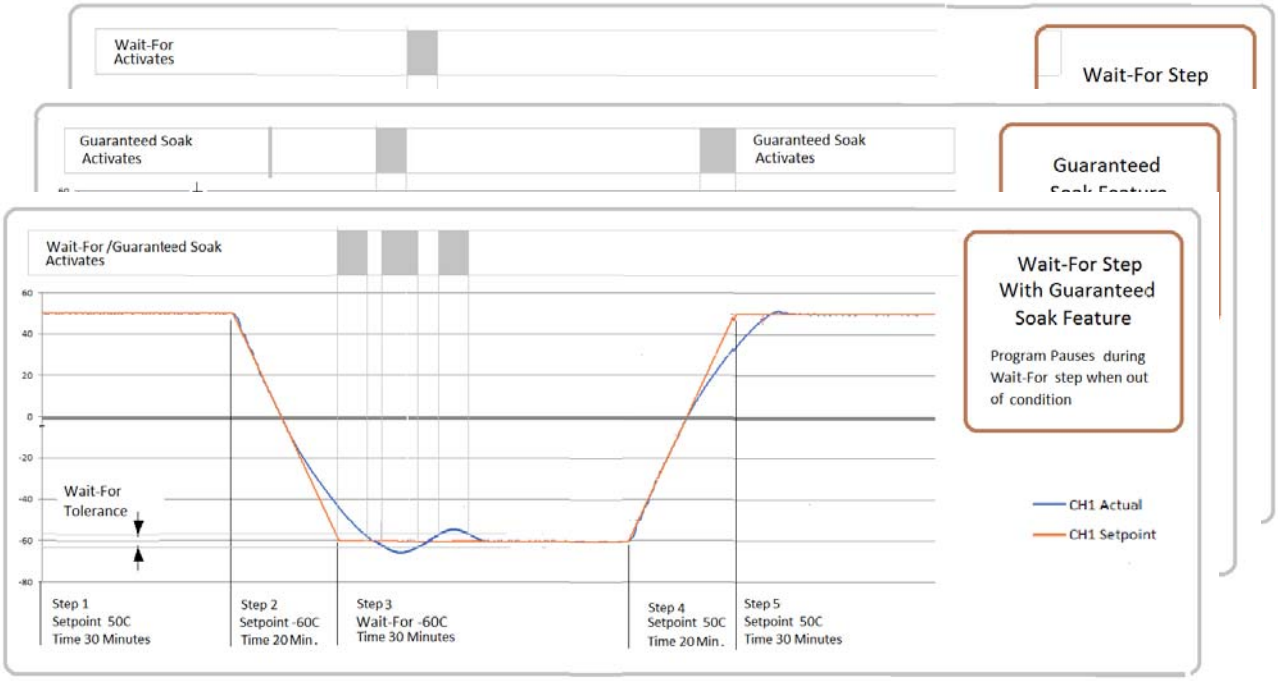
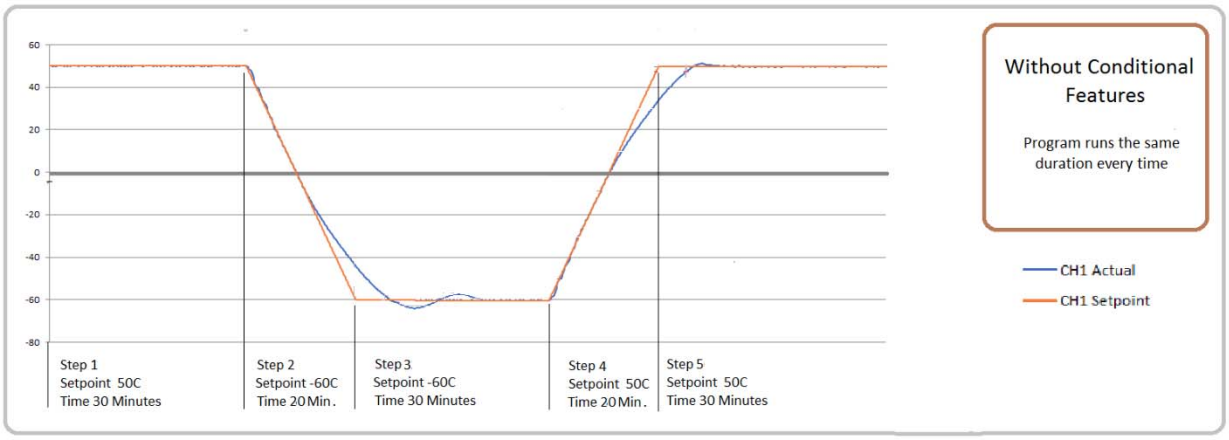
Synergy Controller Conditional Programming Features



