

## Synergy Controller Program Step Descriptions



Tidal Engineering's Synergy Controllers including the ¼ DIN Synergy Nano, the Synergy Quattro, and the Synergy Micro 2 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.

All Synergy Controller models support a programming language that can be used to create complex programs vs. time for up to four channels; i.e. temperature , humidity, pressure, etc. They support seven different step types; **Setpoint**, **Waitfor**, **Jumploop**, **Autostart**, **Stop**, **Pause**, and **Command**. These steps are described in detail below.

This application covers version 3.0.15 and newer. Older versions of the controller software may not support the Pause or the Command step types. Contact us at Tidal Engineering Corporation if you are interested in a free software upgrade.

## Setpoint Step

The Setpoint Step specifies a set of conditions and time duration. The conditions include Channel Setpoints, Event outputs, and humidity operating mode (on Temperature/Humidity Chambers). The Setpoint step is used to ramp the chamber from one condition to another or soak at a constant condition.

Channel 1, the temperature channel must always be on but the other channels can optionally be turned off and not controlled on a step by step basis.

The step duration can be set to a specific time or set to zero. In the latter case the setpoint will go immediately to the step conditions and the program will continue to the next step. If duration (ramp time) is specified, the setpoint will ramp linearly from the starting setpoint to the desired condition during the step.

The last screen of the Setpoint step wizard is the Events screen. Event outputs are generally optional on most chambers and can be wired for example, to enable or disable a UUT, a user device, or a chamber function. Event outputs are set at the beginning of every step and maintained for the duration of the setpoint step. In addition to the user events, Humidity control features such as “Use Drier”, LEV2, and OT11 are set from the Events screen. “Use Drier” enables the drier device (if available) on temperature/humidity chambers and disables the default dehumidify coil. OT11 specifies the output mode for the ambient coil; there are two options; On/Off logic and Time Proportioning logic.

See Program Time Accuracy Considerations concerning the Waitfor step below.

## Waitfor Step

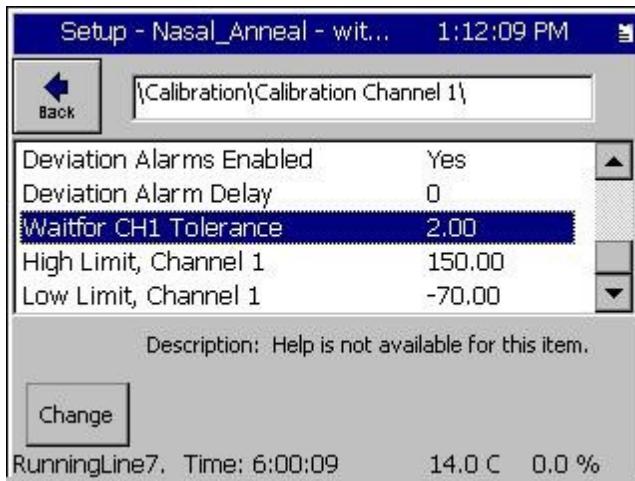
The Waitfor step holds (i.e. pauses) the program execution until the specified conditions are met. Those conditions can be setpoints, time interval, and/or digital inputs.

Waitfor steps can be specified to wait for conditions on any channel. The program will not advance until the process variables (actual temperature, humidity, etc) for the channel(s) reaches the WaitFor value. A programmable WaitFor tolerance can be used to define a window for the WaitFor step. The WaitFor tolerance is available on Synergy Controller versions 3.0.7 and newer. Contact us at Tidal Engineering Corporation if you are interested in a free software upgrade.

In addition to the process variable, Waitfor steps can also wait for a period of time. A value of hours, minutes and seconds specify for the length of time to wait after all other conditions are met. The timer will not start until all process variable targets are met, and any digital inputs are met. Once the conditions are met the WaitFor timer will count down and then the controller will advance to the next step when it reaches zero.

Waitfor steps can optionally wait for one or more digital inputs to be in a specific state. For example, digital inputs can be wired into the Synergy Controller 1) to monitor the unit under test or 2) into a user or computer activated switch closure.

The WaitFor tolerance defines the tolerance band around the WaitFor value. This feature is controlled from the Synergy Controller touch screen as shown below:



The syntax for this Command is as follows:

= WF<sub>n</sub>\_TOL xx.x where xx.x is the tolerance for Channel n, in the current units of measure

The syntax for the Query is:

? WF<sub>n</sub>\_TOL

For example: = WF1\_TOL 2.0 will set the Channel 1 Wait For tolerance to 2.0 Degrees.

See Program Time Accuracy Considerations concerning the Waitfor step below.

