

Synergy Controller Hours and Cycles Maintenance Accumulators



Introduction

Tidal Engineering's Synergy Controllers, including the Synergy Micro 2, Synergy Quattro, Synergy Quattro 2, and the ¼ DIN Synergy Nano and Synergy Nano 2 provide state-of-the-art usability and connectivity for environmental test control and data acquisition. They combine the functionality 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. With the flexibility afforded by their multiple communication ports; Ethernet, GPIB/IEEE 488, and RS-232, these controllers are perfect for today's dynamic testing environments.

The Synergy Controller Hours and Cycles Maintenance Accumulators (HCMA) were developed for organizations using predictive maintenance to reduce downtime and save maintenance costs.

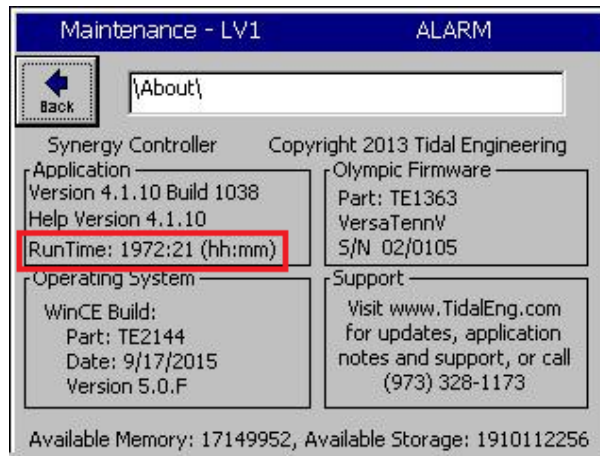
Total Productive Maintenance (TPM) is used to improve production, safety and quality systems. The cycle counts and runtime hours are accumulated for every output and alarms and warnings can be programmed when component life limitations must be anticipated. This application describes these HCMA features.

Information and features concerning HCA Data Persistence, Protection and Redundancy is included in Appendix A.

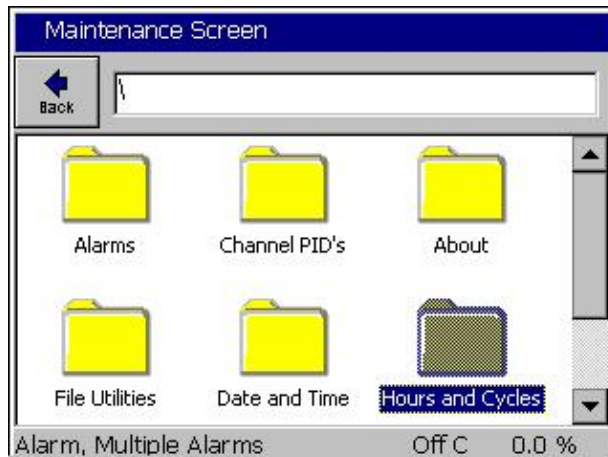
The Synergy Controller HCA feature is available beginning Version 5.3.x .

Hours and Cycles Accumulators

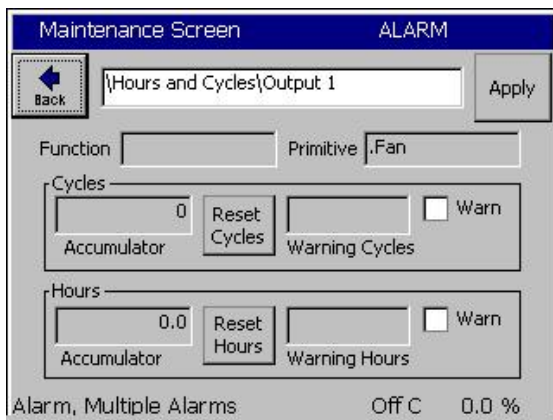
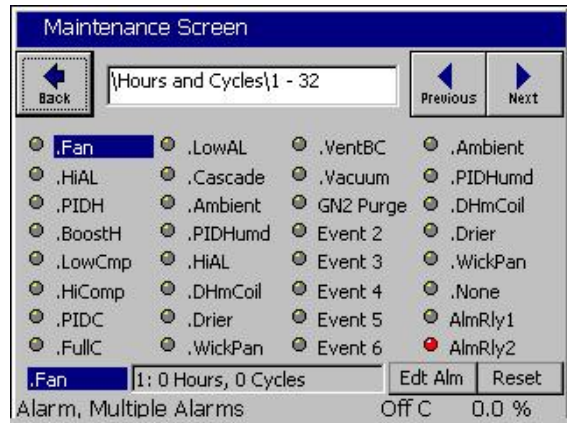
These Hours and Cycles Accumulators extend the functionality of the RunTime Meter feature first available in Synergy Controller version 2.x.x. They are designed to monitor the two principle wear-out mechanisms in mechanical systems, run-time and cycle count, and are used both to measure component lifetime and to schedule preventative maintenance to avoid unscheduled down-time.



