

0729-1751, 1752, 1753, 1754 Series

Mini- Signal Conditioner Boards

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Powys, LD5 4TH, UK**charcroft**
ELECTRONICSActual size: 1.25 X 1.25 "square
(32mm X 32mm square)

Description

These production ready mini signal conditioner series from The Fredericks Company are microprocessor-based printed circuit boards capable of driving one or two electrolytic tilt sensors. The boards can be provided with a built-in wide-range, dual axis tilt sensor or can be operated with up to two external sensors. The signal conditioners can be configured for single axis, dual axis (X and Y in the same sensor), or two single axis modes (X and Y with two separate sensors). Each version has a built-in temperature sensor. There are three different outputs available: SPI, RS-232, RS-485, and Analog/PWM. **These boards are cost-effective and can be integrated into a larger system in a production environment. They are also an easy way to evaluate tilt sensors.**

Specifications

Power supply voltage	3 to 5 VDC (regulated)
Angle range	0 -100% of sensor range
Temperature sensor range	-40°C to + 125°C (10 bit resolution)
Operating temperature range (board only)	-40°C to +85°C
Storage temperature range (board only)	-55°C to +100°C

SPI Board (Part Number: 0729-1751-99)	Board only (Part Number: 6200-005)
Power supply current	6mA @ 5VDC, 3.5mA @ 3.3 VDC
SPI Output	16 bit total value
Data rate (clock)	500 kHz to 20 MHz – 8 bit clock

RS-232 Board (Part Number: 0729-1752-99)	Board only (Part Number: 6200-006)
Power supply current	16mA @ 5VDC, 11mA @ 3.3 VDC
RS-232 output	16 bit in ASCII
Communications settings	9600 baud / 8 data bits / No parity / 1 stop bit

Analog / Digital Board (Part Number: 0729-1753-99)	Board only (Part Number: 6200-007)
Power supply current	15mA @ 5VDC, 10 mA @ 3.3 VDC
Max, output voltage	Power supply voltage (ratiometric)
Min. output voltage	0 VDC
PWM resolution	16 bit (1% - 99%)

RS-485 Board (Part Number: 0729-1754-99)	Board only (Part Number: 6200-008)
Power supply current	9mA @ 5VDC, 3mA @ 3.3 VDC
RS-485 output	16 bit in ACSII
Communications settings	9600 baud / (1200 to 38400) / 8 data bits / No parity/ 1 stop bit

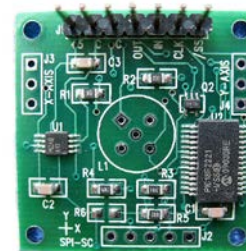
Size: 1.25 X 1.25 inches or 32mm X 32mm square

NOTE: 0729 assemblies include the 0717-4318-99 sensor. If a different sensor is needed, specify board only part number and the sensor type separately.



1-6200-005

SPI Mini Signal Conditioner Board



Actual size

Specifications

Power supply voltage	3 to 5 VDC (regulated)
Power supply current	6mA @ 5VDC 3.5mA @3.3VDC
Operating temp range (board only)	-40°C to +85°C
Storage temp range (board only)	-55°C to 0 +100°C
Angle range	0-100% of sensor range (16 bit, 65535 counts max)
Board dimensions	1.25" x 1.25" or 32mm x 32mm square
Mounting hole and spacing	0.089" dia. and 1.05" (center to center)
Temp. sensor range	-40°C to +125°C (10 bit resolution)

Signal Description J1

Pin #	Signal name	Direction	Description
1	Vcc	Input	Supply voltage input: + 3 to + 5 vdc regulated
2	GND	-	Ground – The reference for the digital signals and the supply voltage
3	GND	-	Ground – The reference for the digital signals and the supply voltage
4	SDO	Output	Slave output – SPI communications to master device 8 bit data from slave with clock from master
5	SDI	Input	Slave input – SPI communications from master device 8 bit data to slave with clock from master
6	SCK	Input	Slave clock – SPI input clock from master device Clock polarity = High, Clock in data = High to Low Data rate = 500kHz to 20MHz
7	/CS	Input	Chip select signal – signal to select slave device from master device (active during 8 bit transfer)

Please refer to the following link section 18.0 to 18.3 for a description of the SPI timing.

