nuts	**5 Nm**	
Licence plate hanger upper moulding to mudguard support bracket	**3 Nm**	
Lower rear crankcase mounting	*	
Mirror	**20 Nm**	
Mirror brackets	**5 Nm**	
Rear footrest clevis	**24 Nm**	
Rear footrest hanger	**24 Nm**	
Rear footrest rubber inserts	**6 Nm**	Fit new fixing(s) if loosened or removed
Rear mudguard tray to ABS bracket	**9 Nm**	
Rear mudguard tray to airbox	**1.5 Nm**	
Rear reflector bracket	**1 Nm**	
Seat lock to frame	**6 Nm**	
Side panel, left hand, embellisher	**3 Nm**	Fit new fixing(s) if loosened or removed

Electrical

Application	Torque (Nm)	Notes
Airbox connector moulding	**1.5 Nm**	
Alternator harness retainer	**9 Nm**	Fit new fixing(s) if loosened or removed
Alternator regulator rectifier	**4 Nm**	
Alternator rotor to crankshaft	*	See Alternator Rotor - Installation
Alternator stator to alternator cover	**12 Nm**	Fit new fixing(s) if loosened or removed
Alternator stator wire guide to alternator cover	**6 Nm**	
Battery cage	**6 Nm**	
Battery ground cable to frame	**6 Nm**	
Battery terminal	**4.5 Nm**	
Connector bracket to headstock	**3 Nm**	
Crankshaft position sensor to alternator cover	**6 Nm**	Fit new fixing(s) if loosened or removed
Front direction indicators	**5 Nm**	Fit new fixing(s) if loosened or removed
Front licence plate fixings	**3 Nm**	
Fuse box bracket	**3 Nm**	
Harness conduit	**3 Nm**	
Headlight bowl fixing	**10 Nm**	
Headlight bowl harness clip	**3 Nm**	

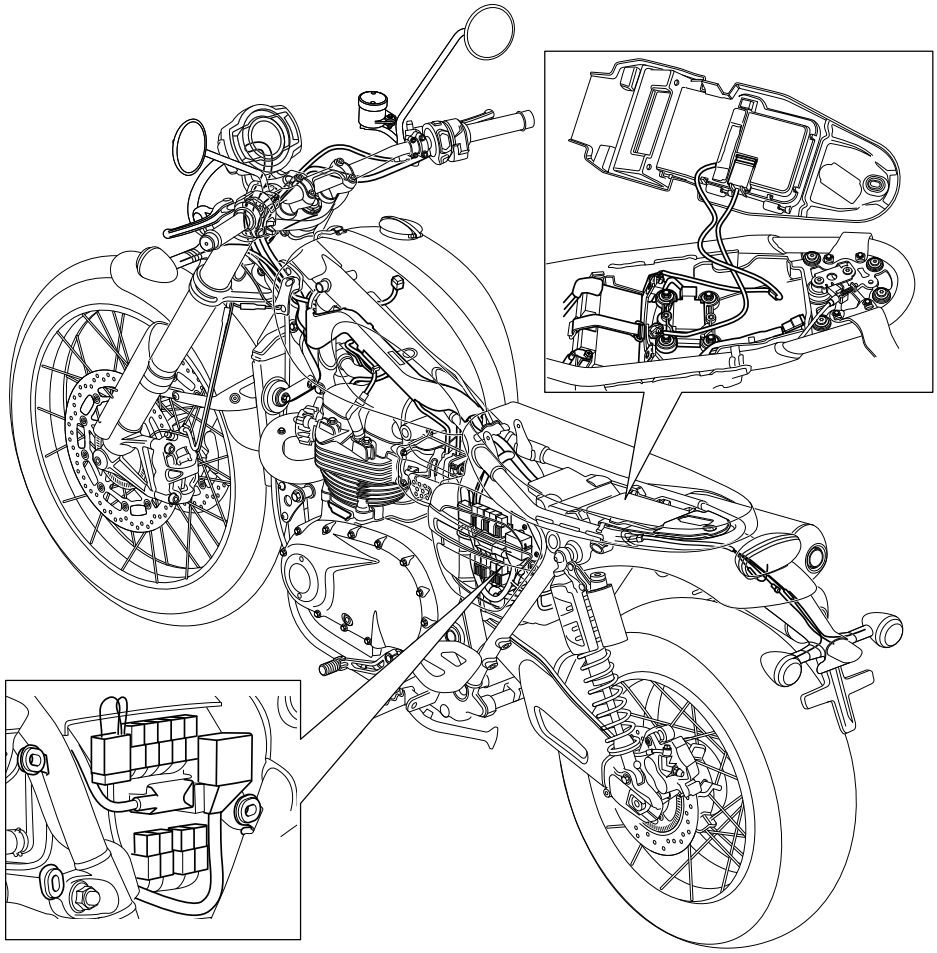
Application	Torque (Nm)	Notes
Headlight bracket lower fixings	**3 Nm**	
Headlight rim fixings	**1.5 Nm**	
Headlight rim bracket fixings	**6 Nm**	
Headlight vertical adjuster	**10 Nm**	
Headstock connector bracket	**3 Nm**	
Headstock tidy	**5 Nm**	Fit new fixing(s) if loosened or removed
Headstock tidy outer cover, bottom fixing	**3 Nm**	
Headstock tidy outer cover, top fixing	**5 Nm**	
Heated grip, left hand	**2 Nm**	
Heated grip switch housing	**0.5 Nm**	
Horn	**24 Nm**	
Ignition coil bracket	**3 Nm**	
Inertial measurement unit	**8 Nm**	
Inertial measurement unit carrier	**4 Nm**	
Instrument adjustment bearing	**5.5 Nm**	
Instrument adjustment handle pinch bolts	**1.5 Nm**	
Instrument bracket to top yoke	**5 Nm**	Fit new fixing(s) if loosened or removed
Instruments	**3 Nm**	Fit new fixing(s) if loosened or removed

Application	Torque (Nm)	Notes
Instruments connector cover	**3 Nm**	
Keyless ECM	**3 Nm**	
LF Antenna	**1.5 Nm**	
Licence plate light	**1 Nm**	
Licence plate upper hanger to lower hanger	**5 Nm**	
Main harness front conduit	**3 Nm**	
Main harness to frame	**3 Nm**	
Rear direction indicators	**5 Nm**	Fit new fixing(s) if loosened or removed
Rear light	**9 Nm**	
Rear light assembly to mudguard and support bracket (nuts)	**9 Nm**	
Rear light assembly to rear mudguard	**8 Nm**	Fit new fixing(s) if loosened or removed
Rear reflector bracket	**1 Nm**	
Relay bracket	**1.5 Nm**	
Rotational power switch (US and CA)	**1.5 Nm**	
Service tool T3880606 lock nut	**10 Nm**	
Smartkey fob	**0.3 Nm**	
Starter motor cable guide	**4 Nm**	Fit new fixing(s) if loosened or removed
Starter motor power lead connection	**5 Nm**	

Application	Torque (Nm)	Notes
Starter motor solenoid lead connection	**5 Nm**	
Starter motor to crankcase	**7 Nm**	

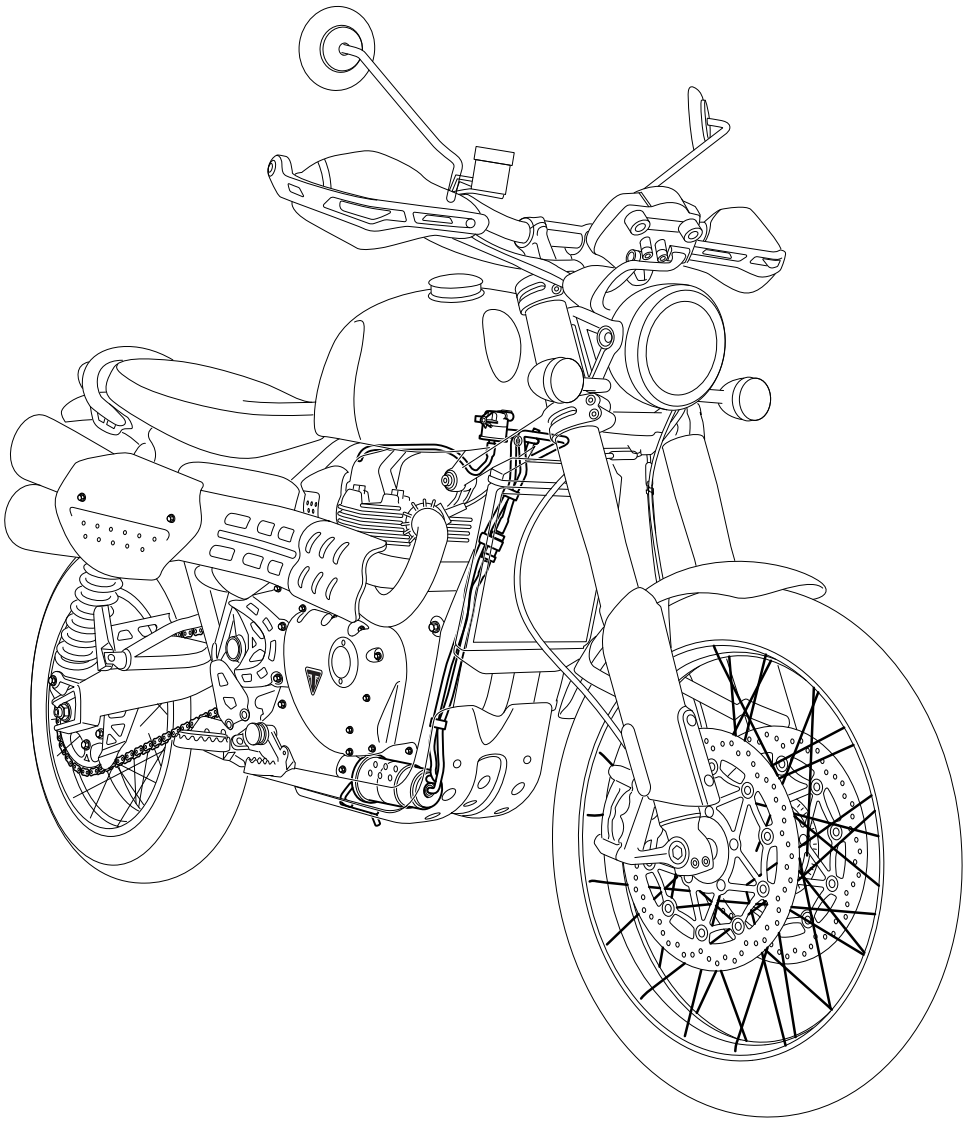
Routings

Main Wiring Harness Routing



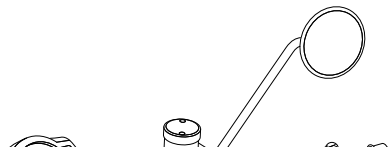
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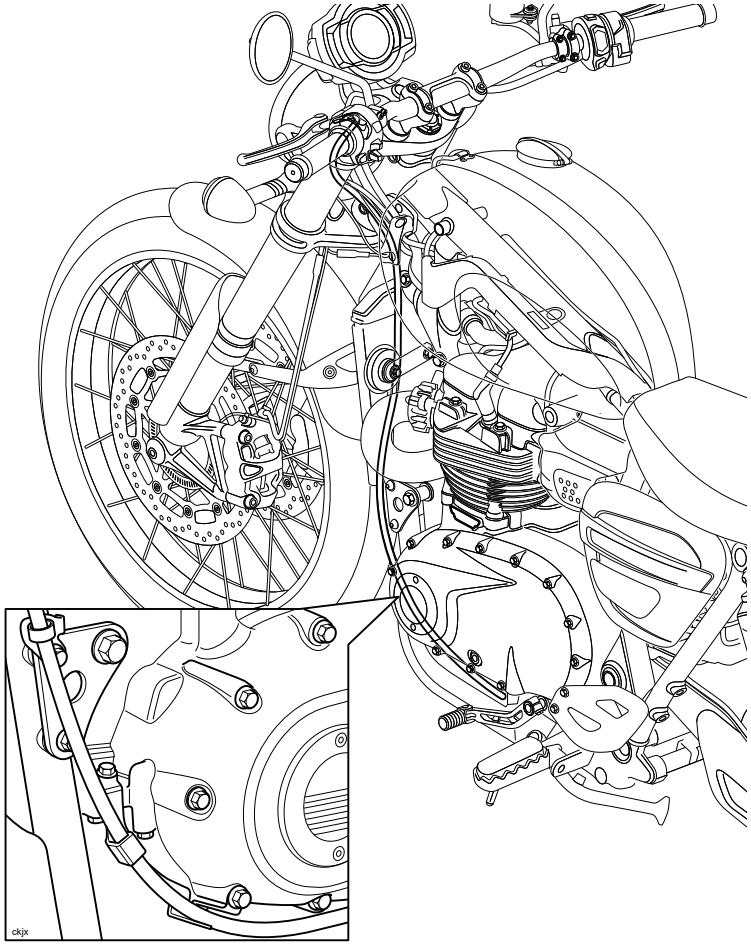
Evaporative Hose Routing



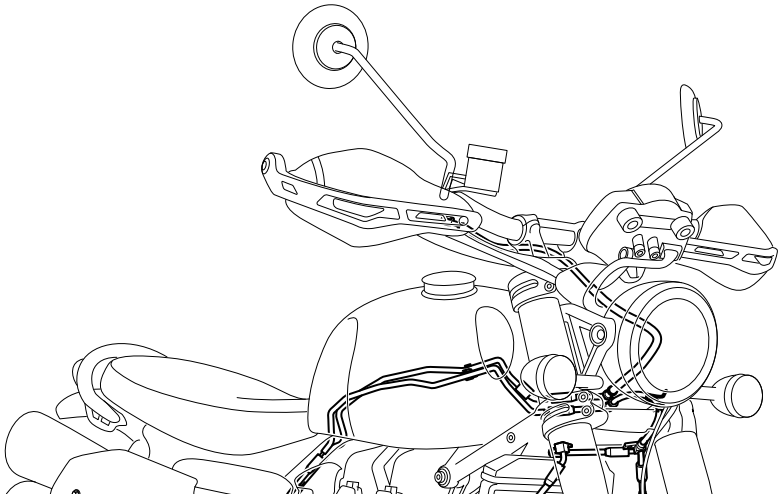
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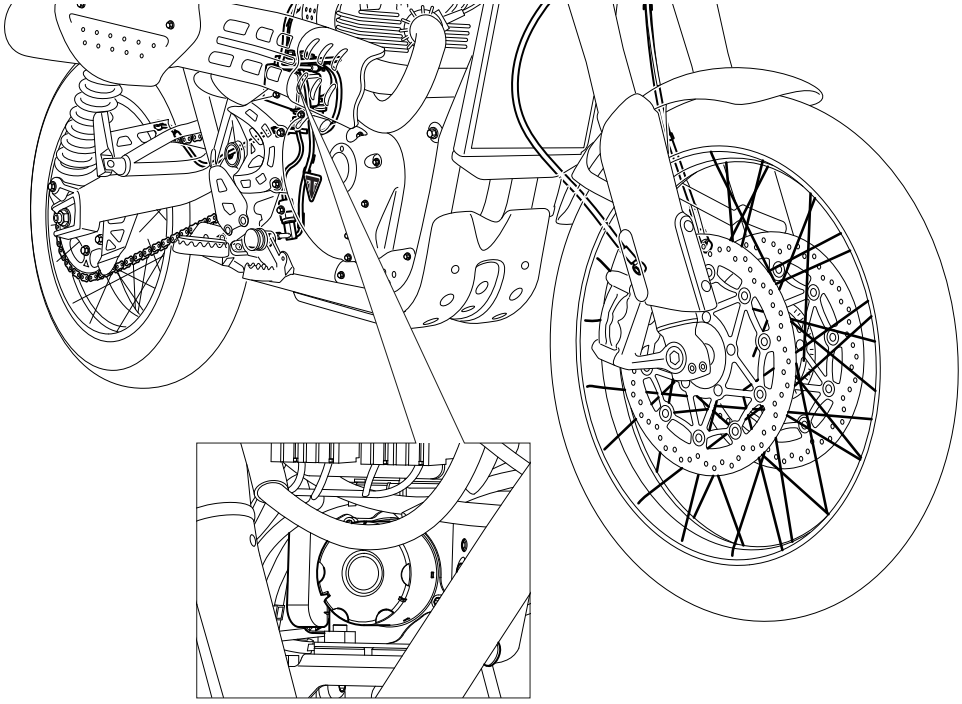
Clutch Cable Routing





ABS Brake Hose Routing





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Routine Maintenance

Scheduled Maintenance

WARNING

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

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.

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 may lead to loss of control and an accident.

Weather, terrain and geographical location affect maintenance. The maintenance schedule should be adjusted to match the particular environment in which the motorcycle is used and the demands of the individual owner.

Special tools, knowledge and training are required in order to correctly carry out the maintenance items listed in the scheduled maintenance chart. Only an authorised Triumph dealer will have this knowledge and equipment.

WARNING

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.

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. The information that follows describes the procedures to follow when carrying out the daily checks and some simple maintenance and adjustment items.

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

1. 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.
2. 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.
3. 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.

Triumph Motorcycles cannot accept any responsibility for damage or injury resulting from incorrect maintenance or improper adjustment.

Service Symbol/General Warning Symbol

The service symbol will illuminate for five seconds after the motorcycle start up sequence as a reminder that a service is due in approximately 60 miles (100 km). The service symbol will illuminate permanently when the mileage is reached, it will remain permanently illuminated until the service interval is reset using the Triumph Diagnostic tool.

The general warning symbol will flash if an ABS or engine management fault has occurred and the ABS and/or MIL warning lights are illuminated. Contact an authorised Triumph dealer as soon as possible to have the fault checked and rectified.

Scheduled Maintenance Table

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**	**20,000 (32,000)**	**40,000 (64,000)**

				(16,000 and 48,000)		
Lubrication						
Engine - check for leaks	Day	•	•	•	•	•
Engine oil - renew	-	•	•	•	•	•
Engine oil filter - renew	-	•	•	•	•	•
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	-	•	•	•	•	•
Fuel system - check fuel hoses for chafing, cracks or damage. Replace if necessary	-			•	•	•
Air filter - renew	-			•	•	•
Fuel filter - renew	-				•	•
Throttle body plate (butterfly) - check/clean	-			•	•	•
Fuel hoses - renew	Every 4 years regardless of mileage					
Evaporative loss hoses* - renew	Every 4 years regardless of mileage					
Ignition System						
Spark plugs - check	-			•		
Spark plugs - renew	-				•	•
Cooling System						
Cooling system - check for	Day	•	•	•	•	•

leaks						
Cooling system - check hoses for chafing, cracks or damage. Replace if necessary	-			•	•	•
Coolant level - check/adjust	Day	•	•	•	•	•
Coolant - renew	Every 3 years regardless of mileage					
Engine						
Clutch cable - check function and adjust as necessary	Day	•	•	•	•	•
Valve clearances - check/adjust	-				•	•
Camshaft timing - check/	-				•	•
Wheels and Tyres						
Wheels - inspect for damage	Day	•	•	•	•	•
Wheel bearings - check for wear/smooth operation	-	•	•	•	•	•
Wheels - check for broken or damaged spokes and check spoke tightness (not alloy wheels)	Day	•	•	•	•	•
Tyre wear/tyre damage - check	Day	•	•	•	•	•
Tyre pressures - check/adjust	Day	•	•	•	•	•
Steering and Suspension						
Steering - check for free operation	Day	•	•	•	•	•
Headstock bearings - check/adjust	-		•	•	•	•
Headstock bearings - lubricate	-				•	•

Front and rear suspension - check for damage/leaks /smooth operation	Day	•	•	•	•	•
Fork oil - renew	-					•
Brakes						
Brake pads - check wear levels	Day	•	•	•	•	•
Brake master cylinders - check for fluid leaks	-	•	•	•	•	•
Brake calipers - check for fluid leaks and seized pistons	-	•	•	•	•	•
Brake fluid levels - check	Day	•	•	•	•	•
Brake fluid - renew	Every 2 years regardless of mileage					
Drive Chain						
Drive chain slack - check/adjust	Day	•	•	•	•	•
Drive chain - wear check	Every 500 miles (800 km)					
Drive chain - lubricate	Every 200 miles (300 km)					
Drive chain rubbing strip - check for wear, cracks or damage. Replace if necessary	-	•	•	•	•	•
Electrical						
Lights, instruments and electrical systems - check/adjust	Day	•	•	•	•	•
General						
Engine ECM, Instruments and Keyless ECM - check for latest calibration download using the Triumph diagnostic tool	-	•	•	•	•	•

Bank angle indicators - check for wear	Day	•	•	•	•	•
Fasteners - inspect visually for security	Day	•	•	•	•	•
Centre stand and/or side stand - check for wear/smooth operation	Day	•	•	•	•	•
Centre stand pivots - clean/grease	-			•	•	•
Side stand pivot pin - clean	-			•	•	•
Rear brake pedal adjuster pivot pin - clean/lubricate	-	•	•	•	•	•
Carry out all outstanding Service Bulletin and warranty work	-	•	•	•	•	•
Carry out road test	-	•	•	•	•	•
Complete the service record book and reset the service indicator (if fitted)	-	•	•	•	•	•
* Evaporative system fitted to models for certain markets only.						

Service Specifications

Engine Oil Type	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
Engine Oil Capacity (Wet Fill Including Filter)	3.40 litres
Spark Plug Type	NGK LMAR8A-9

Spark Plug Gap	0.9 mm +0.0/-0.1 mm
Coolant Type	Triumph HD4X Hybrid OAT coolant
Coolant Capacity	1.89 litres
Cutch Lever Free Play	2.0 - 3.0 mm
Valve Clearances - Inlet	0.05 - 0.13 mm
Valve Clearances - Exhaust	0.12 - 0.22 mm
Front Tyre Pressure	36psi
Rear Tyre Pressure	42psi
Fork Oil Grade	Showa SS47G
Fork Oil Level	160mm
Fork Oil Volume	591cc
Front Fork Pull Through	45.7 mm +/- 0.5 mm from lower edge of top yoke to the top of the inner tube (not the top cap)
Front Brake Pad Minimum Thickness	1.0 mm
Front Brake Disc Minimum Thickness	4.0mm
Front Brake Disc Maximum Run Out	0.25mm
Rear Brake Pad Minimum Thickness	1.5 mm
Rear Brake Disc Minimum Thickness	5mm

Rear Brake Disc Maximum Run Out	0.25mm
Brake Fluid Type	DOT 4
Brake Pad Minimum Thickness	1.5 mm
Drive Chain Type	Chain - EK525ZVX3, 114 links
Drive Chain Slack	20 - 30 mm
Drive Chain 20 Link Limit	319 mm (12.56 in)
Drive Chain Lubrication	Chain spray suitable for X-ring chains
Bank Angle Indicator Service Limit	15mm

Service Torque Wrench Settings

Oil Filter	**10 Nm**	Apply clean engine oil to the seal(s)
Sump Plug	**25 Nm**	Fit new sealing washer(s)
Air Filter to Airbox	**1.5 Nm**	
Spark Plugs	**12 Nm**	
Camshaft Cover	**14 Nm**	See Camshaft Cover - Installation for tightening sequence
Front Wheel Spindle	**65 Nm**	
Front Wheel Spindle Pinch Bolts	**22 Nm**	
Upper Yoke Top Nut	**120 Nm**	

Swinging Arm Spindle Nut	**110 Nm**	
Front Brake Master Cylinder Reservoir Cap	**0.7 Nm**	
Front Brake Master Cylinder Bleed Screw	**14 Nm**	
Front Brake Hose to Caliper	**25 Nm**	
Front Brake Hose to Master Cylinder	**25 Nm**	
Front Brake Caliper	**55 Nm**	
Front Brake Caliper Bleed Screw	**8 Nm**	
Rear Brake Master Cylinder Reservoir	**3Nm**	
Rear Brake Hose to Master Cylinder	**25 Nm**	
Rear Brake Master Cylinder to Control Plate	**18 Nm**	
Rear Brake Caliper Bleed Screw	**6 Nm**	
Fuel Tank to Frame (Rear Fixing)	**8 Nm**	
Battery Terminals	**4.5 Nm**	

Engine Check For Fluid Leaks

WARNING

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

Standard required:

All engine components must be free from fluid leaks.

Check:

Check the visible areas of the crankcase, cylinder head and transmission for fluid leaks.

Visually inspect the oil hoses for fluid leaks and signs of damage or chafing (where accessible).

Rectification if required:

A leaking or damaged component must be replaced.

Engine Oil - 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 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

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.

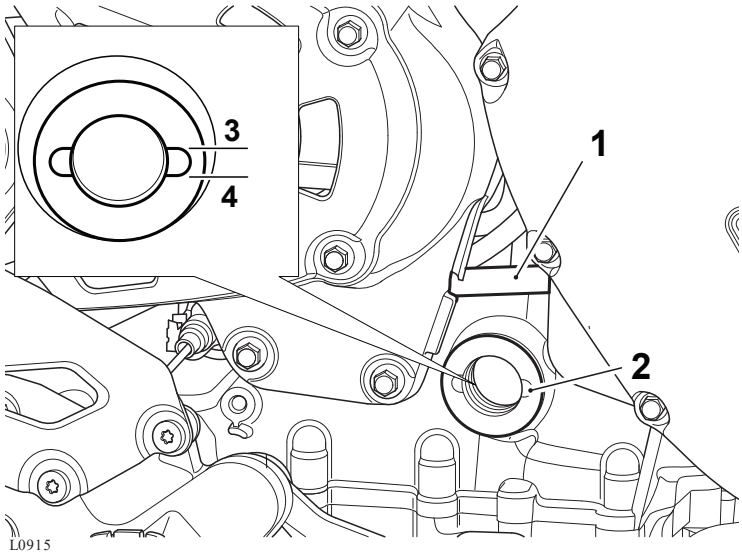
WARNING

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.

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. Start the engine and run at idle for approximately five minutes.
2. Stop the engine, then wait for at least three minutes to allow the oil to settle.
3. Note the oil level visible in the sight glass.
4. When correct, oil should be visible at a point between the upper level and the lower level on the sight glass.



1. **Oil filler plug**
2. **Sight glass**
3. **Upper level (maximum)**
4. **Lower level (minimum)**

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).**

5. If it is necessary to top up the oil level, remove the oil filler plug and using a suitable funnel, add oil, a little at a time, until the level registered in the sight glass is correct.
6. Once the correct level is reached, fit and tighten the oil filler plug to **3 Nm**.

Engine Oil and Filter Renew

WARNING

Before starting work, ensure the 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.

CAUTION

CAUTION

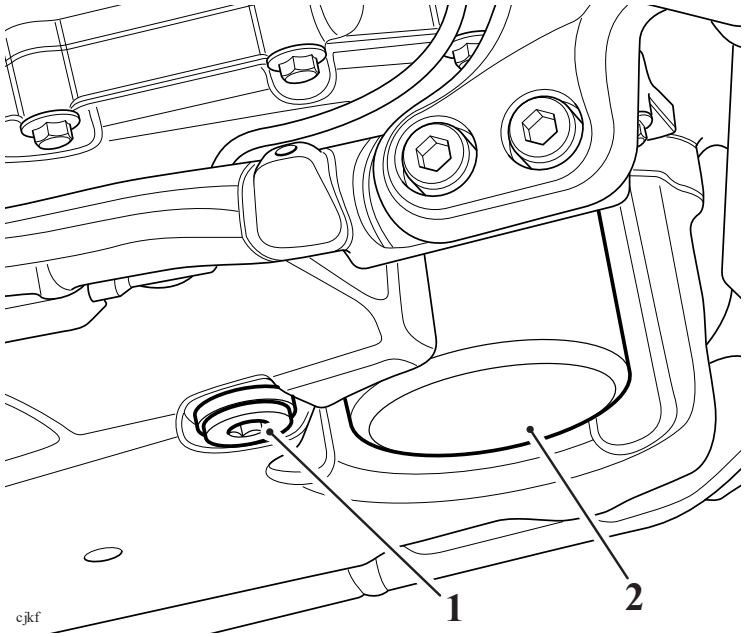
Do not pour engine oil on the ground, down sewers or drains, or into watercourses. To prevent pollution of watercourses etc., dispose of used oil sensibly. If in doubt contact your local authority.

1. Warm up the engine thoroughly, and then stop the engine.
2. Place a waste oil catch tray 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 and discard the sealing washer.



1. **Oil drain plug**
2. **Oil filter**

4. Remove the oil filler plug and discard the sealing washer.
5. With the motorcycle on level ground, and on its side stand, allow the oil to completely drain.
6. Unscrew and remove the oil filter using T3880313 - Oil Filter Wrench.
7. Dispose of the old filter in an environmentally friendly way.
8. Apply a smear of clean engine oil to the sealing ring of the new oil filter.
9. Using T3880313 - Oil Filter Wrench, fit the new oil filter and tighten to **10 Nm**.
10. Fit a new sealing washer to the drain plug.
11. Fit and tighten the drain plug to **25 Nm**.
12. Using a suitable funnel, fill the engine with new 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.

13. Fit a new sealing washer to the oil filler cap.
14. Fit and tighten the oil filler plug to **3 Nm**.
15. Start the engine and allow it to idle for a minimum of 30 seconds.

CAUTION

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

CAUTION

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

16. Ensure that the oil pressure warning light extinguishes shortly after starting.
17. Stop the engine and check the oil level. Adjust if necessary.

Air Filter Element - Renew

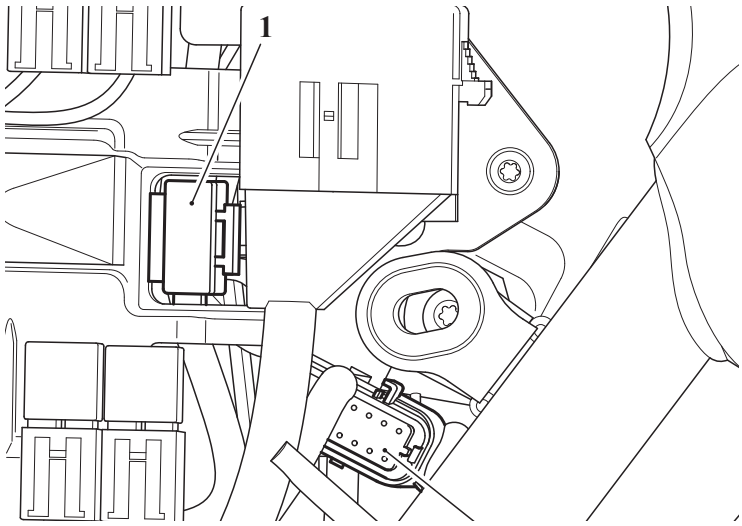
WARNING

Before starting work, ensure the 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:

- Remove the left hand Side Panels

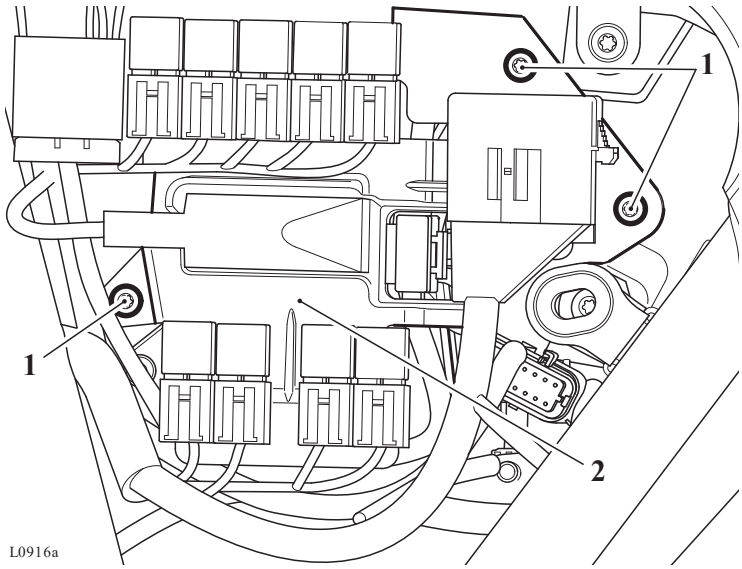
1. Detach the main fuse and the keyless electronic control module (ECM) multiplug from the relay bracket.





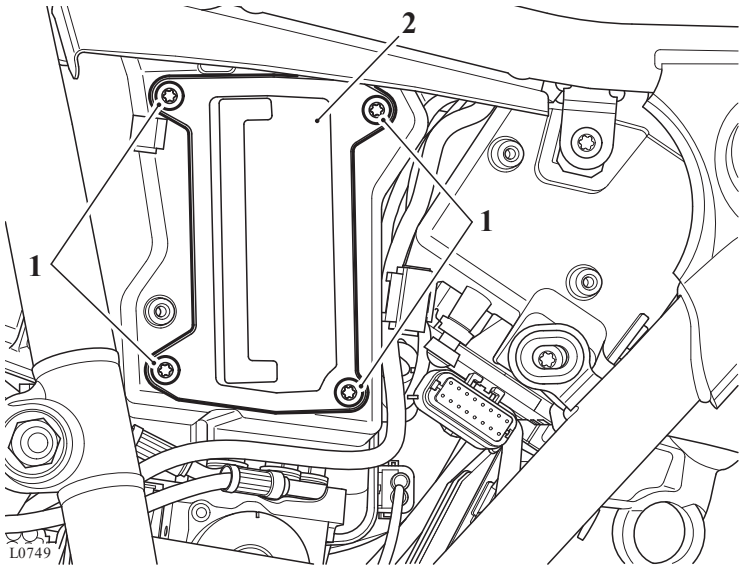
1. **Main fuse**
2. **Keyless ECM multiplug**

2. Remove the fixings and detach the relay bracket from the left hand side of the airbox.



1. **Fixings**
2. **Relay bracket**

3. Release the four fixings securing the air filter cassette to the airbox and remove the air filter cassette.



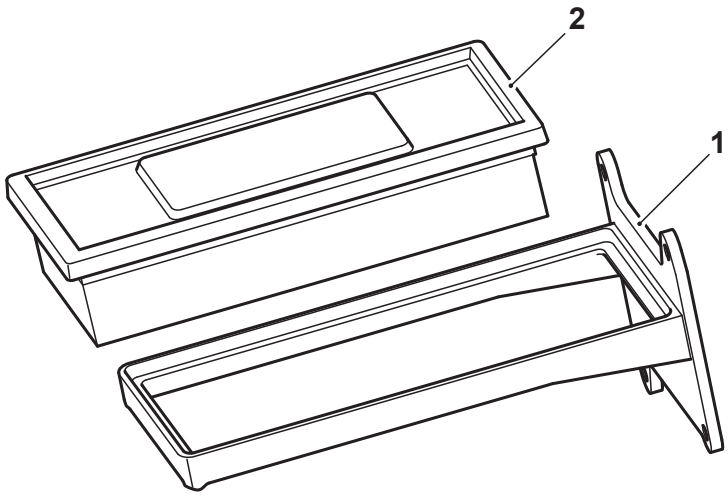
1. **Fixings**
2. **Air filter cassette**

4. Inspect the air filter cassette seal for damage, replace if necessary.

Note

- **Note the orientation of the air filter element and air filter cassette for installation.**

5. Remove the air filter cassette from the air filter.

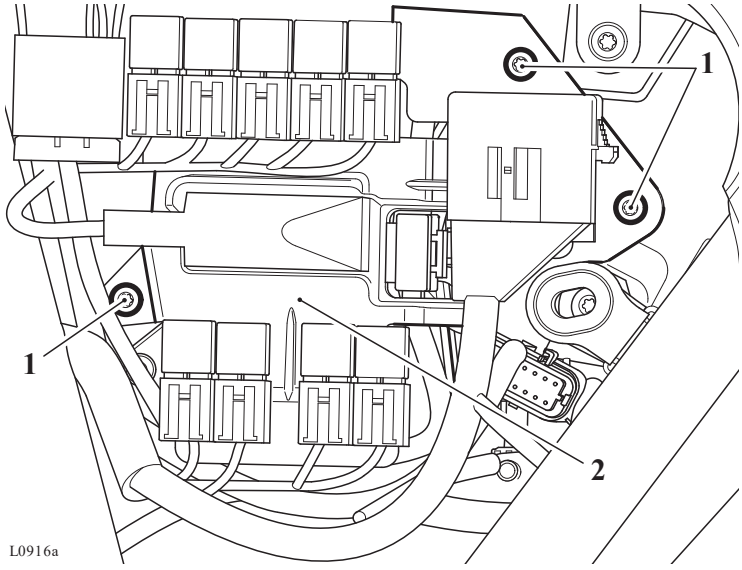


L0750

1. **Cassette**
2. **Air filter element**

Installation

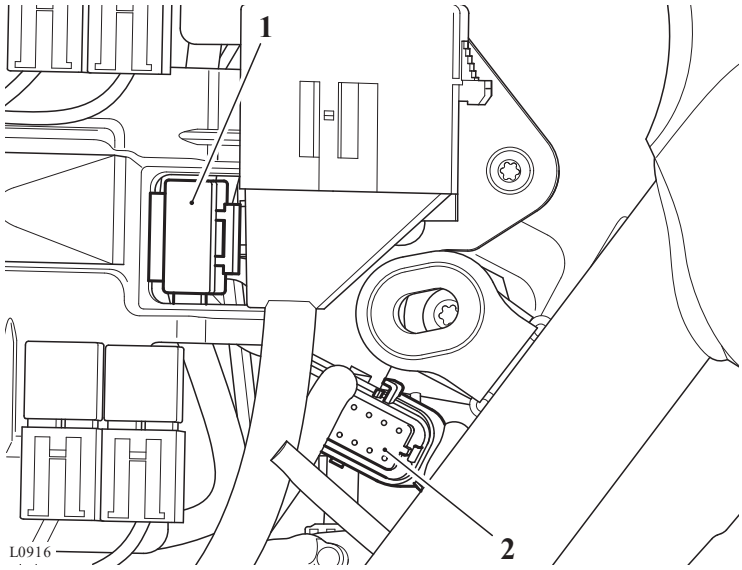
1. Clean the air filter cassette and the interior of the airbox.
2. Locate the new air filter element into the air filter cassette, as noted for removal.
3. Fit the air filter and cassette assembly to the airbox and tighten its fixings to **1 Nm**.
4. Attach the relay bracket to the airbox and tighten its fixings to **1.5 Nm**.



L0916a

1. **Fixings**
2. **Relay bracket**

5. Attach the main fuse and the keyless electronic control module (ECM) multiplug to the relay braket.



1. **Main fuse**
2. **Keyless (ECM) multiplug**

Perform the following operations:

- Refit the left hand Side Panels

Fuel Filter - Renew

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

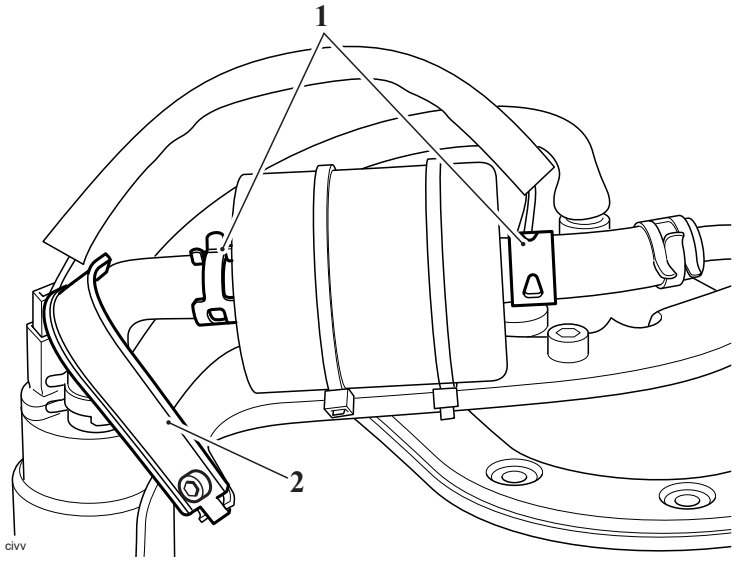
Observe the warning advice given in the General Information section on the safe handling of fuel and fuel containers.

A fire, causing personal injury and damage to property could result from spilled fuel or fuel not handled or stored correctly.

Perform the following operations:

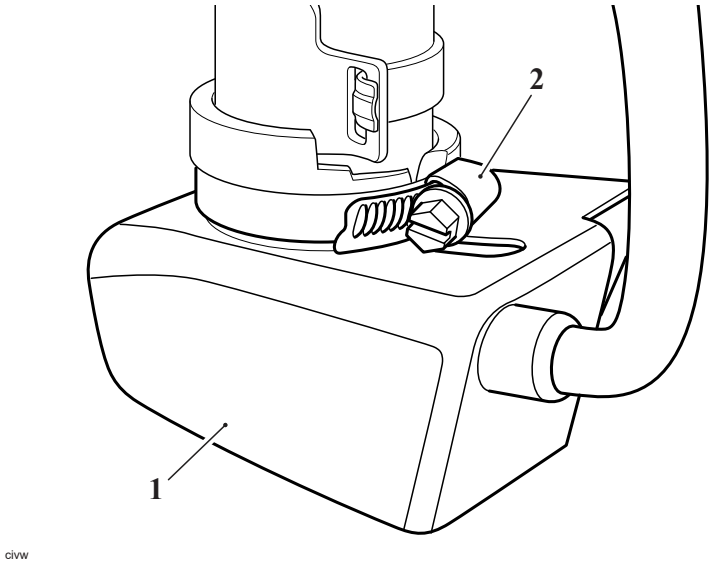
- Fuel Pump Assembly - Removal

1. Release the two fuel hose clips from either side of the fuel filter.
2. Remove the hose bracket from the fuel pump bracket.



1. **Hose clips**
2. **Hose bracket**

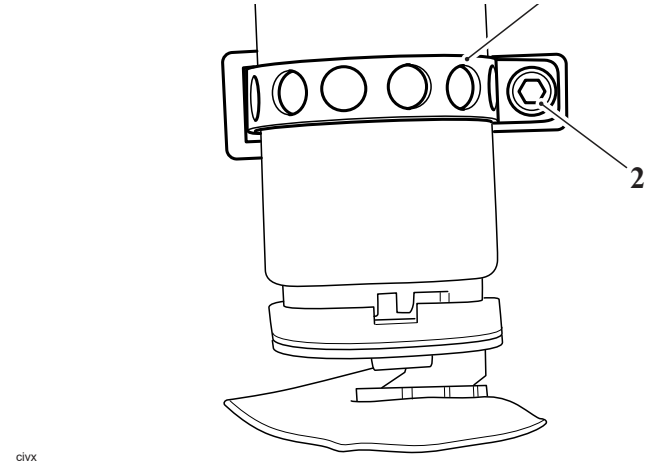
3. Carefully detach the baffle housing from the fuel pump.



1. **Baffle housing**
2. **Hose clip**

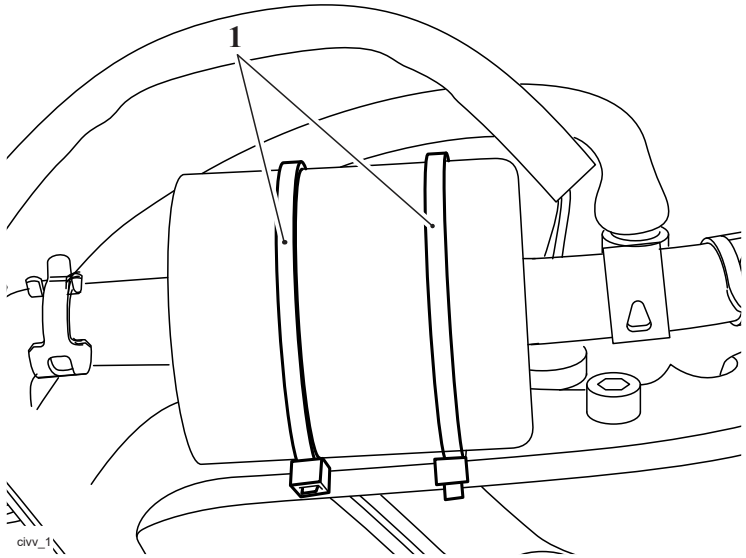
4. Remove the fuel pump securing bolt and strap.





1. **Strap**
2. **Bolt**

5. Disconnect the fuel pump hose from the fuel filter inlet.
6. Remove and discard the two fuel filter cable ties.



1. **Cable ties**

Note

- **Prior to removing the filter, note the direction of the arrow on the side of the filter. The arrow should point away from the fuel pump, towards the pressure regulator.**

7. Remove the fuel filter from the outlet hose.

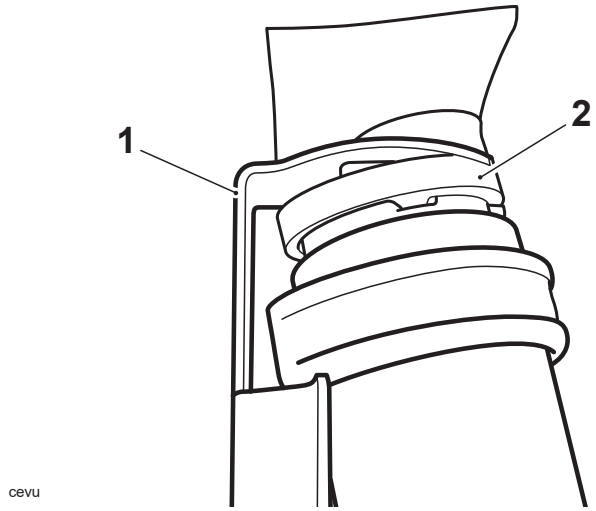
Inspection

1. Inspect all hoses for cracks, splits, fraying and other damage. Replace as necessary.
2. Check all hose clamps for cracks and signs of distortion. Replace as necessary.

3. Check the mesh filter for damage and replace the fuel pump if necessary.

Installation

1. Install the fuel filter to the outlet hose, ensuring the arrow on the filter points away from the pump. Secure the hose with the hose clip.
2. Check and ensure that the feet of the rubber isolator engage correctly in the fork.



1. **Fork**
2. **Isolator feet**

3. Secure the fuel filter to the fuel pump bracket with two new cable ties.
4. Connect the fuel pump hose to the fuel filter and secure with the hose clip.
5. Refit the fuel pump securing bolt and strap and tighten the bolt to **4 Nm**.
6. Refit the hose bracket to the fuel pump bracket and tighten its fixing to **7 Nm**.
7. Carefully refit the baffle material into the front of the baffle housing.
8. Refit the baffle housing to the fuel pump as noted for removal.

Perform the following operations:

- Fuel Pump Assembly - Installation

Throttle Body Plate (butterfly) - check/clean

WARNING

Before starting work, ensure the 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:

- Throttle Body and Inlet Manifold Assembly - Removal

1. Using a lint free cloth and a suitable degreaser such as Castrol Motorcycle Parts Cleaner,

remove any residue from the internal surfaces and throttle plate (butterfly).

2. Check for any signs of damage and ensure the butterfly moves correctly.

Perform the following operations:

- Throttle Body and Inlet Manifold Assembly - Installation

Fuel/Evaporative System - Check For Leaks, Routing, Chafing and Security

Standard required:

Fuel/evaporative hoses must be secure and routed in such a way that they do not chafe against moving parts of the motorcycle.

Fuel/evaporative hoses must not be routed around sharp curves. This could cause restrictions in the flow of fuel.

Fuel/evaporative system components must be free from damage.

The fuel tank cap must be easy to open and close.

The fuel tank cap seal must be free from damage.

The fuel cap lock barrel and key (if fitted) must operate easily and smoothly.

Check:

Visually check fuel/evaporative system components for signs of fuel leakage.

Visually check fuel/evaporative system components for signs of damage.

Visually check fuel/evaporative system components for security (where accessible).

Check the operation of the fuel filler cap and lock (if fitted).

Visually inspect the fuel cap seal for signs of damage.

Rectification if required:

Fuel/evaporative leaks must be rectified.

Damaged fuel/evaporative system components must be replaced.

An incorrectly fitting fuel cap must be replaced.

Autoscan

Actions required

Perform an Autoscan using the Triumph Diagnostic Software in accordance with the Triumph Diagnostic Tool User Guide.

Check

Check all results pass the Autoscan, and save the results.

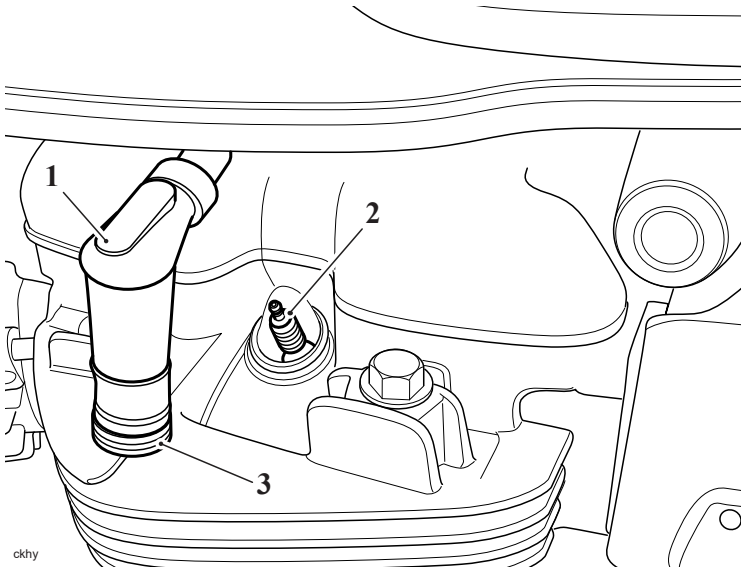
Print a customer copy.

Spark Plugs - Check/Renew

WARNING

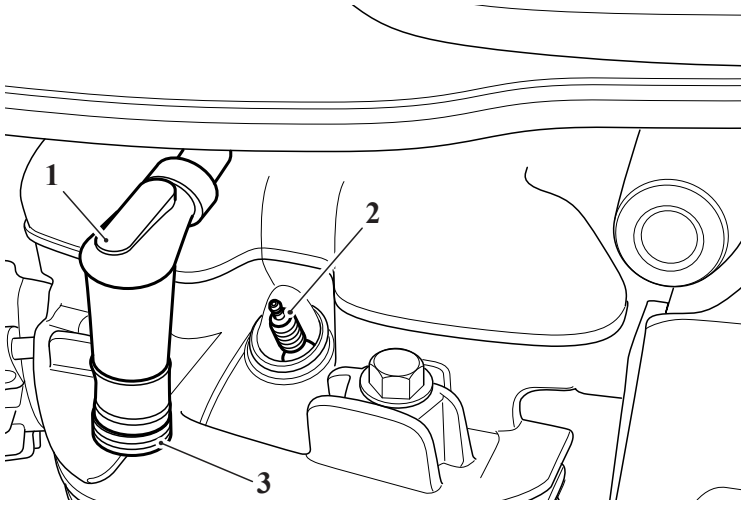
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Detach the spark plug caps from the spark plugs.



1. **Spark plug cap**
2. **Spark plug**
3. **Spark plug cap seal**

2. Using a suitable tool remove the spark plugs from the cylinder head.
3. Check the condition of the spark plug cap seal for wear and/or damage. Replace as necessary.
4. Check for signs of abnormal discolouration or deposits (see Spark Plugs - Inspection).
5. Check and if necessary adjust the spark plug gap to 0.9 mm +0.0/-0.1 mm.
6. Refit the spark plugs or, if required, fit new spark plugs and tighten to **12 Nm**.





1. **Spark plug cap**
2. **Spark plug**
3. **Spark plug cap seal**

7. Refit the spark plug caps to the spark plugs.

Spark Plugs - Inspection

Assessing the condition of a spark plug can be a valuable aid to a technician, and a good source of information about the engines overall operating condition.

In general, a light brown/grey colour tells you that the spark plug is operating at optimum temperature and that the engine is in good condition.

Dark colouring, such as heavy wet or dry deposits, can indicate:

- an overly rich condition
- too cold a heat range spark plug
- a possible vacuum leak
- low compression
- overly retarded timing
- too large a spark plug gap.

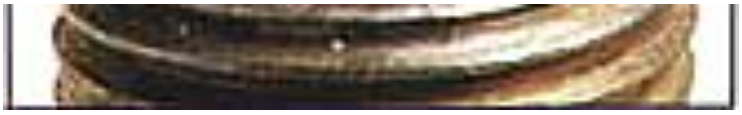
If the deposits are wet, it can be an indication:

- of a breached head gasket
- poor oil control from the piston rings
- valve train problems
- an extremely rich condition - depending on the actual liquid present at the firing tip.

Signs of fouling or excessive heat must be traced quickly to prevent further deterioration of performance and possible engine damage.

Normal Condition





An engines condition can be judged by the appearance of the spark plugs firing end. If the firing end of a spark plug is light brown or grey, the condition can be judged to be good and the spark plug is functioning optimally.

Dry and Wet Fouling



Although there are many different scenarios, if the insulation resistance between the centre electrode and the shell is over 10 Ohms, the engine can be started normally. If the insulation resistance drops to 0 Ohms, the firing end is fouled by either wet or dry carbon.

Overheating





When a spark plug overheats, deposits that have accumulated on the insulator tip melt and give the the insulator a glazed or glossy appearance.

Deposits



The accumulation of deposits on the firing end is influenced by oil leakage, fuel quality and the engines operating duration.

Breakage





Breakage is usually caused by thermal expansion and thermal shock due to sudden heating or cooling.

Normal Life



A worn spark plug not only wastes fuel but also strains the whole ignition system because the expanded gap (due to erosion) requires higher voltages. Normal rates of gap growth are:
0.00063 - 0.000126 inches per 1000 miles (0.01 - 0.02 mm per 1000 km)

Melting





Melting is caused by overheating. Mostly, the electrode surface is rather lustrous and uneven. The melting point of nickel alloy is 1200 to 1300 °C (2200 to 2400 °F).

Erosion, Corrosion and Oxidation



The material of the electrodes has oxidised, and when the oxidation is heavy, it will be green on the surface. The surface of the electrodes will also be fretted and rough.

Coolant Level Inspection

⚠ WARNING

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

⚠ CAUTION

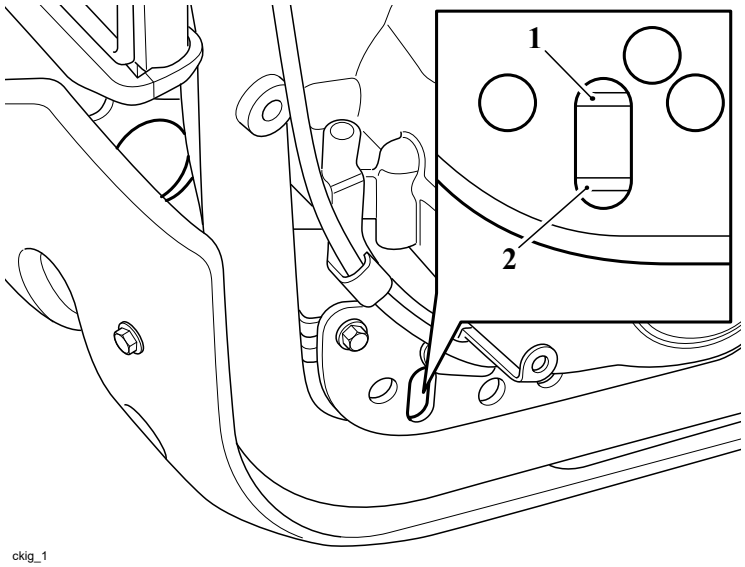
If the coolant level is found to be low, or if coolant has to be added regularly, inspect the cooling system for coolant leaks. If necessary, pressure test the system to locate the source of the leak and rectify as necessary. Loss of coolant may cause the engine to overheat and suffer severe damage.

Note

Note

- **Only inspect the coolant level when the engine is cold.**
- **The coolant level within the expansion tank can be inspected without removing any covers. The expansion tank can be viewed from the left hand side of the motorcycle, at the front of the engine.**

1. Position the motorcycle on level ground and in an upright position.
2. The coolant level must be between the MAX (upper line) and MIN (lower line) marks in the expansion tank.



1. **MAX mark**
2. **MIN mark**

3. If the level of coolant is low, remove the sump guard (see Sump Guard - Removal).
4. Remove the cap from the expansion tank and add coolant mixture as necessary to bring the level up to the MAX mark. Refit the cap.
5. Refit the sump guard (see Sump Guard - Installation).

Coolant Level Adjustment

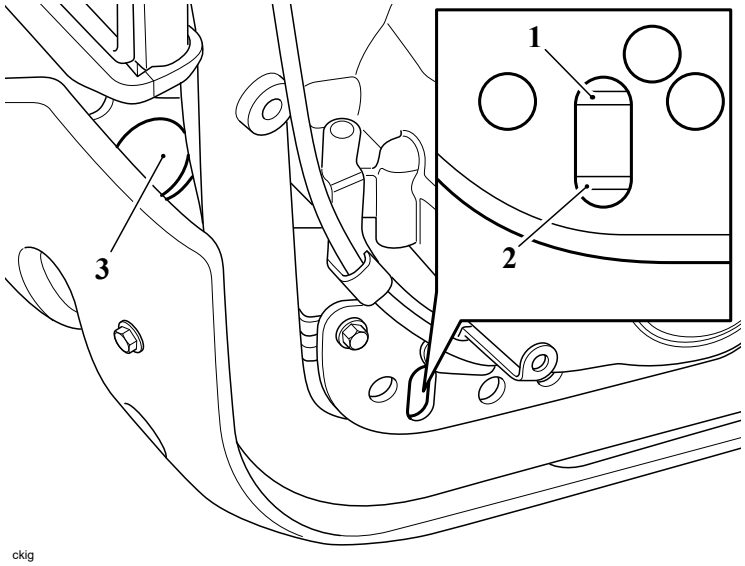
WARNING

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

WARNING

Do not remove the expansion tank or coolant pressure cap when the engine is hot. When the engine is hot, the coolant inside the cooling system will be hot and may also be under pressure. Contact with hot coolant will cause scalds and skin damage.

1. Allow the engine to cool for a minimum of 30 minutes.
2. Remove the sump guard (see Sump Guard - Removal).
3. Remove the cap from the expansion tank, and add coolant mixture through the filler opening until the level reaches the MAX mark. Refit the cap.



1. **Maximum level**
2. **Minimum level**
3. **Filler opening**

4. Refit the sump guard (see Sump Guard - Installation).

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.**

Coolant Renew

WARNING

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

WARNING

Do not remove the expansion tank or coolant pressure cap when the engine is hot. When the engine is hot, the coolant inside the cooling system will be hot and may also be under pressure. Contact with hot coolant will cause scalds and skin damage.

1. Allow the engine to cool for a minimum of 30 minutes.
- Drain the coolant (see Coolant Replacement - Drainage).
- Refill the coolant with Triumph HD4X Hybrid OAT coolant (see Coolant Replacement - Filling).

Valve Clearance 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.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal

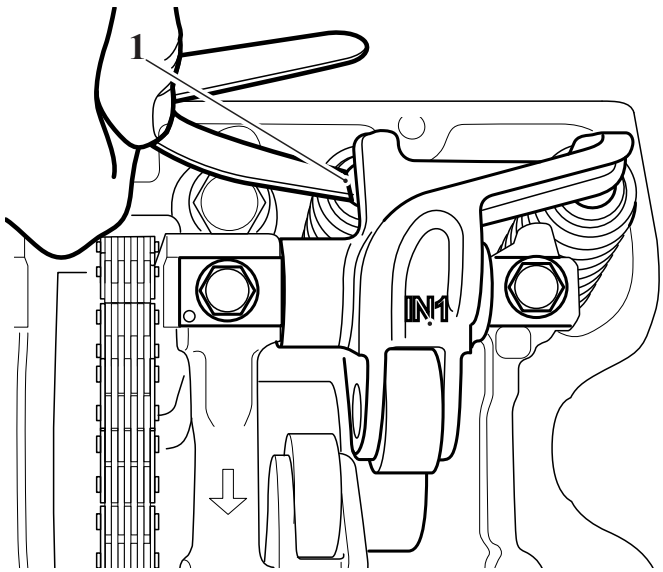
Note

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

Note

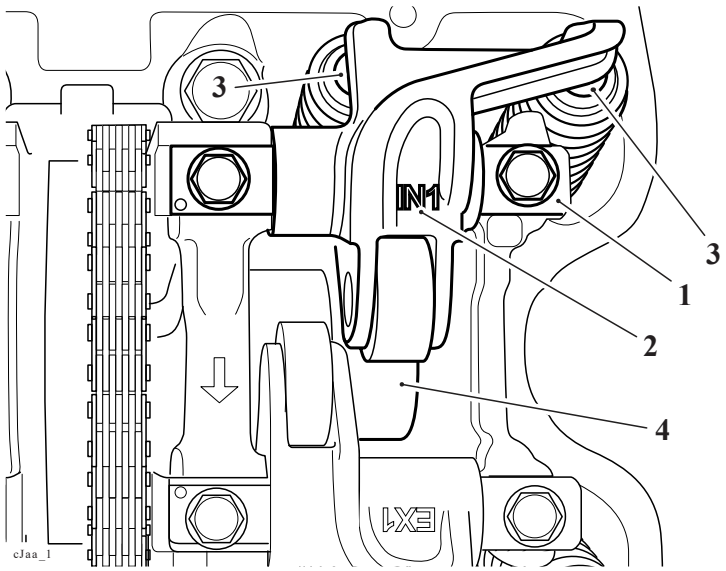
- **Removing the spark plugs reduces compression therefore allowing the engine to be rotated freely.**

1. Remove the spark plugs.
2. Select a high gear and, using the rear wheel, rotate the engine until a camshaft lobe is positioned pointing directly away from the roller on the rocker shaft.
3. Using feeler gauges, measure and record the clearances for this pair of valves only.



1. **Feeler gauges**

4. Measure and record all valve clearances as described previously.
5. Release the two rocker shaft retaining bolts and remove the rocker shaft and rocker arm of a valve that requires adjustment.

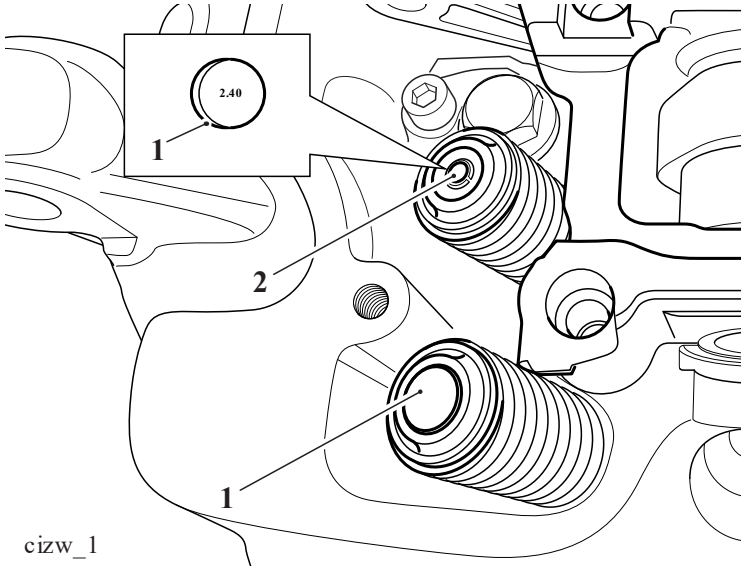


1. **Rocker shaft**
2. **Rocker arm**
3. **Shims (cylinder 1 inlet shown)**
4. **Camshaft**

Note

- **The underside of the shim displays the shim size.**
- **Always place the shim with the shim size facing towards the valve.**

6. Remove the shim from the valve(s) that requires adjustment.



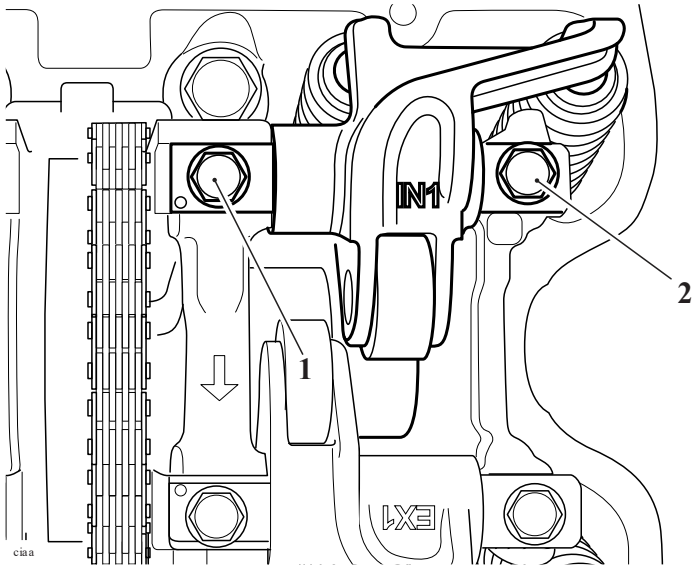
1. **Shim**
2. **Valve**

7. Measure the original shim, using a micrometer.
8. Calculate the shim thickness required to give the correct clearance, for specifications refer toService Specifications.
   - Clearance too small - Fit a thinner shim.
   - Clearance too large - Fit a thicker shim.

Note

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

9. Fit the selected shim to the valve.
10. Refit the rocker arm and shaft, tighten the bolts in the sequence shown below to **10 Nm**.



Rocker Shaft Tightening Sequence

11. Repeat the procedure until all valves requiring adjustment have been correctly set.
12. Rotate the engine several times to fully seat the shims.
13. Repeat the clearance checks on all valves, adjust as necessary.

Perform the following operations:

- Camshaft Cover - Installation
- Fuel Tank - Installation
- Battery - Installation
- Seat - Installation

Clutch Cable - Check/adjust

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.

Standard required:

It should be possible to pull the clutch lever easily and smoothly towards the handlebar grip.

The clutch cable must be routed such that it does not chafe against moving parts of the motorcycle.

When the clutch lever is released, check for correct clutch free play at the lever is as described in the Service Specifications.

Check:

Check the action of the clutch by pulling the clutch lever towards the handlebar grip in order to disengage the clutch.

Check that the clutch cable is correctly routed and free from sharp bends or twists along its length.

Check that the clutch lever returns to the fully forward position when released (allowing for the specified free-play).

Check the operation of the clutch lever span adjuster.

Rectification if required:

If necessary, adjust the clutch cable as described in the Owner's Handbook.

If undue resistance is felt when pulling the clutch lever towards the handlebar grip, check that the clutch cable is correctly routed. Twists or sharp bends in the cable will result in increased friction between the inner and outer cables.

Tyres - Check For Wear/Damage

WARNING

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

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

WARNING

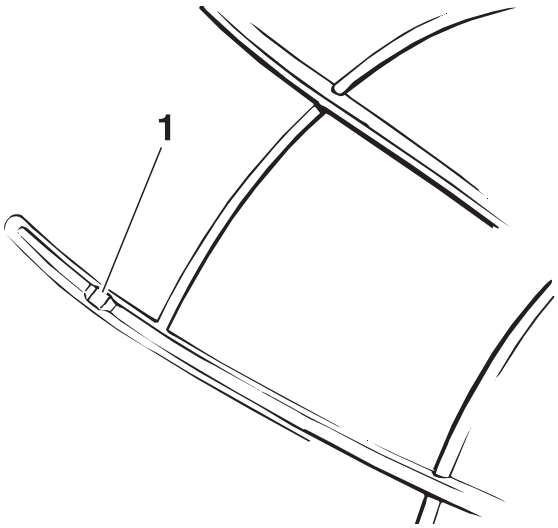
motorcycle stability and handling which may lead to loss of control or an accident.

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.

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.



gafj

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.

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 tyres for cracks, splits and kerb damage. Always replace tyres that are suspected of having become damaged.

Damaged tyres must be replaced.

Wheels - Check For Damage

WARNING

Before starting work, ensure the motorcycle is stabilised and adequately supported. This

WARNING

will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

WARNING

Check the wheel rims for dents or deformation.

Operation with damaged or defective wheels is dangerous and loss of motorcycle control or an accident could result.

Always consult your authorised Triumph dealer for a safety inspection of the wheels, or for wheel replacement.

1. Check for broken or damaged spokes and check spoke tightness.
2. Check the wheel rims for any visible signs of cracks, damage or deformation.
3. Check the wheel hubs for any visible signs of cracks, damage or deformation.

Tyre Pressures - Check/Adjust

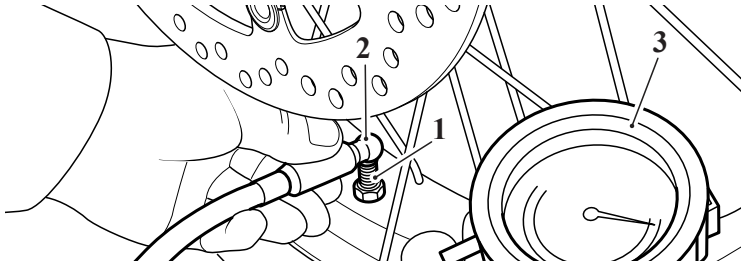
WARNING

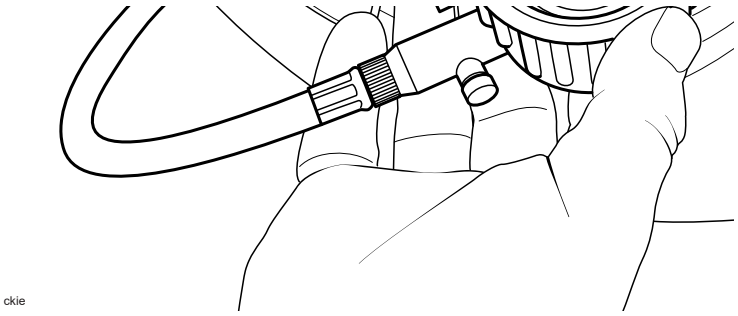
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

Note

- **Always check the tyre pressures when they are cold.**
- **Checking tyre pressures when they are cold will achieve a more accurate reading on the tyre pressure gauge.**

1. Remove the caps from the tyre valves.
2. Position the tyre pressure gauge onto the end of the valve body making sure the tyre valve is in contact with the tyre inflator.
3. Momentarily deflate the tyre to equalise the pressure in the tyre and the gauge.
4. Check that the correct pressure is displayed on the gauge.
5. If the air pressure is below the recommended setting, inflate the tyre until the correct pressure is achieved.
6. If it is greater than the recommended setting, slowly deflate the tyre checking the gauge regularly until the correct reading is achieved.





1. **Tyre Valve**
2. **Tyre gauge (valve connector)**
3. **Tyre gauge**

7. Repeat the process for the remaining tyre.
8. Refit the caps to the tyre valves.

Wheel Bearings - Inspection

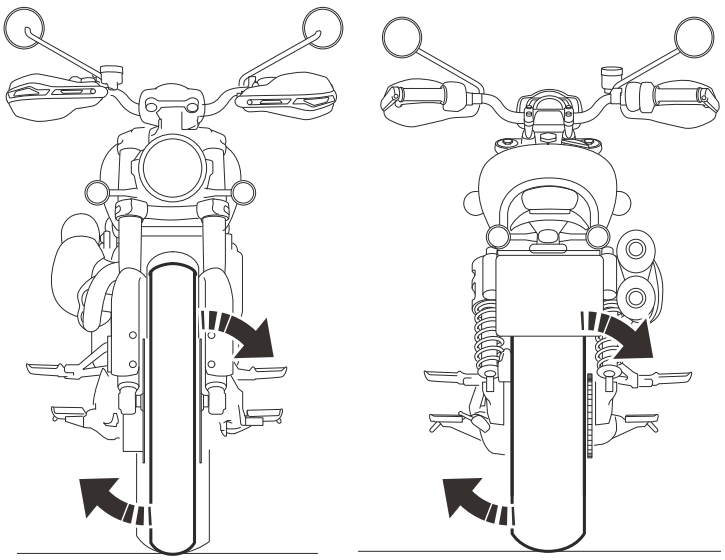
WARNING

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.

Perform the following operations:

- Position the motorcycle on level ground and place on a paddock stand.

1. Hold the wheel at the top and bottom and rock the wheel checking for movement when a force is applied.
2. Check the wheel bearings spin smoothly with no signs of play.
3. If the bearings do not spin smoothly or there is excessive play in the wheel bearings, replace all bearings in that wheel.



Check Lights, Instruments and Electrical Systems

WARNING

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

Check the instruments, lights and electrical systems for functionality. Rectify if necessary.

Steering 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. Move the handlebars to left and right full lock while checking that the brake hose, clutch cable and electrical harnesses do not bind or that the steering feels tight or difficult to turn. Rectify as necessary.

Fork 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.

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 the Front suspension section of this service manual or consult an authorised Triumph dealer.

WARNING

Riding the motorcycle with defective or damaged suspension can cause loss of motorcycle

WARNING

control and an accident. Never ride with damaged or defective suspension.

Headstock Bearings - Check/Adjust

WARNING

Before starting work, ensure the 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:

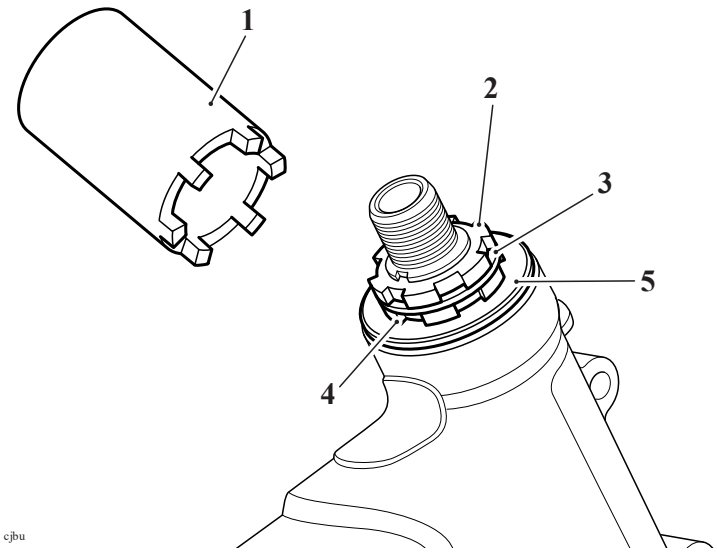
1. Adjust the bearing free play as follows:
   - Remove the adjuster nut.
   - Thoroughly clean the threads on the steering stem.
   - Refit the adjuster nut and tighten to **40 Nm**.
   - Loosen the adjuster nut, then retighten to **15 Nm**.
   - Fit the tab washer and lock nut.

WARNING

It is essential that the adjuster nut is not overtightened. If the adjuster is overtightened it will cause a preload on the headstock bearings. This will introduce tight steering, which could cause loss of motorcycle control and an accident.

Note

- **Ensure the adjuster nut does not move as the lock nut is tightened.**
  - With the bearing free play correctly set, hold the adjuster nut stationary then tighten the lock nut to **40 Nm**.



1. **T3880023 - 50 mm Socket**
2. **Lock nut**
3. **Tab washer**
4. **Adjuster nut**
5. **Dust seal**

Perform the following operations:

- Refit the upper yoke (see Upper Yoke - Installation).

Headstock Bearings - Lubricate

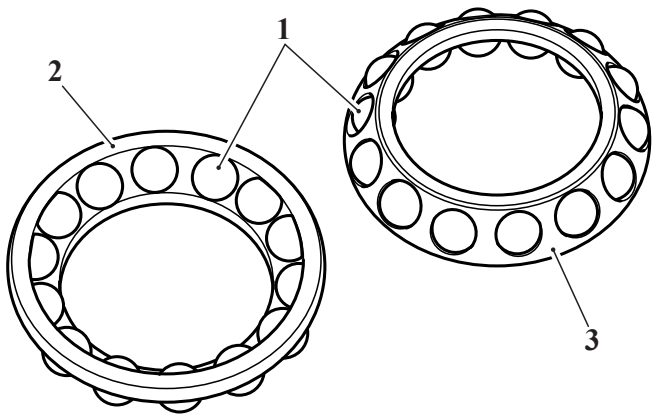
WARNING

Before starting work, ensure the 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:

- Lower Yoke and Headstock Bearings - Removal

1. Inspect the headstock bearings for damage/wear, (see Headstock Bearing - Inspection).
2. Lubricate the headstock bearings, using finger pressure, force five grammes of Castrol LCX 222 or an equivalent heavy duty lithium based grease between the inner race and the carrier.
3. Rotate the ball 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.



ckid

1. **Roller bearing**
2. **Inner carrier face**

3. Outer carrier face

Headstock Bearing - Inspection

WARNING

Only remove raised witness marks from within the frame. Removal of material below any raised areas will reduce the level of interference between the frame and the bearings. Loss of interference could cause the bearing to become loose in the frame leading to loss of motorcycle control and an accident.

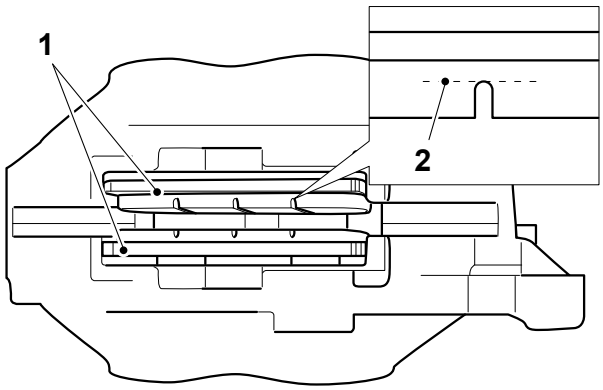
1. Examine the frame for any raised witness marks caused by the removal process. Remove any such marks with fine emery paper or a suitable file.

Brake Pad Wear 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 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

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 Fluid Level Inspection

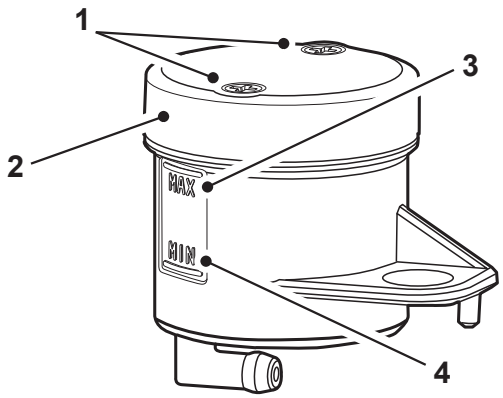
WARNING

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.

Front Brake Fluid Reservoir

1. The brake fluid level must be kept between the upper and lower level lines with the motorcycle on its side stand and the steering on full left lock.



jajc_2

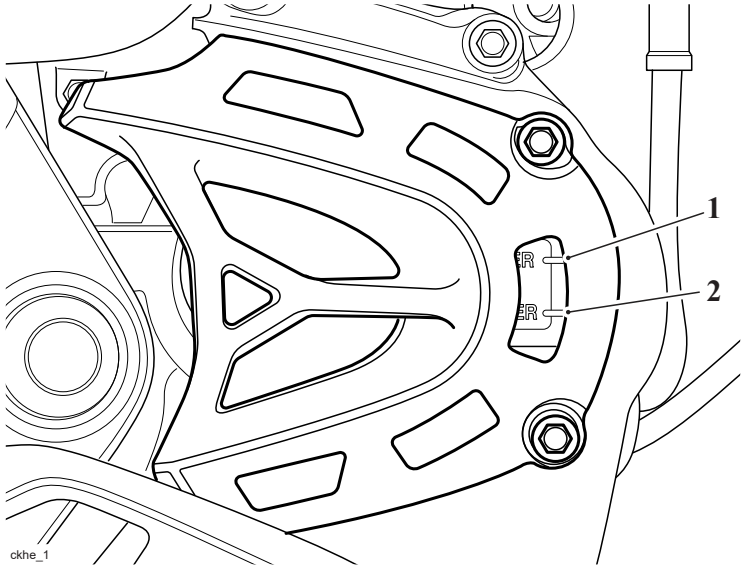
1. **Fixings**
2. **Reservoir cap**
3. **Upper level line**
4. **Lower level line**

Front Brake Fluid Level Adjustment

1. Remove the two fixings.
2. Remove the reservoir cap and the diaphragm seal.
3. Fill the reservoir to the upper level line using new DOT 4 fluid from a sealed container.
4. Refit the reservoir cap and diaphragm seal ensuring that the diaphragm seal is correctly positioned between the cap and the reservoir body.
5. Refit the two fixings and tighten to **0.7 Nm**.

Rear Brake Fluid Reservoir

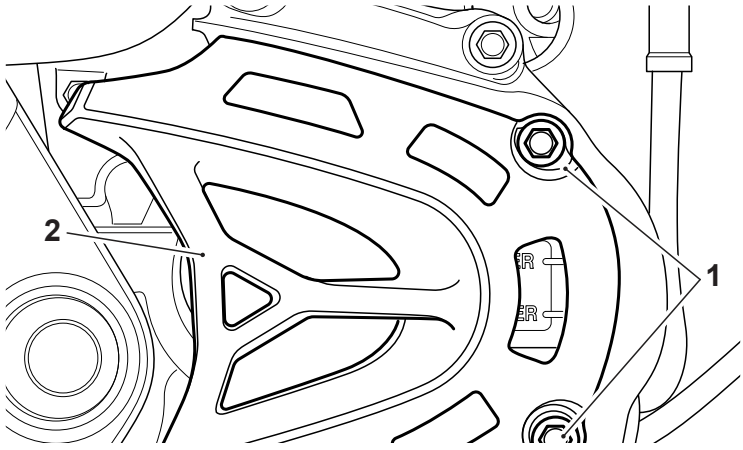
1. The reservoir fluid level lines are visible on the right hand side of the motorcycle on the front sprocket cover.
2. The brake fluid level must be kept between the upper and lower level lines (reservoir held horizontal).



1. **Upper level line**
2. **Lower level line**

Rear Brake Fluid Level Adjustment

1. Release the fixings and remove the front sprocket outer cover.



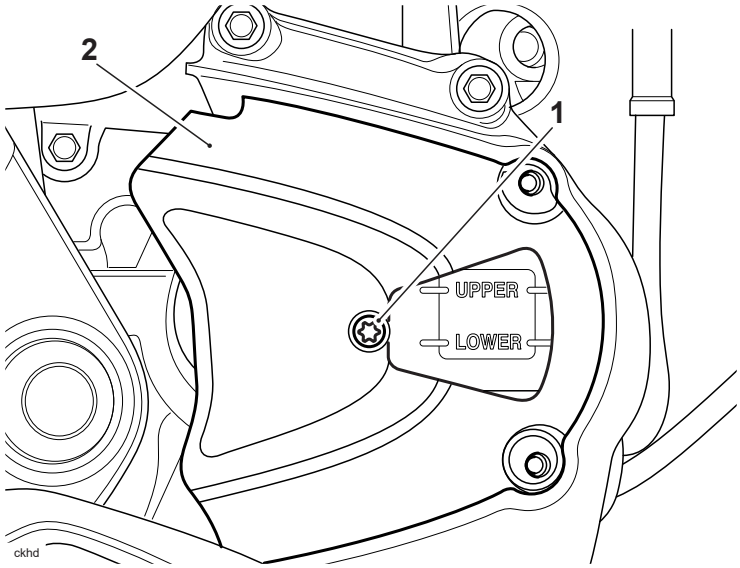


1. **Fixings**
2. **Sprocket outer cover**

Note

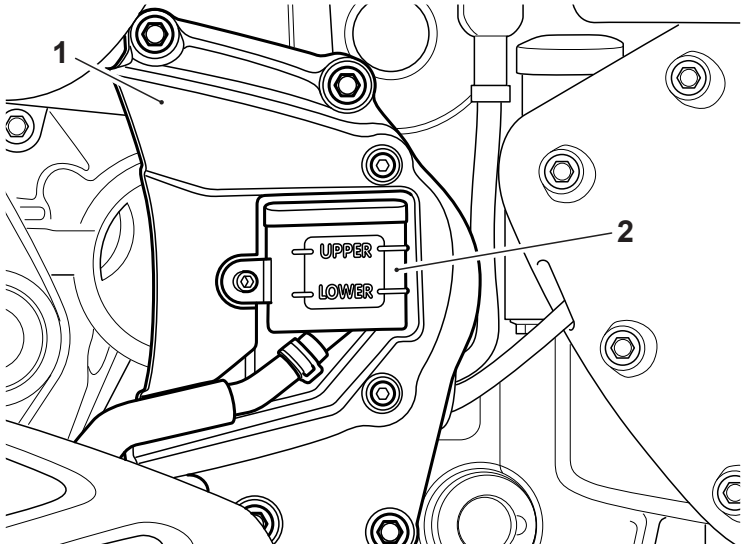
- **The fixing securing the front sprocket middle cover also secures the brake fluid reservoir to the sprocket cover.**

2. Release the fixing and remove the front sprocket middle cover. Discard the fixing.



1. **Fixings**
2. **Sprocket middle cover**

3. Detach the brake fluid reservoir from the sprocket cover.





1. **Brake fluid reservoir**
2. **Sprocket cover**

4. Release the cap screws and remove the reservoir cover noting the position of the sealing diaphragm.
5. Fill the reservoir to the upper level line using new DOT 4 fluid from a sealed container.
6. Refit the reservoir cap ensuring that the diaphragm seal is correctly positioned between the cap and the reservoir body. Tighten the cap retaining screws to **1 Nm**.
7. Attach the brake fluid reservoir to the sprocket cover.
8. Refit the sprocket middle cover and tighten the new fixing to **3 Nm**.
9. Refit the sprocket outer cover and tighten the fixings to **9 Nm**.

Brake Calipers - 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.

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 for correct brake operation and that the caliper pistons are not seized. Rectify as necessary.
2. Inspect the brake calipers for fluid leaks. Rectify as necessary.

Brake Master Cylinders - 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.

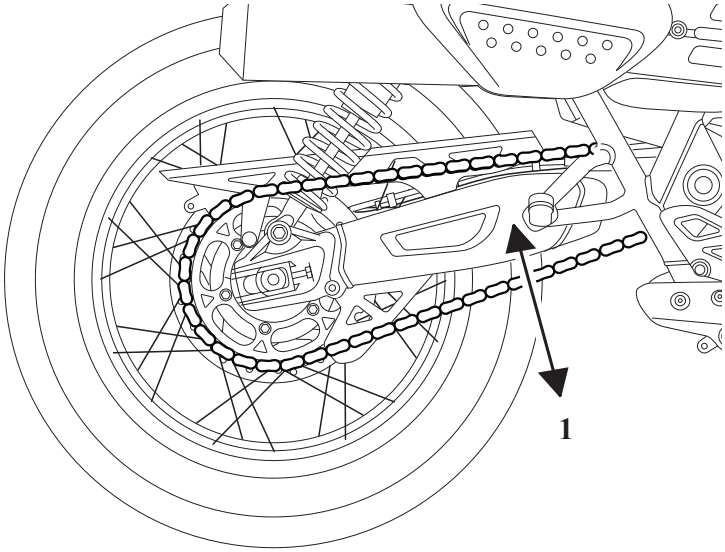
Inspect both the front and rear master cylinders for fluid leaks. Rectify as necessary.

Final Drive Chain 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.

Drive Chain Free Movement Inspection

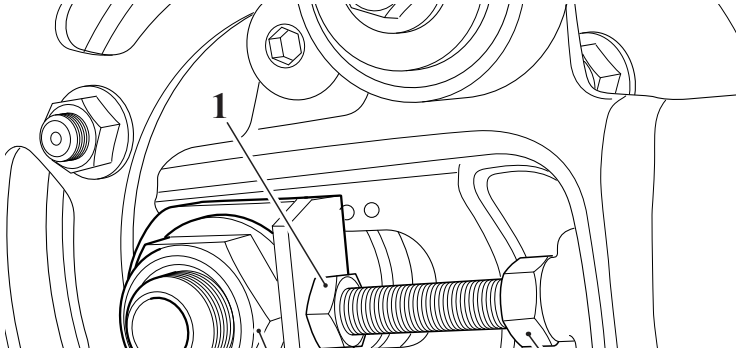


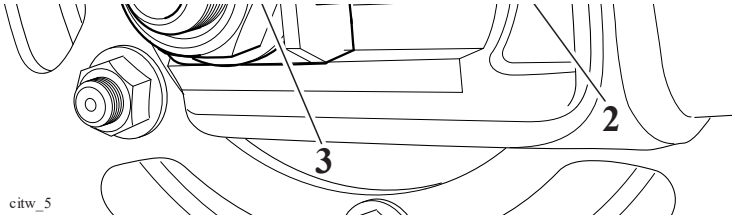
1. Maximum movement position

1. Place the motorcycle on a level surface and hold it in an upright position with no weight on it.
2. Rotate the rear wheel by pushing the motorcycle to find the position where the drive chain has least slack. Measure the drive chain's vertical movement, mid-way between sprockets.
3. If correct, the vertical movement of the drive chain mid-way between the sprockets should be 20 - 30 mm.

Drive Chain Free Movement Adjustment

1. Loosen the wheel spindle nut.
2. Release the lock nuts on both the left hand and right hand chain adjuster bolts.





1. **Adjuster bolt**
2. **Adjuster bolt lock nut**
3. **Rear wheel spindle nut**

3. Moving both adjusters by an equal amount, turn the adjuster bolts clockwise to increase chain free-movement and anticlockwise to reduce chain free-movement.
4. When the correct amount of chain free-movement has been set, push the wheel into firm contact with the adjusters.

CAUTION

Check for equal adjustment on both sides using the graduation marks on the swinging arm.

5. Tighten both adjuster lock nuts to **20 Nm** and the rear wheel spindle nut to **110 Nm**.
6. Repeat the chain adjustment check. Readjust if necessary.

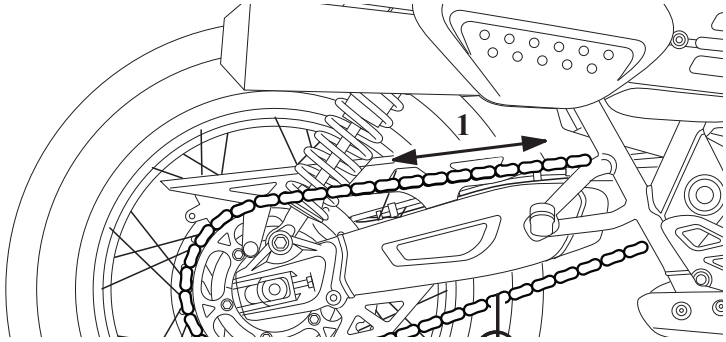
WARNING

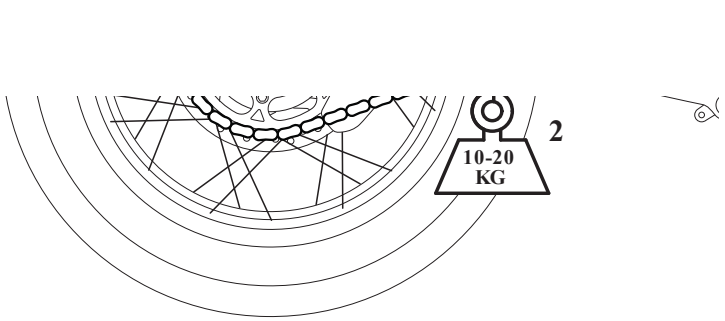
Operation of the motorcycle with insecure adjuster lock nuts or a loose wheel spindle may result in impaired stability and handling of the motorcycle. This impaired stability and handling may lead to loss of motorcycle control and an accident.

Drive Chain and Sprocket Wear Inspection

WARNING

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





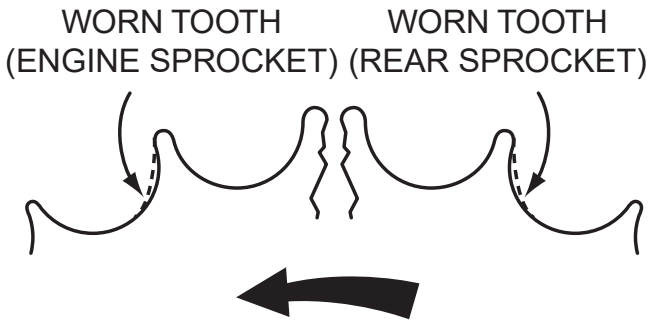
1. **Measurement across 20 links**
2. **10 - 20 kg Weight**

1. Stretch the chain taut by hanging a 10 - 20 kg (20 - 40 lb) weight on the drive chain.
2. Measure a length of 20 links on the straight part of the drive chain from pin centre of the 1st pin to pin centre of the 21st pin. Repeat the test at various sections of the drive chain to establish an average reading. This is because the drive chain may wear unevenly.
3. If the length exceeds the service limit of 319 mm (12.56 in), the chain must be replaced.

WARNING

A drive chain that breaks or jumps off the sprockets could snag on the engine sprocket or lock the rear wheel, severely damaging the motorcycle and causing loss of motorcycle control and an accident.

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



ccol

Final Drive Chain Lubrication

Lubrication is necessary every 200 miles (300 km) and also after riding in wet weather, on wet roads, or any time that the chain appears dry.

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

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

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

CAUTION

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

Drive Chain Rubbing Strip - 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.

Inspect the drive chain rubbing strip for cracks, damage or excessive wear. Replace if necessary.

Side Stand - Clean/Lubricate

Removal

WARNING

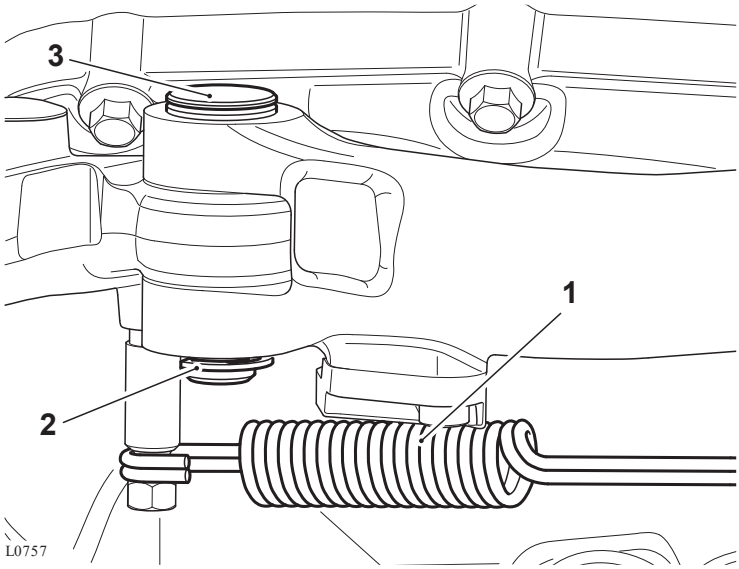
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Raise and support the motorcycle.

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.



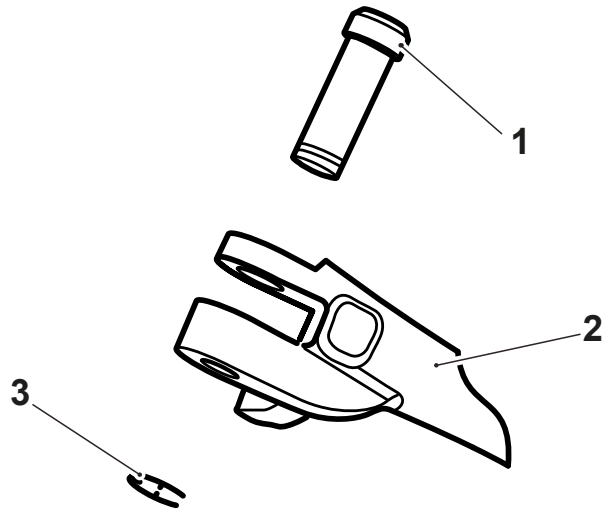
1. **Spring**
2. **E-clip**
3. **Pivot pin**

Inspection

Inspect the surfaces of the pivot pin, side stand carrier bracket and side stand for corrosion or damage and replace if required.

Installation

1. Prior to fitting the side stand ensure the pivot pin and the bushes in the side stand are clean and free from grease.
2. Fit the side stand to the motorcycle and insert the pivot pin.
3. Fit a new E-clip to secure the pivot pin.



1. **Pivot pin**
2. **Side stand**
3. **E-clip**

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.

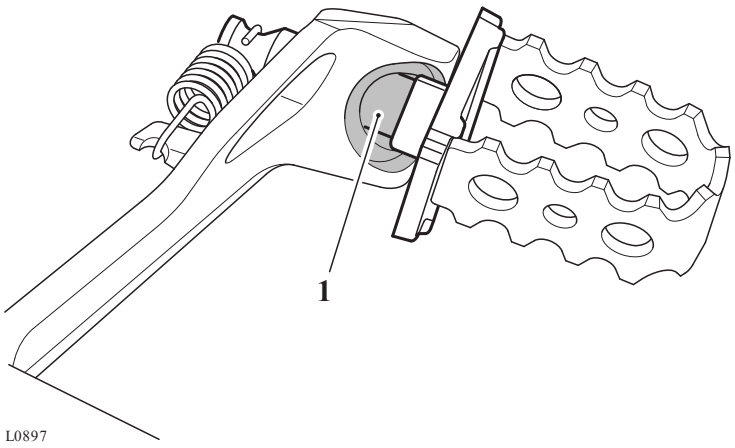
4. Hook the spring onto its frame lug then carefully hook it onto the side stand lug.
5. Check the operation of the side stand before riding the motorcycle. Ensure the spring holds the stand securely in the retracted position.

Rear Brake Pedal Grip - Lubricate

WARNING

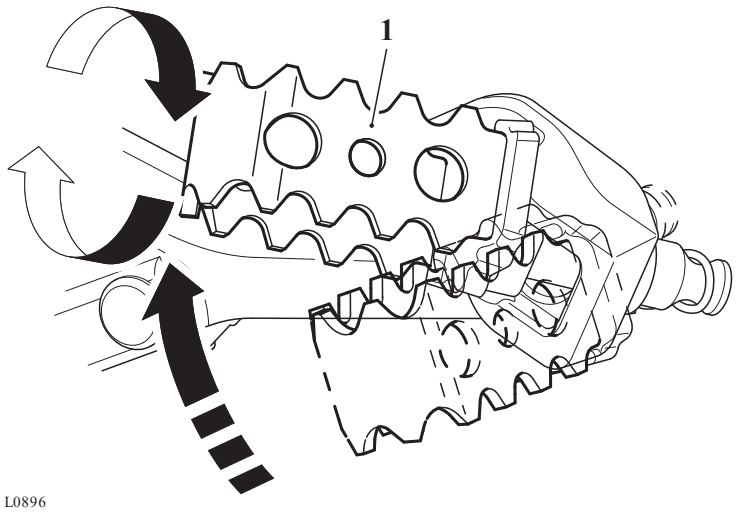
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Use Castrol Motorcycle Parts Cleaner, or an equivalent, to clean all dirt and contamination from the pivot joint on the pedal grip of the rear brake pedal.
2. Fully dry the cleaned area.
3. Apply Castrol Chain Spray O-R, or an equivalent lubricant, to the shaded area shown below.



1. **Lubrication area**

4. Operate the pivoting action of the pedal grip to distribute the lubricant.

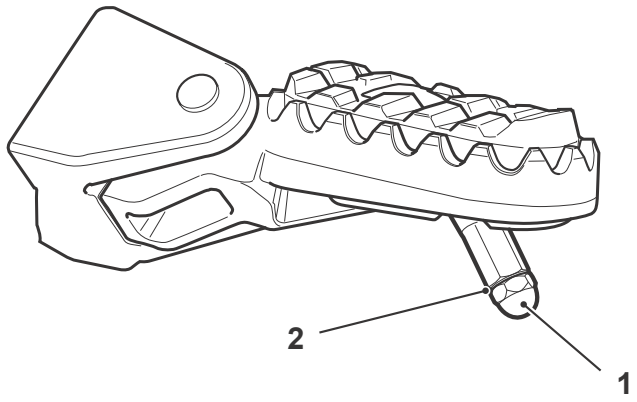


1. Pedal grip

5. Clean all surplus lubricant off the rear brake pedal and grip assembly.

Bank Angle Indicators

1. Inspect the bank angle indicators on the rider's footrests for wear.
2. The bank angle indicators have a wear indicator groove. Replace a bank angle indicator if it has worn down to the groove.



1. Bank angle indicator

2. Wear indicator groove

WARNING

WARNING

Use of a motorcycle with bank angle indicators worn beyond the maximum limit will allow the motorcycle to be banked to an unsafe angle. Therefore, always replace the bank angle indicator pegs when they are worn down to the wear indicator groove.

Banking to an unsafe angle may cause instability, loss of motorcycle control and an accident.

WARNING

The bank angle pegs must not be used as a guide to how far the motorcycle may be safely banked. This depends on many various conditions including, but not limited to, road surface, tyre condition and weather. Banking to an unsafe angle will lead to loss of motorcycle control and an accident.

Latest Calibrations 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.

Check for the latest calibration download for the following using the Triumph Diagnostic Tool:

- Instruments (If applicable)
- Chassis ECM (if fitted)
- Keyless ECM (if fitted)
- Engine ECM

See the Triumph Diagnostic Tool User Guide for more information.

Fasteners - General 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.

Check all visible fasteners for security. Ensure any encapsulated fasteners that have been loosened or removed are replaced.

Road Test

WARNING

WARNING

When riding the motorcycle the rider must always wear a safety helmet, eye protection, gloves, boots, trousers (close fitting around the knee and ankle) and a brightly coloured jacket. Brightly coloured clothing will considerably increase a rider's visibility to other operators of road vehicles. Although full protection is not possible, wearing correct protective clothing can reduce the risk of injury when riding.

WARNING

A safety helmet is one of the most important pieces of riding gear as it offers protection against head injuries. Your safety helmet should be carefully chosen and should fit your head comfortably and securely. A brightly coloured safety helmet will increase a rider's visibility to other operators of road vehicles. An open face helmet offers some protection in an accident though a full face helmet will offer more. Always wear a visor or approved goggles to help vision and to protect your eyes.

Note

- **For the first 500 miles, the motorcycle should be ridden within the running in procedure (see Owner's Handbook), checking for abnormalities, unusual noises and for satisfactory operation.**
- **When checking the brakes on road test, a suitable safe place should be found to carry out the test.**

WARNING

Do not attempt to test the ABS function of the motorcycle's braking system during road test. The ABS function is for use in emergency situations only. Any attempt to artificially create an emergency situation is extremely hazardous and could lead to a collision with a following vehicle or loss of motorcycle control and an accident.

Note

- **Faults detected during road test or post road test inspection, must be rectified before the motorcycle is released to the customer.**
- **The distance covered on the road test should be long enough to allow a satisfactory check to be made in the following areas:**

Engine Cold Start Performance

Standard required:

The engine must start quickly and idle smoothly.

Note

- **This check is to be carried out when the engine is cold.**

Action:

Turn the ignition switch to the ON position.

Start the engine and allow to idle.

ABS (anti-lock brake system) indicator light (models fitted with ABS only)

Standard required:

Refer to the Owner's Handbook for further information regarding the ABS indicator light illumination sequence for the relevant model.

The ABS indicator light should flash on and off and continue to flash after engine start up until the motorcycle first reaches a speed exceeding 6 mph (10 km/h).

Clutch

Standard required:

The clutch should engage smoothly, without judder, slipping or noise.

Gear Change

Standard required:

Changing between gears must be smooth and easily accomplished.

Throttle Response

Standard required:

The engine should be quick to respond to any movement of the throttle.

There should be no pronounced misfires.

The idle speed must not change when the handlebars are turned from lock to lock.

Brakes

Standard required:

The brakes should have a firm, responsive feel.

The brakes should act smoothly and silently without judder.

Upon activation of the brakes, the motorcycle should come to rest without deviating from a straight line.

Instrument Panel

Standard required:

All instruments must operate correctly.

Check:

Check that the warning lights on the instruments operate correctly.

Steering and Suspension

Standard required:

The motorcycle should be easy to steer and should not pull to one side.

Cornering should be precise with the motorcycle leaning naturally into the corner and returning to the upright position upon exiting the corner.

The front and rear suspension operation should be smooth with no excessive stiffness, roughness or tight spots.

Check:

Check the correct action of the front suspension, including the damper action.

Check the correct action of the rear suspension, including the damper action.

Cruise Control (if fitted)

Standard required:

All cruise control switches must operate correctly. All functions and displays must operate as described in the Owner's Handbook.

Check:

Once the relevant conditions have been met as described in the Owner's Handbook, turn the cruise control ON and OFF.

Check the functionality of all following actions:

- SET the speed
- Throttle cancel - twist the throttle fully forward to cancel the cruise control
- Brake cancel - ensure the cruise control is cancelled by use of the front brake, then the rear brake
- Clutch cancel - ensure the cruise control is cancelled by pulling the clutch lever in
- Gear change cancel - ensure the cruise control is cancelled when changing gear
- Sixty second overtake cancel - ensure the cruise control is cancelled after increasing the speed with the throttle for more than sixty seconds.

Service Indicator and Service Maintenance Book

Reset the service indicator using the Triumph Diagnostic Tool.

See the Triumph Diagnostic Tool User Guide for more information.

Stamp and date the relevant section of the Service Record.

Post Road Test

Note

Note

- **The following tests should be carried out immediately after the motorcycle returns from the road test.**
- **Faults detected during road test or post road test inspection, must be rectified before the motorcycle is released to the customer.**

⚠ WARNING

Certain components of the motorcycle will be hot immediately after road test. Care must be taken to avoid burn injuries caused by contact with hot components.

Cooling Fan Operation (liquid cooled engines only)

Standard required:

The fan should operate when the coolant temperature rises above normal operating temperature. It will stop automatically.

The blades of the cooling fan must not come into contact with the radiator or the guard which surrounds the cooling fan blades.

There must be no abnormal noises when the cooling fan is operating.

⚠ WARNING

The cooling fan operates automatically, even with the ignition switched off. To prevent injury, keep hands and clothing away from the fan blades at all times.

Action:

With the engine idling, allow the engine temperature to rise to above normal operating temperature.

⚠ CAUTION

Do not allow the engine temperature to climb too high. Serious damage may result if the engine is allowed to overheat.

Check:

Check the cooling fan for correct operation.

Action:

Switch off the engine.

Hot Start

Note

- **This test should be carried out when the engine is at normal operating temperature.**

Standard required:

The engine should start easily when at normal operating temperature and run smoothly at idle.

Action:

Switch off the engine (if running) and wait thirty seconds.
Start the engine and allow to idle.
Switch off the engine.

Engine

Standard required:

The engine must be free from fluid leaks.

Fuel System

Standard required:

The fuel system must be free from leaks.

Tyres

Standard required:

Front and rear tyres must be free from damage.

WARNING

Check the tyres for cuts, embedded nails or other sharp objects.
Check the wheel 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.

Bodywork

Standard required:

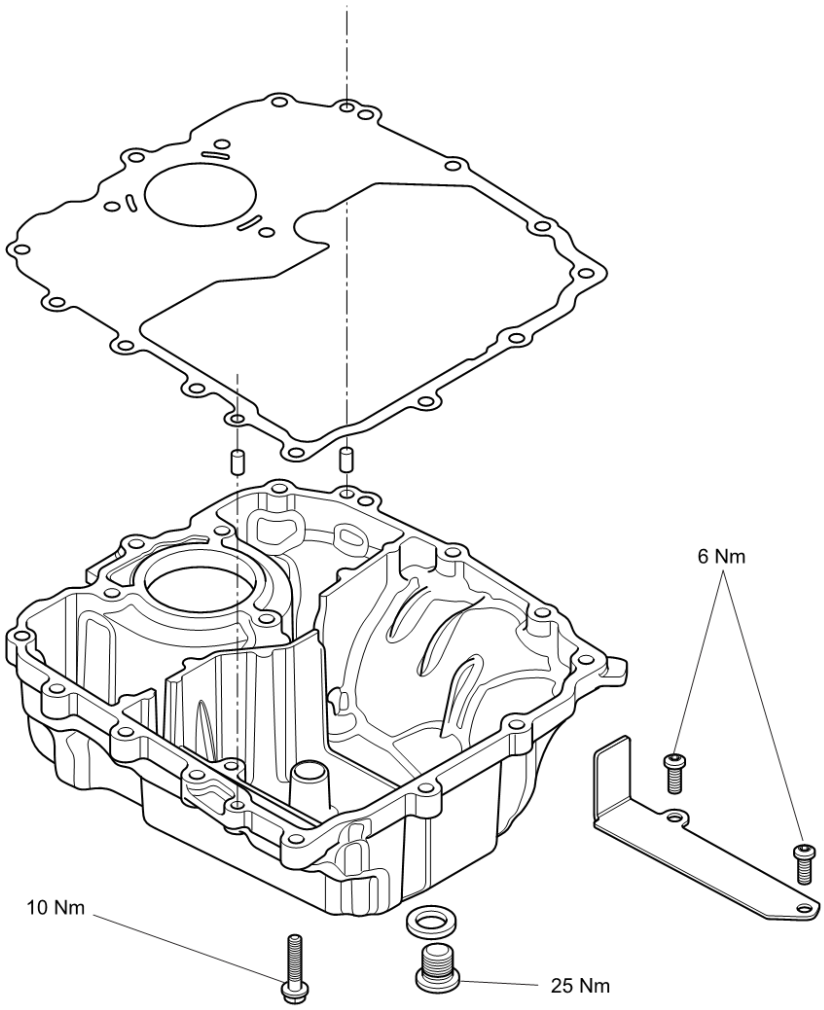
The motorcycle bodywork must be clean and free from damage.

Check:

Check the motorcycle bodywork for new damage.
Check the motorcycle bodywork for cleanliness.

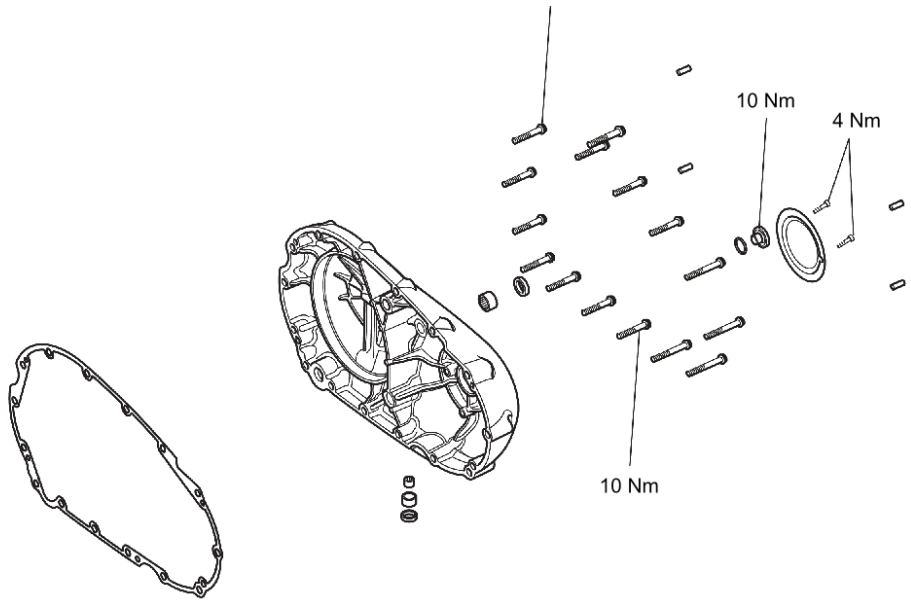
Engine Covers

Exploded View – Sump

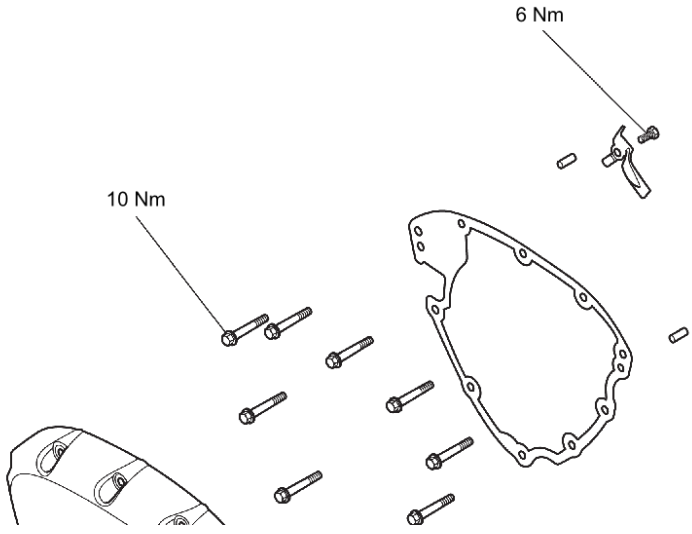


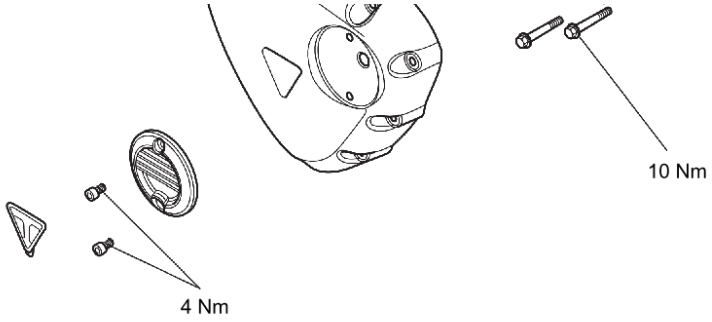
Exploded View – Clutch Cover



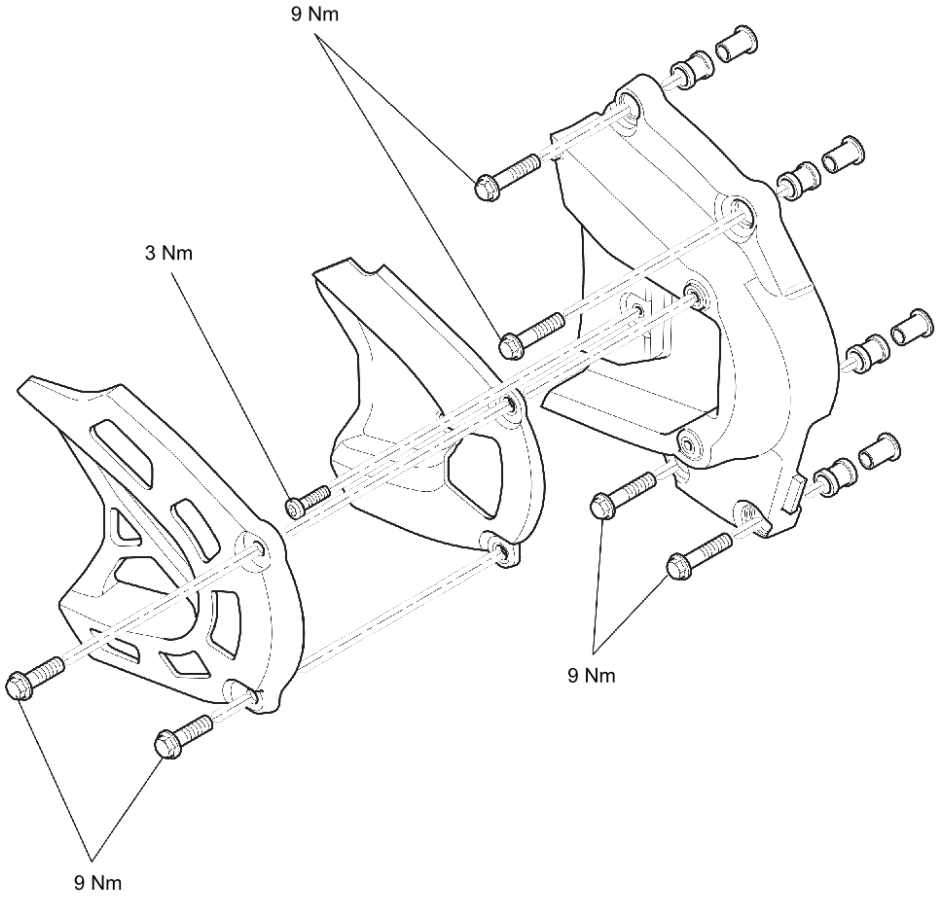


Exploded View – Alternator Cover

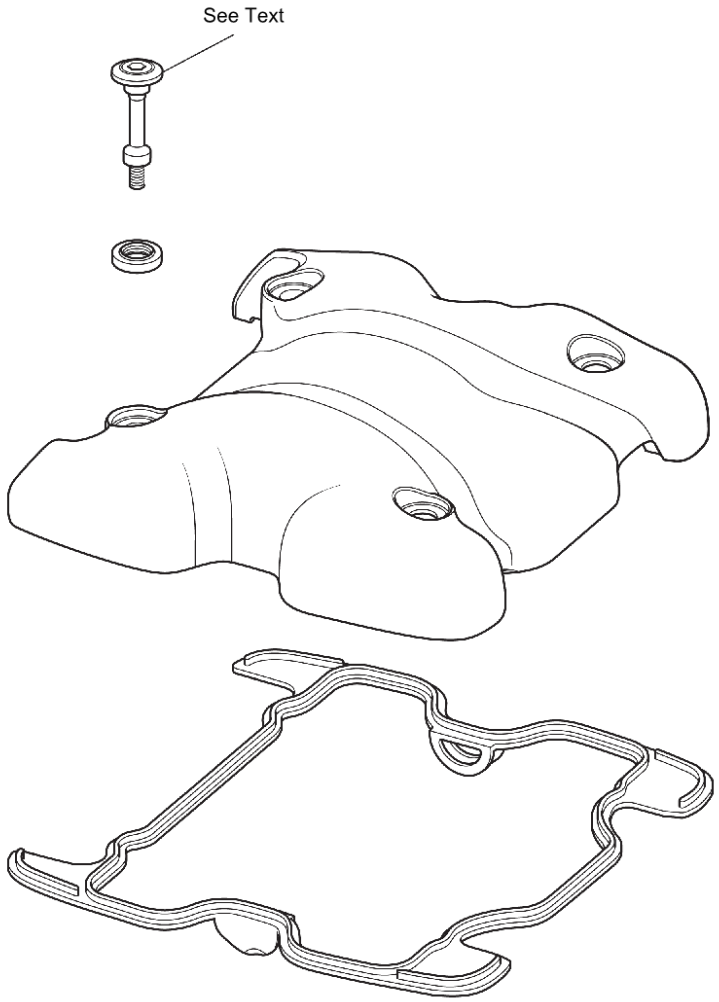




Exploded View – Sprocket Cover



Exploded View – Camshaft Cover



Sump - Removal

WARNING

Before starting work, ensure the motorcycle is stabilised and adequately supported. This

WARNING

will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

WARNING

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

Contact with a hot exhaust could result in burn injuries.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Cradle Assemblies - Removal

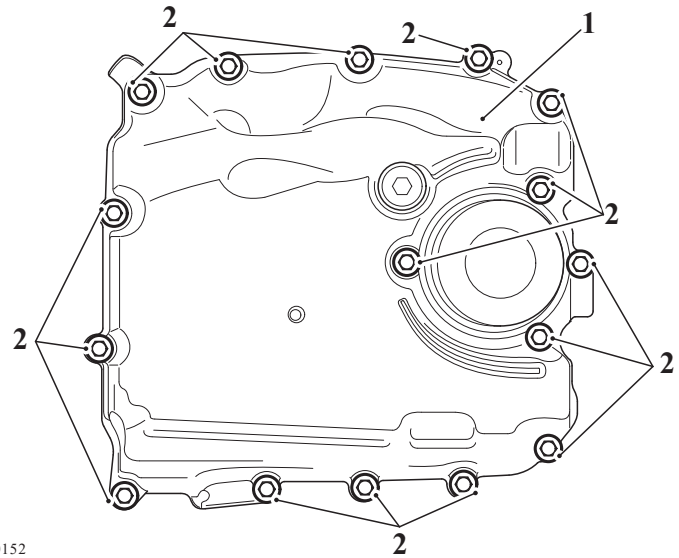
WARNING

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

WARNING

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

1. Drain the engine oil and remove the oil filter (see Engine Oil and Filter Renew).
2. Remove the sump to lower crankcase fixings.



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

3. Release the sump from the lower crankcase.

Note

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

4. Collect the water pump drain tube.
5. Remove and discard the four O-rings from the drain tube.

Sump - Inspection

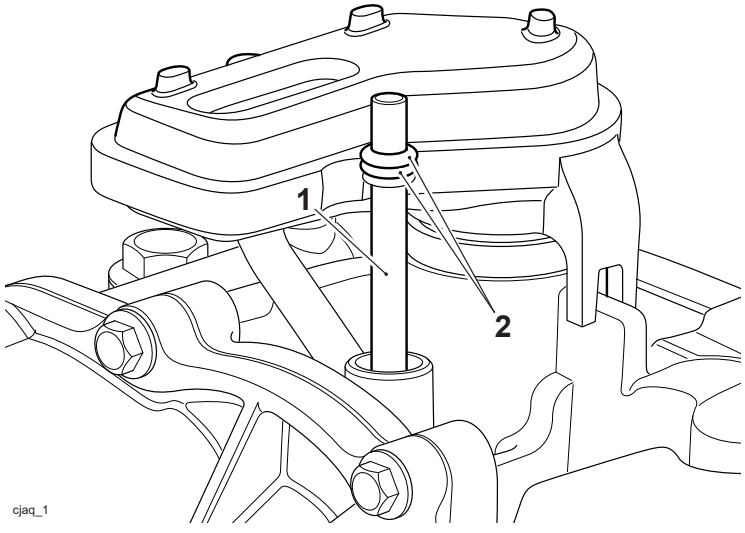
WARNING

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

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

Sump - Installation

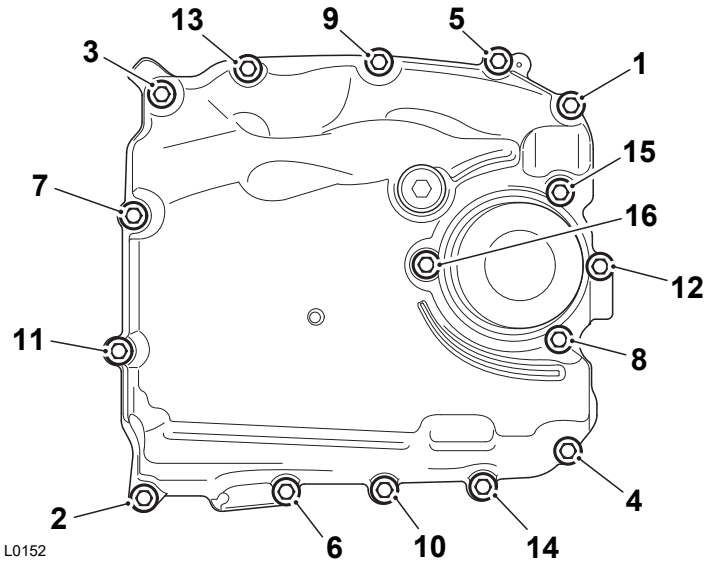
1. Lubricate the four new O-rings with a commercially available soft petroleum jelly and fit two each end of the drain tube.
2. Position the water pump drain tube to the oil pump.



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

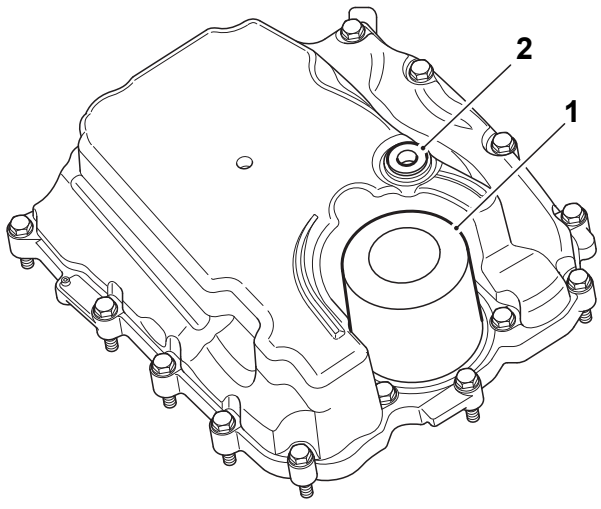
3. Incorporating a new sump gasket/baffle, position the sump to the lower crankcase.

4. Tighten the sump fixings to **10 Nm** in the sequence shown below.
5. Retighten the fixings one and two to **10 Nm**.



Tightening Sequence

6. Using a new washer, refit the oil drain plug and tighten to **25 Nm**.
7. Apply a thin smear of clean engine oil to the sealing ring of the new oil filter. Fit the oil filter using T3880313 - Oil Filter Wrench and tighten to **10 Nm**.



1. **Oil filter**
2. **Oil drain plug**

Perform the following operations:

- Cradle Assemblies - Installation
- Fuel Tank - Installation
- Battery - Installation

- Fill the engine with the correct grade of engine oil (see Engine Oil and Filter Renew).

CAUTION

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

CAUTION

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

- Start the engine and ensure that the low oil pressure warning light goes out shortly after starting.
- Stop the engine and check the engine oil level. Adjust if necessary (see Engine Oil - Level Inspection).

Clutch Cover - Removal

Clutch Cover - Installation

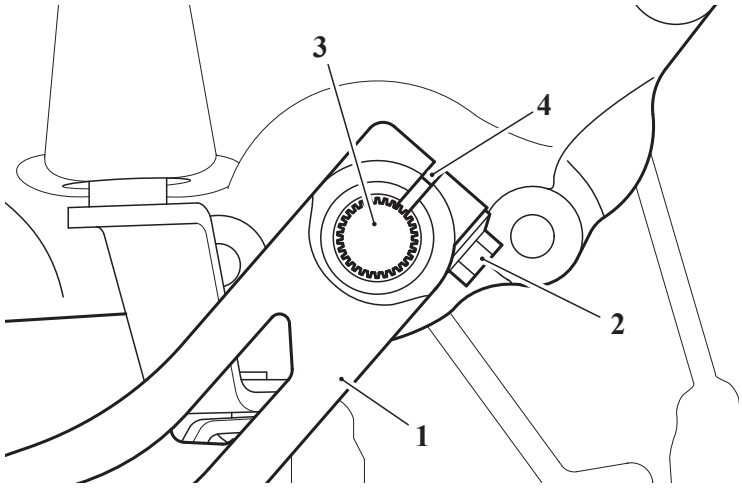
WARNING

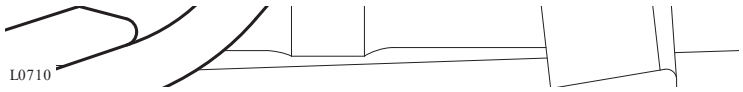
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

Perform the following operations:

- Seat - Removal
- Battery - Removal

1. Disconnect the clutch cable at the clutch cover (see Clutch Cable - Removal).
2. Release the fixing and disconnect the gear change actuator arm at the clutch cover.



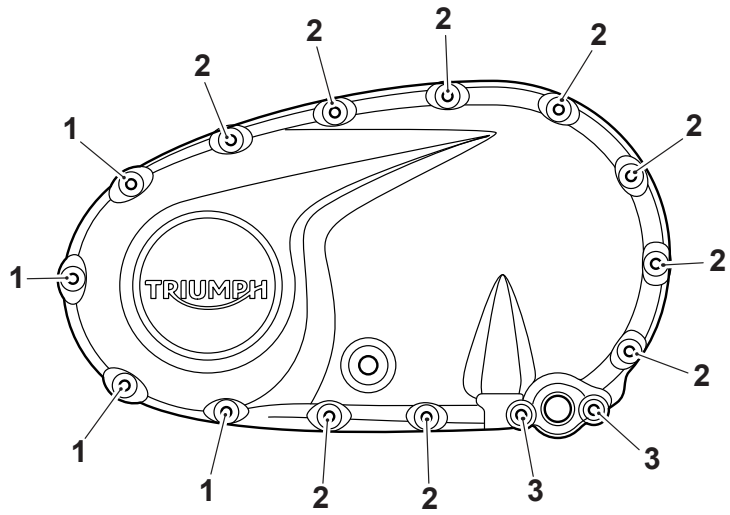


1. **Gear change actuator arm**
2. **Fixing**
3. **Actuator arm alignment mark**
4. **Gear change actuator arm split line**

Note

- **Note the position of the clutch cable brackets prior to removal.**

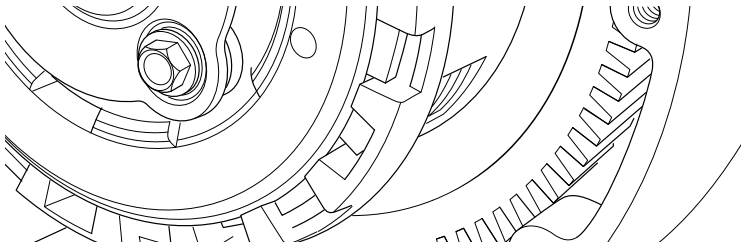
3. Release the fixings securing the clutch cover to the crankcases. Note the position of the encapsulated fixings and discard.

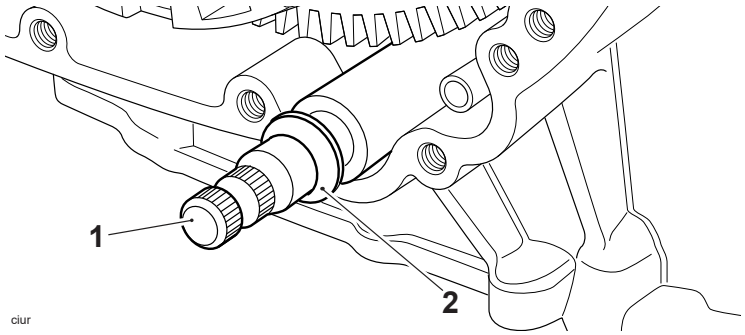


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1. **Fixings M6 x 50 mm**
2. **Fixings M6 x 40 mm**
3. **Encapsulated fixings M6 x 35 mm**

4. Place an oil catch tray beneath the clutch cover to collect any oil that may spill out on removal.
5. Carefully withdraw the cover.
6. Remove the gasket and clean the surfaces of the crankcase and the clutch cover using a lint free cloth.
7. Note the position of the washer on the gear change shaft.





1. **Gear change shaft**
2. **Washer**

Alternator 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.

Note

- **The sound suppression assembly has been removed from the clutch cover from VIN 803544. The clutch cover without the sound suppression assembly is retrofittable to models from the start of production.**
- **If you install a new clutch cover to an engine before VIN 803544, do not try to install the sound suppression assembly.**

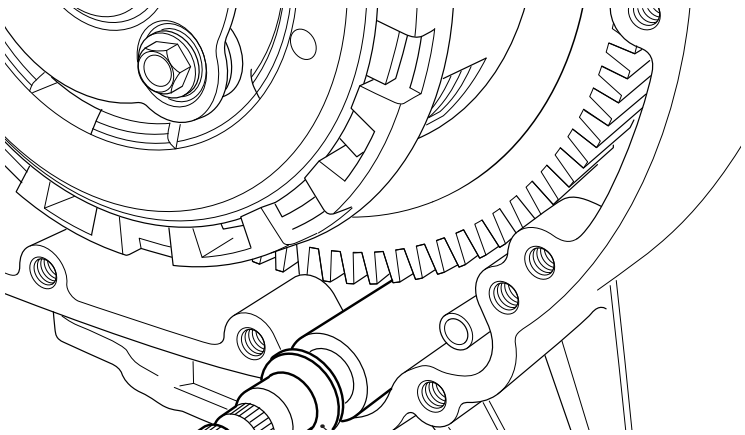
CAUTION

Do not drill or tap the latest condition clutch cover to fit the sound suppression assembly.

Attempting to drill or tap the latest condition clutch cover may crack the boss.

A cracked boss will cause oil to leak from the clutch cover.

1. Ensure the washer is correctly positioned on the gear change shaft.





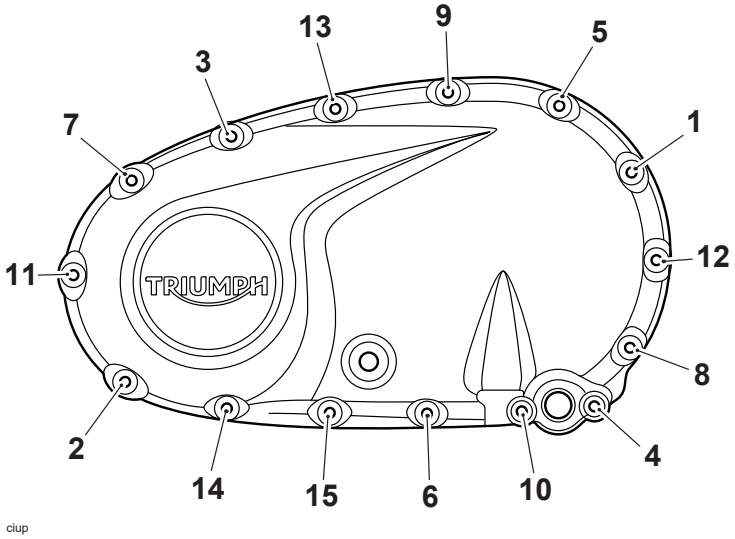
1. **Gear change shaft**
2. **Washer**

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

Note

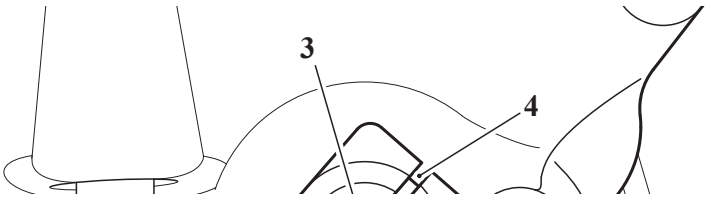
- **Ensure that the lifter piece claw engages correctly with the pull rod during assembly. It may be necessary to rotate the lifter piece rack to allow assembly to take place.**
- **Fixings 4 and 10 are encapsulated and must be replaced during fitment.**

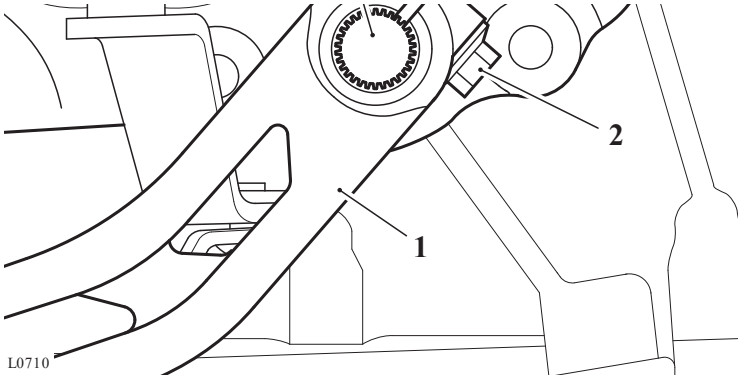
5. Refit the two brackets for the clutch cable and fixings as noted during removal, tighten the fixings as described below:
   - Tighten fixings 1 to 13 in the sequence shown below to **10 Nm**.
6. Fit the clutch cable bracket and tighten fixings 14 and 15 to **10 Nm**.
   - Retighten fixings one, two and six to **10 Nm**.



Tightening Sequence

- Align the split line on the gear change actuator arm with the alignment mark on the gear change shaft and fit the actuator arm to the spline. Fit the fixing and tighten to **8 Nm**.





1. **Gear change actuator arm**
2. **Fixing**
3. **Actuator arm alignment mark**
4. **Gear change actuator arm split line**

- Refit and adjust the clutch cable (see Clutch Cable - Installation).

Perform the following operations:

- Battery - Installation
- Seat - Installation

WARNING

The rotor magnets are very strong. When handling the alternator cover the magnets may 'grab' the stator, causing injury to the hands or fingers. When handling the alternator cover wear suitable gloves and only grip the alternator cover by the outside surfaces; always keep hands and fingers clear when handling the alternator cover.

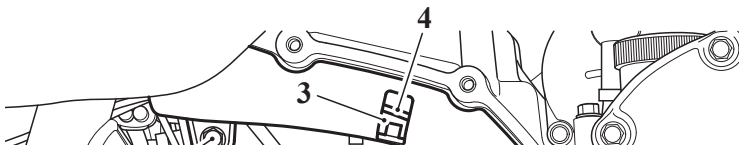
Note

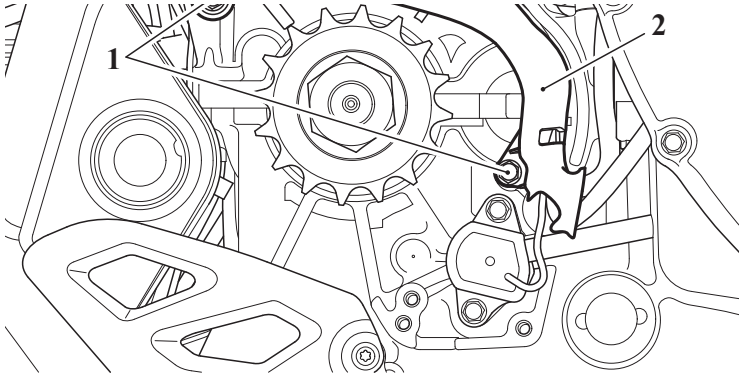
- **The alternator and crankshaft position sensor share the same harness.**
- **Note that the white tape on the harnesses within the harness guide aligns with the upper gap for installation.**
- **Note the routing of the alternator harness for installation.**

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Front Sprocket Cover - Removal
- Rear Mudguard - Removal

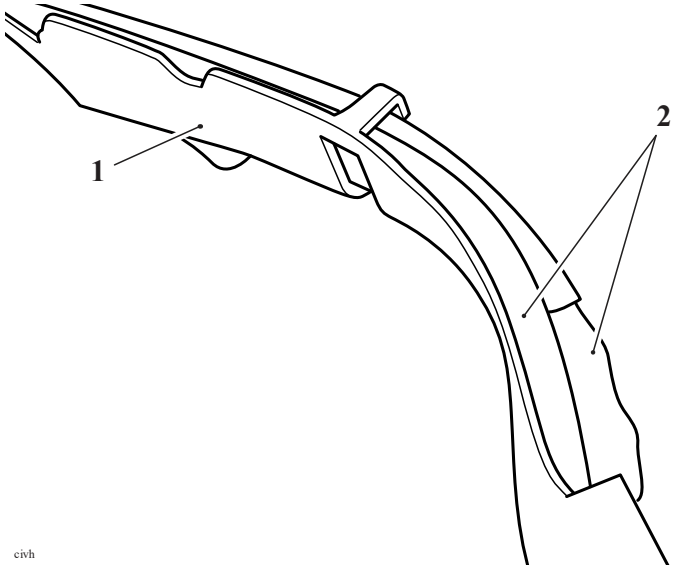
1. Route the alternator harness from the alternator regulator/rectifier to the harness guide on the crankcase.
2. Remove and discard the fixings and detach the harness guide from the crankcase.





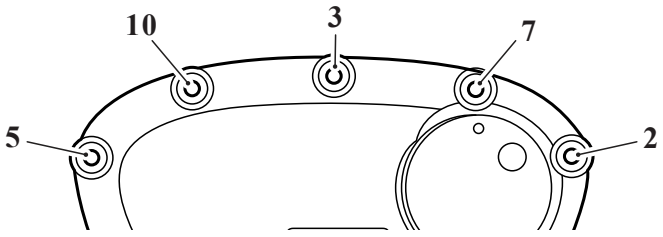
1. **Fixings**
2. **Harness guide**
3. **Upper gap**
4. **White tape**

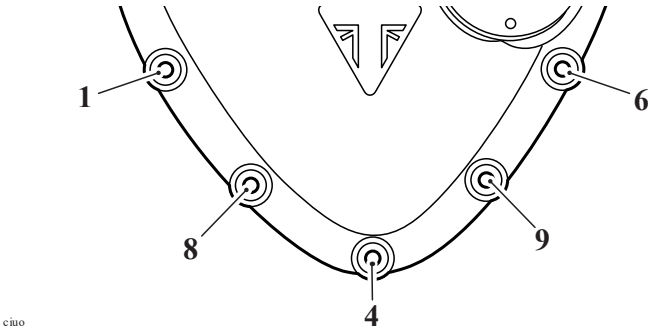
3. Carefully remove the alternator harness from the harness guide.



1. **Harness guide**
2. **Harness**

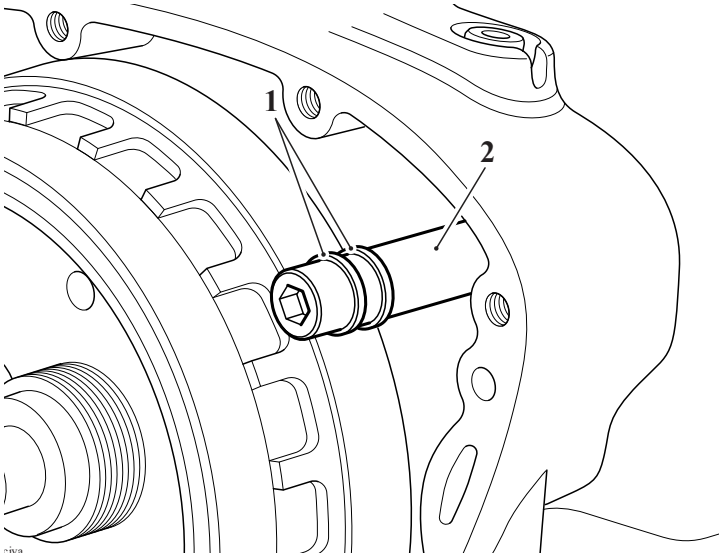
4. Place an oil catch tray beneath the alternator cover to collect any oil that may spill out on removal.
5. Release the fixings securing the alternator cover to the crankcases.





Removal Sequence

6. Carefully withdraw the cover.
7. Remove the gasket and clean the surfaces of the crankcase and the alternator cover using a lint free cloth.
8. Remove and discard the O-rings from the balancer dead shaft.



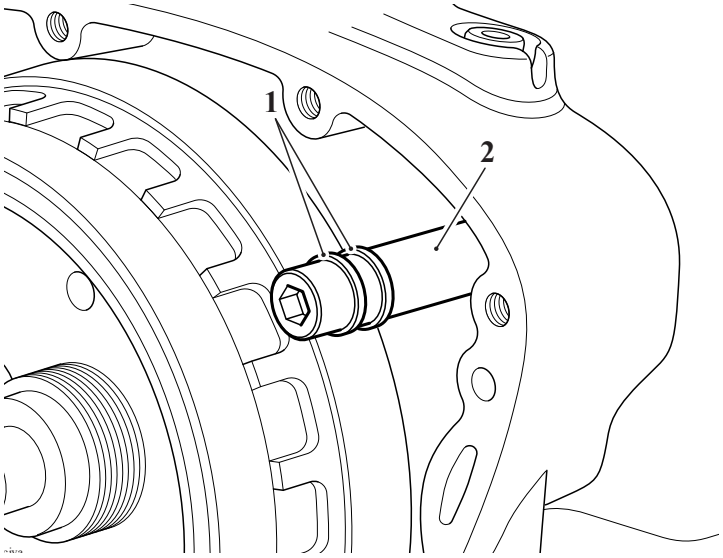
1. **O-ring**
2. **Balancer dead shaft**

Alternator Cover - Installation

WARNING

The rotor magnets are very strong. When handling the alternator cover the magnets may 'grab' the stator, causing injury to the hands or fingers. When handling the alternator cover wear suitable gloves and only grip the alternator cover by the outside surfaces; always keep hands and fingers clear when handling the alternator cover.

1. Thoroughly clean the crankcase, harness grommet and alternator cover mating faces.
2. Fit new O-rings to the balancer dead shaft.



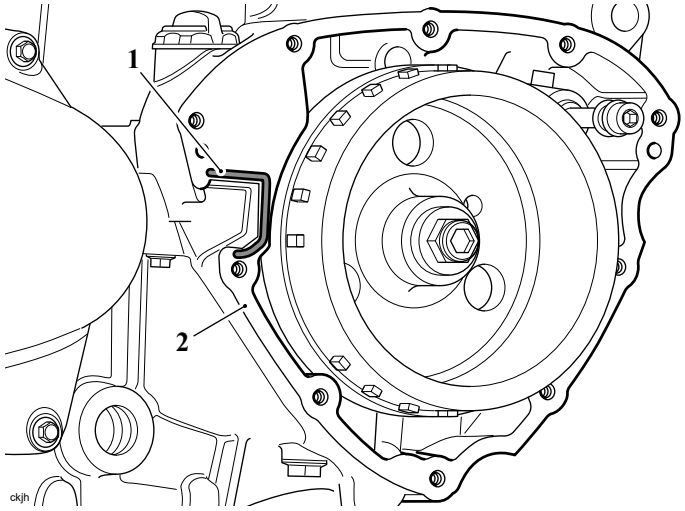
1. **O-rings**
2. **Balancer dead shaft**

3. Position a new gasket to the crankcase dowels.

Note

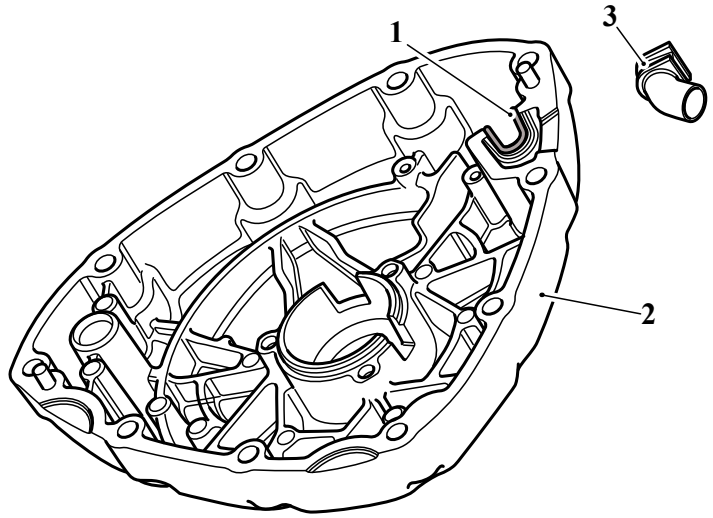
- **When using ThreeBond 1216E the mating faces must come into contact with each other within five minutes of application.**

4. Apply a 2 mm (+/-0.5 mm) bead of silicone sealant to the outer surface of the gasket in the area shown in the diagram below, during manufacture, ThreeBond 1216E is used.



1. **Sealant area**
2. **Gasket**

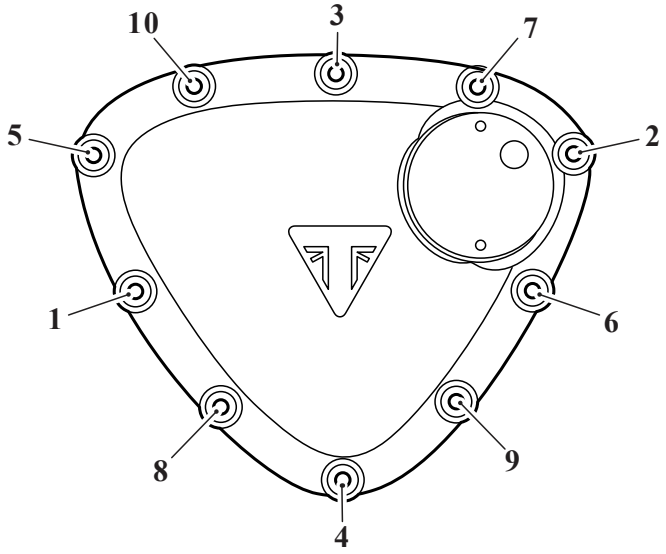
5. Apply a 2 mm (+/-0.5 mm) bead of silicone sealant to the area of the alternator cover at the location of the harness rubber grommet as shown in the diagram below, during manufacture, ThreeBond 1216E is used.



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1. **Sealant area**
2. **Alternator cover**
3. **Rubber grommet (harness removed for clarity)**

6. Fit the alternator cover and tighten the fixings to **10 Nm**, in the sequence shown below.

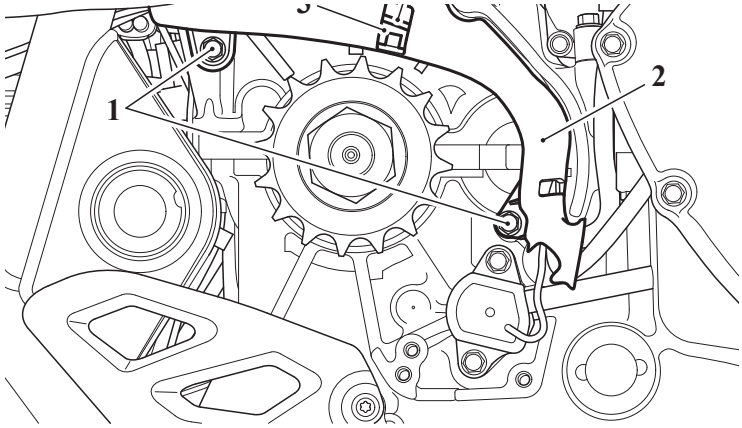


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Tightening Sequence

7. Re-tighten fixings one and two to **10 Nm**.
8. Route the alternator harness to the alternator regulator/rectifier securing it to its clips as noted for removal. Connect it to the alternator regulator/rectifier.
9. Carefully fit the alternator harness into the harness guide as noted for removal.
10. Secure the harness guide to the crankcase and tighten the new fixings to **4 Nm**.





L0706

1. **Fixings**
2. **Harness guide**
3. **Upper gap**
4. **White tape**

Perform the following operations:

- Rear Mudguard - Installation
- Front Sprocket Cover - Installation
- Battery - Installation
- Seat - Installation

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.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal
- Ignition Coils - Removal

1. Remove the spark plugs.
2. Progressively release the camshaft cover fixings.
3. Raise the camshaft cover and manoeuvre it towards the right hand side of the engine, where it can be removed.

CAUTION

CAUTION

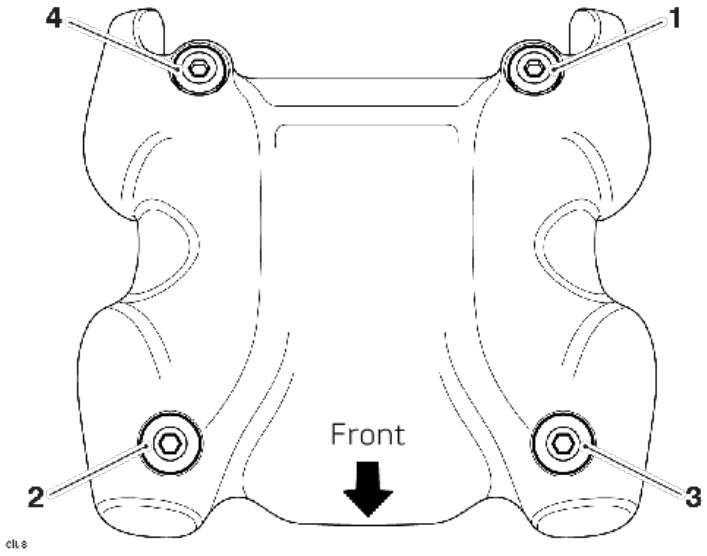
Never use a lever to remove the camshaft cover from the cylinder head.

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

4. Remove the camshaft cover gasket.
5. Discard the camshaft cover gasket and rubber seals.
6. Remove any residual oil from the mating face of the cylinder head using a lint free cloth.

Camshaft Cover - Installation

1. Fit a new camshaft cover seal to the camshaft cover. Ensure the groove in the gasket is correctly seated to the camshaft cover.
2. Position the camshaft cover to the cylinder head. Ensure that the gasket remains in position.
3. Lubricate the new camshaft cover fixing seals with clean engine oil. Fit the camshaft cover fixings and seals and tighten until finger tight.
4. Tighten the fixings in the sequence shown to **14 Nm**.
5. Retighten fixings one to four to **14 Nm**.



Tightening Sequence

6. Refit the spark plugs and tighten to **12 Nm**.

Perform the following operations:

- Ignition Coils - Installation
- Fuel Tank - Installation
- Battery - Installation
- Seat - Installation

Front Sprocket 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.

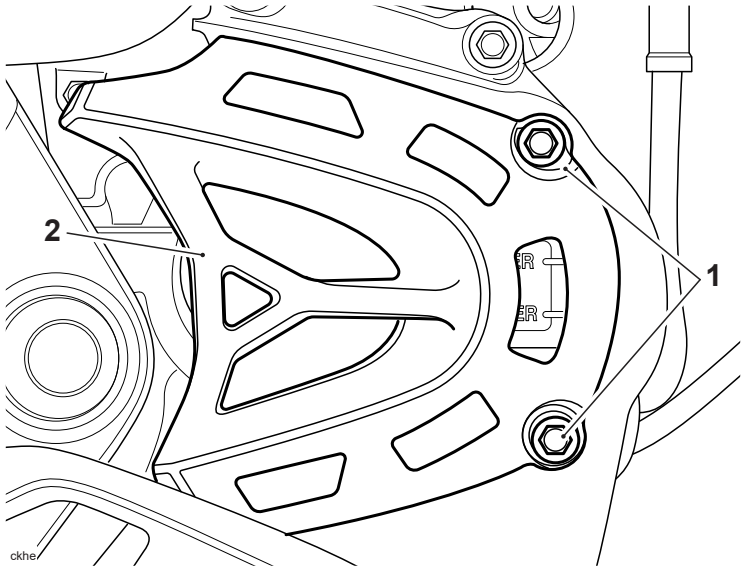
WARNING

Rotating the rear wheel will cause the drive chain to rotate on the sprockets. To prevent injury, never place loose clothing, fingers or hands near the drive chain or sprockets. Loose clothing, fingers or the hands could become trapped as the drive chain rotates on the sprockets causing a crushing injury to the fingers, hands or other parts of the anatomy.

Perform the following operations:

- Seat - Removal
- Battery - Removal

1. Release the fixings and remove the front sprocket outer cover.

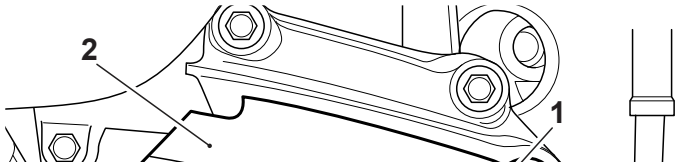


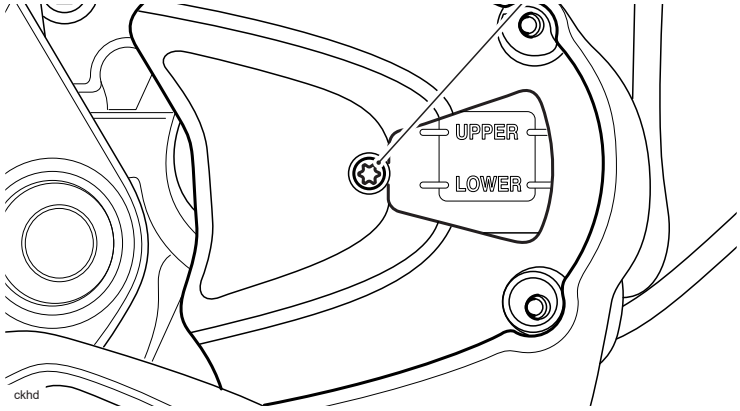
1. **Fixings**
2. **Sprocket outer cover**

Note

- **The fixing securing the brake sprocket middle cover also secure the brake fluid reservoir to the sprocket cover.**

2. Release the fixing and remove the front sprocket middle cover. Discard the fixing.



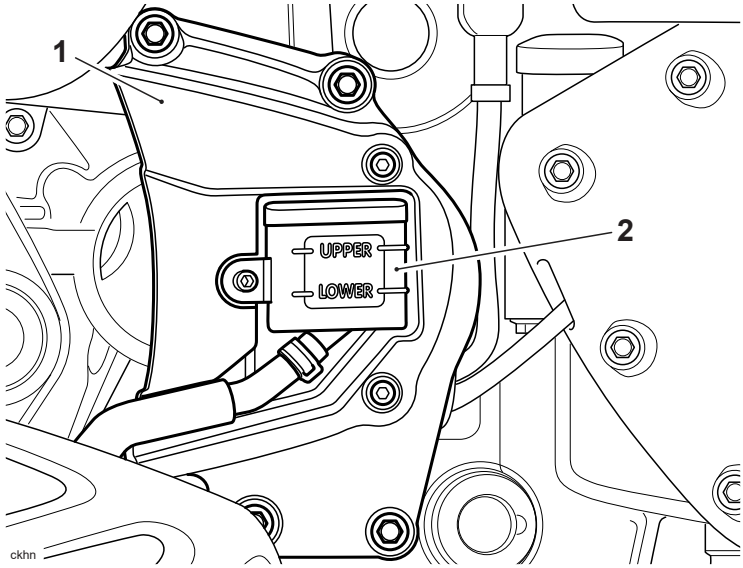


1. **Fixings**
2. **Sprocket middle cover**

CAUTION

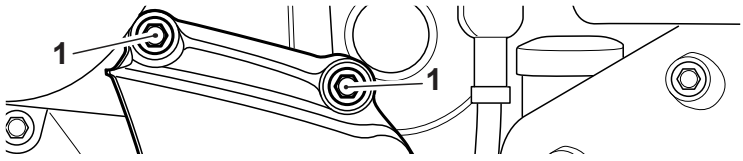
To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

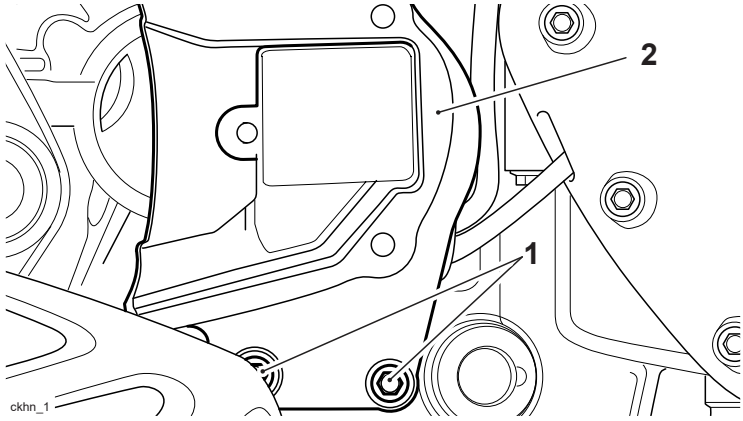
3. Detach the brake fluid reservoir from the sprocket cover.



1. **Brake fluid reservoir**
2. **Sprocket cover**

4. Secure the rear brake fluid reservoir in an upright position.
5. Release the fixings and remove the sprocket cover.





1. **Fixings**
2. **Sprocket cover**

Front Sprocket Cover - Inspection

WARNING

Rotating the rear wheel will cause the drive chain to rotate on the sprockets. To prevent injury, never place loose clothing, fingers or hands near the drive chain or sprockets. Loose clothing, fingers or the hands could become trapped as the drive chain rotates on the sprockets causing a crushing injury to the fingers, hands or other parts of the anatomy.

1. Inspect the rubber grommets, flanged sleeves and rubber buffer for damage or wear.

Front Sprocket Cover - Installation

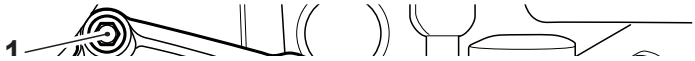
WARNING

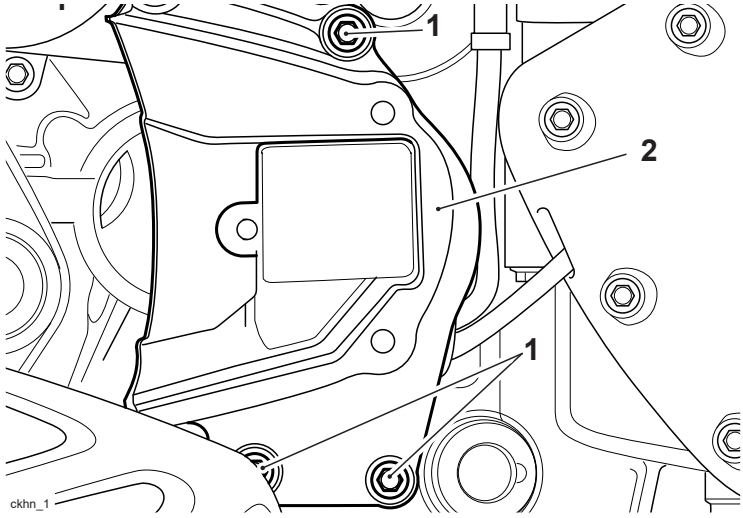
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

WARNING

Rotating the rear wheel will cause the drive chain to rotate on the sprockets. To prevent injury, never place loose clothing, fingers or hands near the drive chain or sprockets. Loose clothing, fingers or the hands could become trapped as the drive chain rotates on the sprockets causing a crushing injury to the fingers, hands or other parts of the anatomy.

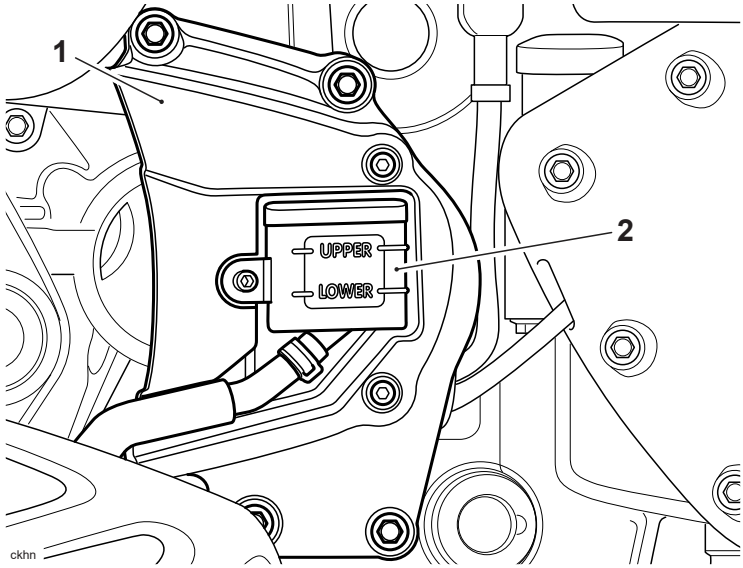
1. If removed, refit the grommets to the sprocket cover.
2. Fit the sprocket cover, ensuring that the flanged sleeves remain in the correct position.
3. Fit the sprocket cover fixings and evenly and progressively tighten to **9 Nm**.





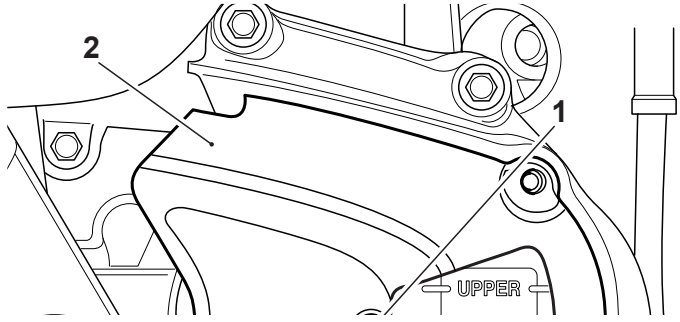
1. **Fixings**
2. **Sprocket cover**

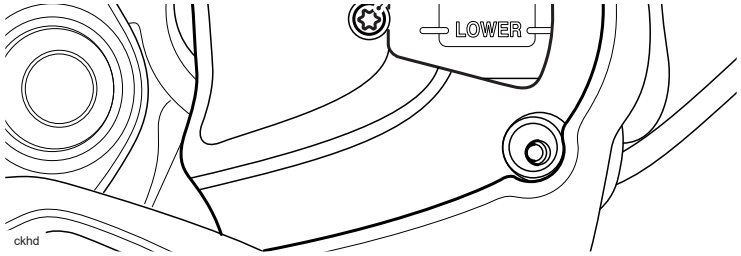
4. Attach the brake fluid reservoir to the sprocket cover.



1. **Brake fluid reservoir**
2. **Sprocket cover**

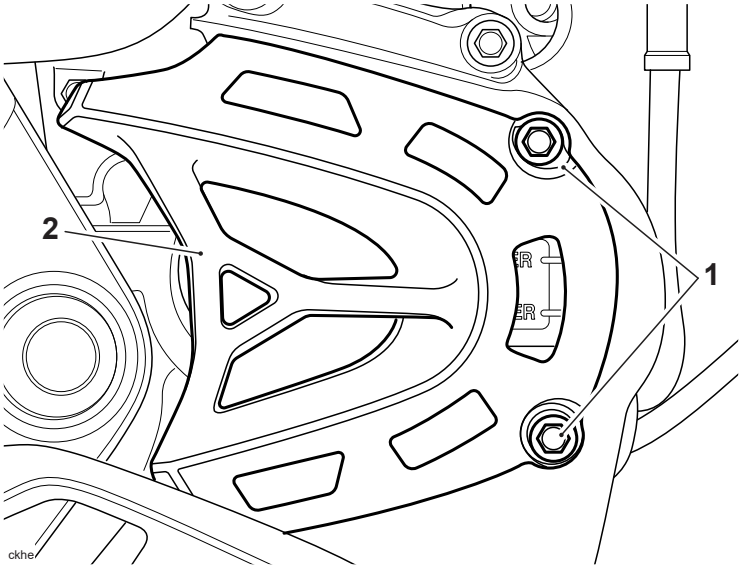
5. Refit the sprocket middle cover and tighten the new fixing to **3 Nm**.





1. **Fixings**
2. **Sprocket middle cover**

6. Refit the sprocket outer cover and tighten the fixings to **9 Nm**.



1. **Fixings**
2. **Sprocket outer cover**

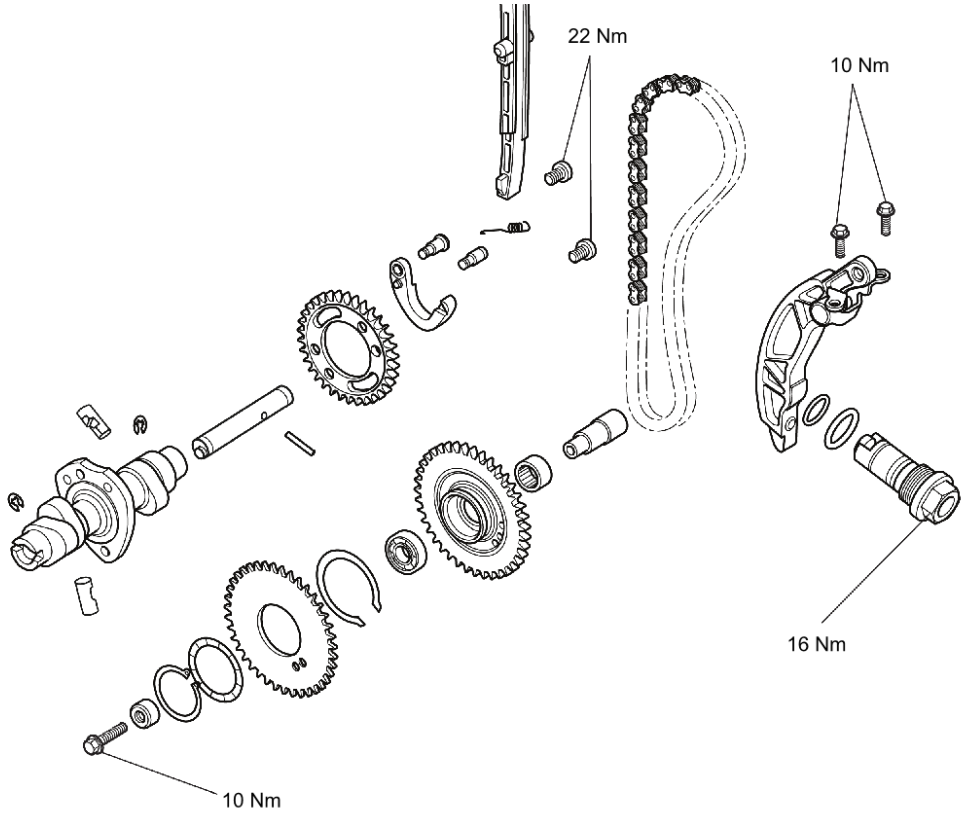
Perform the following operations:

- Battery - Installation
- Seat - Installation

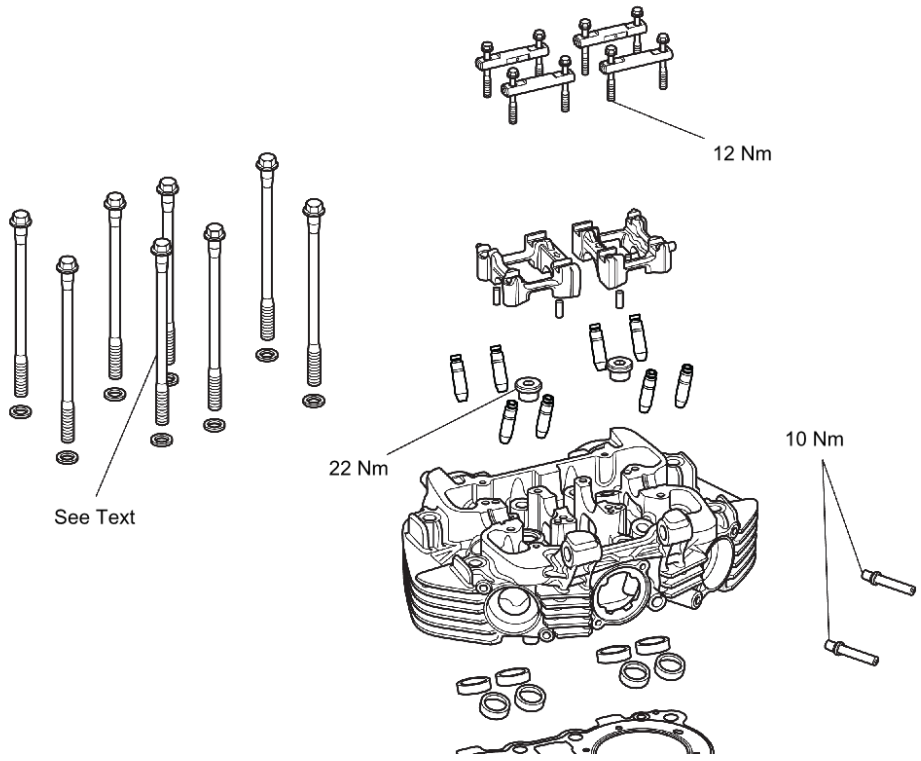
Cylinder Head

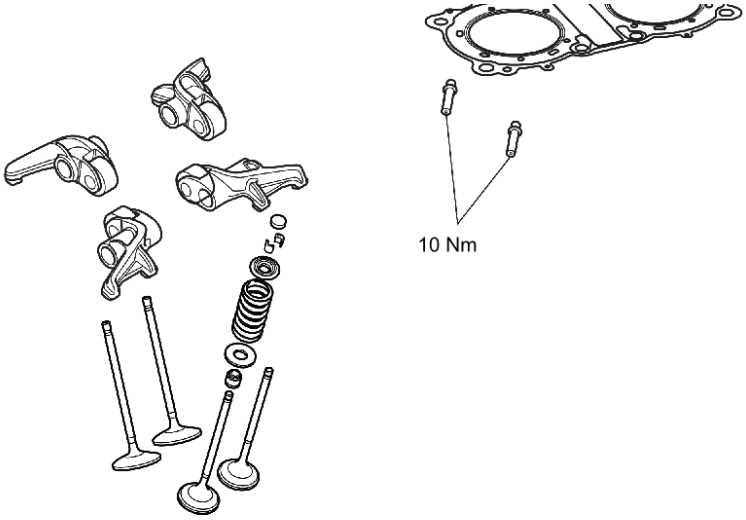
Exploded View – Camshaft and Camshaft Drive





Exploded View – Cylinder Head





Cylinder Head - Description

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

A silent running camshaft drive chain drives the single overhead camshaft, which runs directly in the cylinder head without additional bearings.

The crankshaft drives an idler gear, which in turn drives the camshaft drive chain. The idler gear, and therefore the camshaft rotates in the opposite direction to the crankshaft.

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

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

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

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

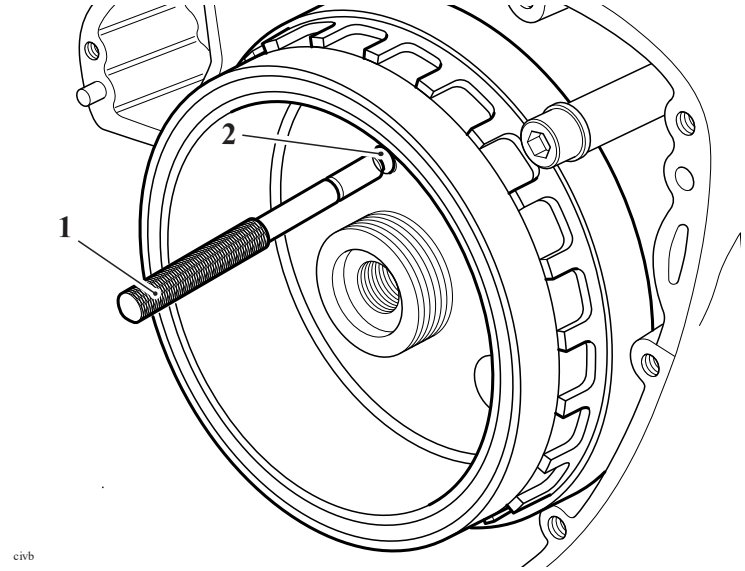
WARNING

motorcycle.

Perform the following operations:

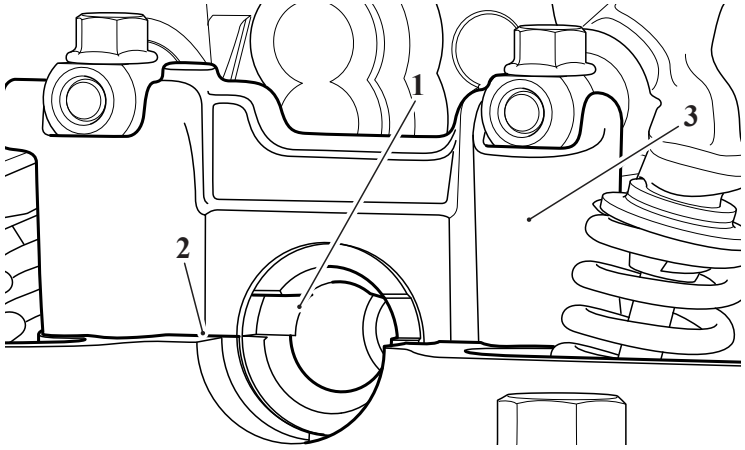
- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal
- Ignition Coils - Removal
- Camshaft Cover - Removal
- Alternator Cover - Removal

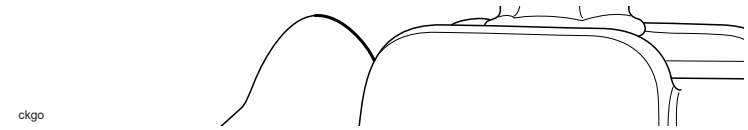
1. Rotate the engine until the T3880601 - Camshaft Timing Pin can be inserted through the hole in the alternator rotor, crankcase and into the idler gear.



1. **T3880601 - Camshaft Timing Pin**
2. **Timing hole in alternator rotor**

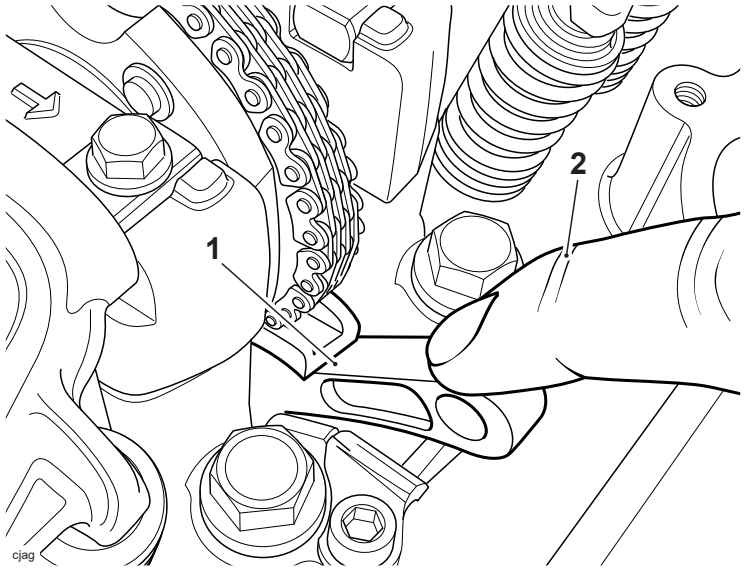
2. In addition to the alignment mark, at TDC, the offset slot on the camshaft will align with the upper surface of the cylinder head.





1. **Camshaft slot**
2. **Cylinder head**
3. **Camshaft ladder (cylinder two)**

3. With the aid of an assistant, hold the camshaft drive chain tensioner blade to keep the camshaft drive chain in position during removal of the tensioner.

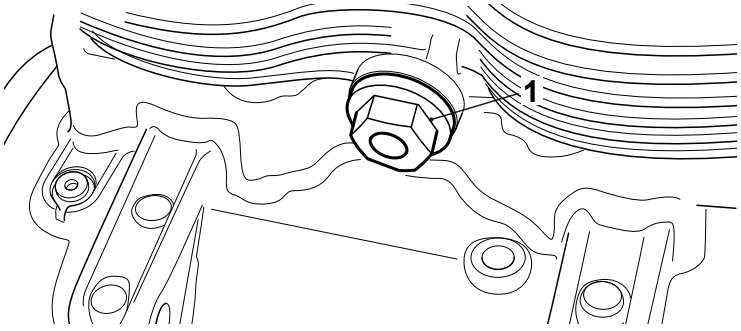


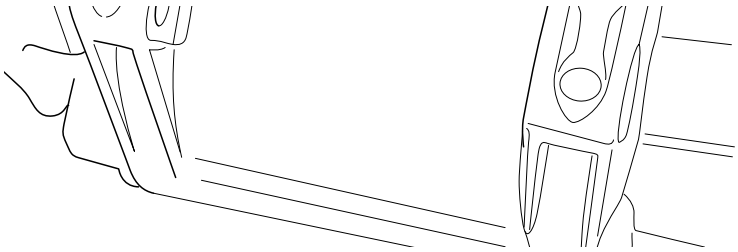
1. **Camshaft drive chain tensioner blade**
2. **Tension (hand held)**

WARNING

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

4. Using T3880649 - Timing Chain Tensioner Socket, unscrew the hydraulic tensioner body until the plunger spring tension has been released.





1. **Tensioner**

5. Remove the hydraulic tensioner and discard the O-rings.

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

Before starting work, ensure the 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 camshaft drive chain tensioner blade is in contact with the camshaft drive chain.
2. Check that the camshaft alignment slot aligns with the cylinder head.
3. To set the hydraulic tensioner onto the first tooth of the ratchet (i.e. minimum extension) carry out the following:

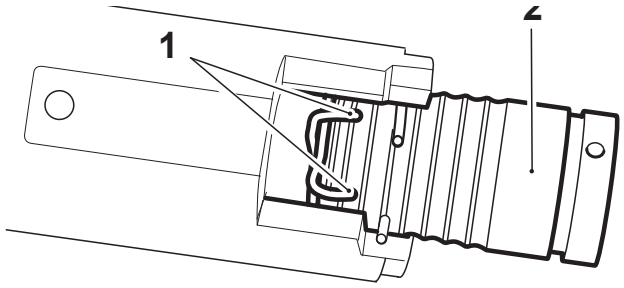
Note

- **If installing a new hydraulic tensioner, do not release the plunger before fitting.**
- **If installing the original hydraulic 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.**

WARNING

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

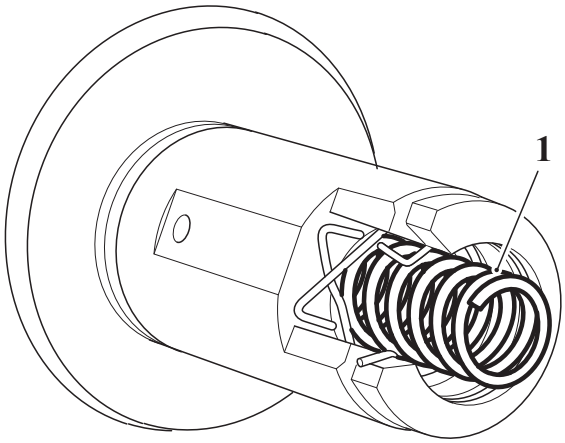
4. Hold the resister ring ends together and pull out the plunger.



cfei_2

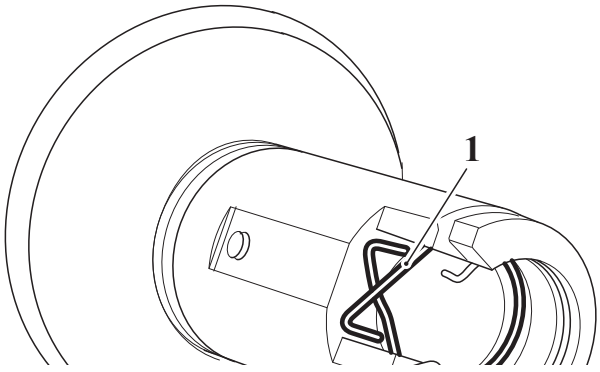
1. **Resister ring ends**
2. **Plunger**

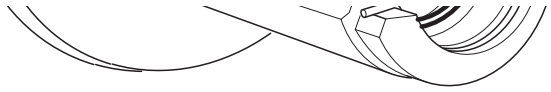
5. Remove the spring.



1. **Spring**

6. While holding the resister ring in place, drain the engine oil into a suitable container.
7. Ensure the resister ring is correctly located as shown below.

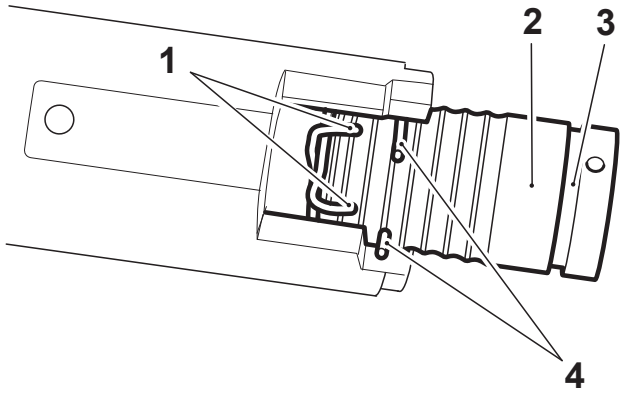




cfho

1. **Resister ring**

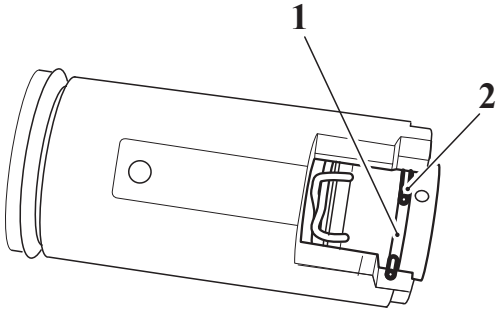
8. Refit the spring.
9. Support the tensioner in a soft jawed vice.
10. Hold the resister ends together, close the vice allowing the plunger to be pushed through the resister ring until the snap ring aligns with the snap ring groove.



cfei

1. **Resister ring**
2. **Plunger**
3. **Snap ring groove**
4. **Snap ring**

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



cfej

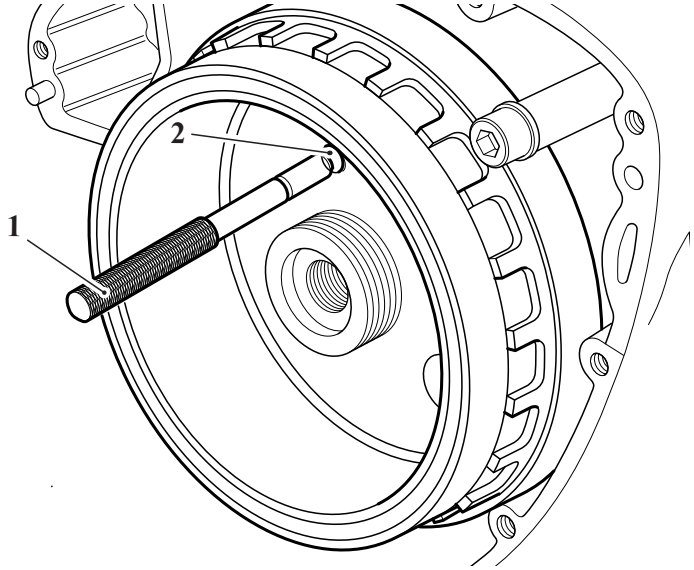
1. **Snap ring groove**
2. **Snap ring**

12. Fit two new O-rings to the camshaft drive chain tensioner body.
13. Fit the tensioner to the cylinder head as noted for removal. Using T3880649 - Timing Chain Tensioner Socket, tighten the tensioner to **16 Nm**.
14. Release pressure to the camshaft drive chain tensioner blade, taking care not to move the tensioner blade.
15. Remove T3880601 - Camshaft Timing Pin.
16. To release the plunger from the snap ring holding the hydraulic tensioner, rotate the crankshaft anticlockwise until the plunger is released.
17. Rotate the crankshaft clockwise until the T3880601 - Camshaft Timing Pin aligns with the hole in the crankcase and the crankshaft.
18. Check that there is tension in the camshaft drive chain and the slot at the camshaft end is 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 pressure is felt at the tensioner plunger. This could take up to 5 seconds.**

19. Check that the tensioner plunger is correctly located in the middle of the camshaft drive chain tensioner blade when viewed from above.
20. Rotate the engine through 4 full revolutions, and reset number 1 cylinder to TDC. Ensure that the T3880601 - Camshaft Timing Pin aligns with the hole in the crankcase and the crankshaft.

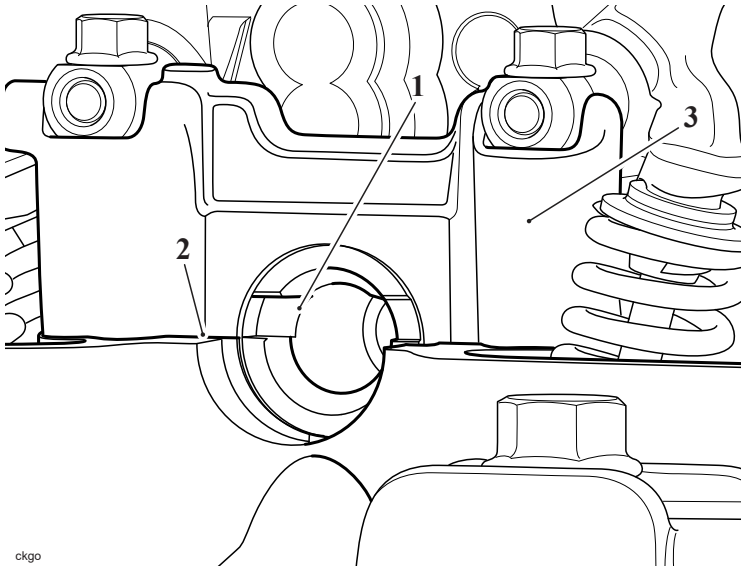


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1. **T3880601 - Camshaft Timing Pin**

2. **Timing hole in alternator rotor**

21. Check that the camshaft timing marks align as shown below.



1. **Camshaft slot**
2. **Cylinder head**
3. **Camshaft ladder (cylinder two)**

22. Recheck the tensioner plunger location against the camshaft drive chain tensioner blade.
23. Remove T3880601 - Camshaft Timing Pin.

Perform the following operations:

- Alternator Cover - Installation
- Camshaft Cover - Installation
- Ignition Coils - Installation
- Fuel Tank - Installation
- Battery - Installation
- Seat - Installation

Camshaft Drive Chain Rubbing Blade - Removal

WARNING

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

Note

- **The camshaft drive chain rubbing blade can only be removed after the cylinder head has been removed.**

Note

- **The camshaft drive chain tensioner blade can be removed without removing the cylinder head.**

Perform the following operations:

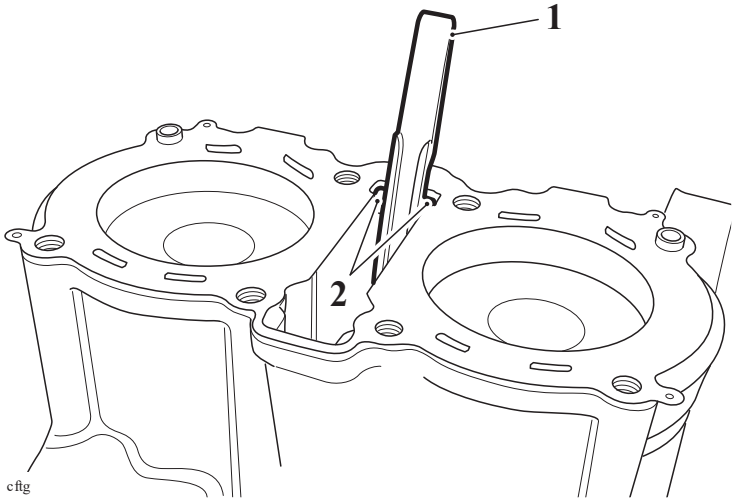
- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal
- Engine - Removal
- Alternator Cover - Removal
- Camshaft Cover - Removal

1. Rotate the engine until T3880039 - Idler Gear Timing Pin can be inserted through the hole in the alternator rotor, crankcase and into the idler gear.
2. Remove the cylinder head (see Cylinder Head - Removal).

Note

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

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

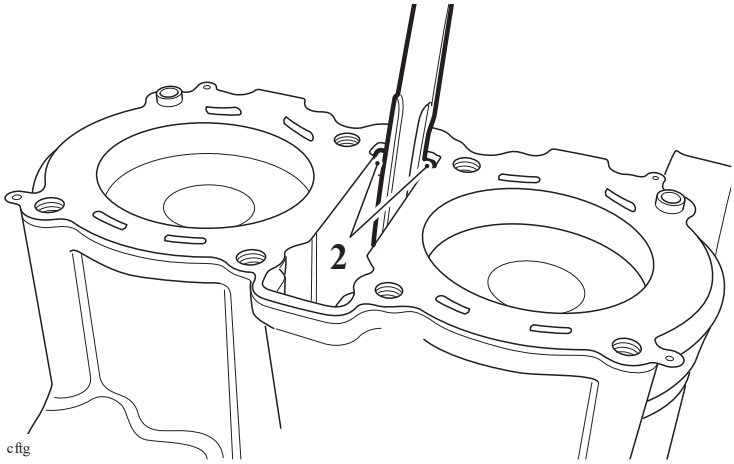


1. **Camshaft drive chain tensioner rubbing blade**
2. **Mounting lugs**

Camshaft Drive Chain Rubbing Blade - Installation

1. Refit the camshaft drive chain rubbing blade. Ensure the lower mounting tip is correctly located in the upper crankcase and the lugs are located in the barrel as noted during removal.





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

2. Refit the cylinder head (see Cylinder Head - Installation).
3. Refit the camshafts (see Camshaft - Installation).
4. Refit the camshaft cover (see Camshaft Cover - Installation).

Perform the following operations:

- Alternator Cover - Installation
- Engine - Installation
- Fuel Tank - Installation
- Battery - Installation
- Seat - Installation

Camshaft Drive Chain and Idler Gear - Removal

WARNING

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

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal
- Engine - Removal

WARNING

The rotor magnets are very strong. When handling the alternator cover the magnets may 'grab' the stator, causing injury to the hands or fingers. When handling the alternator cover

WARNING

wear suitable gloves and only grip the alternator cover by the outside surfaces; always keep hands and fingers clear when handling the alternator cover

- Alternator Cover - Removal

1. Remove the alternator rotor (see Alternator Rotor - Removal).
2. Rotate the engine until T3880039 - Idler Gear Timing Pin can be inserted through the hole in the crankcase and into the idler gear.
3. Remove the cylinder head (see Cylinder Head - Removal).
4. Remove the cylinder barrels (see Barrels - Removal).

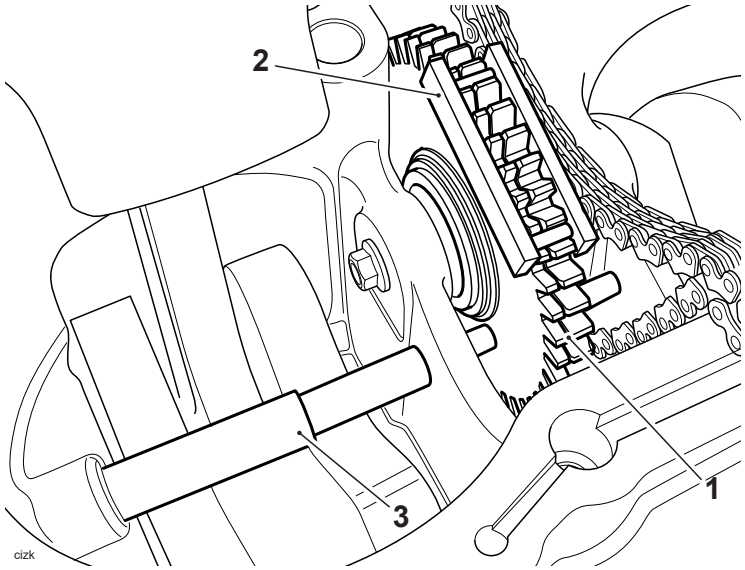
WARNING

Never use a 'dot punch' to mark the camshaft drive chain, camshaft or camshaft driven gears. Severe engine damage will result if impact is applied to machined parts.

Note

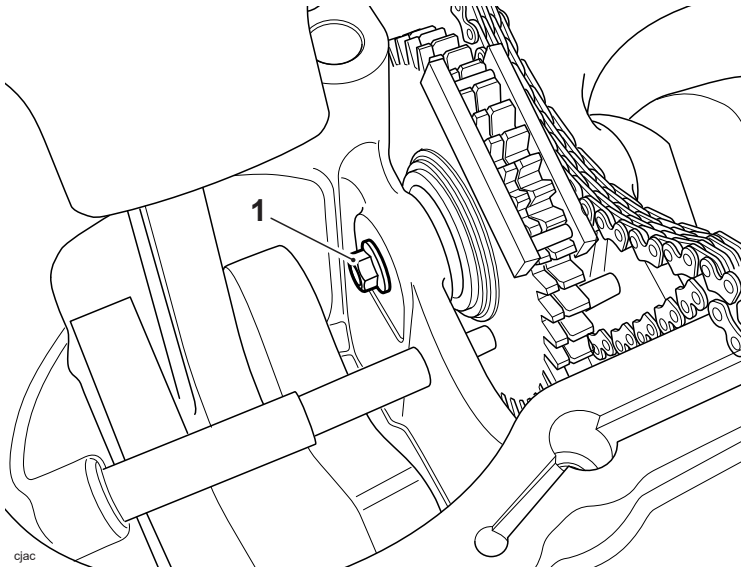
- **To ensure the camshaft drive chain can be refitted in the same orientation, use a suitable marker pen to permanently mark one of the outer plates of the camshaft drive chain prior to removing the camshafts.**
- **Note the side of which the marked outer plate is facing for installation.**

5. Secure the idler gear in position using the locking plate supplied with T3880016 - Balancer Gear C-Spanner-2 by locking the gear teeth as shown below.



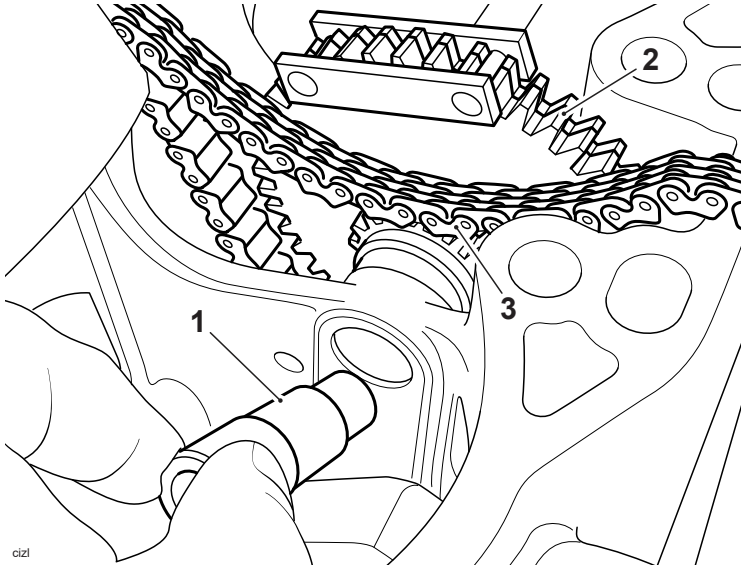
1. **Idler gear**
2. **Locking plate (Part of T3880016 - Balancer Gear C-Spanner)**
3. **T3880039 - Idler Gear Timing Pin**

6. Remove and discard the fixing from the idler gear shaft.



1. **Fixing**

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



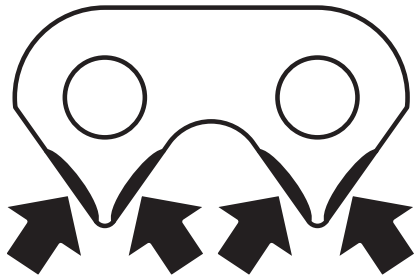
1. **Idler gear shaft**
2. **Idler gear**
3. **Camshaft drive chain**

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

Camshaft Chain - Inspection

Visual in situ checks can also be made as follows:

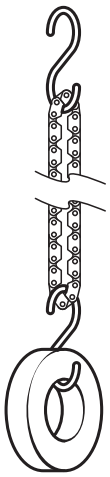
1. Check for significant blue discolouration of the drive chain plates indicating excessive heat build-up.
2. Examine all of the pins for signs of rotation.
3. Check for cracking or deep scratching of the drive chain plates.
4. Check for severe wear of the inner plates as indicated in the diagram below.



ccrv

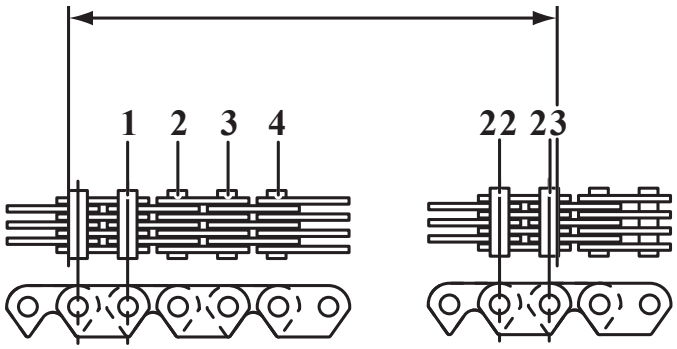
For a more thorough check, proceed as follows:

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.



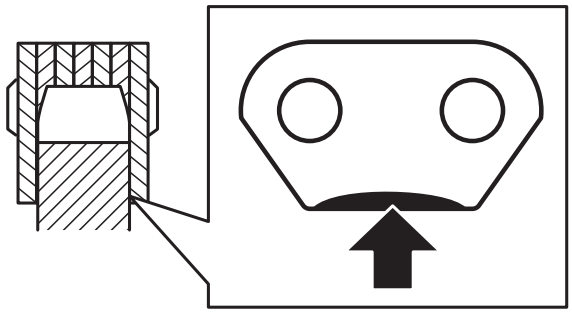
cajs

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 147.50 mm. Measurements beyond 147.50 mm indicate that the drive chain must be replaced.



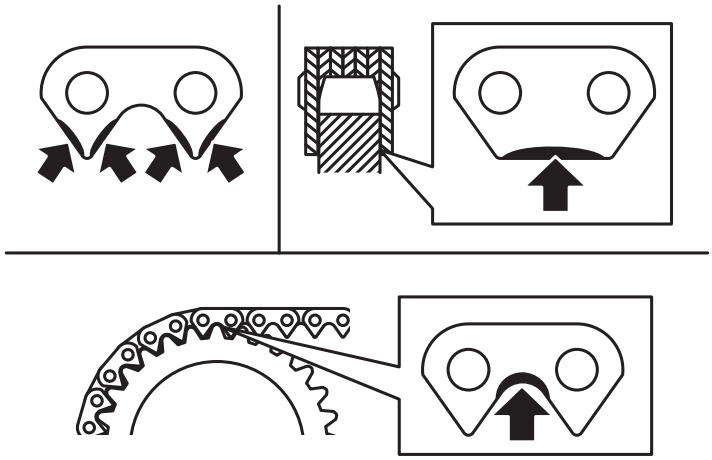
cajt

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



ccru

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

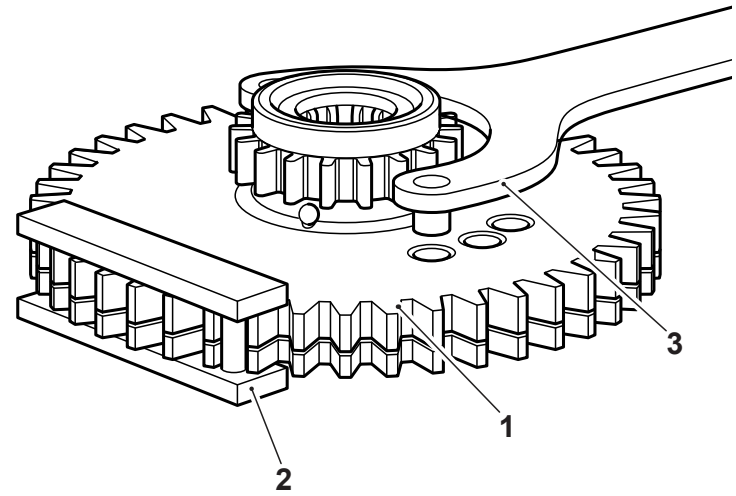


caju

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

Camshaft Drive Chain and Idler Gear - Installation

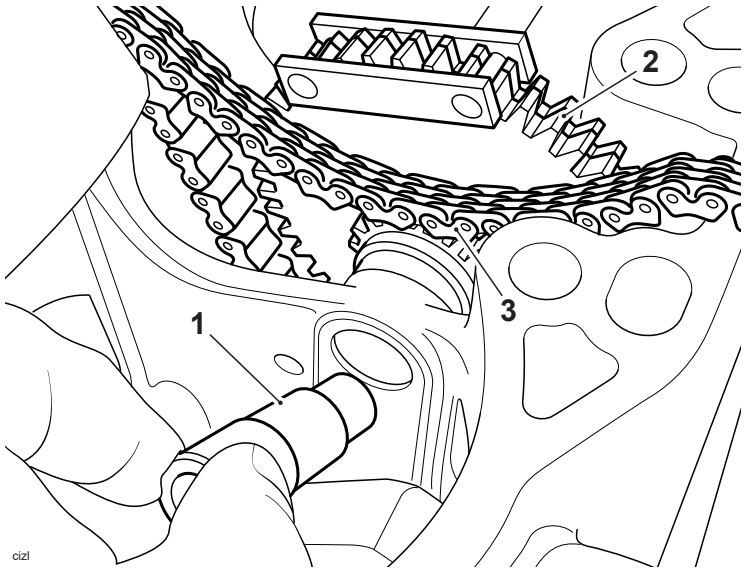
1. Preload the backlash gear using T3880041 - Idler Gear Timing Wrench and locking plate T3880016 - Balancer Gear C-Spanner-2 as shown below.



cizm

1. **Idler gear**
2. **Locking plate (part of T3880016 - Balancer Gear C-Spanner)**
3. **T3880041 - Idler Gear Timing Wrench**

2. Install the camshaft drive chain to the idler gear.
3. Refit the idler gear to the upper crankcase and install the idler gear shaft. Ensure that the marked outer plate on the camshaft drive chain is facing the same direction as noted for removal.

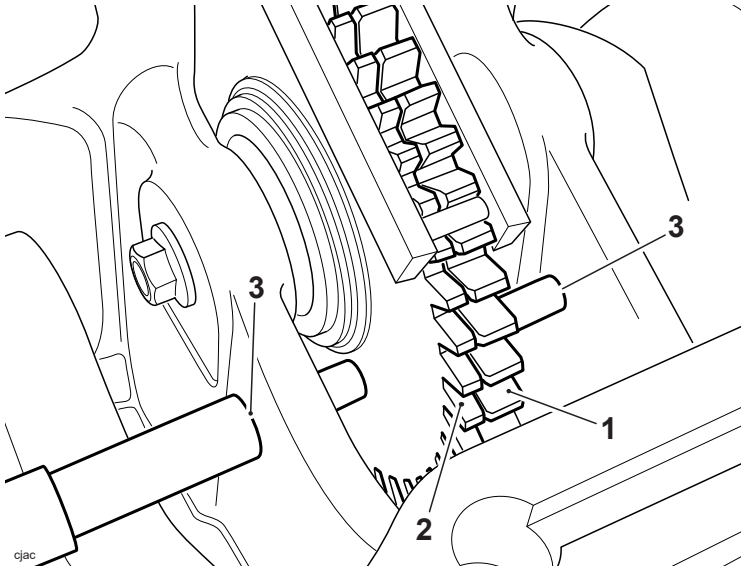


cizl

1. **Idler gear shaft**

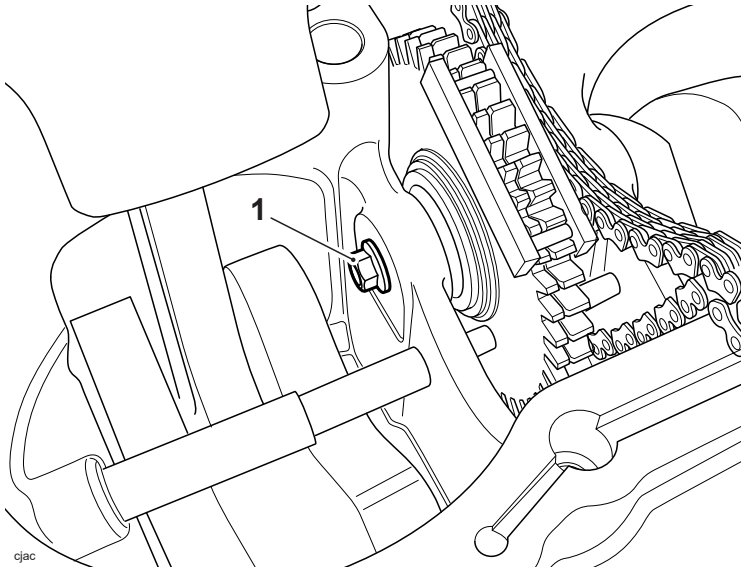
2. **Idler gear**
3. **Camshaft drive chain**

4. Install T3880039 - Idler Gear Timing Pin through the hole in the crankcase (alternator side) and through the smaller hole in the idler gear, as shown below.



1. **Idler gear**
2. **Backlash gear**
3. **T3880039 - Idler Gear Timing Pin**

5. Install the idler gear shaft and a new fixing, Counter hold the idler shaft and tighten the fixing to **10 Nm**.



1. **Fixing**

6. Refit the barrel assembly (see Piston - Installation).

7. Refit the cylinder head (see Cylinder Head - Installation).
8. Refit the camshafts (see Camshaft - Installation).
9. Recheck the tensioner plunger location against the camshaft drive chain tensioner blade.
10. Remove T3880601 - Camshaft Timing Pin from the crankcase.
11. Remove T3880039 - Idler Gear Timing Pin from the idler gear.

Perform the following operations:

- Camshaft Cover - Installation
- Alternator Cover - Installation
- Engine - Installation
- Fuel Tank - Installation
- Battery - Installation
- Seat - Installation

Exhaust Decompressors

Note

- **The decompressor is an integral part of the camshaft. Any internal parts are not serviceable and can only be replaced as part of the camshaft. Always refer to the EPC for parts availability.**

Camshaft - Removal

WARNING

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

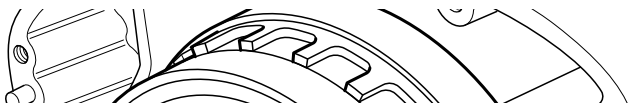
Note

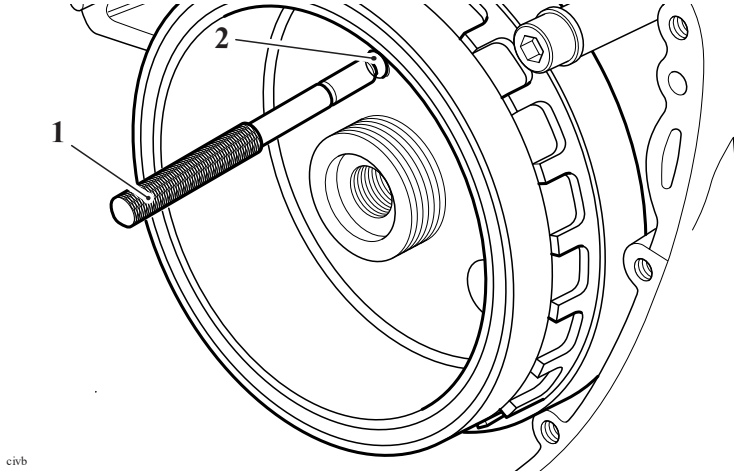
- **The camshaft can be removed from the cylinder head without complete removal of the camshaft drive chain. However, the camshaft drive chain must first be detached from the camshaft.**

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal
- Ignition Coils - Removal
- Camshaft Cover - Removal
- Alternator Cover - Removal

1. Rotate the engine until T3880601 - Camshaft Timing Pin can be inserted through the hole in the alternator rotor, crankcase and into the idler gear.





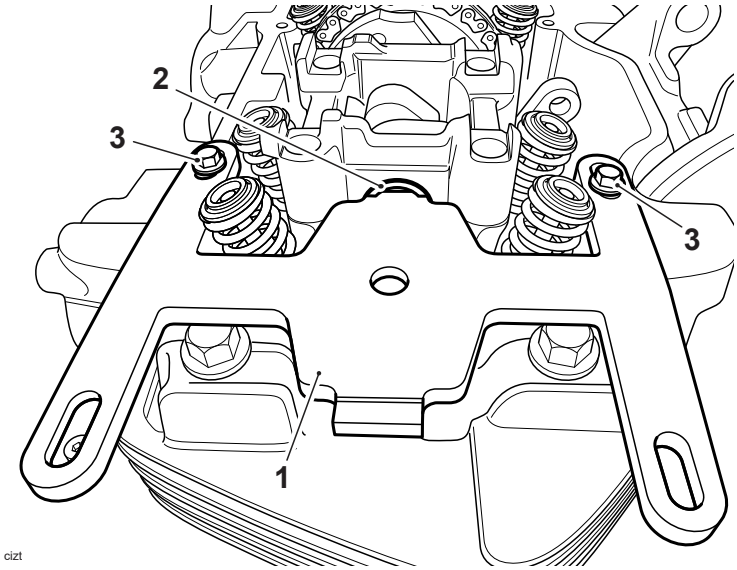
1. **T3880601 - Camshaft Timing Pin**
2. **Timing hole in alternator rotor**

2. In addition to the alignment mark, at TDC, the offset slot on the camshaft will align with the upper surface of the cylinder head.

Note

- **The T3880650 - Camshaft Timing Plate has two different thickness edges marked A and B. If side A will not slide smoothly into the camshaft slot side use side B.**

3. Insert the T3880650 - Camshaft Timing Plate into the camshaft slot. Ensure that the tool is centrally located on the cylinder head and secure as shown below.



1. **T3880650 - Camshaft Timing Plate**
2. **Camshaft slot**
3. **Fixings (6 x 12 mm)**

4. Remove the camshaft drive chain tensioner (see Camshaft Drive Chain Tensioner - Removal).

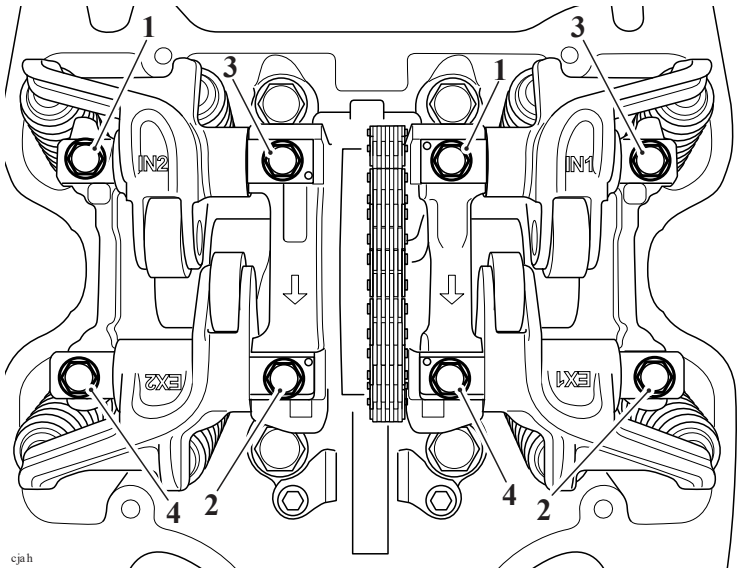
CAUTION

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

Note

- **The camshaft frames can be removed either sequentially or simultaneously.**

5. Evenly and progressively release the camshaft frame fixings in the sequence shown below.



Camshaft Frame Release Sequence

CAUTION

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

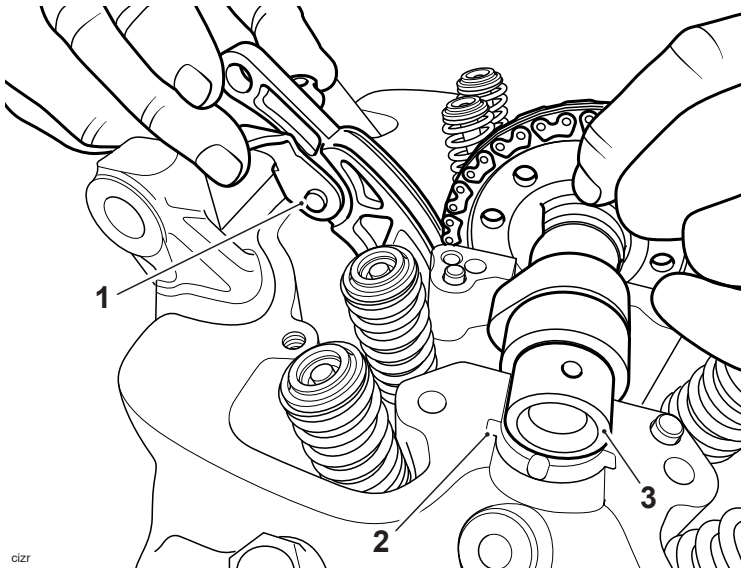
6. Once all of the upward force on the camshaft frames has been released, collect the bolts.

CAUTION

The camshaft frames are located to the cylinder head with dowels. When removing the camshaft frames collect the dowels at the same time. Failure to collect the dowels could cause them to fall into the crankcase and may cause serious damage to the engine.

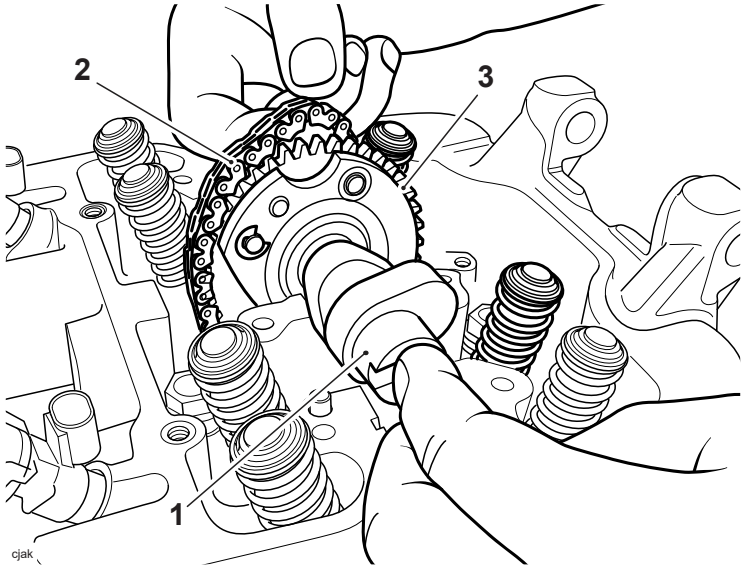
7. Remove the camshaft frames.

8. Release the front camshaft timing chain tensioner blade and discard the fixings.
9. Raise the camshaft slightly from the bearing journals, and remove the camshaft drive chain tensioner blade.



1. **Tensioner guide**
2. **Bearing journal**
3. **Camshaft**

10. Detach the camshaft drive chain from the camshaft.
11. Slide the camshaft to the right and remove it from the cylinder head.



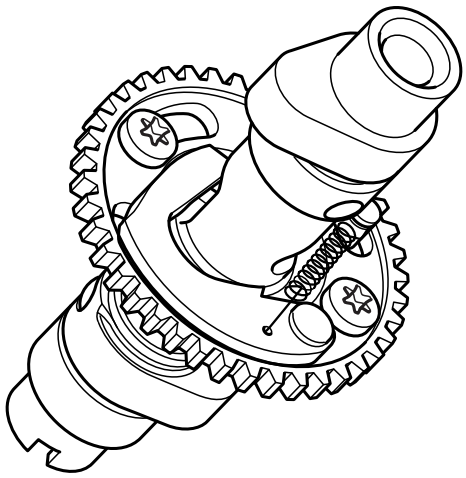
1. **Camshaft**
2. **Camshaft drive chain**
3. **Camshaft drive gear**

12. Secure the camshaft drive chain to prevent it from falling into the crankcase.

Camshaft - Identification

Camshaft - Installation

The single camshaft has four lobes; two inlet and two exhaust. The exhaust lobes contain decompressors, operated by the drive gear.



cizp

Camshaft

WARNING

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

Accurate camshaft timing can only be obtained using the correct timing method and service tools as described below.

CAUTION

The camshaft sprockets are attached to the camshafts using slotted fixing 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.

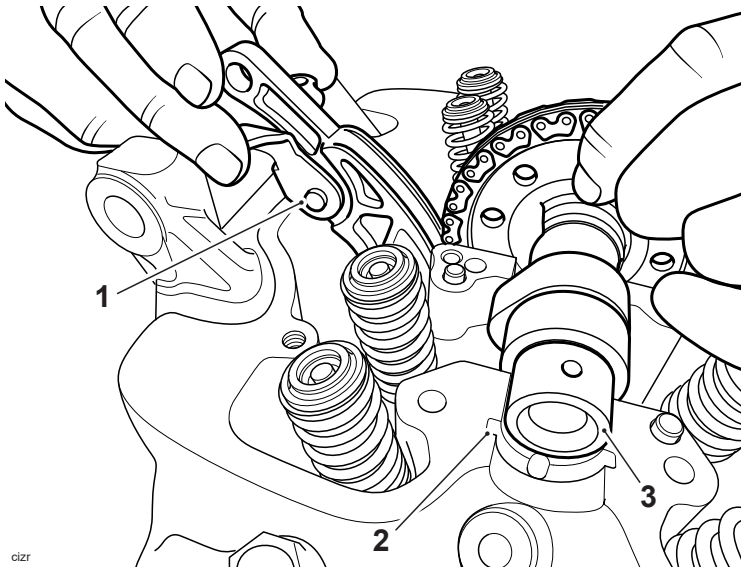
1. If not already installed, install the T3880601 - Camshaft Timing Pin.
2. Thoroughly clean the camshaft and journals. Lubricate the camshaft with clean engine oil before fitting to the cylinder head.

Note

Note

- **Ensure the sprocket fixings are centrally located within the slotted holes of the sprocket.**
- **DO NOT tighten the fixings at this stage; the sprocket must be free to rotate.**

3. If removed, refit the camshaft sprocket noting its orientation, and secure using the original fixings.
4. Locate the camshaft to the cylinder head from the right hand side, hooking the camshaft drive chain over the sprocket.
5. Align the slot in the camshaft end to the upper surface of the cylinder head.
6. Lift the camshaft slightly from the bearing journals, refit the camshaft drive chain tensioner blade. Tighten the new fixings to **10 Nm**.

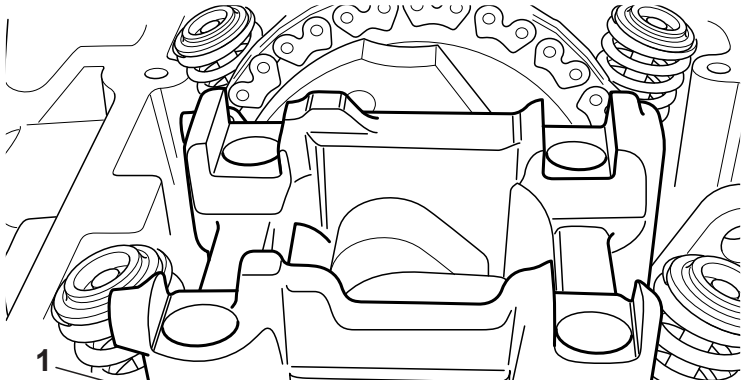


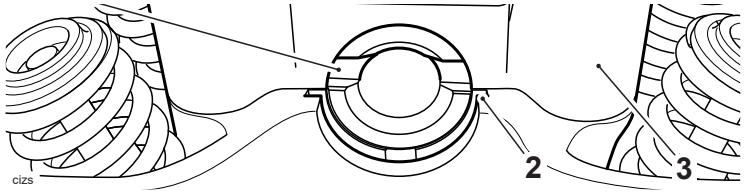
1. **Tensioner blade**
2. **Bearing journal**
3. **Camshaft**

Note

- **It is not necessary to fit the rocker arms at this stage.**

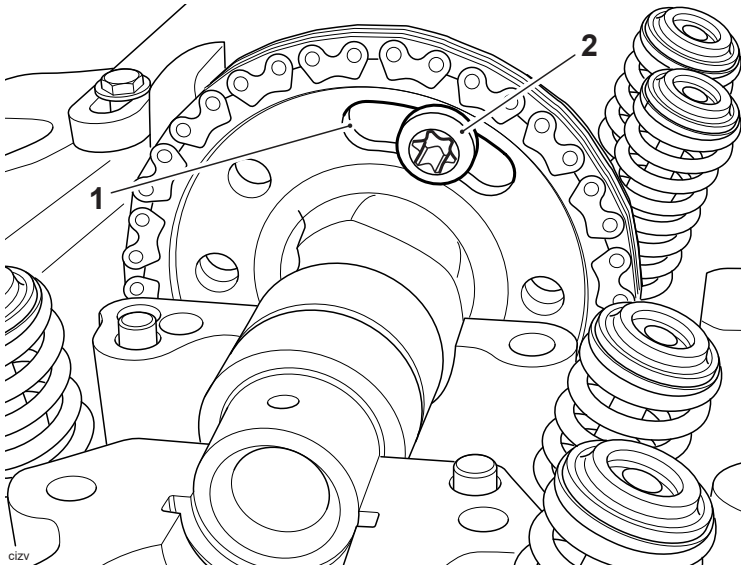
7. Temporarily secure number two cylinder camshaft ladder to the cylinder head with a rocker shaft and one fixing,





1. **Camshaft slot**
2. **Cylinder head**
3. **Camshaft ladder (cylinder two)**

8. Adjust the camshaft sprocket, so that the camshaft chain is taut on the inlet side (rear) of the engine.
9. Ensure there is no slack in the chain between the crankshaft and the sprocket and the sprocket fixings are centrally located within the slotted holes.

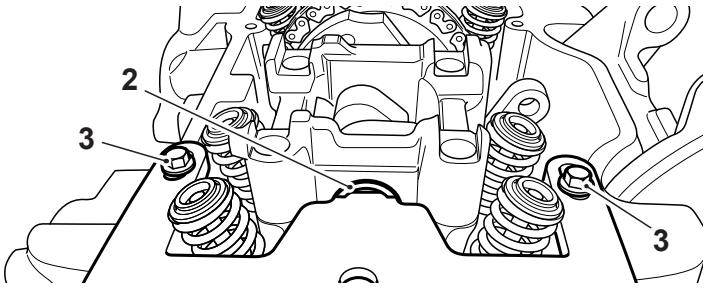


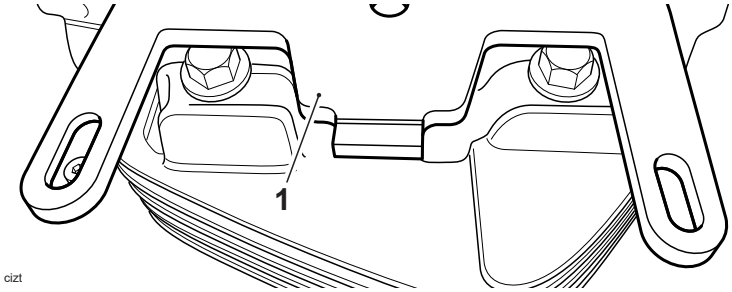
1. **Camshaft slot**
2. **Fixing (one of two on camshaft sprocket)**

Note

- **The T3880650 - Camshaft Timing Plate has two different thickness edges marked A and B. If side A will not slide smoothly into the camshaft slot side use side B.**

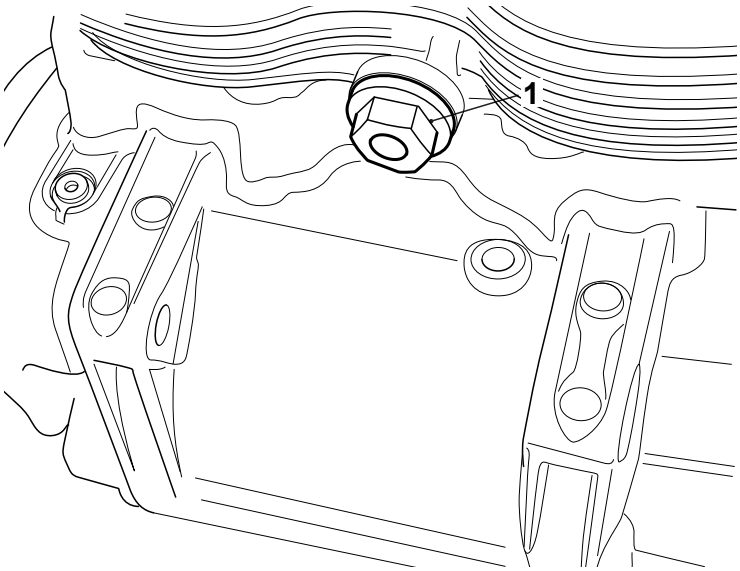
10. Insert the T3880650 - Camshaft Timing Plate into the camshaft slot. Ensure that the tool is centrally located on the cylinder head and secure as shown below.





1. **T3880650 - Camshaft Timing Plate**
2. **Camshaft**
3. **Fixings (6 x 12 mm)**

11. Check that the camshaft drive chain is engaged around the idler gear and the camshaft sprocket is positioned against the tensioner blade.
12. Fit the T3880651 - Timing Chain Tensioner and tighten to **16 Nm**.



1. **T3880651 - Timing Chain Tensioner**

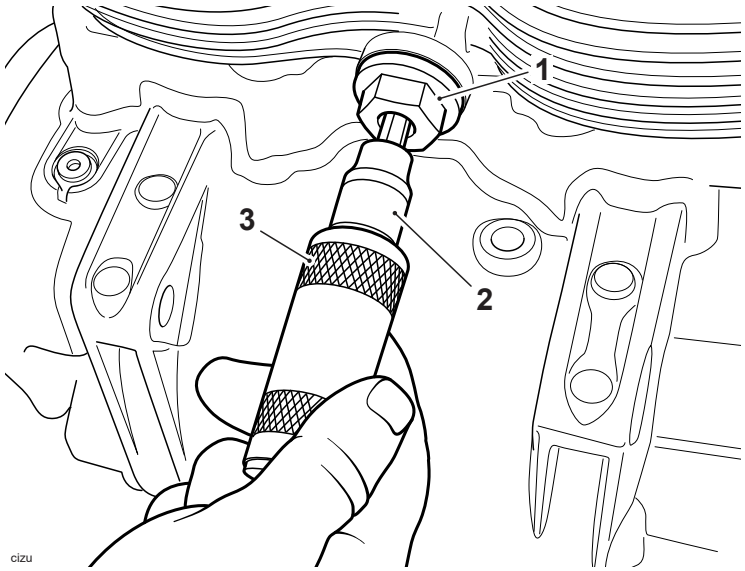
CAUTION

The torque value stated is very important to accurate timing. Always use the correct value of **0.6 Nm**, as set using T3880609 - Timing Torque Limiter. 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.

Note

- **The T3880609 - Timing Torque Limiter is pre-set to 0.6 Nm.**

13. Using the T3880609 - Timing Torque Limiter, tighten the internal screw thread to **0.6 Nm**



1. **T3880651 - Timing Chain Tensioner**
2. **Adaptor**
3. **T3880609 - Timing Torque Limiter**

14. Remove and discard the accessible camshaft sprocket fixing. Install a new encapsulated fixing and tighten to **22 Nm**.
15. Remove the T3880601 - Camshaft Timing Pin.

CAUTION

Always check that the T3880650 - Camshaft Timing Plate has been removed before rotating the engine. Severe damage will result to the camshafts or T3880650 - Camshaft Timing Plate if engine rotation is attempted with the tool installed.

16. Rotate the engine until the remaining sprocket fixing is accessible.
17. Refit the T3880601 - Camshaft Timing Pin.
18. Remove and discard the remaining camshaft sprocket fixing. Install a new encapsulated fixing and tighten to **22 Nm**.
19. Remove T3880601 - Camshaft Timing Pin.

Note

- **With the aid of an assistant, hold the camshaft drive chain taut during removal of the T3880651 - Timing Chain Tensioner.**

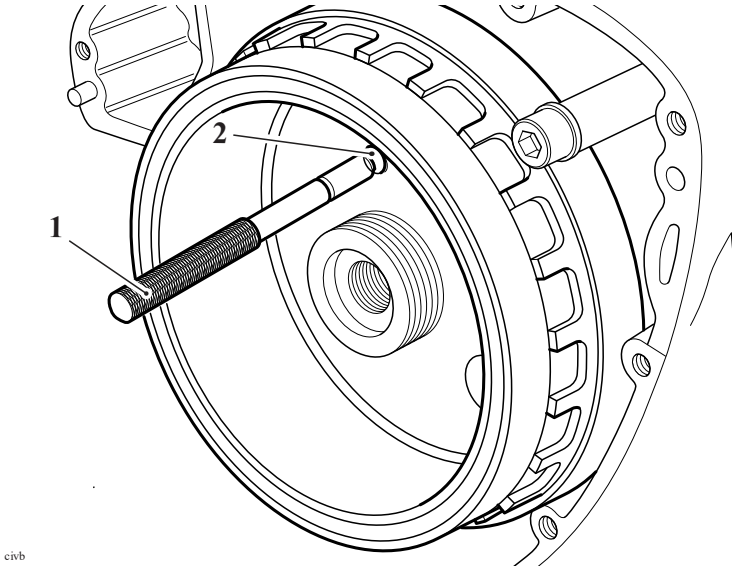
20. Release the tension on the T3880651 - Timing Chain Tensioner.
21. Refit the timing chain tensioner, incorporating two new O-rings (see Camshaft Drive Chain Tensioner - Installation).
22. To activate the tensioner, rotate the crankshaft anticlockwise two complete turns, using the fixing fitted to the end of the crankshaft. Stop rotation when number 1 cylinder is at top dead centre (TDC).

Note

Note

- **Before inserting the timing pin, ensure the slot on the camshaft is aligned with the upper surface of the cylinder head.**

23. Insert the T3880601 - Camshaft Timing Pin into the timing holes in the crankcase and crankshaft.

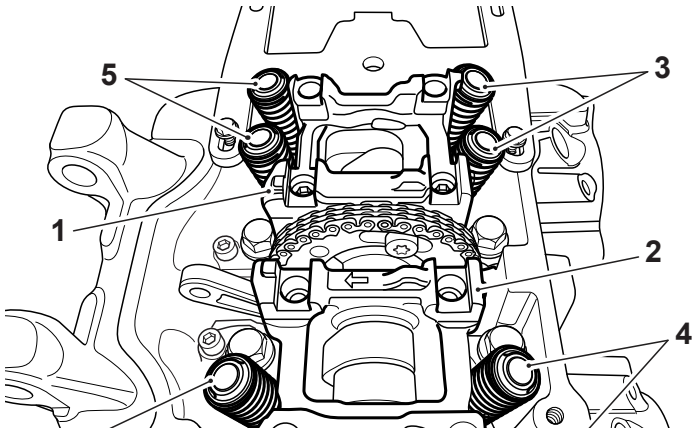


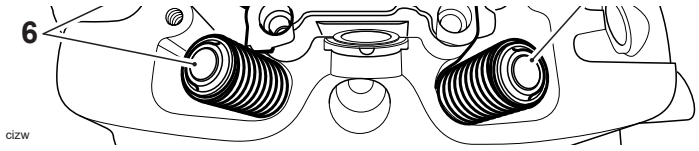
1. **T3880601 - Camshaft Timing Pin**
2. **Timing hole in alternator rotor**

Note

- **The T3880650 - Camshaft Timing Plate has two different thickness edges marked A and B. If side A will not slide smoothly into the camshaft slot side use side B.**

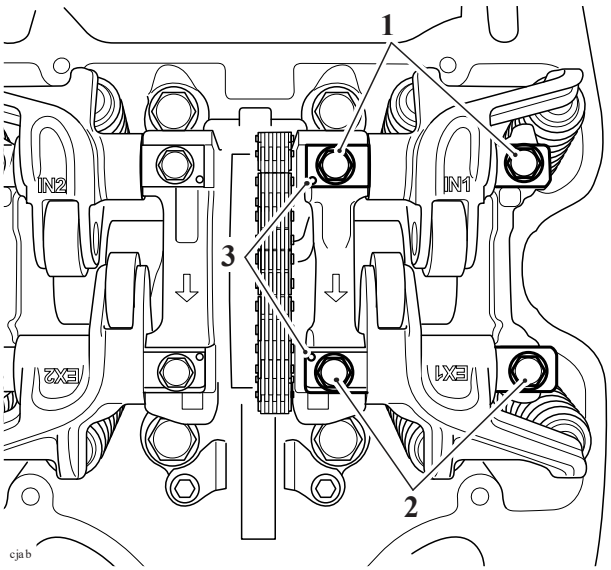
24. Check that the T3880650 - Camshaft Timing Plate fits into the camshaft slot (to check that the camshaft timing has not moved during the removal of the T3880651 - Timing Chain Tensioner.
25. Lubricate the camshaft bearing areas of the camshaft frame with a 50/50 solution of engine oil and molybdenum disulphide grease.
26. Fit the shims to the valves as noted during removal.
27. Position cylinder one camshaft frame to the cylinder head.





1. **Camshaft ladder (cylinder 2)**
2. **Camshaft ladder (cylinder 1**
3. **Shims (cylinder 2 inlet)**
4. **Shims (cylinder1 inlet)**
5. **Shims (cylinder 2 exhaust)**
6. **Shims (cylinder 1 exhaust)**

28. Remove the T3880650 - Camshaft Timing Plate.
29. Remove the T3880601 - Camshaft Timing Pin.
30. Lubricate the threads of the camshaft frame fixings with clean engine oil.
31. Fit the rocker shafts with the dot marks facing upwards and toward the camshaft drive gear.
32. Fit the inlet and exhaust rocker shafts to cylinder number one as shown below. Do not fully tighten at this stage.
33. Finger-tighten the fixings until the under head areas are in contact with the camshaft frame.



1. **Fixings (inlet rocker shaft)**
2. **Fixings (exhaust rocker shaft)**
3. **Dot mark**

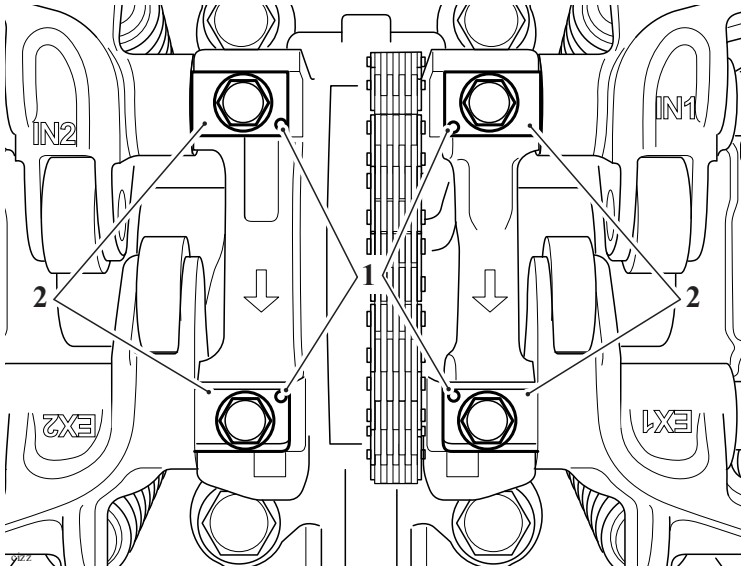
34. Remove the fixing and rocker shaft from cylinder number two camshaft frame.
35. Lubricate the threads of the camshaft frame fixings with clean engine oil.

Note

Note

- **The rocker shaft must be fitted with the dot marks facing upwards and toward the camshaft drive gear.**

36. Fit the inlet and exhaust rockers and shafts to cylinder number two. Do not fully tighten at this stage.



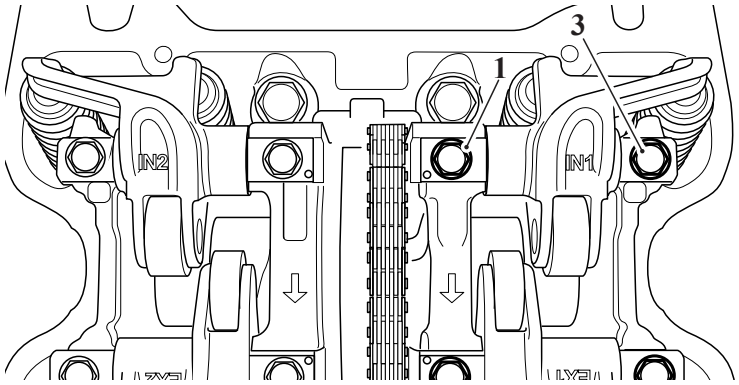
1. **Dot mark**
2. **Rocker shaft**

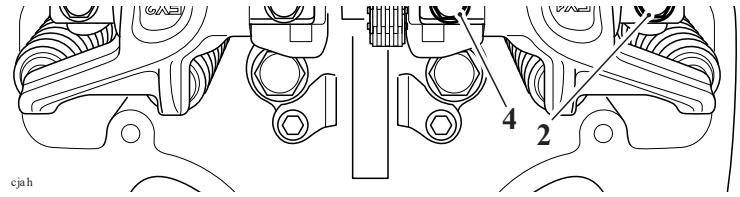
37. Tighten the fixings hand tight until the rocker shafts are in contact with the camshaft frame.

