CMP6050

OPERATOR'S MANUAL

At Conviron we develop and implement innovative and reliable controlled environment solutions.

CMP6050

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PREFACE

Welcome to the Operator's Manual for Conviron's CMP6050 Control System. This Manual has been developed to assist with the setup and daily operation of the CMP6050. The Manual is provided to all clients who have purchased a chamber(s) containing the new control system.

The Manual has been designed to provide sufficient detail for the majority of chamber configurations. The format is structured to provide step-by-step instructions. The typical installation will find sufficient detail including figures, diagrams, and graphics to operate the chamber without issue. However, given that installations are specific to each facility and that facilities may have unique circumstances, additional information or assistance from Conviron may be required. In such cases, contact information is provided on the following page.

SERVICE AND TECHNICAL SUPPORT

Conviron welcomes the opportunity to provide assistance and to answer any technical questions related to the start-up, use and general technical support and troubleshooting of the CMP6050 control system. Before contacting Conviron, please check the following:

- Read this Operator's Manual in its entirety for information about the feature(s) with which you are experiencing trouble.

- If you are having a problem using your CMP6050, pay particular attention to the relevant section and the pertinent information in this Manual, and use the information to diagnose and correct the problem. If the problem persists and/or you require additional assistance, please collect the following information prior to contacting Conviron:

    - The serial number of the chamber which is located on the rating plate on the side of the chamber

    - The software version number of the CMP6050 software. Instructions for obtaining the CMP6050 software version number are provided in Section 3.0 Main Status Screen under InformationIcon.

    - A description of the problem.

    - A description of what you were doing before the problem occurred.

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Conviron Client Services	Toll free in North America Regular telephone Fax Toll free in Europe Regular telephone/fax	1-800-363-6451 1-204-786-6451 1-204-783-7736 0800-1638 0326422 44 1638 741112
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TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

1.0 INTRODUCTION TO THE CMP6050 CONTROL SYSTEM

The first step in becoming familiar with Conviron's new CMP6050 Control system is to understand the key components of the system and the general specifications. This section introduces the CMP6050 control system and provides an overview of its features and capabilities. Topics covered in this section include:

- An overview of the CMP6050
- General Specifications

1.1 An Overview of the CMP6050

Lighting intensity, temperature, and humidity control are three examples of important parameters required in controlled environment systems. Whether the controlled environment is used for plant science research, or research in such other areas as pharmaceutical, neutraceutical, materials testing, or any of the other myriad applications of a Conviron controlled environment system, certain parameters require control and monitoring. For Conviron, this is accomplished with its next-generation CMP6050 control system.

The CMP6050 is configured for each application from the factory and offers a wide array of set-up, control and alarm features to fine tune the configuration on site. The scalability of the CMP6050 also accommodates additional Input/Output ports if necessary. This flexibility enables users to add sensors allowing the CMP6050 to adapt when changing or modifying experiments.

The CMP6050 control system consists of three primary components:

- **Controller**
- **Display**
- Control system **Software**.

1.1.1 The Controller

The **Controller** (Figure 1-1: CMP6050 Controller) is mounted inside the chamber's control cabinet and comprises the actual PLC. The controller's job is to monitor the control parameters and adjust the outputs to coincide with the User's programs/ schedule. The controller also notifies the User with alarms when parameters, for any number of reasons, wander outside of specified limits.

Figure 1-1: CMP6050 Controller

1.1.2 The Display

The **Display** (Figure 1-2: CMP6050 Display) provides the interface to the control system by facilitating interaction directly with the controller. To accomplish this, the Display uses both an LCD (Liquid Crystal Display) touch screen and push-button 'Keys'. There are also three LED indicator lights on the Display which are used for notifying the User of various conditions.

The touch-screen Display provides access to the following functions:

- Programming and Scheduling
- Alarm
- Security
- Logging
- Graphing
- Service

Information on the touch screen is easy to read because the screen is backlit. Icons are 'touch-activated' and initiate a controller action when they are 'tapped' (or activated) with the stylus.

LED Indication Lights   Interactive Touch-screen   Keys

Figure 1-2: CMP6050 Display

1.1.3 The Software

The controller **Software** is installed into the controller by Conviron at the time of chamber manufacture and facilitates interaction with, and control of, the chamber. Like other software products, the CMP6050 software carries a 'Version' number – this, because Conviron is continuously working to enhance its product capabilities resulting in software version number changes. Accessing the installed software version number for the controller is described in Section 3.0 Main Status Screen, under Information Icon.

1.2 General Specifications

a. The CMP6050 control system is a robust industrial grade PLC control system designed for a wide range of controlled environment applications.

b. The display uses a 6 inch touch-screen LCD.

c. Alarms are color-coded directly on the screen making alarm conditions quick to identify and resolve.

d. Temperature set-point changes can be set in either 'Step' or 'Ramp' mode.

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e. A default 'Status Screen' amalgamates set points and actual conditions into single, concise 'dashboard' for easy viewing and improved chamber management.1.3 Local Control Interface-Programming and Scheduling

1.3 Local Control Interface - Programming and Scheduling

a. Touch-screen LCD.

b. Real-time clock programming of control variables.

c. Can store a maximum of 16 real-time, user-entered 'Programs'.

d. Can store up to 48 'Time-lines' per program (with one minute resolution).

e. Programs are then entered into a 'Schedule' (a sequence of up to 8 program entries) to create a single day, multi day, seasonal or infinite schedule.

f. Temperature transitions set as either 'Step' or (user-adjustable) 'Ramp'.

1.4 Data Logging and Management

Log data for the CMP6050 can be viewed two ways – either locally at the control system interface or remotely via a network-connected PC.

1.4.1 Local Data

a. The data available at the local control interface includes main chamber variables – temperature, humidity, lighting, and CO_2 (if applicable).

b. Parameters are all logged automatically by the controller every 18 seconds.

c. Data can be accessed with up to five days of history.

d. Trend graphs can be viewed directly on the local control interface for both 'set-point' and 'actual' values.

e. Zoom and Pan functions provide additional visualization tools allowing the User to precisely and accurately view and assess the data.

1.4.2 Remote Data

a. The data available remotely is more substantial and includes every input and output parameter being monitored and controlled.

b. Data is logged automatically by the controller every 18 seconds regardless of the number of parameters. This provides unprecedented data resolution for the User while it also benefits service personnel.

c. Log data is accessed in several ways:

- A network-connected PC
- An internet-enabled PC
- A Conviron Memory Module™ (Optional)
- Conviron's Central Management system (Optional)

1.5 Alarms

a. Audible and color-coded visual alarms are provided.

b. User-settable absolute alarms for all controlled processes.

c. User-settable process tracking alarms for temperature (in 'Ramp' mode) are available for the User to determine how tightly to monitor the experiment.

1.6 Security

The CMP6050 offers three password-protected levels:

- Users (Access Level 1)
- Administrators (Access Level 2)
- Factory (Access Level 3)

1.7 Start-Up Delay

At start-up, CMP6050 controllers randomly select delay times between 0 and 59 seconds (by default) to reduce start-up loads after a power failure. This delay time can also be programmed by the User (reference Section 7-3: (Chamber) Startup Delay).

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1.8 Communications

Ethernet connectivity is delivered with every controller. The controller is shipped communications-ready. (This does require IT set-up however at the facility.)

1.9 Auxiliary Contacts

Alarm contacts for connection to a Building Management System (BMS) or (optional) auto dialer.

1.10 Optional Accessories

AUX: Programmable Output: Provides an auxiliary switch, terminated in the control panel, for timed control of automatic watering, nutrient dosing, etc.

SEN: Thermistor temperature sensors available in 10ft (3m), 30ft (10m) and 50ft (15m) lengths (please consult factory).

ADIAL: An automatic telephone dialing system (autodialer) to notify the User of a chamber alarm. Note that this requires Conviron's Central Management™ system, which is sold as a separate product. Consult Conviron Client Services for more information.

2.0 INITIAL START-UP AND NAVIGATION OVERVIEW

Now that a general overview of the capabilities of the CMP6050 Control system have been presented, it's time for the initial start-up. This section provides instructions on start-up procedures and general navigation of the CMP6050 control system. Where appropriate, diagrams, actual screen-shots, and step-by-step instructions are provided.

> Important: Do not touch the screen with sharp or pointed objects. Use only the stylus provided. Use of any other objects on the display screen may damage the screen and void the warranty.

2.1 Turning the Display On

The CMP6050 is shipped from Conviron with the latest software installed and with the control system configured for each specific application. Whenever the chamber is turned on, the first screen to be displayed is the Chamber Selector screen shown in Figure 2-1. The Conviron 'wave' icon displayed in this screen represents the chamber(s) that is (are) controllable from the display. Each display can control up to ten (10) chambers. If the display has been configured to control more than one chamber, then the Chamber Selector screen will show additional Icons to represent the additional chambers. The 'blinking' Icon with the red border represents the chamber currently active with the display.
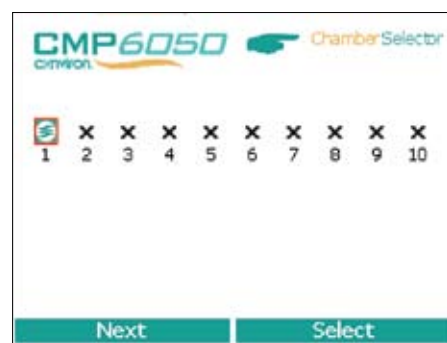

Figure 2-1: Chamber Selector Screen

For example, Figure 2-1: Chamber Selector Screen illustrates that the Display is set up to control two chambers with chamber number 1 being the currently selected chamber. To select a different chamber, simply tap the 'Next' tab at the bottom left of the screen with the stylus and then tap the 'Select' option at the bottom-right of the screen. (To configure additional chambers to be controlled from the same Display, refer to Section 8-4: Logged Data-Network in this Manual.)

Once the desired chamber number has been selected, the main Status Screen is displayed. (Figure 2-2: Main Status Screen).

2.2 Setting the Time and Date

The next step required during the initial start-up is to set the Time and Date. Generally speaking, these steps are required the first time the control system is used, and thereafter only if/when these parameters require changing. They will also be required at times of battery replacement (battery life is approximately 5 years).
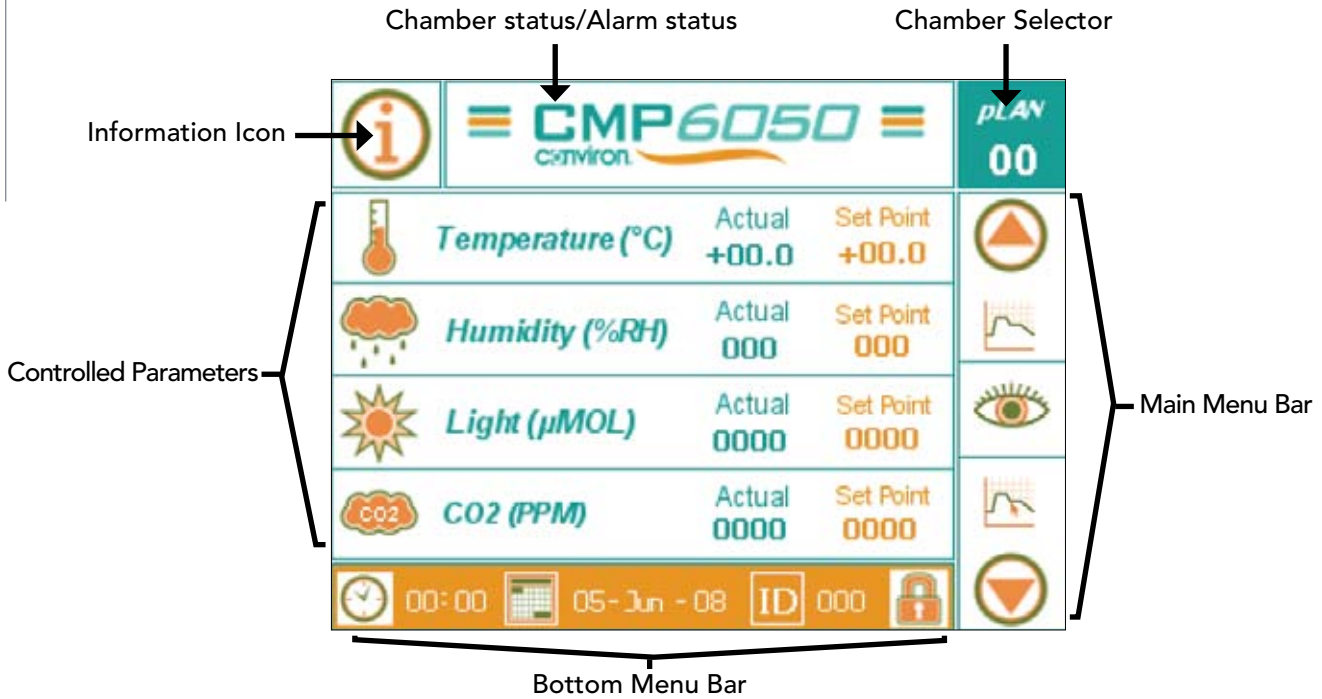
Information Icon

Chamber status/Alarm status

Chamber Selector

Controlled Parameters

Main Menu Bar

Bottom Menu Bar

Figure 2-2: Main Status Screen

Note: The Time and Date set-up can be accessed in two ways – from the main Status Screen and also from the Options Screen. For this Section of the Manual, instructions are provided for accessing these parameters from the Status Screen only. Section 9-1: Option Screen Icons and Locations covers these features via access from the Options Screen.

Figure 2-2: Main Status Screen illustrates the Bottom Menu Bar located along the bottom of the Status Screen. Although this Menu Bar presents for (4) functional Icons, at this stage of the controller set-up, it is only necessary to set up the proper Time and Date.

Figure 2-3: Bottom Menu Bar

Time/Date   [Access Level 1]

Time and Date are essential to the chamber experiment and it is recommended that they be viewed periodically (daily) to prevent experimental error.

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The time is displayed in a 24-hour format (00:00).

The date is displayed in day-month-year format (dd-mmm-yyyy).

Tap either the Time or Date icon to access the following screen (Figure 2-4: Time and Date Set-up).
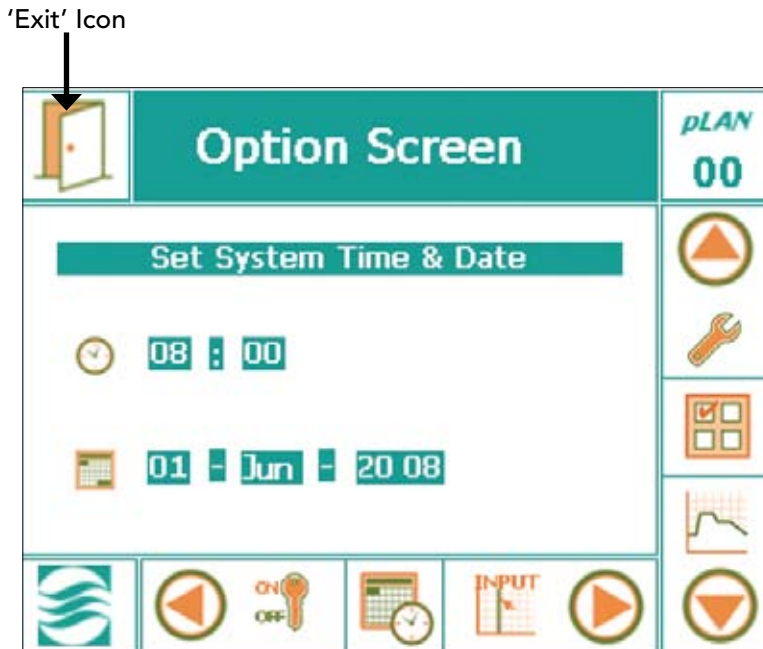
'Exit' Icon

Figure 2-4: Time and Date Set-up

1. Press the 'ENTER' key on the right side of the display to activate the 'Hour' field box. (There should be a blinking cursor.)

2. Press the 'UP or 'DOWN' keys to edit the hour.

3. Press the 'ENTER' key to activate the 'Minute' field box.

4. Repeat Steps two and three for the other field boxes.

5. Press the 'ENTER' key after entering every field box when editing the time and date.

It is essential to follow this process because it locks in the values entered into the controller. THIS IS MANDATORY.

All values entered are in real-time. Ensure that the time and date are correct and checked daily to ensure proper experiment processing.
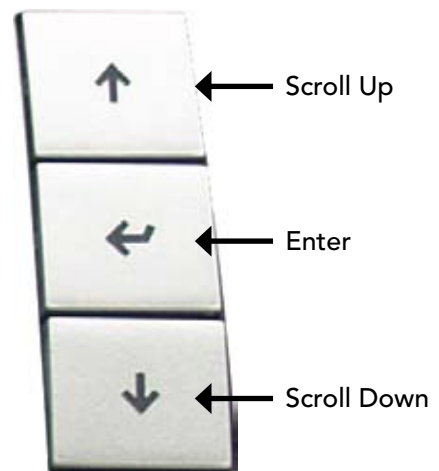

Scroll Up

Enter

Scroll Down

Figure 6.6:
Display Keys

2.3 Other Initial Start-Up Parameters

The Bottom Menu Bar at the bottom of the Main Status screen also includes two other icons – 'ID' Set-Up and 'Security' Set-Up. These parameters are not discussed in this section of the Manual because they are more advanced features that are not critical to the initial 'basic' chamber set-up. That is, they are not required in order for the User to begin using the chamber. The objective for this section is to provide sufficient information to allow the User to get the chamber operating with the bare essentials. Note however, that security at this stage is still disabled.

For information related to the advanced features and options, refer to Section 7.0: Option Screen of this Manual.

