Leading World Technology
in Controlled Environment Systems

Conviron CMP4030

User Guide

For controllers using:

- Version 6.0 software
- Independent temperature shut-off (ITSO)
- External battery

This Guide belongs to: _____

ISO
9001
Certified

Published by
Controlled Environments Limited
590 Berry Street
Winnipeg. Manitoba. Canada
R3H 0R9

November 2002

Safety for you and the equipment

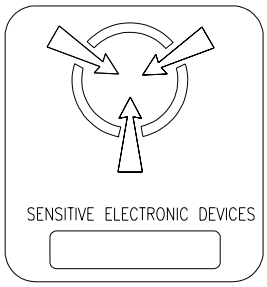
Your safety

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 but this voltage 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 Conviron 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 5 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 (3) minutes after completing any procedure before turning off the controller.

Wait at least 10 seconds before turning the controller on again.

User Guide Table of Contents

Index

Chapter 1: The CMP4030

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

- starting the controller
- setting up programs
- logging data
- understanding and managing alarms
- performing simple troubleshooting and maintenance tasks

Contents

Chapter 4: Alarm Management

This chapter describes:

- the function of alarms in a program
- how to set alarms
- how to respond to alarms

Chapter 5: Security

This chapter describes

- log in procedures
- security

Chapter 6: Setting Options and Logging Data

This chapter describes

- the Options screen
- the Trendgraph screen
- options for logging data
- options for viewing collected data

Chapter 7: Maintenance and Troubleshooting

This chapter describes

- starting the CMP4030 after a power outage
- how to use the diagnostic screen
- basic problem solving

This manual also contains a glossary and four appendices.

Appendix A – Labels

Appendix B – Alarm Messages

Appendix C – Features of Version 6.0 Software

Appendix D – The Psychrometric Chart

Features of Version 6.0 Software

Boot up	• boot up is faster than in previous versions
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
Alarms	• alarms have enhanced error reporting and display user friendly messages
Options	• the control of humidification and the defrost operation have been enhanced • time can be adjusted without losing data
Programming	• a program now maintains the current condition if it is unchained or if the next program in the chain is corrupt
Security	• creating and managing security ID's is more straightforward and the entire process is completed on one screen
Trendgraph	• data is traced on screen many times faster than in previous versions

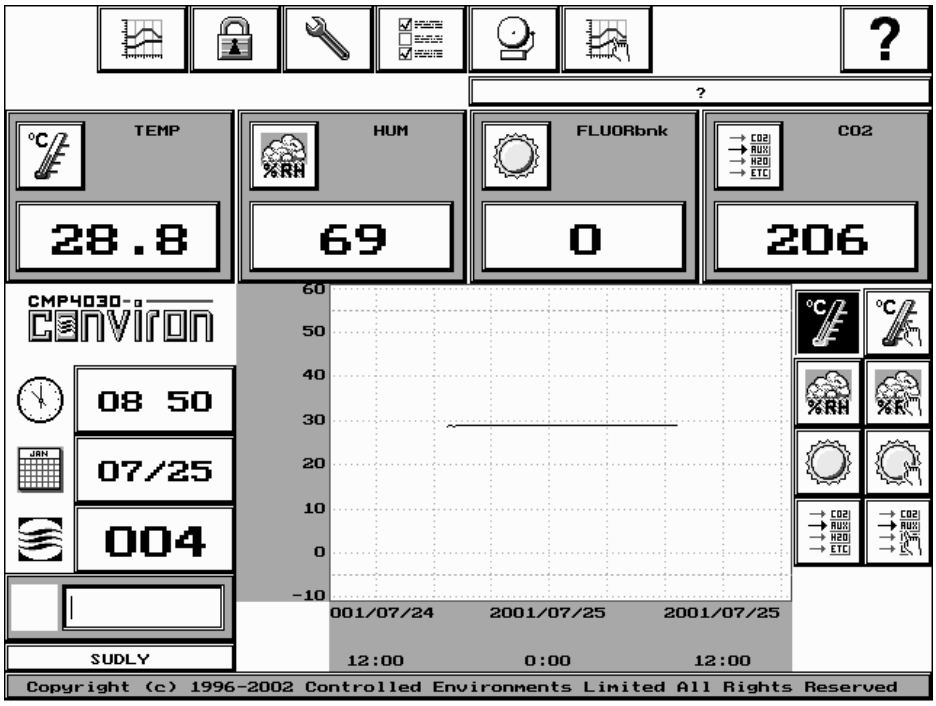
See Appendix C for a complete list of V6.0 features.

Features of the CMP4030

The CMP4030 Local Control System (LCS) is used to control the plant growth chamber. The 'brain' of the LCS is the Version 6.0 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 controls
- assist qualified personnel to service the chamber
- control temperature
- control lighting
- control relative humidity

The screen measures 210mm 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 Disk

Programs can be saved on disk and copied for use with other chambers. The chamber must be equipped with a disk 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®.

Expandability

The CMP4030 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 Conviron Customer Care.

Security

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

Memory-loss Cautions

Memory-loss hazard:

A continuous supply of electricity to the controller is essential to preserve its memory. If memory is lost, the controller will not function and cannot be repaired.

An external battery provides backup when the regular power supply is unavailable. To ensure that the external battery has power, replace it every 5 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.

Conviron's Technical Support

> **Important**:
> When contacting Conviron 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@conviron.com

Conviron Customer Care

Toll free in North America	1-800-363-6451
Regular telephone	1-204-786-6451
Fax	1-204-783-7736
E-mail	service@conviron.com
	euroservice@conviron.com
Web address	www.conviron.com

Chapter 2: The Status Screen

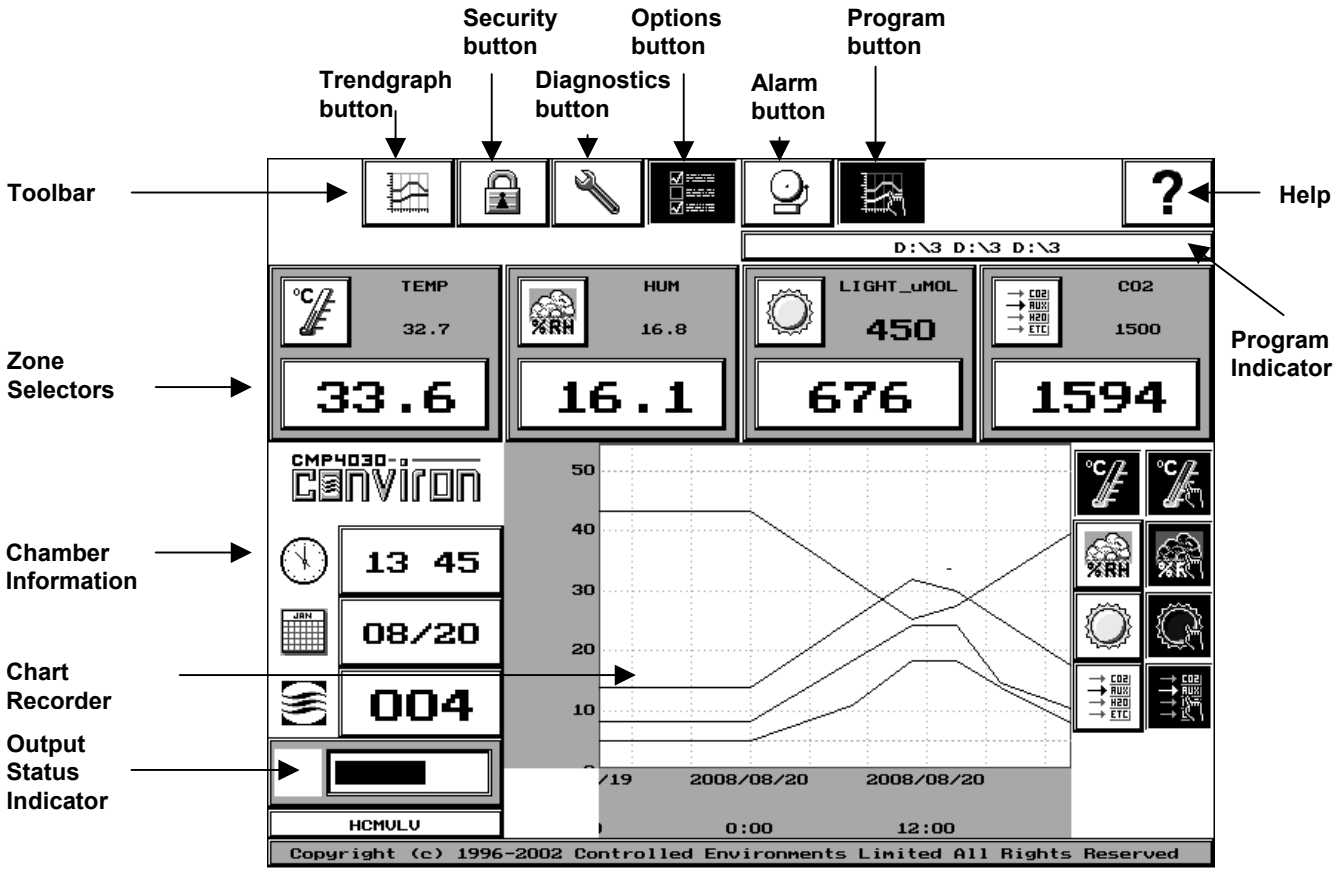
The Status screen provides a comprehensive overview of the chamber's current program and conditions.

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 CMP4030 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 gray areas.
- If a zone does not have a program setting but is being monitored, the condition will be displayed in both the gray 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 — Displays chamber temperatures in degrees Celsius.

(TEMP) Zone Selector

- The default reading, TEMP, is the control zone.
- 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.

Relative Humidity (HUM) Zone Selector

Displays the relative humidity percentage.

- The default reading, HUM, is the control zone.
- This feature is valid only if the chamber is equipped with additive humidity and/or dehumidification.
- 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.

Lighting Zone (LIGHT_uMOL) Selector

Displays values in banks, percentage of full power, or in units such as micromoles (μmol), 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.

CO2 / Auxiliary (CO2) Selector (optional)

Displays one of the following depending on chamber options:

- CO_2 concentration, in parts per million, in the plant growth area.
- An auxiliary on-off event
- Other chamber parameters

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, chamber number and output status.

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:

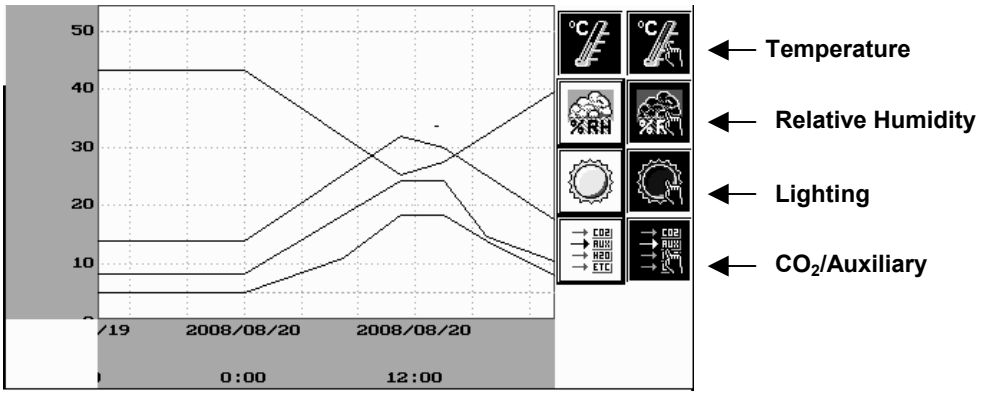
temperature

relative humidity

lighting

CO_2 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_2 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_2 or auxiliary program

The Chart Recorder displays thirty-two 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 by 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

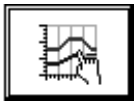
This chapter introduces procedures for programming the CMP4030 using the Program screen.

