

## WSDA<sup>®</sup>-Base-101-LXRS<sup>®</sup>

### Outputting a 4 to 20 mA Current Loop

#### Overview

The LORD MicroStrain<sup>®</sup> WSDA<sup>®</sup>-Base-101-LXRS<sup>®</sup> Wireless Analog Output Base Station supports all data acquisition sessions between wireless nodes and host computers including Synchronized Sampling (both Continuous and Burst modes), Armed Datalogging, Datalogging, Streaming and Low Duty Cycle. As an integral feature, the WSDA<sup>®</sup>-Base-101-LXRS<sup>®</sup> has an analog output back panel that supports analog data acquisition equipment (DAQs). Up to 8 sensor channels from one or multiple wireless nodes can be fed into a DAQ with simultaneous digital feed into a PC, or into a DAQ with the PC removed (stand-alone configuration). Each channel on the back panel has a 0 to 3 volt range representing the particular sensor's full scale output. In some environments and with some equipment, the 0 to 3 volt range is not appropriate; many types of programmable logic controllers (PLCs) and DAQs have only current loop inputs, are therefore incompatible with voltage output sensors, and require a 4 to 20 mA output range to operate. This technical note demonstrates how to convert the 0 to 3 volt output to a 4 to 20 mA output using a third party converter and assumes familiarity with the WSDA<sup>®</sup>-Base-101-LXRS<sup>®</sup>, LORD MicroStrain<sup>®</sup> wireless nodes and Node Commander<sup>®</sup> software.

#### What is a 4 to 20 mA Current Loop Converter?

For industrial process control and instrumentation, 4 to 20 mA current loops are commonly used for analog signaling, with 4 mA representing the lowest end of the range and 20 mA the highest. The key advantages of the current loop are 1) that the accuracy of the signal is not affected by voltage drop in the interconnected wiring including long runs, and 2) that the loop can supply operating power to the device. A detailed explanation can be found [here](#). A current loop converter turns any analog voltage output into a 4 to 20 mA current loop. In our example we are using a [Voltage to 4-20 mA Current Loop Translator](#) made by [Vegetronix](#).

#### Wiring and Using the Converter

For demonstration purposes, we will describe conversion of the 0 to 3 volt measurement range of Channel 1 (X axis accelerometer) of the +/-2g [G-Link<sup>®</sup>-LXRS<sup>®</sup>](#).

- By following instructions given in the [WSDA<sup>®</sup>-Base-101-LXRS<sup>®</sup> User Manual](#) for *Analog Configuration, or "Pairing"*, we first pair Channel 1 of the G-Link<sup>®</sup>-LXRS<sup>®</sup> with the AO1 port on the base station back panel.
- Connect two short wire leads between the base station connector and the converter connector as shown in table 1.

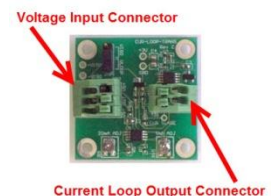


Figure 1: Current Loop

Analog Base Station Back Panel Connector		Wire Lead	Current Loop Converter Voltage Input Connector	
Pin 5	AO1	↔	Pin 2	OUT
Pin 2	GND	↔	Pin 3	VS-

Table 1: Wiring Connection between base station and converter

- Connect your particular DAQ to the Current Loop Output Connector of the converter following the [instructions](#) given by the converter manufacturer.
- In our example, we are using a multi-meter to observe the 4 to 20 mA output and have constructed the following circuit using a 10 ohm resistor and a 9 volt battery:
  - one leg of the 10 ohm resistor is connected to V+ on the Current Loop Output Connector;
  - the other leg of the 10 ohm resistor is connected to the power (+) lead of the 9 volt battery;
  - the ground (-) lead of the battery is connected to V- on the Current Loop Output Connector.

- Set the multi-meter to read mV.
- Connect the Voltage lead of the multi-meter to the battery side of the resistor.
- Connect the Ground lead of the multi-meter to the converter side of the resistor.
- Establish communication between the G-Link<sup>®</sup>-LXRS<sup>®</sup> and Node Commander<sup>®</sup> as normal.
- Configure the G-Link<sup>®</sup>-LXRS<sup>®</sup> with Channel 1 only enabled.
- Start sampling using Low Duty Cycle and observe the G-Link<sup>®</sup>-LXRS<sup>®</sup> on the Data Grid.
- Rotate the G-Link<sup>®</sup>-LXRS<sup>®</sup> about its X axis and establish its 1g, 0g and -1g positions.
- Now place the G-Link<sup>®</sup>-LXRS<sup>®</sup> on your desktop so that in its X axis is reporting 0g. Observe the mV readout on the multi-meter and it will read ~120 mV.
- Place the G-Link<sup>®</sup>-LXRS<sup>®</sup> so that in its X axis is reporting 1g. Observe the mV readout on the multi-meter and it will read ~200 mV.
- Place the G-Link<sup>®</sup>-LXRS<sup>®</sup> so that in its X axis is reporting -1g. Observe the mV readout on the multi-meter and it will read ~40 mV.
- Applying Ohm's Law where  $I=V/R$  (Current = Voltage/Resistance) we calculate as follows:
  - $20 \text{ mA} = 200 \text{ mV} / 10 \Omega$ , i.e.,  $20 \text{ mA} = 1g$
  - $12 \text{ mA} = 120 \text{ mV} / 10 \Omega$ , i.e.,  $12 \text{ mA} = 0g$
  - $4 \text{ mA} = 40 \text{ mV} / 10 \Omega$ , i.e.,  $4 \text{ mA} = -1g$

## Support

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