2.4 Navigation Overview

The CMP6050 Display was developed to be intuitive for the User, while also accounting for a vast array of interactive options and display features. To accomplish this, the Display uses:

- Passive LED Indicator Lights to display various conditions

- An Interactive LCD Touch-Screen
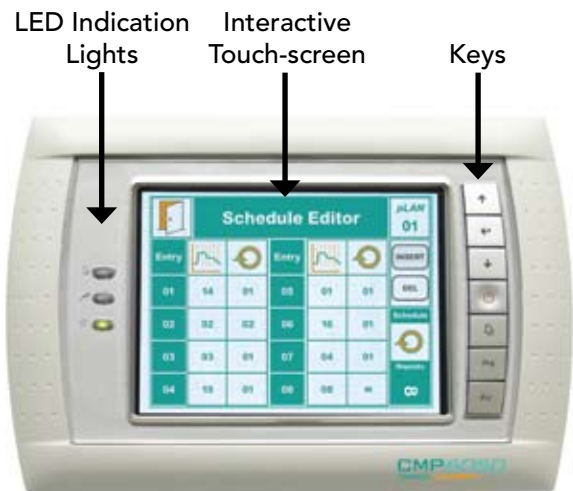
- A set of interactive Keys

2.4.1 LED Indicator Lights

There are three LED indicator lights on the CMP6050 Display. Their functions are as follows:
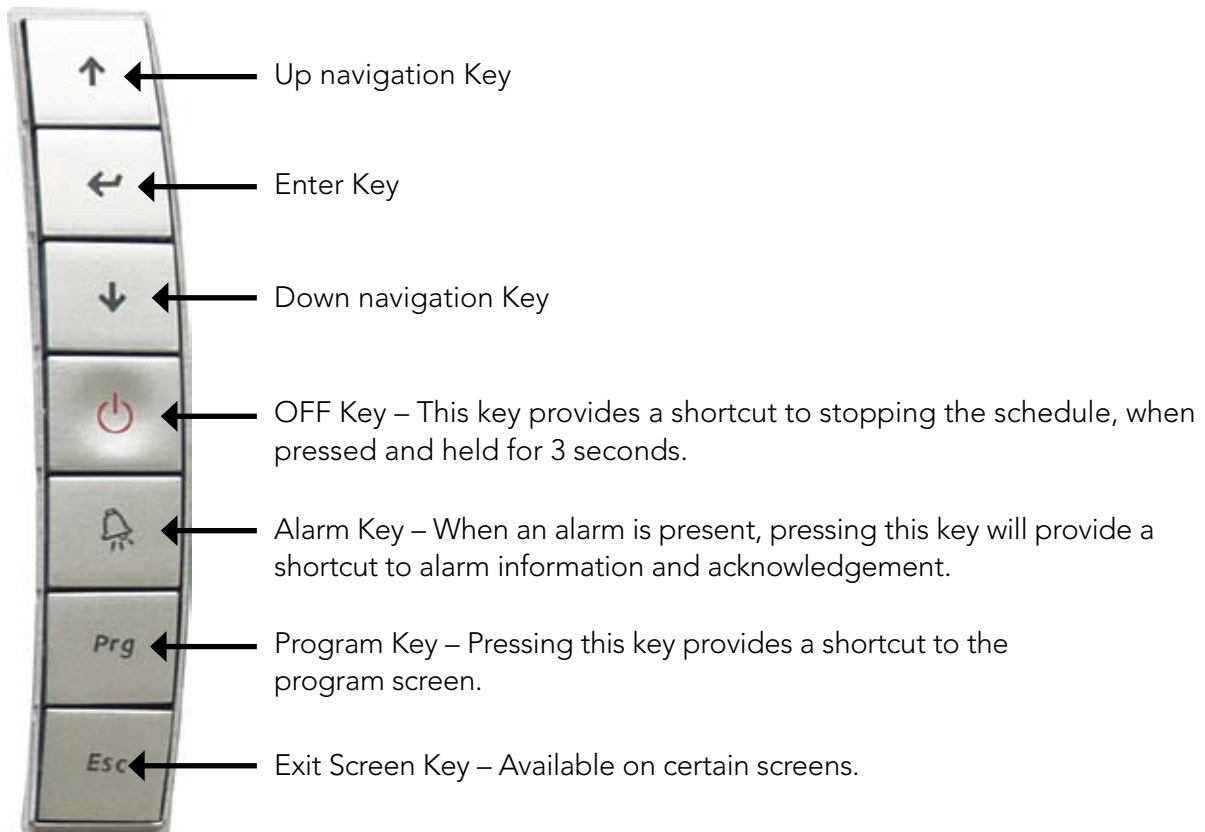
- Top LED – Alarm Condition – Active

- Centre LED – Communication Error (connection between display & controller is lost)

- Bottom LED – Controller On (flashes when running a schedule)

2.4.2 LCD Touch-Screen

The Touch-Screen has two functions – to display information and to facilitate interaction with the Users. Here, a host of primary and secondary screens are used to provide all the necessary information required to fully interact with the controller. Sections 3 through 8 of this Manual describe each Screen in detail. Note that the main Primary (default) Screen is the Main Status screen.

LED Indication Lights   Interactive Touch-screen   Keys

Figure 2-5: CMP6050 Display

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2.4.3 Interactive Keys

As an alternative to using the stylus with the touch screen, the User can also use the Keys at the right of the display for many of the interactive functions. Below, a short description is provided for each Key.

Up navigation Key

Enter Key

Down navigation Key

OFF Key – This key provides a shortcut to stopping the schedule, when pressed and held for 3 seconds.

Alarm Key – When an alarm is present, pressing this key will provide a shortcut to alarm information and acknowledgement.

Program Key – Pressing this key provides a shortcut to the program screen.

Exit Screen Key – Available on certain screens.

3.0 MAIN STATUS SCREEN

At this point in the Manual, instructions have not yet been provided to inform the User how to start an experiment in the chamber. Before that can be done, it is necessary to become familiar with the Main Status screen. This section provides an overview of this important primary screen. Topics covered include:

- Information Icon
- Chamber Status / Alarm Status
- Chamber Selector
- Main Menu Bar
- Bottom Menu Bar
- Controlled Parameters

The CMP6050 control system uses seven (7) primary screens to interact with the various features of the control system. This Section of the Manual provides an overview of the first of those screens – the Main Status Screen. Subsequent sections cover the details of each of the remaining screens.

> **Note:** The Main Menu Bar, which is located at the right hand side of the each of the seven primary screens, stays constant for each of the seven screens while the Bottom Menu Bar changes for each of the seven screens.

As mentioned earlier, the main (default) control screen is the 'Status Screen'. This is the screen that essentially acts as 'home base' for the Display. The main areas of the Status Screen are illustrated in the Figure below:
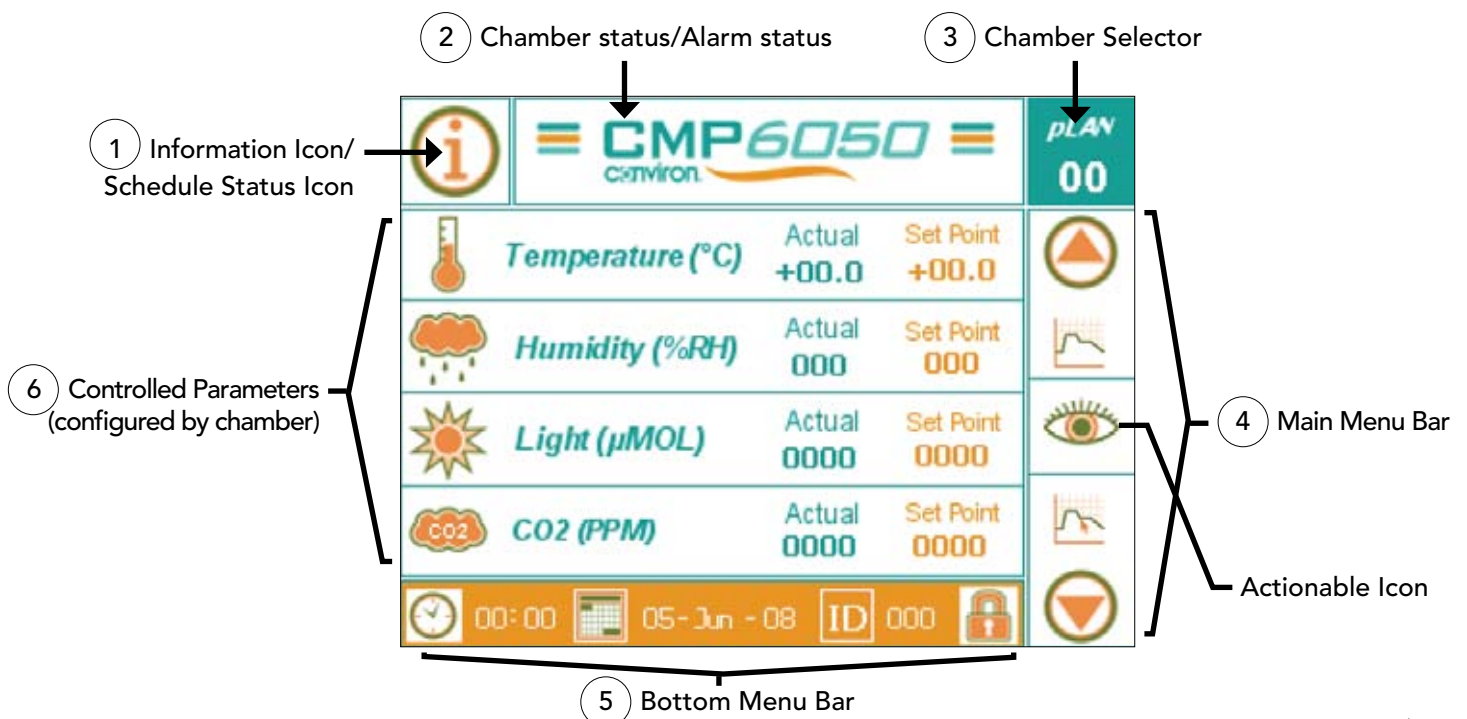

Figure 3-1: Main Status Screen - Key Area Layout

1 Information Icon

This Icon provides access to two areas of information depending on whether a schedule is running or not. If there is <u>no</u> schedule running, this Icon provides access to information related to the controller software, chamber serial number, and contact information for Conviron's Technical Assistance. The information is important for knowing, for example, what version of software is loaded into the controller. This information is not necessarily required on a daily basis but rather during service and/or troubleshooting activities. Activating this Icon using the stylus launches the following screen of information. Tap the 'Exit' Icon (top left corner) to return to the Main Status Screen.

Exit Icon →

Figure 3-2: Information Icon Screen

If a schedule <u>is</u> running, then the (i) icon launches a 'Schedule Status' screen which provides details about the running schedule.

Figure 3.3: Schedule Status Screen

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2 **Chamber Status/Alarm Status**

This Icon provides information related to the chamber status and the alarm status. Under certain conditions, this Icon will blink with certain color combinations. Each color combination has a defined meaning which graphically represents the status of the chamber and alarm conditions. Refer to Section 5.0 Alarm Screen for more details on alarm functionality.

3 **Chamber Selector Icon**

The CMP6050 control system was designed to enable a single Display to control up to ten (10) chambers. This Icon allows the User to select which of the chambers to control with the Display. Note that each additional chamber requires set-up and configuration. Adding chambers to the Display is covered in Section 8.4 Logged Data – Network of this Manual. The Figure below presents the screen image displayed when the Chamber Selector Icon is activated.

To return to the Main Status Screen, tap 'Select' indicator at the bottom of the screen. Note that in the figure below, the Display has been configured to control 2 chambers. Chamber no. 1 is the active chamber (red border around icon). To 'activate a different chamber, simply tap the 'Next' tab and then tap Select.

Figure 3-4: Chamber Selector Screen

(4) Main Menu Bar

The Main Menu Bar remains constant on all seven of the Primary Screens. This Main Menu Bar contains a total of nine (9) Icons, seven of which represent the seven Primary Screens and two of which represent Navigation Icons – one for scrolling up and one for scrolling down. Note that the Main Menu Bar displays only three (3) Primary Screen Icons at a time. The centre Icon is actionable, while the other two (non-actionable) Icons displayed on either side of the actionable Icon are simply there to indicate the next and previous consecutive Icons. The Up and Down Icons are used for scrolling through the seven Primary Screen Icons.

Navigation Icon – Scroll Up

Navigation Icon – Scroll Down

Status Screen (Refer to Section 3 for greater detail)

Security Screen (Refer to Section 6 for greater detail)

Service Screen (Refer to Section 9 for greater detail)

Alarm Screen (Refer to Section 5 for greater detail)

Program Screen (Refer to Section 4 for greater detail)

Options Screen (Refer to Section 7 for greater detail)

Trend Screen (Refer to Section 8 for greater detail)

(5) **Bottom Menu Bar**

The Bottom Menu Bar is dynamic which means it changes depending on the screen being displayed. The Icons displayed in the Bottom Menu Bar for each primary screen duplicate the Icons displayed in the main interactive area for each screen. They are duplicated simply for ease of use allowing Users to choose their preference. Because this section of the Manual pertains to the Main Status Screen, the Bottom Menu Bar for that screen only will be described here.

There are a total of four (4) Icons used in the Bottom Menu Bar for the Main Status Screen. These are described as follows:

 Time Icon – used to display the current time. Tapping the Icon launches the 'Set System Time and Date' screen. (Refer to Section 2.2 Setting Time and Date for greater detail on this subject)

 Date Icon – used to display the current date. Tapping the Icon launches the 'Set System Time and Date' screen. (Refer to Section 2.2 Setting Time and Date for greater detail on this subject)

 ID – used to display the Network Configuration for the controller. (Refer to Section 8.4 Logged Data – Network for greater detail on this subject.)

 Security Login Icon – used to display the Security Screen for the controller. (Refer to Section 6.5 Login Security Screen for greater detail on this subject)

> **Note**: The Time and Date icons were already used to set the Time and Date in Section 2.2 of this Manual. Instructions for setting the ID and Security are covered in Sections 8 and 6, respectively.

6 Controlled Parameters

This area of the Main Status Screen is reserved for displaying the controlled parameters (Temperature, Humidity, Lighting, and CO_2). The parameters actually displayed depend on several factors including the chamber design and the configuration set-up of the controller. For example, only some chambers come equipped with CO_2 and therefore not all chambers will display CO_2 as a Controlled Parameter.

Figures displayed in the Controlled Parameters area of the screen include the 'Actual' value and the current program 'Set-Point' value for each parameter. These figures are displayed in two columns – one for the Actual values (green font) and one for the Set-Point values (orange font).

The Temperature parameter displays the temperature in degrees Celsius only.

The Relative Humidity parameter (if applicable) displays the relative humidity in %RH. This parameter is valid only if the chamber is equipped with humidity control.

The Lighting parameter displays the light intensity in one of several ways – banks; percentage of full power; or unit micromoles.

The CO_2 / Auxiliary parameter displays the parameter in one of several ways – For CO_2 concentration - in PPM: For an Auxiliary on/off event – On or Off. Set-Up for this feature is found in Section 7.0 Option Screen.

4.0 PROGRAM SCREEN

This chapter details the procedures for programming the CMP6050 using the Program Screen. Upon completion of this chapter, the User will be ready to start the chamber and run a schedule. The settings entered in the Program Screen control the conditions in the plant growth chamber.

A Program is defined as User specified experimental set-point data that establishes the desired operating conditions of the chamber. Each Program defines a single 24-hour period and each Program starts at midnight. A time of 00:00 therefore denotes a midnight setting. The CMP6050 controller can store up to a maximum of 16 Programs while each Program can have up to 48 timelines. Regardless of the number of timelines, the total period encompassed by all timelines within a single Program is 24 hours.

Furthermore, the controller does not run individual Programs – it runs a Schedule. A Schedule is defined as a User specified sequence of Programs linked together to form a Schedule. A Schedule can have up to a maximum of 8 Programs where each Program can be repeated from 1 to 99 times, or set to infinity.

4.1 Program Screen Icons and Locations
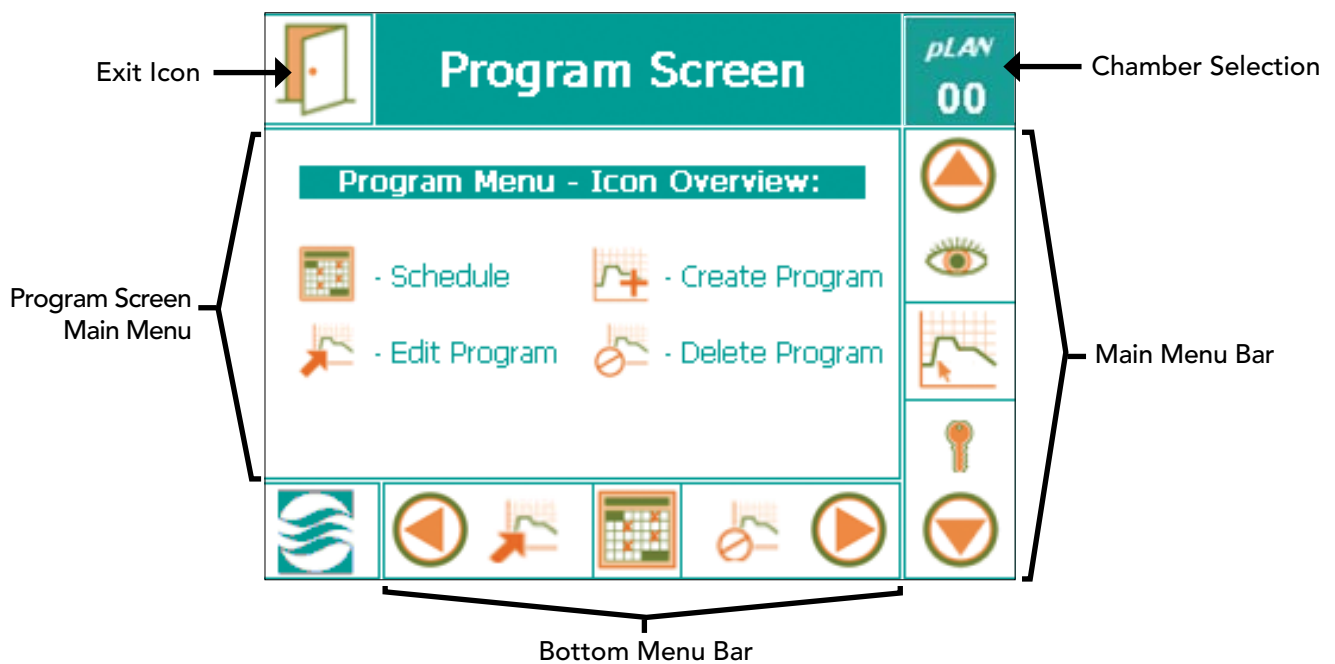
Figure 4-1: Program Screen – Key Area Layout

4.2 Program Screen Main Menu

The Program Screen-Main Menu contains four Sub-menus including

- Schedule
- Create Program
- Edit Program
- Delete Program

These sub-menus can be accessed in two ways – either directly on the main screen area or via the Bottom Menu Bar. Both methods contain the same information and options. User preference will determine the access method. If using the main screen area, simply tap the desired sub-menu. If using the Bottom Menu Bar, use the right and left navigation arrows until the desired sub-menu is displayed in the centre field and then tap that sub-menu icon.