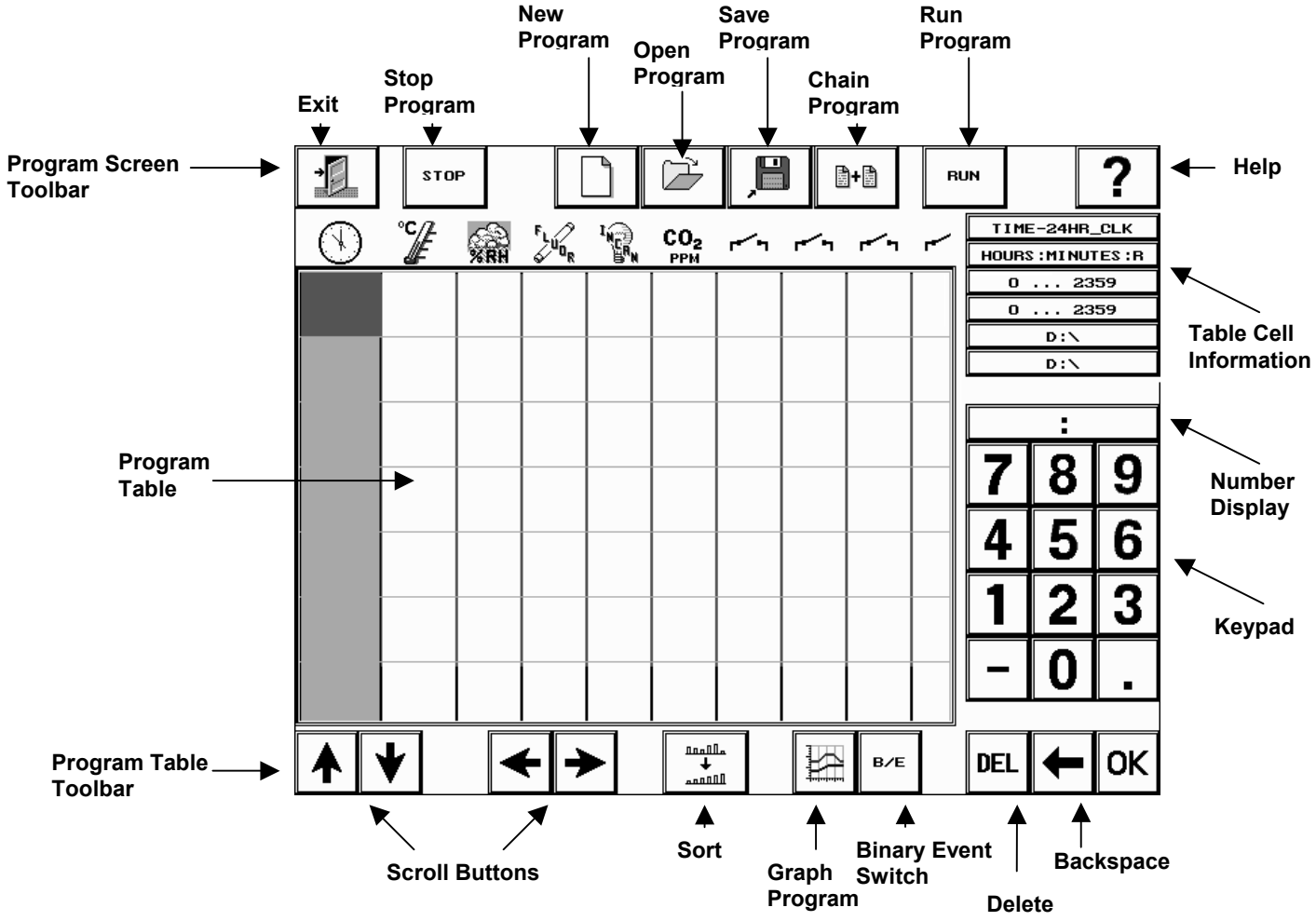
The settings entered in the Program screen control conditions in the plant growth chamber.

This chapter describes:

- The Program screen and toolbar
- Programming the CMP4030
- Multi-day programming
- Managing programs
- How to program auxiliaries

The Program Screen

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.



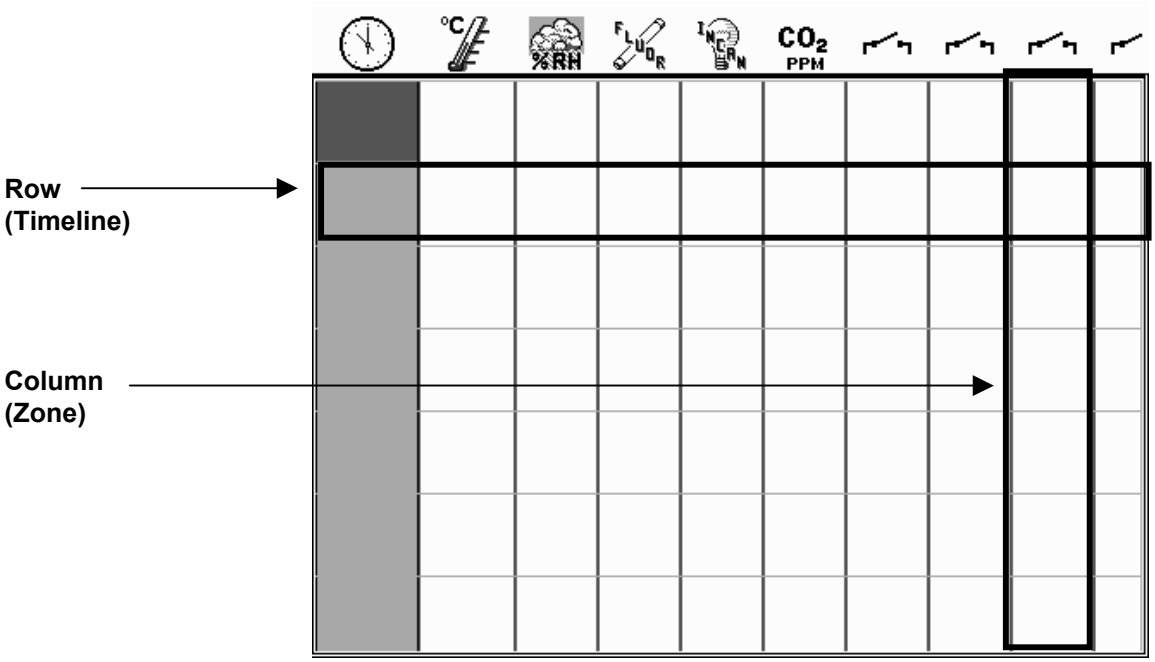
Program Screen Fields

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^2/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_2 in parts per million

Timer – The timer, in seconds.

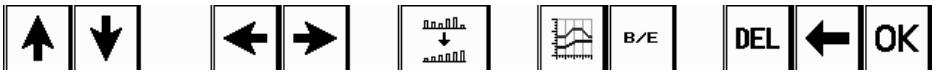
Speed control or intensity –The percentage of full power, usually for fan speed control.

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

Program Screen Toolbar

Exit button	Touch the Exit button to return to the Status screen.
Stop Program button	Touch the Stop Program button to stop a running program.
New Program button	Touch the New Program button to clear the current program table and open a new program table.
Open Program button	Touch the Open Program button to open an existing program.
Save Program button	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.
Chain Program button	Touch the Chain Program button to link the program to another program. **This procedure is required to make programs run continuously**. If a program is not chained, it will stop at midnight.
Run Program button	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.
Help button	To access on-line help, touch the Help button, then the field or button for which help is required.

The Program Table Toolbar



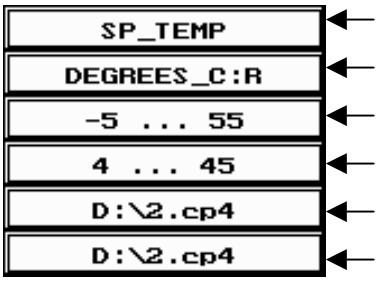
Up/Down Scroll	Use to move the program table up or down.
Left/Right Scroll	Use to move the program table left or right.
Sort	Touch to sort timelines chronologically. When a program is saved, timelines sort automatically.
Graph Program	Touch to view a graph of the program for the active zone.
Binary/Event 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.



Label

Active Cell Units

Active Zone Alarm Limit Range

Active Zone Operating Range

Current Program Path and Number

Chained Program Path and Number

Label	Indicates the label for the active zone
Active Cell Units	Indicate the unit of measurement and mode of operation for the active zone. There are four modes of operation: R, S, B and E.

Ramp – The state changes gradually between timelines

Step – The state changes instantly between timelines

Binary – Auxiliary operates in On/Off mode.

Event – Auxiliary cycles on for a specified period of time.

Active Zone Alarm Limit Range	Displays the range of settings for the alarm limits that apply to the active zone.
Active Zone Operating Range	Displays the chamber operating range for the active zone.
Chained Program Path and Number	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_2, operate in ramp mode. For example, in the graphed program below, the chamber temperature gradually rises from 10º at 0:00 until it reaches the 20º at 9:00.

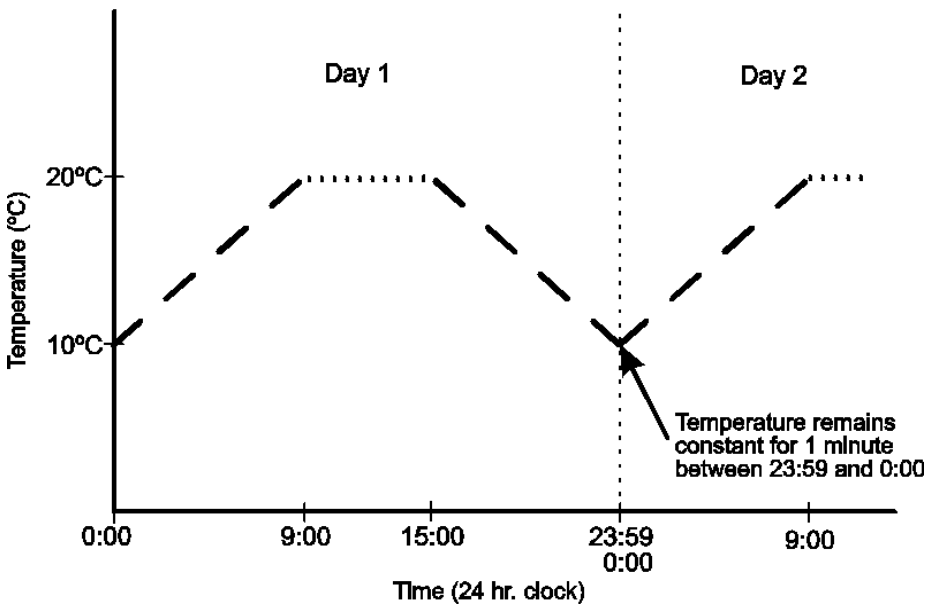
Note: The CMP4030 does not automatically ramp across midnight because it does not read the next day's program. Instead, the controller runs the conditions in the last program timeline until midnight.

