RECLINE:
Remote Inclinometer System

Recline: rɪ'klʌɪn: verb; to relax and be supported

Calibration Procedures Version 2.2

March 2018

Calibration Procedures

It is recommended that a service calibration be carried out every 12 months or sooner if the user feels it is required. The style and or method of use may dictate more frequent calibrations. For example, if constant rough use is experienced then more frequent calibration may be required.

The more accurate you are in the calibration process, the more accurate the results will be.

When working with lasers, please ensure you have the required personal safety equipment and procedures. Eye sight can be damaged permanently if lasers are abused or used in an incorrect manner.

As is the way with these things, even the calibrators require calibrating. Please ensure you start with a good source. Rubbish in = Rubbish out. Please contact us if you have any queries.

Please read and understand the user manual before use.

If you are unsure about the calibration procedure, please feel free to contact us and we will happily talk you through it.

Procedures and techniques are always being improved and updated. Please check the website for updates. www.ksgsensors.com

Laser Alignment Procedure

Adjustable Laser Mounting

Always practice laser safety when working with lasers.

Tools required: Laser Alignment bracket (right angle plate), 3mm Hex key – ball end, 2.5 Hex key, 2mm Hex key, T20 Trox driver, T10 Torx driver (CSU), Pozi Drive PZ2 screwdriver, Loctite

1. Fit sensor to Laser Alignment bracket
2. Place sensor (with the large label facing up) and bracket on a flat level surface – it does not have to be at 0 degrees
3. Place and align a reference laser beside the sensor. We recommend the Laser Liner DigiLevel Pro http://laser-liner.co.uk/product/digilevel-pro-30-cm/ although any accurate laser pointer with minimal deviation will do
4. Aim the lasers at a target some distance away. The greater the distance of the target, the greater the accuracy of the laser alignment. Ensure no one is in or around the target area
5. Activate both lasers. If the sensor lid has been removed, press the laser micro-switch if fitted to complete the laser power circuit. This is fitted on either the sensor internal side wall or on the PCB. Early sensors do not have this item fitted
6. Observe where the reference laser spot falls on the target
7. Align the sensor laser spot so that both the sensor and reference laser meet at the same point. By adjusting the 4 screws on the face of the laser mount, the laser can be aligned in 4 directions
8. If required, apply Loctite internally to threads of laser adjustment screws and grub screws.
9. When aligned, replace cover and 4 screws if removed
10. Make a note of alignment in a log book etc.

If the range of movement in the laser mount is not sufficient, the laser module can be rotated within the laser mounting. To achieve this, remove the Senor Unit lid. Release the grub screws holding the laser module in place, rotate laser module to desired position. Realign laser.

If the focus of the laser is adjusted, this will alter the alignment of the laser.

Laser Focusing Procedure:

Always practice laser safety when working with lasers.

Tools required: 5mm Flat blade screwdriver, Loctite.

To focus the laser, follow the steps below

1. Place the Sensor Unit on a flat and stable surface.
2. Connect Sensor Unit to the Display Unit
3. Turn on Display Unit. Connect external DC PSU if required.
4. Aim the laser at a distant target and note the size and sharpness of the laser.
5. If adjustment is required, got to step 6
6. Insert a flat blade screw driver into the barrel of the laser module and rotate the lens until a sharp point has been achieved
7. Applying Loctite or similar is recommended

The screw driver must be wider than 4mm but less than 6mm. If the screwdriver is too narrow, when inserted into the laser module, it will scratch the lens.

If the focus of the laser is adjusted, this will alter the alignment of the laser.

Display Calibration Procedure:

Single Input Display Mk i and Mk ii

Tools required: Phillips # 2 Screwdriver, Potentiometer Trimmer and Screen Calibrator.

Please note, this procedure only applies to the single input display with the green backlit screen.