4.3 Accessing the Program Screen   [Access Level: 1]

Tap the 'Create Program' icon to access the Create Program sub-menu screen. (Figure 4-2: Program Screen)

- By default, the first program number will show as 01. If a program already exists, then the CMP6050 will automatically show the next program number available.
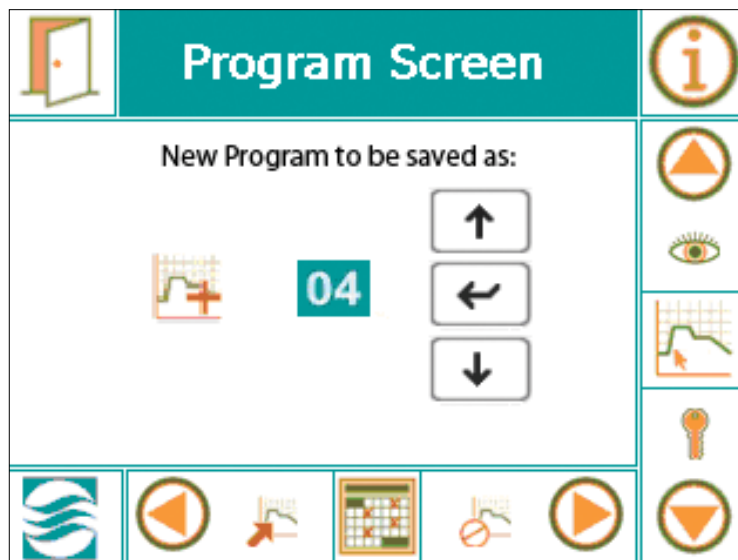
Figure 4-2: Program Screen allowing you to create a new program

- If another program number is required, use the 'UP' or 'DOWN' buttons to select the program. (Programs do not have to be saved in numerical sequence.)

- Tap the "ENTER' button once a program number has been selected.

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4.3.1 Create Program   [Access Level: 1]

1. To activate the first timeline (Row) number, tap the 'INSERT' **INSERT** button. The 'INSERT' button will turn black **INSERT** once tapped and will return to its original state once you have selected the timeline row number

2. Tap the timeline row number '01' in the program to create the first timeline (Figure 4-3).

Figure 4-3: Creating a Timeline.

- All the default values will appear in the first timeline.
- All the program timeline icons will now be activated.
  (i.e. INSERT, SORT, DEL, and all arrow buttons)

3. To change time, tap the hours and/or minutes   field in the first timeline (Row 01).

- Hours and minutes must be entered separately.
- Touch the '00:' field for hours.
- Touch the ':00' field for minutes.
- A standard pop-up window will appear allowing for numerical data entry. (Figure 4-4)

Note: When entering the time field, you are NOT entering a time duration in hours and minutes but rather the actual clock-time at which point you would like the chamber to change to the new set-point parameters. This is why setting the actual Time and Date in Section 2.2 was important. Also, remember that the time field format is 24-hour.
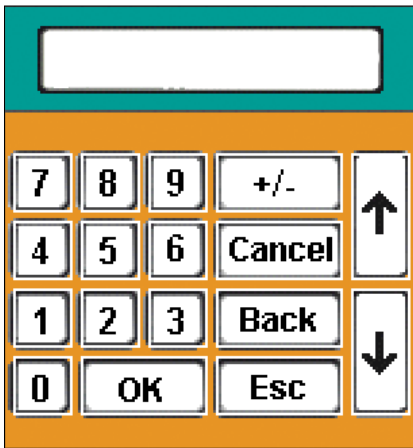
Figure 4-4: Keypad allowing for numerical data entry

4. Tap the 'OK' [OK] button once data has been entered.

5. Tap the temperature value [04.0] to set the desired Temperature.

   • Temperature value is the only parameter with a decimal point. Therefore, always enter 3 digits and a '–ve' sign if the chamber is low temp. Note: Set-point parameters have specified ranges. The controller will only allow values to be entered that are within the range.

   Note: Temperature is the only Set-point parameter that is provided on <u>every</u> controller. All other parameters are optional based on the configuration of the chamber.

6. Tap the humidity value [0000] to set the desired Humidity percentage. (If available).

   • The program screen can only display two Set-point parameters in a single display frame. To access additional parameters press [→]

   • If more than two parameters are controllable, the [→] will be displayed white. Otherwise, the [→] will be displayed grey, indicating no other parameters are available.

7. There are many different lighting configurations for the CMP6050 and it is beyond the scope of this Manual to define every one. Generally speaking, every controller is configured by Conviron for each application. When creating a Program, and provided that Lighting is an available controlled parameter with your chamber configuration, the lighting set-point is accomplished in the same manner as other set-points. Tap the Light field and use the keypad screen to select the desired set-point. If there are multiple Lighting columns for your configuration, then repeat this procedure for each column.

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8. If equipped with CO_2, tap the CO_2 value `0000` and/or the Auxiliary value to set the desired levels.

- To view/modify the CO_2/Auxilliary values, touch the right ➡ arrow button to navigate to the field box.

- To add more programs, repeat the above steps in order.

9. To add another Timeline to the program, tap the insert **INSERT** field and then the '02' Timeline Row. Default values will be displayed. Repeat steps 3 – 8 above to complete the new Timeline. Insert additional Timelines as required.

> **Note:** A maximum of 48 Timelines (Rows) can be entered for each Program. Each Program covers a 24-hour Period.

If Timelines were not entered in time sequence, press the 'Sort' button at the bottom of the screen to automatically sort the rows of the program by time. This allows for simple verification that programs were entered correct and complete.

10. Once all the Timelines have been entered into the program, tap the 'EXIT' button at the top, left hand side of the display screen.
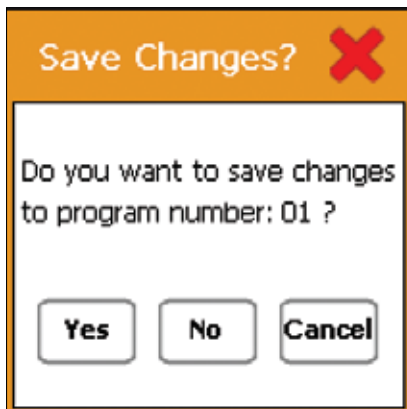
Figure 4-5: Pop-up window to confirm saving the program.

- A pop-up window will appear to confirm saving the program. (Figure 4-5)

- Tap the 'YES' button to save and return to the Program Screen.

- Tap the 'NO' button to cancel all entries made to the specific program and return to the Program Screen.

- Tap the 'CANCEL' button to go back into the program editor and modify any required changes to the Timelines.

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4.3.2 Edit Program   [Access Level: 1]

Tap the edit program icon to access the following screen (Figure 4-6: Program Screen). The default value is program '01'. If more than one program has been entered, the User may select the program to open. Use the scroll and enter tabs to open the select Program.
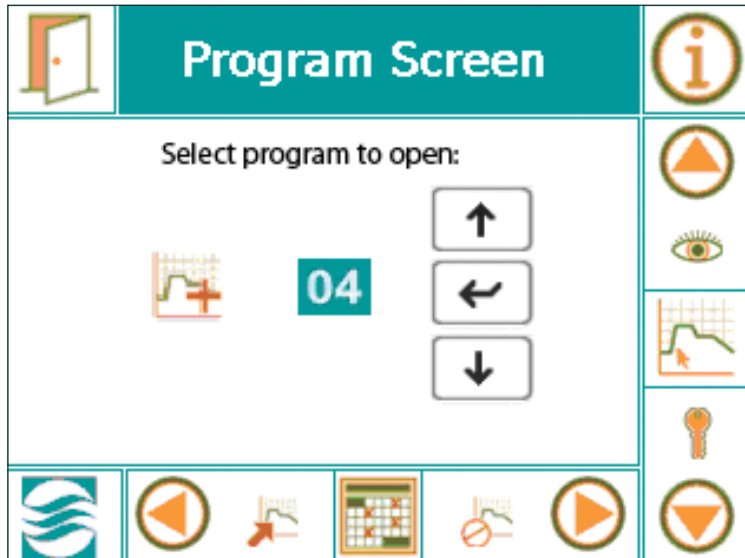
Figure 4-6: Program Screen allowing you to select the program to edit.

- Editing a program has the same procedure as creating a program.
- Touch the necessary field box to modify the Timeline values.

1. To delete a Timeline in the program, tap the 'DEL' button. **DEL**

- The 'DEL' button will turn black **DEL**

2. Now tap the desired Timeline row number to be deleted.

   Note that the **DEL** tab turns back to its original state.

3. To add additional Timelines to the program, repeat step 9 from the previous section.

4. Once all modifications have been entered, tap the 'EXIT' icon on the top, left hand side of the display screen. A pop-up window will appear to confirm saving the edited program.

Note: A program can be edited while the unit is in operation (CMP6050 Software Version 2.10 or greater).

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4.3.3 Delete Program   [Access Level: 1]

Tap the Delete Program icon to access the following screen (Figure 4-7: Program Screen).
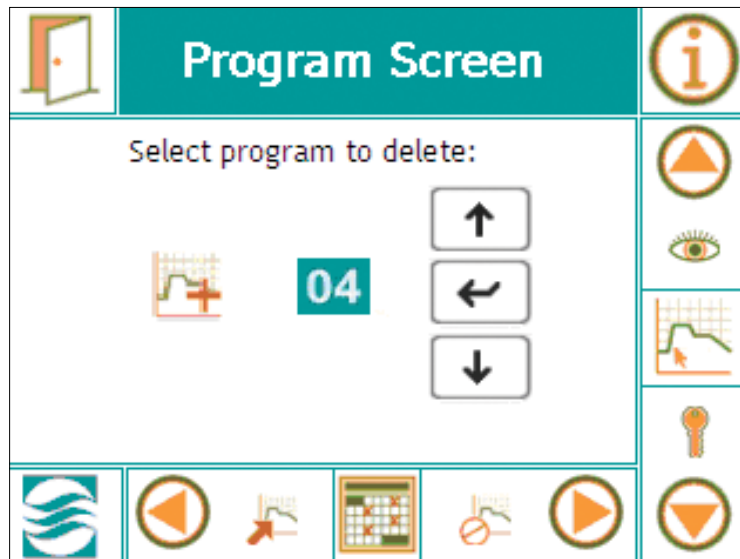
Figure 4-7: Program Screen allowing you
to select a program to delete.

Note: A program cannot be deleted while the unit is in operation.

1. To delete a program, tap the 'UP' or 'DOWN' buttons to select the desired program to delete.

2. Tap the 'ENTER' button.

• A pop-up window will appear to confirm program deletion. (Figure 4-8)
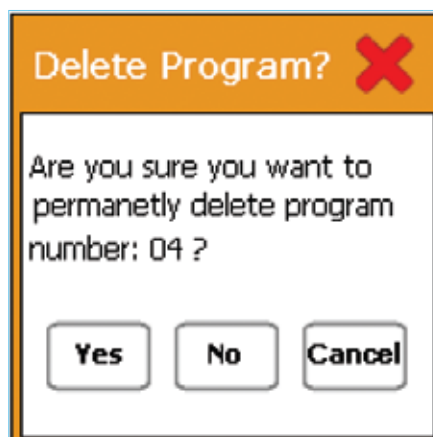
Figure 4-8: Confirmation message.

4.4 Schedule Screen

The CMP6050 scheduling system allows the User to enter a sequence of Programs used to run chamber experiments (Figure 4-9). When the schedule has run through in its entirety, the chamber stops automatically.
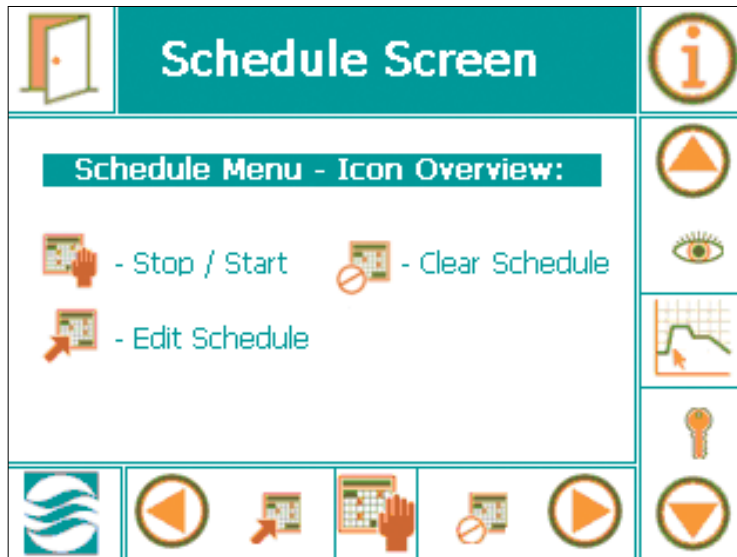
Figure 4-9: Schedule Screen

4.4.1 Edit Schedule

Tap the 'Edit Schedule' icon to create or edit a schedule on the schedule editor screen. Refer to Figure 4-10 for an overview of the schedule editor screen.
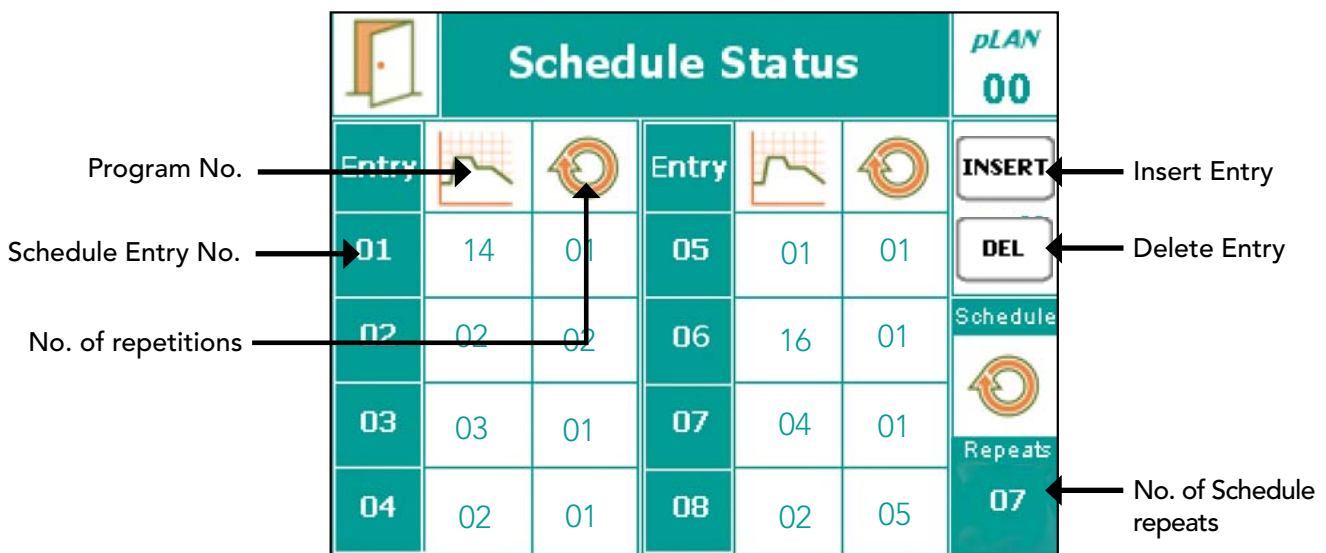
Figure 4-10: Schedule Editor Screen Overview.

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Note: Programs can be modified/edited while the chamber is running. However, you cannot create or edit a Schedule while a Schedule is running. As such, when you tap 'Edit Schedule', a pop-up box will appear to notify the User that a Schedule is running. If this occurs, exit to the 'Schedule Screen' and tap the 'Stop/Start' tab to stop the chamber. Now you can edit the Schedule.

1. Tap the 'INSERT' button.

2. Tap the first Entry of the schedule, which is '01'. The lowest program number will appear with ∞ (infinite) repetitions.

3. Tap the 'Program Number' field to toggle between available programs until the program to run is displayed.

4. Tap the 'Number of Repetitions' field and select the desired number of repetitions for the program.

   - Enter 1 to 99, or
   - To enter ∞ press "0"

5. Repeat steps 1-4 to enter additional programs into the Schedule.

   - Once all programs have been entered, and prior to saving the new/edited Schedule, select the number of Schedule repetitions by tapping the "repeats" box at the bottom right corner.

6. To delete any entry, touch the 'DEL' button followed by the desired entry row.

7. Once all programs have been entered into the schedule editor, touch the 'Exit' button. A pop-up window will appear to confirm saving the schedule. (Figure 4-11)
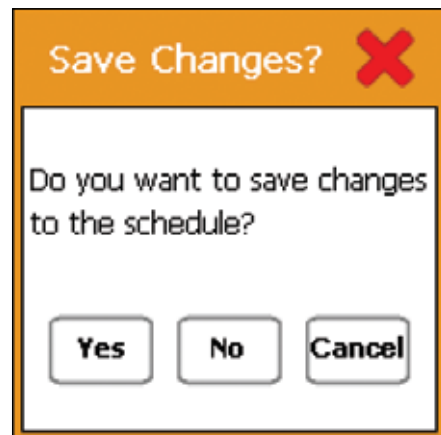
Figure 4-11: Confirmation to save changes.