## Jumploop Step

The Jumploop step is used to repeat all or part of a program. A Jumploop step is defined by two parameters: the step to jump to and the number of times to jump to it. The count can be from one to two hundred fifty five, or -1 for to set the controller to loop indefinitely.

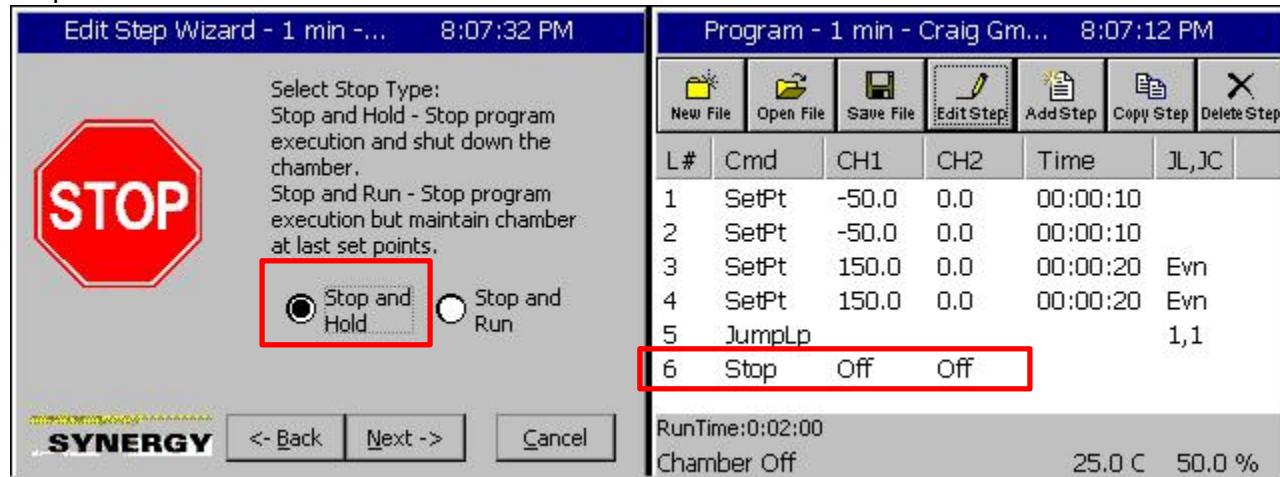
## Autostart Step

The Autostart step is used to automatically start the chamber at some time in the future. The chamber can either be started after a relative time (i.e. ten hours and five minutes from the program start) or at an absolute day and time from the calendar (i.e. Tuesday, November 4th, 2003 at 7:30 AM).

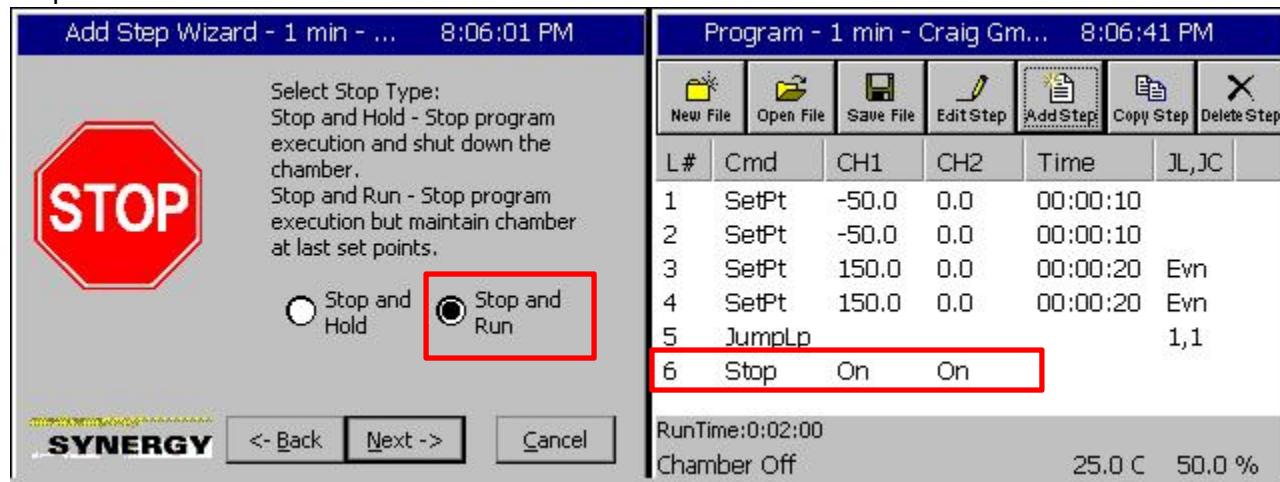
## Stop Step

The Stop step is used at the end of a program and defines the behavior of the controller when the program finished. The Stop Step should be the last step of the program and defines whether the chamber will shut down and turn off (Stop and Hold) or continue to run in steady state mode until manually stopped (Stop and Run). In the latter case the setpoints from the final step will be used as the steady state setpoints. If the Stop Step is not used, the controller will shut off at the end of the program. The screens for these two options are included below.