CAUTION

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

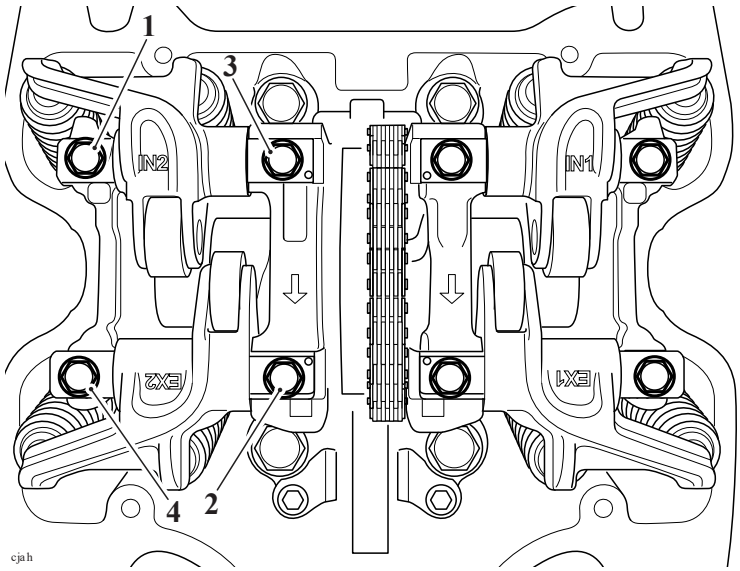
38. In the sequence shown below,
    - Tighten cylinder one camshaft frame fixings to **5 Nm**.
    - Tighten cylinder one camshaft frame fixings to **12 Nm**.





Cylinder One Camshaft Frame Tightening Sequence

- Tighten cylinder two camshaft frame fixings to **5 Nm**.
- Tighten cylinder two camshaft frame fixings to **12 Nm**.



Cylinder Two Camshaft Frame Tightening Sequence

CAUTION

If any components have been renewed, the valve clearances must be checked and adjusted. Running with incorrectly adjusted valve clearances may cause excess engine noise, rough running and engine damage.

39. Check all of the valve clearances and adjust as necessary until the correct clearances are achieved (see Valve Clearance Adjustment).

Perform the following operations:

- Alternator Cover - Installation
- Camshaft Cover - Installation
- Ignition Coils - Installation
- Fuel Tank - Installation
- Battery - Installation
- Seat - Installation

Valve Clearance

Valve Clearance Adjustment

Cylinder Head - Removal

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

Note

- **Valve clearance adjustment must be carried out with the engine cold.**
- **When replacing a valve shim, always refer to the EPC.**
- For valve clearance specifications (see 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.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal

Note

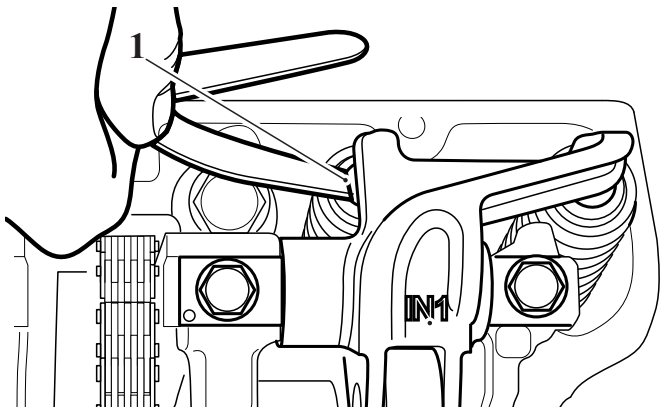
- **Valve clearance checking and adjustment must be carried out with the engine cold.**

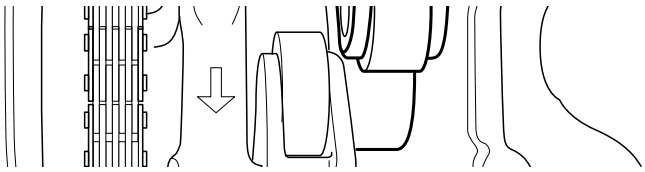
1. Remove the camshaft cover (see Camshaft Cover - Removal).

Note

- **Removing the spark plugs reduces compression therefore allowing the engine to be rotated freely.**

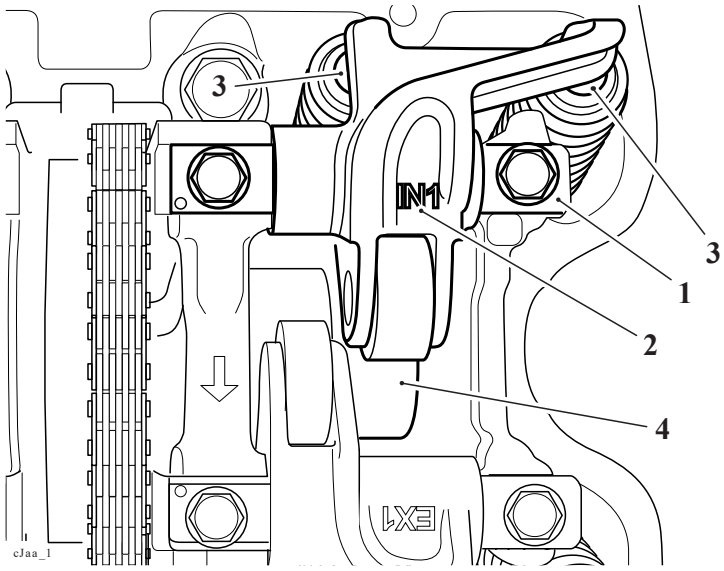
2. Remove the spark plugs.
3. Select a high gear and, using the rear wheel, rotate the engine until a camshaft lobe is positioned pointing directly away from the roller on the rocker shaft.
4. Using feeler gauges, measure and record the clearances for this pair of valves only.





1. **Feeler gauges**

5. Measure and record all valve clearances as described previously.
6. Release the two rocker shaft retaining bolts and remove the rocker shaft and rocker arm of a valve that requires adjustment.

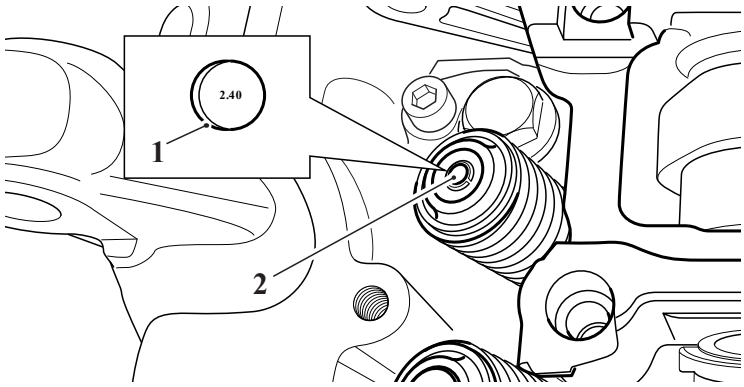


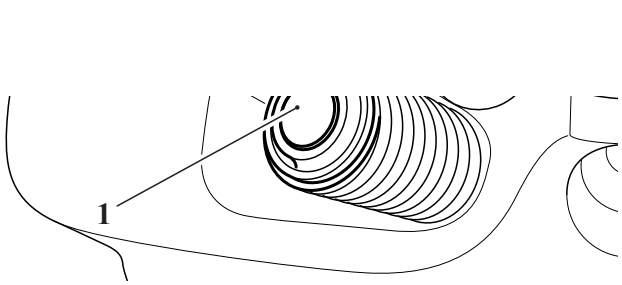
1. **Rocker shaft**
2. **Rocker arm**
3. **Shims (cylinder 1 inlet shown)**
4. **Camshaft**

Note

- **The underside of the shim displays the shim size.**
- **Always place the shim with the shim size facing towards the valve.**

7. Remove the shim from the valve(s) that requires adjustment.





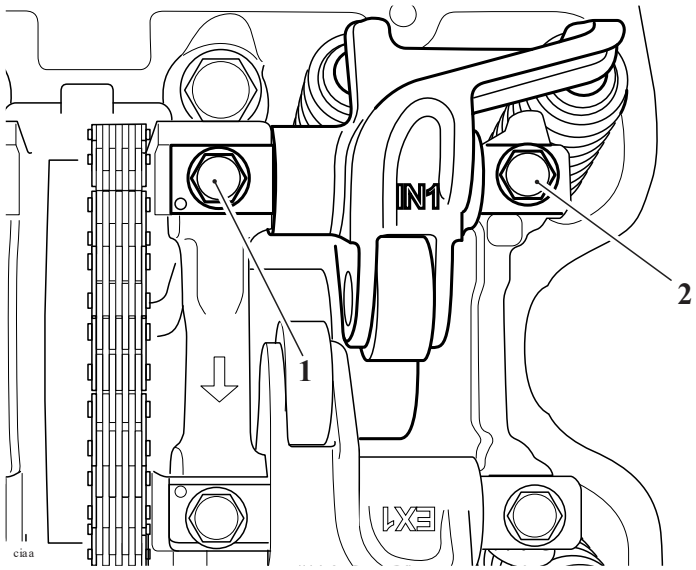
1. **Shim**
2. **Valve**

8. Measure the original shim, using a micrometer.
9. Calculate the shim thickness required to give the correct clearance, for specifications refer toCylinder Head and Valves.
   - Clearance too small - Fit a thinner shim.
   - Clearance too large - Fit a thicker shim.

Note

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

10. Fit the selected shim to the valve.
11. Refit the rocker arm and shaft, tighten the bolts in the sequence shown below to **10 Nm**.



Rocker Shaft Tightening Sequence

12. Repeat the procedure until all valves requiring adjustment have been correctly set.
13. Rotate the engine several times to fully seat the shims.
14. Repeat the clearance checks on all valves, adjust as necessary.
15. Refit the camshaft cover (see Camshaft Cover - Installation).

Perform the following operations:

- Fuel Tank - Installation
- Battery - Installation
- Seat - Installation

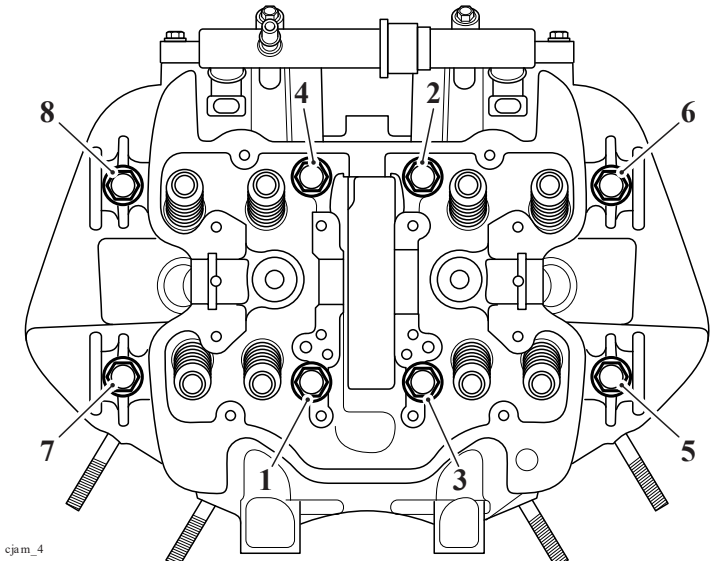
WARNING

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.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal
- Engine - Removal
- Camshaft Cover - Removal
- Camshaft - Removal

1. Noting their position and the thickness of the shims, remove all eight shims from the cylinder head.
2. Progressively release the cylinder head bolts in the order shown below.



Cylinder Head Bolt Release Sequence

3. Remove the cylinder head bolts, retain the washers and discard the cylinder head bolts.

Note

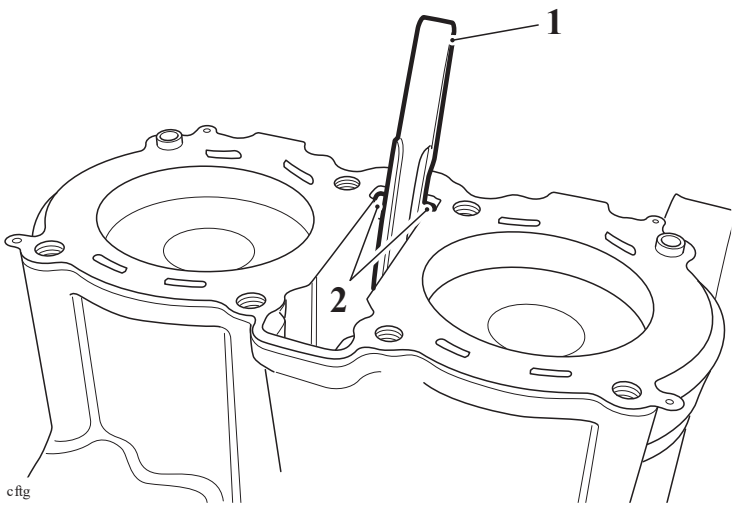
- **If necessary, lightly tap the cylinder head with a soft-faced mallet to break the gasket seal.**

4. Remove the cylinder head from the crankcase.
5. Remove and discard the cylinder head gasket.

Note

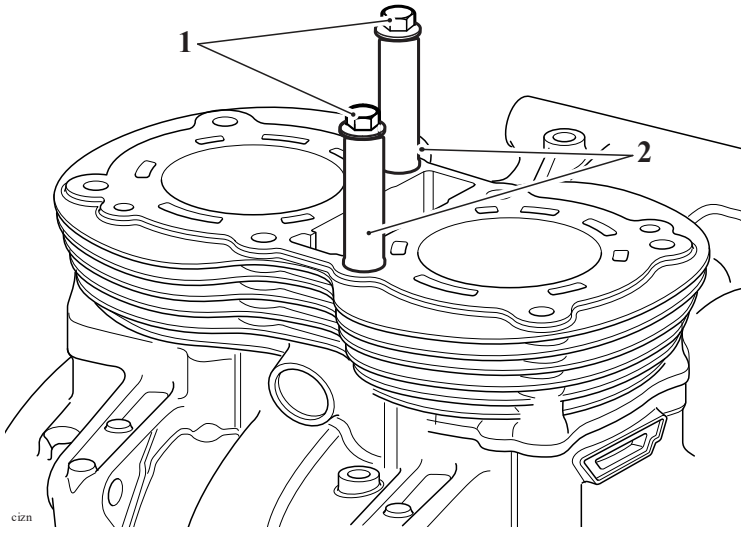
- **Note the position of the camshaft drive chain rubbing blade upper mounting for installation.**

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



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

7. Using T3880308 - Cylinder Barrel Clamps and two of the cylinder head bolts, hold the cylinder barrel in position.

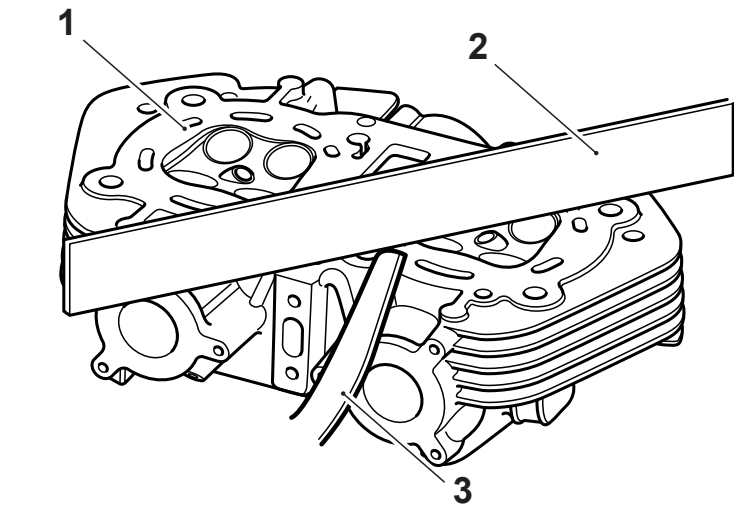


1. **Cylinder head bolts**
2. **T3880308 - Cylinder Barrel Clamps**

Cylinder Head - Inspection

1. Thoroughly clean the surface of the cylinder head and check for damage and/or pitting of the combustion chambers.
2. Using a straight edge and feeler gauges, check the cylinder head face for warp, which

could lead to gasket failure. Replace the cylinder head if warped beyond the flatness limit.



cizq

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

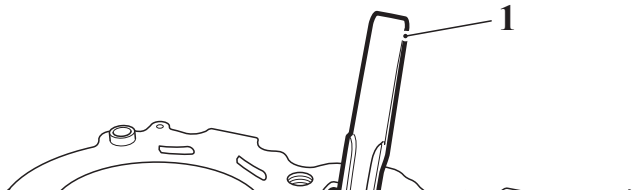
3. For specifications refer to (Cylinder Head and Valves).
4. Inspect the valve guides for damage or wear.
5. If a valve guide is found to be worn beyond the service limit, the complete cylinder head must be renewed.
6. For specifications refer to (Cylinder Head and Valves).
7. Check the camshaft drive chain rubbing blades. Renew if worn or damaged.

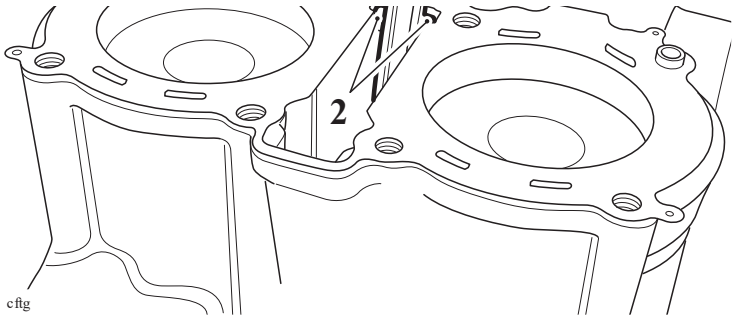
CAUTION

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

Cylinder Head - Installation

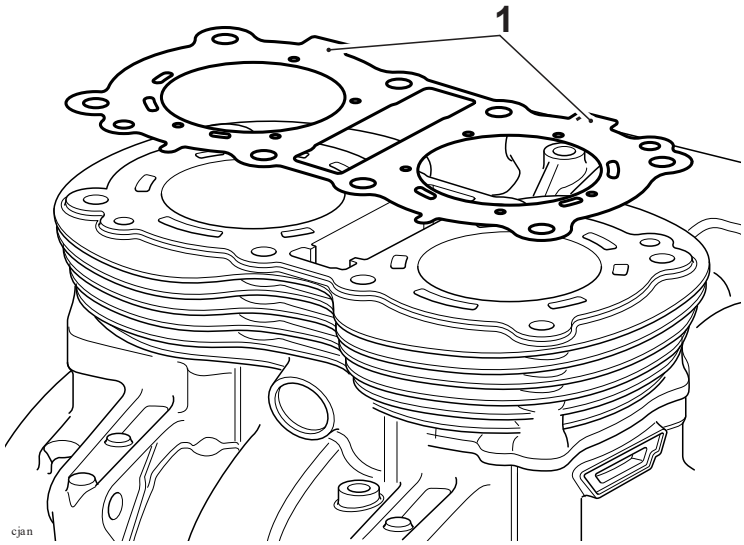
1. Thoroughly clean the upper faces of the cylinder barrel.
2. Refit the camshaft drive chain rubbing blade. Ensure the lower mounting tip is correctly located in the upper crankcase and the lugs are located in the barrel as noted during removal.





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

3. Ensure that both cylinder head dowels are correctly located in the cylinder barrel.
4. Position a new cylinder head gasket to the cylinder barrel, ensuring the gasket is fitted with the lettering uppermost and to the rear of the engine.



1. **Head gasket markings**

Note

- **Ensure the drive chain is fitted to the idler gear and located centrally on the tensioner blade.**

5. Position the cylinder head over the camshaft drive chain rubbing blade and locate it onto the dowels.
6. Position the washers onto the new cylinder head bolts and lubricate the bolt threads with clean engine oil.

CAUTION

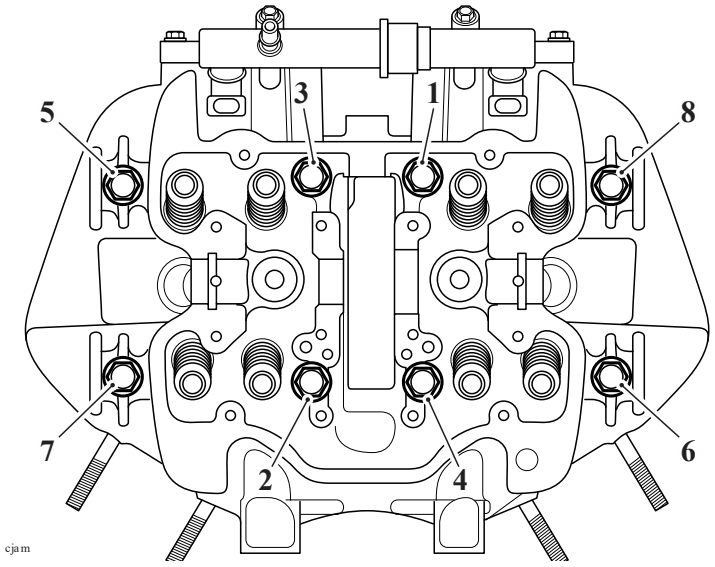
Use the correct procedure to tighten the cylinder head bolts carefully following the four-stage procedure below. This will ensure the long-term reliability of the cylinder head

CAUTION

gasket.

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

7. In the following sequence, tighten the cylinder new head bolts in four stages as follows:
   - Tighten the bolts to **20 Nm**.
   - Tighten the bolts to **30 Nm**.
   - Tighten the bolts through a further 150° using T3880105 - Torque Angle Gauge or similar to measure the torque-angle.
   - Carry out a torque over-check of the bolts to **60 Nm**.



Tightening Sequence

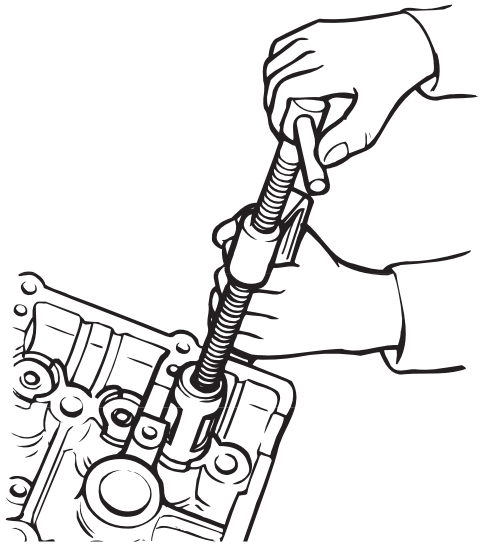
8. Lubricate the valve shims with a 50/50 solution of molybdenum disulphide grease and engine oil, then refit them to their original locations in the cylinder head.

Perform the following operations:

- Camshaft - Installation
- Valve Clearance Adjustment
- Camshaft Cover - Installation
- Engine - Installation
- Fuel Tank - Installation
- Battery - Installation
- Seat - Installation
- Start the engine and allow it to idle while checking for air, oil, coolant and exhaust leaks.
- Rectify as necessary.

Valves and Valve Stem Seals - Removal

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



Valve removal

2. Once the collets are released, remove the following items:
   - Valve spring retainer
   - Valve spring
   - Valve spring base
   - Valve stem oil seal
   - Valve (deburr before removal).

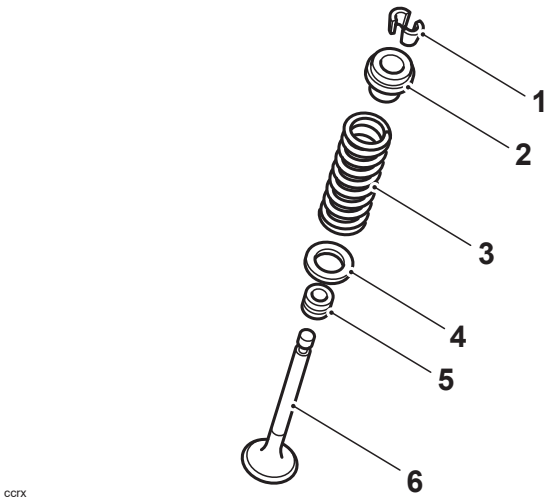


1. Valve stem seal

Note

Note

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



1. **Collets**
2. **Valve spring retainer**
3. **Valve spring**
4. **Valve spring base**
5. **Valve stem oil seal**
6. **Valve**

Valves and Valve Stem Seals - Installation

1. Lubricate the valve stems with a 50/50 solution of engine oil and molybdenum disulphide grease.
2. Install the valve into the valve guide and refit the spring base to the valve spring recess in the head.
3. Fit the valve stem seal over the valve stem and, using a suitable tool, press down fully until the seal is correctly seated over the valve guide.

Note

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

⚠ CAUTION

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.

1. Install the valve spring over the valve stem. Ensure the close wound, colour coded ends of the springs are fitted downwards (towards the piston).
2. Fit the valve spring retainer.
3. Compress the valve spring ensuring that the spring is compressed squarely to prevent damage to the valve stem and cylinder head.
4. 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.

Valve Face Inspection

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

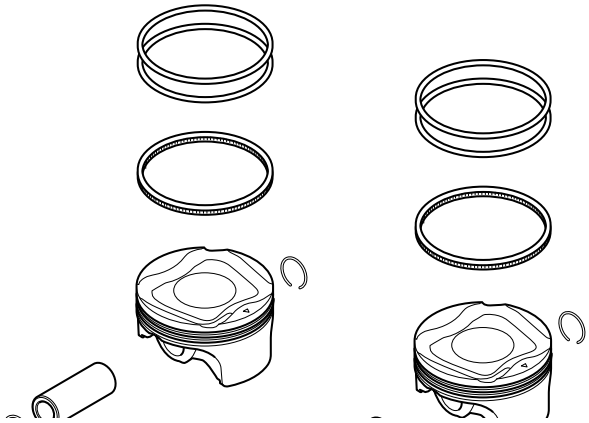
Valve Stems

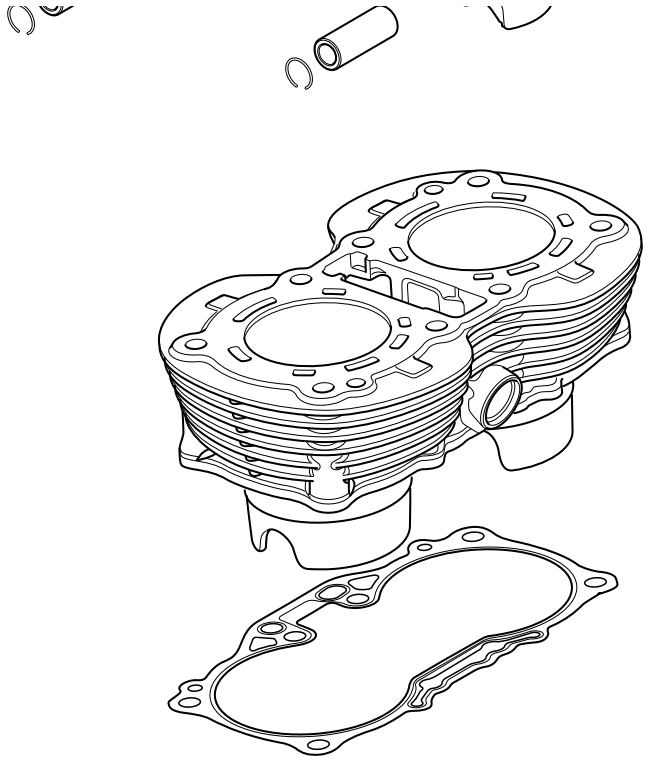
If a valve stem is found to be worn beyond the service limit, the valve must be renewed.

Refer to Cylinder Head and Valves.

Barrels and Pistons

Exploded View - Barrels and Pistons





Barrels - 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.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal
- Engine - Removal
- Alternator Cover - Removal
- Camshaft Cover - Removal
- Cylinder Head - Removal

1. Clean the area around the barrel base gasket joint to prevent dirt falling into the crankcase when the barrels are removed.
2. Ensure the pistons are level with each other then break the seal of the base gasket joint.

CAUTION

Do not strike or lever against the barrel cooling fins to break the seal as the fins are easily damaged.

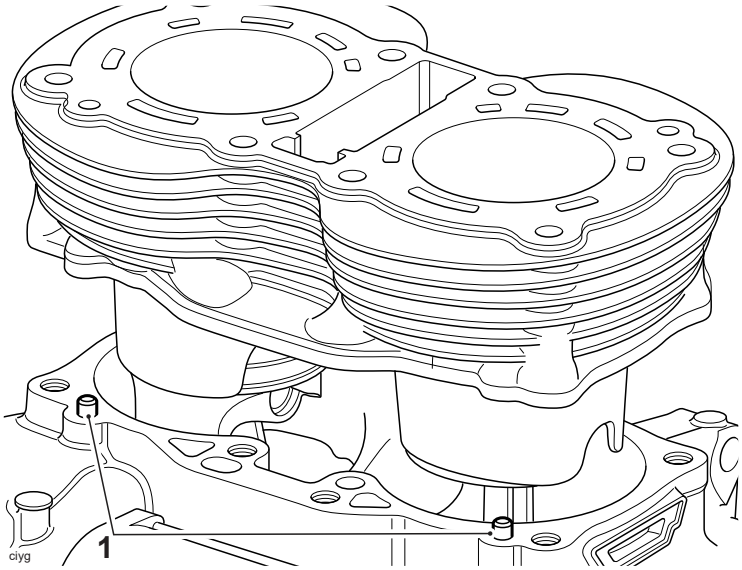
Note

- **Secure the camshaft drive chain to ensure that it does not fall into the crankcase during removal of the barrels.**

⚠ CAUTION

Support the pistons as the barrels are removed to prevent piston damage.

3. Lift off the barrels and recover the locating dowels.



1. Locating dowels

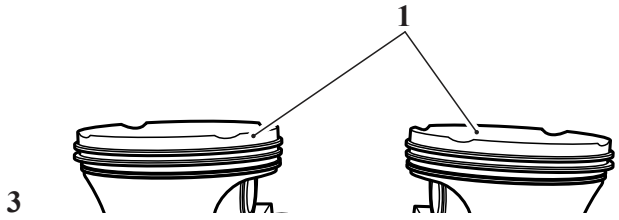
4. Remove and discard the base gasket.

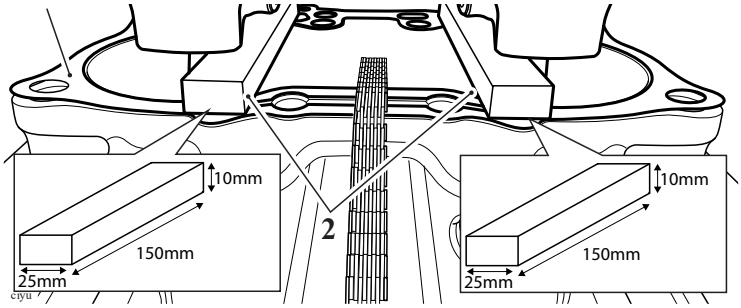
Barrels - Inspection

1. The cylinder barrels are not measurable in service, (see Piston Specifications - 1200).

Barrels - Installation

1. Thoroughly clean the mating surfaces of the crankcase and barrels taking care not to damage the mating surfaces.
2. Fit a new base gasket and refit the locating dowels as noted during removal.
3. Using suitable spacers to support the pistons whilst preventing contact with the crankcase, rotate the crankshaft to position the pistons level with each other.





1. **Pistons**
2. **Spacer**
3. **Crankcase**

CAUTION

Do not allow the pistons to fall against the crankcase when turning the engine. Piston and/or crankcase damage could occur if the pistons are not supported while turning the engine.

4. Ensure the piston ring end gaps are correctly positioned (see Piston Rings - Assembly).

Note

- **Ensure the barrels and pistons are clean prior to installation.**

5. Lubricate the piston rings and the cylinder bores with clean engine oil.

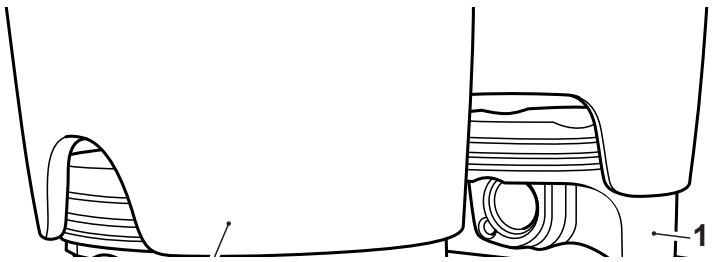
CAUTION

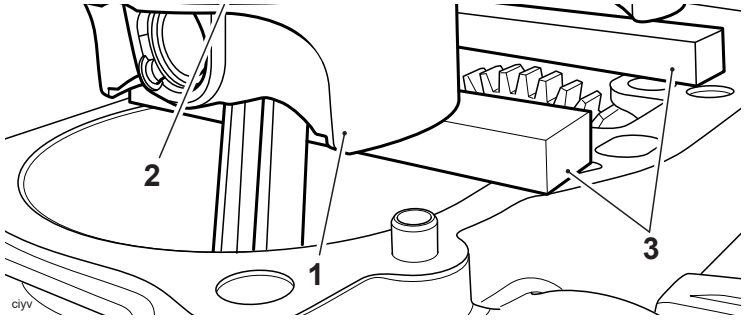
Do not allow the full weight of the barrels to rest unsupported on the pistons. Failure to support the barrels may result in piston ring breakage.

CAUTION

Do not force the pistons into their bores. The base of each bore is chamfered to ease installation and excess force should not be needed. If either piston jams, lift the barrels slightly and check the rings are correctly located into their grooves before continuing. The use of force may result in piston ring breakage.

6. With the aid of an assistant, ease the barrels carefully over the pistons whilst guiding the piston rings into the base of the cylinder bores.





1. **Piston**
2. **Barrel**
3. **Spacer**

7. Slide the barrels fully down, remove the spacers and locate on the dowels.
8. Refit the cylinder head (see Cylinder Head - Installation).
9. Refit the camshafts (see page Camshaft - Installation).
10. Recheck the tensioner plunger location against the camshaft drive chain tensioner blade.
11. Remove T3880039 - Idler Gear Timing Pin from the crankcase.
12. Refit the camshaft cover (see Camshaft Cover - Installation).

Perform the following operations:

- Alternator Cover - Installation
- Engine - Installation
- Fuel Tank - Installation
- Battery - Installation
- Seat - Installation

Piston - 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.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal
- Barrels - Removal

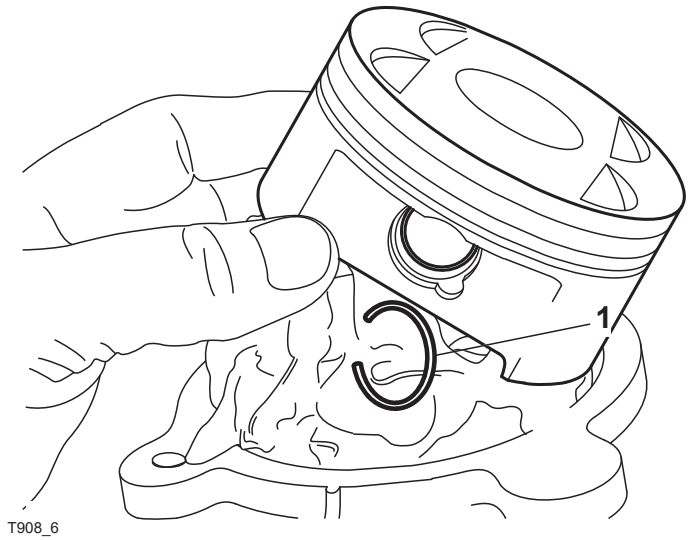
Note

- **If both pistons are being removed, mark each piston to ensure it is refitted in its original location.**

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

CAUTION

If a circlip is dropped into the crankcase, it must be recovered before the crankshaft is rotated. Failure to do so will result in serious engine damage.



1. Circlip

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

CAUTION

Never force the gudgeon pin through the piston. This may cause damage to the piston which may also damage the cylinder barrel 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.**

3. Remove the remaining circlip from the piston and discard it.
4. Remove the piston rings.

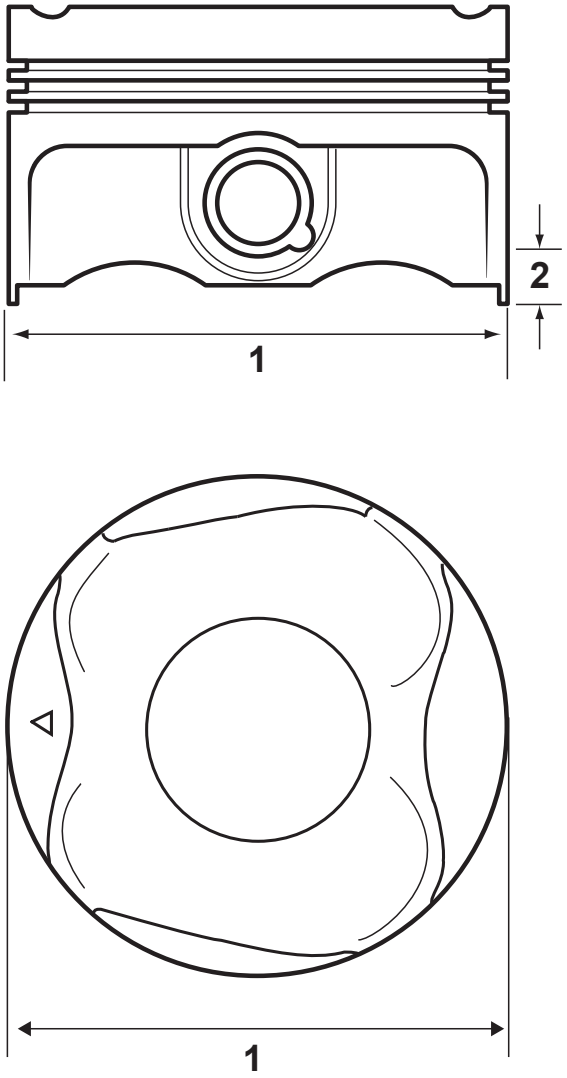
Note

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

Piston - Wear Check

1. Remove any carbon build-up from the piston crown. Inspect the piston crown for signs of pitting and check the piston skirt and ring grooves for signs of wear or scuffing. If any sign of damage is found, renew the piston.

2. Measure the piston outside diameter 10 mm +/- 3 mm from the bottom of the piston and at 90° to the direction of the gudgeon pin.



1. **Piston outside diameter**
2. **Measurement point**

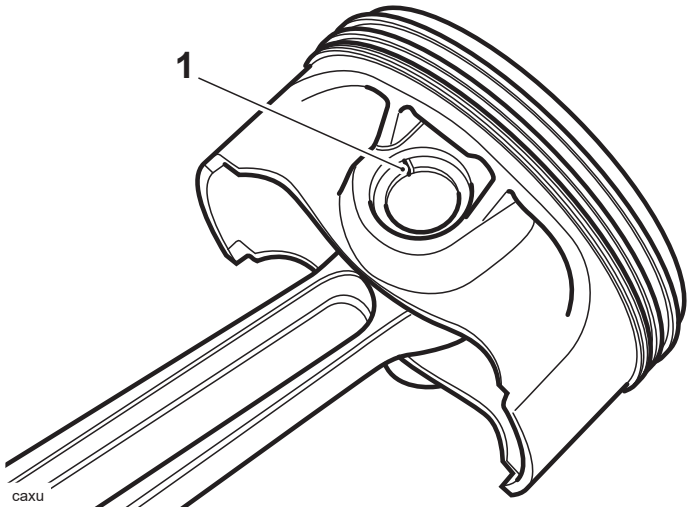
3. Always refer to the specifications table (see Piston).
4. Replace the piston and rings if outside the specified limit.

Piston - Installation

1. Fit a new circlip to the inside of the piston. Ensure the circlip is correctly located in the piston groove.

WARNING

Failure to use new gudgeon pin circlips could allow the pin to detach from the piston. This could seize the engine resulting in loss of motorcycle control and an accident.



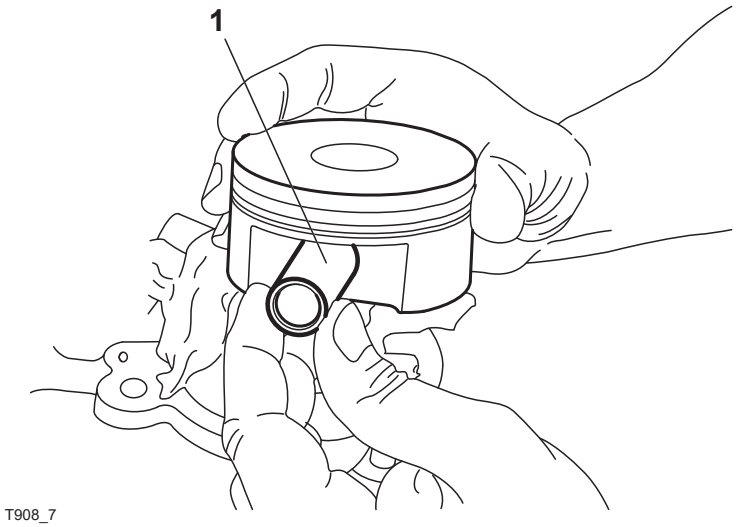
1. **Circlip Fitment**

2. Lubricate the connecting rod small-end and gudgeon pin with clean engine oil.
3. Align the piston with the connecting rod, ensuring the triangular mark on the piston crown is facing towards the front of the engine.

Note

- **If the original pistons are being refitted, ensure they are fitted in their original locations.**

4. Insert the gudgeon pin into the piston and push it fully into position.



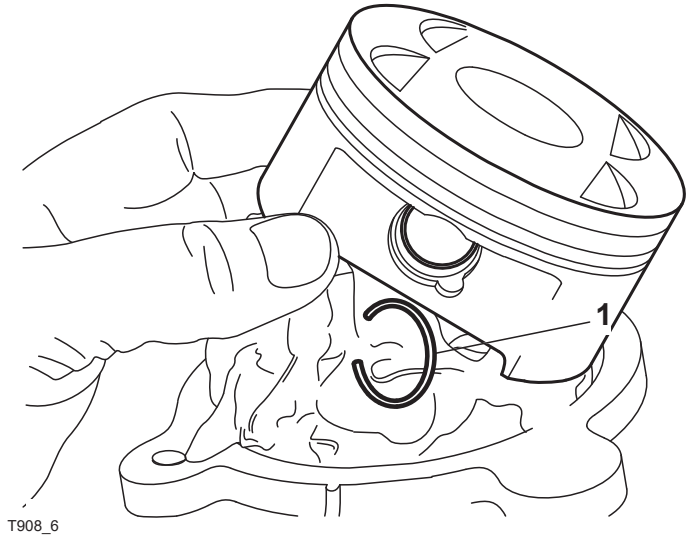
Gudgeon Pin

5. Secure the gudgeon pin in position with the remaining new circlip. Ensure the circlip is correctly located in the piston groove.

CAUTION

CAUTION

If a circlip is dropped into the crankcase, it must be recovered before the crankshaft is rotated. Failure to do so will result in serious engine damage.



1. **Circlip**

CAUTION

Do not allow the pistons to fall against the crankcase when turning the engine. Piston and/or crankcase damage could occur if the pistons are not supported while turning the engine.

6. Install the remaining piston.

Perform the following operations:

- Barrels - Installation
- Fuel Tank - Installation
- Battery - Installation
- Seat - Installation

Piston Ring to Groove - Clearance

Note

- **Prior to removing the rings, check the ring-to-groove clearance of each compression ring.**

1. With the piston rings correctly installed on the piston, check the ring-to-groove clearance of each compression ring, using a feeler gauge.



Piston Ring-to-Groove Clearance Check

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

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 Rings - Removal

⚠ CAUTION

Do not expand the piston rings any more than is necessary to allow them to be removed from the piston. The rings are brittle and will break if expanded too much.

1. Ease the top compression ring out of its groove and remove it from the top of the piston.
2. Remove the second compression ring in the same way.

Note

- **The top and second compression rings are different and are not interchangeable (see Piston Rings - Assembly).**
- **Piston rings must be removed from the piston using hand pressure only. Do not overextend the piston rings during removal.**
- **If the piston rings are to be reused, note the orientation of the oil control rings prior to removal.**

3. Remove the oil control rings and expanders.

Note

- **If the piston rings are to be reused, keep them with their respective piston to ensure they are refitted in their original locations.**

Piston Ring - End Gap

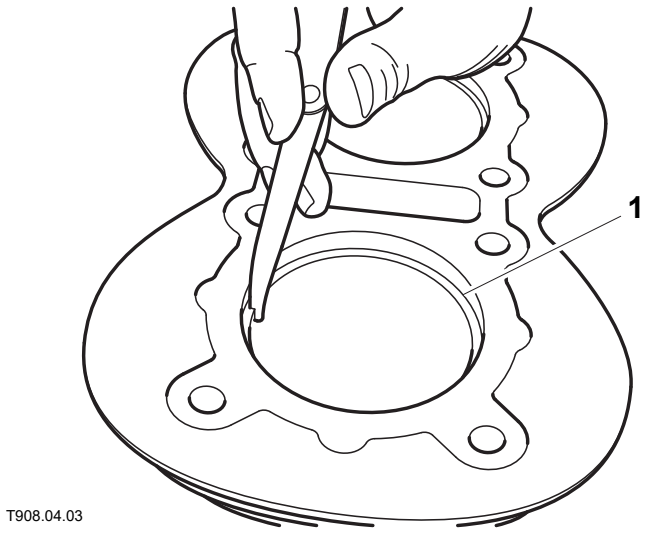
1. Check each piston ring end gap as follows.

Note

- **The piston ring end gap must be measured in the cylinder bore to which the piston ring will be fitted to on installation.**
- **Ensure all piston rings are fitted in their original locations (if original rings are being reused) or to the piston/bore which the end gaps were checked (if new rings are being installed).**

2.

- Position the piston ring into the top of the cylinder bore.
- Using the piston crown, push the piston ring down into the bore (the piston will keep the piston ring square) until the third groove of the piston is level with the top of the bore.
- Remove the piston and measure the gap between the ends of the piston ring, using a feeler gauge.



1. Checking piston ring end gap

3. When checking the piston ring end gap, always refer to the specifications table (see Piston).

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 barrels must be replaced.**
- **If the gap is too small, check the cylinder bore for distortion, replacing as necessary.**
- **Do not file the piston rings.**

4. Repeat the procedure for the remaining piston rings.

Piston Rings - Assembly

1. Ensure the piston ring grooves are clean.

Note

- **Ensure all piston rings are fitted in their original locations (if original rings are being reused) or to the piston/bore which the end gaps were checked (if new rings are being fitted).**

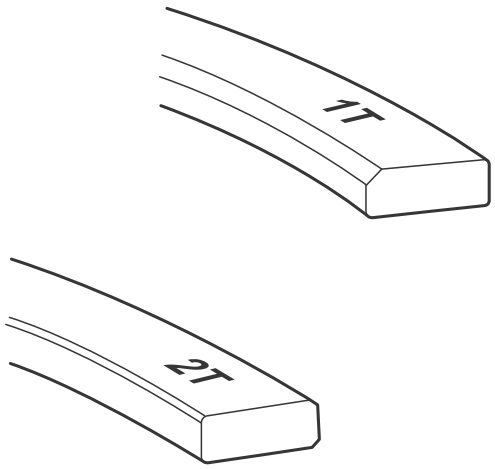
CAUTION

Do not expand the piston rings any more than is necessary to allow them to be installed on the piston. The rings are brittle and will break if expanded too much.

2. Fit the oil control ring expander to the piston then install the upper and lower control rings (the oil control rings are both the same and can be fitted either way up).
3. Fit the second compression ring carefully to the piston, ensuring its **2T** mark is facing upwards.
4. Fit the top compression ring to the piston ensuring its **1T** mark is facing upwards.

Note

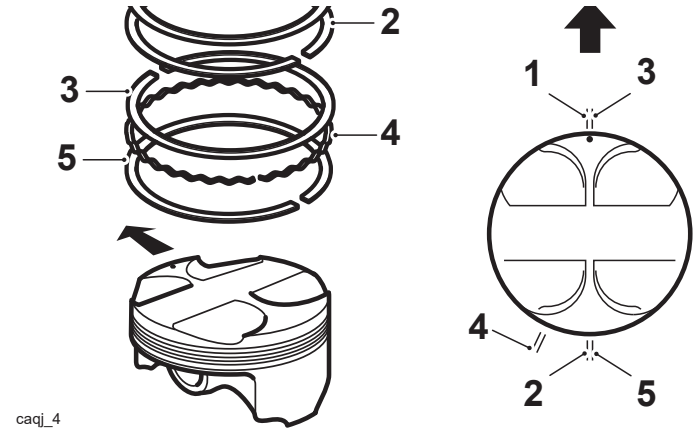
- **Ensure the second and top compression rings are correctly installed.**
- **The second and top compression rings are different and are not interchangeable.**
- **The top ring can be identified by the chamfer on its upper inside edge.**
- **The second ring has no chamfer.**



Piston Ring Identification

5. Ensure all piston rings move freely in their grooves.
6. Position the piston ring end gaps as follows (piston viewed from above, triangular mark facing forwards).





Piston Ring End Gap Locations

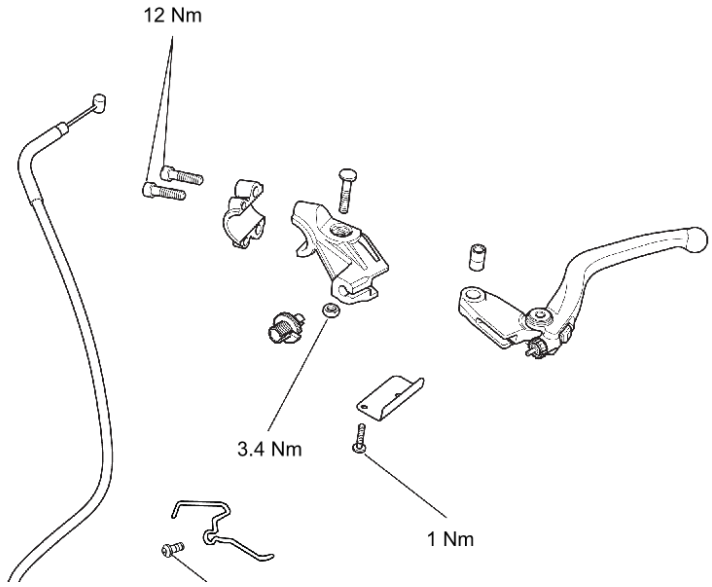
1. **Top ring**
2. **Second ring**
3. **First steel oil control ring**
4. **Oil control ring expander**
5. **Second steel oil control ring**

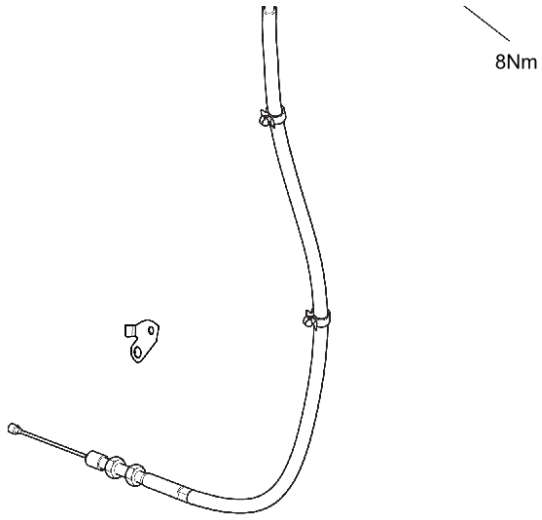
Note

- **The top compression ring gap should be in the 12 o'clock position.**
- **The second compression ring gap should be in the 6 o'clock position.**
- **The first oil control ring gap should be in the 12 o'clock position.**
- **The second oil control ring gap should be in the 6 o'clock position.**
- **The oil control ring expander gap should be in the 7 o'clock position.**

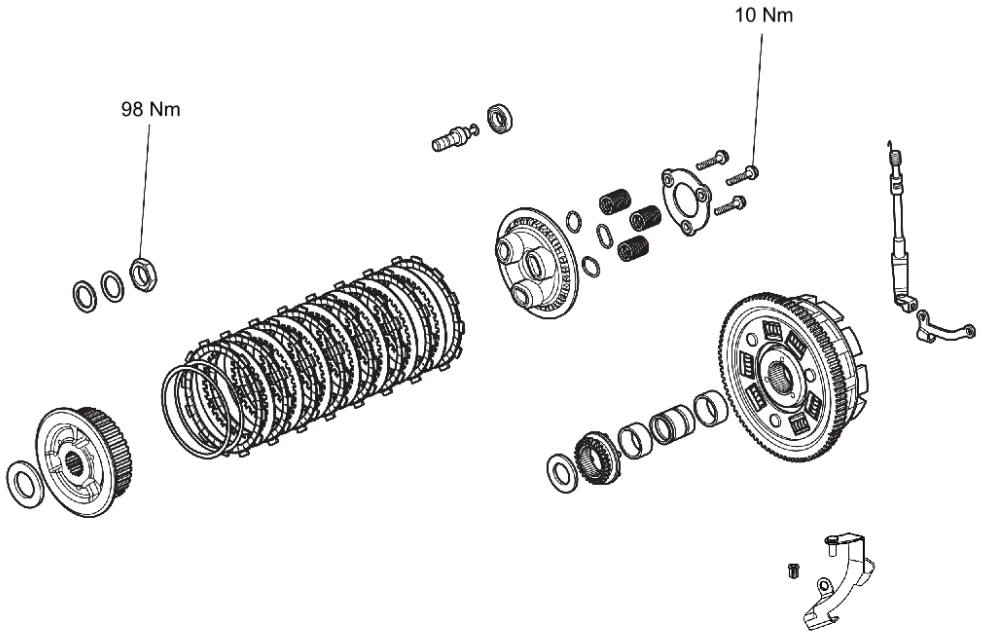
Clutch

Exploded View – Clutch Controls





Exploded View – Clutch



Clutch Cable - Removal

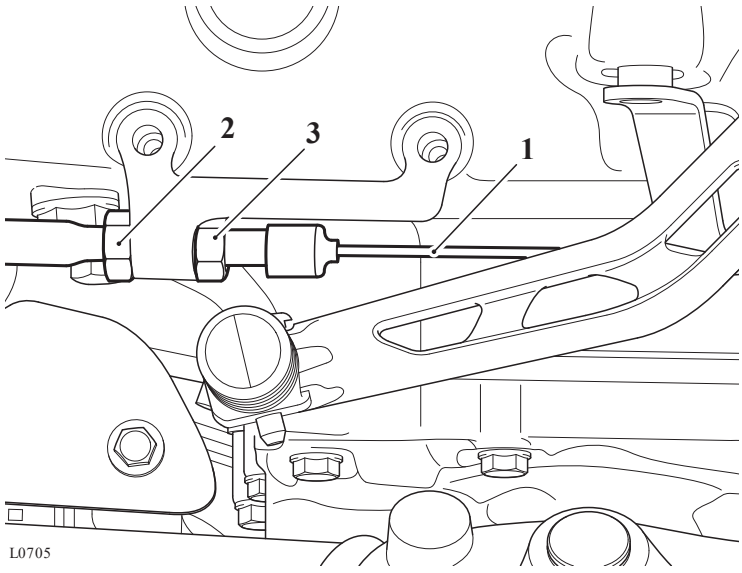
WARNING

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

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal

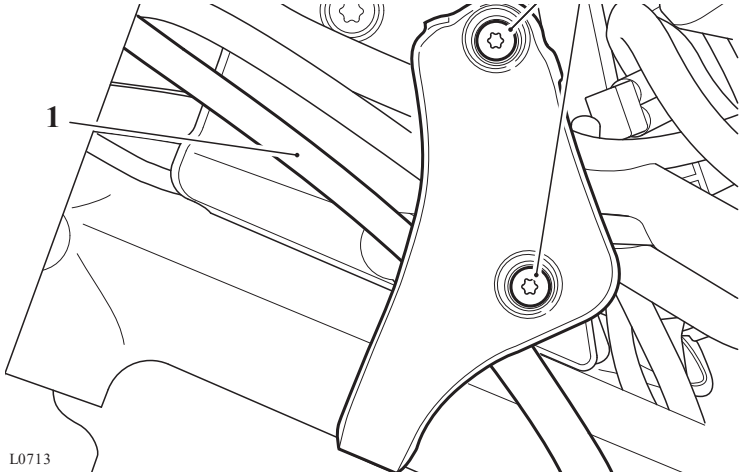
1. Loosen the cable lock nut and release the adjuster at the clutch cover end to give maximum play in the cable.



1. **Clutch cable**
2. **Adjuster nut**
3. **Lock nut**

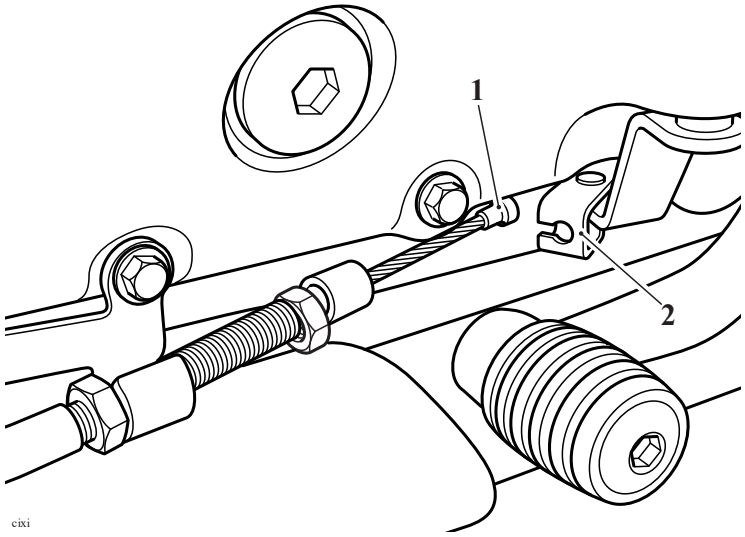
2. From the left hand side of the headstock, remove the cable retaining bracket and discard its fixings.





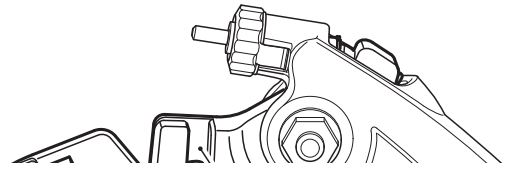
1. **Clutch cable**
2. **Fixings**

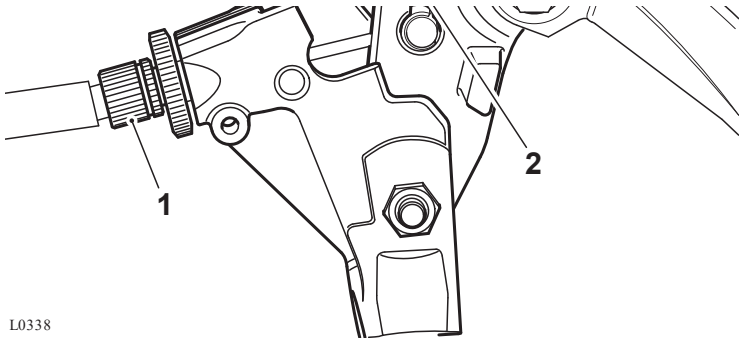
3. Detach the inner clutch cable from the boss on the clutch actuating arm.



1. **Clutch cable**
2. **Boss**

4. Detach the cable retaining guides from the frame down tube.
5. Align the cable adjuster and lever bracket slots.
6. Pull in the clutch lever and turn the inner cable adjuster anticlockwise through the lock nut, until the cable can be detached from the lever.





1. **Cable adjuster/lever bracket slots**
2. **Cable release point**

Note

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

7. Noting the cable routing and retaining guides, remove the cable from the motorcycle

Clutch Cable - Inspection

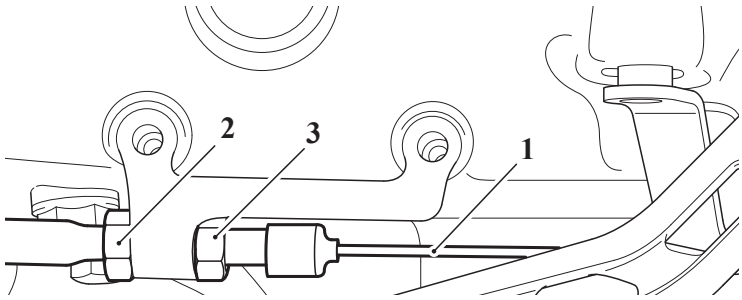
Clutch Cable - Installation

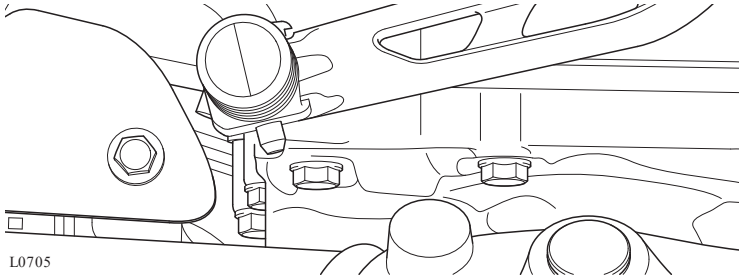
1. Check the inner cable for free movement through the outer cable.
2. Examine the inner cable for frayed strands.
3. Examine the two inner cable nipples for signs of looseness and damage. Replace the cable if necessary.

WARNING

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

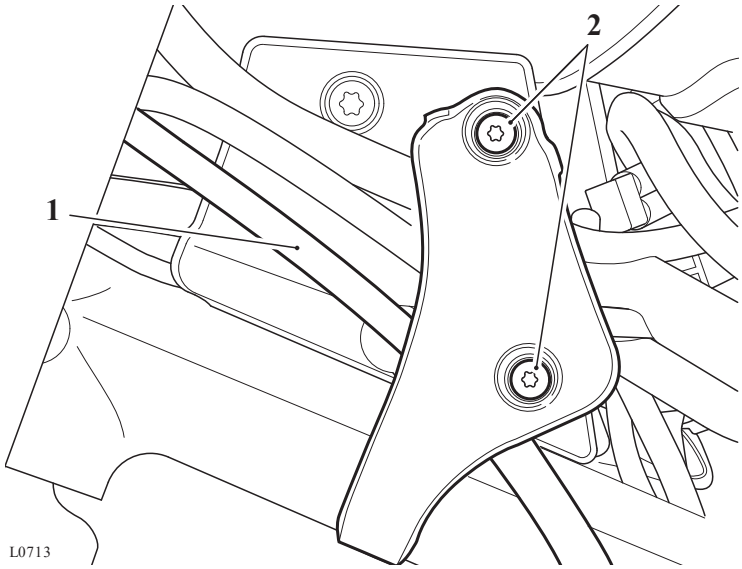
1. Ensure the steering is set to the straight ahead position.
2. Position the cable to the motorcycle following the same routing as noted during removal.
3. Attach the inner cable to the boss on the clutch actuating arm using a reversal of the removal process.
4. Refit the outer cable to the adjuster bracket at the clutch cover end.





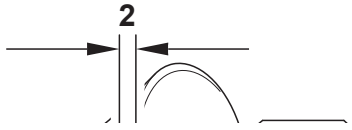
1. **Clutch cable**
2. **Adjuster nut**
3. **Lock nut**

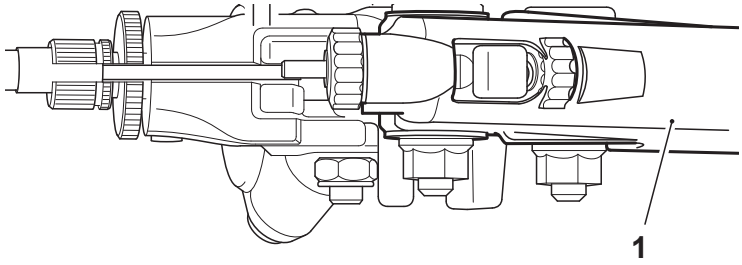
5. Refit the cable retaining guides to the frame down tube.
6. Refit the cable retaining bracket to the headstock and using new fixings tighten to **3 Nm**.



1. **Clutch cable**
2. **Fixings**

7. Set the lever adjuster to a point where an equal adjustment is possible in both directions.
8. Set the adjuster bracket at the clutch cover end to give a preliminary setting of 2 - 3 mm of free play as measured at the lever.
9. Operate the clutch lever several times and recheck the amount of free play present.
10. Tighten the clutch adjuster bracket lock nut at the clutch cover end to **3 Nm**.
11. Set the final adjustment of the cable to give 1 - 2 mm of free play at the lever by turning the adjuster nut and lock nut at the lever end. Secure the setting with the knurled lock nut.





L0337

1. **Clutch lever**
2. **Correct setting, 1 - 2 mm**

Perform the following operations:

Clutch Lifter 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.

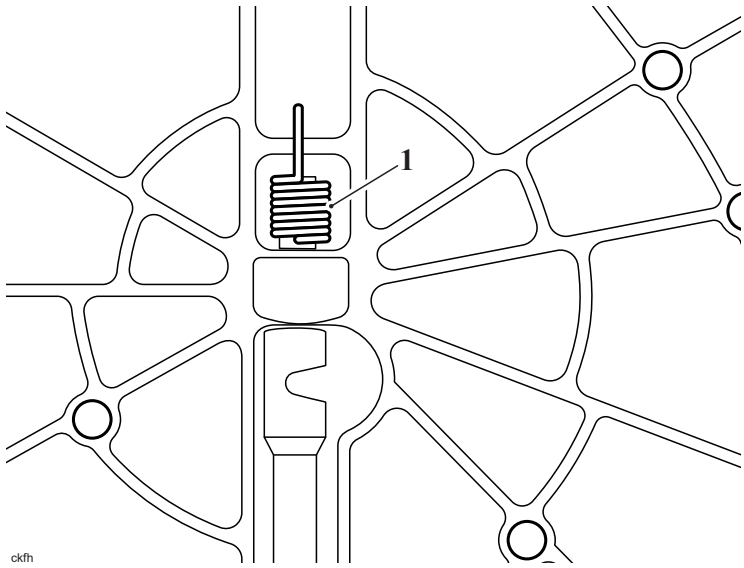
Perform the following operations:

- Clutch Cover - Removal

Note

- **If the clutch lifter arm is removed, the oil seal for the lifter arm in the clutch cover must be replaced.**
- **Note the orientation of the clutch lifter arm for installation.**
- **Note the position and orientation of the lifter arm spring for installation.**

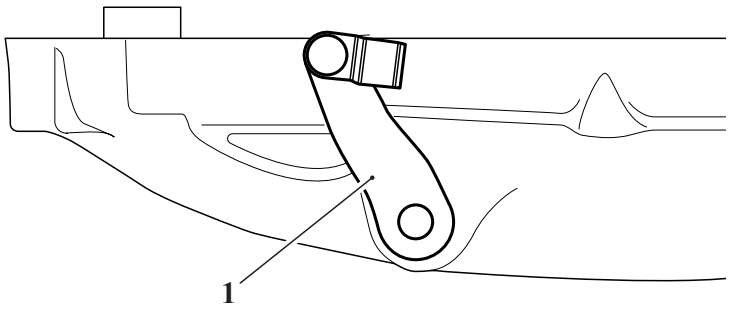
1. Remove the clutch lifter arm spring.



ckfh

1. **Spring**

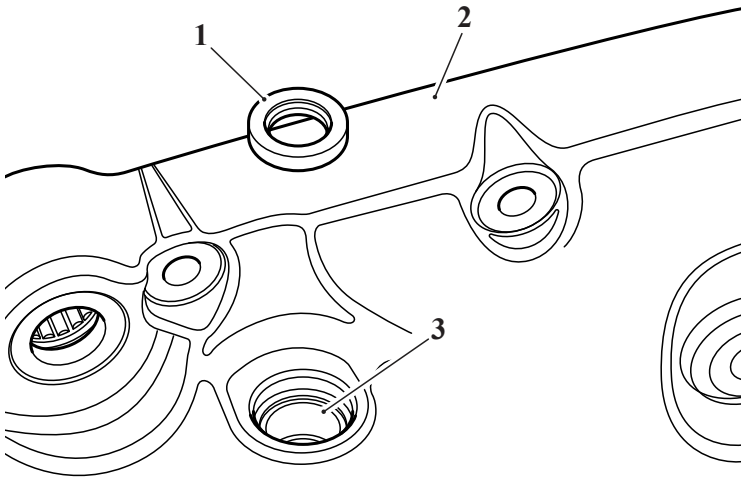
2. Pull out the lifter arm from the clutch cover.



ckfi

1. **Clutch lifter arm plate**

3. Using a suitable tool, carefully remove the oil seal in the clutch cover without damaging the clutch cover.
4. Check the condition of the needle roller bearings and the lifter arm for damage. If necessary renew the needle roller bearings and clutch lifter arm.



ckfj

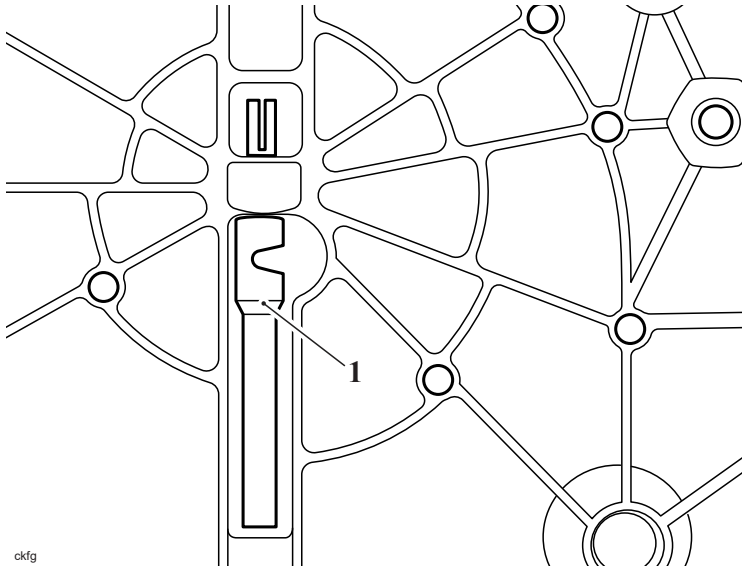
1. **Oil seal**
2. **Clutch cover**
3. **Needle roller bearings**

Clutch Lifter Arm - Installation

WARNING

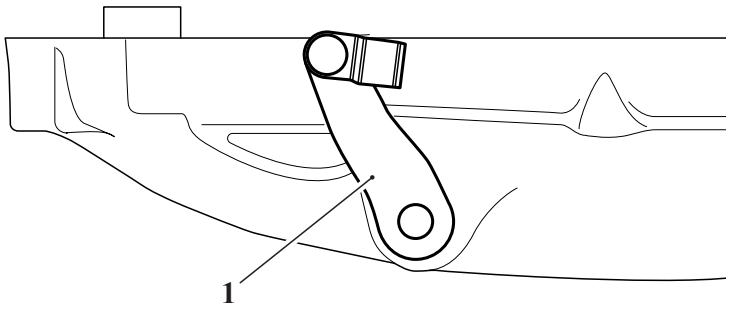
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Press a new clutch lifter rod oil seal to the clutch cover, ensure the sealing lip is facing inwards.
2. Lubricate the seal lip with molybdenum disulphide grease and fit the clutch lifter arm into the clutch cover as noted for removal.



1. Clutch lifter arm

3. Before fitting the spring, ensure the lifter arm plate is positioned as shown in the following illustration.

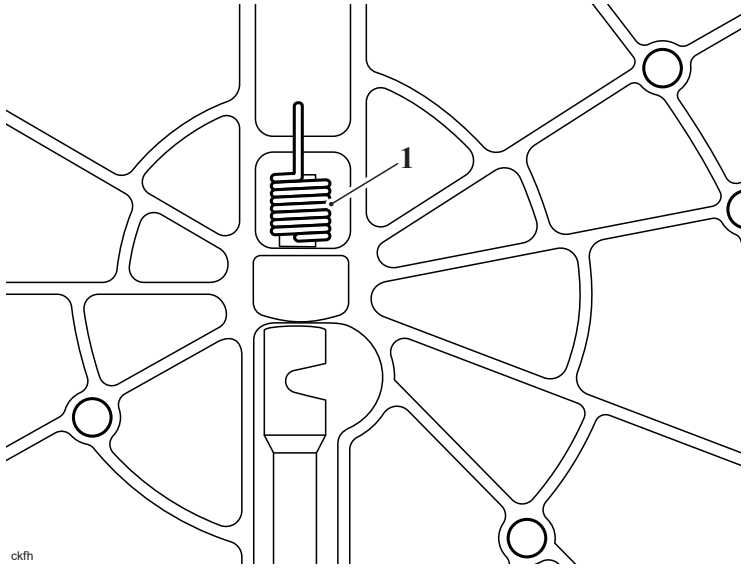


1. **Clutch lifter arm plate**

Note

- **The horizontal tang on the spring fits into the slot of the clutch lifter arm.**

4. Fit the spring as noted for removal.



1. **Spring**

5. Check the operation of the clutch lifter arm before installing the clutch cover.

Perform the following operations:

- Clutch Cover - Installation

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.

Perform the following operations:

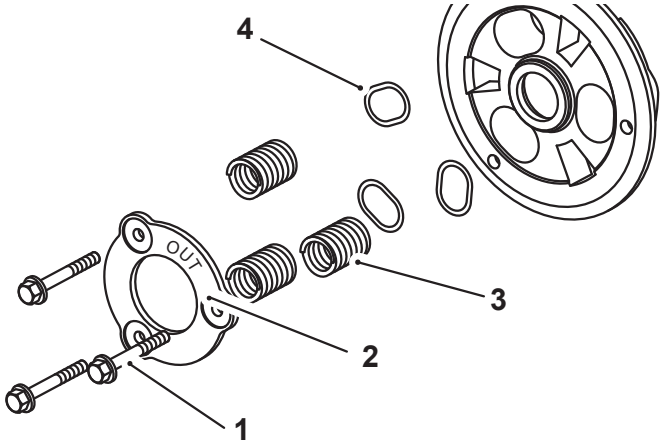
- Clutch Cover - Removal

Note

- **The spring seats will remain seated in the pressure plate during removal.**

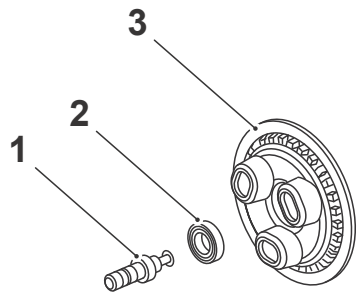
1. Release the three fixings, remove the stopper plate, springs and pressure plate.





1. **Fixings**
2. **Stopper plate**
3. **Springs**
4. **Spring seats**
5. **Pressure Plate**

2. Remove the pull rod and bearing from the clutch pressure plate.



1. **Pull rod**
2. **Bearing**
3. **Clutch pressure plate**

3. Remove the clutch plates, anti-judder seat washers and springs, noting the orientation of the each component as they are removed.

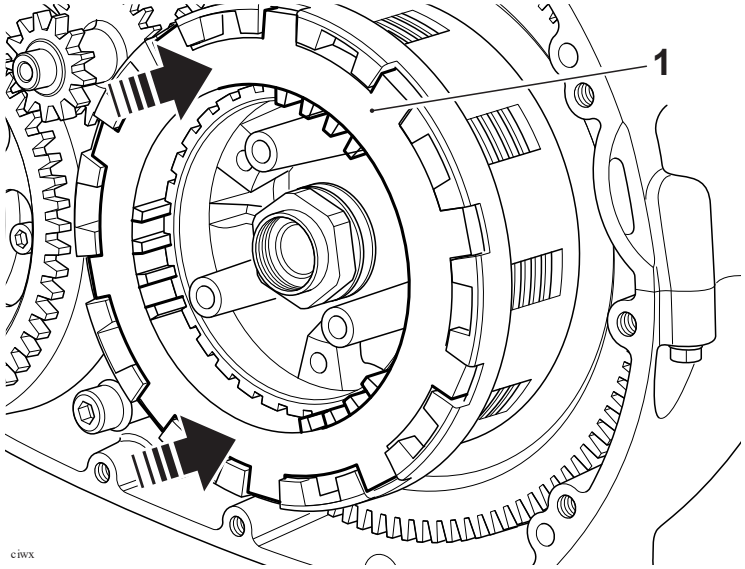
Note

- **The two outermost and the inner friction plate are different to the remainder and must not be fitted in any other position.**

Note

- **Refer to Friction Plate Inspection for details of clutch friction plate inspection.**

4. Engage second gear and lock the inner and outer clutch drums together using T3880307 - Clutch Anti-rotation Jig as shown below.



1. T3880307 - Clutch Anti-rotation Jig

5. Release the clutch centre nut.
6. Remove the centre nut, Belleville washer, plain washer, clutch inner drum and thrust washer.
7. Discard both the Belleville washer and plain washer.

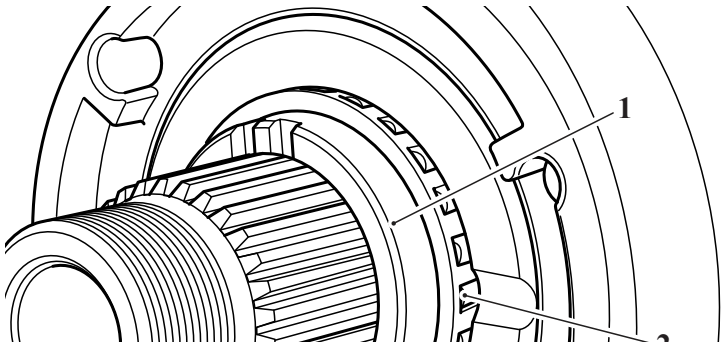
CAUTION

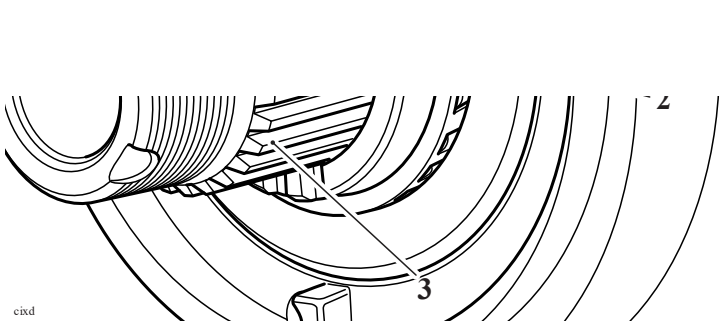
Do not remove the bearing sleeve from the shaft.

Removing the bearing sleeve will allow the oil pump drive chain to become dislodged.

If the oil pump drive chain becomes dislodged the oil pump will not operate causing severe engine damage.

8. Slide the bearing sleeve forward and backwards a maximum of 10 mm to allow the needle roller bearing to become dislodged.
9. Remove the needle roller bearing from the clutch outer drum.





1. **Bearing sleeve**
2. **Needle roller bearing**
3. **Shaft**

10. Slide the clutch outer drum away from the gearbox input shaft.

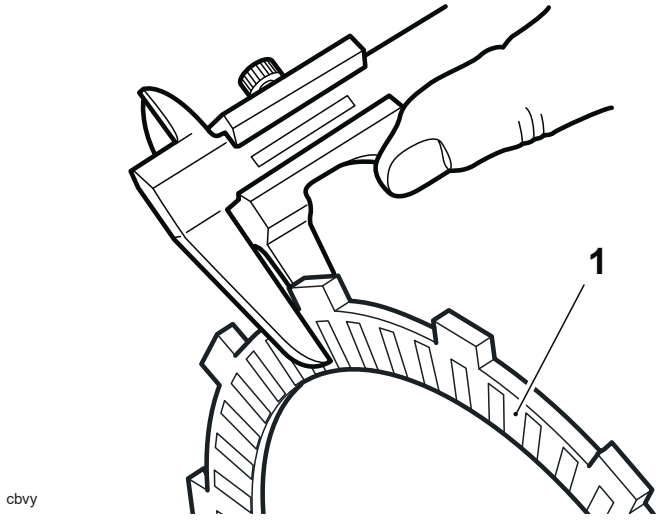
Friction Plate Inspection

Thickness

Note

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

1. Measure the thickness of the friction plate.



1. **Clutch friction plate**

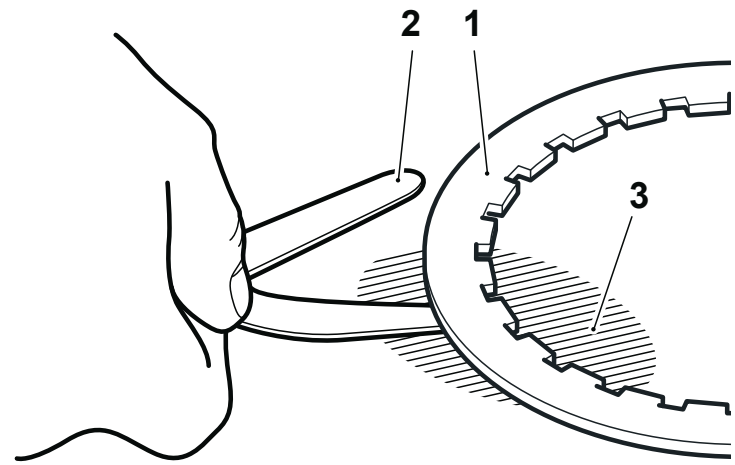
2. For the clutch friction plate thickness, refer to Clutch and Primary Drive.

Steel Plate Inspection

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 service limit thickness between the steel plate and surface plate. If the feeler gauge can be passed beneath the steel plate at any point, renew the plates as a set.



cbvz

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

2. For specifications refer to Clutch and Primary Drive.

Clutch Pack - Height

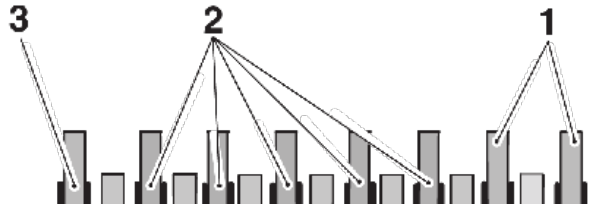
Note

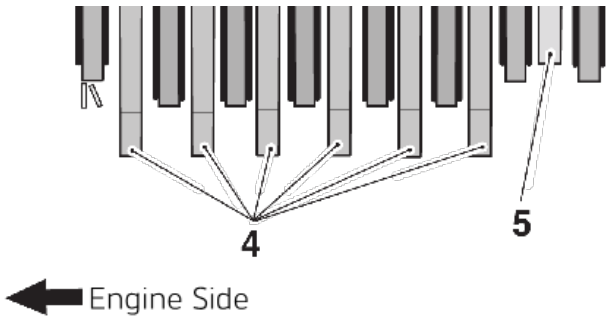
- **The clutch pack height is critical for a smooth operation of the transmission and must be measured prior to installation of new clutch plates.**

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

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

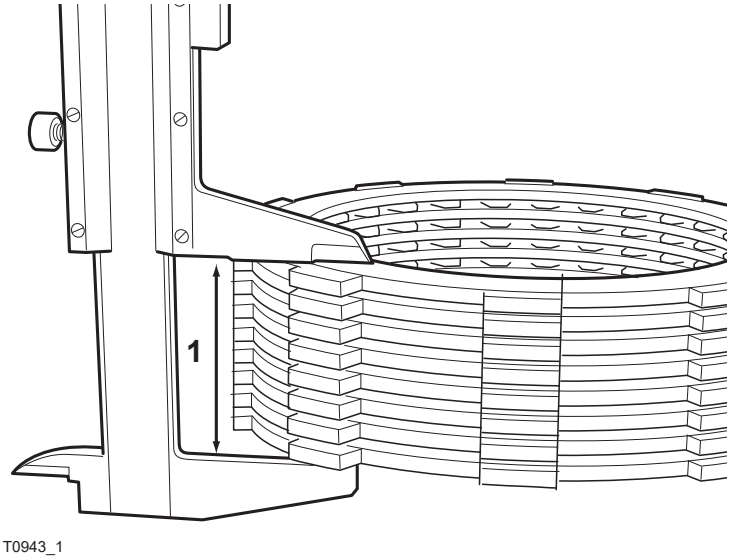
1. Arrange the new friction and new steel plates in a stack as shown below.





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

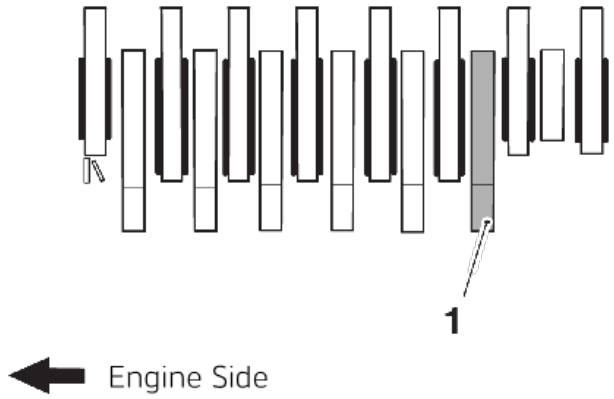
3. The clutch pack height for this clutch assembly is shown in the specification table see Clutch and Primary Drive.
4. If the clutch pack is too high, continue from step 5, omit step 6 then continue from step 7. If the clutch pack is too low, continue from step 6.

Note

- **1.6 mm and 2.3 mm steel plates are available, refer to the Parts Catalogue for part numbers.**
- **No more than one 1.6 mm thick steel plate is to be used in the clutch pack.**

5. If the clutch pack height is too high, replace the 2.0 mm steel plate indicated below with a

new 1.6 mm steel plate.

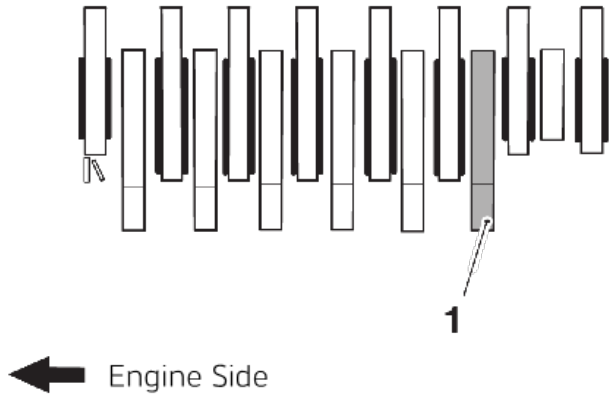


1. **2.0 mm steel plate to be replaced**

Note

- **No more than one 2.3 mm thick steel plate is to be used in the clutch pack.**

6. If the clutch pack height is too low, replace the 2.0 mm steel plate indicated below with a new 2.3 mm steel plate.



1. **2.0 mm steel plate to be replaced**

7. Recheck the clutch pack height as described previously.

Clutch - Installation

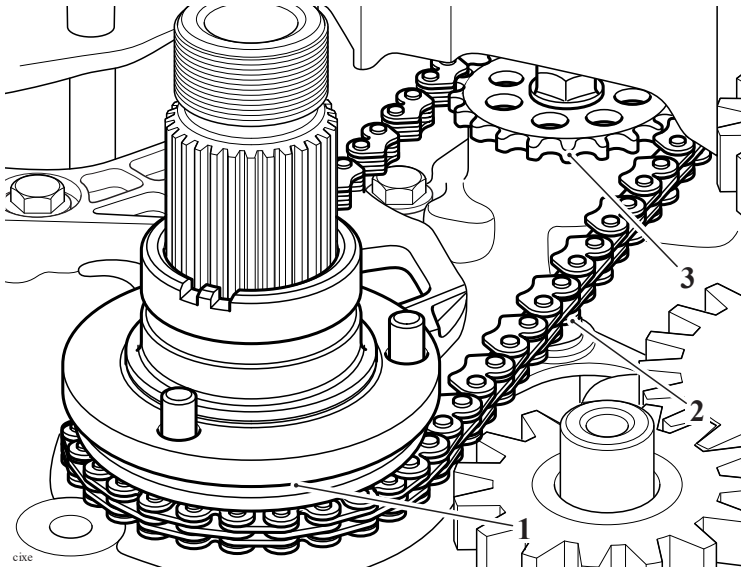
WARNING

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.

CAUTION

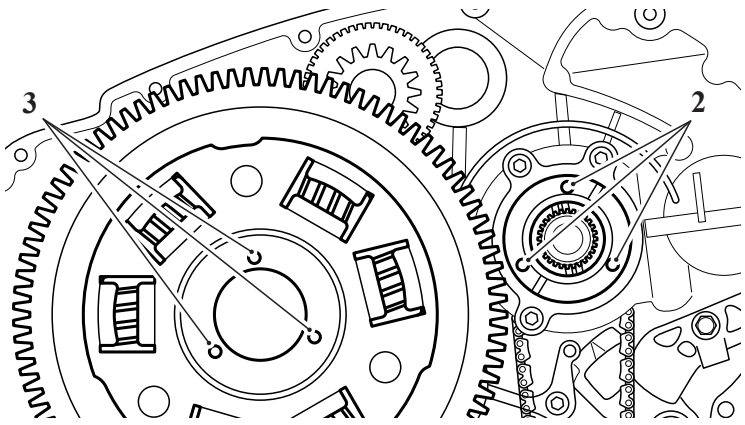
Ensure the oil pump drive chain is engaged with the oil pump drive gears. Running the engine without drive to the oil pump will stop oil supply to the engine. Running the engine without oil pressure will cause severe engine damage.

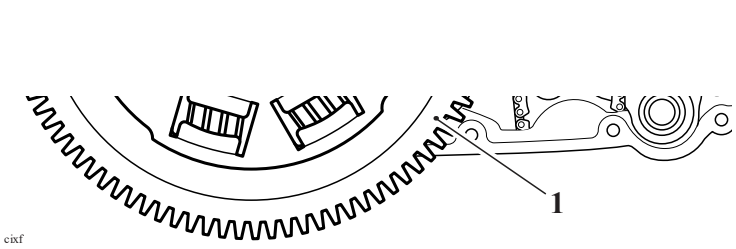
1. Visually check the oil pump drive chain is engaged with the drive gears.



1. **Oil pump drive sprocket**
2. **Oil pump drive chain**
3. **Pump sprocket**

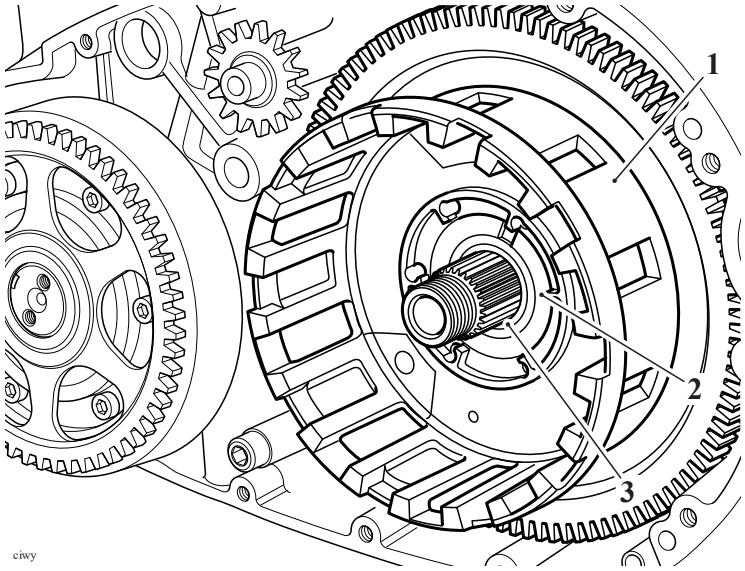
2. Position the clutch outer drum assembly to the input shaft and align the oil pump sprocket drive pegs with the corresponding holes in the rear of the clutch outer drum.





1. **Clutch outer drum (rear view)**
2. **Oil pump sprocket drive pegs**
3. **Clutch outer drum sprocket drive holes**

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

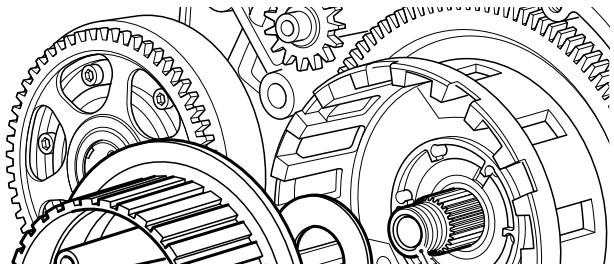


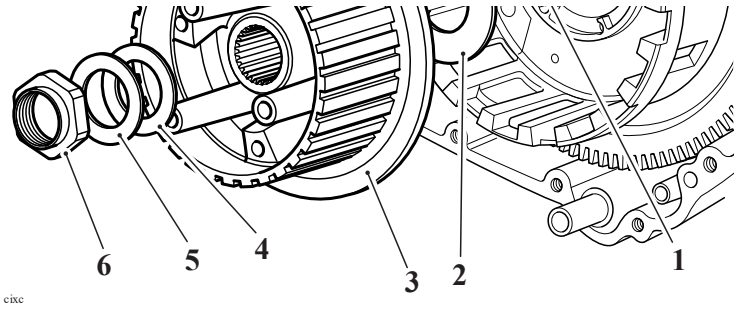
1. **Outer drum**
2. **Bearing sleeve**
3. **Needle roller bearing**

Note

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

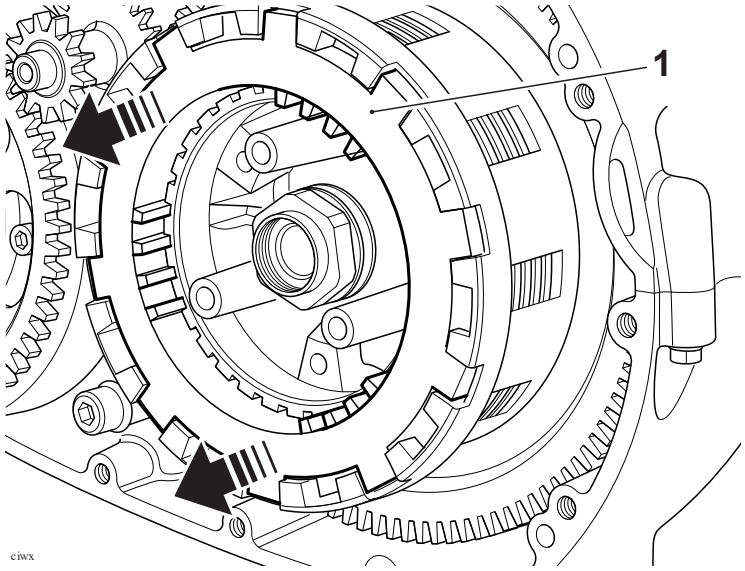
4. Fit the thrust washer to the shaft.
5. Fit the clutch inner drum.
6. Fit the flat washer, a new Belleville washer (OUT mark facing outwards), and a new centre nut.





1. **Shaft**
2. **Thrust washer**
3. **Clutch inner drum**
4. **Flat washer**
5. **Belleville Washer OUT Mark**
6. **Centre nut**

7. Using T3880307 - Clutch Anti-rotation Jig, lock the inner and outer drums together. Depress the rear brake pedal to prevent the engine rotating, and tighten the centre nut to **98 Nm**.
8. Remove T3880307 - Clutch Anti-rotation Jig.



1. **T3880307 - Clutch Anti-rotation Jig**

9. Disengage second gear and check for free rotation of the clutch inner drum.
10. Using a suitable pin punch, stake the nut to the shaft.

Note

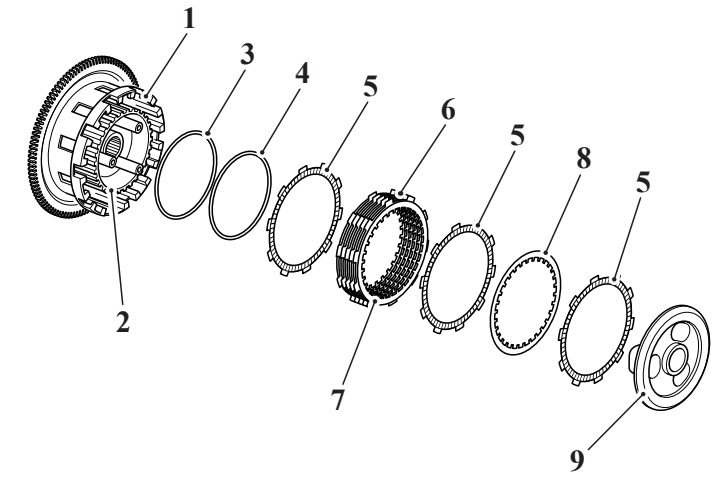
- **Always refer to the Clutch Pack - Height prior to fitting new clutch plates to the motorcycle.**

11. Coat all clutch friction plates in clean engine oil before fitting the friction plates, steel plates, anti-judder spring and anti-judder seat washer to the clutch basket in the same

order and orientation as noted during removal.

Note

- **The inner and the two outermost friction plates are different to the other friction plates. They must be fitted in their noted positions.**
- **The outer steel plate is different to the other plates. It must be fitted in its noted position.**



ciww

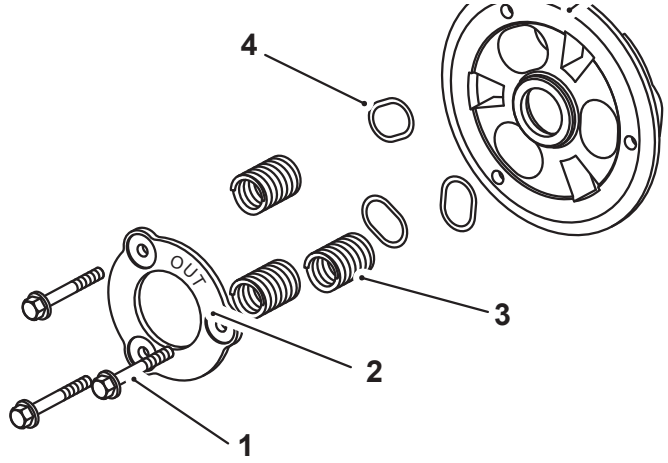
1. **Clutch outer drum**
2. **Clutch inner drum**
3. **Anti-judder seat washer**
4. **Anti-judder spring**
5. **Inner/outer friction plate**
6. **Friction plates**
7. **Steel plates**
8. **Steel plate (outer)**
9. **Pressure plate**

12. Refit the clutch pull rod.
13. Fit the pressure plate. Ensure that the spring seats are fitted into the pressure plate as noted for removal.

Note

- **Note that the stopper plate has an OUT mark. This must face outwards when fitted.**
- **There are spring seats located in the pressure plate. Ensure the seats are in the pressure plate prior to fitting the springs.**

14. Fit the springs and stopper plate, ensure that the OUT mark on the stopper plate is facing outwards. Secure with the fixings and tighten to **10 Nm**.



1. **Fixings**
2. **Stopper plate**
3. **Springs**
4. **Spring seats**
5. **Pressure plate**

Perform the following operations:

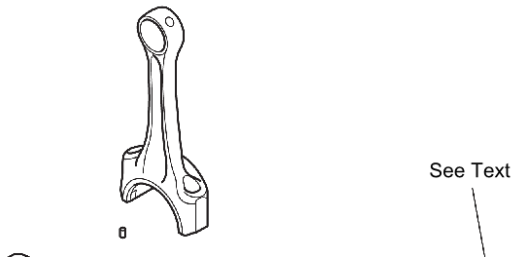
- Clutch Cover - Installation
- Clutch Cable - Installation
- Battery - Installation
- Seat - Installation

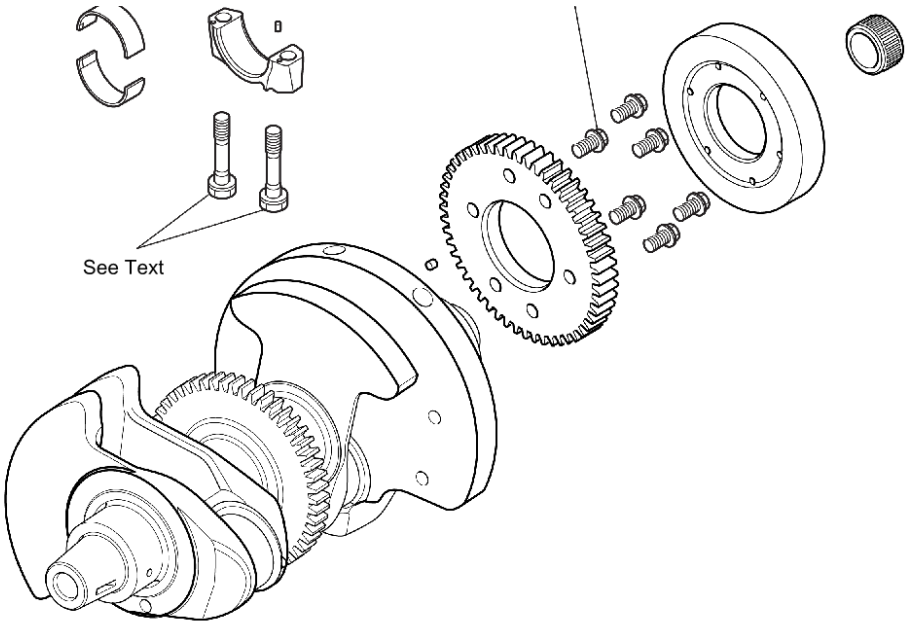
Crankcase, Crankshaft and Connecting Rods

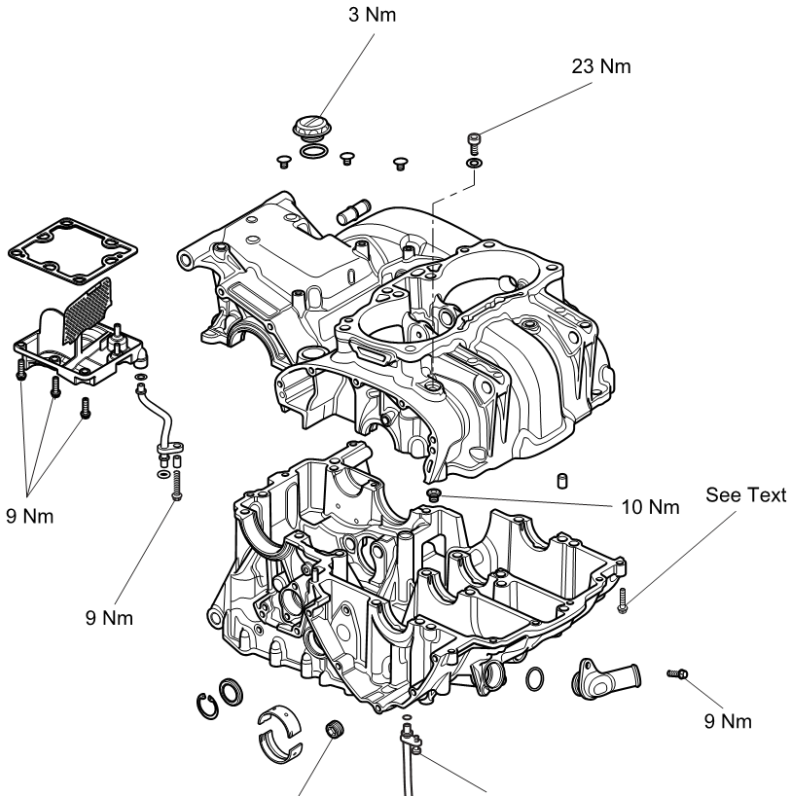
Exploded View – Crankshaft and Connecting Rod

Exploded View – Crankcase

Crankcase - Disassembly




See Text


3 Nm
23 Nm
9 Nm
9 Nm
10 Nm
See Text
9 Nm

25 Nm

9 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.

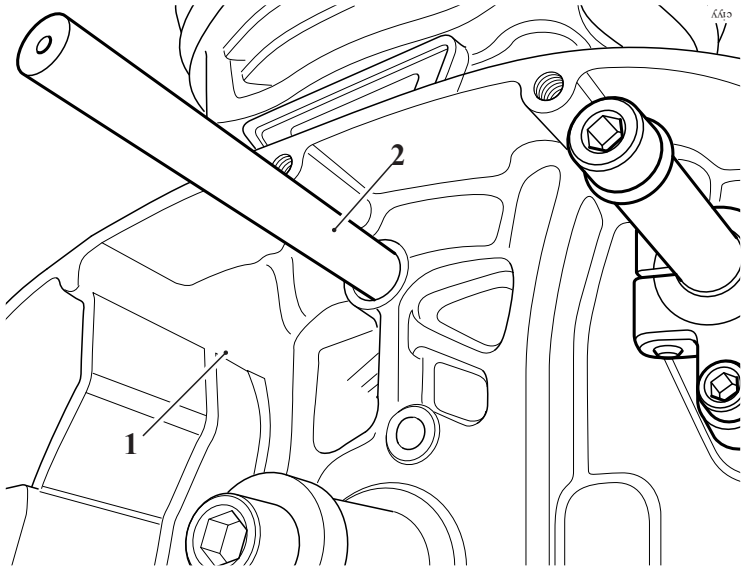
Perform the following operations:

- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal
- Engine - Removal
- Camshaft Cover - Removal
- Sump - Removal
- Alternator Rotor - Removal

Note

- **To allow correct fitment of T3880039 - Idler Gear Timing Pin the engine may require rotating up to seven times.**

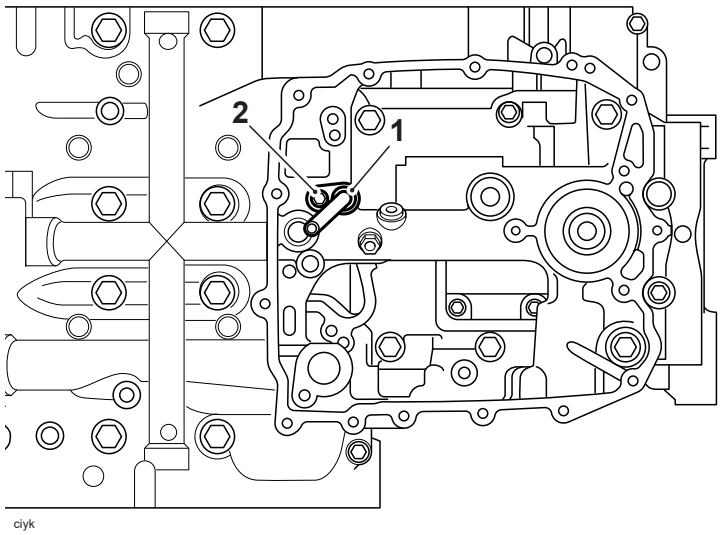
1. Align the timing holes in the crankcase and camshaft idler gear. Lock in position using T3880039 - Idler Gear Timing Pin.



1. **Crankcase**

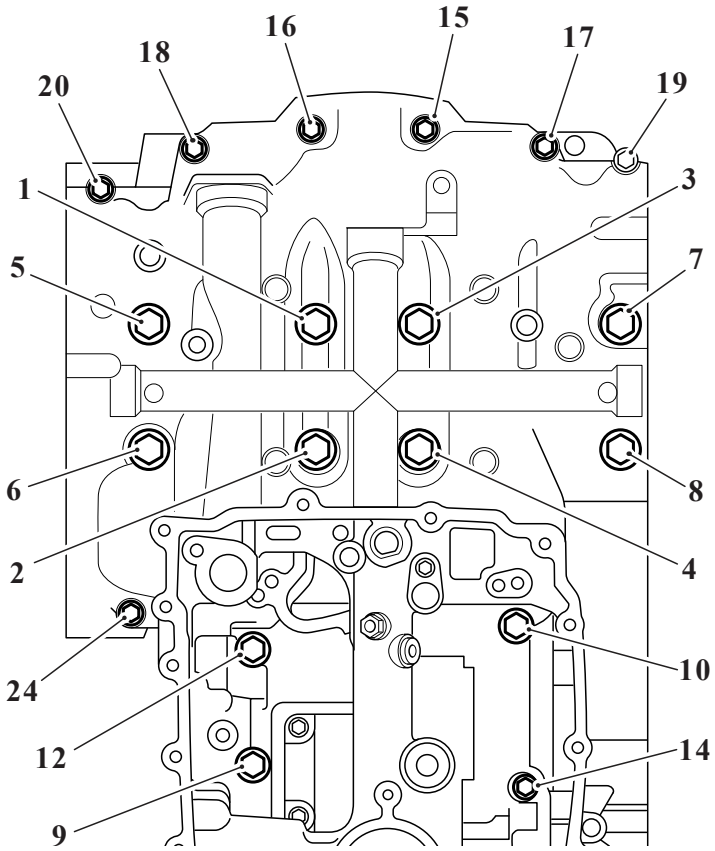
2. **T3880039 - Idler Gear Timing Pin**

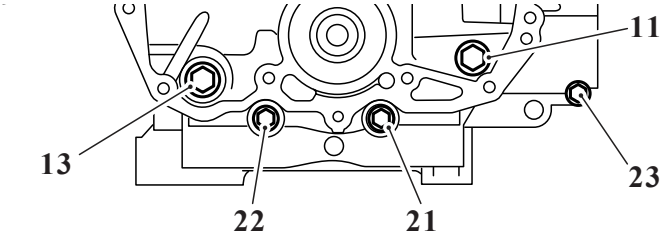
2. Remove the oil and water pump (see Oil and Water Pump - Removal).
3. Release the fixing and remove the coolant drain tube, discard the fixing and the O-ring.



1. **Coolant drain tube**
2. **Fixing**

4. Release the lower crankcase fixings noting their positions in the sequence shown below.





ciyl

Crankcase Fixing Release Sequence

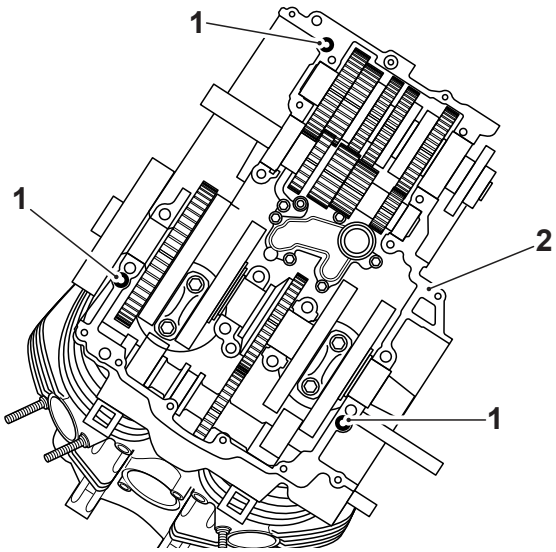
CAUTION

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

Note

- **Always check that all fixings have been released before attempting to separate the crankcases.**

5. Separate the lower crankcase from the upper crankcase noting the position of the three location dowels.



ciyi

1. **Dowels**
2. **Upper crankcase**

Perform the following operations:

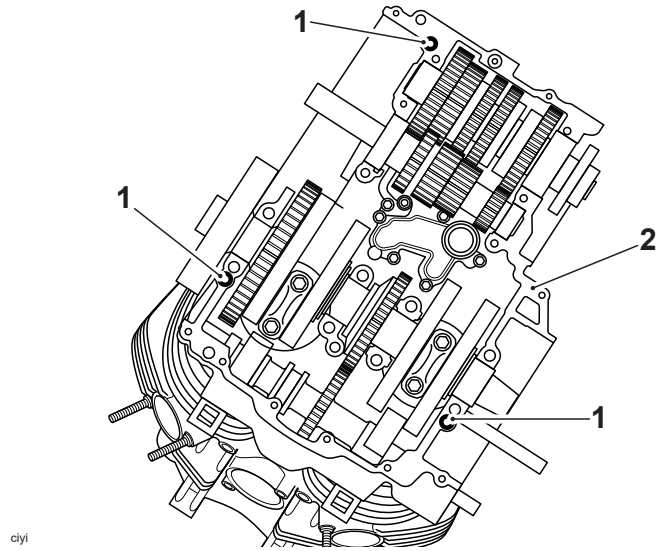
- Front Balancer Shaft - Removal
- Rear Balancer Shaft - Removal
- Crankshaft - Removal
- Selector Forks and Drum - Removal
- Coolant Manifold - Removal

- Breather Plate - Removal

Crankcase - Assembly

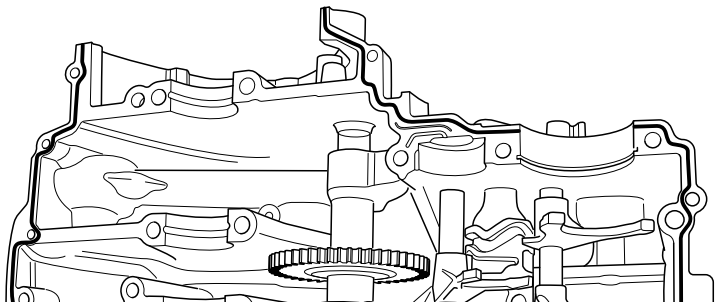
Crankshaft - Removal

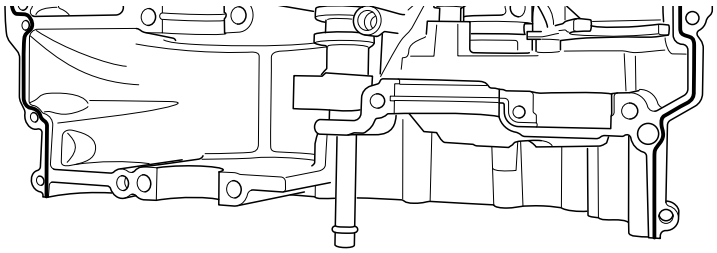
1. Use high flashpoint solvent to clean the crankcase mating faces. Wipe the surfaces clean with a lint-free cloth.
2. Position the transmission shafts and the selector drum in the neutral position.
3. Ensure that the three dowels are located in position in the upper crankcase.



1. **Dowels**
2. **Upper crankcase**

4. Install and lubricate the crankshaft main bearing shells with clean engine oil (see page Crankshaft Main Bearing/Journal Checking, Measuring and Bearing Selection before proceeding).
5. Install and lubricate the front balancer shaft with clean engine oil (see Front Balancer Shaft - Installation).
6. Install and lubricate the rear balancer shaft with clean engine oil (see Rear Balancer Shaft - Installation).
7. Lubricate the crankshaft journals with clean engine oil.
8. Apply a 2 mm (+/-0.5 mm) bead of silicone sealant to the lower crankcase mating faces, (during manufacture, ThreeBond 1216E is used).





Sealer Areas

CAUTION

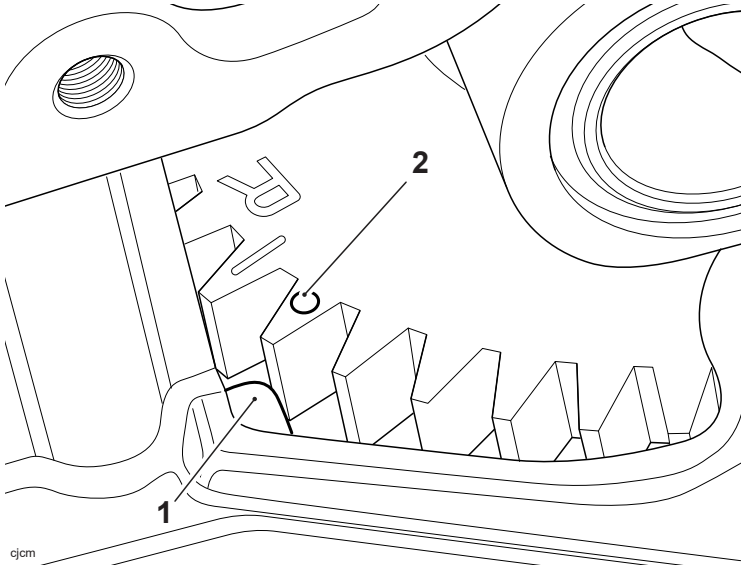
Do not use excessive amounts of sealer. The extra sealer may become dislodged and could block the oil passages in the crankcases, causing severe engine damage.

9. Position the lower crankcase to the upper crankcase. An assistant may be required to support the crankcase during alignment.

Note

- **The rear balancer shaft will rotate one tooth when the upper and lower crankcase are joined.**

10. To check that the balancer shaft is correctly timed to the crankshaft proceed as follows:
11. Check that the dot mark on the rear balancer shaft gear is aligned with the tab on the crankcase, as shown below.



1. **Lower crankcase identification mark**
2. **Rear balancer shaft dot mark**

12. Locate the fixings into their respective positions in the lower crankcase as noted during removal and hand tighten.
13. Tighten the crankcase fixings as follows:

Note

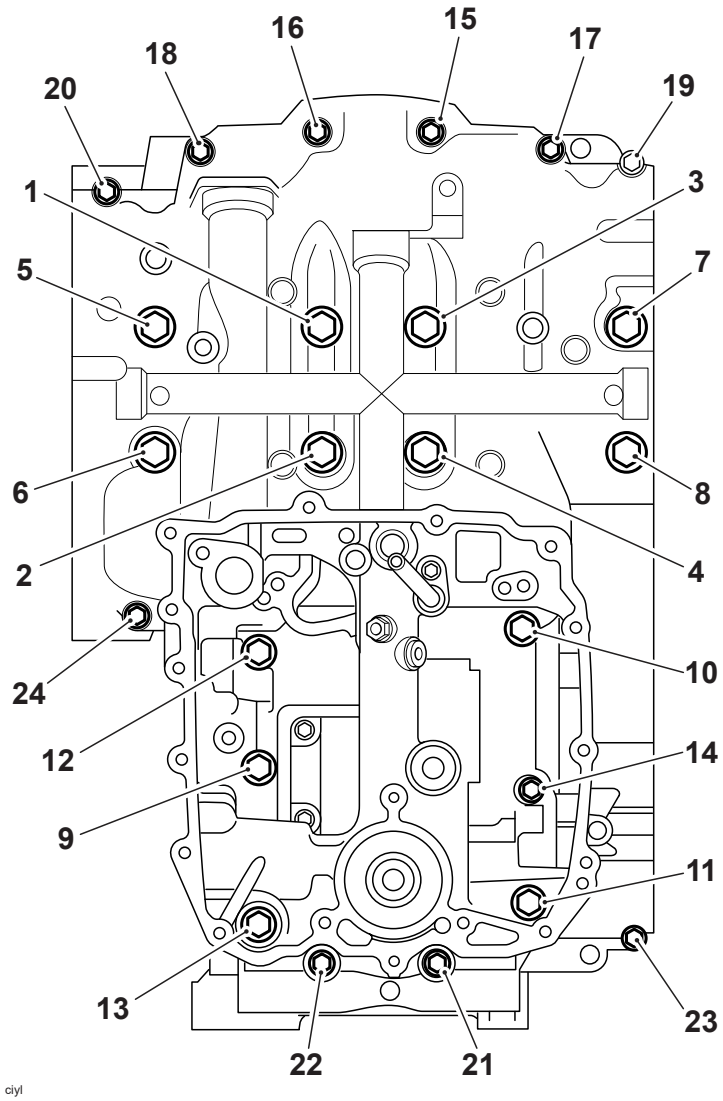
- **The crankcase fixings are tightened in stages.**

⚠ CAUTION

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

Stage 1 - All Fixings

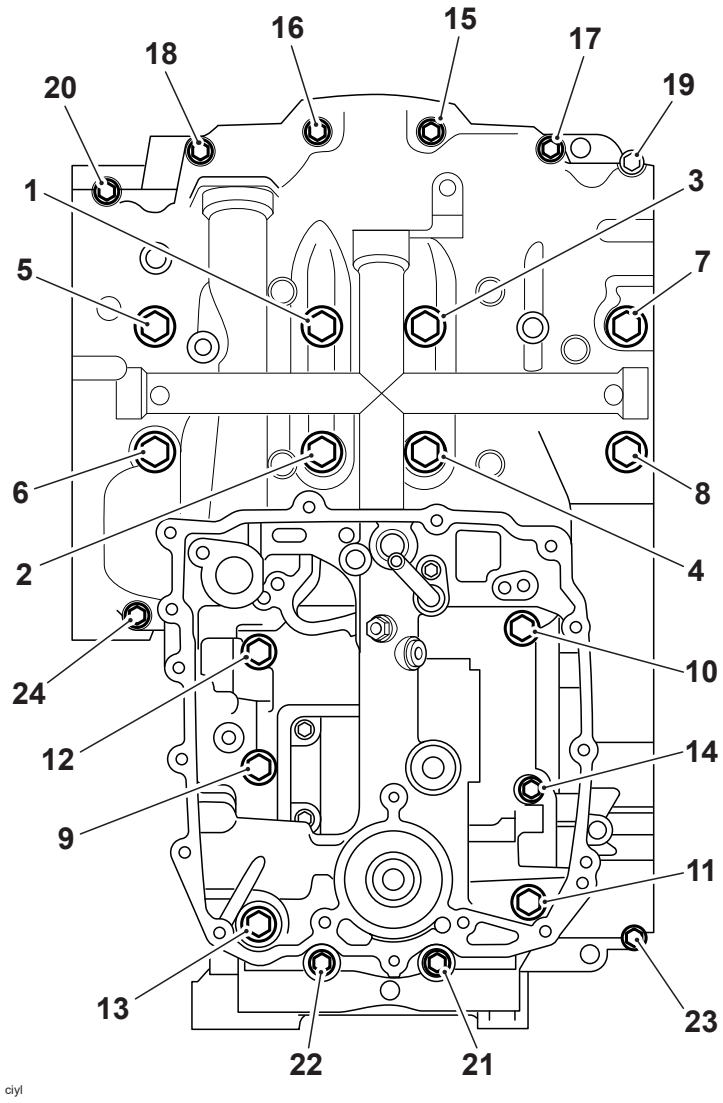
14. In the sequence shown below:
    - Tighten all of the crankcase fixings to **10 Nm**.



All Fixings Tightening Sequence

Stage 2

15. In the sequence shown below:
    - Loosen fixings 1 to 8. through 140°, using T3880105 - Torque Angle Gauge or similar to measure the torque-angle.

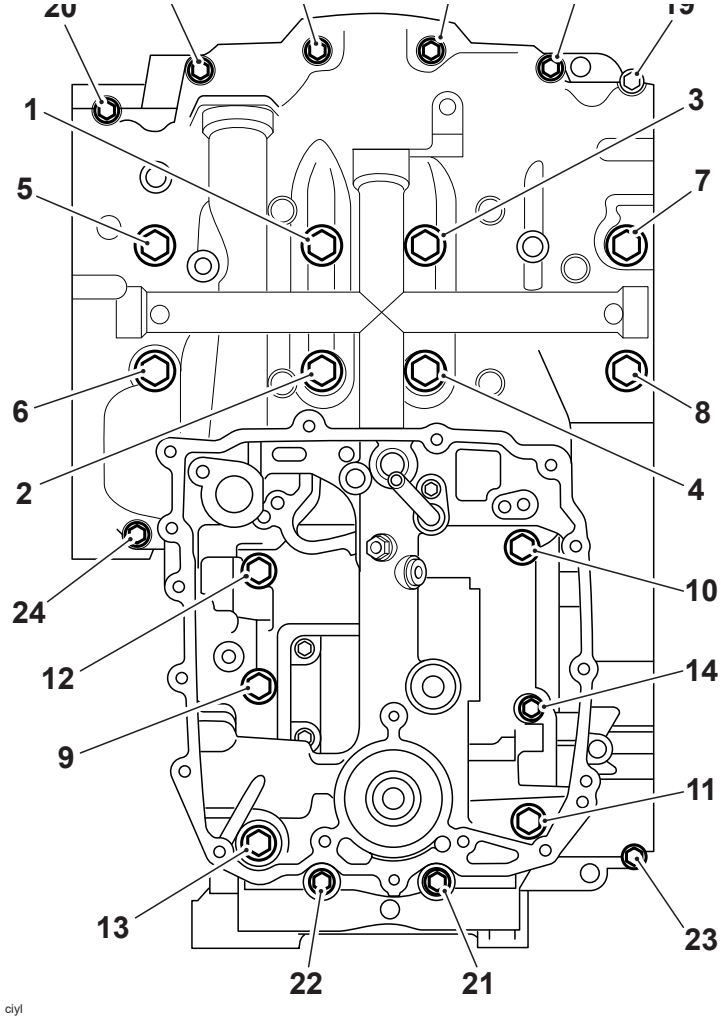


Fixings 1 to 8 Loosening Sequence

Stage 3

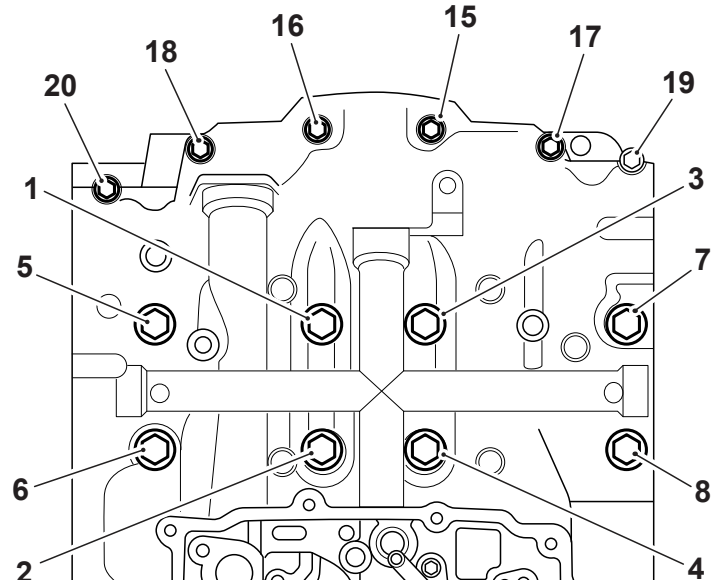
16. In the sequence shown below:
    - Tighten fixings 1 to 8 to **12 Nm**.

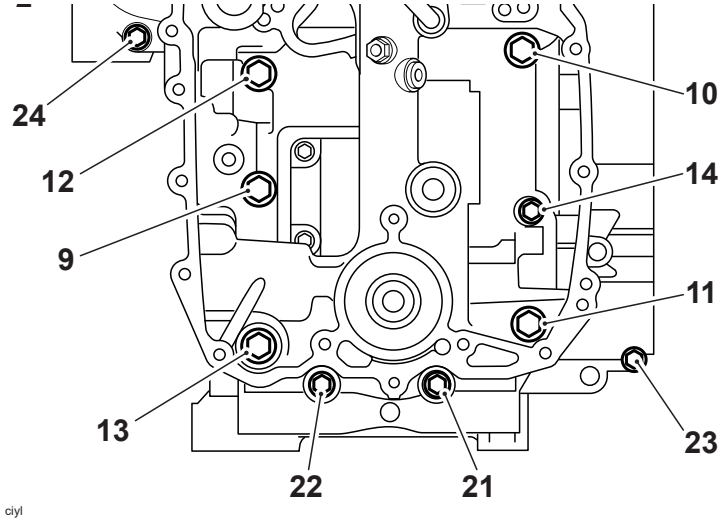




Fixings 1 to 8 Tightening Sequence

17. In the sequence shown below:
    - Tighten fixings 1 to 8 through a further 75° using T3880105 - Torque Angle Gauge or similar to measure the torque-angle.

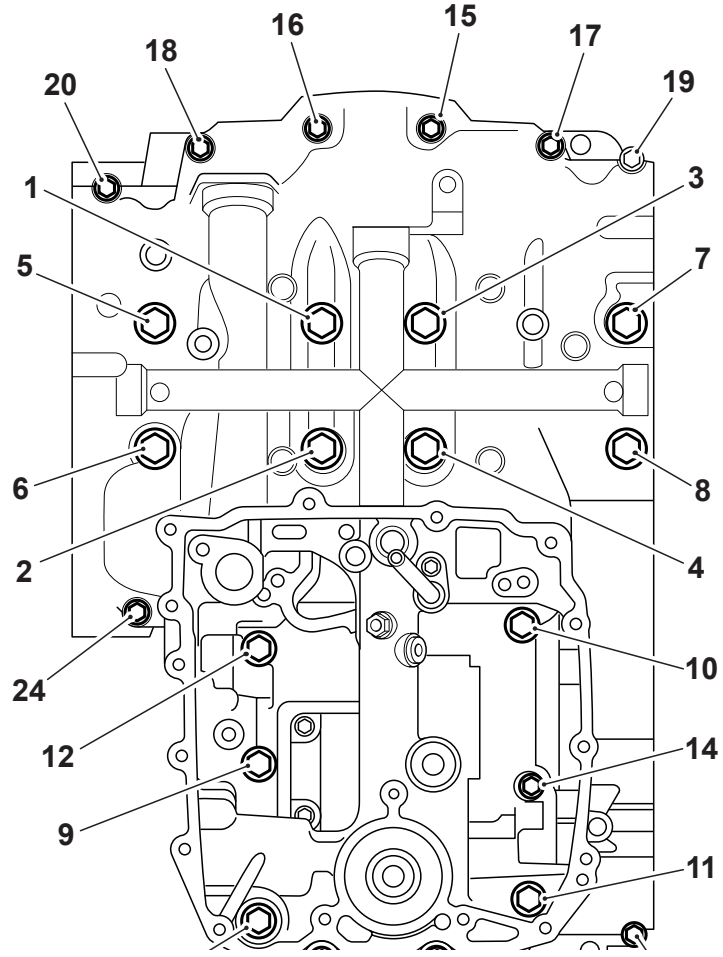


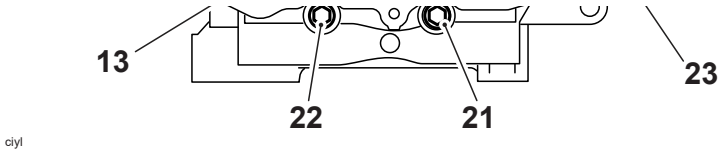


Fixings 1 to 8 Tightening Sequence

Stage 4

18. In the sequence shown below:
    - Tighten fixings 9 to 13 to **32 Nm**.

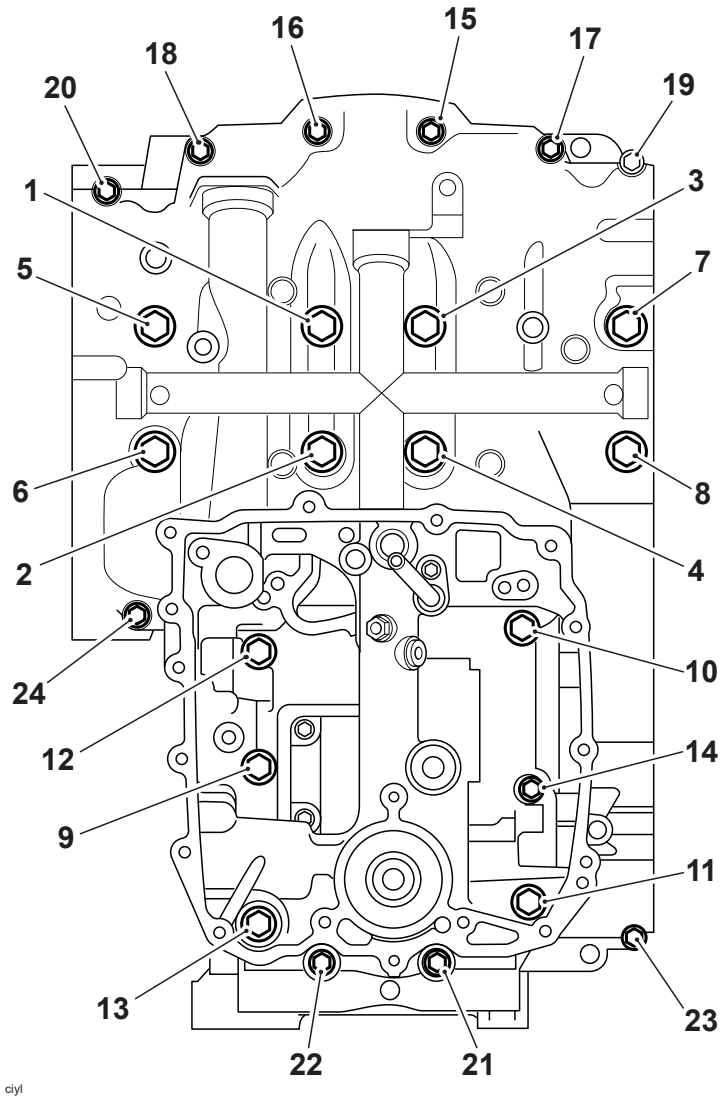




Fixings 9 to 13 Tightening Sequence

Stage 5

19. In the sequence shown below:
    - Tighten fixings 14 to 24 to **12 Nm**.



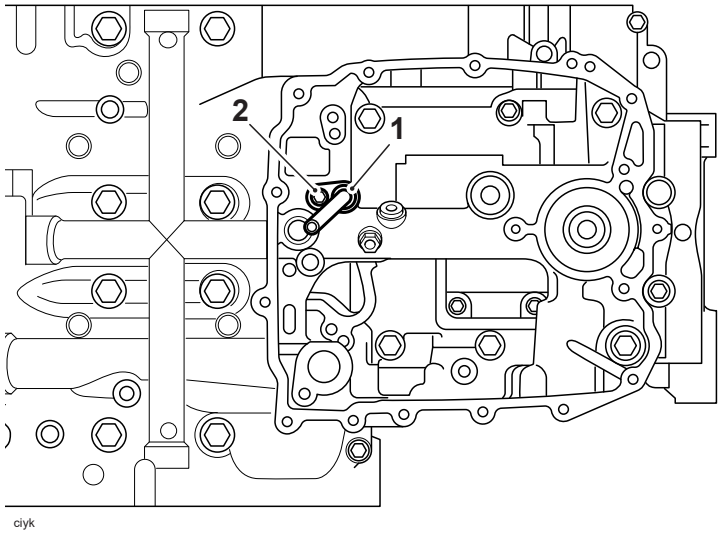
Fixings 14 to 24 Tightening Sequence

Note

Note

- **Prior to fitting an O-ring coat the surfaces with a commercially available petroleum jelly.**

20. Refit the breather drain tube, fit a new O-ring, tighten the new fixing to **9 Nm**.



1. **Breather drain tube**
2. **Fixing**

Perform the following operations:

- Oil and Water Pump - Installation
- Sump - Installation
- Alternator Rotor - Installation
- Clutch - Installation
- Gear Position Sensor - Installation
- Engine - Installation
- Fuel Tank - Installation
- Battery - Installation
- 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.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal

- Engine - Removal
- Crankcase - Disassembly
- Connecting Rods - Removal

Note

- **Support the connecting rods during crankshaft removal to prevent damage to the rods, liners and upper crankcase.**

1. Remove the crankshaft from the upper crankcase.

Crankshaft - Installation

CAUTION

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

1. Select and fit new main and big end bearing shells using the selection processes detailed in Crankshaft Main Bearing/Journal Checking, Measuring and Bearing Selection.
2. Lubricate all of the bearings with clean engine oil.
3. Ensure that the crankshaft is clean, and that the oil ways within the crankshaft are clean, free from blockages and debris.

CAUTION

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

4. Install the crankshaft to the upper crankcase, ensuring the crankshaft drive gear is correctly timed to the balancer shafts and idler gear (see Front Balancer Shaft - Installation).
5. Align the connecting rod big ends to the crankshaft pins.
6. Fit, and in the correct sequence, tighten the big end caps. (see Connecting Rod - Installation).
7. Assemble the crankcases (see Crankcase - Assembly).

Perform the following operations:

- Barrels - Installation
- Cylinder Head - Installation
- Engine - Installation
- Fuel Tank - Installation
- Battery - Installation
- Seat - Installation
- Start the engine and ensure that the low oil pressure warning light goes out shortly after starting.

- Stop the engine and check the engine oil level. Adjust if necessary (see Engine Oil - Level Inspection).

Connecting Rods - Removal

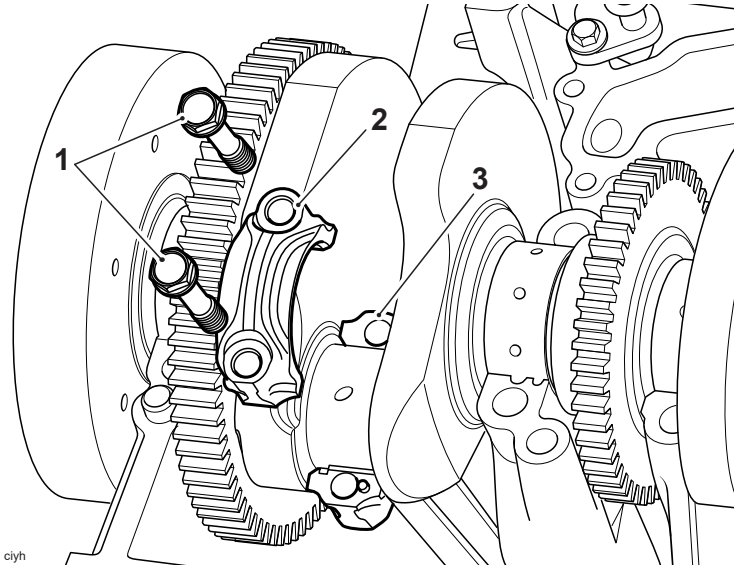
Perform the following operations:

- Fuel Tank - Installation
- Battery - Installation
- Seat - Installation

Note

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

- Engine - Removal
- Clutch - Removal
- Barrels - Removal
- Crankcase - Disassembly
- Remove and discard the connecting rod bolts.



1. **Connecting rod bolts**
2. **Connecting rod cap**
3. **Connecting rod**

1. Collect the connecting rod caps.
2. Collect the piston and connecting rod.
3. Label the assembly to identify the cylinder from which it was removed.

Connecting Rod - Installation

Note

Note

- **The big end bolts are treated with an anti-rust solution, which must not be removed.**

1. Clean the connecting rod with high flashpoint solvent.
2. Fit the piston and connecting rod assemblies to the crankshaft.
3. Select and fit the selected big end bearing shells to the connecting rods and big end caps (see Connecting Rod Big End Journal Checking, Measuring and Bearing Selection).

WARNING

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

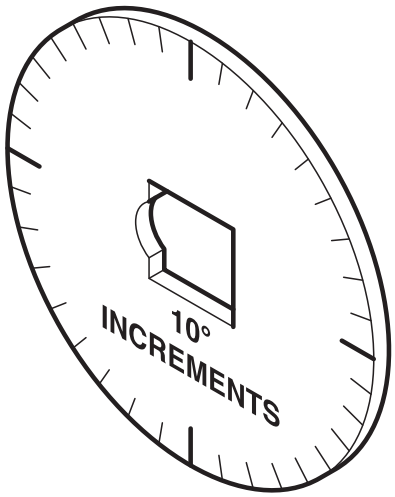
WARNING

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

Note

- **Prior to fitting the big end bolts lubricate the under head and thread areas of the bolts with undiluted molybdenum disulphide grease.**

4. Fit new bolts to the connecting rods.
5. Tighten the bolts, in two stages as follows:
   - Tighten to **16 Nm**.
   - Tighten through 210° using T3880105 - Torque Angle Gauge or similar.



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T3880105 - Torque Angle Gauge

Perform the following operations:

- Crankcase - Assembly
- Barrels - Installation
- Engine - Installation
- Fuel Tank - Installation
- Battery - Installation
- Seat - Installation

Connecting Rod Big End Journal Checking, Measuring and Bearing Selection

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

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

Note

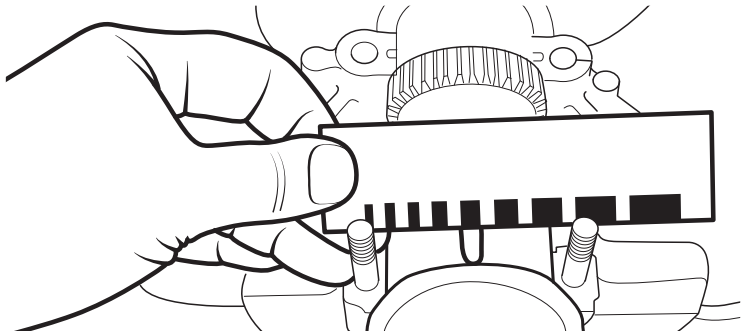
- **Do not turn the connecting rod and crankshaft during the clearance measurement as this will damage the Plastigauge. The crankshaft journal clearances are measured using Plastigauge (Triumph part number 3880150-T0301).**

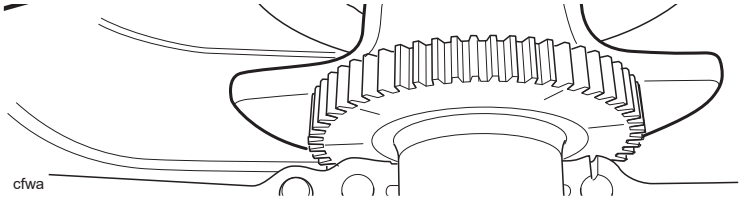
2. Remove the bearing cap from the journal to be checked.
3. Wipe the exposed areas of the crankshaft journal, and the bearing face inside the cap.
4. Apply a thin smear of grease to the journal and a small quantity of silicone release agent to the bearing.
5. Trim a length of the Plastigauge to fit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

Note

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

7. Lubricate the threads of the fixing and the face of the fixing with molybdenum disulphide grease. Refit the lower crankcase and tighten the original fixings (see Crankcase - Assembly).
8. Release the fixings and remove the cap being measured.
9. Using the Plastigauge kit, measure the width of the compressed Plastigauge.





Checking the Big End Bearing/Crankshaft Journal Clearance

10. For specifications refer toCrankshaft.
11. If the clearance exceeds the service limit, measure the diameter of the crankshaft bearing journal.

Note

- **If any 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

Note

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

1. Select the correct bearing shell as follows:
2. Measure and record the diameter of each crankshaft bearing journal.
3. Measure and record each bearing bore diameter (bearings removed, journal caps fitted and all fixings fully torqued) (see Connecting Rod - Installation).
4. Select the correct bearings by matching the information found in the bearing selection chart.
5. Install the new bearings.

Big End Bearing Selection Chart

Shell Colour	Connecting rod bore diameter	Big end bearing journal diameter
WHITE	41.000 to 41.009 mm	37.993 to 38.000 mm
RED	41.000 to 41.009 mm	37.984 to 37.992 mm

For instance:	
Connecting rod Big End Diameter	37.966

For instance:	
Crankshaft Journal Diameter	41.004
Required Bearing	White

Note

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

WARNING

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

Crankshaft Main Bearing/Journal Checking, Measuring and Bearing Selection

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

1. Measure the bearing to crankshaft journal clearance as follows.

Note

- **Do not turn the connecting rods 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).**

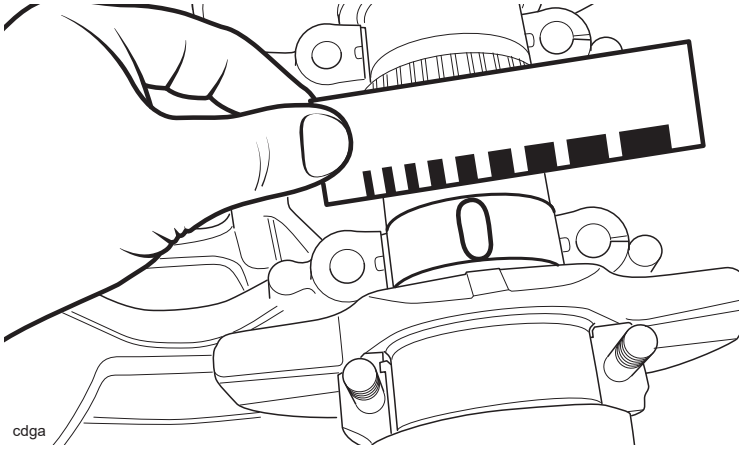
2. Wipe the exposed areas of the crankshaft journals, and the bearing face inside the cap.
3. Apply a thin smear of grease to the journals and a small quantity of silicone release agent to the bearings.
4. Trim a length of the Plastigauge to fit across each journal. Fit the strip to the journal using the grease to hold the Plastigauge in position.

Note

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

5. Lubricate the threads and the face of the fixings with molybdenum disulphide grease. Refit the crankcase and tighten the original fixings (see Crankcase - Assembly).
6. Release the fixings and remove the crankcase.
7. Using the Plastigauge kit, measure the width of the compressed Plastigauge.





Checking the Crankshaft Journal Clearance

8. For specifications refer toCrankshaft.
9. If the clearance exceeds the service limit, measure the diameter of the crankshaft bearing 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 oversize bearings are not available.**

Main Bearing Selection

Note

- **Minor differences in 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 bearings as follows:
2. Measure and record the diameter of each crankshaft bearing journal.
3. Measure and record each bearing bore diameter in the crankcase (bearings removed, journal caps fitted and all fixings fully torqued).
4. Select and install the correct bearings by matching the information found in the main bearing selection chart.
5. Install the new bearings.

Main Bearing Selection Chart

Shell Colour	Crankcase Bore	Crankshaft Journal Diameter	Running Clearance
Red	46.113 to 46.105	43.108 to 43.100	0.040 to 0.018
Blue	46.113 to 46.105	43.099 to 43.092	0.040 to 0.019

Shell Colour	Crankcase Bore	Crankshaft Journal Diameter	Running Clearance
Blue	46.123 to 46.114	43.108 to 43.100	0.042 to 0.019
Green	46.123 to 46.114	43.099 to 43.092	0.042 to 0.020

For instance:	
Crankcase Bore	46.123 mm
Crankshaft Journal Diameter	43.108 mm
Required Bearing	BLUE

WARNING

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

Note

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

Coolant Manifold - 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.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal
- Engine - Removal

WARNING

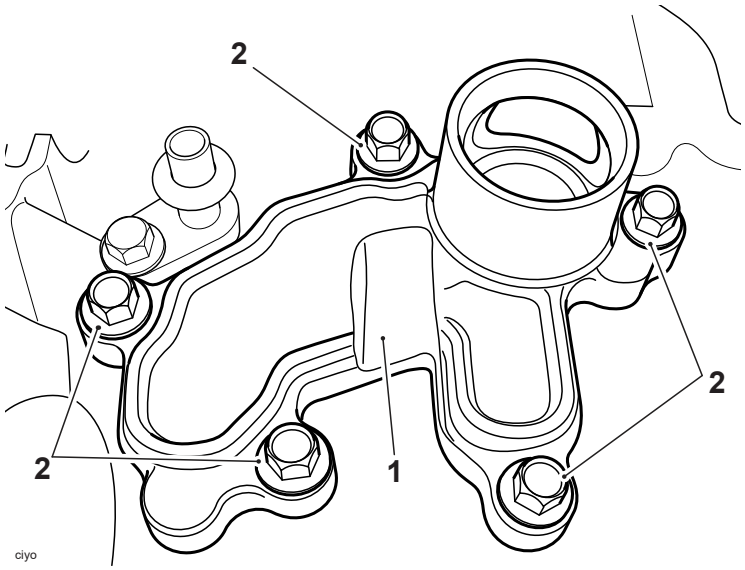
The oil may be hot to the touch. Contact with hot oil may cause the skin to be scalded or burned.

WARNING

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

- Crankcase - Disassembly

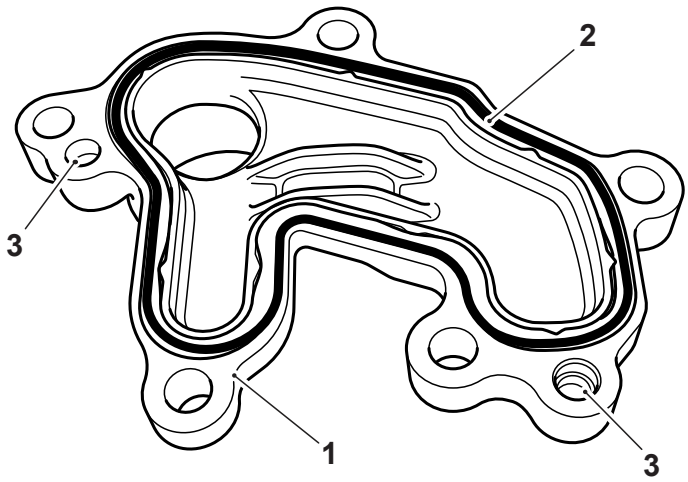
1. Remove the input and output shafts.
2. Release the fixings and remove the coolant manifold, discard the fixings and the sealing ring.



1. **Coolant manifold**
2. **Fixings**

Coolant Manifold - Installation

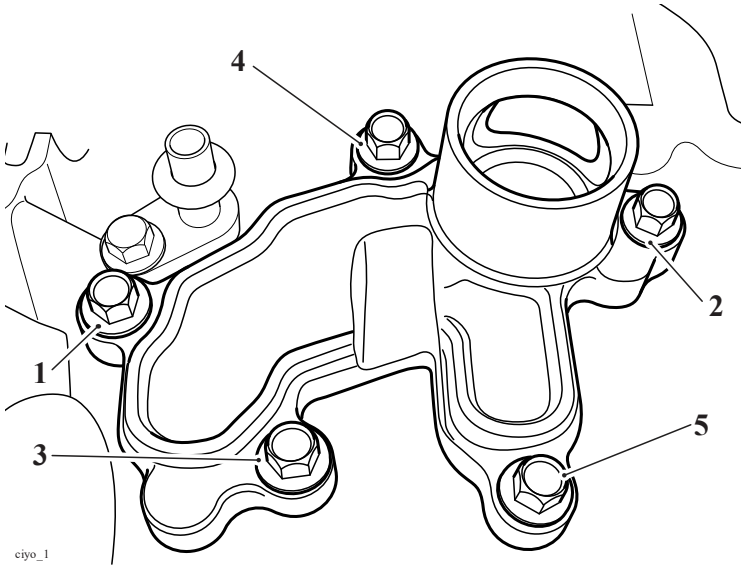
1. Fit a new sealing ring to the coolant manifold.



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1. **Coolant manifold**
2. **Sealing ring**
3. **Dowel locating holes**

2. Position the coolant manifold to the crankcase, ensuring the locating dowels are correctly positioned.
3. Install new fixings and tighten to **9 Nm** in the sequence shown below.



Tightening sequence

4. Refit the input and output shafts.

Perform the following operations:

- Crankcase - Assembly
- Engine - Installation
- Fuel Tank - Installation
- Battery - Installation
- Start the engine and ensure that the low oil pressure warning light goes out shortly after starting.
- Stop the engine and check the engine oil level. Adjust if necessary (see Engine Oil - Level Inspection).
- Seat - Installation

Breather Plate - 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

WARNING

motorcycle.

Perform the following operations:

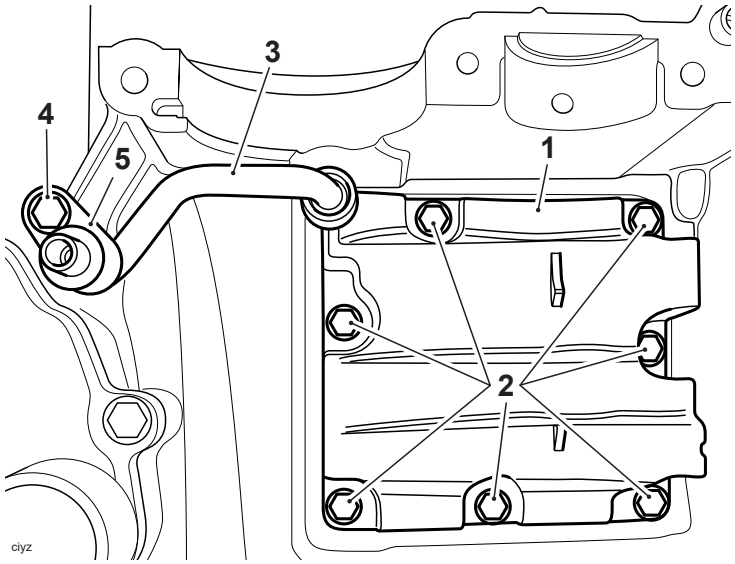
- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal
- Engine - Removal

WARNING

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

- Crankcase - Disassembly

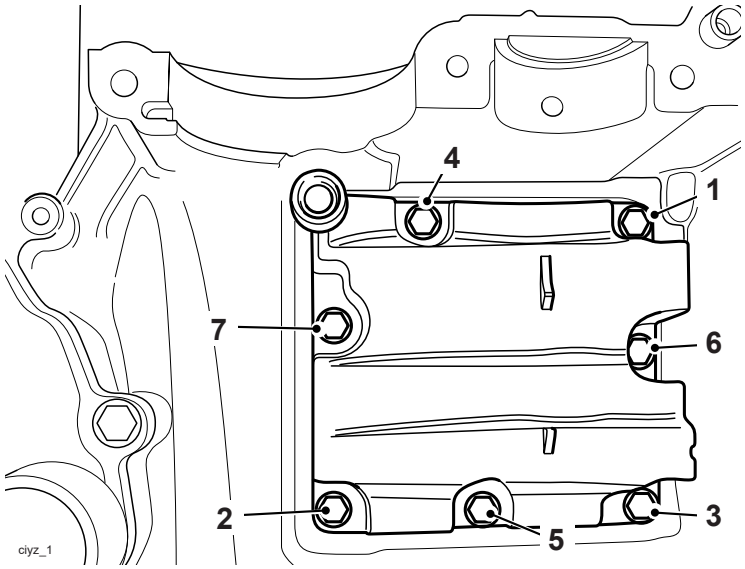
1. Remove the breather drain tube from the crankcase, discard the fixing and the O-ring.
2. Remove the input and output shafts.
3. Remove the engine oil breather plate and baffle, discard the fixings.



1. **Oil breather plate**
2. **Fixings**
3. **Breather drain tube**
4. **Fixings**
5. **O-ring**

Breather Plate - Installation

1. Put the engine oil breather plate in position. Install new fixings and tighten in the sequence shown to **9 Nm**.



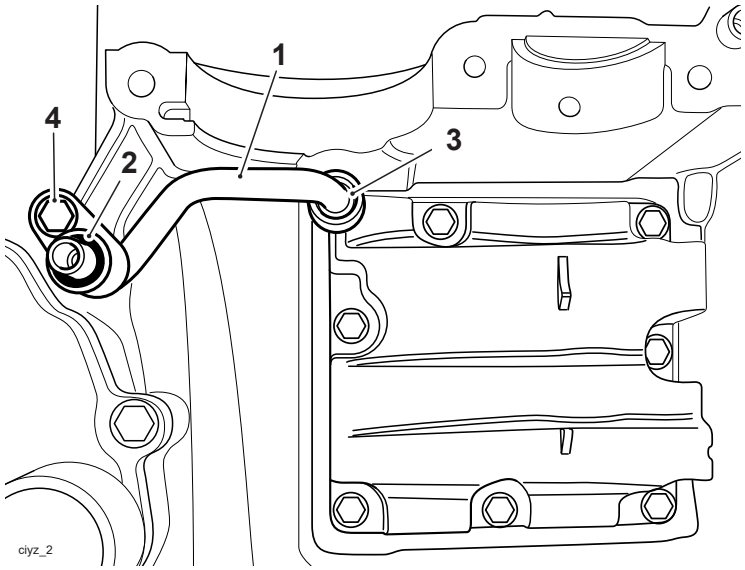
Tightening Sequence

2. Torque fixings 1 and 2 again to **9 Nm**.

Note

- **Before you install the two O-rings, coat the surfaces with petroleum jelly.**

3. Put a new O-ring onto each end of the breather tube and install the breather drain tube into the crankcase. Make sure that the tube is correctly installed in the breather plate housing.
4. Install a new fixing and tighten to **9 Nm**.



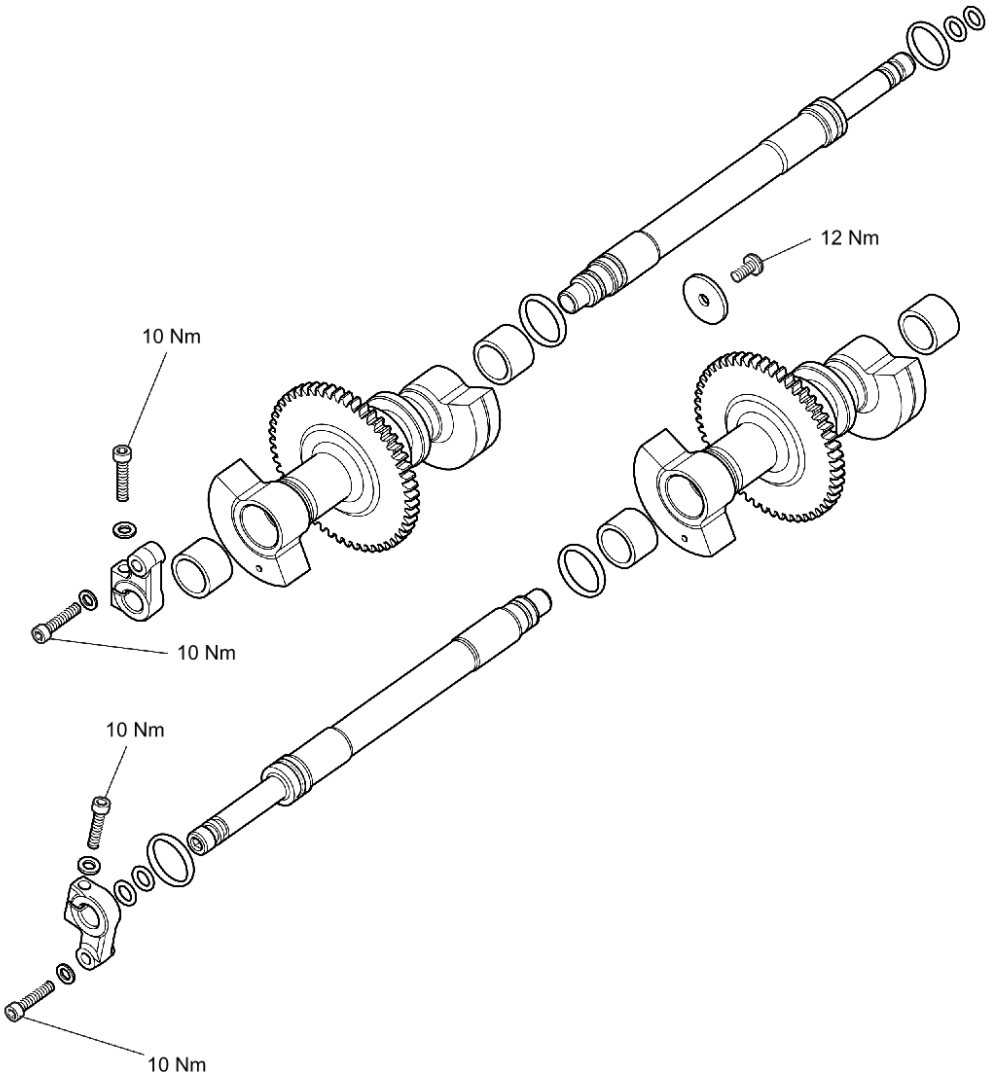
1. **Breather drain tube**
2. **O-ring (7.52 x 3.53 mm)**
3. **O-ring (7.6 x 2.4 mm)**
4. **Fixing**

Perform the following operations:

- Crankcase - Assembly
- Engine - Installation
- Fuel Tank - Installation
- Battery - Installation
- Start the engine and ensure that the low oil pressure warning light goes out shortly after starting.
- Stop the engine and check the engine oil level. Adjust if necessary (see Engine Oil - Level Inspection).
- Seat - Installation

Balancer

Exploded View – Balancers



Introduction

Two balancer shafts are fitted to the engine, one in front of the crankshaft in the upper crankcase and one behind it in the lower crankcase. Each balancer has the effect of a pair of counterbalance weights, which create an equal amount of energy in the opposite direction, and at the same time as that produced by the crankshaft, pistons and connecting rods. Because the opposing pulses occur at the same point of crankshaft rotation, and are of an equal magnitude, a state of equilibrium or balance is reached.

Rear Balancer 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.

Perform the following operations:

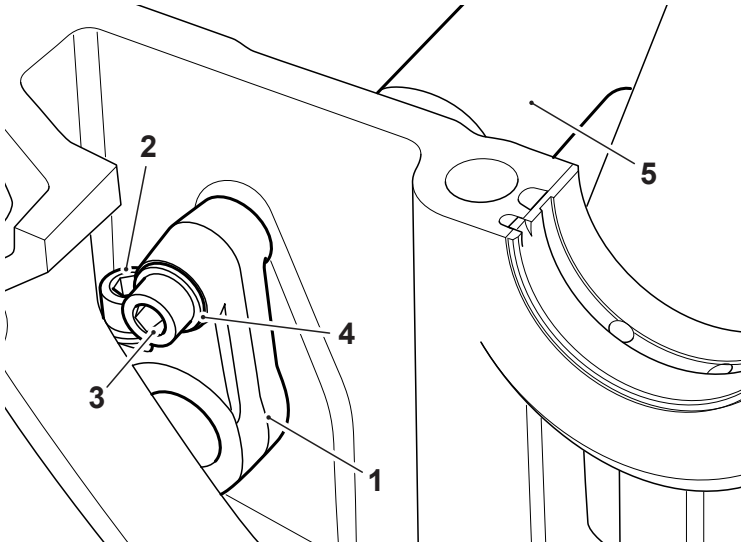
- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal
- Engine - Removal
- Crankcase - Disassembly

1. Remove the input and output shafts.

Note

- **The rear dead shaft clamp is marked with the R facing away from the crankcase.**

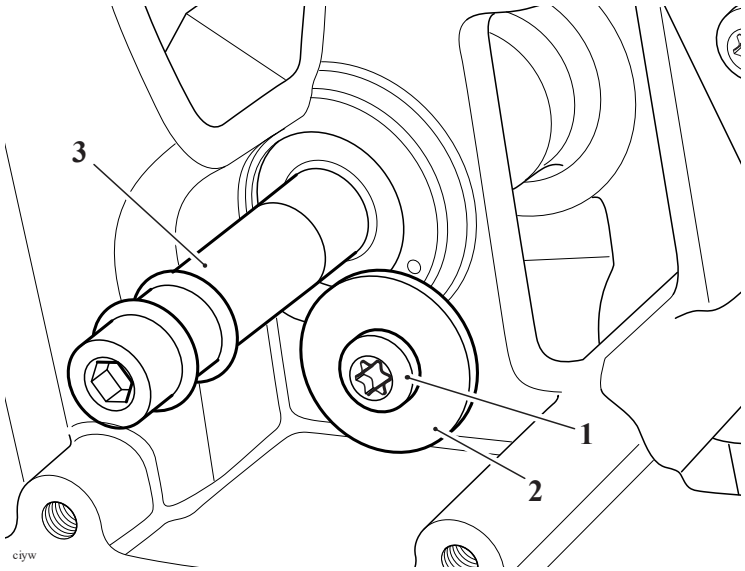
2. Loosen but do not fully remove the dead shaft clamp locking screw,
3. Remove the dead shaft clamp securing screw and washer. Discard the screw, retain the washer for reuse.





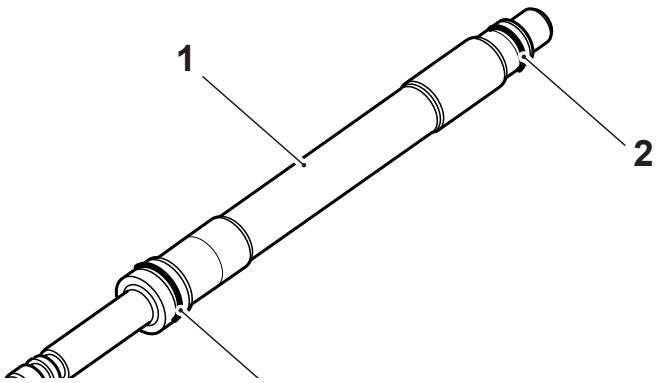
1. **Dead shaft clamp**
2. **Locking screw**
3. **Securing screw**
4. **Washer**
5. **Dead shaft**

4. Release the dead shaft screw and washer. Discard the dead shaft screw and retain the washer.



1. **Screw**
2. **Washer**
3. **Dead shaft**

5. Support the balancer shaft and noting its orientation slide the dead shaft from the crankcase.
6. Remove the balancer shaft.
7. Remove and discard the O-rings from the deadshaft.





1. **Deadshaft**
2. **O-rings**

Front Balancer 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.

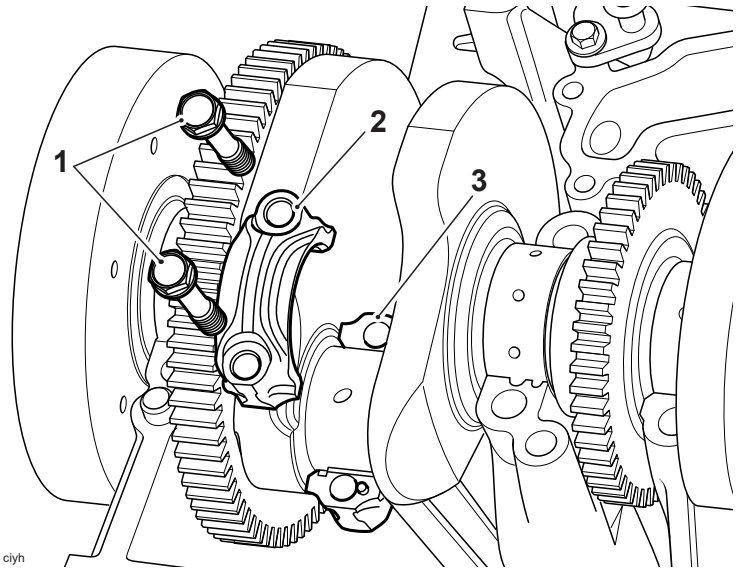
Perform the following operations:

- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal
- Engine - Removal
- Crankcase - Disassembly

Note

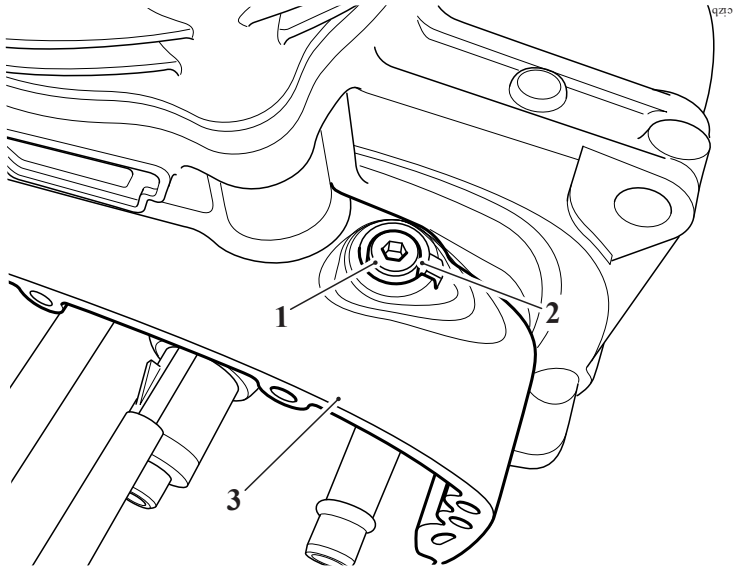
- **The connecting rods and caps should be identified, using a paint mark or similar.**

1. Remove and discard the connecting rod bolts.



1. **Connecting rod bolts**
2. **Connecting rod cap**
3. **Connecting rod**

2. Remove the crankshaft.
3. Remove the front balancer shaft blanking screw and, discard the washer.

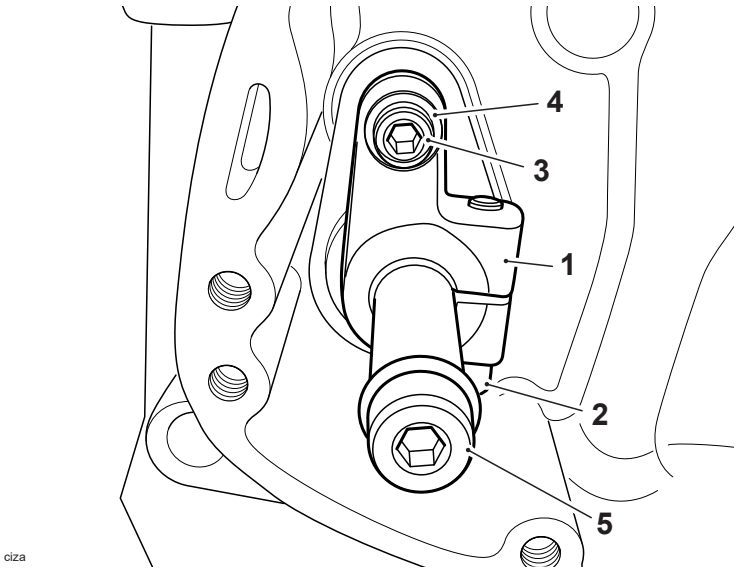


1. **Blanking screw**
2. **Washer**
3. **Upper crankcase**

Note

- **The front dead shaft clamp is marked with the F facing away from the crankcase.**

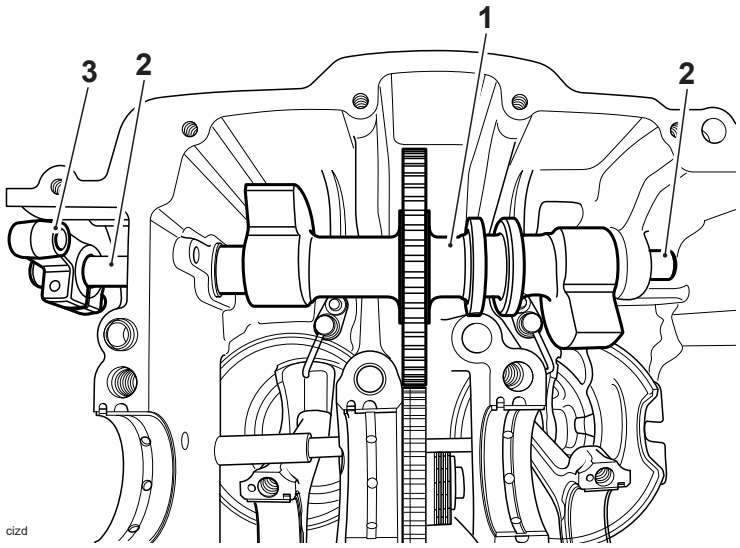
4. Loosen but do not fully remove the dead shaft clamp locking screw.
5. Remove the dead shaft clamp securing screw and washer. Discard the screw, retain the washer for reuse.



1. **Dead shaft clamp**

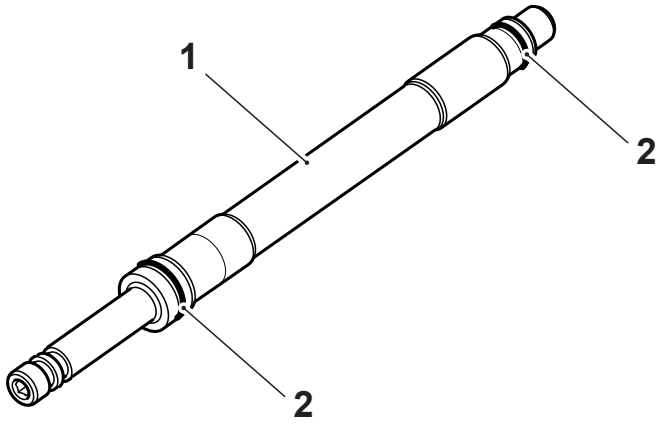
2. **Locking screw**
3. **Securing screw**
4. **Washer**
5. **Dead shaft**

6. Support the balancer shaft and noting its orientation slide the dead shaft from the crankcase.



1. **Balancer**
2. **Dead shaft**
3. **Dead shaft clamp**

7. Remove the balancer shaft.
8. Remove and discard the O-rings from the deadshaft.



1. **Deadshaft**
2. **O-rings**

Balancer shafts - Inspection

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

Front Balancer Shaft - Installation

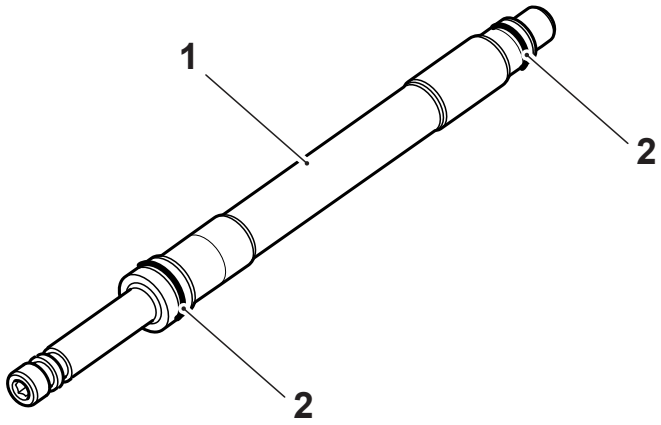
WARNING

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.

Note

- **To ensure a correct relationship, the balancer shaft must be installed in a specific orientation relative to the crankshaft.**

1. Check T3880039 - Idler Gear Timing Pin is fully inserted into the idler gear, and that the camshaft to idler gear timing is correct.
2. Fit a new O-ring to the grooves at each end of the deadshaft.



1. **Deadshaft**
2. **O-rings**

CAUTION

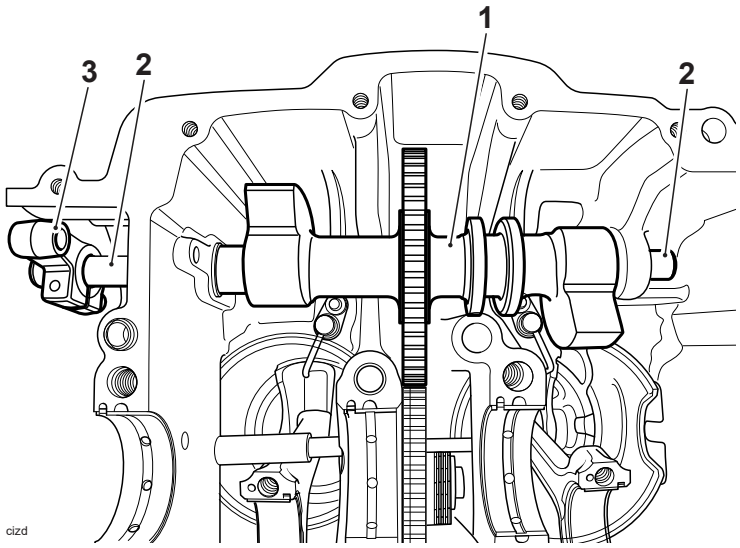
CAUTION

The balancer shaft gear is designed to mesh with the crankshaft gear.

Correct adjustment of the balancer shafts is critical to the performance of the engine and comfort of the rider.

Failure to correctly adjust the balancer shafts may cause serous engine damage and a poor rider experience.

3. Lubricate the balancer shaft, needle roller bearings and O-rings with clean engine oil.
4. Fit the balancer shaft into the crankcase as noted during removal.
5. Support the balancer shaft and noting its orientation, slide the dead shaft through the balancer shaft and into the upper crankcase.

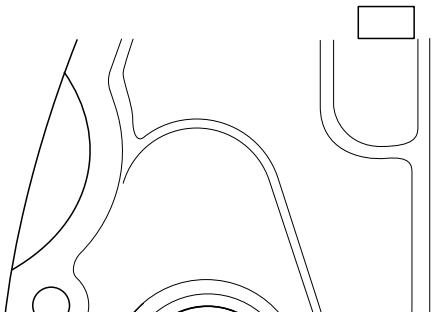


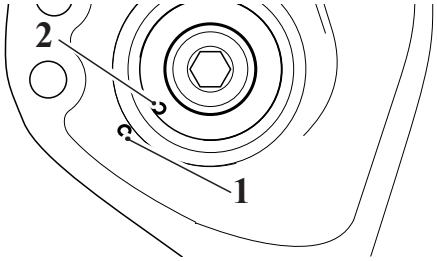
1. **Balancer**
2. **Dead shaft**
3. **Dead shaft clamp**

6. Position the alignment mark on the dead shaft with the alignment mark on the crankcase.

Note

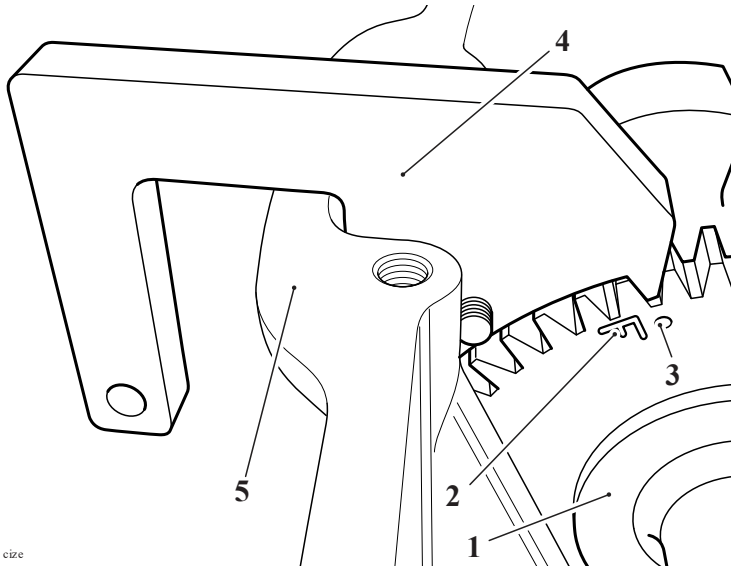
- **The static alignment of the balancer shaft will allow for initial starting of the engine.**
- **Final adjustment must be carried out with the engine running and at operating temperature, see Balancer Shafts Dynamic Adjustment.**





1. **Alignment mark (Crankcase)**
2. **Alignment mark (Dead shaft)**

7. Rotate the balancer shaft until the F and dot mark are visible.
8. Position the peg on T3880811 - Front Balancer Timing Tool to the dot mark on the balancer shaft gear.
9. Allow the balancer shaft to rotate anticlockwise until the flat surface rests against the machined surface of the crankcase, as shown.



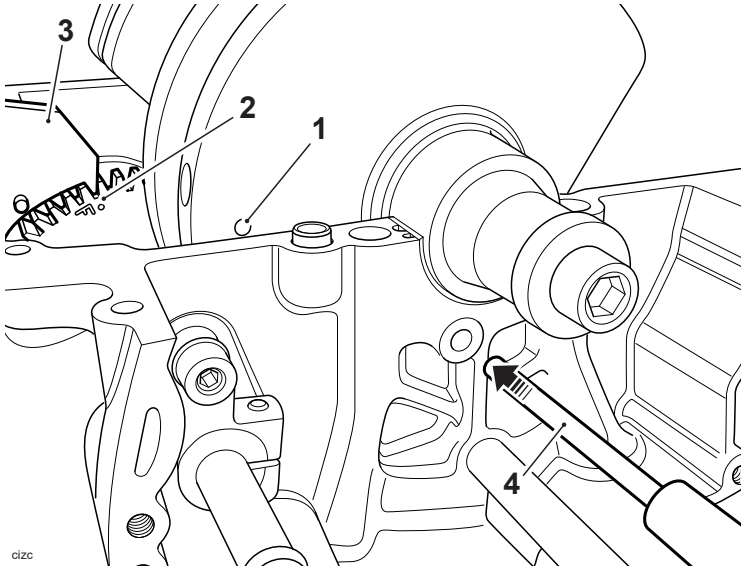
1. **Balancer shaft**
2. **Balancer shaft 'F' (front) mark**
3. **Balancer shaft alignment mark**
4. **T3880811 - Front Balancer Timing Tool**
5. **Crankcase**

10. Clean the crankshaft, crankshaft bearings and big end bearings with a high flashpoint solvent.
11. Lubricate the crankshaft and bearings with clean engine oil.
12. Position the connecting rods as noted during removal.

Note

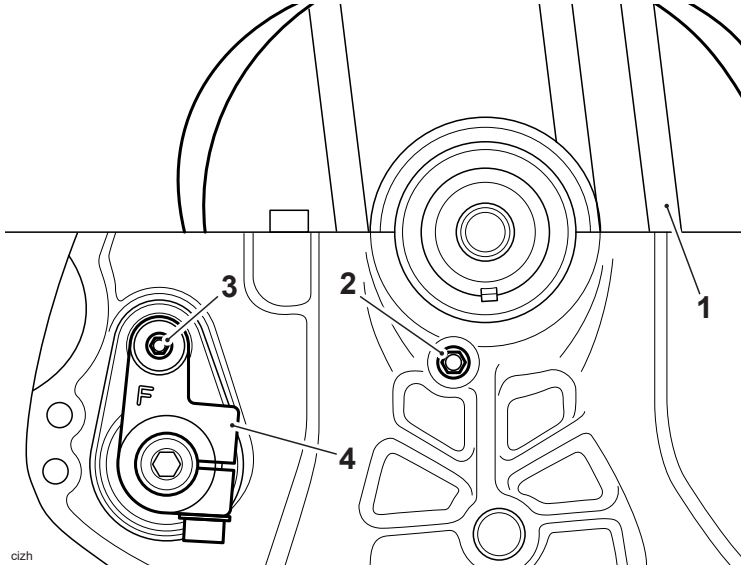
- **As the crankshaft is lowered into position the balancer shaft will rotate and the T3880811 - Front Balancer Timing Tool will no longer rest against the crankcase.**

13. Position the crankshaft to the crankshaft bearings, aligning the timing mark on the crankshaft with the machined surface of the crankcase.



1. **Crankshaft timing mark**
2. **Balancer gear timing marks**
3. **T3880811 - Front Balancer Timing Tool**
4. **T3880601 - Camshaft Timing Pin**

14. To check that the balancer shaft is correctly timed to the crankshaft proceed as follows:
    - The alignment hole in the crankshaft is visible through the hole in the crankcase.
    - The alignment mark on the balancer shaft is visible through the screw hole in the dead shaft clamp.
    - The T3880601 - Camshaft Timing Pin can be inserted fully, locking the crankshaft in position.

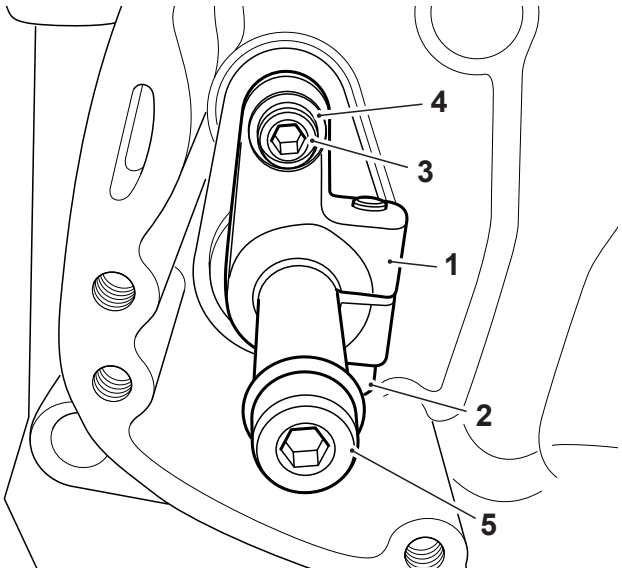


1. **Crankshaft**
2. **Crankshaft dot mark**
3. **Front balancer shaft dot mark**
4. **Dead shaft clamp**

Note

- **If the balancer shafts timing is incorrect, the procedure must be restarted from the beginning.**

15. Refit the dead shaft clamp and tighten the new securing screw to **10 Nm** and then tighten the dead shaft clamp locking screw to **12 Nm**.



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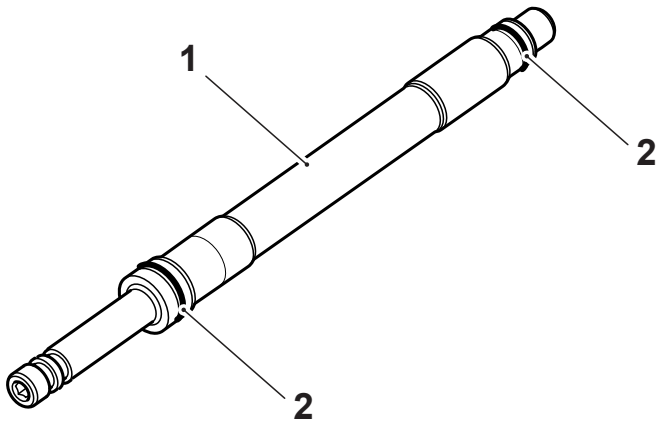
1. **Dead shaft clamp**
2. **Locking screw**
3. **Securing screw**
4. **Washer**
5. **Dead shaft**

Perform the following operations:

- Refit the big end caps to the connecting rods Connecting Rod - Installation
- Rear Balancer Shaft - Installation
- Crankcase - Assembly
- Alternator Cover - Installation
- Clutch Cover - Installation
- Camshaft Cover - Installation
- Engine - Installation
- Fuel Tank - Installation
- Battery - Installation
- Seat - Installation

Rear Balancer Shaft - Installation

1. Fit a new O-ring to the grooves at each end of the deadshaft.



1. **Deadshaft**
2. **O-rings**

2. Lubricate the balancer shaft, needle roller bearings and O-rings with clean engine oil.
3. Position the balancer shaft as noted during removal.
4. Fit the deadshaft into the crankcase as noted during removal and insert the balancer shaft.

CAUTION

The balancer shaft gear is designed to mesh with the crankshaft gear.

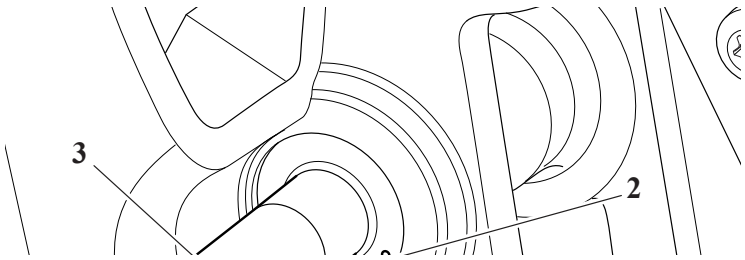
Correct adjustment of the balancer shafts is critical to the performance of the engine and comfort of the rider.

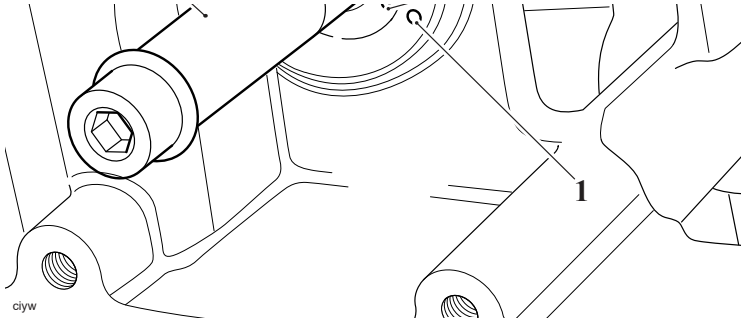
Failure to correctly adjust the balancer shafts may cause serous engine damage and a poor rider experience.

Note

- **The static alignment of the balancer shaft will allow for initial starting of the engine.**
- **Final adjustment must be carried out with the engine running and at operating temperature, see Balancer Shafts Dynamic Adjustment.**

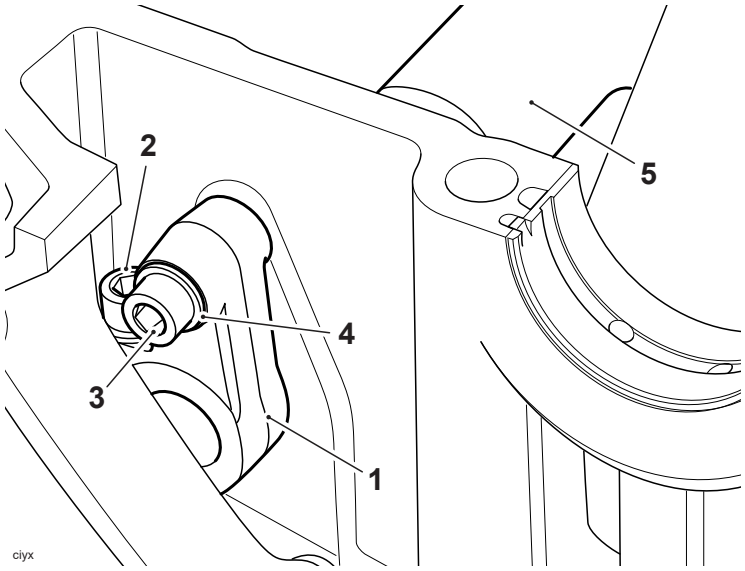
5. Align the dot mark on the dead shaft with the dot mark on the crankcase.





1. **Crankcase dot mark**
2. **Dead shaft dot mark**
3. **Dead shaft**

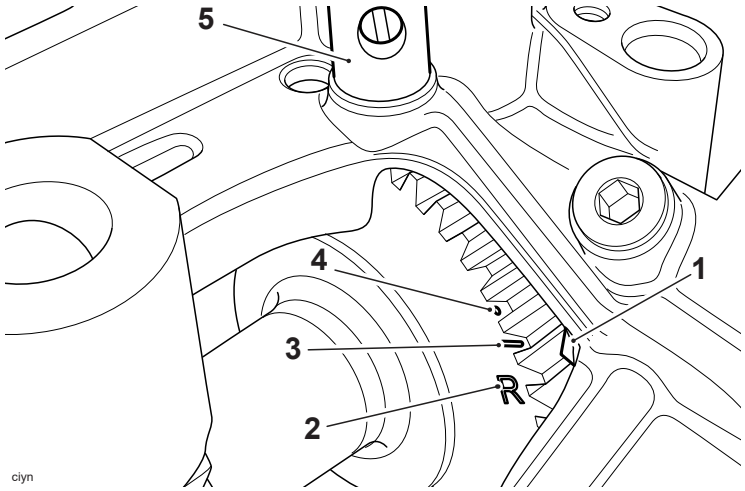
6. Fit a new screw to the washer, install the screw and washer to the dead shaft, ensuring the dot marks are aligned. Tighten to **12 Nm**.
7. Position the balancer shaft so that the preload mark aligns with the crankcase identification mark.
8. Refit the dead shaft clamp and tighten the new securing screw to **10 Nm** and then tighten the dead shaft clamp locking screw to **12 Nm**.



1. **Dead shaft clamp**
2. **Dead shaft clamp locking screw**
3. **Securing screw**
4. **Washer**
5. **Balancer shaft**

9. Lock the balancer shaft into position using T3880809 - Rear Balancer Timing Tool.
10. Lubricate the crankshaft and bearings with clean engine oil.





1. **Crankcase identification mark**
2. **Rear alignment mark**
3. **Preload mark**
4. **Dot mark**
5. **T3880809 - Rear Balancer Timing Tool**

Perform the following operations:

- Crankcase - Assembly
- Alternator Cover - Installation
- Clutch Cover - Installation
- Camshaft Cover - Installation
- Engine - Installation
- Fuel Tank - Installation
- Battery - Installation
- Seat - Installation

Balancer Shafts Dynamic 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

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.

WARNING

The cooling fan is switched on and off by the Engine Control Module 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.

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

- **Before dynamically adjusting the front and rear balancer shafts the engine coolant fan must have cycled once and the coolant temperature must be at least 103°C.**

Front Balancer Shaft Dynamic Adjustment

1. Start the motorcycle's engine and allow to run to operating temperature.

CAUTION

The dead shaft is an eccentric shaft which runs inside the balancer shaft. When rotated the dead shaft therefore closes or opens the gap between the teeth of the balancer gear and the teeth of the crankshaft gear.

If the gap between the balancer gear and crankshaft gear is too small a whine is audible due to the increased load on the gear teeth and bearings.

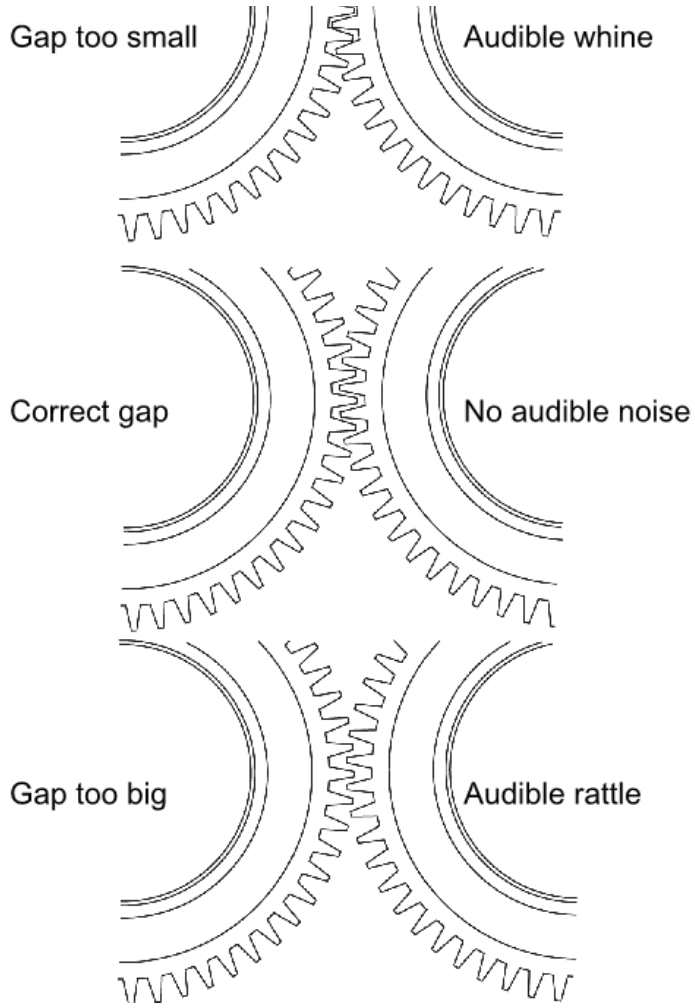
If the gap between the balancer gear and crankshaft gear is too large a rattle is audible due to the increased gap between the gear teeth.

The balancer shafts must always be adjusted in the same operation.

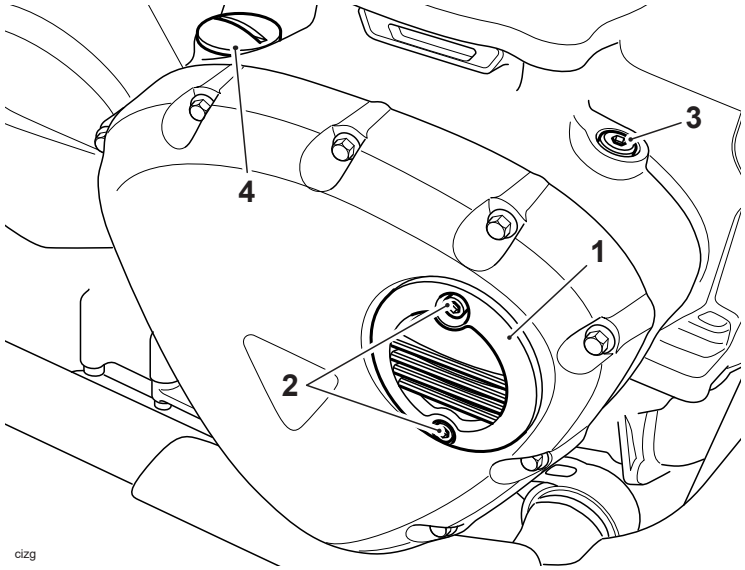
Adjusting the front or rear balancer shafts individually may cause the engine to whine or rattle.

Unsatisfactory adjustment of the balancer shafts may cause severe engine damage.





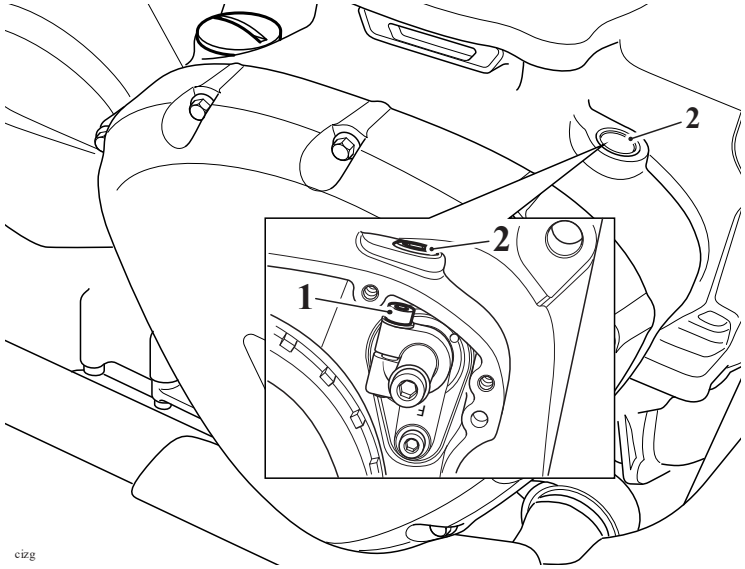
2. Stop the engine.
3. Remove the embellisher from the alternator cover and discard the fixings.
4. Remove the dead shaft clamp blanking plug and discard the washer.



1. **Embellisher**

2. **Fixings**
3. **Dead shaft clamp blanking plug**
4. **Oil filler cap**

5. Loosen the dead shaft clamp locking screw a maximum of two complete turns to allow smooth rotation of the balancer dead shaft in the clamp.



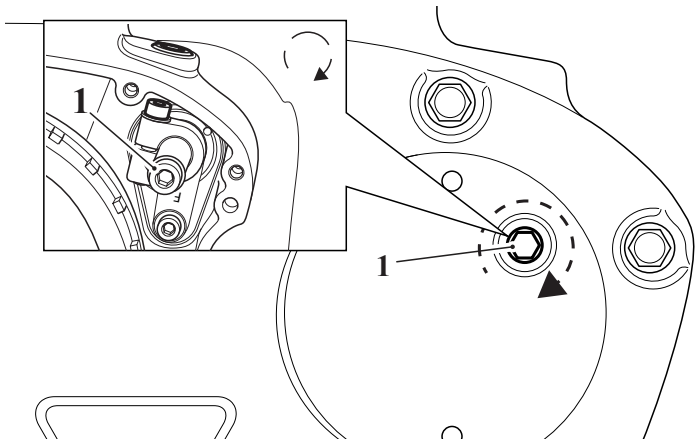
1. **Dead shaft clamp locking screw**
2. **Blanking plug orifice**

⚠ CAUTION

When adjusting the balancer shafts do not allow the gears to whine or rattle for a prolonged period.

Allowing the gears to mesh incorrectly for extended periods may cause damage to the gears and or bearings.

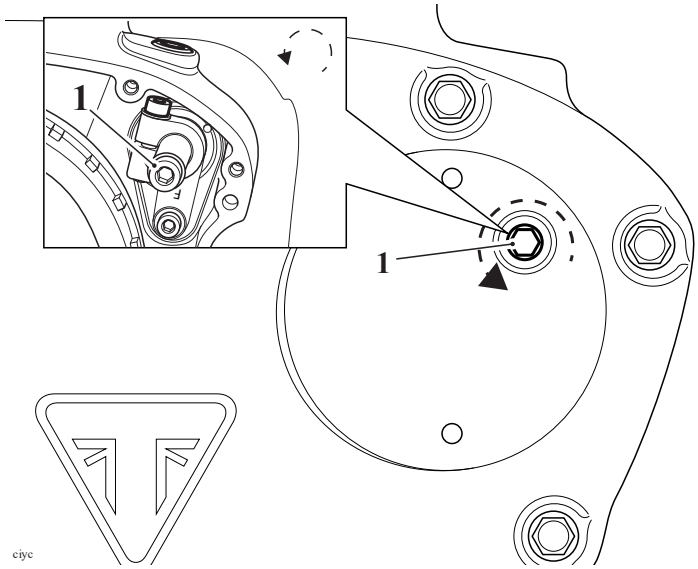
6. Start the engine and allow to idle.
7. Gently rotate the dead shaft clockwise until a whining noise can just be heard.





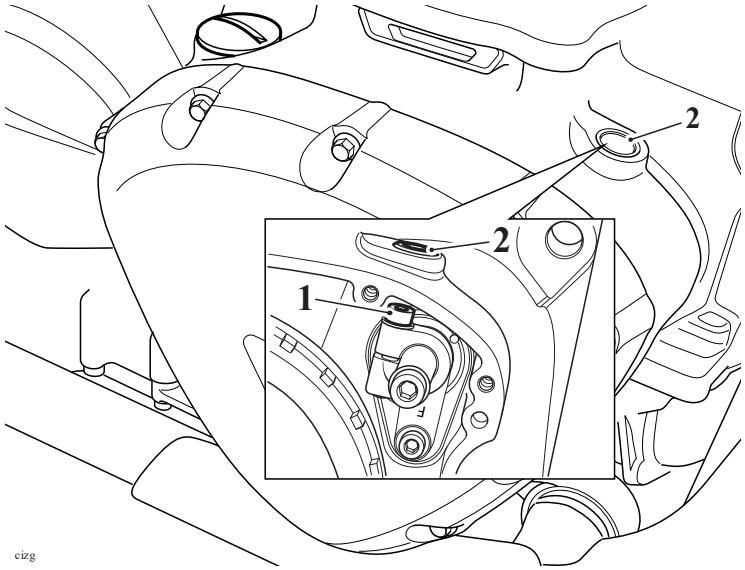
1. **Dead shaft**

8. Rotate the dead shaft anticlockwise until the whining noise can no longer be heard.



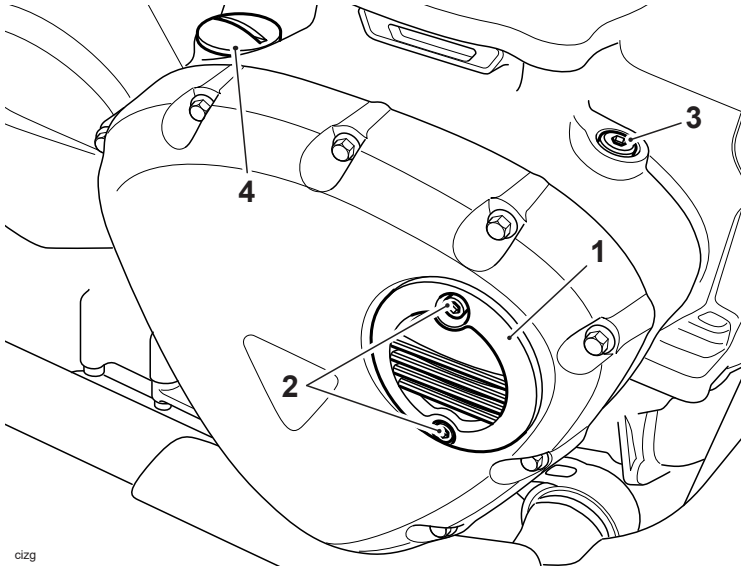
1. **Dead shaft**

9. Tighten the dead shaft clamp locking screw to **12 Nm**.
10. Stop the engine.



1. **Dead shaft clamp locking screw**
2. **Blanking plug orifice**

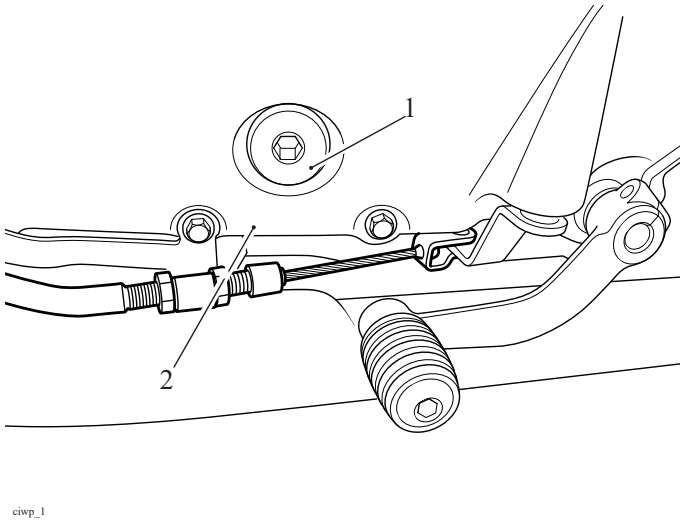
11. Wipe away any spilled oil from the crankcase.
12. Fit a new washer and tighten the dead shaft clamp blanking plug to **23 Nm**.
13. Refit the embellisher cover to the alternator cover, tighten the new fixings to **4 Nm**.



1. **Embellisher**
2. **Fixings**
3. **Dead shaft clamp blanking plug**
4. **Oil filler cap**

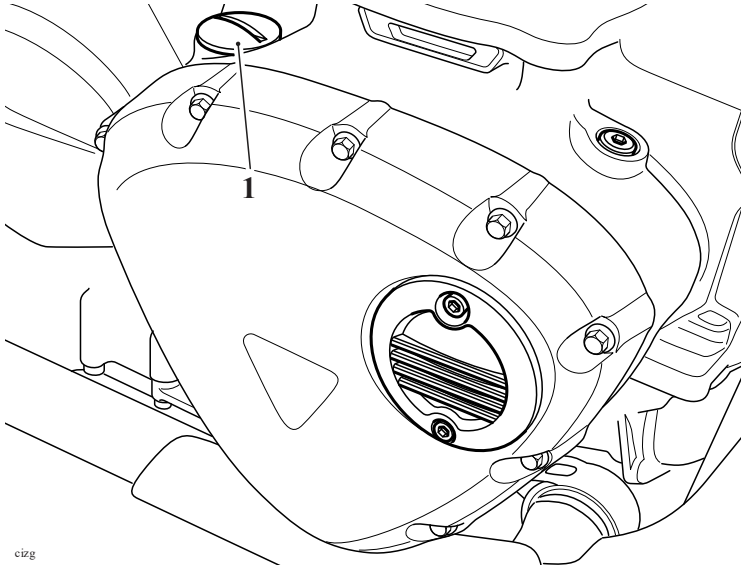
Rear Balancer shaft Dynamic Adjustment

1. Remove the clutch cover plug.



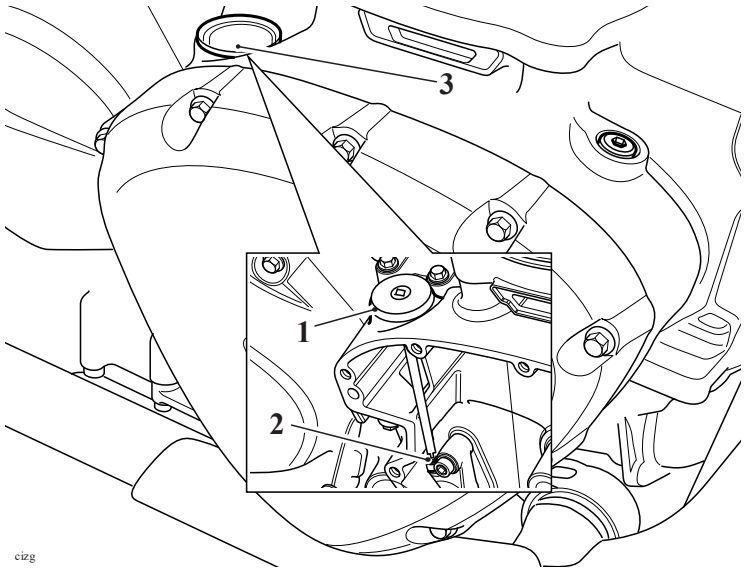
1. **Clutch cover plug**
2. **Clutch cover**

2. Remove the oil filler cap and discard the O-ring.



1. **Oil filler cap**

3. Using T3880652 - Dead Shaft Key Tool, loosen the dead shaft clamp locking screw a maximum of two complete turns to allow smooth rotation of the balancer dead shaft in the clamp.



1. **T3880652 - Dead Shaft Key Tool**
2. **Dead shaft clamp locking screw**
3. **Oil filler orifice**

CAUTION

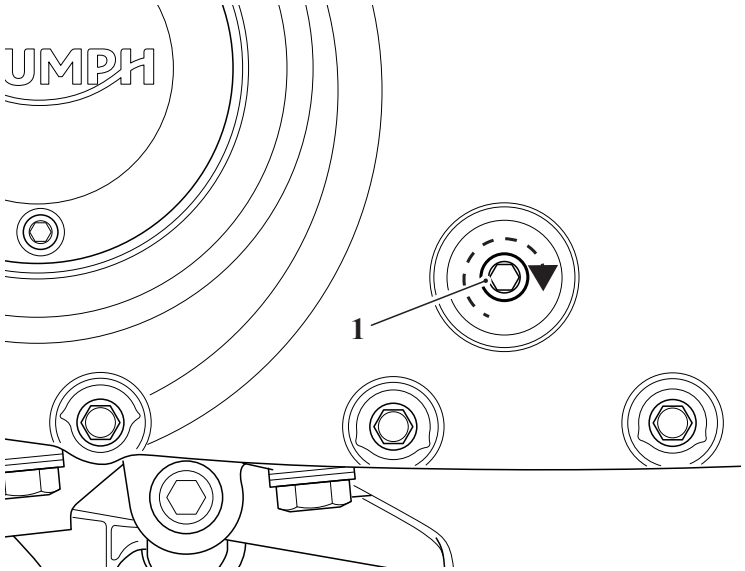
When adjusting the balancer shafts do not allow the gears to whine or rattle for a

CAUTION

prolonged period.

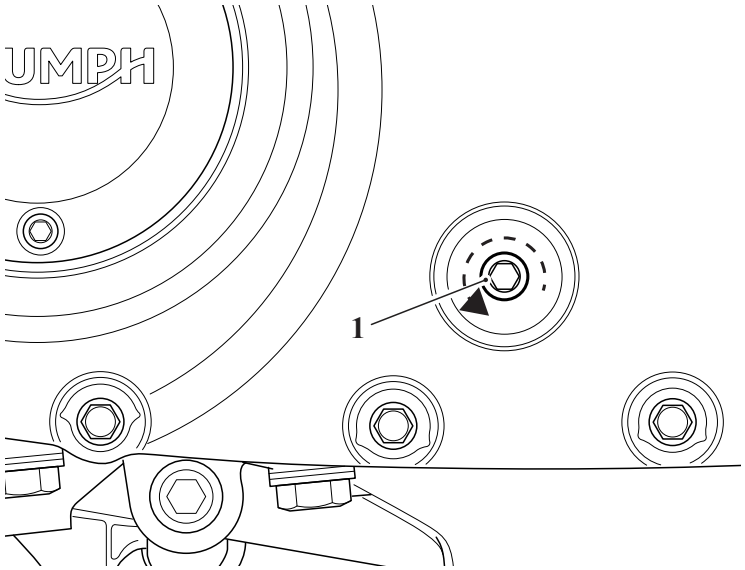
Allowing the gears to mesh incorrectly for extended periods may cause damage to the gears and or bearings.

4. Start the engine and allow to idle.
5. Rotate the rear dead shaft clockwise until a whining noise can be heard.



1. Dead shaft

6. Rotate the dead shaft anticlockwise until the whining noise can no longer be heard.

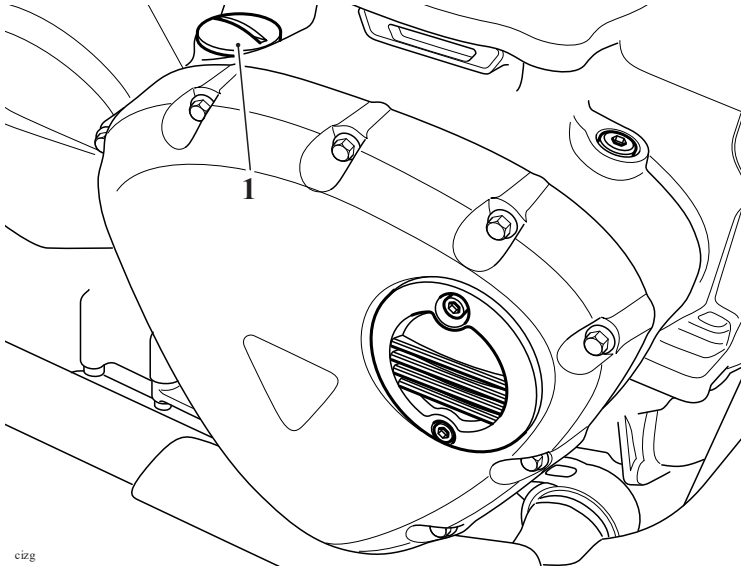


1. Dead shaft

7. Using T3880652 - Dead Shaft Key Tool tighten the dead shaft clamp locking screw to **12**

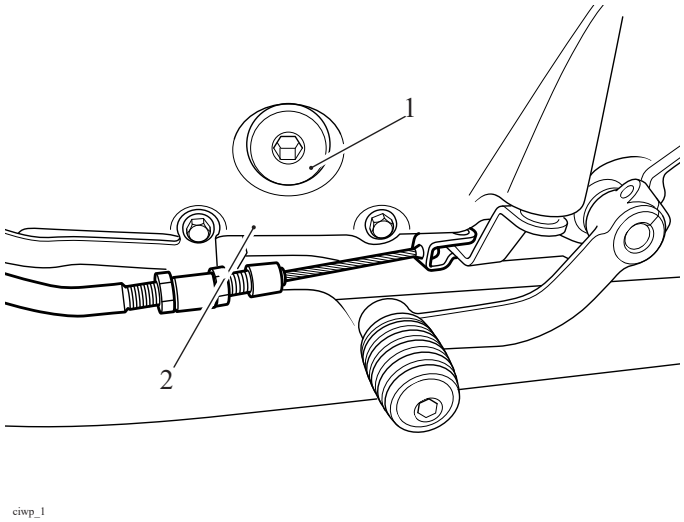
Nm.

8. Stop the engine.
9. Wipe away any spilled oil from the upper crankcase.
10. Using a new O-ring refit the oil filler cap and tighten to **3 Nm**.



1. **Oil filler cap**

11. Refit the clutch cover plug and tighten to **10 Nm**.



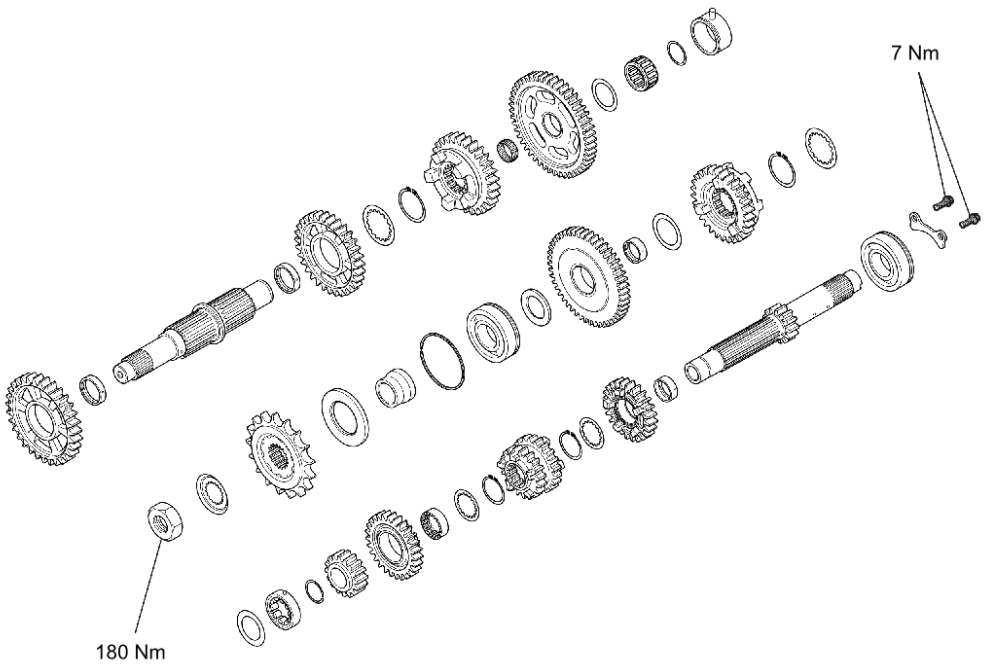
1. **Clutch cover plug**
2. **Clutch cover**

12. Inspect the engine oil level (see Engine Oil - Level Inspection).

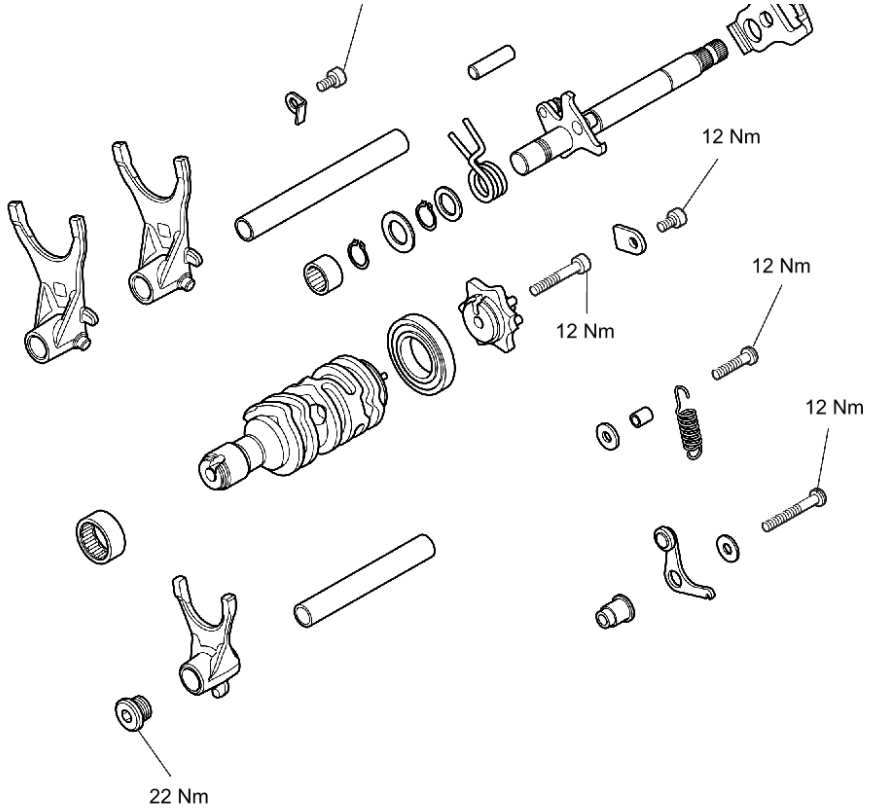
Transmission

Exploded View – Input and Output Shafts

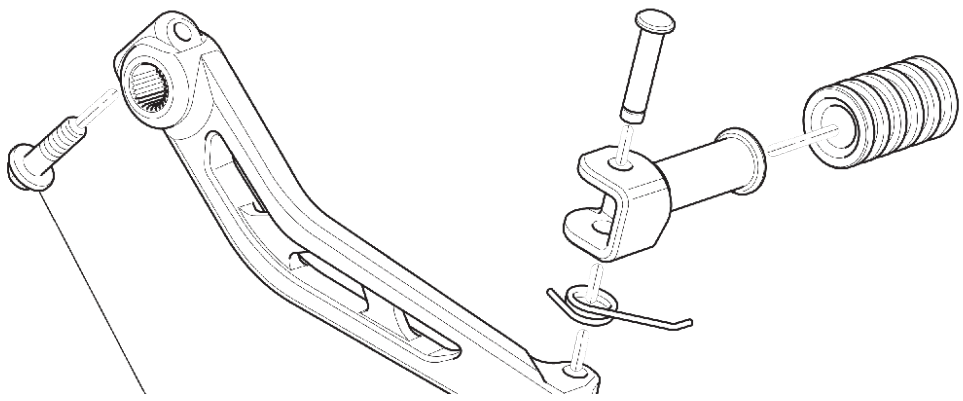
Exploded View – Gear Selector







Exploded View – Gear Change Lever





Gear Change Shaft - Removal

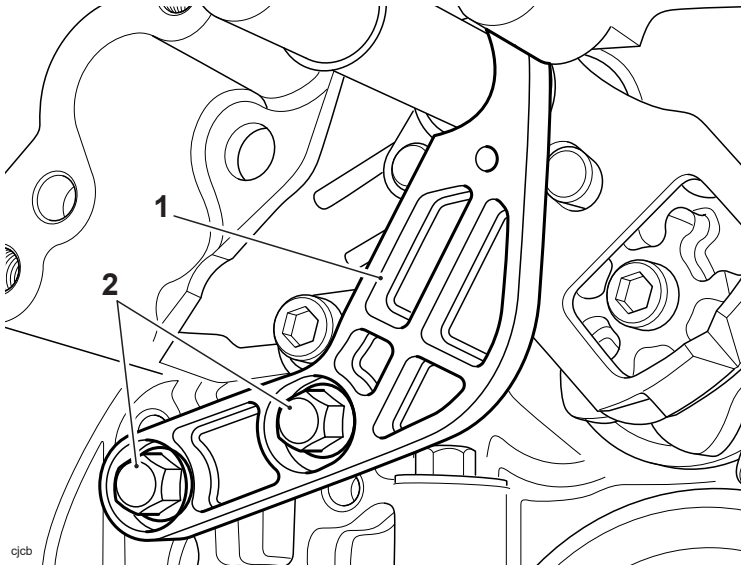
WARNING

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.

Perform the following operations:

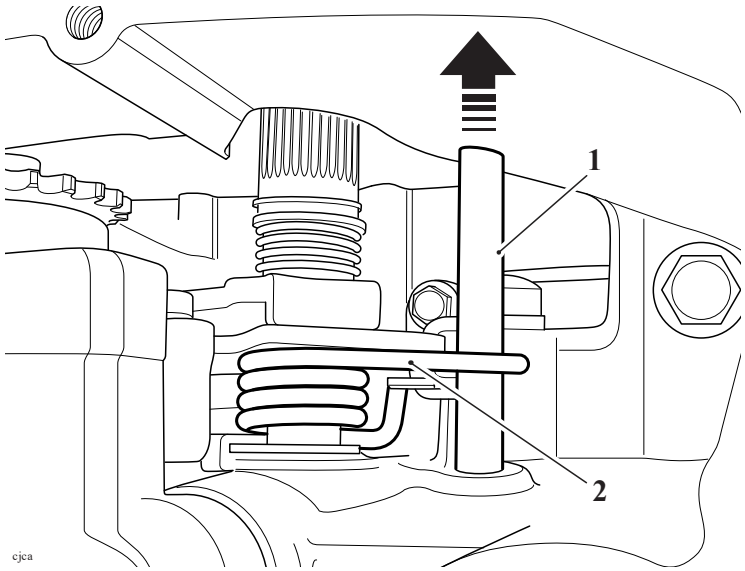
- Seat - Removal
- Battery - Removal
- Clutch - Removal

1. Remove and discard the fixings and remove the oil pump drive chain guide from the crankcase.



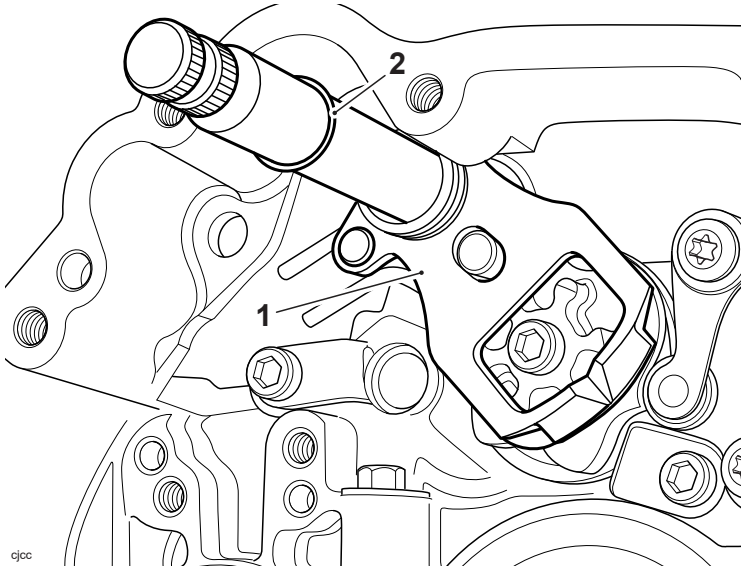
1. **Oil pump drive chain guide**
2. **Fixings**

2. Withdraw the abutment dowel from the crankcase.



1. **Abutment dowel**
2. **Abutment spring**

3. Collect the washer from the gear change shaft.
4. Withdraw the gear change shaft as an assembly.



1. **Gear change shaft assembly**
2. **Washer**

Gear Change Shaft - Inspection

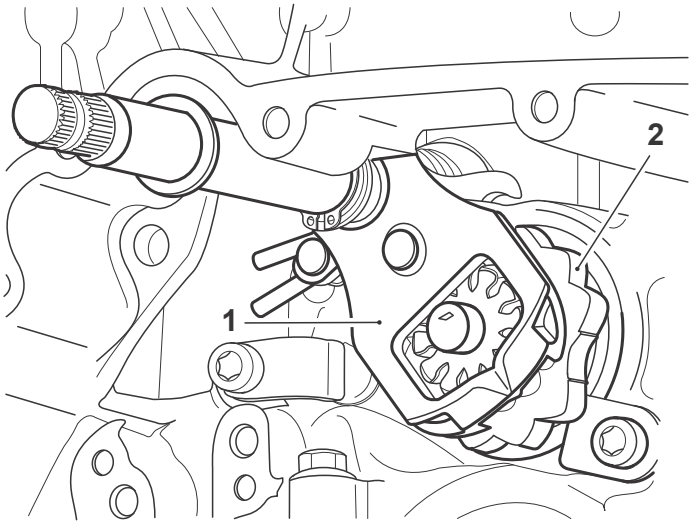
1. Inspect the gear change shaft assembly and spring for damage or wear, the springs for overextension (i.e. abnormal gaps between coils). If any of the components are damaged or worn, replace the complete assembly.

Gear Change Shaft - Installation

WARNING

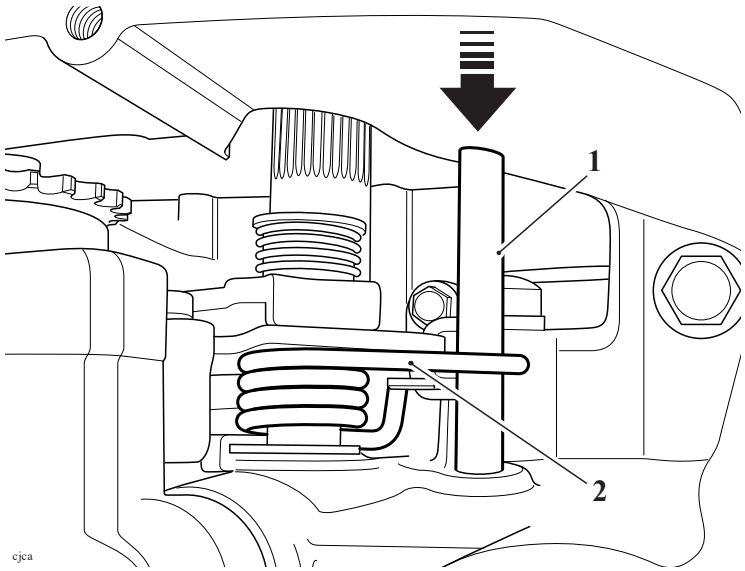
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Position the selector mechanism into the crankcase and locate the pivot plate to the detent wheel.



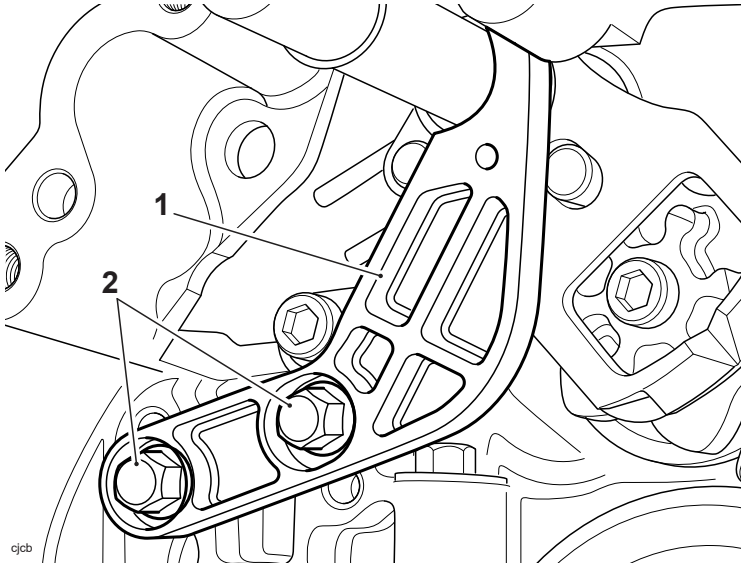
1. **Pivot plate**
2. **Detent wheel**

2. Insert the abutment dowel with the spring tangs positioned to either side.



1. **Abutment dowel**
2. **Abutment spring**

3. Refit the pump drive chain guide to the crankcase. Tighten the new fixings to **7 Nm**.



1. **Pump drive chain guide**
2. **Fixings**

Perform the following operations:

- Clutch - Installation
- Battery - Installation
- Seat - Installation

Gear Change Detent Wheel - Removal

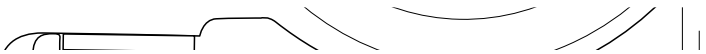
WARNING

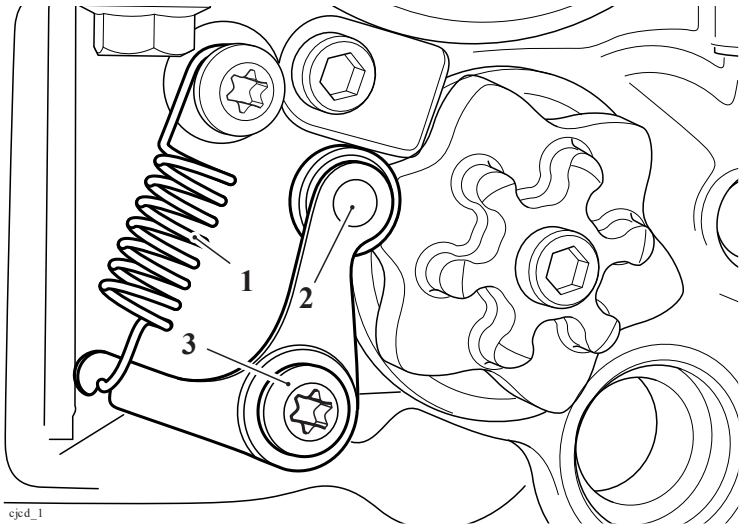
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Gear Change Shaft - Removal
- Remove the gear change shaft (see Gear Change Shaft - Removal).

1. Release the detent arm spring.
2. Release the detent arm fixing and remove the detent arm. Discard the fixing.





1. **Detent arm spring**
2. **Detent arm**
3. **Fixing**

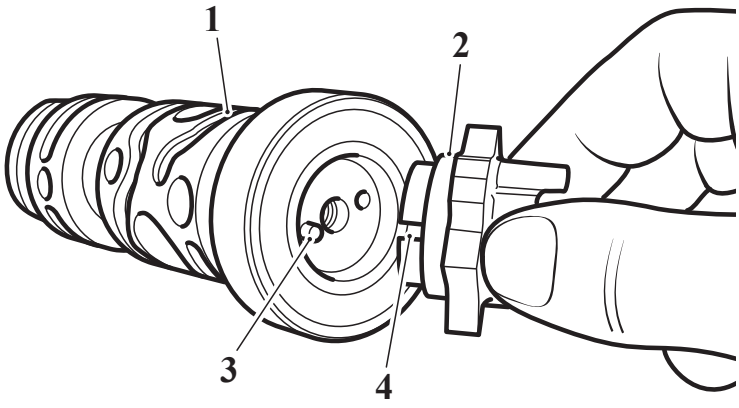
Note

- **Note the position of the spacer, detent arm and washer for installation.**

3. Remove the fixing and the detent wheel from the selector drum. Discard the fixing.

Gear Change Detent Wheel - Installation

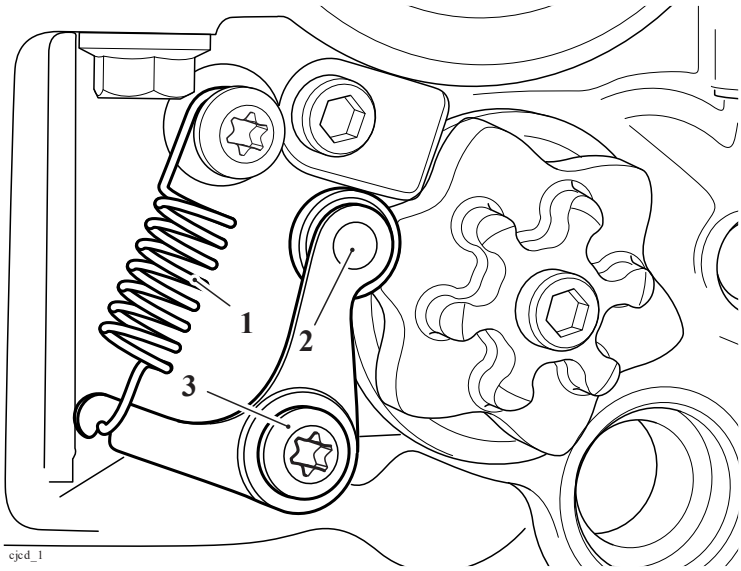
1. Lubricate the selector drum bearings with clean engine oil.
2. Refit the detent wheel to the selector drum, ensuring the pin on the drum locates in the slot in the detent wheel. Prevent the drum from turning and tighten the fixing to **12 Nm**.



1. **Selector drum**
2. **Detent wheel**
3. **Pin**

4. **Slot**

3. Refit the spacer, detent arm, washer and a new fixing as noted during removal.
4. Tighten the new fixing to **12 Nm**.
5. Refit the detent arm spring.



1. **Detent arm spring**
2. **Detent arm**
3. **Fixing**

Perform the following operations:

- Gear Change Shaft - Installation
- Battery - Installation
- Seat - Installation

Selector Forks and Drum - Removal

WARNING

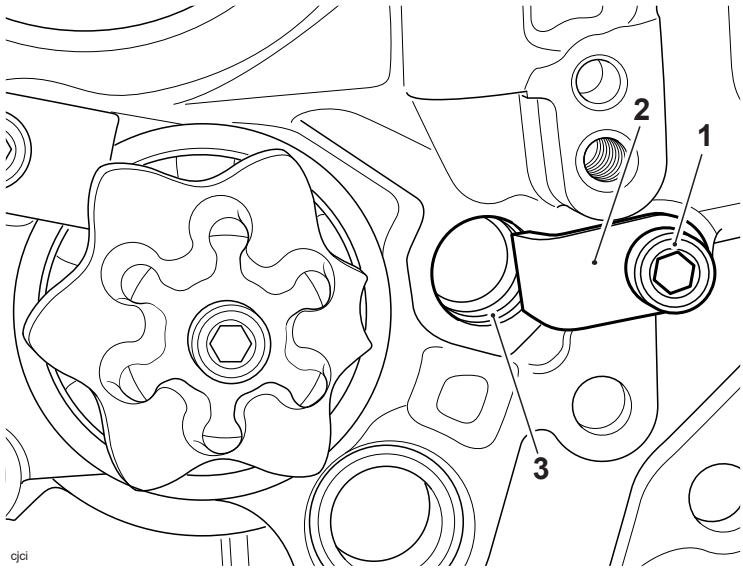
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal
- Engine - Removal
- Crankcase - Disassembly

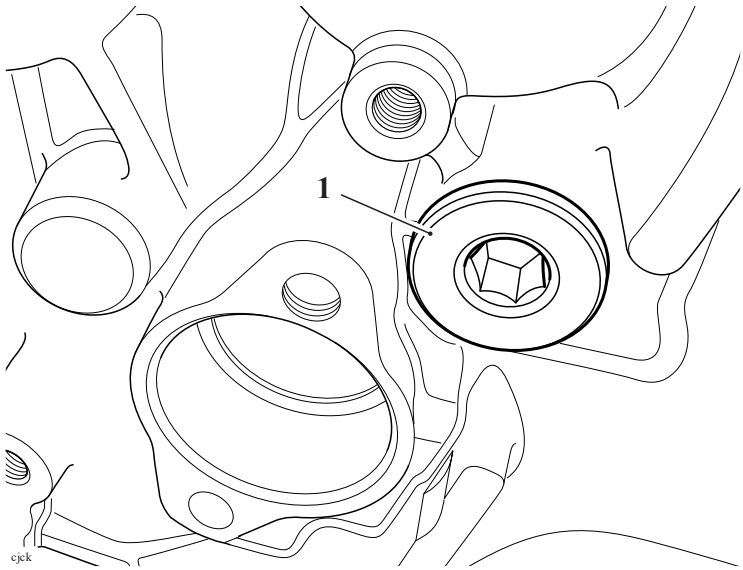
- Remove the transmission shafts
- Gear Change Shaft - Removal
- Gear Position Sensor - Removal

1. Remove and discard the fixing securing the output selector shaft retainer.



1. **Fixing**
2. **Output selector shaft retainer**
3. **Output selector shaft**

2. Remove and discard the fixing securing the input selector shaft.



1. **Fixing**

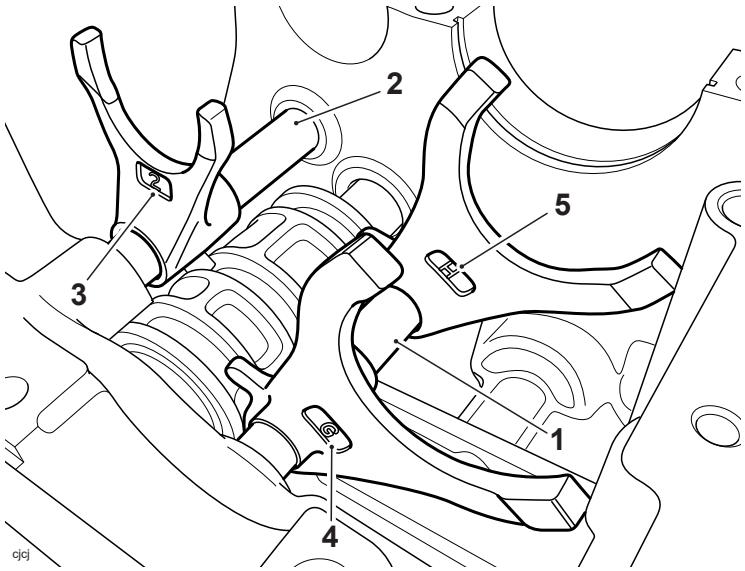
Note

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

Note

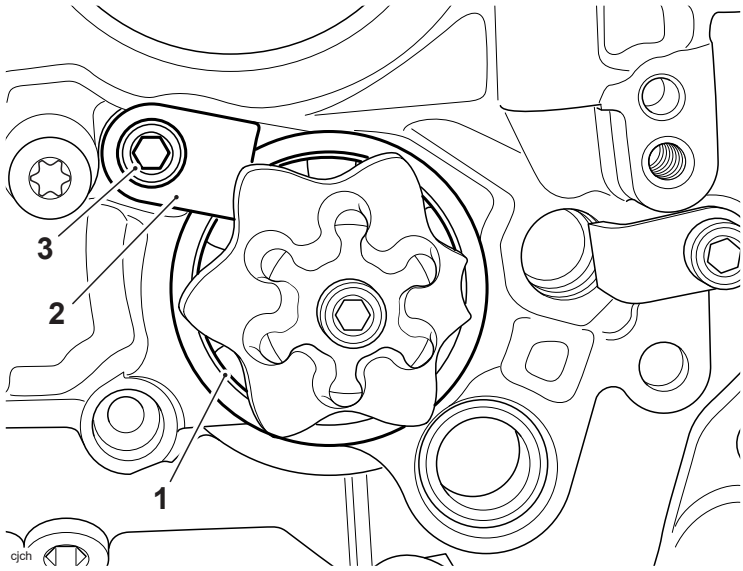
the selector drum.