Note: For the Schedule Status screen displayed in Figure: 4-10, the schedule will run a variety of 6 programs over 13 days and will repeat this sequence 7 times for a total duration of 91 days.

4.4.2 Start/Stop

Tap this icon to start or stop the Schedule for the chamber experiment. A pop-up window appears to confirm starting or stopping the chamber. (Figure 4-12)

If you are starting to run a new schedule, then a new screen entitled 'Select Start Point' will appear (Figure 4-13). Review the Schedule for correctness and then Select the Schedule Entry Number at which point you would like to begin the Schedule. A small white arrowhead along the left side of the Entry Number Column indicates the start point. Tap the 'Run' tab to start the Schedule. A pop-up window appears to confirm running the Schedule (Figure 4-14).
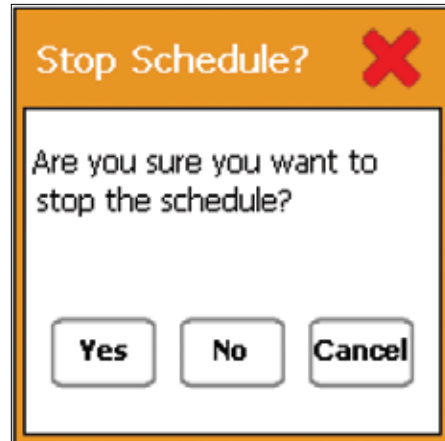
Figure 4-12: Confirmation to stop schedule.

Figure 4-13: Select Start Point screen
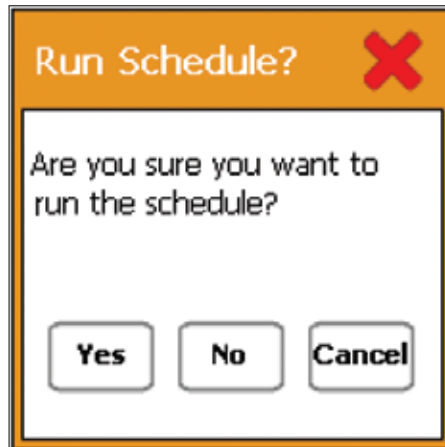
Figure 4-14: Confirmation to run schedule.

Note: Programs will always start at the point in the program that coincides with the true, actual clock time. For example, if a schedule is started at 3:00 pm it will start the Program at whatever the set-point conditions are at the time. If the unit is set in Ramp mode, the temperature will ramp from the starting value to the one entered in the program. If the unit is set in Ramp mode, the set-point will begin its transition from the starting value to the value entered in the program.

Note: If a chamber is shut down while running a schedule upon starting up, the chamber will resume running the schedule at the point where it left off. Once in operation, to quickly stop a schedule, press the ON - OFF button.

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4.4.3 Clear Schedule

To clear the Schedule the chamber must first be stopped (refer to Section 4.4.2: Start/Stop). If you attempt to clear the Schedule while a Schedule is running, a pop-up Warning window appears as in Figure 4-15.
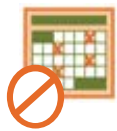
Once the Schedule has been stopped, tap this icon to clear all the programs within the schedule. The following pop-up window displays. (Figure 4-16)

The display now returns to the Schedule Screen view (Figure 4-17). A new schedule can now be created per Section 4.4.1: Edit Schedule.
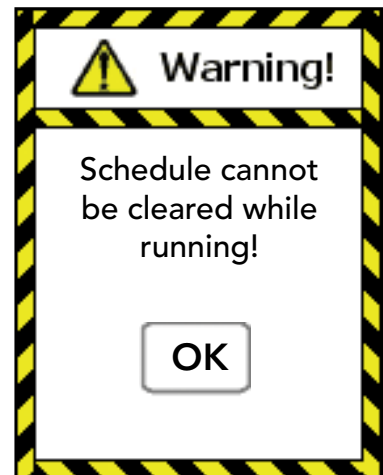
Figure 4-15 Warning Window
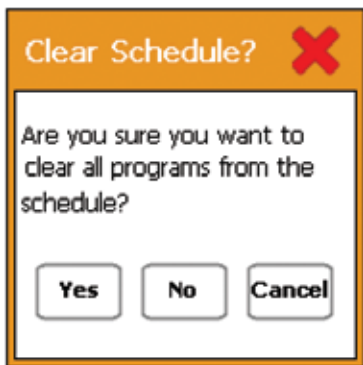
Figure 4-16: Confirmation to clear schedule.

- To see the schedule status while a schedule is running, touch the information icon from the Schedule Screen (Figure 4-17: Schedule Screen).
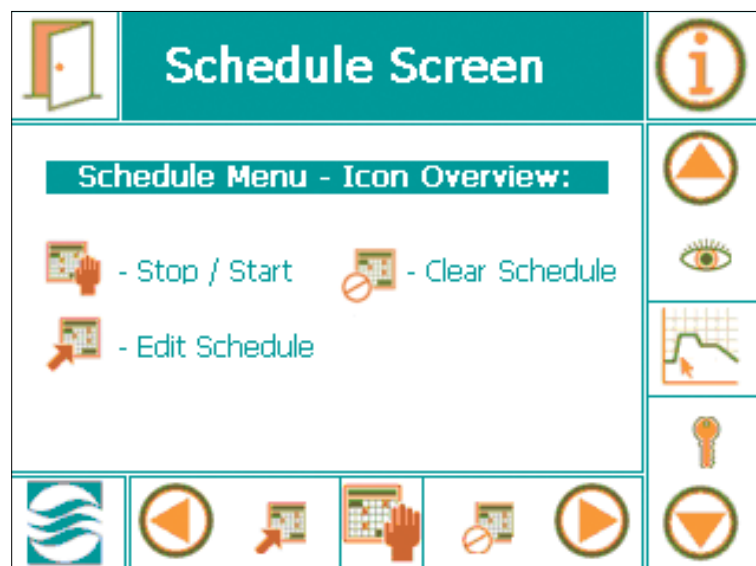
Figure 4-17: Schedule Screen

Note: Once a schedule has run through completely, the unit will automatically shut off.

5.0 ALARM SCREEN

The alarm screen allows the User to set-up and manage alarm conditions for each chamber. Alarms are used to notify the User when <u>actual</u> controlled parameters move outside of the <u>set-point</u> conditions and their respective limits. With the ability to program alarms, receive error messages and manage reporting, experimental research specimens can be effectively protected. This section of the Manual provides information on setting-up and managing alarms effectively. Topics covered include:

- Alarm Settings
- Clear Alarms
- Alarm History

5.1 Alarm Screen Icons

From the Main Menu Bar on the Main Status Screen, tap the Alarm Icon to access the Alarm Screen. The Figure below illustrates the key areas of the Alarm Screen.

5.2 Alarm Overview
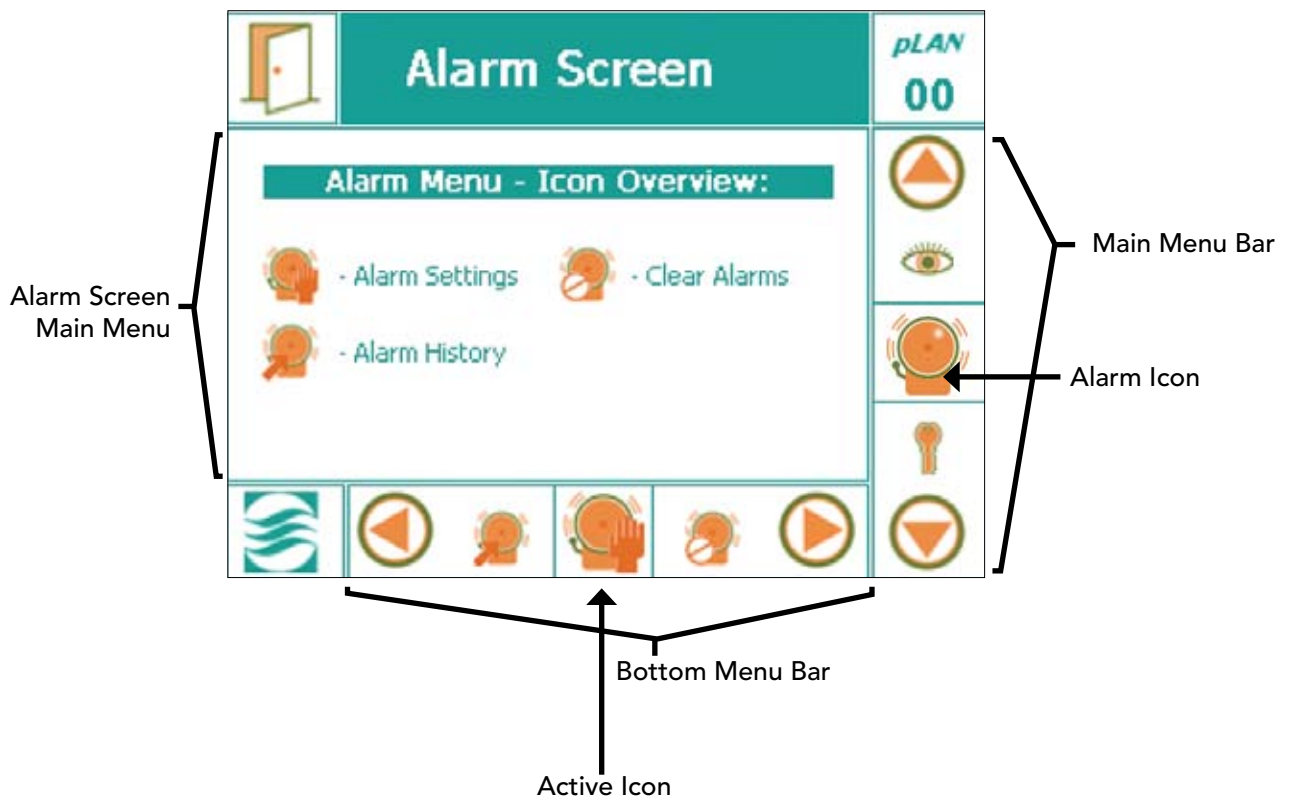
Figure 5-1: Alarm Screen – Overview

The CMP6050 contains a total of 23 alarm types. Based on the configuration of the unit, these alarms will be either enabled or disabled by Conviron at the time of manufacture.

Each of the 23 alarms in the CMP6050 are classified with two (2) main alarm classifications – Warnings and Shutdowns.

1. **Warning**

   Notification of a non-critical alarm condition. The chamber will continue to operate under the alarm condition(s). Examples of this type of alarm include humidity, light, open-door, etc.

2. **Shutdowns**

   Notification of a critical alarm condition. The chamber will deactivate to prevent damage to the chamber and/or experiment. Examples of this type of alarm include temperature, refrigeration system malfunction, circulating fan malfunction, etc. Shutdown alarms are further classified by Latching and Non-Latching

   a) **Latching**

   The chamber does not recover and user intervention is required. This alarm will stop the schedule and force the user to manually re-start the chamber.
   Example: High/low pressure.

   b) **Non-latching**

   The chamber automatically recovers without human intervention when the alarm conditions are corrected and/or no longer active.
   Example: Temperature limits.

5.3 RAMP Mode and STEP Mode

For the Temperature set-point parameter, the User has the option of selecting temperature set-point transitions to either RAMP Mode or STEP Mode. RAMP mode provides a user-defined gradual ramp for temperature transitions, while STEP mode provides an instantaneous set-point 'step' for temperature transitions. Obviously, the chamber cannot produce an instantaneous (step) change in the temperature. As such, in STEP mode, the chamber will transition from the last set-point to the new set-point as fast as the refrigeration system and the chamber conditions will allow. (In STEP mode, the tracking alarm feature is disabled.) The controller software then works to 'soften' the temperature transition to prevent 'overshoot'. Setting the Temperature parameter as either RAMP or STEP mode is described in further detail Section 7.5.1 Temperature Control Mode.

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NOTE: The Temperature Mode is a global setting which means the controller runs in <u>either</u> RAMP or STEP Mode. As such, the User can not run a schedule with some programs running in RAMP mode and some running in STEP Mode. They all either run in RAMP or STEP Mode.

NOTE: The default configuration from Conviron places the CMP6050 Temperature transition to RAMP Mode. To change the Temperature transition mode, refer to Section 7.5.1 of this Manual.

5.3.1 Temperature Tracking – RAMP Mode

When Temperature is set to control in RAMP Mode, an additional User-specified setting, called 'Temperature Tracking', is available. In Temperature Tracking, the User specifies a 'Warning' limit (or low limit) which is defined as the variance allowed before the controller triggers a Temperature Warning alarm. If at any time the Actual Temperature differs from the Set-point temperature throughout the Ramping phase by more that the specified (low limit) value, the Warning alarm will be triggered. The minimum (and default) value for the Warning setting is 2.0°C.

RAMP Mode also has a 'Shutdown' limit (or high limit) which is defined as the variance allowed before the controller triggers a Shutdown Alarm. If at any time the Actual Temperature differs from the Set-point temperature throughout the Ramping phase by more that the specified (high limit) value, a Shutdown alarm will be triggered. The maximum value for the Shutdown setting is 9.9°C.

Note: For the Warning limit in RAMP Mode, the actual temperature would have to exceed the low limit for 2 minutes before a Warning alarm is triggered and for 5 minutes before a Shutdown is triggered. The reason for this is to prevent 'nuisance' alarms where the low limit is exceeded for only a brief period.

5.3.2 Temperature Limits – STEP Mode

Similarly, when Temperature is set to control in STEP Mode, an additional User-specified setting called 'Temperature Limits' is available. With Temperature Limits, the User specifies a Low value and a High value for all Temperature operating conditions. Any breach of these limits triggers a Shutdown.

5.4 Setting Alarms

1. Tap the alarm icon ![alarm icon] to access the alarm screen.

2. Tap the 'Alarm Settings' icon ![alarm settings icon] to access one of the following screens, depending on whether the controller is set for Ramp or Step mode – Figure 5-2: Alarm Screen in Ramp Mode or Figure 5-3: Alarm Screen in Step Mode.

> **Note:** At this point, the actual screen will vary depending on the unit chamber configuration – that is, whether in RAMP or STEP mode.
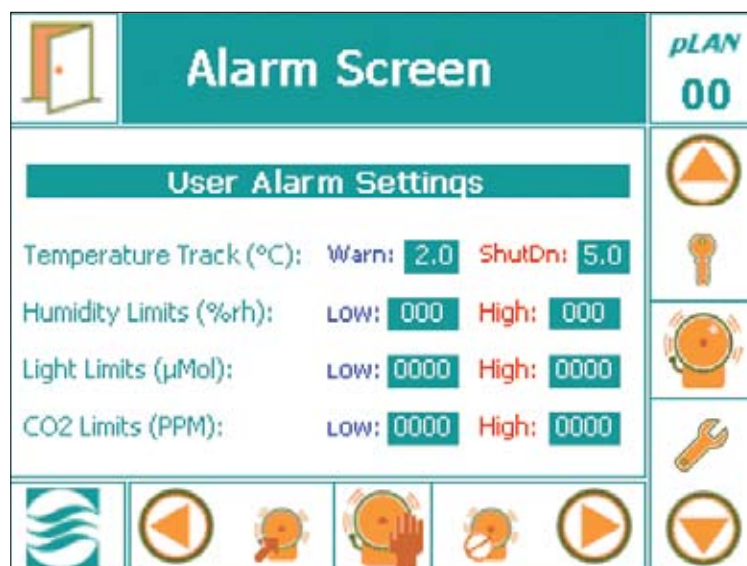
Figure 5-2: Alarm Screen in Ramp mode

5.4.1 When in Ramp Mode

1. **Set the 'Warning' (low) tracking alarm.**

   Tap the 'Warn' field box to display a keypad and enter the low tracking alarm.

   - The value entered cannot be lower than the factory set minimum 2 °C. (Refer to Section 5-3: RAMP Mode and STEP Mode for more information about this value.)

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2. **Set the 'Shutdown' (high) tracking alarm.**

   Tap the shutdown field box to display a keypad and enter the high tracking alarm.

   - The value entered must be in the range of 5.0° to 9.9°C

> **Note:** Setting the Low and High limits for the remaining parameters are independent of RAMP or STEP Mode. Factory set default values are set by Conviron and depend on the chamber configuration. The User is able to change the default settings using the same general instructions for setting the Temperature limits.

5.4.2 When in Step Mode

> **Note:** When in STEP Mode, Temperature Tracking alarms are disabled.
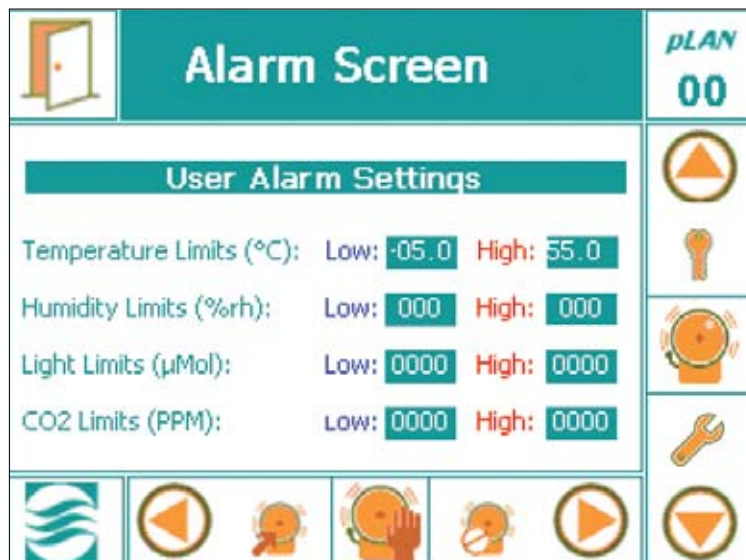
Figure 5-3: Alarm Screen in Step mode

1. **Set the low alarm limit.**

   Tap the low field box to display a keypad and enter the low limit alarm.

   - The value entered cannot be lower than the factory set minimum of -5.0°C.

2. **Set the high alarm limit.**

   Tap the high field box to display a keypad and enter the high limit alarm.

   - The value entered cannot be higher than the factory set maximum of +55.0°C.