<http://ww1.microchip.com/downloads/en/DeviceDoc/39689f.pdf>

Command Format

Command data (SDI) and clock (SCK) from master	Response data from slave (SDO) and clock from master (SCK)
Decimal 49 (ascii `1')	X axis high byte of 16 bit value
Decimal 50 (ascii `2')	X axis low byte of 16 bit value
Decimal 51 (ascii `3')	Y axis high byte of 16 bit value
Decimal 52 (ascii `4')	Y axis low byte of 16 bit value
Decimal 53 (ascii `5')	Board temperature high byte of 10 bit value
Decimal 54 (ascii `6')	Board temperature low byte of 10 bit value
Decimal 57 (ascii `9')	Updates all data (ver. 2.0.0 software)

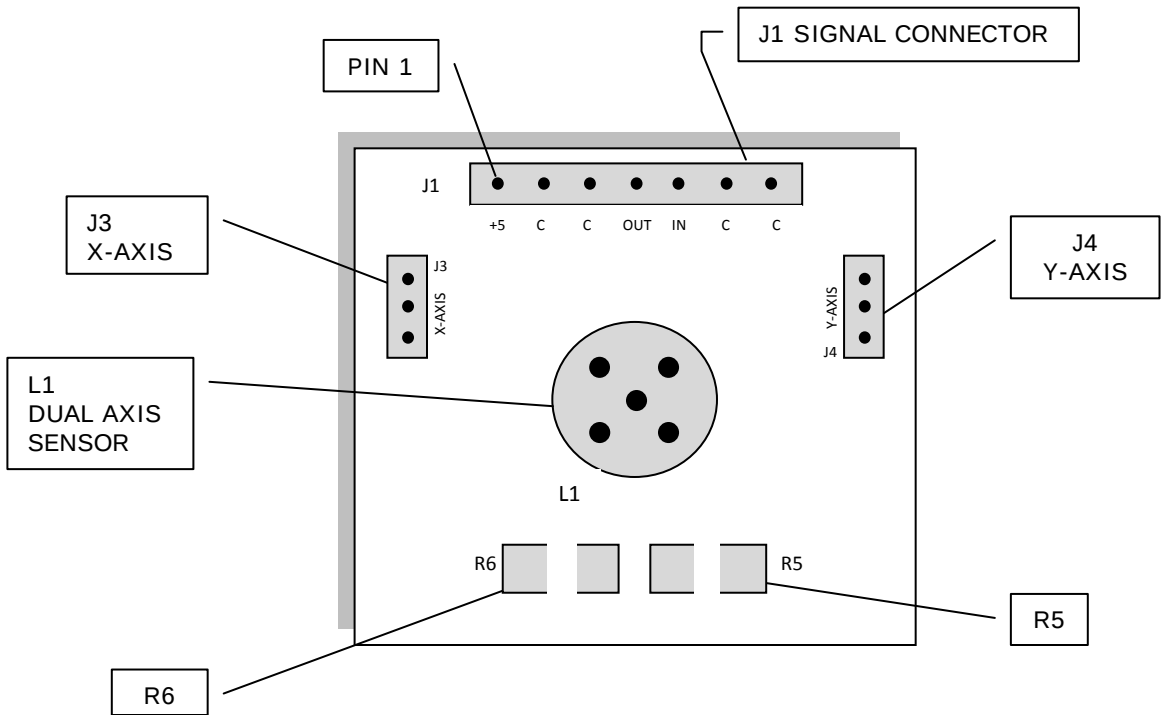
NOTE: Add 1 msec. delay between each 8 bit communications to SPI board.

NOTE: To convert the 10 bit data returned from the on board MCP9700 use the following formulas,

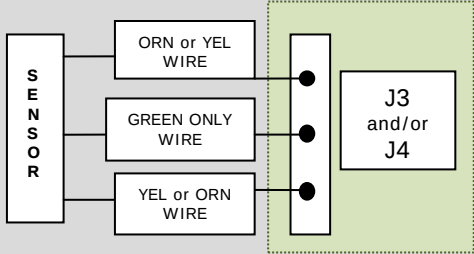
MCP9700 output voltage = 10 bit value / 1023 * supply voltage

Temperature C = (MCP9700 output voltage – 0.5) / 0.010

SPI signal conditioner board assembly



Sensor Configuration

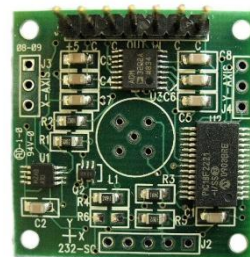
Sensor Configuration	Description
Dual Axis Sensor mounted on board (standard configuration)	- Dual Axis is mounted in location L1 - R5 is 10.0K ohms - R6 is not installed
Single Axis sensors mounted off board	- Single axis sensors are connected to J3 (x-axis) and J4 (y-axis) - No sensor is installed in L1 - R5 is not installed - R6 is 1K ohms Note: if R5 is not removed then R6 must be less than 100 ohms 

NOTE: J2 is for factory use only.



