Synergy Nano Retrofit for VersaTenn Controllers

Introduction

Synergy Controller is Tidal Engineering’s ® Family of process control systems that can drop into virtually any Environmental Test Chamber and provide state-of-the-art usability and operating efficiency.

Synergy Controller features includes:
- Color touch screen
- Ethernet, RS-232 and GPIB communications
- Built in 100 MB Data logger and Data Acquisition, Up to 64 T-type thermocouples
- Built in Web Server for remote control
- Compatible with Synergy Manager software
- Built in USB port compatible with USB Disk drives for data logging and program transfer.

The Synergy Controller family is specifically designed to easily retrofit legacy VersaTenn applications. They can also retrofit chambers from Envirotech, Thermotron, Blue-M, Cincinnati Sub-Zero, etc.

This Synergy Controller application note describes the steps for a Synergy Nano retrofit installation in a VersaTenn equipped environmental test chamber. This note covers the following steps:

 Step I – Removing the existing VersaTenn Controller
 Step II – Mount the new Synergy Nano Controller
 Step III – Wiring the new Synergy Nano Controller
 Step IV – Configuring the Synergy Nano Controller
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Dangerous voltages are present in this equipment. Disconnect electrical service at source and tag circuit out before servicing or replacing components.

Step I - Removing the existing VersaTenn Controller
1. WARNING! Make certain power has been disconnected from the chamber.
2. Mark and remove the cables from the back of the VersaTenn.
3. Remove the four screws holding the controller in place.
4. Pull the controller from the front of the chamber.
Step II - Installing the new Synergy Controller

1. Place the Synergy Controller on the front of the chamber through the rectangular opening using the appropriate panel adapter. See appendix B for various panel adapter options.

2. Install top and bottom mounting clamps and tighten 3/32” Allen screw with the wrench supplied in the accessories kit. Turn the screw counter-clockwise to tighten and be careful not to overtighten.

3. Mount the TE2242-34 adapter and the TE1151-5 Triac board, if required, to the panel.

4. Plug the Solid State relay connector into the Triac board J1 connector.

5. Connect the existing 34-position ribbon cable from the 12-Channel Triac board 1SM to TE2242-34 adapter.

6. See the Synergy Nano technical manual for cabling and setup for communications, UUT Thermocouple Modules, and other accessories.
Step III – Wiring

Temperature - Humidity Application Wiring

1. Connect the 13 wires from the X1 and X2 connectors to the TE2242-34 assembly as shown below.
2. Connect the 34 position ribbon cable to the 1SM board.
3. Connect the 20 position ribbon cable from the Synergy Nano X4 connector to the TE1151-5 board.
4. Wire the RTD to Synergy Nano X3 as shown below.
5. Wire the Humidity Sensor to Synergy Nano X3 Analog Input 1.
6. Connect the Temp Guard input to the Synergy Nano X2 Digital Input 5 (X2-1 to X2-6) as shown below.
7. Wire the VersaTenn Alarm (VST ALARM) output to the 1SM board as shown on the following page.

Temperature Humidity (NANO_TH_VERSATENN.CDF)
Temperature Only (Cascade) Application Wiring.

1. Connect the 13 wires from the X1 and X2 connectors to the TE2242-34 assembly as shown below.
2. Connect the 34 position ribbon cable to the 1SM board.
3. Connect the 20 position ribbon cable from the Synergy Nano X4 connector to the optional TE1151-6 board for events.
4. Wire the RTD to Synergy Nano X3 as shown below.
5. Connect the Temp Guard input to the Synergy Nano X2 Digital Input 5 (X2-1 to X2-6) as shown below.
6. Wire the VersaTenn Alarm (VST ALARM) output to the 1SM board as shown on the following page.

Temperature Only for Cascade Chambers (NANO_TO_VERSATENNCASCADE.CDF)
Temperature Only Application Wiring.
1. Connect the 20 position ribbon cable from the Synergy Nano X4 connector to the TE1151-5 board.
2. Plug the 15 position cable from the VersaTenn into the TE1151-5 board.
3. Wire the RTD to Synergy Nano X3 as shown below.
4. Connect the Temp Guard input to the Synergy Nano X2 Digital Input 5 (X2-1 to X2-6) as shown below.
5. Wire the VersaTenn Alarm (VST ALARM) output to the 1SM board as shown on the following page.

Temperature Only for Single Stage Chambers (NANO_TO_VERSATENN.CDF)
VersaTenn Alarm Output

In most legacy application, the VersaTenn controller VST Alarm Output is wired to shut down the chamber in case of an alarm condition such as over temperature.

