THERMOTRON®

A Venturedyne, Ltd., Company

8825 Display Module Instruction Manual

Revision 7: August 14, 2019

This generic manual is intended for reference purposes only and is not intended to be used to operate your equipment. For operating instructions and a description of the features used on your specific control system, see the hard copy manual set for your Thermotron product.

This manual provides the most current generic operating instructions for this controller at the time of its revision date. Therefore this manual may not include some recent software changes. This manual may also cover features that are not available on your current controller. Examples within this manual are for typical configurations that may not apply to the configuration of your control system.

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Section 1: Setup

Introduction to the 8825 display module

NOTE: For information on the CM2 control module, refer to the *CM2 Control Module Technical Manual*.

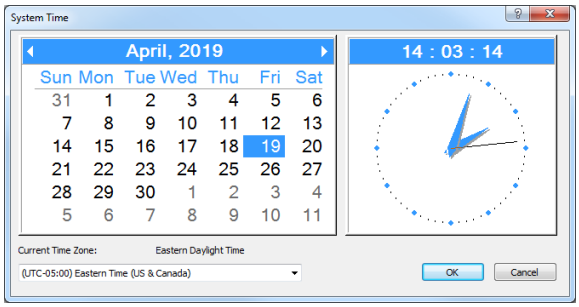
The 8825 display module uses a CM2 control module, an SBC unit running Windows, and a touch screen monitor to control an environmental test chamber. The display module uses a software application written for a Windows environment. The application allows you to operate an environmental test chamber using the 8825 display module touch screen and the CM2 control module. **NOTE**: The 8825 will always power up and auto-run the 8825 application. Any attempt to circumvent this operation and enter the Windows operating system without specific Thermotron guidance will void the warranty of the control system.

Using the touch screen

The touch screen monitor is the only user input device. To push a button or make a selection, touch the appropriate area of the screen with the supplied stylus. **NOTE**: To calibrate the touch screen from any screen, hold the stylus against the touch screen for 10 seconds and follow the instructions on the screen.

When you touch a specific area of the screen one of several things could happen:

- ***The button will remain "in" and perform the desired function.*** For example, touching the **Manual** button will switch the display to the manual mode screen.
- ***A date/time selector will appear***, enabling you to set or select a date and/or time.
- ***A radio button, check box, or line will be selected.*** Touching the item a second time will deselect it.
- ***A drop-down menu will appear***, enabling you to make a selection from a list.



- ***The alphanumeric keypad will appear.*** Use the keypad to enter an alphanumeric value into the field. The 8825 will highlight the last key pressed. Press **Enter** to accept the value, or press **Cancel** to close the keypad without entering a new value.

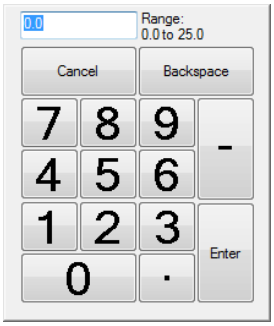
  For example, when you touch a channel name field on the **Chan / Aux Names** panel, the keypad will appear, indicating that you can enter an alphanumeric value.

  The alphanumeric keypad defaults to lowercase letters. To enter uppercase letters or the symbols on the number keys, press **Shift** and then the desired letter keys. To return the keypad to lowercase letters, press **Shift** again.

  The **Backspace** key deletes the character to the left of the cursor. The left and right arrow keys, located on either side of the **Space** key, move the cursor to the left and right in the display field at the top of the keypad.

- ***A numeric keypad will appear.*** At the top of the keypad is a small display field as well as an indication of the allowable range of the selected field. Use the keypad to enter a numeric value into the field. Press **Enter** to accept the new value, or press **Cancel** to close the keypad without entering a new value into the field.

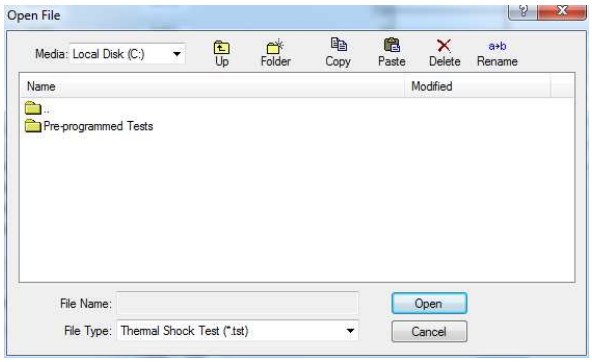
  For example, when you touch the **Deviation** field on the program screen, the numeric keypad will appear, indicating you may enter a value between 0.0 and 25.0 into the field.



File functions

The 8825 uses standard Windows dialog boxes for opening and saving files (such as program files or graph settings files). The buttons at the top of the dialog boxes also allow you to copy, paste, delete, and rename files.

Files may be loaded from and saved to the internal hard drive, a network drive, or an external USB drive.



8825 file types

The following table describes the types of files used by the 8825:

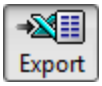
File type	*Extension*	*Access screen*	*8825 functions*	*Description*
Chamber configuration	.pck	Main	Save and open	Allows the user to back up and restore the chamber configuration.
7825 configuration	.cfg	Main	Open	Allows the user to load a Thermotron 7825 programmer/controller configuration into the 8825.
Chamber data	.csv	Graph	Save	Comma-delimited data that can be opened in standard spreadsheet programs.
Graph picture	.bmp	Graph	Save	A bitmap of the current graph that can be opened in standard graphics programs.
Graph view settings	.gvs	Graph	Save and open	Allows the user to back up and restore customized graph view settings.
Thermal shock test	.tst	Program	Save and open	Prints the currently selected test as a combined graph and spreadsheet.
Program	.pgm	Program	Save and open	Allows the user to back up and restore an 8825 program.
7825 program	.prg	Program	Open	Allows the user to load into the 8825 a program written for a Thermotron 7825 programmer/controller.
Control parameters	.prm	Setup/ Control Parameters	Save and open	Allows the user to back up and restore control parameter settings.

The 8825 has a virtually unlimited amount of storage space for settings and data. The only limit on the 8825 storage capacity is the available space on the internal hard drive. **NOTE**: Once the drive is full, the oldest data is automatically deleted to make space for new data.

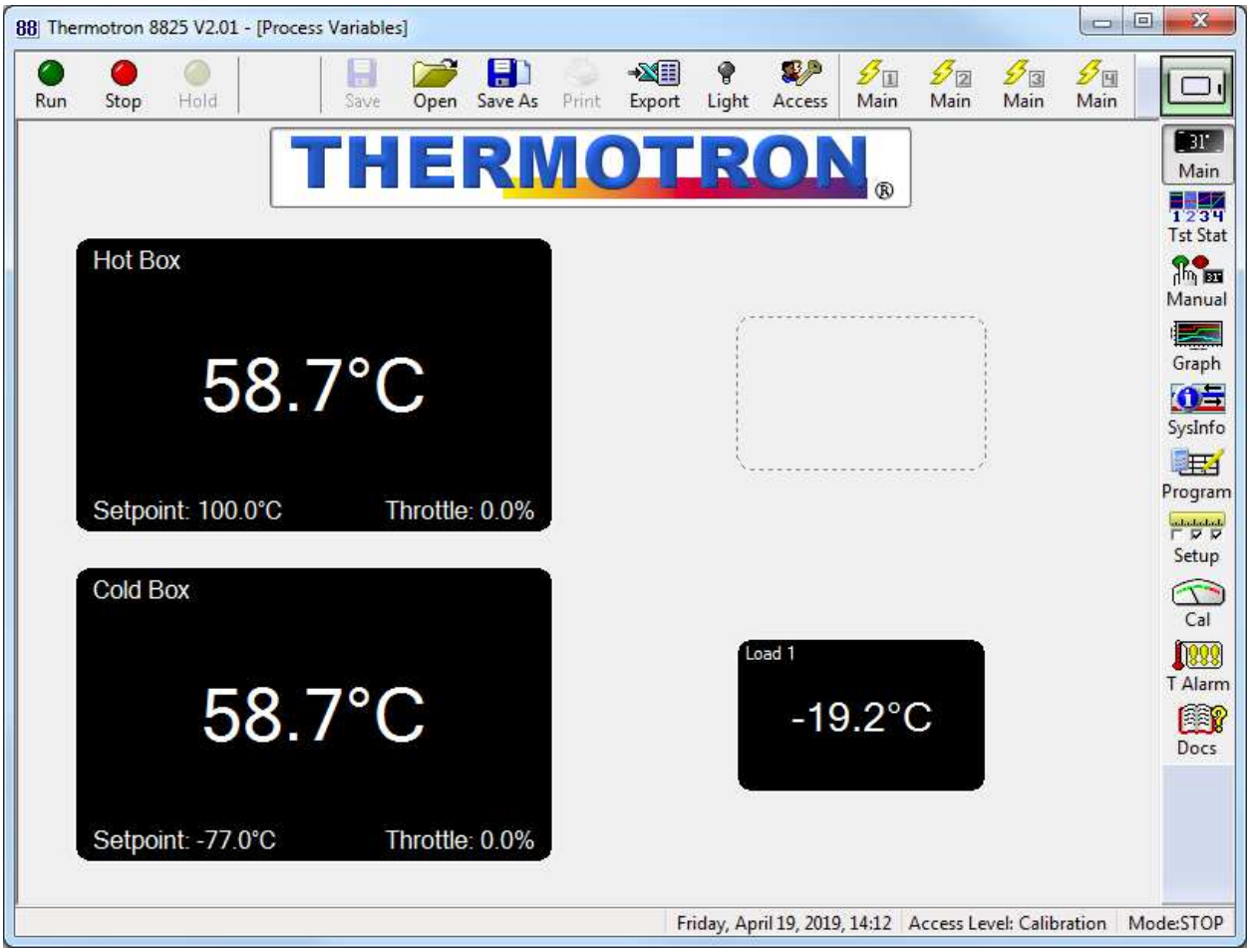
NOTE: The 8825 Backup Wizard helps you create a backup of your programs, settings, and data files so you can prevent data loss and damage caused by disc failures, power outages, virus infections, and other potentially damaging events. The 8825 Restore Wizard helps you restore your previously backed-up data in the event of a hardware failure, accidental erasure, or other data loss or damage. For more information, see "Backup / Restore panel" later in this section.

Exporting 8825 data

Press the **Export** button from any screen to start the Export Data Wizard. This wizard provides step-by-step instructions for exporting program or data log files from the 8825.



8825 display controls

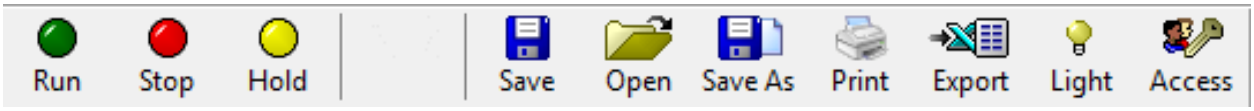


The 8825 display is made up of the following parts:

- The selected screen or panel in the center of the touch screen. The above illustration shows the main screen, which displays the channel name, current process variable, set point, and throttle for each active channel.
- The action buttons, which are always available at the top of the touch screen. For more information, see "Action Buttons" later in this section.
- The function buttons, which are always available along the right side of the touch screen. Function buttons are used to select the various 8825 screens and panels. For more information, see "Function buttons" later in this section.
- The current date, time, access level, and mode of the 8825 display module, which are always displayed at the bottom of the touch screen.
- On thermal shock chambers, a door icon in the upper right corner of the display indicates whether the chamber door is closed  or open  . For information on the door options, see "Actions to take when door is opened" later in this section.

Action buttons

The action buttons are always available at the top of the touch screen. The following paragraphs list the action buttons and briefly describe their functions.



Run In manual mode pressing the **Run** button starts running a manual mode test. When not in manual mode pressing the **Run** button brings up the Run Options dialog box. When a test is running, the green indicator is lit. When a scheduled program is pending, the blue indicator is lit.

Stop When a test is running, pressing the **Stop** button brings up the Stop Confirmation dialog box.

- To stop the test press **Yes**. When a test is stopped, the red stop indicator is lit.
- To cancel the stop request and continue running the test, press **No**.
- To disable stop confirmation, check **Do not ask this again**, or uncheck **Confirm Stop Key Press** on the System Setup panel of the setup screen.

Hold Pauses a test and lights the yellow hold indicator. To resume the test at the same point it was paused, press **Run**.

Save Saves a new or modified file.

Open Loads a saved file.

Save As Saves a file under a new name or in a new location.

Print Prints the currently selected program or graph.

Export Starts the Export Data Wizard. This wizard provides step-by-step instructions for exporting program or data log files from the 8825.

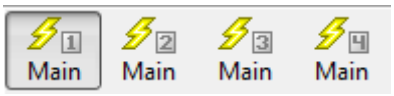
Light Turns the chamber light on and off. When the chamber light is on, the button's yellow light indicator is lit.

Access Brings up the Change Access Level dialog box, allowing you to change the access level and password of the 8825 display module. For more information, see "Changing access levels and passwords" later in this section.

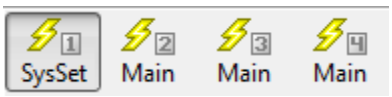
Quick navigation buttons

The user-defined quick navigation buttons allow you to switch quickly between frequently used screens and panels. To assign a quick navigation button:

1. Go to the screen or panel you want to access with a quick navigation button.
2. Press and hold one of the quick navigation buttons.
3. The button name will change to the name of the selected screen or panel.



For example, press the **Setup** button and then select the System Setup panel. Press and hold the first quick navigation button. The button name will change to **SysSet**. The button now can be used to take you directly to the System Setup panel.



Function buttons

The function buttons are always available on the right side of the screen. The following paragraphs list the function buttons and briefly describe their functions.

The **Main** screen displays all currently active control channels in a large, easy-to-read format. In addition to the current value of each channel, the current setpoint and throttle also are displayed.

The **Tst Stat** button accesses the test status screen. This screen allows you to view the status and options for the currently loaded test or program.

The **Manual** screen allows you to run the chamber manually, without preprogrammed times.

The **Graph** screen allows you to view the logged data as a graph as well as select what data will be graphed and how that data will be displayed.

The **Sys Info** panels provide status and diagnostic information.

The **Program** button accesses the program screen. This screen allows you to create, save, load, and modify programs.

The **Setup** panels allow you to modify the system and control parameters, computer interface/network settings, service messages, system events, and channel/auxiliary names.

The **Cal** button accesses the calibration panels. For more details, see the *CM2 Control Module Technical Manual*. **NOTE**: The **Cal** button appears only when the controller is in the Calibration access level.

The **T Alarm** accesses the Therm-Alarm panels. These panels allow you to view and change the Therm-Alarm settings and calibrate the Therm-Alarm. **NOTE**: The **T Alarm** button appears only if your chamber is equipped with one or more Therm-Alarms.

The **Docs** button accesses the online Help system, which allows you to get help on any topic relating to the 8825 control system.

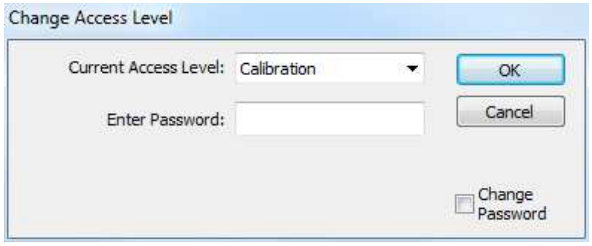
Changing access levels and passwords

The access level function allows you to select from six different levels of access to the 8825 functions. The following table provides a general overview of which functions are available at each access level.

Name	*Functions available*
Locked	All functions are locked out. Most information may be viewed but not modified.
Level One	Program run, stop, and hold modes are enabled.
Level Two	Data logging and manual mode operation are enabled.
Programmer	Program creation/editing/graphing and clock setting are enabled.
Lab Manager	System parameters and process alarms can be set.
Calibration	Calibration and other advanced functions are enabled.

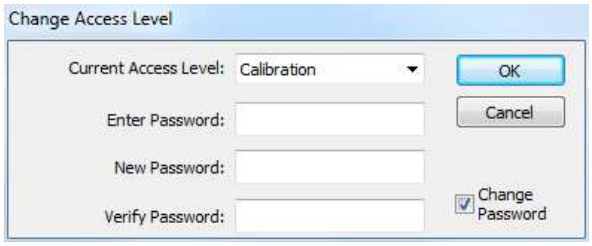
Authorized users can set the access level using a special password. Once the current password is entered, the authorized user can also select a new password.

1. Press the **Access** button at the top of the screen. The Change Access Level dialog box will appear.



2. To change the access level:
   a. Select the desired access level from the Current Access Level drop-down menu.
   b. If no password has been set, press **OK**.
   c. If a password has been set, select the Enter Password field, use the alphanumeric keypad to enter the password, then press **OK**.

3. To change the password:
   a. Select the Change Password check box. The New Password and Verify Password fields will appear.
   b. If no password has been set, go to step 3.d.
   c. If a password has been set, select the Enter Password field and use the alphanumeric keypad to enter the password.



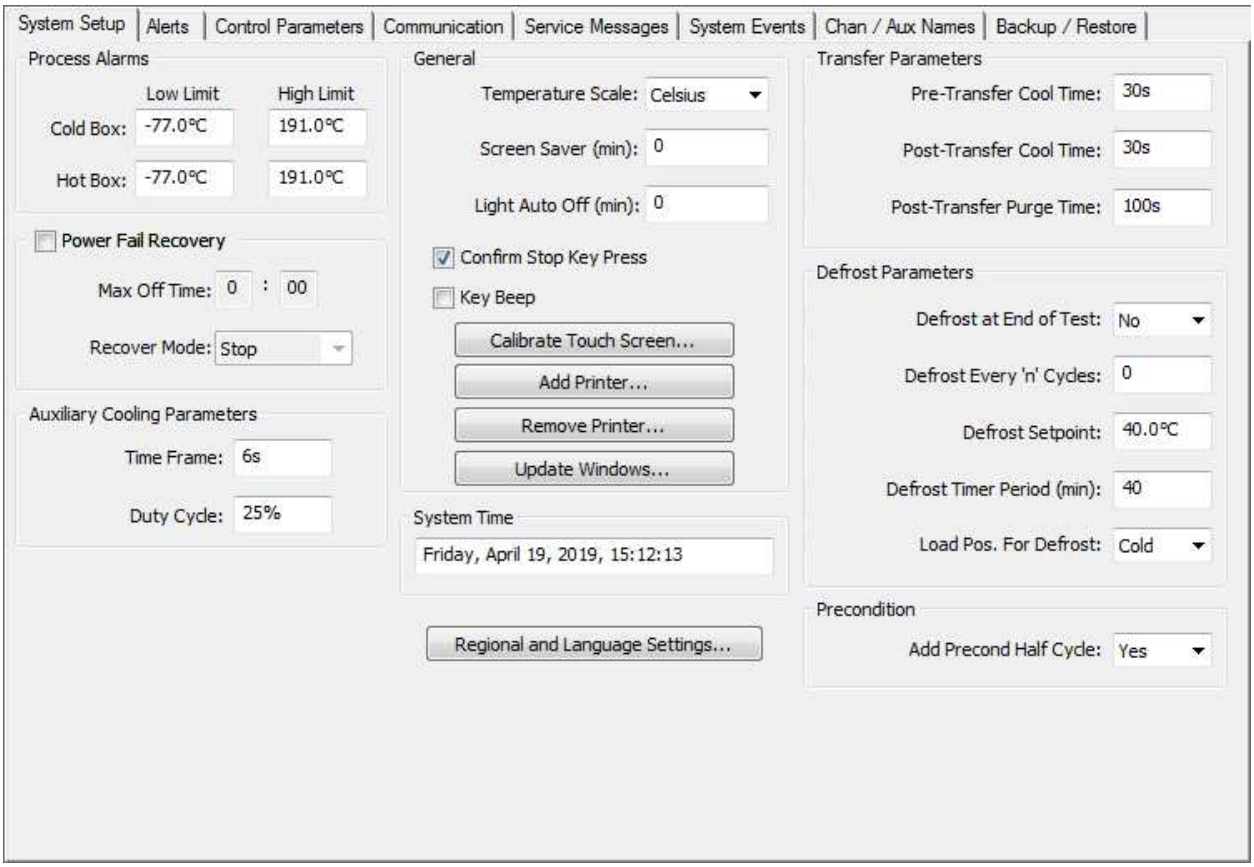
   d. Select the New Password field and use the alphanumeric keypad to enter the new password. Passwords may consist of up to 20 keystrokes using any keys except **Enter** and **Cancel**.
   e. Select the Verify Password field and enter the new password again.
   f. To accept the new password press **OK**, or press **Cancel** to exit without changing the current password.
   g. If you did not enter the new password correctly, this error message will appear:

   h. Press **OK** and repeat step c.

Using the setup panels

Press **Setup** to access the setup panels. These panels allow you to configure the 8825 display module to meet your specific testing needs. This section describes the setup panels and how to use them. To return to the main screen from any setup panel, press **Main**.

System Setup panel



NOTE: To change most settings on the System Setup panel the 8825 access level must be Lab Manager or higher.

General settings

1. From any screen press **Setup**, then select the System Setup panel.
2. Under General select a field and enter or modify the setting. For numeric values the keypad will display the allowable range of the selected field. The following describes each field:
   - Select the **Temperature Scale** (Celsius or Fahrenheit) the 8825 will use to display temperature values.
   - The **Screen Saver** field allows you to enter the number of minutes of idle time before the screen saver is displayed. A value of 0 disables the screen saver function.
   - The **Light Auto Off** field allows you to enter the number of minutes of idle time before the chamber light is automatically shut off. A value of 0 disables the automatic light shut-off function.
   - To disable stop key confirmation, uncheck **Confirm Stop Key Press**. This will prevent the **Stop Confirmation** dialog box from appearing whenever the **Stop** button is pressed.
   - To toggle on or off an audible key beep each time a key is pressed, check or uncheck **Key Beep**.
   - To calibrate the touch screen, press **Calibrate Touch Screen** and follow the instructions on the screen.

- To add a printer, press **Add Printer** and follow the instructions on the screen.
- To update the Windows operating system, press **Update Windows**. This will launch a browser and attempt to connect to the Windows Update server on the Internet. If your company uses a proxy server you will need to supply that information.
- If you want to change the language you use to view and enter text, or how the 8825 formats numbers, time, and dates, press **Regional and Language Settings** and adjust the language or regional formatting settings.

Setting process alarms

CAUTION: It is *your* responsibility to set process alarm limits appropriate for your product. Process alarms will not guarantee the safety of your product. To protect your product from temperature extremes, you must properly configure and use a product protection device such as a Therm-Alarm. If you are testing expensive products, you should have an additional back-up product protection device.

Each channel of the 8825 can be set up to activate an alarm if the temperature, humidity, or other process variable exceeds high or low limits you select. If the variable exceeds the high or low limit, the 8825 enters stop mode. Factory-specified limits are programmed into the 8825. Air and load temperature channel limits typically are -97°C to +200°C. Humidity channel limits typically are 0 to 100% RH.

1. Press **Setup**, then select the System Setup panel.
2. Under Process Alarms select a low or high limit field.
3. The numeric keypad will appear. The allowable range of the selected field appears beside the small display field at the top of the keypad.
4. Enter the desired limit for the channel, then press **Enter**.

Power failure recovery

If the 8825 is in run or hold mode and a power failure occurs that is longer than the **Max Off Time** setting, the 8825 will automatically power up in the mode selected under **Recover Mode**. If the **Max Off Time** is set to 0:00:00, this feature is disabled and the 8825 will power up in whatever mode it was in when power was lost.

1. Press **Setup**, then select the System Setup panel.
2. To enable or disable power fail recovery, check or uncheck the **Power Fail Recovery** check box.
3. For **Max Off Time** select the number of hours and minutes power must be lost before the 8825 enters power failure recovery mode. The keypad will display the allowable range of each field.
4. From the **Recover Mode** drop-down menu select a mode to power up in following any power failure that exceeds the **Max Off Time** setting. The available settings are:
   - **Stop**: The 8825 will stop the test that was running when power failed.
   - **Hold**: The 8825 will hold the test at the point reached when power failed.
   - **Run**: The 8825 will return to the mode it was in when power failed.
   - **Restart**: The 8825 will start running the test again from interval 1.

Auxiliary cooling parameters

Some chambers are equipped with optional liquid nitrogen (LN_2) or carbon dioxide (CO_2) auxiliary cooling systems. When the refrigeration system is operating at full cooling throttle, the auxiliary cooling system can be operated for a programmed percentage (duty cycle) of a selected time frame.

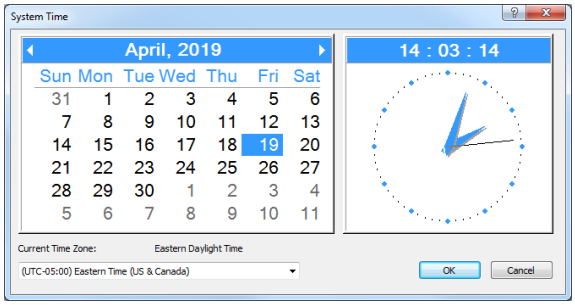
For example, if you set the auxiliary cooling time frame to five seconds and the duty cycle to 30%, the auxiliary cooling system comes on for 1.5 seconds (30% of five seconds) and then goes off for the remaining 3.5 seconds of the five-second interval. If you set the duty cycle to 100, the auxiliary cooling system comes on and stays on for as long as the refrigeration system is operating at full cooling throttle.

1. From any screen press **Setup**, then select the System Setup panel.
2. Under Auxiliary Cooling Parameters select a field and enter or modify the setting.
3. Enter the length of the **Time Frame** in seconds. The keypad will display the allowable range.
4. Enter the percentage of the **Duty Cycle**.

System time

The real time clock keeps track of the time and date, which the 8825 uses for reference, delayed program start, and the time stamp for the graph and data logging functions.

1. Press **Setup** and select the System Setup panel.
2. Selecting the System Time field will bring up the System Time dialog box.
3. Adjust the date, time zone, and/or time as required, then press **OK**.



NOTE: After changing the **Current Time Zone**, there may be a delay of up to 24 hours before all 8825 screens and graphs are updated.

Transfer parameters

1. From the main screen press **Setup**, then select the System Setup panel.
2. Under Transfer Parameters select a field and enter or modify the setting. The keypad will display the allowable range of the selected field. All values are in seconds. The following describes each field:
   - **Pre-Transfer Cool Time**: This is the time in seconds before a transfer that the 8825 locks the cooling output on at 100% to help compensate for the loss of cooling during a basket transfer. With the cooling output locked on, the cold box can actually cool to a lower temperature than the Test Temp + Offset temperature.
   - **Post-Transfer Cool Time**: Once the shuttle transfer occurs, the 8825 starts the Post-transfer Cool Time. This parameter locks the cooling output on at 100% for the programmed number of seconds to help return the cold box to its Test Temp + Offset temperature.
   - **Post-Transfer Purge Time**: This is the time in seconds that the 8825 will leave the purge output energized after a transfer. The purge helps to remove the moisture accumulated during the shuttle transfer. If set to 128, the purge will remain on constantly.

Defrost parameters

The defrost parameters allow you to set up the automatic defrost operations for the cold box. Defrosting the cold box is very important to avoid damage to the evaporator coils and to maintain performance.

1. From the main screen press **Setup**, then select the System Setup panel.
2. Under Defrost Parameters select a field and enter or modify the setting. The keypad will display the allowable range of the selected field. The following describes each field:
   - **Defrost at End of Test**: This selection allows you to program a defrost period at the end of the test. You should enable this function if the ATS does not have a few hours of down time between tests or if your location has high humidity.
   - **Defrost Every 'n' Cycles**: This selection allows you to program a defrost period every 'n' cycles, where 'n' represents a numerical value. Enter a zero to disable this function. Use this function if you are running long tests or if your location has high humidity.

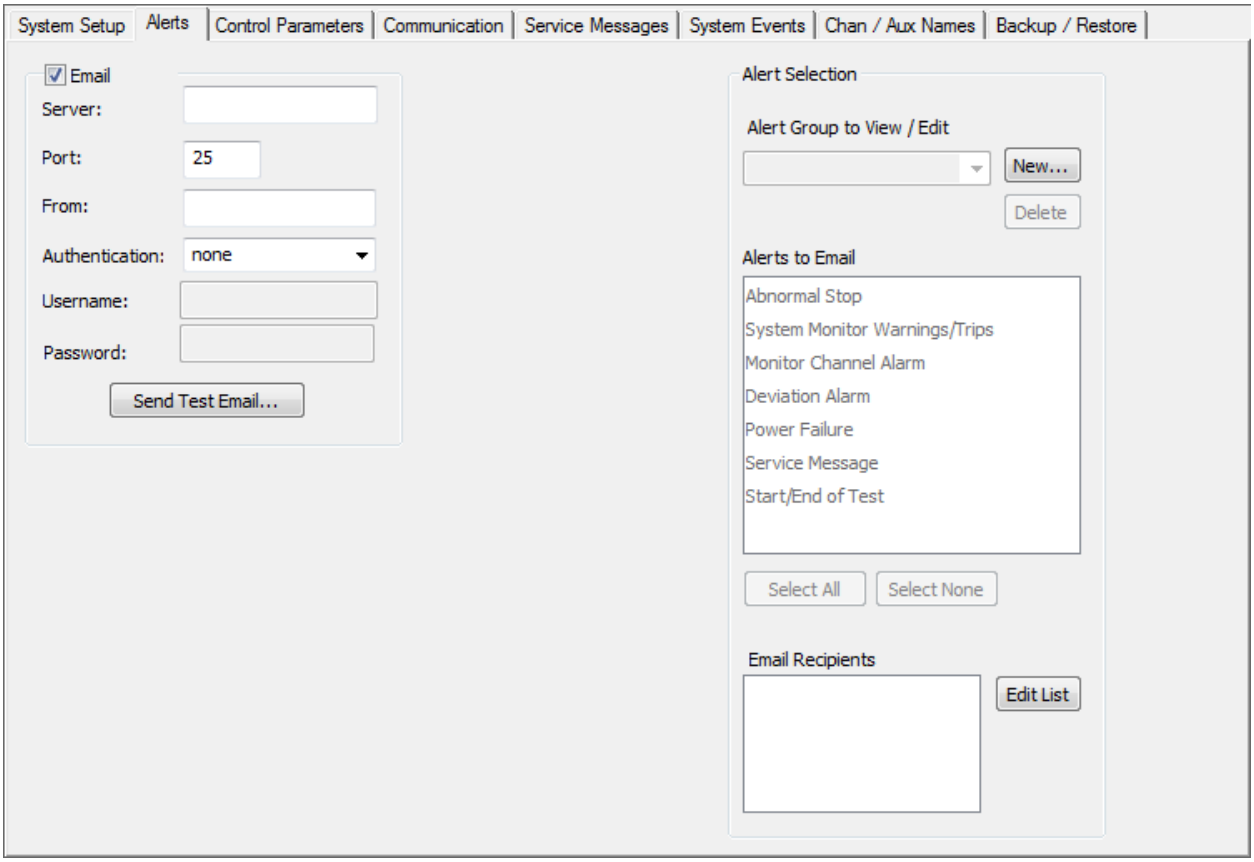
- **Defrost Setpoint**: This is the desired defrost temperature that the cold chamber will go to during the defrost period. Thermotron uses a set point of +40.0°C. You may need to adjust the temperature to compensate for the humidity levels in your area.
- **Defrost Timer Period(min)**: This is the time (in minutes) that the cold chamber will remain in the defrost mode. Thermotron uses a time period of 30 minutes. The time will vary according to the humidity levels in your area.
- **Load Pos. for Defrost**: This is the box you want the shuttle to be in while the system defrosts the cold box.

Precondition

The precondition function adds a beginning half cycle to your test that preconditions the chambers before cycles are counted down.

1. From the main screen press **Setup**, then select the System Setup panel.
2. Under **Precondition** select Yes or No to add a precondition half cycle.

Alerts panel



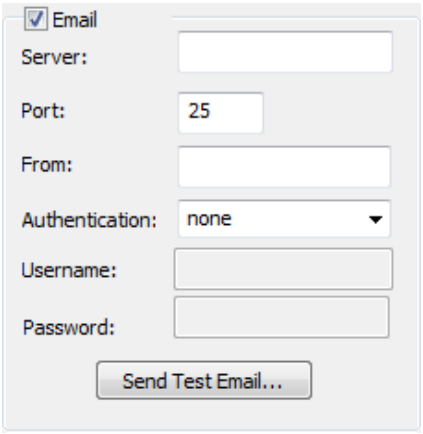
Beginning with software version V2.01, the 8825 can automatically report various chamber alerts by sending an email or text message to selected recipients. **NOTE**: To use this feature the 8825 must be on a local network that is running an email server. You must be in Lab Manager (or higher) access level to edit email and alert settings.

Alert activity is recorded in the 8825's activity log. Email setup and alert information can be backed up as part of the **Setup Data (User setup & Configuration)** selection of the Backup Wizard. As with all setup and configuration data, if this information is restored to a different 8825 it overwrites all current settings.

Setting up access to your local network's email server

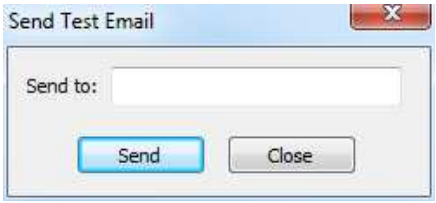
1. Press **Setup**, then select the Alerts panel.
2. Select the **Email** checkbox.
3. Enter the required email settings to access the email server on your network.
   - Contact your IT department for assistance if necessary.
   - The **From:** field can contain any text as long as it includes the @ symbol. This text will be displayed in the From field whenever an email or text is received by a recipient.

     NOTE: Depending on the text you choose for this field, it may be necessary for email recipients to adjust their incoming email settings so that emails from this address are not blocked or routed to junk or spam folders.



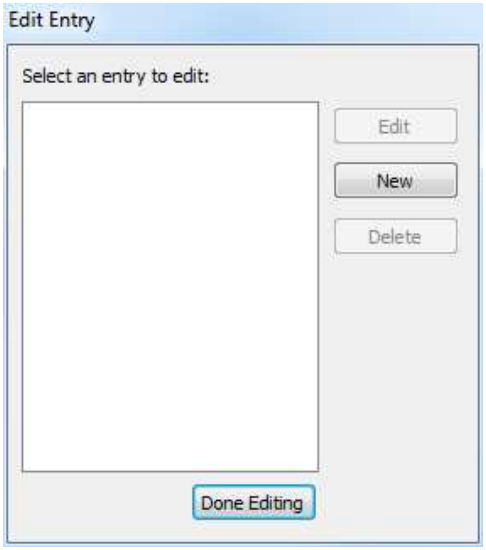
4. When all settings have been entered, press the 8825 **Save** button.

5. To send a test message to verify that the email settings have been entered properly, press the **Send Test Email...** button, enter a valid email address, then press **Send**.

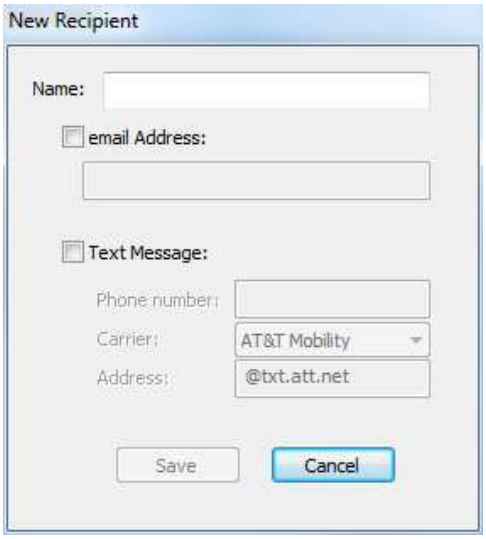


Creating/editing email recipients

1. Press **Setup**, then select the Alerts panel.
2. Press **Edit List**. The **Edit Entry** dialog box will appear:



3. Press **New**. The **New Recipient** dialog box will appear:

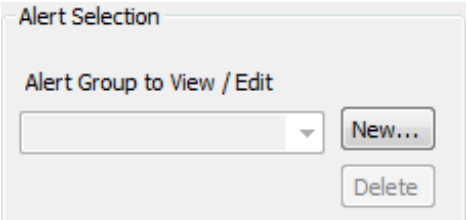


4. Enter a meaningful **Name** for this recipient.
5. A recipient can receive alerts via email, text message, or both.
   - To send email alerts to a recipient, select **email Address** and enter the recipient's email address.
   - To send text message alerts to a recipient, select **Text Message**, enter the recipient's cell phone number, and select their carrier. If the carrier is not listed in the **Carrier** drop-down menu, select **Other** and enter the desired address for this carrier. You might need to contact your cell phone carrier for this information.
6. To save the recipient information, press **Save**.
7. To add more recipients to the list, press **New** again and repeat the above steps.
8. To edit a recipient's information, highlight the desired recipient in the list, then press **Edit**.
9. To delete a recipient, highlight the desired recipient in the list, then press **Delete**.
10. When all recipients have been added, press **Done Editing**.

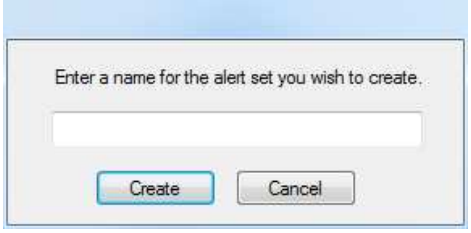
Creating/editing alert groups

NOTE: Before creating an alert group you should create one or more email recipients.

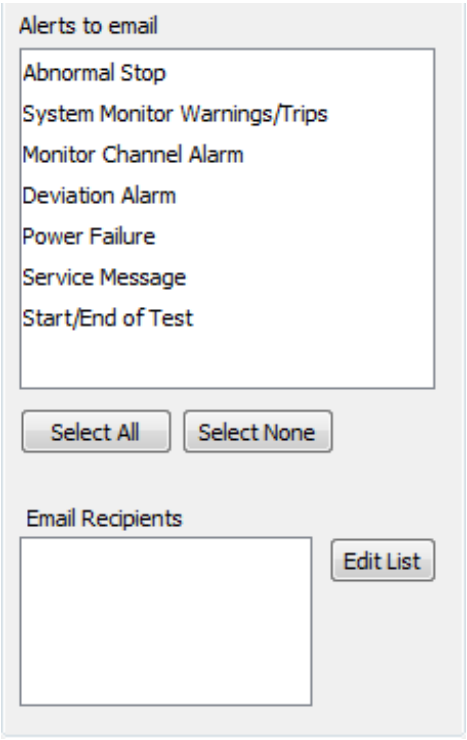
1. Press **Setup**, then select the Alerts panel.
2. Under **Alert Group to View / Edit**, press **New**.



3. Enter a meaningful name for the alert group, then press **Create**. **NOTE**: Once an alert group is created it is always active as long as email functionality is enabled.



4. In the **Alerts to email** list, highlight the desired categories of alerts you want the 8825 to monitor for sending email and/or text message alerts. A detailed description of the alert categories can be found in the "Alert categories, names, message examples" table below.
5. Select the recipient(s) you wish to receive notification of the selected alerts.
6. Press the 8825 **Save** button.
7. To create more alert groups with different combinations of alert categories and recipients, repeat the above steps.
8. To edit an alert group, select the group to edit, make the desired changes in the **Alerts to email** and/or **Email Recipients** list, and press **Save**.
9. To delete an alert group, select the group to delete, press **Delete**, then press **Yes**.

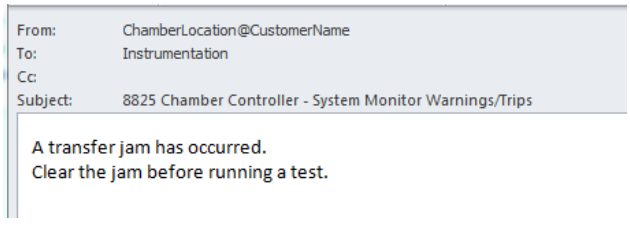


Format of recipient email/text

From: Text entered in the Alerts panel **From:** field.

Subject: Text entered in the **Chamber Description:** field in the Communication panel, followed by the applicable category in the **Alerts to email** list in the Alerts panel.

For sample body text, see the examples in the "Alert categories, names, message examples" table below.

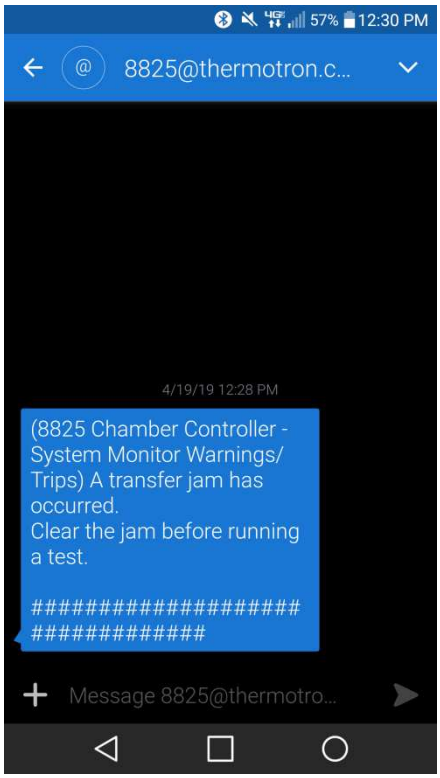


Alert categories, names, message examples

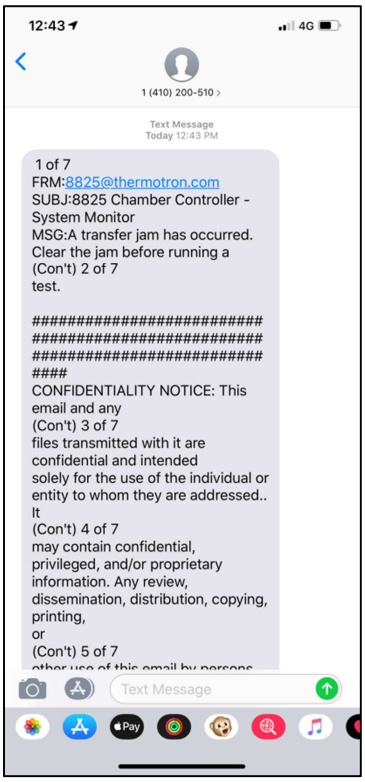
Alert category	*Alert name*	*Message examples*
Abnormal Stop	Open Input	Chamber stopped due to Channel 1 Open Input.
	Low Process Alarm	Chamber stopped due to Channel 2 Low Process Alarm.
	High Process Alarm	Chamber stopped due to Channel 3 High Process Alarm.
	Therm-Alarm Trip	Chamber stopped due to a Therm-Alarm trip: ***Limit = xxx; Maximum Excursion = xxx.***
	Refrigeration Trip	High Stage compressor feedback is no longer detected.
		Low Stage compressor feedback is no longer detected.
		High Stage Suction Pressure Trip.
		High Stage Discharge Pressure Trip.
		High Stage Discharge Temperature Trip.
		Low Stage Suction Pressure Trip.
		Low Stage Discharge Pressure Trip.
		Low Stage Discharge Temperature Trip.
		The compressor did not start correctly.
	Power Failure Stop	Chamber stopped due to a power failure on <date, time> that exceeded the Power Failure Recovery time limit.
	External Input	Chamber stopped due to an external Stop input.
	Deviation Alarm Alert	Chamber stopped due to a Deviation Alarm Alert.
	Transfer Jam Stop	Chamber stopped due to Transfer Jam.
System Warnings/Trips	Refrigeration Warning	High Stage Suction Pressure Warning
		High Stage Discharge Pressure Warning
		High Stage Discharge Temperature Warning
		Low Stage Suction Pressure Warning
		Low Stage Discharge Pressure Warning
		Low Stage Discharge Temperature Warning
	Circulator Trip	No feedback from the circulator contactor. The circulator might be off.
	Control Module(s) Missing	The number of Control Modules found is less than the number configured.
	Therm-Alarm(s) Missing	The number of Therm-Alarms found is less than the number configured.
	Chamber Obstructed	The chamber is obstructed
	Transfer Fault Warning	Transfer Sequence Fault Detected - Re-initializing Transfer.
	Transfer Jam Warning	A transfer jam has occurred. Clear the jam before running a test.
	Generator Tank Low	Low water in the humidity steam generator tank.
	Water Reservoir Low	Low water in humidity reservoir tank.
Monitor Channel Alarm	Monitor Channel Alarm	Monitor channel 1 exceeded its high alarm limit.
		Monitor channel 1 exceeded its low alarm limit.
Deviation Alarm	Deviation Alarm	Channel 1 is outside of its deviation band: ***SP = xxx; PV = xxx; DEV = xxx.***
Power Failure	Power Failure	A Power Failure occurred on Wednesday February 6, 2019 at 9:27.
Service Message	Service Message	<Service Message Text>
Start / End of Test	Program Started	Chamber Started in Program Run Mode. Profile:<name of test>
	Program Stopped	Chamber stopped due to End of Test. Profile:<name of test>
	Test Started	Chamber Started in Program Run Mode. Test:<name of test>
	Test Stopped	Chamber stopped due to End of Test. Test:<name of test>

Alerts sent to cell phones

Actual alert information from the controller will always be 160 characters or less. Alerts that are destined for a cell phone must first pass through a company's email server, which typically appends more information to the original alert message. If the resulting message is greater than 160 characters, the various cell phone carriers will handle the message differently.



Example 1



Example 2

- In **Example 1**, an alert message greater than 160 characters is received by one of the major carriers. It receives the first 160 characters and then terminates. This is sufficient for the 8825 alert feature, since all alert information will be contained in the first 160 characters. The rest of the (truncated) data is often boilerplate security warning information appended to the original message by the company's email server.
- In **Example 2**, a similarly lengthy alert message is received by another major carrier. It receives the entirety of the alert information as seven consecutive text messages. The actual 8825 alert information is contained in the first text message. The rest of the message is boilerplate security information appended by the company's email server.

NOTE: If receiving several texts for a single alert is a concern (or an annoyance), you should consult your company's IT department and see if they can exclude the company appended text for specific recipients.

Control parameters panel

CAUTION: The 8825 programmer/controller was factory-tuned and should not need to be re-tuned unless the product requirements change enough to affect the performance of the chamber. Incorrect values could damage your equipment and/or product.

NOTE: For information on tuning the control parameters, see Appendix B. For information on tuning the product temperature control (PTC) control parameters, see Appendix C.