3. Withdraw the input selector shaft and noting its orientation remove the fork.
4. Withdraw the output selector shafts and noting their orientation, collect the two selector forks.



1. **Output selector shaft**
2. **Input selector shaft**
3. **Selector fork (input shaft)**
4. **Selector fork (output shaft)**
5. **Selector fork (output shaft)**

5. Remove the selector drum bearing keeper plate and discard the fixing.
6. Remove the selector drum.



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

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

Selector Forks and Drum Inspection

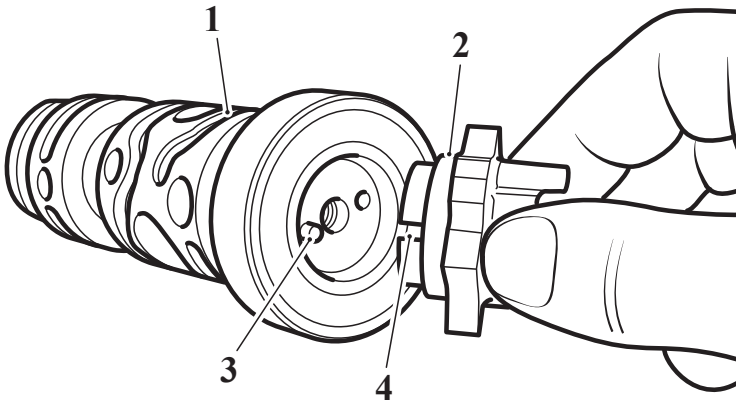
Inspect all bearings for damage or wear. Renew as necessary.

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

- Refer to the specifications table (see Transmission).

Selector Forks and Drum - Installation

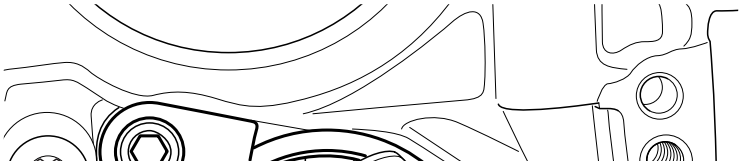
1. If removed, refit the detent wheel to the selector drum, ensuring the pin on the drum locates in the slot in the detent wheel. Prevent the drum from turning and tighten the new fixing to **12 Nm**.

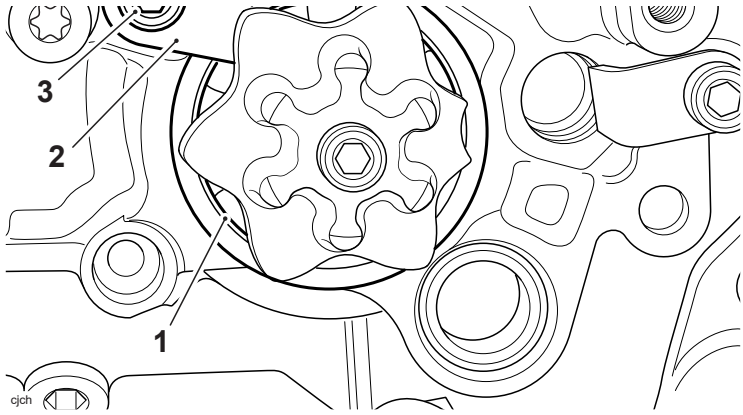


cfwy

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

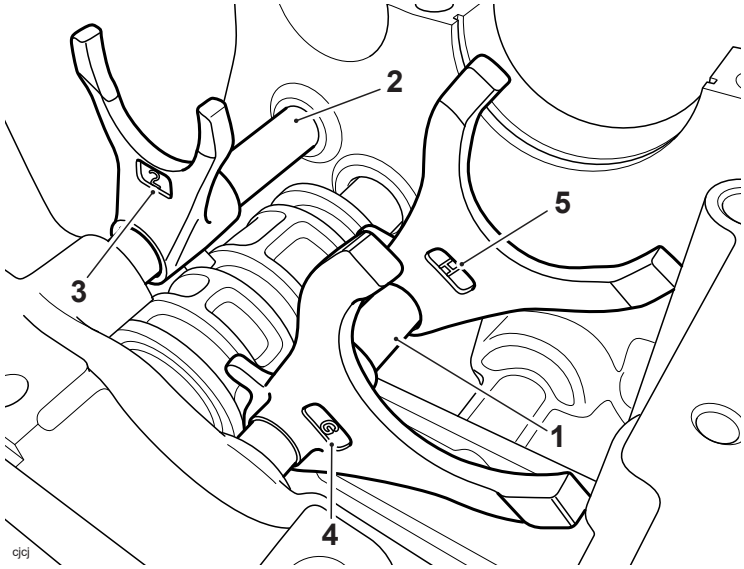
2. Refit the selector drum, ensuring it is pushed fully into the crankcase.
3. Fit the bearing keeper plate and retain the plate in position using a new fixing. Tighten the fixing to **12 Nm**.





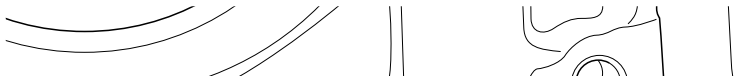
1. **Selector drum**
2. **Bearing keeper plate**
3. **Fixing**

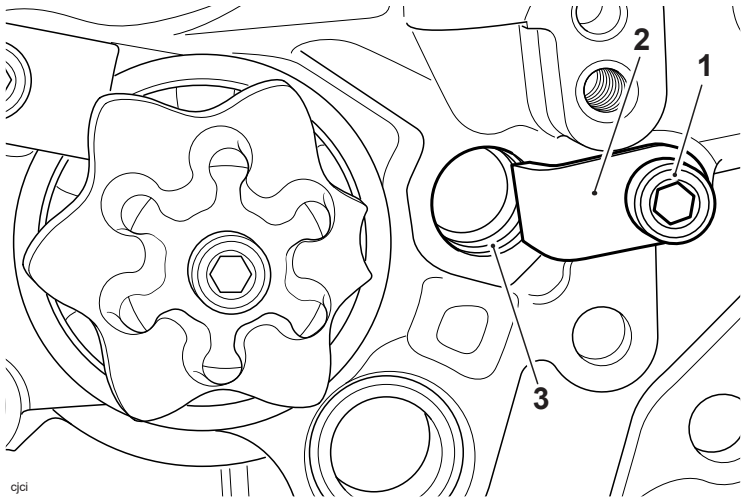
4. Lubricate the forks and shafts with clean engine oil.
5. Position the output selector fork shaft and selector forks to the crankcase as noted during removal,
6. Position the input selector fork shaft and selector fork to the crankcase as noted during removal.



1. **Output selector shaft**
2. **Input selector shaft**
3. **Selector fork (input shaft)**
4. **Selector fork (output shaft)**
5. **Selector fork (output shaft)**

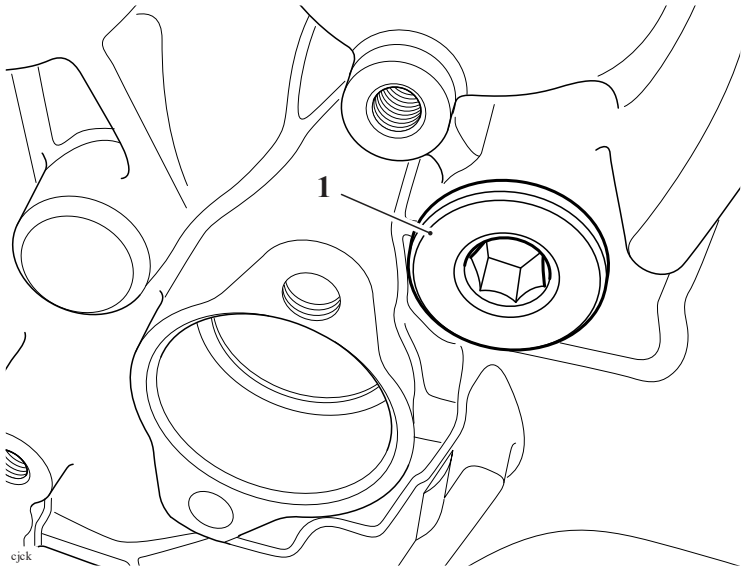
7. Using a new fixing secure the output selector shaft retainer, tighten the fixing to **12 Nm**.





1. **Fixing**
2. **Retainer**
3. **Selector shaft**

8. Using a new fixing secure the input selector shaft, tighten the fixing to **22 Nm**.



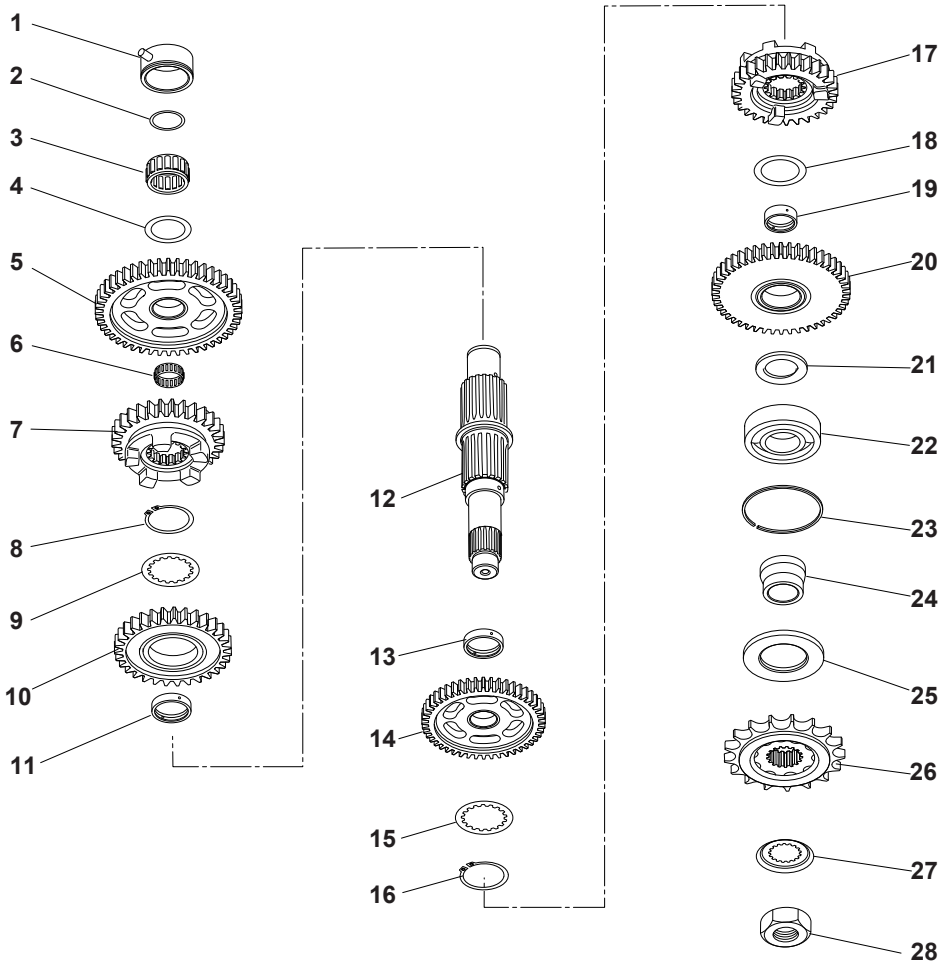
1. **Fixing**

Perform the following operations:

- Gear Position Sensor - Installation
- Gear Change Shaft - Installation
- Refit the transmission shafts
- Crankcase - Assembly
- Engine - Installation
- Fuel Tank - Installation
- Battery - Installation

- Seat - Installation

Exploded View - Output Shaft



1. **Bearing outer carrier**
2. **Circlip**
3. **Needle roller bearing**
4. **Thrust washer**
5. **First gear**
6. **Needle roller bearing**
7. **Fifth gear**
8. **Circlip**
9. **Splined thrust washer**
10. **Fourth gear**
11. **Plain bush**
12. **Output shaft**
13. **Plain bush**
14. **Third gear**

15. **Splined thrust washer**
16. **Circlip**
17. **Sixth gear**
18. **Thrust washer**
19. **Plain bush**
20. **Second gear**
21. **Second gear spacer**
22. **Outer bearing**
23. **Snap ring**
24. **Distance sleeve**
25. **Output shaft seal**
26. **Sprocket**
27. **Tab washer**
28. **Sprocket nut**

Output Shaft - Disassembly

WARNING

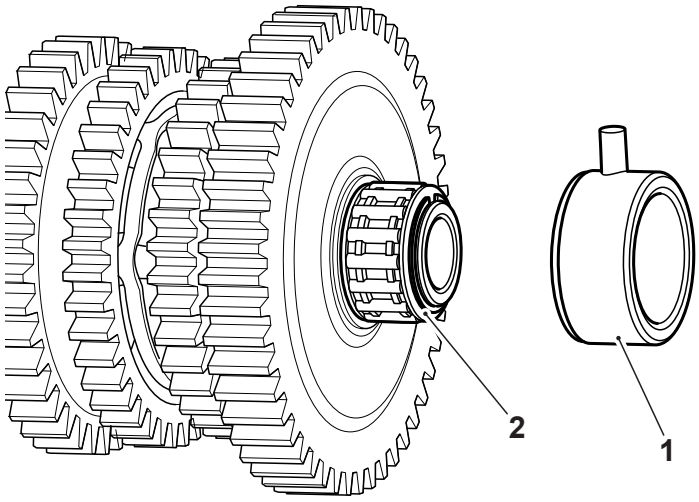
When using a press, always wear overalls, eye, face and hand protection. Objects such as bearings frequently break-up under load and the debris caused during break-up may cause damage and injury to unprotected parts of the body.

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.

Note

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

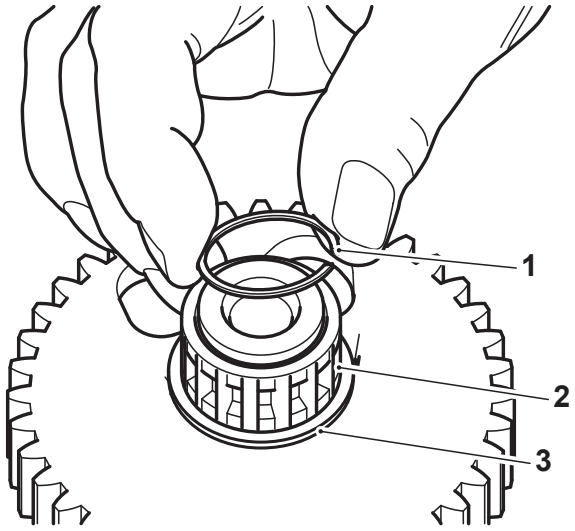
1. Mark one side of the needle roller bearing outer carrier to denote its correct orientation and slide it away from the needle roller bearing.



cjbz

1. **Bearing outer carrier**
2. **Needle roller bearing**

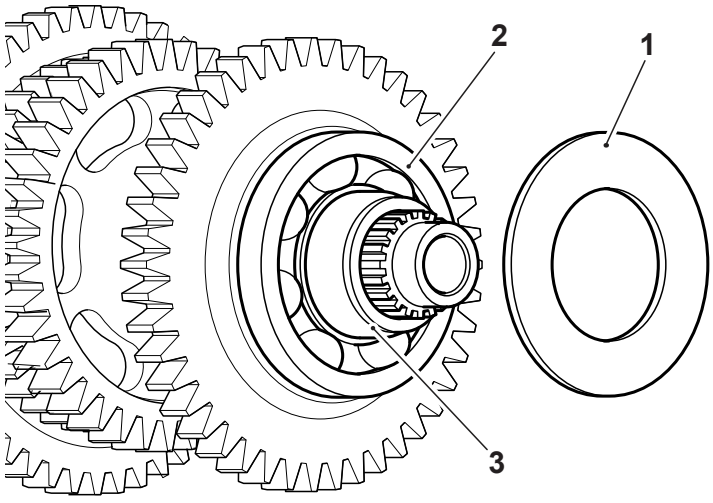
2. Remove and discard the circlip.
3. Noting its orientation, remove the bearing from the output shaft.
4. Remove the thrust washer.



T908.07.27

1. **Circlip**
2. **Needle roller bearing**
3. **Thrust washer**

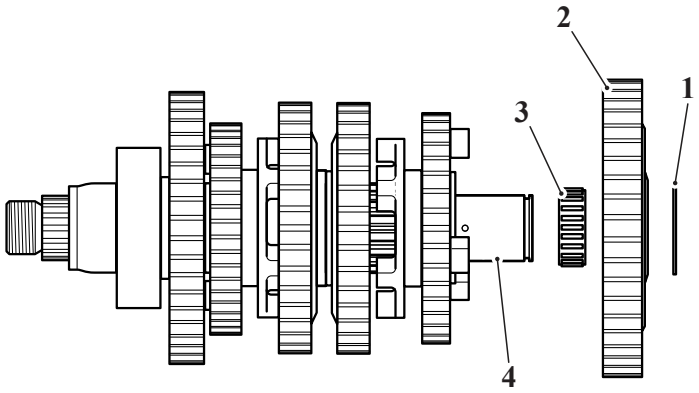
5. Collect the output shaft seal.



cjgk

1. **Output shaft seal**
2. **Roller bearing**
3. **Distance sleeve**

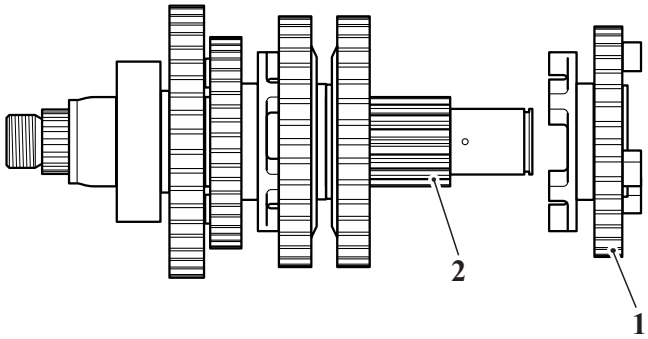
6. Mark one side of first gear to denote its correct orientation and remove it from the shaft.
7. Remove the needle roller bearing from the shaft.



cjgh_2

1. **Thrust washer**
2. **First gear**
3. **Needle roller bearing**
4. **Output shaft**

8. Mark one side of fifth gear to denote its correct orientation and remove it from the shaft.

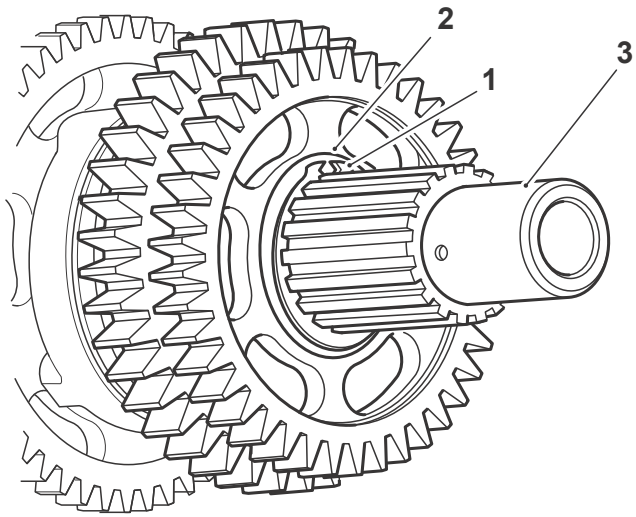


cjgg_1

1. **Fifth gear**

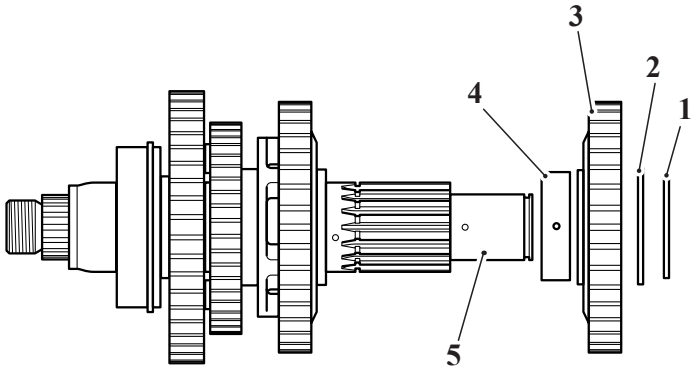
2. **Output shaft**

9. Remove the circlip and splined thrust washer.
10. Discard the circlip.



1. **Circlip**
2. **Splined thrust washer**
3. **Output shaft**

11. Mark one side of fourth gear to denote its correct orientation and remove it from the shaft.
12. Noting its orientation, remove the plain bush which runs inside the gear.

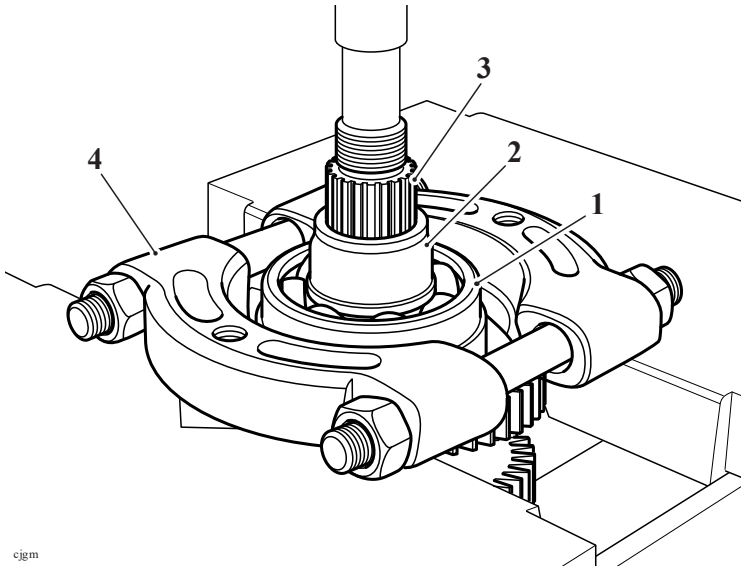


cjgf

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

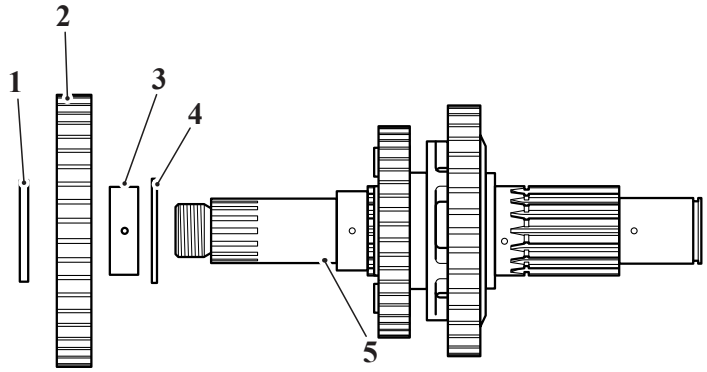
4. **Plain bush**
5. **Output shaft**

13. Working on the opposite end of the shaft, attach a proprietary bearing separator between the outer bearing and second gear as shown below. Using a press, remove the outer bearing and the distance sleeve.



1. **Bearing**
2. **Distance sleeve**
3. **Output shaft**
4. **Bearing separator**

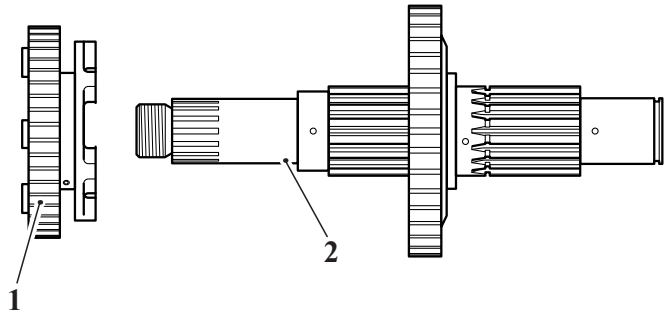
14. Discard the bearing.
15. Remove the second gear spacer.
16. Mark one side of second gear to denote its correct orientation and remove it from the shaft.
17. Noting its orientation, remove the plain bush from the shaft.
18. Remove the thrust washer from the shaft.



cjge_1

1. **Second gear spacer**
2. **Second gear**
3. **Bush**
4. **Thrust washer**
5. **Output shaft**

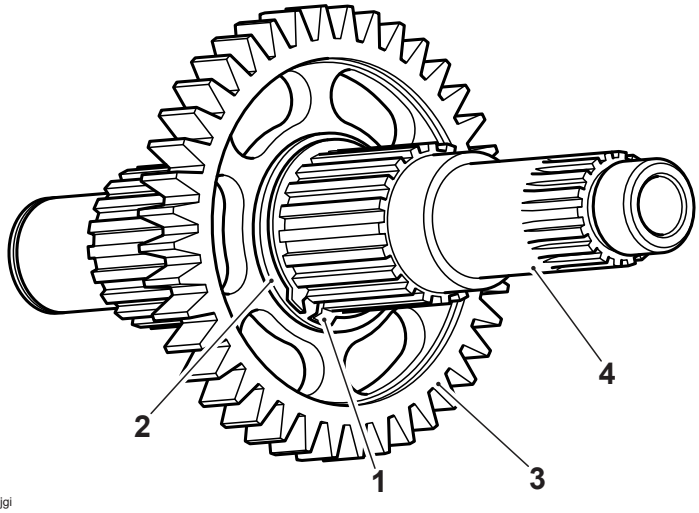
19. Noting its orientation, remove the sixth gear.



cjgd_1

1. **Sixth gear**
2. **Output shaft**

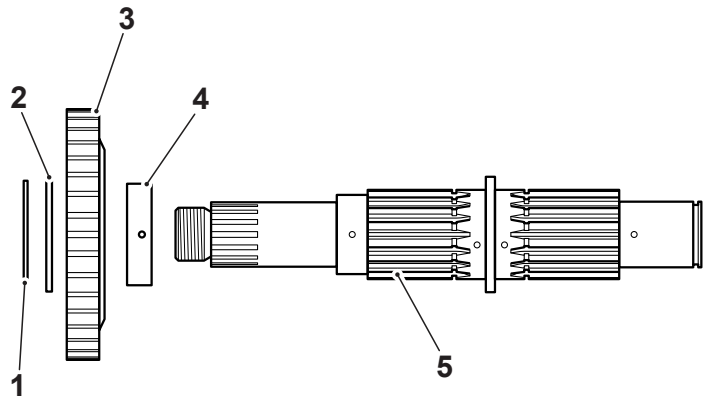
20. Remove the circlip and the splined thrust washer, discard the circlip.



cjgi

1. **Circlip**
2. **Splined thrust washer**
3. **Third gear**
4. **Output shaft**

21. Mark one side of third gear to denote its correct orientation and remove it from the shaft.
22. Noting it’s orientation, remove the plain bush from the shaft.



cjgc

1. **Circlip**
2. **Splined thrust washer**
3. **Third gear**
4. **Third gear bush**
5. **Output shaft**

Output Shaft - Inspection

Output Shaft - Assembly

Exploded View - Input Shaft

Input Shaft - Disassembly

1. Examine all gears, bearings, bushes and thrust washers for damage, distortion, chipped teeth and wear beyond the service limits. Replace all defective components and always use new circlips, a new output shaft seal and a new sprocket tab washer to assemble the shaft.

⚠ WARNING

When using a press, always wear overalls, eye, face and hand protection. Objects such as

WARNING

bearings frequently break-up under load and the debris caused during break-up may cause damage and injury to unprotected parts of the body.

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

WARNING

If the oil holes in the output shaft are aligned with the corresponding hole(s), of the bushes or gears engine oil pressure and lubrication will be reduced.

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

CAUTION

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

CAUTION

Removing the output shaft bearing from the shaft will damage the bearing and snap ring. Never reuse removed bearings or snap rings as use of damaged or weakened components could lead to engine and transmission damage.

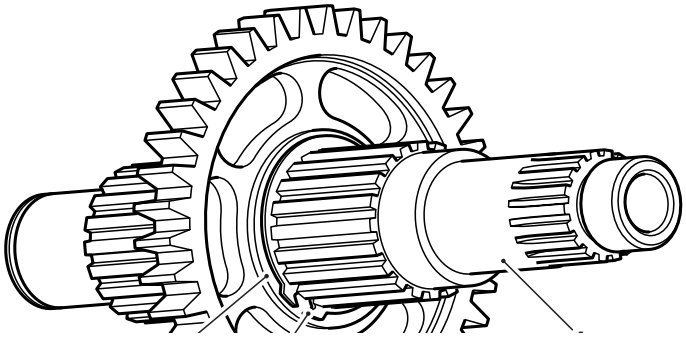
CAUTION

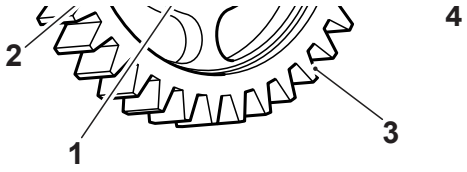
Press only on the bearing inner race to prevent bearing damage.

Note

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

1. Locate third gear and the plain bush to the shaft as noted during disassembly.
2. Fit the splined thrust washer and retain with a new circlip as shown below.

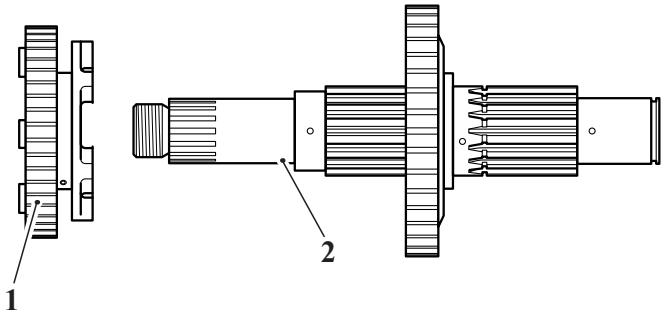




cjcl

1. **Circlip**
2. **Splined washer**
3. **Third gear**
4. **Output shaft**

3. Fit the sixth gear as noted during disassembly.



cjgd_1

1. **Sixth gear**
2. **Output shaft**

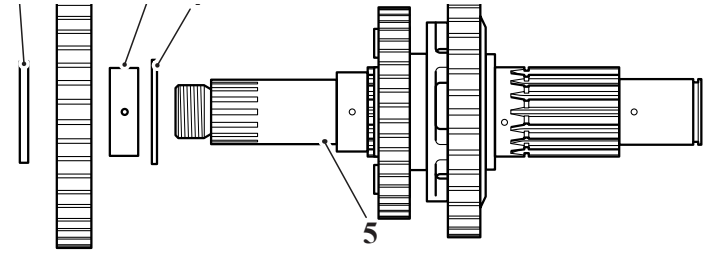
4. Fit the thrust washer.

CAUTION

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

5. Locate second gear and the plain bush to the shaft as noted during disassembly.
6. Fit the second gear spacer.

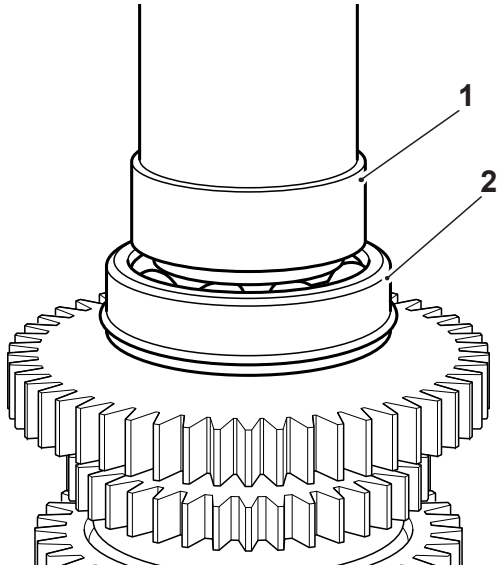




cjge_1

1. **Second gear spacer**
2. **Second gear**
3. **Bush**
4. **Thrust washer**
5. **Output shaft**

7. Place the output shaft on a press bar, align the inner race of the ball bearing to the output shaft.
8. Press the output shaft through the bearing until the bearing face contacts the thrust washer.



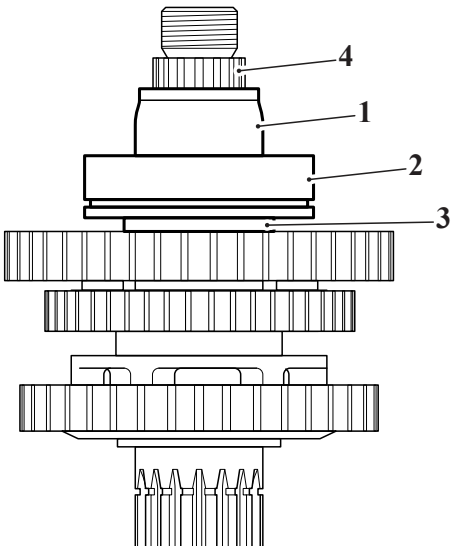
cjgl

1. **Output shaft**
2. **Ball Bearing**

Note

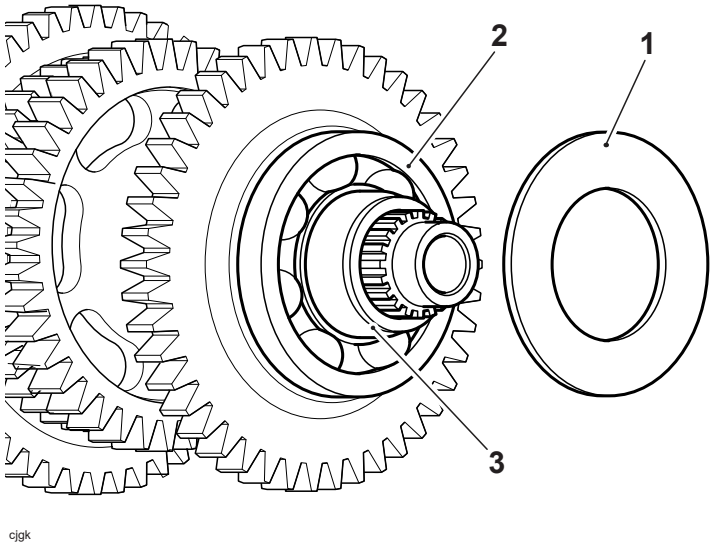
- **Ensure the chamfered edge is facing away from the roller bearing.**

9. Locate the distance sleeve to the bearing,
10. Press the output shaft through the distance sleeve until it comes into contact with the bearing face.



1. **Distance sleeve**
2. **Ball bearing**
3. **Spacer**
4. **Output shaft**

11. Lubricate and fit a new output shaft seal.



1. **Output shaft seal**
2. **Roller bearing**
3. **Distance sleeve**

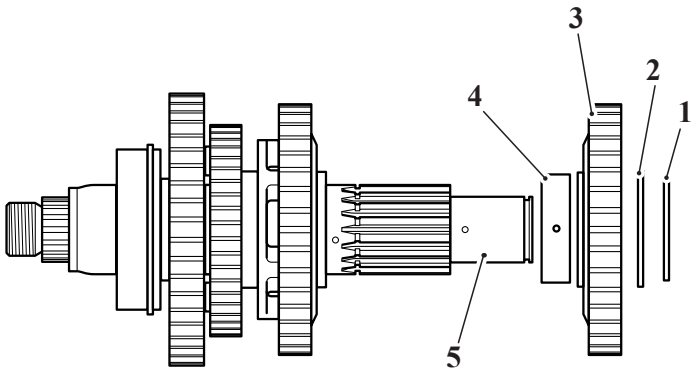
12. Fit the output sprocket, new tab washer and nut. Do not fully tighten the nut at this stage.

CAUTION

CAUTION

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

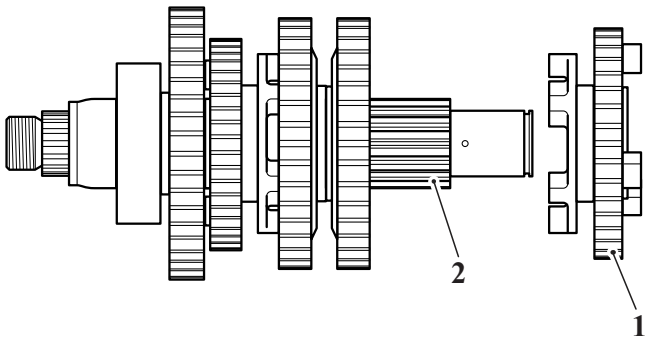
13. Working from the opposite end of the shaft, fit the plain bush as noted during disassembly.
14. Fit fourth gear as noted during disassembly.
15. Fit the splined thrust washer and retain using a new circlip, as shown below.



cjgf

1. **Circlip**
2. **Splined thrust washer**
3. **Fourth gear**
4. **Plain bush**
5. **Output shaft**

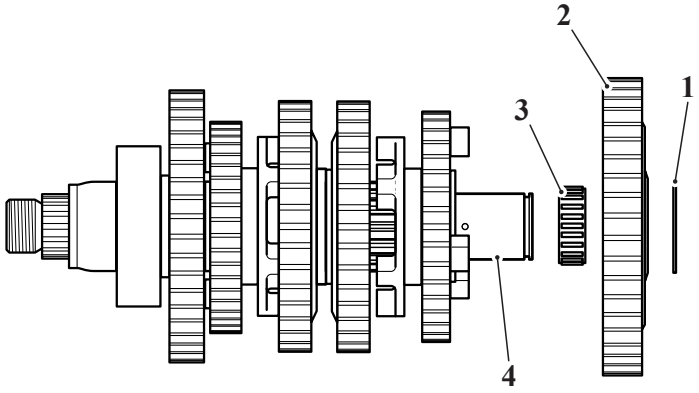
16. Fit fourth gear as noted during disassembly. Ensure that the smaller dogs face towards fourth gear.



cjgg_1

1. **Fifth gear**
2. **Output shaft**

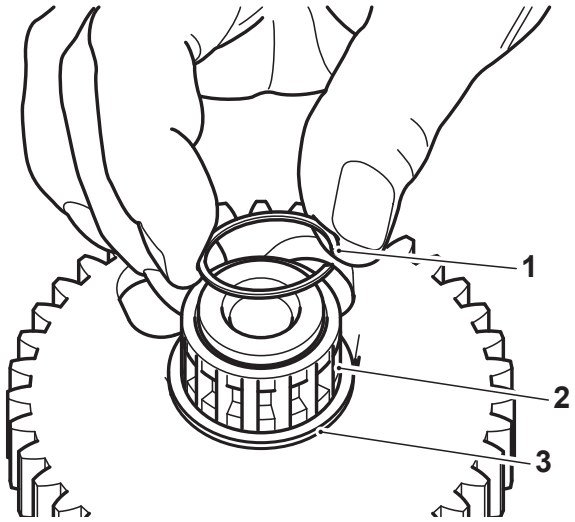
17. Fit the plain bush as noted during disassembly.
18. Fit first gear as noted during disassembly.
19. Fit the thrust washer.



cjgh_2

1. **Thrust washer**
2. **First gear**
3. **Needle roller bearing**
4. **Output shaft**

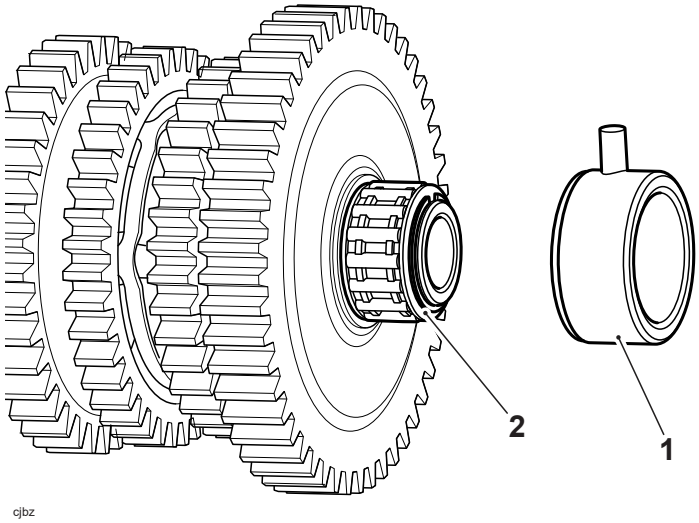
20. Fit the roller bearing to the output shaft as noted during disassembly.
21. Retain the roller bearing using a new circlip.



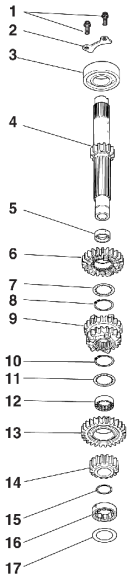
T908 07 27

1. **Circlip**
2. **Needle roller bearing**
3. **Thrust washer**

22. Lubricate the bearing with oil and then slide the bearing outer roller carrier over the needle roller bearing in the orientation noted during disassembly.



1. **Bearing outer carrier**
2. **Needle roller bearing**



1. **Bearing retainer bolts**
2. **Bearing retainer plate**
3. **Ball bearing**
4. **Input shaft**
5. **Plain bush**
6. **Fifth gear**
7. **Splined thrust washer**
8. **Circlip**
9. **Third/fourth gear**
10. **Circlip**
11. **Splined thrust washer**
12. **Splined bush**
13. **Sixth gear**
14. **Second gear**
15. **Circlip**
16. **Roller bearing**
17. **Restrictor washer**

⚠ WARNING

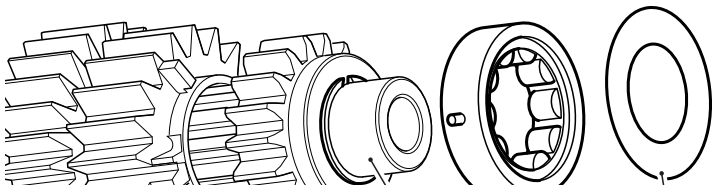
When using a press, always wear overalls, eye, face and hand protection. Objects such as bearings frequently break-up under load and the debris caused during break-up may cause damage and injury to unprotected parts of the body.

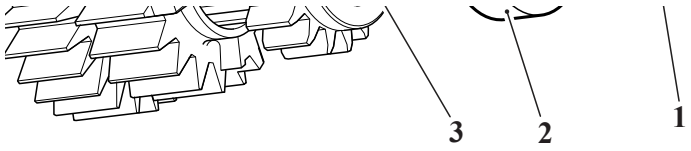
Never wear loose clothing, which could become trapped in the press and cause crushing injury to the hand, arms or other parts of the anatomy.

Note

- **The gears on the input shaft can not be fully disassembled or assembled in service. If for any reason a gear requires replacing, the complete input shaft assembly must be replaced.**

1. Remove the restrictor washer, and roller bearing.





cjbx

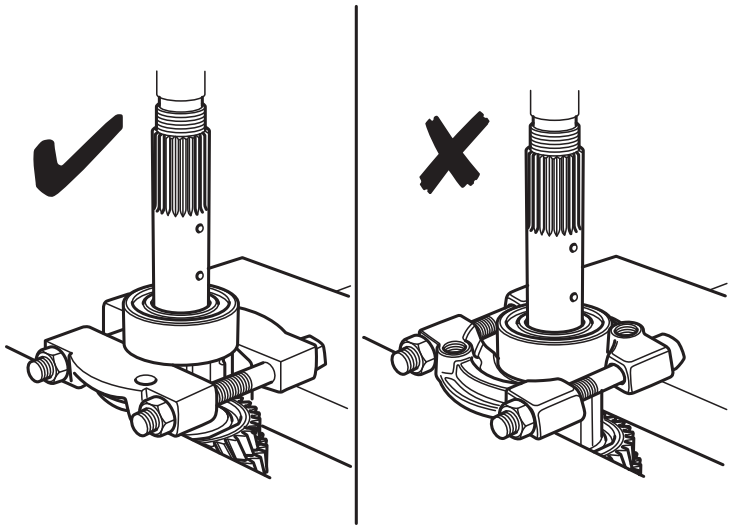
1. **Restrictor washer**
2. **Roller bearing**
3. **Input shaft**

WARNING

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

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

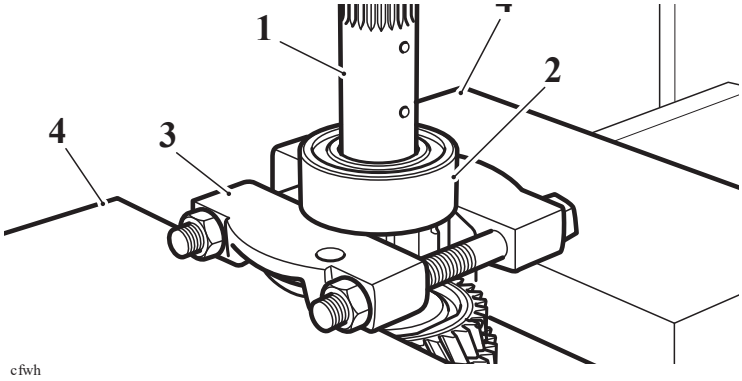
1. Attach T3880109 - Bearing Separator to the bearing, ensuring the flat side of the tool's jaws are in contact with the bearing.



Service Tool Installation

2. Support the T3880109 - Bearing Separator on press bars, then press the shaft through the bearing. Discard the bearing.





1. **Input shaft**
2. **Bearing**
3. **T3880109 - Bearing Separator**
4. **Press bars**

Input Shaft - Inspection

Input Shaft - Assembly

Starter Drive and Sprag Clutch

Exploded View - Starter and Sprag

Examine all gears, bearings, bushes and thrust washers for damage, distortion, chipped teeth and wear beyond the service limits. Replace all defective components.

⚠ WARNING

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

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

⚠ CAUTION

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

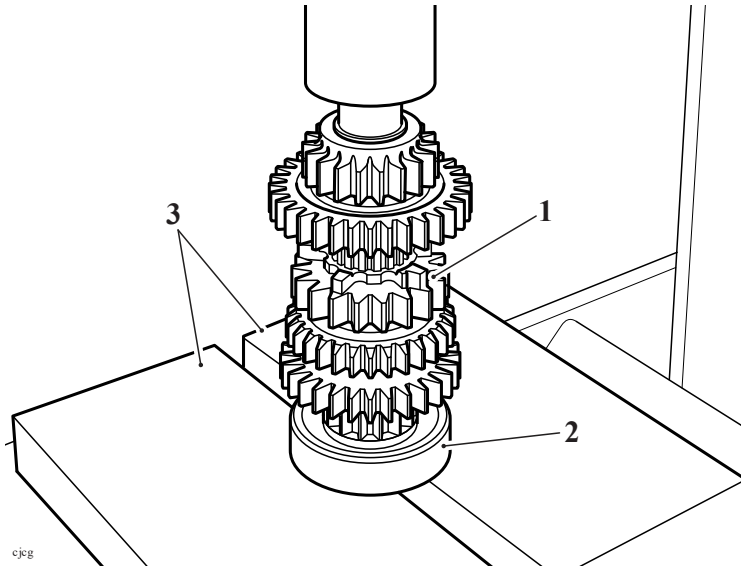
Note

- **Lubricate the bearings with clean engine oil during assembly.**

1. Position a new bearing to the input shaft.
2. Support the bearing on press bars as shown below, ensuring that the press bars support

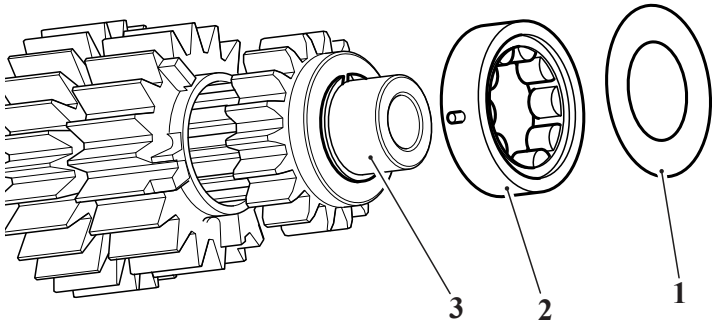
the inner race of the bearing.

3. Press the bearing fully on to the shaft.

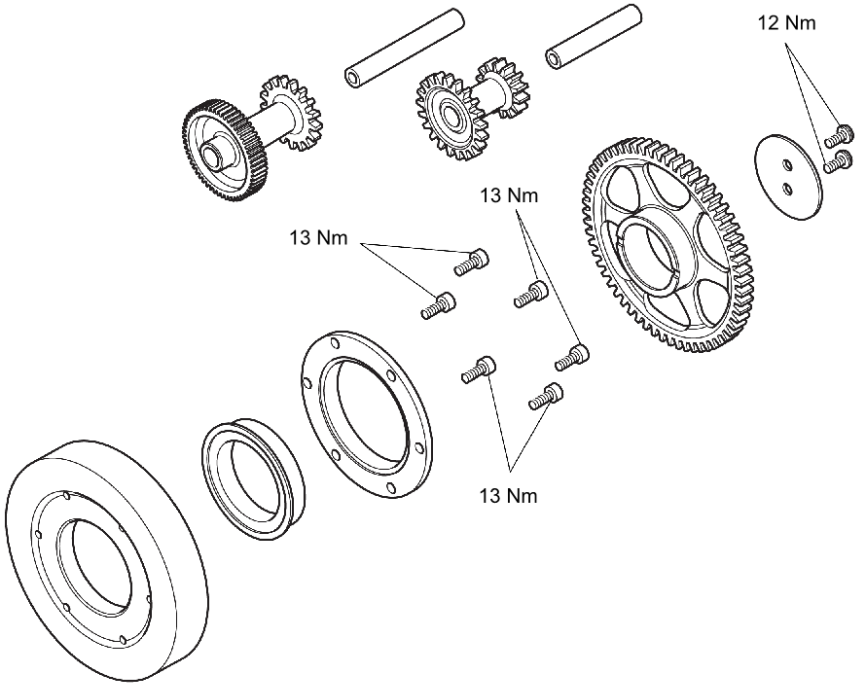


1. **Input shaft**
2. **Bearing**
3. **Press plates**

4. Fit the roller bearing and restrictor washer to the input shaft.



1. **Restrictor washer**
2. **Roller bearing**
3. **Input shaft**



Starter Drive/Sprag Clutch - Removal

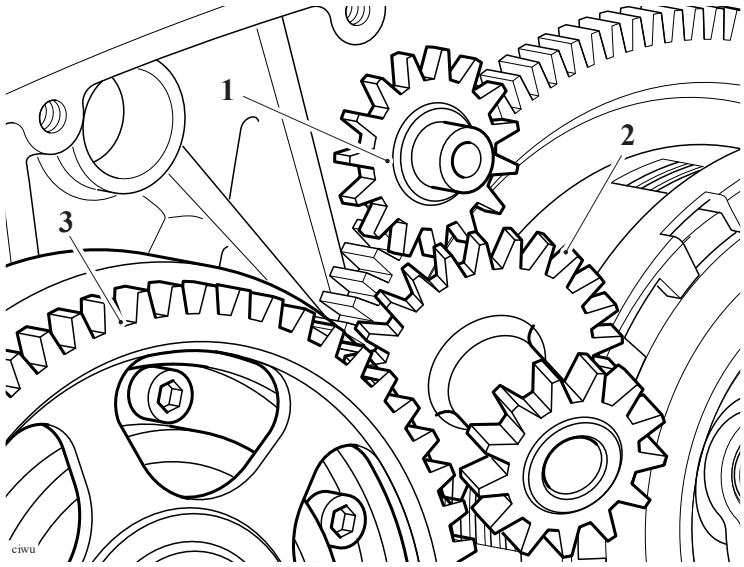
WARNING

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.

Perform the following operations:

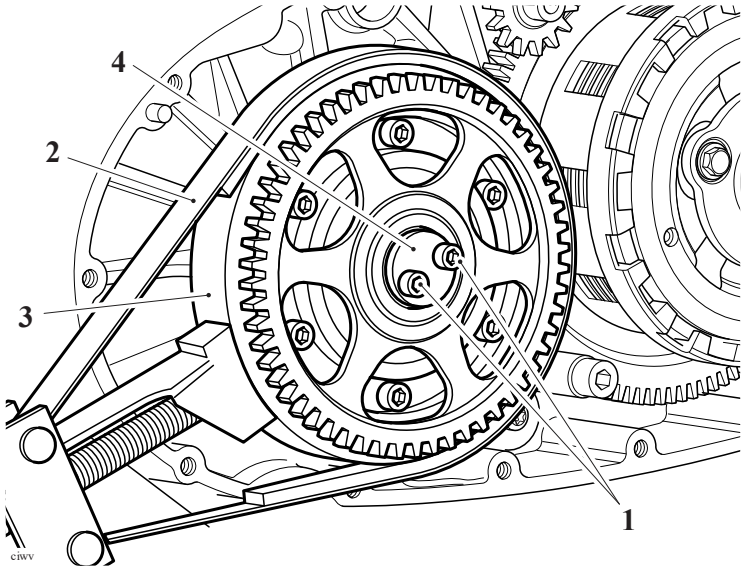
- Seat - Removal
- Battery - Removal
- Clutch Cover - Removal

1. Whilst holding the first idler gear in position, withdraw the second starter idler shaft and gear, noting the fitted position of the components.



1. **Starter idler gear (first)**
2. **Starter idler gear (second)**
3. **Starter sprag gear**

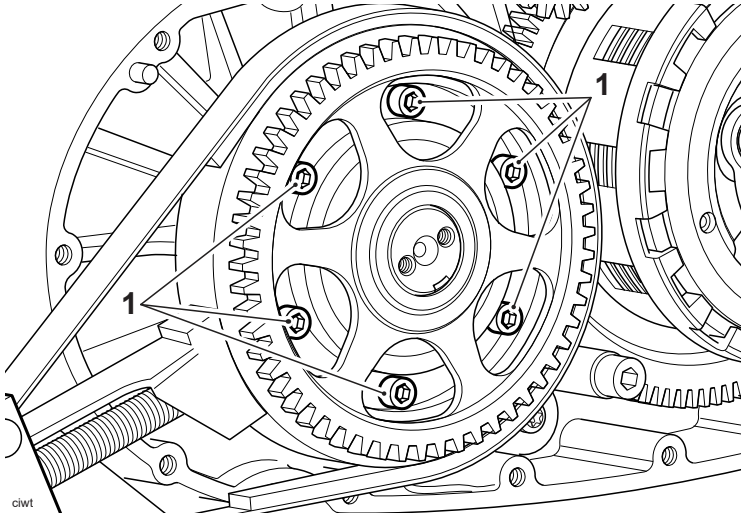
2. Using T3880375 - Alternator Rotor Holder to retain the flywheel, remove and discard the fixings securing the starter gear thrust washer to the sprag clutch housing, as shown below.



1. **Fixings**
2. **T3880375 - Alternator Rotor Holder**
3. **Sprag clutch housing**
4. **Thrust washer**

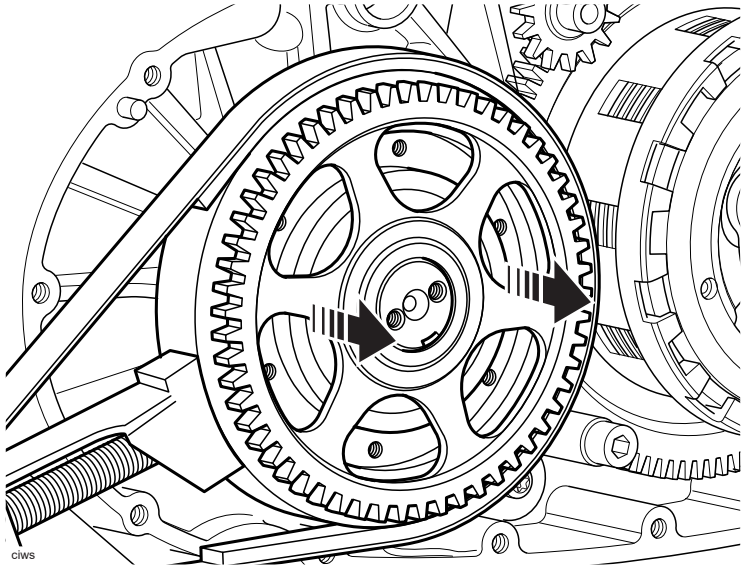
3. Remove and discard the fixings securing the sprag clutch housing to the flywheel.





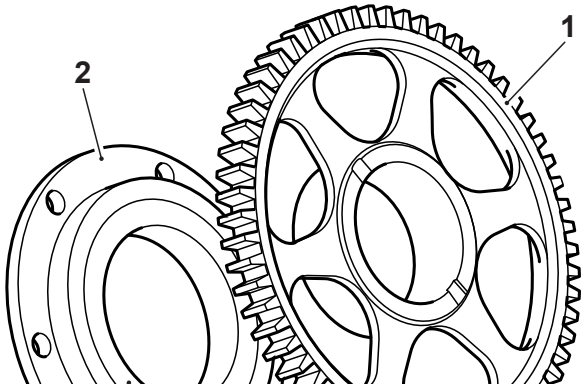
1. Fixings

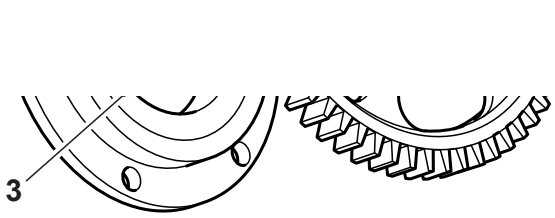
4. Withdraw the starter sprag gear and sprag clutch assembly.



Starter Sprag Gear

5. Remove the starter sprag gear from the sprag clutch housing assembly.

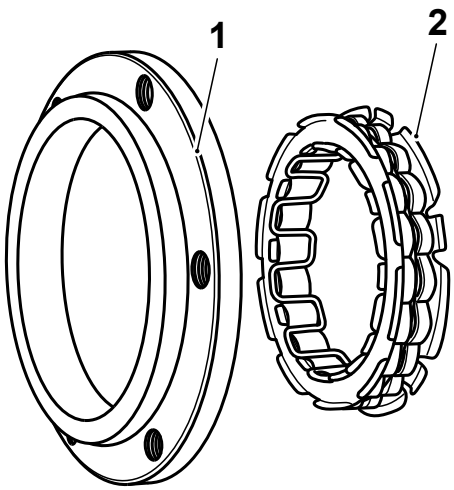




cixh

1. **Starter sprag gear**
2. **Sprag clutch housing**
3. **Sprag clutch**

6. Remove the sprag clutch from the sprag clutch housing.



1. **Sprag clutch housing**
2. **Sprag clutch**

Starter Drive/Sprag Clutch - Inspection

Starter Drive/Sprag Clutch - Installation

Lubrication

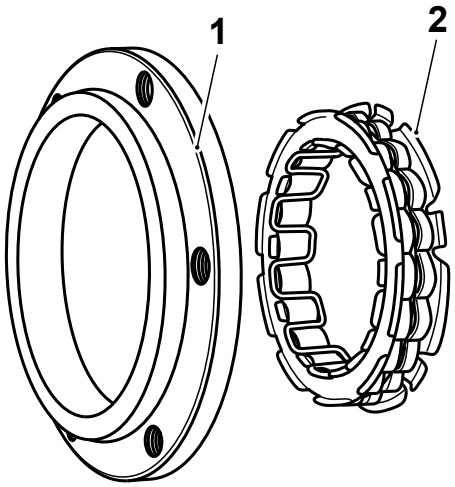
Exploded View – Oil Filter and Pump

Oil Circuit Diagram

1. Check the sprag clutch bearings for overheating, wear and/or non-smooth operation. Replace the sprag clutch if overheating, wear and/or non-smooth operation is found.
2. Examine all gears for chipped teeth and for any other damage.
3. With the sprag clutch mounted in the housing, check the sprag clutch for smooth, free movement in one direction only (as indicated by the arrow marked on the sprag clutch body).

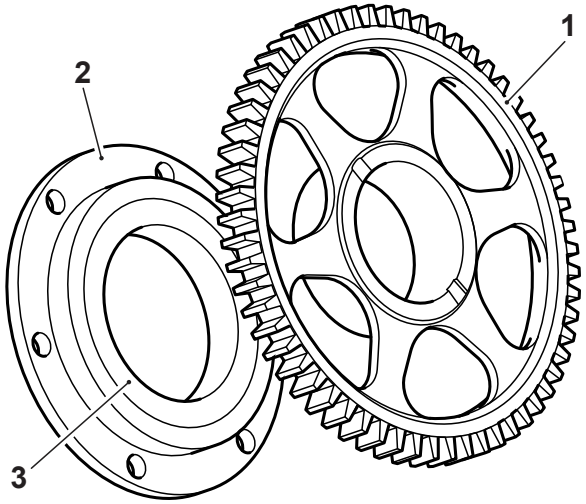
1. Locate the sprag clutch to the sprag clutch housing as shown below. Push firmly until the

lip seats in the recess provided in the housing.



1. **Sprag clutch housing**
2. **Sprag clutch**

2. Fit the starter sprag gear to the sprag clutch.
3. Lubricate the crankshaft bearing with engine oil.
4. Fit the sprag clutch housing to the flywheel.
5. Ensure that the housing is squarely seated and is not jammed on the rotor.



cixh

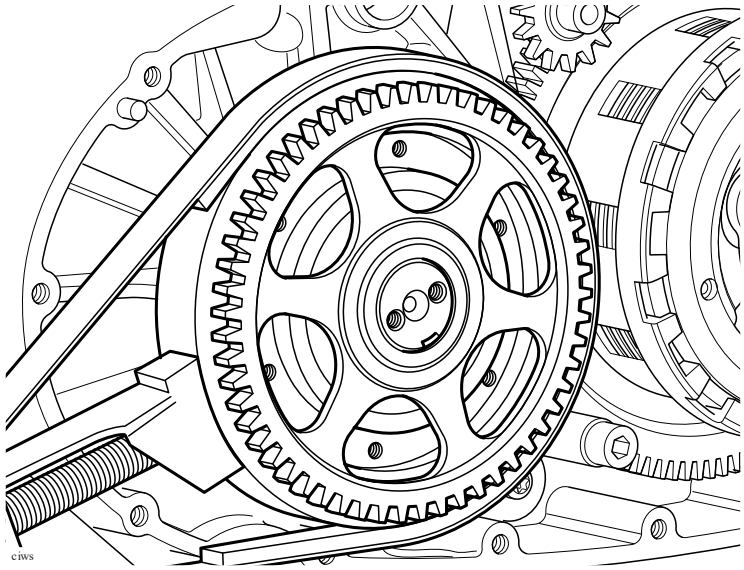
1. **Starter sprag gear**
2. **Sprag clutch housing**
3. **Sprag clutch**

Note

Note

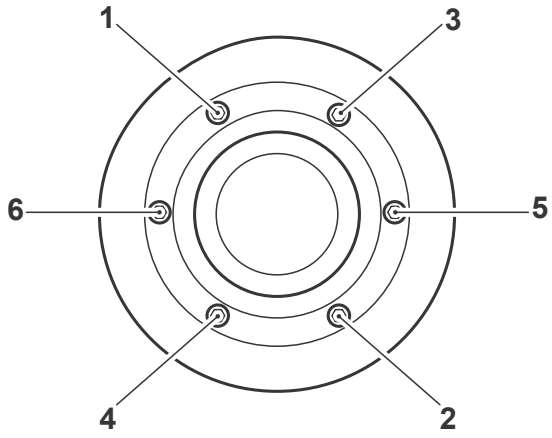
- **Ensure the sprag is seated and flush fitting to the housing before tightening the fixings fully.**

6. Align the drilled holes in the sprag clutch housing with the holes in the flywheel.



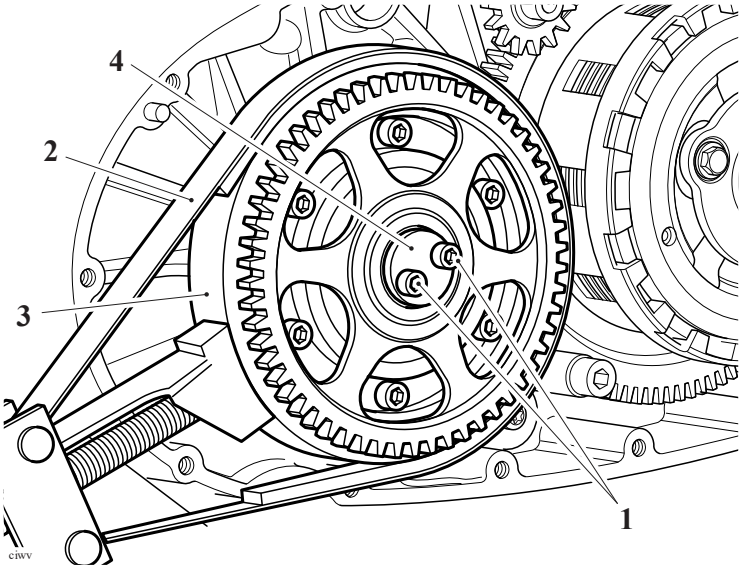
Sprag clutch housing assembly

7. Using T3880375 - Alternator Rotor Holder to retain the flywheel and working in the sequence shown below, fit new fixings and tighten to **13 Nm**. Repeatedly check the fixings in sequence until all are correctly torqued and do not move when checked, this will ensure the sprag clutch housing is correctly seated on the rotor.



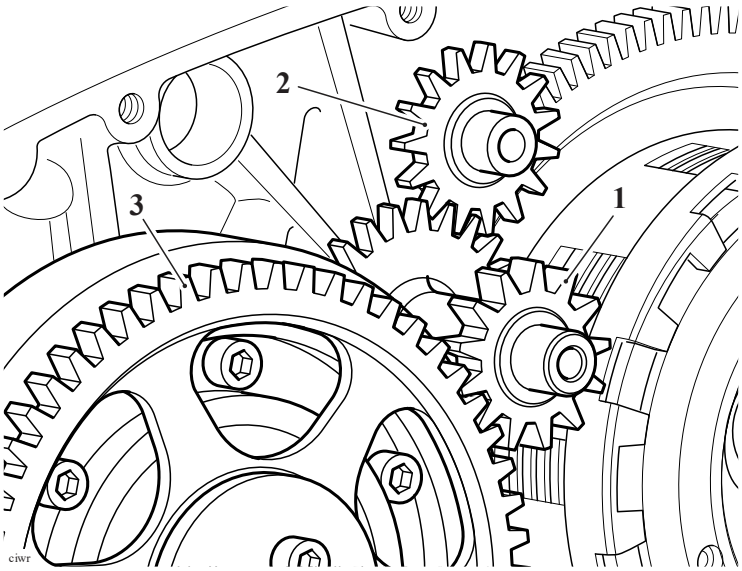
Tightening Sequence

8. Using tool T3880375 - Alternator Rotor Holder Tool to retain the flywheel and using new fixings secure the starter gear thrust washer to the flywheel. Tighten the fixings to **12 Nm**.



1. **Fixings**
2. **T3880375 - Alternator Rotor Holder**
3. **Sprag clutch housing**
4. **Thrust washer**

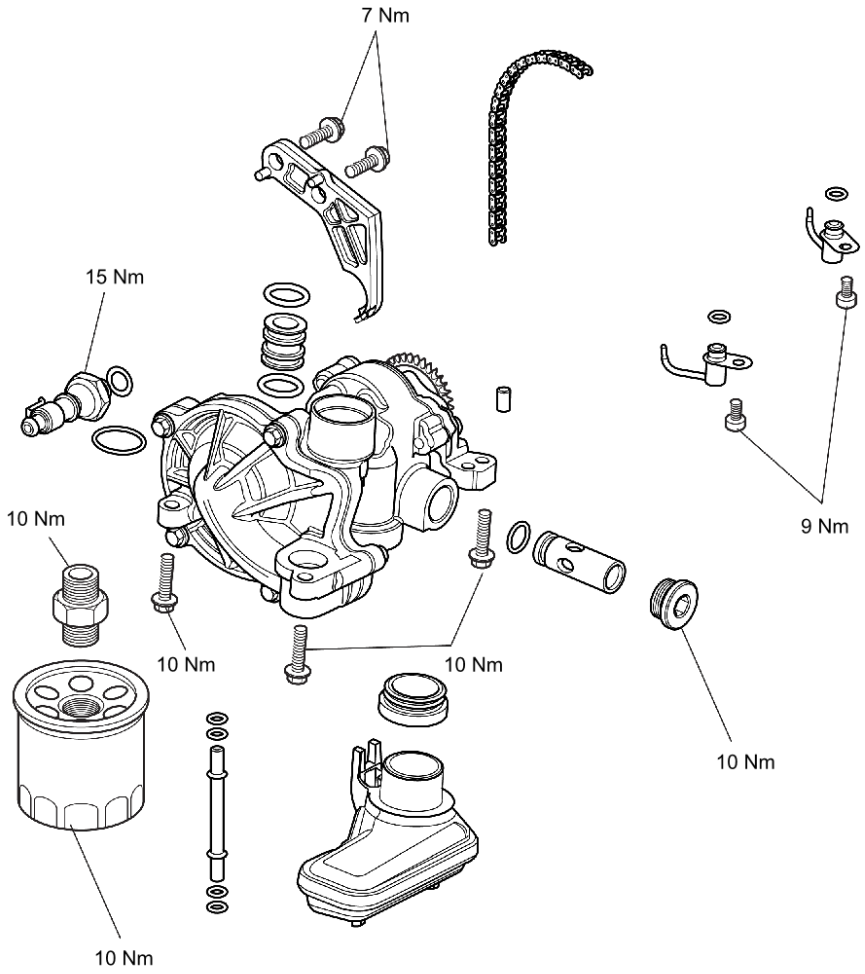
9. Refit the starter idler gear and shaft, as noted during removal.



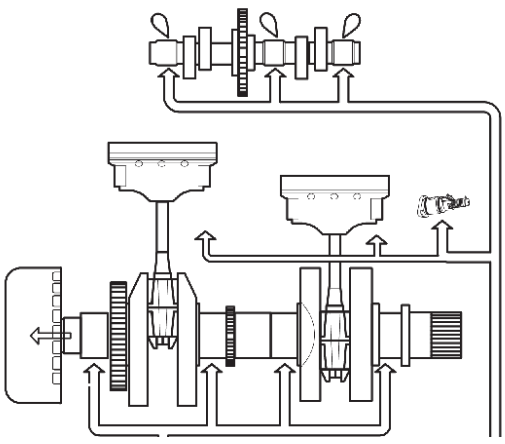
1. **Starter idler gear (second)**
2. **Starter idler gear (first)**
3. **Starter sprag gear**

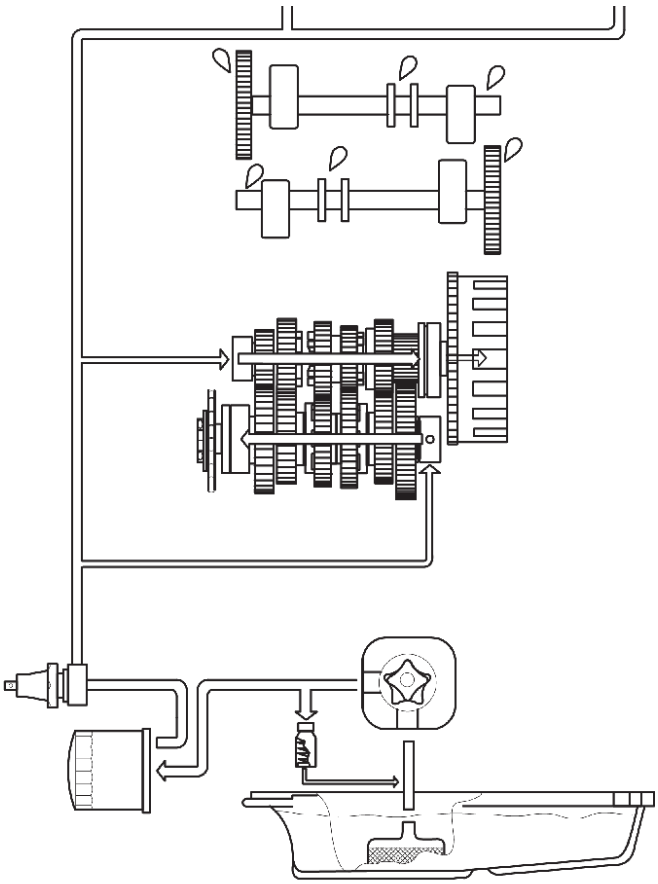
Perform the following operations:

- Clutch Cover - Installation
- Battery - Installation
- Seat - Installation



Oil Circuit





Oil is collected from the sump and is drawn through a mesh strainer into the oil pump rotor. The oil pump is fitted with a single pumping rotor assembly which supplies pressurised oil to the lubrication circuit. The oil circuit is split into two parts - the Main circuit and the Transmission circuit.

Main Circuit

Pressurised oil flows past the oil pressure relief valve, which controls the maximum pressure in the oil circuit. The relief valve is set to open at 5.1 bar (74 lb/in²) and when open, returns high pressure oil directly to the oil pump inlet port.

The oil then flows through the oil filter. Filtered oil is then fed into the lower crankcase gallery. The low oil pressure switch is located in this gallery.

From here oil is distributed around the engine:

- A branch supplies oil to the main gallery below the main bearings. Here it is delivered to the crankshaft main bearings and, via drillings in the crankshaft, to the big end bearings.
- Oil is also fed to the alternator to aid cooling of the alternator. The oil is taken from the crankshaft oil feed and directed to the alternator stator and rotor.
- Spray jets located in the upper crankcase, above the front balance shaft, lubricate the pistons and connecting rod small ends. These jets are fed oil from the cylinder head oil feed.
- Another branch from the cylinder head oil feed supplies oil to the hydraulic camshaft drive chain tensioner.
- Oil is sent to the cylinder head via a drilling in the upper crankcase. From the crankcase the oil divides into the two front cylinder head bolt drilling’s, up through the cylinder barrels

and into the cylinder head. One of the bolt drilling's feeds the left hand cam shaft frame and the other feeds the right hand camshaft frame. Drillings and grooves in the camshaft frames allow oil to flow to the camshaft journals and rocker shafts. Oil from the cylinder head area lubricates the camshaft drive chain before draining back to the sump.

Transmission Circuit

- Pressurised oil is directed via drillings to the input and output shafts and the clutch. Oil is circulated along the gearbox shafts to exit holes that feed directly to the bearings and gears before draining back to the sump.
- The selector drum is splash fed by oil returning to the sump from the transmission gears.

Triumph Engine Oil

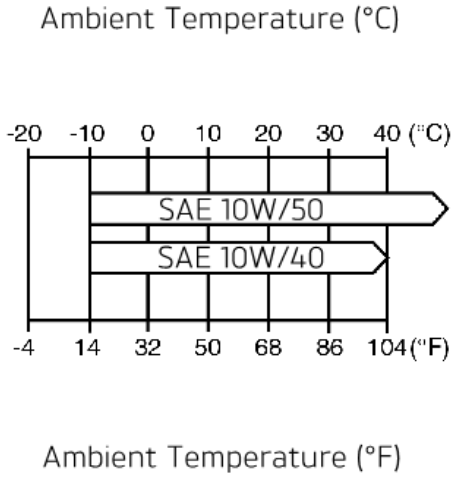
Your Triumph motorcycle is a quality engineered product which has been carefully built and tested to exacting standards. Triumph Motorcycles are keen to ensure that you enjoy optimum performance from your motorcycle and with this objective in mind have tested many of the engine lubricants currently available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

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

CAUTION

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

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

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

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

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 and Water Pump - Removal

WARNING

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

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.

Note

- **The oil pump and water pump are supplied as an assembly and cannot be separated. This procedure covers the removal of the oil and water pump assembly.**

CAUTION

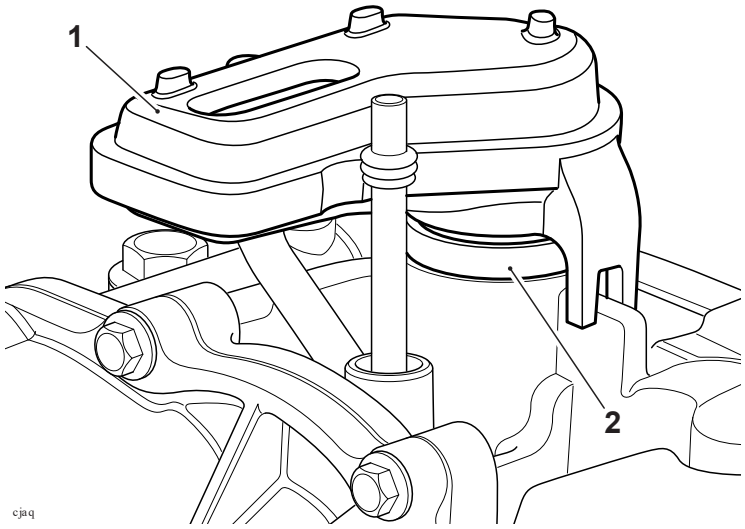
Do not pour engine oil on the ground, down sewers or drains, or into watercourses. To prevent pollution of watercourses etc., dispose of used oil sensibly. If in doubt contact your local authority.

Perform the following operations:

- Seat - Removal

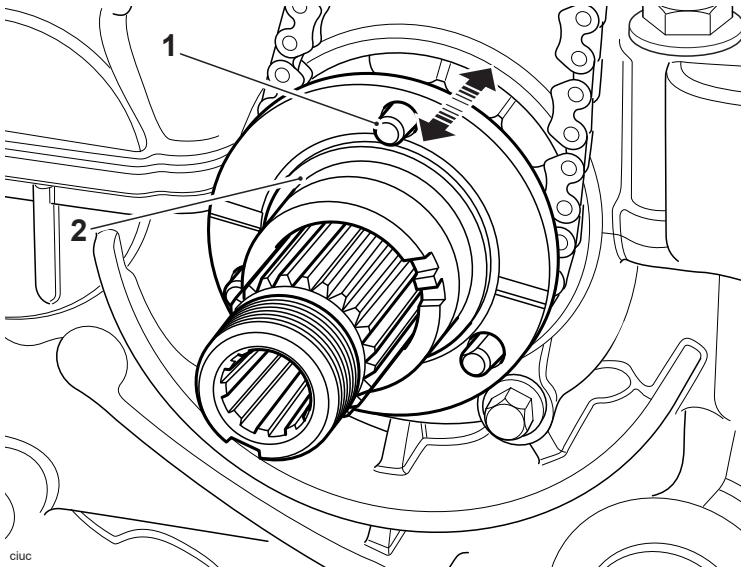
- Battery - Removal
- Drain the coolant Coolant Replacement - Drainage
- Drain the engine oil Engine Oil and Filter Renew
  Sump - Removal
- Clutch - Removal

1. Release the oil pick-up from the oil seal.
2. Remove and discard the oil seal.



1. **Oil pick-up**
2. **Oil seal**

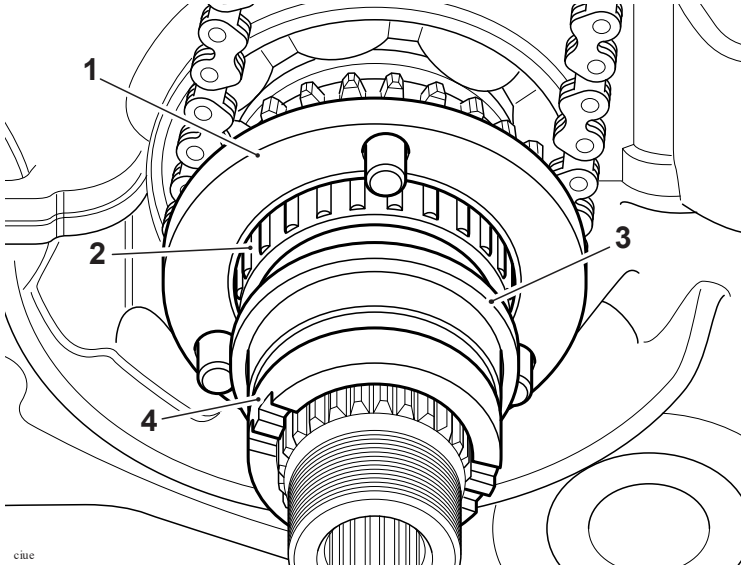
3. Slide the oil pump drive sprocket gently backwards and forwards to release the needle roller bearing.



1. **Oil pump drive sprocket**

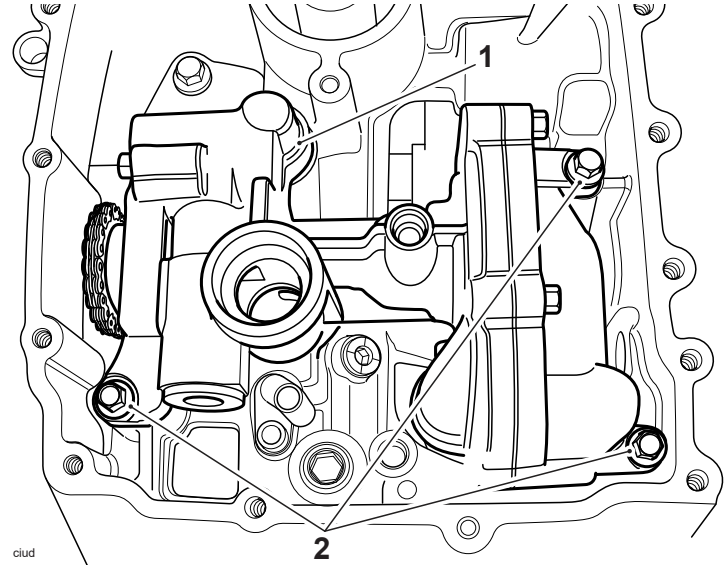
2. **Needle roller bearing**

4. Support the oil pump drive sprocket and carefully remove the bush, spacer and needle roller bearing while noting it's orientation.



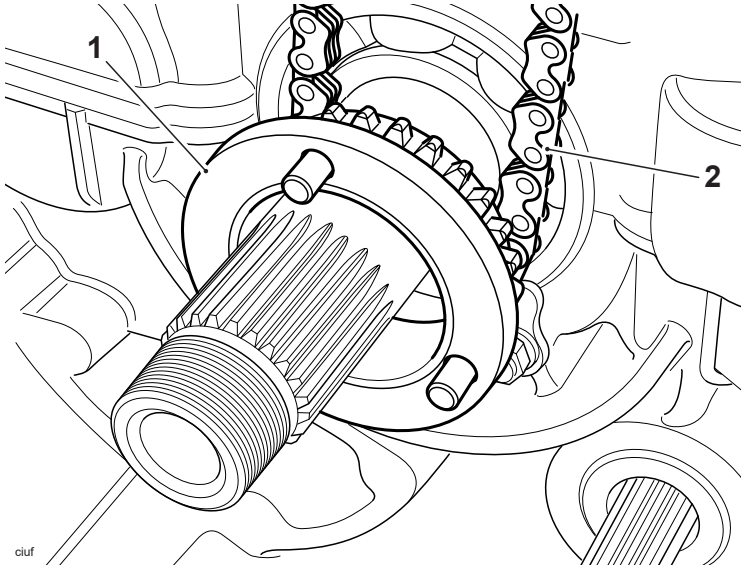
1. **Oil pump drive sprocket**
2. **Needle roller bearing**
3. **Spacer**
4. **Bush**

5. Release and discard the fixings securing the oil and water pump.



1. **Oil and water pump**
2. **Fixings**

6. Detach the drive chain from the oil pump drive sprocket.



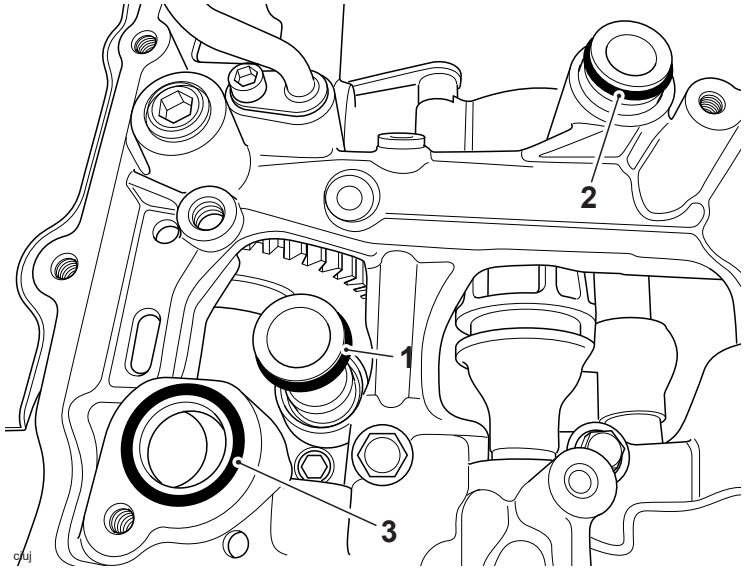
1. **Oil pump drive sprocket**
2. **Drive chain**

7. Carefully withdraw the oil and water pump from the crankcase.

Note

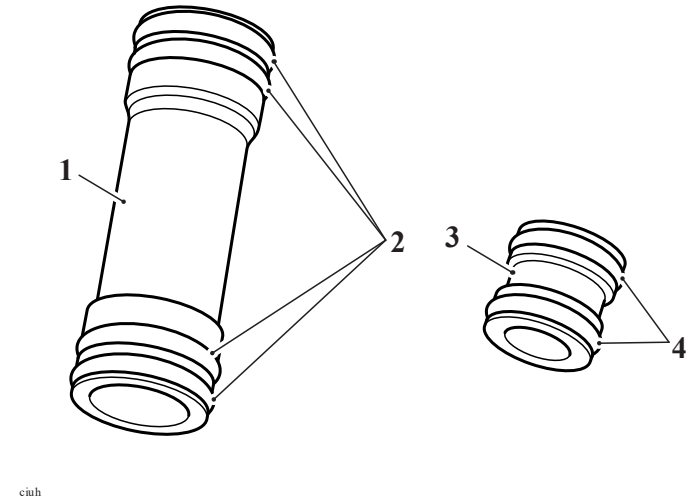
- **The water pump inlet sleeve/O-rings can become dislodged during removal of the oil pump.**

8. Remove the coolant outlet sleeve and the oil pump outlet sleeve from the crankcase.



1. **Coolant outlet sleeve**
2. **Oil outlet sleeve**
3. **Coolant inlet seal**

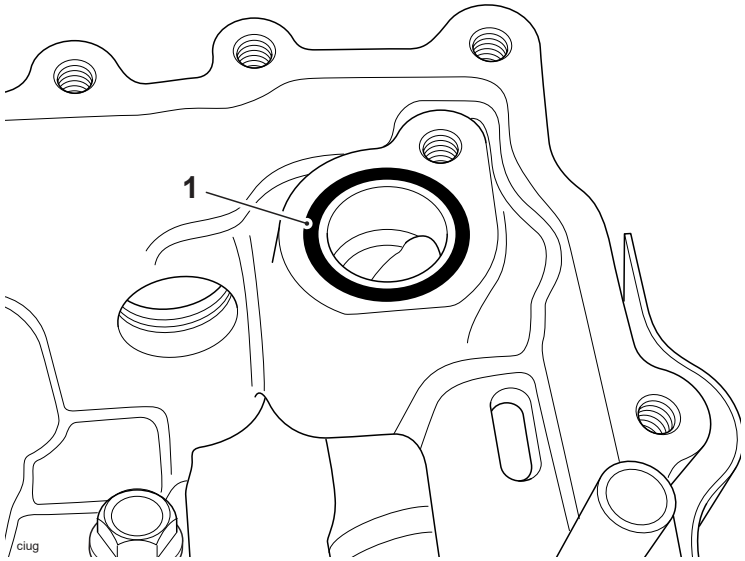
9. Remove and discard the four O-rings from the coolant outlet sleeve and then remove and discard the two O-rings from the oil outlet sleeve.



ciuh

1. **Coolant outlet sleeve**
2. **O-ring (coolant)**
3. **Oil outlet sleeve**
4. **O-ring (oil)**

10. Remove and discard the coolant inlet O-ring from the crankcase.



clug

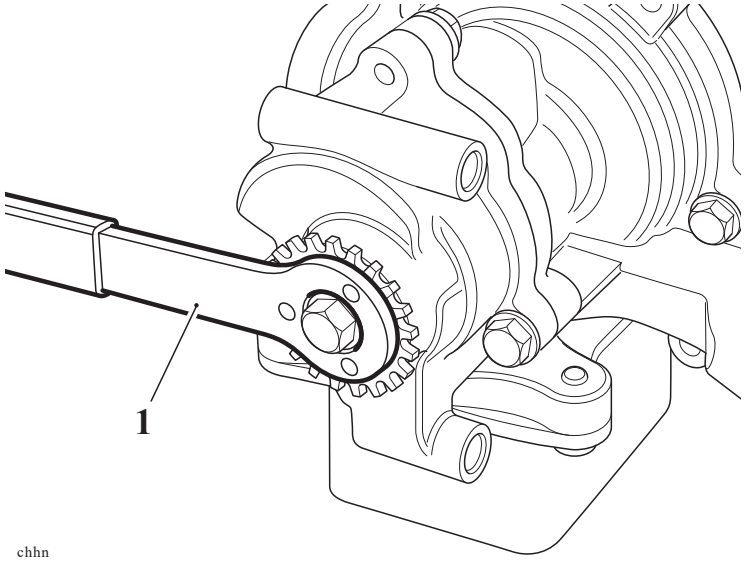
1. **O-ring (coolant inlet)**

Oil Pump Inspection

Oil Pump - Disassembly

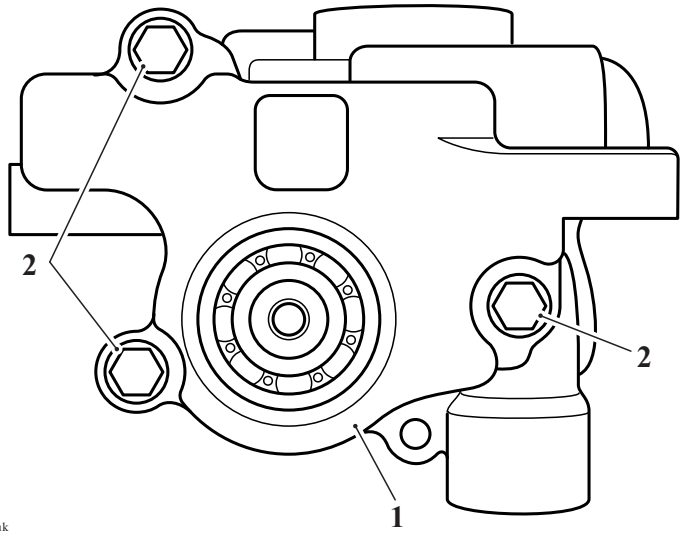
1. Inspect the sprocket and chain for wear and/or damage. Replace the pump and chain if wear is found.
2. Check the shaft and shaft bearings for side and end float. Replace the pump if wear is found.
3. Carry out a visual inspection for corrosion and scale build-up around the coolant pump impeller and in the coolant pump body. Replace the pump assembly if necessary.

1. Using T3880603 - Oil Pump Restraint release the fixing and remove the drive sprocket and spacer washer.



1. T3880603 - Oil Pump Restraint

2. Release the three fixings and withdraw the oil pump end plate.



1. Oil pump end plate
2. Fixings

CAUTION

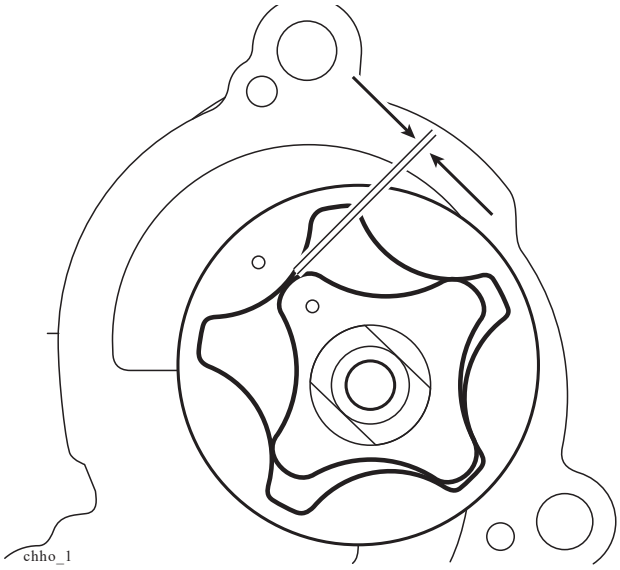
If any part of the oil pump is found to be outside the service limit, the complete pump must be replaced. Severe engine damage may result from the continued use of a faulty oil pump.

Oil Pump Inspection

1. Inspect the sprocket and chain for wear and/or damage. Replace the pump and chain if wear is found.
2. Check the shaft and shaft bearings for side and end float. Replace the pump if wear is found.
3. Carry out a visual inspection for corrosion and scale build-up around the coolant pump impeller and in the coolant pump body. Replace the pump assembly if necessary.

Oil Pump Rotor Tip Clearance

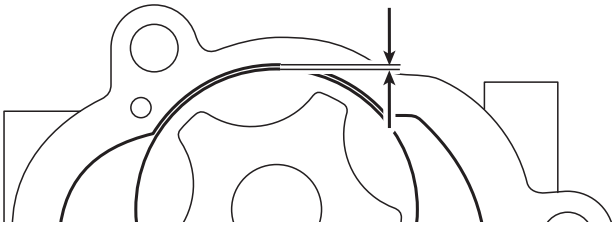
1. Measure the rotor tip clearance using feeler gauges.
2. For specifications refer toLubrication.

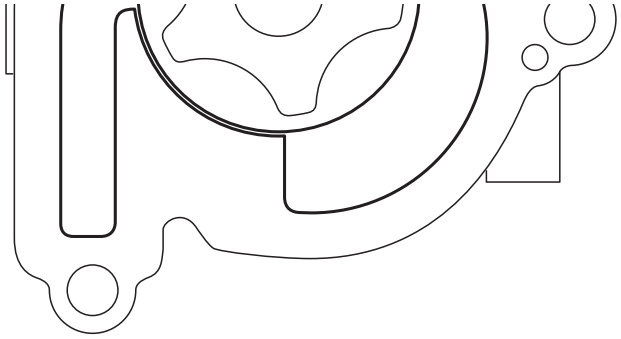


Rotor Tip Clearance

Oil Pump Body Clearance

1. Measure the pump body clearance using feeler gauges.
2. For specifications refer toLubrication.





Pump Body Clearance

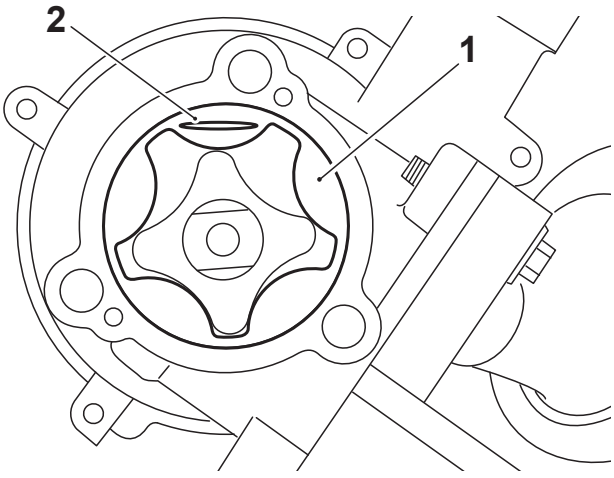
Oil Pump End Clearance

1. Remove the end plate from the pump.
2. Wipe the exposed areas of the rotors and the machined face of the end plate.

Note

- **The oil pump end clearance is measured using Plastigauge (Triumph part number 3880150-T0301). Do not turn the oil pump during the clearance measurement as this will damage the 'Plastigauge'.**

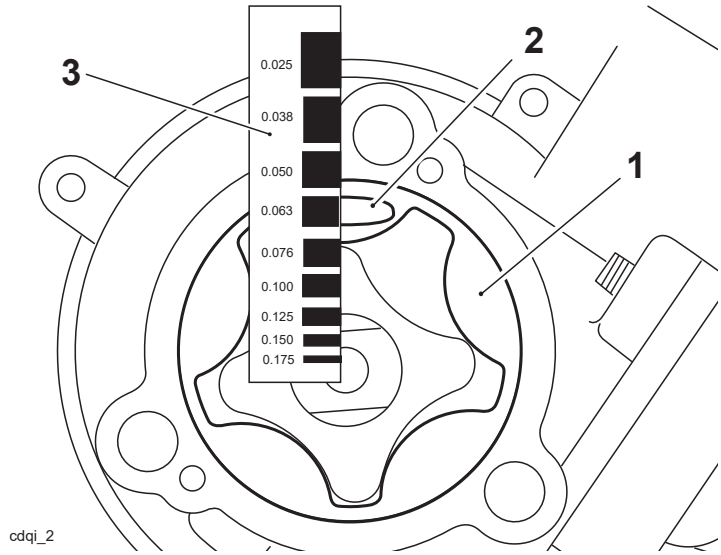
3. Apply a thin smear of grease to the rotor and a small quantity of silicone release agent to the face of the end plate.
4. Cut a length of the Plastigauge to fit across the rotor. Fit the strip to the rotor using the grease to hold the Plastigauge in place.



1. **Outer rotor**
2. **Plastigauge**

5. Without any twisting action, refit the oil pump cover and tighten its fixings to **10 Nm**.
6. Release the bolts and carefully remove the end plate.

7. Using the gauge provided with the Plastigauge kit, measure the width of the compressed Plastigauge.
8. For specifications refer toLubrication.

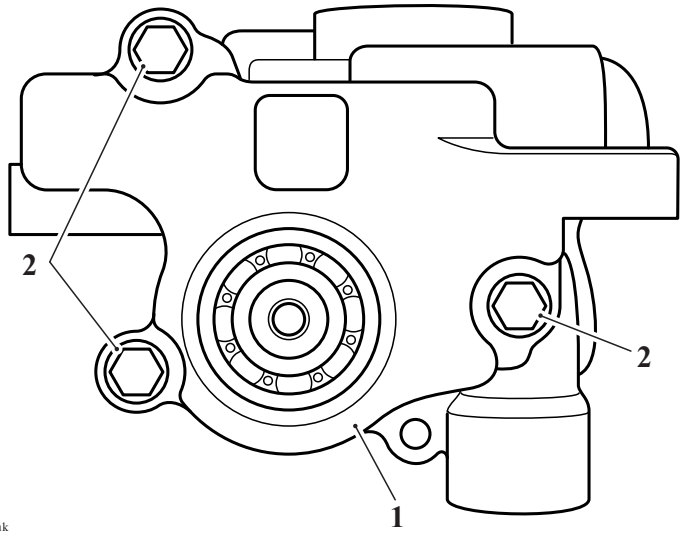


1. **Rotor (outer)**
2. **Plastigauge**
3. **Gauge, in millimetres**

9. If the clearance measured is within the specified tolerance, clean off all traces of Plastigauge from the outer rotor and oil pump cover.
10. If any clearance measured is outside the service limits, renew the complete pump.

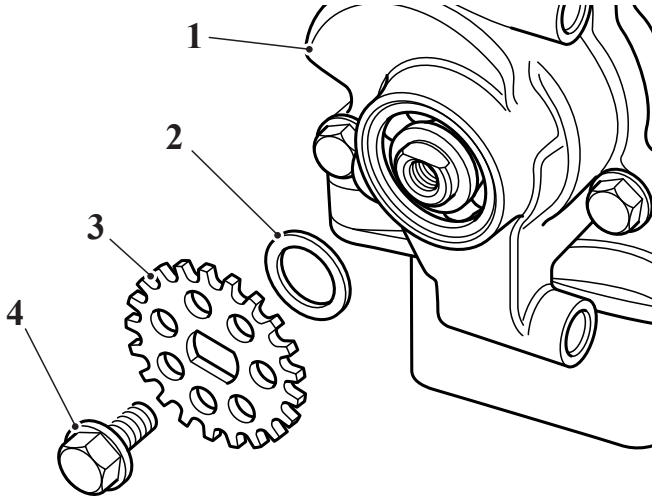
Oil Pump - Assembly

1. If all clearances are within service limits, liberally apply clean engine oil to all internal components and refit the rotor to the oil pump body.
2. Refit the end plate. Apply ThreeBond 1374 to the fixings, refit and tighten to **10 Nm**.



1. **Oil pump end plate**
2. **Fixings**

3. Refit the spacer washer and drive sprocket. Apply ThreeBond 1374 to the fixing and tighten to **12 Nm**.



chhm_1

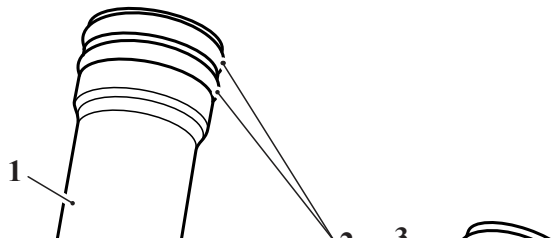
1. **Oil pump**
2. **Spacer washer**
3. **Drive sprocket**
4. **Fixing**

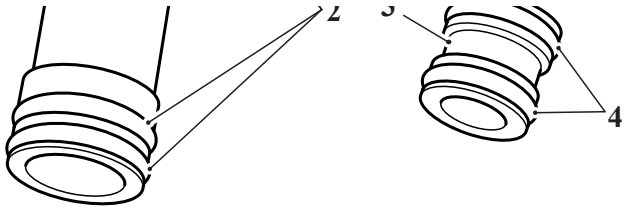
Oil and Water Pump - Installation

CAUTION

Before fitting the 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 four new O-rings to the water pump outlet sleeve.
2. Install two new O-rings to the oil pump outlet sleeve.

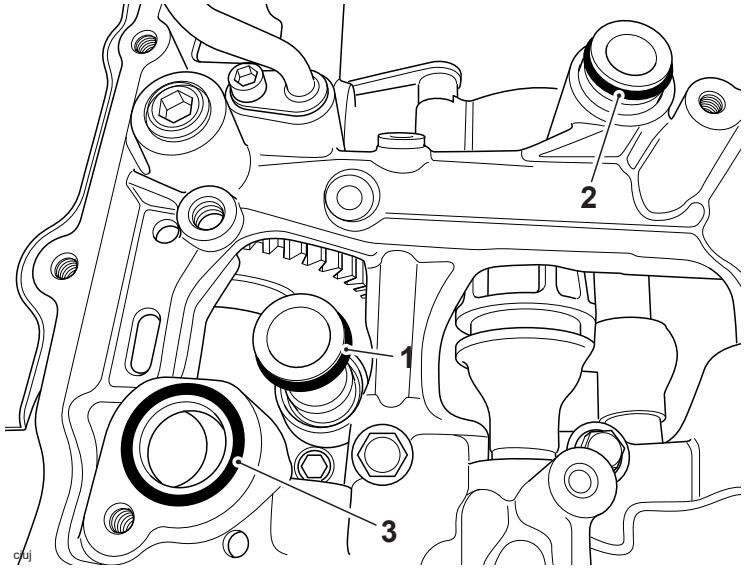




ciuh

1. **Coolant outlet sleeve**
2. **O-ring (coolant)**
3. **Oil outlet sleeve**
4. **O-ring (oil)**

3. Fit the coolant outlet sleeve, the oil outlet sleeve and the coolant inlet O-ring to the crankcase.



cjuj

1. **Coolant outlet sleeve**
2. **Oil outlet sleeve**
3. **O-ring (coolant inlet)**

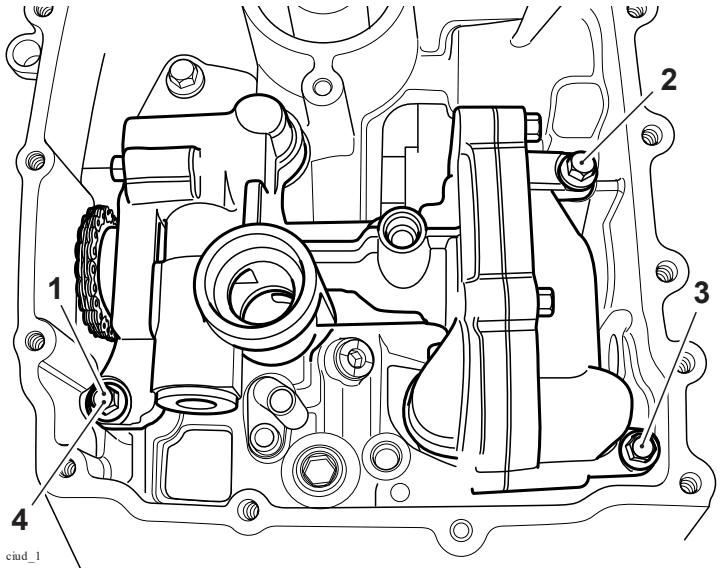
4. Fill the oil pump with new engine oil, turning the pump rotor as the oil is poured in to ensure all surfaces are coated with oil.
5. Position the oil and water pump to the crankcase inserting the oil pump outlet sleeve and the water pump outlet sleeve into the openings.

CAUTION

Do not use excessive force to insert the outlet sleeves into the oil pump. Severe oil pump or outlet sleeve damage may result from the use of excessive force.

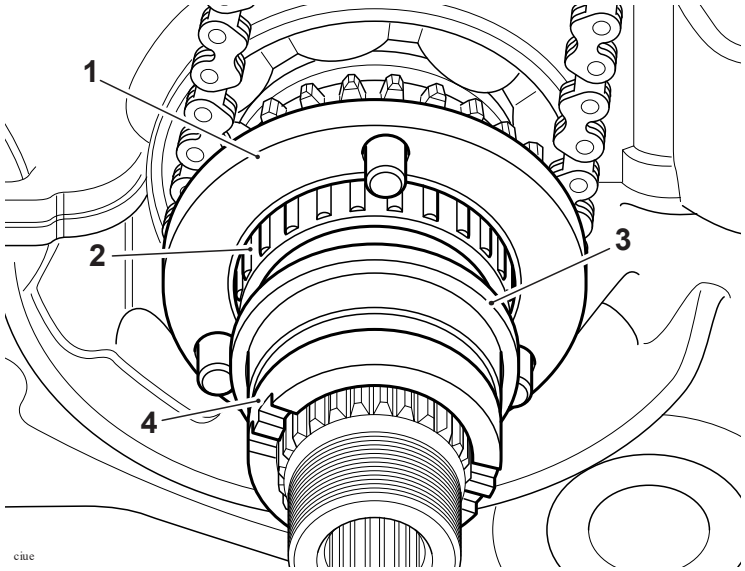
6. Feed the drive chain over the transmission input shaft and fit to the sprocket.

7. Fit the drive chain on to the oil pump sprocket.
8. Refit the oil and water pump. Install new fixings and tighten to **10 Nm** in the sequence shown below.



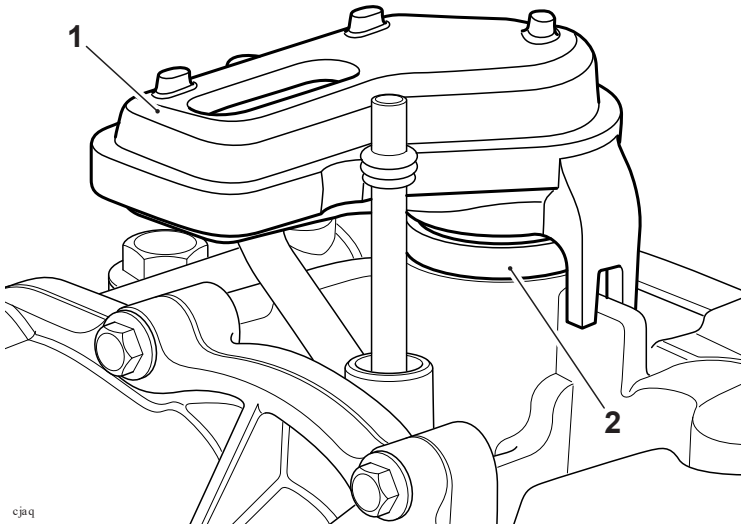
Tightening Sequence

9. Support the oil and water pump drive sprocket and carefully refit the bush spacer and needle roller bearing as noted during removal.



1. **Drive sprocket**
2. **Needle roller bearing**
3. **Spacer**
4. **Bush**

10. Install a new oil seal and refit the oil pick-up.



1. **Oil pick-up**
2. **Oil seal**

Perform the following operations:

- Clutch - Installation
- Sump - Installation
- Engine Oil and Filter Renew
- Coolant Replacement - Filling
- Battery - Installation
- Seat - Installation

Oil Pressure Relief 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.

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.

The oil pressure relief valve is located in the oil pump housing. It is positioned behind a threaded blanking plug in the oil pump body.

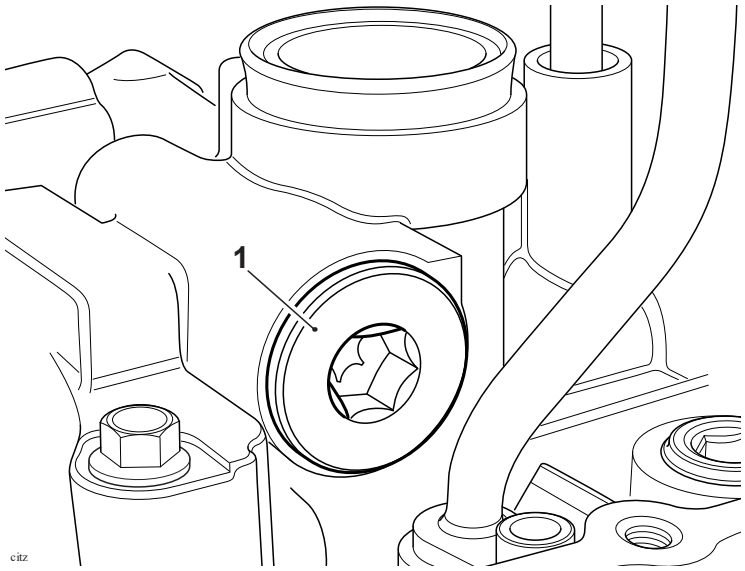
Perform the following operations:

- Seat - Removal
- Battery - Removal
- Sump - Removal

WARNING

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

1. Remove the blanking plug.

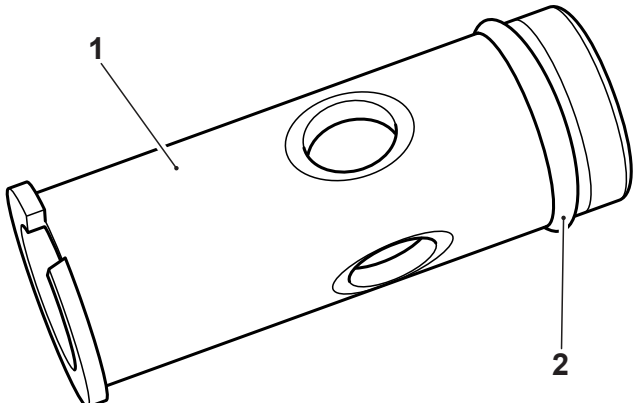


1. Blanking plug

2. Carefully withdraw the oil pressure relief valve from the oil pump housing.
3. Remove and discard the O-ring from the oil pressure relief valve.

Oil Pressure Relief Valve - Installation

1. Lubricate the new O-ring with clean engine oil and fit to the oil pressure relief valve.



city

1. **Oil pressure relief valve**
2. **O-ring**

2. Refit the oil pressure relief valve as noted during removal.
3. Refit the blanking plug and tighten to **10 Nm**.
4. Refit the sump, ensuring the water pump drain tube is correctly installed (see Sump - Installation).

Perform the following operations:

- Battery - Installation
- Seat - Installation

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.

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.

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.

The low oil pressure warning light switch is located in the lower crankcase, behind the sprocket cover.

- Front Sprocket Cover - Removal

WARNING

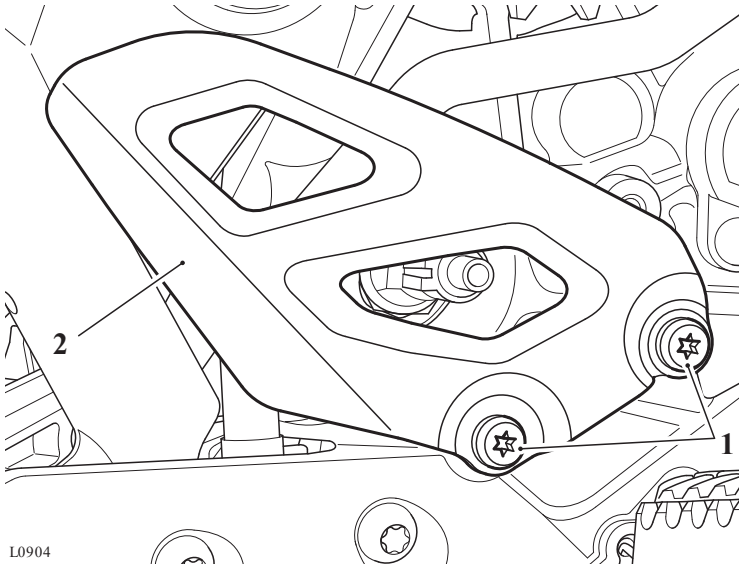
Do not allow a brake component to hang unsupported on the brake hose or line.

Brake hoses or lines that are not unsupported may become damaged or bent.

WARNING

Bent or damaged brake hoses or lines lead to reduced braking efficiency causing loss of motorcycle control and an accident.

1. Remove the fixings and remove the right hand heel guard.



1. Fixings

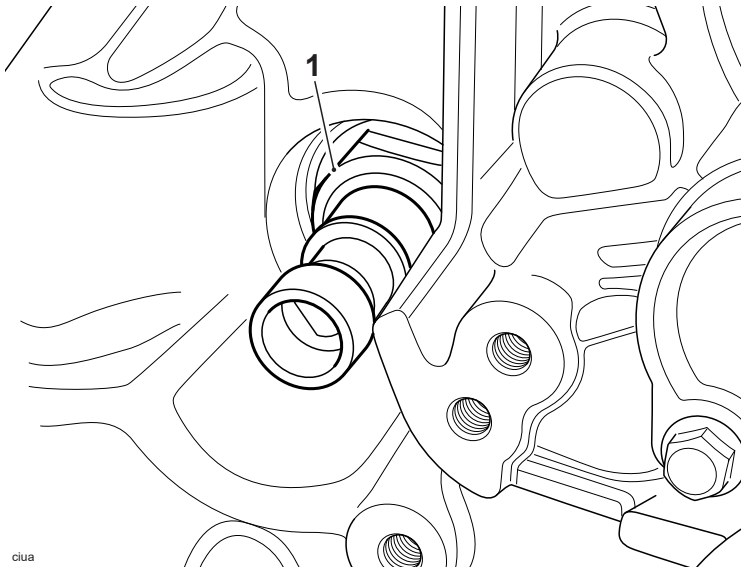
2. Heel guard

2. Disconnect the electrical connector.

Note

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

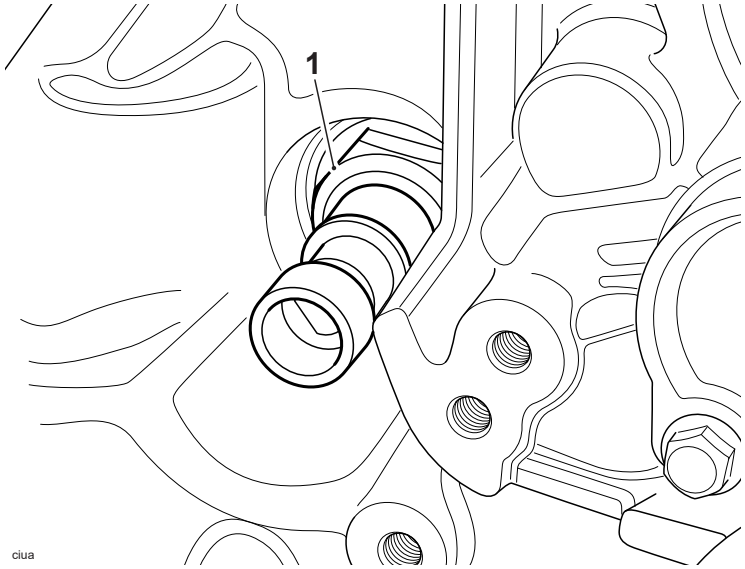
3. Position a suitable receptacle to collect any displaced oil from the oil gallery.
4. Remove the switch and discard the sealing washer.



1. **Low oil pressure warning light switch**

Low Oil Pressure Warning Light Switch - Installation

1. Incorporating a new sealing washer, fit the low oil pressure light switch.
2. Tighten the switch to **15 Nm**.



1. **Low oil pressure warning light switch**

3. Reconnect the electrical connector.
4. Refit the right hand heel guard and tighten the fixings to **7 Nm**.
5. Refit the sprocket cover (see Front Sprocket Cover - Installation).
6. Reconnect the battery positive, (red) lead first (see Battery - Installation) and tighten the terminals to **4.5 Nm**.
7. Start the engine and ensure that the oil pressure warning light extinguishes shortly after starting.
8. Allow the engine to idle for a minimum of 30 seconds.

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.

9. Stop the engine and check the oil level as described (see Engine Oil - Level Inspection). Adjust if necessary.

Perform the following operations:

- Seat - Installation

Engine Remove and Install

Engine - Removal

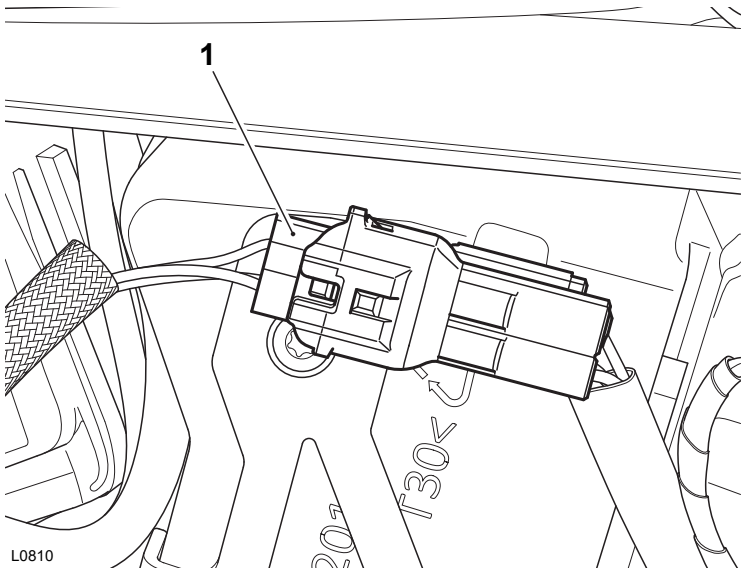
WARNING

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.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal
- Radiator - Removal
- Sump Guard - Removal
- Cradle Assemblies - Removal
- Evaporative Canister (if fitted) - Removal
- Coolant Expansion Tank - Removal
- Exhaust Silencer - Removal, Left Hand Header Pipe - Removal and Exhaust Catalytic Converter - Removal
- Side Panels
- Front Sprocket Cover - Removal
- If required, drain the engine oil - Engine Oil and Filter Renew

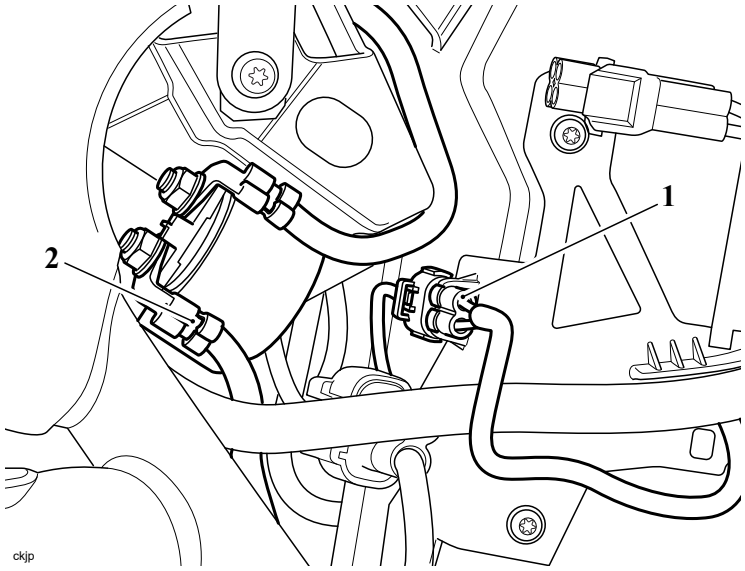
1. Disconnect the coolant hose from the thermostat housing.
2. From the top of the frame, disconnect the following electrical connectors:
   - Spark plug leads
   - Fuel injectors
   - Coolant temperature sensor.
3. Disconnect the clutch cable from the crankcase (see Clutch Cable - Removal).
4. On the right side of the airbox, disconnect the gear position sensor electrical connector from the main harness.



Note

- **To disconnect the alternator harness from the regulator/rectifier, the rear mudguard has to be removed.**
- **Note the routing of the alternator harness, crankshaft position sensor harness and starter motor cable for installation.**

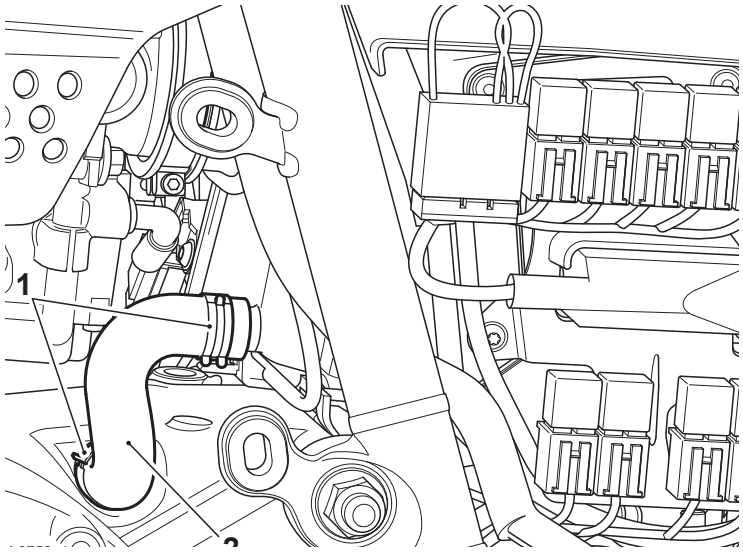
5. Remove the rear mudguard and detach the alternator harness from the regulator/rectifier (see Rear Mudguard - Removal).
6. Detach the crankshaft position sensor electrical connector from the rear of the airbox. Disconnect the crankshaft position sensor from the main harness.
7. Disconnect the starter motor lead from the starter motor solenoid.



1. Crankshaft position sensor electrical connector

2. Starter motor lead

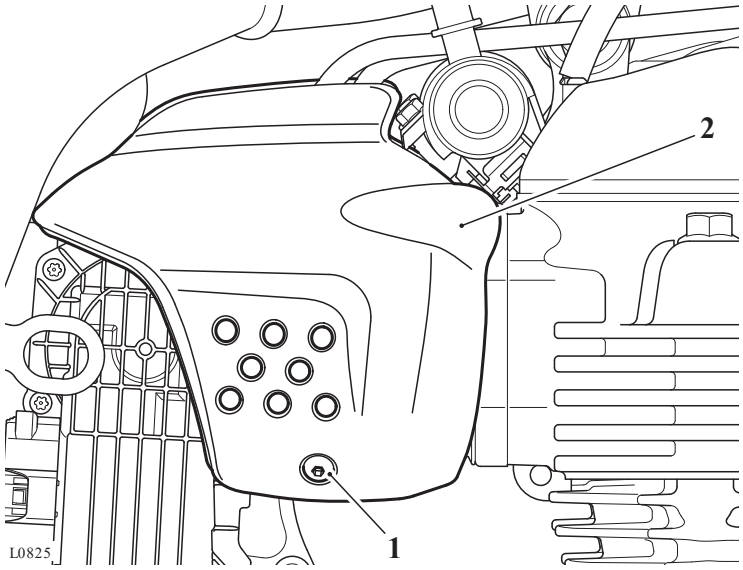
8. Route the three cables down to the engine.
9. Release the two hose clips and remove the engine breather hose.





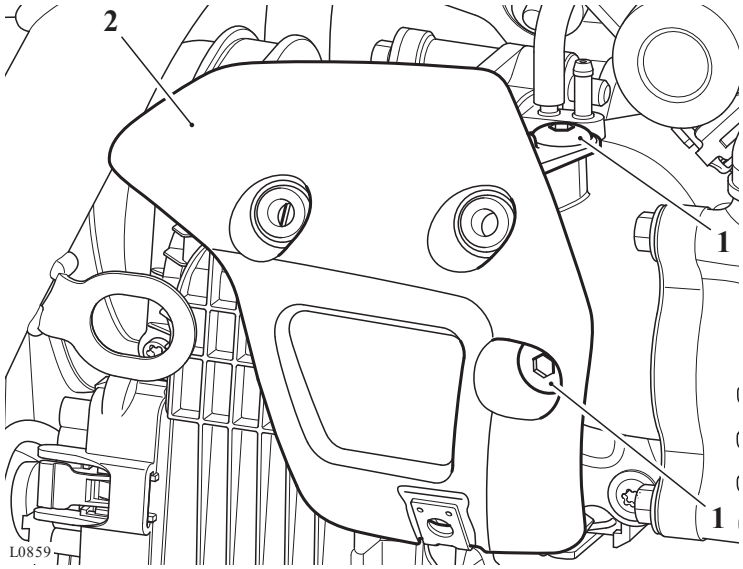
1. **Clips**
2. **Engine breather pipe**

10. Remove the fixing and remove the air intake finishers.



1. **Fixing**
2. **Air intake finisher (right hand side shown)**

11. Remove the two fixings and remove the mountings for the air intake finisher.



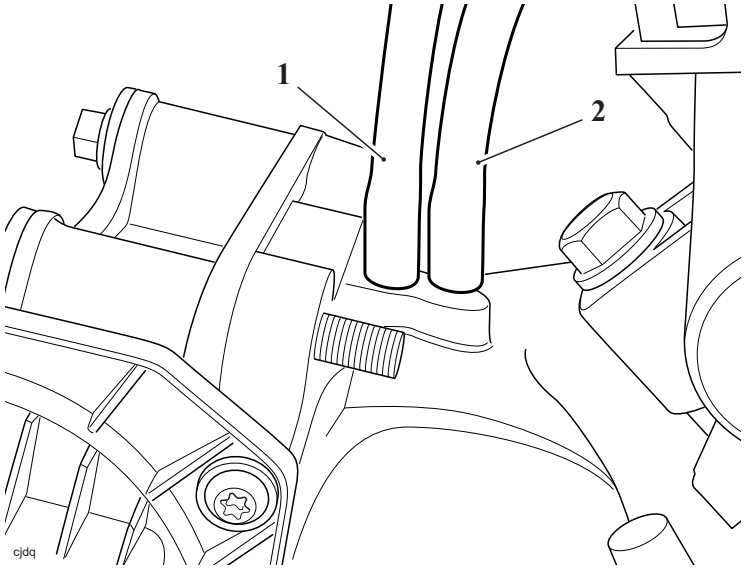
1. **Fixings**
2. **Mounting (right hand side shown)**

Note

Note

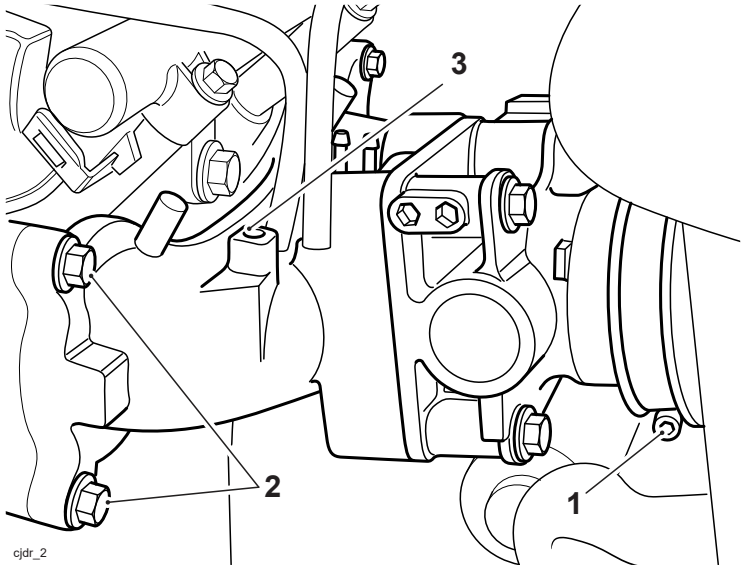
- **Note which spigot on the inlet manifold the MAP sensor hose is fitted to and, if fitted, which spigot the evaporative emissions hose is fitted to for installation.**

12. Disconnect the MAP hose and the evaporative emissions hose from the inlet manifold.



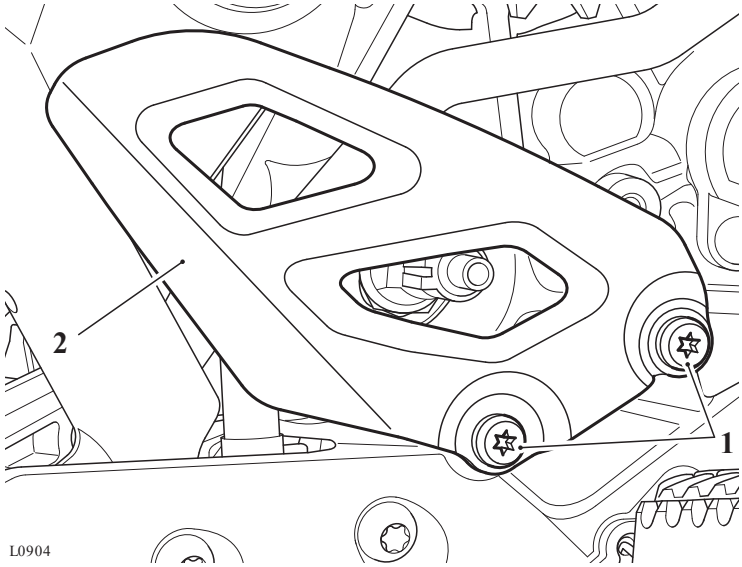
1. **Evaporative hose**
2. **MAP sensor hose**

13. Loosen the throttle body hose clamp.
14. Remove the four fixings securing the inlet manifold to the cylinder head and detach it from the cylinder head. Remove and discard the two seals on the inlet manifold.



1. **Clamp**
2. **Inlet manifold fixings (left hand side)**
3. **Inlet manifold**

15. Remove the fixings and remove the right hand heel guard.



1. **Fixings**
2. **Heel guard**

WARNING

Do not allow a brake component to hang unsupported on the brake hose or line.

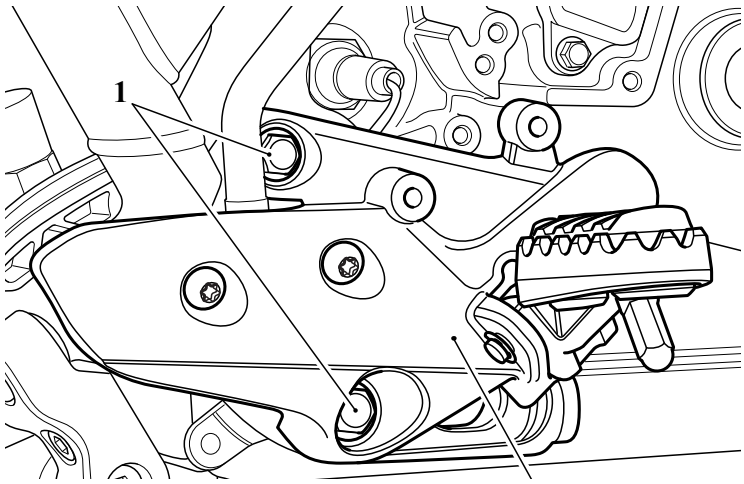
Brake hoses or lines that are not supported may become damaged or bent.

Bent or damaged brake hoses or lines lead to reduced braking efficiency causing loss of motorcycle control and an accident.

CAUTION

To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

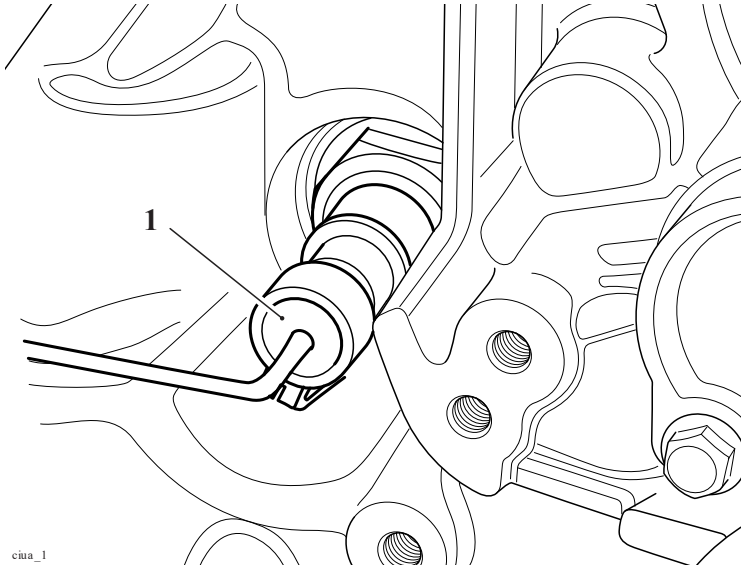
16. Release the fixings and detach the right hand control plate from the frame.





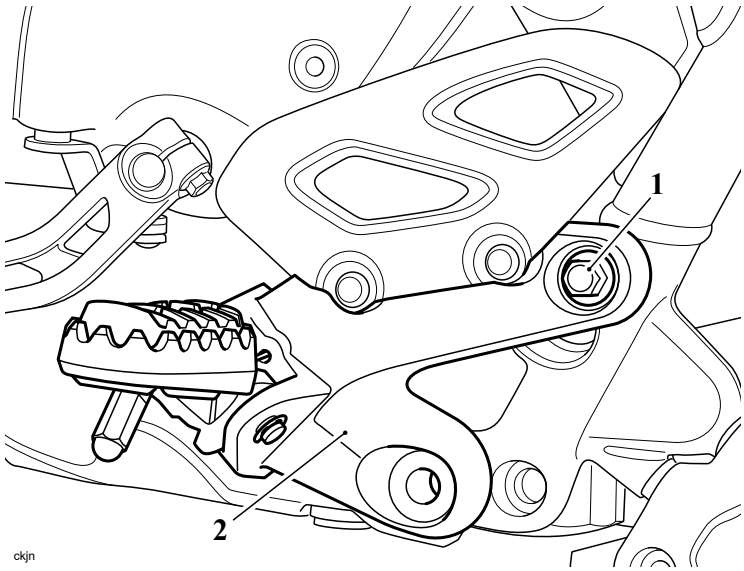
1. **Fixings**
2. **Right hand control plate**

17. Disconnect the oil pressure switch electrical connector.



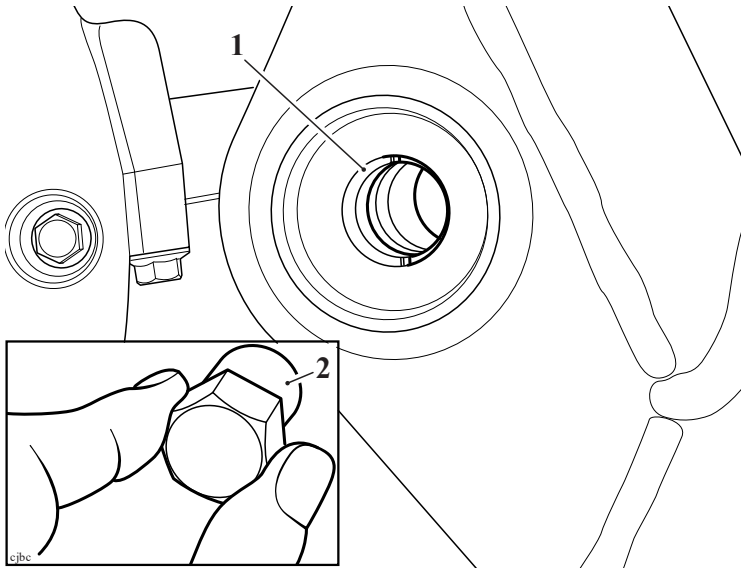
1. **Electrical connector**

18. Loosen the drive chain and remove it from the front sprocket (see Final Drive Chain Adjustment).
19. From the left hand side, disconnect the engine earth strap.
20. Release the fixing and remove the left hand control plate.



1. Fixing
2. Left hand control plate

21. Carefully remove the swinging arm pivot cover on the left hand side of the frame.
22. Remove the swinging arm pivot nut and collect the washer on the left hand side of the frame.
23. Partially remove the swinging arm spindle to access the frame adjuster sleeve.
24. Engage T3880104 - Swinging Arm Adjuster Wrench in the slots of the frame adjuster sleeve and rotate anticlockwise to loosen the sleeve fully.



1. Frame adjuster
2. T3880104 - Swinging Arm Adjuster Wrench

25. Place a support beneath the engine and ensure that the frame is still adequately and securely supported.
26. Release the engine mounting nuts. Collect the nuts and washers, leaving the bolts in position.
27. Remove the left hand cylinder head mounting bolt.
28. Remove the cylinder head rear mounting bolt.
29. Using T3880377 - Engine Mounting Adjuster release the:
    - Rear cylinder head mounting adjuster on the left side of the frame.
    - Upper rear crankcase mounting adjuster.
    - Lower rear crankcase mounting adjuster.
    - Left hand cylinder head mounting adjuster.
30. Remove the right hand cylinder head mounting bolt.
31. Remove the remaining mounting bolts, collecting the spacer from the lower crankcase mounting bolt.

CAUTION

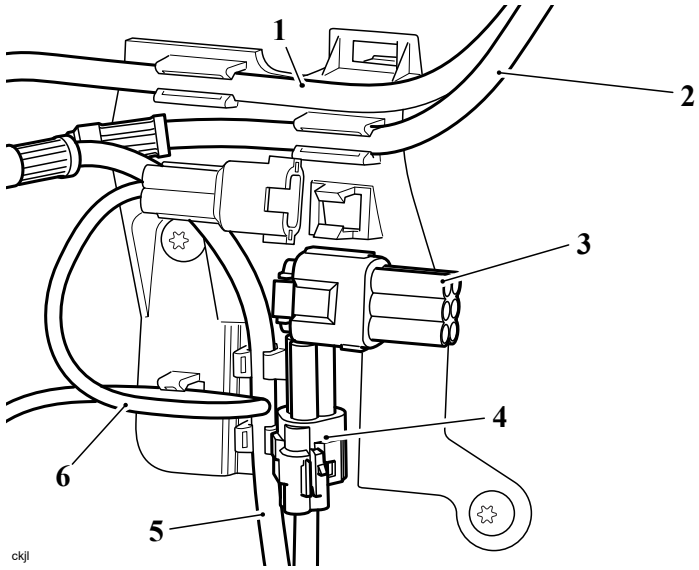
CAUTION

Three brake lines, the rear brake switch harness, rear wheel ABS sensor and the bluetooth connector are attached to the brake line tidy on the rear of the crankcase.

Failure to detach the brake lines or harnesses from the brake line tidy will cause damage to the braking system.

Note the routing of the components attached to the brake line tidy for installation.

32. While carefully lowering the engine, detach the brake lines and harnesses from the brake line tidy and position away from the crankcase.



1. Brake line (front brake master cylinder)
2. Brake line (front brake calipers)
3. Bluetooth connector
4. Rear brake light switch harness
5. Brake line (rear brake master cylinder)
6. Rear wheel ABS sensor

Engine - Installation

Fuel and Exhaust System and Engine Management

Exploded Views

Exploded View – Fuel Tank

Exploded View – Fuel Pump

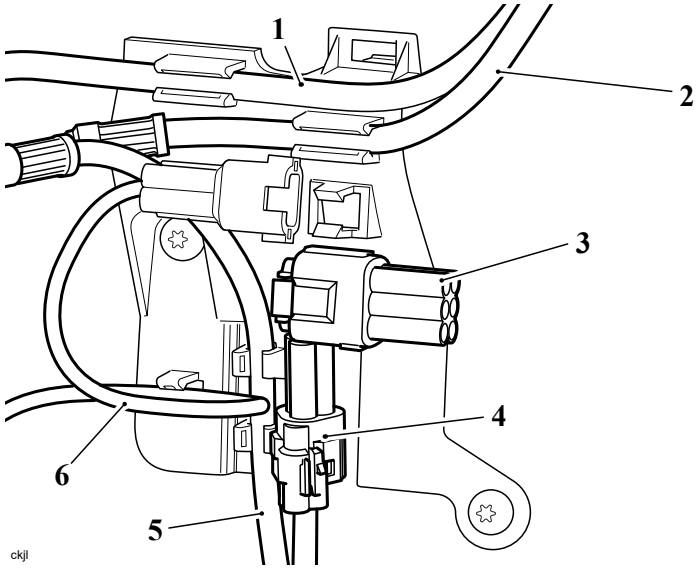
Exploded View – Fuel Rail, Throttles and Injectors

Exploded View - Engine Management

WARNING

Before starting work, ensure the 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. While carefully locating the engine to the frame, attach the brake lines and harnesses to the brake line tidy as noted for removal.



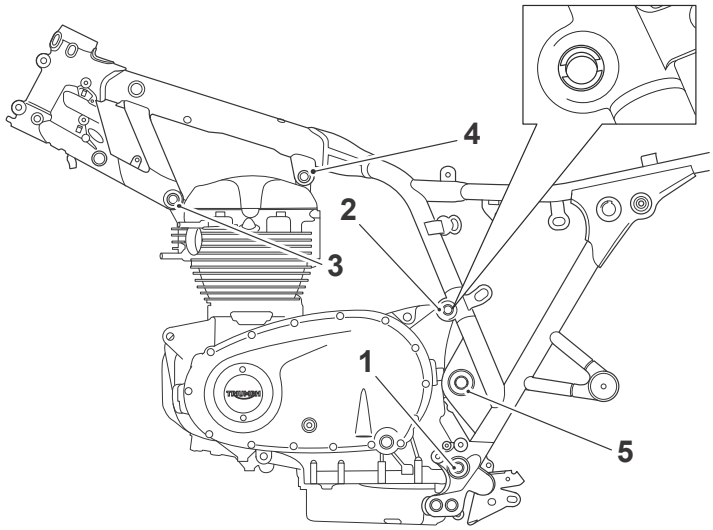
1. Brake line (front brake master cylinder)
2. Brake line (front brake calipers)
3. Bluetooth connector
4. Rear brake light switch harness
5. Brake line (rear brake master cylinder)
6. Rear wheel ABS sensor

2. Align the engine mounting points with the corresponding positions on the frame.
3. Install and tighten the engine mounting bolts in the following 3 stages.
4. **Stage 1**

- Insert the cylinder head left hand front mounting bolt with washer between the bolt and the frame.
- Insert the cylinder head right hand front mounting bolt. Fit a new lock nut but do not fully tighten at this stage.
- Fit the spacer between the crankcase and the frame on the right hand side. Insert the crankcase rear lower mounting bolt from the right hand side. Do not fit the washer and new lock nut at this stage.
- Insert the crankcase rear upper mounting bolt from the right hand side. Do not fit the washer and new lock nut at this stage.

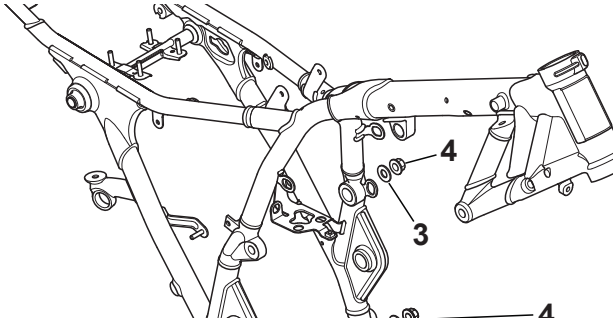
- Insert the cylinder head rear mounting bolt and washer from the left hand side.

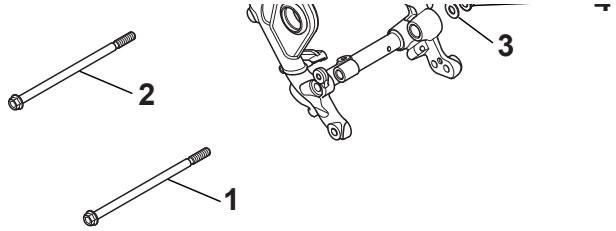
5. **Stage 2**
6. Partially withdraw the crankcase rear lower mounting bolt and tighten the frame adjuster to **5 Nm** using T3880377 - Engine Mounting Adjuster. Refit the bolt and washer.
7. Partially withdraw the crankcase rear upper mounting bolt and tighten the frame adjuster to **5 Nm** using T3880377 - Engine Mounting Adjuster. Refit the bolt and washer.
8. Counter hold the cylinder head front right hand mounting nut and tighten the bolt to **24 Nm**.
9. Withdraw the cylinder head left hand mounting bolt and its washer, tighten the frame adjuster to **5 Nm** using T3880377 - Engine Mounting Adjuster. Insert the washer and bolt with washer between the bolt and the frame.
10. Withdraw the cylinder head rear mounting bolt and tighten the frame adjuster to **5 Nm** using T3880377 - Engine Mounting Adjuster.



1. **Lower rear crankcase adjuster**
2. **Upper rear crankcase adjuster**
3. **Left hand cylinder head frame adjuster**
4. **Rear cylinder head frame adjuster**
5. **Swinging arm adjuster**

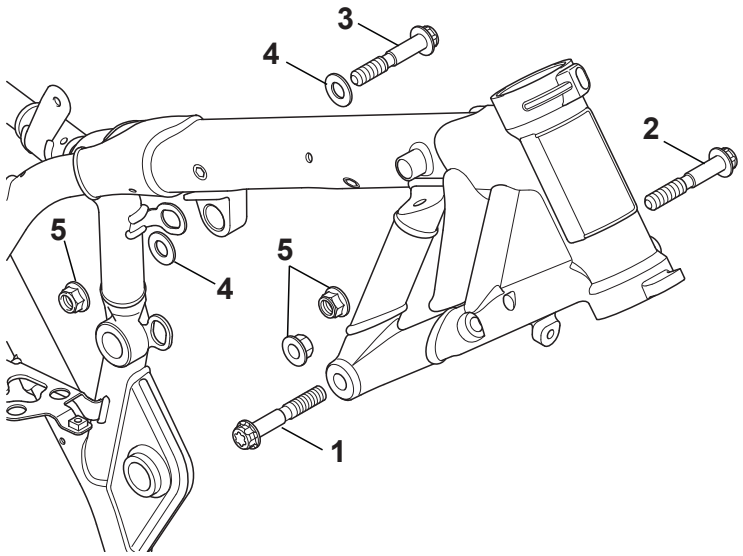
11. Fit the washer and a new lock nut to the crankcase lower rear mounting bolt. Counter hold the bolt and tighten the nut to **80 Nm**.
12. Fit the washer and a new lock nut to the crankcase upper rear mounting bolt. Counter hold the bolt and tighten the nut to **80 Nm**.





1. **Crankcase lower rear mounting bolt**
2. **Crankcase upper rear mounting bolt**
3. **Washer**
4. **Lock nut**

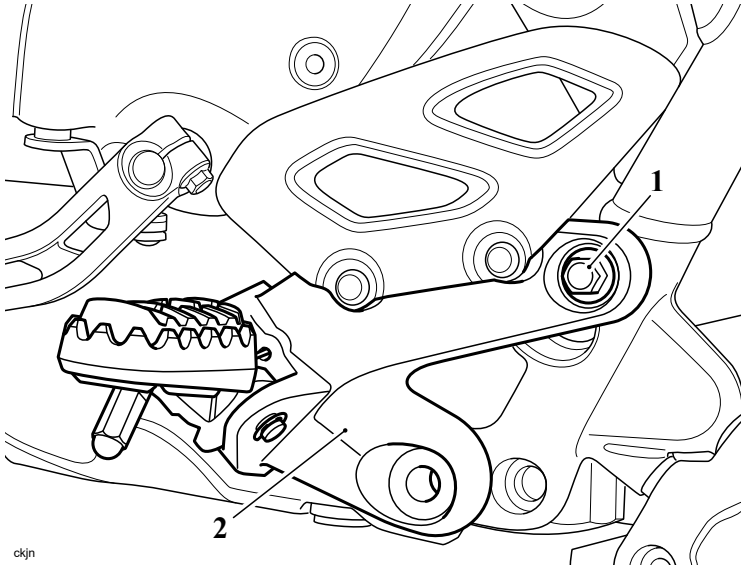
13. Counter hold the nut and tighten the cylinder head front right hand mounting bolt to **105 Nm**.
14. Fit the washer and a new lock nut to the cylinder head front left hand mounting bolt. Counter hold the nut and tighten the bolt to **105 Nm**.
15. Fit the washer and a new lock nut to the cylinder head rear mounting bolt. Counter hold the nut and tighten the bolt to **105 Nm**.



1. **Cylinder head front right hand mounting bolt**
2. **Cylinder head front left hand mounting bolt**
3. **Cylinder head rear mounting bolt**
4. **Washer**
5. **Lock nut**

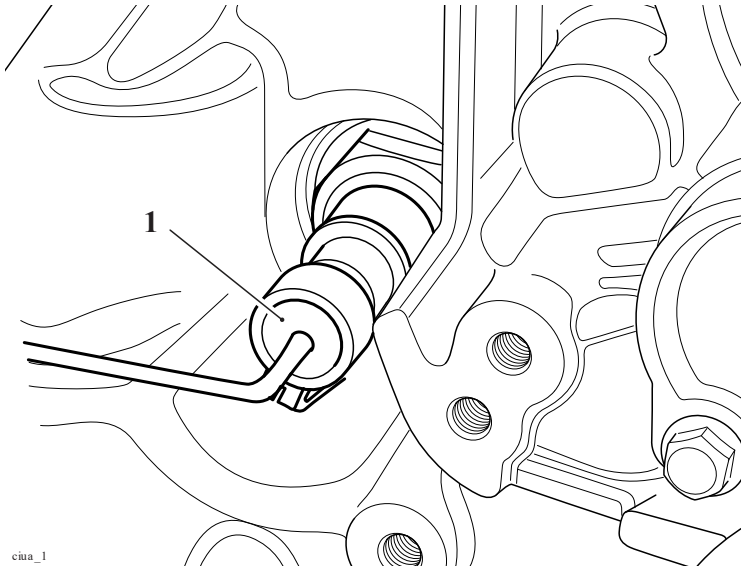
16. **Stage 3**
17. Using T3880104 - Swinging Arm Adjuster Wrench, tighten the swinging arm pivot bolt adjuster sleeve to **6 Nm**.
18. Fit the washer and a new lock nut to the swinging arm spindle. Counter hold the spindle and tighten the nut to **110 Nm**.

19. Refit the swinging arm pivot cover to the left hand side of the frame.
20. On the left hand side, connect the engine ground cable.
21. Refit the rider's left hand control plate, fit the upper fixing only and do not fully tighten at this stage.



1. Fixing
2. Left hand control plate

22. Refit the drive chain to the front sprocket and adjust (see Final Drive Chain Adjustment).
23. Connect the oil pressure switch electrical connector.



1. Electrical connector

WARNING

WARNING

Do not allow a brake component to hang unsupported on the brake hose or line.

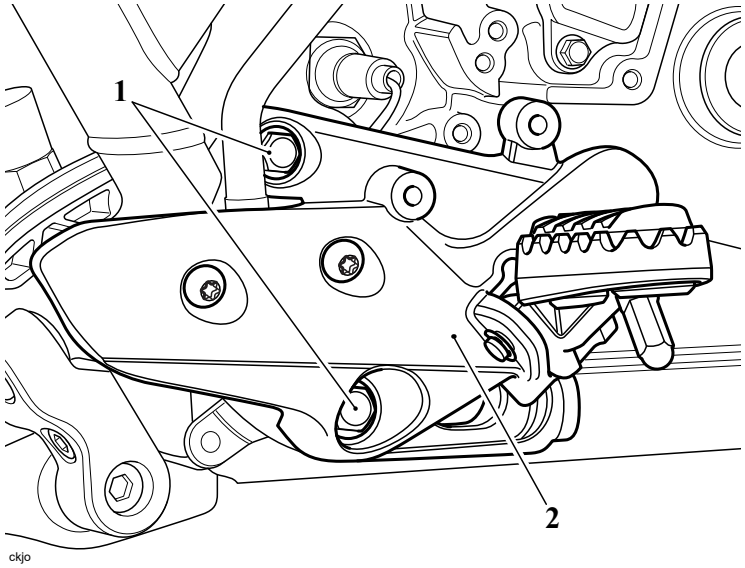
Brake hoses or lines that are not supported may become damaged or bent.

Bent or damaged brake hoses or lines lead to reduced braking efficiency causing loss of motorcycle control and an accident.

CAUTION

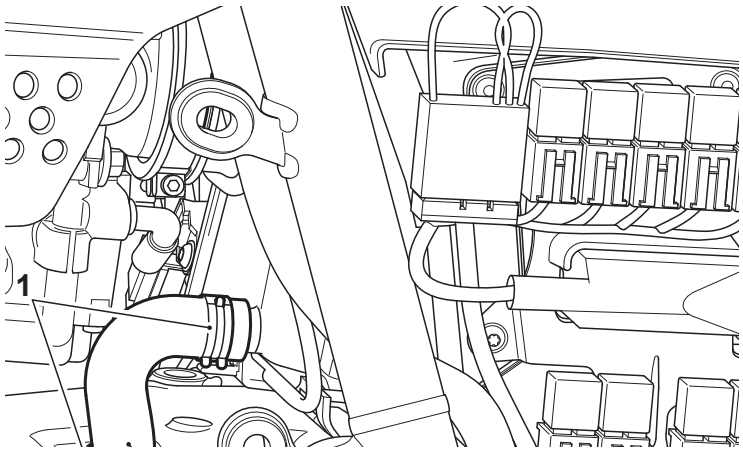
To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

24. Refit the rider's right hand control plate, fit the upper fixing only and do not fully tighten at this stage.



1. **Upper fixing**
2. **Right hand control plate**

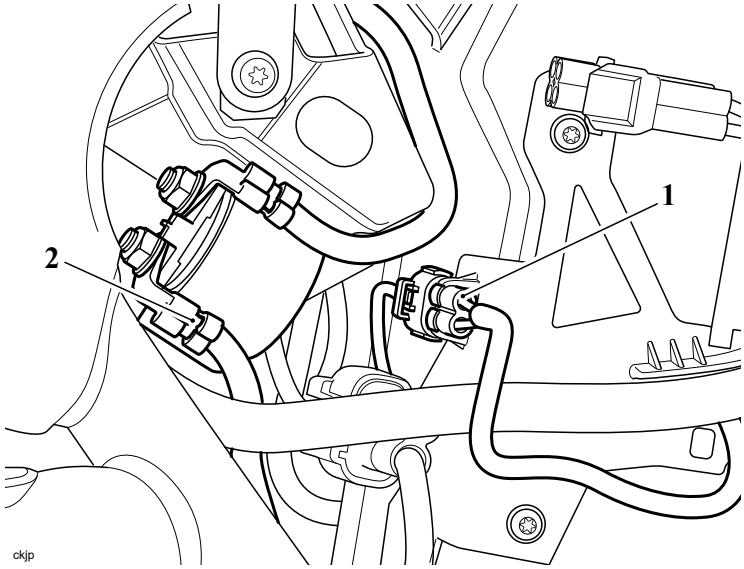
25. Refit the engine breather hose and secure with the hose clips.





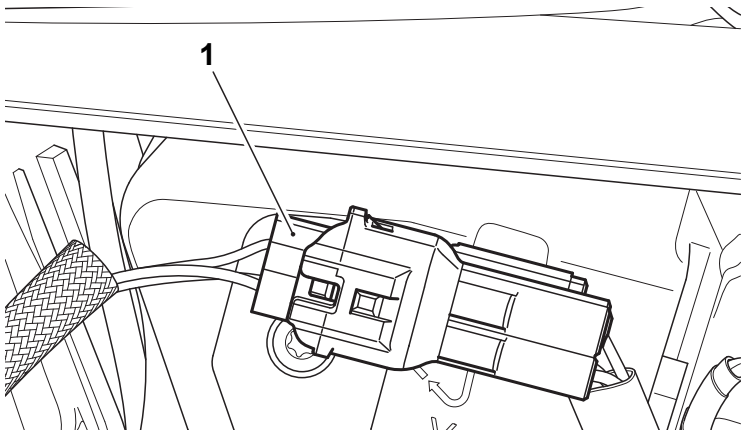
1. **Clips**
2. **Engine breather pipe**

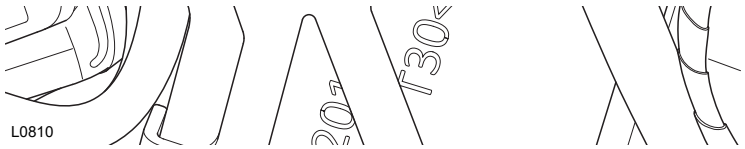
26. Route the alternator harness, crankshaft position sensor harness and starter motor leads as noted for removal.
27. Connect the starter motor lead to the starter motor solenoid and tighten the fixing to **5 Nm**.
28. Connect the crankshaft position sensor to the main harness and attach the connector to the rear of the airbox.



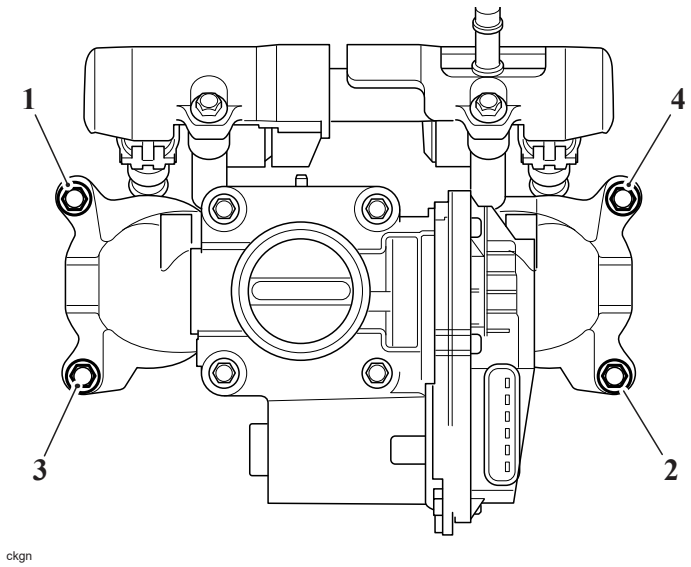
1. **Crankshaft position sensor electrical connector**
2. **Starter motor lead**

29. Connect the alternator harness to the regulator/rectifier and refit the rear mudguard (see Rear Mudguard - Installation).
30. On the right side of the airbox, connect the gear position sensor electrical connector to the main harness.



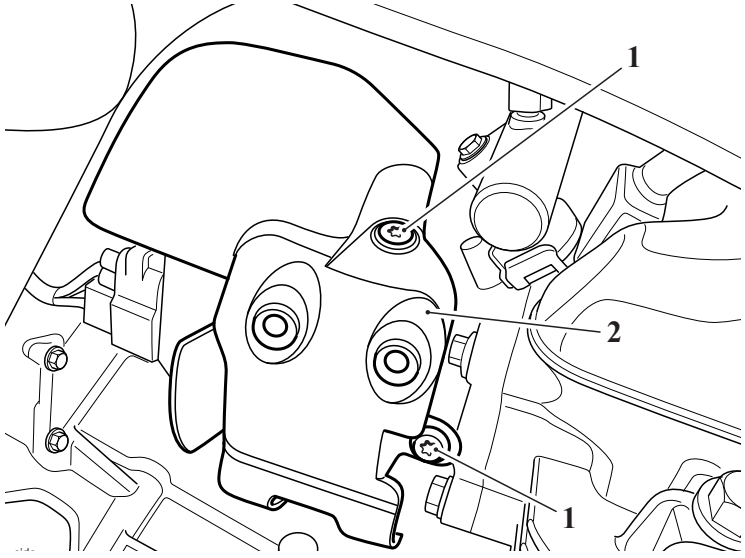


31. Connect the clutch cable to the crankcase and clutch (see Clutch Cable - Installation).
32. Ensure the mating surfaces on the inlet manifold and the cylinder head are clean.
33. Fit two new seals to the mating surfaces of the inlet manifold.
34. Fit the inlet manifold to the cylinder head.
35. Tighten the inlet manifold to cylinder head fixings to **9 Nm** in the sequence shown below.
36. Retighten the fixings one and two to **9 Nm**.



Tightening Sequence

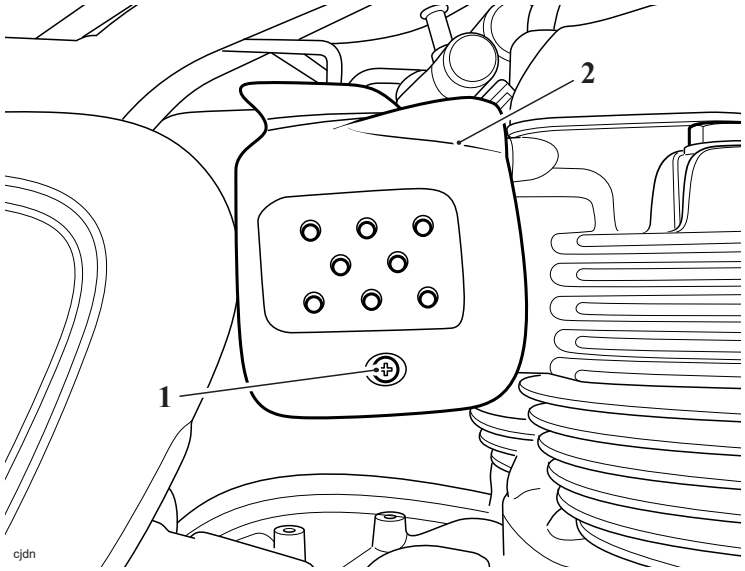
37. Ensure the throttle body hose is correctly fitted and tighten the clip to **1.5 Nm**.
38. Connect the MAP hose and the evaporative emissions hose to the inlet manifold, as noted for removal.
39. Fit the mountings for the air intake finisher and tighten its fixings to **3 Nm**.





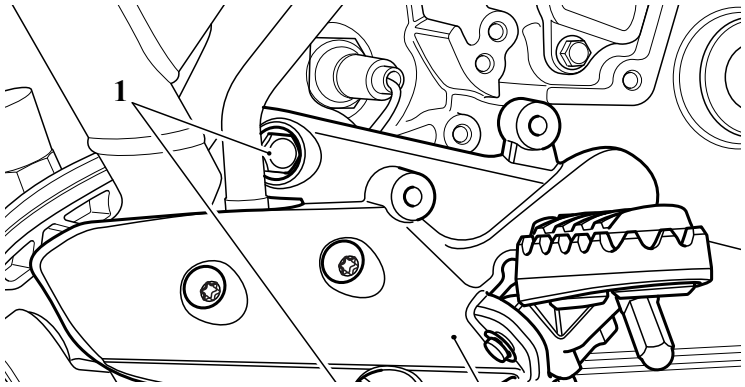
1. **Fixings**
2. **Mounting (right hand side shown)**

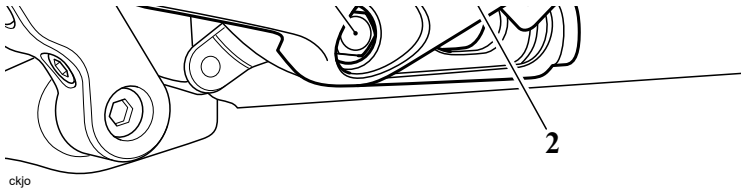
40. Fit the air intake finishers and tighten the fixing to **1.5 Nm**.



1. **Fixing**
2. **Air intake finisher (right hand side shown)**

41. Connect the following electrical connectors:
    - Coolant temperature sensor.
    - Fuel injectors
    - Spark plug leads
42. Refit the coolant hose to the thermostat housing and secure using T3880207 - Hose Clip Pliers.
43. Refit the side panels (see Side Panels).
44. Refit the exhaust catalytic system (see Exhaust Catalytic Converter - Installation, Left Hand Header Pipe - Installation and Exhaust Silencer - Installation).
45. Refit the cradle assemblies (see Cradle Assemblies - Installation).
46. Tighten the rider's right hand control plate upper fixing to **25 Nm**.

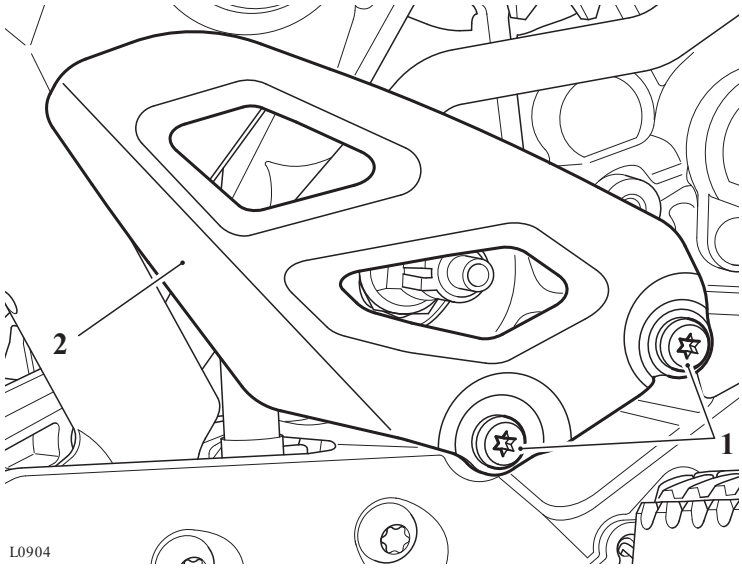




1. Upper fixing

2. Right hand control plate

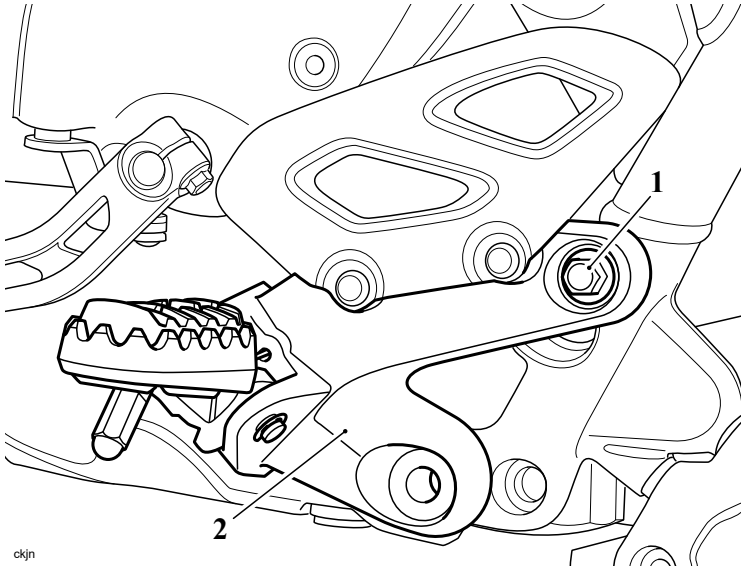
47. Refit the right hand heel guard and tighten its fixings to **7 Nm**.



1. Fixings

2. Heel guard

48. Tighten the rider's left hand control plate upper fixing to **25 Nm**.

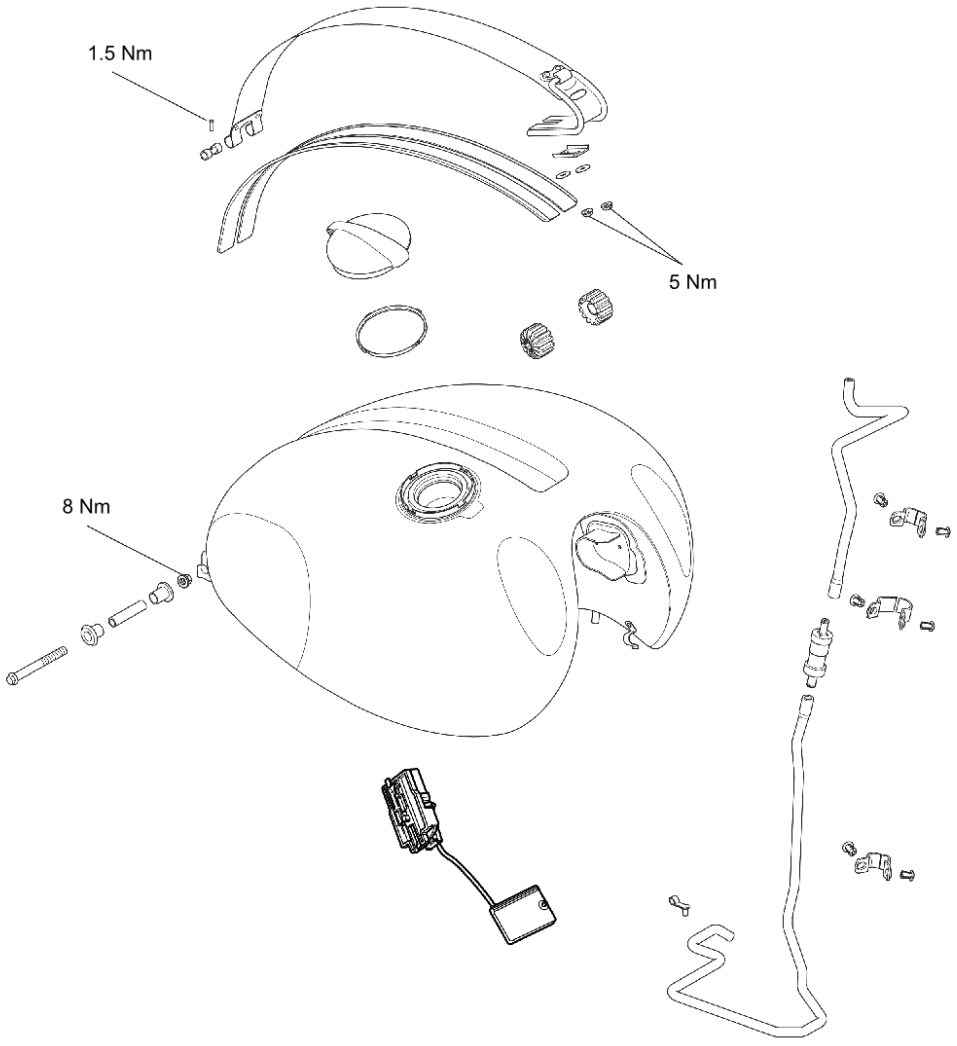


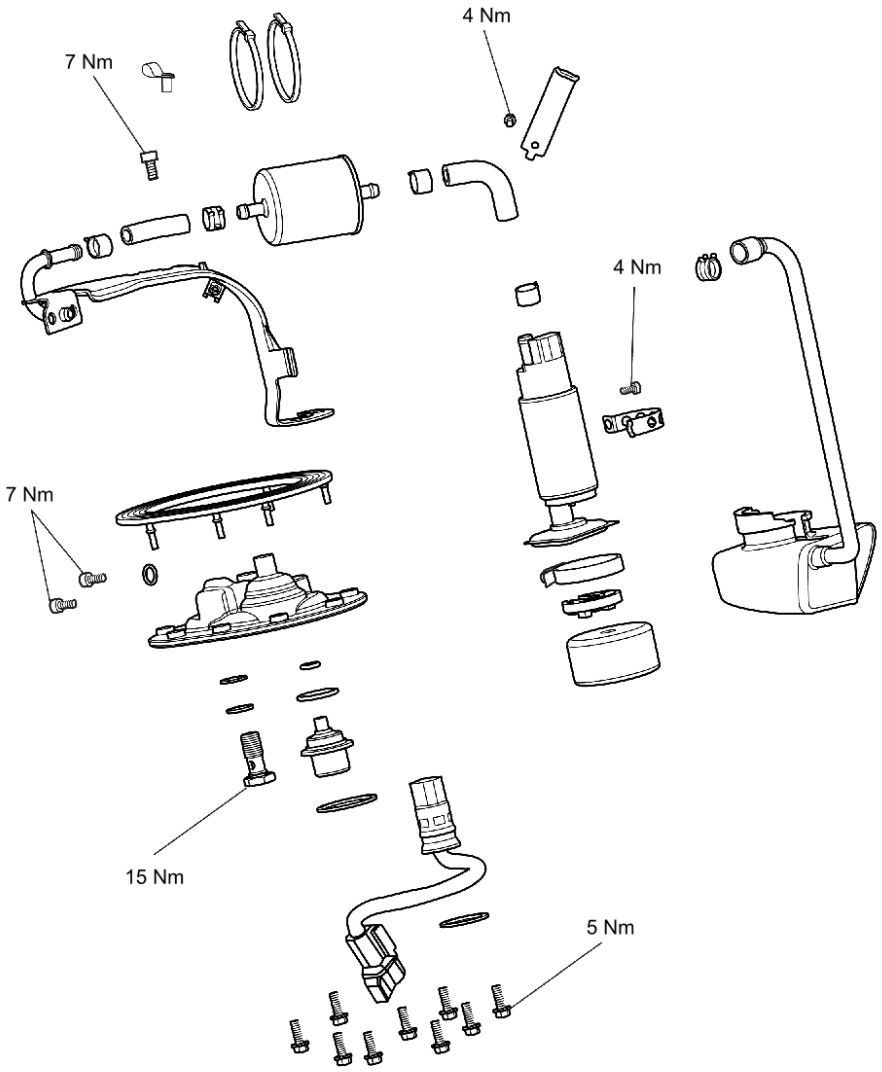
1. Fixing

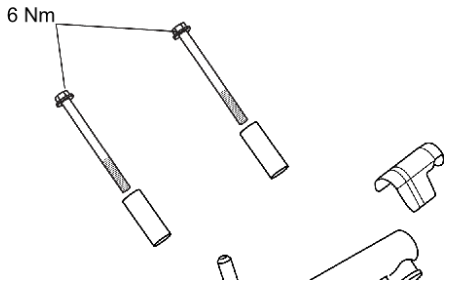
2. Left hand control plate

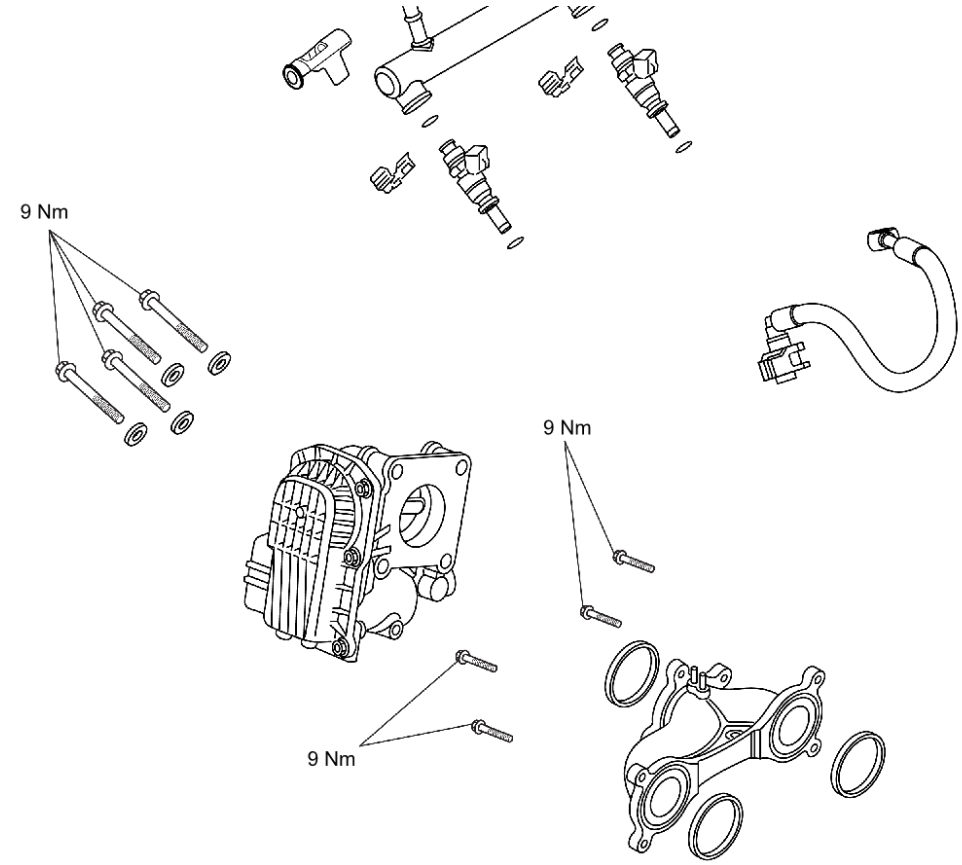
Perform the following operations:

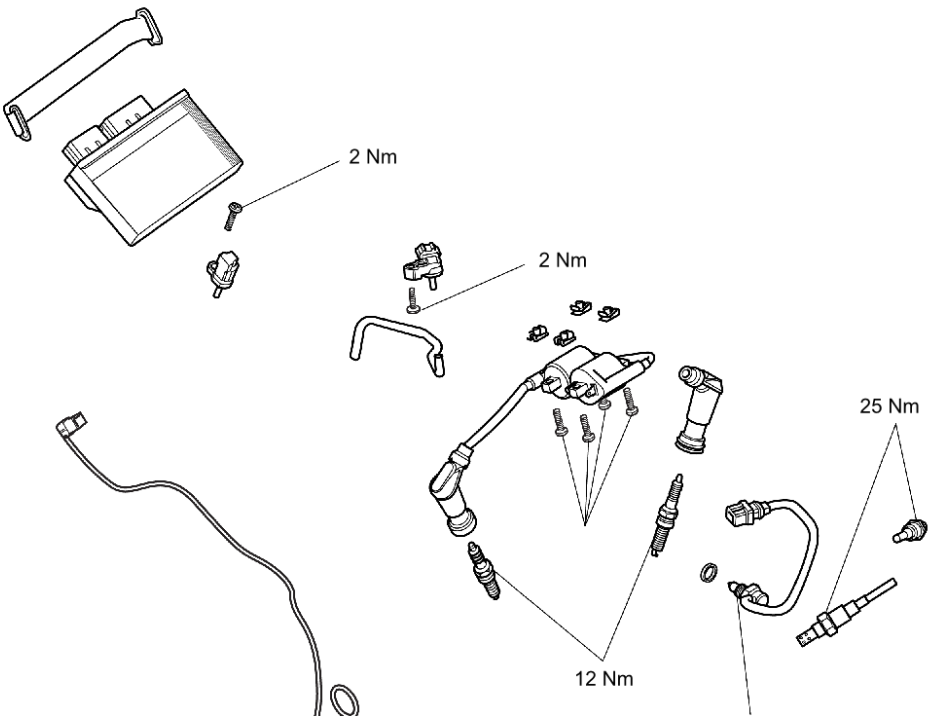
- Front Sprocket Cover - Installation
- Coolant Expansion Tank - Installation
- Evaporative Canister (if fitted) - Installation
- Radiator - Installation
- Sump Guard - Installation
- Fuel Tank - Installation
- Battery - Installation
- Seat - Installation
- If required, refill the engine with engine oil - Engine Oil and Filter Renew
- Reset the neutral position adaption (see Neutral Position Adaption).




7 Nm
4 Nm
4 Nm
7 Nm
15 Nm
5 Nm


6 Nm


9 Nm
9 Nm
9 Nm

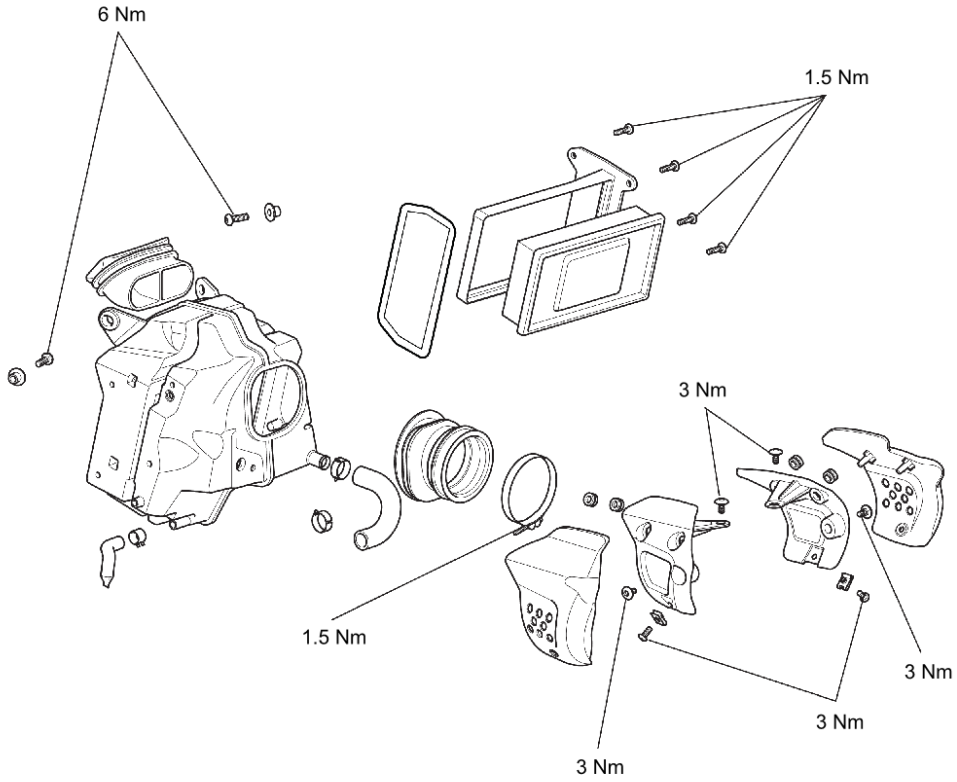

2 Nm
2 Nm
25 Nm
12 Nm

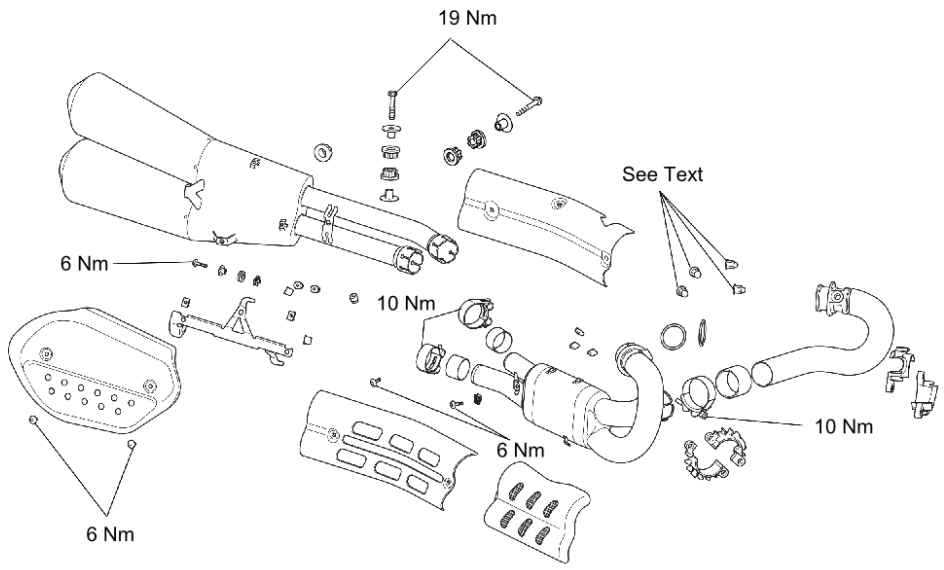


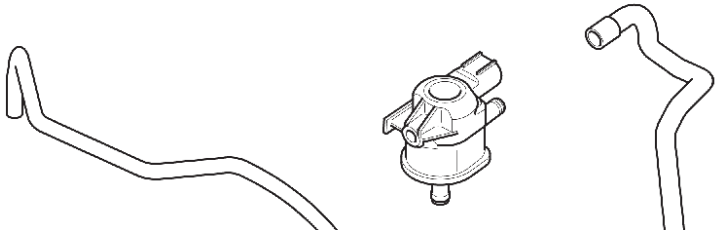
Exploded View – Airbox

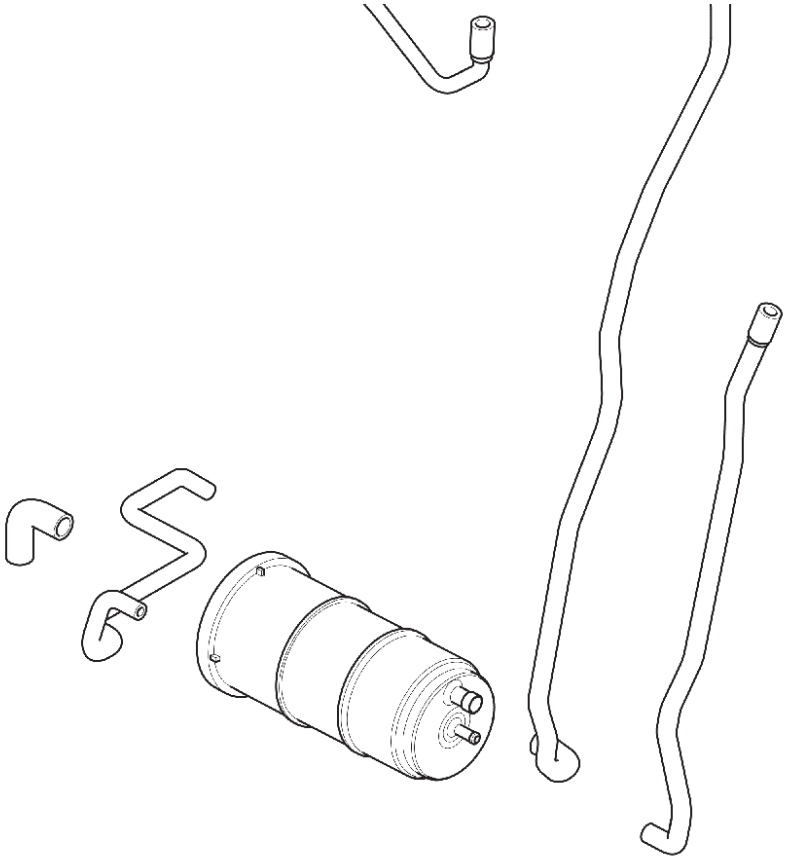
Exploded View – Exhaust System

Exploded View – Evaporative System (if fitted)




19 Nm
See Text
6 Nm
10 Nm
10 Nm
6 Nm
6 Nm





Engine Management

Fuel Requirements

Fuel Requirements - all countries except USA

This model must be run on 91 RON or higher unleaded fuel.

Ethanol

Ethanol is added to petrol in volumes up to 10% in Europe and up to 85% in other countries. Triumph motorcycles can use fuel containing ethanol up to 25%.

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 consumption may be adversely affected by their use. Should any of these difficulties be experienced, run the motorcycle on normal unleaded gasoline.

Ethanol

Ethanol fuel is a mixture of 10% ethanol and 90% gasoline and is often described under the names 'gasohol', 'ethanol enhanced', or 'contains ethanol'. This fuel may be used in Triumph motorcycles.

Methanol

CAUTION

Fuels containing methanol should not be used in Triumph motorcycles as damage to components in the fuel system can be caused by contact with methanol.

MTBE (Methyl Tertiary Butyl Ether)

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

Glossary of Terms

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

ABDC

After Bottom Dead Centre.

Air temperature

The air temperature in the airbox and intake hose.

Air temperature sensor

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

Ambient air pressure

Pressure of the air in the airbox.

ATDC

After Top Dead Centre.

BBDC

Before Bottom Dead Centre.

BTDC

Before Top Dead Centre (TDC).

Battery Voltage

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

Catalytic converter

Device placed in the exhaust system which converts toxic gases and pollutants in exhaust gas into less-toxic pollutants by an oxidation and a reduction reaction.

Closed throttle position

Throttle position at idle, measured as a voltage and expressed as percentage.

Coolant temperature

The coolant temperature in the cylinder head.

Coolant temperature sensor

Sensor which detects coolant temperature.

Cooling fan status

The ON or OFF condition of the cooling fan.

Cruise control cancel switch (if fitted)

A switch located in the twist grip housing, used to cancel the cruise control. The switch is operated by the over-closing of the twist grip.

DTC

Diagnostic Trouble Code.

Electronic steering lock (if fitted)

The electronic steering lock operated by a switch.

EMS main relay

Engine Management System Main Relay. When the ignition is switched on, the EMS main relay is powered up to provide a stable Voltage supply for the engine ECM.

Engine ECM

Engine Electronic Control Module.

Engine speed

The crankshaft revolutions per minute.

Fall detection (if fitted)

The fall detection switch will detect if the motorcycle is on its side and will cut power to the engine ECM immediately.
If the fall detection switch is fitted, the inertial measurement unit (IMU) will not be fitted.

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 engine ECM. This is converted to the gear position value that is displayed on the instrument's gear position indicator and/or neutral lamp.

Idle fuel trim

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

Idle fueling

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

Idle reference speed

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

Ignition advance

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

Ignition switch position

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

Ignition timing

Same as ignition advance.

Immobiliser and Tyre Pressure Monitoring System (TPMS) Control Module

The control module for the immobiliser and TPMS system.

IMU (if fitted)

The Inertial Measurement Unit measures the following:

- Longitudinal acceleration
- Vertical acceleration
- Lateral acceleration
- Pitch rate
- Yaw rate
- Roll rate

From these measurements the IMU calculates the motorcycle's lean angle.

The IMU outputs are used for multiple systems, for example, optimised cornering ABS (OCABS) and fall detection.

If the IMU is fitted, the fall detection switch will not be fitted.

Injector pulse time

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

Keyless ECM (if fitted)

Keyless Electronic Control Module.

Long term fuel trim

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

MAP sensor

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

MIL

Malfunction Indicator Lamp.

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

Neutral switch status

The NEUTRAL or IN GEAR status of the transmission.

Off idle fuel trim

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

Open circuit

A break in an electrical circuit - current cannot flow.

Over temperature

High temperature within the engine Electronic 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 engine ECM. Based on this information, adjustments to air/fuel ratio are made.

Primary throttle position sensor

Sensor for the primary (lower) throttle position.

Purge valve duty cycle (if fitted)

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

Road speed sensor

The rear wheel speed sensor is used to supply road speed data to the engine ECM.

Secondary air injection (if fitted)

A small amount of air injected into the exhaust port to reduce the levels of pollutants in the exhaust gases.

Sensor supply Voltage

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

Short circuit

A short cut in an electrical circuit - current bypasses the intended circuit (usually to ground).

Short term fuel trim

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

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 diagnostic software, fully open need not be 100% nor fully closed 0%.

Throttle Voltage

Voltage at the throttle potentiometer.

TPMS (if fitted)

Tyre Pressure Monitoring System.

Twist grip position sensor

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 actuation motor to the correct position.

Transponder

A transponder-responder chip located in the ignition key. The transponder is activated by a radio signal sent out by the immobiliser control module, via an antenna located around the ignition switch. If the immobiliser control module does not receive the correct code signal from the transponder, the immobiliser will remain active and the engine will not start.

Engine Management System

System Description

This model is fitted with an electronic engine management system which encompasses

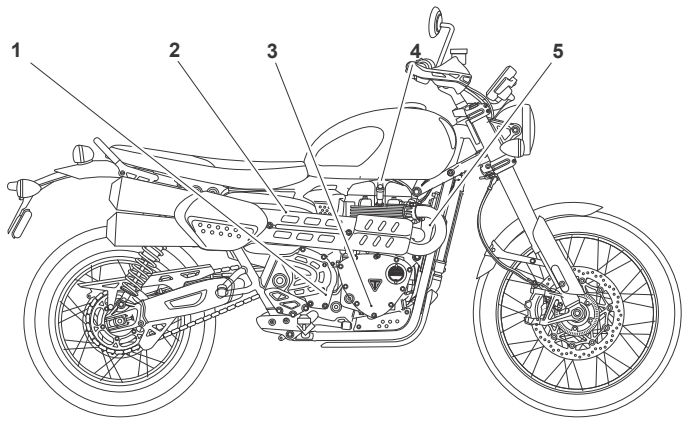
control of both ignition and fuel delivery. The engine electronic control module (ECM) draws information from sensors positioned around the engine, cooling and air intake systems and precisely calculates ignition advance and fueling requirements for all engine speeds and loads.

In addition, the system has an on-board diagnostic function. For additional information, see System Diagnostics.

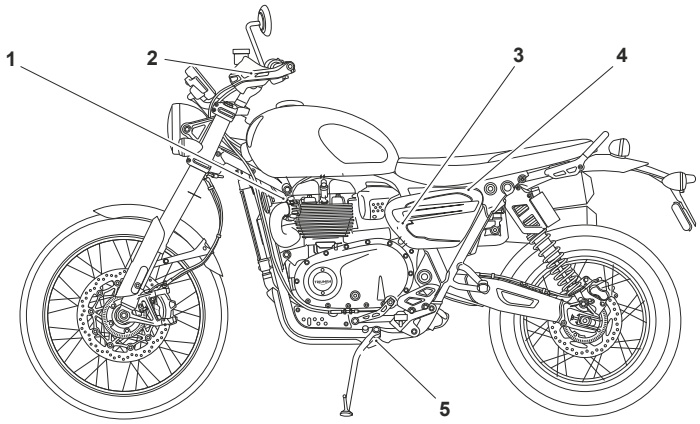
System Sensors

- **Intake air temperature sensor** - situated on left hand side of the airbox. As the density of the air changes with temperature (therefore the amount of oxygen available to ignite the fuel), an intake air temperature sensor is fitted. Changes in air temperature are compensated for by adjusting the amount of fuel injected to a level consistent with clean combustion and low emissions.
- **Ambient air pressure sensor** - situated in front of the airbox. 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 below the fuel tank, connected to the manifold by a length of tube. 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 ECM. This degree of engine load accuracy allows the ECM to make very small adjustments to fuel and ignition which would otherwise not be possible from throttle angle data alone.
- **Clutch switch** - situated on the clutch lever. The clutch must be pulled in for the starter motor to operate.
- **Crankshaft position sensor** - situated in the alternator cover. The crankshaft position sensor detects movement of teeth attached to the alternator rotor. The teeth give a reference point from which the actual crankshaft position is calculated. The crankshaft position sensor information is used by the 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 front of the cylinder head near the thermostat housing. Coolant temperature information, received by the engine ECM, is used to optimise fueling at all engine temperatures and to calculate hot and cold start fueling requirements.
- **Oxygen sensors** - situated in the exhaust header pipe system close to the cylinder head. The oxygen sensors constantly feed 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.
- **Fall detection switch** - situated under the storage box. The fall detection switch will detect if the motorcycle is on its side and will cut power to the ignition and fuel systems immediately. This prevents the engine from running and the fuel pump from delivering fuel. In the event of a fall, the switch is reset by returning the bike to an upright position and switching the ignition off then back on again.
- **Gear position sensor** - situated in the lower crankcase, below the drive chain front sprocket. 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 neutral lamp in the instruments.

Sensor Locations



1. Gear position sensor
2. Intake air temperature sensor
3. Crankshaft position sensor
4. Manifold absolute pressure sensor
5. Coolant temperature sensor



1. Oxygen sensor
2. Clutch switch
3. Ambient air pressure sensor
4. Fall detection switch
5. Side stand switch

Actuators

Actuator Locations

Immobiliser and Keyless Ignition System

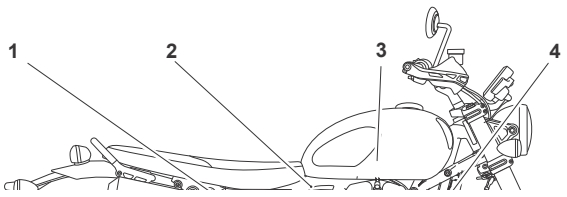
System Actuators

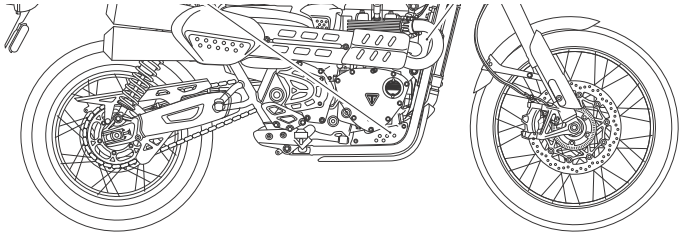
In response to signals received from the sensors, the engine ECM controls and directs messages to a series of electronic and electromechanical actuators. The function and location of the actuators is given below.

- **Throttle actuator motor** - situated at the rear of the throttle body. The throttle actuator motor opens and closes the throttle plate in the throttle body, in response to commands from the engine ECM. The throttle actuator motor is an integral part of the throttle bodies.
- **Canister purge valve (certain markets only)** - situated In front of camshaft cover, attached to the frame. 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 two injectors. The spray pattern of the injectors is fixed but the length of time each injector can remain open is variable according to operating conditions. The duration of each injection is calculated by the engine ECM using data received from the various sensors in the system.
- **Ignition coils** - situated above the camshaft cover, attached to the frame. There are two coils fitted, one for each of the spark plugs. 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 behind the left hand side panel. 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** - situated 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 fuel at 3.5 bar pressure is available to the system as soon as the engine is cranked. Fuel pressure is controlled by a regulator also situated inside the fuel tank.
- **Cooling fan** - situated behind the radiator. The engine ECM controls switching on and off of the cooling fan in response to a signal received from the coolant temperature sensor. When the coolant temperature rises to a level where the cooling effect of natural airflow is insufficient, the cooling fan is turned on by the engine ECM. When the coolant temperature falls sufficiently, the engine ECM turns the cooling fan off. The fan only becomes operational when the engine is running. It will not operate at any other time.

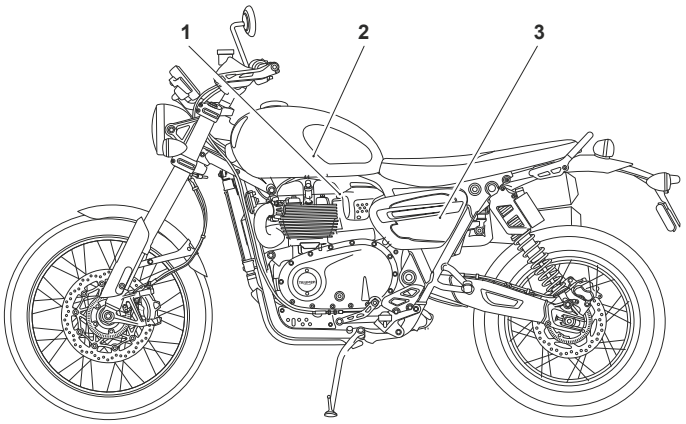
Note

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





1. **Evaporative canister purge valve**
2. **Throttle body motor**
3. **Ignition coils**
4. **Cooling fan**



1. **Fuel injectors**
2. **Fuel pump**
3. **Main power relay**

System Description

This model is fitted with an electronic immobiliser and keyless ignition system to help protect it against theft. The immobiliser and keyless ignition system is incorporated in the keyless ECM. The keyless ECM has to be paired with the engine ECM and the ignition keys which each contain a transponder chip. If all the components are correctly paired, the immobiliser will allow the engine to start. These components can only be paired using the Triumph diagnostic tool..

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 keyless ECM memory. This stored data can then be recovered using the Triumph diagnostic tool (see System Diagnostics).

System Components and Operation

- **Transponder chip** - situated inside the ignition key. The chip is activated when requested

by the keyless ECM, providing the key is in range of the LF antenna (within one meter/three feet for smart keys, within 50 mm for passive keys).

- **Low Frequency (LF) Antenna** - there are two LF Antenna on this model. One is situated on the base of the storage box under the rider's seat. The second is inside the headlight bowl. The transponder chip in the ignition key is activated when it is in range of the LF antenna. The signal from the chip is interpreted by the keyless ECM.
- **Keyless ECM** - situated at the rear of the airbox. This control module communicates with the transponder chip in the key via the LF antenna, and with the engine ECM. The keyless ECM will only allow the motorcycle's electronic systems to turn on and 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 standard keys and one smart key.

Note

- **An additional smart key can be purchased from your Triumph dealer. However, only three keys can be programmed to the motorcycle. This can be any combination of smart keys and standard keys.**
- **A previously paired key must be present when pairing a new key.**
- **Ensure all keys to be paired are present before starting the key pairing process.**

Keys can be deleted or added to the immobiliser system using the Triumph diagnostic tool.

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 keyless ECM using the Triumph diagnostic tool (see System Diagnostics).

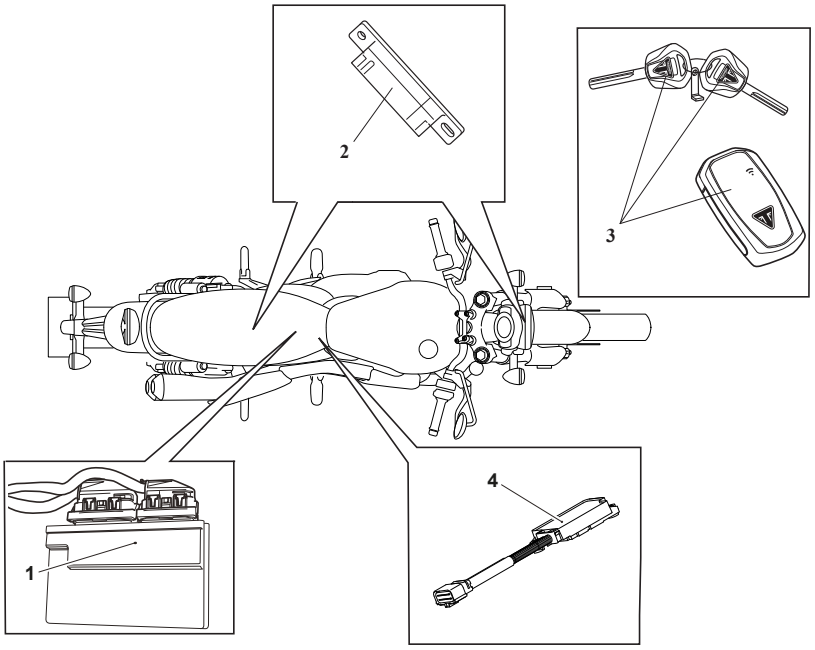
Further Diagnosis

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 System Diagnosis - Keyless ECM).

Immobiliser Components Location

Diagnostics and Testing

Electrical Connectors



1. **Engine ECM**
2. **LF Antenna**
3. **Transponder chip**
4. **Keyless ECM**

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 motorcycle 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

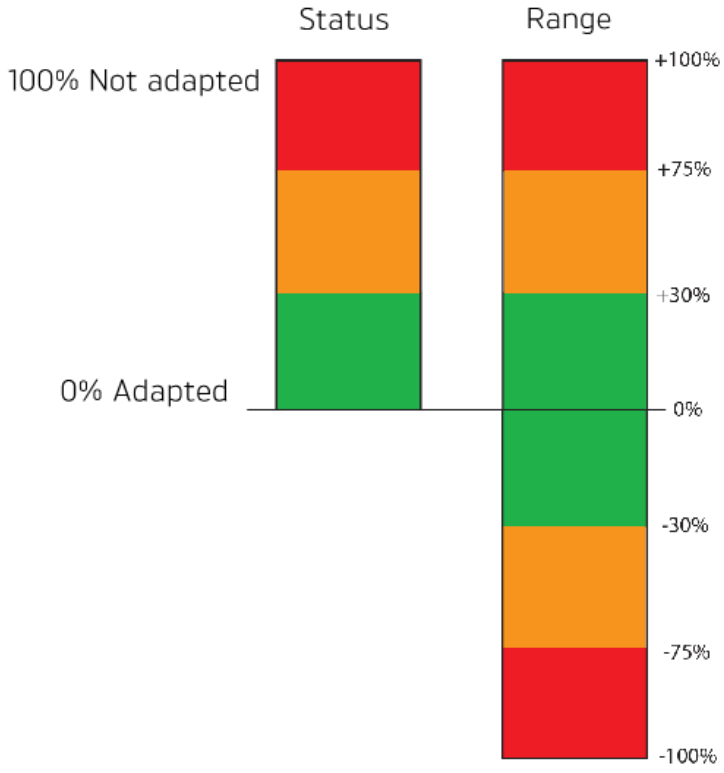
To see if a motorcycle has fully adapted, a facility named 'ADAPTION STATUS' is provided on the diagnostic tool. The following adaption details can be examined:

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.

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.

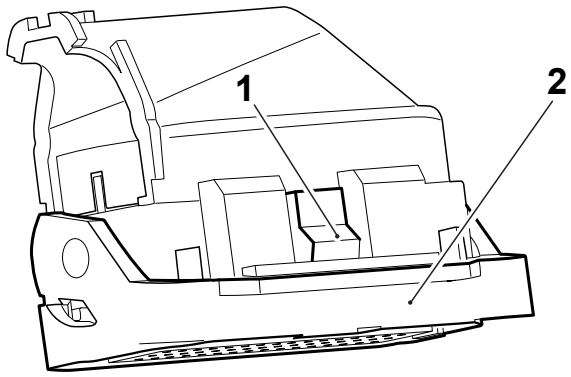
Always disconnect an ECM after disconnecting the battery negative (black) lead first.

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 its bracket and the frame (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.**

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



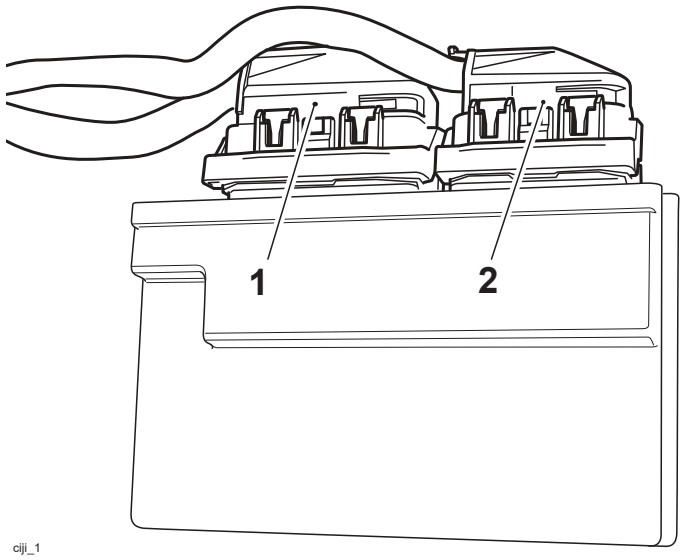
1. **Locking device**
2. **Locking lever**

Reconnection of the 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)**

1. Refit the engine ECM and its bracket to the frame under the seat (see Engine Electronic Control Module (ECM) - Installation).

System Diagnostics

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

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

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

On-board Fault Detection System

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

When the count begins, the fault is detected but not confirmed. If the fault continues to be detected and the count reaches a 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

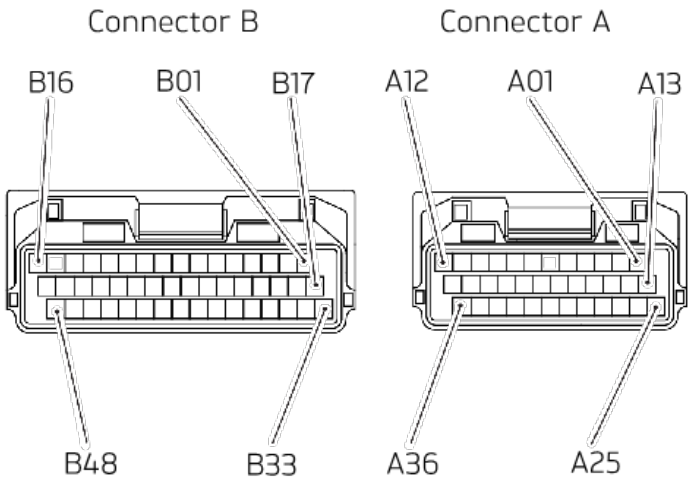
- **In some cases, when a fault is detected, the engine management system will revert to a limp-home mode. In this mode, the engine will still function though the performance and fuel economy may be marginally affected. In some cases, the rider may not notice any appreciable difference from normal operation.**

Service Symbol/General Warning Symbol

The service symbol will illuminate for five seconds after the motorcycle start up sequence as a reminder that a service is due in approximately 60 miles (100 km). The service symbol will illuminate permanently when the mileage is reached, it will remain permanently illuminated until the service interval is reset using the Triumph Diagnostic tool.

The general warning symbol will flash if an ABS or engine management fault has occurred and the ABS and/or MIL warning lights are illuminated. Rectify the fault and clear the diagnostic trouble codes using the Triumph Diagnostic tool.

ECM Connector Pin Numbering



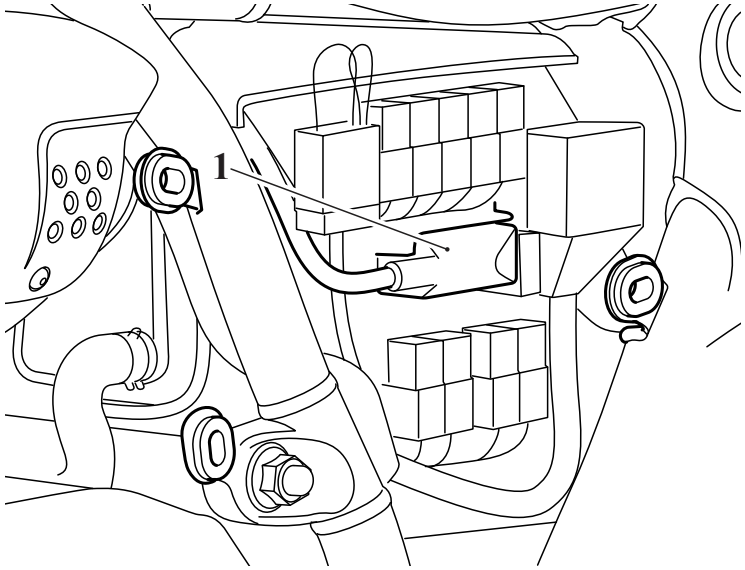
The above illustration shows the pin numbering system used in the engine management circuit diagram.

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.

System Diagnostic Tool Connection

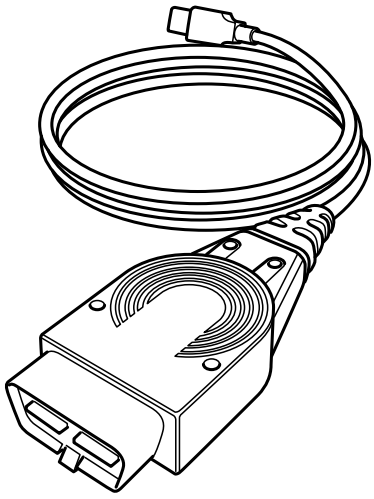
Diagnostic Tool Connection

1. To connect the Triumph diagnostic interface to the motorcycle, remove the left hand side panel (see Side Panels) 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 left hand side panel (see Side Panels).

Triumph Diagnostic Software

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

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

Note

- **Full details of how to operate the software and how to interpret the data can be found in the Triumph Diagnostic Tool User Guide.**

Build Data

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

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

Current Data

The data available under Current Data is:

Function Examined	Result Reported (Scale)
Fuel system status 1	open or closed loop operation
Fuel system status 2	open or closed loop operation/engine not running
Calculated load value	%
Engine coolant temperature	°C

Function Examined	Result Reported (Scale)
Short term fuel trim - bank 1	%
Short term fuel trim - bank 2	%
Intake manifold absolute pressure	mmHg
Engine speed	rpm
Vehicle speed	km/h
Ignition timing advance - cylinder 1	degrees
Intake air temperature	°C
Absolute throttle position	%
Bank 1 - oxygen sensor 1	Volts
Bank 1 - oxygen sensor 1 - short term fuel trim	%
Bank 2 - oxygen sensor 2	Volts
Bank 2 - oxygen sensor 2 - short term fuel trim	%

Sensor Data

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

The data sets are divided into eight groups - Sensor Voltages, Sensor Readings, Injector Data, Ignition Data, Idle Speed and Throttle Data, Inputs, Outputs 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 ECM	Volts

Item Checked	Result Unit
Air temperature sensor voltage	Volts
Coolant temperature sensor voltage	Volts
Atmospheric pressure sensor voltage	Volts
Manifold absolute pressure sensor 1 voltage	Volts
Manifold absolute pressure sensor 2 voltage	Volts
Throttle position sensor voltage	Volts
Fuel level sensor voltage	Volts
Oxygen sensor output 1 voltage	Volts
Oxygen sensor output 2 voltage	Volts
Exhaust butterfly valve sensor voltage‡	Volts

‡ Applies to models fitted with an exhaust butterfly valve only. All other models will show **Not Applicable** in this field.

Sensor Readings

The data available under Sensor Readings is:

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

Item Checked	Result Unit
Exhaust butterfly valve sensor voltage‡	%

‡ Applies to models fitted with an exhaust butterfly valve only. All other models will show **Not Applicable** in this field.

Injector Data

The data available under Injector Data is:

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

Ignition Data

The data available under Ignition Data is:

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

Idle Speed and Throttle Data

The data available under Idle Speed and Throttle Data is:

Item Checked	Result Unit
Engine speed	rpm
Idle reference speed	rpm
Idle speed control current steps	numeric
Idle speed control target steps	numeric
Throttle position	% open

Item Checked	Result Unit
Secondary air injection status ‡	SAI on/off

‡ Applies to models fitted with secondary air injection only. All other models will show **Not Applicable** in this field.

Inputs

The data available under Inputs is:

Item Checked	Result Unit
Starter switch status	switch on/off
Side stand status	up/down
Fall detection switch status	normal/over
Clutch switch status	release/grip
Neutral switch status	gear/neutral
Gear position status	numeric value or neutral
Vehicle speed	km/h
Calculated load	%

Outputs

The data available under Outputs is:

Item Checked	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

Item Checked	Result Unit
Purge valve duty cycle	%
Accessory control relay status	relay on/off
Headlight relay status	headlight 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 altitude, component wear, air leaks etc. This screen displays information on the adaption status of the vehicle which will show if it has adapted or not.

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

Function Tests

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

The Function Tests available are:

Function Examined	Report Method

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*
Fuel Pump - Priming	Listen for fuel pump operation/Stored fault code*
Fuel Pump - Continuous Operation	Fuel pressure test/Listen for fuel pump operation/Stored fault code*
Cooling Fan Control	Observe the cooling fan/Stored fault code*
Secondary Air Injection†	Listen for valve operation/Stored fault code*
Exhaust Butterfly Valve Actuator †	Listen or observe for exhaust butterfly valve actuator operation/Stored fault code*

* If a fault is detected.

†Test will only be displayed if the component is fitted.

Adjust Calibration

Using the Triumph diagnostic software, it is possible to:

- reset the adaptions
- balance the throttle bodies.

Freeze-Frame Data

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

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

Function Examined	Result Reported (Scale)
DTC	Diagnostic Trouble Code (DTC) number
Fuel system status 1	open or closed loop operation
Fuel system status 2	open or closed loop operation

Function Examined	Result Reported (Scale)
Calculated load	%
Coolant temperature	°C
Short term fuel trim - bank 1	%
Short term fuel trim - bank 2	%
Intake manifold absolute pressure	mmHg
Engine speed	rpm
Vehicle speed	km/h
Ignition advance	degrees
Intake air temperature	°C
Throttle position	%
Oxygen sensor 1 output voltage	Volts
Oxygen sensor 1 short term fuel trim	%
Oxygen sensor 2 output voltage	Volts
Oxygen sensor 2 short term fuel trim	%

Gear Position Sensor

This model is fitted with a hall effect gear position sensor that provides a constant voltage output ranging from 0.5 to 4.5 Volts. The output voltage is used to determine which gear is currently engaged.

Voltage Characteristics

The gear position is determined by the following voltage ranges:

Gear	Minimum Voltage	Maximum Voltage
1	0.5 V	0.7 V

Gear	Minimum Voltage	Maximum Voltage
N	0.9 V	1.1 V
2	1.3 V	1.5 V
3	2.0 V	2.2 V
4	2.8 V	3.0 V
5	3.5 V	3.7 V
6	4.3 V	4.5 V

The sensor voltage can be read using the Triumph diagnostic tool.

Further Diagnostics

Refer to Gear Position Sensor for details of pinpoint tests relating to diagnostic trouble codes P0914 and P0917.

Neutral Position Adaption

The motorcycle is delivered from the factory with the neutral position fully adapted.

The neutral position adaption must be reset and re-adapted under the following conditions:

- If a gear position sensor malfunction occurs (DTC P0914 and P0917, see Gear Position Sensor).
- The sensor has been removed or disconnected for any reason.

Refer to Neutral Position Adaption

Neutral Position Adaption

The neutral position adaption is required to allow for manufacturing tolerances of the gearbox and gear position sensor. The motorcycle is delivered from the factory with the neutral position fully adapted.

The neutral position adaption must be reset and re-adapted under the following conditions:

- If a gear position sensor malfunction occurs (DTC P0914 and P0917), see Gear Position Sensor.
- The gear position sensor has been removed or disconnected.

Adaption Reset

To reset the neutral position adaption:

1. Connect the Triumph diagnostic tool and turn the ignition ON.
2. Select ENGINE DIAGNOSTICS.
3. Check and erase any stored DTCs.

4. Select ADJUST TUNE then select Gear Position/Neutral Position Adaption Reset.
5. Click Start.
6. The software will confirm that the adaption has been successfully reset.

Re-Adaption

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.

To re-adapt the neutral position:

1. Ensure the transmission is in neutral.
2. Start the engine.

Note

- **For successful and accurate adaption, The engine must be at normal idle speed and the gear change pedal must be in its normal rested position.**
- **During adaption, do not raise the engine speed and do not touch or move the gear change pedal.**

3. The neutral position will adapt shortly after engine start provided the above conditions are met.
4. The adaption status can be confirmed by selecting GEAR POSITION ADAPTION STATUS on the Triumph diagnostic tool.

Cruise Control Switch Check

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 lever switch
- Twist grip cruise cancel switch (operated by holding the twist grip in the fully closed position)
- Cruise control ON/OFF switch

A malfunction of any switch will not necessarily cause a DTC to be stored and may prevent the cruise control from operating correctly.

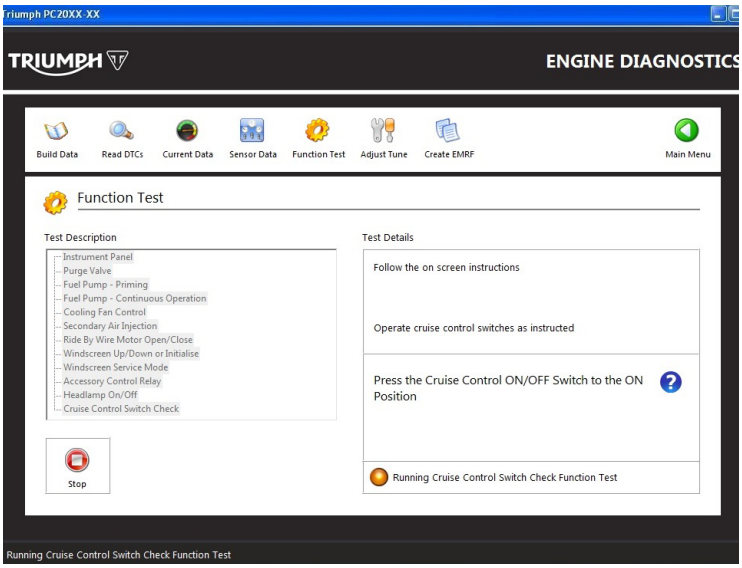
Note

- **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.**

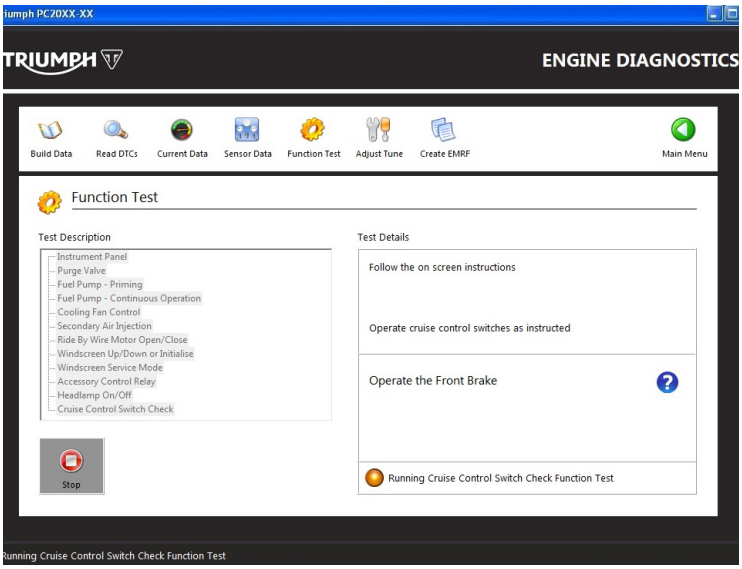
Cruise Control Switch Check Function

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.



Engine Electronic Control Module - Diagnostic Trouble Codes

Diagnostic trouble codes (DTCs) are logged in the ECM memory when there is a confirmed fault in the system.

The codes are reported to the Triumph diagnostic software as a four digit code.

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

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

DTC from the ECM memory. DTCs can be removed at any time using the Triumph diagnostic software.

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

Diagnostic Trouble Code (DTC)	Fault Description	Number of no-fault cycles before turning off MIL	Number of no-fault cycles before DTC is erased	MIL illuminated when fault is logged	Pinpoint test page number
P0030	Oxygen sensor 1 heater open circuit or short to ground	3	40	Yes	Oxygen Sensor Heater
P0032	Oxygen sensor 1 heater short circuit to battery Voltage	3	40	Yes	Oxygen Sensor Heater
P0050	Oxygen sensor 2 heater open circuit or short to ground	3	40	Yes	Oxygen Sensor Heater
P0052	Oxygen sensor 2 heater short circuit to battery Voltage	3	40	Yes	Oxygen Sensor Heater
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	Intake Air Temperature Sensor
P0112	Intake air temperature sensor short circuit to	3	40	Yes	Intake Air Temperature Sensor

Diagnostic Trouble Code (DTC)	Fault Description	Number of no-fault cycles before turning off MIL	Number of no-fault cycles before DTC is erased	MIL illuminated when fault is logged	Pinpoint test page number
	ground				
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 to battery Voltage or open circuit	3	40	Yes	Throttle Position Sensor
P0122	Throttle position sensor 1 short circuit to ground	3	40	Yes	Throttle Position Sensor
P0130	Oxygen sensor 1 open circuit or short circuit to battery Voltage	3	40	Yes	Oxygen Sensor
P0131	Oxygen sensor 1 short circuit to ground	3	40	Yes	Oxygen Sensor
P0150	Oxygen sensor 2 circuit open circuit or short circuit to battery Voltage	3	40	Yes	Oxygen Sensor
P0151	Oxygen sensor 2 short circuit to ground	3	40	Yes	Oxygen Sensor

Further Diagnosis

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

Pinpoint Tests - Fuel

Oxygen Sensor Heater

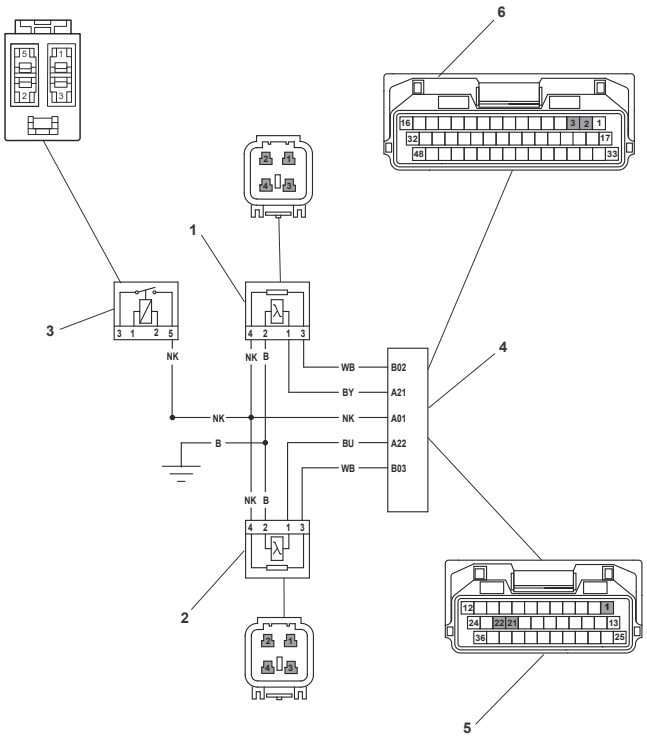
Fault Code	Possible cause	Action
P0030	Oxygen sensor 1 heater open circuit or short to ground	View and note 'freeze-frame' data if available. View and note 'sensor' data. Ensure sensor connector is secure. Disconnect the engine ECM and proceed to pinpoint test 1:
P0050	Oxygen sensor 2 heater open circuit or short to ground	
P0032	Oxygen sensor 1 heater short circuit to battery Voltage	Disconnect oxygen sensor and proceed to pinpoint test 4:
P0052	Oxygen sensor 2 heater short circuit to battery Voltage	

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - ECM pin A21 - ECM pin A22 - Left hand oxygen senor pin 1 - Left hand oxygen senor pin 2 - Right hand oxygen senor pin 1 - Right hand oxygen senor pin 2	OK	Disconnect oxygen sensors and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - ECM pin A21 to ground - ECM pin A22 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 5

Test		Result	Action
	- ECM pin A21 to left hand oxygen sensor pin 1 - ECM pin A22 to right hand oxygen sensor pin 1		
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable for short circuit: - ECM pin A01 to ECM pin A21 (left hand oxygen sensor) - ECM pin A01 to ECM pin A22 (right hand oxygen sensor)	OK	Renew relevant oxygen sensor and proceed to test 5
		Short circuit	Locate and rectify wiring fault, proceed to test 5
5	Reconnect harness, clear fault code and run engine. Check adaption status.	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



1. **Left Hand Oxygen Sensor**
2. **Right Hand Oxygen Sensor**
3. **Engine Management System Relay**
4. **Engine Electronic Control Module**
5. **Engine Electronic Control Module - Connector A**
6. **Engine Electronic Control Module - Connector B**

Manifold Absolute Pressure (MAP) Sensor

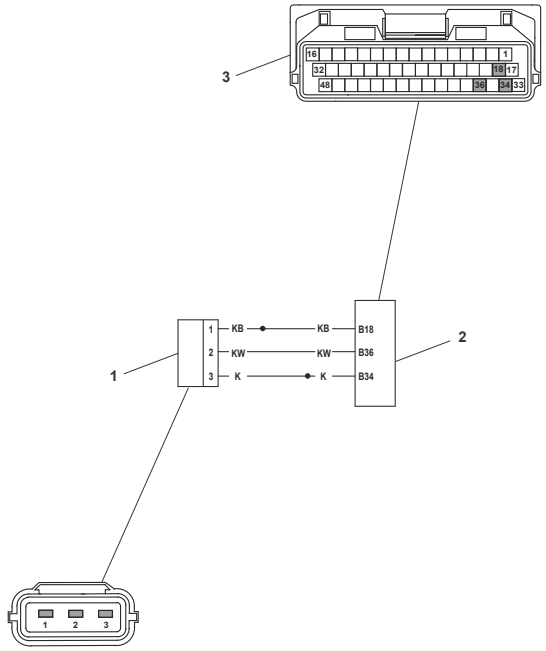
Fault Code	Possible cause	Action
P0107	Manifold absolute pressure sensor 1 short circuit to ground	View and note 'freeze-frame' data if available. View and note 'sensor' data. Ensure sensor connector is secure. Disconnect the engine ECM and proceed to pinpoint test 1:
P0105	Manifold absolute pressure 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: - Engine ECM pin B18 - Engine ECM pin B34 - Engine 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: - Engine ECM pin B36 to ECM pin B18 - Engine 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: - Engine ECM pin B34 to MAP sensor pin 3	OK	Renew relevant MAP pressure sensor, proceed to test 4

Test		Result	Action
	- Engine ECM pin B18 to MAP sensor pin 1 - Engine ECM pin B36 to MAP sensor pin 2		
		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



1. Manifold Absolute Pressure (MAP) Sensor

2. Engine Electronic Control Module

3. Engine Electronic Control Module - Connector B

Intake Air Temperature Sensor

Coolant Temperature Sensor

Fault Code	Possible cause	Action

Fault Code	Possible cause	Action
P0110	Intake air temperature sensor open circuit or short circuit to 5 Volt sensor supply	View and note diagnostic software 'freeze-frame' data if available. View and note diagnostic software 'sensor' data. Ensure sensor connector is secure. Disconnect the engine ECM and proceed to pinpoint test 1:
P0112	Intake air temperature sensor short circuit to ground	Disconnect the engine ECM and inlet air temperature sensor and proceed to pinpoint test 6:

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin B42 - Sensor pin 1 - Sensor pin 2	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 7
2	Check resistance value: - Engine ECM pin B42 to ground (Temperature dependent - see Resistance data)	OK	Proceed to test 6
		Open circuit	Disconnect temp sensor and proceed to test 3
		Short circuit	Disconnect temp sensor and proceed to test 4
3	Check cable continuity: - 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 7
4	Check cable for short circuit: - Engine ECM pin B42 to 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	OK	Proceed to test 7
		Faulty	Renew air temperature sensor,

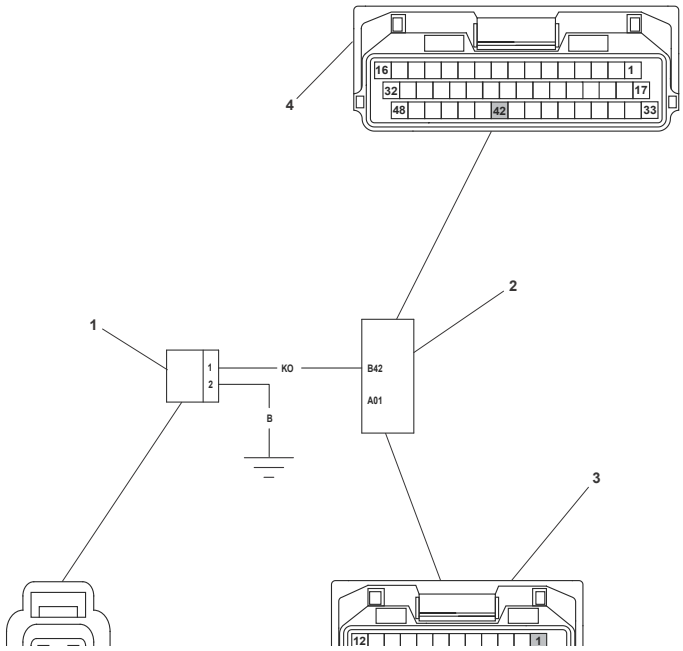
Test		Result	Action
	Resistance data)		proceed to test 7
6	Check cable for short circuit: - Engine ECM pin B42 to ground	OK	Proceed to test 7
		Short circuit	Locate and rectify wiring fault, proceed to test 7
7	Reconnect harness, clear fault code and run engine to verify fault cleared.	OK	Action complete - quit test
		Fault still present	Contact Triumph service

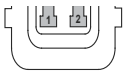
Resistance data:

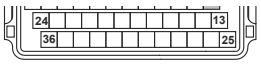
If engine is warm, remove the sensor and allow time to cool to ambient temperature prior to test.

