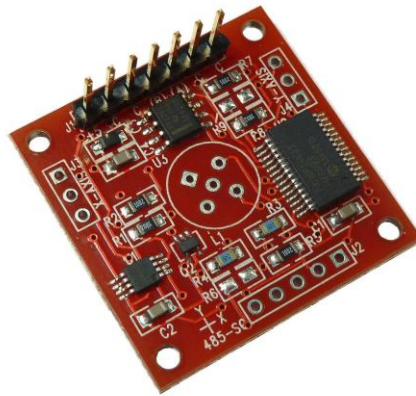




FREDERICKS COMPANY

High Performance Sensing Solutions™

1-6200-008 RS-485 Signal Conditioning Board Instruction Manual Rev C



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1. Product Information

1.1 Description

- 1.1.1 The RS-485 signal conditioner utilizes Fredericks single and dual axis electrolytic tilt sensors. The signal conditioner provides the necessary excitation to the sensor and signal conditioning of the output to communicate over an RS-485 interface.

The standard industrial RS-485 interface enables long transmission distances and the option to connect multiple modules, with individual addresses, to the same bus. In addition to tilt angle, temperature information is also available from the module that can be used for temperature compensation of the sensor.

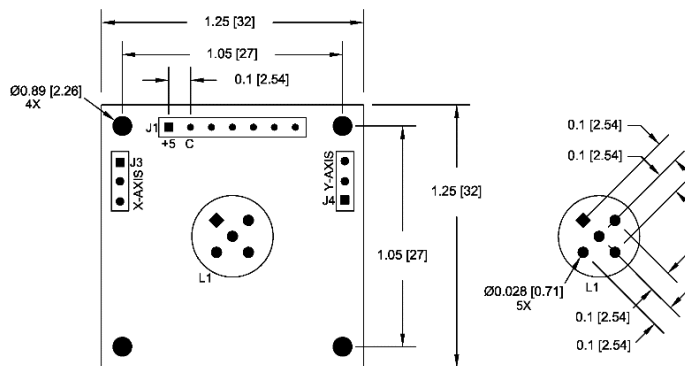
- 1.1.2 For more than 80 years Fredericks has been a global provider and U.S. manufacturer of high-performance tilt measurement products. Built to last, our products are made with state-of-the-art sensing technology, proven processes, and an intrinsic passion for the trade. Offering simple integration and quality and safety benchmarks, our customers benefit not just from standard-setting reliability, but from our commitment to competitive pricing and performance. For more information, visit our website at www.frederickscompany.com.

1.2 Operating Specifications

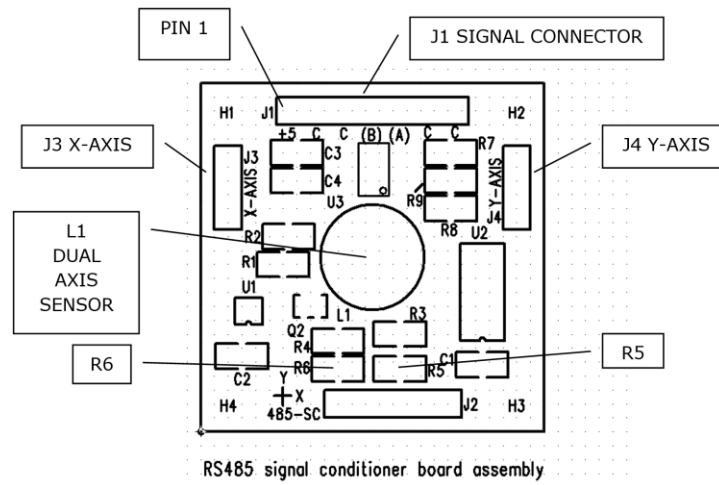
Communications	RS-485
Analog Input Resolution	16 bits (10 bits oversampled)
Operating Range	0% to 100% of sensor range
Supply Voltage	3.3 V DC to 5 V DC
Supply Current	9 mA @ 5 V DC, 6 mA @ 3.3 V DC
Operating Temperature	-40 °C to 85 °C
Storage Temperature	-40 °C to 125 °C
Sensors Controlled	1 or 2
Axes of Measurement	1 or 2
Temperature Sensor Range	-40 °C to 125 °C

