Single Channel RTD Signal Conditioner

Figure 1 TE1988 Single Channel RTD 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 RTDs are required, the TE1988 RTD Signal Conditioner can be used with the controller's analog inputs. Note that for additional thermocouples the TE1908 Single Channel Thermocouple Signal Conditioner is available. These signal conditioners can be used with any of the four High Resolution 0-5V analog inputs or any of the 8 Low Resolution Analog Inputs. The units are DIN rail or side mountable, selectable RTD signal conditioners with 1500 VDC isolation between input and output.

Note that an external regulated 24 VDC power source is required for these signal conditioners. The TE2198-24 power supply available from Tidal Engineering can power 12 signal conditioners.

Each P/N TE1988 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 TE1988 Signal Conditioner dip switch for the appropriate RTD input from the table below. Note the ranges for the supported RTD types from the specification table for configuration in step 7.

Input Selection

The signal conditioner can be configured for either CU10, PT1000 Input and Output signal type of 4 - 20mA.

Input Ranges	Switch Position							
	1	2	3	4	5	6	7	8
CU10	0	0	1	0	1	0	1	1
PT100	1	0	0	0	1	1	0	1
PT1000	0	1	0	0	0	0	0	0

Specifications		
Input Ranges	Ranges	
	CU10	-200°C to 260°C -328°F to 500°F
	PT100*	-200°C to 850°C -328°F to 1562°F
	PT1000	-200°C to 595°C -328°F to 1103°F
RTD Excitation Current	CU10, PT100 PT1000	500µA ±50µA 80µA ±20µA
Common Mode Range	0 -3.5VDC	
Maximum Inaccuracy (includes offset, span,linearity)	0.35% FSO 0.2% FSO @ 25°C 0.26% FSO	CU10 PT100 & PT1000 PT100 & PT1000
Maximum Loop Supply	30VDC	
Load Impedance	0Ω minimum	
Maximum Load / Power Supply	203Ω / 12V, 745Ω / 24V	
Linearity Error	0.35% FSO 0.2% FSO maximum	CU10 PT100 & PT1000
Output Slew Rate	1%@20mS	
Filter Characteristics	105dB@DC, 60dB@10Hz, 40dB@60Hz	
Stability	0.05% FSO maximum	

*The PT100 setting (factory default setting) is calibrated for the DIN temperature vs. resistance curve per DIN 43760, BS1995, or IEC751 which is 0.00385 Ohm/Ohm/C.

2. Attach the RTD to the signal conditioner; connect the single colored wire to the (+) input and the 2 other wires to the (-) and COM inputs on connector “A” as shown in the figure below.

