



**Leading World Technology  
in Controlled Environment Systems**

## **Conviron CMP5090**

### **User Guide**

For controllers using:

- Version 6.2 software
- Independent temperature shut-off (ITSO)
- External battery
- Color screen



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# Safety for you and the equipment

## Your safety

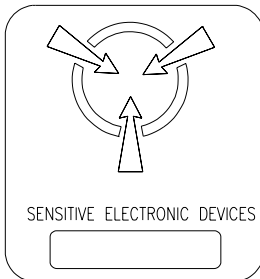


Warning – High voltage hazard:

Some procedures in this manual involve working inside a live control panel. Do NOT attempt them unless you have appropriate knowledge and experience. Proceed only with appropriate safety precautions.

## Equipment safety

### **Electrostatic discharge (ESD) cautions**



Electrostatic hazard:

Many electronic components in the control system can be damaged or destroyed by electrostatic discharges (ESD) that you cannot even feel.

You can discharge 5000 volts without feeling it, which is strong enough to destroy many electronic components of the system.

If you handle system components, you **MUST** wear a grounded wrist strap. **The best ground is to the triac heat sink.**

In addition:

- Do not let anyone that is not wearing a grounded wrist strap work on the control panel.
- Do not touch any parts or conductors on the board even when you are wearing a grounded wrist strap.
- Do not lay paper on static-sensitive parts.
- Ship components to Convicon in anti-static bags.
- Make sure everyone that may work on the control panel is aware of these procedures.

Failure to follow proper ESD precautions may void the warranty!

### **Battery expiry / Memory-loss cautions**



Memory-loss hazard:

A continuous supply of electricity to the controller is essential to preserve its memory. If its memory is lost, the controller cannot operate and will have to be replaced.

An external battery provides backup for the regular supply of electricity for brief periods when the regular supply is not available.

The battery must be replaced (see *Chapter 7: Maintenance and Troubleshooting*) at intervals NOT exceeding five years.

To promote battery life:

- Keep the controller disconnect switch ON (use only the start/stop switch to turn power for the chamber on and off).
- Keep ambient temperatures within the range of human comfort.

 **Operation warning:**

Always wait at least three minutes after completing any procedure before turning off the controller.

Wait at least ten seconds before turning the controller on again.

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## Chapter 1: The CMP5090

This manual is intended for users with moderate experience with computers or with Convicon products. This manual provides instruction on:

- Starting the controller
- Setting up programs
- Logging data
- Understanding and managing alarms
- Performing simple troubleshooting and maintenance tasks

### Features of version 6.2 software

#### Screen functionality

- The functionality of the screen is faster, easier and more intuitive
- A set button/keypad replaces the scrolling arrows used in previous versions

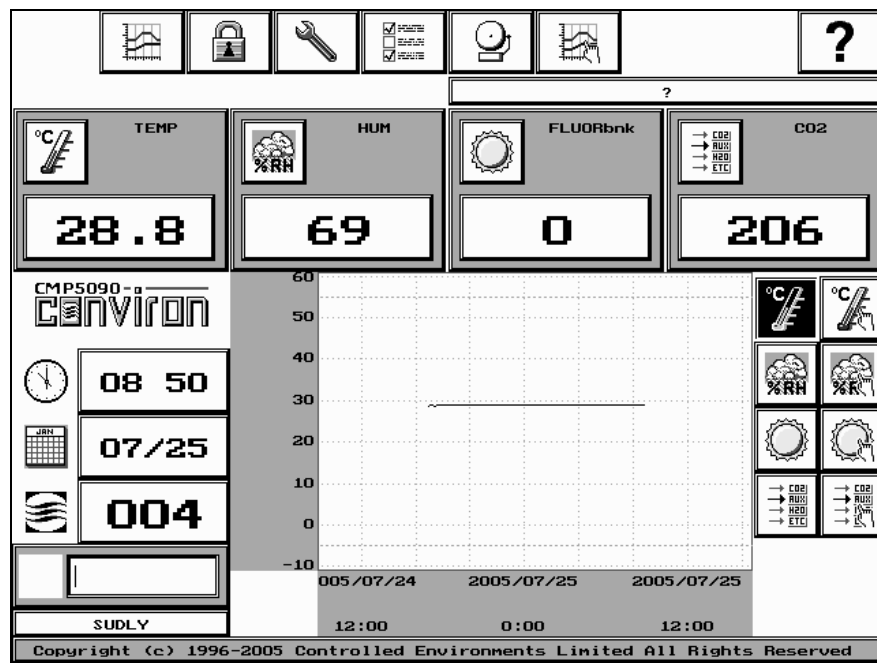
See Appendix C for a complete list of V6.2 features.

### Features of the CMP5090

The CMP5090 Local Control System (LCS) is used to control the plant growth chamber. The 'brain' of the LCS is the Version 6.2 software.

#### The Touch Screen

The system uses a Liquid Crystal Display (LCD) panel with an integrated **Touch Screen** as the user interface.



The Touch Screen provides the facility to:

- Program chamber operation
- Assist qualified personnel to service the chamber
- Access alarm functions
- Access logging functions
- Access security functions
- Graph logged items

The screen measures 211mm x 158mm (8.3" x 6.2").

Information on the touch screen is easy to read because the screen is backlit. Most icons are “touchable” and initiate a controller action when they are touched. In this manual, “touchable” icons are called buttons. When a button is touched, it will flash and the controller will beep.



**Important:**

The screen has a backlight saver. After five minutes of inactivity, the screen goes blank. Touch the screen to reactivate the display.

**Do not touch the screen with sharp or pointed objects. Use your fingertip or the eraser end of a pencil.**

**On-line help**

To access on-line help, touch the Help button, then the field or button for which help is required.

**Saving programs to compact flash drive (CF)**

Programs can be saved on a compact flash drive copied for use with other chambers. The chamber must be equipped with a compact flash drive installed to use this feature.

**Caution!** If a program is to be used on another chamber, the chambers must have the same configuration.

- They must have the same number and type of program zones in the program table
- The program zones must be in the same order

**Exporting logged data**

Data can be exported to other software such as spreadsheets or word processors. The data files are easily imported into programs such as Excel<sup>®</sup>.

**Expandability**

The CMP5090 is a flexible control system and adding capacity is a simple process. If there is a need to control additional devices or equipment, hardware and software upgrades are available. Contact Convicon customer care.

**Security**

Users can be assigned User ID's and passwords to ensure that only authorized staff make program changes.

**Memory-loss**



**Memory-loss hazard:**



## cautions

A continuous supply of electricity to the controller is essential to preserve its memory. An external battery provides backup when the regular power supply is unavailable. To ensure that the external battery has power, replace it every five years. Instructions for replacing an external battery are provided in *Chapter 8: Maintenance and troubleshooting*.

To promote battery life:

- Leave the controller disconnect switch ON. To turn the chamber on and off, use the start/stop switch.
- Keep ambient temperatures within the range of human comfort.

## Convicon's technical support



### Important:

When contacting Convicon for technical support, please provide the chamber **serial number**, which is located on the rating plate on the side of the chamber.

### Head office (Sales and service)

Customer Services  
Controlled Environments Limited (CONVIRON)  
590 Berry Street, Winnipeg, Manitoba, R3H 0R9  
Canada

Sales Department Email: [info@convicon.com](mailto:info@convicon.com)

### Convicon customer care

Toll free in <u>North America</u>	1-800-363-6451
Regular telephone	1-204-786-6451
Fax	1-204-783-7736
Toll Free in <u>Europe</u>	0800 - 0326422
Regular telephone/fax	44 1638 741112

### E-mail

Technical Support Desk	<a href="mailto:service@convicon.com">service@convicon.com</a>
Parts Sales (NA)	<a href="mailto:parts@convicon.com">parts@convicon.com</a>
Training Coordinator	<a href="mailto:training@convicon.com">training@convicon.com</a>
Customer Service (Europe)	<a href="mailto:service@convicon.eu">service@convicon.eu</a>
Parts Sales (EU)	<a href="mailto:parts@convicon.eu">parts@convicon.eu</a>
Web address	<a href="http://www.convicon.com">www.convicon.com</a>

## Chapter 2: The Status Screen

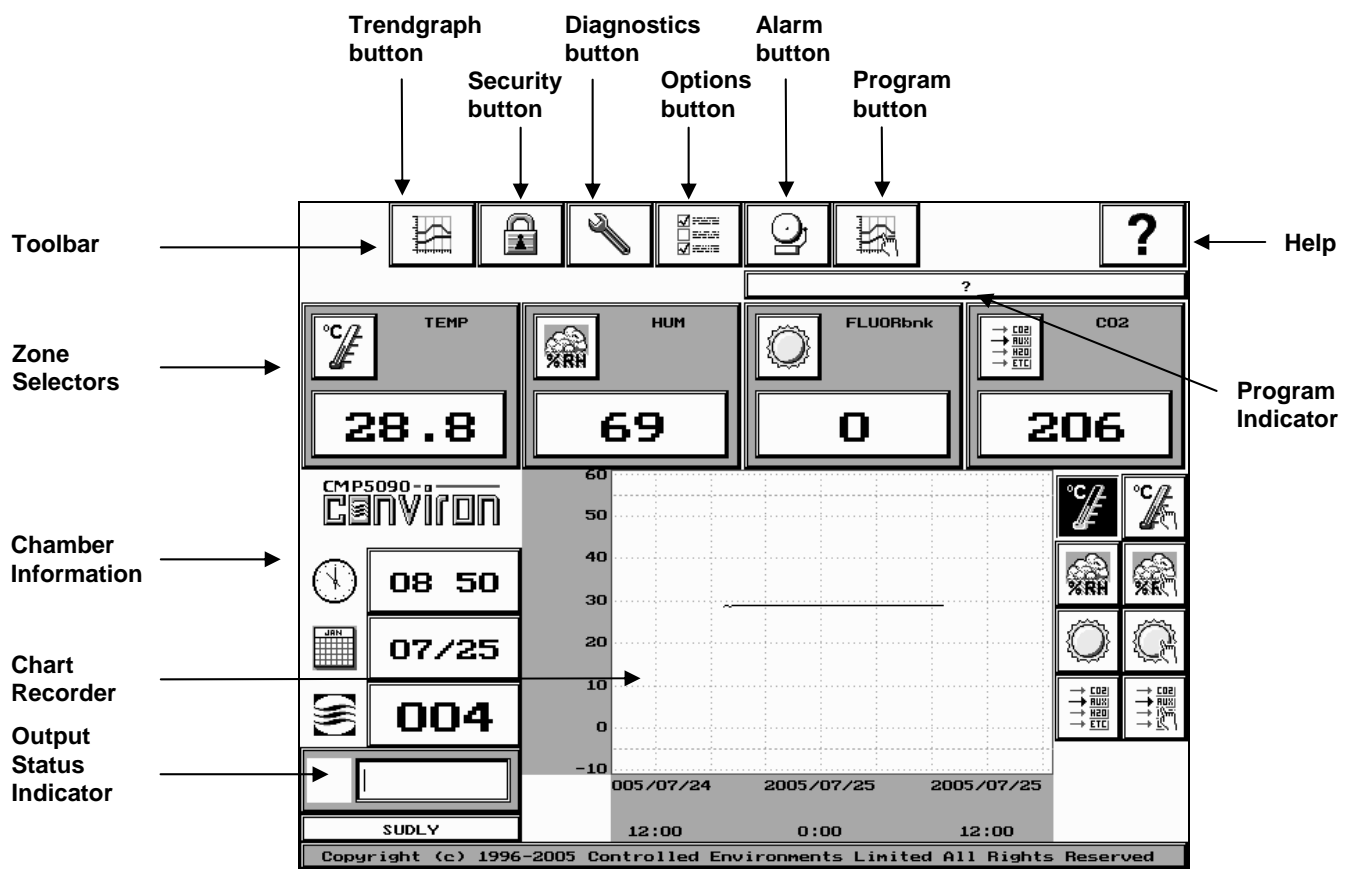
The Status Screen provides a comprehensive overview of the chamber's current program and conditions.

This chapter describes:

- How to use and read Status Screen fields

### The Status Screen

The Status Screen is displayed when the controller is powered on.



### Status Screen fields

- |                   |   |
|-------------------|---|
| Toolbar           | The Status Screen toolbar provides access to other CMP5090 functions. |
| Trendgraph button | Touch to access the Trendgraph Screen.                                |
| Security button   | Touch to access the Security Screen.                                  |

- Diagnostics button** Touch to access the Diagnostics Screen.
- Options button** Touch to access the Options Screen. A flashing Options button indicates that data is being logged.
- The Options screen can be accessed at any time however the date, time and logging options cannot be changed if a program is running.
- Alarm button** Touch to access the Alarms Screen.
- A flashing Alarm button indicates an active alarm.
- Program button** Touch to access the Program Screen.
- A flashing Program button indicates that a program is running.
- Help button** To access on-line help, touch the Help button, then the field or button for which help is required.
- Zone selectors** A zone is a specified area of control and/or monitoring



Zone selectors display the current program's settings and actual values of the conditions in the chamber.

- Current conditions are displayed in the white fields.
- Program settings are displayed in the green areas.
- If a zone does not have a program setting but is being checked, the condition will be displayed in both the green area and the white field of the zone selector.
- Each zone display has a zone selector button that can display multiple sub-zones, based on chamber options such as: soil temperature, auxiliary lighting, lamp loft temperature, etc.

Temperature (TEMP) zone selector	Displays chamber temperatures in degrees Celsius. <ul style="list-style-type: none"> <li>• The default reading, TEMP, is the control zone.</li> <li>• If there is more than one temperature zone, touch the zone selector button to display the readings for each zone. The Chart Recorder will display each zone as it is selected.</li> </ul>
Relative humidity (HUM) zone selector	Displays the relative humidity percentage. <ul style="list-style-type: none"> <li>• The default reading, HUM, is the control zone.</li> <li>• This feature is valid only if the chamber is equipped with additive humidity and/or dehumidification.</li> <li>• If there is more than one relative humidity zone, touch the zone selector button to display the settings for each of the zones. The Chart Recorder will display each zone as it is selected.</li> </ul>
Lighting zone (LIGHT_uMOL) selector	Displays values in banks, percentage of full power, or in units such as micromoles ( $\mu\text{mol}$ ), depending on chamber options.  If there is more than one set or type of lights, touch the zone selector button to display the settings for each type. The Chart Recorder will display each zone as it is selected.
CO <sub>2</sub> / auxiliary selector (optional)	Displays one of the following depending on chamber options: <ul style="list-style-type: none"> <li>• CO<sub>2</sub> concentration, in parts per million, in the plant growth area.</li> <li>• An auxiliary on-off event</li> <li>• Other chamber parameters</li> </ul> Touch the zone selector button to display the possible zones. The Chart Recorder will display each zone as it is selected.
Chamber information	The chamber information fields display the current date, time, and chamber number.  These settings are entered in the Options screen. Refer to Chapter 6, Setting options and logging data, for more information.



**Time** – current time in 24-hour format.

**Note:** Data will be overwritten if time is adjusted forward for any reason such as Daylight Savings Time.



**Date** – date in MM/DD format.



**Chamber identification number** – chamber ID.

The chamber ID identifies the chamber to the central control system (CCS).

- The factory default ID of 100 must be changed prior to connection to a CCS.
- Duplicate IDs on a CCS network cannot be used.

**Output status indicator**

An output is a switch that controls a specified device, such as a valve or a bank of lights.

The Output Status Indicator provides a graphical view of the operation of the selected output.

By touching the white square on the left side of the indicator, the user is able to cycle through the various control system outputs.

- When the output is fully off, the bar graph in the indicator does not display.
- When the output is fully on, the bar graph appears black.
- Modulating or proportional outputs will display a bar graph between 0 and 100% on.

**Program indicator**

The program indicator field displays the program that is currently running as well as programs that are chained to it.

If a program cannot be run, the program indicator field will display one of the following warning messages.

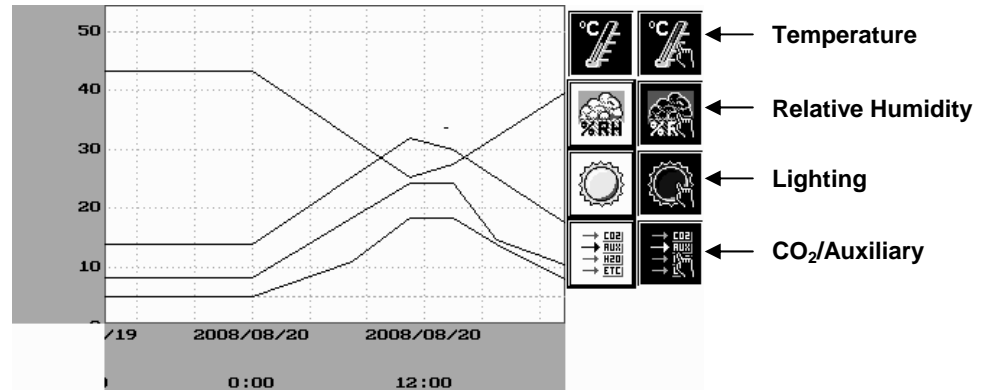
- cannot open current file
- ? no chain specified
- ! cannot open chain file
- [ chain file has incorrect format (and cannot be run)

Chart recorder

The chart recorder provides the facility to view a charted history of four programmed zones including:

- Temperature
- Relative humidity
- Lighting
- CO<sub>2</sub> and/or auxiliaries

The recorder is comprised of a graph and eight buttons.



The eight buttons represent the actual and programmed conditions for each of the four zones.

Touch the corresponding zone button to display a charted history of the zone. When a button is selected, it will appear darkened.

Actual



The actual chamber temperature is charted constantly. This button will always appear darkened.



Touch to chart humidity data



Touch to chart lighting data



Touch to chart CO<sub>2</sub> or auxiliary data

Programmed



Touch to chart the temperature program



Touch to chart the humidity program



Touch to chart the lighting program



Touch to chart the CO<sub>2</sub> or auxiliary program

The Chart Recorder displays 32 hours of graphing time. This includes the previous 24 hours and the next 8 hours.

