

Thermocouple Data Acquisition with Synergy UUT Modules

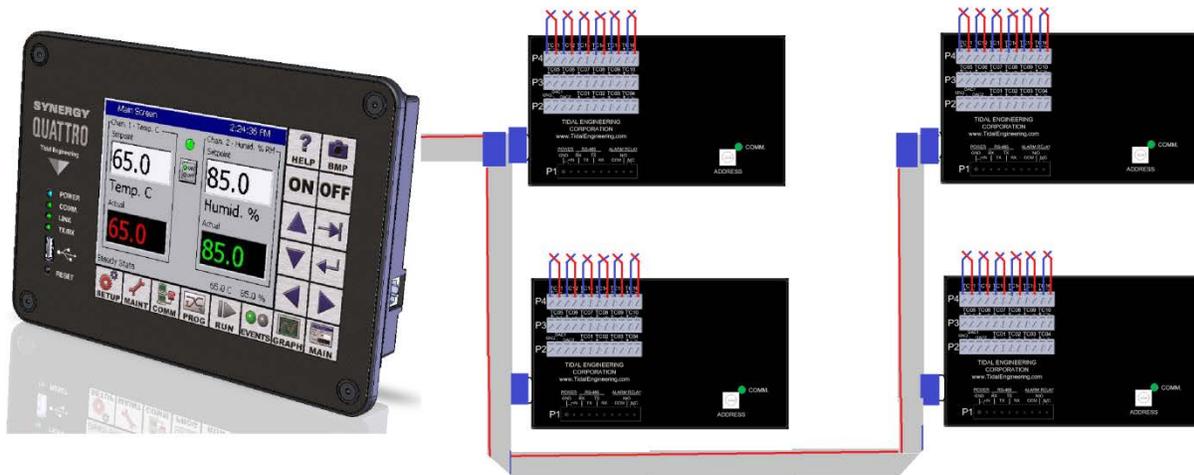


Overview

The Tidal Engineering UUT Module (Unit-Under-Test), P/N TE1299-16, is a 16-channel thermocouple data acquisition unit designed to expand the input capabilities of the controllers in the Synergy family. Each UUT Module allows engineers to capture and log temperature data from the unit-under-test and other test temperatures. Up to four modules can be attached to each Synergy controller providing up to 64 T-Type thermocouple inputs. The UUT sensor data can optionally be logged and the log file may be used for analysis, graphing and reporting.

UUT Features

- ◆ Up to four UUT Modules can be used with the Synergy Controller.
- ◆ 16 thermocouples per module, up to a total of 64 inputs.
- ◆ Type T Thermocouples.
- ◆ RS-485 communications.
- ◆ Compatible with all Synergy Controller models and generations including the VersaTenn V.



UUT Module Uses

The UUT module can be used to monitor and log multiple air temperatures and multiple product temperatures. The controller can control and alarm any one of these sensor inputs.

UUT modules are useful when testing products with a large thermal mass whose temperature is slow to change. When used in conjunction with the Synergy Controller's Cascade control feature, the user can program the chamber to ramp to temperature setpoints and **Waitfor** product temperature instead of the chamber's air temperature.

The UUT Module sensors can also be used to monitor chamber and oven equipment for performance, preventive maintenance, and reliability monitoring; for example compressor discharge and suction temperatures.



The screenshot shows the 'Events Screen' at 3:36:32 PM. The title bar includes a 'Back' button and a text field containing '{Event Outputs\UUT\UUT 1}'. Below the title bar are 'Previous' and 'Next' navigation buttons. The main content is a table with two columns: 'Sensor' and 'Temp'. The table lists eight sensors, all with 'Bad Sensor Reading' in the 'Temp' column. At the bottom of the screen, it displays 'Steady State', '158.0F', and '49.4 %'.

Sensor	Temp
Sensor 1	Bad Sensor Reading
Sensor 2	Bad Sensor Reading
Sensor 3	Bad Sensor Reading
Sensor 4	Bad Sensor Reading
Sensor 5	Bad Sensor Reading
Sensor 6	Bad Sensor Reading
Sensor 7	Bad Sensor Reading
Sensor 8	Bad Sensor Reading

Steady State 158.0F 49.4 %

UUT Temperatures

For UUT Modules 1 thru 8, this screen displays temperature readings for Sensors 1 thru 8 for each UUT.