When one program ends and the next program begins (at midnight), the CMP4030 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,

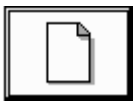
- Start programs at 0:00 and end them at 23:59
- Program interim settings

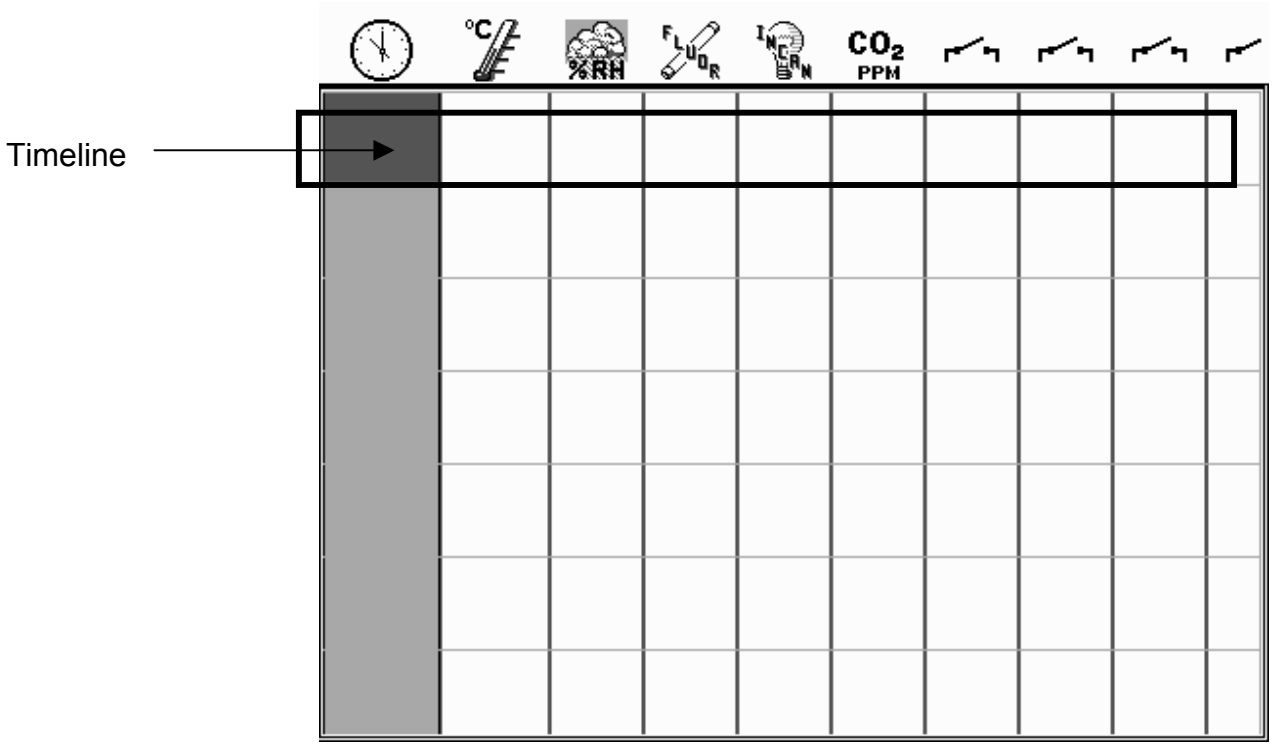
Time	Temp
0:00	10º
9:00	20º
15:00	20º
23:59	10º



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

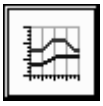
1. **Touch the first cell** in the timeline to be deleted**.**
2. **Touch the DEL button** in the keypad. The contents of all cells in the timeline will be cleared.

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

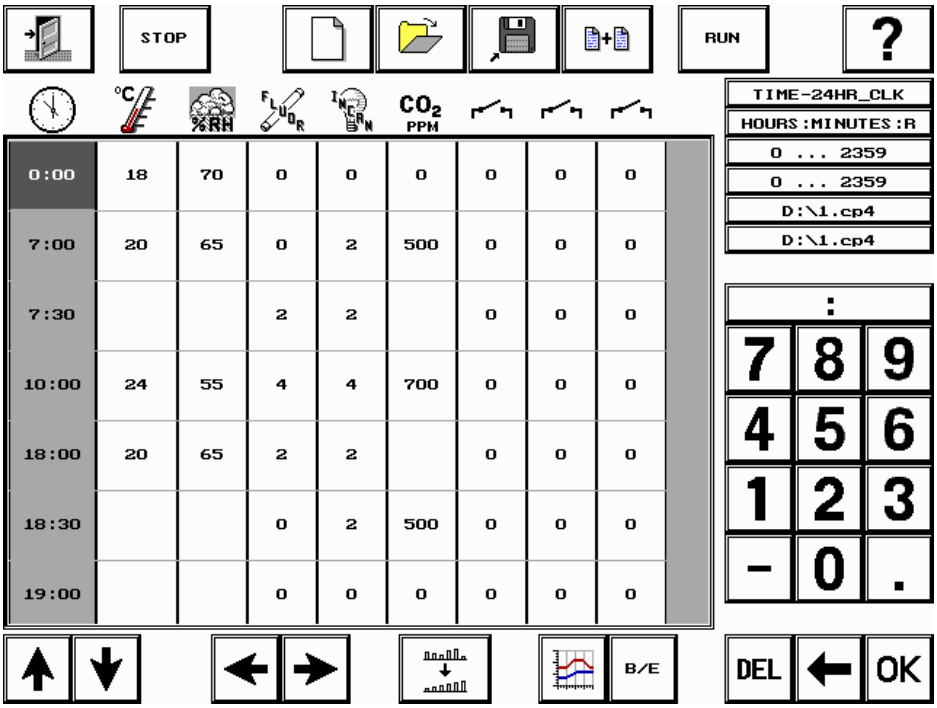
After the timelines have been entered, verify the program by viewing the zones graphically.

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.



Temperature

- Midnight (0:00) – Temperature in the growth chamber is 18º C
- 7:00 – Temperature has risen to 20º C
- 10:00 – Temperature has risen to 24º C
- 18:00 – Temperature has fallen to 20º 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 – Two levels of fluorescent and incandescent lights come on
- 18:30 – All fluorescent lights shut off, CO_2 level is set to 500 ppm
- 19:00 – All incandescent lights shut off, CO_2 level is set to 0 ppm

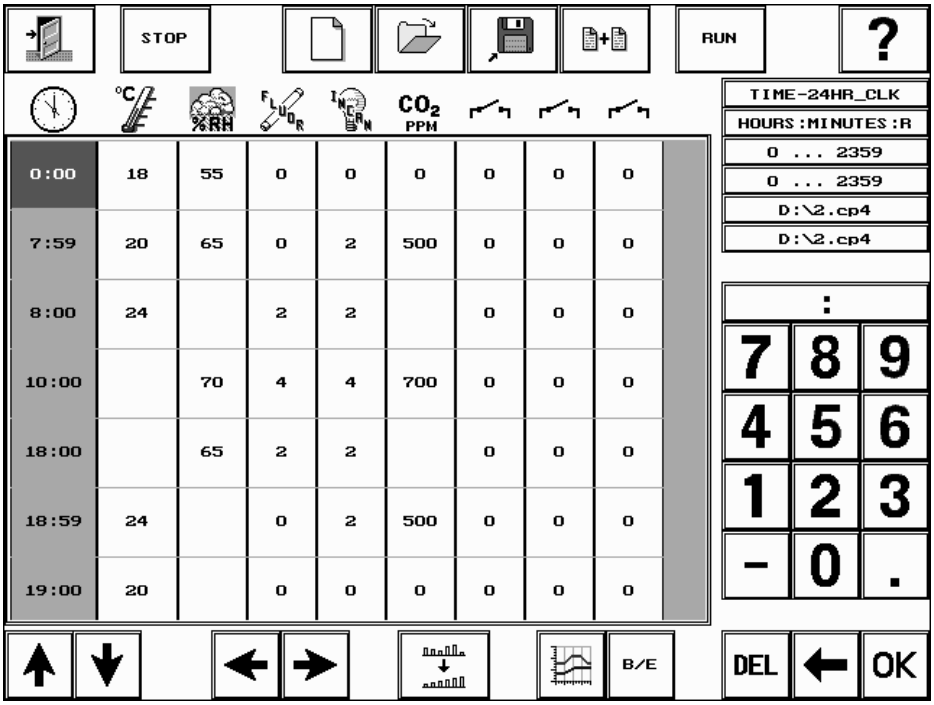
Note: Some cells have been left blank so that zones that are ramping are not affected when the conditions of other zones adjust.

Sample Program 2: Programming in Step Mode

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.

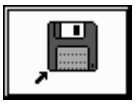
For example, to have the temperature in the chamber rise four degrees at 8:00, then fall four degrees at 19:00 (7:00 pm), program as follows.

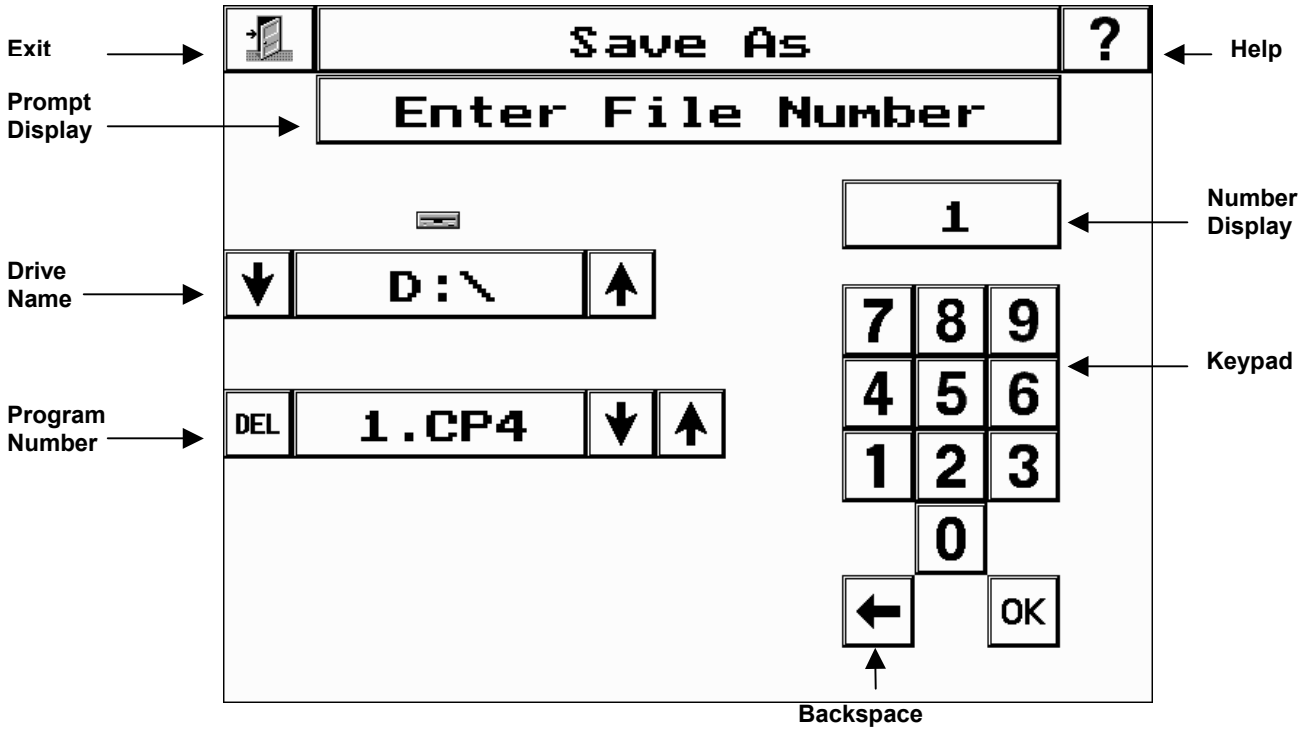
Note: Programming in step mode is more likely to cause alarms due to conditions temporarily overshooting alarm limit settings for the zone. We recommend that the limits be increased if a step program is used.



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

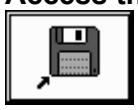
To access the Save Program screen, touch the Save Program  button in the Program toolbar.