> **Note:** With Conviron CMP6050 software, the values entered in the limit fields are saved and do not have to be re-entered when the system is re-booted.

The following figure provides a summary of temperature limits in RAMP Mode.
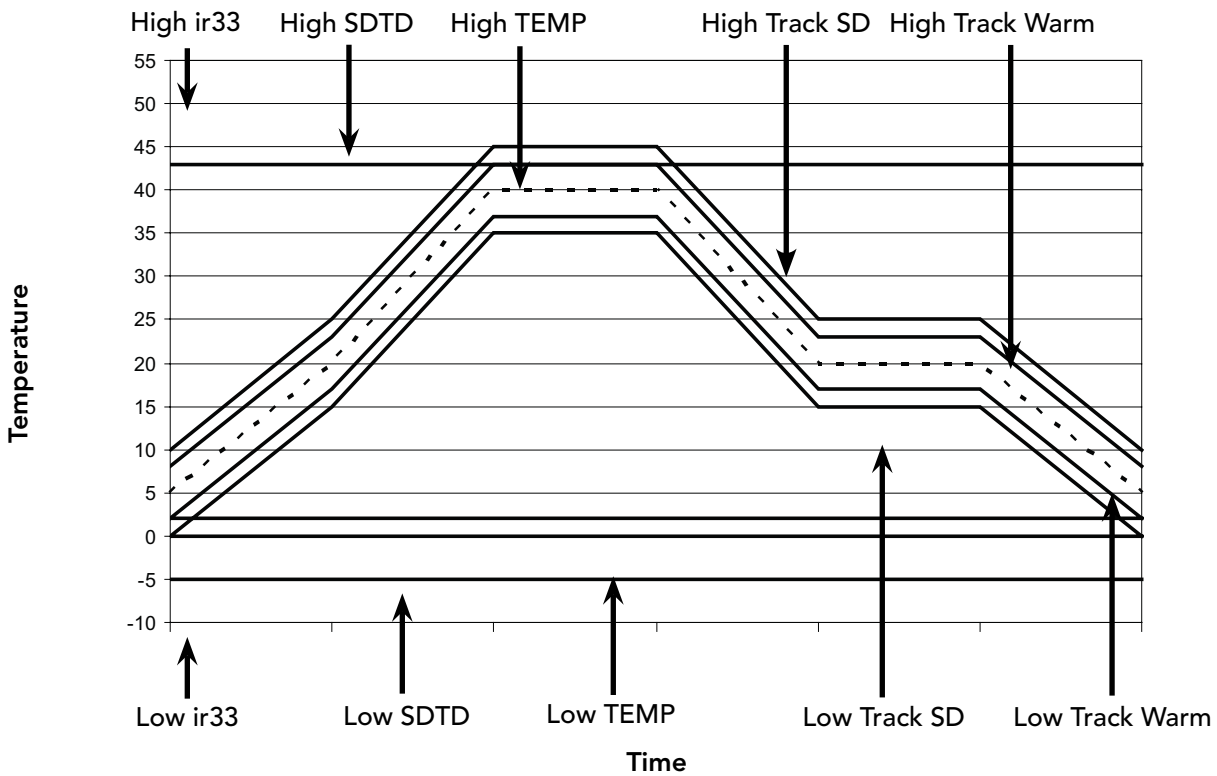
Figure 5-4: Temperature Limit Summary—RAMP Mode

5.5 Alarm Status Indicators

The following Table provides a summary of alarm status indicators and their corresponding pop-up windows.

Status Indicator				Definition & Corresponding Pop-up Window
≡ CMP6050 ≡ conviron			=	No program running/No alarms
≡ CMP6050 ≡ conviron	+	**≡ CMP6050 ≡** conviron (black)	=	Program running/No alarms
≡ CMP6050 ≡ conviron	+	**≡ CMP6050 ≡** conviron (green)	=	No program running/Inactive Unacknowledged alarm (Figure 5-5)
≡ CMP6050 ≡ conviron	+	**≡ CMP6050 ≡** conviron (yellow)	=	No program running/Active Acknowledged alarm (Figure 5-6)
≡ CMP6050 ≡ conviron	+	**≡ CMP6050 ≡** conviron (red)	=	No program running/Active Unacknowledged alarm (Figure 5-7)
≡ CMP6050 ≡ conviron (black)	+	**≡ CMP6050 ≡** conviron (green)	=	Program running/Inactive Unacknowledged alarm (Figure 5-5)
≡ CMP6050 ≡ conviron (black)	+	**≡ CMP6050 ≡** conviron (yellow)	=	Program running/Active Acknowledged alarm (Figure 5-6)
≡ CMP6050 ≡ conviron (black)	+	**≡ CMP6050 ≡** conviron (red)	=	Program running/Inactive Unacknowledged alarm (Figure 5-7)

Note: Tapping the Status Indicator while any of the alarms states are active will provide details of the alarm condition and additional options.
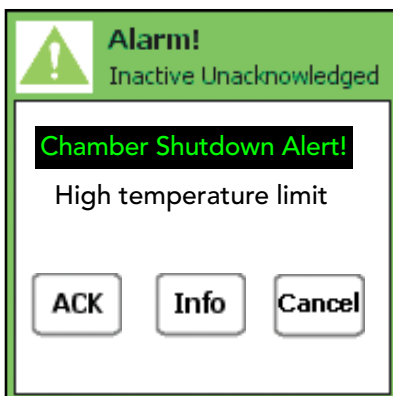
Figure 5-5
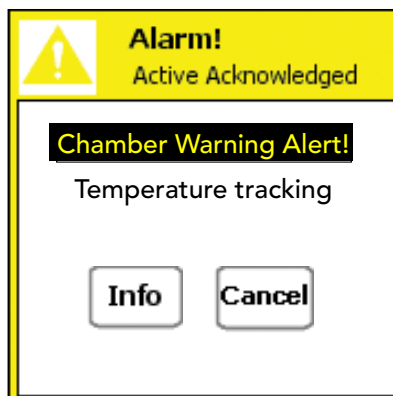
Figure 5-6
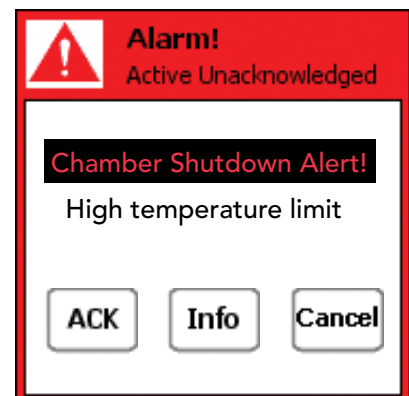
Figure 5-7

5.6 Alarm Corrective Action

For any of the above alarm conditions, tap the CMP6050 logo to access the corresponding pop-up Alarm Screen.

1. Adjust the alarm settings if necessary.

2. Repair the fault where necessary.

3. Shut down and restart the chamber.

> **Important:** Inside the control panel is an independent temperature shut-off device called the ir33. This ir33 acts as a secondary fail-safe protector that shuts off the chamber if its temperature limits are exceeded. The ir33 is set by Conviron and is factory protected.
>
> The factory default setting for the ir33 temperature limit is ten degrees beyond the chamber operating range. Always verify, when changing the (Alarm) Temperature limits, that the limits are still within the minimum and maximum operating limits for the Chamber. This will ensure that the ir33 only triggers in the event that the actual temperature exceeds the Chamber's minimum or maximum temperature limit by 10 degrees. It will also ensure that the ir33 does not trigger 'before' a high or low temperature tracking alarm.
>
> The ir33 is located inside the control panel where there is live high voltage. Contact Conviron Client Services for more information or help if necessary.

5.7 Alarm Types

Following is a list of the 23 alarm types along with a description of each.

Warnings:

Bootup Alarm	A message that is generated each time the controller re-boots.
Temperature Tracking Warning Alarm	A warning message when the temperature drifts beyond the high or low set-points.
Chamber Off Alarm	Chamber power shuts off while a program is running as a result of the main contactor open.
High Humidity Warning Alarm	A warning message that the humidity has drifted above the high alarm.
Low Humidity Warning Alarm	A warning message that the humidity has drifted below the low alarm.
High CO_2 Warning Alarm	The amount of CO_2 in the chamber is above the alarm.
Low CO_2 Warning Alarm	The amount of CO_2 in the chamber is below the alarm.
High Light Warning Alarm	The uMOL or lighting level is above the alarm.
Low Light Warning Alarm	The uMOL or lighting level is below the alarm.
Open Door Warning Alarm	A warning message that the chamber unit door is open for more than 60 seconds. The Chamber will shut down after 5 minutes if the door remains open after that time. (Available in just a few schedules.)
High Pressure Warning Alarm	A warning message that the condensing pressure has reached the high pressure limit value.
Low Pressure Warning Alarm	A warning that the suction pressure has reached the low pressure limit value.
Loft Temperature Warning Alarm	A warning message that the lamp loft temperature has exceeded the set-point
Plenum Temperature Warning Alarm	A warning message that the plenum temperature is above or below the set-point.

Shutdown Latching:

High Pressure Count Alarm	A warning message that the high pressure switch has been tripped off 3 times within the last 30 minutes.
Low Pressure Count Alarm	A warning message that the low pressure switch has been tripped off 3 times within the last 30 minutes.
High Pressure Time Alarm	A warning message that the high pressure switch has tripped off for more than 30 seconds.
Low Pressure Time Alarm	A warning message that the low pressure switch has been tripped off more than 30 seconds.

Shutdown Non-Latching:

ir33 Temperature Shutdown Alarm	Chamber shut off as a result of the ir33 temperature settings have been exceeded.
Temperature Tracking Shutdown Alarm	Chamber shut down as a result of the temperature exceeding the user tracking limit.

5.8 Alarm History   [Access Level: 1]

The Alarm History provides alarm information stored in the CMP6050 for the User to view. The information provides a history of every alarm that the chamber encountered.

Tap the 'Alarm History' icon to access the following screen. (See Figure 5-5)
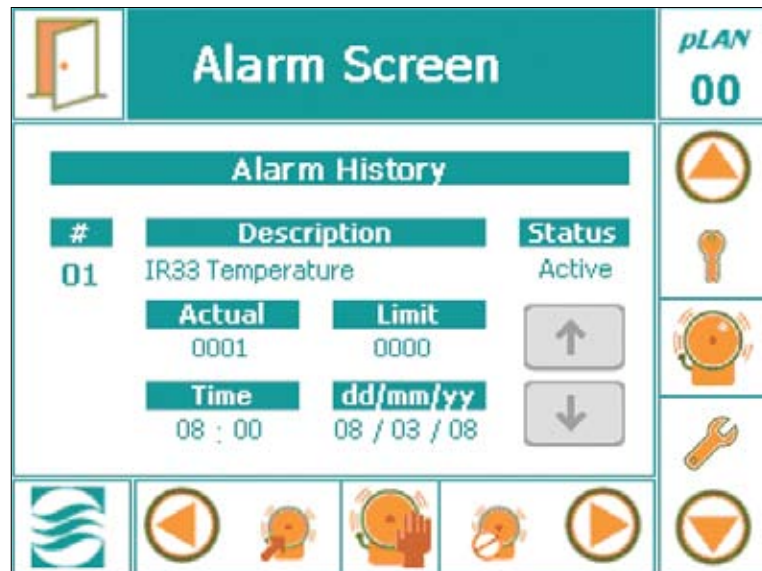
Figure 5-5: Alarm History Screen

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#	Indicates the alarm in sequence of alarm events.
Description	Indicates the alarm cause or malfunction.
Status	Presents the Alarm Indicator (Ref. Section 5-5 Alarm Status Indicators)
Actual	Actual value achieved of the parameter.
Limit	Set-point limit of the parameter.
Time	Indicates the time of the alarm set-off.
DD/MM/YY	Indicates the date of the alarm set-off

- Use the 'UP' or 'DOWN' arrow buttons to view the alarm history

5.9 Clear Alarms [Access Level: 1]

Touch the 'Clear Alarms' icon to access the following pop-up window:

Touch the 'Yes', 'No', or the 'Cancel' button to confirm.

Figure 5-6: Confirmation to clear alarm.

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6.0 SECURITY SCREEN [Access Level: 1]

The CMP6050 has a security feature to manage Users by managing their level of access. The feature requires Users to be set-up (a maximum of 3 User ID passwords can be assigned). Once this is completed (and provided Security is turned On), Users are required to login – this is to ensure that Program modifications are made by authorized personnel only. The Administrator can override all Users and can access all programming functionality.

The CMP6050 is shipped with security features turned Off. This enables any User to start the chamber and become familiar with the chamber controls without having to enter a password.

> **Important:** It is recommend that a security Administrator be assigned to administer User login authority and that security features be added as soon as possible.

6.1 Security Overview

With security enabled, there are three 'types' of Users in the CMP6050 including:

- Users (Access Level 1)
- Administrators (Access Level 2)
- Factory (Access Level 3)

Users have Level 1 access which means they have access to the basic features such as Programming, Alarms, Trend Graphs, and some of the Option features. **Administrators** have Level 2 access which includes Level 1 access plus additional Service and Option features. **Factory** has Level 3 access which includes Level 2 access plus other Service and configuration features. Section 6-4: Edit User Screen provides details on setting up the Users and enabling the Security feature. A step-by-step instruction is provided.

> **Note:** When Security is turned OFF, anyone can access the Level 1 and 2 features. For this reason, it is recommended to setup the Administrator and User login authorities as soon as possible.

6.2 CMP6050 Level Access

The following table provides CMP6050 access levels available to the User, Administrator, or Service/Factory personnel. Access level is password enabled. In this Manual, access level codes are presented at the beginning of every chapter to inform the user of specific access required.

Menu	Sub-Menu	Access Level
Status Options	Input Offset	1
	Time & Date	1
	Security On/Off	2
	Startup Delay	1
	Setup	1
Security	Login	1
	Logout	1
	Change Password	1
Service	I/O Status	1
	CONVIRON Access	3
	System	2
	User Reset	2
	O/P Runtimes	2
	PID Settings	2
Alarms	Settings	1
	History	1
	Clear Alarms	1
Trend Graph	N/A	1
Program	Create	1
	Edit	1
	Schedule	1
	Delete	1

Legend
1 = User access
2 = Administrator access
3 = Factory access

Note: Factory login is only available to Conviron personnel.

6.3 Security Screen Icons and Locations

The figure below (Figure 6-1: Security Screen Layout) presents the key features and layout of the Security Screen. This is the screen used to setup Administrator and User passwords.
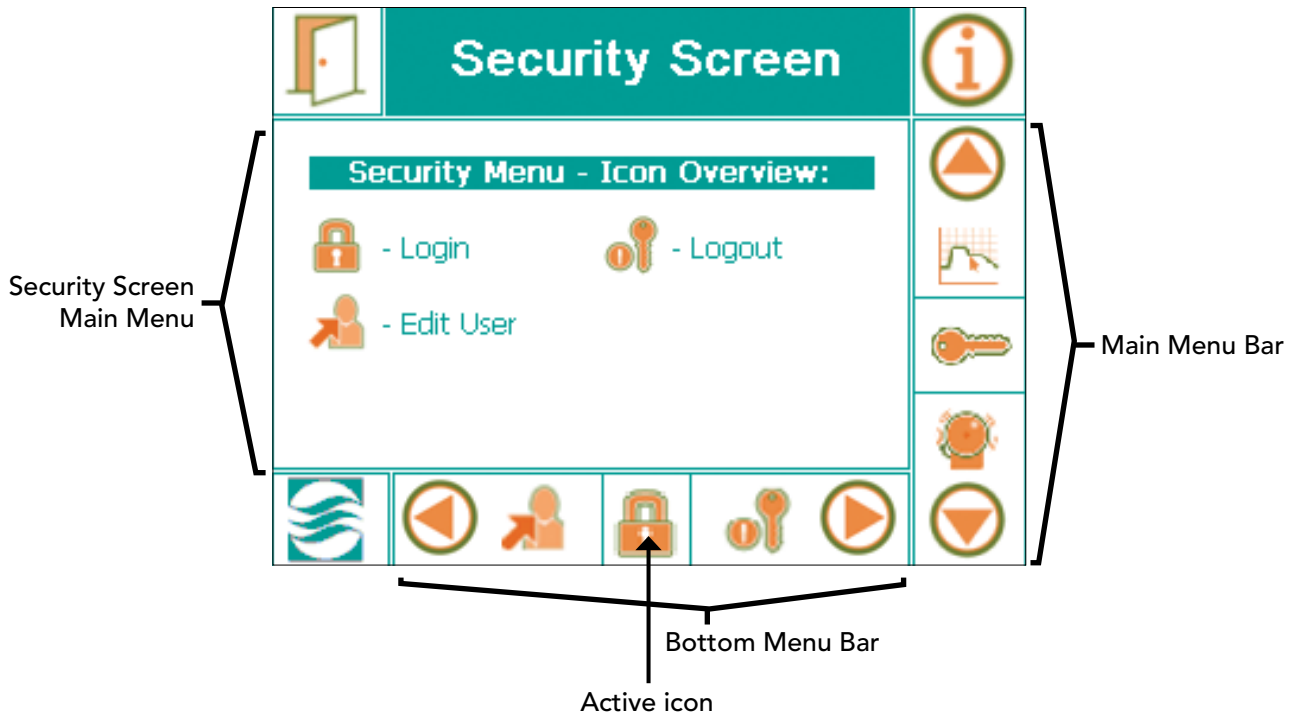
Figure 6-1: Security Screen Layout

6.4 Edit User Screen   [Access Level: 1]

The first step to setting up the Security feature is to setup the Administrator. The CMP6050 comes from the factory with a default Administrator password already set up. Note, this password must be changed as soon as possible. The default password is 72343. Using this as the current password, assign an Administrator and change the Administrator password. This is accomplished as follows:

On the Main Menu Bar, scroll up or down until the 'Key' icon [icon] appears as the 'active' Icon. Tap the Icon to launch the Security Screen (Figure 6-1: Security Screen Layout).

Tap the 'Edit User' icon [icon] in the bottom menu bar to access the following Edit User screen (Figure 6-2).

Figure 6-2: Edit User screen.