1. Turn power to Display unit off and remove all batteries and external power sources from the Display Unit.
1. Connect screen calibrator to Display Unit input.
2. Turn screen calibrator on.
3. Apply 4ma to the screen and take note of reading. It should read -30
4. Apply 12ma to the screen and take note of reading. It should read 0
5. Apply 20ma to the screen and take note of reading. It should read 30

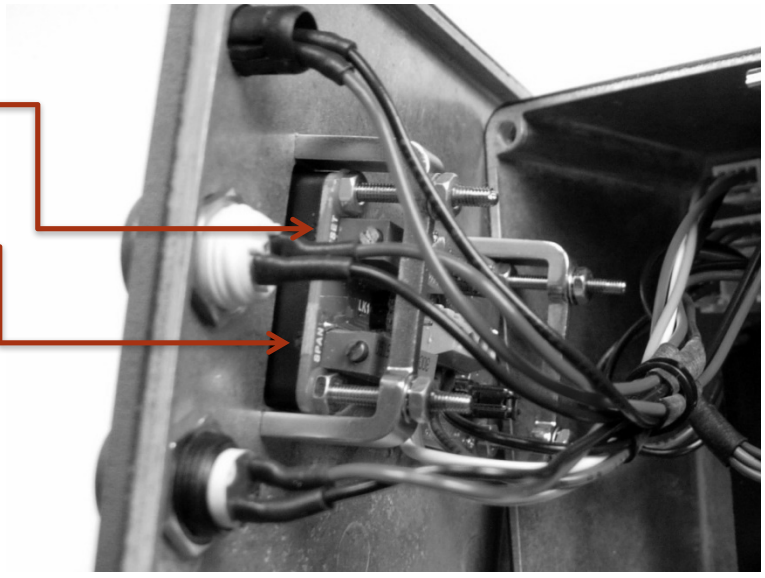
If any of the readings differ, go to step 6

6. Remove cover of display unit by releasing 4 x Phillips head screws.
7. Apply 4ma to the screen and adjust the 'Offset' potentiometer until the display reads -30
8. Apply 20ma to the screen and adjust the 'Span' potentiometer until the display reads 30
9. Apply 12ma to the screen to confirm the reading is 0. Do not adjust when applying 12ma
10. Adjust 'Span' and 'Offset' as necessary for optimum accuracy but repeating steps 9, 10 and 11 until the desire results have been achieved.
11. Turn off screen calibrator and disconnect from Display Unit.
12. Replace Display unit cover and replace four screws.
13. Replace batteries and or external DC PSU and test function of the Display unit.
14. Make a note of calibration in a log book or similar.

Display Unit Screen Detail:

Offset Potentiometer

Span Potentiometer



Dual Input Display Mk i, ii and certain models of the Single Input Display Mk iii

Tools required: Phillips # 2 Screwdriver, Potentiometer Trimmer and Screen Calibrator.

Please note, this procedure only applies to the Single and Dual input displays with the colour 2.4" colour TFT screen and switches that are mounted proud of the label.

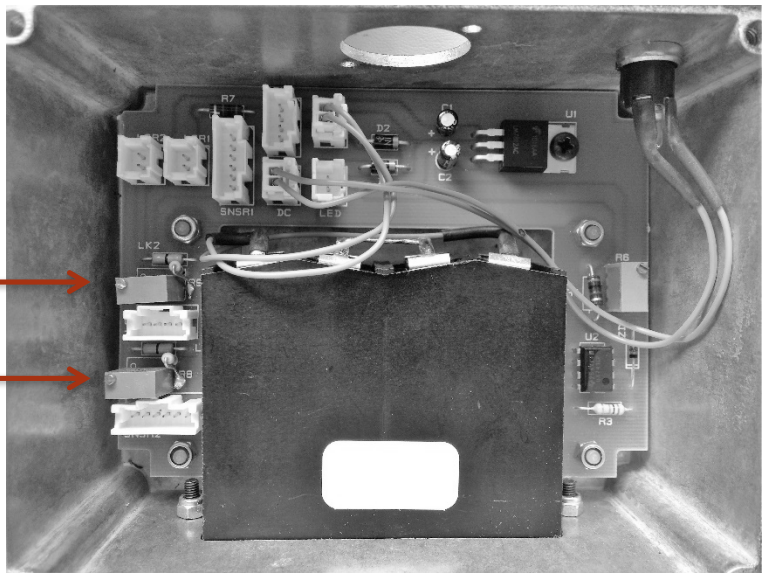
1. Turn on power to display unit
2. Connect screen calibrator to display unit input 1
3. Apply 12ma to the screen and take note of reading. It should read 0