Ambient Temperature	Resistance Value
80ºC	200 to 400 Ohms
20ºC	2.35 to 2.65 K Ohms
-10ºC	8.50 to 10.25 K Ohms

Circuit Diagram







1. **Intake Air Temperature Sensor**
2. **Engine Electronic Control Module**
3. **Engine Electronic Control Module - Connector A**
4. **Engine Electronic Control Module - Connector B**

Fault Code	Possible cause	Action
P0115	Engine coolant temperature sensor open circuit or short circuit to 5 Volt sensor supply	View and note diagnostic software 'freeze-frame' data if available. View and note diagnostic software 'sensor' data. Ensure sensor connector is secure. Disconnect the engine ECM and proceed to pinpoint test 1:
P0117	Engine coolant temperature sensor short circuit to ground	Disconnect temperature sensor and proceed to pinpoint test 6:

Pinpoint Tests

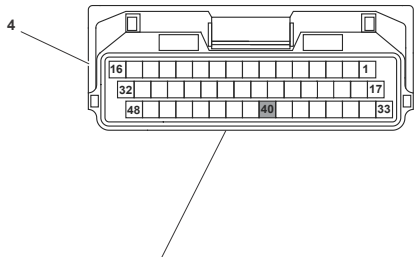
Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin B40	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 7
2	Check resistance value: - Engine ECM pin B40 to ground (Temperature dependent - see Resistance data under typical conditions table)	OK	Proceed to test 6
		Open circuit	Disconnect temperature sensor and proceed to test 3
		Short circuit	Disconnect 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

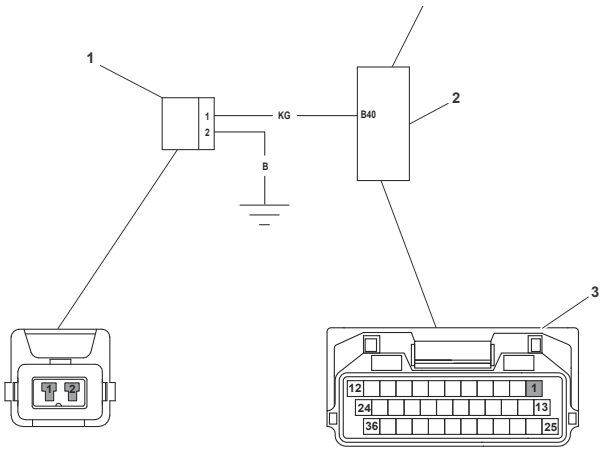
Test		Result	Action
4	Check cable for short circuit: - Engine ECM pin B40 to ECM pin A01	OK	Proceed to test 5
		Short circuit	Locate and rectify wiring fault, proceed to test 7
5	Check sensor resistance: - Sensor pin 1 to sensor pin 2 (Temperature dependent - see Resistance data under typical conditions table)	OK	Proceed to test 7
		Faulty	Renew temperature sensor, proceed to test 7
6	Check cable for short circuit: - Engine ECM pin B40 to ground	OK	Proceed to test 7
		Short circuit	Locate and rectify wiring fault, proceed to test 7
7	Reconnect harness, clear fault code and run engine to verify fault cleared.	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Resistance data under typical conditions:

Cold engine:	**Resistance Value**
20ºC ambient	2.22 to 2.71 K Ohms
-10ºC ambient	8.50 to 10.25 K Ohms
Warm engine:	**Resistance Value**
-	100 to 400 Ohms

Circuit Diagram





1. Coolant Temperature Sensor

2. Engine Electronic Control Module

3. Engine Electronic Control Module - Connector A

4. Engine Electronic Control Module - Connector B

Throttle Position Sensor

Oxygen Sensor

Fault Code	Possible cause	Action
P0120	Throttle position sensor 1 short circuit to battery Voltage or open circuit	View and note diagnostic software 'freeze-frame' data if available. View and note diagnostic software 'sensor' data. Ensure throttle body connector is secure. Disconnect the engine ECM and proceed to pinpoint test 1:
P0122	Throttle position sensor 1 short circuit to ground	
P0220	Throttle position sensor 2 short circuit to battery Voltage 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 - Throttle body connector pin 3 - Throttle body connector pin 4 - Throttle body connector pin 5 - Throttle body connector pin 6	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 throttle body connector pin 6 - Engine ECM pin B26 to throttle body connector pin 4 - Engine ECM pin B19 to throttle body connector pin 3 - Engine ECM pin B33 to throttle body connector pin 5	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 ECM pin B20 - Engine ECM pin B33 to ECM pin B26	OK	Renew the throttle body, 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

Fault Code	Possible cause	Action
P0130	Oxygen sensor 1 open	View and note 'freeze-frame' data if

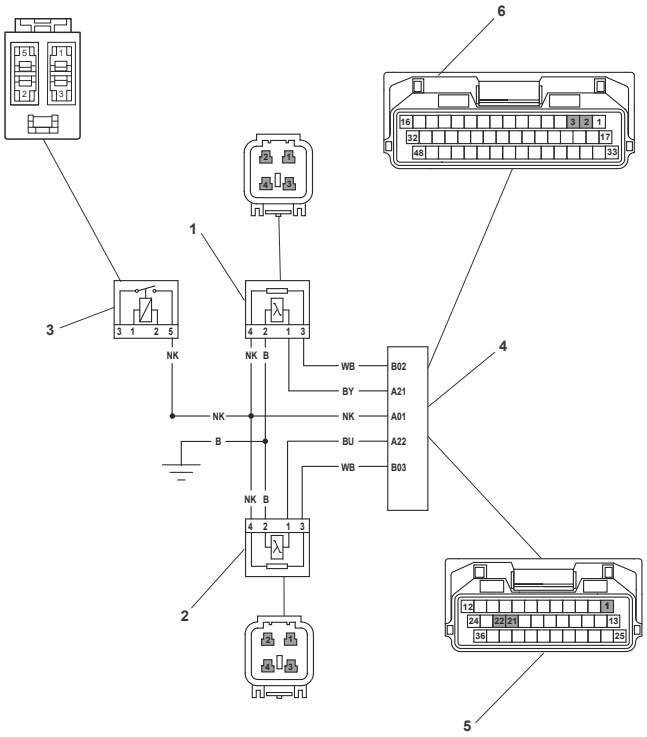
Fault Code	Possible cause	Action
	circuit or short circuit to battery Voltage	available. View and note 'sensor' data. Ensure sensor connector is secure. Disconnect the engine ECM and proceed to pinpoint test 1:
P0131	Oxygen sensor 1 short circuit to ground	
P0150	Oxygen sensor 2 open circuit or short circuit to battery Voltage	
P0151	Oxygen sensor 2 short circuit to ground	

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - ECM pin B02 - ECM pin B03 - Left hand oxygen sensor pin 3 - Left hand oxygen sensor pin 4 - Right hand oxygen sensor pin 3 - Right hand oxygen sensor pin 4 - EMS relay pin 5	OK	Disconnect oxygen sensors and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - ECM pin B02 to ground - ECM pin B03 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 4
3	Check cable continuity: - ECM pin B02 to left hand oxygen sensor pin 3 - ECM pin B03 to right hand oxygen sensor pin 3 - ECM pin A01 to relevant oxygen sensor pin 4	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 4
4	Check cable for short circuit: - ECM pin A01 to ECM pin B02 (left	OK	Renew relevant oxygen sensor, proceed to test 5

Test		Result	Action
	hand oxygen sensor) - ECM pin A01 to ECM pin B03 (right hand oxygen sensor)		
		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



1. Left Hand Oxygen Sensor

2. Right Hand Oxygen Sensor

3. Engine Management System Relay

4. Engine Electronic Control Module

5. Engine Electronic Control Module - Connector A

6. Engine Electronic Control Module - Connector B

Fuel Injectors

Crankshaft Sensor

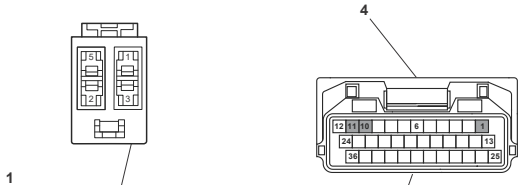
Fault Code	Possible cause	Action
P0201	Injector 1 circuit malfunction	View and note diagnostic software 'freeze-frame' data if available. Ensure relevant injector connector is secure. Disconnect the engine ECM and proceed to pinpoint test 1:
P0202	Injector 2 circuit malfunction	

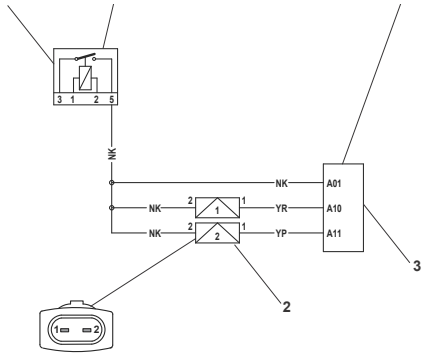
Pinpoint Tests

Test		Result	Action
1	Check Fuse box fuse 8 for integrity	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 9
2	Check cable and terminal integrity: - ECM pin A10 - ECM pin A11 -Injector 1 pin 1 -Injector 1 pin 2 -Injector 2 pin 1 -Injector 2 pin 2 -EMS relay pin 5	OK	Proceed to test 3
		Faulty	Rectify fault, proceed to test 8
3	Check resistance value: - ECM pin A01 to ECM pin A10 (injector 1) - ECM pin A01 to ECM pin A11 (injector 2)	11.4 to 13 Ohms	Proceed to test 4
		Open circuit	Disconnect relevant injector and proceed to test 5
		Short circuit	Disconnect relevant injector and proceed to test 6
4	Check cable for short circuit to ground: - ECM pin A10 to ground - ECM pin A11 to ground	OK	Proceed to test 5
		Short circuit	Locate and rectify wiring fault, proceed to test 9

Test	Result	Action
5 Check cable continuity: - EMS relay pin 5 to relevant injector pin 2 - ECM pin A10 to injector 1 pin 1 - ECM pin A11 to injector 2 pin 1	OK	Proceed to test 7
	Open circuit	Locate and rectify wiring fault, proceed to test 9
6 Check cable for short circuit to supply box: - ECM pin A01 to ECM pin A10 (injector 1) - ECM pin A01 to ECM pin A11 (injector 2)	OK	Proceed to test 7
	Short circuit	Locate and rectify wiring fault, proceed to test 9
7 Check relevant injector resistance: - Injector pin 1 to injector pin 2	11.4 to 12.6 Ohms	Proceed to test 8
	Faulty	Renew relevant injector, proceed to test 9
8 Switch on ignition, measure voltage at EMS relay pin 5	Battery voltage	Proceed to test 9
	Less than across battery voltage	Rectify fault and proceed to test 9
9 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





1. EMS Relay

2. Fuel Injectors

3. Engine Electronic control Unit

4. Engine Electronic Control Unit - Connector A

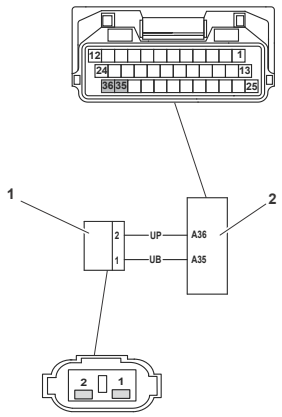
Fault Code	Possible cause	Action
P0335	Crankshaft sensor circuit malfunction	View and note diagnostic software 'freeze-frame' data if available. Ensure sensor is fitted correctly and connector is secure. Disconnect the engine ECM and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check terminal and cable integrity: - Engine ECM pin A35 - Engine ECM pin A36 -Crankshaft sensor pin 1 -Crankshaft sensor pin 2	OK	Disconnect 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

Test		Result	Action
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	Proceed to test 5
		Short circuit	Locate and rectify wiring fault, proceed to test 6
5	Check crankshaft toothed wheel: - Damage to teeth - magnetic debris contamination	OK	Renew crankshaft sensor, proceed to test 6
		Faulty	Clean/renew toothed wheel, proceed to test 6
6	Reconnect harness, clear fault code and run engine to verify fault cleared.	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



1. Crankshaft Sensor

2. Engine Electronic Control Module Connector A

Ignition Coils

Purge Valve

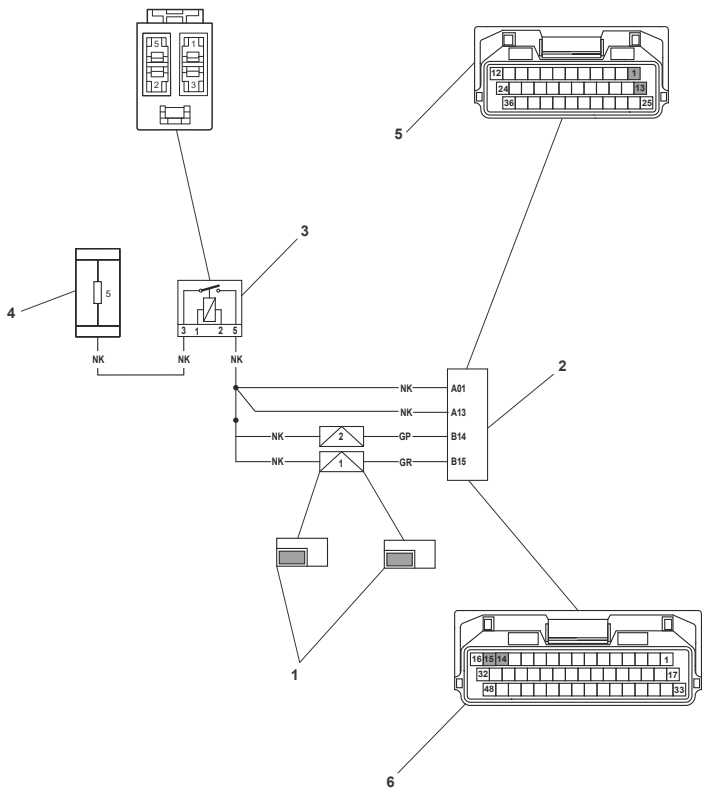
Fault Code	Possible cause	Action
P0351	Ignition coil 1 malfunction	View and note diagnostic software 'freeze-frame' data if available. Ensure relevant ignition coil connector is secure. Disconnect the engine ECM and proceed to pinpoint test 1:
P0352	Ignition coil 2 malfunction	

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin B14 - Engine ECM pin B15 - EMS relay pin 5	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 6
2	Check resistance value: - Engine ECM pin A01 to - Engine ECM pin B14 (ignition coil 1) - Engine ECM pin B15 (ignition coil 2)	3.0 to 4.2 Ohms	Proceed to test 3
		Open circuit	Disconnect relevant ignition coil and proceed to test 4
		Short circuit	Disconnect relevant ignition coil and proceed to test 5
3	Check cable for short circuit: - Engine ECM pin B14 to ground - Engine ECM pin B15 to ground	OK	Proceed to test 6
		Short circuit	Locate and rectify wiring fault, proceed to test 6
4	Check cable continuity: - EMS relay pin 5 to relevant ignition coil pin - Engine ECM pin B14 to ignition coil 2 pin 1 - Engine ECM pin B15 to ignition coil 1 pin 1	OK	Proceed to test 5
		Open circuit	Locate and rectify wiring fault, proceed to test 6
5	Check relevant ignition coil resistance: - Ignition coil pin 1 to ignition coil pin 2	3.0 to 4.2 Ohms	Proceed to test 6
		Faulty	Renew relevant ignition coil,

Test	Result	Action
		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



1. Ignition Coils
2. Engine Electronic Control Module
3. Engine Management system Relay
4. Fuse Box
5. Engine Electronic Control Module - Connector A
6. Engine Electronic Control Module - Connector B

Fault Code	Possible cause	Action

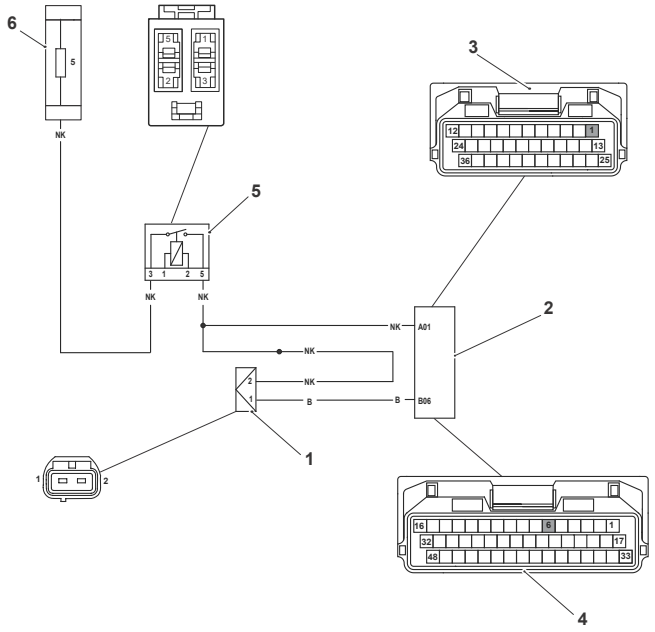
Fault Code	Possible cause	Action
P0443	Purge valve short circuit to ground or open circuit	View and note diagnostic software 'sensor' data. Ensure purge valve connector is secure. Disconnect the engine ECM and proceed to pinpoint test 1:
P0459	Purge valve short circuit to battery Voltage	Disconnect the 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 3 - EMS relay pin 5 - Purge valve connector pin 1 - Purge valve connector pin 2	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 7
		Open circuit	Locate and rectify wiring fault, proceed to test 8
5	Check cable continuity:	OK	Proceed to test 7

Test		Result	Action
	- Valve fly lead pin 1 to valve pin 1 - Valve fly lead pin 2 to valve pin 2		
		Open circuit	Locate and rectify wiring fault, proceed to test 8
6	Check cable for short circuit: - ECM pin A01 to ECM pin B06	OK	Proceed to test 8
		Short circuit	Locate and rectify wiring fault, proceed to test 8
7	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
8	Reconnect harness, clear fault code and run diagnostic software function test to visually verify operation of purge valve.	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



1. **Purge Valve**
2. **Engine Electronic Control Module**
3. **Engine Electronic Control Module - Connector A**
4. **Engine Electronic Control Module - Connector B**
5. **Engine Management System Relay**
6. **Fuse Box**

Fuel Level Sensor Circuit

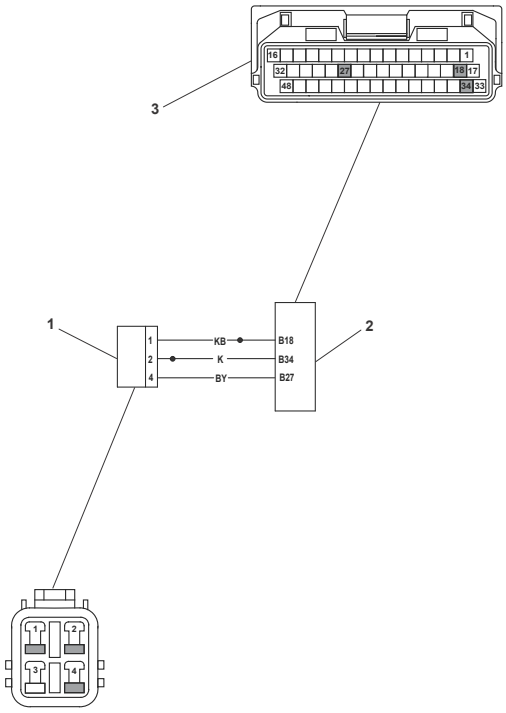
Fault Code	Possible cause	Action
P0460	Fuel level sensor circuit malfunction	View and note 'freeze-frame' data if available. View and note 'sensor' data. Ensure sensor connector is secure. Disconnect the engine ECM and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin B27 - Engine ECM pin B18 - Engine ECM pin B34 - Sensor pin 1 - Sensor pin 2 - Sensor pin 4	OK	Disconnect sensor and proceed to test 2
		Faulty	Rectify fault, proceed to test 4
2	Check cable for short circuit: - Engine ECM pin B27 to ground - Engine ECM pin B34 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 B27 to sensor pin	OK	Proceed to test 4

Test		Result	Action
	4 - Engine ECM pin B34 to sensor pin 2 - Engine ECM pin B18 to sensor pin 1		
		Open circuit	Locate and rectify wiring fault, proceed to test 4
5	Reconnect harness, clear fault code.	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



1. Fuel Level Sensor

2. Engine Electronic Control Module

3. Engine Electronic Control Module - Connector B

Vehicle Speed Sensor

Fault Code	Possible cause	Action
P0500	Wheel speed sensor fault	Refer to the following ABS DTCs. Front Wheel Sensor Open Circuit/Short Circuit Front Wheel Sensor Abnormal Input/Losing Contact Rear Wheel Sensor Open Circuit/Short Circuit Rear Wheel Sensor Abnormal Input/Losing Contact

System Voltage

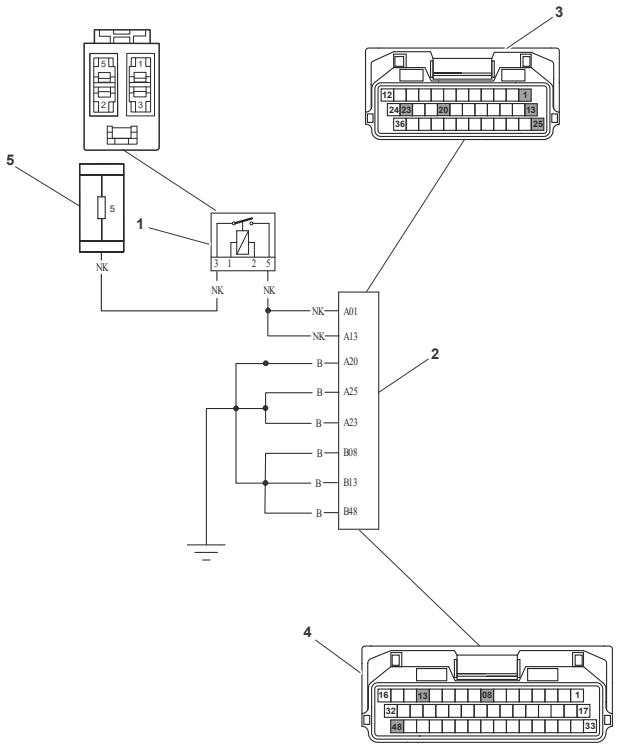
Fault Code	Possible cause	Action
P0560	System voltage - battery circuit malfunction	View and note diagnostic software 'sensor' data. Ensure voltage across battery is greater than 12.0 Volts, note voltage.
		Disconnect the engine ECM and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin A01 - Engine ECM pin A13 - Engine EMS relay pin 3 - Engine EMS relay pin 5	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 4
2	Check cable continuity: - EMS relay pin 5 to Engine ECM pin A01 - EMS relay pin 5 to Engine ECM pin A13	OK	Proceed to test 3
		Faulty	Rectify fault, proceed to test 4
3	With Ignition on check voltage at:	Same as across	Proceed to test 4

Test		Result	Action
	- Engine ECM pin A01 - Engine ECM pin A13	battery voltage	
		Less than across battery voltage	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



1. Engine Management System Relay

2. Engine Electronic Control Module

3. Engine Electronic Control Module - Connector A

4. Engine Electronic Control Module - Connector B

5. Fuse Box

Twist Grip – Cruise Cancel Switch Circuit Malfunction

Brake Switches

EEPROM Error

Fault Code	Possible Cause	Action
P056C	Twist grip cruise cancel switch malfunction	Connect Triumph Diagnostic Tool and turn the ignition ON Check and investigate any other stored DTCs Select Sensor Data - Sensor Voltages on the diagnostic tool and proceed to pinpoint test 1

Pinpoint Tests

Test		Result	Action
1	Roll the twist grip forward to its fully closed (cruise cancel) position and note the following voltages: - Twist Grip Position Sensor 1 - Twist Grip Position Sensor 2	OK Position sensor 1 voltage lower than 0.8 V Position sensor 2 voltage higher than 0.4 V	Proceed to test 2
		Faulty Position sensor 1 voltage 0.8 V or higher and/or Position sensor 2 voltage 0.4 V or lower	Renew twist grip position sensor and proceed to test 2
2	Clear fault code and run engine	OK	Action complete - quit test
		Fault still present	Contact Triumph service

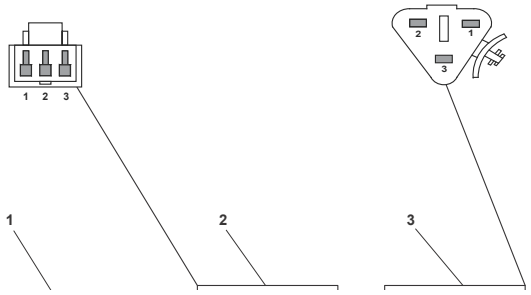
Fault Code	Possible cause	Action
P0571	Brake 1 switch malfunction	View and note freeze frame data if available. Ensure brake switches connectors are secure. Disconnect engine ECM and proceed to pinpoint test 1:
P1576	Brake 1 switch correlation error with brake switch 2	
P1571	Brake 2 switch malfunction	
P1577	Brake 2 switch correlation error with brake switch 1	

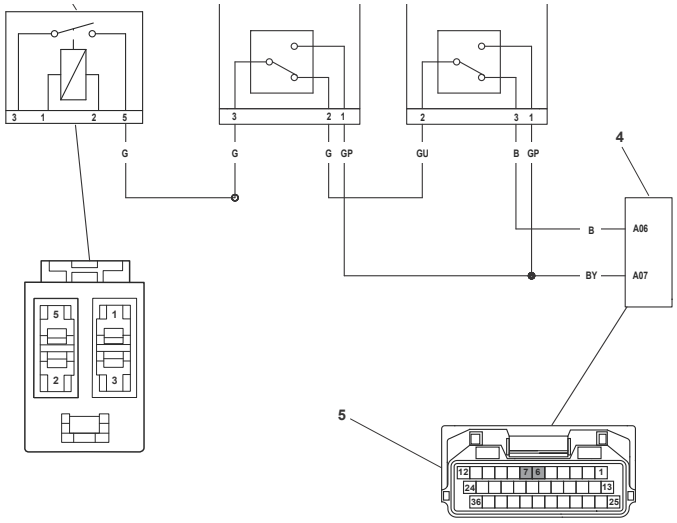
Pinpoint Tests

	Test	Result	Action
1	Turn ignition on, operate rear brake switch and check brake light operation	OK	Proceed to test 2
		Faulty	Locate and rectify wiring fault, proceed to test 7
2	Check cable and terminal integrity: - ECM pin A06 - ECM pin A07	OK	Disconnect front and rear brake switches connector, proceed to test 4
		Faulty	Rectify fault, proceed to test 7
3	With all brakes released, check front and rear brake switch operation: The following should be circuit continuity - Front brake switch pin 2 to pin 3 - Rear brake light switch pin 2 to pin 3 The following should be open circuit - Front brake switch pin 1 to pin 3 - Rear brake light switch pin 1 to pin 3	OK	Proceed to test 4
		Faulty	Replace relevant brake switch, proceed to test 7
4	With both brakes applied, check brake switch operation: The following should be open circuit -Front brake switch pin 2 to pin 3 -Rear brake switch pin 2 to pin 3	OK	Proceed to test 5
		Faulty	Replace relevant brake switch,

	Test	Result	Action
	The following should be short circuit -Front brake switch pin 1 to pin 3 -Rear brake switch pin 1 to pin 3		proceed to test 7
5	Check cables continuity: - ECM pin A07 to front brake switch pin 1 - ECM pin A07 to rear brake switch pin 1 - ECM pin A06 to rear brake switch pin 1 -Front brake switch pin 2 to rear brake switch pin 3 -Ignition switch relay pin 5 to front brake switch pin 3	OK	Proceed to test 6
		Open Circuit	Locate and rectify wiring fault, proceed to test 7
6	With the ignition on, measure the following Voltages back to battery negative: - ECM pin A06 to ground - Rear brake switch pin 2 - Rear brake switch pin 3 - Front brake switch pin 2 - Front brake switch pin 3 - Ignition switch relay pin 5	Greater than 10V	Proceed to test 7
		Less than 10V	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





1. Ignition Master Switch (KL15) Relay

2. Front Brake Switch

3. Rear Brake Switch

4. Engine Electronic Control Module

5. Engine Electronic Control Module - Connector A

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

Starter Motor Relay

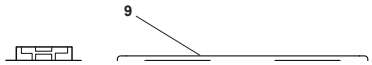
Fault Code	Possible cause	Action
P0616	Starter relay short circuit to ground or open circuit	Ensure starter motor relay connector is secure. Disconnect the engine ECM and proceed to pinpoint test 1:
P0617	Starter relay short circuit to battery Voltage	Disconnect the engine ECM and starter motor relay proceed to pinpoint test 4:

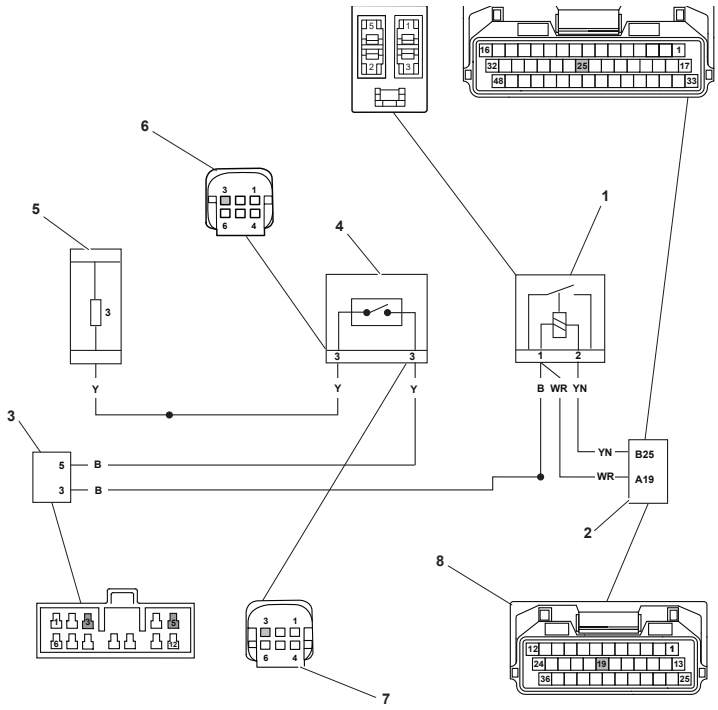
Pinpoint Tests

Test	Result	Action

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin B25 - Engine ECM pin A19 - Starter Relay pin 1 - Starter Relay pin 2 Fuse box fuse 3	OK	Disconnect starter relay and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - Engine ECM pin B25 to ground - Engine ECM pin A19 to ground - Engine ECM pin B25 to engine ECM pin A01	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5
3	To access the black and grey connectors on the right hand switch housing, detach the front brake master cylinder from the handlebar (see). Check cable continuity: - Engine ECM pin B25 to starter relay pin 2 - Engine ECM pin A19 to starter relay pin 1 - Fuse box fuse 3 to alarm pin 5 Alarm pin 3 to engine ECM pin A19 Alarm pin 5 to right hand switch housing black connector pin 3	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 B25 to ECM pin A01	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





1. **Starter Motor Relay**
2. **Engine Electronic Control Module**
3. **Alarm**
4. **Right Hand Switch Housing**
5. **Fuse Box**
6. **Right Hand Switch Housing Grey Connector**
7. **Right Hand Switch Housing Black Connector**
8. **Engine Electronic Control Module - Connector A**
9. **Engine Electronic Control Module - Connector B**

Gear Position Sensor

Traction Control Disabled Due to ABS Malfunction

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 sensor connector is secure. Disconnect the engine ECM and
P0917	Gear position sensor short circuit to 5 Volt sensor	

Fault Code	Possible cause	Action
	supply	proceed to pinpoint test 1:

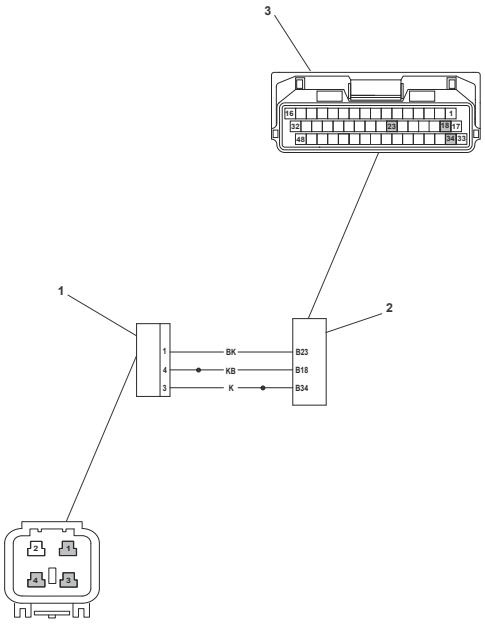
Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin B23 - Sensor pins 1, 3, 4	OK	Disconnect 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	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 sensor pin 1 - Engine ECM pin B18 to sensor pin 4 - Engine ECM pin B34 to sensor pin 3	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable for short circuit: - Engine ECM pin B23 to ECM pin B34	OK	Renew gear position sensor and contact pin and proceed to test 5
		Short circuit	Locate and rectify wiring fault, proceed to test 5
5	Reconnect harness, clear fault code and run engine.	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Note

- **When the pin point tests have been completed, reset the neutral position sensor adaption (see Neutral Position Adaption).**

Circuit Diagram



1. **Gear Position Sensor**
2. **Engine Electronic Control Module**
3. **Engine Electronic Control Module - Connector B**

Fault Code	Possible cause	Action
P1135	Traction Control disabled due to malfunction	Check that there is no other DTC linked to the ABS system or CAN communication stored. Contact Triumph service.

Fuel Pump Relay

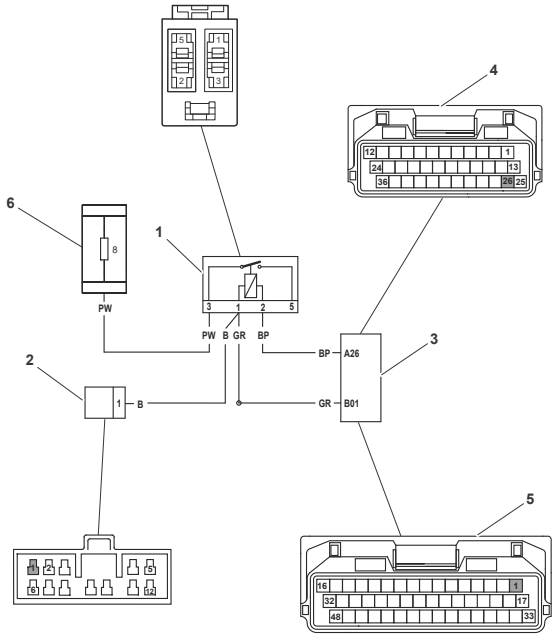
Fault Code	Possible cause	Action
P1231	Fuel pump relay short circuit to ground or open circuit	Check if pump runs briefly when ignition is switched on. Ensure fuel pump relay connector is secure. Disconnect the engine ECM and

Fault Code	Possible cause	Action
		proceed to pinpoint test 1:
P1232	Fuel pump relay short circuit to battery Voltage	Disconnect the engine ECM and fuel pump relay and proceed to pinpoint test 4:

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin A26 - Alarm pin 1 - Alarm pin 2 - Fuel pump relay 1 - Fuel pump relay 2 - Fuel pump relay 3 - Fuel pump relay 5	OK	Disconnect fuel pump relay and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - Engine 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: - Engine ECM pin A26 to fuel pump relay pin 2 - Alarm pin 1 to fuel pump relay pin 1	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable for short circuit: - Engine ECM pin A26 to ECM pin A01	OK	Proceed to test 5
		Short circuit	Locate and rectify wiring fault, proceed to test 5
5	Reconnect harness, clear fault code and run diagnostic software function test to verify fault cleared.	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



1. **Fuel Pump Relay**
2. **Alarm**
3. **Engine Electronic Control Module**
4. **Engine Electronic Control Module - Connector A**
5. **Engine Electronic Control Module - Connector B**
6. **Fuse Box**

Immobiliser and TPMS Control Module ID Incompatible

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	OK	Action complete - quit test

Test		Result	Action
	Immobiliser procedure as described in the Triumph Diagnostic Tool user guide		
		Fault still present	Contact Triumph service

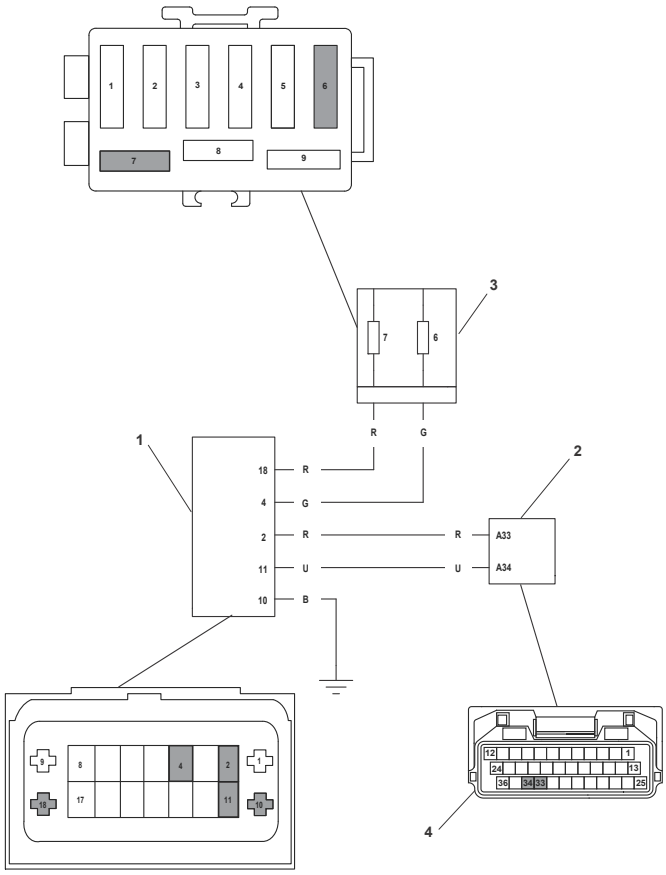
ABS Modulator Communication

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 fuse box Fuse 6 and 7 integrity.	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 6
2	Check cable and terminal integrity: - ECM pin A33 - ECM pin A34 - ABS modulator pin 2 - ABS modulator pin 4 - ABS modulator pin 10 - ABS modulator pin 11 - ABS modulator pin 18	OK	Disconnect the engine ECM and proceed to test 3
		Faulty	Rectify fault, proceed to test 6
3	Check cable for short circuit: - ECM pin A33 to ground - ECM pin A34 to ground	OK	Disconnect ABS modulator and proceed to test 4
		Faulty	Locate and rectify wiring fault, proceed to test 6
4	Check cable for short circuit: - ABS pin 2 to ground - ABS pin 11 to ground	OK	Proceed to test 5
		Faulty	Locate and rectify wiring fault, replace relevant fuse, proceed to test 6

Circuit Diagram



1. ABS Modulator

2. Engine Electronic Control Module

3. Fuse Box

4. Engine Electronic Control Module - Connector A

Cooling Fan Relay

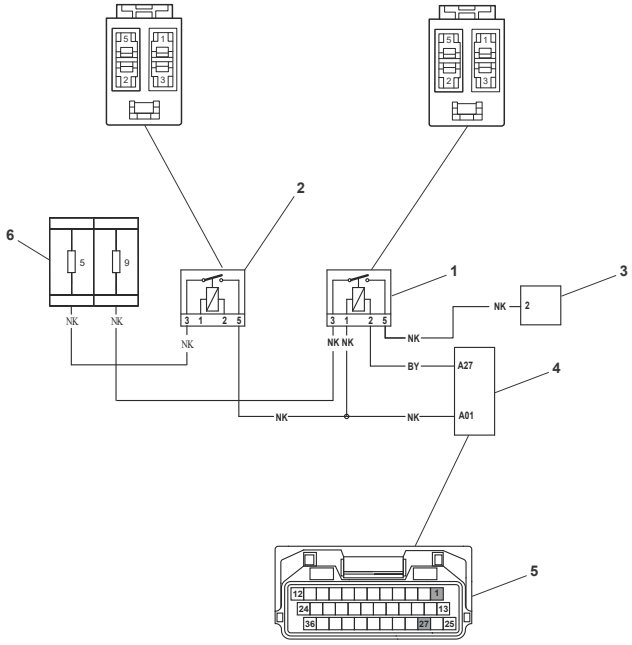
Fault Code	Possible cause	Action
P1552	Cooling fan relay short circuit to ground or open circuit	View and note diagnostic software 'sensor' data. Ensure fan relay connector is secure. Disconnect the engine ECM and proceed to pinpoint test 1:
P1553	Cooling fan relay short circuit to battery Voltage or	Disconnect the engine ECM and fan relay and proceed to pinpoint test 4:

Fault Code	Possible cause	Action
	over temp	

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin A01 - Engine ECM pin A27 - EMS relay pin 3 - EMS relay pin 5 - Cooling fan relay pin 1 - Cooling fan relay pin 2 - Cooling fan relay pin 3 - Cooling fan relay pin 5 - Cooling fan pin 1 - Cooling fan pin 2 - Fuse 5 - Fuse 9	OK	Disconnect fan relay and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - Engine ECM pin A27 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 A27 to fan relay pin 2 - EMS relay pin 5 to fan relay pin 1	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable for short circuit: - Engine ECM pin A27 to ECM pin A01	OK	Proceed to test 5
		Short circuit	Locate and rectify wiring fault, proceed to test 5
5	Reconnect harness, clear fault code and run diagnostic software function test to visually verify operation of cooling fan.	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



1. **Cooling Fan Relay**
2. **Engine management System Relay**
3. **Cooling Fan**
4. **Engine Electronic Control Module**
5. **Engine Electronic Control Module - Connector A**
6. **Fuse Box**

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).

Calibration Lock

Fault Code	Possible cause	Action
P1605	Engine ECM locked by the calibration 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
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	OK	Proceed to test 3

Test		Result	Action
	for the motorcycle, using the diagnostic software.		
		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

Cornering Traction Control and Roll-over Detection Disabled

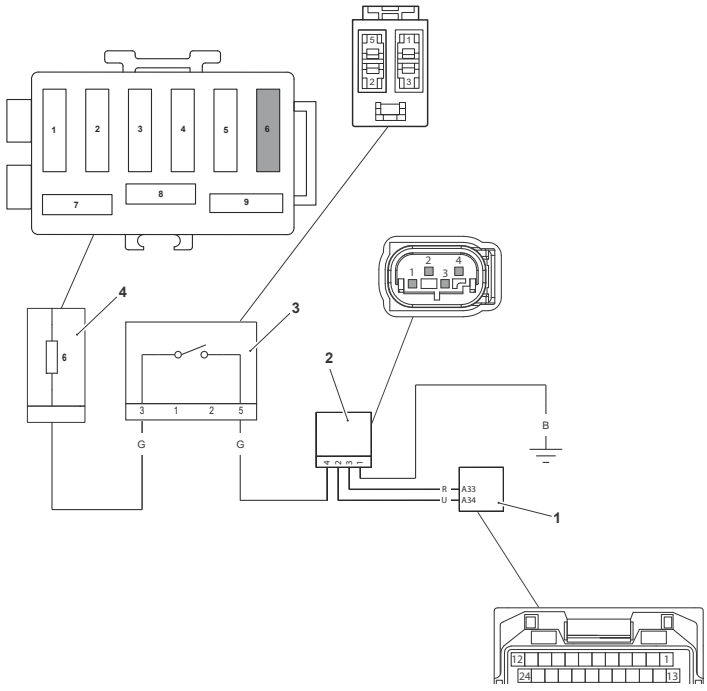
Fault Code	Possible Cause	Action
P1136	Cornering Traction Control disabled due to Inertial Measurement Unit (IMU) malfunction	View and note 'freeze frame' data if available Ensure IMU connector is secure Disconnect Engine ECM and proceed to pinpoint test 1:
P1640	Roll-over detection disabled due to Inertial 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:	OK	Proceed to test 3

Test		Result	Action
	- Engine ECM pin A33 to ground - Engine ECM pin A34 to ground - IMU pin 4 to ground		
		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 KL15 relay pin 5 - IMU pin 1 to ground	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





1. **Engine ECM**
2. **Inertial Measurement Unit**
3. **Ignition Master Switch (KL15) Relay**
4. **Fuse Box**

Keyless ECM Communication

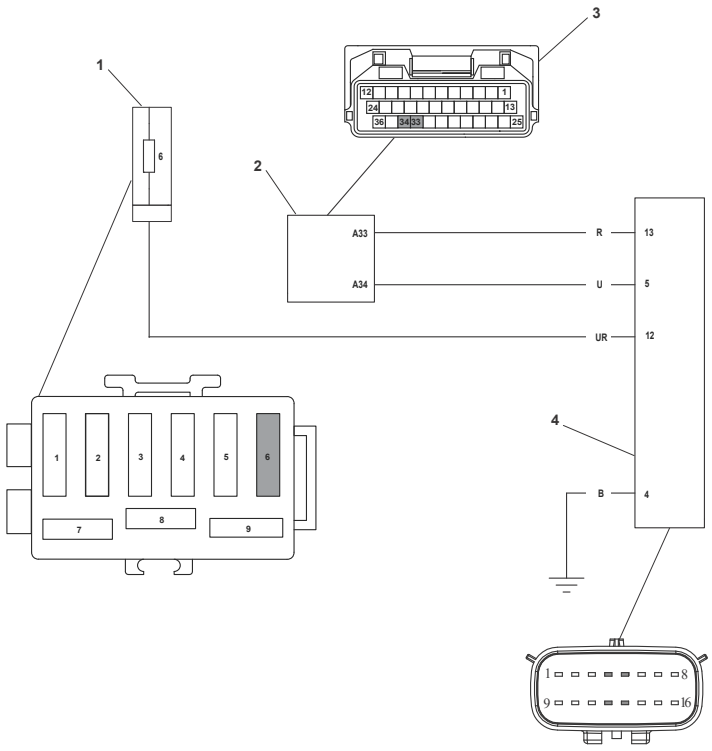
Fault Code	Possible cause	Action
P1650	Lost communication with Keyless ECM	View and note 'freeze-frame' data if available. Ensure keyless ECM connector is secure. Proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - ECM pin A33 - ECM pin A34 - Keyless ECM pin 13 - Keyless ECM pin 5 - Keyless ECM pin 12 - Keyless ECM pin 4	OK	Disconnect ECM and proceed to test 2
		Faulty	Rectify fault, proceed to test 6
2	Check cable for short circuit: - ECM pin A33 to ground - ECM pin A34 to ground	OK	Disconnect immobiliser, ignition switch and proceed to test 3
		Faulty	Locate and rectify wiring fault, proceed to test 6
3	Check fuse box 2 Fuse 6 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
	- Keyless ECM pin 13 to ground - Keyless ECM pin 5 to ground		
		Faulty	Locate and rectify wiring fault, replace relevant fuse, proceed to test 6
5	Check cable continuity: - ECM pin A33 to keyless ECM pin 13 - ECM pin A34 to keyless ECM pin 1 - Keyless ECM pin 4 to ground - Fuse box 2 Fuse 1 to keyless ECM pin 12	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



1. **Fuse Box**
2. **Engine Electronic Control Module**
3. **Engine Electronic Control Module - connector A**
4. **Keyless Electronic Control Module**

EMS Ignition Voltage Input Circuit

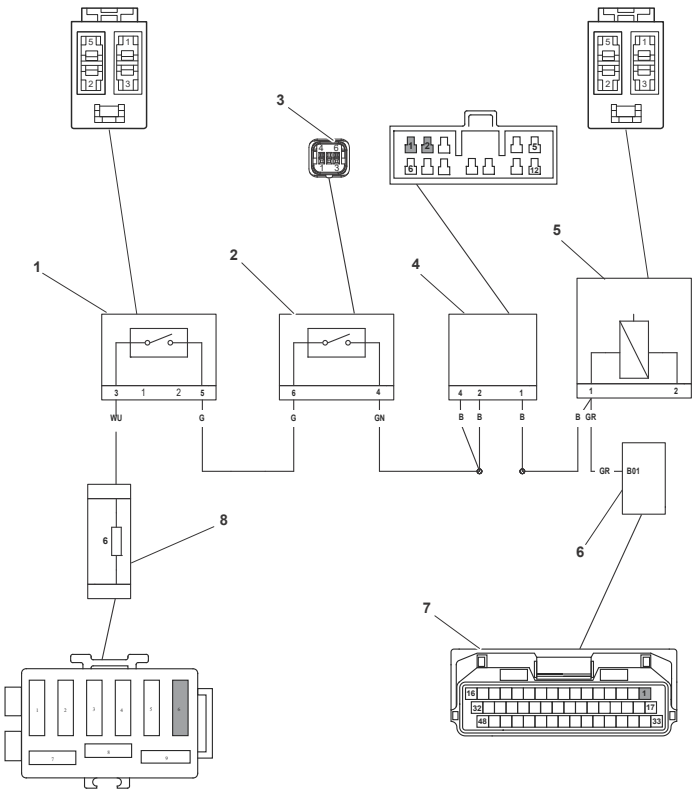
Fault Code	Possible cause	Action
P1659	Ignition power supply malfunction	Disconnect the engine ECM and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check fuse box 1 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 10 and proceed to test 3
		Short circuit	Locate and rectify wiring fault, replace Fuse 10 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 pin 6 (black connector) - Right hand switch housing pin 4 (black connector) - Fuel pump relay pin 1 - Fuel pump relay pin 2	OK	Proceed to test 4
		Faulty	Rectify fault, proceed to test 5
4	Check cable continuity:	OK	Proceed to test 5

Test		Result	Action
	- Engine ECM pin B01 to KL15 relay pin 5 - KL15 relay pin 3 to fuse box fuse 6 Note that the engine stop switch must be in the RUN position and any alarm fitted must be disarmed.		
		Open circuit	Locate and rectify wiring, immobiliser or engine stop switch fault, proceed to test 5
5	Reconnect harness, clear fault code and run engine to verify fault cleared.	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



1. Ignition Master Switch (KL15) Relay

2. Right Hand Switch Housing

3. Right Hand Switch Housing Black Connector

4. Alarm

5. Fuel Pump Relay

6. Engine Electronic Control Module

7. Engine Electronic Control Module - Connector B

8. Fuse Box

EMS Main Relay Circuit

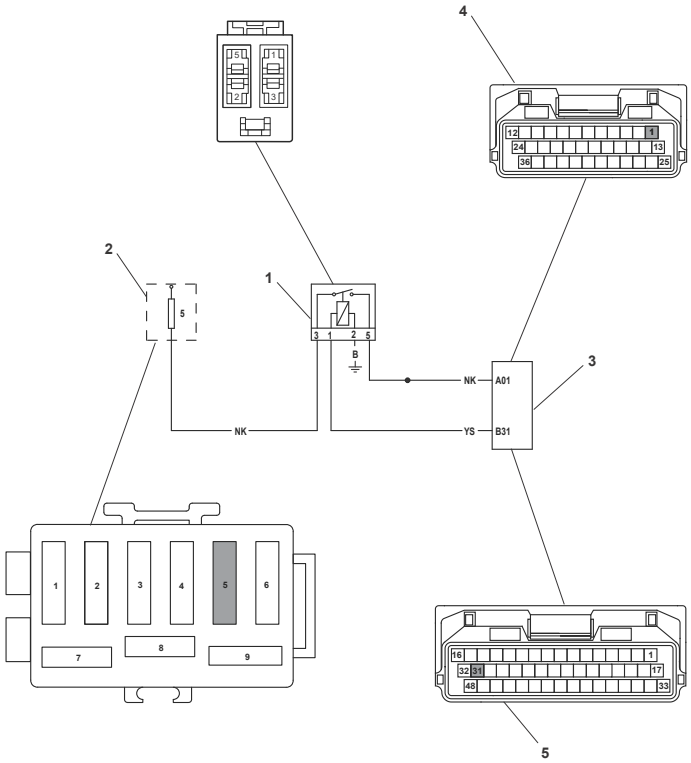
Fault Code	Possible cause	Action
P1685	Main relay circuit malfunction	Note that the starter motor cannot be powered if a main relay fault exists. Ensure the EMS main relay connector is secure. Proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Ensure ignition has been switched off for greater than 90 seconds. Identify EMS main relay on the harness. Check that relay operates when the ignition is switched ON and the stop and run switch is in the RUN position.	OK	Proceed to test 4
		Faulty	Disconnect EMS main relay and engine ECM. Proceed to test 4
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, replace Fuse 5 and proceed to test 6
3	Check cable and terminal integrity: - Engine ECM pin B31 - EMS main relay pin 1 - EMS main relay pin 2 - EMS main relay pin 3 - EMS main relay pin 5	OK	Disconnect main relay and proceed to test 4
		Faulty	Rectify fault, proceed to test 5
4	Check fuse box fuse 5 integrity	OK	Proceed to test 5

Test		Result	Action
		Short circuit	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 fuse box fuse 5	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



1. **EMS Relay**
2. **Fuse Box**
3. **Engine Electronic Control Module**
4. **Engine Electronic Control Module - Connector A**
5. **Engine Electronic Control Module - Connector B**

CAN Communication

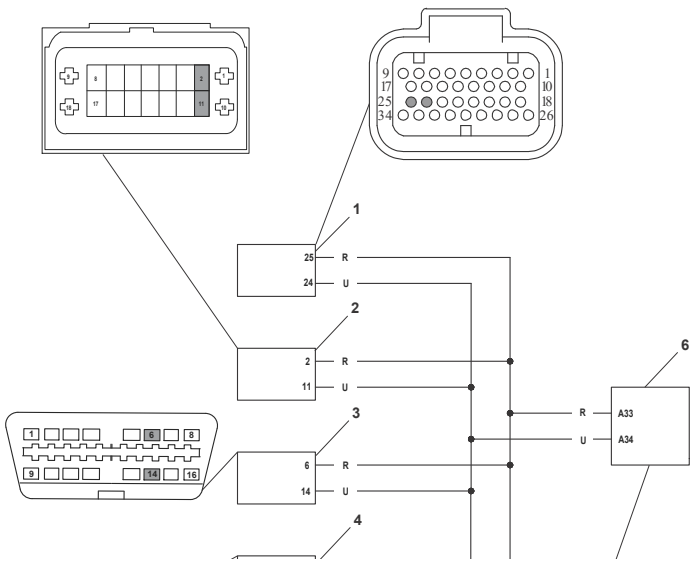
Fault Code	Possible cause	Action
P1690	CAN Fault	View and note 'freeze-frame' data if available. View and note 'sensor' data. Ensure Instrument connector is secure. Disconnect engine ECM and proceed to pinpoint test 1:

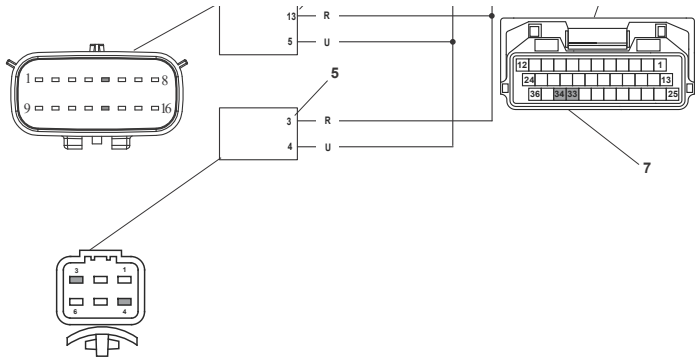
Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin A34 - Engine ECM pin A33 - Instrument pin 24 - Instrument pin 25 - ABS module pin 2 - ABS module pin 11 - Keyless ECM pin 5 - Keyless ECM pin 13 - Bluetooth® module pin 3 - Bluetooth® module pin 4	OK	Disconnect instruments and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - Engine ECM pin A34 to ground - Engine ECM pin A33 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 A34 to Instrument pin 24 - Engine ECM pin A33 to Instrument pin 25 - Engine ECM pin A34 to ABS control module pin 11 - Engine ECM pin A33 to ABS control module pin 2 - Engine ECM pin A34 to Keyless ECM pin 13 - Engine ECM pin A33 to Keyless ECM pin 5 - Engine ECM pin A34 to Bluetooth® module pin 4 - Engine ECM pin A33 to Bluetooth® module pin 3		
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable for short circuit: - Engine ECM pin A34 to 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





1. **Instruments**
2. **ABS Electronic Control Module**
3. **Diagnostic Connector**
4. **Keyless Electronic Control Module**
5. **Bluetooth Module**
6. **Engine Electronic Control Module**
7. **Engine Electronic Control Module - Connector A**

Instrument Communication (CAN)

5 Volt Sensor Supply Circuit

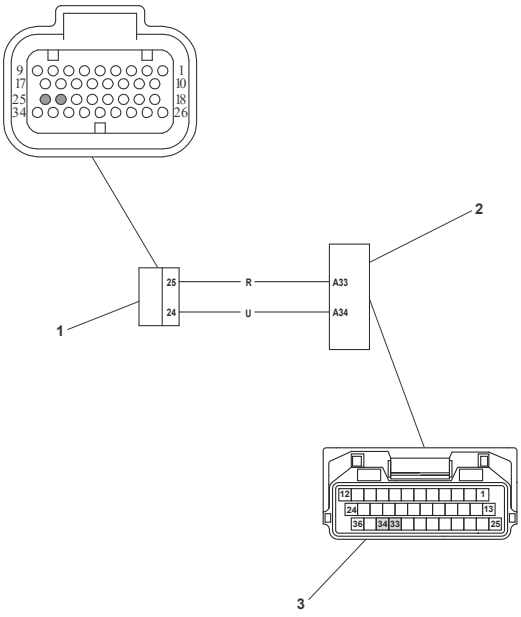
Fault Code	Possible cause	Action
P1695	Lost communication with instrument panel	View and note 'freeze-frame' data if available. Disconnect engine ECM and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - ECM pin A33 - ECM pin A34 - Instrument pin 24 - Instrument pin 25	OK	Disconnect instruments and proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - ECM pin A33 to ground - ECM pin A34 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 5

Test		Result	Action
3	Check cable continuity: - ECM pin A33 to Instrument pin 25 - ECM pin A34 to Instrument pin 24	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



1. **Instruments**
2. **Engine Electronic Control Module**
3. **Engine Electronic Control Module - Connector A**

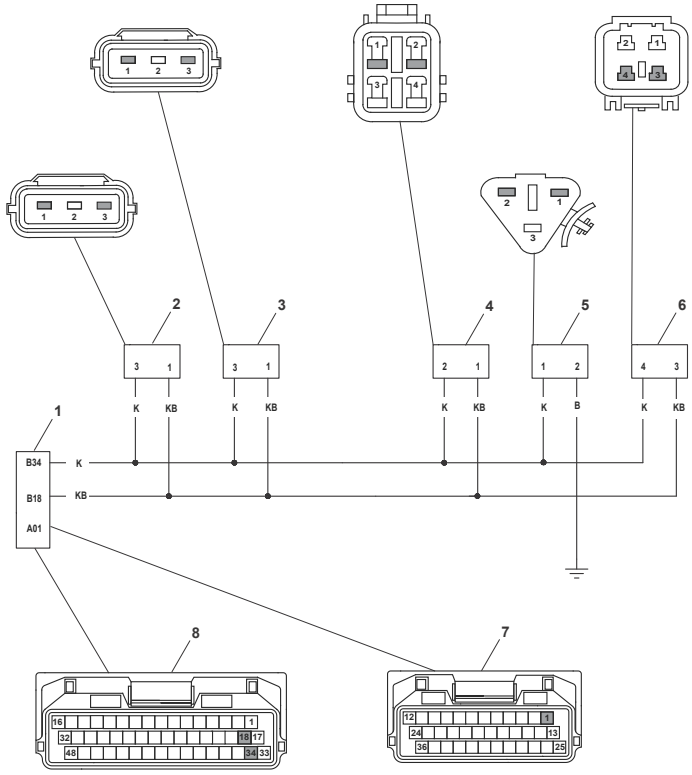
Fault Code	Possible cause	Action
P1698	5 Volt sensor supply malfunction	View and note 'sensor' data. Note ECM sensors requiring a power supply will not be active. Disconnect the engine ECM and proceed to pinpoint test 1:

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 - Fuel level sensor - Side stand switch - 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 A01 - Engine ECM pin B34 to A01 - Engine ECM pin B18 to battery positive - Engine ECM pin B34 to battery	OK	Proceed to test 5
		Short circuit	Locate and rectify wiring fault, proceed to test 5

Test		Result	Action
	positive		
5	Reconnect harness, clear fault code and use diagnostic software to check for correct sensor outputs and 5 volt sensor supply voltage level.	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



1. Engine Electronic Control Module
2. Ambient Air Pressure Sensor
3. MAP Sensor
4. Fuel Level Sender
5. Side Stand Switch
6. Gear Position Sensor
7. Engine Electronic Control Module - Connector A
8. Engine Electronic Control Module - Connector B

Inertial Measurement Unit (IMU) Incompatible

Inertial Measurement Unit (IMU) Circuit Malfunction

Throttle Actuator Motor

Twist Grip Position 1

Fault Code	Possible Cause	Action
P16A0	Engine ECM detects Inertial Measurement Unit (IMU) present but ID incompatible	Proceed to pinpoint test 1:

Pinpoint Tests

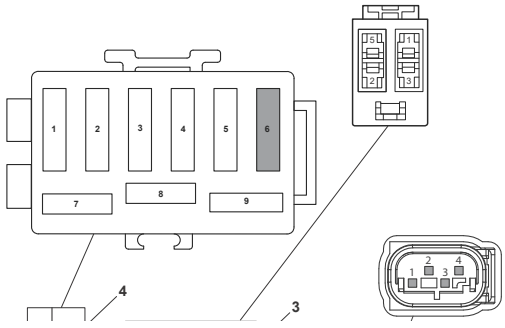
Test		Result	Action
1	Check IMU part number is correct for the motorcycle	OK	Proceed to test 2
		Incorrect	Replace IMU with correct part and proceed to test 3
2	Check that the engine ECM and chassis ECM calibrations are correct for the motorcycle, using the diagnostic software	OK	Proceed to test 3
		Incorrect	Download the correct calibrations using the diagnostic software, proceed to test 3
3	Clear fault code, check for normal operation	OK	Action complete - quit test
		Fault still present	Contact Triumph service

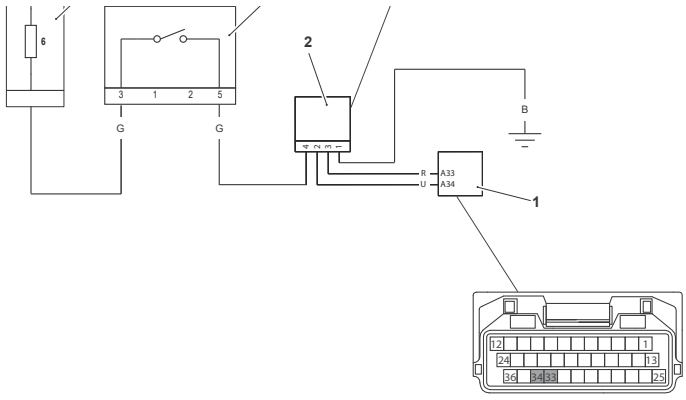
Fault Code	Possible Cause	Action
P16A1	Engine ECM detects Inertial Measurement Unit (IMU) circuit malfunction	View and note 'freeze-frame' data if available. View and note 'sensor' data. Ensure sensor connector is secure. Disconnect Engine ECM and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin A33 - Engine ECM pin A34 - IMU pins 1, 2, 3, 4	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 Ignition Master Switch (KL15) Relay pin 5 - IMU pin 1 to ground	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 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





1. **Engine ECM**
2. **Inertial Measurement Unit**
3. **Ignition Master Switch (KL15) Relay**
4. **Fuse Box**

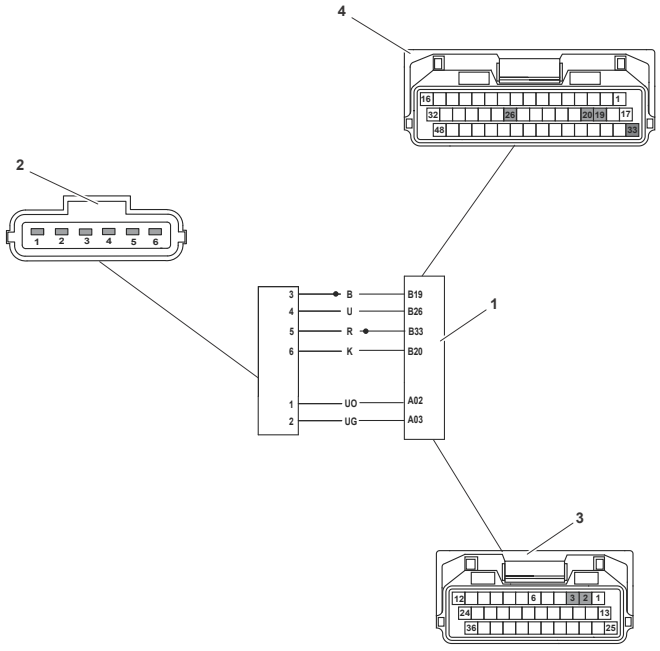
Fault Code	Possible cause	Action
P2100	Throttle actuator short circuit to ground or short circuit to battery Voltage Throttle actuator with default spring open circuit	View and note diagnostic tool freeze frame data if available. View and note diagnostic tool sensor data. Ensure throttle body connector is secure. Disconnect the 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 body connector pin 1 - Throttle body connector pin 2	OK	Disconnect throttle body connector 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

Test		Result	Action
3	Check fuse box Fuse 5 integrity. Check cable continuity: - Engine ECM pin A02 to throttle body connector pin 1 - Engine ECM pin A03 to throttle body connector 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 A02 to ECM pin A01 - Engine ECM pin A03 to 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.	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



1. Engine Electronic Control Module

2. Throttle Body Connector

3. Electronic Control Module - Connector A

4. Electronic Control Module - Connector B

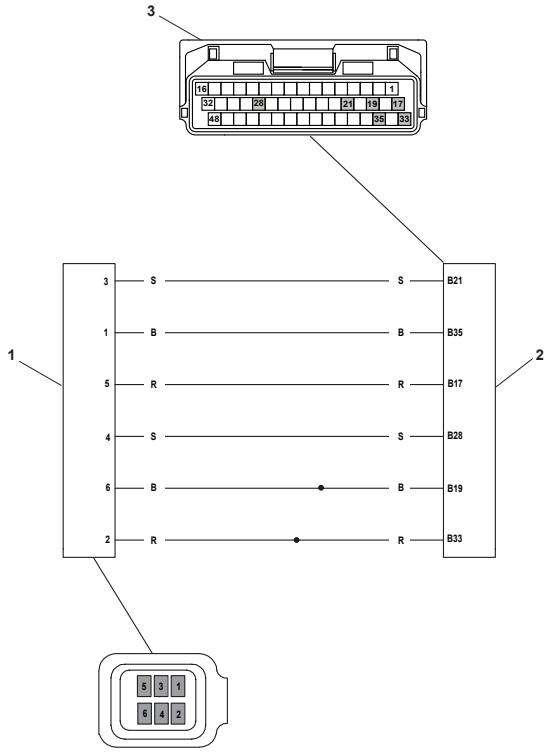
Fault Code	Possible cause	Action
P2120	Twist grip position sensor 1 short circuit to ground or open circuit	View and note 'sensor' data. Note ECM sensors requiring a power supply will not be active. Ensure twist grip position sensor is secure. Disconnect the engine ECM and proceed to pinpoint test 1:
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 Sensor pin 1 Sensor pin 2 Sensor pin 3 Sensor pin 4 Sensor pin 5 Sensor pin 6	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 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 5 - Engine ECM pin B21 to sensor pin 3 - Engine ECM pin B35 to sensor pin 1	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable for short circuit: - Engine ECM pin B21 to Engine	OK	Renew twist grip position sensor, proceed to test 5

Test		Result	Action
	ECM pin B17 - Engine ECM pin B21 to Engine ECM pin B35		
		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



1. Twist Grip Position Sensor

2. Engine Electronic Control Module

3. Electronic Control Module - Connector B

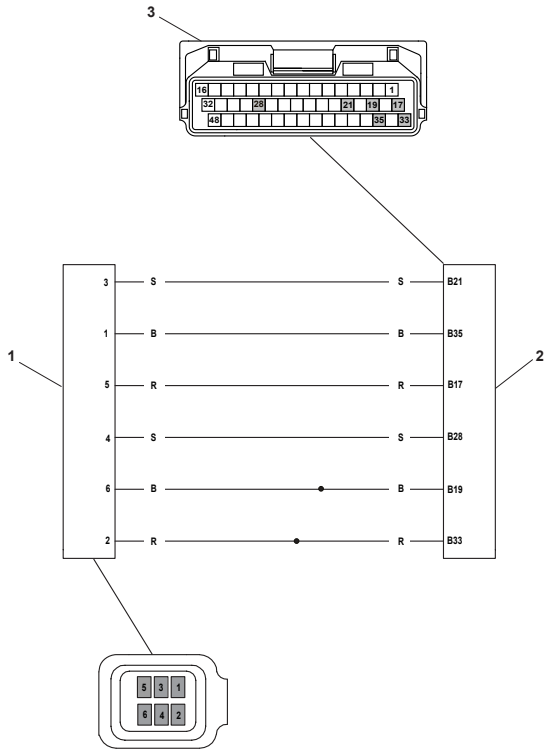
Twist Grip Position 2

Fault Code	Possible cause	Action
P2125	Twist grip position sensor 2 short circuit to ground or open circuit	View and note 'sensor' data. Note ECM sensors requiring a power supply will not be active. Ensure twist grip position sensor is secure. Disconnect the 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 4 - 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 B28 to Engine ECM pin B19 - Engine ECM pin B28 to Engine ECM pin B33	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



1. Twist Grip Position Sensor

2. Engine Electronic Control Module

3. Electronic Control Module - Connector B

Twist Grip Position Sensor 1 Correlation Error with Twist Grip Position 2

Ambient Air Pressure Sensor

Removal and Installation - Fuel and Air Components

Fuel Cap Cover - Removal

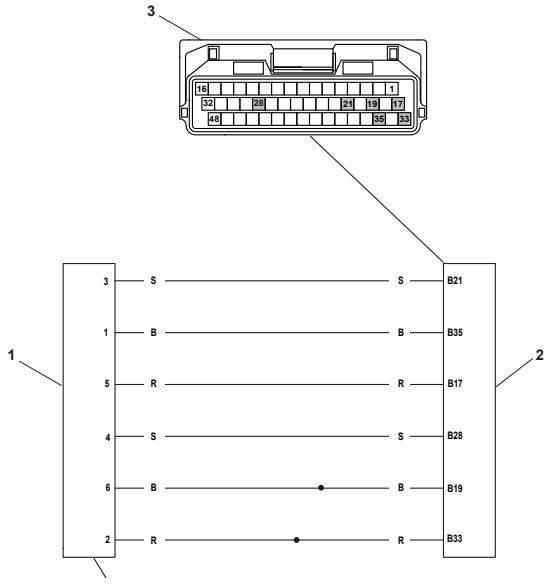
Fault Code	Possible cause	Action
P2138	Twist grip position sensor 1 correlation error with twist grip position sensor 2	View and note diagnostic tool freeze frame data if available. View and note diagnostic tool sensor data. Disconnect twist grip position sensor and proceed to pinpoint test

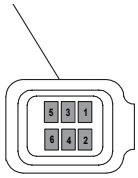
Fault Code	Possible cause	Action
		1:

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	5V DC	Proceed to test 2
		Faulty	Rectify fault, proceed to test 2
2	Check cable continuity: - Engine ECM pin B21 to sensor pin 3 - Engine ECM pin B28 to sensor pin 4	OK	Renew the twist grip and proceed to test 3
		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





1. Twist Grip Position Sensor

2. Engine Electronic Control Module

3. Electronic Control Module - Connector B

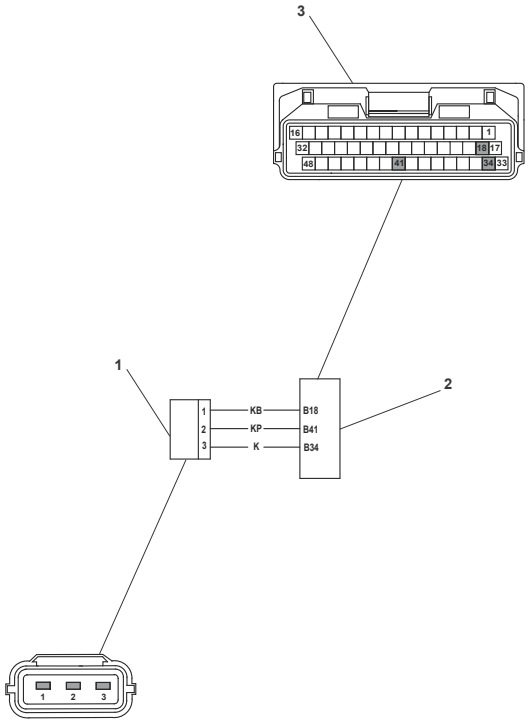
Fault Code	Possible cause	Action
P2228	Ambient air pressure sensor circuit short circuit to ground	View and note 'freeze-frame' data if available. View and note 'sensor' data. Ensure sensor connector is secure. Disconnect the engine ECM and proceed to pinpoint test 1:
P2226	Ambient air pressure sensor circuit open circuit or short circuit to 5 Volt sensor supply	

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - ECM pin B18 - ECM pin B34 - ECM pin B41 - Sensor pin 1, 2, 3	OK	Disconnect ambient pressure sensor and proceed to test 2
		Faulty	Rectify fault, proceed to test 4
2	Check cable for short circuit: - ECM pin B41 to ECM pin B18 - ECM pin B41 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 sensor pin 3 - ECM pin B18 to sensor pin 1 - ECM pin B41 to sensor pin 2	OK	Renew ambient pressure sensor and proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 4

Test		Result	Action
5	Reconnect harness, clear fault code and run engine.	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



1. Ambient Air Pressure Sensor

2. Engine Electronic Control Module

3. Engine Electronic Control Module - Connector B

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

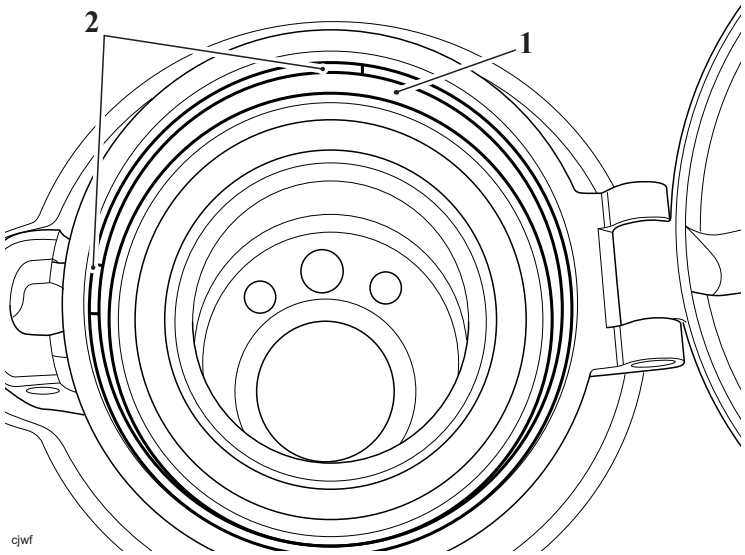
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Open the fuel cap cover and remove the fuel cap.

Note

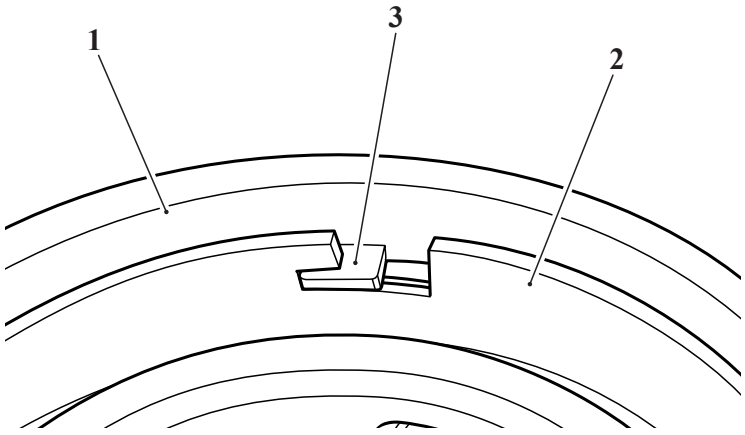
- **Note that the chamfered edge of the plastic locking ring is uppermost for installation.**
- **Note the four locating lugs on the plastic locking ring that fit into the cut outs in the fuel tank filler neck.**

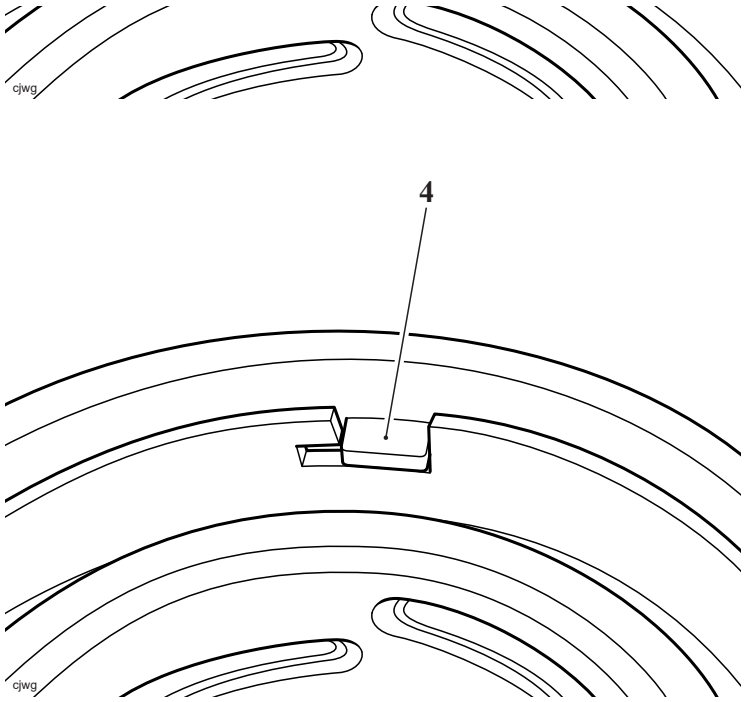
2. Using a suitable proprietary lever, remove the plastic locking ring.



1. **Plastic locking ring**
2. **Locating lug (2 shown)**

3. Turn the fuel cap cover clockwise to release its four locating lugs from the fuel tank filler neck.





1. **Filler cap cover**
2. **Fuel tank filler neck**
3. **Locating lug in locked position**
4. **Locating lug in open position**

4. Carefully lift off the fuel cap cover.

Fuel Cap Cover - Installation

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.

WARNING

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

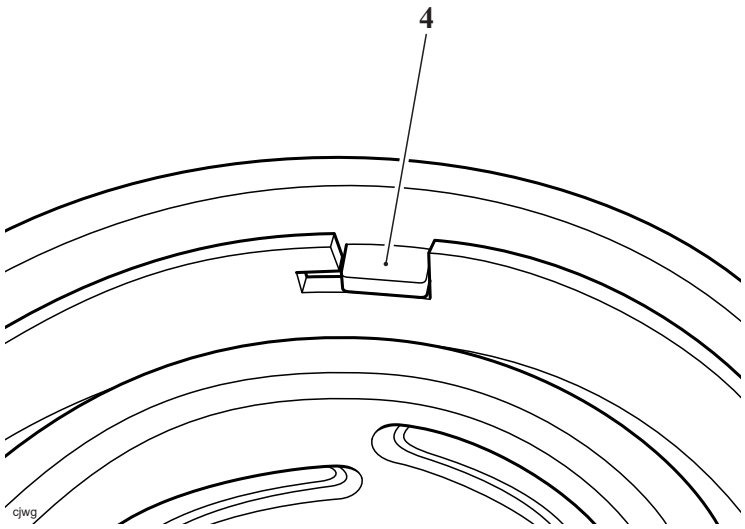
Note

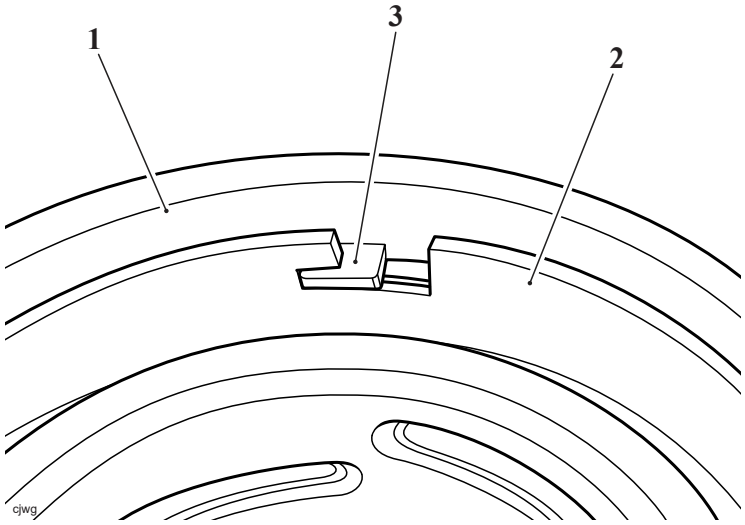
- **Note that the chamfered edge of the plastic locking ring is uppermost as noted during removal.**

Note

- **Note the four locating lugs on the plastic locking ring that fit into the cut outs in the fuel tank filler neck.**

1. Position the fuel cap cover and then turn anticlockwise to lock its four locating lugs into the fuel tank filler neck.

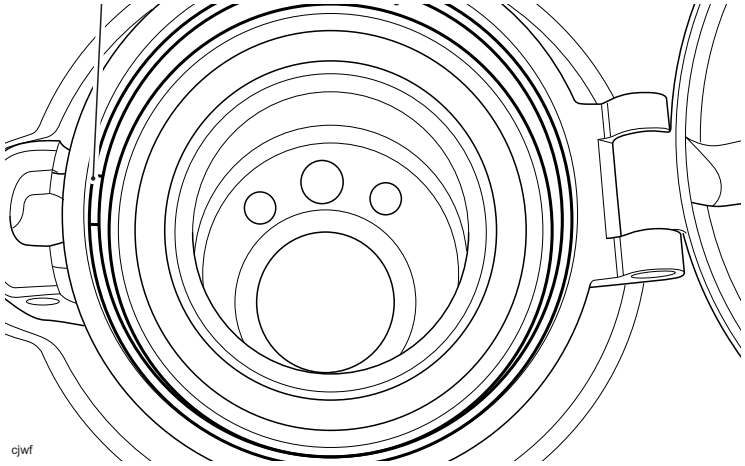




1. **Filler cap cover**
2. **Fuel tank filler neck**
3. **Locating lug in locked position**
4. **Locating lug in open position**

2. Refit the plastic locking ring. Ensure a positive click is felt on each locating lug when fitting the plastic locking ring.





1. **Plastic locking ring**
2. **Locating lug (2 shown)**

3. Refit the fuel cap and check the operation of the lock

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.

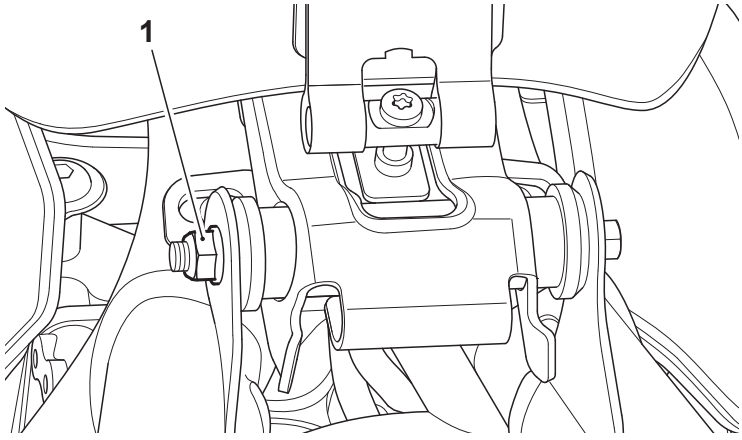
WARNING

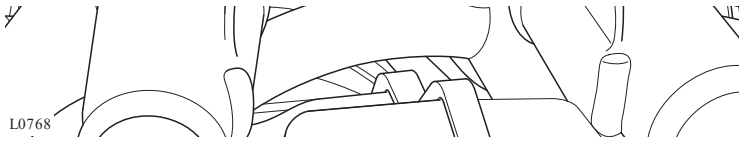
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

Perform the following operations:

- Seat - Removal
- Battery - Removal

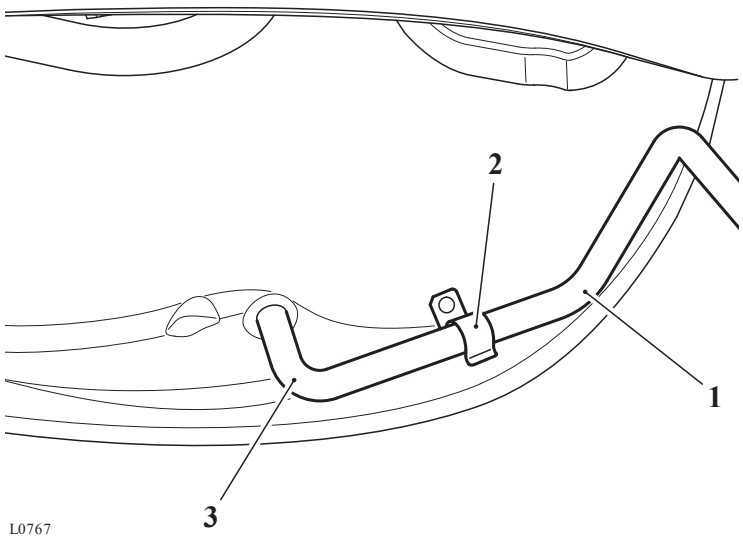
1. Remove the fixing securing the rear of the fuel tank to the frame. Discard the lock nut.





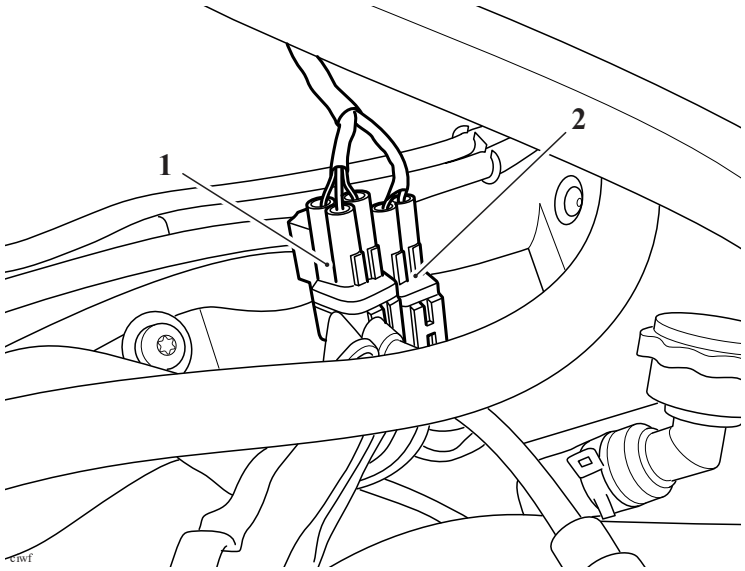
1. **Fixings**

2. Pivot the fuel tank upwards at the rear.
3. Detach the breather hose from its retaining clips on the fuel tank then disconnect it from the fuel tank.



1. **Breather hose**
2. **Retaining clips**
3. **Fuel tank spigot**

4. Disconnect the electrical connectors for the fuel pump and the fuel level sensor from the main harness.



1. **Fuel level sensor electrical connector**
2. **Fuel pump electrical connector**

WARNING

If the fuel rail is dismantled without first reducing pressure, fuel may escape causing clothing and components to be coated with fuel.

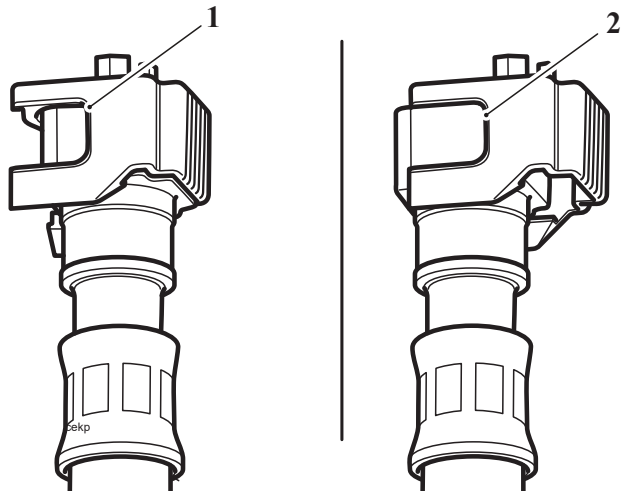
This would represent a serious fire hazard which could lead to burn injuries and damage to property.

5. Temporarily reconnect the battery, positive (red) lead first and tighten the terminals to **4.5 Nm**.

Note

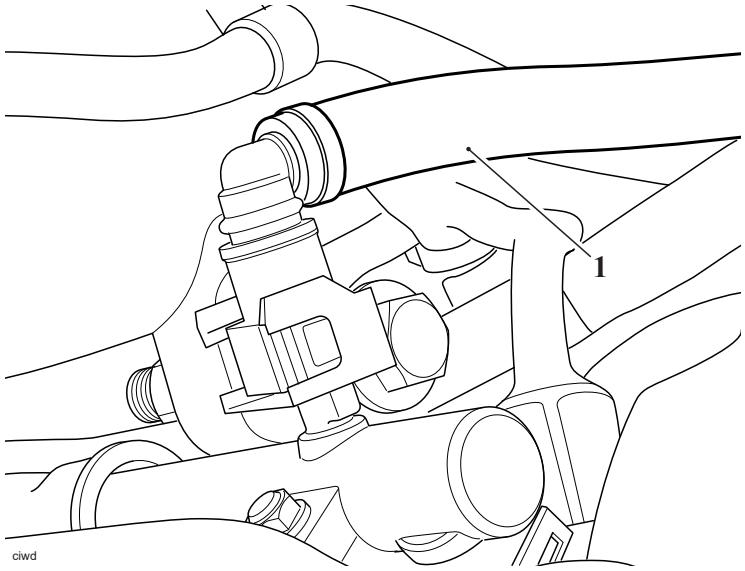
-
- **Because fuel stored in the fuel rail will be at 3.5 bar pressure, it is essential that the fuel pressure is reduced before any dismantling of the fuel rail takes place. To reduce pressure, briefly crank the engine with the fuel pump disconnected.**
- **When disconnected, the fuel tank is self-sealing 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.**

6. Briefly crank the engine to reduce the fuel pressure in the fuel rail.
7. Disconnect the battery, negative (black) lead first.
8. To release the double check clip, ease the latch away from the connector until the release buttons are exposed.



1. **Locked Position**
2. **Unlocked Position**

9. Disconnect the fuel hose by squeezing the sides of the connector and pulling the hose free from its spigot on the fuel pump rail. Collect any fuel remaining in the hose in a suitable container.



1. Fuel hose

10. Detach the fuel pump and fuel level sensor electrical connectors from the ignition coil bracket.
11. Slide the tank rearwards to detach it from the frame.
12. Take care not to lose the front mounting and rear mounting rubbers. Renew any mounting rubber which shows signs of damage.

Fuel Tank - Installation

Fuel Pressure Checking

WARNING

Observe the warning advice given in the General Information section on the safe handling of fuel and fuel containers.

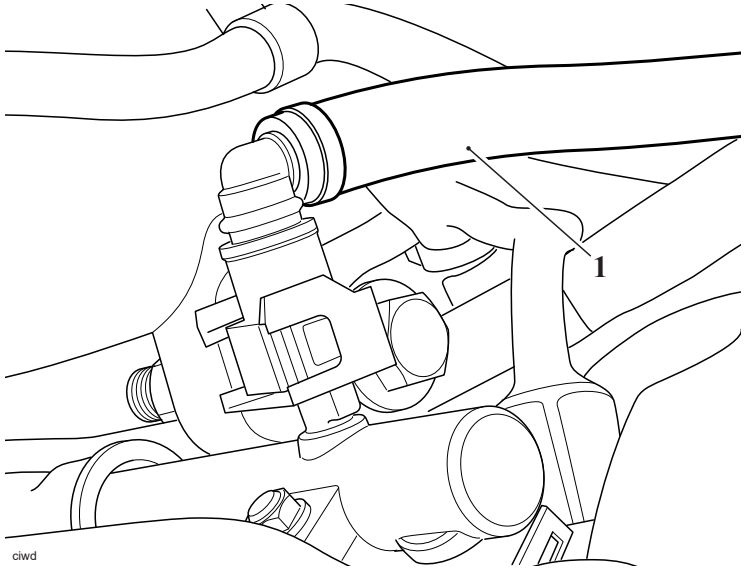
A fire, causing personal injury and damage to property could result from spilled fuel or fuel not handled or stored correctly.

WARNING

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

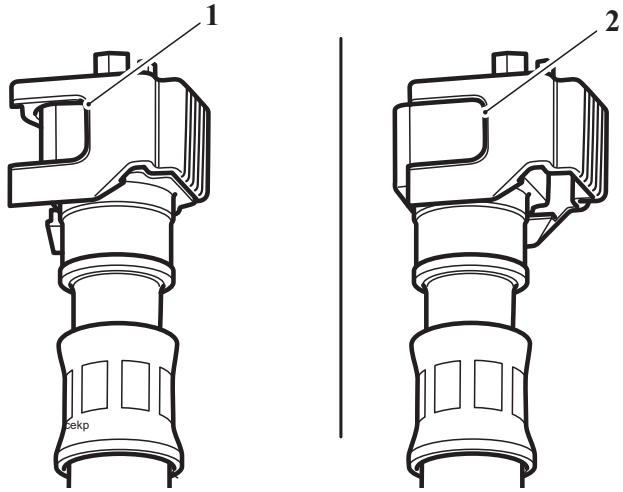
1. Ensure the front and rear mounting rubbers are correctly fitted.
2. Manoeuvre the tank into position, engaging it with the front mounting rubbers.

3. Reconnect the fuel feed hose by gently pushing inwards until the hose engages with a click.



1. **Fuel hose**

4. Slide the double check latch to the locked position until the release buttons are covered. If the latch will not slide into position, then the fuel hose is not fully home on its spigot and must therefore be refitted correctly.



1. **Locked Position**
2. **Unlocked Position**

5. Attach and connect the breather pipe to the fuel tank.
6. Connect the electrical connectors for the fuel pump and the fuel level sensor to the main harness and attach them to the ignition coil bracket.
7. Lower the tank into position ensuring the breather pipe is not trapped, kinked or twisted.

8. Refit the rear fuel tank mounting retaining bolt.
9. Fit a new locknut, counterhold the bolt and tighten the new lock nut to **8 Nm**.
10. If removed, use a proprietary professional automotive workshop equipment approved for fuel handling, to refill the fuel tank with any fuel removed earlier.

Perform the following operations:

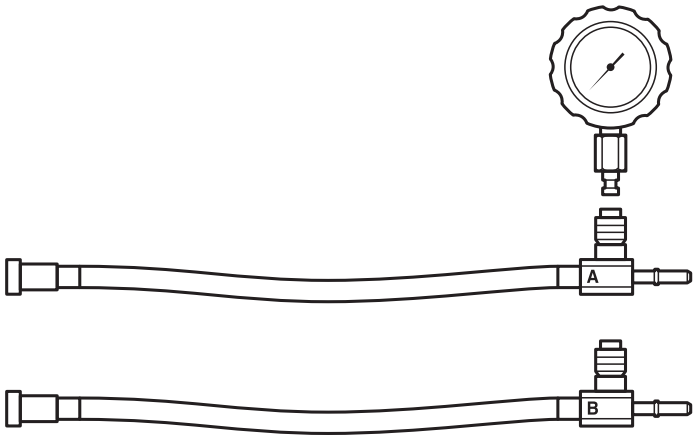
Perform the following operations:

- Battery - Installation
- Seat - Installation

WARNING

Observe the fuel handling precautions given in the General Information section.

Fuel pressure is checked using T3880001 - Fuel Pressure Gauge.



T3880001 - Fuel Pressure Gauge

Perform the following operations:

- Fuel Tank - Removal

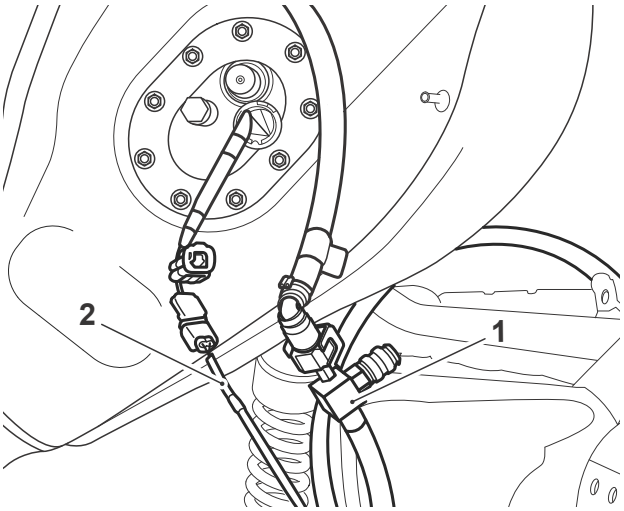
1. Place the fuel tank on a suitable support, close to the motorcycle.
2. Using the T3880391 - Fuel Pump Extension Cable, carefully connect the fuel pump connection on the main harness to the fuel tank.
3. Select the fuel pressure gauge adaptor marked 'A' from T3880001 - Fuel Pressure Gauge.

WARNING

Always use the correct fuel pressure gauge adaptor. Use of an incorrect adaptor will result in a fuel leak. A fuel leak can result in a fire causing damage to property and injury to persons.

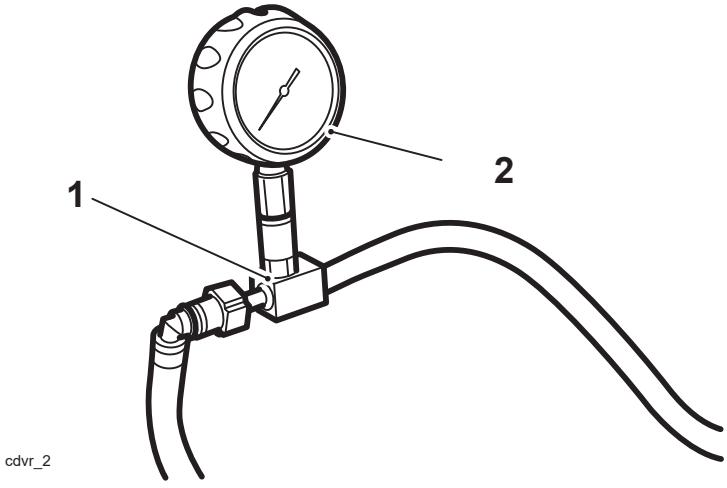
4. Connect the adaptor hose to the fuel pump plate outlet and fuel hose as shown in the

illustration below.



1. **Adaptor hose 'A'**
2. **T3880391 - Fuel Pump Extension Cable**

5. Connect the fuel pressure gauge to the adaptor hose as shown below by pushing the gauge spigot into the adaptor until a click can be heard.



1. **Adaptor hose**
2. **Fuel pressure gauge**

Note

- **To release the fuel pressure gauge from the adaptor, slide the outer ferrule downwards. This will allow the gauge to spring upwards from the adaptor.**

6. Ensure the gauge is visible to the side of the motorcycle.

7. If fuel has been removed from the fuel tank during removal, use a proprietary professional automotive workshop equipment approved for fuel handling, to add fuel to the tank with any 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, disconnect the battery, negative (black) lead first.
11. Disconnect the fuel pressure gauge adaptor and wiring extension. Collect any fuel in the hose in a suitable container.

Perform the following operations:

- Fuel Tank - Installation

Fuel Pump Assembly - 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.

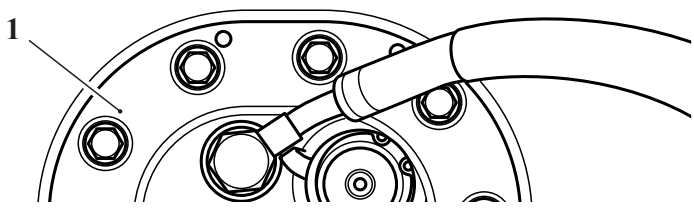
Perform the following operations:

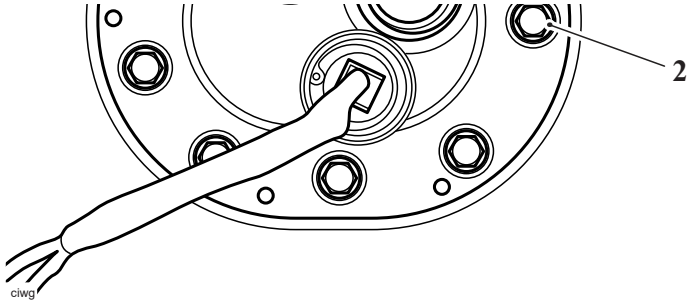
- Seat - Removal
- Battery - Removal

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.

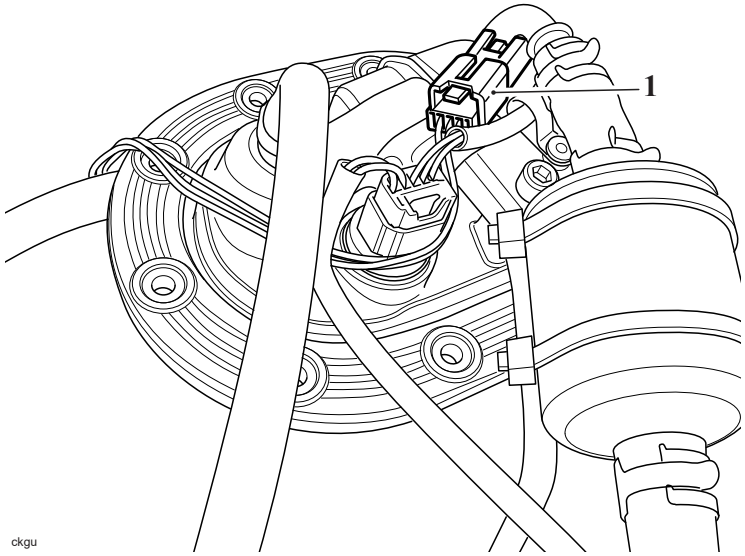
1. Using proprietary professional automotive workshop equipment approved for fuel handling, drain all fuel from the fuel tank.
2. Remove the fuel tank (see Fuel Tank - Removal).
3. Invert the fuel tank and place on a protective surface to prevent paint damage.
4. Remove the ring of fixings securing the fuel pump mounting plate to the tank.





1. **Fuel pump mounting plate**
2. **Fixing**

5. Detach the pump assembly from the fuel tank.
6. Disconnect the fuel level sensor from the fuel pump assembly harness.



1. **Fuel level sensor connector**

7. Remove the fuel pump assembly and discard the fuel pump plate seal.

Fuel Pump Assembly - Inspection

1. Inspect all hoses for cracks, splits, fraying and other damage. Replace as necessary.
2. Check all hose clamps for cracks and signs of distortion. Replace as necessary.
3. Check the mesh filter for damage and replace the fuel pump if necessary.

Fuel Pump Assembly - Installation

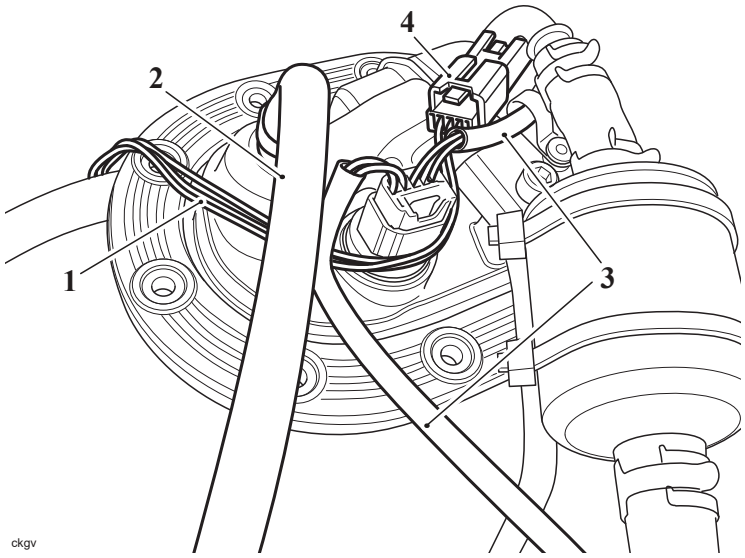
WARNING

⚠ 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. Position a new fuel pump plate seal to the fuel pump plate as noted for removal.
2. Route the fuel level sensor harness under the baffle hose and fuel pump assembly harness, as shown in the illustration below, and connect to the fuel pump assembly harness.



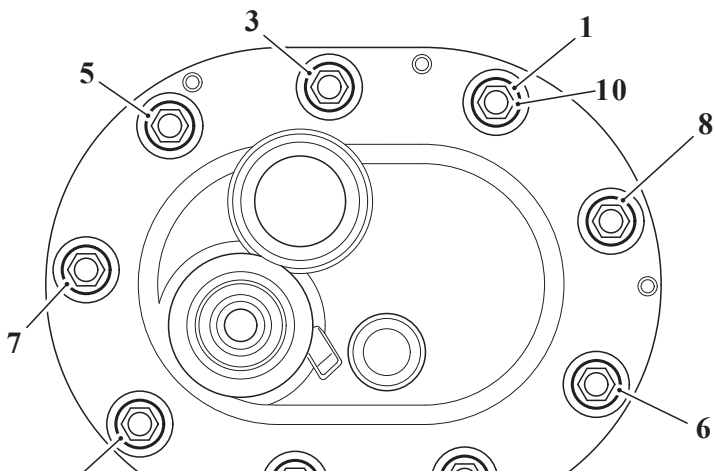
1. Fuel level sensor harness

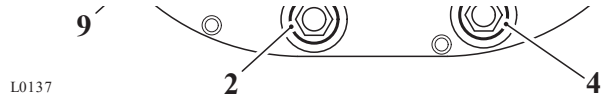
2. Baffle hose

3. Fuel pump harness

4. Fuel level sensor connector

3. Refit the fuel pump assembly to the fuel tank. Fit and tighten the fixings to **5 Nm** in the sequence shown below.





Fuel Pump Plate Tightening Sequence

4. Refit the fuel tank (see Fuel Tank - Installation).
5. Refill the fuel tank with the fuel drained during removal, and check carefully for fuel leaks.

Perform the following operations:

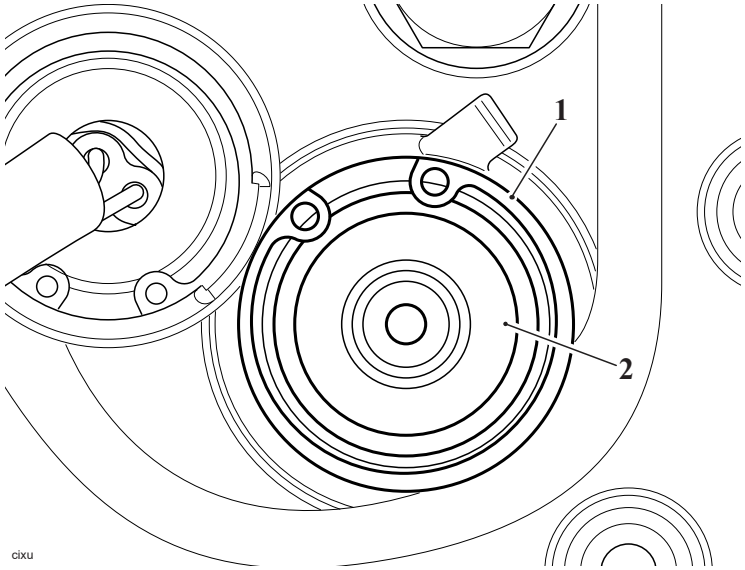
- Battery - Installation
- Seat - Installation

Fuel Pressure Regulator - Removal

Perform the following operations:

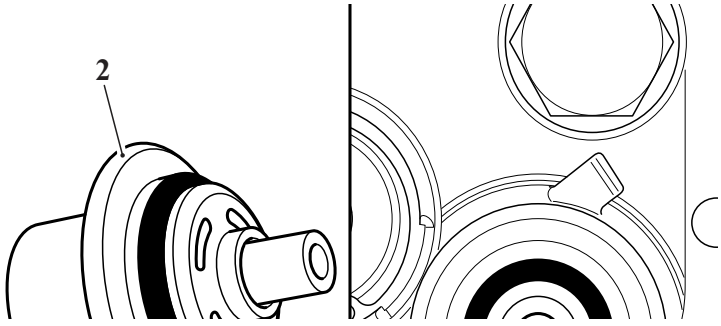
- Fuel Pump Assembly - Removal

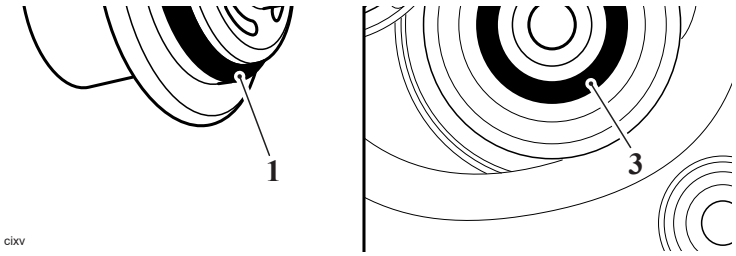
1. Remove and discard the circlip securing the fuel pressure regulator in its housing.



1. **Circlip**
2. **Fuel pressure regulator**

2. Remove the fuel pressure regulator from the fuel pump plate. Discard the large O-ring from the fuel pressure regulator and the small O-ring in the pressure regulator housing.





cixv

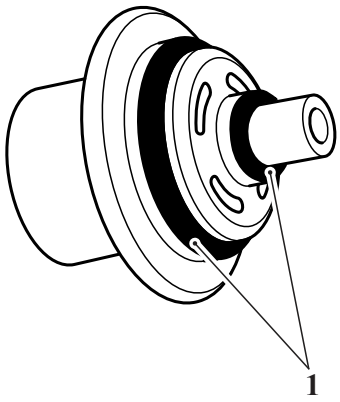
1. **Large O-ring**
2. **Fuel pressure regulator**
3. **Small O-ring**

Fuel Pressure Regulator - Inspection

1. Inspect all hoses for cracks, splits, fraying and other damage. Replace as necessary.
2. Check all hose clamps for cracks and signs of distortion. Replace as necessary.
3. Check the mesh filter for damage and replace the fuel pump if necessary.

Fuel Pressure Regulator - Installation

1. Install new O-rings to the fuel pressure regulator.



cixv_1

1. **O-rings**

2. Apply a small amount of grease, conforming to NLGI 2 specification, to the two O-rings.
3. Position the fuel pressure regulator squarley to the fuel pump plate and press it evenly into its housing.
4. Secure the fuel pressure regulator with a new circlip.
5. Refit the hose and secure with the hose clip. Check for any fuel leaks and rectify if necessary.

Perform the following operations:

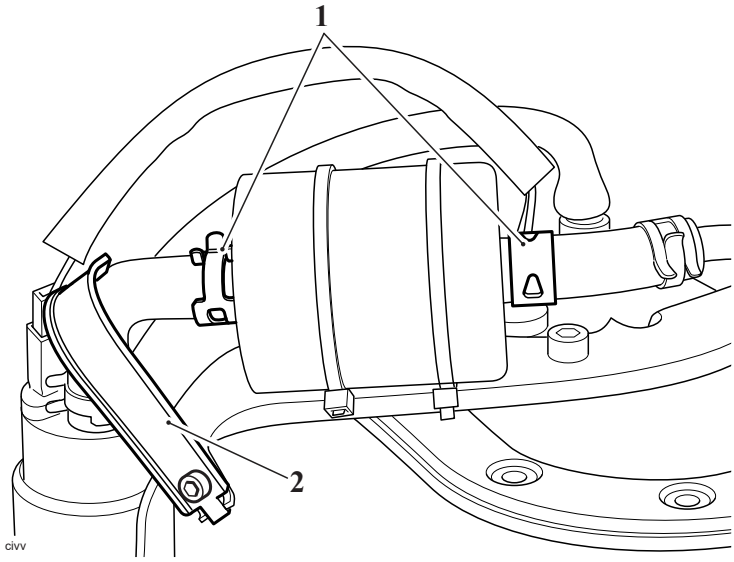
- Fuel Pump Assembly - Installation

Fuel Pump - Removal

Perform the following operations:

- Fuel Pump Assembly - Removal

1. Release the fuel hose clip from the fuel pump side of the fuel filter.
2. Remove the hose bracket from the fuel pump bracket.

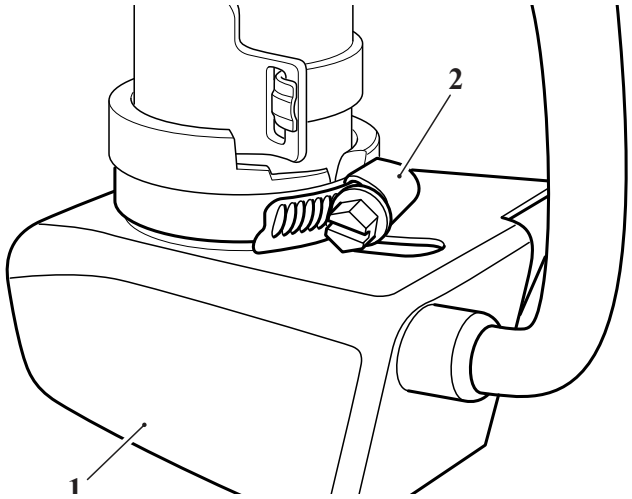


1. **Hose clips**
2. **Hose bracket**

3. Release the hose clip securing the baffle housing to the fuel pump.
4. Reposition the hose clip and carefully slide the baffle housing off the fuel pump body.

Note

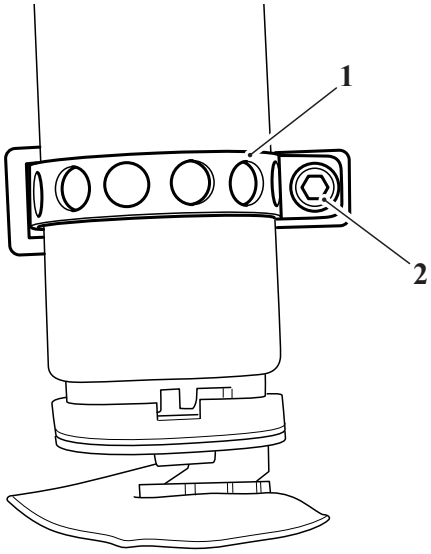
- **Note the orientation of the baffle housing for installation.**
- **It is not necessary to disconnect the baffle housing hose from the fuel pressure regulator unless it is to be removed at the same time as the fuel pump.**



civw

1. **Baffle housing**
2. **Hose clip**

5. Remove the baffle housing hose clip over the inlet filter.
6. Disconnect the fuel pump electrical connector.
7. Remove the fuel pump securing bolt and strap.



civx

1. **Strap**
2. **Bolt**

8. Detach the fuel pump and connector hose from the fuel pump bracket as an assembly.
9. If necessary, release the hose clip and remove the connector hose from the pump.

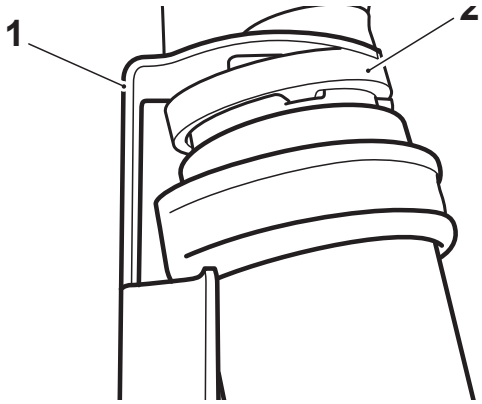
Fuel Pump - Inspection

1. Inspect all hoses for cracks, splits, fraying and other damage. Replace as necessary.
2. Check all hose clamps for cracks and signs of distortion. Replace as necessary.
3. Check the mesh filter for damage and replace the fuel pump if necessary.

Fuel Pump - Installation

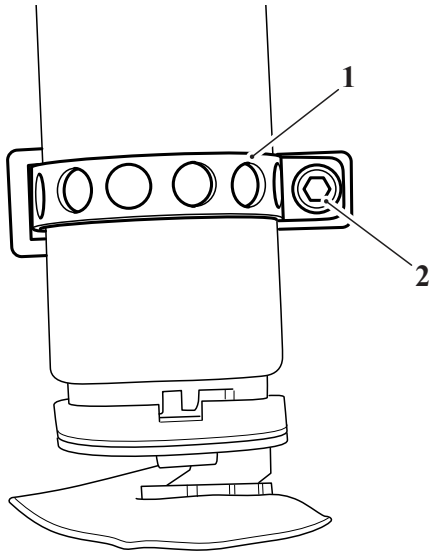
1. If removed, refit the connector hose to the fuel pump. Secure with the hose clip.
2. Position the fuel pump to the bracket, ensuring the feet of the rubber isolator engage correctly in the fork.





1. **Fork**
2. **Isolator feet**

3. Align the fuel pump to the fuel pump bracket and fit the connector hose on to the fuel filter.
4. Fit the fuel pump strap, secure with a new bolt and tighten to **4 Nm**.



1. **Strap**
2. **Bolt**

5. Reconnect the fuel pump electrical connector.
6. Position the baffle housing hose clip loosely over the fuel pump body.
7. Check that the baffle material within the baffle housing is positioned as noted for removal.
8. Refit the baffle housing over the fuel pump, as noted for removal. Refit the hose clip and tighten to **3 Nm**.

Perform the following operations:

- Fuel Pump Assembly - Installation

Fuel Level Sensor - 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.

Note

- **The fuel level sensor is located inside the fuel tank on the right hand side.**
- **Access to the fuel level sensor is through the aperture for the fuel pump.**

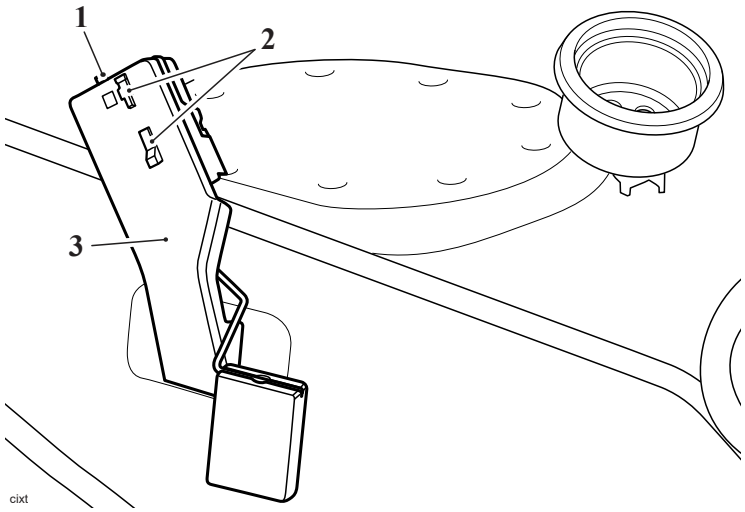
Perform the following operations:

- Fuel Pump Assembly - Removal

Note

- **The mounting for the fuel level sensor is located inside the fuel tank. The illustration shows the bracket outside the fuel tank for clarity.**

1. Release the locking device and slide the fuel level sensor up the bracket and release the two locating lugs from the bracket.



1. **Locking device**
2. **Locating lugs**
3. **Bracket**

2. Remove the fuel level sensor.

Fuel Level Sensor Installation

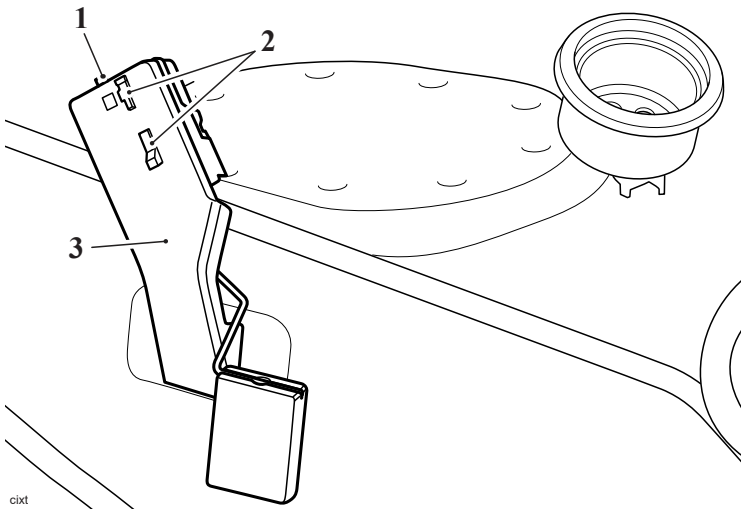
WARNING

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. Align the two locating lugs into the holes in the bracket.
2. Slide the fuel level sensor down the bracket for the locking device to engage and secure the sensor.



1. **Locking device**
2. **Locating lugs**
3. **Bracket**

Perform the following operations:

- Fuel Pump Assembly - Installation
- Refit the fuel tank (see Fuel Tank - Installation).

Airbox - 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.

Perform the following operations:

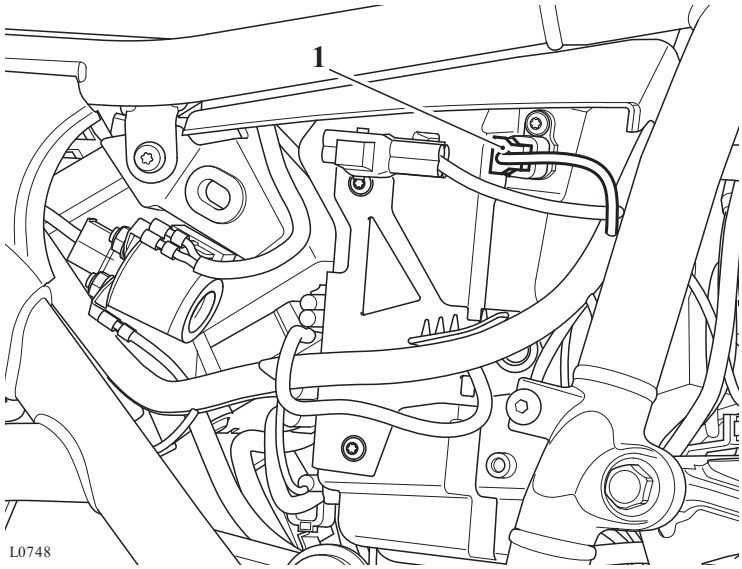
- Seat - Removal
- Battery - Removal

- Fuel Tank - Removal
- Exhaust Silencer - Removal
- Side Panels
- Rear Mudguard - Removal
- Engine Electronic Control Module (ECM) - Removal

Note

- **Before the disconnection of any wiring, note the routing of all wiring and wiring connectors on both sides of the airbox.**

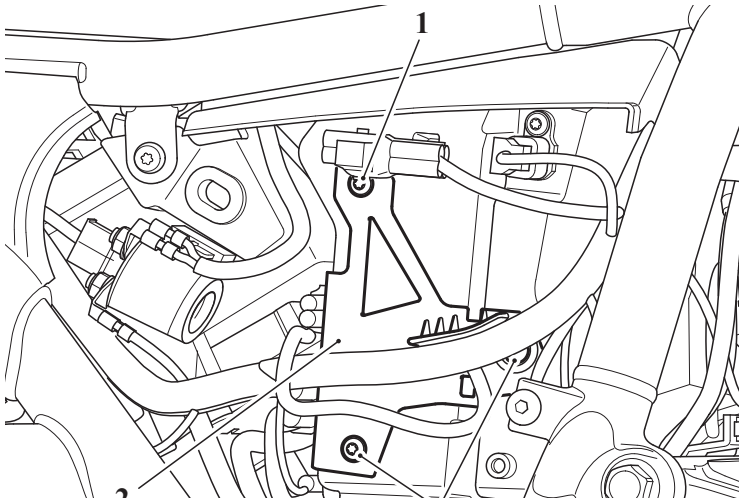
1. Release the fixing and detach the air temperature sensor from the airbox.
2. Disconnect the ambient air pressure sensor connector.

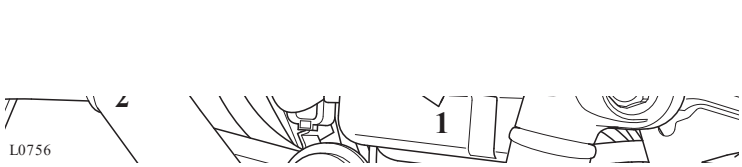


1. Air temperature sensor

2. Ambient air pressure sensor

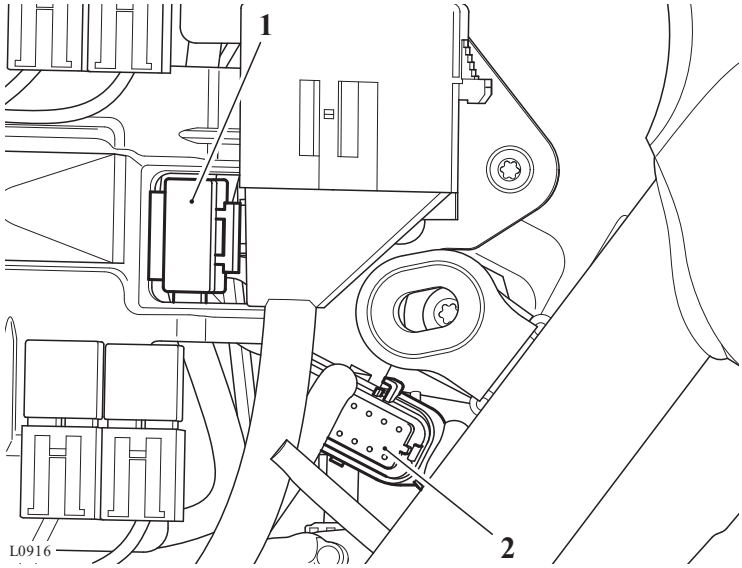
3. Cut the cable tie and detach the connector bracket.
4. Remove the fixings and detach the connector bracket from the right hand side of the airbox.





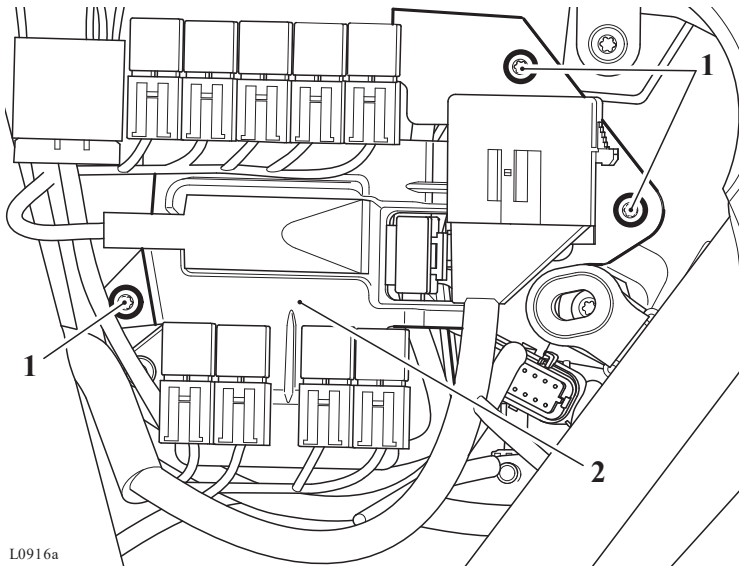
1. **Fixings**
2. **Connector bracket**

5. Detach the main fuse from the relay bracket.
6. Disconnect the electrical connector from the keyless electronic control module (ECM).



1. **Main fuse**
2. **Keyless ECM electrical connector**

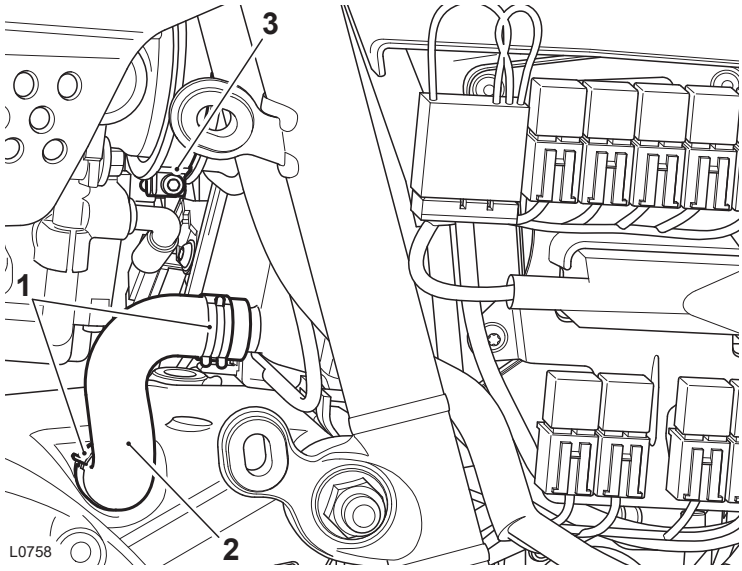
7. Remove the fixings and detach the relay bracket from the left hand side of the airbox.



1. **Fixings**

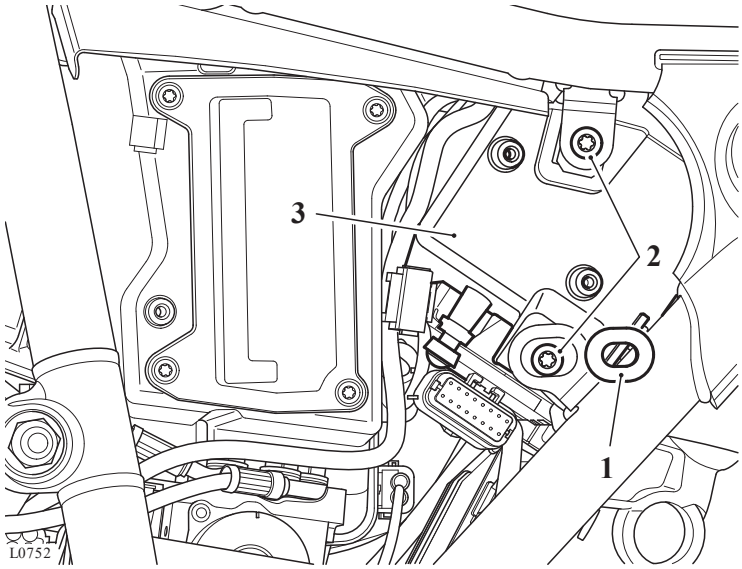
2. **Relay bracket**

8. Release the two hose clips and remove the engine breather hose.
9. Loosen the clamp for the throttle body intake hose.



1. **Clips**
2. **Engine breather pipe**
3. **Clamp**

10. Remove the rear grommet for the left hand side panel for access to battery box lower fixing.
11. Remove the two fixings securing the battery box to the frame.



1. **Grommet**
2. **Fixings**

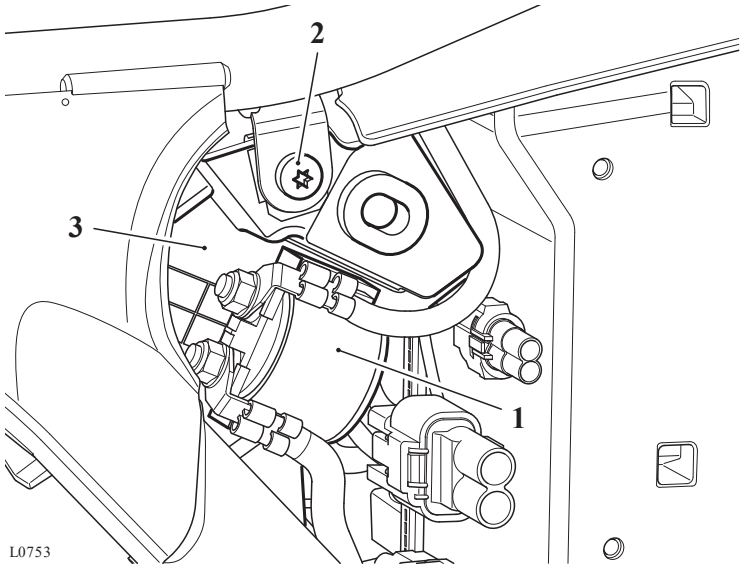
3. Battery box

12. Detach the starter motor solenoid from the right hand side of the battery box.

Note

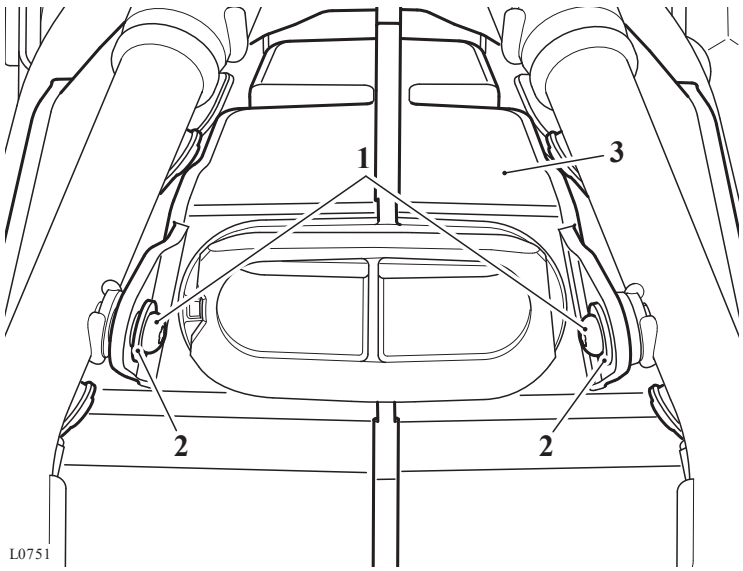
- **The keyless ECM is attached to the underside of the battery box.**

13. Release the fixing and carefully manoeuvre the battery box rearward for removal.



1. **Starter motor solenoid**
2. **Fixing**
3. **Battery box**

14. Remove the fixing and shouldered washer from both sides of the airbox.



1. **Fixing**

2. **Shouldered washer**
3. **Airbox**

Note

- **When removing the airbox, ensure that the brake lines on the right hand side of the frame do not get damaged.**

15. Manoeuvre the airbox rearward to remove it from the motorcycle.

Airbox - Installation

Throttle Body and Inlet Manifold Assembly - Removal

Throttle Body and Inlet Manifold Assembly - Installation

Fuel Injectors and Fuel Rail - Removal

Fuel Injectors and Fuel Rail - Installation

Removal and Installation - Engine Management Components

Engine Electronic Control Module (ECM) - Removal

Engine Electronic Control Module (ECM) - Installation

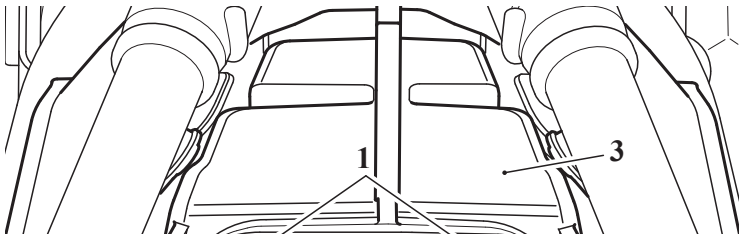
WARNING

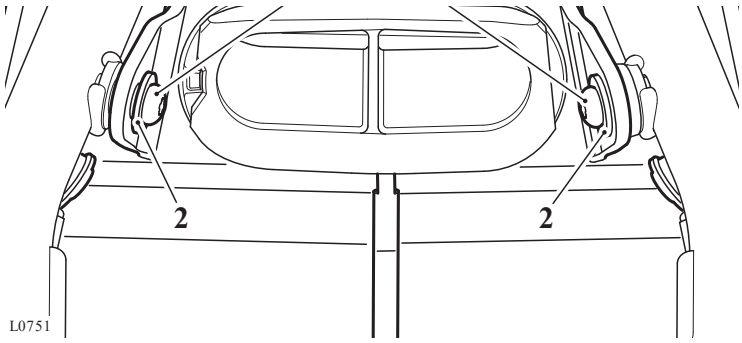
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

Note

- **When installing the airbox, ensure that the brake lines on the right hand side of the frame do not get damaged.**

1. Position the airbox to the frame ensuring the throttle body air duct is correctly aligned to the throttle body.
2. Check that the harnesses and hoses are routed as noted on removal.
3. Tighten the intake hose clamp to **1.5 Nm**.
4. Fit the fixing and shouldered washer to both sides of the airbox, do not fully tighten at this stage.





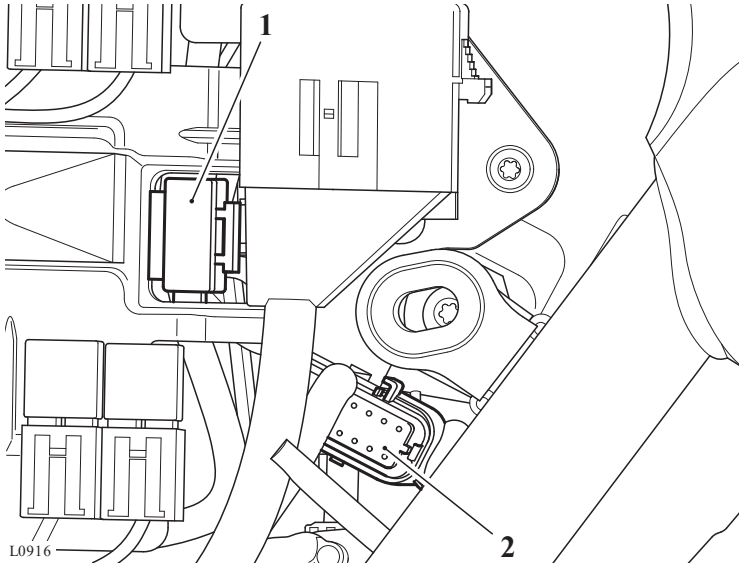
1. **Fixing**
2. **Shouldered washer**
3. **Airbox**

5. Attach the main fuse to the relay bracket.

Note

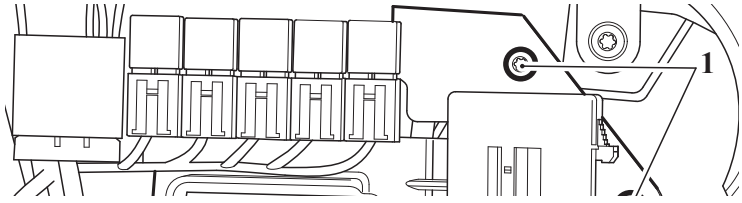
- **The keyless ECM is attached to the underside of the battery box.**

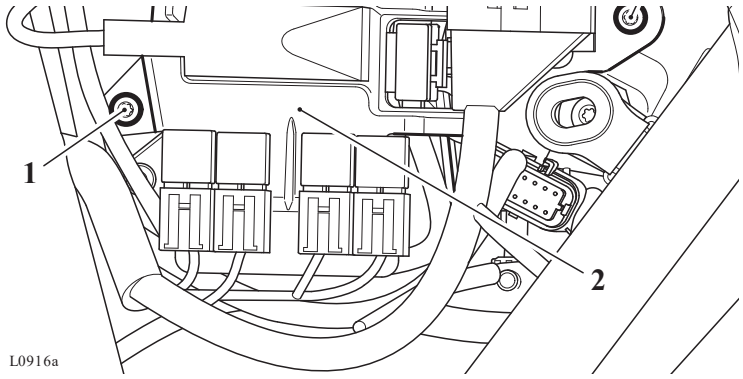
6. Position the battery box to the rear of the airbox and connect the electrical connector to the keyless electronic control module (ECM).



1. **Main fuse**
2. **Keyless ECM electrical connector**

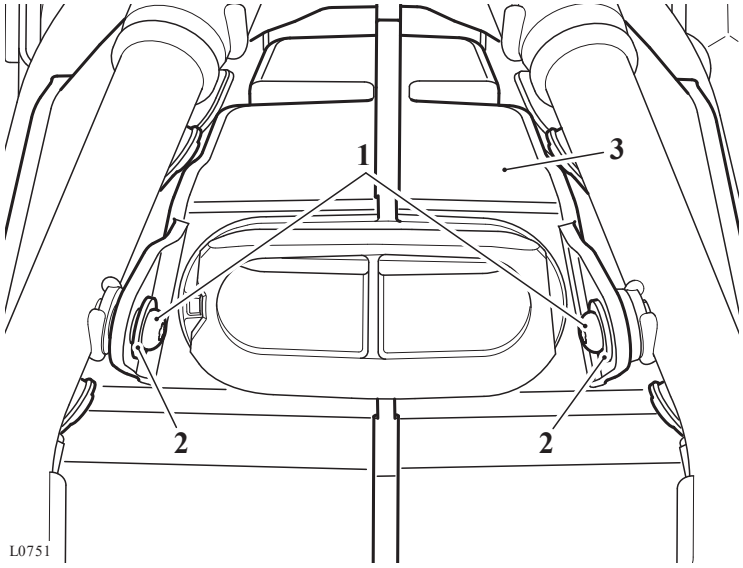
7. Attach the relay bracket to the left hand side of the airbox, ensuring the harness is not trapped, and tighten the three fixings to **1.5 Nm**.





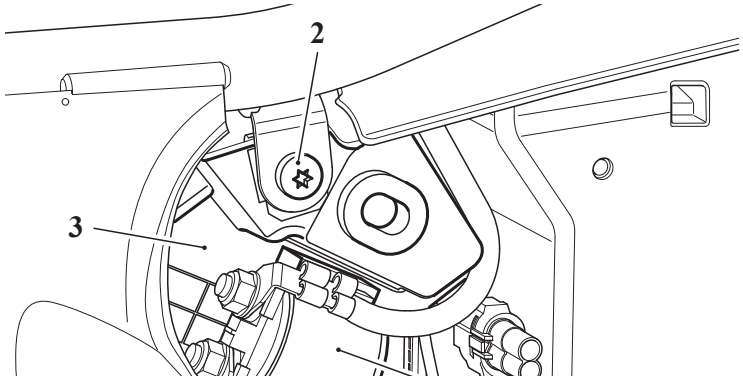
1. **Fixings**
2. **Relay bracket**

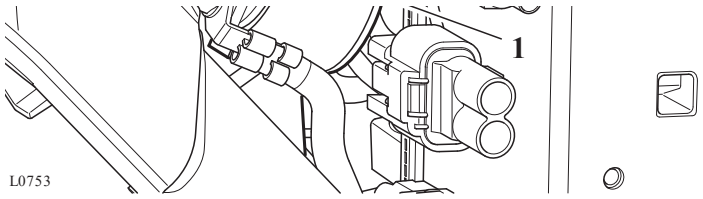
8. Carefully position the battery box to the rear of the airbox and secure to the frame. Tighten the fixings to **6 Nm**.
9. Tighten the airbox fixings to **6 Nm**.



1. **Fixing**
2. **Airbox**

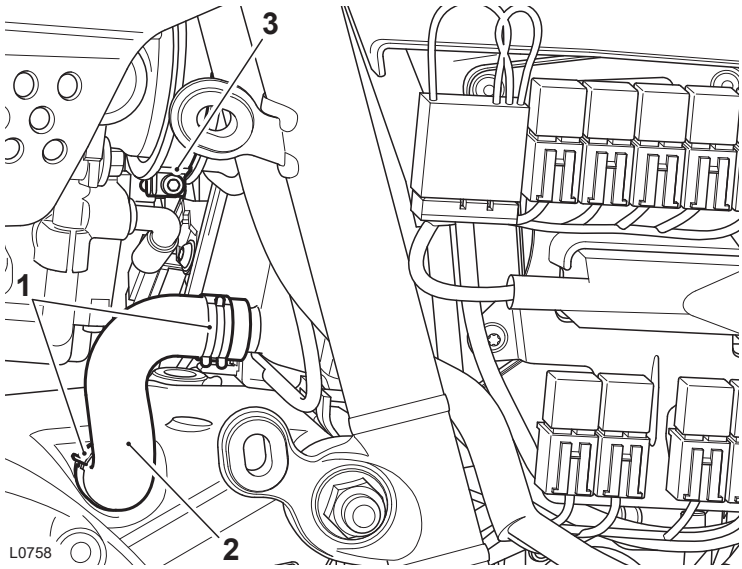
10. Attach the starter motor solenoid to the right hand side of the battery box.





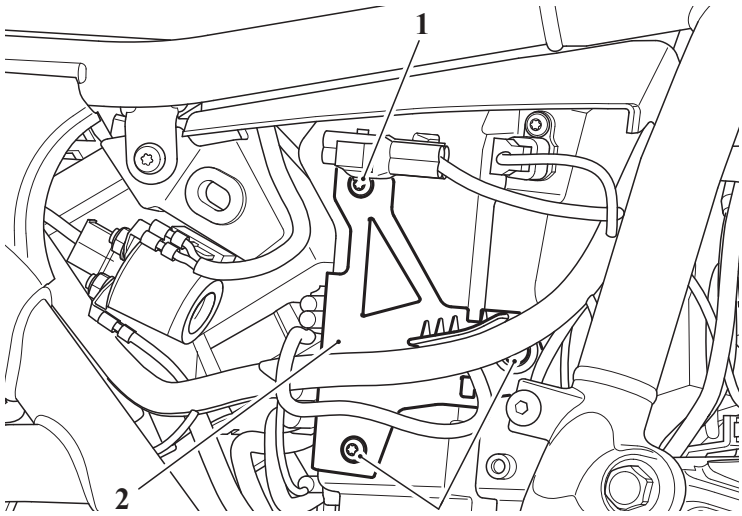
1. **Starter motor solenoid**
2. **Fixing**
3. **Battery box**

11. Fit the rear grommet for the left hand side panel.
12. Refit the engine breather hose and secure with the hose clips.



1. **Clips**
2. **Engine breather pipe**

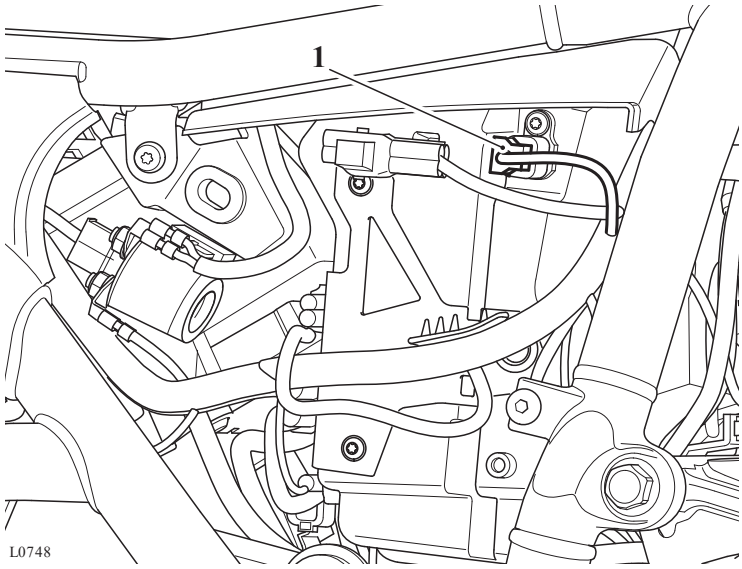
13. Attach the connector bracket to the right hand side of the airbox and tighten the fixings to **1.5 Nm**.





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

14. Attach the air temperature sensor to the airbox and tighten its fixing to **1.5 Nm**.
15. Connect the ambient air pressure sensor connector.



1. **Ambient air temperature sensor**
2. **Air pressure sensor**

Perform the following operations:

- Engine Electronic Control Module (ECM) - Installation
- Rear Mudguard - Installation
- Side Panels
- Fuel Tank - Installation
- Battery - Installation
- Seat - Installation

WARNING

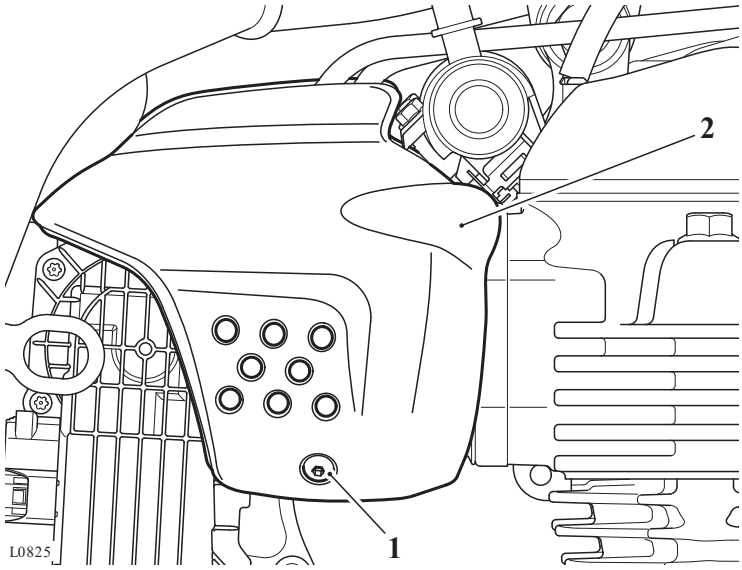
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Exhaust Silencer - Removal

- Side Panels

1. Remove the fixing and remove the air intake finishers.

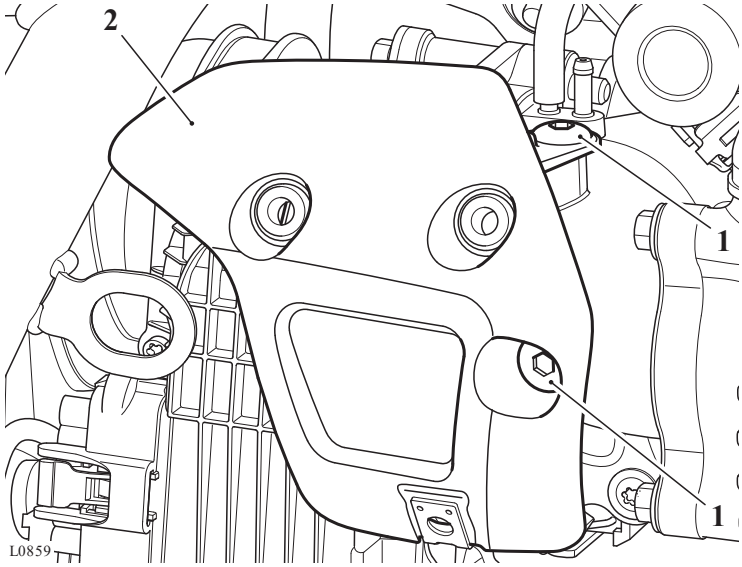


1. **Fixing**
2. **Air intake finisher (right hand side shown)**

Note

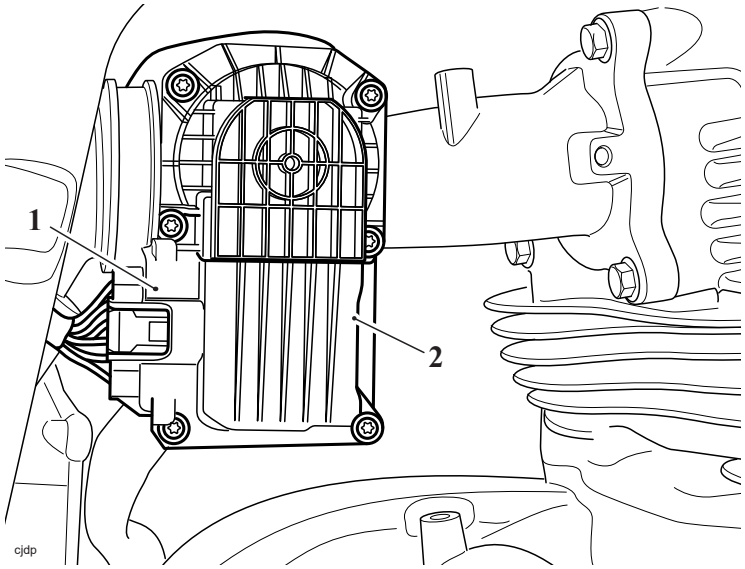
- **For the USA and Canadian Markets only, there is an ignition master switch and bracket assembly secured to the left hand side of the throttle body by the finisher mounting and its fixings.**

2. Remove the two fixings and remove the mountings for the air intake finisher.



1. **Fixings**
2. **Mounting (right hand side shown)**

3. Disconnect the throttle actuator motor multiplug.

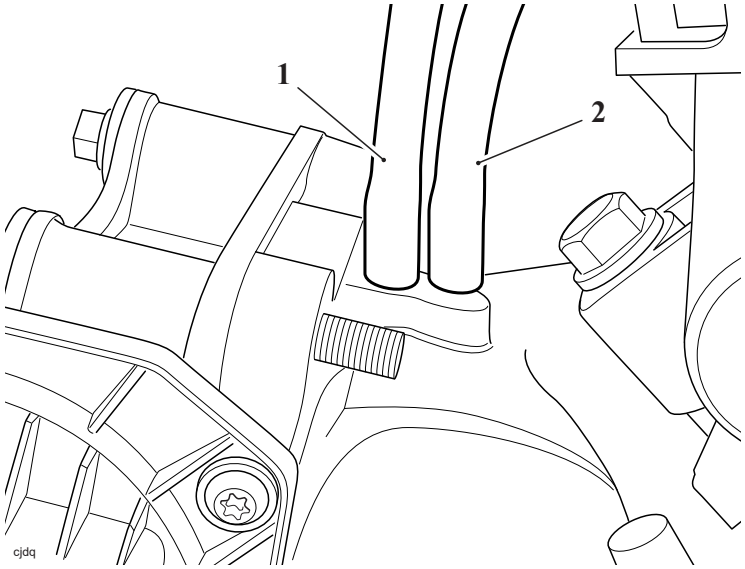


1. **Multiplug**
2. **Throttle actuator motor**

Note

- **Note which spigot on the inlet manifold the MAP sensor hose is fitted to and, if fitted, which spigot the evaporative emissions hose is fitted to for installation.**

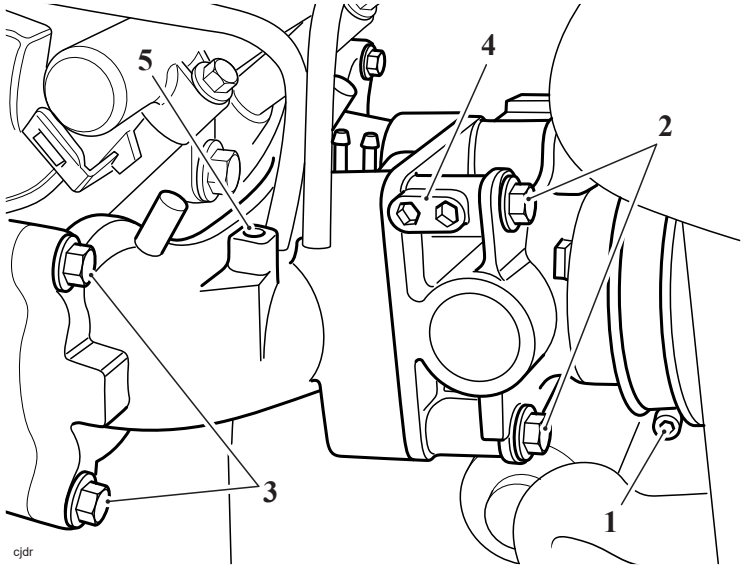
4. Disconnect the MAP hose and the evaporative emissions hose from the inlet manifold.



1. **Evaporative hose**
2. **MAP sensor hose**

5. Loosen the throttle body hose clamp.
6. Remove the four fixings securing the throttle body to the inlet manifold.

7. Remove the four fixings securing the inlet manifold to the cylinder head and remove the inlet manifold.
8. Remove the throttle body.

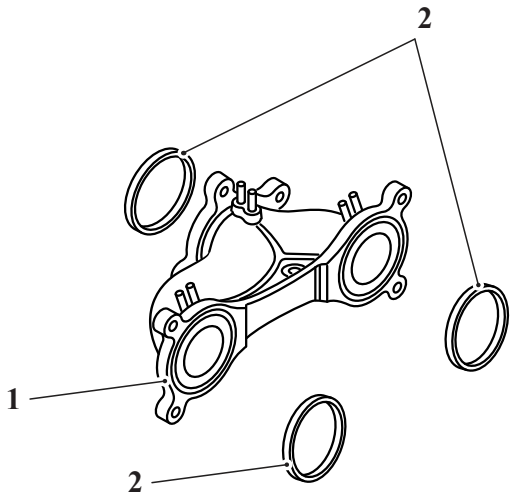


1. **Clamp**
2. **Throttle body fixings (left hand side)**
3. **Inlet manifold fixings (left hand side)**
4. **Throttle body**
5. **Inlet manifold**

Note

- **Note the orientation of the throttle body for installation.**

9. Remove and discard the three seals on the inlet manifold.



1. **Inlet manifold**
2. **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.

CAUTION

From VIN 783907 the purge valve restrictor has been removed from the purge valve hose. The restriction is now controlled by the purge valve spigot on the inlet manifold.

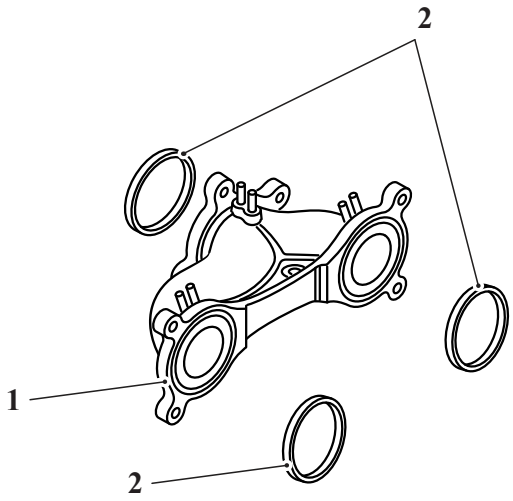
Fitting a new manifold with the purge valve restrictor in the spigot and using the original hose with a restrictor in it will not allow the carbon cannister to purge correctly.

Failure to purge the carbon cannister correctly will cause irreparable damage to the carbon cannister.

Note

- **If replacing the inlet manifold on models up to VIN 783906 check the purge control valve hose for the restrictor, approximately 25 mm from the inlet manifold end of the hose.**
- **If the hose has the restrictor, replace the hose with a new hose without the restrictor. Restriction is controlled by the spigot pressed into the new inlet manifold.**
- **When ordering replacement parts, always refer to the EPC.**

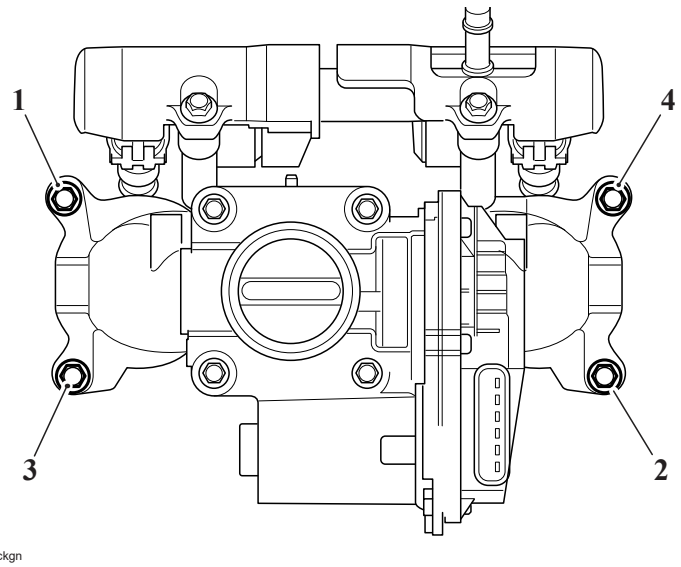
1. Ensure the mating surfaces on the inlet manifold and the cylinder head are clean.
2. Fit three new seals to the mating surfaces of the inlet manifold.



1. **Inlet manifold**

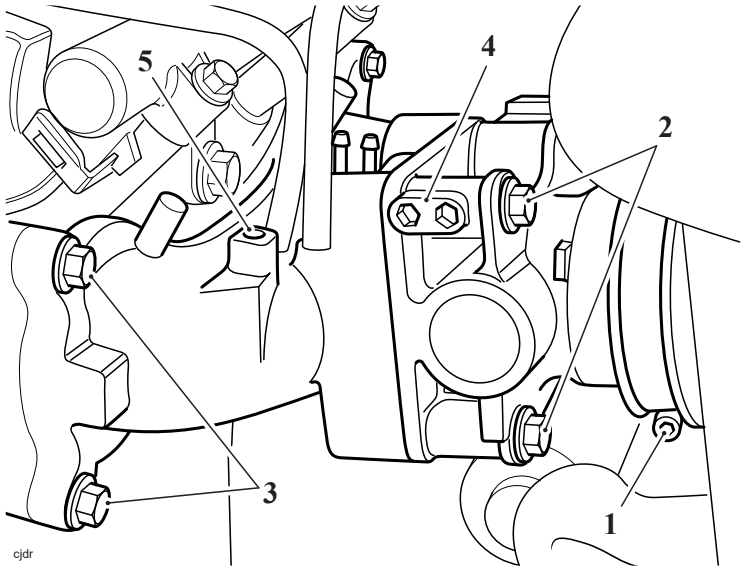
2. **Seals**

3. Fit the inlet manifold to the cylinder head. Do not fully tighten the fixings at this stage.
4. Ensure the mating surfaces of the throttle body and inlet manifold are clean.
5. Position the throttle body to the throttle body hose. Do not tighten the clamp at this stage.
6. Fit the throttle body to the inlet manifold. Do not fully tighten the fixings at this stage.
7. Tighten the inlet manifold to cylinder head fixings to **9 Nm** in the sequence shown below.
8. Retighten the fixings one and two to **9 Nm**.



Tightening Sequence

9. Tighten the throttle body to inlet manifold fixings to **9 Nm**.
10. Ensure the throttle body hose is correctly fitted and tighten the clip to **1.5 Nm**.



1. **Clamp**

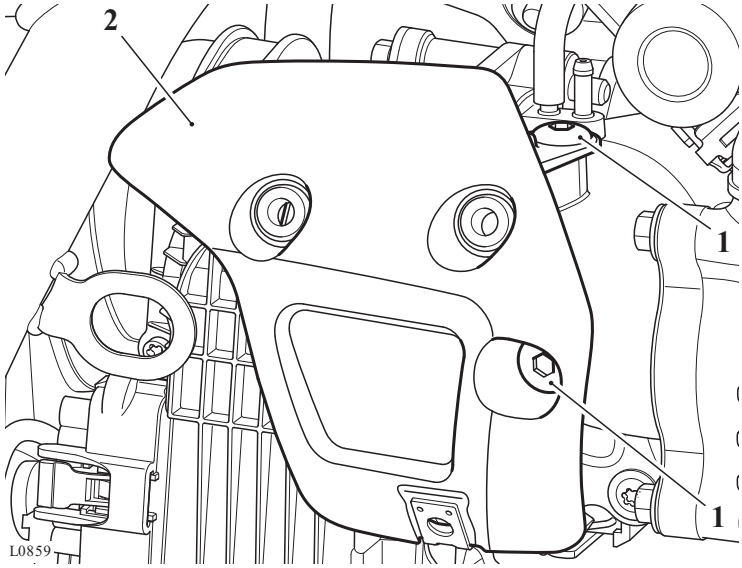
2. **Throttle body fixings (left hand side)**
3. **Inlet manifold fixings (left hand side)**
4. **Throttle body**
5. **Inlet manifold**

11. Connect the multiplug to the throttle actuator motor.
12. Connect the MAP hose and the evaporative emissions hose (if fitted) to the inlet manifold, as noted for removal.

Note

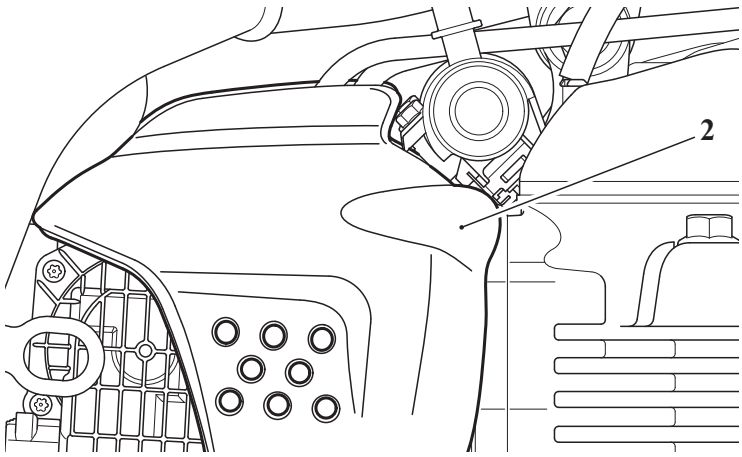
- **For the USA and Canadian Markets only, there is an ignition master switch and bracket assembly secured to the left hand side of the throttle body by the finisher mounting and its fixings.**

13. Fit the mountings for the air intake finisher and tighten its new fixings to **3 Nm**.



1. **Fixings**
2. **Mounting (right hand side shown)**

14. Fit the air intake finishers and tighten the new fixing to **1.5 Nm**.





1. **Fixing**
2. **Air intake finisher (right hand side shown)**

Perform the following operations:

- Side Panels
- Exhaust Silencer - Installation
- Fuel Tank - Installation
- Battery - Installation
- Seat - Installation

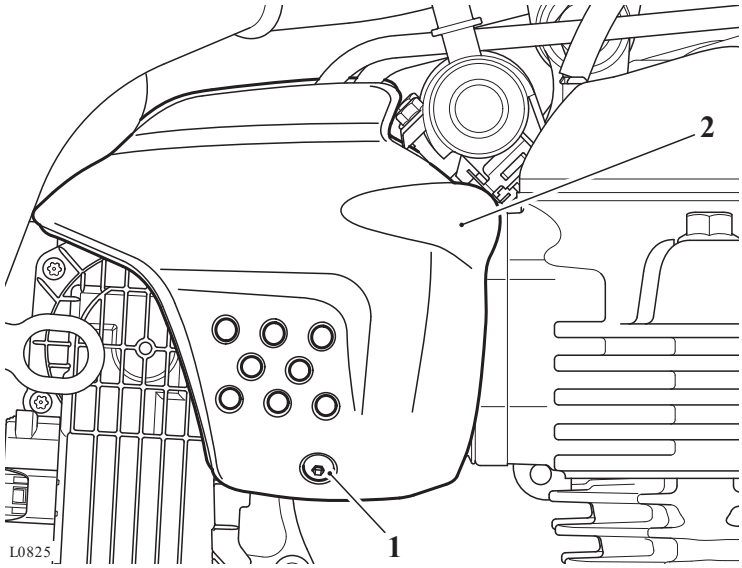
WARNING

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.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal
- Exhaust Silencer - Removal
- Side Panels

1. Remove the fixing and remove the air intake finishers.



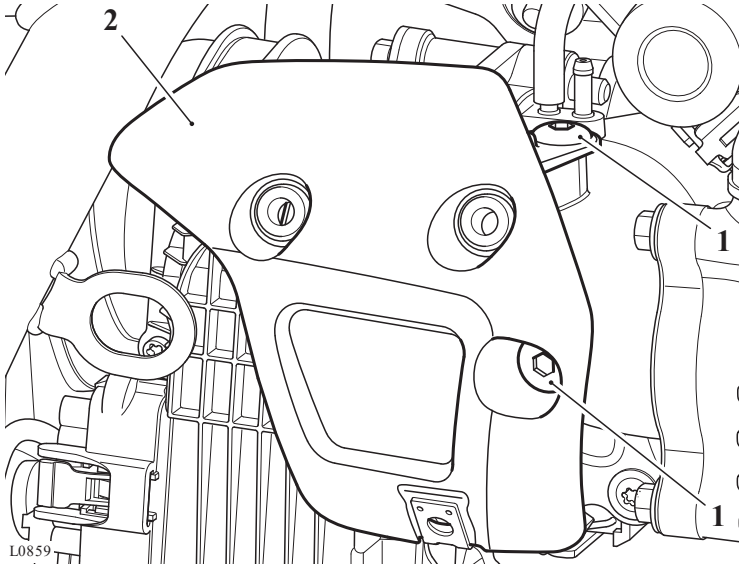
1. **Fixing**

2. **Air intake finisher (right hand side shown)**

Note

- **For the USA and Canadian Markets only, there is an ignition master switch and bracket assembly secured to the left hand side of the throttle body by the finisher mounting and its fixings.**

2. Remove the two fixings and remove the mountings for the air intake finisher.

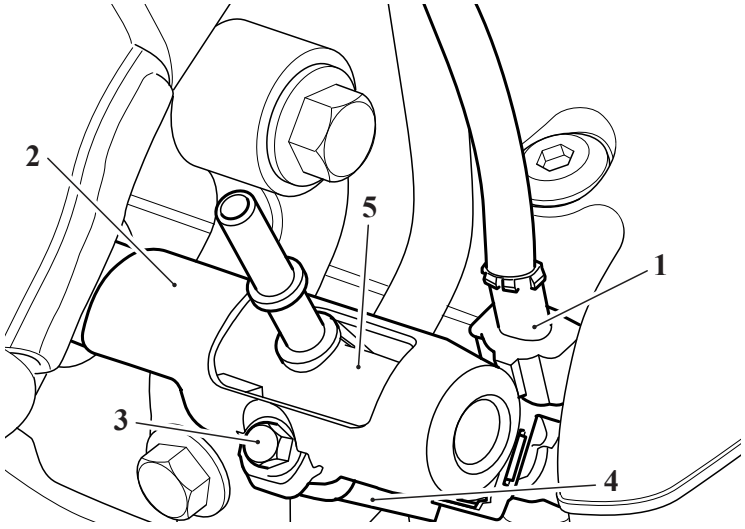


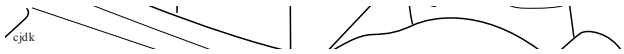
1. **Fixings**
2. **Mounting (right hand side shown)**

Note

- **The fuel rail and injectors are removed from the cylinder head together.**

3. Disconnect the electrical connector from the fuel injectors.
4. Remove the two fixings securing the fuel rail and fuel rail covers to the cylinder head. Collect the spacers between the fuel rail and cylinder head and the two covers.





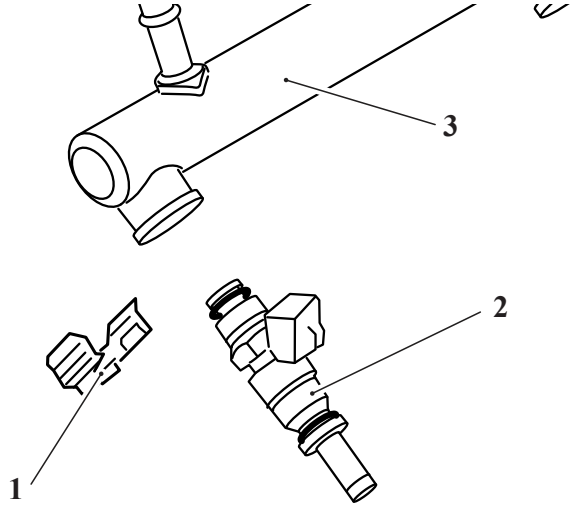
1. **Electrical connector (right hand side shown)**
2. **Fuel rail cover (right hand side shown)**
3. **Fixing (right hand side shown)**
4. **Spacer**
5. **Fuel rail**

5. Gently ease the fuel rail and injectors upwards to release them from the cylinder head.

Note

- **The fuel injectors are not to be removed from the fuel rail unless they are to be replaced.**
- **If the injectors require replacing continue from step 6.**
- **Note the position of the retaining clip for installation.**

6. Carefully remove the retaining clips securing the fuel injectors to the fuel rail.
7. Ease each injector from the fuel rail.

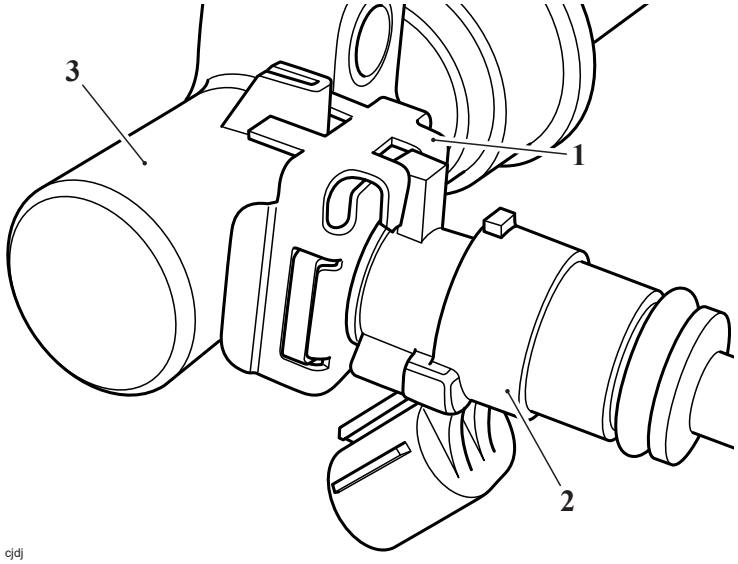


1. **Retaining clip**
2. **Injector**
3. **Fuel rail**

Note

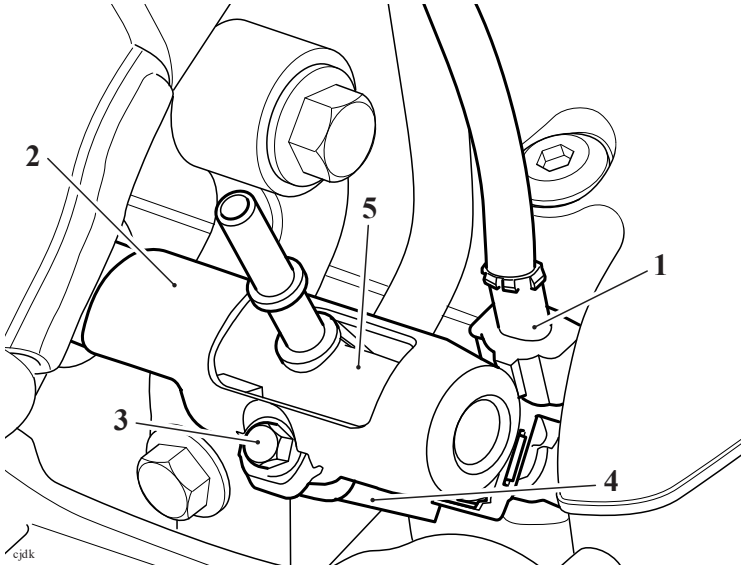
- **If the fuel injectors have been removed from the fuel rail, continue from step 1 and omit steps 3 and 4.**
- **If the fuel injectors have not been removed, continue from step 3.**

1. Lightly lubricate the O-rings with clean engine oil and fit the new fuel injectors to the fuel rail.
2. Fit the retaining clip for each fuel injector as noted for removal.



1. **Retaining clip**
2. **Fuel injector**
3. **Fuel rail**

3. Remove and discard the O-ring on the fuel injector.
4. Fit a new O-ring using finger pressure only.
5. Lightly lubricate the O-ring on the injectors and fit the injector/fuel rail assembly to the cylinder head, orientating each injector such that the electrical connection is facing upwards.
6. Fit the spacers between the fuel rail and cylinder head, fit the fuel rail covers, fit and tighten the fixings to **6 Nm**.



1. **Electrical connector (right hand side shown)**
2. **Fuel rail cover (right hand side shown)**
3. **Fixing (right hand side shown)**

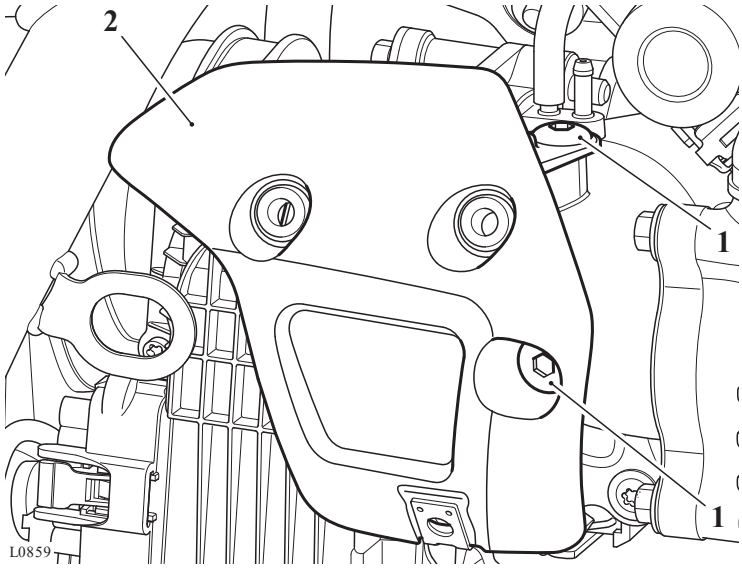
4. **Spacer**
5. **Fuel rail**

7. Connect the electrical connectors to the fuel injectors.

Note

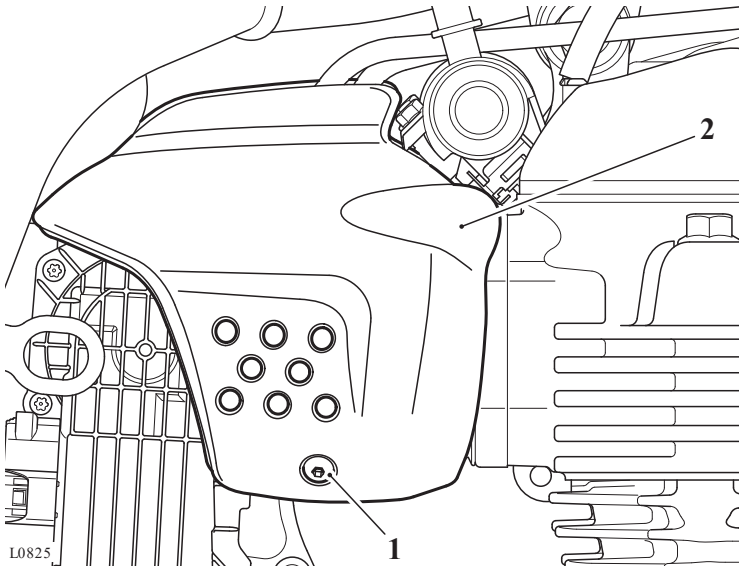
- **For the USA and Canadian Markets only, there is an ignition master switch and bracket assembly secured to the left hand side of the throttle body by the finisher mounting and its fixings.**

8. Fit the mountings for the air intake finisher and tighten its new fixings to **3 Nm**.



1. **Fixings**
2. **Mounting (right hand side shown)**

9. Fit the air intake finishers and tighten the new fixing to **1.5 Nm**.



1. **Fixing**
2. **Air intake finisher (right hand side shown)**

Perform the following operations:

- Side Panels
- Exhaust Silencer - Installation
- Fuel Tank - Installation
- Battery - Installation
- 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.

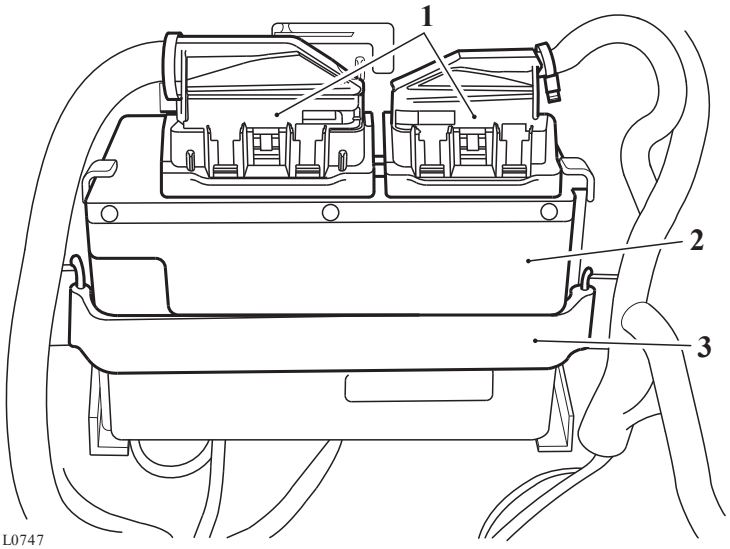
Note

- **The engine ECM is located at the rear of the battery box.**

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Rear Mudguard - Removal

1. Remove the engine electronic control module (ECM) strap and detach it from the battery box.
2. Disconnect the two electrical connectors and remove the engine ECM (see Electrical Connectors).



1. **Electrical connectors**

2. **Engine ECM**
3. **Strap**

Throttle Actuator Motor

Twist Grip - Removal

Twist Grip - Installation

Twist Grip Position Sensor - Removal

Twist Grip 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. Reconnect the engine ECM connectors (see Electrical Connectors).
2. Secure the engine ECM to the battery box with the strap.

Perform the following operations:

- Rear Mudguard - Installation
- Battery - Installation
- Seat - Installation

CAUTION

The fixings for the throttle actuator motor are marked with yellow paint and must not be loosened or removed.

If the fixings have been loosened or removed the throttle body assembly must be replaced as there are no means to reset the throttle actuator motor to its correct position.

The throttle actuator motor is an integral part of the throttle body and cannot be adjusted or replaced separately.

WARNING

Before starting work, ensure the 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:

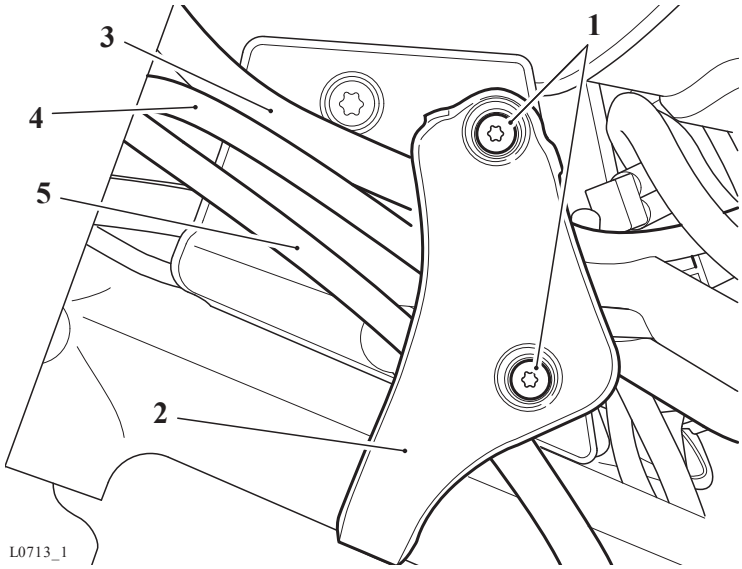
- Seat - Removal
- Battery - Removal

- Fuel Tank - Removal
- Handguards - Removal

Note

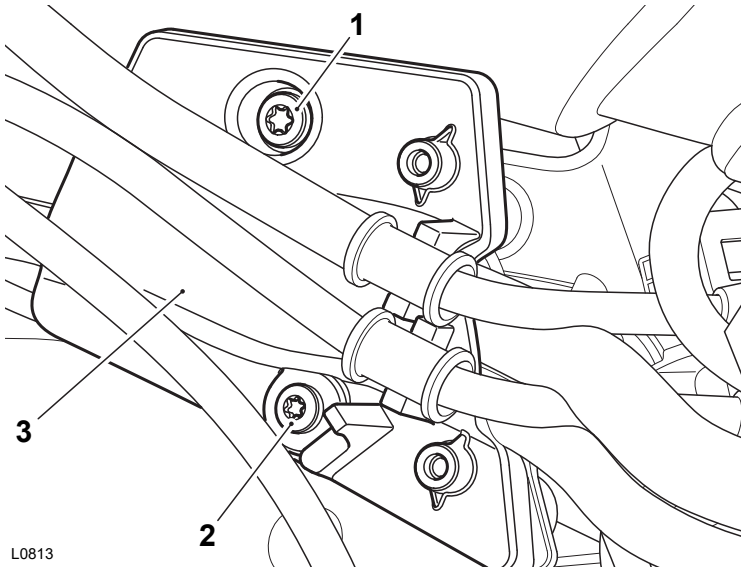
- **Note the routing of the brake lines, clutch cable and harnesses through the headstock tidy for installation.**

1. Release the fixings and remove headstock tidy outer cover.



1. **Fixings**
2. **Outer cover**
3. **Front brake master cylinder brake line**
4. **Front brake caliper brake line**
5. **Clutch cable**

2. Release the fixings and remove the headstock centre cover.

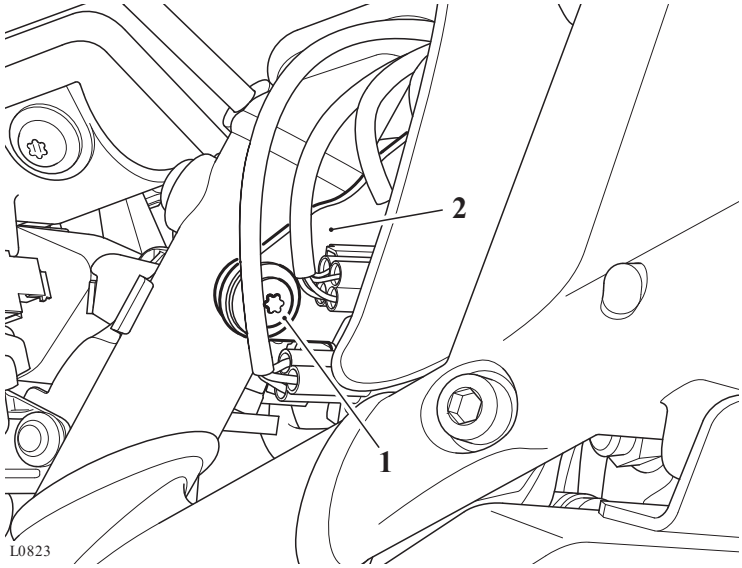


1. **Fixing M5**
2. **Fixing M4**
3. **Centre cover**

Note

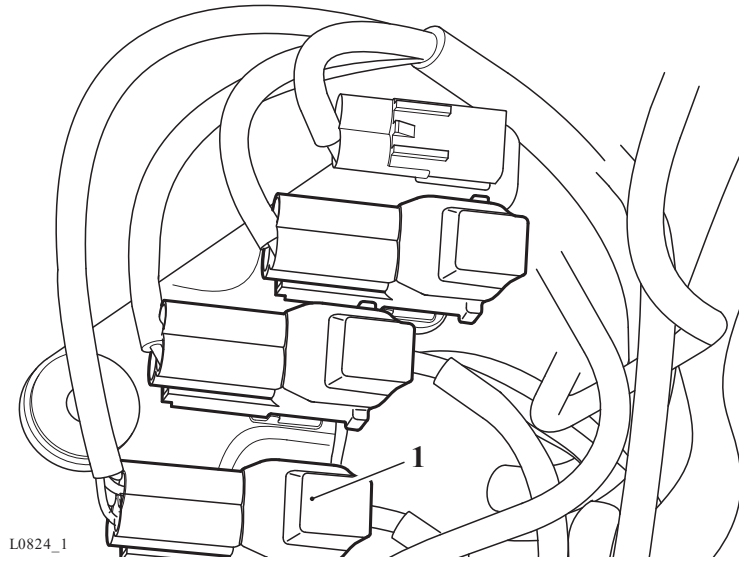
- **Note the routing of the heated grip subharness and its rubber bands for installation.**

3. Release the fixing and detach the connector bracket from the right hand side of the headstock.



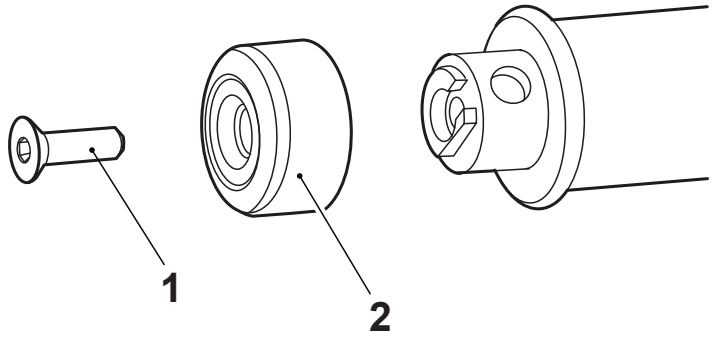
1. **Fixing**
2. **Connector bracket**

4. Disconnect the heated grip electrical connector from the main harness and route the harness to the left hand heated grip.



1. Heated grip connector

5. Remove the right hand handlebar end weight. Discard the fixing.



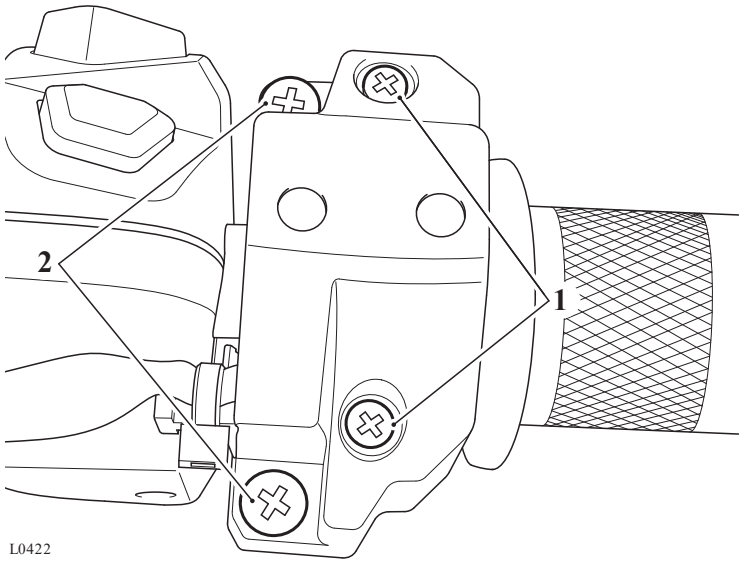
cccw_5

1. **Fixing**
2. **End weight**

Note

- **The anti-tamper fixings on the twist grip housing must not be loosened or removed.**
- **If the anti-tamper fixings have been loosened or removed any warranty claims for the twist grip housing will not be honoured.**

6. Release the fixings and remove the clamp for the twist grip housing from the handlebar.



L0422

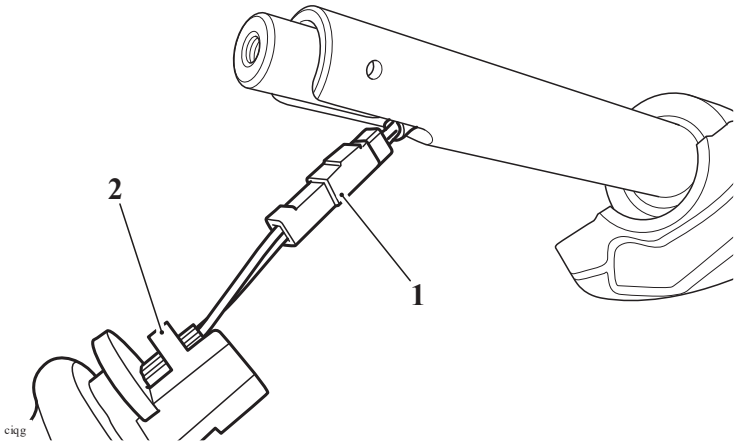
1. **Anti-tamper fixings**

2. **Fixings**

Note

- **Note the position and orientation of the twist grip to its housing for installation.**
- **Note the routing of the heated grip harness for installation.**

7. Slide the heated twist grip off the handlebar while carefully feeding the heated grip subharness into the hole on the left hand side of the handlebar between the switch housing and the clutch lever clamp.
8. Disconnect the electrical connector and remove the heated twist grip.

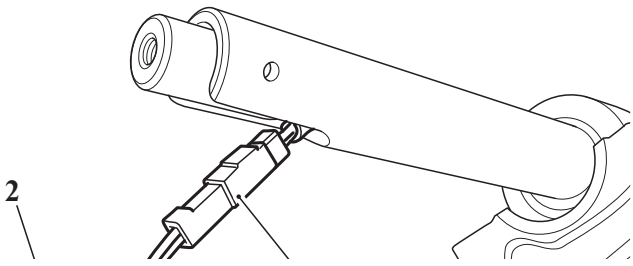


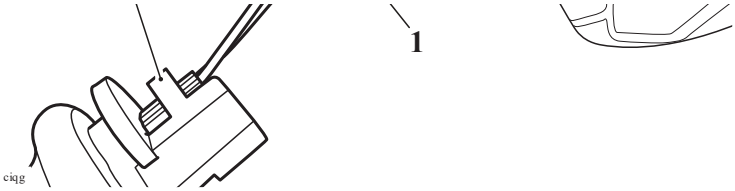
1. **Electrical connector**
2. **Heated twist grip**

WARNING

Before starting work, ensure the 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 of the heated twist grip to the subharness.



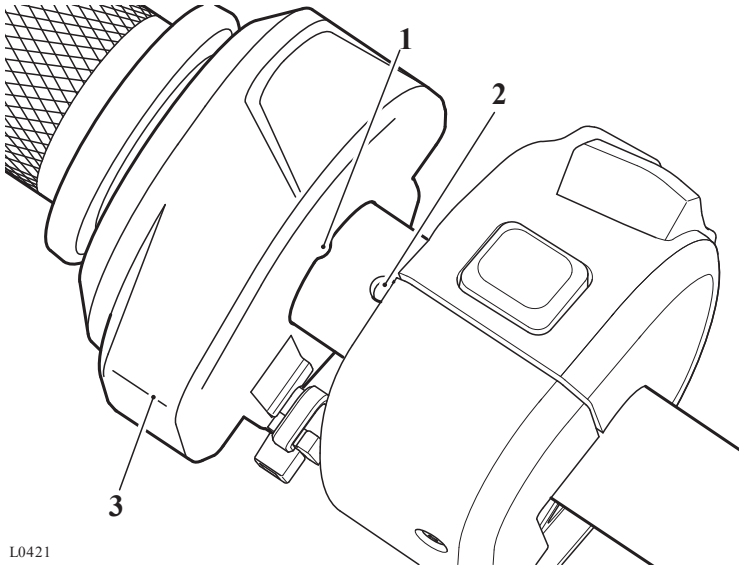


1. **Electrical connector**
2. **Heated twist grip**

CAUTION

When fitting the heated grips, do not excessively twist the grip forward or rearward. Excessive twisting of the grip may damage the heated grip harness.

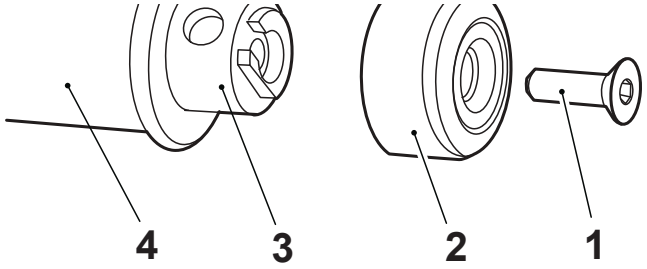
2. Fit the heated twist grip while carefully feeding the subharness out from the hole on the left hand side of the handlebar.
3. Align the twist grip to the twist grip position sensor as noted for removal.
4. Fit the twist grip clamp. Ensure the locating lug fits into its hole on the handlebar.



1. **Locating lug**
2. **Hole**
3. **Twist grip clamp**

5. Fit the fixings and tighten, upper one first, to **2.5 Nm**.
6. Refit the right hand handlebar end weight and spacer. Tighten the new fixing to **5 Nm**.

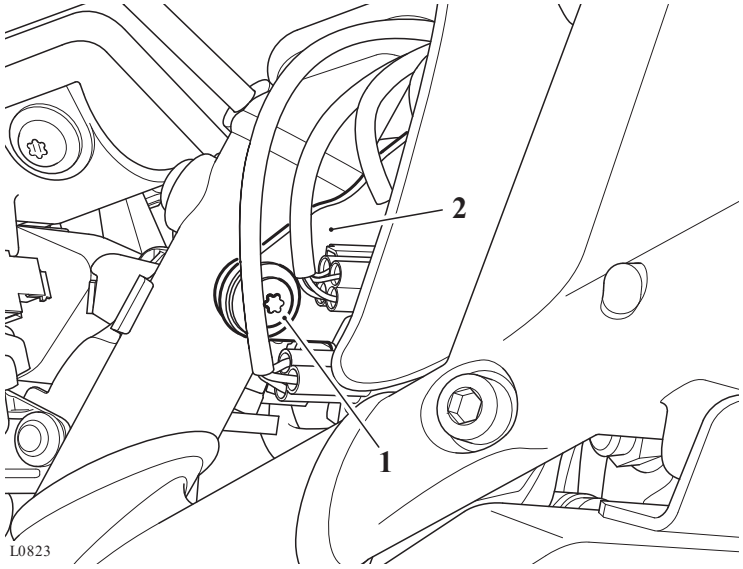




cccw_11

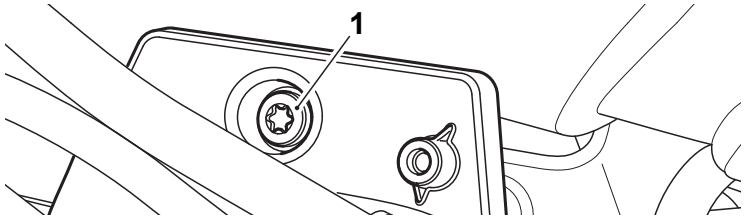
1. **Fixing**
2. **Handlebar end weight**
3. **Handlebar**
4. **Heated twist grip**

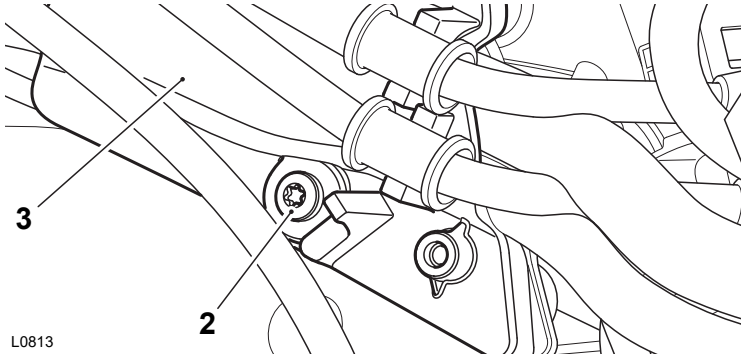
7. Route the heated grip harness to the headstock as noted for removal and connect to the main harness.
8. Fit the connector bracket to the right hand side of the headstock and tighten its fixing to **3 Nm**.



1. **Fixing**
2. **Connector bracket**

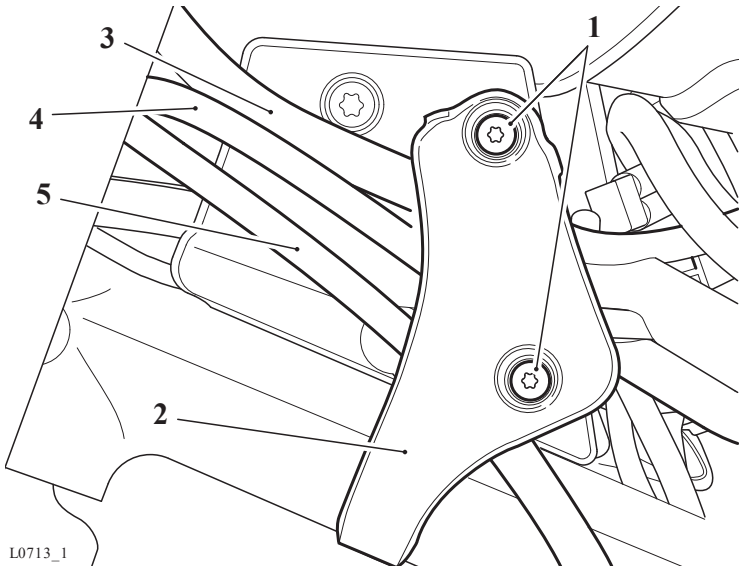
9. Position the harnesses to the headstock tidy as noted for removal. Fit the headstock centre cover and tighten the M5 fixing to **5 Nm** and the M4 fixing to **3 Nm**.





1. **Fixing M5**
2. **Fixing M4**
3. **Centre cover**

10. Position the front brake lines and the clutch cable to the headstock tidy as noted for removal.
11. Fit the headstock tidy outer cover and tighten the fixings to **3 Nm**.



1. **Fixings**
2. **Outer cover**
3. **Front brake master cylinder brake line**
4. **Front brake caliper brake line**
5. **Clutch cable**

Perform the following operations:

- Battery - Installation
- Seat - 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.

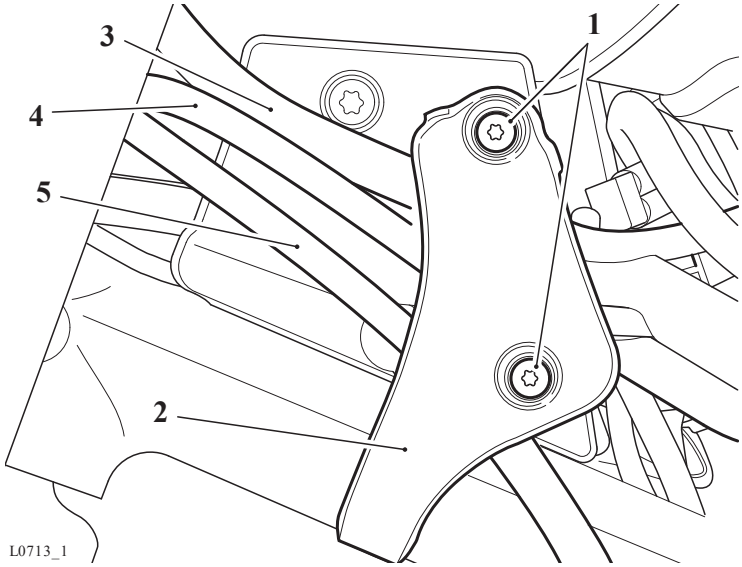
Perform the following operations:

- Seat - Removal
- Battery - Removal
- Twist Grip - Removal

Note

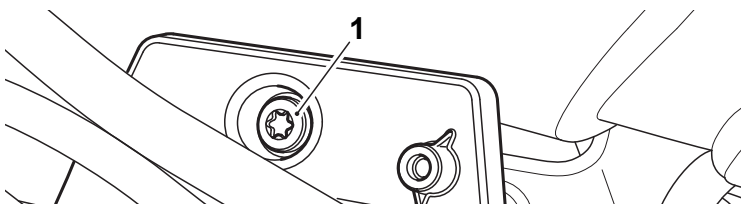
- **Note the orientation of the twist grip position sensor for installation.**
- **Note the routing of the twist grip harness and its rubber bands for installation.**
- **Note the routing of the brake lines, clutch cable and harnesses through the headstock tidy for installation.**

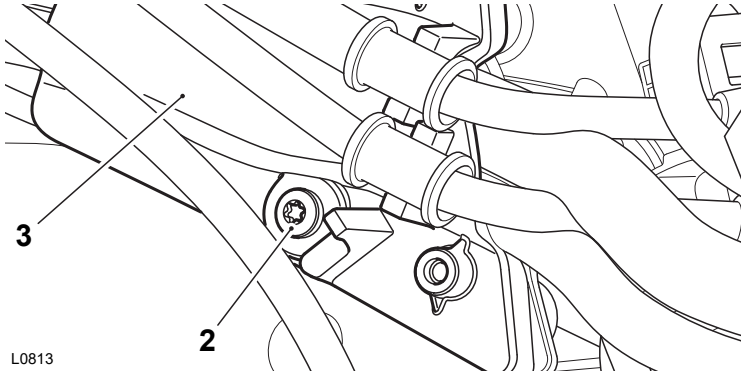
1. Release the fixings and remove headstock tidy outer cover.



1. **Fixings**
2. **Outer cover**
3. **Front brake master cylinder brake line**
4. **Front brake caliper brake line**
5. **Clutch cable**

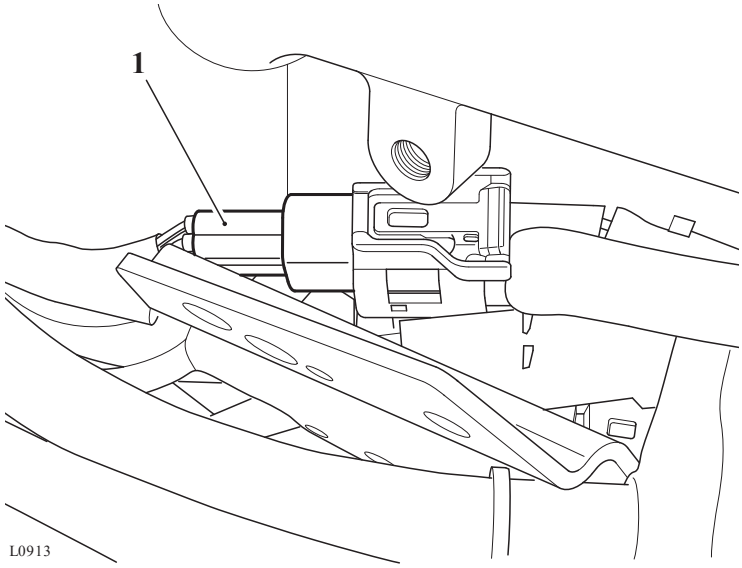
2. Release the fixings and remove the headstock centre cover.





1. **Fixing M5**
2. **Fixing M4**
3. **Centre cover**

3. Disconnect the twist grip position sensor electrical connector from the main harness and route the harness to the twist grip.



1. **Twist grip position sensor electrical connector**

4. Slide the twist grip position sensor off the handlebar.

Intake Air Temperature Sensor - Removal

Intake Air Temperature Sensor - Installation

Coolant Temperature Sensor - Removal

Coolant Temperature Sensor - Installation

Manifold Absolute Pressure (MAP) Sensor - Removal

Manifold Absolute Pressure (MAP) Sensor - Installation

Ambient Air Pressure Sensor - Removal

Ambient Air Pressure Sensor - Installation

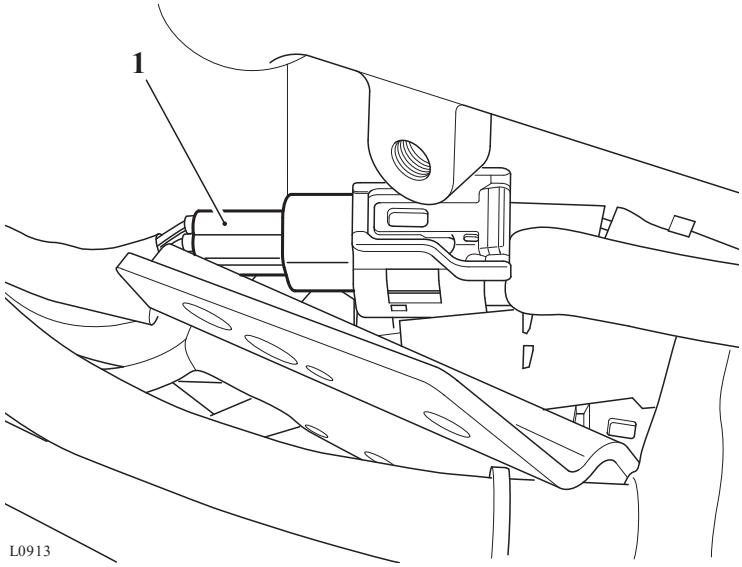
Gear Position Sensor - Removal

Gear Position Sensor - Installation

WARNING

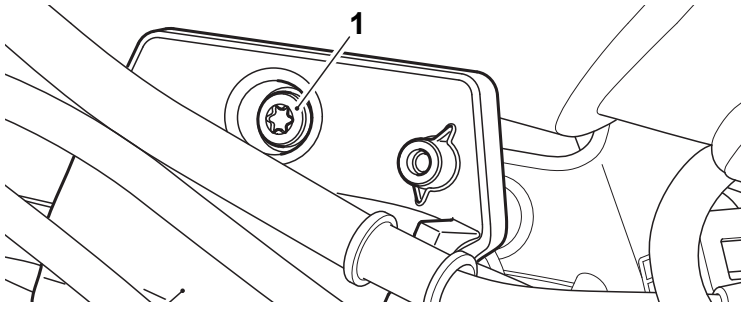
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

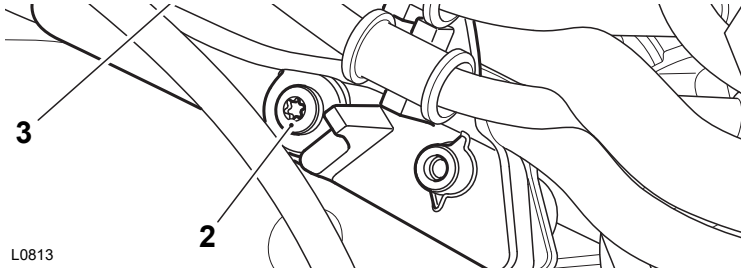
1. Slide the twist grip position sensor onto the handlebar in the orientation noted for removal.
2. Route the twist grip harness to the main harness as noted for removal.
3. Connect the twist grip position sensor electrical connector to the main harness.



1. Twist grip position sensor electrical connector

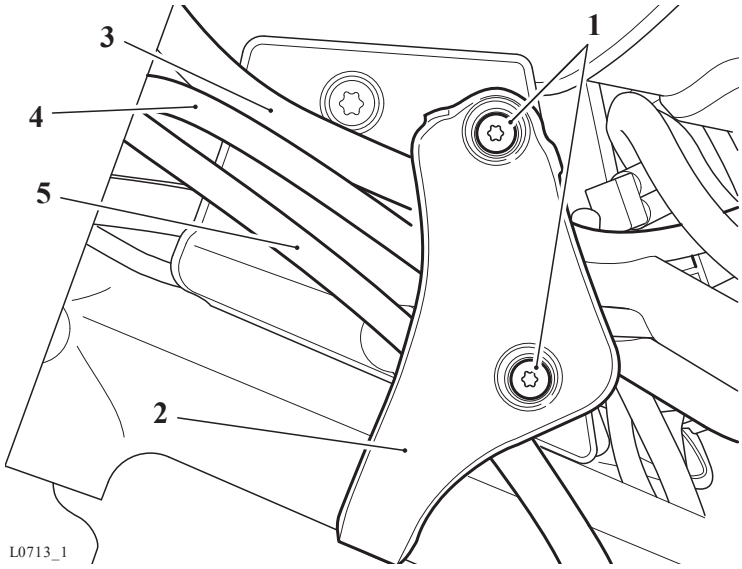
4. Position the harnesses to the headstock tidy as noted for removal. Fit the headstock centre cover and tighten the M5 fixing to **5 Nm** and the M4 fixing to **3 Nm**.





1. **Fixing M5**
2. **Fixing M4**
3. **Centre cover**

5. Position the front brake lines and the clutch cable to the headstock tidy as noted for removal.
6. Fit the headstock tidy outer cover and tighten the fixings to **3 Nm**.



1. **Fixings**
2. **Outer cover**
3. **Front brake master cylinder brake line**
4. **Front brake caliper brake line**
5. **Clutch cable**

Perform the following operations:

- Twist Grip - Installation
- Battery - Installation
- Seat - Installation

WARNING

Move the handlebars to left and right full lock while checking that the brake hose, clutch

WARNING

hose and electrical harnesses do not bind or that the steering feels tight or difficult to turn. A hose, 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.

Check for correct operation of the front brake, clutch and twist grip. Check that the brake hose, clutch hose and electrical harnesses do not bind or restrict the steering when the handlebars are turned from lock-to-lock. Rectify as necessary.

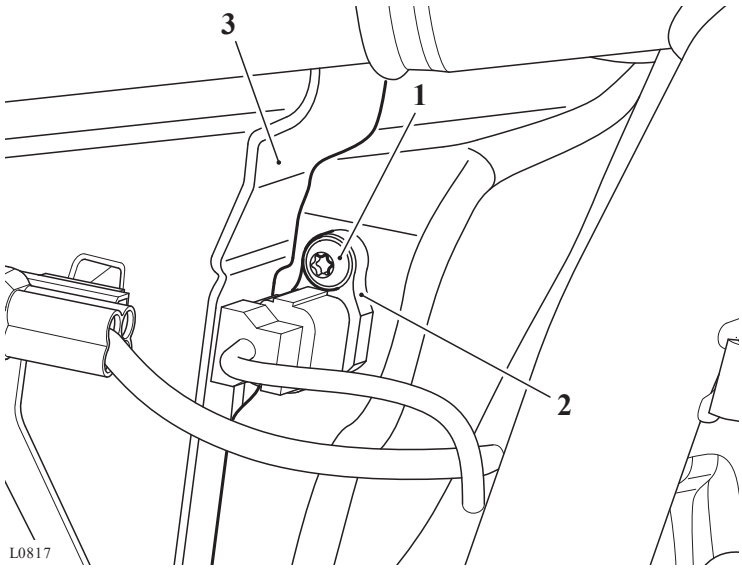
WARNING

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.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Right hand Side Panels

1. Disconnect the electrical connector from the sensor.
2. Remove the fixing and remove the sensor from the airbox.



1. Fixing

2. Electrical connector

3. Airbox

1. Fit the sensor to the airbox and tighten the fixing to **1.5 Nm**.
2. Reconnect the electrical connector to the sensor.

Perform the following operations:

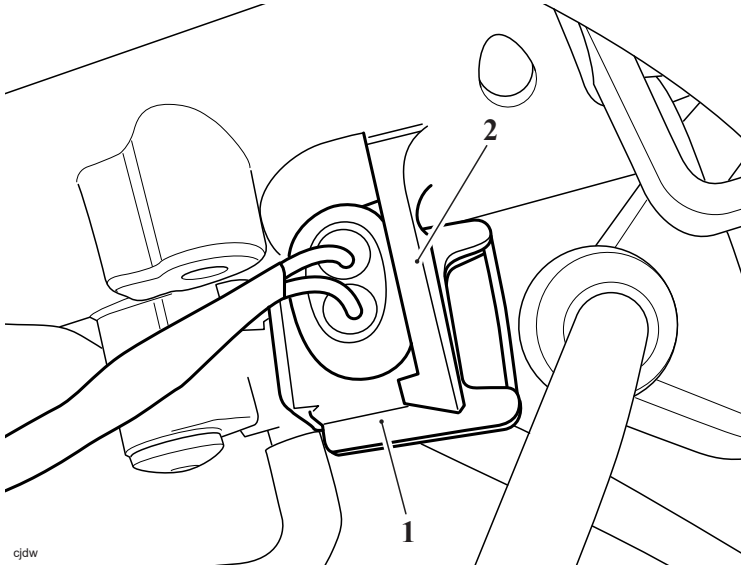
- Refit the right hand Side Panels

- Battery - Installation
- Seat - Installation

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal
- Coolant Replacement - Drainage
- Radiator - Removal

1. Detach the coolant temperature connector from the ignition coils bracket.



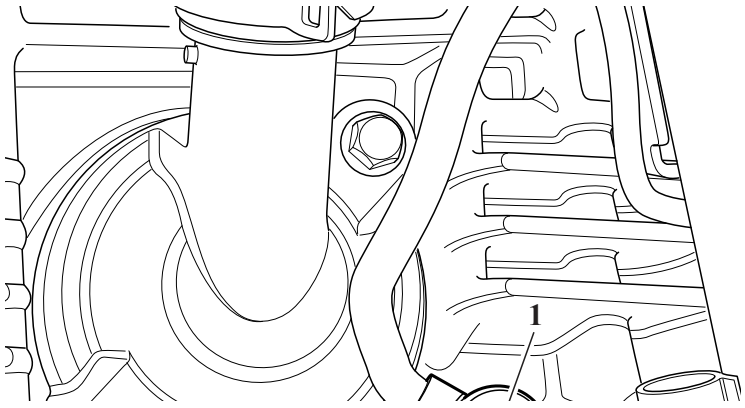
1. **Coolant temperature sensor connector**
2. **Ignition coils bracket**

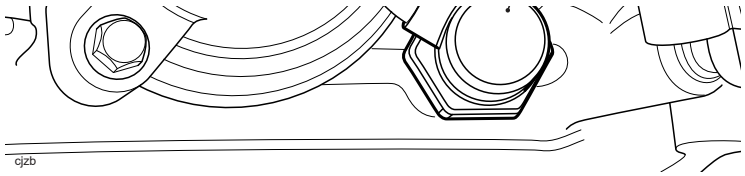
2. Press the wire locking device fully in and detach the coolant temperature sensor from the main harness.

Note

- **Note the routing of the coolant temperature harness for installation.**

3. Remove the rubber cover and using a suitable 19 mm slotted socket, remove the coolant temperature sensor from the cylinder head and discard the washer.





1. Coolant temperature sensor

1. Fit a new washer to the coolant temperature sensor.
2. Apply ThreeBond 1374 to the threads of the coolant temperature sensor.
3. Fit the coolant temperature sensor into the cylinder head and tighten to **18 Nm**.
4. Route the wiring as noted prior to removal and reconnect the sensor to the main harness.
5. Refit the coolant temperature sensor electrical connector to the ignition coils bracket.

Perform the following operations:

- Radiator - Installation
- Coolant Replacement - Filling
- Fuel Tank - Installation
- Battery - Installation
- Seat - Installation

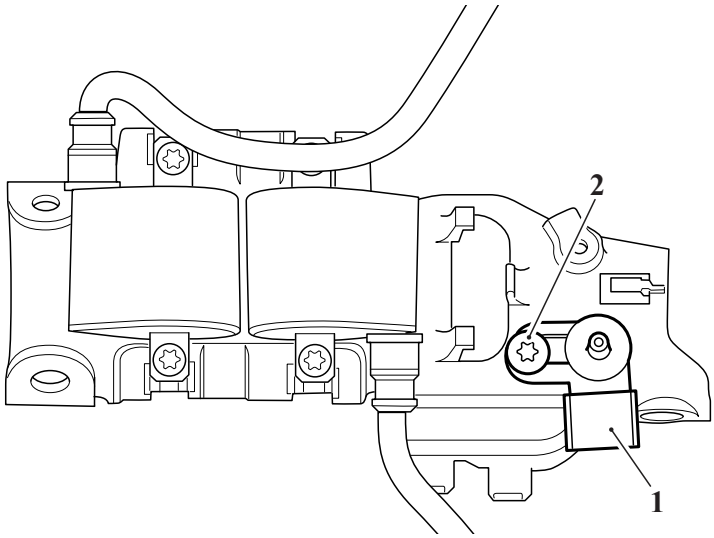
WARNING

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.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal
- Ignition Coils - Removal

1. Remove the fixing and remove the MAP sensor.



cjdv

1. **MAP sensor**
2. **Fixing**

Ignition Coils - Removal

1. Fit the sensor to the ignition coils bracket and tighten the fixing to **2 Nm**.

Perform the following operations:

- Ignition Coils - Installation
- Fuel Tank - Installation
- Battery - Installation
- Seat - Installation

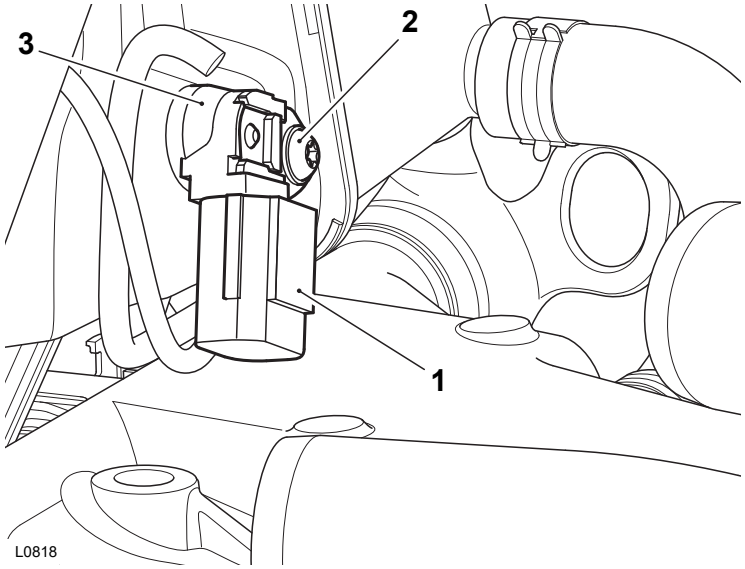
WARNING

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.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Throttle Body and Inlet Manifold Assembly - Removal

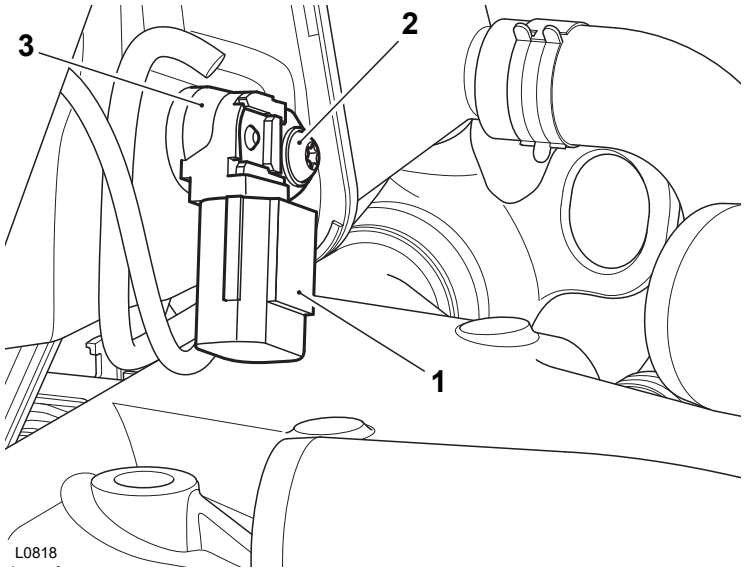
1. Disconnect the electrical connector from the sensor.
2. Release the fixing and remove the sensor.



1. **Electrical connector**
2. **Fixing**

3. Ambient air pressure sensor

1. Fit the sensor to the airbox and secure with the fixing. Tighten to **2 Nm**.
2. Reconnect the electrical connector to the sensor.



1. **Electrical connector**
2. **Fixing**
3. **Ambient air pressure sensor**

Perform the following operations:

- Throttle Body and Inlet Manifold Assembly - Installation
- Battery - Installation
- Seat - Installation

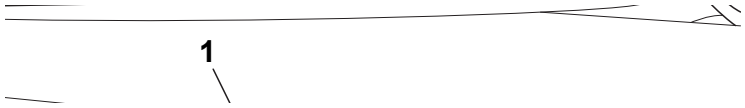
WARNING

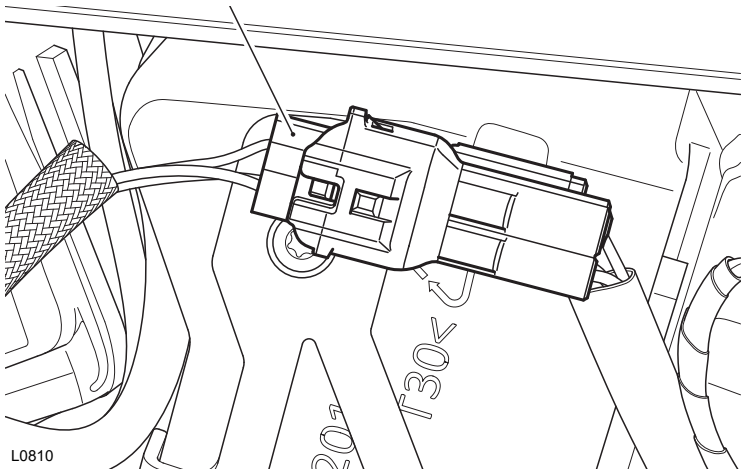
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Right hand Side Panels
- Front Sprocket Cover - Removal

1. On the right side of the airbox, disconnect the gear position sensor electrical connector from the main harness.





1. **Gear position sensor electrical connector**

Note

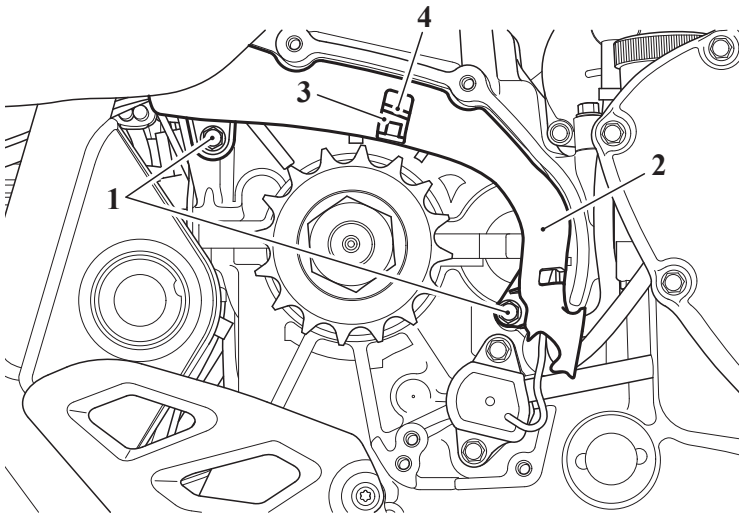
- **Note the routing of the gear position sensor harness for installation.**

2. Route the gear position sensor harness through the frame to the harness guide on the crankcase.

Note

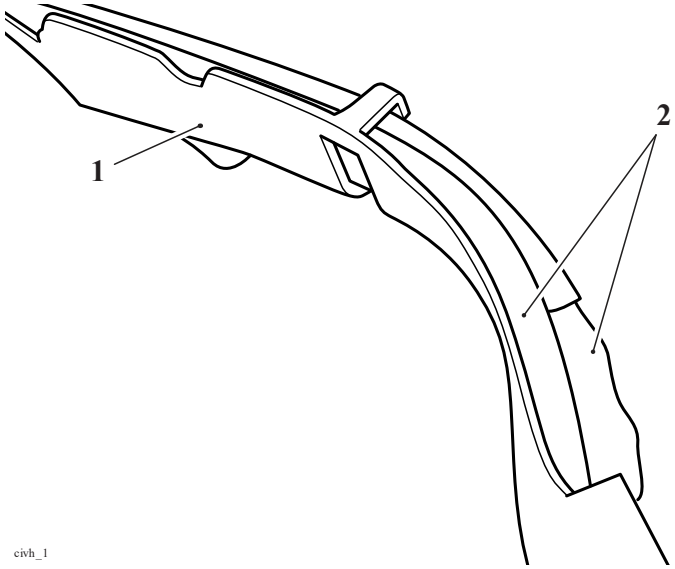
- **Note that the white tape on the harnesses within the harness guide aligns with the upper gap for installation.**

3. Remove and discard the fixings and detach the harness guide from the crankcase.



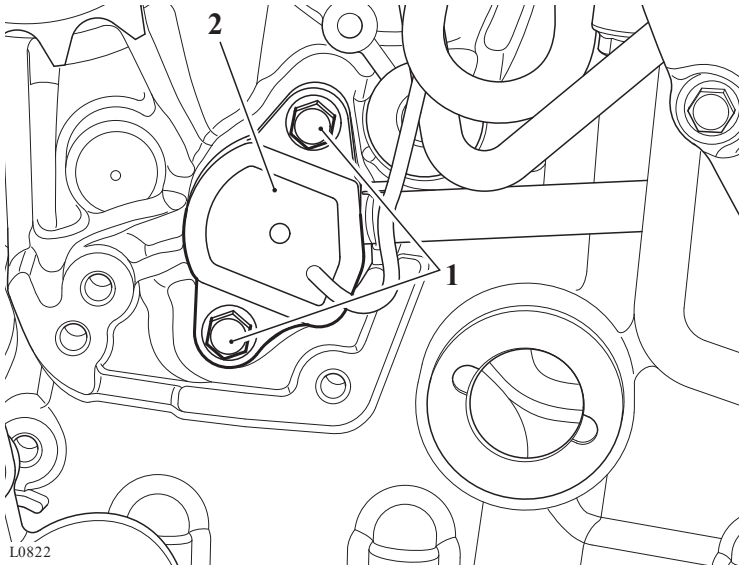
1. **Fixings**
2. **Harness guide**
3. **Upper gap**
4. **White tape**

4. Carefully remove the gear position sensor harness from the harness guide.



1. **Harness guide**
2. **Harness**

5. Remove and discard the two fixings and remove the gear position sensor.

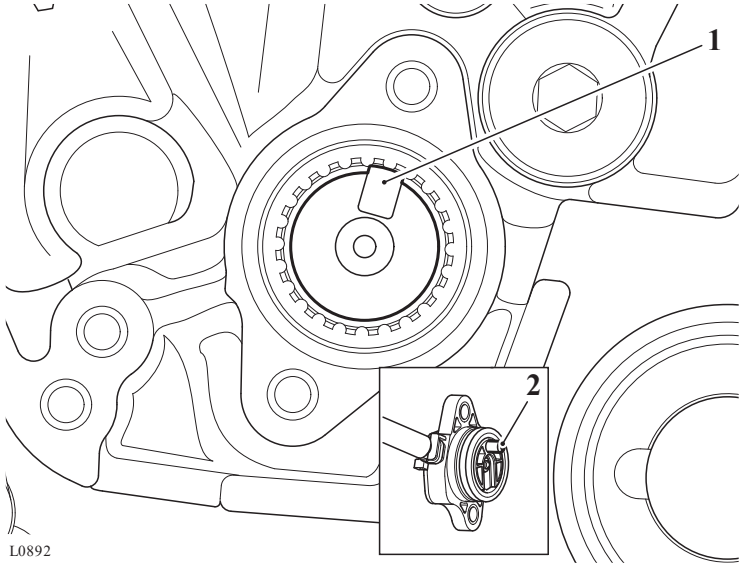


1. **Fixings**
2. **Gear position sensor**

WARNING

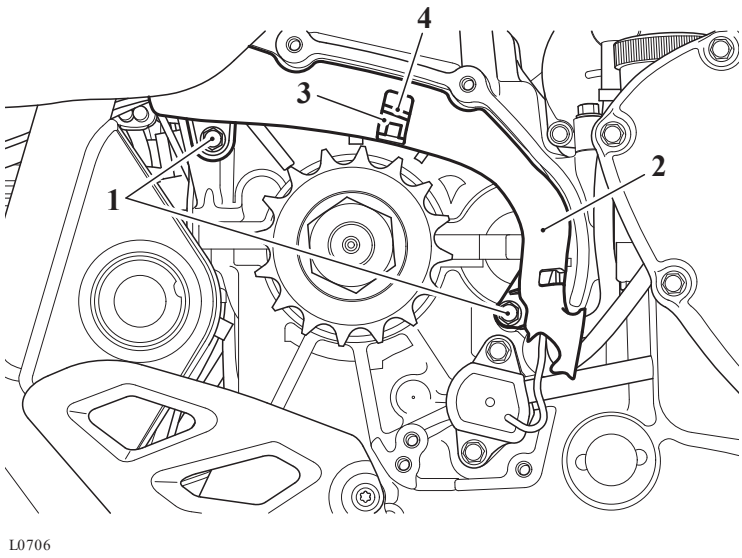
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Fit new O-rings to the sensor. Lubricate the O-rings with a smear of petroleum jelly.
2. Position the sensor to the engine, ensuring that the lug on the sensor engages with the slot in the selector drum shaft.



1. **Slot**
2. **Lug**
3. **Gear position sensor**

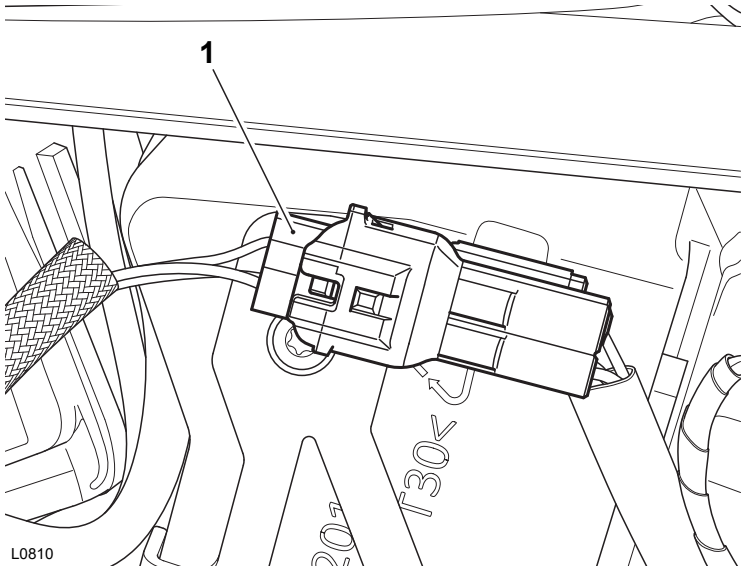
3. Secure with the two new fixings and tighten to **5 Nm**.
4. Carefully fit the gear position sensor harness into the harness guide as noted for removal with the white tape shown in the upper gap.
5. Secure the harness guide to the crankcase and tighten the new fixings to **4 Nm**.



1. **Fixings**
2. **Harness guide**

3. **Upper gap**
4. **White tape**

6. Route the gear position sensor harness through the frame to the right hand side of the airbox, as noted for removal. Connect the gear position sensor electrical connector to the main harness.



1. **Gear position sensor electrical connector**

7. Reset the neutral position adaption (see Neutral Position Adaption).

Perform the following operations:

- Front Sprocket Cover - Installation
- Right hand Side Panels
- Battery - Installation
- Seat - Installation

Ignition Coils - Installation

Keyless ECM - Removal

Keyless ECM - Installation

Crankshaft Position Sensor - Removal

Crankshaft Position Sensor - Installation

Removal and Installation - Exhaust System Components

Exhaust Silencer - Removal

Exhaust Silencer - 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.

Perform the following operations:

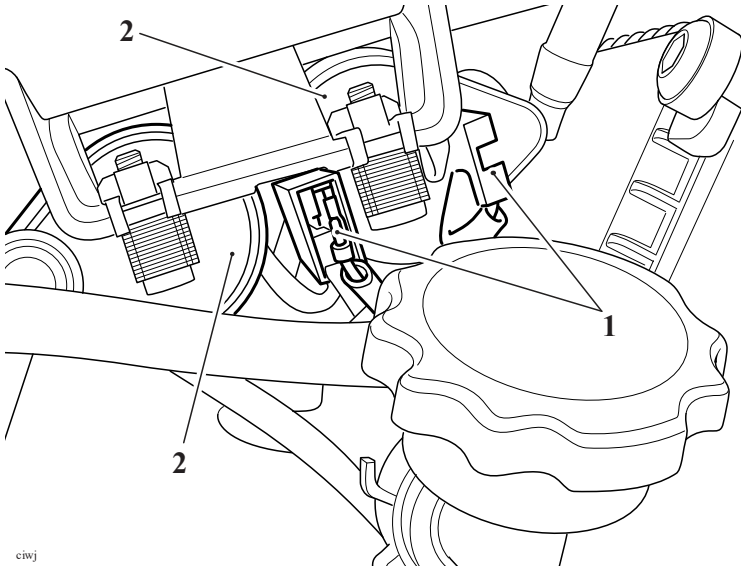
- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal

1. Disconnect the high tension cables from the spark plugs.

Note

- **The ignition coil wires identified with the red tape are fitted to the right hand side of the ignition coils.**
- **Note the position of the four wires connected to the ignition coils for installation.**

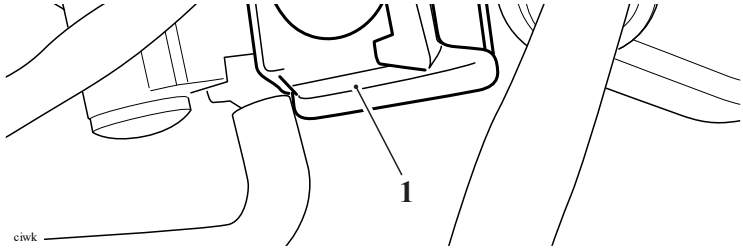
2. Disconnect the four wires from the ignition coils (two either side of the ignition coils).



1. **Ignition coil connections (right hand side shown)**
2. **Ignition coils**

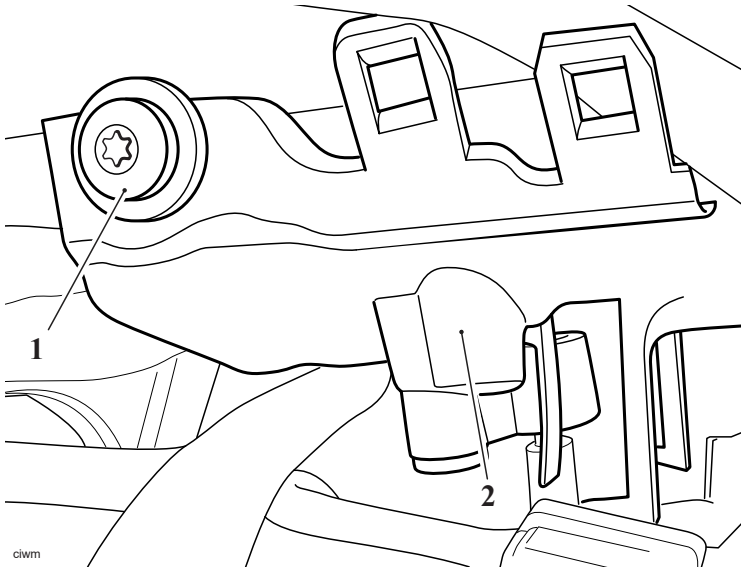
3. Detach the coolant temperature connector from the ignition coils bracket.





1. **Coolant temperature sensor connector**

4. Remove the three fixings and detach the ignition coil bracket from the motorcycle frame.

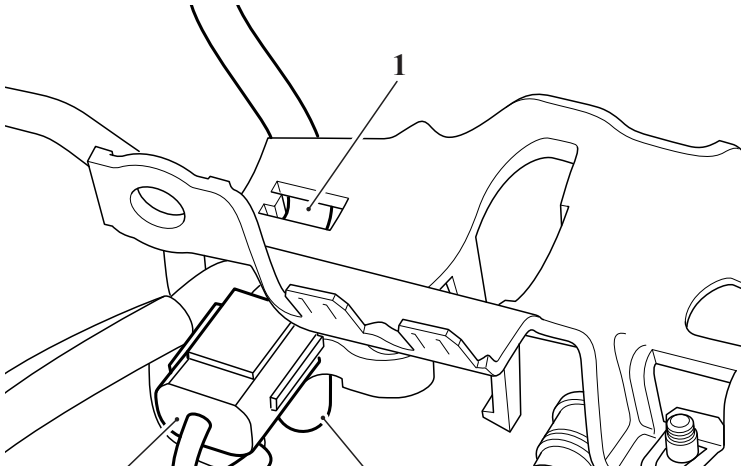


1. **Fixing (right hand side shown)**
2. **Ignition coil bracket**

Note

- **Note the routing of the fuel pump harness on the ignition coil bracket for installation.**

5. Detach the fuel pump harness from the ignition coils bracket.
6. Disconnect the MAP sensor hose and the electrical connector from the MAP sensor.



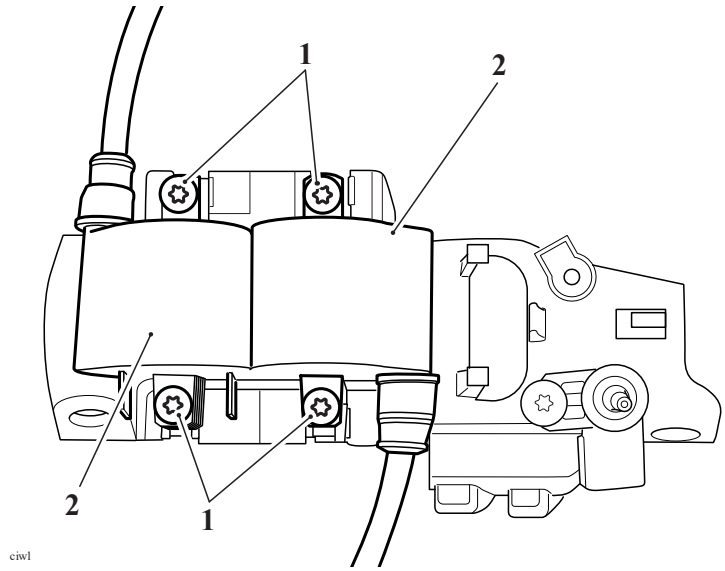


1. **Fuel pump harness**
2. **MAP sensor electrical connector**
3. **MAP sensor hose**

Note

- **The front ignition coil has the longer HT lead.**

7. Remove and discard the four fixings and remove the ignition coils from their bracket.

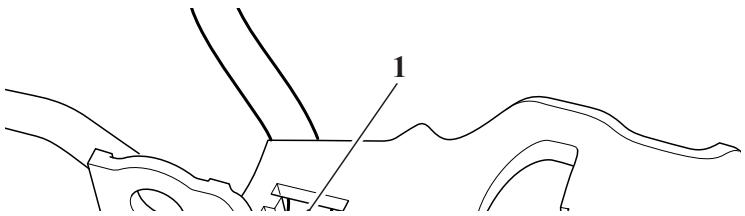


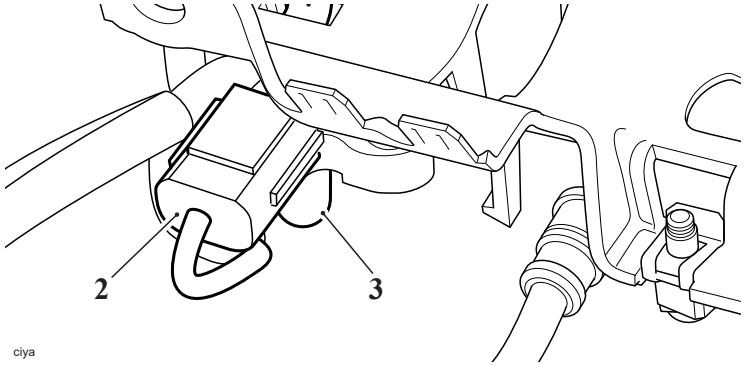
1. **Fixings**
2. **Ignition coils**

WARNING

Before starting work, ensure the 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 ignition coils onto their bracket, secure with new fixings and tighten to **3 Nm**.
2. Connect the MAP sensor hose and the electrical connector to the MAP sensor.
3. Attach the fuel pump harness to the ignition coil bracket, as noted for removal.





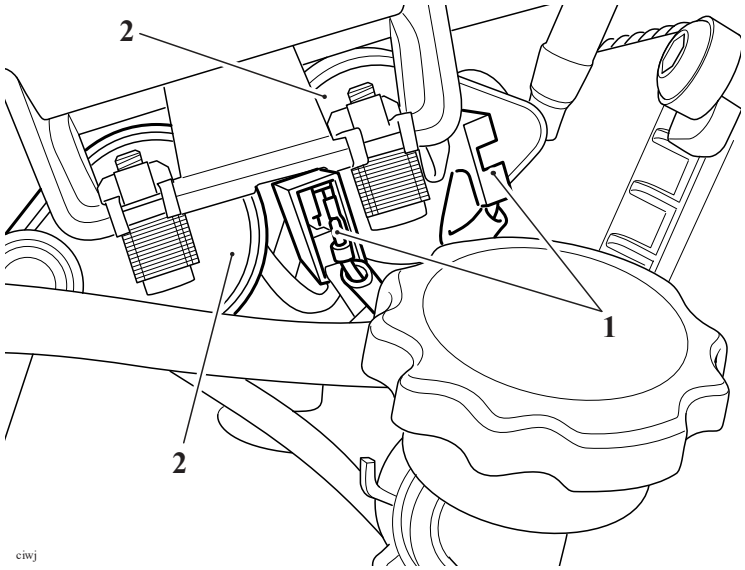
1. **Fuel pump harness**
2. **MAP sensor electrical connector**
3. **MAP sensor hose**

4. Position the ignition coils and bracket assembly to the motorcycle frame, secure with the fixings and tighten to **3 Nm**.
5. Attach the coolant temperature sensor connector onto the ignition coil bracket.