Save Screen Fields

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.
Prompt Display	Provides prompts to assist the user.
Drive Name	Displays the currently active drive • C:\ or D:\ for internal storage (depending on hardware) • B:\ for a floppy disk drive. The B:\ drive is valid for controllers with a floppy disk drive. Touch the arrow buttons to select the drive at the prompt.
Program Number	Touch the arrow buttons to view existing file numbers on the selected drive and display them in the number display field.
Number Display	Displays the same file number as in the Program Number field. Displays the file number entered when the keypad is used.
Keypad	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 (C:\ or D:\)
   - To save programs to the floppy disc drive (FDD), use the arrow keys to select B:\.

   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

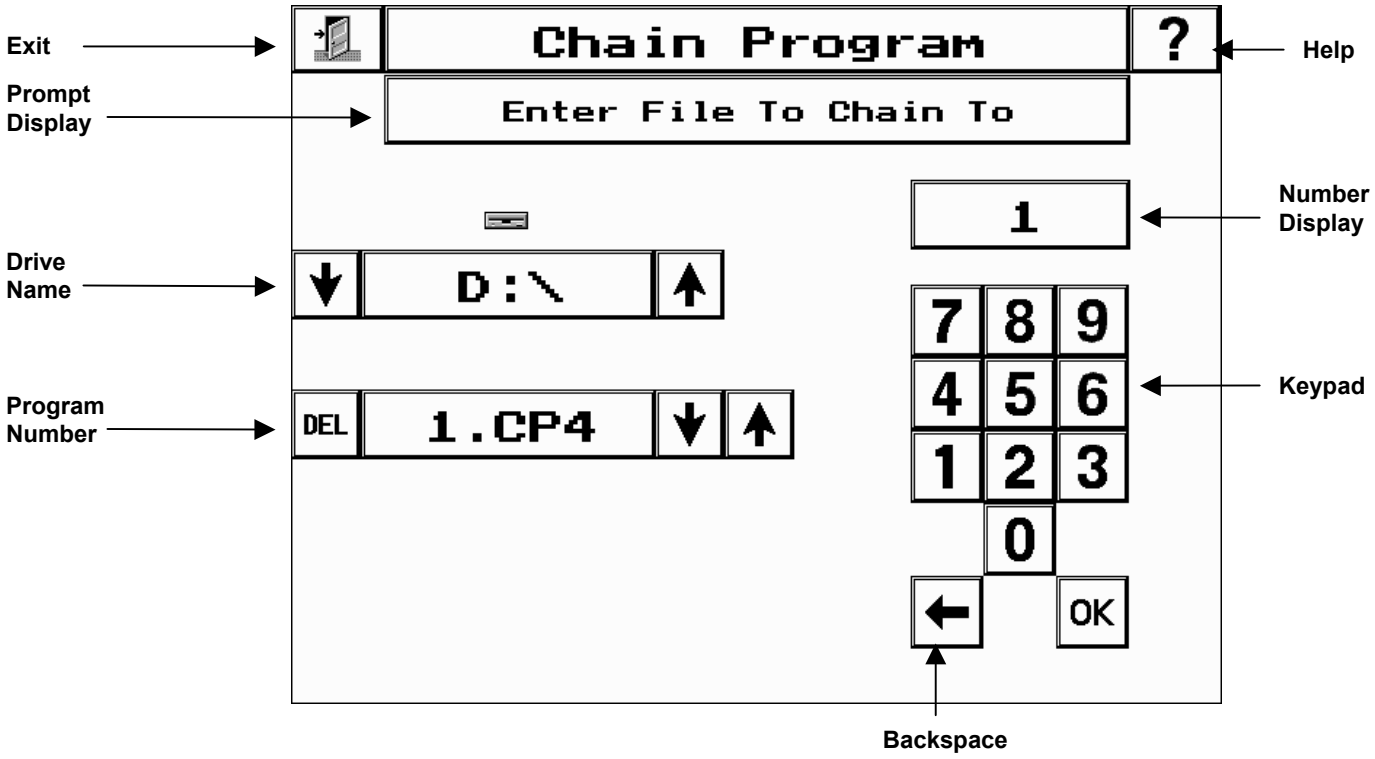
The Chain Program screen provides the facility to create programs that can run with different conditions over multiple days.

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 floppy disk 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.
Prompt Display	Provides prompts to assist the user.
Drive Name	Displays the currently active drive • C:\ or D:\ for internal storage (depending on hardware) • B:\ for a floppy disk drive. The B:\ drive is valid for controllers with a floppy disk drive. Touch the arrow buttons to select the drive at the prompt.
Program Number	Displays the number of the selected program.
Number Display	Displays the numbers entered when the keypad is used.
Keypad	Use the keypad to enter the chain number.
Backspace	Touch the Backspace key to clear a digit.
OK	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.

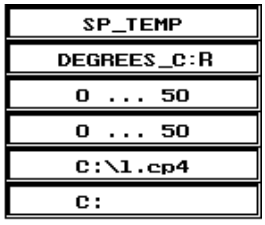
1. Ensure that the program to be chained is displayed on the Program Screen.
2. **Touch the Chain Program button** in the Program toolbar. The Chain screen will display. The message in the Prompt display field will read: *Enter file to chain to:*
3. **Enter the program number** using the keypad.
4. **Touch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

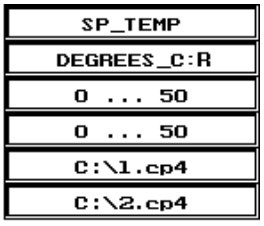
Chaining Several Programs

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.



before Chaining



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.

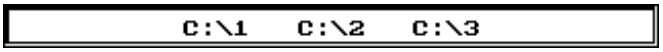
4. Running a Chained Program

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 C:\ and program 1 is chained to itself.

- The program below is stored on C:\ 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.

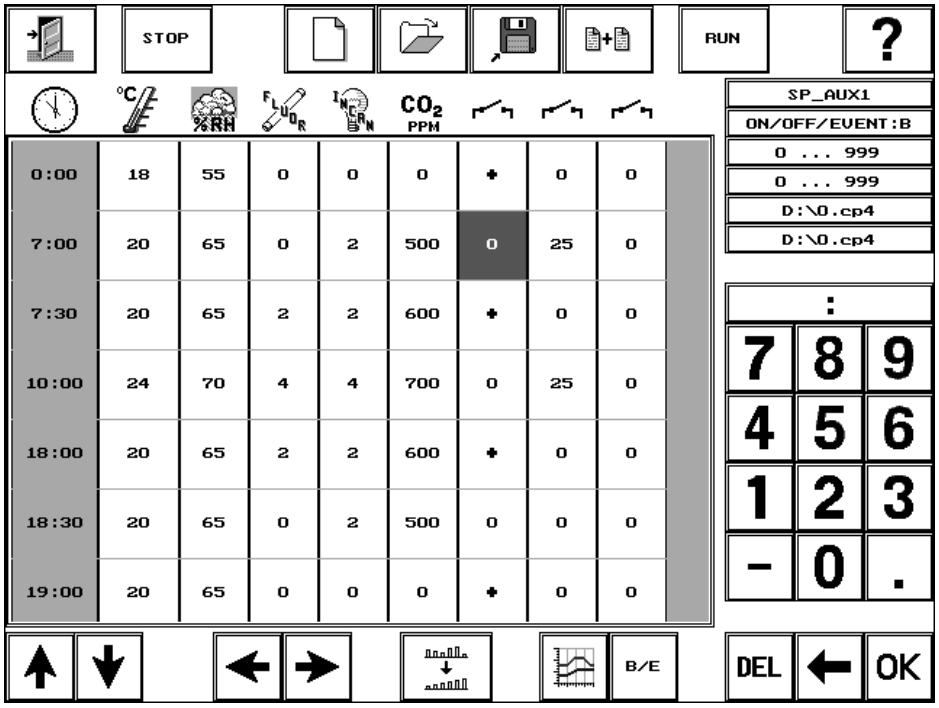
   Note: All timelines in an auxiliary zone must be in the same mode. Different auxiliary zones can operate in different modes.

Auxiliary Program Example

The graph 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.
- 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.



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

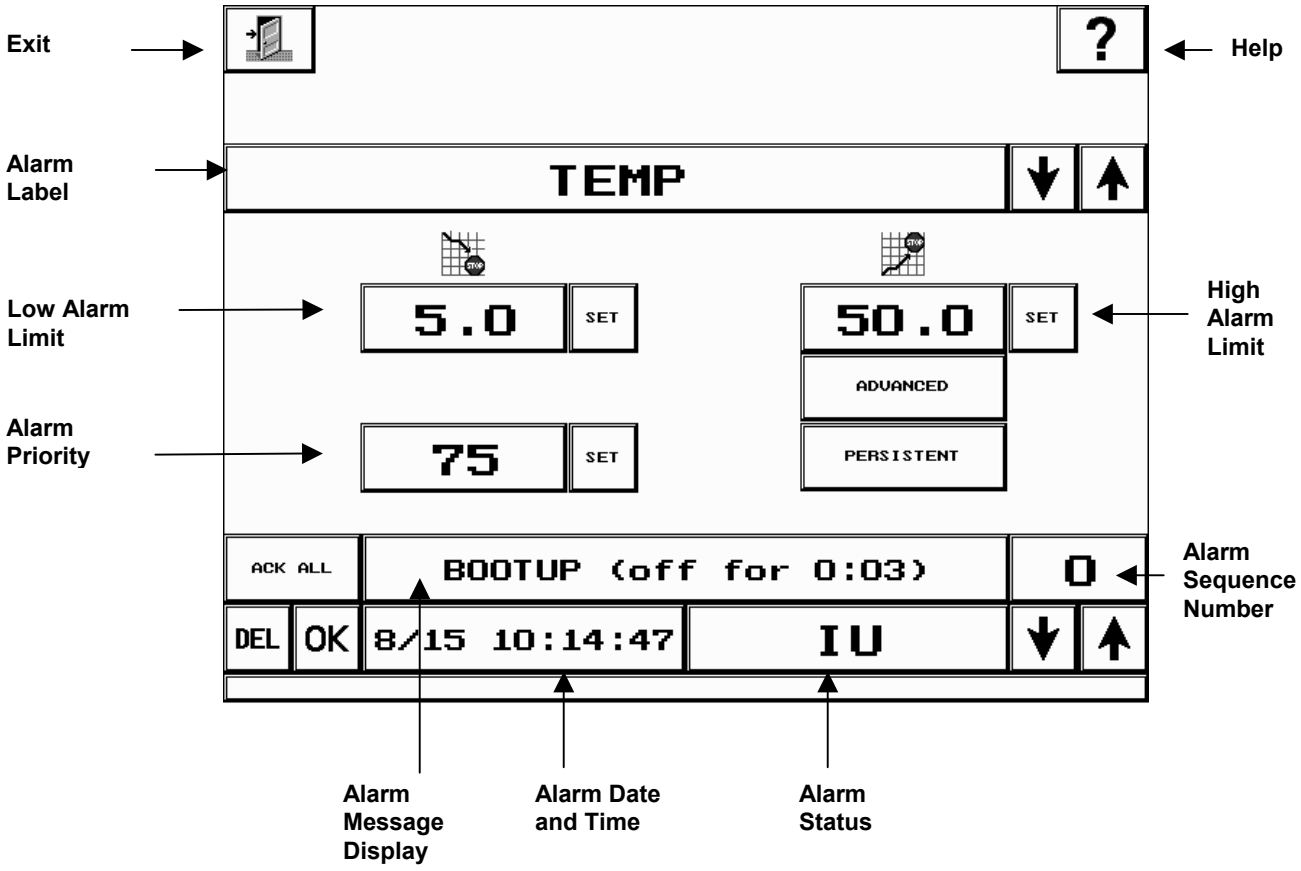
Chapter 4: Alarm Management

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 user with ample time to systematically shut down the chamber so that an error affects the research as little as possible.