Control parameters adjust the performance of the chamber around the set point. As the chamber nears the set point, the 8825 adjusts the chamber throttles to provide a smooth ramp to the set point. To prevent overshooting and oscillation around the final set point, the refrigeration, heating, and other systems must be damped as they approach the set point. To maximize chamber performance, you must also compensate for lag times. The adjustments are always made to the box parameters. Horizontal and vertical two-zone chambers also have product temperature control functions. The load parameters are adjusted for product temperature control operations.

To restore the control parameters set at the factory, press the **Restore Factory Defaults** button.

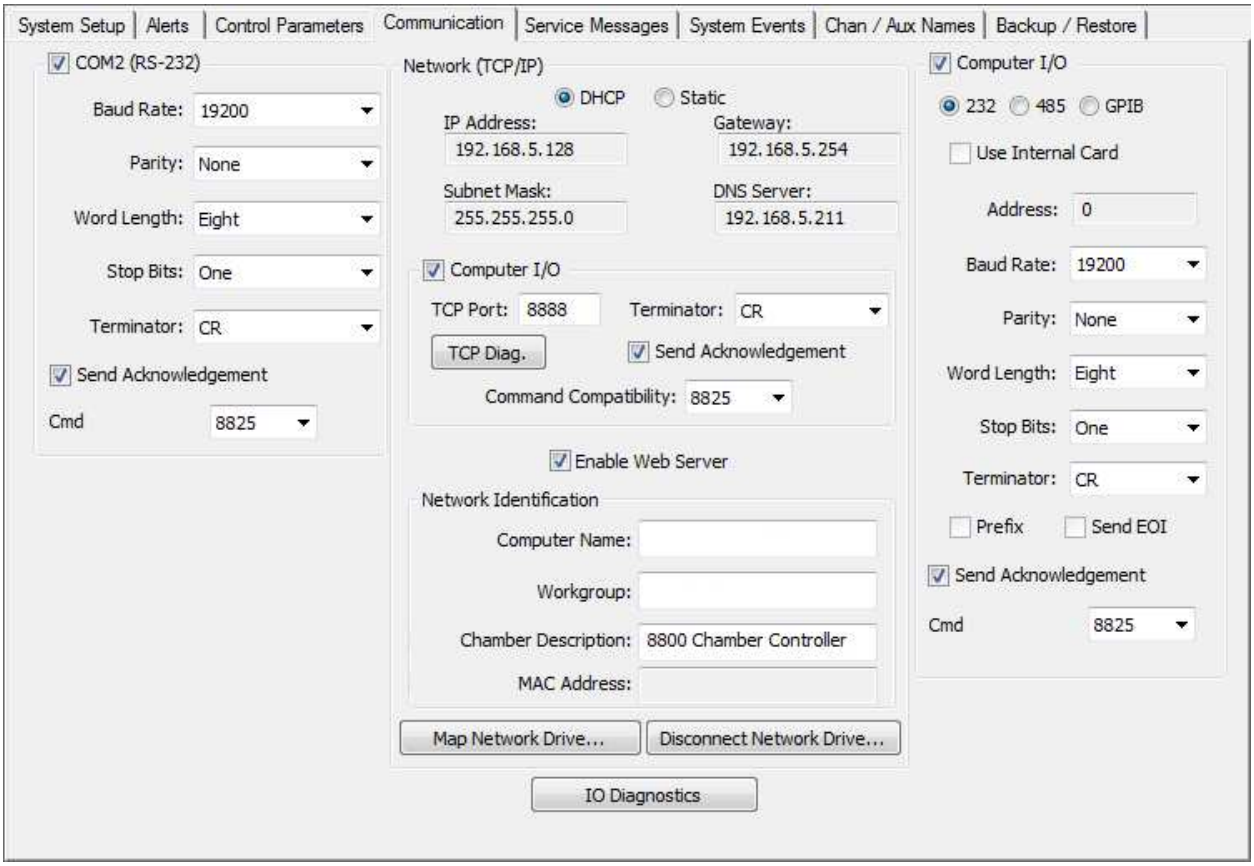
Control parameter files

You may also save and load control parameters to and from a file using the **Save As** and **Open** buttons. This provides the ability to save sets of custom control parameters.

Control parameters files can also be associated with a program such that every time a program runs it will use the control parameters in a file instead of the currently loaded parameters. To do so you must save a control parameter file with the same name as the program you wish to associate the parameters with.

For example, if you have a program named Simple Test.prg, and you save a set of control parameters in a file named Simple Test.prm, every time you run Simple Test it will automatically use the parameters in the Simple Test.prm file.

Communication panel



NOTE: To change any computer interface setting, the 8825 access level must be Lab Manager or higher. For more information on computer interface settings, refer to Section 4 of this manual.

Each 8825 is equipped with up to three independent computer interface ports. The 8825 can communicate through all three ports at the same time:

- **COM2 (RS-232)**: Communication through the 8825 PC's COM2 serial port. This port enables the 8825 PC to communicate with another personal computer using Thermotron's serial communications protocol. Any off-the-shelf RS-232 cable will work with this port. **NOTE**: This port is only for RS-232 communications.
- **Network (TCP/IP)**: Communication through the 8825 PC's Ethernet connector. This connector is a standard eight-pin RJ45 connector. It is intended to enable a personal computer to communicate with an 8825 over a standard Ethernet network.
- **Computer I/O**: Communication through the control module's optional computer I/O module. Available protocols are RS-232, RS-485, or GPIB (IEEE-488). For more information, refer to the *CM2 Control Module Technical Manual*.

The following paragraphs discuss communication protocols and how to properly configure the 8825 to use them.
NOTE: For computer I/O purposes, the 8825 can emulate 7825 controllers using the Command Compatibility setting.

COM2 (RS-232)

1. From any screen press **Setup**, then select the Computer IO / Networking panel.
2. Under COM2 (RS-232) select each field to modify its setting.
3. From the **Baud Rate** drop-down menu select the baud rate the host computer's interface card will be using.
4. Select the desired **Parity**. To disable parity checking select **None**.

5. Select the desired **Word Length**. For most applications, select **Eight**.
6. Select the desired **Stop Bits**. For most applications, select **One**.
7. Select the desired **Terminator**.
8. The 8825 uses the **Send Acknowledgement** function to provide feedback to the computer when the 8825 is ready for the next command. The 8825 will only send an acknowledgement back to the host computer for non-query commands.
   - When the error code is received by the host computer it knows that the 8825 is finished processing the command. If a response has not been received within two seconds the command should be re-sent.
   - A non-zero error code response indicates that the 8825 did not process the command properly. Refer to "Error codes" in Section 4 of this manual.
9. Select the desire **Cmd Compatibility**. Command compatibility allows the 8825 to emulate a legacy instrument's command set. For more information see "Legacy instrumentation command compatibility" later in this section.

Network (TCP/IP)

1. From any screen press **Setup**, then select the Computer IO / Networking panel.
2. Under Network (TCP/IP) select each field to modify its setting.
3. Network address settings:
   - Select the type of TCP/IP addressing (either **DHCP** or **Static**). **NOTE**: The following need to be set only if Static is selected. If DHCP is selected they are grayed out and filled in automatically.
   - Enter a valid **IP Address**.
   - Enter a valid **Subnet Mask**.
   - Enter a valid **Gateway** address.
   - Enter a valid **DNS Server** address.
4. Computer I/O settings:
   - Enter a valid **TCP Port** address.
   - Select the desired **Terminator**.
   - The 8825 uses the **Send Acknowledgement** function to provide feedback to the computer when the 8825 is ready for the next command. The 8825 will only send an acknowledgement back to the host computer for non-query commands.
     - When the error code is received by the host computer it knows that the 8825 is finished processing the command. If a response has not been received within two seconds the command should be re-sent.
     - A non-zero error code response indicates that the 8825 did not process the command properly. Refer to "Error codes" in Section 4 of this manual.
   - Select the desired **Command Compatibility**. Command compatibility allows the 8825 to emulate a legacy instrument's command set. For details see "Legacy instrumentation command compatibility" below.
5. Selecting **Enable Web Server** allows you to view the 8825 controller status from any computer on the network by entering the 8825's **IP Address** in a web browser. **NOTE**: This function is enabled by default.
6. Network Identification settings:
   - Enter a valid **Computer Name**.
   - Enter the name of the **Workgroup** this 8825 should use.
   - Enter a **Chamber Description.**
   - The **MAC Address** field displays the unique media access control address of the 8825.

7. Network drives:

   Map Network Drive:

   The 8825 allows you to map a remote folder on your network to a local drive letter. Press the **Map Network Drive…** button, then select the local drive letter, choose a local name, and select the remote folder.

   Disconnect Network Drive:

   At any time you can remove a mapped drive association by pressing the **Disconnect Network Drive…** button and choosing the local drive letter.

Computer I/O

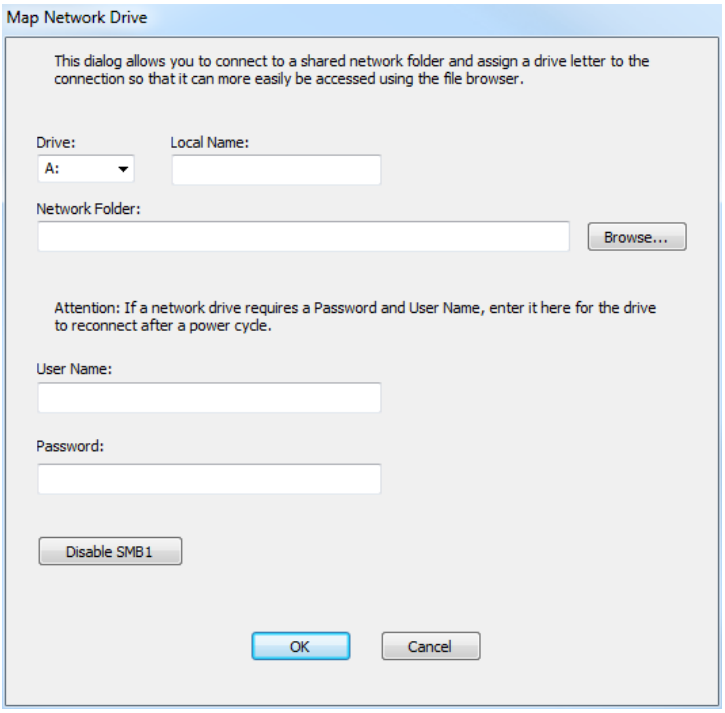
The 8825 allows you to configure and use the computer interface capabilities of its control module. For more information, refer to the *CM2 Control Module Technical Manual*.

1. From any screen press **Setup**, then select the Computer IO / Networking panel.
2. Under Computer I/O select each field to modify its setting.
3. Select the desired interface (RS-**232**, RS-**485**, or **GPIB**). **NOTE**: The RS-232 interface requires a three-wire, null modem cable.
4. If applicable:
   - Enter a valid multidrop **Address**.
   - From the **Baud Rate** drop-down menu select the baud rate the host computer's interface card will be using.
   - Select the desired **Parity**. To disable parity checking select None.
   - Select the desired **Word Length**. For most applications, select Eight.
   - Select the desired **Stop Bits**. For most applications, select One.
   - Select the desired **Terminator**.
   - If needed for multidrop communication, select **Prefix** or **Send EOI**.
   - The 8825 uses the **Send Acknowledgement** function to provide feedback to the computer when it has finished processing a non-query command. When enabled, the 8825 will echo back the error code to the host computer when the non-query command has been processed. This serves two functions:
     - When the error code is received by the host computer it knows that the 8825 is finished processing the command. If a response has not been received within two seconds the command should be re-sent.
     - A non-zero error code response indicates that the 8825 did not process the command properly. Refer to "Error codes" in Section 4 of this manual.
   - Select the desired **Cmd Compatibility**. Command compatibility allows the 8825 to emulate a legacy instrument's command set. For details see "Legacy instrument command compatibility" below.
5. Selecting **Enable Web Server** allows you to view the 8825 controller status from any computer on the network by entering the 8825's **IP Address** in a web browser. **NOTE**: This function is enabled by default.
6. Under Network Identification, enter a valid **Computer Name**, the name of the **Workgroup** this 8825 should use, and, if desired, a **Chamber Description**.
7. To map a remote folder on your network to a local drive letter, press the **Map Network Drive…** button, select the local **Drive** letter, choose a **Local Name**, and select the remote **Network Folder**.
8. To remove a mapped drive association, press the **Disconnect Network Drive…** button and select the **Network Drive** letter.

Disabling/enabling SMB1

SMB1 is a network file sharing protocol. To disable or enable the SMB1 file protocol, follow these steps:

1. Make sure the 8825 is in stop mode.
2. From any screen press **Setup**, then select the Communication panel.
3. Press the **Map Network Drive...** button.
4. Press the **Disable SMB1** button.
5. If the controller is ***not*** in stop mode, the user will be told that the controller must be in stop mode to disable or enable SMB1.
6. If the controller is in stop mode, the user will be asked if they want to disable or enable SMB1 (depending on whether SMB1 is already enabled or disabled).
   a. If the user answers **Yes**, the controller will automatically restart after disabling or enabling SMB1.
   b. If the user answers **No**, no change will be applied.



I/O diagnostics

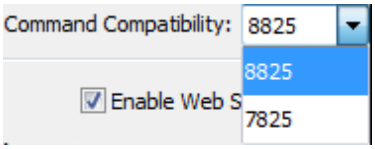
Pressing the **IO Diagnostics** button will take you to the computer interface diagnostic panel. This panel allows you to examine the current computer I/O communications as well as the last 25 computer I/O errors that have occurred. For more information, refer to "Computer interface diagnostic panel" in Section 3 of this manual.

Legacy instrumentation command compatibility

The 8825 computer interface is fully compatible with the 7825 legacy instrumentation's command sets:

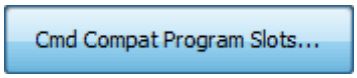
If you have a program written to control a legacy instrument it will work seamlessly with an 8825 without any changes. The 8825 can be set up to use any of the legacy command sets per interface (COM2, network, computer I/O), providing you with extra flexibility. For example, you could use your legacy software to communicate with the 8825 using GPIB, and at the same time use ThermoTrak II to communicate with the 8825 over your network.

To select which instrument's command set to use for each interface, use the **Command Compatibility** drop-down menu. Any selection other than 8825 will cause the **Cmd Compat Program Slots...** and **Cmd Compat Test Slots...** buttons to appear.

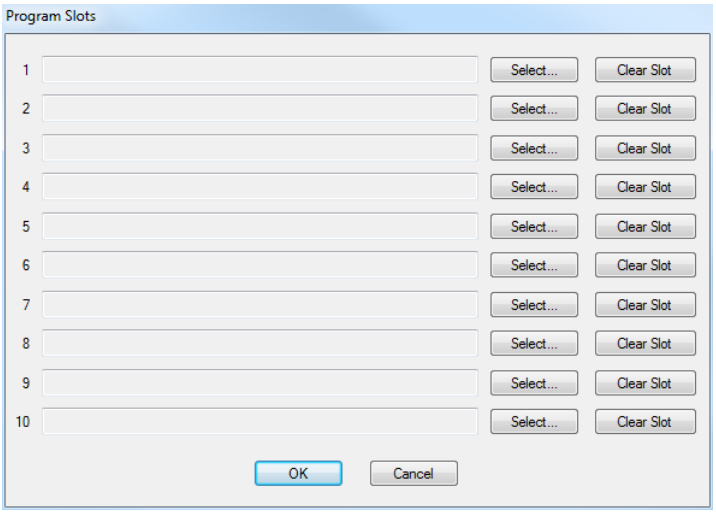


Legacy program slots

In addition to selecting the desired command set, you may also set up which 8825 programs occupy the legacy instrument's 10 program slots.



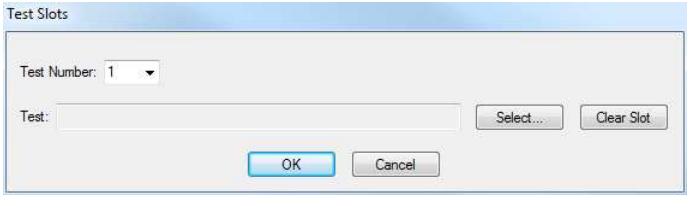
1. To view the program slot information, press the **Cmd Compat Program Slots...** button. The Program Slots dialog box will appear.
2. To assign a program to a slot, press the slot's **Select...** button, navigate to the desired program, and press **Select**.
3. To clear a program from a slot, press the slot's **Clear Slot** button.
4. To accept your selections press **OK**. To close the Program Slots dialog box without making any selections, press **Cancel**.



Legacy test slots

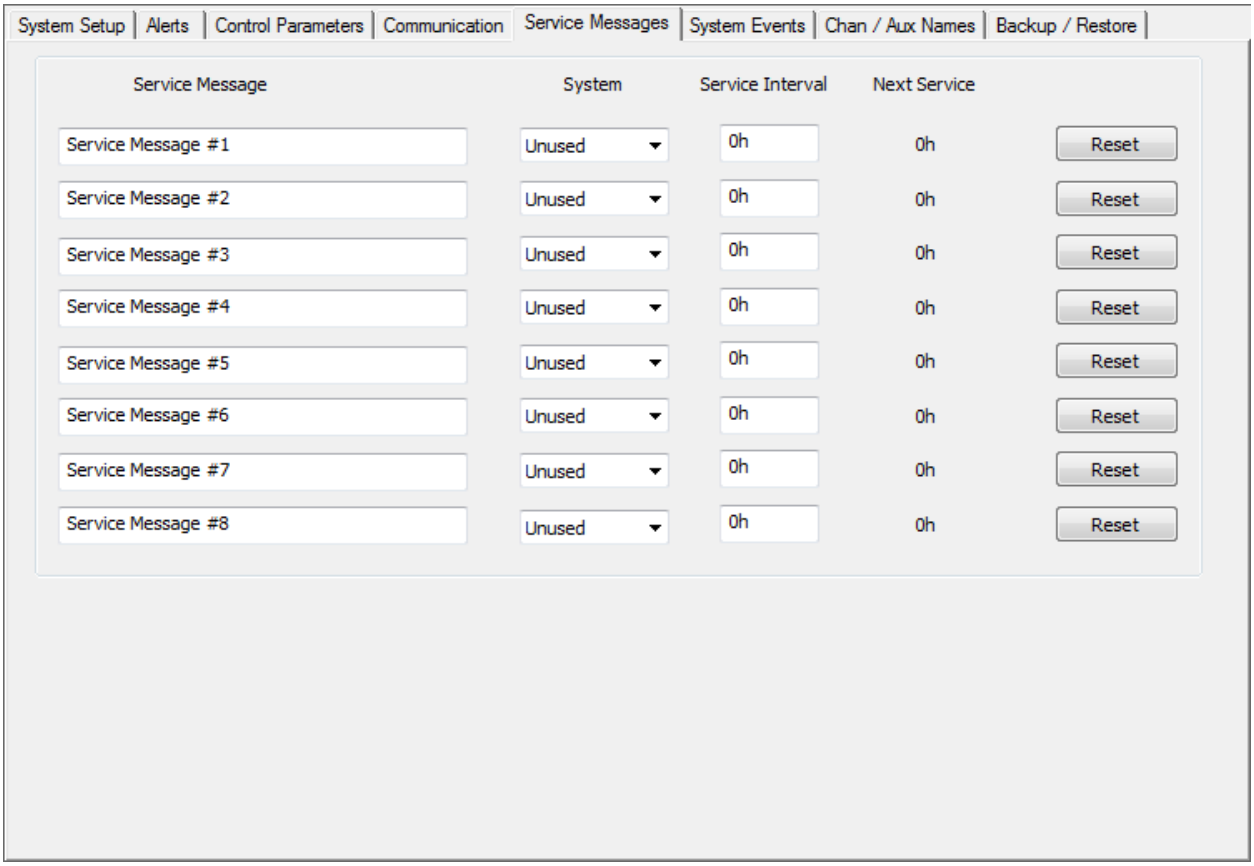
In addition to selecting the desired command set, you may also set up which 8825 programs occupy the legacy instrument's 25 test slots.

1. To view the test slot information, press the **Cmd Compat Test Slots...** button. The Test Slots dialog box will appear.
2. To assign a test number to a slot, press the slot's **Select...** button, navigate to the desired program, and press **Select**.



3. To clear a test from a slot, press the slot's **Clear Slot** button.
4. To accept your selections press **OK**. To close the Program Slots dialog box without making any selections, press **Cancel**.

Service Messages panel



NOTE: To modify service messages, the 8825 access level must be Lab Manager or higher.

The Service Messages panel allows the user to create up to eight different messages that can be displayed when certain events take place. Service Messages can be based off of four types of events:

- **System Run Times**: These services messages will be displayed after the selected chamber system has run for the specified service interval.
- **Calendar Dates**: These service messages will be displayed at noon on the selected Date.
- **Digital Input**: These service messages will be displayed when the specified digital input (service interval) goes active.
- **Digital Output**: These service messages will be displayed when the specified digital output (service interval) goes active.

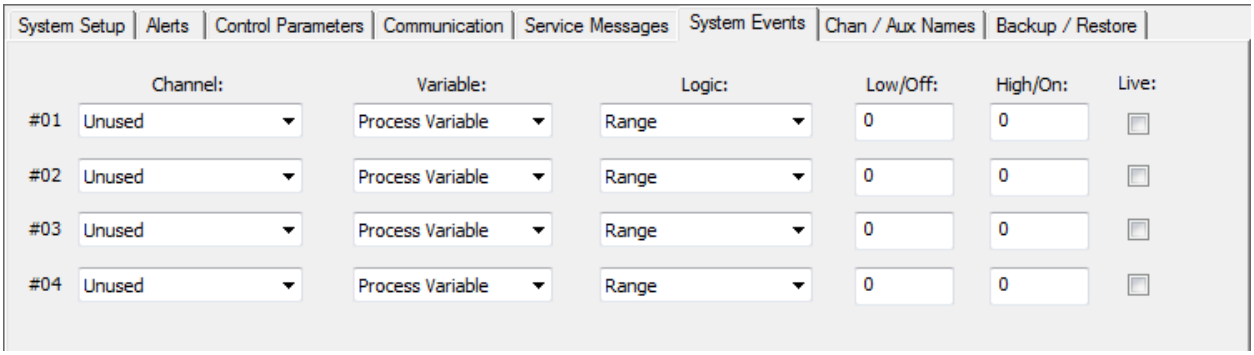
Once the service is completed, return to the Service Messages panel and reset the message's service interval timer.

To modify service messages, follow these steps:

1. Select a **Service Message** field and use the alphanumeric keypad to enter the text of the message. Messages can be up to 40 characters long.
2. From the **System** drop-down menu select a system to associate with the selected service message.
3. For run time messages select the **Service Interval** field and use the numeric keypad to enter the desired length of the interval in hours. For calendar messages select the date control field and use the calendar to select the desired date. For digital input and output messages select the **Service Interval** field and use the numeric keypad to enter the desired digital input.

4. The **Next Service** column displays the number of hours left in each service interval before its service message is displayed.
5. To reset a service message interval time, press **Reset**.

System Events panel



System events monitor variables, such as temperature or throttle, and turn digital outputs on or off based on the state of the monitored variables. **NOTE**: To configure a system event, the 8825 access level must be Lab Manager or higher. The number of system events available for your use depends on your 8825 programmer/controller's factory configuration.

Each system event must be configured with some or all of the parameters listed in this section. These parameters specify the control points for the selected logic. The following table explains the meaning of each of these relative to the logic type selected.

Logic Type	*Low/Off*	*High/On*
Range	The low value of the active range.	The high value of the active range.
Point	The off point, which may provide hysteresis.	The on point.
Duty cycle output	The time period. The total time from one on cycle to the next.	The duty cycle. The percent of the period during which the system event will be activated.
Repeat cycle timer	The off time. The amount of time the system event will be deactivated.	The on time. The amount of time the system event will be activated.

NOTE: The low/off and high/on parameters are unitless. They assume the units of the variable selected, or minutes in the case of the timers.

System event parameters defined

1. **Channel** identifies the channel associated with the system event. Any configured control or monitor channel can be used to trigger system events. Selecting **unused** indicates that the system event is not used. For control channels the system event logic will only be active when the channel associated with it is selected and running. For monitor channels the system event logic will be active whenever the system is running.
2. **Variable** indicates which variable the 8825 will monitor for the selected channel. The available variable types are:
   - **Process Variable**: The system event uses the selected channel's process variable to trigger the event. Any value within the range of the selected control channel can be used.
   - **Set Point**: The system event uses the selected channel's set point to trigger the event. Any value within the range of the selected control channel can be used.
   - **Throttle**: The system event uses the selected channel's throttle to trigger the event. The range is -100% throttle to +100% throttle.
   - **Deviation**: This variable is the process variable minus the set point. This variable uses the same unit of measurement as the process variable and set point.

3. **Logic** indicates the type of system event. This parameter determines when the 8825 will activate and deactivate the system event. The available logic types are:

   - **Range**: The system event output will be activated when the variable is within the selected range (between the low and high parameters, inclusive).
   - **Point**: The system event output will be activated when the variable is at the on point, and deactivated when the variable is at the off point. This provides some switching hysteresis when required. The relative values of the on point and the off point determine the logic as follows:

On Point ≥ Off Point		
Var ≤ Off	Off < Var < On	Var ≥ On
Deactivate	No Change	Activate
On Point < Off Point		
Var ≤ On	On < Var < Off	Var ≥ Off
Activate	No Change	Deactivate

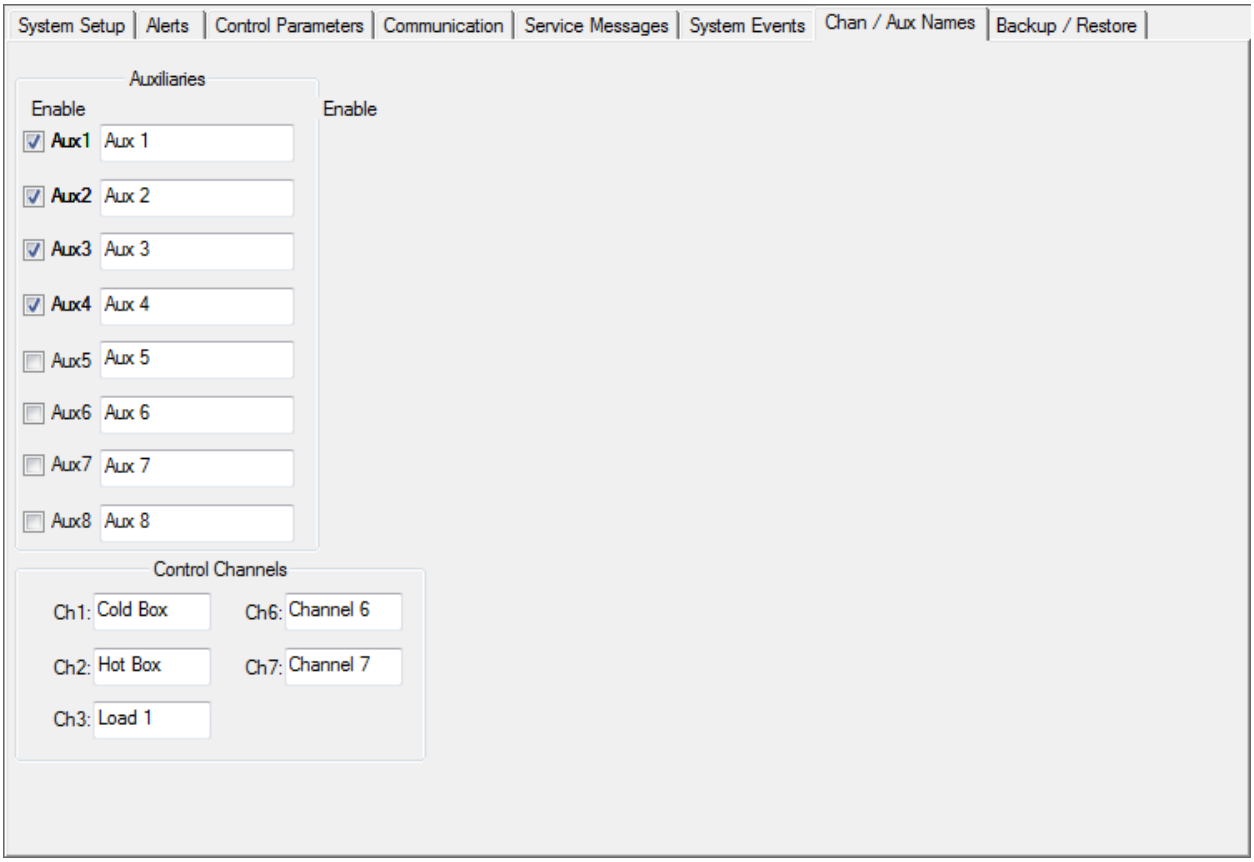
   - **Duty Cycle Output**: This type of system event will provide a pulse output based on the low and high settings. The low/off setting specifies the output's period in minutes, and the high/on setting specifies the output's duty cycle (percentage on). For example, a low/off setting of 1.0 with a high/on setting of 50.0 will provide a 50% duty cycle pulse with a period of one minute (the output will be activated for 30 seconds and deactivated for 30 seconds.)
   - **Repeat Cycle Timer**: This type of system event will provide a variable pulse with an adjustable on/off time setting. This type of system event is very similar to the duty cycle type, except that the parameters are set differently. The low/off setting specifies the off time in minutes, and the high/on setting specifies the on time in minutes.

4. **Low/Off**: Low or off point
5. **High/On**: High or on point

Setting up system events

1. From any screen press **Setup**, then select the System Events panel.
2. Before you change any system event parameters, you should record the original settings.
3. Select each field to modify its setting.
4. System events can be configured to be live, allowing them to function even when the 8825 is not in run mode. To configure a system event to be live, select the system event's **Live** check box.
5. Record the new system event settings on the 8825 worksheets in Appendix D. Keep these settings with the 8825 manual.

Chan / Aux names panel



NOTE: To modify any of these settings, the 8825 access level must be Lab Manager or higher. To help reduce clutter in the program and manual mode screens, enable only the auxiliary relays of interest.

The Chan / Aux Names panel allows you to enable and disable auxiliary relays, and to assign descriptive names to auxiliaries and control channels for display in all screens and data logging.

Modifying auxiliary relay settings

1. From any screen press **Setup**, then select the Chan / Aux Names panel.
2. To enable an auxiliary, select the auxiliary's **Enable** check box.
3. To rename an auxiliary relay:
    a. Select the field of the auxiliary you want to rename. The alphanumeric keypad will appear.
    b. Enter the desired name of the auxiliary relay.

Changing a control channel name

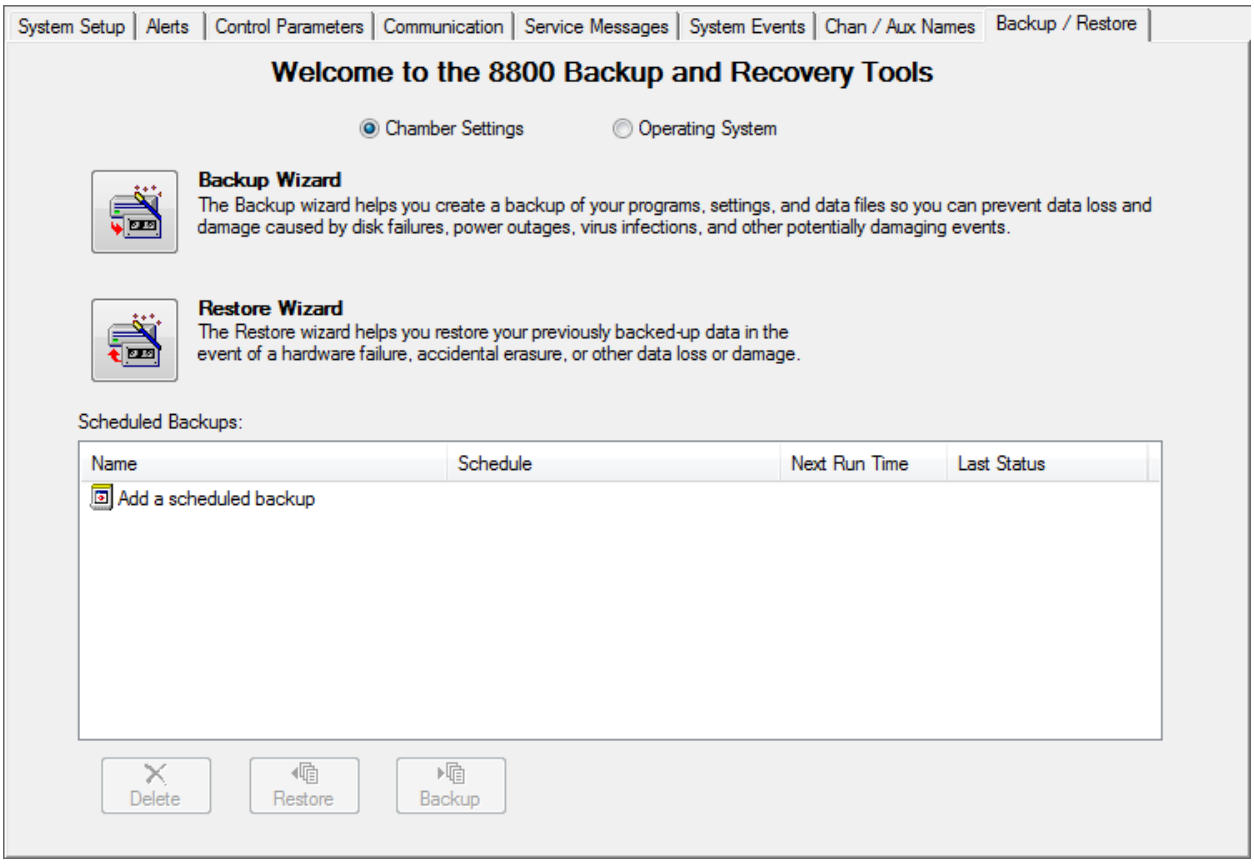
1. From any screen press **Setup**, then select the Chan / Aux Names panel.
2. Select the field of the control channel name you want to modify. The alphanumeric keypad will appear.
3. Enter the desired name of the channel.

Backup / Restore panel

The 8825 has two types of built-in Backup and Restore functions:

- **Chamber Settings**: This feature lets you back up and restore your chamber's information, including its setup information, programs, data log, and activity log.
- **Operating System**: This feature lets you set system-wide restore points, which can be used to restore you system to a previously known state if anything unexpected happens.

Backup and recovery tools: Chamber settings



The **Backup Wizard** helps you create immediate or scheduled backups of your programs, settings, and data files so you can prevent data loss and damage caused by disc failures, power outages, virus infections, and other potentially damaging events.

To back up your programs, settings, and data files, perform the following:

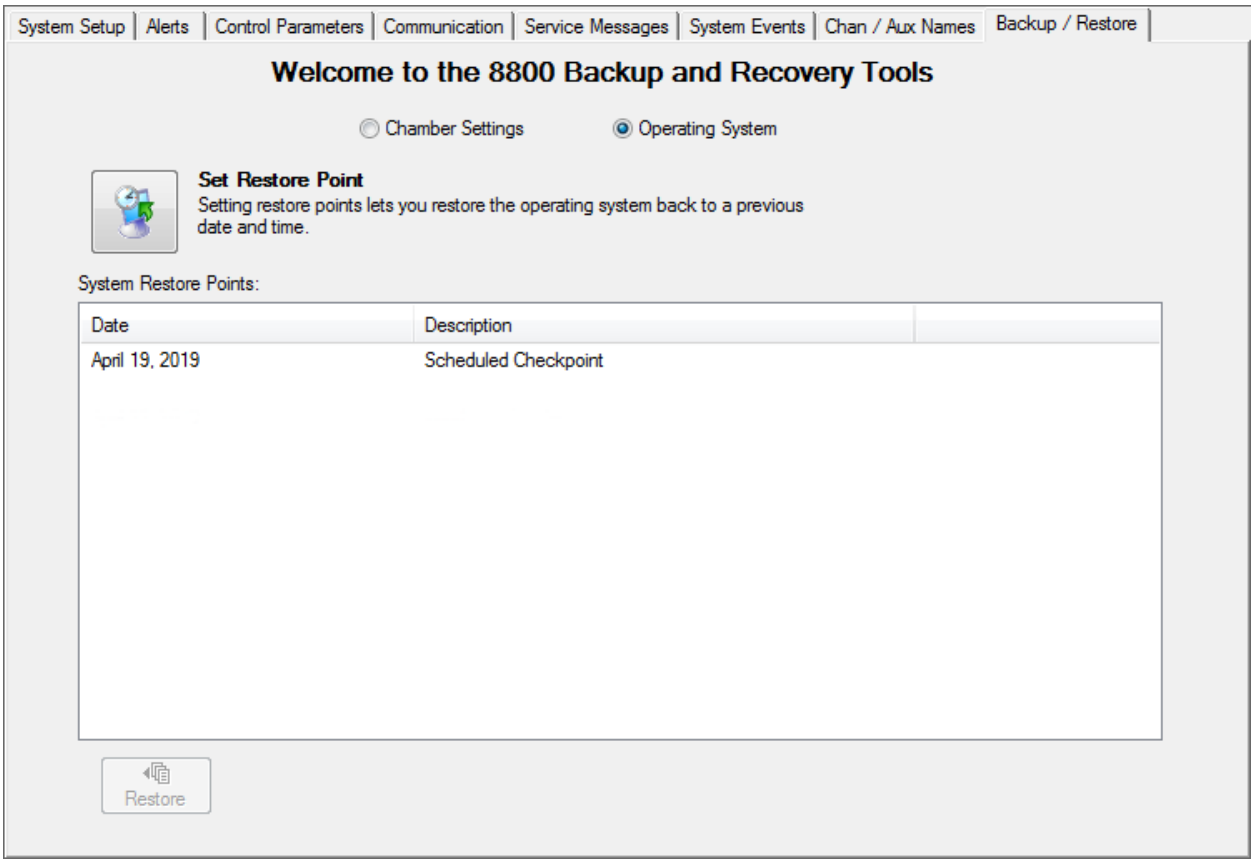
1. From any screen press **Setup**, then select the Backup / Restore panel.
2. Press **Backup Wizard** and follow the instructions on the screen.
3. To delete a scheduled backup, select the item in the **Scheduled Backups** field, then press **Delete**.

The **Restore Wizard** helps you restore your previously backed-up data in the event of a hardware failure, accidental erasure, or other data loss or damage.

To restore previously backed-up data, perform one of the following:

- Press **Restore Wizard** and follow the instructions on the screen.
- Select the item in the **Scheduled Backups** field, then press **Restore**.

Backup and recovery tools: Operating system



Restore Points let you restore the entire operating system (not including data) to a previously known state. If your system is free of problems, such as viruses, you may wish to set a restore point. Then at any time in the future if problems arise you could restore the operating system back to exactly the way it was when you created the restore point.

To set a restore point, perform the following:

1. From any screen press **Setup**, then select the Backup / Restore panel.
2. Press the **Operating System** radio button.
3. Press the **Set Restore Point** button and follow the instructions on the screen.

To restore the system to a previous spot, perform the following:

1. From any screen press **Setup**, then select the Backup / Restore panel.
2. Press the **Operating System** radio button.
3. Choose a restore point from the list and press **Restore**.

Specific backup example

To create a backup file for a specific range of dates, use the following procedure:

1. Insert your flash drive into one of the two USB ports on the 8825 SBC.
2. Press the **Setup** icon on the right-hand side of the 8825 screen.
3. Select the **Backup/Restore** tab.
4. Make sure the **Chamber Settings** radio button is selected.
5. Select the **Backup Wizard** button and press **Next** to continue.
6. Select all four of the check boxes and then press **Next** to continue.
7. Select the **Now** radio button and press **Next** to continue.
8. Select the **Custom** radio button.
    a. Select the **Start Box** and select the start date from the calendar.
    b. Select the **End Box** and select the end date from the calendar.
    c. Press **Next** to continue.
9. Press the **Browse** button and a dialog box will open.
    a. Select your flash drive from the **Media** drop-down menu.
    b. Select the file name text box and enter the chamber serial number (for example, 43195).
    c. Press **Save** to continue.
10. Press **Next** to continue.
11. Press **Finish** to save the backup file to the flash drive.
12. Remote the flash drive from the 8825.

Section 2: Operation

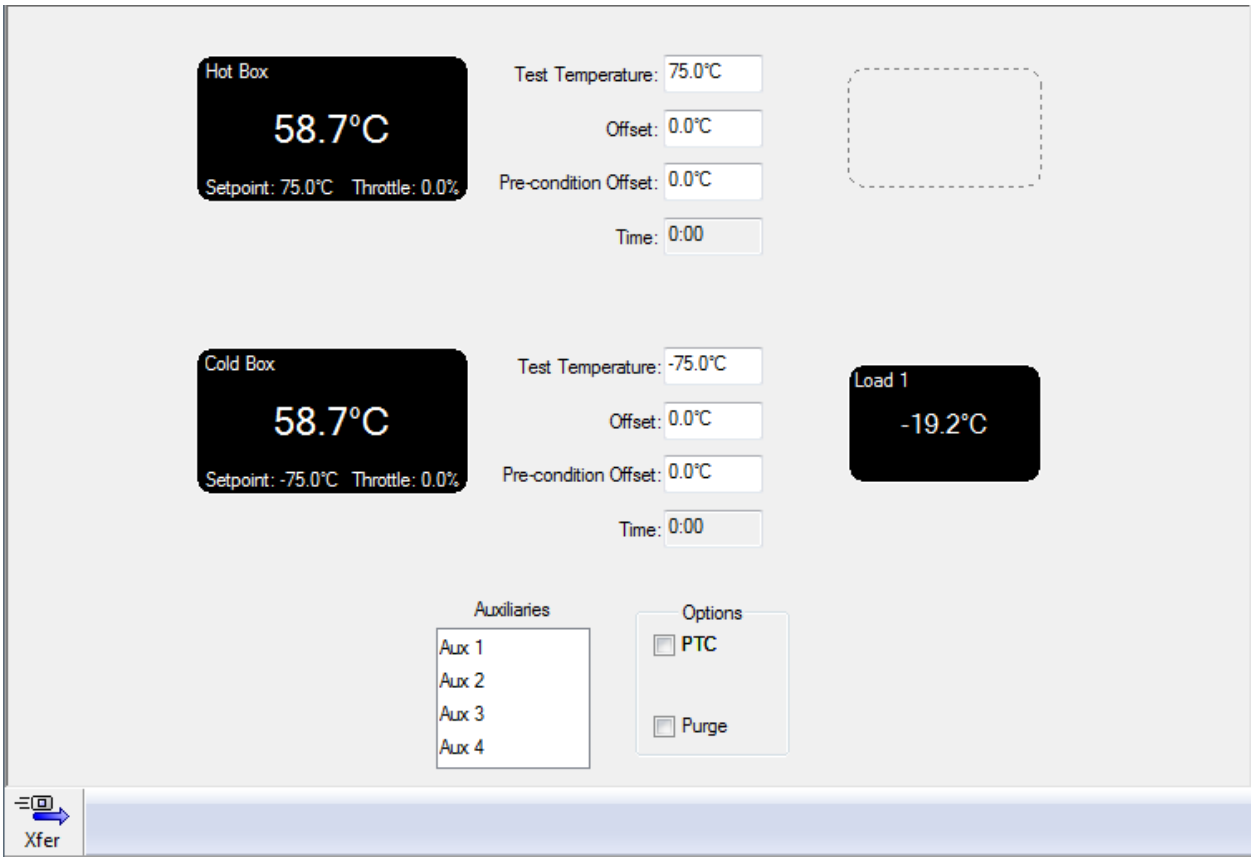
Manual mode allows you to operate the hot and cold boxes at specific temperatures, turn auxiliaries on and off, and transfer the basket between the boxes. You can enter manual mode when the system is in stop mode. You also can enter manual mode from hold program mode, if, while running a program, you want to perform a special operation in manual mode and then continue with the program.

Program mode operates the 8825 using a thermal shock test or temperature profile.

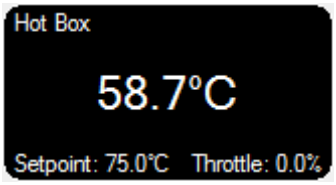
- A thermal shock test consists of a programmed test cycle that preconditions each box for the test and involves a series of transfers and soak times. The test runs this series for a programmed number of cycles.
- A temperature profile consists of a group of intervals. In each interval the controller cycles the cold box toward a final temperature and other process variables in a specified amount of time. When the interval is completed, the 8825 either transitions to the next interval or loops back to an earlier interval.

Running in manual mode

1. Press **Manual**. The manual mode screen will appear.



2. Select and change the settings for the manual mode test. The following list describes the manual mode values and options displayed:



Box status: The following are displayed for each box:

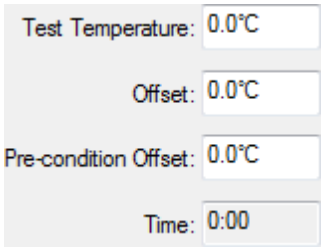
- **Name**: The user-assigned name for the box.
- **Box temperature**: The current air temperature reading.

- **Set point**: The temperature the 8825 is working to maintain:
  - In double-duty chambers the set point is equal to the test temperature.
  - In vertical two-zone and horizontal three-zone chambers, when the basket is in the box, the set point is the test temperature plus the programmed offset. When the basket is not in the box, the set point is the test temperature plus the precondition offset. **NOTE**: The precondition offset is disabled when PTC is enabled.

  For example, the basket is in the cold box, which is programmed with a test temperature of -45°C, an offset of -7°C, and a precondition offset of -9.5°C. As the test starts, the cold box set point is calculated to be -52°C. When the basket is transferred to the hot box, the cold box set point will be calculated to be -54.5°C.
- **Throttle**: The percentage of total heating or cooling capability currently being used by the box. A negative value indicates a cooling throttle.

Load status: The following are displayed for each load:

- **Name**: The user-assigned name for the load.
- **Load temperature**: The current temperature measured by the thermocouple in the product carrier.



Test Temperature: The required temperature of each box. To produce the set point the 8825 adds the offset or precondition offset to the test temperature.

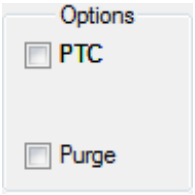
Offset: The number of degrees past the test temperature the hot or cold box may deviate to achieve the test temperature at the product.