If the reading differs, go to step 4

4. Remove cover of display unit by release 4 x Phillips head crews.
5. Apply 12ma to the display unit. Turn the corresponding input potentiometer to adjust the angle shown on the screen so that it reads -0.00. Repeat for input 2 if required
6. Apply a small amount of Loctite to the potentiometer
7. Turn off screen calibrator and disconnect from Display Unit
8. Replace display unit cover and replace four screws
9. Test display unit with a sensor unit to confirm calibration

Input 1 Calibration Pot

Input 2 Calibration Pot



Single Input Display Mk iv and Dual Input Display Mk iii

Tools required: Phillips # 2 Screwdriver, Potentiometer Trimmer and Screen Calibrator.

Please note, this procedure only applies to the Single and Dual input displays with the colour 2.4" colour TFT screen and switches that are recessed under the label.

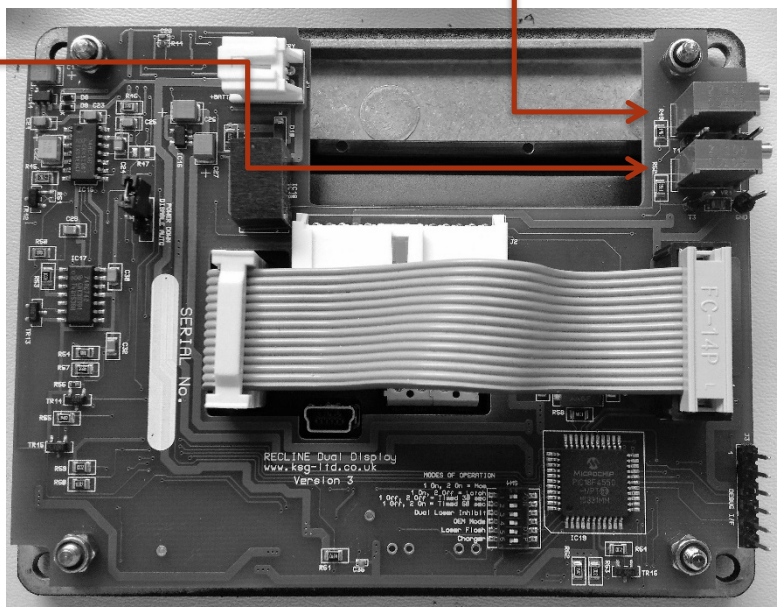
1. Turn on power to display unit
2. Connect screen calibrator to display unit input 1
3. Apply 12ma to the screen and take note of reading. It should read 0

If the reading differs, go to step 4

4. Remove cover of display unit by release 4 x Phillips head crews.
5. Apply 12ma to the display unit. Turn the corresponding input potentiometer to adjust the angle shown on the screen so that it reads -0.00. Repeat for input 2 if required
6. Apply a small amount of Loctite to the potentiometer
7. Turn off screen calibrator and disconnect from Display Unit
8. Replace display unit cover and replace four screws
9. Test display unit with a sensor unit to confirm calibration

Input 2 Calibration Pot

Input 1 Calibration Pot

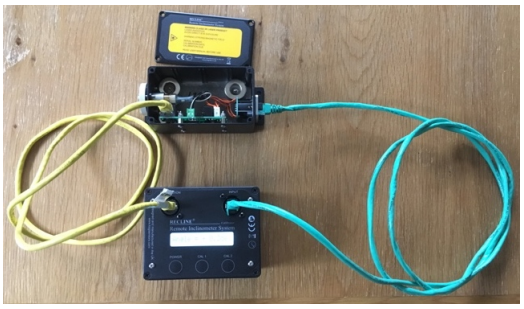


Inclinometer Sensor Calibration:

Mk vii Sensor Unit (Electronic Calibration)

Tools required: Pozi Drive # 2 Screwdriver, XLR cable, RJ45 cable (not crossover!)