1-6200-006

RS232 Mini Signal Conditioner Board



Actual size

Specifications

Power supply voltage	3 to 5 VDC (regulated)
Power supply current	16mA @ 5VDC 11mA @ 3.3VDC
Operating temp range (board only)	-40°C to +85°C
Storage temp range (board only)	-55°C to +100°C
Angle range	0-100% of sensor range (16 bit, 65535 counts max)
Board dimensions	1.25" x 1.25" or 32mm x 32mm square
Mounting hole and spacing	0.089" dia. and 1.05" (center to center)
Temp. sensor range	-40°C to +125°C (10 bit resolution)

Signal Description J1

Pin #	Signal name	Direction	Description
1	Vcc	Input	Supply voltage input: + 3 to + 5 vdc regulated
2	GND	-	Ground – The reference for the digital signals and the supply voltage
3	GND	-	Ground – The reference for the digital signals and the supply voltage
4	TX	Output	RS232 transmit output Response time: 25 msec (max) after command for complete ascii data string output
5	RX	Input	RS232 transmit input
6	GND	-	Ground – The reference for the digital signals and the supply voltage
7	GND	-	Ground – The reference for the digital signals and the supply voltage

RS232 Communications Port

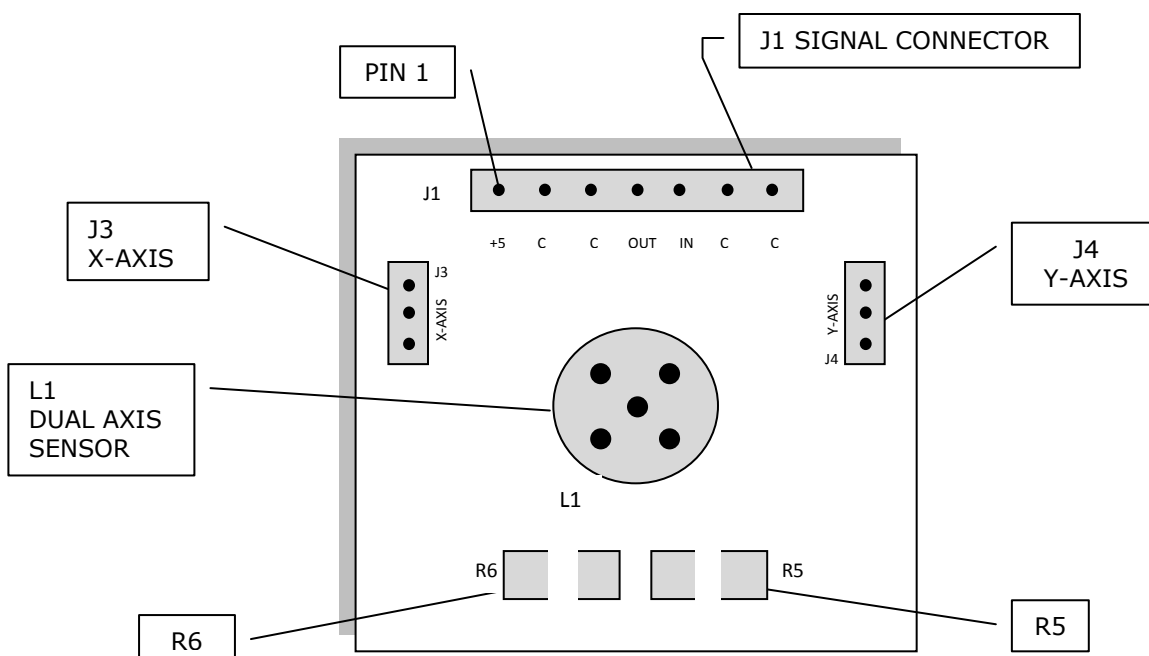
Baud rate	Data bits	Parity	Stop bits
9600	8	None	1