**Note:** The controller does not have the facility to read the next day's program.

**Note:** Multiple zones can be simultaneously charted but the scales differ for each condition. When viewing several zones on the Chart Recorder, the scale displayed will relate to the zone that was most recently charted.

We recommend that the chart be used to view the programmed and actual conditions of one zone at a time.

## Chapter 3: Programming

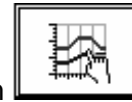
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### The Program Screen

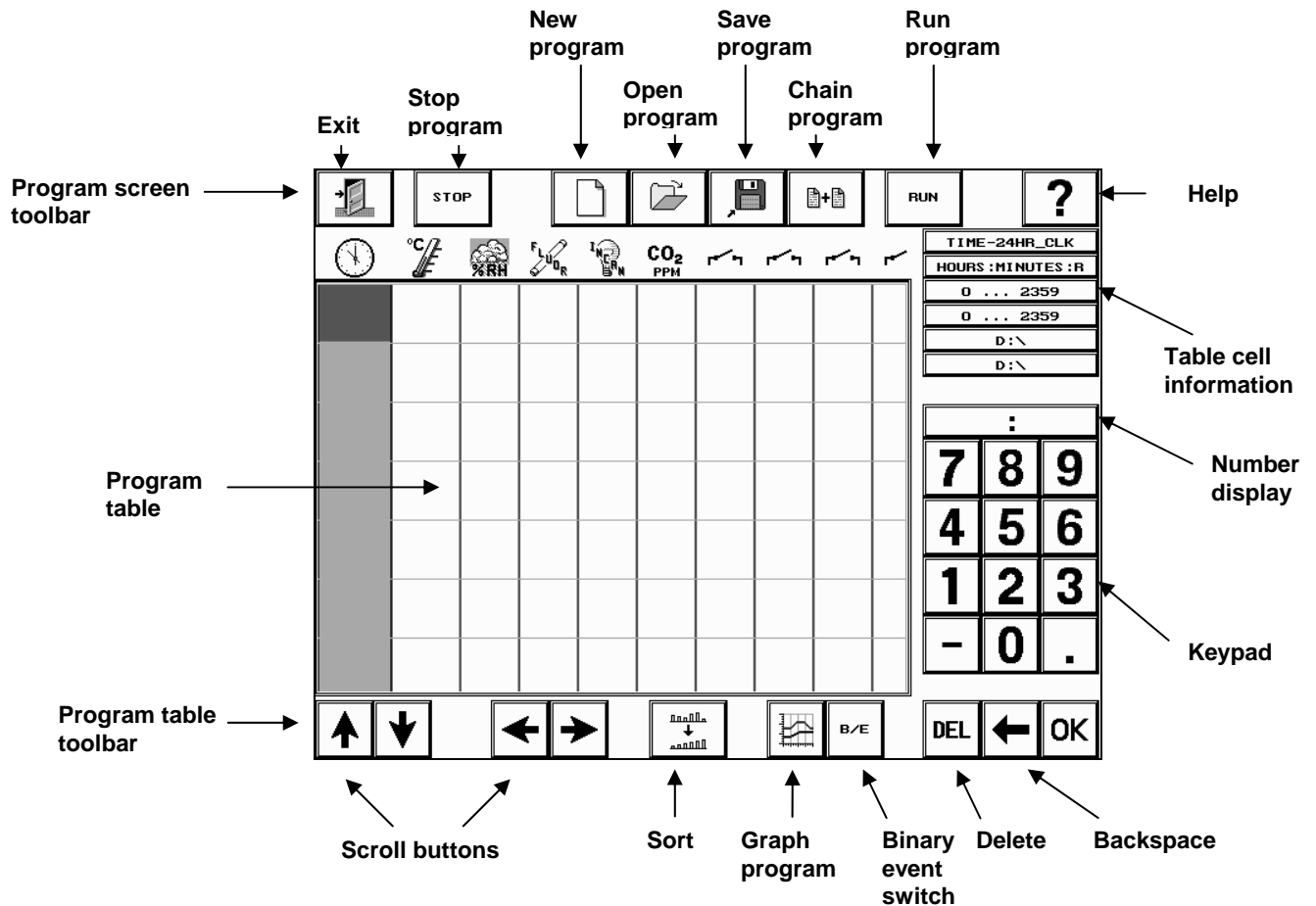
This chapter introduces procedures for programming the CMP5090 using the Program screen. The settings entered in the Program screen control conditions in the plant growth chamber. This chapter describes:

- The Program screen and toolbar.
- Programming the CMP5090.
- Multi-day programming.
- Managing Programs.
- How to program auxiliaries.





To access the Program Screen, touch the Program button in the Status toolbar. The Program Screen will appear and will display the last program that was opened.

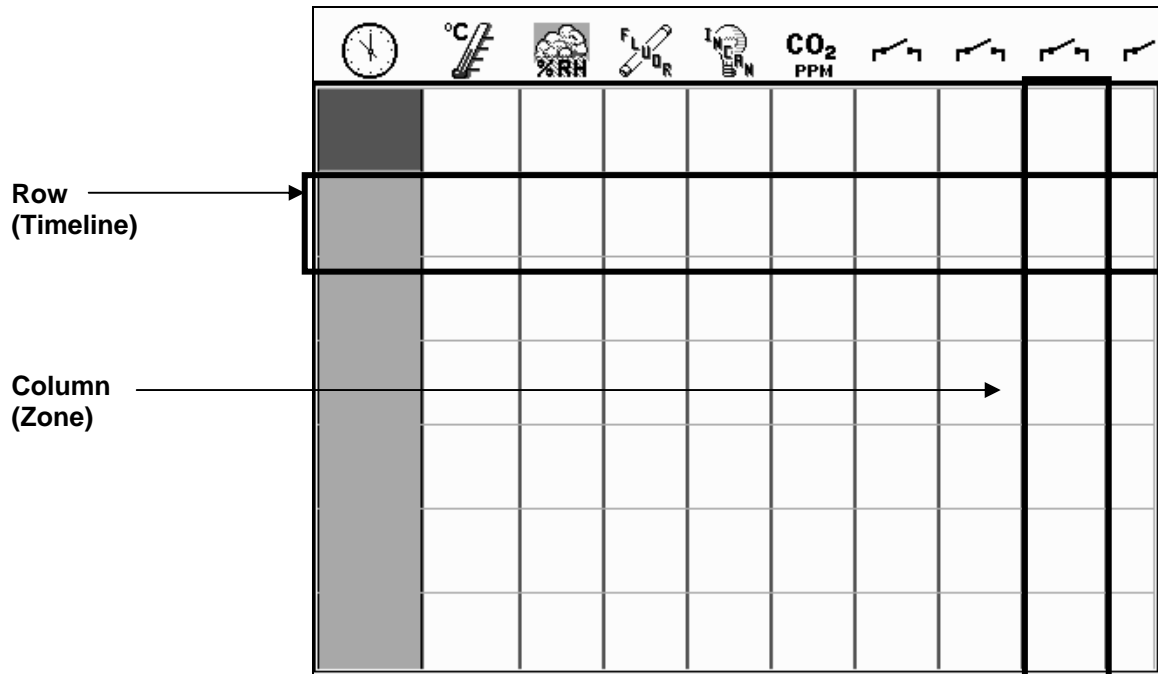


## Program Screen fields

- The Program table**
- Each **row** of the program table represents a **timeline**.
  - Each **column** represents a **zone**.

## Program table icons

Each icon at the top of the table corresponds to a chamber zone. The configuration of the controller will determine which zones are displayed. If the chamber does not have a control for a specific condition, a zone for that condition will not be displayed.



**Time** –The start time of the timeline in a 24-hour format.



**Temperature** –The temperature in degrees Celsius.



**Relative humidity** –The percent relative humidity.



**Fluorescent lighting** –The fluorescent lighting in discrete levels, as a percentage of full power, or in micromoles/m<sup>2</sup>/s.



**Incandescent lighting** –The incandescent lighting in discrete levels or percentage of full power.



**Metal halide lighting** –The metal halide lighting in discrete levels.



**High-pressure sodium lighting** –The high-pressure sodium lighting in discrete levels.



**Carbon dioxide** –The level of CO<sub>2</sub> in parts per million



**Timer** – The timer, in seconds.



**Speed control or intensity** –The percentage of full power, usually for fan speed control.

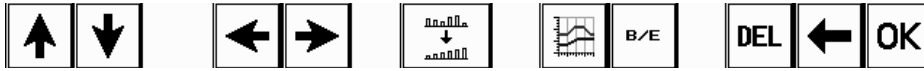


**Auxiliary switch** – switch an auxiliary device in binary or event mode.

### Program screen toolbar

<b>Exit button</b>	Touch the Exit button to return to the Status screen.
<b>Stop Program button</b>	Touch the Stop Program button to stop a running program.
<b>New Program button</b>	Touch the New Program button to clear the current program table and open a new program table.
<b>Open Program button</b>	Touch the Open Program button to open an existing program.
<b>Save Program button</b>	Touch the Save Program button to save a program. If the program is not saved it will be lost if the controller is powered off.
<b>Chain Program button</b>	Touch the Chain Program button to link the program to another program. <b>This procedure is required to make programs run continuously.</b> If a program is not chained, it will stop at midnight.
<b>Run Program button</b>	Touch the RUN button to start the displayed program. When a program is running, the Run Program button on the Program screen and the Program button on the Status screen flash.
<b>Help button</b>	To access on-line help, touch the Help button, then the field or button for which help is required.

## The Program table toolbar



- Up/Down scroll** Use to move the program table up or down.
- Left/Right scroll** Use to move the program table left or right.
- Sort** Touch to sort timelines chronologically. When a program is saved, timelines sort automatically.
- Graph program** Touch to view a graph of the program for the active zone.
- Binary/Event switch** Touch to set an auxiliary to Binary or Event mode.

## The keypad

- Number display** As numbers are touched in the keypad, they will display in the Number Display field. A colon will display for time entries only. The decimal will function for temperature set points only.
- Backspace** Touch the Backspace key to clear a digit.
- Delete** Touch the DEL button to delete an entry.
- OK** Touch OK to enter the value in the Number Display field into the active table cell.

## Table cell information

Table cell fields display information specific to the active cell in the Program table.

SP_TEMP	← Label
DEGREES_C:R	← Active Cell Units
-5 ... 55	← Active Zone Alarm Limit Range
4 ... 45	← Active Zone Operating Range
D:\2.cp4	← Current Program Path and Number
D:\2.cp4	← Chained Program Path and Number

**Label** Indicates the label for the active zone

<b>Active Cell Units</b>	Indicate the unit of measurement and mode of operation for the active zone. There are four modes of operation: R, S, B and E.  <u>R</u> amp – The state changes gradually between timelines  <u>S</u> tep – The state changes instantly between timelines  <u>B</u> inary – Auxiliary operates in On/Off mode.  <u>E</u> vent – Auxiliary cycles on for a specified period of time.
<b>Active zone alarm limit range</b>	Displays the range of settings for the alarm limits that apply to the active zone.
<b>Active zone operating range</b>	Displays the chamber operating range for the active zone.
<b>Chained program path and number</b>	Displays the chained program path and number.

## Programming the controller

There are four major steps to completing a program.

1. Entering timelines
2. Saving the program
3. Chaining the program
4. Running the program

**Ramping** Ramping means that the conditions in the chamber change steadily between timelines.

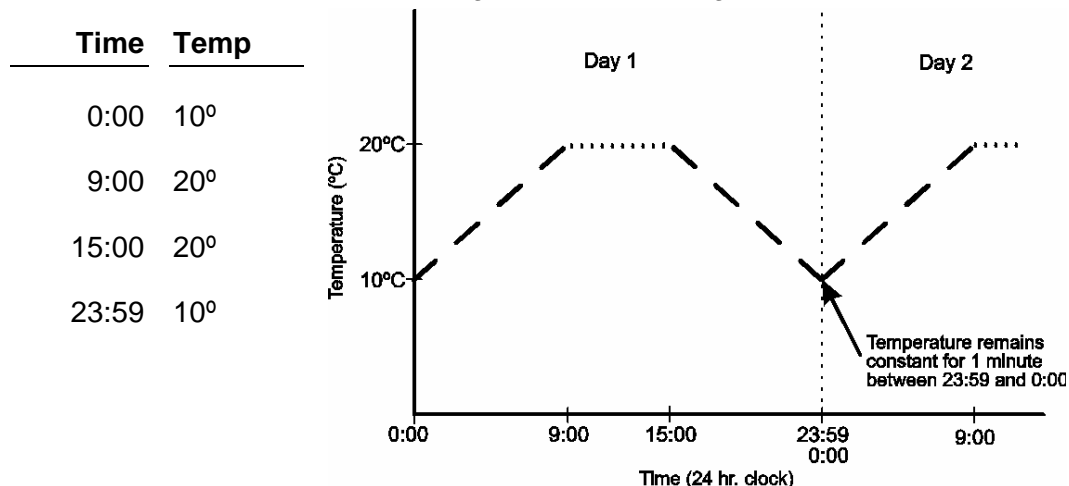
Most control zones in the chamber, such as temperature, relative humidity and CO<sub>2</sub>, operate in ramp mode. For example, in the graphed program below, the chamber temperature gradually rises from 10° at 0:00 until it reaches the 20° at 9:00.

**Note:** The CMP5090 does not automatically ramp across midnight because it does not read the next day's program. Instead, the controller runs the conditions in the last program timeline until midnight.

When one program ends and the next program begins (at midnight), the CMP5090 opens the program file for the new day and reads the first timeline regardless of the program's time settings.

It is important that programs are well defined so that the controller interprets the settings as intended. To avoid problems,

- Start programs at 0:00 and end them at 23:59
- Program interim settings

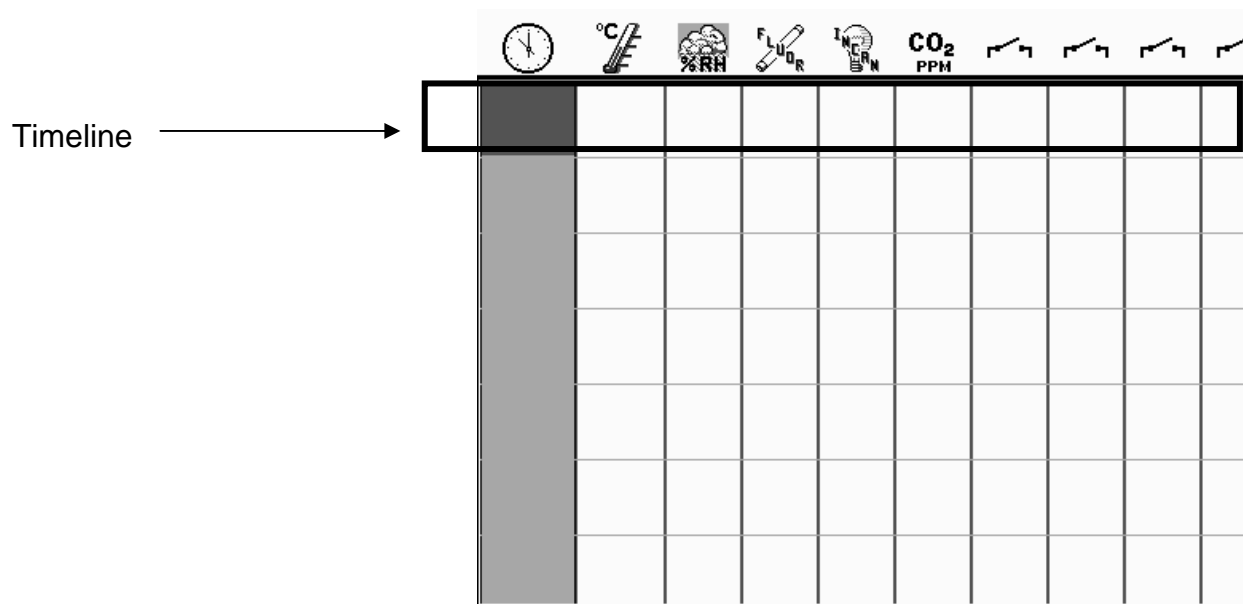


### 1. Entering timelines

A timeline is a series of control settings scheduled to occur at a specific time. This represents one row on the Program Table. A program can be made up of one or many timelines. The duration of a program is a 'day' – a 24-hour period from midnight to 23:59.



1. Touch the **New** button to display a blank program table.




2. **Touch a cell in the Time zone.** It will appear darkened.
3. **Enter the time** on the keypad using the 24-hour format.
4. **Touch the OK button** to confirm the value entered. After values are entered in a cell, the cell to the right will appear darkened.
5. **Enter the temperature** using the keypad. **Touch OK.**
6. **Enter the relative humidity** using the keypad. **Touch OK.**  
Note: If the RH is programmed at 0%, any related dehumidification equipment will be shut off.
7. **Enter the lighting settings** using the keypad. **Touch OK.**  
Depending on the lamp types in the chamber, there may be more than one zone for lighting.
8. **Complete the timeline** by entering values in the remaining zones.
9. **Complete the program** by entering additional timelines as required.

**Tips:**


- Start programs at 00:00 and end them at 23:59. Programs following this format are easier to interpret.
- It is not necessary to enter timelines in chronological order. Touch the Save button at any time to save and sort the timelines entered.
- To enter the default minimum value in a cell, touch the cell, then touch OK.
- Timelines can be inserted in the middle of a ramp to control other zones. Calculating and inserting the condition of the ramping zone is not necessary.

- Changing a timeline**
1. **Touch** the cell to be changed. The cell will appear darkened.
  2. **Enter the changes** using the keypad.
  3. Touch **OK.**

- Inserting a timeline**
1. **Touch a blank cell in the Time column** at the bottom of the program table.
  2. **Enter the values** using the keypad. **Touch OK.**
  3. **Touch the Sort**  **button.** The timeline will display in the program table in the correct chronological order.

It is not necessary to sort the timelines. Touching either the Save or Run button will automatically sort them.