In many environmental testing procedures and standards, the test chamber controller is required to adjust the timing of the program based on the conditions in the chamber, for example, frequently the soak timer starts only after the chamber temperature gets into condition.

The Synergy Controller provides several features that can satisfy these requirements. This application note addresses these conditional programming features.

With the Synergy Controller, Setpoint Steps don't inherently consider the chamber conditions. That is, setpoint steps are deterministic; i.e. the controller behaves the same way each time based on the step parameters. Of course, this doesn't mean that the chamber will behave the same way each time; i.e. the chamber may not actually be capable of following the condition vs. program's time profile. In the chart below, the program timing doesn't consider that the temperature lags the setpoint. In addition, program will take the same time to run even if the chamber never reaches the setpoint.



To handle tests where the controller must consider the conditions in the chamber, the Synergy Controller supports the following features:

1. Guaranteed Soak.
   The controller waits at the end of every step for the temperature to get into condition.

2. Wait-For (WF) Program Steps.
   These program steps can be placed into the program at the specific locations where the specification requires the controller to "wait-for" a condition; i.e. a combination of channel Process Variables (temperature, humidity, etc.) and digital inputs.

   Note that WF steps don't specify controller setpoints, they only specify the wait for condition. The controller setpoints come from the previous step.

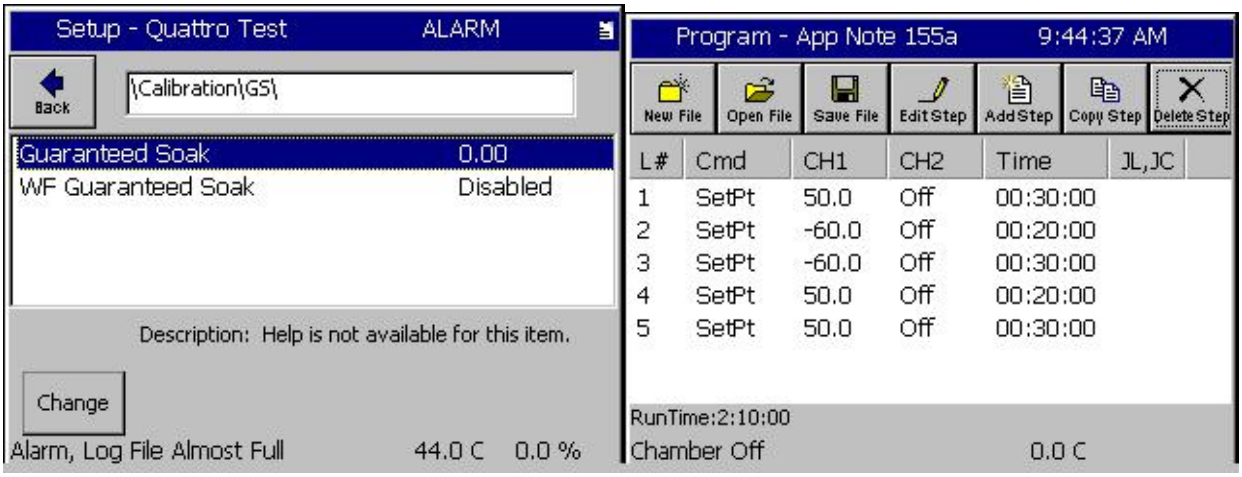
3. Wait-For (WF) Program Steps in WF/Guaranteed Soak Mode
   With the WF/Guaranteed Soak mode, WF program steps can be used where the specification requires the controller to soak at a set of conditions for a specific time. Any time the conditions are not met doesn't count toward the soak time requirement; i.e. The step timer pauses when the Wait-For step conditions are not met.