- In double-duty chambers the 8825 adds the offset to the test temperature to produce a set point for each box.
- In vertical two-zone or horizontal three-zone chambers, the offset is added to the test temperature only when the basket is in the box. When the basket is not in the box the precondition offset is added to the test temperature.

  The hot box offset must be a positive number, and the cold box offset must be a negative number. (An offset of 5 for the hot box and -5 for the cold box is a good place to start.) If you do not want the set point to be different from the test temperature, enter zero for the offsets.

Pre-condition Offset: In vertical two-zone or horizontal three-zone chambers, the precondition offset value is added to the test temperature only when the basket is not in the box. **NOTE**: This field does not appear when product temperature control (PTC) is enabled.

Time: The amount of time in minutes and seconds that the basket has been in its current position. Each position (cold, hot, or ambient) has a related timer. The timer operates when the basket is in the respective position. The timers reset whenever you press **Run**.



PTC: This field enables or disables product temperature control. During normal thermal shock testing, the product temperature will lag behind the box air temperature. When PTC is enabled, you must program two test temperatures: one for the hot box and one for the cold box. The 8825 then senses the temperature at the product and operates the heating or cooling system at a faster throttle and higher set point to make up for the temperature lag. The PTC software increases temperature performance at the product by computing the two air temperature set points based on the load test temperatures, the offset, and the gain parameters. **NOTE**: PTC is not available when the 8825 is configured for double-duty thermal shock chambers.

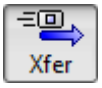
Purge: Enabling the purge option helps to remove the moisture accumulated in the chamber.

Auxiliaries: Select the auxiliary relays you want to activate. Auxiliaries are active only when the 8825 is running. For more information, see "Chan / Aux names panel" in Section 1 of this manual.

Humidity: Enables the optional humidity system. Humidity is available only on single-duty systems and will be controlled only in the hot box. **NOTE**: Humidity cannot be enabled when using PTC.

For humidity information press the humidity information button next to the **Humidity** field. The Humidity Info dialog box will appear:

3. To start running in manual mode using the settings entered above, press **Run**.
4. To suspend the test at its current settings, press **Hold**. The 8825 will enter hold manual mode.
5. To resume running a suspended test, press **Run**.
6. To stop manual mode operation, press **Stop**.
7. To move the product basket from one position to another, press the **Xfer** button at the bottom of the screen.



Program mode operation

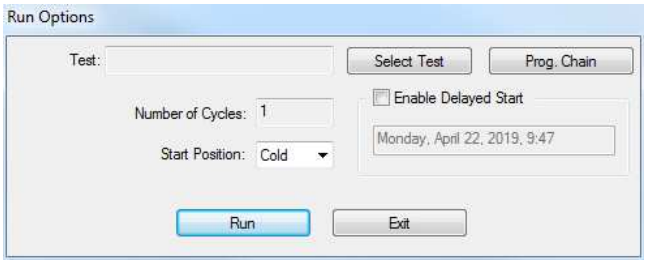
The programmer function operates the 8825 using thermal shock tests or temperature programs.

- **Thermal shock tests**: These programs consist of a programmed test cycle that sets up the test in each box and involves a complete series of transfers and soak times. The test runs this series a programmed number of cycles.
- **Temperature programs**: These are programs that utilize the cold box as a standard temperature chamber. Each program consists of a group of intervals. In each interval the controller cycles the cold box toward a final temperature in a specified amount of time. Once the interval is completed, the 8825 either transitions to the next interval or loops back to an earlier interval.

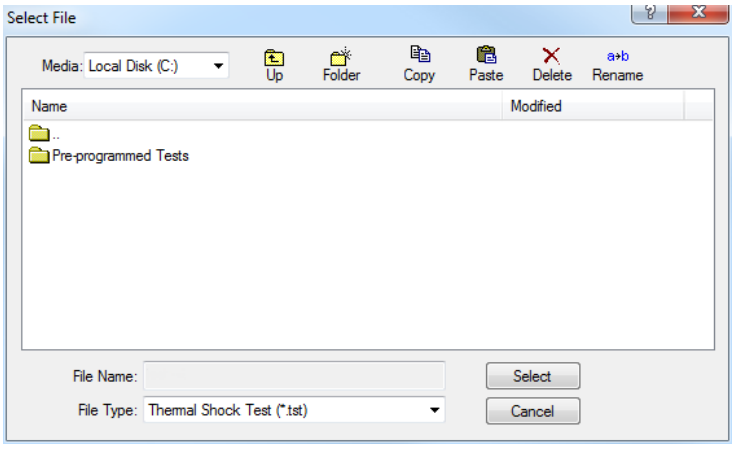
Once a test is entered into memory it can be run immediately, or it can be set up for a delayed start. To run an existing test, see "Running a test" below. To create or modify a test, see "Programmed cycling" later in this section.

Running a test

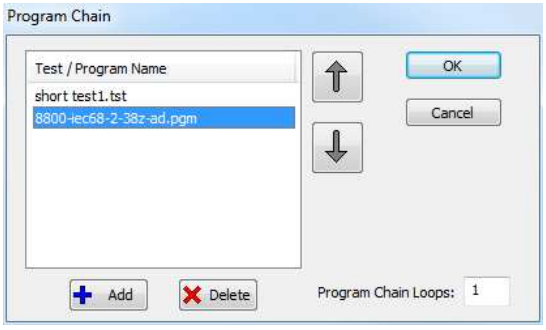
1. With the 8825 in stop mode, press **Run** from any screen other than the manual mode screen. The Run Options dialog box will appear.



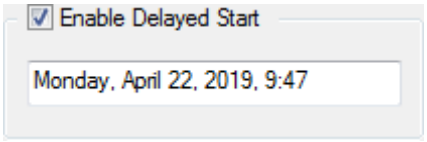
2. The name of the currently loaded test appears in the **Test** field. To load a different thermal shock test:
   a. Press the **Select Test** button. The Select File dialog box will appear:
   b. Select the desired test or profile.
   c. Press **Select**.



3. To run several tests in sequence, press the **Prog. Chain** button. The Program Chain dialog box will appear.



   - To add a thermal shock test or temperature program to the chain, press the **Add** button and use the Select File function.
   - To remove a test or program from the chain, press the name of the test or program, then press the **Delete** button.
   - To change the order of the chain, press the name of a test or program, then press the up or down arrow button.
   - To run the entire chain two or more times, select the **Program Chain Loops** field, then enter the number of times you want the chain to run.
   - To close the Program Chain dialog box without saving the chain, press **Cancel**. To save the chain and close the dialog box, press **OK**.
4. The **Number of Cycles** field displays the total number of cycles in the loaded test.
5. From the **Start Position** drop-down menu you can select which position to start the basket in.
6. To schedule the selected test or profile to start at a preset time in the future:

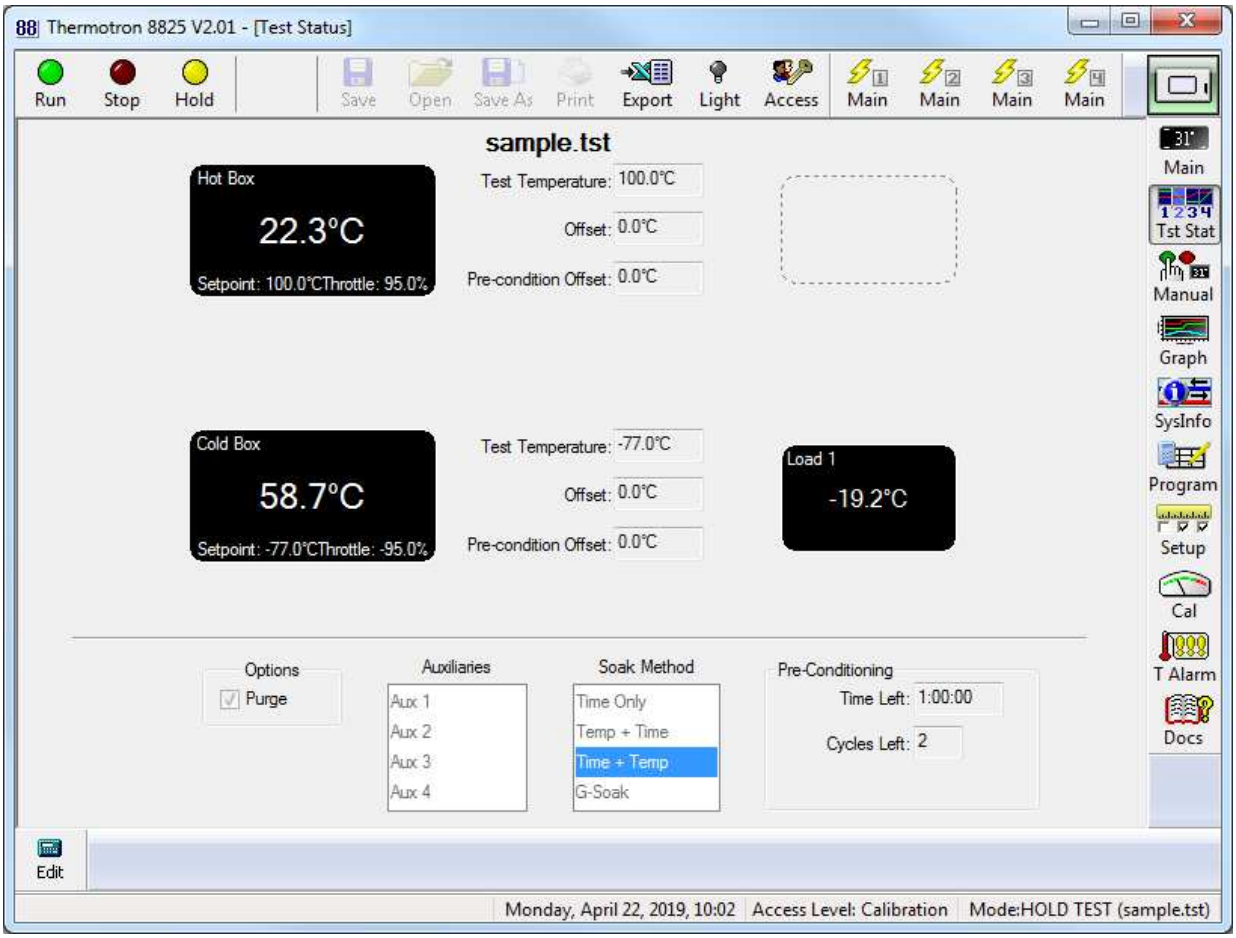


   a. Select **Enable Delayed Start**.
   b. Select the adjacent date and time field to choose when to start running the program.
   c. Press **Start Delay**. The 8825 will enter delayed start mode and the **Run** indicator will turn blue.

   NOTE: You cannot run another program or enter manual mode while a delayed start is pending. To cancel a delayed start, press **Run**, then press **Cancel Delay**.

7. To start the program immediately, press **Run**. The 8825 will enter run program mode. The **Run** indicator will turn green, and the test status screen will appear.

8. To suspend the program at its current settings, press **Hold**.



The 8825 will enter hold program mode and the **Edit** button will appear in the lower left corner of the screen. **NOTE**: In hold program mode the 8825 will maintain the chamber test space at the last set point.

- To enter temporary values into the program, go to step 9.
- To resume running a suspended program, press **Run** and go to step 10.

9. To enter temporary values into the current program:

   a. Press the edit button.

   b. Select and edit the values and options as desired.

   c. Press the edit button again, then press **Run**. The 8825 will enter run program mode again using the new values for the remainder of the current interval.

   NOTE: Once the current interval or cycle is completed, the temporary values are discarded. The next time the interval or cycle is run, the original programmed values apply.

10. To stop a running test, press **Stop**.

Programming the 8825

The 8825 provides programmed control of the thermal shock temperature cycling operations for your chamber. This section provides a general description of programmed cycling and programming options, followed by step-by-step programming procedures. It is divided into two sections:

- **Thermal shock tests** are normal tests involving complete thermal shock transfer and soak cycles.
- **Temperature profiles** are timed tests performed inside the cold box. The cold box has its own set of heaters that allow you to perform hot and cold temperature cycling.

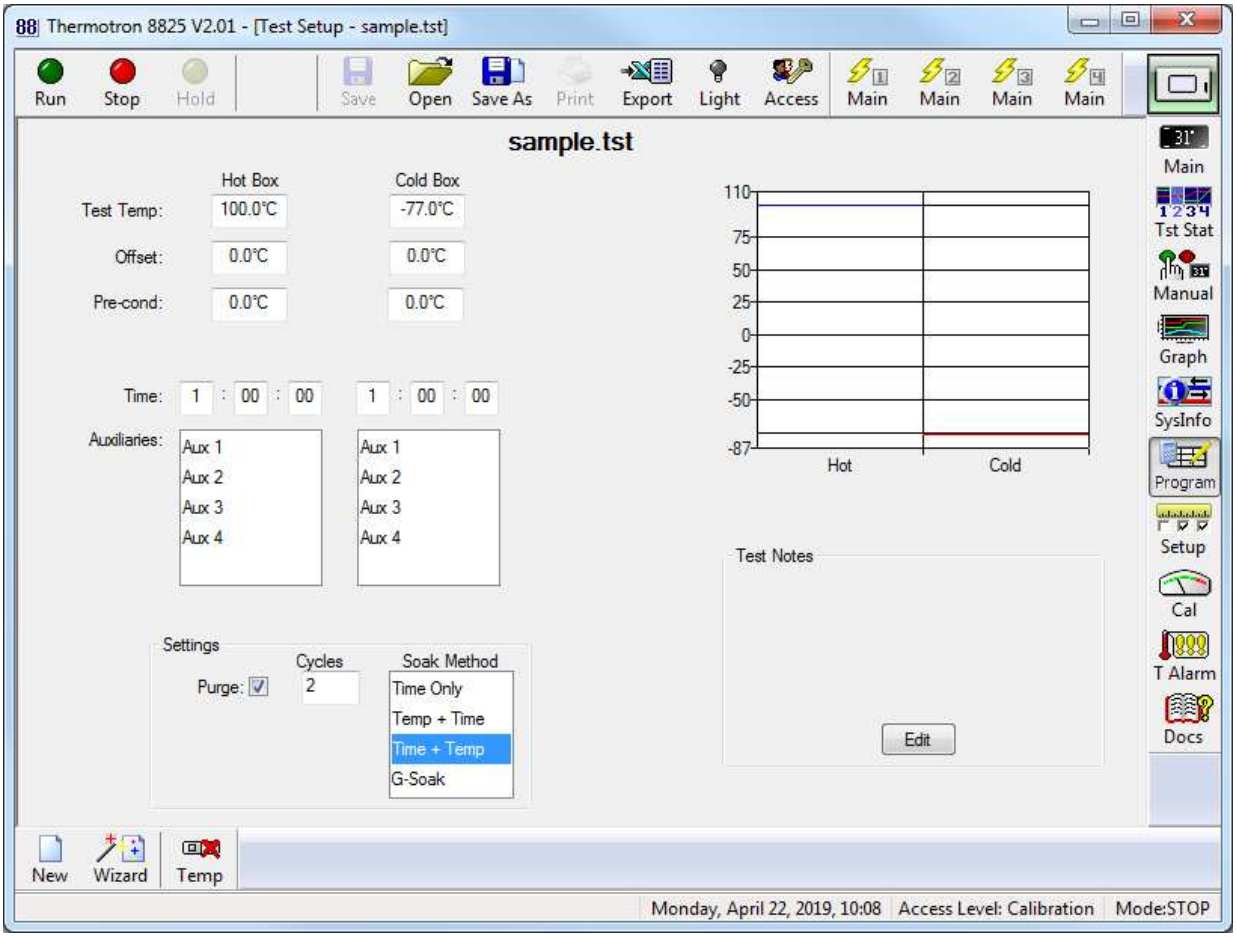
Thermal shock tests

The basic purpose of a thermal shock test is to cycle products through immediate extreme temperature shocks. This involves at a minimum a hot box and a cold box. Three-zone chambers provide an additional ambient space where the product is exposed to ambient air. Double-duty chambers simply apply two product carriers to the hot box and cold box transition.

Creating or modifying a thermal shock test

To perform thermal shock cycling a simple test is written to set up the box temperatures, soak times and methods, and the number of test cycles to be performed on the products. In addition, it allows other conditions to be set by programming auxiliary relays on or off. To create a thermal shock test perform the following:

1. Press **Program**. The program mode screen will appear:



2. If you want to modify an existing program:

   a. Press **Open**. The Open File dialog box will appear.

   b. Select the desired program.

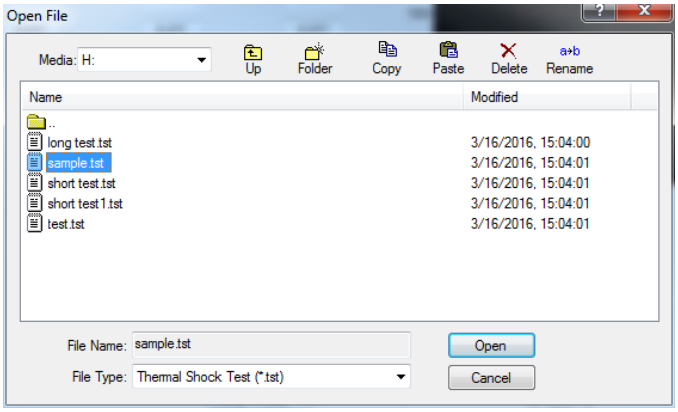
   c. Press **Open**.

   d. Go to step 4.

3. If you want to start with a blank profile:

   a. Press **New**.

   b. For on-screen, step-by-step instructions, press **Wizard**, press **Next**, and follow the instructions in the Profile Creation Wizard. Otherwise, go to step 4.



4. Select and change the settings for the thermal shock test. The following list describes the values and options displayed:

   - **Test Temp**: The required temperature for each box. To produce the set point the 8825 adds the offset or precondition offset to the test temperature. The 8825 operates the chamber to maintain the hot and cold box temperatures at the set point.
   - **Offset**: The number of degrees past the test temperature the hot or cold box may deviate to achieve the test temperature at the product.
     - In double-duty chambers the 8825 adds the offset to the test temperature to produce a set point for each box. The boxes will be at this set point temperature before the product enters the box.
     - In vertical two-zone or horizontal three-zone chambers, the offset value is added to the test temperature only when the basket is in the box. When the basket is not in the box, the precondition offset is added to the test temperature.

     The hot box offset must be a positive number and the cold box offset must be a negative number. (An offset of 5 for the hot box and -5 for the cold box is a good place to start.) If you do not want the set point to be different from the test temperature, enter zero for the offsets.
   - **Precondition Offset**: In vertical two-zone or horizontal three-zone chambers, the precondition offset is added to the test temperature only when the basket is not in the box. **NOTE**: This field does not appear when product temperature control (PTC) is enabled.
   - **Soak Time**: The total time in hours, minutes, and seconds on the "soak timer" for each box. See **Soak Method** below for information on how the soak timers are used.
   - **Auxiliaries**: The states of the auxiliary outputs at each carrier position. Normally, each auxiliary output operates a solid-state relay.
   - **Cycles**: The number of complete cycles to be run in the test.
   - **PTC**: This field enables or disables product temperature control. During normal thermal shock testing, the product temperature will lag behind the box air temperature. When PTC is enabled, you must program two test temperatures: one for the hot box and one for the cold box. The 8825 then senses the temperature at the product and operates the heating or cooling system at a faster throttle and higher set point to make up for the temperature lag. The PTC software increases temperature performance at the product by computing two air temperature set points based on the load test temperatures, the offset, and the gain parameters. **NOTE**: PTC is not available when the 8825 is configured for double-duty thermal shock chambers.
   - **Humidity**: This field enables or disables the humidity system. Humidity is available only on single-duty systems and will be controlled in the hot box only. **NOTE**: Humidity cannot be enabled when using PTC.

- **Purge**: Enabling the purge options helps to remove moisture that has accumulated in the chamber.
- **Soak Method**: The type of soak method being used. The methods are listed below:
  - **Time Only**: The timing starts when the basket completes its transfer into the respective box. Once the timer starts, it counts down to 0:00:00 and then transfers the basket to the other box.
  - **Time + Temp**: After the basket completes its transfer, the 8825 will wait until the boxes are at their required test temperatures before it starts timing. This usually takes only a minute or two. After the boxes reach their test temperatures, the timer start timing. When the timer counts to 0:00:00, the 8825 will check to see if the load is at the test temperature. If it is not, the 8825 will wait until the load reaches the test temperature. Then it will transfer the basket to the other box.
  - **Temp + Time**: The 8825 waits until the load temperature (sensed by the sensor traveling with the basket) reaches the programmed test temperature before starting the timer. Once the timer starts, it counts down to 0:00:00 and then transfers the basket to the other box.
  - **G-Soak**: The timer starts once the box is at the right temperature. The load temperature is not checked.

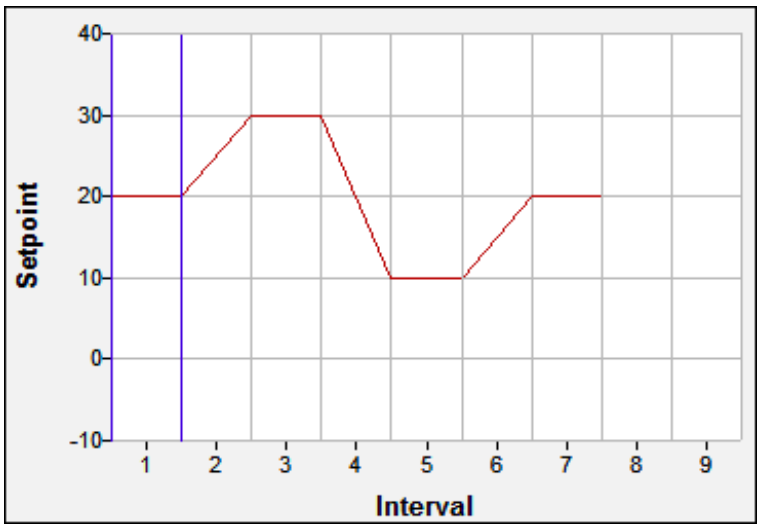
Temperature profiles

The basic purpose of a temperature profile is to cycle products inside the cold box through a wide range of temperature conditions. To perform process variable cycling, programs are written to control the chamber. Each program is made up of intervals. Each interval runs the cold box from an initial temperature to a final temperature in a specified amount of time. An interval's time can vary up to 99 hours, 59 minutes, 59 seconds, and is limited only by the speed a chamber can reach a given parameter. Refer to your chamber manual's performance specifications to determine change rates.

Each basic interval is programmed with the following entries:

- **Initial Value** is the starting value of the set point for this program. Initial values can be edited only in interval 1. After the first interval, the initial value is always the final value of the previous interval.
- **Final Value** is the ending value of the set point for this interval.
- **Deviation** controls how far you will allow the temperature or other process variable to be from set point. The deviation will be monitored and the deviation alarm will activate if the value is exceeded. **NOTE**: In an interval with guaranteed soak (G-Soak) enabled, the 8825 will immediately set the set point equal to the interval's final value and then wait until the process variable is within the deviation band of the final value. Once the process variable is within the deviation band, the interval time will begin counting down. For temperature-humidity programs, all non-zero deviation bands must be satisfied before the interval time will begin counting down.
- **Ramp Rate** controls the speed (in degrees or other units per minute) at which the 8825 cycles a process variable to a new set point.
- **Humidity** enables or disables the optional humidity system. **NOTE**: Humidity is disabled if product temperature control (PTC) is enabled.
- **PTC** enables product temperature control, an optional heating and cooling process that controls the process variable from the product temperature rather than the test space air temperature. PTC uses the load temperature to control the channel 1 air set point for faster load stabilization. **NOTE**: Product temperature control is disabled if humidity is enabled.
- **Purge** enables the purge option (if applicable).
- **Auxiliaries** (auxiliary relays) may be enabled or disabled for each interval. Auxiliaries are active only when the 8825 is running. For more information, see "Chan / Aux names panel" in Section 1 of this manual.
- **Time** is the duration of the interval. This value controls how fast the set point is to be cycled from initial value to final value.

The image to the right illustrates a sample temperature program with seven intervals. Each interval represents an action or condition inside the chamber. The first interval ensures the chamber reaches a given starting temperature, in this case 20°C. The second interval increases ("ramps") to the next required temperature of 30°C. The third interval maintains that temperature for five minutes. The fourth interval lowers the temperature to 10°C. The fifth interval holds the temperature for five minutes. The sixth interval raises the temperature to 20°C, with the seventh interval holding that temperature for five minutes.



Along with raising, lowering, and holding the chamber temperature, each interval lasts a specified length of time. The time a temperature is held depends on the product being tested at that temperature.

The interval time has two methods of control:

- If you enter a **Time** greater than zero, the 8825 performs a temperature ramp. This cycles the temperature evenly to the final temperature within the programmed time. If too short a time is programmed, the 8825 will transition to the next interval when the time runs out anyway.
- If you enable guaranteed soak (**G-Soak**) and set one or more **Deviations**, the 8825 will immediately set the set point equal to the interval's final value and then wait until the process variable is within the deviation band of the final value. Once the process variable is within the deviation band, the interval time will begin counting down. **NOTE**: For temperature-humidity programs, all non-zero deviation bands must be satisfied before the interval time will begin counting down.

- Sequential programming is selected by allowing the 8825 to increment to the next sequential interval (the default value in the **Next Int** field). Programmed looping is selected by using the **Next Int** and **# Loops** values. **Next Int** indicates the interval to transition to after completion of the current interval; **# Loops** is the total number of times the programmed loop will be executed.

  For programmed looping, the **Next Int** value is valid only if it is less than or equal to the number of the current interval, and if the **# Loops** value is greater than 1. The interval will actually loop back to the target interval the **# Loops** value minus 1. The following rules apply to looping:

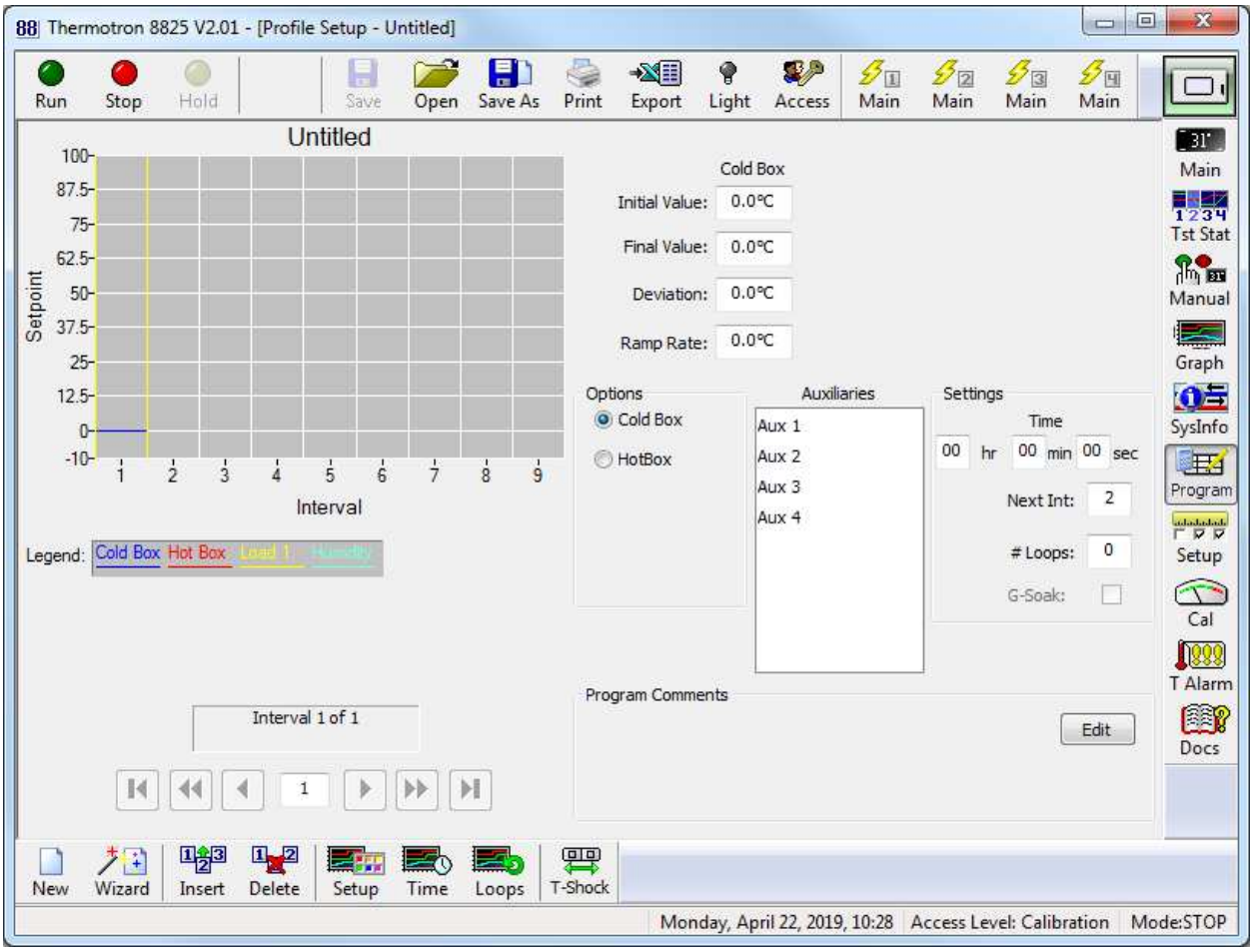
  - The target interval may be the target of another loop, but must not cross into another loop. (When a loop is crossed, the target interval is between the beginning interval and the ending interval of the loop).
  - Nested looping is legal. In nested looping, one loop starts and finishes inside another loop. Both loops can have the same target interval.
  - The final value of the looping interval should be the same as the initial value of the target interval.

Using the above program entry steps, a relatively complex program can be written. Repetitive tests can be looped and repeated rather than rewritten. Fast temperature cycles can be programmed using the guaranteed soak (**G-Soak**) method. Controlled temperature cycles can be programmed using the ramp method.

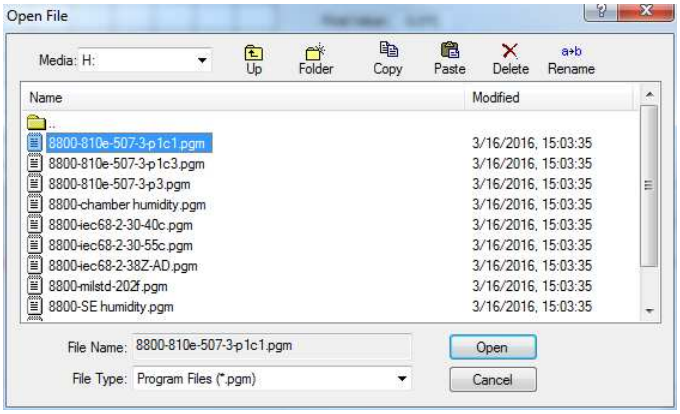
Creating or modifying a temperature profile

1. Press **Program**. The thermal shock test setup screen will appear.

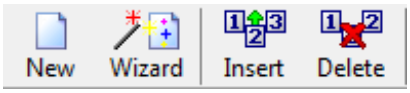
2. Press the **Temp** button at the bottom of the screen. The temperature profile setup screen will appear:



3. If you want to modify an existing program:
   a. Press **Open**. The Open File dialog box will appear.
   b. Select the desired program.
   c. Press **Open**. Go to step 5.

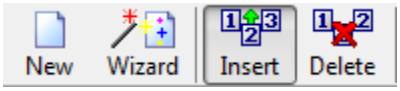


4. If you want to start with a blank profile:
   a. Press **New**.
   b. For on-screen, step-by-step instructions, press **Wizard**, press **Next**, and follow the instructions in the Profile Creation Wizard. Otherwise, go to step 5.



5. Select and change the settings for each interval of the program. The following list describes the program values and options displayed:

   - For **Initial Value** enter the starting temperature for the cold box for this interval. After interval 1 the initial value will always be the final value of the previous interval and cannot be edited.
   - For **Final Value** enter the ending value for the cold box's set point for the interval.
   - For **Deviation** enter how far you will allow the cold box's temperature to be from set point. Enter a positive number only; the 8825 will monitor both plus and minus deviations and activate the deviation alarm if the values are exceeded.
   - If you want to specify a **Ramp Rate**, enter the speed (in units of measurement per minute) for the 8825 to cycle cold box temperature to a new set point. (Refer to your chamber manual's performance specifications to determine change rates.) The 8825 will calculate the difference between the interval's initial and final values, divide the difference by the ramp rate, and adjust the interval **Time** accordingly.
   - Select the desired **Options** for the interval. **NOTE**: Enabling **Humidity** disables the **PTC** (product temperature control). Enabling **PTC** disables the **Humidity** channel. When **PTC** is enabled, only the values for the **PTC** channel can be edited.
   - Select the desired **Auxiliaries** for the interval. Auxiliaries are active only when the 8825 is running.
   - For **Time** enter the length of the interval in hours, minutes, and seconds. The maximum interval time is 99 hours, 59 minutes, 59 seconds.
   - For **Next Int** enter the number of the interval you want the 8825 to transition to after this interval is complete. For programmed looping this number must be less than or equal to the current interval number, and the **# Loops** value must be greater than 1. If no loops are programmed, the **Next Int** field displays the number of the next interval.
   - For **# Loops** enter the number of times you want the programmed loop to be executed. A loop can be repeated up to 999 times. **NOTE**: The interval will actually loop back to the target interval the **# Loops** value minus 1.
   - To enable guaranteed soak, check **G-Soak** and set one or more **Deviations**. The 8825 will immediately set the set point equal to the interval's final value and then wait until the process variable is within the deviation band of the final value. Once the process variable is within the deviation band, the interval time will begin counting down. **NOTE**: For temperature-humidity programs, all non-zero deviation bands must be satisfied before the interval time will begin counting down.
   - To insert a new interval following the current interval, press **Insert**.
   - To delete the current interval, press **Delete**.

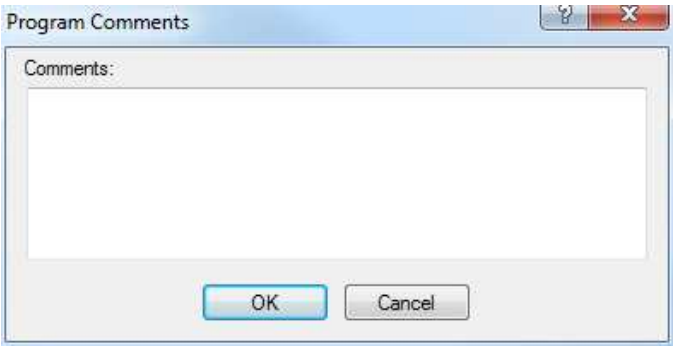


6. To add descriptive comments to your program:

   a. Press **Edit** under Program Comments. The Program Comments dialog box will open:

   b. Select the Comments field and use the alphanumeric keyboard to add your comments.

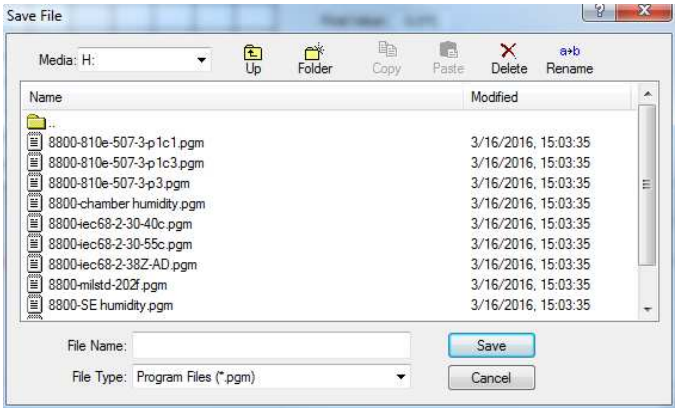
   c. To save your comments, press **OK**.



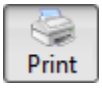
7. You may save your program at any time by pressing **Save**.

   a. The first time you save the program, select the File Name field and use the alphanumeric keypad to enter a file name.

   b. Press **Save.**



8. To print the currently loaded program as a combined graph and spreadsheet, press **Print**. **NOTE**: Programs can be printed only in interval view. Programs cannot be printed in time or expanded loop view. For more information, see "Using the program graph" below.



9. To delete a saved program:

   a. Press **Open**. The Open File dialog box will appear.

   b. Select the desired program.

   c. Press **Delete**.

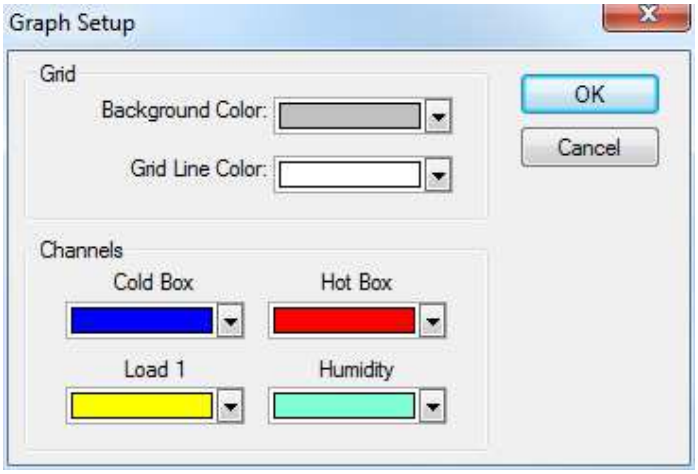
   d. Press **Yes** to confirm the deletion.

Using the program graph

The program graph lets you view your program before running it. The following section describes how to set up and use the program graph.

1. To modify the program graph's appearance:

   a. Press the graph **Setup** button. The Graph Setup dialog box will appear:

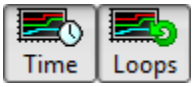


   b. Select the background and grid line colors from the drop-down menus.

   c. Select the channel colors from the drop-down menus.

   d. Press **OK** to accept your selections or **Cancel** to close the Graph Setup dialog box without making any selections.

2. The program data can be viewed on the graph in several different ways:

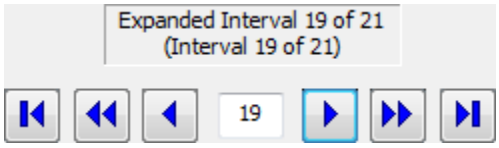


   a. To display the program with each interval given space based on its duration, select **Time**.

   b. To display the program with each interval given the same amount of space regardless of its duration, deselect **Time**.

   c. In either interval or time view, you may display all of the loops in a program by selecting **Loops**. **NOTE**: To get an estimated running time of the entire program on the X axis of the graph, select **Loops** and **Time**, and then use the arrow buttons to move to the end of the program.

3. Once a program is loaded, you can use the arrow buttons to move through the graph:



   a. To move back to the first interval, press the first button.

   b. To move back 12 intervals, press the second button.

   c. To move back to the previous interval, press the third button.

   d. To move forward to the next interval, press the fourth button.

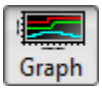
   e. To move forward 12 intervals, press the fifth button.

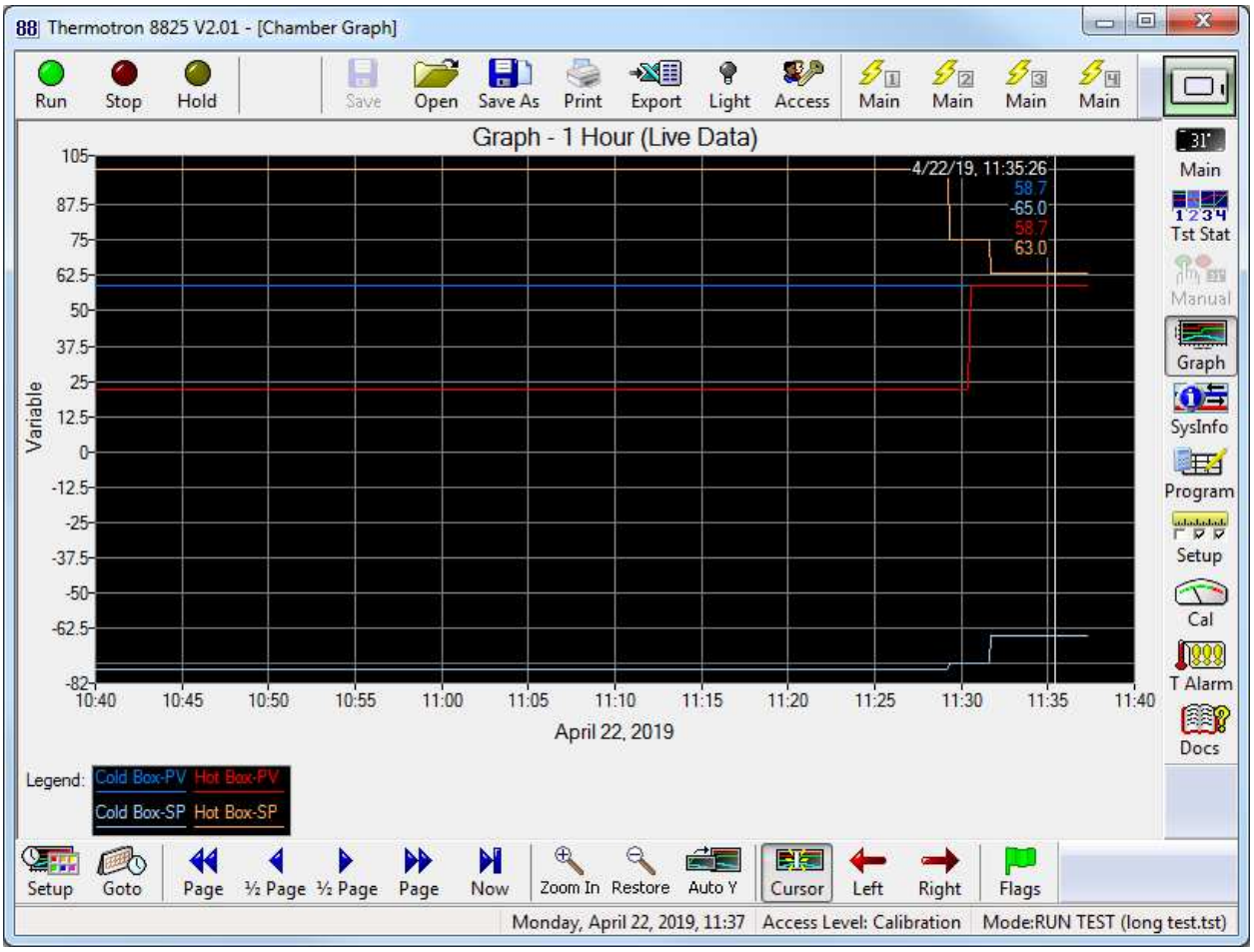
   f. To move to the last interval, press the sixth button.

   NOTE: You can also jump to an interval by clicking on it in the graph.

Using the Graph panel

From any screen press **Graph** to view the graph screen. The graph screen allows you to see a graphic representation of such chamber data as process variables, monitor channel temperatures, and refrigeration system readings. The graph setup screens allow you to customize the graph. The button bar at the button of the graph screen allows quick set-up and navigation of graph data.

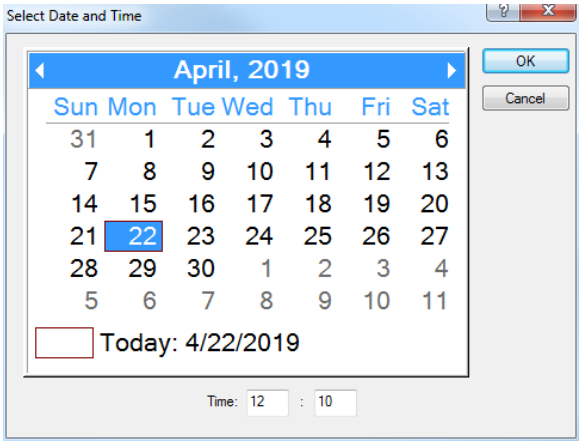




Using the graph buttons

Use the graph buttons to set up and navigate through the recorded chamber data:

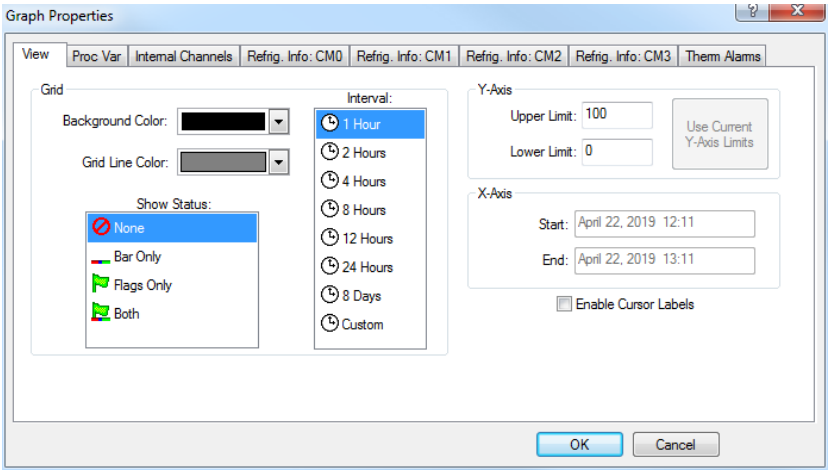
1. To modify the graph settings press **Setup**. See "Graph setup" below.
2. To change the graph view to a specific date and time:
   a. Press **Goto**. The Select Date and Time dialog box will appear:
   b. Select a date from the calendar. The currently displayed date is highlighted in blue and today's date is outlined in red. Use the left and right arrow buttons to display the previous and next months.
   c. Select the time fields to specify a time. The selected time will appear at the center of the graph.
   d. Press **OK** to accept your selections or **Cancel** to close the dialog box without making any selections.