### Stop and Hold



## Stop and Run



## Pause Step

The Pause step puts the program in pause until the operator presses the Run button or the controller receives the Run command.

## Command Step

The command step is used to insert commands from the communications command set into a program. Commands can include virtually any from the controller command list including PID settings, Deviation Alarm settings, Deviation Alarm Enable/Disable, etc.

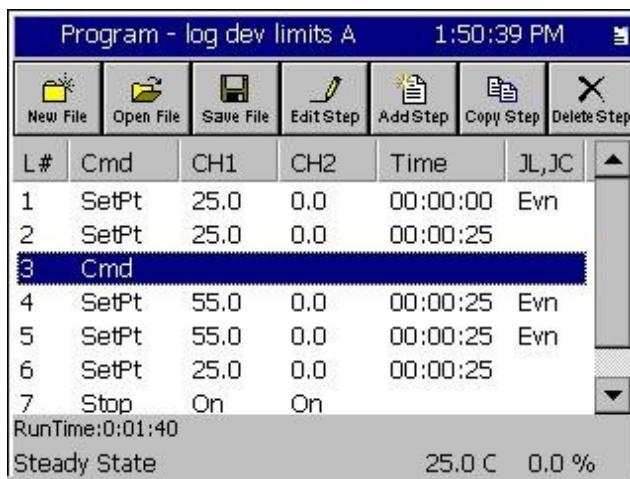
### To use the Command Step

1. Open the Program screen on the controller and create a program using the Add Step button. Include a setpoint step at each location in the program for all the required Command steps to act as a placeholder. Save the program to a USB Flash Drive. (Note that commands steps can be added to a program manually but the step numbers must adjusted accordingly).

2. Open the program on the PC using Note Pad as shown below:

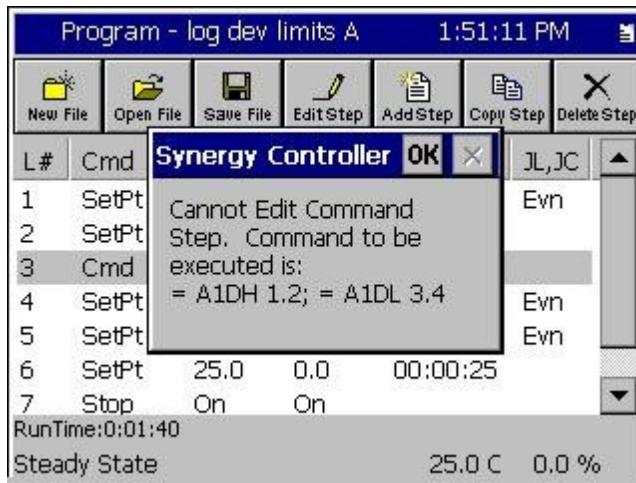
3. Replace each placeholder line with the command(s) from the communications list as shown below.