The Synergy Nano doesn’t have a dedicated VST output but the unused output 1SM-12 is assigned this function in NANO_TH_VERSATENN and NANO_TO_VERSATENN_CASCADE Chamber Definition Files.

Tempgard Alarm Input

The Tempgard Alarm input from the Over-Temperature Protection (OTP) allows the Synergy Controller respond to an Over-Temperature condition and to shut down the chamber and record the fault in the Synergy controller log. The auxiliary alarm contact (the contact opens on fault) should be wired to X2, Pins 1 and 6. This feature can be jumped out to get the controller to run, however, the controller’s compressor algorithms will not provide the short cycle timing features designed to protect the compressor(s).

Note that the 1CON auxiliary contact is used in VersaTenn applications that aren’t equipped with a TempGard OTP.
Humidity Sensor Wiring

Connect the Humidity sensor to Analog In 1 as shown below:

Note regarding humidity sensors.
The Vaisala HMM30C was a popular Relative Humidity Sensor for environmental test chamber applications but it is now obsolete. The HMM30C is not temperature compensated. The Vaisala replacement for this sensor, the HMM100 is temperature compensated.

The Synergy Controller should be setup to compensate the HMM30C sensors as follows.
Some software versions will identify the “HMM30C-Ch1” option as “VSLA-Ch1”. These are equivalent.

For HMM100 sensors setup the analog input as “Linear” shown below. Some software versions will identify this option as “Other”. These are equivalent.
Step IV - Configuring the Synergy Nano Controller

1. Confirm all connections are correct and secure.
2. Connect power to the chamber.
3. Confirm that the Synergy Controller LCD displays the boot process, the Synergy Nano logo and finally the MAIN screen.
4. Go to the SETUP screen and select the Chamber Setup folder as shown below.

5. Tap Change and choose the appropriate chamber definition.
   For VersaTenn Temperature/Humidity Chambers, select the NANO_TH_VERSATENN.
   For VersaTenn Temperature Only configurations select NANO_TO_VERSATENN.
   For VersaTenn Temperature Only configurations for Cascade refrigeration applications, select NANO_TO_VERSATENN_CASCADE.
   See the Output mapping table for these configurations on the next page.

   The Dialog will ask you to reset the controller and tap yes when the controller reboots.
If the required Chamber Definition is not in the list, contact Tidal Engineering for an updated Chamber list, then use the Import function on the Chamber Setup screen to copy the required CDF to the controller:

Select the USB Hard Disk from the Drive List and then select the appropriate CDF, then tap Select.
Tap the Import button and then Acknowledge the Dialog as shown below.

![Import Dialog]

Now that the new CDF is loaded on the controller, go back to the beginning of step 5 to select it.

6. Tap the **Restart Controller** button in the Chamber Setup Screen.

![Restart Controller]

7. When the controller reboots, acknowledge the two dialogs confirming the change by tapping OK.
Synergy Nano Chamber Definition Mappings for three popular VersaTenn Configurations

<table>
<thead>
<tr>
<th>NANO_TH_VERSATENN</th>
<th>NANO_TO_VERSATENN_CASCADE</th>
<th>NANO_TO_VERSATENN</th>
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<tr>
<td><strong>Temperature Humidity</strong></td>
<td><strong>Temperature Only (Cascade Refrigeration)</strong></td>
<td><strong>Temperature Only (Single Stage)</strong></td>
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<td><strong>X1 - Main Outputs</strong></td>
<td><strong>X1 - Main Outputs</strong></td>
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<tr>
<td>Out 3</td>
<td>PID Heat</td>
<td>Out 3</td>
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<tr>
<td>Out 4</td>
<td>Boost Heat</td>
<td>Out 4</td>
</tr>
<tr>
<td>Out 5</td>
<td>Low Comp</td>
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<table>
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<th><strong>X2 - Auxiliary Outputs</strong></th>
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<tr>
<td>Event 6</td>
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</table>

For further information concerning the operation of the Synergy Controller please consult the Tidal Engineering website at [http://www.tidaleng.com](http://www.tidaleng.com).

Once there, please download the free SimpleComm and Synergy Manager applications at [http://www.tidaleng.com/download.htm](http://www.tidaleng.com/download.htm).
Appendix A Troubleshooting

When starting up the controller for the first time you may see one or more alarms if there is any problem with the sensor wiring.

To identify the issues, open the Maintenance screen and browse to the Alarms folder as shown below.

![Maintenance Screen](image)

1. TempGard.
   This is the input for the Over-Temperature Protection (OTP) controller. The OTP auxiliary alarm contact (the contact should open on fault) should be wired to X2, Pins 1 and 6. This feature can be jumped out, however, the controllers compressor protection algorithms will not be functional; i.e. shjort cycle timers, etc.