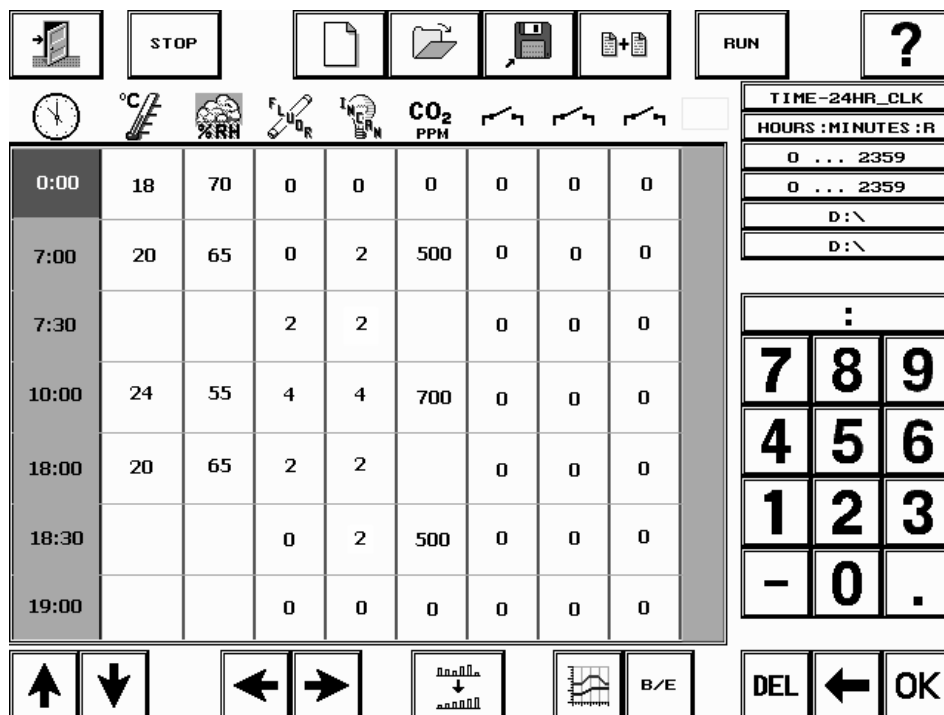
- Deleting a timeline**
1. **Touch the first cell** in the timeline to be deleted.
  2. **Touch the DEL button** in the keypad. The contents of all cells in the timeline will be cleared.
- Deleting individual cell settings**
1. **Touch the cell** for which the setting is to be deleted.
  2. **Touch the DEL button.** The contents of the cell will be cleared.
- Verifying a program**
- After the timelines have been entered, verify the program by viewing the zones graphically.
1. **Select the zone** by touching a cell in the column.

2. **Touch the Program Graph  button** in the Program Table toolbar. The Program Graph screen will display the timelines.
3. **Check the program** to ensure that all entries are correct.
4. **Touch the Exit button** to return to the program table.

### Sample Program 1: Basic day/night program

This program is useful to simulate outdoor conditions.

**Note:** Program red light spectrum for dawn and dusk by turning on two levels of incandescent lamps and turning off fluorescent lamps.



Time	Temp (°C)	Humidity (%RH)	Fluorescent (F)	Incandescent (I)	CO2 (PPM)	Lamp 1	Lamp 2	Lamp 3
0:00	18	70	0	0	0	0	0	0
7:00	20	65	0	2	500	0	0	0
7:30			2	2		0	0	0
10:00	24	55	4	4	700	0	0	0
18:00	20	65	2	2		0	0	0
18:30			0	2	500	0	0	0
19:00			0	0	0	0	0	0



- Temperature**
- Midnight (0:00) – Temperature in the growth chamber is 18° C
  - 7:00 – Temperature has risen to 20° C
  - 10:00 – Temperature has risen to 24° C
  - 18:00 – Temperature has fallen to 20° and stays constant until 23:59

- Relative humidity**
- Midnight (0:00) – RH is 70%.
  - 7:00 – RH has decreased to 65%
  - 10:00 – RH has decreased to 55%
  - 18:00 – RH has increased to 65% and stays constant until 23:59

- Inserting timelines in a ramp**
- Note:** Timelines were inserted into this program to control other zones:
- 7:30 – Three levels of fluorescent and incandescent lights come on
  - 18:30 – All fluorescent lights shut off, CO<sub>2</sub> level is set to 500 ppm
  - 19:00 – All incandescent lights shut off, CO<sub>2</sub> level is set to 0 ppm

**Note:** Some cells have been left blank so that zones that are ramping are not affected when the conditions of other zones adjust.

## Sample Program 2: Programming the controller to step between changes

Step programming can be approximated for zones that usually ramp by inserting timelines to keep the conditions constant until one minute before the new condition is required. (Except temperature control)

The CMP5090 controller is standard configured to limit temperature changes to a rate of 1 C per four minutes on smaller chambers and 1 C per six minutes on larger chambers. This allows the tracking alarm to function properly.

For example, to have the relative humidity in the chamber rise five percent at 8:00, then fall five percent at 19:00 (7:00 pm), program as follows.

**Note:** Programming in step mode is more likely to cause alarms due to conditions temporarily overshooting alarm limit settings for the zone. We recommend that the limits be increased if a step program is used.

The screenshot displays the controller's programming interface. At the top, there are control buttons: a home icon, 'STOP', a file icon, a folder icon, a save icon, a plus icon, 'RUN', and a question mark. Below these are icons for a clock, temperature (°C), relative humidity (%RH), fan speed (F), CO2 (PPM), and three switch icons. The main display area is a table with the following data:

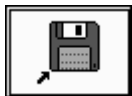
Time	Temp (°C)	%RH	F	CO2 (PPM)	Switch 1	Switch 2	Switch 3
0:00	18		0	0	0	0	0
7:59		65	0	2	500	0	0
8:00		70	2	2		0	0
10:00			4	4	700	0	0
18:00			2	2		0	0
18:59		70	0	2	500	0	0
19:00		65	0	0	0	0	0

Below the table is a numeric keypad with digits 7-9, 4-6, 1-3, and symbols for colon (:), hyphen/underscore (-), zero (0), and period (.). At the bottom are navigation buttons: up/down arrows, left/right arrows, a list icon, a graph icon, 'B/E', 'DEL', a left arrow, and 'OK'.

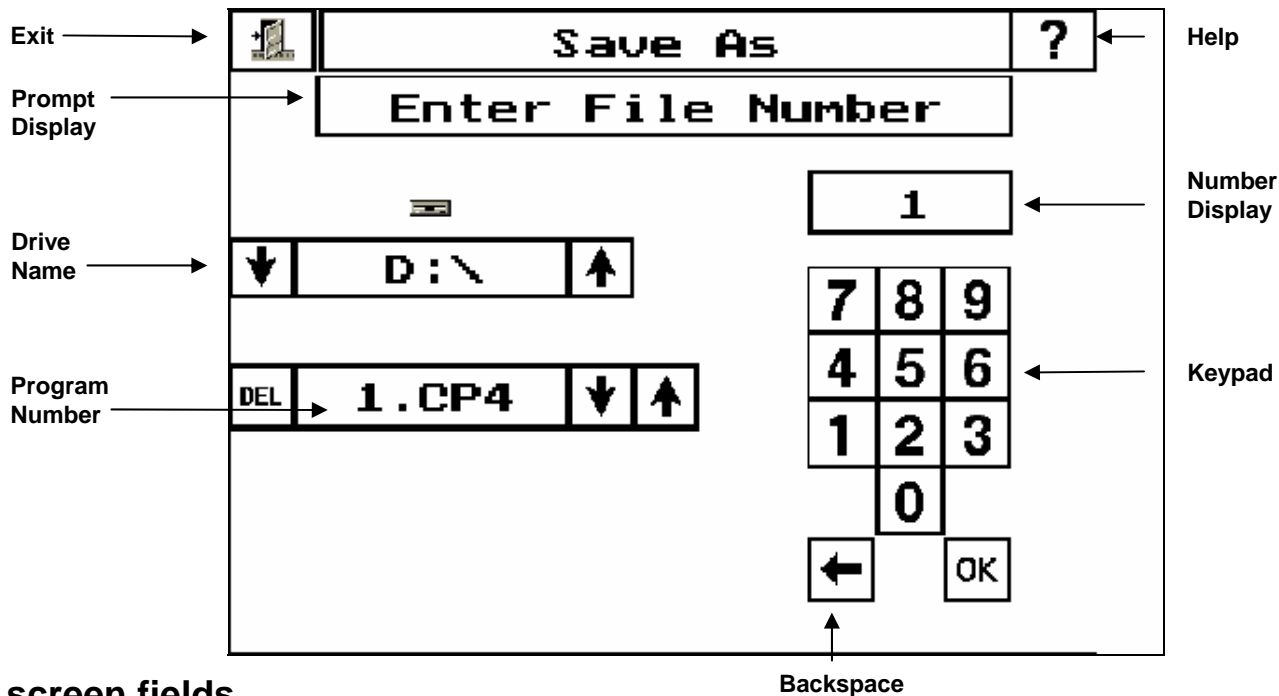
**Note:** The psychrometric chart is a valuable tool when writing a program. To view a copy of the psychrometric chart and for more information on understanding and using the chart, refer to Appendix D.

## 2. Saving programs

To access the Save Program screen, touch the Save Program



button in the Program toolbar.



### Save screen fields

- |                       |   |
|-----------------------|---|
| <b>Exit button</b>    | Touch the Exit button to return to the Program screen.  |
| <b>Help button</b>    | To access on-line help, touch the Help button, then the field or button for which help is required.   |
| <b>Prompt display</b> | Provides prompts to assist the user.  |
| <b>Drive name</b>     | Displays the currently active drive <ul style="list-style-type: none"> <li>• D:\ for internal storage</li> <li>• E:\ for a compact flash drive. The E:\ drive is valid for controllers with a compact flash drive.</li> </ul> <p>Touch the arrow buttons to select the drive at the prompt.</p> |
| <b>Program number</b> | Touch the arrow buttons to view existing file numbers on the selected drive and display them in the number display field.   |
| <b>Number Display</b> | Displays the same file number as in the Program Number field. Displays the file number entered when the keypad is used.   |
| <b>Keypad</b>         | Use the keypad to enter a program number.   |

**Backspace**

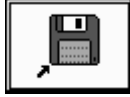
Touch the Backspace key to clear a digit.

**OK**

Touch OK to transfer the entry to the program number field.

## Saving a program

1. **Access the Save Program screen** by touching the Save Program




button in the Program toolbar.

2. **Follow the prompts** in the Prompt Display field.

### Drive

- Defaults to the internal memory in the controller (D:\)
- To save programs to the compact flash drive (CF), use the arrow keys to select E:\.

### Program Number

- To overwrite a program, use the arrow keys to view the list of existing programs. The program number will appear in the Program Number field. When the program to be overwritten is displayed, touch OK to save.
- Rather than rewriting all of the timelines in a program, modify an existing program and save it as a new program number.
- To save a program as a new program number, use the keypad to enter a program number. Touch OK to confirm.
- Use caution when assigning a program number. If the program number already exists, it will be overwritten with the new program when the OK button is touched.
- To clear a digit, touch .
- By default, the system adds the .CP4 extension to programs.

## Deleting a program

1. **Locate the program number** to be deleted using the arrow buttons in the Program Number field.
2. When the program number appears, **touch the DEL button**. A dialogue box will appear for confirmation to delete.
3. **Touch Yes** to confirm. The program will be deleted.

The delete program function is available in the Save Program or Chain Program screens.


### 3. Chaining Programs – Multi-Day Programming

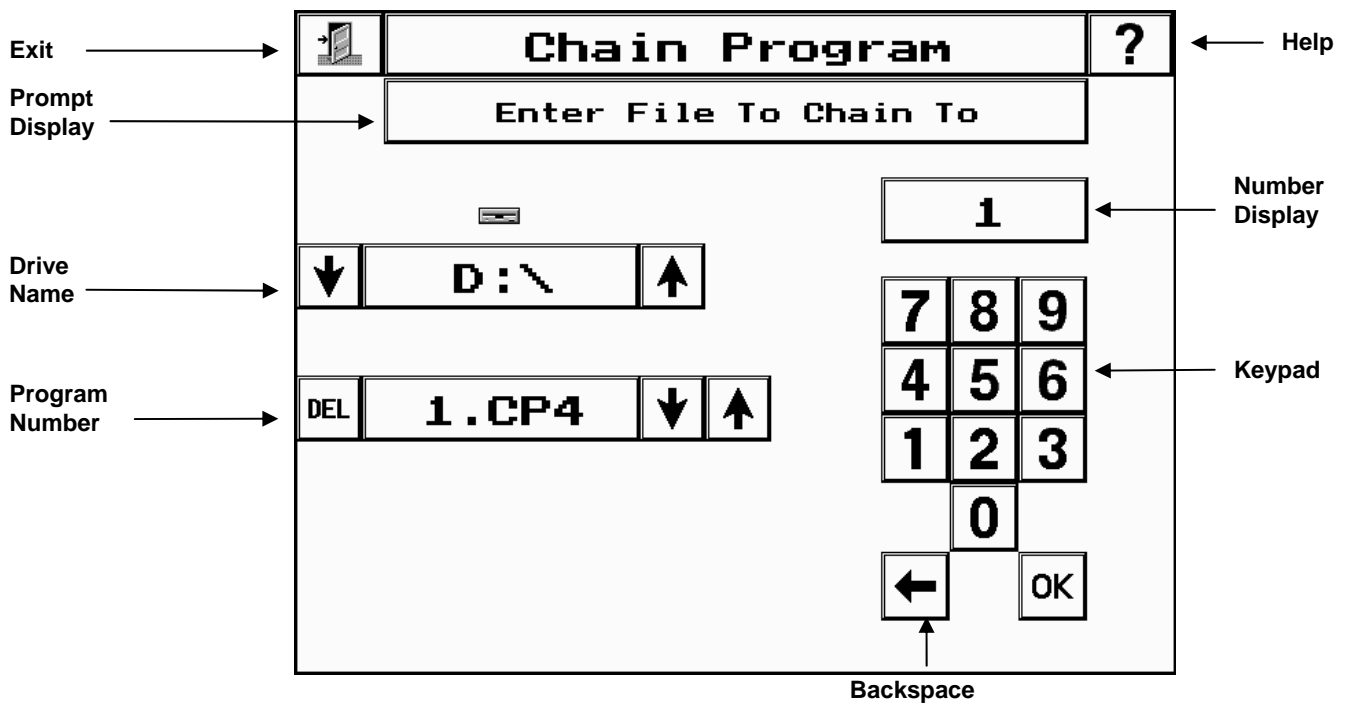
The Chain Program screen provides the facility to create programs that can run with different conditions over multiple days.

Chaining is the process of linking programs together so that they run continuously in sequence. **If a program is not chained to itself or to another program, it will stop running at midnight.**

- To run the plant growth area under the same program every day, chain the program to itself.
- To run the plant growth area under different programs each day, chain two or more programs together. These are called multi-day programs. Multi-day programs are limited in size only by the amount of storage space available in the controller. For additional storage, use a compact flash drive.

We recommend that each program have 0:00 and 23:59 timelines and that the 23:59 timeline match the 0:00 timeline of the next program in the chain to create a smooth transition from one program to the next.

Access the Chain Program screen by touching the  Chain Program button in the Program toolbar.



#### Chain Program screen fields

- Exit button** Touch the Exit button to return to the Status screen.
- Help button** To access on-line help, touch the Help button, then the field or

	button for which help is required.
<b>Prompt Display</b>	Provides prompts to assist the user.
<b>Drive Name</b>	Displays the currently active drive <ul style="list-style-type: none"> <li>• D:\ for internal storage</li> <li>• E:\ for a compact flash drive.</li> </ul> <p>The E:\ drive is valid for controllers with a compact flash drive.</p> <p>Touch the arrow buttons to select the drive at the prompt.</p>
<b>Program Number</b>	Displays the number of the selected program.
<b>Number Display</b>	Displays the numbers entered when the keypad is used.
<b>Keypad</b>	Use the keypad to enter the chain number.
<b>Backspace</b>	Touch the Backspace key to clear a digit.
<b>OK</b>	Touch OK to transfer the entry to the program number field.

## Chaining a program to itself

Chaining a program to itself is the most straightforward method of chaining. If a program is not chained to itself or to another program, it will stop at midnight.

1. Ensure that the program to be chained is displayed on the Program Screen.
2. **Touch the Chain Program button** in the Program toolbar. The Chain screen will display. The message in the Prompt display field will read: *Enter file to chain to:*
3. **Enter the program number** using the keypad.
4. **Touch the OK button.** The controller will save the chain.

The Program screen will display when the programs have been chained. The program table cell Information field for the chained program path will be updated with the chained program number.

## Chaining several programs

1. Access the Program Screen.
2. **Open the first program** in the chain.
3. **Touch the Chain Program button** in the Program toolbar. The Chain screen will display. The message in the Prompt display field will read: *Enter file to chain to:*
4. **Enter the second program number** using the keypad.

5. **Touch OK.** The controller will save the chain.

The Program screen will display. The program table cell information field will display the program number and extension.

SP_TEMP
DEGREES_D:R
0 ... 50
0 ... 50
D:\1.cp4
D :

Before chaining

SP_TEMP
DEGREES_D:R
0 ... 50
0 ... 50
D:\1.cp4
D:\2.cp4

After chaining

6. **Open the second program.**
7. **Touch the Chain Program** button in the Program toolbar.
8. **Enter the third program number** using the keypad.
9. **Touch the OK button.** The controller will save the chain.
10. **Open the third program.**
11. **Touch the Chain Program button** in the Program toolbar.
12. **Enter the first program number.** This will chain the third program to the first program to form a loop. This must be done to run the program continuously.
13. **Touch the OK button.** The controller will save the chain.

#### 4. Running a chained program

1. **Access the Program screen.** Ensure the correct program is displayed. (Usually the first program in the chain is displayed).
2. **Touch the Run button** to start the loaded program.
3. **Touch the Exit button.** The Status screen will appear.