Synergy Controller Conditional Programming Feature Comparison Chart

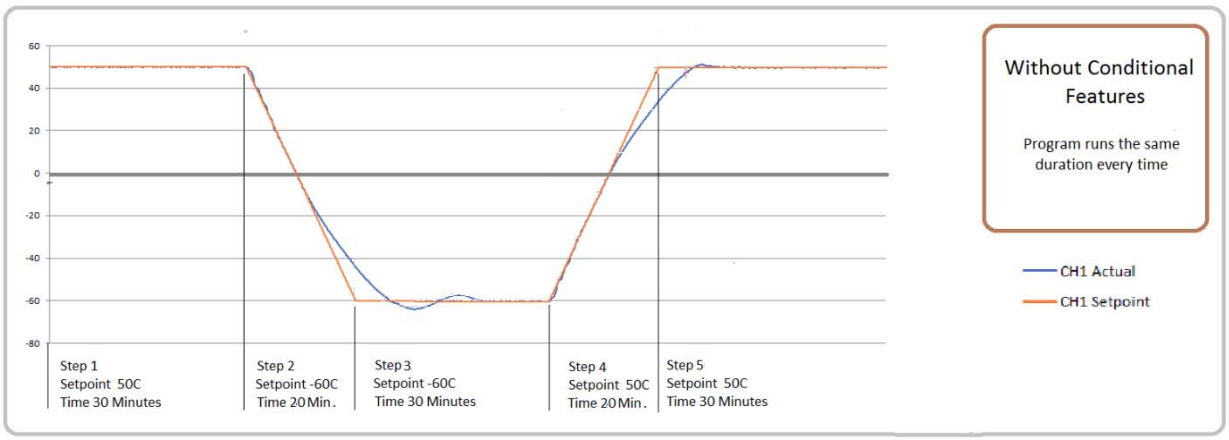
	Guaranteed Soak	Wait-For Step	WF/Guaranteed Soak Mode
Temperature	X	X	X
Humidity		X	X
Altitude		X	X
Vibration		X	X
Digital Inputs		X	X
Setpoint Steps	X		
Wait-For Steps		X	X
During Soak			X

Programming with no conditional Features

When Guarantied Soak is turned off (Set to 0.0C), and no Wait-For Steps are included, the program will run the same every time without regard to the chamber conditions.



Note that the first step of the program is dependent on the Steady State Setpoints of the controller when the chamber starts. For example, if the current temperature setpoint is 50 C, the first step will be 30 minutes at a constant 50C temperature as shown the example below. If the first step is not 50C, then the first step will ramp to 50C from the current setpoint in 30 minutes. To include the initial conditions in the program, insert an additional Setpoint step at the beginning of the program with zero time.