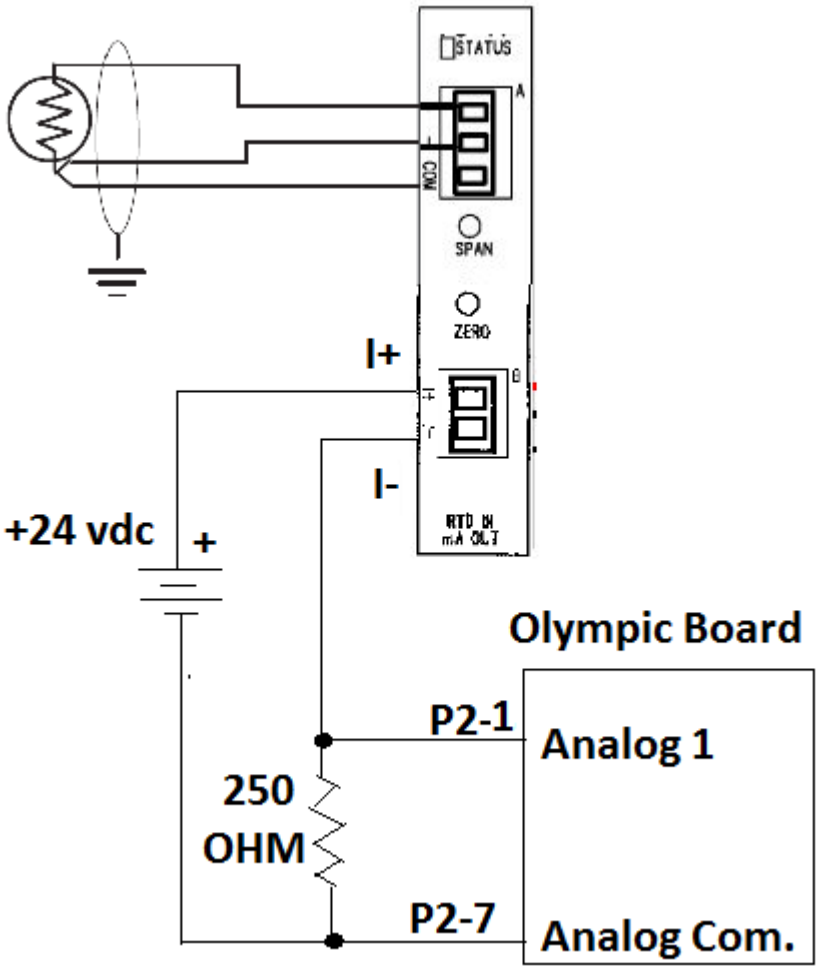


Figure 3 TE1155 Olympic Board Identification

3. Next, connect the 4-20 mA signal conditioner output to the appropriate input on the Synergy Micro, Synergy Quattro, and Synergy Nano Controllers as shown below.

Synergy Micro and Synergy Micro 2 Controller Olympic board connections.

Note: 250 Ohm resistor is required for all 12 input options 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

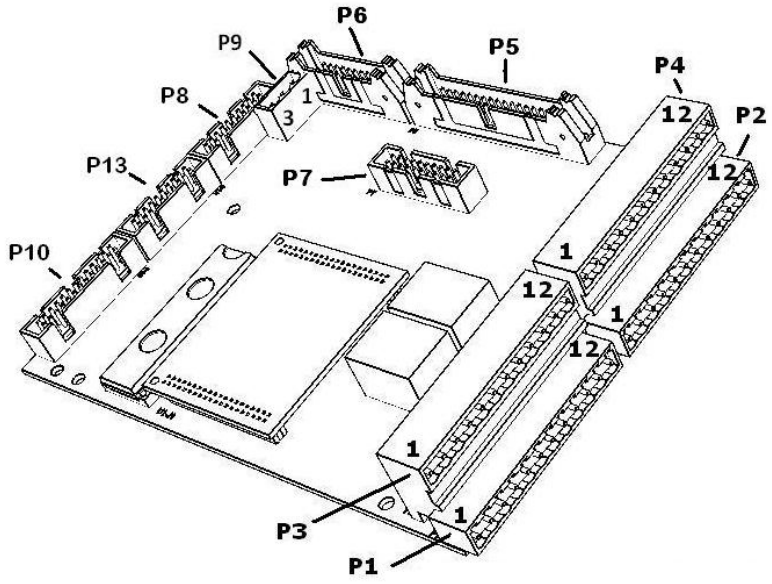


Figure 4 TE1155 Olympic Board Identification

Synergy Quattro Controller Olympic board connections.

Note: 250 Ohm resistor is required as shown in the table below

Synergy Controller Signal	Olympic Board Connector-Pin	Olympic Board Reference Pin	250 Ohm Resistor
High Resolution Analog Input 1	P2-1	P2-7	Yes
High Resolution Analog Input 2	P2-5	P2-7	Yes
High Resolution Analog Input 3	P2-2	P2-4	No
High Resolution Analog Input 4	P2-8	P2-10	No