1.3 Physical Specifications

Weight	4 g
Length	32 mm (1.25")
Width	32 mm (1.25")
Hole Center	27 mm (1.05")
Hole Diameter	2.25 mm (0.089")



1.4 Board Layout



1.5 Compatible Sensors

Part Number	Axes	Operating Range	Linear Range	Repeatability
0717-4318-99	2	±60°	±25°	±0.1°
0717-4319-99	2	±50°	±20°	±0.1°
0717-4313-99	2	±50°	±20°	±0.05°
0717-4315-99	2	±60°	±25°	±0.05°
0703-0711-99	1	±3°	±1°	±0.001°
0703-1602-99	1	±25°	±10°	±0.005°
0737-0101-99	1	±10°	±5°	±0.0006°
0737-1203-99	1	±0.5°	±0.15°	±0.0003°
0711-0763-99	1	±1°	±0.25°	±0.0008°
0711-0768-99	1	±3°	±0.25°	±0.0008°
0719-3705-99	1	±10°	±5°	±0.0006°
0719-3703-99	1	±0.5°	±0.15°	±0.0003°
0719-1138-99	1	±1°	±0.25°	±0.0008°
0719-1143-99	1	±3°	±0.25°	±0.0008°

Other Fredericks Company electrolytic tilt sensors will also be compatible. Visit www.frederickscompany.com/product_category/tilt-sensors-electronics/ for a complete list.

1.6 Related Products

Description	Part Number
Signal Conditioner (SPI)	1-6200-005
Signal Conditioner (RS-232)	1-6200-006
Signal Conditioner (Analog/PWM)	1-6200-007
Signal Conditioner (Analog/RS-232)	1-6200-012
±60° Range, ±0.1° Repeatability Inclinator (SPI)	0729-1751-99
±60° Range, ±0.1° Repeatability Inclinator (RS-232)	0729-1752-99
±60° Range, ±0.1° Repeatability Inclinator (Analog/PWM)	0729-1753-99
±60° Range, ±0.1° Repeatability Inclinator (RS-485)	0729-1754-99

Visit us online at www.frederickscompany.com to see our entire collection of tilt sensors and inclinometers.

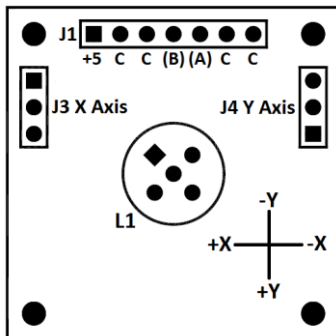
2. Installation

2.1 Mounting

- 2.1.1 The board is mounted in a horizontal position when a sensor is installed into the board. If external single axis sensors are connected with wires, then the board can be mounted in any position.

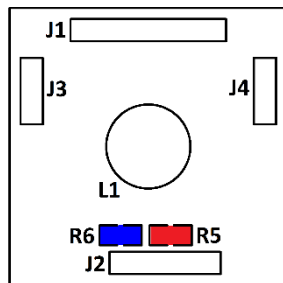
2.2 Electrical Connections

Pin Label	Signal Name	Description
+5	V _{CC}	Supply voltage input: +3 to +5 V DC regulated
C	GND	Ground – Reference for the digital signals and supply voltage
C	GND	Ground – Reference for the digital signals and supply voltage
B	TX	RS-485 B
A	RX	RS-485 A
C	GND	Ground – Reference for the digital signals and supply voltage
C	GND	Ground – Reference for the digital signals and supply voltage
L1	-	Connection for dual axis electrolytic sensor
J2	-	Factory use only
J3	-	Connection for single axis electrolytic sensor (X axis)
J4	-	Connection for single axis electrolytic sensor (Y axis)