These features are access from the Maintenance Screen by clicking on the Maintenance Counters icon.

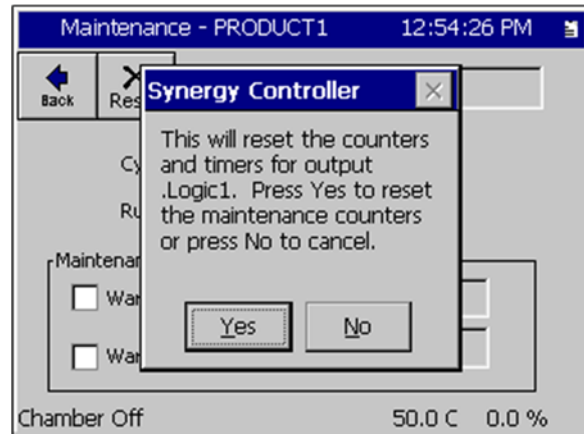


The operational time and cycle count variables are displayed at the bottom of the screen for the selected Output. Click on any output to show the output's counters (including Virtual Outputs).



To reset an Output's hours and cycle accumulator, select the Output and press the **Edit Alarm** button. From this screen, the HCAs and their Alarms can be set and cleared.

The controller will prompt the user for confirmation after the **Reset** button is pressed.





To reset all counters and timers in the system, click the **Reset All** button. The controller will prompt the user for confirmation after the **Reset All** button is pressed.

Algorithms

For On-Off outputs, the Cycle Count increases for each transition from On to Off. The Timer increases each second the output is on.

For PWM outputs, the Cycle count is incremented:

- once each period when the output is > 0% and < 100%.
- when the output is turned off.
- or after one or more full 100% on cycles output drops below 100%.

For PWM outputs, time is accumulated based on sum of the output percentages taken each second of the Output's period.

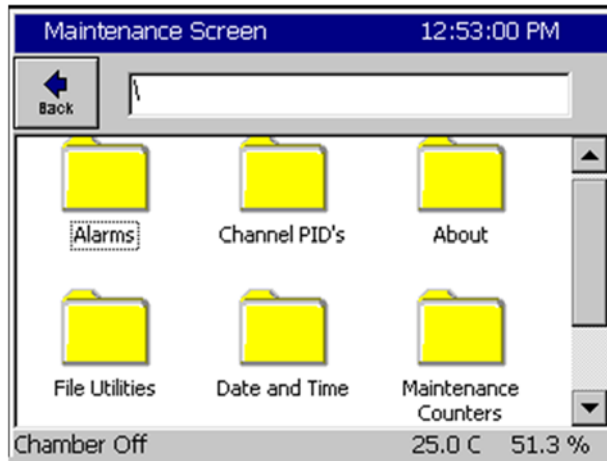
When reset button is pressed or the reset command is received, the cycle count value and runtime hours accumulators are both reset back to zero.