4. Copy the program back to the controller. The Command step will appear in the Program Screen as shown below.



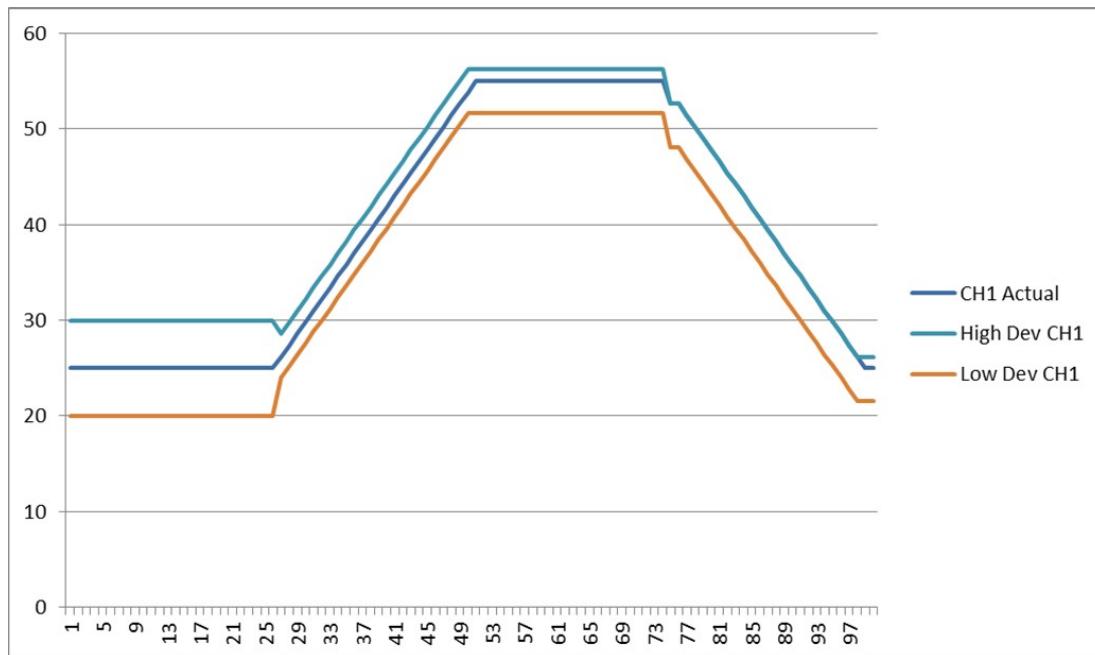
Note that Synergy Controller program files must have the “.VPL” extension. When using Notepad or any other text editor to edit programs, be sure to use the quoted name and path when saving them. For example “log dev limits A.VPL”. Files such as “log dev limits A.VPL.txt” and “log dev limits A.txt” will not be recognized by the controller when browsing for programs.

5. Select the command and press the Edit Step button as shown below to view the contents of the command line.



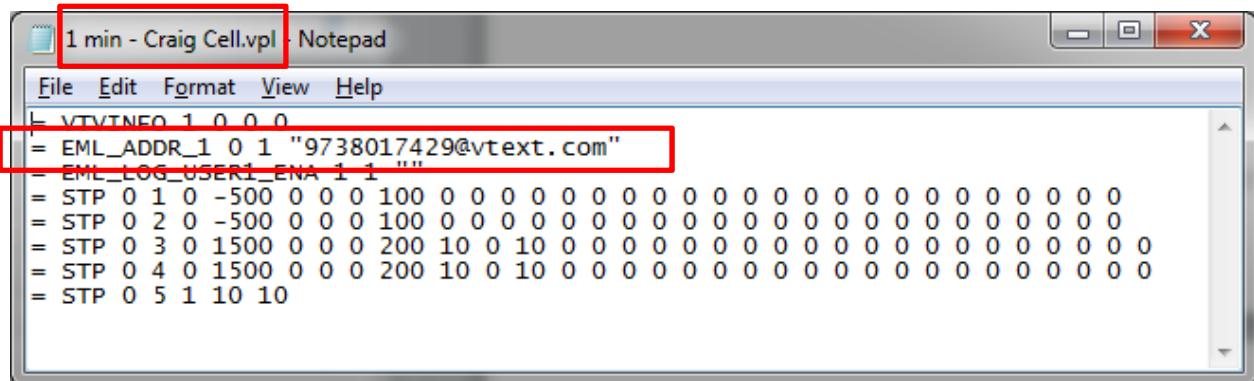
Note that there are no provisions to edit the Command step on the controller screen.

The chart below shows the execution of program “log dev limits A”. Note that the Deviation Limits change from 5.0 Degrees and 5.0 Degrees (High and Low) to 1.2 Degrees and 3.4 Degrees (High and Low) at sample 25.

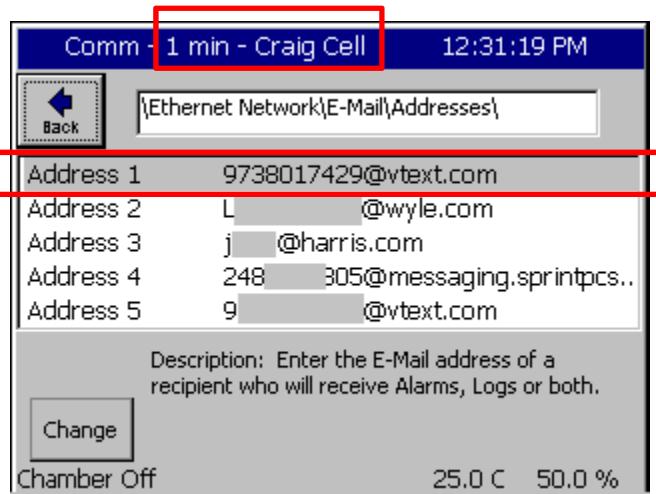


In addition to the command step (type 6) described in the section above, commands can also be placed in the VPL and executed when the program loads (as opposed to being executed when the controller reaches the step number it does for all of the other step types.)

