

## V-Link<sup>®</sup>-LXRS<sup>®</sup>

### Measuring Small Voltages

#### Overview

The LORD MicroStrain<sup>®</sup> V-Link<sup>®</sup>-LXRS<sup>®</sup> Wireless 7 Channel Analog Input Sensor Node supports a wide range of Wheatstone bridge and analog sensors including acceleration, vibration, strain, load cells, torque, pressure, magnetic fields, displacement, geophones, etc. As a basic function of support for these sensors, the V-Link<sup>®</sup>-LXRS<sup>®</sup> is measuring small voltages. This technical note demonstrates how to measure a voltage within a +/-20 mV range on channels 1 through 4 and assumes some familiarity with the V-Link<sup>®</sup>-LXRS<sup>®</sup> and Node Commander<sup>®</sup> software. The technical note goes on to demonstrate measurement of other small voltage ranges.

#### Apply Test Connector

- Turn the V-Link<sup>®</sup>-LXRS<sup>®</sup> off.
- Using 2 each 100 Kohm resistors ( $\leq 1\%$ ):
  - connect one leg of resistor 1 to SP+,
  - connect the other leg of resistor 1 to S1-,
  - connect one leg of resistor 2 to GND, and
  - connect the other leg of resistor 2 to S1-.
- Connect a flying lead to S1+.
- Connect a second flying lead to S1-. These flying leads will connect to the voltage source that we are going to measure.

#### Configure Node Commander<sup>®</sup>

- Establish communication between the V-Link<sup>®</sup>-LXRS<sup>®</sup> and Node Commander<sup>®</sup> as normal.
- Right-click the Node and a drop-down menu will appear.
- Click Configure. Click Configure Node and the Configuration screen will appear.
- Click the Channels tab.
- Enable Channel 1 by clicking the checkbox; disable all other channels.
- Click the ... button for Channel 1 and the Channel 1 Configuration window appears.
- Select +/-20 mV [75] in the Input Range drop-down.
- Set Midscale by clicking the radio button.
- Click the Auto-Balance button.
- An Information window will appear indicating the channel has been auto-balanced to a value of ~2048 with an offset of ~512. In our example we see Channel 1 is balanced to 2038. Click OK and the window will disappear.
- Select Volts in the Class drop-down.
- Select mV in the Units drop-down.
- Click the Modify button in the Bits to mV frame.
- Using the *Slope* indicated for the +/-20mV Input Range in figure 1, we enter 0.0097656 as the Slope in the Bits to V frame.
- Using a calculator, multiply the Slope 0.0097656 by the 2038 Channel 1 balance noted above.
- The result is 19.902. Enter -19.902 as the Offset in the Bits to V frame (we add the minus to subtract the offset of 19.902 and zero the output).
- Click the Lock button.
- Click OK and the Channel 1 Configuration window disappears.
- Click the Streaming tab.
- Unclick the Continuous Streaming checkbox.
- Enter 10000 in the Sweeps in the number scroll box. Click Apply.
- Click OK and the Configuration window disappears.

Input Range	Gain	Slope
+/- 70 mV	21	0.0348772
+/- 50 mV	30	0.0244141
+/- 20 mV	75	0.0097656
+/- 10 mV	147	0.0049825
+/- 5 mV	291	0.0025169
+/- 2.5 mV	569	0.0012872
+/- 1 mV	1214	0.0006033
+/- 600 µV	2222	0.0003296
+/- 350 µV	3799	0.0001928
+/- 100 µV	13074	0.0000560

Figure 1: Slope for Each Input Range

### Verify Zero Point

- Temporarily short the S1+ flying lead to the S1- flying lead.
- Using Node Commander® software, establish communication with the V-Link®-LXRS®.
- Right-click the Node and a drop-down menu will appear.
- Click Configure.
- Click Configure Node and the Configuration screen will appear.
- Click the Channels tab.
- Enable Channel 1 by clicking the checkbox; disable all other channels.
- Click the Streaming tab.
- Unclick the Continuous Streaming checkbox.
- Enter 10000 in the Sweeps in the number scroll box.
- Click Apply.
- Click OK and the Configuration window disappears.
- Right-click the Node and a drop-down menu will appear.
- Click Sample.
- Click Stream.
- Click Start and the Streaming Graph will appear.
- Verify that the streaming plot is at or near zero. This confirms that the system is reading zero volts when 0 volts is being input.
- Remove the short.

### Connecting to Voltage Source

- For our example, we are connecting to a 10 mV voltage source.
- The flying lead connected to S1+ on the V-Link®-LXRS® is connected to the + (power) side of our voltage source.
- The flying lead connected to S1- is connected to the – (ground) side of our power source.
- Right-click the Node and a drop-down menu will appear.
- Click Sample.
- Click Stream.
- Click Start and the Streaming Graph will appear.
- The streaming will plot at 10 mV.

## Utilizing Other Input Ranges

This technical note details measuring voltage within the +/-20 mV range. As you may have noted in the Channel 1 Configuration window and/or figure 1, the V-Link®-LXRS® has other Input Ranges available. These wider and narrower ranges can be measured using the same steps laid out in the *Configure Node Commander®* and *Connecting to Voltage Source* sections above. Select the correct Slope for the voltage range being measured and calculate the correct Offset as explained.

## Support

LORD MicroStrain® support engineers are always available to expand on this subject and support you in any way we can.