The Alarm Screen

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



Alarm Screen Fields

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

Alarm Options

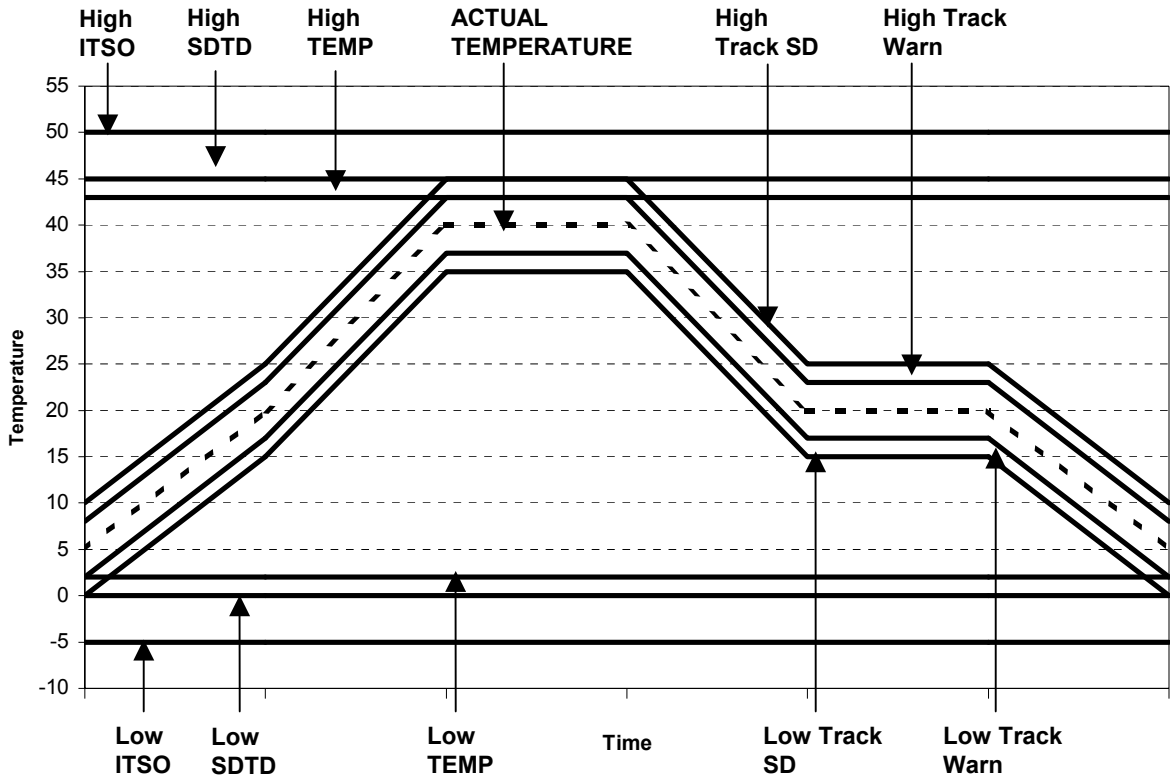
Two types of program alarm options are available, Deviation and Tracking.

- Deviation alarms set upper and lower limits that apply to the entire program.
- 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.
- Both alarms include a preliminary warning and shutdown settings.

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

The chart below displays various temperature alarms and possible settings.

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



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**:

   New with Conviron's Version 6.0 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
21 – 40	High	Alarm button, lamp, buzzer
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 CMP4030 controller or as an indication that the ITSO (independent temperature shut-off) has shut off the chamber. For more information on the ITSO, refer to page 8 of this chapter.

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.
    - All Alarms can be deleted. However, active Alarms immediately recur.
    - 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 Conviron Technical Support should set parameters. Contact Conviron Customer Care for more information.

Technical Support

For technical support, contact your local technicians.

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

Conviron Customer Care

Toll free in North America	1-800-363-6451
Local telephone	1-204-786-6451
Fax	1-204-783-7736
E-mail	service@conviron.com
	euroservice@conviron.com
Web address	www.conviron.com

Chapter 5: Login and Security Procedures

CMP4030 Security Procedures

The CMP4030 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.

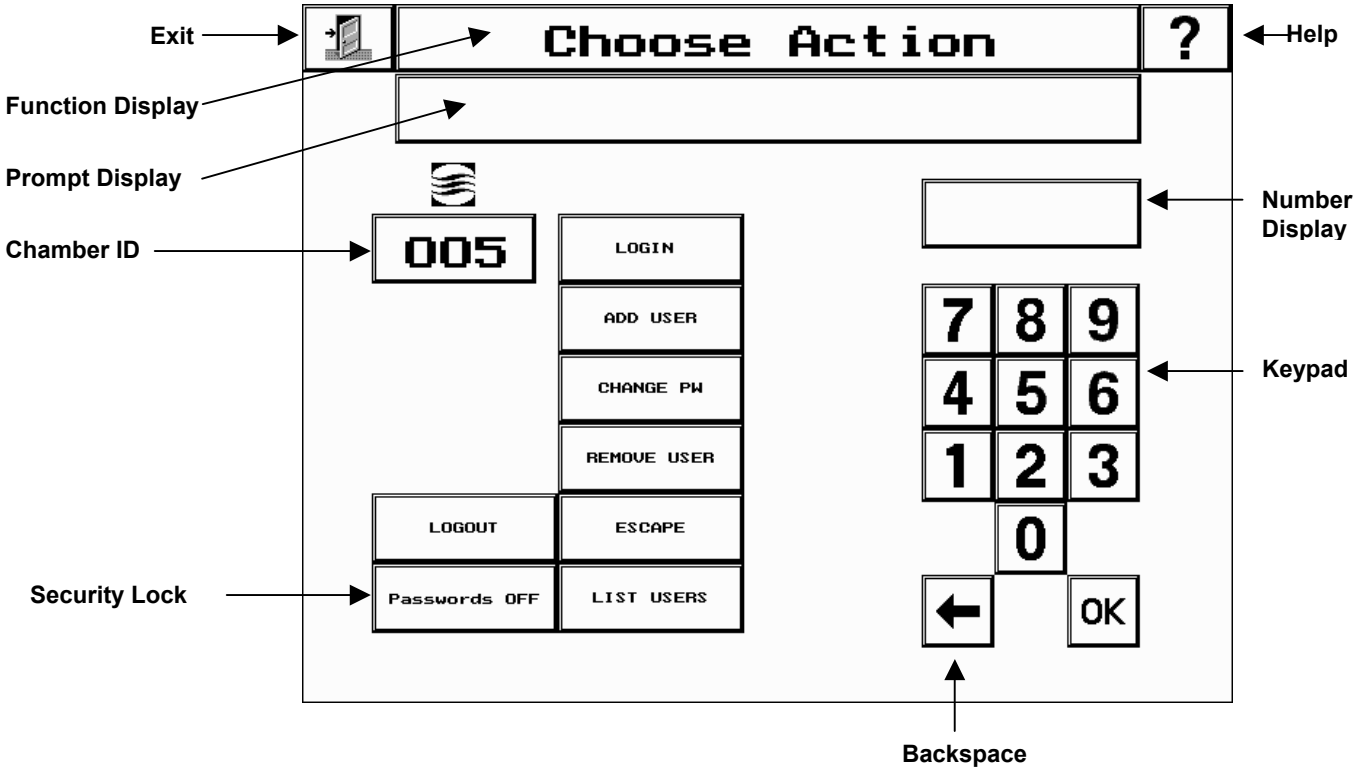
We recommend that a security administrator be assigned to administer user login authority and that security features are added as soon as possible.

This chapter describes:

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

The Login Screen

To access the Login screen, touch the Security  button in the Status toolbar.



Login Screen Fields

Exit button	Touch the Exit button to close the Login screen and 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.
Function Display	This field displays the function selected.
Prompt Display	Provides prompts to assist the user.
Chamber ID	This field displays the chamber ID. The Chamber ID identifies the chamber to the CCS if installed on a network.
Login button	Touch this button to start the login process.
Add User button	Touch this button to add a new user to the system. This feature is used most often by the security administrator.
Change Password (PW) button	Touch this button to change a password.
Remove user button	Touch this button to remove a user from the system.
Logout	Touch this button to log out the current user ID.
Escape	Touch this button to stop the current procedure.
Security Lock	A binary button used to turn security on or off. Once security is on, only a user with the correct security level can turn if off.
List Users	Touch this button to view a current list of users that have access to the system.
Keypad	As numbers are entered using the keypad, they will display in the Number Display field.
Backspace button	Touch the Backspace key to clear a digit.
OK	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 also 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* and you will have access to the CMP4030 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 Status screen will appear and 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

Security Level	Provides Access to:
10	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.
20	Program screen
	Program Graphing screen
	Deleting alarms
	Changing alarm settings, priority and persistence
	Options screen, excluding setting chamber ID, which requires security level 30.
30	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 *Access Denied.*

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, and LIST USERS buttons function
- The ADD USER, CHANGE PW, REMOVE USER, and ESCAPE buttons do not function
- User ID's cannot be added until PASSWORDS ON is selected.

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 ID 40 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, enter a new password (between 1– 8 digits)
   - 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 Conviron. 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.

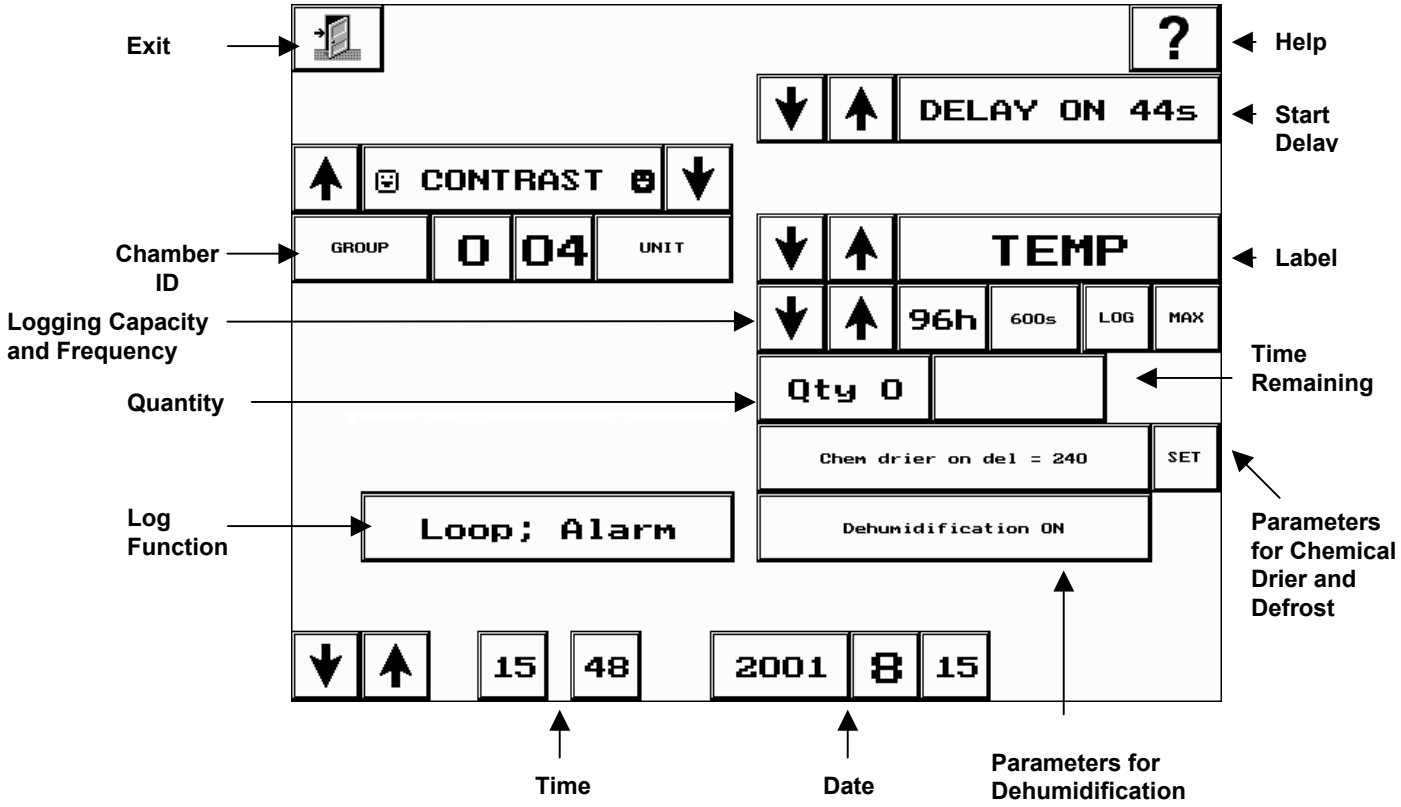
The logging feature provides a record of chamber conditions throughout the experiment.