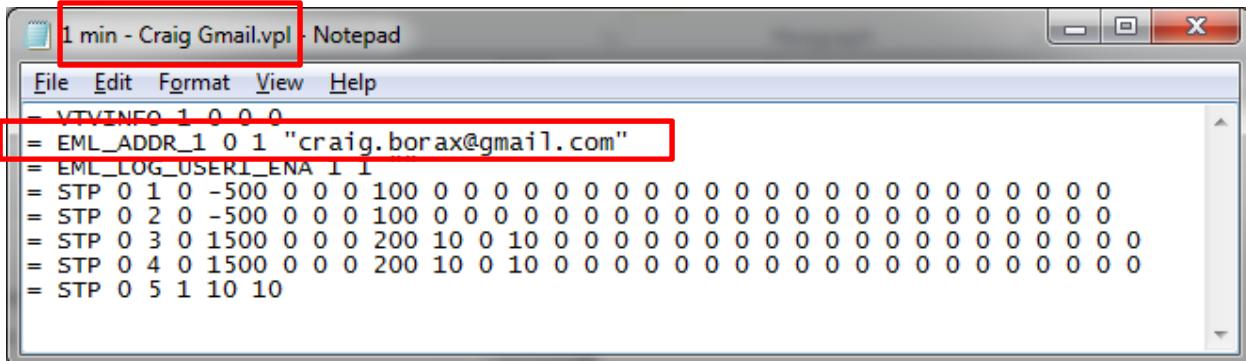
For example, the VPL file below changes recipient e-mail address 1 and sets the Log parameter for recipient 1.



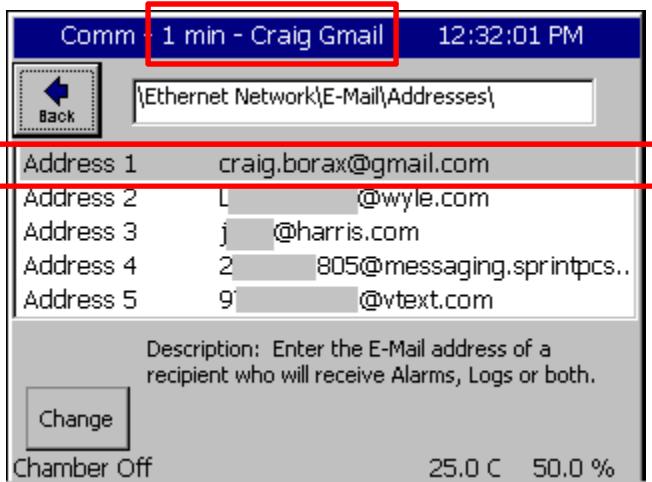
When the program “1 min – Craig Cell” above is opened, the e-mail address for recipient 1 is changed to 9738017439.vtext.com as shown below.



For example, the VPL file below changes recipient e-mail address 1 and sets the Log parameter for the recipient.



When the program “1 min – Craig Gmail” above is opened on the controller, the e-mail address for recipient 1 is changed to [craig.borax@gmail.com](mailto:craig.borax@gmail.com).



Note that it is not necessary to create a place holder with the program editor for commands that are executed at load time since a step number and step type are not required. The place holder is only required for “= STP” commands that should be executed when the program is running.

**Program Time Accuracy Considerations**

The real-time clocks used in all Synergy Controllers are crystal controlled and typically +/- 20 PPM. (About +/- 0.0012 seconds an hour.)

Since the controller software that executes the program samples the real-time clock at a 1 second interval, the program accuracy is typically +/- 1 second.

In general, the time duration of the Setpoint step type is deterministic; it always runs for the programmed duration. Keep in mind, however, that Guaranteed Soak feature, when enabled, will effectively pause the Setpoint step timer when the Temperature Process Variable (PV) is outside the Guaranteed Soak temperature window. Therefore, when Guaranteed Soak is enabled, the duration of Setpoint step is not deterministic and can be longer than the programmed interval.

In addition, the Wait-For step type is designed to be dependent on one or more aspects of the test chamber condition or test equipment status; for example, the temperature PV, or state of one or more digital inputs. Obviously, since the Wait-For step will wait for one or more specific condition, the duration of this type of step is not deterministic and can be longer than the programmed duration.

# Synergy Controller

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## Application Note 11

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### About the Synergy Controller Family

Tidal Engineering's Synergy Controllers; the Synergy Micro 2, Synergy Quattro, and the ¼ DIN Synergy Nano provide state-of-the-art usability and connectivity for environmental test control and data acquisition and 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 visit <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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