Creating Alarms with HCA

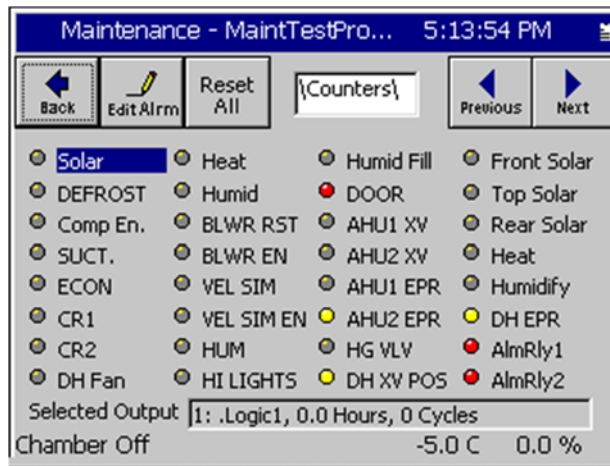
The Synergy Controller calculates HCA data for every output. There are two ways to create alarms for specific outputs to help with preventative maintenance, for example for cryogenic valves and compressors: 1) Maintenance warnings can be setup from the Maintenance Accumulator screen, or 2) the User Alarm System SETUP\User Alarms can be used to create Maintenance warnings.

Creating Alarms from the Hours and Cycles Screen

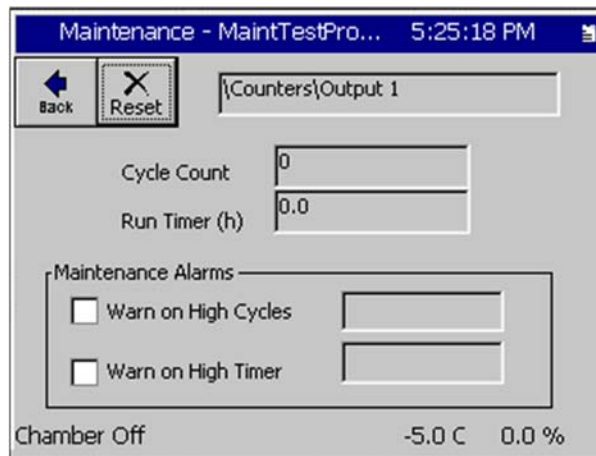
Access the Maintenance Accumulators from the Maintenance screen by clicking on the Hours and Cycles folder icon. Creating or modifying HCA warnings through the Maintenance Counter screen will create, modify and delete custom User Alarms. It is a simplified method of creating the alarms described in the next section.



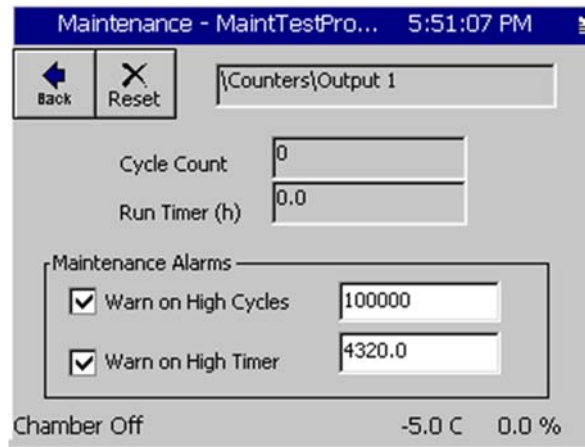
Select an output and then click on the **Edit Alarm** button.



Use this screen to reset any output's counters and timers, view the current counters, and view and modify HCA Alarms.



To enable an HCA alarm, click on “Warn on High Cycles” to alarm on high cycle counts, or “Warn on High HOURS” to alarm on high runtime. After selecting these options, click on the text boxes to the right and enter the alarm threshold (hours or cycles). The screenshot below shows a cycle warning at 100,000 cycles, and a runtime warning at 4320 hours (180 days of runtime).



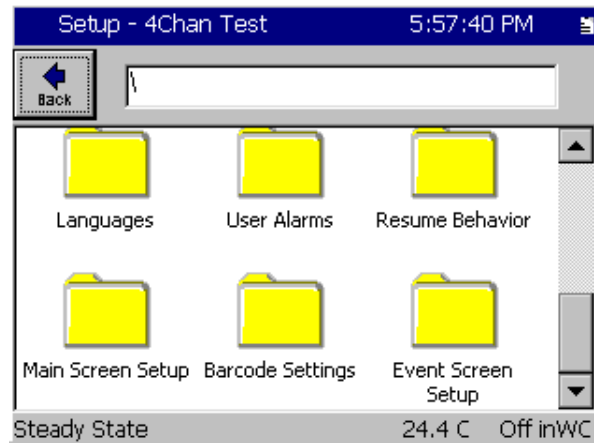
Unchecking one of the HCA Alarms will remove the alarm. Modifying the alarm value will update the alarm. Any changes will be saved when you click on the **Back** button.



