



SPI Signal Conditioner for Electrolytic Tilt Sensors

Part Number: **1-6200-005**

Operating Specifications¹

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

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.

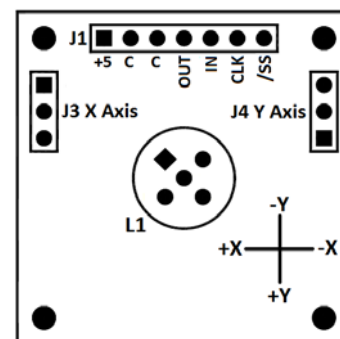
A detailed list of compatible sensors can be found on page 2 in the Related Products section.

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 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

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¹ Visit www.frederickscompany.com for a list of definitions.



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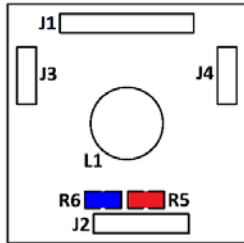
Part Number: **1-6200-005**

Board Configuration

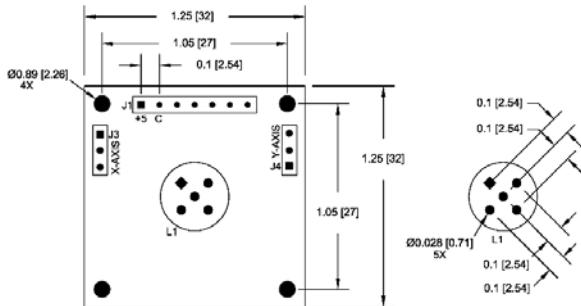
The 1-6200-005 signal conditioner can be configured to operate one dual axis sensor or two single axis sensors. This configuration is determined by the resistor values of R5 and R6.

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

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:

$$\text{Temperature in } ^\circ\text{C} = (((\text{output}/1023) * \text{supply voltage}) - 0.5) / 0.01$$

SPI Slave Information

Clock	From master, idle high, 500 kHz to 1 MHz
Data Transfer Edge	Clock high to low
Data Bits	8, MSB first
SPI Mode	2 (CPOL = 1, CPHA = 0)
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

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