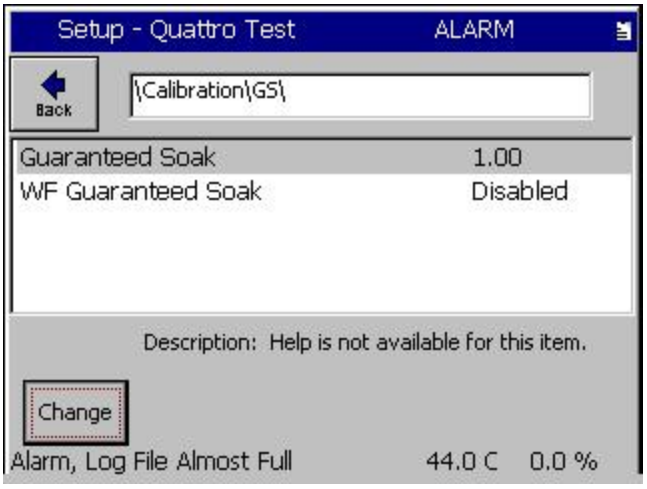


Guaranteed Soak

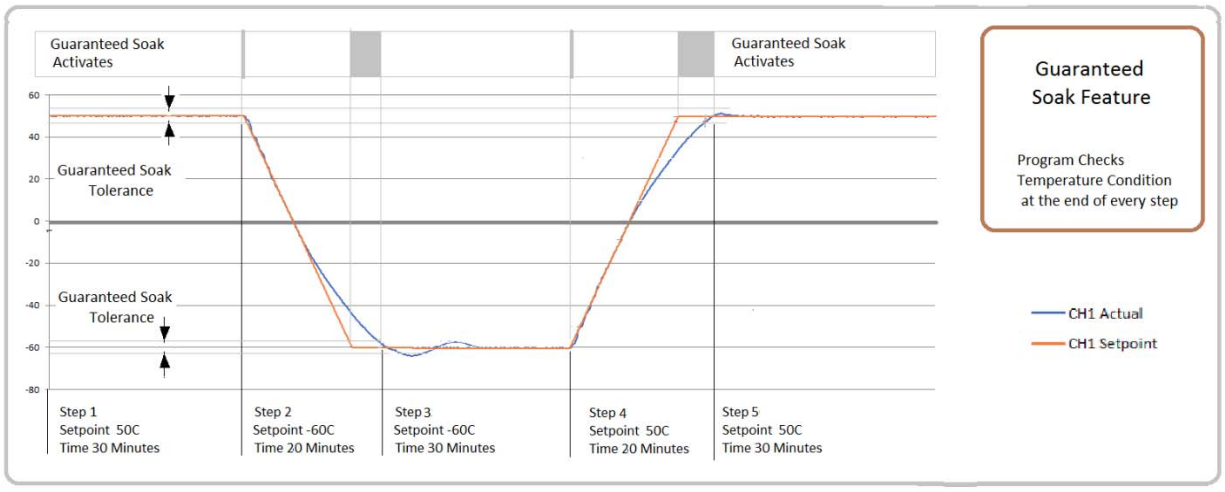
The Guaranteed Soak (GS) feature tests the Channel 1 Temperature (PV) at the end of each step and stops the program from advancing to the next step until the PV is within the GS limits. Range for GS is 0 to 50 degrees. This GS value applies to each setpoint step in the program. Set Guaranteed Soak parameter to 0.0 C to turn off the feature.

As an example, for a setpoint of 50 degrees with GS of 1 degree, the program will wait at the end of the step until the temperature is between 49 and 51 degrees before advancing. The GS soak feature is global; i.e. when its enabled, it will affect all setpoint steps.

SETUP\Calibration\Guaranteed Soak\



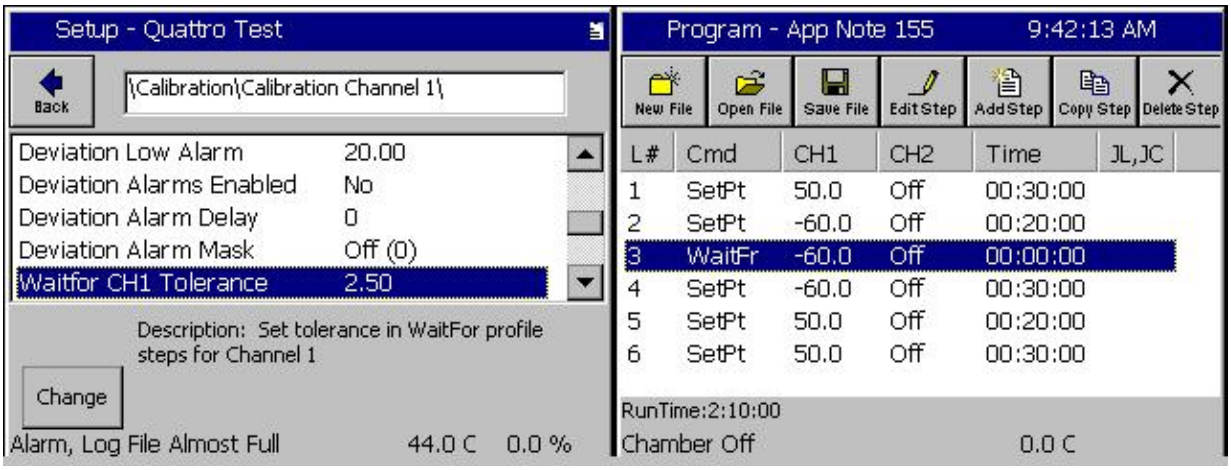
The chart below shows when the Guaranteed Soak feature will affect the programming timing.