The Program Indicator field will display the location of the program and the program numbers being run.

- The program below is stored on D:\ and program 1 is chained to itself.

D:\1    D:\1    D:\1
----------------------

The program below is stored on D:\ and programs 1, 2 and 3 have been chained and will be repeated.



- The Program  button in the Status toolbar will flash to indicate an active program.

### Chaining notes

- Each program sets operating parameters for a 24-hour period ending at 23:59 (midnight).
- **If a program is run without being chained to another program, it will stop running at midnight.**
- For continuous operation, programs must be chained together in series, with the last program chained back to the first to create a loop.
- **If there is only one program, it must be chained to itself to allow continuous operation.**
  
- If a program is not in the correct format, when you attempt to chain the program and error message will appear. Programs may be incompatible if they were written in different versions of software.

If the controller is not able to follow the chain:


- An alarm(s) will be displayed and an error message will indicate why the chain could not be followed
- The current program will run continuously

## Programming auxiliaries

Auxiliary switches are programmable timers that are used to power other devices on or off.

Auxiliary switches can be used for:

- Time lapse photography
- Automatic watering
- Gas dosing
- Fertilizing

These switches are an optional feature. If the chamber is equipped with auxiliaries, the program table will display an auxiliary icon  for each one, as each auxiliary is a zone of control.



## Modes of operation

Auxiliary switches have two modes of operation.

- Binary mode
- Event mode

The B/E button works as a toggle switch so as the button is touched, the Active Cell Unit box will display either B or E. **Binary mode** – in binary mode, the auxiliary is either on or off.

To program an auxiliary in Binary mode,

1. Touch the B/E button in the Program Table so the Active Cell Unit box in the Program Table Unit displays a B.
2. Touch the cell in which you want to enter information.
3. Using the keypad, enter either 0 or 1
  - 0 – Off during the period covered by the timeline
  - 1 – On during the period covered by the timeline

The controller displays a + symbol to represent each '1' entered.

**Event mode** – in Event mode, the auxiliary switch can be programmed to turn on for a defined period after the start of the timeline. Entries are made in seconds and the value can range from 0 to 999.

To program an auxiliary in event mode,


1. Touch the B/E button in the Program Table so the Active Cell Unit box in the Program Table Unit displays an E.
2. **Touch the cell** in which you want to enter information.
3. **Enter the number of seconds** that the auxiliary should come on after the start of the timeline.

Note: All timelines in an auxiliary zone must be in the same mode. Different auxiliary zones can operate in different modes.

## Auxiliary Program example

The figure below is an example of a program using auxiliaries.

The Program provides the following information:

- There are three auxiliaries 
- The first auxiliary zone is in binary mode. The Active Cell Units field is displaying a B and plus (+) signs are displayed within some cells in the zone. The plus (+) sign is a symbol for 'on'.

- The second auxiliary zone is in event mode. This is evident because some of the settings are greater than 1.
- The third auxiliary is not used.
- There is one program and it is chained to itself.

Time	Temp (°C)	Humidity (%)	CO2 (PPM)	Event 1	Event 2	Event 3	Event 4	Event 5
0:00	18	55	0	0	0	+	0	0
7:00	20	65	0	2	500	0	25	0
7:30	20	65	2	2	600	+	0	0
10:00	24	70	4	4	700	0	25	0
18:00	20	65	2	2	600	+	0	0
18:30	20	65	0	2	500	0	0	0
19:00	20	65	0	0	0	+	0	0

Auxiliary 1 – Binary mode

- Is on from 7:30 until 10:00 am.
- Is on from 18:00 (6:00 pm) until 18:30 (6:30 pm)
- Is on from 19:00 (7:00 pm) until 7:00 am.

Auxiliary 2 – Event mode


- Is on for 25 seconds at 7:00 am
- Is on for 25 seconds at 10:00 am

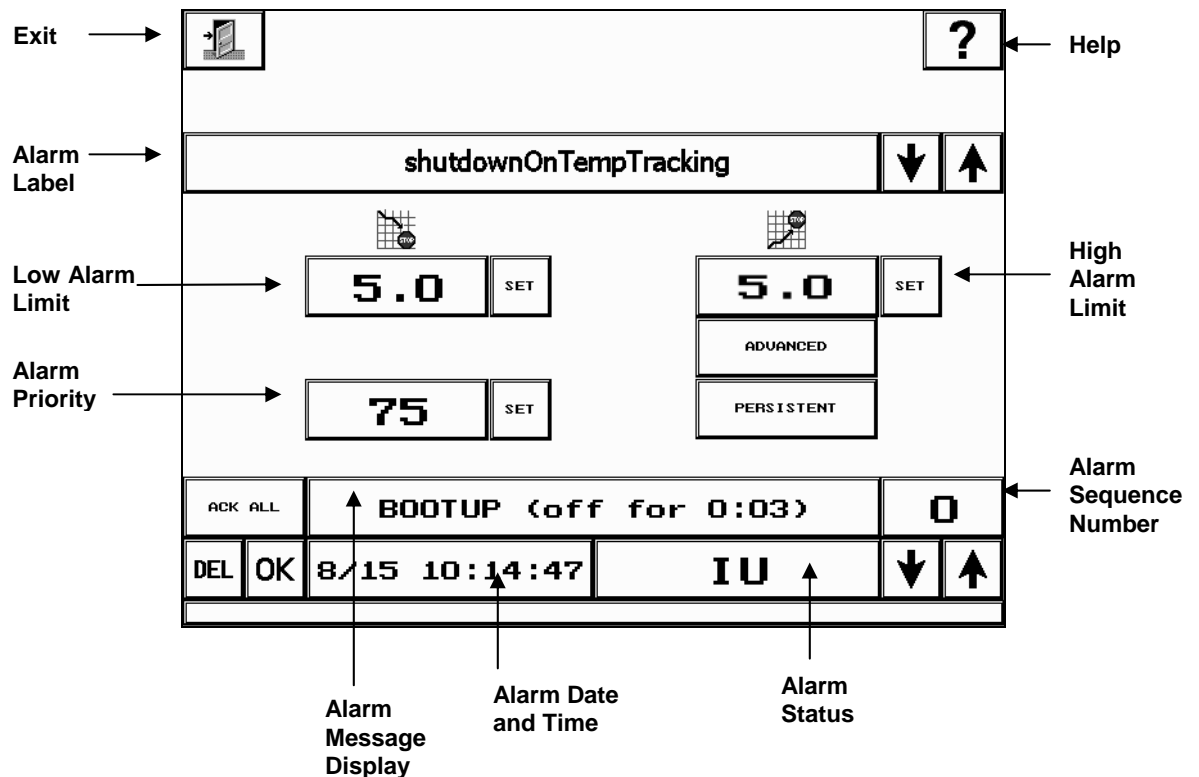
## Chapter 4: Alarm management

Setting and managing Alarms are essential parts of an experiment. Alarms monitor experiment conditions and provide notification when a condition changes beyond the set limits. The Alarm facility provides:

- The ability to program Alarms to protect the experiment and research.
- Error messages and reporting management.

### The Alarm Screen

To access the Alarm Screen, touch the Alarm  button in the Status Screen toolbar.



### Alarm Screen fields

- |                    |   |
|--------------------|---|
| <b>Exit button</b> | From the Alarm Screen, touch the Exit button to return to the Status Screen.                        |
| <b>Help button</b> | To access on-line help, touch the Help button, then the field or button for which help is required. |

<b>Alarm Label</b>	This field displays the current Alarm Label. Use the arrows to scroll through the list of labels.
<b>Low Alarm Limit</b>	This field displays the low Alarm limit for the current Alarm configuration. Touch the Set button to display a keypad and enter a value.
<b>High Alarm Limit</b>	This field displays the high Alarm limit for the current Alarm configuration. Touch the Set button to display a keypad and enter a value.
<b>Alarm Priority</b>	This field displays the Alarm Priority. Touch the Set button to display a keypad and enter a value.
<b>Advanced button</b>	Touch this button to view all possible alarm labels in the Alarm Label field. Ordinarily, only commonly used labels are displayed.
<b>Persistent button</b>	Touch this button to attach the Persistent feature to an Alarm. Persistent alarms cannot be turned off until the condition is cleared.
<b>Acknowledge All button (Ack All)</b>	Touch the Ack All button to acknowledge all active Alarms.
<b>Alarm sequence number field</b>	This field displays the sequence of the alarm messages, from 0 to 99.
<b>Delete button (Del)</b>	The Delete button deletes the currently displayed Alarm.  If the alarm condition is still active the alarm will recur immediately.
<b>Alarm Status field</b>	This field displays the current status of an Alarm
<b>Alarm message display</b>	This field displays alarm messages. Touch the up and down arrows to scroll through the Alarm messages.  See <i>Appendix B: Alarm messages</i> for more information.
<b>OK button</b>	Touch OK to acknowledge the currently displayed Alarm.

## Alarm Options

Two types of program alarm options available include tracking and deviation.

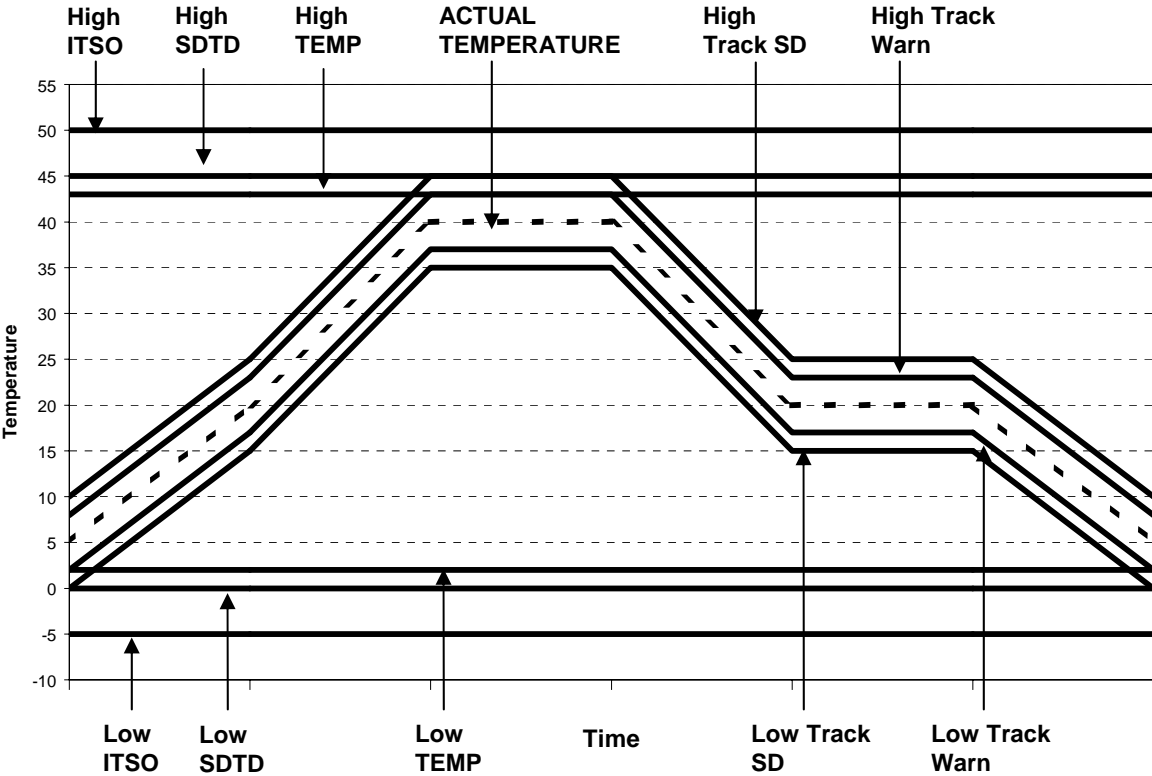
- Tracking alarms are based on the set point at any particular time in the program, including during ramping. The user sets the minimum and maximum variance from set point. (Standard alarm configuration.)
- Deviation alarms set upper and lower limits that apply to the entire program. (Optional alarm configuration.)
- Both alarms include a preliminary warning and shutdown settings.

### Alarm priority

Priority determines what action is taken when an alarm limit is reached, for example raising an alarm message, initiating an auto-dialer.

The chart below displays various temperature alarms and possible settings.

- ITSO = Independent Temperature Shut Off
- Track SD = Shut Down on Tracking alarm
- SDTD = Shut Down on Temperature Deviation (optional)
- TEMP = Temperature warning alarm
- Track Warn = Tracking alarm warning



## Programming an Alarm

1. **Access the Alarm screen.**
2. **Select the Alarm to be programmed.** Use the arrow keys in the Alarm Label field to cycle through the list.

For a complete list of labels, refer to on-line Help or see *Appendix A: Labels*.

3. **Set the Low Alarm limit.** Touch the Set button in the Low Alarm field to display a keypad and enter the low limit.
  - The value entered cannot be lower than the factory set minimum.
4. **Set the High Alarm limit.** Touch the Set button in the High Alarm field to display a keypad and enter the high limit.
  - The value entered cannot be higher than the factory set maximum.



### Note:

Now with Convion's Version 6.2 software, the values entered in the limit fields are saved so that this information does not have to be re-entered when the system is re-booted.

Complete steps 5 and 6 if a setting other than the default is required.

5. **Set the Alarm Priority.** Touch the Set button in the Alarm Priority field to display a keypad and enter the high limit. Refer to the Alarm Priority Values chart below.
  - The value entered must be between 1 and 99. The chart below lists the urgency associated to each block of numbers.
  - See *Appendix B: Alarm messages* for default Alarm priorities.

### Alarm priority values

Number	Urgency	Indicator device(s) activated
1 – 20	Very high	Alarm button, lamp, buzzer, auto dialer, CAC
21 – 40	High	Alarm button, lamp, buzzer, CAC
41 – 60	Medium	Alarm button, lamp
61 – 80	Low	Alarm button
81 – 99	None	None


6. **Touch the Persistent button** to attach this feature to the Alarm.

Typically, this feature is used on more critical components of an experiment because the alarm can only be cleared manually (as opposed to other alarms that will clear automatically when the condition causing the alarm no longer exists).

## Alarm indicators

An Alarm indicator notifies the user that a problem exists. Two standard Alarm indicators are built into every Conviron growth chamber. In addition to these, there are optional Alarms which can be built into the chamber.

### Standard Alarm Indicators

- An Alarm button  will flash on the Status toolbar of the controller when there is an active, unacknowledged Alarm. The button will continue to flash until the Alarm is acknowledged.
- A buzzer will sound as the audible equivalent of the flashing Alarm on the CMP5090 controller or as an indication that the ITSO (independent temperature shut-off) has shut off the chamber. Refer to page 8 of this chapter for more information.


### Optional Alarm indicators

- An external Alarm Indicator lamp, which will light up when an Alarm is active.
- A Chamber Alarm Contact (CAC) relay. The CAC is connected to another device or system selected by the user which will indicate an active Alarm.

In most cases, the CAC is connected to an existing internal building security system or an autodialer that will dial a pre-programmed number and leave a message to alert the operator that an Alarm exists.

### Responding to an Alarm

An Alarm provides warning that a problem exists in the program.

1. **Access the Alarm screen** by touching the Alarm  button in the Status toolbar.
2. **Read the Alarm message.** If you do not understand the message, refer to *Appendix B: Alarm Messages*.
3. **Record the time that the message was issued.**
4. **Acknowledge the Alarm.** When the Alarm is acknowledged, the Alarm Status will be updated.
  - To acknowledge the current Alarm, touch the OK button. The system will set the status of the Alarm to inactive.
  - To acknowledge all Alarms, touch the Ack All button. The system will set the status of the Alarms to inactive.
  - Active alarms can not be deleted.
  - If the Persistent feature has been added to the Alarm, the



condition must be corrected before the status of the Alarm can be acknowledged to change the status to Inactive.

**Alarm status field codes**

AU	Active, Unacknowledged. The Alarm is active and acknowledged.
AA	Active, Acknowledged. The Alarm has been acknowledged but the condition that caused the Alarm has not been corrected.
IU	Inactive, Unacknowledged. The condition that caused the Alarm has been corrected, but the Alarm has not been acknowledged.
IA	Inactive, Acknowledged. The Alarm message has been acknowledged and the condition that caused the Alarm has been corrected.

**Take corrective action**

- Adjust Alarm settings if necessary.
- Repair the fault.
- Shut down and restart the chamber.

**Independent temperature shut-off (ITSO)**

The ITSO is a fail-safe protector that shuts the chamber off if its limits are exceeded. The ITSO relies on its own sensor so that it operates completely independently in case of control system failure.

The factory default settings are 5° beyond the chamber operating range. If settings are changed, they should be no less than 10° outside the range of the programmed high and low temperature settings for the experiment.

The operation of the ITSO is not directly reflected on the Alarm screen of the controller. However, if the ITSO shuts off the chamber, the resulting loss of power to the outputs will trigger a 'chamber off' Alarm.

ITSO controls are located inside the control panel where there is live high voltage. Service personnel under the instruction of Convicon Technical Support should set parameters. Contact Convicon Customer Care for more information.

**Technical support**

For technical support, contact your local technicians.

When contacting Convicon Customer Care, please provide the chamber **serial number**, which is located on the rating plate on the side of the chamber.