Note

- **The wires for the right hand side of the ignition coils are identified with the red tape.**

6. Connect the four wires from the ignition coils as noted for removal (two either side of the ignition coils).



1. **Ignition coil connections (right hand side shown)**
2. **Ignition coils**

7. Connect the high tension cables to the spark plugs.

Perform the following operations:

- Fuel Tank - Installation
- Battery - Installation

- Seat - Installation

Left Hand Header Pipe - 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.

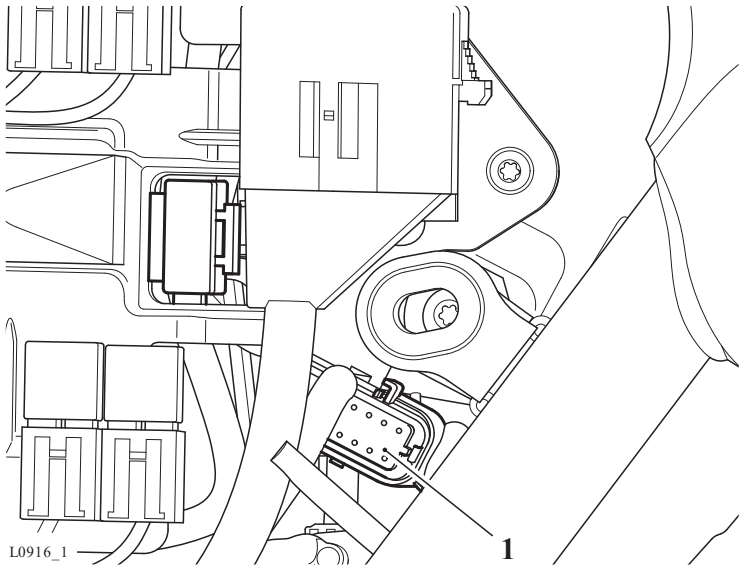
Perform the following operations:

- Exhaust Silencer - Removal
- Side Panels
- Rear Mudguard - Removal
- Engine Electronic Control Module (ECM) - Removal

Note

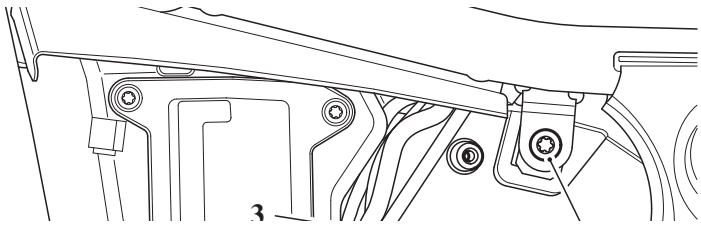
- **Before the disconnection of any wiring, note the routing of all wiring and wiring connectors on both sides of the airbox.**

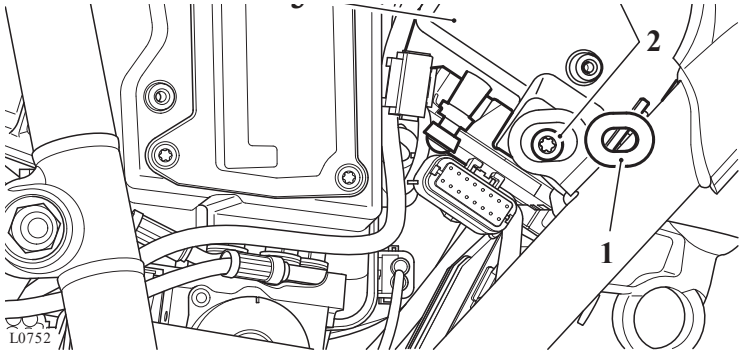
1. Disconnect the electrical connector from the keyless electronic control module (ECM).



1. Keyless ECM electrical connector

2. Remove the rear grommet for the left hand side panel for access to battery box lower fixing.





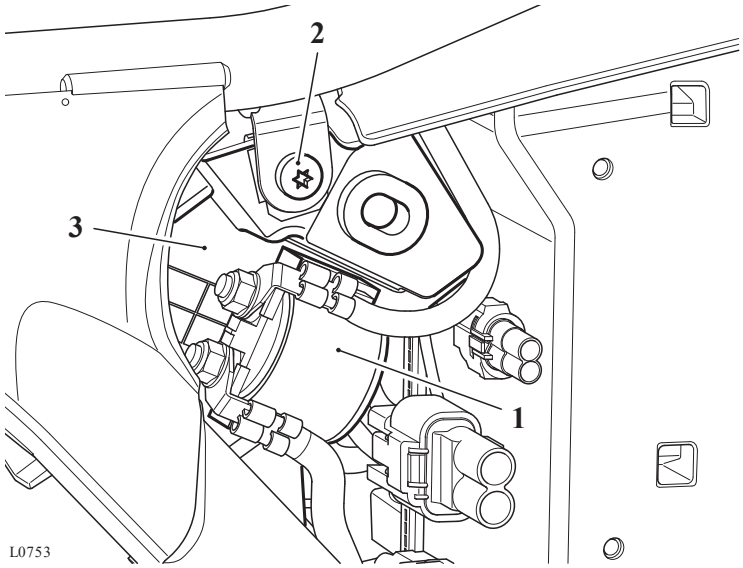
1. **Grommet**
2. **Fixings**
3. **Battery box**

3. Detach the starter motor solenoid from the right hand side of the battery box.

Note

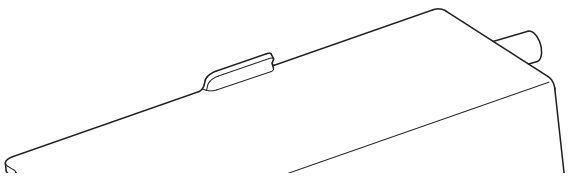
- **The keyless ECM is attached to the underside of the battery box.**

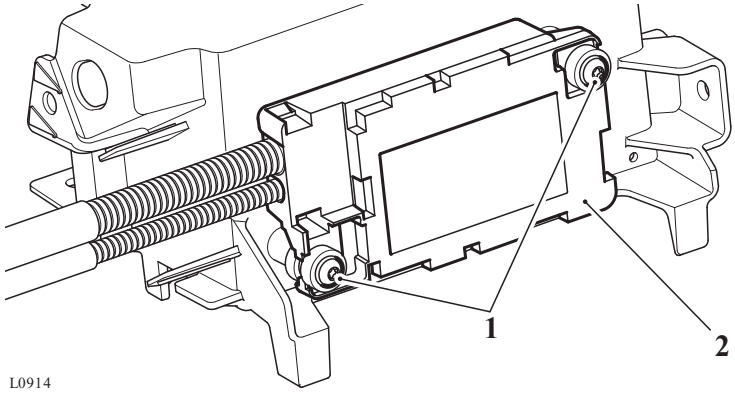
4. Remove the two fixings securing the battery box to the frame and carefully manoeuvre the battery box rearward for removal.



1. **Starter motor solenoid**
2. **Fixing**
3. **Battery box**

5. Release the fixing and remove the keyless ECM.





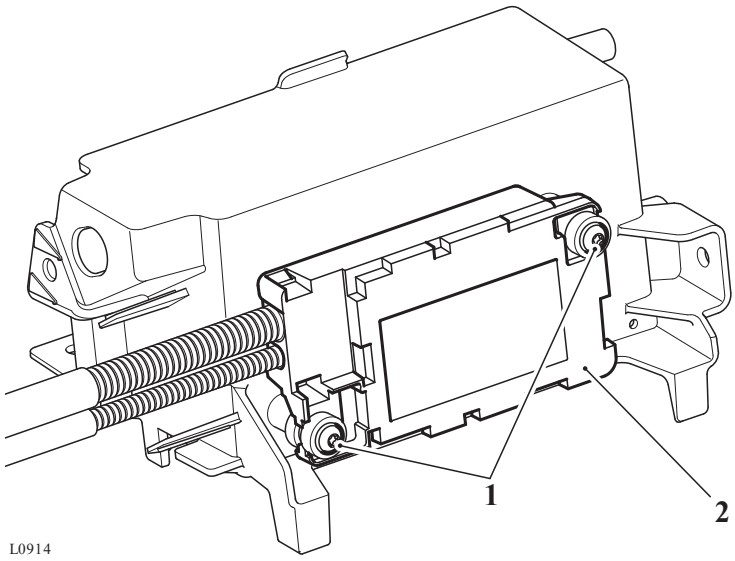
1. Fixings

2. Keyless ECM

WARNING

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

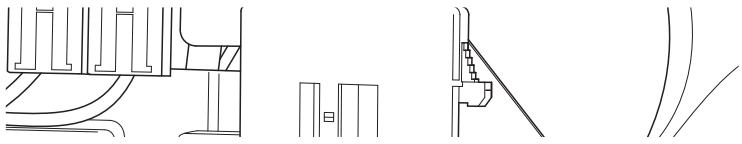
1. Fit the keyless ECM to the battery box as noted for and tighten the fixings to **3 Nm**.

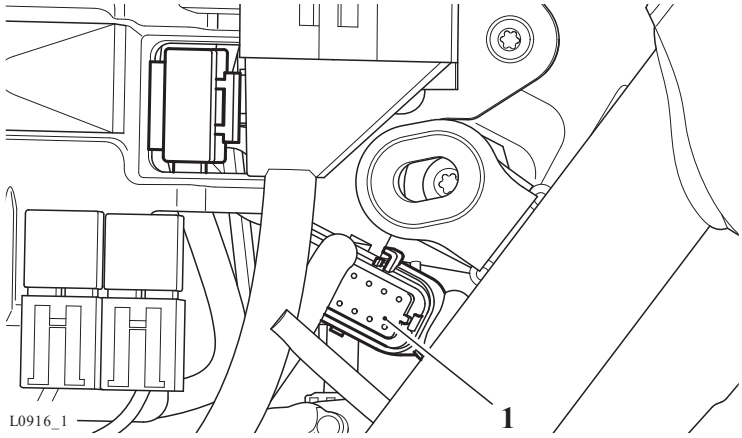


1. Fixings

2. Keyless ECM

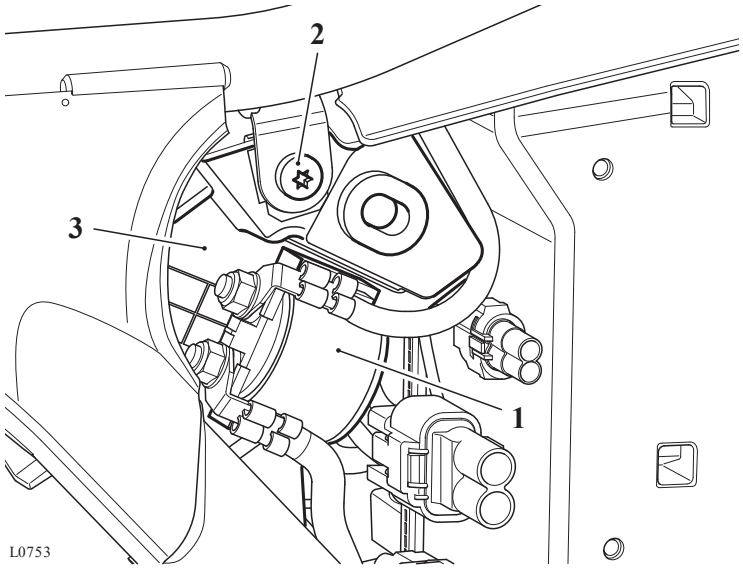
2. Position the battery box to the rear of the airbox and connect the electrical connector to the keyless ECM.





1. **Keyless ECM electrical connector**

3. Carefully position the battery box to the rear of the airbox and secure to the frame. Tighten the fixings to **6 Nm**.
4. Attach the starter motor solenoid to the right hand side of the battery box.



1. **Starter motor solenoid**
2. **Fixing**
3. **Battery box**

5. Fit the rear grommet for the left hand side panel.
6. If a replacement keyless ECM has been fitted, it must be setup as described in Setup Flow Chart - Replacement Keys and Keyless ECM.

Left Hand Header Pipe - 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.

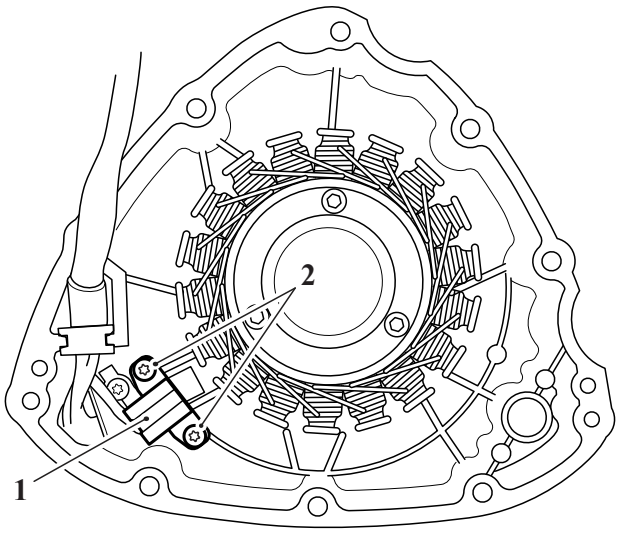
Note

- **If the crankshaft position sensor needs to be replaced, the alternator stator will also be replaced as they are one assembly.**

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Alternator Cover - Removal

1. Remove and discard the fixings securing the crankshaft position sensor to the alternator cover.



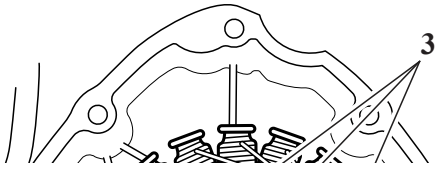
civn

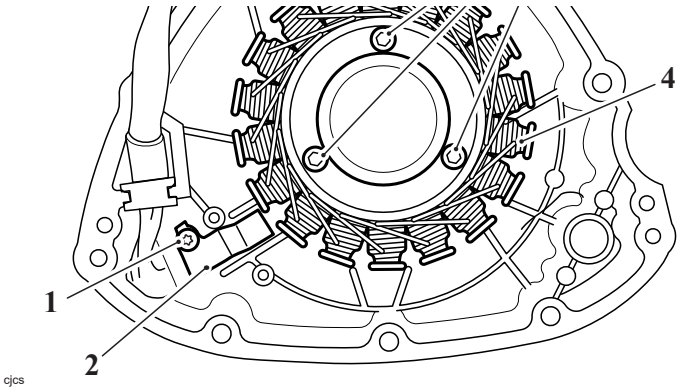
1. **Crankshaft position sensor**
2. **Fixings**

Note

- **Note the routing of the alternator harness for installation.**

2. Remove and discard the fixing and remove the harness cover from the alternator cover.
3. Remove and discard the fixings securing the stator to the alternator cover and remove the stator.



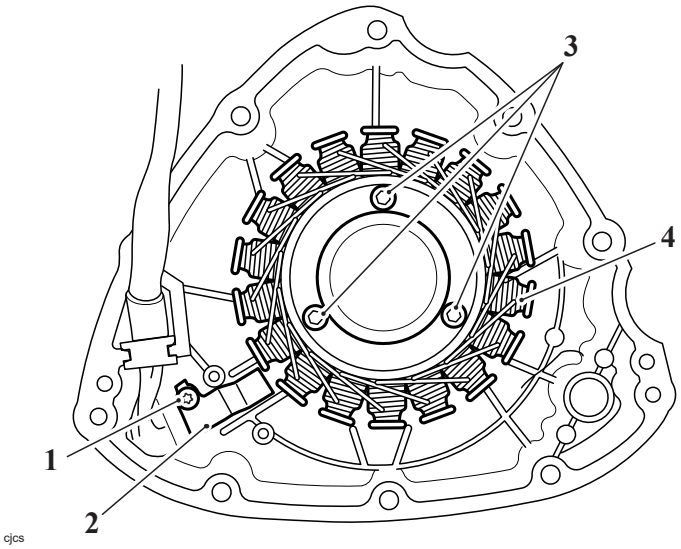


1. **Fixing**
2. **Harness cover**
3. **Fixings**
4. **Stator**

WARNING

Before starting work, ensure the 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 stator to the alternator cover and route the harness as noted for removal. Secure the stator with new fixings and tighten to **12 Nm**.



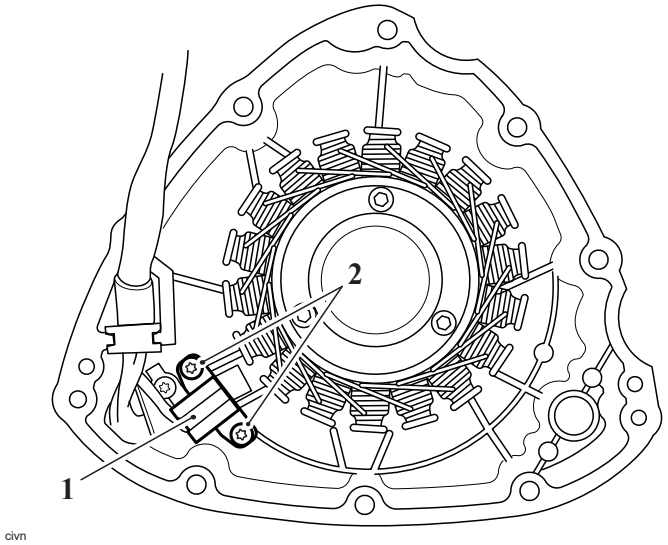
1. **Fixing**
2. **Harness cover**
3. **Fixings**
4. **Stator**

2. Fit the harness cover and tighten the new fixing to **6 Nm**.

Note

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

3. Fit the crankshaft position sensor with two new fixings and tighten to **6 Nm**.



1. **Crankshaft position sensor**
2. **Fixings**

Perform the following operations:

- Alternator Cover - Installation
- Battery - Installation
- Seat - Installation

Exhaust Catalytic Converter - Removal

WARNING

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

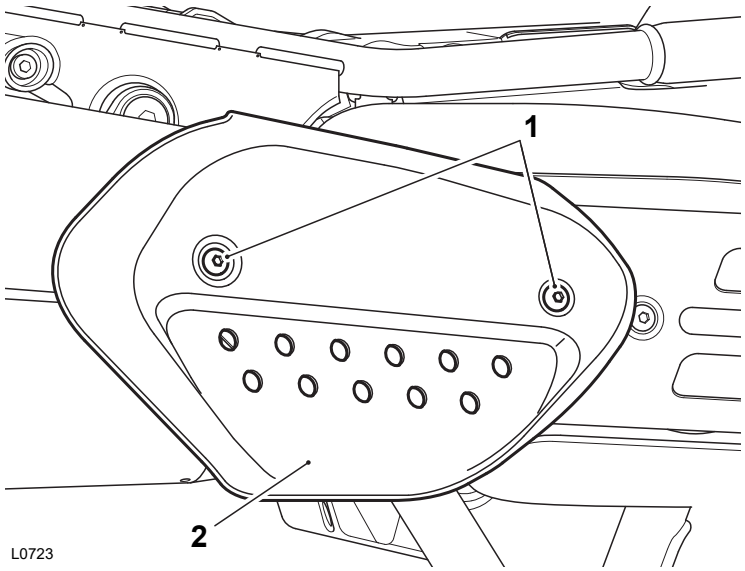
WARNING

If the engine has recently been running, the exhaust components may be hot to the touch. Contact with the hot components may cause damage to exposed skin. To avoid skin damage, always allow the hot parts to cool before working on the exhaust system.

Perform the following operations:

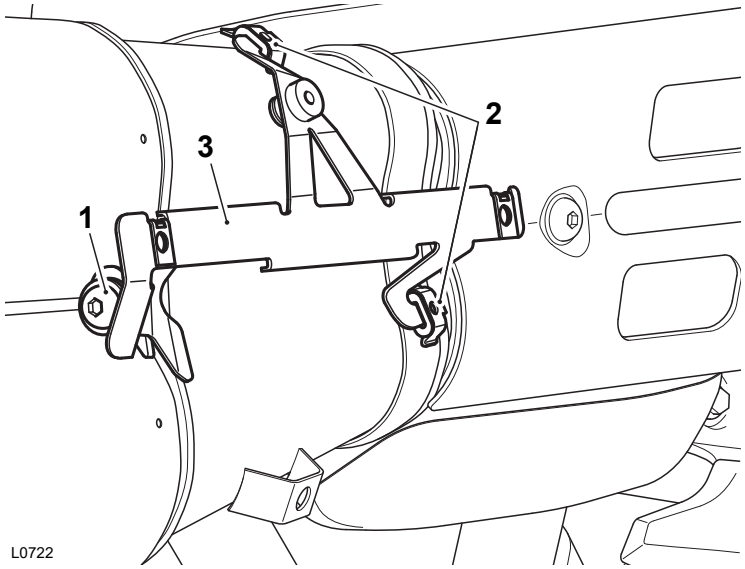
- Seat - Removal

1. Release the two fixings and remove the silencer rear heat shield.



1. **Fixings**
2. **Heat shield**

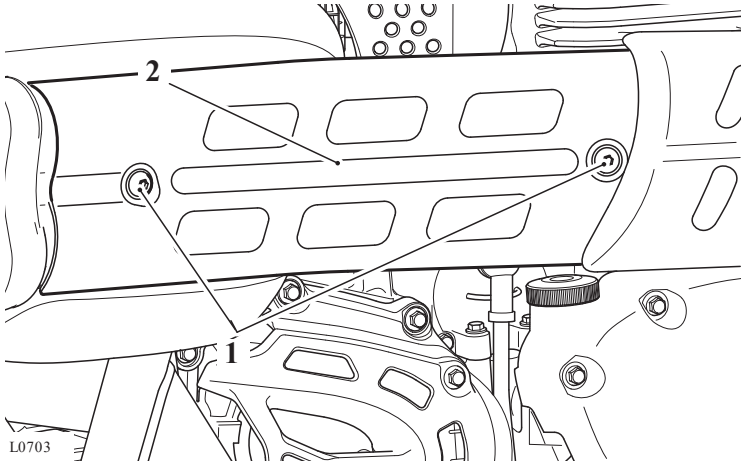
2. Remove the fixing and move the heat shield bracket rearwards for removal. Collect the two rubber grommets.



1. **Fixing**
2. **Rubber grommets**
3. **Heat shield bracket**

3. Release the fixings and remove the centre heat shield.



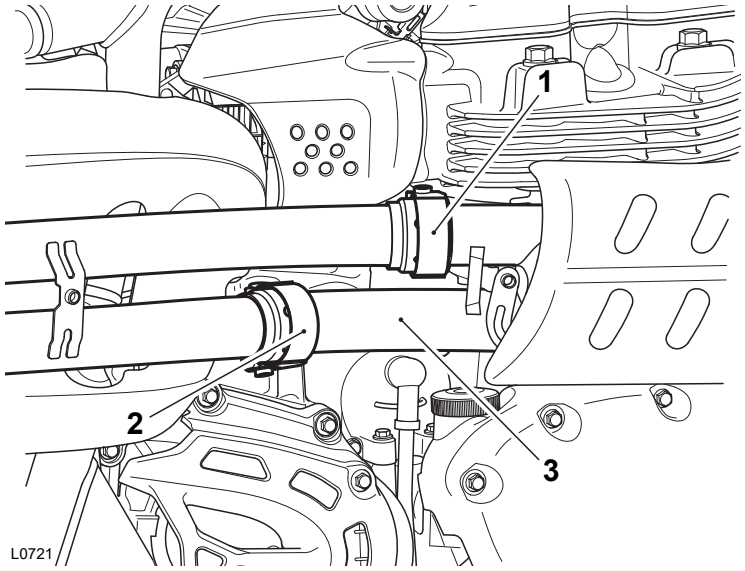


1. **Fixings**
2. **Centre heat shield**

Note

- **Always note the position and orientation of the exhaust clamps prior to releasing them, and return them to the noted position and orientation on assembly.**

4. Release the clamps securing the silencers to the catalytic converter.

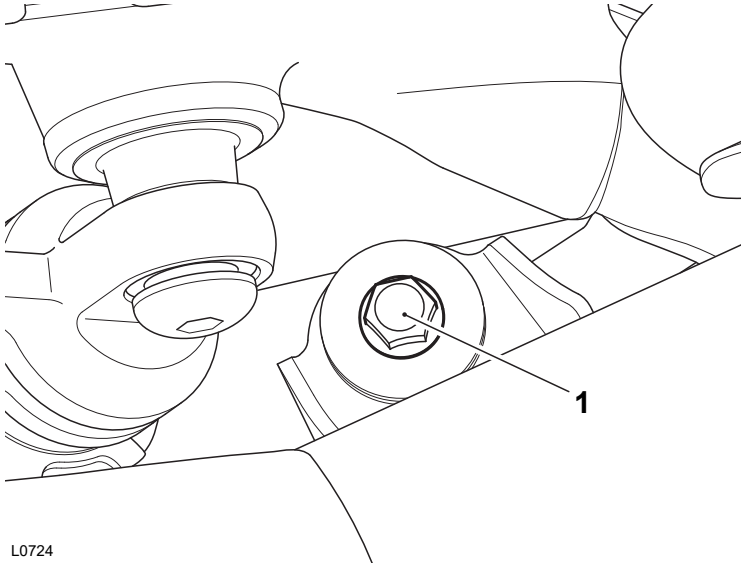


1. **Upper silencer clamp**
2. **Lower silencer clamp**
3. **Catalytic converter**

Note

- **Note the position of the shouldered washers and rubber bushes in the silencer mountings for installation.**

5. Support the silencer assembly and remove the upper fixing.

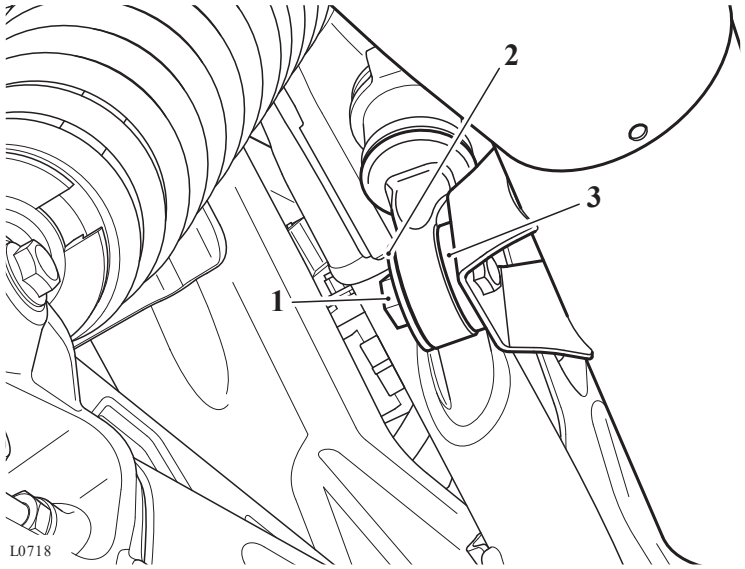


1. Fixing

Note

- **The lower mounting consists of two rubber bushes, one shouldered washer and a bolt. Note the position of the shouldered washer for installation.**

6. Release the lower mounting fixing and remove the exhaust silencer assembly. Collect the rubber bushes and the shouldered washer.



1. Fixing

2. Shouldered washer

3. Rubber bushes

7. Remove and discard the exhaust gaskets.

Exhaust Catalytic Converter - Installation

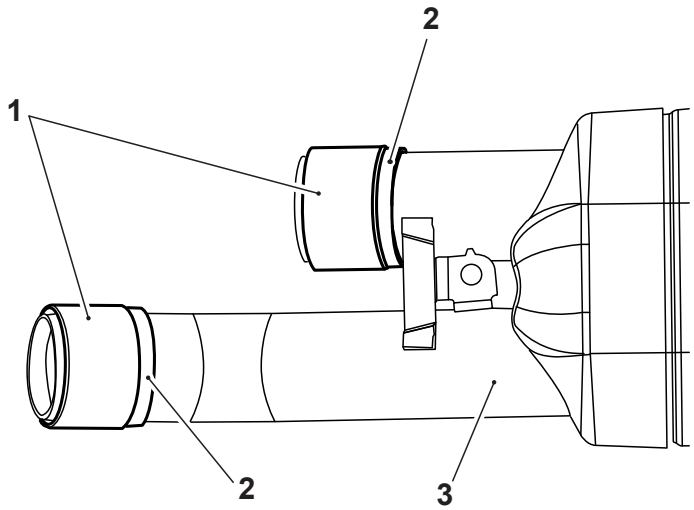
Evaporative System Components

Evaporative Loss Control System – Certain Markets Only

WARNING

Before starting work, ensure the 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. Check rubber mountings for cracks and wear, replace if necessary.
2. Fit the rubber bushes and shouldered washers to the silencers rear mounting as noted for removal.
3. Fit new exhaust silencer gaskets to the catalytic converter, ensure they are positioned up to the collar.

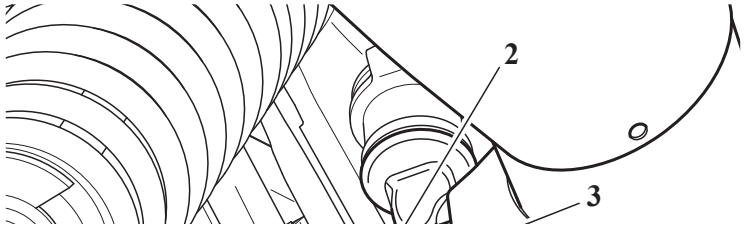


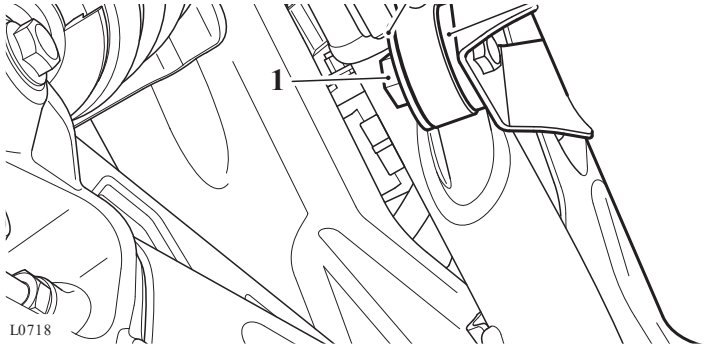
1. Exhaust gaskets

2. Collar

3. Catalytic converter

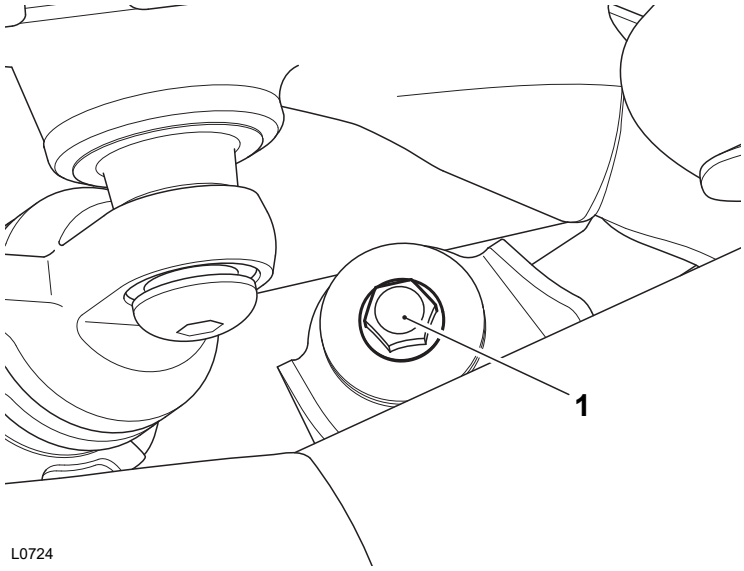
4. Fit the two rubber bushes and the shouldered washer to the lower mounting as noted for removal
5. Position the exhaust clamps onto the silencer.
6. Position the silencer assembly onto the catalytic converter.
7. Fit the lower mounting fixing, do not fully tighten at this stage.





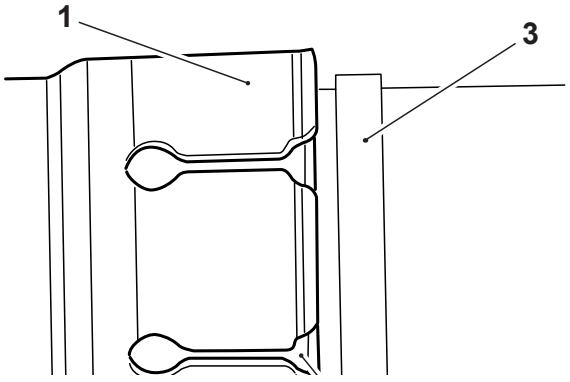
1. **Fixing**
2. **Shouldered washer**
3. **Rubber bushes**

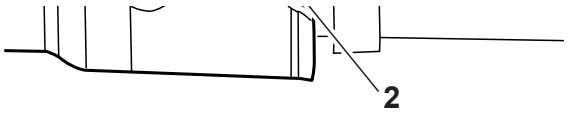
8. Align the silencer upper mounting to the frame and fit the fixing but do not fully tighten at this stage.



1. **Fixing**

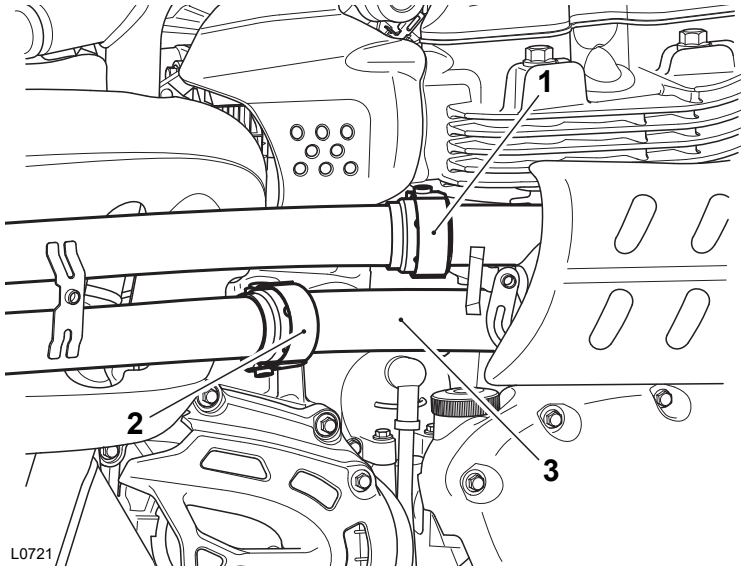
9. Position the exhaust gaskets into the silencer clamp area until flush with the end of the silencer clamp area.





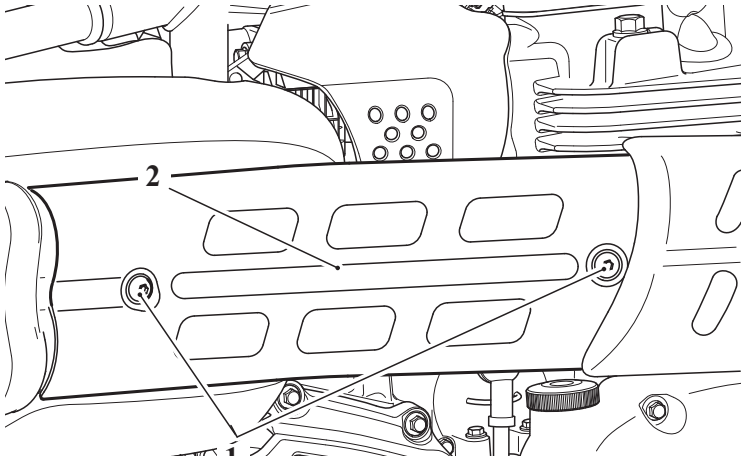
1. **Clamp area**
2. **Exhaust gasket**
3. **Collar**

10. Position the silencer clamps as noted for removal and tighten to **10 Nm**.



1. **Upper silencer clamp**
2. **Lower silencer clamp**
3. **Catalytic converter**

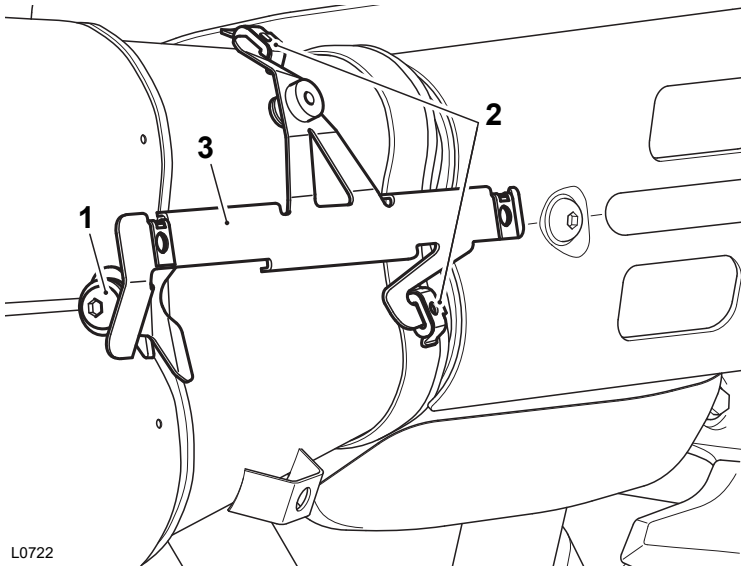
11. Tighten the silencer assembly upper fixing to **19 Nm**.
12. Tighten the silencer assembly lower fixing to **19 Nm**.
13. Position the inner and outer covers of the centre heat shield to the silencers, fit the fixings and tighten to **6 Nm**.





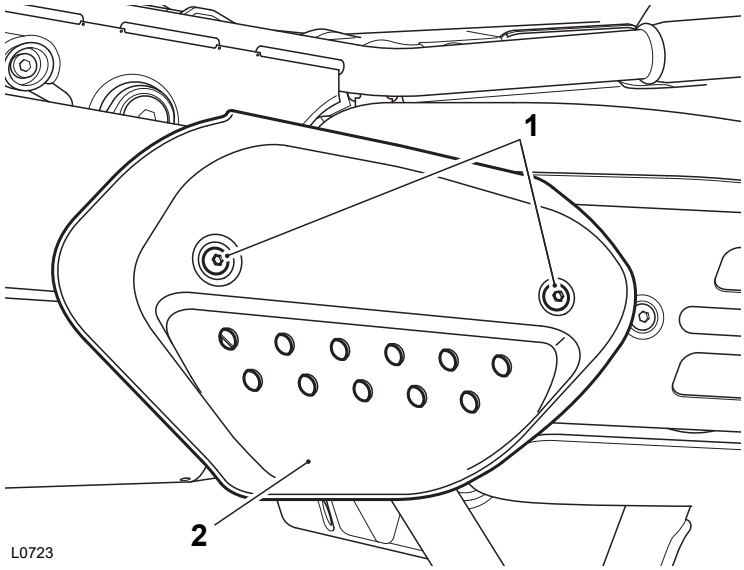
1. **Fixings**
2. **Centre heat shield**

14. Fit the two rubber grommets to the heat shield mounting bracket.
15. Fit the heat shield bracket to its locating lugs on the exhaust silencer. Fit and tighten the bracket rear fixing to **6 Nm**.



1. **Fixing**
2. **Rubber grommets**
3. **Heat shield bracket**

16. Fit the rear heat shield and tighten its fixings to **6 Nm**.



1. **Fixings**
2. **Heat shield**

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

Perform the following operations:

- 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.

WARNING

If the engine has recently been running, the exhaust components may be hot to the touch. Contact with the hot components may cause damage to exposed skin. To avoid skin damage, always allow the hot parts to cool before working on the exhaust system.

Note

- **The right hand header pipe is part of the catalytic converter.**

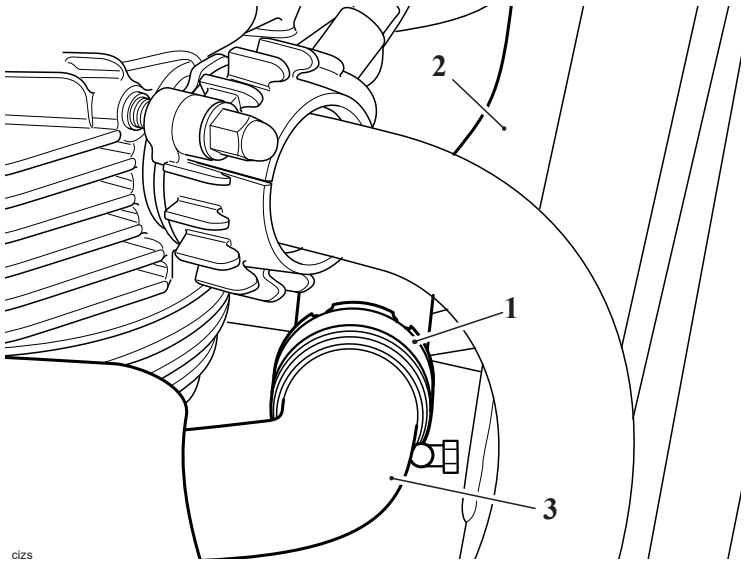
Note

- **Always note the position and orientation of exhaust clamps prior to releasing them, and return them to the noted position and orientation on assembly.**

Perform the following operations:

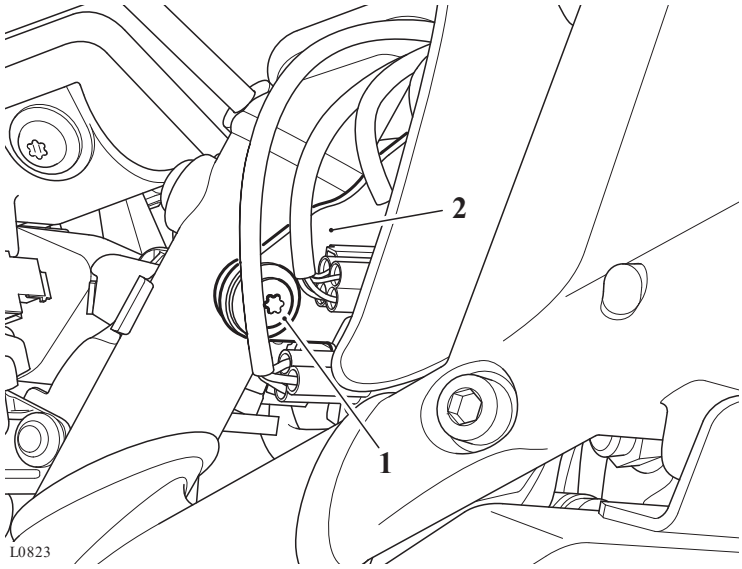
- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal

1. Loosen the clamp securing the left hand header pipe to the catalytic converter.



1. **Exhaust clamp**
2. **Left hand header pipe**
3. **Catalytic converter**

2. Release the fixing and detach the connector bracket from the right hand side of the headstock.

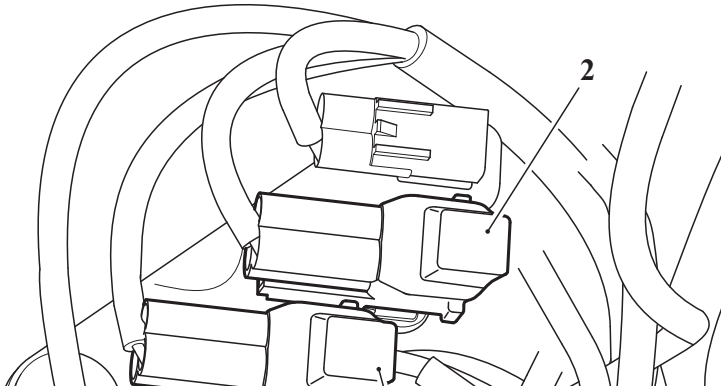


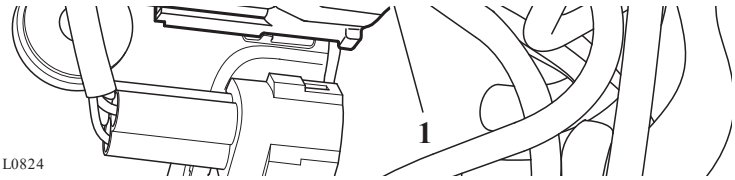
1. **Fixing**
2. **Connector bracket**

Note

- **Note the routing of the oxygen sensor harness for installation.**
- **The oxygen sensor electrical connections must not be swapped between cylinders. If the connections are swapped over, engine malfunctions will occur.**
- **The right hand (Cylinder 2) oxygen sensor harness has a small section of red tape for identification.**
- **The oxygen sensors are NOT marked. Always ensure the right hand oxygen sensor harness is connected to the correct main harness connector, identified by the red tape.**

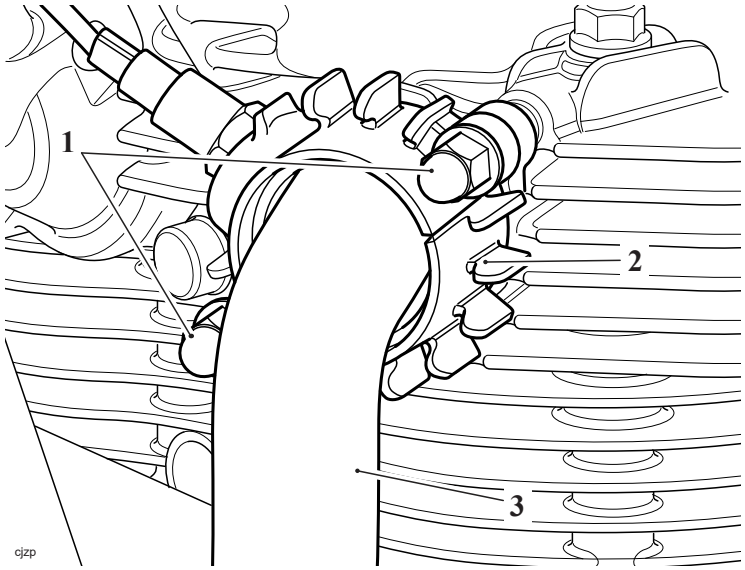
3. Disconnect the left hand oxygen sensor from the main harness.





1. **Left hand oxygen sensor connector**
2. **Right hand oxygen sensor connector**

4. Remove the fixings and the finned clamps securing the exhaust header pipe to the cylinder head.



1. **Fixings**
2. **Finned clamps**
3. **Exhaust header pipe**

5. Detach the exhaust header pipe from the catalytic converter, remove the exhaust header pipe. Remove and discard the gasket from the cylinder head ports.
6. Remove and discard the exhaust header pipe gasket from the catalytic converter.
7. If necessary, remove the oxygen sensor.

WARNING

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

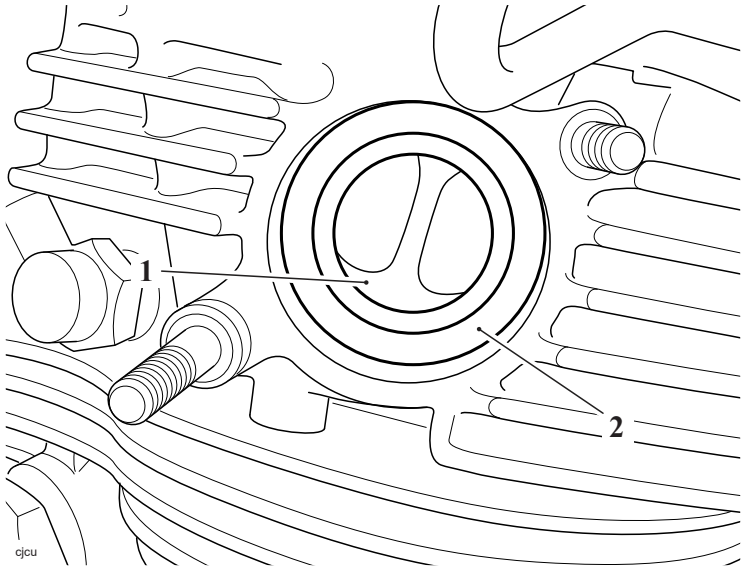
1. If removed, apply a thin smear of anti-seize compound to the threads of the oxygen sensor, install the oxygen sensor and tighten to **25 Nm**.
2. Fit a new gasket to the header pipe and position the clamp over the joint.

Note

Note

- **To retain the gaskets during assembly, apply a smear of grease or petroleum jelly to the gasket faces in the head.**

3. Fit new gaskets to the cylinder head ports.

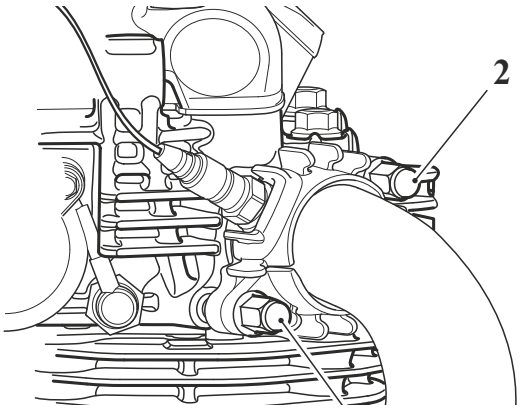


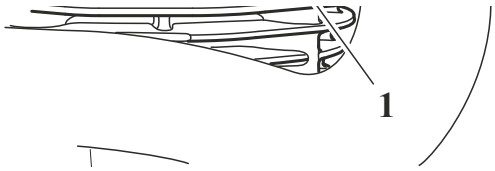
1. **Cylinder head port**
2. **Gasket**

4. Apply a proprietary high temperature grease to the header pipe studs on the cylinder head.
5. Locate the exhaust header pipe to the cylinder head, ensure the gasket does not become displaced during assembly. At the same time attach the header pipe to the catalytic converter.
6. Fit the fixings to the cylinder head studs and tighten in the sequence shown below.

Stage 1:

- Header pipe lower nut to **10 Nm**
- Header pipe upper nut to **10 Nm**
- Retighten the header pipe lower nut to **10 Nm**.





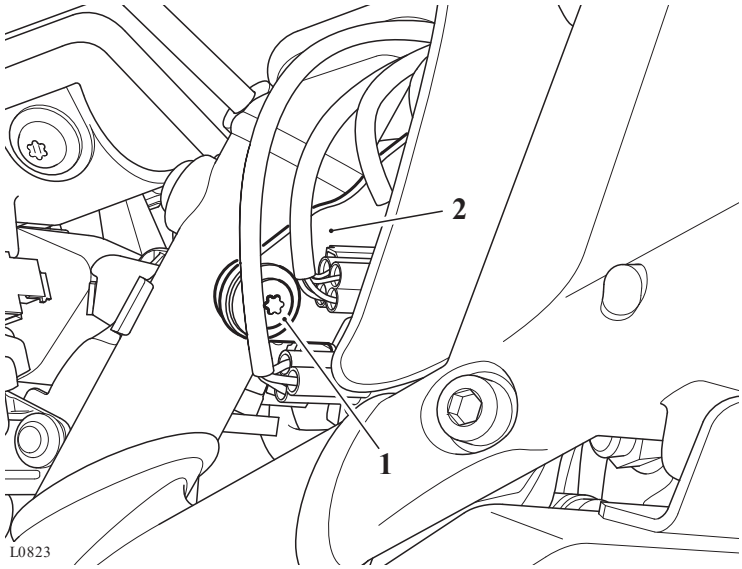
1. **Header pipe lower nut**
2. **Header pipe upper nut**

Stage 2:

- Header pipe lower nut to **19 Nm**
- Header pipe upper nut to **19 Nm**
- Retighten the header pipe lower nut to **19 Nm**.

Installation Continued

1. Position the exhaust header to catalytic converter clamp as noted for removal and tighten to **10 Nm**.
2. Route the oxygen sensor harness as noted for removal and connect to the main harness as noted for removal.
3. Fit the connector bracket to the right hand side of the headstock and tighten its fixing to **3 Nm**.



1. **Fixing**
2. **Connector bracket**

Perform the following operations:

- Fuel Tank - Installation
- Battery - Installation

- Seat - Installation
- Start the engine and check for exhaust gas leaks. Rectify if necessary.

Evaporative Control System – Engine Off

WARNING

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

WARNING

If the engine has recently been running, the exhaust components may be hot to the touch. Contact with the hot components may cause damage to exposed skin. To avoid skin damage, always allow the hot parts to cool before working on the exhaust system.

Note

- **Always note the position and orientation of exhaust clamps prior to releasing them, and return them to the noted position and orientation on assembly.**

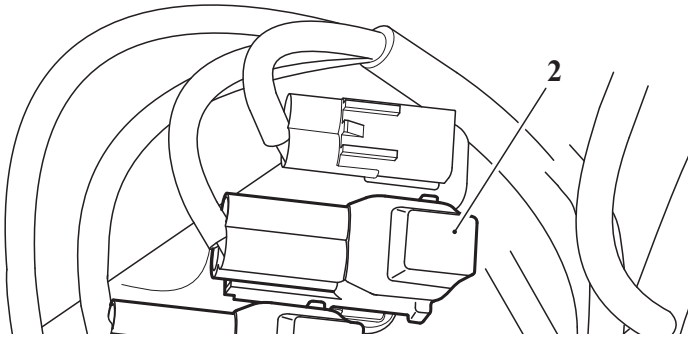
Perform the following operations:

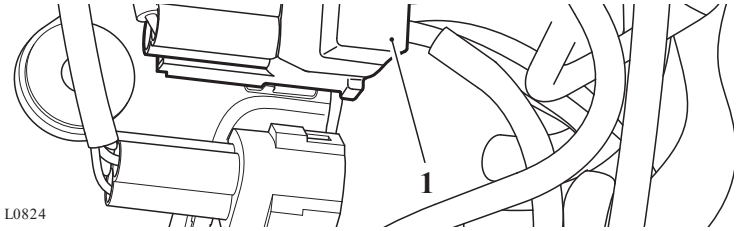
- Seat - Removal
- Battery - Removal
- Exhaust Silencer - Removal
- Left Hand Header Pipe - Removal
- Fuel Tank - Removal

Note

- **Note the routing of the oxygen sensor harness for installation.**
- **The oxygen sensor electrical connections must not be swapped between cylinders. If the connections are swapped over, engine malfunctions will occur.**
- **The right hand (Cylinder 2) oxygen sensor connector on the main harness has a red connector (main harness side).**
- **The oxygen sensors are NOT marked. Always ensure the right hand oxygen sensor harness is connected to the main harness connector with the red connector.**

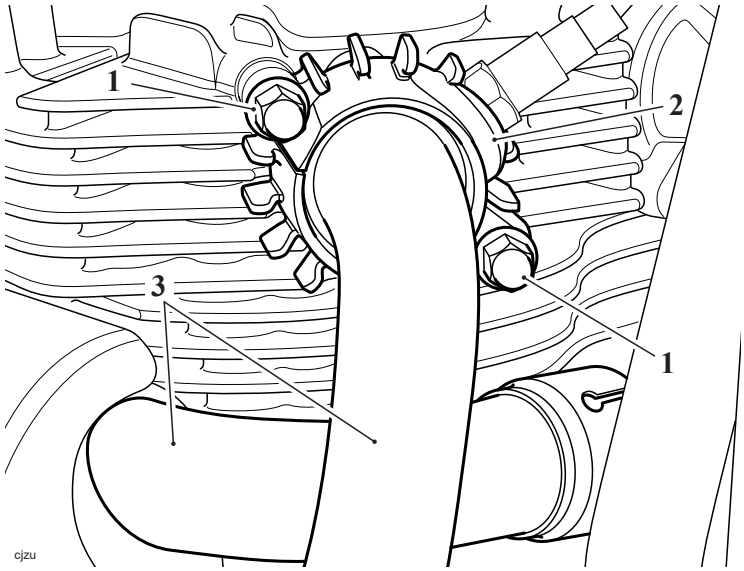
1. Disconnect the right hand oxygen sensor from the main harness.





1. **Left hand oxygen sensor connector**
2. **Right hand oxygen sensor connector**

2. While supporting the catalytic converter, remove the fixings and the finned clamps securing the exhaust header pipe to the cylinder head. Remove the catalytic converter.



1. **Fixings**
2. **Finned clamps**
3. **Catalytic conveter**

3. If necessary, remove the oxygen sensor.

WARNING

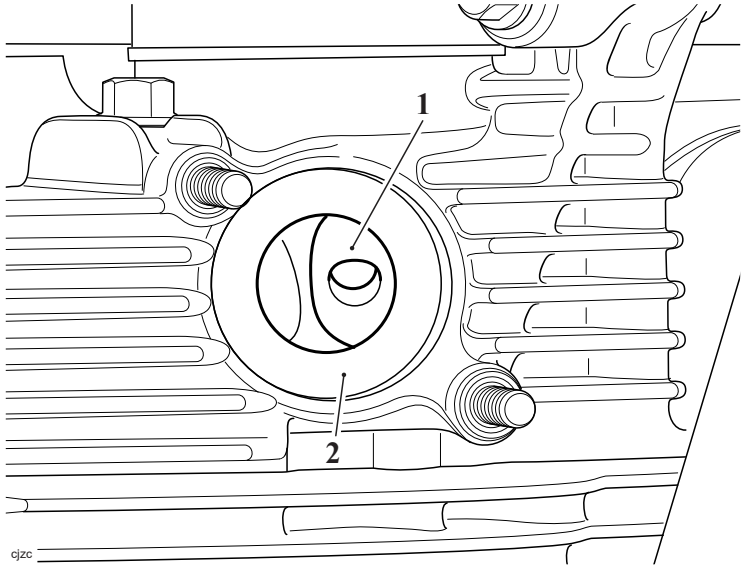
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. If removed, apply a thin smear of anti-seize compound to the threads of the oxygen sensor, install the oxygen sensor and tighten to **25 Nm**.

Note

- **To retain the gaskets during assembly, apply a smear of grease or petroleum jelly to the gasket faces in the head.**

2. Fit a new gasket to the cylinder head right hand port.

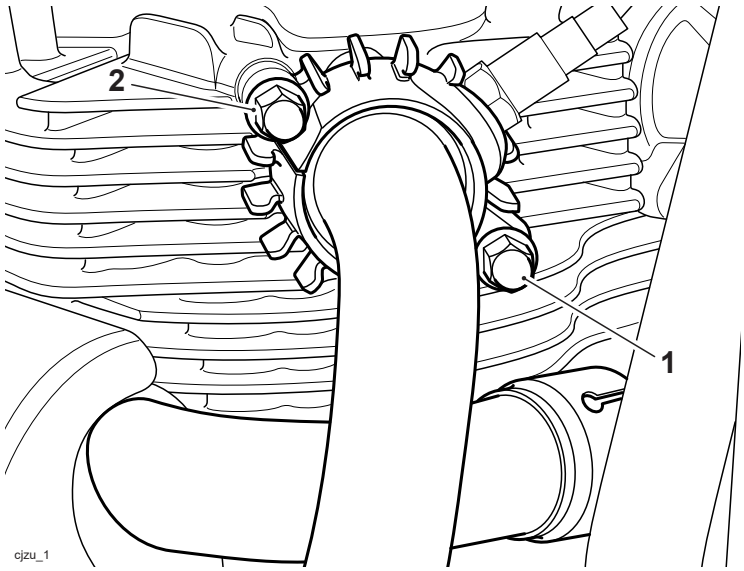


1. **Cylinder head port**
2. **Gasket**

3. Apply a proprietary high temperature grease to the header pipe studs on the cylinder head.
4. Locate the exhaust header pipe to the cylinder head, ensure the gasket does not become displaced during assembly.
5. Fit the fixings to the cylinder head studs and tighten in the sequence shown below.

Stage 1:

- Header pipe lower nut to **10 Nm**
- Header pipe upper nut to **10 Nm**
- Retighten the header pipe lower nut to **10 Nm**

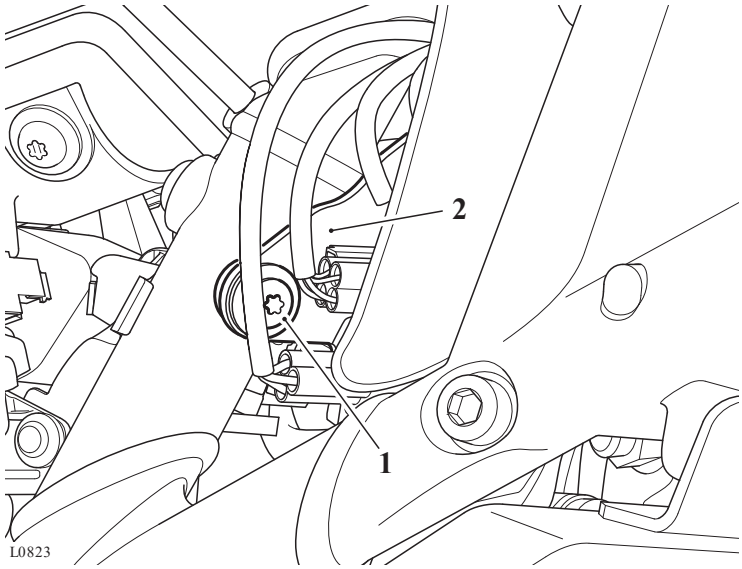


1. **Header pipe lower nut**
2. **Header pipe upper nut**

Stage 2:

- Header pipe lower nut to **19 Nm**
- Header pipe upper nut to **19 Nm**
- Retighten the header pipe lower nut to **19 Nm**

1. Route the oxygen sensor harness as noted for removal and connect to the main harness as noted for removal.
2. Fit the connector bracket to the right hand side of the headstock and tighten its fixing to **3 Nm**.



1. **Fixing**
2. **Connector bracket**

Perform the following operations:

- Left Hand Header Pipe - Installation
- Exhaust Silencer - Installation
- Fuel Tank - Installation
- Battery - Installation
- Seat - Installation
- Start the engine and check for exhaust gas leaks. Rectify if necessary.

Some models in certain markets are fitted with a system to control the evaporation of fuel vapour to the atmosphere.

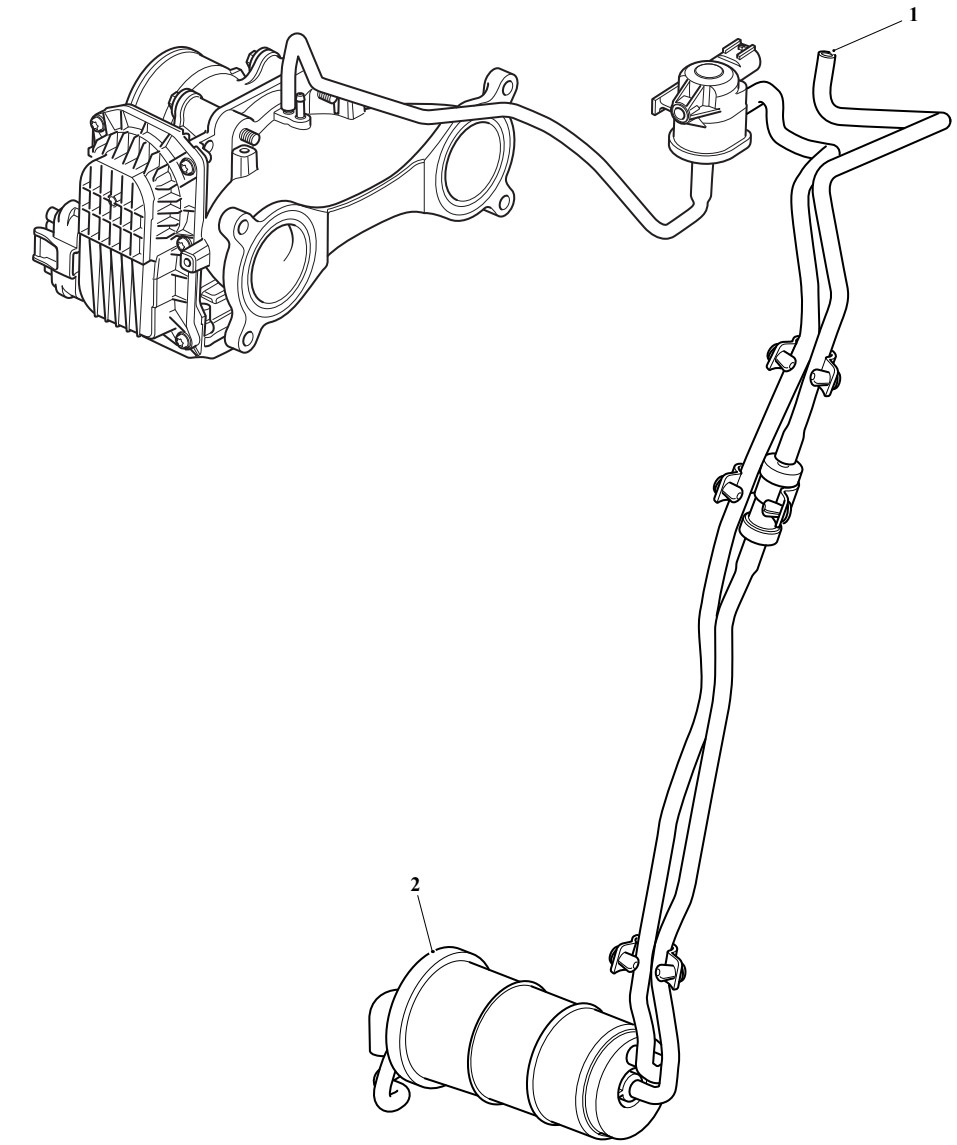
A carbon filled evaporative canister absorbs vapour while the engine is not running. When the engine is started, the vapour is returned to the engine and burned.

There are two distinct phases to the system's operation; engine off and engine running. These two conditions are explained overleaf.

Component Locations

Evaporative Canister - under the airbox.

Purge Control Valve - (electronically controlled by the engine ECM) left hand side of the airbox behind the side panel.



ckjg

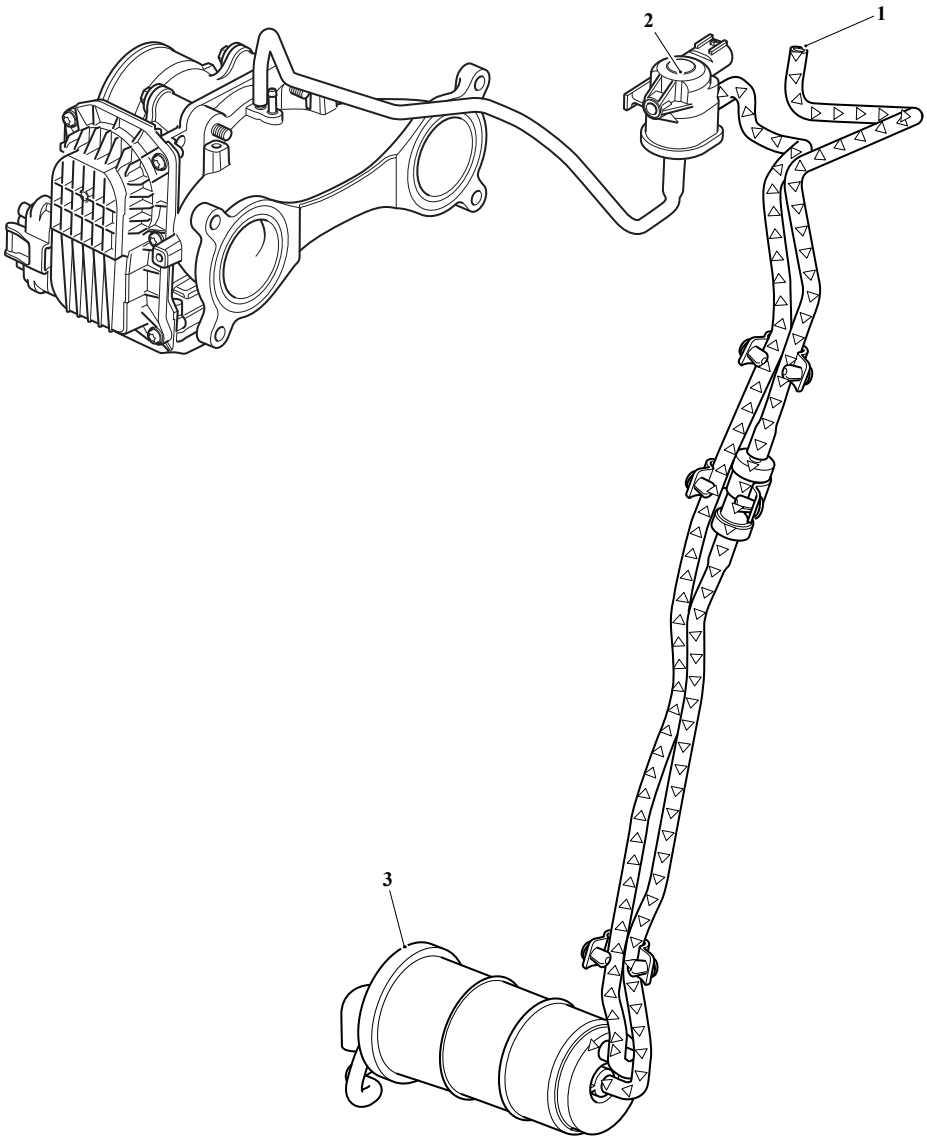
1. Evaporative canister

2. Purge valve

Evaporative Control System – Engine Running

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 that stores the vapour.

Once in the canister, vapour cannot return to the fuel tank because the purge valve is closed.



ckjg_1

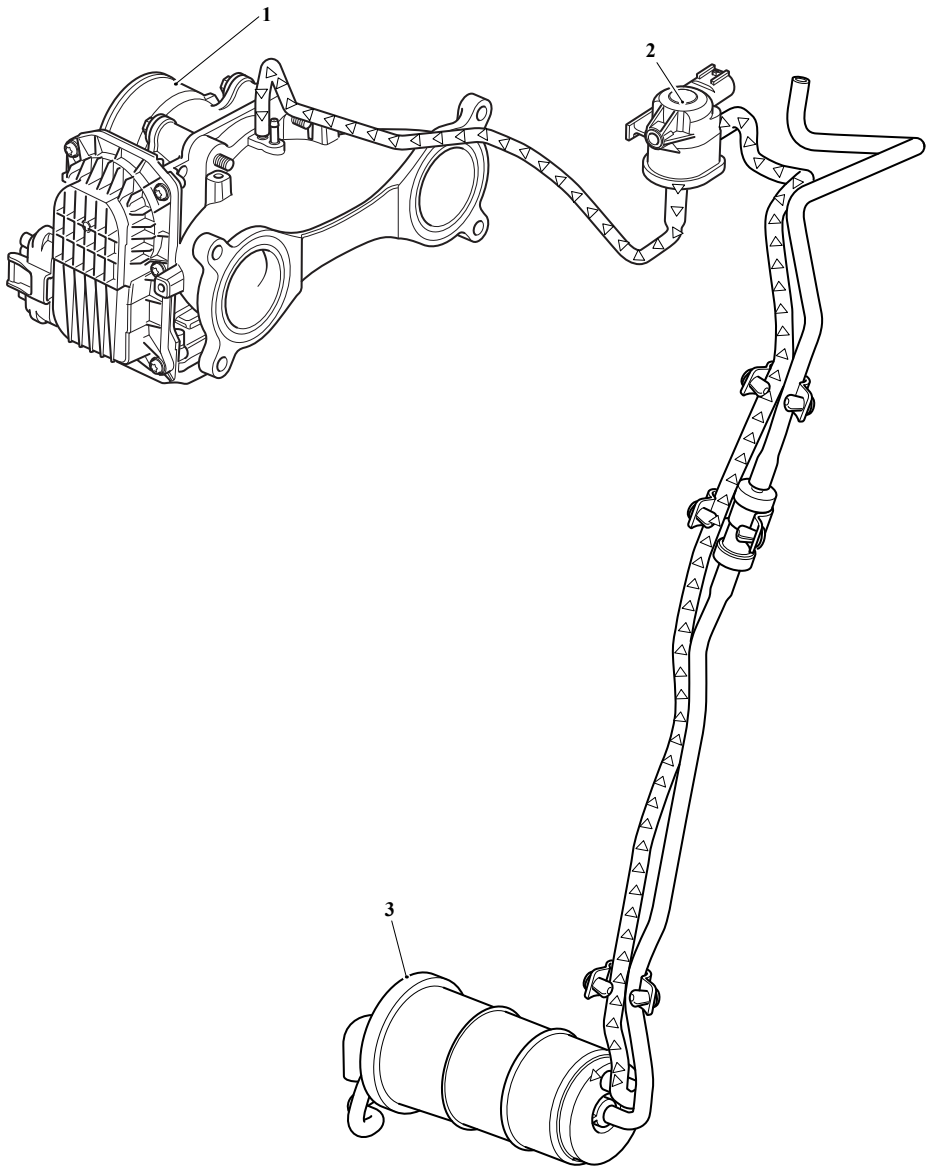
1. **Breather pipe A**
2. **Evaporative canister**
3. **Purge valve**

Evaporative Canister (if fitted) - Removal

When the engine is started, a vacuum is applied to the purge hose from the inlet manifold.

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 inlet manifold 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.



ckjg_2

1. **Throttle bodies**
2. **Purge valve**
3. **Evaporative canister**

WARNING

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

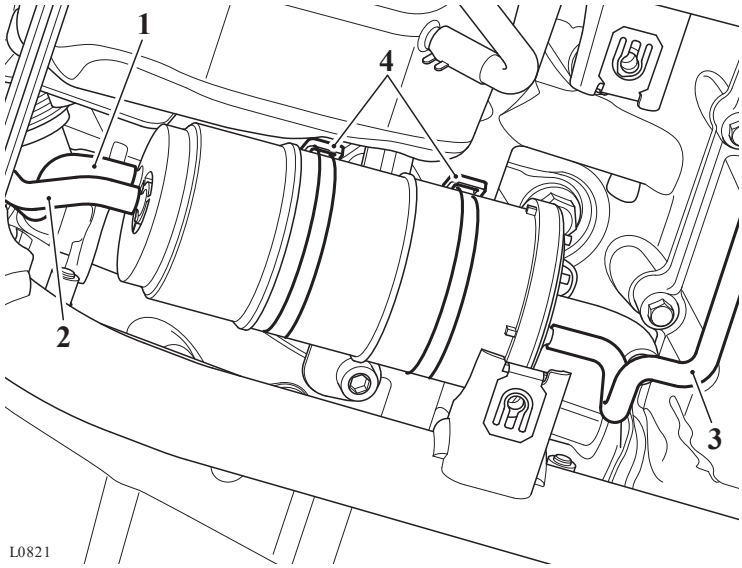
Perform the following operations:

- Sump Guard - Removal

Note

- **Note the routing and locations of the hoses connected to the evaporative canister for installation.**
- **Not the orientation of the evaporative canister for installation.**

1. Detach the hoses from the evaporative canister.
2. Cut and remove the two cable ties securing the evaporative emissions canister to the frame and remove the evaporative canister.



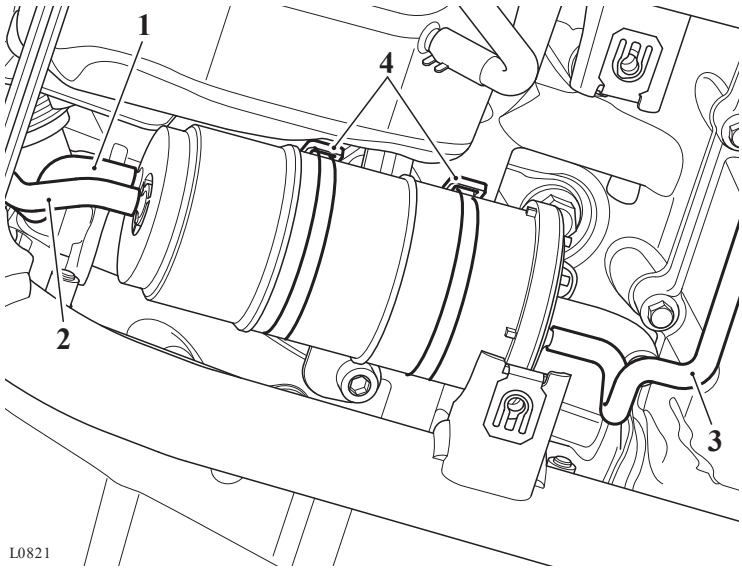
1. **Hose to purge valve**
2. **Hose to fuel tank vent**
3. **Hose evaporative cannister vent**
4. **Cable ties**

Evaporative Canister (if fitted) - 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 hoses to the evaporative canister as noted for removal.
2. Secure the evaporative canister to its mounting bracket with two cable ties as noted for removal.



1. **Hose to purge valve**
2. **Hose to fuel tank vent**
3. **Hose evaporative cannister vent**
4. **Cable ties**

Perform the following operations:

- Sump Guard - Installation

Purge Control Valve (if fitted) - 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.

Perform the following operations:

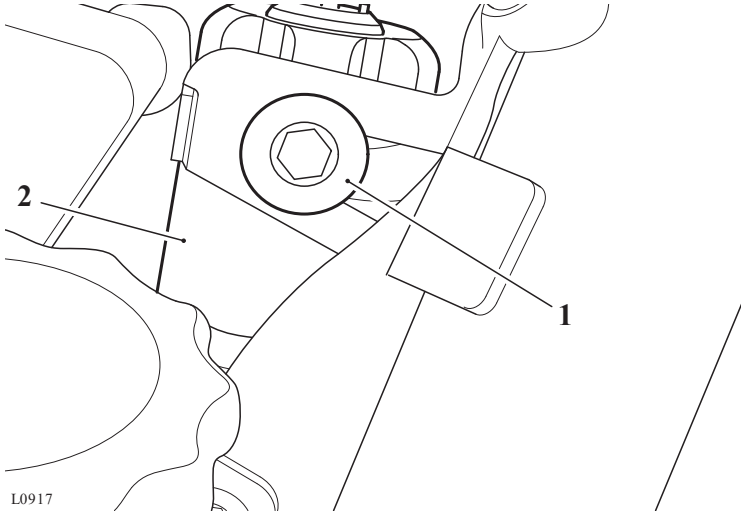
- Fuel Tank - Removal

Note

- **The purge valve is located in front of the ignition coils.**
- **Note the position of the purge valve for installation.**
- **Note the routing of the purge valve hoses for installation.**

1. Remove the fixing securing the purge control valve to its mounting bracket and manoeuvre it to left hand side of the frame.

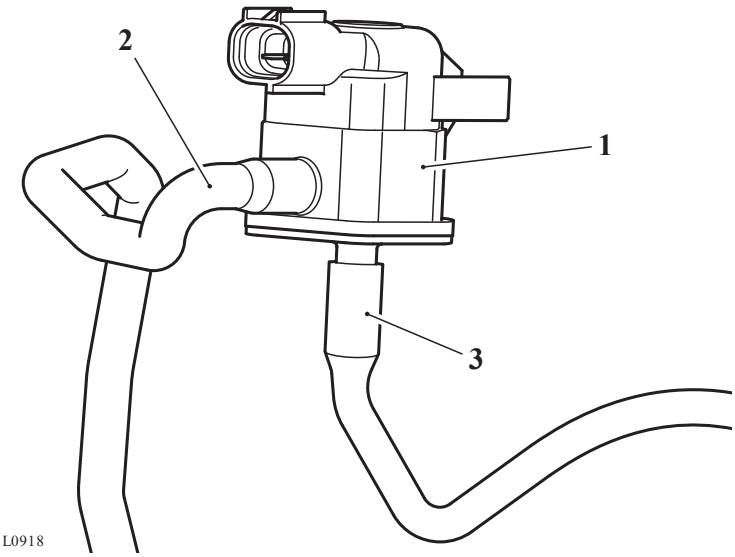




1. Fixing

2. Purge valve

2. Disconnect the electrical connector from the purge control valve.
3. Detach the two hoses and remove the purge control valve.



1. Purge valve

2. Hose (from evaporative cannister)

3. Hose (to inlet manifold)

Purge Control Valve (if fitted) - Installation

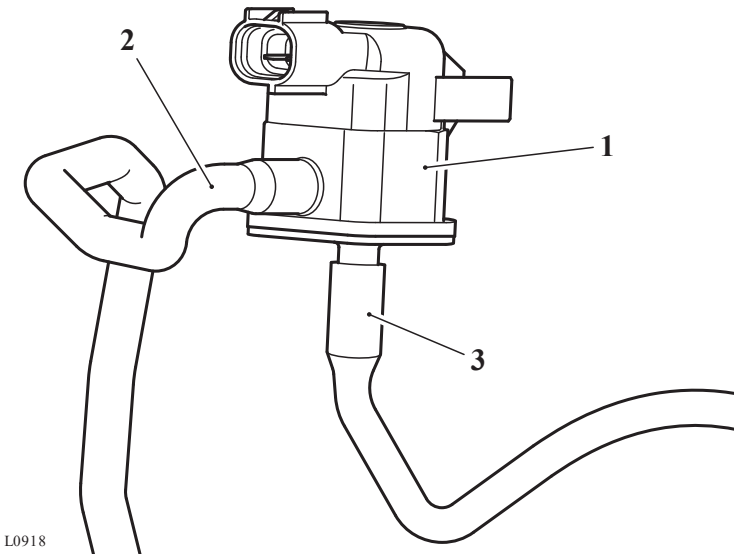
WARNING

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

WARNING

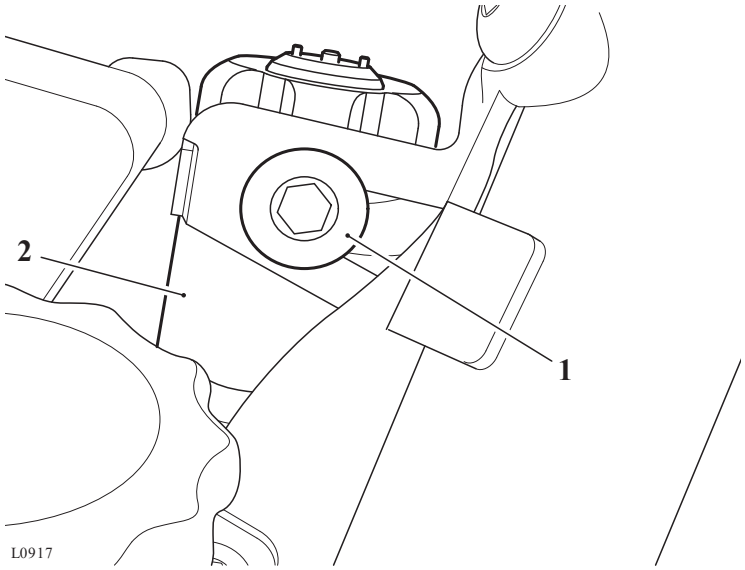
motorcycle.

1. Connect the hoses to the purge control valve as noted during removal.



1. Purge valve
2. Hose (from evaporative cannister)
3. Hose (to inlet manifold)

2. Connect the electrical connector to the purge control valve.
3. Position the purge control valve to its mounting bracket and tighten the fixing to **3 Nm**.



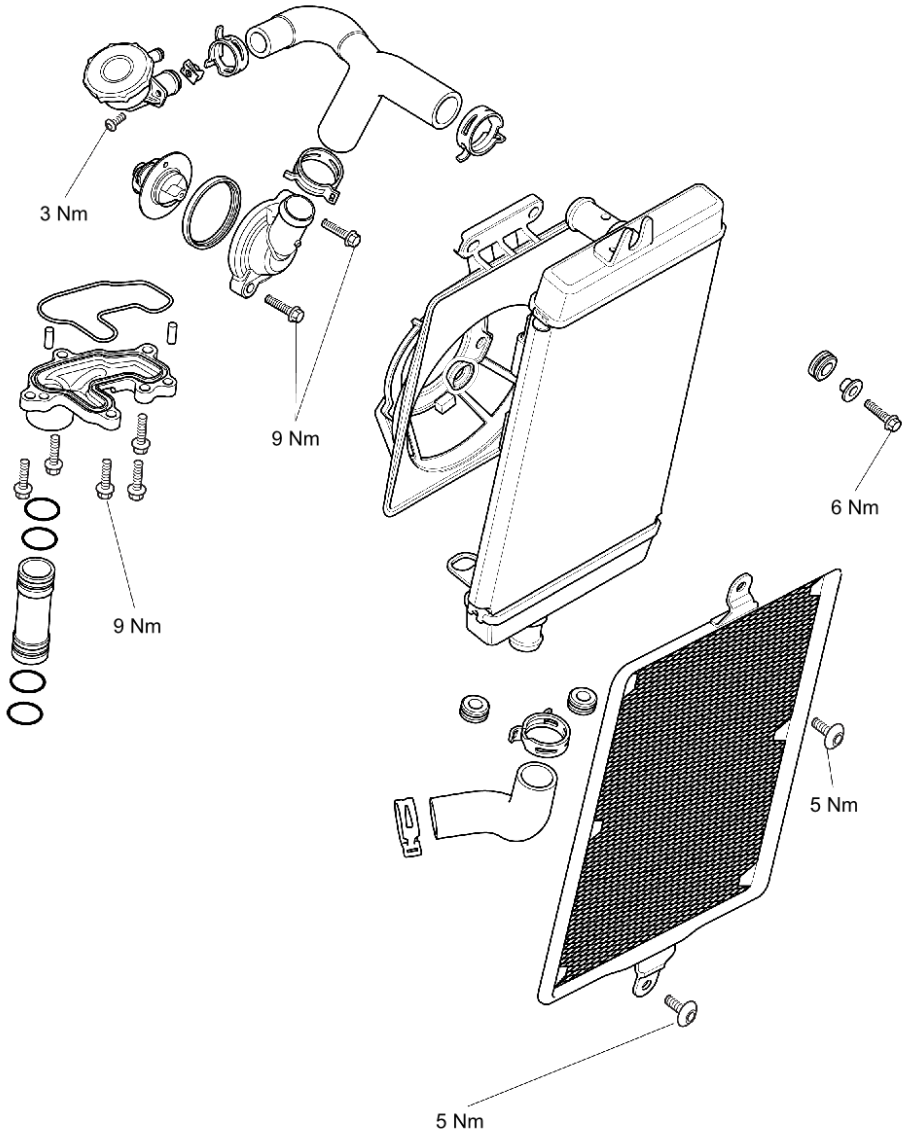
1. Fixing
2. Purge valve

Perform the following operations:

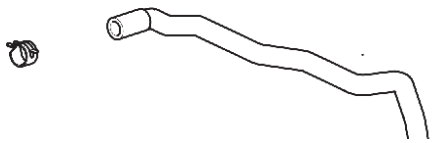
- Fuel Tank - Installation

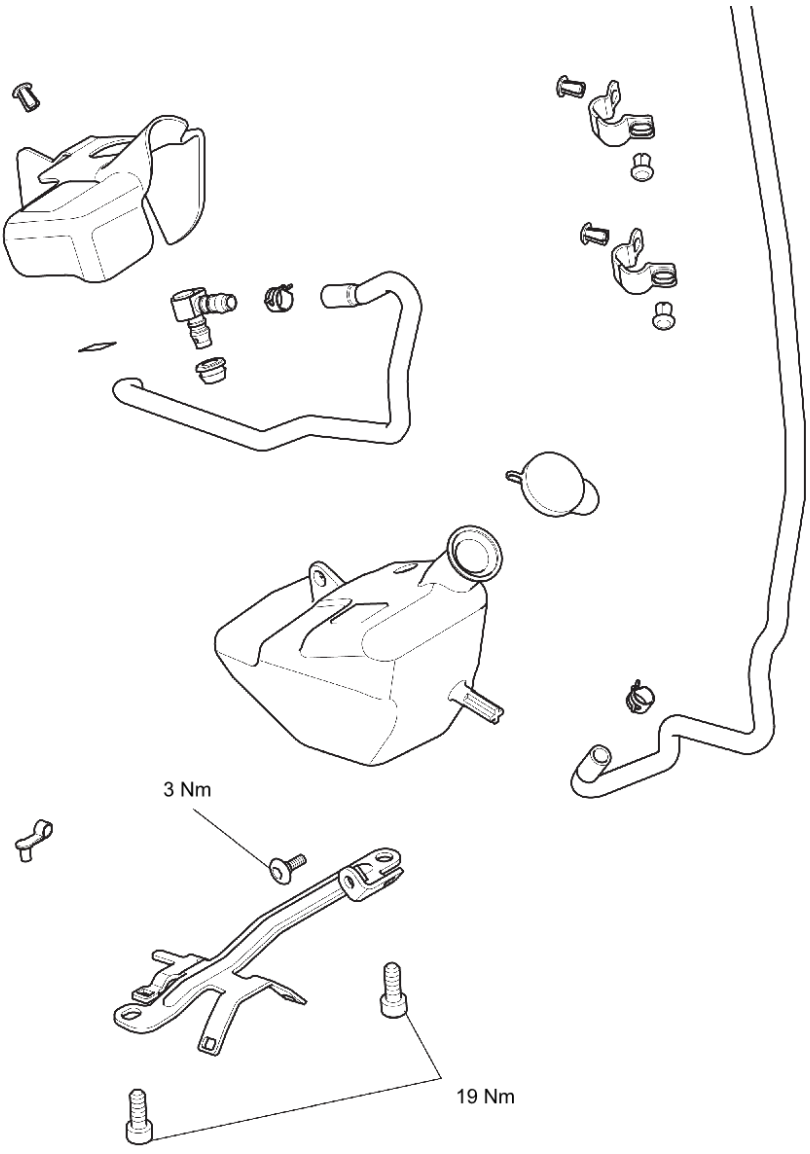
Cooling

Exploded View – Radiator and Hoses



Exploded View - Coolant Expansion Tank





Radiator Hoses

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 switched on and off by the Engine Control Module 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

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.

CAUTION

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 engine to overheat and suffer severe damage.

Coolant Replacement - Drainage

WARNING

Before starting work, ensure the 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.

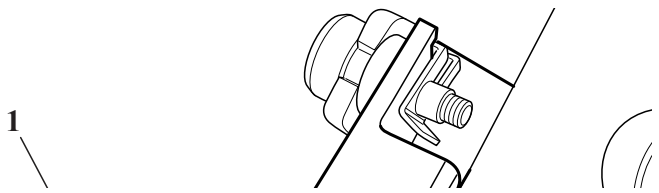
Note

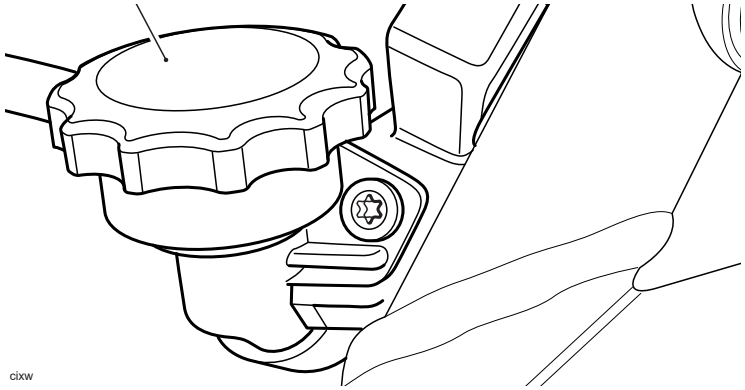
- **Prior to disassembly of the coolant hoses, note the orientation and position of the hose clamps to help ensure that they are returned to the same positions and orientation on assembly.**
- **Use T3880207 - Hose Clip Pliers for removal and installation of the hose clamps.**

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal

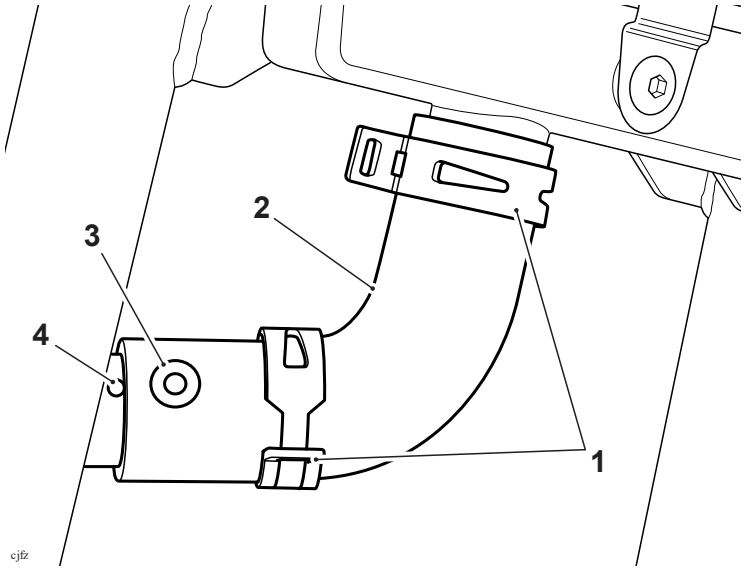
1. Remove the coolant pressure cap.





1. **Coolant pressure cap**

2. Position a container below the engine and radiator to collect the displaced coolant.
3. Using T3880207 - Hose Clip Pliers, release the hose clamps then release the bottom hose from the radiator and allow the coolant to drain.



1. **Hose clamps**
2. **Bottom hose**
3. **Coolant hose alignment mark**
4. **Hose alignment mark**

4. Disconnect the bottom hose.

Coolant Replacement - Filling

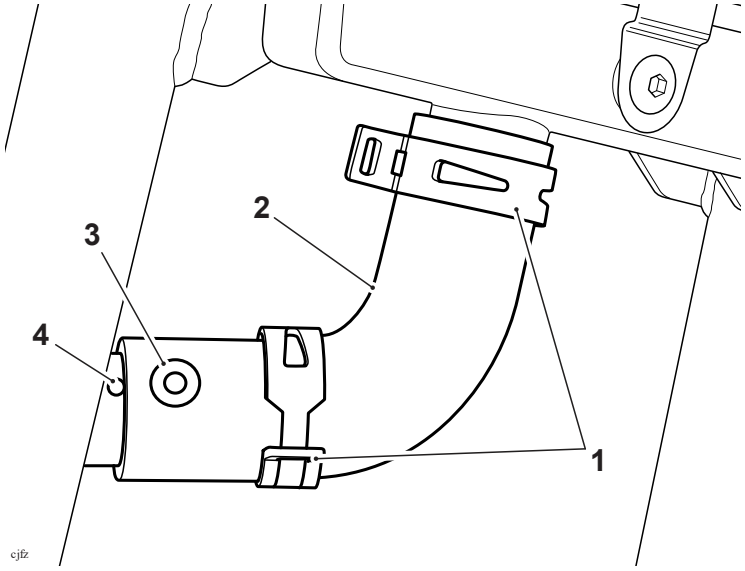
WARNING

Before starting work, ensure the 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

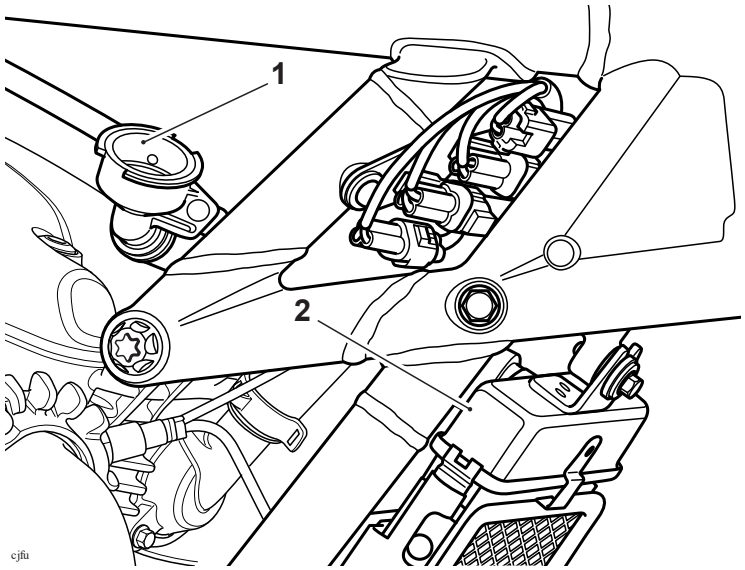
Do not remove the coolant pressure cap when the engine is hot. When the engine is hot, the coolant inside the radiator is hot and also under pressure. Contact with hot coolant will cause scalds and skin damage.

1. Refit the bottom hose. Ensure the hose is positioned to the alignment mark and the clamp is positioned as noted for removal.



1. **Hose clamps**
2. **Bottom hose**
3. **Coolant hose alignment mark**
4. **Hose alignment mark**

2. With the aid of an assistant, raise the rear wheel until the filler opening is above the radiator's upper coolant tank.



1. **Filler opening**
2. **Radiator's upper coolant tank**

3. Slowly add coolant mixture to the system, through the filler opening, until coolant escapes from the filler opening.

Note

- **If the system has filled correctly and fully, there should be coolant visible through the filler opening.**

Note

- **During filling, squeezing the bottom hose with both hands will help to pump coolant around the system and remove trapped air.**

4. Refit the coolant pressure cap.
5. Lower the motorcycle's rear wheel to the ground.
6. Refit the fuel tank (see Fuel Tank - Installation).
7. Reconnect the battery, positive (red) lead first and tighten the battery terminals to **4.5 Nm**.
8. Start the motorcycle and allow the engine to idle. Briefly raise the engine speed several times to allow any air to be expelled from the system.
9. Stop the engine and allow it to cool.
10. With the aid of an assistant, raise the fuel tank to allow access to the coolant pressure cap.
11. Remove the coolant pressure cap.
12. If necessary, top up the system through the filler.
13. Refit the coolant pressure cap.

Perform the following operations:

- Fuel Tank - Installation
- Check the expansion tank level and top up if necessary (see Coolant Level Inspection).
- Seat - Installation

Water Pump

Water Pump - 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.

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 and Water Pump - Removal for removal and Oil and Water Pump - Installation for installation).**

1. Check the water pump face and shaft seals for signs of leakage. Renew the pump if leakage is evident.

Coolant System Pressure Test

WARNING

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

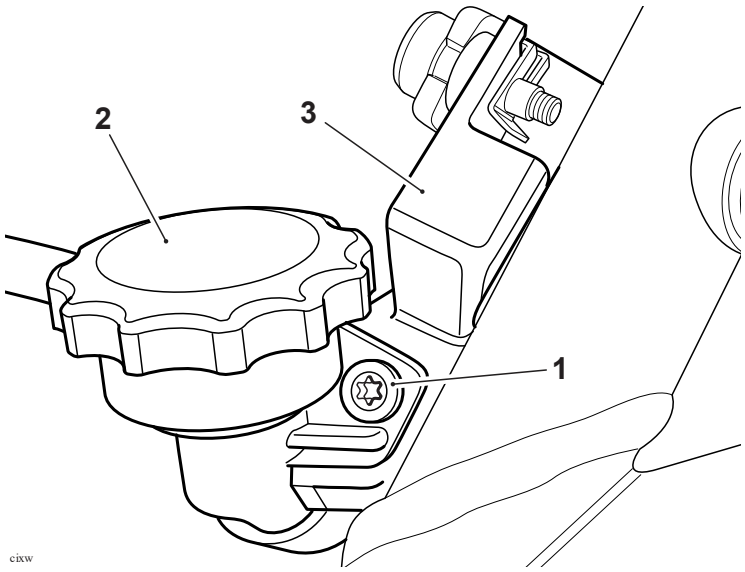
WARNING

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.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal

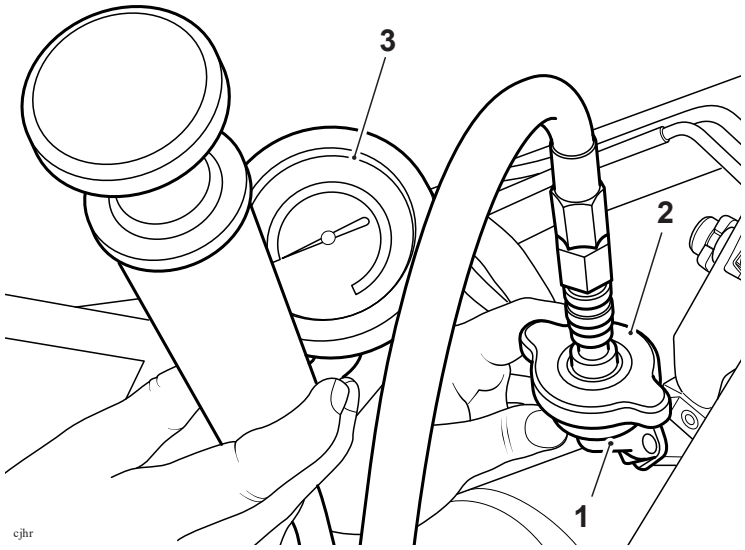
1. Remove the fixing and position the coolant filler neck away from the immobiliser bracket.



1. **Fixing**
2. **Coolant pressure cap**
3. **Immobiliser bracket**

2. Remove the coolant filler cap.
3. Select the T3880176 - Radiator Pressure Test (use with T3880147) bayonet type adapter and securely fasten to the coolant filler neck.

4. Carefully connect the hand pump (part of T3880147 - Radiator and Cap Tester Kit) to the T3880176 - Radiator Pressure Test (use with T3880147) ensuring an air tight seal is maintained.



1. **Coolant filler neck**
2. **T3880147 - Radiator and Cap Tester Kit**
3. **Hand held pump (part of T3880147 - Radiator and Cap Tester Kit)**

Note

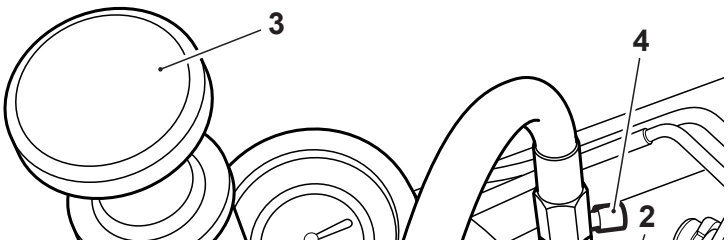
- **Do not exceed 1.2 bar when carrying out a coolant pressure test.**

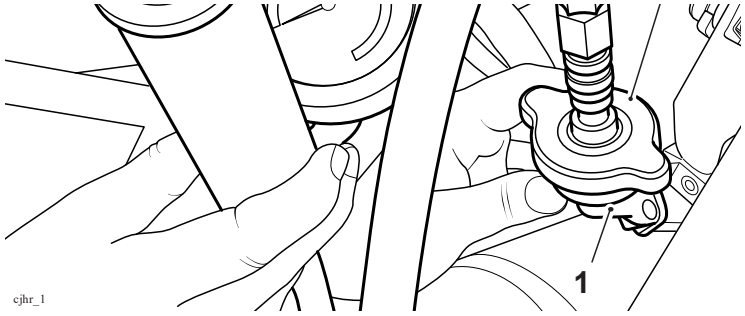
5. Pressurise the cooling system to the operating pressure, using the hand pump, taking care not to exceed 1.2 bar.
6. Hold the pressure for a minimum of 10 minutes, whilst visually inspecting the external components of the coolant system for leaks.

Note

- **If the engine oil is contaminated further exploratory investigation will be required.**
- **Engine oil with a hazy or milky appearance may indicate water emulsion.**
- **If the engine oil is contaminated rectify the cause of the problem and then renew the oil and filter.**

7. Remove the engine oil filler cap and check for contamination of the engine oil caused by coolant escaping into the engine sump.
8. De-pressurise the coolant test kit using the pressure release valve.





1. **Coolant filler neck**
2. **Bayonet type connector**
3. **Hand held pump**
4. **Pressure release valve**

9. Detach the T3880176 - Radiator Pressure Test (use with T3880147) bayonet type adapter from the coolant filler neck.
10. Refit the coolant filler neck and tighten the fixing to **3 Nm**.

Perform the following operations:

- Fill the coolant expansion tank to the maximum mark Coolant Level Adjustment
- Refit the coolant pressure cap
- Fuel Tank - Installation
- Battery - Installation
- Seat - Installation

Coolant Pressure Cap Test

WARNING

Before starting work, ensure the 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

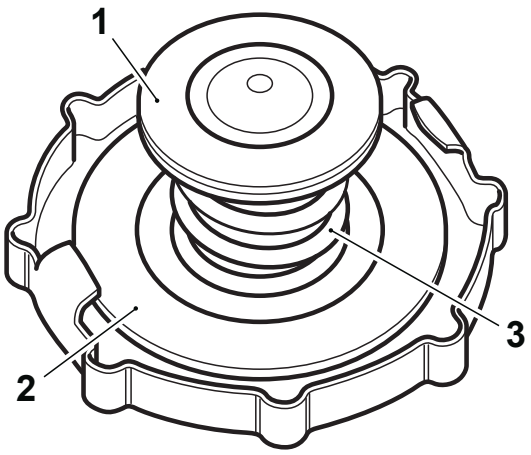
Do not remove the coolant pressure cap when the engine is hot. When the engine is hot, the coolant inside the radiator is hot and also under pressure. Contact with hot coolant will cause scalds and skin damage.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal

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.



ccer

1. **Lower Seal**
2. **Upper Seal**
3. **Spring**

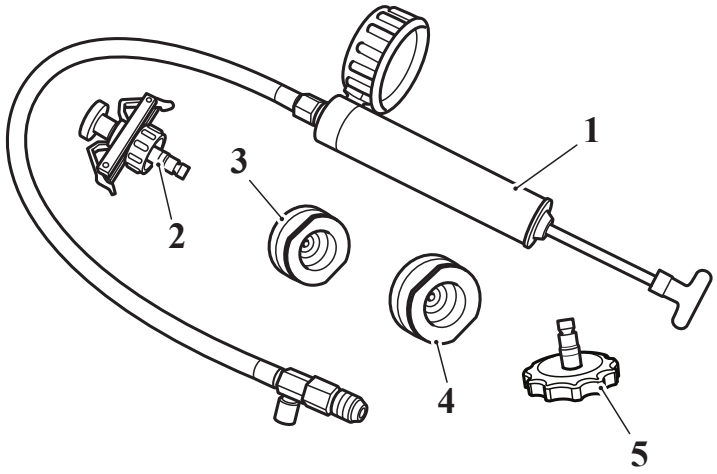
Note

- **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 1.2 bar as described using T3880147 - Radiator and Cap Tester Kit.

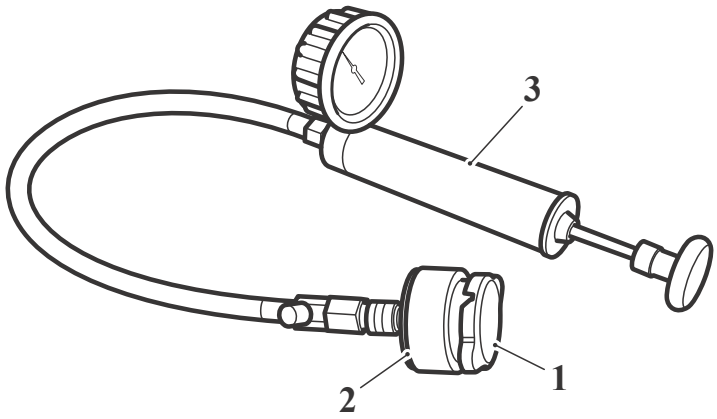
Note

- **It is recommended to carry out coolant pressure cap and cooling system pressure tests consecutively.**



1. **Hand held pump**
2. **Bayonet type connector**
3. **Pressure cap test adapter 44 mm**
4. **Pressure cap test adapter 46 mm**
5. **Coolant cap type connector**

5. Select the correct test adapter and securely fasten to the pressure cap.
6. Carefully connect the hand pump to the adapter ensuring an air tight seal is maintained.



cgwq

1. **Pressure cap**
2. **Test adapter**
3. **Hand held pump**

7. Pressure test the cap to it's 1.2 bar 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.

Perform the following operations:

- Refit the coolant pressure cap
- Fuel Tank - Installation
- Battery - Installation
- Seat - Installation

Thermostat - Removal

WARNING

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

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal

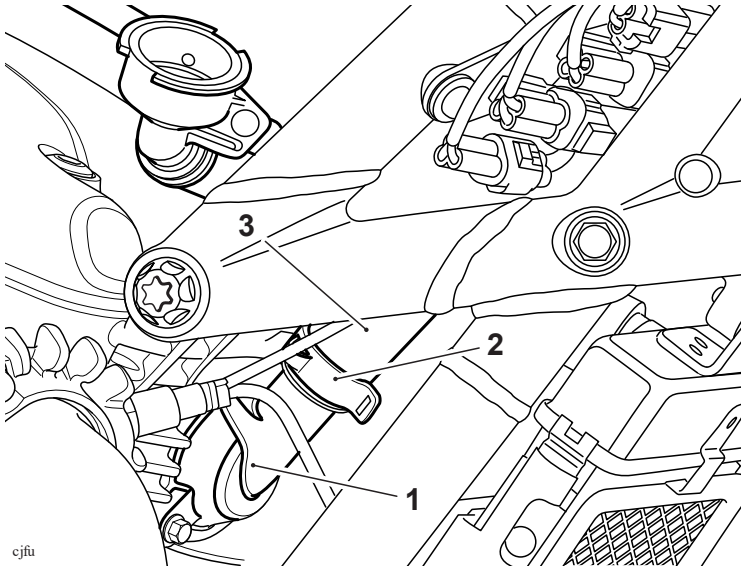
WARNING

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.

Note

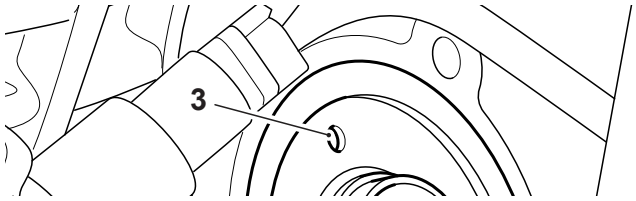
- **Prior to disassembly of the coolant hoses, note the orientation and position of the hose clamps to help ensure that they are returned to the same positions and orientation on assembly.**
- Drain the coolant (see Coolant Replacement - Drainage).

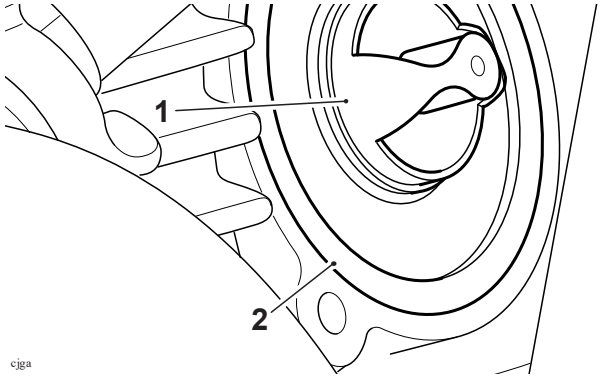
1. Release the hose clamp from the thermostat housing.



1. **Thermostat housing**
2. **Hose clamp**
3. **Top hose**

2. Release the fixings securing the thermostat housing to the cylinder head, and withdraw the housing downwards, detaching it from the top hose.
3. Remove the housing, collect the thermostat and discard the seal.





1. **Thermostat**
2. **Thermostat seal**
3. **Bypass hole**

Thermostat - Inspection

1. Inspect the thermostat at room temperature. If the thermostat is open, it must be replaced.
2. To check the thermostat is opening at the correct temperature, suspend the thermostat in a suitable container of water and raise the temperature of the water until the thermostat opens.
3. Measure the water temperature with an accurate thermometer.
   - Refer to the General Information section for the correct thermostat opening temperature.
4. If the temperature at which thermostat opening takes place is incorrect, replace the thermostat.

Thermostat - Installation

WARNING

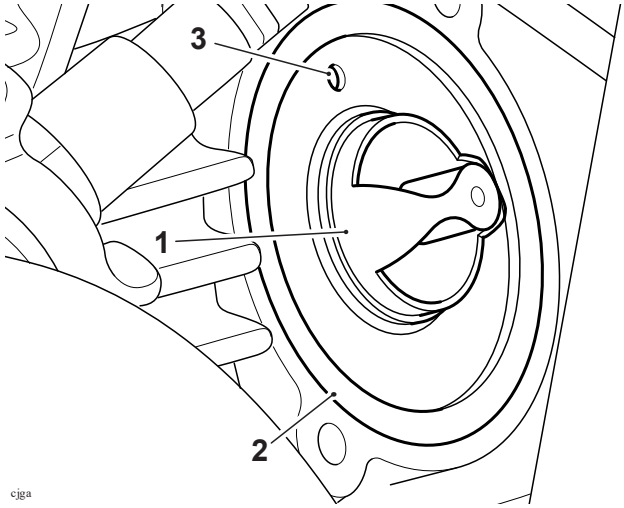
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

WARNING

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. Clean the mating surfaces of the cylinder head and thermostat housing.
2. Position a new seal to the thermostat, seating the thermostat into the groove in the seal.
3. Locate the thermostat into the cylinder head with the centre bars of the thermostat in a horizontal position, and the bypass hole positioned uppermost.





1. **Thermostat**
2. **Thermostat seal**
3. **Bypass hole**

4. Reconnect the top hose to the thermostat housing. Ensure the hose clamp is positioned as noted during removal.
5. Locate the thermostat housing to the cylinder head, ensuring that the top hose is fully seated on to the thermostat outlet. Tighten the fixings to **9 Nm**.

- Refill the cooling system (see Coolant Replacement - Filling).
- Check the expansion tank level and top up if necessary (see Coolant Level Inspection).

Perform the following operations:

- Fuel Tank - Installation
- Battery - Installation
- Seat - Installation

Radiator - Removal

WARNING

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

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.

Note

- **Prior to disassembly of the coolant hoses, note the orientation and position of the hose**

Note

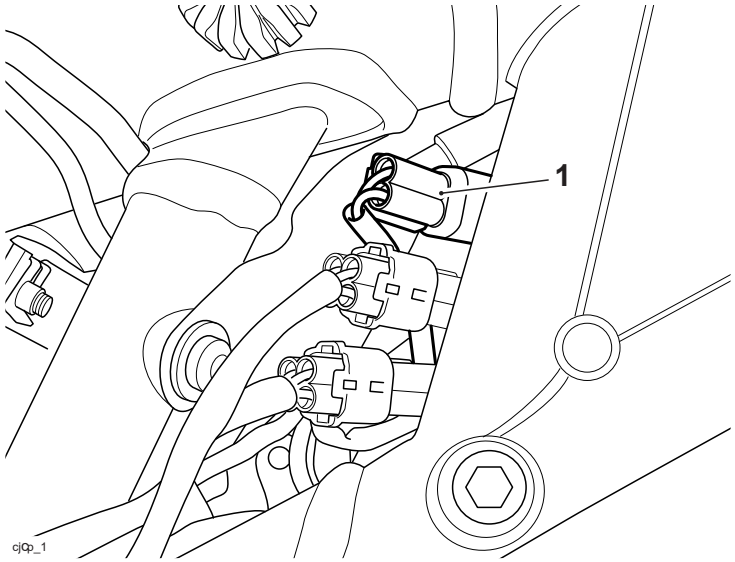
clamps to help ensure that they are returned to the same positions and orientation on assembly.

- **Use T3880207 - Hose Clip Pliers for their removal and installation.**

Perform the following operations:

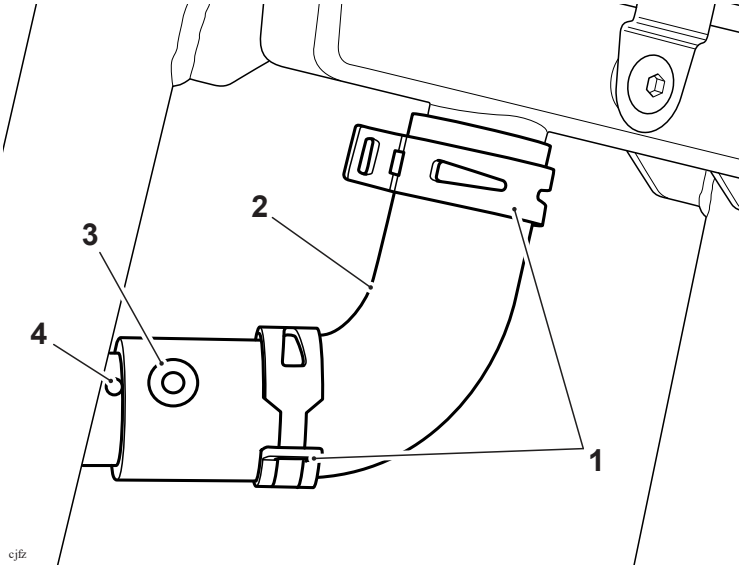
- Remove the right hand frame cradle (see Cradle Assemblies - Removal).
- Drain the coolant (see Coolant Replacement - Drainage).

1. Disconnect the cooling fan electrical connector.



1. **Cooling fan electrical connector**

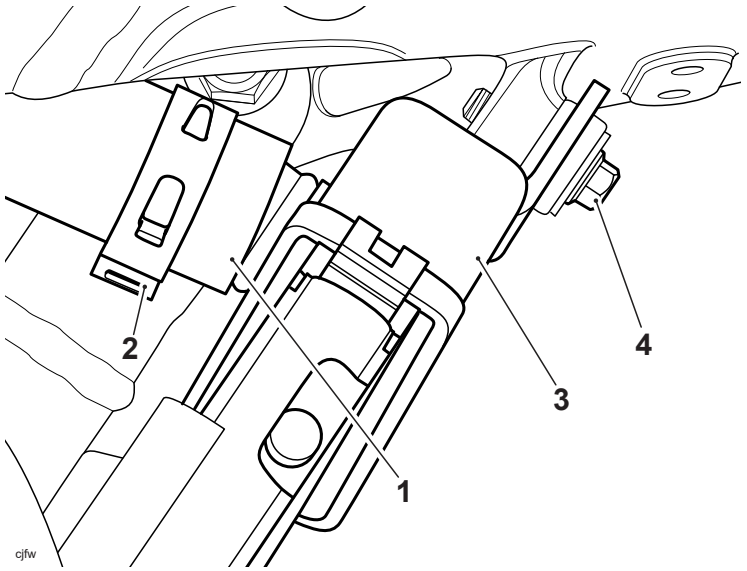
2. Disconnect the bottom hose from the radiator.



1. **Hose clamps**
2. **Bottom hose**

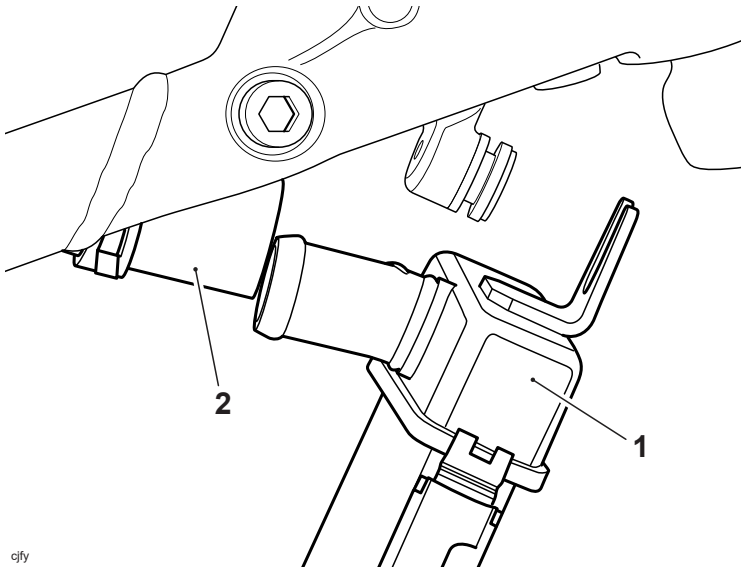
3. **Coolant hose alignment mark**
4. **Outlet pipe alignment mark**

3. Disconnect the top hose clamp from the radiator.
4. Release the fixing securing the radiator to the frame.



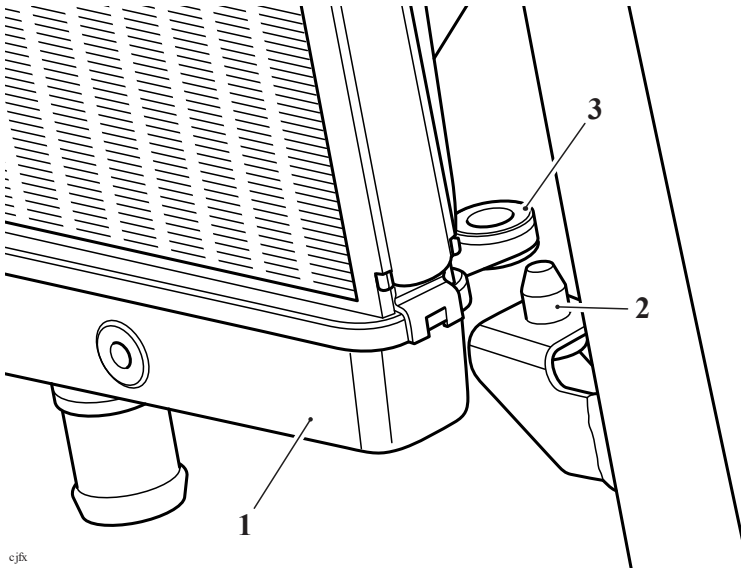
1. **Top hose**
2. **Hose clamp**
3. **Radiator**
4. **Fixing**

5. Release the top hose.



1. **Radiator**
2. **Top hose**

6. Raise the radiator and rubber mounting from its lower mounting on the left hand cradle assembly.



1. **Radiator**
2. **Radiator lower mounting**
3. **Rubber mounting**

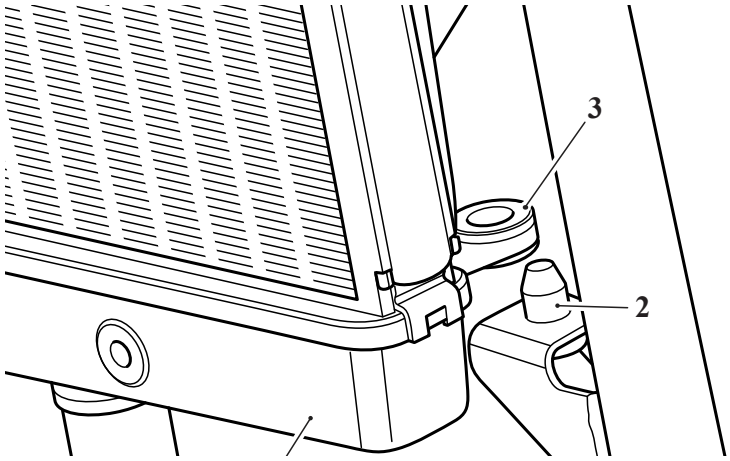
7. Remove the radiator from the motorcycle, taking care not to damage the radiator, left hand frame cradle or front mudguard.

Radiator - 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.

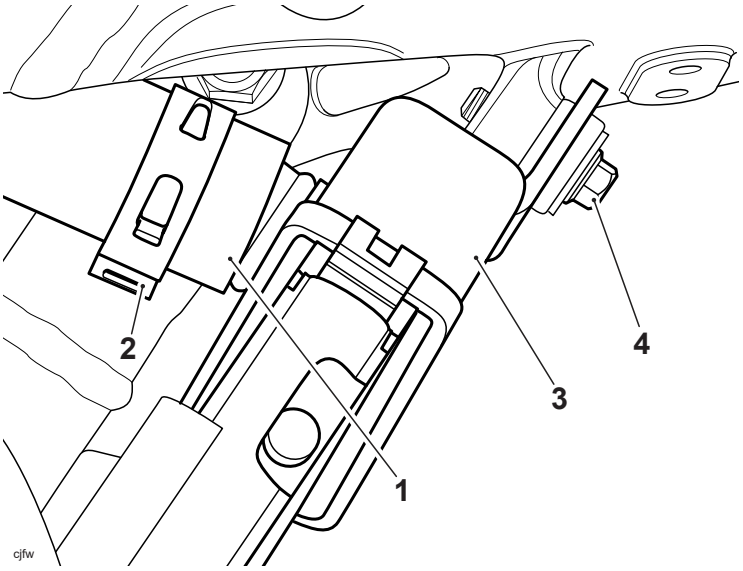
1. Align the radiator's lower rubber mounting to its mounting on the left hand cradle assembly.





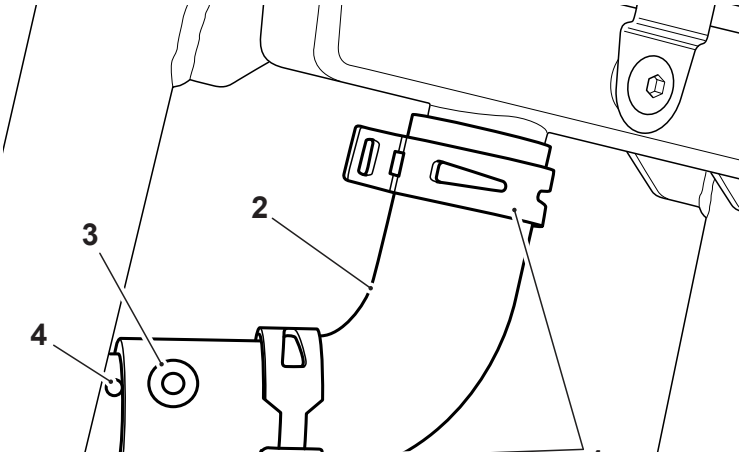
1. **Radiator**
2. **Radiator lower mounting**
3. **Rubber mounting**

2. Refit the radiator to the top hose, ensure the top hose clamp is positioned as noted during removal.
3. Align the radiator upper mounting and tighten the fixing to **6 Nm**.



1. **Top hose**
2. **Clamp**
3. **Radiator**
4. **Fixing**

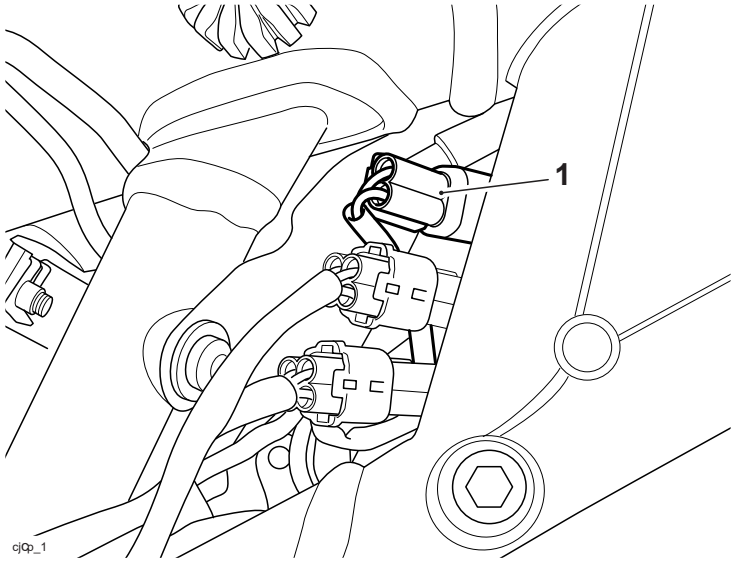
4. Refit the right hand frame cradle assembly (see Cradle Assemblies - Installation).
5. Refit the bottom hose, positioning the clamps as noted during removal.





1. **Clamps**
2. **Bottom hose**
3. **Coolant hose alignment mark**
4. **Outlet pipe alignment mark**

6. Re-connect the cooling fan electrical connector.



1. **Cooling fan electrical connector**

7. Refill the cooling system (see Coolant Replacement - Filling).
8. Check the expansion tank level and top up if necessary (see Coolant Level Inspection).

Perform the following operations:

- Fuel Tank - Installation
- Battery - Installation
- Seat - Installation

Coolant Expansion 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

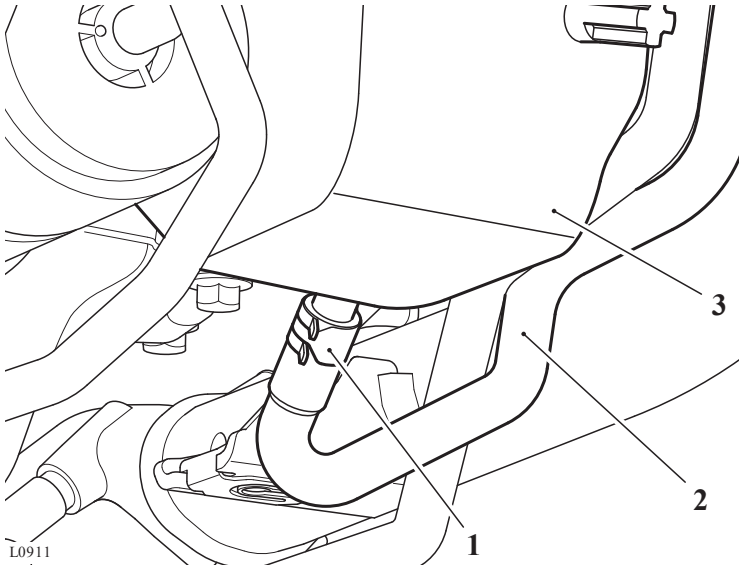
WARNING

If the motorcycle has recently been running, some 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 motorcycle.

Perform the following operations:

- Sump Guard - Removal

1. Position a container below the engine and radiator to collect the displaced coolant.
2. Release the hose clamp and drain the coolant from the coolant expansion tank.

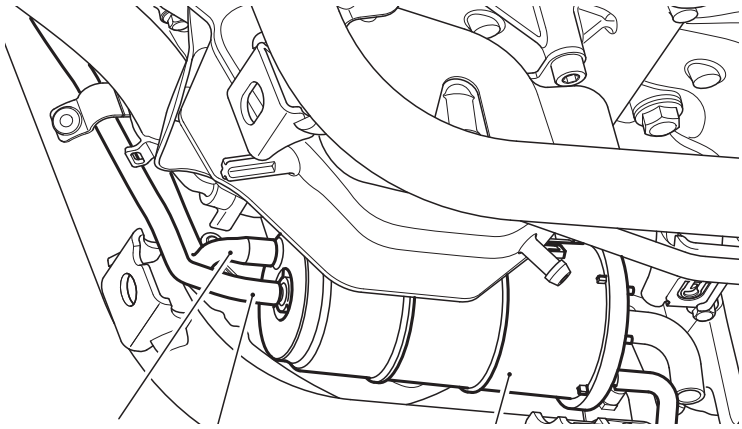


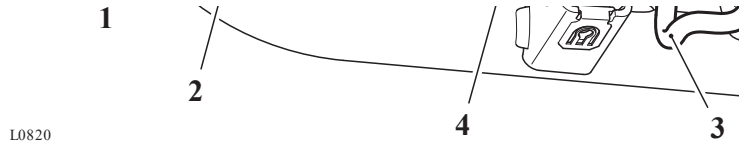
1. **Hose clamp**
2. **Coolant expansion tank hose**
3. **Coolant expansion tank**

Note

- **Note the routing and locations of the hoses connected to the evaporative canister for installation.**

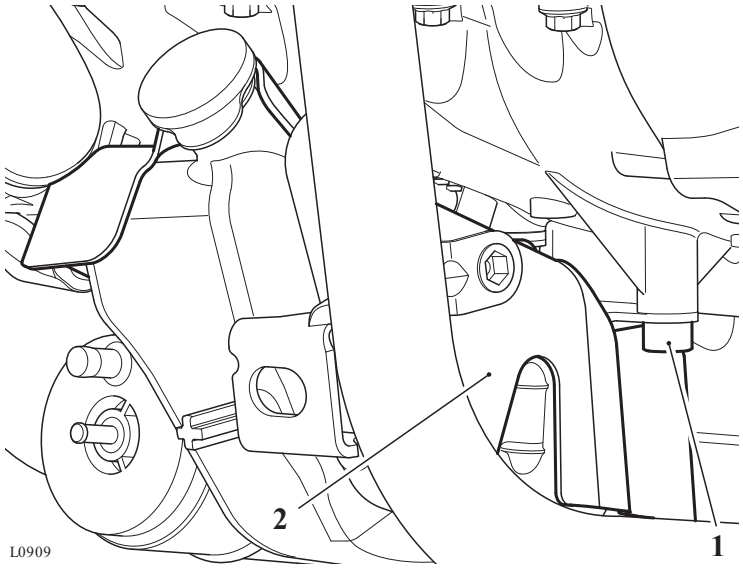
3. If fitted, detach the hoses from the evaporative canister.





1. **Hose to purge valve**
2. **Hose to fuel tank vent**
3. **Hose evaporative cannister vent**
4. **Evaporative canister**

4. Remove the two fixings securing the coolant expansion tank and its bracket to the crankcase and remove the assembly.

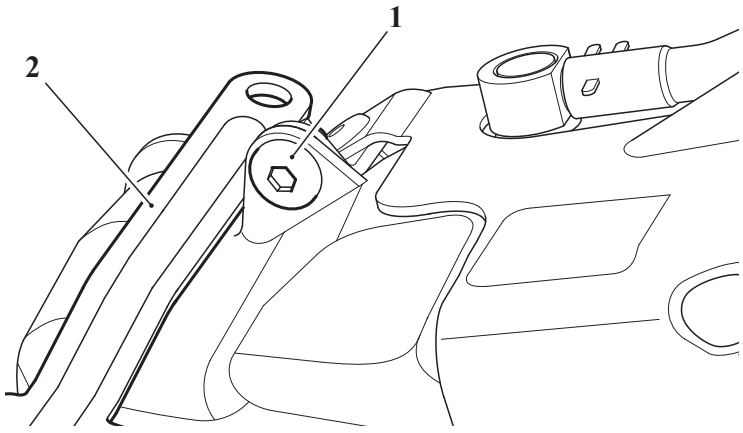


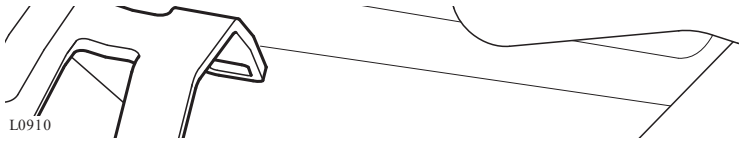
1. **Fixing (left hand side shown)**
2. **Coolant expansion tank bracket**

Note

- **Note the position of the coolant expansion tank hoses for installation.**

5. Remove the fixing and remove the coolant expansion tank from its bracket.





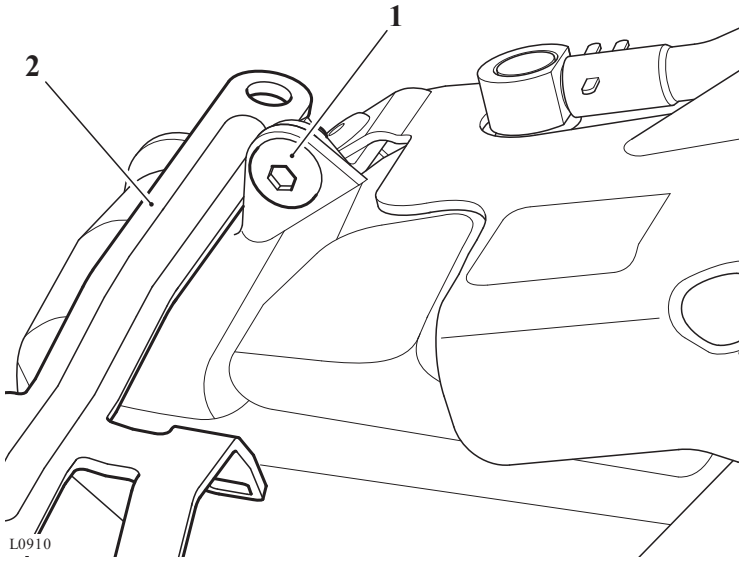
1. **Fixing**
2. **Coolant expansion tank bracket**

Coolant Expansion Tank - Installation

WARNING

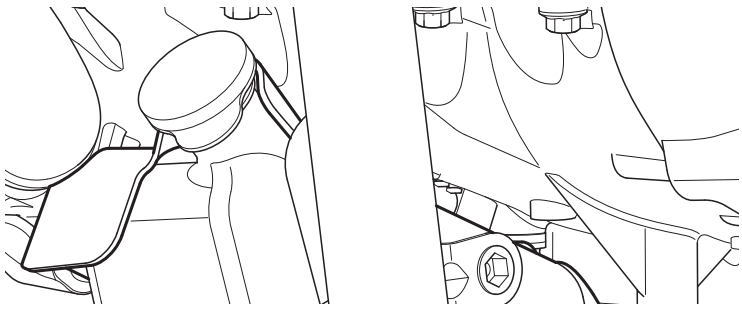
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

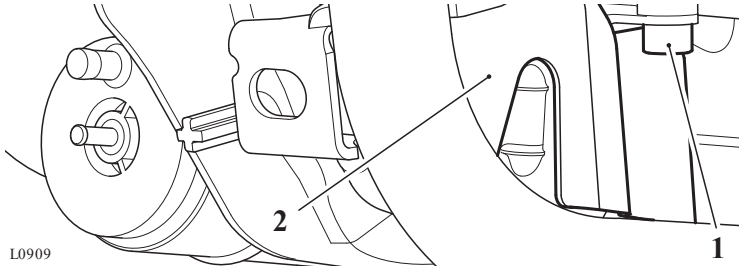
1. Fit the coolant expansion tank its bracket and tighten the fixing to **3 Nm**.



1. **Fixing**
2. **Coolant expansion tank bracket**

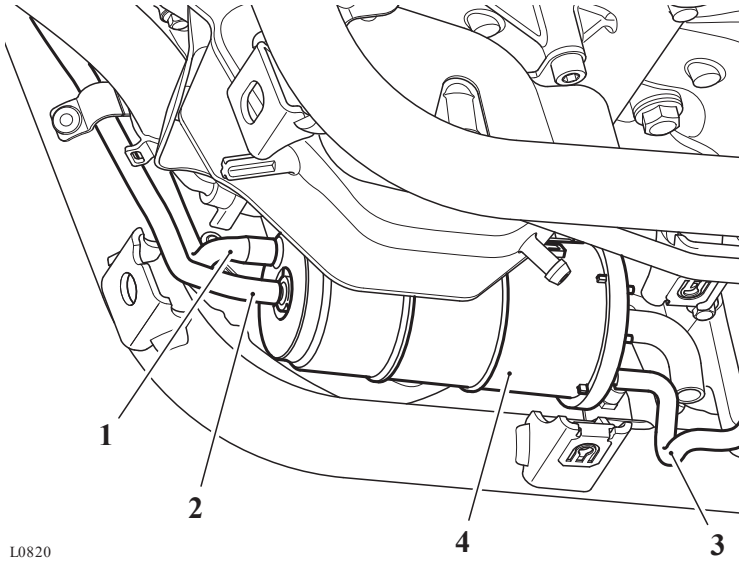
2. Position the coolant expansion tank and its bracket assembly to the crankcase and tighten the fixing to **19 Nm**.





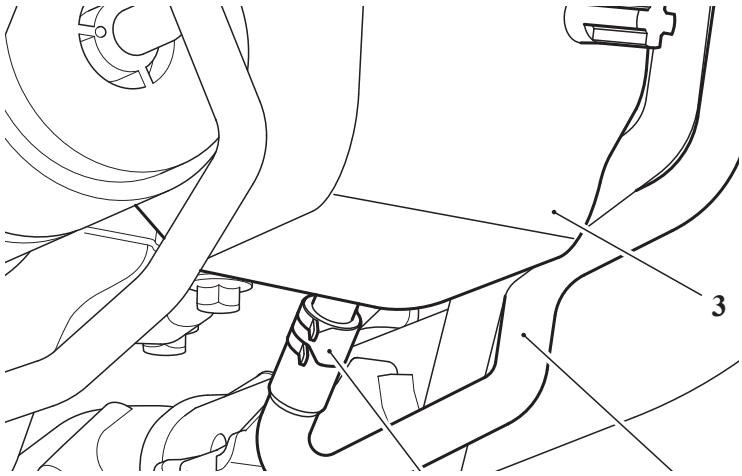
1. **Fixing (left hand side shown)**
2. **Coolant expansion tank bracket**

3. If fitted, connect the hoses to the evaporative canister as noted for removal.



1. **Hose to purge valve**
2. **Hose to fuel tank vent**
3. **Hose evaporative cannister vent**
4. **Evaporative canister**

4. Refit the expansion tank hose and secure using the hose clamp.





1. **Hose clamp**
2. **Coolant expansion tank hose**
3. **Coolant expansion tank**

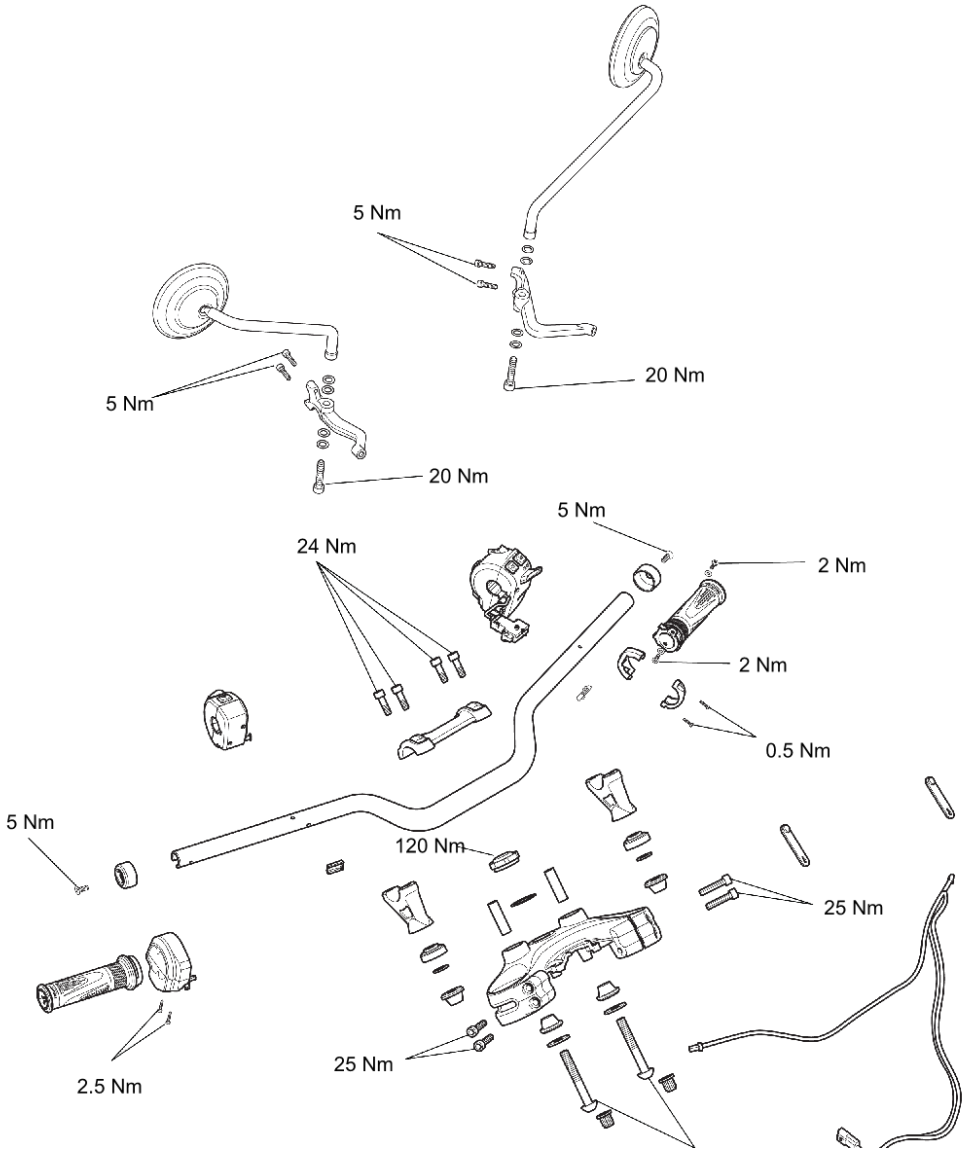
5. Fill the coolant expansion tank to the maximum mark (see Coolant Level Adjustment).

Perform the following operations:

- Sump Guard - Installation

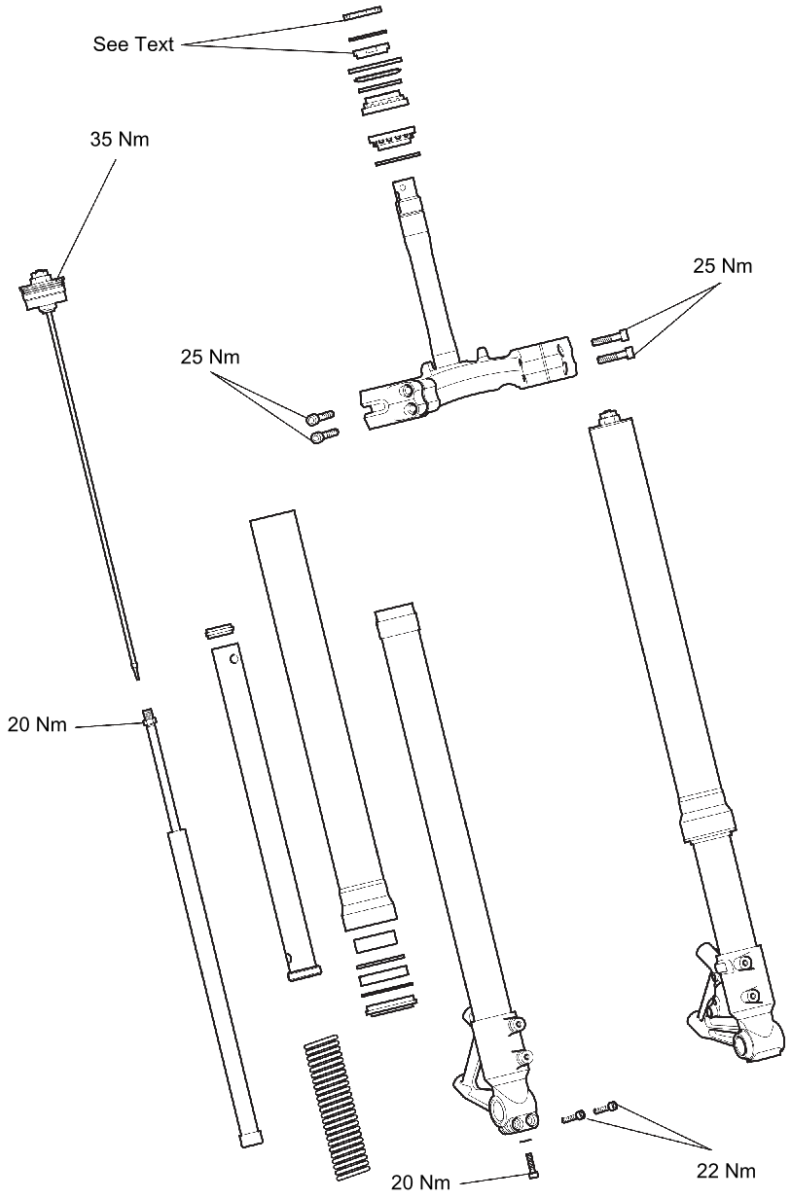
Front Suspension

Exploded View – Handlebars and Upper Yoke



38 Nm

Exploded View – Front Fork, Lower Yoke and Steering Head Bearings



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.

WARNING

Do not allow a brake component to hang unsupported on the brake hose or line.

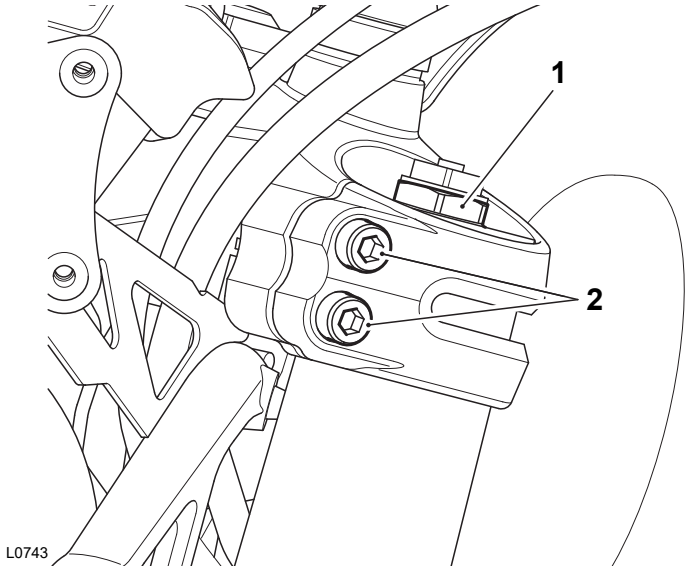
Brake hoses or lines that are not supported may become damaged or bent.

Bent or damaged brake hoses or lines lead to reduced braking efficiency causing loss of motorcycle control and an accident.

Perform the following operations:

- Raise and support the front of the motorcycle.
- Front ABS Wheel Speed Sensor - Removal
- Front Wheel - Removal
- Front Mudguard - Removal

1. If the forks are to be dismantled, loosen the fork top caps.
2. Loosen the upper yoke clamp fixings.



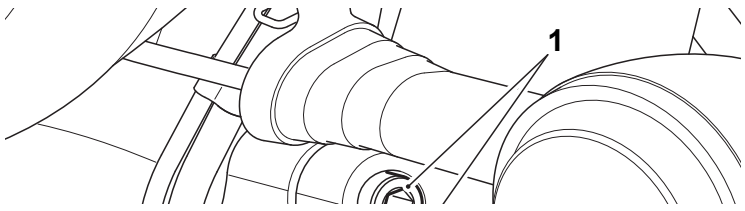
1. Fork top cap

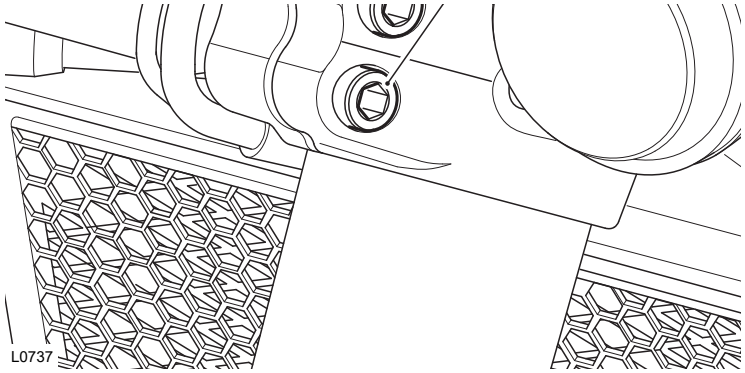
2. Upper yoke clamp fixings

CAUTION

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

3. Loosen the lower yoke clamp fixings.





1. **Lower yoke clamp fixings**

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

Fork Oil Change - Oil Draining

WARNING

Before starting work, ensure the 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 change the fork adjustment settings. If they are changed, this will change the handling of the motorcycle from those which the rider is used to. Riding with unfamiliar fork settings may cause unexpected handling characteristics leading to loss of control and an accident.

1. Remove the fork (see Front Fork - Removal).

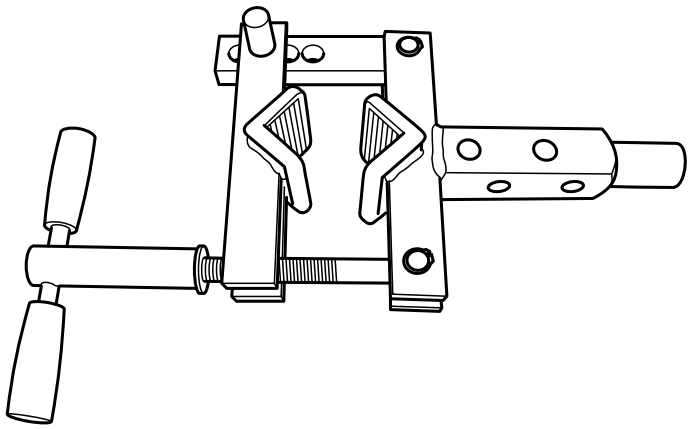
WARNING

Put on eye protection and be careful when you loosen the top cap. If the fork preload has been adjusted, there can be some spring pressure when the cap is released. If you do not hold the cap firmly, the fork top cap can be released suddenly and cause injury.

CAUTION

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

2. With the top cap facing upwards, using T3880171 - Fork Holding Tool clamp the fork outer tube, then unscrew the top cap from the outer tube.



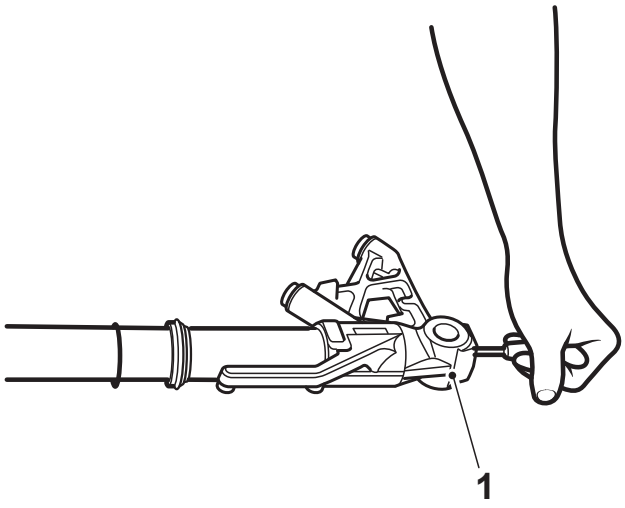
cjlx

T3880171 - Fork Holding Tool

Note

- **If the damper is to be removed from the fork, do the step below before you loosen the top cap.**

3. If the damper is to be removed, loosen the damper fixing at the bottom of the fork by a half turn.



ccux_2

1. Damping cylinder fixing location

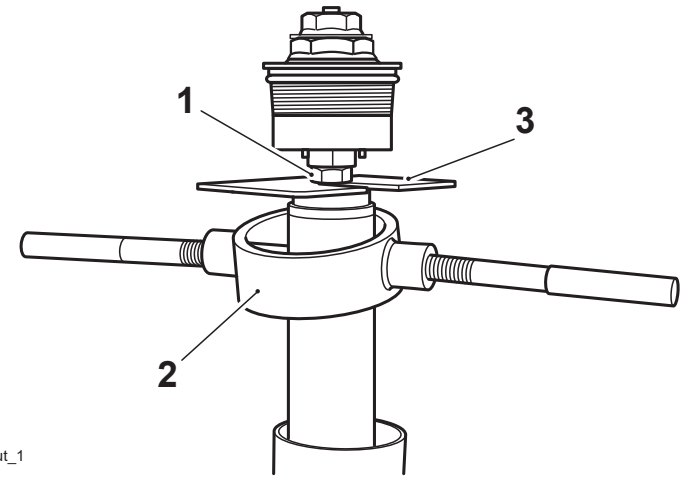
4. Holding the inner and outer tubes together, invert the fork and pour out the fork oil into a suitable container.
5. Return the fork to T3880171 - Fork Holding Tool.
6. Allow the outer tube to slide down the inner to allow access to the spring spacer.

WARNING

WARNING

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

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



1. **Damper locknut**
2. **T3880067 - Fork Spring Compressor**
3. **Spring holder (part of T3880067 - Fork Spring Compressor)**

Note

- **During the step that follows, measure the length of the threads above the locknut for the installation procedure.**

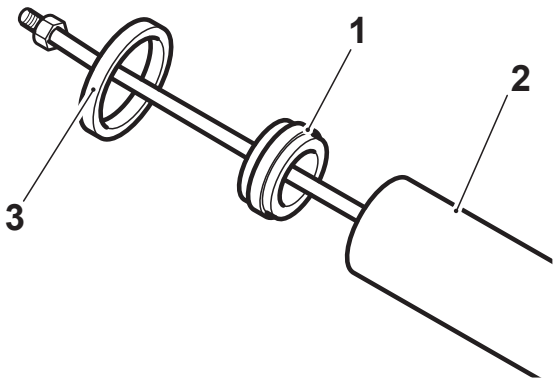
9. Loosen the damper locknut a small amount, then unscrew and remove the top cap and the rebound adjuster rod, taking care not to bend the rod. The top cap assembly cannot be dismantled.
10. Measure the length of threads from the lock nut to the damper rod end.
11. Compress the fork spring again and remove the spring holder and T3880067 - Fork Spring Compressor.
12. Pump the damper rod to remove all the oil.

WARNING

WARNING

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

13. Remove the bump rubber (if not attached), nylon spacer, spring spacer and spring.



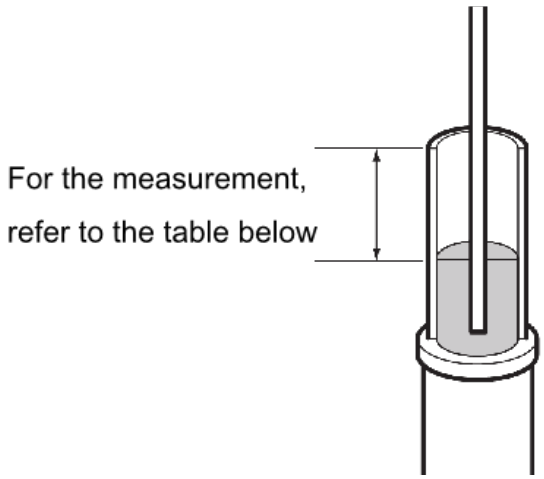
ccwz_1

1. **Nylon spacer**
2. **Spring spacer**
3. **Bump rubber**

14. Invert the fork and pour out the remaining fork oil into a suitable container.

Fork Oil Change - Oil Refilling

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



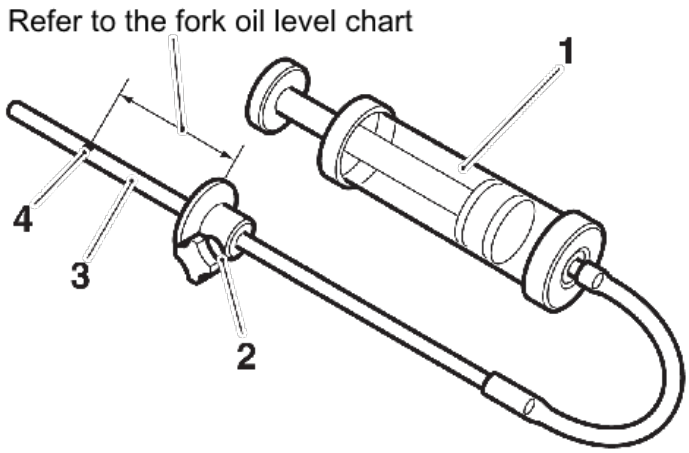
cbyf

Fork Oil Level (spring, spring seat and spacer removed, and the fork fully compressed)

Fork Oil Level (spring, spring seat and spacer removed, and the fork fully compressed)

Fork Oil Level	160 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.
2. Pump the fork assembly and damper several times to expel any trapped air then fully compress the fork and support it in an upright position. Leave the fork for a few minutes to allow the oil to stabilise.
3. Set the scale on T3880160 - Fork Oil Filler/Evacuator to the level specified (see the fork oil table or illustration below for the correct level setting).



cbyg

1. **T3880160 - 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.**

4. Insert the scale end of the tool into the fork inner tube.
5. Hold the tool adjuster plate level with the upper surface of the fork inner tube and draw

fluid into the syringe until fluid flow ceases (empty the syringe if the body becomes full before fluid flow stops).

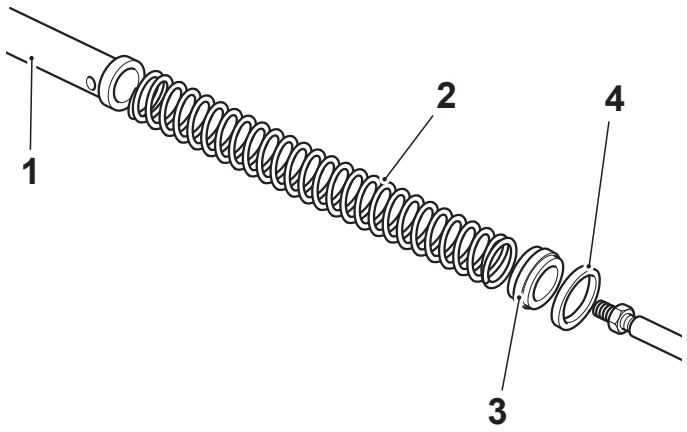
6. The fluid level in the fork is now set to the height set on the tool scale. Check the tool scale setting and repeat the process if incorrectly set.

WARNING

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

Assemble the Front Fork

1. Position the fork assembly as for compression of the fork spring during strip down.
2. Refit the fork spring spacer, spring, nylon spacers and the bump rubber.



ccuu_2_1

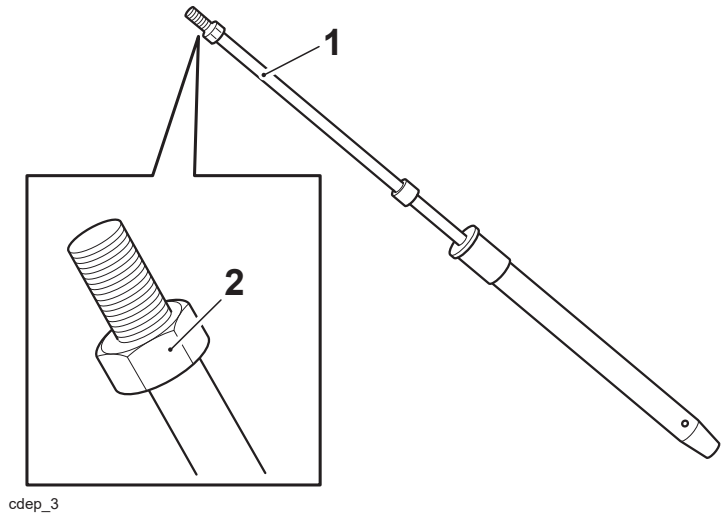
1. **Spring spacer**
2. **Spring**
3. **Nylon spacer**
4. **Bump rubber**

3. Attach T3880085 - Fork Piston Holder to the threads of the damper rod and pull the damper upwards.

CAUTION

If removed, the damping rod locknut must be fitted with the flat face facing to the top of the fork. The slightly tapered face must face the fork spring. Incorrect orientation may lead to a loosening of the locknut.

4. Turn the damper rod locknut until the length of threads to the end of the rod is equal to the length measured during disassembly.

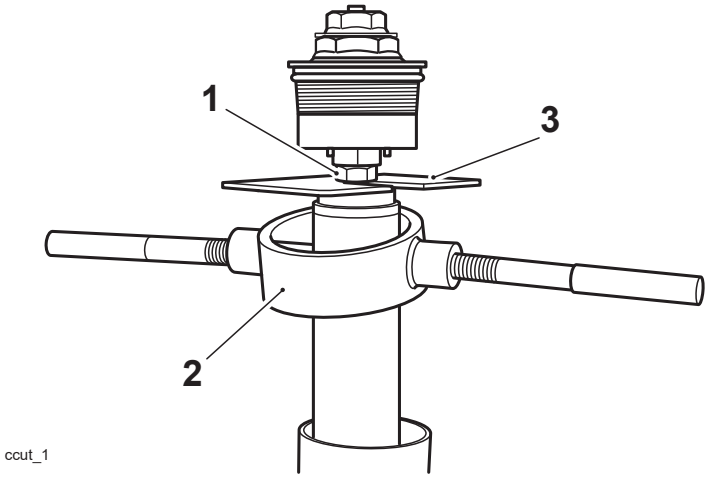


1. **Damper rod**
2. **Locknut**

WARNING

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

5. Refit T3880067 - Fork Spring Compressor as previously described. Compress the fork spring and refit the spring holder.



1. **Damper locknut**
2. **T3880067 - Fork Spring Compressor**

3. **Spring holder (part of T3880067 - Fork Spring Compressor)**

6. Inspect the O-ring for the top cap for any damage, replace if necessary.
7. Carefully install the top cap and rebound adjuster rod. Slowly turn the cap until it touches the locknut.
8. Hold the top cap while tightening the damper rod locknut to **20 Nm**.

WARNING

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

9. Recompress the spring to remove the spring holder.
10. Lubricate the O-ring on the top cap with a smear of fork oil then screw the top cap fully into the outer tube.
11. Fit the fork (see Linked procedure not present at the moment.) but do not fully tighten the top yoke clamp fixings at this stage.
12. Tighten the top cap to **35 Nm**.
13. Tighten the top yoke clamp fixings to **25 Nm**.

Note

- **It is much easier to tighten the top cap when the fork has been refitted.**

Fork Oil Level Chart

Oil Level	Oil Volume	Oil Grade	Fork Pull Through
160 mm	591cc	Showa SS47	45.7 mm +/- 0.5 mm from lower edge of top yoke to the top of the inner tube (not the top cap)

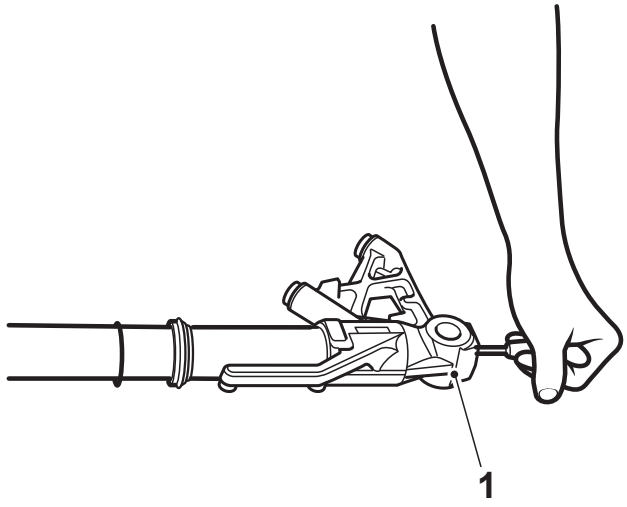
Front Fork - Disassembly

WARNING

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

1. Drain the fork oil (see Fork Oil Change - Oil Draining).

2. Loosen the damper fixing at the bottom of the fork by a half turn.



ccux_2

1. Damping cylinder fixing location

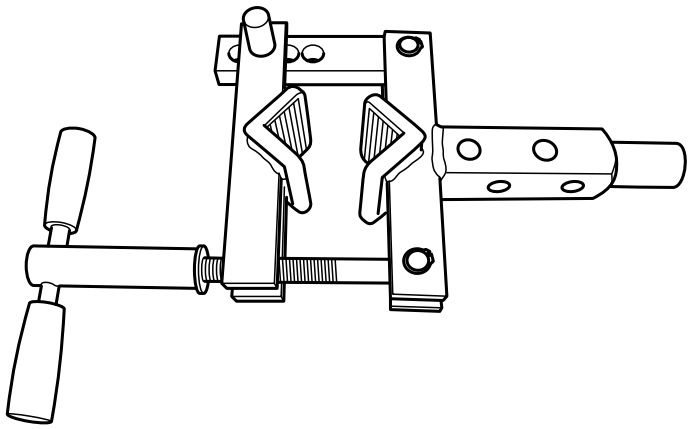
Note

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

CAUTION

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

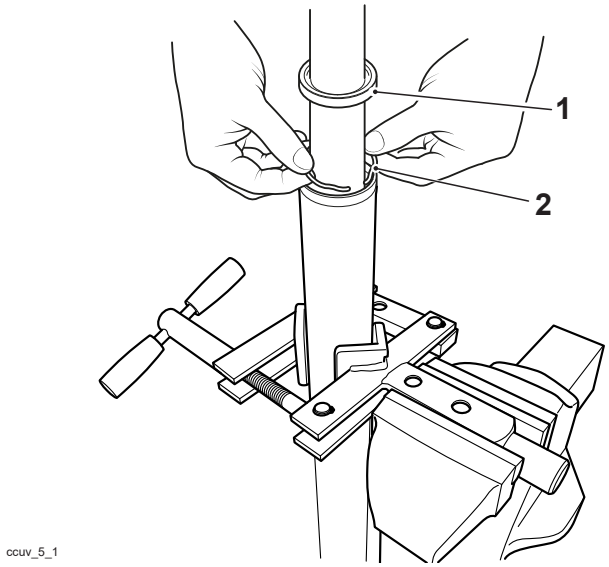
3. Using T3880171 - Fork Holding Tool clamp the fork outer tube.



cjix

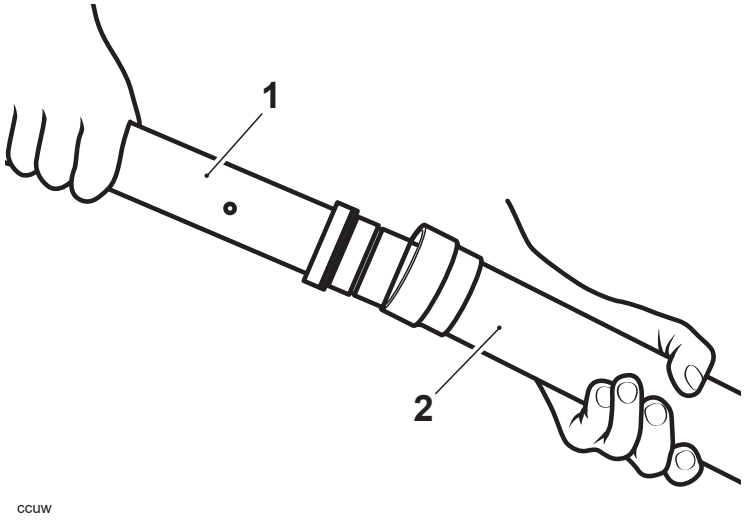
T3880171 - Fork Holding Tool

4. Raise the inner tube and remove the dust seal and circlip from the outer tube.



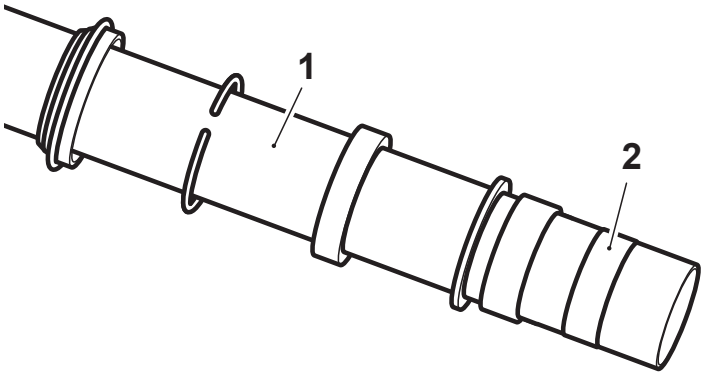
1. **Dust seal**
2. **Circlip**

5. Remove the fork from T3880171 - Fork Holding Tool and, using a slide hammer action to release the oil seal and bushes from the outer tube. Separate the inner and outer tubes, leaving the seals and bushes in place on the inner tube. Note the relative positions and orientation of all bushes and seals before removal.



1. **Inner tube**
2. **Outer tube**

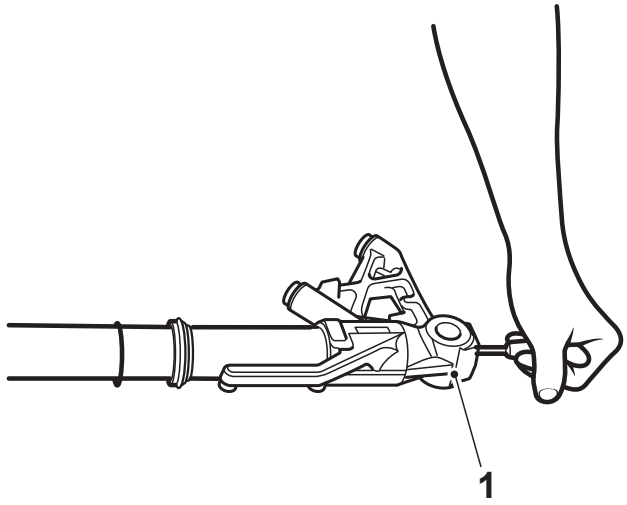
6. To allow the removal of the seals and bushes, carefully remove the upper bush from the inner tube.



ccup_3

1. **Inner tube**
2. **Upper bush**

7. Remove the damper fixing from the bottom of the fork.



ccux_2

1. **Damping cylinder fixing location**

8. Remove the damping cylinder from the inner tube.





ccuy_1

1. **Damping cylinder**

Front Fork - Assembly

WARNING

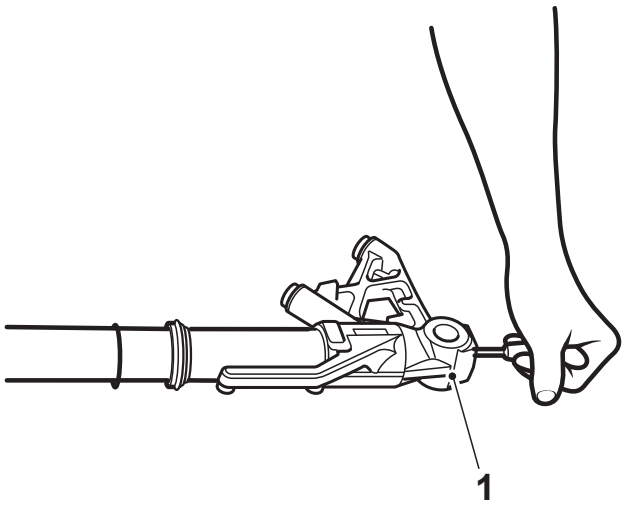
The front forks comprise of many precision machined parts. Total cleanliness must be observed at all times and assembly must take place in a dirt/dust-free environment.

Dirt ingress may cause damage to the fork parts, leading to incorrect operation, instability, loss of motorcycle control or an accident.

Note

- **If the damper has not been removed, omit operations 1 and 2.**

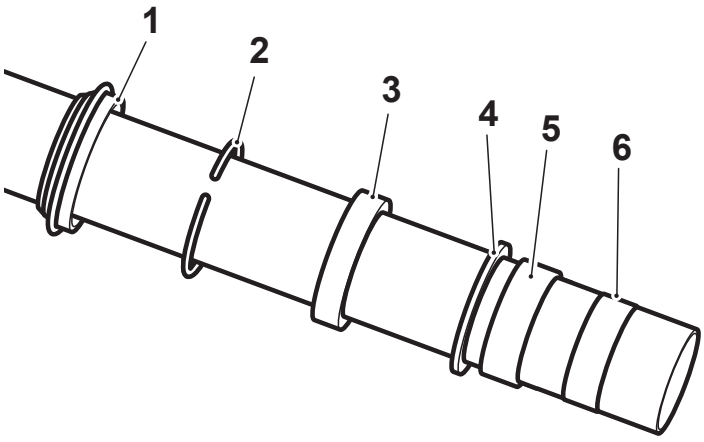
1. Clean the threads of the damping cylinder fixing and fit a new sealing washer. Prevent the cylinder from turning while tightening the damping cylinder securing fixing to **20 Nm**.



ccux_2

1. **Damping cylinder fixing location**

2. Invert the fork and secure in T3880171 - Fork Holding Tool.
3. Apply a smear of fork oil to the bushes and new seals.
4. Position the seals and bushes to the inner tube as noted during removal. Ensure the oil seal (item 3) is positioned with the text end facing the circlip (item 2). Use a new circlip.



ccup_2

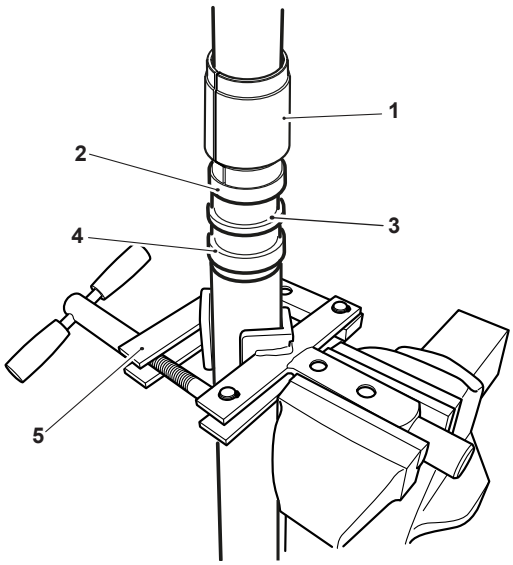
1. **Dust seal**
2. **Circlip**
3. **Oil seal**
4. **Washer**
5. **Lower bush**
6. **Upper bush**

5. Using a suitable tool, fit the upper bush to the fork inner tube.
6. Position the inner tube assembly to the outer, ensuring that the oil and dust seal lips do not become damaged.

Note

-
-

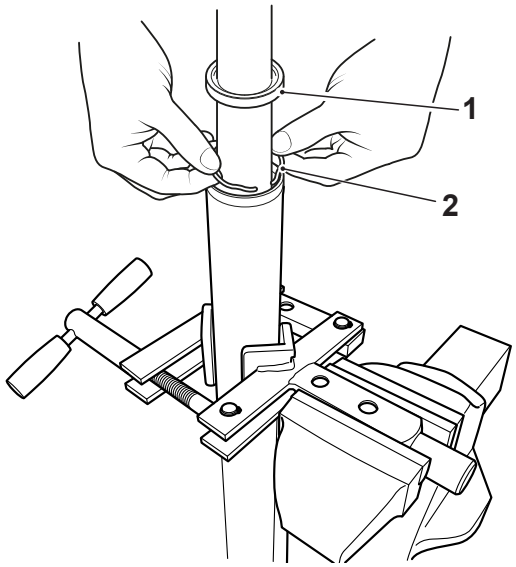
7. Use the narrow end of T3880183 - Fork Seal Tool, 47 mm to guide the lower bush, washer and oil seal into position.



ccuq_5

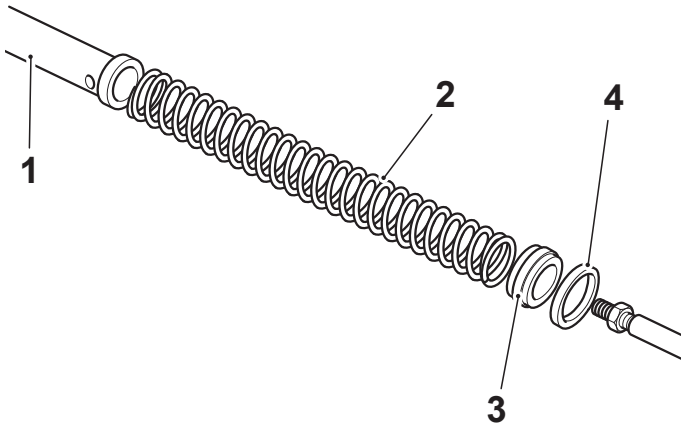
1. **T3880183 - Fork Seal Tool, 47 mm**
2. **Oil seal**
3. **Washer**
4. **Lower bush**
5. **T3880171 - Fork Holding Tool**

8. Install a new circlip to retain the oil seal.
9. Position the dust seal to the outer tube.
10. Use the wider end of T3880183 - Fork Seal Tool, 47 mm with hand pressure only, to press the dust seal into position in the outer tube.



1. **Dust seal**
2. **Circlip**

11. Fill the fork with oil (see Fork Oil Change - Oil Refilling).
12. Position the fork assembly as for compression of the fork spring during strip down.
13. Refit the fork spring spacer, spring, nylon spacers and the bump rubber.



ccuu_2_1

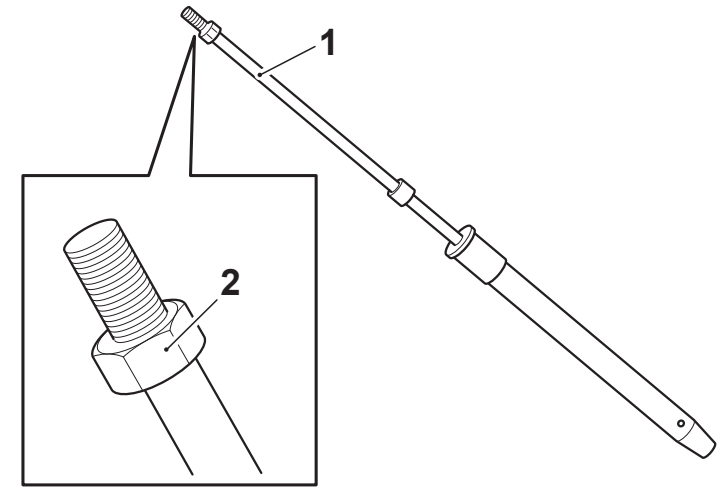
1. **Spring spacer**
2. **Spring**
3. **Nylon spacer**
4. **Bump rubber**

14. Attach T3880085 - Fork Piston Holder to the threads of the damper rod and pull the damper upwards.

CAUTION

If removed, the damping rod locknut must be fitted with the flat face facing to the top of the fork. The slightly tapered face must face the fork spring. Incorrect orientation may lead to a loosening of the locknut.

15. Turn the damper rod locknut until the length of threads to the end of the rod is equal to the length measured during disassembly.



cdep_3

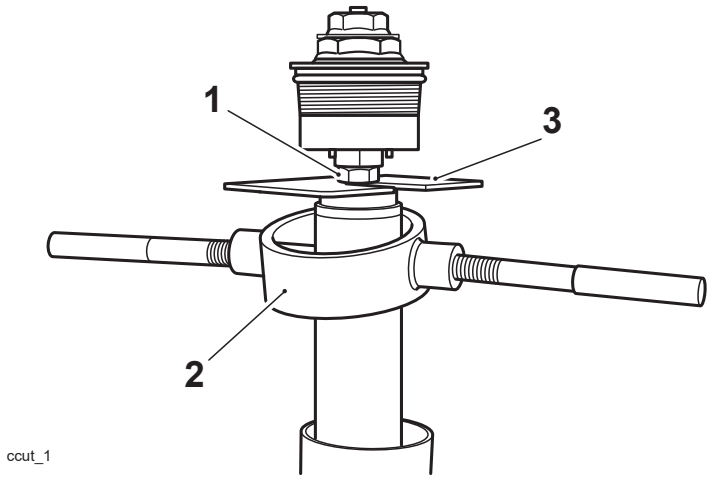
1. **Damper rod**
2. **Locknut**

WARNING

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

16. Refit T3880067 - Fork Spring Compressor as previously described. Compress the fork

spring and refit the spring holder.



1. **Damper locknut**
2. **T3880067 - Fork Spring Compressor**
3. **Spring holder (part of T3880067 - Fork Spring Compressor)**

17. Inspect the O-ring for the top cap for any damage, replace if necessary.
18. Carefully install the top cap and rebound adjuster rod. Slowly turn the cap until it touches the locknut.
19. Hold the top cap while tightening the damper rod locknut to **20 Nm**.

WARNING

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

20. Recompress the spring to remove the spring holder.
21. Lubricate the O-ring on the top cap with a smear of fork oil then screw the top cap fully into the outer tube.
22. Fit the fork (see Linked procedure not present at the moment.) but do not fully tighten the top yoke clamp fixings at this stage.
23. Tighten the top cap to **35 Nm**.
24. Tighten the top yoke clamp fixings to **25 Nm**.

Note

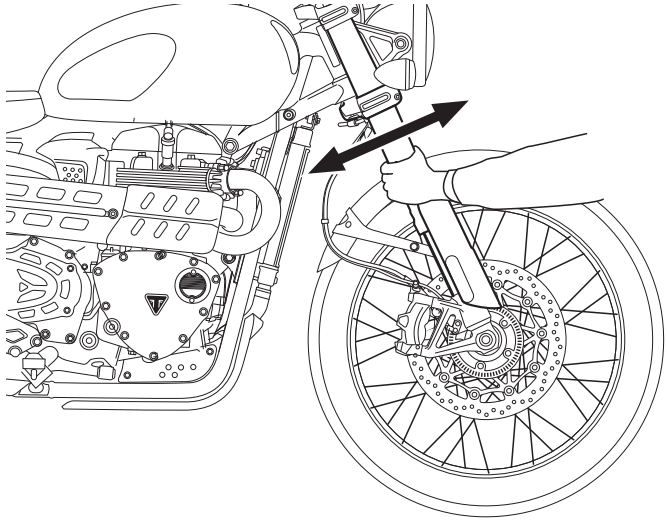
- **It is much easier to tighten the top cap when the fork has been refitted.**

Steering Head Bearing - 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. Raise and support the motorcycle so that the front wheel is clear of the ground.
2. Move the handlebars from lock-to-lock whilst checking for signs of tight spots or notchiness (bearings overtightened).
3. Hold the lower end of the front forks and try to move them forward and backward to check for signs of free play in the bearings (bearings insufficiently tightened or worn).



jaau_12

Checking for Free Play in Steering Head Bearings

4. Adjust as described in Steering Head Bearing - Adjustment then lower the motorcycle to the ground.

Steering Head 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.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Upper Yoke - Removal

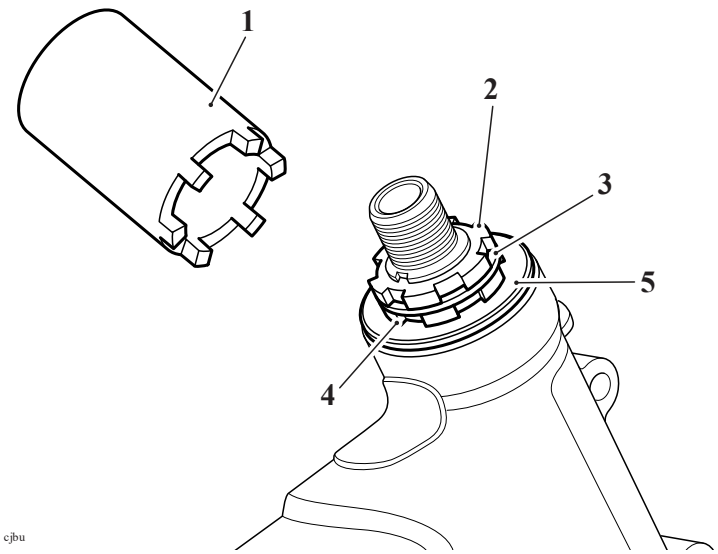
WARNING

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.

1. Using T3880023 - 50 mm Socket loosen the lock nut and adjuster nut.



1. **T3880023 - 50 mm Socket**
2. **Lock nut**
3. **Tab washer**
4. **Adjuster nut**
5. **Dust seal**

2. Adjust the bearing free play as follows:
   - Remove the lock nut, tab washer and adjuster nut.
   - Thoroughly clean the threads on the steering stem.
   - Refit the adjuster nut and tighten to **40 Nm**.
   - Loosen the adjuster nut, then retighten to **15 Nm**.
   - Fit the tab washer and lock nut.

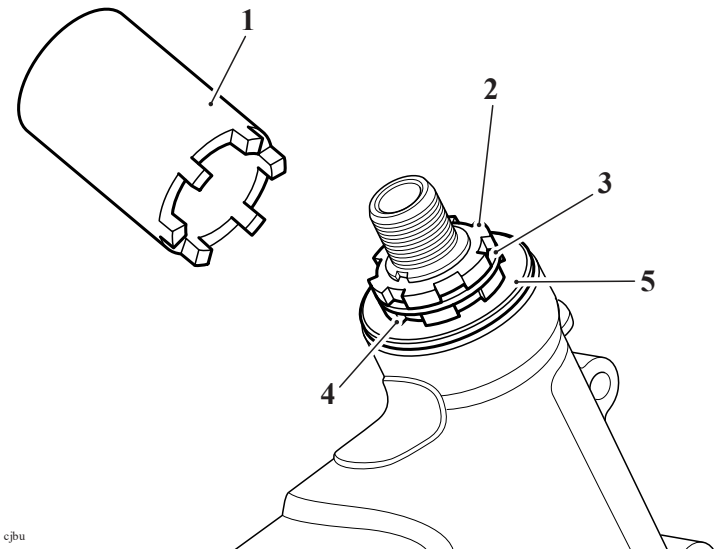
WARNING

It is essential that the adjuster nut is not overtightened. If the adjuster is overtightened it will cause a preload on the headstock bearings. This will introduce tight steering, which could cause loss of motorcycle control and an accident.

Note

Note

- **Ensure the adjuster nut does not move as the lock nut is tightened.**
  - With the bearing free play correctly set, hold the adjuster nut stationary then tighten the lock nut to **40 Nm**.



1. **T3880023 - 50 mm Socket**
2. **Lock nut**
3. **Tab washer**
4. **Adjuster nut**
5. **Dust seal**

Perform the following operations:

- Check that the free play has been eliminated and that the steering can be turned freely from lock-to-lock without any sign of tightness. Readjust if necessary.

WARNING

Operation of the motorcycle with incorrectly adjusted steering head bearings, either too loose or too tight, may cause a dangerous riding condition leading to loss of motorcycle control and an accident.

Upper Yoke - Removal

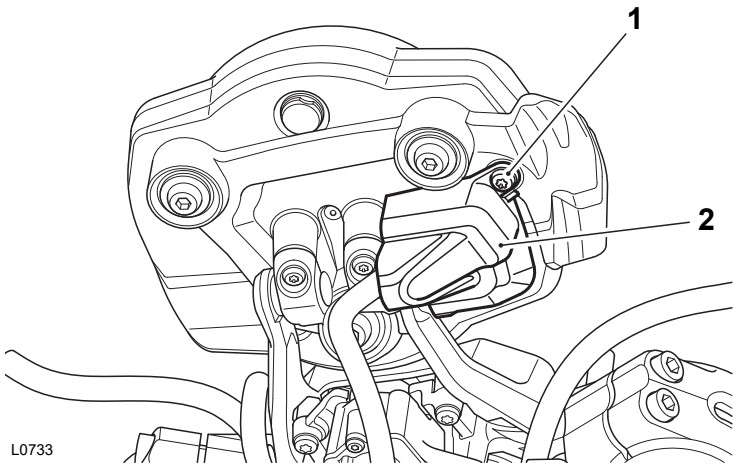
WARNING

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.

Perform the following operations:

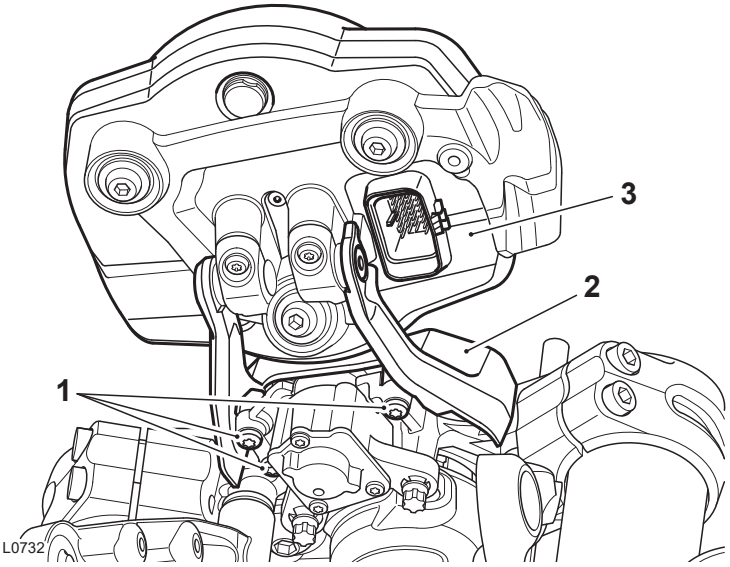
- Seat - Removal
- Battery - Removal
- Remove the fuel tank (see Fuel Tank - Removal) and place on a suitable support, close to the motorcycle.

1. Remove the headlamp assembly (see Headlight - Removal).
2. Remove the fixing that attaches the cover for the instrument connector and remove the cover.



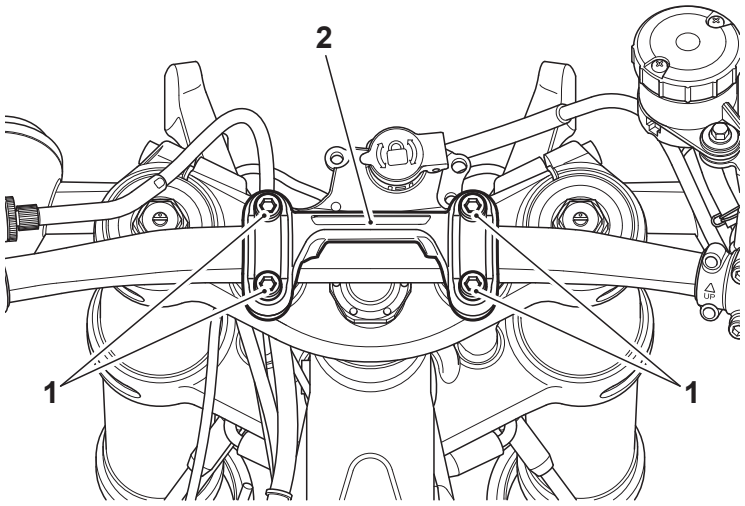
1. **Fixing**
2. **Cover**

3. Disconnect the electrical connector from the instruments.
4. Remove the three fixings that attach the instrument and bracket assembly to the upper yoke and remove the instrument and bracket assembly.



1. **Fixings**
2. **Instrument bracket**
3. **Instruments**

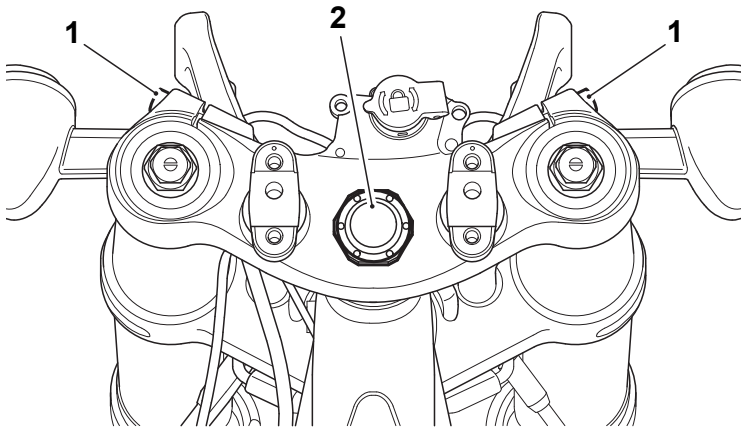
5. Support the handlebars and remove the handlebar clamp fixings.



L0728_1

1. **Fixings**
2. **Handlebar clamp**

6. As an assembly, raise the handlebars until they are clear of the upper yoke. Rest the assembly forward of the steering stem so that access to the headstock top nut is not restricted. Make sure that the master cylinder stays upright.
7. Loosen the upper yoke pinch bolts.
8. Loosen and remove the top nut from the steering stem.



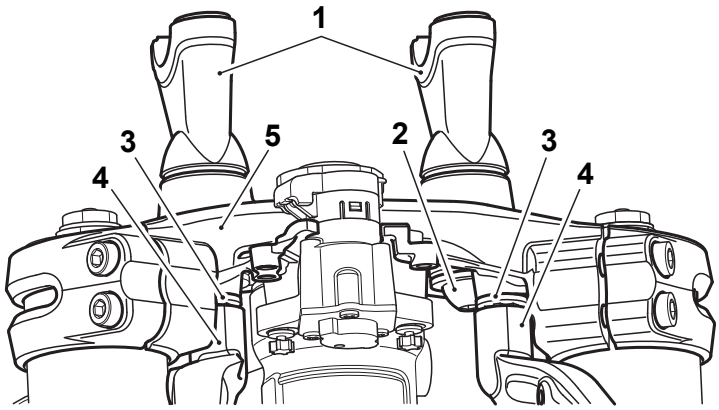
L0744

1. **Upper yoke pinch bolts**
2. **Top nut**

9. Remove the upper yoke.
10. If necessary, remove the fixings that attach the two handlebar risers, and remove the risers and spacers (if installed).

Upper Yoke - Installation

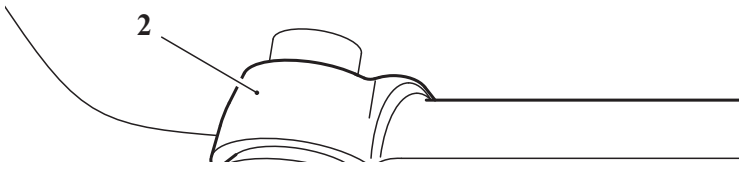
1. If removed, put the two handlebar risers and spacers (if installed) in position.
2. Install the fixings that attach the two handlebar risers and torque the fixings to **38 Nm**.
3. Refit the upper yoke. Make sure that the two pins on the underside of the upper yoke are engaged into the grommets for the headlight bracket.

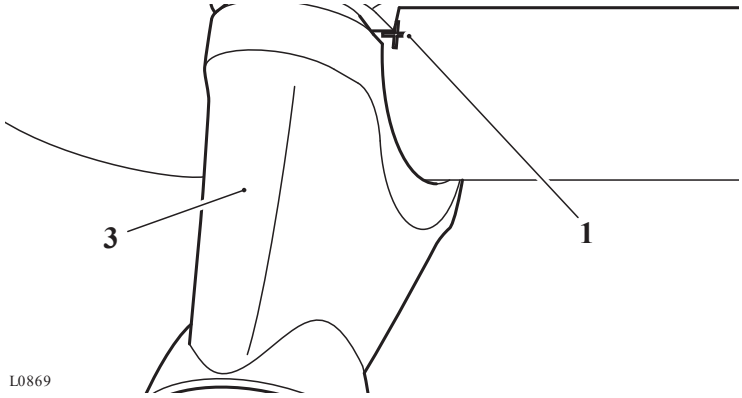


L0729

1. **Handlebar risers**
2. **Riser fixings**
3. **Grommets**
4. **Headlight brackets**
5. **Upper yoke**

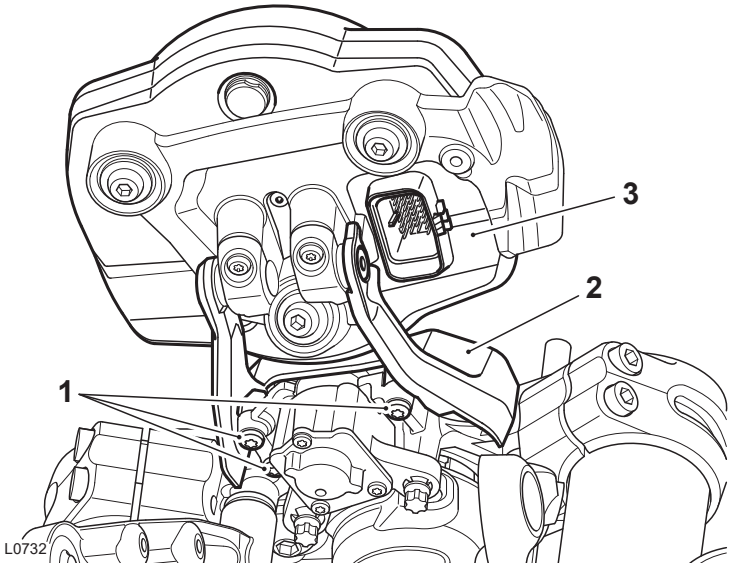
4. Fit and tighten the top nut to **120 Nm**.
5. Tighten the upper yoke pinch bolts to **25 Nm**.
6. Locate the handlebars onto the risers. Fit the clamp and the fixings but do not fully tighten at this stage.
7. Rotate the handlebar so that the alignment mark on the handlebar aligns with the bottom face of the handlebar clamp.





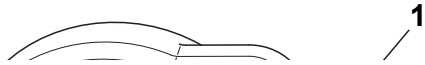
1. **Alignment mark**
2. **Handlebar clamp**
3. **Right riser**

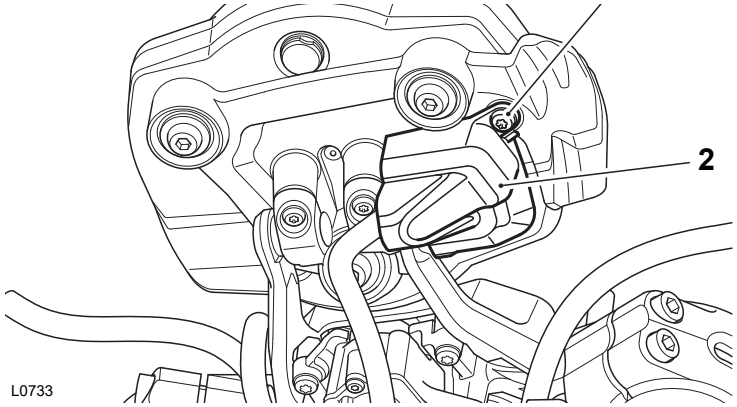
8. Tighten the handlebar clamp fixings, front ones first, to **24 Nm**.
9. Put the instrument and bracket assembly in position.
10. Install three new fixings and torque to **5 Nm**.



1. **Fixings**
2. **Instrument bracket**
3. **Instruments**

11. Connect the electrical connector to the instruments.
12. Install the cover for the connector.
13. Install and torque the fixing for the cover to **3 Nm**.





1. **Fixing**
2. **Cover**

Perform the following operations:

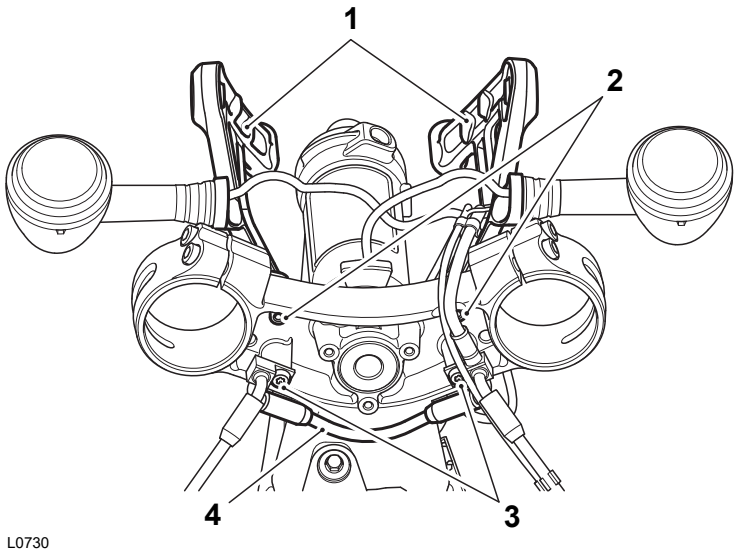
- Headlight - Installation
- Battery - Installation
- Seat - Installation

Lower Yoke and Headstock Bearings - Removal

Perform the following operations:

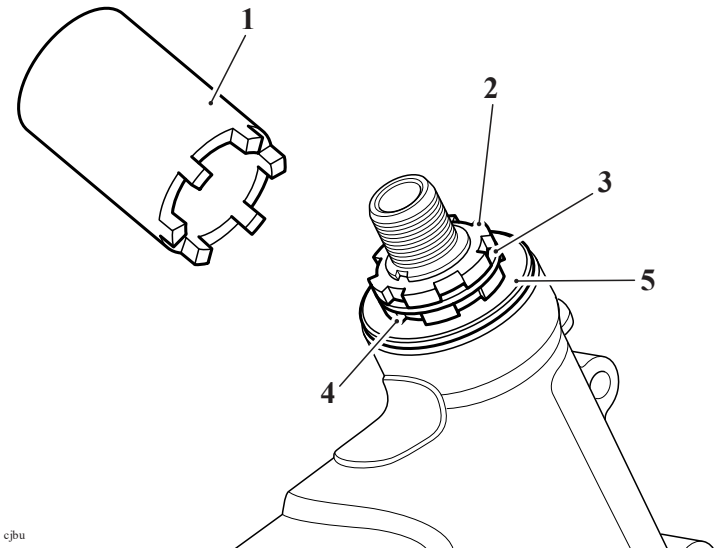
- Seat - Removal
- Battery - Removal
- Remove both front forks (see Front Fork - Removal).
- Remove the upper yoke (see Upper Yoke - Removal).

1. Disconnect the electrical connectors for the front indicators from the main harness.
2. Release the fixings and remove the headlight brackets.
3. Remove the fixings and release the brake hose assembly from the lower yoke.



1. **Headlight brackets**
2. **Headlight bracket fixings**
3. **Brake hose fixings**
4. **Brake hose assembly**

4. UseT3880023 - 50 mm Socket to remove the lock nut.
5. Remove the tab washer, then use T3880023 - 50 mm Socket again to remove the adjuster nut.
6. Remove the bearing cover and dust seal.



1. **T3880023 - 50 mm Socket**
2. **Lock nut**
3. **Tab washer**
4. **Adjuster nut**
5. **Bearing cover and dust seal**

7. Remove the lower 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.

8. Using a suitable drift, evenly and progressively drive the bearing races from the frame headstock.
9. Remove the inner race and dust seal from the lower yoke using a press or puller.

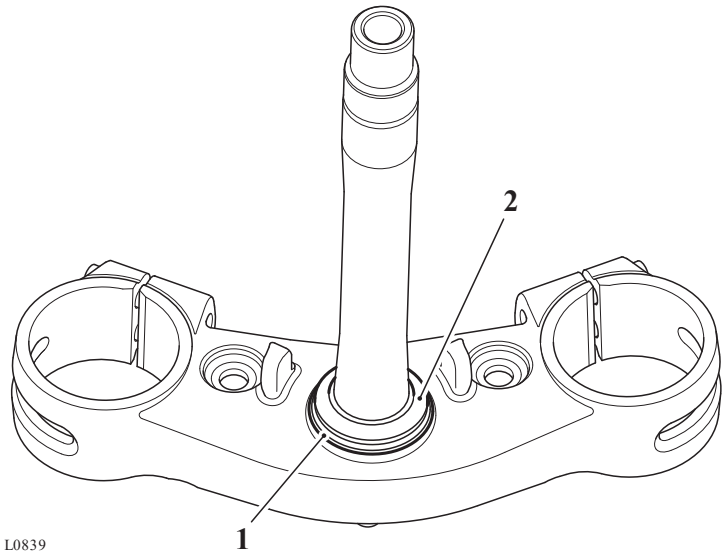
Lower Yoke and Headstock Bearings - Installation

1. Fit a new dust seal to the steering stem on the lower yoke as noted for removal.

CAUTION

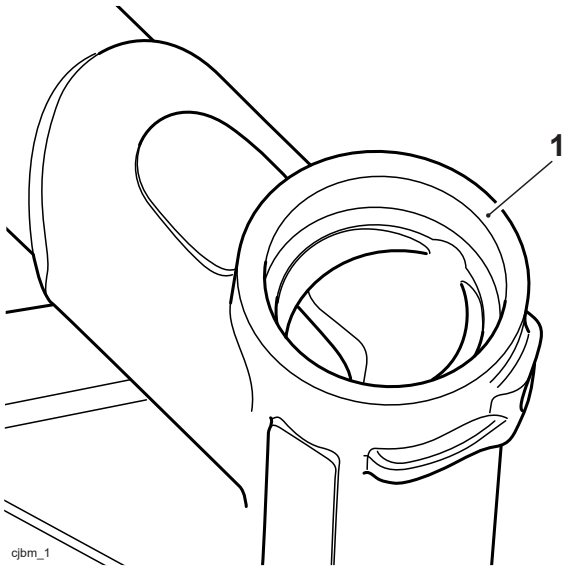
Protect the threads of the lower yoke when using a press or a puller as damaged threads may mean replacing the lower yoke completely.

2. Press a new lower bearing inner race onto the steering stem of the lower yoke.



1. **Dust seal**
2. **Bearing inner race**

3. Evenly and progressively drive the new upper and lower bearing outer races into the frame headstock.



1. **Headstock**

4. Lubricate the headstock bearings using Castrol LCX 222 or an equivalent heavy duty

lithium based grease.

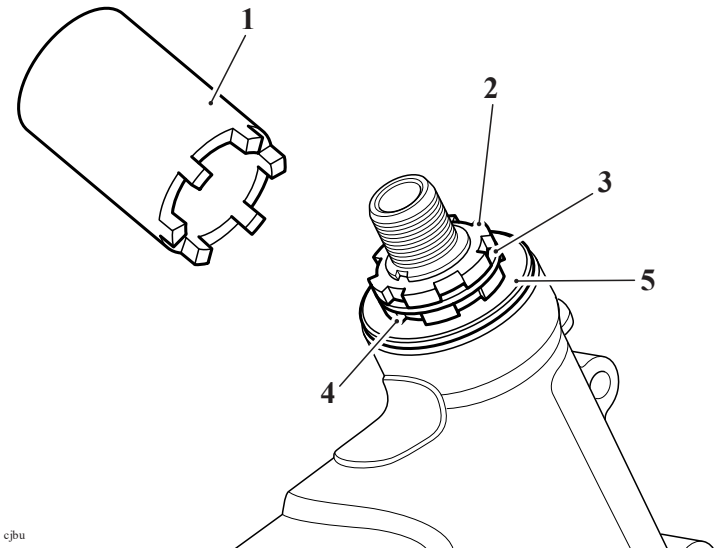
5. Fit the bearing to the bearing inner race on the steering stem.
6. Insert the lower yoke to the frame headstock, fit the upper bearing, inner race, dust seal and retain with the adjuster nut.
7. Adjust the bearing free play as follows:
   - Remove the adjuster nut.
   - Thoroughly clean the threads on the steering stem.
   - Refit the adjuster nut and use T3880023 - 50 mm Socket to torque the adjuster nut to **40 Nm**.
   - Loosen the adjuster nut, then retighten to **15 Nm**.
   - Fit the tab washer and lock nut.
   - Torque the lock nut to **40 Nm**.

WARNING

It is essential that the adjuster nut is not overtightened. If the adjuster is overtightened it will cause a preload on the headstock bearings. This will introduce tight steering, which could cause loss of motorcycle control and an accident.

Note

- **Ensure the adjuster nut does not move as the lock nut is tightened.**



1. **T3880023 - 50 mm Socket**
2. **Lock nut**
3. **Tab washer**
4. **Adjuster nut**
5. **Dust seal**

8. Fit the headlight brackets to the lower yoke and tighten the fixings to **3 Nm**.
9. Connect the electrical connectors for the front indicators.

Perform the following operations:

- Upper Yoke - Installation
- Linked procedure not present at the moment.
- Battery - Installation
- Seat - Installation

WARNING

Operation of the motorcycle with incorrectly adjusted steering head bearings, either too loose or too tight, may cause a dangerous riding condition leading to loss of motorcycle control and an accident.

- Check and if necessary correct the headlight adjustment (see Headlight Vertical Adjustment).
- Check that the free play has been eliminated and that the steering can be turned freely from lock-to-lock without any sign of tightness. Readjust if necessary.

Handlebars - Removal

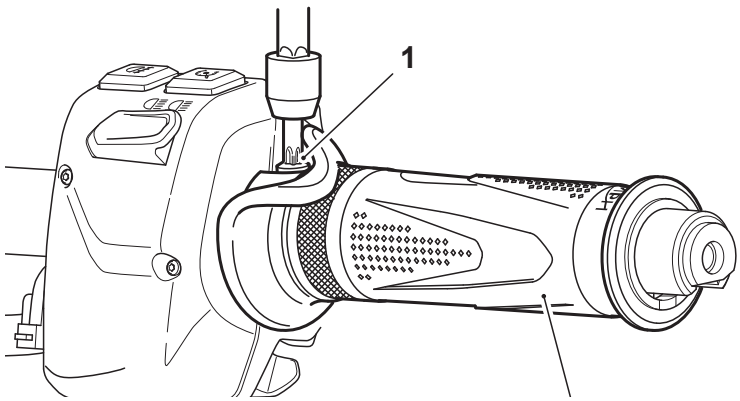
WARNING

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.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Handguards - Removal
- Mirrors - Removal
- Twist Grip - Removal
- Heated Grips - Removal

1. Remove the fixings for the mirror brackets and release the brackets.
2. If a non-heated left handgrip is installed, remove the top and bottom fixings and remove the grip.

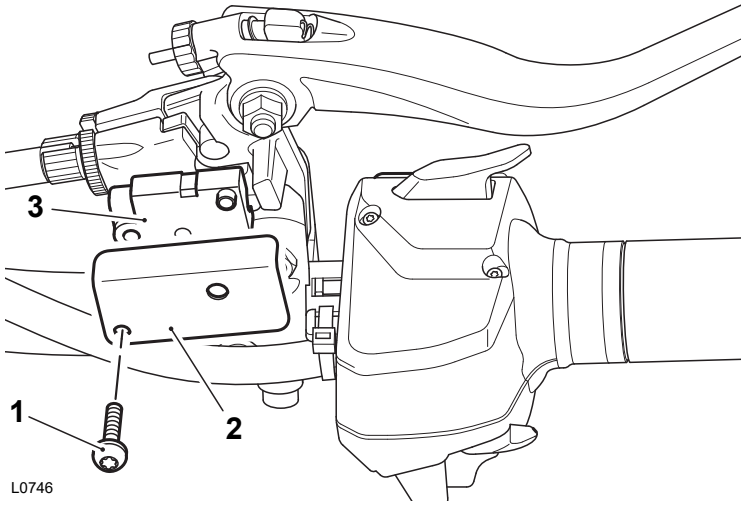




L0734_2

1. **Fixing**
2. **Grip**

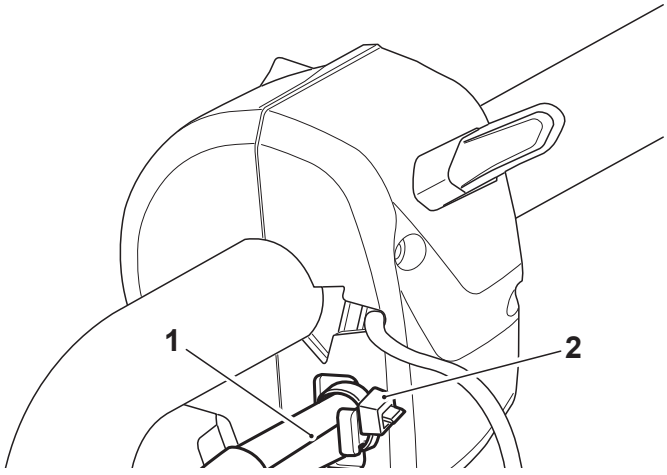
3. Release the fixing and detach the clutch switch and switch cover from the clutch lever assembly.



L0746

1. **Fixing**
2. **Switch cover**
3. **Clutch switch**

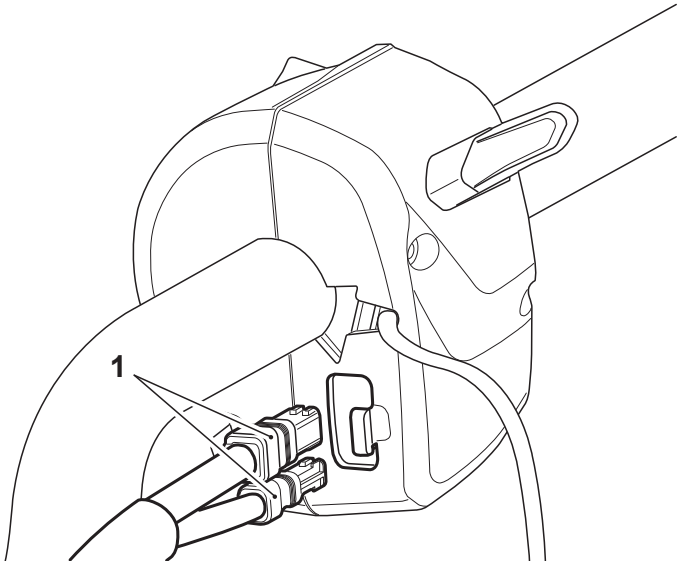
4. Release the fixings and remove the clamp from the clutch lever assembly. Without disconnecting the clutch cable, lay the lever aside.
5. Remove the cable tie securing the switch housing wiring harness to the left hand switch housing.





1. **Wiring harness**
2. **Cable tie**

6. Gently pull on the wiring harness to disconnect the switch housing connectors.



1. **Switch housing connectors**

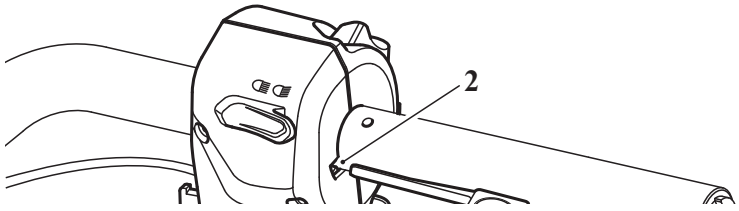
WARNING

The T3880369 - Switch Housing Removal Tool is required to release the handlebar switch housings from their retaining clips.

When inserting T3880369 - Switch Housing Removal Tool into the switch housing, a click can be felt/heard as the retaining clip is released.

The retaining clip will remain in position on the handle bar as the switch housing is removed. Note the position and orientation of the clip for installation.

7. Insert T3880369 - Switch Housing Removal Tool into the opening on the left hand switch housing until a click is felt/heard.

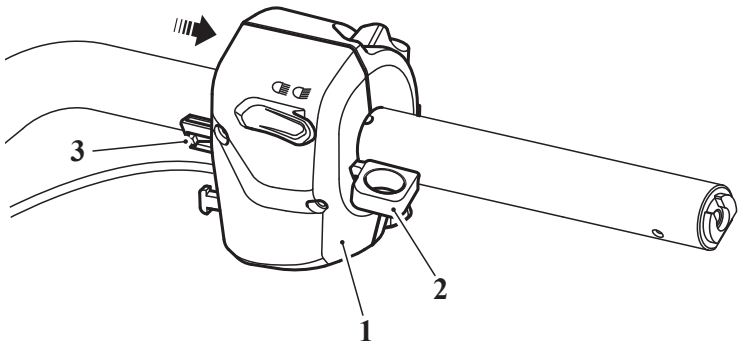




L0386_1

1. **Left hand switch housing**
2. **Opening**
3. **T3880369 - Switch Housing Removal Tool**

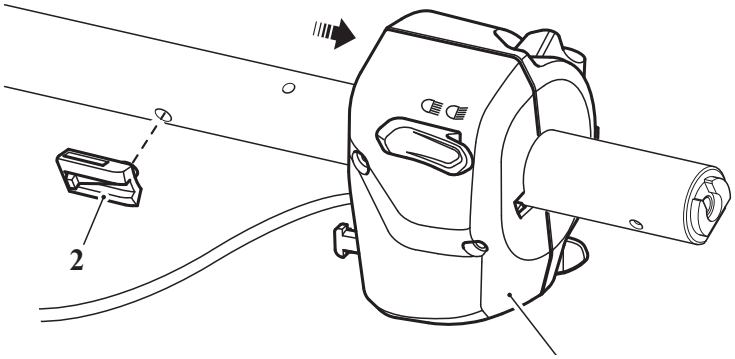
8. Slide the switch housing towards the end of the handlebar to free it from the retaining clip.
9. Withdraw T3880369 - Switch Housing Removal Tool from the switch housing.



L0386_2

1. **Left hand switch housing**
2. **T3880369 - Switch Housing Removal Tool**
3. **Retaining clip**

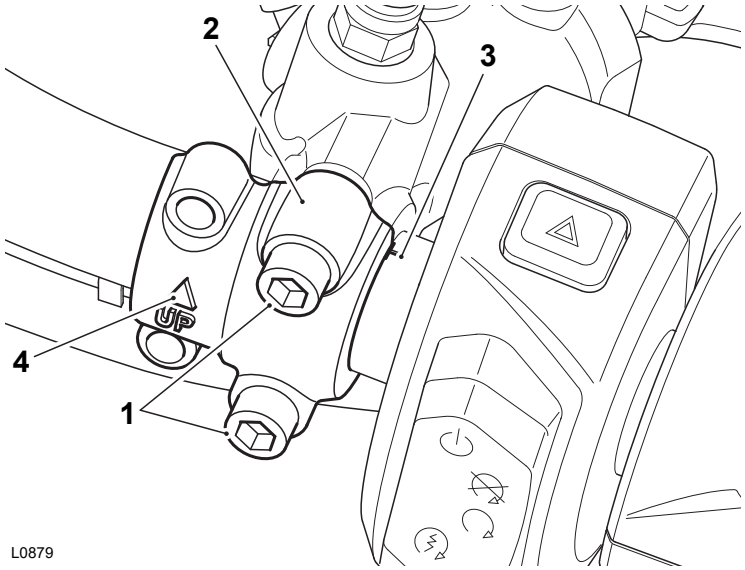
10. Slide the switch housing off the handlebar and collect the retaining clip.



L0385

1. **Switch housing**
2. **Retaining clip**

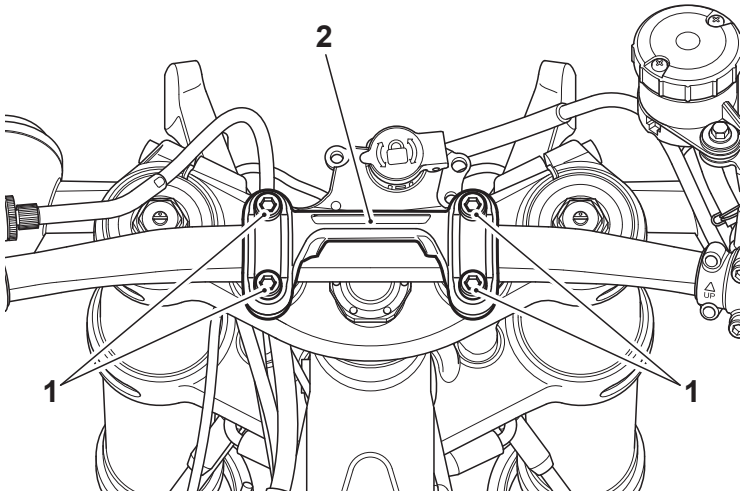
11. Disconnect and remove the right hand switch housing as described in steps 4-9.
12. Release the fixings and remove the clamp from the front brake master cylinder. Taking care to not invert the brake fluid reservoir, lay the assembly aside.



L0879

1. **Fixings**
2. **Clamp**
3. **Alignment mark**
4. **"UP" Arrow**

13. With the aid of an assistant, support the handlebar and release the fixings securing the handlebar clamp to the risers. Remove the handlebar clamp.



L0728_1

1. **Fixings**
2. **Handlebar clamp**

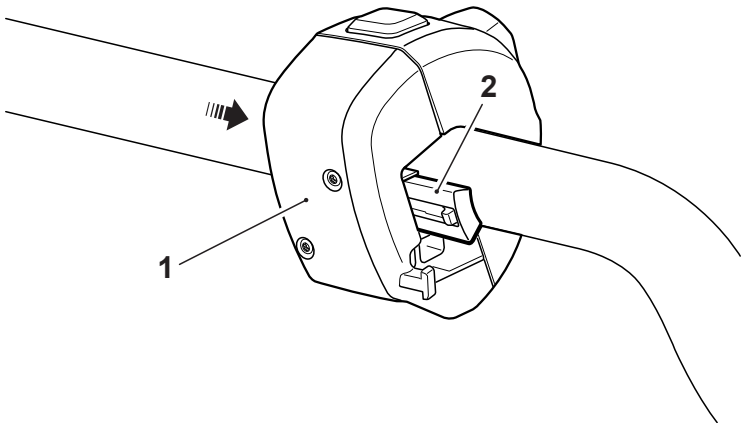
14. Slide the twist grip position sensor off the handle bar. Without disconnecting any wiring, lay the sensor aside.
15. Disconnect and remove the right hand switch housing as described in steps 3 to 8.

Handlebars - 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.

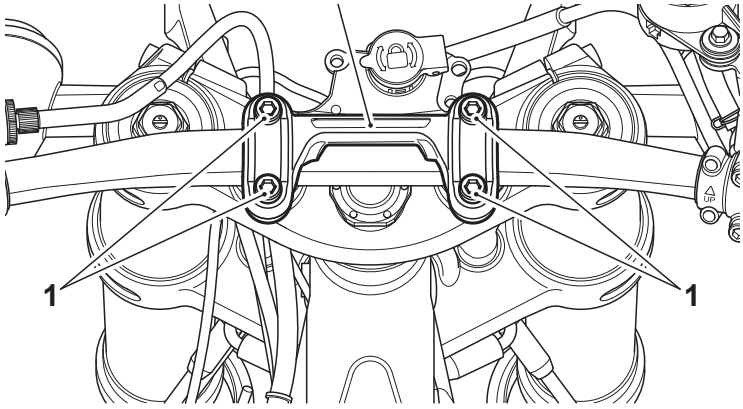
1. Fit the right hand switch housing retaining clip to the handlebar as noted during removal.
2. Slide the right hand switch housing onto the handlebar and over the retaining clip until it locks into position.



1. **Switch housing**
2. **Retaining clip**

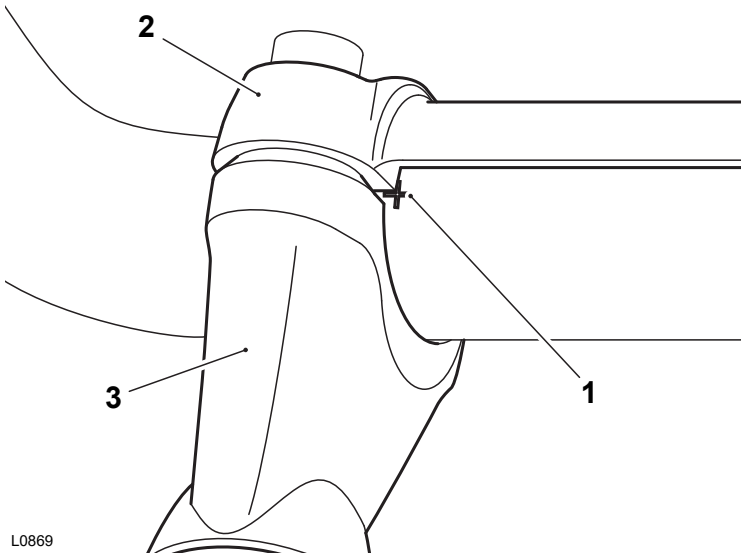
3. Slide the twist grip position sensor onto the right hand side of the handlebar.
4. Locate the handlebar onto the risers, fit the clamp and the fixings. Do not fully tighten at this stage.





1. **Fixings**
2. **Handlebar clamp**

5. Position the handlebar so that the inside corner of the clamp is aligned with the alignment mark on the front of the handlebar, as shown below.



1. **Clamp**
2. **Alignment mark**
3. **Handlebar riser**

6. Tighten the handlebar clamp fixings, front ones first, to **24 Nm**
7. Connect the right hand switch housing electrical connectors.
8. Use a new cable tie to secure the wiring harness to the switch housing.
9. Do steps 1 and 2 again for the left switch housing.

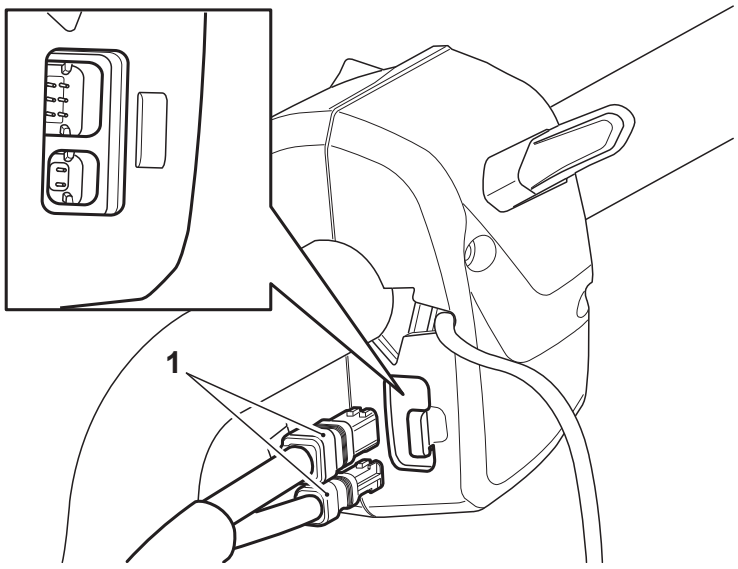
Note

- **The left hand switch housing electrical connections are recessed into the switch housing body.**
- **To aid orientation, there are coloured dots on each connector. The coloured dots**

Note

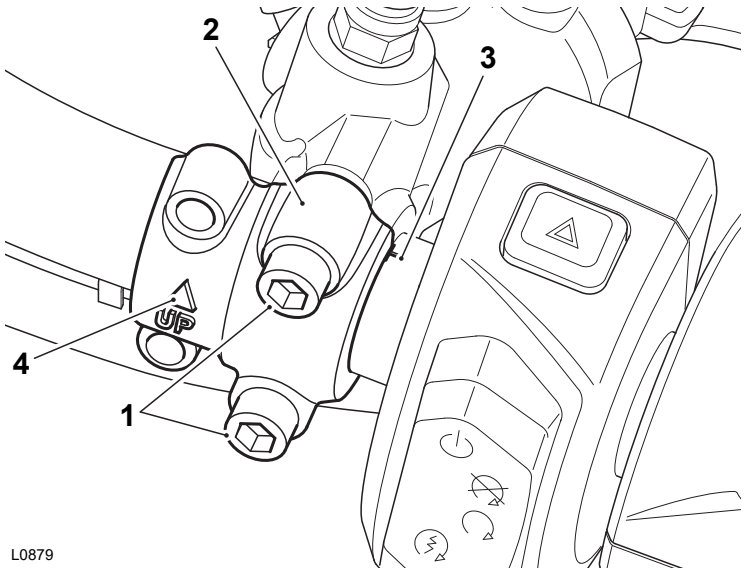
identify the bottom face of the connector.

- **When inserting the connectors, carefully locate the connectors into their sockets, then use a suitable flat ended pin punch to push the connectors fully home. An audible click can be heard when the connectors are fully inserted.**
- **Do not use sharp tools, such as a flat bladed screw driver, to insert the connectors.**



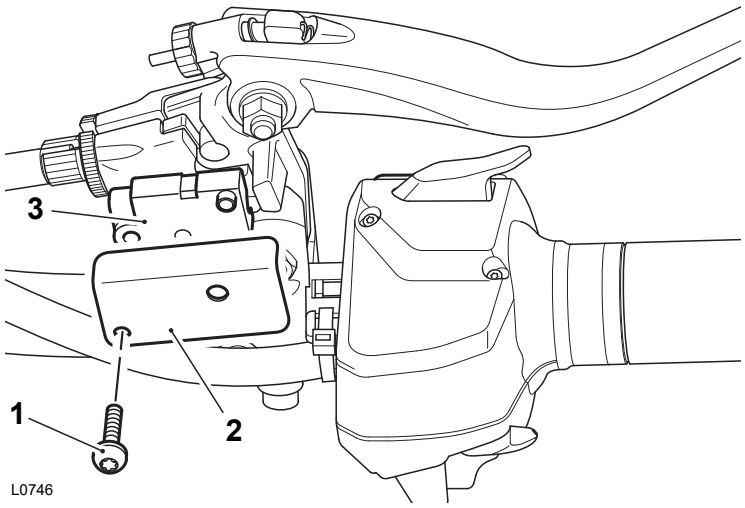
1. Switch housing electrical connectors

10. Connect the left hand switch housing electrical connectors.
11. Use a new cable tie to secure the wiring harness to the switch housing.
12. Locate the master cylinder to the handlebars and position the clamp with the UP arrow pointing upwards. Do not tighten the clamp bolts at this stage.
13. Align the split line of the master cylinder clamp to the alignment mark on the top surface of the handlebar. Tighten the clamp fixings, upper one first, to **8 Nm**.



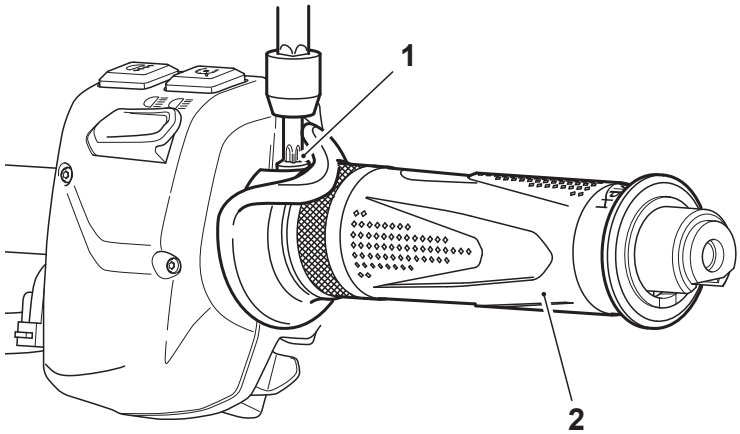
1. **Fixings**
2. **Clamp**
3. **Alignment mark**
4. **"UP" Arrow**

14. Position the clutch lever assembly to the handlebar.
15. Align the split line of the clutch lever clamp to the alignment mark on the top surface of the handlebar. Tighten the clamp fixings, upper one first, to **12 Nm**.
16. Put the clutch switch and switch cover in position.
17. Install the fixing to attach the clutch switch and switch cover to the clutch lever assembly. Torque the fixing to **1 Nm**



1. **Fixing**
2. **Switch cover**
3. **Clutch switch**

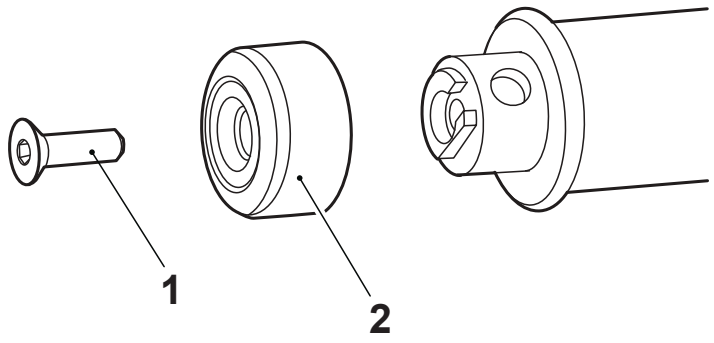
18. If a non-heated left handgrip is installed, install the grip and tighten the top and bottom fixings to **2 Nm**.



L0734_2

1. **Fixing**
2. **Grip**

19. If installed, fit the heated hand grip (see Heated Grips - Installation).
20. Install the left hand handlebar end weight and tighten the fixing to **5 Nm**.



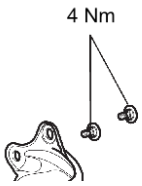
cccw_5

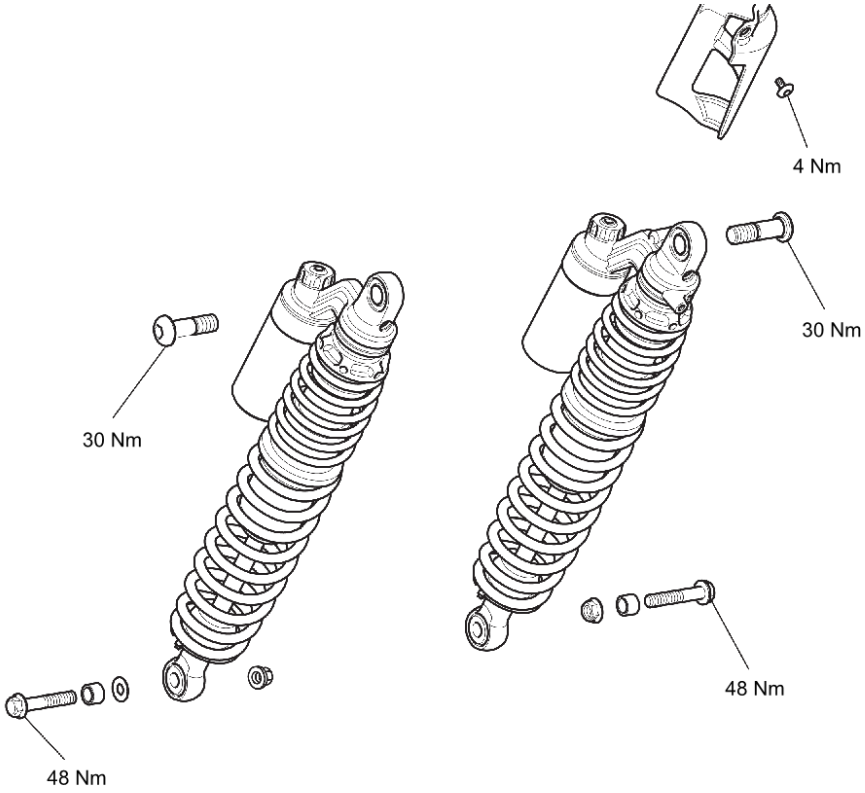
Position the two mirror brackets and tighten the fixings to **5 Nm**.
Perform the following operations:

- Install the heated twist grip (see Twist Grip - Installation).
- Install the two mirrors (see Mirrors - Installation).
- Battery - Installation
- Seat - Installation

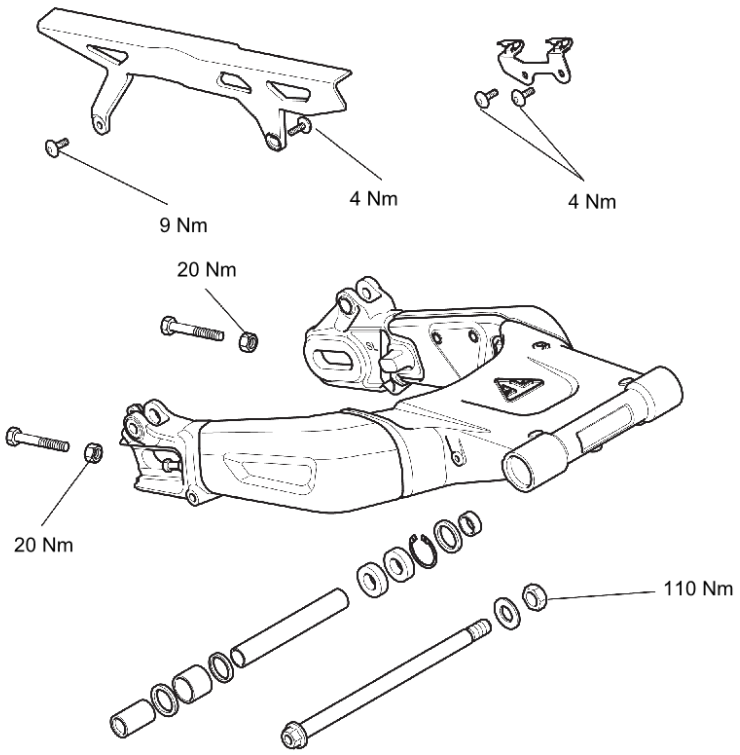
Rear Suspension

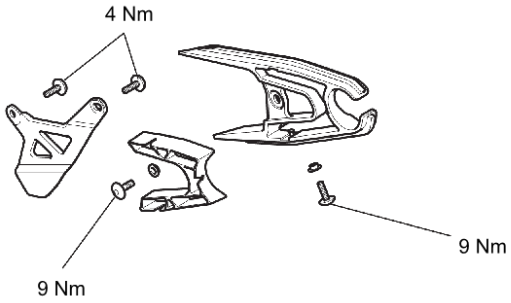
Exploded View – Rear Suspension Units





Exploded View – Swinging Arm





Rear Suspension Units - Removal

WARNING

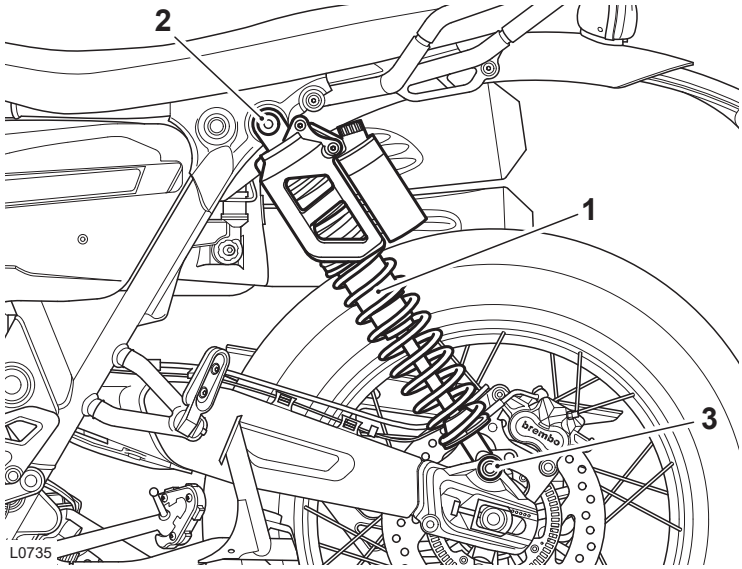
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Raise and support the motorcycle so that the rear wheel is clear of the ground.