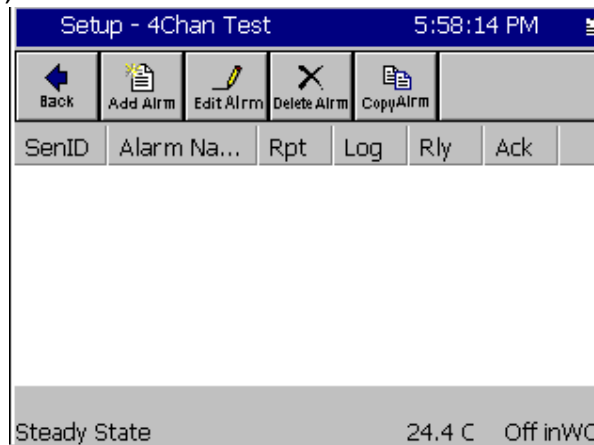
Press Yes to save the changes. Press No to discard the Changes. Press Cancel to return to the screen and continue to make changes.

Creating Alarms for HCAs using User Alarms

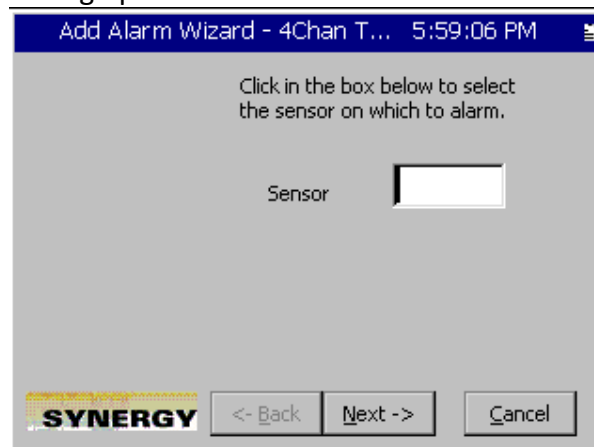
On the Setup screen, click on User Alarms



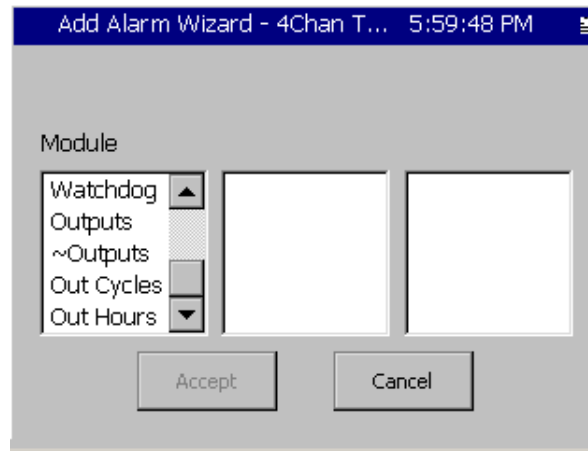
In the User Alarm screen, click on Add Alarm.



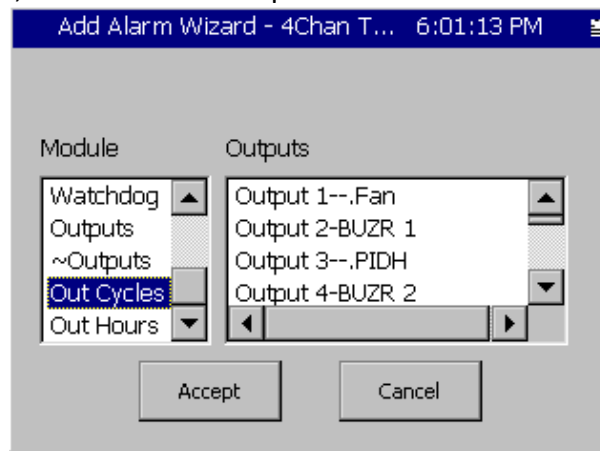
Click in the Sensor field to bring up the Sensor Select screen