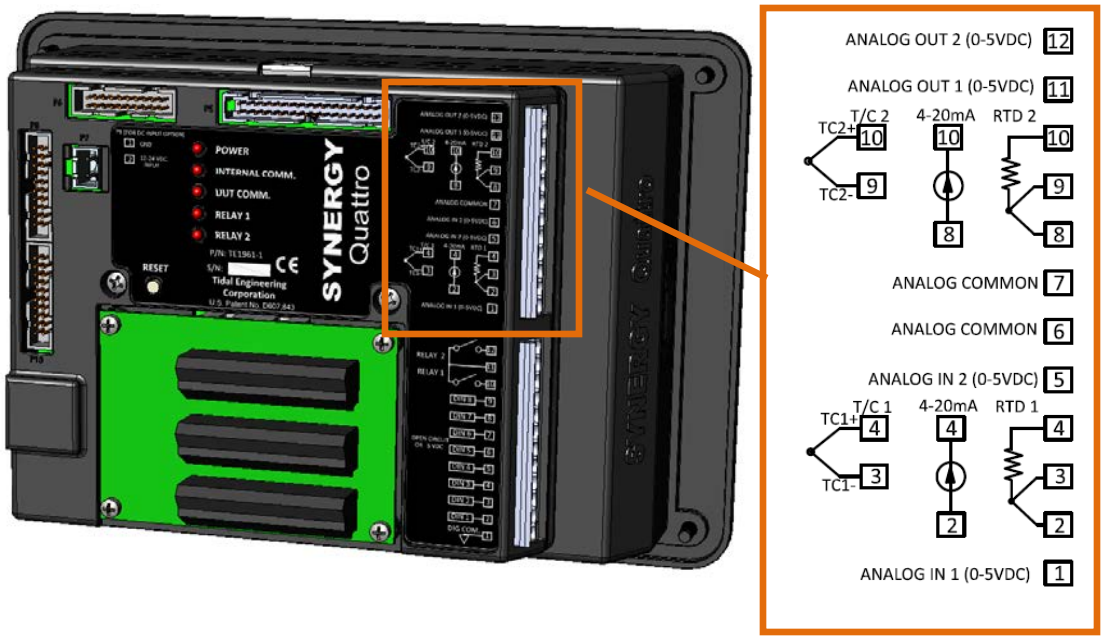
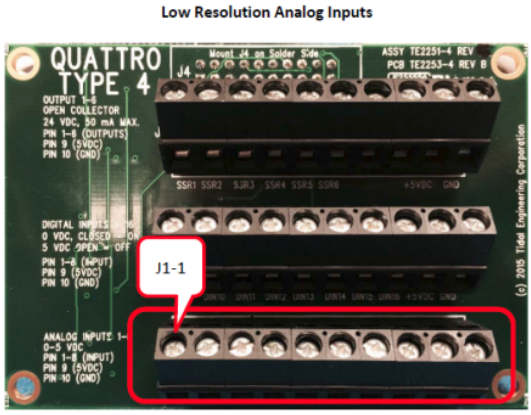


Figure 5 Synergy Quattro Olympic Board Identification



J1 Terminal	Signal	Description
J1-1	Low Res Analog 1	0-5 Volts DC, +/- 2 mV
J1-2	Low Res Analog 2	0-5 Volts DC, +/- 2 mV
J1-3	Low Res Analog 3	0-5 Volts DC, +/- 2 mV
J1-4	Low Res Analog 4	0-5 Volts DC, +/- 2 mV
J1-5	Low Res Analog 5	0-5 Volts DC, +/- 2 mV
J1-1	Low Res Analog 6	0-5 Volts DC, +/- 2 mV
J1-7	Low Res Analog 7	0-5 Volts DC, +/- 2 mV
J1-8	Low Res Analog 8	0-5 Volts DC, +/- 2 mV
J1-9	Common	Common
J1-10	+5 VDC	100 mA available to power sensors.