Note

- **If both suspension units are to be removed, place a block beneath the rear wheel to prevent it dropping when the second unit is removed.**

2. Loosen and remove the lower mounting nut, sleeve and bolt. Discard the nut.
3. Loosen and remove the upper bolt and remove the suspension unit. Discard the bolt.

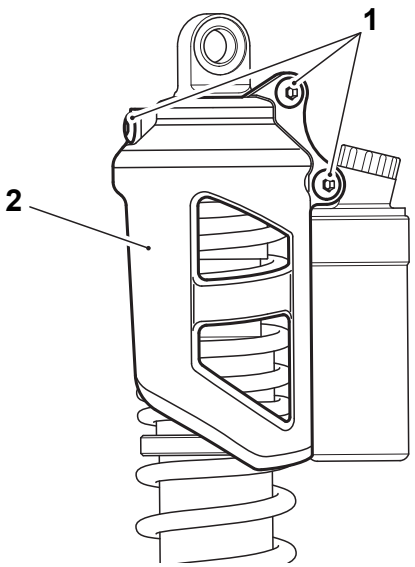


1. **Rear suspension unit**
2. **Upper mounting bolt**
3. **Lower mounting nut and bolt**

4. Repeat steps 2 and 3 for the other rear suspension unit (if required).

Rear Suspension Unit - Disassembly

1. On the left rear suspension unit, remove the three fixings that attach the stone protector and remove the stone protector.

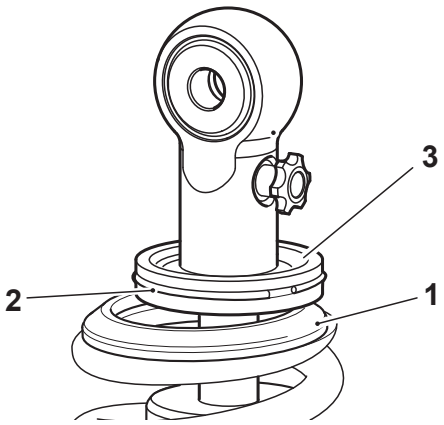


1. **Fixings**
2. **Stone protector**

WARNING

Wear eye and hand protection when you release or compress the spring on the rear suspension unit. The spring on the rear suspension unit is under pressure and if released suddenly can cause injury.

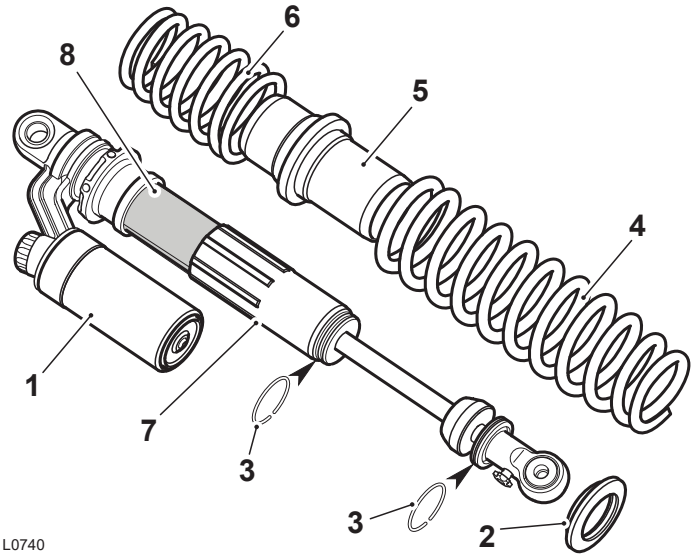
2. Compress the spring by hand until the spring seat is accessible.
3. Move the spring seat and spring under the collar of the lower mount so that the circlip is accessible.
4. Carefully remove and discard the circlip.





1. **Spring seat**
2. **Circlip**
3. **Lower mount collar**

5. Align the spring seat with the collar on the lower mount.
6. Slowly release the tension from the spring and let the spring seat pass over the collar.
7. Noting their position and orientation, remove the lower spring, the circlip that attaches the inner spring guide, outer and inner spring guides, and the upper spring from the damper assembly.
8. Discard the circlip.



1. **Damper assembly**
2. **Spring seat**
3. **Circlip**
4. **Lower spring**
5. **Outer spring guide**
6. **Upper spring**
7. **Inner spring guide**
8. **Protective film label**

9. Fully clean all dirt and contamination from all components.
10. Examine the inner and outer spring guides for excessive wear, scoring or damage. Replace the spring guides if necessary.
11. Examine the protective film label on the damper assembly. Replace the film label if necessary.
12. Examine all other components for wear or damage. Replace all worn or damaged

components.

WARNING

Always renew both rear suspension units as a pair, even if only one appears to be faulty. If only one suspension unit is replaced, the handling of the motorcycle could be adversely affected. This could result in an unsafe riding condition leading to a loss of motorcycle control and an accident.

13. Examine the damper assembly for fluid leaks and replace the assembly if there are leaks.

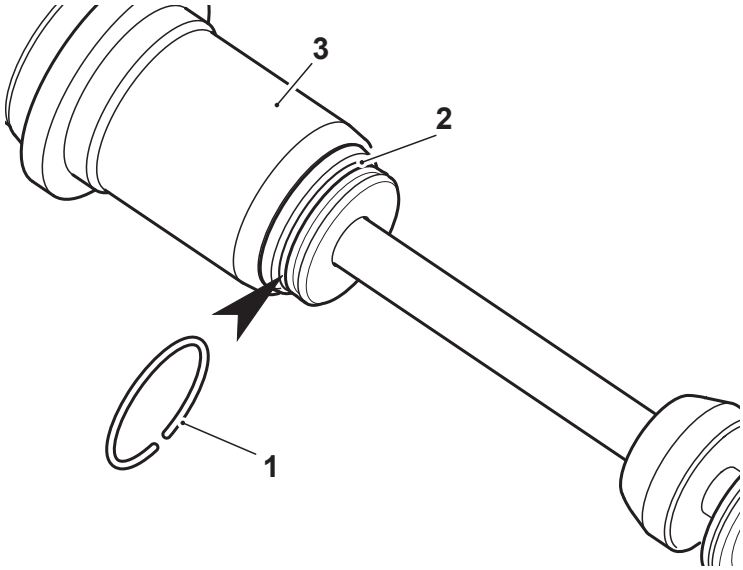
Rear Suspension Unit - Assembly

1. Put the upper spring in position on the damper assembly in the direction noted during the disassembly process.
2. Install the inner spring guide and outer spring guide onto the damper assembly.

Note

- **Install the circlip in the second groove away from the damper piston rod in the step that follows as shown below.**

3. Install a new circlip to attach the spring guides.

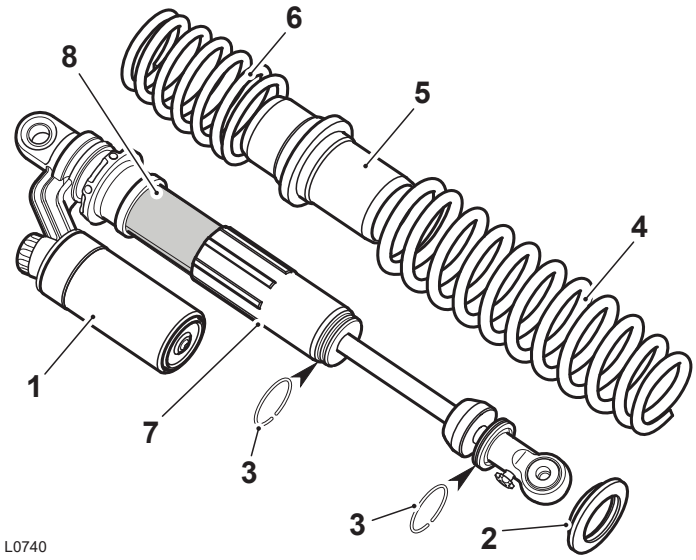


1. Circlip
2. Circlip groove
3. Outer spring guide

WARNING

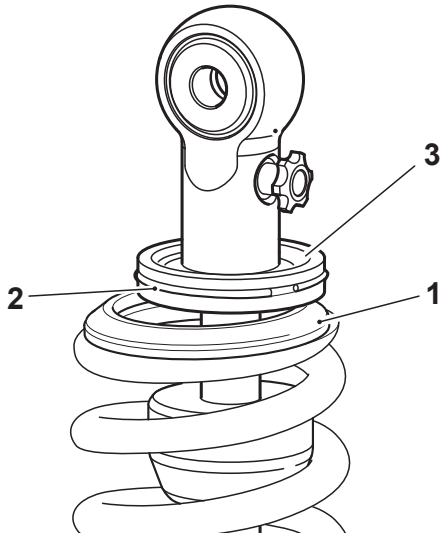
Put on eye protection when you release or compress the spring on the rear suspension unit. The spring on the rear suspension unit is under pressure and if released suddenly can cause injury.

4. Put the lower spring and spring guide over the collar on the lower mount.
5. Compress the spring until you can move the spring seat under the collar of the lower mount.
6. Install a new circlip onto the collar of the lower mount.



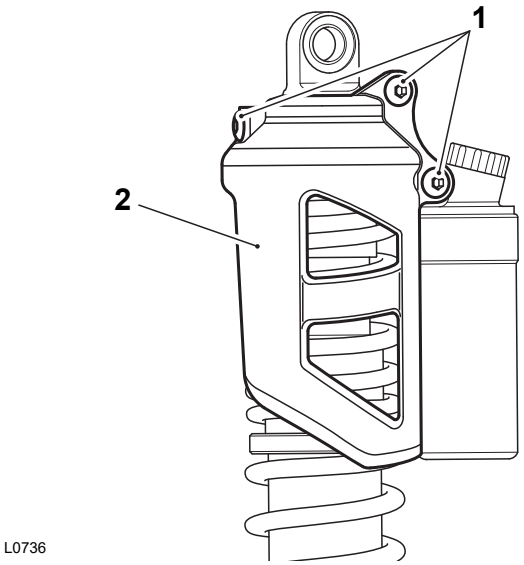
1. **Damper assembly**
2. **Spring seat**
3. **Circlip**
4. **Lower spring**
5. **Outer spring guide**
6. **Upper spring**
7. **Inner spring guide**
8. **Protective film label**

7. Align the spring seat with the collar on the lower mount until it is in the correct position.



1. **Spring seat**
2. **Lower mount collar**
3. **Bump stop**

8. Slowly release the tension from the spring ensuring the spring seat is positioned as noted during removal.
9. Make sure that the bump stop is against the lower mount.
10. For the left side rear suspension unit, install the stone protector and torque the fixings to **4 Nm** .



1. **Fixings**
2. **Stone protector**

Rear Suspension Units - 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. Put the suspension unit into position over the upper mounting.
2. Fit a new mounting bolt to the upper mounting and tighten to **30 Nm**.
3. Align the lower mounting.
4. Fit a new nut, the sleeve and the mounting bolt to the lower mounting and tighten to **48 Nm**.
5. Repeat steps 1 to 3 for the other rear suspension unit (if removed).
6. Remove the wheel support (if fitted), lower the motorcycle to the ground and park it on the side stand.

Swinging Arm - Removal

WARNING

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

- Raise and support the rear of the motorcycle under the frame or engine. Position a block to support the rear wheel.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Rear Wheel - Removal

WARNING

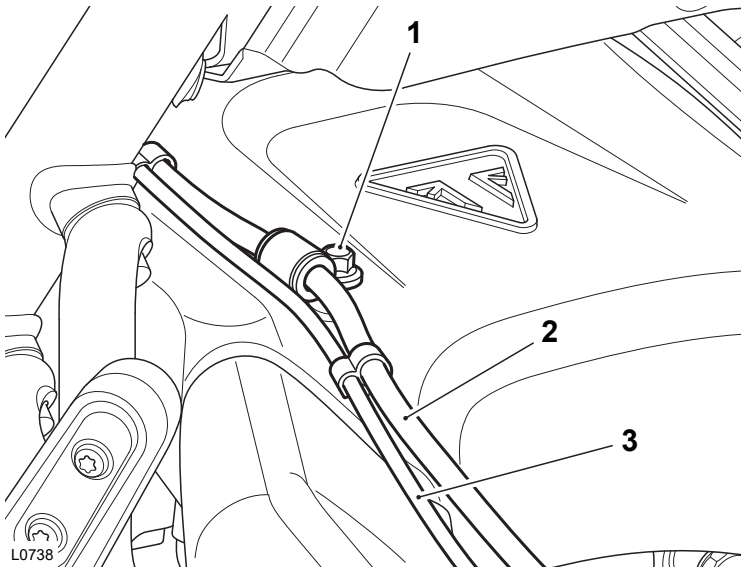
Do not allow a brake component to hang unsupported on the brake hose or line.

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.

- Use suitable support to prevent the swinging arm from dropping.
- Rear Suspension Units - Removal

1. Remove the fixing for the brake hose clip from the swinging arm.
2. Move the brake hose and ABS sensor harness aside.

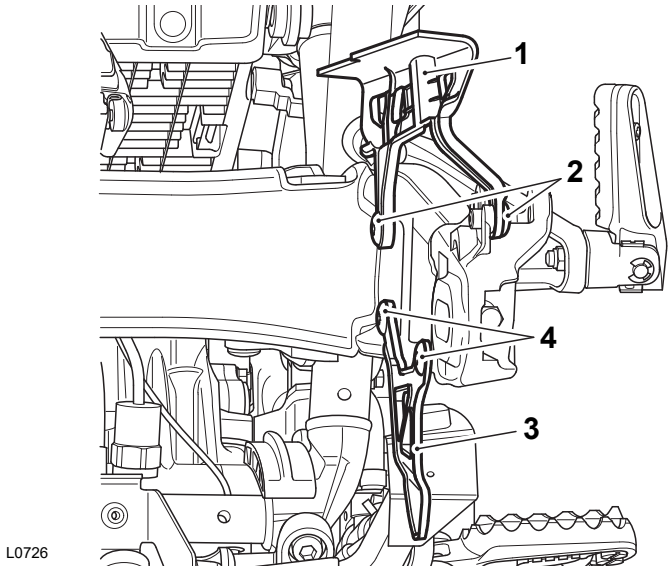


1. Fixing

2. Brake hose

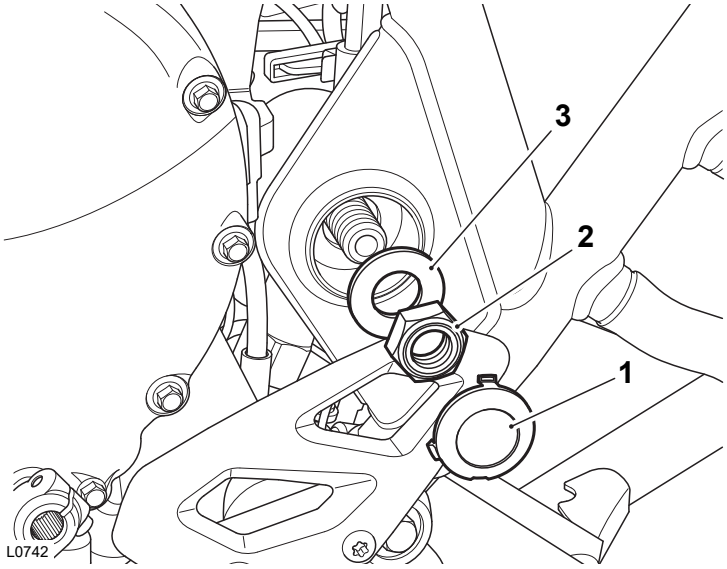
3. ABS sensor harness

3. Remove the fixings and remove the upper chain guard.
4. Remove the fixings and remove the lower chain guard.



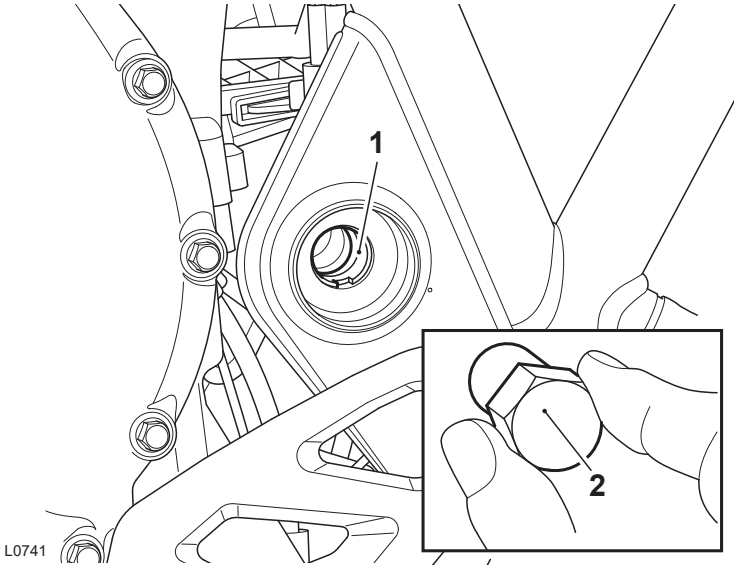
1. **Upper chain guard**
2. **Fixings**
3. **Lower chain guard**
4. **Fixings**

5. Release the brake hose and the ABS sensor harness from the hose guide on the swinging arm.
6. Remove the swinging arm pivot covers at the left and right side.



1. **Pivot cover**
2. **Nut**
3. **Washer**

7. Remove the swinging arm pivot nut and collect the washer on the left hand side of the frame.
8. Support the swinging arm and partially remove the swinging arm spindle from the right side to allow access to the frame adjuster with T3880104 - Swinging Arm Adjuster Wrench from the left side.
9. Engage T3880104 - Swinging Arm Adjuster Wrench in the slots of the frame adjuster sleeve and rotate anticlockwise to loosen the sleeve fully.



1. **Frame adjuster**
2. **T3880104 - Swinging Arm Adjuster Wrench**

10. Support the swinging arm and withdraw the swinging arm spindle from the right hand side.
11. Carefully manoeuvre the swinging arm rearwards and remove from the frame.

Swinging Arm - 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.

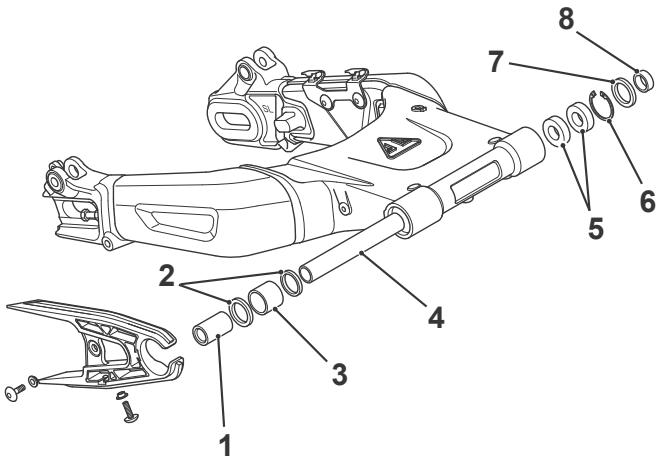
- Support the motorcycle so that the rear wheel is clear of the ground, with no weight on the swinging arm and suspension units.
- Remove the swinging arm (see Swinging Arm - Removal).

1. Remove the left hand ball bearings by drifting through from the right.
2. Collect the spacer tube.

Note

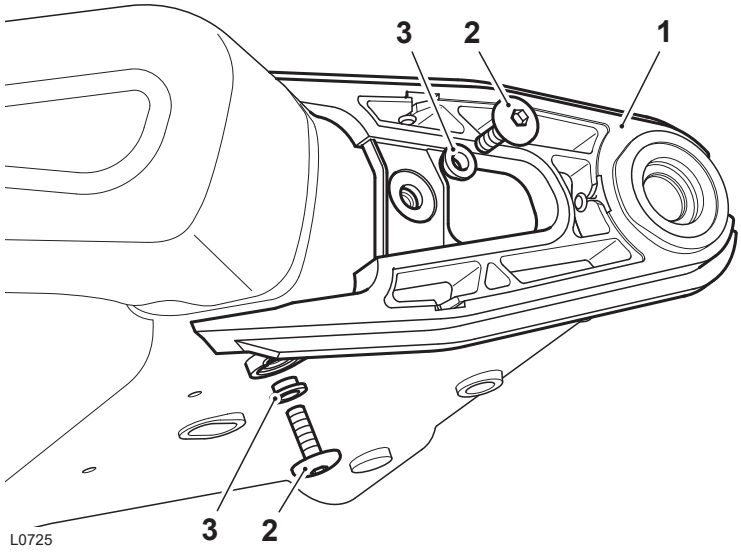
- **The needle roller bearing in the right hand side of the arm cannot be removed undamaged.**

3. Remove the right hand needle roller bearing by drifting through from the left.



1. **Sleeve**
2. **Seal**
3. **Needle roller bearing**
4. **Spacer tube**
5. **Ball bearings**
6. **Circlip**
7. **Seal**
8. **Spacer**

4. Remove the two fixings and sleeves that attach the chain rubbing strip to the swinging arm.
5. Remove the chain rubbing strip.



1. **Chain rubbing strip**
2. **Fixing**
3. **Sleeve**

Swinging Arm - Inspection

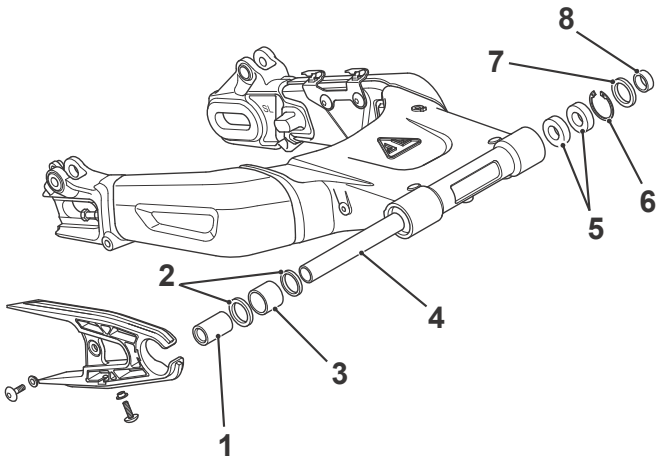
1. Check all swinging arm bearings for damage, pitting, and cracks. Replace as necessary.
2. Check the swinging arm for damage. Replace as necessary.
3. Check the chain rubbing strip for wear or damage. Replace as necessary.
4. Check the wheel bearings for damage, pitting, and cracks. Replace as necessary.
5. Check all bearing seals for damage, splits etc. Replace as necessary.
6. Check the drive chain for wear, damage etc. Replace as necessary.
7. Check both drive chain sprockets for wear, damage etc. Replace as necessary.

Swinging Arm - 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.

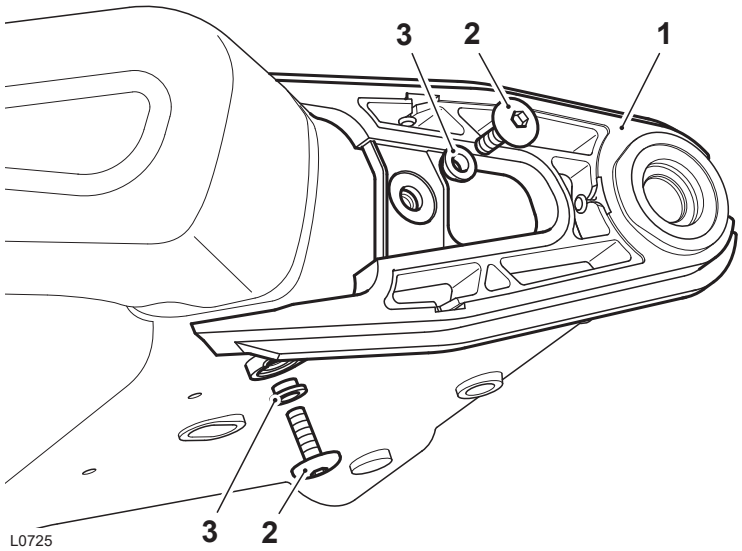
1. Install the bearings (marking faces outwards), sleeves and seals etc. into the swinging arm in the order shown in the following illustration. Use new seals throughout.



1. **Sleeve**
2. **Seal**
3. **Needle roller bearing**
4. **Spacer tube**

5. **Ball bearings**
6. **Circlip**
7. **Seal**
8. **Spacer**

2. Install the chain rubbing strip with the two fixings and sleeves. Tighten the fixings to **9 Nm**.



1. **Chain rubbing strip**
2. **Fixing**
3. **Sleeve**

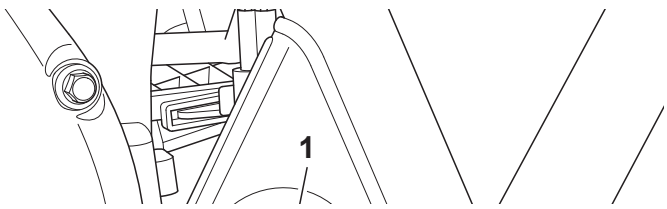
3. Install the swinging arm (see Swinging Arm - Installation).

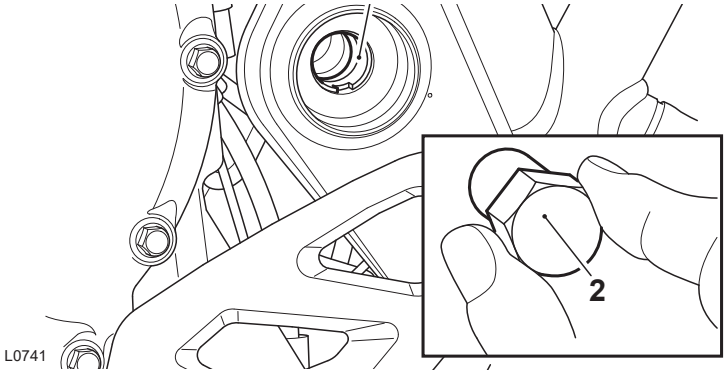
Swinging Arm - Installation

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.

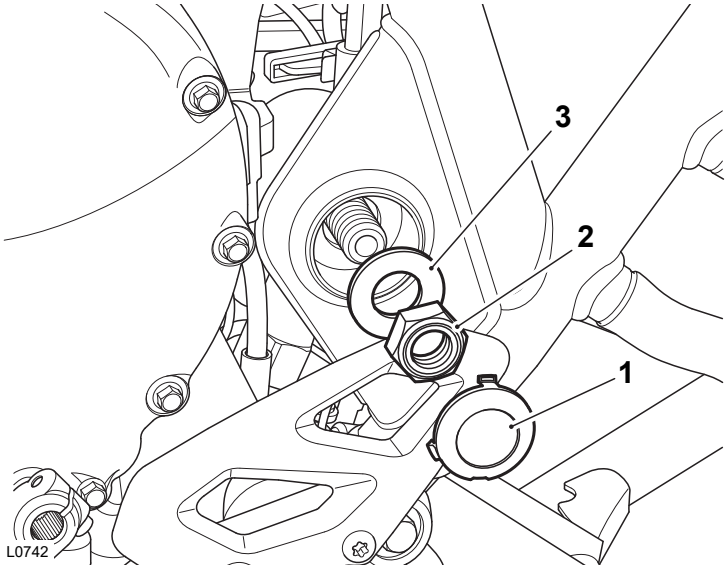
1. Position the swinging arm assembly to the frame and partially insert the swinging arm spindle from the right hand side, allowing access to the frame adjuster.
2. Support the weight of the swinging arm using suitable blocks.
3. Using T3880104 - Swinging Arm Adjuster Wrench, tighten the frame adjuster to **6 Nm**.





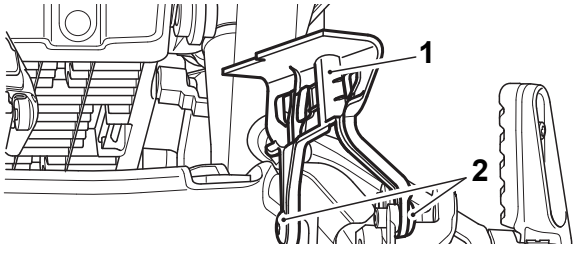
1. **Frame adjuster**
2. **T3880104 - Swinging Arm Adjuster Wrench**

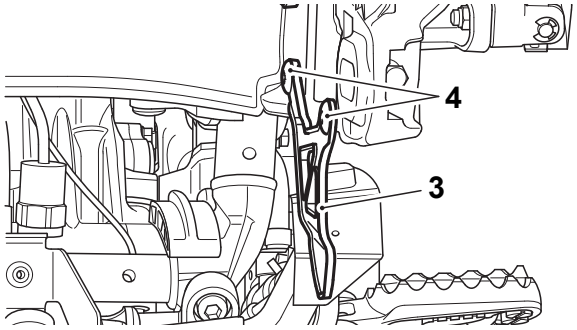
4. Install the washer and new nut onto the swinging arm spindle and tighten the nut to **110 Nm**.



1. **Pivot cover**
2. **Nut**
3. **Washer**

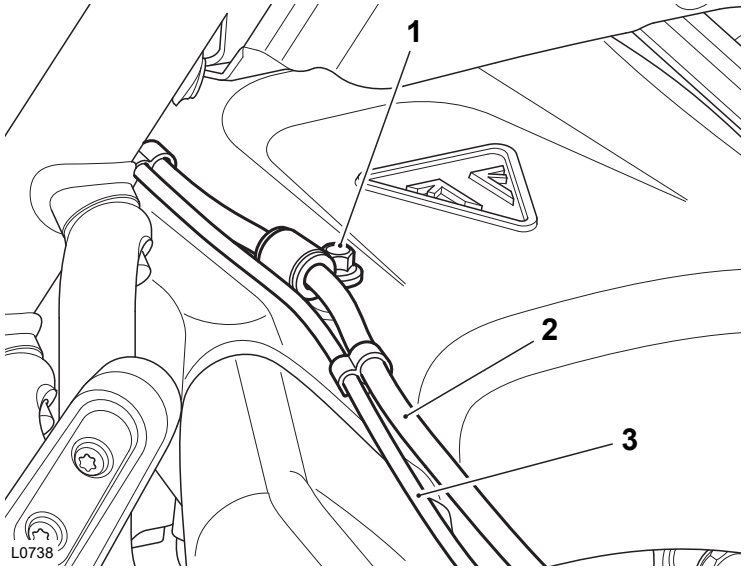
5. Install the pivot covers for the swinging arm at the left and right sides.
6. Put the lower chain guard in position. Install the two fixings and torque them to **4 Nm**.
7. Put the upper chain guard in position. Install and torque the rear fixing to **9 Nm**.
8. Install and torque the upper chain guard front fixing to **4 Nm**.





1. **Upper chain guard**
2. **Fixings**
3. **Lower chain guard**
4. **Fixings**

9. Route the brake hose and ABS sensor harness along the swinging arm.
10. Put the rear brake hose clip into position. Make sure that the clip engages with the anti-rotation rib on the swing arm.
11. Install the fixing that attaches the rear brake hose clip and torque to **5 Nm**.



1. **Fixing**
2. **Brake hose**
3. **ABS sensor harness**

12. Install the brake hose and harness for the ABS wheel speed sensor into the hose guide on the swinging arm.
13. Put the rear brake caliper and mounting bracket assembly in position on the swinging arm.
14. Make sure that the brake hose and ABS sensor harness are in the correct positions and securely attached.

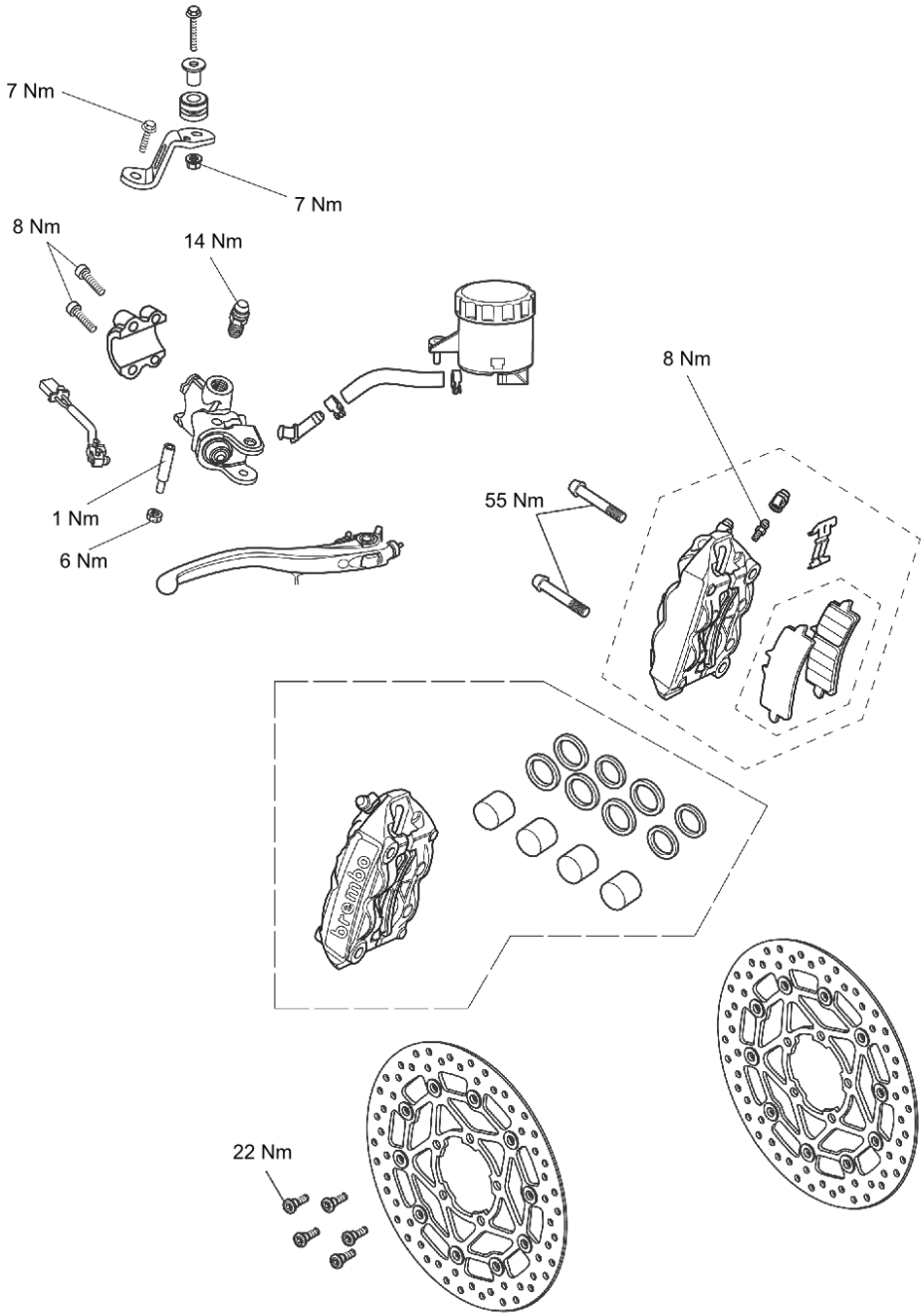
Perform the following operations:

- Rear Suspension Units - Installation
- Rear Wheel - Installation
- Battery - Installation
- Seat - Installation
- Lower the motorcycle to the ground and park it on the side stand.

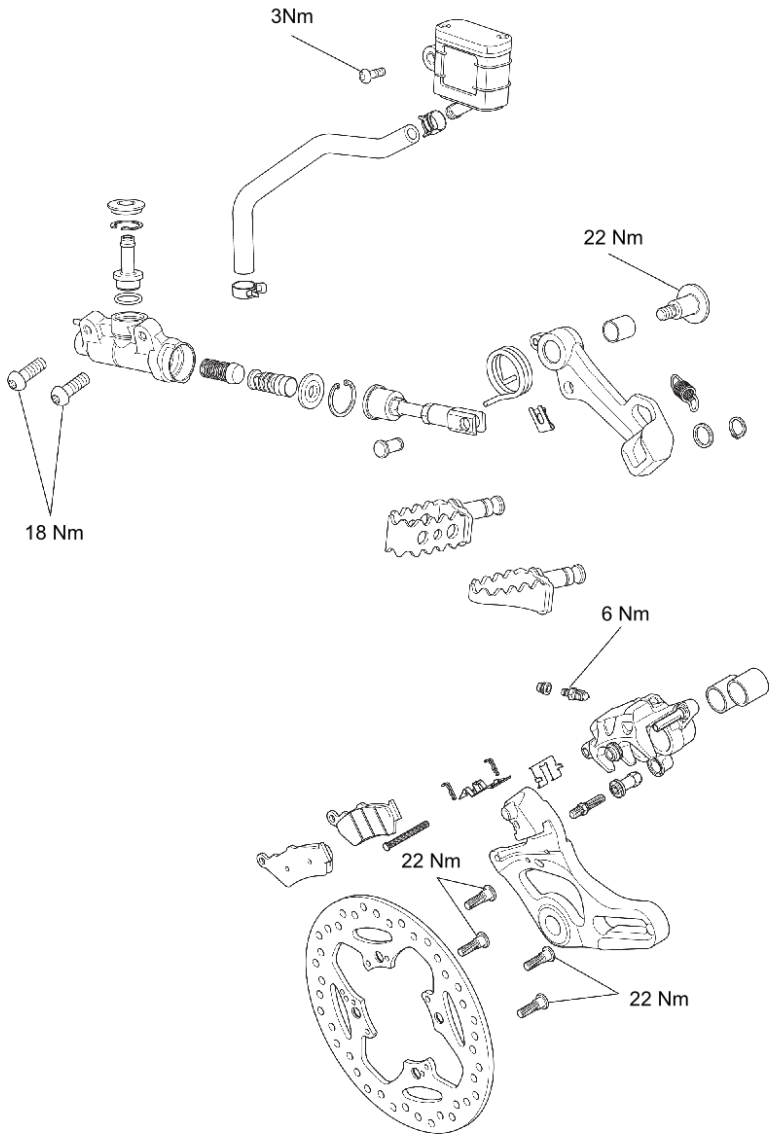
Brakes

Exploded Views

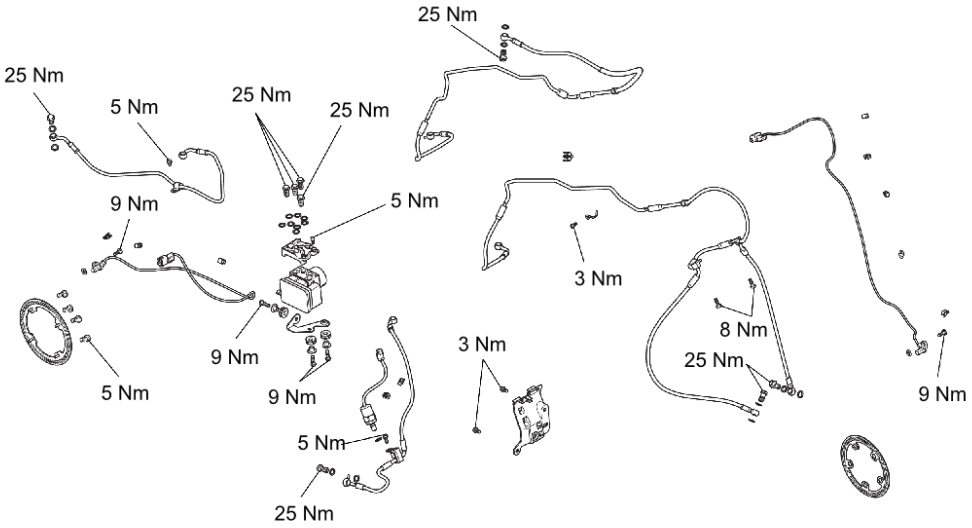
Exploded View – Front Brake Master Cylinder, Caliper and Brake Disc



Exploded View – Rear Brake Master Cylinder, Caliper and Brake Disc



Exploded View – ABS System



Braking System Maintenance and Safety

Braking System Maintenance Safety Precautions

WARNING

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

Replace brake fluid in line with the Scheduled Maintenance chart. A dangerous riding condition could result if this important maintenance item is neglected.

Do not spill brake fluid onto any area of the bodywork as this will damage any painted or plastic surface.

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

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

Check regularly for brake hose damage.

FAILURE TO OBSERVE ANY OF THE ABOVE WARNINGS MAY REDUCE BRAKING EFFICIENCY LEADING TO LOSS OF MOTORCYCLE CONTROL AND AN ACCIDENT.

WARNING

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

If the brake lever or pedal feels soft when it is applied, or if the lever/pedal travel becomes excessive, there may be air in the brake lines or the brake may be defective.

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

WARNING

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

Failure to change the brake fluid at the interval specified in the Scheduled Maintenance chart may reduce braking efficiency resulting in loss of motorcycle control and an accident.

WARNING

Never use mineral-based grease in any part of the braking system or in any area where contact with the braking system is possible. Mineral-based grease will damage the hydraulic seals in the calipers and master cylinders. Damage caused by contact with mineral-based grease may reduce braking efficiency resulting in loss of motorcycle control and an accident.

WARNING

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

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

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

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

WARNING

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:

·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.

Brake Fluid Level Inspection

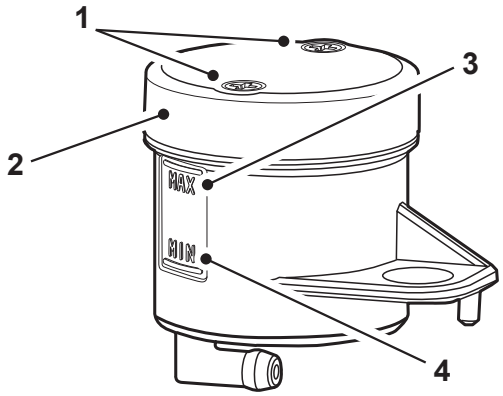
WARNING

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.

Front Brake Fluid Reservoir

1. The brake fluid level must be kept between the upper and lower level lines with the motorcycle on its side stand and the steering on full left lock.



jajc_2

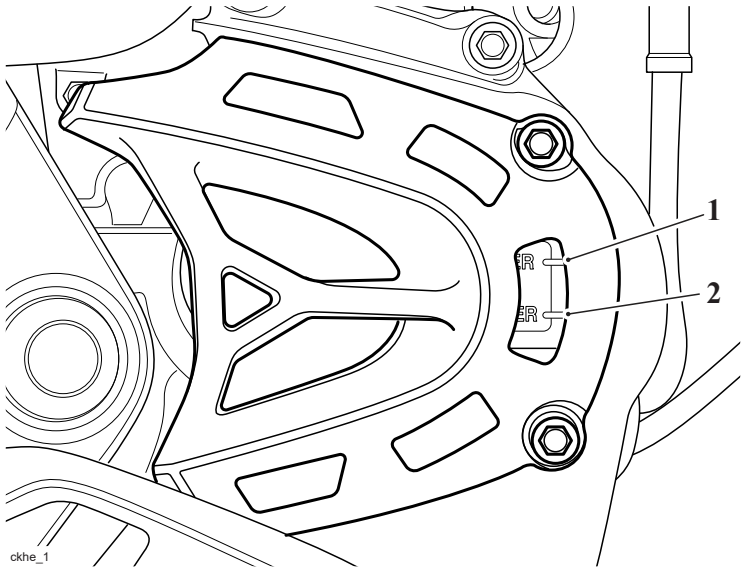
1. **Fixings**
2. **Reservoir cap**
3. **Upper level line**
4. **Lower level line**

Front Brake Fluid Level Adjustment

1. Remove the two fixings.
2. Remove the reservoir cap and the diaphragm seal.
3. Fill the reservoir to the upper level line using new DOT 4 fluid from a sealed container.
4. Refit the reservoir cap and diaphragm seal ensuring that the diaphragm seal is correctly positioned between the cap and the reservoir body.
5. Refit the two fixings and tighten to **0.7 Nm**.

Rear Brake Fluid Reservoir

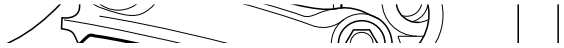
1. The reservoir fluid level lines are visible on the right hand side of the motorcycle on the front sprocket cover.
2. The brake fluid level must be kept between the upper and lower level lines (reservoir held horizontal).

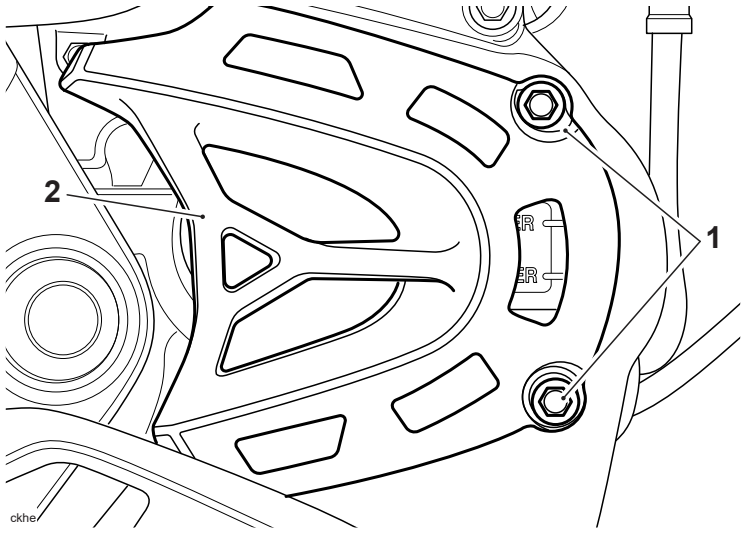


1. **Upper level line**
2. **Lower level line**

Rear Brake Fluid Level Adjustment

1. Release the fixings and remove the front sprocket outer cover.



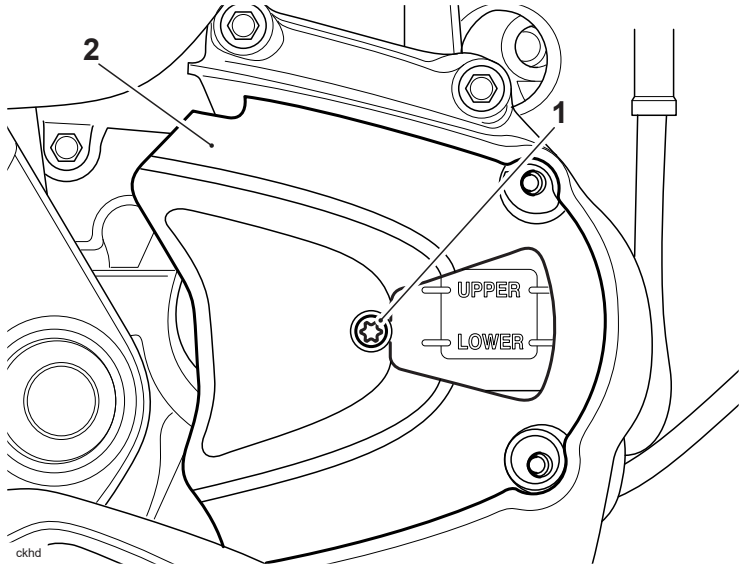


1. **Fixings**
2. **Sprocket outer cover**

Note

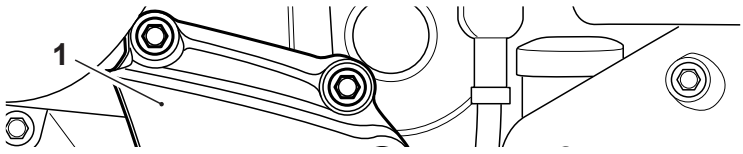
- **The fixing securing the front sprocket middle cover also secures the brake fluid reservoir to the sprocket cover.**

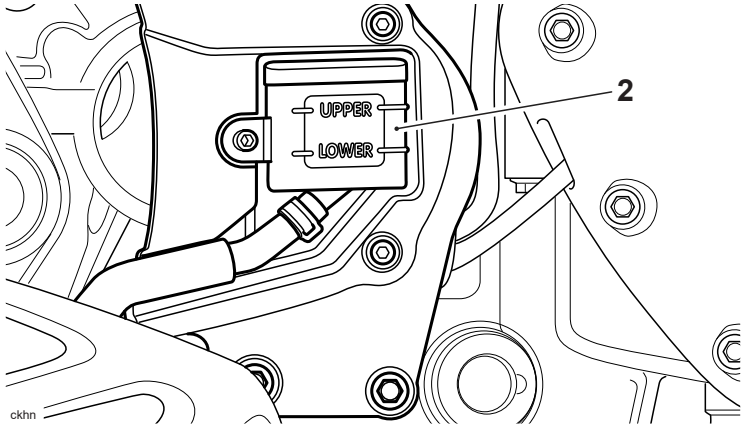
2. Release the fixing and remove the front sprocket middle cover. Discard the fixing.



1. **Fixings**
2. **Sprocket middle cover**

3. Detach the brake fluid reservoir from the sprocket cover.





1. **Brake fluid reservoir**
2. **Sprocket cover**

4. Release the cap screws and remove the reservoir cover noting the position of the sealing diaphragm.
5. Fill the reservoir to the upper level line using new DOT 4 fluid from a sealed container.
6. Refit the reservoir cap ensuring that the diaphragm seal is correctly positioned between the cap and the reservoir body. Tighten the cap retaining screws to **1 Nm**.
7. Attach the brake fluid reservoir to the sprocket cover.
8. Refit the sprocket middle cover and tighten the new fixing to **3 Nm**.
9. Refit the sprocket outer cover and tighten the fixings to **9 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

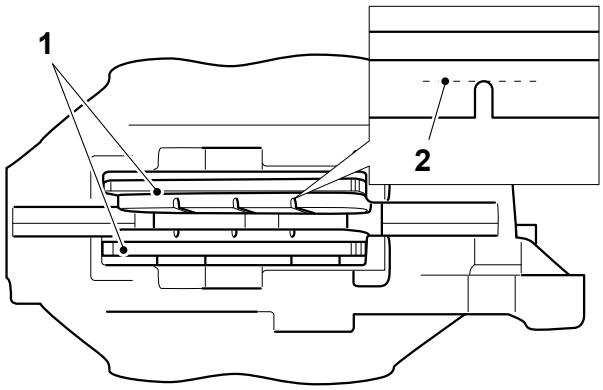
Front and rear brake pad wear is automatically compensated for and has no effect on brake lever or pedal action.

Brake Pad Wear 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 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.

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

WARNING

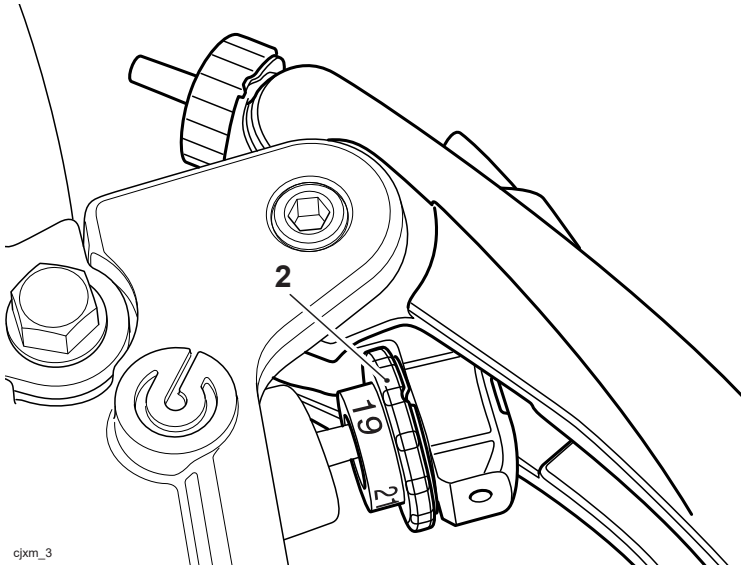
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

Note

- **The master cylinder should always be bled last. Bleed each caliper in turn before bleeding the master cylinder.**

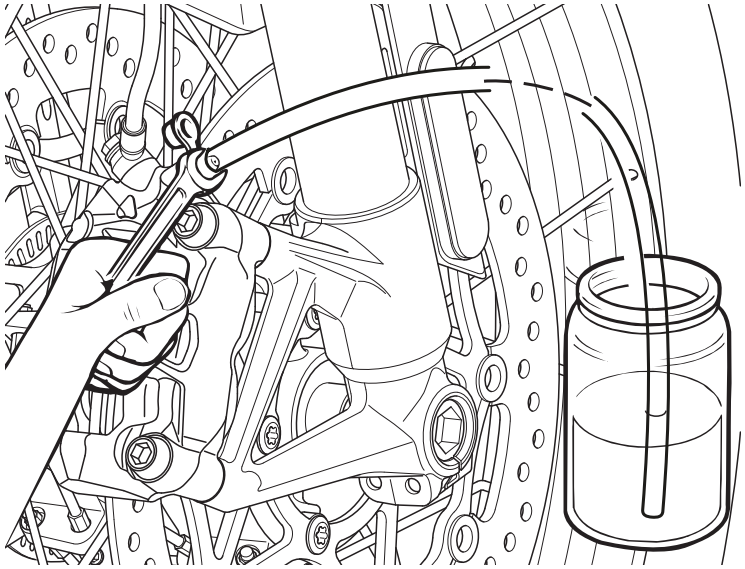
1. Note the original setting of the brake lever adjuster in order that it can be returned to the same position when the bleeding operation is complete. Turn the brake lever adjuster fully

in.



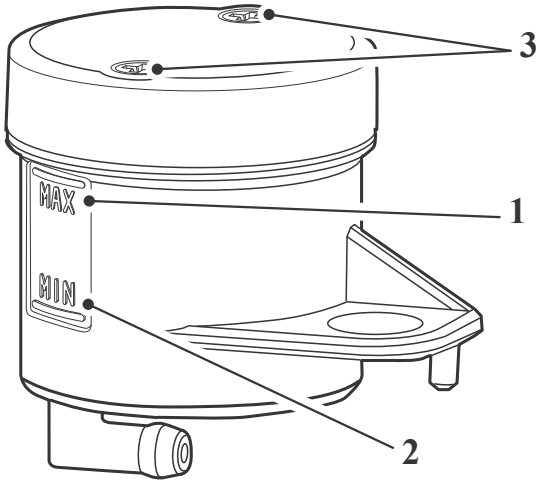
1. **Brake lever**
2. **Adjusting screw**

2. Remove the rubber cap from the bleed nipple on the right hand caliper.
3. Attach a transparent tube to the bleed nipple.



1. **Bleed nipple**
2. **Spanner**
3. **Bleed tube**
4. **Container**

4. Place the other end of the tube in a suitable receptacle containing new brake fluid.
5. Turn the handlebars to bring the fluid reservoir to a level position.



abdj_2

1. **Front reservoir upper level**
2. **Front reservoir lower level**
3. **Screws**

6. Remove the screws from the brake reservoir cover.

WARNING

Ensure absolute cleanliness when adding brake fluid to the brake fluid reservoir. Do not allow moisture or debris to enter the cylinder as this will adversely affect the fluid properties. Always use fluid from a sealed container and do not use fluid from a container which has been opened for any period of time. Always check for fluid leakage around hydraulic fittings and for damage to hoses.

A dangerous riding condition leading to an accident could result if this warning is ignored.

CAUTION

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

7. Carefully remove the reservoir cover taking care not to spill any fluid.
8. Check the condition of the sealing diaphragm for the reservoir. Replace if necessary.
9. Release the bleed nipple.

WARNING

Use only 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.

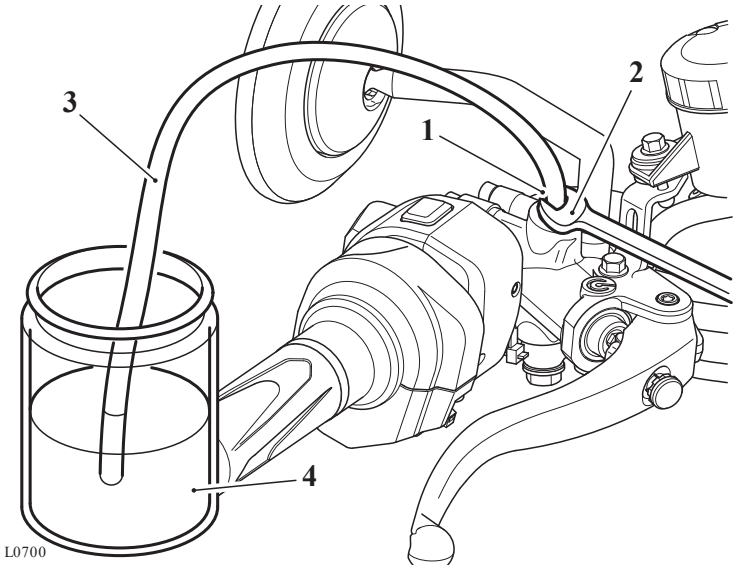
Observe the brake fluid handling warnings given earlier in this section of the manual.

Note

Note

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

10. Slowly pull the brake lever to the handlebar and, holding the lever fully in, close the bleed nipple.
11. Repeat steps 9 and 10 until no more air appears in the bleed tube.
12. When all air has been expelled from the system, hold the lever in and close the bleed nipple. Tighten the nipple to **8 Nm**.
13. Fill the reservoir to the upper level with new DOT 4 fluid.
14. Remove the transparent bleed tube.
15. Repeat the bleeding procedure for the left hand caliper.
16. Repeat the bleed procedure for the bleed nipple on the master cylinder. Tighten the bleed nipple to **14 Nm**.



1. **Bleed nipple**
2. **Spanner**
3. **Bleed tube**
4. **Container**

17. When both calipers and the master cylinder 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.
18. Fill the reservoir to the upper level with new DOT 4 fluid.
19. Refit the reservoir diaphragm and cover. Secure the cap with its screws. Tighten the screws to **0.7 Nm**.

WARNING

Always return the lever adjuster to the original setting. Operating the motorcycle with lever

WARNING

settings which are unfamiliar may lead to loss of control or an accident.

20. Reset the brake lever adjuster to the original setting.
21. Check that the brake operates correctly. 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 ride the motorcycle again. Failure to take remedial action may result in reduced braking efficiency leading to loss of motorcycle control and an accident.

22. Connect the Triumph diagnostic tool (see Triumph Diagnostic Software - ABS).
23. Follow the on screen menu to ABS Diagnostics. From the menu, select 'BLEED SYSTEM' (see Triumph Diagnostic Software - ABS).

CAUTION

On pressing the **Start** button, the diagnostic software will send a command to the ABS ECM to open the 2nd circuit solenoid.

When the ABS modulator 2nd circuit is activated by the bleed command, the front brake lever travel will increase as the ABS modulator solenoids are opened and will then decrease as the solenoids are automatically closed.

Pressure must be applied to the front brake lever before operating the bleed sequence on the diagnostic tool. An assistant will be required to open the bleed nipple while pressure is applied to the brake lever.

24. Apply pressure to the front brake lever, press the **Start** button to activate the bleed sequence on the diagnostic tool, and with assistance, release one of the bleed nipples.
25. Get an assistant to slowly pull the brake lever to the handlebar.
26. With the lever held fully against the handlebar, close the bleed nipple. Once the bleed nipple is closed, release the brake lever.
27. Repeat steps 5 and 6 until no more air appears in the bleed tube, maintaining the brake fluid level between the upper and lower reservoir levels whilst bleeding is being carried out.
28. The bleed sequence will run for a maximum of 90 seconds. Press the **Stop** button to end the bleed sequence at any time. Once the bleed sequence has completed the diagnostic tool will display a message **ABS system bleed complete**.
29. Repeat the above procedure as necessary until all air is expelled from the system.
30. When all air has been expelled from the system, apply pressure to the brake lever and close the bleed nipple. Tighten the nipple to **8 Nm**.
31. Repeat the brake bleed procedure as detailed in steps 1 to 21.

CAUTION

CAUTION

The ABS modulator must be allowed to cool between bleeding operations. Always allow the ABS modulator to cool for 5 minutes before starting the bleed procedure again. Failure to follow this instruction may result in damage to the ABS modulator.

Bleeding the Rear Brakes, Renewing Brake Fluid

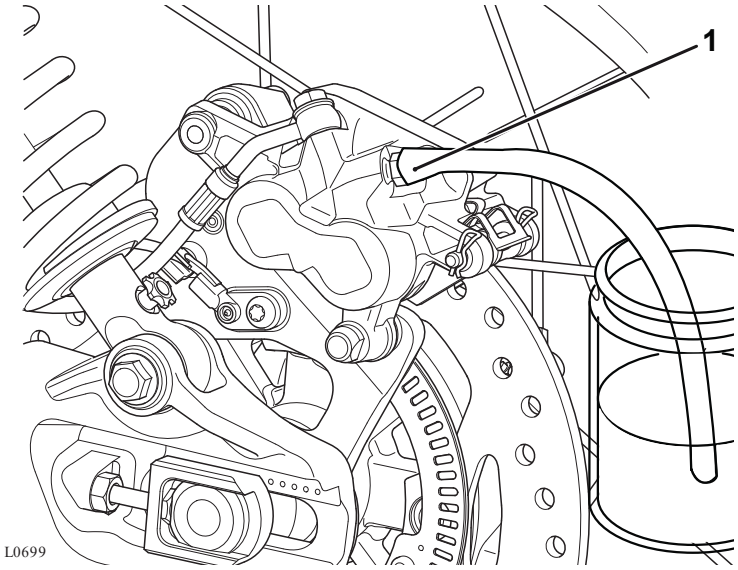
WARNING

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.

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 cap from the rear bleed nipple.
2. Attach a transparent tube to the bleed nipple.
3. Place the other end of the tube in a suitable receptacle containing new brake fluid.



1. **Bleed nipple**
2. **Bleed tube**

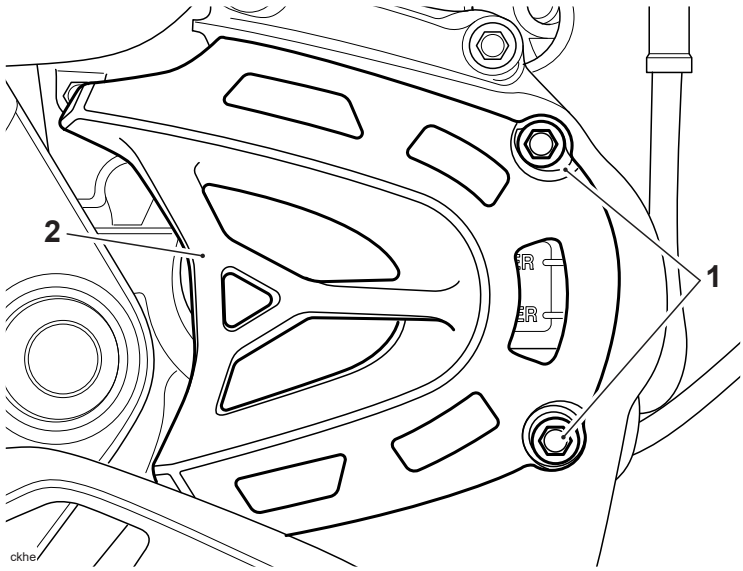
WARNING

Ensure absolute cleanliness when adding brake fluid to the brake fluid reservoir. Do not

WARNING

allow moisture or debris to enter the cylinder, as this will adversely affect the fluid properties. Always use fluid from a sealed container and do not use fluid from a container that has been opened for any period of time. Always check for fluid leakage around hydraulic fittings and for damage to hoses. A dangerous riding condition leading to loss of motorcycle control and an accident could result if this warning is ignored.

4. Release the two fixings and remove the front sprocket outer cover.

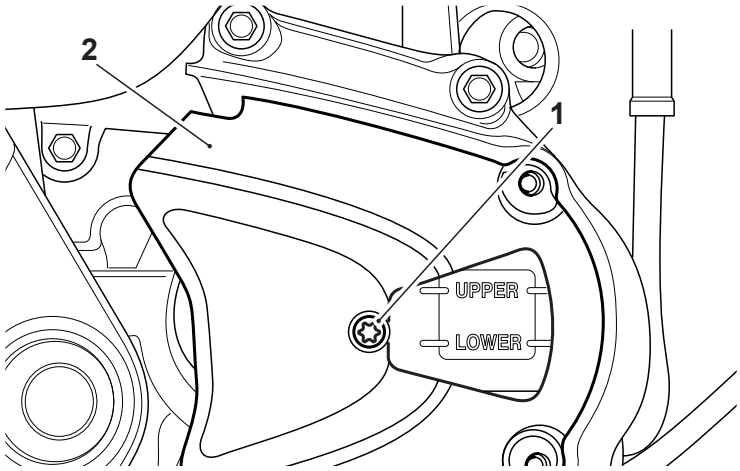


1. **Fixings**
2. **Outer cover**

Note

- **When the front sprocket middle cover has been removed, the rear brake fluid reservoir will be detached from the sprocket cover.**
- **To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.**

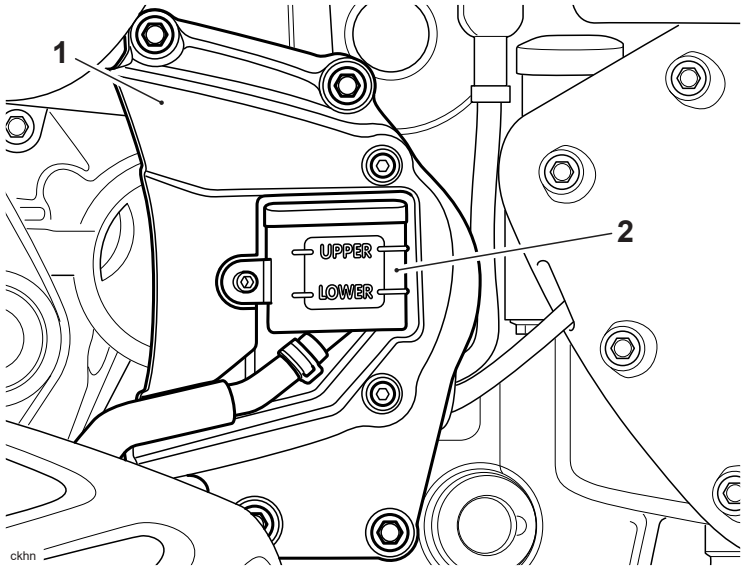
5. Release the fixing and remove the front sprocket middle cover.





1. **Fixings**
2. **Middle cover**

6. Detach the brake fluid reservoir from the front sprocket cover.



1. **Brake fluid reservoir**
2. **Front sprocket cover**

7. Release the cap screws and remove the reservoir cover noting the position of the sealing diaphragm.
8. Check the condition of the reservoir sealing diaphragm. Replace if necessary.
9. Release the bleed nipple.

CAUTION

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.

10. Get an assistant to slowly depress the brake pedal and, holding the pedal fully down, close the bleed nipple.
11. Repeat steps 6 and 7 until no more air appears in the bleed tube.
12. When all air has been expelled from the system, hold the pedal fully down and close the bleed nipple.
13. Connect the Triumph Diagnostic Interface (see System Diagnostics).
14. Follow the on screen menu to ABS Diagnostics. From the menu, select **BLEED SYSTEM** (see System Diagnostics).

CAUTION

On pressing the **Start** button, the diagnostic software will send a command to the ABS ECM to open the 2nd circuit solenoid.

When the ABS modulator 2nd circuit is activated by the bleed command, the rear brake pedal travel will increase as the ABS modulator solenoids are opened and will then decrease as the solenoids are automatically closed.

Pressure must be applied to the rear brake pedal before operating the bleed sequence on the diagnostic tool. An assistant will be required to open the bleed nipple while pressure is applied to the rear brake pedal.

15. Apply pressure to the rear brake pedal, press the **Start** button to activate the bleed sequence on the diagnostic tool and release the bleed nipple.
16. Slowly depress the brake pedal and, holding the pedal fully down, close the bleed nipple. Repeat until no more air appears in the bleed tube, maintaining the brake fluid level between the upper and lower reservoir levels whilst bleeding is being carried out.
17. Repeat steps 12 and 13 until no more air appears in the bleed tube, maintaining the brake fluid level between the upper and lower reservoir levels whilst bleeding is being carried out.
18. The bleed sequence will run for a maximum of 20 seconds. Press the **Stop** button to end the bleed sequence at any time. Once the bleed sequence has completed, the diagnostic tool will display the message **ABS system bleed complete**.

CAUTION

The ABS module must be allowed to cool between bleeding operations. Always allow the ABS modulator to cool for 5 minutes before starting the bleed procedure again. Failure to follow this instruction may result in damage to the ABS modulator.

19. Repeat the above procedure a minimum of twice or as necessary until all air is expelled from the system.
20. When all air has been expelled from the system, apply pressure to the brake lever and close the bleed nipple.
21. Disconnect the Triumph diagnostic Interface.
22. Repeat steps 6 and 7 until no more air appears in the bleed tube.
23. When all air has been expelled from the system, apply pressure to the brake pedal and close the bleed nipple and tighten it to **8 Nm**.
24. Remove the bleed tube.
25. Replace the bleed nipple cap.
26. Fill the reservoir to the upper level with new DOT 4 fluid.

WARNING

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

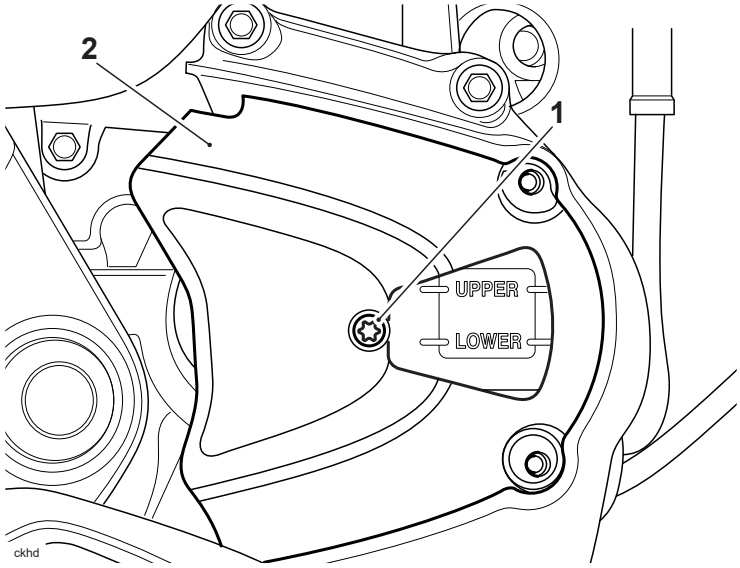
WARNING

Observe the brake fluid handling warnings given earlier in this section of the manual.

CAUTION

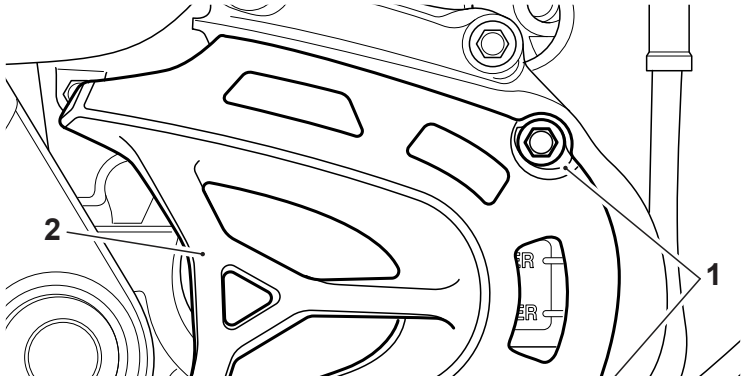
To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

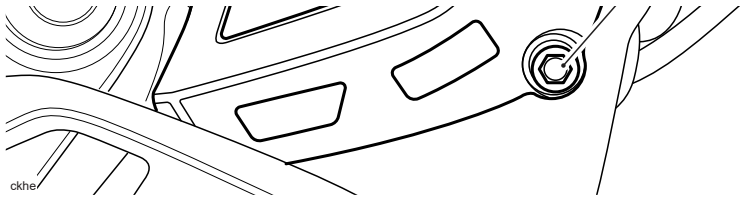
27. When the caliper has been bled, ensure the brake pedal operation has a firm resistive feel to it, does not feel spongy and that the brake pedal does not have excessive movement. Take remedial action as necessary.
28. Refit the reservoir cap ensuring that the diaphragm seal is correctly positioned between the cap and the reservoir body. Tighten the cap retaining screws to **1 Nm**.
29. Attach the brake fluid reservoir to the front sprocket cover.
30. Fit the front sprocket middle cover and tighten its fixing to **3 Nm**.



1. **Fixings**
2. **Middle cover**

31. Fit the front sprocket outer cover and tighten its fixings to **9 Nm**.





1. **Fixings**
2. **Outer cover**

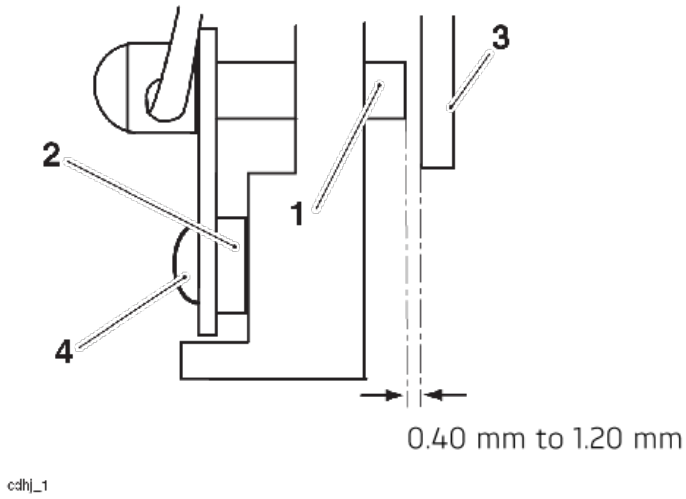
32. Check the operation of the rear brake. Rectify as necessary.

WARNING

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

Air Gap Measurement

1. Using feeler gauges, measure the air gap between the wheel speed sensor and the pulser ring.



1. **ABS sensor (front sensor shown)**
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 to achieve an air gap between 0.40 mm and 1.20

mm.

4. Shims are available in the following sizes:
   - shims - 0.5 mm, 1.0 mm, 1.5 mm and 2.0 mm.
5. If necessary, remove the wheel speed sensor, fit the correct thickness shim and refit the wheel speed sensor and tighten the fixing to **9 Nm**.
6. Repeat the air gap measurement. Readjust as necessary.

Anti-lock Brake System (ABS) Management

Anti-lock Brake System (ABS)

System Description

Ths model is fitted with an electronic anti-lock brake system which is designed to prevent the wheels from locking or skidding by reducing braking effort to the front or rear brake caliper as required.

The system consists of a hydraulic modulator and ECM assembly mounted to a bracket beneath the swinging arm, a front wheel speed sensor mounted to the front fork, and a rear wheel speed sensor mounted to the rear brake caliper carrier.

Both front and rear wheels have a pulser ring mounted on to the wheel hub.

The front and rear master cylinders are connected via lines to the modulator and from the modulator the lines connect to the brake calipers.

The front and rear brake circuits operate as separate systems. The front and rear brakes are not connected in any way inside the modulator.

The modulator ECM continuously calculates the front and rear wheel speeds, and from these inputs the ECM calculates the estimated motorcycle speed, wheel deceleration/acceleration, the wheel speed difference and the wheel slip (skid) rate. This is calculated by comparing the calculated wheel speeds with the calculated vehicle speed, so that if one wheel speed deviates significantly from the other two readings, this wheel is calculated to be slipping (skidding).

Under braking, if the modulator detects that either wheel is slipping, due to the brake force exceeding the available traction between the tyre and road surface (the wheel will begin to slip or 'skid'), the ECM very rapidly releases and reapplies the brake pressure to prevent the wheel from slipping.

This is felt through the brake pedal or lever as a rapid 'pulsing'.

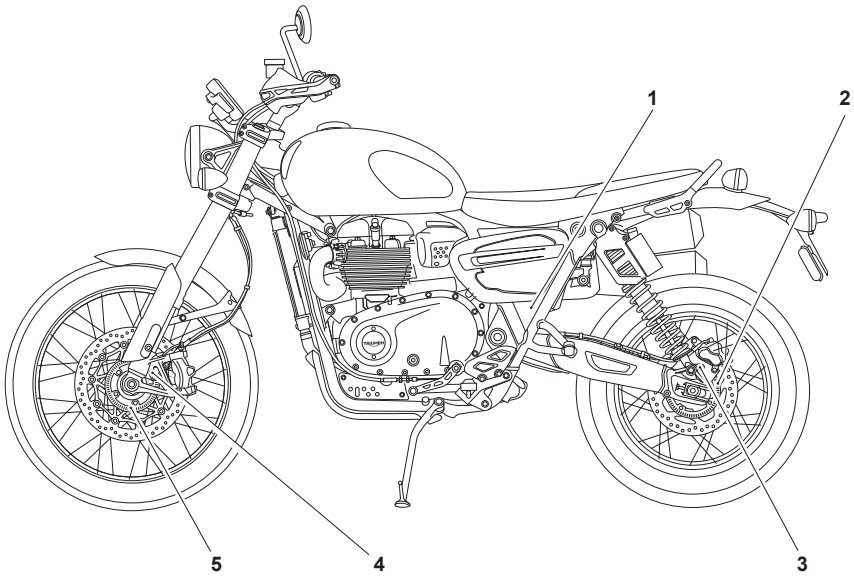
If the rider reduces braking effort, or traction increases (so that traction exceeds braking force, the wheel will rotate once more) the wheel will no longer lock up. The ABS system will detect this and stop controlling brake pressure, and return to its monitoring state.

The system has a self diagnostic function built-in which monitors the fail safe relay, solenoid valves, motor relay, wheel speed sensors, power supply and ground, as well as internal ECM functions. In the event of a malfunction being detected, the ECM will illuminate the ABS warning light, and store a diagnostic trouble code in the system memory. This stored data can then be recovered using the Triumph Diagnostic Tool which is mandatory for all Triumph dealers. In this way, precise diagnosis of a fault can be made and the fault quickly rectified.

Under normal operation, the ABS warning light will flash on and off after the ignition is switched on and until the vehicle speed exceeds 6 mph (10 km/h). The ABS performs a self check and if no faults are found the light is extinguished. If a trouble code is stored the ABS warning light will stay illuminated and the ABS will not function, however the brakes will

operate normally. If the ABS warning light does not extinguish, or illuminates whilst the motorcycle is being ridden, refer to the ABS system diagnostics (see Diagnostic Trouble Codes).

Component Locations



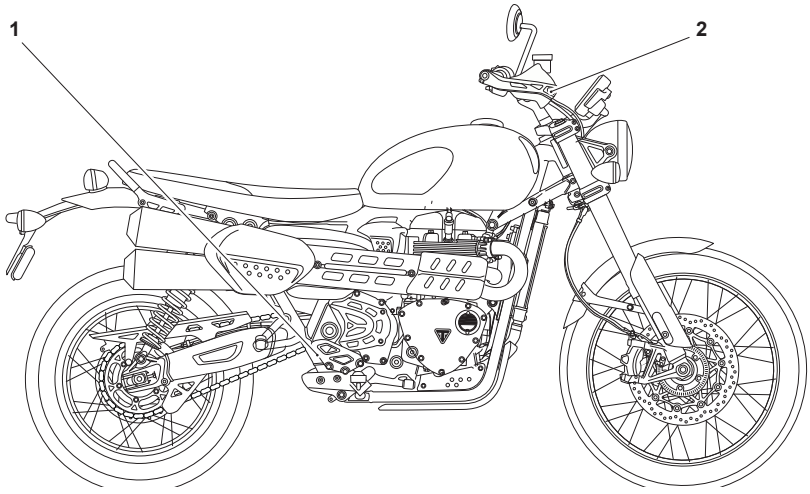
1. ABS Modulator

2. Rear Wheel Pulser Ring

3. Rear Wheel Speed Sensor

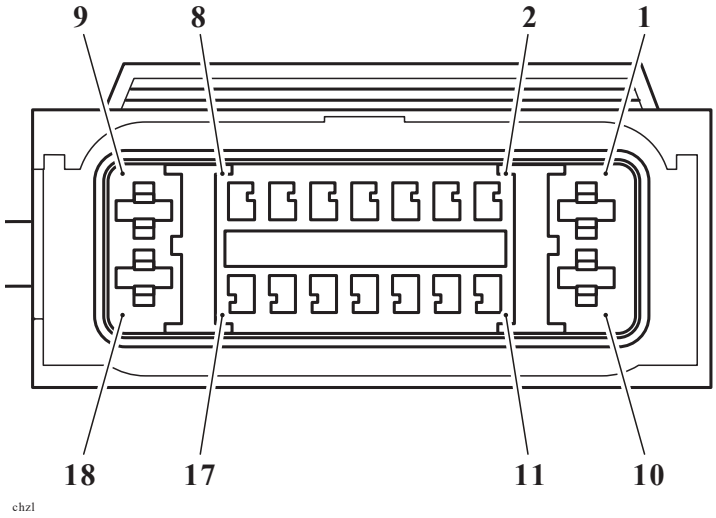
4. Front Wheel Speed Sensor

5. Front Wheel Pulser Ring



1. **Rear Brake Light Switch**
2. **Front Brake Light Switch**

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 right to left with number one in the top right hand corner.

Diagnostics and Testing

System Diagnostics

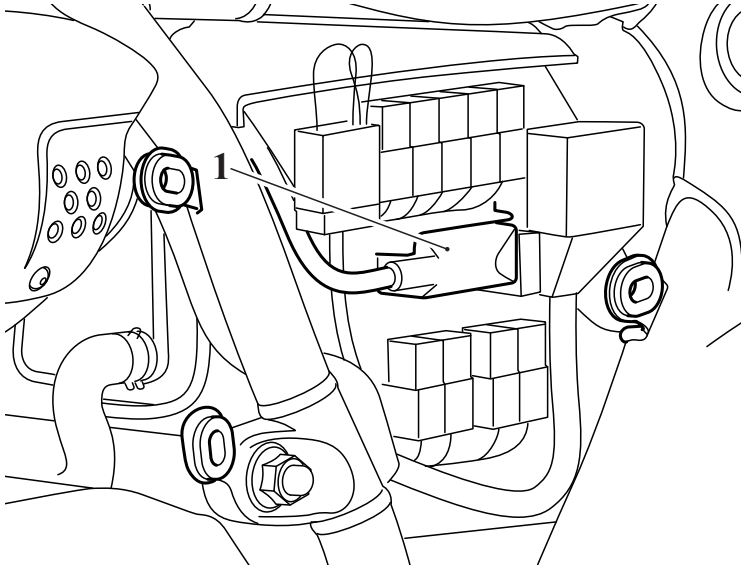
The ABS system has an on-board diagnostics feature which allows service technicians to retrieve stored data from the ECM using Triumph diagnostic software. Full details of the Triumph diagnostic software operation and how to interpret the results are given in the Triumph Diagnostic Tool User Guide.

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.

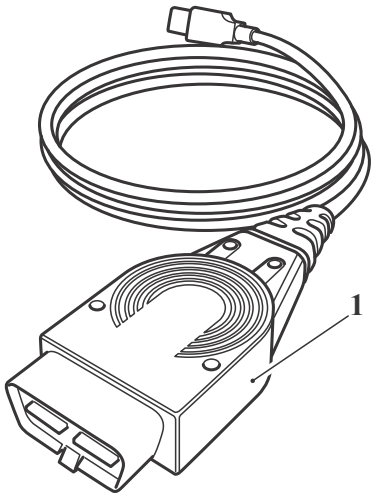
Diagnostic Tool Connection

1. To connect the Triumph diagnostic interface to the motorcycle, remove the left hand side panel (see Side Panels) and release the diagnostic connector from its locating tang.



1. **Diagnostic connector**

2. Plug the diagnostic interface directly into the diagnostic connector.



1. **Diagnostic connector**

1. When the diagnostic session is completed, disconnect the Triumph diagnostic interface.
2. Refit the diagnostic connector to its locating tang and refit the left hand side panel (see Side Panels).

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.**

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
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

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 Page Number**
C1611	Front wheel sensor short circuit to ground or open circuit	Front Wheel Sensor Open Circuit/Short Circuit
C1612	Front wheel sensor incorrect or missing signal	Front Wheel Sensor Abnormal Input/Losing Contact
C1613	Rear wheel sensor short circuit to ground or open circuit	Rear Wheel Sensor Open Circuit/Short Circuit
C1614	Rear wheel sensor incorrect or missing signal	Rear Wheel Sensor Abnormal Input/Losing Contact
C1621	Front wheel pulser ring missing teeth	Front Wheel Pulser Ring Missing Teeth
C1623	Rear wheel pulser ring missing teeth	Rear Wheel Pulser Ring Missing Teeth
C1631	Front wheel input solenoid short circuit to ground or open circuit	Front or Rear Input/Output Solenoid Open/Short Circuit

Diagnostic Trouble Code (DTC)	Fault Description	Pinpoint Test Page Number
C1632	Front wheel output solenoid short circuit to ground or open circuit	Front or Rear Input/Output Solenoid Open/Short Circuit
C1633	Rear wheel input solenoid short circuit to ground or open circuit	Front or Rear Input/Output Solenoid Open/Short Circuit
C1634	Rear wheel output solenoid short circuit to ground or open circuit	Front or Rear Input/Output Solenoid Open/Short Circuit
C1635	Low pressure feed valve short circuit to ground or open circuit	Front or Rear Input/Output Solenoid Open/Short Circuit
C1636	Low pressure feed valve short circuit to ground or open circuit	Front or Rear Input/Output Solenoid Open/Short Circuit
C1641	Front Wheel Actuator (Hydraulic Control) Wheel Lock	Front or Rear Wheel Actuator (Hydraulic Control) Wheel Lock
C1643	Rear Wheel Actuator (Hydraulic Control) Wheel Lock	Front or Rear Wheel Actuator (Hydraulic Control) Wheel Lock

Diagnostic Trouble Code (DTC)	Fault Description	Pinpoint Test Page Number
C1651	Motor - Circuit fault	Motor – Lock; Motor Does Not Run; Motor Runs Continually
C1652	Motor - Does not run	Motor – Lock; Motor Does Not Run; Motor Runs Continually
C1653	Motor - Runs continually	Motor – Lock; Motor Does Not Run; Motor Runs Continually
C1654	Solenoid relay does not operate or operates continually	Front or Rear Input/Output Solenoid Open/Short Circuit
C1661	Power source voltage too low	Power Source Voltage Drop/Voltage Rise
C1662	Power source voltage too high	Power Source Voltage Drop/Voltage Rise
C1663	Power source - short term under-voltage detected	Power Source Voltage Drop/Voltage Rise
C1664	Power source - long term Under-voltage detected	Power Source Voltage Drop/Voltage Rise

Diagnostic Trouble Code (DTC)	Fault Description	Pinpoint Test Page Number
C1671	Incorrect tyre size detected	Incorrect Tyre Size Detected
C1681	ABS ECM internal error	ABS ECM Internal Error
C1682	CAN fault - lost communication with engine ECM	CAN Fault
C1683	CAN fault - lost communication with instrument panel	CAN Fault
C1684	CAN fault - all communication lost	CAN Fault

Diagnostic Trouble Codes

Dependant on the DTC stored, the ABS ECM will act in one of two ways:

1. Inhibit ABS operation immediately, irrespective of the ABS operating mode;or
2. Allow the ABS operation to complete before inhibiting the ABS.

Once the ABS ECM has inhibited ABS function, the ECM will act in one of three ways:

1. Allow the ABS to resume operation if the fault clears;or
2. Allow ABS operation after an ignition cycle if the fault clears;or
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

- **ABS is Active means that the ABS system is completing an ABS manoeuvre.**

ABS Electrical Connectors

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

Note

- **A major cause of hidden electrical faults can be traced to faulty electrical connectors.**

For example:

- Dirty/corroded terminals
- Damp terminals
- Broken or bent cable pins within multiplugs.

For example, the 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 battery supply and ground pins should be virtually battery volts with a small deviation allowable for usual voltage drop within wiring circuits. If there is a noticeable change, suspect faulty/dirty connections. Refer to the ABS circuit diagram within this Service Manual for pin numbers.

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 the battery negative (black) lead before disconnecting the ABS ECM.

Reconnection of the ABS ECM Connector

CAUTION

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

Pinpoint Tests

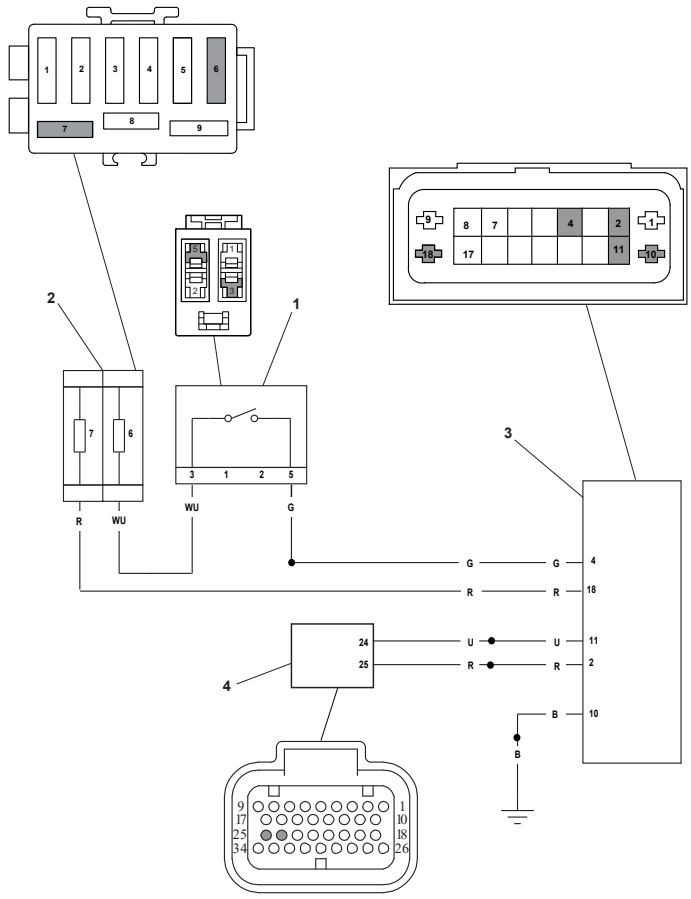
ABS Warning Light ON (No DTCs Stored)

Fault Code	Possible cause	Action
ABS Warning Light ON (No DTCs Stored)	ABS Ignition supply fuse/circuit fault ABS Warning light circuit fault	Ensure ABS modulator/ECM connector is secure. Disconnect ABS ECM connector and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - ABS modulator/ECM connector pin 4 and ground pin 10 - Fuse box fuses 6 and 7 - Ignition Master Switch (KL15) Relay pin 3 - Ignition Master Switch (KL15) Relay pin 5	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 4
2	Check cable continuity: - Instrument pin 24 to ABS modulator/ECM pin 11 - Instrument pin 25 to ABS modulator/ECM pin 2	OK	Proceed to test 3
		Faulty	Rectify fault, proceed to test 4
3	Check cable continuity of the ABS ignition supply circuit: With the ignition 'ON', check voltage between: - ABS modulator/ECM connector pin 4 and ground pin 10	Voltage greater than 10 V	Proceed to test 4
		Voltage less than 10 V	Locate and rectify wiring fault, proceed to test 4
4	Reconnect ABS modulator/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



1. Ignition Master Switch (KL15) Relay

2. Fuse Box

3. ABS Control Module

4. Instruments

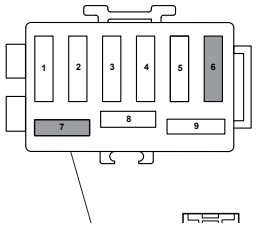
ABS Warning Light Does not Illuminate (No DTCs Stored)

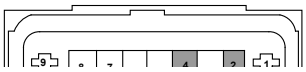
Fault Code	Possible cause	Action
ABS Warning Light OFF (No DTCs Stored)	Warning light circuit fault ABS modulator/ECM ground circuit fault	Ensure ABS modulator/ECM connector is secure. Ensure ABS modulator/ECM ground connection is secure. Disconnect ABS ECM connector and proceed to pinpoint test 1:

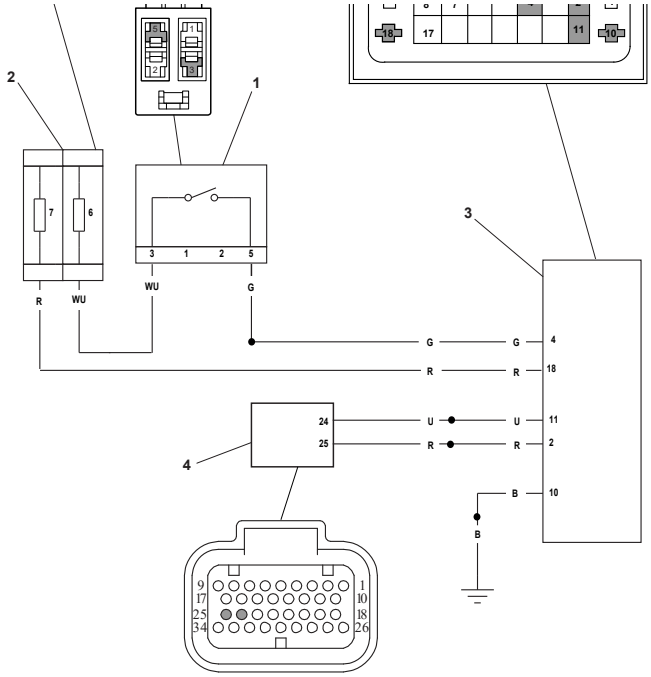
Pinpoint Tests

Test		Result	Action
1	Check fuses 6 and 7 in the fuse box	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable and terminal integrity: - ABS modulator/ECM connector pin 4 and ground pin 10 - Fuse box fuses 6 and 7 - Ignition Master Switch (KL12) Relay pin 3 - Ignition Master Switch (KL12) Relay pin 5	OK	Proceed to test 3
		Faulty	Replace fuse, proceed to test 5
3	Check cable continuity: - Instrument pin 24 to ABS modulator/ECM pin 11 - Instrument pin 25 to ABS modulator/ECM pin 2	OK	Proceed to test 4
		Faulty	Locate and rectify wiring fault, proceed to test 5
4	Check cable continuity of the ABS ignition supply circuit: With the ignition 'ON', check voltage between: - ABS modulator/ECM connector pin 4 and ground pin 10	OK	Proceed to test 5
		Faulty	Locate and rectify fault, proceed to test 5
5	Reconnect ABS modulator/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







1. Ignition Master Switch (KL15) Relay

2. Fuse Box

3. ABS Control Module

4. Instruments

Front Wheel Sensor Open Circuit/Short Circuit

Fault Code	Possible cause	Action
C1611	Front wheel sensor short circuit to ground or open circuit	Ensure ABS ECM connector is secure. Ensure wheel speed sensor connector is secure. Disconnect ABS ECM connector and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity:	OK	Proceed to test 2

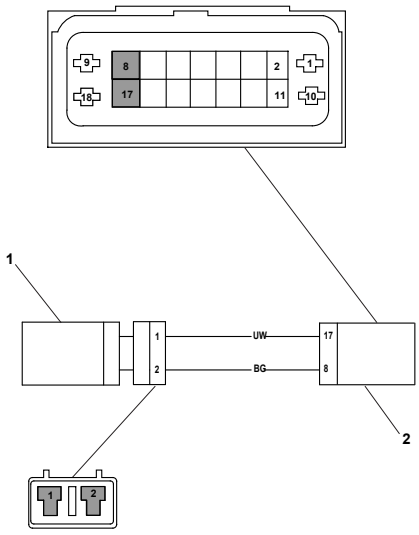
Test		Result	Action
	- ABS ECM connector pin 17 and ABS ECM connector pin 8 - Sensor connector pin 1 - Sensor connector pin 2		
		Faulty	Rectify fault, proceed to test 9
2	Check cable for short circuit: - ABS ECM connector pin 8 and ground	OK	Proceed to test 4
		Short circuit	Proceed to test 3
3	Disconnect 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 17 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 8 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 17 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 8 (positive) and pin 17 (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	1.8 mA	7.5 mA	16.8 mA



1. Front Wheel Sensor
2. ABS Control Module

Rear Wheel Sensor Open Circuit/Short Circuit

Fault Code	Possible cause	Action
C1613	Rear wheel sensor short circuit to ground or open circuit	Ensure ABS modulator/ECM connector is secure. Ensure wheel speed sensor connector is secure. Disconnect ABS modulator/ECM connector and proceed to pinpoint test 1:

Pinpoint Tests

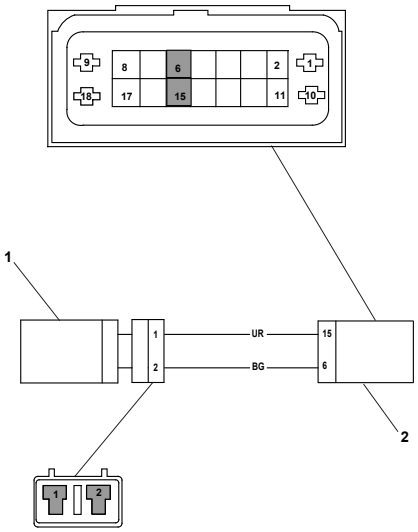
Test		Result	Action
1	Check cable and terminal integrity: - ABS modulator/ECM connector pin 6 and ABS ECM connector pin 15	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 9
2	Check cable for short circuit: - ABS modulator/ECM connector pin 6 and ground	OK	Proceed to test 4
		Short circuit	Proceed to test 3
3	Disconnect the rear wheel speed sensor connector. Check cable for short circuit: - Wheel speed sensor connector pin 6 (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 modulator/ECM connector pin 15 and ground	OK	Proceed to test 6
		Short circuit	Proceed to test 5
5	Check cable for short circuit: - Wheel speed sensor	OK	Replace the wheel speed sensor, proceed to test 9

Test		Result	Action
	connector pin 1 (motorcycle harness side) and ground		
		Short circuit	Locate and rectify wiring harness fault, proceed to test 9
6	Check cable continuity: - ABS modulator/ECM connector pin 6 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 modulator/ECM connector pin 15 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 6 (positive) and pin 15 (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 modulator/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	1.8 mA	7.5 mA	16.8 mA



1. Rear Wheel Speed Sensor

2. ABS Control Module

Front Wheel Sensor Abnormal Input/Losing Contact

Fault Code	Possible cause	Action
C1612	Front Wheel Sensor Open Circuit/Short Circuit Incorrect wheel speed sensor air gap Damaged or dirty pulser ring Loose or incorrectly installed wheel speed sensor	Ensure ABS modulator/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	OK	Proceed to test 2

Test		Result	Action
	wheel speed sensor between the sensor and the pulser ring: - Air gap between 0.40 mm and 1.20 mm		
		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	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

Rear Wheel Sensor Abnormal Input/Losing Contact

Fault Code	Possible cause	Action
C1614	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

Test		Result	Action
1	Measure the air gap of the rear wheel speed sensor between the sensor and the pulser ring: - Air gap between 0.40 mm and 1.20 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	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

Front Wheel Pulser Ring Missing Teeth

Fault Code	Possible cause	Action
C1621	Front wheel pulser ring missing teeth Damaged or dirty pulser ring Loose or incorrectly installed wheel speed sensor Damaged/incorrect wheels	Ensure ABS modulator/ECM connector is secure. Proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action

Test		Result	Action
1	Measure the air gap of the front wheel speed sensor between the sensor and the pulser ring: - Air gap between 0.40 mm and 1.20 mm	OK	Proceed to test 2
		Faulty	Rectify the fault and proceed to test 5
2	Check the pulser ring for damage or contamination by road grime or ferrous metal filings.	OK	Proceed to test 3
		Faulty	Clean or replace the ABS pulser ring, proceed to test 5
3	Check the wheel speed sensors for correct installation, and the fixings for correct torque.	OK	Proceed to test 4
		Faulty	Rectify the fault and proceed to test 5
4	Check the motorcycle wheel for damage/incorrect size.	OK	Proceed to test 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

Rear Wheel Pulser Ring Missing Teeth

Fault Code	Possible cause	Action
C1623	Rear wheel pulser ring missing teeth Damaged or dirty pulser ring Loose or incorrectly installed wheel speed sensor Damaged/incorrect wheels	Ensure ABS modulator/ECM connector is secure. Proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action

Test		Result	Action
1	Measure the air gap of the rear wheel speed sensor between the sensor and the pulser ring: - Air gap between 0.40 mm and 1.20 mm	OK	Proceed to test 2
		Faulty	Rectify the fault and proceed to test 5
2	Check the pulser ring for damage or contamination by road grime or ferrous metal filings.	OK	Proceed to test 3
		Faulty	Clean or replace the ABS pulser ring, proceed to test 5
3	Check the wheel speed sensors for correct installation, and the fixings for correct torque.	OK	Proceed to test 4
		Faulty	Rectify the fault and proceed to test 5
4	Check the motorcycle wheel for damage/incorrect size.	OK	Proceed to test 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

Front or Rear Input/Output Solenoid Open/Short Circuit

Fault Code	Possible cause	Action
C1631	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:
C1632	Front wheel output solenoid short circuit to ground or open circuit	
C1633	Rear wheel input solenoid short circuit to ground or open circuit	

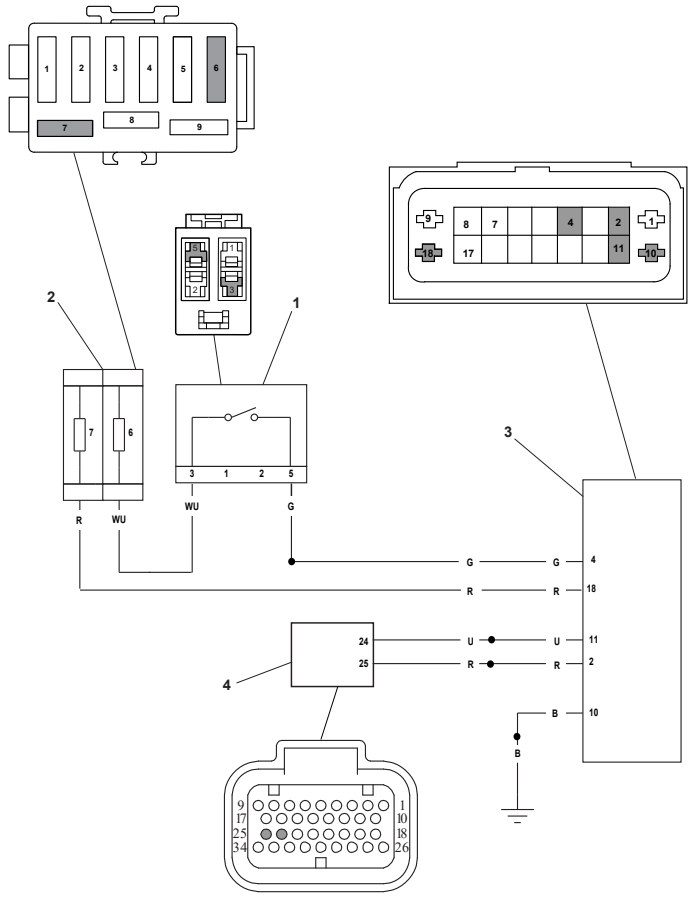
Fault Code	Possible cause	Action
C1634	Rear wheel output solenoid short circuit to ground or open circuit	
C1635	Master cylinder isolation valve short circuit to ground or open circuit	
C1636	Low pressure feed valve short circuit to ground or open circuit	
C1654	Solenoid relay does not operate or operates continually	

Pinpoint Tests

Test		Result	Action
1	Check the ABS main fuse in fuse box (fuse 7):	OK	Proceed to test 3
		Faulty	Proceed to test 2
2	Check cable and terminal integrity: - ABS ECM connector pin 18 and ground pin 10	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: - ABS ECM connector pin 18 and ground pin 10	Voltage greater than 11 V	Proceed to test 4
		Voltage less than 11 V	Locate and rectify fault, proceed to test 5
4	Check cable for continuity: - ABS ECM connector pin 10 and ground	OK	Proceed to test 5
		Faulty	Locate and rectify fault, proceed to test 5
5	Clear fault code and test ABS to	OK	Action complete - quit test

Test	Result	Action
verify fault cleared.		
	Fault still present	Contact Triumph service

Circuit Diagram



1. Ignition Master Switch (KL15) Relay

2. Fuse Box

3. ABS Control Module

4. Instruments

Front or Rear Wheel Actuator (Hydraulic Control) Wheel Lock

Fault Code	Possible cause	Action
C1641	Front wheel Actuator (Hydraulic control) wheel lock	Ensure ABS modulator/ECM connector is secure.

Fault Code	Possible cause	Action
	Binding brake Incorrect Wheel speed sensor air gap Loose or incorrectly installed wheel speed sensor	Proceed to pinpoint test 1:
C1643	Rear wheel Actuator (Hydraulic control) wheel lock Binding brake Incorrect Wheel speed sensor air gap Loose or incorrectly installed wheel speed sensor	

Pinpoint Tests

Test		Result	Action
1	Check the relevant wheel for brake bind caused by caliper or master cylinder faults, or other mechanical causes.	OK	Proceed to test 2
		Faulty	Rectify the fault and proceed to test 4
2	Measure the air gap of the wheel speed sensor between the sensor and the pulser ring: - Air gap between 0.40 mm to 1.20 mm	OK	Proceed to test 3
		Faulty	Rectify the fault and proceed to test 4
3	Check the wheel speed sensors for correct installation, and the fixings for correct torque.	OK	Proceed to test 4
		Faulty	Rectify the fault and proceed to test 4
4	Clear fault code and test ABS to verify fault cleared.	OK	Action complete - quit test
		Fault still present	Contact Triumph service

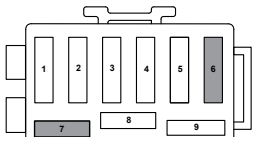
Motor – Lock; Motor Does Not Run; Motor Runs Continually

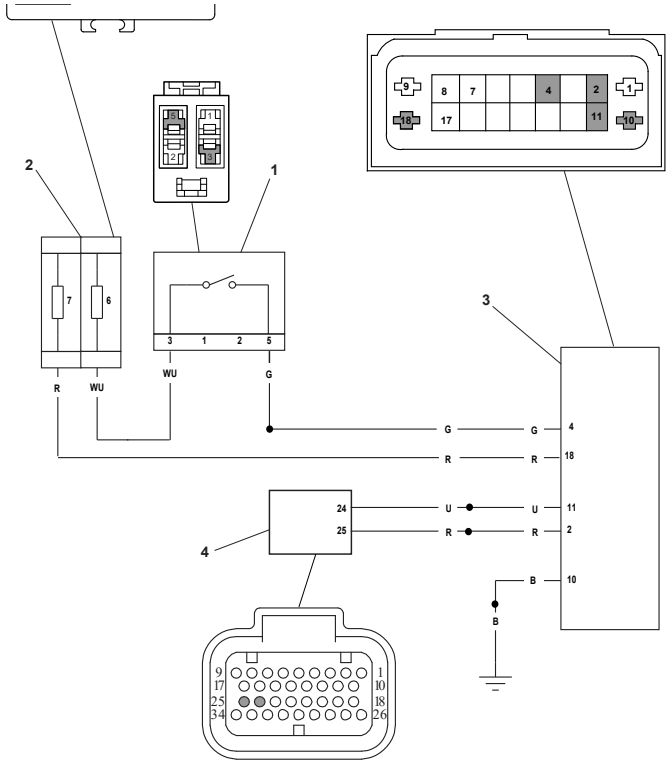
Fault Code	Possible cause	Action
C1651	Motor circuit fault	Ensure ABS ECM connector is secure. Turn the ignition 'ON'. Proceed to pinpoint test 1:
C1652	Motor - does not run	
C1653	Motor - runs continually	

Pinpoint Tests

Test		Result	Action
1	Check the ABS main fuse in the fuse box (fuse 7)	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 18 and ground pin 10	Voltage greater than 11 V	Proceed to test 4
		Voltage less than 11 V	Locate and rectify wiring fault, proceed to test 5
4	Check cable for continuity: - ABS ECM connector pin 10 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





1. **Ignition Master Switch (KL15) Relay**
2. **Fuse Box**
3. **ABS Control Module**
4. **Instruments**

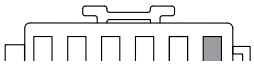
Power Source Voltage Drop/Voltage Rise

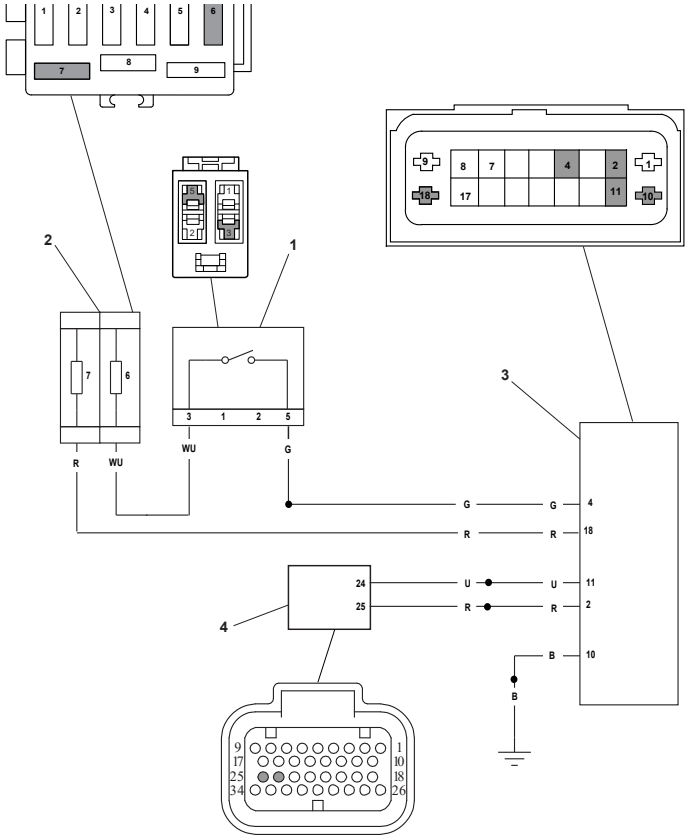
Fault Code	Possible Cause	Action
C1661	Power source voltage too low	Ensure ABS ECM connector is secure Disconnect ABS ECM connector and proceed to pinpoint test 1:
C1662	Power source voltage too high	
C1663	Power source - short term under-voltage detected	
C1664	Power source - long term Under-voltage detected	

Pinpoint Tests

Test		Result	Action
1	Check ABS fuse integrity fuse box (fuse 7)	OK	Proceed to test 2
		Faulty	Replace fuse and proceed to test 6
2	Check cable and terminal integrity: - ABS ECM connector pin 4 - ABS ECM connector pin 10 - ABS ECM connector pin 18 - Ignition Master Switch (KL15) Relay pin 3 - Ignition Master Switch (KL15) Relay pin 5	OK	Proceed to test 3
		Faulty	Rectify fault, proceed to test 6
3	Check the cable for continuity: - ABS ECM connector pin 10 and Ground	OK	Proceed to test 4
		Faulty	Rectify wiring harness fault, proceed to test 6
4	Check battery voltage: With the ignition ON, check the voltage between: - ABS ECM connector pin 4 and Ground pin 10	Voltage greater than 10 V	Proceed to test 5
		Voltage less than 10 V	Locate and rectify fault, proceed to test 6
5	Check battery voltage: Reconnect ABS ECM connector and start the engine. Check the voltage between: - Battery positive (red) terminal and negative (black) terminal	Voltage between 10 V and 16 V	Proceed to test 6
		Voltage greater than 16 V	Check the battery charging circuit. Locate and rectify fault, proceed to test 6
6	Clear fault code and test ABS to verify fault cleared	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram





1. Ignition Master Switch (KL15) Relay

2. Fuse Box

3. ABS Control Module

4. Instruments

Incorrect Tyre Size Detected

Fault Code	Possible cause	Action
C1671	Incorrect tyre size detected Incorrect tyre pressures Incorrect wheel speed sensor air gap Damaged or dirty pulser ring	Ensure ABS modulator/ECM connector is secure. Proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check for installation of wheels	OK	Proceed to test 2

Test		Result	Action
	and tyres of the correct size.		
		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 rings 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 sensors between the sensor and the pulser ring: - Air gap between 0.40 mm to 1.20 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
C1681	ABS ECM internal error Incorrect wheel speed sensor air gap Damaged or dirty pulser ring Loose or incorrectly installed wheel speed sensor	Ensure ABS modulator/ECM connector is secure. Proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Measure the air gap of the	OK	Proceed to test 1

Test		Result	Action
	wheel speed sensors between the sensor and the pulser ring: - Air gap between 0.40 mm to 1.20 mm		
		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

CAN Fault

Fault Code	Possible cause	Action
CAN fault - lost communication with engine ECM	CAN fault - lost communication with engine ECM	Ensure ABS modulator/ECM, Engine ECM, Instruments, and Bluetooth connectors are secure. Proceed to pinpoint test 1:
CAN fault - lost communication with instrument panel	CAN fault - lost communication with instrument panel	
CAN fault - all communication lost	CAN fault - all communication lost	

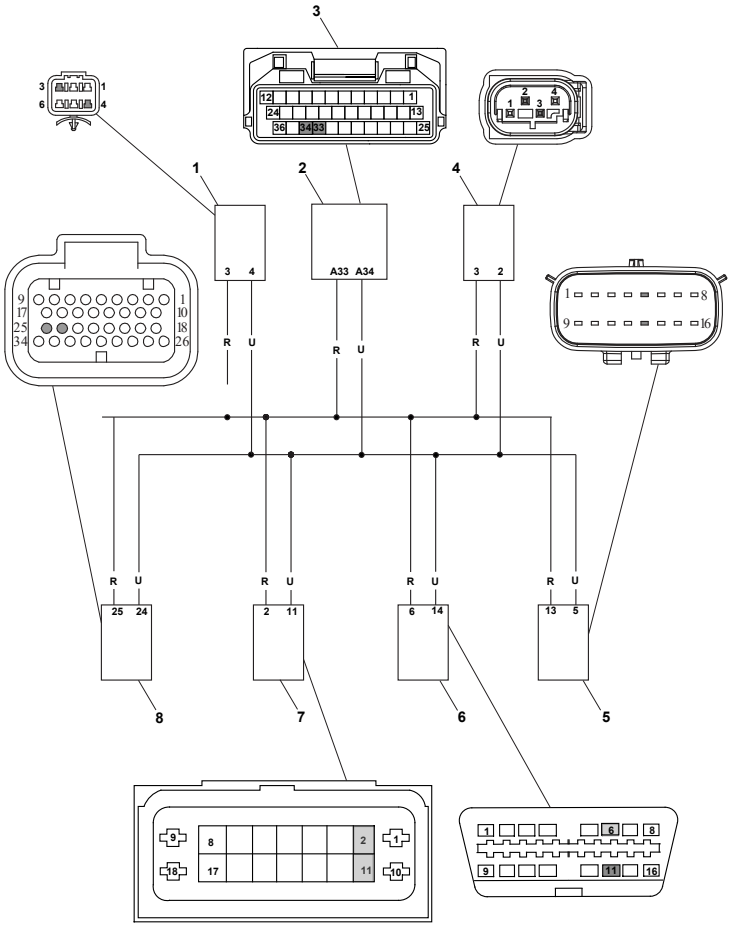
Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity:	OK	Disconnect instruments and proceed to test 2

Test		Result	Action
	- ABS ECM connector pin 2 - ABS ECM connector pin 11		
		Faulty	Rectify fault, proceed to test 5
2	Check the cable for continuity: - ABS ECM pin 2 to ground - ABS ECM pin 11 to ground	OK	Proceed to test 3
		Short circuit	Rectify wiring harness fault, proceed to test 5
3	Check cable continuity: - ABS ECM pin 2 to ECM pin A33 - ABS ECM pin 11 to ECM pin A34 - ABS ECM pin 2 to Instruments pin 25 - ABS ECM pin 11 to Instruments pin 24 - ABS ECM pin 2 to Diagnostic connector pin 6 - ABS ECM pin 11 to Diagnostic connector pin 14 - ABS ECM pin 2 to Keyless ECM module pin 13 - ABS ECM pin 11 to Keyless ECM module pin 5 - ABS ECM pin 2 to Bluetooth module pin 3 - ABS ECM pin 11 to Bluetooth module pin 4 - ABS ECM pin 2 to Inertial Measurement Unit pin 3 - ABS ECM pin 11 to Inertial Measurement Unit pin 2	OK	Proceed to test 4
		Open circuit	Rectify wiring harness fault, proceed to test 5
4	Check cable for short circuit: - ABS ECM pin 2 to ABS ECM pin 11	OK	Proceed to test 5
		Short circuit	Rectify wiring harness fault, proceed to test 5
5	Clear fault code and test ABS to verify fault cleared.	OK	Action complete - quit test
		Fault still	Contact Triumph service

Test	Result	Action
	present	

Circuit Diagram



1. **Bluetooth Module**
2. **Engine Electronic Control Module**
3. **Engine Electronic Control Module - Connector A**
4. **Inertial Measurement Unit**
5. **Keyless ECM**
6. **Diagnostic Connector**
7. **ABS Control Module**
8. **Instruments**

ABS Modulator Malfunction

Fault Code	Possible Cause	Action

Fault Code	Possible Cause	Action
C1690	Modulator - active pressure control malfunction	Contact Triumph service
C1691	Modulator input (master cylinder) pressure sensor malfunction	
C1692	Modulator output (wheel) pressure sensor malfunction	

ABS Variant Coding Error

Fault Code	Possible cause	Action
C1700	ABS variant coding error	Note the ABS build data. Proceed to pinpoint test 1:

Pinpoint Tests

	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
C1711	Inertial Measurement Unit (IMU) ID incompatible	Proceed to pinpoint test 1:

Pinpoint Tests

Test	Result	Action

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

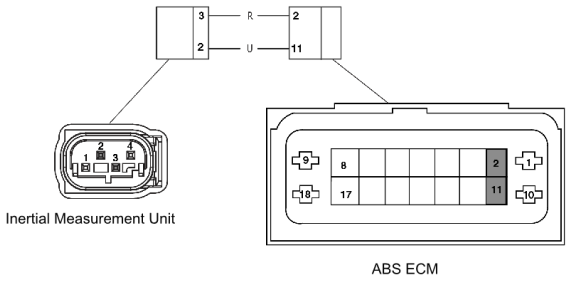
Fault Code	Possible Cause	Action
C1712	CAN fault - lost communication with Inertial Measurement Unit (IMU)	View and note 'freeze-frame' data if available Disconnect ABS ECM and IMU. Proceed to pinpoint test 1:
C1713	Inertial Measurement Unit (IMU) signal error	

Pinpoint Tests

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 2 - ABS ECM pin 11 - IMU pin 3 - IMU pin 2	OK	Proceed to test 3
		Faulty	Rectify fault, proceed to test 6

Test	Result	Action
3 Check cable for short circuit: - ABS ECM pin 2 to ground - ABS ECM pin 11 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 2 to ABS pin 11	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



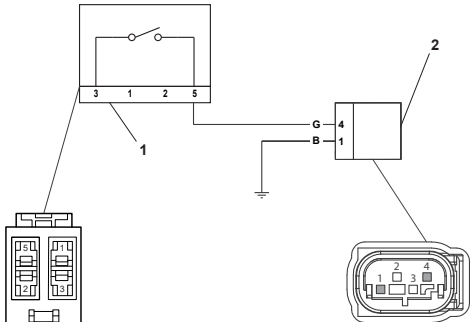
Inertial Measurement Unit (IMU) Voltage Too High or Too Low

Fault Code	Possible Cause	Action
C1714	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 Engine stop switch in RUN position and check cable continuity: - Ignition master switch (KL15) relay pin 5 to IMU pin 4	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	With the ignition ON, check the voltage between the Inertial Measurement Unit pin 4 and ground.	Between 10 V and 16 V	Proceed to Test 5
		Less than 10 V	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



1. **Ignition Master Switch (KL15) Relay**
2. **Inertial Measurement Unit**

Removal and Installation - Front Brakes Components

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.

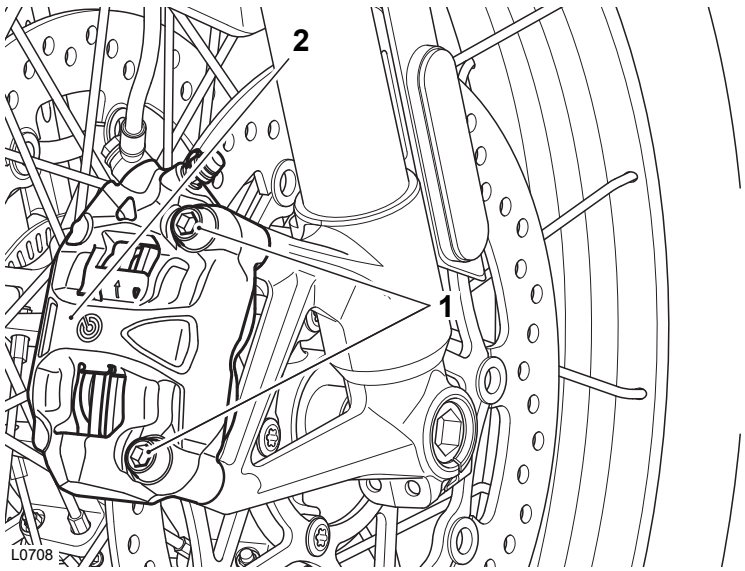
WARNING

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.

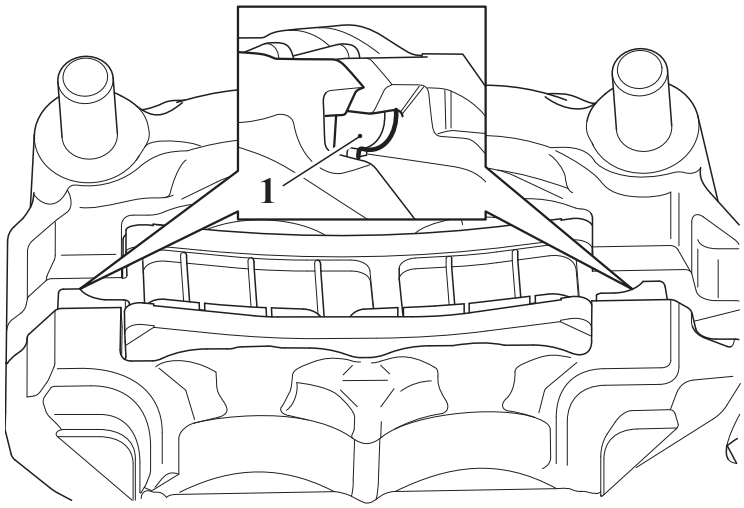
Bent or damaged brake hoses or lines lead to reduced braking efficiency causing loss of motorcycle control and an accident.

1. Remove the caliper mounting bolts and slide the caliper off the disc.



1. **Caliper mounting bolts**
2. **Caliper**

2. Release the brake pad retaining lug from its mounting in the caliper and remove the brake pad.

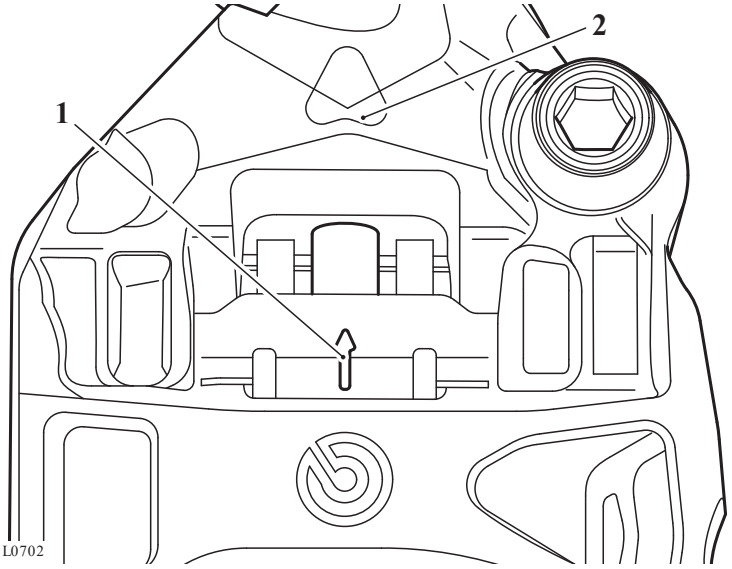


1. **Brake pad retaining lug**

3. Repeat for the other brake pad.

Note

- **Note the position and orientation of the anti-rattle spring for installation.**
- **Note that the arrow on the anti-rattle spring is pointing in the same direction as the arrow on the caliper.**



1. **Arrow, anti-rattle spring**
2. **Arrow, front caliper**

Note

Note

- **Complete the assembly of the brake pads to one caliper (see assembly for details) before removing the pads from the other caliper.**

Front Brake Pads - Inspection

1. Check the brake pads anti-rattle springs and retaining pins. Renew any component which shows signs of damage or corrosion.
2. Check there is no sign of leakage from the piston seals. Rectify any problems before installing the brake pads.
3. Inspect the brake pads for wear (see Linked procedure not present at the moment.).

Front Brake Pads - 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.

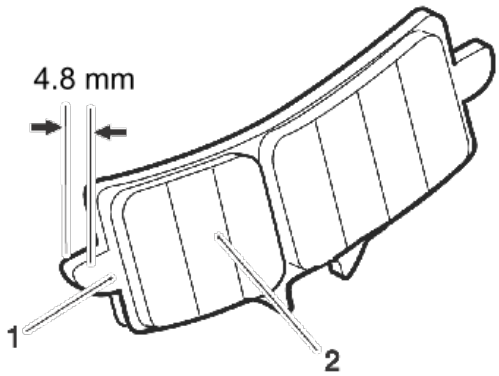
Damage caused by contact with mineral-based grease may reduce braking efficiency resulting in loss of motorcycle control and an accident.

WARNING

If fitting new proprietary brakes pads, check that the carrier plate of the brake pad is at least 4.5 mm thick.

Fitting brake pads with the carrier plate less than 4.5 mm thick may result in brake failure due to the possible loss of the brake pad as it wears.

Brake pads for this model supplied by Triumph will have the carrier plate at least 4.8 mm thick. Always have replacement brake pads supplied and fitted by your Triumph dealer.



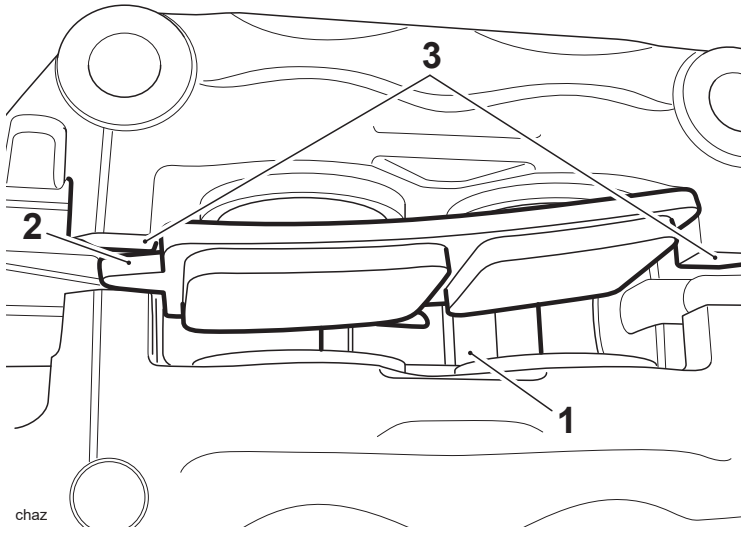
1. **Carrier plate**
2. **Brake pad**

CAUTION

Never lever directly against the disc, caliper or the pad lining material as this will damage these components. Always use a levering tool made from a soft material which will not cause damage to the load bearing surfaces.

Brake fluid will be displaced as the caliper pistons are compressed. To prevent body damage, ensure that the displaced fluid does not come into contact with any part of the bodywork.

1. If new pads are being installed, push the pistons fully back into the caliper body. Keep an eye on the fluid level in the reservoir whilst retracting the pistons to prevent fluid spillage.
2. Ensure that the anti-rattle plate position and orientation is as noted for removal.
3. Fit one of the brake pad's retaining lugs into its mounting in the caliper with its friction material surfaces facing the other side of the caliper.



1. **Anti-rattle spring**
2. **Retaining lug**
3. **Retaining lug mounting**

4. Using finger pressure only, fit the pad's other retaining lug into its mounting of the caliper. Ensure that both retaining lugs are fully fitted into their mountings.
5. Repeat steps 2 to 4 for the other brake pad.
6. Fit the front brake caliper (see Front Brake Caliper - Installation).

WARNING

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.

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 ride the motorcycle again. Failure to take remedial action may result in reduced braking efficiency leading to loss of motorcycle control and an accident.

Front Brake Caliper - Removal

WARNING

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

CAUTION

To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

1. Remove the front brake pads (see Front Brake Pads - Removal).

Note

- **Note the orientation of the brake hose on the caliper for installation.**

2. Disconnect the brake hose at the caliper and place the free end of the hose in a suitable container to collect the brake fluid.

Front 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,

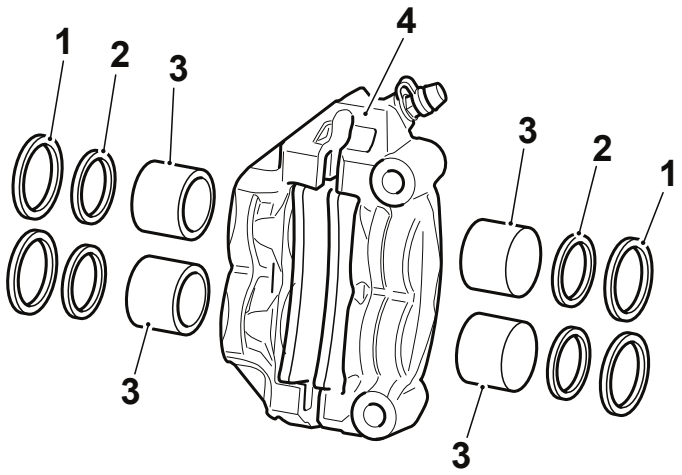
WARNING

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. Use either compressed air, or reconnect the master cylinder and pump the brake lever to remove the pistons one at a time.



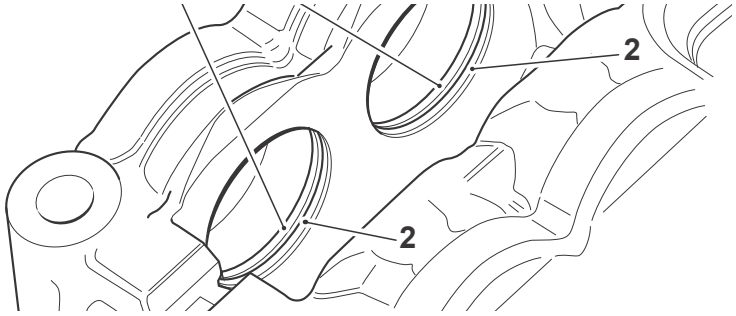
1. **Dust Seal**
2. **Piston Seal**
3. **Piston**
4. **Caliper**

2. Extract the dust seals and piston seals. Take care not to damage the piston bores. Discard the old seals and pistons, these must not be reused.

Note

- **The piston seals are slightly thicker than the dust seals.**





1. **Piston Seals**
2. **Dust Seals**

3. Check caliper and mounting bracket for signs of damage. Pay particular attention to the caliper bores. If damage is present, renew the worn component or the complete caliper assembly.

Front Brake Caliper - Assembly

WARNING

Ensure that the caliper bores do not become scratched during piston removal and assembly. Ensure that the pistons remain square to their bores during fitment otherwise damage to the caliper could result.

A dangerous riding condition leading to an accident could result if this warning is ignored.

WARNING

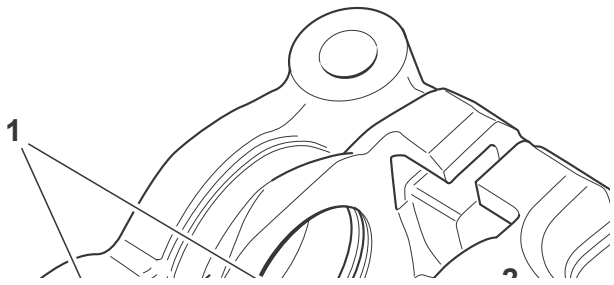
Before installation, all internal brake components should be cleaned and lubricated with clean new DOT 4 brake fluid.

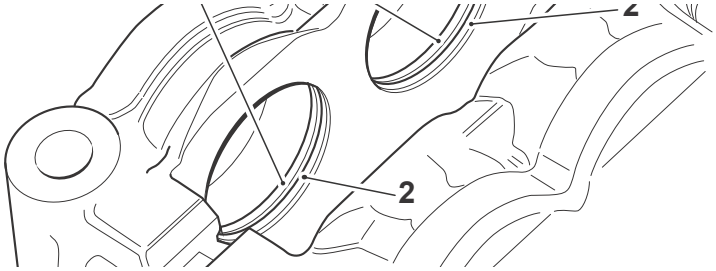
Never use solvents, petrol (gasoline), engine oil, or any other petroleum distillate on internal brake components as this will cause deterioration of the hydraulic seals in the calipers and master cylinders.

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

If the caliper body is serviceable, obtain a piston and seal kit and reassemble the caliper as follows:

1. Fit the piston seals and the dust seals to the caliper bores as shown below.





1. **Piston Seals**
2. **Dust Seals**

2. Lubricate the fluid seals, caliper bore and the outside of the pistons with clean DOT 4 brake fluid.
3. Ease the pistons squarely into the bores, taking care not to displace the seals.

Front Brake Caliper - Installation

WARNING

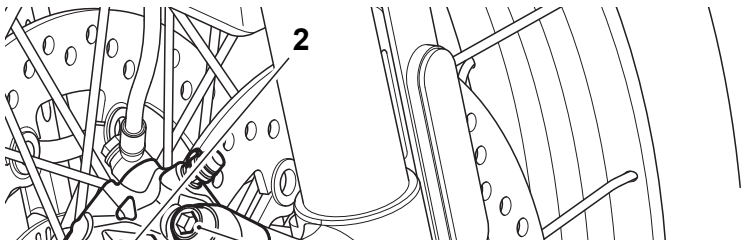
Do not allow the calipers to hang on the brake hoses as this may damage the hoses and could lead to loss of motorcycle control and an accident.

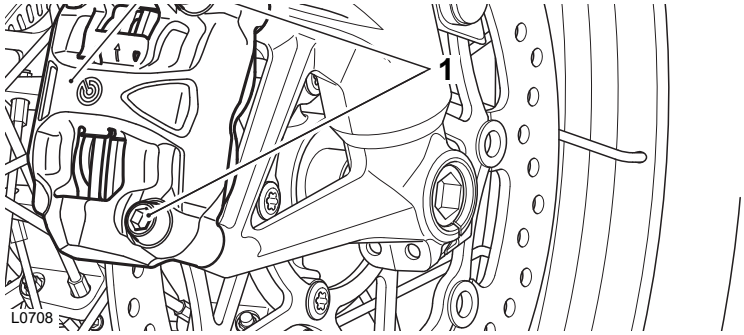
1. Connect the brake hoses to the calipers incorporating new sealing washers on each side of the hose connections.
2. Ensure the orientation of the brake hose is as noted for removal and tighten the union bolt to **25 Nm**.
3. If removed, fit the front brake pads (see Front Brake Pads - Installation).
4. Push the pistons fully back into the caliper body. Observe the fluid level in the reservoir whilst retracting the pistons to prevent fluid spillage.
5. Thoroughly clean the threaded fixing holes for the front fork brake caliper fixings.
6. Thoroughly clean the threaded part of the fixing and smear the first four threads with a proprietary copper based grease.
7. Position the caliper over the disc.

Note

- **DO NOT operate the front brake.**
- **Operating the front brake will allow the front brake pads to come into contact with the brake disc.**

8. Secure the brake caliper with the fixings, until the mating face of the caliper touches its mounting point but is able to slide from side to side, do not fully tighten at this stage.





1. **Caliper mounting fixings**
2. **Caliper**

9. Position both front brake calipers to give maximum clearance between both sides of the brake disc and the brake caliper.
10. Hold the caliper in position and initially tighten the fixings to **10 Nm** and then fully tighten to **55 Nm**.
11. Repeat the installation process for the other caliper.

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 ride the motorcycle again. Failure to take remedial action may result in reduced braking efficiency leading to loss of motorcycle control and an accident.

12. Fill the master cylinder with new, DOT 4 brake fluid from a sealed container.
13. Bleed the front brake line (see Bleeding the Front Brakes, Renewing Brake Fluid).
14. Check for correct brake operation.

Front Brake Master Cylinder - Removal

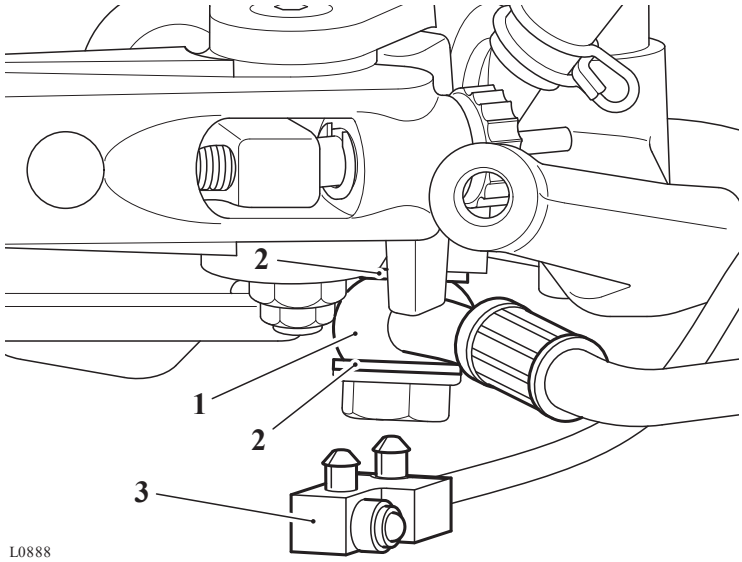
WARNING

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.

CAUTION

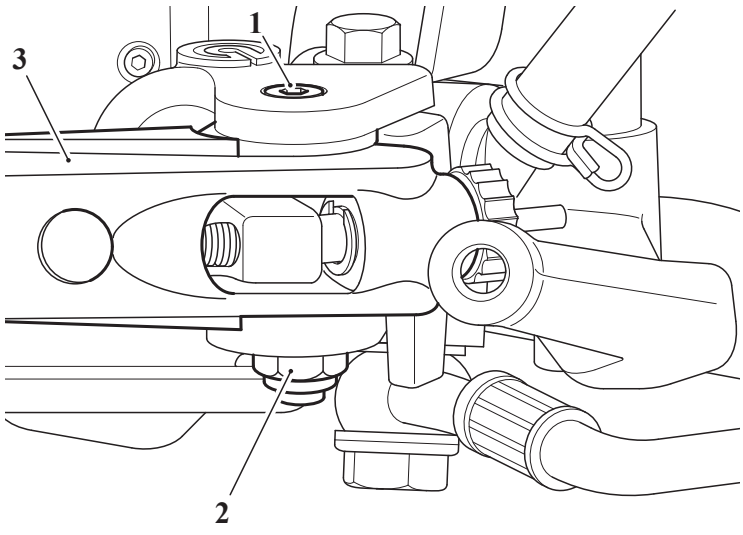
To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

1. Attach a tube to the front brake caliper bleed nipple. Loosen the nipple and operate the brake lever until all fluid has been expelled into a suitable container.
2. Disconnect the brake hose from the master cylinder and discard the two sealing washers.
3. Detach the brake light switch from the master cylinder.



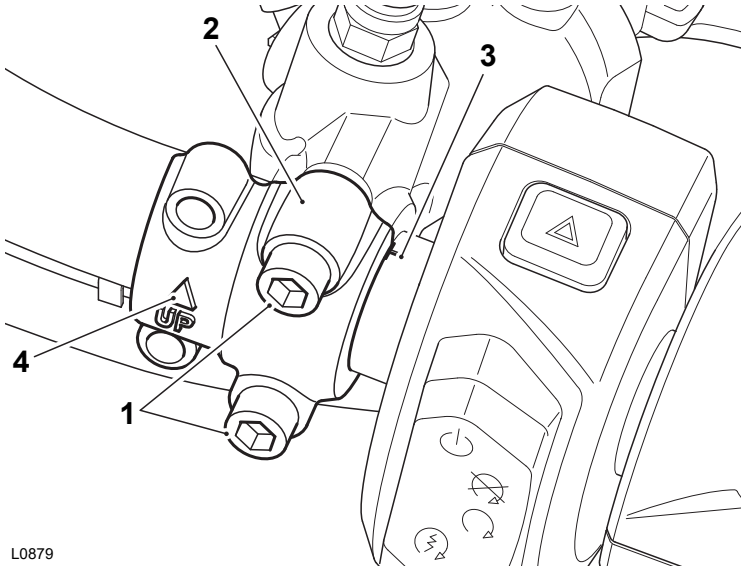
1. **Brake hose connection**
2. **Sealing washers**
3. **Brake light switch**

4. Remove the pivot bolt and lock nut securing the brake lever to the master cylinder. Remove the brake lever.



1. **Pivot bolt**
2. **Lock nut**
3. **Brake lever**

5. Release the clamp fixings from the handlebar to remove the master cylinder.



1. **Fixings**
2. **Clamp**
3. **Alignment mark**
4. **"UP" Arrow**

Front Brake Master Cylinder - Disassembly

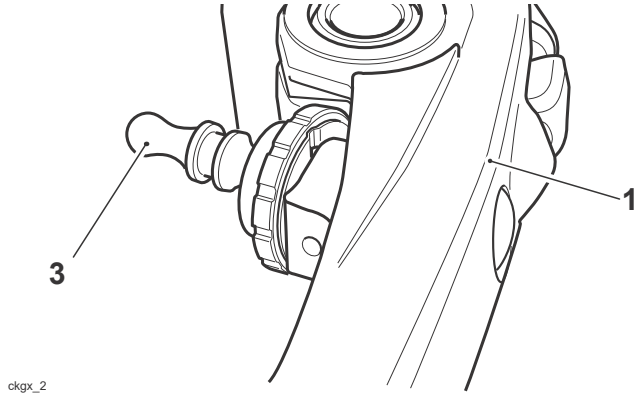
The following items can be replaced on the front brake master cylinder:

- Brake lever;
- Bleed screw;
- Brake light switch.

Brake Lever

1. Note the setting of the brake lever adjuster(s) to ensure they are returned to the same position when the overhaul operation is complete.
2. Remove the lock nut from the brake lever pivot bolt.
3. Remove the brake lever pivot bolt.
4. Release the brake lever from the master cylinder assembly.

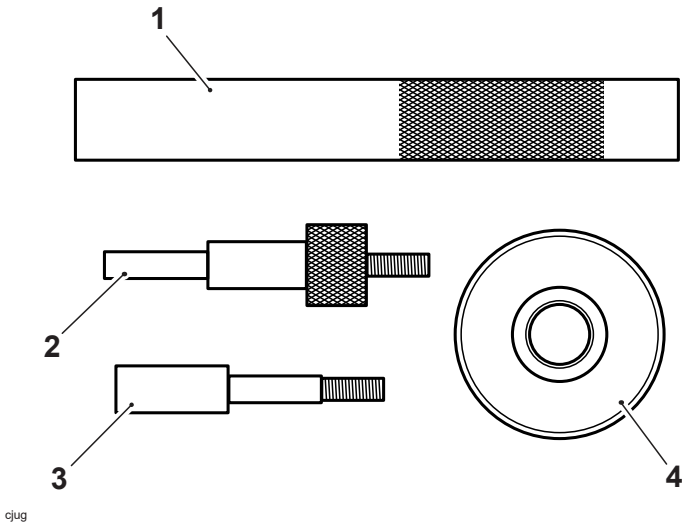




1. **Brake lever**
2. **Pivot assembly**
3. **Push rod**

Note

- **The T3880636 - Kit, Brake Lever Pivot Sleeve is required to remove the front brake lever pivot sleeve.**



T3880636 - Kit, Brake Lever Pivot Sleeve

1. **Mandrel**
2. **Extractor**
3. **Installer piece**
4. **Support piece**

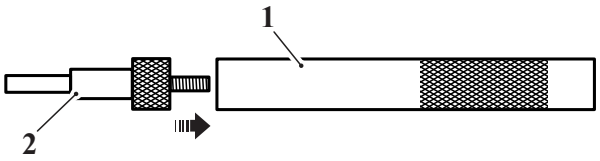
WARNING

When removing the brake lever pivot sleeve, always wear overalls, eye, face and hand protection. The brake lever sleeve is hardened and liable to splinter if broken. Debris from

WARNING

broken components could cause injury to eyes, face and any unprotected parts of the body.

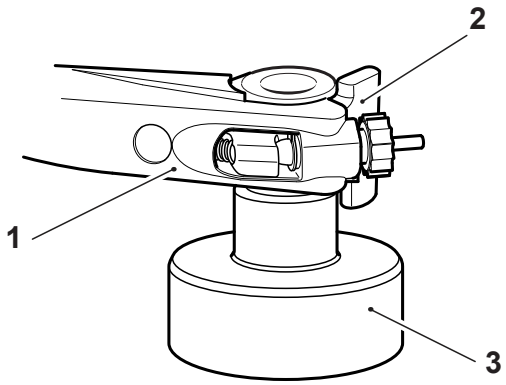
5. Fit the extractor to the mandrel as shown.



cjug

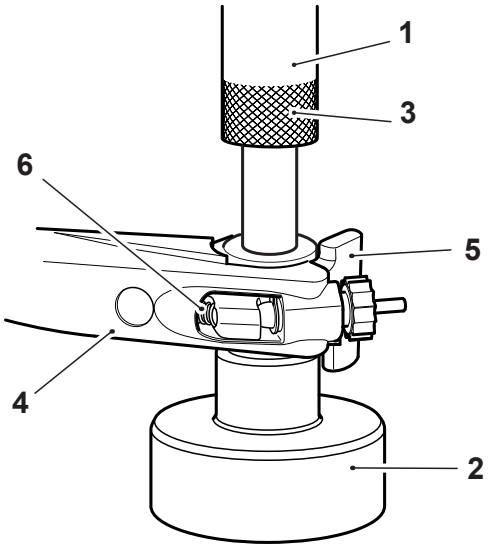
1. **Mandrel**
2. **Extractor**

6. Position the brake lever assembly with the pivot facing towards the support piece as shown.



1. **Brake lever**
2. **Pivot assembly**
3. **Support piece**

7. Position the mandrel and extractor to the brake lever and press out the pivot sleeve from the brake lever assembly.



cjue_1

1. **Mandrel**
2. **Support piece**
3. **Extractor**
4. **Front brake lever**
5. **Pivot assembly**
6. **Return spring**

8. Retain the brake lever pivot sleeve for reuse during assembly.

WARNING

Always wear eye, hand and face protection when separating brake lever components. Uncontrolled release of the brake lever components may cause the spring to become detached during dismantling. Flying springs may cause injury to eyes, face and any unprotected parts of the body.

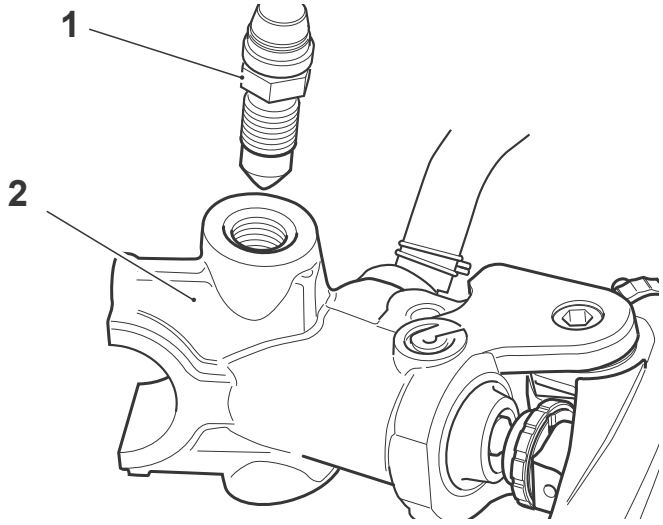
Note

- **Note the orientation of the return spring, push rod and brake lever pivot for installation.**

9. Carefully remove the extractor from the brake lever assembly.
10. Collect the brake lever pivot sleeve from the support piece.
11. Carefully detach the lever from the pivot assembly.

Bleed Screw

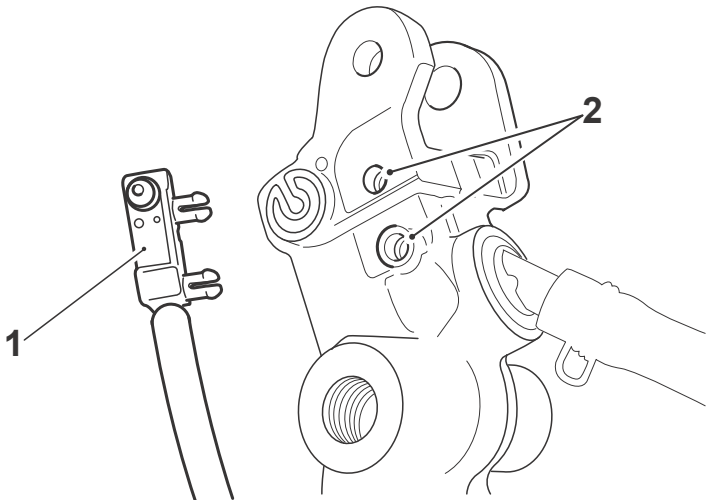
1. Remove the cover from the bleed screw. Release the bleed screw and remove from the master cylinder assembly.



1. **Bleed screw**
2. **Front brake master cylinder**

Brake Switch

1. Pulling carefully on the brake switch housing, remove the brake switch from the master cylinder assembly.

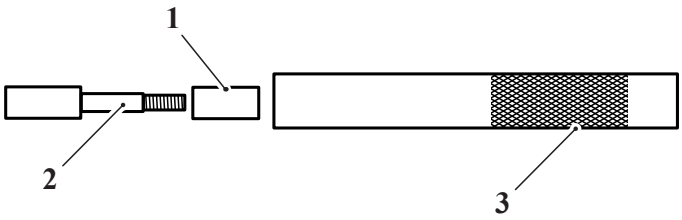


1. **Brake switch**
2. **Location holes**

Front Brake Master Cylinder - Assembly

Pivot Sleeve Installation

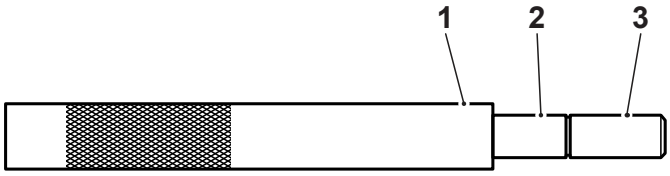
1. Locate the pivot sleeve over the shank of the installer piece.



cjug

1. **Pivot sleeve**
2. **Installer piece**
3. **Mandrel**

2. Screw the installer piece into the mandrel.



cjud

1. **Mandrel**
2. **Pivot sleeve**
3. **Installer piece**

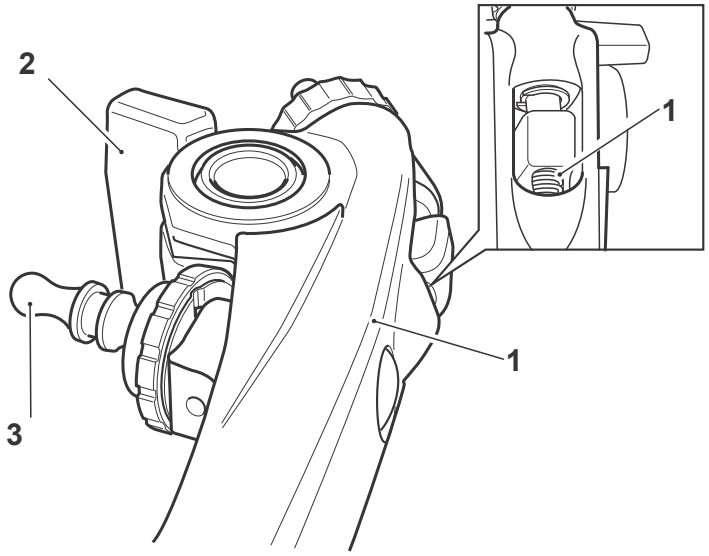
WARNING

Do not attempt to adjust the push rod. The push rod is pre-set at the factory and is not adjustable. If for any reason the threaded part of the push rod is adjusted the brake master cylinder assembly must be replaced. Adjusting the push rod affects the braking

WARNING

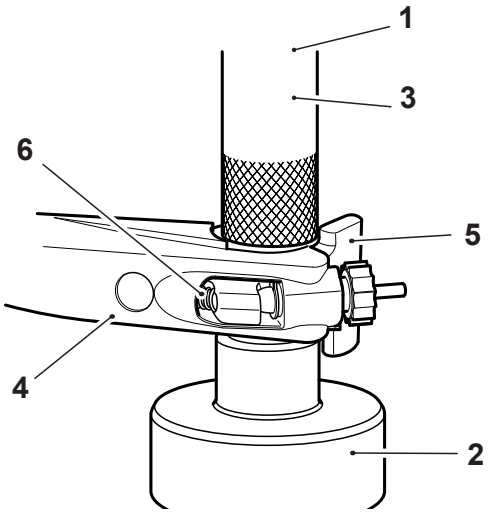
characteristics of the front brakes when applied leading to loss of motorcycle control and an accident.

3. Align the brake lever to the brake lever pivot assembly ensuring the return spring and push rod are located as noted during removal.



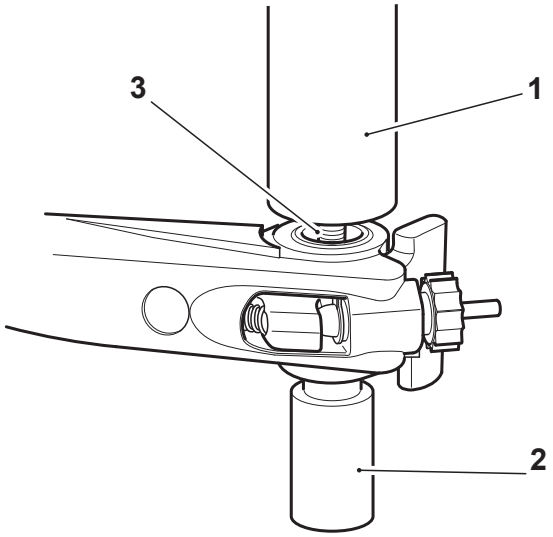
1. **Brake lever**
2. **Pivot assembly**
3. **Push rod**
4. **Spring**

4. Using the service tool align the installer piece to the brake lever and gently push down on the mandrel locating the installer piece, through the lever and pivot.
5. Place the lower surface of the brake lever onto the support piece, and then using a press push the pivot sleeve through the brake lever pivot until the mandrel touches the upper brake lever surface.



1. **Mandrel**
2. **Support piece**
3. **Installer piece**
4. **Front brake lever**
5. **Pivot assembly**
6. **Return spring**

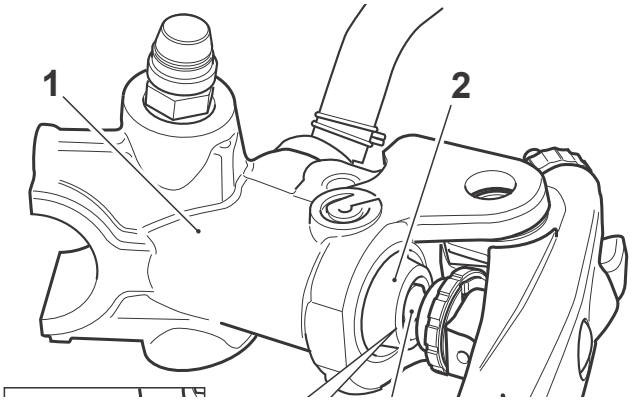
6. Support the brake lever, hold the mandrel and turn the installer piece anticlockwise to release it from the mandrel.

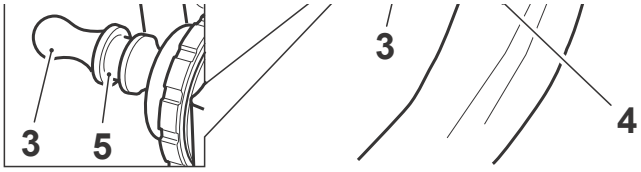


cjuf_1

1. **Mandrel**
2. **Installer piece**
3. **Thread**

7. Visually check the pivot sleeve, return spring, brake lever pivot and push rod are installed as noted during removal.
8. Locate the pin of the brake lever assembly into the hole in the master cylinder dust seal, ensuring the dust seal correctly locates into its location groove in the push rod.



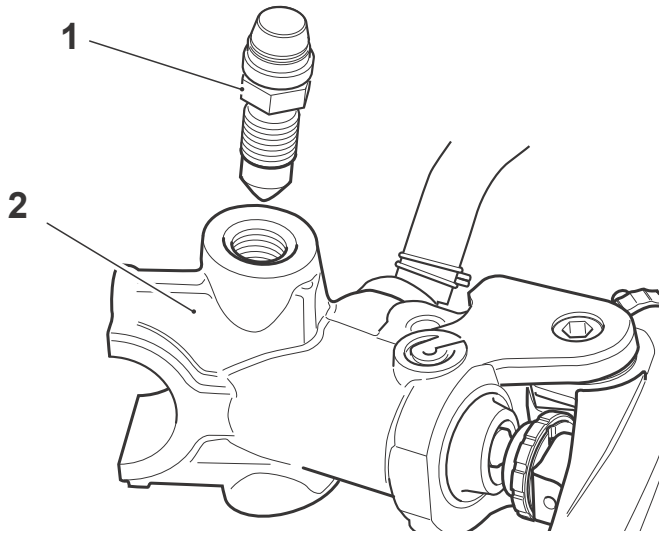


1. **Front brake master cylinder**
2. **Dust seal**
3. **Push rod**
4. **Brake lever**
5. **Location groove**

9. Line up the holes of the brake lever and master cylinder, and insert the pivot bolt. Tighten the pivot bolt to **1 Nm**.
10. Fit the pivot bolt lock nut and tighten to **6 Nm**.
11. Check lever operation and ensure the rubber seal is still correctly seated.

Bleed Screw

1. Fit the bleed screw to the master cylinder and tighten to **14 Nm**

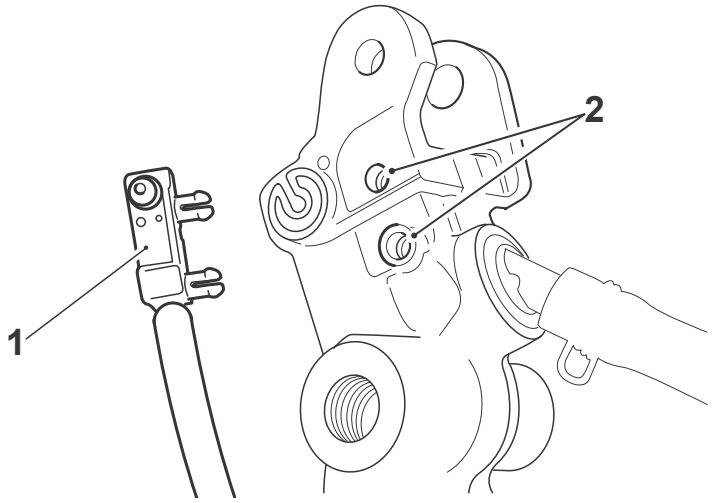


1. **Bleed screw**
2. **Front brake master cylinder**

2. Fit the rubber cover to the bleed screw.

Brake Switch

1. Position the brake switch to the master cylinder. Locate the brake switch in the location holes and push firmly home.



1. **Brake switch**
2. **Location holes**

Front Brake Master Cylinder - Installation

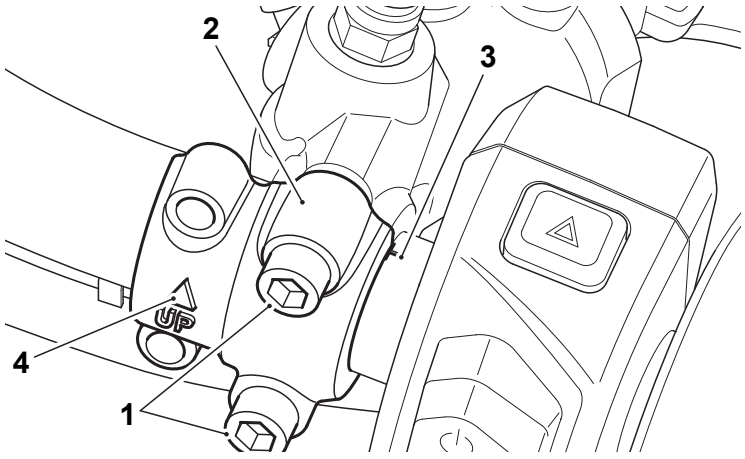
WARNING

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.

CAUTION

To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

1. Locate the master cylinder to the handlebars and position the clamp with the UP arrow pointing upwards. Do not tighten the clamp bolts at this stage.
2. Align the split line of the master cylinder clamp to the alignment mark on the upper surface of the handlebar and tighten the clamp fixings to **8 Nm**.





1. **Fixings**
2. **Alignment mark**
3. **UP arrow**

3. Align the attachment pegs on the brake light switch with the holes in the master cylinder and press the switch into position.
4. Position the brake lever ensuring that the pivot boss is correctly aligned to the master cylinder push rod.
5. Fit and tighten the pivot bolt to **1 Nm**, and the lock nut to **6 Nm**.
6. Connect the brake hose to the master cylinder incorporating new sealing washers to each side of the union. Tighten the union bolt to **25 Nm**.

WARNING

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

Observe the brake fluid handling warnings given earlier in this section of the manual.

CAUTION

To prevent body damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

7. Fill and bleed the front brakes (see Bleeding the Front Brakes, Renewing Brake Fluid).
8. Examine the system for correct operation and fluid leaks. Rectify as necessary.
9. Check the operation of the front brake. Rectify as necessary.

WARNING

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

Perform the following operation:

- Handguards - Installation

Front Brake Disc - 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

To avoid wheel damage, always support the wheel as instructed below. A dangerous riding condition leading to loss of motorcycle control and an accident could result if this warning is ignored.

CAUTION

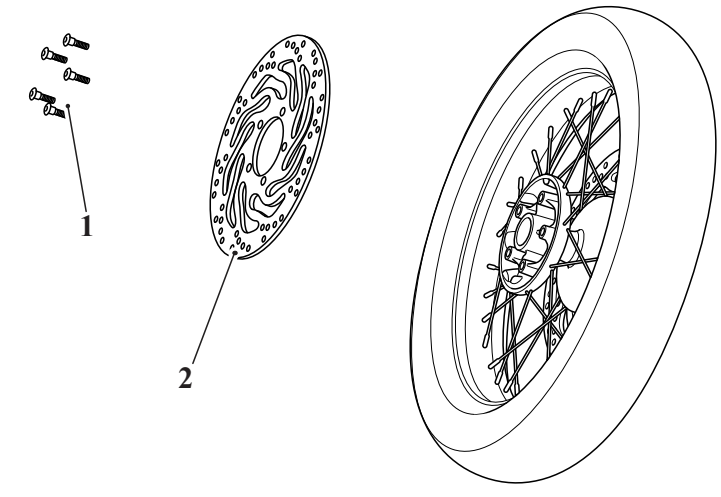
The fixings securing the left hand brake disc to the wheel also secures the ABS pulser ring.

Note the orientation of the brake discs and the ABS pulser ring for the installation procedure.

Perform the following operations:

- Front Wheel - Removal

1. Support the wheel on blocks to avoid damage to the wheel centre and brake disc.
2. Remove and discard the brake disc fixings and remove the brake disc and the ABS pulser ring, if fitted.



1. **Fixings**
2. **Brake disc (right hand side shown)**

3. Repeat the steps for the other side.

Front Brake Disc - Wear

WARNING

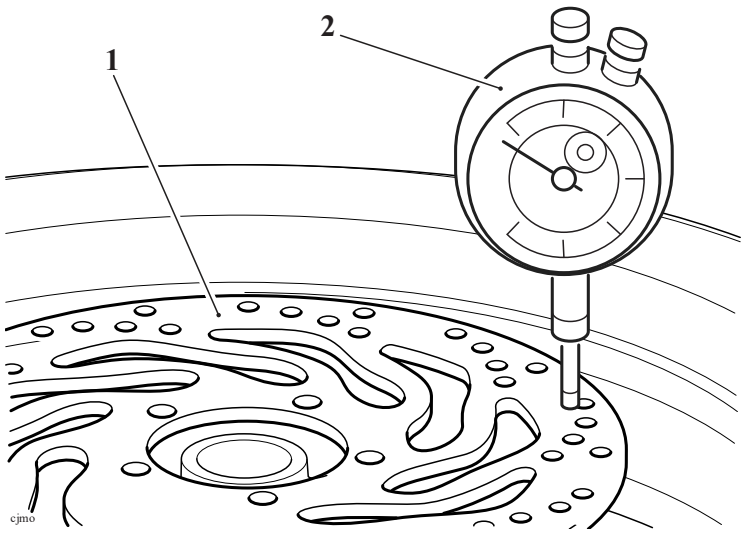
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

Front Brake Disc Wear

Front Brake Disc Thickness	
Standard	4.5 mm
Service limit	4.0 mm

Brake Disc Run-out	
Service limit	0.25 mm

1. Measure disc run out using an accurate dial gauge mounted on a surface plate.



1. **Disc**
2. **Dial gauge**

2. Replace any brake disc worn beyond the service limit or exceeding the disc run-out limit.

Front Brake Disc - Installation

WARNING

Before starting work, ensure the motorcycle is stabilised and adequately supported. This

WARNING

will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

Note

- **The ABS pulser ring is to be fitted to the left hand brake disc.**

1. Locate the brake discs and ABS pulser ring (left hand side) to the wheel as noted during removal.
2. Fit new disc fixings and tighten to **22 Nm**.
3. Refit the wheel (see Front Wheel - Installation).
4. Check and, if necessary, adjust the air gap between the wheel speed sensor and the ABS pulser ring (see Air Gap Measurement).
5. Check the operation of the front brake. Rectify as necessary.

WARNING

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

Front Brake Master Cylinder Hose Inlet - Removal

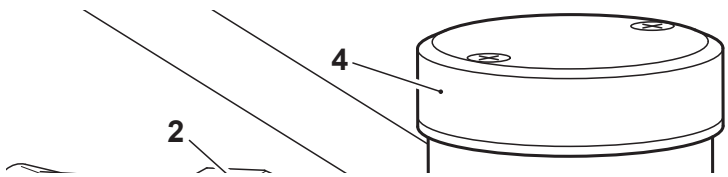
WARNING

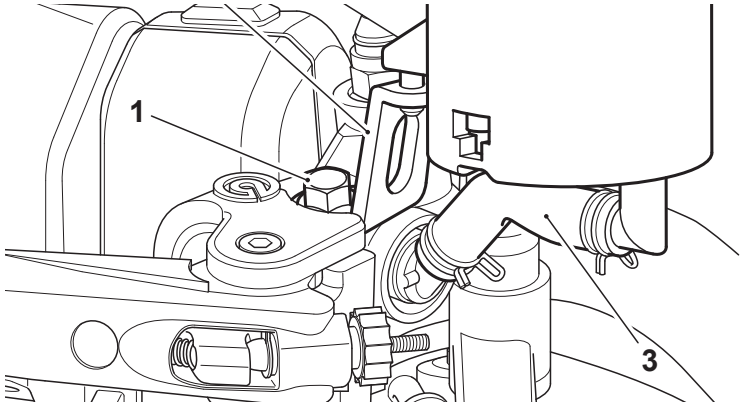
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

CAUTION

To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

1. Drain the fluid from the master cylinder by bleeding the system at the rear brake caliper until all fluid has been expelled.
2. Release the fixing and detach the brake fluid reservoir bracket from the master cylinder.
3. Disconnect the brake fluid reservoir hose from the master cylinder and remove the brake fluid reservoir.





1. **Fixing**
2. **Bracket**
3. **Brake fluid reservoir hose**
4. **Brake fluid reservoir**

WARNING

Do not operate the front brake lever.

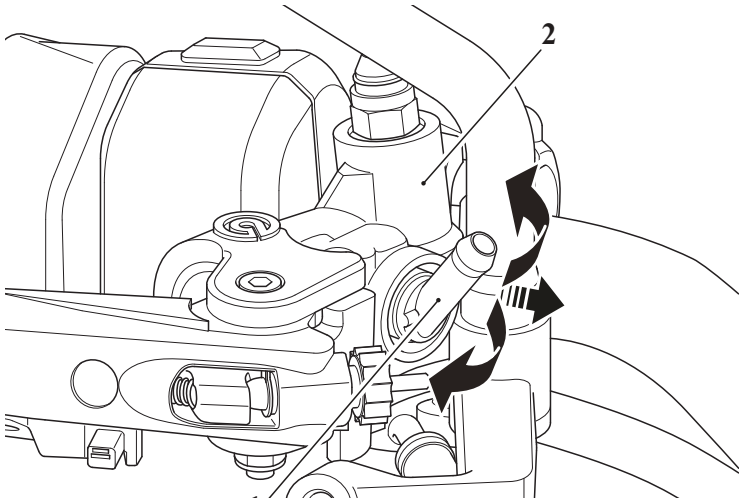
Operating the front brake lever with the fluid reservoir disconnected will allow air to enter the brake system.

A brake system containing air reduces braking efficiency and may cause loss of motorcycle control and an accident.

Note

- **Note the orientation of the hose inlet prior to removing it from the master cylinder.**
- **In some instances the grommet may remain located in the aperture of the master cylinder.**

4. With the aid of an assistant to support the handlebars, loosen the hose inlet by moving from side to side whilst pulling and remove the hose inlet assembly from the master cylinder.
5. Discard the hose inlet.



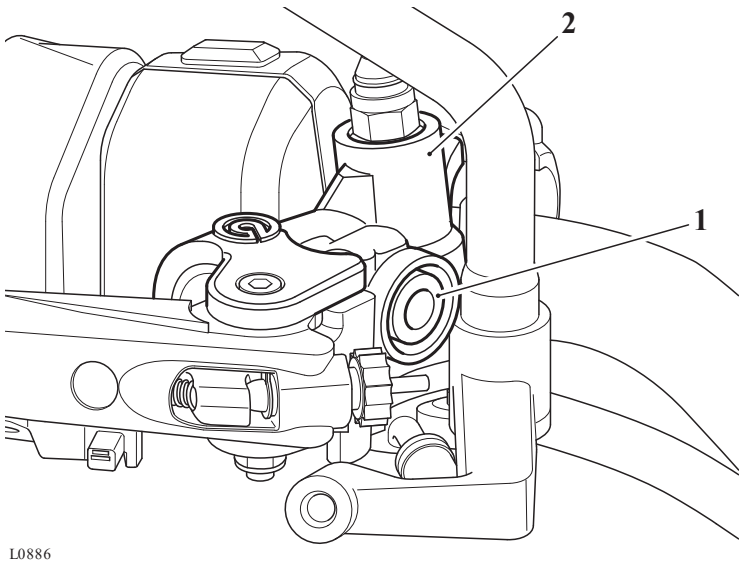


1. **Hose inlet**
2. **Master cylinder**

CAUTION

Never lever directly against the brake master cylinder as this will damage these components. Always use a levering tool made from a soft material which will not cause damage to the machined surfaces.

6. Remove the grommet from the master cylinder.



1. **Grommet**
2. **Master cylinder**

Front Brake Master Cylinder Hose Inlet - 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.

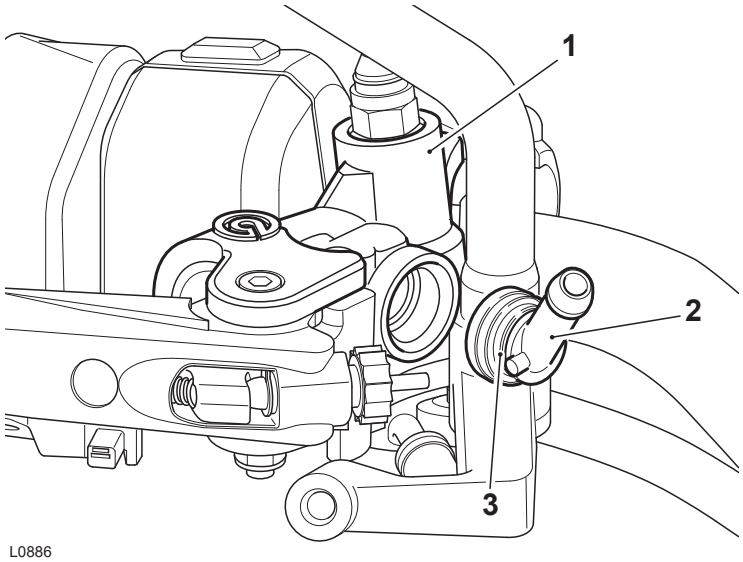
CAUTION

To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

Note

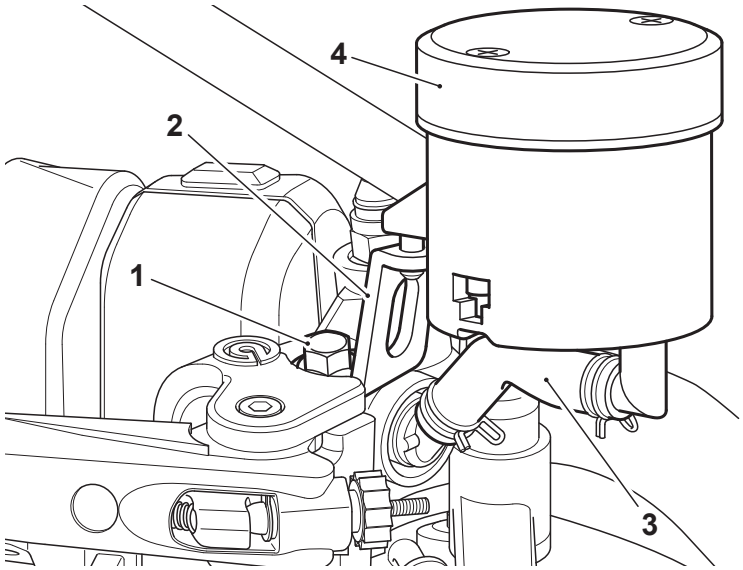
- **Prior to fitting the hose inlet assembly ensure the grommet is positioned with the smaller diameter closer to the hose inlet.**

1. Install the hose inlet assembly into the master cylinder until the grommet is fully seated.



1. **Master cylinder**
2. **Hose inlet**
3. **Grommet (smaller diameter)**

2. Rotate the hose inlet to the position noted during removal.
3. Refit the brake fluid reservoir hose to the master cylinder and attach the brake fluid reservoir.
4. Attach the brake fluid reservoir bracket to the master cylinder and tighten the fixing to **7 Nm**.



1. **Fixing**

2. **Bracket**
3. **Brake fluid reservoir hose**
4. **Brake fluid reservoir**

5. Fill and bleed the front brakes (see Bleeding the Front Brakes, Renewing Brake Fluid).
6. Refit the reservoir diaphragm and cover. Secure the cap with its fixings and tighten to **0.7 Nm**.
7. Check the operation of the front brake. Rectify as necessary.

WARNING

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

Removal and Installation - Rear Brakes Components

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.

Note

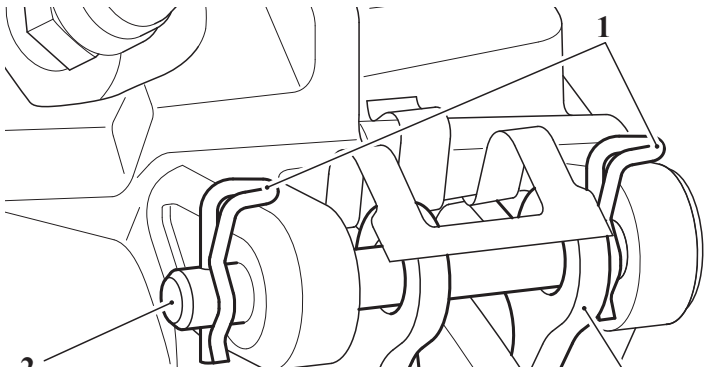
- **Before removing the brake pads, note the relationship of the pads to the caliper and ensure that, on assembly, they are fitted in the same way.**

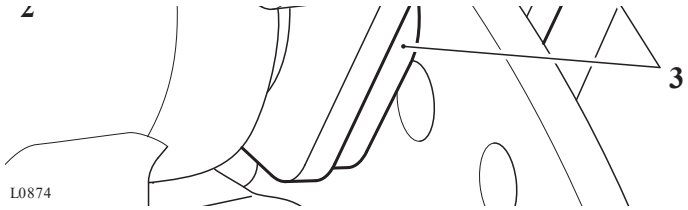
1. Push the brake caliper inwards towards the wheel in order to displace the caliper pistons.

Note

- **Note the orientation of the R-clips for installation.**

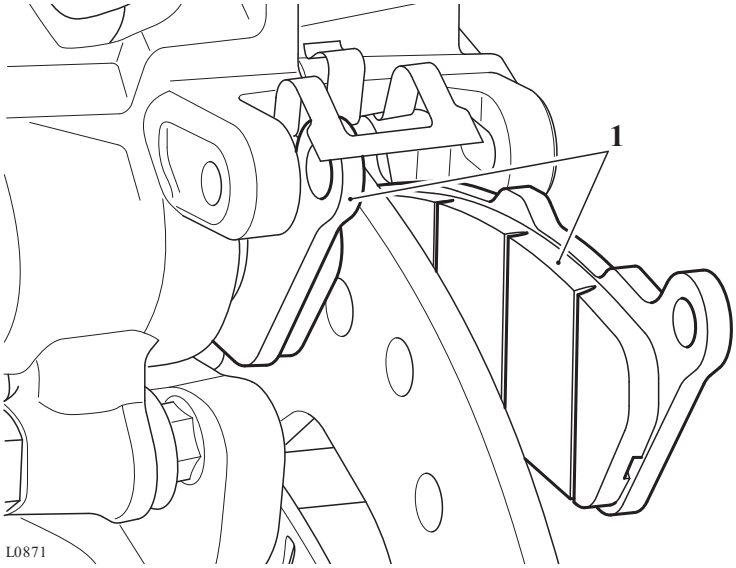
2. Remove the two R-clips from the pad retaining pin.
3. Using a suitable pin punch, tap the pad retaining pin out.





1. **R-clips**
2. **Pad retaining pin**
3. **Brake pads**

4. Remove the brake pads.

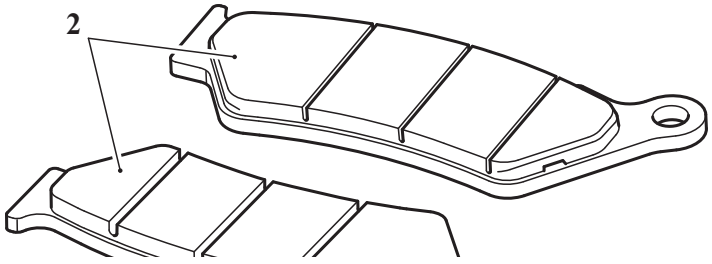


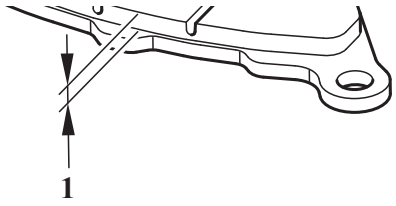
1. **Brake pad**

5. Remove the anti-rattle springs.
6. For inspection, remove the caliper (see Rear Brake Caliper - Removal).

Rear Brake Pads - Inspection

1. Check the friction material of each brake pad for signs of contamination and measure its thickness. If the friction material of either pad is contaminated or has worn beyond the service limit, renew both pads as a set.





1. **Friction material thickness (service limit 1.5 mm)**
2. **Brake pads**

2. Check the anti-rattle springs, retaining pin and R-clips. Renew any component which shows signs of damage or corrosion.
3. Check that the caliper body slides easily on the mounting bracket pins and check there is no sign of leakage from the piston seals. Rectify all problems before you install the brake pads.

Rear Brake Pads - Installation

WARNING

Always have replacement brake pads supplied and fitted by your Triumph dealer.

The ABS calibration is optimised for use with the friction material provided on brake pads supplied by Triumph.

The use of proprietary brands of brake pads is not recommended as differing friction material specifications will affect the performance of the ABS, potentially causing loss of motorcycle control and an accident.

WARNING

Brake pads for this model supplied by Triumph are specifically designed for use with the brake calipers fitted to your motorcycle.

The use of proprietary brands of brake pads is not recommended as these may have a reduced carrier plate thickness when compared with the Triumph genuine parts.

Brake pads with an incorrect carrier plate thickness can potentially become dislodged from the caliper body as they wear, leading to brake failure, loss of motorcycle control and an accident.

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

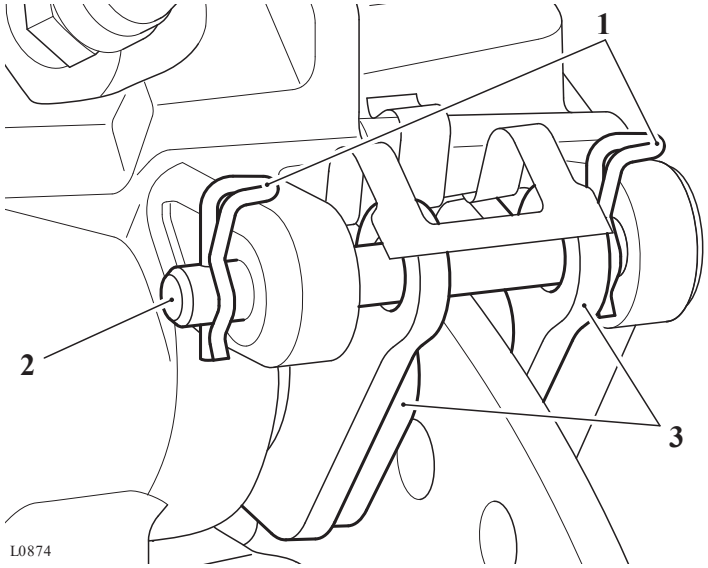
To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

1. If removed, fit the anti-rattle springs.
2. If fitting new pads, use hand pressure to compress the caliper piston fully into its bore. Monitor the fluid level in the reservoir whilst retracting the pistons to prevent fluid spillage.
3. 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 pad retaining pins. Excess grease may contaminate the brake pads, hydraulic seals and discs causing reduced braking efficiency and an accident.

4. Lubricate the pad retaining pin using a minimum amount of proprietary high temperature brake grease.
5. Install the brake pad retaining pin.
6. Install the R-clips to the brake pad retaining pin, as noted for removal.



1. **R-clips**
2. **Pad retaining pin**
3. **Brake pads**

7. Pump the brake pedal to correctly position the caliper pistons.
8. Check the brake fluid level in the rear reservoir and top-up as required with new DOT 4 fluid.

WARNING

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.

9. Refit the caliper if removed (see Rear Brake Caliper - Installation).
10. 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 Brake Caliper - Removal

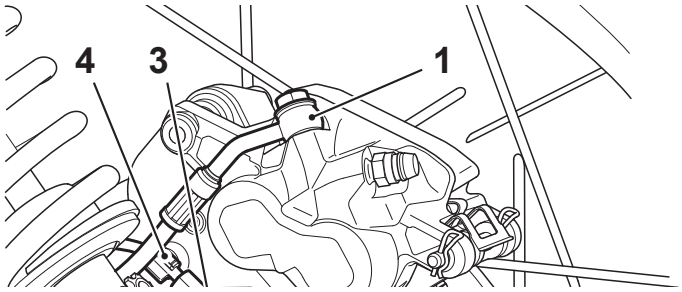
WARNING

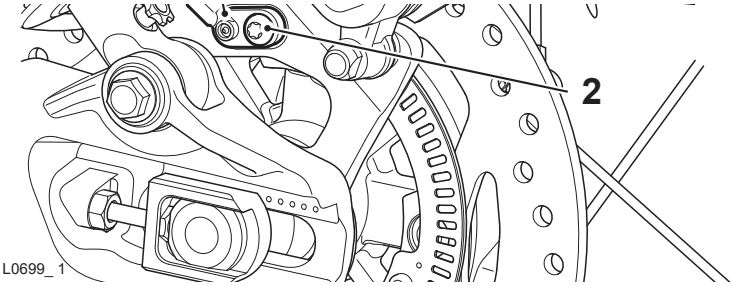
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

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 Rear Brake Pads - Removal).
2. 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.
3. Release the fixing and remove the rear ABS wheel speed sensor. Collect the shim from between the sensor and brake anchor plate and discard the fixing.
4. Release the electrical cable for the ABS wheel speed sensor from the cable clip on the brake anchor plate.





1. **Hose connection**
2. **Rear ABS wheel speed sensor fixing**
3. **Rear ABS wheel speed sensor**
4. **Cable clip**

Note

- **Note the position of the rear brake caliper for installation.**

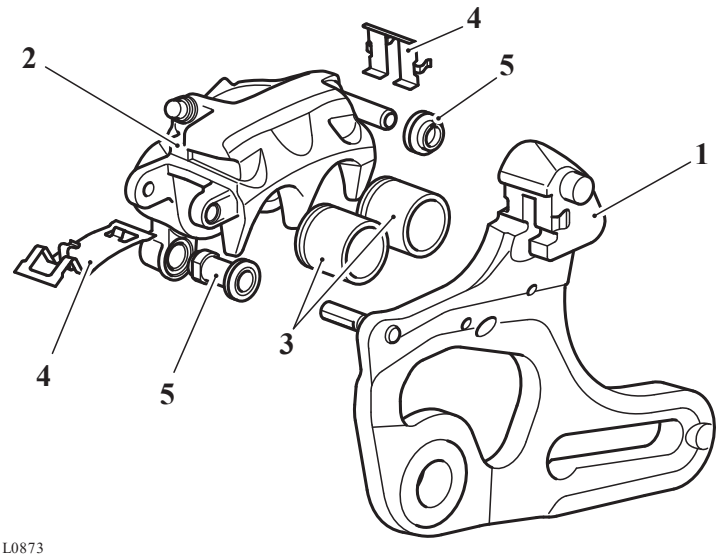
5. Remove the rear wheel (see Rear Wheel - Removal).
6. Remove the brake caliper and brake anchor plate.

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 direct contact with compressed air.

1. Separate the brake caliper and the mounting bracket.



1. **Mounting bracket**

2. Caliper

3. Piston and seal

4. Anti-rattle spring

5. Sliding pin gaiter

2. Cover the caliper opening with a clean, heavy cloth and, using either compressed air or by reconnecting the master cylinder and pumping the rear brake pedal, eject both pistons from the caliper at the same time.

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.

3. Extract the piston seals, taking care not to damage the caliper bores.

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 pistons, caliper, mounting bracket and mounting bracket sliding pin gaiters 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.

Rear Brake Caliper - Assembly

1. If all components are serviceable, obtain a piston seal kit and reassemble the caliper as follows:

WARNING

Always renew caliper seals after removal of the pistons. An effective hydraulic seal can only be made if new seals are fitted.

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.

WARNING

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.

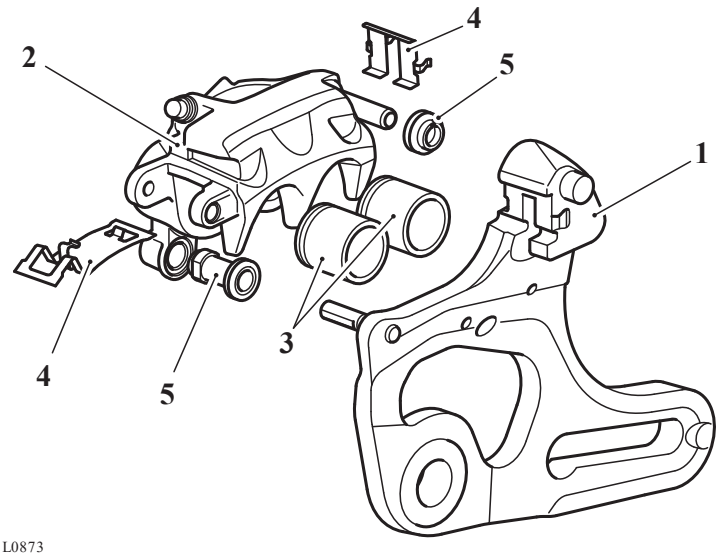
A dangerous riding condition leading to loss of motorcycle control and an accident could result if this warning is ignored

2. Ensure all components are clean, then fit the new seals to their grooves in the caliper bores.
3. Lubricate the fluid seals, caliper bore and the outside of the pistons with clean DOT 4 brake fluid.
4. Ease the pistons squarely back into the bores, taking care not to displace the seals.

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 an accident.

5. Lubricate the mounting bracket pins with silicone based grease (such as T2022021 supplied by Triumph) then reassemble the mounting bracket and caliper. Ensure the pin gaiters are correctly located on both the bracket and caliper.
6. Install the anti-rattle springs.



L0873

1. Mounting bracket

2. Caliper

3. Piston and seal

4. Anti-rattle spring

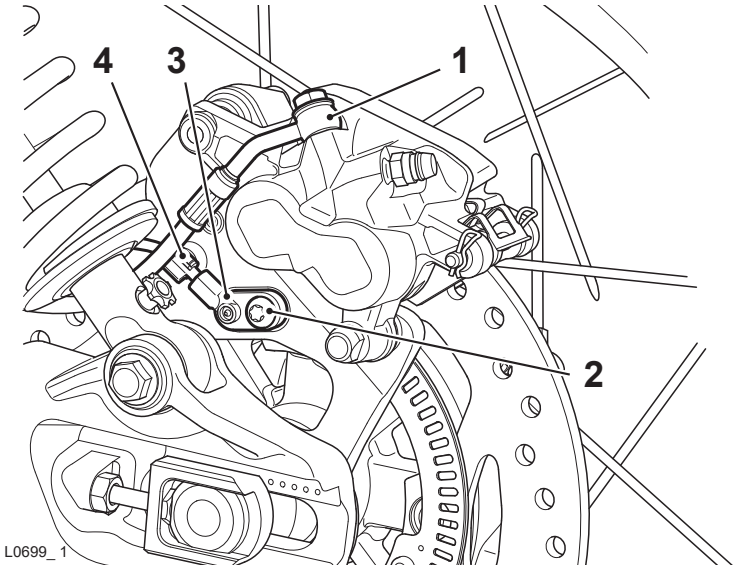
5. Sliding pin gaiter

Rear Brake Caliper - 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 the caliper has been overhauled, install the brake pads.
2. Position the rear brake anchor plate and caliper assembly onto the swinging arm.
3. Fit the rear wheel (see Rear Wheel - Installation).
4. Install the electrical cable for the rear wheel ABS sensor into the cable clip on the brake anchor plate.
5. Refit the rear wheel ABS sensor and its spacer to the rear brake anchor plate. Check and, if necessary, adjust the ABS sensor to pulser ring air gap (see Air Gap Measurement). Tighten the new fixing to **9 Nm**.
6. Connect the brake hose to the caliper incorporating new sealing washers on each side of the brake hose union.
7. Tighten the brake hose union to **25 Nm**.



1. Hose connection
2. Rear ABS wheel speed sensor fixing
3. Rear ABS wheel speed sensor
4. Cable clip

8. Bleed the rear brake (see Bleeding the Rear Brakes, Renewing Brake Fluid).
9. Check the operation of the brake and carry out a thorough leak check before riding the motorcycle.

WARNING

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

Rear Brake Disc - Wear

WARNING

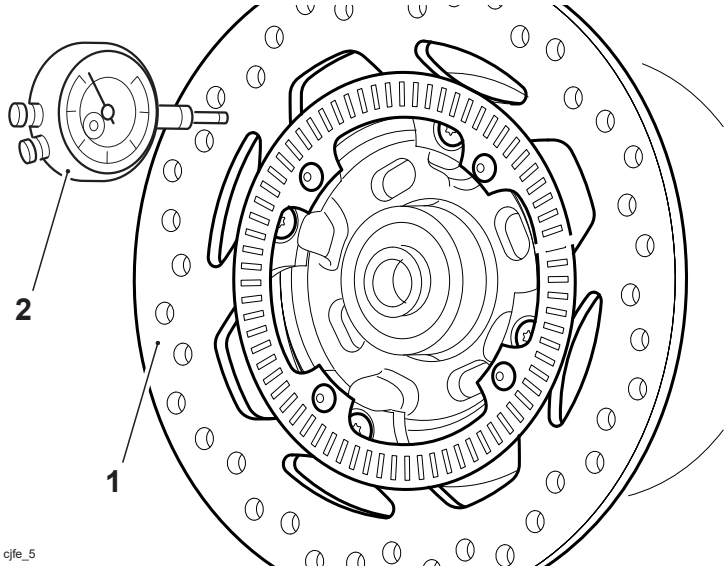
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Replace any brake disc worn beyond the service limit or exceeding the disc run-out limit.

Rear Disc Thickness	
Standard	5.5 mm
Service limit	5 mm

Disc Run-out	
Service limit	0.25 mm

Measure disc run-out using an accurate dial gauge mounted on a surface plate.



1. **Brake disc**
2. **Dial gauge**

Rear Brake Disc - Removal

WARNING

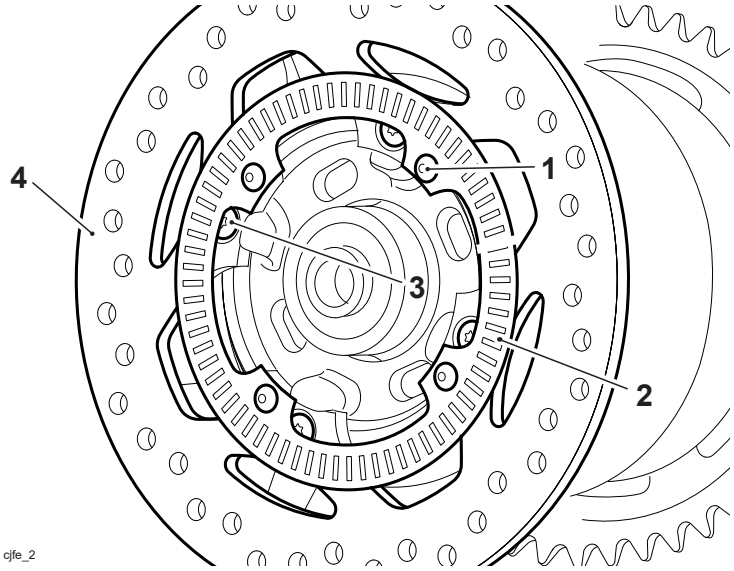
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

Perform the following operations:

- Rear Wheel - Removal

Perform the following operations:

1. Support the wheel on blocks to avoid damage to the wheel centre.
2. Remove and discard the fixings and remove the ABS pulser ring.
3. Remove and discard the fixings and remove the brake disc.



1. **Fixings (ABS pulser ring)**
2. **ABS pulser ring**
3. **Fixing (rear brake disc)**
4. **Rear brake disc**

Rear Brake Disc - Installation

1. Locate the brake disc to the wheel.
2. Fit new fixings and tighten to **22 Nm**.
3. Locate the ABS pulser ring to the rear brake disc.

4. Fit new fixings and tighten to **5 Nm**.

Perform the following operations:

- Rear Wheel - Installation
- Check and, if necessary, adjust the air gap between the wheel speed sensor and the ABS pulser ring (see Air Gap Measurement).
- Check the operation of the rear brake. Rectify as necessary.

Rear 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.

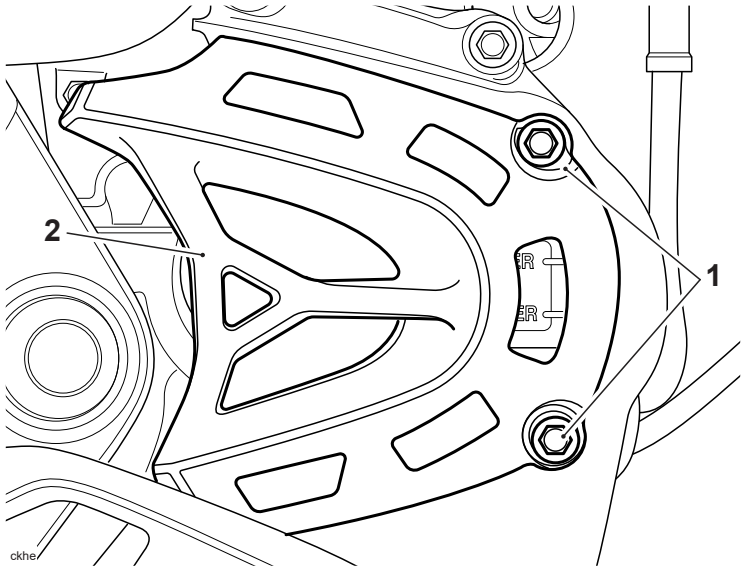
CAUTION

To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Remove the front sprocket cover (see Front Sprocket Cover - Removal).

1. Release the fixings and remove the front sprocket outer cover.



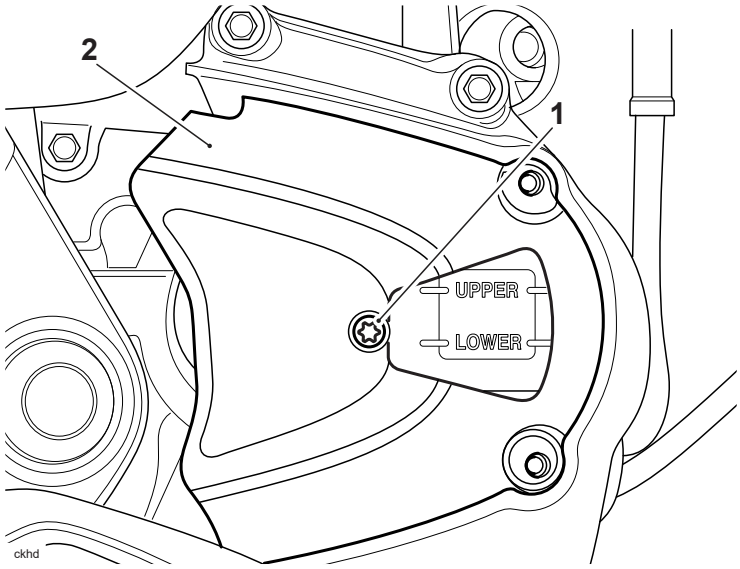
1. **Fixings**
2. **Sprocket outer cover**

Note

Note

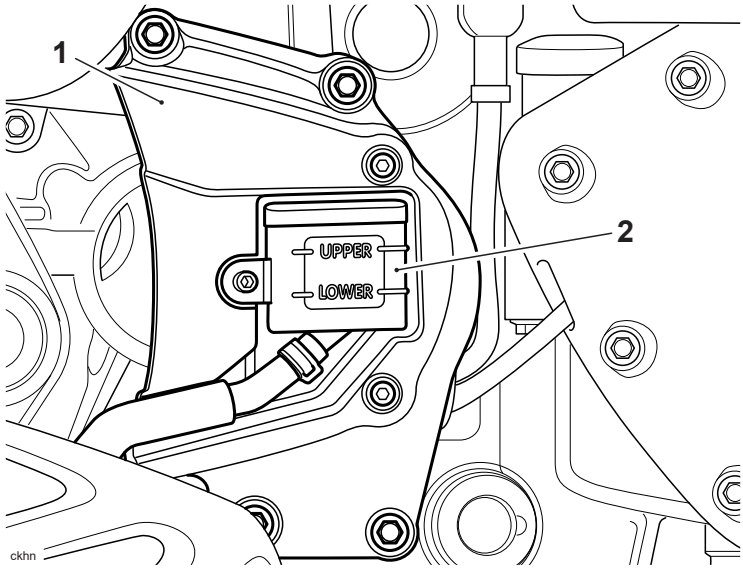
- **The fixing securing the brake sprocket middle cover also secure the brake fluid reservoir to the sprocket cover.**

2. Release the fixing and remove the front sprocket middle cover. Discard the fixing.



1. **Fixings**
2. **Sprocket middle cover**

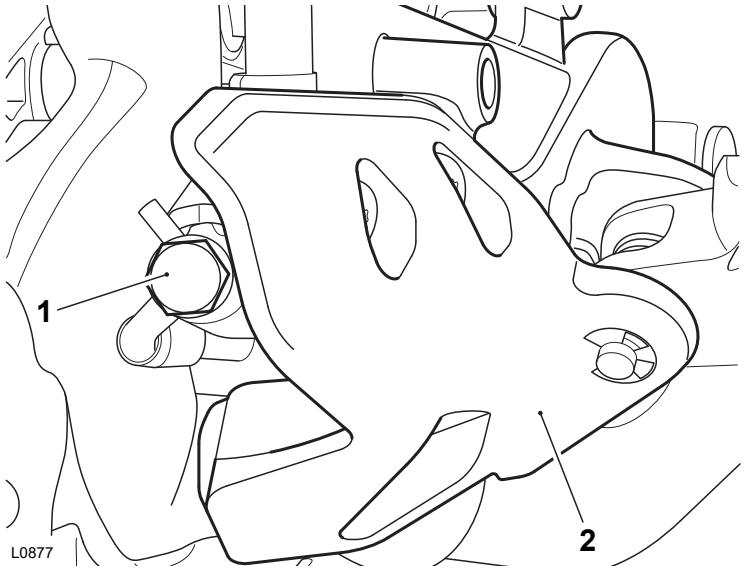
3. Detach the brake fluid reservoir from the sprocket cover.



1. **Brake fluid reservoir**
2. **Sprocket cover**

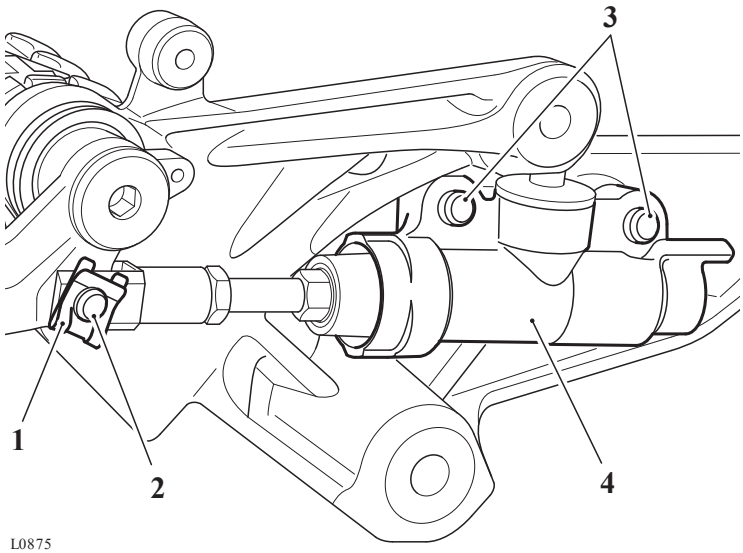
4. Drain the fluid from the master cylinder by bleeding the system at the rear brake caliper until all fluid has been expelled.

5. Remove the fixings and remove the heel guard.
6. Disconnect the brake line from the rear master cylinder. Discard the sealing washers.



1. **Brake line connection**
2. **Right control plate**

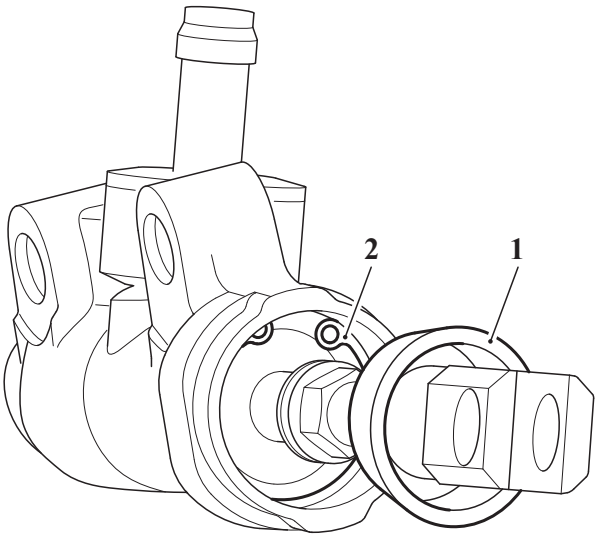
7. Remove the fixings and remove the right control plate.
8. Remove the E-clip and clevis pin from the front footrest and remove the footrest from the control plate, noting the orientation of the spring for installation.
9. Remove the fixings and detach the right hand control plate from the frame.
10. Release the clip, and noting its orientation, remove the brake fluid reservoir and hose from the master cylinder.
11. Remove the clip and clevis pin from the end of the brake pushrod.
12. Remove the two fixings and detach the rear brake master cylinder from the right hand control plate. Discard the lock nut.



1. **Clip**
2. **Clevis pin**
3. **Fixings**
4. **Master cylinder**

Rear Brake Master Cylinder - Disassembly

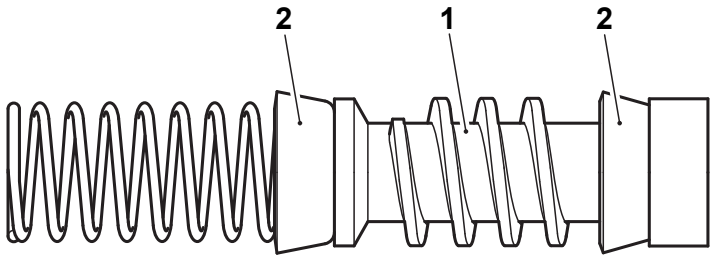
1. Remove the rubber boot from the cylinder and pushrod.
2. Remove the circlip retaining the pushrod to the cylinder.



L0876

1. **Rubber boot**
2. **Circlip**

3. Remove the pushrod and piston set from the master cylinder bore noting the relative position of the seals and piston components.



L0878

1. **Piston**
2. **Seals**

Rear Brake Master Cylinder - Assembly

WARNING

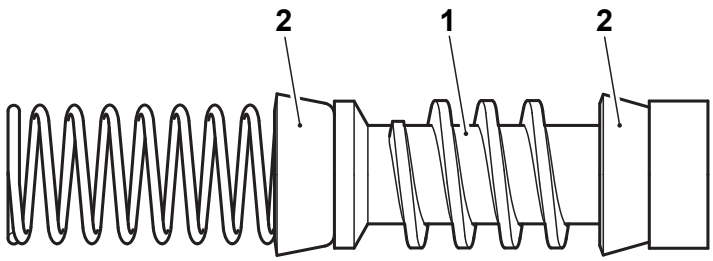
Never use mineral-based grease in any part of the braking system or in any area where contact with the braking system is possible. Mineral-based grease will damage the hydraulic seals in the calipers and master cylinders. A dangerous riding condition leading to loss of motorcycle control and an accident could result from use of mineral grease.

1. Lubricate the piston and cylinder with new, clean brake fluid.

WARNING

Ensure that the piston and piston seal are fitted facing the same way as noted during removal. A dangerous riding condition leading to loss of motorcycle control and an accident could result from incorrect assembly of the master cylinder.

2. Fit the new piston and seal set into the master cylinder.

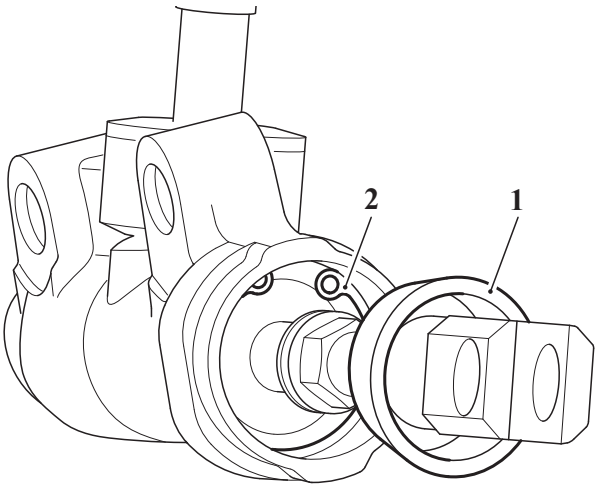


L0878

1. **Piston**
2. **Seals**

3. Apply a small amount of brake grease to the pushrod.
4. Install the pushrod in the master cylinder, compress the spring and retain the assembly with a new circlip.





1. **Rubber boot**
2. **Circlip**

5. Refit the master cylinder boot.

Rear Brake Master Cylinder - Installation

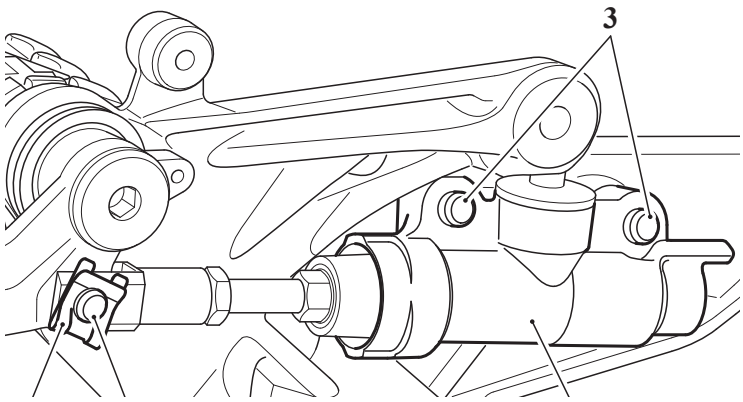
WARNING

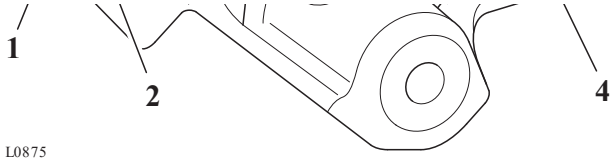
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

CAUTION

To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

1. Fit the rear brake master cylinder to the right hand control plate and tighten the fixings to **18 Nm**.
2. Position the brake pedal to the pushrod, engage the clevis and retain it with the clip. Ensure the clip is fitted as shown below:





1. **Clip**
2. **Clevis pin**
3. **Fixings**
4. **Master cylinder**

3. Refit the brake fluid reservoir and its hose to the master cylinder as noted during removal. Secure with the clip.
4. Put the right hand control plate in position on the frame. Install and torque the top fixing to **25 Nm**.
5. Install and torque the control plate bottom fixing to **40 Nm**.
6. Incorporating new washers to either side of the union, fit the brake line. Tighten the union bolt to **25 Nm**.
7. Put the right hand heel guard in position. Install and torque the heel guard fixings to **7 Nm**.
8. Fill and bleed the rear brake system, then install the middle and outer sprocket covers (see Bleeding the Rear Brakes, Renewing Brake Fluid).

Perform the following operations:

- Battery - Installation
- Seat - Installation

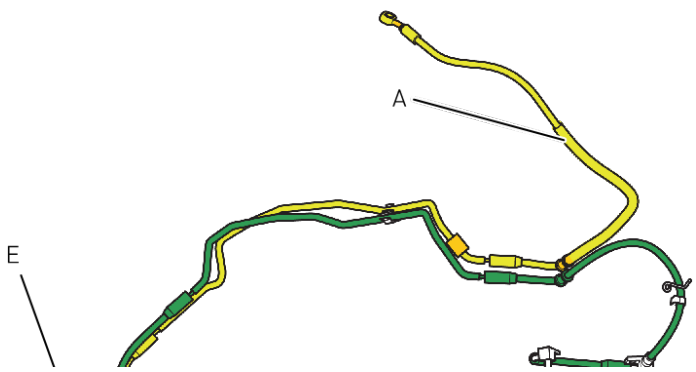
WARNING

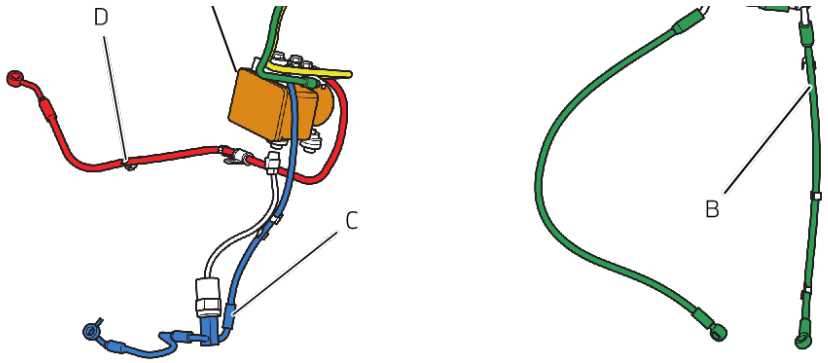
It is dangerous to operate the motorcycle with defective brakes; you must have your authorised Triumph dealer take remedial action before you attempt to ride the motorcycle again. Failure to take remedial action may reduce braking efficiency leading to loss of motorcycle control and an accident.

- Check the operation of the rear brake. Rectify as necessary.

Removal and Installation - ABS Components

ABS Hydraulic Circuit Layout





A. Front Brake Circuit from Master Cylinder to ABS Modulator

B. Front Brake Circuit from ABS Modulator to Front Calipers

C. Rear Brake Circuit from Master Cylinder to ABS Modulator

D. Rear Brake Circuit from ABS Modulator to Rear Caliper

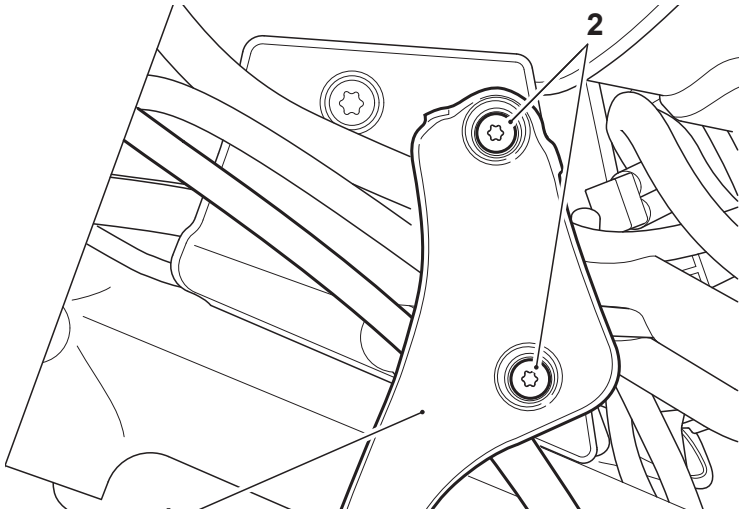
E. ABS Modulator

Front 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.

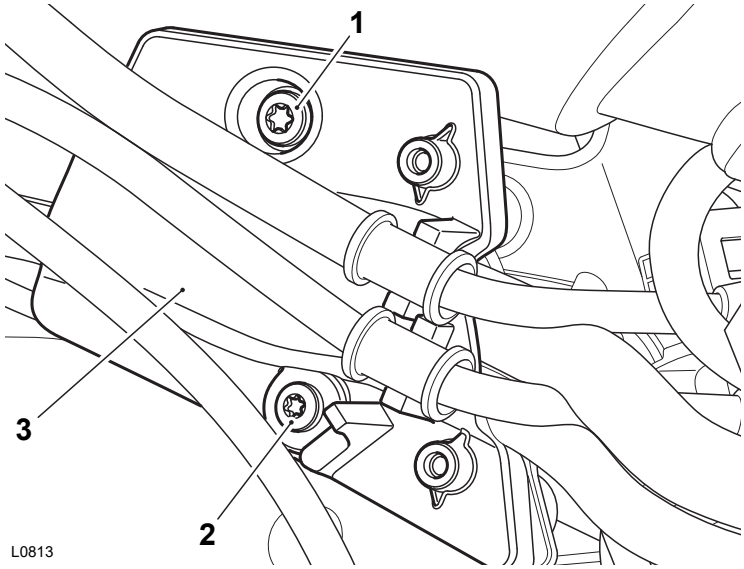
1. Release the fixings and remove the headstock cable guide.





1. **Fixings**
2. **Cable guide**

2. Reposition the brake hoses and the clutch cable to give access to the headstock harness cover.
3. Remove the two fixings that attach the headstock harness cover to the headstock.



1. **Fixing**
2. **Fixing**
3. **Harness cover**

4. Disconnect the electrical connector for the front wheel speed sensor (sensor) from the main harness, located under the left hand side of the fuel tank.

CAUTION

Note the routing of the wheel speed sensor harness and it clips for installation.

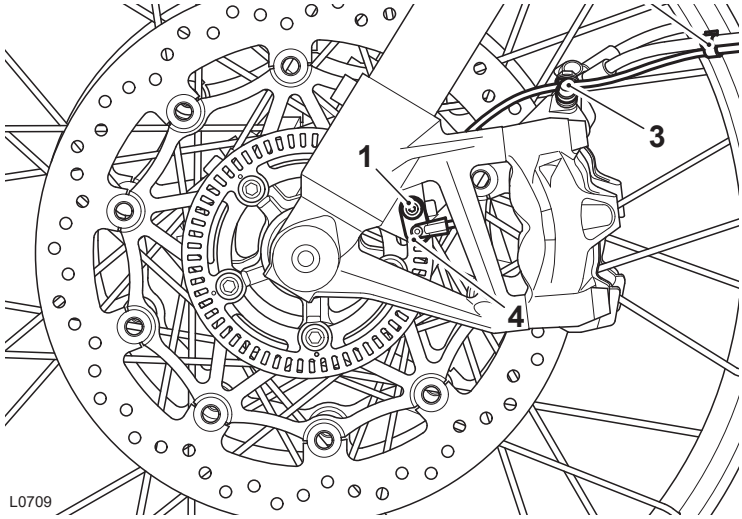
5. Detach the sensor harness from the clip on the left front brake line.
6. Release the sensor harness from the rubber cap on the bleed nipple.
7. Route the sensor harness down to the front brake caliper.

Note

- **There is a shim between the wheel speed sensor and the front fork leg.**

8. Release the fixing securing the sensor to the fork leg.
9. Remove the sensor and collect the shim.





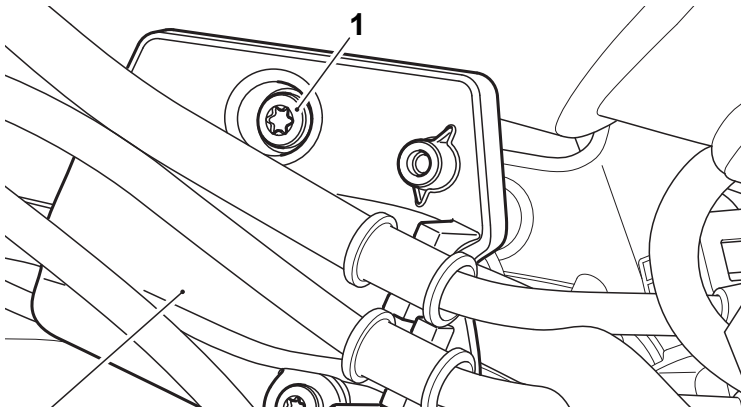
1. **Fixing**
2. **Clip (to brake line)**
3. **Bleed nipple rubber cap**
4. **Front ABS wheel speed sensor**

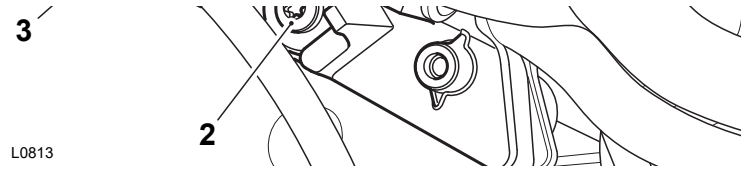
Front ABS Wheel Speed Sensor - Installation

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.

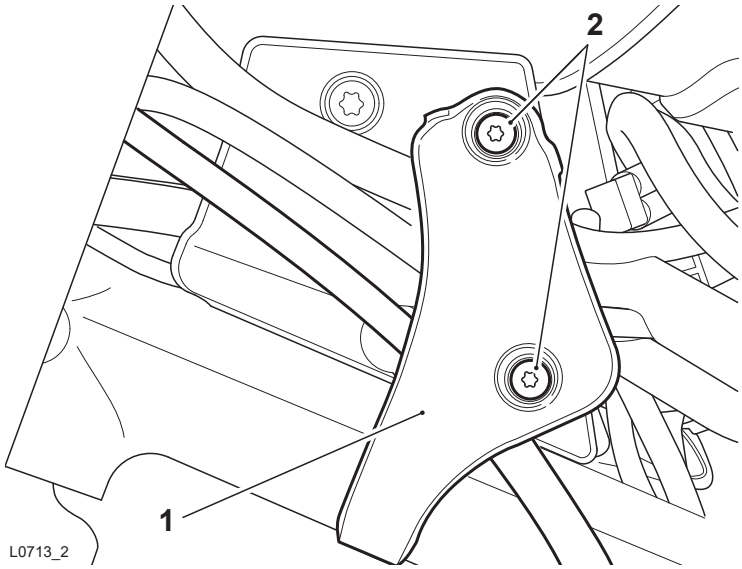
1. Position the wheel speed sensor and shim to the fork leg, as noted for removal. Fit the fixing and tighten to **9 Nm**.
2. Route and secure the sensor harness to the bleed nipple rubber cover and the brake hose clip.
3. Route the harness as noted for removal and connect the wheel speed sensor electrical connector to the main harness.
4. Install the headstock harness cover.
5. Install and torque the two fixings to **5 Nm**.





1. **Fixing**
2. **Fixing**
3. **Harness cover**

6. Put the brake hoses and clutch cable into the correct position.
7. Install the cable guide and torque the two fixings to **3 Nm**



1. **Fixings**
2. **Cable guide**

8. The air gap between the wheel speed sensor and the pulser ring must be between 0.4 mm and 1.2 mm. Check, and if necessary, adjust the air gap (see Air Gap Measurement).

- Install the fuel tank (see Fuel Tank - Installation).

Rear ABS Wheel Speed Sensor - Removal

WARNING

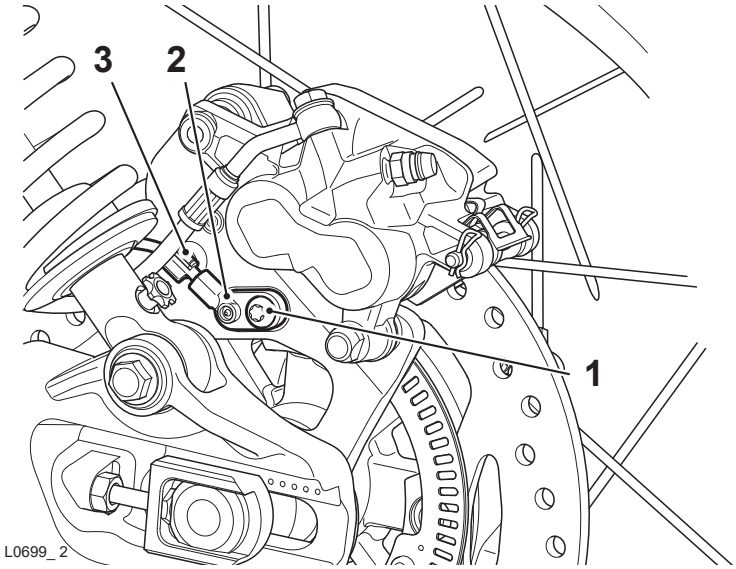
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

- Seat - Removal
- Battery - Removal

CAUTION

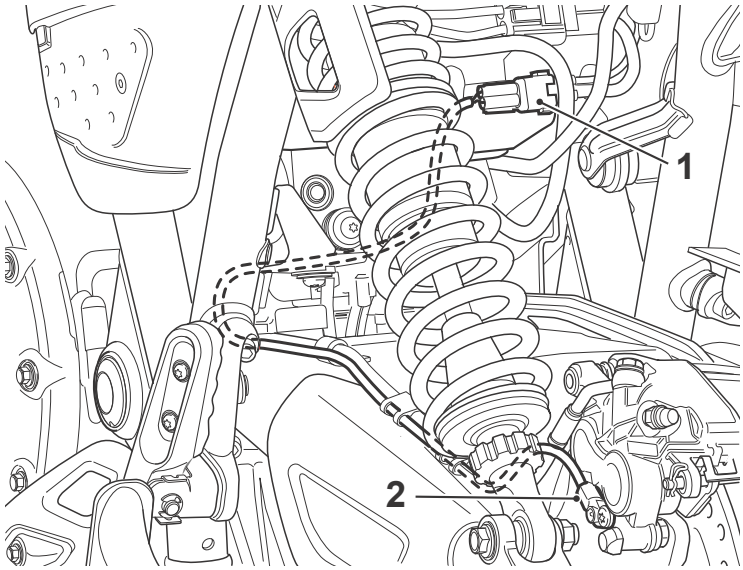
Note the routing of the wheel speed sensor harness and it clips for installation.

1. Remove the rear mudguard (see Rear Mudguard - Removal).
2. Release the fixing securing the wheel speed sensor to the rear brake caliper carrier, and remove the sensor. Collect the shim.
3. Release the wheel speed sensor harness from the retaining clip on the brake caliper carrier.



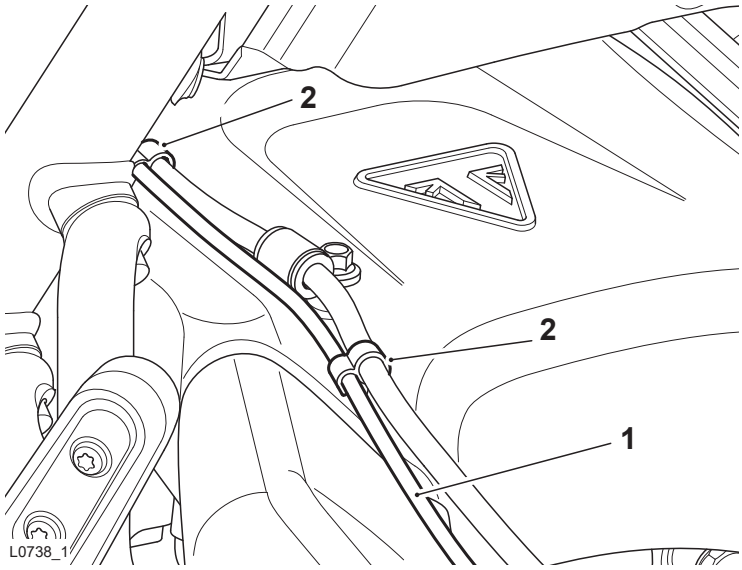
1. **Fixing**
2. **ABS rear wheel speed sensor**
3. **Retaining clip**

4. Disconnect the wheel speed sensor electrical connector, identified as the white connector.



1. **Harness connector**
2. **ABS rear wheel speed sensor**

5. Release the wheel speed sensor cable from the clips on the left hand side of the swinging arm.



1. **Wheel speed sensor cable**
2. **Clips**

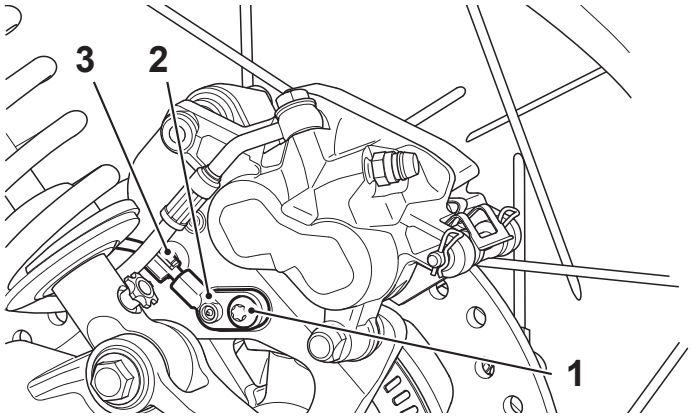
6. Route the wheel speed sensor harness to the rear caliper and remove the wheel speed sensor.

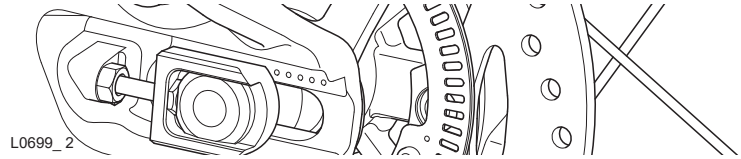
CAUTION

Note the location of the shim for the ABS wheel speed sensor for installation.

Rear ABS Wheel Speed Sensor - Installation

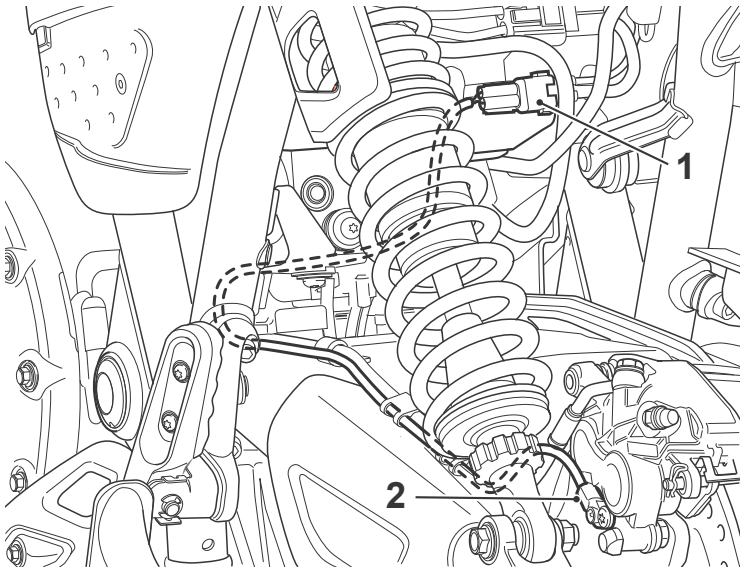
1. Position the wheel speed sensor and shim to the brake caliper carrier, as noted for removal. Fit the fixing and tighten to **9 Nm**.





1. **Fixing**
2. **ABS rear wheel speed sensor**
3. **Retaining clip**

2. Route and secure the ABS rear wheel speed sensor harness to its retaining clips as noted for removal.
3. Connect the wheel speed sensor electrical connector to the main harness.



1. **Harness connector**
2. **ABS rear wheel speed sensor**

4. Attach the ABS sensor cable and brake hose clips to the left hand side of the swinging arm.
5. The air gap between the wheel speed sensor ring and the sensor must be between 0.40 mm and 1.20 mm. Check, and if necessary, adjust the air gap (see Air Gap Measurement).
6. Install the rear mudguard (see Rear Mudguard - Installation).

Perform the following operations:

- Refit the left hand side panel (see Side Panels).
- Battery - Installation
- Seat - Installation

Front ABS Pulser Ring - Removal

1. Remove front brake disc and pulser ring (see Front Brake Disc - Removal).

Front ABS Pulser Ring - Inspection

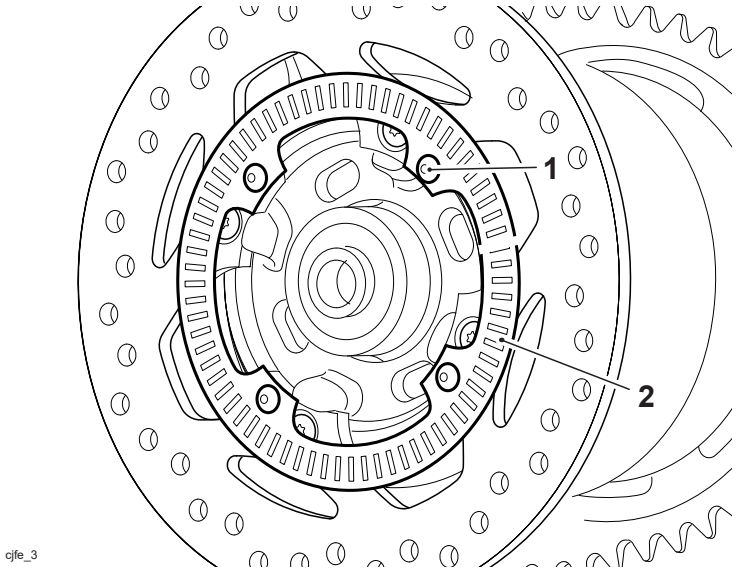
1. Check the pulser ring for damaged, missing or cracked teeth or distortion. Renew the pulser ring as necessary.

Front ABS Pulser Ring - Installation

1. Fit the front brake disc and ABS pulser ring (see Front Brake Disc - Installation).

Rear ABS Pulser Ring - Removal

1. Remove and discard the four fixings and remove the pulser ring.



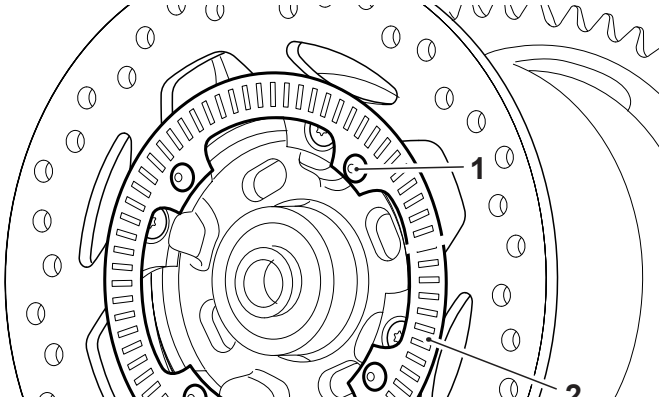
1. **Fixings (ABS pulser ring)**
2. **ABS pulser ring**

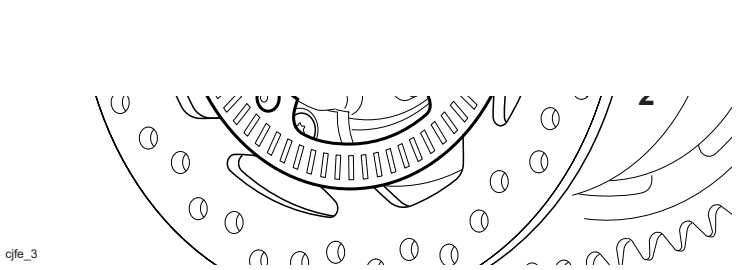
Rear ABS Pulser Ring - Inspection

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 on the brake disc, fit new fixings and tighten to **5 Nm**.





1. **Fixings (ABS pulser ring)**
2. **ABS pulser ring**

2. Refit the rear wheel (see Rear Wheel - Installation).
3. Check and, if necessary, adjust the air gap between the wheel speed sensor and the ABS pulser ring (see Air Gap Measurement).

ABS Hydraulic Modulator/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.

CAUTION

To prevent paint damage, do not spill brake fluid onto any area of the bodywork. Spilled brake fluid will damage paintwork.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Drain the brake fluid from the front master cylinder by bleeding the system at the front caliper until all fluid has been expelled (see Bleeding the Front Brakes, Renewing Brake Fluid).
- Drain the fluid from the rear master cylinder by bleeding the system at the rear caliper until all fluid has been expelled (see Bleeding the Rear Brakes, Renewing Brake Fluid).

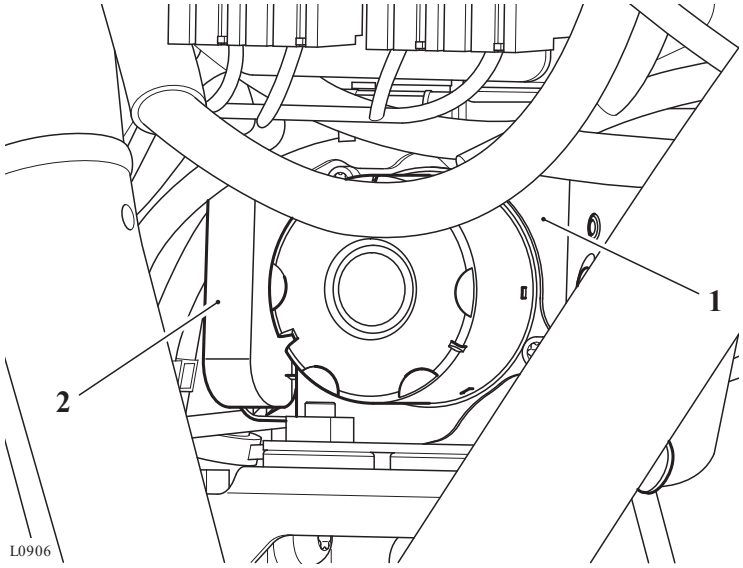
1. Remove the swinging arm (see Swinging Arm - Removal).
2. Remove the three clips that attach the lower infill panel at the left side of the frame, below the left side panel. Remove the infill panel.
3. Remove the alternator regulator/rectifier (see Alternator Regulator/Rectifier - Removal).
4. Remove the airbox (see Airbox - Removal).