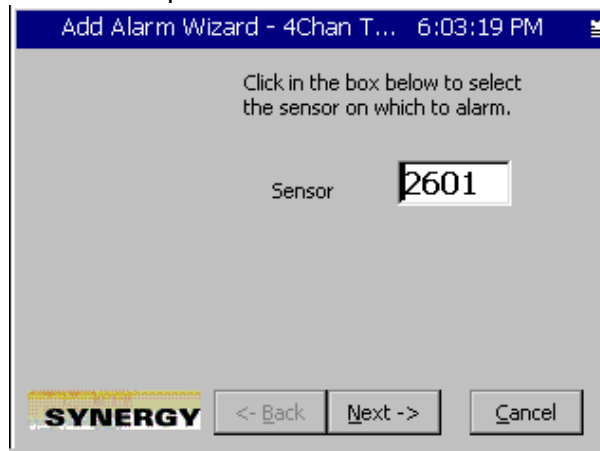
At the bottom of the Module list, are entries Out Cycles and Out Hours. These stand for Output Cycles and Output Hours. Selecting either of these options items will populate a list of all outputs in the system.



Select the desired output, and click the 'Accept' button.



Click 'Next' to continue with the setup.



For the comparison, select 'Greater Than' and for Data Scaling, select 'Raw Value'. Click 'Next'.

Add Alarm Wizard - 4Chan T... 6:04:53 PM

Click in the boxes below to select the comparison type and data scaling.

Comparison: (Sensor vs. Threshold)
Greater Than

Data Scaling:
Raw Value

SYNERGY <- Back Next -> Cancel

Enter the alarm threshold (such as 10,000 cycles as shown)

Add Alarm Wizard - 4Chan T... 6:07:37 PM

Click in the box below to enter the alarm threshold.

Alarm Threshold: 10000

SYNERGY <- Back Next -> Cancel

Enter an alarm string

Add Alarm Wizard - 4Chan T... 6:08:43 PM

Click in the box below to enter the text that will be displayed when an alarm is active, as well as logged into the log (if selected next step).

Alarm:
Fan Cycle Warning

SYNERGY <- Back Next -> Cancel

Select Alarm actions. For a warning, be sure to not check 'Disable Chamber'



Click Next, and then click Finish. The alarm is now created and will warn once the Output reaches 10,000 cycles.

Appendix A HCA Data Persistence, Protection and Redundancy

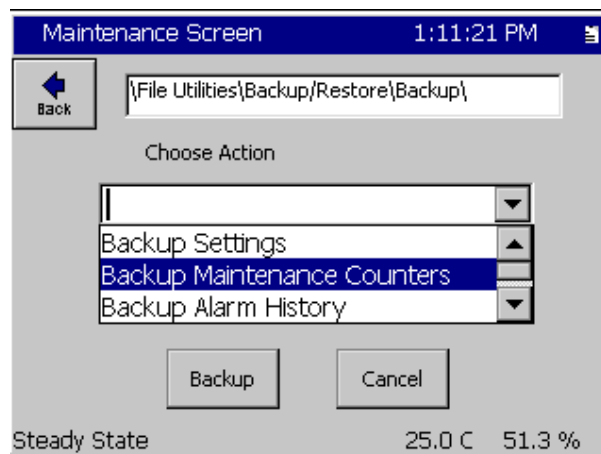
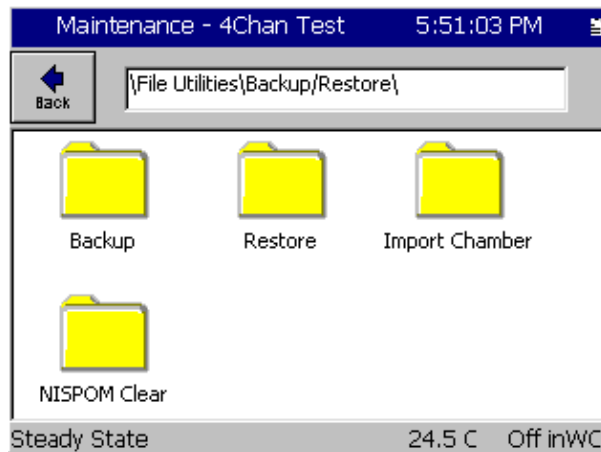
HCA data (cycle counts and runtime hours) are stored in a primary and backup file on the Synergy Controller. The primary file is \Storage Card\running.dat. The backup file is \FlashDisk\running.dat. The HCA values are written to disk every 30 minutes.