To navigate through this screen, use the three (3) Keys on the right side of the display. (Figure 6-3)

1. Press the 'ENTER' key to navigate to the 'Select User' field. A blinking white cursor will appear in the field box.

2. Press either the 'UP or 'DOWN' Key to scroll through the available users. The options include Users 1-3 plus Administrator.

3. Press the 'ENTER' Key once you have selected the desired user.

> **Note:** It is recommended that the first user to be setup be the Administrator. Once the Administrator has been setup, other Users (up to 3) can be setup.

4. a) In the initial setup for the Administrator, insert the default password (72343) in the "Enter Current Password" field.

   b) In the initial setup for each User, the "Current Password" is '00000'. Press the 'ENTER' Key five (5) times to skip through this field.

5. In the 'Enter New Password' section, a blinking white cursor is displayed in the 1st digit field. Use the 'UP/DOWN' Keys to toggle the digit and press the 'ENTER' Key to confirm.

6. Repeat Step 5 for every digit until completed. A notice will appear in the lower portion of the screen "Password Change Successful".

7. Press the 'ENTER' key again to return to the Security menu screen.

Note: The Administrator and all Users should record their passwords for reference. If a User forgets/loses his/her password, it can be reset by the Administrator. If the Administrator forgets/loses his/her password, Conviron Technical Services must be contacted.

6.5 Login Security Screen   [Access Level 1]

Now that passwords have all been set up, Security should be turned 'ON'. If passwords are all set up and Security is <u>not</u> turned ON, anyone can access Level 1 and 2 functions. When Security is turned ON, Users can only access Level 1 functions while Administrators can access Level 1 and 2 functions.

Turning Security ON is accomplished from the Option Screen. Note however that the Option Screen has not yet been covered at this point in the Manual. Please refer to Section 7.6: Security On/Off for instructions on how to turn the Security ON. Once Security has been turned ON, proceed with the following instructions regarding logging in.

Figure 6.3: Display – Right Side Keys

Touch the 'Login' icon   to access the following screen. (Figure 6.4: Login Screen)

To navigate through this screen, use the three (3) Keys on the right side of the display (Figure 6-3).

1. Press the 'ENTER' key to navigate to the Select User field. A blinking white cursor will appear in the field.

   - **'Factory' is inaccessible to the User. Requires Access Level: 3**.

2. Press either the 'UP' or 'DOWN' keys to scroll through the available users.

3. Press the 'ENTER' key after selecting the desired user.

4. There should now be a blinking white cursor in the Enter Password (1st digit) field box. Press the 'UP' or 'DOWN' key to enter the code.

5. Once the last digit of the password has been entered, press the 'ENTER' key. An 'Unlocked icon' and 'Login Successful' is displayed when finished at the bottom of the login screen.

   - Authorized access to various Level-dependent sections of the CMP6050 is now enabled.
   - If a mistake is made entering a password, tap the 'Exit' Icon. This will move you back to the previous screen. You'll then have to re-enter the Login Screen.

Figure 6-4: Login screen.

6.6 Logout Security Screen   [Access Level: 1]

Touch the Logout icon ◯ ◯ to access the following pop-up window. (Figure 6-5)

Touch the 'Yes', 'No', or the 'Cancel' button.

After selecting the desired button, by default, it will return to the Main Status Screen.

- After five (5) minutes of inactivity, the CMP6050 will automatically Logout all Users, including the Administrator. (Figure 6-6)

- A pop-up window will appear and inform the User to Log in again.

- Follow the same procedure in Section 6-4: Login Security Screen to re-gain access.

Figure 6-5: Log out confirmation.
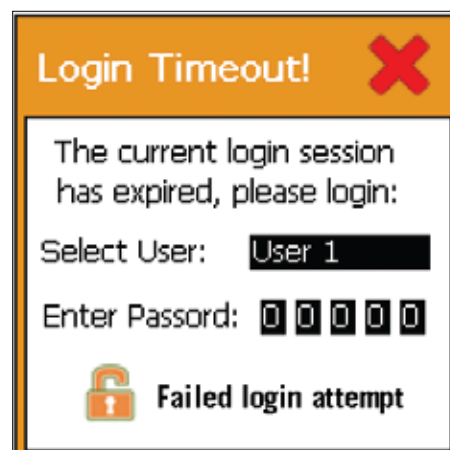
Figure 6-6: Login timeout.

7.0 OPTION SCREEN

In previous sections of this Manual, instructions were provided to enable the User to start-up and begin using the CMP6050 to control the Chamber. Those instructions comprised just the basics of what was required to begin operating the control system. In this section, an expanded palette of features and options are presented. These new features provide the User enhanced control over the control system operation. Some of the options and features presented in this section affect the logged data, and as such it is important that the additional variables be appropriately set.

7.1 Option Screen - Layout

The Option Screen presents five key menu options as illustrated below.
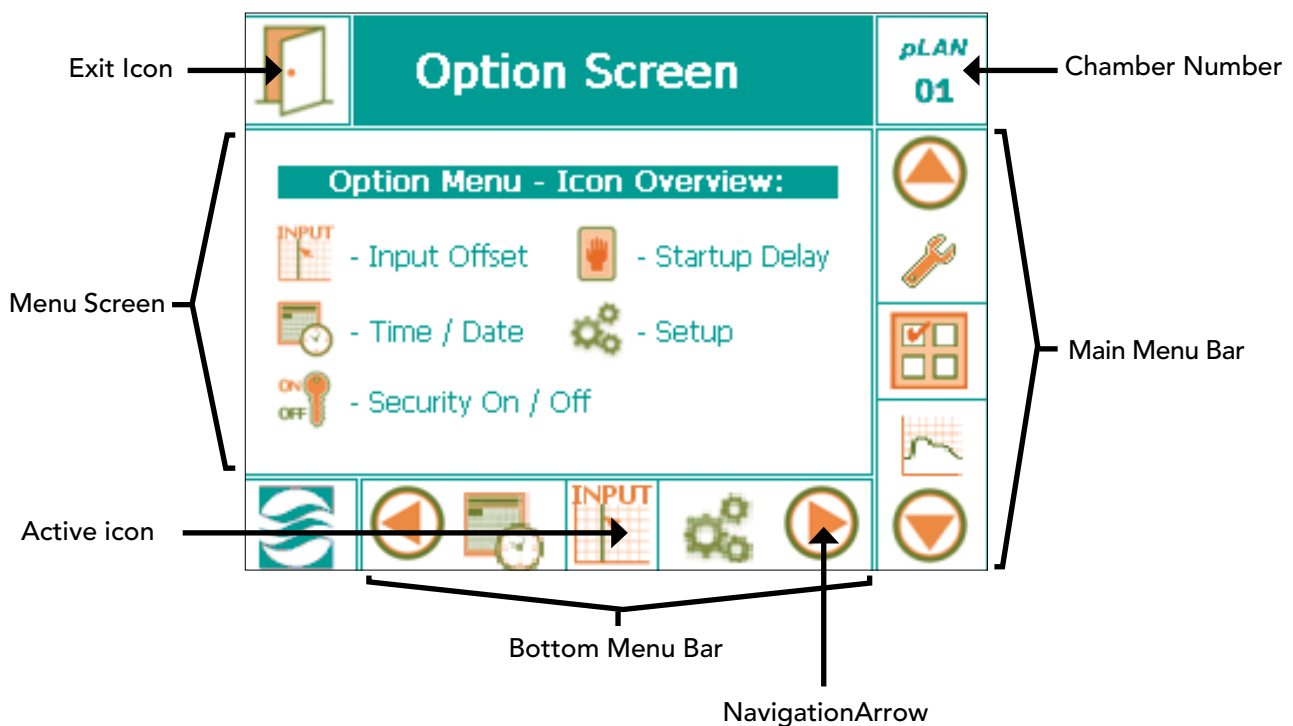
Figure 7-1: Option Screen Layout

7.2 Input Offset (Sensor Calibration)

Input offset refers to sensor calibration which is a feature that allows the User to apply an offset correction to the actual sensor reading. This is particularly useful when the User has an independent sensor device that is considered to be highly accurate and that produces a slightly different reading than the CMP6050 reading.

For example, if the chamber is running at 25°C and an independent temperature sensor is placed into the chamber and it reads 24.3°C, provided the independent sensor is deemed to be accurate, a 0.7°C offset correction can be applied to the chamber sensor.

Offset correction is also useful since humidity sensors have a tendency to drift over time. In such circumstances, the User can increase the offset correction to compensate for this. Conviron recommends replacing the controller humidity sensor every two years.

To change the offset, tap the Input Offset icon in the main Option Screen to access the following screen (Figure 7.1: Input Offset):
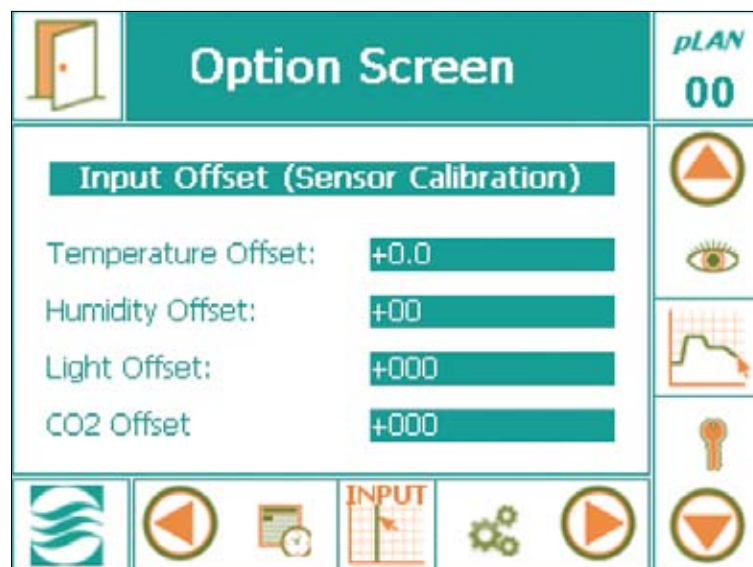
Figure 7.2: Input Offset (sensor calibration)

There are typically three (3) basic sensors installed in a chamber including Temperature, Humidity, and Light. The CO_2 sensor is an optional component that appears below the light sensor field.

1. Tap the desired field to modify the numerical data using the pop-up keypad (Figure 7-3: Keypad). Tap the 'OK' button on the keypad when finished.

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2. Repeat the process until all required offsets have been entered in the appropriate fields.

3. Tap the 'EXIT' icon on the top, left hand side to store the values and exit to the Main Status Screen.

> **Note:** If negative values are entered, there maybe conflict with alarm set-points, specifically with light and CO_2.

Figure 7.3: Keypad

7.3 (Chamber) Startup Delay   [Access Level 1]

For facilities that house multiple chambers, the CMP6050 offers a valuable feature called 'Start-up Delay'. This feature allows for the configuration of a power-on delay for each chamber which 'staggers' their start-up sequence. In the event of a power failure, once power is resumed, chambers would start sequentially as opposed to all at once – an event that could cause an undesirable power surge or, worse yet, another power failure. Configuring each chamber to start several seconds after the previous chamber is a wise precautionary step.

Conviron by default configures a start-up delay of between 1 and 59 seconds. To modify the default value, tap the Startup Delay icon in the Main Option Screen to access the following screen (Figure 7.4: Chamber Startup Delay):

Figure 7.4: Chamber Startup Delay
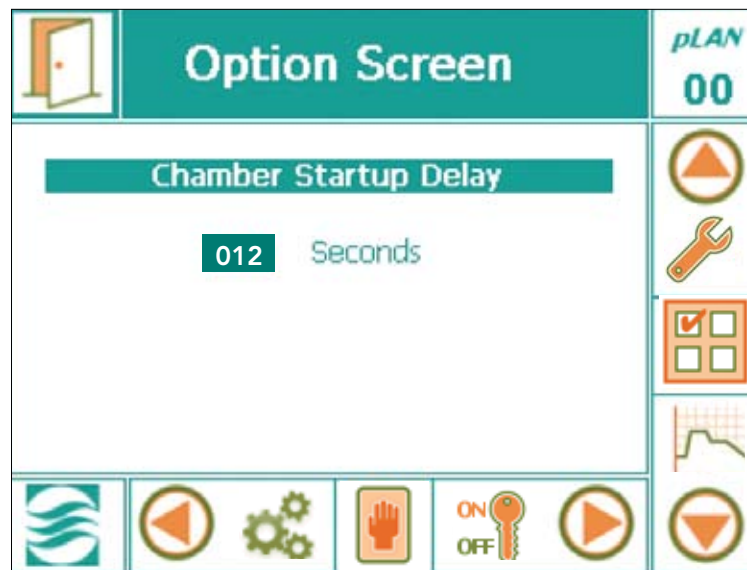
1. Tap the digit field to access the pop-up numerical keypad. (Figure 7.3: Keypad)

2. Tap the desired number of seconds on the numerical keypad. Conviron recommends a number between 10 and 59 seconds.

3. Tap the 'OK' button once finished. An alternative to using the electronic keypad is to use the Keys on the right side of the display.

7.4 Time/Date

Note: The Time / Date parameters were already setup in Section 2: Initial Setup And Navigation Overview. The operation does not need to be repeated here.

7.5 Setup

The 'Setup' option screen enables the User to specify the temperature control mode as either Step or Ramp mode. It also allows for the selection of the Data Storage Location.

7.5.1 Temperature Control Mode

Tap the Setup icon   to access the Temperature Control Mode options.

1. Tap the control mode field to activate the field. Use the right side keys to navigate through the temperature control modes and select either Step or Ramp.

2. If Step was selected, press the 'ENTER' key to store the selection. Now press either the Up or Down Key to progress to the Data Storage Location Setup option.

3. If Ramp was selected, a new field called 'Temperature Ramp Rate' emerges. Tap the numerical field to access the pop-up numerical keypad (Figure 7.3: Keypad)
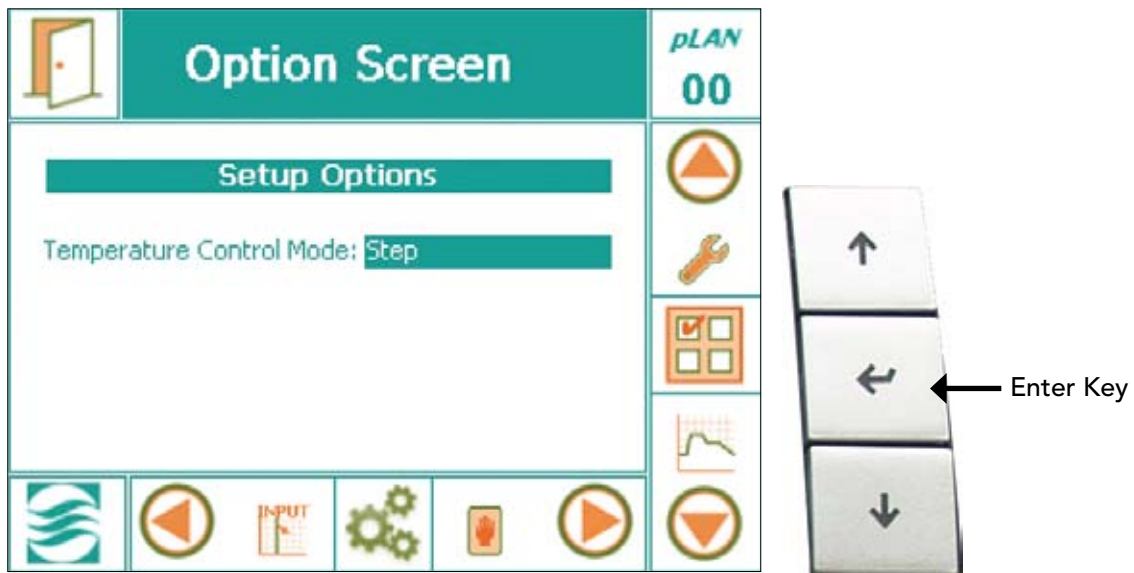
Figure 7.5: Temperature Control Mode

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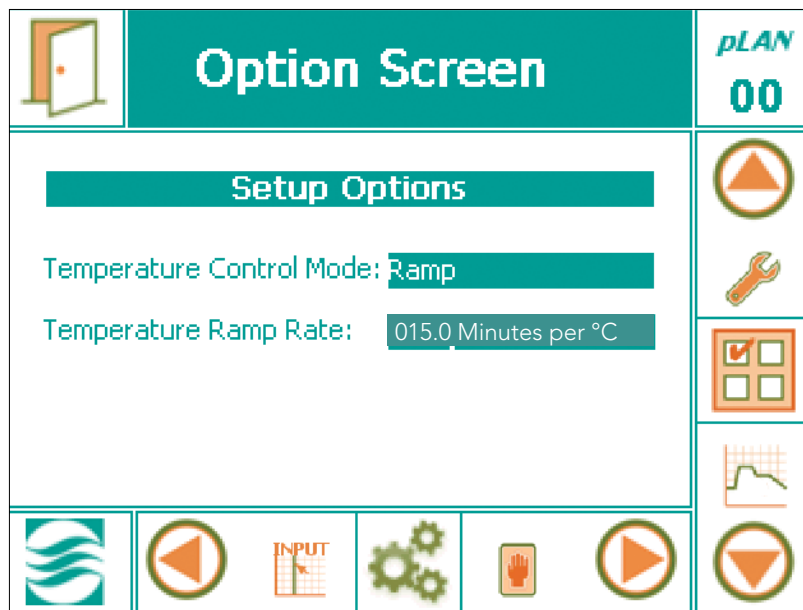
Figure 7.5: Ramp Mode Setup Options

4. Enter Temperature Ramp Rate values.

> **Note:** The maximum (i.e. fastest) ramp rate is determined by the refrigeration system capacity, control, and modulating hot gas bypass components used. Maximum Ramp rate values are as follows:
>
> **MAXIMUM** 3 min/°C
> Ramp rate for conventional refrigeration systems (DX)
>
> **MAXIMUM** 4 min/ °
> Ramp rate for glycol systems

5. Tap the 'OK' button on the numerical keypad once finished entering desired numbers.

6. Tap the Exit icon to save values and exit the setup.

> **Important:** When Step Mode is selected, the tracking alarm feature (discussed in Section 5.4 Setting Alarms) is disabled.

