



**Motorcycle
Electronic Cruise Control**

**MCS850 Compact Electric Throttle Servo
Fault Diagnosis and Removal**

MOTORCYCLE CRUISE CONTROLS

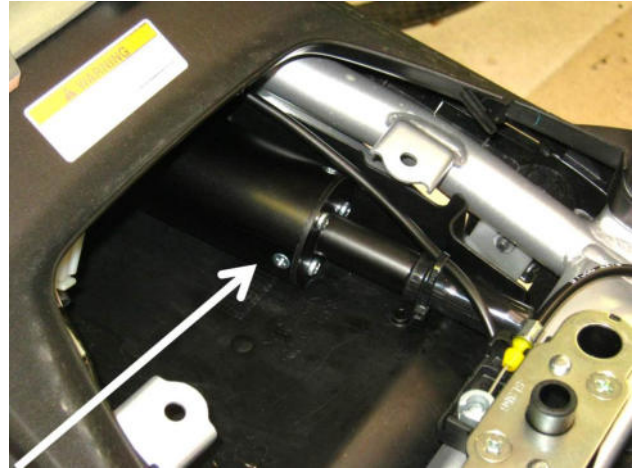
**MotorCycle Setup Pty. Ltd.
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This manual covers the procedures to diagnose faults and the cruise control throttle servo, and remove the servo from the bike for further testing and repairs if needed. It does not cover any repair procedures. The servo is serviceable, but must be returned to MotorCycle Cruise Controls for service if required. There are no user serviceable parts inside the throttle servo.

The photos below show some different methods and locations of mounting the cruise control throttle servo on different motorcycles. Refer to your cruise control installation instructions to find the location of the throttle servo if you don't know where the servo is on your bike.

Suzuki DL1000.

The servo is under the pillion seat.



Honda GL1800F6B

The servo is below the right side stereo speaker, inside the fairing.



BMW R1200GS

The servo is attached to the frame above the exhaust system.



On bike testing.

Note: - The ignition will be turned on without the engine running for a few minutes. Make sure the battery is charged and in good condition.

Put the cruise control in diagnostic mode, then servo test mode. Use the following procedure to do this.

- Place the bike on the centre stand (if it has one) and make sure it is in neutral.
- Turn the bike's ignition switch OFF
- Make sure that the bike's engine kill switch is ON (engine RUN position).
- Press and hold the SET and ON-OFF buttons.
- Turn ON the bike's ignition switch - DO NOT START the engine. **HOLD THE BUTTONS FOR AT LEAST 5 SECONDS or until you see the back lights behind the control switch buttons come on.** After 5 seconds (or the lights coming on) release the buttons.
- The cruise control is now in diagnostic mode. You may hear the throttle servo do its self-test on power up. Apply and release the brakes. Check that the light on the cruise control switch comes on green when the brakes are applied and goes out when it is released. This confirms that the cruise is in diagnostic mode. If the green light does NOT come on and off with brakes application, return to the start.
- Press and HOLD the cruise control ON-OFF button (green light on) until the light changes to red (15~30 seconds).

The cruise control is now in Throttle Servo Test Mode.

Servo motor test.

NOTE: - The bike's throttle will NOT be operated during this test.

- Listen for noises from the throttle servo motor while doing this test.
- Press the SET button. The servo motor should run for about 2 seconds (to full throttle position) then stop. Release the button.
- Press the RES button. The servo motor should run for about 2 seconds (to closed throttle position) then stop. Release the button.
- Press, the SET button, then the RES button alternately a few times to confirm that the motor runs and stops consistently in both directions.
- Press the SET button and wait for the motor to stop in the full throttle position. Release the button.
- Apply and release the brakes (touch and release). The motor should run for about 2 seconds (from full throttle to closed throttle position), stop briefly, then run again for a fraction of a second (to home or 'park' position).
- If necessary, press the SET button again to drive the servo to full throttle position, then apply and release the brakes while listening for the motor to run for 2 seconds, stop, then run again to home position.

Note: - This park procedure for the servo is critical to the operation of the servo. If the servo does not stop and then run again for a fraction of a second, it may not have moved to the park position. If this does not happen, the servo will not work correctly (the servo clutch cannot engage).

Note: - If the servo motor does not run for about 2 seconds and stop consistently in both directions, either the cruise control computer or the throttle servo has a fault.

If no fault is found, proceed to the next test.

Servo motor and clutch test.

- Listen for noises from the throttle servo motor & observe the twist grip.

NOTE: - The cruise control is normally set up to be able to apply about ½ throttle on large capacity bikes, and about ¾ throttle on smaller bikes. It is rarely set up to apply more than ¾ throttle. On most bikes (that have two throttle cables at the twist grip), the twist grip will move with the cruise control applying throttle, on some others (with only one throttle cable) the twist grip will develop free play equivalent to the amount of the throttle the cruise control has applied.