Select UUT 1 thru UUT 8 with Previous and **Next** buttons.

These values may be logged.

UUT Module Setup Procedure

This is the installation and setup procedure for one or more UUT (Unit-Under-Test) modules. If your UUT modules are already installed and wired to your controller, go to Step 9 in this procedure for instructions on how to view your thermocouple temperature readings on the Synergy Controller touch-screen. Refer to the UUT Module – Board and Connector Layout Drawing at the end of this section.

UUT Setup



Disconnect power to the test chamber before starting. Lock-out / Tag-out your power source.

Follow the steps below to configure the UUT Module and to make necessary connections.

1. Set up the UUT Module Address.

Locate the small square selector switch on the UUT Module labeled Address Switch. Turn the dial on the switch to the proper Module Address setting indicated in the table at right.

16 CHANNEL MODULE ADDRESS SWITCH SELECTION	
MODULE NO	SETTING
Module 1	1
Module 2	3
Module 3	5
Module 4	7



2. Locate the RS-485 DB9 male plug as shown below. The TE1608 cable is provided with Synergy Quattro and Synergy Micro 2 installations and TE1595 is provided for Synergy Nano applications. Plug it into the UUT module. For aftermarket installations, the cable may be mounted on the back of the chamber and labeled RS-485 port or hanging freely behind the panel.