The Options screen allows the user to:

- enter or adjust system settings
- set logging data options
- set the chamber ID

The Options Screen

To access the Options screen, touch the Options button in the Status toolbar.



Options 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.

Contrast and Brightness

Location of the Brightness controls depends on controller model.

The V1 and V2 hardware (displayed in the diagram on page 2), do not have outboard controls so contrast must be set using the on-screen control. Touch the arrows to adjust contrast.

V3 and later hardware is equipped with outboard contrast and brightness controls so this feature does not appear on screen.

Ambient temperature can affect the brightness of the controller screen. Use the brightness controls to make adjustments.

Chamber ID

The Chamber ID identifies the chamber to the Central Control System (CCS). The ID is comprised of Group and Unit numbers

	System (CCS). The ID is comprised of Group and Unit numbers. Group number – may be used to identify a group of chambers by a common trait such as room, floor or owner. Unit number – indicates the number of the individual chamber in the group.
Log Function button	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.
Start Delay	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.
Label	This field displays the label for which logging options are currently being set.
Logging Capacity and Frequency	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. 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.
Quantity	The Qty field shows the number of items selected to log.
Chemical Drier and Defrost	The Chemical Drier parameter button is used to make adjustments to the additive humidity and dehumidification. The Defrost parameter button is used to make adjustments in the defrost cycle.
Dehumidification	The Dehumidification On/Off button allows this feature to be turned off when it is not required.
Time Remaining	The Time Remaining field displays in hours, the amount of logging time left on the floppy disk. This field is valid only if the unit is equipped with an FDD.
Time	Displays the time in a 24-hour format.
Date	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 – 7.
   - 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 – 30.
   - 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 multiple start up 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.

Consult Conviron Customer Care before adjusting these settings.

Setting the Chemical Drier

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 Conviron Technical Support. Contact Conviron 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.

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 an FDD or connected to a CCS, automatically download data to those devices. Setting the appropriate log function is important should one of these devices fail.

Settings	**System Response**

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

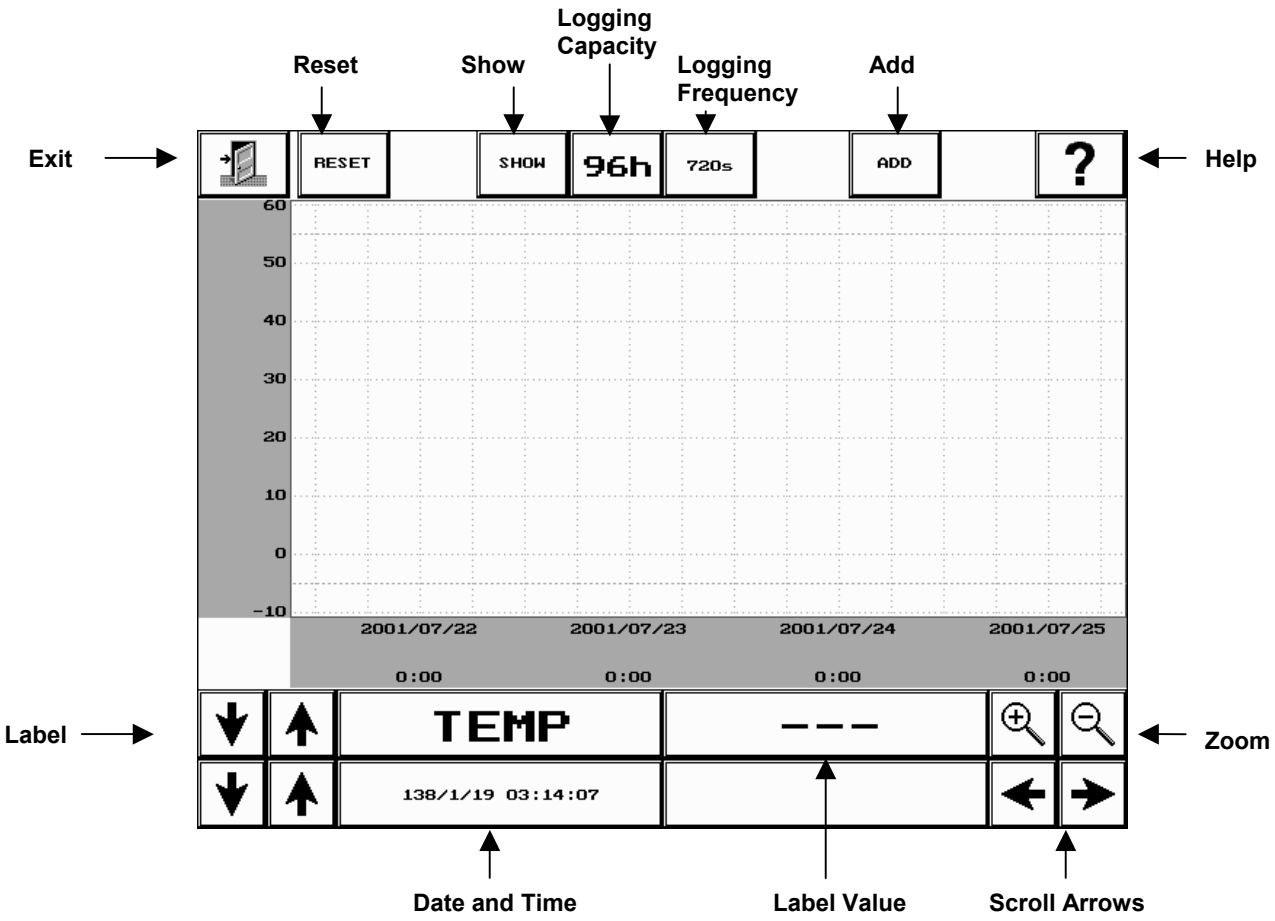
Logged data is automatically stored into the internal memory (storage) in the controller. Regardless of additional storage options, logged data is stored in this facility first. In addition to the internal memory area, your controller may be equipped with the options of logging to a CCS or a floppy disk.

- If the controllers are networked to a CCS, data is logged to the CCS.
- If the controller has a floppy disk drive, data is logged to the disk in the B:\ drive.
- To export data to other software, the chamber must be equipped with a floppy disk drive or be connected to a CCS.
- If the chamber is not equipped with a CCS or a floppy disk 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

Exit button	Touch the Exit button to return to the Status screen.
Reset	Touch the Reset button to clear the screen
Show	Touch the Show button to display a graph of the data for the selected label.

Logging Capacity The Logging Capacity field displays the number of hours of logged data that can be stored in the internal memory of the controller.

If logged data exists for the time period, it will be displayed on the Trendgraph screen and the X-axis will be scaled.

Logging Frequency The Logging Frequency field displays the frequency that was set in the Options screen.

Add Touch the Add button to plot the data from another label on the displayed graph.

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

Label This field displays the Label of the most recently displayed graph.

Label Value This field displays the value for the date and time.

- When there is no value, the field will display a row of dashes. (- - -).
- If the number of dashes displayed is continuously changing, this indicates that the controller is currently tracking logged data.

Zoom These buttons provide zoom in and zoom out features.

Date and Time This field displays the date and time for the Label value displayed.

Scroll Arrows 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 an FDD 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 floppy disk drive, data is logged to the disk in the B:\ 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

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 (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 Conviron 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 Conviron 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.

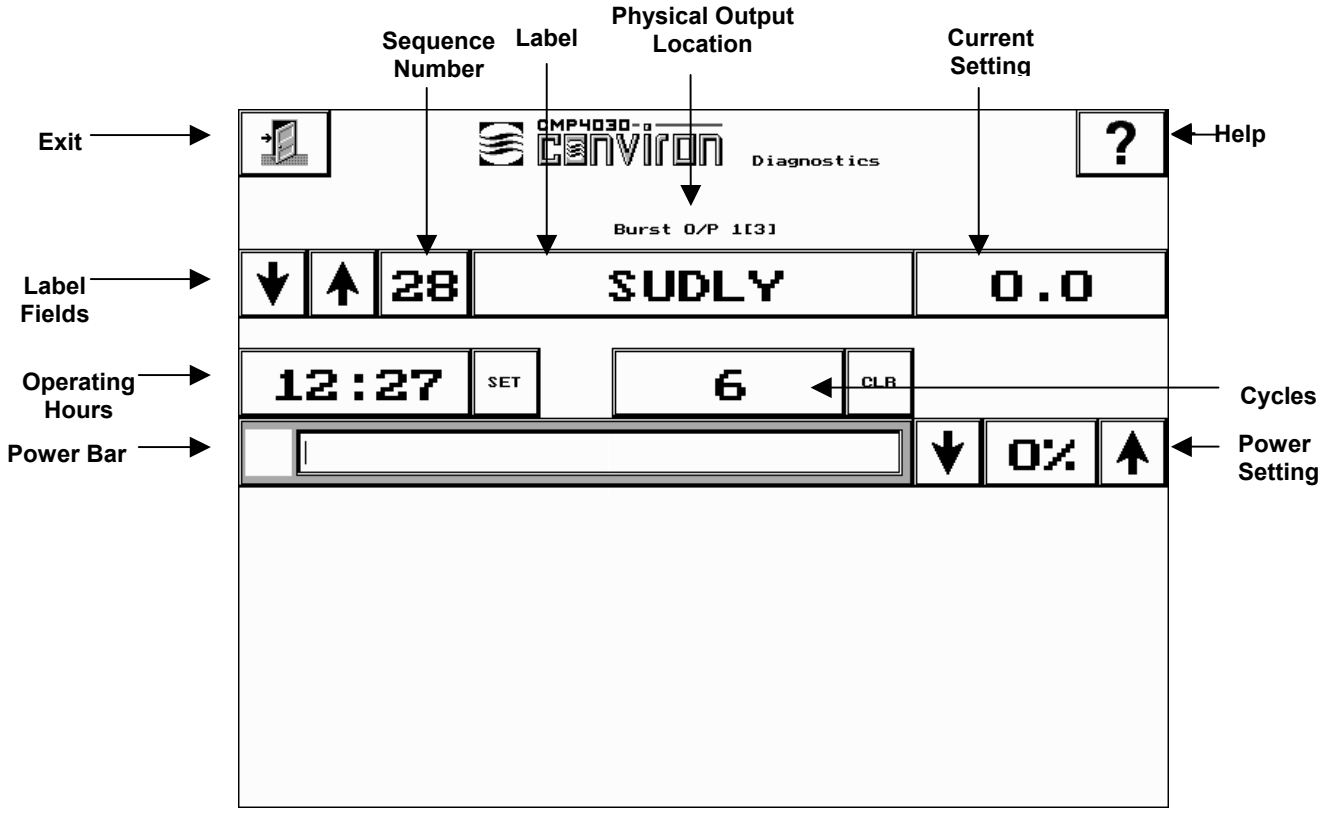
The connections may become dirty and may loosen with equipment vibration or thermal expansion.