- Apply and release the brakes. Wait for at least 2 seconds after releasing the brakes.
- Press and HOLD the ON-OFF button. This turns on the clutch in the servo (no noise). **Do NOT release the ON-OFF button.**

NOTE: - If you accidentally release the ON-OFF button, apply and release the brakes to ‘reset’ the servo before the resuming the test.

- Press the SET button. The servo motor should run for about 2 seconds (to full throttle position) then stop. The twist grip should move to open the throttle at the same time, or develop free play. Release the button.
- Press the RES button. The servo motor should run for about 2 seconds (to closed throttle position) then stop. The twist grip should move at the same time, or take the free play out. Release the button.
- Press, the SET button, then the RES button a few times to confirm that the motor runs and stops consistently in both directions and the twist grip moves (or free play changes) at the same time.
- Press the SET button and wait for the motor to stop. Release the button.
- Release the ON-OFF button. There should be a pronounced ‘clunk’ from the servo and the throttle should return instantly to closed position when the servo clutch releases.
- Apply and release the brakes. The motor should run for 1~2 seconds (from full throttle to closed throttle position), stop briefly, then run again for a fraction of a second (to home or ‘park’ position).

Note: - This park procedure for the servo is critical to the operation of the servo. If the servo motor does not stop and then run again for a fraction of a second after brake application, it may not have moved to the ‘park’ position. If this does not happen, the servo clutch cannot engage and the servo will not work.

Note: - If the servo motor does not run for about 2 seconds and stop consistently in both directions and the throttle does not move with operation of the servo, either the cruise control computer or the throttle servo has a fault.

If the servo and clutch pass these all these tests, then the cruise computer and servo are working as they should. If the cruise control is not working correctly, the throttle servo and drivers are not the cause.

The next section showing tests with the servo cable disconnected can be used to diagnose if the servo is at fault or there is a cable issue.

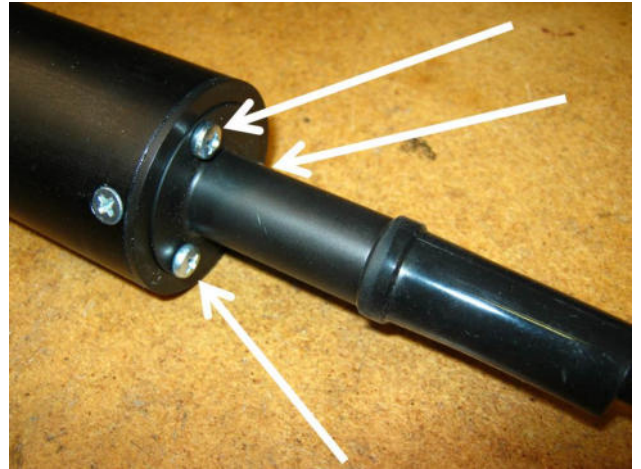
On bike testing with the servo cable disconnected from the servo.

The following tests can be done with the servo on or off the bike. In order to check the operation of the servo clutch, the servo cable must be disconnected from the servo. The following instructions show how to disconnect the cable and perform the tests.

Loosen and remove the three screws that hold the 'nose' of the servo.

You may need to take the servo off the bike to access these screws.

Note: - It is not usually necessary to disconnect the servo cable from the bike.



Have an assistant hold the bike's throttle twist grip on full throttle. This will give lots of free play in the servo cable.

Pull the nose away from the servo. This will extend the servo cable. The servo cable nipple can be seen in the photo (arrowed) connected to the servo lost motion device (the metal tube with the slot and hole in it).



Disconnect the cable nipple from the lost motion device.



Try to push the lost motion device inward.

There should be no detectable movement at all, however this does depend on what state the servo was left in at the end of the previous tests.

As long as the last operation done was to apply and release the brakes before the ignition switch was turned off, the lost motion device should not push in at all.



Note: - The ignition will be turned on without the engine running for a few minutes. Make sure the battery is charged and in good condition.

Put the cruise control in diagnostic mode, then servo test mode. Use the following procedure to do this.

- Place the bike on the centre stand (if it has one) and make sure it is in neutral.
- Turn the bike's ignition switch OFF
- Make sure that the bike's engine kill switch is ON (engine RUN position).
- Press and hold the SET and ON-OFF buttons.
- Turn ON the bike's ignition switch - DO NOT START the engine. **HOLD THE BUTTONS FOR AT LEAST 5 SECONDS or until you see the back lights behind the control switch buttons come on.** After 5 seconds (or the lights coming on) release the buttons.
- The cruise control is now in diagnostic mode. You may hear the throttle servo do its self-test on power up. Apply and release the brakes. Check that the light on the cruise control switch comes on green when the brakes are applied and goes out when it is released. This confirms that the cruise is in diagnostic mode. If the green light does NOT come on and off with brake application, return to the start.
- Press and HOLD the cruise control ON-OFF button (green light on) until the light changes to red (15~30 seconds).