Command Format

Command (ascii – not case sensitive)	Response (ascii)
'X'	X axis value (16 bit -65535 max)
'Y'	y axis value (16 bit -65535 max)
'T'	Temperature value (10 bit – 1023 max)
'S'	Output X axis, Y axis, Temperature at set intervals
'R'	Reset the 'S' command
'1' TO '5'	Set delay for 'S' command, 1 to 5 seconds (default = 1 second)

NOTE: To convert the 10 bit data returned from the on board MCP9700 use the following formulas,
MCP9700 output voltage = 10 bit value / 1023 * supply voltage
Temperature C = (MCP9700 output voltage – 0.5) / 0.010

SPI signal conditioner board assembly



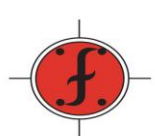
Sensor Configuration

Sensor Configuration	Description
Dual Axis Sensor mounted on board (standard configuration)	- Dual Axis is mounted in location L1 - R5 is 10.0K ohms - R6 is not installed
Single Axis sensors mounted off board	- Single axis sensors are connected to J3 (x-axis) and J4 (y-axis) - No sensor is installed in L1 - R5 is not installed - R6 is 1.0K ohms Note: if R5 is not removed then R6 must be less than 100 ohms The diagram shows a vertical box labeled 'SENSOR' connected to three wires: ORN or YEL WIRE, GREEN ONLY WIRE, and YEL or ORN WIRE. These wires are connected to the pins of J3 and J4, which are labeled J3 and/or J4.

NOTE: J2 is for factory use only.

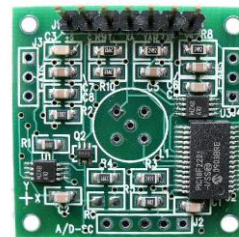
Interface to PC

To PC (DB9)		6200-006	
Pin2	RX	Pin 4	TX
Pin 3	TX	Pin 5	RX
Pin 5	GND	Pin 3	GND



1-6200-007

Analog/Digital Mini Signal Conditioner Board



Actual size

Specifications

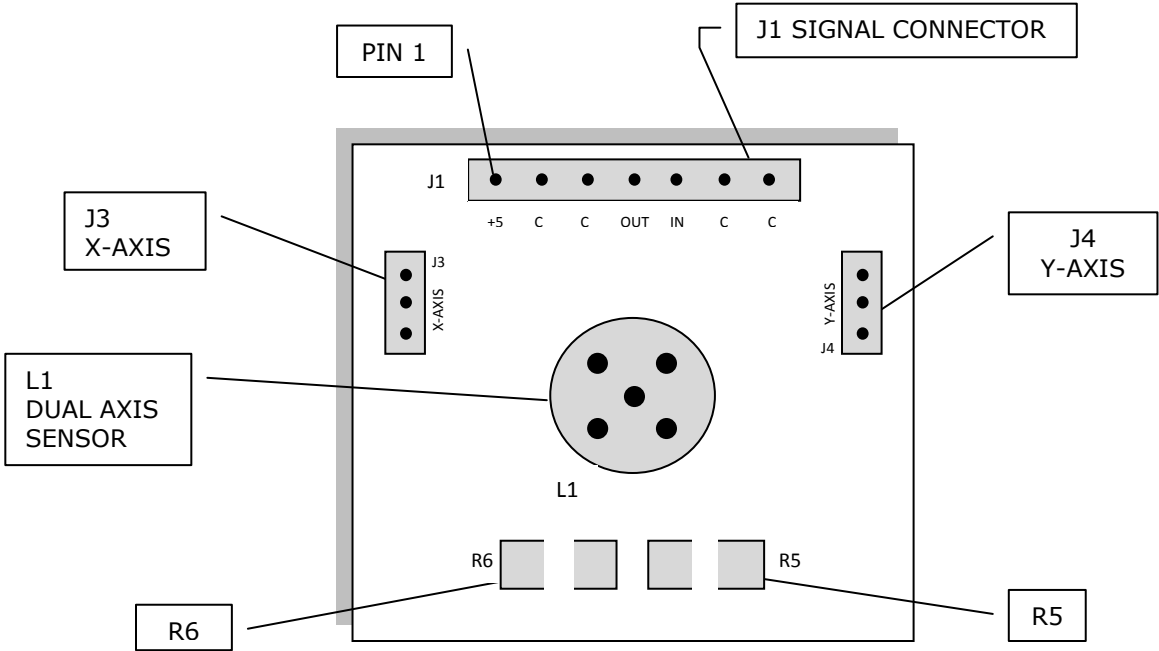
Power supply voltage	3 to 5 VDC (regulated)
Power supply current	15mA @ 5VDC 10mA @ 3.3VDC
Operating temp range (board only)	-40°C to +85°C
Storage temp range (board only)	-55°C to 0 +100°C
Angle range	0-100% of sensor range (16 bit, 65535 counts max)
Board dimensions	1.25" x 1.25" or 32mm x 32mm square
Mounting hole and spacing	0.089" dia. and 1.05" (center to center)
Temp. sensor range	-40°C to +125°C (10 bit resolution)