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## Chapter 5: Login and security procedures

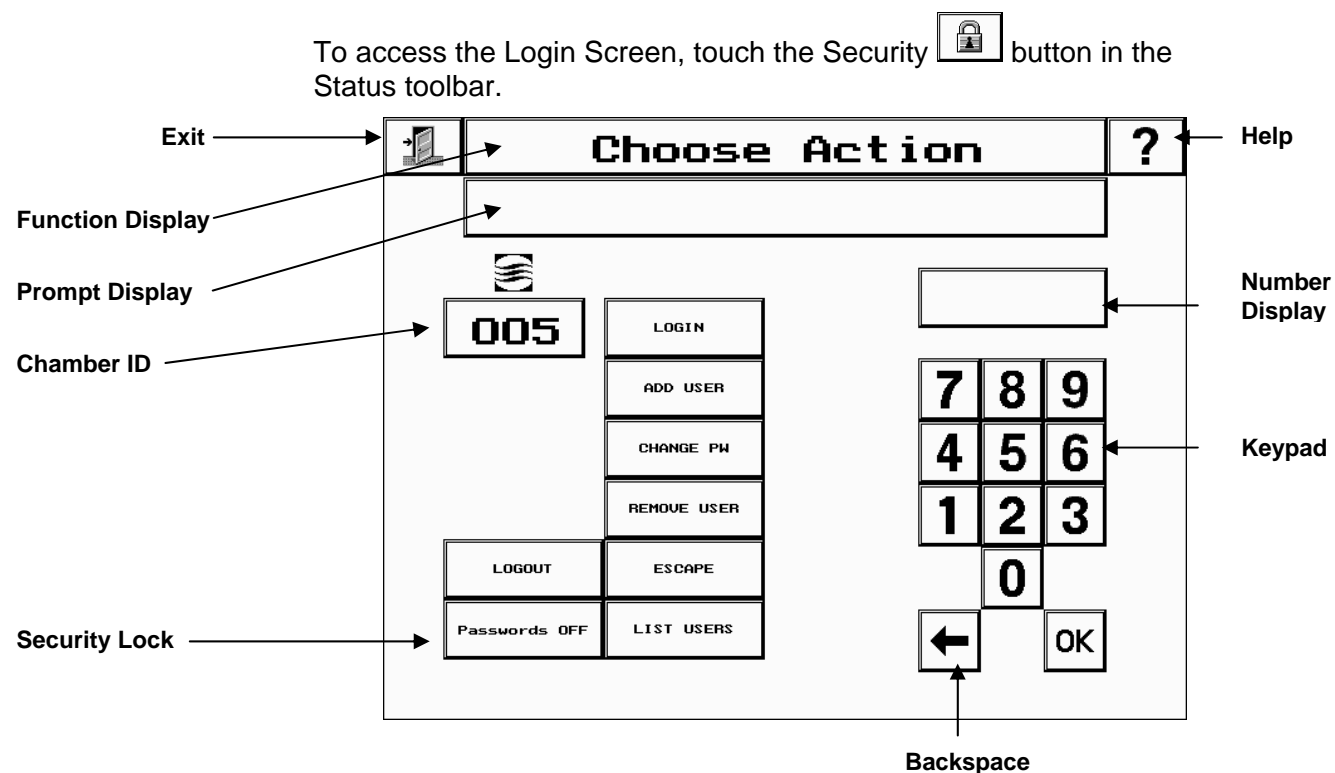
### CMP5090 Security procedures

The CMP5090 is shipped with security features turned off. This enables the user to start the chamber and become familiar with the chamber controls without having to enter a password. We recommend that a security administrator be assigned to administer user login authority and that security features are added as soon as possible.

This chapter describes:

- The Login screen
- Login procedures
- How to change your password
- How to assign security levels
- Security Administrator procedures

### The Login Screen



### Login Screen Fields

#### Exit button

Touch the Exit button to close the Login screen and to return to the Status Screen.

<b>Help button</b>	To access on-line help, touch the Help button, then the field or button for which help is required.
<b>Function Display</b>	This field displays the function selected.
<b>Prompt Display</b>	Provides prompts to assist the user.
<b>Chamber ID</b>	This field displays the chamber ID. The Chamber ID identifies the chamber to the CCS if installed on a network.
<b>Login button</b>	Touch this button to start the login process.
<b>Add User button</b>	Touch this button to add a new user to the system. This feature is used most often by the security administrator.
<b>Change Password (PW) button</b>	Touch this button to change a password.
<b>Remove user button</b>	Touch this button to remove a user from the system.
<b>Logout</b>	Touch this button to log out the current user ID.
<b>Escape</b>	Touch this button to stop the current procedure.
<b>Security Lock</b>	A binary button used to turn security on or off. Once security is on, only a user with the correct security level can turn it off.
<b>List Users</b>	Touch this button to view a current list of users that have access to the system.
<b>Keypad</b>	As numbers are entered using the keypad, they will display in the Number Display field.
<b>Backspace button</b>	Touch the Backspace key to clear a digit.
<b>OK</b>	Touch OK after correctly entering a number using the keypad.

## Security Screen procedures

**Logging In** If the controller security lock is on, follow the login procedures below.  
**Note:** Logging in may be done at the Central Control System.

1. **Touch the Login button.**

The Function Display field will read *Login*

The Prompt Display field will read *Enter User ID*

2. **Enter your User ID** using the keypad. **Touch OK.**
3. **Enter your Password. Touch OK.**

The Function Display field will read *Login successful*. You now have access to the CMP5090 screens associated with your security level.

If the Login screen reads *User not found* or *Password incorrect*, contact your Security Administrator. If this is your first time logging into the controller, change your password now.

## Changing your password

For security reasons, it is recommended that you change your password frequently. Your Security Administrator will assign your first (temporary) password.

1. **Touch the Change PW button** on the Login Screen.

Follow the instructions that appear in the Prompt display field.

- Passwords can be between 1 and 8 characters long.
- All characters must be numeric.

2. **Touch the Exit button** to return to the Status screen.

## Logging out

1. **Touch the Logout button** on the Security screen. The controller will display a Local Logout message.

**Note:** After five minutes of inactivity, the system will automatically log out all users and return to the Status screen.

## Security levels and functions

<b>Security level</b>	<b>Provides access to:</b>
<b>10</b>	Status screen Trendgraph screen Security screen excluding: adding or removing users with a security level greater than 10. Alarm screen in view only mode, which allows you to cycle through the labels and alarm messages but not to change settings or delete messages.
<b>20</b>	Program screen Program Graphing screen Deleting alarms Changing alarm settings, priority and persistence Options screen, excluding setting chamber ID, which requires security level 30.
<b>30</b>	Adding and removing users with security levels of 30 or lower. Setting startup delay and chamber ID

- 40** All screens and features  
Diagnostics screen  
Security lock OFF  
Adding or removing users with a security level of 40 or lower.

**Note:** If you attempt to access a screen for which you do not have authority, the screen prompt field will display the message *Security Level Too Low..*

### Activating security

Security administrator set-up The security administrator is responsible for initiating controller security.

The security lock default setting is **passwords off**. In this mode:

- The **login, logout, escape** and **list users** buttons function
- The **add user, change pw, remove user**, buttons do not function
- User ID's cannot be added until **passwords on** is selected.

For reference, maintain a paper copy of the User ID's and passwords. This information is restricted and should be stored in a secure place.

1. **Touch the Passwords button** to toggle to **PASSWORDS ON**.

Note: When the screen displays Passwords ON, a password is required. Users without a password have a security level of 10.

2. **Touch the Login button**. Follow the prompts to enter User ID40 and password 0.

Note: After entering numbers using the keypad, touch the OK button.

3. Touch the Add User button and follow the prompts to create an ID, between 1-8 digits, for the security administrator. Enter 40 as the required security level.

The Security screen will display a message indicating that the User ID has been added. The Security screen will return to Login mode.

4. Touch the Change PW button.
  - At the prompt, enter the security administrator ID created in step 3.
  - At the enter password prompt, touch OK.
  - At the prompt, re-enter the new password. The prompt will display a message that the password was changed.

Repeat steps 3 and 4 to add other users. Remember to set the appropriate security level.

For reference, maintain a paper copy of the User ID's and passwords. This information is restricted and should be stored in a secure place.

5. For added security, change or remove the default User ID 40. Use one of the following methods.

- I. **Touch the Change PW button.**

Enter 0 when prompted for the current password. Change the password for User ID 40 to a number other than 0.

- II. **Touch the Remove User button.**

Enter 40 when prompted for the User ID. The prompt will confirm the User was removed.

## Default User IDs

Default User IDs are set at Convion. This allows the Security Administrators to first, activate security and then set up temporary User IDs and passwords for themselves and for other users.

After signing on once with a default User ID and password, the user should immediately change his or her User ID and password.

IDs and passwords can consist of numeric characters only.

User ID	Security level	Password
10	10	0
20	20	0
30	30	0
40	40	0

## Chapter 6: Setting options and logging data

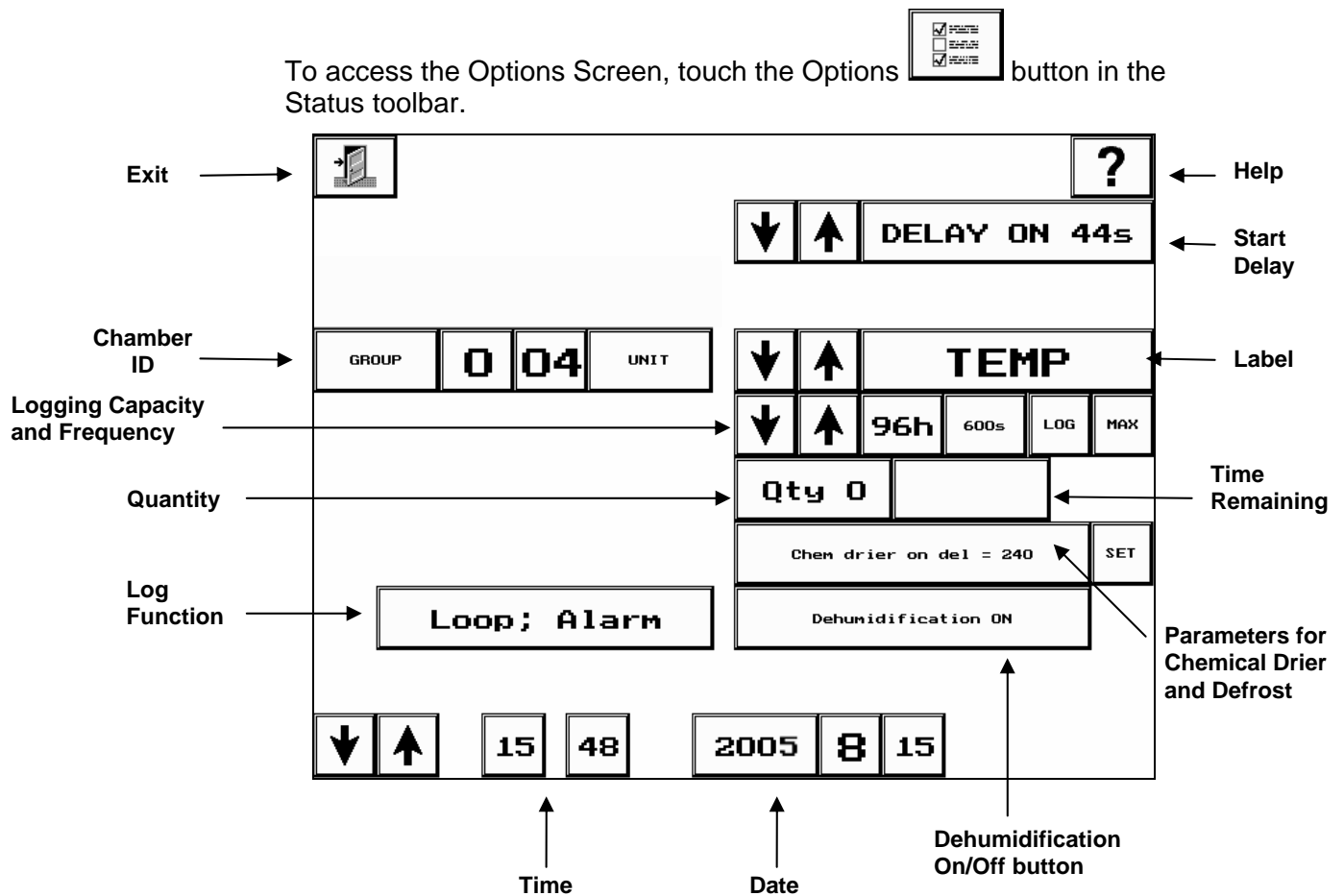
Setting options is a critical part of control system operation as the experiment data recorded is dependent on the type of options selected.

The logging feature provides a record of chamber conditions throughout the experiment.

The Options Screen allows the user to:

- Enter or adjust system settings
- Set logging data options
- Set the chamber ID

### The Options Screen



## Options Screen fields

<b>Exit button</b>	Touch the Exit button to return to the Status Screen.
<b>Help button</b>	To access on-line help, touch the Help button, then the field or button for which help is required.
<b>Chamber ID</b>	<p>The Chamber ID identifies the chamber to the Central Control System (CCS). The ID is comprised of Group and Unit numbers.</p> <p><b>Group number</b> – may be used to identify a group of chambers by a common trait such as room, floor or owner.</p> <p><b>Unit number</b> – indicates the number of the individual chamber in the group.</p>
<b>Log function button</b>	This button is used to set the log function to one of four choices. The field displays the Log Function selected. The log function determines what happens when internal memory is full.
<b>Start delay</b>	This field shows the delay, in seconds, of startup for the chamber. A start delay is recommended to avoid a drain on the electrical power source.
<b>Label</b>	This field displays the label for which logging options are currently being set.
<b>Logging capacity and frequency</b>	<p>The first field (to the right of the arrows), displays logging capacity in hours. This is the number of hours of data that can be logged to the memory in the controller. It varies inversely with the logging frequency.</p> <p>The second field displays logging frequency in seconds. This is the number of seconds between each recording of the data. It varies inversely with the logging capacity.</p>
<b>Quantity</b>	The Qty field shows the number of items selected to log.
<b>Chemical drier and defrost</b>	<p>The chemical drier parameter button is used to make adjustments to the dehumidification.</p> <p>The defrost parameter button is used to make adjustments in the defrost cycle.</p>
<b>Dehumidification</b>	The Dehumidification On/Off button allows this feature to be turned off when it is not required.
<b>Time remaining</b>	The Time Remaining field displays in hours, the amount of logging time left on the compact flash drive. This field is valid only if the unit is equipped with a compact flash drive.



<b>Time</b>	Displays the time in a 24-hour format.
<b>Date</b>	Displays the date in year-month-day format.

**Note:** The date, time and logging options cannot be changed if you have a program running. To make modifications, stop the program from the Program screen and make the necessary changes.

## System settings

This section provides instruction on programming system settings. Generally, it is not necessary to change the information in the system settings fields with each experiment.

1. **Enter the chamber ID.** Touch the Group and Unit buttons to set the ID.

**Note:** The chamber ID identifies the chamber to the CCS. If the chamber is not connected to a CCS, disregard this setting.

- The default ID of 100 must be changed.
- The Group number can be set from 0 – 9.
- The Group number can be used to identify a series of chambers with some commonality. For instance, the same floor, same user, etc.
- The Unit number can be set from 1 – 99.
- The Unit number can be used to identify the individual chamber.
- The chamber ID is displayed as a read-only field on the Status and Security screens

Reboot the controller after completing this procedure.

2. **Set the Start Delay.** Use the arrows to set the number of seconds for start delay.
  - Chambers can be set to turn on at staggered times to avoid a drain on the building power supply. It is recommended that start delays be set in 10-second intervals.

### Chemical drier/defrost and dehumidification settings

If your chamber is equipped with chemical drier, defrost or dehumidification features, the buttons to adjust these parameters will appear on the Options Screen.

## Setting the chemical drier

Consult Convicon customer care before adjusting these settings.

### Setting dehumidification

1. **Touch the Parameter button** to cycle through the parameter list. There are two adjustable parameters for the chemical drier operation:
  - i. Chem. drier on delay – sets the delay time before the drier comes on when %RH is greater than the set limit.
  - ii. Chem drier off delay – sets the delay time before the drier shuts off when %RH is less than the set limit.
2. **Touch the Set button.** The keypad will appear.
3. **Enter the chemical drier settings** using the keypad.
4. **Touch the OK button** to confirm the value entered.
5. **Touch the Exit button** to return to the Options screen.

### Dehumidification ON/OFF

The Dehumidification On/Off button allows this feature to be turned off when it is not required.

Touch the Dehumidification button to toggle between Dehumidification ON and Dehumidification OFF.

- The additive humidity function will still operate if the Dehumidification feature is turned off. If the relative humidity is greater than the set limit, it will eventually settle to ambient condition, adjusted for the temperature variance between ambient and chamber.
- Turning the Dehumidification feature off saves on energy costs and wear on the components.

### Setting defrost

Defrost parameters should be set by service personnel under the instruction of Convicon technical support. Contact Convicon customer care for more information.

## Setting logging options

This section provides instruction on setting logging options. Generally, information that exists in the logging options fields is changed with each experiment.

1. **Access the Options screen.**
2. **Select the Label to be logged.** Use the arrow keys in the Alarm Label field to cycle through the list.
  - When a label is selected for data logging,
    - The Log button on the Option screen will darken.

- The Options button on the Status screen will flash when Program is running.

3. **Set the Logging Capacity and Frequency.** Use the arrow keys to cycle through the available logging options.
  - The first field (logging capacity) displays the capacity, in hours, of internal memory.
  - The second field (logging frequency) displays the interval, in seconds, between each data recording.
  - As Labels to be logged are added, the capacity will decrease.
  - As the logging frequency increases, the logging capacity decreases.
  - The controller automatically samples data every ½ second and records the average of these samples according to the Frequency setting.
  - The Trendgraph screen displays logged data only.
4. **Touch the LOG button** to enable the Logging function. If the LOG button is not touched, data for the label will not be recorded.
5. **Touch the MAX button** to log the maximum value in the logging period rather than the average value.

**Note:** The Qty (Quantity) field displays the number of items selected to log. As the number of items changes, the logging frequency and capacity will change.

6. **Set the Log function** to specify system response when internal memory is full. There are four available settings.

**Note:** Chambers equipped with a CF or connected to a CCS automatically download data to those devices. Setting the appropriate log function is important should one of these devices fail.

<b>Settings</b>	<b>System Response</b>
1. No Loop, Alarm (Default Setting)	Stop logging to prevent overwriting of data and raise an alarm on the Alarm screen.
2. Loop, Alarm	Overwrite the oldest data in internal memory and raise an alarm on the Alarm screen.
3. No Loop, No alarm	Stop logging when internal memory is full but do not raise an alarm.
4. Loop, No alarm	Overwrite the oldest data in internal memory but do not raise an alarm.