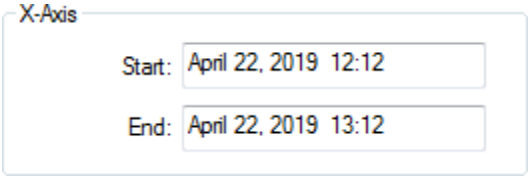
3. To move the graph backward one time period as defined by the interval time, press the first **Page** button. For example, on an eight-hour graph this button will move the graph back eight hours.
4. To move the graph backward one half time period as defined by the interval time, press the first **½ Page** button For example, on an eight-hour graph this button will move the graph back four hours.
5. To move the graph forward one half time period as defined by the interval time, press the second **½ Page** button. For example, on an eight-hour graph this button will move the graph forward four hours.
6. To move the graph forward one time period as defined by the interval time, press the second **Page** button. For example, on an eight-hour graph this button will move the graph forward eight hours.
7. To move the graph to current date and time from any location on the graph, press **Now**.
8. To resize the graph to half of its previous Y-axis range, press **Zoom In** and then click a location on the graph. The graph will be centered around the point selected.
9. To reset the graph to its original settings (no zoom), press **Restore**.
10. To automatically adjust the Y-axis range to include the highest and lowest values in the current graph view, press **Auto Y**.
11. To activate a cursor press **Cursor**. The cursor displays the selected data readings at one point on the graph. Clicking anywhere on the graph moves the cursor to that point.
12. To move the cursor left one time unit, press **Left**.
13. To move the cursor right one time unit, press **Right**.
14. To display chamber start and stop times at the bottom of the graph, press **Flags**. A green (run), red (stop), yellow (hold), or blue (delayed start) text box is displayed showing the state of the chamber, manual or program mode, and the date and time of the change of state.

Graph setup

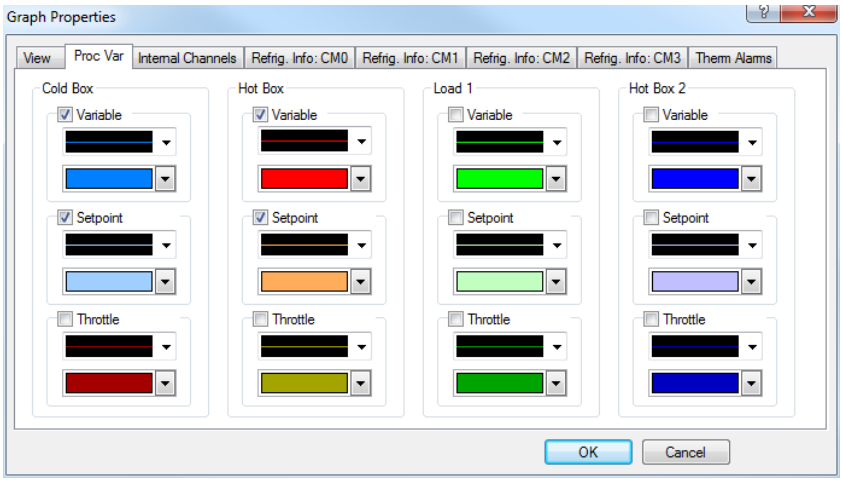
1. Press the **Setup** button to access the graph properties panels. The Graph Properties dialog box will appear with the View panel selected:



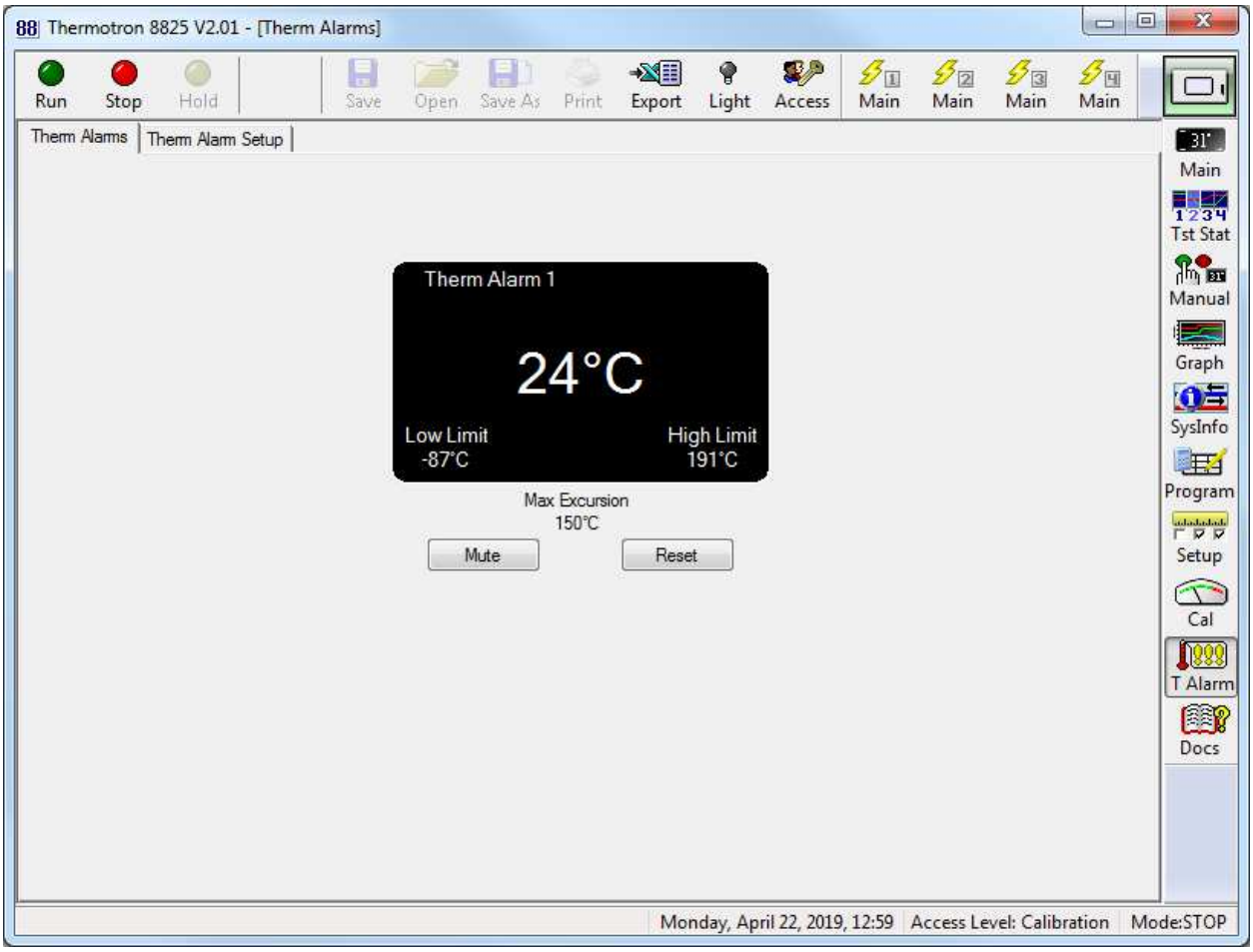
2. Under Grid, select the background and grid line colors from their drop-down menus.
3. Select the graph time span:
   a. Under **Interval**, select one of the standard time spans for the graph.
   b. To specify a non-standard time span, select **Custom**. Under X-Axis select the **Start** and **End** date and time fields to modify the graph's X-axis.



4. Under Show Status, select how the run/stop/hold status will be displayed at the bottom of the graph.
   a. To display no chamber status information, select **None**.
   b. To display chamber status information as a bar at the bottom of the graph, select **Bar Only**. Chamber status is displayed as green (run), red (stop), yellow (hold), and blue (delayed start).
   c. To display chamber start and stop times at the bottom of the graph, select **Flags Only.** A green (run), red (stop), yellow (hold), or blue (delayed start) text box is displayed showing the state of the chamber, manual or program mode, and the date and time of the change of state.
   d. To display chamber status information and stop and start flags at the bottom of the graph, select **Both**.
5. Under Y-Axis you can customize the graph's upper and lower limits. Press **Use Current Y-Axis Limits** to select the current Y-axis settings.
6. The other Graph Properties panels allow you to select how the graph displays process variables, monitor or internal channels, and refrigeration data. For each panel:
   a. Select the appropriate check box to display a channel's **Variable**, **Setpoint**, or **Throttle** reading.
   b. From the drop-down menus select the line type and color for each type of data displayed.
7. Press **OK** to accept your changes or **Cancel** to close the dialog box without making any changes.



Using the Therm-Alarm panels



CAUTION: It is *your* responsibility to set Therm-Alarm limits appropriate for your product, and to properly place any Therm-Alarm thermocouples or analog sensors. When used properly, the Therm-Alarm is an effective product protection device; however, it is not a fail-safe device and will not guarantee the safety of your product. If you are testing expensive products, you should have an additional back-up product protection device. If you are testing products with live electrical loads, you should install additional power cutoffs. Please call Thermotron Industries if you have any questions on additional product protection.

The Therm-Alarm is a redundant protection system. Each Therm-Alarm has one temperature channel and may also have one linear analog channel. The Therm-Alarm can detect undesirable conditions at the products under test and alert you with audible and visible alarms. The Therm-Alarm can also disconnect power to the products being tested and to the chamber heating and cooling mechanisms.

The Therm-Alarm's temperature channel uses a thermocouple to monitor the temperature at the products under test. Likewise the Therm-Alarm's analog channel monitors the signal from an analog sensing device, such as a humidity sensor. If the product temperature or the analog signal exceeds either the high or low limits, the Therm-Alarm disables the control circuit at the chamber circulators. This cuts off power to the control circuitry.

In the following instructions "input temperature" refers to the temperature of the product being tested (measured by the input thermocouple). "Limit temperature" refers to the adjustable high and low temperature settings. "Analog signal" refers to the analog channel's signal. "Analog limit" refers to the adjustable high and low analog channel limit settings. An alarm occurs if the input temperature reaches a limit temperature or the analog signal reaches an analog limit.

This section includes a description of the Therm-Alarm operating modes, instructions for setting up the Therm-Alarm, instructions for muting and resetting alarms, and calibration instructions.

Therm-Alarm operating modes

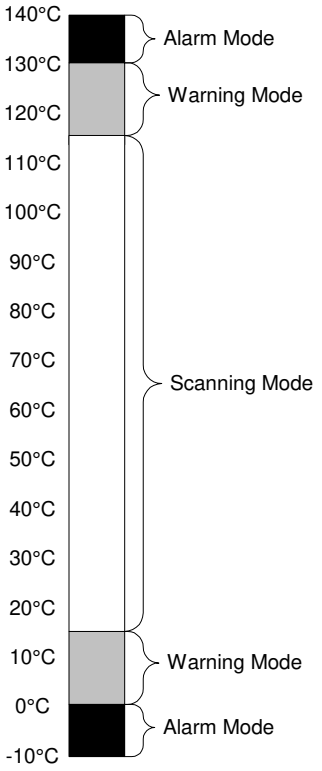
The Therm-Alarm stays in ***scanning mode*** as long as the input temperature and analog signal are within the acceptable range between the high and low warning settings.

Warning mode occurs when the input temperature comes within the warning temperature band of a limit temperature, or the analog signal comes within the warning band of an analog limit. (For information on setting the warning band, see "Changing the Therm-Alarm settings" later in this section.) The chamber heating and cooling systems continue to operate during this mode. In this mode the Therm-Alarm is automatically reset when the condition that caused the mode is removed.

The Therm-Alarm goes into ***alarm mode*** as soon as the input temperature or analog signal exceeds the high or low limits by more than five units. (For information on setting the temperature or analog limits, see "Changing the Therm-Alarm settings" later in this section.) This mode also occurs if the limit is exceeded by less than five units and the alarm delay timer has timed out. During alarm mode, the Therm-Alarm disconnects power to any circuit wired through its mechanical relay contacts. If the input temperature or analog signal causes an alarm and then returns to an acceptable level, the Therm-Alarm must be reset to exit from alarm mode. For information on resetting the instrument, see "Alarm mute and reset mode functions" later in this section.

Open thermocouple mode occurs when the input thermocouple is not connected or is open. During this mode the Therm-Alarm disconnects power to any circuit wired through its mechanical relay contacts. In this mode the Therm-Alarm is automatically reset when the condition that caused the mode is removed.

Failure mode occurs if the Therm-Alarm detects a problem within its own circuitry. During this mode the Therm-Alarm disconnects power to any circuit wired through its mechanical relay contacts.



High limit: +130°C
Low limit: 0°C
Warning bandwidth: 15°C

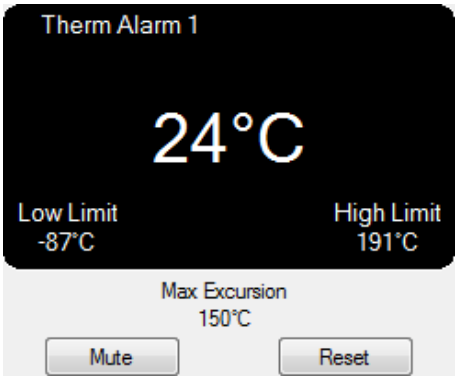
Positioning the input thermocouple or analog sensor

A long wire connects the input thermocouple or analog sensing device to the Therm-Alarm. Because it is important to measure the conditions of the product itself, you must place the thermocouple or analog sensor directly on the product being tested, or as close to the product as possible.

CAUTION: It is *your* responsibility to properly place any Therm-Alarm thermocouples or analog sensing devices. When used properly, the Therm-Alarm is an effective product protection device. However, it is not a fail-safe device and will not guarantee the safety of your product. If you are testing expensive products, you should have an additional back-up product protection device. If you are testing products with live electrical loads, you should install additional power cutoffs. Please call Thermotron Industries if you have any questions on additional product protection.

Viewing the Therm-Alarm settings

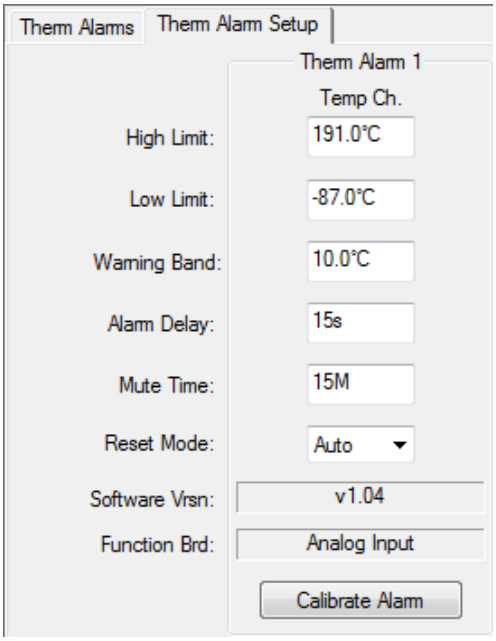
From any screen press **T Alarm** to display the Therm-Alarms panel.



- If you have a temperature-only Therm-Alarm, you will see the current temperature at the product under test as measured by the input thermocouple. If your Therm-Alarm is configured for temperature and the additional analog channel, you will see both the current temperature and the current analog signal.
- **Low Limit** and **High Limit** indicate the temperature limits which, if exceeded, will cause a Therm-Alarm trip. For information on setting these limits, see "Changing the Therm-Alarm settings" below.
- **Max Excursion** is the most extreme temperature experienced during the most recent alarm condition.

Changing the Therm-Alarm settings

NOTE: The Therm-Alarm temperature channel settings are based on the temperature scale currently selected. If you change the scale the Therm-Alarm settings will automatically adjust.



1. From any screen press **T Alarm**, then select the Setup panel.

   CAUTION: The screen shot shown to the right displays the Therm-Alarm factory default settings. It is *your* responsibility to set Therm-Alarm limits appropriate for your product.

2. Select the **High Limit** or **Low Limit** field. In each field, use the numeric keypad to enter the temperature or analog limit that you want to cause a Therm-Alarm trip if it is exceeded at the product being tested.
3. Select the **Warning Band** field and enter the number of units from the limits you want the warning band to begin. You can enter any number from 0 to 99. To disable the warning mode select 0.
4. Select the **Alarm Delay** field and enter the number of seconds you want the alarm mode to be delayed after the input temperature or analog signal reaches a limit. You can enter any number of seconds from 0 to 99. If you select 0 seconds, the alarm mode will begin as soon as a limit temperature is reached.

   NOTE: If the limits are exceeded by more than five units, the alarm delay will not occur.

5. Select the **Mute Time** field and enter the number of minutes you want an audible alarm to remain silent after it is muted. You can enter any number of minutes from 0 to 99. If an alarm is still active after the mute period, the audible alarm will resume sounding.
6. From the **Reset Mode** drop-down menu, select **Manual** or **Auto**. This setting determines how the Therm-Alarm is reset when it is in alarm mode.
   - In manual reset mode you must go to the Therm-Alarm main screen and select **Reset** to reset the Therm-Alarm.
   - In auto reset mode the Therm-Alarm will reset itself after the input temperature or analog signal is two units inside of the acceptable range.

Alarm mute and reset mode functions

During warning, alarm, open thermocouple, and failure modes, the Therm-Alarm emits an audible alarm. From the Therm-Alarm screen you can mute the alarm and/or reset the instrument.

In ***warning mode*** the Therm-Alarm resets itself after the input temperature or analog signal moves into the scanning mode (normal) range.

In ***alarm mode*** the Therm-Alarm is reset manually or automatically, depending on the reset mode.

- If the reset mode has been set to manual and the input temperature or analog signal has returned to within the high and low limits, you must reset it to normal operating conditions from the Therm-Alarm screen. (See the instructions below.)
- If the reset mode has been set to auto, the Therm-Alarm resets itself when the input temperature or analog signal is at least two units inside the acceptable range. If the temperature or analog signal is still inside the warning mode band, the Therm-Alarm drops from alarm mode to warning mode.

In ***open thermocouple mode*** the Therm-Alarm resets itself once the thermocouple is closed or repaired.

In ***failure mode*** you must remove power from the Therm-Alarm and then apply power again to reset it.

Muting or resetting the Therm-Alarm

1. From any screen press **T Alarm** to display the Therm-Alarms panel.
2. To mute an audible alarm for the number of minutes set in the Therm-Alarm setup screen, press **Mute**. If an alarm is still active after the mute period, the audible alarm will resume sounding.
3. To reset the Therm-Alarm to normal operating conditions, press **Reset**.

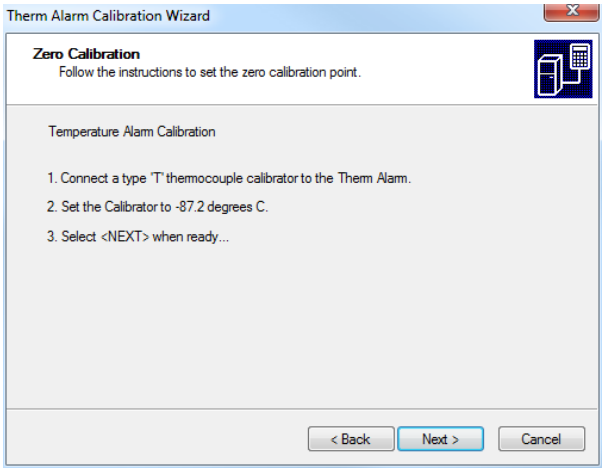
   NOTE: For more information on the mute or reset functions, see “Changing the Therm-Alarm settings” earlier in this section.

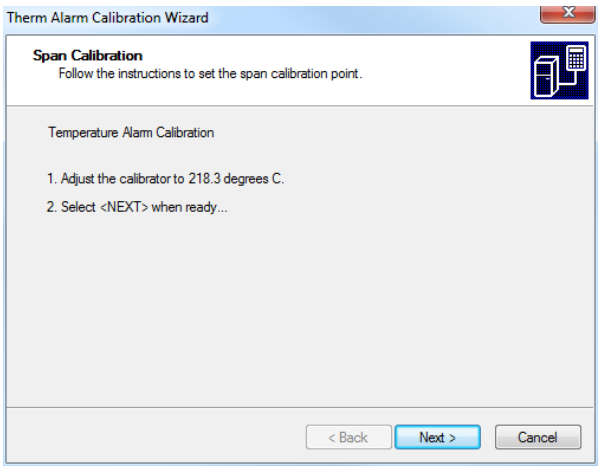
Calibrating a Therm-Alarm

To calibrate a Therm-Alarm temperature channel, a type 'T' thermocouple simulator is required. To calibrate a Therm-Alarm analog channel, an appropriate power supply is required.

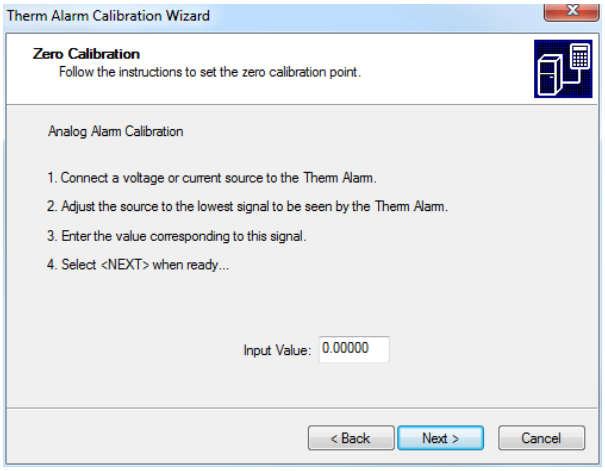
1. Make sure the controller's temperature scale is set to Celsius. If needed, see "General settings" in Section 1 of this manual.
2. From any screen press **T Alarm**, then select the Therm Alarm Setup panel.
3. For the Therm-Alarm you want to calibrate, press **Calibrate Alarm**.
4. If your Therm-Alarm has the analog channel configured, choose the channel you wish to configure.
5. Follow the on-screen instructions to set the **Zero** and **Span** calibration points and complete the calibration.

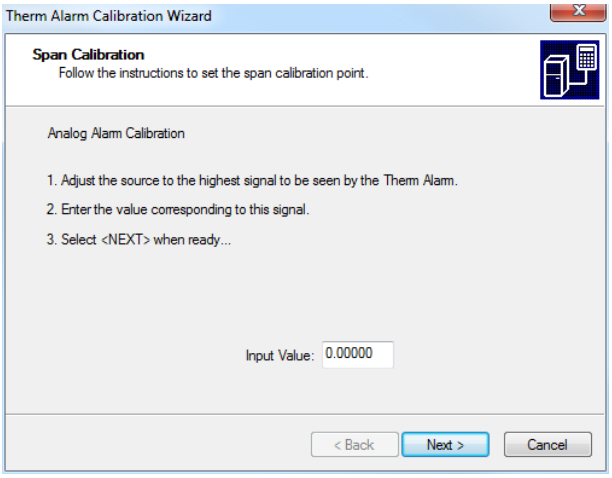
Temperature alarm calibration





Analog alarm calibration



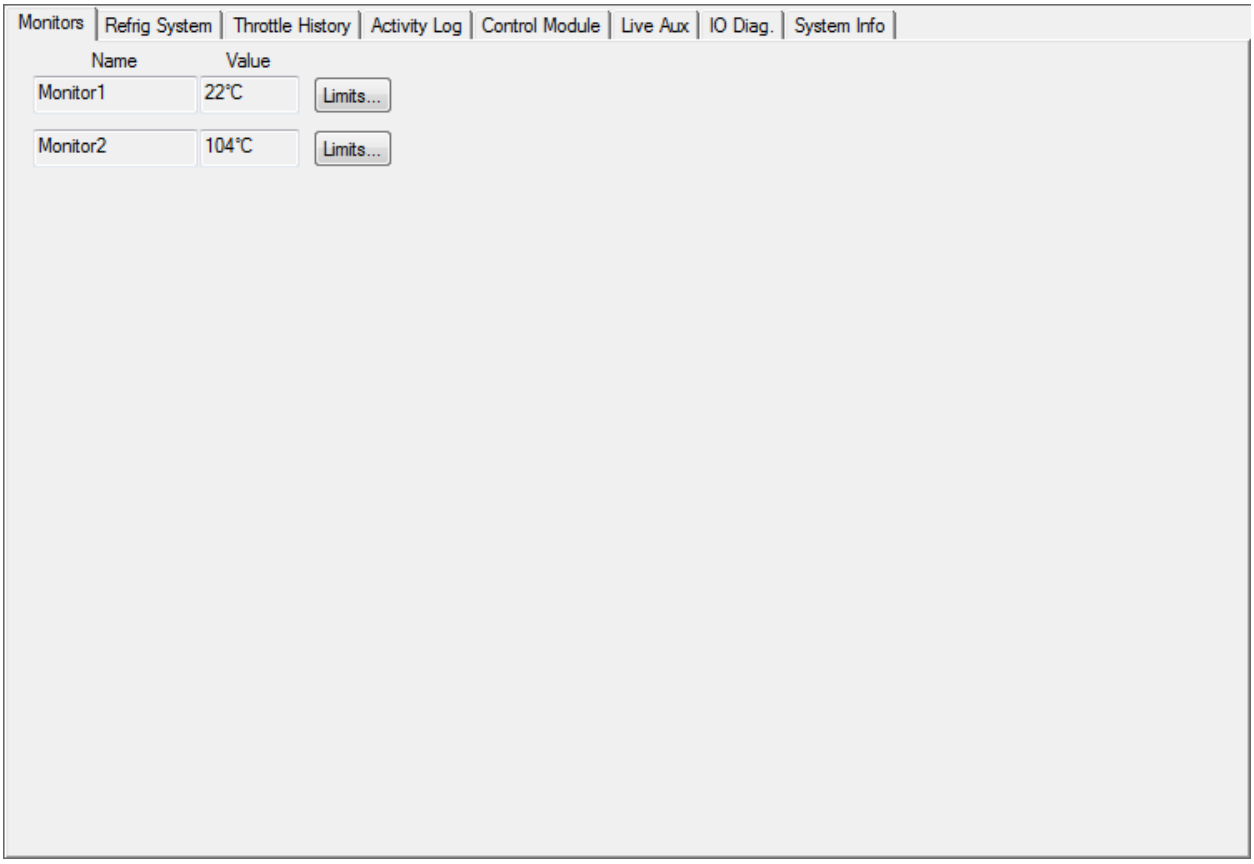


Section 3: System Information

Press **SysInfo** to access the system information panels. These panels provide diagnostic, reference, and historical information for your chamber system. This section describes the system information panels and how to use them. To return to the main screen from any system information panel, press **Main**.

NOTE: For information on calibration, refer to Section 5 of this manual.

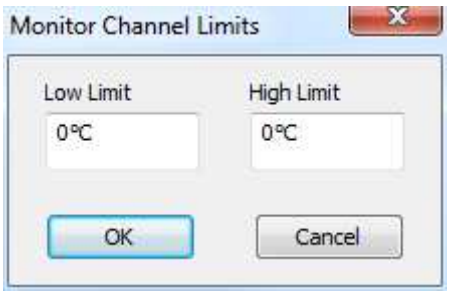
Monitors panel



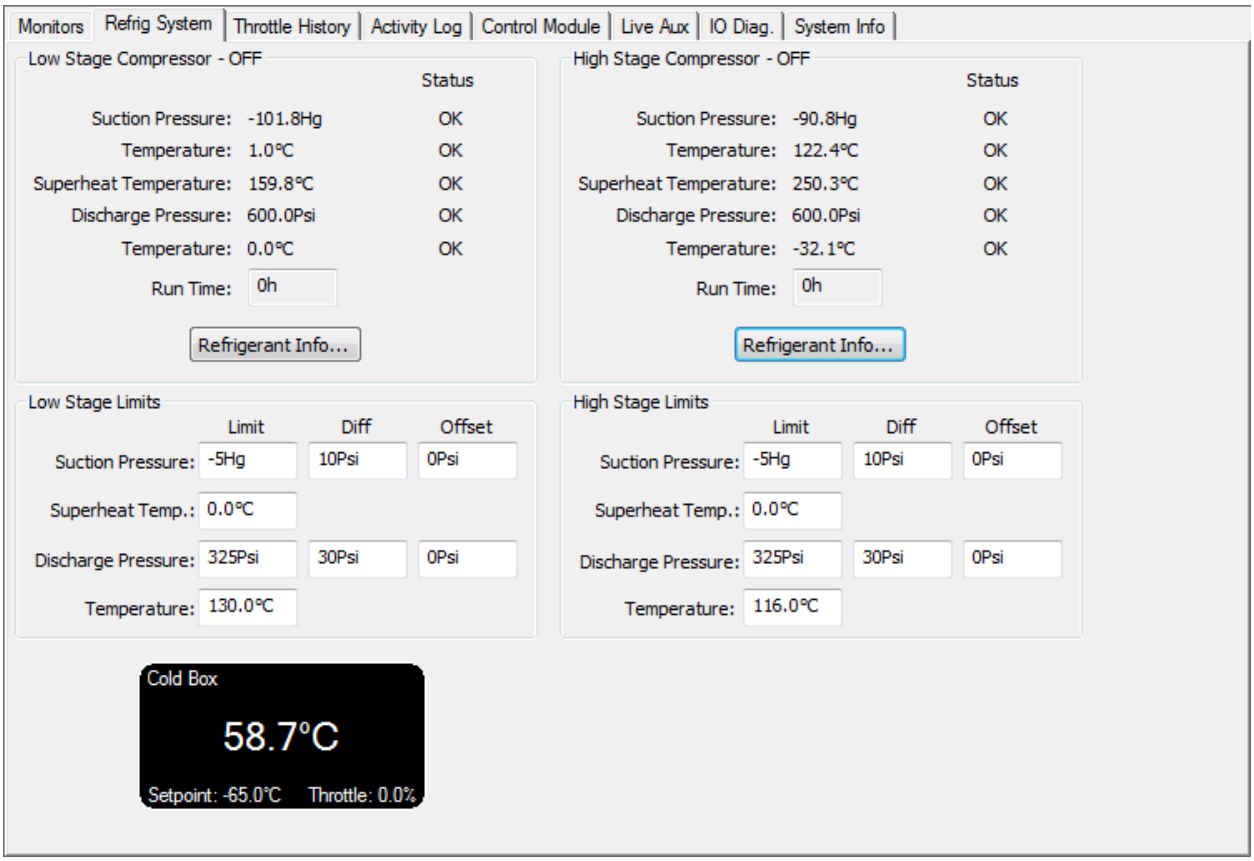
NOTE: The monitors panel appears only if one or more monitor channels were configured at the factory. To modify a monitor channel alarm setting, the 8825 access level must be Lab Manager or higher.

Monitor channels monitor processes within the chamber. If the high or low alarm limit is exceeded for a monitor channel, the 8825 alarm outputs are activated.

1. Press **SysInfo**, then select the Monitors panel.
2. Select **Limits...**
3. Select the low or high alarm field.
4. The numeric keypad will appear.
5. Enter the desired alarm limit, then press **Enter**.



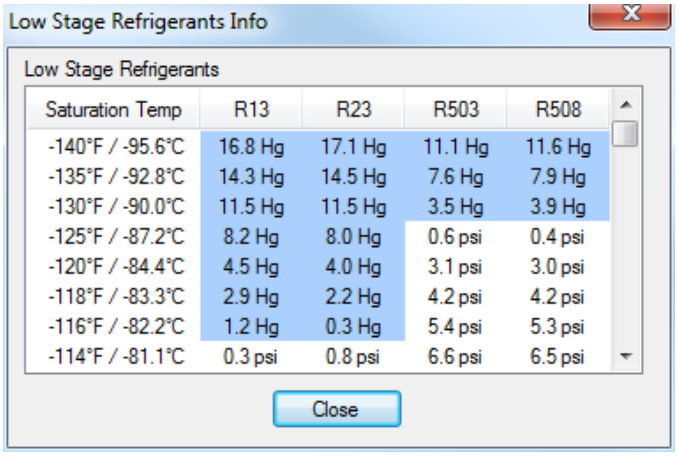
Refrigeration System panel



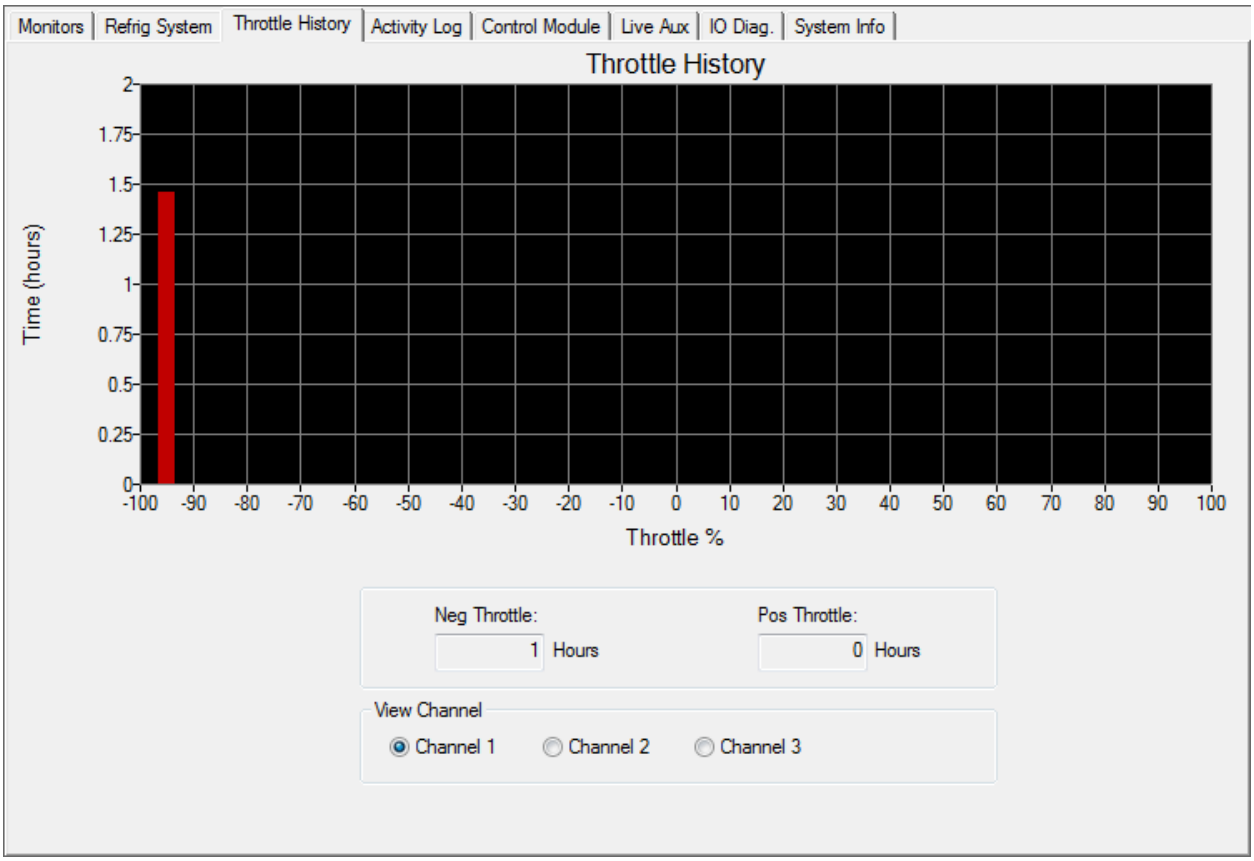
CAUTION: Access to the Low Stage Limits and High Stage Limits is provided to allow you to troubleshoot your chamber with the assistance of a Thermotron Technical Liaison. For assistance please call the Thermotron Product Support group at (616) 392-6550.

For chambers with refrigeration monitoring, the Refrig System panel provides diagnostic information, such as status, pressures, temperatures, compressor run times, and trip limits. The Refrig System panel also provides access to two pressure/temperature tables:

- For a table listing the low-stage refrigerants commonly used by Thermotron, press **Refrigerant Info...** under Low Stage Compressor.
- For a table listing the high-stage refrigerants commonly used by Thermotron, press **Refrigerant Info...** under High Stage Compressor.



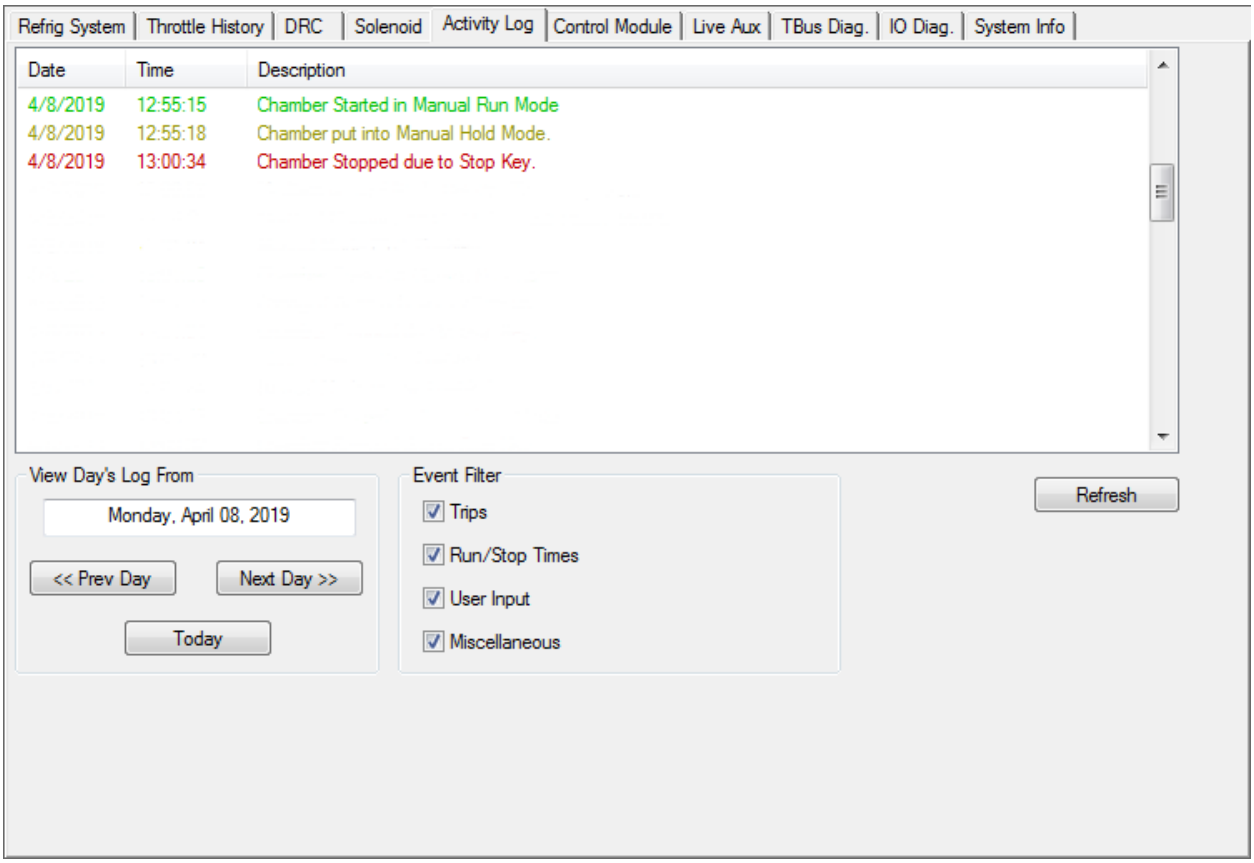
Throttle History panel



The Throttle History panel provides a histogram of percentage of throttle versus time for each control channel. Under View Channel, press a control channel to display that channel's histogram.

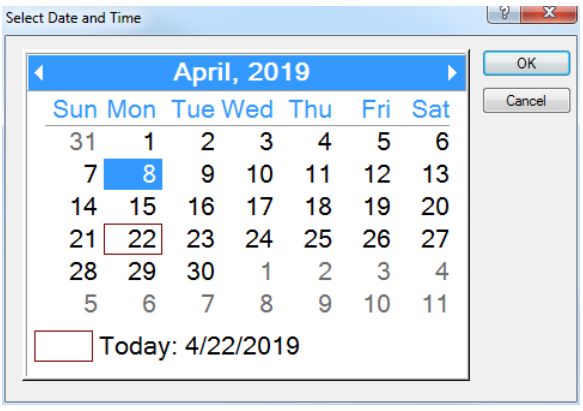
The panel also displays run times in hours for the selected channel's negative and positive throttles.

Activity Log panel



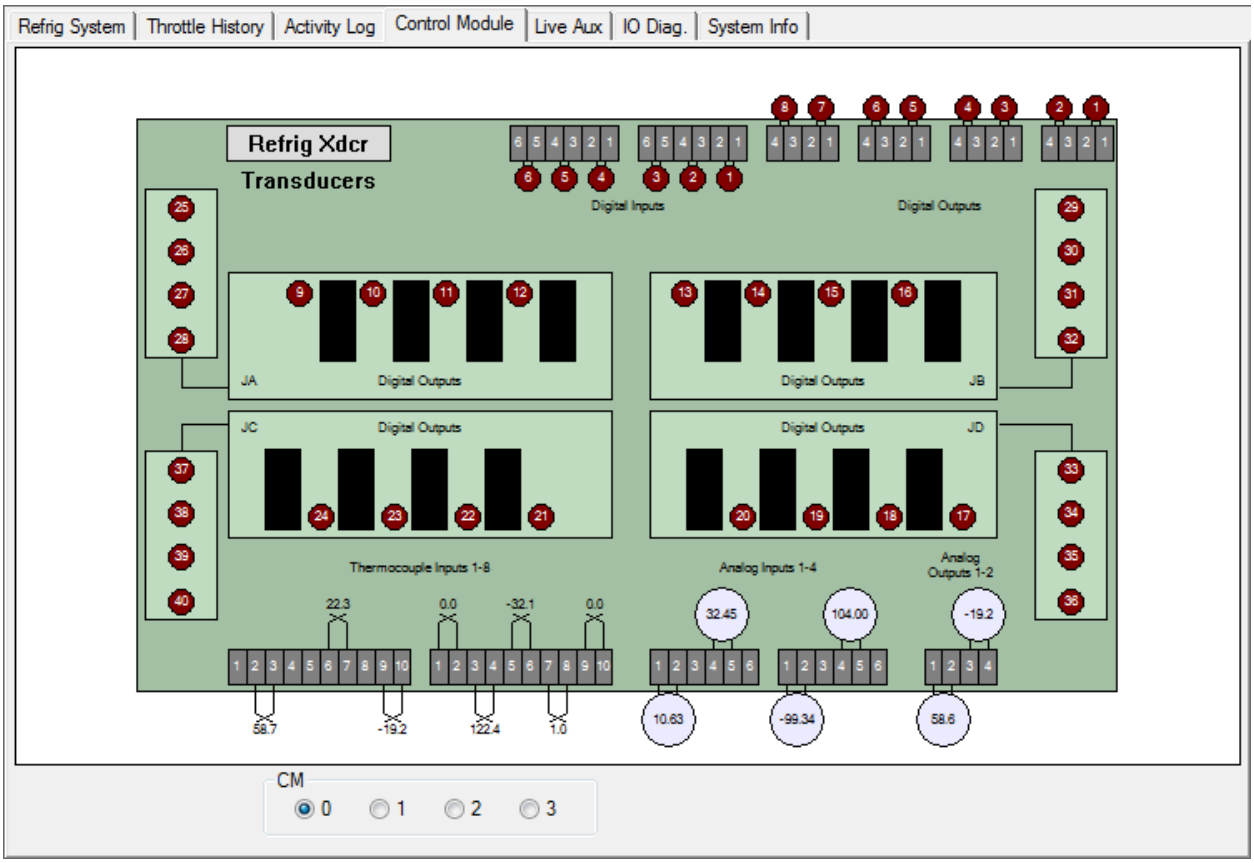
The Activity Log panel displays the date, time, and description of all system activities from a specific date to the present. To modify and view the activity log display, follow these steps:

1. Press **Today** to display the current activity log.
2. Press **Prev Day** or **Next Day** to move one day backward or forward.
3. To jump to a specific date:
   a. Press the date field. The Select Date and Time dialog box will appear:
   b. Select a date from the calendar. The currently displayed date is highlighted in blue and today's date is outlined in red. Use the left and right arrow buttons to display the previous and next months.
   c. Press **OK** to accept your selections or **Cancel** to close the dialog box without making any selections.



4. Select the type of activities displayed (such as trips, run/stop times, or user input):
   a. Check or uncheck each filter field as desired.
   b. Press **Refresh** to implement your changes and redisplay the activity log.
5. The activity log can be sorted by pressing the appropriate column header. For example, to sort by description, press the word **Description** at the top of the third column.

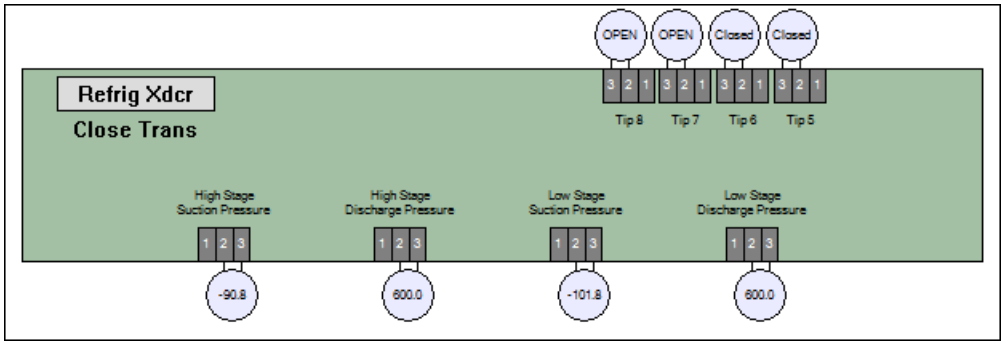
Control Module panel



NOTE: Access to control module information is provided to allow you to troubleshoot your chamber with the assistance of a Thermotron Technical Liaison. For assistance please call the Thermotron Product Support group at (616) 392-6550.

The Control Module panel displays a schematic of the 8825 control module with live data for all analog and digital inputs and outputs. All inputs and outputs are numbered for cross reference with chamber electrical and instrument drawings. The numbers of the digital inputs and outputs light up to indicate activity. If the 8825 has more than one control module installed, you can select which to display by selecting the appropriate **CM** number.

Transducer data

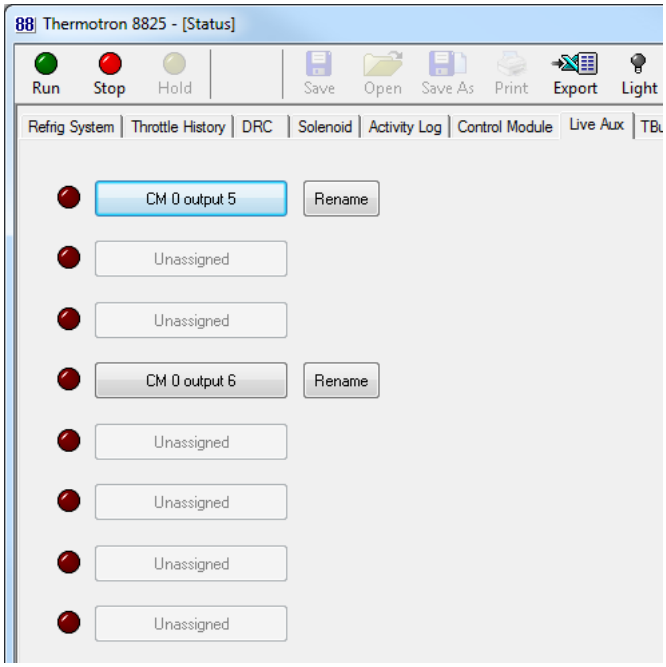


If your chamber is equipped with transducers, you can bring up a schematic of the refrigeration transducer board with live data by pressing the connector above the word **Transducers**. To close the transducer board display, press the connector above the words **Close Trans**.