CAUTION

When loosening the ABS modulator brake line unions, hold the ABS modulator.

Note the position of the four brake lines on the ABS modulator for installation.

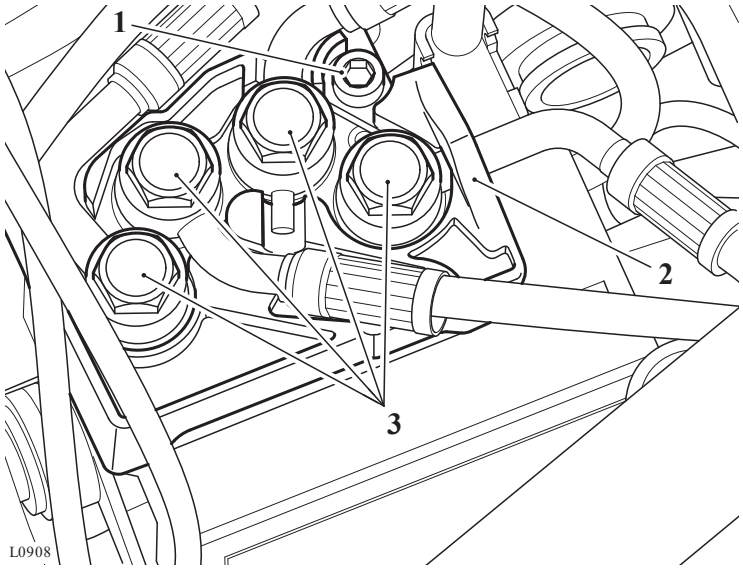
5. Disconnect the ABS modulator multiplug (see ABS Electrical Connectors).



1. ABS Modulator

2. Multiplug

6. Remove the fixing for the anti-rotation moulding.
7. Remove the four brake line unions and the anti-rotation moulding. Discard the sealing washers and the fixing for the anti-rotation moulding.

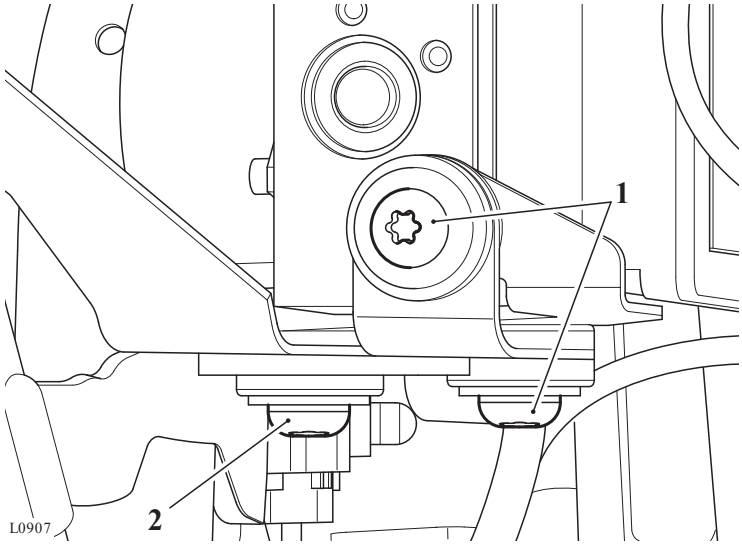


1. Anti-rotation moulding fixing

2. Anti-rotation moulding

3. Brake line unions

8. Remove the two fixings that attach the ABS modulator to the bracket, shown in the following illustration, and remove the ABS modulator. Discard the fixings.



1. **Fixing (ABS modulator to bracket)**
2. **Fixing (ABS modulator bracket to frame)**

ABS Hydraulic Modulator/ECM - Installation

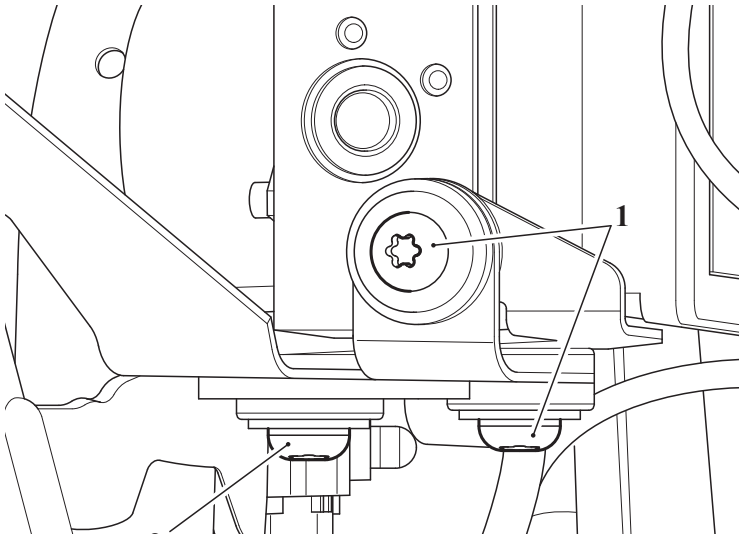
WARNING

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CAUTION

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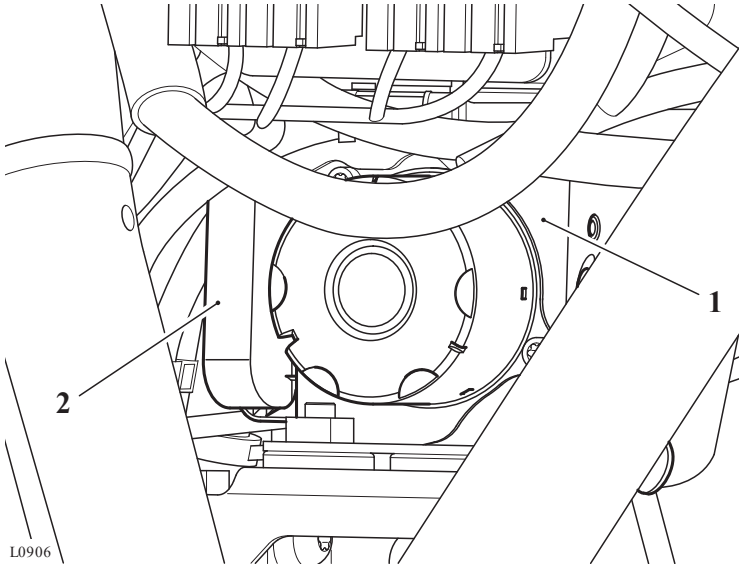
1. Position the ABS modulator onto its bracket. Fit new fixings and tighten to **9 Nm**.





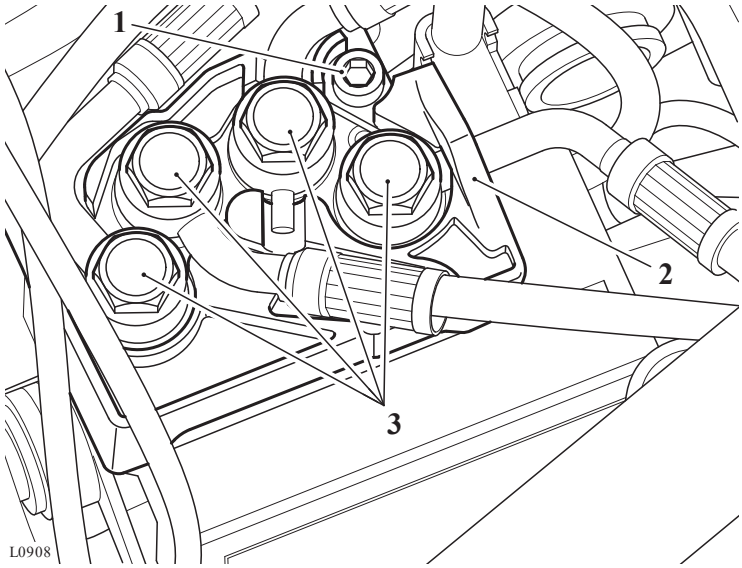
1. **Fixing (ABS modulator to bracket)**
2. **Fixing (ABS modulator bracket to frame)**

2. Connect the ABS modulator multiplug (see ABS Electrical Connectors).



1. **ABS Modulator**
2. **Multiplug**

3. Incorporating new washers to either side of the unions, fit the brake lines and the anti-rotation moulding to the ABS modulator as noted for removal. Tighten the brake line unions to **25 Nm**.
4. Fit a new anti-rotation moulding fixing and tighten to **5 Nm**.



1. **Anti-rotation moulding fixing**
2. **Anti-rotation moulding**
3. **Brake line unions**

5. Put the lower infill panel in position and install the three attachment clips.
6. Fit the airbox (see Airbox - Installation).
7. Refit the alternator regulator/rectifier (see Alternator Regulator/Rectifier - Installation).
8. Fit the swinging arm (see Swinging Arm - Installation).

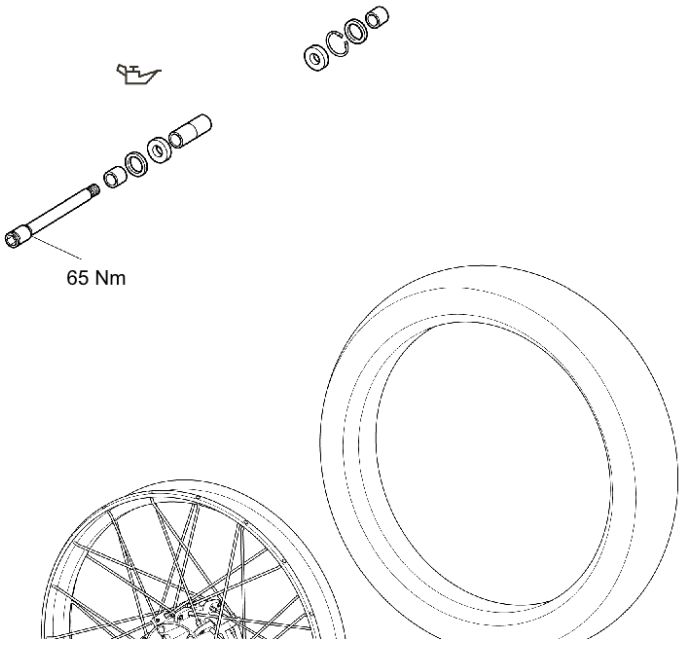
- Battery - Installation
- Seat - Installation
- Bleed the front brakes (see Bleeding the Front Brakes, Renewing Brake Fluid).
- Bleed the rear brakes (see Bleeding the Rear Brakes, Renewing Brake Fluid).

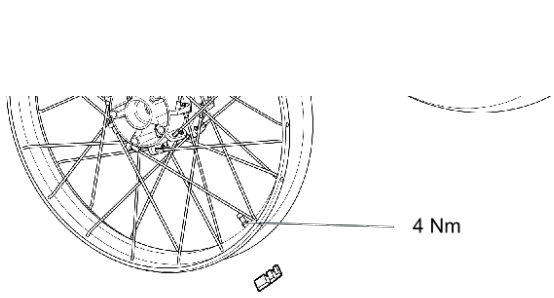
WARNING

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

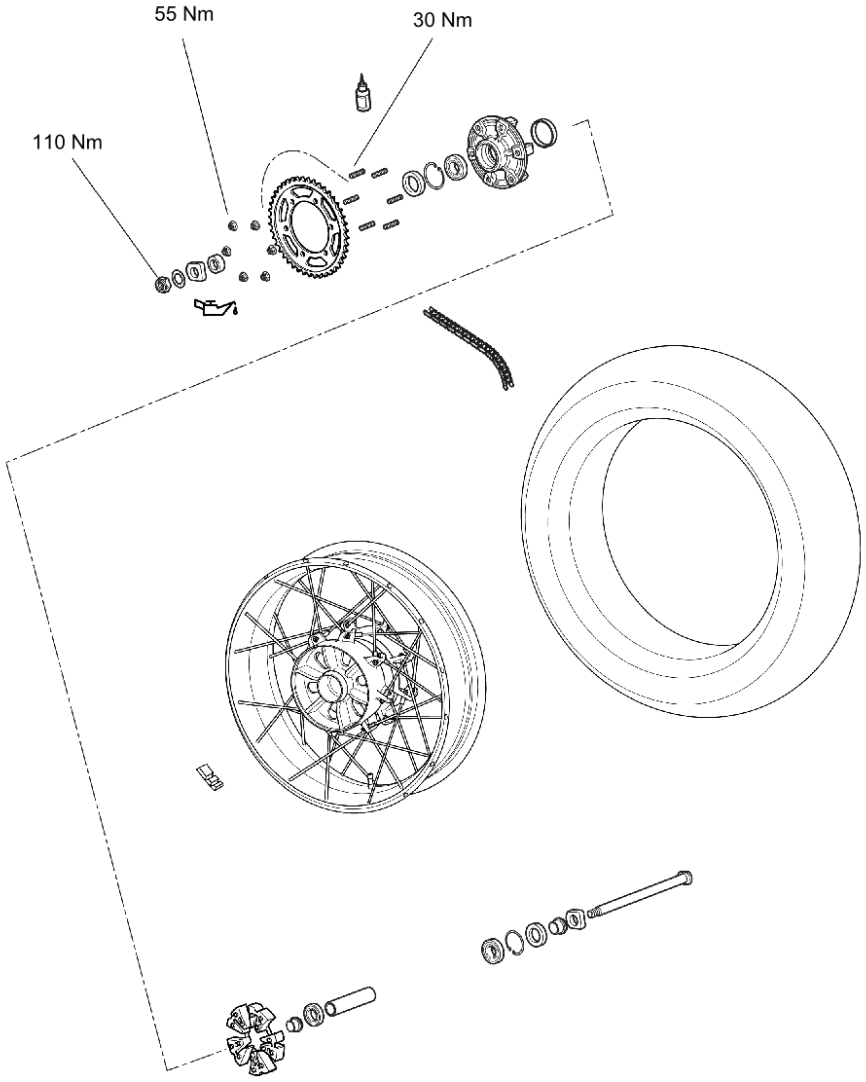
Wheels and Tyres

Exploded View – Front Wheel





Exploded View – Rear Wheel and Cush Drive



Tyre Inflation Pressures

WARNING

Incorrect tyre inflation will cause abnormal tread wear and instability problems that may lead to loss of control and an accident.

Under inflation may result in the tyre slipping on, or coming off the rim. Overinflation will cause instability and accelerated tread wear.

Both conditions are dangerous as they may cause loss of control leading to an accident.

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. See the Specification section for details of the correct inflation pressures.

Minimum Recommended Tread Depth

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.

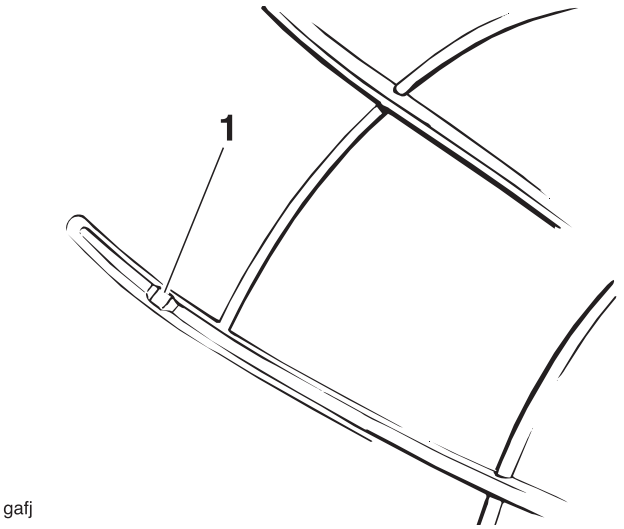
In accordance with the periodic maintenance chart, measure the depth of the tread with a depth gauge, and replace any tyre that has worn to, or beyond the minimum allowable tread depth specified in the table below:

Under 80 mph (130 km/h)	2 mm (0.08 in)
Over 80 mph (130 km/h)	Front 2 mm (0.08 in) Rear 3 mm (0.12 in)

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.

Front Wheel - Removal

WARNING

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

WARNING

motorcycle.

Perform the following operations:

- Raise and support the front of the motorcycle.

WARNING

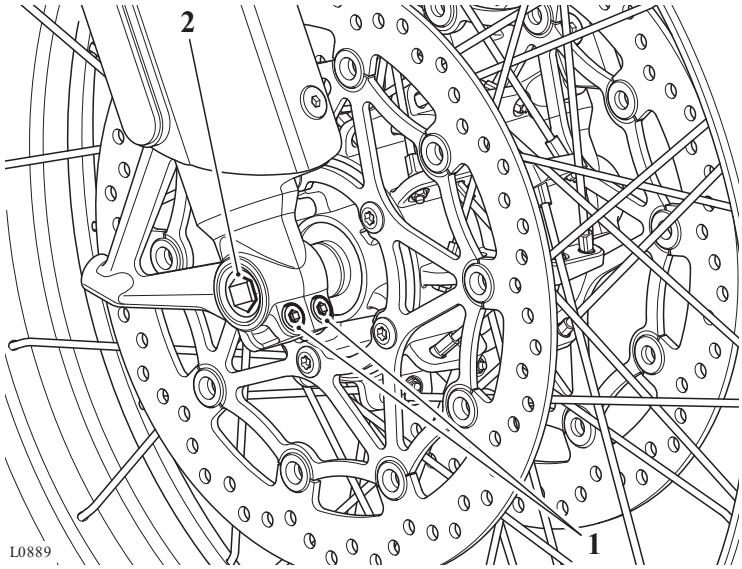
Do not allow the brake caliper to hang on the brake hose as this may damage the hose.

Damaged hoses could cause brake failure leading to loss of motorcycle control and an accident.

Note

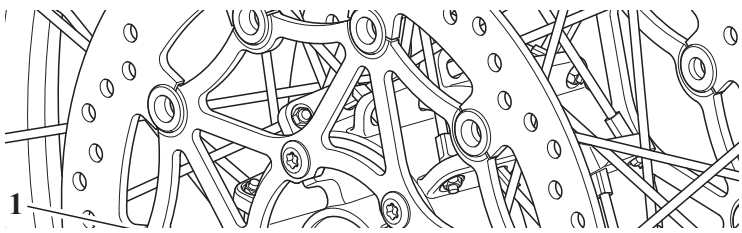
- **It is not necessary to disconnect the brake hoses.**
- Detach and support the front brake calipers (see Front Brake Pads - Removal).

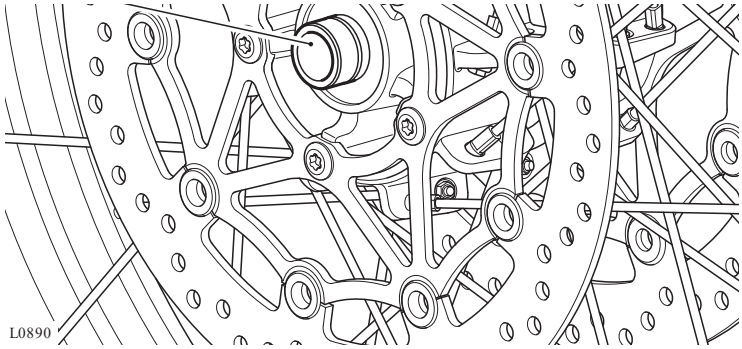
1. Loosen the pinch bolts at the lower end of the right hand fork.
2. Working from the right hand side, release and remove the wheel spindle which is threaded into the left hand fork.



1. **Pinch bolts**
2. **Wheel spindle**

3. Remove the wheel, recovering the spacers from both sides.





1. **Spacer (right hand shown)**

4. Place the wheel on wooden blocks to prevent damage to the brake discs.

WARNING

Do not allow the wheel to rest on the brake disc as this may damage the disc leading to loss of motorcycle control and an accident.

CAUTION

To prevent wheel and wheel bearing damage, ensure dirt and debris are not allowed to enter the wheel bearings.

5. Thoroughly clean all components and inspect for wear or damage.

Front Wheel - Inspection

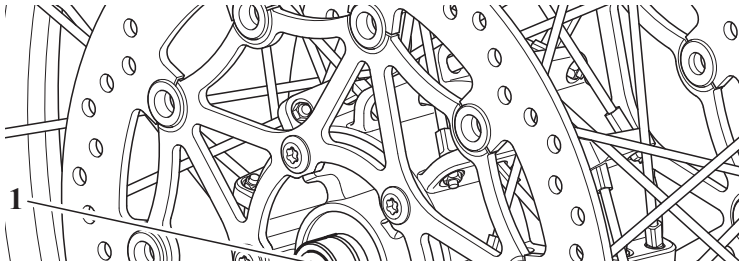
1. Check the wheel bearings spin smoothly with no signs of play. If not, renew the bearings (see Front and Rear Wheel Bearings - Removal).

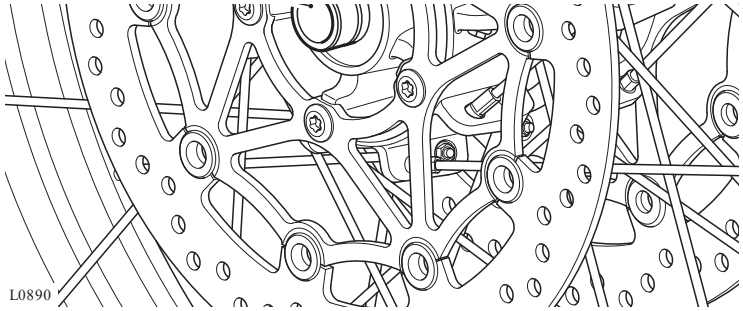
Front Wheel - Installation

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. Lightly smear the wheel spacers with grease and locate in the hubs.





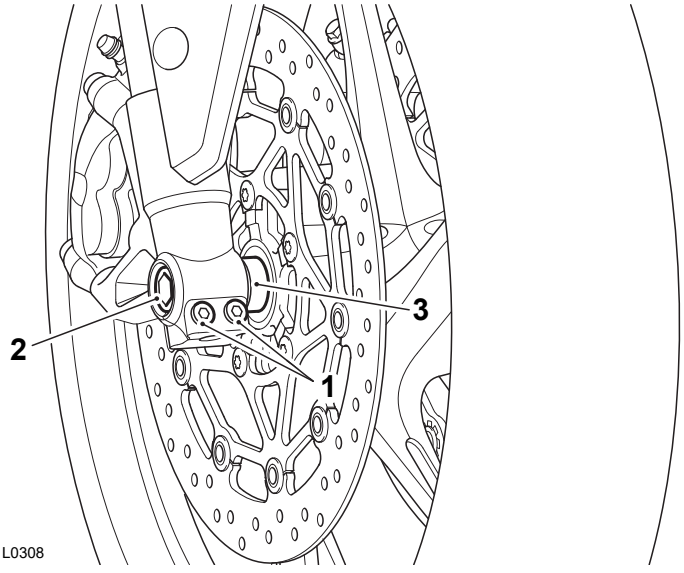
1. **Spacer (right hand shown)**

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**.
4. Lower the motorcycle to the ground and position the front wheel up against a fixed surface. Bounce the front suspension numerous times to allow the right hand fork to float to its natural position on the wheel spindle.

Note

- **Do not lean on the motorcycle or compress the front suspension prior to tightening the fork pinch bolts.**

5. Tighten the fork pinch bolts to **22 Nm**.



1. **Fork pinch bolts**
2. **Wheel spindle**
3. **Wheel spacers (right hand shown)**

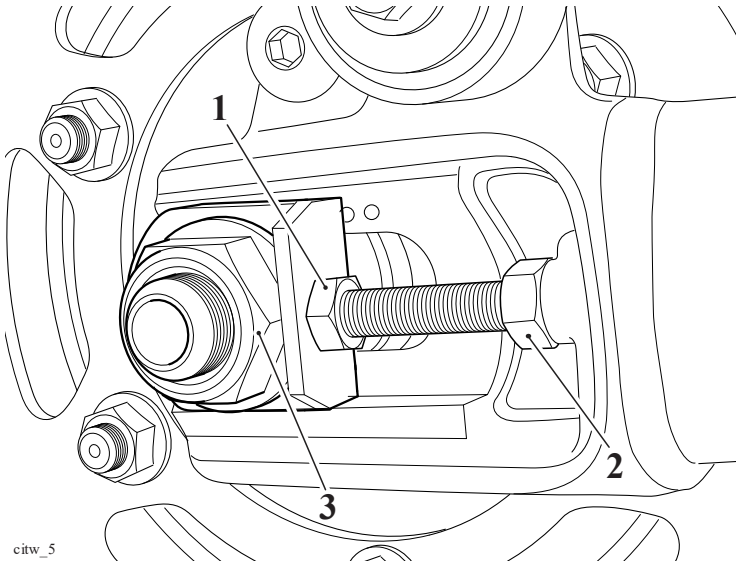
6. Thoroughly clean and degrease the brake discs.
7. Refit the front brake calipers (see Front Brake Caliper - Installation).

Rear Wheel - Removal

WARNING

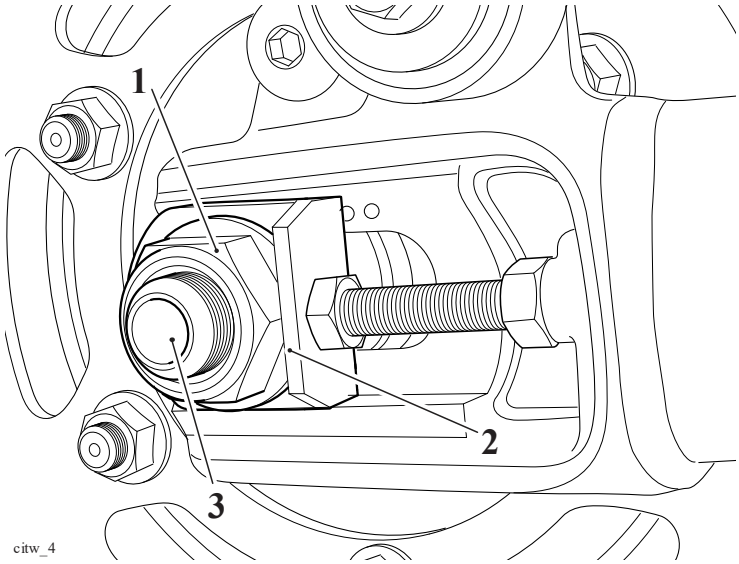
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Support the motorcycle so the rear wheel is raised clear of the ground.
2. Loosen the wheel spindle nut.
3. Release the lock nuts on both the left hand and right hand chain adjuster bolts.



1. **Adjuster bolt**
2. **Adjuster bolt lock nut**
3. **Spindle nut**

4. Remove the spindle nut and washer then support the wheel and withdraw the spindle. Discard the nut.



1. **Spindle nut**
2. **Washer**
3. **Spindle**

5. Lower the wheel to the ground, and noting its position, release the brake caliper and carrier from the lug on the swinging arm.

WARNING

Do not allow the caliper to hang on the brake hose as this may damage the hose.

Damaged hoses could cause brake failure leading to loss of motorcycle control and an accident.

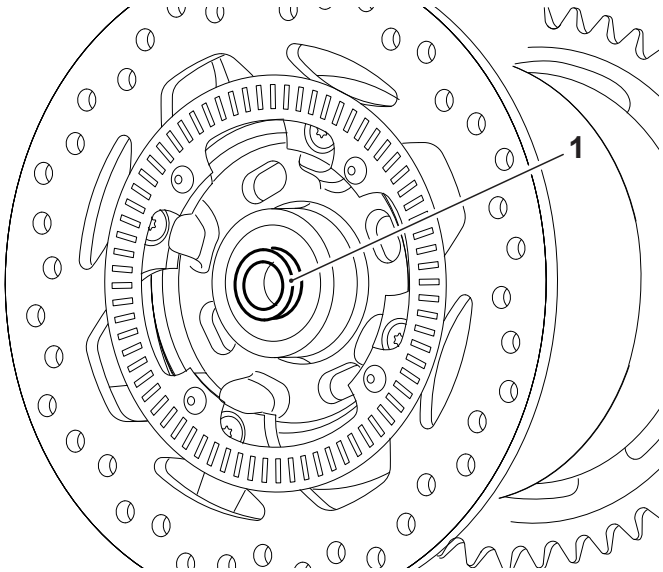
6. Roll the wheel forward until the drive chain can be detached from the rear sprocket.
7. Manoeuvre the wheel out of position and recover the spacers from the hub and drive flange.

WARNING

Do not allow the wheel to rest on the brake disc as this may damage the disc leading to loss of motorcycle control and an accident.

CAUTION

To prevent wheel and wheel bearing damage, ensure dirt and debris are not allowed to enter the wheel bearings.



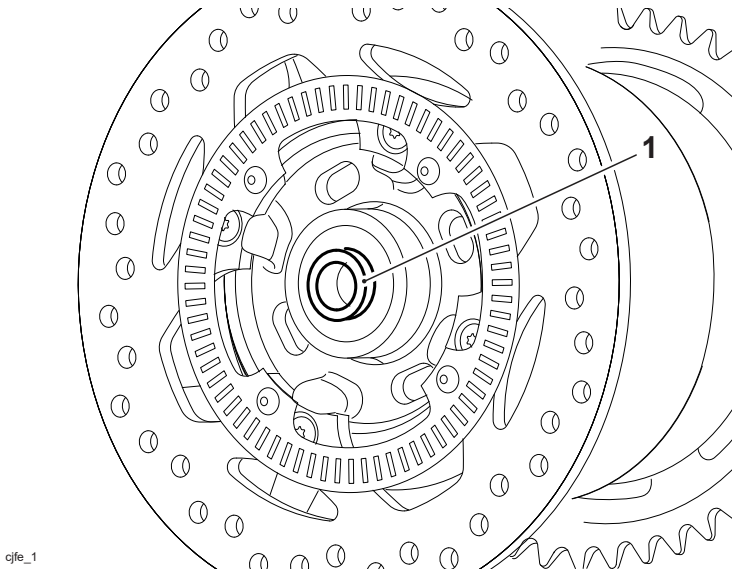
1. **Spacer (left hand shown)**

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. Lubricate the lips of the wheel bearing seals with a smear of multipurpose grease.
2. Fit the spacer to the hub and drive flange.



1. Spacer (left hand shown)

3. Position the wheel in between the swinging arm and engage the drive chain with the sprocket.
4. Fit the brake caliper mounting plate, locating its slot on the swinging arm lug.
5. Lift the wheel into position, ensuring the spacers and caliper mounting plate remain correctly positioned, and insert the spindle from the left hand side.

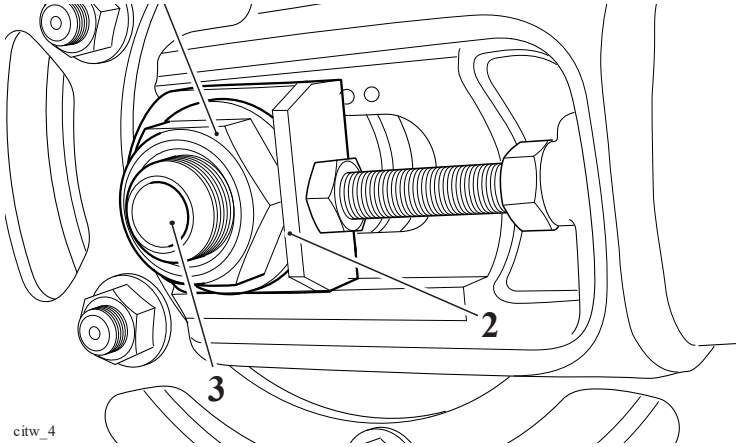
WARNING

If a rear wheel adjuster block is to be replaced, the left and right hand side adjuster blocks must be replaced as a pair.

Failure to replace the rear wheel adjuster blocks as a pair may result in a misalignment of the rear wheel when adjusting the drive chain tension resulting in loss of motorcycle control and an accident.

6. Fit the washer and a new nut to the spindle and hand tighten.





1. **Nut**
2. **Washer**
3. **Spindle**

7. Lower the motorcycle to the ground and adjust the drive chain free movement (see Final Drive Chain Adjustment), then tighten the spindle nut to **110 Nm**.
8. Operate the brake pedal a few times to ensure the brake pads are in firm contact with the disc.
9. Check the operation of the rear brake. Rectify as necessary.

WARNING

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

Front and Rear Wheel Bearings - Removal

Perform the following operations:

- Front Wheel - Removal
- Rear Wheel - Removal

WARNING

To avoid wheel damage, always support the wheel as instructed below. A dangerous riding condition leading to loss of motorcycle control and an accident could result if this warning is ignored.

1. Support the wheel on blocks to prevent damage to the sprocket and wheel rim.

WARNING

Always wear eye, hand and face protection when using a drift as use of a hammer and drift

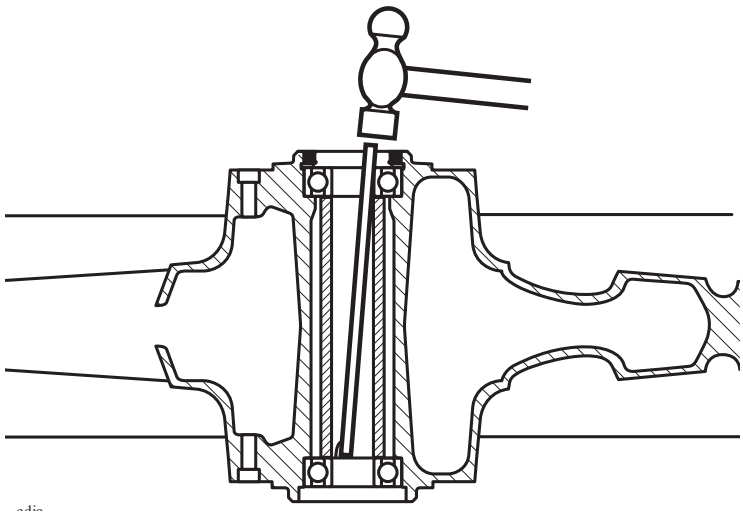
WARNING

can cause bearings to fragment. Pieces of fragmented bearing could cause eye and hand injuries if suitable protective apparel is not worn.

CAUTION

To prevent wheel damage and to aid bearing removal, always apply force evenly on both sides of the bearing to prevent it from 'tipping' and becoming stuck. Application of uneven force will lead to difficulty in removing the bearing and to a damaged wheel.

2. Remove and discard the seal (two on the front wheel, one on the rear) and the bearing circlip.
3. Using a suitable pin punch through the centre of the wheel, drift out the wheel bearings. Collect the centre sleeve.



Wheel Bearing Removal

Wheel Bearings - Inspection

1. Check the wheel bearings spin smoothly with no signs of play. If not, renew the bearings.

Front and Rear Wheel Bearings - 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.**

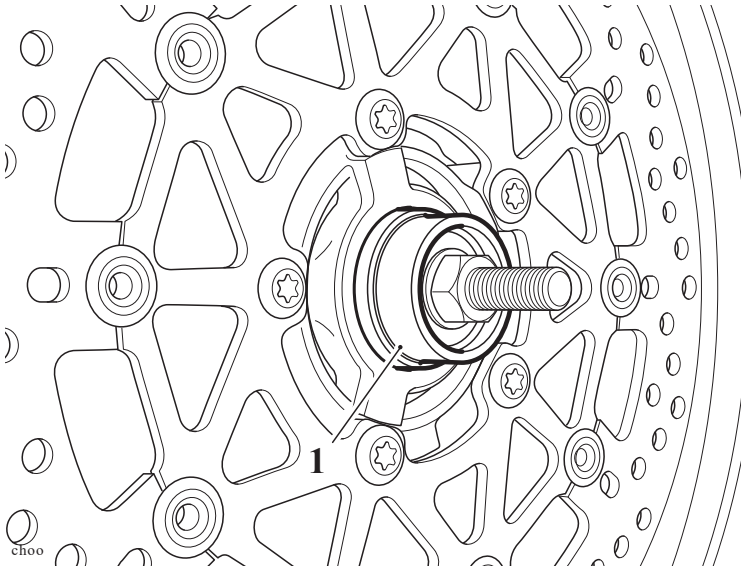
Front Wheel Bearing Tool Selection Chart

	Bearing insertion tool	Support tool
Left bearing	T3880053 - Wheel Bearing Extraction Kit Small face to bearing	T3880075 - Bearing Installer Large face to wheel
Right bearing	T3880053 - Wheel Bearing Extraction Kit Small face to bearing	T3880075 - Bearing Installer Large face to wheel

Rear Wheel Bearing Tool Selection Chart

	Bearing insertion tool	Support tool
Left bearing	T3880053 - Wheel Bearing Extraction Kit Large face to bearing	T3880075 - Bearing Installer Large face to wheel
Right bearing	T3880053 - Wheel Bearing Extraction Kit Large face to bearing	T3880075 - Bearing Installer Large face to wheel

1. Fit the wheel bearings and centre sleeve using the method described above.



1. **T3880075 - Bearing Installer in position on front wheel**

2. Fit a new circlip.
3. Lubricate and fit new seal(s) to the wheel. Lubricate the seal's knife-edge with grease to

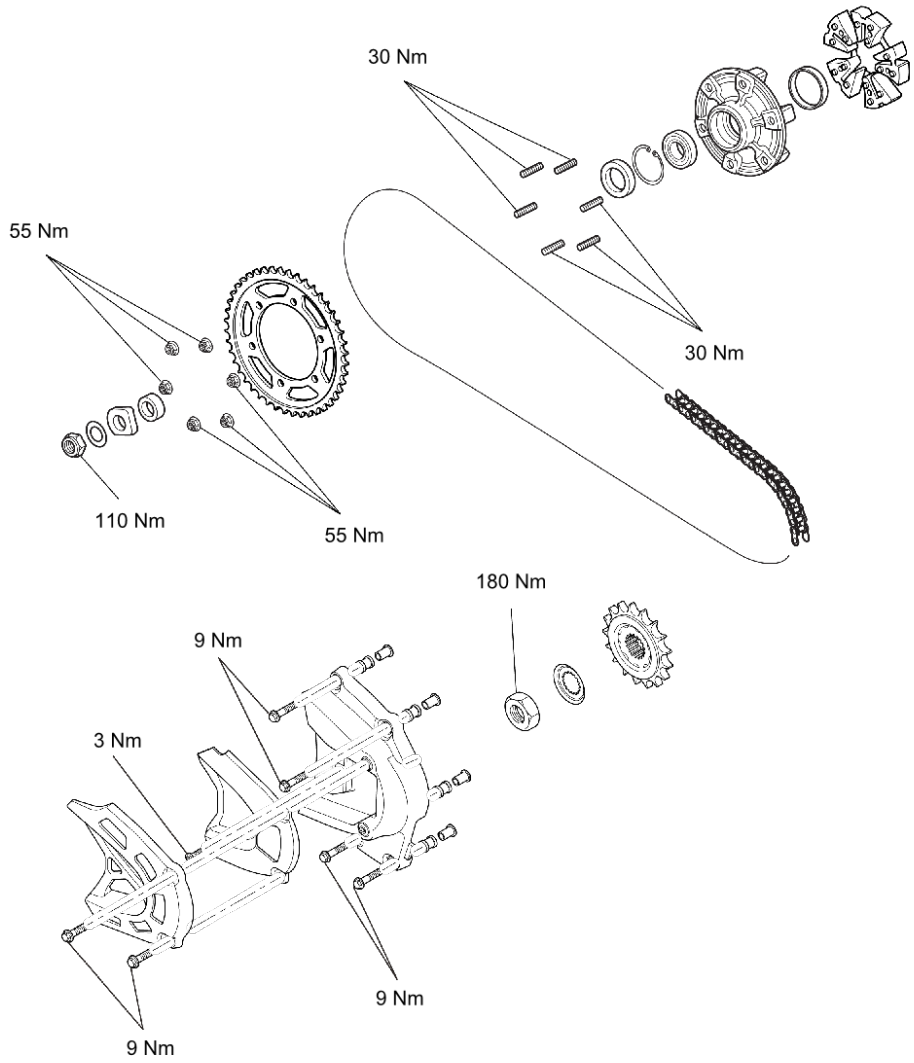
NLGI 2 specification.

Perform the following operations:

- Front Wheel - Installation
- Rear Wheel - Installation

Final Drive

Exploded View – Final Drive



Final Drive Chain

For safety and to prevent excessive wear, the drive chain must be checked, adjusted and lubricated in accordance with scheduled maintenance requirements. Checking, adjustment

and lubrication must be carried out more frequently for extreme conditions such as salty or heavily gritted roads.

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

WARNING

A drive chain that breaks or jumps off the sprockets could snag on the engine sprocket or lock the rear wheel, severely damaging the motorcycle and causing an accident. Never neglect chain maintenance.

Note

- **Lubrication of the drive chain should ideally be carried out with the motorcycle set up so that the rear wheel is free to rotate.**
- **The drive chain must be adjusted with the motorcycle in an upright position, resting on its wheels, and with no additional weight on it.**

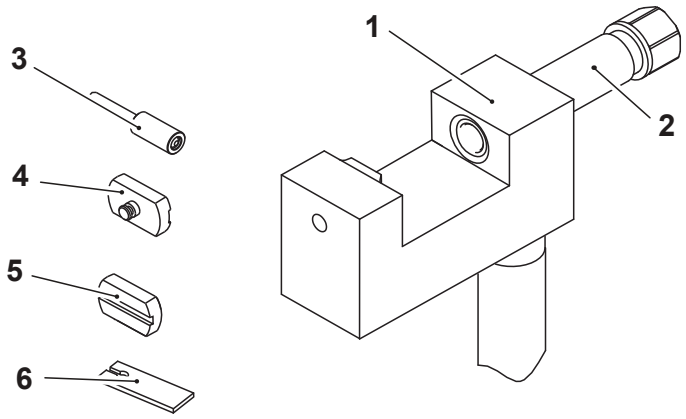
Drive Chain Replacement

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.

Rivet Link Type

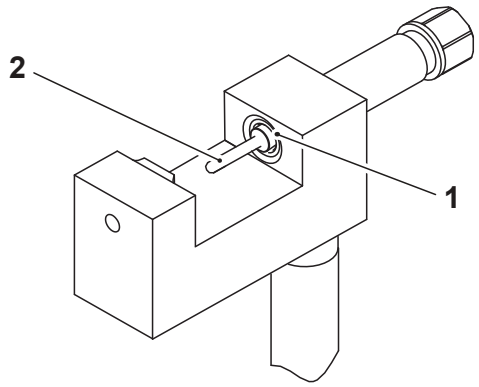
The following instructions for the replacement of rivet link type drive chains requires the use of T3880635 - Final Drive Chain Cut and Rivet.



T3880635 - Final Drive Chain Cut and Rivet

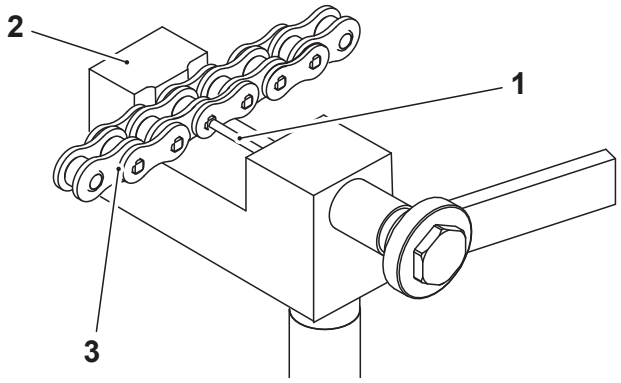
1. **Service tool body**
2. **Pin holder**
3. **Cut/rivet pin**
4. **Plate holder A**
5. **Plate holder B**
6. **Gauge**

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



1. **Pin holder**
2. **Cut/rivet pin**

3. If required, file the domed heads of the chain link pins flat.
4. Position T3880635 - Final Drive Chain Cut and Rivet so that the drive chain is between the cut/rivet pin and the service tool body, with the pin that is to be removed aligned with the hole in the service tool body.
5. Turn the pin holder clockwise until its pin contacts the link pin. Ensure that the pin is centralised on the link pin to be removed.



1. **Guide plate holder**
2. **Service tool body**
3. **Drive chain**

6. Retain the tool body and rotate the pin holder clockwise until the link pin is pressed out from the chain.
7. Remove the tool and separate the two ends of the chain.

Note

- **The replacement chain is supplied in a split condition, complete with a link kit to join the two ends.**

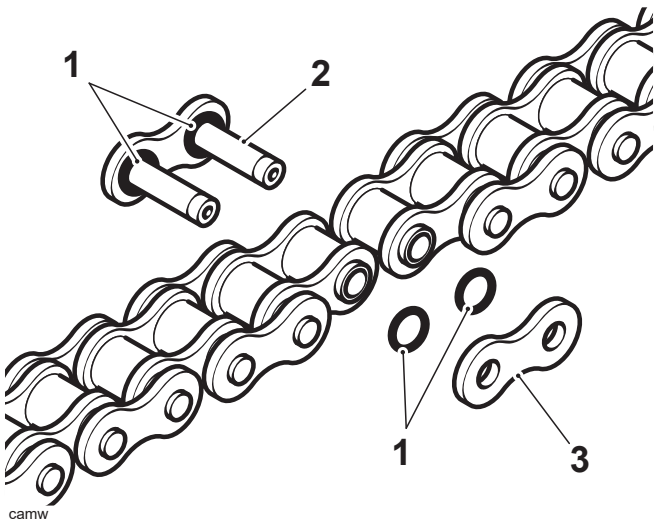
CAUTION

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

Note

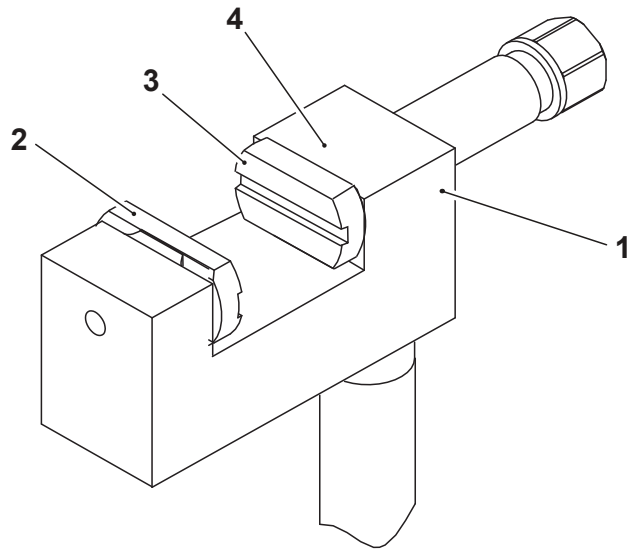
- **Do not use the new connector link as the special grease on it may be removed.**

8. Use the old drive chain to pull the new chain into position as follows: Temporarily attach the end of the new chain to a free end of the old chain using the old connector link. Carefully pull the other end of the old chain to pull the new chain around the sprockets.
9. Using the new link supplied with the chain kit, join the two ends of the chain. Ensure that the O-rings are positioned as shown below and the link plate is fitted with its markings facing outwards.



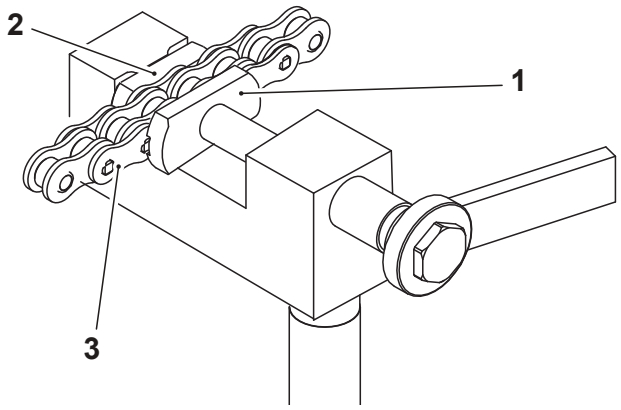
1. **O-rings**
2. **Link**
3. **Link plate**

10. Insert the cut/rivet pin into the pin holder so its larger diameter end (riveting point) is facing away from holder as shown.
11. Fit the guide plate A to the service tool as shown below.



1. **Cut/rivet pin**
2. **Guide plate B**
3. **Guide plate A**
4. **Service tool body**

12. Fit the new connecting link plate to the new link by hand or with a suitable pair of pliers.
13. Position T3880635 - Final Drive Chain Cut and Rivet so that the new connecting link plate of the drive chain is in contact with guide plate A.
14. Rotate the pin holder clockwise until the drive chain link makes contact with guide plate B.
15. Ensure the connecting link is correctly positioned and then continue to rotate the pin holder to press the connecting link fully on.



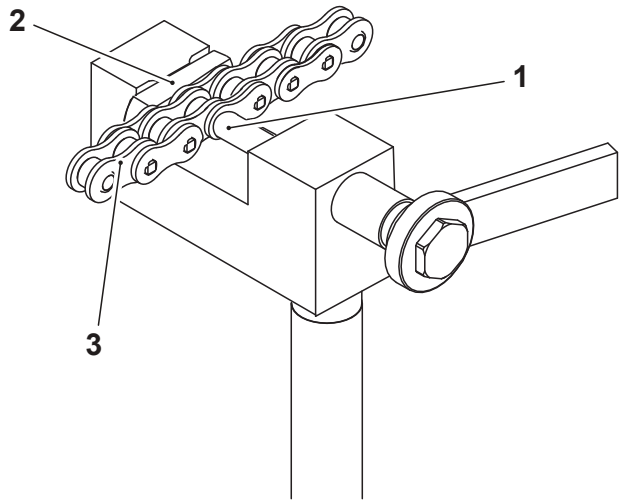
1. **Guide plate A**
2. **Guide plate B**
3. **Drive chain**

16. Rotate the pin holder anticlockwise and remove the Guide plate A and insert the cut/rivet pin into the pin holder so its larger diameter end (riveting point) is facing away from the holder.
17. Align one of the split link pins to the cut/rivet pin then turn the pin holder clockwise until the pin contacts the split link pin. Ensure the split link pin is centrally located on the cut/rivet pin.

Note

- **The riveting end of the cut/rivet pin is shaped to prevent over tightening. Over tightening may cause damage to the connecting link pin and the cut/rivet pin.**

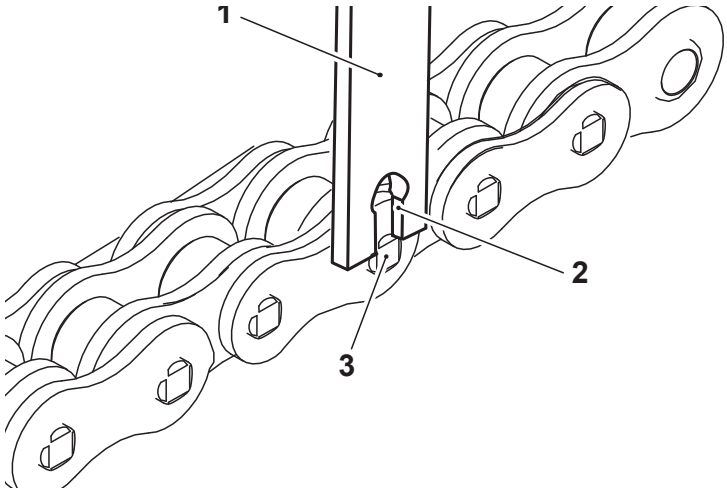
18. Retain the tool body then tighten the pin holder until the split link end is riveted-over.



1. **Cut rivet pin**
2. **Guide plate B**
3. **Drive chain**

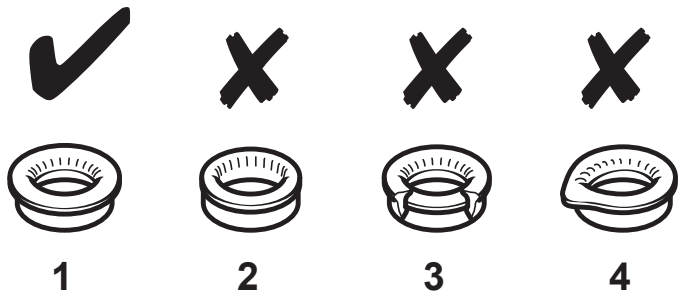
19. Back off the pin holder and rivet the remaining split link pin as described above.
20. Remove the tool from the chain and using the gauge from T3880635 - Final Drive Chain Cut and Rivet check that both the split link pins are correctly riveted. The rivet should not pass through the slot on the gauge.





1. **Gauge**
2. **Slot**
3. **Rivet**

21. Also check that both the split link pins are correctly riveted as shown below.



cana

1. **Correct riveting**
2. **Insufficient riveting**
3. **Excessive riveting**
4. **Riveting off-centre**

WARNING

If either split link pin is not correctly riveted, the split link must be removed and replaced with a new link. Never operate the motorcycle with an incorrectly riveted split link as the link could fail resulting in an unsafe riding condition leading to loss of motorcycle control and an accident.

Endless Type

WARNING

Before starting work, ensure the 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:

- Swinging Arm - Removal

1. Free the chain from the front sprocket and remove it from the motorcycle.
2. Locate the new chain on the front sprocket.

Perform the following operations:

- Swinging Arm - Installation

Front Sprocket - Removal

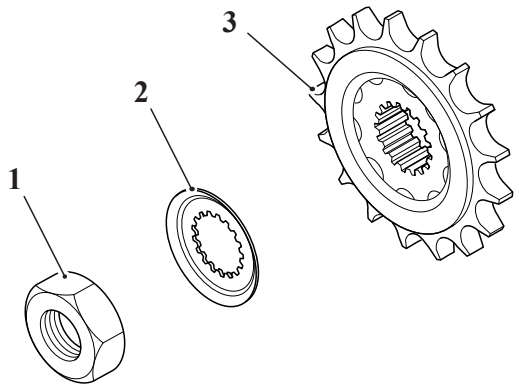
WARNING

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.

Perform the following operations:

- Front Sprocket Cover - Removal

1. Bend back the front sprocket lock washer.
2. Have an assistant sit on the motorcycle, select sixth gear and apply the front brake hard.
3. Loosen the front sprocket nut.



1. **Nut**

2. **Lock washer**
3. **Front sprocket**

4. Remove the front sprocket nut and discard the lock washer.
5. Set the drive chain adjustment to allow maximum free play in the drive chain.

Note

- **Note the orientation of the front sprocket for installation.**

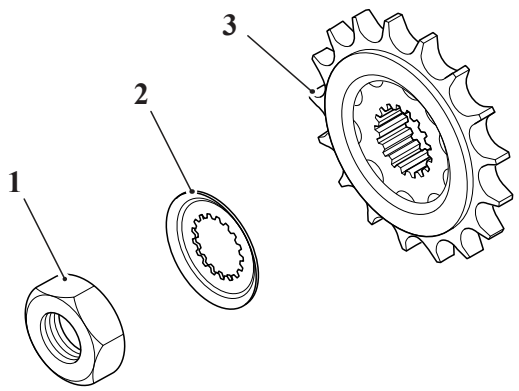
6. Disengage the front sprocket from the drive chain and slide it off the output shaft.

Front Sprocket - 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 front sprocket, as noted for removal, and engage it with the drive chain.
2. Fit a new lock washer engaging it with the output shaft splines, and fit the sprocket nut hand tight.



1. **Nut**
2. **Lock washer**
3. **Front sprocket**

3. Have an assistant sit on the motorcycle, select sixth gear and apply the front brake hard.
4. Tighten the front sprocket nut to **180 Nm**.
5. Secure the front sprocket nut in position by bending the lock washer down to contact one of the nut flats.

6. Adjust the final drive chain free movement (see Final Drive Chain Adjustment).

Perform the following operations:

- Front Sprocket Cover - Installation

Rear Sprocket - Removal

CAUTION

Do not allow the wheel to rest on the brake disc, as this may damage the disc. Support the wheel on wooden blocks, equally spaced around the rim, such that the brake disc is raised above the ground.

Perform the following operations:

- Rear Wheel - Removal

1. Place the wheel on wooden blocks with the drive chain sprocket uppermost.

Note

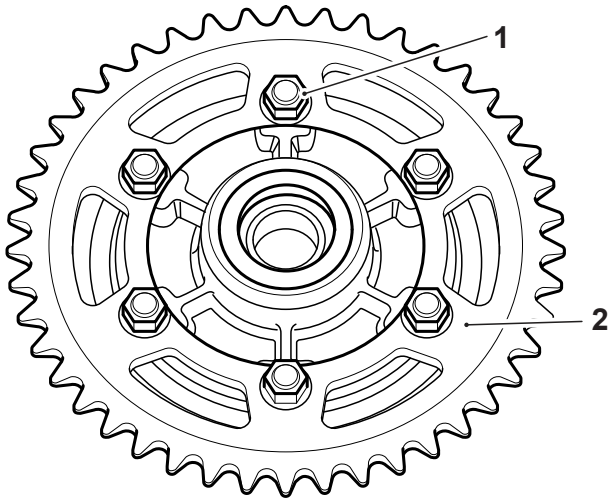
- **If the studs for the rear sprocket become loose or removed, they must be replaced.**

2. Evenly and progressively, remove and discard the rear sprocket lock nuts.

Note

- **Note the orientation of the rear sprocket for installation.**

3. Remove the rear sprocket.



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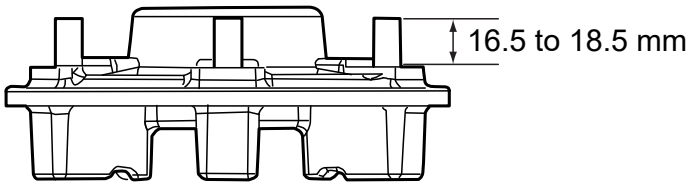
1. **Lock nut**
2. **Sprocket**

Rear Sprocket - Installation

CAUTION

Do not allow the wheel to rest on the brake disc, as this may damage the disc. Support the wheel on wooden blocks, equally spaced around the rim, such that the brake disc is raised above the ground.

1. If necessary, replace any rear sprocket studs that have been loosened or removed as follows:
   - Remove and discard any of the studs that have become loose.
   - Fit new studs and tighten to **30 Nm**.
   - Check the height of the studs when fitted to the sprocket carrier. The top of the stud must be between 16.5 to 18.5 mm above the sprocket carrier face.



1. Height of stud (16.5 to 18.5 mm)

2. Fit the rear sprocket to the sprocket carrier as noted during removal.
3. Fit new lock nuts, evenly and progressively tighten to **55 Nm**.

Perform the following operations:

- Rear Wheel - Installation

Rear Sprocket Carrier and Cush Drive - 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

CAUTION

Do not allow the wheel to rest on the brake disc, as this may damage the disc. Support the wheel on wooden blocks, equally spaced around the rim, such that the brake disc is raised above the ground.

Perform the following operations:

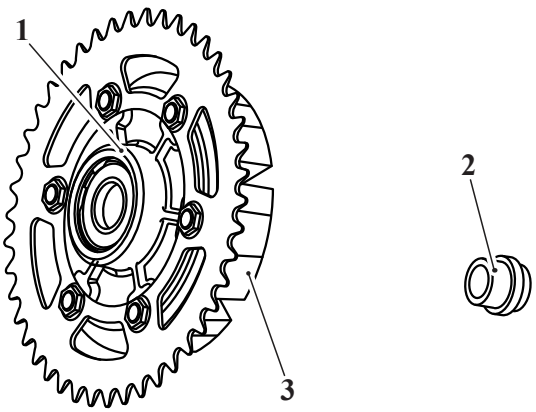
- Rear Wheel - Removal

1. Place the wheel on wooden blocks with the drive chain sprocket uppermost.

Note

- **Note the position and orientation of the spacer for installation.**

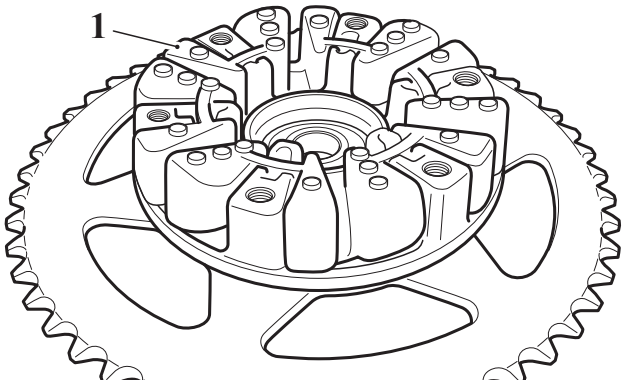
2. Gently lever the drive chain sprocket and flange from the wheel hub. Collect the spacer.



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1. **Rear sprocket carrier**
2. **Spacer**
3. **Cush drive rubber**

3. Remove the cush drive rubber.





1. **Cush drive rubber**

Rear Sprocket Carrier and Cush Drive - Inspection

1. Check the cush drive rubbers for deterioration and cracks.
2. Inspect the sprocket teeth for wear, damage and chips.
3. Check the wheel and drive flange for wear, cracks and damage.

Rear Sprocket Carrier and Cush Drive - 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

Do not allow the wheel to rest on the brake disc, as this may damage the disc. Support the wheel on wooden blocks, equally spaced around the rim, such that the brake disc is raised above the ground.

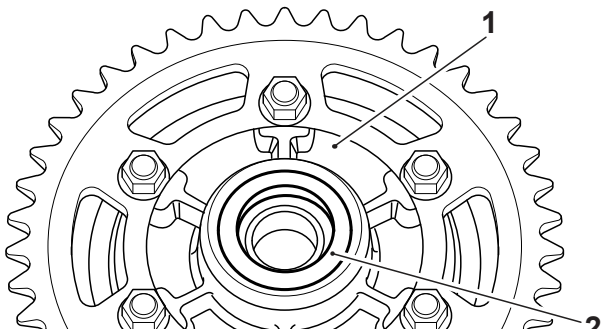
1. Install the cush drive rubbers to the wheel hub.
2. Fit the spacer to the wheel hub as noted for removal.
3. Refit the sprocket carrier to the wheel.

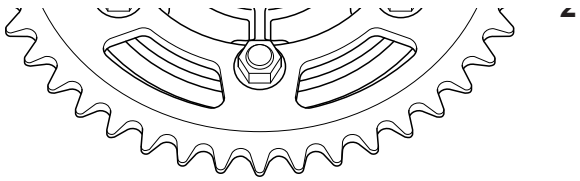
Perform the following operations:

- Rear Wheel - Installation

Rear Sprocket Carrier Bearings - Disassembly

1. Remove the rear sprocket carrier and cush drive (see Rear Sprocket - Removal).
2. Remove and discard the seal.

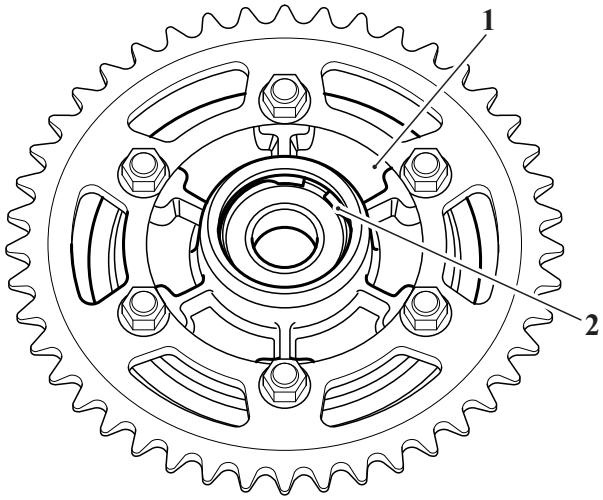




cjej_1

1. **Sprocket carrier**
2. **Seal**

3. Remove and discard the bearing circlip.



cjej

1. **Sprocket carrier**
2. **Circlip**

WARNING

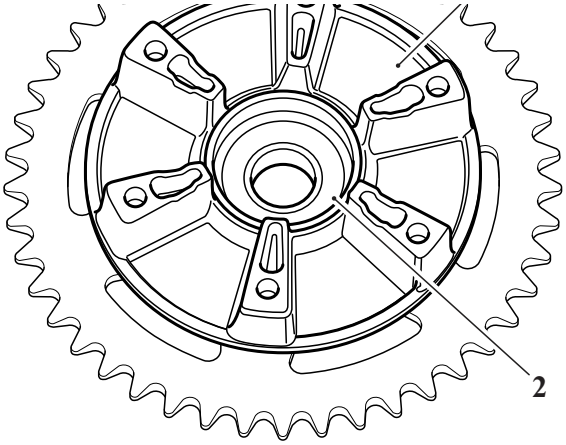
Always wear eye, hand and face protection when using a hammer and drift. Use of a hammer and drift can cause bearings to fragment. Pieces of fragmented bearing could cause eye and soft tissue injuries if suitable protective apparel is not worn.

CAUTION

To prevent sprocket carrier damage and to aid bearing removal, always apply force evenly on both sides of the bearing to prevent it from 'tipping' and becoming stuck. Application of uneven force will lead to difficulty in removing the bearing and to a damaged drive flange.

4. Turn the sprocket carrier over, and use a pin punch to drift out the ball bearing.





cjek

1. **Sprocket carrier**
2. **Ball bearing**

Drive Pulley Flange Bearings - Inspection

1. Inspect the bearings and bearing sleeve for wear or damage. Renew if necessary.

Rear Sprocket Carrier Bearings - Assembly

WARNING

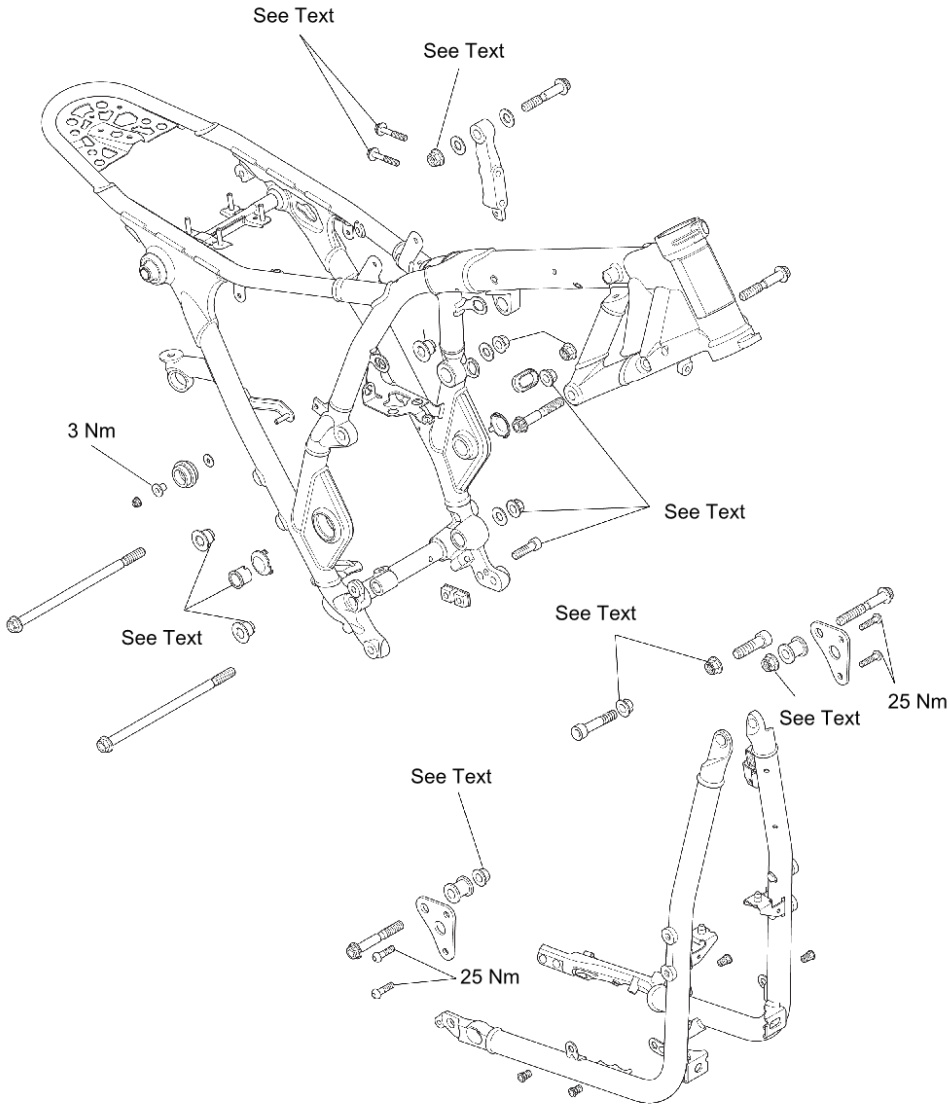
When using a press, always wear overalls, eye, face and hand protection. Objects such as bearings frequently break-up under load and the debris caused during break-up may cause damage and injury to unprotected parts of the body.

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

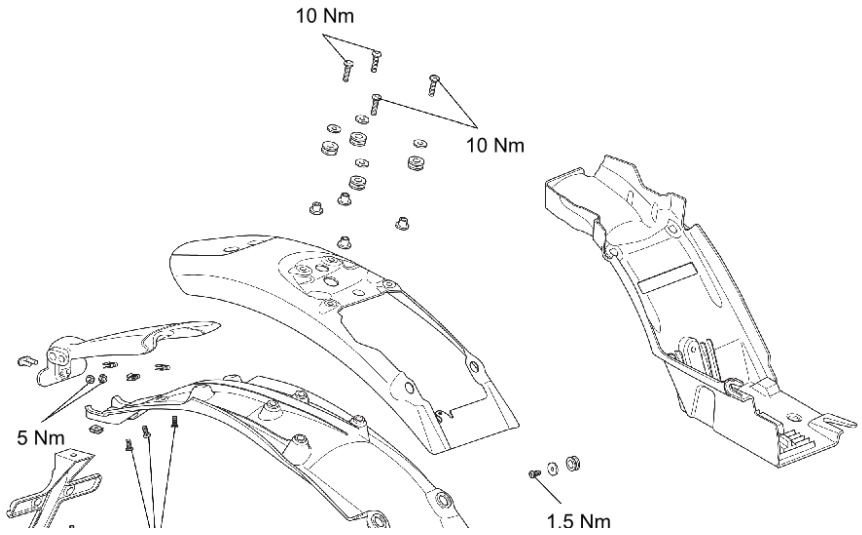
1. Position the bearing, marked side facing outwards, to the drive flange.
2. Using a suitable press, fully insert the bearing into the sprocket carrier, ensuring both the inner and outer races are pressed.
3. Fit a new circlip.
4. Install a new seal, marked side facing outwards, to the sprocket carrier.
5. Lubricate the seal's knife-edge with grease to NLGI 2 specification.
6. Install the cush drive rubbers to the wheel hub.
7. Fit the spacer to the wheel hub as noted for removal.
8. Refit the sprocket carrier to the wheel.

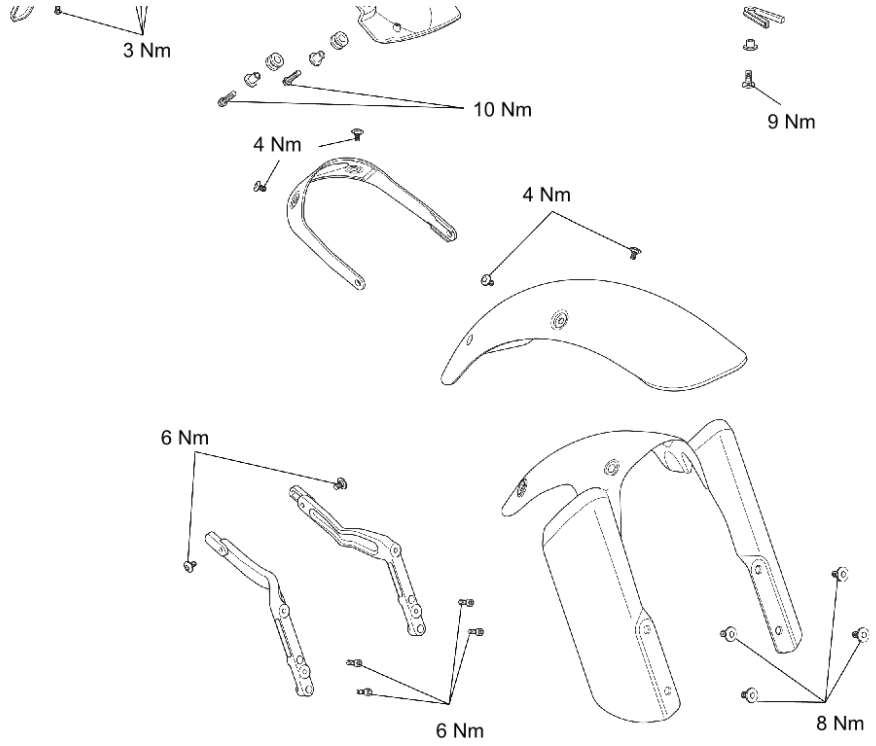
Frame and Bodywork

Exploded View – Frame and Fixings

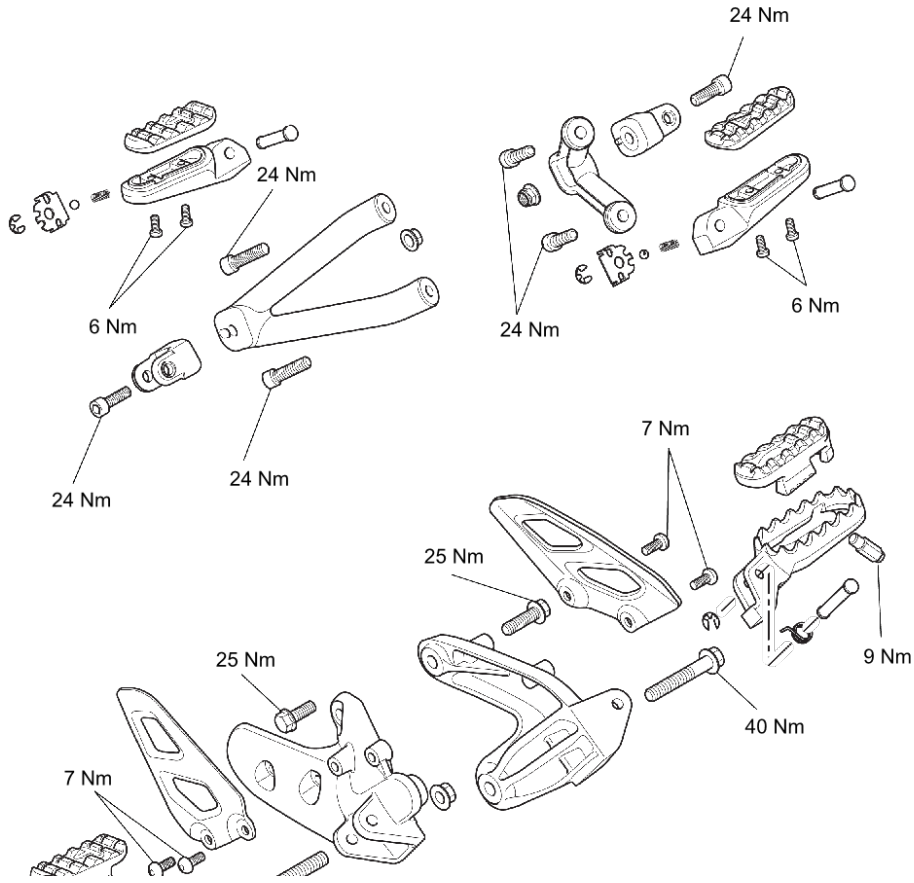


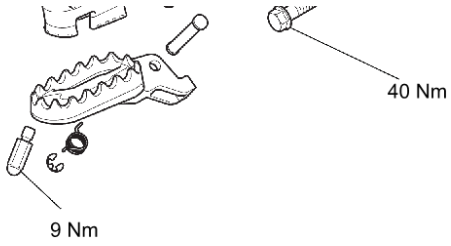
Exploded View – Front and Rear Mudguards



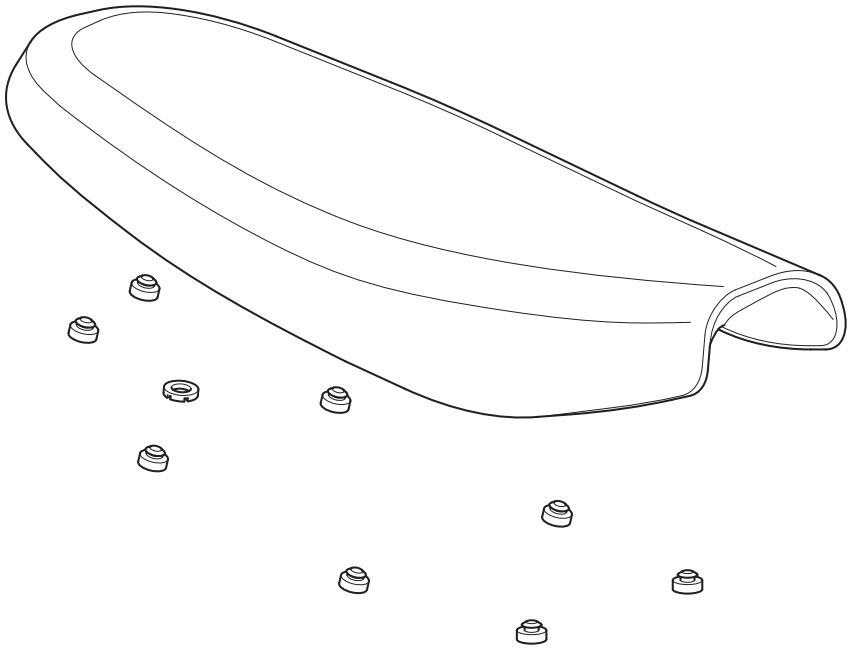


Exploded View – Front and Rear Footrests

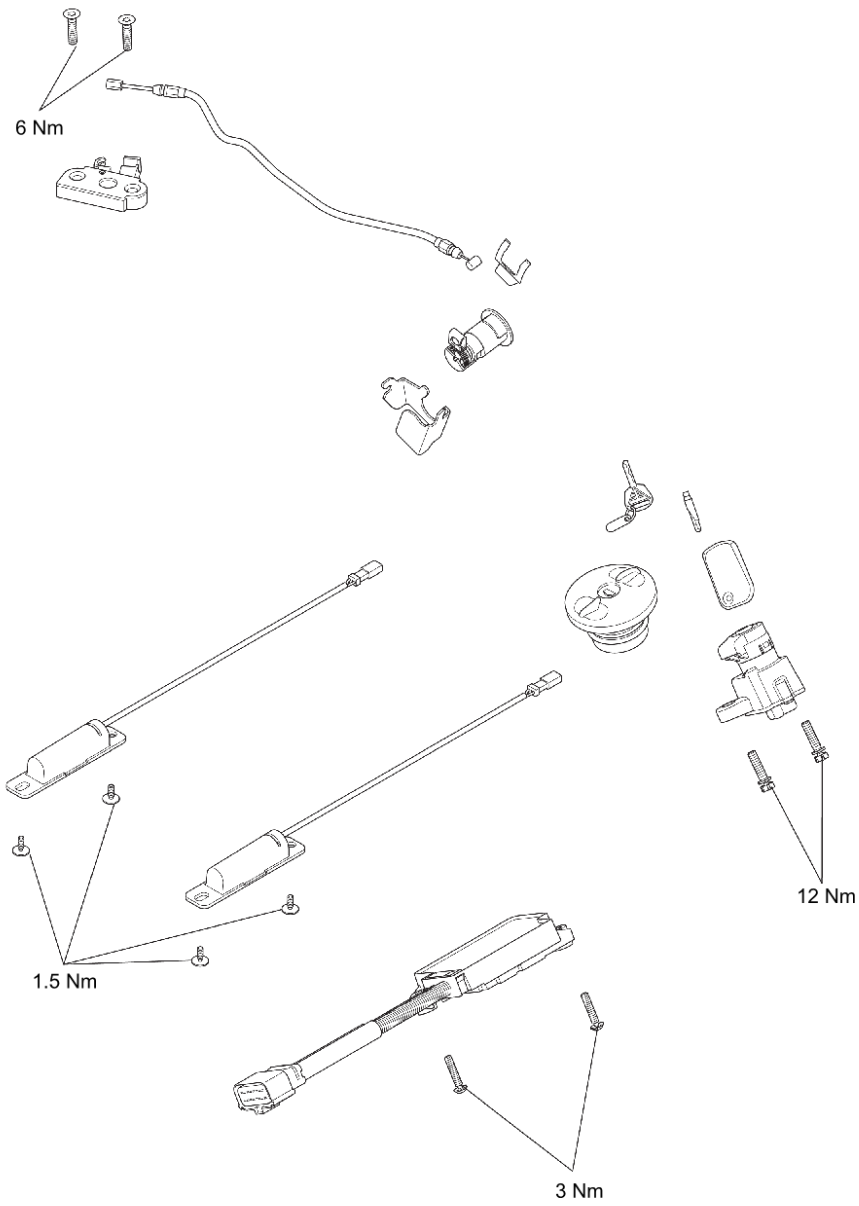




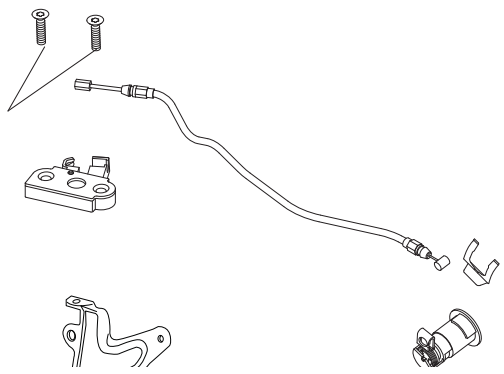
Exploded View – Seat

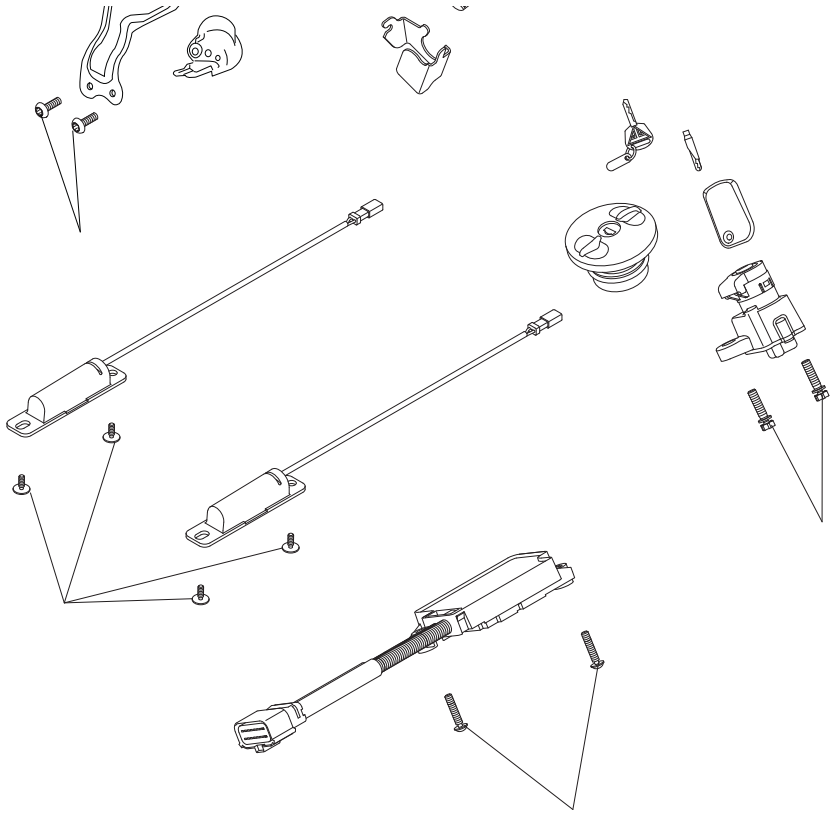


Exploded View - Steering Lock, Lockset and Keyless ECM

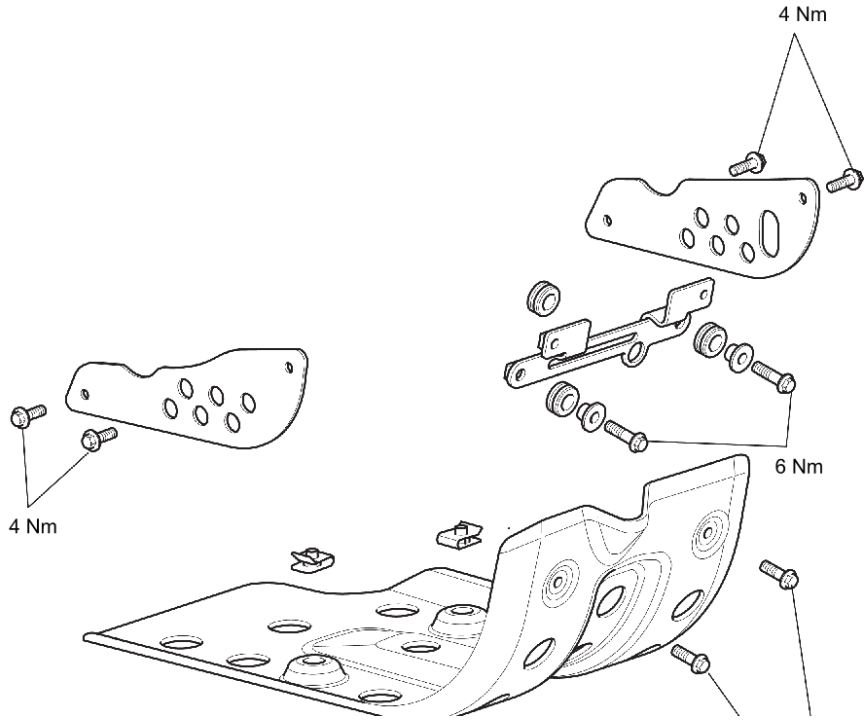


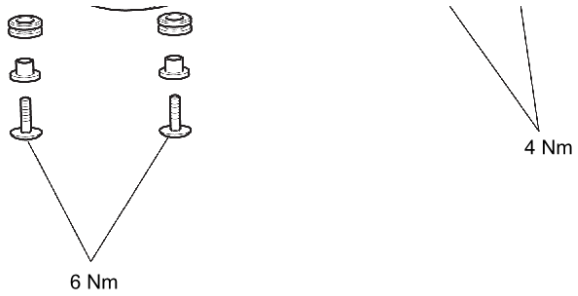
Exploded View - Ignition Switch, Steering Lock, Lockset and Keyless ECM (US only)



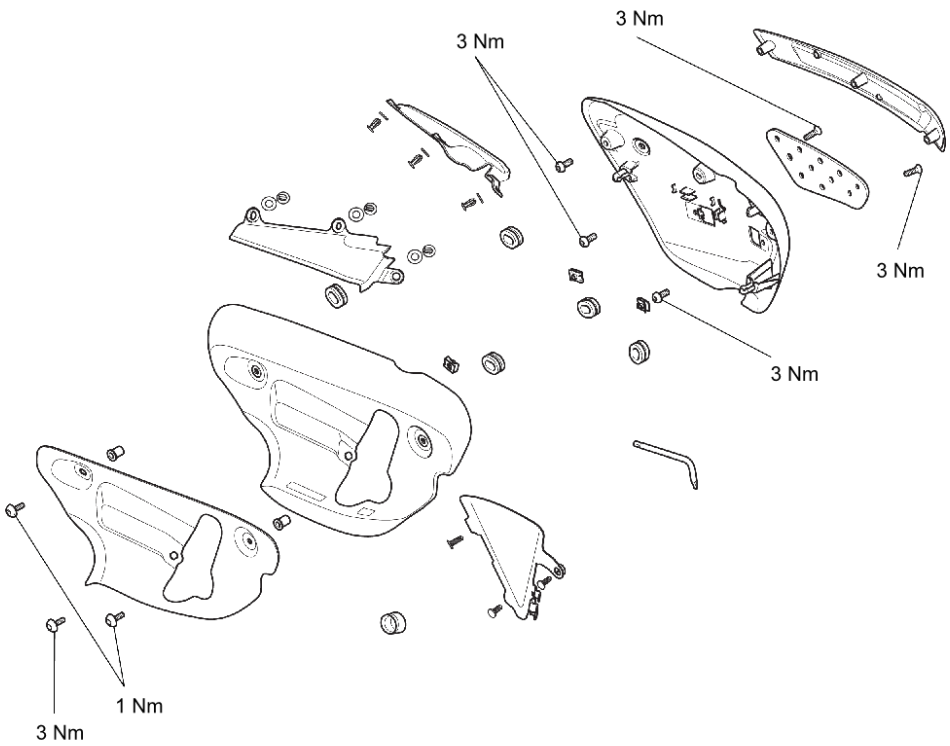


Exploded View - Sump Guard

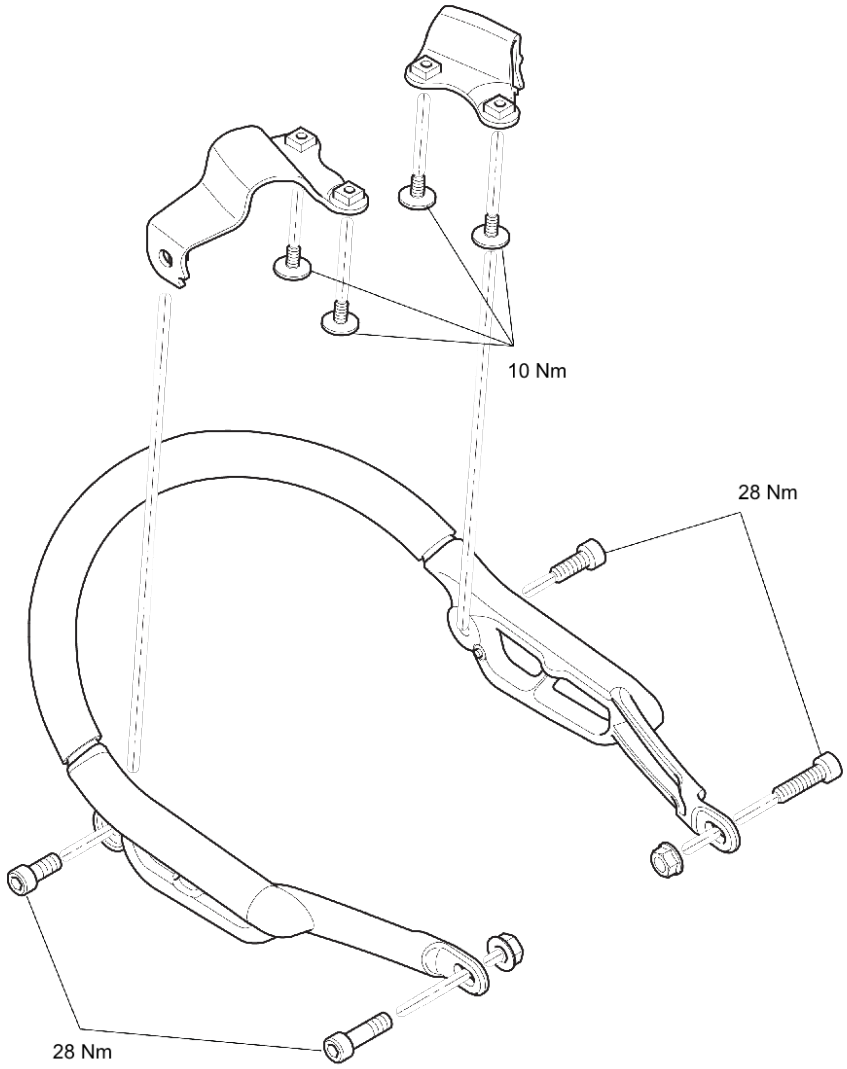




Exploded View – Side Panels

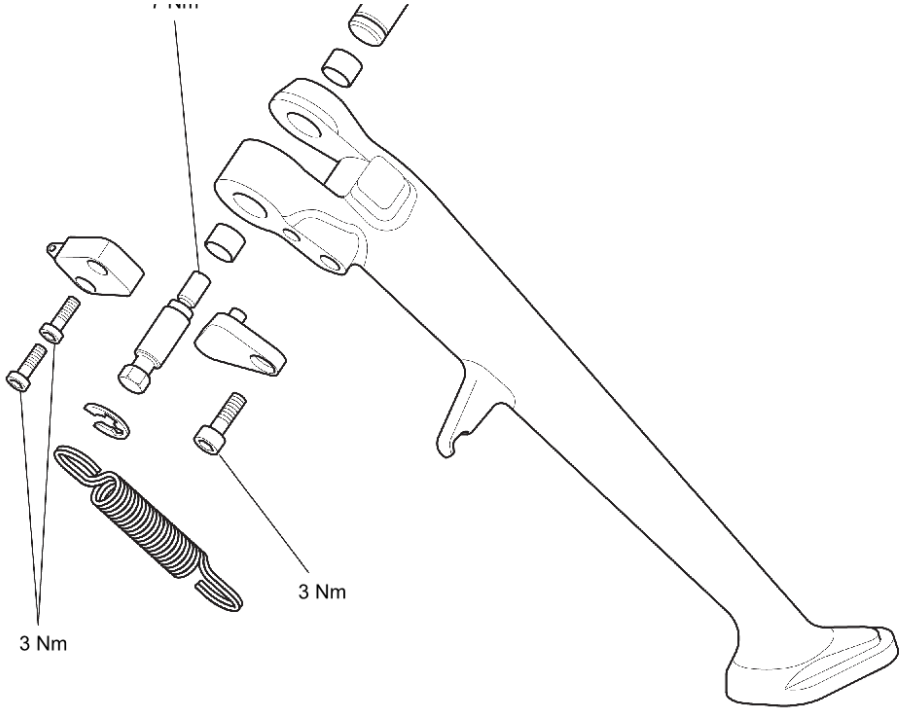


Exploded View - Grab Rail

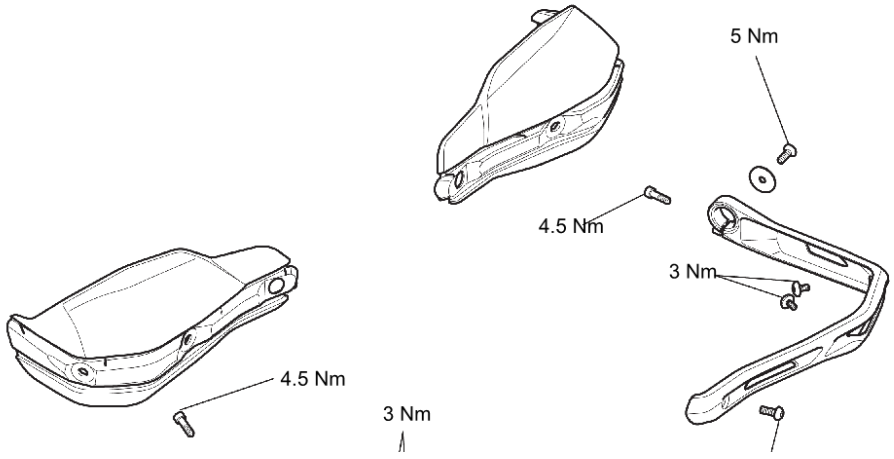


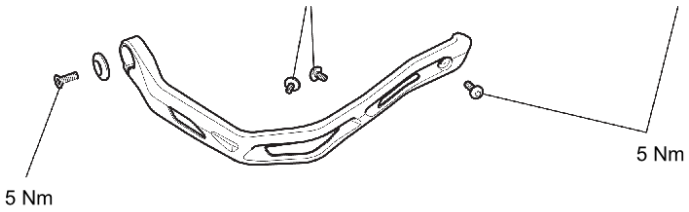
Exploded View – Side Stand





Exploded View - Handguards





General Frame Inspection

1. Inspect the frame, bodywork and footrests for accident and other damage, cracks, splits and general dilapidation. Check all fixings for security. If any faults are found, rectify as necessary. If any faults with the frame are found, the frame must be replaced; repairs to the frame are not permitted.

WARNING

If the motorcycle is involved in an accident or collision it must be taken to an authorised Triumph dealer for inspection and repair before it is ridden again.

WARNING

The frame must not be modified in any way. Any modification to the frame, such as welding or drilling, may weaken the structure causing an unsafe riding condition leading to loss of 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.

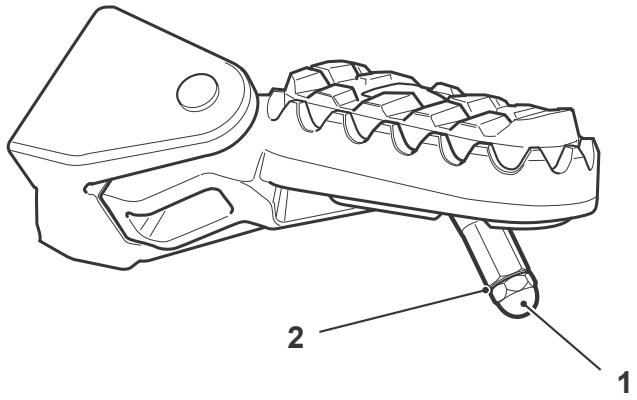
WARNING

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.

Bank Angle Indicators

1. Inspect the bank angle indicators on the rider's footrests for wear.
2. The bank angle indicators have a wear indicator groove. Replace a bank angle indicator if it has worn down to the groove.



1. **Bank angle indicator**
2. **Wear indicator groove**

WARNING

Use of a motorcycle with bank angle indicators worn beyond the maximum limit will allow the motorcycle to be banked to an unsafe angle. Therefore, always replace the bank angle indicator pegs when they are worn down to the wear indicator groove.

Banking to an unsafe angle may cause instability, loss of motorcycle control and an accident.

WARNING

The bank angle pegs must not be used as a guide to how far the motorcycle may be safely banked. This depends on many various conditions including, but not limited to, road surface, tyre condition and weather. Banking to an unsafe angle will lead to loss of motorcycle control and an accident.

Seat - Removal

WARNING

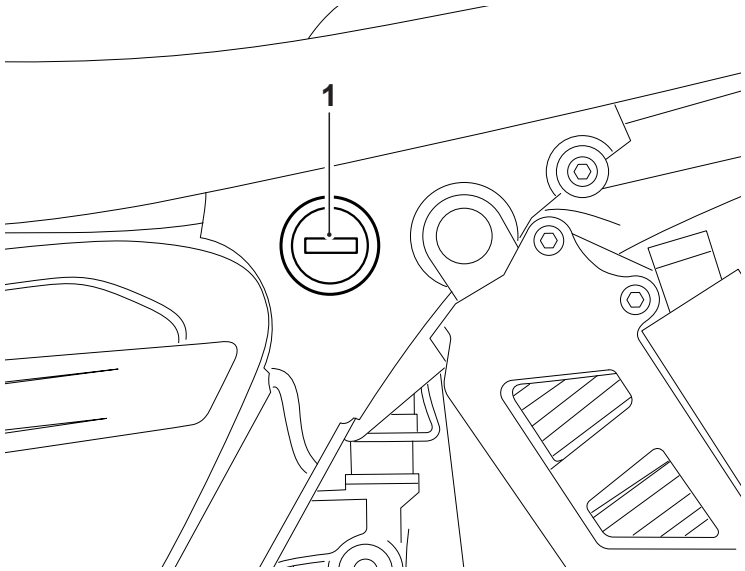
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

CAUTION

To prevent 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. Insert the ignition key into the seat lock and turn it anticlockwise while pressing down on the rear of the seat.
2. Lift the seat up from the back and slide rearwards for complete removal from the motorcycle.



1. Seat lock

Seat - Installation

1. Engage the seat's tongue under the fuel tank.

Note

- **An audible click can be heard when the seat is correctly engaged in the lock.**

2. Press firmly down in the centre of the seat to engage the seat lock.

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.

3. Grasp the seat and ensure that it is securely retained.

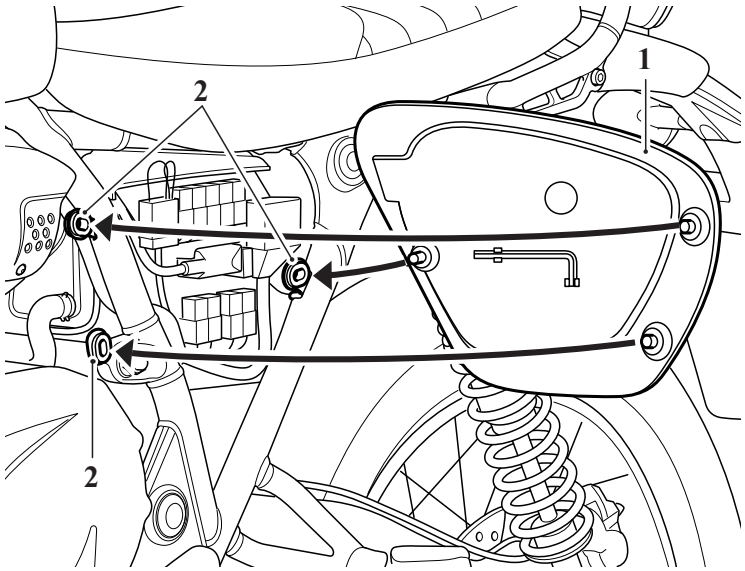
Side Panels

WARNING

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

Left Hand Side Panel

To remove the left hand side panel, grasp the panel firmly in both hands and pull the panel away from the motorcycle until it clears the three retaining grommets (leaving the grommets in place).



1. **Side panel (left hand side)**
2. **Grommets**

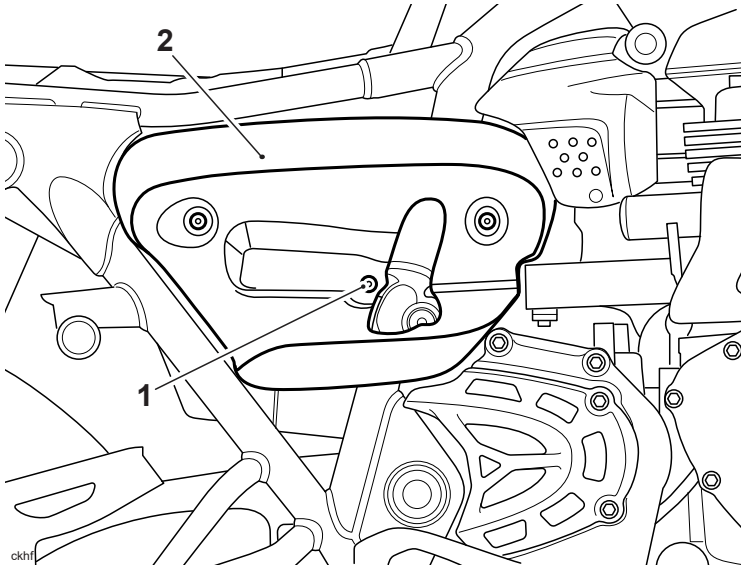
To refit, position the three locating dowels to the grommets, then press firmly to secure the panel.

Finally, grasp the panel and make sure that it is fully retained.

Right Hand Side Panel

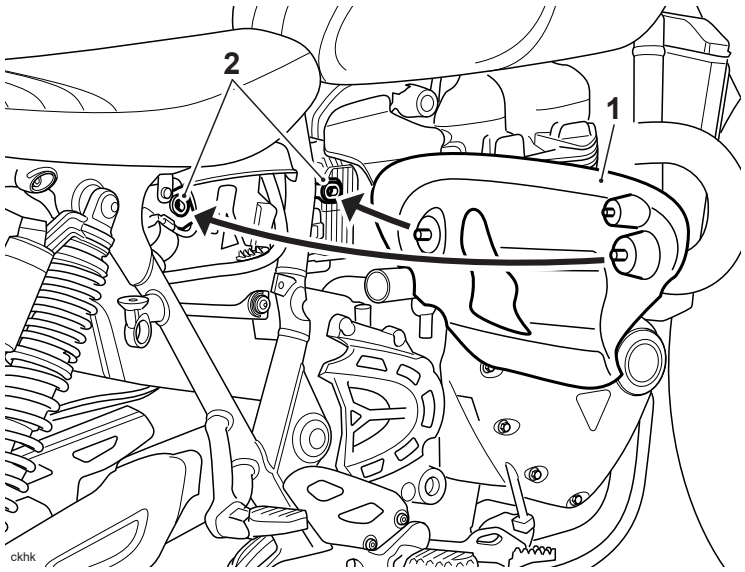
To remove the right hand side panel, remove the exhaust silencers (see Exhaust Silencer - Removal).

Release the fixing securing the side panel to the frame.



1. **Side panel (right hand side)**
2. **Fixing**

Pull the panel away from the motorcycle until it clears the two top retaining grommets (leaving the grommets in place) and remove the panel.



1. **Side panel (right hand side)**
2. **Upper grommets**

To refit, position the two locating dowels to the upper grommets, then press firmly to secure

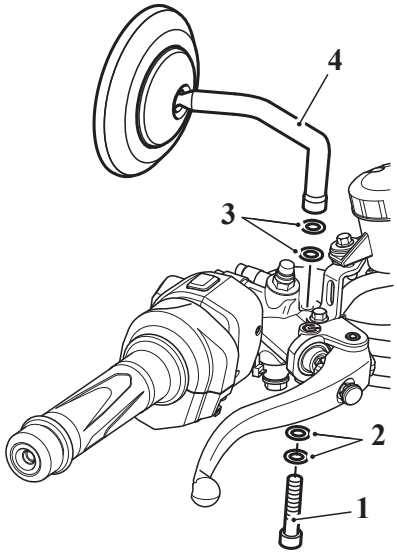
the panel.

Fit the fixing and tighten to **1 Nm**.

Refit the exhaust silencers (see Exhaust Silencer - Installation).

Mirrors - Removal

1. Remove the mirror fixing and collect the two lower washers. Discard the fixing.
2. Remove the mirror and collect the two upper washers.



L0840

1. **Fixing**
2. **Washers (2 lower)**
3. **Washers (2 upper)**
4. **Mirror**

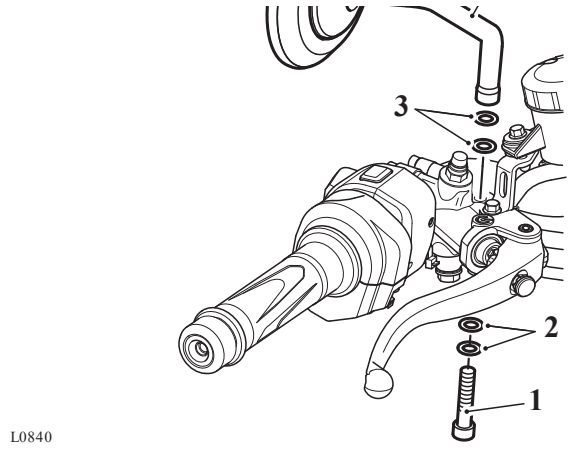
Mirrors - Installation

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.

1. Fit the two upper washers into the housing for the mirror.
2. Fit the two lower washers to the mirror new fixing.
3. Align the mirror to its mounting and fit the mirror fixing. Do not fully tighten at this stage.
4. Position the mirror arm to give rear visibility in the riding position and tighten the fixing to **20 Nm**.



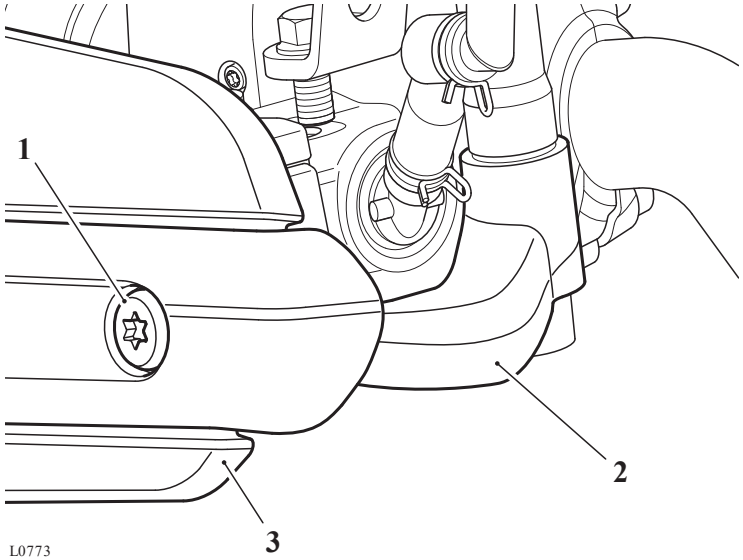


1. **Fixing**
2. **Washers (2 lower)**
3. **Washers (2 upper)**
4. **Mirror**

5. Repeat the procedure for the other mirror.

Handguards - Removal

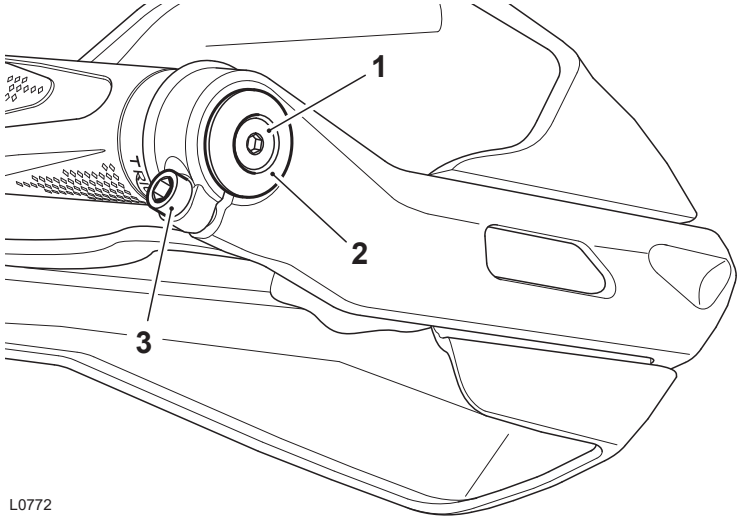
1. Remove the fixing securing the handguard to mirror bracket. Discard the fixing.



1. **Fixing**
2. **Mirror bracket**
3. **Handguard (right handguard shown)**

2. Remove the handlebar end fixing and the handlebar end finisher. Discard the fixing.
3. Remove and discard the handguard pinch bolt. Remove the handguard.





1. **Fixing**
2. **Handlebar end finisher**
3. **Handguard pinch bolt**

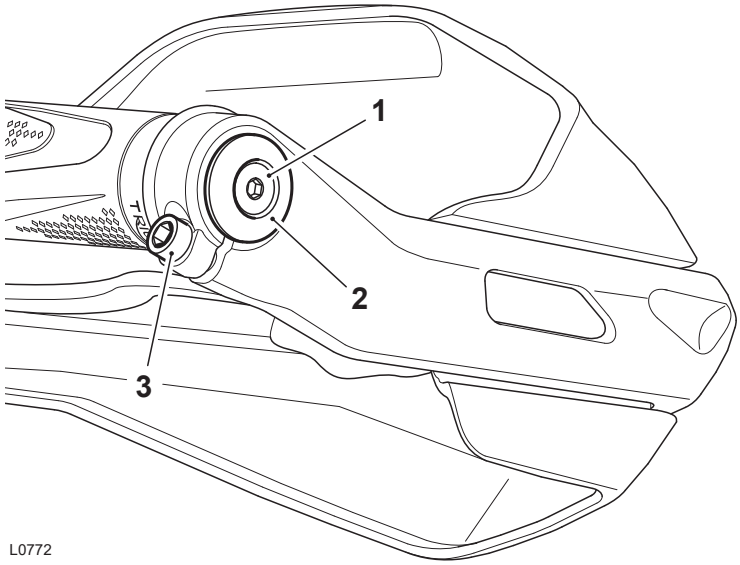
4. Repeat for the other handguard.

Handguards - Installation

Note

- **Ensure that the handlebar end weight anti-rotation lug is correctly located to the slot on the end of the handlebar.**

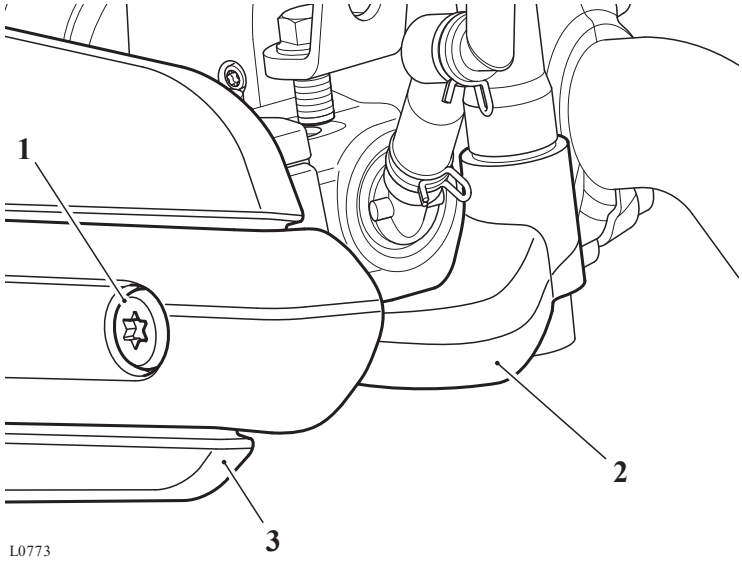
1. Position the handguard onto the handlebar. Fit the handguard pinch, handlebar end finisher and its fixing. Do not fully tighten at this stage.



1. **Fixing**
2. **Handlebar end finisher**

3. **Handguard pinch bolt**

2. Position the handguard onto the mirror bracket and secure with a new fixing. Tighten the fixing to **5 Nm**.



1. **Fixing**
2. **Mirror bracket**
3. **Handguard (right handguard shown)**

3. Tighten the handlebar end fixing to **5 Nm**.
4. Tighten the handguard pinch bolt to **4.5 Nm**.
5. Repeat for the other handguard.

Steering Lock - Removal

WARNING

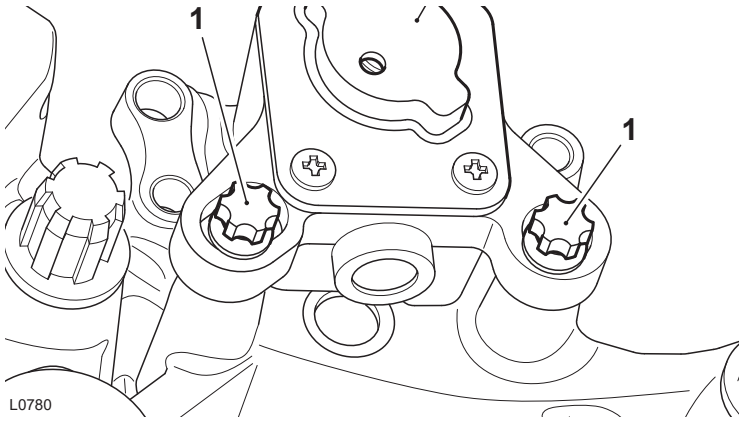
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Upper Yoke - Removal

1. Remove the shear bolts then remove the steering lock.





1. **Shear bolts**
2. **Steering lock**

Steering Lock - Installation

WARNING

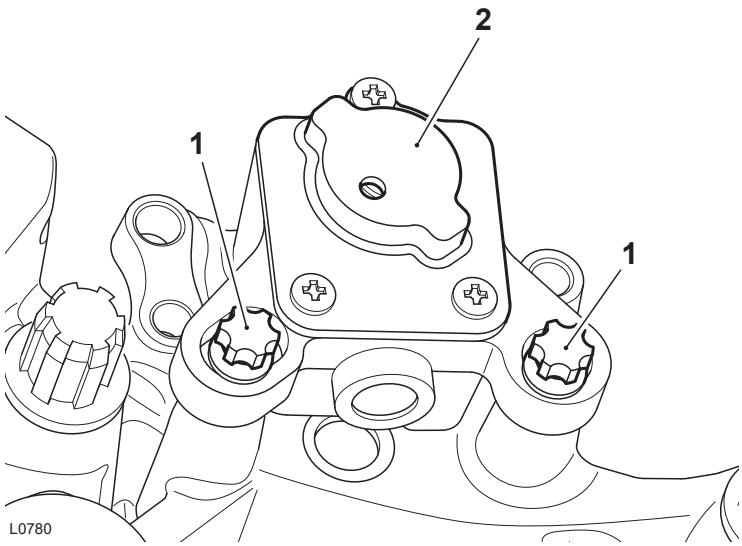
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Fit the steering lock to the upper yoke.

Note

- **The Torx head section on top of the bolt snaps off when fully tightened, leaving a tamper-proof dome.**

2. Fit new shear bolts and tighten to **12 Nm**.



1. **Shear bolts**
2. **Steering lock**

Perform the following operations:

- Upper Yoke - Installation
- Battery - Installation
- Seat - Installation

Front Mudguard - Removal

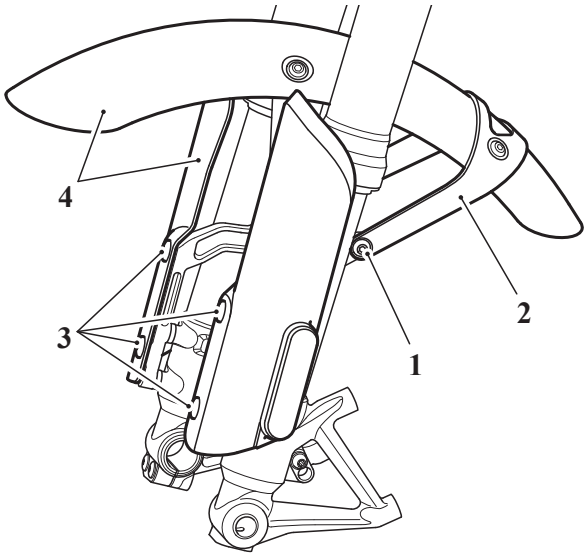
WARNING

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.

Perform the following operations:

- Front Wheel - Removal

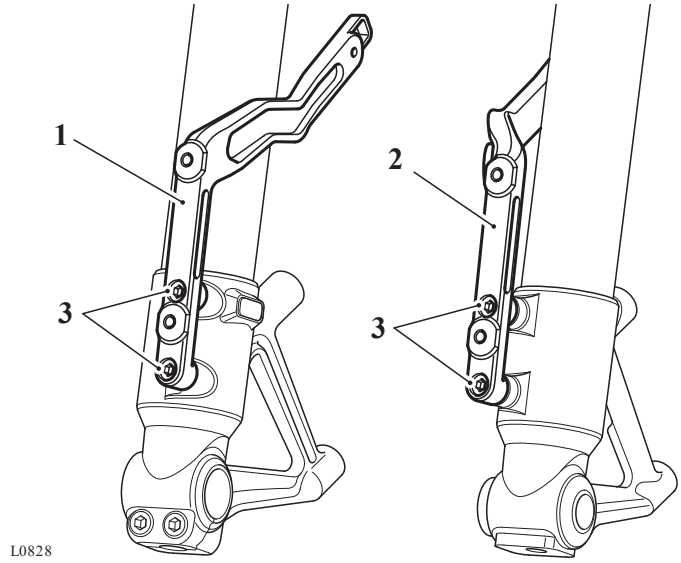
1. Remove the two fixings that attach the mudguard stay to the front mudguard brackets. Discard the fixings.
2. Remove the four fixings that attach the front mudguard and support assembly to the front forks and carefully remove the mudguard.



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1. **Mudguard stay fixings**
2. **Mudguard stay**
3. **Mudguard support fixings**
4. **Mudguard and support assembly**

3. Remove and discard the two fixings that attach each of the two front mudguard brackets to the fork legs and remove the mudguard brackets.



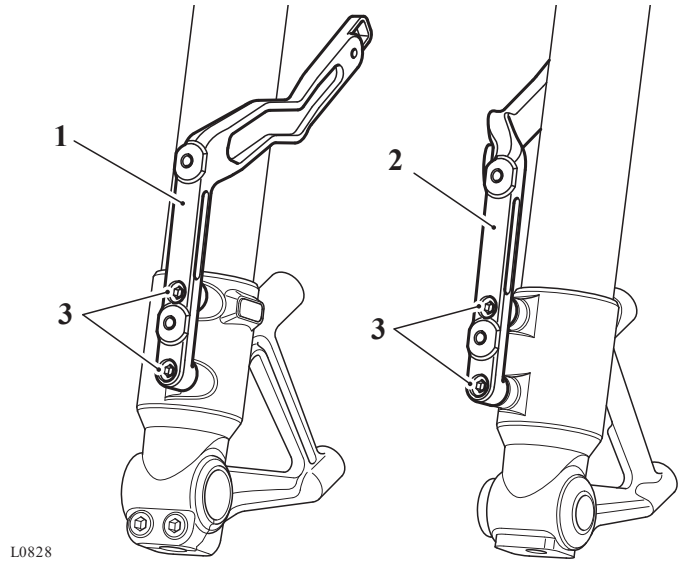
1. **Right mudguard bracket**
2. **Left mudguard bracket**
3. **Fixings**

Front Mudguard - Installation

WARNING

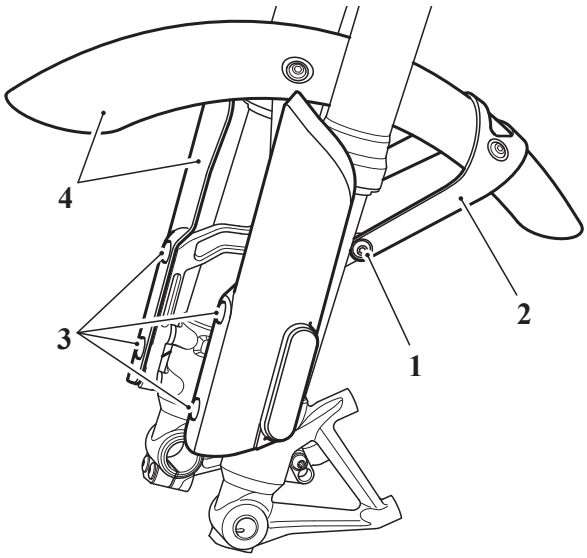
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Put the left mudguard bracket into position and attach it with two new fixings. Torque the fixings to **6 Nm**.



1. **Right mudguard bracket**
2. **Left mudguard bracket**
3. **Fixings**

2. Put the right mudguard bracket into position and attach it with two new fixings. Torque the fixings to **6 Nm**.
3. Carefully manoeuvre the mudguard and support assembly into position between the forks.
4. Install the four fixings and tighten them to **8 Nm**.



1. **Mudguard stay fixings**
2. **Mudguard stay**
3. **Mudguard support fixings**
4. **Mudguard and support assembly**

5. Install the two mudguard stay new fixings and torque them to **6 Nm**.

Perform the following operations:

- Front Wheel - Installation

Rear Mudguard - Removal

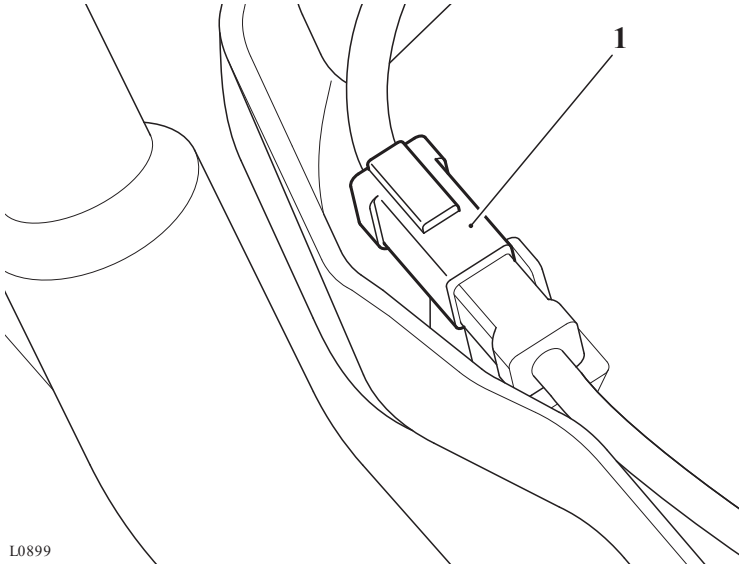
WARNING

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.

Perform the following operations:

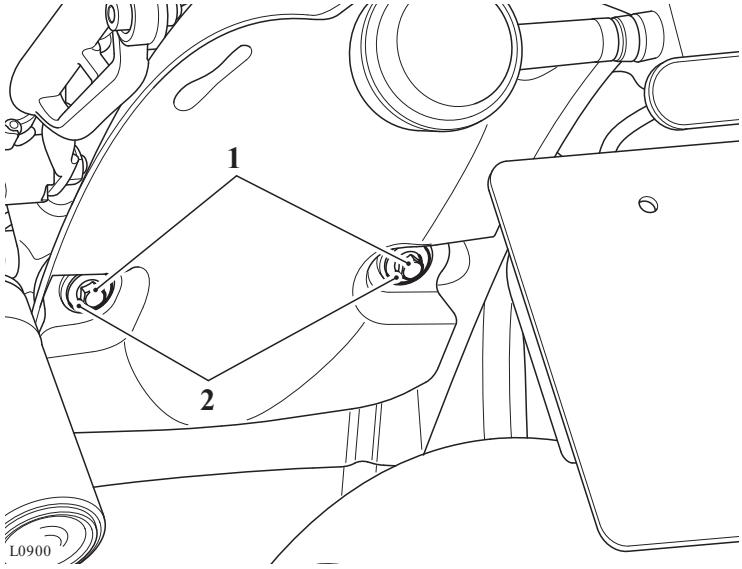
- Seat - Removal
- Battery - Removal

1. Disconnect the rear light harness from the main harness.



1. Rear light connector

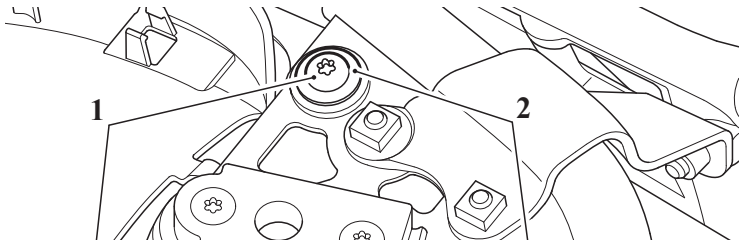
2. Remove the two front fixings and flanged sleeves from the underside of the rear mudguard.

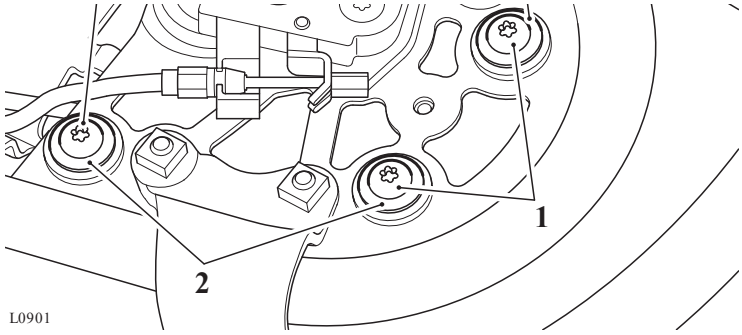


1. Fixings

2. Flanged sleeve

3. Remove the four rear fixings and flanged sleeves from the rear mudguard and carefully remove the mudguard.



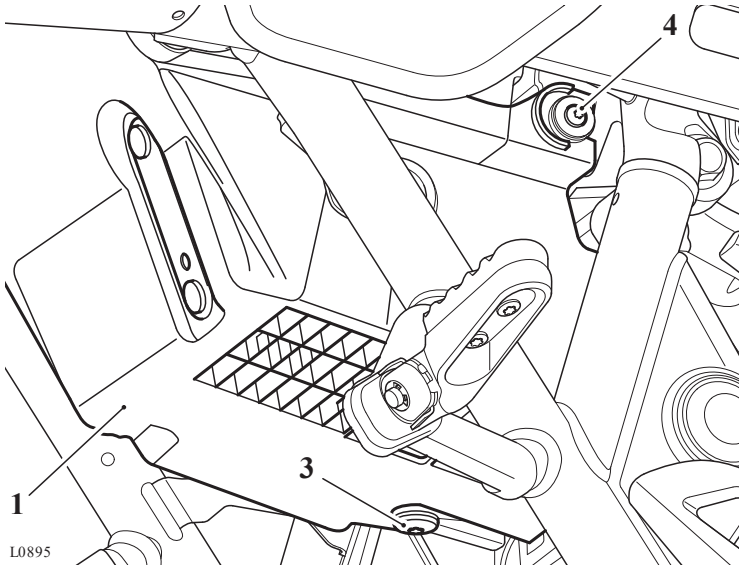


1. **Fixings**
2. **Flanged sleeves**

Note

- **Note the routing and retaining clips of the rear light harness for installation.**

4. Detach the rear light harness from the rear mudguard tray.
5. Slide the rear mudguard tray rearwards to detach its mountings from the right hand side of the airbox and left hand side of the frame (swinging arm removed for clarity).



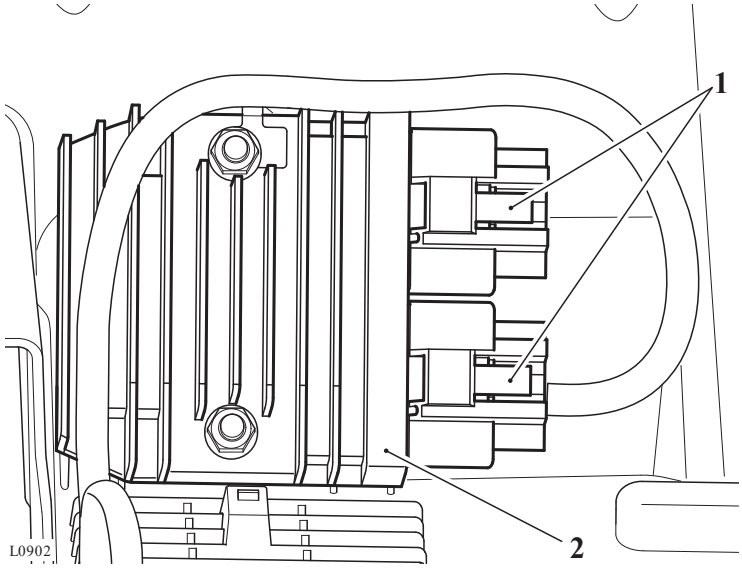
1. **Mudguard tray**
2. **Mounting to frame**
3. **Mounting to airbox**

Note

- **The alternator regulator/rectifier harnesses are secured to the keyless electronic control module harness with a rubber band. The keyless electronic control module is located under the battery box.**
- **Note the routing of the harnesses for installation.**

6. Release the rubber band and detach the alternator regulator/rectifier harnesses from the keyless electronic control module harness

7. Disconnect both electrical connectors from the alternator regulator/rectifier and remove the rear mudguard tray.



1. Electrical connectors

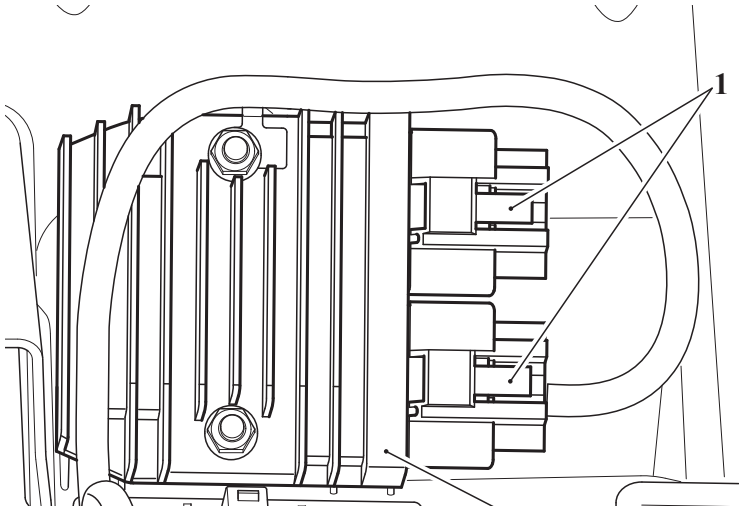
2. Alternator regulator/rectifier.

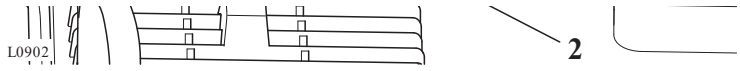
Rear Mudguard - Installation

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. Route the alternator regulator/rectifier harnesses as noted for removal.
2. Secure the alternator harness to the keyless electronic control module harness with the rubber band as noted for removal.
3. Connect both electrical connectors to the alternator regulator/rectifier.

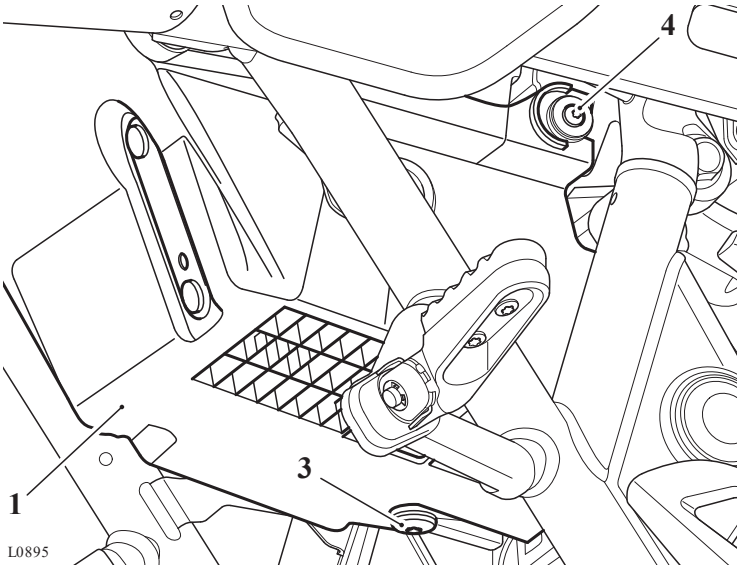




1. Electrical connectors

2. Alternator regulator/rectifier.

4. Secure the alternator regulator/rectifier harnesses to the keyless electronic control module harness with the rubber band as noted for removal.
5. Position the rear mudguard tray to its mountings on the right hand side of the airbox and left hand side of the frame and slide forwards until the mountings are fully engaged (swinging arm removed for clarity).

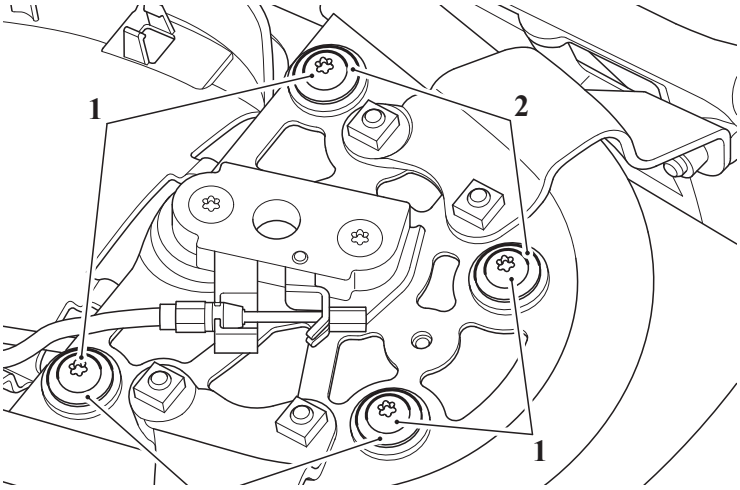


1. Mudguard tray

2. Mounting to frame

3. Mounting to airbox

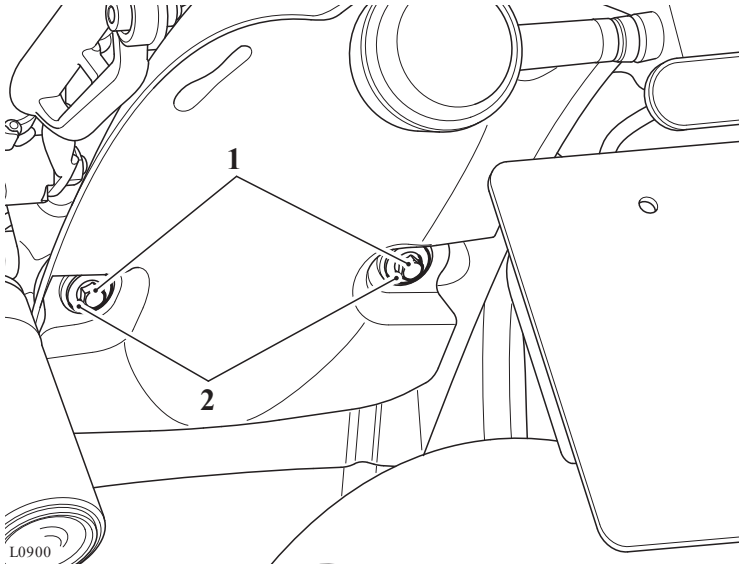
6. Carefully locate the mudguard to the frame, positioning the locating holes to the holes in the frame.
7. Fit the four flanged sleeves and the new fixings. Tighten the fixings to **10 Nm**.





1. **Fixings**
2. **Flanged sleeves**

8. Fit the two flanged sleeves and the new fixings. Tighten the fixings to **10 Nm**.



1. **Fixings**
2. **Flanged sleeve**

9. Connect the rear light harness to the main harness.
10. Attach the rear light harness to the rear mudguard tray as noted for removal.

Perform the following operations:

- Battery - Installation
- Seat - Installation

Grab Handle - 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.

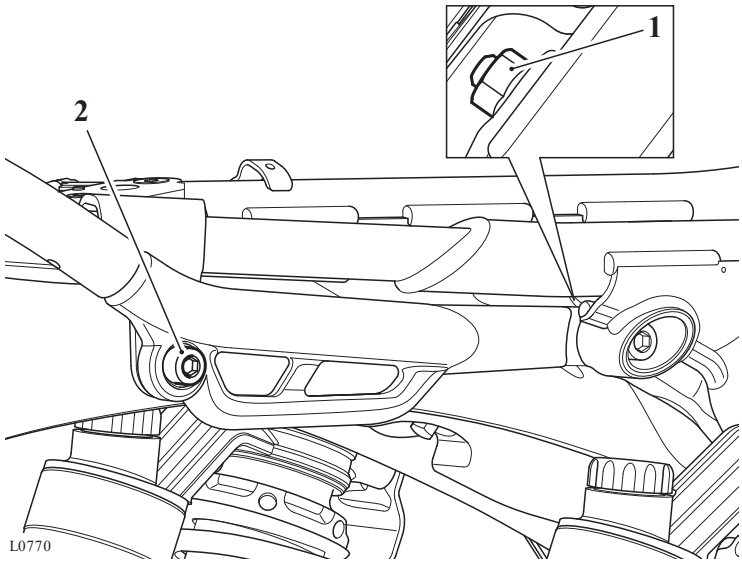
Note

- **To prevent damage to the mudguard do not place or lean it against any surface which may damage the paint work or rear lights.**
- **Care must be taken when removing the grab handle to prevent damage to the mudguard.**

Perform the following operations:

- Seat - Removal
- Rear Mudguard - Removal

1. Release the four fixings.

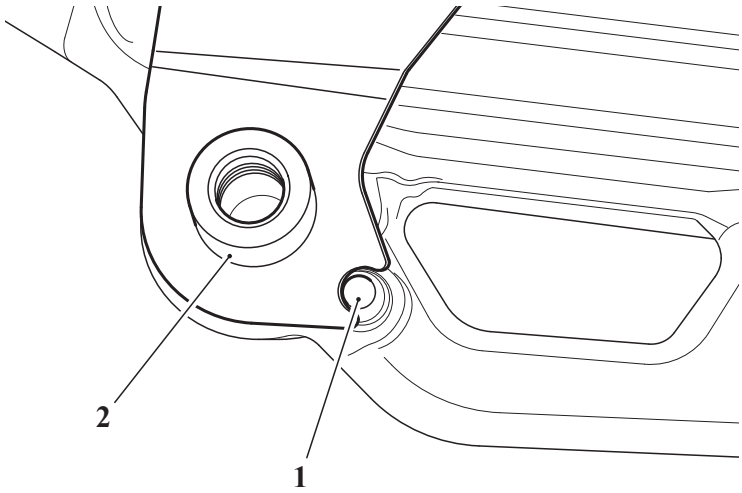


1. **Front fixings (right hand side)**
2. **Rear fixing (right hand side)**

Note

- **Note the position of the locating lugs on the grab handle to the mounting brackets for installation.**

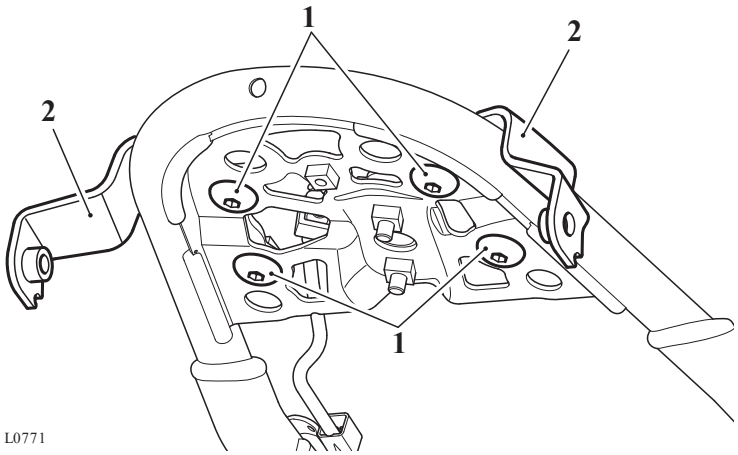
2. Manoeuvre the grab handle slightly forward to disengage the locating lugs from the mounting bracket. Remove the grab handle.



1. **Locating lug**

2. **mounting bracket**

3. Remove the fixings and remove the grab handle mountings. Discard the fixings.



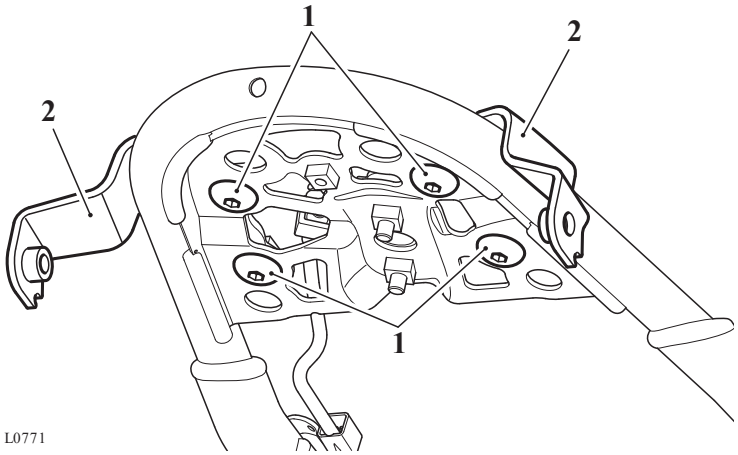
1. **Fixings**
2. **Mountings**

Grab Handle - Installation

WARNING

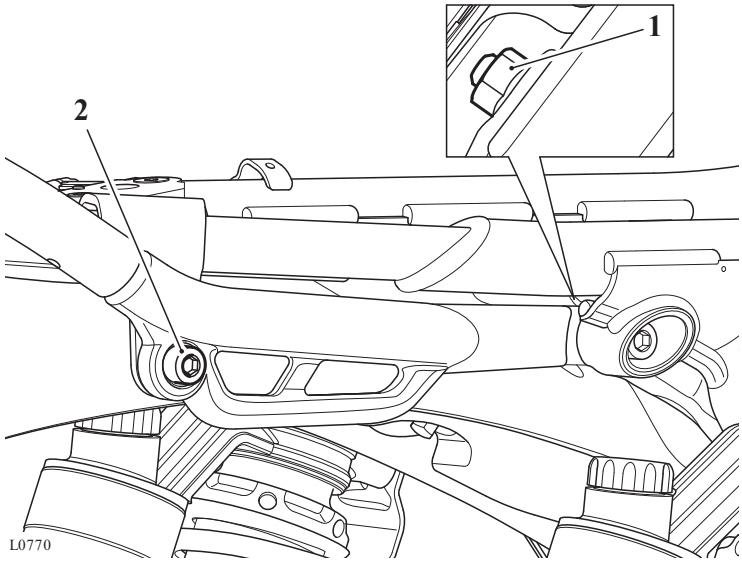
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Align the grab handle mountings to the frame fit new fixings and tighten to **10 Nm**.



1. **Fixings**
2. **Mountings**

2. Align the grab handle locating lugs to the mountings as noted for removal. Fit the four bolts and two new lock nuts and tighten to **28 Nm**.



1. **Front fixings (right hand side)**
2. **Rear fixing (right hand side)**

Perform the following operations:

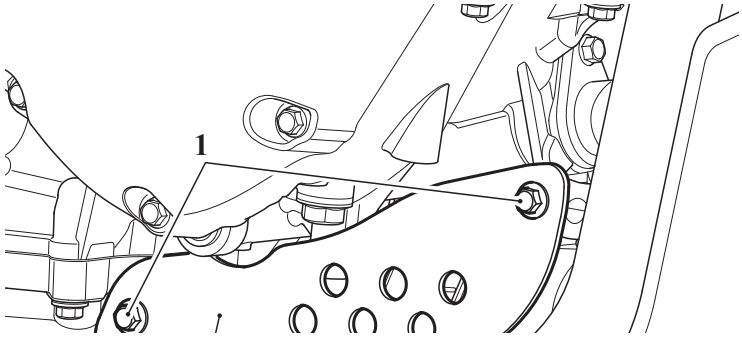
- Rear Mudguard - Installation

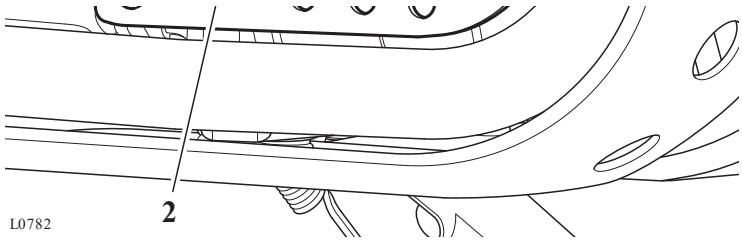
Sump Guard - Removal

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.

1. Release the fixings and remove the sump guard left and right infill panels.



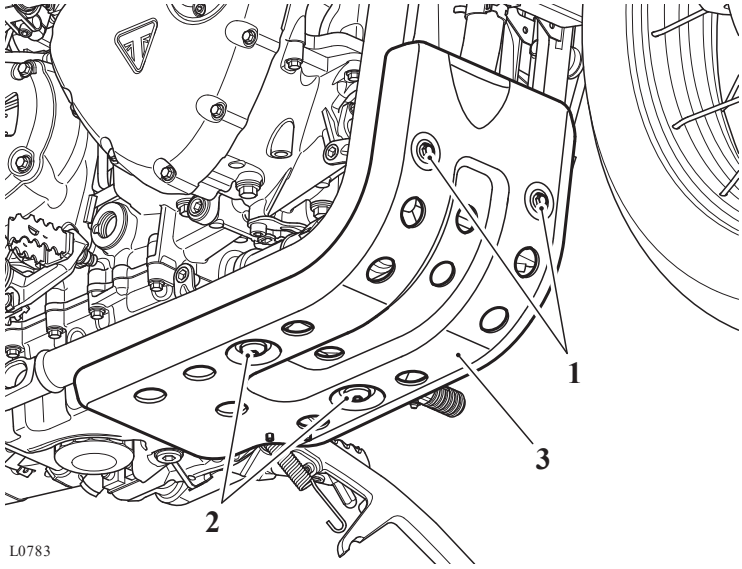


1. **Fixings**
2. **Sump guard infill panel (right hand side)**

Note

- **Note the positions and orientations of the rubber grommets and shouldered washers for installation.**

2. Remove the sump guard front fixings.
3. Remove the sump guard lower fixings with their shouldered washers and lower the sump guard.

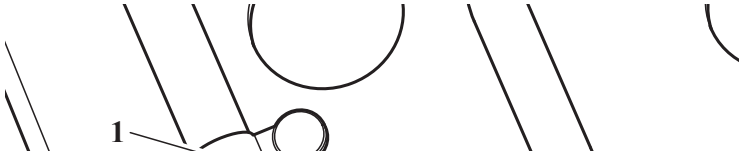


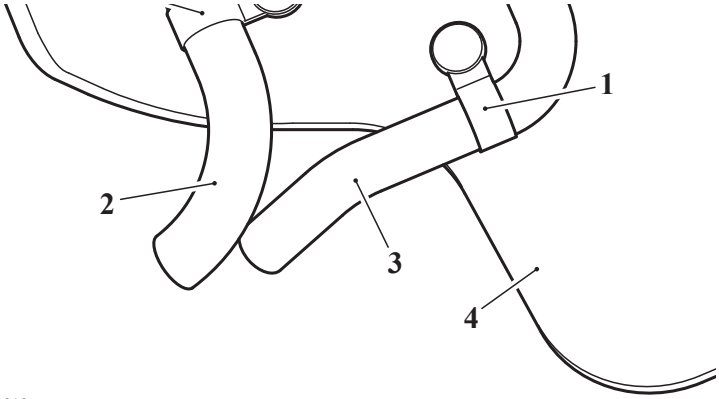
1. **Front fixings**
2. **Lower fixings**
3. **Sump guard**

Note

- **Note the routing of the coolant expansion tank and fuel tank drain hoses for installation.**

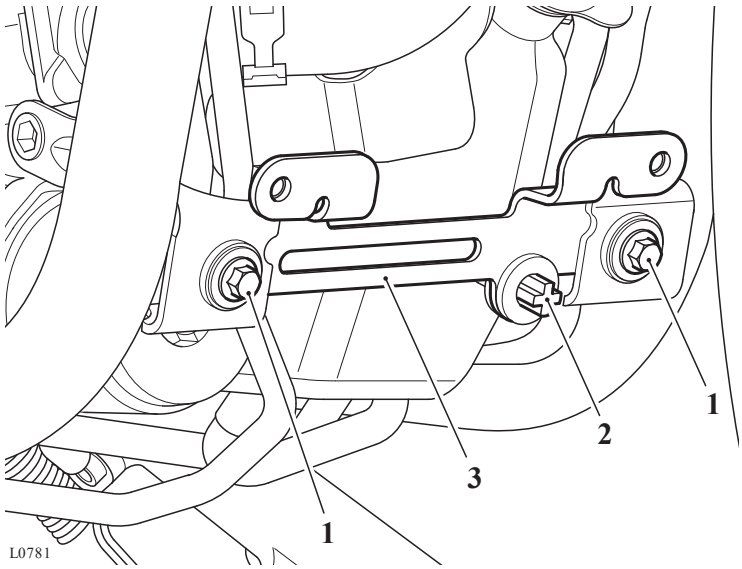
4. Detach the coolant expansion tank and fuel tank drain hoses and remove the sump guard.





1. **Retaining clips**
2. **Coolant expansion tank drain hose**
3. **Fuel tank drain hose**
4. **Sump guard**

5. If required, remove the two fixings, detach the sump guard mounting bracket from the coolant expansion tank and remove the bracket.



1. **Fixings**
2. **Coolant expansion tank spigot**
3. **Mounting bracket**

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

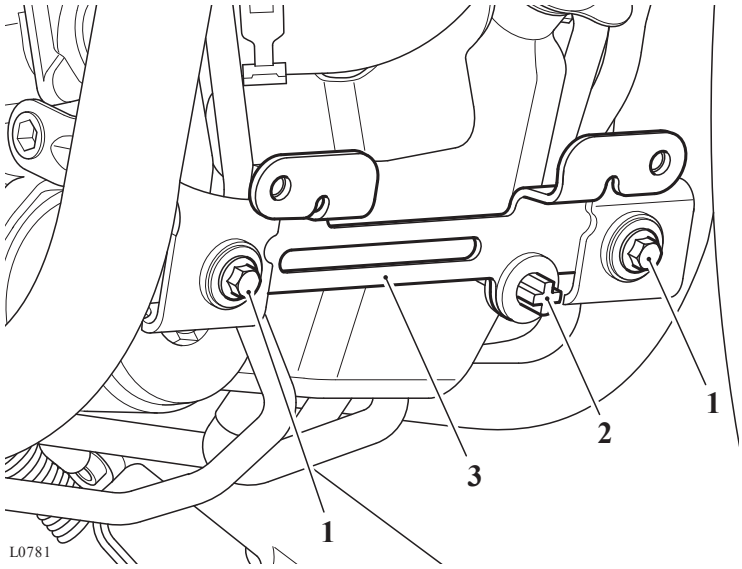
WARNING

motorcycle.

Note

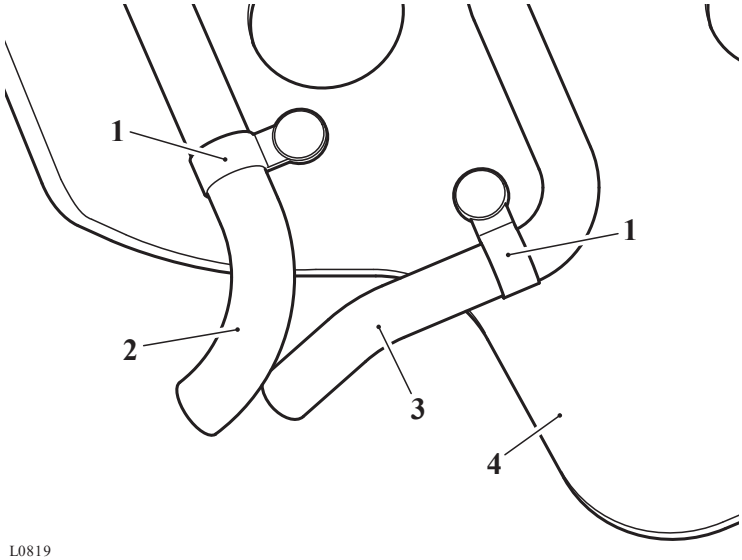
- **Make sure that the rubber grommets and shouldered washers are fitted as noted for removal.**

1. If removed, attach the sump guard bracket to coolant expansion tank, fit the bracket fixings and tighten to **6 Nm**.



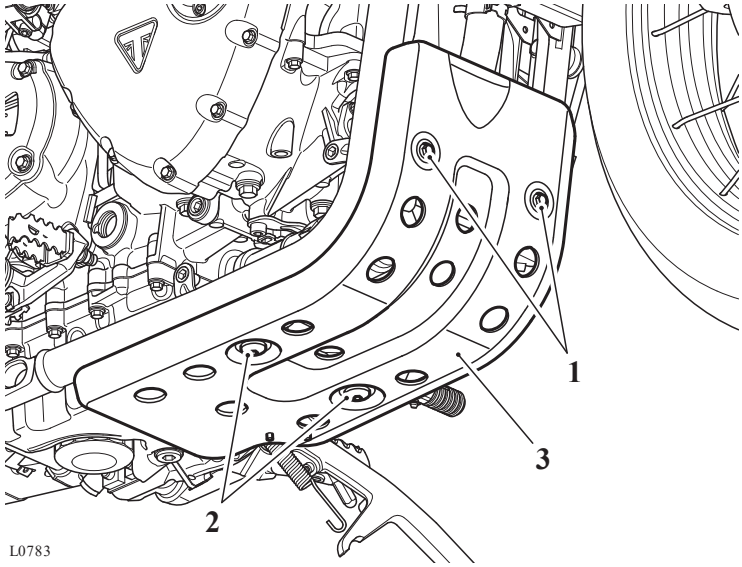
1. **Fixings**
2. **Coolant expansion tank spigot**
3. **Bracket**

2. Secure the coolant expansion tank and fuel tank drain hoses to the sunp guard as noted for removal.



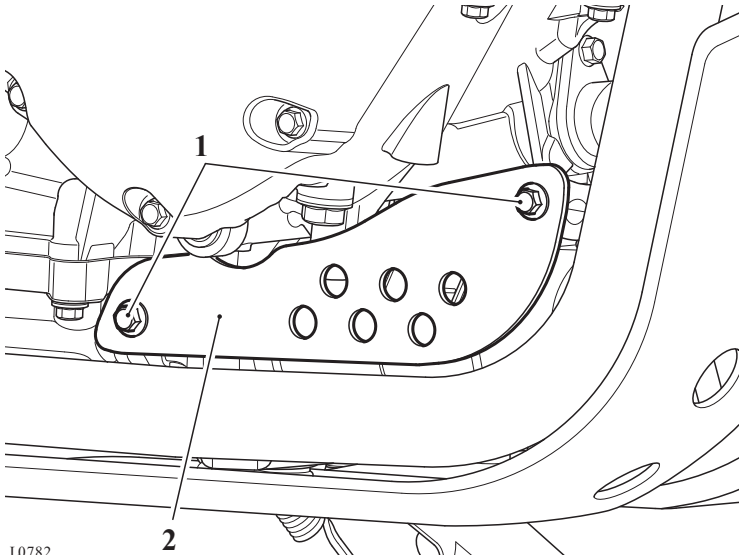
1. **Retaining clips**
2. **Coolant expansion tank drain hose**
3. **Fuel tank drain hose**
4. **Sump guard**

3. Align the sump guard to the mounting bracket.
4. Fit the two front fixings, do not fully tighten at this stage.
5. Fit two new lower fixings and tighten to **6 Nm**.
6. Tighten the front fixings to **4 Nm**



1. **Front fixings**
2. **Lower fixings**
3. **Sump guard**

7. Position the sump guard infill panels to the cradle assemblies and tighten the fixings to **4 Nm**.



1. **Fixings**
2. **Sump guard infill panel (right hand side)**

Side Stand - Removal

WARNING

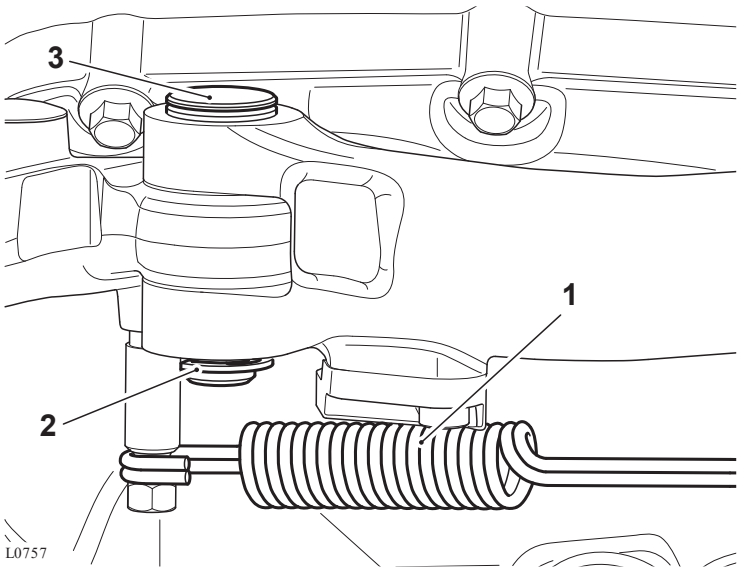
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Raise and support the motorcycle.

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.

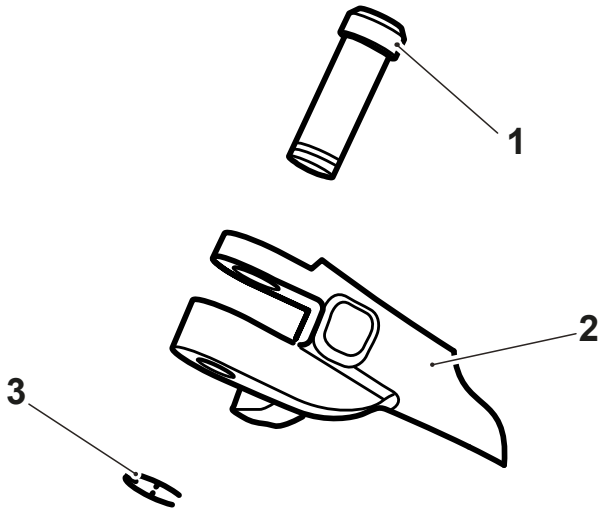
2. With the side stand in the up position, unhook the spring from the side stand and remove it from the motorcycle.
3. Remove and discard the E-clip securing the pivot pin.
4. Remove the pivot pin and remove the side stand.



1. **Spring**
2. **E-clip**
3. **Pivot pin**

Side Stand - Installation

1. Prior to fitting the side stand ensure the pivot pin and the bushes in the side stand are clean and free from grease.
2. Fit the side stand to the motorcycle and insert the pivot pin.
3. Fit a new E-clip to secure the pivot pin.



1. Pivot pin

2. Side stand

3. E-clip

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.

4. Hook the spring onto its frame lug then carefully hook it onto the side stand lug.
5. Check the operation of the side stand before riding the motorcycle. Ensure the spring holds the stand securely in the retracted position.

WARNING

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

Cradle Assemblies - Removal

WARNING

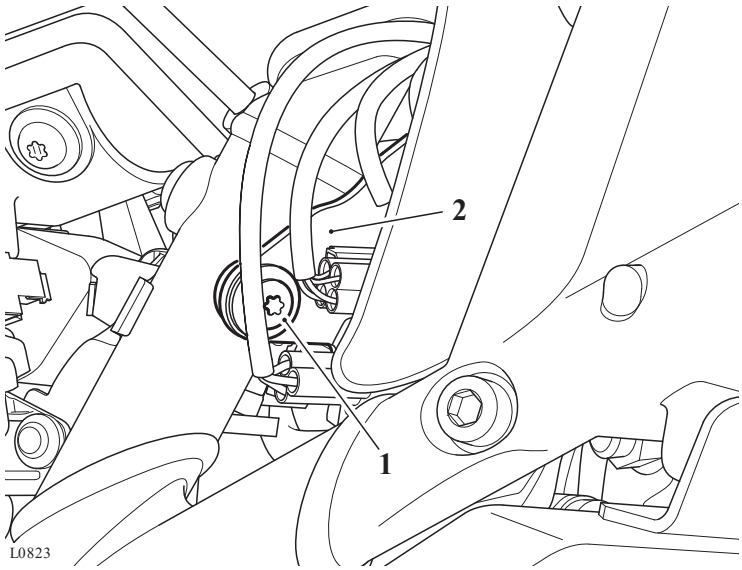
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the

WARNING

motorcycle.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Fuel Tank - Removal
- Sump Guard - Removal
- If required, Side Stand - Removal
- Release the fixing and detach the connector bracket from the right hand side of the headstock to access the nut and bolt securing the cradle assembly to the headstock.



1. **Fixing**
2. **Connector bracket**

Left Hand Cradle Assembly

- Remove the left hand side panel (see Side Panels).

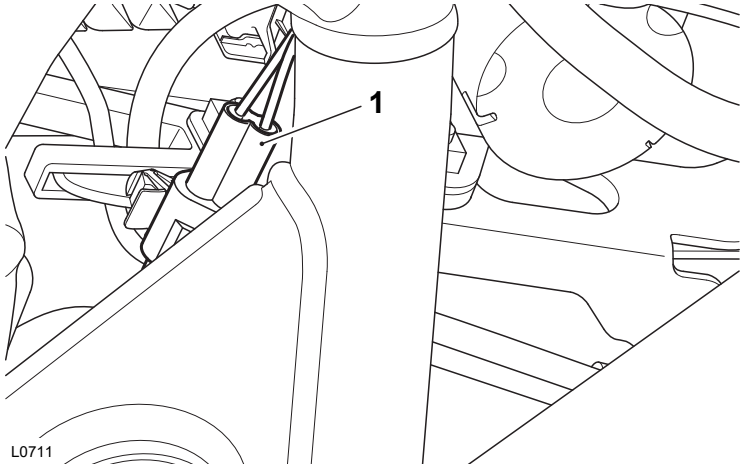
CAUTION

Note the routing and the retaining clips of the side stand switch harness for installation.

The coolant expansion tank hose is attached to the left hand cradle.

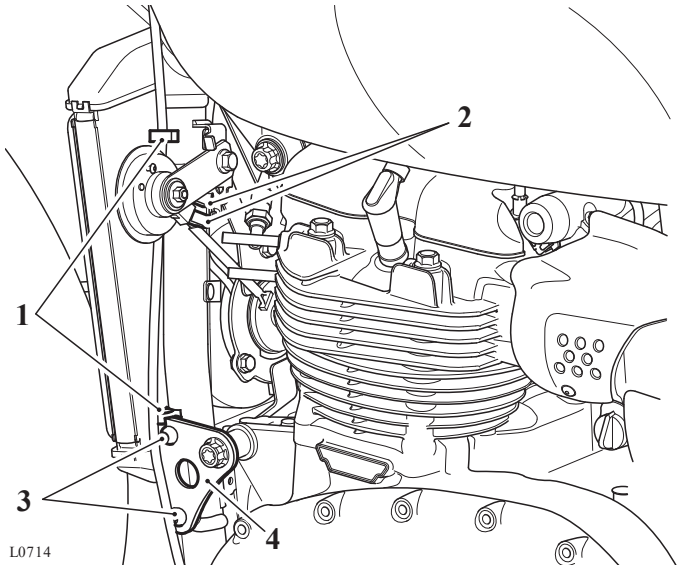
1. Disconnect the side stand switch electrical connector from the main harness and feed it down to the side stand switch.





1. Side stand switch electrical connector

2. Detach the two clutch cable clips from the cradle assembly.
3. Disconnect the two wires from the horn.
4. Remove the fixings securing the engine mounting bracket to the cradle.



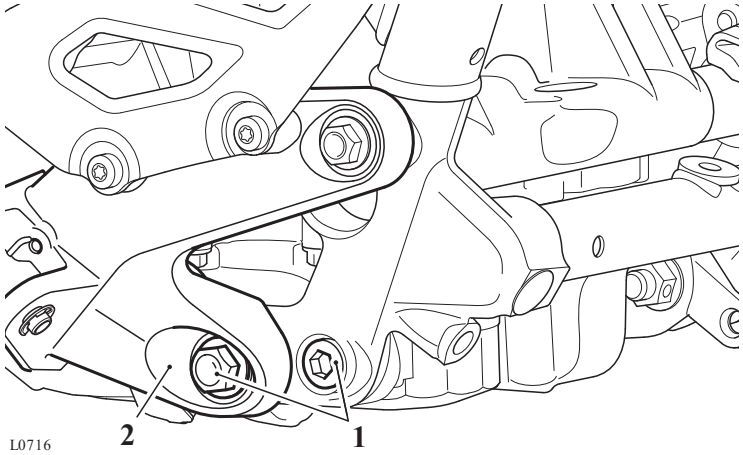
1. Clips (clutch cable)
2. Horn connectors (exhaust removed for clarity)
3. Fixings
4. Engine mounting bracket

Note

- **The front of the two rear fixings also secures the left hand front control plate.**

5. Remove the cradle assembly two rear mounting bolts and collect the nuts.

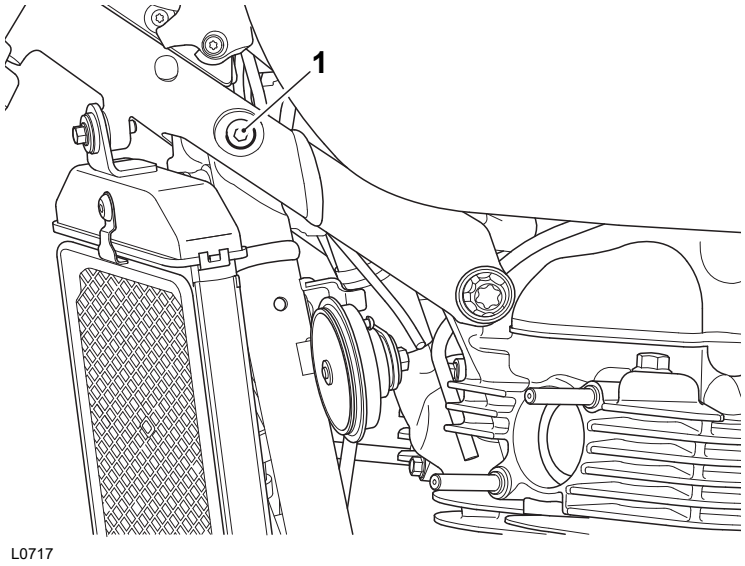




1. Mounting bolts

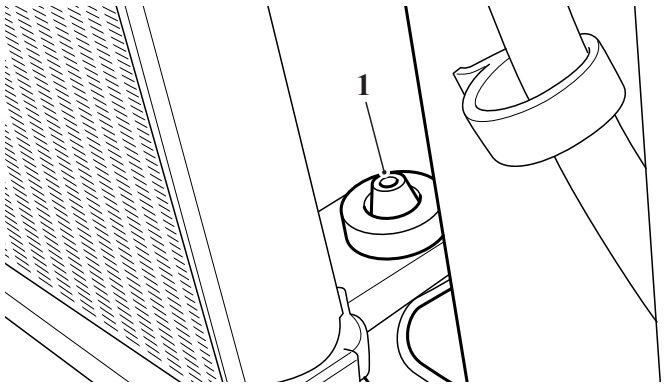
2. Control plate

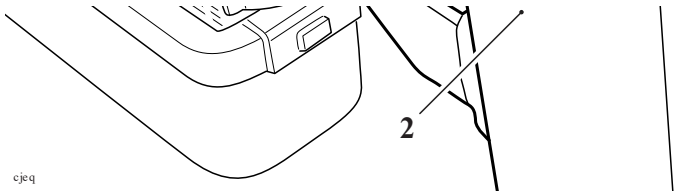
6. Remove the nut and bolt securing the cradle assembly to the headstock.



1. Bolt

7. Detach the cradle assembly from the lower mounting of the radiator and detach the cradle from the frame.



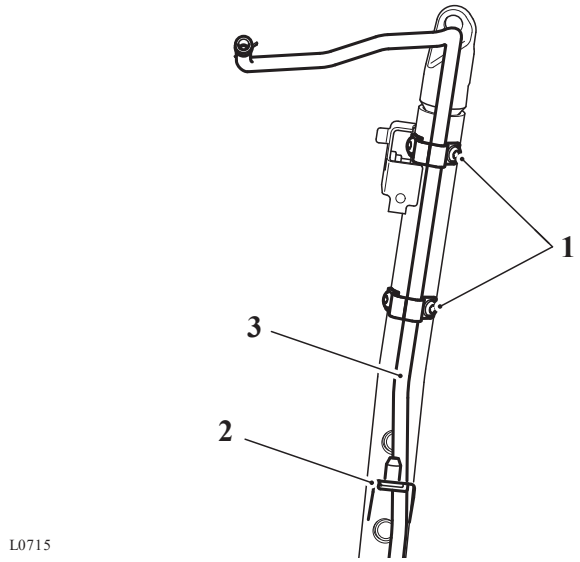


1. **Radiator lower mounting**
2. **Cradle assembly**

Note

- **Note the routing of the coolant expansion tank hose for installation.**

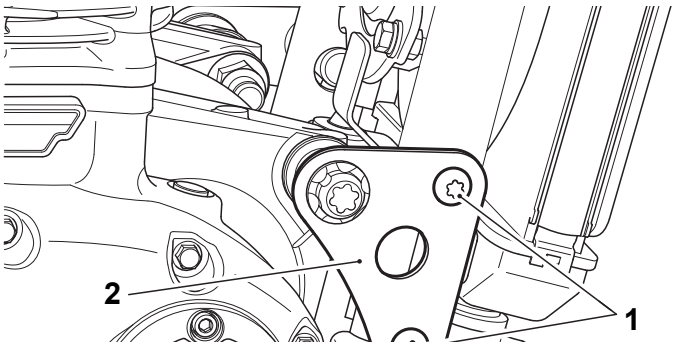
8. Detach the coolant expansion tank hose from the cradle and remove the cradle assembly. Discard the two retaining clips.

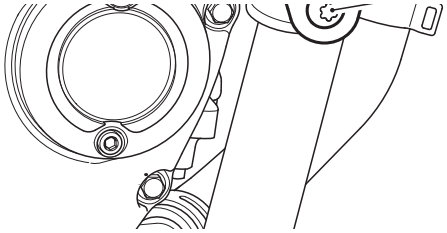


1. **Retaining clips**
2. **Radiator lower mounting**
3. **Coolant expansion tank hose**

Right Hand Cradle Assembly

1. Remove the fixings securing the engine mounting bracket to the cradle.





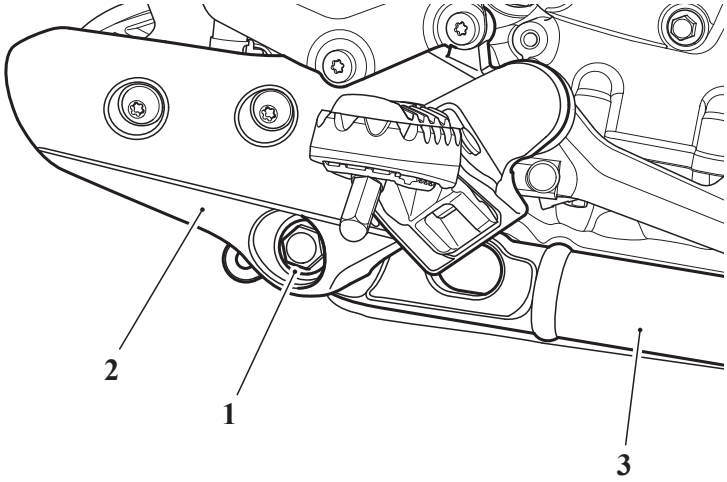
L0720

1. **Fixings**
2. **Engine mounting bracket**

Note

- **The cradle assembly rear fixing also secures the right hand front control plate.**

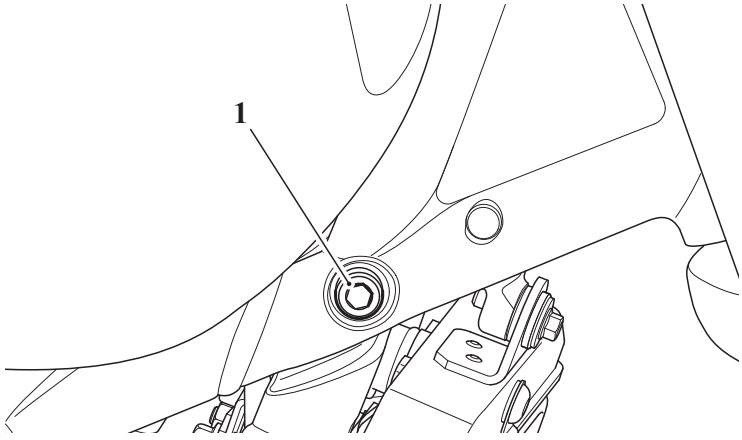
2. Remove the cradle's rear mounting bolt and nut.

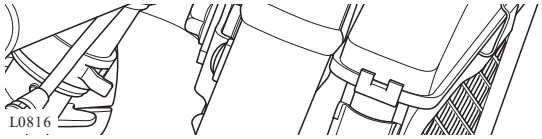


L0903

1. **Bolt**
2. **Control plate**
3. **Cradle assembly**

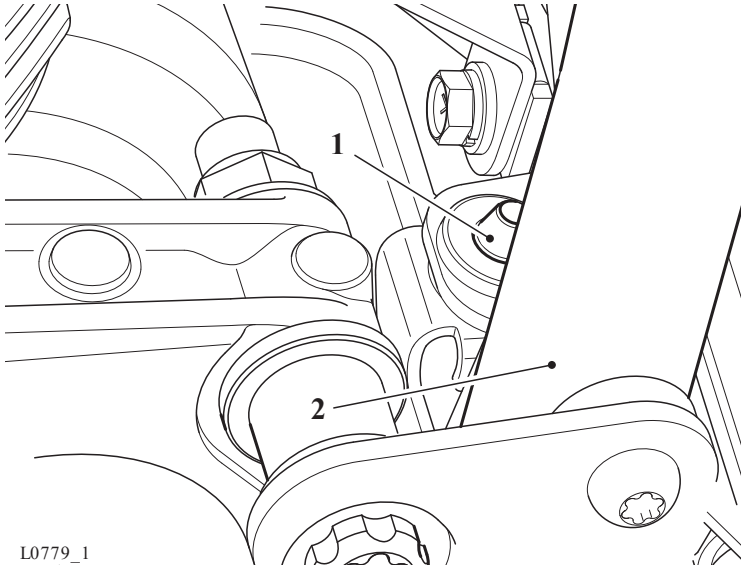
3. Remove the nut and bolt securing the cradle assembly to the headstock.





1. **Bolt**

4. Detach the cradle assembly from the lower mounting of the radiator and detach the cradle from the frame.

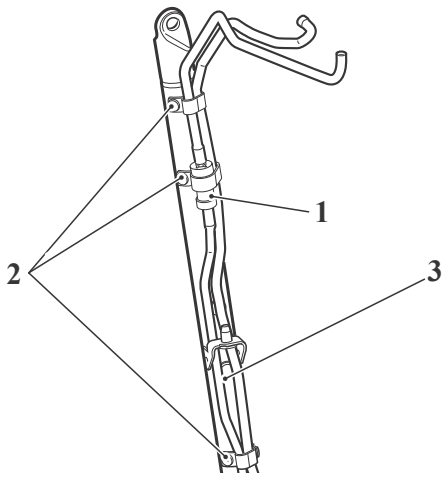


1. **Radiator lower mounting**
2. **Cradle assembly**

Note

- **Note the position of the roll over valve and the routing of the fuel tank breather hose for installation.**

5. Detach the fuel tank breather hose from the cradle and remove the cradle assembly. Discard the three retaining clips.



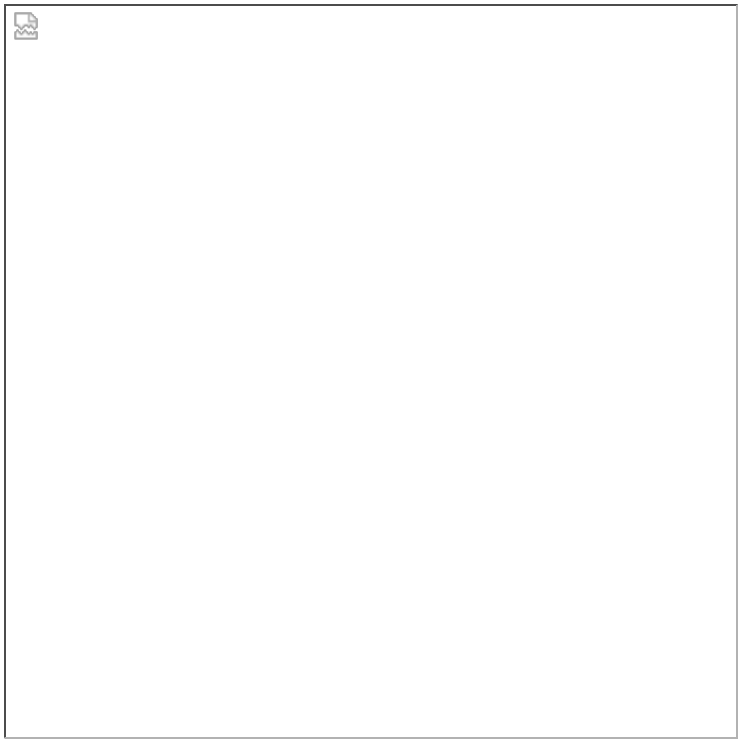
1. **Roll over valve**
2. **Retaining clips**
3. **Breather pipe**

Cradle Assemblies - 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 cradle assembly to the frame, ensure the lower mounting of the radiator is attached to the cradle assembly.
2. Fit the nut and bolt securing the cradle assembly to the headstock, do not fully tighten at this stage.

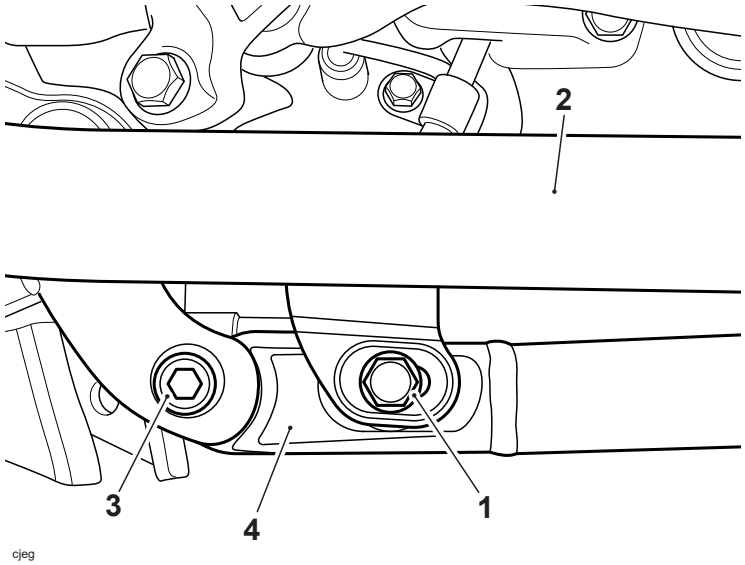


1. **Bolt (to crankcase front mounting)**
2. **Bolt (to headstock)**

3. Fit the engine mounting brackets to the cradles with two bolts, do not tighten at this stage.
4. Fit the crankcase front mounting nut, bolt and spacer, do not fully tighten at this stage.

Right Hand Cradle Assembly

1. Fit the cradle assembly rear mounting bolt and nut, do not fully tighten at this stage.
2. Fit the nut and bolt to secure the exhaust intermediate pipe to the cradle assembly. Do not fully tighten at this stage.

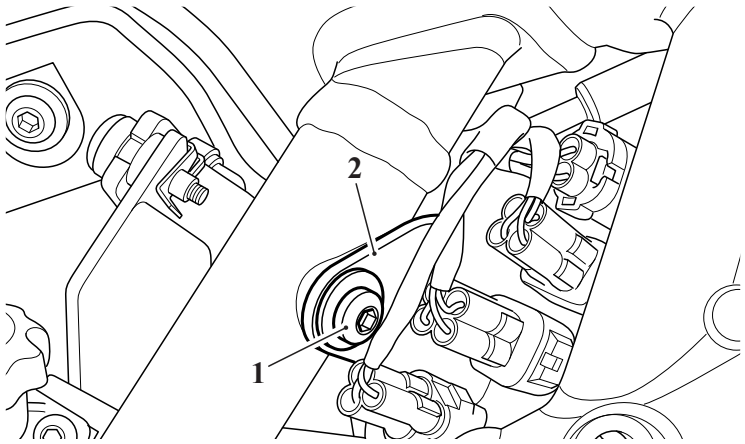


1. **Bolt**
2. **Intermediate exhaust pipe**
3. **Bolt**
4. **Cradle assembly**

Note

- **When tightening the cradle assembly mounting bolts and nuts, hold the nut and torque the bolt.**

3. Tighten the cradle assembly to headstock bolt to **40 Nm**.
4. Tighten the cradle assembly rear mounting bolt to **40 Nm**.
5. Tighten the engine mounting bracket bolts to **25 Nm**.
6. Tighten cradle assembly to crankcase bolt to **105 Nm**.
7. Attach the electrical connector bracket to the frame and tighten its new fixing to **3 Nm**.

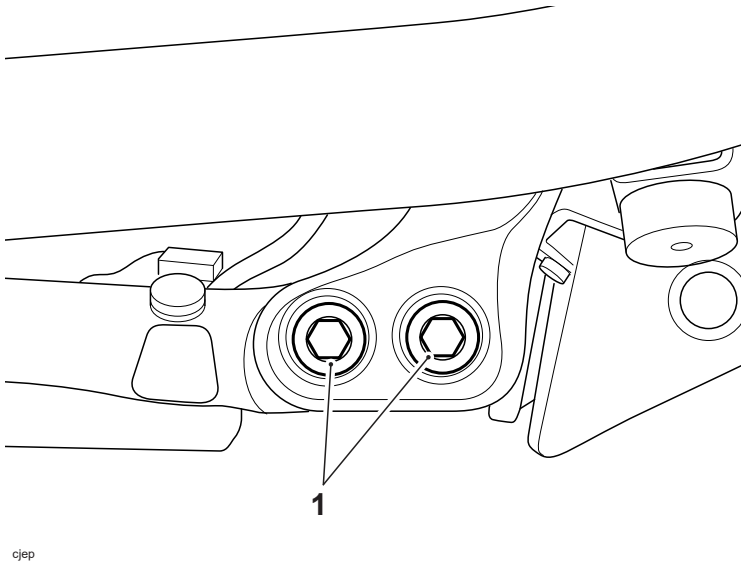




1. **Fixing**
2. **Electrical connector bracket**

Left Hand Cradle Assembly

1. Fit the cradle assembly two rear mounting bolts and nut plate, do not fully tighten at this stage.

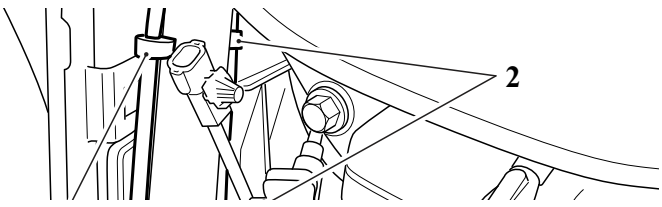


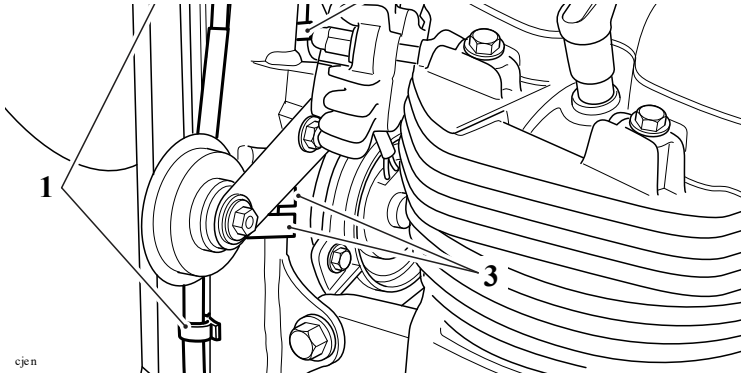
1. **Mounting bolts**

Note

- **When tightening the cradle assembly mounting bolts and nuts, hold the nut and torque the bolt.**

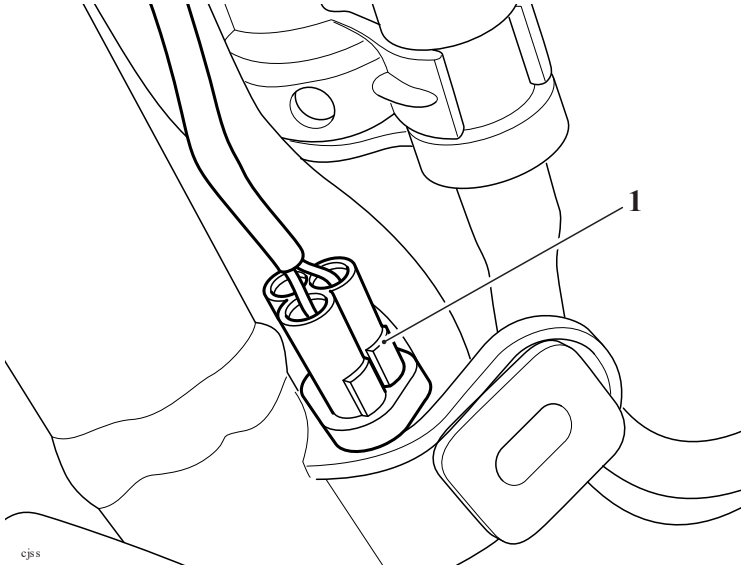
2. Tighten the cradle assembly to headstock bolt to **40 Nm**.
3. Tighten the cradle assembly rear mounting bolts to **40 Nm**.
4. Tighten the engine mounting bracket bolts to **25 Nm**.
5. Tighten cradle assembly to crankcase bolt to **105 Nm**.
6. Fit the horn to the cradle arm and tighten its fixing to **24 Nm**. Connect the two wires to the horn.
7. Refit the clips for the clutch cable and horn harness to the cradle assembly.





1. **Clips (clutch cable)**
2. **Clips (harness, exhaust header removed for clarity)**
3. **Horn connectors**

8. Route the side stand switch harness to the left hand side of the airbox as noted for removal. Connect the electrical connector to the main harness.



1. **Side stand switch electrical connector**

Perform the following operations:

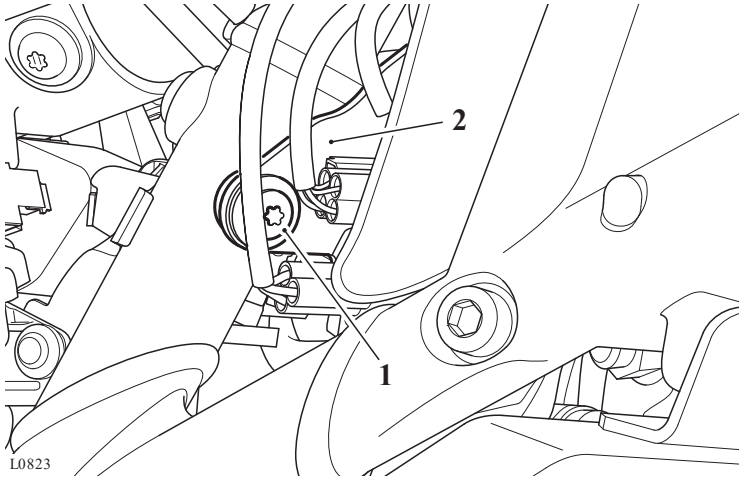
- Refit the left hand side panel (see Side Panels).

Both Cradle Assemblies

Perform the following operations:

- If removed, Side Stand - Installation
- Fit the connector bracket to the right hand side of the headstock and tighten its fixing to **3 Nm**.





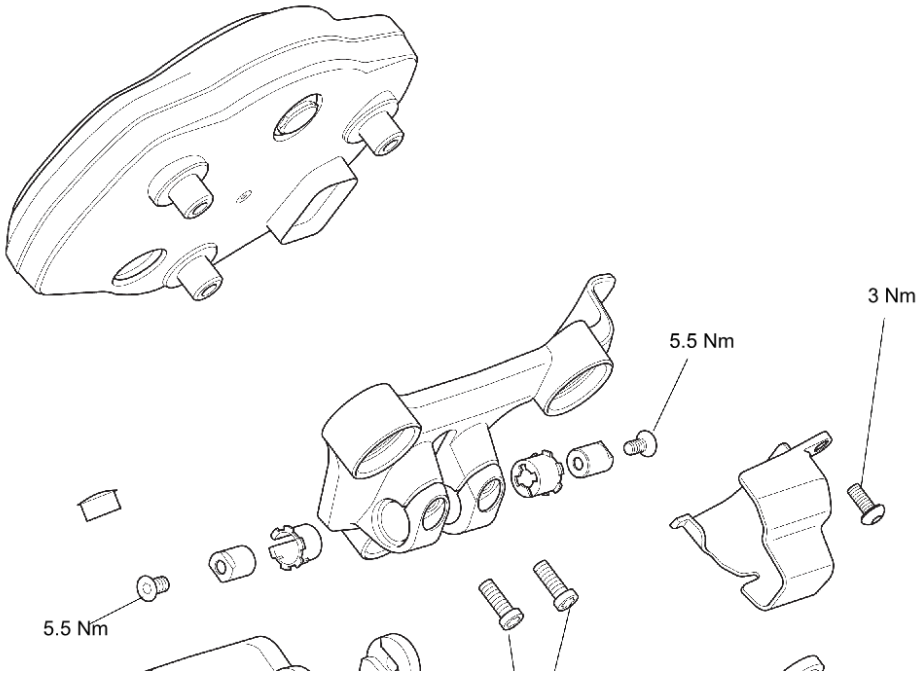
1. **Fixing**
2. **Connector bracket**

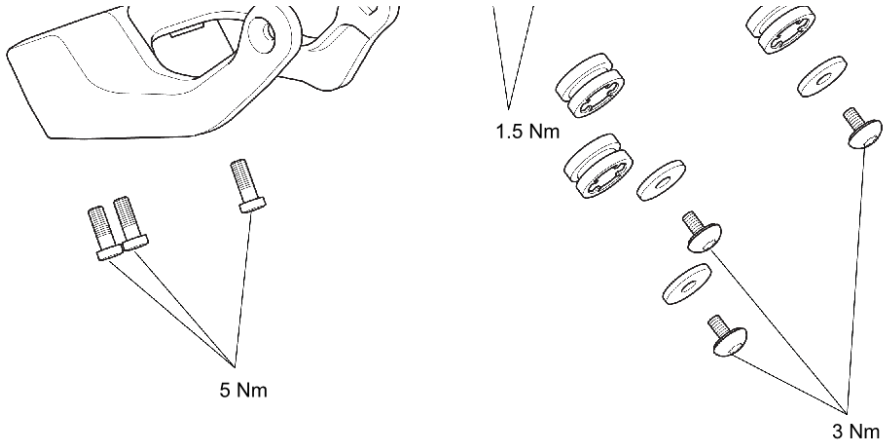
- Sump Guard - Installation
- Fuel Tank - Installation
- Battery - Installation
- Seat - Installation

Electrical

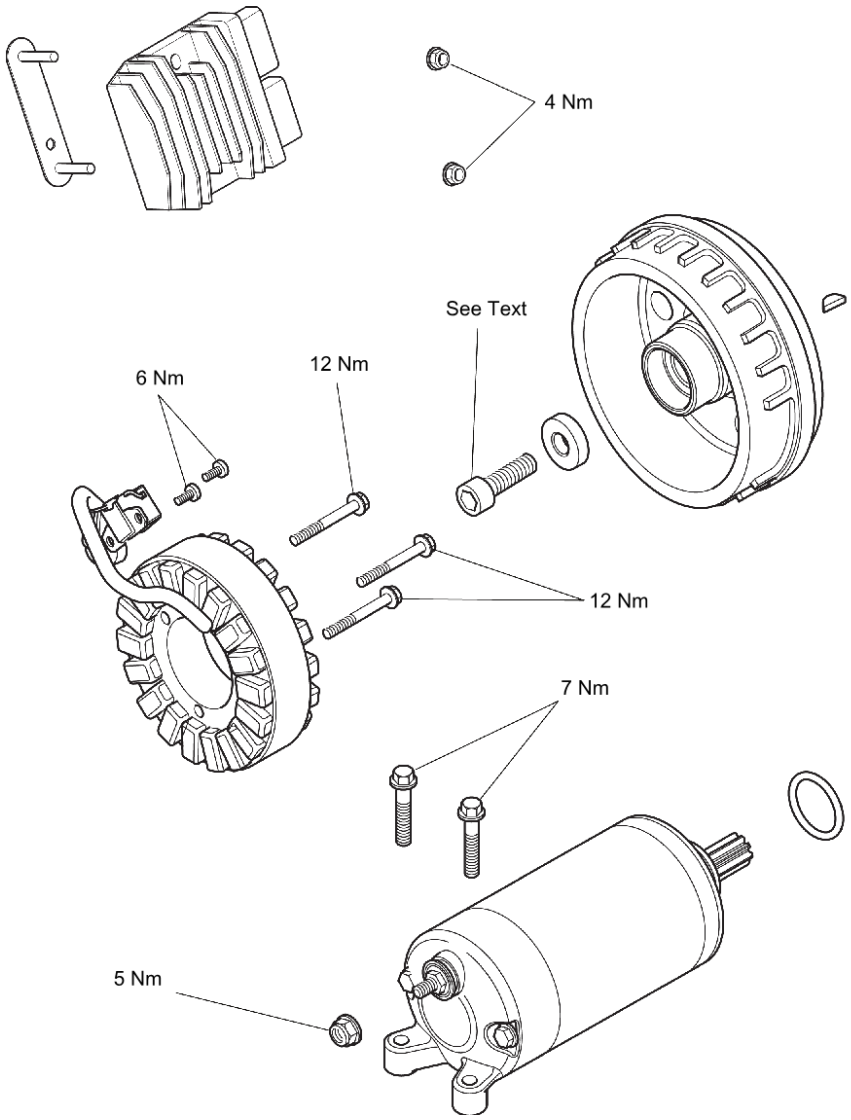
Exploded Views

Exploded View – Instruments

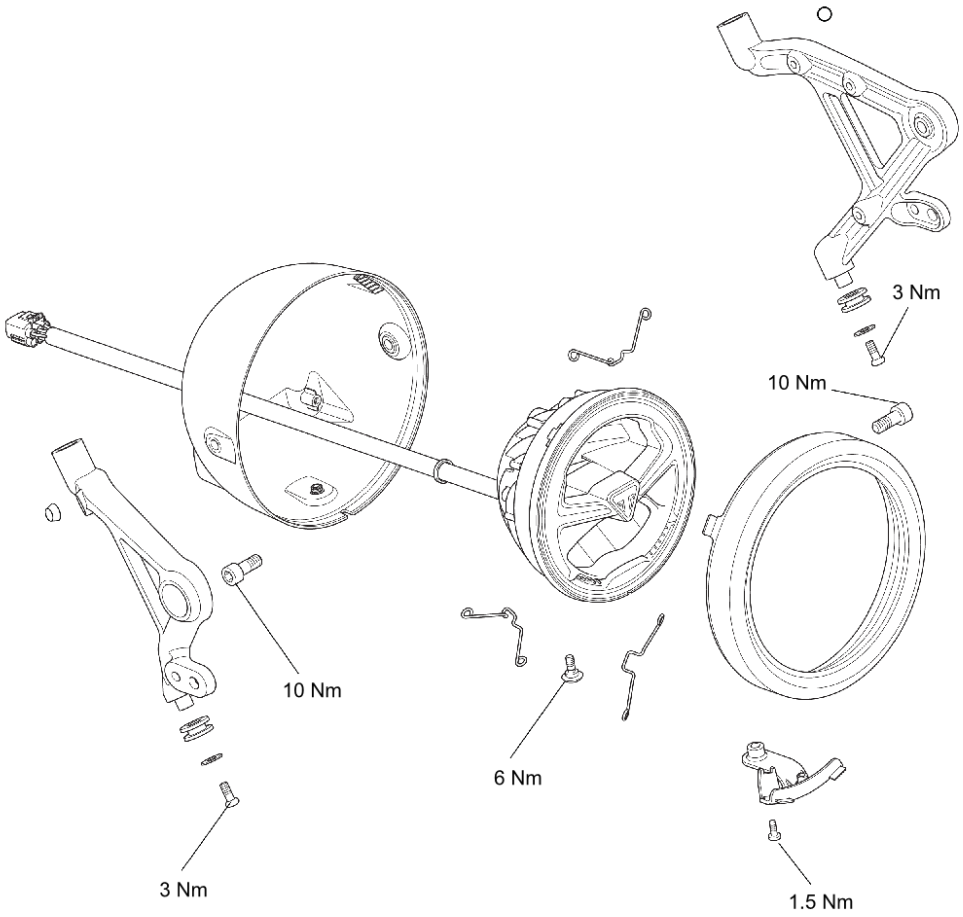




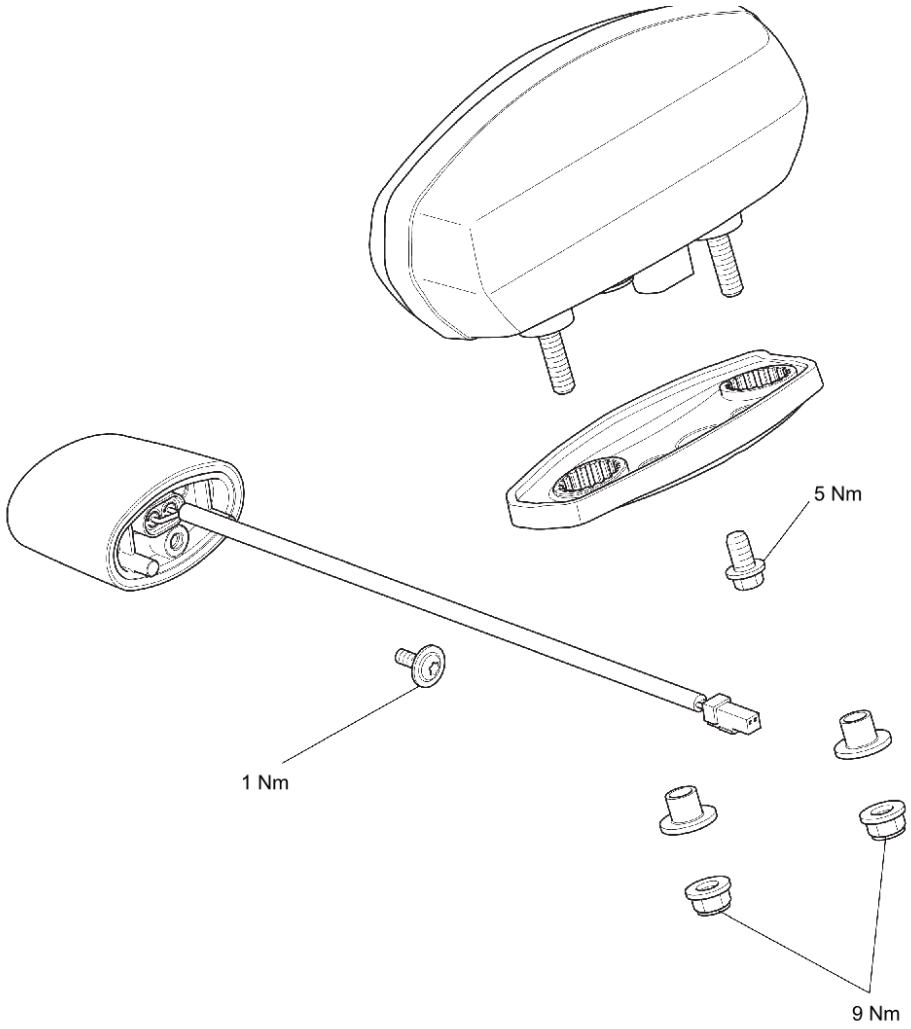
Exploded View – Alternator and Starter Motor



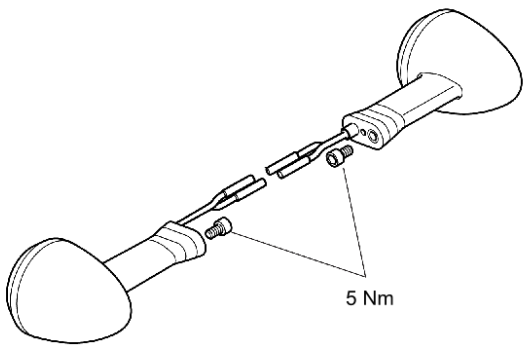
Exploded View – Headlight

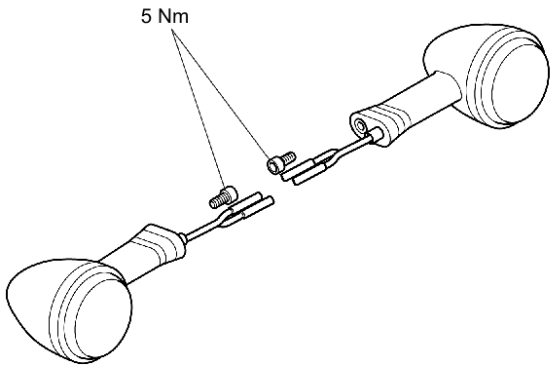


Exploded View – Rear Lights

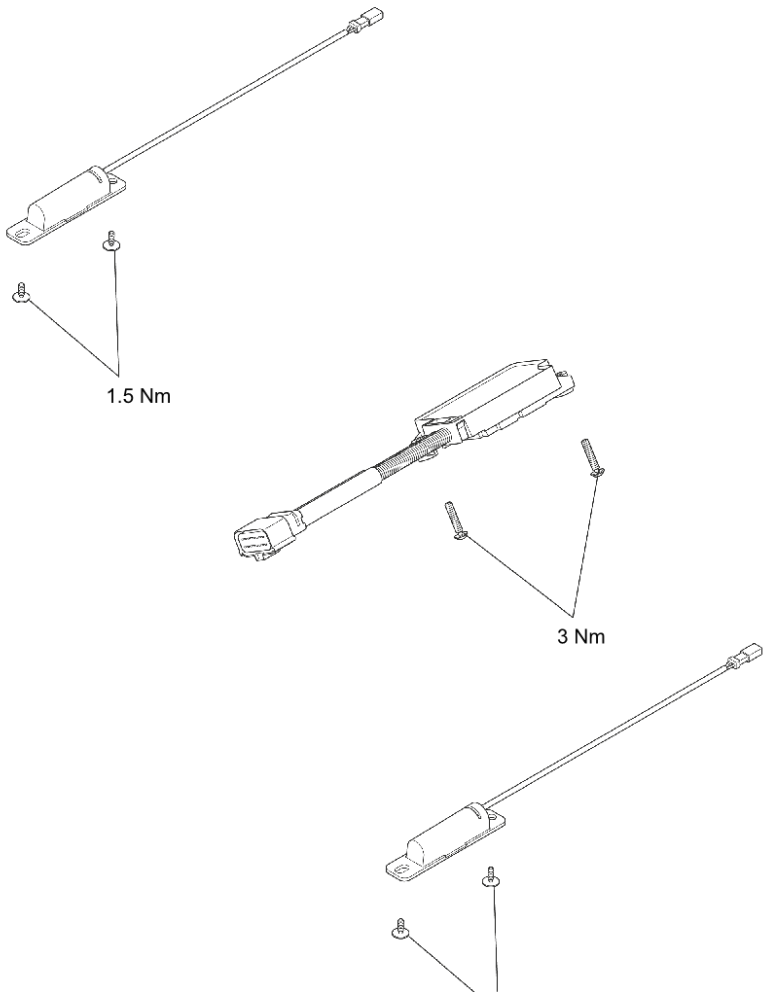


Exploded View – Direction Indicators



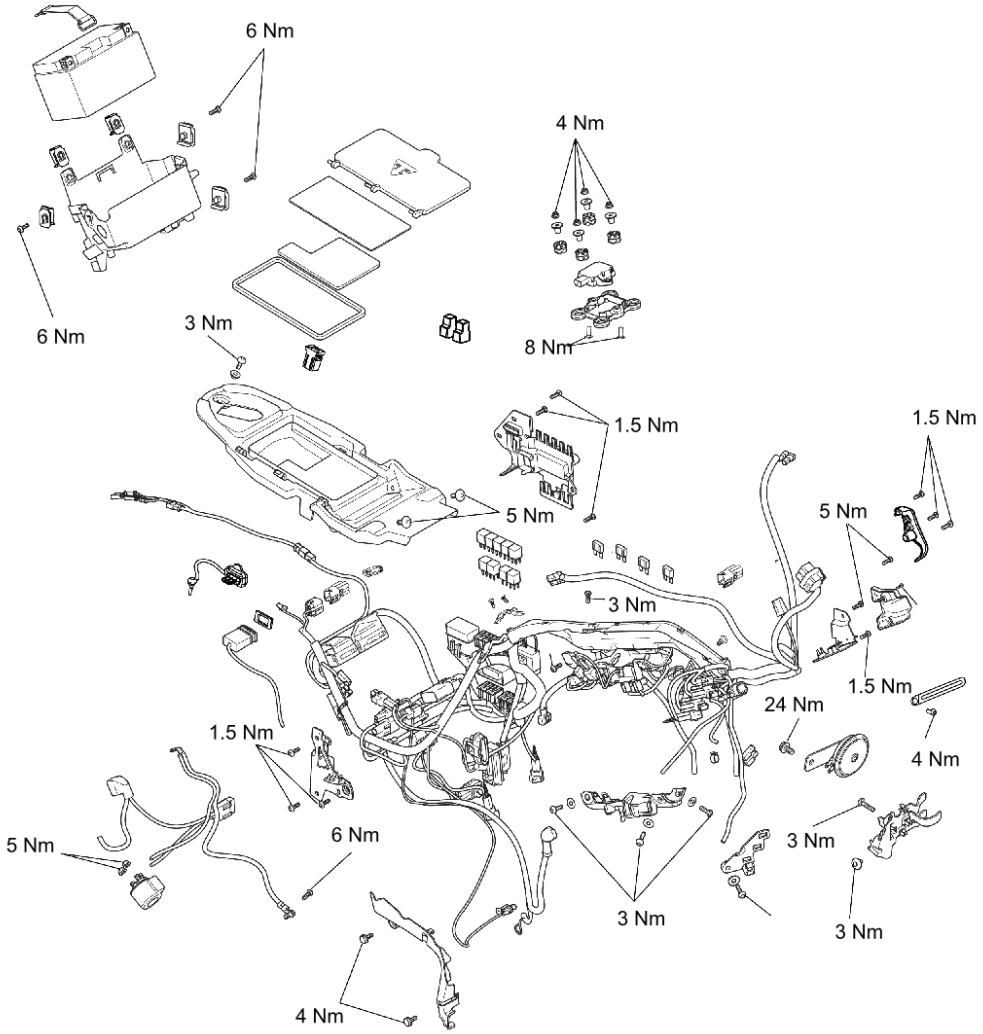


Exploded View - Keyless

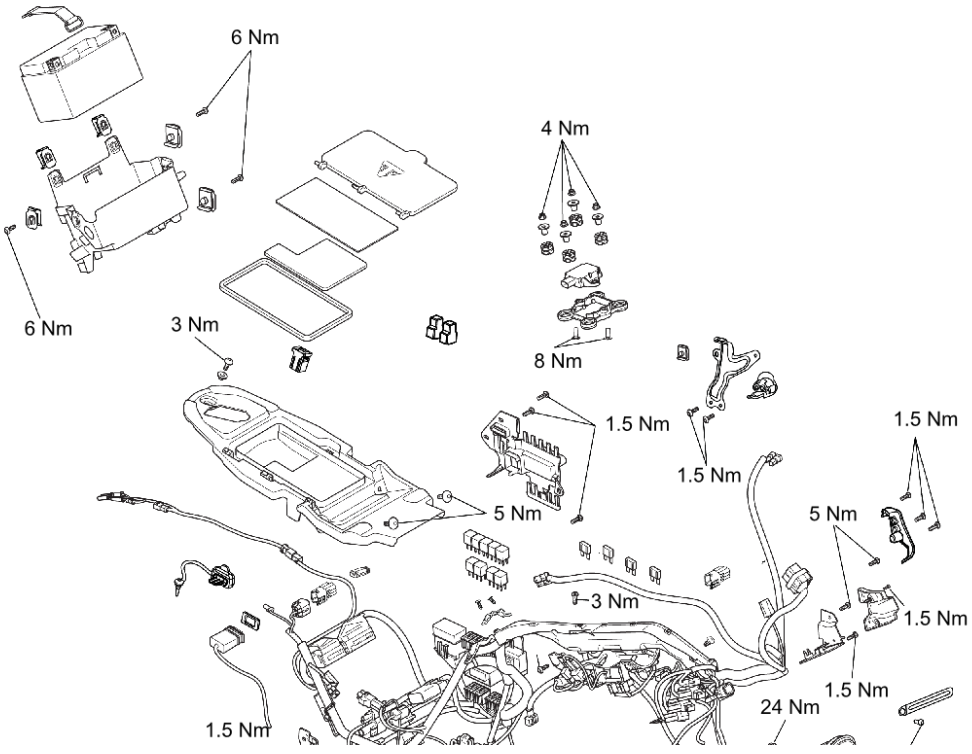


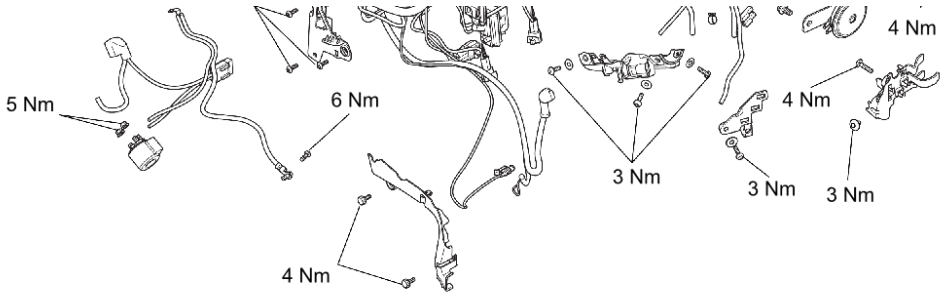
1.5 Nm

Exploded View – Battery, Horn and Wiring



Exploded View – Battery, Horn and Wiring (US only)





Battery, Fuses and Relays

Battery

WARNING

Under some circumstances, the battery can give off explosive gases; keep sparks, flames and cigarettes away. Provide adequate ventilation when charging or using the battery in an enclosed space.

The battery contains sulphuric acid (electrolyte). Contact with skin or eyes may cause severe burns. Wear protective clothing and a face shield.

If electrolyte gets on your skin, flush with water immediately.

If electrolyte gets in your eyes, flush with water for at least 15 minutes and SEEK MEDICAL ATTENTION IMMEDIATELY.

If electrolyte is swallowed, drink large quantities of water and SEEK MEDICAL ATTENTION IMMEDIATELY.

KEEP ELECTROLYTE OUT OF THE REACH OF CHILDREN.

WARNING

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

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

Battery Disposal

Should the battery ever require replacement, the original battery must be handed to a recycling agent who will ensure that the dangerous substances from which the battery is manufactured do not pollute the environment.

Battery - Removal

WARNING

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

Before disconnecting the battery or removing a fuse for any reason note and record the rider's settings. Once the fuse has been refitted or the battery reconnected the rider's settings should be reset as noted.

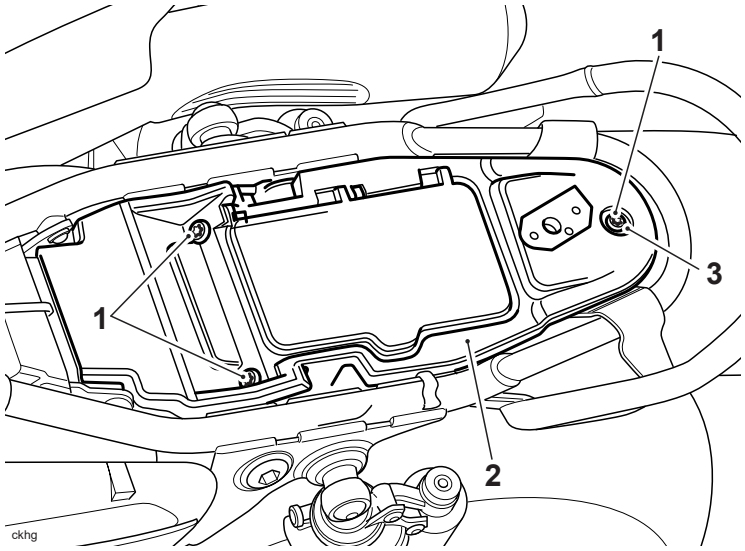
WARNING

If the battery has been disconnected or the fuses removed for any reason advise the rider to confirm the original mode settings have been correctly set. Failure to reset the motorcycle to the rider's preferred rider mode settings and subsequently being ridden may cause loss of motorcycle control and an accident.

Perform the following operations:

- Seat - Removal

1. Release the three fixings and detach the storage box from the frame. Collect the shouldered washer for the rear fixing.

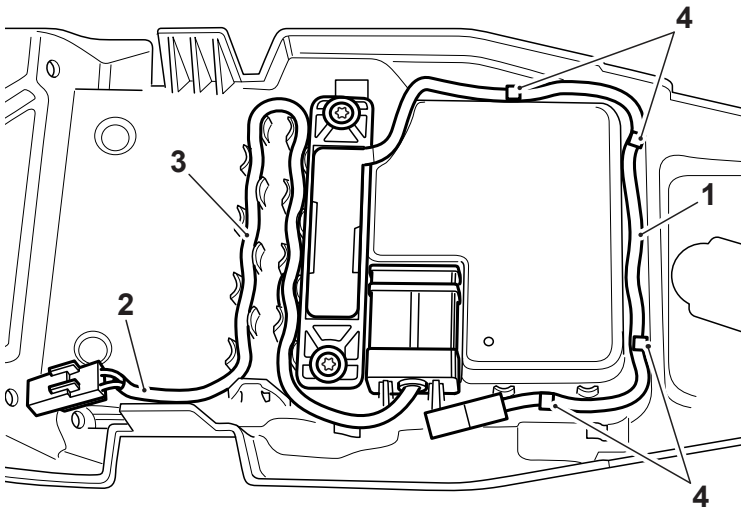


1. **Fixings**
2. **Storage box**
3. **Shouldered washer**

Note

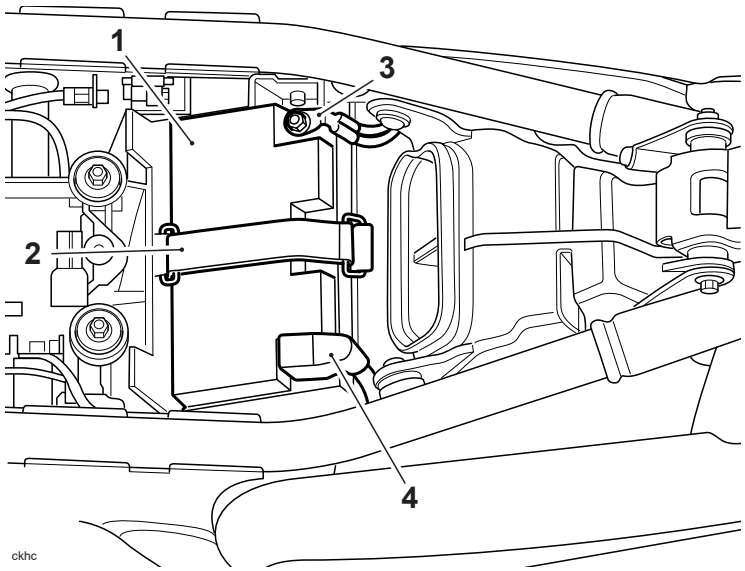
- **Note the routing and retaining clips of the USB connector and the low frequency (LF) antenna cables for installation.**

2. Carefully turn over the storage box and detach the USB connector and the low frequency (LF) antenna cables from the storage box.



1. **Low frequency (LF) antenna cable**
2. **USB connector cable**
3. **Retaining clips USB connector**
4. **Retaining clips LF antennal**

3. Position the storage box to access the battery.
4. Disconnect the battery leads, negative (black) lead first.



WARNING

Ensure that the battery terminals do not touch the motorcycle frame as this may cause a short circuit or spark, which would ignite battery gases causing a risk of personal injury.

5. Remove the battery strap.
6. Take the battery out of the case.

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.

Before disconnecting the battery or removing a fuse for any reason note and record the rider's settings. Once the fuse has been refitted or the battery reconnected the rider's settings should be reset as noted.

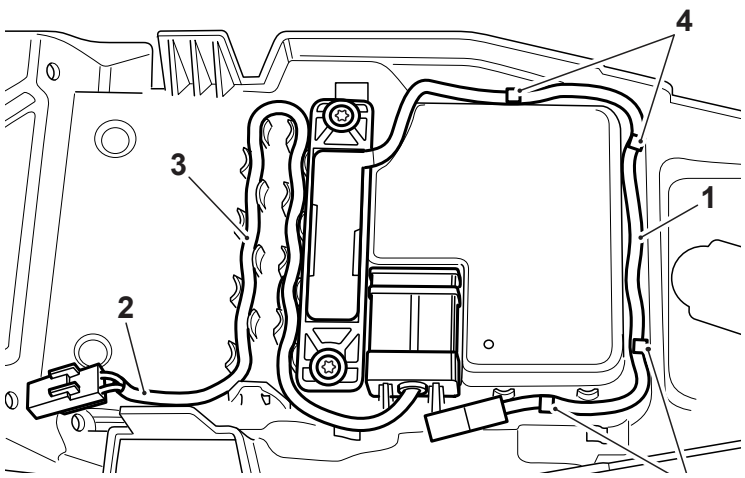
WARNING

If the battery has been disconnected or the fuses removed for any reason advise the rider to confirm the original mode settings have been correctly set. Failure to reset the motorcycle to the rider's preferred rider mode settings and subsequently being ridden may cause loss of motorcycle control and an accident.

WARNING

Ensure that the battery terminals do not touch the motorcycle frame as this may cause a short circuit or spark, which would ignite battery gases causing a risk of personal injury.

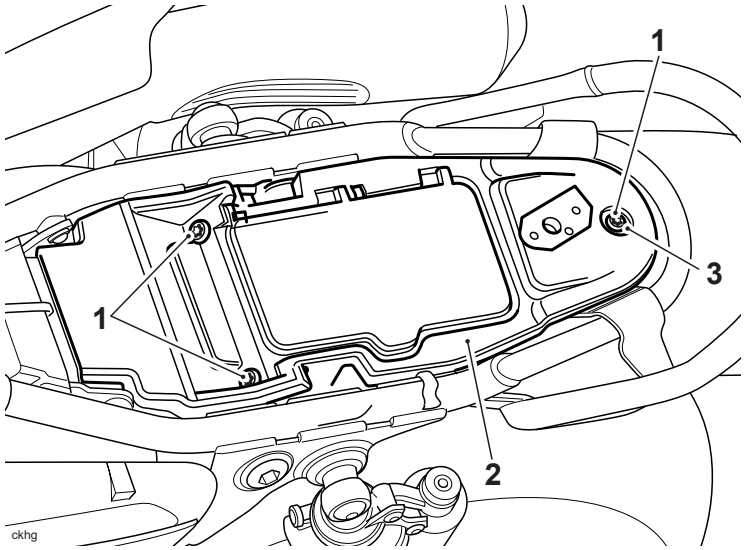
1. Place the battery in the battery case and secure with the battery strap.
2. Secure with the battery strap.
3. Reconnect the battery, positive (red) lead first and tighten the battery terminals to **4.5 Nm**.
4. Apply a light coat of grease to the terminals to prevent corrosion.
5. Cover the positive terminal with the protective cap.
6. Attach the USB connector and the low frequency (LF) antenna cables to the storage box as noted for removal.





1. **Low frequency (LF) antenna cable**
2. **USB connector cable**
3. **Retaining clips USB connector**
4. **Retaining clips LF antennal**

7. Refit the storage box and tighten the front fixings to **5 Nm**. Fit the shouldered washer for the rear fixing and the fixing to **3 Nm**.



1. **Fixings**
2. **Storage box**
3. **Shouldered washer**

Perform the following operations:

- Seat - Installation

Factory Activated Battery

This model is fitted with a factory activated battery and no commissioning is required. However, routine maintenance of the battery is required.

Refer to:

- Battery Maintenance
- Battery Already in Service

Battery Maintenance

The battery is a sealed type and does not require any maintenance other than checking the voltage and routine recharging such as during storage.

It is not possible to adjust the electrolyte level in the battery.

Note

- **The charge level in the battery must be maintained to maximise the battery life.**

With normal use of the motorcycle, the charging system will keep the battery charged. If the motorcycle is unused, the battery will gradually discharge due to battery self discharge and the continuous current drain for the clock and the engine control module memory.

The rate of battery discharge can be greatly increased by the addition of electrical security systems or other accessories.

Allowing a battery to discharge, or leaving it discharged over a period of time, causes sulphation of the lead plates within the battery.

Sulphation is a normal chemical reaction inside the battery and over a period of time sulphate will crystallise on to the lead plates making charging difficult or impossible. The result is a permanently damaged battery, which would not be covered by the motorcycle warranty.

Keeping a battery at full charge reduces the chance of it freezing in cold conditions. Allowing a battery to freeze can cause serious internal damage to the battery.

When leaving the motorcycle standing for more than a few days, regularly check the battery voltage using a digital multimeter. Should the battery voltage fall below 12.8 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.

Battery Already in Service

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 4 months from date of delivery	None required
75% - 100%	12.5 V - 12.8 V	Charge and check in 4 months from date of last check	3 - 6 hours

State of charge	Voltage	Action	Charge time (using BatteryMate 150-9)
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

Fuse Box

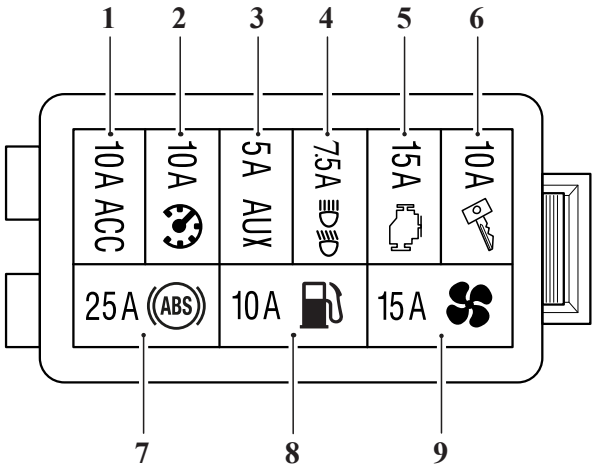
WARNING

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.

A blown fuse is indicated when all of the systems protected by that fuse become inoperative. When checking for a blown fuse, refer to the fuse identification table to establish which fuse has blown.

The fuse box is located behind the left hand side panel. To gain access to the fuse box, the side panel must be removed (see Side Panels).



Fuse Identification Table

Position	Circuit Protected	Rating (Amps)
1	Accessory socket, heated grip	10

Position	Circuit Protected	Rating (Amps)
2	Instruments	10
3	Auxiliary (alarm, horn)	5
4	Lighting	7.5
5	EMS	15
6	Ignition	10
7	ABS	25
8	Fuel pump	10
9	Cooling fan	15

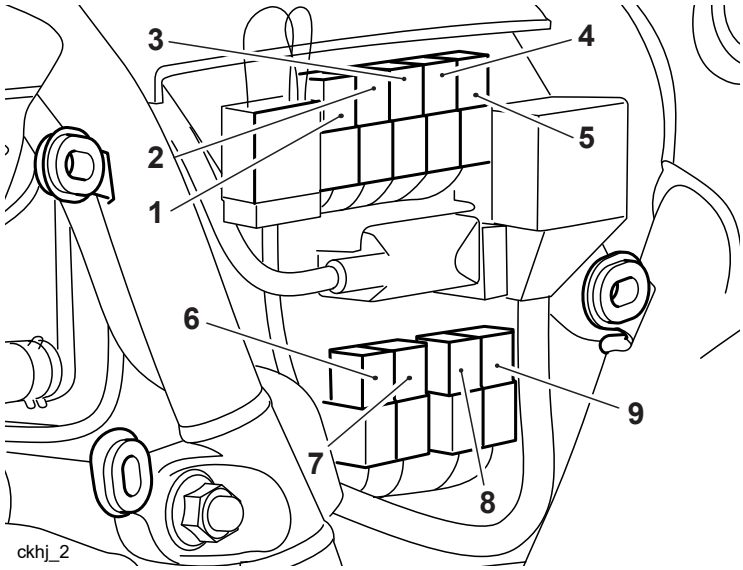
Note

- **The 30 Amp main fuse is in a separate fuse box also located behind the left hand side panel.**

Relays

Identification and Location

The relays are located behind the left hand side panel. To gain access to the relays, remove the left hand side panel (see Side Panels).



1. **R18 - Horn relay**

2. **R11 - Daytime running lights/lights relay**
3. **R33 - Fuel pump relay**
4. **R12 - Main beam relay**
5. **R37 - Fog light relay**
6. **R16 - Cooling fan relay**
7. **R07 - Engine management system relay**
8. **R17 - Ignition relay**
9. **R17 - Ignition relay**

Diagnostics - Starter and Charging Circuits

Starting Circuit

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 ground 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/keyless ECM (if fitted)/chassis ECM (if fitted) are disconnected.**

Rectify any defects as necessary.

General Fault Finding – Starter Motor and Relay

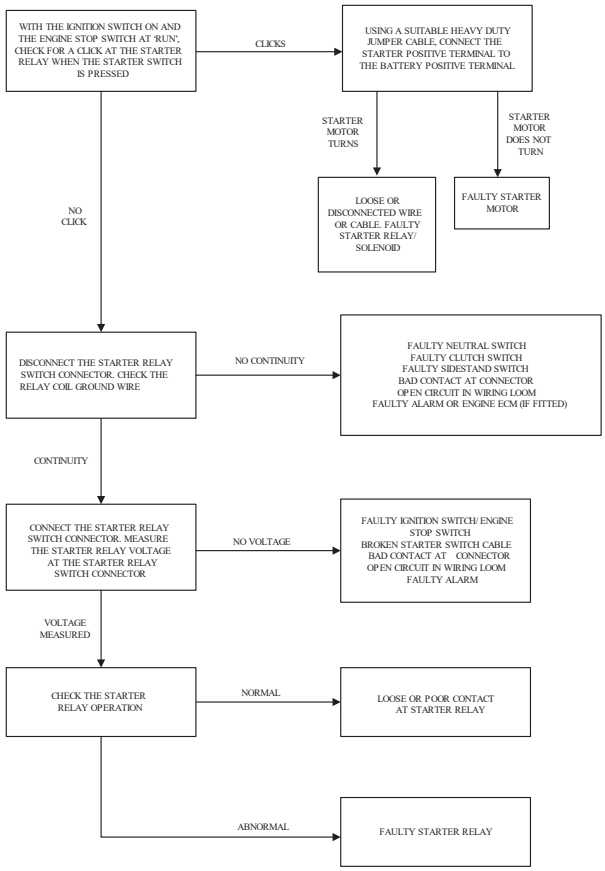
Symptom	Possible cause(s)
Starter relay does not click, starter motor does not turn	Battery discharged or defective
	Blown main or starter relay fuse
	Defective starter relay wiring or starter

Symptom	Possible cause(s)
	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
	Defective starter motor
	Starter cable open circuit
	Defective starter relay
Starter motor turns but engine does not turn over	Starter motor or starter ring gear

Diagnosis – Starter Circuit

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.**



Alternator/Charging System

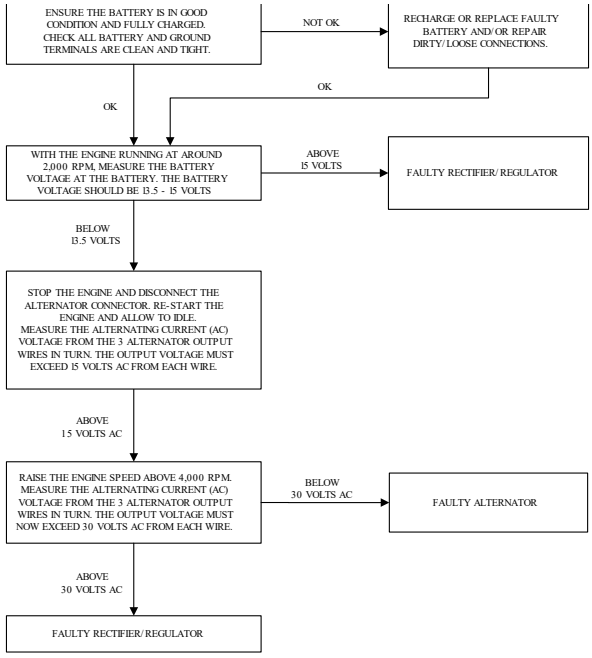
The charging system consists of an alternator, a rectifier/regulator assembly and the battery. The alternator is made up of two parts, the stator, which is mounted to the crankcase or the engine cover, and the rotor, mounted to the end of the crankshaft. The stator is an assembly of 18 coils, arranged into 3 phases. The rotor is a series of magnets mounted in the engine flywheel, which are arranged so as to be positioned around the outside of the stator coils. As the engine rotates the alternator produces an AC (alternating current) voltage in each of the three phases of the alternator, typically of around 35 to 40 volts AC at 4,000 - 5,000 rpm, although this figure varies between models. As the battery requires DC (direct current) voltage for correct charging, this AC voltage must be first rectified to DC current, and then regulated to the correct voltage for the battery of 14.5 +/- 0.5 volts. This is done by the rectifier/regulator, which uses diodes to convert the alternator output to DC Volts and limits the resulting output to the correct figure required for optimal battery charging.

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

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

Rectify any defects as necessary.

Diagnosis – Charging Circuit



Alternator Stator

The alternator stator is an assembly of 18 coils, arranged into three phases. It is possible to check for continuity and short circuits through the coils and to ground.

Note

- **Only repair the stator harness between the alternator regulator/rectifier and where the harness goes into the crankcase.**
- **Do not attempt to repair the alternator stator coils.**
- **If the battery is not fully charged, the charging voltage may be lower than specified when checking at 2,000 rpm.**
- **Ensure all additional accessories (auxiliary lights, heated grips etc.) are switched off.**

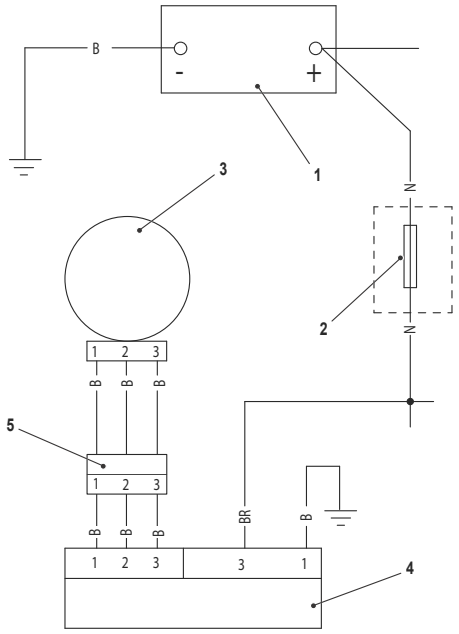
Fault	Possible cause	Action
Battery not charging	Main fuse	Check the condition of the main 30A fuse:
	Battery	Check the condition of the battery. Test the battery using the BatteryMate 150-9. Refer to the instructions supplied with the BatteryMate 150-9. Ensure the battery is serviceable:
	Alternator	Proceed to pinpoint test 1:
	Regulator/Rectifier	Test the regulator/rectifier (see Regulator/Rectifier)

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Battery positive (+) - Battery negative (-) - Regulator/rectifier black connector pin 1 - Regulator/rectifier black connector pin 3 - Regulator/rectifier grey connector pin 1 - Regulator/rectifier grey connector pin 2 - Regulator/rectifier grey connector pin 3 - Alternator harness connector pin 1 - Alternator harness connector pin 2 - Alternator harness connector pin 3	OK	Disconnect the battery leads, negative (black) lead first. Disconnect regulator/rectifier black connector and proceed to test 2
		Faulty	Rectify fault, proceed to test 4
2	Check cable continuity: - Regulator/rectifier black connector pin 1 to battery lead negative connector - Regulator/rectifier black connector pin 3 to battery lead positive connector	OK	Reconnect the battery leads, positive (red) lead first. Reconnect the regulator/rectifier black connector. Disconnect the rectifier/regulator grey connector and proceed to test 3
		Open circuit	Locate and rectify wiring fault, proceed to test 4
3	Check resistance through the coils: - Alternator pin 1 to pin 2 - Alternator pin 2 to pin 3 - Alternator pin 3 to pin 1	0.14 to 0.18 Ohms	Proceed to test 4
		Open circuit or short circuit	If the fault is between the rectifier and the crankcase, repair the harness. Proceed to test 4 If the fault is after the crankcase, replace the unit. Proceed to test 5
4	Reconnect the harness and run the engine. Check the charging	13.5 V - 15 V	Action complete - quit test

Test		Result	Action
	voltage at 2,000 rpm:		
		Fault still present	Disconnect the regulator/rectifier grey connector and proceed to test 5
5	Check the alternator AC output voltage at 850 rpm by probing the 3-pin stator connector as follows: - Positive (+) probe to pin 1 negative (-) probe to pin 2 - Positive (+) probe to pin 2 negative (-) probe to pin 3 - Positive (+) probe to pin 3 negative (-) probe to pin 1	15 V AC to 25 V AC	Test regulator/rectifier (see Regulator/Rectifier)
		Less than 15 V AC	Replace unit. Proceed to pinpoint test 6
6	Reconnect the harness and run the engine. Check the charging voltage at 2,000 rpm:	13.5 V - 15 V	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



1. **Battery**

2. **Starter solenoid main fuse**
3. **Alternator**
4. **Rectifier/Regulator**
5. **Alternator harness connector**

Regulator/Rectifier

Internally the rectifier/regulator consists of three diodes, one between each input and the positive terminal, and three Field Effect Transistors (FETs), one between each input and the ground terminal.

As the voltage of the AC signal from the alternator rises, the voltage controller switches the FETs to avoid over voltage on the output.

The diodes and FETs can be checked using a multimeter on DIODE setting. Disconnect the two electrical connectors from the rectifier/regulator and check the readings as indicated below.

Note

- **This test does not check for voltage regulation.**

Fault	Possible cause	Action
Battery not charging	Main Fuse	Check the condition of the main 30A fuse:
	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.
	Regulator/Rectifier	Disconnect the black and the grey connectors from the rectifier/regulator and proceed to pinpoint test 1:
	Alternator	Test the alternator stator (see Alternator Stator).

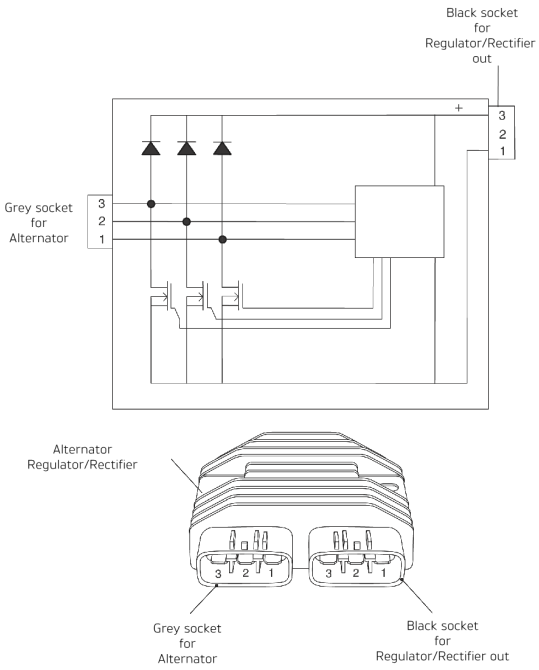
Pinpoint Tests

Test		Result	Action
1	Check FET forward bias:	0.4 V to 0.7	Proceed to test 2

Test		Result	Action
	Positive (+) probe to rectifier black socket pin 1 to: - Negative (-) probe to rectifier grey socket pin 1 - Negative (-) probe to rectifier grey socket pin 2 - Negative (-) probe to rectifier grey socket pin 3	V	
		Open circuit or short circuit	Replace the unit. Proceed to test 4
2	Check diodes function forward bias: Negative (-) probe to rectifier black socket pin 3 to: - Positive (+) probe to rectifier grey socket pin 1 - Positive (+) probe to rectifier grey socket pin 2 - Positive (+) probe to rectifier grey socket pin 3	0.1 V to 0.3 V	Proceed to test 3
		Open circuit or short circuit	Replace the unit. Proceed to test 4
3	Check diodes reverse bias: Negative (-) probe to rectifier black socket pin 1 to: - Positive (+) probe to rectifier grey socket pin 1 - Positive (+) probe to rectifier grey socket pin 2 - Positive (+) probe to rectifier grey socket pin 3 Positive (+) probe to rectifier black socket pin 3 to: - Negative (-) probe to rectifier grey socket pin 1 - Negative (-) probe to rectifier grey socket pin 2 - Negative (-) probe to rectifier grey socket pin 3	More than 1.4 V or OL on meter	Proceed to test 4
		Less than 1.4 V or short circuit	Replace the unit. Proceed to test 4
4	Reconnect the harness and run the engine. Check the charging voltage at 2,000 rpm:	13 V - 15 V	Action complete - quit test
		Fault still present	Test alternator stator (see Alternator Stator)
			If alternator stator is

Test	Result	Action
		serviceable, contact Triumph service

Circuit Diagram



System Diagnostics - Keyless ECM

System Diagnosis - Keyless ECM

The keyless 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 behind the left hand side panel. By using a dedicated plug, no electrical connectors associated with the system are disturbed, reducing potential connector damage.