Figure 6 Synergy Quattro Expansion Board Wiring

Synergy Nano Controller connections for Analog 1 thru Analog 4

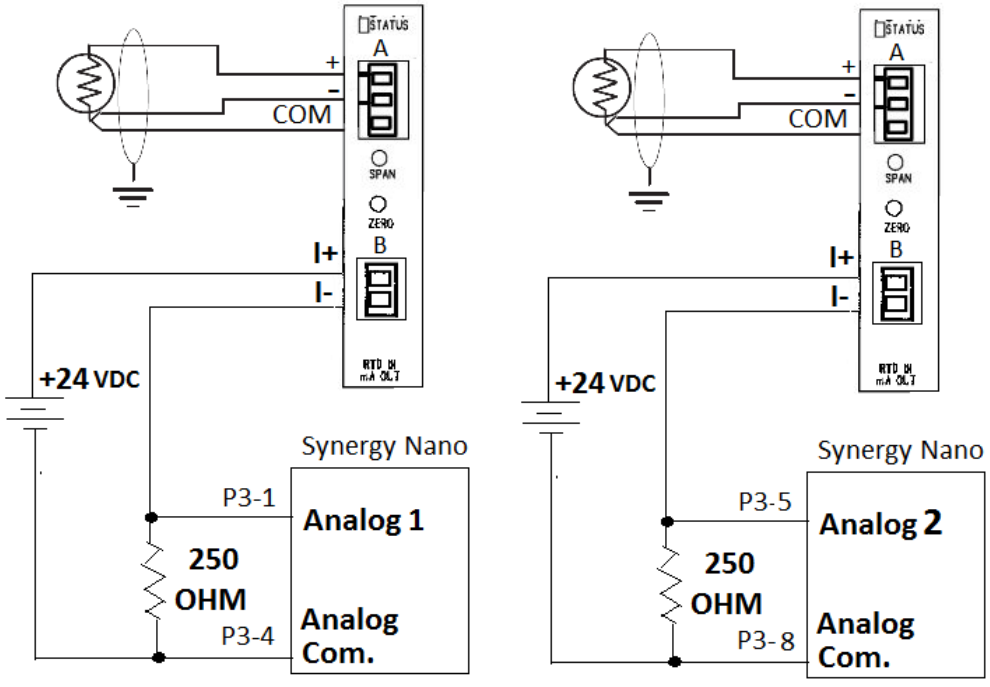


Figure 7 Synergy Nano, Analog 1 and Analog 2

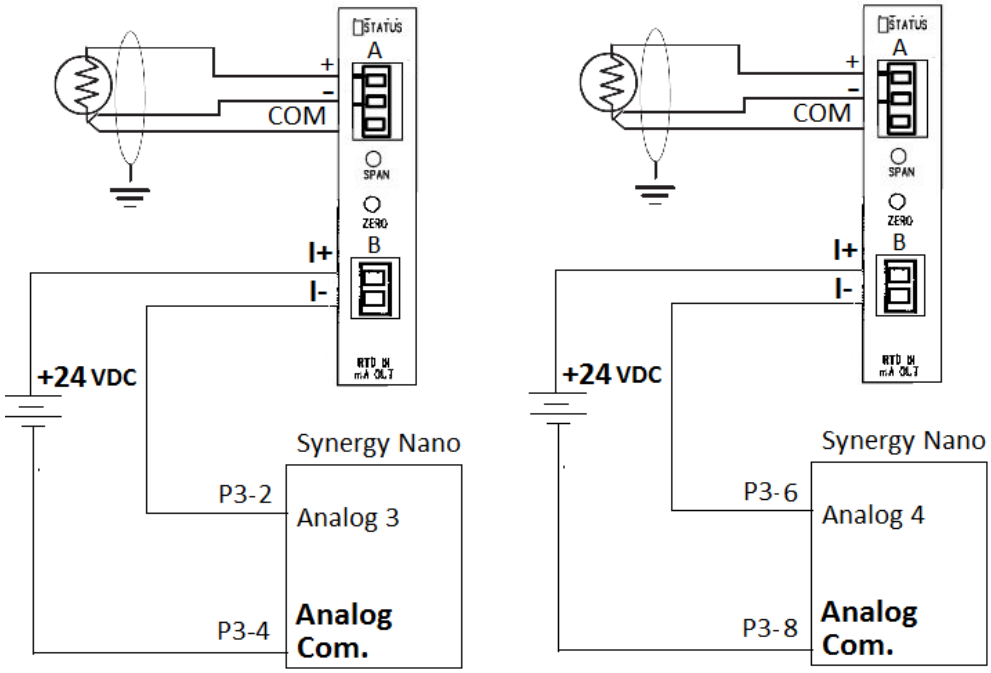


Figure 8 Synergy Nano, Analog 3 and Analog 4

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

To setup the Synergy Controller to use this RTD 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.