Live Aux panel

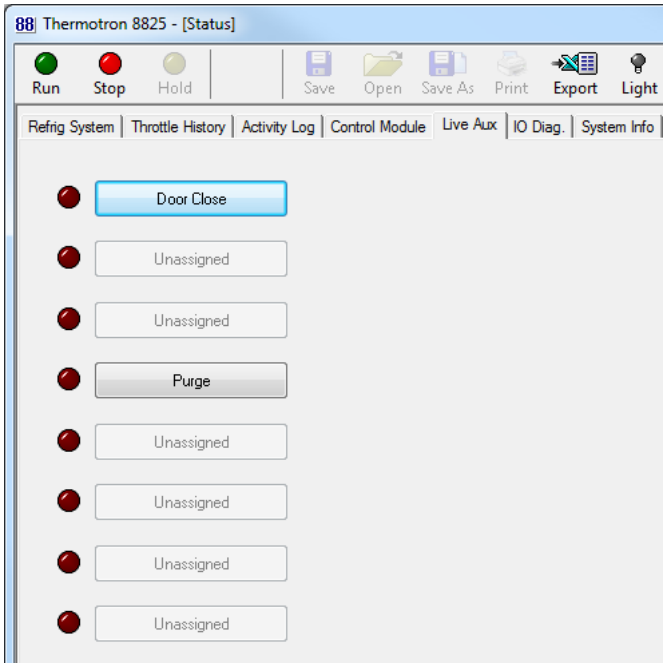
The Live Aux panel will appear only if your 8825 has live auxiliaries configured. Live auxiliaries are outputs that the user can turn on or off manually or via computer I/O regardless of the chamber's operating mode. For more information on your live auxiliaries, refer to your chamber manual.

- When a live auxiliary is first configured, it will automatically be named with its associated control module number and output number. This may be helpful for initial testing and troubleshooting by Thermotron personnel.
- Each assigned live auxiliary button can be renamed by pressing the **Rename** button and entering up to 20 characters. **NOTE**: The **Rename** button will be visible only if the 8825 access level is at or above Calibration level.
- A grayed-out button labeled **Unassigned** indicates that no physical output has been assigned at the factory to this live auxiliary.

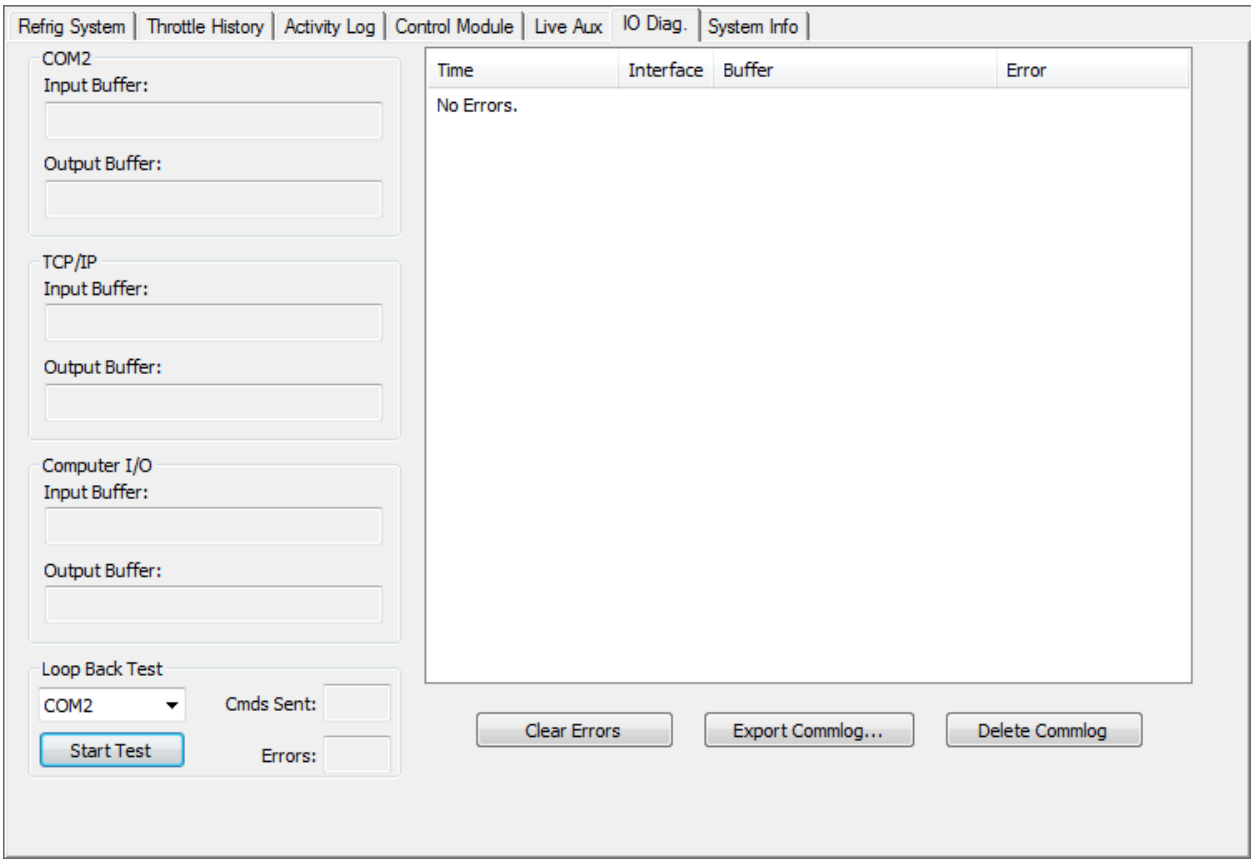


The image to the right shows two live auxiliary buttons that have been renamed **Door Close** and **Purge**. Also, the 8825 access level has been set to Lab Manager, so the **Rename** buttons are no longer visible.

- Each live auxiliary button can be pressed to toggle the configured output on or off regardless of the chamber's operating mode.
- The LED icon to the left of each button will be unlit (dark red) when the live auxiliary is off or unassigned, and will be lit (bright red) when the live auxiliary is on.



Computer interface diagnostic panel



This screen allows you to examine the current computer I/O communications as well as the last 25 computer I/O errors that have occurred. From here you can also export a complete history of all I/O communication errors.

Input and output buffers for the three interfaces

- **Input Buffer**: Shows the last data received by the 8825.
- **Output Buffer**: Shows the last data sent by the 8825.

List of the last 25 errors

- **Time**: Date and time the error occurred.
- **Interface**: The interface the error occurred on. This will be one of the following values: COM2, CM-RS232, CM-RS485, CM-GPIB, or TCP/IP.
- **Buffer**: Contents of the input buffer when the error occurred.
- **Error**: Text describing the actual error that occurred.
- **Clear Errors** button: Clears the error list screen but does not affect the commlog file saved on the hard drive.

Commlog file

- **Export Commlog...**: Allows the user to save the commlog file to a flash drive. The user may then inspect the file or e-mail it to Thermotron Product Support. The format is a spreadsheet that displays the time of each error, the device generating the error, and the command that generated the error.
- **Delete Commlog...**: Clears the entire commlog file.

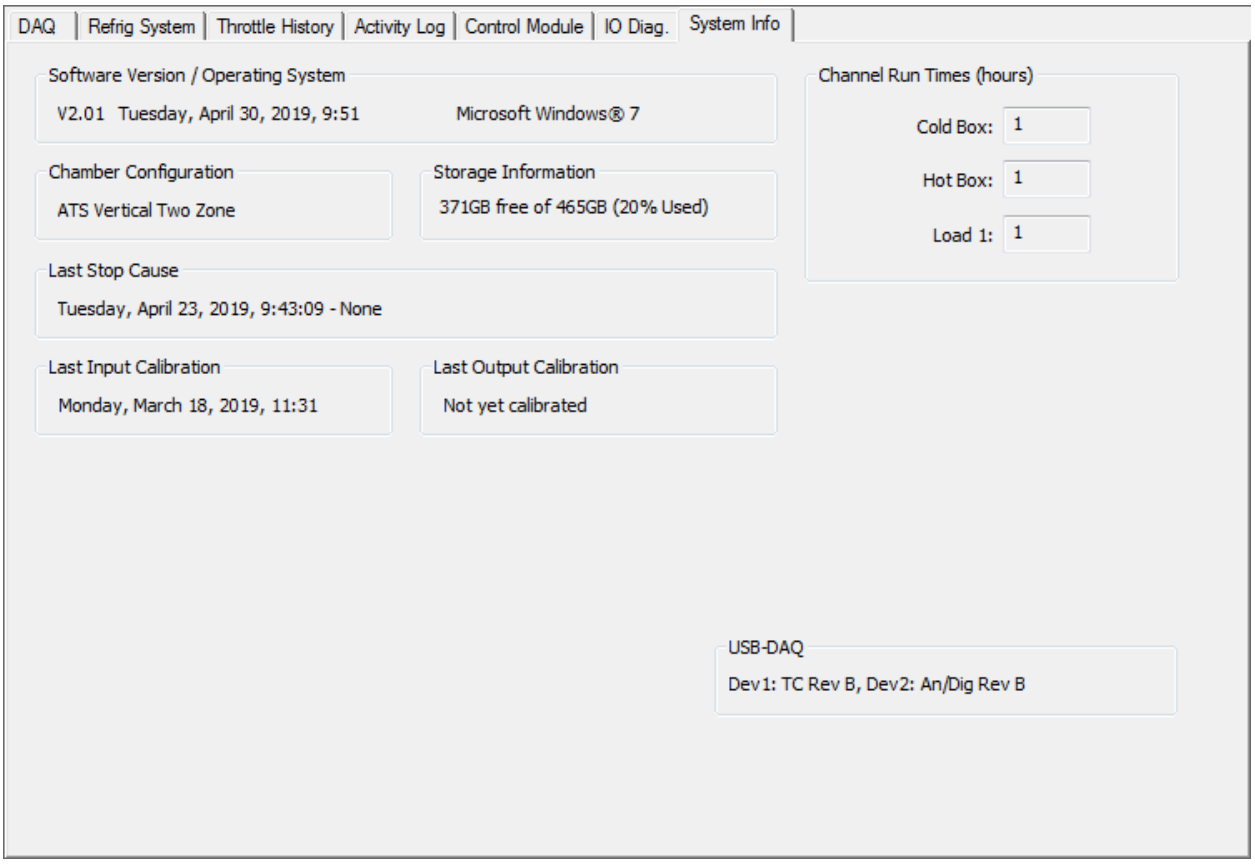
Loop back test

NOTE: You must be in Lab Manager access level to perform the loop back test.

The loop back test allows you to check whether the COM2 serial port of the 8825 computer is working correctly. To perform the test, short together pins 2 and 3 of the COM2 serial port.

- **Comm Port**: Select the port to test. **NOTE**: The 8825 only supports testing port COM2.
- **Start Test**: Press to start the loop back test. Press again to end the loop back test.
- **Cmds Sent**: A running total of the number of commands sent out the COM2 port.
- **Errors**: The total number of errors that have occurred during the test.

System Info panel



The System Info panel provides general information, including:

- The 8825 software version and operating system
- Chamber configuration
- Storage information
- Last stop cause information
- Input and output calibration status
- Channel run times
- USB-DAQ status (For more information on the DAQ option, refer to the *8800 DAQ Instruction Manual*.)

Section 4: Computer Interface

Overview

The 8825 interface command set allows you to control, monitor, and program the 8825 from a host computer. The commands use a specified structure and syntax for communication. This section describes the 8825 interface command set and gives examples of how to use this command set to operate the 8825 from a host computer.

Basic serial communication protocol

The basic command protocol consists of the command and terminator:

CMND<t> or **CMND<data><t>**

The 8825 responds with the following:

<data><t>

Where:

CMND = command mnemonic

<data> = data or character string sent with command mnemonic

<t> = computer terminator, for example a carriage return <cr>

Multidrop address communication protocol (RS-485)

The RS-485 serial interface require two additional addressing parameters for proper multidrop communication:

1. Each instrument on the multidrop network must have a separate address between 1 and 127. The multidrop addressing protocol places a pound sign followed by the address number in front of each command mnemonic.
   - When the host computer transmits a command and data, each 8825 checks the first character after the pound sign. If the character matches the 8825's address, it reads the command and performs the assigned task.
   - When the 8825 sends data to the host computer, the computer reads the first character after the pound sign to determine the source of the data. It then handles the data according to its source.
2. The multidrop prefix protocol places an additional character (FF hexadecimal, shown as [FF]) in front of each command or data transmission (before the multidrop addressing protocol). The interface uses this character to eliminate communication problems that may occur as the interface bus drivers go active. The [FF] character provides these additional advantages to the interface:
   - It provides the necessary time for the receivers to become active.
   - FF hexadecimal is translated to binary and transmitted as all 1's, keeping the interface in a driven state.
   - FF hexadecimal is very unlikely to be interpreted as an ASCII pound sign (35 decimal), the first character of the addressing protocol.

Thermotron recommends that you use the following syntax for multidrop communications. This syntax incorporates both the multidrop addressing and prefix protocols to help ensure dependable communications.

The host computer sends:

[FF]#aCMND<t> or **[FF]#aCMND<data><t>**

The 8825 responds with:

[FF]#a<data><t>

Where:

[FF] = prefix character (FF hexadecimal)

= ASCII pound sign (35 decimal)

a = One-byte address of the 8825 (1...127)

CMND = command mnemonic

<t> = computer terminator, for example a carriage return <cr>

<data> = data or character string sent with command mnemonic

GPIB-specific commands

The 8825 uses the control module's GPIB converter. GPIB communication uses the same commands and syntax required by the serial communication but adds several service request commands.

Service request (SRQ)

The GPIB converter provides service request capability to the 8825 computer interface. The 8825 can be configured to request service by asserting the GPIB SRQ line when certain events occur. The SRQ mask byte enables these events. The service request status is read using the GPIB serial poll protocol. The status and corresponding mask bits are defined as follows:

Bit 7 Power on reset. This bit is set when the 8825 goes through a power-up sequence. It is also set as a result of an INIT command.

Bit 6 Reserved by GPIB.

Bit 5 Error. This bit is set by any type of command and/or interface error.

Bit 4 End of program. This bit is set at the end of a program, when the 8825 goes into stop mode.

Bit 3 Match interval. This bit is set at the start of the match interval. If the match interval parameter is set to 0, then this bit is set at the start of each interval.

Bit 2 End of interval. This bit is set at the end of each interval, either when the time left has gone to 0:00:00, or when a guaranteed soak is completed.

Bit 1 Alarm status change. This bit is set when there has been a change in the alarm status.

Bit 0 State change. This bit is set when there has there has been a change in the operating state.

Service request related commands

SRQB?	Read the service request status byte.
SRQM? or SRQMddd	Read or load the service request enable mask.
MINT? or MINTddd	Read or load the match interval.

For more information see "Interface command descriptions" later in this section.

Command syntax

The 8825 computer interface command set provides query commands and operation commands. The command set can use a basic command as either a query command or an operation command. For more information see "Interface command descriptions" later in this section.

Query commands

A query command asks the 8825 to supply information to the computer about the controller's functions, readings, or status. The basic query command is a simple string with the following parts:

- The root command is always four ASCII characters long (upper or lower case letters).
- If needed, the root command is followed by an ASCII numeric character that indicates a channel or group number.
- The command string ends with an ASCII question mark (?) which defines it as a query command.

For example, if the host computer sends the SETP2? command, and channel 2 has a set point of -82°C, the 8825 would send -82.0 back to the host computer.

Operation commands

An operation command causes the 8825 to perform an operation. Each operation command consists of the following parts:

- The root command is always four ASCII characters long (upper or lower case letters).
- If needed, the root command is followed by an ASCII numeric character that indicates a channel or group number, followed by an ASCII comma (,).
- All operation commands, except control commands, have some form of data at the end of the command string.

For example, if the host computer sends the OPTN49 command, the 8825 loads the manual mode options register with the PTC, purge, and cascade options.

Another example of an operation command: if the host computer sends the AUXE1,142 command, the 8825 enables AUX 1-2, AUX 1-3, AUX 1-4, and AUX 1-8.

Command data formats

The 8825 can send and receive data in the following formats:

- **Integer format**: The data consists of an ASCII sign character (**+** or **-**) followed by ASCII decimal digits representing an integer number, for example an interval number or the number of loops left in an interval.
- **Coded integer format**: A coded integer is a decimal integer that displays the sum of a binary-weighted code. The number of ASCII digits vary with each command type. Each bit in the original code is assigned a binary weight (1, 2, 4, 8, 16, 32, 64, or 128). The integer sent is the decimal sum of the coded bits that are enabled, for example the 8825's response to an OPTN? or AUXE? command.
- **Decimal format**: The data consists of an optional ASCII sign or character (**+** or **-**) followed by ASCII decimal digits, decimal point, and the number of digits needed for the selected resolution, for example the set point of a temperature channel.
- **String format**: The data consists of a string of ASCII characters. The information and format varies between commands and are defined in each command description.

Command concatenation

You can concatenate several commands on the same line. To concatenate commands, separate them with a semicolon. The 8825 processes the concatenated commands in the order that it receives them. **NOTE**: The 8825 will only send a response for the first query command it sees in a concatenated string. Therefore Thermotron recommends that the user include only one query command in any concatenated string.

For example: **STOP;RUNM;PVAR1?** These commands would stop the 8825, place it in run manual mode, and cause it to send the channel 1 process variable reading back to the host computer.

NOTE: The 8825 can hold up to 128 characters. Make sure the data strings and/or concatenated command strings are not longer than 128 characters. Also, any command with more than 30 parameters will cause the 8825 to return an "Unknown command" error.

Functional command sets

The 8825 interface command set can be divided into five functional groups. The following paragraphs are brief descriptions of these functional groups. For more information, see "Interface command descriptions" and "Using the interface command set" later in this section.

Control commands

Control commands tell the 8825 to perform a specific operation and/or sets its operating mode. For example, if the host computer sends the STOP command, the 8825 is placed in stop mode.

Program status and edit from hold commands

Program status commands allow you to query the 8825 for real-time, program-specific values, while edit from hold commands allow you to run the 8825 using temporary values in edit from hold mode. Use these commands when you are running the 8825 in run program mode. For example, if the host computer sends the INTN? command, the 8825 responds with the current interval number of the program.

Programming commands

Programming commands allow you to write programs on your host computer, and then load them into the 8825. Additionally, they allow you to load a program from a 8825 into your computer.

System status commands

System status commands (except LOCK and RLTM) are query commands that allow you to read the information from the controller. For example, if the host computer sends the IDEN? command, the 8825 responds with the type of programmer/controller.

Variable commands

Variable commands can be either query or operation commands. The variable query commands allow you to read the 8825 registers for the current variables and parameters. The variable operation commands allow you to operate the 8825 from the run manual mode only. For example, if the host computer sends the VRSN? command, the 8825 responds with the software version.

Interface command descriptions

The following lists the interface commands, including mnemonic, type, description, syntax, and examples.

NOTE: Your 8825 factory configuration determines which options, data types, and other variables are available to you.

AACH

Command name: Send Therm-Alarm analog input units value

Command type: System status

Description: The 8825 returns 1-3 characters for the value. Common unit codes are % and T (torr).

Syntax: AACHn?

Where **n** is a Therm-Alarm number (1 to 4).

Data type: 1-3 characters

Query example: AACH1?

8825 response: % (The analog input of Therm-Alarm 1 is programmed in percent.)

ALRM

Command name: Send alarm status

Command type: System status

Description: The 8825 returns the current alarm status for the selected channel. The alarm status is an eight-bit coded integer. The value of each bit when it is active, as well as its definition, is listed below:

Bit #	*Value when active*	*Definition*	*Bit #*	*Value when active*	*Definition*
0	1	Low deviation alarm	**4**	16	Low process alarm
1	2	High deviation alarm	**5**	32	High process alarm
2	4	*Not used*	**6**	64	*Not used*
3	8	*Not used*	**7**	128	*Not used*

NOTE: Only one bit can be set at a time.

Syntax: ALRMn?

Where **n** is any process variable channel (1 through 8).

Data type: Eight-bit coded integer

Query example: ALRM2?

8825 response: 32. This response means that only bit **5** (32) is active. When bit **5** is active it indicates a high process alarm.

AUXE

Command name: Auxiliaries event status

Command type: Variable; edit from hold

Description: The query command allows you read the on and off states of the auxiliary groups (1 or 2). Auxiliary group 1 refers to auxiliaries 1-8 and auxiliary group 2 refers to auxiliaries 9-16. The operation command allows you to change the auxiliary states for run manual mode operations and/or edit from hold operations.

Syntax: AUXEn? or AUXEn,ddd

Where **n** is an auxiliary group (1 or 2), and where **ddd** is a three-digit coded integer defined as follows:

1 = AUX 1	16 = AUX 5
2 = AUX 2	32 = AUX 6
4 = AUX 3	64 = AUX 7
8 = AUX 4	128 = AUX 8

The code provides a value between 0 and 255 that adds the values of all the enabled auxiliaries in the selected group. For example, a value of 097 indicates that AUX 7, AUX 6, and AUX 1 are on or turns these auxiliaries on.

Data type: See Syntax

Query example: AUXE1?

8825 response: 148 (This value indicates that AUX 8, AUX 5, and AUX 3 of auxiliary group 1 are on.)

Operation example: AUXE1,59

8825 response: 0 (If the 8825 is in run manual mode, AUX 6, AUX 5, AUX 4, AUX 2, and AUX 1 of auxiliary group 1 are enabled. If they are enabled, the 8825 turns off AUX 8, AUX 7, and AUX 3 of auxiliary group 1.)

CCHR

Command name: Send process variable units character

Command type: System status

Description: The 8825 returns the ASCII units for the character. Common unit codes are C (Celsius), F (Fahrenheit), and % (percent relative humidity).

Syntax: CCHRn?

Where **n** is any process variable channel (1 to 8) or monitor channel (101-140). **NOTE**: 101 = monitor channel 1, 102 = monitor channel 2, etc.

Data type: ASCII units character

Query example: CCHR1?

8825 response: C (Channel 1 is programmed in degrees Celsius.)

CCNF

Command name: Send process channel configuration information

Command type: System status

Description: The 8825 sends a single coded integer describing the channel type.

0 = Channel not used
1 = Percent relative humidity channel using a wet bulb/dry bulb thermocouple pair
2 = Temperature channel using a thermocouple
3 = Linear channel using a programmable range
4 = Linear 0% to 100% relative humidity channel using a solid-state sensor
5 = Product temperature control channel

Syntax: CCNFn?

Where **n** is any process variable channel (1 to 8).

Data type: Coded integer

Query example: CCNF2?

8825 response: 4 (Linear % relative humidity)

CHRT

Command name: Channel run time

Command type: System status

Description: Queries the 8825 for a channel's accumulated run time. The 8825 sends an integer to indicate the number of hours the channel has been running.

Syntax: CHRTn?

Where **n** is any process variable channel (1 to 8).

Data type: Integer

Query example: CHRT2?

8825 response: 962 (This indicates that channel 2 has accumulated a total run time of 962 hours.)

CHST

Command name: Channel on and configured status

Command type: System status

Description: The 8825 sends a two-byte coded integer describing the channel on and configuration status.

Byte 1 = Channel on status: Bits 0 through 7 indicate the on status of channels 1 through 8 respectively. The 8825 sets the bit for each channel that is on.

Byte 2 = Channel configured status: Bits 8 through 15 indicate the configured status of channels 1 through 8 respectively. The 8825 sets the bit for each channel that is configured.

Syntax: CHST?

Data type: Coded integer

Query example: CHST?

8825 response: 769 (Binary value 00000011 00000001. This indicates that channels 1 and 2 are configured and that channel 1 is on.)

CMST

Command name: Comm status

Command type: System status

Description: This query command asks the 8825 for the current comm status. The 8825 sends a coded integer value. The edit operation command changes the current comm status. The CMST data byte is defined as follows:

Bits 0 – 7
1 = Send acknowledge
2, 4, 8, 16, 32, 64, 128 = Unused

Syntax: CMST? or CMSTn?

Where **n** is the new comm status.

Data type: Coded integer

Query example: CMST?

8825 response: 1 (send acknowledge is on)

Operation example: CMST0

8825 response: The 8825 turns off send acknowledge.

CNAM

Command name: Get name of channel

Command type: System status

Description: This command allows you read the assigned name of any process variable or monitor channel.

Syntax: CNAMn?

Where **n** = Channel number (1-8 are process variable channels, 101-140 are monitor channels)

Data type: ASCII units character

Query example: CNAM1?

8825 response: COLD BOX

CONF

Command name: Send configured options

Command type: System status

Description: The 8825 sends three coded-integer bytes. These are binary-weighted bytes that indicate all the system options selected at the factory for the 8825. The bytes are defined below:

Byte 1 (Bits 0 through 7)
0 = Vertical two-zone chamber
1 = Horizontal three-zone chamber
2 = Vertical double-duty chamber
3 = Horizontal double-duty chamber

Bytes 2 and 3 are unused.

Syntax: CONF?

Data type: Three bytes of coded integers

Query example: CONF?

8825 response: 2 (The controller is configured for a vertical double-duty chamber.)

CYCL

Command name: Send cycles left

Command type: Control command

Description: Queries the 8825 for the number of cycles left in the current thermal shock test.

Syntax: CYCL?

Data type: Integer

Query example: CYCL?

8825 response: 15 (This indicates that there are 15 cycles left in the current thermal shock test.)

DEVN

Command name: Deviation

Command type: Variable; edit from hold

Description: The query command asks the 8825 for the current deviation reading from a selected channel. The 8825 sends the value in the channel's selected units. The operation command loads a deviation setting into the 8825 for the current manual mode operation, or sends a temporary deviation value during an edit from hold operation.

Syntax: DEVNn? or DEVNn,data

Where **n** is any control channel (1 to 4).

Data type: Decimal

Query example: DEVN1?

8825 response: 2.3

Operation example: DEVN2,5

8825 response: 0 (If the 8825 is in manual mode, it loads a deviation value of 5 units into channel 2.)

DIRP

Command name: Program directory

Command type: Programming command

Description: This command queries a specific directory on the 8825 for a list of program files and directories. This command will return the name of the program or directory followed by a number. If the name refers to a program file the number will be the number of intervals in the program. If the name refers to a directory the number will be -2. Continue calling this command to get a list of all directories and programs on the 8825. When you have iterated through all the items in the current directory this command will return "No More Files" for the name and -1 for the number.

Syntax: DIRPpathname?

Where **pathname** is the name of a path on the 8825 or "\" for the root path of the 8825.

Query example: DIRP\?

8825 response: Pre-programmed Tests, -2 (Directory called Pre-programmed Tests)

Query example: DIRP\Pre-programmed Tests?

8825 response: No More Files, -1 (You have iterated through all the items in the directory Pre-programmed Tests director.)

DOOR

Command name: Get status of door

Command type: System status

Description: This command returns 1 if there is a "Door" digital input defined and it is currently closed. It returns 0 if the door is open or there is no digital input defined for it.

Syntax: DOOR?

Data type: Integer

Query example: DOOR?

8825 response: 1 (There is a "Door" digital input defined and it is currently closed.)

DREF

Command name: Reference data type

Command type: System status

Description: The 8825 sends an integer representing the channel's reference channel data type.

Data type codes:
0 – Unused
1 – Temperature
2 – RH wet bulb/dry bulb
3 – RH linear
4 – RH temperature compensated
5 – Linear
6 – Altitude Kft
7 – Vibration
8 – Scaled linear
9 – Altitude linear (torr)

For example, assume channel 2 is an RH temperature-compensated channel referencing channel 1, which is a temperature channel. Sending DREF2? will return a 1 (temperature), the data type of channel 2's reference channel.

Syntax: DREFn?

Where **n** is a channel number (1 to 36).

1 – 8: Process variable channels
9 – 12: Unused
13 – 36: Monitor channels (1-24).

Data type: Integer

Query example: DREF2?

8825 response: 1

DTYP

Command name: Data type

Command type: System status

Description: The 8825 sends an integer representing the channel's data type.

Data type codes:
0 – Unused
1 – Temperature
2 – RH wet bulb/dry bulb
3 – RH linear
4 – RH temperature compensated
5 – Linear
6 – Altitude Kft
7 – Vibration
8 – Scaled linear
9 – Altitude linear (torr)
10 – Temperature average
11 – Humidity ratio
12 – Dew point
13 – Transducer
14 – Temperature minimum
15 – Temperature maximum

Syntax: DTYPn?

Where **n** is a channel number (1 to 36).

1 – 8: Process variable channels
9 – 12: Unused
13 – 36: Monitor channels (1-24).

Data type: Integer

Query example: DTYP1?

8825 response: 1 (The channel 1 data type is temperature.)

FVAL

Command name: Final value

Command type: Program status; edit from hold manual mode

Description: This query command asks the 8825 for the current interval's final value for channel n (1 to 4). The 8825 sends a decimal value for the selected channel. The edit from hold operation command temporarily changes the current interval's final value.

Syntax: FVALn?

Where **n** is any control channel (1 to 4).

Data type: Decimal

Query example: FVAL2?

8825 response: 25.0 **NOTE**: When in manual mode FVAL returns the new set point value.

Operation example: FVAL1,-33

8825 response: 0 (The 8825 loads -33 as the final value for channel 1.)

HOLD

Command name: Hold program or manual mode operation

Command type: Control

Description: Places a running program or test in hold mode.

Syntax: HOLD

Data type: No data

Operation example: HOLD

8825 response: 0 (Places the programmer/controller in hold mode.)

IDEN

Command name: Send device identification

Command type: System status

Description: The 8825 sends an ASCII character string to the host computer.

Syntax: IDEN?

Data type: ASCII character string

Query example: IDEN?

8825 response: 8825 CHAMBER CONTROLLER

IERR

Command name: Send last error code

Command type: System status

Description: The 8825 sends the code of the last error that occurred. For more information see "Error code listing" later in this section.

Syntax: IERR?

Data type: Coded integer

Query example: IERR?

8825 response: 3 (This indicates that the 8825 output buffer is full.)

NOTE: The error code buffer holds the last eight errors. You can use the IERR? command repeatedly to read the entire buffer in a first in – last out format. When the 8825 returns an error code of 0, the error buffer is empty.

INIT

Command name: Initialize controller

Command type: Control

Description: This command is included for backwards compatibility with legacy instruments. It is not needed with the 8825 controller, but will not generate an error if it is run.

Syntax: INIT

Data type: No data

NOTE: Legacy instruments required a 35-second delay after receiving the INIT command. This delay is not necessary with the 8825 controller.

INTN

Command name: Interval number

Command type: Program status

Description: Queries the 8825 for the current interval number. The 8825 sends an integer to indicate the interval number.

Syntax: INTN?

Data type: Integer

Query example: INTN?

8825 response: 10 (This indicates that the 8825 is on interval 10 of the currently selected program.)

INTV

Command name: Program interval

Command type: Programming

Description: The query command asks for the interval string that initializes the program (INTV0) or for one of the program intervals (INTVn). During load program by value operations, send an INTV0? command, followed by an INTVn? command for every interval in your program. Use the PROGn? command to determine how many intervals you need to receive.

The operation command sends an interval string to initialize the program (INTV0) or one of the program intervals (INTVn).

Interval 0 syntax: INTV0? or INTV0,fv1,fv2,fv3,fv4,active channels

Where:

fv1 ... fv4 = Decimal values for the channel 1 through channel 4 initial values. **NOTE**: The final values of interval 0 are the initial values of interval 1.

active channels = Two-digit coded integer that assigns the active channels the following weight:

1 = Channel 1 2 = Channel 2 4 = Channel 3 8 = Channel 4

Interval n syntax: INTVn? or INTVn,fv1,fv2,fv3,fv4,dv1,dv2,dv3,dv4,hh:mm:ss,lp,ni,ax1, ax2,display status,options

Where:

n = Interval number

fv1 ... fv4 = Decimal values for the channel 1 through channel 4 final values

dv1 ... dv4 = Decimal values for the channel 1 through channel 4 deviations from set point

hh:mm:ss = Hours (0 to 99), minutes (0 to 99), and seconds (0 to 99). See the TLFT command for the time field entry variations.

lp = Number of loops (0 to 9999)

ni = Next interval (1 to 300)

ax1, ax2 = Auxiliaries enabled in each AUX group. Each value is a three-digit coded integer with the following values:

1 = AUX 1	16 = AUX 5
2 = AUX 2	32 = AUX 6
4 = AUX 3	64 = AUX 7
8 = AUX 4	128 = AUX 8

display status byte = Byte that sets up the program channels and display for the operations being performed. It allows you to set up each interval to run different channels and program functions. It assigns the following weighting values to the program functions and displays:

1 = Looping	16 = Channel 1
2 = Auxiliaries	32 = Channel 2
4 = Deviations	64 = Channel 3
8 = Unassigned	128 = Channel 4

When you use the display status byte, make sure you program on all the functions that you are programming in the string. As an option, you can send a 7 in the lower byte to display all three functions.

options = The options byte for the program (0 to 1023). This byte turns the options on or off. You must turn on the option in order to use its programmed values. For example, to use product temperature control (PTC), you must program the PTC channel and turn the PTC option on. This byte assigns the following weighting values to the options:

1 = PTC	32 = Cascade refrigeration (SE-series chambers only)
2 = Humidity system	64 = Power save mode (SE-series only)
4 = Low humidity system	128 = Single-stage refrigeration (SE-series only)
8 = -10°C dew point	256 = Rapid cycle (AST module only)
16 = Purge	512 = Altitude

NOTE: NEVER assign a PTC channel with a humidity channel.

Data type: Coded integer

Query example 1: INTV0?

8825 response: 30.0, 50.0, 0.0, 0.0,3 (Channel 1 is set to +30 units and channel 2 is set to +50 units; channels 1 and 2 are active.)

Query example 2: INTV22?

8825 response: 52,-67,,,3,10,,,1:10:00,5,18,14,26,55,49

Interval 22 is programmed as follows:

Final values: Channel 1 = -52 units; channel 2 = -67 units

Deviations: Channel 1 = 3 units, channel 2 = 10 units

Time: 1 hour, 10 minutes

Number of loops: 5

Next interval: 18

Auxiliaries enabled: AUX 1-2, AUX 1-3, AUX 1-4, AUX 2-2, AUX 2-4, and AUX 2-5

Display status enabled: Looping, auxiliaries, deviations, channel 1, channel 2

Options enabled: PTC, purge, cascade refrigeration. **NOTE**: The commas are left in any unused parameter locations to maintain the proper parameter positions in the string

Operate example 1: INTV0,-10,20,,,3

8825 response: The 8825 loads the program with a channel 1 initial value of -10 units, a channel 2 value of 20 units, and sets channels 1 and 2 as active.

Operate example 2: INTV35,75,98,,,5,8,,,0:20:00,20,15,3,1,55,150

8825 response: The 8825 loads the following values into interval 35:

Final values: Channel 1 = 75 units; channel 2 = 98 units

Deviations: Channel 1 = 5 units, channel 2 = 8 units

Time: 20 minutes

Number of loops: 20

Next interval: 15

Auxiliaries enabled: AUX 1-1, AUX 1-2, AUX 2-1

Display status enabled: Looping, auxiliaries, deviations, channel 1, channel 2

Options enabled: Humidity, low humidity, purge, single-stage refrigeration

ISAA

Command name: Therm-Alarm analog input channel availability

Command type: Variable

Description: The query command asks the 8825 if the analog input channel for Therm-Alarm "n" is available. The 8825 returns a 0 (not available) or a 1 (available).

Syntax: ISAAn

Where **n** is a Therm-Alarm number (1 to 4).

Data type: Integer

Query example: ISAA1?

8825 response: 1 (This indicates that the analog input channel for Therm-Alarm 1 is available.)

ITIM

Command name: Send interval time

Command type: Program status

Description: Queries the 8825 for the programmed time for the current interval.

Syntax: ITIM?

Data type: String

Query example: ITIM?

8825 response: 0:10:30 (This indicates that the current interval is 10 minutes, 30 seconds long.)

IVAL

Command name: Send initial value

Command type: System status

Description: Queries the 8825 for the current interval's initial value parameter for channel n (1 to 4). The 8825 sends a decimal value for the selected channel.

Syntax: IVALn?

Where **n** is the channel number (1 to 4).

Data type: Decimal

Query example: IVAL3?

8825 response: 25.0 (The current interval's initial value for channel 3 is 25.0.)

LANG

Command name: Get language code

Command type: System status

Description: This command queries the 8825 for the current language mode.

Syntax: LANG?

The 8825 will respond with 0 (English) or 1 (French).

Data type: Integer

Query example: LANG?

8825 response: 1 (This indicates that the 8825 is in the French language mode.)

LAUX

Command name: Send or load live auxiliary settings

Command type: Variable

Description: Unlike standard auxiliary relays, live auxiliaries can be enabled without the 8825 being in run mode. The query command asks the 8825 for the status of the selected live auxiliary. The operation command allows you to set the live auxiliary variables.

Query syntax: LAUXaux?

Operation syntax: LAUXaux, state

Where:

aux live auxiliary number (1 through 8)

state 0 (off) or 1 (on) **NOTE**: The 8825 will also return a 0 if the specified live aux has never been configured.

Query example 1: LAUX2?

8825 response: 0 (Live auxiliary 2 is not on)

Query example 2: LAUX1?

8825 response: 1 (Live auxiliary 1 is on)

Operation example: LAUX2, 1

8825 response: 0 (The 8825 changed live auxiliary 2 to be on, but only if it is enabled.)

LGHT

Command name: Send/load the light status

Command type: System status

Description: The query command asks the 8825 for the status of the light (on or off). The operation command allows you to remotely turn the chamber light on or off.

Syntax: LGHT? or LGHTn

Where **n** is 0 (light off) or 1 (light on).

Data type: Integer

Query example: LGHT?

8825 response: 1 (Indicates that the chamber light is on.)

Operation example: LGHT0

8825 response: Turns the chamber light off.

LLFT

Command name: Send program loops left

Command type: Program status; edit from hold

Description: The query command asks the 8825 for the number of loops left to be executed for the current loop. On nested looping, the value is for the inside loop. The 8825 sends an integer to indicate the number of loops left. The edit from hold operation command temporarily changes the current interval's loop counter.

Syntax: LLFT? or LLFTn

Where **n** is the number of loops.

Data type: Integer

Query example: LLFT?

8825 response: 8

Operation example: LLFT15

8825 response: Changes the loops left counter to 15.

LOCK

Command name: Lock status

Command type: System status

Description: This is the only system status command that allows you to change the 8825's status. It allows you to read and change the access level of the 8825.

Syntax: LOCK? or LOCKn

Where **n** indicates access level (0 to 5):

0 = Locked	3 = Programmer
1 = User level 1	4 = Lab manager
2 = User level 2	5 = Calibration lab

Data type: Coded integer

Query example: LOCK?

8825 response: 3 (This indicates that the 8825 is set to access level 3.)

Operation example: LOCK0

8825 response: This command locks out all user access to the 8825 functions at the keyboard.

MINT

Command name: Send or load match interval

Command type: System status

Description: The match interval is used to trigger the interval match interrupt event for a service request. The interval match interrupt event occurs at the beginning of the previously loaded match interval. If the value loaded for the match interval is 0, the match interval event will occur at the beginning of every interval.

Syntax: MINT? or MINTdata

Data type: Integer (range 0 to 300)

Query example: MINT?

8825 response: 14 (A service request interrupt will occur at the start of interval 14 when running a program.)

Operation example: MINT3

8825 response: The 8825 loads the match interval parameter with a value of 3.

MNTR

Command name: Send monitor channel value

Command type: Variable

Description: Queries the 8825 for the current value of the selected monitor channel.

Syntax: MNTRn?

Where **n** is the selected monitor channel number (1 to 24).

Data type: Decimal

Query example: MNTR1?

8825 response: -35.8 (The current value of monitor channel 1 is -35.8.)

MODE

Command name: Send the operating mode of the 8825

Command type: System status

Description: The query command asks the 8825 for its current operating mode.

Syntax: MODE?

The 8825 will respond to this query command with a coded integer byte:

Bit 0 = Program mode	Bit 4 = Manual mode
Bit 1 = Edit mode (controller in stop mode)	Bit 5 = Delayed start mode
Bit 2 = View program mode	Bit 6 = Unused
Bit 3 = Edit mode (controller in hold mode)	Bit 7 = Calibration mode

Data type: Coded integer

Query example: Mode?

8825 response: 0 (This indicates that the 8825 is in program mode.)

MRMP

Command name: Manual ramp

Command type: Variable

Description: This is a manual mode command. The query command reads the manual ramp setting for the selected channel in units per minute. The units are in the scale selected at the 8825 (such as °C, °F, %RH, etc.).

Syntax: MRMPn? or MRMPn,data

Where **n** is any control channel (1 to 4) and **data** is the manual ramp rate.

Data type: Integer

Query example: MRMP2?

8825 response: 30 (This indicates the manual ramp for channel 2 is 30 units per minute.)

Operation example: MRMP1,12

8825 response: This sets the manual ramp for channel 1 to 12 units per minute.

MTHT

Command name: Send and receive manual throttle command

Command type: System status

Description: The query command allows you to read the current manual throttle mode of the 8825. The operation command allows you to change the current manual throttle mode of the 8825. **NOTE**: You have to be in run manual mode to use this command. You can use THTL to modify the throttle values once you enter manual throttle mode.

Syntax: MTHTn? or MTHTn, data

Where **n** indicates a process variable channel (1 to 8) and **data** = 0 (disable manual throttle mode) or 1 (enable manual throttle mode).

Data type: Integer

Query example: MTHT1?

8825 response: 0 (This indicates that channel 1 is not in manual throttle mode.)

Operation example: MTHT1,1

8825 response: This command places channel 1 in manual throttle mode.

NUML

Command name: Send number of loops

Command type: Program status

Description: Queries the 8825 for the programmed number of loops assigned to the current loop. For nested looping, the value is for the inside loop. The 8825 sends an integer indicating the number of loops assigned to the current loop.

Syntax: NUML?

Data type: Integer

Query example: NUML?

8825 response: 15 (There are 15 loops assigned to the current loop.)

NXTI

Command name: Next interval

Command type: Program status

Description: Queries the 8825 for the next interval that will be executed. The 8825 sends an integer indicating the next interval number.

Syntax: NXTI?

Data type: Integer

Query example: NXTI?

8825 response: 5 (The next interval that will be executed is 5.)

OFST

Command name: Query/modify offsets and precondition offsets

Command type: System status command

Description: The query command allows you to read the current offset values from the 8825. The operation command allows you to modify the current offset values.

Syntax: OFST? or OFST<OFF1>[,<OFF2>][,<PCNDOFF1>][,<PCNDOFF2>]

Where:

OFF1 = Offset of cold box

OFF2 = Hot box 1 offset

PCNDOFF1 = Precondition offset cold box

PCNDOFF2 = Precondition offset hot box (vertical two-zone and horizontal three-zone only)

Data type: Integer

Query example: OFST?

8825 response: The query command will return one of two different string formats, depending on the configuration of the chamber. If the chamber is configured as a vertical two-zone or a horizontal three-zone, the values returned are

<Off 1>, <Off 2>, <PrCnd 1>, <PrCnd 2>

If configured as a double-duty chamber, the values returned are

<Off 1>, <Off 2>, <Off 3>

There are no precondition offsets associated with double-duty chambers.

Operation example: OFST5,5,5,5

8825 response: This command changes all of the offsets to 5.

OPRM

Command name: Get/set operating parameters

Command type: System status command

Description: The query command allows you to read the current operating parameters from the 8825. The operation command allows you to modify the current operating parameters.

Syntax: OPRM? or OPRM,[var1],[var2],[var3],etc.

Where:

var1 = Defrost set point

var2 = Defrost every 'n' cycles

var3 = Pre-cool time

var4 = Post-cool time

var5 = Purge time

var6 = Aux cool time

var7 = Aux cool duty cycle

var8 = Defrost at end of test (0=no, 1=yes)

var9 = Defrost time

var10 = Add half cycle (0=no, 1=yes)

var11 = Defrost wait zone (0=cold, 1=hot, 2=ambient)

Data type: Integer except for defrost set point.

Query example: OPRM?

8825 response: 40, 0, 30, 30, 100, 6, 25, 0, 40, 1, 1

Defrost set point = 40

Defrost every 'n' cycles = 0

Pre-cool time = 30

Post-cool time = 30

Purge time = 100

Aux cool time = 6

Aux cool duty cycle = 25

Defrost at end of test = No

Defrost time = 40

Add half cycle

Defrost wait zone = Hot box

Operation example: OPRM40, 0, 30, 30, 100, 6, 25, 0, 40, 1, 1

8825 response: This command changes all of the operating parameters to the values in the string above.

OPTN

Command name: Controller options

Command type: Variable

Description: The query command reads the options register of the 8825. If the 8825 is in manual mode, the operation command temporarily changes the 8825 options register to the new set of options. **NOTE**: If the selected options are not available on your chamber, the 8825 will return an error code.

Syntax: OPTN? or OPTN[,]dddd

Where **dddd** is a four-digit coded integer with each option having the following weight:

1 = PTC	32 = Cascade refrigeration (SE-series chambers only)
2 = Humidity system	64 = Power save mode (SE-series only)
4 = Low humidity system	128 = Single-stage refrigeration (SE-series only)
8 = -10°C dew point	256 = Rapid cycle (AST module only)
16 = Purge	512 = Altitude

The code provides a value between 0 and 1023 that is the sum of the values of all the enabled options. For example, a 49 indicates that the cascade refrigeration system, purge, and product temperature control options are enabled.

Data type: Coded integer; see Syntax

Query example: OPTN?

8825 response: 1 (This indicates that product temperature control is enabled.)

