

G-Link[®]



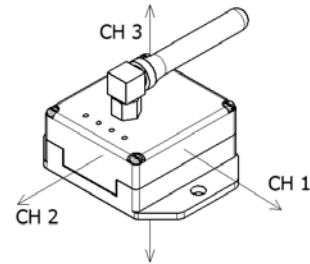
Using the G-Link[®] as a dual axis tilt sensor

Overview

MicroStrain's G-Link[®] wireless accelerometer node contains a tri-axial accelerometer array that can be utilized to produce a dual axis tilt sensor. The G-Link[®] is calibrated at the factory and the calibration coefficients necessary to output accelerations in Gs are written to non-volatile memory. By further scaling the accelerations with the appropriate formulas, the G-Link[®] can be made to produce both pitch and roll. MicroStrain provides a simple software application that demonstrates this capability. This technical note provides details on this use of the G-Link[®] and the demonstration software.

Accelerometer Designation

Channel 1 of the G-Link[®] outputs the X axis accelerometer, channel 2 is the Y axis accelerometer and channel 3 is the Z axis accelerometer.



Bits and Coefficients to Gs

The G-Link[®] outputs 'bits' to the base station and into the host software. These 'bits' can be combined with the on-board calibration coefficients to produce Gs. The formula is discussed in detail in the Channel Actions section (starting on page 35) of the Data Communications Protocol manual http://www.microstrain.com/pdf/dcp/2400_DCP_V1.03.pdf. The coefficients are referred to as Slope (or Gain) and Offset. Each channel has a Slope and an Offset. The formula is as follows:

$$Gs = (\text{Bits value} - \text{Offset}) / \text{Slope}$$

Retrieving Calibration Coefficients

The simplest way to get the Slope and Offset for each channel is to use Node Commander[®] software.

- Launch Node Commander[®] software.
- Establish communication with the G-Link[®] as normal.
- Right-click the Node and a drop-down menu appears.
- Click Configure and the Configuration window appears.
- Click the Configure button to the right of Channel 1 and the Configuration window for Channel 1 appears.
- Note down the Slope and Offset for channel 1. Our example in Figure 1 shows a Slope of 238.667 and an Offset of 2020.

- Click OK and the Configuration window for Channel 1 disappears.
- Do the same for channels 2 and 3.

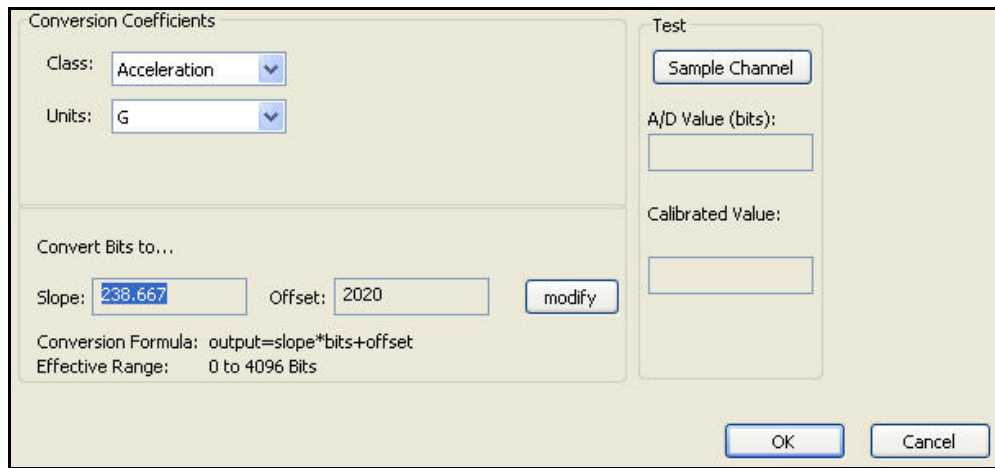


Figure 1

Example

If our current bits output on channel 1 was 2048, here how the formula would work:

$$0.117 \text{Gs} = (2048 \text{ bits} - 2020 \text{ offset}) / 238.667 \text{ slope}$$

Gs to Tilt

Our formulas to produce tilt are as follows:

$$\text{Pitch} = \text{Atn}(aX / (-aX * aX + 1)^2)$$

where Pitch is in radians
 where Atn is inverse tangent
 where aX is the acceleration in Gs on channel 1

$$\text{Roll} = \text{Atan2}(-aY, -aZ)$$

where Roll is in radians
 where Atan2 is inverse sine
 where aY is the acceleration in Gs on channel 2
 where aZ is the acceleration in Gs on channel 3

Pitch and roll can be further processed into degrees as follows:

$$\text{Pitch in degrees} = \text{Pitch in radians} * 57.2958$$

$$\text{Roll in degrees} = \text{Roll in radians} * 57.2958$$

Download Demonstration Software

http://www.microstrain.com/myplace/G-Link_Tilt_Sensor.zip

Using the MicroStrain Dual Axis Tilt Sensor Demonstration Software

- Before using the demonstration software, use Node Commander[®] software to configure the G-Link[®] and base station on the same frequency, set the G-Link[®] with channels 1, 2 and 3 active, set the streaming mode to Continuous and note the slopes and offsets of the channels.