The cruise control is now in Throttle Servo Test Mode.

Motor forward test.

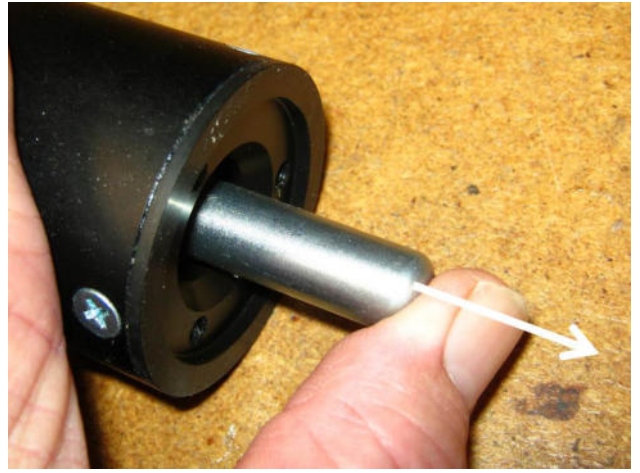
Press the SET button. The servo motor should run for about 2 seconds (to full throttle position) then stop. Release the button.

Push on the end of the lost motion device.

It should push in against light spring pressure until the end of the lost motion device is roughly level with the end of the servo housing.



Release the pressure, the spring inside should push the lost motion device out again.

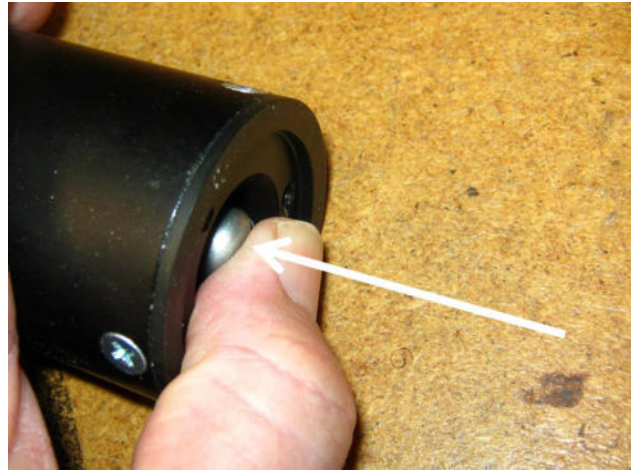


Solenoid clutch hold test.

Press and HOLD the ON-OFF button.

Push on the end of the lost motion device.

It should push in against light spring pressure until the end of the lost motion device is roughly level with the end of the servo housing, it will stop when it contacts the solenoid clutch inside the servo.



Remove your finger.

The lost motion device should stay inside the servo.

The solenoid clutch in the servo should 'grab' the lost motion device and hold it firmly.

Push the end of the lost motion device sideways firmly (not hard enough to break it though) to see if you can 'dislodge' the solenoid clutch. It should hold, even with firm pressure applied to it.



Release the ON-OFF button.

The lost motion device should instantly 'pop' back out.



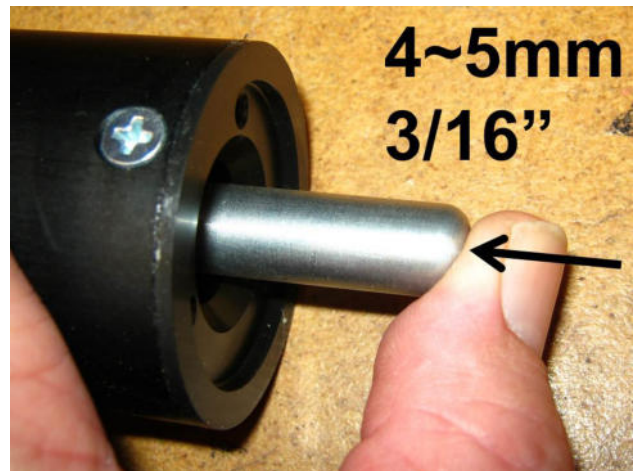
Motor reverse test.

Press the RES button. The servo motor should run for about 2 seconds (to full throttle position) then stop. Release the button.

Push on the end of the lost motion device.

It should push in against light spring pressure about 4~5mm (3/16"), it will stop when it contacts the solenoid clutch inside the servo.

Release the pressure, the spring inside should push the lost motion device out again.



Motor home or 'park' test.