Operation example: OPTN17

8825 response: 0 (This command sets the 8825 manual mode options to enable product temperature control and purge.)

PALH

Command name: High process alarm limit

Command type: Program status

Description: Queries the 8825 for a channel's high process alarm limit. The 8825 sends an integer indicating the alarm limit.

Syntax: PALHn?

Where **n** is a channel number.

Data type: Integer

Query example: PALH1?

8825 response: 100 (The channel 1 high process alarm limit is 100.)

PALL

Command name: Low process alarm limit

Command type: Program status

Description: Queries the 8825 for a channel's low process alarm limit. The 8825 sends an integer indicating the alarm limit.

Syntax: PALLn?

Where **n** is a channel number.

Data type: Integer

Query example: PALL1?

8825 response: -40 (The channel 1 low process alarm limit is -40.)

PARM

CAUTION: This command is included for advanced users. Changing parameter settings can adversely affect chamber control.

Command name: Parameter values command

Command type: Variable

Description: The query command causes the 8825 to send the values of the tuning parameters for the selected channel. The operation command sends new parameter values for a selected channel. The 8825 loads the parameter values into the parameter registers in any mode.

Query syntax: PARMc?

Where **c** = control channel number (1-4).

Non-PTC operation: PARMc, hpb, cpb, hit, cit, htl, ctl

Where:

c = Control channel number (1-4)

hpb/cpb = Heat and cool proportion bands (0.0 – 9999.0)

hit/cit = Heat and cool integral time (0 to 1000 seconds)

htl = Heat throttle limit (0.0 to 100.0)

ctl = Cool throttle limit (-100.0 to 0.0)

PTC operation: PARMc, hgn, cgn, hit, cit, hof, cof

Where:

c = Control channel number (1-4)

hgn/cgn = Heat and cool gain settings for PTC operations (0.0 – 9999.0)

hit/cit = Heat and cool integral time (0 to 1000 seconds)

hof = Heat offset (0.0 to 100.0)

cof = Cool offset (-100.0 to 0.0)

Data type: Integer

Query example: PARM2?

8825 response: 35.0,35.0,200,200,100.0,-100.0 (These values are the parameter settings for channel 2.)

Operation example: To set the channel 1 cool proportional band to 35.7, send: PARM1,,35.7.

With channel 4 in PTC mode, send the following command to set the channel 4 heat gain to 0.8, the cool integral time to 128 seconds, and the cool offset to 12.0: PARM4,0.8,,,128,,12.

PMEM

Command name: Send available program memory

Command type: System status

Description: Queries the 8825 for the available amount of program memory. The 8825 sends the number of unused intervals remaining in program memory (0 to 300). If a program exceeds the amount of program memory remaining, the 8825 will return an error code.

Syntax: PMEM?

Data type: Integer

Query example: PMEM?

8825 response: 300 (This indicates there is space in the 8825's memory for up to 300 additional intervals.)

PNAM

Command name: Send program name

Command type: Program status

Description: Queries the 8825 for the name of the currently loaded program. The 8825 responds with the program's assigned name (a string up to 15 characters long).

Syntax: PNAM?

Data type: String

Query example: PNAM?

8825 response: STRESS SCREEN40

POSN

Command name: Send basket position

Command type: Program status command

Description: Queries the 8825 for the current position of the product carrier.

Syntax: POSN?

Data type: Coded integer (0 = cold, down, or right; 1 = hot, up, or left; 2 = ambient)

Query example: POSN?

8825 response: 1 (This indicates that the product carrier is in the hot box.)

PRGN

Command name: Current program number

Command type: System status

Description: Queries the 8825 for the number of the currently loaded program; 0 indicates none.

Syntax: PRGN?

Data type: Integer

Query example: PRGN?

8825 response: 7 (This indicates that the current program is loaded into program slot 7.)

PROG

Command name: Program by value command

Command type: Programming

Description: This command sets up the 8825 or host computer to load an entire program into the 8825's program memory. The query command receives the data string from the 8825, while the operation command sends the data string to the 8825. For additional information, see "Using the Interface Command Set" later in this section.

The query command sets up which program will be retrieved, and responds with the name of the program and the number of intervals in the program. You can query a program by name or by number. If query by number the 8825 returns the information for the program stored in the virtual program slot referenced by the number. The 8825 maintains a virtual list of 10 programming slots for backwards compatibility.

The operation command sets up the name and the number of intervals in the program.

Syntax: PROGname? or PROGn? or PROG,name,number of intervals

Where:

name = Program name

n = Program number

number of intervals = Integer (1 to 300)

Data type: See Syntax

Query example: PROG1?

8825 response: LO COOL,14 (This indicates that the first program the 8825 saved is named LO COOL and is 14 intervals long.)

Query example: PROGtemp_test?

8825 response: temp_test,6 (This indicates that the program "temp_test" exists and is 6 intervals long.)

Operation example: PROG,HI HUMIDITY,25

8825 response: 0 (The 8825 will load a 25-interval program and name the program HI HUMIDITY.)

PTCM

Command name: Get PTC status

Command type: System status command

Description: Queries the 8825 for the current PTC status.

Syntax: PTCM?

The 8825 will respond with 0 (air control mode) or 1 (PTC mode)

Data type: Integer

Query example: PTCM?

8825 response: 1 (This indicates that the 8825 is running in product temperature control mode.)

PTIM

Command name: Send program time

Command type: Program status

Description: Queries the 8825 for the total estimated time for the current program.

Syntax: PTIM?

Data type: String

Query example: PTIM?

8825 response: 48:30:10 (This indicates that the current program is 48 hours, 30 minutes, 10 seconds long.)

PTLF

Command name: Send program time remaining

Command type: Program status

Description: Queries the 8825 for the estimated time left in the current program.

Syntax: PTLF?

Data type: String

Query example: PTLF?

8825 response: 12:54:30 (This indicates that there are 12 hours, 54 minutes, and 30 seconds left in the current program.)

PVAR

Command name: Send process variable

Command type: Variable

Description: Queries the 8825 for the current value of the selected channel. The channel selections for the PVAR command are divided as follows:

Channel	Description
1 through 4	External process variable channels 1 through 4
5 through 8	Internal process variable channels 5 through 8
9 through 16	Monitor channels 1 through 8
17 through 32	Undefined
33 through 36	System Monitor temperature channels for refrigeration system 1 (high-stage suction, high-stage discharge, low-stage suction, and low-stage discharge)
37 through 48	System Monitor channels for refrigeration systems 2, 3, and 4
101 through 140	Monitor channels 1 through 40

Syntax: PVARn?

Where **n** is the channel number (1 to 140). See Description.

Data type: Decimal

Query example: PVAR1?

8825 response: -42.3 (The channel 1 process variable is -42.3.)

REFG

Command name: Send refrigeration system pressures

Command type: System status

Description: When used, "n" is the refrigeration system number (1, 2, 3, or 4). When "n" is not used, the 8825 defaults to system 1. The 8825 returns four pressures and four temperatures in integer format, and a binary-coded decimal refrigeration mode word. The pressures are in psi and the temperatures are in Celsius. The string breaks down as follows:

- Four pressures for high-stage suction, high-stage discharge, low-stage suction, and low-stage discharge.
- Four temperatures for high-stage suction, high-stage discharge, low-stage suction, low-stage discharge.
- One coded integer that indicates the refrigeration mode. Each mode has its own weighting value:

1 = Humidity cooling mode	8 = Pump-down mode
2 = Temperature cooling mode	16 = High-stage compressor trip
4 = Cascade mode	32 = Low-stage compressor trip

For example, a 6 indicates the 8825 is in cascade and temperature cooling modes.

Syntax: REFG(n)?

Data type: String (**NOTE**: The first four variables in the string are integers, the next four variables are one-decimal place real numbers, and the final variable is an integer.)

Query example: REFG?

8825 response: 25,220,25,249,-23.2,87.5,-23.6,113.4,6. (This string gives the refrigeration system's pressures and temperatures, and indicates that it is in cascade and temperature cooling modes.)

RESM

Command name: Resume program or manual mode operation

Command type: Control

Description: Returns a program or test from hold mode to its run mode.

Syntax: RESM

Data type: No data

Operation example: RESM

8825 response: This command returns the processor to run mode.

RLTM

Command name: Read or load real time clock

Command type: System status

Description: The query command tells the 8825 to return the date and time reading from its real time clock. The operation command loads new values into the real time clock, and resets seconds to 00.

Syntax: RLTM? or RLTMmn,dd,hh,mm

Where **mn** is month, **dd** is day, **hh** is hour, and **mm** is minute.

Data type: String

Query example: RLTM?

8825 response: 3/11 14:32:45 (This indicates that the date is March 11 and the time is 2:32 p.m.)

Operation example: RLTM3,11,14,32

8825 response: This command loads the date and time of March 11, 2:32 p.m. into the 8825.

RUNM

Command name: Run manual mode

Command type: Control

Description: Places a stopped 8825 in run manual mode.

Syntax: RUNM

Data type: No data

Operation example: RUNM

8825 response: Places a stopped 8825 in run manual mode.

RUNP

Command name: Run program mode

Command type: Control

Description: Places a stopped 8825 in run program mode, and specifies the program and starting interval.

Syntax: RUNPp,i[,S/R]

Where:

p = Program name (**NOTE**: The program must be in the root directory of the 8825's hard drive.)

i = Interval number

S = Single-step mode places the program in hold program mode at the end of each interval. Send the RESM command to continue executing the program.

R = Resume the test from the exact point it was at when it was stopped.

Data type: See Syntax

Operation example: RUNPsimple_test,5,S

8825 response: Runs program simple_test.pgm, starting at interval 5, in single-step mode.

RUNT

Command name: Run thermal shock test

Command type: Control command

Description: Places a stopped 8825 in run program mode, and specifies the thermal shock test to run.

Syntax: RUNTn

Where **n** = Thermal shock test number (1 to 10)

Data type: See Syntax

Operation example: RUNT7

8825 response: Runs thermal shock test number 7.

SCOD

Command name: Send stop code

Command type: System status

Description: The stop code identifies the cause of the most recent transition to the stop state. The stop codes are defined as follows:

0 Cold boot power up. The 8825 memory has been initialized.
1 Currently running. Not in stop.
2 Stop key pressed.
3 End of test.
4 External input. An input defined as stop has been activated.
5 Computer interface. The 8825 received the stop command.
6 Open input. A thermocouple or analog input is open.
7 Process alarm. A process alarm setting has been exceeded.
8 System Monitor trip.
9 Power fail recovery. The selected power fail recover mode was stop.
10 Therm-Alarm trip.

Syntax: SCOD?

Data type: Integer

Query example: SCOD?

8825 response: 3 (Indicates that the currently loaded test has ended.)

SCRR

Command name: Screen reset

Command type: Control

Description: Forces the 8825 to go to the main screen.

Syntax: SCRR

Data type: No data

Operation example: SCRR

8825 response: Switches the 8825's current screen to the main screen.

SERL

Command name: Serial number

Command type: System status

Description: This query command asks the 8825 for the chamber's serial number.

Syntax: SERL?

Data type: Integer

Query example: SERL?

8825 response: 42679

SETP

Command name: Set point

Command type: Variable

Description: The query command asks the 8825 for the current set point reading from channel "n". The 8825 sends the set point value in the channel's selected units. In manual mode, the operation command loads a new set point into the 8825 for the current operation.

Syntax: SETPn? or SETPn,data

Where **n** is any process variable channel (1 to 8) and **data** is the set point.

Data type: Decimal

Query example: SETP1?

8825 response: -33.0

Operation example: SETP2,95

8825 response: If the 8825 is in manual mode, a set point of 95 units is loaded into channel 2.

SRQB

Command name: Service request status

Command type: System status

Description: The 8825 returns the same data that a GPIB serial poll would return. The events, which set the associated bits in the response data, must be enabled in the SRQ mask and are loaded using the SRQM command. The bits are defined as follows:

Bit #	Definition	Bit #	Definition
0	Change in state	4	End of program
1	Change in alarm status	5	Error
2	End of interval	6	Reserved by GPIB (RSV)
3	Match interval	7	Power on reset

Syntax: SRQB?

Data type: Coded integer

Query example: SRQB?

8825 response: 65 (Binary value 1000001, which indicates RSV + state change.)

SRQM

Command name: Send or load the service request event mask byte

Command type: System status

Description: This byte enables the various events for requesting service via the GPIB SRQ line. The coded integer data represents the enabled events using the definitions given under SRQB.

Syntax: SRQM? or SRQMdata

Data type: Coded integer (0 to 255)

Query example: SQRM?

8825 response: 4 (The end of interval service request bit has been enabled.)

Operation example: SRQM1

8825 response: 0 (The 8825 loads the SRQ mask with the value 1, enabling the state change SRQ event.)

SSTP

CAUTION: This command is included for advanced users.

Command name: Safety stop command

Command type: Variable

Description: The query command causes the 8825 to return the values of the safety stop parameters. The operation command sends new safety stop parameter values.

Query syntax: SSTP?

Operation syntax: SSTPm, sp, prg, dev, ctl

Where:

m = Safety stop mode enabled (1) or disabled (0)

sp = Safety stop set point (0 - 50C)

prg = Safety stop purge time (0 - 3,600 seconds)

dev = Safety stop deviation (0 - 50C)

ctl = Safety stop control mode on (1) or off (0)

Query example: SSTP?

8825 response: 1,25.0,30, 2.5, 1 (Safety stop mode enabled, set point = 25, purge = 30 seconds, deviation = 2.5C, control = on)

Operation examples: SSTP1,30,10,5,1 (Enable safety stop mode, set point = 30C, purge = 10 seconds, deviation = 5C, control = on.)

SSTP1 (Enable safety stop mode. Leave other parameters as they were.)

SSTP0 (Disable safety stop mode. Leave other parameters as they were.)

STAT

Command name: Send status word

Command type: System status

Description: The 8825 returns one byte of coded-decimal data to indicate the status of the 8825. The byte is defined below:

Bits 0 – 7
1 = Run
2 = Run test mode
4 = Hold timers
8 = Run manual mode
16 = Undefined
32 = Undefined
64 = Temperature scale: bit set = Fahrenheit, bit clear = Celsius
128 = Undefined: bit set = temperature profile mode, bit clear = thermal shock mode

Syntax: STAT?

Data type: Coded decimal

Query example: STAT?

8825 response: 8 (This indicates that the 8825 is in run manual mode.)

STOP

Command name: Stop controller

Command type: Control

Description: Places the 8825 in stop mode.

Syntax: STOP

Data type: No data

Operation example: STOP

8825 response: The 8825 goes into stop mode.

TALF

Command name: Send the Therm Alarm flags byte

Command type: Status

Description: The command allows you to retrieve the Therm Alarm status flags byte. The flags byte, a coded integer containing status about the Therm Alarm, is defined as follows:

Bits 0 – 7
1 = High alarm
2 = Low alarm
4 = High warning
8 = Low warning
16 = Mute
32 = Over range
64 = Unused
128 = Open thermocouple

Syntax: TALF?

Data type: Coded integer

Query example: TALF?

8825 response: 17 (high alarm and mute)

TALM

Command name: Send or load the Therm-Alarm settings

Command type: Setup

Description: The query command allows you to retrieve the Therm-Alarm settings. The 8825 sends the following in response to a TALM? command:

temp, low, high, maxex, mute, warn, delay, reset, state, flags

Where:

temp = Therm-Alarm temperature

low = Therm-Alarm low limit

high = Therm-Alarm high limit

maxex = Therm-Alarm maximum excursion

mute = Therm-Alarm mute time

warn = Therm-Alarm warning band

delay = Therm-Alarm alarm delay time

reset = Therm-Alarm reset status: auto (0) or manual (1)

state = Therm-Alarm operating state (internal use only)

flags = Therm-Alarm warning/trip flags (internal use only)

The operation command allows you to set the Therm-Alarm settings. The operation command syntax is as follows:

TALMlow, high, mute, warn, delay, reset.

Where:

low = Therm-Alarm low limit (see chamber documentation for valid ranges)

high = Therm-Alarm high limit (see chamber documentation for valid ranges)

mute = Therm-Alarm mute time (0-99 minutes)

warn = Therm-Alarm warning band (0-15 degrees C)

delay = Therm-Alarm alarm delay time (0-30 seconds)

reset = Therm-Alarm reset status (0 = auto reset, 1 = manual reset)

CAUTION: The use of this command to alter the high and low alarm limits may affect the Therm-Alarm's capability to protect the chamber and/or your unit under test. Use with caution!

Syntax: TALM? or TALMlow, high, maxex, mute, warn, delay, reset

Data type: Decimal

Query example: TALM?

8825 response: 27, -87, 191, 210, 2, 10, 10, 0, 0, 0

Operation example: TALM, -50, 150, 0, 5, 20, 1

8825 response: 0 (The 8825 loads the Therm-Alarm with the specified settings.)

THAA

Command name: Therm-Alarm analog input value

Command type: Variable

Description: The query command asks the 8825 for the current Therm-Alarm "n" analog input value. The 8825 sends the value as an integer.

Syntax: THAAn

Where **n** is a Therm-Alarm number (1 to 4).

Data type: Integer

Query example: THAA1?

8825 response: 65 (The current analog input value for Therm-Alarm 1 is 65.)

THAT

Command name: Therm-Alarm temperature

Command type: Variable

Description: The query command asks the 8825 for the current Therm-Alarm "n" temperature reading. The 8825 sends the temperature value as an integer.

Syntax: THATn

Where **n** is a Therm-Alarm number (1 to 4).

Data type: Integer

Query example: THAT1?

8825 response: 65 (The current temperature reading for Therm-Alarm 1 is 65.)

THTL

CAUTION: Do not use the THTL command as an operation command. Using the THTL as an operation command overwrites 8825 internal control functions.

Command name: Throttle

Command type: Variable

Description: The query command asks the 8825 for the current channel "n" throttle reading. The 8825 sends the throttle value as a percentage.

Syntax: THTLn

Where **n** is any process variable channel (1 to 8).

Data type: Integer (-100 to +100)

Query example: THTL1?

8825 response: -56 (The current channel 1 throttle reading is -56%.)

TLFT

Command name: Time left

Command type: Program status; edit from hold

Description: Queries the 8825 for the time left in the current interval. The edit from hold operation command temporarily changes the current interval's time left counter.

Syntax: TLFT? or TLFThh:mm:ss

Where **hh** is hours, **mm** is minutes, and **ss** is seconds.

Data type: String

Query example: TLFT?

8825 response: 1:17:57 (This indicates there is 1 hour, 17 minutes, and 57 seconds left in the current interval.)

Operation example: TLFT::85

8825 response: This command sets the time left in the current interval to 1 minute and 25 seconds.

TMPS

Command name: Temperature scale

Command type: Variable

Description: Allows you to read or change the temperature scale used on the 8825 display. **NOTE**: This command does not affect the 8825 interface commands.

Syntax: TMPS?

Data type: Coded integer (0 = Celsius, 1 = Fahrenheit)

Query example: TMPS?

8825 response: 0

Operation example: TMPS1

8825 response: The 8825 sets the temperature scale to Fahrenheit.

TSTM

Command name: Test memory

Command type: Programming command

Description: The query command asks the 8825 for the operating parameters for test number "n". The 8825 responds by sending a comma-delimited character string that includes all the programming parameters for the test.

The operation command loads 8825 test number "n" with the test parameters in the same comma-delimited format as the query command.

Query syntax: TSTMn?

Operation syntax: TSTMn,tt1,tt2,tt3,of1,of2,of3,time1,time2,time3,ax1,ax2,ax3,cycle,soak method

Where:

n = Test number.

tt1,tt2,tt3 = Test temperature for the cold box (tt1), hot box #1 (tt2), and hot box #2 (tt3) in decimal format.

of1,of2,of3 = Offset temperature for the cold box (of1), hot box #1 (of2), and hot box #2 (of3) in decimal format.

time1,time2,time3 = Soak time for the cold box (time1), hot box #1 and #2 (time2), and ambient box (time3) in the format mm:ss, where mm is in minutes (0-5999) and ss is in seconds (0-59).

ax1,ax2,ax3 = Auxiliary settings for the cold box (ax1), hot box #1 and #2(ax2), and ambient box (ax3). Each value has a three-digit coded integer with the following weighting values for the auxiliaries:

1 = AUX 1
2 = AUX 2
4 = AUX 3
8 = AUX 4
16 = AUX 5
32 = AUX 6
64 = AUX 7
128 = AUX 8

For example, a value of 97 indicates that AUX 7, AUX 6, and AUX 1 are on and the other auxiliaries are off.

cycle = The number of full cycles to be performed during the test in integer format. One complete cycle involves two soaks and two transfers for two-zone and double-duty chambers. A three-zone chamber performs three soaks and three transfers per cycle.

soak method = The soak method used during the test in the following integer format:

0 = Time only
1 = Time and temperature
2 = Temperature and time

Data type: Coded integer

Query example: TSTM16?

8825 response: -50,+150,,-10,+8,,30:45,30:45,,46,27,,12,2

The response is for a two-zone thermal shock, because the tt3 and of3 fields are empty for hot box #2, and the time3 and ax3 fields are empty for the ambient box. Test number 16 of the 8825 provides the following test parameters:

The cold box is programmed with a test temperature of -50°, an offset of -10°, and a soak time of 30 minutes and 45 seconds. During the soak time in the cold box, AUX 6, AUX 4, AUX 3, and AUX 2 are programmed on.

The hot box is programmed with a test temperature of +150°, an offset of 8°, and a soak time of 30 minutes and 45 seconds. During the soak time in the hot box, AUX 5, AUX 4, AUX 2, and AUX 1 are programmed on.

The test is programmed for 12 full cycles and a "temperature and time" soak method.

Operation example: TSTM9,-54,+120,,-9,+10,,25:30,30,0:45,36,22,14,10,1

8825 response: The command loads the following test parameters into test number 9 of the 8825: The data is for a three-zone chamber, because the tt3 and of3 fields are empty for hot box #2, and the time3 and ax3 fields contain values for the ambient box.

The cold box is programmed with a test temperature of -54°, an offset of -9°, and a soak time of 25 minutes and 30 seconds. During the soak time in the cold box, AUX 6 and AUX 3 are programmed on.

The hot box is programmed with a test temperature of +120°, an offset of 10°, and a soak time of 30 minutes. During the soak time in the hot box, AUX 5, AUX 3, and AUX 2 are programmed on.

The ambient box is programmed with a soak time of 45 seconds. During the soak time in the ambient box, AUX 4, AUX 3, and AUX 2 are programmed on.

The test is programmed for 10 full cycles and a "time and temperature" soak method.

TSTN

Command name: Thermal shock test number

Command type: Program status command

Description: Queries the 8825 for the current thermal shock test number. Returns 0 if the current test is not assigned to a program slot.

Syntax: TSTN?

Data type: Integer

Query example: TSTN?

8825 response: 25 (This indicates that thermal shock test number 25 is currently loaded into the 8825.)

TTMP

Command name: Send test temperature

Command type: Program status command

Description: The query command asks the 8825 for the current test temperature reading from channel "n" during a thermal shock test. The 8825 sends this value in the channel's selected units. In manual mode, the operation command loads a new test temperature into the 8825 for the current operation.

Syntax: TTMPn? Or TTMPn,data

Where **n** is any process variable channel (1 to 5) and **data** is the test temperature.

Data type: Decimal

Query example: TTMP1?

8825 response: -33.0 (The current channel 1 test temperature is -33.0.)

Operation example: TTMP3,95

8825 response: If the 8825 is in manual mode, a test temperature of 95 units is loaded into channel 3.

VRSN

Command name: Send software version

Command type: System status

Description: Queries the 8825 for the version number of the display software.

Syntax: VRSN?

Data type: String

The 8825 returns a string in the "Vx.yy.zz DD Mmm YY" format to identify its software version.

Query example: VRSN?

8825 response: V1-11-05 5 Dec 01

WDOG

Command name: Watchdog

Command type: Control

Description: This command provides an extra level of protection for customers operating their chambers entirely through computer I/O. The watchdog operates as an "everything is ok" command. If the watchdog is enabled and happens to time out due to a loss of communication, the controller will enter a known fail-safe state by running a program called "failsafe.pgm". If that particular program does not exist the chamber will simply enter the stop mode.

The syntax for the command is WDOGn, where **n** is a number of seconds between 0 and 60. A positive value sets the watchdog timer value. A zero value turns off the watchdog feature. Once the watchdog is set, the 8825 internally begins counting down. If the internal watchdog timer ever reaches 0, the 8825 will enter the fail-safe state. For this reason you must periodically send the WDOGn command to reset the watchdog timer.

Syntax: WDOGn

Where **n** is the number of seconds between 0 and 60.

Data type: No data

Operation example: WDOG30

8825 response: Resets the internal watchdog timer to 30 seconds.

XFER

Command name: Transfer carrier

Command type: Control command

Description: Tells the 8825 to transfer the product carrier to the selected box.

Syntax: XFERn

Where **n** is one of the following transfer carrier commands:

0 = Transfers the product carrier to the cold box, down, or right

1 = Transfers the product carrier to the hot box, up or left

2 = Transfers the product carrier to the ambient zone

Data type: Integer

Operation example: XFER0

8825 response: The 8825 transfers the product carrier to the cold box, down, or right.

Using the interface command set

The following section describes how to operate the 8825 programmer/controller from a host computer using the interface command set.

Using the manual mode commands

The 8825 can be operated in manual mode from a host computer using the following interface commands:

STOP Stop controller
POSN Send basket position
TTMP Load test temperature
OFST Modify offset values
SETP Load set point
OPTN Change 8825 options
AUXE Enable auxiliaries
RUNM Run manual mode
PVAR Send process variable
XFER Transfer product carrier

Manual mode example:

1. Send the **STOP** command to stop the 8825.
2. Send the **POSN** query to determine the current position of the product carrier. If necessary, send the **XFER** command to transfer the product carrier to another box before starting the test.
3. While in stop mode, send the **SETP** or **TTMP** and **OFST** commands to set up the test.
   - For double-duty chambers use **SETP** to load the set point for each box.
   - For vertical two-zone or horizontal three-zone chambers, you can use **TTMP** and **OFST** to load the test temperature, offset, and precondition offset for each box.

   This loads the registers and sets up the system before you start running the chamber. Pre-loading the parameters before running is optional, but it makes for a cleaner, more organized test. **NOTE**: Although this sets up the 8825 registers for the test, your manual mode screen will not display these values until you enable run manual mode.
4. Send the **OPTN** command to change the options for the test, and the **AUXE** command to enable auxiliary relays.
5. Send the **RUNM** command to place the 8825 in run manual mode. The manual mode screen will now display these parameters as the 8825 operates the chamber control systems.
6. As the test progresses, send the **PVAR** query to determine the current value of the selected channel.
7. When the boxes are at the desired temperatures, send the **XFER** command to transfer the product carrier.
8. As the chamber runs, you can send manual mode commands as needed to change the values. You also can send variable and chamber status queries to read back the chamber variables and the 8825 status.
9. At the end of the test, send the **STOP** command to place the 8825 in stop mode.

Vertical two-zone chamber thermal shock example	
Command	***Description***
stop	Place the 8825 in stop mode.
posn?	Send the current position of the product carrier.
xfer0	Transfer the product carrier to the cold box.
ttmp1,-55	Load a channel 1 (cold box) set point of -55°C.
ttmp2,150	Load a channel 2 (hot box) set point of +150°C
ofst5,5,5,5	Change all offsets to 5.
optn16	Enable purge.
auxe,25	Turn on AUX 1, AUX 4, and AUX 5.
runm	Place the 8825 in run manual mode.
pvar1?	Send the current channel 1 process variable.
pvar2?	Send the current channel 2 process variable.
xfer1	Transfer the product carrier to the hot box.
stop	Place the 8825 in stop mode.

Using the programming commands for a thermal shock test

The test memory command **TSTM** allows you to write thermal shock tests on your host computer, and then to load them into your 8825. The following paragraphs describe how to use the test memory command.

Query example: TSTM16?

8825 response: -50,+150,,-10,+8,,30:45,30:45,,46,27,,12,2

The TSTM16? command queries the 8825 for the operating parameters for test number 16. The 8825 responds by sending a comma-delimited character string that includes all the programming parameters for test 16. The response is for a two-zone thermal shock, because the tt3 and of3 fields are empty for hot box #2, and the time3 and ax3 fields are empty for the ambient box. Test number 16 of the 8825 provides the following test parameters:

tt1	*tt2*	*tt3*	*of1*	*of2*	*of3*	*time1*	*time2*	*time3*	*ax1*	*ax2*	*ax3*	*cycle*	*soak method*
-50	+150		-10	+8		30:45	30:45		46	27		12	2

- The cold box is programmed with a test temperature of -50°, an offset of -10°, and a soak time of 30 minutes and 45 seconds. During the soak time in the cold box AUX 6, AUX 4, AUX 3, and AUX 2 are programmed on.
- The hot box is programmed with a test temperature of +150°, an offset of 8°, and a soak time of 30 minutes and 45 seconds. During the soak time in the hot box AUX 5, AUX 4, AUX 2, and AUX 1 are programmed on.
- The test is programmed for 12 full cycles and a "temperature and time" soak method.

Operation example: TSTM9,-54,+120,,-9,+10,,25:30,30,0:45,36,22,14,10,1

The data is for a three-zone chamber, because the tt3 and of3 fields are empty for hot box #2, and the time3 and ax3 fields contain values for the ambient box. The command loads the following test parameters into test number 9 of the 8825:

n	*tt1*	*tt2*	*tt3*	*of1*	*of2*	*of3*	*time1*	*time2*	*time3*	*ax1*	*ax2*	*ax3*	*cycle*	*soak method*
9	-54	+120		-9	+10		25:30	30	0:45	36	22	14	10	1

- The cold box is programmed with a test temperature of -54°, an offset of -9°, and a soak time of 25 minutes and 30 seconds. During the soak time in the cold box AUX 6 and AUX 3 are programmed on.
- The hot box is programmed with a test temperature of +120°, an offset of 10°, and a soak time of 30 minutes. During the soak time in the hot box AUX 5, AUX 3, and AUX 2 are programmed on.
- The ambient box is programmed with a soak time of 45 seconds. During the soak time in the ambient box AUX 4, AUX 3, and AUX 2 are programmed on.
- The test is programmed for 10 full cycles and a "time and temperature" soak method.

Using the programming commands for a temperature profile test

The program by value (**PROG**) and program interval (**INTV**) commands allow you to transfer programs between the 8825 and a host computer. The operation commands allow you to send a program to the 8825. The query commands allow you to retrieve a program from the 8825. The following paragraphs describe each type of transfer and provide a program transfer example.

Sample profile: LongSoak25Loops									
int #	***fv1***	***dv1***	***hh:mm:ss***	***lp***	***ni***	***ax1***	***ax2***	***display status***	***options***
1	20		2:00:00	0	2	-2-4--78	-2-4—7-	23	48
2	30	2	0:00:00	0	3	-2-4--78	--------	23	48
3	30	3	2:00:00	0	4	--------	--------	23	48
4	65		1:10:00	0	5	1-3—6--	12------	23	48
5	65	3	8:00:00	0	6	1-3—6--	12------	23	48
6	30	2	0:00:00	25	3	--------	--------	23	48

The sample temperature profile, named LongSoak25Loops, can be described as follows:

Interval 1: Ramps to 20°C in 2 hours and turns on auxiliary relays 1-2, 1-4, 1-7, 1-8, 2-2, 2-4, and 2-7. The display status enables channel 1, looping, auxiliaries, and deviations displays. The cascade refrigeration and purge options are enabled.

Interval 2: Steps to +30°C, waits until the temperature is within ±2° C of the set point, and turns auxiliary relays 2-2, 2-4, and 2-7 off.

Interval 3: Soaks at +30°C for 2 hours, sets off the deviation alarm if the temperature deviates more than ±3°C from the set point, and turns off all auxiliary relays.

Interval 4: Ramps to +65°C in 1 hour and 10 minutes, and turns on auxiliary relays 1-1, 1-3, 1-6, 2-1, and 2-2.

Interval 5: Soaks at +65°C for 8 hours and sets off the deviation alarm if the temperature deviates more than ±3°C from the set point.

Interval 6: Steps to +30°C and waits until the temperature is within ±2°C of the set point, turns all the auxiliary relays off, loops back to interval 3, and repeats intervals 3 through 6 twenty-four times.

Using the operation commands to load a temperature profile into the 8825

Operation commands can be used to load the sample temperature profile, LongSoak25Loops, into the 8825. See "Using the programming commands for a temperature profile test" above for descriptions of the intervals.

1. Send the PROG,LongSoak25Loops,6 command string to the 8825. This string loads a six-interval program named LongSoak25Loops.
2. Send the INTV0,20,,,,1 command string to the 8825. This string sets the initial value of interval 0 to +20°C and sets channel 1 active.
3. Send the interval 1 command string: INTV1,20,,,,,,,2,1,,,202,74,23,48.
4. Send the interval 2 command string: INTV2,30,,,,2,,,,2,,,,0.
5. Send the interval 3 command string: INTV3,,,,,3,,,,2,1,,,0.
6. Send the interval 4 command string: INTV4,65,,,,0,,,,1:10:00,,,,37,3.
7. Send the interval 5 command string: INTV5,,,,,3,,,,8.
8. Send the interval 6 command string: INTV6,30,,,,2,,,,,2,25,3,0,0.

NOTE: You need to use the commas to maintain proper placement for the values in each string. Each command string ends after the last non-null data field. The null fields (,,) make use of the following 8825 default values:

- The final values field uses the initial values field (final values field from the preceding interval).
- The deviation and auxiliary group fields use the value from the preceding interval, or 0 if interval 1.
- The number of loops field defaults to 0.
- The next interval field defaults to the next sequential interval.
- The display status and options fields default to the preceding interval's values.

Using the query commands to load a temperature profile from the 8825

Query commands can be used to retrieve the sample temperature profile, LongSoak25Loops, from the 8825.

1. Send the PROG4? command string to the 8825.

   NOTE: Use the PROGn? command to find out how many intervals a program has, and remember to include interval 0 when you begin to retrieve program intervals from the 8825.
2. Send the INTV0? command string to retrieve the initial values of interval 0.
3. Send the INTV1? command string to retrieve the interval 1 data.
4. Send the INTV2? command string to retrieve the interval 2 data.
5. Send the INTV3? command string to retrieve the interval 3 data.
6. Send the INTV4? command string to retrieve the interval 4 data.
7. Send the INTV5? command string to retrieve the interval 5 data.
8. Send the INTV6? command string to retrieve the interval 6 data.

Computer interface troubleshooting and error codes

This section contains basic troubleshooting information as well as a list of the 8825 computer interface errors codes.

Common computer interface problems and solutions

Before attempting to run the 8825 communication interface in a user application program on the host computer, it is often helpful to use a dumb terminal or a terminal emulation program to test the serial communications. This allows you to become familiar with the 8825 command syntax.

The 8825 and host computer are not able to communicate using RS-232

If the 8825 and the host computer are not able to send and receive interface commands:

1. Press **Setup**, then select the Computer IO / Networking panel. Check the appropriate RS-232 settings (COM2 or Computer I/O). Typically **Send Acknowledgement** should be checked and **Terminator** should be set to last input. Check the **Baud Rate**.
2. Make sure that you are sending a command that returns information; for example, PVAR1? or IDEN?
3. Try another controller.
4. Try another host computer.
5. Try ThermoTrak II software and cabling.

The 8825 and host computer are not able to communicate using RS-485

If the 8825 and the host computer are not able to send and receive interface commands:

1. Check the cabling.
2. Press **Setup**, then select the Computer IO / Networking panel. Under Computer I/O, check the RS-485 settings.
    a. Verify the **Address** setting.
    b. Check the **Baud Rate**.
    c. Set **Terminator** to Last Input.
    d. Make sure **Prefix** is checked.
    e. Make sure **Send Acknowledgement** is checked.
3. Try another controller.
4. Try another host computer.
5. Try ThermoTrak II software and cabling.

The 8825 and host computer are not able to communicate using GPIB

If the 8825 and the host computer are not able to send and receive interface commands:

1. Check the cabling
2. Press **Setup**, then select the Computer IO / Networking panel. Check the GPIB settings. Set **Terminator** to Last Input.
3. Try another controller.
4. Try another host computer.

The host computer sends commands, but does not receive data

If the 8825 accepts interface commands without returning the required data, check the computer interface terminator and/or the handshake signals.

- **Terminator problem**: When the 8825 is receiving command strings, it recognizes a carriage return, a line feed character, or a carriage return and line feed to signify the end of the command string. Verify that the 8825 and the computer agree on the selected termination.
- **Handshake problem**: The 8825 does not use handshaking. Verify that handshaking is disabled on the host computer. Instead of handshaking, enable **Send Acknowledgment** for all serial interfaces. This setting programs the 8825 to send the last error code after receiving each operation command.

The host computer receives wrong or garbled data from the 8825

Wrong or garbled data can be caused by the improper use of command sequences or by entering improper communication parameters. The more common problems and solutions are described below.

- **Buffer out of synch**: This typically occurs when the computer does not read all of the data requested from the 8825. Make sure the host computer reads all requested data.
- **Parameter mismatch**: Check the serial interface setting. For RS-485 applications, check the addressing and prefix protocol parameters. If the prefix protocol and addressing options are enabled, be sure to use the correct protocol syntax at the host computer. **NOTE**: If the serial parameters do not match, the 8825 probably will not receive any commands.

The host computer sends and receives data, but has problems with specific commands

Some commands may cause problems if you do not send them in the proper manner or sequence.

- Use the 8825 error codes listed below to help troubleshoot these types of problems. Use the IERR? command to read the error codes.
- Verify that the data sent with the command is within the acceptable range.
- Verify that the data sent with the command is in the proper form.
- If you are having problems with PROG and INTV commands, make sure you set up the command series to include the INTV0 command.

Error codes

The 8825 error codes provide fault indications that aid in debugging programs and identifying interface problems. For error identification, programs should periodically send an IERR? command.

Error code 00

Command name: No error

Description: There was no error.

Error code 01

Command name: Serial interface error

Description: This error may occur because of problems with the communication parameters set in the Computer IO / Networking panel on the 8825 (baud rate, parity, stop bits, word length, etc.). The 8825 will usually have another error (most commonly error code 04) because the data that caused this error will be misinterpreted. If this occurs after loading a value into the 8825, recheck the value and reload as required.

Error code 02

Command name: Input buffer overflow

Description: The data string sent to the 8825 is too long. The 8825 can hold up to 128 characters; make sure the data strings and/or concatenated command strings are not longer than 128 characters.

Error code 03

Command name: Output buffer overflow

Description: Make sure your computer is reading the 8825 output buffer each time it requests data.

Error code 04

Command name: Unidentified command

Description: The 8825 did not recognize the command string; make sure the string sent is a legal command. On RS-485 networks, check to see if you are using multidrop addressing and prefix protocol; you may wish to implement these features if you have not already.

Error code 05

Command name: Number parser error

Description: The 8825 could not successfully parse the operation command string's data into its discrete parts. Check the command string to ensure you separated it properly with commas and sent the correct number of characters.

Error code 06

Command name: Value loaded was too high.

Description: The value sent to the 8825 exceeded the high end limit; check the value against the programmed range of the channel or parameter.

Error code 07

Command name: Value loaded was too low.

Description: The value sent to the 8825 exceeded the low end limit; check the value against the programmed range of the channel or parameter.

Error code 08

Command name: Incorrect channel number

Description: The value sent to the 8825 was not an acceptable channel value. Check the 8825 channel configuration for the channel. Also, check the options set up for the channel. For example, the PTC and humidity options can enable or disable channels.

Error code 09

Command name: Bad command syntax

Description: The command was sent to the 8825 in an unrecognizable form. For the proper command syntax see "Interface command descriptions" earlier in this section.

Error code 10

NOTE: The 8825 programmer/controller does not use this error code.

Error code 11

Command name: Illegal interval number sequence

Description: The value sent to the 8825 is not a valid interval value. During load program by value operations, make sure you are sending INTV operation commands that include interval 0 and all the intervals in sequential order.

Error code 12

Command name: Not enough program memory

Description: The program is too large to load into the 8825's memory; delete any unused programs and reload the program.

Error code 13

Command name: Illegal stop command

Description: The 8825 must be in run or hold mode to execute a STOP command.

Error code 14

Command name: Illegal hold command

Description: The 8825 must be in run mode to execute the HOLD command.

Error code 15

Command name: Illegal run manual command

Description: The 8825 must be in stop or hold mode to execute the RUNM command.

Error code 16

Command name: Incorrect operating mode

Description: Do not send programming commands while in manual mode or manual mode commands while in program mode, etc.

Error code 17

Command name: Run program error

Description: If you are running from stop mode, the command requires the program number and the interval number.

Error code 18

Command name: Resume command error

Description: The 8825 must be in hold manual or hold program mode to execute the RESM command.

Error code 19

Command name: Options not configured

Description: The 8825 is factory-configured for the options on your chamber. Check to see if your options byte is selecting an option that is not available on your chamber.

Error code 20

NOTE: The 8825 programmer/controller does not use this error code.

Error code 21

Command name: Control module not present

Description: The 8825 returns this error code if a query or operation command attempts to access a control module that is not present and/or that the 8825 is not configured for.

Compatible 8825 interface commands

The 8825 programmer/controller **does not** support any of the computer interface commands for the Thermotron 6825 programmer/controller.

The 8825 programmer/controller supports the computer interface commands for the Thermotron 7825 programmer/controller with the following exceptions:

7825 command	*Description*	*8825 programmer/controller compatibility note*
INIT	Initialize	Will not generate an error, but doesn't do anything
LANG	Language mode	Will not generate an error, but doesn't do anything
MTHT	Manual throttle	Not supported. Reserved for internal Thermotron use only.
PMEM	Get program memory	Always returns 300 to indicate maximum profile storage available.
PRGN	Get program number	In 7825 compatibility mode, this command is supported as documented in "Interface command descriptions" above.

Programming examples

Programs can be written to operate the 8825 programmer/controller from a host computer in a variety of programming languages. The following section is a brief sampling of the types of programs that can be written to operate the 8825 from a host computer. Thermotron does not support any of the programming languages used in this sampling. For additional information, refer to the documentation included with the programming languages and/or compilers.

Microsoft Visual Basic

In this example, the command string found in the text box 'Text1.text' is modified by adding an ASCII carriage return to the end of it before it is passed to the Read8825 routine. Note that this is done by using the chr$(13) construct, as opposed to the '\r' method. Visual Basic does not pass the '\r' with the string to the ibwrt function. The Read8825 routine checks for the presence of the carriage return in the string returned by the ibrd function.

```
read8825 (text1.text & chr$(13))

private sub read8825(cmd$) 'send commands to 8825, read results or error code ack.

        resp_recd = false
        call ibwrt(dev%, cmd$)
        resp$ = space$(100)
        call ibrd(dev%, resp$)
        crposition = instr(resp$, chr$(13))
        if crposition <> 0 then
                inputstring$ = left$(resp$, crposition)
                resp_recd = true
        end if

end sub
```

Microsoft Visual C++ (or C)

Visual C++ does allow the use of the '\r' and '\n' symbols for carriage returns and line feeds

GPIB example

```
#include "decl-32.h"

int status, inst;
char resp[100];
char *dev = "dev10\0";
char *cmd = "pvar1?\r\0";

inst = ibfind(dev);
status = ibwrt(inst, cmd, strlen(cmd));
status = ibrd(inst, resp, 100);
```

TCP example

```
#include "Winsock2.h"

//command to send
CString cmd = "IDEN?\r";

//buffer for response
char buf[256];

//IP Address and Port to connect to
CString address = "192.168.4.27";
int port = 8888;

//handle to a windows socket
SOCKET m_hSocket = INVALID_SOCKET;

//The SOCKADDR_IN structure is used by Windows Sockets
//to specify a local or remote endpoint address
//to which to connect a socket.
SOCKADDR_IN addr;

//always AF_INET
addr.sin_family = AF_INET;

//port number in big-endian form
addr.sin_port = htons(port);
```

```
//IP Address converted from a dotted address (x.x.x.x) form to the SOCKADDR_IN form.
*(ULONG *)&(addr.sin_addr) = inet_addr(address.GetBuffer(0));

//create a socket
m_hSocket = socket(AF_INET, SOCK_STREAM, 0);

// Set the timeouts for the socket
int timeout = 1000;
setsockopt(m_hSocket, SOL_SOCKET, SO_RCVTIMEO, (char *)&timeout, sizeof(timeout));
setsockopt(m_hSocket, SOL_SOCKET, SO_SNDTIMEO, (char *)&timeout, sizeof(timeout));

//connect to the specified destination
connect(m_hSocket, (sockaddr *)&addr, sizeof(addr));

//send a command
send(m_hSocket, cmd.GetBuffer(0), cmd.GetLength(), 0);

//read a response
recv(m_hSocket, buf, sizeof(buf), 0);

//close the connection
closesocket(m_hSocket);
m_hSocket = INVALID_SOCKET;
```

Note that the carriage return from the 8825 will be included in the response string 'resp'.

National Instruments Interactive Control Utility (IBIC)

It is important to use the special symbols \r and/or \n to add a carriage return (\r), or line feed (\n) to the strings sent to the ibwrt function. The following sequence finds the device at address 10, sends the 'pvar1?' query command, and then reads the data.

Win32 Interactive Control


```
type 'help' for help or 'q' to quit.
: ibfind "dev10"
dev10: ibwrt "pvar1?\r"
[0100]   ( cmpl )
count:  7

dev10: ibrd 22
[2100]   ( end cmpl )
count:  5
32  35  2e  31  0d                     2 5 . 1 .

dev10:
```

Note that even though a count of 22 characters was specified for the ibrd function, it returned complete and no errors since it terminated on the carriage return. Note also that the carriage return (0x0d) is included in the string returned by the ibrd function.

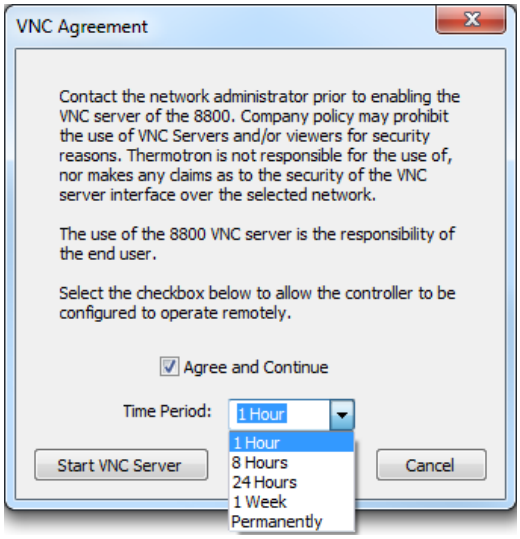
Virtual Network Computing (VNC)

NOTE: In this section *italicized* text indicates features that cannot be demonstrated using the Thermotron 8825 controller demo software.