### Storing logged data

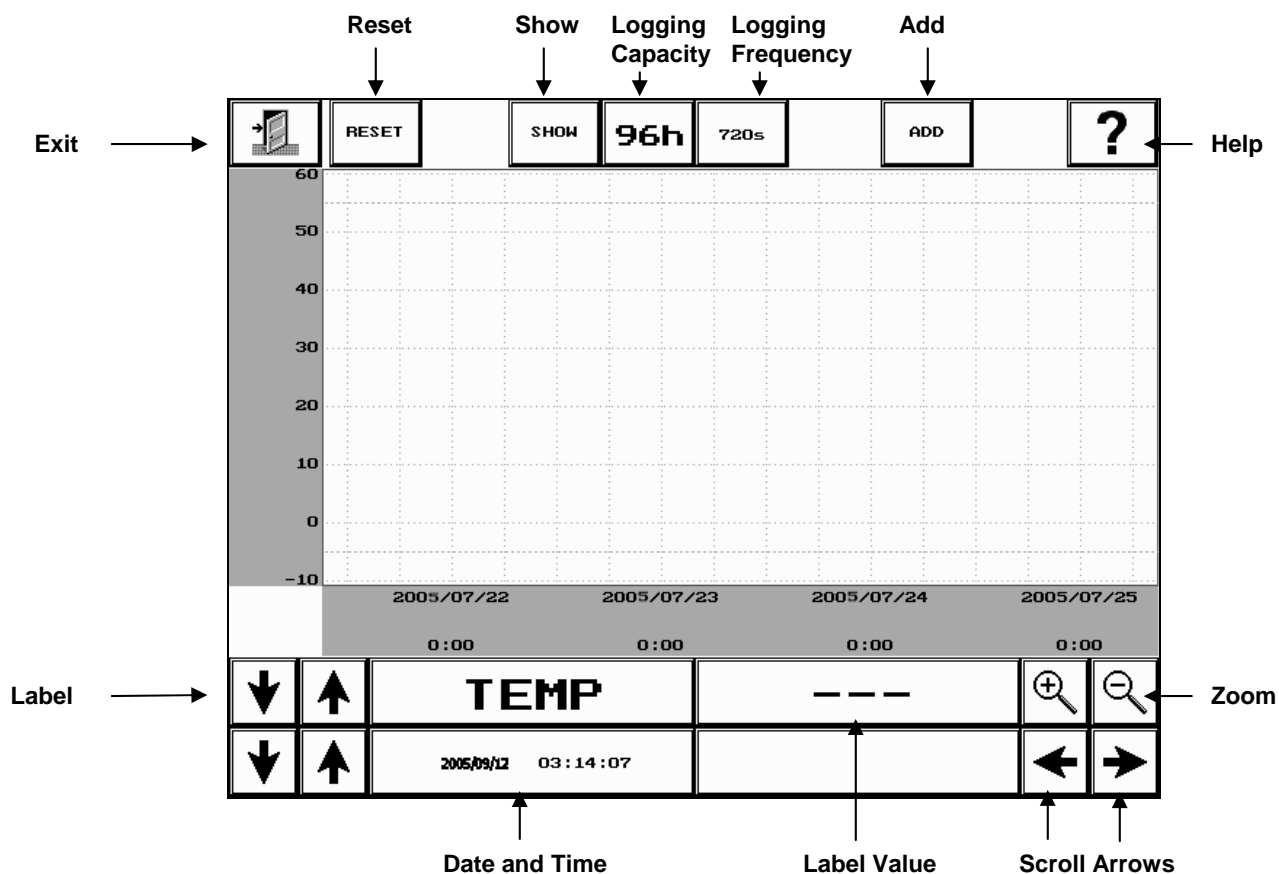
Logged data is automatically stored into the internal memory (storage) in the controller. Regardless of additional storage options, logged data is stored in this facility first. In addition to the internal memory area, your controller may be equipped with the options of logging to a CCS or a compact flash drive (CF).

- If the controllers are networked to a CCS, data is logged to the CCS.
- If the controller has a compact flash drive, data is logged to the compact flash drive in the E:\ drive.
- To export data to other software, the chamber must be equipped with a compact flash drive or be connected to a CCS.
- If the chamber is not equipped with a CCS or a compact flash drive, the data will be logged to the internal memory only and can only be viewed on the Trendgraph Screen.

### The Trendgraph Screen

The Trendgraph Screen provides a graphical view of logged data.

To access the Trendgraph Screen, touch the Trendgraph  button in the Status toolbar.



## Trendgraph Screen fields

<b>Exit button</b>	Touch the Exit button to return to the Status screen.
<b>Reset</b>	Touch the Reset button to clear the screen
<b>Show</b>	Touch the Show button to display a graph of the data for the selected label.
<b>Logging capacity</b>	<p>The Logging Capacity field displays the number of hours of logged data that can be stored in the internal memory of the controller.</p> <p>If logged data exists for the time period, it will be displayed on the Trendgraph screen and the X-axis will be scaled.</p>
<b>Logging frequency</b>	The Logging Frequency field displays the frequency that was set in the Options screen.
<b>Add</b>	Touch the Add button to plot the data from another label on the displayed graph.
<b>Help button</b>	To access on-line help, touch the Help button, then the field or button for which help is required.
<b>Label</b>	This field displays the Label of the most recently displayed graph.
<b>Label value</b>	<p>This field displays the value for the date and time.</p> <ul style="list-style-type: none"><li>• When there is no value, the field will display a row of dashes. (- - -).</li><li>• If the number of dashes displayed is continuously changing, this indicates that the controller is currently tracking logged data.</li></ul>
<b>Zoom</b>	These buttons provide zoom in and zoom out features.
<b>Date and time</b>	This field displays the date and time for the Label value displayed.
<b>Scroll arrows</b>	These buttons provide a scroll feature to view the entire graph.

## Creating a graph

The Trendgraph Screen displays data that is logged in the internal memory of the controller. The data is logged according to the settings in the capacity and frequency fields of the Options Screen.

Data that is stored to either a compact flash drive (CF) or to the CCS can be viewed separately on a PC using common applications such as Excel or Lotus.

- If your controllers are networked to a CCS, data is logged to the CCS.
- If your controller has a compact flash drive (CF), data is logged to the disk in the E:\ drive.
- If you have neither of these, data is logged only to the internal memory in the controller.

1. **Select a Label** by touching the up and down arrows.
2. **Touch the Show button** to display the graph on screen. The hourglass symbol will appear and the Label Value screen will display moving dashes while the graph is being plotted.

**Note:** Graphing does not disturb the operations of the chamber.

### Displaying multiple labels

The Trendgraph Screen has the ability to plot the logged data from several or all logged labels on one screen.

**Touch the Add button** to plot the data of another logged label on the graph.

- The scale of the y-axis changes to the scale of the most recently selected label.

### Stop graphing

To stop graphing, **touch the graph area** of the screen once.

## Chapter 7: Maintenance and troubleshooting

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This chapter describes:

- How to inspect and clean control panel components
- How to check operating histories using the Diagnostics screen
- How to clear the static Ram (Random Access Memory) (SRAM) and re-calibrate the touch screen
- How to replace the external controller battery
- Controller software updates

For more information on troubleshooting with alarms, see Chapter 4, *Alarm management*.

### Inspecting and cleaning control panel components

#### Inspecting cooling fans

Most Convicon chambers are equipped with cooling fans, primarily for the control panel or lighting ballasts.

Regular inspection of the fans is crucial to maintaining reliability and avoiding equipment damage.

Replace non-working fans immediately.

#### Cleaning the air intake filter

Most Convicon control panels are equipped with a fresh air intake to cool the control panel components. The intake grill and filter prevent dust and other debris from getting inside the control panel.

Clean the air intake filter regularly to ensure adequate cooling of the components.

To clean the filter:

1. Remove the air intake grill mounting screws. Remove the grill and filter from the control panel.
  - It is safe to leave the chamber running while the grill and filter are being cleaned.
2. Wash the filter with a mild soap solution. Rinse with clean water.
3. Dry the air intake filter thoroughly.

Remount the air intake grill and filter using the mounting screws.

#### Cleaning the BUS and other cable connections


Cables connect the components of the control system.

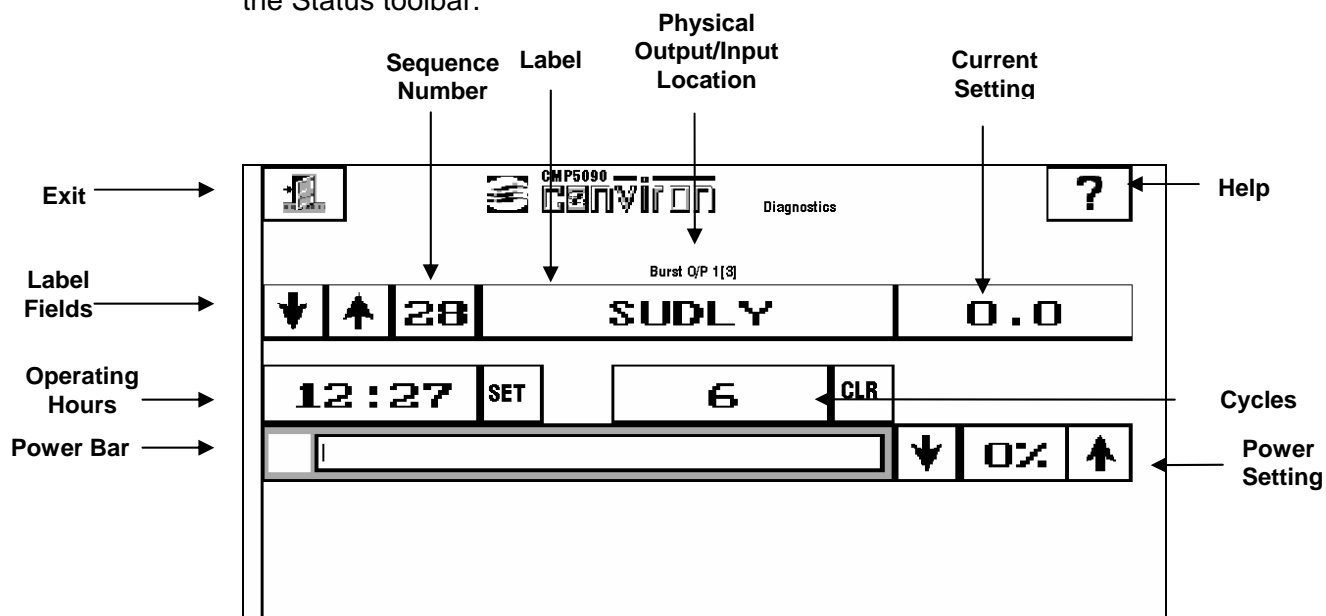
The connections may become dirty and may loosen with equipment vibration or thermal expansion.

To avoid control system failure, we recommend that cleaning and reseating these connections be performed as routine maintenance between experiments.

**Qualified service personnel using electrostatic discharge precautions must perform this work.** The procedure is outlined in the *CMP5090 service manual*.

## The Diagnostic Screen

To access the Diagnostic Screen touch the Diagnostic  button in the Status toolbar.



## Diagnostic Screen fields

The Diagnostics Screen is generally intended for use by qualified service personnel to aid in the diagnosis of equipment problems.

In addition to this, the Diagnostics Screen also displays operating histories for each output. The operating histories are particularly useful for monitoring the 'age' of the lamps in order to schedule replacement before lighting intensity decreases too much or they fail completely.

**Exit** Touch the Exit button to return to the Status Screen.

**Help** To access on-line help, touch the Help button, then the field or button for which help is required.



## Label fields

<b>Sequence number</b>	Displays the output or input label sequence number.
<b>Label</b>	Displays the output or input label. This label matches the label on both the chamber schematics and the physical outputs.
<b>Physical output/ input location</b>	Displays the physical location (board #, channel #) of the output or input.
<b>Current setting</b>	Displays the current condition of the input or output.

**Service history fields:** Operating hours and cycles are service history fields. They display the service history for output labels only.

<b>Operating hours</b>	Displays the number of output operating hours. Touch the SET button to display a keypad to change the operating hours.
<b>Cycles</b>	Displays the number of completed output cycles. Touch the CLR button to clear the service history for the output
<b>Power bar</b>	The Power Bar displays the current output voltage relative to maximum output voltage. The voltage can be adjusted to perform diagnostics.

## Clearing SRAM memory and recalibrating the Touch Screen

Read these directions completely before clearing the SRAM or recalibrating the touch screen.

This procedure is not equipped with an Escape feature. Once started, it must be completed.

### Important:

If you make a mistake,

- Wait three minutes before turning off the controller.
  - Wait another 10 seconds and turn the controller on again.
1. **Turn the controller disconnect switch to OFF**, wait at least 1 minute and turn the switch to ON. This will initiate the boot up process.

The screen will display the question:

```
"DO YOU WANT TO ZERO THE STATIC RAM (Y/N)?  
TOUCH SCREEN FOR Y"
```

2. **Touch the screen once.**

The controller will display the message:

```
"Static RAM will be zero'ed."
```

The calibration screen will appear.

3. **Touch the circles as they appear on the screen.** This process must be completed.

When the screen is calibrated, the controller will complete its boot up. The Status screen will appear.

The screen calibration is complete and the new software version is active.

**Note:** If the touch screen does not respond after recalibrating, the recalibration was not successful.

1. Wait three minutes before turning off the controller.
2. Wait another 10 seconds and turn the controller on again.
3. Repeat steps 1–3.

## Replacing the external controller battery

**Warning: Memory-loss hazard**

**Ensure regular supply of electricity to controller is ON.**

Read these directions completely before replacing the controller battery.

The controller battery is located at the back of the controller and is attached with a Velcro fastener and a locking electrical connector.

1. **Open the control panel door** to access the battery.
  - A warning label next to the battery indicates when the battery should be replaced.
  - If the controller is equipped with an internal battery, factory service is required to upgrade to an external battery. Contact Conviron Customer Care.
2. **Have a new controller battery** as specified in the Major Component Reference List (Appendix B of the *Conviron CMP5090 Service Manual*) and one of the following tools **ready**:
  - a probe – 1.5mm (1/16") diameter by 12mm (1/2") long
  - or
  - a flat-blade screwdriver – 3mm (1/8") wide
3. **Make sure that the building electrical supply to the chamber is**

ON and is not likely to be interrupted.

4. **Ensure that the Controller Disconnect switch is in the ON position** and is left ON throughout this procedure.
5. **Set the Start/Stop switch to Stop** to turn the chamber off (for safety reasons). Maintain power to the controller – do not turn the controller disconnect switch to OFF.
6. To **unlock the electrical connector to the battery** (see following diagram), press its release catch using one the following methods:

Insert the probe through the vent hole

Or

Insert the screwdriver though the battery plug opening

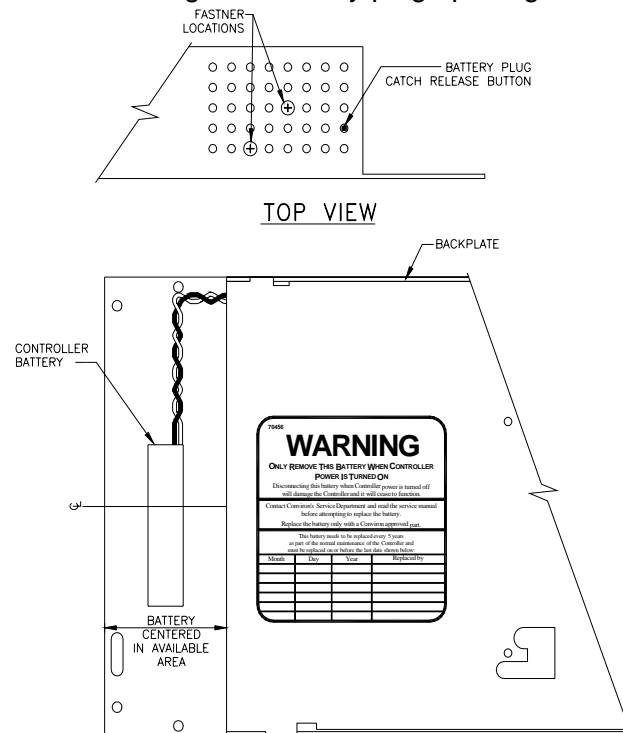


Figure 1 Electrical connection

7. **Remove the existing battery** by separating the Velcro fasteners.
8. To **install the new battery**, insert and lock its electrical connector and join the Velcro fasteners.
9. **Ensure the electrical connector and battery are secure.**
10. **Initial the current "replace by" date** on the Warning Label. Write a new “replace by” date that is five years in the future.
11. **Test the new battery** by turning the Controller Disconnect switch to **off** for 15 seconds and then **on** again. If the controller reboots completely and all functions operate correctly, the replacement was successful. Specifically verify the following functions:
  - Accept and run a program

- Change time and date
- Recognize the compact flash drive, if so equipped

**Note:** When a battery is tested there is a risk of losing controller memory. If the memory is lost, the controller must be replaced. To avoid problems, perform the test when the chamber is not in use.

## **Controller software updates**

Convion periodically releases new versions of controller software. Instructions for performing software updates are included in the *CMP5090 service manual*. We recommend that service personnel or users with advanced knowledge of the CMP5090 controller perform software updates.

Contact Convion customer care for more information. For more efficient service, please have the serial number of your chamber available.

## Appendix A: Labels

---

This appendix lists and describes various labels displayed on the CMP5090 controller.

There are four label categories: Reference, Input, Output and Set Point. Each label falls into one of the four categories.

### Reference

- Reference labels describe useful information about the chamber, such as the model type and/or serial number.
- The serial number is required for service.

Because the information is chamber specific, labels are not listed in the table below.

### Input

- Input labels describe parameters that are sensed by the input board or by the TTL inputs.
- They can be monitored and logged.