Signal Description J1

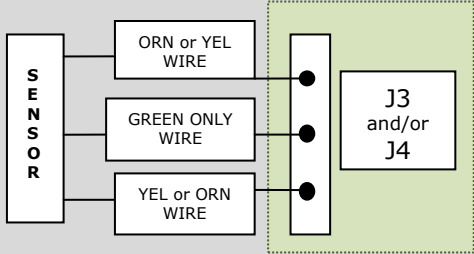
Pin #	Signal name	Direction	Description
1	Vcc	Input	Supply voltage input: + 3 to + 5 vdc regulated
2	GND	-	Ground – The reference for the digital signals and the supply voltage
3	Temperature	Output	Voltage output from the on board temperature sensor MCP9700 NOTE: to convert the voltage from the on board MCP9700 use the following formula, $\text{Temperature } C = (\text{MCP9700 output voltage} - .05) / 0.010$
4	X axis analog	Output	X axis voltage output – ratiometric with supply voltage For example: Null (zero degrees of angle) = 2.5 volts with supply voltage at 5V Null (zero degrees of angle) = 1.65 volts with supply voltage at 3.3 V
5	Y axis analog	Output	Y axis voltage output – ratiometric with supply voltage For example: Null (zero degrees of angle) = 2.5 volts with supply voltage at 5V Null (zero degrees of angle) = 1.65 volts with supply voltage at 3.3 V
6	X axis PWM	Output	X axis PWM output – 122 Hz duty cycle, 16 bit resolution (1% to 99%) For example: Null (zero degrees of angle) = 50% modulation
7	Y axis PWM	Output	Y axis PWM output – 122 Hz duty cycle, 16 bit resolution (1% to 99%) For example: Null (zero degrees of angle) = 50% modulation

NOTE: The analog voltage output circuit is integrated from the PWM output. This circuit will be sensitive to moisture. Protected environment or conformal coating may be needed in higher humidity conditions.

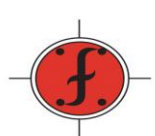
Analog / Digital signal conditioner



Sensor Configuration

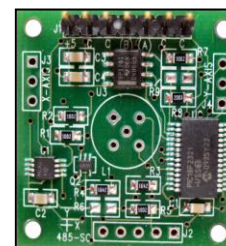
Sensor Configuration	Description
Dual Axis Sensor mounted on board (std configuration)	- Dual Axis is mounted in location L1 - R5 is 10.0K ohms - R6 is not installed
Single Axis sensors mounted off board	- Single axis sensors are connected to J3 (x-axis) and J4 (y-axis) - No sensor is installed in L1 - R5 is not installed - R6 is 1K ohms Note: if R5 is not removed then R6 must be less than 100 ohms  The wiring diagram shows a vertical 'SENSOR' block connected to three wires: 'ORN or YEL WIRE', 'GREEN ONLY WIRE', and 'YEL or ORN WIRE'. These wires connect to a 3-pin header labeled 'J3 and/or J4'.

NOTE: J2 is for factory use only.



1-6200-008

RS485 Mini Signal Conditioner Board



Actual size

Specifications

Power supply voltage	3 to 5 VDC (regulated)
Power supply current	9mA @ 5VDC 6mA @ 3.3VDC
Operating temp range (board only)	-40°C to +85°C
Storage temp range (board only)	-55°C to 0 +100°C
Angle range	0-100% of sensor range (16 bit, 65535 counts max)
Board dimensions	1.25" x 1.25" or 32mm x 32mm square
Mounting hole and spacing	0.089" dia. and 1.05" (center to center)
Temp. sensor range	-40°C to +125°C (10 bit resolution)

