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LEAP WIRELESS SENSOR SYSTEM

WELDABLE STRAIN SENSOR NODE USER MANUAL

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Revision 1.0

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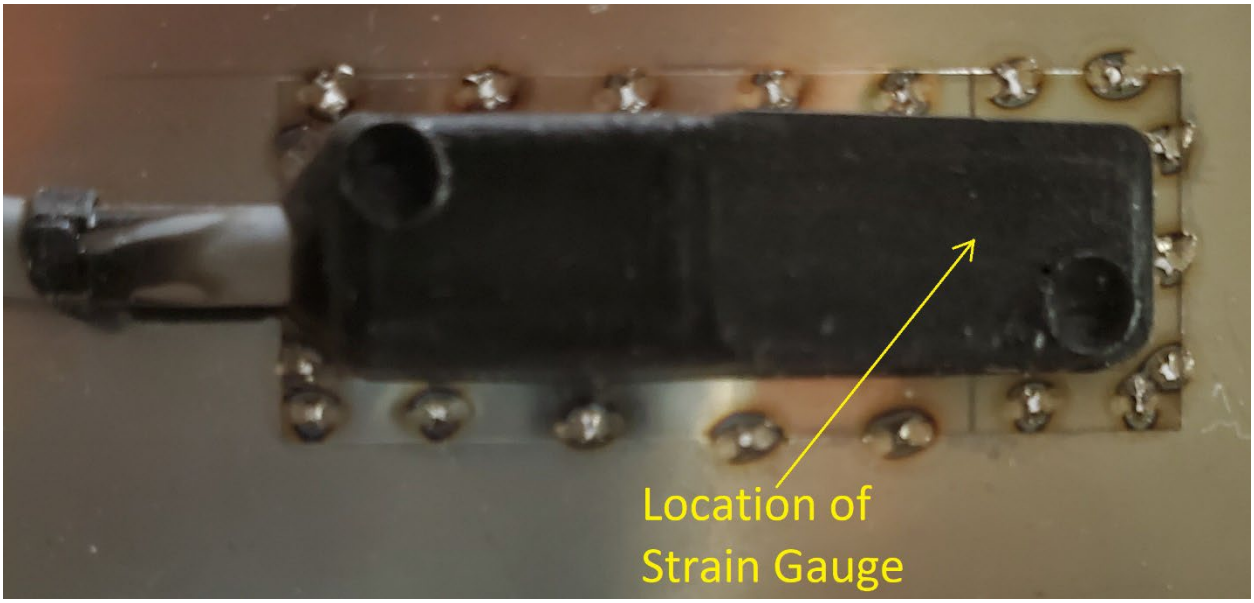
1. Welding the Strain Gauges

The strain gauges for all the weldable strain sensors are mounted on 5 mill thick shims made of 317L stainless steel. Minimal cleaning of the shims is needed to allow for good welding performance. They can be welded to most other steel alloys.

Before welding:

- The surface to which they are to be welded must be clean, flat and oxide free to allow for a reliable weld connection.
- Check that the shim is flat and doesn't have any significant bends or creases.

During welding, press the center of the shim against the surface to which it will be welded. Verify it is sitting flat against that surface. Using a spot welder, begin welding at one corner, and proceed around the perimeter of the shim placing a weld every 0.2" or so, for a total of 10 to 18 weld spots around the entire gauge.



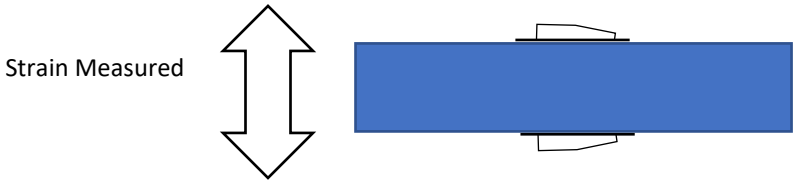
Example of strain gauge welding

1.1 Axial Strain Sensor Gauge Welding

The strain gauges of an axial strain sensor should be welded directly opposite of each other on either side of the material to be measured. Orient the gauges so the long axis of the gauge is parallel to the direction of the force to be measured on a plane that intersects both gauges.