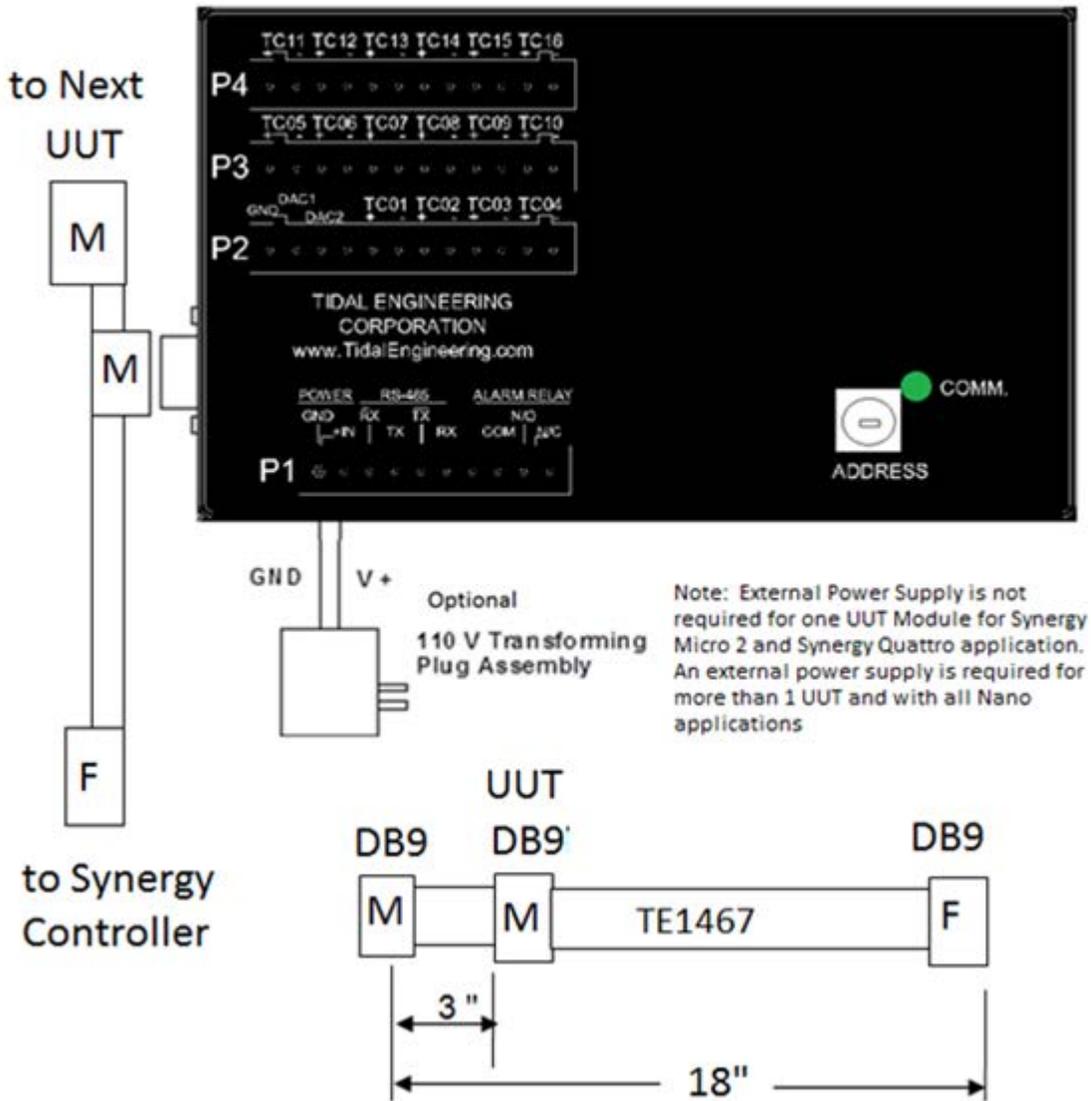


Notes:

Although the supplied ribbon cable makes all the connection between the controller and the UUT module required, the P1 connector can also be used to wire the RS – 485 connections if the ribbon cable connection is not long enough or if another cabling type is specified.

If necessary, connect additional UUT Modules using the supplied TE1467 Daisy Chain Cable.

UUT MODULE - Board and Connector Layout



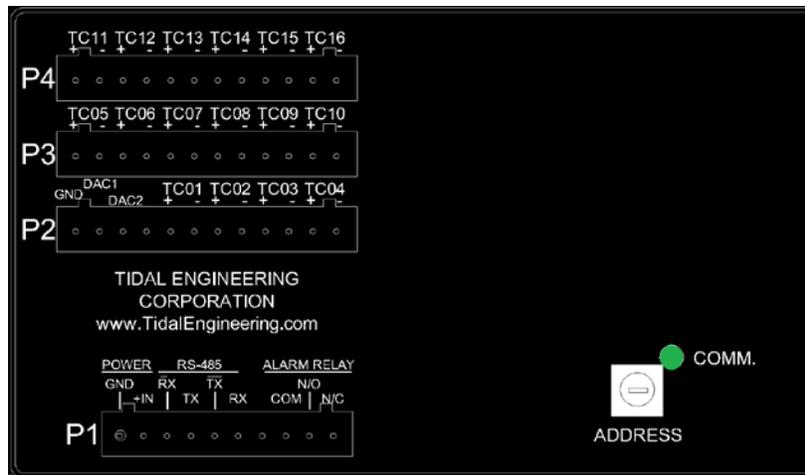
3. Connect the power supply to the P1 connector if required. One UUT Module can be powered by the Synergy Micro 2 and Synergy Quattro Controllers. For Synergy Nano applications, and other applications that require more than one module, then an external 9-24 VDC Power supply is required and can be connected to the P1 Plus according to the table below. Verify that the green LED on the UUT Module is illuminated. It should be on steadily.

- Connect your T-Type Thermocouple sensor wires to the appropriate terminal blocks P2 thru P4 on the UUT Module. Consult the Thermocouple Connection Tables on the UUT Module drawing for proper terminations.

Pin	P1
1	GND
2	+Power (9-24VDC)
3	/RX
4	TX
5	/TX
6	RX
7	Not Used
8	Not Used
9	Not Used
10	Not Used