Signal Description J1

Pin #	Signal name	Direction	Description
1	Vcc	Input	Supply voltage input: + 3 to + 5 vdc regulated
2	GND	-	Ground – The reference for the digital signals and the supply voltage
3	GND	-	Ground – The reference for the digital signals and the supply voltage
4	B	Bi-directional	RS485 - B
5	A	Bi-directional	RS485 - A
6	GND	-	Ground – The reference for the digital signals and the supply voltage
7	GND	-	Ground – The reference for the digital signals and the supply voltage

Command Format

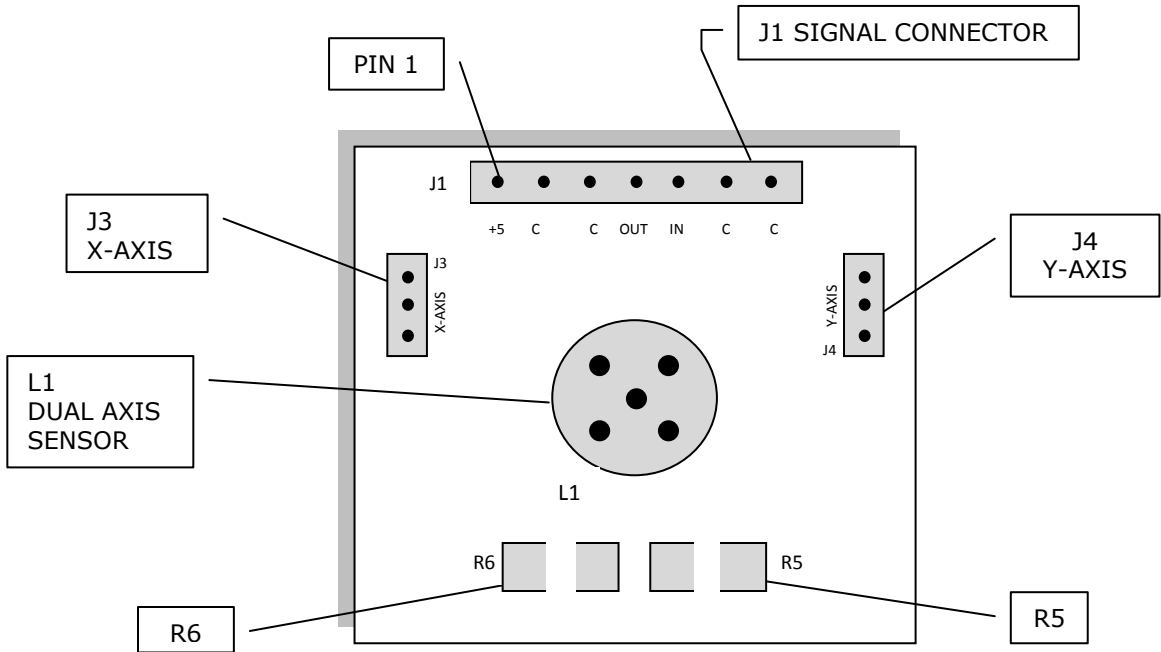
XXYY# (= start of string, XX = address, YY = command, # = end of string)
Commands for X and Y axis, temperature
Additional commands to change address (1 to 99), baud rate (1200 to 38400), and enter and save a user ID
Refer to operating manual for all RS485 commands

NOTE: To convert the 10 bit data returned from the on board MCP9700 use the following formulas,

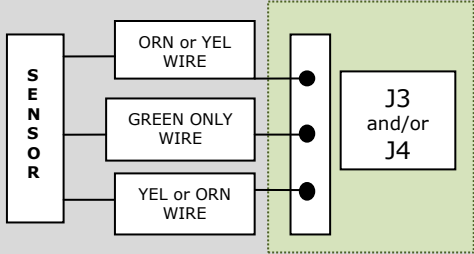
MCP9700 output voltage = 10 bit value / 1023 * supply voltage

Temperature C = (MCP9700 output voltage – 0.5) / 0.010

SPI signal conditioner board assembly



Sensor Configuration

Sensor Configuration	Description
Dual Axis sensor mounted on board (standard configuration)	- Dual Axis is mounted in location L1 - R5 is 10.0K ohms - R6 is not installed
Single Axis sensors mounted off board	- Single axis sensors are connected to J3 (x-axis) and J4 (y-axis) - No sensor is installed in L1 - R5 is not installed - R6 is 1.0K ohms Note: if R5 is not removed then R6 must be less than 100 ohms 

NOTE: J2 is for factory use only.