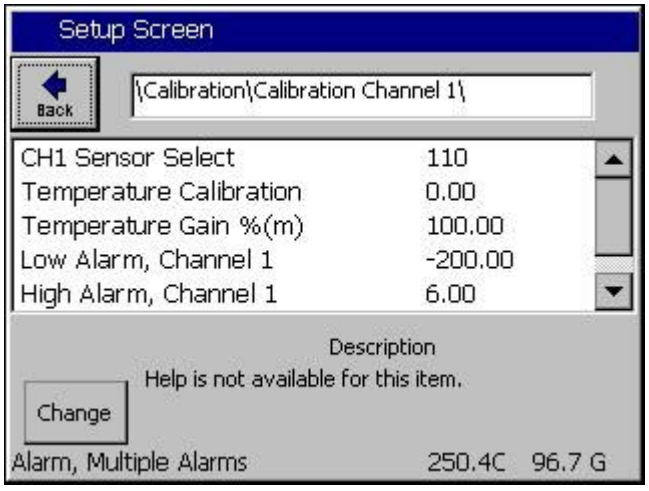


Figure 9 SETUP\Calibration\Calibration Channel 1 screenshot

To setup the Synergy Controller to use this RTD 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 contact the factory for a registration key to access the Cascade PID settings.

Then press “Sensor Select” and press change.

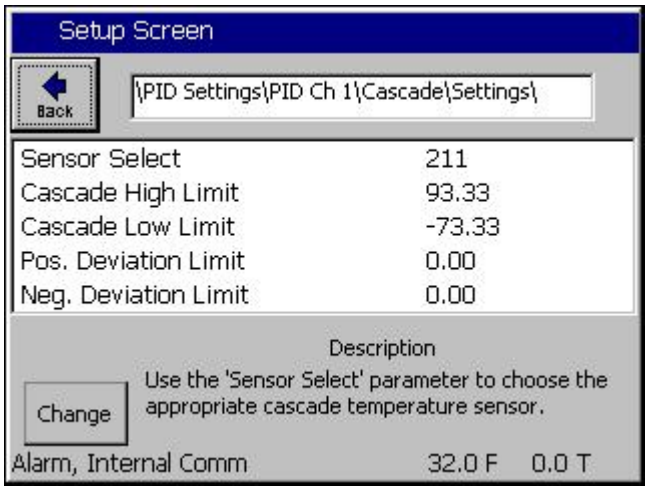
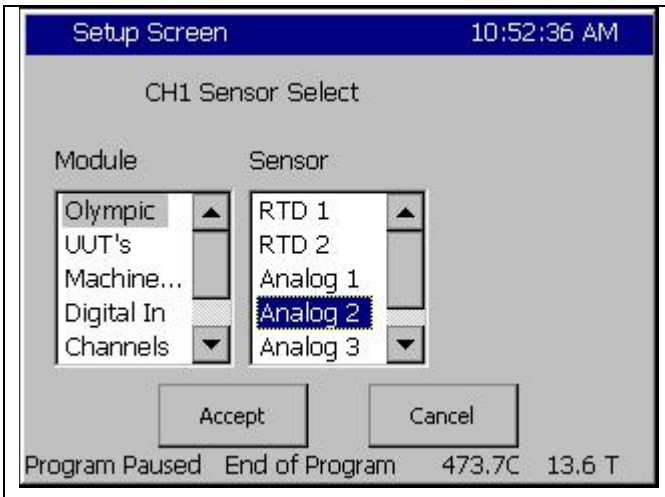
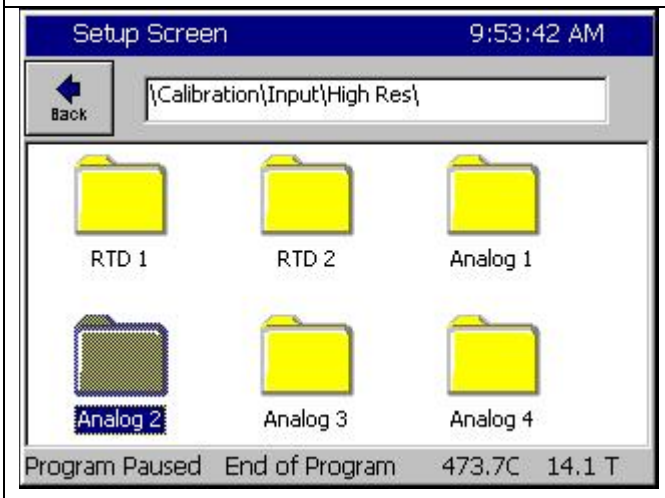