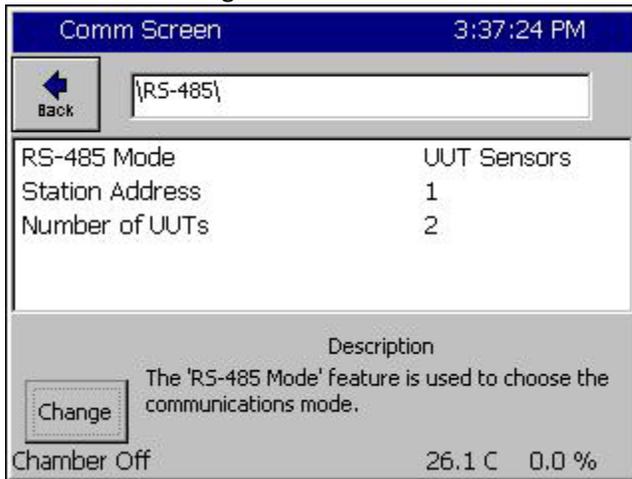
UUT Terminal Wiring Table							
Pin	P2	P3	P4				
1	GND	T/C 05	T/C 11				
2	Not Used	TC05+	TC11+				
3	Not Used	TC05-	TC11-				
4	Not Used	T/C 05	T/C 12				
5	T/C 01	TC06+	TC12+				
6	TC01+	TC06-	TC12-				
7	TC01-	T/C 05	T/C 13				
8	T/C 02	TC07+	TC13+				
9	TC02+	TC07-	TC13-				
10	TC02-	T/C 05	T/C 14				
11	T/C 03	TC08+	TC14+				
12	TC03+	TC08-	TC14-				
	TC03-	T/C 05	T/C 15				
	T/C 04	TC09+	TC15+				
	TC04+	TC09-	TC15-				
	TC04-	T/C 05	T/C 16				
		TC10+	TC16+				
		TC10-	TC16-				

Be careful to route the thermocouple wires and the power supply cord safely through the appropriate opening to avoid pinching.



- Turn on power to your test chamber. Once the Synergy Controller completes the boot-up procedure, press the **COMM** Navigation key. Open the RS-485 folder to arrive at the screen below.

Configure RS-485 Mode and Station Address to the values displayed in the screen below by pressing on each item. Make the changes in the screens that follow. Configure the Number of UUTs using the chart on the right.



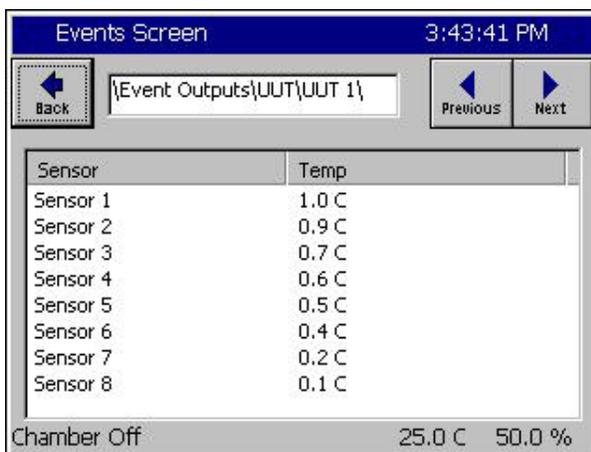
Number of Thermocouples	Number of UUTs Value to be Entered
1 - 16	2
1 - 32	4
1 - 48	6
1 - 64	8

- Cycle power to the chamber but leave the UUT power supply plugged in to the 120 V outlet.

After the Synergy Controller boots up successfully, verify that the green LED on the UUT Module is blinking. This indicates that data communications have been established between the Synergy Controller and the UUT Module.

When you have more than one UUT Module, verify that the green LED blinks on each module. Each module is queried sequentially as the Synergy Controller gathers the temperature data from each of the modules.

- Verify thermocouple temperature readings.** Press the **EVENTS** Navigation key on the Synergy Nano. Open the UUT Temperature folder to display the screen below