Apply and release the brakes. After a second or so delay, the motor should run for a fraction of a second to home or 'park' position.

Try to push the lost motion device inward.

There should be no detectable movement at all.



Motor forward with clutch engaged test.

Press and HOLD the ON-OFF button.

Try to hold the lost motion device with your fingers to prevent it being pulled into the servo.

Press the SET button (HOLD the ON-OFF button)

The motor should run for about 2 seconds, and the lost motion device should retract into the servo housing even if you are holding the lost motion device firmly.

HOLD the ON-OFF button for the next test.



Brake test.

HOLD the ON-OFF button for this test.

Apply and release the brakes.

The motor should run for 1~2 seconds and the lost motion device should come out of the servo.

The motor should stop briefly (a fraction of a second), then the lost motion device should 'pop' out the last few mm and the motor will then run again for a fraction of a second to the home or 'park' position.

Release the ON-OFF button.



If the servo passes all of these tests, then the operation of the servo and the computer is normal.

The next section showing the Servo Electrical Tests can be used to diagnose if the servo is at fault or the cruise control computer.

Servo Electrical Tests.

The following tests can be done with the servo on or off the bike. In order to check the operation of the servo clutch, the servo cable must be disconnected from the servo. The following instructions show how to disconnect the cable and perform the tests.

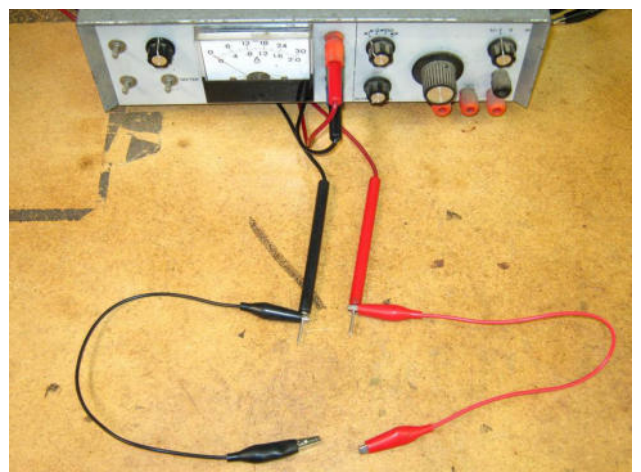
There are some simple resistance tests after this section as well, they may be useful if the cruise is blowing fuses.

In order to test the servo functions, you will need the following equipment.

A suitable 12V power supply with the ability to supply about 0.5 to 1 amp of current. A 12V battery is suitable, but a current limited power supply would be better in the event of accidental short circuits.

A pair of suitable electrical probes or wires. Again, insulated probes are better to prevent risk of short circuits.

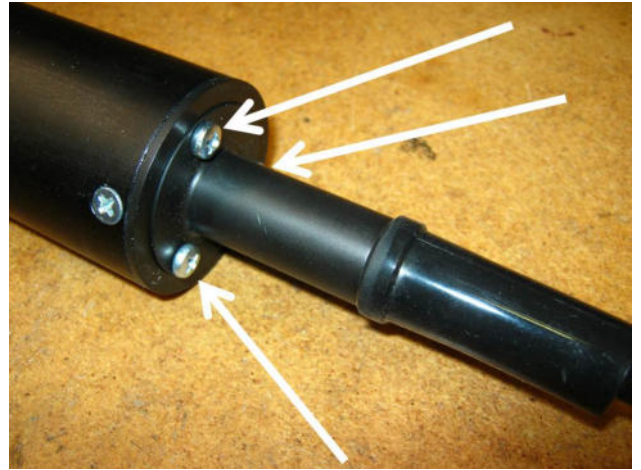
Clip leads are also helpful, short leads with a small alligator clip at both ends.



Loosen and remove the three screws that hold the 'nose' of the servo.

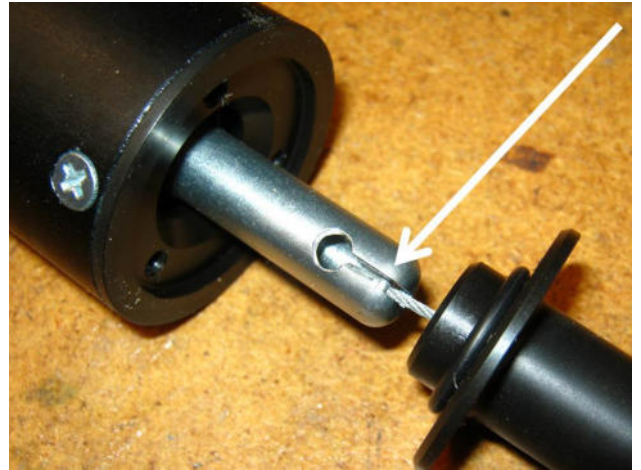
You may need to take the servo off the bike to access these screws.