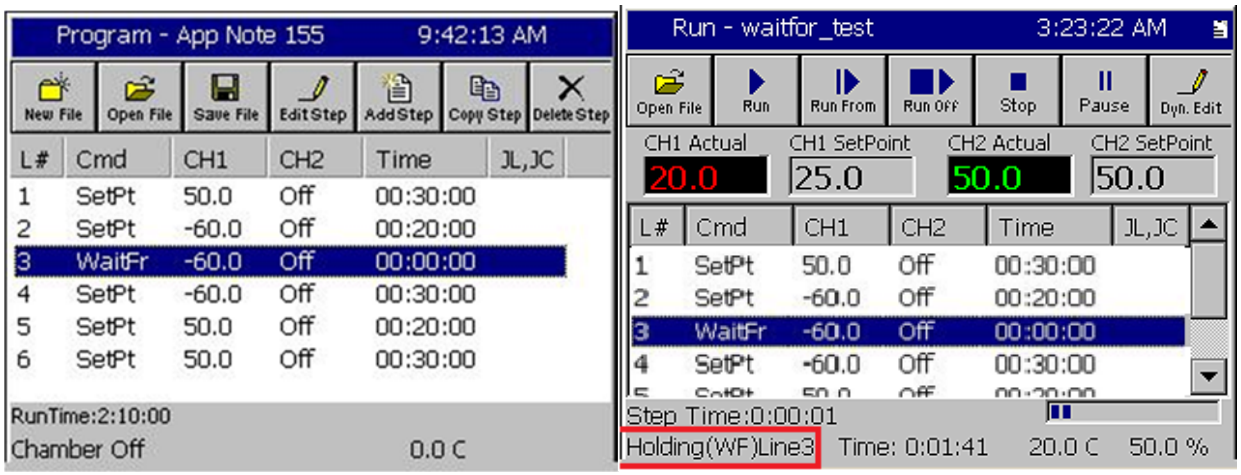
Wait-For Steps

When the controller executes a Wait-For step, it waits at the step until all the specified conditions are met. The controller can wait for all Process Variables (up to 4) and external digital inputs (up to 16).

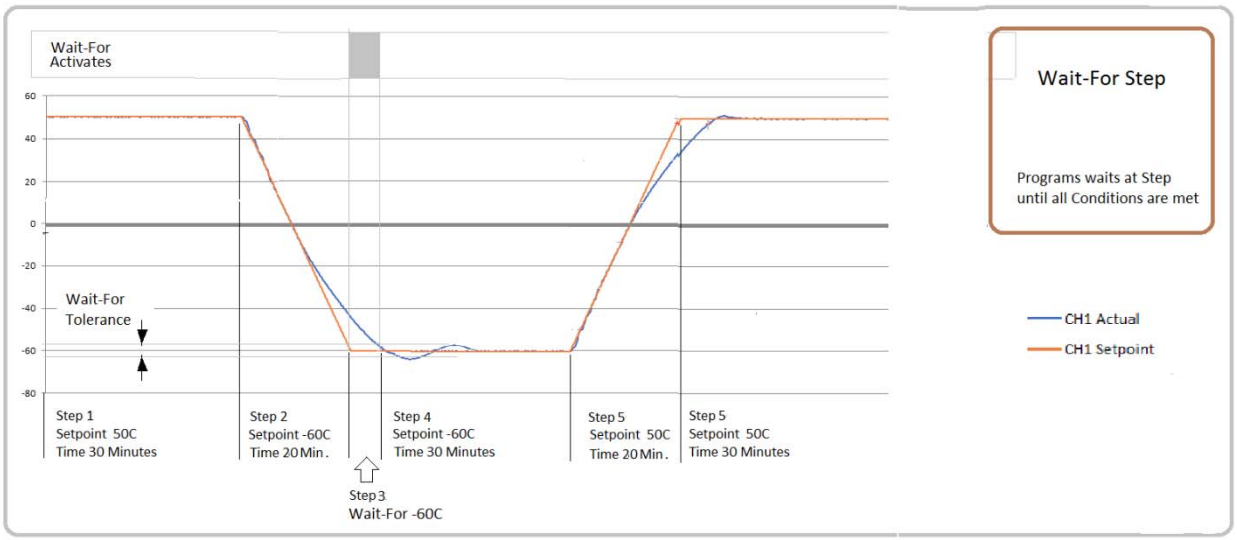
The tolerance for each channel is specified on a channel-by-channel basis in the Setup Screen shown below. The Wait-For step doesn't control the setpoints during the step. The setpoints during the WaitFor step are determined by the setpoints of the prior step and are held constant for the duration of the step.



