

Single Channel Thermocouple Signal Conditioner



Figure 1 TE1908 Single Channel Thermocouple Signal Conditioner

Overview

The Synergy Controller has two built-in RTD inputs and can also accommodate T-Type Thermocouples using as many as four Synergy UUT modules for up to 64 temperature measurements. In addition, if additional thermocouples types other than T are required, the TE1908 Single Channel Thermocouple Signal Conditioner is available and can be used with any of the four High Resolution 0-5V analog inputs or any of the 8 Low Resolution Analog Inputs. This unit is a DIN rail or side mountable, selectable thermocouple signal conditioner with 1500 VDC isolation between input and output.

24 VDC power is required for the signal conditioner.

Each P/N TE1908 Signal Conditioner is supplied with a precision 250 Ohm terminating resistor, P/N TE1924.

CAUTION! : The analog inputs on the Synergy Controller will be damaged if a 4-20 mA input is attached without a 250 Ohm resistor.



Figure 2 TE1924, Wire Wound Resistor, 250 ohms, Precision 0.1%

Synergy Controller and Signal Conditioner Setup

1. Configure the TE1908 Signal Conditioner dip switch for the appropriate thermocouple input from the table below. Note the Ranges for the type you are using from the table for configuration in step 7.

Type	Ranges °C	Ranges °F	Resolution note 1	Switch Position			
				5	6	7	8
J	-190 to 760	-310 to 1400	0.23°C	1	1	1	1
K	-150 to 1372	-238 to 2502	0.37°C	1	1	1	0
E	-210 to 1000	-345 to 1832	0.295°C	1	1	0	1
R	65 to 1768	149 to 3214	0.42°C	1	1	0	0
S	65 to 1768	149 to 3214	0.42°C	1	0	1	1
T	-230 to 400	-382 to 752	0.15°C	1	0	1	0
B	529 to 1820	984 to 3308	0.315°C	1	0	0	1
N	-70 to 1300	-94 to 2372	0.33°C	1	0	0	0
C	65 to 2320	149 to 4208	0.55°C	0	1	1	1
156.25 mV			0.038mV	0	1	0	0
±156.25 mV			0.076mV	0	0	1	1

*

2. Then hook up your thermocouple to the signal conditioner using the + and - inputs on connector "A" as shown in the figure below.

3. Next, connect the 4-20 mA signal conditioner output to the appropriate input on the Synergy Controller's Olympic board from the table below.

Synergy Controller Signal	Olympic Board Connector-Pin	Olympic Board Reference Pin
High Resolution Analog Input 1	P2-1	P2-7
High Resolution Analog Input 2	P2-5	P2-7
High Resolution Analog Input 3	P2-6	P2-7
High Resolution Analog Input 4	P2-11	P2-7
Low Resolution Analog Input 1	P4-1	P4-10
Low Resolution Analog Input 2	P4-2	P4-10
Low Resolution Analog Input 3	P4-3	P4-10
Low Resolution Analog Input 4	P4-4	P4-10
Low Resolution Analog Input 5	P4-5	P4-10
Low Resolution Analog Input 6	P4-6	P4-10
Low Resolution Analog Input 7	P4-7	P4-10
Low Resolution Analog Input 8	P4-8	P4-10