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 *CMP4030 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

Sequence Number	Displays the output or input label sequence number.
Label	Displays the output or input label. This label matches the label on both the chamber schematics and the physical outputs.
Physical Output Location	Displays the physical location (board #, channel #) of the output or input.
Current Setting	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.

Operating Hours	Displays the number of output operating hours. Touch the SET button to display a keypad to change the operating hours.
Cycles	Displays the number of completed output cycles. Touch the CLR button to clear the service history for the output
Power Bar	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 (3) 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 (3) 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 CMP4030 Service Manual*) and one of the following tools **ready**:

   a probe – 1.5mm (1/16") diameter by 12mm (1/2") long

   or

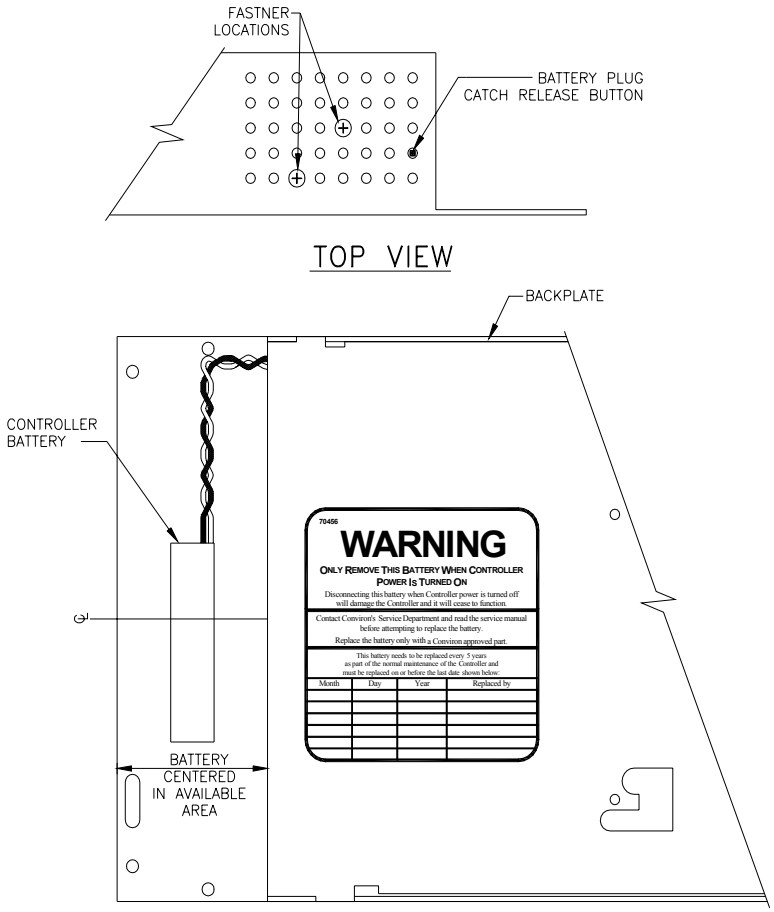
   a flat-blade screwdriver – 3mm (1/8") wide

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



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 5 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 floppy disk 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

Conviron periodically releases new versions of controller software.

Instructions for performing software updates are included in the *CMP4030 Service Manual*. We recommend that service personnel or users with advanced knowledge of the CMP4030 controller perform software updates.

Contact Conviron Customer Care for more information.

For more efficient service, please have the serial number of your chamber available.

Conviron Customer Care

Toll free in North America	1-800-363-6451
Local telephone	1-204-786-6451
Fax	1-204-783-7736
E-mail	service@conviron.com
	euroservice@conviron.com
Web address	www.conviron.com

Appendix A: Labels

This appendix lists and describes various labels displayed on the CMP4030 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
DEHMVLV	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)
IMµMOL	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 lamps)

Label	Category	Description
		lamps)
SP_MHAL	set point	Metal halide lighting
SUDLY	output	Start up delay (controls main contactor)
TEMP	input	Temperature inside the plant growth area
		Tip: 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 Conviron Service Bulletins.

Note: If the recommended solutions do not resolve the existing problem, contact Conviron Customer Care.

Alarm code	**1/2 wv; bd x ch y**
Description	A triac is "half waving"
Defaults	• priority: 75 • User Interaction Level: not accessible
Cause	Output board line voltage problem.
Solution	1. Ensure that the Start/Stop switch is set to ON. 2. Check the line power to the board.
Alarm code	**A-D ov rng; bd x ch y**
Description	An input reading is out of range.
Defaults	• priority: 75 • User Interaction Level: not accessible
Cause	Possible sensor or input board failure
Solution	Ensure that the sensor is connected to input board properly.
Alarm code	**A-D pol; bd x ch y**
Description	An input reading has the wrong polarity
Defaults:	• priority: 75 • User Interaction Level: not accessible
Cause	Possible sensor failure
Solution	Ensure that the sensor is connected to input board properly.
Alarm code	**[input] inp ov lim: x y**
Description	The actual value of an input is higher than its high limit level. • [input] is the input label that generated the alarm • x is the value of the limit that was exceeded • y is the actual input value at the time of the alarm
Defaults	Defaults: • priority: 75 • User Interaction Level: normal Alarm Screen
Cause	1. possible sensor location or aspiration problem 2. possible equipment failure
Solution	Ensure that the limit settings in the Alarm screen are correct for the range of the program.

Alarm code	**[input] inp und lim: x y**
Description	The actual value of an input is lower than its low limit level. • [input] is the input label that generated the alarm • x is the value of the limit that was exceeded • y is the actual input value at the time of the alarm
Defaults	• priority: 75 • User Interaction Level: normal Alarm Screen
Cause	1. possible sensor location or aspiration problem 2. possible equipment failure
Solution	Ensure that the limit settings in the Alarm screen are correct for the range of the program.
Alarm code	**Alm msgCode x y**
Description	An alarm event occurred for which the msgCode is undefined.
Solution	Contact Conviron Customer Care
Alarm code	**alm to host**
Description	Reports an error writing an alarm record to the CCS (host).
Defaults	• priority: 75 • User Interaction Level: not accessible
Cause	Probable loss of connection to CCS.
Solution	1. Check thumbnail on host to ensure connection, if not: 2. Check Ethernet connections. 3. Check hub(s) are powered
Alarm code	**alm to disk**
Description	Reports an error writing a alarm record to the floppy disk
Defaults	• priority: 75 • User Interaction Level: not accessible
Cause	Possible problem with the disk, drive or communication to it.
Solution	Check storage space on the floppy disk and the controller.
Alarm code	**BOOTUP/zero SRAM BOOTUP (off for x:xx)**
Description	Power on boot up message This message cannot be disabled
Defaults	• priority: 75 • User Interaction Level: not accessible
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	**Chamber Off**
Description	Reports if the main contactor opens, causing the chamber to shut off while a program is running
Defaults	• priority: 20 • persistent • delay: 60 seconds • User Interaction Level: not accessible
Cause	Possibly caused by a safety limit or the chamber on/off switch.

Solution	1. Verify Start/Stop switch set to ON. 2. Check ITSO limits. Will not appear if SUDLY is off • Alarm limit shut down – alarm for limit raised. • Program stopped – no alarm message
Alarm code	**Circulation fan failure (if equipped with monitoring)**
Description	The chamber circulation fans have stopped unexpectedly.
Defaults	• priority: 20 • delay: 30 seconds • persistent • User Interaction Level: not accessible
Cause	Probable circulation fan problem
Solution	Repair circulating fans as needed.
Alarm code	**Could not follow chain: Error opening chain file**
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	• priority: 40 • persistent • User Interaction Level: not accessible
Cause	Probable corrupt chain file.
Solution	1. Verify/correct the program to be chained to. 2. If the program is corrupt, it will need to be recreated.
Alarm code	**Could not follow chain: Error opening program file**
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	• priority: 40 • persistent • User Interaction Level: not accessible
Cause	Probable corrupt program file.
Solution	1. Verify/correct the program to be chained to. 2. If the program is corrupt, it will need to be recreated.
Alarm code	**Could not follow chain: Program not compatible**
Description	The next program in the chain is not compatible with the controller configuration and cannot be run.
Defaults	• priority: 40 • persistent • User Interaction Level: not accessible
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	**Data Logging reset & stopped x**
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	• priority: 75 • User Interaction Level: not accessible	
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	**log data crpt**	
Description	The system is attempting to log data from a label that was not defined in the configuration software	
Defaults	• priority: 75 • User Interaction Level: not accessible	
Cause	May occur on boot up if the SRAM is corrupt.	
Solution	Reboot the controller to clear SRAM.	
Alarm code	**log to host**	
Description	An error occurred writing logged data to the host	
Defaults	• priority: 75 • User Interaction Level: not accessible	
Cause	Probable lost connection to CCS	
Solution	1. Check thumbnail on host. 2. Check Ethernet connections	
Alarm code	**log to disk**	
Description	An error occurred writing logged data to the floppy disk.	
Defaults	• priority: 75 • User Interaction Level: not accessible	
Cause	Possible problem with the disk, drive or communication to it	
Solution	Check storage space on the floppy disk and the controller.	
Alarm code	**log data lost: block x lost**	
Description	Logged data was lost due to an overflow of the data buffer.	
Defaults	• priority: 75 • User Interaction Level: not accessible	
Cause	Controller memory is full. Probable floppy disk or CCS connection problem.	
Solution	The LOOP/NO LOOP setting in the Options screen determines if this message displays. Four settings are possible. **NO LOOP, ALARM**: (default) Stop logging to prevent overwriting of data. An alarm is raised if the controller is unable to transmit data to the floppy disk or CCS.	

	LOOP, ALARM: Logging is continuous by overwriting the oldest data. An alarm is raised if the controller is unable to transmit data to the floppy disk or CCS. **LOOP, NO ALARM**: Overwrite the oldest data in internal memory. No alarm is raised. **NO LOOP, NO ALARM**: Stop logging when internal memory is full. No alarm is raised.
Alarm code	**lost power to OP x board y**
Description	An AC output board cannot detect power on any output.
Defaults	1. priority: 75 2. User Interaction Level: not accessible
Cause	No line power to output board. Possible main contactor or wiring problem.
Solution	If the chamber has Chamber Off detection, this alarm will only be seen if: - a program is running - the main contactor is closed - there is no power to an output. The alarm will not be raised if a fuse on the board blows. If the chamber does not have Chamber Off detection, then: 1. If there is only one board, check it, 2. If all boards but SUDLY, check the SUDLY circuit between the line side of the SUDLY output and the main contactor coil. If all boards including SUDLY, check Start/Stop switch.
Alarm code	**Alarm code: max ret exc get_bd_mem** **Alarm code: max ret exc set_bd_mem**
Description	The controller failed to read or write a byte from an input board, 3 times.
Defaults	• priority: 75 • User Interaction Level: not accessible
Cause	These messages indicate a serious hardware problem.
Solution	Contact Conviron Customer Care
Alarm code	**max ret exc; inp bd x**
Description	The controller failed to read or write a byte from an input board, 3 times. Maximum retries exceeded communicating with input board.
Defaults	• priority: 75 • User Interaction Level: not accessible
Cause	This message indicates a serious problem.
Solution	Contact Conviron Customer Care.
Alarm code	**max ret exc; out bd x**
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	• priority: 75 • User Interaction Level: not accessible
Cause	This message indicates a serious problem.
Solution	Contact Conviron Customer Care