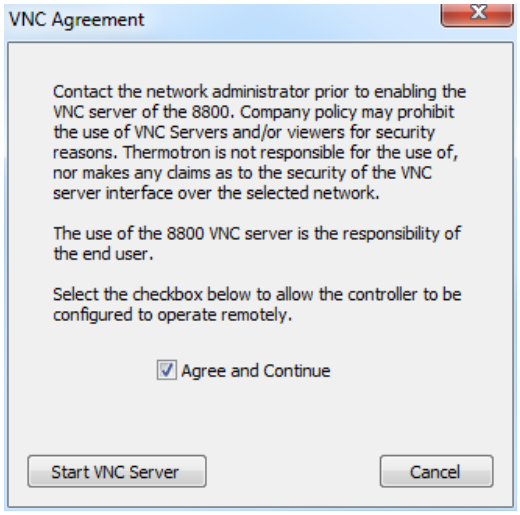
Virtual Network Computing (VNC) in 8800 and 8825 controllers

NOTE: All VNC messages refer to the controller as an 8800, even if it is an 8825 controller.

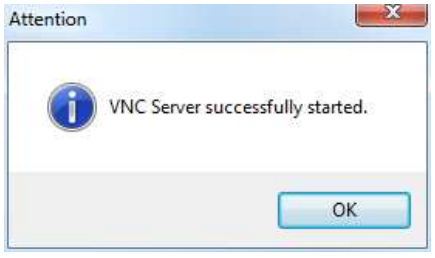
1. To allow the controller to be configured to be operated remotely for a specified length of time, enter the RUNVNC password. The **VNC Agreement** dialog will appear:
   - Check the **Agree and Continue** checkbox.
   - Select a time period for the VNC server to run.
   - To start the VNC server, select the **Start VNC Server** button. To cancel starting the VNC server, select the **Cancel** button.



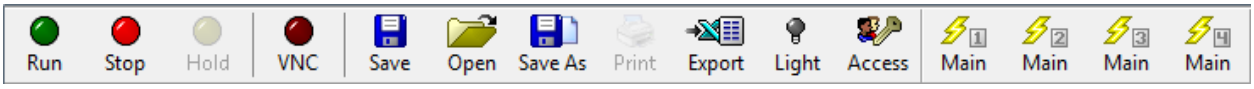
2. To allow the controller to be configured to be operated remotely for an indefinite length of time, enter the RUNVNCPERM password. The **VNC Agreement** dialog will appear:
   - Check the **Agree and Continue** checkbox.
   - To start the VNC server, select the **Start VNC Server** button. To cancel starting the VNC server, select the **Cancel** button.



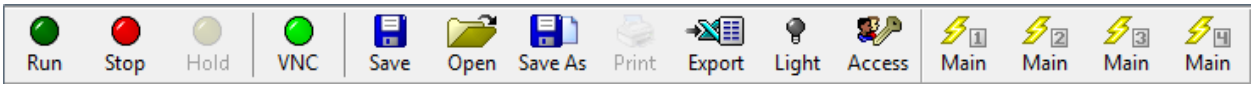
3. If the **Start VNC Server** button is pressed an acknowledgement message will appear:



4. When the VNC server is running a new **VNC** button now appears on the top button bar between the **Hold** and **Save** buttons. If the **VNC** LED is red and unlit it means that the VNC server is running but there are no remote clients connected to this 88xx controller.

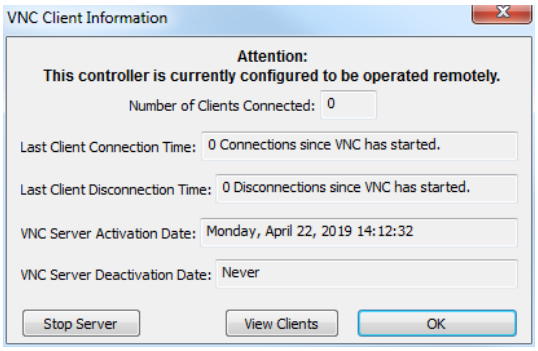


*If the **VNC** LED is green and flashing it means that the VNC server is running and one or more remote clients are currently connected to this 88xx controller.*

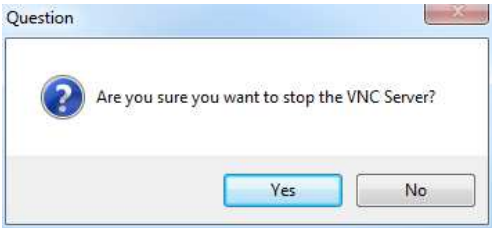


5. You can press the **VNC** button at any time to display the **VNC Client Information** dialog, which displays the following information:

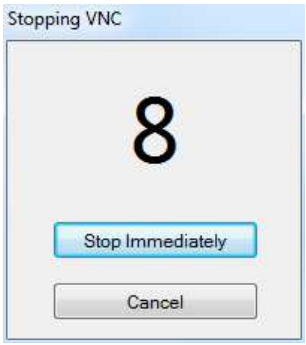
   - A reminder that this 88xx controller is configured to be operated remotely.
   - The number of remote clients that are currently connected.
   - The last time any client connected or disconnected.
   - When the VNC server was activated.
   - When the VNC server will deactivate.



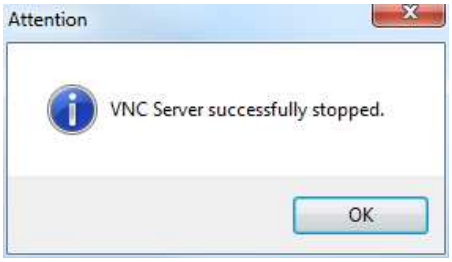
6. From this dialog you can stop the VNC server by pressing the **Stop Server** button. It prompts with a confirmation pop-up:



   - If you select **Yes** another pop-up will appear indicating that the VNC server will time out in 10 seconds (the timer counts down from 10 to 0). During this 10-second period you can press the **Stop Immediately** button to stop the VNC server right away, or press the **Cancel** button if you decide you don't want to stop the VNC server. Otherwise, after 10 seconds the VNC server will stop.

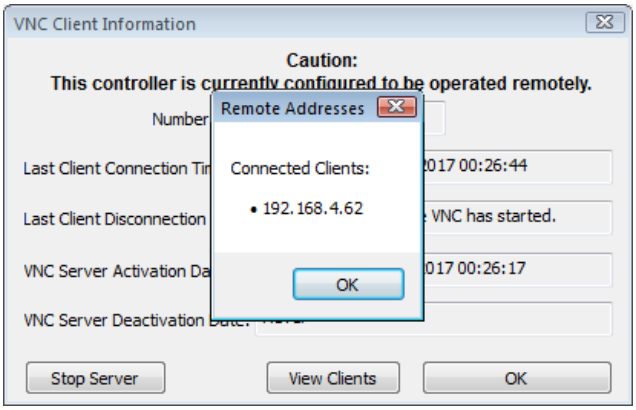


   - Once the VNC server has stopped a confirmation pop-up will be displayed:

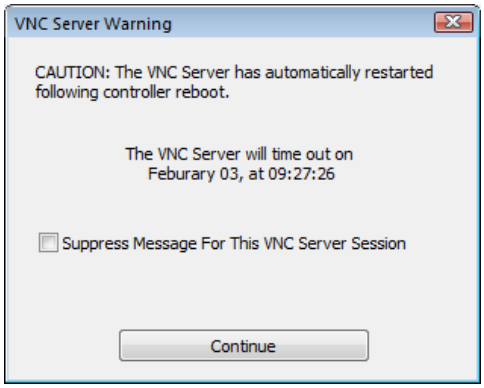


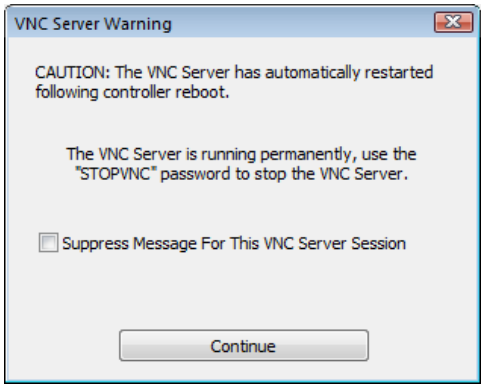
NOTE: When the VNC server is stopped the VNC button on the top button bar will also disappear.

7. Pressing the **View Clients** button on the **VNC Client Information** dialog will display the IP addresses of all clients currently connected to this 88xx controller. In this example there is one client connected to this 88xx. The client is at IP address 192.168.4.62. **NOTE**: The demo software will never show any clients connected.



8. *If the VNC server is running when a power cycle occurs, one of these messages will be displayed at startup (depending on whether the VNC server is running for a specified time period or running permanently):*

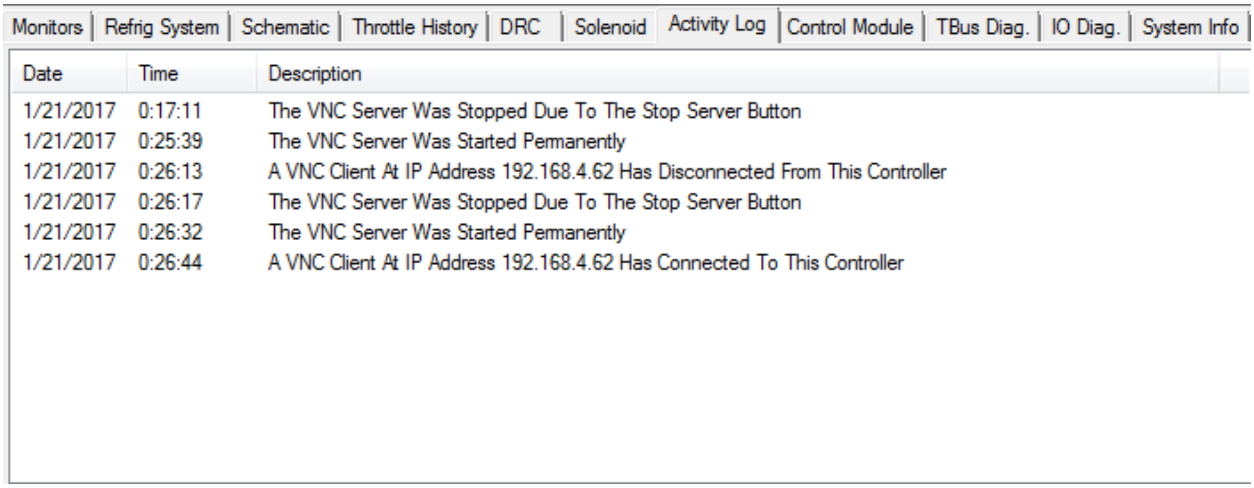




- *Press **Continue** to dismiss this message.*
- *Checking the **Suppress Message For This VNC Server Session** checkbox will keep this message from being displayed on future power cycles until the next time the VNC server is stopped and restarted.*

VNC activity logging

All VNC activity is logged in the Activity Log.



The Activity Log displays the following information:

- When the VNC server started and for how long.
- When the VNC server stopped and why.
- *When a client connects or disconnects, including IP address.*

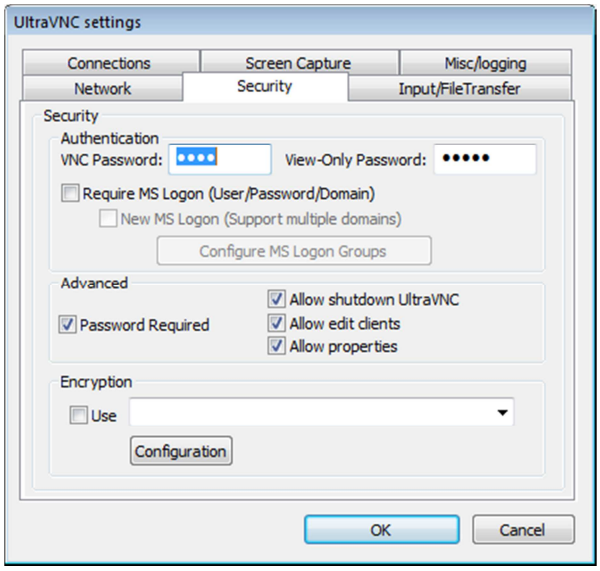
VNC authentication

When a client connects to the 8800 or 8825 controller, the default **VNC Authentication** password is "8800".

Changing the VNC password

*To change the VNC password, enter the CFGVNC password. The **UltraVNC settings** dialog will appear:*

- *You can set up separate passwords for view-only and full control.*
- *Other VNC configuration functions are not supported by the 88xx controller.*

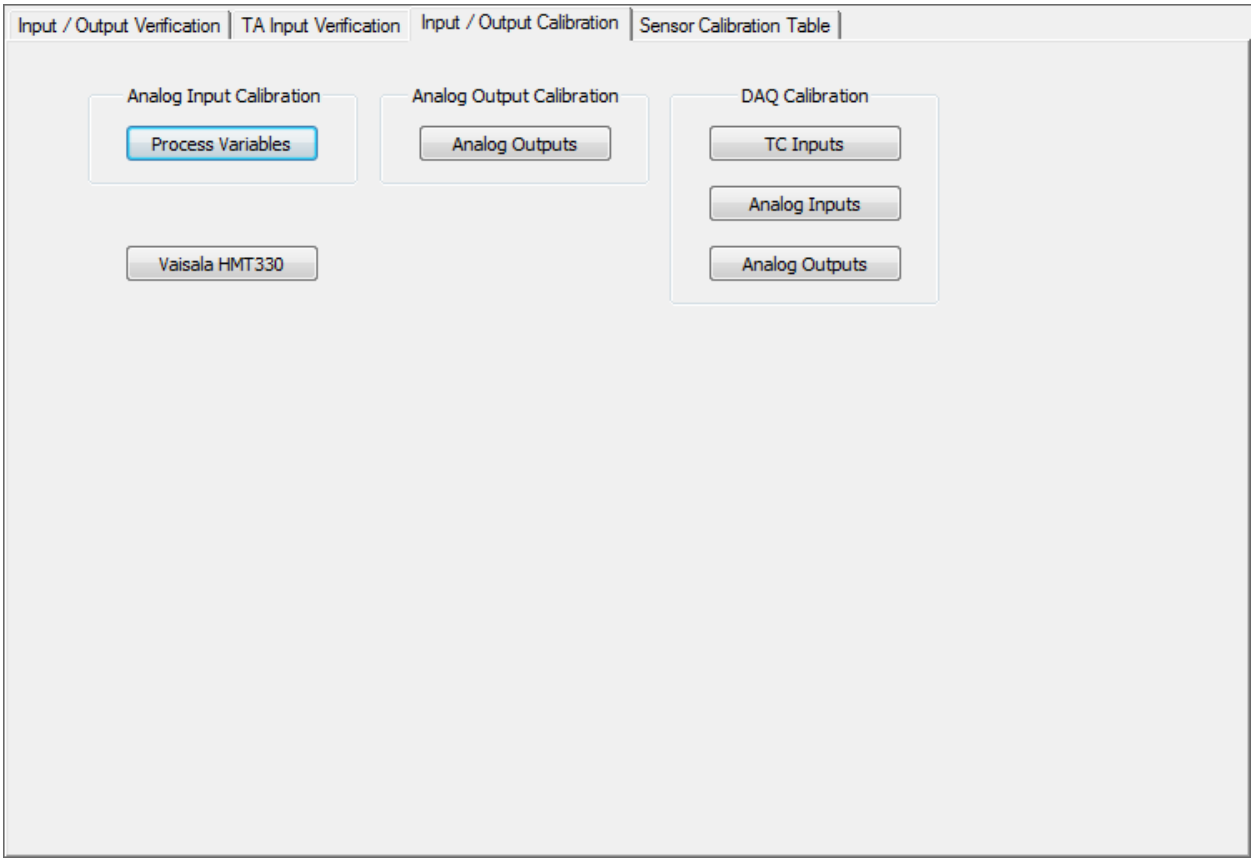


Section 5: CM2 Control Module Calibration

This section describes how to calibrate a CM2 control module's analog inputs and analog outputs.

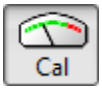
CAUTION: This section is not a substitute for adequate technical training. Improper calibration could damage your programmer/controller, chamber, refrigeration system, or products under test.

Calibration panels



NOTE: The CM2 analog inputs were calibrated by Thermotron for accurate performance. Make sure the instruments used during calibration are properly calibrated themselves. Before beginning any calibration procedure, make sure the display module's temperature scale is set to Celsius.

Press **Cal** to access the calibration panels. The calibration panels provide access to the calibration functions for process variables (control channels and monitor channels) and analog outputs:



- *Control channels* are the external and internal channels that both monitor and operate chamber systems. These channels use the CM2's thermocouple, RTD, and analog inputs to sense the chamber's conditions; they can also use the relay board and analog outputs for chamber control. Up to four channels can be factory-configured as chamber process variable control channels. Channels 5 through 8 are factory-set internal control channels.

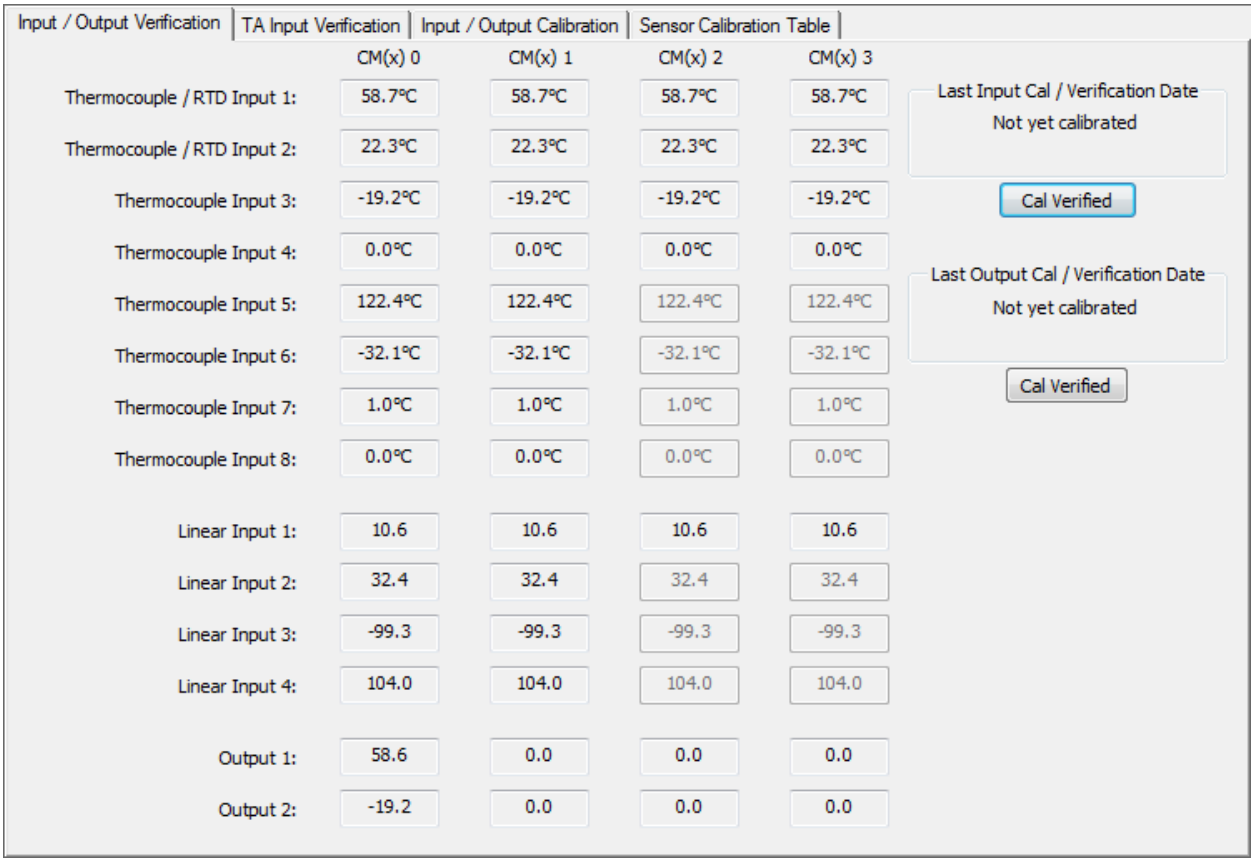
  To determine which thermocouple, RTD, or analog inputs are configured as control channels, refer to your instrumentation and configuration schematics. Instrumentation schematics show the physical interconnects. Configuration schematics show the channel assignments.

- *Monitor channels* also use the control module's thermocouple, RTD, and analog inputs to sense chamber environmental conditions. However, these channels do not operate control outputs to the chamber.

To determine which thermocouple, RTD, or analog inputs are configured as monitor channels, refer to your instrumentation and configuration schematics. Instrumentation schematics show the physical interconnects. Configuration schematics show the channel assignments.

- Each CM2 has two *analog outputs* that can be factory-configured to retransmit chamber readings or provide linear control to an instrument or control device. Analog outputs can be set to voltage or current, with a maximum range of 0-10 VDC or 0-20 mA.

Verifying analog inputs and analog outputs

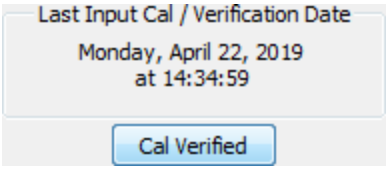


To determine if calibration is necessary, the data from independent calibration equipment attached to the CM2 can be compared to the "raw" analog input and output data shown on the Input / Output Verification panel.

1. Press the **Cal** button, then select the Input / Output Verification panel.
2. *Input example*: To make verification easier, the data shown on this panel has not been altered in any way. If **Linear Input 1** represents a temperature-compensated humidity reading, the reading here is presented without the temperature compensation applied. Therefore, if the input were originally calibrated such that 0-5 VDC = 0-100%, that linear relationship would hold true on this panel, making verification very straightforward.

   NOTE: Any adjustments made to any input channel via the Sensor Calibration Table would not be reflected on the Input / Output Verification panel.
3. *Output example*: If **Output 1** had been configured and calibrated such that -100°C to +200°C represented a 0-5 VDC output, the value displayed here would reflect the temperature equivalent of the voltage currently being sent to the analog output. Therefore, if **Output 1** were reading 50.0°C on the Input / Output Verification panel (halfway between -100°C and +200°C), the physical analog output should be reading 2.5 VDC (halfway between 0 VDC and 5 VDC) if calibrated (and configured) properly.

4. Press the **Cal Verified** button for the verification date of the last Input/Output calibration.

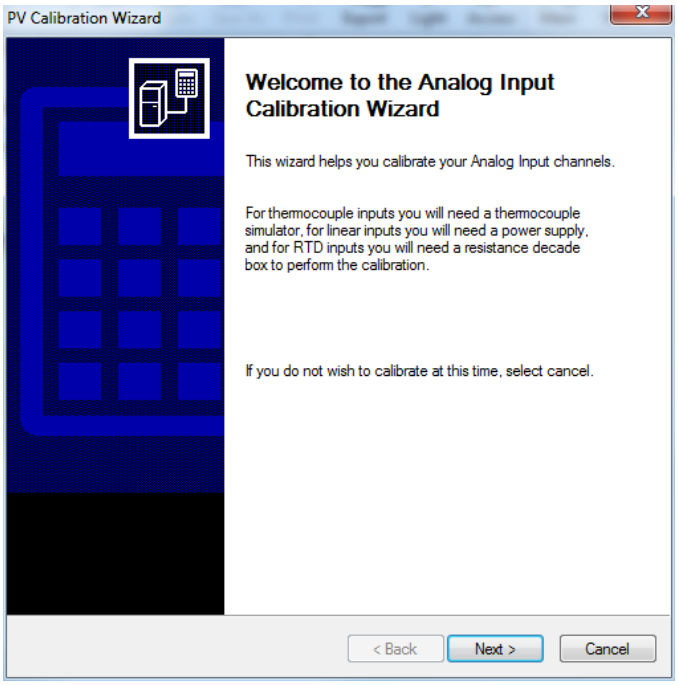


Calibrating analog input and analog output channels

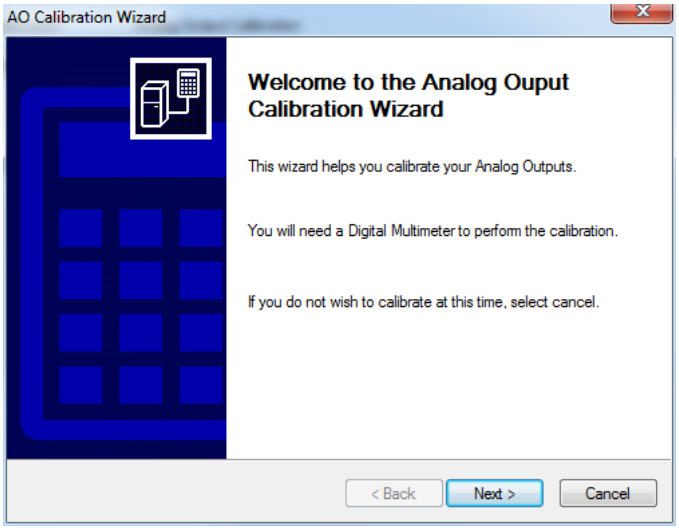
1. Press the **Cal** button, then select the Input / Output Calibration panel.

   - To calibrate analog inputs, press **Process Variables**. The Analog Input Calibration Wizard will start.

     NOTE: The calibration wizard allows channels of identical input types to be calibrated together. As soon as the first selection is made, the wizard grays out any non-identical inputs.



   - To calibrate analog outputs, press **Analog Outputs**. The Analog Output Calibration Wizard will start.



2. Follow the instructions on the screen, pressing **Next** when you are ready.

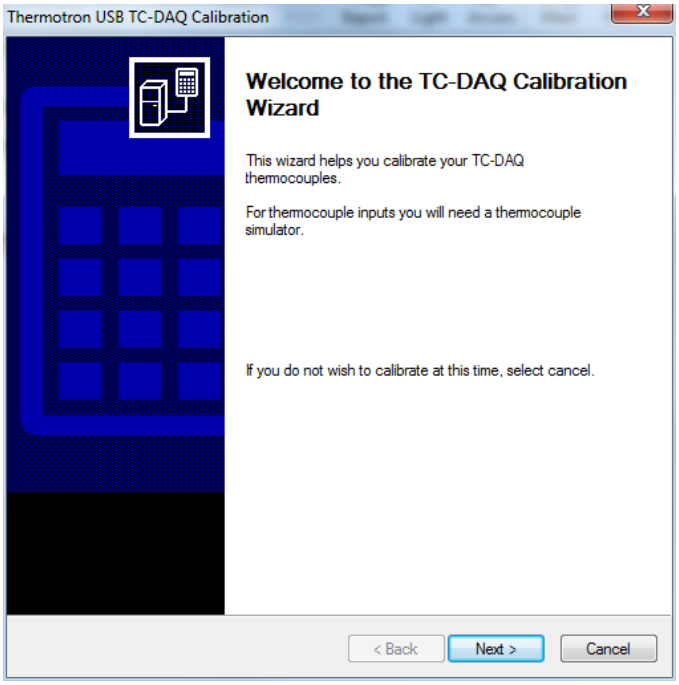
Calibrating DAQ thermocouple inputs and analog inputs and outputs

The 8825 supports revision B of the Thermotron Tier 2 USB-DAQ option. Revision B uses all Thermotron hardware and allows calibration of the thermocouple inputs and analog inputs and outputs. **NOTE**: The USB-DAQ status and revision level are indicated on the System Info panel. For more information, refer to "System Info panel" in Section 3 of this manual.

When the 8825 detects a revision B USB-DAQ, the Input / Output Calibration panel displays DAQ Calibration buttons that launch calibration wizards similar to those used for process variable and monitor channels.

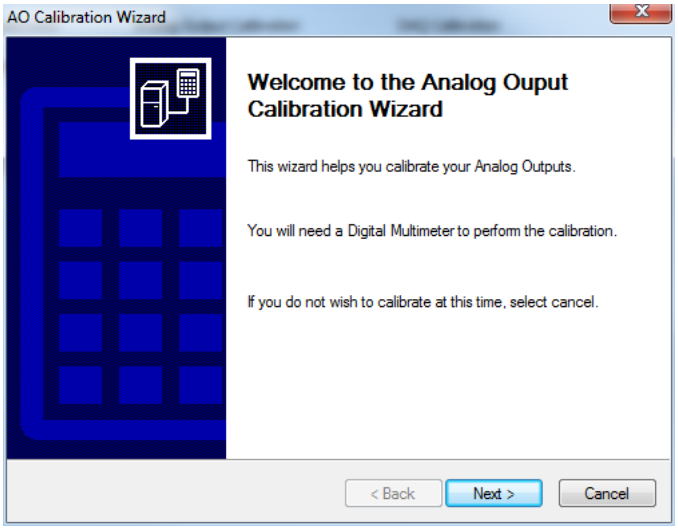
1. Press the **Cal** button, then select the Input / Output Calibration panel.

   - To calibrate the DAQ thermocouple inputs, press **TC Inputs**. The TC-DAQ Calibration Wizard will start.



   - To calibrate the DAQ analog inputs, press **Analog Inputs**. The Analog Input Calibration Wizard will start.

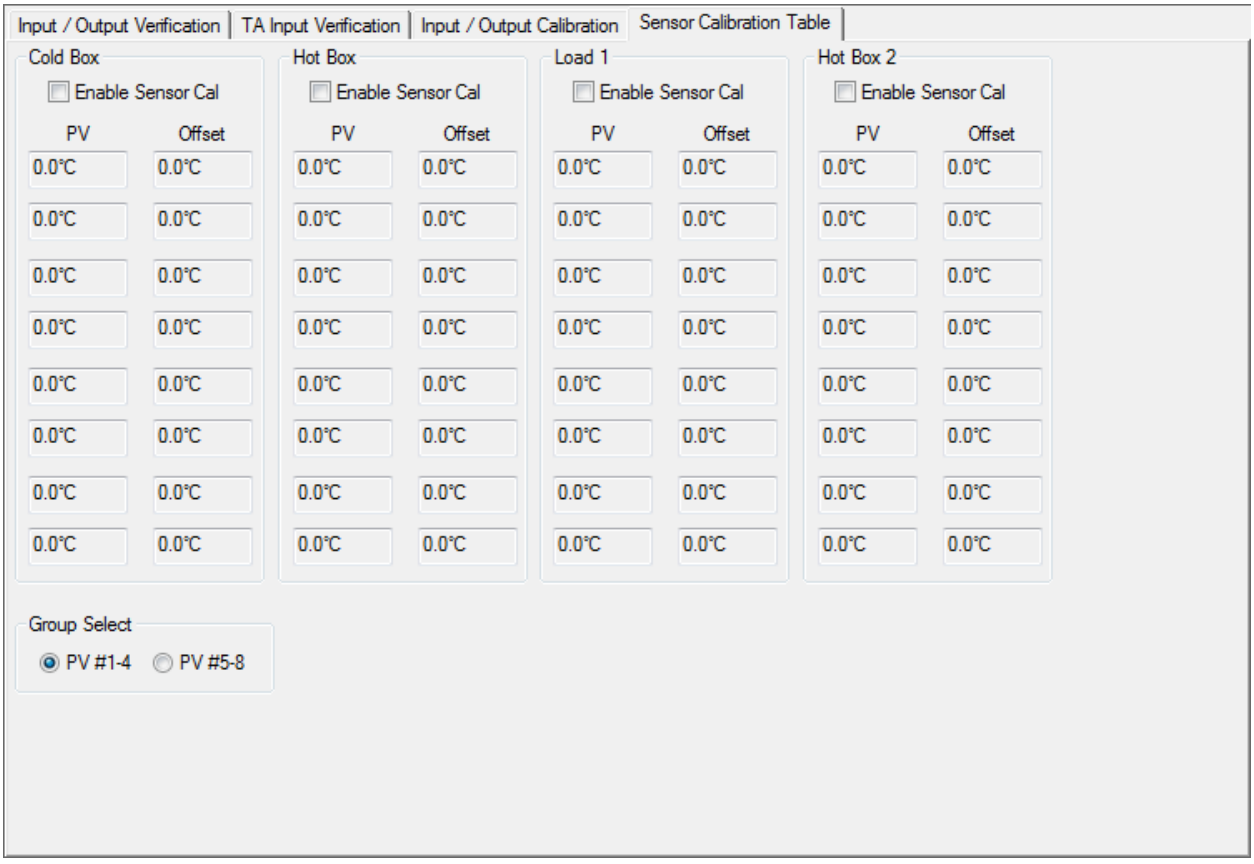
- To calibrate the DAQ analog outputs, under DAQ Calibration press **Analog Outputs**. The Analog Output Calibration Wizard will start.



2. Follow the instructions on the screen, pressing **Next** when you are ready.

Adjusting process variable channels

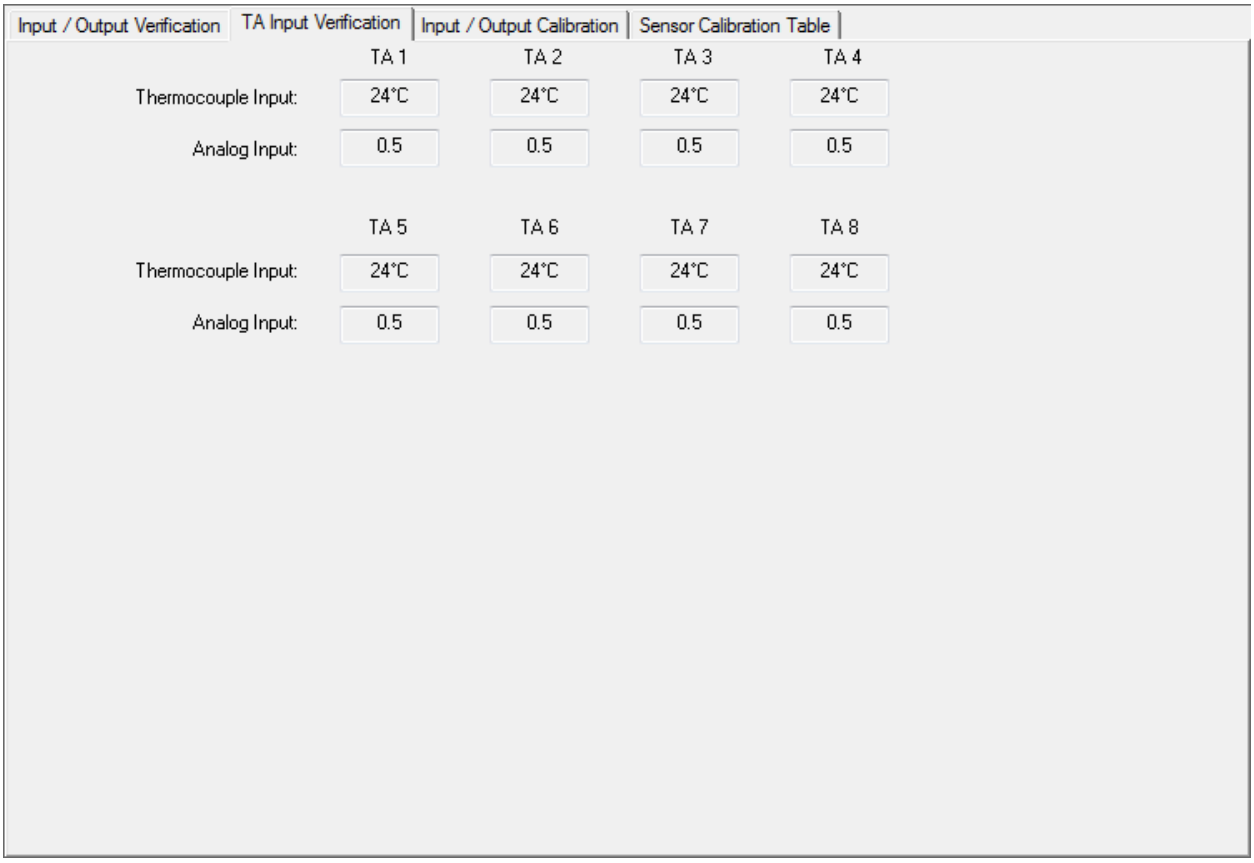
Calibrated process variable channels can be further adjusted to match independent sensors. The adjustment can be a simple offset shift, or up to eight different data breakpoints and deviations throughout the entire range of the channel input.



1. Press **Cal**, then select the Sensor Calibration Table panel.
2. Under Group Select, press the desired process variable group. **NOTE**: Process variable channels 5 through 8 are factory-set internal control channels.
3. To adjust a channel's input, select the channel's **Enable Sensor Cal** check box.
4. Enter the appropriate adjustment values into the **PV** and **Offset** fields.

Verifying Therm-Alarm inputs

To determine if Therm-Alarm input calibration is necessary, press the **Cal** button, then select the TA Input Verification panel.



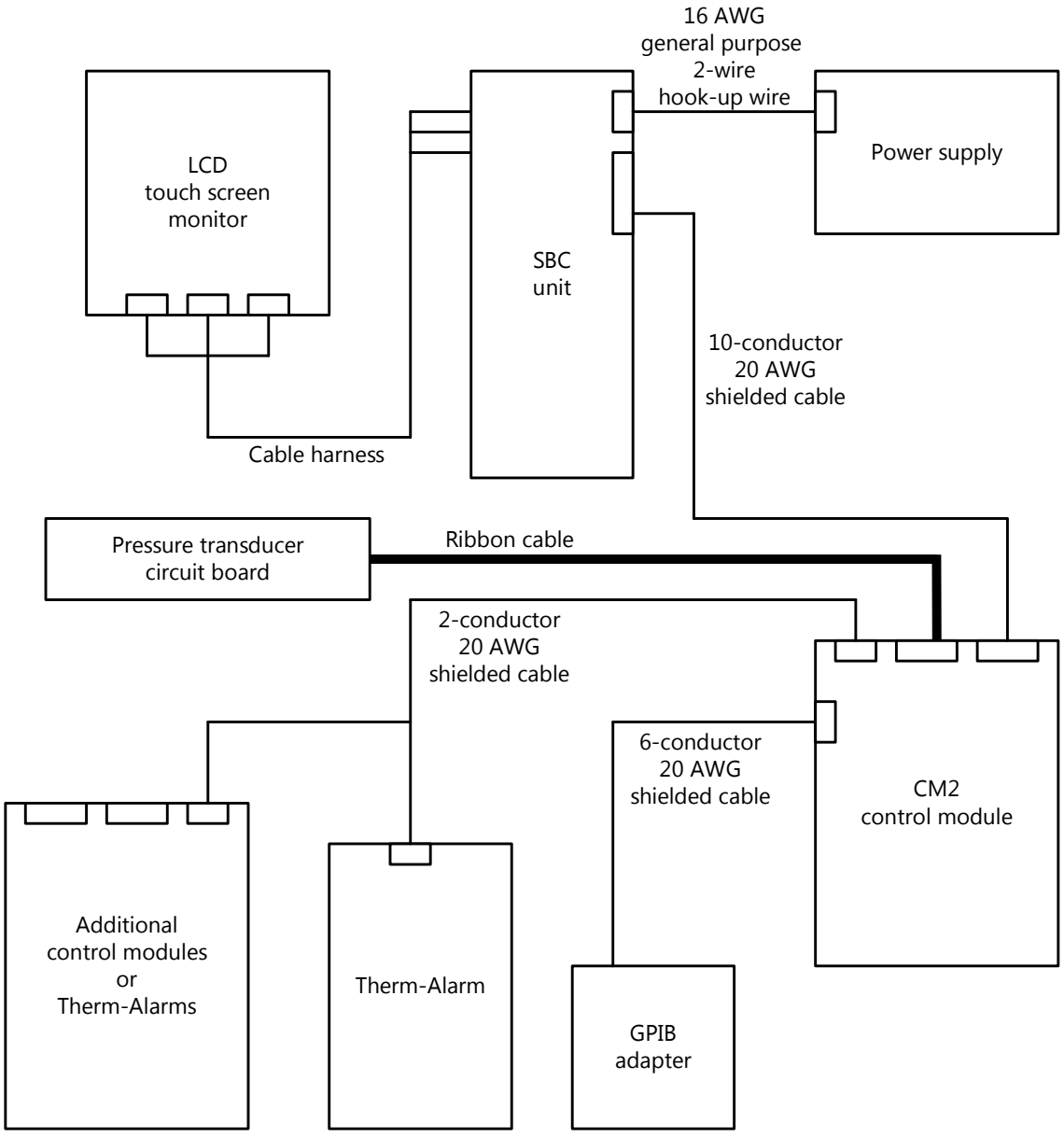
The data from independent calibration equipment attached to the CM2 can be compared to the "raw" input data shown on the TA Input Verification panel. If Therm-Alarm input calibration is necessary, refer to "Calibrating a Therm-Alarm" in Section 2 of this manual.

Section 6: Technical Information and Troubleshooting

This section provides technical information and troubleshooting procedures for the 8825 display module. For information on the CM2 control module, refer to the *CM2 Control Module Technical Manual*.

NOTE: Units equipped with an 8825 display module ship from the factory with all of the necessary hardware and software installed. If you need to reinstall any of the hardware or software, please call the Thermotron Product Support group at (616) 392-6550.

Figure 1. 8825 system block diagram



SBC unit specifications

Operating temperature	0-50°C
Power requirements	35 watts at 15 volts
USB	Four USB 2.0 ports

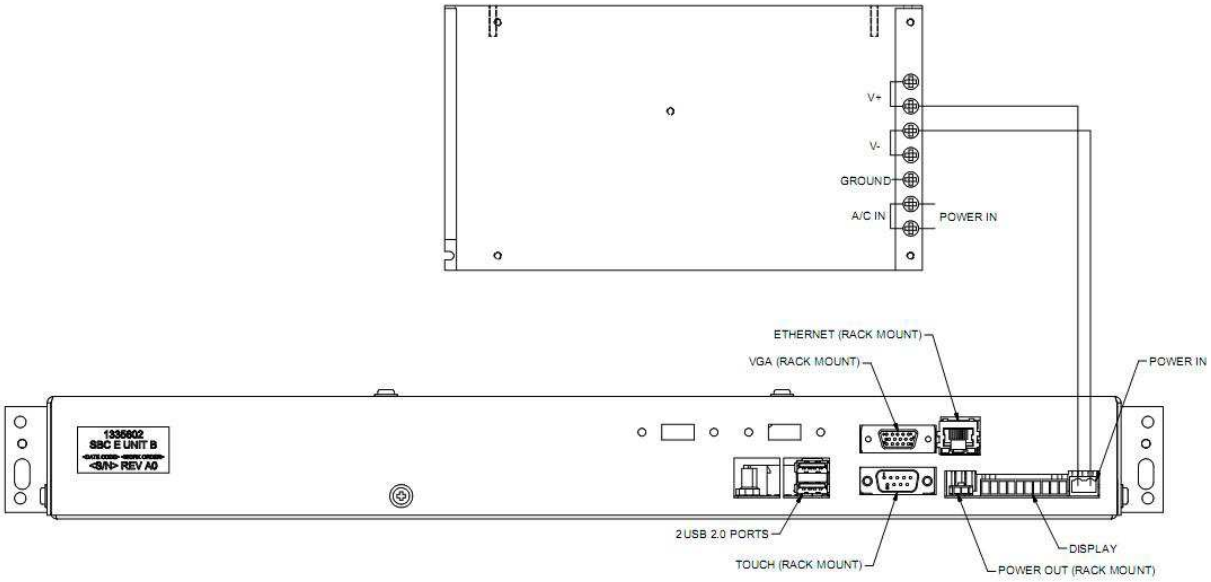


Figure 2. Rear view of the SBC unit and power supply

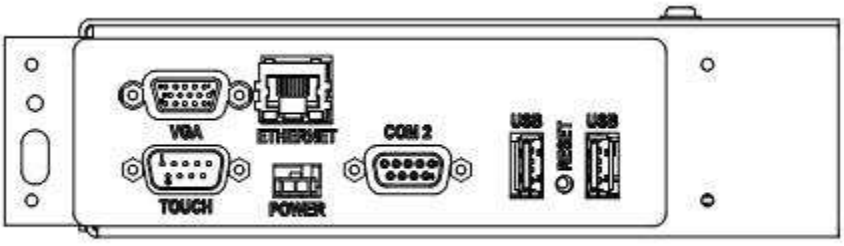


Figure 3. Detail of the front side of the SBC unit

Required components

The 8825 enhanced display module requires three separate components to be operational: the 8825 SBC (single-board computer) unit, a power supply, and a touch screen monitor.

Power supply

The 8825 power supply is a 150-watt, 15-volt, off-the-shelf power supply. It is intended to be mounted in the electrical compartment and hooked up to the 8825 with general 16 AWG hook-up wire (a pluggable terminal block is provided on the 8825). All of the power required by the 8825 is supplied by this power supply, which means an 8825 can operate outside of a chamber without a control module.

SBC unit

The SBC unit contains the single-board computer (SBC), hard drive, and a circuit board assembly that distributes power to the components of the 8825 and provides the interface between the SBC and the control module. The SBC unit has connectors coming out of two sides. The front side is shown above in Figure 3. The back side is shown in Figure 2. Refer to these two figures for the connector descriptions shown below:

Power in The 15-volt power supply is connected to this connector located on the back of the SBC unit. Positive voltage is connected to pin 1, which is on the left when facing the connector as shown in the diagrams. The 8825 unit consumes a worst case 35 watts of power. The power supply has been sized to work over a 0-70°C operating range.

Display The display connector located in the back of the SBC unit is the connection point to a control module. The pins of this connector are numbered left to right when facing the back of the SBC unit as shown in Figure 2. The 8825 does not need the power pins in the display cable, but they can be connected and energized without harming the SBC unit.

COM 2 An extra serial port is provided on the front of the SBC unit to enable the 8825 to communicate with a personal computer using Thermotron's serial communications protocol. This port will only do RS-232 communications, but it has a standard 9-pin, female, D-subminiature connector with a pin-out compatible with the standard 9-pin RS-232 pin-out. Any off-the-shelf RS-232 cable will work with this port. Any other communications protocol (RS-422, RS-485, TCIP, or GPIB) will have to be done through the control module.