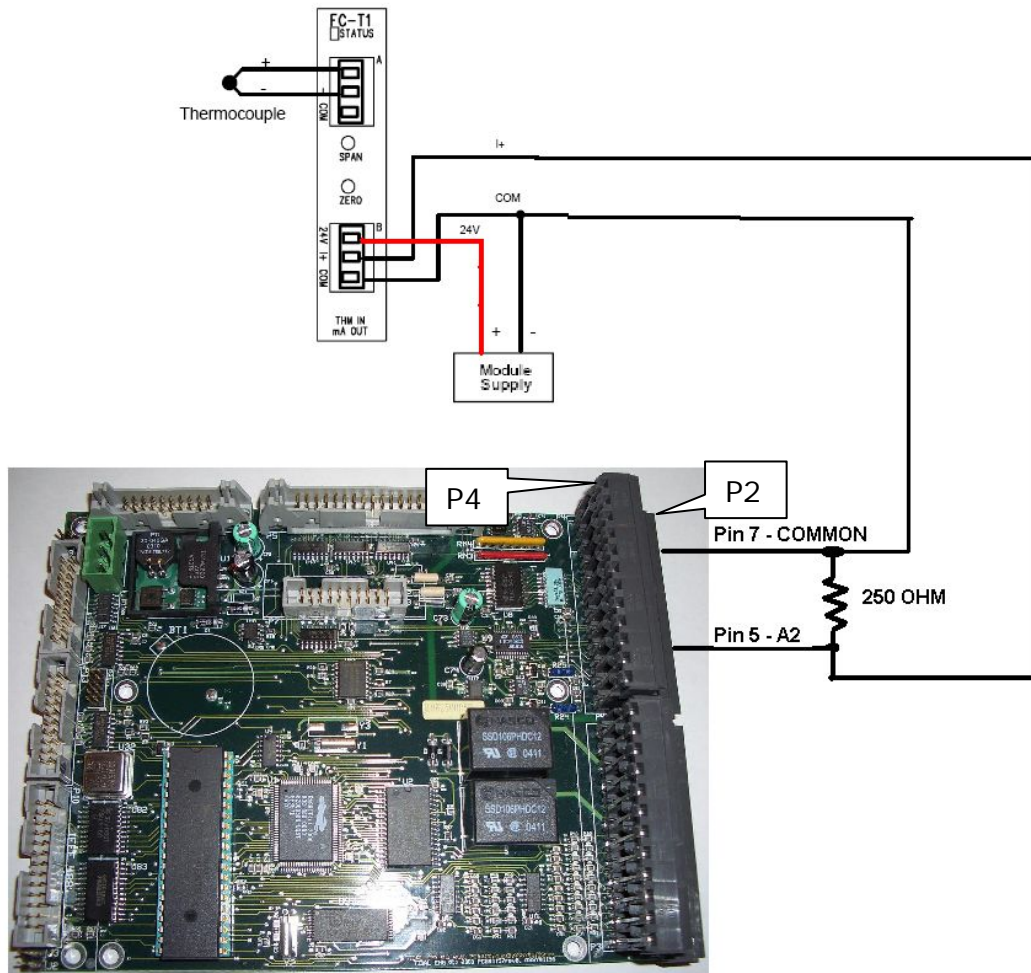


Figure 3 TE1908 Connection for input A2

4. Setup the Synergy Controller to use the thermocouple as the air temperature sensor, the cascade (product) sensor or for logging.

To setup the Synergy Controller to use this thermocouple as the air temperature sensor, go to the setup screen as shown below. (SETUP\Calibration\Calibration Channel 1)

Then press "CH1 Sensor select", press change, and then select the sensor.

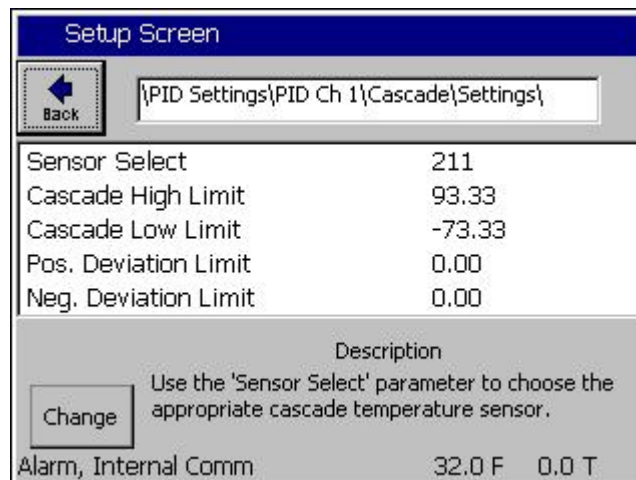
Figure 4 SETUP\Calibration\Calibration Channel 1 screenshot



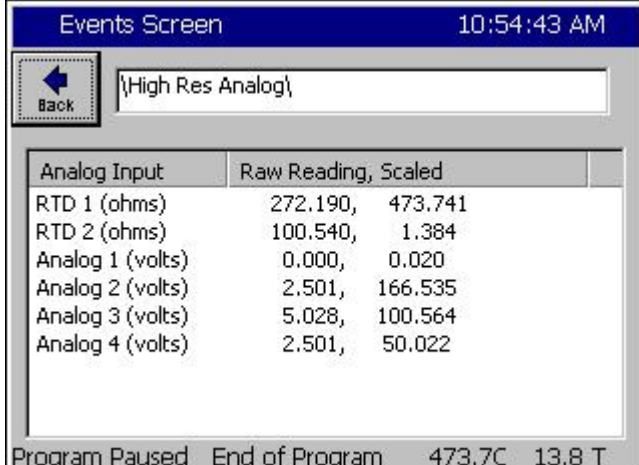
To setup the Synergy Controller to use this thermocouple as the product temperature sensor, go to the setup screen as shown below. (SETUP\PID settings\PID Ch 1\Cascade\Settings). Note that you may need to consult the factory for a registration key to access the Cascade PID settings.

Then press "Sensor Select" and press change.

Figure 5 SETUP\PID settings\PID Ch 1\Cascade\Settings screenshot



	<p>5. Next, Select the sensor as shown on the left.</p>
	<p>6. Then go to the High Resolution (High Res) input calibration screen as shown and open the appropriate Analog channel.</p>
	<p>7. Set the High Eng Scale and Low Eng Scale from the thermocouple ranges from step 1.</p> <p>Set the Low Volts Scale and High Volts Scale to 1 and 5 respectively corresponding to 4 mA and 20 mA.</p> <p>For example, when using a J-type thermocouple, setup the scaling as shown at the left.</p>