At startup, the file with the newest timestamp (defaulting to the version on the Storage Card if the timestamps are identical) is loaded first. If there is an error loading or reading the primary file, a dialog prompts the user to either load data from the backup or older copy, or to reset the maintenance counters to zero. If the Maint\File Utilities\ file doesn't exist or can't be read, the maintenance counters are reset and a message indicating that "The HCA values have been reset".

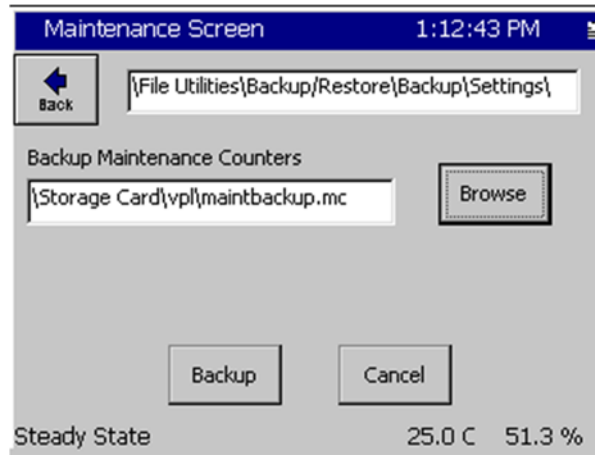
Importing and Exporting HCA Data

To import or export HCA data (when creating a backup, loading exported maintenance counter data onto a new controller after a hardware change, etc.), users can access the Backup and Restore functions under File Utilities on the Maintenance Screen.

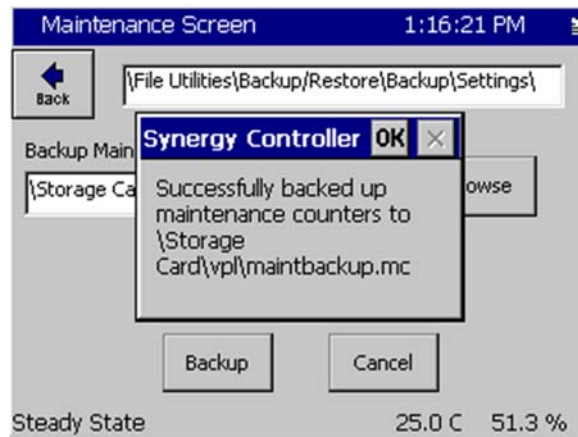
Browse to Maint\File Utilities\Backup/Restore.



The controller will prompt for the save location for the backup file. Select an appropriate location to backup the maintenance counters to (such as a USB drive).

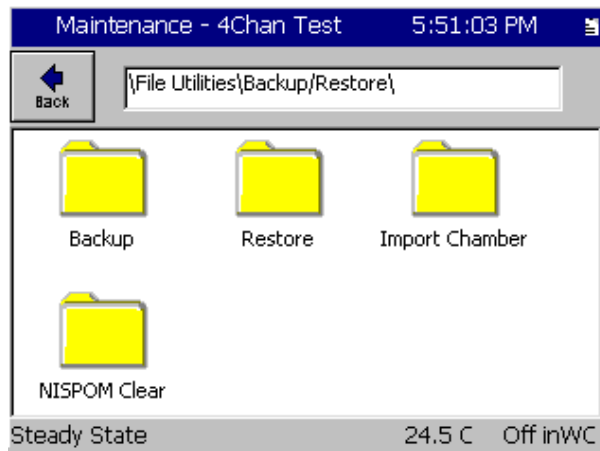


Select the backup location and Press the 'Backup' button to backup the maintenance counters. Once the backup is complete, a message will confirm the success of the backup. Store the backed up maintenance counters in a safe location.