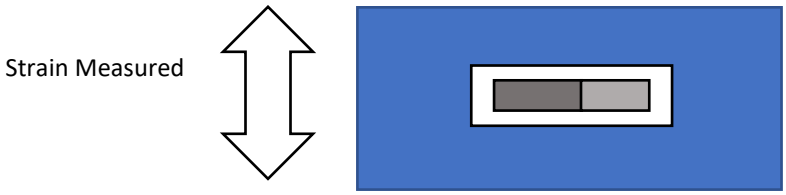
1.2 Bending Strain Sensor Gauge Welding

The strain gauges of a bending strain sensor should be welded directly opposite of each other on either side of the material to be measured. Orient the gauges so the long axis of the gauge is perpendicular to the direction of the force to be measured on a plane that intersects both gauges.



1.3 Torsion (Shear) Strain Sensor Gauge Welding

The strain gauge of a torsion or shear strain sensor should be welded to the surface of the material to be measured oriented so the gauges long axis is perpendicular to the direction of the force to be measured on a plane parallel to the surface to which the gauge is welded.



2. Calibrating and Zero-ing the Strain Sensor

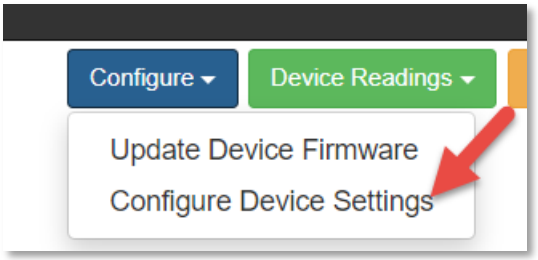
After welding there will typically be residual strain in the gauges that result from the welding process that will result in a measurement offset. This offset can be removed using the auto-balance feature in the strain sensor.

Before using the auto-balance feature be sure that any residual heat from welding has dissipated, and that the material to be measured is at a normal operating temperature.

Note: The axial strain sensors are sensitive to temperature. The output will change 11 με / °C with temperature.

2.1 Auto Zero the Load Cell with No Load

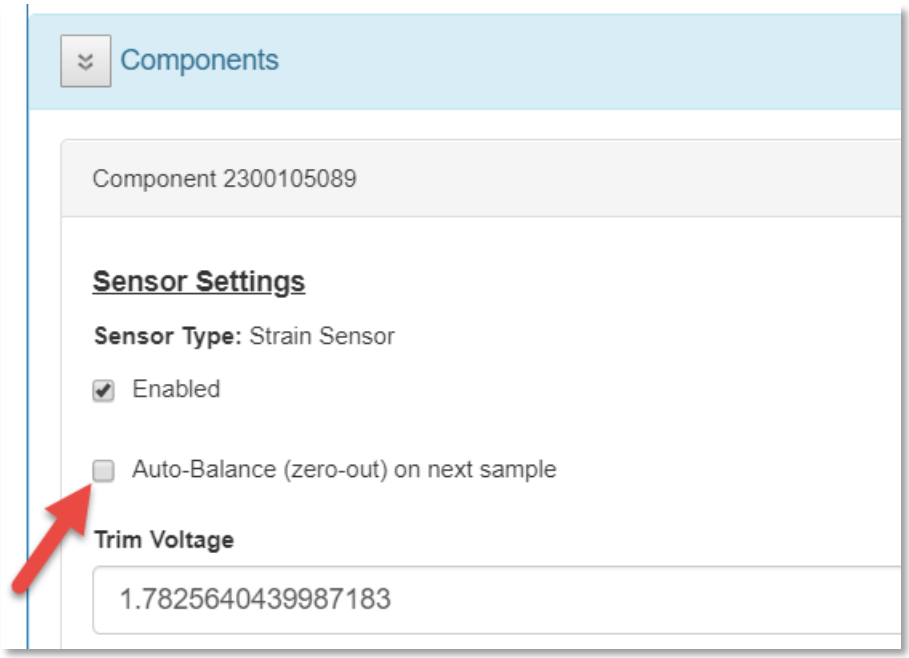
To zero, or "tare" the load cell, place it so that no load is on it.