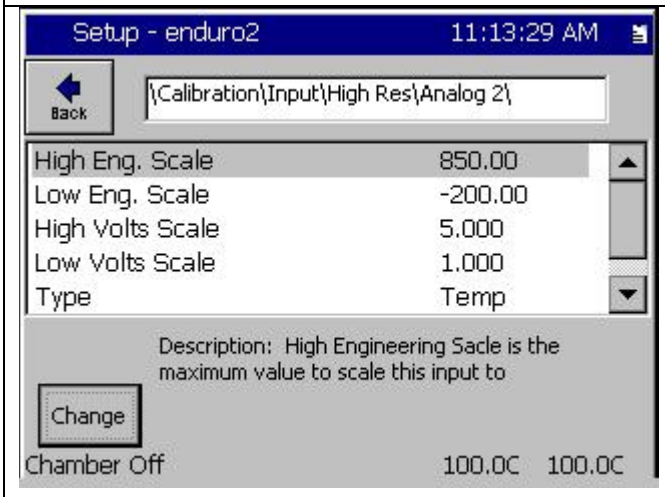
Figure 10 SETUP\PID settings\PID Ch 1\Cascade\Settings screenshot



5. Next, Select the sensor as shown on the left.



6. Then go to the High Resolution (High Res) input calibration screen as shown and open the appropriate Analog channel.

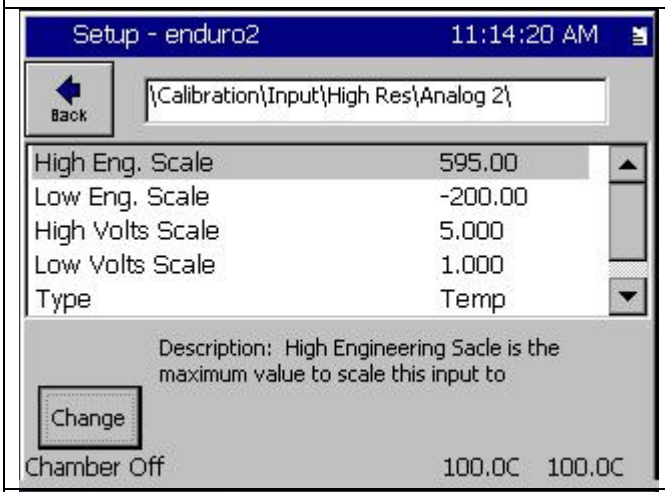
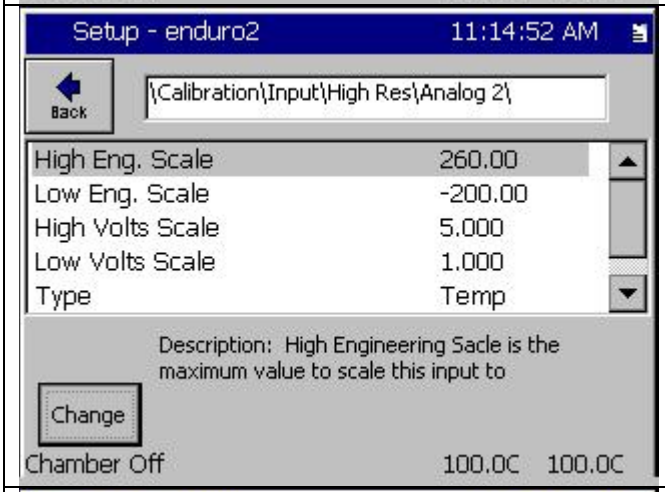
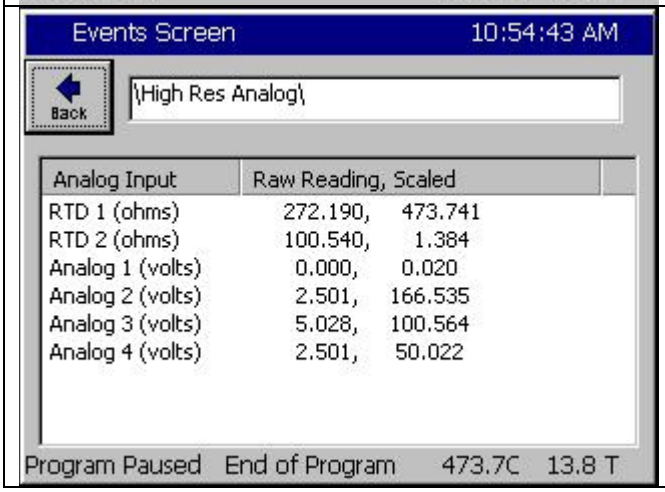


7. Set the High Eng Scale and Low Eng Scale from the RTD ranges from step 1.

Set the Low Volts Scale and High Volts Scale to 1 and 5 respectively corresponding to 4 mA and 20 mA.

For example, when using a PT100-type RTD, setup the scaling as shown at the left.

Note that the Scaling Type should be set to Temp (for Temperature).

	8. Setup the scaling as shown on the left when using a PT1000-type RTD,. Note that the Scaling Type should be set to Temp (for Temperature).
	9. Setup the scaling as shown on the left when using a CU100-type RTD. Note that the Scaling Type should be set to Temp (for Temperature).
	10. Verify the temperature readings in the EVENTS screen, High Res Analog folder or Low Res Analog folder as appropriate.

Conclusion

This Synergy Controller application note explains the setup and use of the TE1988 RTD signal conditioner with the Synergy Controller. The TE1908 Single Channel Thermocouple Signal Conditioner is also available from Tidal Engineering for Thermocouples.

About the Synergy Family
Tidal Engineering's Synergy Controllers, the ¼ DIN Synergy Nano, Synergy Micro 2 and the Synergy Quattro provide state-of-the-art usability and connectivity for environmental test control and data acquisition. They combine the functions of a chamber controller and a data logger and are designed to improve test efficiency by supporting both factory automation and test and measurement protocols and standards.

Synergy Controller feature highlights includes:

- ➔ Color touch screen
- ➔ Ethernet, RS-232 and GPIB communications
- ➔ Built in 100 MB Data logger with USB drive support
- ➔ Data Acquisition, up to 64 T-type thermocouples (Optional)
- ➔ Built-in Web Server for remote control; WebTouch Remote ™
- ➔ Compatible with Synergy Manager for PC based control, monitoring and programming.
- ➔ Built-in FTP Server for factory automation and test and measurement applications

For more information regarding these controllers please see the full Synergy Controller Technical Manual on our website at http://www.tidaleng.com/synergy.htm

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 is recognized for technical expertise in such areas as Embedded IEEE 488, and turnkey SCADA (Supervisory Control and Data Acquisition) systems.

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