Note: - It is not usually necessary to disconnect the servo cable from the bike.



Have an assistant hold the bike's throttle twist grip on full throttle. This will give lots of freeplay in the servo cable.

Pull the nose away from the servo. This will extend the servo cable. The servo cable nipple can be seen in the photo (arrowed) connected to the servo lost motion device (the metal tube with the slot and hole in it).



Disconnect the cable nipple from the lost motion device.



Try to push the lost motion device inward.

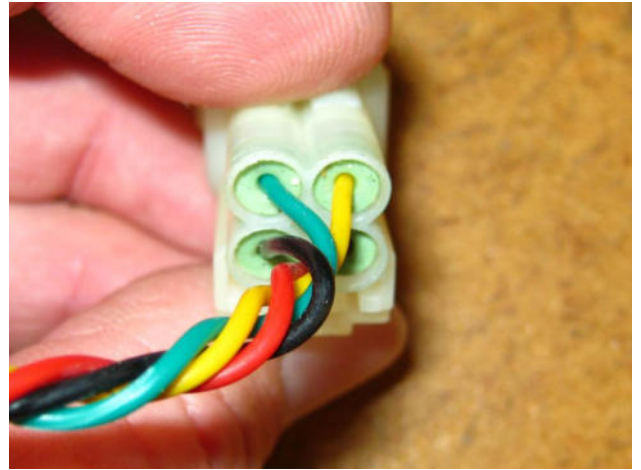
There should be no detectable movement at all, however this does depend on what state the servo was left in at the end of the previous tests.

As long as the last operation done was to apply and release the brakes before the ignition switch was turned off, the lost motion device should not push in at all.



Disconnect the servo electrical plug from the cruise control harness.

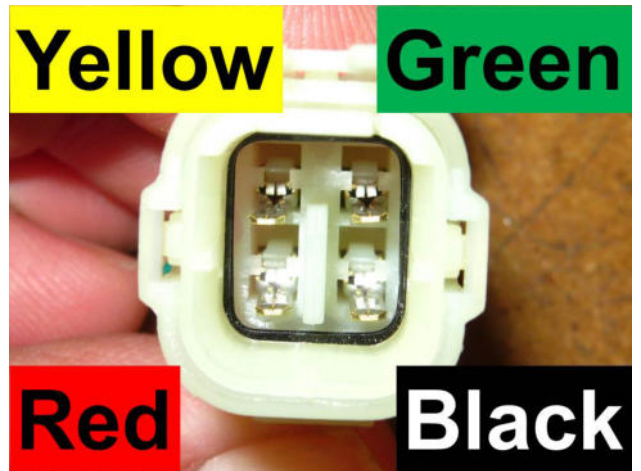
The back of the plug is shown here with the yellow, green, red and black wires.



This picture shows the terminal in the plug and the wire colours.

The yellow and green (**blue & green** on later versions) wires connect to the servo motor.

The red and black wires connect to the servo clutch.



Motor forward test.

Connect the positive power supply lead to the yellow (or blue) servo motor wire.

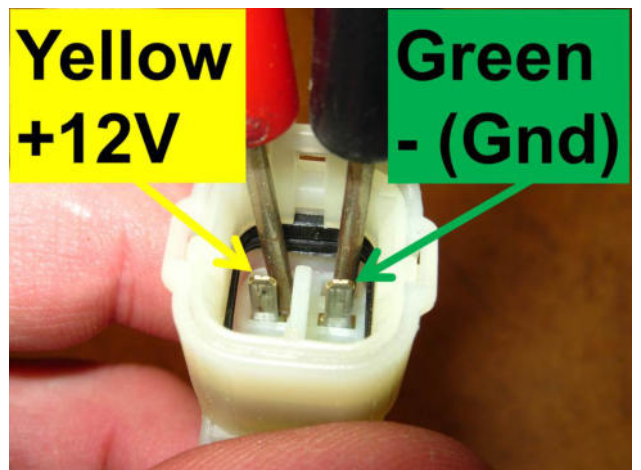
Connect the negative power supply lead to the green servo motor wire.

CAUTION: - Take great care not to touch the other terminals on the red and black wires. An accidental touch can damage electrical components inside the servo.

Turn on the power supply. The servo motor should run for about 2 seconds and stop.

Disconnect the leads from the servo plug.

Note: - There may be some 'rattling' noises from within the servo while the motor is running, this is not always present but is normal. It does not indicate a fault.