### Output

- Output labels describe parameters that are switched by the output boards.
- They can be monitored and logged.


### Set Point

- Set Point labels describe parameters that are set in the Program Screen.
- They are used to control the operation of the chamber.
- They can be monitored and logged.

Label	Category	Description
AUX1...	output	Auxiliary switch 1...
CFMTR	output	Circulating fan motor
CFMTR_SW	input	Circulating fan motor switch (for monitoring fan status)
CO2 (CO2A)	input	Carbon dioxide sensor
COSVLV	output	CO2 solenoid valve
CSVLV	output	Cooling solenoid valve
CSW1...	input	Current switch 1... (for monitoring device status)
DBDMTR	output	Dehumidification bypass damper motor
DDDMTR	output	Dehumidification drier damper motor
DECFMTR	output	Dehumidification evaporator circulating fan motor
DECSVLV	output	Dehumidification evaporator cooling solenoid valve
DEHMLV	output	Dehumidification evaporator modulating valve
DEHSVLV	output	Dehumidification evaporator heating solenoid valve
DHTR	output	Defrost heater
DRIER	output	Dehumidification chemical (desiccant) drier
DRIER_OFF (SP_DRIER_OFFDLY )	set point	Dehumidification drier off delay
DRIER_ON (SP_DRIER_ONDLY)	set point	Dehumidification drier on delay
DSVLV	output	Drain solenoid valve
EDMTR	output	Exhaust damper motor
FLUOR1...	output	Fluorescent lamp 1...
FLUORbnk	output	Fluorescent lamp bank

Label	Category	Description
FLUOR_VOLTS	input	Fluorescent volts (for controlling dimming ballasts)
HCMTR	output	Centrifugal atomizing humidifier motor for additive humidity
HCMVLV	output	Heat/cool modulating (proportional) valve
HPSOD1...	output	High pressure sodium lamp 1...
HSVLV	output	Heating solenoid valve
HTR1...	output	Electric heater 1...
HUM (HUM_100)	input	Humidity (%RH)
IM $\mu$ MOL	input	Input module light meter micromole
INCANbnk	output	Incandescent lamp bank
LOFT_TEMP1	input	Lamp loft temperature
MHAL1...	output	Metal halide lamp 1...
HPRSW (PR_HIGH)	input	Refrigeration pressure switch - high
HLPRSW (PR_HILO)	input	Refrigeration pressure switch - high/low
LPRSW (PR_LOW)	input	Refrigeration pressure switch - low
SNVLV	output	Spray nozzle solenoid valve for additive humidity
SODIUMbnk	output	High pressure sodium lamp bank
SP_AUX1...	set point	Auxiliary 1...
SP_CO2	set point	Carbon dioxide
SP_DRIER	set point	Chemical drier (dehumidifier)
SP_FLUOR	set point	Fluorescent lighting
SP_HPSOD	set point	High pressure sodium lighting
SP_HUM	set point	Humidity
SP_INCAN	set point	Incandescent lighting
SP_LIGHT	set point	Lighting (Combination of different types of

**Appendix A: Labels**

<b>Label</b>	<b>Category</b>	<b>Description</b>
		lamps)
SP_MHAL	set point	Metal halide lighting
SUDLY	output	Start up delay (controls main contactor)
TEMP	input	Temperature inside the plant growth area
		 <b>Tip:</b> The TEMP label applies to both control and alarm settings. Enter alarm limits that are slightly beyond the experiment's minimum and maximum program conditions.
TIME-24HR_CLK	set point	Time



## Appendix B: Alarm messages

This appendix describes standard alarm history messages, possible causes and recommended solutions. For more information on these procedures, refer to *Chapter 7: Maintenance and troubleshooting*.

Additional information can be found in Convion service bulletins.

**Note:** If the recommended solutions do not resolve the existing problem, contact Convion customer care.

Alarm code	<b>1/2 wv; bd x ch y</b>
Description	A triac is "half waving"
Defaults	<ul style="list-style-type: none"> <li>• priority: 75</li> <li>• User Interaction Level: not accessible</li> </ul>
Cause	Output board line voltage problem.
Solution	<ol style="list-style-type: none"> <li>1. Ensure that the Start/Stop switch is set to ON.</li> <li>2. Check the line power to the board.</li> </ol>
Alarm code	<b>A-D ov rng; bd x ch y</b>
Description	An input reading is out of range.
Defaults	<ul style="list-style-type: none"> <li>• priority: 75</li> <li>• User Interaction Level: not accessible</li> </ul>
Cause	Possible sensor or input board failure
Solution	Ensure that the sensor is connected to input board properly.
Alarm code	<b>A-D pol; bd x ch y</b>
Description	An input reading has the wrong polarity
Defaults:	<ul style="list-style-type: none"> <li>• priority: 75</li> <li>• User Interaction Level: not accessible</li> </ul>
Cause	Possible sensor failure
Solution	Ensure that the sensor is connected to input board properly.
Alarm code	<b>[input] inp ov lim: x y</b>
Description	<p>The actual value of an input is higher than its high limit level.</p> <ul style="list-style-type: none"> <li>• [input] is the input label that generated the alarm</li> <li>• x is the value of the limit that was exceeded</li> <li>• y is the actual input value at the time of the alarm</li> </ul>
Defaults	<p>Defaults:</p> <ul style="list-style-type: none"> <li>• priority: 75</li> <li>• User Interaction Level: normal Alarm Screen</li> </ul>
Cause	<ol style="list-style-type: none"> <li>1. possible sensor location or aspiration problem</li> <li>2. possible equipment failure</li> </ol>

**Appendix B: Alarm Messages**

Solution	Ensure that the limit settings in the Alarm screen are correct for the range of the program.
Alarm code	<b>[input] inp und lim: x y</b>
Description	The actual value of an input is lower than its low limit level. <ul style="list-style-type: none"> <li>• [input] is the input label that generated the alarm</li> <li>• x is the value of the limit that was exceeded</li> <li>• y is the actual input value at the time of the alarm</li> </ul>
Defaults	<ul style="list-style-type: none"> <li>• priority: 75</li> <li>• User Interaction Level: normal Alarm Screen</li> </ul>
Cause	<ol style="list-style-type: none"> <li>1. possible sensor location or aspiration problem</li> <li>2. possible equipment failure</li> </ol>
Solution	Ensure that the limit settings in the Alarm screen are correct for the range of the program.
Alarm code	<b>alm to host</b>
Description	Reports an error writing an alarm record to the CCS (host).
Defaults	<ul style="list-style-type: none"> <li>• priority: 75</li> <li>• User Interaction Level: not accessible</li> </ul>
Cause	Probable loss of connection to CCS.
Solution	<ol style="list-style-type: none"> <li>1. Check thumbnail on host to ensure connection, if not:</li> <li>2. Check Ethernet connections.</li> <li>3. Check hub(s) are powered</li> </ol>
Alarm code	<b>alm to disk</b>
Description	Reports an error writing an alarm record to the compact flash drive.
Defaults	<ul style="list-style-type: none"> <li>• priority: 75</li> <li>• User Interaction Level: not accessible</li> </ul>
Cause	Possible problem with the drive or communication to it.
Solution	Check storage space on the compact flash drive and the controller.
Alarm code	<b>BOOTUP/zero SRAM BOOTUP (off for x:xx)</b>
Description	Power on boot up message This message cannot be disabled
Defaults	<ul style="list-style-type: none"> <li>• priority: 75</li> <li>• User Interaction Level: not accessible</li> </ul>
Cause	This message displays the length of time that the controller was off for and indicates whether the SRAM was zeroed.  This is a notification message only. No action is required.
Alarm code	<b>Chamber Off</b>
Description	Reports if the main contactor opens, causing the chamber to shut off while a program is running

Defaults	<ul style="list-style-type: none"> <li>• priority: 20</li> <li>• persistent</li> <li>• delay: 60 seconds</li> <li>• User Interaction Level: not accessible</li> </ul>
Cause	Possibly caused by a safety limit or the chamber on/off switch.
Solution	<ol style="list-style-type: none"> <li>1. Verify Start/Stop switch set to ON.</li> <li>2. Check ITSO limits.</li> </ol> <p>Will not appear if SUDLY is off</p> <ul style="list-style-type: none"> <li>• Alarm limit shut down – alarm for limit raised.</li> <li>• Program stopped – no alarm message</li> </ul>
Alarm code	<b>Circulation fan failure (if equipped with monitoring)</b>
Description	The chamber circulation fans have stopped unexpectedly.
Defaults	<ul style="list-style-type: none"> <li>• priority: 20</li> <li>• delay: 30 seconds</li> <li>• persistent</li> <li>• User Interaction Level: not accessible</li> </ul>
Cause	Probable circulation fan problem
Solution	Repair circulating fans as needed.
Alarm code	<b>Could not follow chain: Error opening chain file</b>
Description	The controller could not open the next program in the chain. The current program will continue to run until the chain problem is corrected.
Defaults	<ul style="list-style-type: none"> <li>• priority: 40</li> <li>• persistent</li> <li>• User Interaction Level: not accessible</li> </ul>
Cause	Probable corrupt chain file.
Solution	<ol style="list-style-type: none"> <li>1. Verify/correct the program to be chained to.</li> <li>2. If the program is corrupt, it will need to be recreated.</li> </ol>
Alarm code	<b>Could not follow chain: Error opening program file</b>
Description	The controller could not open the current program to follow the chain. The current program will continue to run until the chain problem is corrected.
Defaults	<ul style="list-style-type: none"> <li>• priority: 40</li> <li>• persistent</li> <li>• User Interaction Level: not accessible</li> </ul>
Cause	Probable corrupt program file.
Solution	<ol style="list-style-type: none"> <li>1. Verify/correct the program to be chained to.</li> <li>2. If the program is corrupt, it will need to be recreated.</li> </ol>
Alarm code	<b>Could not follow chain: Program not compatible</b>
Description	The next program in the chain is not compatible with the controller configuration and cannot be run.

**Appendix B: Alarm Messages**

Defaults	<ul style="list-style-type: none"> <li>• priority: 40</li> <li>• persistent</li> <li>• User Interaction Level: not accessible</li> </ul>
Cause	Program is not compatible, usually because it was created in a previous version of software or was copied from a chamber with a different configuration
Solution	Create a new program on the controller and chain the original program to it.
Alarm code	<b>Data Logging reset &amp; stopped x</b>
Description	1. The data log was reset on boot up and any data in it was lost. x is the actual fault reason code
	Fault Code
	1 The number of log items or the log cycle was out of range
	2 The start time of one or more data blocks was 0 indicating a memory failure.
	3 An item in the log list no longer exists most likely because a change was made to the chamber configuration without zeroing the SRAM
	4 An item index number was out of range indicating a memory failure
Defaults	<ul style="list-style-type: none"> <li>• priority: 75</li> <li>• User Interaction Level: not accessible</li> </ul>
Cause	In most cases this message appears due to changes to controller configuration. In this case the message is a notification only.
Solution	If the message persists, contact Conviron Customer Care.
Alarm code	<b>log data crpt</b>
Description	The system is attempting to log data from a label that was not defined in the configuration software
Defaults	<ul style="list-style-type: none"> <li>• priority: 75</li> <li>• User Interaction Level: not accessible</li> </ul>
Cause	May occur on boot up if the SRAM is corrupt.
Solution	Reboot the controller to clear SRAM.
Alarm code	<b>log to host</b>
Description	An error occurred writing logged data to the host
Defaults	<ul style="list-style-type: none"> <li>• priority: 75</li> <li>• User Interaction Level: not accessible</li> </ul>
Cause	Probable lost connection to CCS
Solution	<ol style="list-style-type: none"> <li>1. Check thumbnail on host.</li> <li>2. Check Ethernet connections</li> </ol>
Alarm code	<b>log data lost: block x lost</b>

Description	Logged data was lost due to an overflow of the data buffer.
Defaults	<ul style="list-style-type: none"> <li>• priority: 75</li> <li>• User Interaction Level: not accessible</li> </ul>
Cause	Controller memory is full. Probable compact flash drive or CCS connection problem.
Solution	<p>The LOOP/NO LOOP setting in the Options screen determines if this message displays. Four settings are possible.</p> <p><b>LOOP, ALARM:</b> (default) Logging is continuous by overwriting the oldest data. An alarm is raised if the controller is unable to transmit data to the compact flash drive or CCS.</p> <p><b>NO LOOP; ALARM:</b> Stop logging to prevent overwriting of data. An alarm is raised if the controller is unable to transmit data to the compact flash drive or CCS.</p> <p><b>LOOP; NO ALARM:</b> Overwrite the oldest data in internal memory. No alarm is raised.</p> <p><b>NO LOOP/ ALARM:</b> Stop logging when internal memory is full. No alarm is raised.</p>
Alarm code	<b>lost power to OP x board y</b>
Description	An AC output board cannot detect power on any output.
Defaults	<ol style="list-style-type: none"> <li>1. priority: 75</li> <li>2. User Interaction Level: not accessible</li> </ol>
Cause	No line power to output board. Possible main contactor or wiring problem.
Solution	<p>If the chamber has Chamber Off detection, this alarm will only be seen if:</p> <ul style="list-style-type: none"> <li>• A program is running</li> <li>• The main contactor is closed</li> <li>• There is no power to an output.</li> </ul> <p>The alarm will not be raised if a fuse on the board blows.</p> <p>If the chamber does not have Chamber Off detection, then:</p> <ol style="list-style-type: none"> <li>1. If there is only one board, check it,</li> <li>2. If all boards but SUDLY, check the SUDLY circuit between the line side of the SUDLY output and the main contactor coil.</li> </ol> <p>If all boards including SUDLY, check Start/Stop switch.</p>
Alarm code	<b>max ret exc get_bd_mem</b> <b>max ret exc set_bd_mem</b>
Description	The controller failed to read or write a byte from an input board, 3 times.
Defaults	<ul style="list-style-type: none"> <li>• priority: 75</li> <li>• User Interaction Level: not accessible</li> </ul>
Cause	These messages indicate a serious hardware problem.
Solution	Contact Convion Customer Care
Alarm code	<b>max ret exc; inp bd x</b>
Description	The controller failed to read or write a byte from an input board, 3 times. Maximum retries exceeded communicating with input board.

**Appendix B: Alarm Messages**

Defaults	<ul style="list-style-type: none"> <li>• priority: 75</li> <li>• User Interaction Level: not accessible</li> </ul>
Cause	This message indicates a serious problem.
Solution	Contact Conviron Customer Care.
<b>Alarm code</b>	<b>max ret exc; out bd x</b>
Description	The controller failed to read or write a byte from an output board or the output board reported a CRC error. Maximum retries exceeded communicating with output board.
Defaults	<ul style="list-style-type: none"> <li>• priority: 75</li> <li>• User Interaction Level: not accessible</li> </ul>
Cause	This message indicates a serious problem.
Solution	Contact Conviron Customer Care
<b>Alarm code</b>	<b>r err; log hand fr sram</b>
Description	The log handler could not read a buffer from SRAM.
Defaults	<ul style="list-style-type: none"> <li>• priority: 75</li> <li>• User Interaction Level: not accessible</li> </ul>
Cause	Possible SRAM corruption.
Solution	Reboot the controller and zero the SRAM.
<b>Alarm code</b>	<b>RH TrcLim Warning x y</b>
Description	<p>The chamber humidity is outside of the tracking limits.</p> <ul style="list-style-type: none"> <li>• x is the value of the limit that was exceeded (humidity set point +/- limit value) at the time of the alarm</li> <li>• y is the actual input value at the time of the alarm</li> </ul>
Defaults	<ul style="list-style-type: none"> <li>• priority: 40</li> <li>• delay: 10 minutes</li> <li>• User Interaction Level: Alarm Screen</li> </ul>
Cause	Possible incorrect settings or equipment problem.
Solution	<ol style="list-style-type: none"> <li>1. Ensure that the limit settings in the Alarm screen are adequate. RH limits must allow a wide tolerance from set point.</li> <li>2. If the settings are adequate, there is a possible equipment failure. Contact Conviron Customer Care.</li> </ol>
<b>Alarm code</b>	<b>RS485 BUS</b>
Description	Reports a failure to communicate on the local IO (RS485) bus.
Defaults	<ul style="list-style-type: none"> <li>• priority: 75</li> <li>• User Interaction Level: not accessible</li> </ul>
Cause	<ul style="list-style-type: none"> <li>• COMMS, Input or Output board failure.</li> <li>• Boards incorrectly pinged.</li> <li>• Bad communications bus cable connection.</li> </ul>

Solution	<ol style="list-style-type: none"> <li>1. Clean and reseal the bus cables and sockets.</li> <li>2. Re-ping I/O boards</li> <li>3. If the error persists, contact Convion Customer Care.</li> </ol>
<b>Alarm code</b>	<b>sync_timeout</b>
Description	No response from the COMMS board to last sync command.
Defaults	<ul style="list-style-type: none"> <li>• priority: 75</li> <li>• User Interaction Level: not accessible</li> </ul>
Cause	This message indicates a serious problem.
Solution	Contact Convion Customer Care.
<b>Alarm code</b>	<b>Temperature Limit Shutdown x y</b>
Description	<p>The chamber has turned itself off because the temperature is outside of the deviation limits.</p> <ul style="list-style-type: none"> <li>• x is the value of the limit that was exceeded</li> <li>• y is the actual input value at the time of the alarm</li> </ul>
Defaults	<ul style="list-style-type: none"> <li>• priority: 20</li> <li>• persistent</li> <li>• delay: 15 seconds</li> <li>• User Interaction Level: normal Alarm Screen</li> </ul>
Cause	Possible incorrect settings or equipment failure
Solution	<ol style="list-style-type: none"> <li>1. Ensure that the limit settings in the Alarm screen are sufficient for the range of the program.</li> <li>2. If they are sufficient, there is a possible equipment failure. Contact Convion Customer Care.</li> </ol>
<b>Alarm code</b>	<b>Temperature TrcLim x y</b>
Description	<p>This is a warning that the chamber temperature is outside of the tracking limits.</p> <ul style="list-style-type: none"> <li>• x is the value of the limit that was exceeded (temperature set point +/- limit value) at the time of the alarm</li> <li>• y is the actual input value at the time of the alarm</li> </ul>
Defaults	<ul style="list-style-type: none"> <li>• priority: 40</li> <li>• delay: 5 minutes</li> <li>• User Interaction Level: normal Alarm Screen</li> </ul>
Cause	Possible incorrect settings or equipment failure
Solution	<ol style="list-style-type: none"> <li>1. Ensure that the limit settings are sufficient.</li> <li>2. If they are sufficient, there is a possible equipment failure. Contact Convion Customer Care.</li> </ol>
<b>Alarm code</b>	<b>Temperature TrcLim Shutdown x y</b>
Description	<p>Reports a condition where the chamber has turned itself off because the temperature is outside of the user tracking limits.</p> <ul style="list-style-type: none"> <li>• x is the value of the limit that was exceeded (temperature set point +/- limit value) at the time of the alarm</li> </ul>