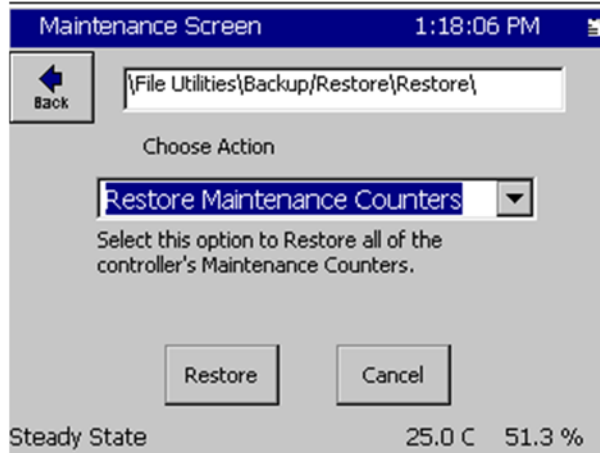


Importing HCA Data

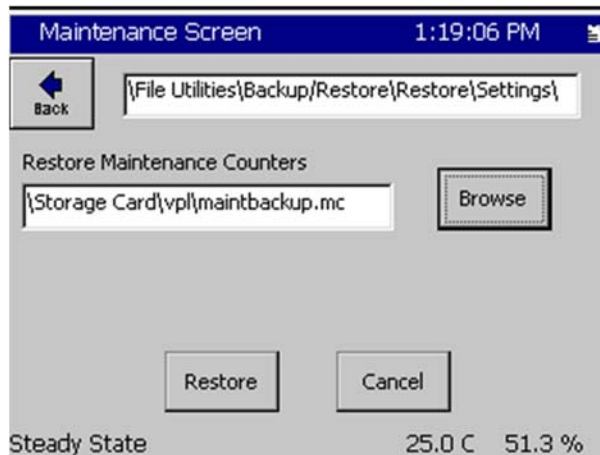
To import (or restore) HCA data, from the 'Backup/Restore' screen under the Maintenance Screen, click on Restore.



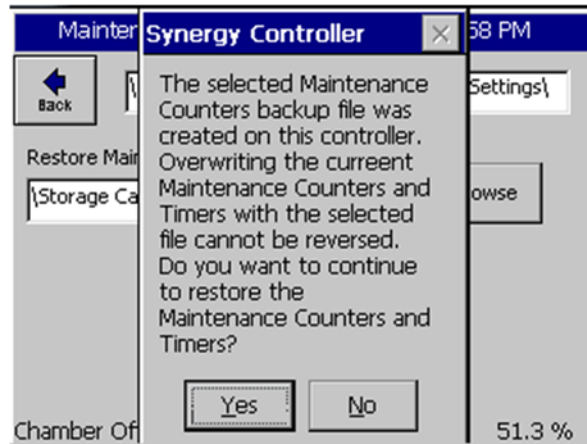
Select 'Restore Maintenance Counters' and press the 'Restore' button.



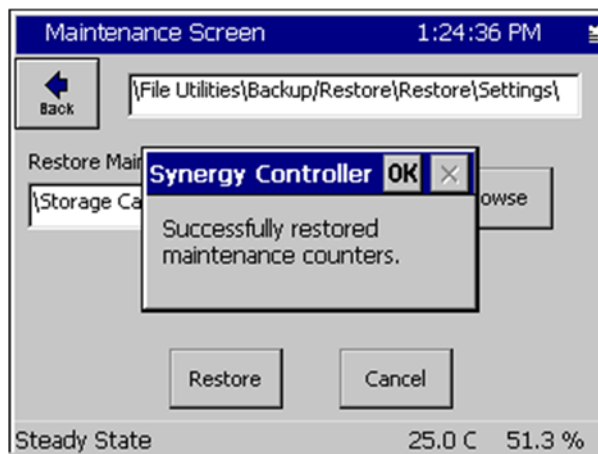
Select the restore file and then press the 'Restore' button.



A prompt will appear requiring the user to confirm they would like to restore the selected maintenance counters. If the maintenance counters were exported from a different controller serial number, the user will be warned of that as well. Click **Yes** to restore, or click **No** to cancel the operation.



A confirmation window will be displayed to confirm the loading of the maintenance counters from the selected file.





About the Synergy Controller Family

Tidal Engineering's Synergy Controllers, both the Synergy Micro 2, Synergy Quattro, and the 1/4 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. These controllers 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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