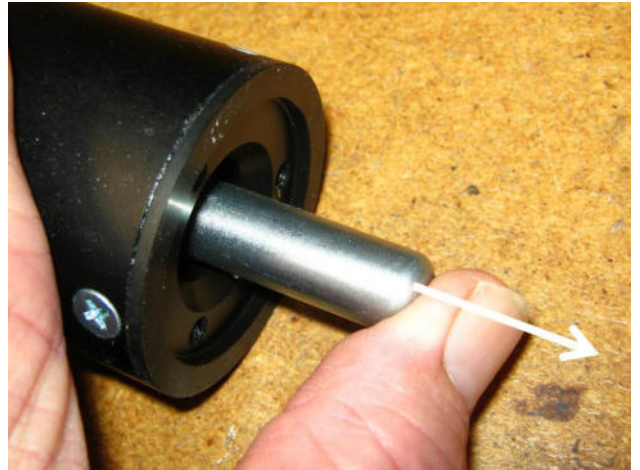


Push on the end of the lost motion device.

It should push in against light spring pressure until the end of the lost motion device is roughly level with the end of the servo housing.



Release the pressure, the spring inside should push the lost motion device out again.



Solenoid clutch hold test.

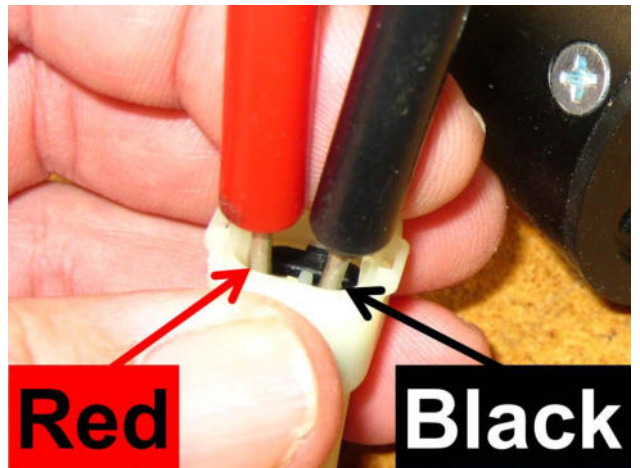
CAUTION: - Take great care not to reverse the connection to the servo clutch wires. This will cause a short circuit and may damage components inside the servo.

Connect the **positive** power supply lead to the **red** servo clutch wire.

Connect the **negative** power supply lead to the **black** servo clutch wire.

CAUTION: - Take great care not to touch the other terminals on the yellow and green wires.

Turn on the power supply; this will energise the servo solenoid clutch.



Push on the end of the lost motion device.

It should push in against light spring pressure until the end of the lost motion device is roughly level with the end of the servo housing, it will stop when it contacts the solenoid clutch inside the servo.



Remove your finger.

The lost motion device should stay inside the servo.

The solenoid clutch in the servo should 'grab' the lost motion device and hold it firmly.



Turn the power supply off or disconnect the wires.

The lost motion device should instantly 'pop' back out.



Motor reverse test.

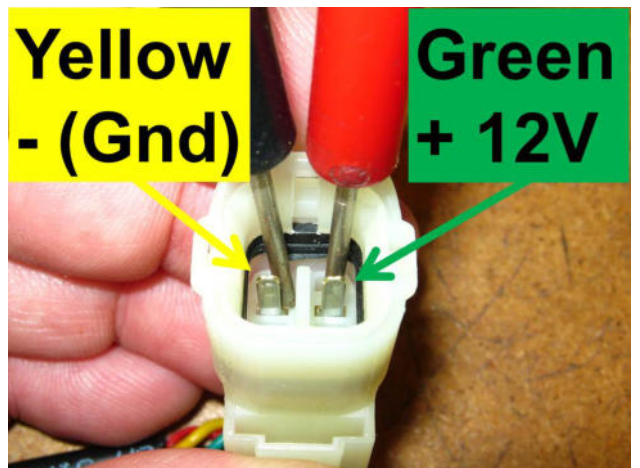
Connect the positive power supply lead to the green servo motor wire.

Connect the negative power supply lead to the yellow servo motor wire.

CAUTION: - Take great care not to touch the other terminals on the red and black wires.

Turn on the power supply. The servo motor should run for about 2 seconds and stop.

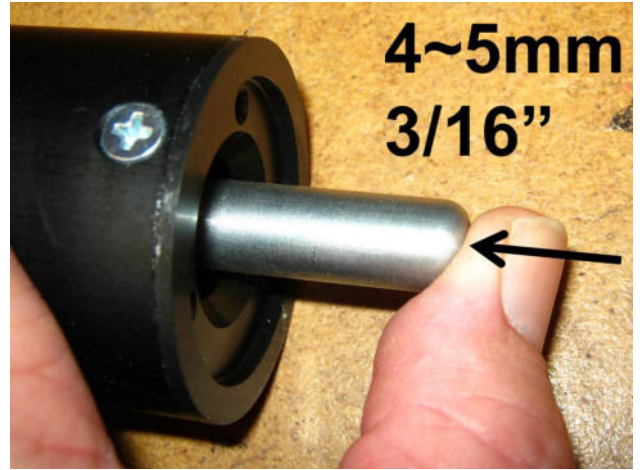
Disconnect the leads from the servo plug.