In the figure below, Step 3 is the Waitfor Step. The program waits at Step 3 until the temperature is in Tolerance.

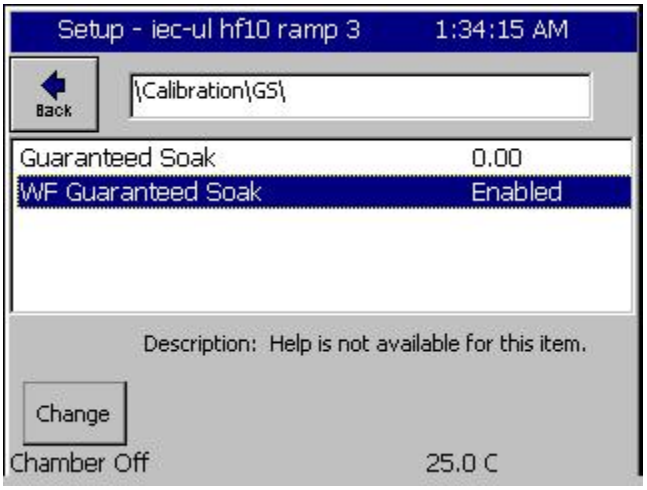


The chart below shows when the Wait-For Step will affect the programming timing.

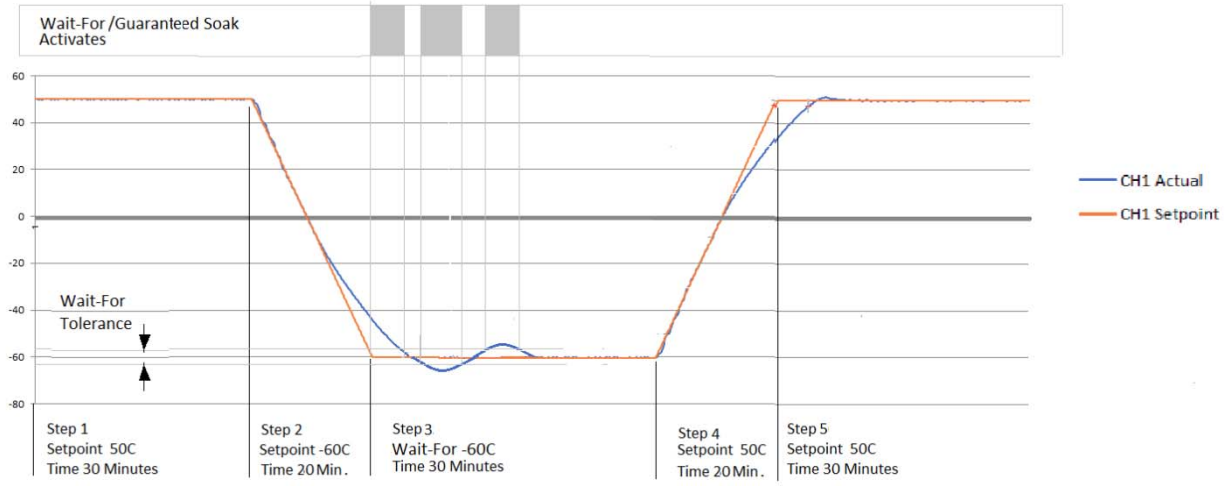


WF Guaranteed Soak

When the **WF Guaranteed Soak** option is enabled, the Wait-For step becomes a Soak Step (Constant Setpoints) and the step timer pauses when the process variable is outside the Wait For tolerance. The controller also pauses the step timer when any specified digital input conditions are not met.



The chart below shows a test with a Wait-For Step with WF Guaranteed Soak Features enabled. The places where the Wait-For Step affects the programming timing are shown at the top of the chart.



Note that the setpoints during the WaitFor step are determined by the final setpoints of the prior step and are held constant for the duration of the step. This is true both if the WF Guaranteed Soak Mode is enabled and if it is disabled.

About the Synergy Controller Family

Tidal Engineering's Synergy Controllers; the ¼ DIN Synergy Nano, the 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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