- Launch the demonstration software.
- The Main screen appears as shown in **Figure 2**.
- Enter the Comm Port of your base station.
- Enter the G-Link[®] Node Address.
- Enter the Slope and Offset for channels 1, 2 and 3.
- Click File.
- Click Run and the software will display and write to file the accelerometer readings (X, Y and Z) and the tilt readings (Roll and Pitch) of the G-Link[®].

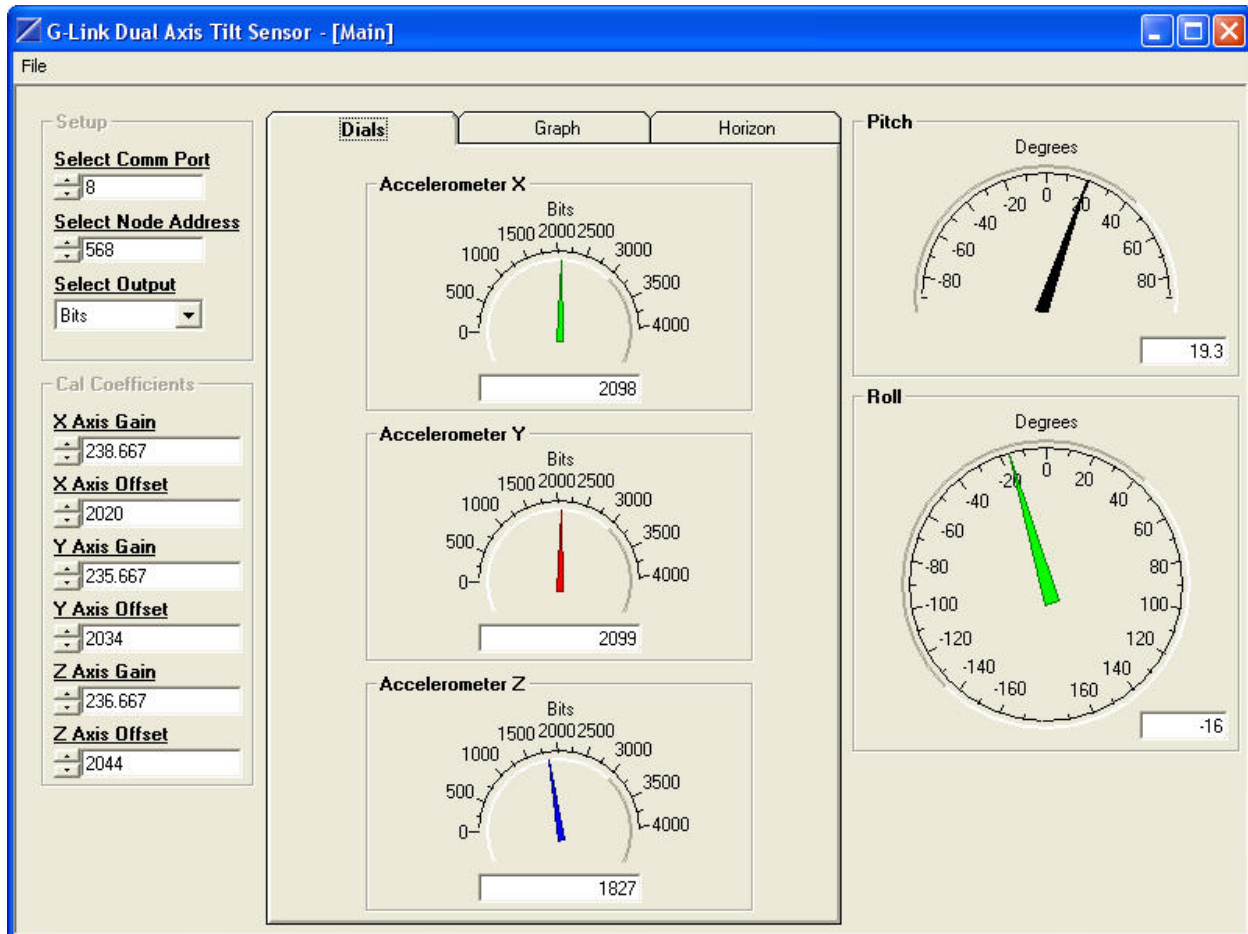


Figure 2

Support

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