2.3 Sensor Connection

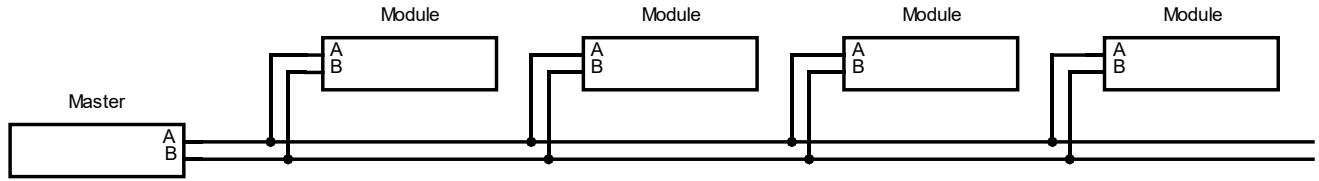
- 2.3.1 The 1-6200-008 signal conditioner can be configured to operate one dual axis sensor or two single axis sensors. This configuration is determined by the resistor values of R5 and R6.



- 2.3.2 For a dual axis sensor: R5 is 10 kΩ, R6 is not installed (open), sensor is connected to L1.
- 2.3.3 For single axis sensors: R5 is not installed (open), R6 is 1kΩ, and sensor(s) are connected to J3 and/or J4.

2.4 Data Bus Connections

- 2.4.1 Before connecting the modules to the bus, make sure they all have different addresses (see 3.2 Setup Commands). Connect the 'A' pins of each module and the 'B' pins of each module. Up to 32 modules can be connected on a single bus. If communication fails to connect, switch A and B at the master end.



2.5 RS-485 Communication Settings

- 2.5.1 For communication, use software such as Tera Term or Microsoft Hyper-Terminal (included with Windows 8 and earlier). The following parameters are the factory defaults, but some can be changed later.

Setting	Value	Comments
Baud Rate	9600 (factory default)	Settable from 1200 to 38400
Data Bits	8	Fixed
Parity	None	Fixed
Stop Bits	1	Fixed
Address	99	Settable from 01 to 99

3. Commands

3.1 Data Commands

3.1.1 The following is the command format to read the sensor output and board temperature.

***XXYY#** * = start of command XX = address YY = command # = end of command

Description	Command	Output*
X Axis Data	*XX11#	ASCII (16-bit)
Y Axis Data	*XX21#	ASCII (16-bit)
Board Temperature	*XX41#	ASCII (10-bit)

*All responses are terminated with newline and carriage return characters

The board's MCP9700 temperature sensor will return a raw 10-bit value. Use the following equations to convert this to temperature:

$$\text{Temperature in } ^\circ\text{C} = \frac{\left(\frac{10 \text{ bit output}}{1023} * V_{CC}\right) - 0.5}{0.01}$$

3.2 Configuration Commands

Command*	Description	Output														
*9980#	Read product information	Fredericks RS485 signal conditioner Ver 1.0														
*9981Axx#	Change address (xx = new address, 01 to 99)	Returns new address														
*9982Sxxxxxxxxxxxx#	Enter user information X must be exactly 12 characters Alphanumeric, '-' and space are allowed	Returns ID														
*9982D#	Read user information	Returns user information														
*9984Z#	Zero unit to current position (Ver 2.0 only)	Zeroing														
*9984R#	Reset zero and clear offset	Resetting zero														
*9988Rx#	Change baud rate X = code for new baud rate <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Code</th> <th>Rate</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1200</td> </tr> <tr> <td>2</td> <td>2400</td> </tr> <tr> <td>3</td> <td>4800</td> </tr> <tr> <td>4</td> <td>9600 (default)</td> </tr> <tr> <td>5</td> <td>19200</td> </tr> <tr> <td>6</td> <td>38400</td> </tr> </tbody> </table>	Code	Rate	1	1200	2	2400	3	4800	4	9600 (default)	5	19200	6	38400	None
Code	Rate															
1	1200															
2	2400															
3	4800															
4	9600 (default)															
5	19200															
6	38400															
*9989B#	Reset to factory defaults Address = 99 Baud rate = 9600	None														

*All commands assume address 99

3.3 Restore Factory Defaults

3.3.1 In addition to the reset command that can be used, there is a hardware reset that can be used if the baud rate or address are unknown. This is done by placing a short on R9 on the PCB before powering the unit. After power is applied, remove power and short. This will reset the unit to default values. Refer to 2.3 Electrical Connections & Board Layout for R9 location.