FREDERICKS COMPANY

SPI Signal Conditioner for Electrolytic Tilt Sensors
Part Number: 1-6200-005

Operating Specifications[1]

Interface	SPI
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	6 mA @ 5 V DC, 4 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

Dimensions

Housing	None
Electrical Connections	7 Pin, 2.54 mm (0.1") spacing
Weight	4 g
Length	32 mm (1.25")
Width	32 mm (1.25")
Hole Center	27 mm (1.05")

SPI Commands, ASCII and Hexadecimal Values

'1', 0x31	X axis high byte of 16 bit output
'2', 0x32	X axis low byte of 16 bit output
'3', 0x33	Y axis high byte of 16 bit output
'4', 0x34	Y axis low byte of 16 bit output
'5', 0x35	Board temperature high byte of 10 bit output
'6', 0x36	Board temperature low byte of 10 bit output
'9', 0x39	Update all data (software version 2.0.0 and higher)

Note: Use 1 ms delays between commands.

Electrical Connections

J1 Pin 1 (+5)	Supply (+)
J1 Pin 2 (C)	Supply (-)
J1 Pin 3 (C)	Ground
J1 Pin 4 (OUT)	SDO, SPI slave data output
J1 Pin 5 (IN)	SDI, SPI slave data input
J1 Pin 6 (CLK)	SCK, SPI slave clock input
J1 Pin 7 (/SS)	SPI slave select
L1	Dual axis sensor connection
J3	Single axis sensor x axis connection
J4	Single axis sensor y axis connection

Benefits

- Very low power consumption
- Simple integration
- Excellent resolution and repeatability of measurements
- Superior performance in extreme temperatures and environments
- Excellent customer support
- Manufactured in the United States of America

Description

The 1-6200-005 SPI signal conditioner can be used with any Fredericks electrolytic tilt sensor. This signal conditioner can be connected to a dual axis tilt sensor or 1 or 2 single axis tilt sensors to provide single or dual axis position measurement over the sensor's range.

Fredericks 0717 series wide range sensors can be mounted directly to the PCB for a complete inclinometer solution. Single axis sensors must be mounted externally to the PCB and connected with wires.

A detailed list of compatible sensors can be found on page 2 in the Related Products section.

Applications

- Recreational vehicle leveling (also known as an RV, caravan, camper van, or motorhome)
- Construction vehicles
- Geotechnical and structural monitoring
- Laser leveling
- Machine tool leveling
- Rail track monitoring
- Satellite positioning

View a full list of applications on The Fredericks Company website at www.frederickscompany.com.

Pin Diagram and Direction of Measurement
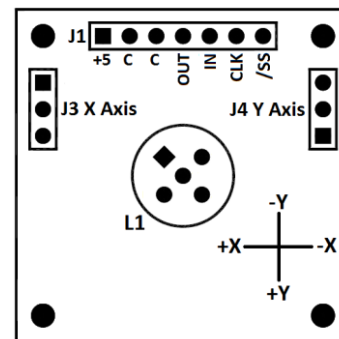
Note that the direction of measurement only applies when a dual axis sensor is mounted on the PCB.

Certifications and Ratings

- RoHS Compliant

Converting Temperature Values

The board temperature output is a 10-bit value (0 to 1023). To convert that value to a temperature in °C, use the following equation:

Temperature in °C = (((output/1023)*supply voltage)-0.5)/0.01

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SPI Slave Information

Clock	From master, idle high, 500 kHz to 20 MHz
Data Transfer Edge	Clock high to low
Data Bits	8, MSB first
Start Bits	1
Stop Bits	1
Slave Select Polarity	Idle high, low when transferring data

Related Products

Dual Axis Electrolytic Sensors - Metal	
0717-4318-99	±60˚ range, ±0.1˚ repeatability
0717-4319-99	±50˚ range, ±0.1˚ repeatability
0717-4313-99	±50˚ range, ±0.05˚ repeatability
0717-4315-99	±60˚ range, ±0.05˚ repeatability

Single Axis Electrolytic Sensors - Metal	
0703-0711-99	±3˚ range, ±0.001˚ repeatability
0703-1602-99	±25˚ range, ±0.005˚ repeatability

| Single Axis Electrolytic Sensors - Glass	
0737-0101-99	±10˚ range, ±0.0006˚ repeatability
0737-1203-99	±0.5˚ range, ±0.0001˚ repeatability
0711-0763-99	±1˚ range, ±0.0008˚ repeatability
0711-0768-99	±3˚ range, ±0.0008˚ repeatability

| Single Axis Electrolytic Sensors - Glass Encapsulated	
0719-3705-99	±10˚ range, ±0.0006˚ repeatability
0719-3703-99	±0.5˚ range, ±0.0001˚ repeatability
0719-1137-99	±1˚ range, ±0.0008˚ repeatability
0719-1143-99	±3˚ range, ±0.0008˚ repeatability

Board Configuration

The 1-6200-005 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.

For a dual axis sensor: R5 is 10 kΩ, R6 is not installed. The sensor is connected to L1.

For single axis sensors: R5 is not installed, R6 is 1 kΩ. Sensors are connected to J3 and J4.
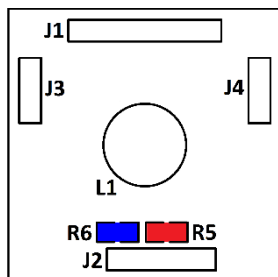
Dimensional Drawings
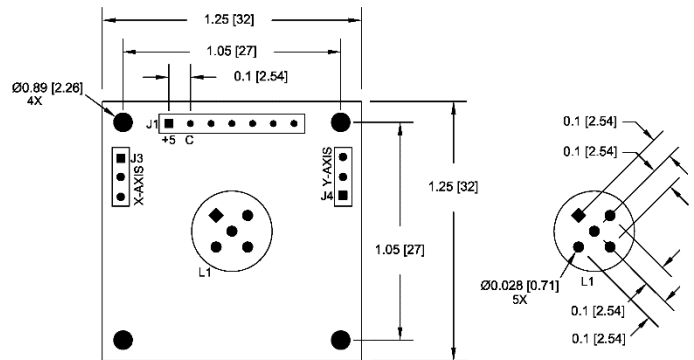
Example SPI Command Sequence

Update data and retrieve X and Y axis tilt values which both return 32768 (0° tilt), transmit and receive values are listed in hexadecimal:

[Master TX] 0x39   //update all values
[Master RX] Ignore. //no valid data in buffer yet
Delay 1 ms.
[Master TX] 0x31   //request x axis high byte
[Master RX] 0x2A   //'*' response to 0x39 command, data updated
Delay 1 ms.
[Master TX] 0x32   //request x axis low byte
[Master RX] 0x80   //x axis high byte, response to 0x31 command
Delay 1 ms.
[Master TX] 0x33   //request y axis high byte
[Master RX] 0x00   //x axis low byte, response to 0x32 command
Delay 1 ms.
[Master TX] 0x34   //request y axis low byte
[Master RX] 0x80   //y axis high byte, response to 0x31 command
Delay 1 ms.
[Master TX] 0x39   //update all values
[Master RX] 0x00   //y axis low byte, response to 0x32 command

X axis value = 0x8000 = 32768 = 0° tilt
Y axis value = 0x8000 = 32768 = 0° tilt

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