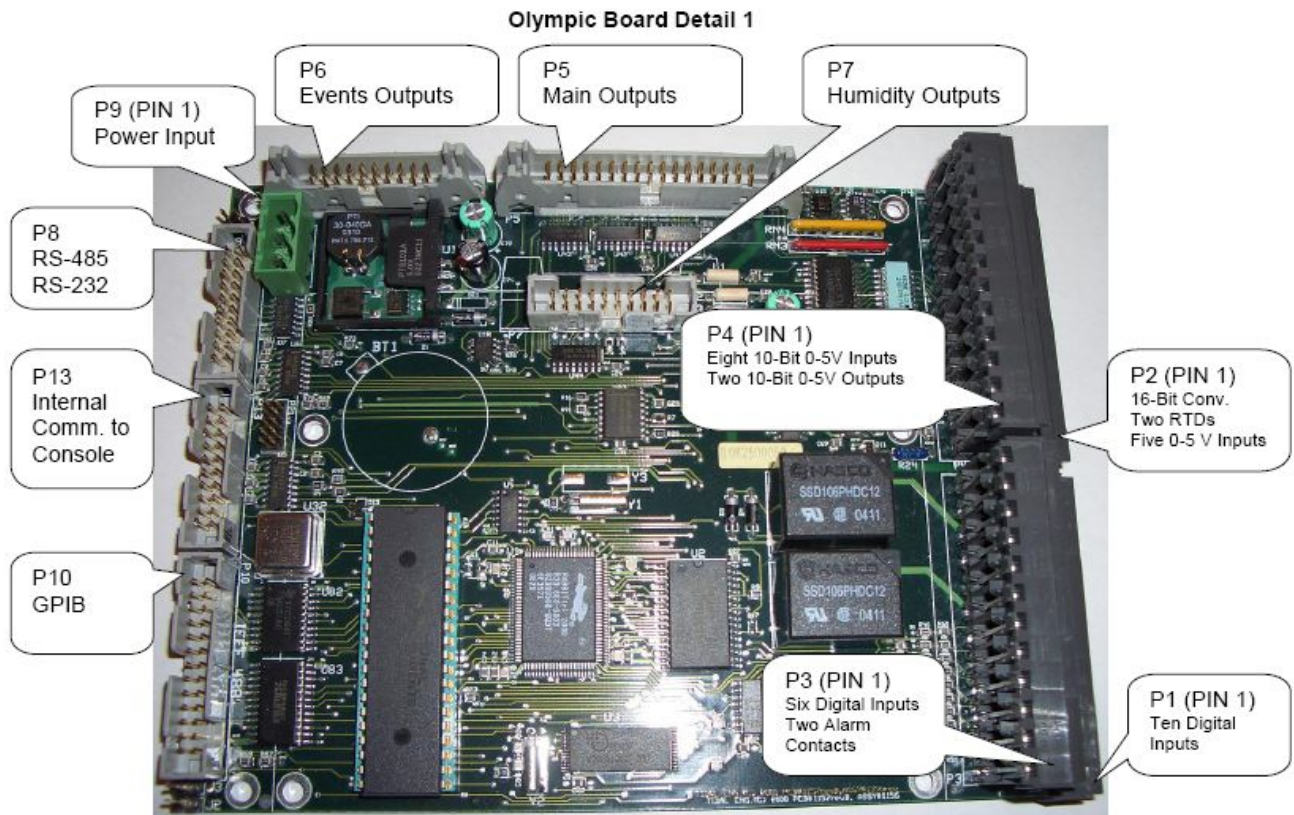


The screenshot shows the 'Events Screen' at 10:54:43 AM. A 'Back' button is visible. The main display area shows a table of analog input data under the folder path '{High Res Analog}'. The table has two columns: 'Analog Input' and 'Raw Reading, Scaled'. The data is as follows:

Analog Input	Raw Reading, Scaled	
RTD 1 (ohms)	272.190,	473.741
RTD 2 (ohms)	100.540,	1.384
Analog 1 (volts)	0.000,	0.020
Analog 2 (volts)	2.501,	166.535
Analog 3 (volts)	5.028,	100.564
Analog 4 (volts)	2.501,	50.022

At the bottom of the screen, it indicates 'Program Paused', 'End of Program', and temperature readings '473.7C' and '13.8 T'.

8. Verify the temperature readings in the EVENTS screen, High Res Analog folder.



Conclusion

This Synergy Controller Application Note demonstrated the setup and use of a TE1908 thermocouple signal conditioner for air and product temperature control. A TE1988 Single Channel RTD Signal Conditioner is also available from Tidal Engineering for RTD's.

As noted previously, this example demonstrated the use of a signal conditioner with High Resolution analog inputs. The eight Low Resolution analog inputs can also accommodate these signal conditioners.

About Tidal Engineering

Headquartered in Randolph, NJ, Tidal Engineering Corporation has been designing and building award-winning embedded hardware and software for test and measurement and data acquisition applications since 1992. The company further provides product development services together with engineering support, and is recognized for technical expertise in such areas as Embedded IEEE 488, and turnkey SCADA (Supervisory Control and Data Acquisition) systems. Tidal's products are available exclusively through ADI American Distributors Inc., an ISO-9002 certified distributor of electronic and electromechanical components and assemblies.

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