> **Important:** Ramp mode only applies to the Temperature parameter. All other parameters change in Step mode.

> **Note:** For shock testing, use Step mode. Do not modify ramp mode values.

7.5.2 Data Storage Location

There are two options for storing the log data – Network storage and Card Reader storage. The Network setting allows for log data to be downloaded to a network-connected PC. Obviously, this requires the chamber to be connected to a Local Area Network (LAN). The data is downloaded in .txt format which is importable by such programs as MS Excel®.

The Card Reader setting allows data to be downloaded to a card reader called the Conviron Memory Module (sold separately). This option is appropriate for installations where the chamber is not able to be connected to a LAN. The card from the Memory Module can then be inserted into a PC for data retrieval in .txt format.

7.6 Security On/Off   [Access Level 2]

Security features of the CMP6050 were already covered to some extent in Section 6: SECURITY SCREEN, of this Manual. The focus in Section 6 was getting the Administrator and Users set up with passwords, which is more of an infrequent (set-up) requirement. Security instructions provided in this section of the Manual pertain more to daily security interactions with the controller. Note that some instructions provided in this section may be redundant with those of Section 6.

The Security on/off feature is only available to the Administrator. When Security is turned OFF, all users have access to all Level 1 and 2 features. When Security is turned ON, features are limited by the access level (Level 1 for Users; Level 2 for Administrator).

With Security ON, anyone attempting to access a Level 1 or Level 2 screen will need to enter a password (this is referred to as "logging in"). If a User (not the Administrator) is logged in and s/he tries to access a Level 2 screen, a pop-up 'Warning' window appears (Figure 7-6: Warning Pop-Up) referencing the need to login as an Administrator. Tapping the OK field automatically brings up the Security Login screen (Figure 7-7: Security Login Screen).

> **Note:** The 'Security' icon located at the right side of the Bottom Menu Bar of the Main Status Screen provides a shortcut to the Security Login Screen.
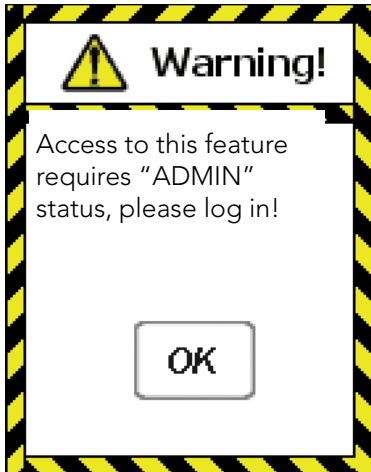
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Figure 7.6: Warning Pop-Up Window

Figure 7.7: Security Login Screen

1. Login per instructions in Section 6.5: Login Security Screen.

8.0 TREND SCREEN

Data management is an important aspect of controlled environment systems. Common is the need for researchers to be able to view and assess their log data. In some cases, this is a critical requirement. This section of the Manual is about Data Management. Key topics covered include;

- on-screen trend data, and
- log data downloadable over a network.

The CMP6050 employs a data logging feature that logs two data 'sets'. One set of data is viewable locally directly on the Display while the other set is viewable remotely via a network-connected PC. The local data, viewable on the Display, is automatically logged every 18 seconds and includes Temperature, Humidity, Light, and CO_2 (where applicable). The data is viewed in the form of Trend Graphs (a charted history) on the Display (Figure: 8-1: Trend Graph Screen). The controller has sufficient memory capacity to store 5 days worth of data after which it over-writes the oldest data.

The remote data, viewable on a network-connected PC, is more substantial and includes the log data for all I/O parameters. Again, the controller stores a `package` of data every 18 seconds, regardless of the number of parameters being logged. The data is stored in memory as a .txt file with each file representing a 24-hour period. The file name used has the format: MM-DD-YY.txt which provides for convenient data retrieval and management. The controller has sufficient storage capacity to store up to approximately 20 days of data, depending on how many parameters are being stored for a particular chamber configuration.

Given the capacity of the controller's memory, it is recommended to extract the log data on a weekly basis (Reference: Section 8.4 – Log Data – Network).
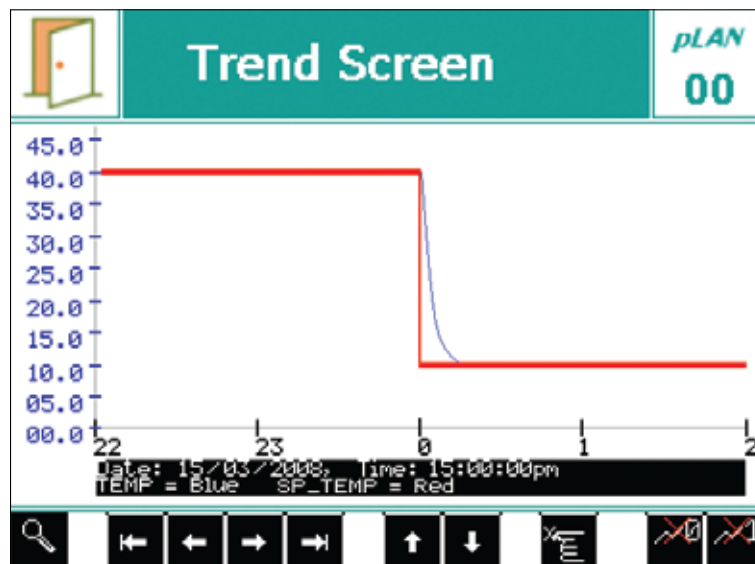
Figure 8-1: Trend Graph screen

To access the Trend Screen for any of the four (4) Key parameters (Temperature, %RH, Light, CO_2) tap the desired parameter on the Main Status Screen. The example below (Figure 8-2) shows the Trend Screen for Temperature.

LOCAL DISPLAY DATA

8.1 Trend Screen – Key Area Layout

Important: When the controller memory has reached full capacity, by default, it will overwrite the oldest data stored present in the memory, without issuing a warning to the User.

To activate the Trend Screen, tap the 'Actual' (green font) value of the desired parameter.

To update the graph press

Figure 8-2: Trend Screen – Key Area Layout for Pan Mode

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8.1.1 Pan Mode Screen Fields

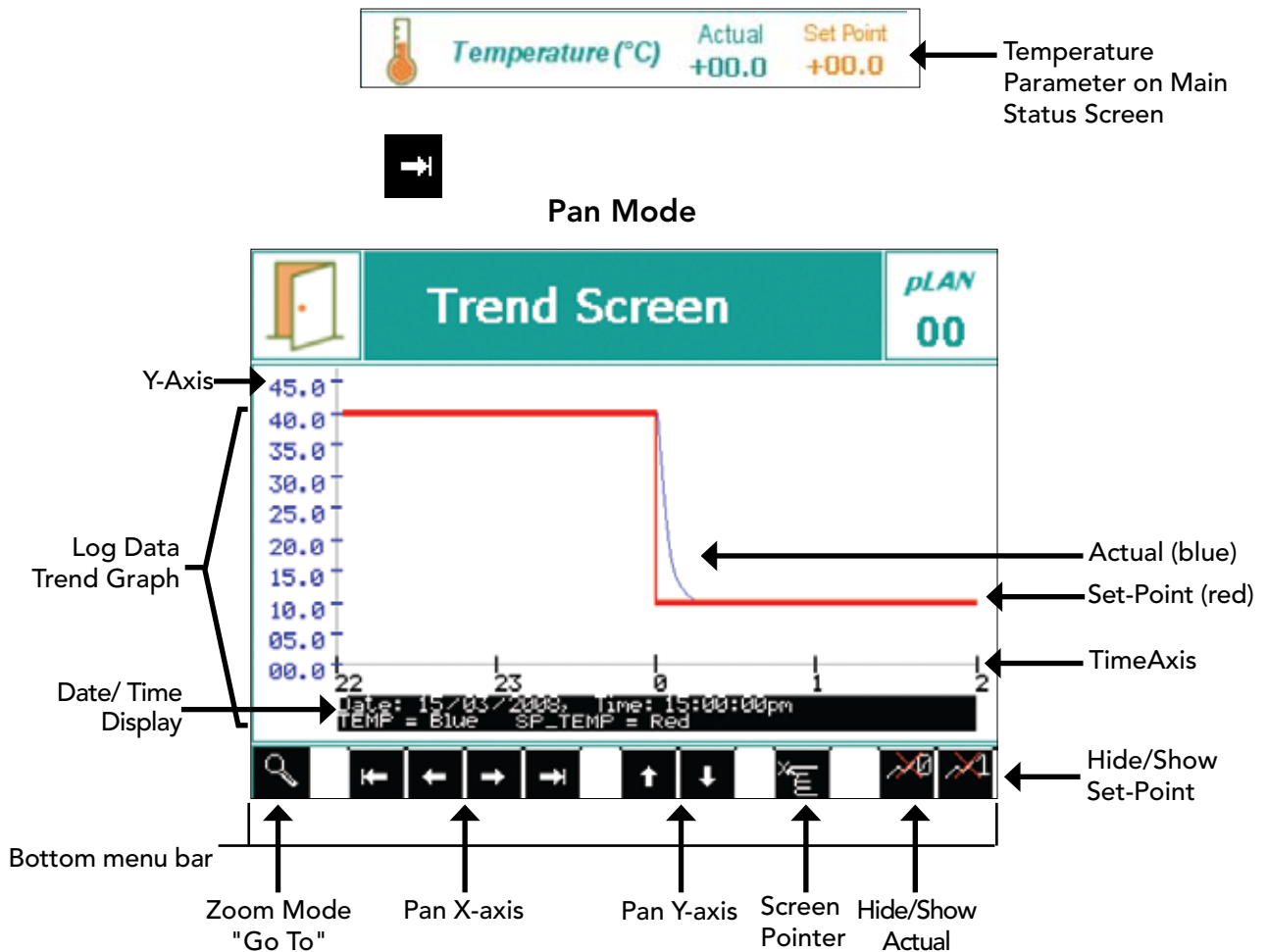|	
Bottom Menu Bar	The Bottom Menu Bar displays all of the functions available with Pan Mode.
Zoom Mode	Tap this icon to access magnification menus for the current trend screen.
Pan X-axis	Tap the outer left/right icons to move horizontally to the beginning or end of the experimental data. Tap the left or right icons to view the trend graph horizontally at specific intervals.
Pan Y-axis	Tap to pan the trend graph vertically.
Screen Pointer	Tap to activate – now tap anywhere on the trend graph screen to view the data information at with the 'tapped' point moved to the screen centre.
Hide/Show Actual	Tap this icon to hide or show the 'Actual' data trend line.
Hide/Show Set-Point	Tap this icon to hide or show the 'Set-Point' data trend line.
Actual	Actual trend line that the CMP6050 is showing (blue coloured line).
Set-Point	The trend line that the CMP6050 is programmed to 'follow' per the user's program (red coloured line).
Axis	Depending on the trend graph, these values will change. For example, temperature will indicate units in degrees Celsius while relative humidity will indicate units measured as a %.
Time Axis	The Time Axis shows integers in units of time, and these units change as you Pan. To know what units the Time Axis is displaying ensure you are viewing the Trend Screen in Pan Mode (Figure 8-2) and then compare the Time display (in the Date/Time field) with the left-most integer on the Time Axis. If the left-most integer matches (for example) the 'minutes' field in the Date/Time display, then the Time Axis is being display in 'minutes'. Notice that as you Pan to the right, both the Date/Time display AND the left-most integer on the Time Axis change simultaneously.[1]
Date/Time Display	Depending on the trend graph being displayed, this display field shows the exact time and date synchronized to the trend displayed.[1]

[1] When using magnification (zoom), these values are adjusted automatically and in - sync with the Trend graph display.

8.2 How to Pan on the Trend Screen

The Trend graph display can be panned left/right and up/down. To Pan right/left, tap the Pan X-Axis buttons. To Pan up/down, use the Pan Y-Axis buttons.

8.3 How to Zoom on the Trend Screen

Tap the zoom mode button 🔍 from the Pan Mode Screen to access the following Zoom Mode screen: (same trend graph as Figure 8-1, but a different bottom menu bar)
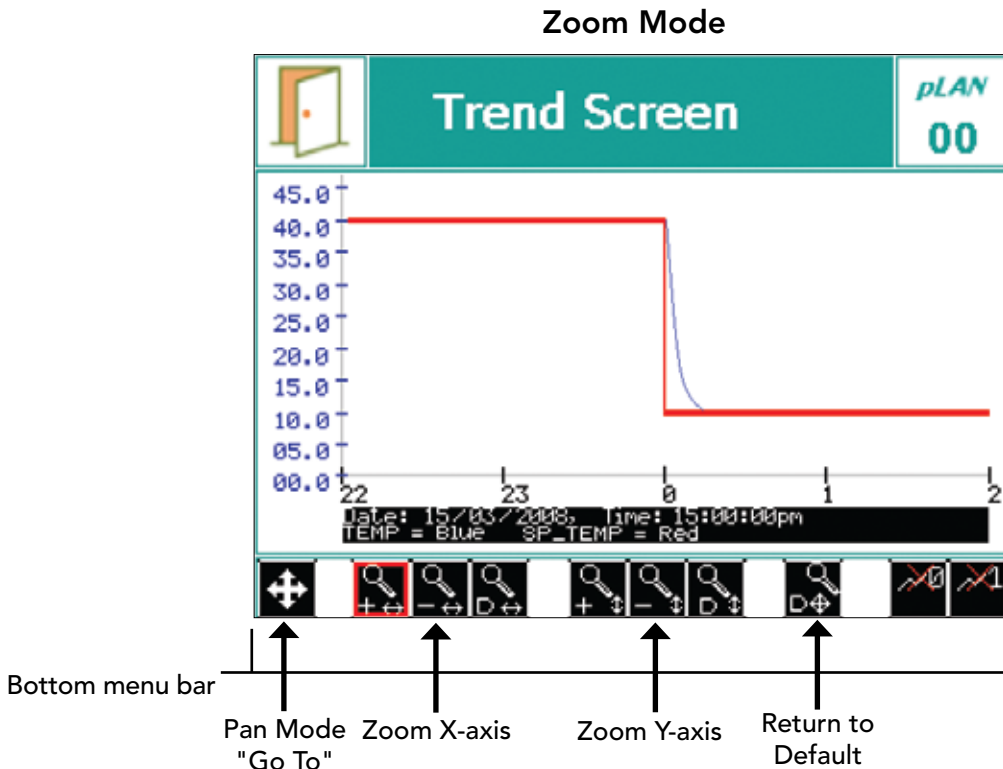
Zoom Mode

Figure 8-3: Trend Screen - Key Area Layout for Zoom Mode

8.3.1 Zoom Mode Screen Fields

Bottom Menu Bar   The bottom menu bar displays all the functions for Zoom Mode.

Zoom X-axis   Tap the 🔍 button to zoom in along the x-axis.

Tap the 🔍 button to zoom out along the x-axis.

Tap the 🔍 button to return to default zoom x-axis.

Zoom Y-axis   Tap the [icon] button to zoom in along the y-axis.

Tap the [icon] button to zoom out along the y-axis.

Tap the [icon] button to return to default zoom y-axis.

Return to Default   Tap the [icon] button to return to default trend screen.

Pan Mode   Tap the [icon] button to return to Pan Mode.

The last button to be tapped will display a red perimeter

Example: [icon]   to   [icon]

REMOTE DATA

8.4 Logged Data – Network

The CMP6050 can be accessed from an FTP client to retrieve log data. To access the FTP site, the controller must be connected to a network. The network can be as simple as connecting it to a single PC or to a Local Area Network. There are two places where the controller IP addresses must be setup - at the controller and at the PC. Additionally, if a Central Management (CM) system is used, the CM Address must also be defined.

> **Note:** This feature will give you a 'Warning!' pop-up window if the unit is not connected through the LAN network. (Figure 8-4)

Figure 8-4: Warning pop-up window.

8.4.1 Setting the IP address at the controller:
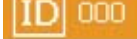
There are two network addresses to set up in the CMP6050 as follows:

*CMP Address: Defines the identity of the controller within the network

*Netmask: Divides an IP address into subnets and specifies the network's available host.

*CM Address: Conviron's Central Management ^{TM} IP Address

> **Important:** A valid IP address is needed for the CM Address value only when there is a Central Management system present. If there is no Central Management system present, the CM Address should be set to 'Disabled'.

> **Note:** This Section typically requires assistance from the client's IT services group.

To set the Chamber Addressing:

1. From the Main Status Screen, tap the 'ID' button [ID 000] in the Bottom Menu Bar to access the network configuration as shown below:
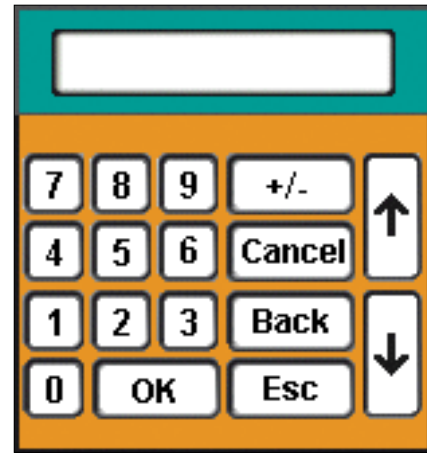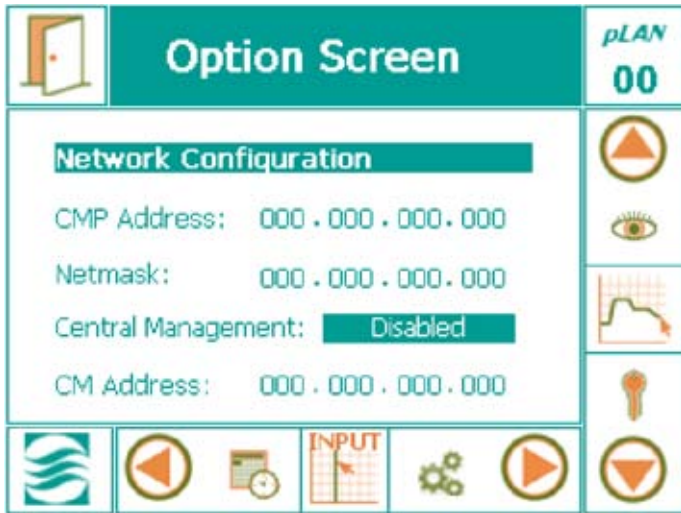
Figure 8-5: Pop-up Keypad

2. To change the address numbers, tap each individual numerical field. A pop-up Keypad will appear each time a field is accessed (Figure 8-5).