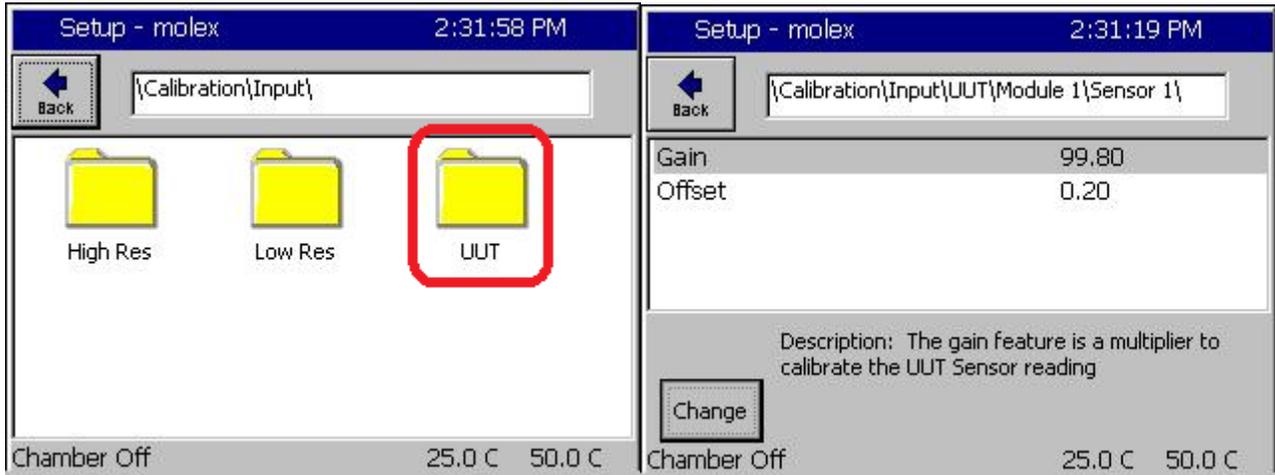


- Each UUT Module can accept up to 16 T/C inputs.
- Each screen displays 8 sensors labeled Sensor 1 thru Sensor 8.
- Press the **Next** button to view the next set of eight sensors for the first UUT Module. The path display changes from UUT1 to UUT2. The UUT2 screen will show the readings for sensors No.'s 9 – 16.
- To view sensor inputs for UUT Modules. 2, 3 and 4, continue pressing the **Next** button.

Important Note: If your screen shows "x.x" for sensor "Temp", go back to Step 7 and verify the Number of UUTs entered. X.x indicates that the module isn't being queried by the Synergy Controller.

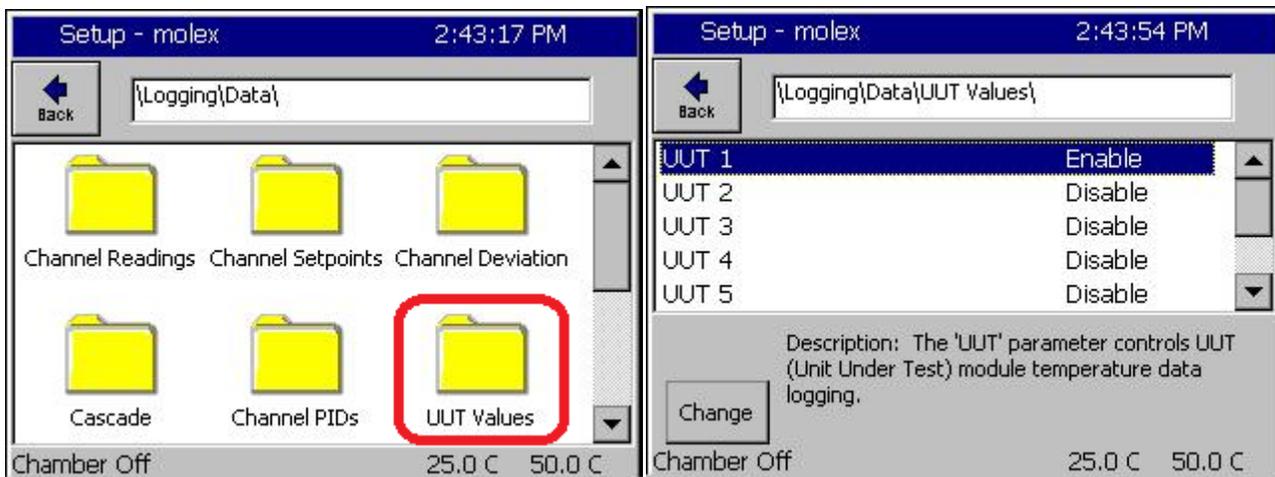
Calibration

To calibrate a UUT module, enter a Gain (Span) and Offset for each UUT Sensor from the Setup\Calibration\UUT\Module n\Sensor screen. These factors are easily calculated using a spreadsheet by entering a two known temperature values along with the corresponding Synergy Controller readings. See Application note 40 on the [www.tidaleng.com](http://tidaleng.com) website for details. <http://tidaleng.com/appnotes/SCAP40.pdf>