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

On-board Fault Detection System

The on-board diagnostic system has two stages to fault detection. When a fault is detected,

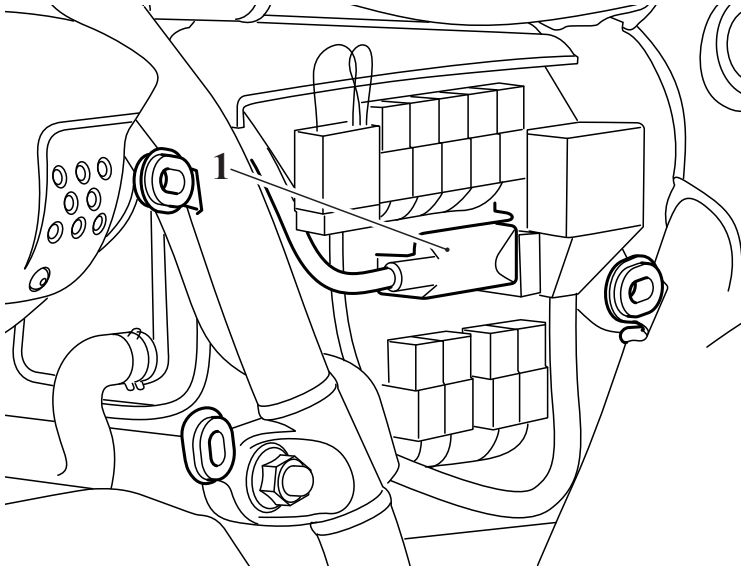
the DSM (Diagnostic Status Manager) raises a flag to indicate that a fault is present and increments a counter. The counter checks the number of instances that the fault is noted.

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.

System Diagnostic Tool Connection

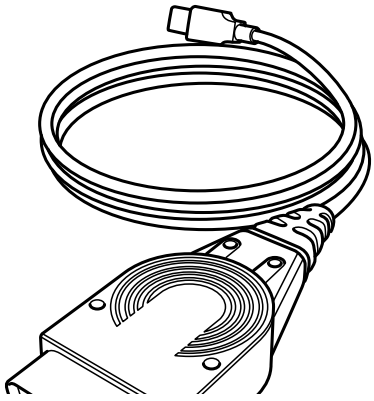
Diagnostic Tool Connection

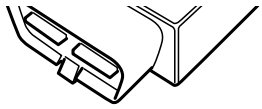
1. To connect the Triumph diagnostic interface to the motorcycle, remove the left hand side panel (see Side Panels) and release the diagnostic connector from its locating tang.



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 left hand side panel (see Side Panels).

Keyless ECM Diagnostic Trouble Codes

Diagnostic Trouble Codes (DTCs) are logged in the keyless 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.

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 keyless 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 keyless 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 keyless ECM memory. DTCs can be removed at any time using the Triumph diagnostic tool.

Diagnostic Trouble Code (DTC)	Fault Description	Ignition switch cycles before clearing fault	Ignition switch cycles before DTC is erased	Warning Light/Instrument message/Visual Indication	Pinpoint test
C1001	Main power supply overvoltage	1	20	-	Power Supply Rail Overvoltage/Undervoltage
C1002	Main power supply undervoltage	1	20	-	Power Supply Rail Overvoltage/Undervoltage
C1003	Keyless ECM internal power supply malfunction	1	20	-	Keyless ECM Internal Power Supply Malfunction

Diagnostic Trouble Code (DTC)	Fault Description	Ignition switch cycles before clearing fault	Ignition switch cycles before DTC is erased	Warning Light/Instrument message/Visual Indication	Pinpoint test
C1008	Starter motor switch malfunction	1	20	-	Starter Motor Switch Malfunction
C1017	Instrument wake-up signal overcurrent	1	40	-	Instrument Wake-up Signal Overcurrent
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)
C1095	Keyless ECM internal error	-	40	Motorcycle continues to run when fault logged but will not start after first ignition cycle.	Keyless 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

Diagnostic Trouble Code (DTC)	Fault Description	Ignition switch cycles before clearing fault	Ignition switch cycles before DTC is erased	Warning Light/Instrument message/Visual Indication	Pinpoint test
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)
C1124	Keyless ECM restarted due to process time out during normal operation	1	40	-	Keyless ECM Restarted Due to Process Time Out During Normal Operation
C1125	Keyless ECM restarted due to process time	1	40	-	Keyless ECM Restarted Due to Process Time Out During Normal Operation

Diagnostic Trouble Code (DTC)	Fault Description	Ignition switch cycles before clearing fault	Ignition switch cycles before DTC is erased	Warning Light/Instrument message/Visual Indication	Pinpoint test
	out during normal operation				
C1126	Keyless ECM restarted due to process time out during normal operation	1	40	-	Keyless ECM Restarted Due to Process Time Out During Normal Operation
C1127	Keyless ECM restarted due to calibration download	1	40	-	Keyless ECM Restarted due to Calibration Download
C1128	Unexpected keyless ECM restart	1	40	-	Unexpected Keyless ECM Restart
C1129	Power supply interrupted	1	40	-	Keyless ECM Power Supply Interrupted
C1130	Keyless ECM parameters reset to default	1	40	-	Keyless ECM Parameters Reset to Default
C1147	Keyless ECM ignition output 1 over current	-	-	-	Keyless ECM Ignition Fault - Output 1
C1148	Keyless ECM ignition output 1 under current	-	-	-	Keyless ECM Ignition Fault - Output 1
C1149	Key missing during riding	-	-	-	Key Missing During Riding
C1151	Ignition ON requested with	-	-	-	Ignition ON Requested With No Key in Range

Diagnostic Trouble Code (DTC)	Fault Description	Ignition switch cycles before clearing fault	Ignition switch cycles before DTC is erased	Warning Light/Instrument message/Visual Indication	Pinpoint test
	no key in range				
C1156	Right hand switch housing malfunction	-	-	-	Right Hand Switch Housing Malfunction
C1157	Right hand switch housing malfunction	-	-	-	Right Hand Switch Housing Malfunction
C1158	Right hand switch housing malfunction	-	-	-	Right Hand Switch Housing Malfunction

* MIL illuminated by engine ECM in response to keyless ECM DTC being stored.

Pinpoint Tests - Keyless ECM

Power Supply Rail Overvoltage/Undervoltage

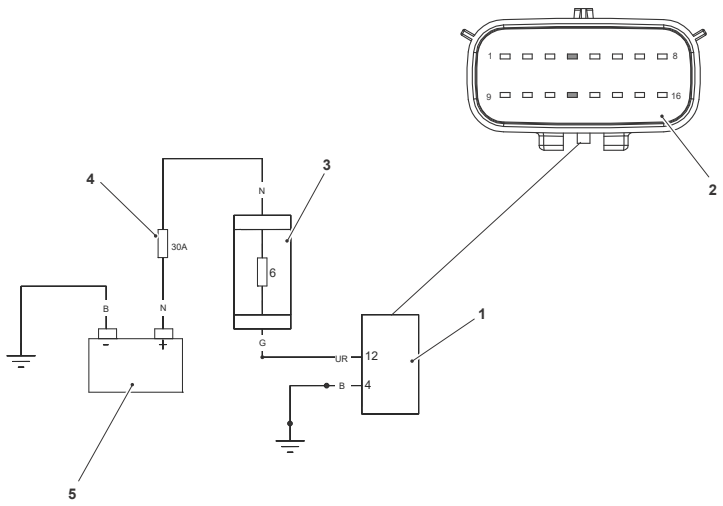
Fault Code	Possible Cause	Action
C1001; C1002	Main power supply overvoltage Main power supply undervoltage Blown fuse Short circuit to ground or open circuit Charging system fault	Disconnect Keyless ECM connectors and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check fuse integrity: - Fuse box 2, fuse 6: - Main 30 Amp fuse	OK	Proceed to test 2
		Faulty	Replace blown fuse(s), proceed to test 5

Test		Result	Action
2	Check cable and terminal integrity: - Keyless ECM pin 12 - Keyless ECM pin 4 - Battery positive terminal - Battery negative terminal	OK	Proceed to test 3
		Faulty	Rectify fault, proceed to test 5
3	Check cable for short circuit: - Keyless ECM pin 12 to ground	OK	Proceed to test 4
		Short circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable continuity: - Battery positive terminal to Keyless ECM pin 12 - Battery negative to terminal keyless ECM pin 4	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



1. **Keyless ECM**
2. **Keyless ECM Connector**

3. **Fuse Box**
4. **Main 30A Fuse**
5. **Battery**

Keyless ECM Internal Power Supply Malfunction

Fault Code	Possible Cause	Action
C1003	Keyless ECM internal power supply malfunction	If DTC C1002 is also present, rectify DTC C1002 (see Power Supply Rail Overvoltage/Undervoltage) then erase DTCs. Monitor for further instances. If C1002 is not present, check and record all other DTCs and contact Triumph service.

Starter Motor Switch Malfunction

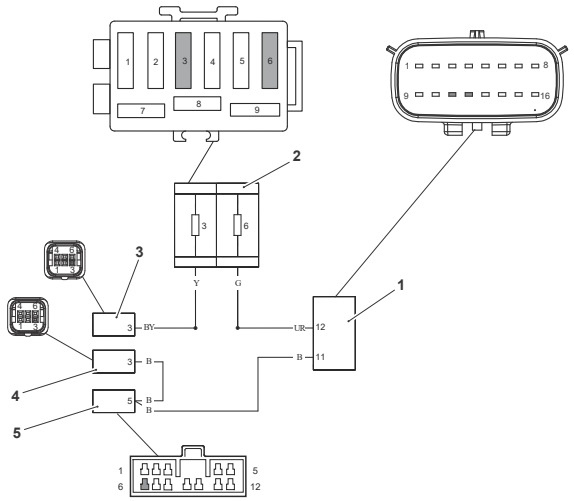
Fault Code	Possible Cause	Action
C1008	Starter motor switch malfunction	Disconnect keyless ECM connector and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Keyless ECM pin 11 - Keyless ECM pin 12 - Alarm pin 5	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to step 5
2	With the start switch ON check cable continuity: - Keyless ECM pin 11 to keyless ECM pin 12	OK	Proceed to test 3
		Open circuit	Rectify fault, proceed to step 5
3	Check cable for short circuit:	OK	Proceed to test 5

Test		Result	Action
	- Keyless ECM pin 11 to ground		
		Short Circuit	Rectify fault, proceed to test 5
4	Check cable for short circuit: - Keyless ECM pin 11 to keyless ECM pin 12	OK	Proceed to test 5
		Short Circuit	Rectify fault, proceed to test 5
4	Reconnect harness, clear fault code and run engine.	OK	Action complete - quit test
		Fault still present	Contact Triumph service

Circuit Diagram



1. **Keyless ECM**
2. **Fuse Box**
3. **Right Hand Switch Housing Grey Connector**
4. **Right Hand Switch Housing Black Connector**
5. **Alarm**

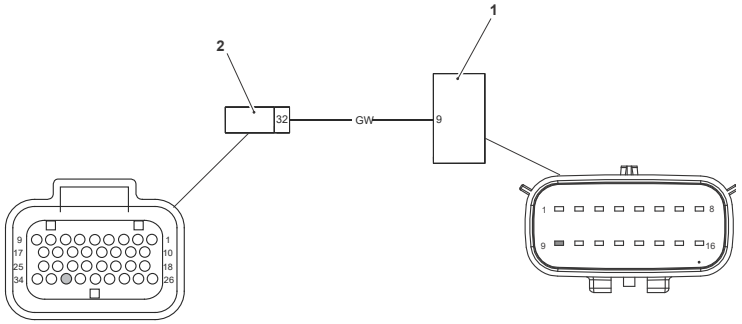
Instrument Wake-up Signal Overcurrent

Fault Code	Possible Cause	Action
C1017	Instrument wake-up signal overcurrent	Disconnect keyless ECM and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Keyless ECM pin 9 - Instrument pin 32	OK	Disconnect instruments connector and proceed to test 2
		Faulty	Rectify fault, proceed to test 4
2	Check cable for short circuit: - Keyless ECM pin 9 to ground - Keyless ECM pin 9 to battery positive	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault, proceed to test 4
3	Check cable continuity: - Keyless ECM pin 9 to instrument pin 32	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



1. **Keyless ECM**
2. **Instruments**

Instrument Communication (CAN)

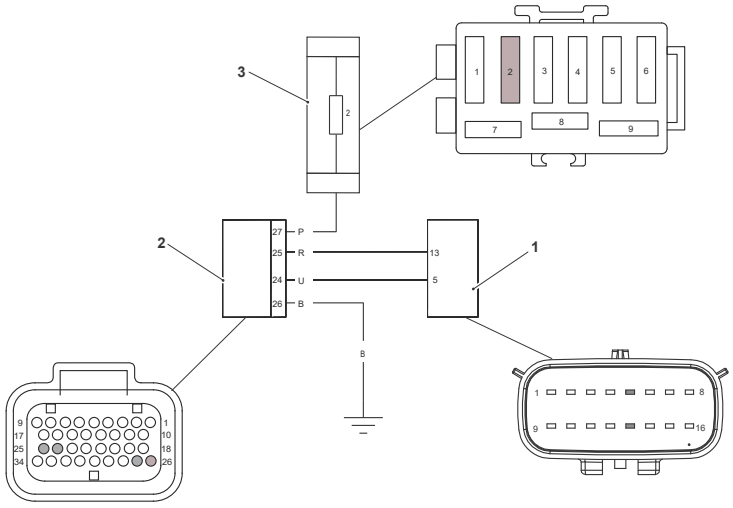
Fault Code	Possible Cause	Action
C1087	CAN fault - lost communication with instruments	Proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Turn the ignition to the ON position. Verify instrument panel is operating.	OK	Disconnect keyless ECM and instrument connectors and proceed to test 3
		Faulty	Proceed to test 2
2	Check fuse integrity: - Fuse box fuse 2	OK	Disconnect keyless ECM and instrument connectors and proceed to test 3
		Faulty	Replace blown fuse, proceed to test 8
3	Check cable continuity: - Instruments pin 27 to battery positive terminal - Instruments pin 26 to ground	OK	Proceed to test 4
		Faulty	Rectify fault, proceed to test 8
4	Check cable and terminal integrity: - Keyless ECM pin 5 - Keyless ECM pin 13 - Instruments pin 25 - Instruments pin 24	OK	Proceed to test 5
		Faulty	Rectify fault, proceed to test 8
5	Check cable for short circuit: - Keyless ECM pin 5 to ground - Keyless ECM pin 13 to ground	OK	Proceed to test 6
		Short circuit	Locate and rectify wiring fault, proceed to test 8
6	Check cable continuity: - Keyless ECM pin 13 to instrument pin 25 - Keyless ECM pin 5 to	OK	Proceed to test 7
		Open circuit	Locate and rectify wiring fault, proceed to test 8

Test		Result	Action
	instrument pin 24		
7	Check cable for short circuit: - Keyless ECM pin 13 to Keyless ECM pin 5	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



1. **Keyless ECM**
2. **Instruments**
3. **Fuse Box**

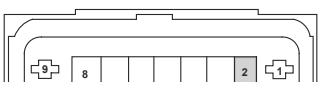
ABS Communication (CAN)

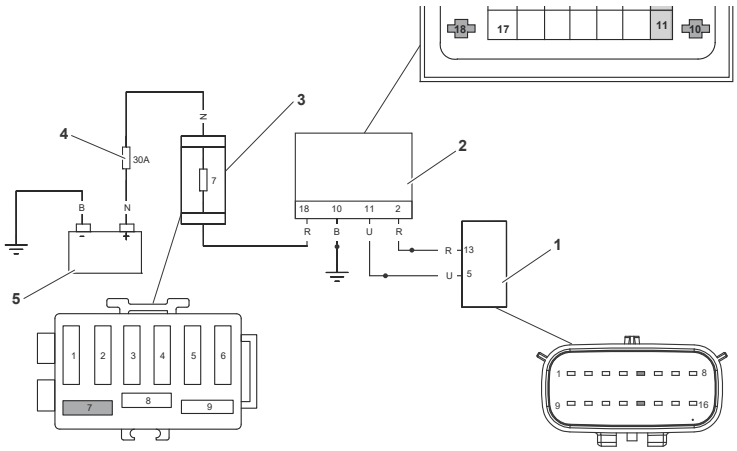
Fault Code	Possible cause	Action
C1088	CAN fault - lost communication with ABS module	Disconnect Keyless ECM connector and proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check ABS fuse integrity: - Fuse box fuse 7	OK	Proceed to test 2
		Faulty	Replace blown fuse, proceed to test 7
2	Check cable continuity: - ABS ECM pin 18 to battery positive terminal - ABS ECM pin 10 to ground	OK	Proceed to test 3
		Open circuit	Locate and rectify wiring fault, proceed to test 7
3	Check cable and terminal integrity: - Keyless ECM pin 13 - Keyless ECM pin 5 - ABS ECM pin 2 - 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: - Keyless ECM pin 13 to ground - Keyless ECM pin 5 to ground	OK	Proceed to test 5
		Short circuit	Locate and rectify wiring fault, proceed to test 7
5	Check cable continuity: - Keyless ECM pin 5 to ABS ECM pin 11 - Keyless ECM pin 13 to ABS ECM pin 2	OK	Proceed to test 6
		Open circuit	Locate and rectify wiring fault, proceed to test 7
6	Check cable for short circuit: - Keyless ECM pin 13 to Keyless ECM pin 5	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





1. **Keyless ECM**
2. **ABS ECM**
3. **Fuse Box**
4. **Main 30A Fuse**
5. **Battery**

Engine ECM Communication (CAN)

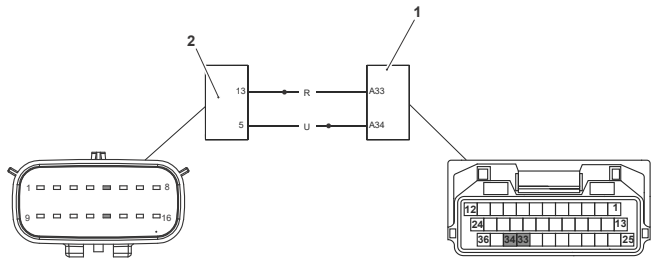
Fault Code	Possible cause	Action
C1091	CAN fault - lost communication with Engine ECM	Disconnect Keyless ECM and Engine ECM connectors and proceed to pinpoint test 1:
C1106	No Engine ECM immobiliser communication	

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Engine ECM pin A33 - Engine ECM pin A34 - Keyless ECM pin 13 - Keyless ECM pin 5	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - Engine ECM pin A33 to ground	OK	Proceed to test 3
		Short circuit	Locate and rectify wiring fault,

Test		Result	Action
	- Engine ECM pin A34 to ground		proceed to test 5
3	Check cable continuity: - Engine ECM pin A33 to Keyless ECM pin 13 - Engine ECM pin A34 to Keyless ECM pin 5	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



1. **Engine ECM Connector A**
2. **Keyless ECM**

Tyre Pressure Monitoring System (TPMS) Wheel Sensors

Fault Code	Possible cause	Action

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	
C1101	Front wheel sensor unit loss of communication error	If the problem persists: Using the Triumph diagnostic tool, check that the correct ID number for the relevant wheel pressure sensor is registered to the Keyless ECM 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
C1102	Rear wheel sensor unit loss of communication error	

Immobiliser Antenna

Fault Code	Possible Cause	Action
C1103	Immobiliser antenna - loss of communication with key	Check that the key has been registered with the Keyless ECM, if it is a new key or an additional key Check that there are no
C1104	Invalid key: Key authentication unsuccessful	

Fault Code	Possible Cause	Action
		additional keys with a transponder chip fitted close to the ignition key and proceed to pinpoint test 1:
C1105	Immobiliser antenna internal error	

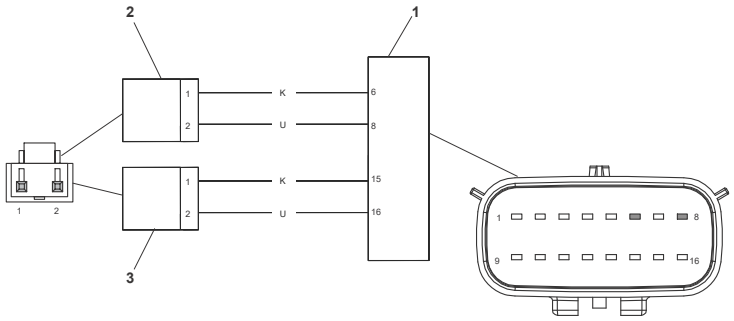
Pinpoint Tests

Test		Result	Action
1	If available, try to start the motorcycle with another 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: - Keyless ECM pin 14 - Keyless ECM pin 1 - Keyless ECM pin 2 - Keyless ECM pin 15 - Keyless ECM pin 16 - Rear LF antenna pin 1 - Rear LF antenna pin 2 - Front LF antenna pin 1 - Front LF antenna pin 2	OK	Proceed to test 3
		Faulty	Rectify fault, proceed to test 7
3	Check cable for short cirucuit: - Keyless ECM pin 1 to ground - Keyless ECM pin 2 to ground	OK	Proceed to test 4
		Short circuit	Locate and rectify wiring fault, proceed to test 7
4	Check antenna coil resistance: - Rear LF antenna pin 1 to pin 2 - Front LF antenna pin 1 to pin 2	0.70 to 0.85 Ohms*	Proceed to test 5
		Faulty	Replace the LF antenna, register new keys and proceed to test 7
5	Check cable continuity: - Keyless ECM pin 8 to rear LF	OK	Proceed to test 6

Test		Result	Action
	antenna pin 2 - Keyless ECM pin 6 to rear LF antenna pin 1 - Keyless ECM pin 15 to front LF antenna pin 1 - Keyless ECM pin 16 to rear LF antenna pin 2		
		Open circuit	Locate and rectify wiring fault, proceed to test 7
6	Check cable for short circuit: - Keyless ECM pin 6 to Keyless ECM pin 8	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

* It may not be possible to accurately measure 0.70 to 0.85 Ohms using standard workshop equipment. When measuring the resistance, a reading of 0 to 3 Ohms should indicate a normally functioning LF antenna coil.

Circuit Diagram



1. **Keyless ECM**
2. **Rear LF Antenna**
3. **Front LF Antenna**

Keyless ECM Internal Error

Fault Code	Possible Cause	Action
C1095	Keyless 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

Keyless ECM Restarted Due to Process Time Out During Normal Operation

Fault Code	Possible Cause	Action
C1124	Keyless ECM restarted due to process time out during normal operation	Note and investigate any other stored DTCs Contact Triumph service
C1125		
C1126		

Keyless ECM Restarted due to Calibration Download

Fault Code	Possible Cause	Action
C1127	Keyless ECM restarted due to calibration download	Erase DTC No further action required

Unexpected Keyless ECM Restart

Fault Code	Possible Cause	Action
C1128	Unexpected keyless 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

Keyless ECM Power Supply Interrupted

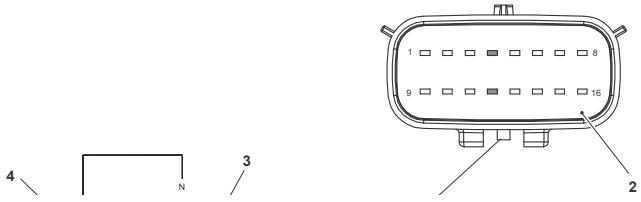
Fault Code	Possible Cause	Action
C1129	Keyless ECM power supply interrupted	Ensure voltage across battery is acceptable. Note

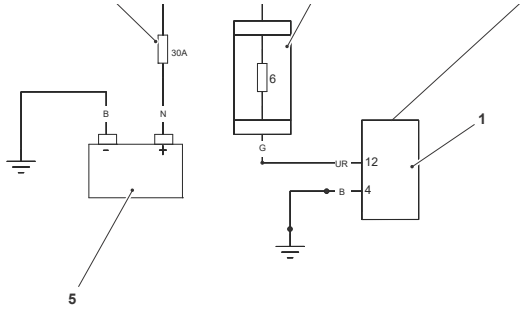
Fault Code	Possible Cause	Action
		Voltage

Pinpoint Tests

Test		Result	Action
1	Has the battery been disconnected?	Yes	Proceed to test 5
		No	Disconnect Keyless ECM and proceed to test 2
2	Check cable and terminal integrity: - Battery terminals - Keyless ECM pin 12 - Keyless ECM pin 4 - Alternator cable	OK	Proceed to test 3
		Faulty	Rectify fault, proceed to test 5
3	Check fuse integrity - Fuse box , fuse 6	OK	Proceed to test 4
		Faulty	Replace fuse(s), proceed to test 4
4	With Ignition 'ON', check Voltage across: - Keyless ECM pin 12 (positive) - Keyless ECM pin 4 Negative)	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





1. **Keyless ECM**
2. **Fuse Box 2**
3. **Main Fuse**
4. **Battery**

Keyless ECM Parameters Reset to Default

Fault Code	Possible Cause	Action
C1130	Keyless ECM parameters reset to default	Download the latest keyless ECM calibration to ensure correct model specific configuration Erase stored DTCs from all ECMs

Keyless ECM Ignition Fault - Output 1

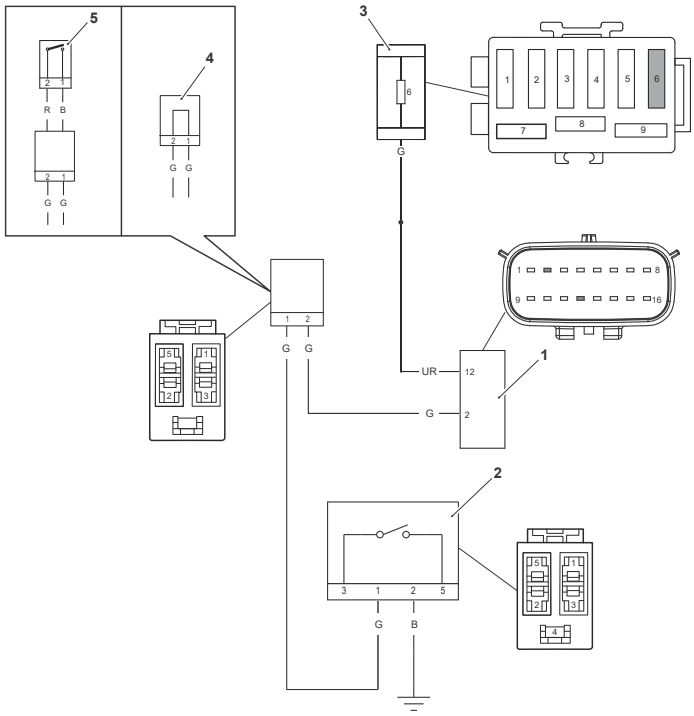
Fault Code	Possible Cause	Action
C1147	Keyless ECM ignition output 1 over current	Disconnect Keyless ECM, handle bar switches subharness, instruments, headlight and reserved connector blanking plug. Proceed to pinpoint test 2:
C1148	Keyless ECM ignition output 1 under current	Proceed to pinpoint test 1:

Pinpoint Tests

Test		Result	Action
1	Check fuse integrity:	OK	Disconnect keyless ECM and

Test		Result	Action
	- Fuse box fuse 6		KL15 relay. Proceed to pinpoint test 2:
		Faulty	Replace blown fuse, proceed to test 5
2	Check cable and terminal integrity: - Keyless ECM pin 12 - Keyless ECM pin 2 - Ignition master switch link connector pin 1 - Ignition master switch link connector pin 2 - KL15 relay pin 1 - KL15 relay pin 2	OK	Proceed to test 3
		Faulty	Rectify fault, proceed to test 5
3	Check cable for short circuit: - Keyless ECM pin 2 to ground	OK	Proceed to test 4
		Short circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable continuity: -Fuse box fuse 6 to Keyless ECM pin 12 Note: For all markets except US, the ignition master switch link connector must be fitted For US markets only, the ignition master switch must be in the ON position Check cable continuity: - Keyless ECM pin 2 to KL15 relay pin 1	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



1. **Keyless ECM**
2. **Ignition Master Switch (KL15) Relay**
3. **Fuse Box**
4. **Ignition Master Switch Link Connector (all markets except US)**
5. **Ignition Master Switch (US markets only)**

Key Missing During Riding

Fault Code	Possible Cause	Action
C1149	Key missing during riding Smart key flat battery	Ensure smart key is kept in range (1 meter/3 feet) of LF antenna during riding Replace smart key battery

Right Hand Switch Housing Malfunction

Fault Code	Possible Cause	Action
C1156 C1157 C1158	Right hand switch housing malfunction - Engine start/stop switch correlation fault	Disconnect right hand switch housing, engine ECM connector B and keyless ECM and proceed

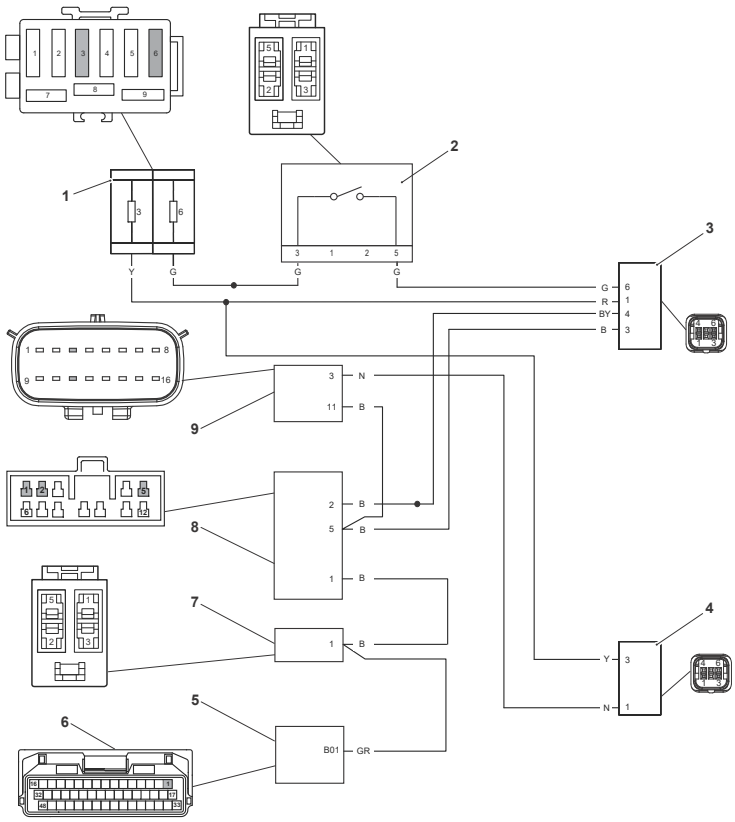
Fault Code	Possible Cause	Action
		to pinpoint test 1:
	CAN fault - lost communication with engine ECM	Refer to CAN fault - lost communication with engine ECM (see Engine ECM Communication (CAN))

Pinpoint Tests

Test		Result	Action
1	Check cable and terminal integrity: - Right hand switch housing black connector pin 1 - Right hand switch housing black connector pin 3 - Right hand switch housing black connector pin 6 - Right hand switch housing grey connector pin 1 - Right hand switch housing grey connector pin 3 - Keyless ECM pin 11 - Keyless ECM pin 3	OK	Proceed to test 2
		Faulty	Rectify fault, proceed to test 5
2	Check cable for short circuit: - Keyless ECM pin 11 to ground - Keyless ECM pin 3 to ground - Engine ECM pin B01 to ground	OK	Proceed to test 3
		Short circuit	Rectify fault, proceed to test 5
3	Check cable continuity: - Keyless ECM pin 11 to right hand switch housing black connector pin 3 - Keyless ECM pin 3 to right hand switch housing grey connector pin 1	OK	Proceed to test 4
		Open circuit	Locate and rectify wiring fault, proceed to test 5
4	Check cable for short circuit:	OK	Proceed to test 5

Test		Result	Action
	- Keyless ECM pin 11 to pin 3		
		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



1. Fuse Box

2. Ignition Master Switch (KL15) Relay

3. Right Hand Switch Housing Black Connector

4. Right Hand Switch Housing Grey Connector

5. Engine Electronic Control Module

6. Engine Electronic Control Module - Connector B

7. fuel Pump Relay

8. Alarm

9. Keyless Electronic Control module

Ignition ON Requested With No Key in Range

Fault Code	Possible Cause	Action
C1151	Ignition ON requested with no key in range	Erase DTC Ensure a paired key is in range of the LF antenna when turning the ignition ON No further action required

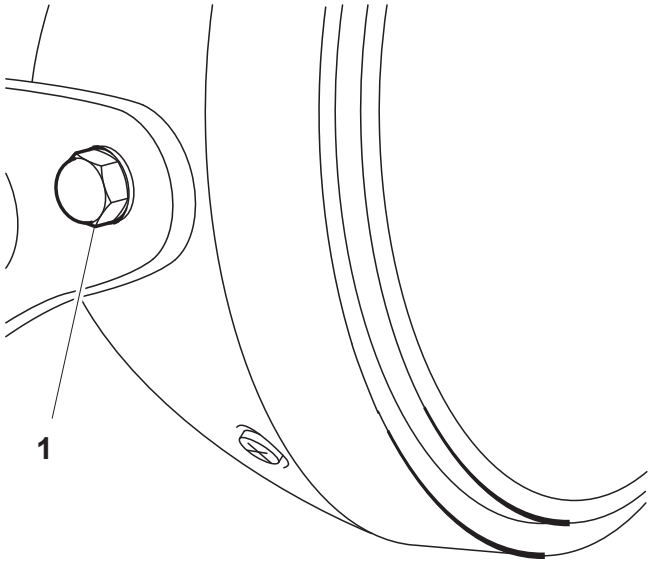
Lighting Adjustment and Bulb Replacement

Headlight Vertical Adjustment

Note

- **Always make sure the handlebars are in the straight ahead position when checking and adjusting the headlight beam setting.**

1. Switch the headlight dipped beam on.
2. Loosen the headlight assembly mounting fixings sufficiently to allow restricted movement of the headlight.
3. Adjust the position of the headlight to give the required beam setting.
4. Tighten the mounting fixings to **10 Nm**.
5. Recheck the headlight beam setting.
6. Switch the headlight off when the beam setting is satisfactorily set.



1. **Headlight mounting fixings**

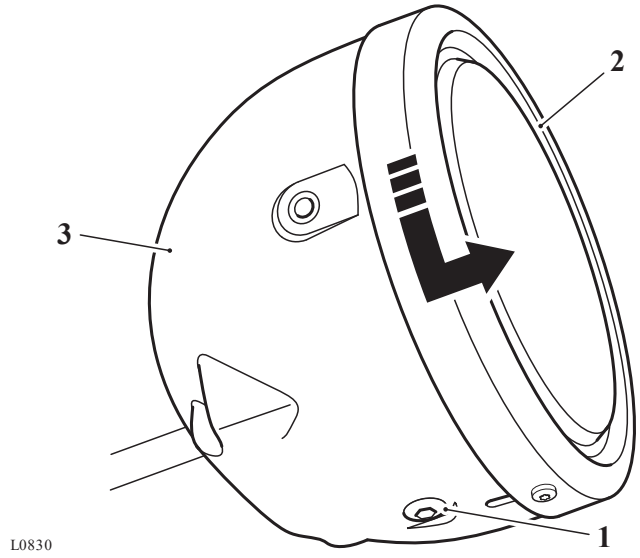
Headlight/Position Light LED Unit Replacement

The position light and headlight are situated within the headlight assembly and are sealed, maintenance free LED unit. If the headlight or position light fails, the complete unit must be replaced.

Perform the following operations:

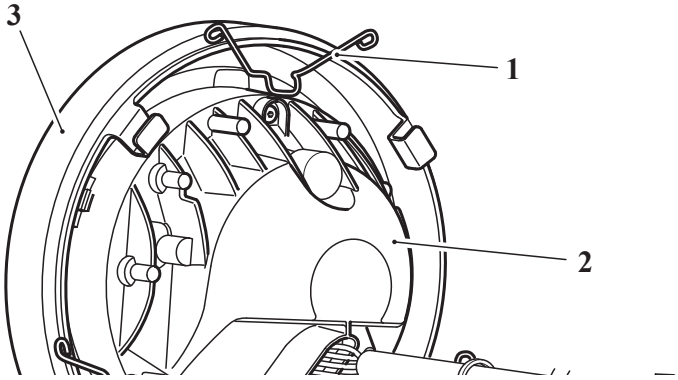
- Headlight - Removal

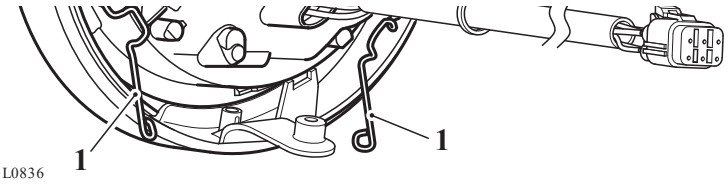
1. Remove the fixing and detach the headlight harness grommet.
2. Turn the bezel and LED unit assembly counterclockwise to release it from the headlight bowl.



1. **Fixing**
2. **Bezel and LED module assembly**
3. **Headlight bowl**

3. Note the routing of the headlamp electrical harness for the installation procedure.
4. Disconnect the electrical connector for the headlight module.
5. Remove the three retaining clips and remove the headlight LED module from the bezel.





1. **Retaining clips**
2. **Headlight LED unit**
3. **Headlight bezel**

Installation is the reversal of removal.

Perform the following operations:

- Headlight - Installation

Rear Light Bulb Replacement - LED

The rear light unit is a sealed, maintenance free LED unit.

- Rear Light - RemovalRear light removal.

LED Direction Indicators

The LED units inside the direction indicators are sealed for life units and must be replaced in the event of a failure.

- Front Direction Indicators - RemovalRemove the front direction indicator.
- Rear Direction Indicators - RemovalRemove the rear direction indicator.

LED Licence Plate Light

The LED units inside the licence plate light are sealed for life units. If failure occurs, they must be replaced.

Removal and Installation - Electrical Components

Headlight - Removal

WARNING

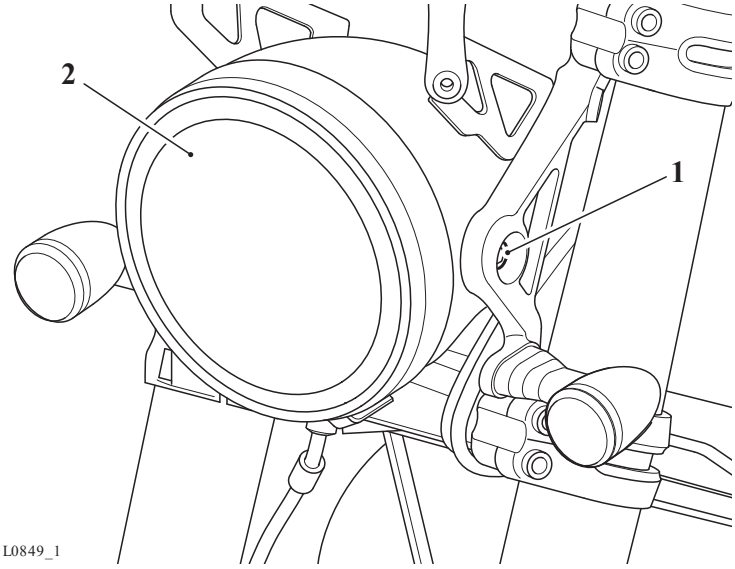
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

Perform the following operations:

- Seat - Removal
- Battery - Removal

1. Remove the headlight bezel and LED module assembly (see Headlight/Position Light LED Unit Replacement).

2. Record the electrical connections in the headlight for the indicators and the LF antenna and disconnect the electrical connections.
3. Release the grommet from the rear of the headlight.
4. Carefully remove the harnesses through the rear of the headlight bowl.
5. Remove the two fixings that attach the headlight assembly to the headlight brackets, and remove the headlight bowl.



1. Fixing

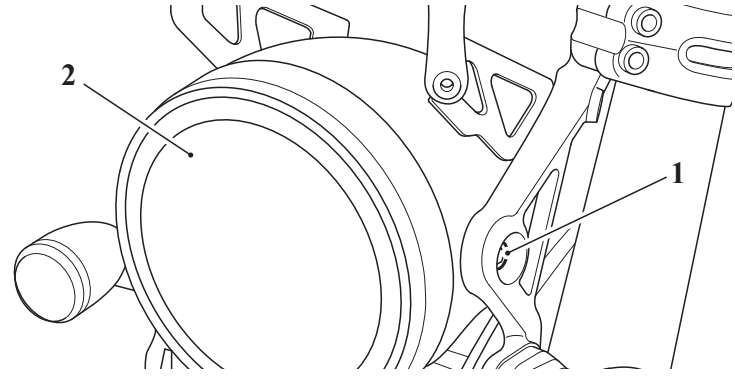
2. Headlight

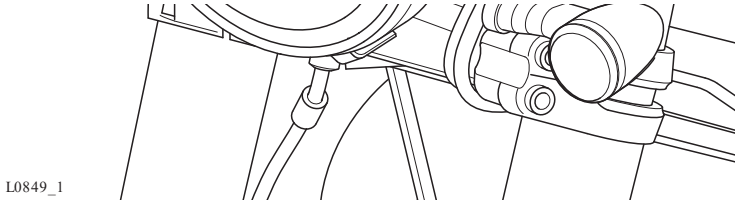
Headlight - Installation

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. Route the electrical harnesses through the rear of the headlight
2. Position the headlight assembly between the headlight brackets.
3. Install the two fixings and torque them to **10 Nm**.





1. Fixing

2. Headlight

4. Connect the electrical connectors as recorded during removal.
5. Ensure the grommet for the harness is fitted to the headlight bowl and the split faces to the right hand side.
6. Install the headlight bezel and LED module assembly (see Headlight/Position Light LED Unit Replacement).

Perform the following operations:

- Battery - Installation
- Seat - Installation
- Check the headlight operation and the beam setting, rectify as necessary.

Rear Light - Removal

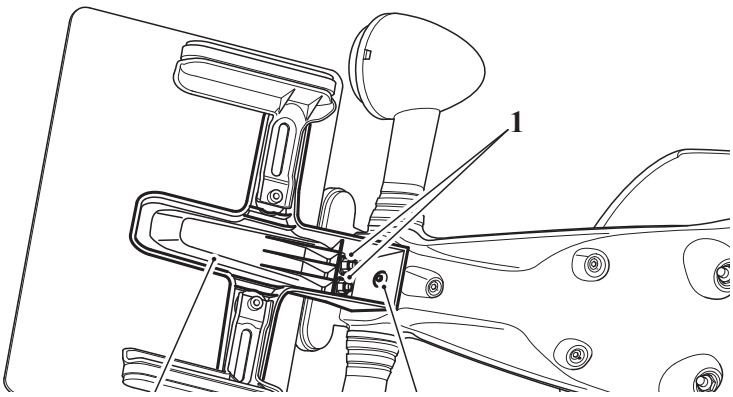
WARNING

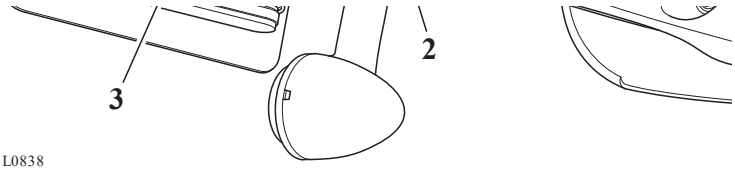
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Rear Mudguard - Removal

1. Remove the two nuts that attach the lower licence plate hanger assembly to the upper licence plate hangar.
2. Remove the fixing that attaches the lower licence plate hanger assembly to the upper licence plate hangar and remove the lower licence plate hanger assembly.



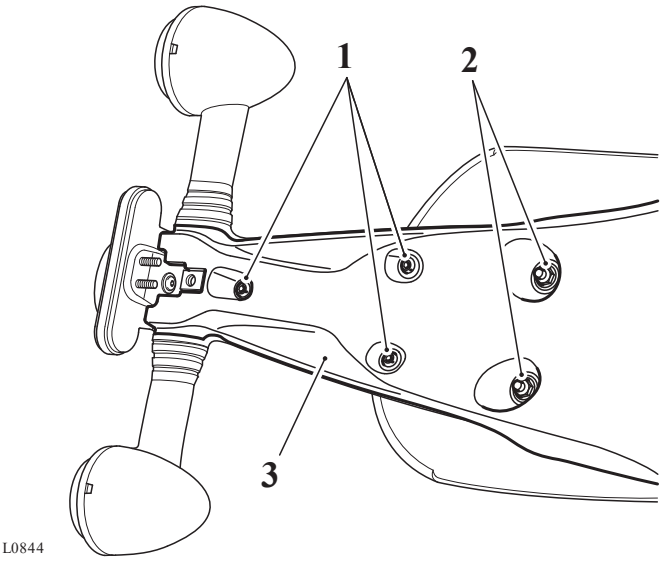


1. **Nuts**
2. **Fixing**
3. **Lower licence plate hanger assembly**

CAUTION

When you remove the fixings and separate the parts in the steps that follow, the wiring for the rear lights and indicators will still be attached. Be careful not to damage the wiring.

3. Remove the fixings that attach the rear mudguard support bracket to the upper number plate hanger.
4. Remove the two nuts that attach the rear mudguard and rear light to the rear mudguard support bracket. Collect the two flanged washers



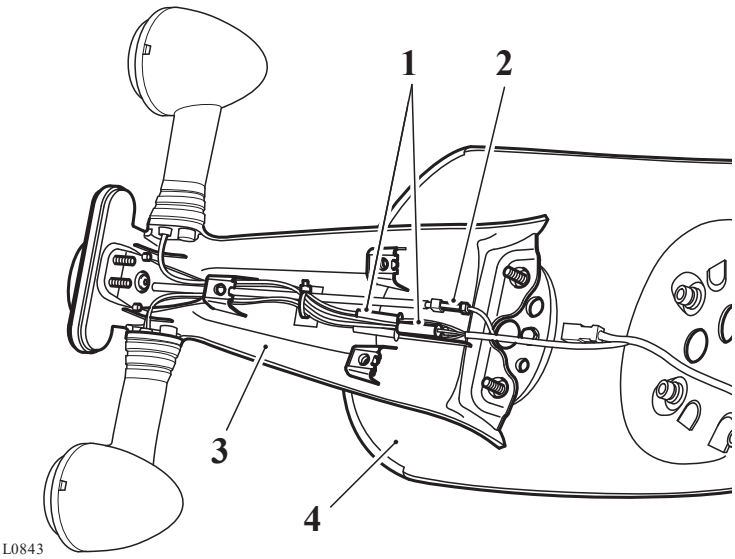
1. **Upper licence plate hanger fixings**
2. **Mudguard/rear light fixings**
3. **Rear mudguard support bracket**

Note

- **Note the routing of the direction indicator and licence plate light harnesses for installation.**

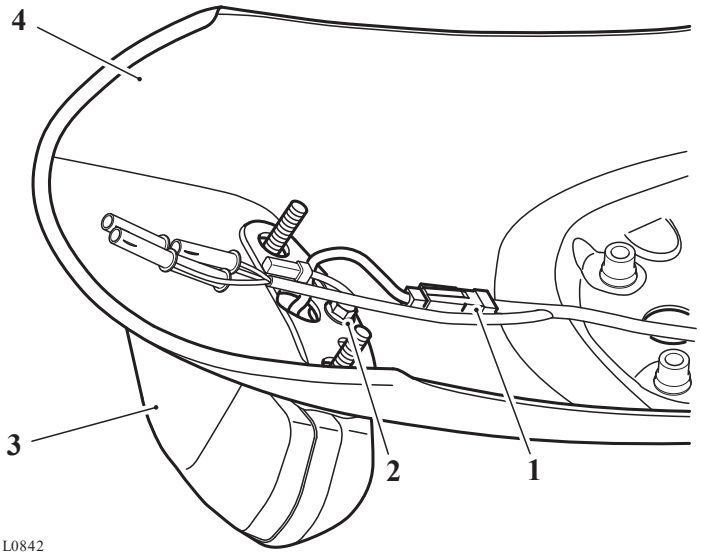
5. Disconnect the electrical connectors for the rear direction indicators and the licence plate light.
6. Remove the upper licence plate hanger, indicator and licence plate light assembly from

the rear mudguard.



1. **Rear direction indicator electrical connectors**
2. **Licence plate light electrical connector**
3. **Upper licence plate hanger**
4. **Rear mudguard**

7. Disconnect the electrical connector for the rear light.
8. Remove the fixing that attaches the rear light to the rear mudguard and remove the rear light and its seal.



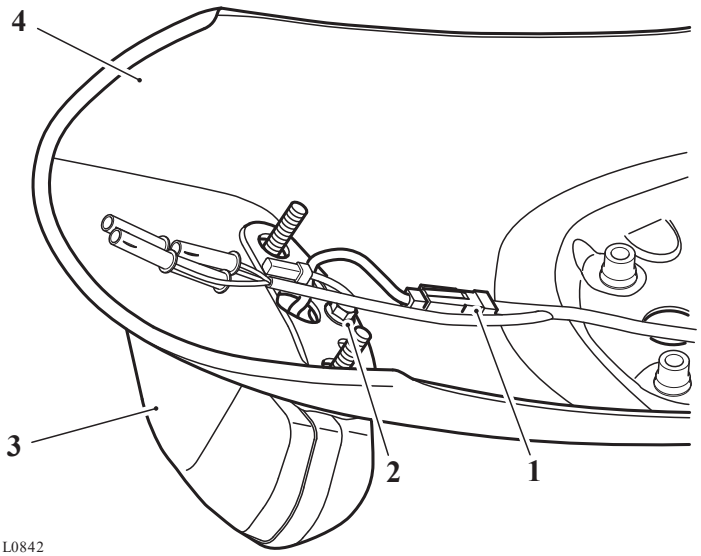
1. **Electrical connector**
2. **Fixing**
3. **Rear light**
4. **Rear mudguard**

Rear Light - Installation

WARNING

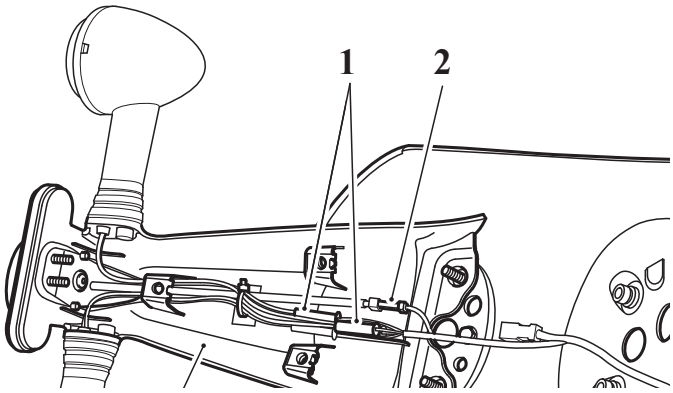
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

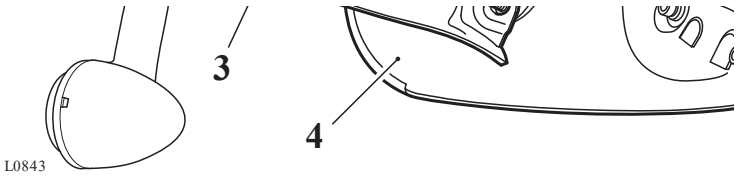
1. Put the rear light with its seal in position on the rear mudguard and install the fixing. Tighten the fixing to **8 Nm**.



1. **Electrical connector**
2. **Fixing**
3. **Rear light**
4. **Rear mudguard**

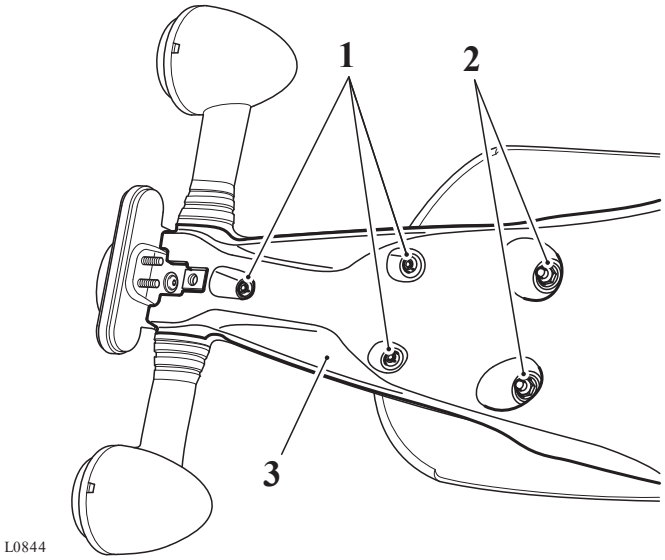
2. Connect the electrical connector for the rear light.
3. Put the upper licence plate hanger, indicator and licence plate light assembly in position onto the rear mudguard.
4. Route the direction indicator and licence plate light harnesses as recorded for removal, and connect the electrical connectors to the rear light harness.





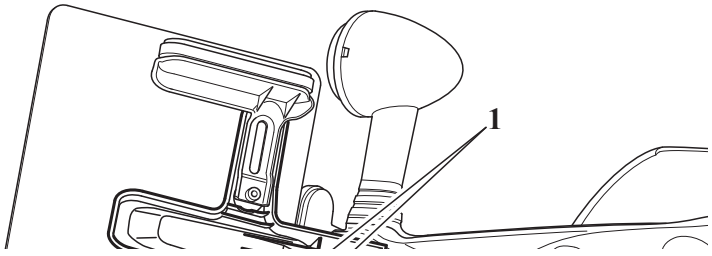
1. **Rear direction indicator electrical connectors**
2. **Licence plate light electrical connector**
3. **Upper licence plate hanger**
4. **Rear mudguard**

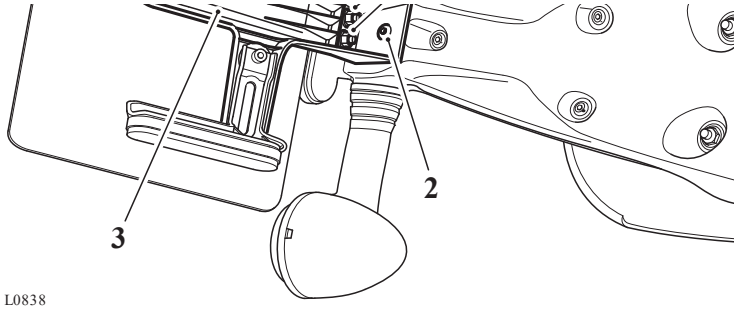
5. Position the rear mudguard support bracket to the rear mudguard.
6. Fit the two flanged washers into the rear mudguard support bracket.
7. Install the fixings that attach the rear light, rear mudguard and the support bracket together, and tighten the fixings to **9 Nm**.
8. Install the three fixings for the upper licence plate hanger, and tighten the fixings to **3 Nm**.



1. **Upper licence plate hanger fixings**
2. **Mudguard/rear light fixings**
3. **Rear mudguard support bracket**

9. Put the lower licence plate hanger assembly in position.
10. Install the fixing and tighten it to **3 Nm**.
11. Install the two nuts and tighten them to **5 Nm**.





1. **Nuts**
2. **Fixing**
3. **Lower licence plate hanger assembly**

12. Refit the rear mudguard (see Rear Mudguard - Installation).

Perform the following operations:

- Battery - Installation
- Seat - Installation
- Check the operation of the rear light and rectify if necessary.

Front Direction Indicators - Removal

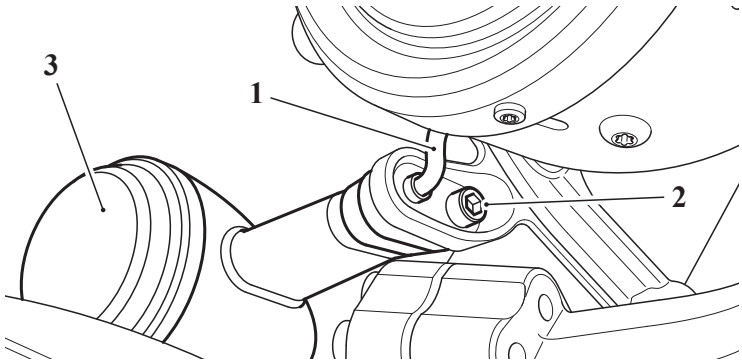
WARNING

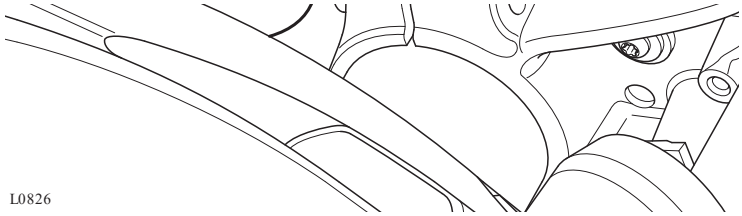
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

Perform the following operations:

- Seat - Removal
- Battery - Removal

1. Remove the headlight bezel and LED module assembly (see Headlight/Position Light LED Unit Replacement).
2. Disconnect the applicable front direction indicator electrical connectors in the headlight bowl.
3. Note the route of the front direction indicator harnesses to the direction indicator.
4. Remove the front direction indicator fixing, and remove the direction indicator.





1. Electrical harness

2. Fixing

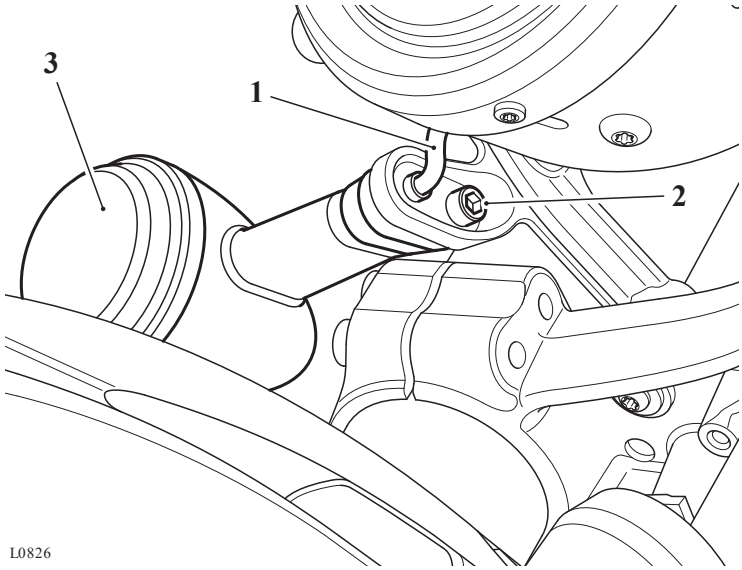
3. Front direction indicator

Front Direction Indicators - 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. Put the Front indicator into position on the headlight bracket.
2. Install the fixing and torque it to **5 Nm**.



1. Electrical harness

2. Fixing

3. Front direction indicator

3. Route the electrical harness from the front indicator into the headlight bowl.
4. Connect the electrical connectors into the harness in the headlight bowl.
5. Install the headlight bezel and LED module assembly (see Headlight/Position Light LED Unit Replacement).

Perform the following operations:

- Battery - Installation
- Seat - Installation
- Check the front indicator operation and rectify as necessary.

Rear Direction Indicators - Removal

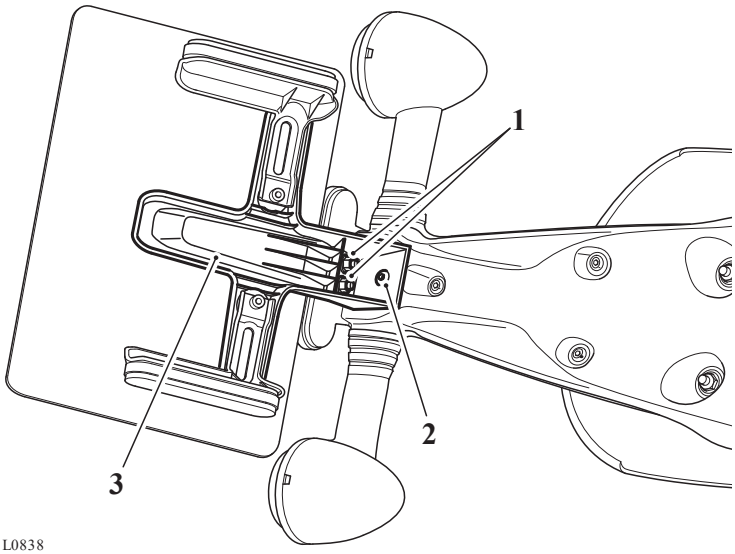
WARNING

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.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Rear Mudguard - Removal

1. Remove the two nuts that attach the lower licence plate hanger assembly to the upper licence plate hangar.
2. Remove the fixing that attaches the lower licence plate hanger assembly to the upper licence plate hangar and remove the lower licence plate hanger assembly.



1. **Nuts**
2. **Fixing**
3. **Lower licence plate hanger assembly**

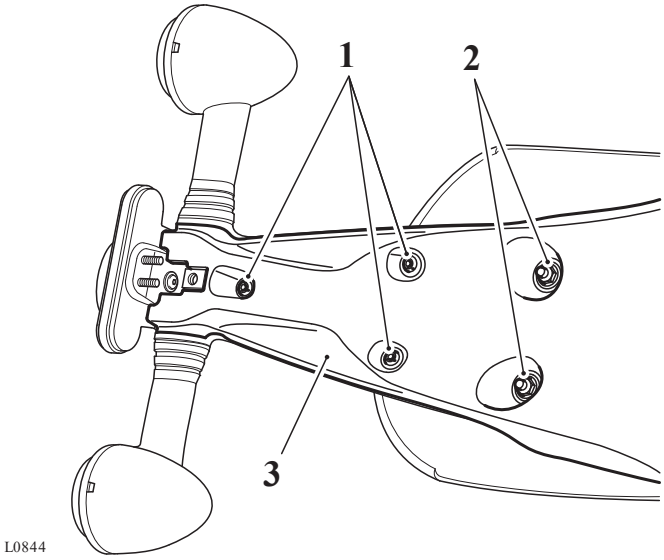
CAUTION

When you remove the fixings and separate the parts in the steps that follow, the wiring for

CAUTION

the rear lights and indicators will still be attached. Be careful not to damage the wiring.

3. Remove the fixings that attach the rear mudguard support bracket to the upper number plate hanger.
4. Remove the two nuts that attach the rear mudguard and rear light to the rear mudguard support bracket. Collect the two flanged washers

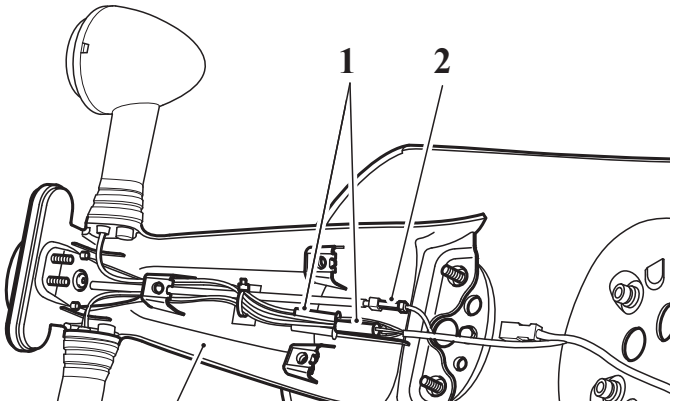


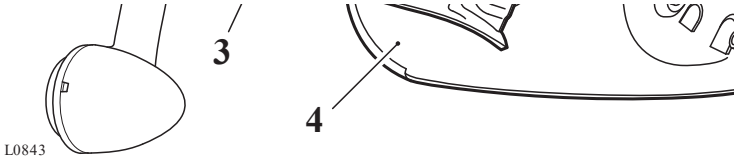
1. **Upper licence plate hanger fixings**
2. **Mudguard/rear light fixings**
3. **Rear mudguard support bracket**

Note

- **Note the routing and connection of the direction indicator and licence plate light harnesses for installation.**

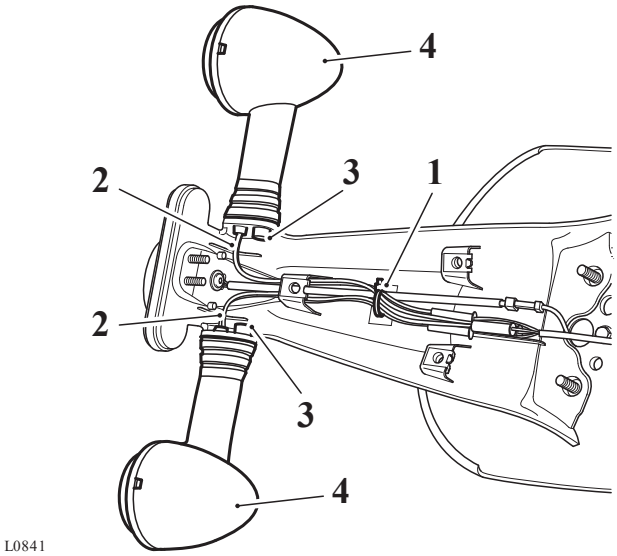
5. Disconnect the electrical connectors for the rear direction indicators and the licence plate light.
6. Remove the upper licence plate hanger, indicator and licence plate light assembly from the rear mudguard.





1. **Rear direction indicator electrical connectors**
2. **Licence plate light electrical connector**
3. **Upper licence plate hanger**
4. **Rear mudguard**

7. Cut and remove the cable tie.
8. Remove the fixing for the applicable rear direction indicator.
9. Remove the rear direction indicator.



1. **Cable tie**
2. **Direction indicator harness**
3. **Fixing**
4. **Direction indicator**

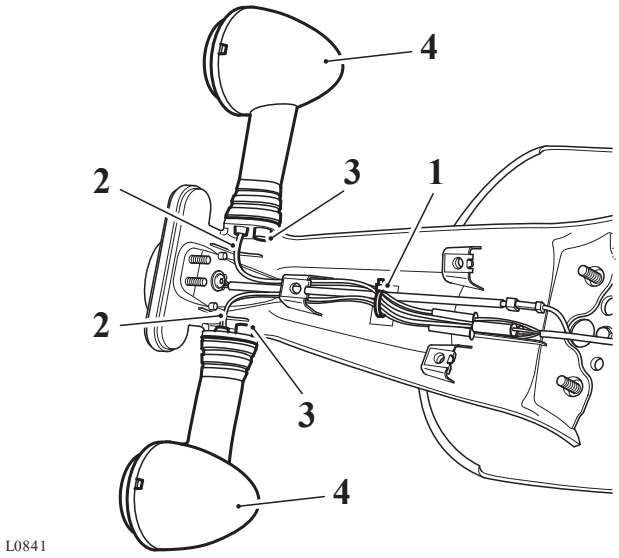
Rear Direction Indicators - Installation

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.

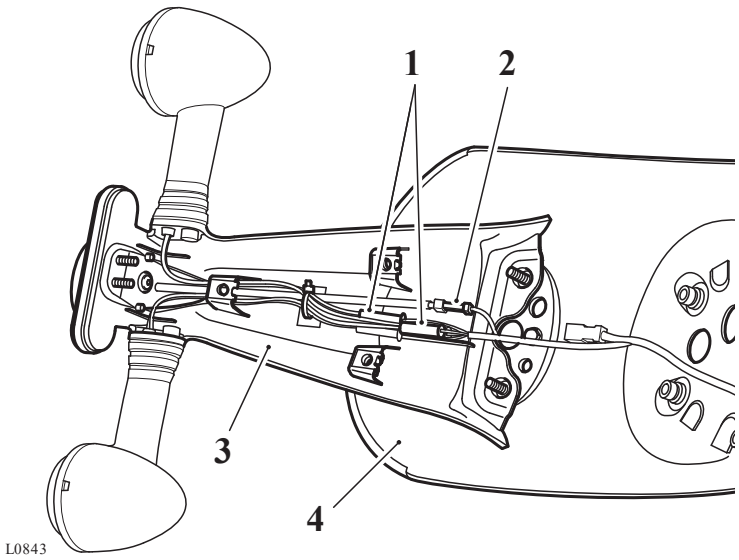
1. Reposition the rear direction indicator to the upper licence plate hanger and install the fixing. Tighten the fixing to **5 Nm**.

2. Route the wiring harness as noted during the removal procedure.
3. Install a new cable tie to hold the harnesses in position. Cut the excess material from the cable tie.



1. **Cable tie**
2. **Direction indicator harness**
3. **Fixing**
4. **Direction indicator**

4. Put the upper licence plate hanger, indicator and licence plate light assembly in position onto the rear mudguard.
5. Connect the electrical connectors to the rear light harness.

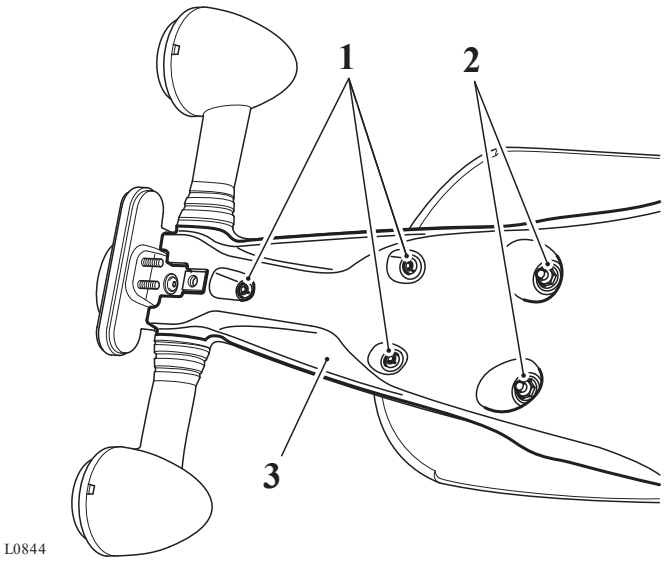


1. **Rear direction indicator electrical connectors**
2. **Licence plate light electrical connector**

3. Upper licence plate hanger

4. Rear mudguard

6. Put the rear mudguard support bracket in position.
7. Fit the two flanged washers into the rear mudguard support bracket.
8. Install the fixings that attach the rear light, rear mudguard and the support bracket together, and tighten the fixings to **9 Nm**.
9. Install the three fixings for the upper licence plate and tighten the fixings to **3 Nm**.

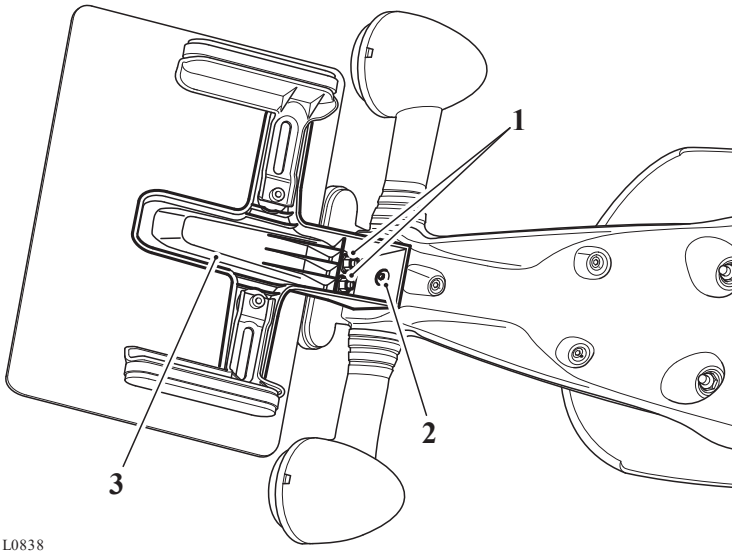


1. Upper licence plate hanger fixings

2. Mudguard/rear light fixings

3. Rear mudguard support bracket

10. Put the lower licence plate hanger assembly in position.
11. Install the fixing and tighten it to **3 Nm**.
12. Install the two nuts and tighten them to **5 Nm**.



1. **Nuts**
2. **Fixing**
3. **Lower licence plate hanger assembly**

13. Refit the rear mudguard (see Rear Mudguard - Installation).

Perform the following operations:

- Battery - Installation
- Seat - Installation
- Check the operation of the rear indicators and rectify if necessary.

Rear Licence Plate Light - Removal

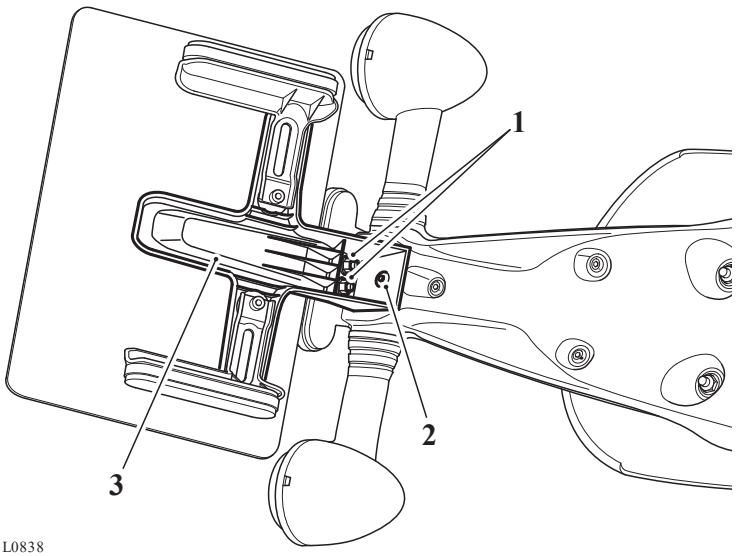
WARNING

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.

Perform the following operations:

- Rear Mudguard - Removal

1. Remove the two nuts that attach the lower licence plate hanger assembly to the upper licence plate hangar.
2. Remove the fixing that attaches the lower licence plate hanger assembly to the upper licence plate hangar and remove the lower licence plate hanger assembly.

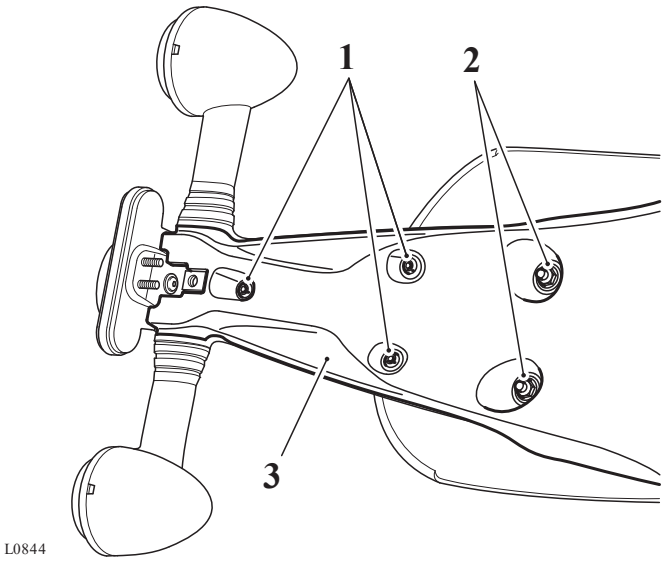


1. **Nuts**
2. **Fixing**
3. **Lower licence plate hanger assembly**

CAUTION

When you remove the fixings and separate the parts in the steps that follow, the wiring for the rear lights and indicators will still be attached. Be careful not to damage the wiring.

3. Remove the fixings that attach the rear mudguard support bracket to the upper number plate hanger.
4. Remove the two nuts that attach the rear mudguard and rear light to the rear mudguard support bracket. Collect the two flanged washers

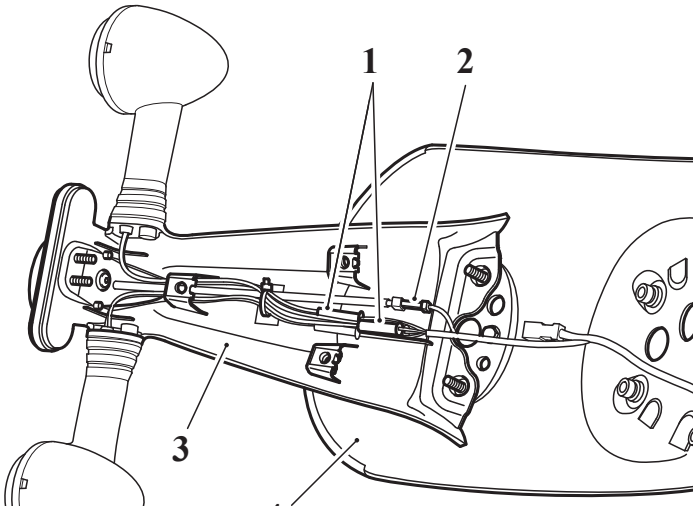


1. **Upper licence plate hanger fixings**
2. **Mudguard/rear light fixings**
3. **Rear mudguard support bracket**

Note

- **Note the routing and connection of the licence plate light harness for installation.**

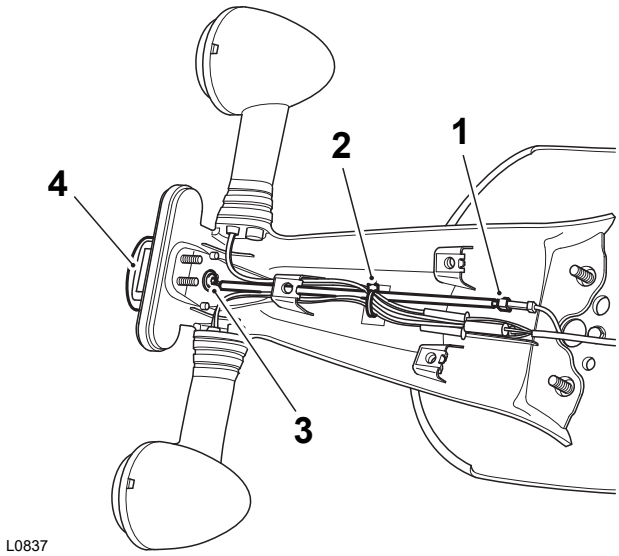
5. Disconnect the electrical connector for the licence plate light.





1. **Rear direction indicator electrical connectors**
2. **Electrical connector**
3. **Upper licence plate hanger**
4. **Rear mudguard**

6. Cut and remove the cable tie.
7. Remove the fixing for the rear licence plate light and remove the light.



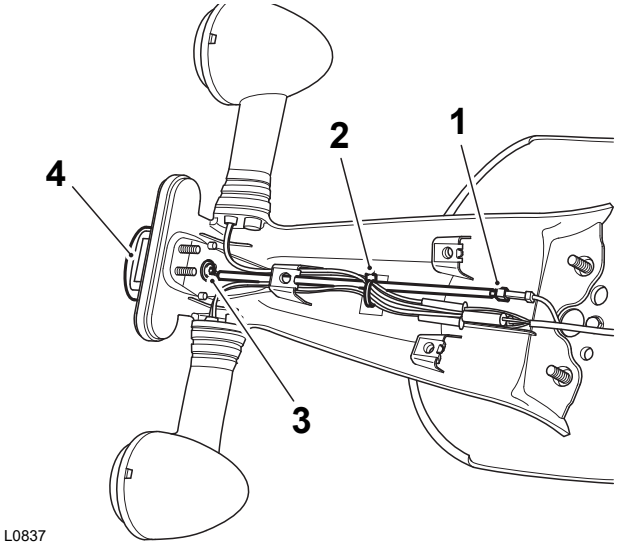
1. **Electrical connector**
2. **Cable tie**
3. **Fixing**
4. **Rear licence plate light**

Rear Licence Plate Light - Installation

WARNING

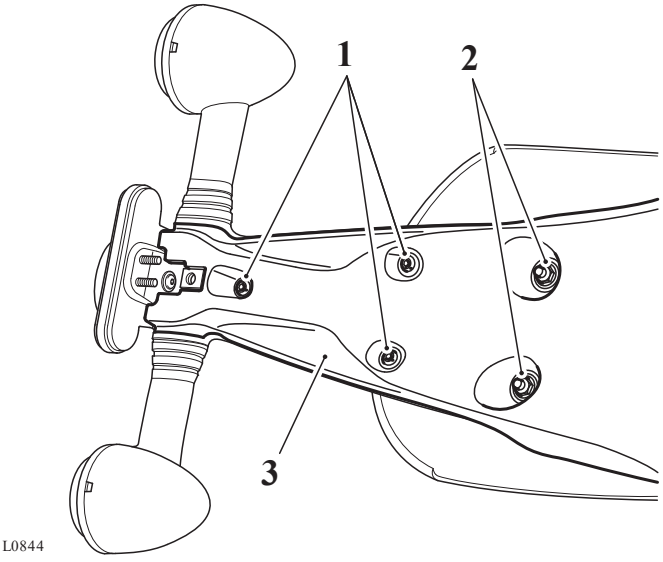
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Put the licence plate light in position on the upper licence plate hanger and install the fixing. Tighten the fixing to **1 Nm**.
2. Route the wiring harness as recorded during the removal procedure.
3. Install a new cable tie to hold the harnesses in position. Cut the excess material from the cable tie.



1. **Electrical connector**
2. **Cable tie**
3. **Fixing**
4. **Rear licence plate light**

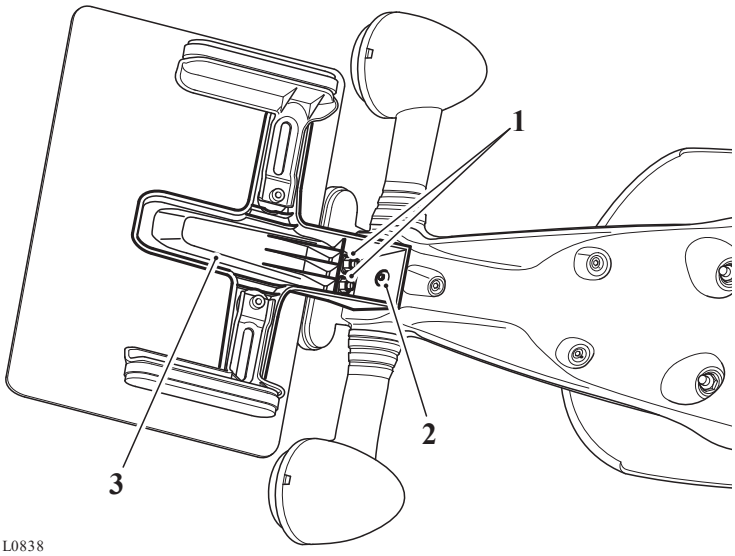
4. Put the rear mudguard support bracket in position.
5. Fit the two flanged washers into the rear mudguard support bracket.
6. Install the fixings that attach the rear light, rear mudguard and the support bracket together, and torque the fixings to **9 Nm**.
7. Install the three fixings for the upper licence plate and torque the fixings to **3 Nm**.



1. **Upper licence plate hanger fixings**
2. **Mudguard/rear light fixings**
3. **Rear mudguard support bracket**

8. Put the lower licence plate hanger assembly in position.

9. Install the fixing and torque it to **3 Nm**.
10. Install the two nuts and torque them to **5 Nm**.



1. **Nuts**
2. **Fixing**
3. **Lower licence plate hanger assembly**

Perform the following operations:

- Rear Mudguard - Installation
- Check the operation of the rear licence plate light and rectify if necessary.

Instruments - Removal

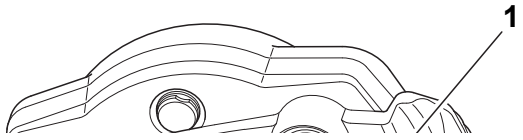
WARNING

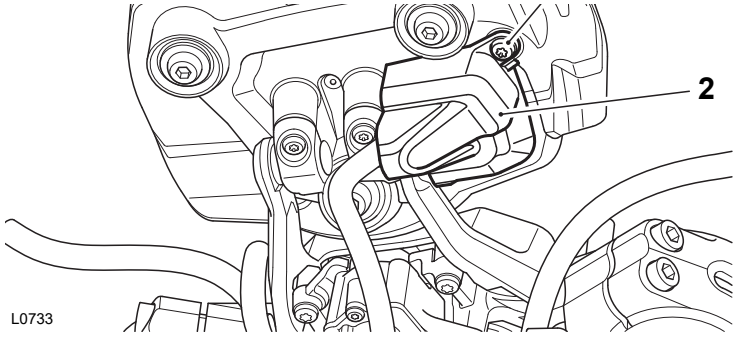
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Headlight - Removal

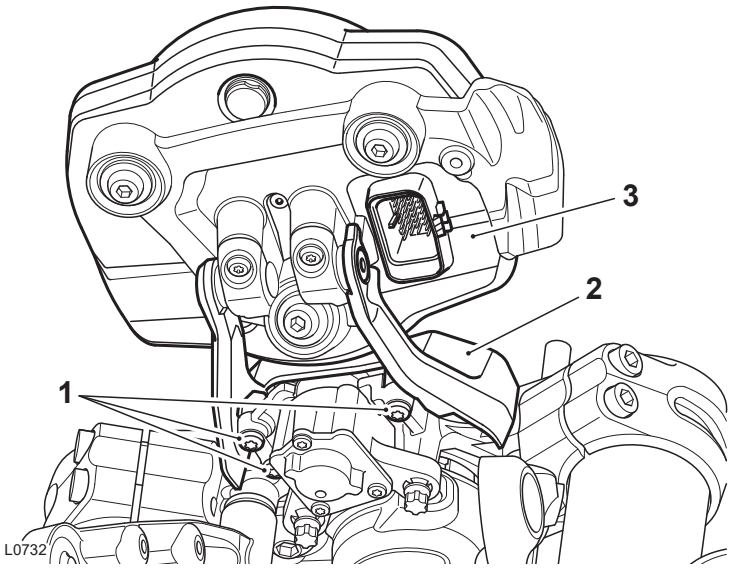
1. Remove the instrument connector cover fixing and remove the cover.





1. **Fixing**
2. **Instrument connector cover**

2. Disconnect the instrument electrical connector.
3. Remove and discard the three fixings that attach the instrument and bracket assembly to the upper yoke and remove the instrument and bracket assembly.



1. **Fixings**
2. **Instrument bracket**
3. **Instruments**

Instruments - Disassemble

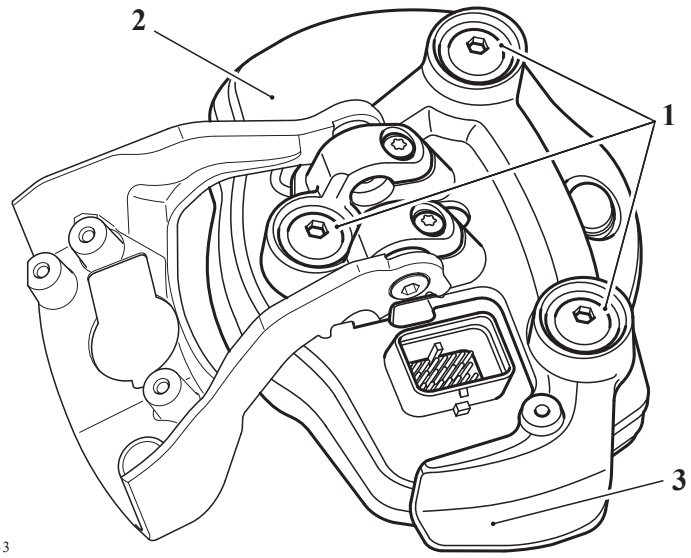
WARNING

Before starting work, ensure the 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:

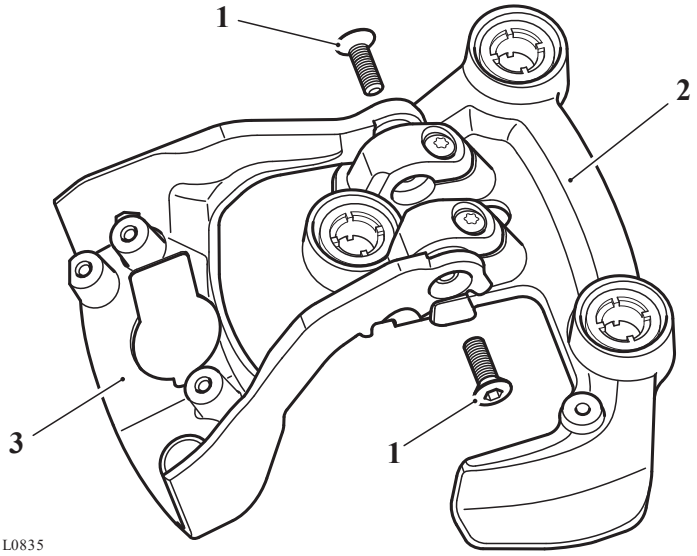
- Seat - Removal
- Battery - Removal
- Remove the fuel tank (see Fuel Tank - Removal) and place on a suitable support, close to the motorcycle.
- Remove the instrument assembly (see Instruments - Removal).

1. Remove the fixings and washers that attach the instruments to the adjustment handle.



1. **Fixings**
2. **Instruments**
3. **Adjustment handle**

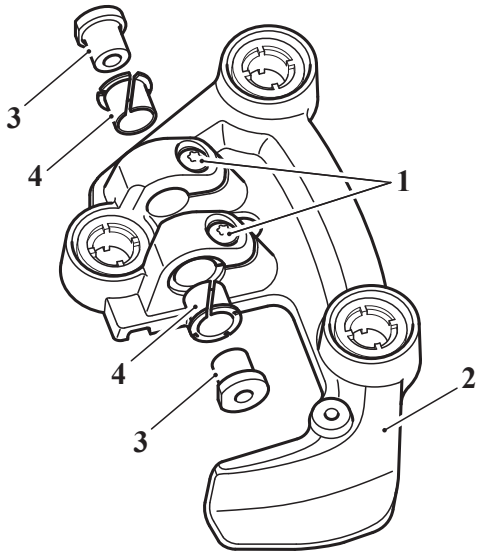
2. Remove the two fixings from the pivot bearings and separate the adjustment handle from the mounting bracket.



1. **Fixings**

2. **Adjustment handle**
3. **Mounting bracket**

3. Loosen the two clamp screws for the pivot bearings.
4. Remove the flanged pins and the pivot bearings.



1. **Clamp screws**
2. **Adjustment handle**
3. **Flanged pins**
4. **Pivot bearings**

5. Examine the flanged pins and pivot bearings for wear and damage. Replace all worn or damaged parts.

Instruments - Assemble

WARNING

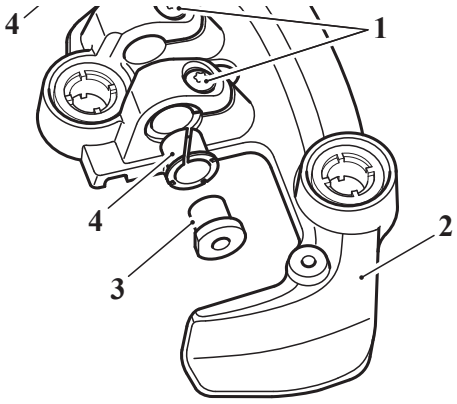
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Install the pivot bearings and the flanged pins.

Note

- **Do not tighten the clamp screws at this stage.**

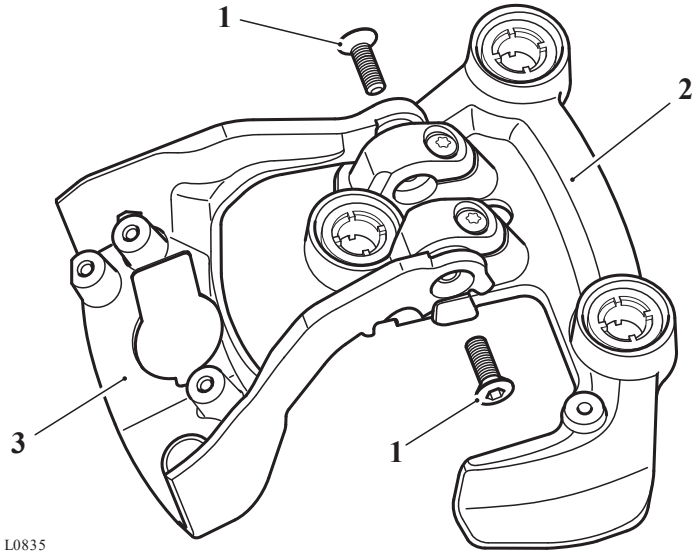




L0834

1. **Clamp screws**
2. **Adjustment handle**
3. **Flanged pins**
4. **Pivot bearings**

2. Align the bearings in the adjustment handle with the holes for the fixings and install the fixings.
3. Tighten the fixings to **5.5 Nm**.
4. Tighten the clamp screws to **1.5 Nm**.

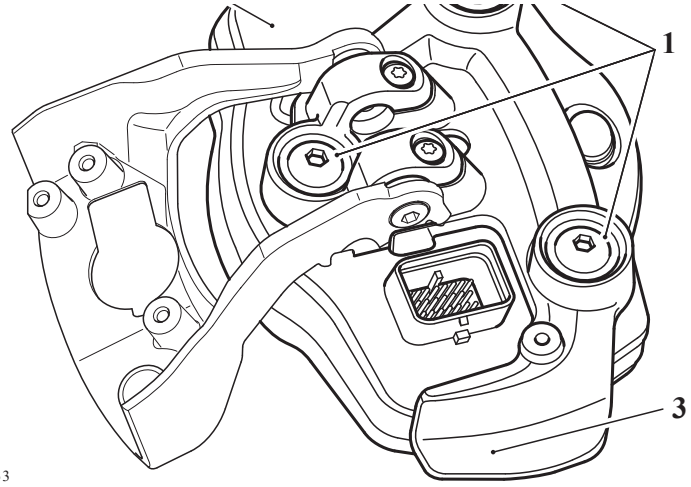


L0835

1. **Fixings**
2. **Adjustment handle**
3. **Mounting bracket**

5. Put the instrument pack in position on the adjustment handle.
6. Install the fixings and washers that attach the instrument pack to the adjustment handle. Tighten the fixings to **3 Nm**





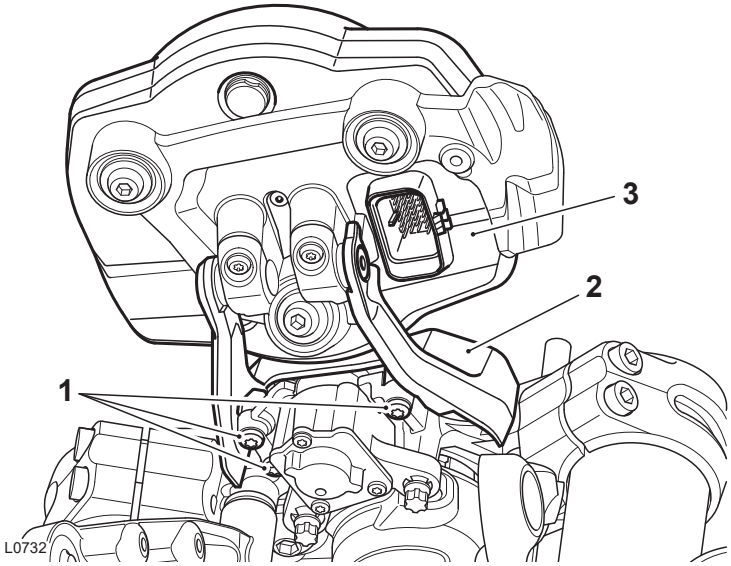
1. **Fixings**
2. **Instrument pack**
3. **Adjustment handle**

Perform the following operations:

- Instruments - Installation

Instruments - Installation

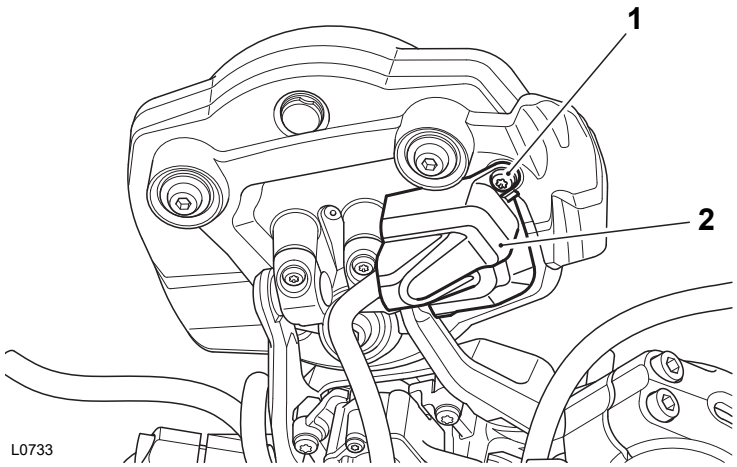
1. Put the instrument and bracket assembly in position.
2. Install three new fixings and tighten to **5 Nm**.



1. **Fixings**
2. **Instrument bracket**
3. **Instruments**

3. Connect the electrical connector to the instruments.

4. Install the cover for the connector.
5. Install and tighten the fixing for the cover to **3 Nm**.



1. **Fixing**
2. **Cover**

Perform the following operations:

- Headlight - Installation
- Battery - Installation
- Seat - Installation

Headlight Low Frequency (LF) Antenna - Removal

WARNING

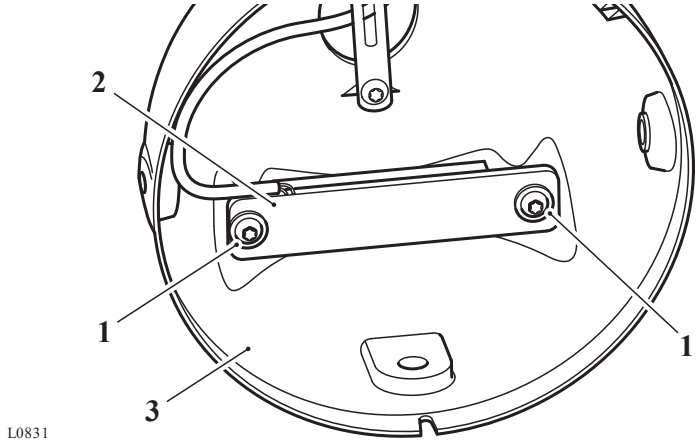
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

Perform the following operations:

- Seat - Removal
- Battery - Removal

1. Remove the headlight bezel and LED module assembly (see Headlight/Position Light LED Unit Replacement).
2. Disconnect the electrical connector in the headlamp for the LF antenna.
3. Remove the two fixings and remove the low frequency (LF) antenna from the headlight bowl.





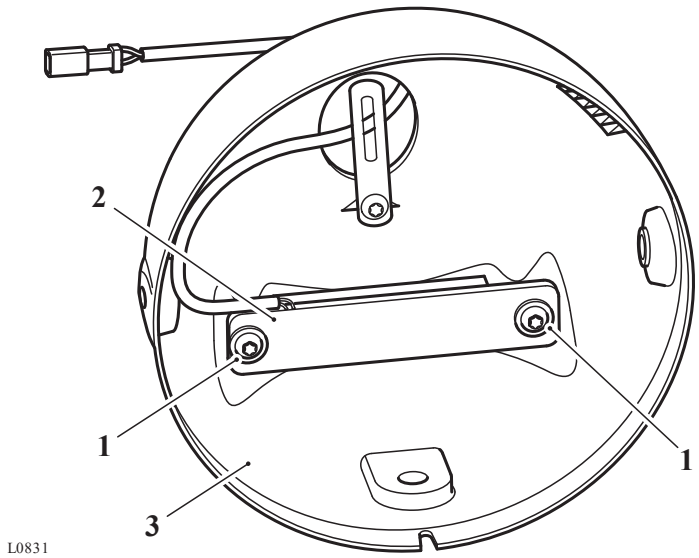
1. **Fixings**
2. **LF antenna**
3. **Headlight bowl**

Headlight Low Frequency (LF) Antenna - 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. Put the low frequency (LF) antenna into position in the headlight bowl.
2. Install the two fixings and tighten them to **1.5 Nm**.



1. **Fixings**
2. **LF antenna**

3. Headlight bowl

3. Connect the electrical connector for the LF antenna.
4. Install the headlight bezel and LED module assembly (see Headlight/Position Light LED Unit Replacement).

Perform the following operations:

- Battery - Installation
- Seat - Installation

Under Seat Low Fequency (LF) Antenna - Removal

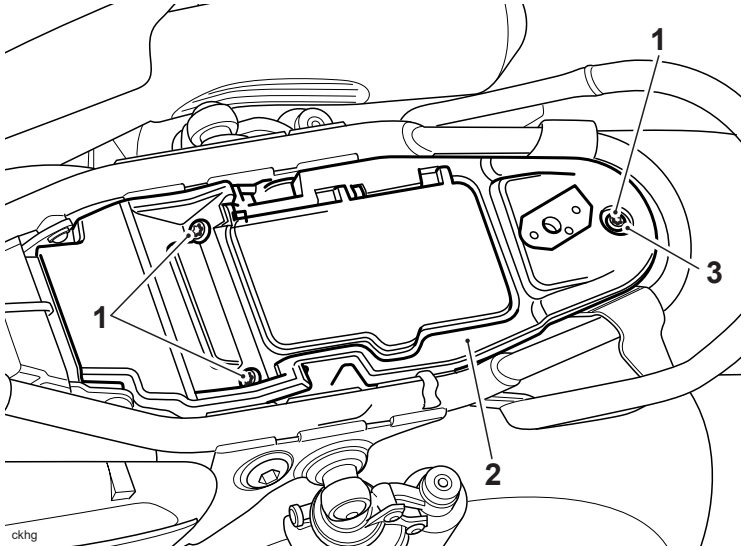
WARNING

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.

Perform the following operations:

- Seat - Removal
- Battery - Removal

1. Release the three fixings and detach the storage box from the frame. Collect the shouldered washer for the rear fixing.

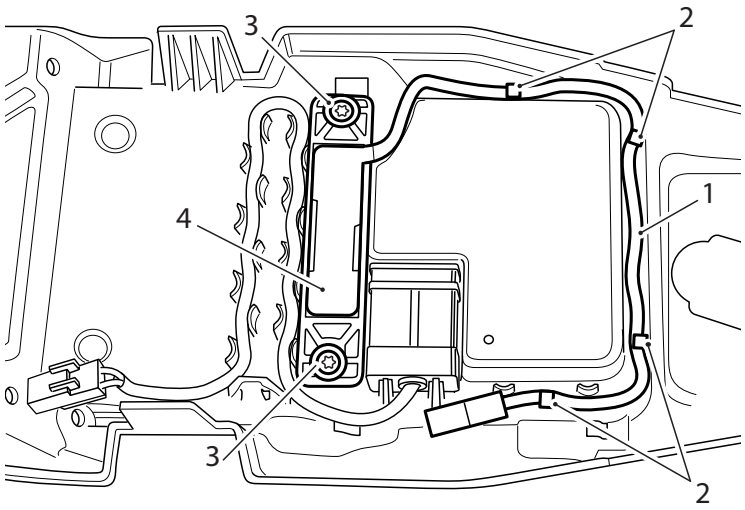


1. Fixings
2. Storage box
3. Shouldered washer

Note

- **Note the routing and retaining clips of the USB connector and the low frequency (LF) antenna cables for installation.**

2. Carefully turn over the storage box and detach the low frequency (LF) antenna cable from the storage box.
3. Remove the fixings and remove the low frequency (LF) antenna.



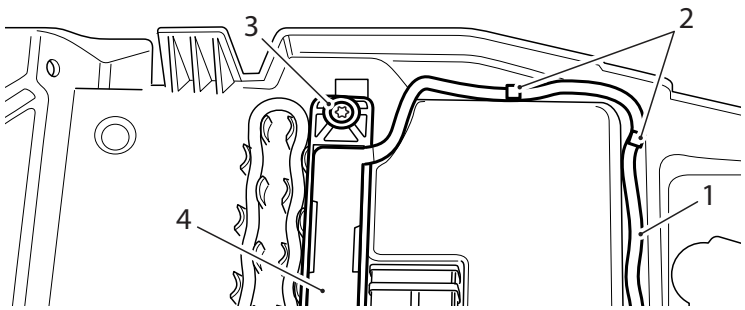
1. **Low frequency (LF) antenna cable**
2. **Retaining clips (LF antenna)**
3. **Fixings**
4. **Low frequency (LF) antenna**

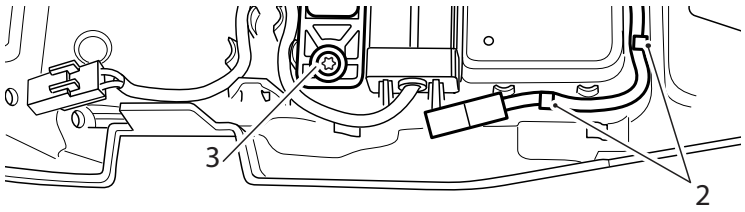
Under Seat Low Frequency (LF) Antenna - Installation

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.

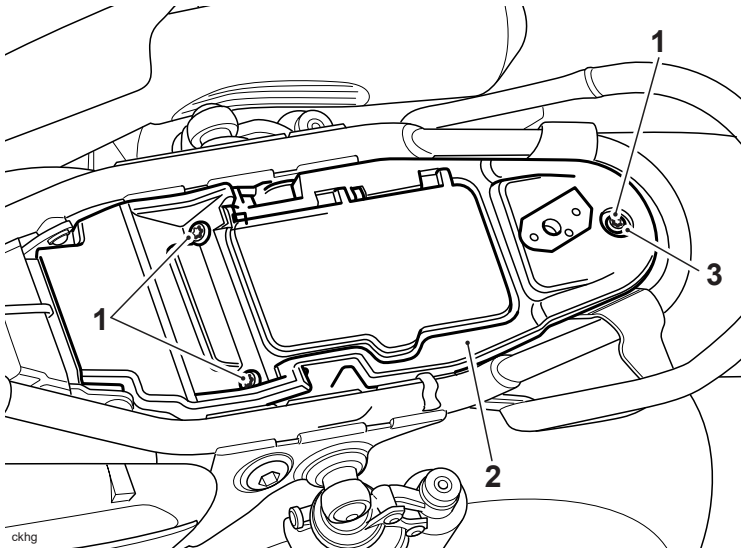
1. Position the low frequency (LF) antenna on the storage box.
2. Install the two fixings and tighten them to **1.5 Nm**.
3. Route the low frequency (LF) antenna harness around the retaining clips on the storage box.
4. Connect the electrical connector for the low frequency (LF) antenna.





1. **Low frequency (LF) antenna cable**
2. **Retaining clips (LF antenna)**
3. **Fixings**
4. **Low frequency (LF) antenna**

5. Refit the storage box and tighten the front fixings to **5 Nm**. Fit the shouldered washer for the rear fixing and tighten the rear fixing to **3 Nm**.



1. **Fixings**
2. **Storage box**
3. **Shouldered washer**

Perform the following operations:

- Battery - Installation
- Seat - Installation

USB Charger - Removal

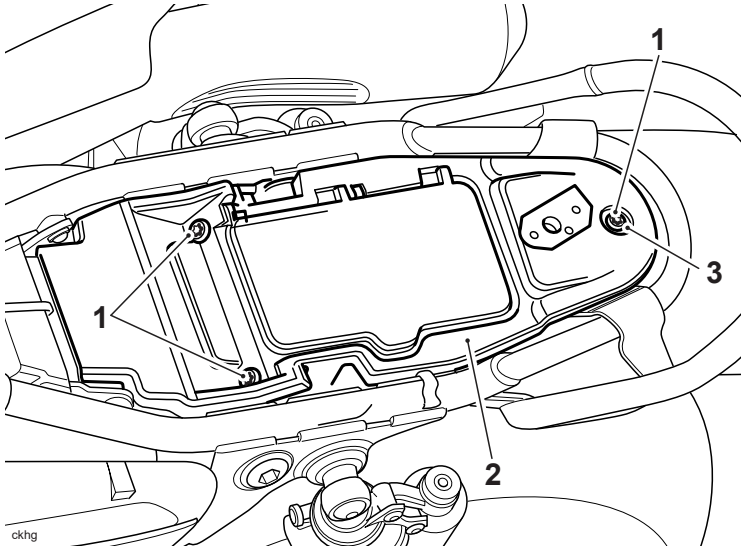
WARNING

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.

Perform the following operations:

- Seat - Removal
- Battery - Removal

1. Release the three fixings and detach the storage box from the frame. Collect the shouldered washer for the rear fixing.

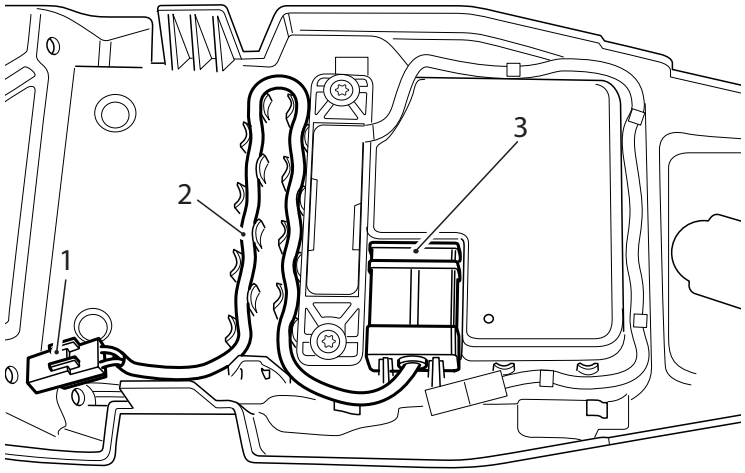


1. **Fixings**
2. **Storage box**
3. **Shouldered washer**

Note

- **Note the routing and retaining clips of the USB charger cable for installation.**

2. Carefully turn over the storage box and detach the USB charger cable from the storage box.
3. Disconnect the electrical connector.
4. Carefully pull the USB charger out of the cable retaining clips in the storage box.



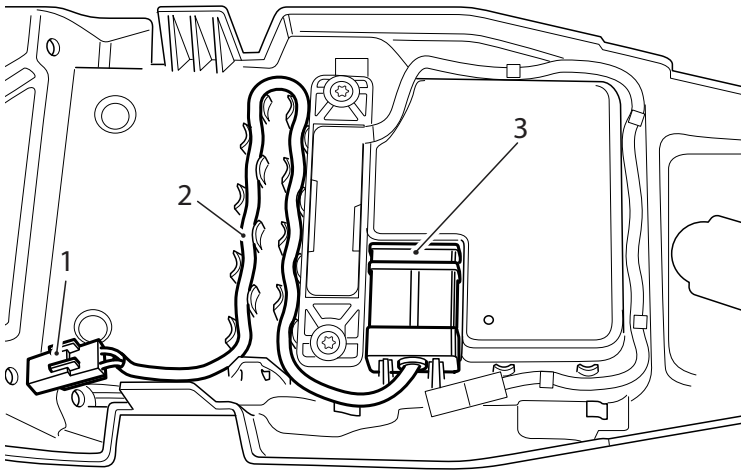
1. **Electrical connector**
2. **Cable retaining clips**
3. **USB charger**

USB Charger - Installation

WARNING

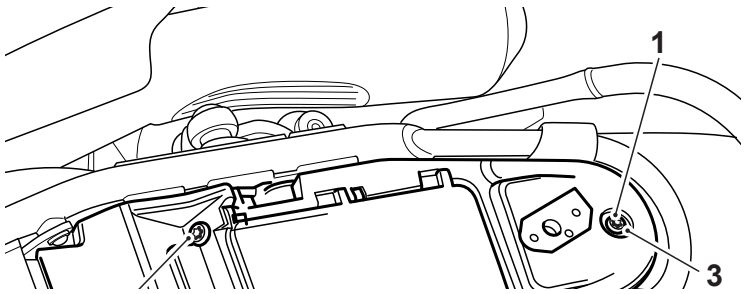
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

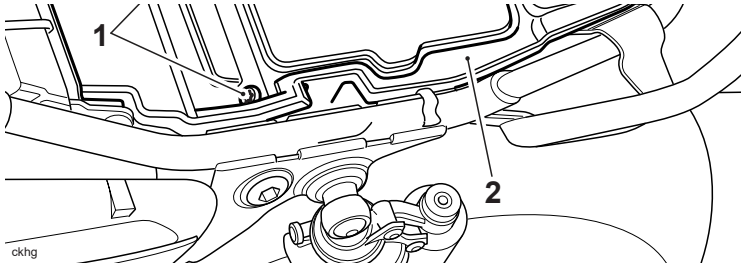
1. Engage the USB charger into the retaining clips in the storage box.
2. Route the USB charger harness around the cable retaining clips on the storage box.
3. Connect the electrical connector USB charger.



1. **Electrical connector**
2. **Cable retaining clips**
3. **USB charger**

4. Refit the storage box and tighten the front fixings to **5 Nm**. Fit the shouldered washer for the rear fixing and tighten the rear fixing to **3 Nm**.





1. **Fixings**
2. **Storage box**
3. **Shouldered washer**

Perform the following operations:

- Battery - Installation
- Seat - Installation

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.

Perform the following operations:

- Seat - Removal
- Battery - 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.

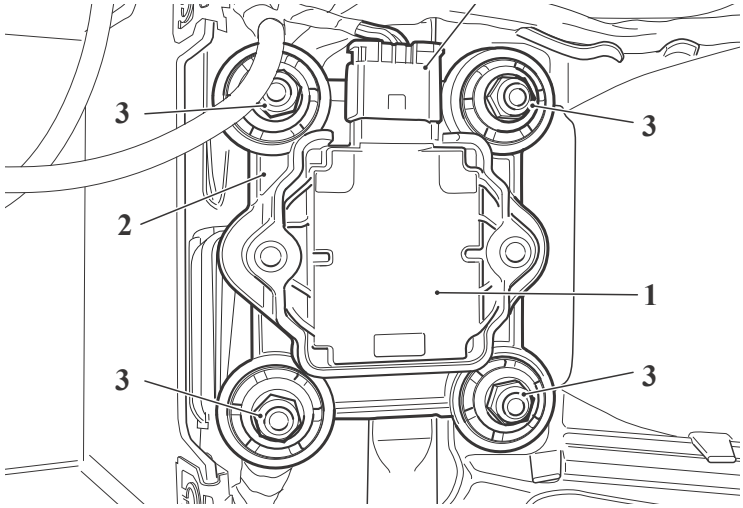
Care must be taken when removing or installing the IMU, not to expose it to excessive shock or vibration. When releasing or tightening fixings, use suitable hand tools only. Do not use air or battery powered tools.

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.

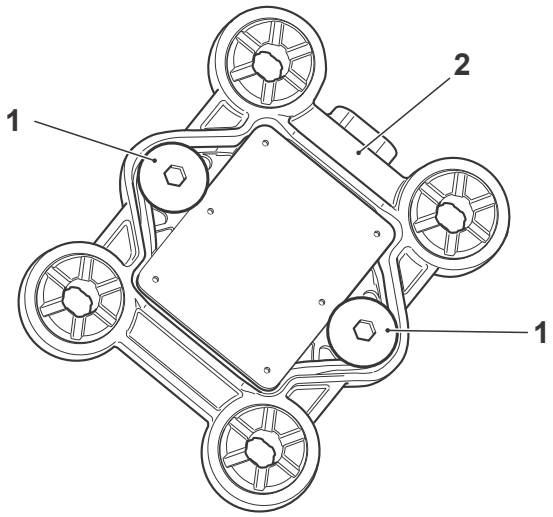
1. Release the four fixings and detach the inertial measurement unit (IMU) and its bracket from the frame. Collect the shouldered washers and discard the fixings.
2. Disconnect the IMU electrical connector from the main harness and remove the Inertial measurement unit (IMU) and its bracket.





1. **Inertial measurement unit (IMU)**
2. **Bracket**
3. **Fixings**
4. **Connector**

3. Release the two fixings and remove the IMU from the bracket.



1. **Fixings**
2. **IMU bracket**

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

WARNING

motorcycle.

CAUTION

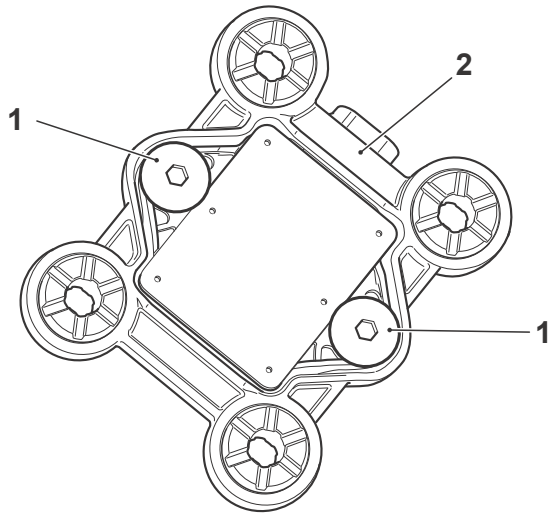
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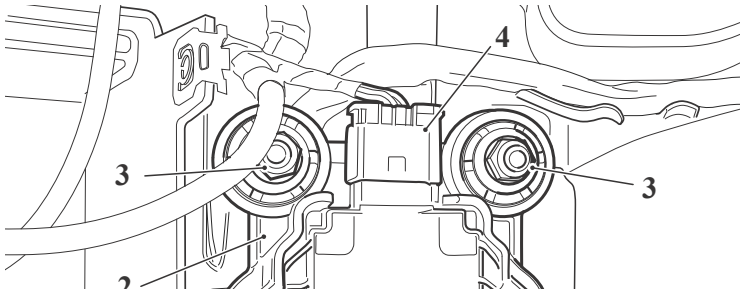
Do not drop the IMU. An IMU that has been dropped will be irreparably damaged and must be replaced.

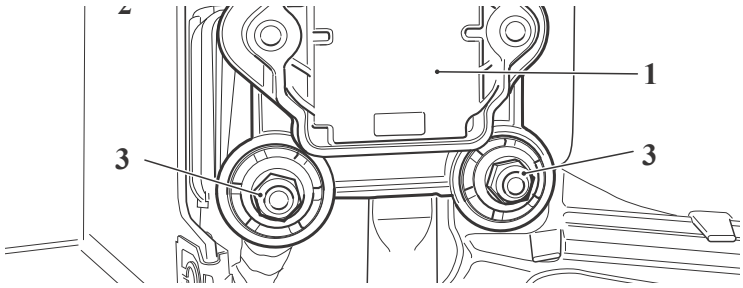
1. Refit the Inertial Measurement Unit (IMU) to its bracket and tighten the fixings to **8 Nm**.



1. **Fixings**
2. **IMU bracket**

2. Reconnect the IMU electrical connector to the main harness.
3. Fit IMU and bracket assembly to the frame and tighten the new fixings to **4 Nm**.





1. **Inertial measurement unit (IMU)**
2. **Bracket**
3. **Fixings**
4. **Connector**

Perform the following operations:

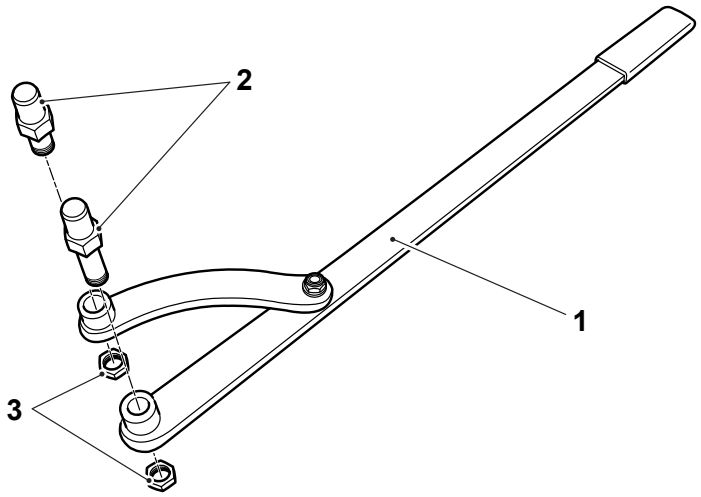
- Battery - Installation
- Seat - Installation

Alternator Rotor - Removal

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Alternator Cover - Removal

1. Assemble the T3880656 - Pulley Wrench Pin Set to the T3880606 - Flywheel Restraint Handle, ensuring the shorter pin is fitted to the short arm of T3880606 - Flywheel Restraint Handle. Fit the nuts and tighten to **10 Nm**.

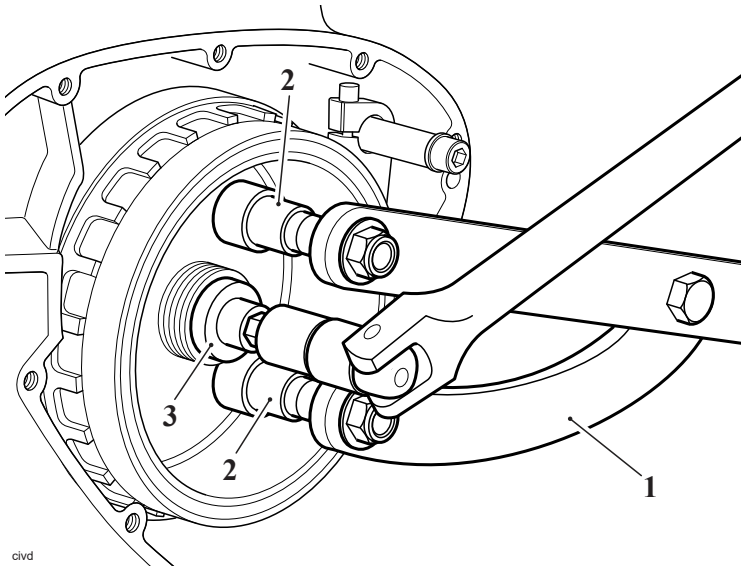


1. **T3880606 - Flywheel Restraint Handle**
2. **Pins (T3880656 - Pulley Wrench Pin Set)**
3. **Nuts (T3880656 - Pulley Wrench Pin Set)**

WARNING

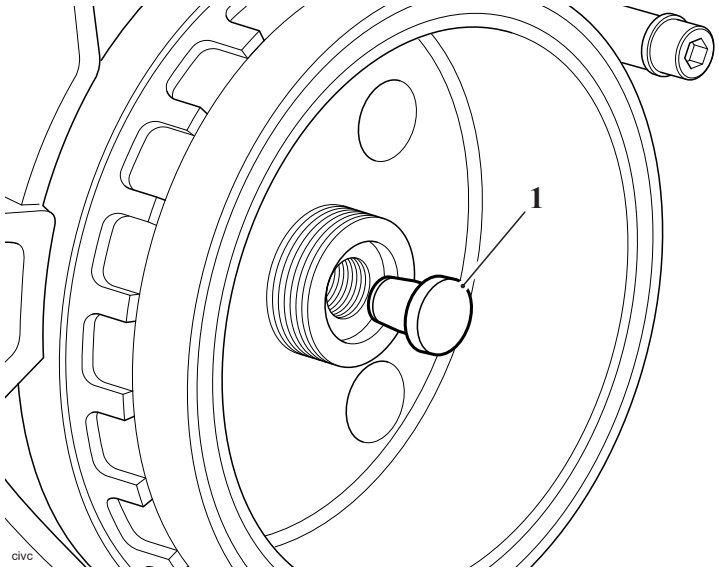
The rotor magnets are very strong. When fitting the service tools to the rotor the magnets may 'grab' the service tool, causing injury to the hands or fingers. When installing the service tools, wear suitable gloves to protect hands and fingers.

2. Using the T3880606 - Flywheel Restraint Handle and T3880656 - Pulley Wrench Pin Set, prevent the rotor from turning and remove the rotor fixing and washer from the end of the crankshaft.



1. **T3880606 - Flywheel Restraint Handle**
2. **T3880656 - Pulley Wrench Pin Set**
3. **Rotor fixing**

3. Locate the spigot from the larger of the two thrust pads supplied with T3880365 - Alternator Housing Puller to the crankshaft.



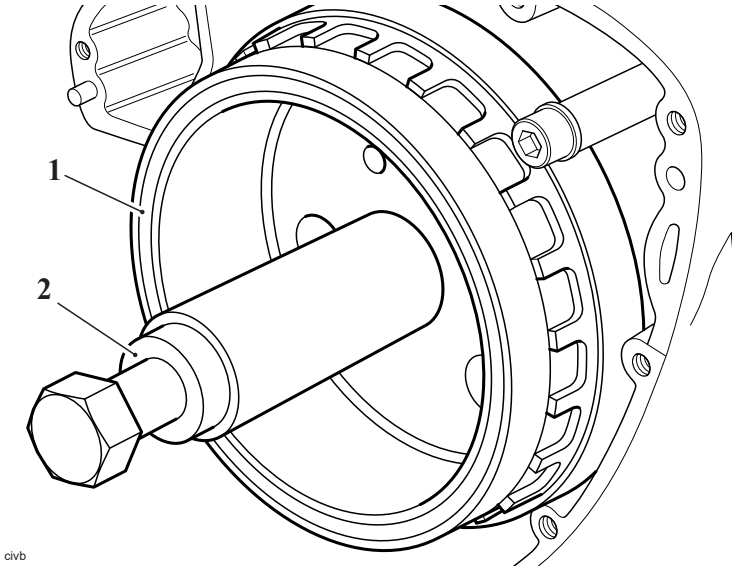
1. **Thrust pad**

4. Assemble T3880365 - Alternator Housing Puller to the threaded centre section of the rotor.

Note

- **Ensure that the thrust pad does not fall out during assembly of the tool.**

5. 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 rotor from the crankshaft.



1. **Rotor**
2. **T3880365 - Alternator Housing Puller**

6. Withdraw the rotor and tool as an assembly and then separate the tool from the rotor. Collect the Woodruff Key and the tool thrust pad from the crankshaft.

Alternator Rotor - Installation

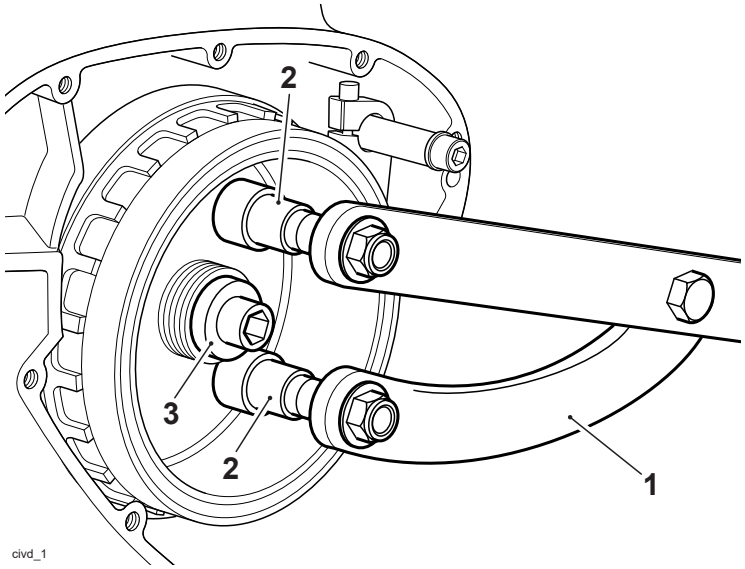
1. Refit the Woodruff key to the crankshaft.
2. Assemble the rotor to the key way on the crankshaft, ensuring the Woodruff key remains in position.

WARNING

The rotor magnets are very strong. When fitting the service tools to the rotor the magnets may 'grab' the service tool, causing injury to the hands or fingers. When installing the service tools, wear suitable gloves to protect hands and fingers.

3. Refit the T3880606 - Flywheel Restraint Handle and T3880656 - Pulley Wrench Pin Set to prevent the crankshaft from rotating.
4. Tighten the rotor retaining fixing in the following stages:
   - **Stage 1.** Tighten the rotor retaining fixing to **85 Nm**.

- **Stage 2.** Tighten the rotor retaining fixing to **120 Nm**.



1. **T3880606 - Flywheel Restraint Handle**
2. **T3880656 - Pulley Wrench Pin Set**
3. **Rotor fixing**

5. Remove the T3880606 - Flywheel Restraint Handle and T3880656 - Pulley Wrench Pin Set from the rotor.

Perform the following operations:

- Alternator Cover - Installation
- Battery - Installation
- Seat - Installation

Alternator Regulator/Rectifier - Removal

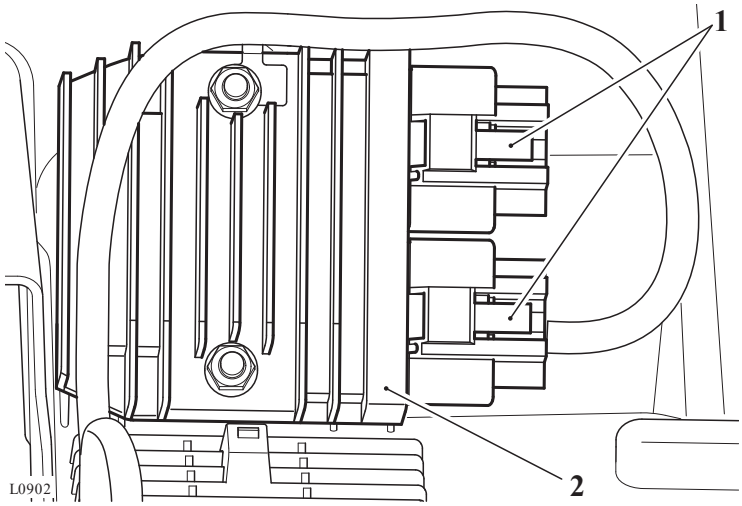
WARNING

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.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Rear Mudguard - Removal

1. Release the rubber band that attaches the harness for the regulator/rectifier.
2. Remove the two nuts that attach the regulator/rectifier to the rear mudguard.
3. Remove the regulator/rectifier.



1. Nuts

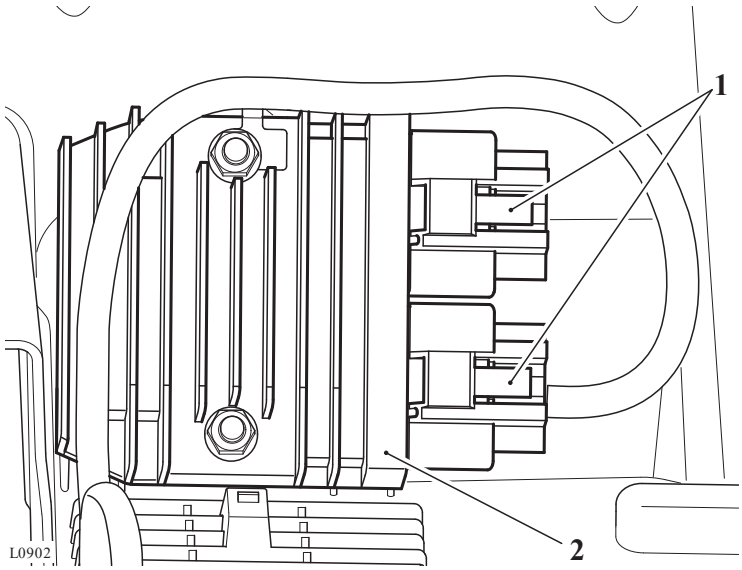
2. Alternator regulator/rectifier.

Alternator Regulator/Rectifier - 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. Put the regulator/rectifier in position over the studs on the rear mudguard.
2. Fit the two nuts and torque the nuts to **4 Nm**.



1. Nuts

2. Alternator regulator/rectifier.

3. Use the rubber band to secure the electrical harness for the regulator/rectifier.

Perform the following operations:

- Rear Mudguard - Installation
- Battery - Installation
- Seat - Installation

Side Stand 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.

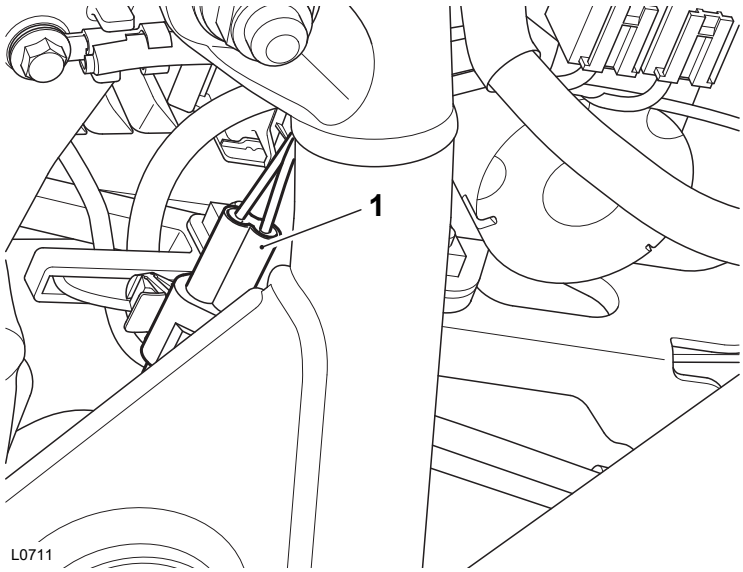
Perform the following operations:

- Seat - Removal
- Battery - Removal

CAUTION

Note the routing and the retaining clips of the side stand switch harness for installation.

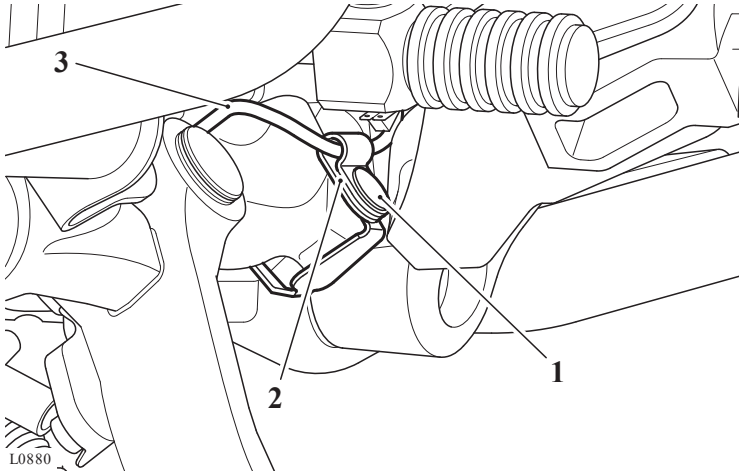
1. Disconnect the side stand switch electrical connector from the main harness and route it down to the side stand switch.



1. Side stand switch electrical connector

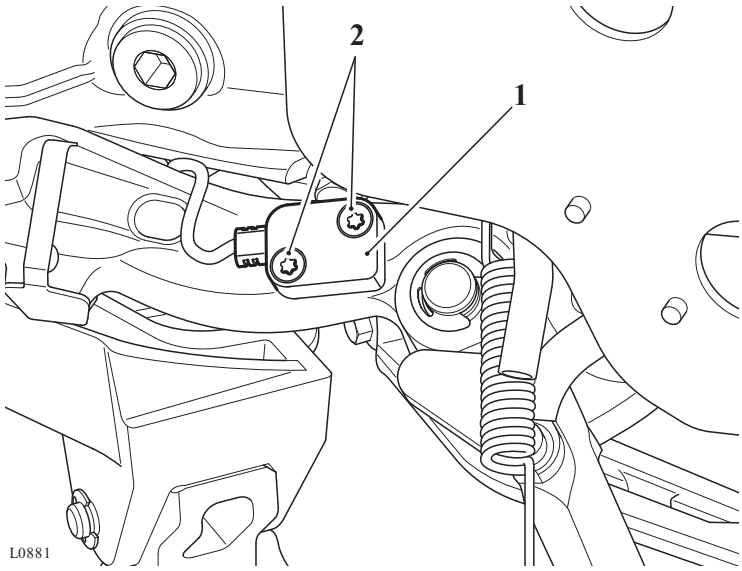
2. Remove and discard the fir tree clip from the frame cradle and retain the P-clip.





1. **Fir tree clip**
2. **P-clip**

3. Remove the side stand switch and discard the fixings.



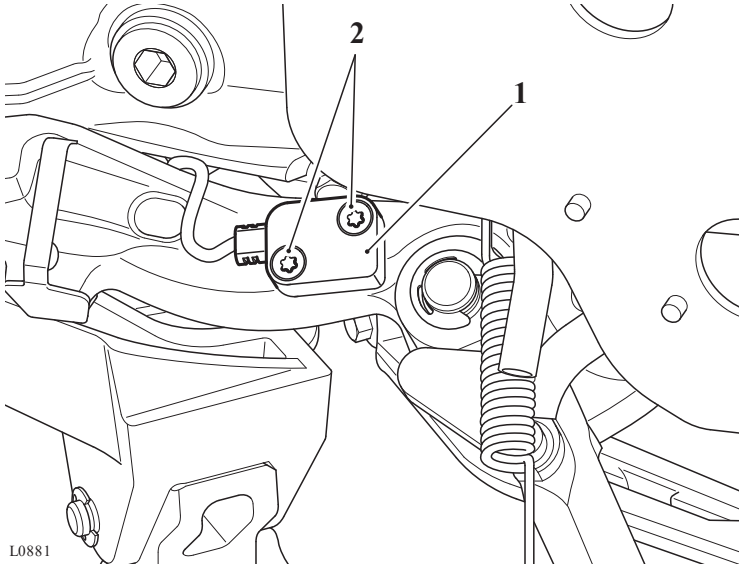
1. **Side stand switch**
2. **Fixings**

Side Stand Switch - Installation

WARNING

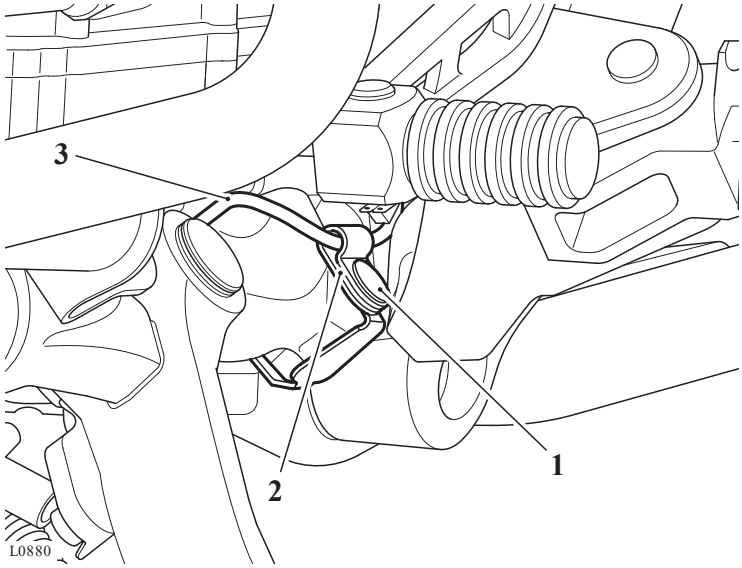
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

1. Refit the side stand switch, tighten the new fixings to **3 Nm**.



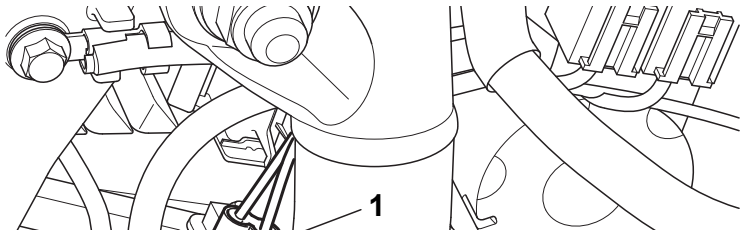
1. **Side stand switch**
2. **Fixings**

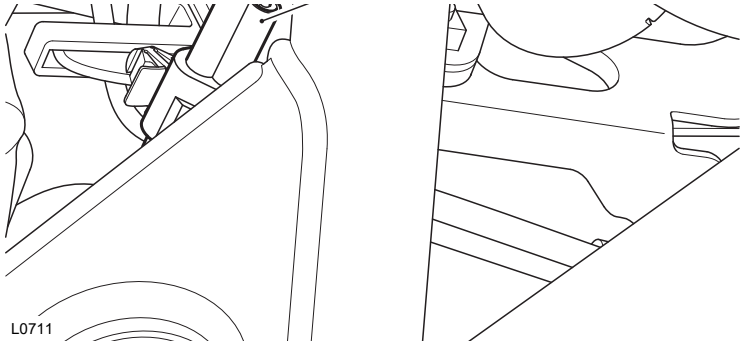
2. Secure the harness using a new fir tree clip and the original P-clip.



1. **Fir tree clip**
2. **P-clip**

3. Route the side stand switch harness to the left hand side of the airbox as noted for removal. Connect the electrical connector to the main harness.





1. **Side stand switch electrical connector**

Perform the following operations:

- Battery - Installation
- Seat - Installation

Starter Motor - Removal

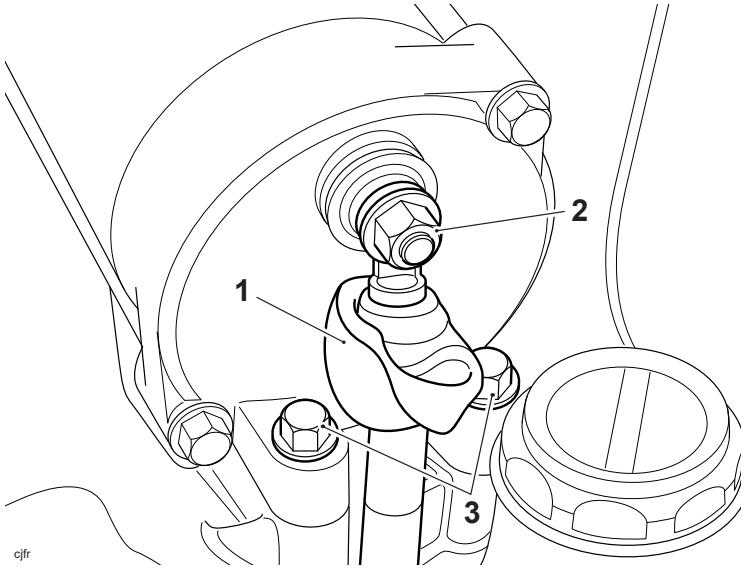
WARNING

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.

Perform the following operations:

- Seat - Removal
- Battery - Removal

1. Ease the rubber boot from the starter cable, release the nut and disconnect the cable.
2. Protect the crankcase painted surfaces from damage, using a suitable self-adhesive tape such as masking tape.
3. Release the two bolts securing the starter motor to the crankcase.



1. **Rubber boot**
2. **Nut**
3. **Bolts**

CAUTION

Damage to painted surfaces could result from inadequate care during removal or installation of the starter motor. Always protect the crankcase from damage during removal or installation.

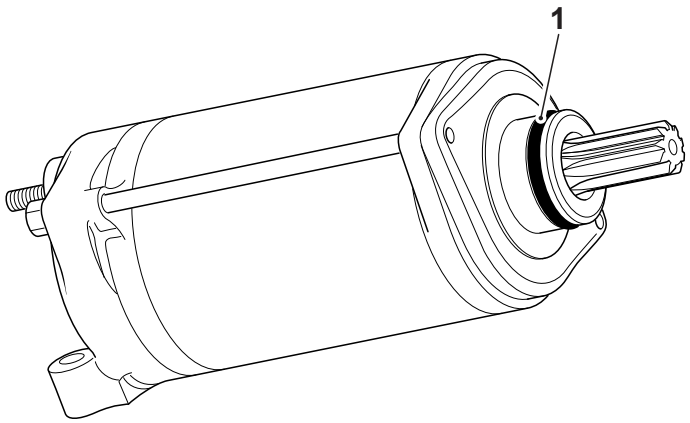
4. Carefully manoeuvre the starter motor out to the left side of the motorcycle.

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.

1. Fit a new O-ring to the starter motor.



cjfs

1. **O-ring**

CAUTION

Damage to painted surfaces could result from inadequate care during removal or installation of the starter motor. Always protect the crankcase from damage during removal or installation.

2. Carefully position the starter motor to the crankcase and retain with the two bolts and tighten to **7 Nm**.
3. Remove any self-adhesive tape used to protect the crankcase.
4. Locate the starter cable to its connection pole. Fit the nut and tighten it to **5 Nm**.
5. Refit the rubber boot.

Perform the following operations:

- Battery - Installation
- Seat - Installation

Heated Grips - Removal

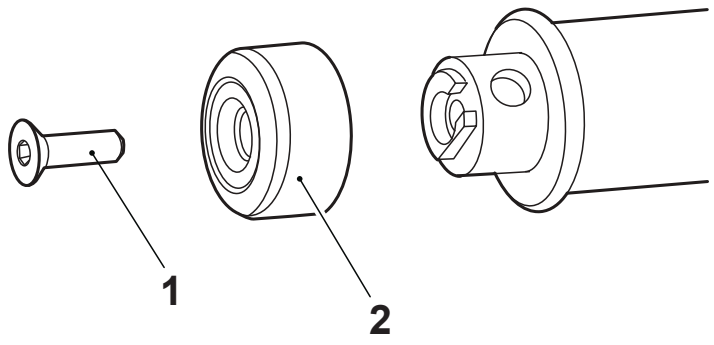
WARNING

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.

Perform the following operations:

- Seat - Removal
- Battery - Removal
- Handguards - Removal
- For the removal of the heated twist grip see Twist Grip - Removal.

1. Remove the left hand handlebar end weight.

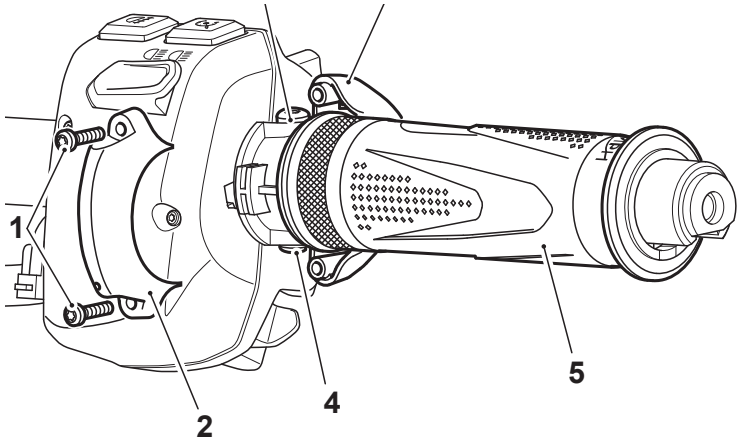


cccw_5

1. **Fixing**
2. **End weight**

2. Remove the two fixings and remove the front and rear heated grip switch housings.

4 3



L0734

1. **Fixings**
2. **Heated grip front switch housing**
3. **Heated grip rear switch housing**
4. **Heated grip fixings**
5. **Heated grip**

3. Remove the two fixings securing the heated grip to the handlebar.
4. Disconnect the electrical connector for the heated grip.

Note

- **Note the orientation of the heated grip for installation.**

5. Slide the twist grip off the handlebar while carefully feeding the harness into the handlebar.

Heated Grips - 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

Check for burrs or sharp edges around the access holes/slots which may damage the harness.

Always remove burrs or sharp edges with a suitable file or abrasive paper.

Burrs or sharp edges may cause irreparable damage to the harness and the motorcycle.

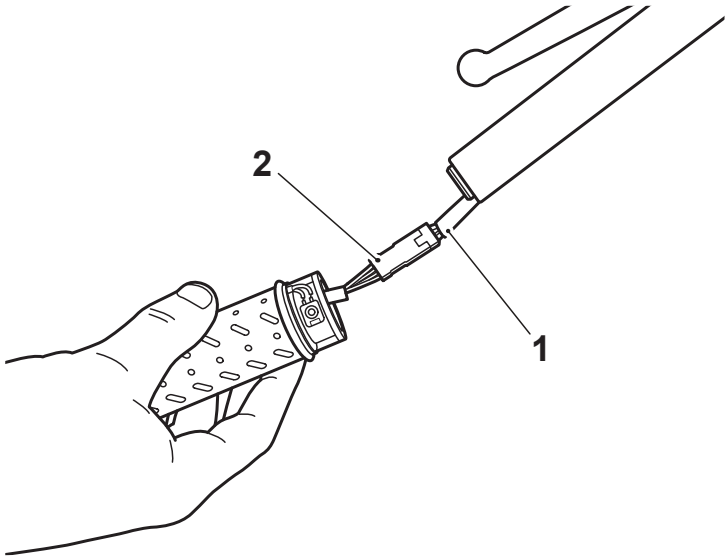
- For the installation of the heated twist grip see Twist Grip - Installation.

CAUTION

CAUTION

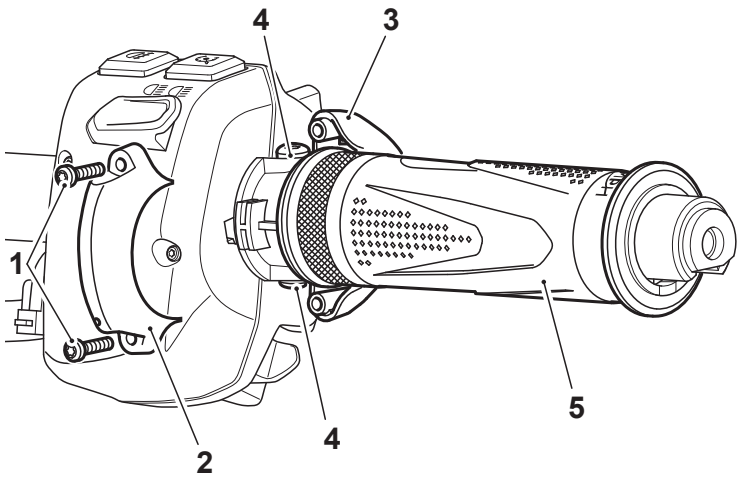
When fitting the heated grips, do not excessively twist the grip forward or rearward. Excessive twisting of the grip may damage the heated grip harness.

1. With the heated grip aligned as noted for removal, connect the heated grip subharness to the heated grip connector.



1. **Heated grip subharness**
2. **Heated grip connector**

2. Slide the heated grip back until its fixings holes align with their holes in the handlebar, ensuring the wires remain in the slot in the bar end.
3. Secure the heated grip to the handlebar with two new fixings, and tighten to **2 Nm**.
4. Refit the front and rear heated grip switch housings and tighten the fixings to **0.5 Nm**.



L0734

1. **Fixings**
2. **Heated grip front switch housing**
3. **Heated grip rear switch housing**
4. **Heated grip fixings**
5. **Heated grip**

5. Refit the mirror (see Mirrors - Installation).

Perform the following operations:

- Battery - Installation
- Seat - Installation
- Install the left and right handguards (see Handguards Install DS).

Ignition Master Switch (US Markets Only) - 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.

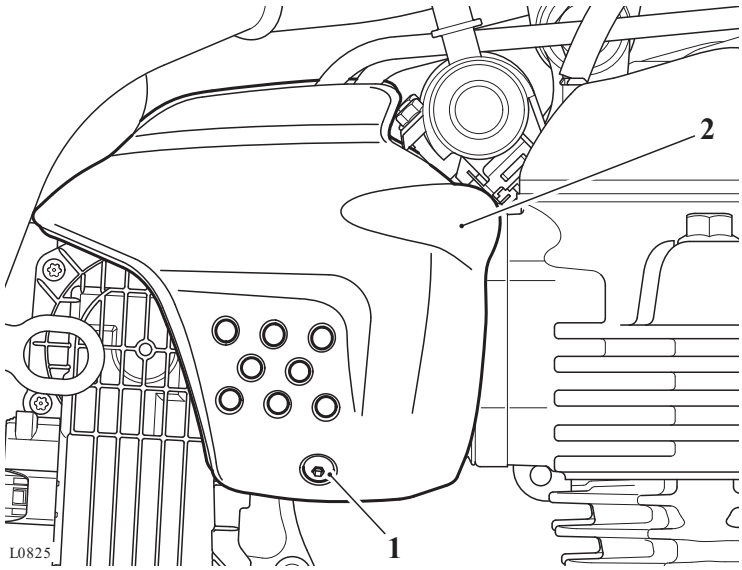
Perform the following operations:

- Seat - Removal
- Battery - Removal
- Side PanelsLeft side panel - Removal

Note

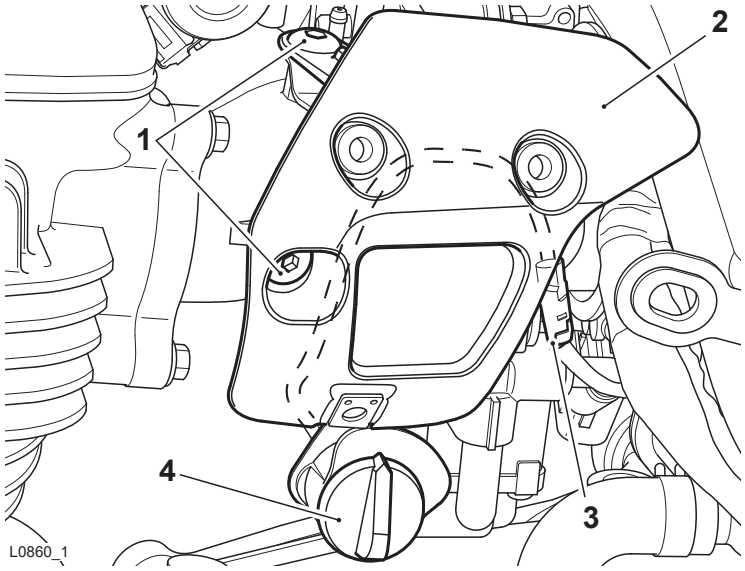
- **The ignition master switch and its bracket are behind the left hand air intake finisher mounting.**
- **Note the position of the ignition master switch for installation.**

1. Remove the fixing and remove the air intake finisher.



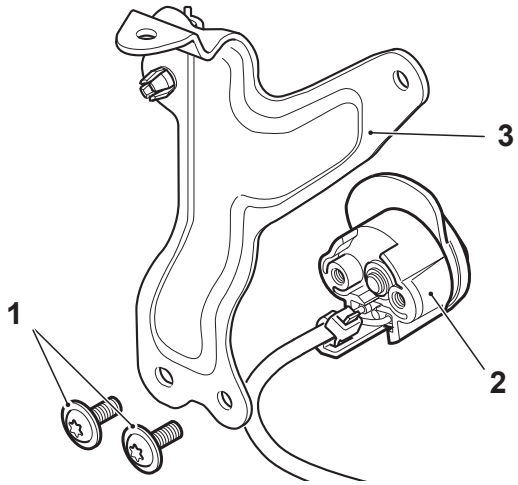
1. **Fixing**
2. **Air intake finisher (right hand side shown)**

2. Note the routing of the electrical harness to the ignition master switch.
3. Disconnect the ignition master switch electrical connector.
4. Remove the two fixings and remove the mountings for the air intake finisher.



1. **Fixings**
2. **Mounting**
3. **Electrical connector**
4. **Ignition master switch**

5. Remove the two fixings and remove the ignition master switch from the mounting bracket assembly.



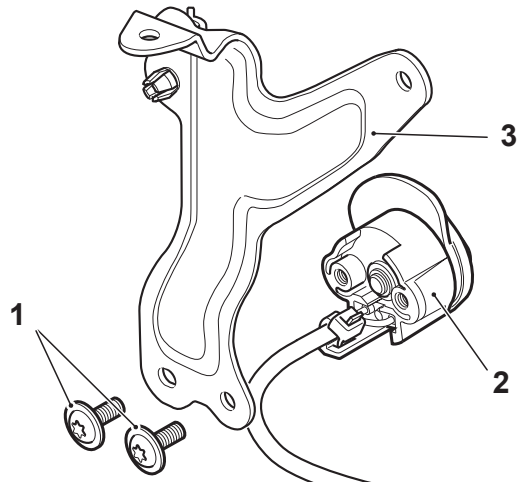
1. **Fixings**
2. **Ignition master switch**
3. **Mounting bracket**

Ignition Master Switch (US Markets Only) - Installation

WARNING

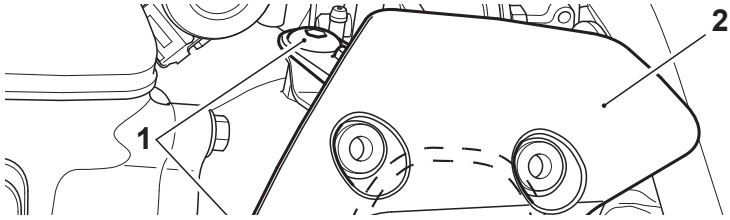
Before starting work, ensure the motorcycle is stabilised and adequately supported. This will help prevent it from falling and causing injury to the operator or damage to the motorcycle.

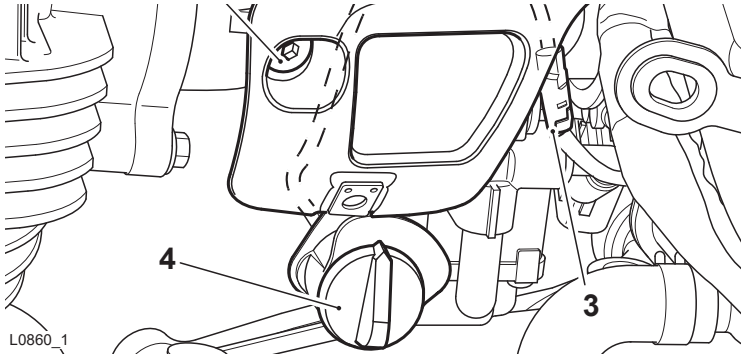
1. Position the master switch to the bracket assembly and secure with the two fixings.



1. **Fixings**
2. **Master switch**
3. **Mounting bracket**

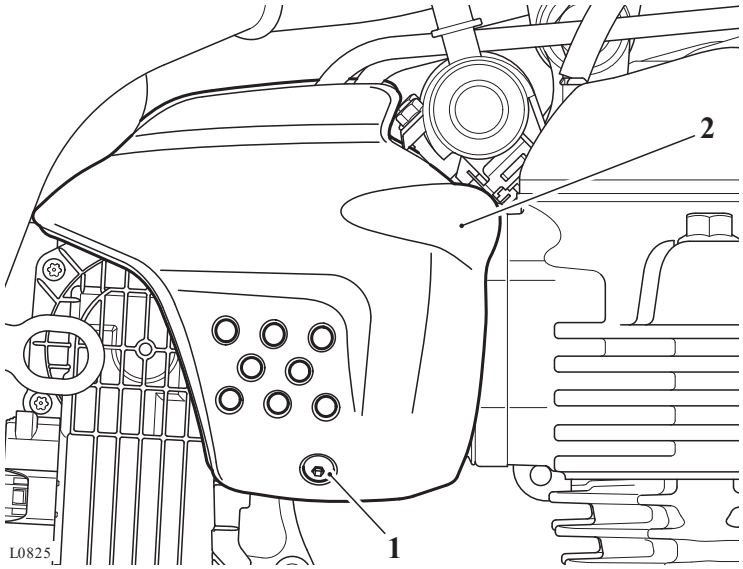
2. Tighten the fixings to **1.5 Nm**.
3. Route the master switch electrical harness as noted during removal, and connect it to the main harness.
4. Position the ignition master switch and the air intake finisher mounting to the inlet manifold.
5. Fit the mounting for the air intake finisher and tighten its new fixings to **3 Nm**.





1. **Fixings**
2. **Mounting**
3. **Electrical connector**
4. **Master switch**

6. Fit the air intake finisher and tighten the new fixing to **1.5 Nm**.



1. **Fixing**
2. **Air intake finisher (right hand side shown)**

Perform the following operations:

- Side PanelsLeft side panel - Installation
- Battery - Installation
- Seat - Installation

Circuit Diagrams

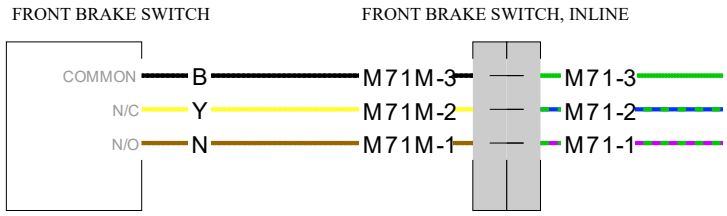
Glossary of Circuit Diagram Symbols

The following is a description of the symbols and information found in the circuit diagrams for this model.

Note

- **Wire colours and connector pin references shown in the illustrations below are examples and may differ from those contained in circuit diagrams for this model.**

Components with a Fly lead and an In-line Connector



The illustration shows an example of a component with a fly lead and an in-line connector.

The component is represented by a white box, with fly lead wires leading to an in-line connector (shaded grey). Information provided with the component includes:

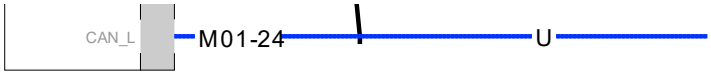
- The component name - located above the component.
- A function reference for each terminal - located inside the component, adjacent to the connecting wire (provided in English only).
- Wire colour references - located on each wire.
- An in-line connector name - located above the in-line connector.
- A component and pin number reference - located on each wire entering the in-line connector.

In the above example, the component and pin number references can be interpreted as follows:

M71	Component reference for the front brake switch
M	Identifies the mating connector (component side only)
-	Separator
1, 2, 3	Connector pin number reference

Components with an Integral Connector





The illustration shows an example of a component with an integral connector.

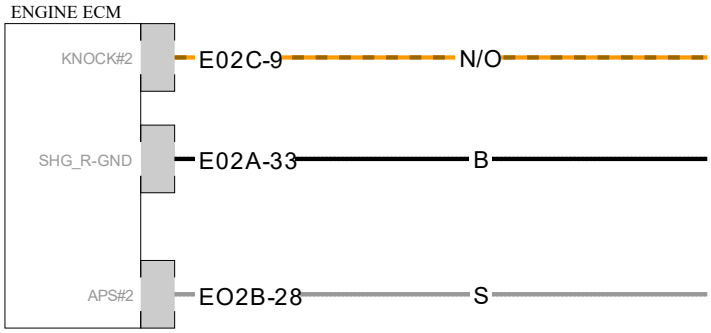
The component is identified by a white box, with a grey shaded area representing the integral connector. Information provided with the component includes:

- The component name - located above the component.
- A function reference for each terminal - located inside the component, adjacent to the connecting wire (provided in English only).
- Wire colour references - located on each wire.
- A component and pin number reference - located on each wire entering the integral connector.

In the above example, the component and pin number references can be interpreted as follows:

M01	Component reference for the instruments
-	Separator
24, 25	Connector pin number reference

Components with Multiple Integral Connectors



The illustration shows an example of a component with multiple integral connectors.

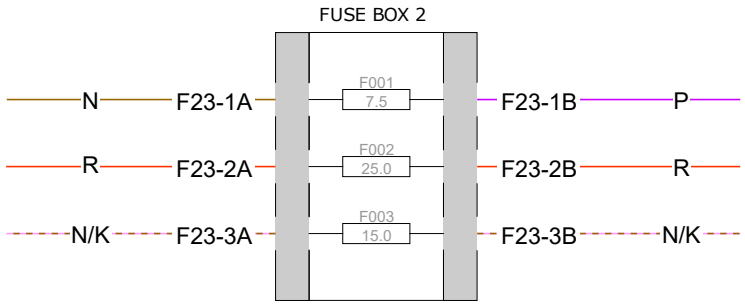
The multiple integral connectors can be identified by separated grey shaded areas (as shown), or by a grey shaded area that is divided into multiple sections by black line(s).

The above example shows an engine ECM with three integral connectors, connectors A, B and C. The component, connector and pin number references can be interpreted as follows:

E02	Component reference for the engine ECM

A, B, C	Connector reference
-	Separator
9, 28, 33	Connector pin number reference

Fuse Boxes



The illustration shows an example of a fuse box.

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.

Information provided with the fuse box includes:

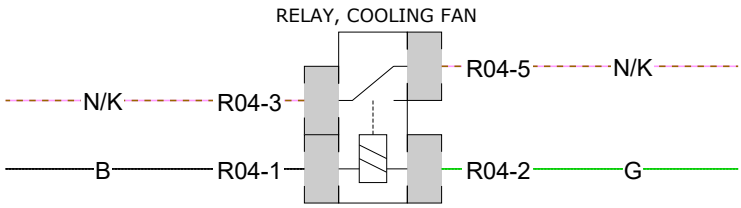
- The fuse box name - located above the fuse box.
- A fuse number/location reference for each fuse - located above the fuse.
- A fuse rating (in Amps) for each fuse - located inside the fuse.
- A fuse box, terminal number and terminal block reference - located on each wire entering the fuse box.

In the above example, the fuse box, terminal number and terminal block references can be interpreted as follows:

F	Reference code for a fuse box
2	Denotes the type of fuse box: 1 = Fuse box 1 (Main fuse) 2 = Fuse box 2 (Individual circuit protection)
3	Indicates the number of fuses contained in the fuse box
-	Separator
1, 2, 3	Terminal number reference

A or B	Terminal block reference A (power in) or B (power out)

Relays



The illustration shows an example of a 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.

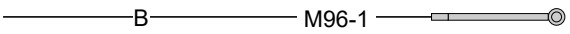
Information provided with the relay includes:

- The relay name - located above the relay.
- A relay and terminal number reference - located on each wire entering the relay terminals.

In the above example, the relay and terminal number reference can be interpreted as follows:

R04	Reference for the cooling fan relay
-	Separator
1, 2, 3, 5	Terminal number reference

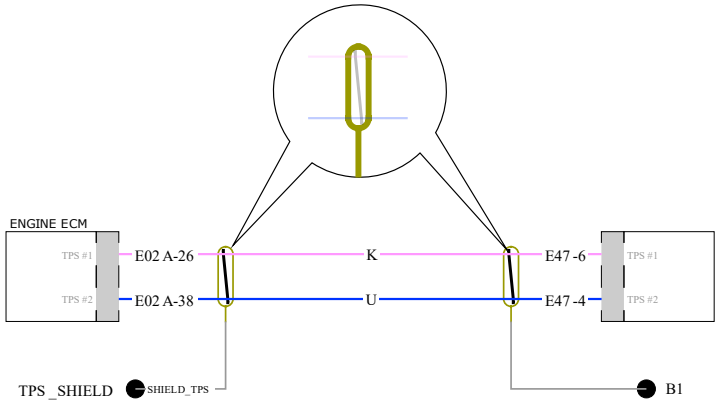
Ring Terminals



The illustration shows the symbol used to identify a ring terminal (commonly used as ground points).

A ring terminal reference is provided on the wire entering the terminal.

Shielded Wires



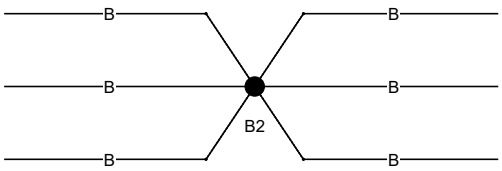
The illustration shows the symbol used to identify wires that are shielded against electromagnetic interference.

Examples of components that have shielded wires include:

- ABS wheel speed sensors
- Immobiliser antenna
- Throttle position sensor
- USB socket

The wire shielding is typically connected to ground.

Splices

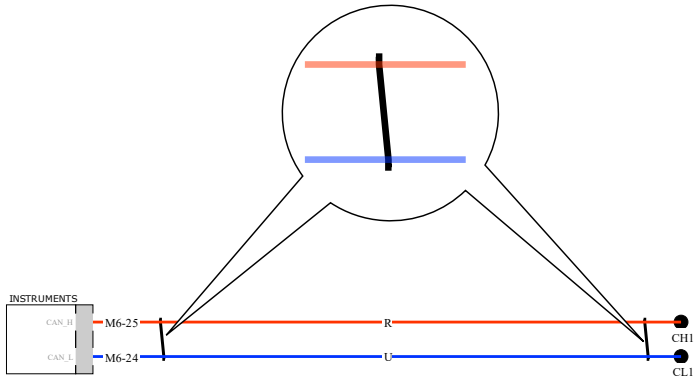


The illustration shows an example of a splice.

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

A splice reference code is provided at the nearest convenient location to the splice symbol.

Twisted Wires



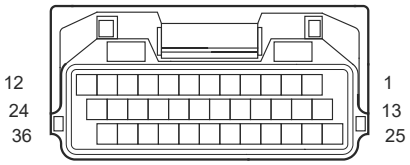
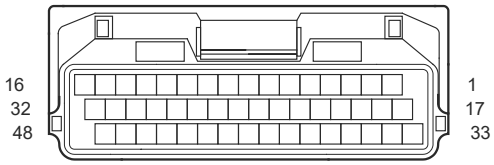
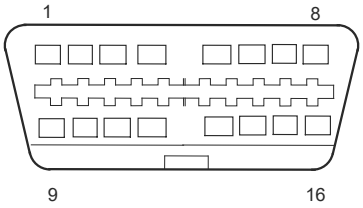
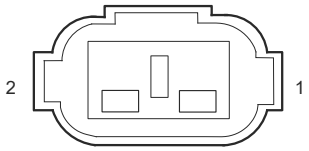
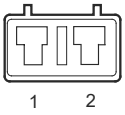
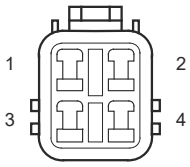
The illustration shows the symbol used to indicate a pair of wires that are twisted together, such as CAN circuit wires.

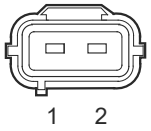
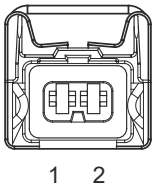
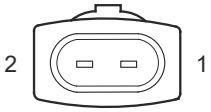
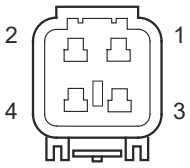
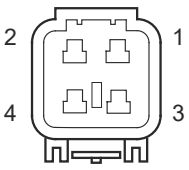
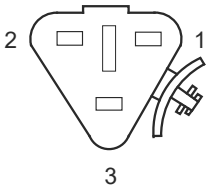
Key To Wiring Colour Codes

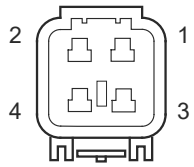
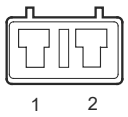
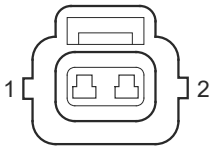
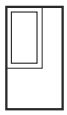
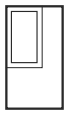
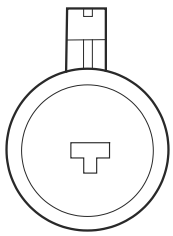
Code	Wiring Colour
B	Black
U	Blue
N	Brown
G	Green
S	Slate/Grey
O	Orange
K	Pink
R	Red
P	Purple
W	White
Y	Yellow
LG	Light Green
LU	Light Blue

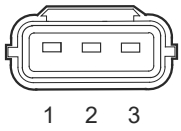
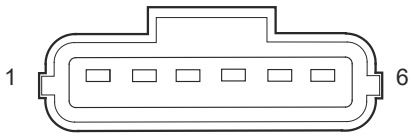
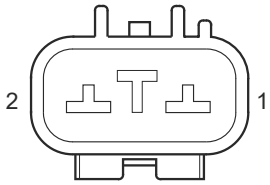
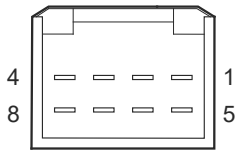
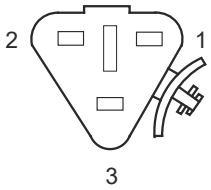
Main Wiring Harness Electrical Connectors

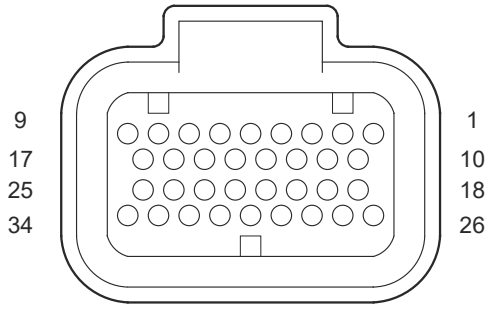
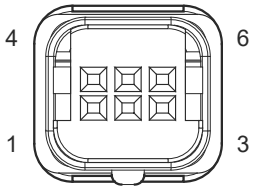
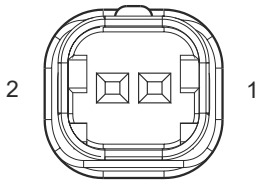
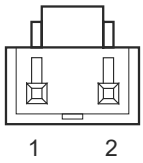
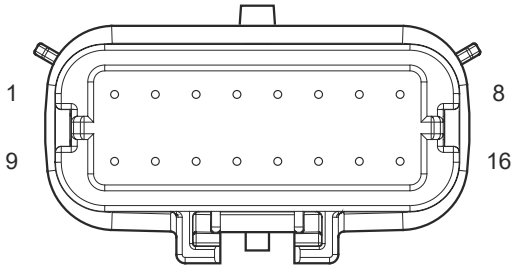
The table below shows the connector pin diagrams for each electrical connector on the main wiring harness for this model.

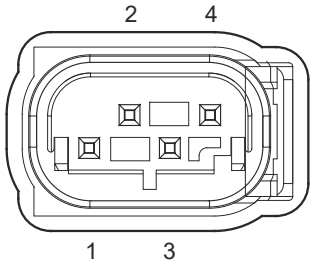
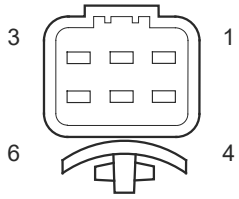
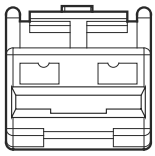
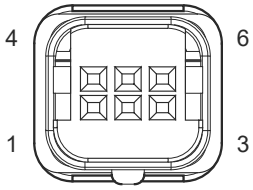
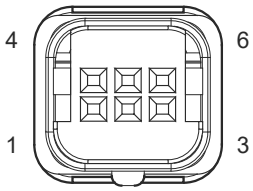
	
E02A - Engine ECM connector A	E02A - Engine ECM connector B
	
E04 - Diagnostic connector	E05 - Crank position sensor
	
E06 - Fuel pump	E07 - Fuel level sensor

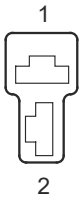
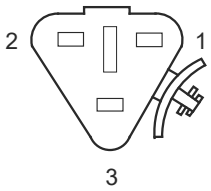
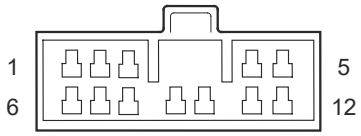
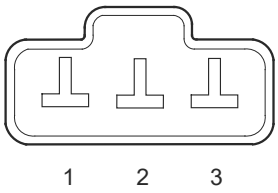
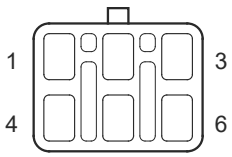
	
E09 - Purge valve	E10 - Coolant temperature sensor
	
E11 - Fuel injector 1 E12 - Fuel injector 2	E15 - Gear position sensor
	
E16 - Oxygen sensor 1	E17 - Side stand sensor

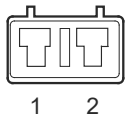
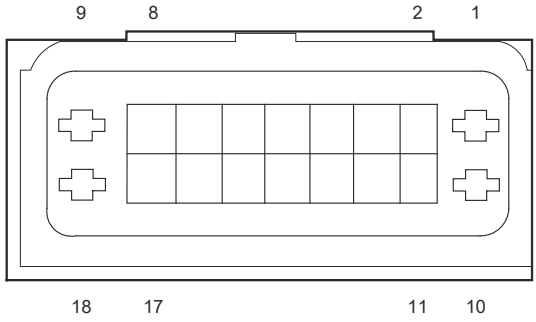
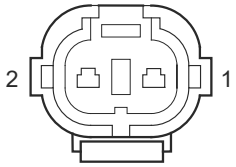
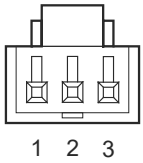
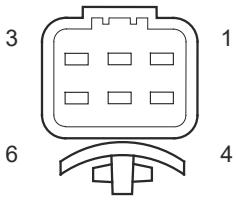
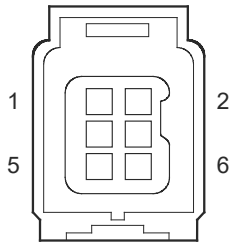
	
E18 - Oxygen sensor 2	E19 - Cooling fan
	
E20 - Intake air temperature sensor	E21A - Ignition coil 1 connector A E21B - Ignition coil 1 connector B
	
E22A - Ignition coil 2 connector A E22B - Ignition coil 2 connector B	E25 - Oil pressure sensor

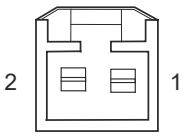
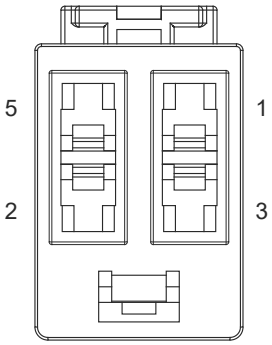
	
E38 - Manifold absolute pressure sensor E39 - Ambient air pressure sensor	E47 - Throttle body
	
H02 - Battery sub-harness	H03 - Rear light sub-harness
	
H04 - Heated grips sub-harness	H07 - Master ignition switch link sub-harness

	
M01 - Instruments	M02A - Left switch housing connector A
	
M02B - Left switch housing connector B	M03B - LF antenna M03A - Second LF antenna
	
M04A - Front left direction indicator connector A M04B - Front left direction indicator connector B	M05 - Keyless ECM

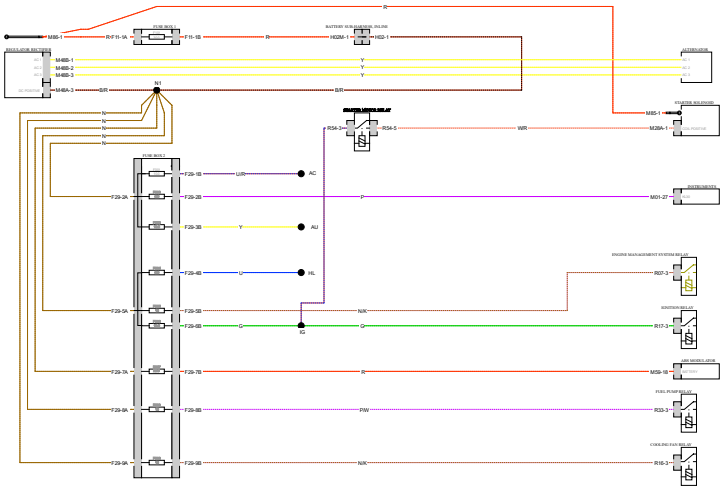
	
M06 - Inertial measurement unit - Scrambler 1200 XE only	M07 - Headlight
	
M11A - Horn connector A M11B - Horn connector B	M14A - Right switch housing connector A
	
M14B - Right switch housing connector B	M19A - Front right direction indicator connector A M19B - Front right direction indicator

	connector B
	
M21 - Accessory socket, live	M26 - Rear brake switch
	
M28A - Starter solenoid connector A M28B - Starter solenoid connector B	M36 - Alarm
	
M48A - Regulator rectifier connector A	M51 - Fall detection switch - Scrambler 1200 XC only

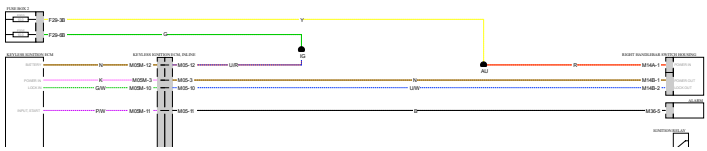
	
M57 - Front ABS wheel speed sensor M58 - Rear ABS wheel speed sensor	M59 - ABS modulator
	
M70 - USB charger	M71 - Front brake switch
	
M72 - Bluetooth module	M73 - Twist grip position sensor

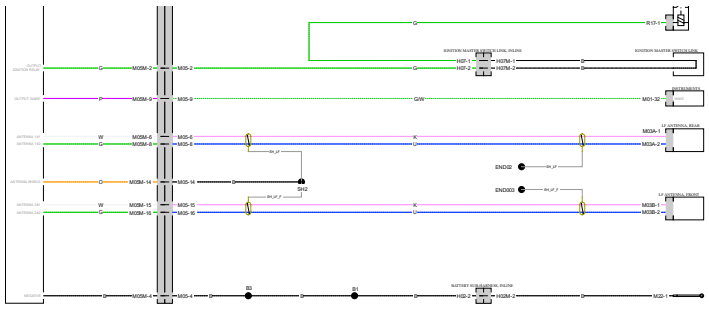
	
M81 - Right foglight M82 - Left foglight	R07 - Engine management system relay R11 - Daytime running lights/lights relay R12 - Main beam relay R16 - Cooling fan relay R17 - Ignition relay R18 - Horn relay R33 - Fuel pump relay R37 - Fog light relay R54 - Starter relay

Power Distribution Circuit

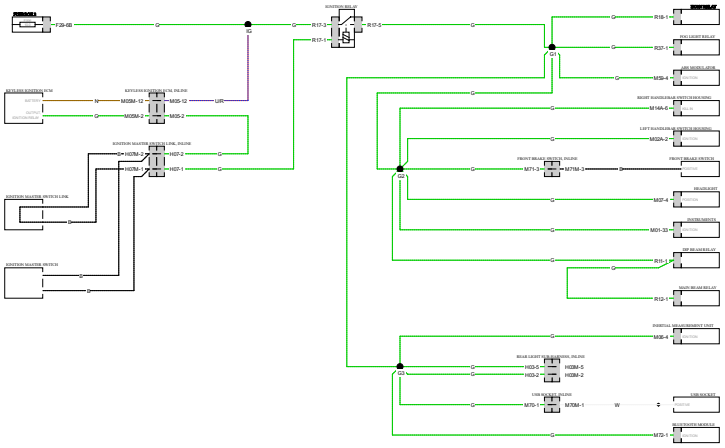


Keyless Control Circuit

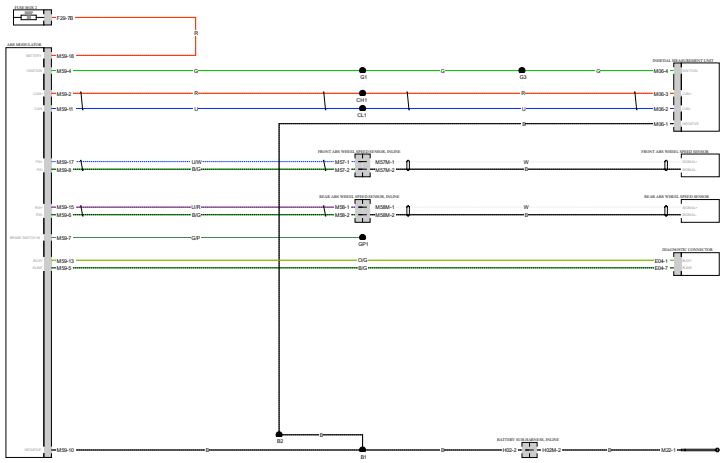




Ignition Circuit

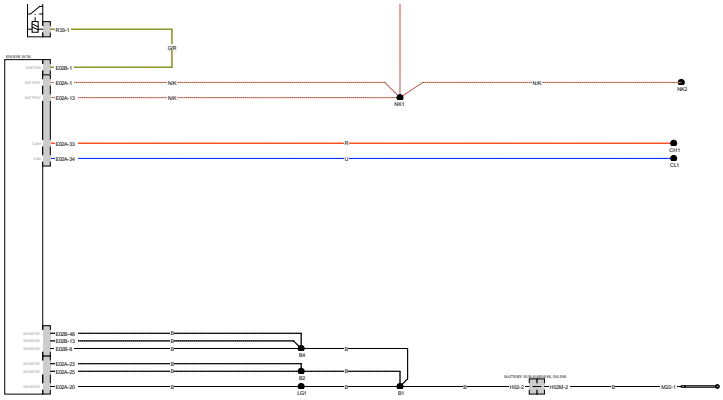


ABS Circuit

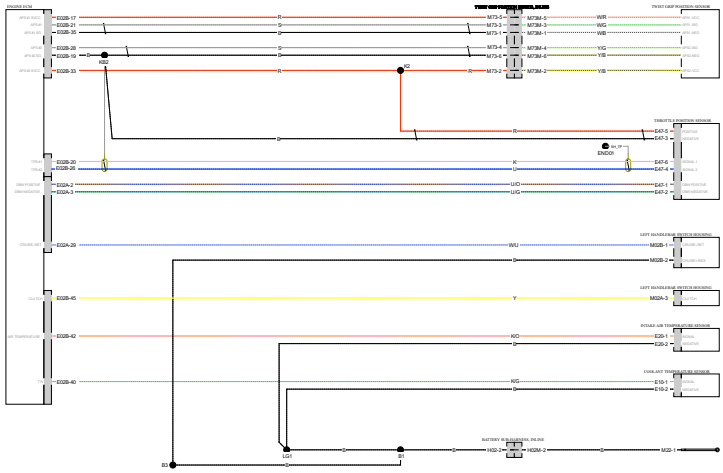


Engine Management Circuit - Power Distribution, CAN

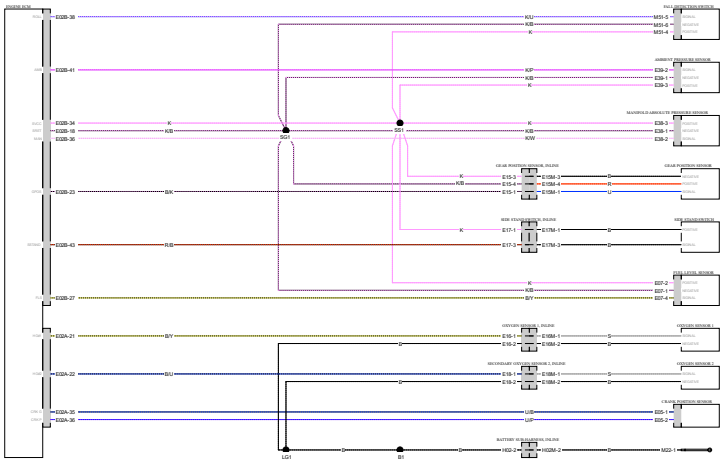




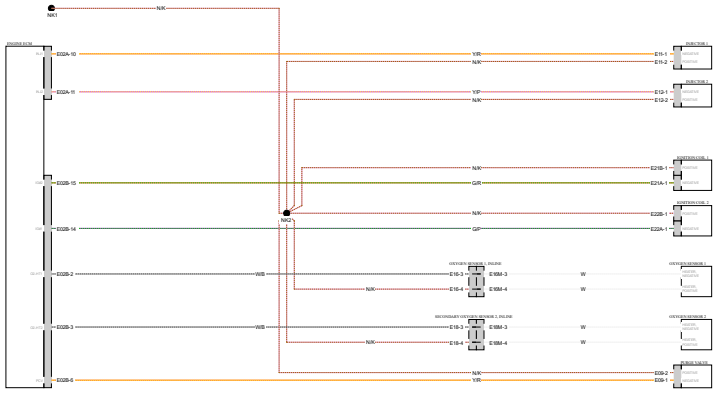
Engine Management Circuit - Throttle Control



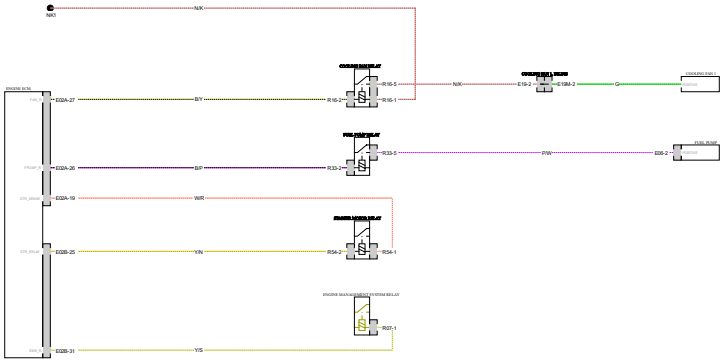
Engine Management Circuit - Sensor Network



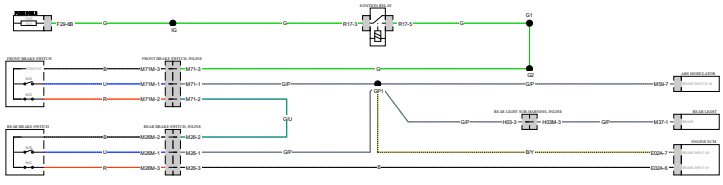
Engine Management Circuit - Coils, Injectors, Heaters, Purge



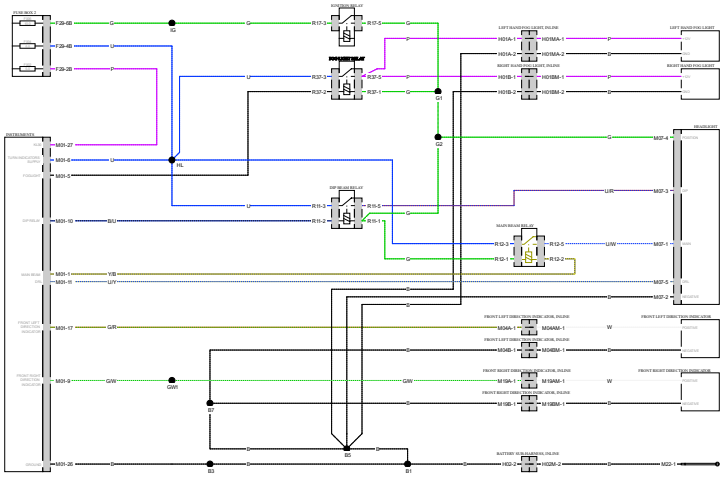
Engine Management Circuit - Relay Management



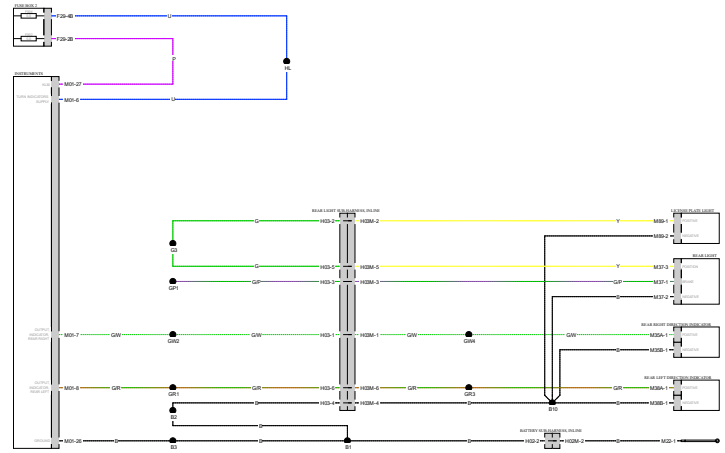
Brake Circuit



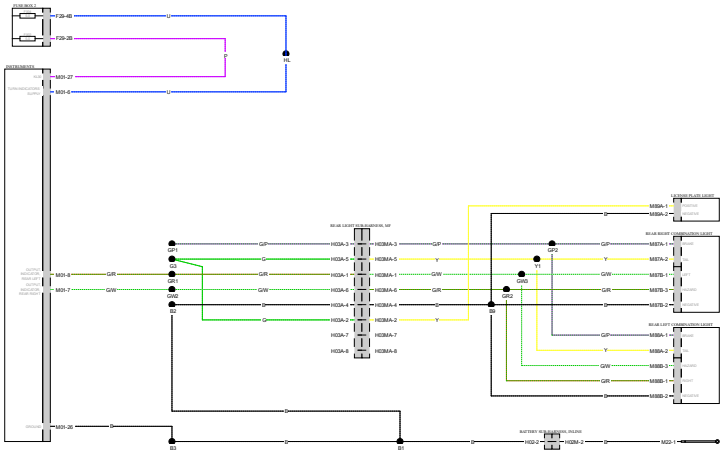
Lighting Circuit - Front



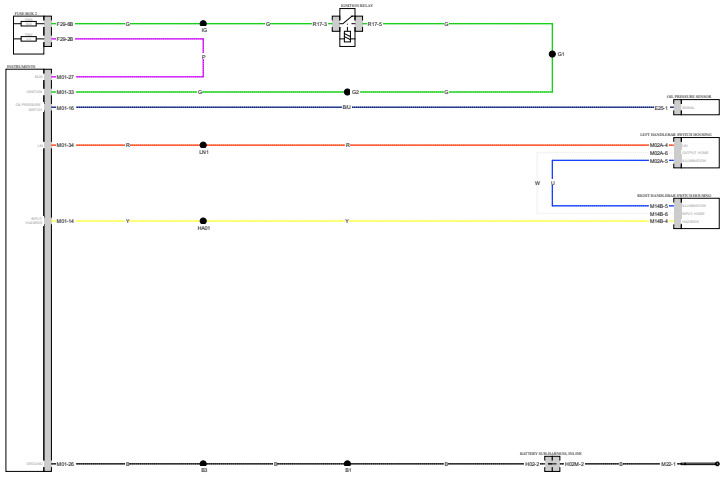
Lighting Circuit - Rear - Standard



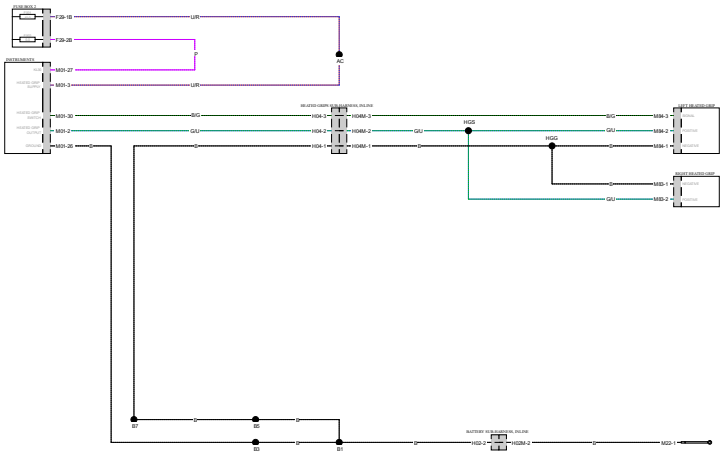
Lighting Circuit - Rear - Multifunction



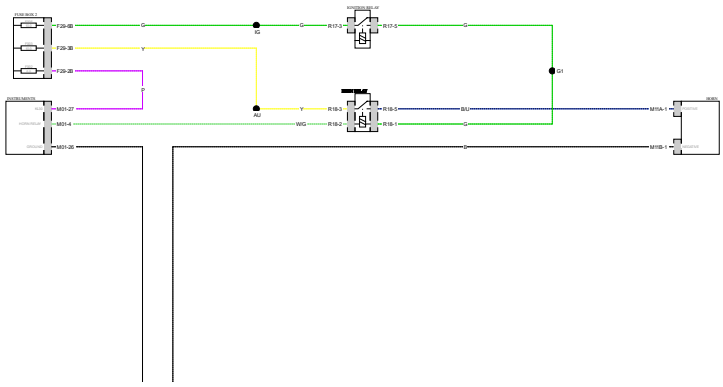
Rider Information and Controls Circuit

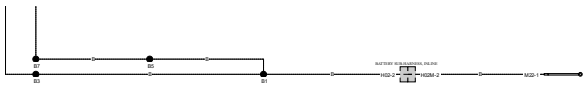


Heated Grip Circuit

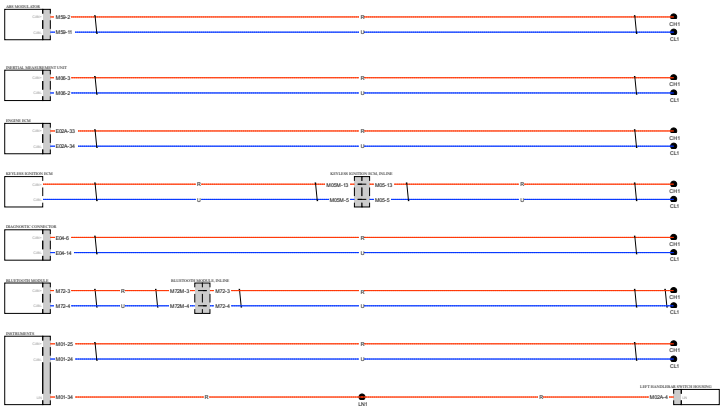


Horn Circuit

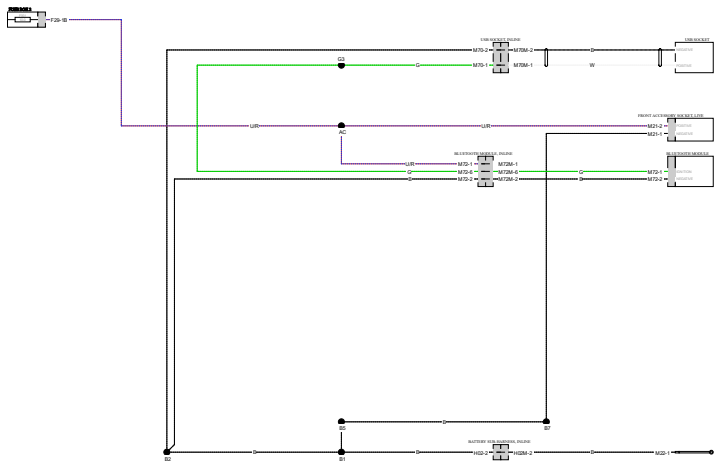




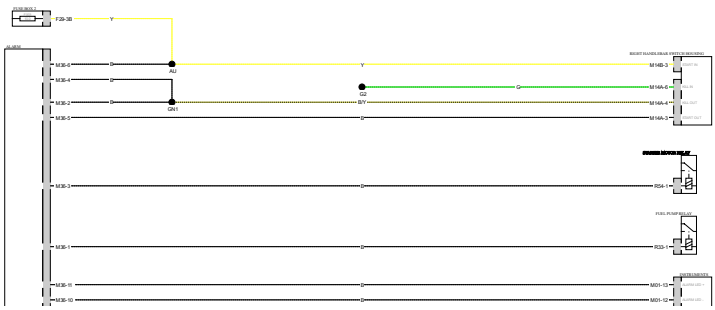
CAN and LIN Circuit

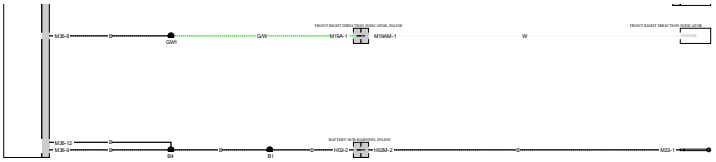


Auxiliary Connection Circuit

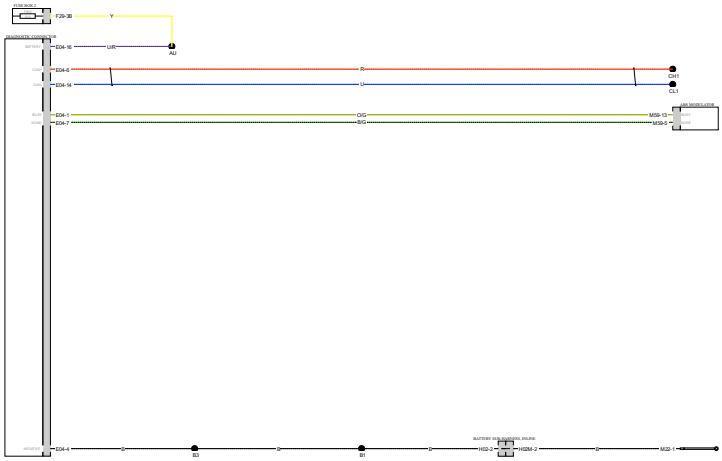


Alarm Circuit

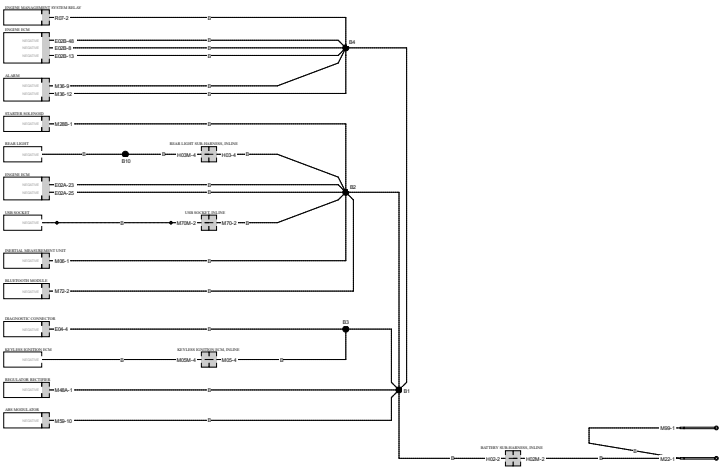




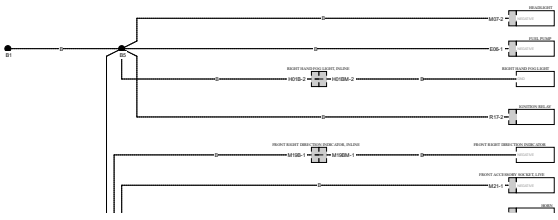
Diagnostic Connector Circuit

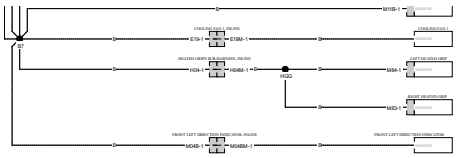


Earth Circuit - 01

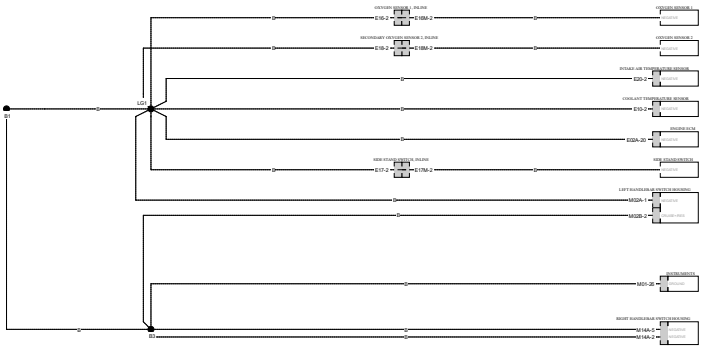


Earth Circuit - 02





Earth Circuit - 03



Electronic Systems Configuration and Setup

General Information

Calibration Downloading General Information

CAUTION

The calibration download procedures detailed in the flow charts provided in the following chapters must be followed precisely. Failure to precisely follow the procedures may result in permanent damage to the component receiving the calibration download.

CAUTION

When downloading a calibration, always ensure the calibration selected is correct for your model and region. Failure to select the correct calibration may result in permanent damage to the component receiving the calibration download.

CAUTION

When downloading an engine ECM calibration, always ensure the correct calibration is

CAUTION

selected for your fuel type. Engine damage may result if a calibration for an incorrect fuel type is installed.

Note

- **Some calibration downloads can take up to 20 minutes to complete. Before starting a download, ensure the battery voltage is at least 12.8 Volts.**
- **The headlight fuse may be removed prior to starting a download to prevent the headlight draining the battery. Refer to the label on the fuse box cover for the fuse location.**
- **Ensure the ignition and engine Start/Stop switches are set to the positions detailed at the beginning of each download process flowchart.**
- **Once the calibration download has been started, do not switch the ignition or engine Start/Stop switches to a different position unless instructed to do so by the Triumph Diagnostic Tool/download process flow chart.**
- **Do not disconnect the diagnostic interface during the calibration download.**
- **During a calibration download, multiple files are downloaded and the progress bar displayed will repeatedly rise from 0% to 100% as each file is downloaded. Always wait for the Verifying Download screen to appear to confirm that the full calibration has downloaded successfully and click the Finish button to end the process. Do not click the Cancel button while the download is still in progress.**

Instrument Calibration Downloads

Following an instrument calibration download, the following items (if fitted) may return to their factory default settings. Before starting an instrument calibration download, record the settings of each item where applicable so that the settings can be restored after the download has finished.

- Time/date
- Distance/time to next service
- TPMS instrument display (enabled/disabled)
- All riding mode settings
- Self cancelling indicators (enabled/disabled).

Downloading Sequence - Calibration Downloads to Multiple ECMs

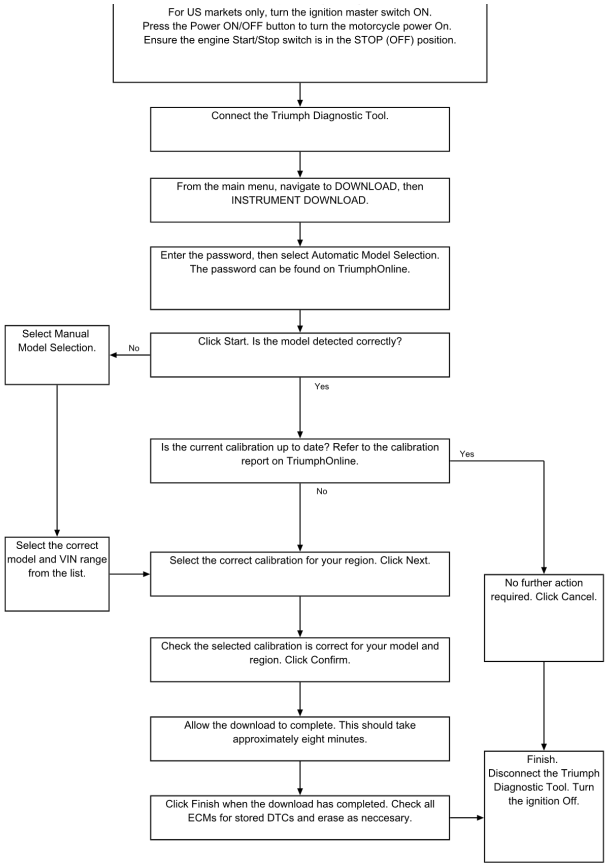
When planning to download a calibration, check each of the motorcycle's ECMs for out of date calibrations and ensure all ECMs are updated as necessary. Where calibration updates are available for more than one ECM, the ECMs should be updated in the following order.

1. Instruments
2. Chassis ECM/Keyless ECM (if fitted)
3. Engine ECM

Instruments

Instrument Calibration Download Flow Chart





Note

- **If the download fails to complete, turn the ignition Off and allow the motorcycle to power down (approximately one minute) before restarting the download. If the download continues to fail, see Linked procedure not present at the moment..**

Odometer Reset

This model is equipped with an odometer that allows the recorded odometer value to be reset to zero during the PDI check.

In the event of replacement this functionality will also allow a new set of instruments to be programmed with the motorcycle's existing odometer value.

Note

- **Motorcycles with the odometer reset functionality enabled will display the Set/Reset Odometer option in the chassis diagnostics menu.**
- **If the odometer has recorded more than 120 miles (200 km) or previously been reset the option will not be available and the buttons will be greyed out.**

Triumph Motorcycles LTD. would like to emphasise the importance of following the correct process whilst using the Triumph Diagnostic Tool to SET/RESET the odometer.

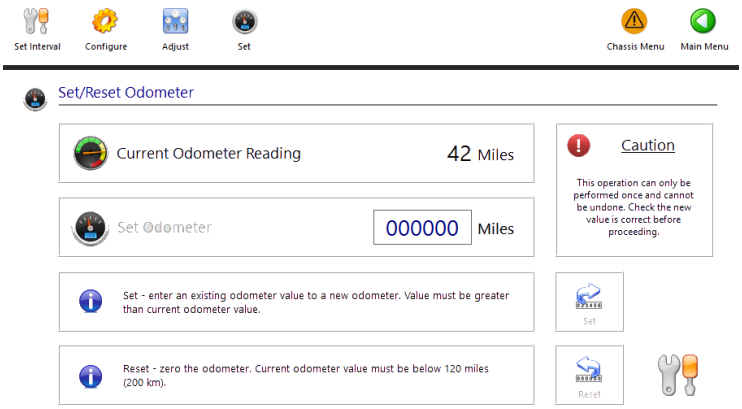
CAUTION

This operation can only be performed once and cannot be undone.

Check the new value is correct before proceeding.

When setting or resetting the odometer value ensure:

- The CORRECT odometer value is displayed in the Set Odometer box before pressing the Set or Reset button.
- DO NOT press the Set or Reset buttons before entering the correct odometer value. Once pressed the option to set or reset the odometer will no longer be available.
- REMEMBER, pressing the set or reset buttons will lock the odometer and no further programming will be allowed.



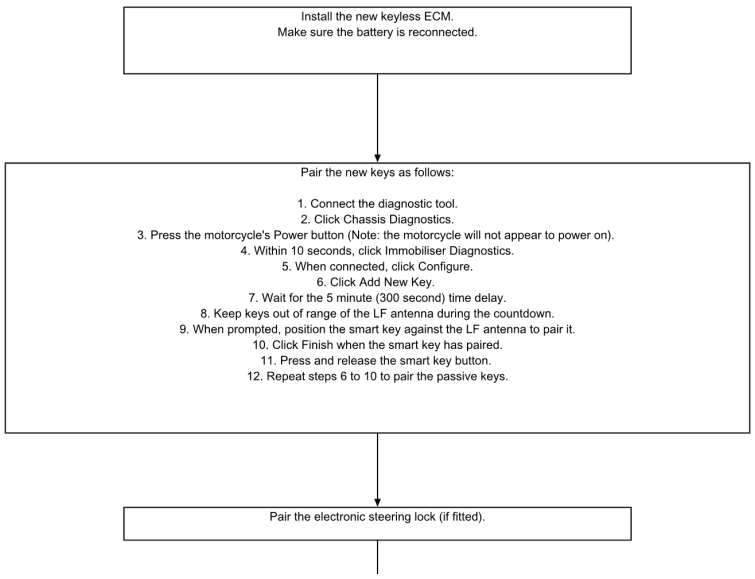
To Set/Reset the Odometer always refer to Set/Reset Odometer in the Chassis Diagnostics chapter of the Triumph Diagnostic User Guide.

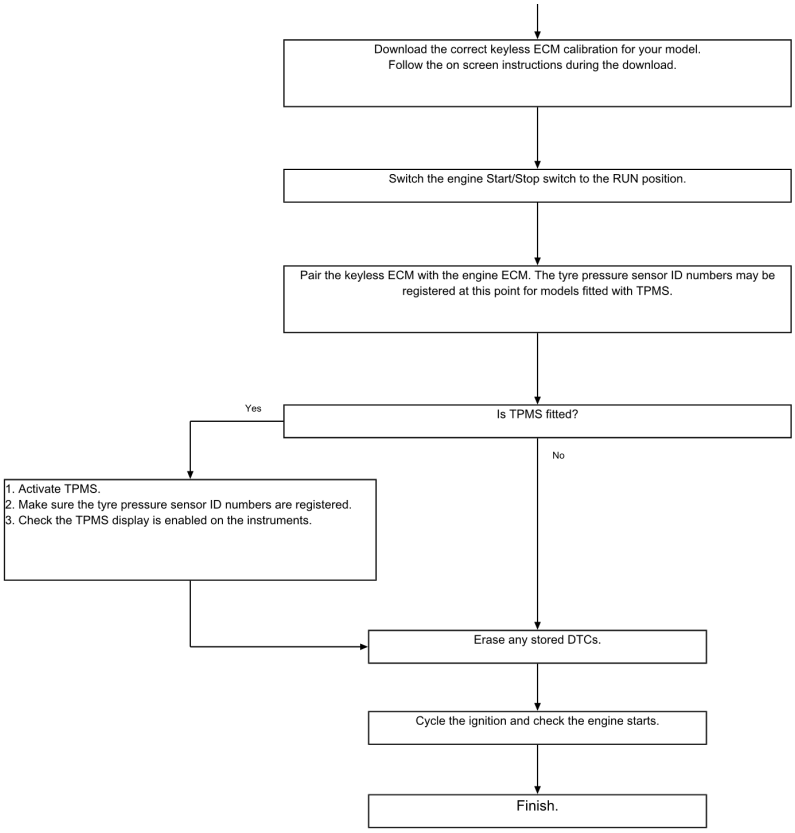
Keyless ECM

Setup Flow Chart - Replacement Keys and Keyless ECM

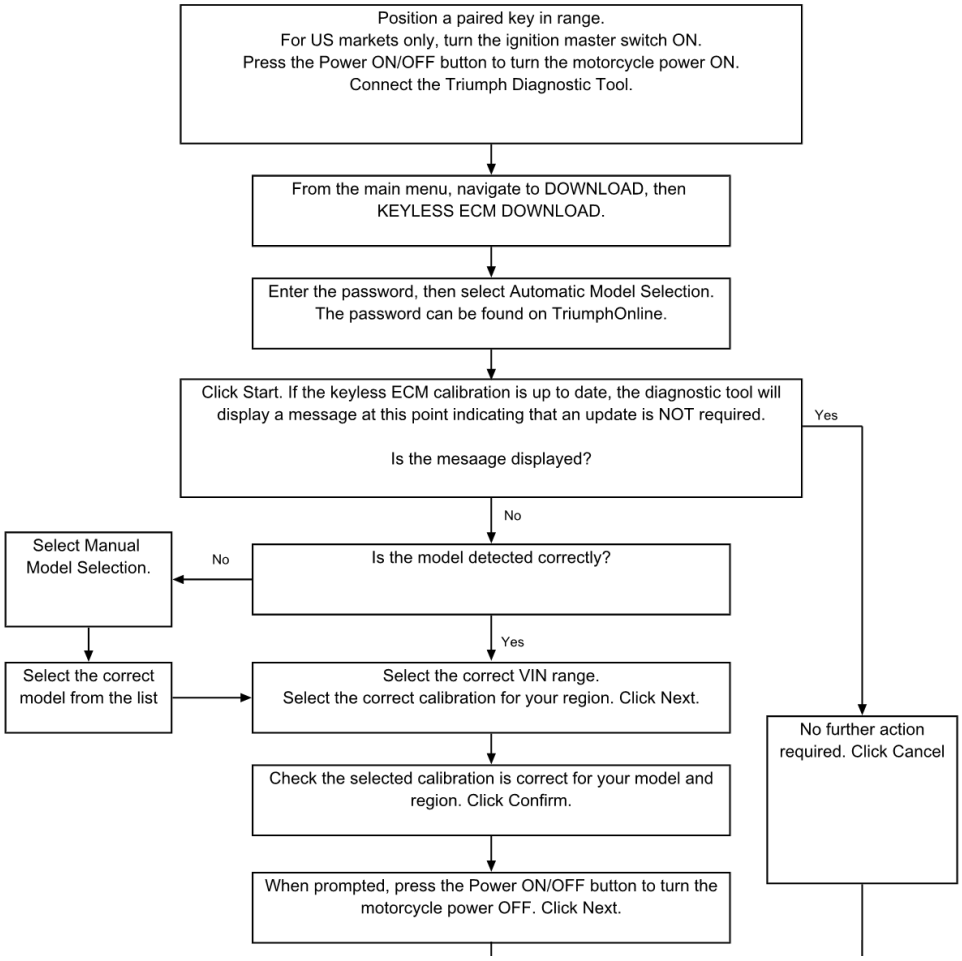
Note

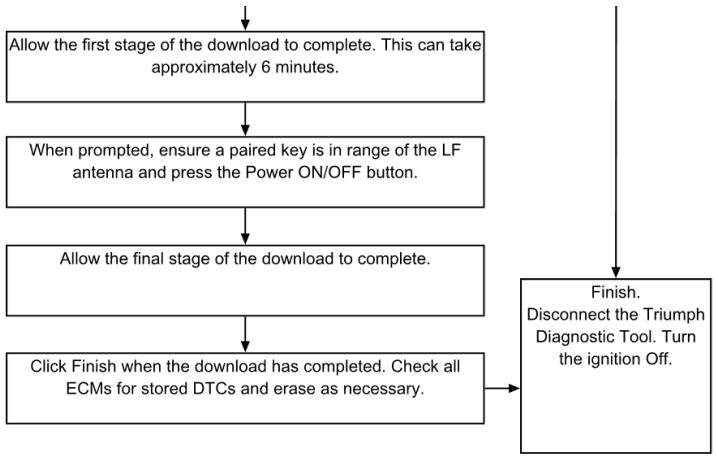
- **It can take up to 30 minutes to complete the system pairings, downloads and calibrations necessary for correct keyless ECM setup.**
- **Before starting the setup procedure, ensure the battery voltage is at least 12.8 Volts.**
- **An approved battery charger suitable for use with maintenance free batteries, may be used to maintain battery charge during the setup process.**





Keyless ECM Calibration Download Flow Chart





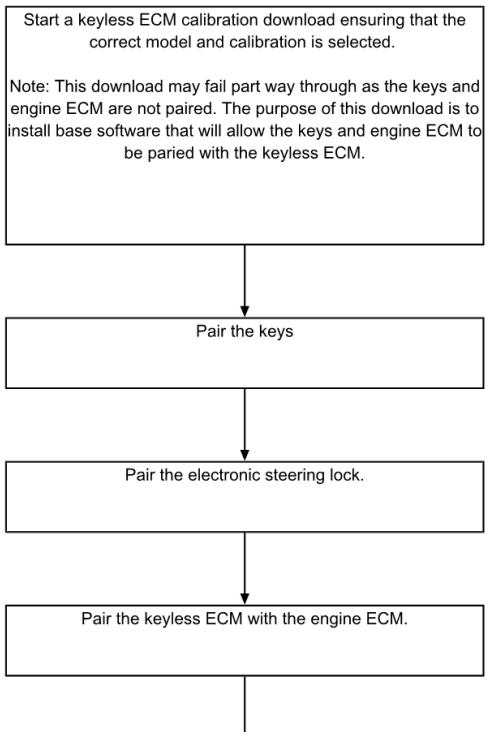
Note

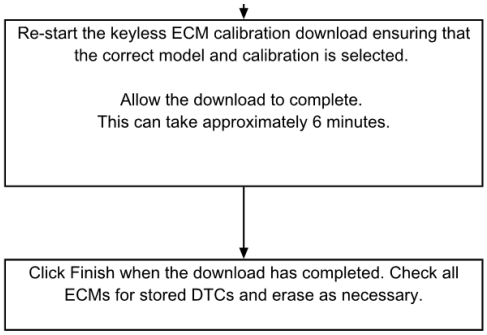
- **If the download fails to complete, turn the ignition Off, disconnect the diagnostic tool and allow the motorcycle to power down (approximately one minute) before restarting the download. If the download continues to fail, see Keyless ECM Calibration - Failed Download Recovery Flow Chart**

Keyless ECM Calibration - Failed Download Recovery Flow Chart

Note

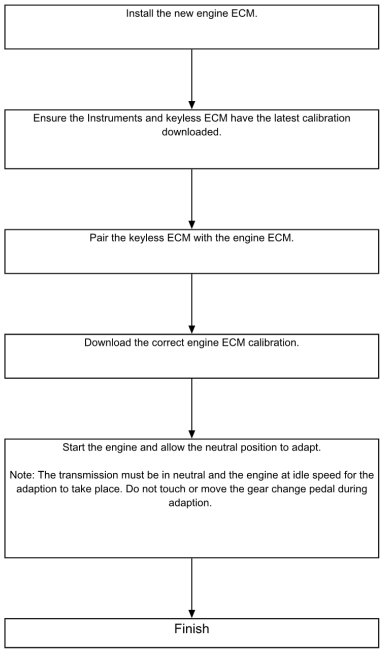
- **If a keyless ECM calibration download fails for any reason, it is possible that any existing software and immobiliser system pairings may have been erased from the keyless ECM's memory. Where this is the case, the keyless ECM can be recovered as described below.**
- **If after completing this procedure, the download continues to fail, contact Triumph Service.**



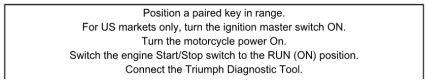


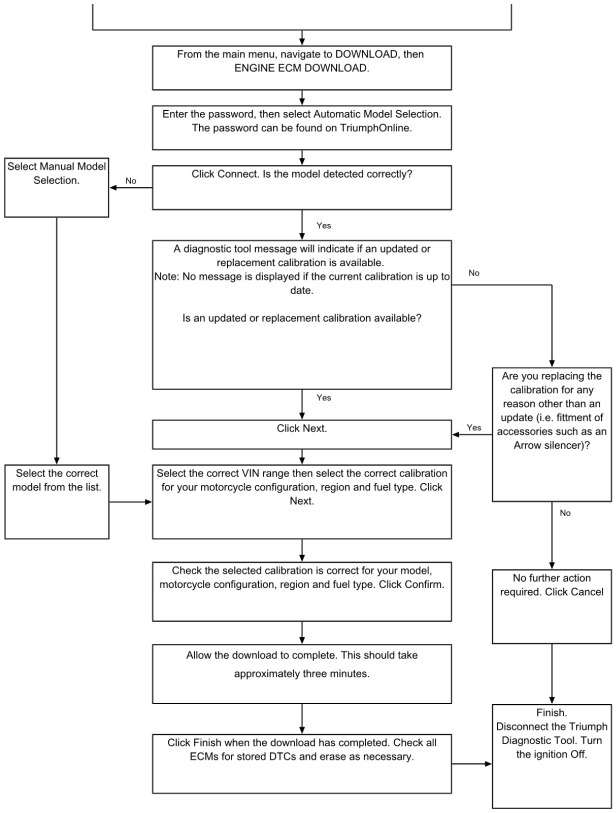
Engine ECM

Replacement Engine ECM Setup



Engine ECM Calibration Download Flow Chart





Note

- **If the download fails to complete, turn the ignition Off and allow the motorcycle to power down (approximately one minute) before restarting the download.**

Immobiliser System

Keyless Ignition Keys

The keyless ignition system allows the motorcycle to be started without the use of a mechanical key. There are three keys supplied with the motorcycle. One smart key and two passive keys.

To turn the motorcycle on, ensure a key is positioned in range of the LF antenna as described below and press either the Power button or Engine Start button on the Engine Start/Stop switch.

CAUTION

All keys supplied are locked to the keyless ECM. They cannot be used with any other motorcycle or keyless ECM.

If all keys are lost, misplaced or damaged, then the keyless ECM will need to be replaced.

To avoid unnecessary cost and time, make sure that all spare keys are kept in a secure location.

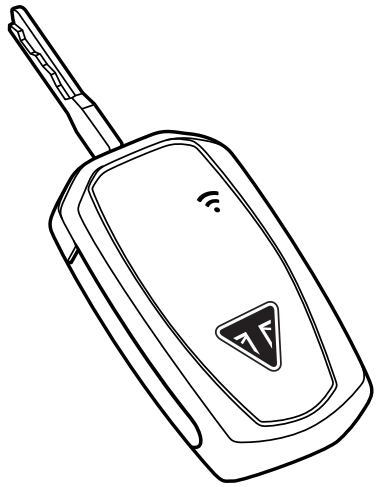
Note

- **Additional smart keys can be purchased from your Triumph dealer. However, only three keys can be programmed to the motorcycle. This can be a combination of smart keys**

Note

and standard keys.

Smart Key Operation



Smart Key

The smart key has two modes, active mode and passive mode.

A short press on the smart key button shows the current status of the key. The smart key LED will flash:

- Green when the key is in active mode.
- Red when the key is in passive mode.

To switch modes, press and hold the smart key button until the LED changes colour from green to red or vice versa.

In active mode, the smart key must be within (one metre/three feet) of the LF antenna to allow the motorcycle to be powered on and started. If the smart key is out of range of the LF antenna then it will be unresponsive and the keyless ignition cannot be activated.

In passive mode (or if the smart key battery is flat) the smart key must be held against the LF antenna to allow the motorcycle to be powered on and started (see Immobiliser Components Location).

Passive Key Operation

Passive keys must be held against the LF antenna to allow the motorcycle to be powered on and started.

Smart Key Battery Replacement

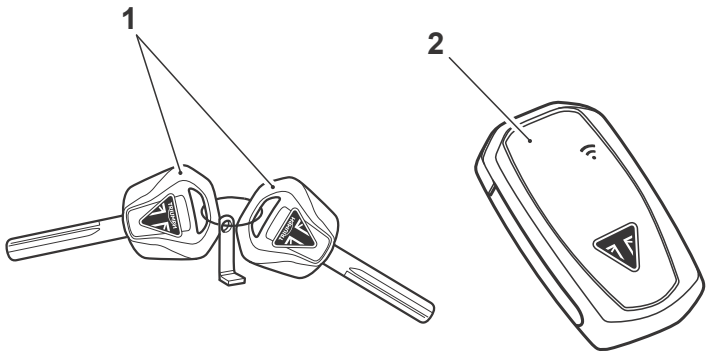
1. Ensure the smart key is turned to its passive mode (red LED).
2. Remove the fixing and remove the battery cover.
3. Noting its orientation, remove the battery.

Installation is the reversal of removal, noting the following.

- A CR2032 battery is required.
- Tighten the fixing to **0.3 Nm**.

Keyless Ignition System - Key Pairing General Information

The motorcycle is delivered from the factory with three keys; two passive keys and one smart key.



1. **Passive keys**
2. **Smart Key**

CAUTION

All of the motorcycle's available keys should be obtained before performing any key pairing operations.

Starting a key paring operation without having obtained all of the motorcycle's keys will render any spare keys inactive. In some circumstances, absent spare keys may also be rendered permanently unusable.

- Lost or unwanted keys can be erased, and additional/replacement keys added using the Triumph diagnostic tool.
- A maximum of three keys can be paired to the keyless ECM at any one time. This can be any combination of smart keys and passive keys. It is not possible to pair further keys when the maximum of three paired keys is reached.
- When pairing a combination of smart keys and passive keys, it is recommended that any smart keys are paired first, followed by the passive keys.
- A paired key can have three different states, active, inactive and erased.
- Once a key is paired it is regarded as active. At this point the key is permanently locked to its paired keyless ECM and cannot be paired to any other keyless ECM.
- A paired key is required to allow the motorcycle to power ON in order to perform key pairing operations. All available paired keys should be obtained before starting these operations.

- Paired keys can be erased using the Re-Register All Keys function on the Triumph diagnostic tool. When this function is used, the key being used to power the motorcycle will remain paired and active. Any other paired keys will be registered as inactive.
- When using the Re-Register All Keys function, a ten minute (600 second) security time delay is applied to the first key pairing. Further key pairings are subject to a five minute (300 second) time delay.
- Inactive keys can be either paired and reactivated, or replaced by new keys and overwritten.
- Any inactive keys that are overwritten are then stored as erased in the keyless ECM memory. A maximum of three erased keys can be stored.
- Erasing more keys after the maximum of three erased keys has been reached, will result in the erased keys being overwritten. Erased keys that are overwritten are then rendered permanently unusable.
- Stored erased keys can be paired and reactivated providing that the maximum number of three paired keys has not been reached. When a key is reactivated, it is moved from its ‘erased’ memory slot to a vacant ‘active’ memory slot.

Pairing New or Replacement Keys

1. Obtain all available motorcycle keys from the owner.
2. Remove the rider’s seat.
3. Power the motorcycle ON using a paired key.

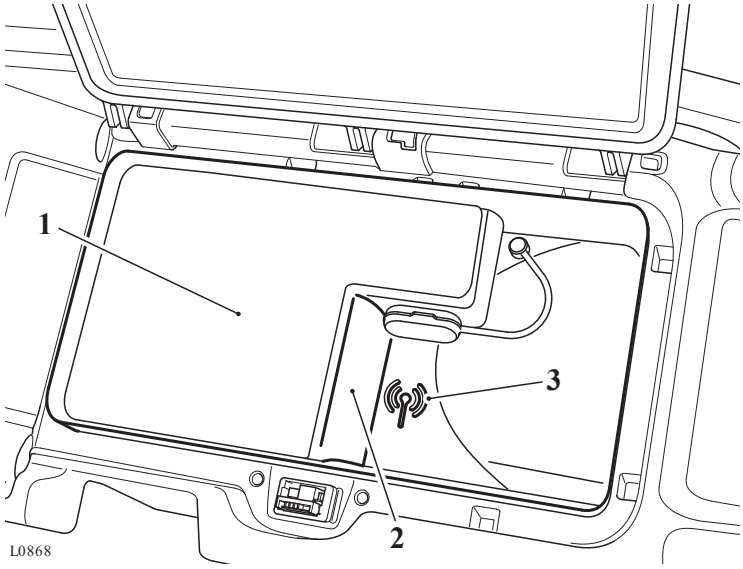
Note

- **Refer to the following guidelines for advice on which key to use to power the motorcycle ON:**
- **Guidelines - Replacing a Lost Smart Key**
- **Guidelines - Adding a Second Smart Key**

4. Connect the Triumph diagnostic tool.
5. Navigate to CHASSIS DIAGNOSTICS - IMMOBILISER DIAGNOSTICS - Configure.

Note

- **Before clicking Re-Register All Keys, ensure that you have all keys being paired to hand.**
- **A ten minute (600 second) security time delay is then initiated for the first key pairing. Do not leave the motorcycle unattended during this time.**
- **During the ten minute (600 second) time delay, the pairing of the key used to power the motorcycle ON is retained. It is therefore not necessary to re-pair this key. All other paired keys are registered as inactive.**
- **After the ten minute (600 second) time delay has elapsed, a pairing command is transmitted by the Low Frequency (LF) antenna. The Triumph diagnostic tool will prompt you to position the key being paired against the LF antenna.**
- **The LF antenna is located beneath the underseat storage compartment. For pairing purposes, the antenna can be accessed from inside the storage compartment. A symbol is provided inside the storage compartment to identify the antenna location.**
- **Only allow one key to be brought into close proximity of the LF antenna during each key pairing.**
- **Further keys can be paired by clicking Add. A five minute (300 second) time delay is applied to each subsequent key pairing.**

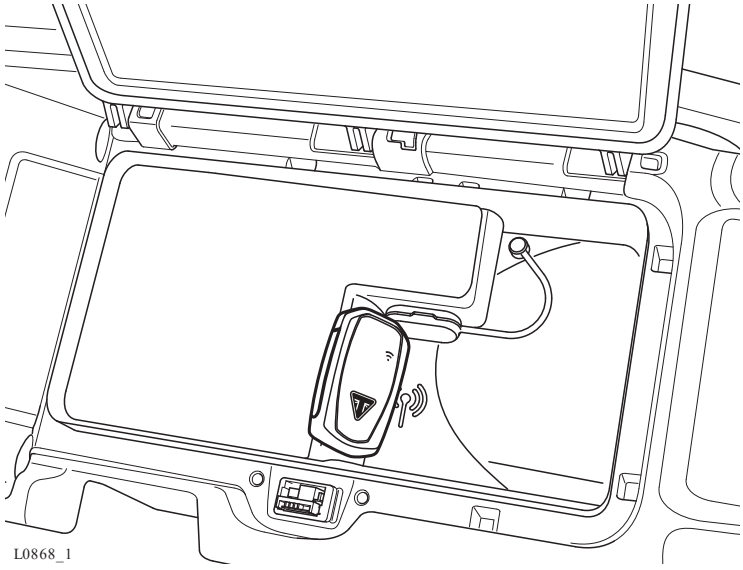


1. **Underseat storage compartment**
2. **LF antenna location**
3. **LF antenna Symbol**

6. Click Re-Register All Keys.
7. A ten minute (600 second) security time delay will begin.
8. When the time delay has elapsed, place the key against the LF antenna as prompted by the Triumph diagnostic tool.

Note

- **Smart keys should be positioned so that the side with the logo/button is facing away from the LF antenna.**



Key Placed Against LF Antenna

9. Hold the key against the LF antenna location until the Triumph diagnostic tool reports the

key has been successfully paired.

Note

- **If pairing does not occur immediately, slowly adjust the position of the key to the LF antenna (keeping it in close proximity) until the pairing is achieved.**

10. Click Add to pair another key in the same way or click Finish to end the process.

Guidelines - Replacing a Lost Smart Key

This instruction provides a brief outline of the process for pairing a replacement smart key, in the event that the original smart key has been lost. The instruction assumes the motorcycle is in its delivered condition, with one smart key and two passive keys paired.

1. Obtain all available motorcycle keys from the owner.
2. Power the motorcycle ON using one of the passive keys.
3. Connect the Triumph diagnostic tool.
4. Select Re-Register All keys.

Note

- **The pairing of the passive key used to power the motorcycle ON is retained.**
- **The other two keys are registered as inactive.**

5. Pair the replacement smart key.
6. Press the smart key button to lock the new smart key to the keyless ECM.
7. Pair the passive key that was NOT used to power the motorcycle ON.

Note

- **The motorcycle now has two passive keys and the replacement smart key paired.**
- **The original smart key is stored as an erased key in the keyless ECM memory. If the original smart key is later found, it can be paired and reactivated by following the 'Adding a Second Smart Key' procedure (see Guidelines - Adding a Second Smart Key).**

Guidelines - Adding a Second Smart Key

This instruction provides a brief outline of the process for pairing a second smart key. The instruction assumes the motorcycle is in its delivered condition, with one smart key and two passive keys paired.

1. Obtain all available motorcycle keys from the owner.
2. Power the motorcycle ON using the original smart key.
3. Connect the Triumph diagnostic tool.
4. Select Re-Register All Keys.

Note

- **The pairing of the smart key used to power the motorcycle ON is retained.**
- **The two passive keys are registered as inactive.**

5. Pair the additional smart key.
6. Press the smart key button to lock the new smart key to the keyless ECM.
7. Pair a passive key.

Note

- **The motorcycle now has two smart keys and one passive key paired.**
- **The second passive key is stored as an erased key in the keyless ECM memory.**
- **The erased passive key can be later paired and reactivated, in the event that one of the paired keys is lost.**

8. Attach a suitable label or key fob to the erased passive key to aid future identification.

All Keys Lost

CAUTION

Always store spare keys and the key number tag in a safe place away from the motorcycle.

At least one paired key is required to start any key pairing operations. If all keys have been lost, it will not possible to pair any replacement keys.

In this situation the keyless ECM and all keys must be replaced.

If the tag bearing the key number is also lost, the lock set (fuel tank cap, seat lock etc.) must also be replaced.

For details of the replacement keyless ECM setup process, refer to the Setup Flow Chart - Replacement Keys and Keyless ECM.

Pairing the Engine ECM

Note

- **There must be at least one key registered before the engine ECM can be paired to the keyless ECM.**

1. Remove the rider's seat.
2. Power the motorcycle ON using a paired key.
3. Switch the engine Start/Stop switch to the ON (RUN) position.
4. Connect the Triumph diagnostic tool.
5. Navigate to CHASSIS DIAGNOSTICS - IMMOBILISER DIAGNOSTICS - Configure - Pair ECM and Immobiliser.

Note

- **The tyre pressure sensor ID numbers may be registered at this point for models fitted with TPMS.**
- **Upon clicking Pair, a five minute (300 second) security time delay will be initiated. Do not leave the motorcycle unattended during this time.**

6. **Models fitted with TPMS only** - Enter the front and rear tyre pressure sensor ID numbers in the spaces provided.
7. Click Pair. The five minute (300 second) security time delay will begin.
8. The pairing will completed after the time delay has elapsed. The Triumph diagnostic tool will report if the pairing has been successful.

Trouble Shooting

Key Pairing

The following table lists possible causes of a key pairing failure along with remedial actions.

Key Pairing Failure - Possible Causes	Remedial Actions
Maximum number of 3 keys reached	Erase paired keys Pair the required keys
Key not positioned correctly to LF antenna after security time delay	Restart key pairing function. Ensure the key is correctly positioned to the LF antenna
Smart key flat battery	Replace battery
Key is locked to another keyless ECM	Replace key
Key has been erased then overwritten by another erased key.	Replace key
Key transponder not functioning due to damage, water ingress, etc.	Replace key
LF antenna not functioning	Check LF antenna for damage Check LF antenna is securely connected Check stored DTC's. rectify as necessary
Keyless ECM not configured	Download the correct keyless ECM calibration for your motorcycle

Further Immobiliser System Diagnostics Using the Instrument Panel Alarm/Immobiliser LED

The table below lists immobiliser system faults that can be diagnosed In the event that the motorcycle cannot be powered ON. The faults can be diagnosed by observing the behaviour of red alarm/immobiliser LED. Depending on the fault present, the LED will display a sequence of long and short flashes as follows.

Fault	LED Operation	Possible Causes	Remedial Action
Key authentication fault	1 long flash	1. Key out of range 2. Key inactive or erased 3. No keys paired	1. Bring an active paired key in range of the LF antenna 2. Obtain all available paired keys then pair any inactive or erased keys as necessary 3. Pair new keys

Spares Kits Matrix - Keyless Ignition System

Spares Kits Matrix - Keyless Ignition System							
Spares Item	Scenario:						
	Lost keys (still have other keys or smart key	Lost smart key	Non-functional smart key (still have blade)	Non-functional keyless ECM	Lost all keys and tag	Damaged/faulty lock set (still have keys)	Lost all keys (still have tag)
Standard lock set						•	
Spare keys (cut)	•						
Spare keys (uncut)	•						
Spare smart key, roll pin and blade (cut) [Japan]		•					
Spare smart key, roll pin and blade (cut) [Rest of world]		•					
Spare smart key, roll pin and blade (uncut) [Japan]		•	• Without blade.				
Spare smart key, roll pin and blade (uncut)		•	• Without blade.				

[Rest of world]							
Keyless ECM kit (ECM, smart key without blade, 2 keys) [cut, Japan				•	•		•
Keyless ECM kit (ECM, smart key without blade, 2 keys) [cut, rest of world				•	•		•
Keyless ECM kit (ECM, smart key without blade, 2 keys) [uncut, Japan				•	•		•
Keyless ECM kit (ECM, smart key without blade, 2 keys) [uncut, rest of world				•	•		•