**Appendix B: Alarm Messages**

	<ul style="list-style-type: none"> <li>• y is the actual input value at the time of the alarm</li> </ul>
Defaults	<ul style="list-style-type: none"> <li>• priority: 20</li> <li>• persistent</li> <li>• delay 5 minutes</li> <li>• User Interaction Level: normal Alarm Screen</li> </ul>
Cause	Possible incorrect settings or equipment failure
Solution	<p>1. Check the limit settings to make sure they are sufficient.</p> <p>After shut down on the tracking alarm, the controller will monitor the temperature and will restart the chamber if the temperature is moving towards the set limit. If the temperature is not moving towards the set limit, use one of the following procedures.</p> <p><b>Procedure A:</b> If the temperature exceeded the limit by a small margin, widen the setting so the chamber restarts.</p> <p>If the temperature stabilizes let the chamber run and monitor for problems.</p> <p>If the temperature continues to move away from the set limit, contact Convicon Customer Care.</p> <p><b>Procedure B:</b> If the temperature has significantly exceeded the limit, turn the chamber off and open the doors to let the temperature stabilize to ambient. At ambient temperature, restart the chamber and monitor. (To restart, it will be necessary to either stop and restart the program or cycle the power to the chamber).</p> <p>If the temperature continues to move away from the set limit for more than a minute, contract Convicon Customer Care.</p>
Alarm code	<b>Tracking Alarm Feature Disabled</b>
Description	The tracking alarm disabled via the manual over-ride switch.
Defaults	<ul style="list-style-type: none"> <li>• priority: 60</li> <li>• User Interaction Level: not accessible</li> </ul>
Cause	Disable switch in ON position. This is a notification message only. No action is required
Alarm code	<b>triac on; bd x ch y</b>
Description	A triac that should be powered off is on.
Defaults	<ul style="list-style-type: none"> <li>• priority: 75</li> <li>• User Interaction Level: not accessible</li> </ul>
Cause	Possible defective triac or driver
Solution	Contact Convicon Customer Care
Alarm code	<b>w err; log hand to sram</b>
Description	The log handler could not write a buffer from SRAM.
Defaults	<ul style="list-style-type: none"> <li>• priority: 75</li> <li>• User Interaction Level: not accessible</li> </ul>
Cause	Probable SRAM corruption.
Solution	Reboot the controller and zero the SRAM.



Alarm code	<b>wb &gt; db</b>
Description	The wet bulb temperature of a humidity input is higher than the dry bulb temperature.
Defaults	<ul style="list-style-type: none"><li>• priority: 30</li><li>• User Interaction Level: not accessible</li></ul>
Cause	Probable wet bulb maintenance or possible sensor failure.
Solution	<ol style="list-style-type: none"><li>1. Ensure correct water level in reservoir.</li><li>2. Clean or replace wet sock.</li></ol>

## Appendix C: Features of version 6.2 software

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### User interface

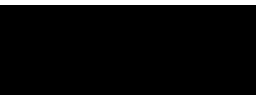
#### Improved look and feel to all user screens

- Color screen.
- Larger, easier to read touch screen.
- Compact flash media.

### Smart features

#### Screen functionality

- The functionality of the screen is faster, easier and more intuitive.
- A set button/keypad replaces the scrolling arrows used in previous versions.



## Appendix D: The Psychrometric chart

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Psychrometrics defines the relationship between air temperature and moisture content and their effect on relative humidity and dew point.

The psychrometric chart graphically represents the relationship of air temperature and moisture content. Developing an understanding of psychrometrics and how to read the psychrometric chart will help you,

- Understand how to recognize and interpret the influence of ambient conditions on chamber operation and achievable humidity range.
- Be aware of the performance capabilities of your chamber.

The Psychrometric chart identifies five values.

1. **Dry bulb temperature** – the air temperature read by a shielded sensor or simply, the air's temperature.
2. **Wet bulb temperature** – a reading based on evaporative cooling effect. To read the wet bulb temperature, cover a sensor using a wick that has been thoroughly wetted and placed in a moving air stream. The cooling effect of the evaporating water causes a lower temperature compared to the dry bulb air temperature.
3. **Dew point temperature** – the temperature at which condensation first begins, as a mixture of air and water vapor is cooled. Above this temperature, the moisture stays in vapor form in the air.
4. **Moisture content** – the amount of water vapour in the air by weight. This is also referred to as the humidity ratio.
5. **Relative humidity (percent saturation)** – the percentage saturation of the air at a given dry bulb temperature. Relative humidity is a relative measure, because the moisture-holding capacity of air increases as air is warmed. In practice, relative humidity indicates the moisture level of the air compared to the air's moisture-holding capacity at the same temperature.

### Using the Psychrometric chart

If you know the dry bulb temperature of the air and *any one* of the other values, you can determine the rest of the values.

Refer to the attached Psychrometric chart. Using the values that you know, locate their intersection on the chart to determine the other values.

### **Example 1**

Determine the relative humidity.

- The dry bulb temperature is 25°C
  - The wet bulb temperature is 20°C
1. Locate the 25° point of the dry bulb temperature on the chart.
  2. Locate the 20° point of the wet bulb temperature on the chart.
  3. Follow the chart lines until they intersect.

From the intersection, follow the chart lines of the other variables to determine their values. The chart indicates that the relative humidity is 63%, the moisture content is 0.0128 kg/kg and the dew point is 16.5°C.

### **Example 2**

Determine the moisture content.

- the dry bulb temperature is 5°C
  - the relative humidity is 60%
1. Locate the 5°point of the dry bulb temperature on the chart.
  2. Locate the 60% relative humidity point on the chart.
  3. Follow the chart lines until they intersect.

From the intersection, follow the chart lines of the other variables to determine their values. The chart indicates that the moisture content is 0.0032 kg/kg, the wet bulb temperature is 3.5°C and the dew point is 2°.

When defining experiment values in the chamber, ensure that the combination of values entered is possible.

By referring to the Psychrometric chart, we can determine for example,

- That the condition of a dry bulb temperature of 30°C with relative humidity of 90% is achievable only with the lights off.
- The combination of a dry bulb temperature of 40°C and 60% relative humidity is not achievable at all.

### **Understanding your chamber's performance capabilities**

A chamber's relative humidity operating range is defined by:

- The chamber's options
- Its physical operation

## Lower limit of operation

- The cooling coil temperature determines the lower limit of operation. The cooling coil usually runs between 4 – 5 degrees colder than the set air temperature.
- If the lights are on in the chamber, the cooling coil runs between 6 –10 degrees colder than the set air temperature.
- Because the temperature of the cooling coil is slightly lower than the temperature of the chamber, the dew point is met and condensation occurs. The result is a dehumidification effect.

**Note:** The coil temperature cannot run below freezing. The condensation will freeze on the coil and result in mechanical failure.

**Note:** This information is accurate assuming that the chamber is equipped with the additive humidification option and is well sealed.

## Lower limit with dehumidification

If your chamber is equipped with a dehumidification option, the lower limit of achievable RH is determined by:

1. The type of dehumidification
  - A coil type dehumidifier is limited by the same factors that affect the chamber cooling coil. The temperature of the cooling coil is slightly lower than the temperature of the chamber. Most importantly, its temperature cannot go below 0°C or it will freeze.
  - A desiccant type or chemical dryer is not affected by temperature but is limited by the amount of moisture that the desiccant can absorb. These types of dryers come in a variety of sizes, so this limitation can be accommodated.
2. Ambient conditions and the amount of ambient air infiltrating the chamber.
  - In this case, assume the ambient conditions have a humidifying effect. It is a matter of the dehumidifier's ability to remove moisture versus the amount of moisture introduced through fresh air.

## Upper limit of operation

The upper limit of operation is determined by the effectiveness of the additive humidity devices (such as spray nozzles), and the cooling coil temperature.

- The warmer the air, the more moisture it can hold. However, there are physical limitations to how much moisture can be injected and absorbed into the air. The temperature of the cooling coil is slightly lower which causes moisture to be condensed out of the air.
- If the fresh air and exhaust ports are open to allow air and CO<sub>2</sub> exchange with ambient, the conditions of the ambient air will affect the operational limits of the chamber.

- The RH% of the ambient air is not valid in determining the effect, unless the ambient temperature is the same as the chamber temperature, because this is percentage saturation at a given temperature.

### **Determining moisture content**

Refer to the psychrometric chart to determine the moisture content of the ambient air and of the air inside the chamber.

- If the ambient air has lower moisture content than the air inside the chamber, it will create a dehumidifying effect.
- If the ambient air has higher moisture content than the air inside of the chamber, it will create a humidifying effect.
- At normal operating and ambient temperatures, the humidifiers in the chamber can compensate for most dehumidifying effects.
- If the chamber's operating temperature is low, the additive humidity effect of the ambient air at normal temperatures will create a very high resultant RH inside the chamber.
- If the chamber's operating temperature is high, the dehumidifying effect of the ambient air at normal temperatures will limit the chamber's ability to achieve high RH values.





If the chamber does not have any additive humidification or dehumidification options, the RH % inside the chamber is entirely dependent on the operating temperature of the cooling coil and more importantly, the ambient condition, (as some air infiltration always occurs).

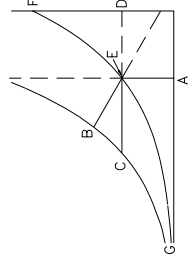
# PSYCHROMETRIC CHART

WITH HUMIDITY CONTROL LIMITS FOR CONVIRON CHAMBERS (EMPTY)

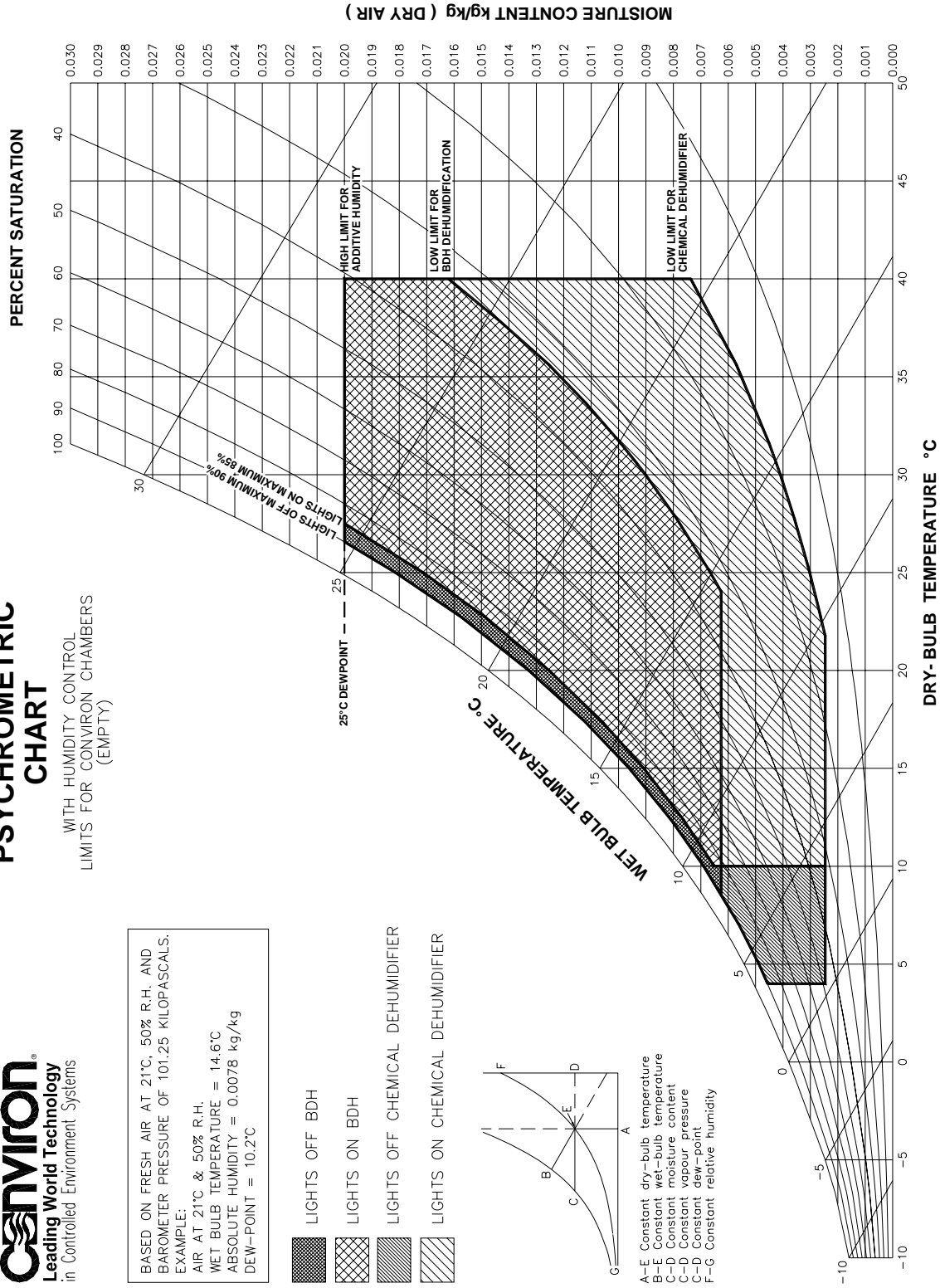


BASED ON FRESH AIR AT 21°C, 50% R.H. AND BAROMETER PRESSURE OF 101.25 KILOPASCALS.  
 EXAMPLE:  
 AIR AT 21°C & 50% R.H.  
 WET BULB TEMPERATURE = 14.6°C  
 ABSOLUTE HUMIDITY = 0.0078 kg/kg  
 DEW-POINT = 10.2°C

-  LIGHTS OFF BDH
-  LIGHTS ON BDH
-  LIGHTS OFF CHEMICAL DEHUMIDIFIER
-  LIGHTS ON CHEMICAL DEHUMIDIFIER



A-E Constant dry-bulb temperature  
 B-E Constant wet-bulb temperature  
 C-D Constant moisture content  
 C-D Constant vapour pressure  
 C-D Constant dew-point  
 F-G Constant relative humidity



MOISTURE CONTENT kg/kg ( DRY AIR )

PERCENT SATURATION

DRY-BULB TEMPERATURE °C

WET BULB TEMPERATURE °C

25°C DEWPOINT --- 25  
 LIGHTS OFF MAXIMUM 85%  
 LIGHTS ON MAXIMUM 90%

HIGH LIMIT FOR ADDITIVE HUMIDITY

LOW LIMIT FOR BDH DEHUMIDIFICATION

LOW LIMIT FOR CHEMICAL DEHUMIDIFIER

## Glossary

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<b>Button</b>	<p>An active spot on the screen that performs an action when touched.</p> <p>Buttons on the CMP5090 screens contain text or icons.</p>
<b>CCS</b>	<p>Acronym for <i>Central Control System</i>.</p>
<b>Cell</b>	<p>The individual entry points in the program table defined by the intersection of any row (timeline) and any column (zone).</p>
<b>Central Control System (CCS)</b>	<p>A remote control and monitoring system available for chambers with CMP5090 controllers. Contact your Convion sales representative for more information.</p>
<b>Chaining</b>	<p>The process of linking programs to run sequentially. If a program is not chained to another program or to itself, it will stop running at midnight.</p> <p>Chaining a series of different programs together is referred to as a multi-day program.</p> <p>A program chained to it will run continuously and repeat the same program every 24 hours.</p>
<b>Chamber</b>	<p>The entire unit is called the chamber. Parts of the chamber include the control screen, the electrical panel, the refrigeration system and the plant growth area.</p>
<b>Controller</b>	<p>The device that sets and records the conditions in the plant growth area according to a user created program. The CMP5090 is the most recent controller model.</p>
<b>Field</b>	<p>An area on the screen where data is displayed or is entered.</p>
<b>Host</b>	<p>Another term for the Central Control System. It is more commonly used in alarm messages and technical documentation.</p>
<b>Icon</b>	<p>A graphical symbol.</p>
<b>Outputs</b>	<p>Switches that control specific devices or conditions within the chamber.</p>
<b>Plant growth area</b>	<p>The environmentally controlled section of the chamber.</p>



<b>Program</b>	<p>One or more timelines that create conditions in the growth area during a 24-hour period. The timelines entered into the Program Table indicate program conditions to the computer. A multi-day program is a series of different programs, chained together.</p> <p>An optional compact flash drive or host CCS may also be used to store programs.</p>
<b>Program table</b>	<p>The series of columns and rows used for entering program timelines on the Program screen.</p> <p>The intersection of a row and a column is a cell.</p>
<b>Ramping</b>	<p>When conditions change gradually and steadily between timelines. The CMP5090 works in ramping mode.</p>
<b>Timeline</b>	<p>Any single row in the program table that contains a setting or settings that define conditions in the plant growth area. For example, temperature and relative humidity.</p> <p>One or more timelines make up a program.</p>
<b>Toolbar</b>	<p>A series of buttons that usually displays at the top of a screen. The buttons provide shortcuts to specific functions such as on-line help, security and exit.</p>
<b>Zone</b>	<p>An area of the chamber that is independently controlled or monitored.</p>