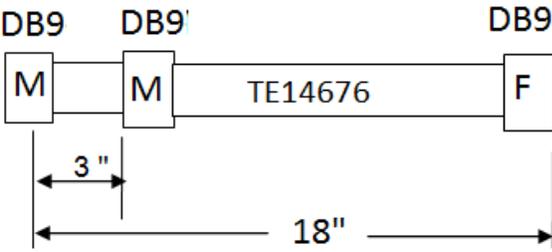


Logging

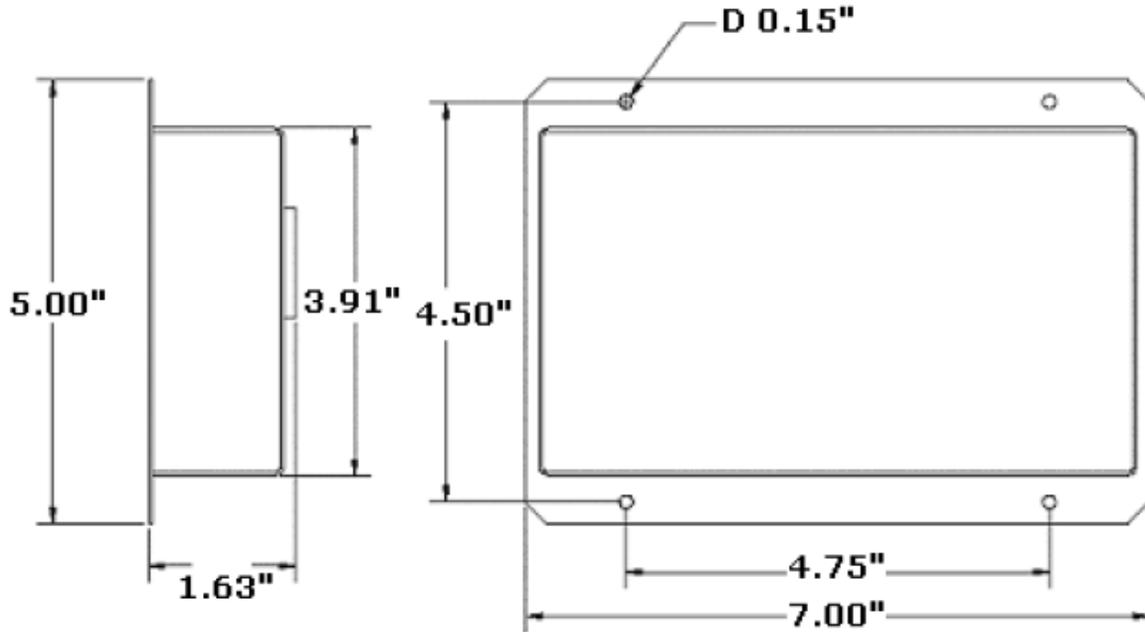
The UUT sensors are frequently used to monitor additional temperatures on the Unit-Under-Test or on the oven or chamber equipment (for exa. The Synergy Controller can log the UUT Sensors for use in the test or for equipment performance monitoring. UUT sensor logging is enable in groups 8 sensors (2 grouple per module from the Setup\Logging\Data\UUT Modules folder. See Application note 85 on the [www.tidaleng.com](http://tidaleng.com) website for more information regarding the logging system setup and applications. <http://tidaleng.com/appnotes/SCAP85.pdf>



TE1299-16 Parts List

Part Number	QTY	
TE1435 Wall Power Supply With Plug P1 PLUG, 10 POSITION, 5 MM 9 VDC, 500 mA Note: This plug and wall transformer are not required for Synergy Micro and Synergy Quattro applications for 1 module.	1	 <p>P1 120-D-121/10</p>
120-D-121/12 PLUG, 12 POSITION, 5 MM	3	 <p>P2-P4 P/N 120-D-121/12</p>
TE1299-16-0 UUT Module	1	
TE1467 Daisy Chain Cable	1	 <p>DB9 DB9 DB9 M M TE14676 F 3" 18"</p>
TE2198-12 DIN Rail Power Supply 12 V, 1.25 A	Optional	

Specifications	
Sensor Type	T-Type Thermocouples
Sensors	16 per module. Up to 64 per controller (4 Modules)
Scan Rate:	All sensors are scanned 1/sec
Accuracy	+/- 2C including Thermocouples
Communications:	RS-485
Power:	9-24 VDC
Dimensions:	5" x 7" x 1.63"
Mounting:	Panel
Controller Compatibility	VersaTenn V Synergy Nano Synergy Compact Synergy Micro Synergy Micro 2 Synergy Quattro



UUT Module Mechanical Drawing



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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