

# Measuring a Load Cell with instruNet

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A load cell is a 4 wire strain gage that is attached to a diaphragm, such that it returns a Voltage Out to Voltage In ratio that is proportional to force (e.g. LBs, Kg). A similar configuration, is the standard strain gage, that often outputs Strain units, which are proportional to the amount of bending that a material experiences under pressure.

A Load Cell has 4 wires and a shield, that route to a 4 gage bridge, which typically has a bridge resistance of 350 ohms. The bridge has an excitation input voltage (Exc+ = Vout, Exc- = GND) and an output voltage (out+ = Vin+, out- = Vin-). instruNet supplies the excitation voltage at it's Vout screw terminal (e.g. 1V with the iNet-100 and 4V with the iNet-100HC), and also measures the sensor output with it's Vin+/Vin- screw terminals. Typical wire is as following: load cell Exc+ = instruNet Vout, load cell out+ = instruNet Vin+, load cell Exc- = instruNet GND, load cell out- = instruNet Vin-, load cell Cable Shield = instruNet GND. For details on load cell accuracy issues, please see [www.instruNet.com#14](http://www.instruNet.com#14).

To set up a Load Cell, select "Load Cell" in the SENSOR field within the Hardware area of the Channel dialog, and proceed with the interview that helps one set the parameters described below.

If your cable is long, and/or not well shielded, you might need to add a gaurd against RFI by placing a 0.1uF capactor between instruNet GND and instruNet Vin-, and a 0.1uF capactor between instruNet Vin- and instruNet Vin+. A load cell typically puts out a certain number of Volts per Volt of excitation, for a specific amount of force. For example, a 0 to 2000LB 2mV/V load cell will put out 2mV per 1 Volt of excitation at the 2000LB maximum load. If the excitation is 4V, then the max voltage would be 8mV at 2000LB; with 0Volts at 0LBs. When setting fields programmatically via Visual Basic, C, instruNet or LabVIEW; please set them in them in the below listed order since a few of these are dependent on the others (e.g. Ro, Vout, Vrange). To tell instruNet to return the ratio of the Voltage Out to the Excitation Voltage into the sensor, one must set the following instruNet software fields. These are set up automatically when one does the interview after selecting LOAD CELL in the SENOR field.

SETTINGS	FIELD	VALUE
Hardware	Sensor Type	Load Cell (or Voltage)
Hardware	Wiring Type	Bridge
Hardware	Integration	0.001 to 0.020 Secs (typically)
Constants	Vinit	Calibration voltage (e.g. 0.0V)
Constants	Ro	350 ohms (typical bridge resistance)
Constants	Vout	4V (it may go to less due to mA limit)
Hardware	Range	0.010 Volts (typically)

After these settings, instruNet will return the out/in ratio (e.g. 0.002 for 2000 LB load). To convert this to units that are more pleasing, one must specify a linear mapping to another scale (e.g. 0.0 to 0.002 is mapped to 0.0 to 2000 LBS). One does this in the Mapping setting area:

SETTINGS	FIELD	VALUE
Mapping	Internal 1	0
Mapping	External 1	0
Mapping	Internal 2	max ratio, e.g. 0.002
Mapping	External 2	max force, e.g. 2000.0
General	Units Label	units of new scale, e.g. "LBs"

Then, if you want to do a 1 point calibration at 0 Force, one must:

1. Press the Setup button in the Record page (Ver > 1.26), press the Calibration button, and set the Cal Btn popup menu to Bal Bridges (or "Bal Gages"). This has set it up so that pressing the Calibrate button at the top of the Network page causes the voltages to be read across all your bridges, and places these values into the Vinit fields, which are subtracted from the measured readings; in effect, calibrating your bridges. After setting up this button to have this function, only press it when all your Bridges have 0 force