Push on the end of the lost motion device.

It should push in against light spring pressure about 4~5mm (3/16"), it will stop when it contacts the solenoid clutch inside the servo.

Release the pressure, the spring inside should push the lost motion device out again.



Motor home or 'park' test.

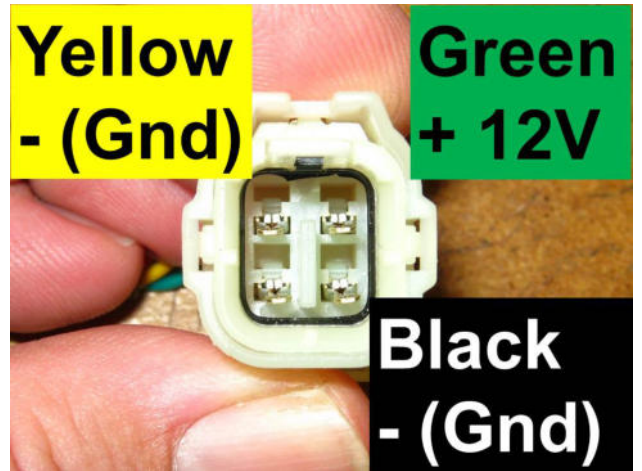
In order to reset or 'park' the servo, these connections are required.

Connect the positive power supply lead to the green servo motor wire.

Use a clip lead to connect the negative power supply lead to the yellow servo motor wire.

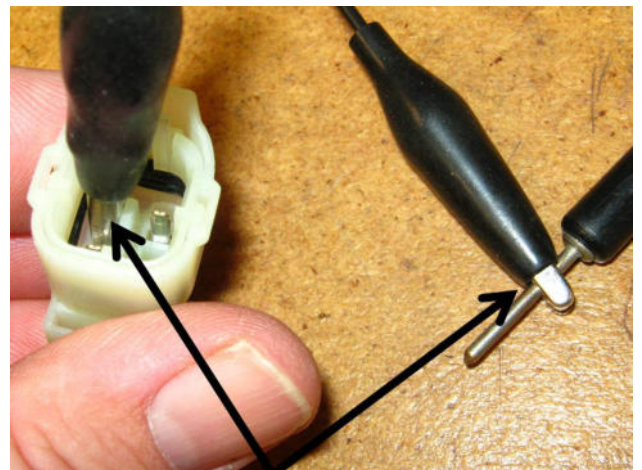
Connect the negative power supply lead to the black servo clutch ground wire.

See below for more detail.



CAUTION: - Take great care not to touch the other terminals on the red and black wires.

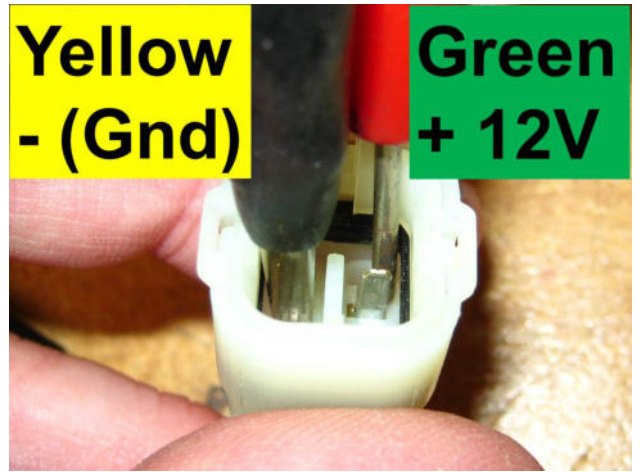
Use a clip lead to connect the negative power supply lead to the yellow servo motor wire.



Connect the positive power supply lead to the green servo motor wire.

This will make the motor connection ready to 'park'.