Alarm code	**r err; log hand fr sram**
Description	The log handler could not read a buffer from SRAM.
Defaults	• priority: 75 • User Interaction Level: not accessible
Cause	Possible SRAM corruption.
Solution	Reboot the controller and zero the SRAM.
Alarm code	**RH TrcLim Warning x y**
Description	The chamber humidity is outside of the tracking limits. • x is the value of the limit that was exceeded (humidity set point +/- limit value) at the time of the alarm • y is the actual input value at the time of the alarm
Defaults	• priority: 40 • delay: 10 minutes • User Interaction Level: Alarm Screen
Cause	Possible incorrect settings or equipment problem.
Solution	1. Ensure that the limit settings in the Alarm screen are adequate. RH limits must allow a wide tolerance from set point. 2. If the settings are adequate, there is a possible equipment failure. Contact Conviron Customer Care.
Alarm code	**RS485 BUS**
Description	Reports a failure to communicate on the local IO (RS485) bus.
Defaults	• priority: 75 • User Interaction Level: not accessible
Cause	Possible COMMS board failure
Solution	1. Clean and reseat the bus cables and sockets. 2. Reboot the system. 3. If the error persists, replace the controller.
Alarm code	**sync_timeout**
Description	No response from the COMMS board to last sync command.
Defaults	• priority: 75 • User Interaction Level: not accessible
Cause	This message indicates a serious problem.
Solution	Contact Conviron Customer Care.
Alarm code	**Temperature Limit Shutdown x y**
Description	The chamber has turned itself off because the temperature is outside of the deviation limits. • x is the value of the limit that was exceeded • y is the actual input value at the time of the alarm
Defaults	• priority: 20 • persistent • delay: 15 seconds • User Interaction Level: normal Alarm Screen

Cause	Possible incorrect settings or equipment failure
Solution	1. Ensure that the limit settings in the Alarm screen are sufficient for the range of the program. 2. If they are sufficient, there is a possible equipment failure. Contact Conviron Customer Care.
Alarm code	**Temperature TrcLim x y**
Description	This is a warning that the chamber temperature is outside of the tracking limits. • x is the value of the limit that was exceeded (temperature set point +/- limit value) at the time of the alarm • y is the actual input value at the time of the alarm
Defaults	• priority: 40 • delay: 5 minutes • User Interaction Level: normal Alarm Screen
Cause	Possible incorrect settings or equipment failure
Solution	1. Ensure that the limit settings are sufficient. 2. If they are sufficient, there is a possible equipment failure. Contact Conviron Customer Care.
Alarm code	**Temperature TrcLim Shutdown x y**
Description	Reports a condition where the chamber has turned itself off because the temperature is outside of the user tracking limits. • x is the value of the limit that was exceeded (temperature set point +/- limit value) at the time of the alarm • y is the actual input value at the time of the alarm
Defaults	• priority: 20 • persistent • delay 5 minutes • User Interaction Level: normal Alarm Screen
Cause	Possible incorrect settings or equipment failure
Solution	1. Check the limit settings to make sure they are sufficient. 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. **Procedure A**: If the temperature exceeded the limit by a small margin, widen the setting so the chamber restarts. If the temperature stabilizes let the chamber run and monitor for problems. If the temperature continues to move away from the set limit, contact Conviron Customer Care. **Procedure 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). If the temperature continues to move away from the set limit for more than a minute, contract Conviron Customer Care.

Alarm code	**Tracking Alarm Feature Disabled**
Description	The tracking alarm disabled via the manual over-ride switch.
Defaults	• priority: 60 • User Interaction Level: not accessible
Cause	Disable switch in ON position. This is a notification message only. No action is required
Alarm code	**triac on; bd x ch y**
Description	A triac that should be powered off is on.
Defaults	• priority: 75 • User Interaction Level: not accessible
Cause	Possible defective triac or driver
Solution	Contact Conviron Customer Care
Alarm code	**w err; log hand to sram**
Description	The log handler could not write a buffer from SRAM.
Defaults	• priority: 75 • User Interaction Level: not accessible
Cause	Probable SRAM corruption.
Solution	Reboot the controller and zero the SRAM.
Alarm code	**wb > db**
Description	The wet bulb temperature of a humidity input is higher than the dry bulb temperature.
Defaults	• priority: 30 • User Interaction Level: not accessible
Cause	Probable wet bulb maintenance or possible sensor failure.
Solution	1. Ensure correct water level in reservoir. 2. Clean or replace wet sock.

1620 Alarm Messages

The following alarm messages pertain to units equipped with the 1620 TEMP_LIMIT sensor only. This unit was discontinued in 1998.

TEMP_LIMIT is the label used in the Alarm screen of the CMP4030 controller to set the limits in the 1620 device.

All of the sensors are located in the aspirator. The 1620 TEMP_LIMIT sensor is approximately 4" long.

Alarm code	**1620 ov lim x y**
Description	Chamber temperature has exceeded the high setting for TEMP_LIMIT. x is the value of the limit that was exceeded y is the actual input valve at the time of the alarm
Defaults	• priority: 20 • persistent • User Interaction Level: Alarm Screen
Cause	Possible incorrect settings or device failure.
Solution	Ensure that the TEMP_LIMIT settings in Alarm screen are above and below the ranges of the program. Check TEMP_LIMIT in Diagnostics screen to ensure that the reading is not 'frozen'. a) reboot the controller to re-establish communications to the 1620. b) if rebooting is unsuccessful, replace the 1620. If the reading is not frozen, there is a possible mechanical problem. Contact Conviron Customer Care
Alarm code	**1620 und lim x y**
Description	Chamber temperature has exceeded the low setting for TEMP_LIMIT. • x is the value of the limit that was exceeded • y is the actual input value at the time of the alarm
Defaults	• priority: 20 • persistent • User Interaction Level: Alarm Screen
Cause	Possible incorrect settings or device failure.
Solution	See 1620 ov lim x y
Alarm code	**1620 r err A bd 999**
Description	Reports a condition where the system has shut down the chamber because it has been unable to read the 1620 sensor temperature for a period of 30 minutes or more.
Defaults	• priority: 20 • persistent • User Interaction Level: not accessible
Cause	Probable communication problem or failed sensor.
Solution	1. Reboot the controller to re-establish communications to the 1620 2. If rebooting is unsuccessful, replace the 1620.

Alarm code	**1620 r err B bd x**
Description	The 1620 config register could not be read. • x is the number of the input board the 1620 is connected to
Defaults	• priority: 75 • User Interaction Level: not accessible
Cause	Probable communication problem or failed sensor.
Solution	1. Reboot the controller to re-establish communications to the 1620. 2. If rebooting is unsuccessful, replace the 1620
Alarm code	**1620 r err C bd x**
Description	TEMP_LIMIT settings in CMP4030 memory are not the same as in 1620 memory. • x is the number of the input board the 1620 is connected to
Defaults	• priority: 75 • User Interaction Level: not accessible
Cause	Probable communication problem or failed sensor.
Solution	1. Reboot the controller to re-establish communications to the 1620. 2. If rebooting is unsuccessful, replace the 1620.
Alarm code	**1620 r err D bd x**
Description	The limit values could not be corrected after they were found to be wrong. • x is the number of the input board the 1620 is connected to
Defaults	• priority: 75 • User Interaction Level: not accessible
Cause	Probable communication problem or failed sensor.
Solution	1. Reboot the controller to re-establish the communications to the 1620 2. If rebooting is unsuccessful, replace the1620.
Alarm code	**1620 r err F bd x**
Description	The 1620 config register is not in the proper state and cannot be corrected. • x is the number of the input board the 1620 is connected to
Defaults	• priority: 75 • User Interaction Level: not accessible
Cause	Probable communication problem or failed sensor.
Solution	1. Reboot the controller to re-establish communications to the 1620. 2. If rebooting is not successful, replace 1620.
Alarm code	**1620 w err B bd x**
Description	The CMP4030 was unable to write new low or high limit values to the 1620. • x is the number of the input board the 1620 is connected to
Defaults	• priority: 75 • User Interaction Level: not accessible
Cause	Probable communication problem or failed sensor.
Solution	1. Reboot the controller to re-establish communications to the 1620. 2. If rebooting is not successful, replace the 1620.

Appendix C: Features of Version 6.0 Software

User Interface

Improved look and feel to all user screens

- Faster, easier and more intuitive.
- Keypads replace arrows for faster value entry.
- Better reaction to user touches.
- User friendly on-screen information.
- Trendgraph screen plots in a few seconds.
- Option screen can be opened with a program running.
- Tracking alarm capability for both temperature and humidity.

Faster bootup sequence with better information

- Fewer on-screen messages.
- Screen calibration automatically re-starts if an error is made.
- Error codes are included to aid in diagnosing configuration problems.

Improved CCS interaction

- Faster file transfer.
- Synchronize time from the CCS.
- Improved CCS Login/Logout operation.

User adjustable dehumidification and defrost parameters

- Turn off dehumidification when it is not needed.
- Adjust defrost threshold and cycle times.
- An RH set point of 0 disables all humidification and dehumidification functions.

Smart features

- Chamber restarts at the current temperature if the temperature in the chamber is beyond the limits of the controller settings.
- Current program continues if it is unable to follow the chain.
- Controller checks that the program is complete before saving it.
- Controller checks that the program is compatible before using it.
- Alarm priorities are saved during the reboot procedure.
- Enhanced error detection and alarm reporting.
- Boot up message reports how long the chamber was down and if the SRAM was zeroed on boot up.
- Main contactor state is monitored (Chamber Off alarm).
- The chamber qualifies alarm conditions to prevent nuisance alarms that are a result of the main contactor state.

Appendix D: The Psychrometric Chart

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 psychrometic 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 airs 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_2 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)

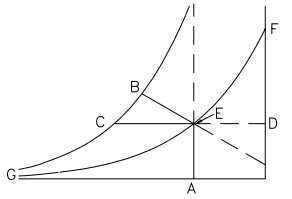
BASED ON FRESH AIR AT 21°C, 50% R.H. AND BAROMETER PRESSURE OF 101.25 KILOPASCALS.
EXAMPLE:
AIR AT 21°C & 50% R.H.
WET BULB TEMPERATURE = 14.6°C
ABSOLUTE HUMIDITY = 0.0078 kg/kg
DEW–POINT = 10.2°C

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

PERCENT SATURATION

LIGHTS OFF MAXIMUM 90%

LIGHTS ON MAXIMUM 85%

29°C DEWPOINT

MAXIMUM HUMIDITY IN TROPICS

LOW LIMIT FOR BDH DEHUMIDIFICATION

LOW LIMIT FOR CHEMICAL DEHUMIDIFIER

WET BULB TEMPERATURE °C

MOISTURE CONTENT kg/kg (DRY AIR)

DRY- BULB TEMPERATURE °C

PSY_HUM.DWG

Glossary

button	An active spot on the screen that performs an action when touched. Buttons on the CMP4030 screens contain text or icons.
CCS	Acronym for *Central Control System*.
cell	The individual entry points in the program table defined by the intersection of any row (timeline) and any column (zone).
Central Control System (CCS)	A remote control and monitoring system available for chambers with CMP4030 controllers. Contact your Conviron sales representative for more information.
chaining	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. Chaining a series of different programs together is referred to as a multi-day program. A program chained to itself will run continuously and repeat the same program every 24 hours.
chamber	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.
controller	The device that sets and records the conditions in the plant growth area according to a user created program. The CMP4030 is the most recent controller model.
field	An area on the screen where data is displayed or is entered.
host	Another term for the Central Control System. It is more commonly used in alarm messages and technical documentation.
icon	A graphical symbol.
outputs	Switches that control specific devices or conditions within the chamber.
plant growth area	The environmentally controlled section of the chamber.

program 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.

An optional floppy disk drive or Host CCS may also be used to store programs.

program table The series of columns and rows used for entering program timelines on the Program screen.

The intersection of a row and a column is a cell.

ramping When conditions change gradually and steadily between timelines. The CMP4030 works in ramping mode.

timeline 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.

One or more timelines make up a program.

toolbar 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.

zone An area of the chamber that is independently controlled or monitored.