- Click on the sensor that you want to zero in the "Devices" screen of leap LeapSensorManager software.
- Click on the "Configure" button, then on "Configure Device Settings"
- 

- Scroll down to the "Components" section at the bottom of the page.

- **NOTE:** Great care should be taken when auto-zeroing the load cell. This should only be done when you are certain that there is no load on the load cell.

- To auto-zero the load cell, check the "Auto-Balance…" box.

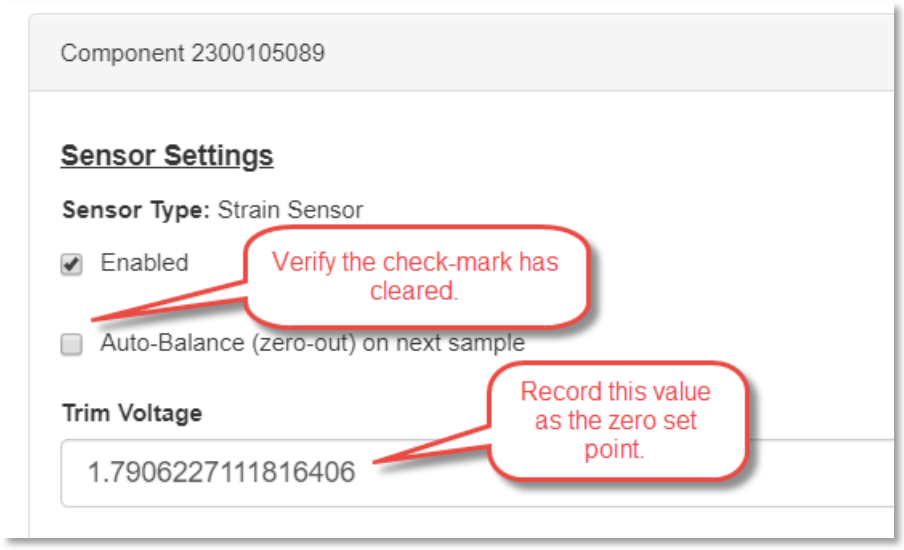


- Click “Save” at the bottom of the screen – then click OK to confirm the change.

- On the device screen, the sensor will show “Configuration Pending”.

    - **It will take 2 transmissions for the sensor to first receive the new zero-information, then the second transmission to apply the new settings.**
    - Depending on the span of the sensor, it is likely that the sensor will not be exactly zero on each transmission. The reading is likely to vary within the accuracy of the sensor and will probably not be exactly zero.

- **CRITICAL: Always verify the sensor did go to zero after the “Auto-Balance” is completed.**
- **IMPORTANT: Once the sensor has auto-zeroed, go back to the configuration screen for the sensor.**
- Verify that the “Auto-Balance…” box is now un-checked, indicating that the auto-zero has completed.
- **IMPORTANT: Record the “Trim Voltage” below.** This way, if the Auto-Balance is ever accidently activated, you can re-set the trim voltage to the value when there was no load.



IMPORTANT: When passwords are assigned to new users, there is the option to make a user an "Administrator". Administrators will have access to change (at any time) the auto-balance (sensor zero-out) and the sensor calibration. The sensor should never be re-calibrated unless it is done in a very controlled manner. Auto-zero-ing with a load or calibrating with an un-known load will result in the sensor giving totally incorrect readings. Access to administrator rights to the system should be carefully controlled so that the sensor is not mis-calibrated.

2.2 Trim Voltage Record

Sensor SN	Date	Trimmed by (Name)	Trim Voltage
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____