3. Once all the addresses have been entered, tap the 'EXIT' button [door icon] and a pop-up warning window will appear to confirm the numerical entries (Figure 8-6).

4. Tap the 'Yes' or 'No' button to return to the Status Screen. Tap the 'Cancel' button to re-enter any numerical address errors.

Note: Once the Chamber Addressing has been set, the Chamber ID displays the last three digits of the CMP Address. If a Central Management system is installed, the Chamber ID identifies the Chamber to the CM system. Duplicate IDs on the CM system cannot be used, and no warning is issued. The Chamber ID's (last 3 digits) will also display in each of the respective chamber thumbnails on the CM dashboard.

Figure 8-6: Confirmation Pop-Up

To configure additional Chambers operating from the same controller, tap the pLAN icon, select the chamber number, and repeat steps 1-4 above.

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8.4.2 CMP6050 FTP site access

Three steps must be completed to access the CMP6050 logged data form a PC other than a Central management system.

- Setup the PC address
- Set the CMP6050 controller address
- Issue the FTP command in a Browser

Setting up the IP address for at the PC (for Windows XP only)

1. Click on **Start> Control Panel> Network Connections**. Right click on the Local Connection where the controller is connected (Figure 8-7).
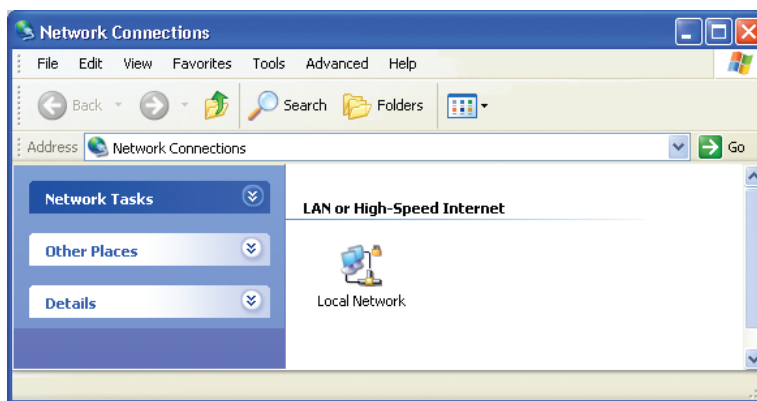
Figure 8-7: Network Connections

2. The **Network Properties** screen will come up. Scroll down and select Internet Protocol (TCP/IP). Then click on properties (Figure 8-8).

Figure 8-8: Network Properties

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Important: Read the following instructions entirely before proceeding

3. There are two possible options:

Option 1: The system has an IP that was automatically assigned by a DHCP server. In this case, the property screen should look like the screen below (Figure 8-8).

Option 2: The system has a fixed IP. In this case, the property screen should look like the screen below (Figure 8-9).

Figure 8-8: Internet Protocol (TCP/IP) DHCP Addressing
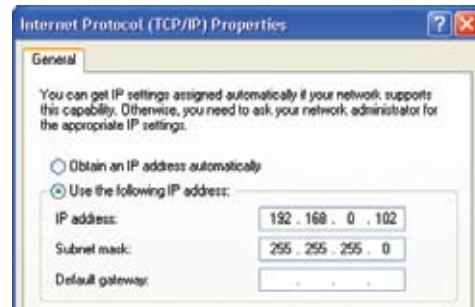
Figure 8-9: Internet Protocol (TCP/IP) Static Addressing

With either Option, if you are connecting to a "shared" local area network you must contact your site's I.T. Administrator for a TCP/IP address that will be suitable to assign to the CMP6050. This will ensure your PC and the CMP6050 are "address compatible".

If you are connecting directly to the chamber from the PC, you can safely set both TCP/IP addresses without affecting other systems. Select the "Use the Following IP address" button and type in the suggested address for the PC from the example below.

Note: If you set a TCP/IP address to the same value as another PC on the network, you will cause an error that will disable both systems from network access. You may also have firewall security settings on your computer that could inhibit or impair the performance of this computer connection.

Conviron suggests the following basic configuration;

CMP6050 TCP/IP Address: 192.168.0.1   netmask: 255.255.255.0

PC TCP/IP Address: 192.168.0.2   netmask: 255.255.255.0

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8.4.3 Selecting an IP for the Controller:

Set the controller address to the example on the previous page, if you are connected directly to a PC or in the situation of a network connected PC, use the address supplied by your IT network administrator.

> **Important:**
> **To connect it to a single PC:** Use an ethernet cross-over cable to connect to the PC
> **To connect it to a network:** Use standard ethernet cable

8.4.4 To access the FTP site and download data (for Windows XP only)

1. Open an internet browser

2. Type in the address bar:
   ftp://guest:fguest@xxx.yyy.www.zzz/usr/local/root/http/

3. The browser will display a long list of files, from which the one containing data is generically called:

   XXX.YYY.WWW.ZZZ. Year-month-date. CSV

4. Copy the file into the folder where data is to be stored.

5. Using Microsoft Excel ® or any similar application, search the file and open it.

   The file will automatically be converted to an *.csv* file, which can be rapidly converted into an .xls file, for use in MS Excel.

6. To graph the variables, simply sort the table, remove the unneeded titles, and proceed with the graph feature.

> **Note:** The text of XXX.YYY.WWW.ZZZ in the above filename and address is actually a TCP/IP addresses. These will be different in each controller, as addresses must be unique. Using the suggested Conviron address you would substitute 192.168.0.1 for XXX.YYY.WWW.ZZZ.

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9.0 SERVICE SCREEN

Service features have been available on Conviron control systems since the CMP4000 generation and have provided a powerful, valuable, and effective tool. Primarily intended for interaction with the control system by Conviron factory personnel and Conviron authorized service personnel, the Service area provides the status of all controlled inputs and outputs of the chamber. Most importantly, however, the Service area permits service personnel to override output variables allowing for quick and effective troubleshooting in the field.

The CMP6050 controller extends the Service capabilities of previous control systems by providing access to Users (minimum security level required is Access Level 1). With the CMP6050, savvy Users can, with the support of Conviron's service personnel, navigate the Service Screen to determine why a unit is underperforming or malfunctioning. This, together with the ability to manipulate output parameters, facilitates efficient and effective troubleshooting which results in minimum chamber downtime and repair costs.

> **Note:** This Manual covers only the I/O Status area of the Security Screen. All other areas are beyond the scope of this Manual and are restricted to Access Level 3 personnel.

The Input and Output (I/O) parameters are configured for each chamber at the time of manufacture based on the product model, design configuration, and client options. As such, the I/O Status screen provides a list of the analog and digital input and output parameters configured for the particular chamber.

The following section provides greater detail regarding the I/O Status Screen, specifically as it pertains to service/troubleshooting.

> **Note:** For safety reasons, interaction with the I/O Status screen is not available remotely using Conviron's Central Management system (previously named CCS – Central Control System). As such, in order to manipulate any of the output parameters from within the I/O Status screen, someone needs to be physically present at the chamber to witness the chamber reactions.

9.1 Service Screen Icons

From the Main Status screen, scroll through the icons on the Main Menu Bar until the Service icon ![wrench] appears in the active location. Tap the icon to launch the Service Screen (Figure 9-1: Service Screen).
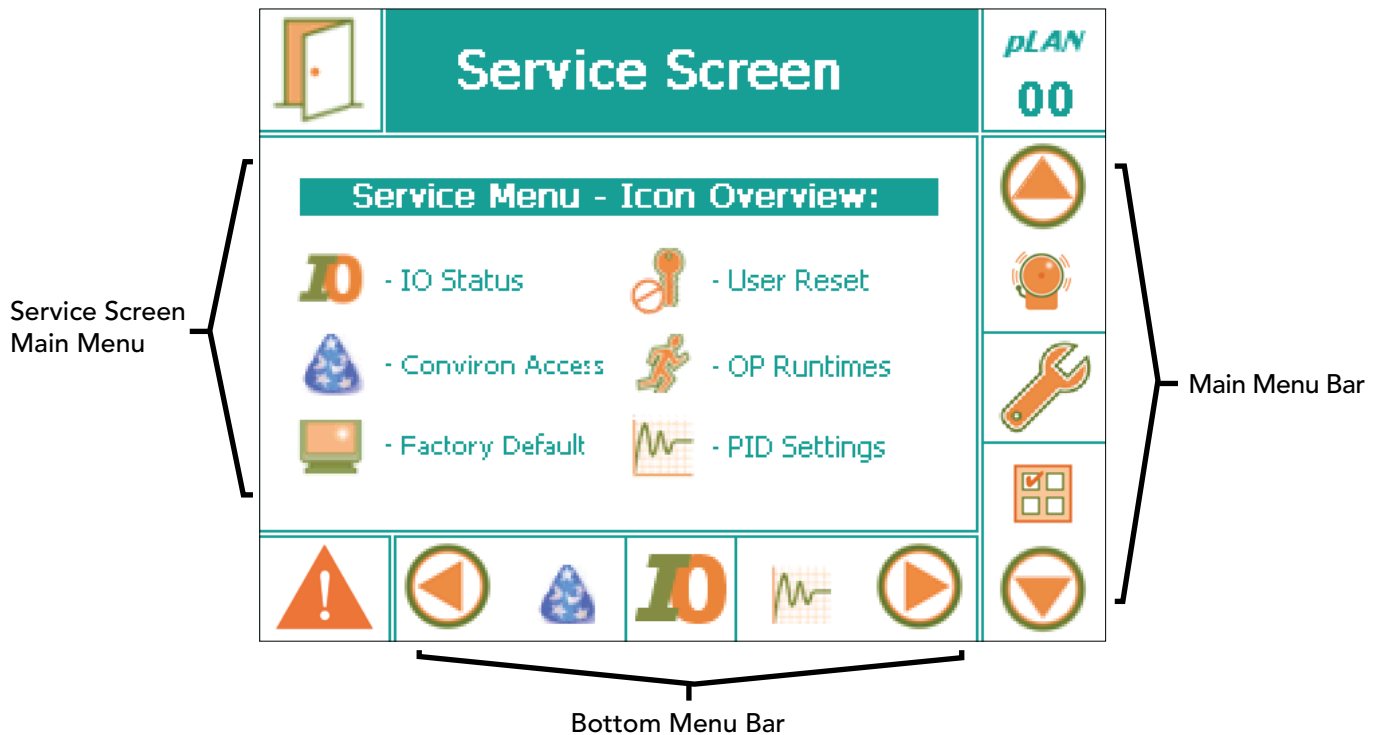
Figure 9-1: Service Screen

The Service Menu shows six interactive icons. Of these, the **I/O Status** is the only one accessible with User - Level 1 access. Tap the I/O Status icon to launch a series of screens that present the status of all configured I/O parameters.

9.2 I/O Status

Figure 9-2 illustrates a sample I/O screen (schedule <u>not</u> running) showing several of the configured Analog Input parameters for a particular chamber. Using the up and down navigation Keys at the right of the display, scroll through the various screens to view the

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Figure 9-2: Sample I/O Screen - Analog Inputs
(Schedule <u>not</u> running)

status of all I/O parameters configured for that particular chamber. Only those parameters that have been configured (at the Factory) for a particular chamber will be displayed. The parameters are always displayed in the following order:

- Analog Inputs

- Analog Outputs

- Digital Inputs

- Digital Outputs

The information presented for each parameter type and the corresponding interactivity available depends on whether or not a schedule is running. The following table summarizes the I/O Status Screen information and interactivity.

Table 9-1: Summary of I/O Status Screen Parameters

SCHEDULE RUNNING (Read-only mode)			
I/O Type	**Display**		**Interactivity**
	(Green)	**(Orange)**	
Analog Inputs	Actual Value	Set Point	Read-only when schedule running.\n\nNo interactivity allowed.
Analog Outputs	Actual Value	N/A	
Digital Inputs	Current Status	N/A	
Digital Outputs	Current Status	N/A	
SCHEDULE NOT RUNNING (Troubleshooting mode)*			
Analog Inputs	Actual Value	N/A	No
Analog Outputs	N/A	Current Condition	Yes
Digital Inputs	Current Condition	N/A	No
Digital Outputs	N/A	Current Condition	Yes

*Note: See Warning message – next page.

WARNING: When a Schedule is **not** running, Alarms are disabled! No one other than a single, designated on-site service technician should be operating the chamber. Altering output parameters to troubleshoot a chamber, while others are handling mechanical or electrical systems within the chamber, COULD BE HAZARDOUS AND MAY RESULT IN PERSONAL INJURY. As such, manipulation of output parameters must be performed with either a qualified service technician present or via phone support with Conviron's Technical Services group.
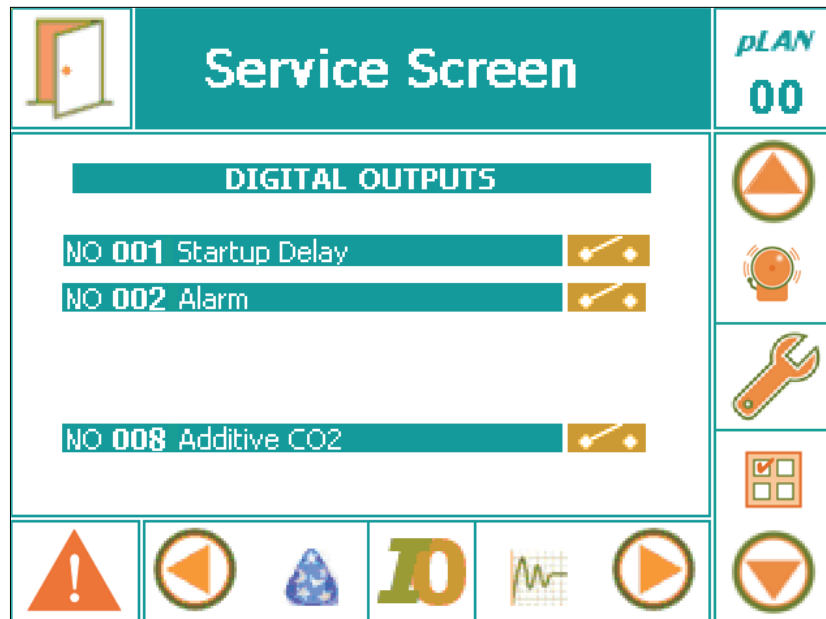

Fig 9-3: Sample I/O Screen - Digital Outputs
(Schedule not running)

From the table above, note the following:

- When a program is running, the I/O Status screen provides Read-only information regarding the status of the I/O parameters – no interactivity is allowed.

- When a program is <u>not</u> running, the I/O Status screen allows analog and digital <u>output</u> signals to be altered. This interactivity enables qualified service technicians to troubleshoot the chamber. Refer to Figure 9-3 for a sample screenshot of Digital Outputs. Note that the 'Orange' fields (when a Schedule is not running) can be altered. **(Note: Warning message above.)**

To exit the I/O Status screen, tap the exit icon in the upper-left corner of the screen. When the unit is running a Schedule (Read-only mode), this action simply returns to the Main Status Screen. When the unit is not running a Schedule (Troubleshooting mode), this action will stop the unit.

9.3 Scalable Options:

One of the many impressive features of the CMP6050 is its scalability – that is, the ability to expand the I/O capacity, configure optional devices, and add secondary controllers that

communicate with the main (primary) controller and the same (main) display. The following represent available options also displayed on the I/O Status screen, where configured.

SENSORS – additional sensors can be added to the chamber and configured in the controller. The (parameter) value of the additional sensors can be viewed at the I/O Status screen.

ADDITIONAL MODULES – For chambers that require the control of additional parameters, expansion modules are added to the CMP6050 to increase the I/O capacity. In such circumstances, the communication status and value of each additional parameter is displayed in the I/O Status screen (appropriately as input/output, analog/digital) without differentiation from those variables controlled by the 'main' controller.

LAMP LOFT CONTROL - Units that require lamp loft control are equipped with a secondary controller. The secondary controller communicates with the main (primary) control system which records all lamp loft parameters as well. The status of the communication ('On Line' or 'Disabled') and the variables being controlled are displayed in the I/O Status screen as well, in a single screen.

CONTINUOUS DEFROST - As with the lamp loft control, this feature is also controlled by a secondary controller. Communication status and parameter values are displayed in the I/O Status screen.

GLOSSARY

Button	An active spot on the screen that performs an action when touched. Buttons on the CMP6050 screens contain text or icons.
Cell	The individual entry points in the program table defined by the intersection of any row (timeline) and any column (zone).
CCS	Acronym for Central Control System.
Central Control System (CCS)	A remote control and monitoring system available for chambers with CMP6050 controllers. Contact Conviron Client Services for more information.
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 CMP6050 is the most recent controller model.
Data storage	An optional *Micro sD card or host CCS may also be used to store data information. [* - In process of development]
Field box	A specified area on the screen where data is displayed and/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.
Inputs	User defined parameters that enable controllers' activity.
Outputs	Switches that control specific devices or conditions within the chamber.
Plant growth area	The environmentally controlled section of the chamber interior.
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 controller. A multi-day program is a series of different programs, scheduled together.
Program table	The series of columns and rows used for entering program timelines on the Program screen.

GLOSSARY

Ramp mode	When conditions change gradually and steadily between timelines.
RHS display buttons	Right hand side (RHS); Use these keys for entering controller information and for navigational purposes.
Step mode	When conditions change dramatically between timelines. The CMP6050 works in step mode.
Time line	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.
Schedule	One or more programs make up a schedule.
Menu bar/Tool bar	A series of buttons that usually displays at the bottom of the screen. The buttons provide shortcuts to specific functions such as on-line help, security and exit.
Zone box	An area of the chamber that is independently controlled or monitored.

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