Please ensure the calibrator is calibrated before carrying out this procedure.



1. Remove Sensor Unit cover
2. Connect XLR cable between Calibrator and Sensor Unit external connector
3. Connect XLR cable between Calibrator and Sensor Unit PCB
4. Select calibration mode on the Calibrator but holding down Inc and Dec buttons
5. Place sensor unit on a flat stable surface of 0 degree
6. Press Inc (Cal 1)
7. When calibration is complete (Pass) place Sensor Unit to +30 degrees
8. Press Dec (Cal 2)
9. When calibration is complete (Pass) place Sensor Unit to 0 degrees, observe reading on Calibrator to confirm if the calibration was a success. Re-run calibration if required. When complete, remove all cables
10. Check that there are no loose screws or fittings in the Sensor Unit enclosure
11. Refit Sensor Unit cover
12. Take note of Sensor Unit calibration in log book or similar.

Mk vi and earlier (Mechanical Calibration)

Tools required: Pozi Drive # 2 Screwdriver, 2.5mm Hex Key, 2mm Hex key or Pozi Drive #1 Screw driver

Calibrate the Display Unit before carrying out this procedure.

1. Remove Sensor Unit cover
2. Remove Laser Module PSU (small circuit board) by releasing four M3 screws in side wall of sensor. It is not necessary to disconnect the wires.
3. Place sensor unit on a flat stable surface (of known incline) with a fixed guide to reference against. Have the sensor firmly placed against the reference guide.
4. Connect sensor unit to display unit
5. Turn on display Unit. Connect external DC supply if required.
6. Take note of angle displayed. If angle differs from known incline of the surface in step 4, continue with calibration procedure.

For dual axis calibration go to step 8, for single axis go to step 12

7. Rotate sensor through 90° so as the side with the four laser PSU holes is on the bottom.
8. Check angle displayed against know incline of surface.
9. To adjust, slightly loosen the lower inclinometer sensor retaining nut (M3 nylock).
10. In small increments, move the sensor backing plate up or down to achieve the desired angle.
11. Tighten the lower inclinometer sensor retaining nut

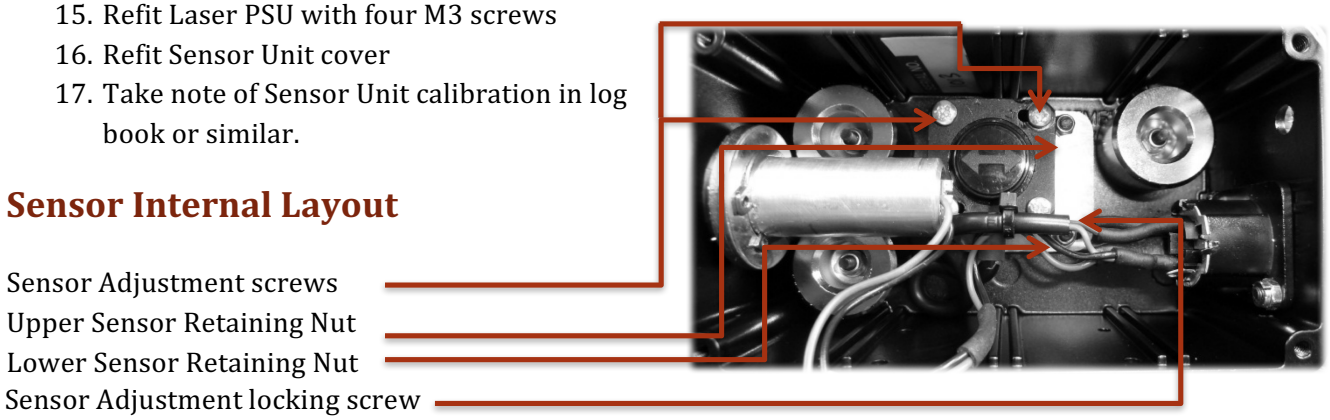
It may be necessary to release the upper inclinometer sensor retaining nut if the movement of the sensor backing plate is difficult. Please remember to tighten this when completed.