USB Four standard USB 2.0 ports have been provided: two on the front side and two on the back side of the SBC unit. These ports will work with any standard USB cable or device. The 8825 can handle four high-power USB devices (500 mA per port) at the same time.

Reset A recessed hardware reset button has been provided in case problems ever arise with the system. This button may be pressed by pushing a small, pointed object into the hole between the USB connectors on the front of the SBC unit. **CAUTION: Because any unsaved setup or programming data will be lost after a reset, performing a reset while editing setup data or entering programs is not recommended.**

The following four connectors are part of the monitor connector cluster. They are located in the back of the SBC unit (as shown in Figure 2). A special cable harness that contains all of the cabling necessary to run the monitor in one sheath has been designed and built.

VGA The VGA connector is a standard high-density, 15-pin, female D-subminiature connector intended to connect the LCD monitor to the SBC on the 8825. Any standard VGA cable will work in this situation, but a special cable harness that contains all of the cabling necessary to run the monitor in one sheath has been designed and built.

Touch The communication between the SBC and the touch screen controller is done on a standard RS-232 serial port. This connector has been dedicated for that purpose and is a standard 9-pin, male, D-subminiature connector. The pin-out of this connector abides by the 9-pin serial standard, so that any standard female-to-male RS-232 cable will work.

Power out This connector provides power for the LCD monitor. The power supply behind this connector has been sized to power a 12-volt, 15-watt, 12.1-inch monitor.

Ethernet The Ethernet connector is part of the monitor connector cluster due to space reasons only. This connector is a standard 8-pin, RJ45 connector, but only makes use of four pins (two twisted pair). It is intended to enable a personal computer to communicate with an 8825 over a standard Ethernet network.

Troubleshooting procedures

NOTE: If you need to reinstall any of the hardware or software, please call the Thermotron Product Support group at (616) 392-6550.

Symptom 1: The touch screen display appears blank

1. Make sure the LCD monitor is turned on.
2. Touch the screen to see if the display comes on.
3. Make sure power is applied to the chamber and SBC unit.
4. Check the cable harness for proper connections and conductivity. Replace any bad cables.
5. Replace the LCD monitor.

Symptom 2: The touch screen does not work, works randomly, or produces incorrect results

1. Calibrate the 8825 touch screen monitor:
   a. From any screen, hold the stylus against the touch screen for 10 seconds.
   b. Follow the instructions on the screen.
2. Check the cable connections at connectors P9 or labeled “Touch” on the LCD monitor.
3. Replace the LCD monitor.

Replacing the touch screen monitor

1. Remove power from the chamber.
2. Disconnect the LCD cable harness from the back of the LCD monitor. **NOTE**: The LCD cable harness consists of a VGA cable, RS-232 serial cable, and a DC power cable bundled in one sheath.
3. Remove the four screws connecting the LCD monitor to the mounting bracket. Be careful not to drop the monitor during this process.
4. Attach the new LCD monitor to the bracket with the screws removed in the previous step. **NOTE**: The LCD mounting screws are metric screws and new screws are not provided with new monitors.
5. Reconnect the LCD cable harness to the back of the LCD monitor.

Appendix A: Glossary

access level: A function that allows you to select from six levels of access to the 8825 programmer/controller functions.

alarm band: The maximum area around the current set point that the process variable (actual test space or product condition) can deviate from. If the process variable drifts outside the alarm band, the 8825 enables its alarm functions.

alarm delay: The number of seconds the Therm-Alarm alarm mode will be delayed after the input temperature reaches a limit temperature. If the limit temperature is exceeded by more than five degrees, the alarm delay will not occur.

auxiliary cooling: An optional, non-mechanical refrigeration system that uses liquid nitrogen (LN_2) or carbon dioxide (CO_2) to provide cooling.

auxiliary cooling duty cycle; auxiliary cooling time frame: Settings that control an auxiliary cooling system. When the mechanical refrigeration system is operating at full cooling throttle, the auxiliary cooling system can be operated for a programmed percentage or duty cycle (such as 50%) of a selected time frame (such as six seconds).

auxiliary group: One of two groups of eight auxiliary outputs available with the 8825 programmer/controller.

auxiliary output: A programmable signal generated by the 8825 that provides on/off control to a system or circuit.

auxiliary relay: A solid-state relay operated by an auxiliary output that uses the TTL output to switch a line voltage. Auxiliary relays operate additional systems or circuits. You can turn these outputs on or off during programmed intervals, or you can operate them in manual mode. There are two auxiliary groups of eight outputs each available with the 8825.

calibration: The process of checking or adjusting an instrument by comparing it with a standard.

cascade: A mechanical refrigeration system with two compressors and a cascade condenser. The refrigerant of the first compressor removes heat from the test space. The refrigerant of the second compressor removes heat from the refrigerant of the first compressor. An air-cooled or water-cooled condenser then removes the heat from the refrigerant of the second compressor.

chamber: A general name for a Thermotron environmental simulation testing system. The chamber includes the testing section, the machinery section, the console, and, on air-cooled chambers, condensers.

channel names: Names that appear as channel headings for all channel-dependent 8825 screens. Channel names may be customized to reflect the variable they are controlling or monitoring.

command: A code sent to the 8825 by a host computer that the 8825 interprets to perform an action.

computer interface: A hardware component, such as an RS-232 or IEEE-488, that connects two or more other components for the purpose of passing information from one to the other.

concatenation: A programming technique that allows the programmer to send more than one command in a single data transmission. The programmer enters the commands on one line, separating them with a delimiter. (On the 8825, the delimiter is a semicolon.) The computer then transmits the commands together.

conditioning system signals: Signals used by a controller to operate chamber systems such as heating, cooling, and humidity. These signals are dedicated to the system and are internally programmed.

console: The section where you control the test functions of the chamber. The console usually contains the control panel and the instrumentation. A console can be a separate, remote unit, or it can be attached to the chamber.

control channels (process variable channels): Channels that receive analog inputs from thermocouples and other sensing devices used to monitor the environmental conditions inside the chamber's test space. The 8825 operates the chamber control systems based on the process variable readings and the demands of the test.

control module: The hardware assembly that includes the microprocessor used to perform the chamber interface operations and distribute power to the display module. The 8825 display module can have up to four control modules.

control option: One of the various options, such as humidity or product temperature control, that can be enabled or disabled for manual mode operation or for each programmed interval.

control parameter: Settings that adjust the performance of the chamber around set point. As the chamber nears set point, the programmer/controller adjusts the chamber throttles to provide a smooth ramp to set point. To prevent overshooting and oscillation around the final set point, the refrigeration, heating, and other systems must be damped as they approach the set point. To maximize chamber performance, lag times must also be compensated for.

control sensor: A device (or group of devices) that monitors the environmental conditions in the chamber's test space for the programmer/controller.

controlled ramp: The process of changing the test space temperature, humidity, or other variable from an initial set point to a higher or lower set point at a linear rate.

cooling ramp: The process of decreasing the test space temperature from an initial set point to a lower temperature set point at a linear rate.

csv files: Comma-separated-variable files; the file format that the 8825 uses.

cycle: A set of programmer/controller intervals repeated during a programmed test.

delayed start: A function that causes the 8825 to wait until a specified date and time before running a program.

deviation: The difference between the process variable (actual test space or product condition) and the set point (assigned test space or product condition).

deviation alarm: A 8825 programmer/controller function that can be programmed to activate an alarm if the chamber temperature, humidity, or other process variable is outside the channel's +/- deviation alarm band. A deviation alarm band programs how far the temperature or humidity can be from set point. For example, a deviation alarm band of 5°C activates the alarm output if the chamber temperature is more than 5°C above or below set point.

***discharge pressure* (*head pressure*)**: The pounds per square inch of refrigerant present at the outlet of the compressor.

display module: The 8825 display module is composed of a single-board computer, touch screen monitor, and power supply.

droop: An effect that prevents a process variable from reaching the final set point. For example, natural heat loss through the chamber walls can prevent the test space temperature from reaching the final set point.

dry bulb: A thermocouple that monitors the test space temperature.

dry bulb temperature: The actual test space air temperature.

early life failure: A defect in a product that causes it to fail during its infancy.

error code: A two-character byte sent by the 8825 to indicate a fault or communication problem.

event relay: A relay programmed by a computer. When the relay is programmed on, the operation controlled by the relay is activated.

final value: The final temperature or other process variable the chamber is to reach during an interval.

GPIB: General Purpose Interface Bus; a parallel interface bus built under the IEEE-488 standard.

graph: A programmer/controller function that plots changes in process variables (such as temperature or humidity), set points, and other data.

g-soak (guaranteed soak): A g-soak interval will immediately set the set point equal to the interval's final value and then wait until the process variable is within the +/- deviation band of the final value. Once the process variable is within the deviation band, the interval time will begin counting down. For multiple channel programs, all non-zero deviation bands must be satisfied before the interval time will begin counting down.

handshaking: A series of signals acknowledging that communication can take place between devices.

heat-up: The process of the test space temperature going from one set point to a higher set point.

heating ramp: The process of increasing the test space temperature from an initial set point to a higher temperature set point at a linear rate.

high alarm limit: The upper temperature limit which, if exceeded, will cause a Therm-Alarm trip.

I/O: Input/output.

IEEE-488 (GPIB): A parallel interface bus built under the IEEE-488 standard. This is the standard bus used for communication between the host computer and the programmer/controller.

initial value: The starting temperature or other process variable of an interval. After the first interval of a program, the initial value is always the final value of the previous interval and cannot be edited.

input temperature: The temperature of the product being tested as measured by the input thermocouple.

input thermocouple: A dry bulb thermocouple the Therm-Alarm uses to monitor the temperature at the products under test.

integral time: A control parameter that determines how quickly the throttle will be adjusted to compensate for droop. Droop is an effect, such as natural heat loss through the test space walls, that prevents the process variable from reaching the final set point. The integral time parameter adjusts the throttle to take the droop out of the proportional band settings and allow the chamber to reach set point.

interval: A programmed period during which the chamber operates under a specified set of conditions.

interval graph: A graph in which each interval is given the same amount of space regardless of its duration. Compare to time graph.

interval time: A setting that controls how fast the temperature, humidity, or other process variable is to be cycled from the initial value to the final value.

key beep: An audible beep that is sounded each time a 8825 programmer/controller key is pressed, unless this function is disabled.

limit temperature: The Therm-Alarm adjustable high and low temperature settings. An alarm occurs if the input temperature reaches a limit temperature.

loop: A series of intervals programmed to be repeated.

low alarm limit: The lower temperature limit which, if exceeded, will cause a Therm-Alarm trip.

main screen: The base or home screen for the 8825 display module. Press **Main** to return to the main screen.

manual mode: A function that allows you to operate the 8825 controller functions. Manual mode operates the chamber using set point and rate of change (ramp rate) settings. You can enter manual mode when the system is in stop mode. You also can enter manual mode from hold program mode if, while running a program, you want to perform a special operation in manual mode and then continue with the program.

maximum excursion: A Therm-Alarm function; the hottest or coldest temperature experienced during the most recent alarm condition.

mechanical refrigeration system: A system that uses pressurized refrigerants to remove heat from the test space.

monitor channel: A channel used by the 8825 for monitoring processes within the chamber. If the high or low limit is exceeded for any channel, the 8825 alarm outputs are activated.

multidrop addressing: An addressing protocol used on RS-485 interfaces that allows each instrument to send data to or receive data from another specific instrument using the same physical interface cable.

offset: The amount the test space air temperature may exceed the final temperature set point during product temperature control operation.

operation command: A code sent to the 8825 that causes the 8825 to perform an internal action and use any accompanying data to update internal registers or memory storage.

options byte: A one-to-three-character data transmission that sets or indicates the function options used in the 8825 operations.

overshoot: A test condition where the process variable runs past final set point.

parse: To separate a command expression into sub-units to determine the relationship between the sub-units. For example, the 8825 separates the command, channel or group designator, and data to translate the command into action.

password: A string of up to 20 keystrokes that must be entered to set the 8825 programmer/controller access level. Once the current password is entered, the authorized user can also select a new password.

percent relative humidity (%RH): A measurement of the moisture content of air. See also relative humidity.

+/- deviation: How far you will allow the temperature, humidity, or other process variable to be from set point. If the value is exceeded, the deviation alarm is activated.

power fail recover mode; power fail recover time: A function that allows you to set up how the 8825 programmer/controller will recover after a power failure. If the power fails for longer than the selected power fail recover time, the 8825 will power up in one of four power fail recover modes: stop, hold, run, or restart. If the power failure is shorter than the power fail recover time setting, or if the setting is 0:00:00, the 8825 will recover by returning to its last mode of operation.

prefix protocol: A communication convention that places a dummy character in front of each multidrop serial data transmission to help avoid data loss during the time an instrument's receiver drivers are turning on.

process alarm: A 8825 programmer/controller function that can be programmed to activate an alarm if the chamber temperature, humidity, or other process variable exceeds high or low limits you select. If the variable exceeds the high or low limit, the 8825 enters stop mode.

process variable: The actual sensed condition within the test space, such as temperature or humidity, that is controlled by the programmer/controller.

process variable channels: See control channels.

product: The device or equipment the chamber tests.

product temperature control (PTC): A heating and cooling process that controls the process variable from the product temperature rather than the test space air temperature. During normal temperature cycling, the chamber is cycled to the final set point in the specified time. However, the product temperature will approach final set point at an exponentially decreasing rate, lagging behind the chamber air temperature. The PTC software is written to minimize the lag time. The software senses two thermocouple inputs: channel 1 from the chamber air and a second channel from the product under test. When PTC is enabled, the second channel senses the temperature at the product and causes channel 1 to operate the heating and cooling systems at a faster throttle and higher set point to make up for the temperature lag. When PTC is disabled, channel 1 operates the chamber's control systems.

profile: A relationship between a test space condition and time.

program: A set of parameters divided into time intervals that are used to control the 8825 operations.

proportional band: A control parameter that determines the point at which the control switches from 100% output to a proportional output. As the process variable nears set point, it enters the proportional band. Once inside the proportional band, the throttle is backed off in proportion to the difference between the set point and the current process variable.

psi: Pounds per square inch; a unit of pressure.

PTC: See product temperature control.

pulldown: The process of the chamber going from one temperature set point to a lower temperature set point.

purge: An option, either dry air or gaseous nitrogen (GN_2), used to reduce moisture inside the test space.

query command: A code sent to the 8825 that causes the 8825 to send information to the host computer or server.

ramp: A controlled process where the process variable transitions from an initial value to a final value in a specified amount of time. During this time, the 8825's control parameters maintain a smooth transition.

ramp rate: The speed, measured in number of units (such as degrees Celsius) per minute, at which the controller cycles a process variable to a new set point. If the number of units is zero, the controller performs a step change. **NOTE**: Only one active channel's ramp rate can be set at a time.

real time clock: A 8825 programmer/controller function that keeps track of the time and date. These are used for reference, delayed start, and the time stamp for the graph function.

relative humidity (RH): A percentage of the maximum amount of moisture that the air can hold at a given temperature and pressure.

reset mode: A setting that determines how the Therm-Alarm is reset when it is in alarm mode.

resistance temperature device (RTD): An electronic device used to sense temperature as a function of resistance.

RH: See relative humidity.

RS-232: A standard serial data interface between two electronic devices.

RS-485: A standard serial half-duplex (shared transmit/receive line) data interface with addressing capabilities.

RSA time: Refrigeration system anticipator time; a performance parameter that allows you to set the number of minutes the 8825 will precool the refrigeration system before a temperature pulldown set to 00:00:00 time with a continue deviation. The precool occurs during the interval before the 00:00:00 time interval.

RTD: See resistance temperature device.

run time: A programmer/controller function that maintains a running count of the number of hours refrigeration systems or control channels operate.

service interval: The frequency of scheduled maintenance.

set point: An assigned value for a test space condition. There are three types of set point:

- *Initial set point*: The value that the chamber is at in the beginning of an interval.
- *Final set point*: The final value the chamber is to reach within an interval.
- *Current set point*: One of the intermediate set points the programmer/controller sets when ramping from the initial set point to the final set point.

single stage: A mechanical refrigeration system with one compressor. The refrigerant of the compressor removes heat from the chamber. A condenser then removes the heat from the refrigerant. Compare to cascade.

starting interval: The interval that a program begins with; typically a program begins with interval 1.

status word: A one-to-three-character data transmission from the 8825 whose bits are set or cleared to indicate the operating conditions of the 8825.

step change: If the ramp rate is set to zero, the controller performs a step change. During a step change, the 8825 outputs a full demand (±100% throttle) until it enters the set point's proportional band.

stress screening: Changing temperatures as quickly as possible to force any early life failures on each product.

system event: A control device that monitors certain variables, such as temperature or throttle, and turns its outputs on or off based on the monitored variables.

t/c: See thermocouple.

temperature profile: The relationship between time and the test space temperature.

temperature scale: Celsius or Fahrenheit.

terminator: A code used to indicate the end of a data transmission. The 8825 interprets and transmits carriage return and line feed characters as terminators.

test space: The space within the test compartment where the product is tested.

Therm-Alarm: A product protection instrument that monitors the temperature at the product. If the product temperature exceeds either the high or low temperature you select, the Therm-Alarm disables the chamber control systems and alerts you with audible and visible alarms.

thermocouple (t/c): A device used to sense temperature as a function of current.

throttle: The percentage of output applied by a chamber's conditioning system to reach set point. Any positive throttle is a heating demand, and any negative throttle is a cooling demand. For example, to heat the test space as quickly as possible, the 8825 will operate the throttle at +100%. When the process variable (temperature) reaches the proportional band, the 8825 will begin reducing the throttle to control the process variable to equal the set point.

throttle limit: A parameter setting that can limit the 8825 controller throttle output.

time graph: A graph in which each interval is given space based on its duration. Compare to interval graph.

timed soak: Maintaining the same test space temperature, humidity, or other variable for a specified time. When entering a test profile, a timed soak period results when the initial and final set points for an interval are the same.

transducer: A device that converts information from one medium, such as pressure, to another, such as current.

transition: The crossing point at which a value changes from one condition to another.

TTL: Transistor-transistor logic.

variable: An actual value of a test space condition. For example, if the temperature in the test space is +100°C, the temperature variable is +100°C.

Appendix B: Tuning Control Parameters

CAUTION: The 8825 programmer/controller was factory-tuned and should not need to be re-tuned unless the product requirements change enough to affect the performance of the chamber. Incorrect values could damage your equipment and/or product.

NOTE: To tune control parameters, the 8825 access level must be Lab Manager or higher. Tuning the 8825 control parameters is a time-consuming procedure that will take a minimum of two to three hours to complete.

Proportional band parameters

The proportional band parameters are a **coarse** adjustment (1 to 9999 units) to the control algorithm. These parameters set the proportional bandwidth around the set point for the control channel's process variable. As the process variable nears the set point, it enters the proportional band. Once inside the proportional band, the throttle is backed off in proportion to the difference between the set point and the current process variable. **NOTE**: The proportional bands use the same units of measurement as the process variable.

- If the proportional band is too large it can result in very slow transition times — the chamber may never reach set point.
- Smaller proportional bands can result in faster transitions.
- If the proportional band is too small it can result in overshoot or oscillation around the set point.
- As a rule for the proportional band, **smaller = faster** response, **larger = slower** response. Generally, you should adjust the proportional band to the smallest value possible without the process variable excessively overshooting or oscillating around the set point.

Integral time parameters

The integral time parameter is a **fine** adjustment to the control algorithm. The integral time parameter is used when the process variable nears the set point and the throttle is backing off. The integral time parameter adjusts the throttle to take the droop out of the proportional band setting and allows the chamber to reach the set point.

Droop is an effect, such as natural heat loss through the test space walls, that prevents the process variable from reaching the final set point. The integral time parameter determines how quickly the throttle will be adjusted to compensate for droop. Without an integral time entered, the process variable will not reach or remain at the set point. **NOTE**: The integral time parameter is programmable from 0 (integral off) to 1,000 seconds.

- Longer integral times result in longer times to reach the set point.
- Shorter integral times result in shorter times to reach the set point.
- If the integral time is too short, the process variable will oscillate indefinitely when it reaches the set point.
- As a rule for the integral time, **shorter = faster** response, **longer = slower** response. Generally, shorter integral times mean shorter transition times.

Tuning the proportional band and integral time parameters

The proportional band and integral time parameters must be "tuned up" to produce an efficient, controlled environmental test cycle. First you tune up the proportion band for quality control near set point, then you tune up the integral time to achieve accuracy.

For the optimal combination of performance and quality, each control channel is tuned to be critically damped. This occurs when the process variable overshoots the set point slightly and then oscillates around the set point slightly until it stabilizes at the set point. This level of control becomes available only with properly tuned proportional band and integral time parameters.

When tuning up chamber parameters with two or more control channels, tune up one channel at a time, always tuning the proportional band parameters first.

Example starting parameters			
Heat proportional band	20	Heat integral time	60
Cool proportional band	40	Cool integral time	90

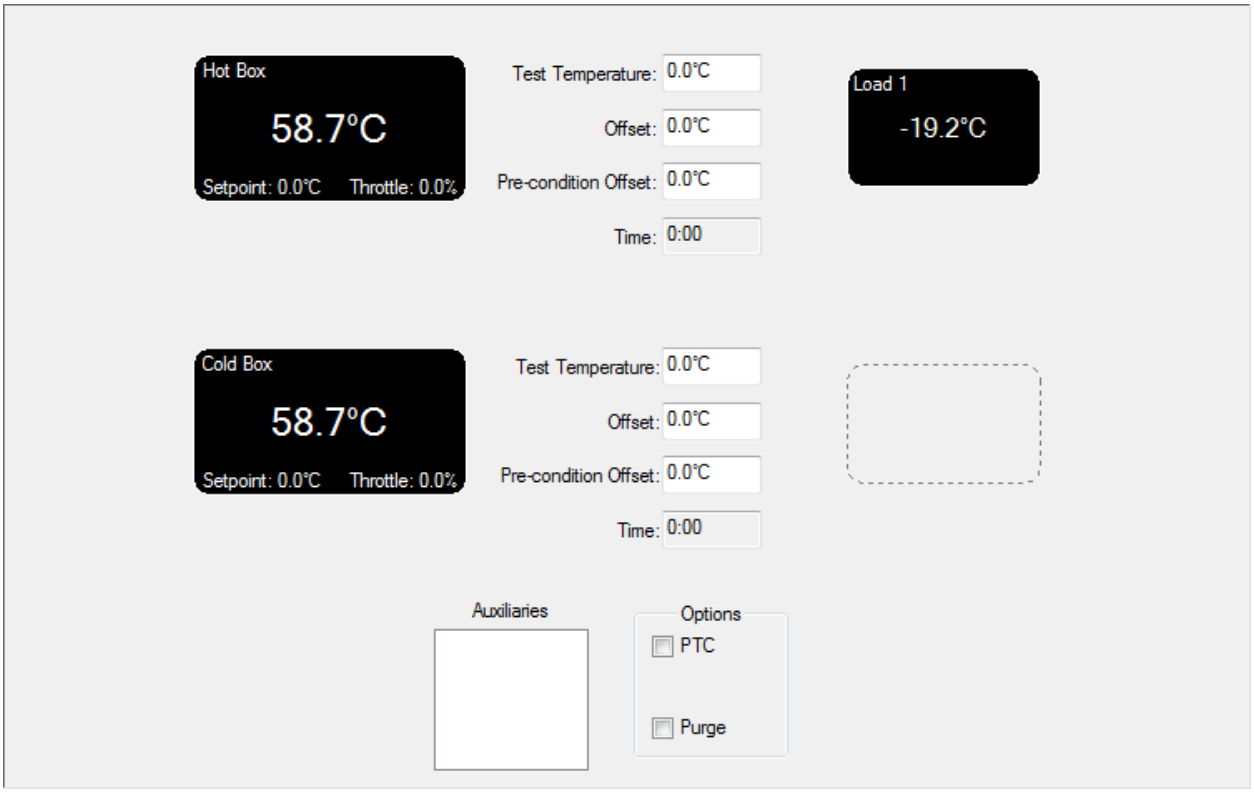
Record the original parameter settings

1. Press **Setup**, then select the Control Parameters panel.

2. Write down the heating and cooling proportional band (**Prop. Band**) and **Integral Time** settings for the box that you are tuning. This record will provide you with a valuable future reference, and you will use the integral time value later in this procedure.
3. Select the **Integral Time** field or fields for the box that you are tuning, and set the parameter to zero.

Obtain a performance baseline

4. Place a load in the product carrier that is close to the weight of your normal product load.
5. Press **Manual** to go to the manual mode screen. Enter a temperature that will soak the product carrier in the box that you are tuning for a long time (such as one hour). **NOTE**: On two-zone chambers make sure PTC is disabled.
   - To tune the heating proportional band, enter a test temperature of +150°C and press **Run**.
   - To tune the cooling proportional band, enter a test temperature of -54°C and press **Run**.
6. Allow the box to stabilize at the set point for at least fifteen minutes.



7. Watch the basket or load temperature for the box that you are tuning. At this point you are tuning the box for the quality (stability) of temperature control rather than accuracy. You need to decrease the proportional band to the smallest value that does not cause the box temperature to oscillate around the **Setpoint**. As you watch the box temperature, look for these indications:
   - If the box temperature is oscillating across the **Setpoint**, you need to increase the proportional band to the largest value at which the box temperature stops oscillating.
   - If the box temperature is stable near **Setpoint**, you may need to decrease the proportional band to the smallest value without causing oscillation.

Adjust the proportional band setting

8. Press **Setup**, then select the Control Parameters panel.
9. Select the **Prop. Band** field or fields of the box that you are tuning, and change the displayed value by no more than 20%.

10. To adjust the proportional band:
    a. Change the set point to a high temperature (for example 100°C) and let it soak at that temperature for one hour.
    b. Watch to see how the chamber comes into control.
        - If it oscillates coming into set point, then double the heat proportional band.
        - If it is lagging coming into set point then halve the heat proportional band.
    c. Change the set point to a low temperature (for example -50°C) and let it soak at that temperature for one hour.
    d. Watch to see how the chamber comes into control.
        - If it oscillates coming into set point, then double the cool proportional band.
        - If it is lagging coming into set point, then halve the cool proportional band.
    e. Repeat steps a through d.
    f. Again watch to see how the chamber comes into control.
        - If it oscillates coming into set point, then double the proportional band.
        - If it is lagging coming into set point, then halve the proportional band.
        - If the control looks good then but a little slow coming into set point, try a proportional band setting that is halfway between your current setting and the previous setting.
            - If it oscillates coming into set point then try a proportional band setting that is halfway between your current setting and the previous setting.
            - If it is lagging coming into set point then try a proportional band setting that is halfway between your current setting and the previous setting.

    NOTE: If you double or halve the original proportional bands twice and you see no improvement, then you have a mechanical issue that needs to be resolved.
11. Repeat steps 7 through 10 until the box is using the smallest possible proportional band that provides stable control.

Adjust the integral time setting

12. If necessary, you can tune the current channel's integral time parameter once you have tuned the channel's proportional band parameter. Press **Setup**, then select the Control Parameters panel.
    a. Select the **Integral Time** field or fields of the box that you are tuning.
    b. Type in the original **Integral Time** parameter and press **Save**.
    c. Return to the main screen and watch the box temperature for the box that you are tuning. Now you need to adjust the **Integral Time** for an accurate box temperature. As you watch the box temperature, look for these indications:
        - If the box temperature is oscillating around a temperature above the **Setpoint**, you need to increase the integral time.
        - If the box temperature is drooping below the **Setpoint**, you need to increase the integral time.
        - If the box temperature is oscillating around a temperature below the **Setpoint**, you need to increase the integral time.
        - If the box temperature is drooping above the **Setpoint**, you need to decrease the integral time.
13. Press **Setup**, then select the Control Parameters panel.

14. Move the cursor to the **Integral Time** field or fields of the box that you are tuning, and change the displayed value by no more than 20%.
15. Repeat steps 12 through 14 until the box temperature is displaying the best quality and accuracy that you can achieve. **NOTE**: The box temperature can oscillate slightly, but it must stay within ±1°C of the **Setpoint** once it has stabilized.
16. Once you are finished tuning the box, you can stop the test.

Repeat as needed

17. Once the first set of parameters (such as the heating parameters) have been tuned up, the other set of parameters can be tuned up.
18. Once the parameters for the first channel have been tuned up, the next channel's parameters can be tuned up.
19. Once you have finished tuning up all the channels, record the parameter settings on the 8825 worksheets in Appendix D. Keep these settings with the 8825 manual.

Summary

When adjusting the control parameters you want to follow this general outline:

1. Run a heat-up test to see how the chamber controls. If necessary adjust the heat parameters.
2. Run a cool-down test to see how the chamber controls. If necessary adjust the cool parameters.
3. Run a heat-up test to see the effect of the changes from step 1. If necessary adjust the heat parameters again.
4. Run a cool-down test to see the effect of the change from step 2. If necessary adjust the cool parameters again.
5. Continue to run alternating heat-up and cool-down tests, adjusting the heat and cool parameters as needed to achieve the desired level of control.

Appendix C: Tuning PTC Control Parameters

CAUTION: The 8825 programmer/controller was factory-tuned and should not need to be re-tuned unless the product requirements change enough to affect the performance of the chamber. Incorrect values could damage your equipment and/or product.

NOTE: To tune PTC parameters, the 8825 access level must be Lab Manager or higher. Tuning the 8825 control parameters is a time-consuming procedure that will take a minimum of two to three hours to complete.

Control parameters adjust the performance of the chamber around the set point. As the chamber nears the set point, the 8825 adjusts the throttles to provide a smooth ramp to the set point. To prevent overshooting and oscillation around the final set point, the refrigeration, heating, and other systems must be damped as they approach the set point. To maximize chamber performance, you must also compensate for lag times.

The product temperature control (PTC) control parameters are tuned in manual mode. The adjustments are made to the gain, integral time, and offset parameters.

Gain parameters for PTC

The gain parameter is a **coarse** adjustment to the PTC control algorithm. The larger the gain, the longer the 8825 will wait to start slowing down the throttle as the load temperature approaches the load set point.

$$\textbf{gain} = \frac{\textbf{maximum offset}}{\textbf{proportional band}}$$

For example, if the maximum offset is 10°C and the desired proportional band is 5°C, the gain would be set to 10°C/5°C = 2.

The temperature channel will still perform using the air parameters, but the offset parameters control the set point of the temperature channel in relation to the PTC channel's set point. When a PTC program is run, the temperature channel immediately cycles beyond the set point by the maximum offset. With the chamber air at maximum offset, the product cycles toward the final set point at its maximum rate. The temperature channel remains at the maximum offset above the PTC channel's set point until the product temperature enters the proportional band near final set point. The throttle of the temperature channel is reduced in relation to the PTC channel until the final set point is reached.

The gain parameter is related to the time constant of the load. The greater the time constant of the load, the more gain is required to change the temperature of the load. Increase the gain parameter for a faster load response. Additionally, a higher gain causes the load to proportion into the set point when the temperature is closer to the final set point.

As a rule for the gain setting, **smaller = slower** response, **larger = faster** response. Generally, you will want the largest gain setting possible without the process variable excessively overshooting the set point.

Integral time parameters for PTC

The integral time parameter is a **fine** adjustment to the PTC control algorithm. The integral time parameter is used when the process variable nears the set point and the throttle is backing off. The integral time parameter adjusts the throttle to take the droop out of the gain setting and allows the chamber to reach the set point.

Droop is an effect, such as natural heat loss through the test space walls, that prevents the process variable from reaching the final set point. The integral time parameter determines how quickly the throttle will be adjusted to compensate for droop. Without an integral time entered, the process variable will not reach or remain at the set point.

- Longer integral times result in longer times to reach the set point.
- Shorter integral times result in shorter times to reach the set point.
- If the integral time is too short, the process variable will oscillate when it reaches the set point and will continue to oscillate indefinitely.

- As a rule for the integral time, **shorter = faster** response, **longer = slower** response. Generally, shorter integral times mean shorter transition times.

NOTE: The integral time parameter is programmable from 0 (integral off) to 1,000 seconds.

Offset parameters for PTC

CAUTION: It is your responsibility to program the offset value correctly to avoid damaging any products under test.

The offset is the number of degrees Celsius that the air temperature set point will be allowed to exceed the load temperature set point when attempting to move the load temperature to the new load set point. The offset allows the air temperature channel to overshoot the set point by up to ±100°C.

- Larger offsets can result in faster transitions.
- If the offset is too large it can result in overshoot, and may trip process alarms.
- As a rule for the offset, **smaller = slower** (less aggressive), **larger = faster** (more aggressive). Generally, you should adjust the offset to the highest value possible without the process variable excessively overshooting the set point.

The maximum offset should be programmed to allow the chamber air to overshoot the final value by an amount that will not damage any portion of the load. For example, if the final set point is +100°C and the load could be damaged by temperatures above +110°C, then the maximum heat offset should be +10°C.

Tuning the PTC gain, integral time, and offset parameters

The gain, integral time, and offset parameters must be "tuned up" to produce an efficient, controlled environmental test cycle. First you tune up the gain parameter for quality control near set point, then you tune up the integral time and offset parameters to achieve accuracy.

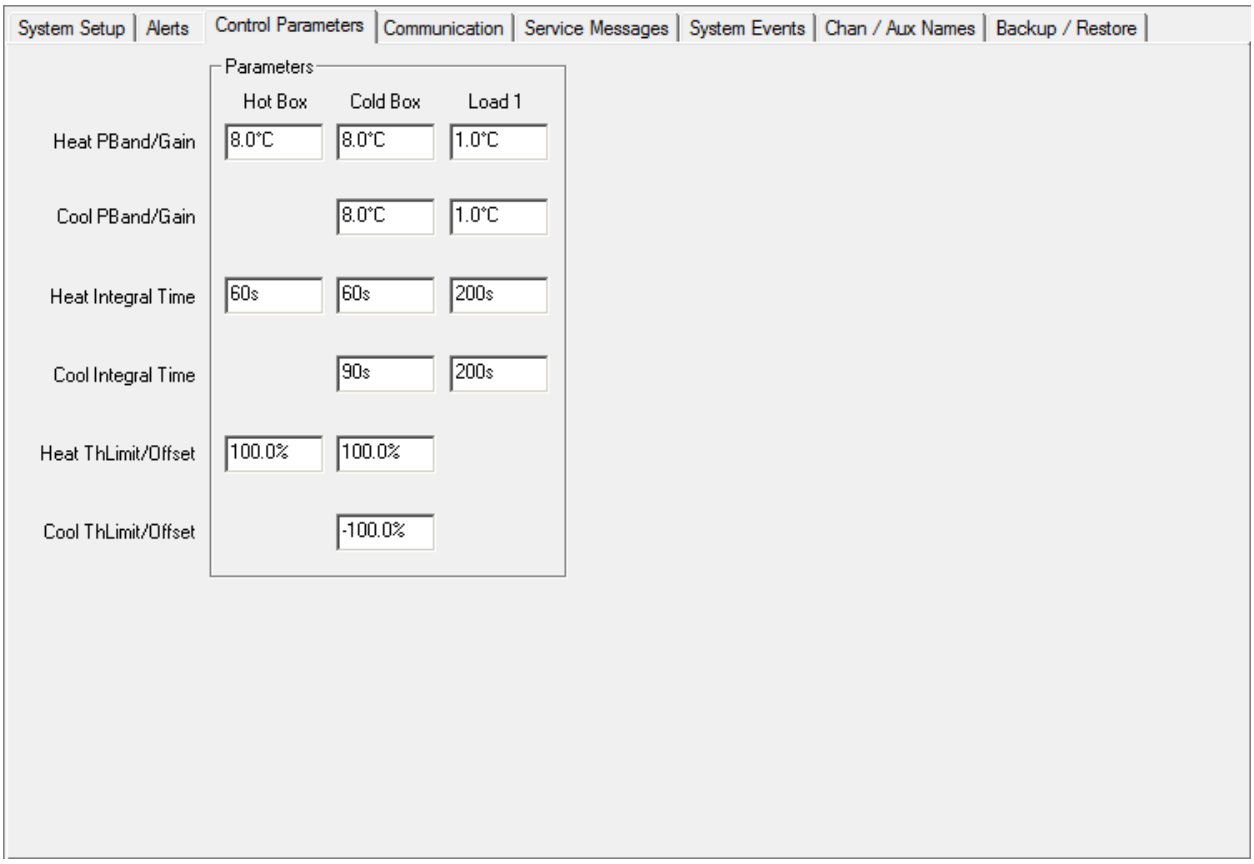
For the optimal combination of performance and quality, each control channel is tuned to be critically damped. This occurs when the process variable overshoots the set point slightly and then oscillates around the set point slightly until it stabilizes at the set point. This level of control becomes available only with properly tuned PTC control parameters.

NOTE: The PTC parameters should be tuned only after the air temperature control parameters have been tuned, and only with a product load in the chamber.

Example starting parameters					
Heat gain	3.0	Heat integral time	200	Heat offset	10
Cool gain	3.0	Cool integral time	400	Cool offset	-10

Record the original parameter settings

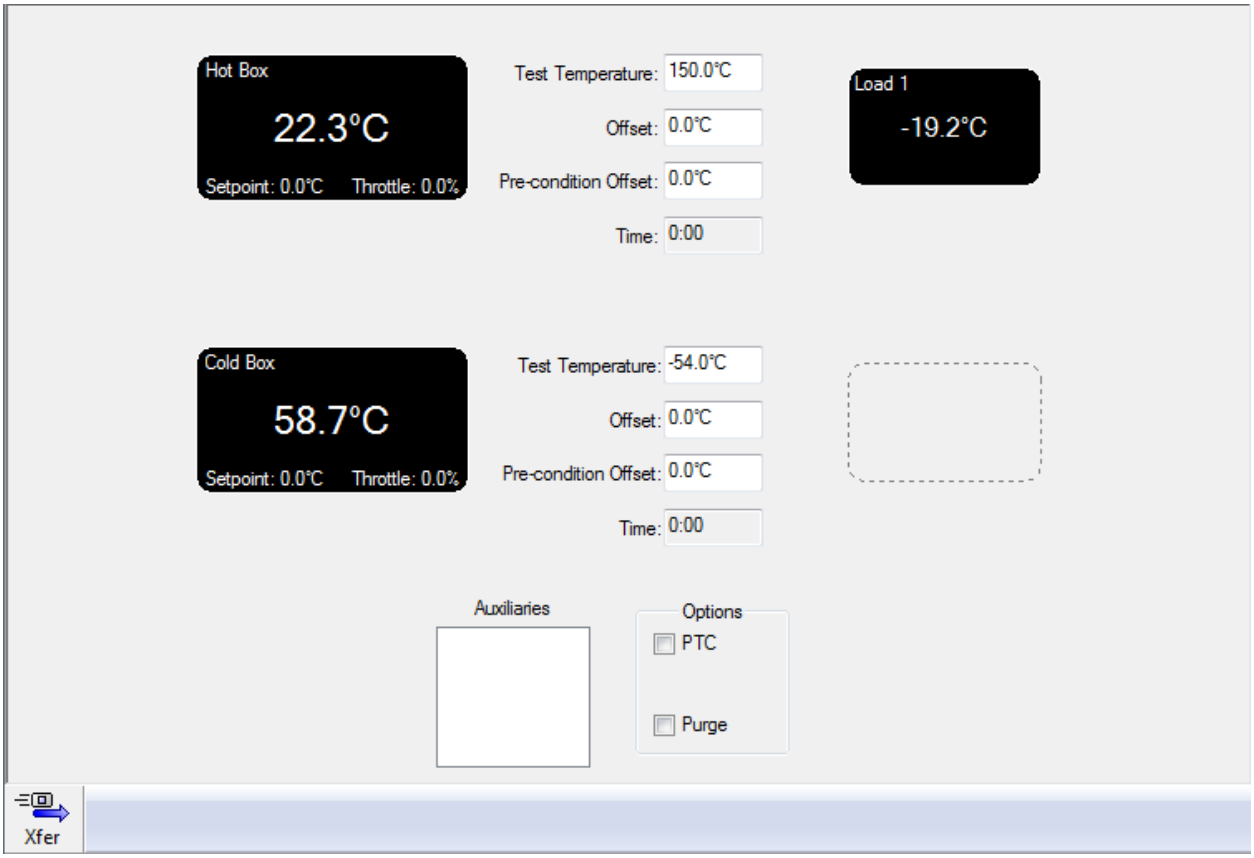
1. Press **Setup**, then select the Control Parameters panel.



2. Write down the **Gain** and **Integral Time** fields for the loads. This record will provide you with a valuable future reference, and you will use the Integral time value later in this procedure.
3. Select the **Integral Time** field for the box that you are tuning, and set the parameter to zero.

Obtain a performance baseline

4. Place a load in the product carrier that is close to the weight of your normal product load.
5. Press **Manual** to go to the manual mode screen. Enter a temperature that will soak the product carrier in the box that you are turning for a long time (such as one hour). **NOTE**: On two-zone chambers make sure PTC is disabled.
   - To tune the heating proportional band, enter a test temperature of +150°C and press **Run**.
   - To tune the cooling proportional band, enter a test temperature of -54°C and press **Run**.
6. Allow the box to stabilize at the set point for at least fifteen minutes.



7. Watch the temperature for the box that you are turning. Press the **Xfer** button to transfer into the other box. Watch the **Load** temperature. At this point, you are tuning the box for the quality (stability) of temperature control at the load rather than accuracy. You need to decrease the proportional band to the smallest value that does not cause the load temperature to overshoot and oscillate around the **Setpoint**. As you watch the load temperature, look for these indications:
   - If the load temperature oscillates across the **Setpoint**, you need to decrease the gain to the smallest value at which the load temperature stops oscillating.
   - If the load temperature stabilizes near the **Setpoint**, you may need to increase the gain to the smallest value without causing oscillation.

Adjust the gain setting

8. To adjust the gain:
    a. Change the set point to back the process variable away from the set point you will use to tune the parameter.
    b. Press **Setup** to return to the parameters screen.
    c. Change the heating or cooling gain for the channel you are tuning.
9. Repeat step 7 to see the effect of the new gain setting. The ideal gain setting is obtained when the process variable stabilizes near set point (for example, within ±2°C). As it stabilizes, it oscillates decreasing amounts until it droops just above or below the set point. **NOTE**: The integral time function will adjust the set point up or down to compensate for this droop.
    - If the process variable continues oscillating, you will need to decrease the gain setting just until the oscillation stops.
    - If the process variable is not oscillating, you will need to increase the gain setting just until oscillation begins, then decrease the setting until the oscillation stops.

Adjust the integral time setting

10. If necessary, you can tune the current channel's integral time parameter once you have tuned the channel's proportional band parameter. Press **Setup**, then select the Control Parameters panel.
    a. Select the **Integral Time** field or fields of the box that you are tuning.
    b. Type in the original **Integral Time** parameter and press **Save**.
    c. Return to the main screen, and watch the temperature for the box that you are tuning. Now you need to adjust the **Integral Time** for an accurate box temperature. As you watch the box temperature, look for these indications:
        - If the box temperature is oscillating around a temperature above the **Setpoint**, you need to increase the load integral time.
        - If the box temperature is drooping below the **Setpoint**, you need to increase the load integral time.
        - If the box temperature is oscillating around temperature below the **Setpoint**, you need to increase the load integral time.
        - If the box temperature is drooping above the **Setpoint**, you need to increase the load integral time.
11. Press **Setup**, then select the Control Parameters panel.
12. Move the cursor to the **Integral Time** field of the box that you are tuning, and change the displayed integral time by no more than 20%.
13. Repeat steps 7 through 9 until the box temperature is displaying the best quality and accuracy that you can achieve. **NOTE** The box temperature can oscillate slightly, but it must stay within ±1°C of the **Setpoint** once it has stabilized.
14. Press **Manual** to go to the manual mode screen.
15. Press the **Xfer** button to transfer the basket into the other box.
16. Repeat steps 7 through 9 until the load temperature is displaying the best quality and accuracy that you can achieve. **NOTE**: The load temperature can oscillate slightly, but it must stay within ±1°C of the **Setpoint** once it has stabilized.
17. Once you are finished tuning the box, you can stop the test.

Repeat as needed

18. Once the first set of parameters (such as the heating parameters) have been tuned up, the other set of parameters can be tuned up.
19. Once the parameters for the first channel have been turned up, the next channel's parameters can be tuned up.
20. Once you have finished tuning up all the channels, record the PTC parameter settings on the 8825 worksheets in Appendix D. Keep these settings with the 8825 manual.

Summary

When adjusting the product temperature control parameters you want to follow this general outline:

1. Run a heat-up test to see how the chamber controls. If necessary adjust the heat parameters.
2. Run a cool-down test to see how the chamber controls. If necessary adjust the cool parameters.
3. Run a heat-up test to see the effect of the changes from step 1. If necessary adjust the heat parameters again.
4. Run a cool-down test to see the effect of the change from step 2. If necessary adjust the cool parameters again.
5. Continue to run alternating heat-up and cool-down tests, adjusting the heat and cool parameters as needed to achieve the desired level of control.

Appendix D: Parameter and System Event Worksheets

NOTE: Thermotron grants you permission to copy this appendix to use for your records.

Channel ____ non-PTC parameter settings	
Parameter	***Setting***
Heat proportional band	
Cool proportional band	
Heat integral time	
Cool integral time	
Heat throttle limit	
Cool throttle limit	

Channel ____ non-PTC parameter settings	
Parameter	***Setting***
Heat proportional band	
Cool proportional band	
Heat integral time	
Cool integral time	
Heat throttle limit	
Cool throttle limit	

Channel ____ non-PTC parameter settings	
Parameter	***Setting***
Heat proportional band	
Cool proportional band	
Heat integral time	
Cool integral time	
Heat throttle limit	
Cool throttle limit	

Channel ___ PTC parameter settings	
Parameter	***Setting***
Heat gain	
Cool gain	
Heat integral time	
Cool integral time	
Heat offset	
Cool offset	

8825 system parameters	
Auxiliary cool time frame	
Auxiliary cool duty cycle	
Refrigeration system anticipator time	

System events					
System event	***Channel***	***Variable***	***Logic***	***Low or off setting***	***High or on setting***
Event 1					
Event 2					
Event 3					
Event 4					