2. Bad Sensor Channel 1
   Connect a three wire 100 Ohm pt. RTD to P3 Pins 2, 3 and 4. 3 and 4 are common.

3. Bad Sensor Channel 2
   Connect a 0-5 V humidity Signal, or a jumper if humidity is not monitored, between P3, Pins 1(Input 1) and 4(Gnd).

Once these inputs are verified, tap the Ack ALL button to acknowledge the alarms.
Appendix B Identify your VersaTenn Controller and pick a panel

Synergy Controllers easily upgrade the following legacy VersaTenn Controllers; VersaTenn, VersaTenn II, VersaTenn III, and VersaTenn IV.

![VersaTenn III Diagram](image)

TE2076 Mounting Panel

<table>
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<tr>
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<th>Rear</th>
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</thead>
<tbody>
<tr>
<td><img src="image" alt="Front View" /></td>
<td><img src="image" alt="Rear View" /></td>
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</tbody>
</table>

**TE2076 Mounting Panel**
TE2094 Synergy Nano VersaTenn Panel Adapter, 6” x 9”
Appendix C Synergy Nano Product Label

![Synergy Nano Product Label Diagram]
Appendix D Identifying Parts

TE2242-34 Adapter and Label

<table>
<thead>
<tr>
<th>Tidal Engineering Corporation P/N TE2242-34</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL OUTPUTS ARE OPEN COLLECTOR, 24 VDC, 50 mA MAX</td>
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<table>
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</tr>
</tbody>
</table>

TE1151-12, 1SM Output Board

TE1151-5 Output Board
Appendix E Reference Materials
Download the Synergy Nano data sheet, technical manual, and installation guide here:

You can access our YouTube channel to see some of the unique features and benefits of our controllers here: https://www.youtube.com/channel/UCxJF1O5aUDzcpdlCCoCKh6w

The application notes on these topics can be accessed using the links below.

AppNote 1 - Replacing a VersaTenn III Controller
AppNote 2 - Synergy Controller Data Logging Capacity Calculations
AppNote 3 - Retrofitting a Qualmark HALT/HASS Chamber
AppNote 4 - Configuring the Synergy Controller to Read from a Bar Code scanner
AppNote 5 - Synergy Controller vs. VersaTenn III
AppNote 7 - Synergy Controller WebTouch Remote Feature
AppNote 8 - Using SimpleComm application to communicate with the Synergy Controller
AppNote 10 - Synergy Controller Retransmit Signal Conditioner
AppNote 20 - Using the TE1908 Single Channel Thermocouple Signal Conditioner
AppNote 25 - Using the Synergy Controller with Space Chamber applications
AppNote 26 - Using the programmable User Alarms with the Synergy Controller
AppNote 40 - Two Point Calibration
AppNote 45 - Using the Synergy Controller’s ftp server
AppNote 49 - Synergy Controller Security Enhancements
AppNote 56 - Using the Synergy Controller Watchdog Timers
AppNote 58 - Synergy Controller Wet-Bulb/Dry-Bulb Humidity Measurements
AppNote 59 - Synergy Controller Wireless Network Setup
AppNote 60 - Graphing Synergy Log Files in Microsoft Excel
AppNote 67 - Synergy Controller Mounting Options
AppNote 71 - Synergy Controller PWM Retransmit Feature
AppNote 72 - Synergy Controller Thermocouple Data Acquisition with Synergy UUT Modules
AppNote 74 - Synergy Controller LED Backlight Retrofit Kit
AppNote 77 - Synergy Controller Remote Start/Stop Feature
AppNote 84 - Synergy Controller E-Mail Feature
AppNote 85 - Synergy Controller Logging Features and Applications
AppNote 89 - Synergy Controller Loop-Back Setup
AppNote 90 - Synergy Controller Network Printing Feature
AppNote 91 - Synergy Controller Built-In Alarms
AppNote 95 - Synergy Controller Kft and other Pressure Display
AppNote 96 - Synergy Controller Analog Retransmit Applications
AppNote 99 - Synergy Server Feature
AppNote 102 - Synergy Certified OEM and Installer Training
AppNote 106 - Synergy Controller Cascade Loop (Part Temperature) Control Feature
AppNote 107 - Synergy Controller Programming with Python
AppNote 109 - Synergy488 Kit Setup for Synergy Nano and Synergy Quattro GPIB
AppNote 112 - General Purpose Logic Programming for OEMS and Integrators
AppNote 113 - Main Screen Display Setup Options
AppNote 116 - Synergy Controller Pressure Applications
AppNote 117 - Synergy Controller Help System Video QR Codes
AppNote 121 - Synergy_Controller_Ramp_Rate_Control
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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