12. With the Sensor Unit in the standard position, read angle achieved.
13. Tighten or loosen the inclinometer sensor adjustment screws to achieve the desired angle.

Do not loosen inclinometer screws off completely. There should always be some pressure excerpted on the sensor by the screws.

14. Check that there are no loose screws or fittings in the Sensor Unit enclosure
15. Refit Laser PSU with four M3 screws
16. Refit Sensor Unit cover
17. Take note of Sensor Unit calibration in log book or similar.

Sensor Internal Layout

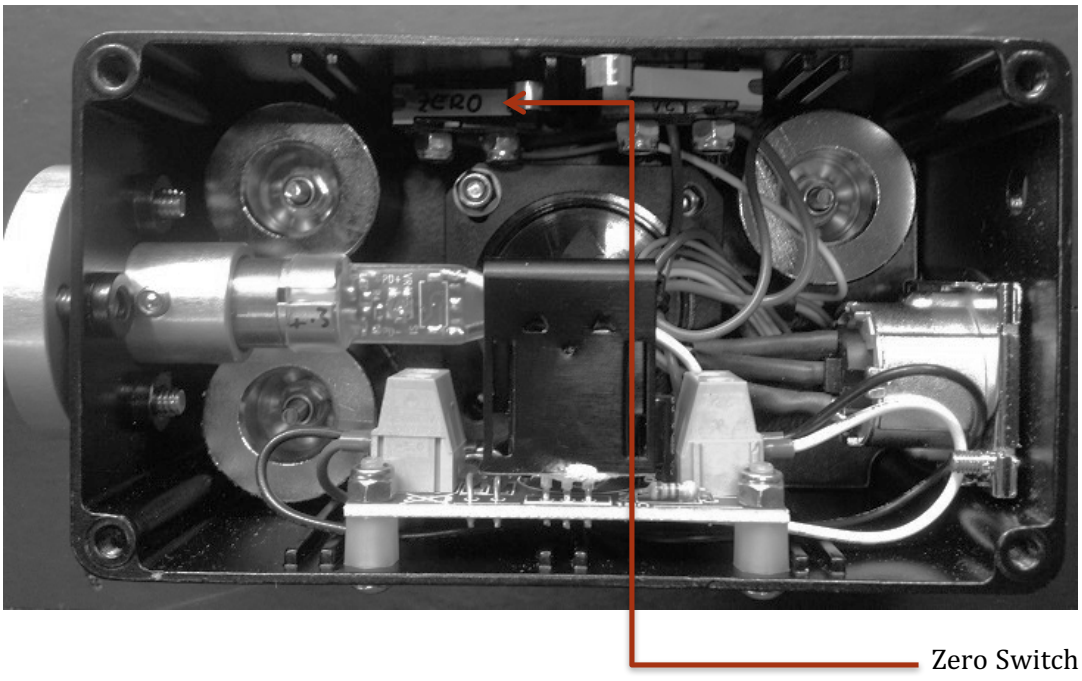


Dual Axis Sensor Calibration:

Tools required: Pozi Drive # 2 Screwdriver,

Calibrate the Display Unit before carrying out this procedure.

1. Remove Sensor Unit cover
2. Place Sensor Unit on a flat stable surface (of 0 degrees in both axis)
3. Turn on Display Unit. Connect external DC supply if required.
4. Connect the Sensor Unit to the Display Unit
5. Wait a few minutes for the electronics to 'warm up'
6. Disconnect the Sensor Unit
7. Reconnect the Sensor Unit. You will now have 60 seconds to calibrate the sensor
8. Depress the switch located inside the Sensor Unit labelled 'Zero'. Hold down for a minimum of 5 seconds. The sensor will now calibrate to 0 degrees.
9. After calibration you have and other 60 seconds to re-calibrate if necessary.
10. Check angle displayed against known incline of surface.
11. Check that there are no loose screws or fittings in the Sensor Unit enclosure
12. Refit Sensor Unit cover
13. Take note of Sensor Unit calibration in log book or similar.



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