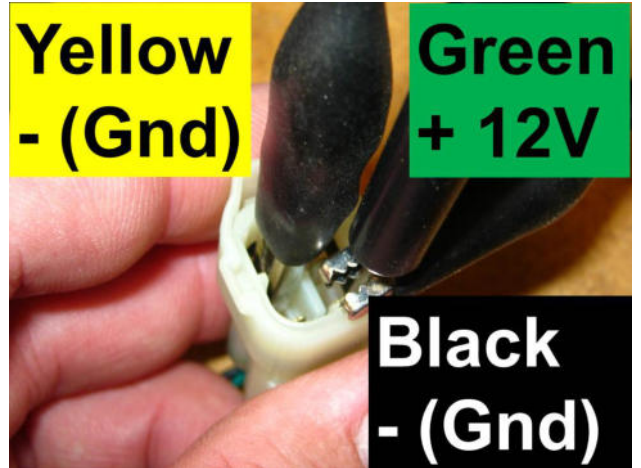
Turn the power supply on.



Connect the negative power supply lead to the black servo clutch ground wire. This will trigger a circuit in the servo to allow the servo to park.

All three connections are required to 'park' the servo.

The motor should operate briefly and stop in the 'parked' position.



Try to push the lost motion device inward.

There should be no detectable movement at all.



If the servo passes all of these tests, then the operation of the servo is normal.

Servo resistance tests.

For these tests you will need a multi-meter and suitable probes.

Measure the resistance both ways, eg. Red probe to red wire, black probe to black wire, then swap probe positions.

Solenoid Clutch resistance test.

<u>Wire colours</u>	<u>Resistance readings</u>
Red & Black	50~80 ohms both ways
OR	50~80 ohms one-way, lower reading the other way, how low depends on the type of multi-meter. The reading should never be below a few ohms and should not be over 100 ohms, regardless of the type of multi-meter.

Servo Motor resistance test.

The resistance of the motor depends on where the servo motor is in its range of movement. Push in the lost motion device, if it does not move, or only can be pushed in ~5mm (~3/16") it is at idle or home position.

If it can be pushed in against a light spring so the end of the lost motion device is level with the servo housing, it is at full travel position.

At any point in between these extremes, it is in its 'normal' or mid travel range.

A failed servo is most likely to be stuck in either the home or full travel position.

<u>Wire colours</u>	<u>Resistance readings</u>
Yellow (or Blue) & Green	Mid travel - 3~5 ohms both ways
Yellow (or Blue) & Green	Home, idle or full travel positions Infinity or Mega ohms one way Typically, a few hundred ohms the other way

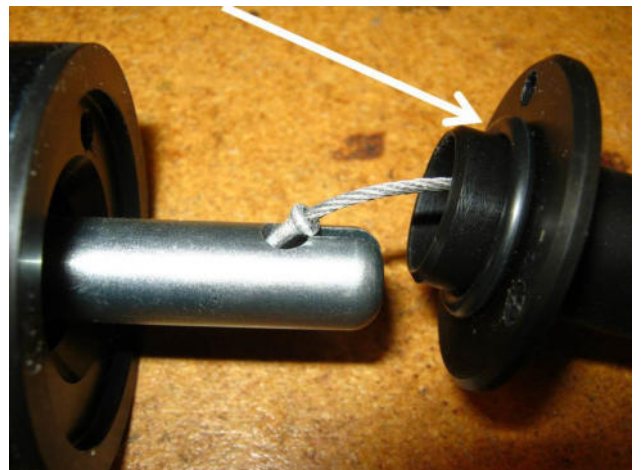
The reading will depend on what type of meter is used but these are typical results in a good servo.

Servo re-assembly.

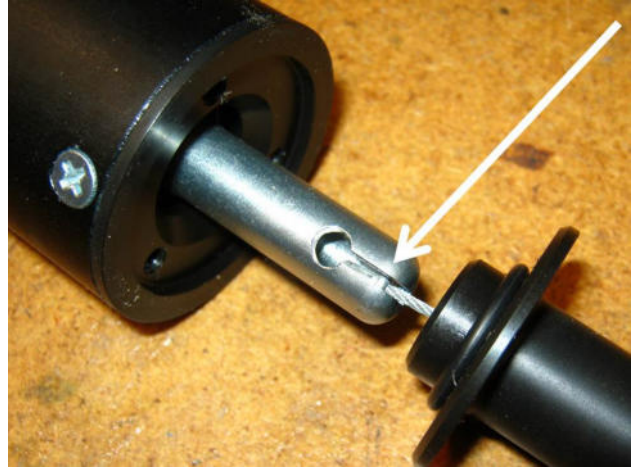
Apply a smear of 'O' ring grease to the 'O' ring on the servo nose (arrowed).

Have an assistant apply full throttle on the twist grip. Use a pair of needle nose pliers to grab the cable nipple inside the nose.

Connect the cable nipple to the servo lost motion device.



Connect the cable nipple to the servo lost motion device.



Replace the nose on the servo.

Apply a drop of low or medium strength thread locking compound to the threads of the screws to seal the threads.

Replace the screws in the servo and tighten them gently and evenly.

Note: - Take care not to overtighten the screws and strip the threads.



Notes: