



ESPEC WEB CONTROLLER
Version 3.3
USER'S MANUAL

- Read this operation manual thoroughly before operating the equipment.
- Familiarize yourself with all safety precautions before using the equipment.
- Keep this operation manual handy for future reference.

ESPEC NORTH AMERICA, INC.

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Read this manual thoroughly and familiarize yourself with all safety precautions before using equipment.

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Revision History

Revision	Remarks	ECO	By	Date
1.00	Version 3.0. Initially Released as Web Controller for T-series for support of HALT/HASS chambers.	50053	PNL	04/2021
1.01	Second draft. Updated content from software addendum and rework on user interface with new figures.		PNL	08/2021
1.02	Version 3.1. Released as ESPEC Web Controller for Environmental and HALT/HASS chambers, supporting ESPEC chambers that include P300 and Watlow F4T.		PNL	03/2022
1.03	Version 3.2. Added additional features and support of legacy chambers with SCP220, ES102 and F4 PLCs.		PNL	07/2022
1.04	Added new sections on Data Logging features and procedure for Importing logged data into MS Excel. Firmware update procedure for standalone system.		PNL	11/2022
1.05	Added new sections on touchscreen and procedure on Setup Wizard for T-series as a standalone system or as a networked system.		PNL	02/2023
1.06	Version 3.3. Complete overhaul of the manual with rearrangements and expansion of major sections with new features: Network Monitor page and Trend graph. Rearranged Settings section; expanded instructions on Firmware update, Network and Server settings.		PNL	05/2023
1.07	Version 3.3.2. Merged the manual of custom F4T chamber with the main manual. New feature: Added a new section on Timers with examples detailing practical use of the short-cut features of Macros, implemented to support all chambers.	50390	PNL	09/2023

Part I

Introduction

CHAPTER 1

Introduction

This manual provides information for the use of ESPEC Web Controller (EWC), Version 3.3. EWC is capable of communicating and controlling the following process controllers and programmable logic controllers (PLCs): ESPEC P300, SCP220, ES102, Watlow F4 and F4T, Allen Bradley CompactLogix, ControlLogix and Micro8xx series. Communication can be established via an Ethernet TCP/IP protocol through an Ethernet port or via an RS-232/RS-485 through a serial or USB-to-Serial interface.

Our EWC is an embedded computer powered by a Debian GNU/Linux distribution as the operating system. It is based on an x86 64-bit architecture called UP2Board designed by AAEON. Through stack programming, this embedded computer is configured and customized to utilize a standard Web browser to provide (i.e., host) its user interface (UI) to operate and control the chamber; hence, the name Web Controller.

EWC can operate as a standalone system with its touchscreen as the dedicated HMI for control and operation. As a networked system, EWC can join a network to host its UI through a Web browser, accessible through its IP address or its hostname. Thanks to the ability of a Web browser to operate from any computer on the network, chamber operations can be performed via EWC remotely by authorized users on the network. Access to EWC is possible only for any device on the same network.

With EWC, the tedious process of controlling or programming the chamber via the controller HMI is now replaced with the easy-to-use simple UI with multi-tasking capabilities. Many practical features offered by EWC include chamber alerts via an e-mail communication, remote operation through RESTful API, data-logging, access to other EWCs (and chambers) on the same network, and much more. These and other features will be described in detail in this manual.

With Debian GNU/Linux periodically receiving security updates, our embedded system is kept secure and up to date. Additional measures, such as read-only access and no-login accounts, were taken to secure the embedded system. No one can log into the operating system to install a software or modify its configurations for exploitation. Any update package for EWC is signed by ESPEC software engineering team to ensure that only ESPEC update package can be installed on EWC. The user accounts (c.f. Section 1.5) available at the API level of EWC are limited to controlling and operating the chamber and EWC only, but not the Debian GNU/Linux embedded system that hosts EWC. In other words, the entire embedded system of EWC is completely locked down and there are no known methods to break into it. In spite of all the security measures put in place, it is important to recognize that there is no such thing as a secure system; it is all a matter of how difficult and how long a system can be breached.

To provide robustness in terms of stability and self-correct operation, EWC has a dual root partition structure. This configuration ensures that during a system update (or upgrade) at least one root partition is always in the stable operating state, should the firmware update fail. This feature thereby provides seamless updates and overall system management. In short, EWC is robust, secure, easy to manage and operate.

controller.

1.1 How to Use this Manual

This user manual is split into separate parts, each containing specific chapters to address detailed discussion of each chamber and PLC that ESPEC Web Controller supports.

1. **PART I:** Introduction

All users must read PART I to understand how ESPEC Web Controller operates. This part discusses the general features of ESPEC Web Controller that include the user interface (UI), user account types, network configuration, initial setup and end-users policies.

2. **PART II:** T-Series Chamber

For ESPEC T-series chamber, navigate to this part for its operation manual.

3. **PART III:** ESPEC Chamber with Watlow F4T

For ESPEC chamber with Watlow F4T, navigate to this part for its operation manual.

4. **PART IV:** ESPEC Custom Chamber with Watlow F4T and Touch Display

For ESPEC chamber with Watlow F4T and Touch Display, navigate to this part for its operation manual.

5. **PART V:** ESPEC Chamber with Watlow F4

For ESPEC chamber with Watlow F4, navigate to this part for its operation manual.

6. **PART VI:** ESPEC P300 Chamber

For ESPEC chamber with P300, navigate to this part for its operation manual.

7. **PART VII:** ESPEC SCP220 Chamber

For ESPEC chamber with SCP220, navigate to this part for its operation manual.

8. **PART VIII:** ESPEC ES102 Chamber

For ESPEC chamber with ES102, navigate to this part for its operation manual.

9. **PART IX:** Settings

The **Settings** menu is the administration page of ESPEC Web Controller where different settings and configurations can be applied to the Web Controller and the chamber.

This manual is currently available in two formats: (1) Online and (2) PDF. The online manual is structured for easy navigation via the Table of Contents; it also focuses on a specific chamber. Instead of scrolling down the Web page, users can jump to a specific chapter or section by just clicking on the specific topic listed under the Table of Contents (at the top of the Web page). Click the back button on the Web page to return to the Table of Contents to select a new topic.

The PDF format is available as an online viewable from within EWC, accessible under the Manual tab in the **About** menu.

1.2 Operating System, Software or Hardware Requirement

No software installation is required to use EWC. Only a Web browser running on the local computer is needed to access EWC via its IP address or hostname (as outlined in the chapter on Initial Setup and First-Time Use). A computer running MS Windows, Mac OS or GNU/Linux can operate EWC. A handheld device, such as a smartphone, on the same network can also access and operate EWC.

1.3 Web browser Compatibility

Our EWC supports the following Web browsers: Chromium, Google-Chrome, Mozilla Firefox, Microsoft Edge, Apple Safari and Opera. Microsoft Internet Explorer 11 can also be used to

access and operate EWC. However, due to its slow performance, the use of Microsoft Internet Explorer 11 is strongly discouraged.

1.4 Home Page of EWC

The following figure depicts the home page of EWC, displayed using the Google Chrome Web browser. EWC can be accessed via its IP address or its hostname. As depicted in the figure, EWC was accessed via its IP address (<http://10.30.100.108/>). Chapter 2 provides detail how to access EWC via its IP address or its hostname from your local computer.

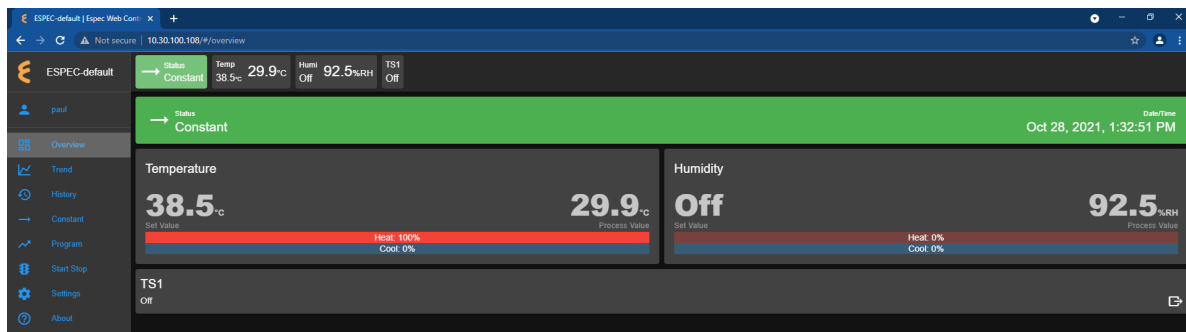


Figure 1.1: ESPEC Web Controller home page

The home page of EWC consists of the main operation menus grouped together in the menu bar which remains fixed on the left. Their descriptive names associated with their icons on the left identify their functionality.

The home page of EWC is essentially the **Overview** menu. Every time EWC starts, its home page is presented as an **Overview** page. Three display areas make up the EWC page, as depicted in the following figure. They are outlined and described as follows:

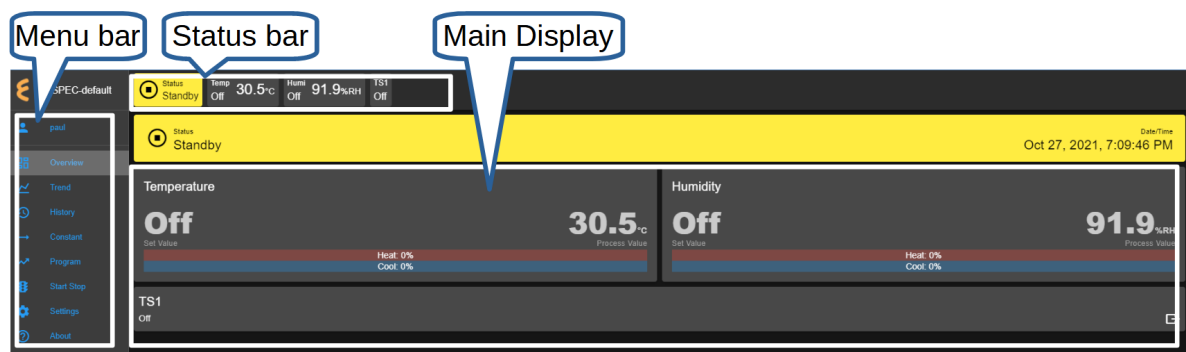


Figure 1.2: Overview page for users with full access privilege

1. **Menu bar:** The menu bar provides the main operation menu of EWC which remains fixed on the left throughout the operation. The contents of each menu are displayed in the main display area (Item 3 below). **Settings** and **Program** menus contain submenus to offer further control of EWC and operation of the chamber. Access permission to these menus is managed by the admin user. The **User Settings** submenu (under the **Settings** menu)

allows the admin user to control access to the menu bar. Different types of access privilege are described in Section 1.5.

2. **Status bar:** The status bar displays the status of the chamber operation mode and its condition. The bar remains fixed on the top throughout the operation. The first tab (called status tab) displays the current status of the chamber operating modes, available in **Standby**, **Constant**, **Program** and **Alarm**. Depending on the type of chamber and controller, the next several tabs display the status of air temperature, product temperature, humidity, vibration, time signals, and refrigeration, including light fixtures in the chamber. The **Overview** menu discusses in detail the operation of these tabs.
3. **Main Display:** Contents associated with each specific menu in the menu bar are displayed in the main display area. The menu in the menu bar is highlighted to indicate its active status. As depicted in the above figure, the main display area displays the contents of the **Overview** menu, showing the current conditions of the chamber such as its temperature, vibration and time signal settings.

1.4.1 EWC and its HMI Touchscreen

During its startup (i.e., during booting), if EWC detects a monitor connected directly to its HDMI or video display port, it will automatically start the graphical user interface on the detected monitor. This trigger applies to both a standard monitor or a touchscreen. The dedicated touchscreen is called HMI, generally attached onto the front or the side of the chamber. This HMI provides complete control and operation of the chamber through EWC.

The following figure depicts a typical home page of EWC displaying the touchscreen menu bar designated and labeled as item 1. Components and functionality of the touchscreen menu bar are described as follows:

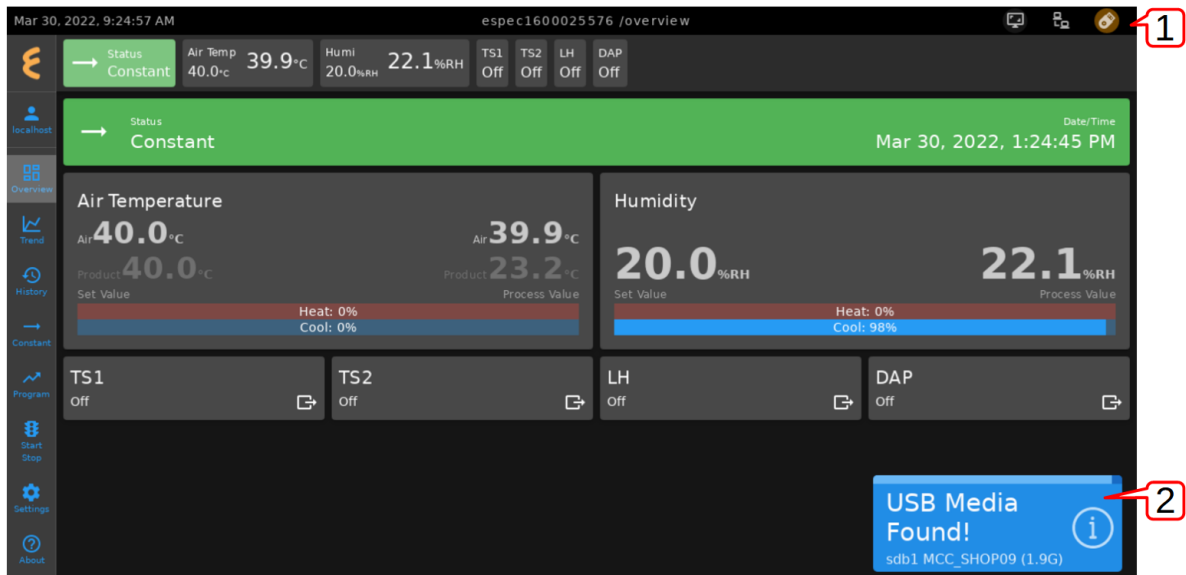


Figure 1.3: ESPEC Web Controller UI on its dedicated touchscreen monitor

1. **Touchscreen Menu Bar:** EWC on its HMI has the touchscreen menu bar (at the top) to provide the touchscreen operation as shown above. It includes the URL that displays its

current menu in the middle, three icons on the right (labeled as **Screen shot**, **Network Info** and **USB Device**) described as follows:

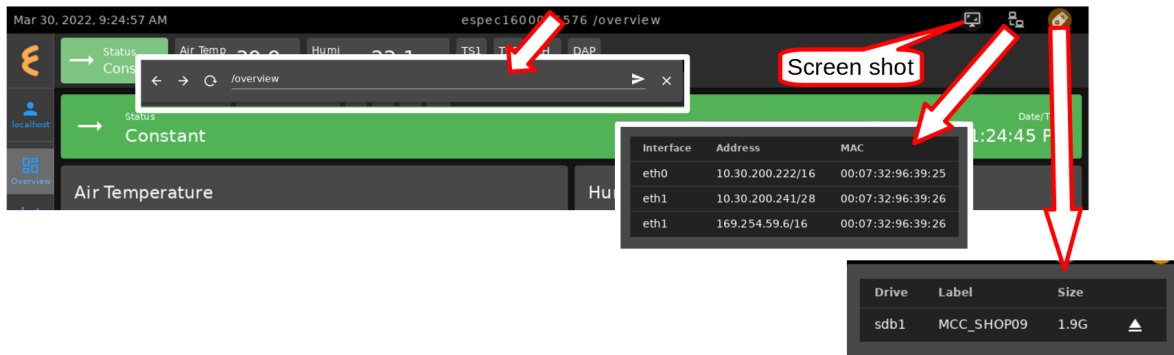


Figure 1.4: Touchscreen operational options

- URL/Menu:** To access the URL menu bar, touch the middle area of the touchscreen menu bar indicated by the arrow. This URL displays the current menu of EWC. It provides an extended operation of EWC menu navigation, such as backward or forward menu, refresh the UI page, or access a new menu. It is probably easier to access a different menu via the menu bar (on the left via the touch operation), but the URL field accepts input of a new menu by entering its name and pressing the right arrow.
 - Screen shot:** This button can only be used to take screen shots of the EWC user interface if an external USB storage device is plugged into the USB port (on the HMI panel) and detected by EWC. To use this button, first plug in the USB device.
 - Network Info:** EWC hardware has two Ethernet ports. They are labeled as **eth0** and **eth1**. Press this icon to list their IP address(es). As shown in the figure, **eth0** displays the IP address of EWC with its MAC address, **eth1** displays the IP address. A user on the same network may access EWC user interface via the Web browser using the IP address on **eth0**. Detail of **eth0** and **eth1** is discussed in the **Settings** menu.
 - USB Device:** This icon flashes in orange if a USB device is attached to EWC. Do not unplug (that is, simply pull out) the USB thumb drive from the USB port. Doing so would corrupt the filesystem on the USB thumb drive. To disconnect the USB thumb drive from EWC, perform the following procedure:
 1. Touch the **USB Device** button.
 2. Touch the **Eject** button in the drop-down menu, as depicted above. The system will update the filesystem on the USB thumb drive and dismount it from EWC. A pop-up window appears at the lower right to indicate the status of the ejection.
 3. Pull out your USB Thumb drive.
2. **USB Notification:** A notification is displayed when EWC detects an external USB device. It displays the device name and storage space.

1.4.2 EWC on a Desktop

The **Overview** page automatically handles and renders the display based on the Web browser window or the monitor resolution. The menu bar will collapse to display only its icons if **Overview** cannot fit in the display window, as shown in the following figure. In order to maintain full display, the browser window has to be expanded (or maximized).

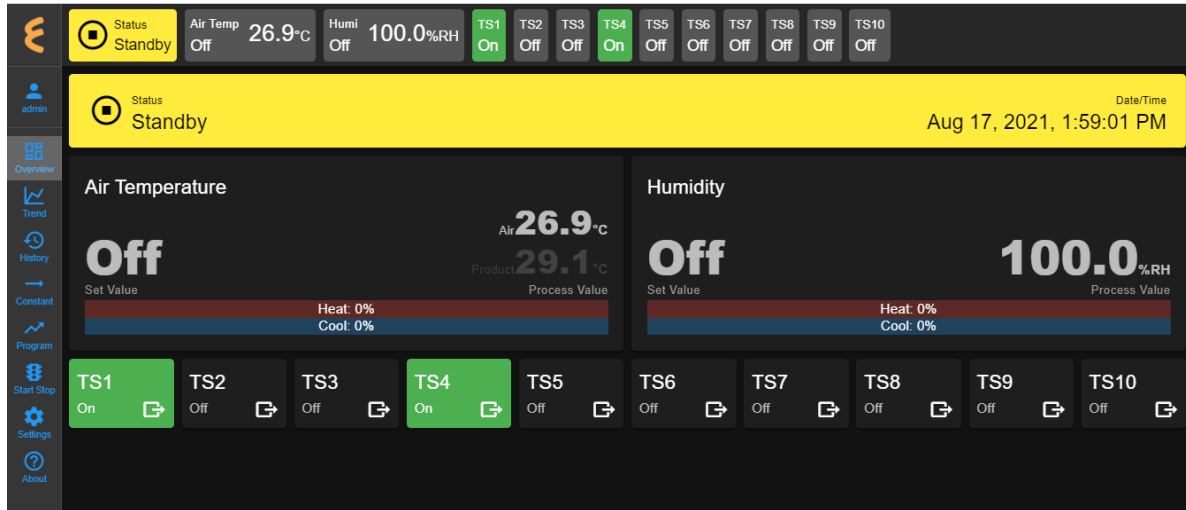


Figure 1.5: Overview page in a smaller display screen

1.4.3 EWC on a Handheld Device

EWC can also be controlled wirelessly via a handheld device, such as a tablet PC or a smart-phone, provided the device is part of the main network that EWC is connected to. Typical display of EWC **Overview** page on a handheld device is depicted in the following figure.

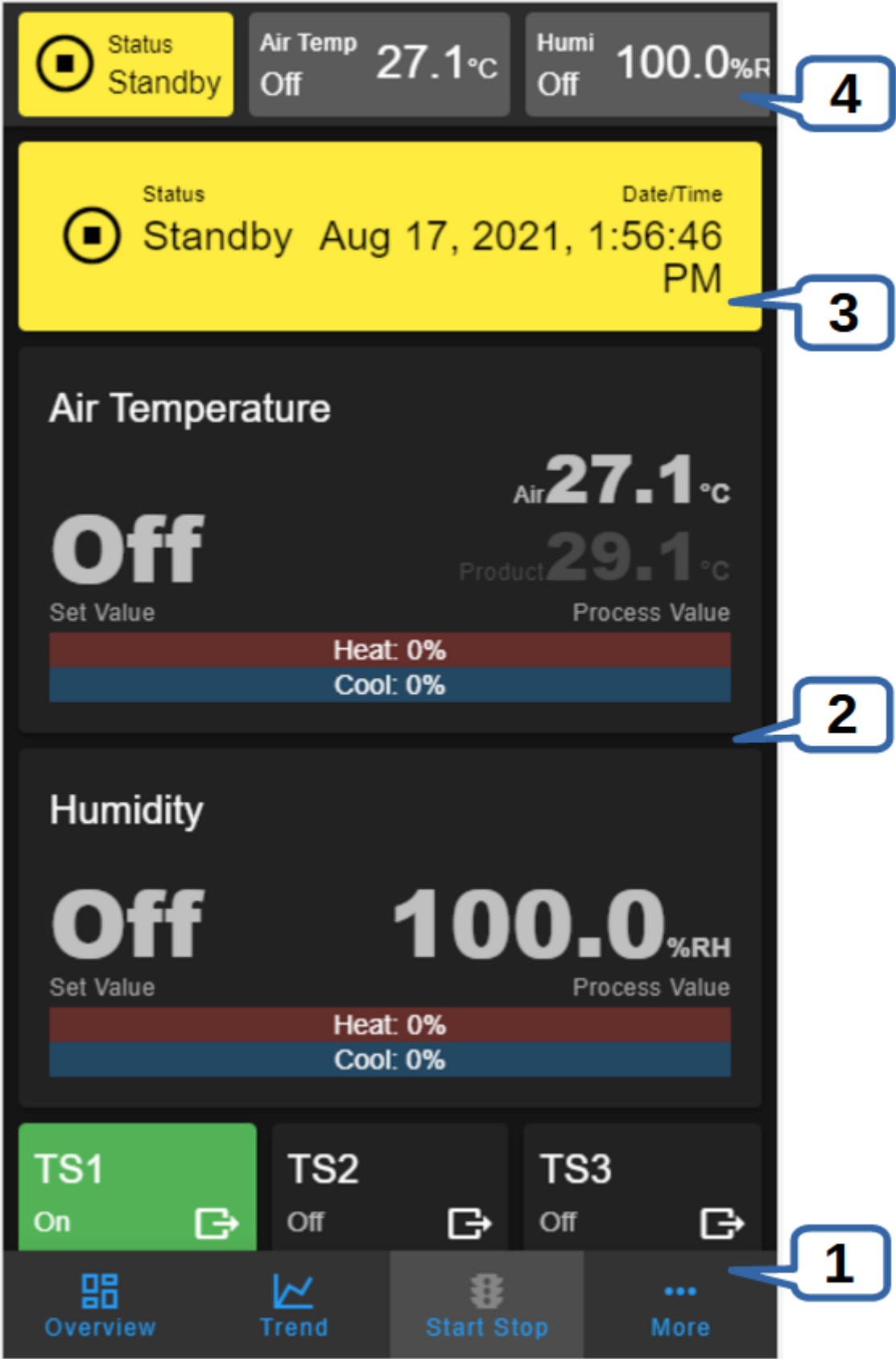


Figure 1.6: Overview page on a handheld device

1. **Tab bar:** The menu bar is relocated to the bottom of the page, called tab bar. As depicted in the above figure, three main menus are displayed. The rest of the menus can be accessed by tabbing on the **More** button. This action causes the menu to display in vertical bar. To close the vertical bar, tab on the down-arrow icon.
2. **Main Display:** The main display area provides a tab-up or tab-down action to access and control the chamber according to each selected (or active) menu.
3. **Status Tab Extension bar:** Still remains in the original position below the status tab, this extension bar of the status tab now opens as a drop-down menu to access and control all the operating modes.
4. **Status bar:** Still remains in the original position but displays only a few tabs, this status bar now becomes the slider bar.

The discussion in this manual focuses on the operation of EWC using the Web browser on a desktop or laptop computer.

1.5 User Account Types

To help protect the chamber from getting damaged by unauthorized users or users with limited knowledge of the chamber operation, user accounts with different level of privileges can be created. EWC is shipped with two user accounts with different level of privileges as outlined in the following table:

Account	Overview	Trend	History	Constant	Program	Start Stop	Settings
Guest	RO	RO	RO	NA	NA	NA	NA
Admin	RW	RW	RW	RW	RW	RW	RW

where **NA**, **RO** or **RW** under each menu has the following meaning:

- **NA** stands for No Access. Users with **NA** privilege cannot access the EWC menu in any form. Any menu associated with **NA** is grayed out; it is thus inaccessible to the user, as depicted in the following figure. Any attempt to access the grayed-out menu (by clicking on it), the user will be prompted to login.

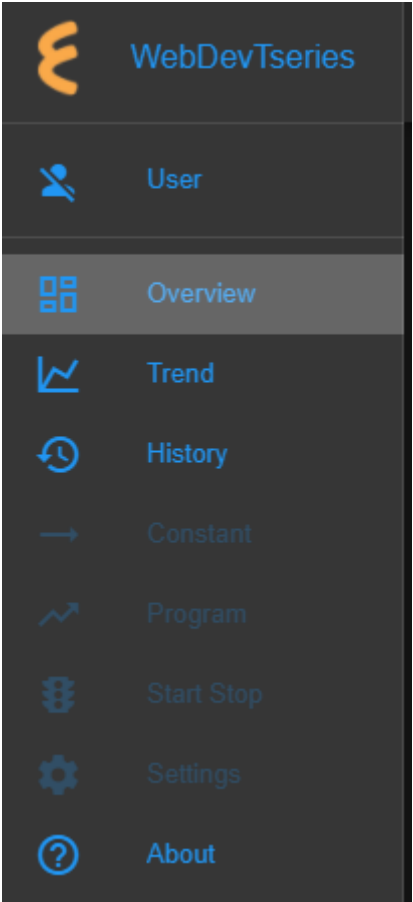


Figure 1.7: Overview page for users with limited access privilege

- **RO** stands for Read-Only access. Users with **RO** privilege may view the contents of any page (or menu). All clickable contents or links are disabled.
- **RW** stands for Read-Write access. Users with **RW** privilege can access, view and modify the contents of any page (or menu). All clickable contents or links may be accessed and/or modified by this user.

The Guest represents a user who does not have an account on EWC. This user can access all the menus in browse or Read-Only mode (designated by **RO**). The administrator account called **admin** is one that has complete powers to operate EWC, including managing user accounts.

These **NA**, **RO** and **RW** access types can be used by the administrator to assign access privilege to different user accounts on EWC.

EWC is shipped with the administrator account using the following credentials:

- username: **admin**
- password: **admin**

This password should be changed to something more secure. Additional accounts should be created to set specific privileges for designated users. This topic is discussed under the **Settings** menu.

CHAPTER 2

Initial Setup and First-Time Use

When EWC is turned on for the first time, it goes through an initial configuration via a **Setup Wizard** page. The procedure involves assigning a new password for the administrator account, setting up a password recovery e-mail and network settings.

EWC can operate both as a standalone system (with its touchscreen as the dedicated HMI) or as a networked system to offer remote access and operation of the chamber. Two types of chambers configured by default to operate as a standalone system are T-series and custom F4T chambers. With other chambers (such as, ESPEC P300, SCP220 and ES102, standard Watlow F4T and F4), EWC is configured to operate as a networked system.

EWC can join a Dynamic Host Control Protocol (DHCP) network or a static network. The following sections describe the different scenarios to set up your chamber and EWC to provide operational versatility.

2.1 DHCP Network: P300, SCP220, ES102 and F4T/F4

By default, EWC applies DHCP to obtain an IP address assigned by the DHCP server to join the network. The configuration is done automatically on EWC as soon as it detects a DHCP server on the network.

To connect the chamber (and EWC) to a DHCP main network, complete the following steps:

1. Plug an RJ-45 Ethernet cable into the Ethernet port on the chamber, as depicted in the following figure.

EP/EGN/EWP/EWS/EN Chambers



2. Plug the other end of the cable into an Ethernet port (or a router) that connects to the main network.
3. Your computer (PC or laptop) must also join the main network as shown in the following diagram.

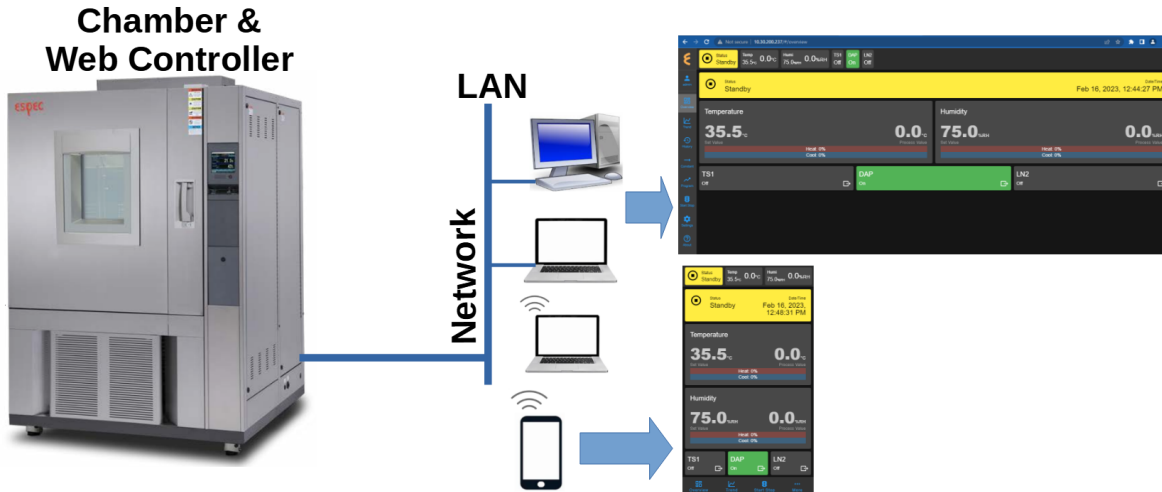


Figure 2.1: Network connection on a DHCP setup

To access and use EWC wirelessly from a laptop (or a handheld device), that laptop (or handheld device) must also join the main network through a wireless connection.

2.2 Static Network: P300, SCP220, ES102 and F4T/F4

By default, EWC can join a DHCP network automatically. If DHCP service is not available, EWC uses its preconfigured Class C static network settings called fallback static IP:

- **IP Address:** 192.168.0.83
- **Subnet Mask:** 255.255.255.0
- **Gateway:** 192.168.0.1

This protocol occurs when EWC is connected directly to a computer or a network hub without DHCP service.

2.2.1 Static Network Connection

To use a Class C static network on EWC, complete the following steps:

1. Plug an RJ-45 Ethernet cable into the Ethernet port on the chamber, as indicated in the previous figure.
2. Plug the other end of the cable into the Ethernet port of your PC or a network hub. If a network hub is used, your PC must also connect to it via an Ethernet cable.
3. Your computer should be connected to the chamber directly or via a network hub as pictured below.

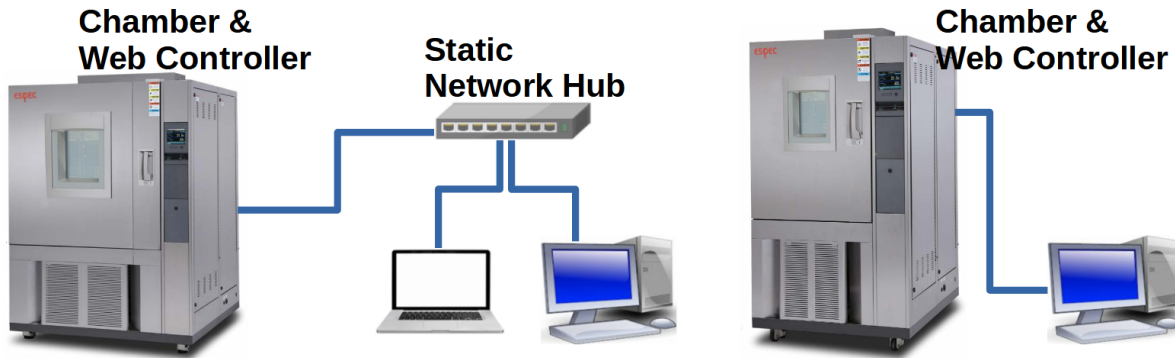


Figure 2.2: Network connection on a static setup

2.2.2 Static IP on your PC

Your computer must also use a Class C network protocol with the following recommendation:

- **IP Address:** 192.168.0.84
- **Subnet Mask:** 255.255.255.0
- **Gateway:** 192.168.0.1
- **Preferred DNS server:** 8.8.8.8
- **Alternate DNS server:** 8.8.4.4

The following procedure applies to a PC running MS Windows 8/10/11:

1. Hold down the **Windows** key and press **R** to launch the Run Command dialog box.
2. In the Run dialog box, enter **ncpa.cpl** into the Open box field and press **Enter**.
3. Point and Right-Click the “Local Area Connection” icon, then click Properties from the drop-down menu (as illustrated in the following figure). NOTE: The Local Area Connection icon is the one connected to a hub (or EWC via a straight-through or crossover Ethernet cable). It is important to access the correct icon in case your computer has multiple Ethernet ports or devices.

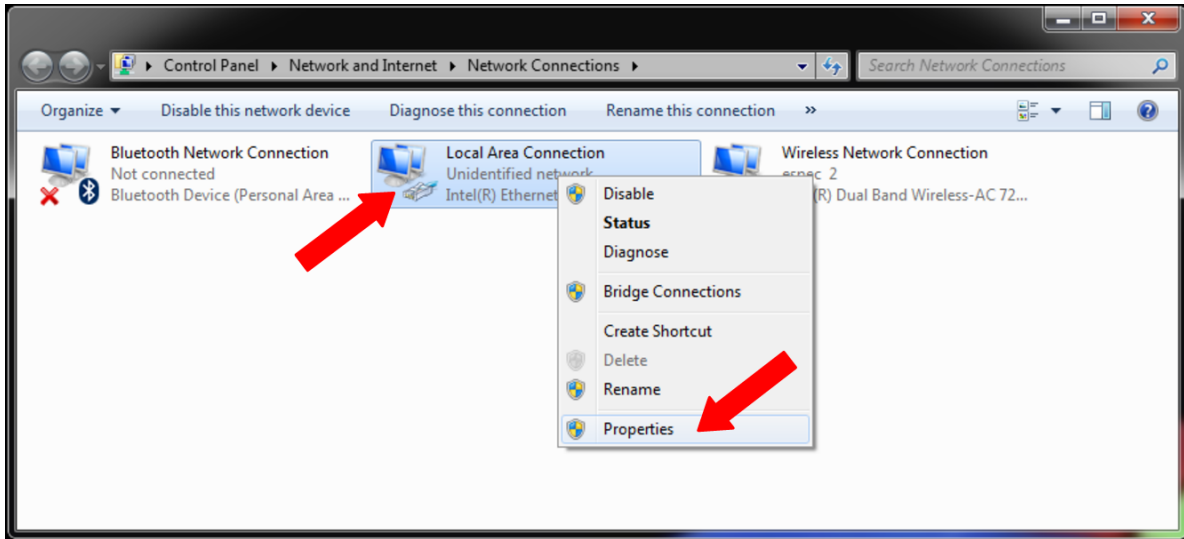


Figure 2.3: Selecting the right Local Area Connection

4. In the “Local Area Connection Properties” window, confirm that there is a check mark placed in front of “Internet Protocol Version 4 (TCP/IPv4)”, as illustrated in the following figure. If not, check it. Click to highlight “Internet Protocol Version 4 (TCP/IPv4)” and then click Properties in the lower-right corner.

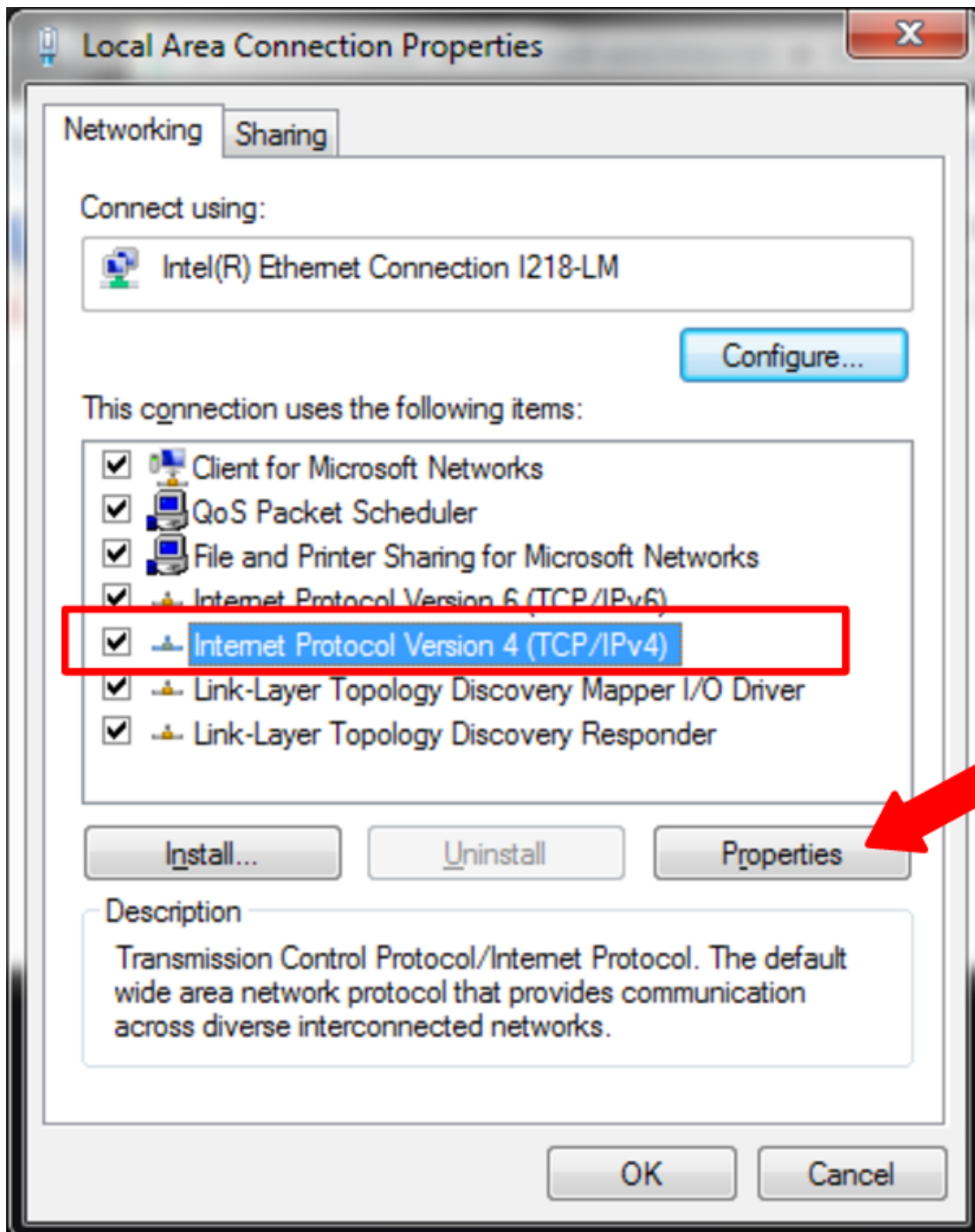


Figure 2.4: Setting TCP/IPv4 properties

5. In the “Internet Protocol Version (TCP/IPv4) Properties” window, turn on the radio button for “Use the following IP address:” and enter these settings (see the figure below):
 - **IP Address:** 192.168.0.84
 - **Subnet Mask:** 255.255.255.0
 - **Gateway:** 192.168.0.1
6. In the “Use the following DNS server addresses:” section, enter the following address (as shown in the following figure):
 - **Preferred DNS server:** 8.8.8.8
 - **Alternate DNS server:** 8.8.4.4
7. Turn on “Validate settings upon exit” with a check mark and click OK, as illustrated in the following figure.

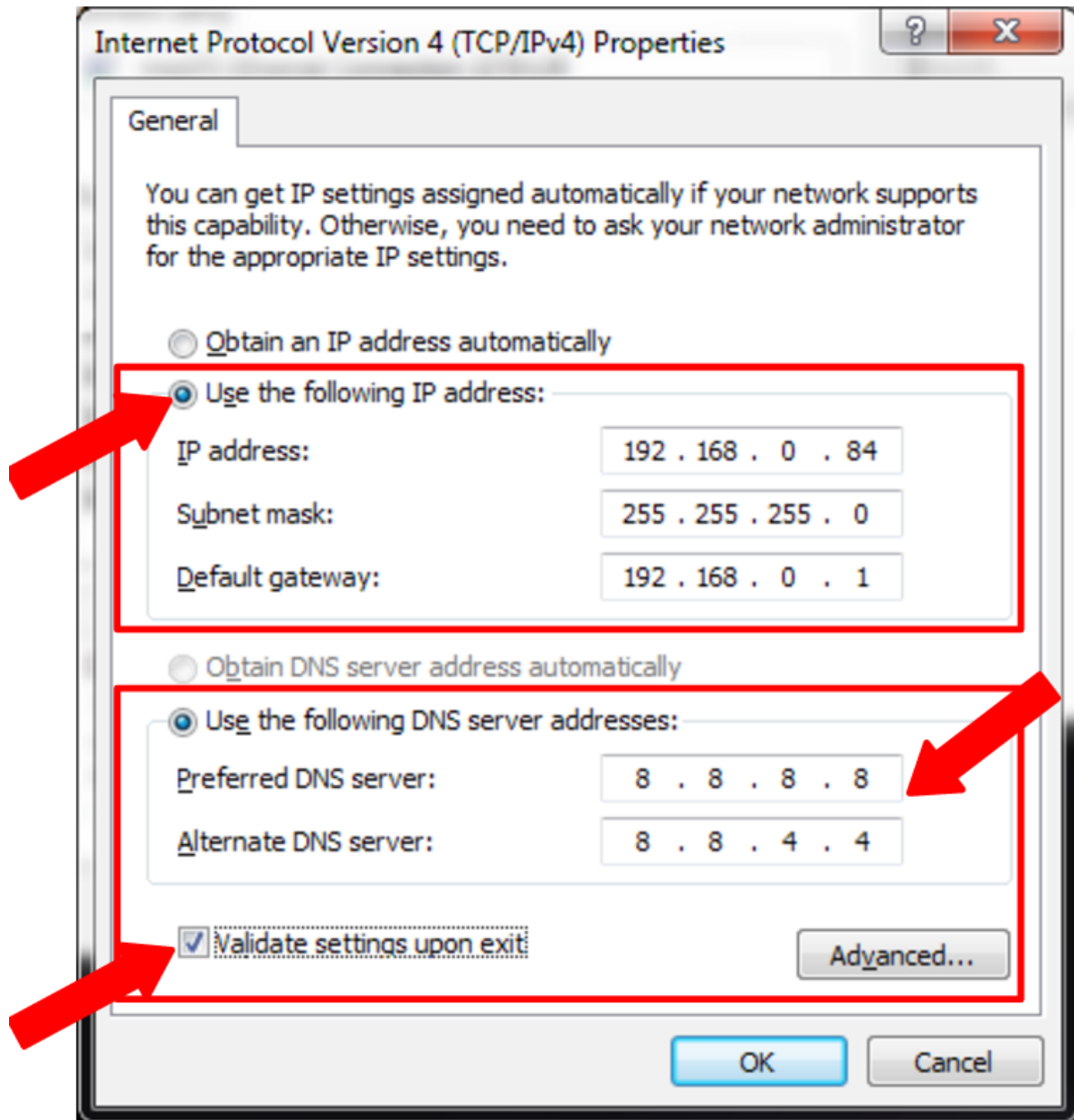


Figure 2.5: The complete static IP config on the TCP/IPv4 connection

8. Click OK to close “Local Area Connection Properties” window.
9. Close out the Network window.
10. To access EWC, proceed to the next Section.

2.3 How to Access EWC on a Network

EWC can be accessed via its hostname on either a DHCP network or a static network. The default hostname is **especSN#**, where **SN#** is the serial number of the chamber, as depicted in the following figure.

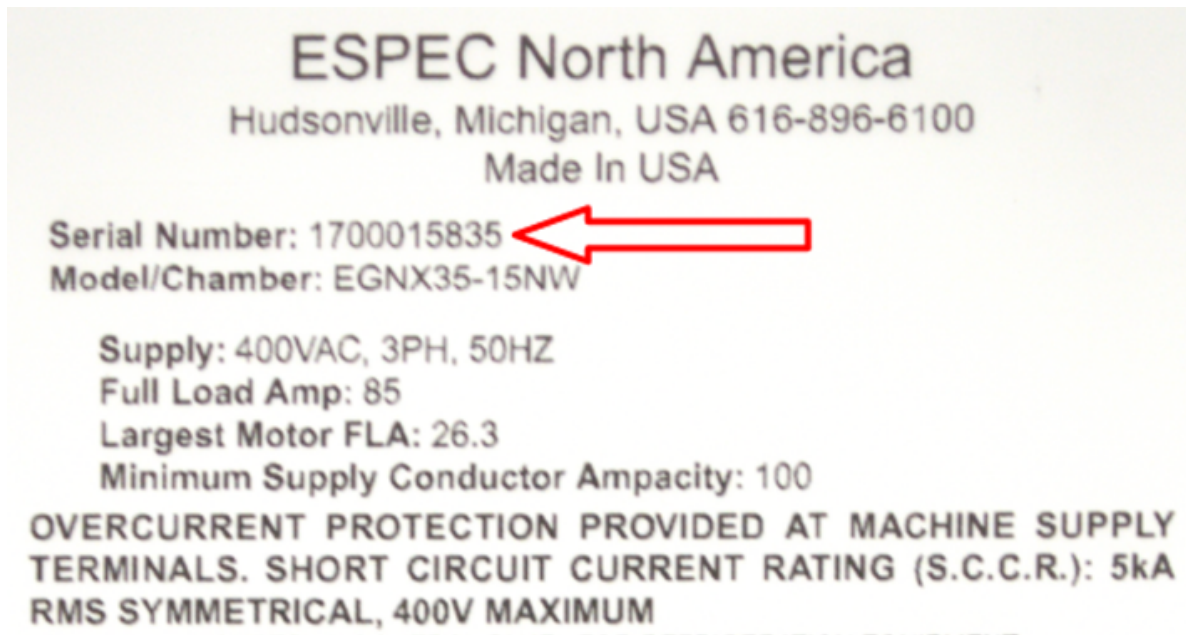


Figure 2.6: Serial number of the chamber

2.3.1 EWC via Its Hostname

EWC can be accessed via its hostname on either a DHCP network or a static network. Complete the following steps to access EWC for the first time.

1. With both the chamber and computer joined the network as described above, apply power to both devices.
2. On your computer, open a Web browser.
3. Enter `http://especSN#.local/` in the URL address field. For example, based on the serial number depicted in the previous figure, the URL appears as: `http://espec1700015835.local/`.
4. When EWC is accessed for the first time, its **Setup Wizard** page will appear. Proceed to Section 2.4 to complete this **Setup Wizard** page.
5. If access failed, verify that both the chamber and computer are on the same network. Cycle power on the chamber to reboot EWC and wait one minute before accessing EWC again.
6. If the problem persists, contact Customer Support for assistance.

2.3.2 EWC via Its Fallback IP

EWC can be accessed via its fallback static IP address on a Class C static network with the following steps:

1. With both the chamber and computer joined the network as described above, apply power to both devices.
2. On your computer, open a Web browser.
3. Enter `http://192.168.0.83/` in the URL address field.
4. When EWC is accessed for the first time, its **Setup Wizard** page will appear. Proceed to Section 2.4 to complete this **Setup Wizard** page.
5. If access failed, verify that both the chamber and computer are on the same network. Check to confirm that your PC uses a Class C network protocol as outlined previously. The local computer must use an IP address 192.168.0.xxx, where xxx is any number other than 1 or 83. The recommended IP address is: 192.168.0.84. Cycle power on the chamber to reboot EWC and wait one minute before accessing EWC again.
6. If the problem persists, contact Customer Support for assistance.

2.3.3 EWC IP on P300 or F4T HMI

With ESPEC P300 or Watlow F4T, the IP address of EWC can be located via the PLC's HMI.

1. **P300 HMI:** When EWC starts and is in communication with the chamber, it posts its hostname and IP address on the chamber's controller. On the P300, the IP address is displayed on the **Set LAN** screen. The following figure illustrates detailed steps to access and view EWC's IP address on the P300 HMI.

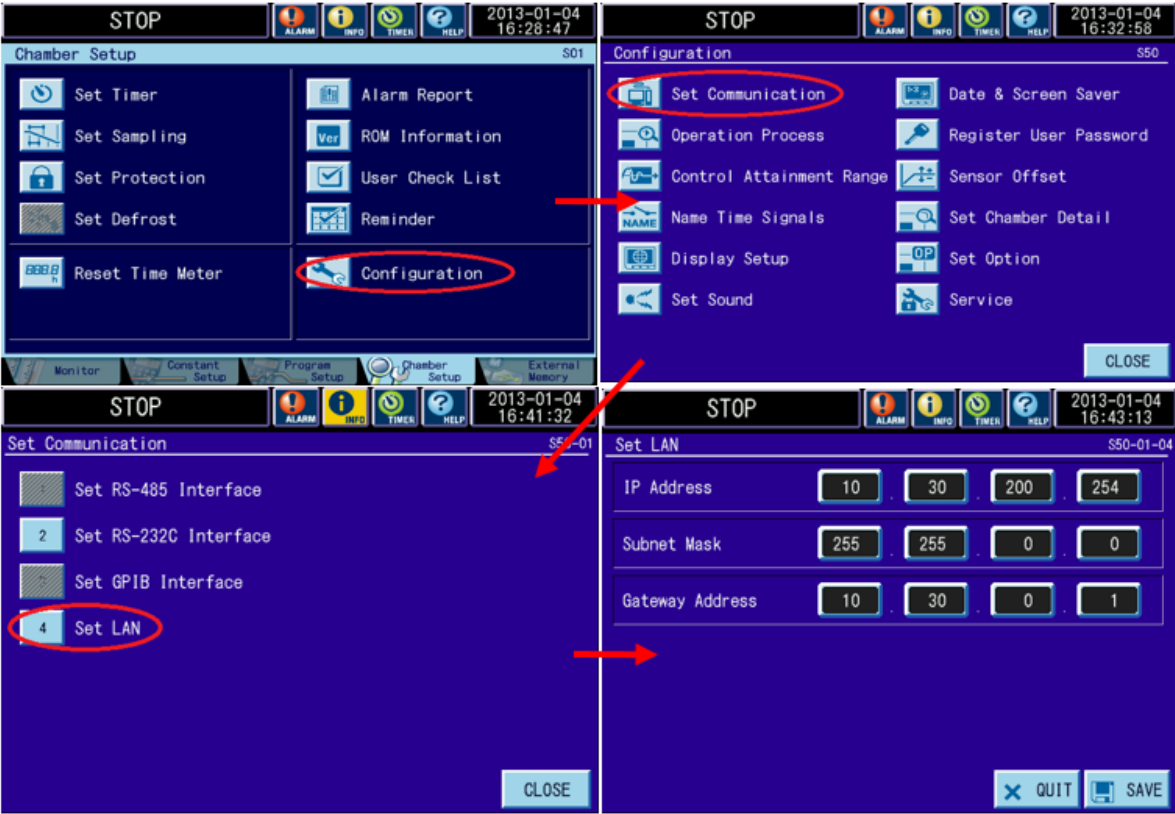


Figure 2.7: The “Set LAN” screen on the P300

2. **F4T HMI**: When EWC starts and is in communication with the chamber, it posts its hostname and IP address on the chamber's controller. With Watlow F4T, this information is displayed on the **Message** tab via the **Controller Status** button, as depicted in the right image of the following figure.

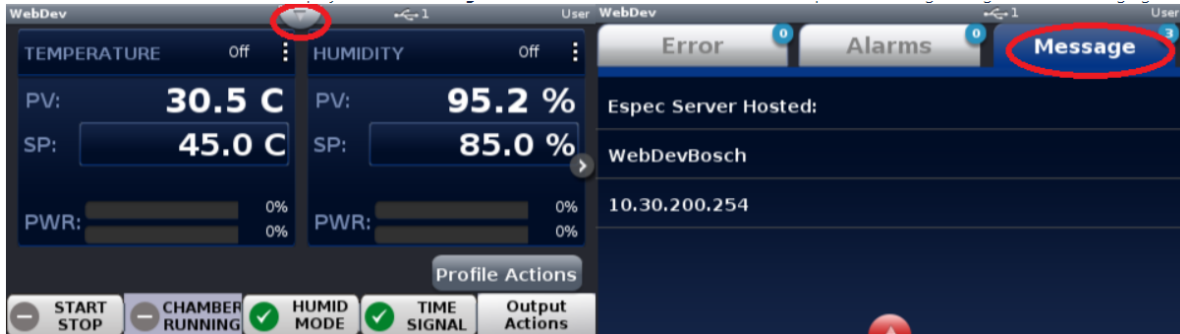


Figure 2.8: The Watlow F4T message screen

2.3.4 EWC via ESPEC Locator Utility

Another method exists for locating EWC on the local network via the ESPEC Locator utility. This utility software is MS Windows-based and is executable on Windows 7/8/10. From a security standpoint, its practical use is dictated by the customer's IT department. Once executed, the utility scans for EWC (ver. 2.0 and higher) on the local network. It then displays each detected EWC via its hostname, IP address and firmware version, as depicted in the following figure. To access EWC, click on its hostname/IP address link, as indicated by the arrow in the following figure.

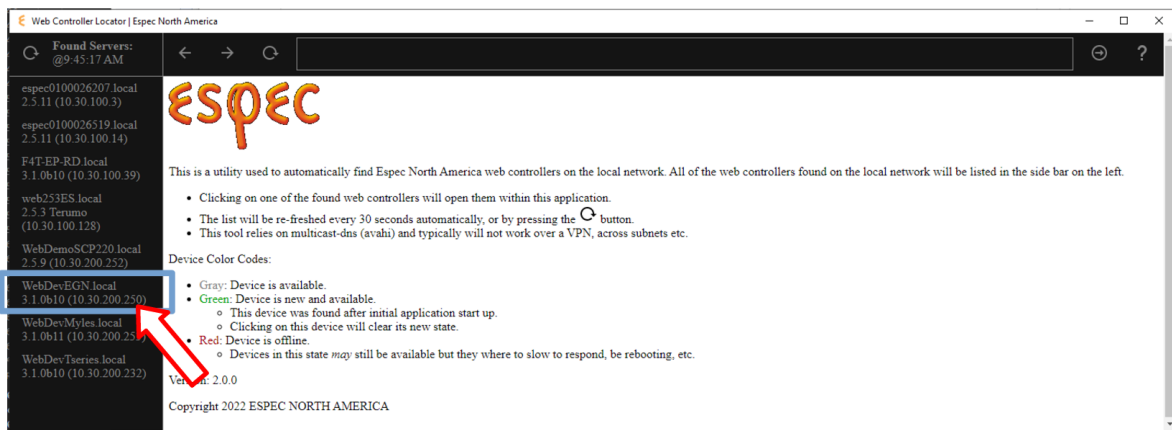
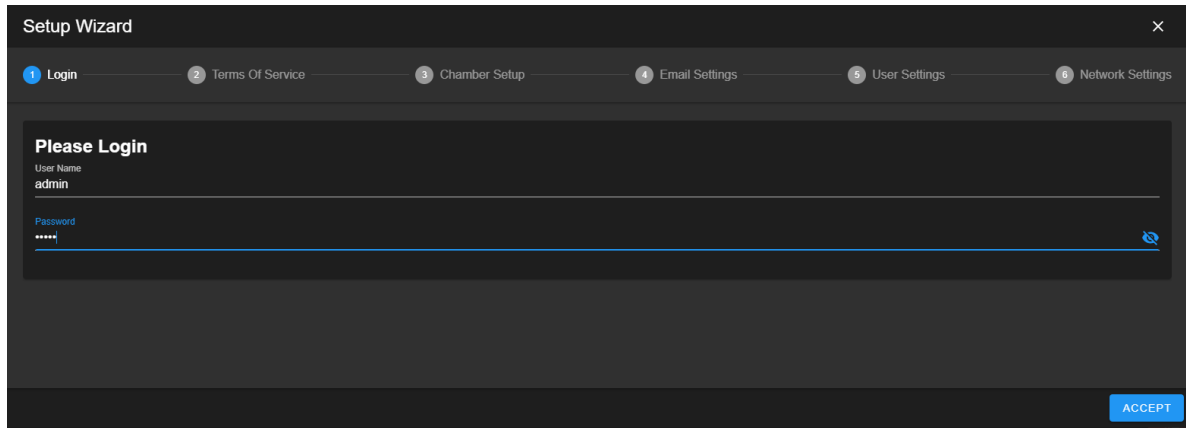


Figure 2.9: EWC Locator Utility

2.4 Setup Wizard of EWC on a Network

Before EWC can be used for the first time, you must complete the **Setup Wizard**. This process involves accepting **Terms of Service**, setting an e-mail for a password recovery, resetting the administrator's password. When EWC is first started, the **Setup Wizard** page appears as follows:

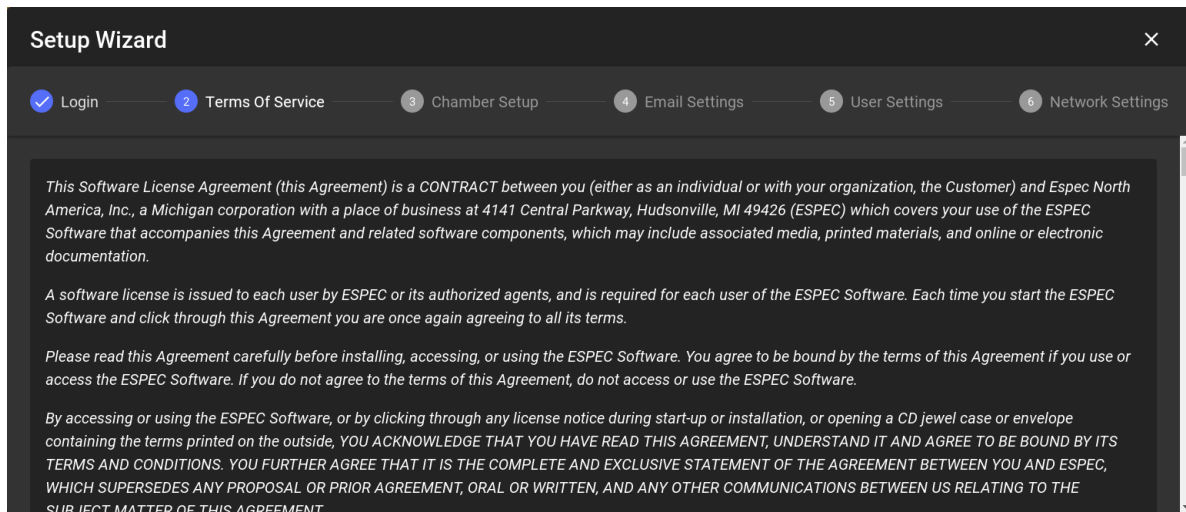
1. **Login:** When prompted, log in using the administrator account credentials (specified in Section 1.5), as depicted in the following figure.



The screenshot shows the 'Setup Wizard' window with a progress bar at the top indicating six steps: 1. Login (active), 2. Terms Of Service, 3. Chamber Setup, 4. Email Settings, 5. User Settings, and 6. Network Settings. The main content area is titled 'Please Login' and contains two input fields: 'User Name' with the text 'admin' and 'Password' with masked characters '*****'. A blue eye icon is visible next to the password field. At the bottom right, there is a blue 'ACCEPT' button.

Figure 2.10: Login prompt in the Setup Wizard page

2. **Terms of Service:** Scroll down the page to read and accept ESPEC terms of service in order to use the product.



The screenshot shows the 'Setup Wizard' window with the progress bar updated: 1. Login (checked), 2. Terms Of Service (active), 3. Chamber Setup, 4. Email Settings, 5. User Settings, and 6. Network Settings. The main content area displays the 'Software License Agreement' text, which is scrollable. The text describes the contract between the user and ESPEC North America, Inc., and includes a statement of acknowledgment at the bottom.

Figure 2.11: Terms of service and agreement

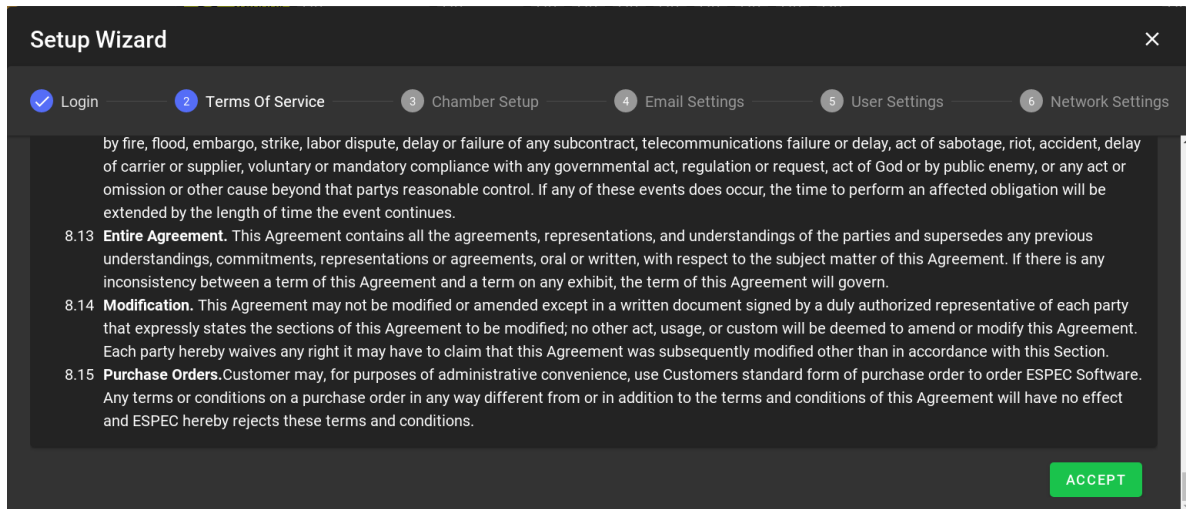


Figure 2.12: Accepting the Terms of service

If EWC registration page appears as depicted in the following figure, contact ESPEC customer service for detail about your registration.

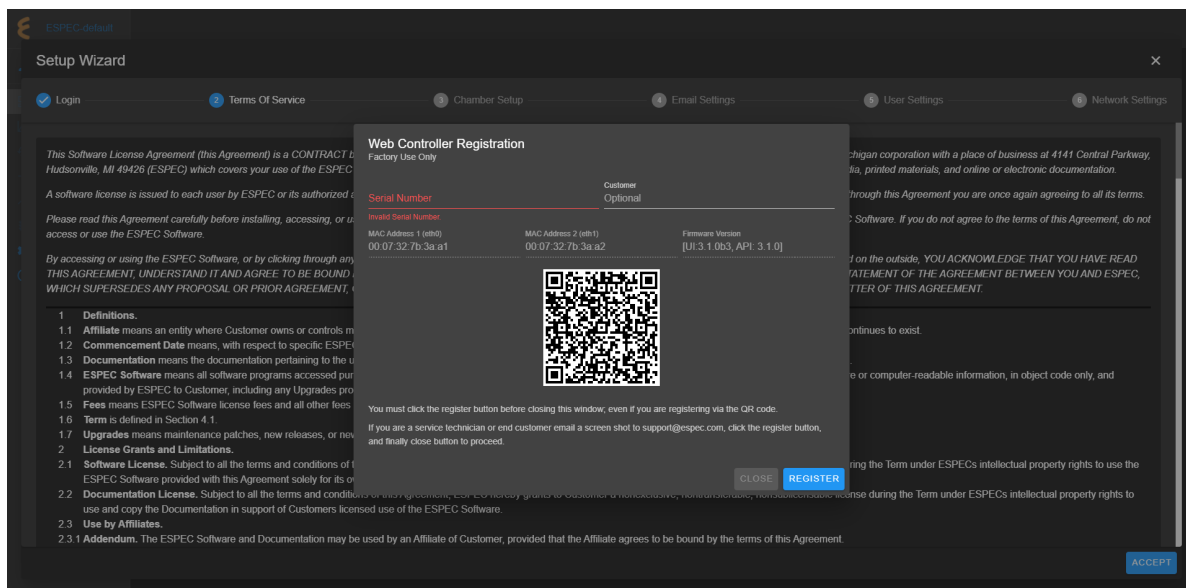


Figure 2.13: EWC Registration

3. **E-mail Settings:** This page allows the administrator to set up an e-mail for password recovery and e-mail alert of chamber conditions. If your EWC does not have access to the Internet, this setting be skipped for now by clicking on the **ACCEPT** button. Such information can be entered later via the **Settings** menu.

Setup Wizard

☒ Login
 ☒ Terms Of Service
 ☒ Chamber Setup
 ☒ **Email Settings**
☐ User Settings
 ☐ Network Settings

Chamber alerts can be notified via e-mails. Use this page to set up the e-mail server and add your e-mail addresses for alert notifications. Enter your e-mail address in the Alert Addresses field and click Save.

Host	<input type="text" value="smtp.office365.com"/>	Host name or IP address of the mail server.
Port	<input type="text" value="587"/>	TCP port used by the mail server.
Send As	<input type="text" value="chamber_controller@espec.com"/>	The sender of the email. In many cases this must match User.
Require Authentication	<input checked="" type="checkbox"/>	A username/password must be used to send the email.

4. **User Settings:** It is imperative that the administrator account password be changed to something more secure than the one given in the manual. Enter the current administrator's password, then enter the new secure password twice and click **ACCEPT** to apply the new password setting.

Setup Wizard

☒ Login
 ☒ Terms Of Service
 ☒ Chamber Setup
 ☒ Email Settings
 ☒ **User Settings**
☐ Network Settings

Update "admin" Password

Current Password

New Password

Repeat New Password

☐ Show Passwords

Figure 2.14: Changing the administrator's password

NOTE: An error message, as depicted in the following figure, will be displayed if a new password is not entered.

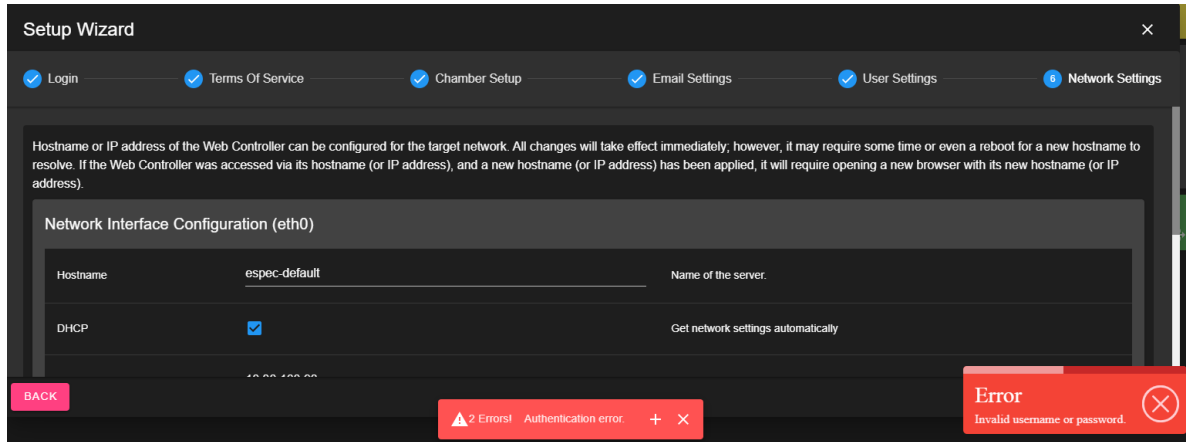


Figure 2.15: Error message for skipping admin password

5. **Network Settings:** Make note of the hostname and IP address of EWC, as shown in the figure, and click **ACCEPT** to continue. It is recommended to use the default setting during the initial setup. The EWC hostname or IP address may be changed later via the **Settings** menu.

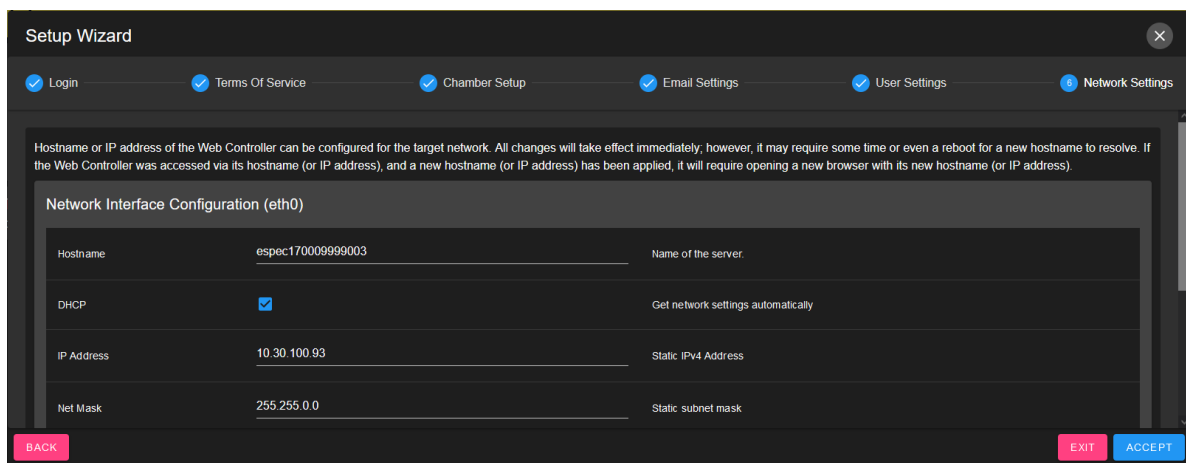


Figure 2.16: Networking configuration—DHCP or Static

IMPORTANT NOTE: If you click **SKIP** on any of the above **Setup Wizard** pages, they will reappear every time you log into EWC.

After the **Setup Wizard** is complete, EWC displays its main home page in **Overview** mode. EWC is ready for operation. Users may begin to log into EWC to operate the chamber. Proceed to Chapter 3 (**User**) to begin operating the chamber.

2.5 Standalone System: T-Series and Custom F4T

By default, T-series or custom F4T chambers with EWC and its touchscreen are configured to operate as a standalone system. Such a system, in total isolation without the need to join a network, offers complete control and operation via its dedicated HMI (as depicted in the figure).

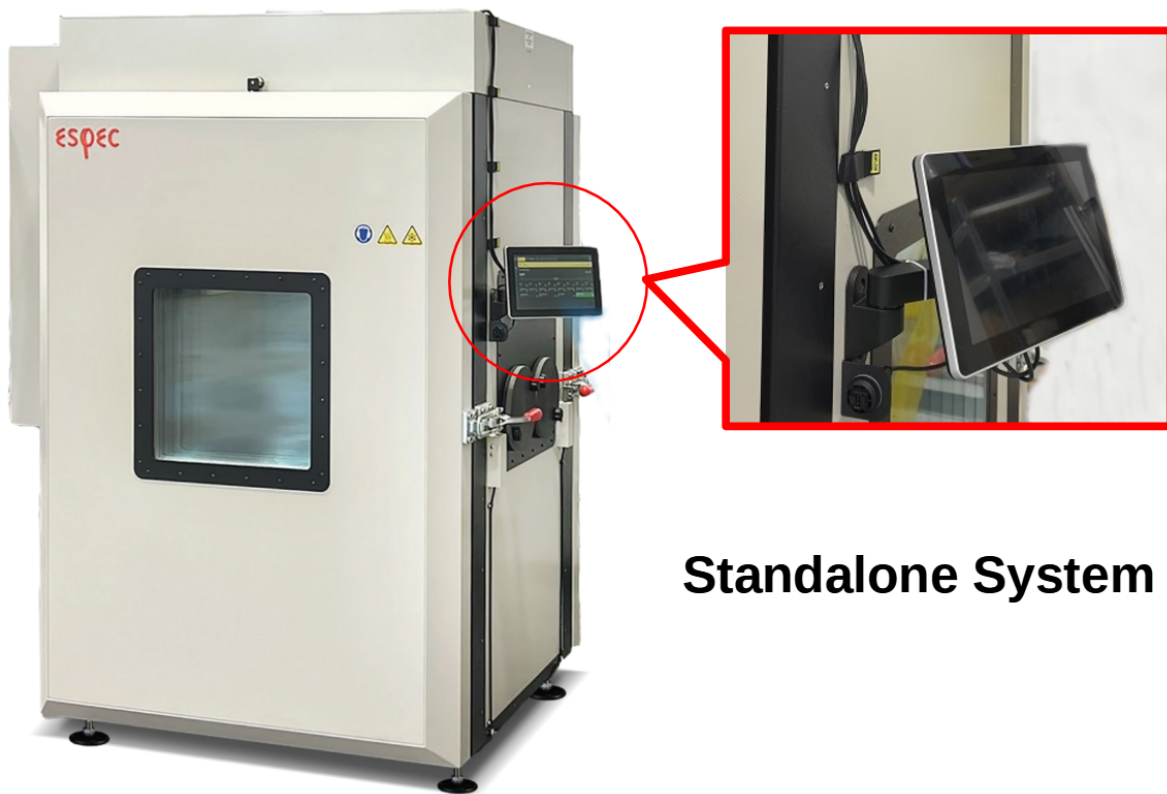


Figure 2.17: T-series with ESPEC Web Controller and its touchscreen

When you turn on your chamber for the first time, it presents a Setup Wizard to help configure how EWC should operate: as a standalone system or a networked system. The following steps guide you through to complete the Setup Wizard for a standalone system.

1. **Login:** Log in with User Name as **admin** and password as **admin** (see Section 1.5) using the floating keyboard. Touch an area outside of the Setup Wizard window (e.g., the menu bar) to expose the **ACCEPT** button, then touch it to log in.

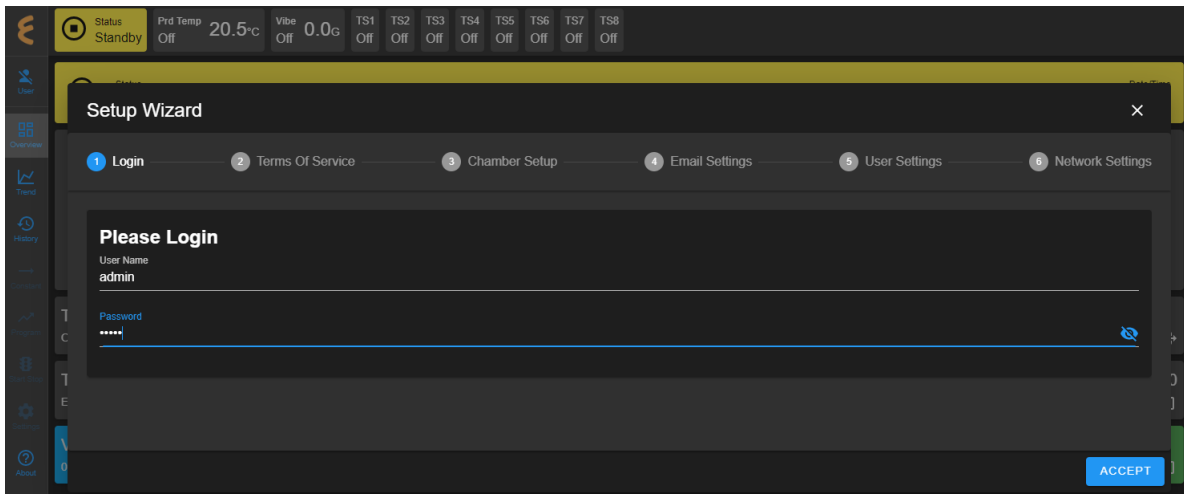


Figure 2.18: Login prompt in the Setup Wizard page

2. **Terms of Service:** Swipe the touchscreen upward to read through the **Terms of Service**, then touch **ACCEPT** to accept the terms.

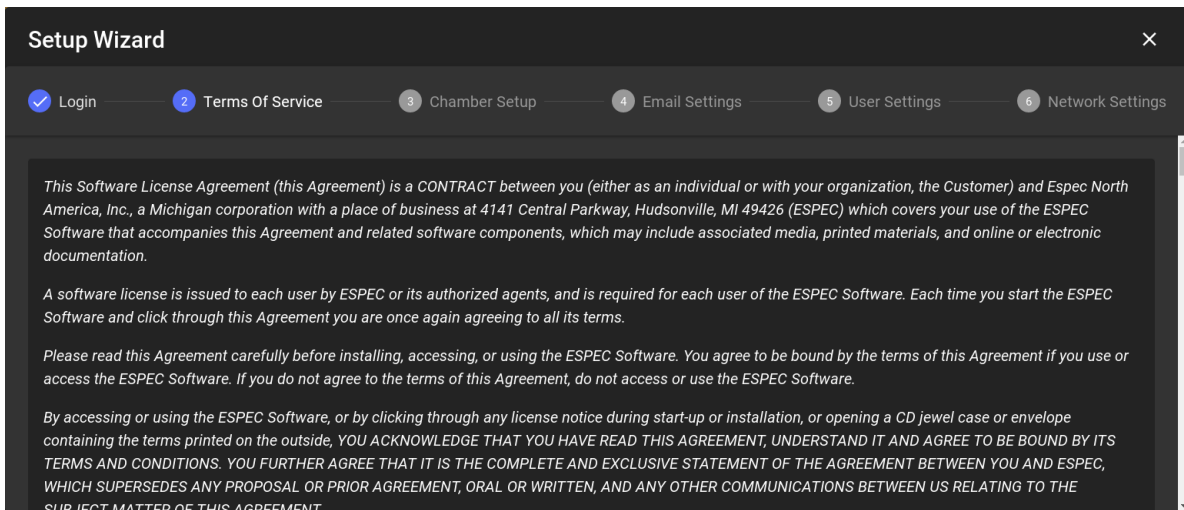


Figure 2.19: Terms of service and agreement

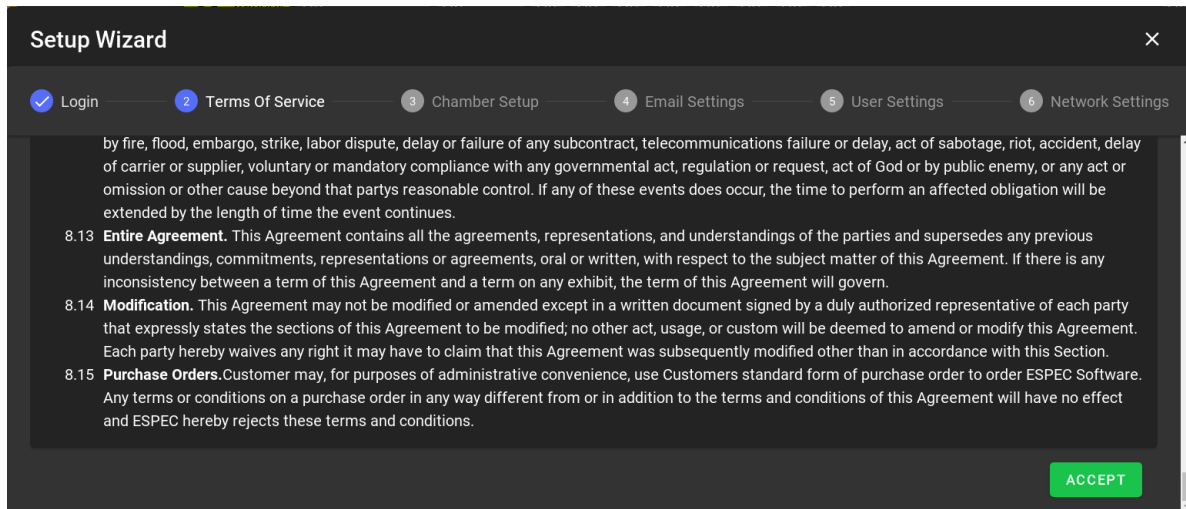


Figure 2.20: Accepting the Terms of service

If EWC registration page appears as depicted in the following figure, contact ESPEC customer service for detail about your EWC registration.

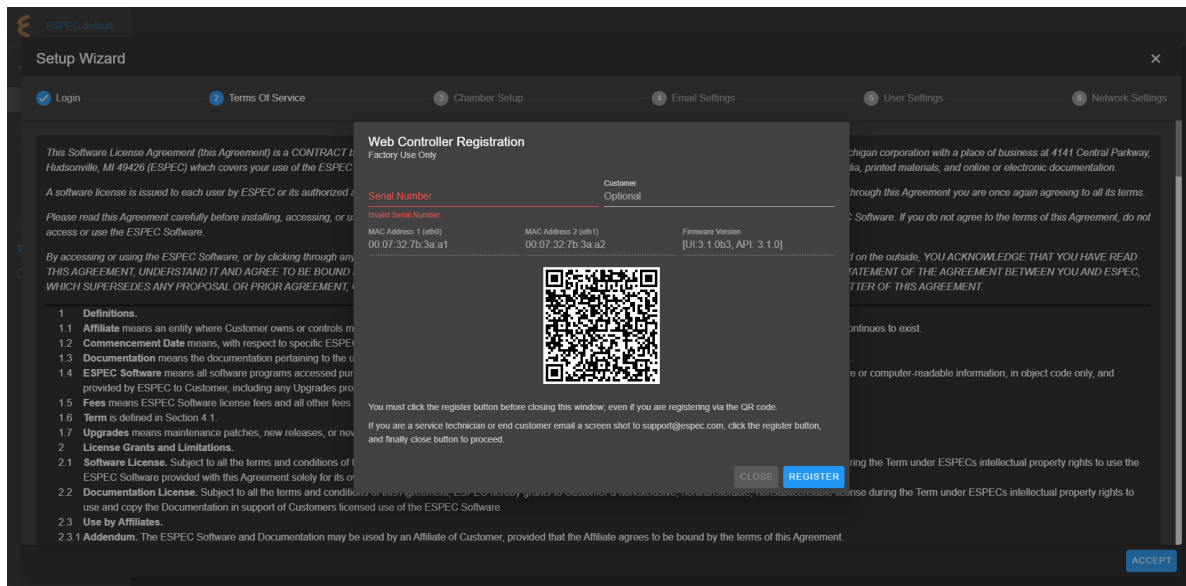


Figure 2.21: ESPEC Web Controller Registration

3. **Email Settings:** For a standalone system, this setup page can be left with its default setting. Touch the **ACCEPT** button to continue. **Note:** Account recovery e-mail and alert e-mail setup can be configured later using the **Settings** menu after your EWC has joined a network and can access the Internet.

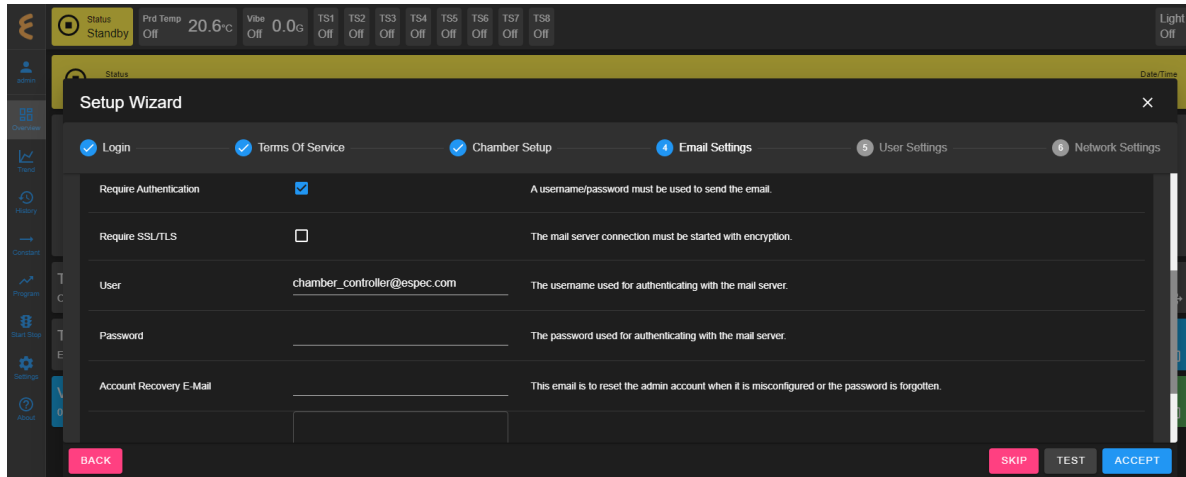


Figure 2.22: Setting e-mail alerts

4. **User Settings:** Change your admin password to something secure to protect your chamber and EWC.
 1. Enter current password: **admin**
 2. Enter new password; touch the menu bar to expose the third field.
 3. Tab on the third field and enter new password, again.
 4. Touch **ACCEPT**.

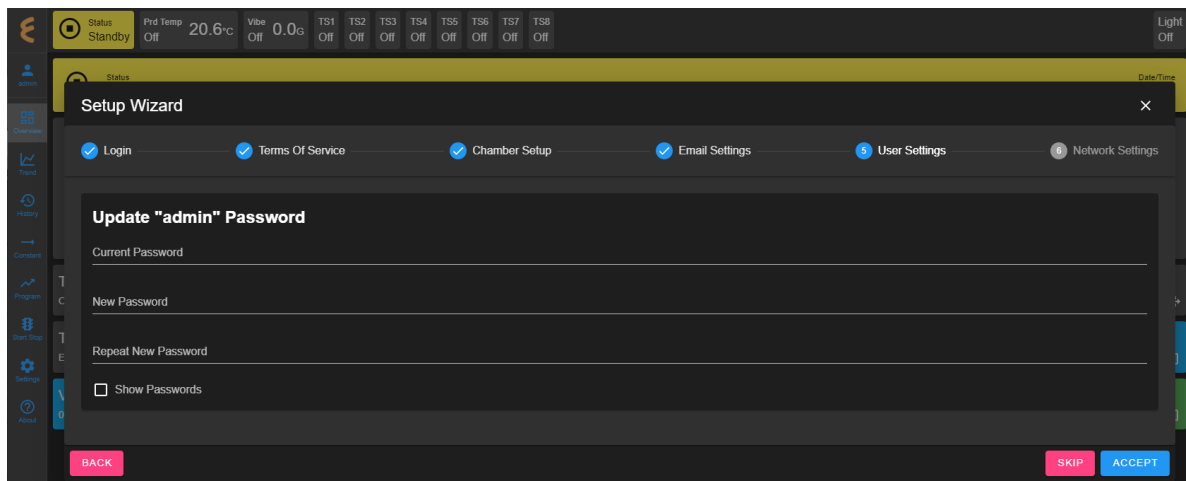


Figure 2.23: Changing the administrator's password

NOTE: An error message, as depicted in the following figure, will be displayed if a new password is not entered.

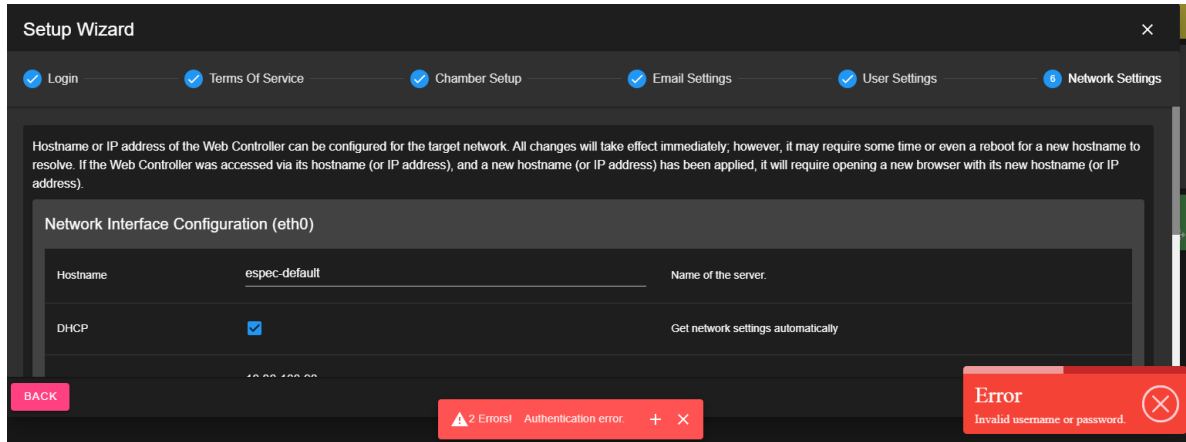


Figure 2.24: Error message for skipping admin password

5. **Network Settings:** For a standalone system, network configuration is empty, as there is no connection to the outside world. Touch **ACCEPT** to continue.
6. The Setup Wizard is complete; EWC displays its main home page in **Overview** mode and is now ready for chamber operation.
7. Single-User or Multi-User:
 1. If multiple operators need to control and operate the chamber, they should have separate account on the system. Proceed to Section 10.7 to create different accounts and privileges for these operators. Users may begin to log into the system to operate the chamber; proceed to Chapter 3 (**User**).
 2. If this is a single-user system, proceed to Chapter 3 (**User**).

2.6 Networked System: T-Series and Custom F4T

Your T-series or custom F4T chamber with EWC can operate both as a standalone and/or networked system to allow authorized users to access and control the chamber remotely from any device on the network.

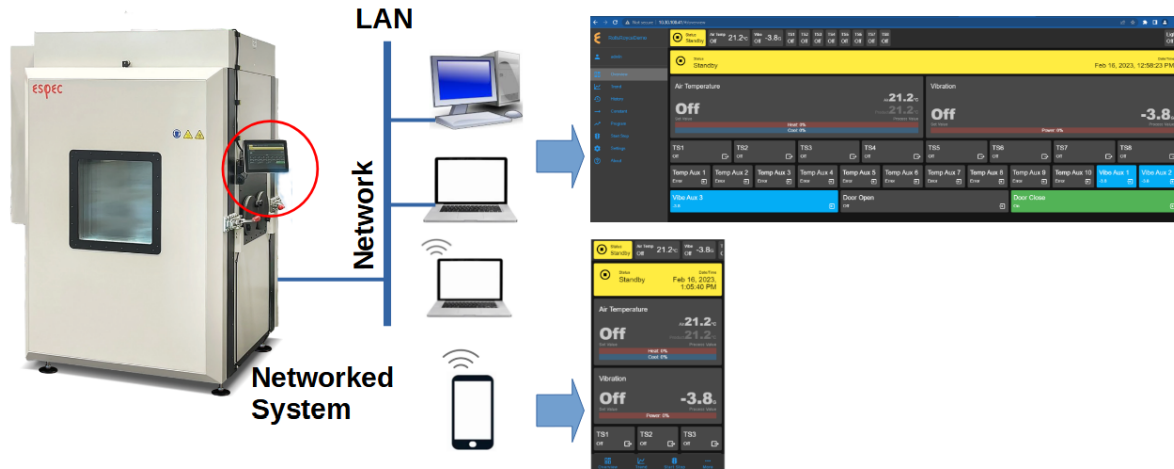


Figure 2.25: T-Series with ESPEC Web Controller as a networked system

2.6.1 DHCP Network: T-series and Custom F4T

By default, EWC applies DHCP to obtain an IP address assigned by the DHCP server to join the network automatically.

Complete the following steps to connect your EWC to a DHCP network.

1. Plug an RJ-45 Ethernet cable into the Ethernet port (EPO port) at the front of the chamber, while the system is still running.
2. Plug the other end of the cable into an Ethernet port (or a router) that connects to the main network.
3. In less than a minute (30 seconds), touch the network icon on the upper-right corner to view the IP address assigned for eth0 (indicated by the arrow in the figure). Its IP address (on eth0) can be used to access EWC from any device on the network. Note: The IP address assigned to eth1 is used for internal communication between the T-Series PLC and EWC.

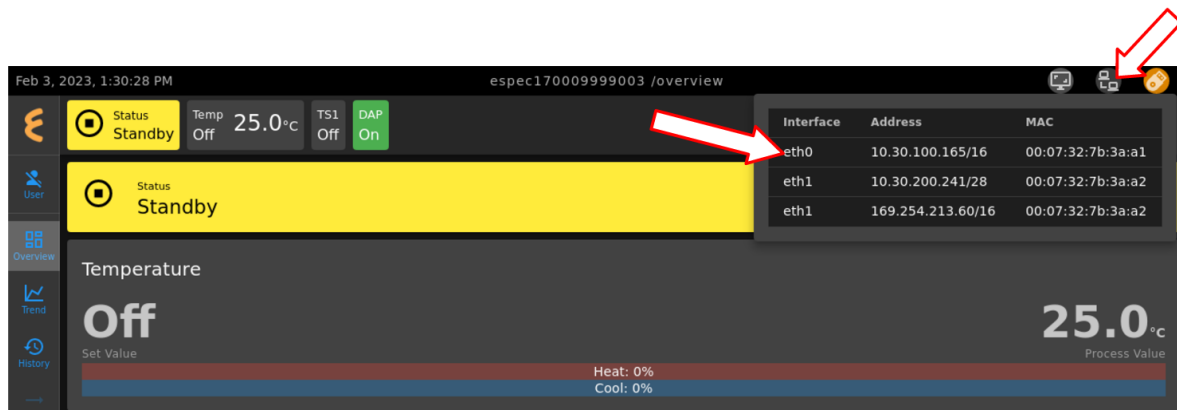


Figure 2.26: IP address to ESPEC Web Controller

4. Your PC or laptop must also join the main network (as shown in the above diagram) in order to access EWC via its IP address assigned on eth0.
5. From any device on the network, open a Web browser and, in the URL, navigate to: `http://IP-address/`, where IP-address is the IP address assigned for eth0.

2.6.2 Static Network: T-series and Custom F4T

When EWC detects there is a network, it first applies DHCP protocol to obtain an IP address from the DHCP server to join that network. If DHCP service is not available, EWC uses its preconfigured Class C static network with the following configurations:

- **IP Address:** 192.168.0.83
- **Subnet Mask:** 255.255.255.0
- **Gateway:** 192.168.0.1

This static network protocol occurs when EWC is connected directly to a computer or a network hub (without DHCP service) via a cross-over or standard Ethernet cable. Modern devices can connect directly to each other with a standard CAT 5/6 cable.

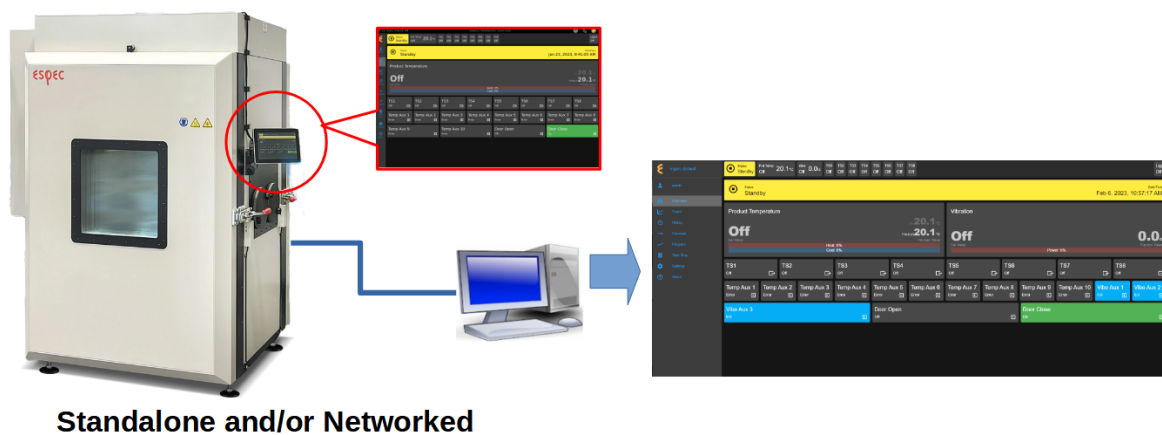


Figure 2.27: Static network configuration

In order for EWC to use its predefined static IP address, your PC must be configured with the following settings:

- **IP Address:** 192.168.0.84
- **Subnet Mask:** 255.255.255.0
- **Gateway:** 192.168.0.1
- **Preferred DNS server:** 8.8.8.8
- **Alternate DNS server:** 8.8.4.4

Note: 192.168.0.84 is the recommended IP address; your PC can use any IP address except 192.168.0.83.

Complete the following steps:

1. Hold down the **Windows** key and press **R** to launch the Run Command dialog box.
2. In the Run dialog box, enter **ncpa.cpl** into the Open box field and press **Enter**.

3. Point and Right-Click the “Local Area Connection” icon, then click Properties from the drop-down menu (as illustrated in the following figure). NOTE: The Local Area Connection icon is the one connected to a hub (or EWC via a straight-through or crossover Ethernet cable). It is important to access the correct icon in case the PC has multiple Ethernet ports or devices.

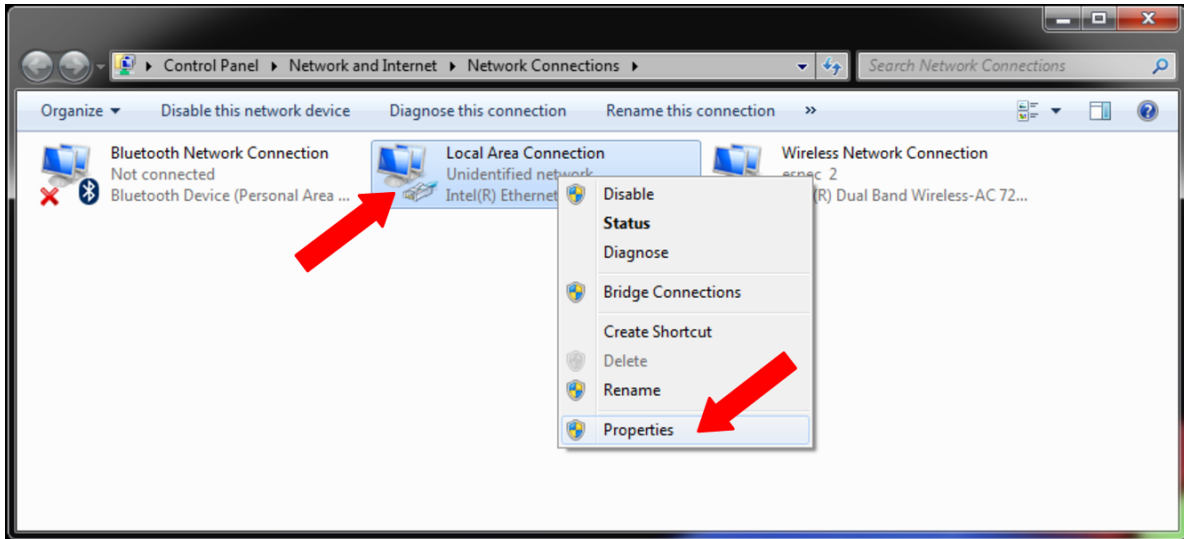


Figure 2.28: Selecting the right Local Area Connection

4. In the “Local Area Connection Properties” window, confirm that there is a check mark placed in front of “Internet Protocol Version 4 (TCP/IPv4)”, as illustrated in the following figure. If not, check it. Click to highlight “Internet Protocol Version 4 (TCP/IPv4)” and then click Properties in the lower-right corner.

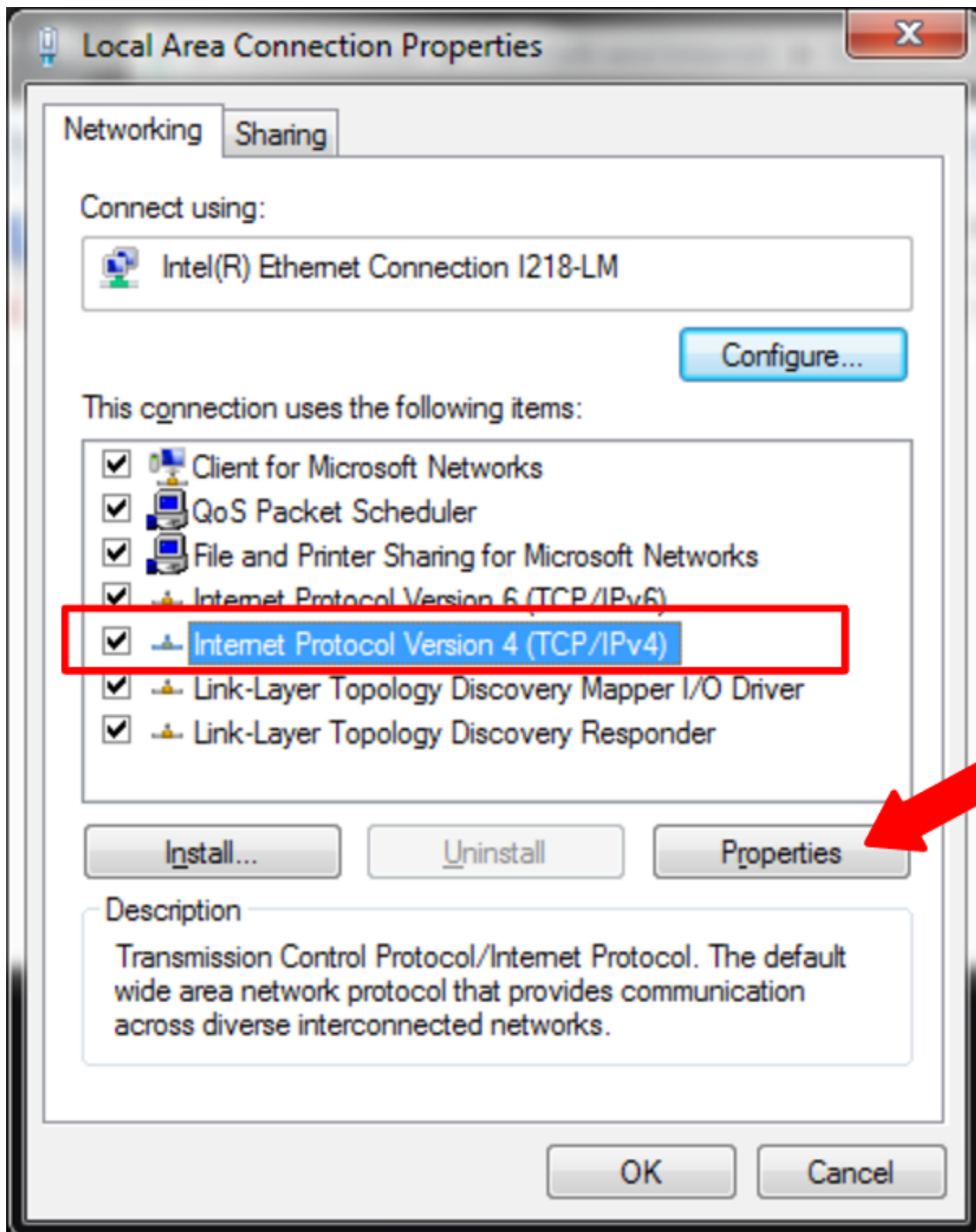


Figure 2.29: Setting TCP/IPv4 properties

5. In the “Internet Protocol Version (TCP/IPv4) Properties” window, turn on the radio button for “Use the following IP address:” and enter these settings (see the figure below):
 - **IP Address:** 192.168.0.84
 - **Subnet Mask:** 255.255.255.0
 - **Gateway:** 192.168.0.1
6. In the “Use the following DNS server addresses:” section, enter the following address (as shown in the following figure):
 - **Preferred DNS server:** 8.8.8.8
 - **Alternate DNS server:** 8.8.4.4
7. Turn on “Validate settings upon exit” with a check mark and click OK, as illustrated in the following figure.

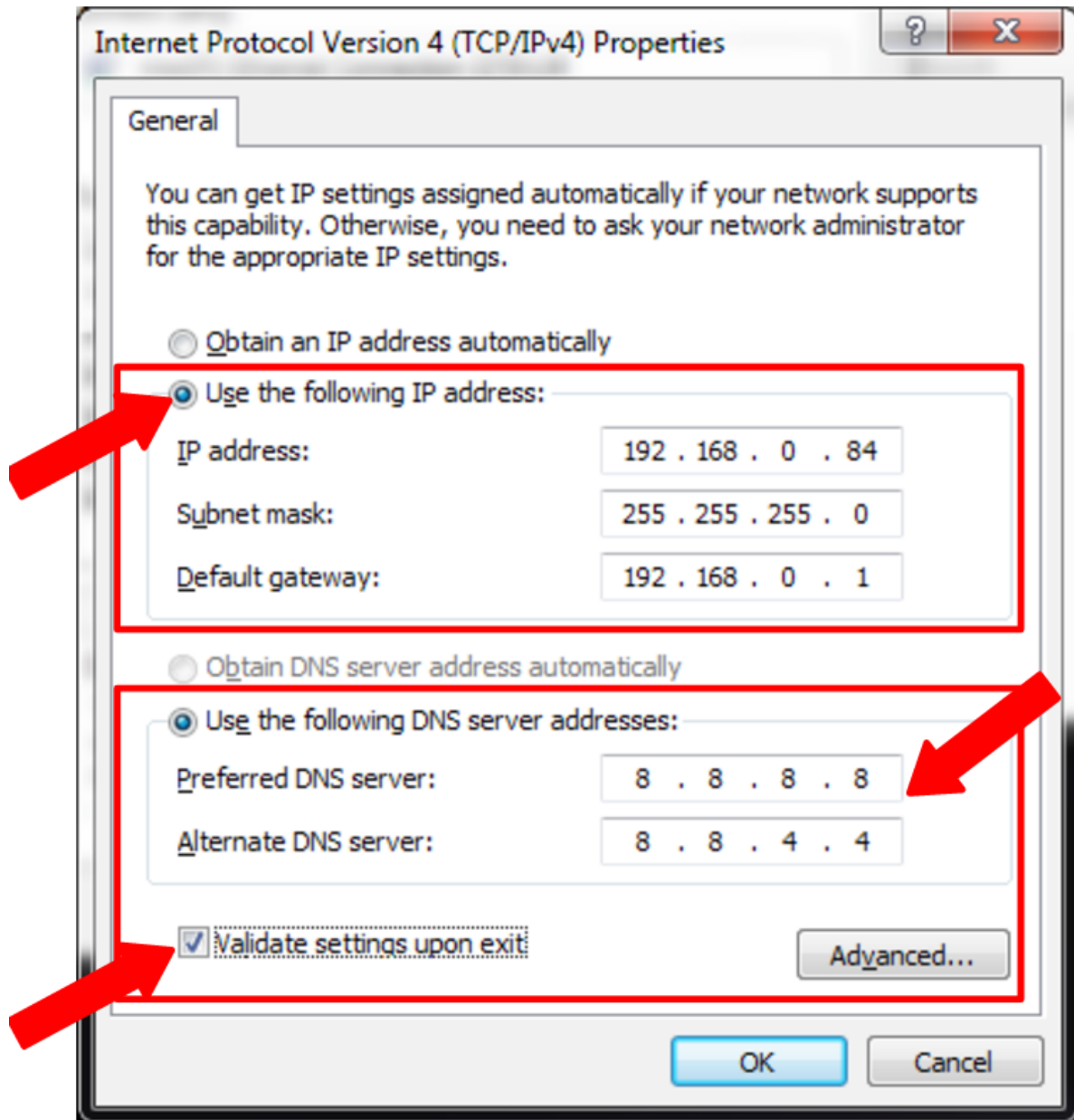


Figure 2.30: The complete static IP config on the TCP/IPv4 connection

8. Click OK to close “Local Area Connection Properties” window.
9. Close out the Network window.
10. Plug an RJ-45 Ethernet cable into the Ethernet port (EPO port) at the front of the chamber.
11. Plug the other end into the PC Ethernet port (or a router).
12. In less than a minute (30 seconds), touch the network icon on the upper-right corner to confirm that eth0 has been assigned to 192.168.0.83 as its IP address (indicated by the arrow in the Figure).

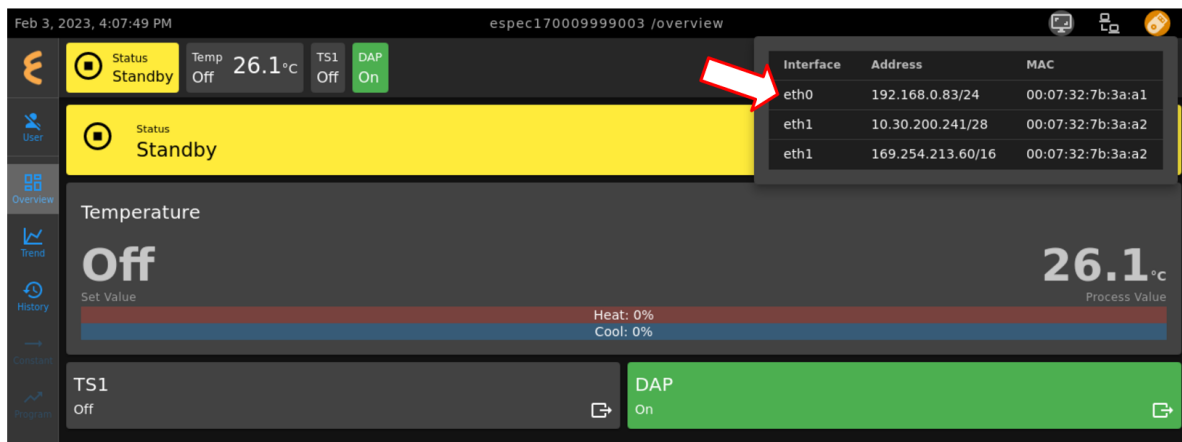


Figure 2.31: ESPEC Web Controller with its static IP

13. To access EWC, open a Web browser on your PC and navigate to: <http://192.168.0.83/>
14. Proceed to Chapter 3 (User) to begin operating the chamber.

IMPORTANT NOTE: If you click **SKIP** on any of the above **Setup Wizard** pages, they will reappear every time you restart and log into EWC.

CHAPTER 3

User

This chapter explains how users log into EWC to control and operate the chamber. EWC protects the chamber by permitting only authorized users to login and operate the chamber. The following sections discuss how to login, logout and set a new password.

3.1 Login

To log into a specific account, click the **User** menu in the menu bar and enter account name and password, and click **SUBMIT** as depicted in the following figure.

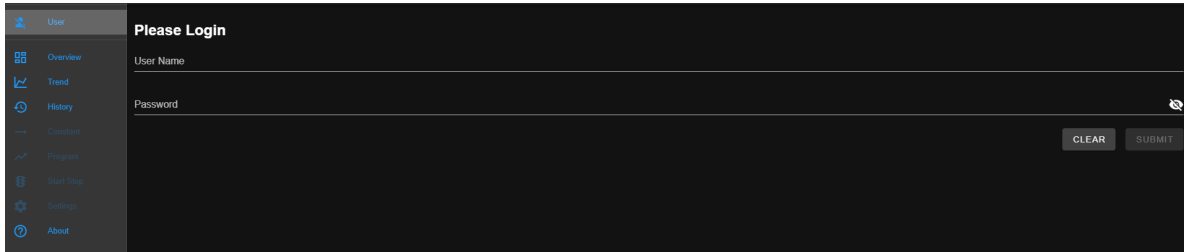


Figure 3.1: Log into ESPEC Web Controller

To log into a specific account on EWC via its HMI (touchscreen), such as T-series or custom F4T chambers, use the touchscreen keyboard as shown below.

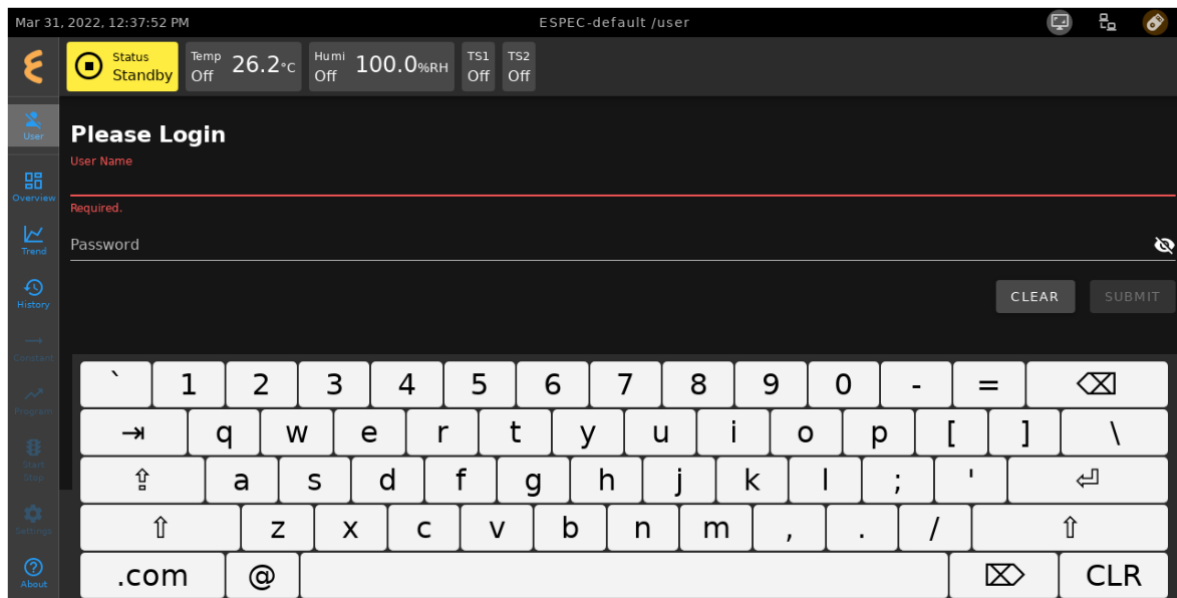


Figure 3.2: Log into EWC via HMI

If the login fails, an **Invalid username or password** message pops up at the lower right corner. Click the **Close** button and re-enter username and password.

To set the Web browser to remember the login credentials, check the **Remember Me** box. This method is not advisable on a public computer using a public account. Only apply the **Remember Me** feature on your computer or your user account on a public computer. After authentication is verified, EWC logs you in and the web page is displayed in **Overview** mode.

To log into a different account, click the **User** menu (which now displays the current login name), click **LOGOUT**, enter new username and password and click **SUBMIT** (or press **Enter**).

3.2 Logout

To end an EWC session and logout your account, click the **User** menu in the menu bar, which now displays your username, and click **LOGOUT**, as depicted in the following figure.

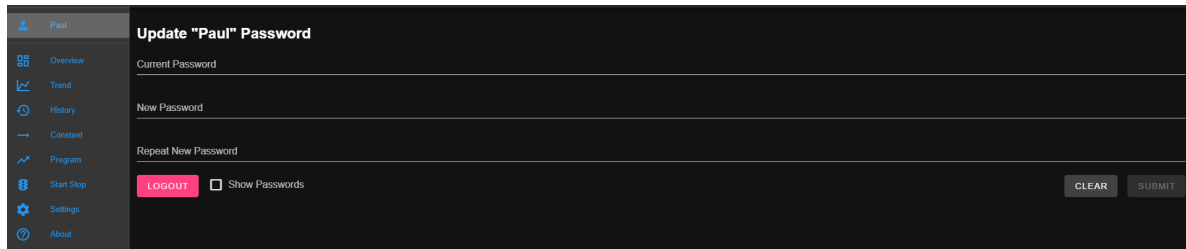


Figure 3.3: Logout and login using a different username

EWC reverts all its navigation links to Read-Only mode with only **User**, **Overview**, **Trend**, **History** and **About** visible and accessible as depicted in the figure in Section 3.1.

3.3 Set New Password

There are two ways to set or change a user's password:

1. **User-Own Setting:** A user can reset their password via the **User** menu, as depicted in the previous figure:
 - Once logged in, click **User** which now displays the account name.
 - Enter the current password in the **Current Password** field.
 - Enter the new password in the **New Password** and **Repeat New Password** fields.
 - Click **SUBMIT** to apply the setting, or click **CLEAR** to cancel the setting.

If authentication is checked and confirmed, a new password to the user account will be set and becomes effective immediately.

2. **Administrator Setting:** A user account password can be reset by the administrator via the **User Settings** submenu.

Username	Password	Repeat Password	Overview/Trend	Start Stop	Features	Constant	Program	Settings
Guest (No user logged in)			Read Only	No Access	No Access	No Access	No Access	No Access
admin			Read Write	Read Write	Read Write	Read Write	Read Write	Read Write
Paul			Read Write	Read Write	Read Write	Read Write	Read Write	Read Write

Figure 3.4: Resetting password via User Settings submenu

This method will be discussed in detail under a separate chapter on the **Settings** menu.

CHAPTER 4

Network Monitor

EWC can communicate with each other on the network. The E logo atop the menu bar or the hostname of EWC itself is a clickable link accessible from within any menu (with **Overview** illustrated in the figure) that, when clicked, opens a drop-down menu to display a link to the Network Monitor page and a list of clickable links to other EWC devices on the network.

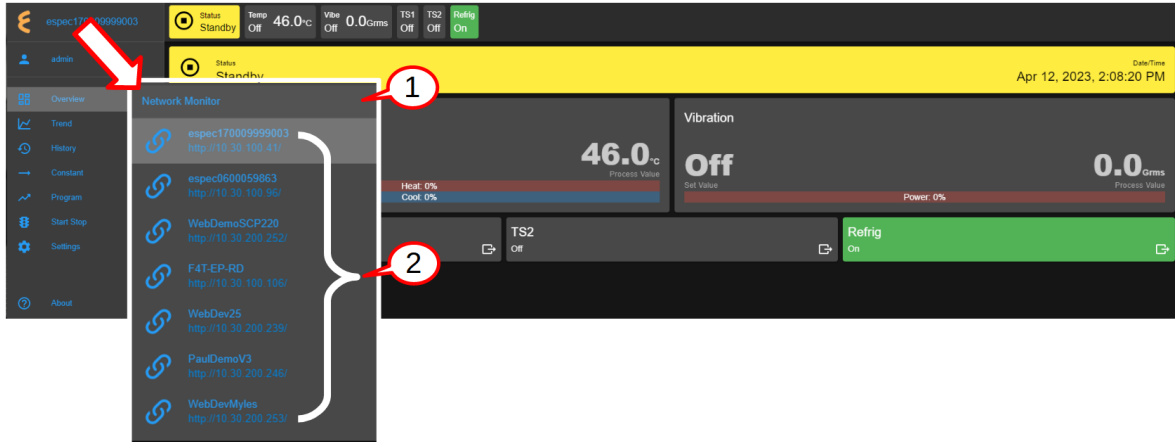


Figure 4.1: List of EWC on the local network

1. **Network Monitor:** The Network Monitor page is a clickable link that opens in a new page to allow the operator to manage all active EWC devices on the local network. Its features and application will be discussed in the following section. The Network Monitor link is bound to user privileges; a user must have specific privileges identified in the user account in order to use it.
2. **Active EWC on Network:** All EWC devices detected on the local network are listed here. The top one on the list is the current EWC that points to itself when clicked. Any EWC on the list can be accessed directly by clicking on its hostname. The back button of the Web browser or the E logo of the current EWC can be used to return to the original EWC. Any EWC on the network can access each other via the E logo.

The Network Monitor page cannot be accessed or operated on the touchscreen or on a monitor connected to the HDMI or display port of EWC. It can only be accessed and controlled from a Web-based device on the local network. For this reason, the touchscreen of a T-series or custom F4T chamber cannot be used to set up a Network Monitor page.

4.1 Network Monitor Page and EWC

The Network Monitor page offers an appealing feature that allows all EWC devices on the local network be displayed in one central monitor without the need for a central server to monitor them, as depicted in the following figure.

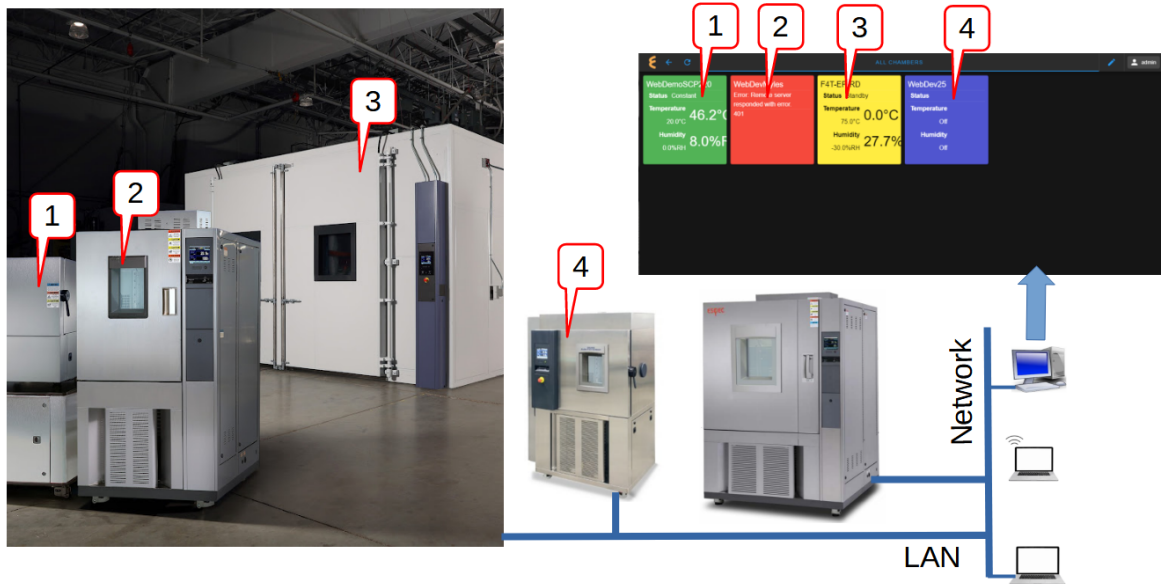


Figure 4.2: Network Monitor page displaying all EWC devices on the local network

An operator can monitor the operating mode, status and conditions of all EWC devices on their network and take action on any of them when a situation arises, such as an alarm was tripped or a communication error occurred with the chamber, etc.

To access and manage the Network Monitor page,

1. Log in as admin or as a user with permission to control the Network Monitor page
2. Click the E logo or the hostname of EWC
3. Click the Network Monitor link on the drop-down menu

The following figure illustrates the layout of the Network Monitor page with seven (7) important components. Each is listed and described as follows:

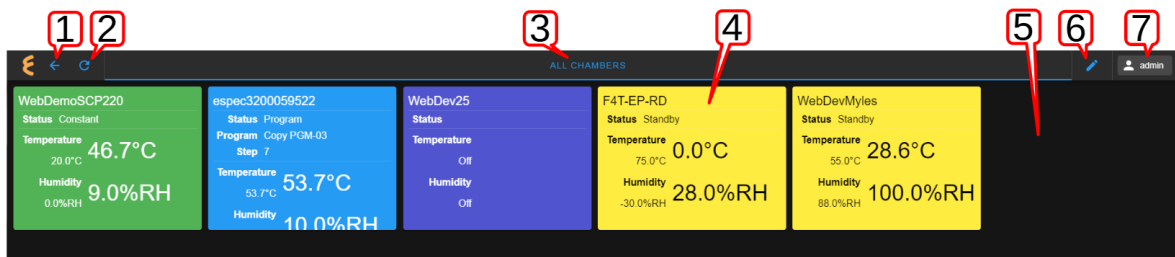


Figure 4.3: Components and menu options of the Network Monitor page

1. **Back Button:** This button closes the Network Monitor page and returns to the **Overview** of EWC.
2. **Refresh Button:** The refresh button updates the display of the Network Monitor page to apply any new configuration.
3. **Monitor Tab:** By default, only one tab with default name **ALL CHAMBERS** is active

and ready to populate the selected EWC devices (as depicted in the above figure). Multiple tabs with unique and descriptive names can be created to display different groups of EWC devices.

4. **EWC on the Network:** By default, each EWC is displayed with its hostname for identification, but a unique name may be created in place of the hostname. As shown in the above figure, each EWC is displayed based on its operating status, such as Standby, Constant or Program, using its default color. Each EWC can be accessed directly and displayed inside the Monitor tab as shown in the following figure for F4T-EP-RD. To close F4T-EP-RD, click the X button on the top right. To open it entirely in a new Web browser tab, click the expand button next to its hostname.

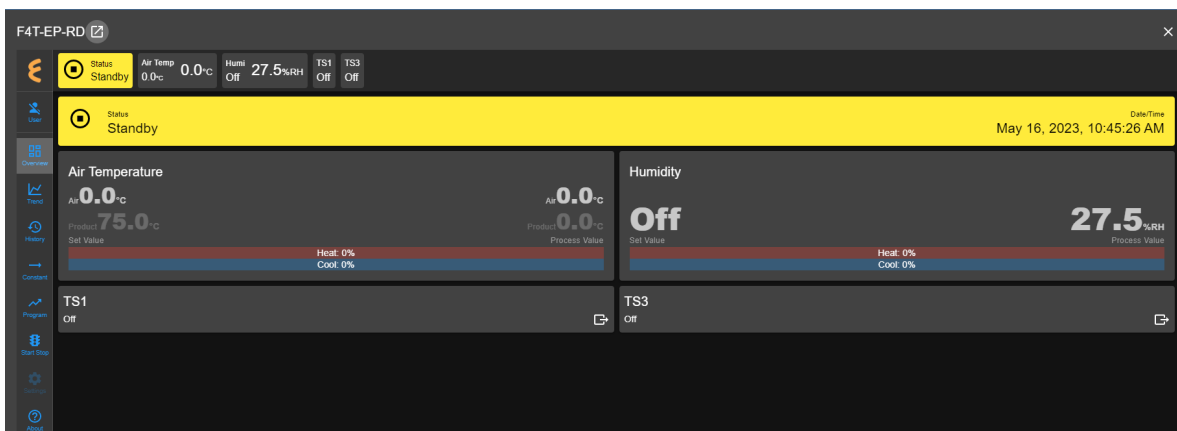


Figure 4.4: EWC displayed inside the Network Monitor tab

The color coding scheme allows the operator to quickly identify a chamber with issues, such as the one depicted in the following figure.

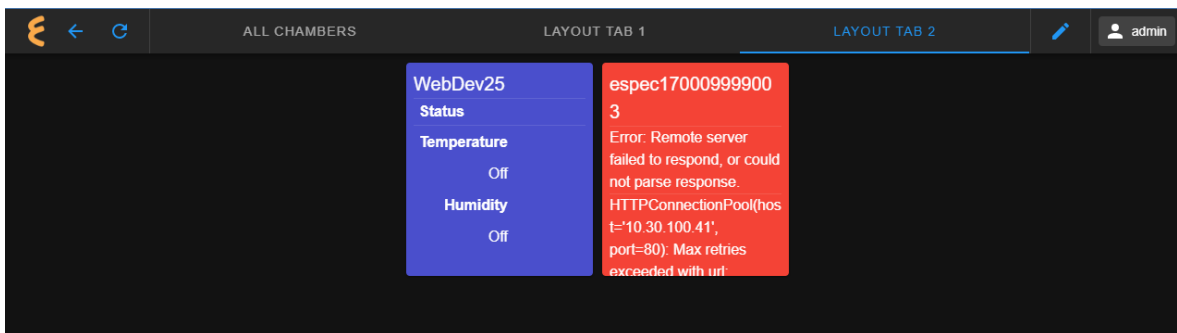


Figure 4.5: Chamber error identifiable by its color

5. **Monitor Area:** The monitor area is based on the size of the monitor screen which defines the real estate of the display to accommodate EWC devices.
6. **Edit Layout:** The **Edit Layout** (pen icon) is a clickable link/button that provides the edit menu with options to create additional tabs to populate EWC devices, as shown below.



Figure 4.6: Edit Layout and its menu options

From left to right, the four buttons are: Revert (back button), Save, Add Chamber/Device, Edit/Create Tab. Detailed operations of these buttons will be discussed in the following section.

7. **User:** Identity of the current user is listed here for reference.

4.2 Managing Network Monitor

When Network Monitor page is open for the first time, it has an empty tab with default tab name **ALL CHAMBERS**.

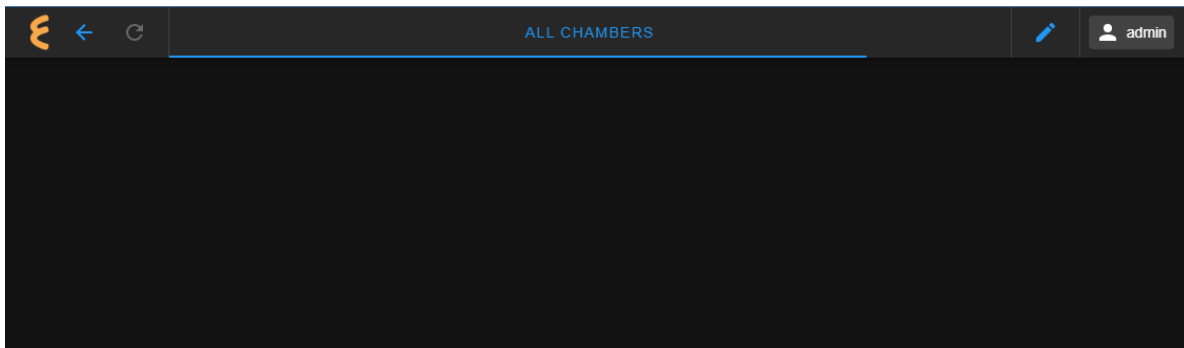


Figure 4.7: Empty network monitor tab

The **Edit Layout** (pen icon) button can be used to edit or create new tabs to populate and display EWC devices. The four buttons in the menu (labeled in the figure) can be used to manage and edit the layout.

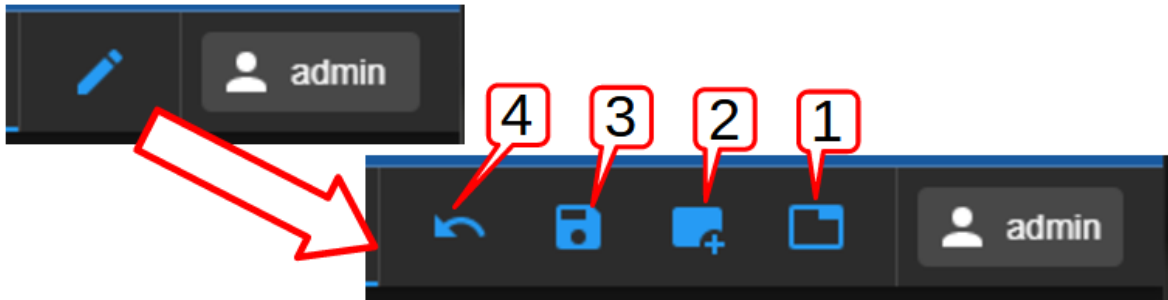


Figure 4.8: Edit Layout features

These four buttons are described as follows:

1. **Edit Tab:** The default tab name **All Chambers** can be edited via this button. Additional tabs can be added via the + button. Any tab on the list can be removed with the trash bin button. The up/down arrows on the right can be used to select a tab to be edited.

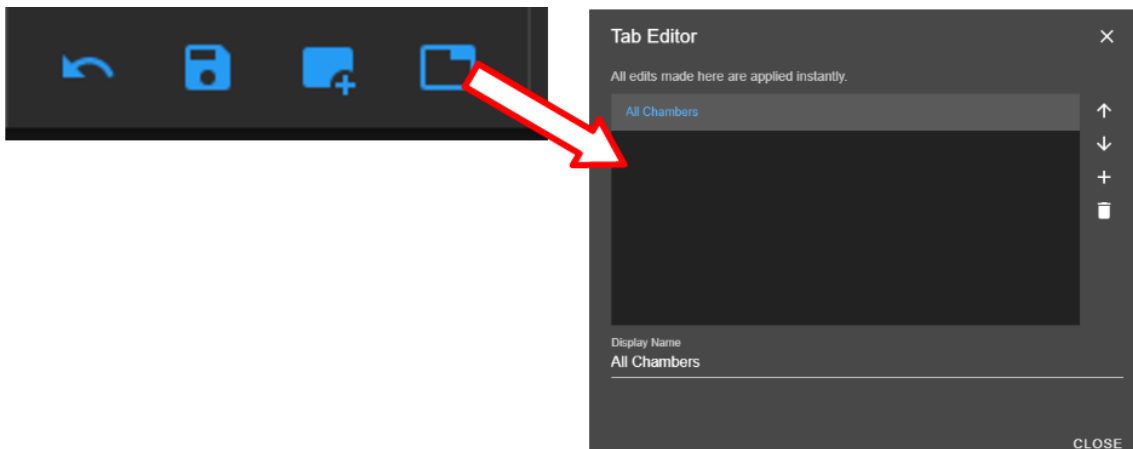


Figure 4.9: Editing network tabs

2. **Add Chamber/Device:** A new EWC device can be selected to add into the display tab via (1) the **Create New** button or (2) the EWC list as shown in the following figure. The first option permits manual configuration, while the second option applies the default settings for the selected EWC device which includes hostname, IP address, type of EWC and its version, as depicted in the following figure (for WebDev25).

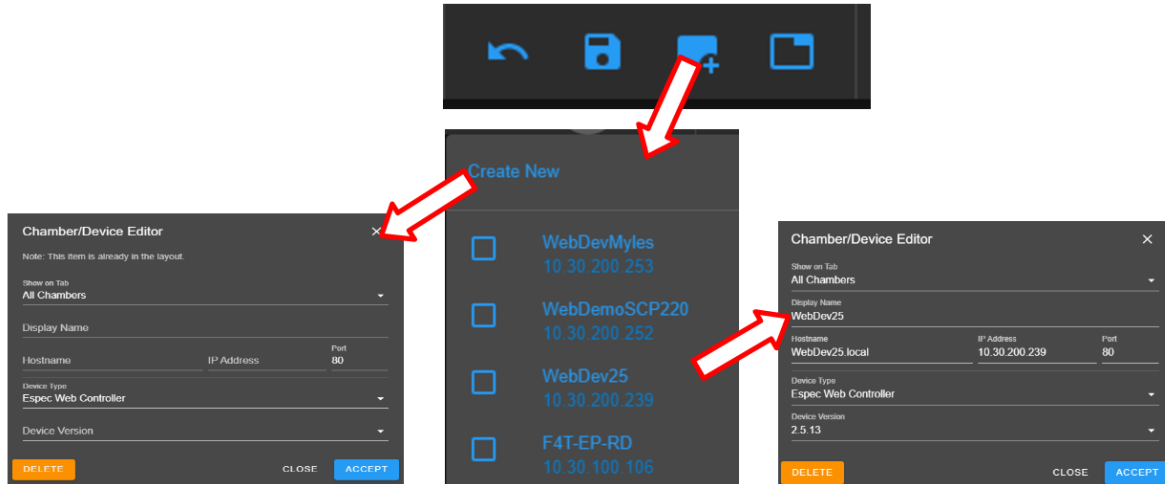


Figure 4.10: Adding new EWC devices

3. **Save:** To apply all settings made in the network tab, the **Save** button must be applied.
4. **Revert:** This is the back button to exit the **Edit Layout**.

In the following section, we provide an example how to set up the Network Monitor page.

4.3 Example 1

In this section, we provide a step-by-step example how to set up and configure a network monitor page to display three EWC devices in the default Monitor tab. This example can be completed only if you have at least two EWC devices, one as a host and the other as a client on your network. Note: All EWC device hostnames and IP addresses used in this example are for illustration purposes only. You must use the hostnames and IP address of your EWC devices found on your network.

1. Select one EWC on the network to host a Network Monitor page.
2. Log in as admin or as a user with Network Monitor privilege.
3. Click the E logo or the hostname of EWC.

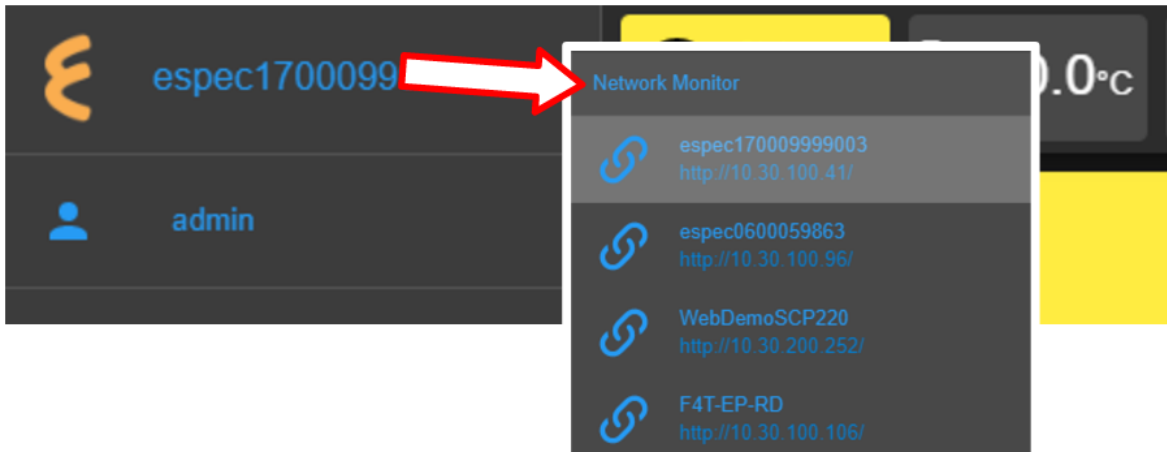


Figure 4.11: Accessing the Network Monitor page

4. Click the **Network Monitor** link on the drop-down menu.
5. Click **Edit Layout** (pen icon) in the Network Monitor page.

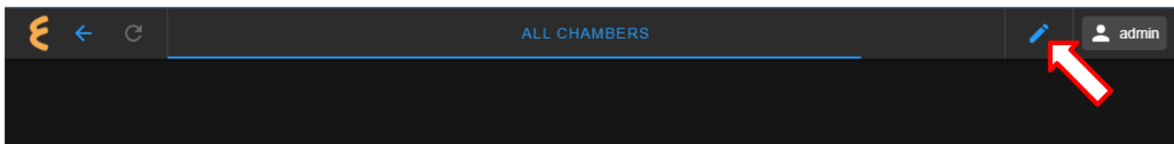


Figure 4.12: Accessing the Edit Layout option

6. Click the **Add Chamber/Device** button. Two options are available for adding the EWC device into the Monitor tab: (1) Create New and (2) Select from the drop-down list. The first option is for a manual configuration; the second option applies the default configuration. Option 2 will be used for this example. From the drop-down menu, click to select the desired EWC to populate the Monitor tab.

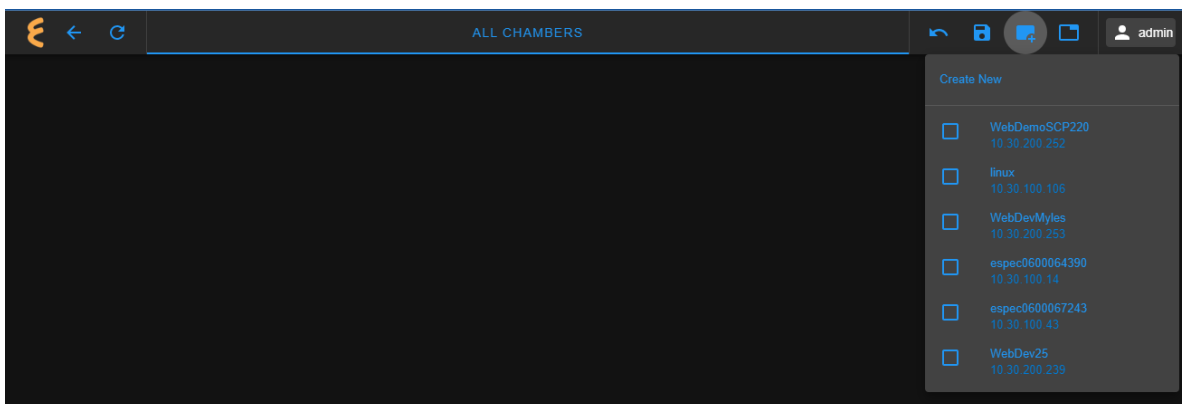


Figure 4.13: Selecting EWC to populate the Monitor tab

Default configuration of the selected EWC has been applied as shown in the pop-up window, which includes hostname, IP address, type of EWC and version.

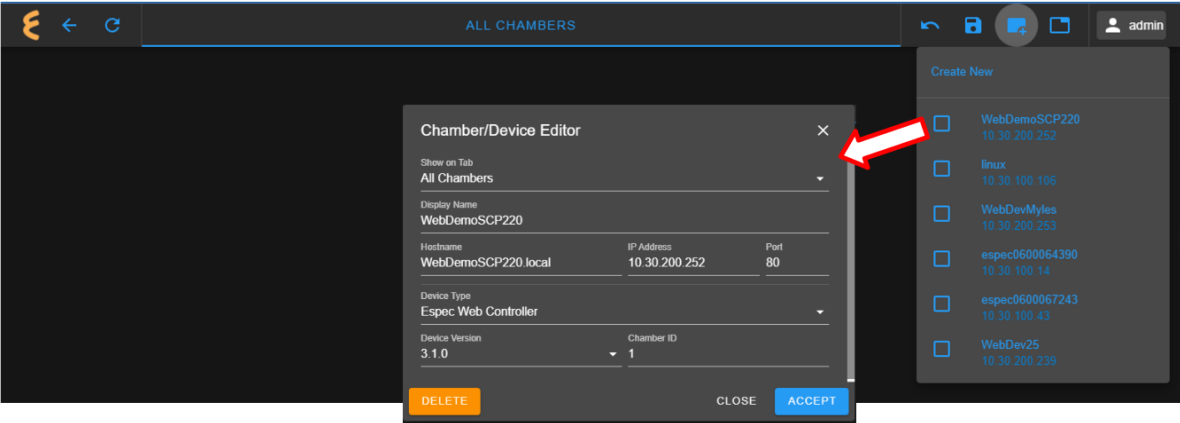


Figure 4.14: Accept default setting

Click **ACCEPT** to populate this device in the Monitor tab.

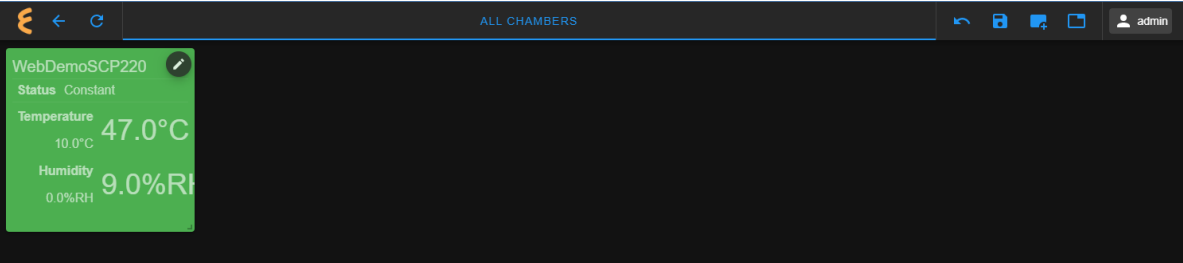


Figure 4.15: First EWC populated in the Monitor tab

7. Apply step 6 again to add two additional EWC devices from the list. The selected EWC devices will be populated below the first one in a single-column profile. The check mark in each box indicates the device selection.

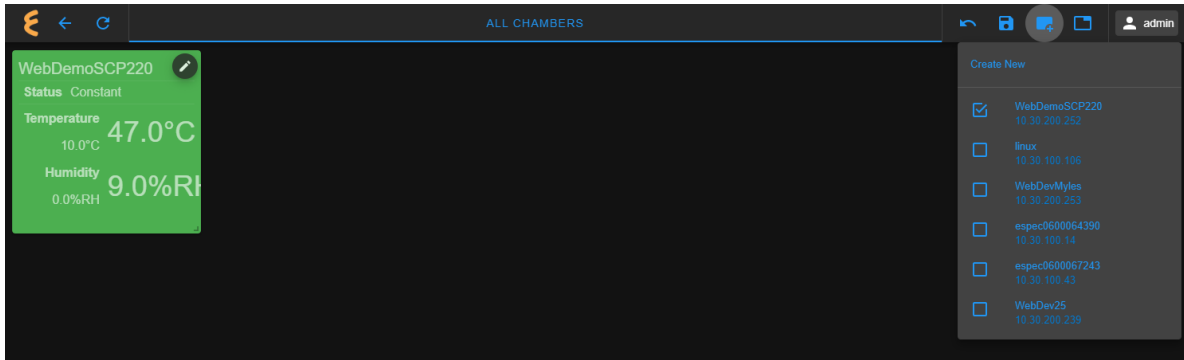


Figure 4.16: Adding a second EWC

8. The pen icon appearing in each EWC object indicates that the Monitor tab is still in edit mode. Click and drag to relocate or arrange each EWC in the Monitor tab, as shown below.

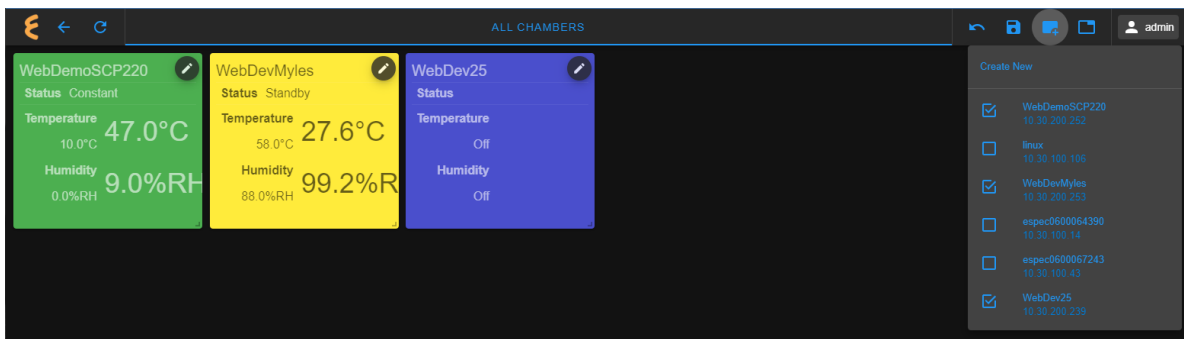


Figure 4.17: Rearranging EWC devices in the Monitor tab

9. Click **Save** to apply the settings. The Network Monitor page configuration is complete with three EWC devices in the Monitor tab (called **ALL CHAMBERS**).

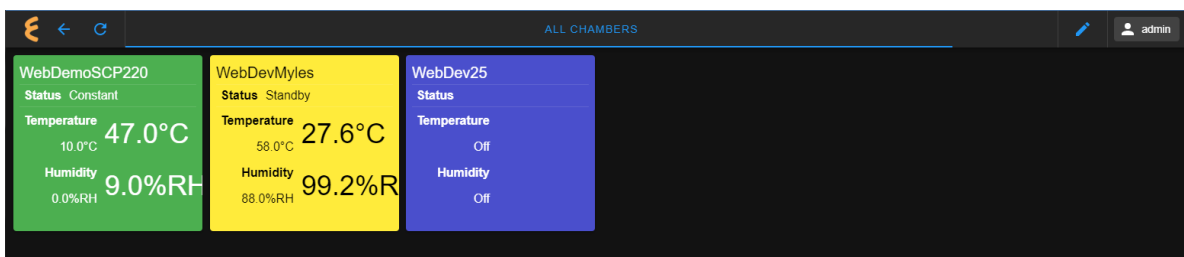


Figure 4.18: Selected EWC devices in the Monitor tab

10. Each EWC in the Monitor tab is a clickable link that, when clicked, opens the selected EWC inside the Network Monitor page, as depicted below.

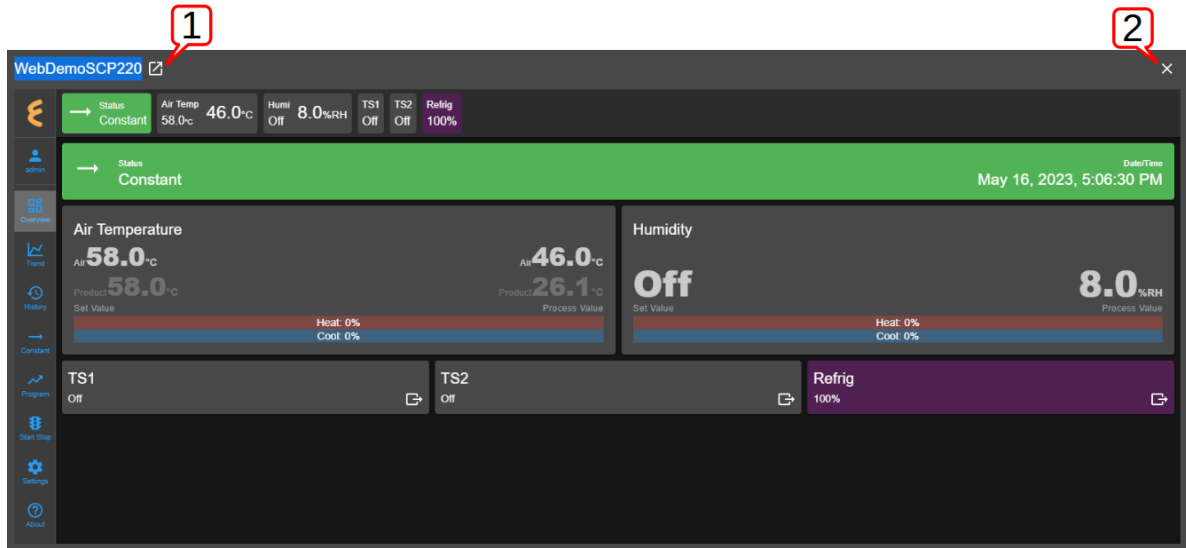


Figure 4.19: EWC opened inside the Monitor tab

The expand button (1) next to the hostname can be used to open WebDemoSCP220 in a new Web browser tab so that the Network Monitor page is free to manage other EWC devices. The X button (2) can be used to exit and close WebDemoSCP220 to get back to the Network Monitor page.

11. The back button (indicated by the arrow) can be used to return to the host EWC for its chamber control and operation.

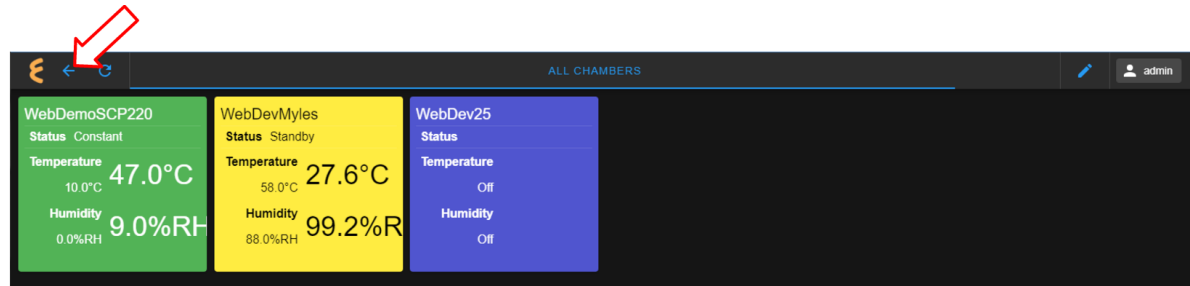
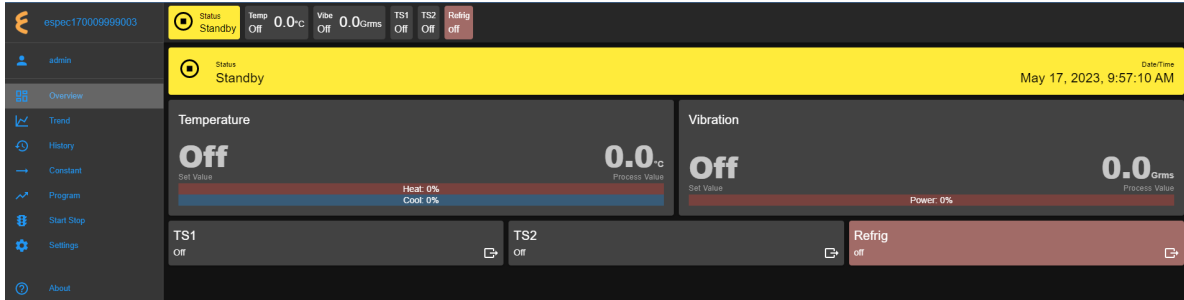


Figure 4.20: Returning to the **Overview** page

Figure 4.21: The host EWC in **Overview** home page

The E logo (in the **Overview** page) and the back button (in the Network Monitor page) can be used to toggle back and forth between the EWC's Overview page and its Network Monitor page to monitor other EWC devices on the network. The toggle operation can be performed during any operating mode of the host EWC, not just in Standby as shown in the figure.

4.4 Example 2

In this section, four more examples are given to illustrate the practical application of the Network Monitor page. The EWC device in Example 1 will be used as the host EWC in following examples.

4.4.1 Adding a new Monitor tab

This short example illustrates how to create and add a new Monitor tab (called **TESTS**). It is then populated with two EWC devices.

1. Log into EWC as admin or as a user with Network Monitor privilege.
2. Click the E logo (or the hostname).
3. Click **Network Monitor** link on the drop-down menu.
4. Click **Edit Layout** (pen icon).

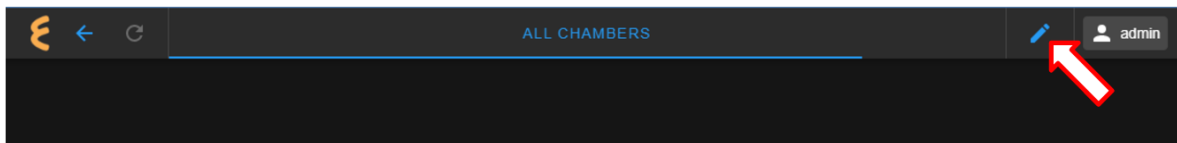


Figure 4.22: Access the Edit Layout option

5. Click **Edit Tabs**; then, click + in the **Tab Editor** window and edit the Display Name field with **TESTS**, and click **CLOSE**.

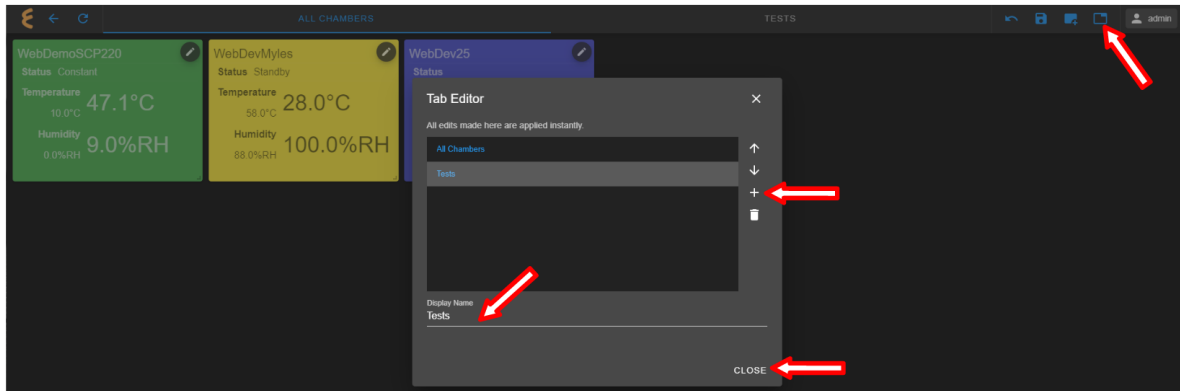


Figure 4.23: Creating TESTS in Tab Editor

6. Click the **TESTS** tab, then click **Add Chamber/Device** to select and populate two EWC devices.

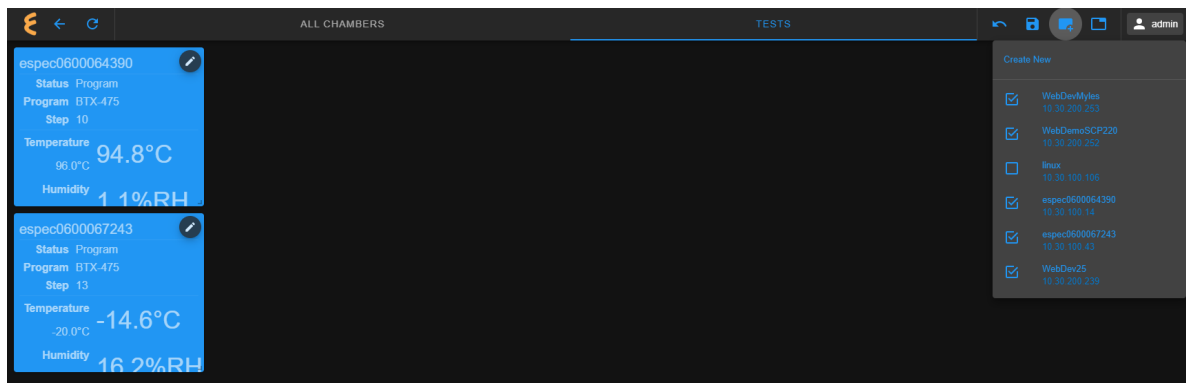


Figure 4.24: Populating two EWC devices in TESTS

Rearrange the layout and click **Save** to complete the configuration.

7. **TESTS** tab and **ALL CHAMBERS** tab can be toggled to display two groups of EWC devices, as illustrated in the following figure. An active tab is highlighted and underlined in blue (as indicated by the arrows).

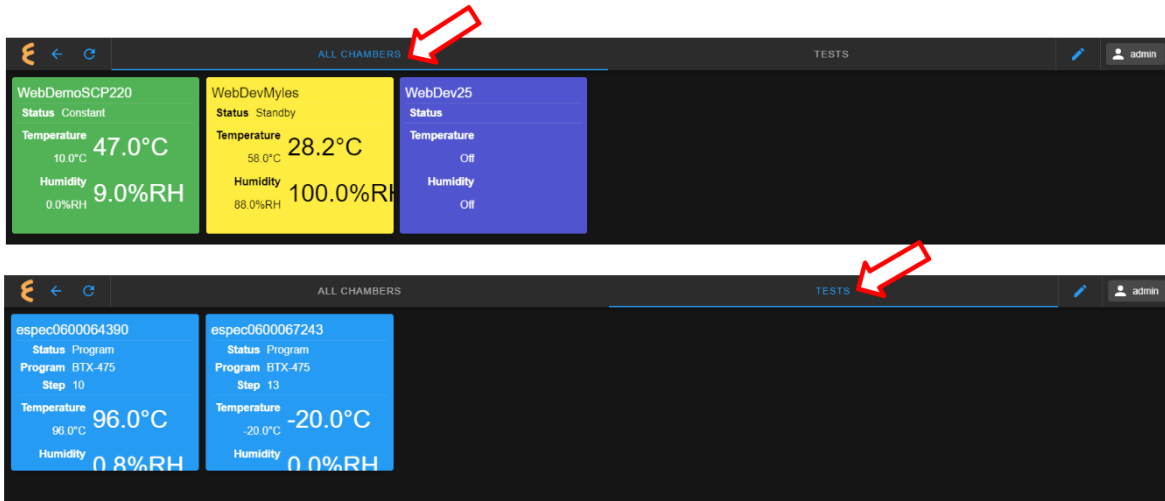


Figure 4.25: Toggling between two Monitor tabs

8. Additional tabs may be created and added into the tab bar by repeating steps 5-7, as depicted in the following figure.

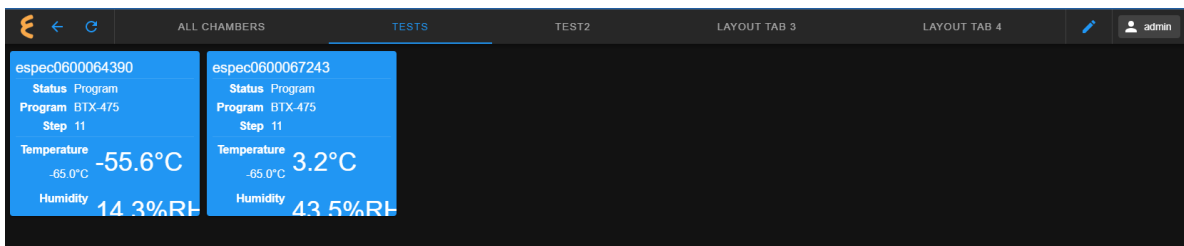


Figure 4.26: Multiple Monitor tabs in the tab bar

4.4.2 Removing an EWC Device

This short example illustrates how to remove an EWC device from a Monitor tab. As a concrete example, WebDev25 will be removed from the **ALL CHAMBERS** tab.

1. Starting from the Network Monitor page, click the **ALL CHAMBERS** tab.
2. Click the **Edit Layout** (pen icon).
3. Click the pen icon of the WebDev25 object, then click **DELETE** in the Chamber/Device Editor window as shown in the following figure.

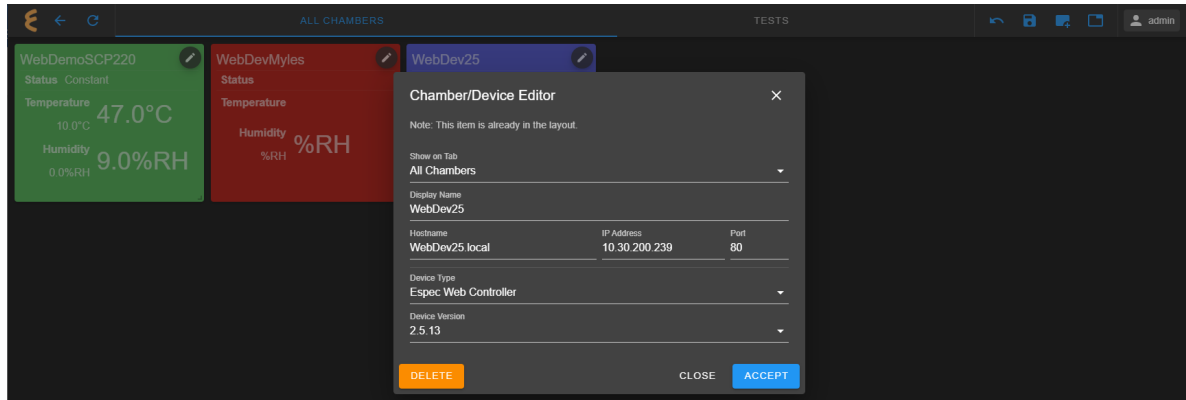


Figure 4.27: Deleting WebDev25

4. Click **Save** to apply new settings to this tab. Only two EWC devices remain in this tab.

4.4.3 Adding a New EWC Device

This short example illustrates how to manually add a new EWC device (using WebDev25 as an example) to the **TESTS** tab using the **Create New** button.

1. Starting from the Network Monitor page, click the **ALL CHAMBERS** tab. Note: It is not necessary to select **ALL CHAMBERS**, but selecting it allows a complete manual configuration (as will be apparent at step 4).
2. Click the **Edit Layout** (pen icon).
3. Click the **Add Chamber/Device** button and click **Create New**.
4. Apply the following steps to the Chamber/Device Editor:

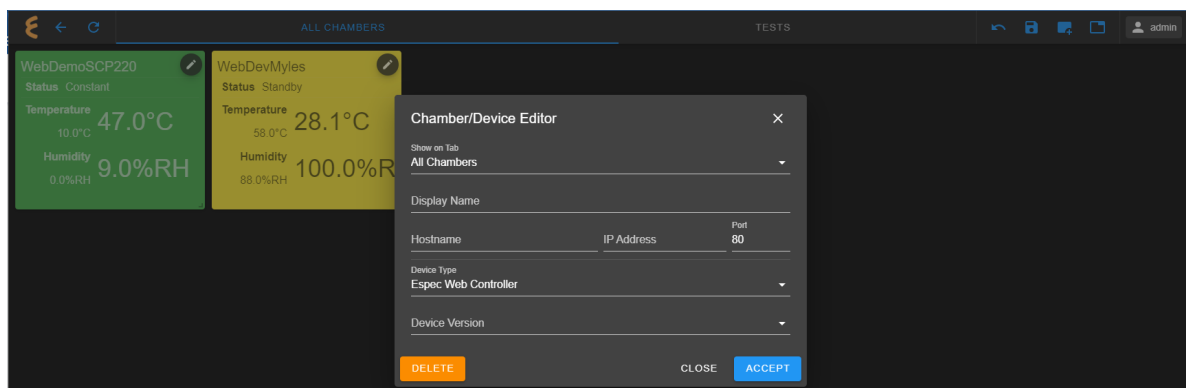


Figure 4.28: Editing the Monito Tab

- Click the **Show on Tab** spin button to select **TESTS** from the list.
- Enter **MyWebDev25** in the Display Name field. Note: To display the EWC device by its hostname, **WebDev25** may be entered here. This field cannot be left blank or an **INVALID NAME** will be displayed.
- Enter hostname as “webdev25.local”.

- Enter its IP address (10.30.200.239).
 - Click the Device Version field to select 2.?.? from the list. The selected EWC is known to have version 2.x.x. The correct version must be selected or an error will occur.
 - Click **ACCEPT**.
5. Click **Save**.
 6. Click the **TESTS** tab to view its new display and notice that WebDev25 is now identified as **MyWebDev25**.

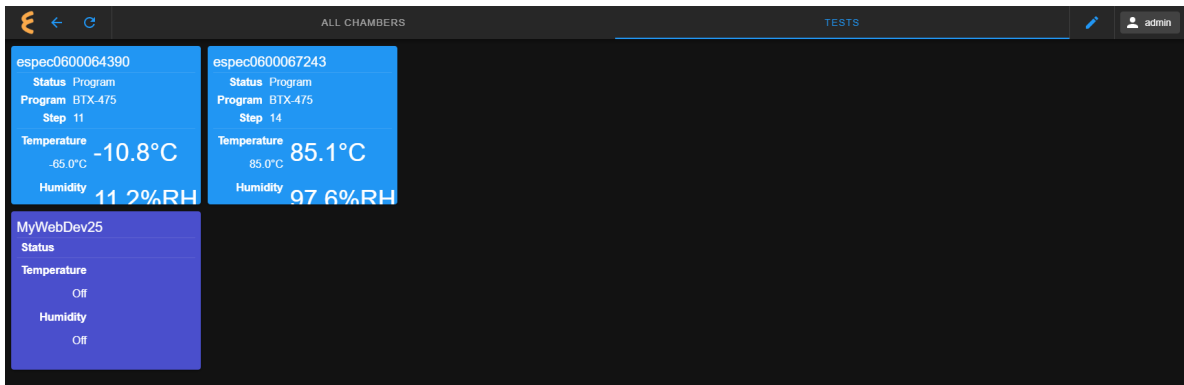


Figure 4.29: Viewing new display of TESTS tab

Warning! At step 4 above, it is crucial to enter the correct IP address, since the system tries to locate the device based on that IP address on its network. A wrong IP address would produce an EWC error as depicted in the following figure. Here, steps 1-5 were repeated to create a new EWC device with a non-existing IP address.

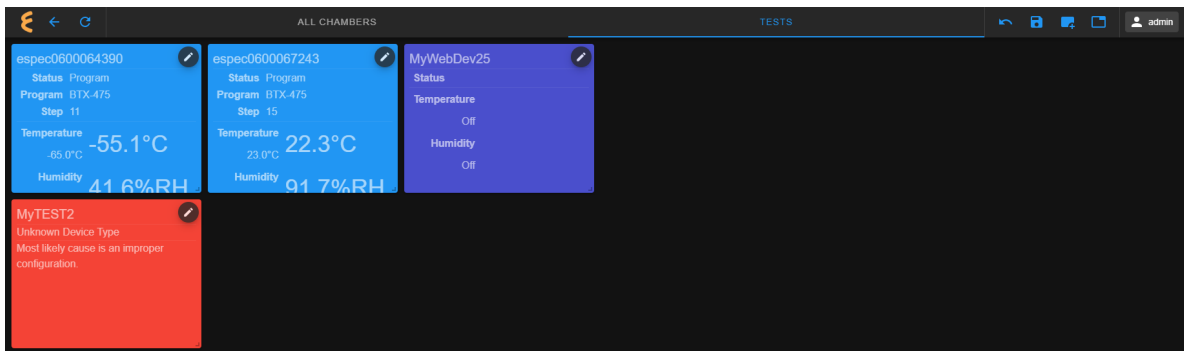


Figure 4.30: Unknown EWC device

To remove a misconfigured EWC device, such as **MYTEST2**, refer to the previous example on **Removing an EWC Device**.

4.4.4 Removing a Monitor Tab

This short example illustrates how to remove **TESTS** from the Monitor tab.

1. Starting from the Network Monitor page, click the **Edit Layout** button (from within any active tab).
2. Click **Edit Tabs**.
3. In the Tab Editor window, click to select **TESTS** in the tab list, then click the trash bin (to remove it) and click CLOSE.

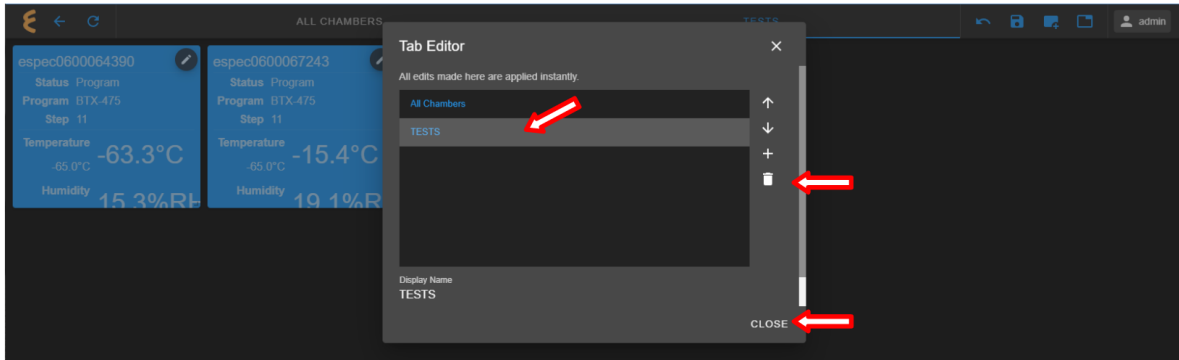


Figure 4.31: Removing TESTS tab from the list

4. Click **Save** to apply the changes. **TESTS** tab is now removed from the Monitor tab and no longer appears in the tab bar.

CHAPTER 5

About

The last menu of EWC in the menu bar is the **About** page. It provides information about the EWC software, its version number, terms of service to end-users, online manual, ESPEC software support and download options.

5.1 LEGAL

By default, the menu opens and displays the **LEGAL** tab that provides an overview of the software license, its legal aspect, and its practical application and usage that all end-users must acknowledge and abide to in order to use the product. Important notes are outlined as follows:

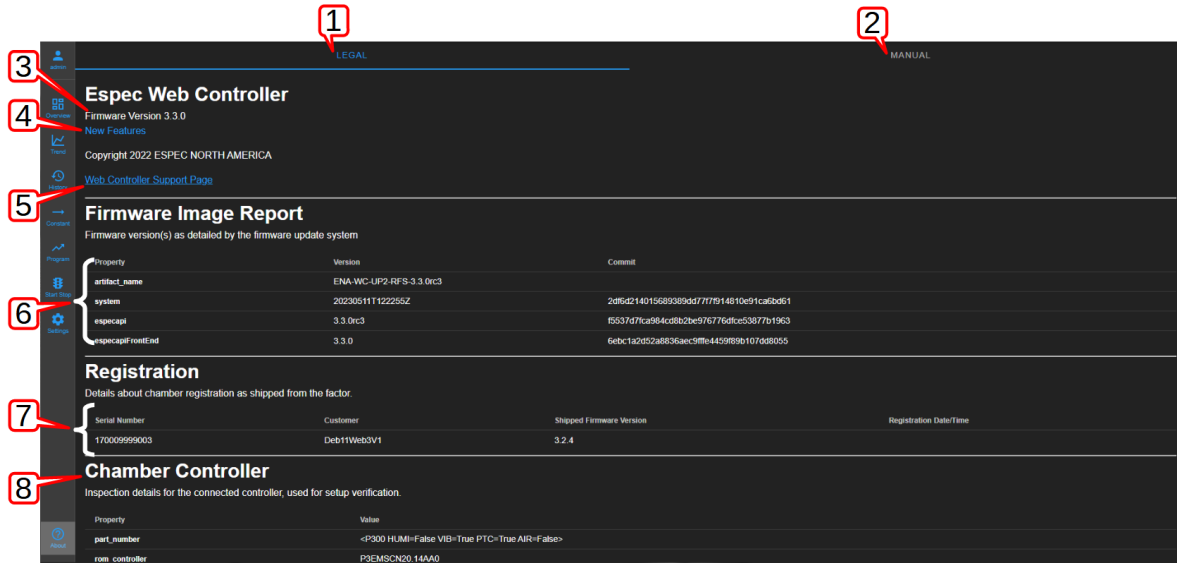


Figure 5.1: Terms of service of EWC

- LEGAL:** The **LEGAL** tab consists of a one-page view containing complete information of EWC software, version number, registration information, chamber, and license for end-users (customers). The bottom portion of this page contains user agreement and terms of service, a list of different modules and functions used in EWC software which are governed by various license terms. End-users are encouraged to view this page in its entirety, including the respective licenses applied to each of them. This page implies that, by using this software (i.e., EWC), end-users have read, understood and accepted all the terms outlined herein.
- User's Manual:** EWC User's Manual is available in two different formats: (1) online and (2) PDF. Item 5 (below) provides a link to the fully online manual on the Internet (hosted by bitbucket via the wiki public access). The PDF format is available under this tab. Users can browse through the table of contents to select and view a specific section or chapter regarding a particular topic.
- EWC Version:** This firmware version number can be used to check against the current release of EWC by ESPEC to ensure your system is current and up to date. This firmware can also be used to check against the original version shipped with the chamber (see Item 7).
- New Features:** After a software update/upgrade, a quick flash video pops up to highlight the new features on the system, as depicted below. This flash video can be launched again

any time by its link.

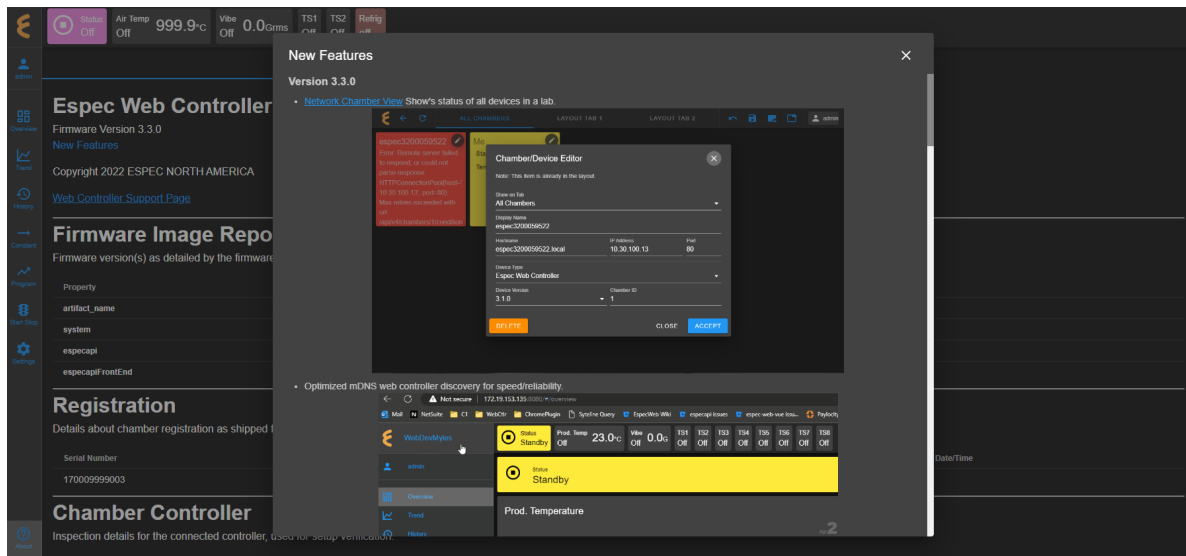


Figure 5.2: Flash video of new features

5. **Support and Download Page:** If your EWC has access to the Internet, this link points to ESPEC website that provides support for software download and other requests. **Note:** On a touchscreen (HMI), this link is blocked (inoperative), even when the system (EWC) has access to the Internet.

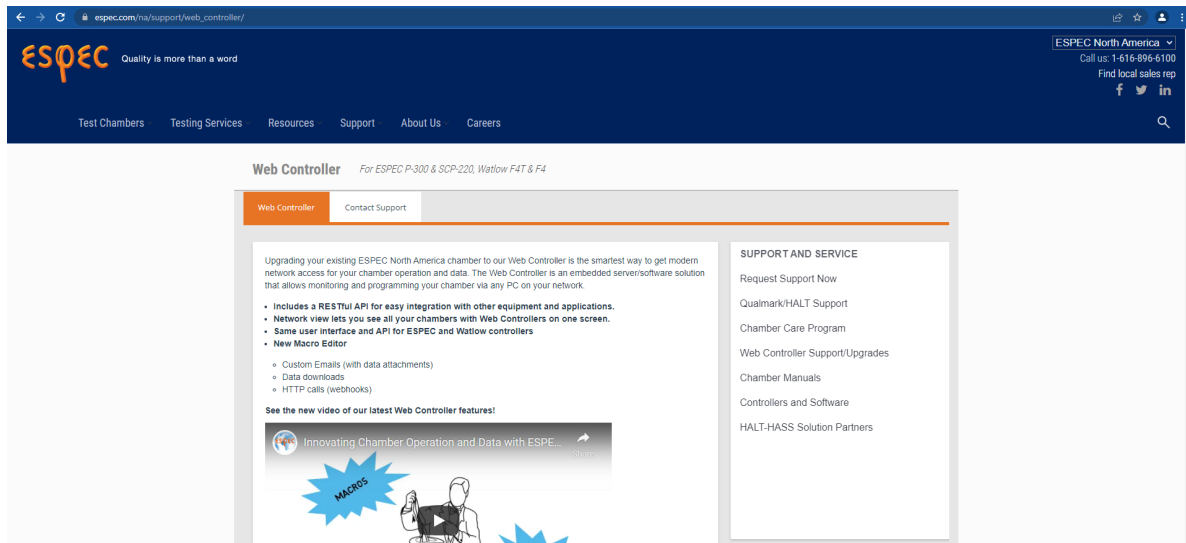


Figure 5.3: ESPEC homepage for download support

6. **Firmware Information:** This section displays a number of important pieces related to our EWC, which includes package name of the firmware that was last updated, the time (UTC time) it was last updated, and ID numbers for each package that was/were pushed from the cloud service.
7. **Registration Information:** The serial number of your chamber is found here, including

initial firmware and registration date.

8. **Chamber Controller Information:** The last section displays information of the chamber, such as part number and PLC ROM.

5.2 MANUAL

The **MANUAL** tab as depicted in the above figure (item 2) offers an online operation manual of EWC. This User's Manual covers all aspects of ESPEC chambers. When EWC is accessed via a Web browser, the operator can use the Tables of Content on the left, as depicted in the following figure, to navigate through the manual for a specific type of chamber and PLC (indicated by the arrow).

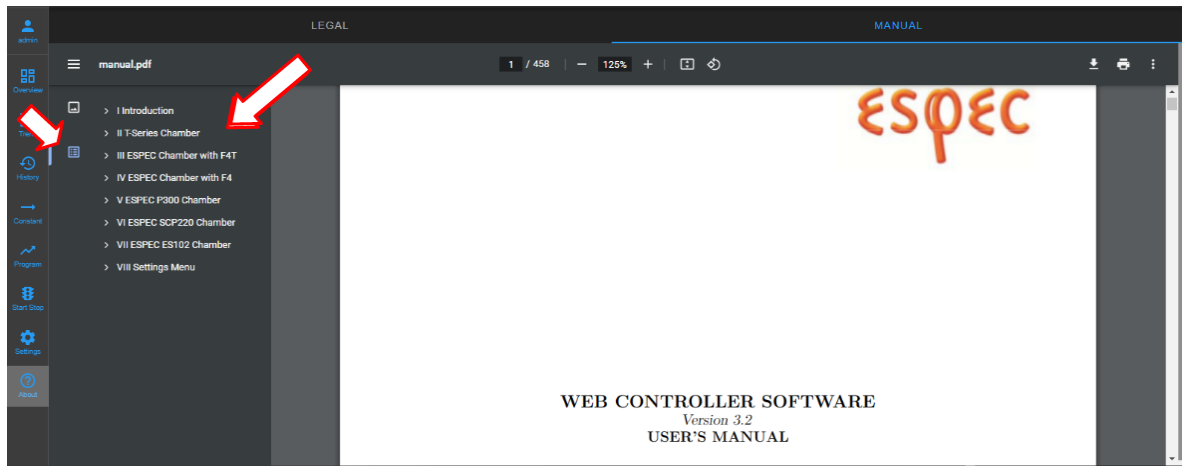


Figure 5.4: Online User's Manual

If you have a T-series or custom F4T chamber, on the touchscreen, the manual can be navigated to a specific chamber via the PDF menu properties on the right as shown in the figure by the arrows.

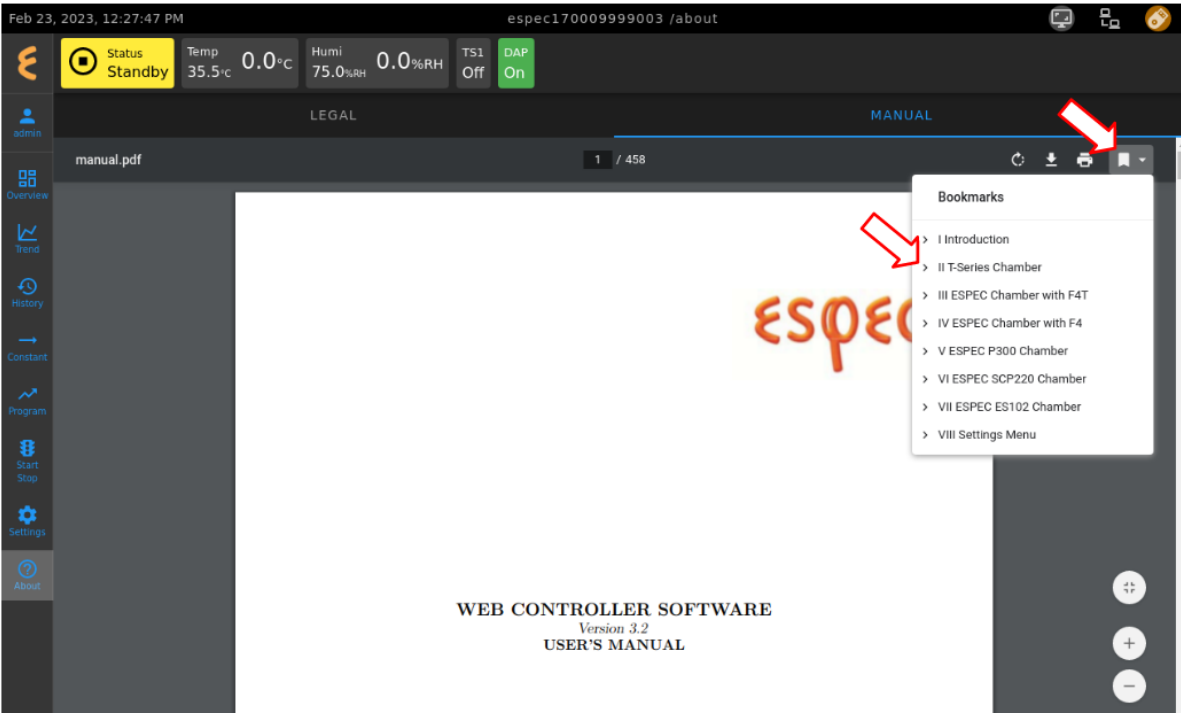


Figure 5.5: Online User’s Manual on touchscreen

Part II

T-Series Chamber

CHAPTER 6

Overview

The **Overview** page displays the current status of the chamber and its operating mode. A user is brought to this page after logging into EWC. The following figure depicts **Overview** with the chamber in Standby as indicated in the status tab and its extension bar. This extension bar is only available in the **Overview** menu. The date/time posted in the extension bar is the date/time on the chamber/controller. While date/time stamp of data logs and Macros automated actions are based on the date/time on EWC, the controller date/time should also synchronize with that on EWC and the local device (that launched the Web browser). The date/time of EWC can be viewed under the **Settings** menu. It can also synchronize with that on the local device (to be discussed in the **Settings** menu).

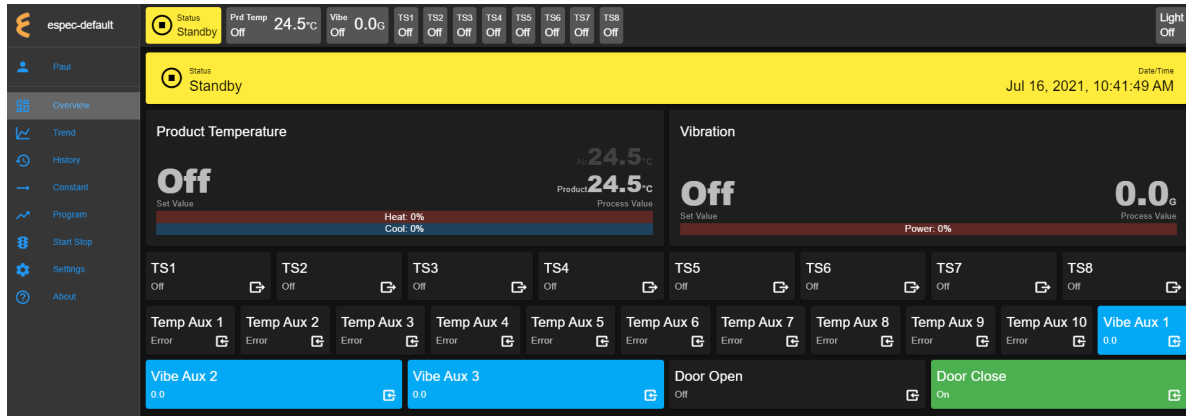


Figure 6.1: Overview page with chamber in Standby mode

The following figure depicts **Overview** showing the chamber in Constant mode.

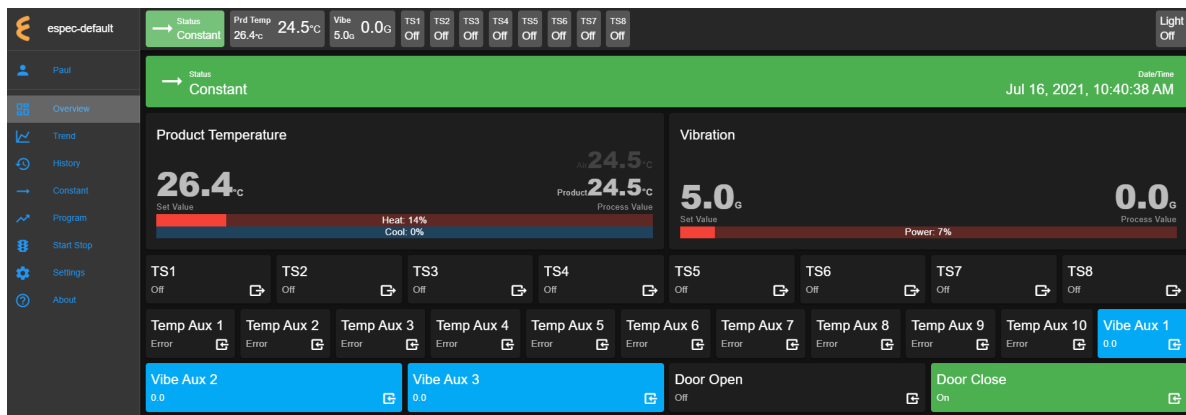


Figure 6.2: Overview page with chamber in Constant mode

The following figure depicts **Overview** showing the chamber in Program mode. Detailed information about the program, including what step is being executed, is listed in the extension bar (of the status tab). This feature provides the operator with useful information about the status of the chamber and the program.

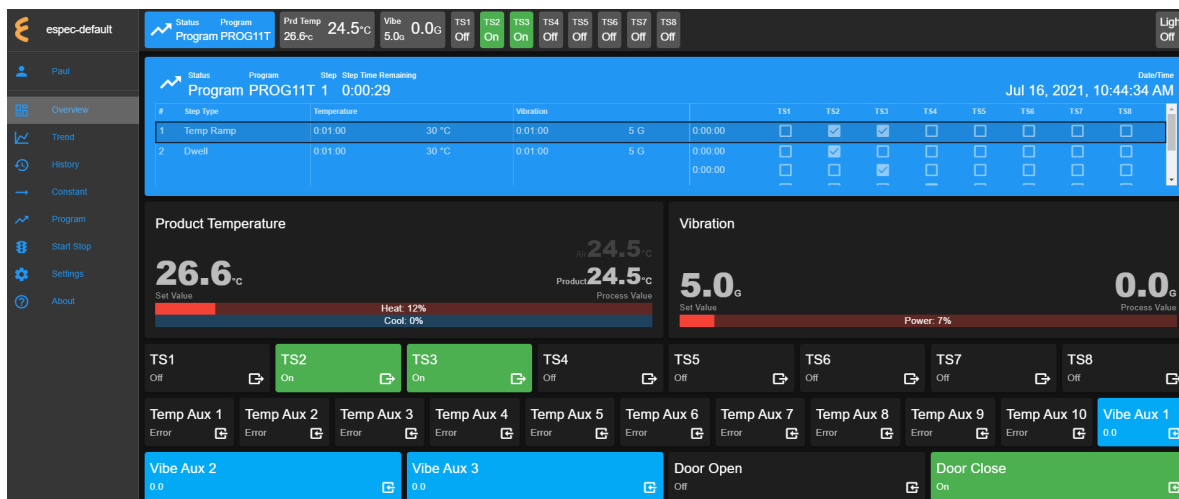


Figure 6.3: Overview page with chamber in Program mode

Only users with read-write privilege can control the chamber operation mode from within this page. Supported operation modes are **Standby**, **Constant** and **Program**. Each tab in the status bar may be accessed to apply new settings at any time. This feature enables the operator to control the chamber without having to access the **Start Stop** menu in the menu bar. The following sections detail a step-by-step procedure how to control the chamber's operating mode via the **Overview** menu for users with read-write privilege.

Management of **Alarm** mode can also be controlled (by an operator with read-write privilege) within this page to clear all alarm alerts triggered by the chamber. However, all alarms triggered by the chamber must be resolved before EWC can clear all alert messages displayed in the alarm tab in the status bar.

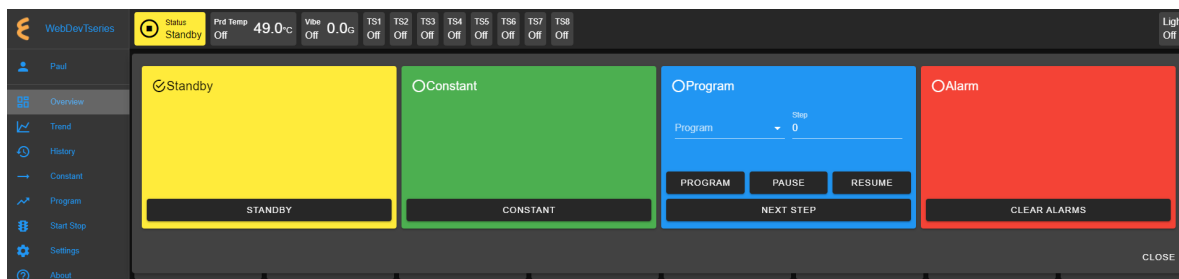
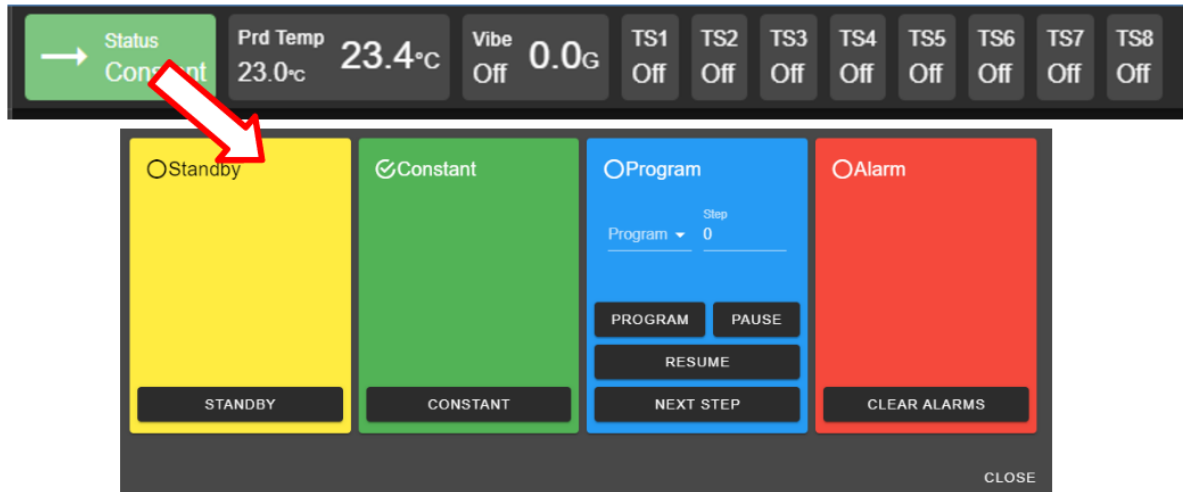


Figure 6.4: Status Bar in the Overview page

6.1 Standby Setting

For authorized users with read-write privilege, to set the chamber in **Standby** mode, proceed with the following steps. Initially, the chamber is operating in **Constant** mode. We wish to switch its operation mode to **Standby**.

1. Click the status tab in the status bar to access the drop-down tabs, as shown in the figure.



An alternative way to access these drop-down tabs is to click on the extended tab of the status tab itself, as depicted in the following figure. The drop-down tabs display over this extend tab as shown in the right figure. This extended tab is available only in the **Overview** page.

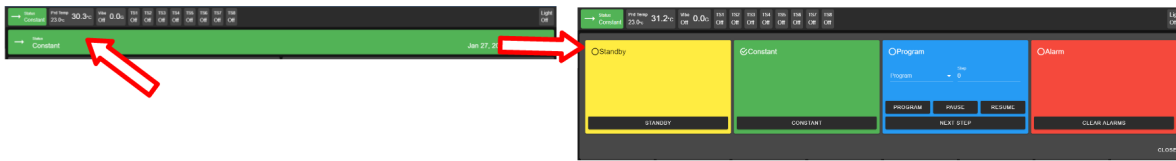


Figure 6.5: Status tab drop-down menu via the extended tab

2. Click the **STANDBY** button. EWC immediately moves to apply the operating mode to the chamber. A pop-up window appears in the lower-right corner to indicate the update of the operating mode. A check mark in the **Standby** tab indicates and confirms its standby mode.
3. To close the drop-down tabs, perform one of the following action:
 - Click an empty area in the Main Display.
 - Click a different menu in the menu bar.
 - Click the status tab itself. or
 - Click the **CLOSE** button underneath the alarm tab.

6.2 Constant Setting

For authorized users with read-write privilege, to set the chamber in **Constant** mode, proceed with the following steps. Suppose, initially, the chamber is operating in **Standby** mode. We wish to switch its operation mode to **Constant**.

1. Click the status tab in the status bar. As depicted in the following figure, the chamber is in **Standby** mode.

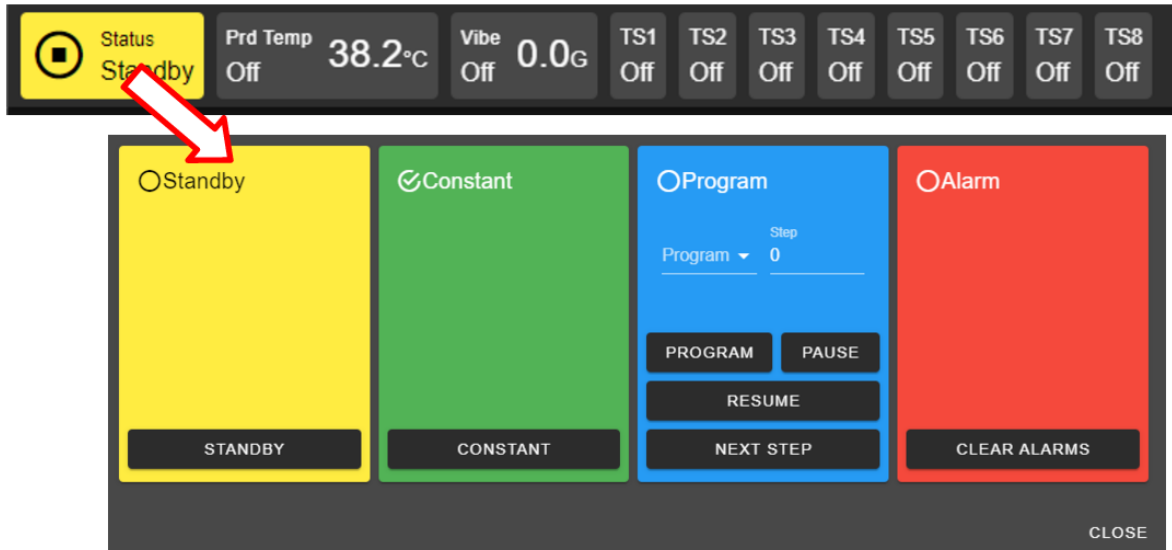


Figure 6.6: Constant mode setting

2. Click the **CONSTANT** button in the constant tab. EWC immediately moves to apply the operating mode to the chamber.
3. To close the drop-down tabs, perform one of the following action:
 - Click an empty area in the Main Display.
 - Click a different menu in the menu bar.
 - Click the status tab itself. or
 - Click the **CLOSE** button underneath the alarm tab.

6.3 Program Setting

To set the chamber in **Program** mode means a program is loaded onto EWC, it then executes the program and sends those instructions to the chamber controller to carry out the tasks. For authorized users with read-write privilege, to set the chamber in **Program** mode, proceed with the following steps:

1. Click the status tab in the status bar, or the extension bar of the status tab, to access the drop-down menu.
2. Click the radio button in the program tab to access the program drop-down list, as illustrated in the following figure.

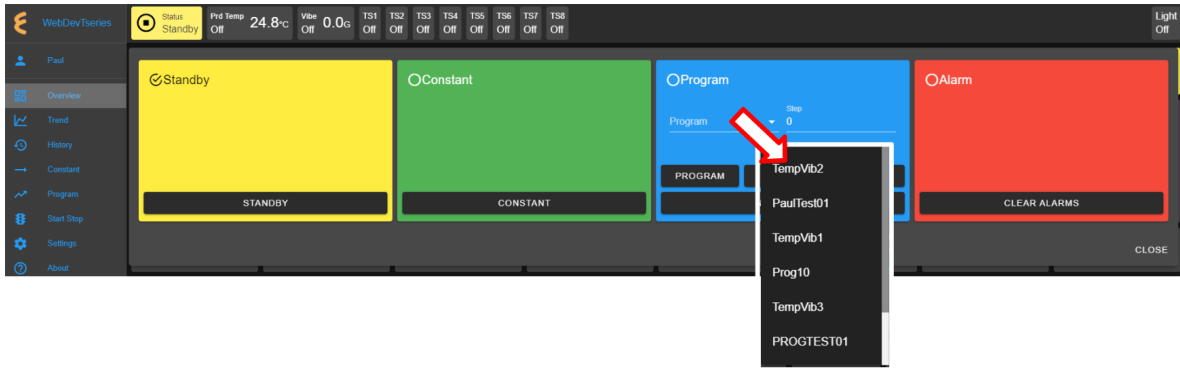


Figure 6.7: Select program to start chamber in Program mode

If program has not been created, no program is available to be loaded, and a message depicted in the following figure will display. A program must be created first before it can be loaded for execution. Chapter 8 discusses how to create a program to control the chamber.

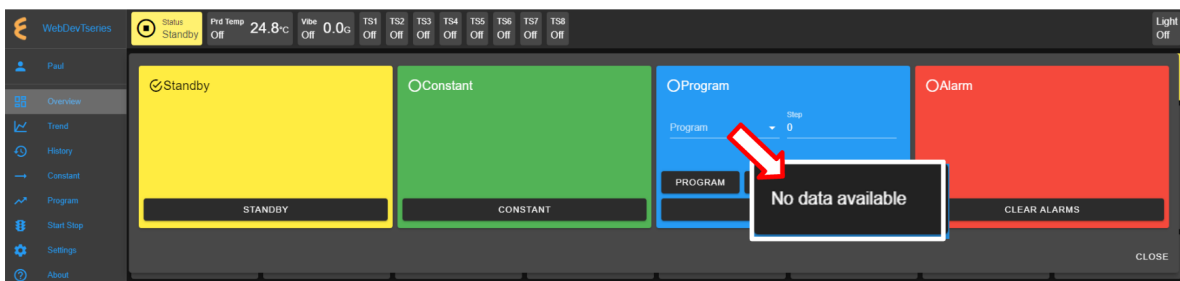


Figure 6.8: No program available for execution

3. Click to select a program from the list. Apply the scroll bar, if necessary, to select the desired program.
4. Enter a desired step number in the step field for program to start. Default step is 0 for program to begin at step 1.
5. Click the **PROGRAM** button to execute the program. EWC immediately moves to apply the operating mode to chamber. A pop-up window appears in the lower-right corner to indicate the update. Note: This program tab offers a few practical methods during a program execution. The **Pause** button can be used to pause the program. Program can be resumed via the **RESUME** button. Program instruction lines can be stepped through via the **NEXT STEP** button.
6. Click the **CLOSE** button to view the status of program execution displayed in the status tab extension bar.
7. To end or interrupt the program execution, switch the chamber to **Standby** or **Constant** mode via the status tab.

6.4 Clear Alarms

When EWC detects that the chamber is in an alarm state, it also sets itself in an alert state by displaying a list of active alarms and fault names in the **Overview** page to require an immediate action from the operator, as depicted in the following figure. To clear all alarm messages, for authorized users with read-write privilege, proceed with the following steps:

1. Click the status tab in the status bar, then click the **CLEAR ALARMS** button, as depicted in the following figure.

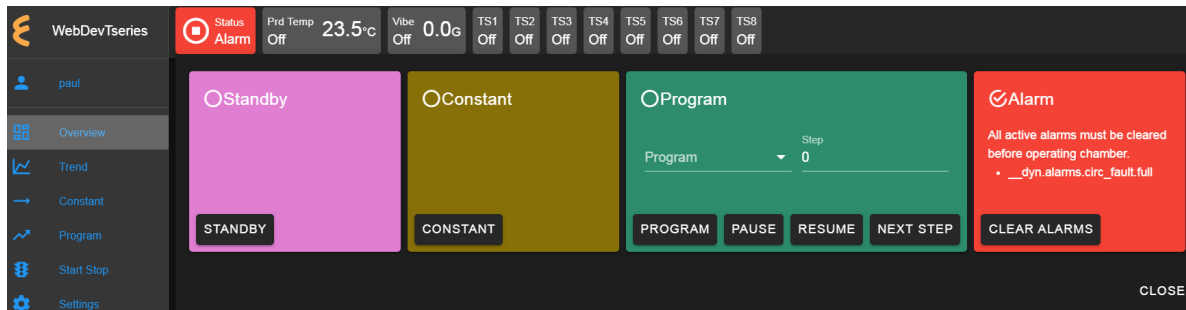


Figure 6.9: Overview page showing the Status bar with alarm message

Note: All alarm messages can be cleared only after alarms in the chamber are resolved.

2. To close the extended status tab, click the status tab itself or the **CLOSE** button underneath the **Alarm** tab.

6.5 Temperature, Vibration or Time Signal Settings

On the **Overview** page, settings of Temperature, Vibration or Time Signals can be controlled via the tabs in the status bar or the dedicated tabs in the main display area, as shown in the following figure. Only authorized users with read-write privilege can make changes to these settings.

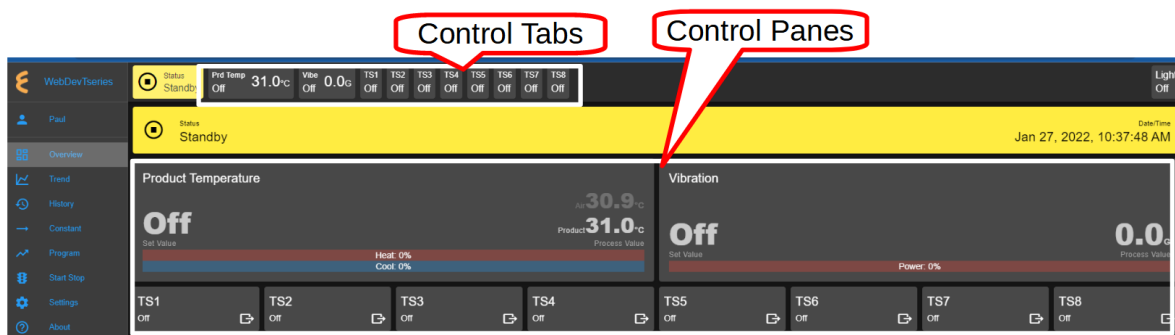


Figure 6.10: Control settings via the control panes

6.5.1 Settings via the Status Bar

To set product temperature with a new set value, complete the following steps:

1. Click the Temp tab in the status bar.

- In the drop-down pane, click the boxes to **Enable** or turn on **Product** temperature, and enter new value in the Set Value field or click the up/down arrow to adjust the value, as illustrated in the following figure.

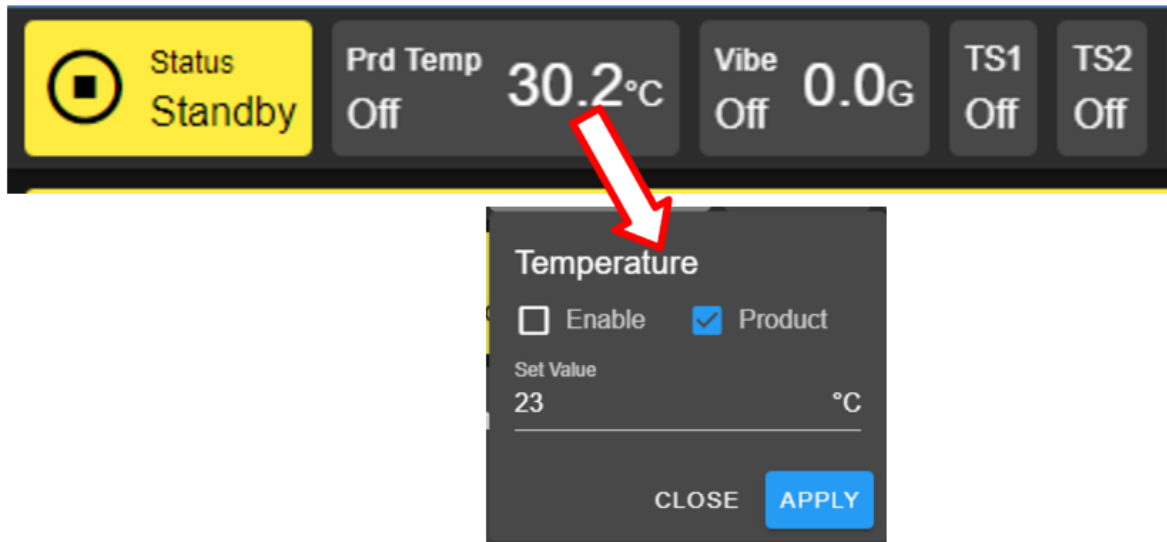


Figure 6.11: Setting new temperature value via the temp tab

- Click **APPLY** to apply the new setting.
- To cancel the setting, click the **CLOSE** button.

To turn on vibration and set its value, complete the following steps:

- Click the Vibe tab in the status bar.
- In the drop-down pane, click the box to **Enable** vibration, and enter new value in the Set Value field or click the up/down arrow to adjust the value, as illustrated in the following figure.

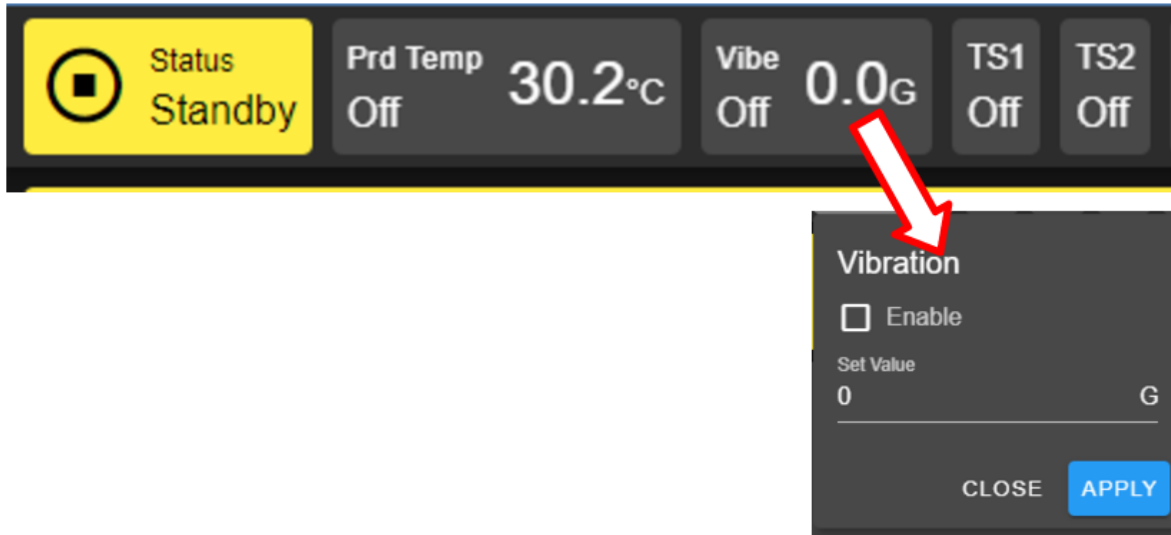


Figure 6.12: Setting new vibration value via the temp tab

3. Click **APPLY** button to apply the setting.
4. To cancel the setting, click the **CLOSE** button.

The time signals in the status bar can be switched on or off individually. The following steps illustrate how to turn on TS1. The rest of the time signals, if available, can be applied using the same method:

1. Click the TS1 tab in the status bar.
2. Check the box to enable TS1, as depicted in the following figure.

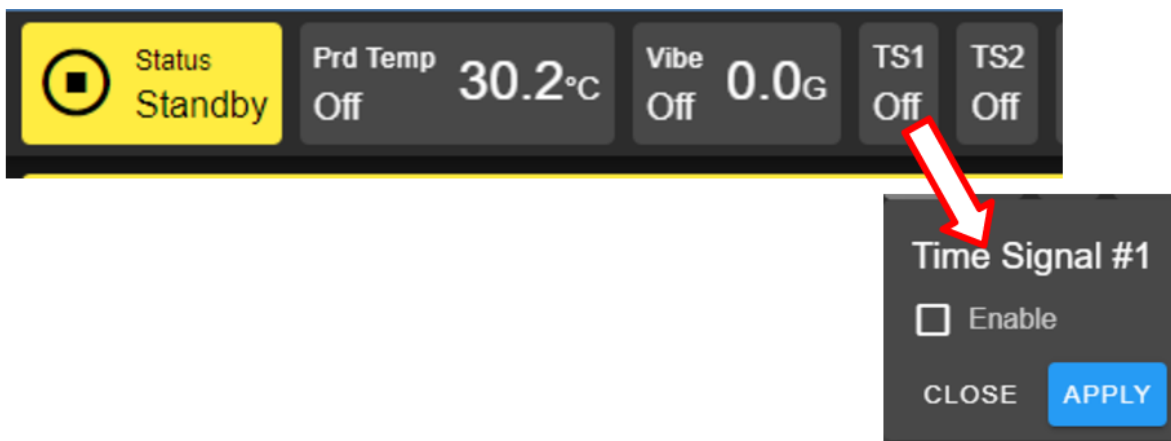


Figure 6.13: Enable or disable time signal setting

3. Click **APPLY**.
4. To cancel the setting, click **CLOSE** (instead of **APPLY**) or click the TS1 tab itself in the status bar.

To turn off TS1, apply the following steps:

1. Click the TS1 tab in the status bar.
2. Uncheck the box to disable TS1.
3. Click **APPLY**.
4. To cancel the setting, click **CLOSE** (instead of **APPLY**) or click the **TS1** tab itself in the status bar.

6.5.2 Settings via the Dedicated Panes

With EWC, there are multiple ways to complete the same task. The dedicated panes for temperature, vibration or humidity, time signals, or refrigeration, in the main display area are actually clickable panes. These are CTA (call-to-action) panes through which new parameter settings (such as, temperature, vibration or humidity, time signal and refrigeration) can be applied.

To apply a new setting to temperature, proceed as follows:

1. Click the Temperature pane.
2. In the input pane, click and enter new value in the Set Value field or click the up/down arrow to adjust the value, as illustrated in the following figure.

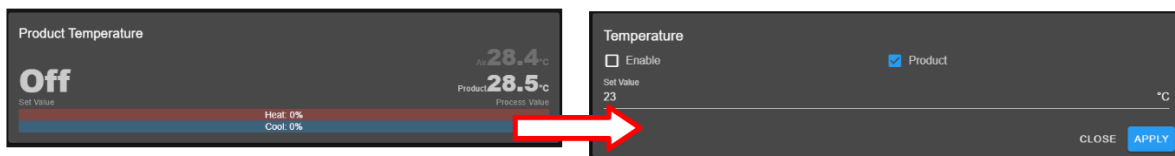


Figure 6.14: Setting new temperature value via the temperature (CTA) pane

3. Click **APPLY**. To cancel the setting, click **CLOSE** (instead of **APPLY**).

The above procedure can be applied to vibration and time signal.

CHAPTER 7

Trend

The **Trend** menu can be used by an operator to view a scatter plot of data points collected during the chamber operation. Data collection can occur in two distinct modes: **Always** and **When Chamber is on**. These two modes are selectable and configured under the **Data Logging Settings** submenu found under the **Settings** menu. Plot elements and detailed configuration of the trend graph will be discussed on **Data Logging Settings** page in the **Settings** menu.

By default, the trend graph provides a scatter plot of data points collected during the last hour. Various options of plot range of data points accumulated more than one hour can be selected. Data can be downloaded in whole or in portion to be stored on the local computer as CSV file.

7.1 Trend: Components

There are seven different groups that make up the main display of **Trend** and the scatter plot, as depicted in the following figure. The scatter plot shown in the figure is a result of the data points being collected with the chamber in program mode. Detailed descriptions of these groups based on the labels in the figure are outlined as follows:



Figure 7.1: Trend graph showing plots of current data from the chamber

1. **Trend Graph:** Data points collected from the chamber are rendered as a trend graph based on a scatter plot methodology. These data points—product temperature, air temperature, humidity, vibration, etc.—are plotted as a function of time. Temperature is displayed in degree Celsius, vibration in root-mean-square of acceleration (Grms or G), etc. The vertical y-axis represents the scale of these values. The horizontal x-axis represents the data logging runtime. Based on the default configuration, the chamber logs data points in a 10-second interval (refer to the **Data Logging Settings** submenu, under **Settings**). Depending on the type of chamber, data logging interval can be set to lower than 10 seconds. The grid scaling on both the y- and x-axes will change according to the application of the Pan/Zoom Controls buttons or the drag-and-select via the mouse and scroll wheel. Default setting can be restored by clicking the refresh button on the Web browser (not shown in the above figure).
2. **Trend Graph Manipulation Buttons:** Seven manipulation buttons are available to help manipulate and control the trend graph features and options. Detailed functionality and operation of these buttons are discussed in the following section.

3. **Snapshot of Data:** By hovering a mouse pointer on the trend graph area, a snapshot of the data at a particular time is displayed (shown in the figure). This feature allows a quick peek of the data at a certain point in time. Depending on the chamber's condition, the snapshot displays set values (SV) and process values (PV) of temperature, product or air temperature, or vibration, chamber operating mode or status, as well as program name and alarm. The contents in the snapshot are based on the selected options displayed in the legend set by the **Graph View** button of item 2 (above); and the color scheme selection under the **User Interface Settings** submenu (found under the **Settings** menu).
4. **Y-axis Label:** The y-axis displays the selected type of data points to be plotted, such as Temperature, Humidity, Vibration ,etc. These values are populated based on the selection of the **Graph View** under item 2 (above).
5. **Line Graph:** Different types or styles of graph—solid line, dashed line and color—are used to designate each type of data points in the plot to help for visualization and readability. As depicted in the figure, solid line represents process values, while dashed line represents set values with a distinctive color, as indicated in the legend (see item 7).
6. **Status:** Status of chamber operating mode is displayed along the time line on the trend graph, indicating when and how long the chamber was in specific operating mode. This feature provides a quick preview of the chamber operating status. The **Pan/Zoom button of Trend Graph Manipulation Buttons** (item 2) may be used to manipulate the display and shift the graph back into the past to view the chamber's operating mode.
7. **Legend of Trend Graph:** The legends are used to identify each item on the trend graph with color code, as well as line/dash graph, to designate the different type of data being plotted.

7.2 Trend Graph Manipulation Buttons

The following is a detailed list of the seven **Manipulation Buttons** of **Trend Graph**, item 2 in the previous figure.

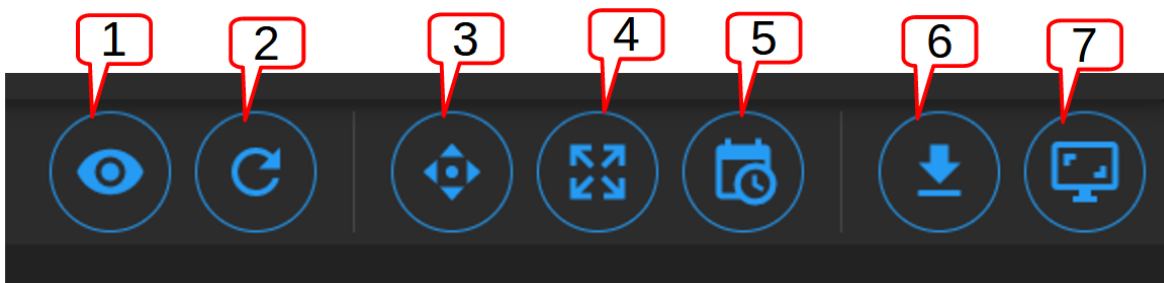


Figure 7.2: Trend Graph manipulation buttons

1. **Graph View:** Data visualization is very important. Elements or components of the trend graph are predefined by the configuration set in the **Data Logging Settings** submenu (found in the **Settings** menu). The **Customize** option depicted below allows the operator to select what to include in the trend graph to help simplify data visualization. Three different options represented by the arrows in the figure can be selected. The minimum and maximum Y range can be adjusted over the default values to help scale the graph for better

visualization; different data types can be enabled for display. The **Save** button (last arrow) can be applied to save the settings and render the graph.

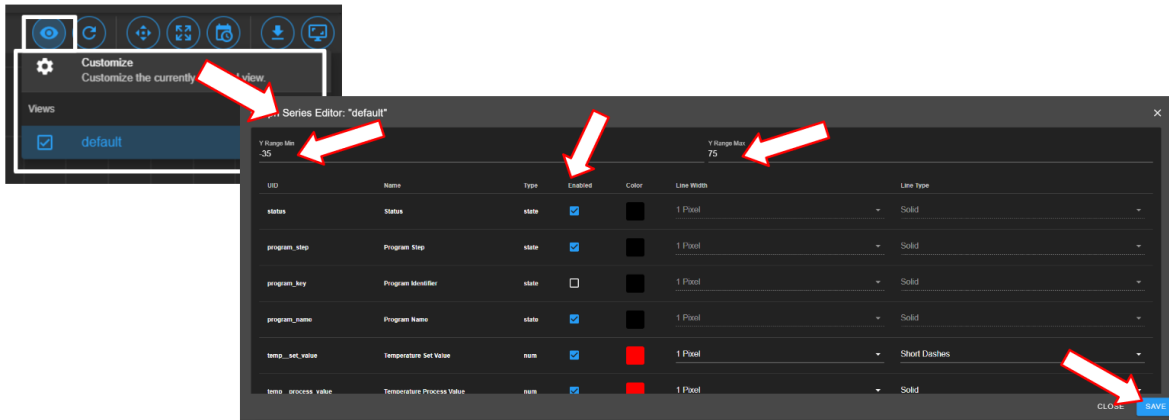


Figure 7.3: Tread graph view and custom settings

2. **Auto Refresh:** This Auto Refresh button reconstructs the graph to include data points up to the current time. Suppose a scroll wheel was applied to zoom out the trend graph that included future time which data points have not yet been sampled, as shown in the figure below.

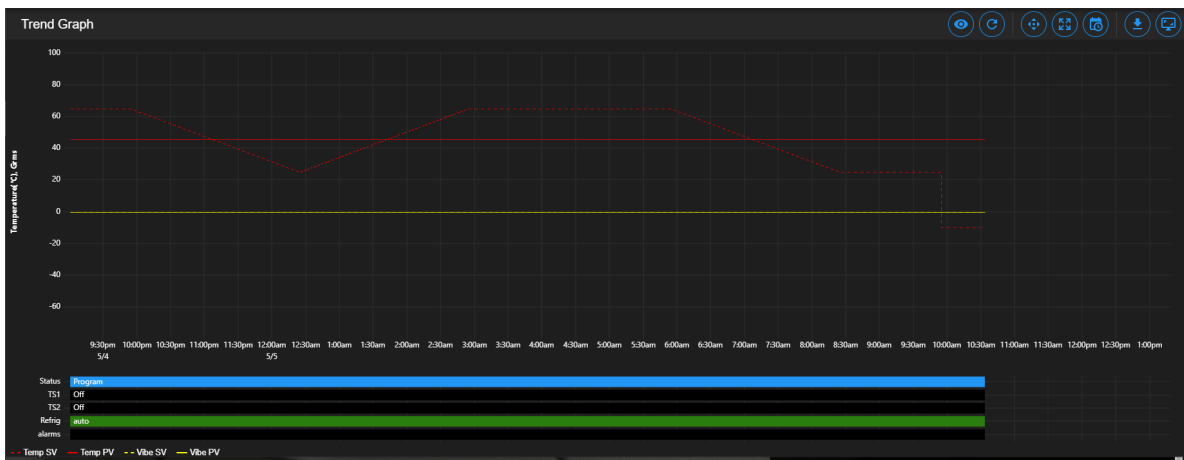


Figure 7.4: Off-scaled trend graph including future time (no data points)

The auto refresh button will rescale the graph to eliminate the gap (future time) on the right to expand and display the trend graph up to the current time.



Figure 7.5: Trend graph rescaled with current time

3. **Pan/Zoom Controls:** The Pan/Zoom Controls button allows the operator to control and adjust the viewable section in the trend graph. This button presents six operation buttons to manipulate and display the trend graph as follows:

- **Zoom In:** The **Zoom In** button allows the operator to zoom into a small section of the trend graph. Depending on the degree of zooming, the display area will be confined to a small set of data points ranging between minutes to hours. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Zoom Out:** The **Zoom Out** button does the opposite by allowing the operator to zoom out on the trend graph, thereby giving the operator an expansive view of the trend graph. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Move Up:** This button allows the operator to move up the graph along the vertical axis to adjust the viewable area of the scatter plot. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Move Down:** This button allows the operator to move down the trend graph along the vertical axis with the purpose to adjust the viewable area of the scatter plot. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Move Left:** This button allows the operator to pan left on the trend graph, offering a quick preview of a plot of data points tracing back the time in hours or days. With this feature, the operator can quickly gain a preview of past data points which the operator may have missed.
- **Move Right:** This button does the opposite to **Move Left** by allowing the operator to pan right on the trend graph to the current time. To reconstruct the trend graph to contain the most recent data points, the **Auto Refresh** button allows the quickest operation.

4. **Zoom Extents:** With this button, trend graph may be provided using data points from within the last one hour, last two hours or the last six hours. To make adjustment of the trend graph based on these three selections, click on the **Zoom Extents** button, then click one of the selection from the drop-down menu.
5. **Plot Range Selectors:** Data points can be selected from start date/time to end date/time to produce a desired trend graph. Arbitrary date and time can be selected for the plot range, as depicted in the following figure.

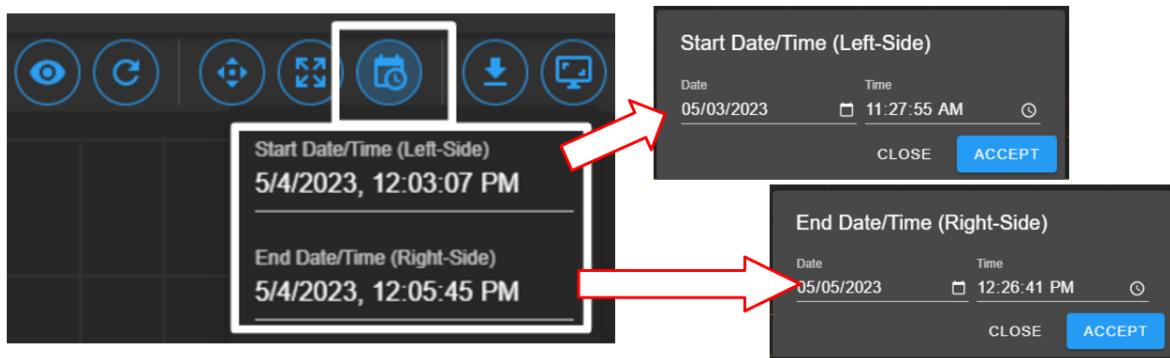


Figure 7.6: Plot range for start date/time and end date/time

To set the plot range,

- access the **Plotted Range Selectors** button.
 - access the **Start Date/Time**; edit date (m/d/y) and time (H:M:S) fields or apply the calendar and clock icons to select date/time.
 - apply **ACCEPT**
 - access the **End Date/Time**; edit date (m/d/y) and time (H:M:S) fields or apply the calendar and clock icons to select date/time.
 - apply **ACCEPT**. Note: Values of end date must be later (or greater) than start date.
6. **Download Data:** To download data and store it on the local computer, click the **Download Data** button and select **Download Current View** to download a portion of data from the displayed trend graph. To download the entire collection of data, select **Download All Data**. Data file will be stored in the Downloads folder of the local computer with filename: hostname_data_date.CSV.
 7. **Capture Screenshot/Download:** Trend graph can be captured, downloaded and stored on the local computer in PNG file, as shown in the figure.

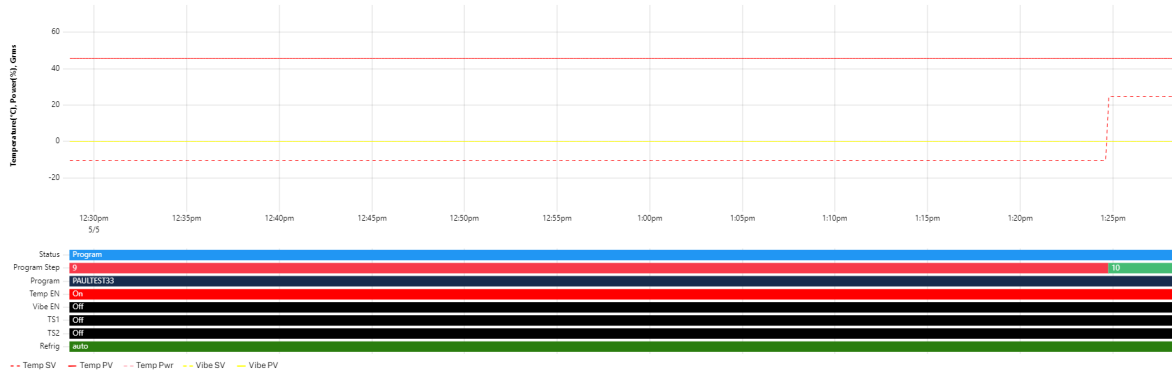


Figure 7.7: Screenshot of trend graph

7.3 How to Handle Downloaded Data File

Data points collected from the chamber are stored in CSV format. The recorded time of the data points is stored based on a UTC (or Universal Time Coordinated, previously referred to as the GMT) instead of the local time. To preserve the integrity of the CSV file and its UTC time stamp, do not rename the data file with MS Excel extension or attempt to open it directly with MS Excel. Any attempt to force open it in MS Excel will result in the wrong time conversion as shown in the following figures.

The following figure displays the CSV file which was directly opened with MS Excel. The time stamp in the first column is wrong; it is still based on UTC time stamp indicated by the arrows.

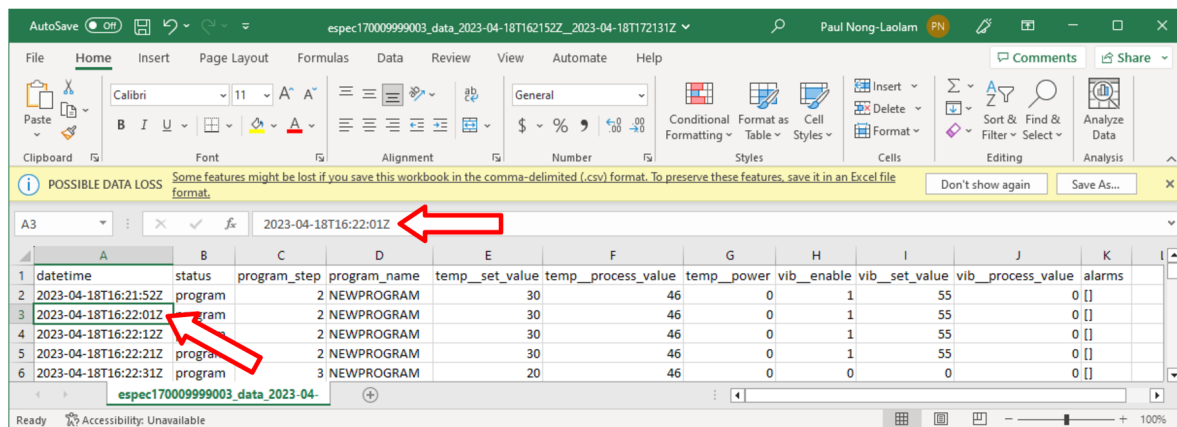


Figure 7.8: Data file improperly open in MS Excel

The following figure displays the same CSV file which was properly imported into MS Excel with the correct time stamp conversion for local time indicated by the arrows.

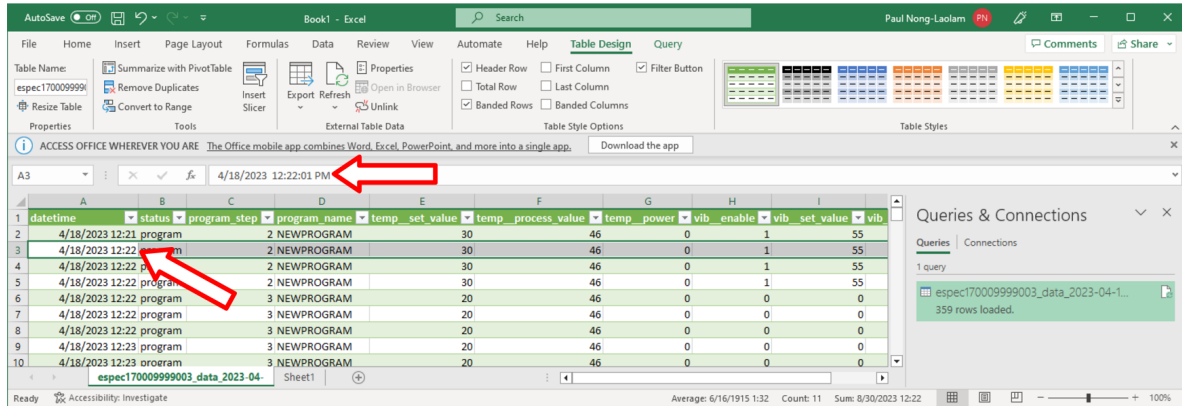


Figure 7.9: Data file properly imported into MS Excel

The proper way to handle this CSV file is to import it using the following procedure to render the correct conversion of the UTC time to the local time on all data points.

Complete the following steps:

1. Select **Trend** in the main menu bar
2. Click the **Download** button (item 6 in the previous section) to download the data (current view or entire data) in CSV file
3. Launch MS Excel and start a new blank spreadsheet
4. Click the **Data** ribbon
5. Click **From Text/CSV** (that appears under the **Home** ribbon)
6. In the **Import Data** Window explorer, open the **Downloads** folder and select the downloaded CSV file (in step 2) and click the **Import** button (in the bottom).
7. Click the **Load** button to load data into the current spreadsheet.
8. To save the current spreadsheet as Excel Workbook, click **Save As** and follow the standard steps to complete the process.

CHAPTER 8

History

The **History** page displays operation history of the chamber, its operating modes and statistics. Any alarms or alerts that were triggered during the chamber's operation are logged and displayed here. By default, history log of the chamber's operating modes, alarms or statistics from the previous week will be displayed, as depicted in the following figure. There are five important components in the **History** main display area. They are labeled and described as follows:

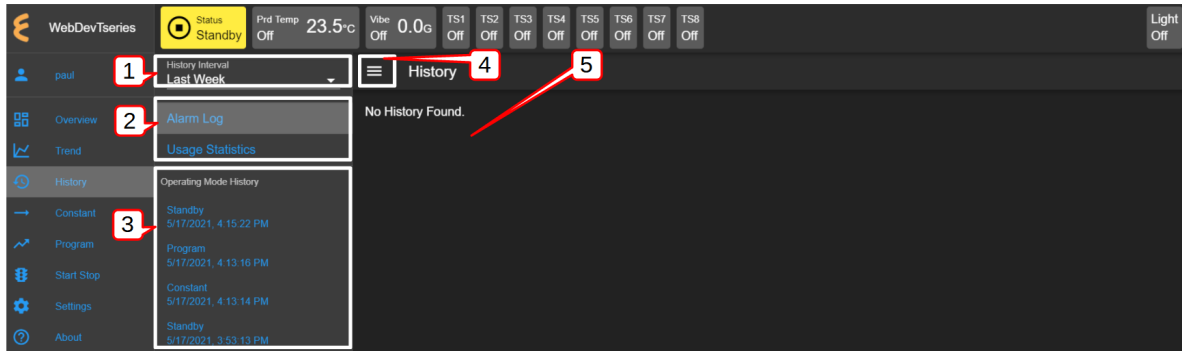


Figure 8.1: Operation history of the chamber

1. **History Interval:** Display options of the operating history are: one week, two weeks, one month, three months, six months, one year or the entire period of the chamber's operation. To access the history interval, click the radio button to select the period from the list.

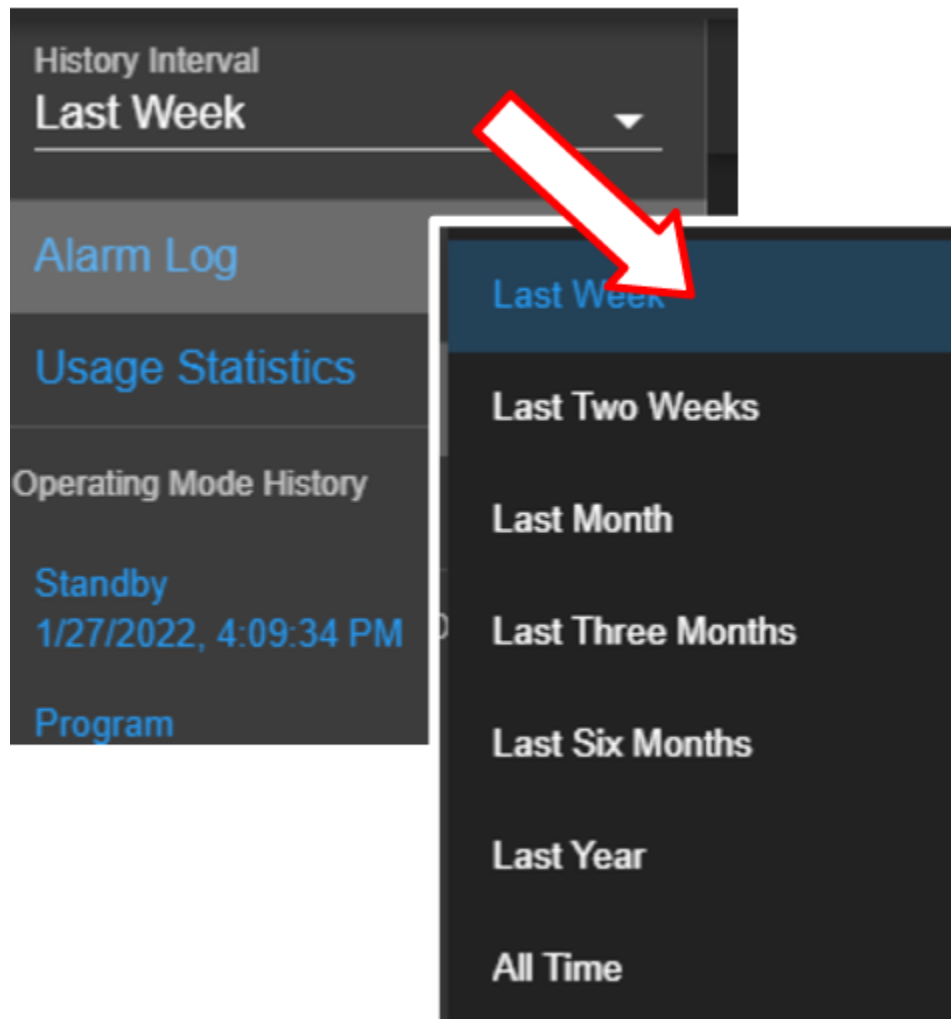


Figure 8.2: History interval and display selection

2. Alarm or Statistics Submenus:

- **Alarm Logs:** By default, alarm logs will be displayed in the main display area. The logs indicate which alarm had occurred and when they were resolved (cleared). Most recent events are listed at the top. To view detail of each log, click on its name (with its log date and time).

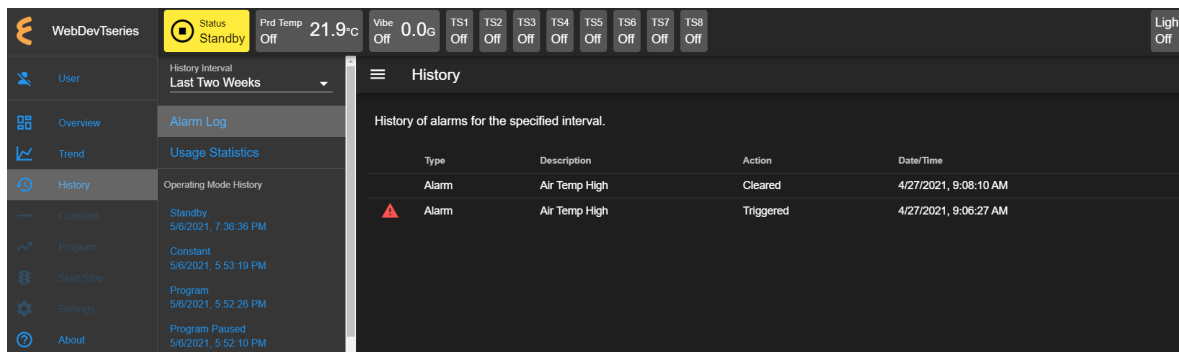


Figure 8.3: History of alarm

- **Usage Statistics:** To display the operation statistics, click on this submenu. Percentage of each operation mode based on the selection period in the **History Interval** is displayed as shown in the following figure:

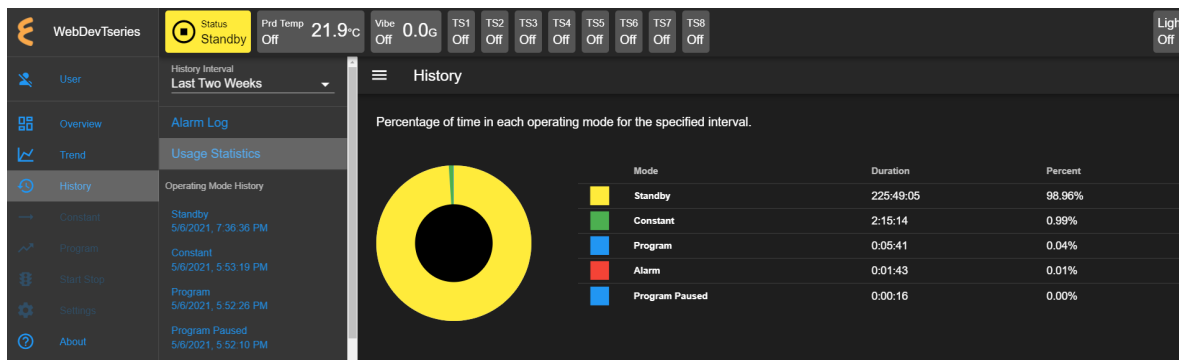


Figure 8.4: Operation statistics

Such information provides the operator a good idea of the overall performance of the chamber by identifying when and how much time it was in a certain operating mode.

3. **Operating Mode History:** A list of operating modes of the chamber is displayed here based on the option selected under the **History Interval**. Default listing is based on a one-week interval. A trend graph, identical to that produced in the **Trend** menu, based on the data points collected during the operating mode can be produced by clicking on the particular operating mode on this list, as illustrated in the following figure.

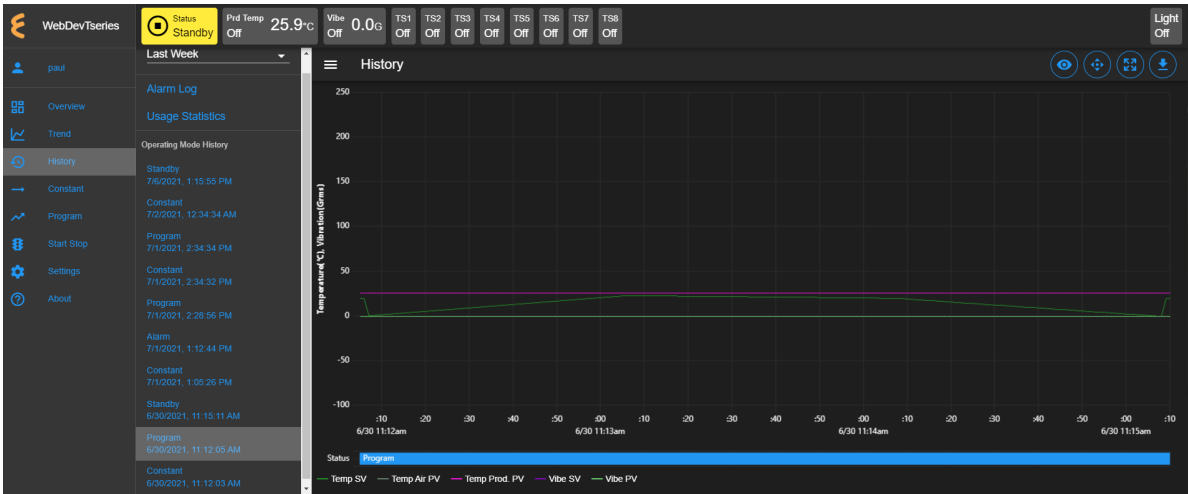


Figure 8.5: Trend graph of operating mode history

4. **Show/Hide Submenu:** To provide a larger real estate for the main display area, this Show/Hide button can be used to show or hide the **History** submenu. The following figure shows how the submenu is hidden and the main display area is expanded.

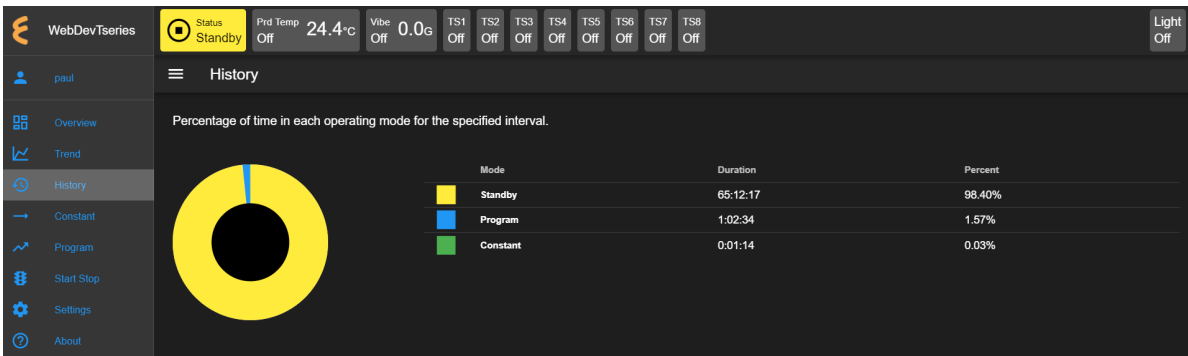


Figure 8.6: The show/hide button of the main display of the History page

5. **Main Display:** The content of the submenu page of **Alarm Log** and **Usage Statistics** is displayed here (refer to item 2, above).

CHAPTER 9

Constant

The existence of EWC **Constant** page is such that all features and their parameters are collected and displayed in one place to control their constant mode settings. The main display of **Constant** consists of three separate CTA panes, displayed as **Temperature**, **Humidity** (or **Vibration**) and **Outputs**, as depicted in the following figure. These CTA panes provide input options to adjust the settings directly.

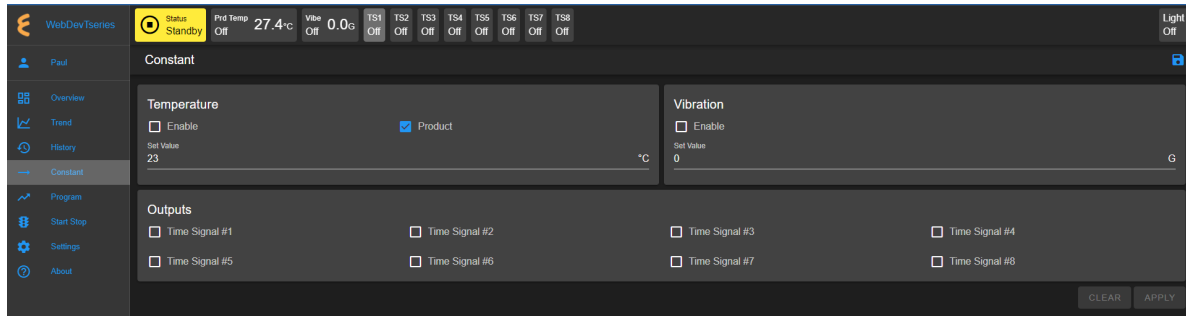


Figure 9.1: The Constant menu and its components

The following sections describe how to configure and control each of these parameters.

9.1 Product or Air Temperature Setting

Complete the following steps to turn on or modify temperature setting:

1. Enable air temperature or product temperature by checking the appropriate boxes.
2. Click the Set Value field and enter a new value, or apply the up/down arrow to adjust the value.

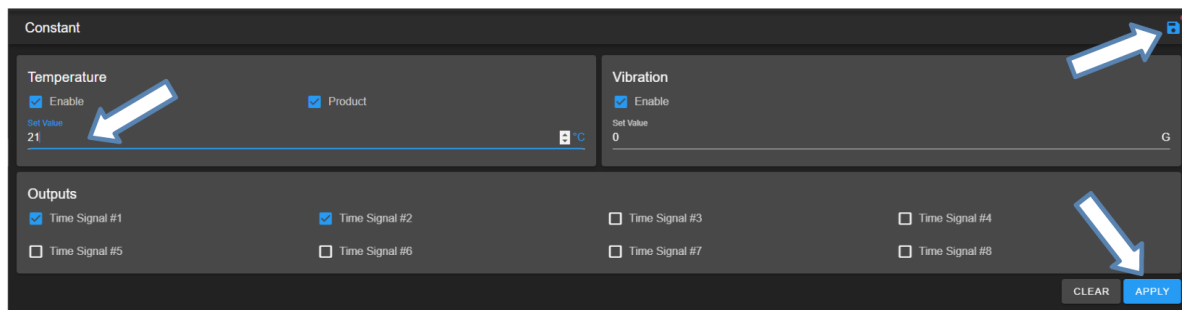


Figure 9.2: Apply new constant setting on temperature

3. Click the **APPLY** button or the **Save** icon (indicated by the arrows) to apply and save the new setting. The red dot next to the **Save** icon indicates that the new setting has not been saved. If you exit this pane by accessing a different menu in the menu bar, a warning message will appear (shown in figure).

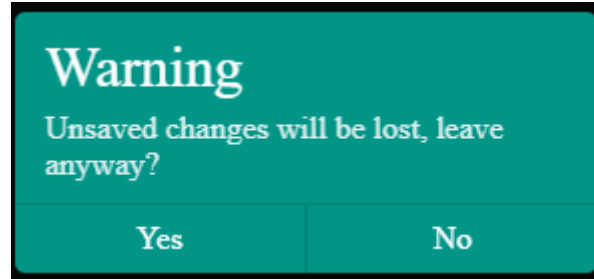


Figure 9.3: New setting must be save before exiting the pane

4. To cancel the setting, click **CLEAR**.

The new setting takes effect immediately with its new status displayed in the status bar. To reverse or cancel the setting, repeat the above steps to reset the set value and click **APPLY**.

9.2 Vibration Setting

Complete the following steps to turn on or modify vibration setting:

1. Place a check mark in the **Enable** box (refer to the above figure).
2. Click the Set Value field and enter a new value, or click the up/down arrow to adjust the value.
3. Click the **APPLY** button or the save icon as indicated by the arrows in the above figure to apply and save the setting.
4. To cancel the setting, click **CLEAR**. If you exit this pane by accessing a different menu in the menu bar, a warning will appear (see above figure) which requires you to save the setting before attempting to access any other menus.

The new setting takes effect immediately with its new status displayed in the status bar. To reverse or cancel the setting, repeat the above steps to uncheck the box, reset the set value and click **APPLY**.

9.3 Time Signals Setting

Complete the following procedure to turn on output for any time signal:

1. To turn on output for **Time Signal # 1**, place a check mark in its box.
2. Repeat the above step for any time signal available in the main display area.
3. Click the **APPLY** button or the save icon as indicated by the arrows in the above figure to apply and save the setting.
4. To cancel the setting, click **CLEAR**. If you exit this pane by accessing a different menu in the menu bar, a warning will appear which requires you to save the setting before attempting to access any other menus.

The new setting takes effect immediately with its new status displayed in the status bar. To reverse or cancel the setting, repeat the above steps to uncheck the box and click **APPLY**.

It is important to note that all the parameters (temperature, humidity, vibration, time signal) in the main display can be adjusted altogether simultaneously with a single **APPLY** or save button.

However, individual setting may provide security to avoid any adverse effect.

CHAPTER 10

Program

The **Program** menu allows the operator to create a program to control the chamber. All the programming features available on the supported PLC's listed in Chapter 1 (“**Introduction**”) can be composed into programs to control the chamber. The operator can: (1) open, view, edit a program; (2) preview the output of the program; (3) edit and/or overwrite an existing program ; (4) delete program from the list; (5) rename program on the list; (6) download a program and store it on the local computer in JSON file; (7) upload a program from the local computer to EWC, and much more.

Here are some of the benefits of the **Program** menu:

- Easy to operate.
- Quick management of programs, programming or editing.
- Require less time to develop a new program or modify an existing program.
- Program Editor offers flexibility with multitasking capabilities.
- Control program operation and program end mode.
- Preview program operation before execution; operator can see exactly what the program does prior to its execution.
- Download program from EWC to the local computer for backup.
- Upload program from the local computer to EWC.

Only authorized users with read-write privilege can access and utilize the **Program** menu and its contents. The **Program** menu in the **Side Bar** is grayed out, as depicted in the following figure, which requires the user to log into their account with read-write privilege in order to access and utilize the **Program** menu.

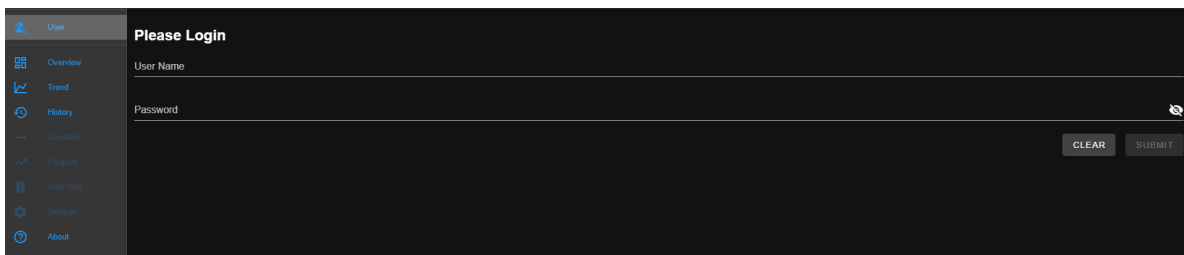


Figure 10.1: User with read-write privilege is required to operate the Program menu

10.1 List Programs

The following figure depicts a typical layout of the **Program** page with its submenu hidden. Its UI components are numbered and explained as follows:

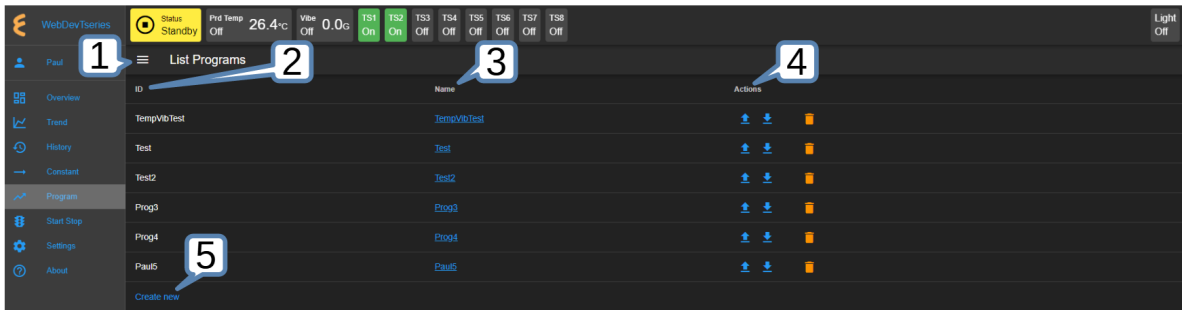


Figure 10.2: Program listing page with submenu hidden

1. **Submenu Show/Hide:** This button toggles between the “show and hide submenu” to allow the program editor utilize the entire main display area (see above figure).
2. **ID:** The system uses a program identification code (ID) to identify each program. This ID list is inaccessible to users; it is a list of all the available programs which have been created or stored in the system (that is, EWC).
3. **Program Name:** All available programs are listed under the **Name** column. Users can access each program under this list by clicking on the program name, which is a clickable link. The program editor then opens up to display the program instructions. Detailed operation of the program editor is discussed in the next section.
4. **Actions:** Three action buttons (Upload Program, Download Program, Delete) are available for managing the program under each row.
 - **Upload:** Program can be uploaded from the local computer directly to EWC. Program will be saved and placed on the row where the **Upload** action button was clicked, thus overwriting the existing one on that row. If the program name is different than that under the **ID** column, the program name will be listed under the **Name** column; the name under the **ID** column will remain unchanged. To make both names consistent (under **ID** and **Name** columns), open the program in to the program editor, change the program name to match that under the **ID** column, save the program via the **Save** button. The following figure illustrates this effect when a new program was uploaded into last row.

Prog4	Prog4	↑	↓	🗑
Paul5	TempVibTest	↑	↓	🗑
Create new				

Figure 10.3: Program ID and Name unmatched

- **Download:** Program can be downloaded and saved on the local computer.
 - **Delete:** A program to the left of the trash bin (where this action is applied) will be deleted.
5. **Create New:** This button opens the program editor to prepare a new program. The **Create New** button is conveniently placed in two locations: (1) under the **ID** list and (2) in the **Program** submenu (shown in the following figure).

The following figure displays the **Program** page with its submenu unhidden. The submenu (item

2) has two operation buttons: (i) List Programs and (ii) Create New (program).

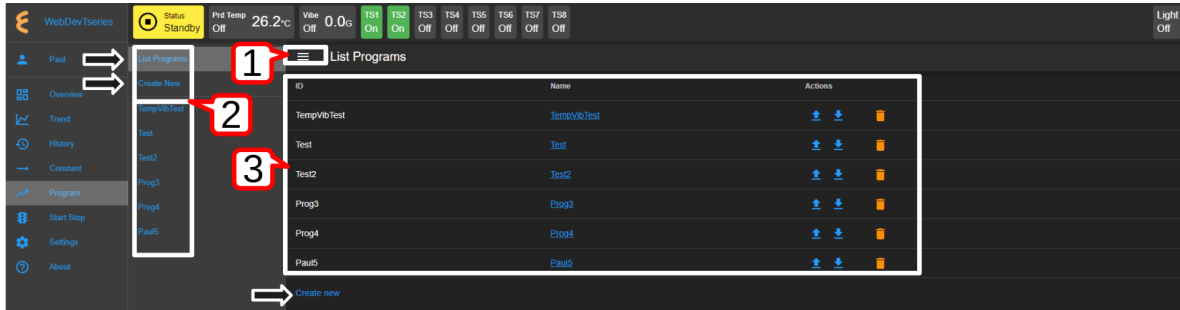


Figure 10.4: Program listing page with submenu unhidden

1. **Show/Hide:** The **Show/Hide** button can be used to hide or unhide the **Program** submenu (see item 2 below).
2. **Submenu:** This submenu has two operation buttons (indicated by the arrows): List Programs and Create New (program). All the available programs in the chamber stored in EWC are listed below these operation buttons (as shown in the above figure). With the submenu hidden, the main display has a larger real estate to display the program elements.
 - **List Programs:** The **List Programs** button offers a quick exit out of the program editor (explained in the following section). To exit out of the program editor mode, simply click this **List Programs** button. This action will cancel and exit the program editor being used to create, edit or import a program.
 - **Create New:** Similar to the **Create New** button under the **List Programs** display page (see item 3 below), this button opens the program editor with an empty template for constructing a new program. Detailed discussion is provided in the following section. A program from the local computer can also be imported into this empty template.
3. **List Programs:** This is the main display of the program list depicted in the previous figure. Click the **Show/Hide** button (see item 1) to hide the submenu and to expand the **List Programs** display page.

10.2 Create New Program

To create a new program, simply click on the **Create New** button in the submenu or under the **List Programs** main display indicated by the arrows in the following figure.

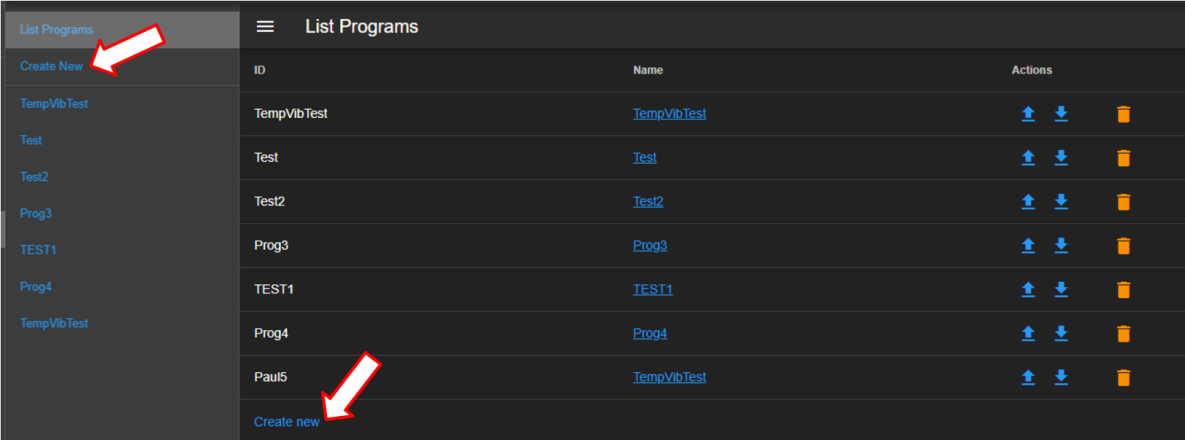


Figure 10.5: Creating a new program

The following figure depicts the general layout of the empty template for a new program.

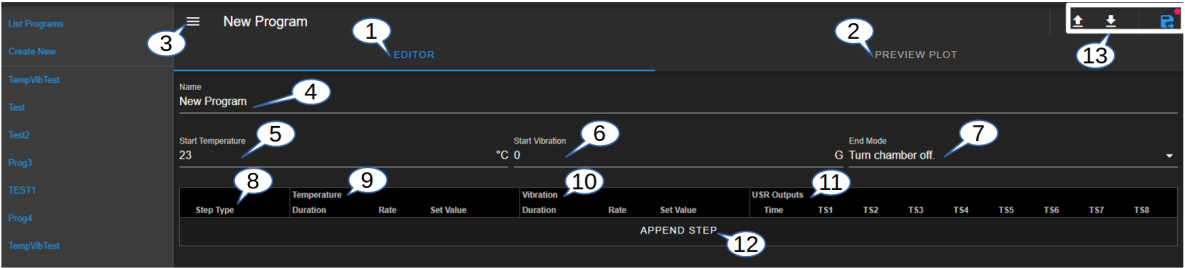


Figure 10.6: The structure and UI of the Programming Editor

The UI and components of the program editor (pictured above) are numbered and described as follows:

1. **Editor:** By default, a program is open and placed in the program editor. The program editor is highlighted in blue to indicate its active status.
2. **Preview Plot:** The output of the current program can be previewed via this button. Both the Editor (item 1 above) and this button can be used to toggle between the editing and previewing mode of the current program. The **PREVIEW PLOT** button is operational only when a program is loaded into the program editor or a program has been constructed in the program editor.
3. **Submenu Show/Hide:** To utilize the entire main display area for the program editor, this button can be used to hide the submenu.
4. **Program Name:** A unique program name, using an alphanumeric naming convention (ASCII), is required for each program. The program name is case-sensitive. This means that program names **PROG01** and **Prog01** are two different programs. If your PC is based on Microsoft Windows, these two program names are identical; that is, Microsoft Windows sees them as one and the same program file. Therefore, a consistent naming convention must be established to guard against accidentally overwriting programs with identical names on your Windows-based PC when the **Export** button is used on EWC.
5. **Start Temperature:** The initial temperature value (in Celsius) is required. The initial value can be set either by directly entering the specific value into the value field or by click-

ing the up/down arrow next to the C unit.

6. **Start Vibration:** The initial vibration value (in G) is required. The initial value can be set either by directly entering the specific value into the value field or by clicking the up/down arrow next to the G unit.
7. **End Mode:** Two types of operation mode are available for program End Mode:
 - **Turn Chamber Off:** The chamber will be turned off at the end of the program.
 - **Hold Last Step:** The chamber will operate based on the instructions in the last step of the program.
8. **Step Type:** There are five different step types available for each step in the program:
 - **Temp & Vibe Ramp:** Set ramp for both temperature and vibration.
 - **Temp Ramp:** Set ramp for temperature only.
 - **Vibe Ramp:** Set ramp for vibration only.
 - **Dwell:** Set constant value.
 - **Go To Step:** Jump to a specific step within the program. With this **Goto Step** feature, the program can have a loop or subroutine where instructions in a specific step (or steps) can be executed. With loops or subroutines, the program contains fewer lines of steps.

A selection can be made from these five types by accessing the program step option. To add the first step in a new program (as pictured in the above figure) requires clicking on the **APPEND STEP** button (item 8 below), at which point, the five step types can be accessed by clicking on the program step itself (to be explained below).

9. **Temperature:** In each step, temperature can be set via three parameters: Duration, Rate and Set Value. They are described as follows:
 - **Duration:** The format is HH:MM:SS. The time value must be less than 100:00:00. In other words, the entry for the maximum number of hours accepted by the system is 99:59:59. The operation time can be entered in HH:MM:SS format or in pure numerical value and the system will convert it to HH:MM:SS. For instance, if a numerical value 15 is entered, the system sets it to 15 seconds like this: 00:00:15. If 66 is entered, the system converts it to 00:01:06. Similarly, if 90:00 is entered, the system renders this value to 1:30:00.
 - **Rate (C/min):** Temperature rate (measured in Celsius per minute) is determined by the program editor based on the initial temperature (specified in item 3 above) and the target value (Set Value, as described below). The rate will be determined to operate within the specifications of the chamber. Consult the chamber operation manual for detail.
 - **Set Value:** This is the target temperature value. This value will be checked against the chamber's threshold value by EWC to validate the proper operating value. Consult the chamber operation manual for detail on the threshold or the upper limit the chamber can reach.
10. **Vibration:** In each step, vibration can be set with three parameters:
 - **Duration:** The format is HH:MM:SS. The time value must be less than 100:00:00. The maximum number of hours accepted by the system is 99:59:59. Similar to the **Duration** described in item 5 (above), the operation time for vibration can be entered in HH:MM:SS format or in pure numerical value and the system will convert it to HH:MM:SS. Refer to item 5 for examples of acceptable values and format conversion. Note: If **Dwell** is selected for step type (see item 4), the vibration time will (automatically) default to use the temperature time.
 - **Rate (G/min):** Vibration rate (measured in G/min) is determined by the program

editor based on the initial vibration (specified in item 6 above) and the target value (Set Value, as described below). The rate will be determined to operate within the specifications of the chamber. Consult the chamber operation manual for detail.

- **Set Value:** This is the target vibration value. This value will be checked against the chamber's threshold value by EWC to validate the proper operating value. Consult the chamber operation manual for detail on the threshold or the upper limit the chamber can reach.
11. **Time Signals:** Different time signals can be controlled individually.
 - **Time:** This is the delay time value when each TS # will be turned on (if checked) after the program step has been executed. To turn on any TS for the duration of the program execution, this time field can be left blank. Multiple lines for time duration (with line numbered 1, 2, 3, etc.) can be used to control each or all TS's using various time delay.
 - **Time Signal:** Individual time signal(s) can be selected for output. For each step, multiple time signals with different time settings can be selected (to be illustrated below).
 12. **APPEND STEP:** As shown in the previous figure, the program editor has an empty template. No instructions or steps of program have been added. To create an instruction, a new step must be created (or added). This APPEND STEP button is used to add a new step. Once a program has a step, additional steps can be added using this button or the drop-down menu of the Step Number (to be explained below). The APPEND STEP button always adds a new step as the last step in the program. By contrast, the drop-down menu of the Step Number allows a new step to be inserted above or below the current step. It also has a delete button to remove any step from the program.
 13. **File Manipulation:** Three available buttons can be used to manipulate the program file.
 - **Open Program:** This button imports a program file from the local computer into the program editor. The filename will be used as the program name by program editor. The program is not yet saved in EWC system until the **Save As** button is applied. TEWC only accepts a program in JSON format. To ensure compatibility, the program structure should be based on the one downloaded from EWC itself (see **Download Program** below).
 - **Download Program:** This button downloads the current program and saves it on the local computer. The downloaded file is based on the program name, saved in JSON format.
 - **Save As:** The **Save As** button can be applied to save the current program with a new filename. **Note:** In edit mode, an additional button called **Save** will be available for saving (or updating) the modified program content.

A new program should begin with its unique name. The rest of the required components or parameters can be constructed based on the above listed items in the order that they appear.

10.2.1 Programming: Add Program Step

NOTE: *The programming illustration here is for the purpose of learning how to create or edit steps in the program editor, which does not imply the practical application to operate the chamber. Operators must comply with the operation manual of the chamber to apply the appropriate initial step to start the chamber properly, such as setting the initial run of the Dwell mode for a specified time interval before actually starting any operating step, such as Temp Ramp or Temp & Vibe*

Ramp, etc.

The following example outlines a simple procedure to create a new program and add a new step with step type **Temp & Vibe Ramp** and time duration of 10 minutes. The initial temperature used for this example is 23 C with a target value of 30. The rate of 0.7 C/min is determined and set by the program editor (according to the initial and set values, and chamber specifications). Vibration duration is also 10 minutes. Its initial value is 0 G/min with a set value of 10. Its rate is thus 1 G/min based on the 10-min time duration. The program contains one time signal output (TS1) which will be turned on for the duration of the program. The chamber will be turned off at the end of the program execution.

1. **Program Name:** Enter **TempVib1** in the program name field.
2. **Start Temperature:** Enter 23 over the 0 value in the **Start Temperature** field, or hover the mouse pointer in front the C unit and click on the up arrow to set a value of 23.
3. **Start Vibration:** We will start vibration from 0; hence, the default setting in the **Start Vibration** field is left as is.
4. **End Mode:** Point and click the **End Mode** and select **Turn chamber off** from the list.
5. **Add New Step:** Click the **APPEND STEP** button at the bottom of the program template (indicated by the arrow). By default, the **Temp & Vibe Ramp** is selected for the list for this new step type. Refer to Item 4 in the previous section.
6. **Step 1:** By default, the **Temp & Vibe Ramp** is selected for this new step type; it is the desired step type for this program. If a different step type is required, click on the down arrow to select a different step type from the drop-down list.
 - **Temperature:** Enter the following values for the temperature parameters.
 - **Duration:** Enter 00:10:00 in the duration field.
 - **Rate:** This field can be left blank for the program editor to determine the value; or, enter the correct rate value based on the initial and target value computed using the duration time (i.e., 0.7 C/min).
 - **Set Value:** Apply the up-arrow button (next to the C unit) to set value to 30. The **Rate** value will be changed simultaneously.
 - **Vibration:** Enter the following values for the vibration parameters.
 - **Duration:** Enter 00:10:00 in the duration field.
 - **Rate:** Leave this field blank and let the program editor to determine the value; or, enter the correct rate value based on the initial and target value computed using the duration time (i.e., 10 min) and chamber specifications. If the incorrect rate value is enter manually, the program editor will flag an error message. The simplest approach is to allow the program editor to do its work.
 - **Set Value:** Apply the up arrow button (next to G) to set the value to 10. The **Rate** value (in the previous field) will be changed simultaneously.
 - **USR Outputs:**
 - **Time:** To allow TS1 to stay on for the entire program, leave this setting as is (i.e., 0:00:00).
 - **TS1:** Check the TS1 box.
7. **Step 2:** Two different methods are available for adding a second step in the program: (i) Click the **APPEND STEP** button or (ii) Click step number in the circle of Step 1 and

choose **Insert Before**, **Insert After** or **Delete** (as shown in the following figure). The action of the **APPEND STEP** button is sequential; it always adds a new step as the last step in the program by copying the content of the immediate previous step. Method (ii) allows a programmer to add a new step any where within the program by inserting a new one above or below the selected step. This method also allows the programmer to delete any step within the program, thus, giving complete freedom to edit the program.

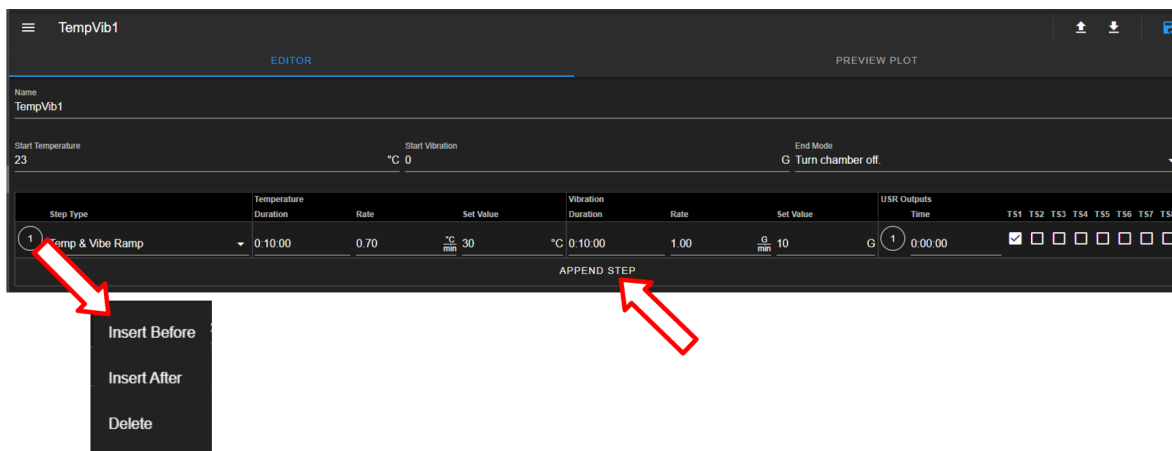


Figure 10.7: Adding or Inserting a program step

8. **Program Preview:** EWC provides an instant preview of the program output. This feature allows the operator/programmer to study its output before execution. Click the **PREVIEW PLOT** button (as shown below) to preview the program output.

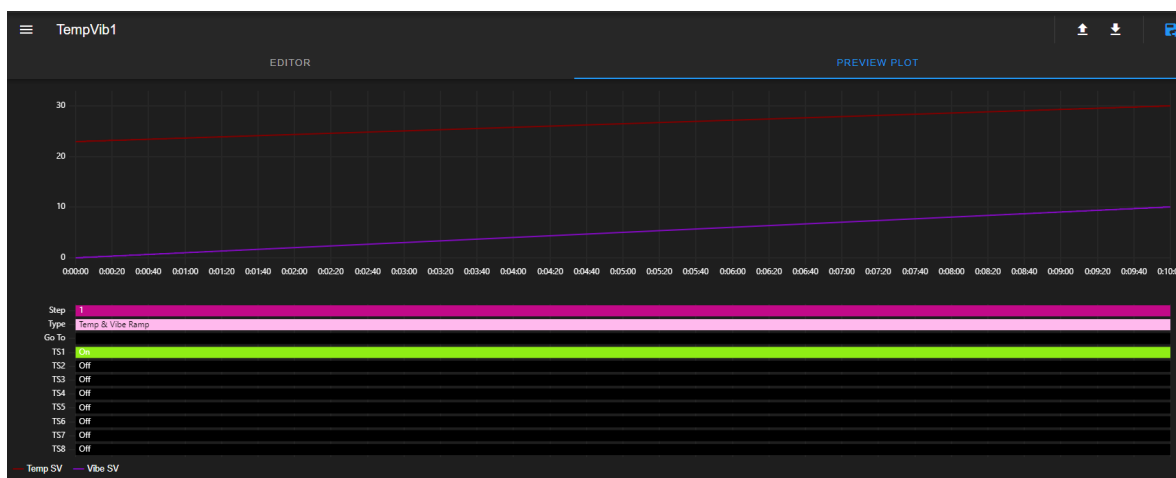


Figure 10.8: Preview of the program output

9. **Save Program:** To save program, click on the **Save As** button as shown below.

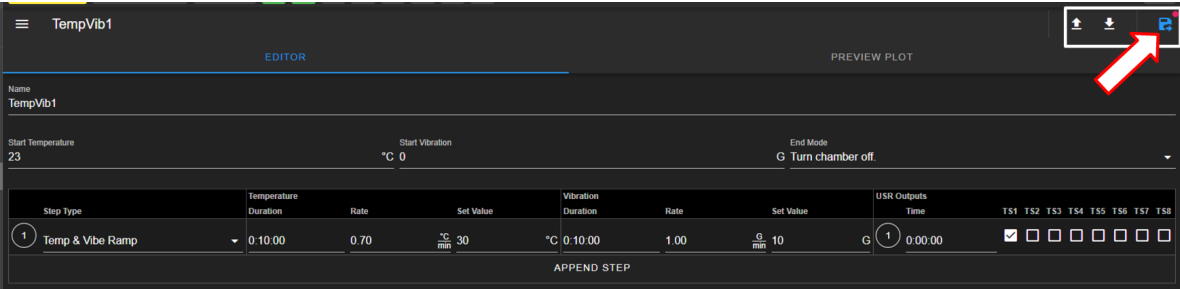


Figure 10.9: Saving a program profil

10. **List Programs:** Once saved, click the **Submenu Show/Hide** button to reveal the **Program** submenu. The new program should appear in the listing in this submenu.

This program (TempVib1) will be used as an example in the following sections.

10.3 View, Edit, Save Program

This section describes how to open an existing program for viewing and editing. Changes made in the program can be updated by overwriting the program contents back in the file (using **Save**) or saving them as a new program with a different name (using **Save As**).

10.3.1 Open Program

An existing program can be opened for viewing or editing by clicking on its name under the Name list, as shown in the following figure.

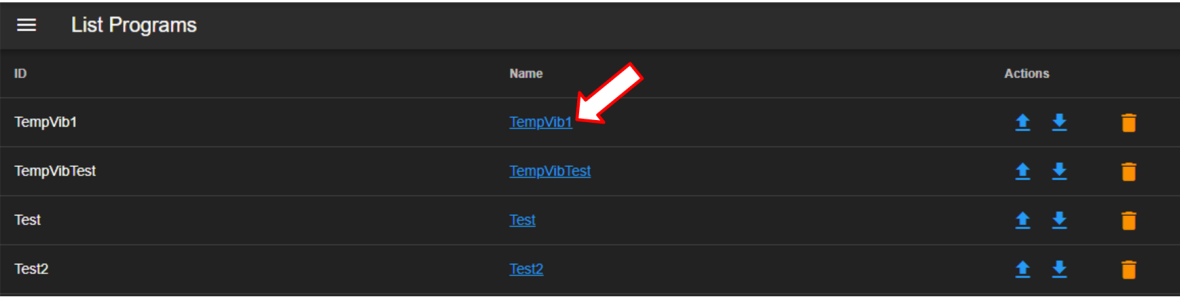


Figure 10.10: Opening a program profile

The program **TempVib1** (indicated by the arrow) that was created in the previous section will be used for illustration. It is open and displayed as follows:

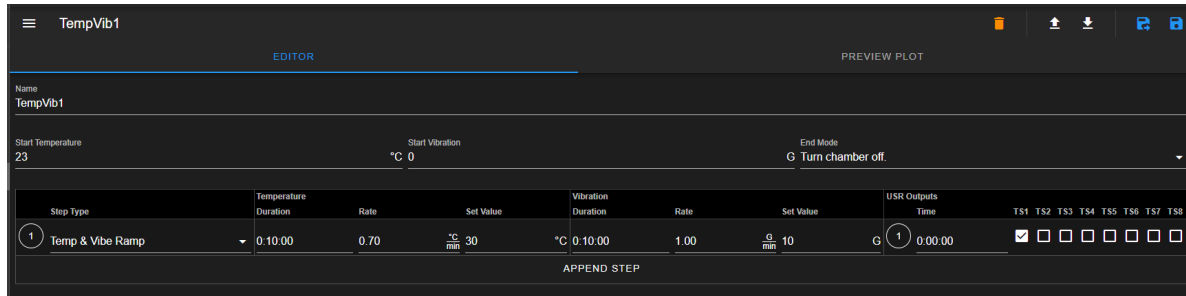


Figure 10.11: Editing program using Program Editor

As depicted in the upper-right in the above figure, five buttons are available for managing the program file in the program editor: **Delete**, **Open Program**, **Download Program**, **Save As** and **Save**. They will be explained in detail in the following sections.

10.3.2 Programming Example: Edit Program

In this section, we illustrate how to edit and modify **TempVib1** program with four additional steps, each using a different step type selected from the available list. We also illustrate how a subroutine can be applied to repeat a number of steps for a specific number of repetition. Application of a time interval and delay to turn on the time signals is also included.

With **TempVib1** program open in the program editor, as shown in the previous figure, complete the following steps to add four additional steps with their specific step type and parameters as follows:

1. **Add Step 2:** Click the **APPEND STEP** button to add the second step.
 - **Step Type:** Click the down arrow and select **Temp Ramp** from the drop-down list.
 - **Temperature:** Enter the following values for the temperature parameters.
 - **Duration:** Enter 00:10:00.
 - **Rate:** Leave it as 0 for program editor to determine the rate value. Or, enter 0.5 based on the calculation of initial and final temp values.
 - **Set Value:** Enter 35. The **Rate** value will change to 0.5 automatically.
 - **Vibration:** Since this step uses **Temp Ramp** without vibration, all the vibration parameters are not applicable.
 - **USR Outputs:** Enter the following values for the user signal relay outputs:
 - **Time:** (Leave it at 0:00:00).
 - **TS1:** Check the TS1 and TS2 boxes.
2. **Add Step 3:** Click the **APPEND STEP** button to add the third step.
 - **Step Type:** Click the down arrow and select **Vibe Ramp** from the drop-down list.
 - **Temperature:** Since this step uses **Vibe Ramp**, all the temperature parameters are not applicable.
 - **Vibration:** Enter the following values for the vibration parameters.
 - **Duration:** Enter 0:10:00.
 - **Rate:** Leave it as 0 for program editor to determine the rate value. Or, enter 0.5 based on the calculation of initial and final temp values.
 - **Set Value:** Enter 15. The **Rate** value will change automatically.

- **USR Outputs:** Enter the following values for the user signal relay outputs:
 - **Time:** (Leave it at 0:00:00).
 - **TS:** Check the TS3 and TS4 boxes.
3. **Step 4:** Click the **APPEND STEP** button to add the fourth step.
- **Step Type:** Click the down arrow and select **Dwell** from the drop-down list.
 - **Temperature:** Enter the following values for the temperature parameters.
 - **Duration:** Enter 0:10:00.
 - **Rate:** This field is grayed out.
 - **Set Value:** This field is grayed out.
 - **Vibration:** Enter the following values for the vibration parameters.
 - **Duration:** The vibration time duration will automatically default to use the temperature time duration; that is, 0:10:00 will be filled in immediately after clicking on the **Vibration Duration** field.
 - **Rate:** This field is grayed out.
 - **Set Value:** This field is grayed out.
 - **USR Outputs:** We will apply delay and time interval to control the time signal outputs for TS5 and TS6. We will be implementing this using the set time intervals.
 - **(1)Time:** (Leave it at 0:00:00).
 - **TS:** Check the TS5 box. Under this configuration, TS5 will turn on when Step 4 gets executed. It will remain on until the next time interval starts and TS6 turns on (refer to the program preview below).
 - **(2)Time:** To add the second time interval, click the 1 in the circle and select **Insert After** from the drop-down list, as depicted in the following figure. Enter 0:05:00 in the time field. This value will dictate when TS6 turns on.
 - **TS:** Check the TS6 box. Under this configuration, TS6 will turn on 5 minutes after this step has been executed. Thus, TS6 signal has a 5-minute time delay; it will stay on for 5 minutes (refer to the program preview below).

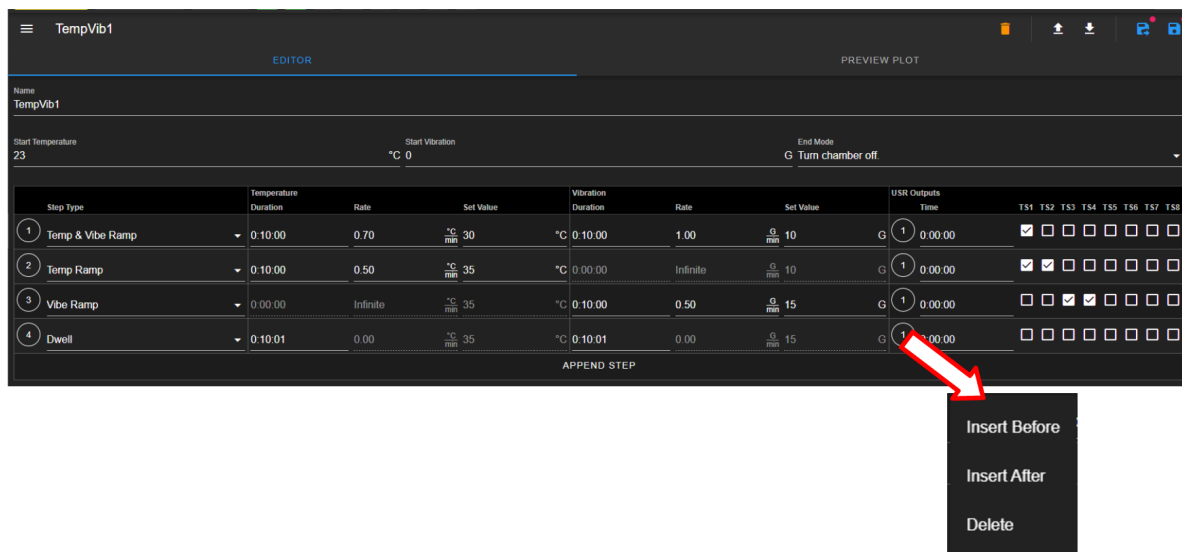


Figure 10.12: Adding the second time interval for TS

4. **Step 5:** Click the **APPEND STEP** button to add the fifth step.

- **Step Type:** Click the down arrow and select **Go To Step** from the drop-down list.
- **Temperature:** Under the **Go To Step** field (under the Temperature field), click the down arrow to select **Step 2**.
- **Vibration:** Under the **Go To Step Count** (under the Vibration field), enter 10 or click the up arrow to select 10.

5. **Save Program:** The complete program is illustrated in the following figure. To save the program, click the Save icon in the upper-right corner. The following section describes how to apply other buttons in this upper-right corner. The complete program is illustrated in the following figure.

The screenshot shows the 'TempVib1' program editor. At the top, there are tabs for 'EDITOR' and 'PREVIEW PLOT'. Below the tabs, the program name 'TempVib1' is displayed. The main area contains a table of program steps. The table has columns for Step Type, Temperature (Duration, Rate, Set Value), Vibration (Duration, Rate, Set Value), and USR Outputs (Time, TS1-TS8). The steps are as follows:

Step	Step Type	Temperature Duration	Temperature Rate	Temperature Set Value	Vibration Duration	Vibration Rate	Vibration Set Value	USR Outputs Time	TS1	TS2	TS3	TS4	TS5	TS6	TS7	TS8
1	Temp & Vibe Ramp	0.10.00	0.70	30 °C	0.10.00	1.00	10 g	0.00.00	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Temp Ramp	0.10.00	0.50	35 °C	0.00.00	Infinite	10 g	0.00.00	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Vibe Ramp	0.00.00	Infinite	35 °C	0.10.00	0.50	15 g	0.00.00	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Dwell	0.10.01	0.00	35 °C	0.10.01	0.00	15 g	0.00.00	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Go To Step	Go To Step Step 2			Go To Step Count 10			0.05.00	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

At the bottom of the table, there is an 'APPEND STEP' button.

Figure 10.13: A sample program in the Program Editor

6. **Preview Output:** Click the **PREVIEW PLOT** button to preview the program output, as depicted in the following figure.

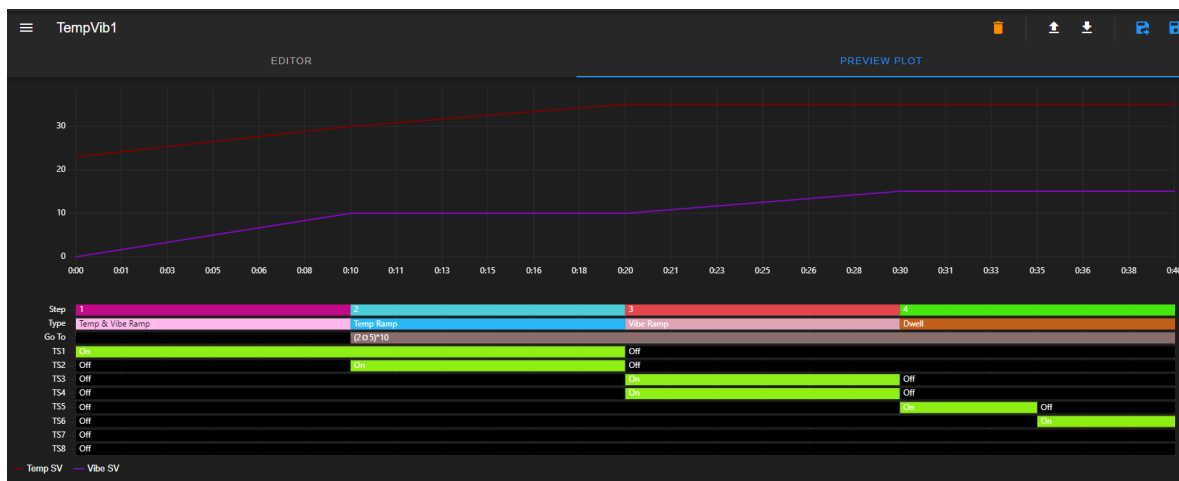


Figure 10.14: An output preview of the Sample Program

10.3.3 Managing Program File via the Program Editor

This section describes how to apply the five file manipulation options available in the upper-right corner of the program editor, as depicted in the following figure. :

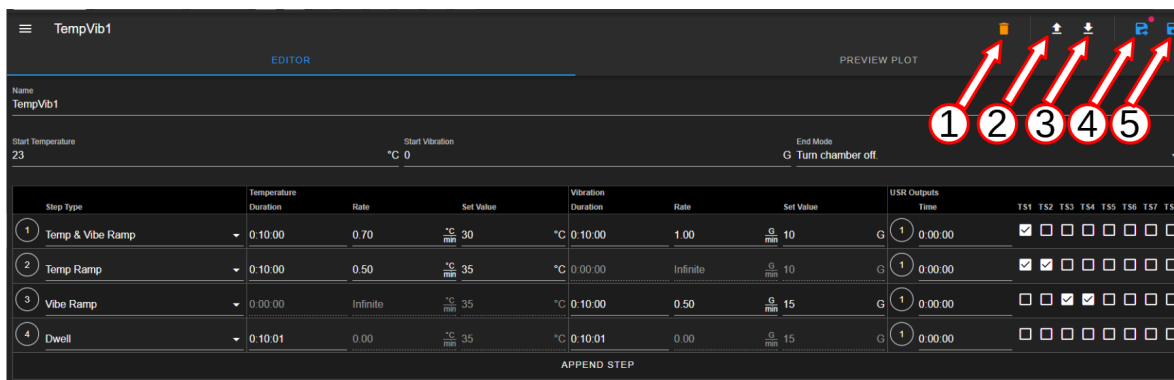


Figure 10.15: File manipulation options

They are described as follows:

1. **Delete:** Click the trash bin icon to delete the current program in the program editor. As a safety measure, the system will prompt to confirm the action with a pop-up warning with a Yes/No option to proceed with the action. Upon completion, the system returns to the Program menu to update and display the Name list.
2. **Open Program:** This button imports a program file from the local computer into the program editor. By default, the system opens the Downloads folder on the local computer to upload the program file. Navigate to the program's location, if necessary, and double-click on the desired program to import it into the program editor buffer. The program editor only accepts program structure and format in JSON.
3. **Download Program:** The current program in the program editor can be downloaded onto the local computer as a backup. By default, the program will be stored in the Downloads folder, with filename based on the program name (e.g., TempVib1.json).
4. **Save As:** This button can be used to produce a duplicate of the current program under a new name. In order to apply this feature, the program name in the Name field must be changed to a desired filename, as illustrated in the following figure.

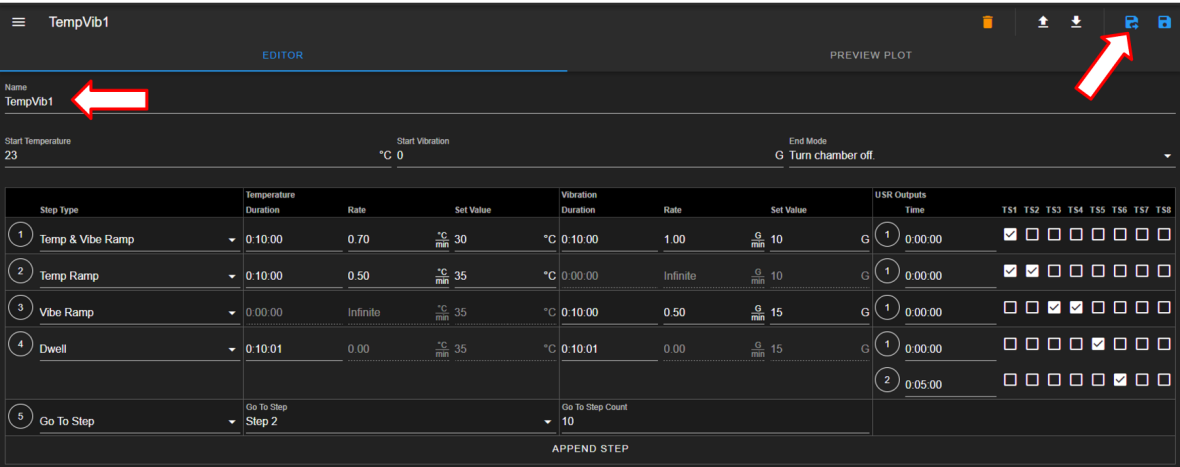


Figure 10.16: Renaming a program in the Program Editor

5. **Save:** Apply this button to update the program file. To help check the editing status of the program, the program editor utilizes a red dot placed above the **Save** or **Save As** button to indicate an update yet to be saved.

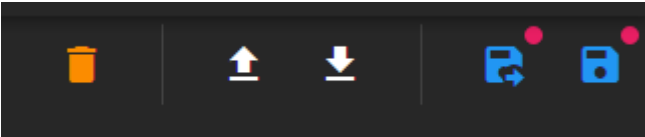


Figure 10.17: Update indicator

Navigating out of the editor without saving the update will trigger a warning prompt, as depicted in the following figure.

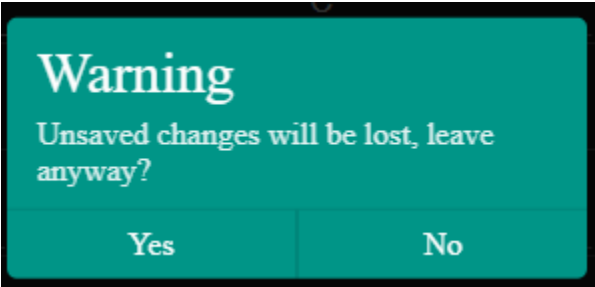


Figure 10.18: Confirm the save or discard update

The T-series chamber does not store any program in the controller. All programs displayed in the **List Programs** submenu are stored in the EWC data directory. When an operator runs the program, EWC loads that program into its memory, executes each line and sends instructions to the controller in the T-series to carry out the task. Even though these programs require EWC for execution, they can be exported (item 3 above) to the local computer as backups.

10.3.4 Managing Program File via the Name List

This section describes how to apply the three file manipulation options on the Name list, as depicted in the following figure.

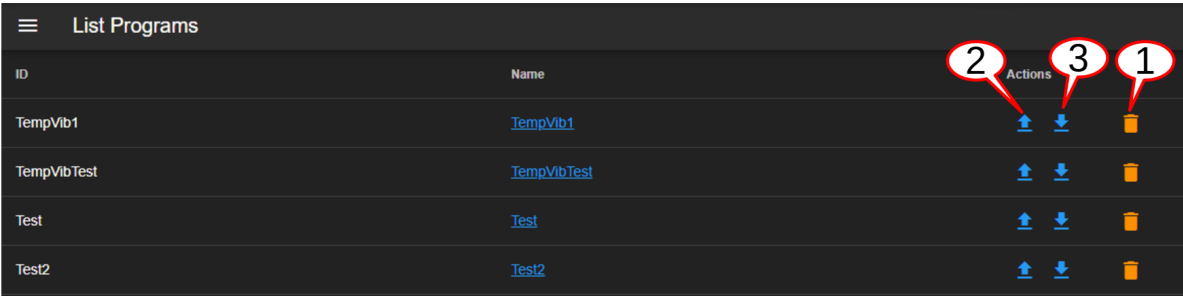


Figure 10.19: Manage programs on the Name list

These three options are listed and described as follows:

- 1. **Delete:** To delete **Test** from the Name list, click the trash bin icon as depicted in the following figure. As a safety measure, the system will prompt to confirm the action with a pop-up warning with a Yes/No option to proceed with the action. It may be necessary to apply the refresh button of the Web browser after deleting the program file from the Name list.

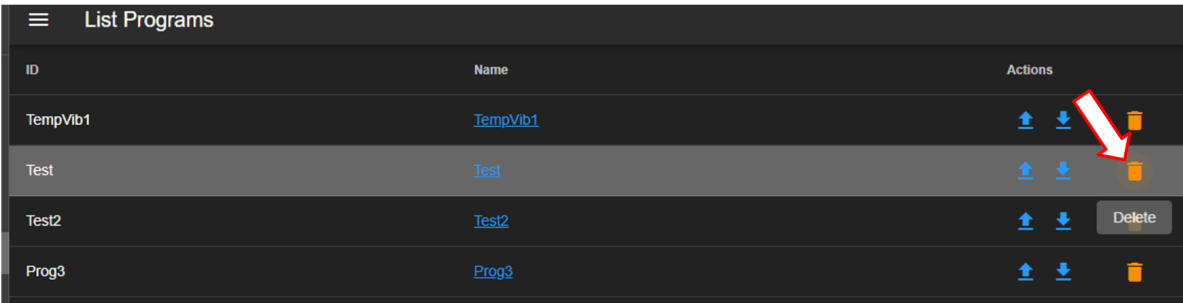


Figure 10.20: Deleting program from the Name list

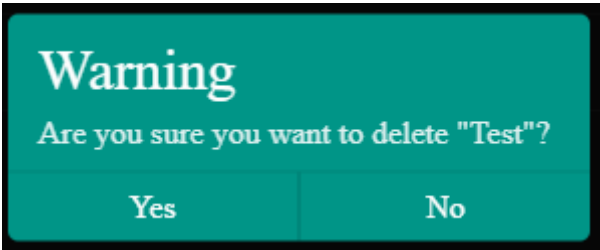
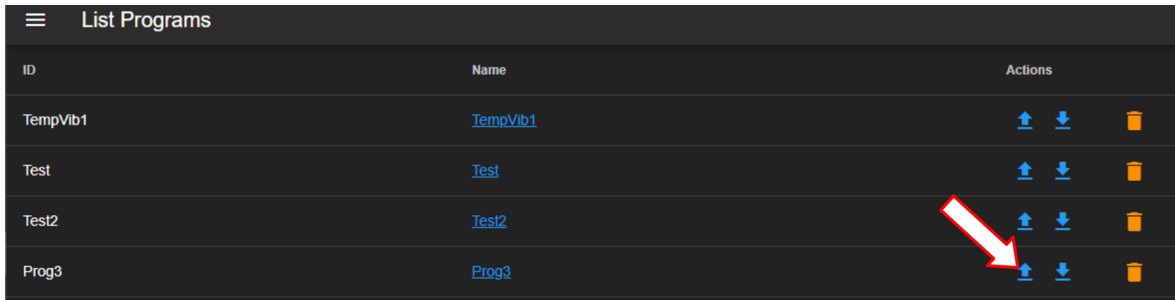


Figure 10.21: Confirm deletion

- 2. **Upload Program:** This button can be used to import a program file from the local computer directly into the EWC storage, which is then displayed on the Name list. To import a program into ID **Prog3**, click the **Upload** button, as indicated by the arrow in the following figure. Navigate to locate the desired file on the local computer and double-click it to

complete the process. **Caution:** This operation is extremely dangerous. The imported program will overwrite the contents of **Prog3** on the Name list under ID **Prog3**. A new name based on the name of the imported program will be placed on the Name list. Program **Prog3** is thus gone after this operation. The most effective way to add a new program (from the local computer) onto the Name list is via the Program Editor using the **Open Program** operation button or creating a new one in the program editor itself.







ID	Name	Actions
TempVib1	TempVib1	↑ ↓ 
Test	Test	↑ ↓ 
Test2	Test2	↑ ↓ 
Prog3	Prog3	↑ ↓ 

Figure 10.22: Importing a program

3. **Download Program:** To download (i.e., export) a program **Test2** under ID **Test2** on the Name list (see above figure), click on the **Download** button. By default, the program file will be stored in the **Downloads** folder on the local computer using filename: Test2.json.

CHAPTER 11

Start Stop

This menu allows the operator with read-write privilege to control or manage the chamber with the following operation modes: **Standby**, **Constant**, **Program**, **Alarm**. The following figure depicts these modes displayed in the main display area as individual tabs.

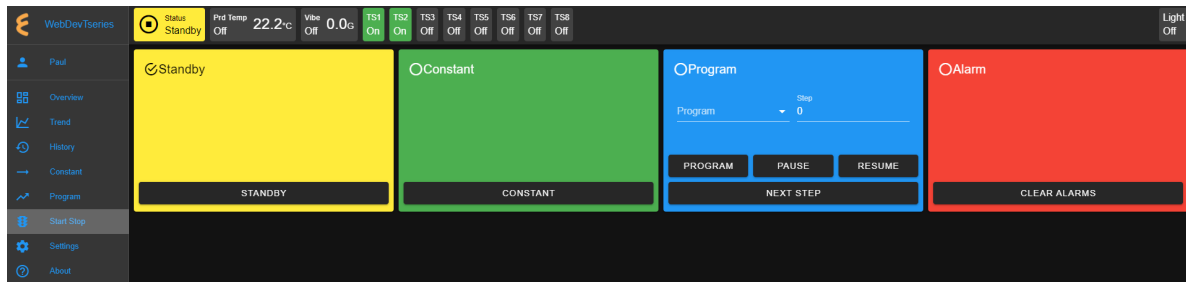


Figure 11.1: The Start/Stop menu with a Status Bar

It should be noted that the **Status** tab in the status bar also provides access to these modes for control and operation. Refer to the **Overview** menu for detail on how to control the chamber operating modes.

11.1 Standby Mode

In **Standby** mode, the chamber is off, and the status tab in the status bar displays as **Standby**. There is also a check mark placed in the circle next to **Standby** in the tab of the main display area, as illustrated in the above figure.

11.2 Constant Mode

In **Constant** mode, the chamber operates using the constant configuration, and the status tab displays as **Constant**. This status is also indicated by the check mark in the circle, as depicted in the following figure.

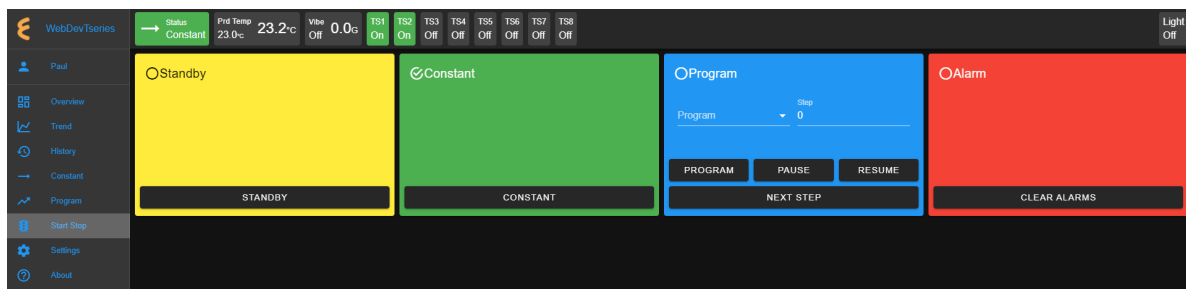


Figure 11.2: The Start/Stop menu with chamber in Constant mode

11.3 Program Mode

In **Program** mode, the chamber is carrying out instructions of the program being executed. The status tab in the status bar indicates the chamber is in **Program** mode, along with the name of the program being executed, as depicted in the following figure. This status is also indicated by the check mark in the circle in the program tab.



Figure 11.3: The Start/Stop menu with chamber in Program mode

11.4 Alarm Mode

In **Alarm** mode, the chamber is in alarm state. It will halt operation until issues are fixed and alarms triggered in the chamber are cleared.

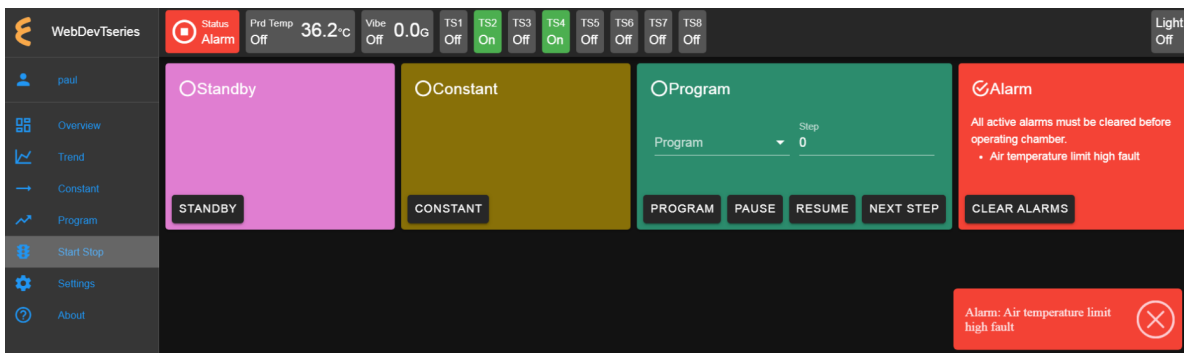


Figure 11.4: The Start/Stop menu with chamber in Alarm mode

As depicted in the above figure, we have one alarm occurred. Three different locations are used to flag the alert and the type of alarms. The status tab in the status bar indicates chamber is in **Alarm** state. A check mark next to the **Alarm** status in the tab of the main display area signifies the **Alarm** state; it also indicates the type of alarm as **Air temperature limit high fault**. An alert message of the nature of that alarm is displayed at the lower right of the main display area. This pop-up message can be suppressed by clicking the **X** button. But, the **Alarm** state still remains until all alarms triggered in the chamber are resolved.

If multiple alarms occurred, multiple alerts are displayed in this lower-right area (in the main display), as depicted in the following figure. A list of alarm types will be displayed in the **Alarm** tab in the main display area, as depicted in the following figure.



Figure 11.5: Managing chamber alarms in the Start/Stop menu

Each pop-up alert may be suppressed or cleared by clicking on their **X** buttons. But, again, the **Alarm** state still remains until all alarms triggered in the chamber are resolved.

11.5 Start/Stop Standby Mode

Authorized users with read-write privilege may set the chamber in **Standby** mode by clicking the **STANDBY** button in the **Standby** tab. In this mode, the chamber is in the **OFF** state. To terminate the **Standby** mode, activation of a new mode is necessary. For instance, to switch the chamber **ON** and to operate in **Constant** mode, click the **CONSTANT** button in the **Constant** tab in the main display area. EWC immediately moves to apply the operating mode to the chamber.

11.6 Start/Stop Constant Mode

Authorized users with read-write privilege may set the chamber to operate in **Constant** mode by clicking the **CONSTANT** button in the main display area. In this mode, the chamber operates by executing the constant settings in the configuration. To terminate the **CONSTANT** mode, activation of a new mode is necessary. For instance, to switch the chamber from its **Constant** mode to **Standby** mode, click the **STANDBY** button in the **Standby** tab. EWC immediately moves to apply the operating mode to the chamber.

11.7 Start/Stop Program Mode

Authorized users with read-write privilege may set the chamber to operate in **Program** mode by performing a series of operations in the **Program** tab. The following subsections describe the procedures how to run (execute) a program, pause, resume or step through the instructional steps in the program.

11.7.1 Run Program

To load and execute a program to control the chamber, complete the following steps:

1. Click the radio button in the **Program** tab to select a program from the list. Apply the scroll bar, if necessary, to search through the long list of programs, as depicted in the following figure.

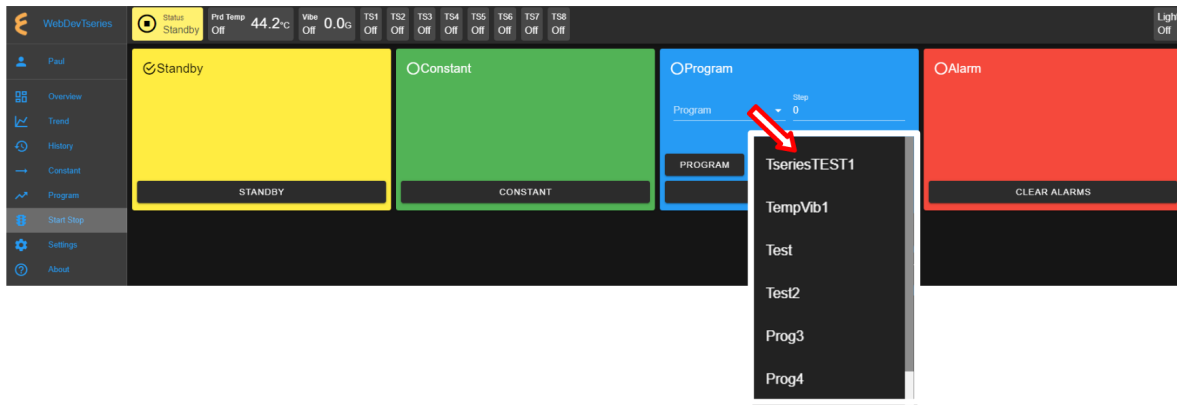


Figure 11.6: Executing a program from the Program List

2. Click to select the desired program name.
3. To start this program at a certain step, enter the step number in the **Step** field. Default setting is 0, which means to start program at step 1.
4. Click the **PROGRAM** button to execute the program. EWC immediately moves to apply the operating mode to the chamber. The status tab and status bar now display the program being executed, as depicted in the following figure. The **Overview** page maybe accessed to display the detail of the program being executed.

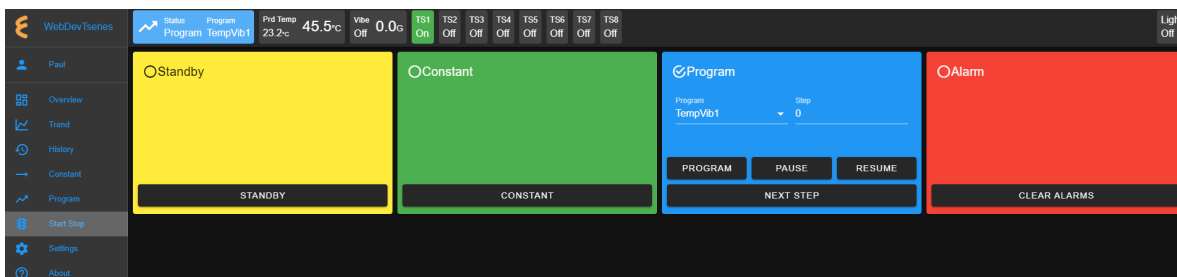


Figure 11.7: Program being executed

11.7.2 Pause/Resume Program

Authorized users with read-write privilege may control the chamber during program execution. **Program** mode may be interrupted and put in a “suspense mode” using the **PAUSE** button in the **Program** tab. To pause a program during execution, click the **PAUSE** button; all operations are suspended. An update notification appears in the lower-right corner. The **Paused** notification is posted in the status tab.

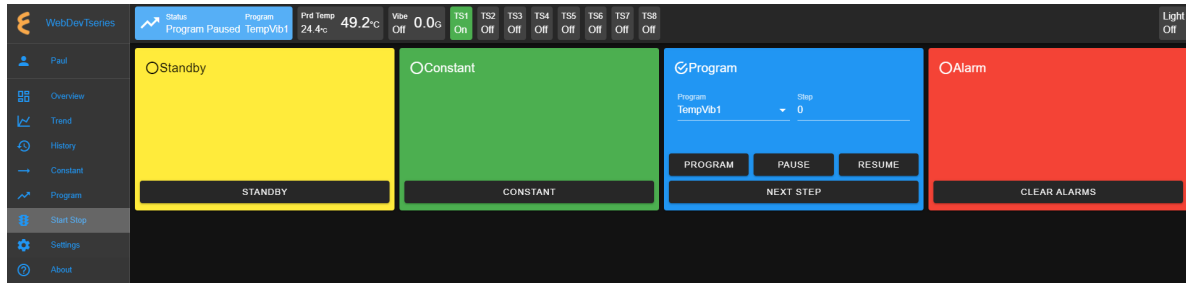


Figure 11.8: Program is paused, all operations suspended

To resume the operation and continue program execution, click the **RESUME** button. An update notification appears in the lower-right corner. The chamber will continue to operate based on instructions in the program. Program name is posted in the status tab to indicate chamber is in **Program** mode and that program (name) is being executed.

11.7.3 Stepping through Program

Without having to wait for each step in the program to complete its tasks for the entire time duration in the instruction, an operator may step through the program to study the effects of the instructions in a certain step. While the program is being executed, click the **NEXT STEP** button to execute the next step in the program. An update notification appears in the lower-right corner to confirm the action. This action may be repeated until the last step in the program is reached. The **Overview** page in combination with the extended tab maybe accessed to display the detail of the program being executed and its steps being stepped through. The following figure depicts program **TempVib1** being stepped through to executing step 4.

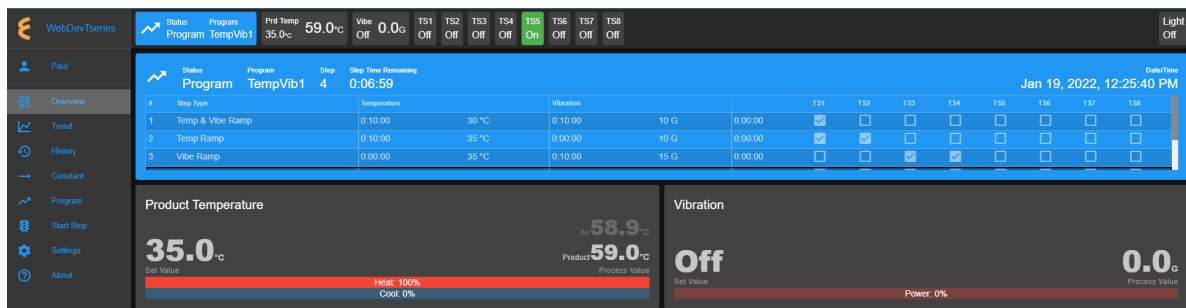


Figure 11.9: Stepping through a program

11.8 Clear Alarms

The chamber is set in the **Alarm** state as a result of an alarm or alarms triggered in and by the chamber. EWC relays all alert messages to the operator for immediate action or intervention to prevent further damage to the chamber or any test products inside the chamber. The **Alarm** tab in the main display area can be used to clear all alarm messages once those alarms are resolved in the chamber. Click the **CLEAR ALARMS** button to clear all alarm messages in order to resume the chamber operation.

11.9 Timers

The **Timers** tab provides a quick way to apply the Macro Editor to automate a simple macro action to extend the operating mode of the chamber. There are two timer types: One-time timer and repeated timer. The one-time timer or one-shot timer allows an operator to set up a single (hence, one-time) operation on the chamber, while the repeated timer permits an operator to set up a repeated operation on the chamber. The repeated timer will operate indefinitely until it is disabled. The following figure depicts these two timer types.

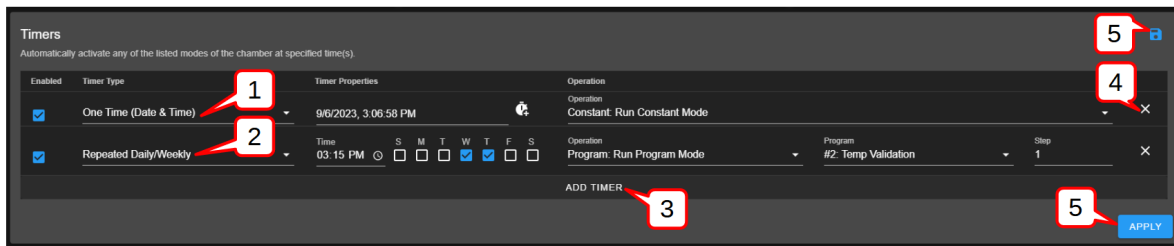


Figure 11.10: Example of one-time and repeated timer operation

1. **One-Time:** This timer fires the constant mode operation at 3:06:58 PM on 9/6/2023. The timer instruction and 3:06:58 PM must be configured ahead of time, later than the current time in order for the operation to take effect. For this reason, EWC date/time must synchronize with the current or local date/time (refer to **Date/Time Settings** under the **Settings** menu for detail). The one-shot timer is date/time dependent.
2. **Repeated Daily/Weekly:** This line is added after the first line got executed. Since it is set to occur after the first line, it will trip at 3:15 PM on Wednesday and Thursday of the week (in reference to the current date/time of EWC). The action executes a program from slot 2 (also referenced by the program name). When program execution is complete, the chamber will be set in the operating mode specified by the instruction in the program. This timer type is date/time independent; the operation will recur until the timer itself is removed from the **Timers** list or disabled with the **Enabled** box unchecked.
3. **Add Timer:** A new timer can be added using the **Add Timer** button, which will be added at the bottom of the list.
4. **Remove/Delete:** Each timer can be removed using the **X** button to its right.
5. **Save/Apply:** To start the timer, the **Save** or **Apply** button must be used. The two timer instructions (depicted above) are saved under the Macro Editor called **Operation Timer 1** and **Operation Timer 2**, respectively. If the timers are edited with new instructions and saved, the system generates a new name **Operation Timer 3** for the third timer, with a numeral incremented by one per each update. If the timer instructions are all removed from the **Timers** list, and a new timer is created and saved, the system starts over with **Operation Timer 1**, with its numeral incremented by one on each new update. This information can be viewed under the **Macros** submenu (under the **Settings** menu).

11.9.1 Program Mode: One-Time Timer

A one-shot timer sets the **Timers** to fire a certain action once based on the set date and time. With this feature, a selected program can start at a certain day and time once. The running pro-

gram can be paused, resumed or stopped by another (subsequent) one-shot timer. An operator can plan to stop a certain program and switch the chamber to a different mode with the one-shot timer.

The following example illustrates how to set a one-shot timer to switch the chamber from **Standby** to **Program** and execute the said program starting with step 1.

1. Log in using the **admin** account
2. Access the **Start Stop** menu
3. Touch or click the **ADD TIMER** bar
4. Select/confirm that **One Time** is selected from the drop-down list of the **Timer** type; by default, **One Time** is selected.

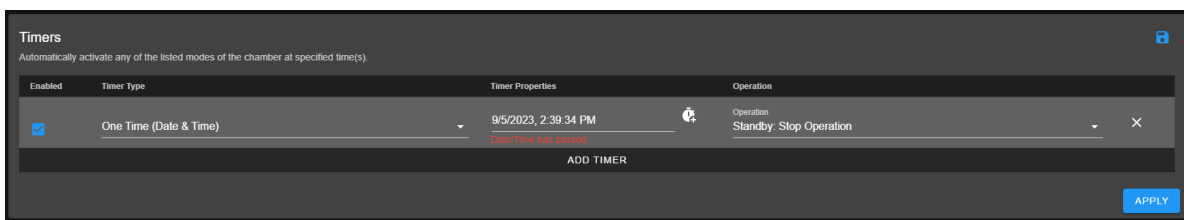


Figure 11.11: Setting a one-time automation

5. Touch or click the date/time field under the **Timer Properties** and apply the calendar and time to set the desired time. **Note:** Date and time must be ahead of the current date and time on the EWC system.

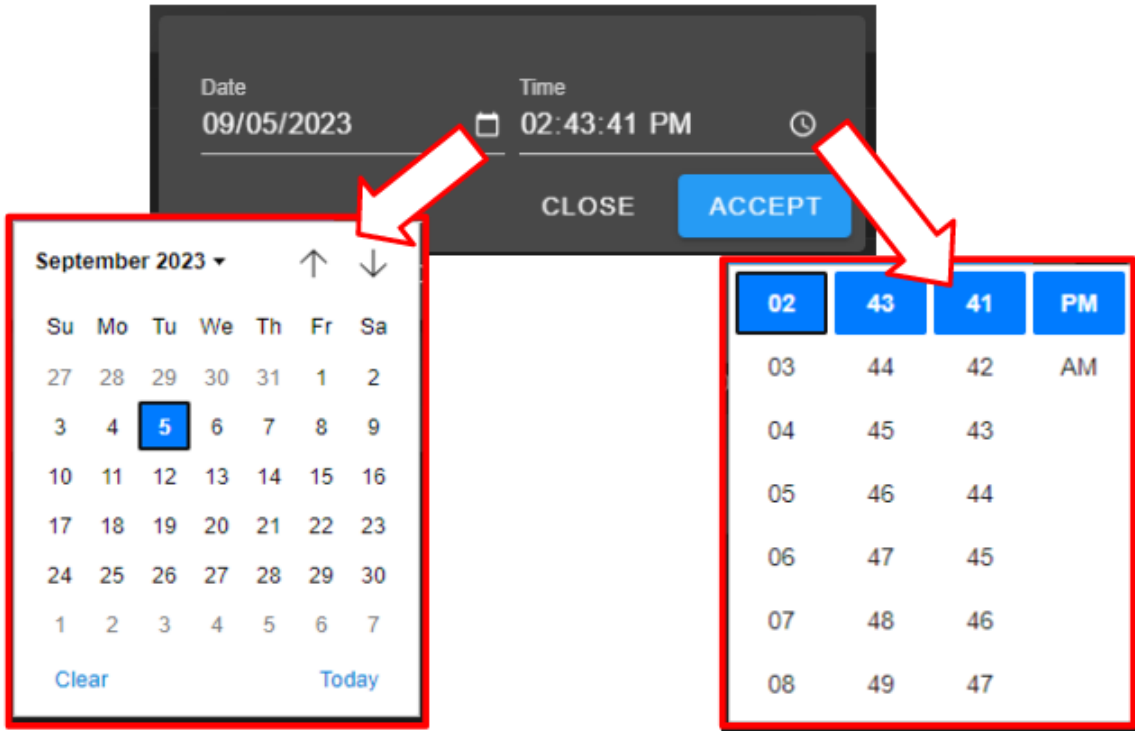


Figure 11.12: Set date/time for a one-shot action

Note: For a one-time operation, it is easier to use the Offset button (on the right of the date/time field) to adjust the future time, as depicted by the arrows in the following figure. Here, EWC will add the time to the current time to calculate when this action will fire.

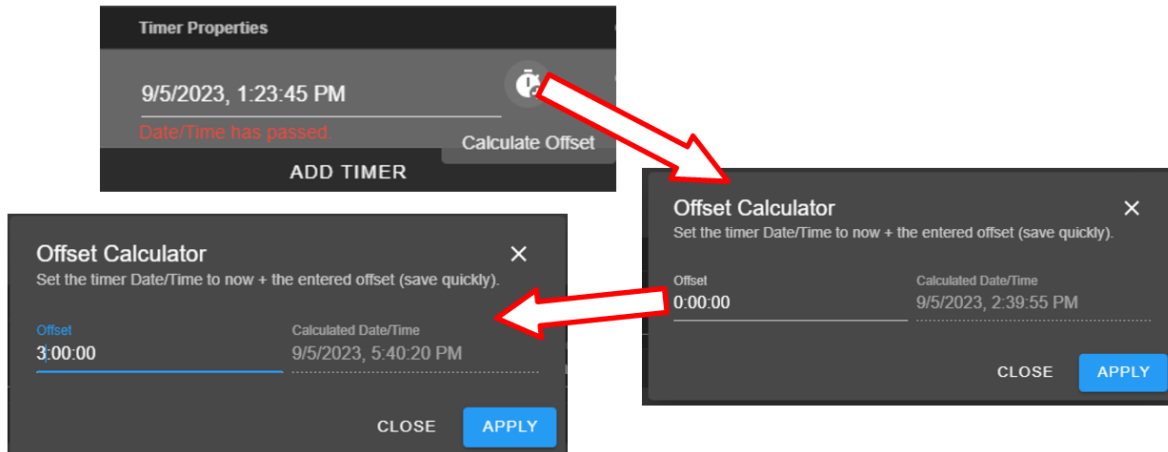


Figure 11.13: Using the time-offset calculator

6. Under **Operation**, select **Program: Run Program**
7. Under **Program**, select a program (by its name) on the program list.
8. Under **Step**, select what step to start
9. Apply the setting with the **APPLY** button

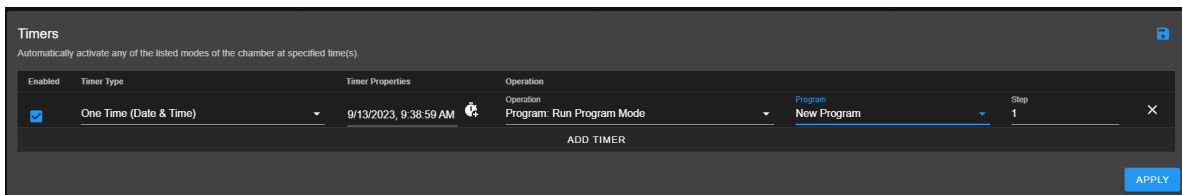


Figure 11.14: Program mode for a one-time start

Note: Both the **Save** and **APPLY** buttons provide the same effect. Either button can be used to save the settings and apply the action.

10. The program (named **NewProgram**), as depicted in the example, will commence at 9:38:59PM (according to the EWC local time).

11.9.2 Removing or Adding a Timer

The one-shot or repeated timer can be removed from or added to the **Timers** list with the **X** or **ADD TIMER** button. Each new timer is added to the bottom of the list and takes effect after each update.

To add a new timer and use it, simply activate the **ADD TIMER** bar. The following figure illustrates how a second timer is added to switch the chamber from a program mode (activated by the first timer) to **Constant**. Here, program **test** gets executed (by the timer in the first line) at 9:58:22 AM, with execution time to last several hours. The timer in line 2 will switch the chamber to **Constant** mode at 10:08:27 AM. **Note:** This is for illustration only; the actual program execution requires more time to prepare the chamber, etc.

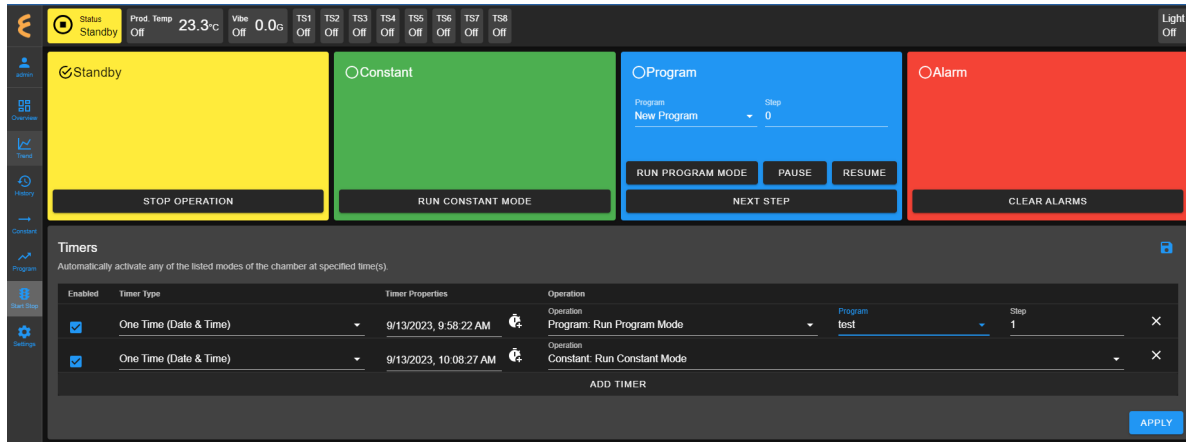


Figure 11.15: Setting additional one-shot timer after the first

Different timers on the list can be enabled or disabled using the **Enabled** box. Additional timer can be added to the **Timers** list and updated to take effect, provided the time is set for future time.

11.9.3 Constant Mode: One-Time Timer

The following example illustrates how to configure a one-shot timer to stop the current program and switch the chamber to **Constant** at a specific time. The timer is configured as a new instance with one line by itself, as depicted in the following figure. The action is instant and the program being executed will be stopped immediately; therefore, the action must be applied with care using the necessary precautions as described in the T-series operation manual.

1. Log in using the **admin** account
2. Access the **Start Stop** menu
3. Clear all or current timer settings with the **X** button (if necessary).
4. Click or touch the **ADD TIMER** bar
5. Confirm that **One Time** is selected (or make selection from the drop-down list).
6. Click or touch the date/time field under the **Timer Properties** and apply the calendar and time to set the desired time.
7. Under **Operation**, select **Standby: Stop Operation**
8. Apply the setting with the **APPLY**. This action script is now saved in the Macros list.

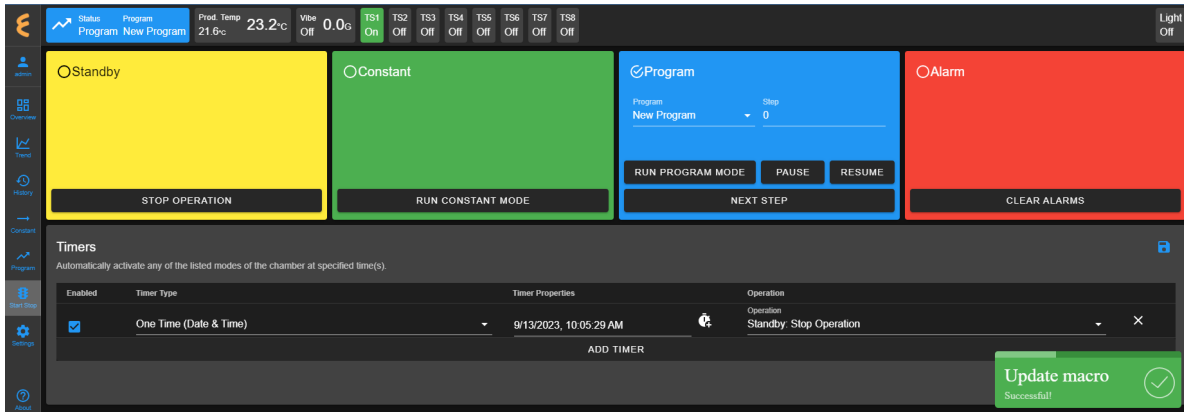


Figure 11.16: Scheduled a one-time timer to set chamber in Constant mode

9. The timer is activated at the set time, as depicted in the Macros list under the Operation Timer 1 script. To view the Operation Timer 1 action, access the **Settings** menu and select **Macros** from the submenu.

11.9.4 Program Mode: Weekly Repetition

With a weekly repeated timer, a program can start on a certain day, at a certain time. The following example illustrates how to execute a program on a weekly basis (one day during each week) at a certain time. Here, we set a program to execute every Wednesday at 10:30 PM.

1. Log in using the **admin** account
2. Access the **Start Stop** menu
3. Clear all or current timer settings with the **X** button (if necessary).
4. Touch or click the **ADD TIMER** bar
5. Under **Timer Type**, select **Repeated Daily/Weekly**
6. Edit the time to 10:30 PM
7. Check the box under W. The calendar format is Sunday(S) to Saturday (S).
8. Under **Operation**, select **Program: Run Program Mode**
9. Under **Program**, select a desired program from the list (program named **NewProgram** was used as an example).
10. Set and select program step 1 to begin execution.
11. Apply the setting using the **APPLY** button. The complete configuration is depicted in the following example.

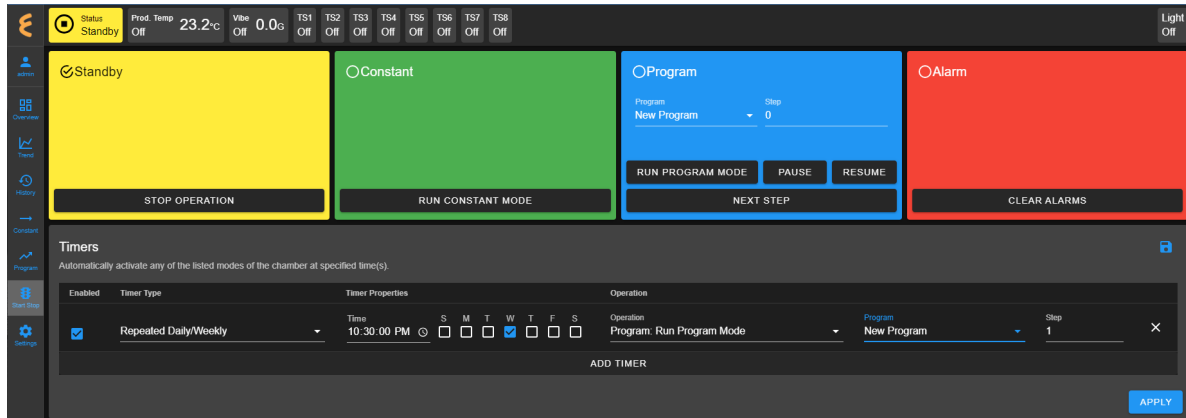


Figure 11.17: Single-day weekly timer

This timer can be disabled or enabled by manipulating the **Enabled** box. If you stop the program or switch the chamber to a different mode (such as, **Constant**), while this timer is still enabled, the selected will recur on Wednesday at 10:30 PM the following week. To disable the timer permanently, it must be removed from the list (with the X and APPLY button).

11.9.5 Program Mode: Daily Repetition

The following example illustrates how to execute a program on a daily basis, from Monday through Friday, at 9:45 AM during each week.

1. Log in using the **admin** account
2. Access the **Start Stop** menu
3. Clear all or current timer settings with the **X** button (if necessary).
4. Touch or click the **ADD TIMER** bar
5. Touch or click **Timer Type** and select **Repeated Daily/Weekly**
6. Edit the time to 9:45 AM
7. Check the boxes under M through F. The calendar format is Sunday(S) to Saturday (S).
8. Under **Operation**, select **Program: Run Program Mode**
9. Under **Program**, select the desired program from the list (**NewProgram** used as an example).
10. Set and select program to begin at step 1.
11. Apply the settings using the **APPLY** button. The complete configuration is depicted in the following example.

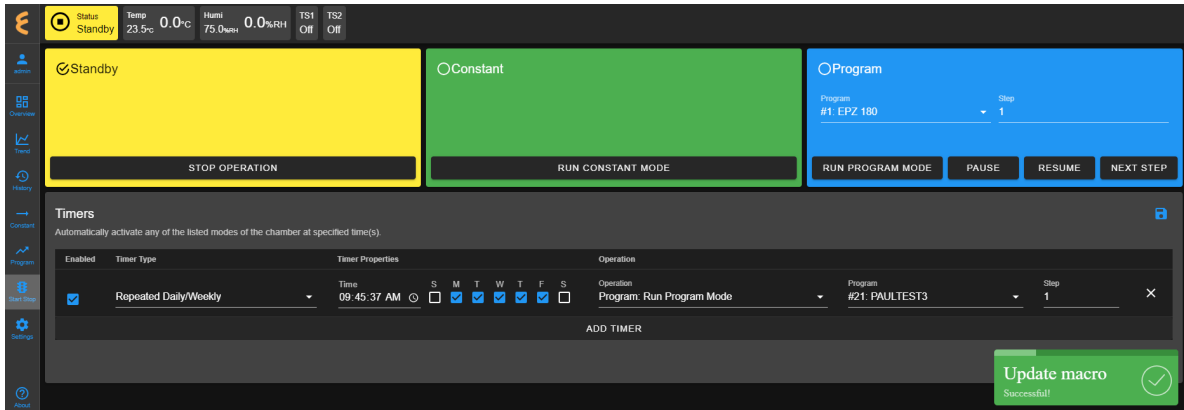


Figure 11.18: Timer setting for everyday of the week

The following trend graph is a typical result of the timer, taken from a different chamber for illustration, with its configuration set to run for several days. The trend graph was produced by extrapolating the data from the last three days (Friday through Sunday). It shows how program was repeated each day at 6:05 PM and ended shortly before 9:00 AM, as indicated by the status bar at the bottom of the graph. The chamber was put in a **Standby** mode until 6:05 PM, at which time the program recurred.

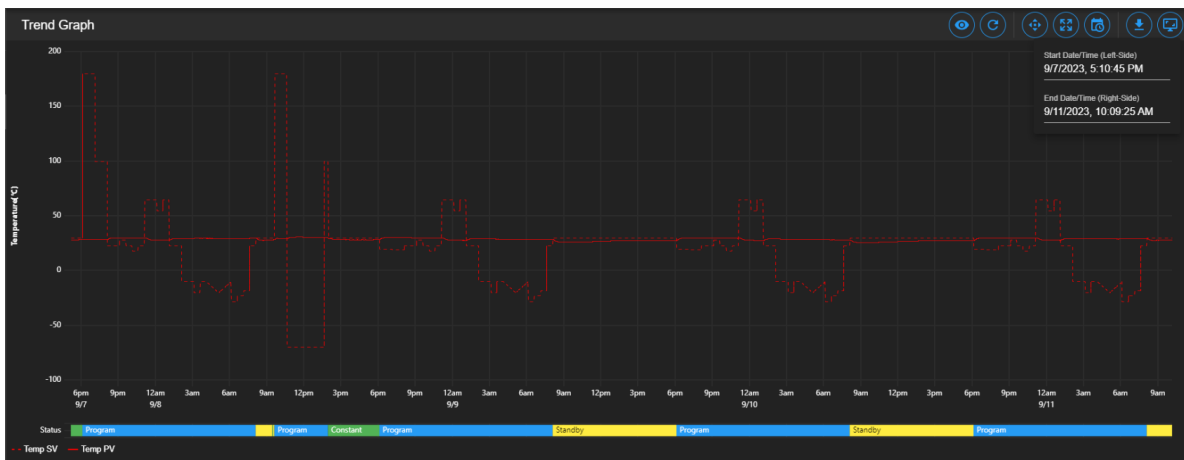


Figure 11.19: Trend graph of chamber controlled by a timer

This timer can be disabled or enabled by manipulating the **Enabled** box. If you stop the program or switch the chamber to a different mode (such as, **Constant**), while this timer is still enabled, the selected program will recur on the next day. To disable it permanently, the timer can be removed from the list (with the X and APPLY button).

11.9.6 Multiple Timers: One-Time or Repeated Daily/Weekly

The **Timers** list may contain multiple timers with different instructions for a specific operation. Multiple timers allow for sequential activations, order of script execution or specific execution via the **enabled** box selection, etc.

The following figure depicts a list of multiple timers, each with a specific function and operation,

which has been prepared to execute in the top-to-bottom paradigm.

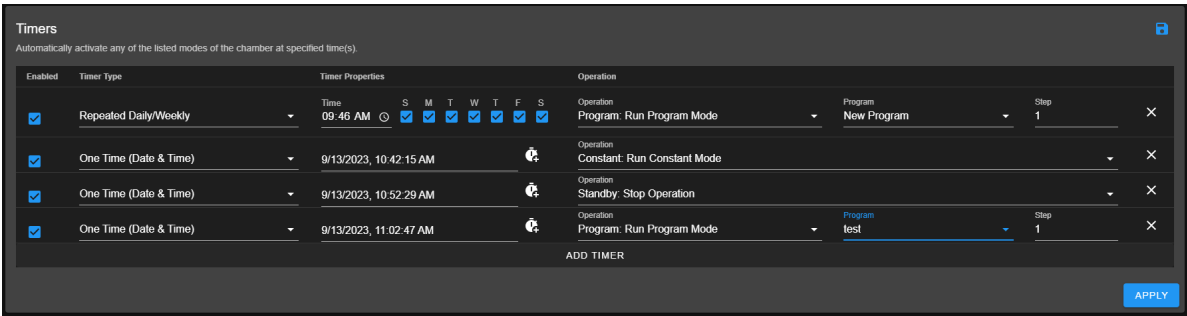


Figure 11.20: Multiple sequential timer operations

Each entry in the above figure is added after the previous one (above it) has been executed. All of which are enabled by default. Only timer 1 (top line) and timer 4 (bottom line) remain in effect, since the middle two are one-shot timers. In addition, the last timer is also a one-shot timer and it will end after the program it has executed has ended. Each timer causes action to take over the previous one.

Part III

ESPEC Chamber with F4T

CHAPTER 12

Overview

The **Overview** page displays the current status of the chamber and its operating mode. A user is brought to this page after logging into EWC. The following figure depicts **Overview** with the chamber in Standby as indicated in the status tab and its extension bar. This extension bar is only available in the **Overview** menu. The date/time posted in the extension bar is the date/time on the chamber/controller. While date/time stamp of data logs and Macros automated actions are based on the date/time on EWC, the controller date/time should also synchronize with that on EWC and the local device (that launched the Web browser). The date/time of EWC can be viewed under the **Settings** menu. It can also synchronize with that on the local device (to be discussed in the **Settings** menu).

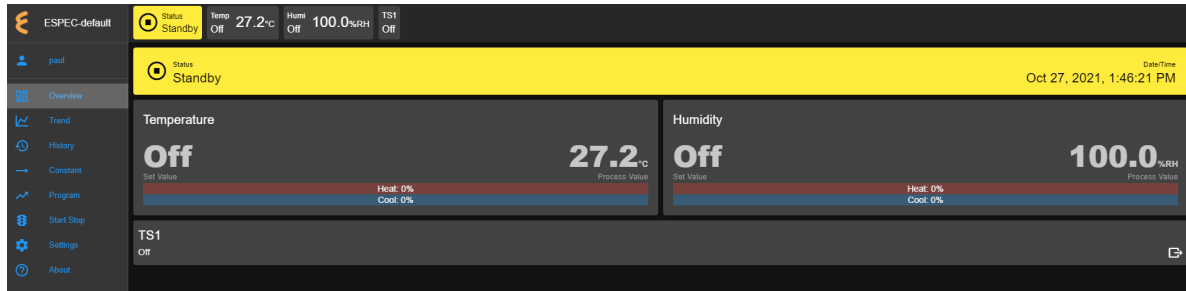


Figure 12.1: Overview page with chamber in Standby mode

The following figure depicts **Overview** showing the chamber in Constant mode.

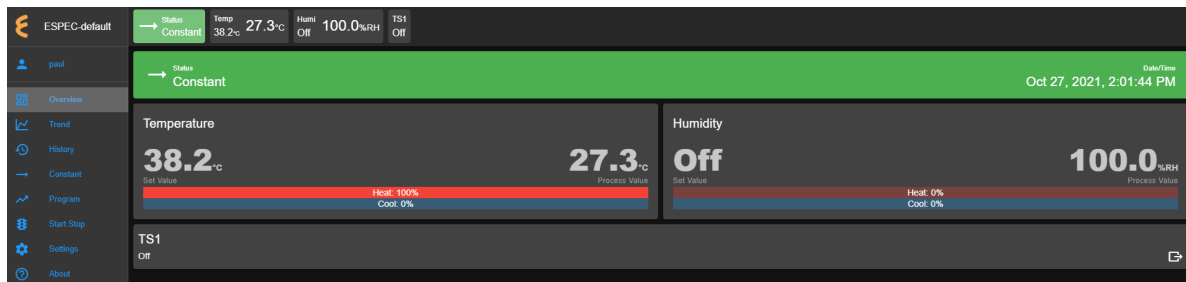


Figure 12.2: Overview page with chamber in Constant mode

The following figure depicts **Overview** showing the chamber in Program mode. Detailed information about the program, including what step is being executed, is listed in the extension bar (of the status tab). This feature provides the operator with useful information about the status of the chamber and the program.

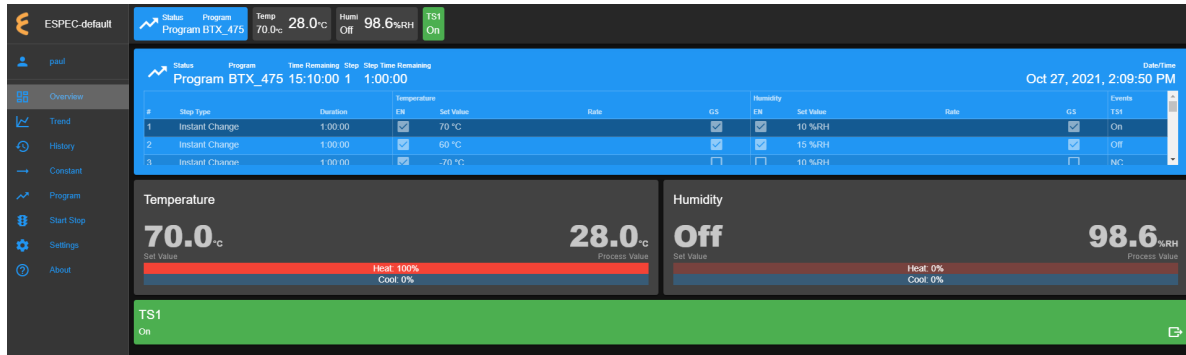


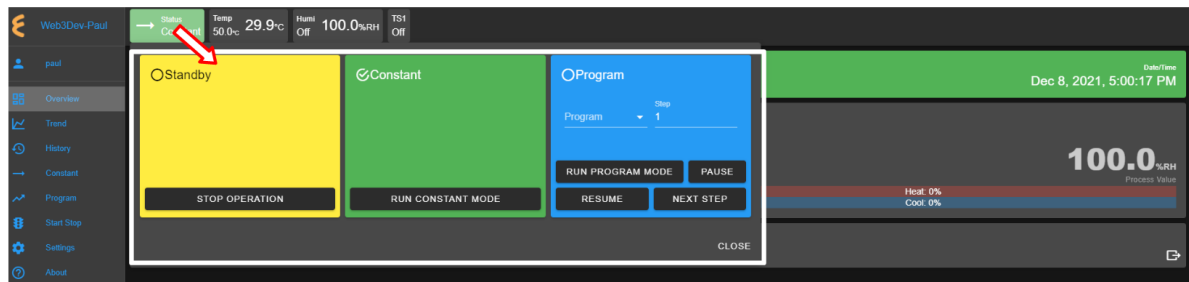
Figure 12.3: Overview page with chamber in Program mode

Only users with read-write privilege can control the chamber operation mode from within this page. Supported operation modes are **Standby**, **Constant** and **Program**. Each tab in the status bar may be accessed to apply new settings at any time. This feature enables the operator to control the chamber without having to access the **Start Stop** menu in the menu bar. The following sections detail a step-by-step procedure how to control the chamber's operating mode via the **Overview** menu for users with read-write privilege.

12.1 Standby Setting

For authorized users with read-write privilege, to set the chamber in **Standby** mode, proceed with the following steps. Initially, the chamber is operating in **Constant** mode. We wish to switch its operation mode to **Standby**.

1. Click the status tab in the status bar to access the drop-down tabs, as shown in the figure.



An alternative way to access these drop-down tabs is to click on the extended tab of the status tab itself, as depicted in the following figure. This extended tab is available only in the **Overview** page.

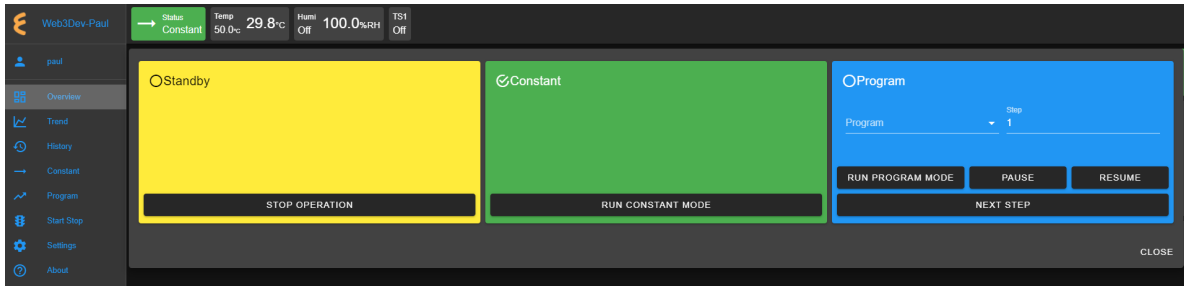


Figure 12.4: Status tab drop-down menu via the extended tab

2. Click the **Stop** button in the standby tab. EWC immediately moves to apply the operating mode to the chamber. A check mark in the **Standby** tab indicates and confirms its standby mode.
3. To close the drop-down tabs, perform one of the following action:
 - Click an empty area in the Main Display.
 - Click a different menu in the menu bar.
 - Click the status tab itself. or
 - Click the **CLOSE** button underneath the alarm tab.

12.2 Constant Setting

Suppose the chamber is in **Standby** mode. For authorized users with read-write privilege, the chamber can be set in **Constant** mode with the following steps.

1. Click the status tab in the status bar. As depicted in the following figure, the chamber is in **Standby** mode.

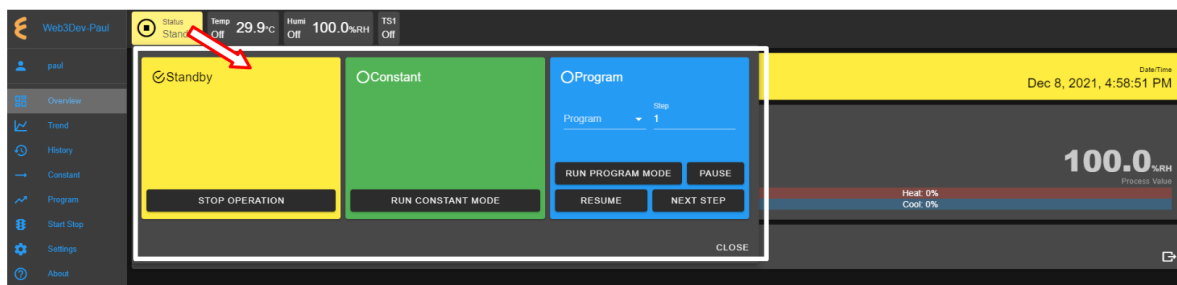


Figure 12.5: Constant mode setting

2. Click the **CONSTANT** button in the constant tab. EWC immediately moves to apply the operating mode to the chamber.
3. To close the drop-down tabs, click the **CLOSE** button in the lower-right corner (underneath the alarm tab); or the one of the alternative options mentioned above.

12.3 Program Setting

To set the chamber in **Program** mode means a profile (i.e., program) is loaded and executed.

1. Click the status tab in the status bar or the extension bar of the status tab.
2. Click the radio button in the program tab to access the program list (see the figure below).

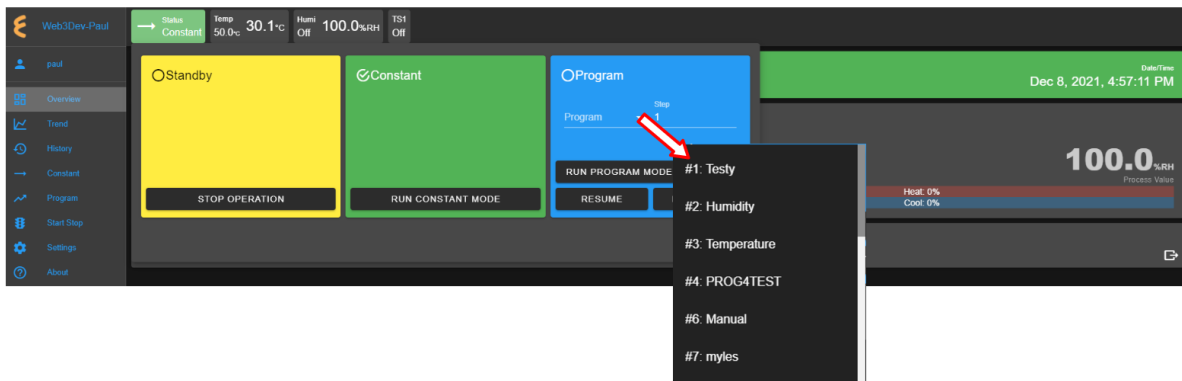


Figure 12.6: Select program to start chamber in Program mode

If no program is available for loading, the list contains slot numbers without programs, as depicted in the following figure. A program must be created first before it can be loaded for execution. Chapter 8 discusses how to create a program to control the chamber.

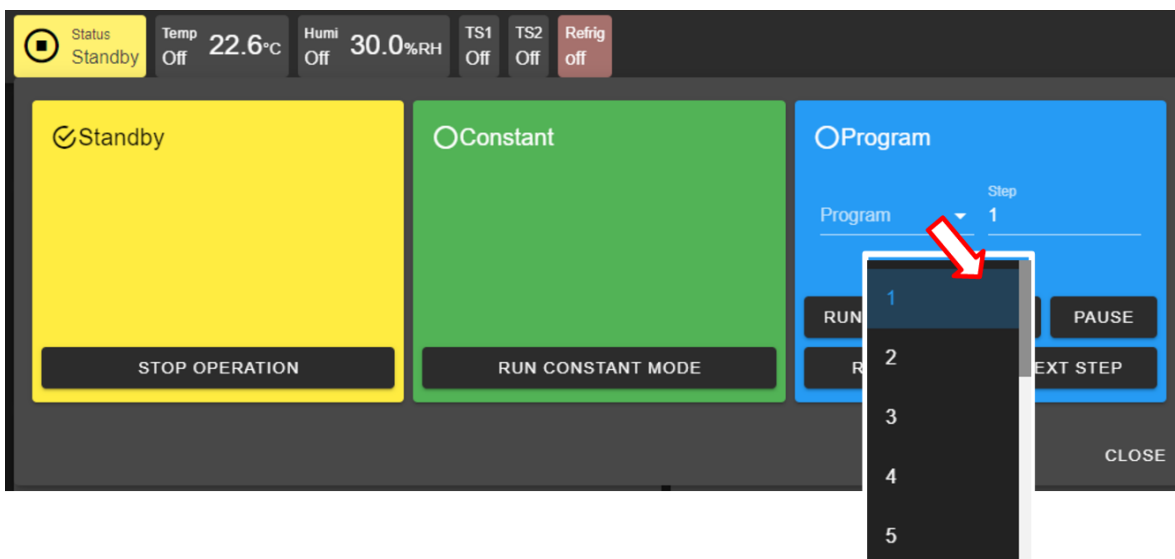


Figure 12.7: No program available for execution

3. Click to select a program from the list. Apply the scroll bar, if necessary, to select the desired program.
4. Enter a desired step number in the step field for program to start. Default start step is 1.
5. Click to select a program from the list. Apply the scroll bar, if necessary, to select the desired program.
6. Enter a desired step number in the step field for program to start. Default start step number is 1.

7. Click the **RUN PROGRAM MODE** button to execute the program. EWC immediately moves to apply the operating mode to the chamber. Note: This program tab offers a few practical methods during a program execution. The **Pause** button can be used to pause the program. Program can be resumed via the **RESUME** button. Program instruction lines can be stepped through via the **NEXT STEP** button.
8. Click the **CLOSE** button to view the status of program execution displayed in the extended tab.
9. To end or interrupt the program being executed, switch the chamber to **Standby** or **Constant** mode via the **Status** tab.

12.4 Clear Alarms

When EWC detects that the chamber is in an alarm state, it also sets itself in an alert state by displaying a list of active alarms and fault names in the red window to require an immediate action from the operator, as depicted in the following figure.

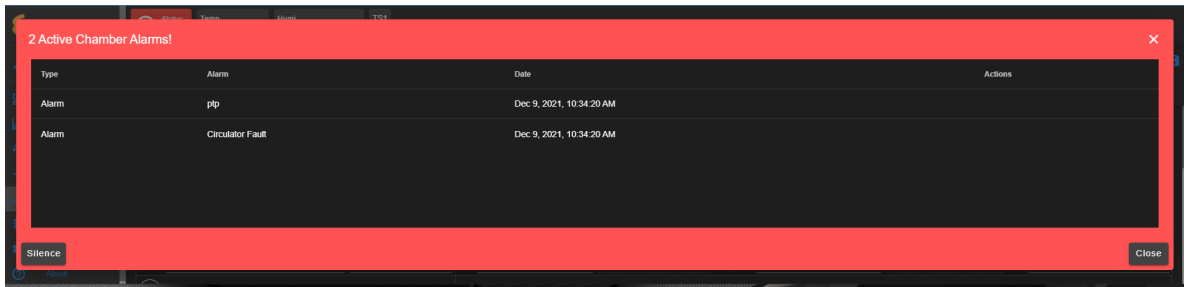


Figure 12.8: Chamber in alarm state

A repeating beep on the local computer controlling EWC via the Web browser is also tripped to get the operator's attention. The **SILENCE** button can be used to turn off the beep. This alert window can be closed by clicking the **CLOSE** button or the X button. However, the alarm state still remains to be resolved as indicated by the **Status** tab in the following figure. To redisplay or expand the alarm list, click the red dot in the lower-right corner.

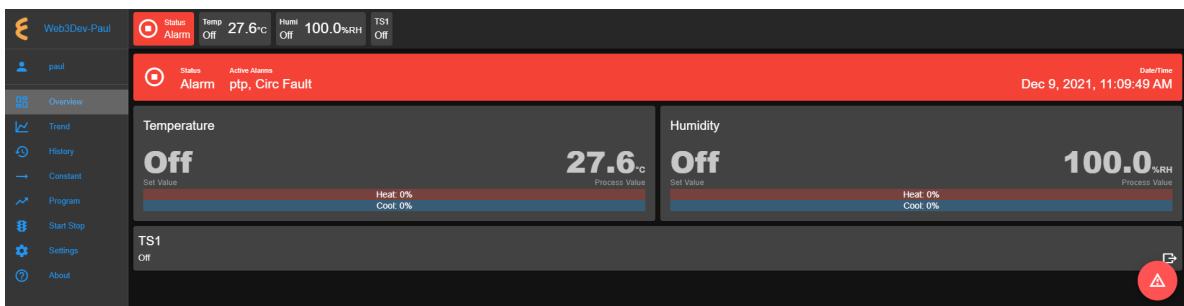


Figure 12.9: Alarm state in overview page

In an alarm state, operation is halted until all alarms triggered by the chamber are resolved. Once all alarms are cleared, EWC automatically clears all alert messages and resumes normal operation by switching the chamber to a **Standby** mode, as depicted in the following figure.

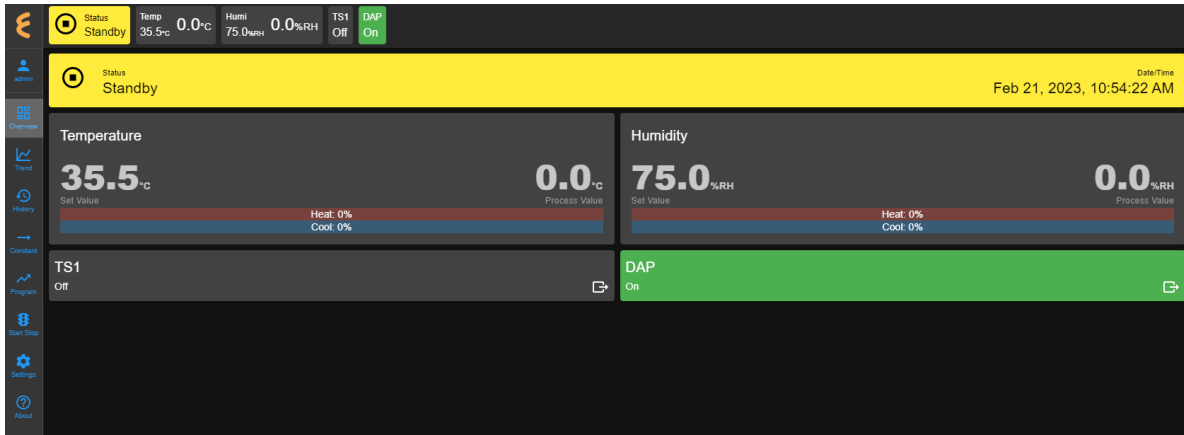


Figure 12.10: Standby mode after alarms are cleared

12.5 Temperature, Humidity or Time Signal Settings

On the **Overview** page, settings of temperature, humidity or time signals can be controlled via the tabs in the status bar or the dedicated panes in the main display area, as shown in the following figure.

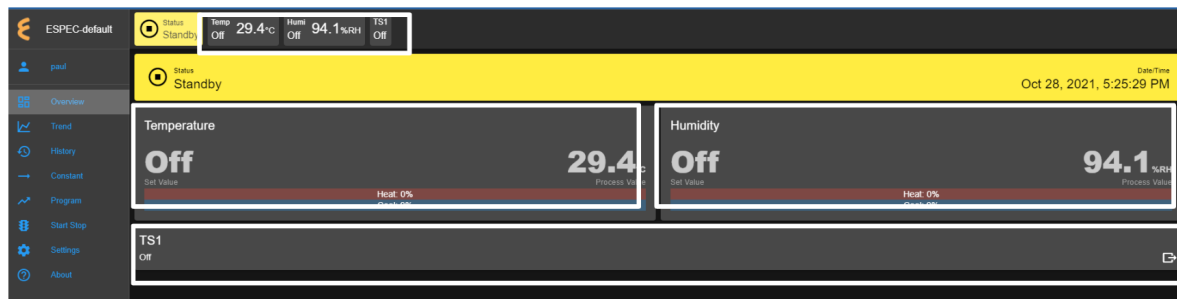


Figure 12.11: Perform settings via the main display area

12.5.1 Settings via the Status Bar

To set temperature with a new set value, complete the following steps:

1. Click the Temp tab in the status bar.
2. In the drop-down pane, click and enter new value in the Set Value field or click the up/down arrow to adjust the value, as illustrated in the following figure.

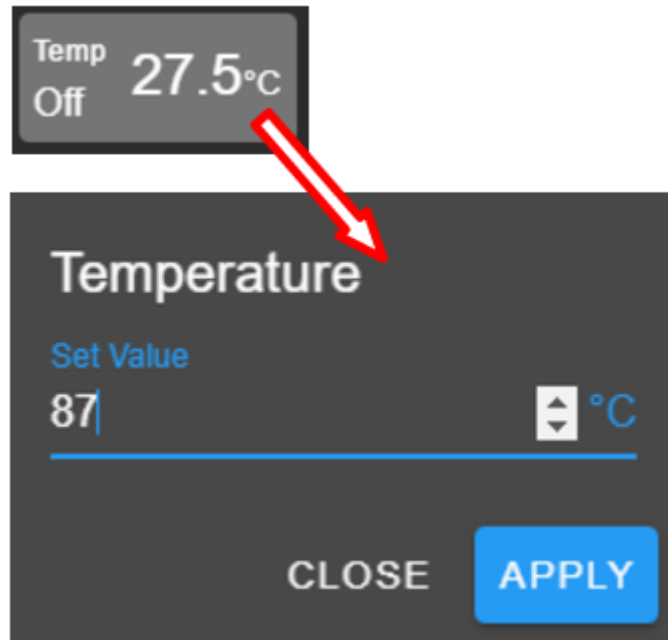


Figure 12.12: Setting new temperature value via the temp tab

3. Click **APPLY** to apply the new setting.
4. To cancel the setting, click the **CLOSE** button.

To turn on Humidity and set its value, complete the following steps:

1. Click the Humi tab in the status bar.
2. In the drop-down pane, check the box to enable humidity.
3. Click and enter new value in the Set Value field or click the up/down arrow to adjust the value, as illustrated in the following figure.

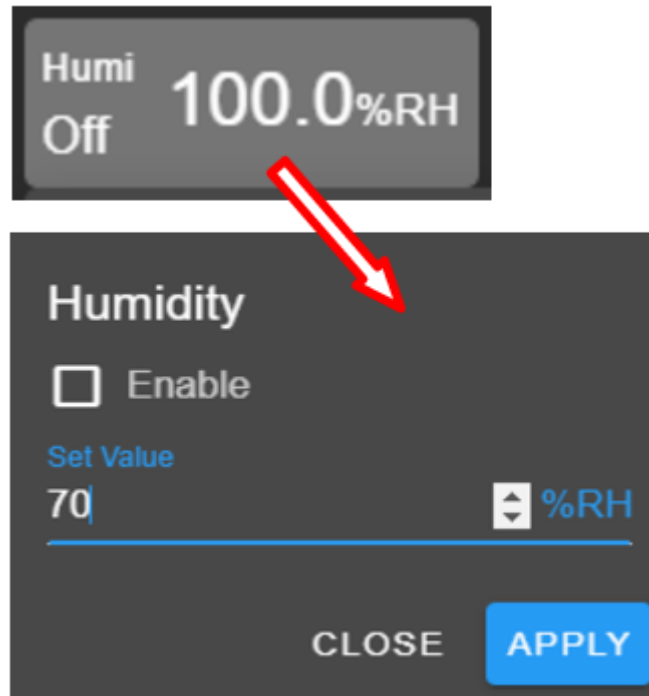


Figure 12.13: overview-humi-tab-setting-02.PNG

4. Click **APPLY** button to apply the setting.
5. To cancel the setting, click the **CLOSE** button.

The time signals in the status bar can be switched on or off individually. The following steps illustrate how to turn on TS1. The rest of the time signals, if available, can be applied using the same method:

1. Click the TS1 tab in the status bar.
2. Check the box to enable TS1.
3. Click **APPLY**.
4. To cancel the setting, click **CLOSE** (instead of **APPLY**) or click the TS1 tab itself in the status bar.

To turn off TS1, apply the following steps:

1. Click the TS1 tab in the status bar.
2. Uncheck the box to disable TS1.
3. Click **APPLY**.
4. To cancel the setting, click **CLOSE** (instead of **APPLY**) or click the **TS1** tab itself in the status bar.

12.5.2 Settings via the Dedicated Panes

With EWC, there are multiple ways to complete the same task. The dedicated panes for temperature, vibration or humidity, time signals, or refrigeration, in the main display area are actually clickable panes. These are CTA (call-to-action) panes through which new parameter settings

(such as, temperature, vibration or humidity, time signal and refrigeration) can be applied.

To apply a new setting to temperature, proceed as follows:

1. Click the Temperature pane.
2. In the input pane, click and enter new value in the Set Value field or click the up/down arrow to adjust the value, as illustrated in the following figure.

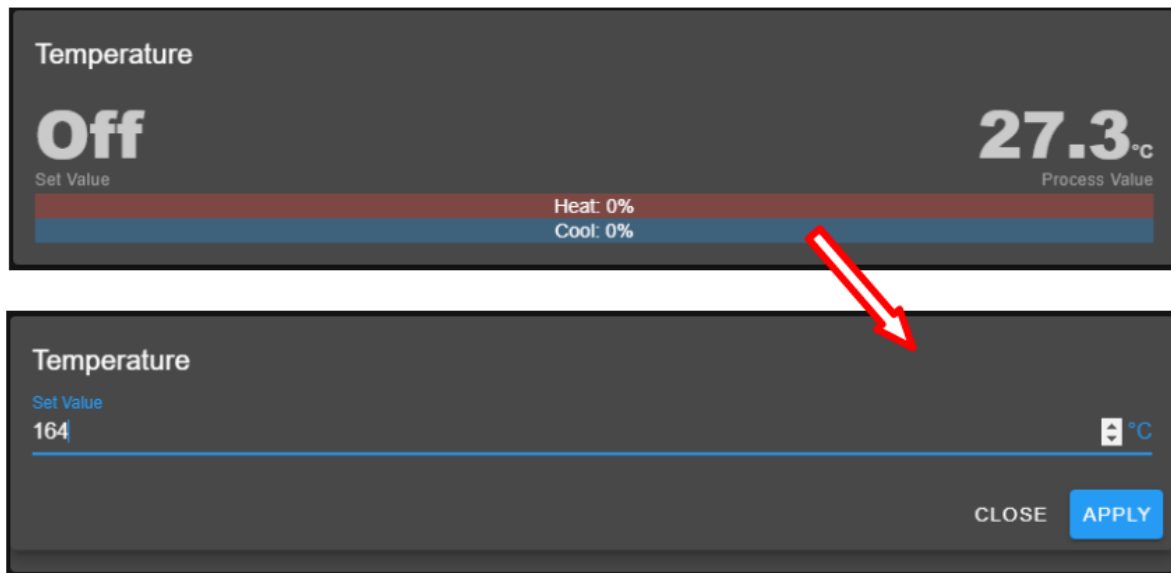


Figure 12.14: Setting new temperature value via the temperature (CTA) pane

3. Click **APPLY**. To cancel the setting, click **CLOSE** (instead of **APPLY**).

The above procedure can be applied to humidity and time signal.

CHAPTER 13

Trend

The **Trend** menu can be used by an operator to view a scatter plot of data points collected during the chamber operation. Data collection can occur in two distinct modes: **Always** and **When Chamber is on**. These two modes are selectable and configured under the **Data Logging Settings** submenu found under the **Settings** menu. Plot elements and detailed configuration of the trend graph will be discussed on **Data Logging Settings** page in the **Settings** menu.

By default, the trend graph provides a scatter plot of data points collected during the last hour. Various options of plot range of data points accumulated more than one hour can be selected. Data can be downloaded in whole or in portion to be stored on the local computer as CSV file.

13.1 Trend: Components

There are seven different groups that make up the main display of **Trend** and the scatter plot, as depicted in the following figure. The scatter plot shown in the figure is a result of the data points being collected with the chamber in program mode. Detailed descriptions of these groups based on the labels in the figure are outlined as follows:



Figure 13.1: Trend graph showing plots of current data from the chamber

1. **Trend Graph:** Data points collected from the chamber are rendered as a trend graph based on a scatter plot methodology. These data points—product temperature, air temperature, humidity, vibration, etc.—are plotted as a function of time. Temperature is displayed in degree Celsius, vibration in root-mean-square of acceleration (Grms or G), etc. The vertical y-axis represents the scale of these values. The horizontal x-axis represents the data logging runtime. Based on the default configuration, the chamber logs data points in a 10-second interval (refer to the **Data Logging Settings** submenu, under **Settings**). Depending on the type of chamber, data logging interval can be set to lower than 10 seconds. The grid scaling on both the y- and x-axes will change according to the application of the Pan/Zoom Controls buttons or the drag-and-select via the mouse and scroll wheel. Default setting can be restored by clicking the refresh button on the Web browser (not shown in the above figure).
2. **Trend Graph Manipulation Buttons:** Seven manipulation buttons are available to help manipulate and control the trend graph features and options. Detailed functionality and operation of these buttons are discussed in the following section.

3. **Snapshot of Data:** By hovering a mouse pointer on the trend graph area, a snapshot of the data at a particular time is displayed (shown in the figure). This feature allows a quick peek of the data at a certain point in time. Depending on the chamber's condition, the snapshot displays set values (SV) and process values (PV) of temperature, product or air temperature, or vibration, chamber operating mode or status, as well as program name and alarm. The contents in the snapshot are based on the selected options displayed in the legend set by the **Graph View** button of item 2 (above); and the color scheme selection under the **User Interface Settings** submenu (found under the **Settings** menu).
4. **Y-axis Label:** The y-axis displays the selected type of data points to be plotted, such as Temperature, Humidity, Vibration ,etc. These values are populated based on the selection of the **Graph View** under item 2 (above).
5. **Line Graph:** Different types or styles of graph—solid line, dashed line and color—are used to designate each type of data points in the plot to help for visualization and readability. As depicted in the figure, solid line represents process values, while dashed line represents set values with a distinctive color, as indicated in the legend (see item 7).
6. **Status:** Status of chamber operating mode is displayed along the time line on the trend graph, indicating when and how long the chamber was in specific operating mode. This feature provides a quick preview of the chamber operating status. The **Pan/Zoom button of Trend Graph Manipulation Buttons** (item 2) may be used to manipulate the display and shift the graph back into the past to view the chamber's operating mode.
7. **Legend of Trend Graph:** The legends are used to identify each item on the trend graph with color code, as well as line/dash graph, to designate the different type of data being plotted.

13.2 Trend Graph Manipulation Buttons

The following is a detailed list of the seven **Manipulation Buttons** of **Trend Graph**, item 2 in the previous figure.

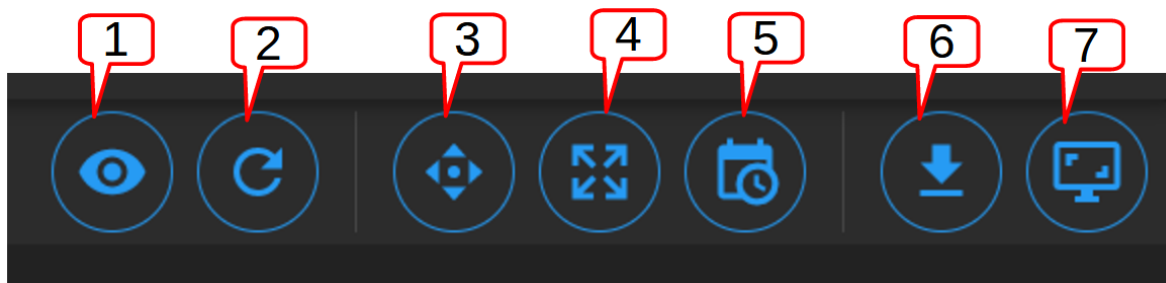


Figure 13.2: Trend Graph manipulation buttons

1. **Graph View:** Data visualization is very important. Elements or components of the trend graph are predefined by the configuration set in the **Data Logging Settings** submenu (found in the **Settings** menu). The **Customize** option depicted below allows the operator to select what to include in the trend graph to help simplify data visualization. Three different options represented by the arrows in the figure can be selected. The minimum and maximum Y range can be adjusted over the default values to help scale the graph for better

visualization; different data types can be enabled for display. The **Save** button (last arrow) can be applied to save the settings and render the graph.

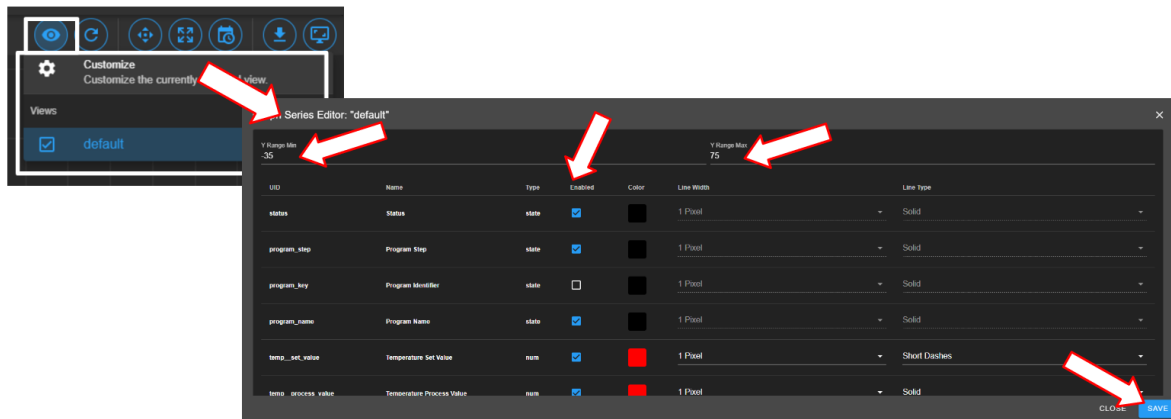


Figure 13.3: Tread graph view and custom settings

2. **Auto Refresh:** This Auto Refresh button reconstructs the graph to include data points up to the current time. Suppose a scroll wheel was applied to zoom out the trend graph that included future time which data points have not yet been sampled, as shown in the figure below.



Figure 13.4: Off-scaled trend graph including future time (no data points)

The auto refresh button will rescale the graph to eliminate the gap (future time) on the right to expand and display the trend graph up to the current time.

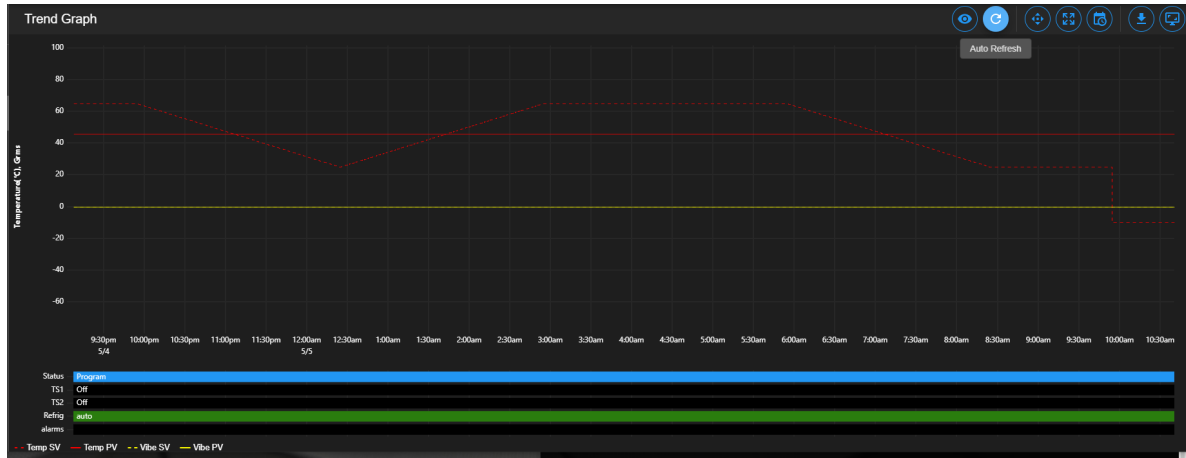


Figure 13.5: Trend graph rescaled with current time

3. **Pan/Zoom Controls:** The Pan/Zoom Controls button allows the operator to control and adjust the viewable section in the trend graph. This button presents six operation buttons to manipulate and display the trend graph as follows:

- **Zoom In:** The **Zoom In** button allows the operator to zoom into a small section of the trend graph. Depending on the degree of zooming, the display area will be confined to a small set of data points ranging between minutes to hours. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Zoom Out:** The **Zoom Out** button does the opposite by allowing the operator to zoom out on the trend graph, thereby giving the operator an expansive view of the trend graph. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Move Up:** This button allows the operator to move up the graph along the vertical axis to adjust the viewable area of the scatter plot. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Move Down:** This button allows the operator to move down the trend graph along the vertical axis with the purpose to adjust the viewable area of the scatter plot. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Move Left:** This button allows the operator to pan left on the trend graph, offering a quick preview of a plot of data points tracing back the time in hours or days. With this feature, the operator can quickly gain a preview of past data points which the operator may have missed.
- **Move Right:** This button does the opposite to **Move Left** by allowing the operator to pan right on the trend graph to the current time. To reconstruct the trend graph to contain the most recent data points, the **Auto Refresh** button allows the quickest operation.

4. **Zoom Extents:** With this button, trend graph may be provided using data points from within the last one hour, last two hours or the last six hours. To make adjustment of the trend graph based on these three selections, click on the **Zoom Extents** button, then click one of the selection from the drop-down menu.
5. **Plot Range Selectors:** Data points can be selected from start date/time to end date/time to produce a desired trend graph. Arbitrary date and time can be selected for the plot range, as depicted in the following figure.

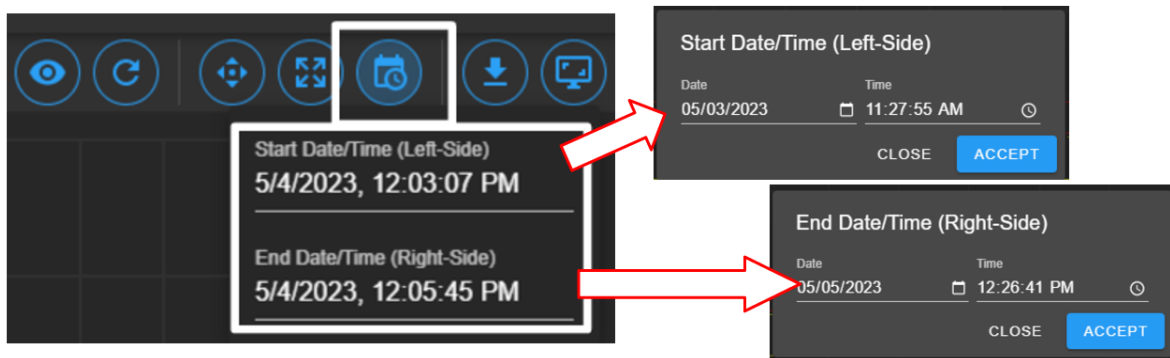


Figure 13.6: Plot range for start date/time and end date/time

To set the plot range,

- access the **Plotted Range Selectors** button.
 - access the **Start Date/Time**; edit date (m/d/y) and time (H:M:S) fields or apply the calendar and clock icons to select date/time.
 - apply **ACCEPT**
 - access the **End Date/Time**; edit date (m/d/y) and time (H:M:S) fields or apply the calendar and clock icons to select date/time.
 - apply **ACCEPT**. Note: Values of end date must be later (or greater) than start date.
6. **Download Data:** To download data and store it on the local computer, click the **Download Data** button and select **Download Current View** to download a portion of data from the displayed trend graph. To download the entire collection of data, select **Download All Data**. Data file will be stored in the Downloads folder of the local computer with filename: hostname_data_date.CSV.
 7. **Capture Screenshot/Download:** Trend graph can be captured, downloaded and stored on the local computer in PNG file, as shown in the figure.

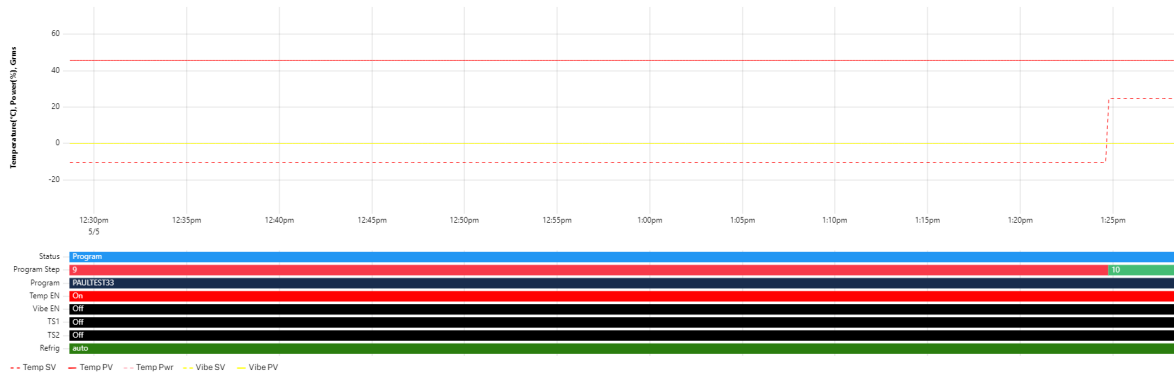


Figure 13.7: Screenshot of trend graph

13.3 How to Handle Downloaded Data File

Data points collected from the chamber are stored in CSV format. The recorded time of the data points is stored based on a UTC (or Universal Time Coordinated, previously referred to as the GMT) instead of the local time. To preserve the integrity of the CSV file and its UTC time stamp, do not rename the data file with MS Excel extension or attempt to open it directly with MS Excel. Any attempt to force open it in MS Excel will result in the wrong time conversion as shown in the following figures.

The following figure displays the CSV file which was directly opened with MS Excel. The time stamp in the first column is wrong; it is still based on UTC time stamp indicated by the arrows.

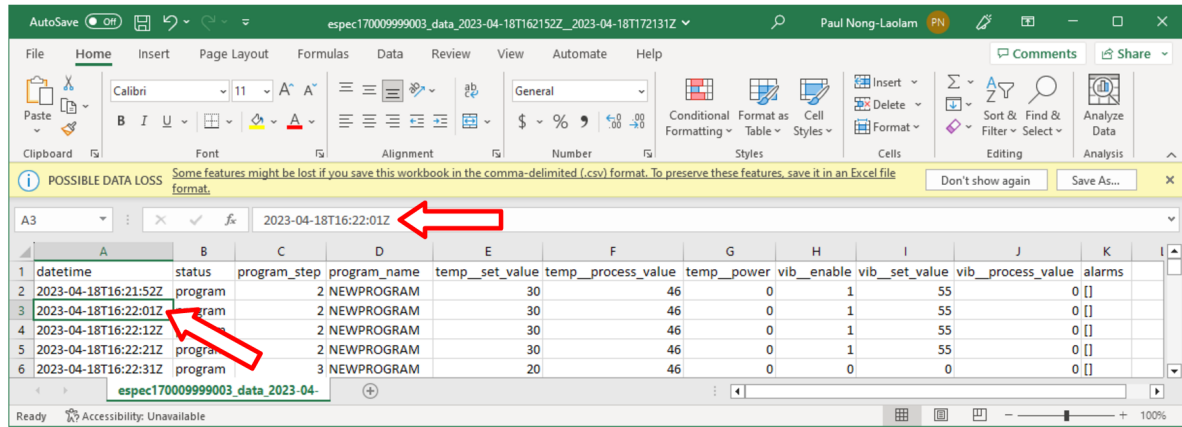


Figure 13.8: Data file improperly open in MS Excel

The following figure displays the same CSV file which was properly imported into MS Excel with the correct time stamp conversion for local time indicated by the arrows.

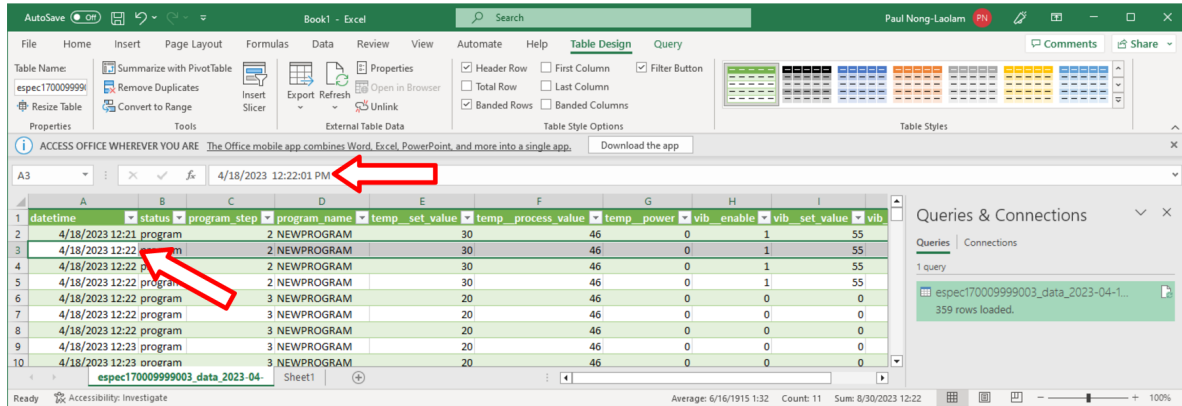


Figure 13.9: Data file properly imported into MS Excel

The proper way to handle this CSV file is to import it using the following procedure to render the correct conversion of the UTC time to the local time on all data points.

Complete the following steps:

1. Select **Trend** in the main menu bar
2. Click the **Download** button (item 6 in the previous section) to download the data (current view or entire data) in CSV file
3. Launch MS Excel and start a new blank spreadsheet
4. Click the **Data** ribbon
5. Click **From Text/CSV** (that appears under the **Home** ribbon)
6. In the **Import Data** Window explorer, open the **Downloads** folder and select the downloaded CSV file (in step 2) and click the **Import** button (in the bottom).
7. Click the **Load** button to load data into the current spreadsheet.
8. To save the current spreadsheet as Excel Workbook, click **Save As** and follow the standard steps to complete the process.

CHAPTER 14

History

The **History** page displays operation history of the chamber, its operating modes and statistics. Any alarms or alerts that were triggered during the chamber's operation are logged and displayed here. By default, history log of the chamber's operating modes, alarms or statistics from the previous week will be displayed, as depicted in the following figure. There are five important components in the **History** main display area. They are labeled and described as follows:

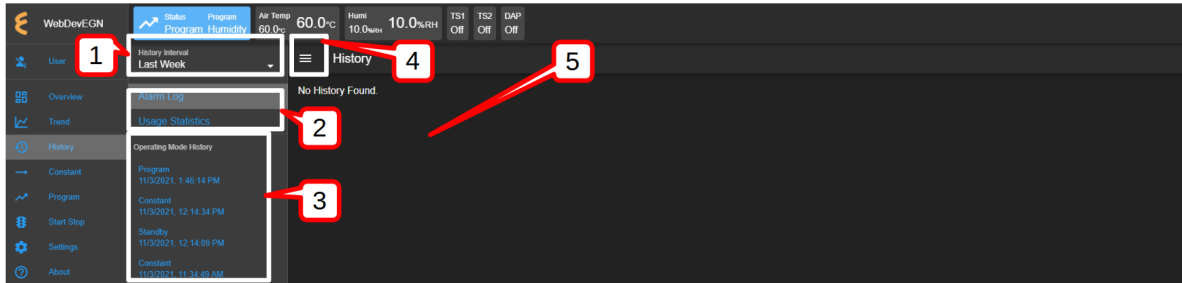


Figure 14.1: Operation history of the chamber

The nomenclature of the **History** page is described as follows:

1. **History Interval:** Display options of the operating history are: one week, two weeks, one month, three months, six months, one year or the entire period of the chamber's operation. To access the history interval, click the radio button to select the period from the list.

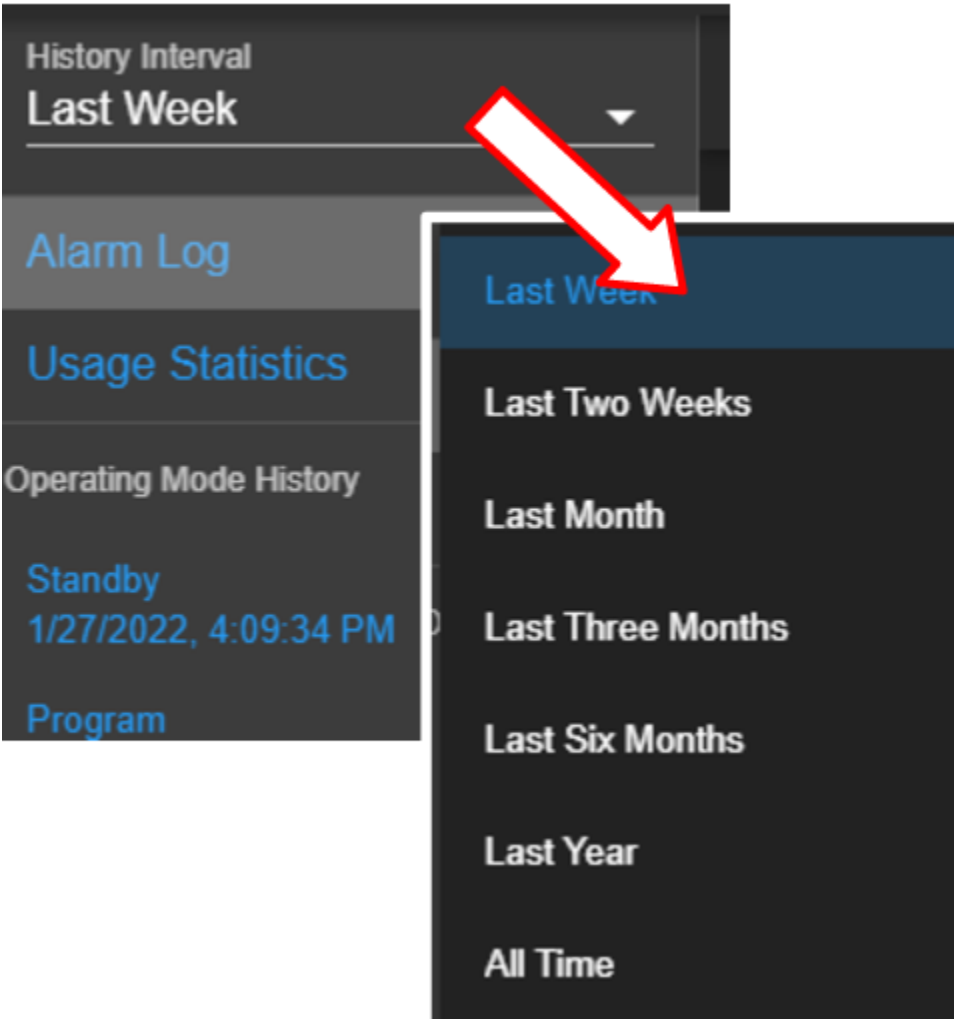


Figure 14.2: History interval and display selection

2. Alarm or Statistics Submenus:

- **Alarm Logs:** By default, alarm logs will be displayed in the main display area. The logs indicate which alarm had occurred and when they were resolved (cleared). Most recent events are listed at the top. To view detail of each log, click on its name (with its log date and time).

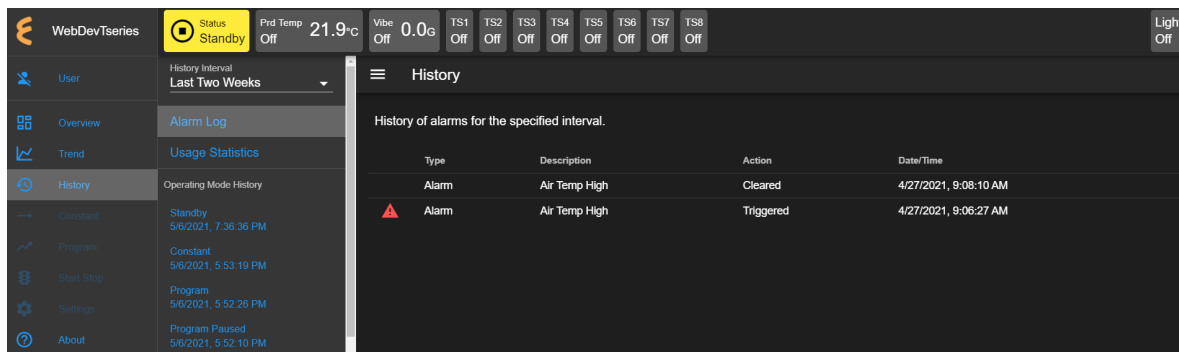


Figure 14.3: History of alarm

- **Usage Statistics:** To display the operation statistics, click on this submenu. Percentage of each operation mode based on the selection period in the **History Interval** is displayed as shown in the following figure:

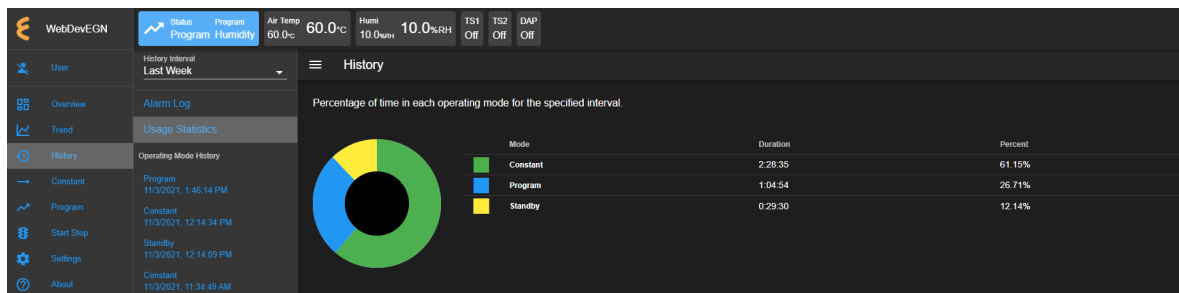


Figure 14.4: Operation statistics

Such information provides the operator a good idea of the overall performance of the chamber by identifying when and how much time it was in a certain operating mode.

3. **Operating Mode History:** A list of operating modes of the chamber is displayed here based on the option selected under the **History Interval**. Default listing is based on a one-week interval. A trend graph, identical to that produced in the **Trend** menu, based on the data points collected during the operating mode can be produced by clicking on the particular operating mode on this list, as illustrated in the following figure.

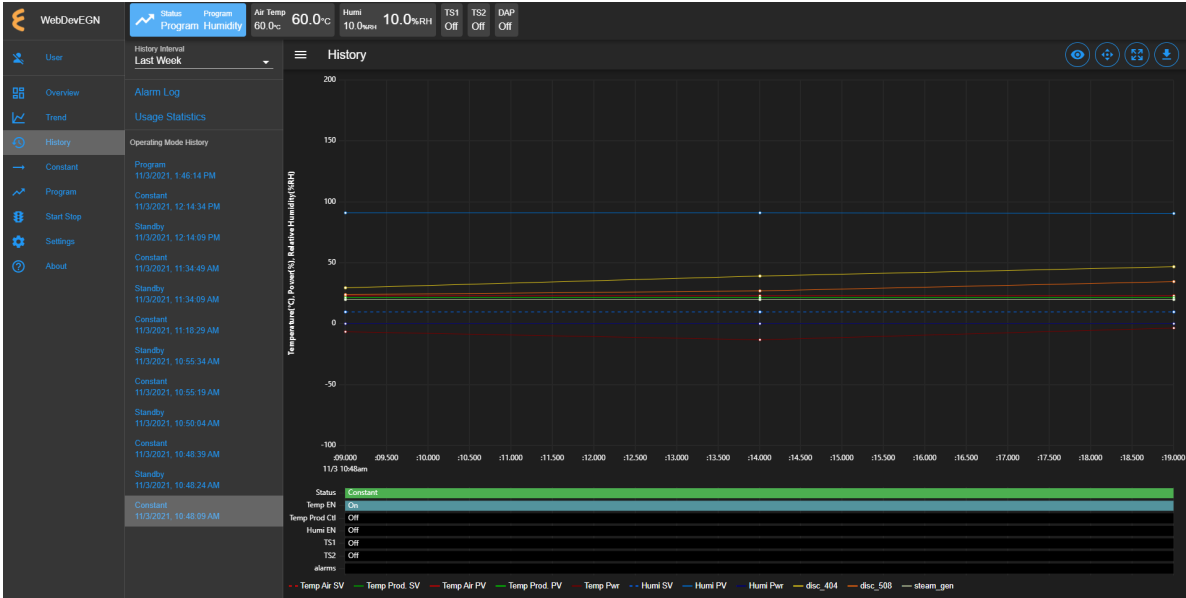


Figure 14.5: Trend graph of operating mode history

4. **Show/Hide Submenu:** To provide a larger real estate for the main display area, this Show/Hide button can be used to show or hide the **History** submenu. The following figure shows how the submenu is hidden and the main display area is expanded.

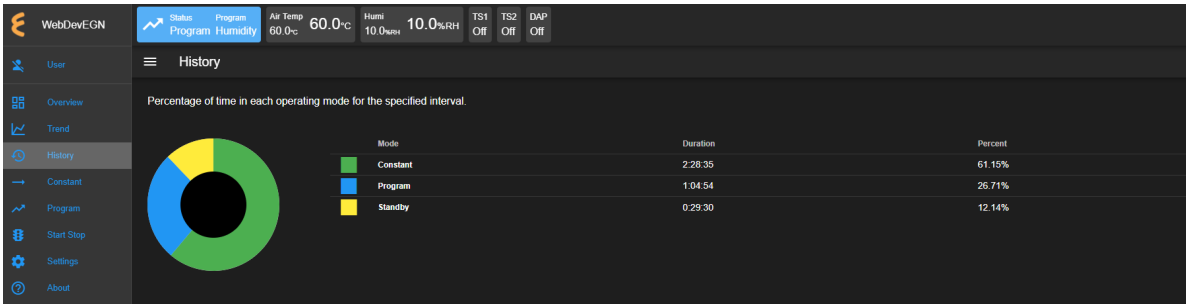


Figure 14.6: The show/hide button of the main display of the History page

5. **Main Display:** The content of the submenu page of **Alarm Log** and **Usage Statistics** is displayed here (refer to item 2, above).

CHAPTER 15

Constant

The existence of the EWC **Constant** page is such that all features and their parameters are collected and displayed in one place to control their constant mode settings. The main display of **Constant** consists of three separate CTA panes, displayed as **Temperature**, **Humidity** (or **Vibration**) and **Outputs**, as depicted in the following figure. These CTA panes provide input options to adjust the settings directly. The Humidity Range Chart is a two-dimensional graph of the current temperature-humidity relationship, displayed below these CTA panes.

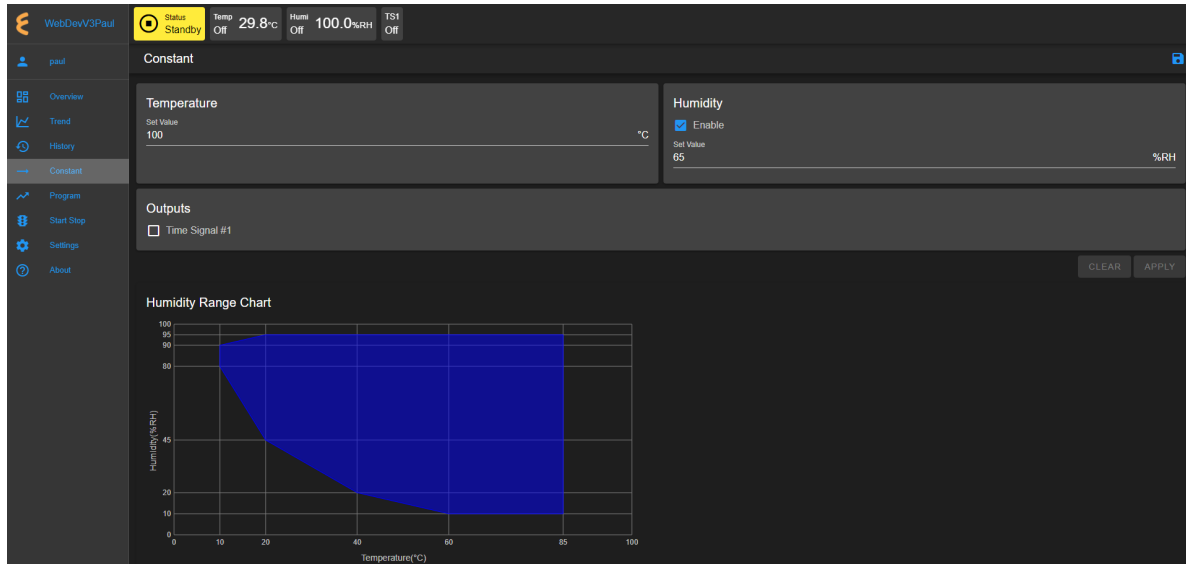


Figure 15.1: The Constant menu and its display page

The following sections describe how to configure and control each of these parameters.

15.1 Product or Air Temperature Setting

Complete the following steps to turn on or modify temperature setting:

1. Click the Set Value field and enter a new value, or click the up/down arrow to adjust the value.
2. Click the **APPLY** button or the save icon as indicated by the arrows in the following figure to apply and save the setting.

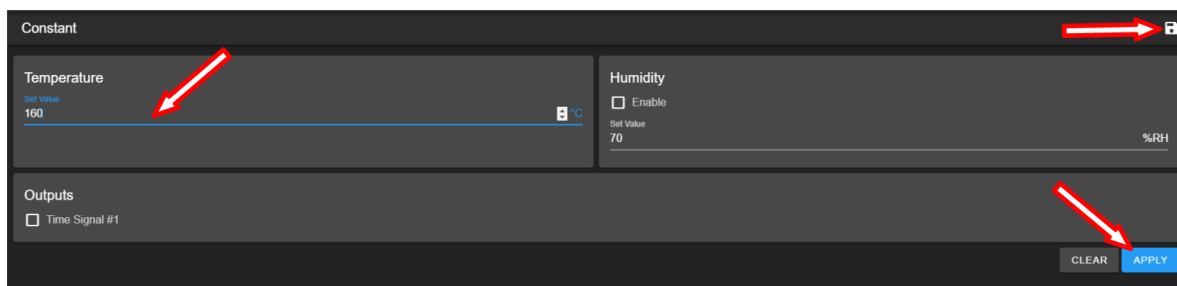


Figure 15.2: Apply new constant setting on temperature

3. To cancel the setting, click **CLEAR**. If you exit this pane by accessing a different menu in the menu bar, a warning will appear, as depicted in the following figure, which requires you to save the setting before attempting to access any other menus.

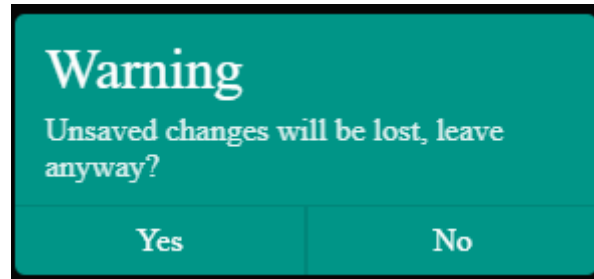


Figure 15.3: New setting must be save before exiting the pane

The new setting takes effect immediately with its new status displayed in the status bar. To reverse or cancel the setting, repeat the above steps to reset the set value and click **APPLY**.

15.2 Humidity Setting

Complete the following steps to turn on or modify humidity setting:

1. Place a check mark in the **Enable** box (refer to the above figure).
2. Click and enter new value in the Set Value field or click the up/down arrow to adjust the value.
3. Click the **APPLY** button or the save icon as indicated by the arrows in the above figure to apply and save the setting.
4. To cancel the setting, click **CLEAR**. If you exit this pane by accessing a different menu in the menu bar, a warning will appear (see above figure) which requires you to save the setting before attempting to access any other menus.

The new setting takes effect immediately with its new status displayed in the status bar. To reverse or cancel the setting, repeat the above steps to uncheck the box, reset the set value and click **APPLY**.

15.3 Time Signals Setting

Complete the following procedure to turn on output for any time signal:

1. To turn on output for **Time Signal # 1**, place a check mark in its box.
2. Repeat the above step for any time signal available in the main display area.
3. Click the **APPLY** button or the save icon as indicated by the arrows in the above figure to apply and save the setting.
4. To cancel the setting, click **CLEAR**. If you exit this pane by accessing a different menu in the menu bar, a warning will appear which requires you to save the setting before attempting to access any other menus.

The new setting takes effect immediately with its new status displayed in the status bar. To reverse or cancel the setting, repeat the above steps to uncheck the box and click **APPLY**.

It is important to note that all the parameters (temperature, humidity, vibration, time signal) in the main display can be adjusted altogether simultaneously with a single **APPLY** or save button. However, individual setting may provide security to avoid any adverse effect.

CHAPTER 16

Program

The **Program** menu allows the operator to create a program to control the chamber. All the programming features available on the supported PLC's listed in Chapter 1 (“**Introduction**”) can be composed into programs to control the chamber. The operator can: (1) open and view a program; (2) preview the output of the program; (3) edit and/or overwrite an existing program ; (4) delete program from the list; (5) rename program on the list; (6) download a program and store it on the local computer in JSON file; (7) upload a program from the local computer to EWC, and much more.

Here are some of the benefits of the **Program** menu:

- Easy to operate.
- Quick management of programs, programming or editing.
- Require less time to develop a new program or modify an existing program.
- Program Editor offers flexibility with multitasking capabilities.
- Control program operation and program end mode.
- Preview program operation before execution; operator can see exactly what the program does prior to its execution.
- Download program from EWC to the local computer for backup.
- Upload program from the local computer to EWC.

Only authorized users with read-write privilege can access and utilize the **Program** menu. The menu is grayed out, as depicted in the following figure. Access to the menu requires read-write privilege and the user log into their account to use the menu.

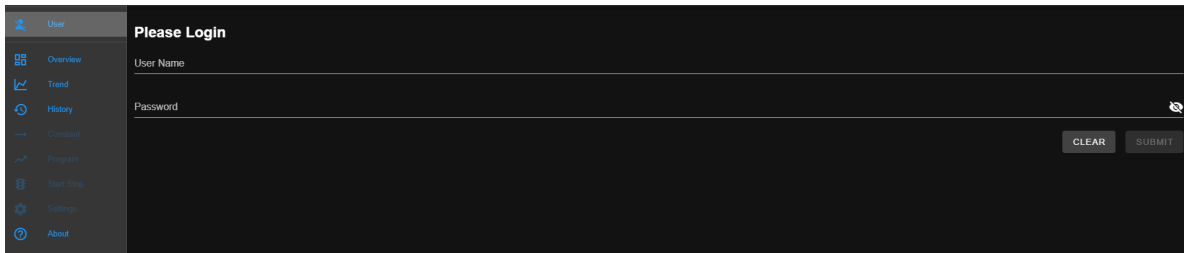


Figure 16.1: User with read-write privilege is required to operate the Program menu

16.1 List Programs

The following figure depicts a typical layout of the **Program** page with its submenu hidden. This is the default display of program list when the **Program** menu is accessed for the first time. Its UI components are numbered and explained as follows:

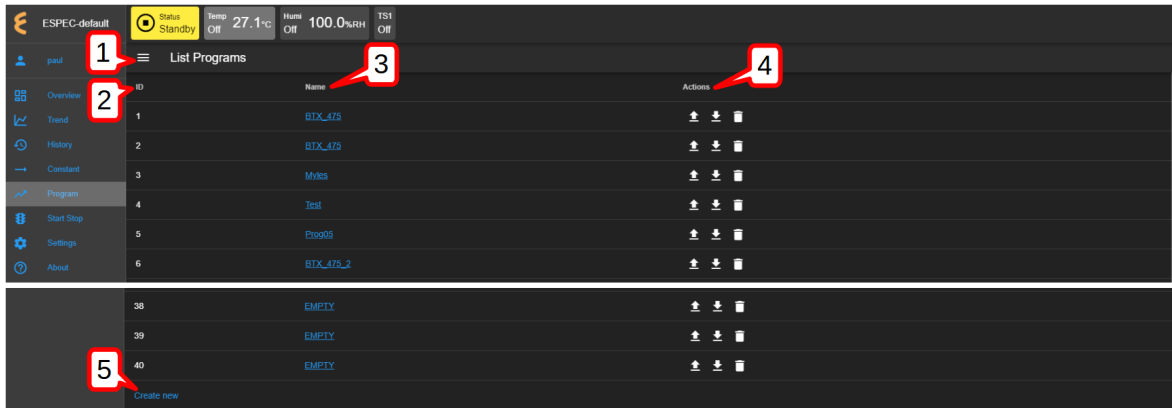


Figure 16.2: Program listing page with submenu hidden

1. **Submenu Show/Hide:** This button toggles between the “show and hide submenu” to allow the program editor utilize the entire main display area (see above figure).
2. **ID:** EWC identifies each program by its slot number stored in the PLC register. This list reflects the actual list of programs read from the F4T register. A total of 40 program slots are available, numbered from 1 to 40. The system uses a program identification code (ID) to identify each program.
3. **Program Name:** All available programs are listed under the **Name** column by program name. These programs are stored by their slot number. Any slot not yet occupied by the program is mark **EMPTY**. Users can access each program under this list by clicking on the program name, which is a clickable link. The program editor then opens up to display the program instructions. Detailed operation of the program editor is discussed in the next section. Displays the name of a program.
4. **Actions:** Three action buttons (Upload Program, Download Program, Delete) are available for managing the program under each row:
 - **Upload:** Program can be uploaded from the local computer to EWC which will then be stored in the F4T register using the slot number where the action was applied.
 - **Download:** Program can be downloaded and saved on the local computer.
 - **Delete:** A program to the left of the trash bin (where this action is applied) will be deleted. The F4T register will no longer contain this program.
5. **Create New:** This button opens the program editor for creating a new program. The **Create New** button is conveniently placed in two locations: (1) under the **ID** list and (2) in the **Program** submenu (shown in the following figure).

The following figure displays the **Program** page with its submenu unhidden. The submenu (item 2) has two operation buttons: (i) List Programs and (ii) Create New (program).

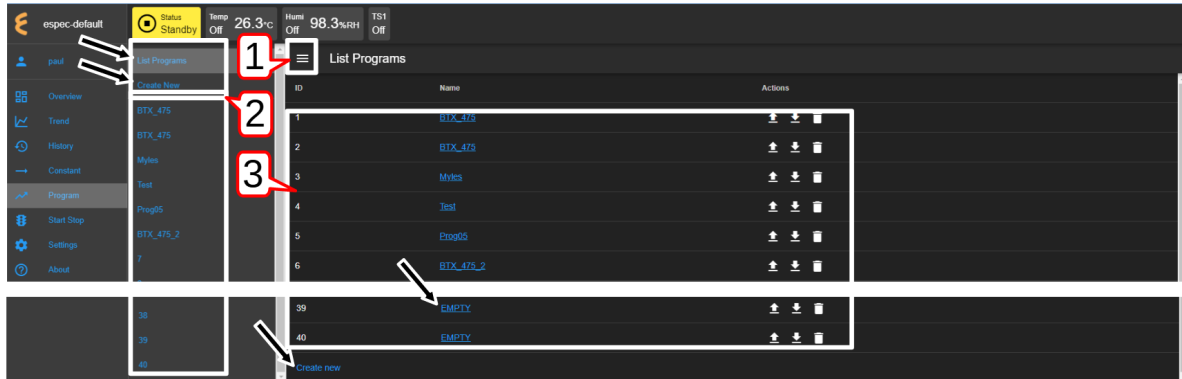


Figure 16.3: Program listing page with submenu unhidden

1. **Show/Hide:** The **Show/Hide** button can be used to hide or unhide the **Program** submenu (see item 2 below).
2. **Submenu:** This submenu has two operation buttons (indicated by the arrows): **List Programs** and **Create New** (program). All the available programs in the chamber stored in EWC are listed below these operation buttons (as shown in the above figure). With the submenu hidden, the main display has a larger real estate to display the program elements.
 - **List Programs:** The **List Programs** button offers a quick exit out of the program editor (explained in the following section). To exit out of the program editor mode, simply click this **List Programs** button. This action will cancel and exit the program editor being used to create, edit or import a program.
 - **Create New:** Similar to the **Create New** button under the **List Programs** display page (see item 3 below), this button opens the program editor with an empty template for constructing a new program. Detailed discussion is provided in the following section. A program from the local computer can also be imported into this empty template.
3. **List Programs:** This is the main display of the program list depicted in the previous figure. Click the **Show/Hide** button (see item 1) to hide the submenu and to expand the **List Programs** display page.

16.2 Create New Program

A new program can be created via one of the buttons depicted in the following figure.

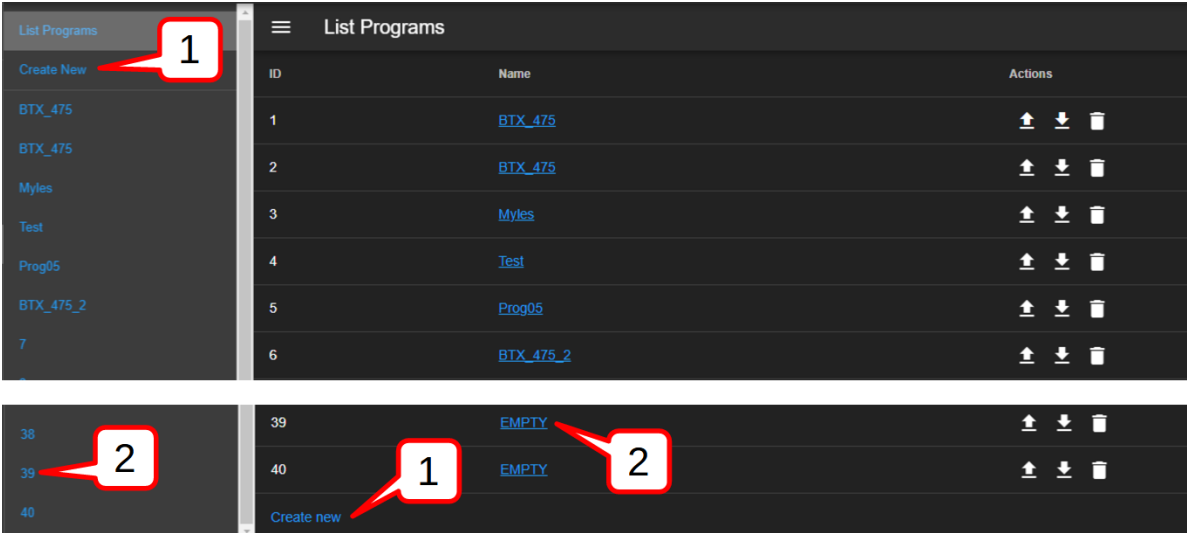


Figure 16.4: Different methods to creating a new program

Each of these buttons follows a different pattern to complete the task.

1. **Create New:** Click the **Create New** button in the submenu or under the **List Programs** in the main display to launch the program editor to create a new program. An empty template is opened for a new program, as depicted in the following figure. For the F4T chamber, this **Create New** button seems unnecessary or redundant. However, its important role is necessary for other types of chamber/controller (e.g., Typhoon HALT chambers).

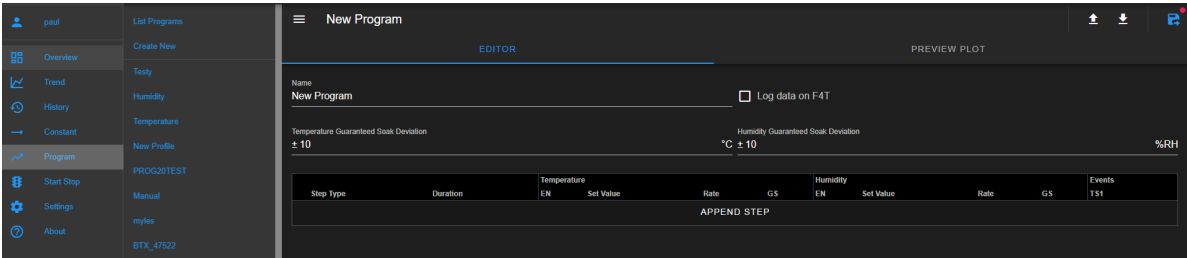


Figure 16.5: Empty template for a new program

The new program being constructed does not yet have a predefined location. For this reason, the program editor has only the **Save As** option to save the program in a specific or a desired slot number, as depicted in the following figure.

2. **EMPTY:** A new program can be created using a specific slot number. Click the slot number in the submenu or the **EMPTY** button on a desired slot number under the **List Programs** in the main display to launch the program editor to create a new program. An empty template is opened for a new program, as depicted in the previous figure.

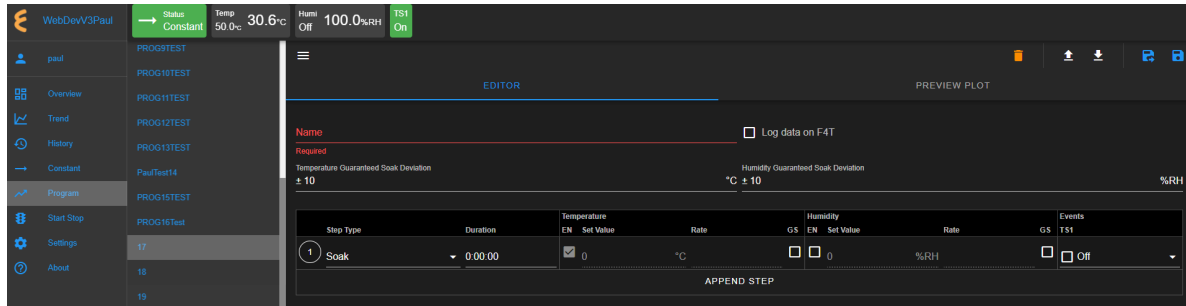


Figure 16.6: Empty template for a new program

Since the slot number has already been defined, the program editor offers two options to save the program: (1) Save As by selecting a new slot number or (2) Save (on the current slot number).

The following figure depicts the general layout of the empty template for a new program. As depicted in the following figure, slot 9 of the F4T register, as highlighted under the program list in the submenu, will be used to store the program once it is completed and saved.

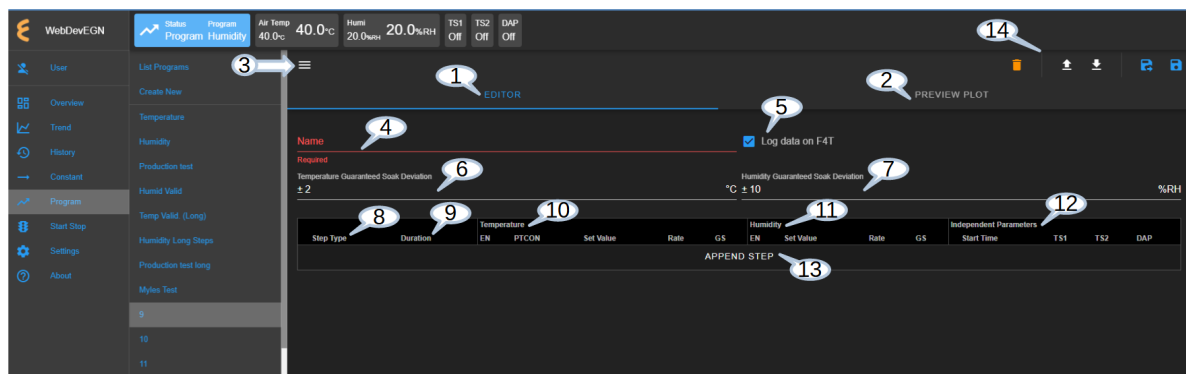


Figure 16.7: The structure and UI of the Programming Editor

The UI and components of the program editor (pictured above) are numbered and described as follows:

1. **Editor:** By default, a program is open and placed in the program editor. The program editor is highlighted in blue to indicate its active status.
2. **Preview Plot:** The output of the current program can be previewed via this button. Both the **Editor** (item 1 above) and this button can be used to toggle between the editing and previewing mode of the current program. The **PREVIEW PLOT** button is operational only when a program is loaded into the program editor or a program has been constructed in the program editor.
3. **Submenu Show/Hide:** This button toggles between the show and hide mode of the submenu. To utilize the entire main display area for the program editor, this button can be used to hide the submenu.
4. **Program Name:** An alphanumeric naming convention based on ASCII with lower- or upper-case letters applies to program name with up to 20 characters. EWC will chop and

use only the first 20 characters if more than 20 characters were entered. Program name should be kept short and descriptive. Since each program is individually stored in a unique slot in the PLC, a unique name on EWC is not necessary. However, these programs must have unique names when they are stored on the local computer. When a program name is entered into this field, this name also appears in the title bar next to the show/hide button (item 3).

5. **Log Data:** This checkbox is available for logging data on the F4T during program execution. This option applies only on an F4T with this feature, as shown in the following figure.



Figure 16.8: F4T with data logging feature

6. **Temp GS Dev:** This value determines how close the set point to the process value for the step duration timer to count down. If the temperature fluctuates outside this set point, the soak time will reset. This is to ensure (hence, guarantee) that soaking is taking place at that specific temperature for that specific amount of time. A desired value can be adjusted via the up/down arrow or via a direct input in the field. On the F4T touch screen, this is Guaranteed Soak Deviation 1.
7. **Humi GS Dev:** Similar to item 6, humidity guaranteed soak deviation can also be adjusted. On the F4T touch screen, this is Guaranteed Soak Deviation 2.
8. **Step Type:** Step type selection can be made after a step has been added to the program. The first step in a new program must be added using the **APPEND STEP** button (item 13 below). Additional steps can be added via the drop-down menu of the Step Number (explained below) or via the **APPEND STEP** button. There are seven (7) different step types available for each step in the program:

- **Instant Change:** The set point will be set instantly. EWC will determine the thresh-

old value if this set point is possible based on the chamber specification. The time and guaranteed soak have no effect on this step type.

- **Ramp Time:** The set point will be ramped to the new set point over the given duration.
 - **Ramp Rate:** The set point will be ramped to the new set point based on the set rate.
 - **Soak:** Instead of changing the set point, the program maintains the previous set point for a specified duration for this step.
 - **Wait For:** With this step type, the F4T waits until the chamber has reached the set point value before it proceeds to the next step.
 - **Go To Step:** With this feature, the program can have a loop or subroutine where instructions in a specific step (or steps) can be executed and looped through for a specified number of time. With the go-to loop, the program contains fewer lines of steps.
 - **End:** All programs must have an end step. The end statement instructs the controller what to do when the program ends. The available options for end action are: Hold Last Step, Disable Control and Constant Set Value. They apply to both temperature and humidity (as well as vibration). The chamber can also be stopped completely when the program ends; it will be set in standby mode.
9. **Duration:** The time format for duration is HH:MM:SS. If a pure numerical value is entered, EWC will convert it to HH:MM:SS. For instance, if a numerical value 15 is entered, the system treats it as 15 seconds, and the conversion in HH:MM:SS will be 00:00:15. If 66 is entered, the system converts it to 00:01:06. Similarly, if 90:00 is entered, the system renders the value to 1:30:00.
10. **Temperature:** In each step, temperature can be set via five parameters: (1) EN (2) PTCON, (3) Set Value, (4) Rate and (5) GS.
- **EN:** Enable temperature loop for this step.
 - **PTCON:** Enable Product Temperature Control (PTCON).
 - **Set Value:** This is the target temperature value. This value will be checked against the chamber's threshold value by EWC to validate the proper operating value. Consult the chamber operation manual for detail on the threshold or the upper limit the chamber can reach.
 - **Rate (C/min):** Temperature rate (measured in Celsius per minute) is determined by the program editor based on the initial temperature (specified in item 3 above) and the target value (Set Value, as described below). The rate will be determined to operate within the specifications of the chamber. Consult the chamber operation manual for detail.
 - **GS:** Enable Guaranteed Soak with the checkbox. If enabled, it prevents the duration timer from counting down until the process value is within the deviation set in item 6 (above).
11. **Humidity:** In each step, humidity can be set with four parameters:
- **EN:** Enable humidity loop for this step.
 - **Set Value:** This is the target humidity value. This value will be checked against the chamber's threshold value by EWC to validate the proper operating value. Consult the chamber operation manual for detail on the threshold or the upper limit the cham-

ber can reach.

- **Rate (%RH/min):** Humidity rate is determined by the program editor based on the initial temperature (specified in item 3 above) and the target value (Set Value, as described below). The rate will be determined to operate within the specifications of the chamber. Consult the chamber operation manual for detail.
 - **GS:** Enable Guaranteed Sock with the checkbox. If enabled, it prevents the duration timer from counting down until the process value is within the deviation set in item 7 (above).
12. **Independent Parameters:** These parameters describe the output signals of the chamber during operation. They can be controlled with a start time. Different chambers have different independent parameters. They may have different names, but they generally are labeled as TS1, TS2, etc.
- **Start Time:**
 - **TS1:** Output time signal number 1
 - **TS2:** Output time signal number 1
13. **APPEND STEP:** As shown in the previous figure, the program editor has an empty template. No instructions or steps of program have been added. To create an instruction, a new step must be created (or added). This APPEND STEP button is used to add a new step. Once a program has a step, additional steps can be added using this button or the drop-down menu of the Step Number (to be explained below). The APPEND STEP button always adds a new step as the last step in the program. By contrast, the drop-down menu of the Step Number allows a new step to be inserted above or below the current step. It also has a delete button to remove any step from the program.
14. **File Manipulation:** Five different buttons (icons) are available for file manipulation. Their action can be previewed by hovering the mouse pointer over them. They are described from left to right as follows.
- **Delete:** Click on the trash bin icon to delete the current program. This action will delete the program in the program editor and its location in the current slot number of the F4T register. A pop-up warning appears, as depicted in the following figure, to reaffirm the action.

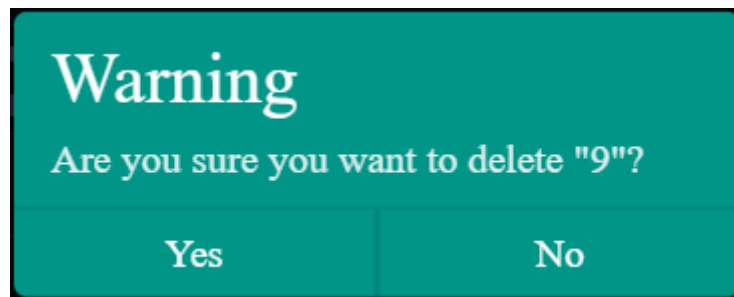


Figure 16.9: File deletion confirmation

- **Open Program:** This button imports a program file from the local computer into the program editor. EWC only accepts a program in JSON format. To ensure compatibility, the program structure should be based on the one downloaded from EWC itself (see **Download Program** below).

- **Download Program:** This button downloads the current program file and stores it on the local computer. The program is saved in JSON format using slot number as its filename (e.g., 9.json).
- **Save As:** Save the current program to a different slot number under the program list. This action brings up a program list, as depicted in the following figure, to select a new slot to hold the current program. To cancel this action, click the **CLOSE** button. **WARNING!:** A vacant slot should be selected to save the program. Otherwise, the current program will overwrite the existing one in the slot without prompting for reconfirmation, thus, destroying the program previously in that slot. The current program in a new slot still uses the same program name. To make it unique, edit item 4 (above) with a new name and apply the **Save** button (see below) to resave the program.

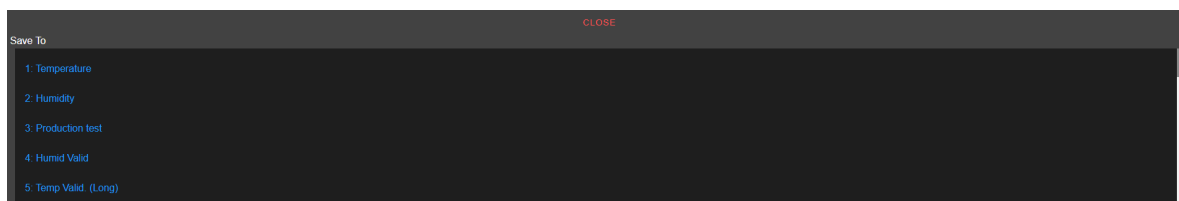


Figure 16.10: Save program to a new slot

- **Save:** This button saves the current program in the current slot on the F4T.

16.2.1 Programming: Add Program Step

The following example illustrates how to create a new program using three steps with step type **Ramp Time**, **Ramp Rate** and **End**. The duration for the ramp time is 5 minutes with the target temperature at 35 degrees C. The rate for **Ramp Rate** will be 10 degrees C/min with target value at 45 degrees C. Guaranteed soak deviation for both temperature and humidity will be set at +/-0.5 and +/- 10, respectively. A standby mode will be set when the program ends. While this sample program does not have any real practical implication, it does show how program steps and their parameters are created. New program will be selected to occupy slot 15. We begin from the main menu.

1. Click **Program** in the side bar.
2. Click **EMPTY** on slot 15 on the Program List (scroll down if necessary). To follow along with this example, slot 15 should be empty.
3. **Program Name:** Enter **PROG15TEST** in the program name field. EWC will chop and use only the first 20 characters if more than 20 characters were entered.
4. **Log Data:** Enable data logging by checking the box.
5. **Temp GS Dev:** Apply the up/down arrow to adjust the deviation value to +/-0.5 or enter the value 0.5 directly into the field.
6. **Humi GS Dev:** Adjust deviation value for humidity guaranteed soak in the same way to +/-10.
7. **Add New Step:** Click the **APPEND STEP** button. By default, **Soak** is selected as the step type. Refer to Item 8 in the previous section.

8. **Step 1:** Click **Soak** under step type and select **Ramp Time** from the drop-down menu, as indicated by the arrow in the following figure. Complete the following fields for this step:

The screenshot shows the 'PROG15TEST' software interface. At the top, there's a header with 'PROG15TEST' and 'EDITOR'. Below this, there's a section for 'Name' (PROG15TEST) and a checkbox for 'Log data on F4T'. The main area contains a table for step configuration. The table has columns for Step Type, Duration, Temperature (EN, Set Value, Rate), Humidity (GS, EN, Set Value, Rate), and Events (GS, TS1). The first row shows a 'Soak' step with a duration of '0:00:00', temperature set to '0' °C, and humidity set to '0' %RH. A red arrow points to the 'Soak' step type, which has opened a dropdown menu with the following options: 'Instant Change', 'Ramp Time', 'Ramp Rate', 'Soak' (highlighted), 'Wait For', and 'Go To Step'.

Figure 16.11: Adding step type

- **Duration:** Enter 0:05:00.
- **Temperature:**
 - **EN:** Enabled by default (from temperature ramp time selection).
 - **Set Value:** Enter 35 or apply the up/down arrow to adjust the value.
 - **Rate:** Greyed out. EWC sets the rate based on the initial and final temperature according to the given duration.
 - **GS:** Disable; leave the box unchecked.
- **Humidity:**
 - **EN:** Check the box to enable humidity set value.
 - **Set Value:** Enter 15 or apply the up/down arrow to adjust the value.
 - **Rate:** Greyed out. EWC sets the rate based on the set value and duration.
 - **GS:** Disable GS option with the box unchecked.
- **Events:**
 - **TS1:** Click the **NC** field (or the down-arrow) to select **On** from the drop-down menu, as depicted in the following figure.

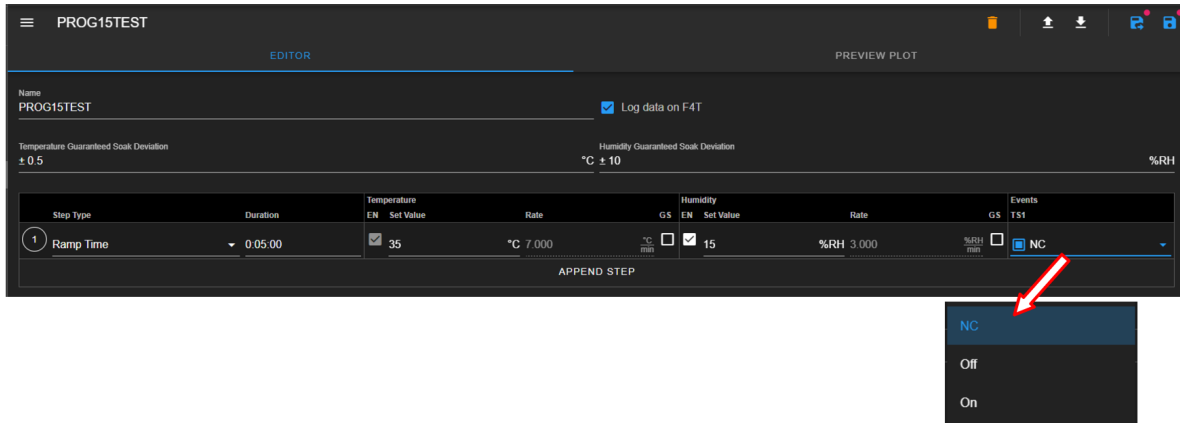


Figure 16.12: Enable time signal output.

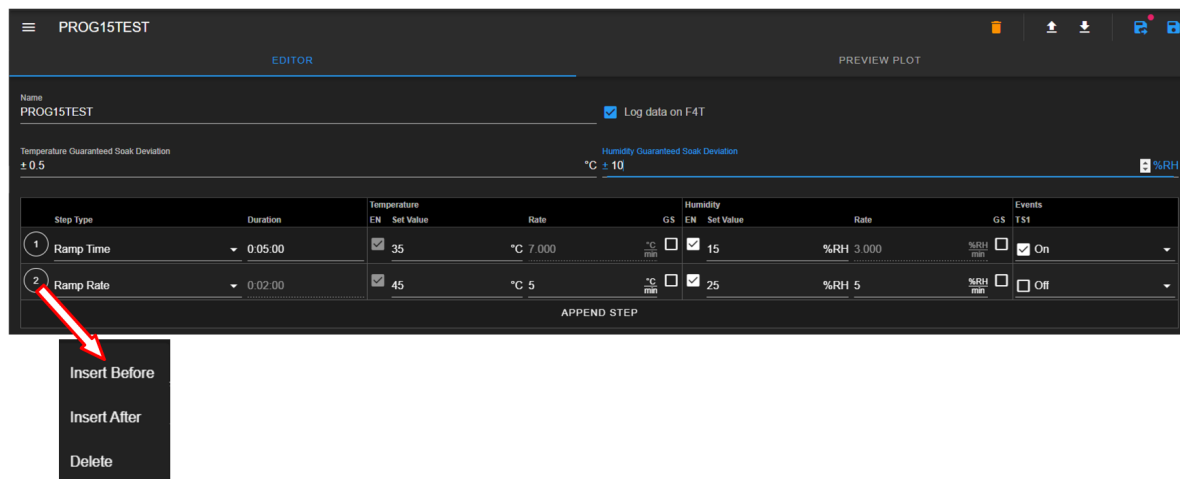
- **TS2:** If you have additional TS's, leave them as-is.

9. **Step 2:** Click **APPEND STEP**. Default step type is **Soak**. Click the **Soak** under step type and select **Ramp Rate** from the drop-down menu (refer to the previous figure, Step 8). Complete the following fields for this step:

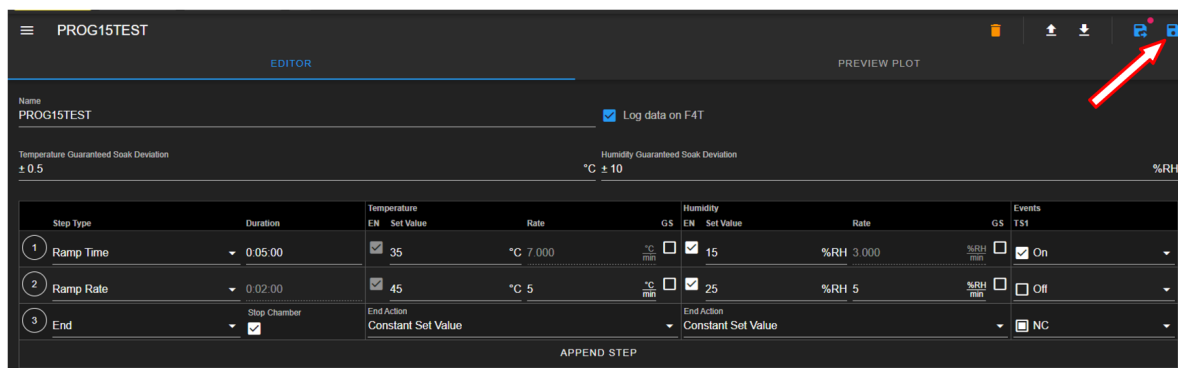
- **Duration:** Grayed out. Value to be determined by system according to the set value and rate.
- **Temperature:**
- **EN:** Enabled by default.
 - **Set Value:** Enter 45.
 - **Rate:** Enter 10.
 - **GS:** Disable; leave the box unchecked.
- **Humidity:**
 - **EN:** Check the box to enable humidity set value.
 - **Set Value:** Enter 25.
 - **Rate:** Enter 5.
 - **GS:** Disable GS option with the box unchecked.
- **Events:**
 - **TS1:** Click the **NC** field (or the down-arrow) to select **Off** from the drop-down menu.
 - **TS2:** If you have additional TS's, leave them as-is.

10. **Step 3:** Click step number 2 in the circle that precedes **Ramp Rate** on the second step. Select **Insert After** from the drop-down menu as depicted in the following figure. Click the **Soak** under step type, scroll down to the bottom of the drop-down list and select **End**.

- **End:** Place a check mark in the box under **Stop Chamber**. This option will set the chamber in **Standby** mode when the program ends. The End Action for both temperature and humidity will be defaulted to **Constant Set Value**, but the **Stop Chamber** option will overwrite these settings. No setting is required for **NC** under **Events**.



11. **Save Program:** Click the **Save** icon in the upper-right corner, as shown in the following figure. This figure also illustrates the complete program in the program template.



12. **Preview:** Click the **PREVIEW PLOT** button to preview the output of the current program (see figure below). Click the **EDITOR** button to toggle back to the editor mode. Program cannot be saved while in the preview mode. In order to save the program, navigate back to the program editor to apply the **Save** or **Save As** button.

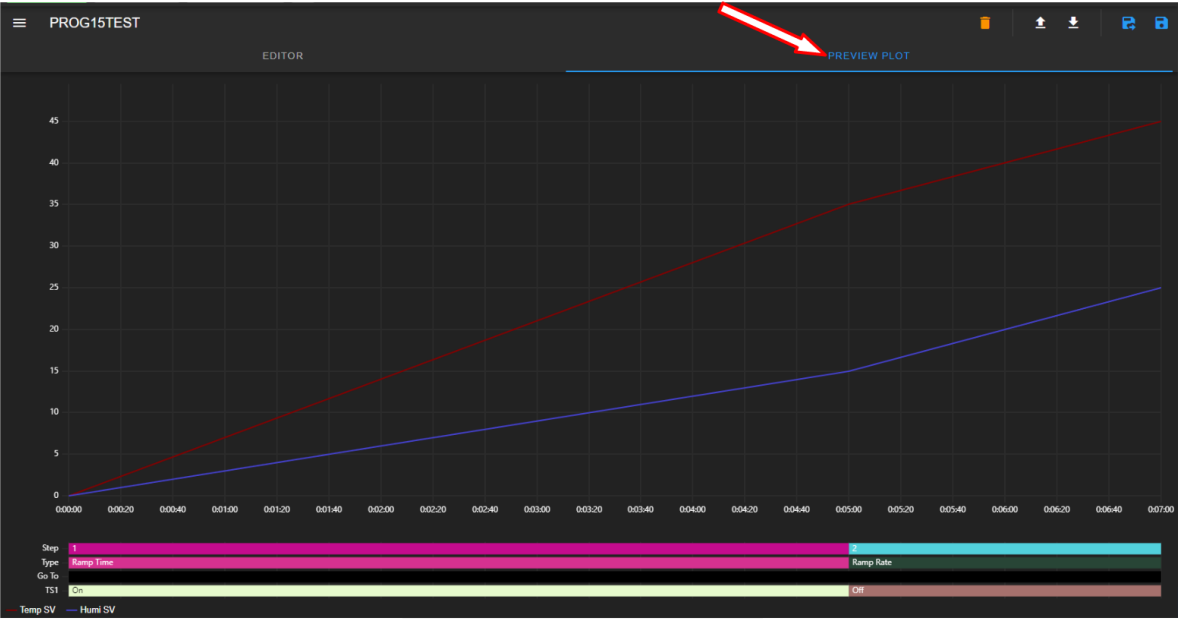


Figure 16.13: Program in preview mode

16.3 View, Edit, Save Program

This section describes how to open an existing program for viewing and editing. Changes made in the program can be updated by overwriting the program contents back in the file (using **Save**) occupying its existing slot or saving them as a new program using a new slot (with **Save As**).

16.3.1 Open Program

An existing program can be opened for viewing or editing by clicking on its name under the Name list, as shown in the following figure.

The screenshot shows the 'List Programs' window. It contains a list of programs with their names and icons. A red arrow points to the 'PROG15TEST' program.

Slot	Program Name	Icon
12	PROG16TEST	Icon
13	PROG13TEST	Icon
14	PaulTest14	Icon
15	PROG15TEST	Icon
16	PROG16Test	Icon
17	EMPTY	Icon
18	EMPTY	Icon

The program **PROG15TEST** (indicated by the arrow) that was created in the previous section will be used for illustration. It is open and displayed as follows:

Step Type	Duration	Temperature	Rate	Humidity	Rate	Events
		EN Set Value		GS EN Set Value		TS1
1 Ramp Time	0.05.00	<input checked="" type="checkbox"/> 35	°C 7.000	<input type="checkbox"/> 15	%RH 3.000	<input checked="" type="checkbox"/> On
2 Ramp Rate	0.02.00	<input checked="" type="checkbox"/> 45	°C 5	<input type="checkbox"/> 25	%RH 5	<input type="checkbox"/> Off
3 End	Stop Chamber	End Action Constant Set Value		End Action Constant Set Value		<input type="checkbox"/> NC

APPEND STEP

Figure 16.14: Program Editor displays an opened program in edit mode

As depicted in the upper-right in the above figure, five buttons are available for managing the program file in the program editor: **Delete**, **Open Program**, **Download Program**, **Save As** and **Save**. They will be explained in detail in the following sections.

16.3.2 Editing Program: Programming Example

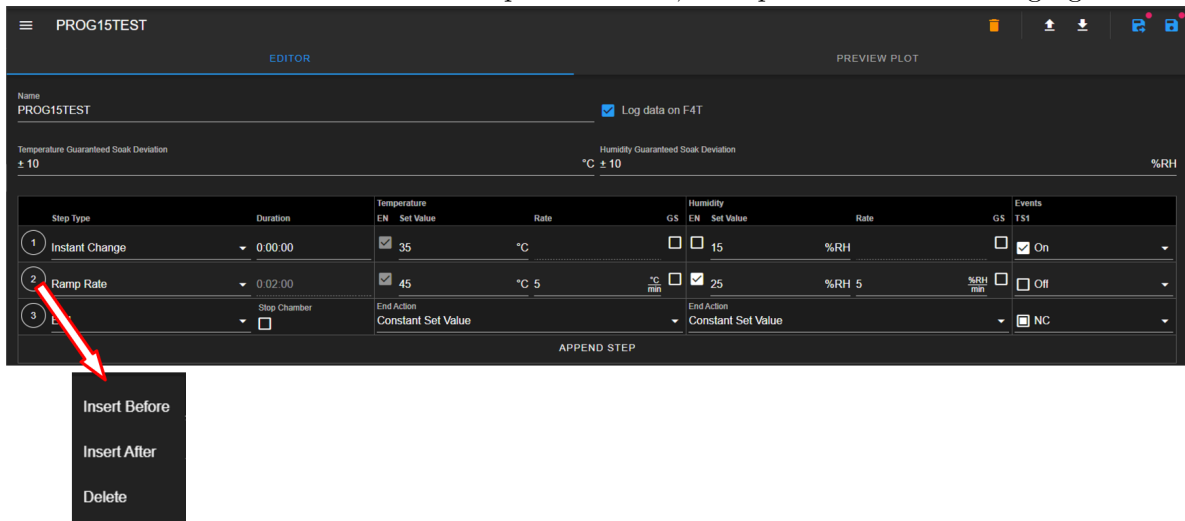
In this section, we illustrate how to edit and modify **PROG15TEST** program with additional steps, applying the available step types from the list. The structure of our new program consists of the following steps and types, with temperature and humidity guaranteed soak deviation both set at ± 10 .

1. **Instant Change** to 35 degrees C.
2. **Wait For** temp to drop below 35.1 degrees C.
3. **Soak** for 30 minutes.
4. **Ramp Rate** of 2 degrees C until -15 degrees C is reached.
5. **Wait For** temp to drop below -15 degrees C.
6. **Soak** for 30 minutes.
7. **Ramp Time** of 30 minutes to 45 degrees C and 50% RH.
8. **Wait For** temp to rise higher than 45.1 degrees C and humi below 50% RH.
9. **Soak** for 30 minutes.
10. **End** stop chamber.

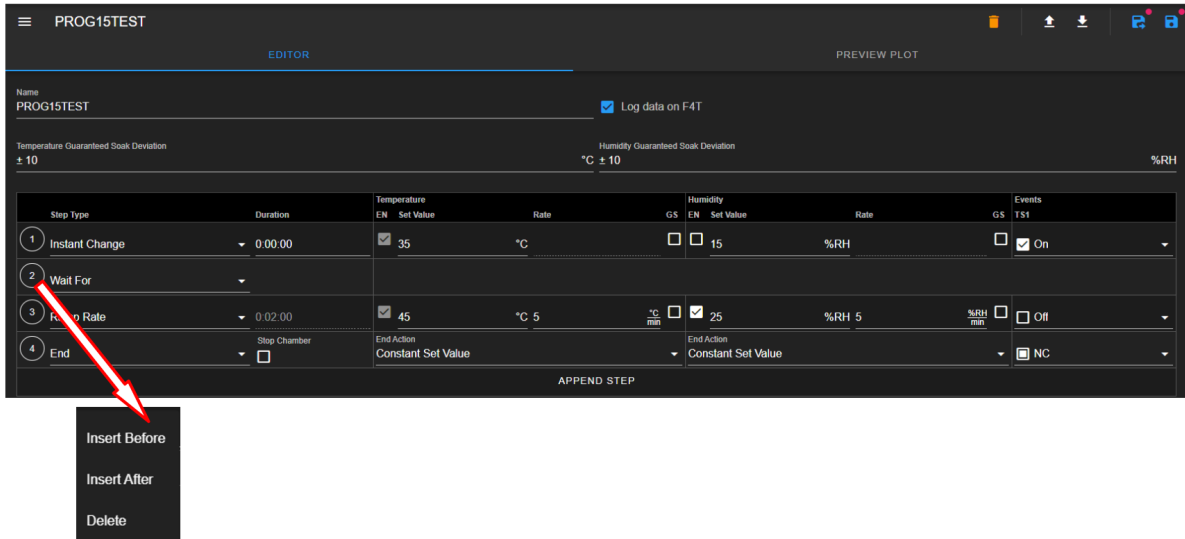
With **PROG15TEST** program open in the program editor, as shown in the previous figure, complete the following steps to modify and add additional steps with their specific step type and parameters as follows:

1. **Guaranteed Soak Deviation:** Set temperature and humidity guaranteed soak deviation to ± 10 degrees C and $\pm 10\%$ RH, respectively.
2. **Step 1:** Modify step type.
 - **Step Type:** Click the down arrow and select **Instant Change**.
 - **Duration:** Reset duration time to 0:00:00.
 - **Temperature:**
 - **EN:** Check the EN box.
 - **Set Value:** Enter 35 or click the up/down arrow to adjust the value to 35.
 - **Rate:** Leave blank (empty)
 - **GS:** Leave GS box unchecked.

- **Humidity:**
 - **EN:** Leave EN box unchecked.
 - **Set Value:** Leave set value as-is or at 0.
 - **Rate:** Empty
 - **Events:**
 - **TS1:** Set to **On**.
3. **Step 2:** Inserting a new step. Click step number 2 in the circle that precedes **Ramp Rate** and select **Insert Before** from the drop-down menu, as depicted in the following figure.



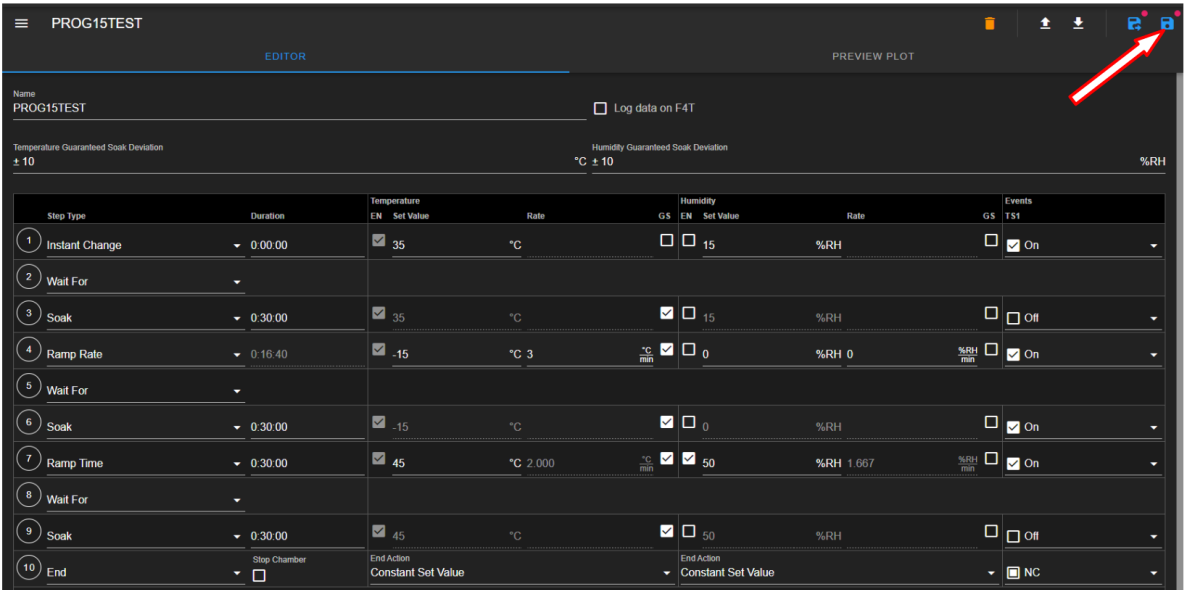
- **Step Type:** Click the down arrow and select **Wait For**. The rest of the parameters will be rendered blank.
4. **Step 3:** Inserting a new step. Click step number 2 in the circle that precedes **Wait For** and select **Insert After** from the drop-down menu, as depicted in the following figure.



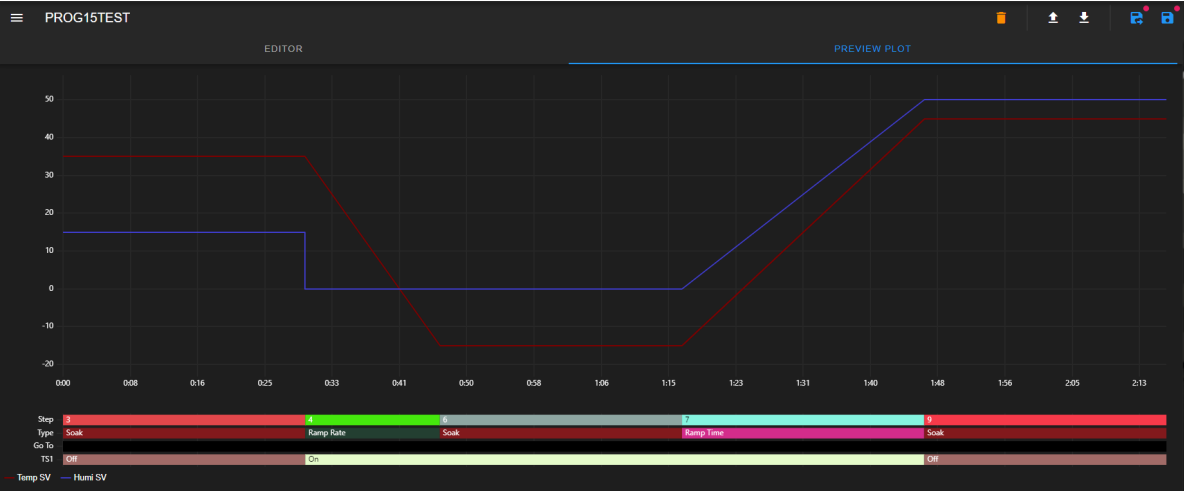
- **Step Type:** Default selection will be **Soak**.
- **Duration:** Set duration time to 0:30:00.
- **Temperature:**
 - **EN:** Enabled by default (grayed out).
 - **Set Value:** default (grayed out).

- **Rate:** default (empty)
 - **GS:** Place a check in the GS box.
 - **Humidity:**
 - **EN:** Leave EN box unchecked.
 - **Set Value:** Grayed out; default value from previous setting.
 - **Rate:** Empty (grayed out).
 - **Events:**
 - **TS1:** Set to **Off**.
5. **Step 4:** Modifying the current step.
- **Step Type:** Leave the step type as **Ramp Rate**.
 - **Duration:** Grayed out (to be determined by EWC based on temperature set value and rate).
 - **Temperature:**
 - **EN:** Confirm that **EN** is enabled.
 - **Set Value:** Enter -15 or apply the up/down arrow to adjust the value to -15.
 - **Rate:** Enter 3 or apply the up/down arrow to adjust the value to 3.
 - **GS:** Place a check in the GS box.
 - **Humidity:**
 - **EN:** Leave EN box unchecked.
 - **Set Value:** Enter 0.
 - **Rate:** Enter 0.
 - **Events:**
 - **TS1:** Set to **On**.
6. **Step 5:** Inserting a new step. Click step number 4 in the circle that precedes **Ramp Rate** and select **Insert After** from the drop-down menu.
- **Step Type:** Click the down arrow and select **Wait For** from the drop-down list. The rest of the parameters are rendered blank.
7. **Step 6:** Inserting a new step. Click step number 5 in the circle that precedes **Wait For** and select **Insert After** from the drop-down menu.
- **Step Type:** Leave the step type as **Soak** (selected by default).
 - **Duration:** Set duration time to 0:30:00.
 - **Temperature:**
 - **EN:** Grayed out.
 - **Set Value:** Grayed out.
 - **Rate:** Grayed out.
 - **GS:** Place a check in the GS box.
 - **Humidity:**
 - **EN:** Leave EN box unchecked.
 - **Set Value:** Grayed out.
 - **Rate:** Grayed out.
 - **Events:**
 - **TS1:** Set to **On**.
8. **Step 7:** Inserting a new step. Click step number 6 in the circle that precedes **Soak** and select **Insert After** from the drop-down menu.
- **Step Type:** Click the down arrow and select **Ramp Time** from the drop-down list.
 - **Duration:** Set duration time to 0:30:00.
 - **Temperature:**
 - **EN:** Enable **EN** by checking the box.

- **Set Value:** Enter 45 or apply the up/down arrow to adjust the value to 45.
 - **Rate:** Grayed out.
 - **GS:** Place a check in the GS box.
 - **Humidity:**
 - **EN:** Enable **GS** with a check mark in the box.
 - **Set Value:** Enter 45 or apply the up/down arrow to adjust the value to 45.
 - **Rate:** Grayed out.
 - **Events:**
 - **TS1:** Set to **On**.
9. **Step 8:** Inserting a new step. Click step number 7 in the circle that precedes **Ramp Time** and select **Insert After** from the drop-down menu.
- **Step Type:** Click the down arrow and select **Wait For** from the drop-down list. The rest of the parameters are rendered blank.
10. **Step 9:** Inserting a new step. Click step number 8 in the circle that precedes **Wait For** and select **Insert After** from the drop-down menu.
- **Step Type:** Default selection will be **Soak**.
 - **Duration:** Set duration time to 0:30:00.
 - **Temperature:**
 - **EN:** Grayed out (default to previous setting).
 - **Set Value:** Grayed out (default to previous value).
 - **Rate:** Grayed out (blank).
 - **GS:** Place a check in the GS box.
 - **Humidity:**
 - **EN:** Uncheck the box.
 - **Set Value:** Grayed out (default to previous value).
 - **Rate:** Grayed out (blank).
 - **Events:**
 - **TS1:** Set to **Off**.
11. **Step 10:** This step has been pushed down while the above steps were being added.
- **Step Type:** Program is ended with **End**. Leave the Stop Chamber box unchecked. Select End Action under both temperature and humidity to **Constant Set Value** and set **TS1** to **NC**.
12. **Save Program:** To save the program, click the **Save** icon in the upper-right corner. The following section describes how to apply other buttons in this upper-right corner. The complete program is illustrated in the following figure.

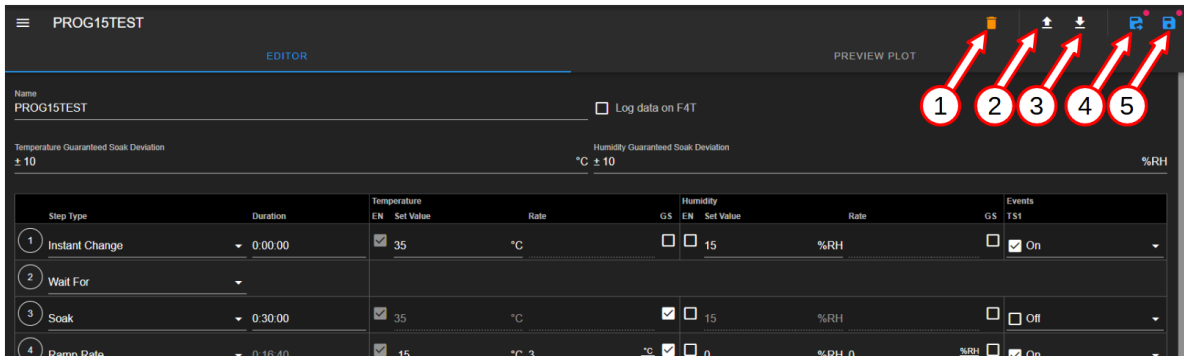


13. The above program can be previewed prior to execution by clicking on the **PREVIEW PLOT** button, as depicted in the following figure.



16.3.3 Managing Program File via the Program Editor

This section describes how to apply the five file manipulation options available in the upper-right corner of the program editor, as depicted in the following figure.



They are described as follows:

1. **Delete:** Click the trash bin icon to delete the current program in the program editor. The slot for this program on the Name list under the **List Programs** table will be rendered as **EMPTY**, since the program has been removed from the F4T register. As a safety measure, the system will prompt to confirm the action with a pop-up warning with a Yes/No option to proceed with the action. Upon completion, the system returns to the Program menu to display the programs on the Name list.
2. **Upload Program:** This button imports a program file from the local computer into the program editor. By default, the system opens the Downloads folder on the local computer to upload the program file. Navigate to the program's location, if necessary, and double-click on the desired program to import it into the program editor.
3. **Download Program:** The current program in the program editor can be downloaded onto the local computer as a backup. By default, the program will be stored in the Downloads folder, with filename based on the slot number (e.g., 15.json).
4. **Save As:** This button can be used to copy the current program to a different slot. To make the program name unique, the Name field may be edited with a new program name. This procedure thus requires a two-step process indicated by the arrows in the following figure. First, edit the program name; second, click the **Save** button and select a new slot from the drop-down list.

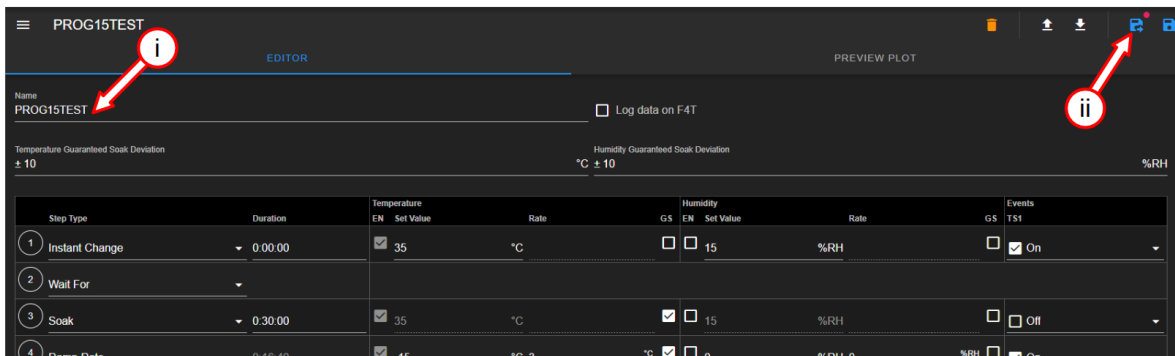


Figure 16.15: Save current program as a new file

5. **Save:** Apply this button to update the program file. To help check the editing status of the program, the program editor utilizes a red dot placed above the **Save** or **Save As** button to indicate an update yet to be saved.

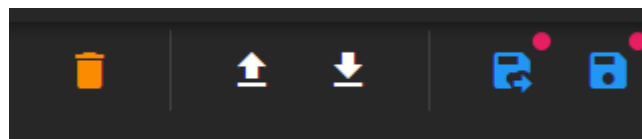


Figure 16.16: Update indicator

Navigating out of the editor without saving the update will trigger a warning prompt, as depicted in the following figure.

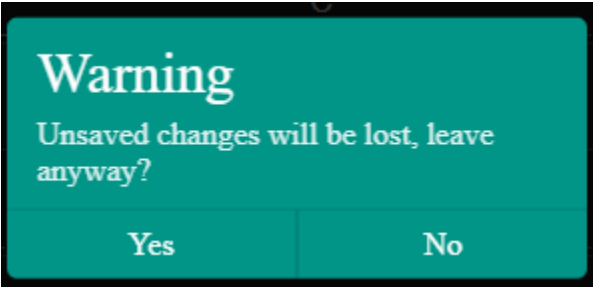
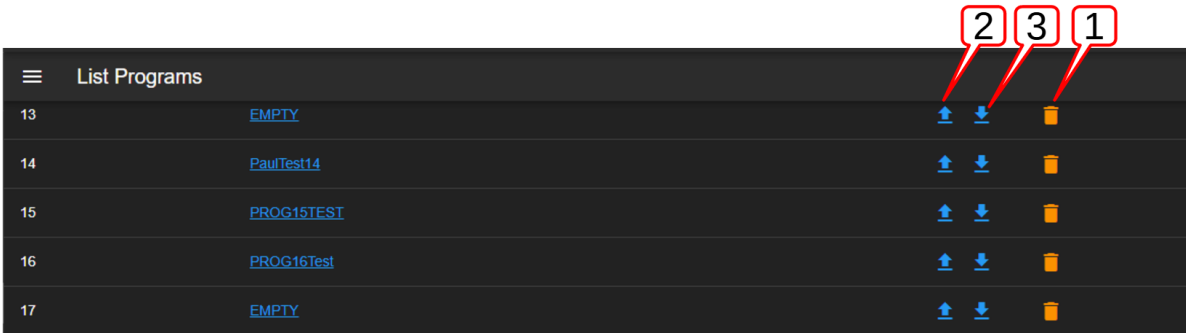


Figure 16.17: Confirm the save or discard update

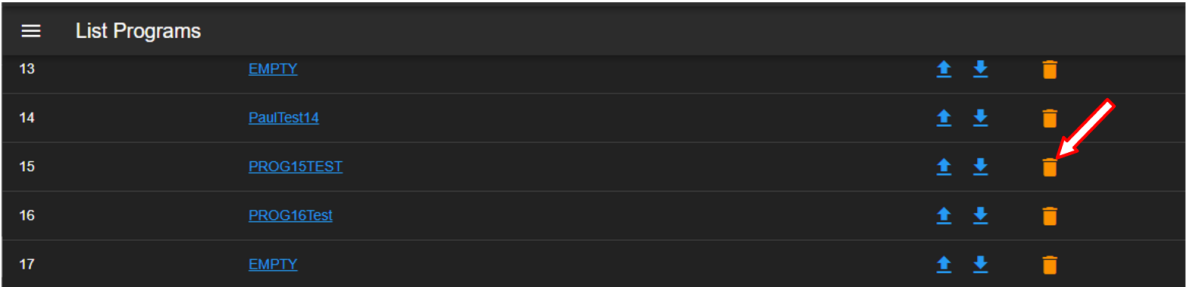
16.3.4 Managing Program File via the Name List

This section describes how to apply the three file manipulation options on the Name list, as depicted in the following figure.

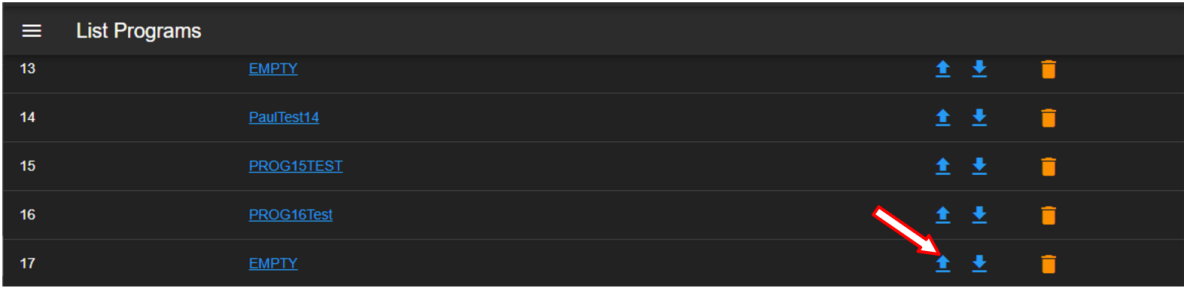


These three options are listed and described as follows:

- 1. **Delete:** To delete **PROG15TEST** from the Name list (and F4T register), click the trash bin icon as depicted in the following figure. As a safety measure, the system will prompt to confirm the action with a pop-up warning with a Yes/No option to proceed with the action. It may be necessary to apply the refresh button of the Web browser after deleting the program file from the Name list.



- 2. **Upload Program:** This button can be used to import a program from the local computer directly into a program slot on the Name list and F4T register. To upload (i.e., import) a program into slot 17, click on the **Upload** button, as indicated by the arrow in the following figure. Navigate to locate the desired file on the local computer and double-click it to complete the process.



List Programs			
13	EMPTY	↑ ↓	🗑
14	PaulTest14	↑ ↓	🗑
15	PROG15TEST	↑ ↓	🗑
16	PROG16Test	↑ ↓	🗑
17	EMPTY	↑ ↓	🗑

3. **Download Program:** To download (i.e., export) a program **PROG16Test** on slot 16 (see above figure), click on the **Download** button. By default, the program file will be stored in the **Downloads** folder on the local computer using filename: 16.json.

CHAPTER 17

Start Stop

This menu allows the operator with read-write privilege to control or manage the chamber with the following operation modes: **Standby**, **Constant**, **Program**. The following figure depicts these modes displayed in the main display area as individual tabs.

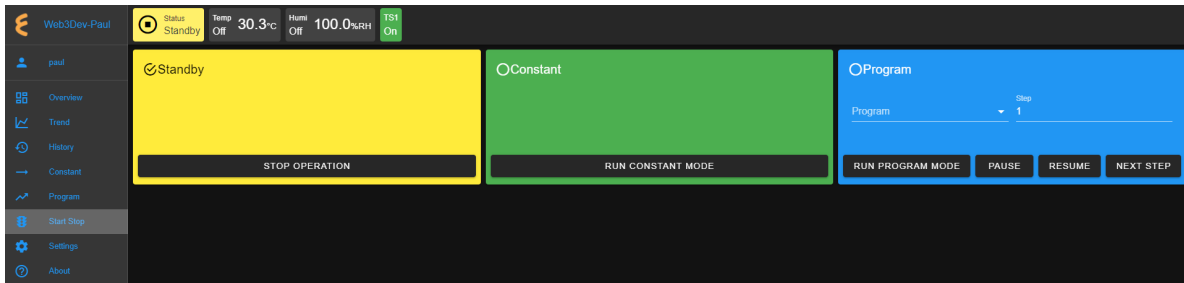


Figure 17.1: The Start/Stop menu with a Status Bar

It should be noted that the **Status** tab in the status bar also provides access to these modes for control and operation. Refer to the **Overview** menu for detail on how to control the chamber operating modes.

17.1 Standby Mode

In **Standby** mode, the chamber is off, and the status tab in the status bar displays as **Standby**. This status is also indicated by the check mark in the circle, as illustrated in the above figure.

17.2 Constant Mode

In **Constant** mode, the chamber operates using the constant configuration, and the status tab displays as **Constant**. This status is also indicated by the check mark in the circle, as depicted in the following figure.

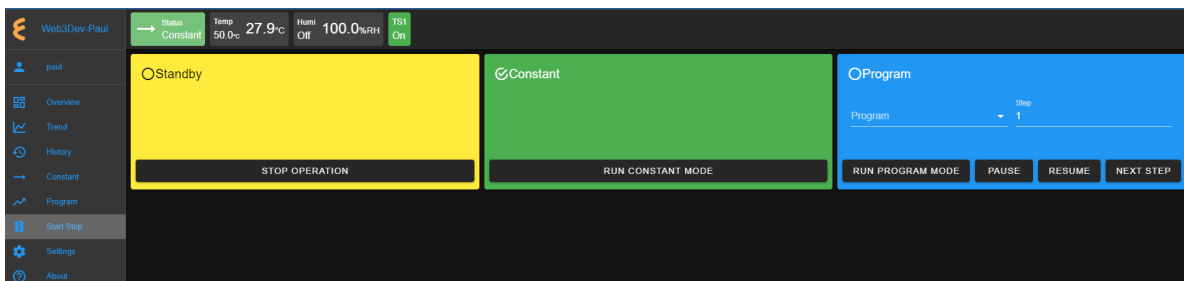


Figure 17.2: The Start/Stop menu with chamber in Constant mode

17.3 Program Mode

In **Program** mode, the chamber is carrying out instructions of the program being executed. The status tab in the status bar indicates the chamber is in **Program** mode, along with the name of the program being executed, as depicted in the following figure. This status is also indicated by the check mark in the circle in the program tab.

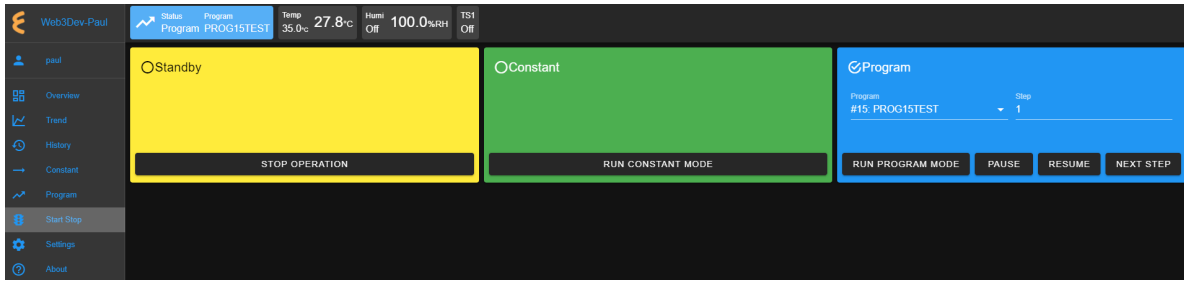


Figure 17.3: The Start/Stop menu with chamber in Program mode

17.4 Start/Stop Standby Mode

Authorized users with read-write privilege may set the chamber in **Standby** mode by clicking the **STANDBY** button in the **Standby** tab. In this mode, the chamber is in the **OFF** state. To terminate the **Standby** mode, activation of a new mode is necessary. For instance, to switch the chamber **ON** and to operate in **Constant** mode, click the **CONSTANT** button in the **Constant** tab in the main display area. EWC immediately moves to apply the operating mode to the chamber.

17.5 Start/Stop Constant Mode

Authorized users with read-write privilege may set the chamber to operate in **Constant** mode by clicking the **CONSTANT** button in the main display area. In this mode, the chamber operates by executing the constant settings in the configuration. To terminate the **CONSTANT** mode, activation of a new mode is necessary. For instance, to switch the chamber from its **Constant** mode to **Standby** mode, click the **STANDBY** button in the **Standby** tab. EWC immediately moves to apply the operating mode to the chamber.

17.6 Start/Stop Program Mode

Authorized users with read-write privilege may set the chamber to operate in **Program** mode by performing a series of operations in the **Program** tab. The following subsections describe the procedures how to run (execute) a program, pause, resume or step through the instructional steps in the program.

17.6.1 Run Program

To load and execute a program to control the chamber, complete the following steps:

1. Click the radio button in the **Program** tab to select a program from the list. Apply the scroll bar, if necessary, to search through the long list of programs, as depicted in the following figure.

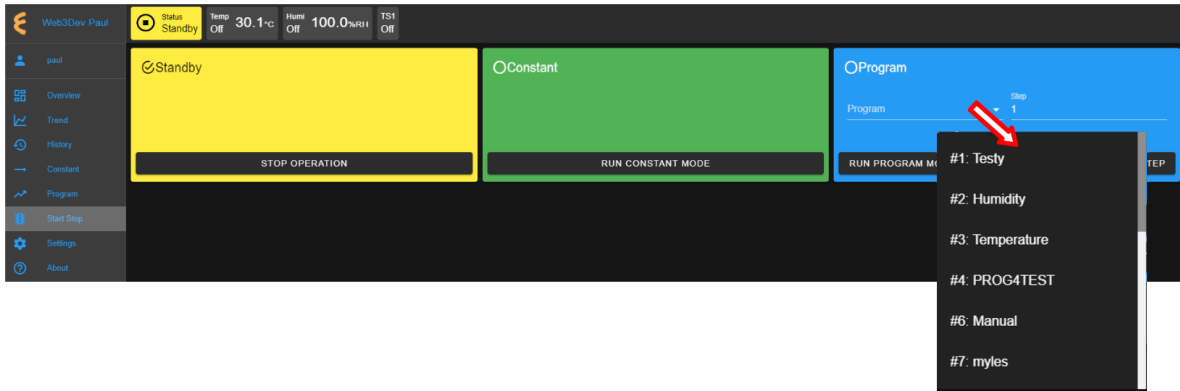
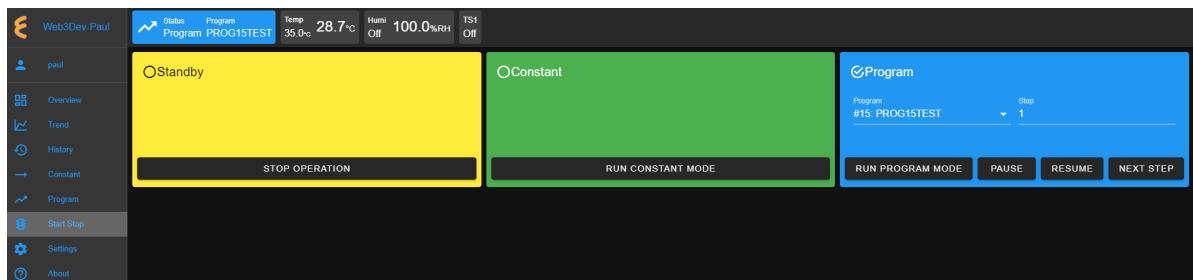


Figure 17.4: Executing a program from the Program List

2. Click to select the desired program name.
3. To start this program at a certain step, enter the step number in the **Step** field. Default setting is 1.
4. Click the **RUN PROGRAM MODE** button to execute the program. EWC immediately moves to apply the operating mode to the chamber. The **Status** tab and **Status** bar now display the program being executed, as depicted in the following figure. The **Overview** page maybe accessed to display the detail of the program being executed.



17.6.2 Pause/Resume Program

Authorized users with read-write privilege may control the chamber during program execution. **Program** mode may be interrupted and put in a “suspense mode” using the **PAUSE** button in the **Program** tab. To pause a program during execution, click the **PAUSE** button; all operations are suspended. An update notification appears in the lower-right corner. The **Paused** notification is posted in the **Status** tab.

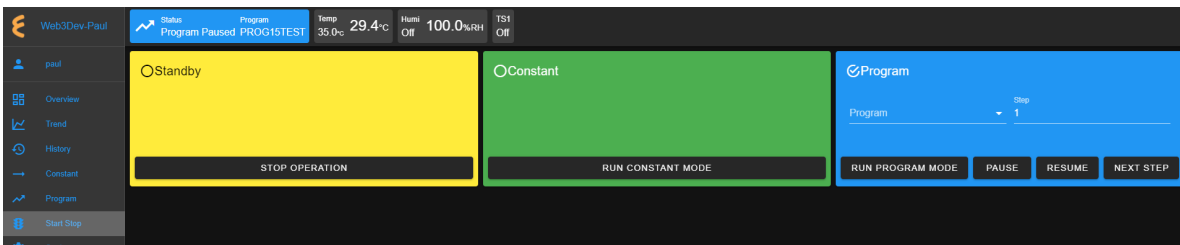


Figure 17.5: Program is being paused.

To resume the operation and continue program execution, click the **RESUME** button. The chamber will continue to operate based on instructions in the program. Program name is posted on the **Status** tab to indicate chamber is in **Program** mode and that program (name) is being executed.

17.6.3 Stepping through Program

Without having to wait for each step in the program to complete its tasks for the entire time duration in the instruction, an operator may step through the program to study the effects of the instructions in a certain step. While the program is being executed, click the **NEXT STEP** button to execute the next step in the program. An update notification appears in the lower-right corner to confirm the action. This action may be repeated until the last step in the program is reached. The **Overview** page in combination with the extended tab maybe accessed to display the detail of the program being executed and its steps being stepped through.

17.7 Timers

The **Timers** tab provides a quick way to apply the Macro Editor to automate a simple macro action to extend the operating mode of the chamber. There are two timer types: One-time timer and repeated timer. The one-time timer or one-shot timer allows an operator to set up a single (hence, one-time) operation on the chamber, while the repeated timer permits an operator to set up a repeated operation on the chamber. The repeated timer will operate indefinitely until it is disabled. The following figure depicts these two timer types.

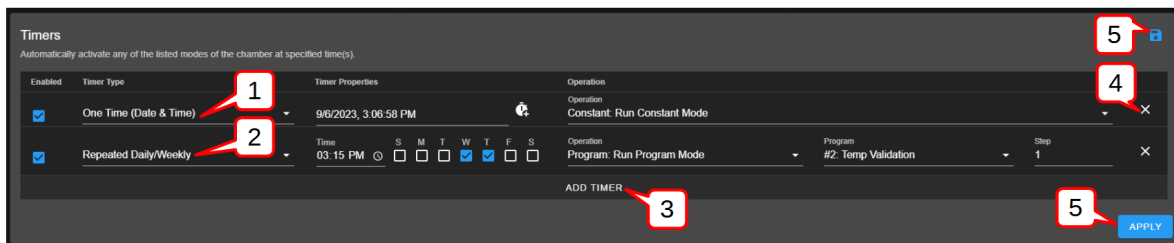


Figure 17.6: Example of one-time and repeated timer operation

1. **One-Time:** This timer fires the constant mode operation at 3:06:58 PM on 9/6/2023. The timer instruction and 3:06:58 PM must be configured ahead of time, later than the current time in order for the operation to take effect. For this reason, EWC date/time must synchronize with the current or local date/time (refer to **Date/Time Settings** under the **Settings** menu for detail). The one-shot timer is date/time dependent.
2. **Repeated Daily/Weekly:** This line is added after the first line got executed. Since it is set to occur after the first line, it will trip at 3:15 PM on Wednesday and Thursday of the week (in reference to the current date/time of EWC). The action executes a program from slot 2 (also referenced by the program name). When program execution is complete, the chamber will be set in the operating mode specified by the instruction in the program. This timer type is date/time independent; the operation will recur until the timer itself is removed from the **Timers** list or disabled with the **Enabled** box unchecked.
3. **Add Timer:** A new timer can be added using the **Add Timer** button, which will be

added at the bottom of the list.

4. **Remove/Delete:** Each timer can be removed using the **X** button to its right.
5. **Save/Apply:** To start the timer, the **Save** or **Apply** button must be used. The two timer instructions (depicted above) are saved under the Macro Editor called **Operation Timer 1** and **Operation Timer 2**, respectively. If the timers are edited with new instructions and saved, the system generates a new name **Operation Timer 3** for the third timer, with a numeral incremented by one per each update. If the timer instructions are all removed from the **Timers** list, and a new timer is created and saved, the system starts over with **Operation Timer 1**, with its numeral incremented by one on each new update. This information can be viewed under the **Macros** submenu (under the **Settings** menu).

17.7.1 Program Mode: One-Time Timer

A one-shot timer sets the **Timers** to fire a certain action once based on the set date and time. With this feature, a selected program can start at a certain day and time once. The running program can be paused, resumed or stopped by another (subsequent) one-shot timer. An operator can plan to stop a certain program and switch the chamber to a different mode with the one-shot timer.

The following example illustrates how to set a one-shot timer to switch the chamber from **Standby** to **Program** and execute the said program starting with step 1.

1. Log in using the **admin** account
2. Access the **Start Stop** menu
3. Touch or click the **ADD TIMER** bar
4. Select/confirm that **One Time** is selected from the drop-down list of the **Timer** type; by default, **One Time** is selected.

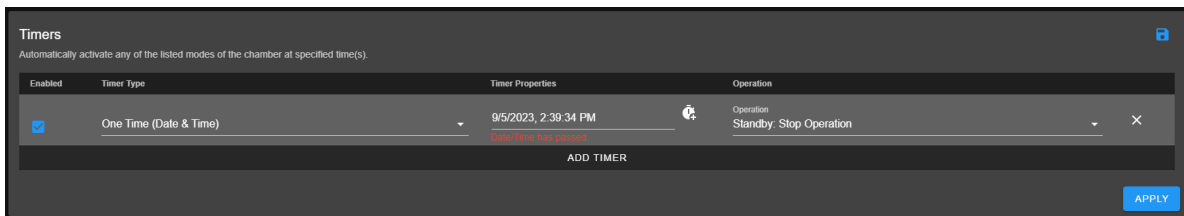


Figure 17.7: Setting a one-time automation

5. Touch or click the date/time field under the **Timer Properties** and apply the calendar and time to set the desired time. **Note:** Date and time must be ahead of the current date and time on the EWC system.

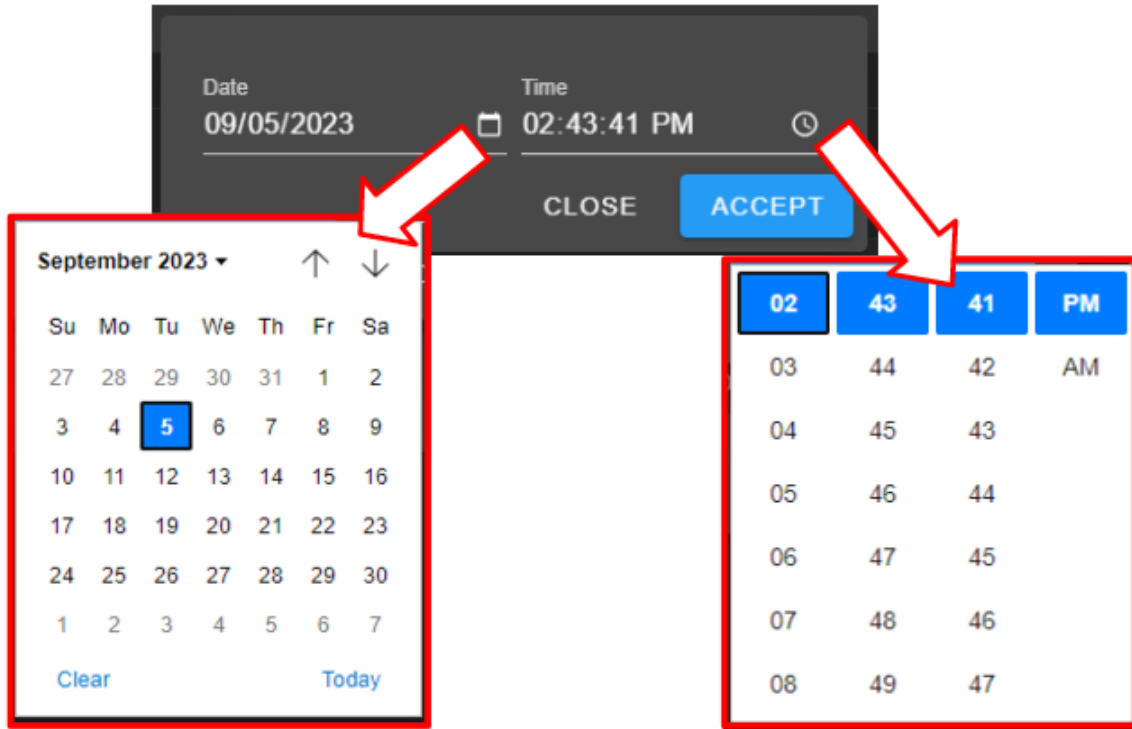


Figure 17.8: Set date/time for a one-shot action

Note: For a one-time operation, it is easier to use the Offset button (on the right of the date/time field) to adjust the future time, as depicted by the arrows in the following figure. Here, EWC will add the time to the current time to calculate when this action will fire.

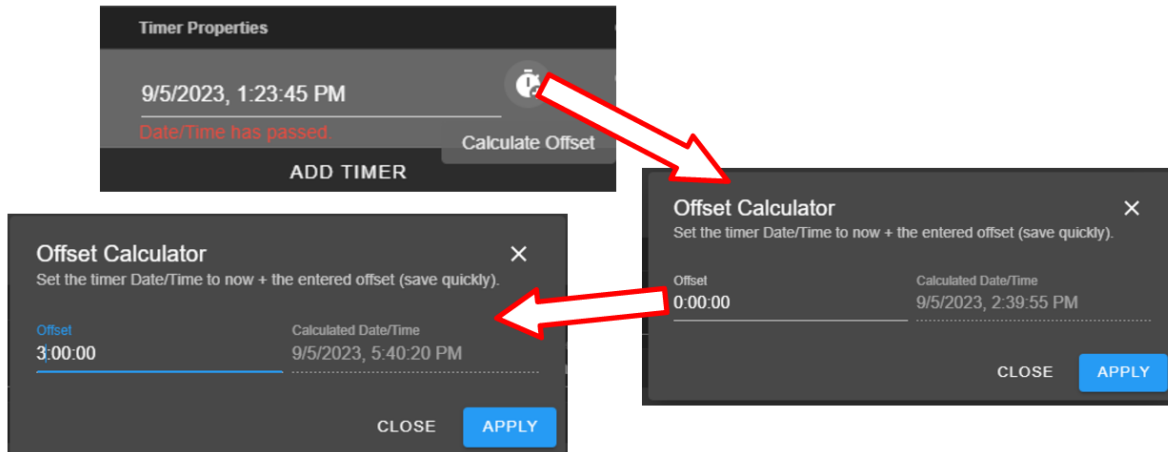


Figure 17.9: Using the time-offset calculator

6. Under **Operation**, select **Program: Run Program**
7. Under **Program**, select from name (or slot number)
8. Under **Step**, select what step to start
9. Apply the setting with the **APPLY** button

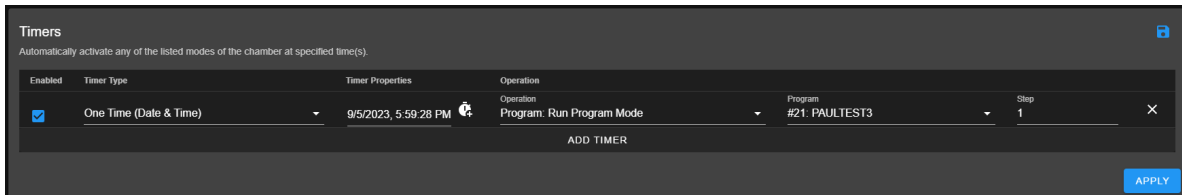


Figure 17.10: Program mode for a one-time start

Note: Both the **Save** and **APPLY** buttons provide the same effect. Either button can be used to save the settings and apply the action.

10. The program in slot 21 (as depicted in the example) will commence at 5:59:28PM (according to the EWC local time).

17.7.2 Removing or Adding a Timer

The one-shot or repeated timer can be removed from or added to the **Timers** list with the **X** or **ADD TIMER** button. Each new timer is added to the bottom of the list and takes effect after each update.

To add a new timer and use it, simply apply the **ADD TIMER** button. The following figure illustrates how a second timer is added to switch the chamber from a program mode (activated by the first timer) to **Constant**. Here, program from slot 21 gets executed (by the timer in the first line) at 1:20:15 PM, with execution time to last several hours. The timer in line 2 will switch the chamber to **Constant** mode at 2:00:00 PM.

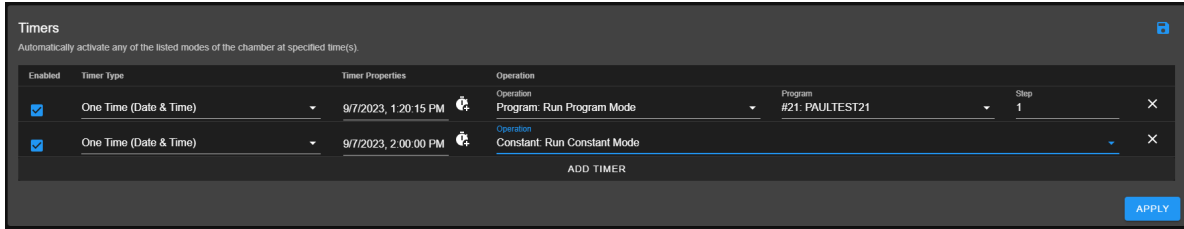


Figure 17.11: Setting additional one-shot timer after the first

Different timers on the list can be enabled or disabled using the **Enabled** box. Additional timer can be added to the **Timers** list and updated to take effect, provided the time is set for future time.

17.7.3 Constant Mode: One-Time Timer

The following example illustrates how to configure a one-shot timer to stop the current program and switch the chamber to **Constant** at a specific time. The timer is configured as a new instance with one line by itself, as depicted in the following figure. The action is instant and the program being executed will be stopped immediately; therefore, the action must be applied with care.

1. Log in using the **admin** account
2. Access the **Start Stop** menu
3. Clear all or current timer settings with the **X** button (if necessary).
4. Touch or click the **ADD TIMER** bar
5. Confirm that **One Time** is selected (or make selection from the drop-down list).
6. Touch or click the date/time field under the **Timer Properties** and apply the calendar and time to set the desired time.
7. Under **Operation**, select **Standby: Stop Operation**
8. Apply the setting with the **APPLY** button. The timer is now saved in the Macros list.

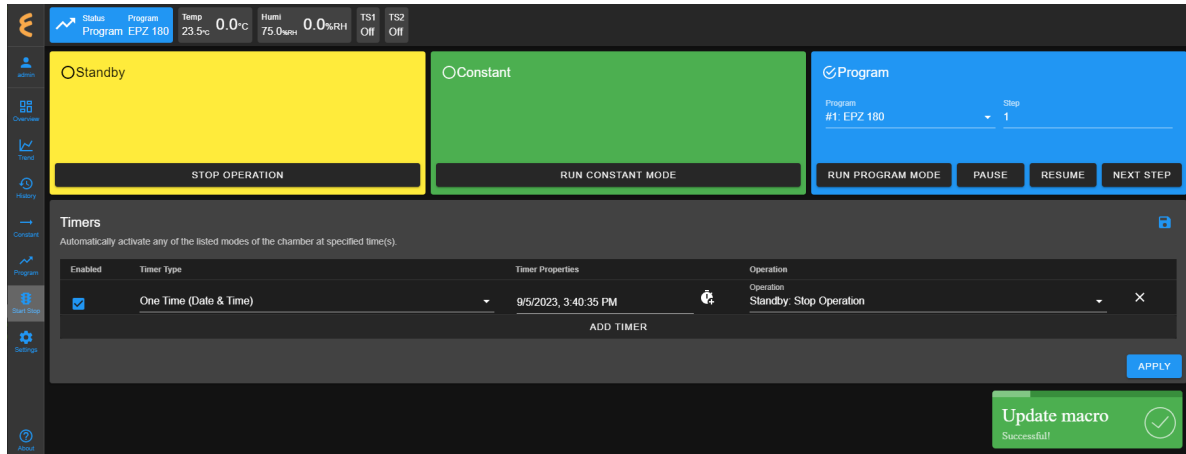


Figure 17.12: Scheduled a one-time timer to set chamber in Constant mode

- The timer is activated at the set time, as depicted in the Macros list under the Operation Timer 1 script. To view the Operation Timer 1 action, access the Settings menu and select Macros from the submenu.

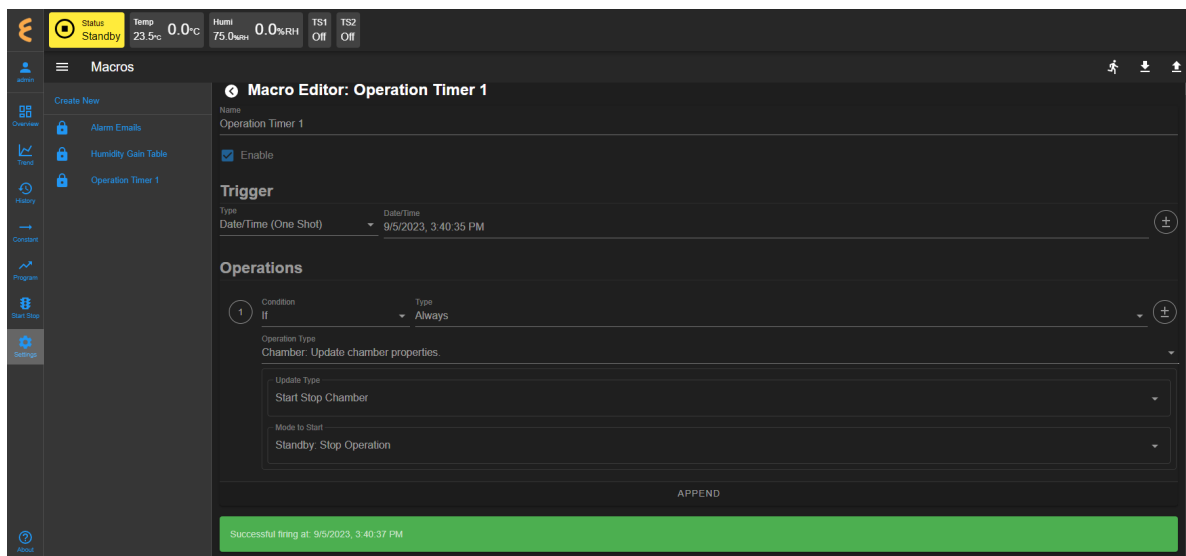


Figure 17.13: Macros action recorded on the one-time Timer

17.7.4 Program Mode: Weekly Repetition

With a weekly repeated timer, a program can start on a certain day, at a certain time. The following example illustrates how to execute a program on a weekly basis (one day during each week) at a certain time. Here, we set a program to execute every Wednesday at 6:00 AM.

- Log in using the **admin** account
- Access the **Start Stop** menu
- Clear all or current timer settings with the **X** button (if necessary).

4. Touch or click the **ADD TIMER** bar
5. Touch or click **Timer Type** and select **Repeated Daily/Weekly**
6. Edit the time to 6:00 AM
7. Check the box under W. The calendar format is Sunday(S) to Saturday (S).
8. Under **Operation**, select **Program: Run Program Mode**
9. Under **Program**, touch or click to select slot number and name (slot 21 and PAULTEST3 was used as an example).
10. Set and select program step 1 to begin execution.
11. Apply the setting using the **APPLY** button. The complete configuration is depicted in the following example.

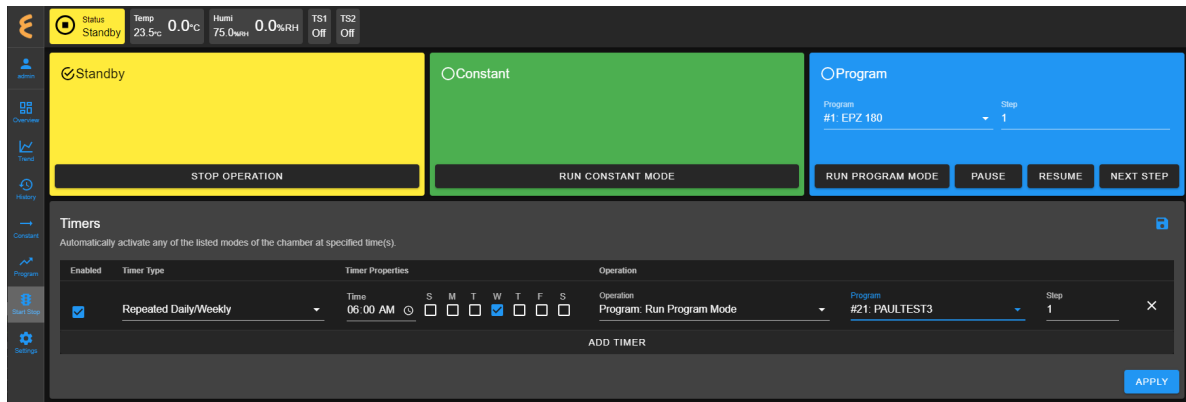


Figure 17.14: Single-day weekly timer

This timer can be disabled or enabled by manipulating the **Enabled** box. If you stop the program or switch the chamber to a different mode (such as, **Constant**), while this timer is still enabled, the selected will recur on Wednesday at 6:00 AM the following week. To disable the timer permanently, it must be removed from the list (with the X and APPLY button).

17.7.5 Program Mode: Daily Repetition

The following example illustrates how to execute a program on a daily basis, from Monday through Friday, at 9:45 AM during each week.

1. Log in using the **admin** account
2. Access the **Start Stop** menu
3. Clear all or current timer settings with the **X** button (if necessary).
4. Touch or click the **ADD TIMER** bar
5. Touch or click **Timer Type** and select **Repeated Daily/Weekly**
6. Edit the time to 9:45 AM
7. Check the boxes under M through F. The calendar format is Sunday(S) to Saturday (S).

8. Under **Operation**, select **Program: Run Program Mode**
9. Under **Program**, touch or click to select slot number and name (slot 21 and PAULTEST3 was used as an example).
10. Set and select program to begin at step 1.
11. Apply the setting using the **APPLY** button. The complete configuration is depicted in the following example.

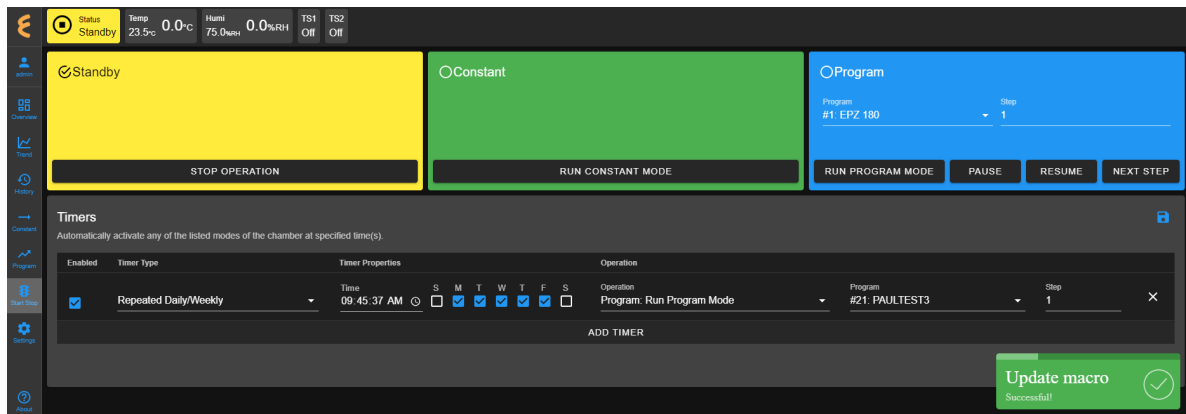


Figure 17.15: Timer setting for everyday of the week

The following trend graph is a result of the timer with its configuration set to run over several days. The trend graph was produced by extrapolating the data from the last three days (Friday through Sunday). It shows how program was repeated each day at 6:05 PM and ended shortly before 9:00 AM, as indicated by the status bar at the bottom of the graph. The chamber was put in a **Standby** mode until the select program recurs at 6:05 PM.

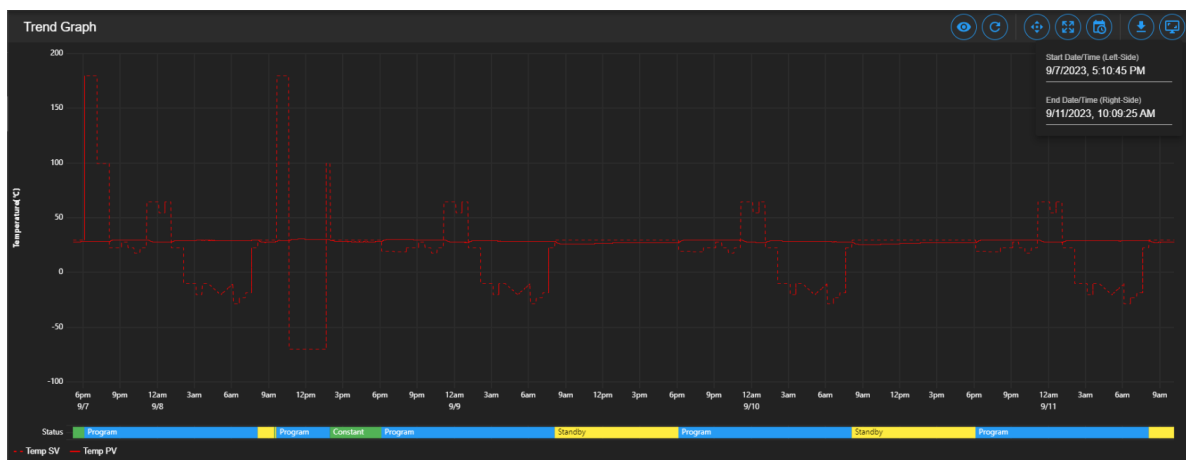


Figure 17.16: Trend graph of chamber controlled by a timer

This timer can be disabled or enabled by manipulating the **Enabled** box. If you stop the program or switch the chamber to a different mode (such as, **Constant**), while this timer is still enabled, the selected program will recur on the next day. To disable it permanently, the timer can be removed from the list (with the X and APPLY button).

17.7.6 Multiple Timers: One-Time or Repeated Daily/Weekly

The **Timers** list may contain multiple timers with different instructions for a specific operation. Multiple timers allow for sequential activations, order of script execution or specific execution via the **enabled** box selection, etc.

The following figure depicts a list of multiple timers, each with a specific function and operation, which has been prepared to execute in the top-to-bottom paradigm.

The screenshot shows a 'Timers' window with the subtitle 'Automatically activate any of the listed modes of the chamber at specified time(s)'. It contains a table with four timer entries. Each entry has an 'Enabled' checkbox, a 'Timer Type' dropdown, 'Timer Properties' (Time and day-of-week indicators), and 'Operation' details (Operation, Program, and Step). The first timer is 'Repeated Daily/Weekly' at 06:05:54 PM, enabled for all days, with the operation 'Run Program Mode' for program '#21: PAULTEST21' at step 1. The second and third timers are 'One Time (Date & Time)' at 9:27:59 AM and 9:31:20 AM respectively, both with the operation 'Constant: Run Constant Mode'. The fourth timer is 'One Time (Date & Time)' at 9:36:36 AM, with the operation 'Standby: Stop Operation'. The fifth timer is 'One Time (Date & Time)' at 9:36:36 AM, with the operation 'Run Program Mode' for program '#5: Temp Validation' at step 1. An 'ADD TIMER' button is at the bottom, and an 'APPLY' button is at the bottom right.

Enabled	Timer Type	Timer Properties	Operation
<input checked="" type="checkbox"/>	Repeated Daily/Weekly	Time: 06:05:54 PM S M T W T F S (all checked)	Operation: Run Program Mode Program: #21: PAULTEST21 Step: 1
<input checked="" type="checkbox"/>	One Time (Date & Time)	9/8/2023, 9:27:59 AM	Operation: Constant: Run Constant Mode
<input checked="" type="checkbox"/>	One Time (Date & Time)	9/8/2023, 9:31:20 AM	Operation: Standby: Stop Operation
<input checked="" type="checkbox"/>	One Time (Date & Time)	9/8/2023, 9:36:36 AM	Operation: Run Program Mode Program: #5: Temp Validation Step: 1

ADD TIMER

APPLY

Figure 17.17: Multiple sequential timer operations

Each entry in the above figure is added after the previous one (above it) has been executed. All of which are enabled by default. Only timer 1 (top line) and timer 4 (bottom line) remain in effect, since the middle two are one-shot timers. In addition, the last timer is also a one-shot timer and it will end after the program it has executed has ended. Each timer causes action to take over the previous one.

Part IV

ESPEC Custom Chamber with Watlow F4T and Touch Display

CHAPTER 18

Overview

The **Overview** page displays the current status of the chamber and its operating mode. A user is brought to this page after successfully logging into EWC. The following figure depicts **Overview** with the chamber in Standby as indicated in the status tab and its extension bar. This extension bar is only available in the **Overview** menu.

The date/time being used by EWC is displayed on the left in the system bar, labeled as item 1. The date/time posted in the extension bar is the date/time being used by the chamber/controller, labeled as item 2. These two may show different date/time. While the date/time stamp of data logs and Macros automated actions are based on the date/time used by EWC, the controller date/time should also synchronize with that on EWC and the local device (that launched the Web browser). Detail of date/time synchronization is discussed in the **Date/Time Settings** submenu (under the **Settings** menu).

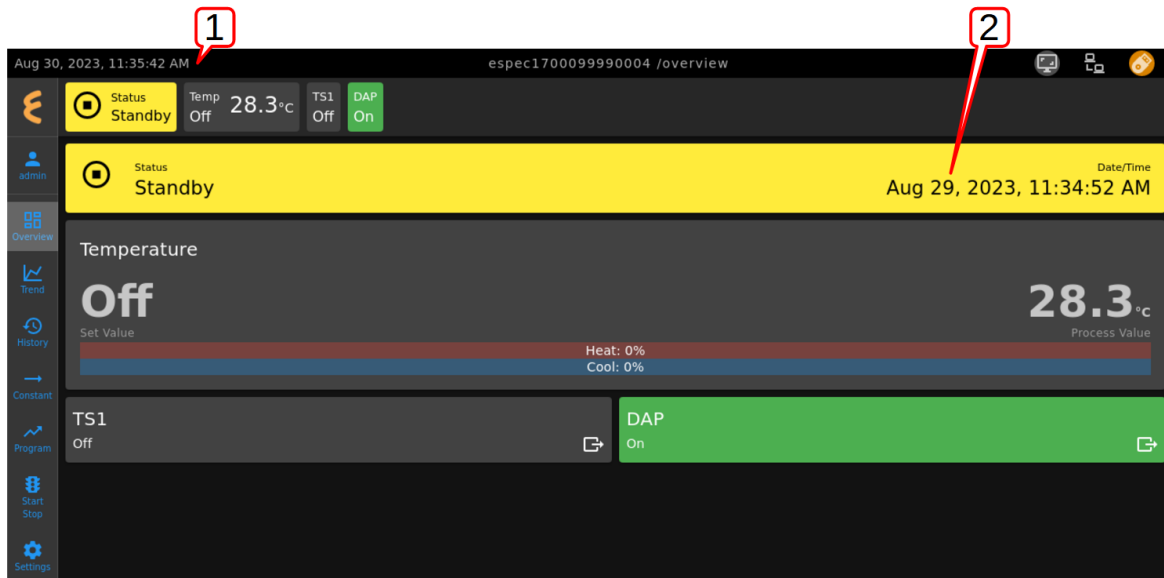


Figure 18.1: Overview page with chamber in Standby mode

The following figure shows that the date/time of EWC (upper left, item 1) and that of the chamber/controller (in the extension bar, item 2) is almost synchronized.

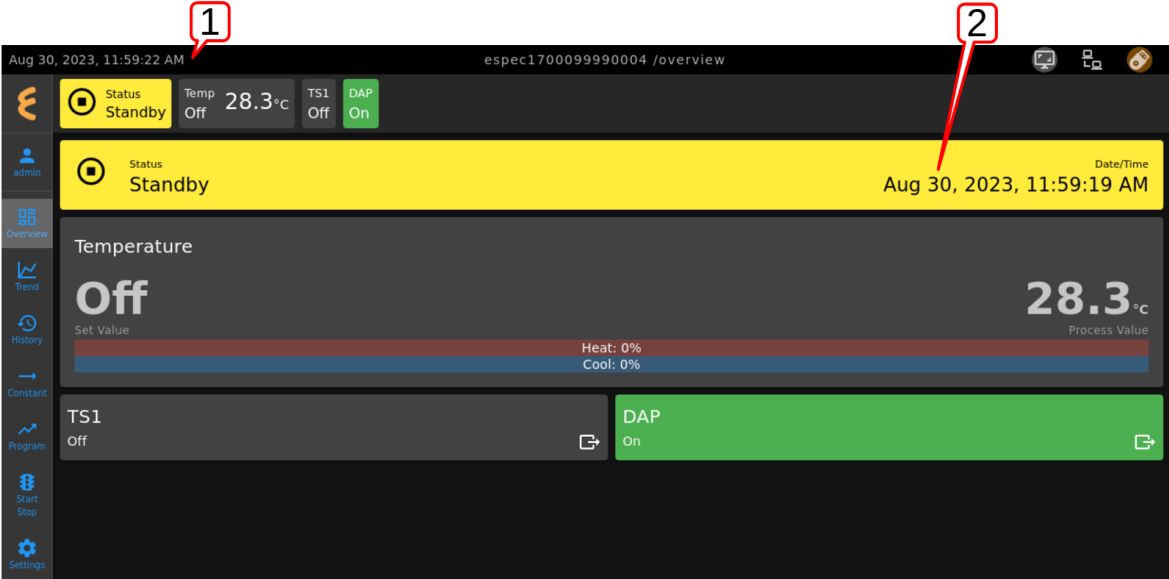


Figure 18.2: Chamber/controller and EWC date/time is synchronized

The following figure depicts **Overview** showing the chamber in Constant mode.

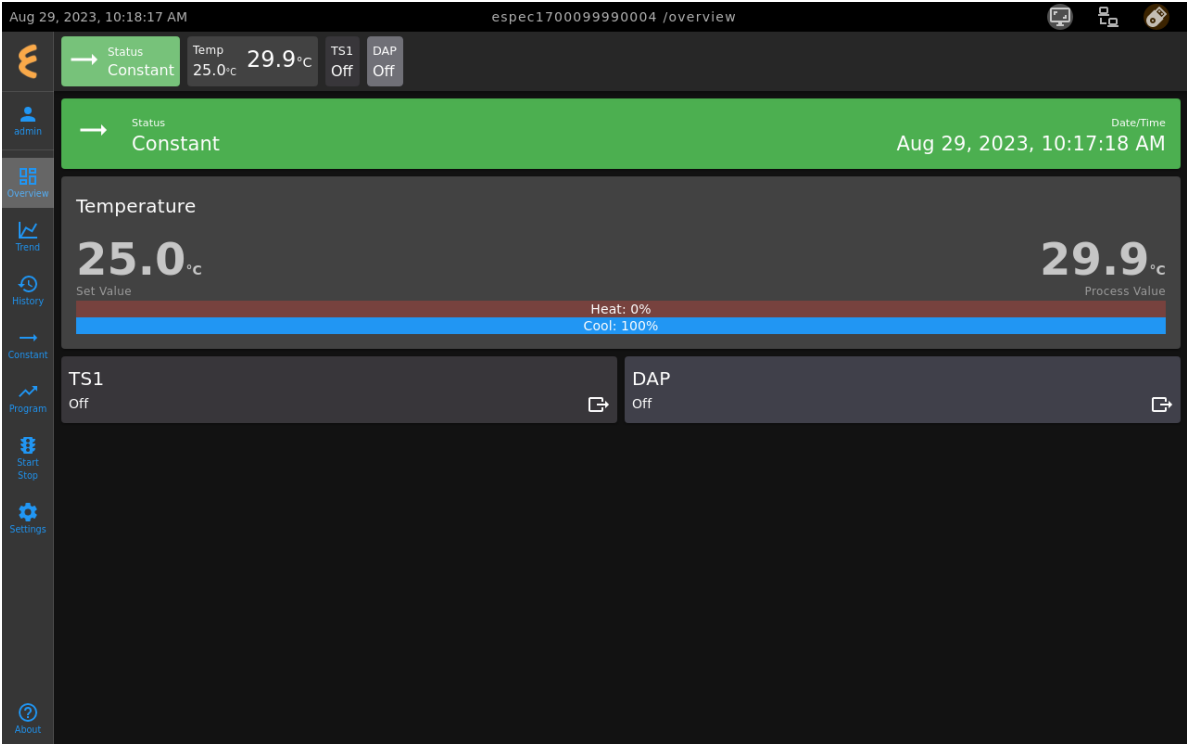


Figure 18.3: Overview page with chamber in Constant mode

The following figure depicts **Overview** showing the chamber in Program mode. Detailed information about the program, including what step is being executed, is listed in the extension bar (of the status tab). This feature provides the operator with useful information about the status of the chamber and the program.

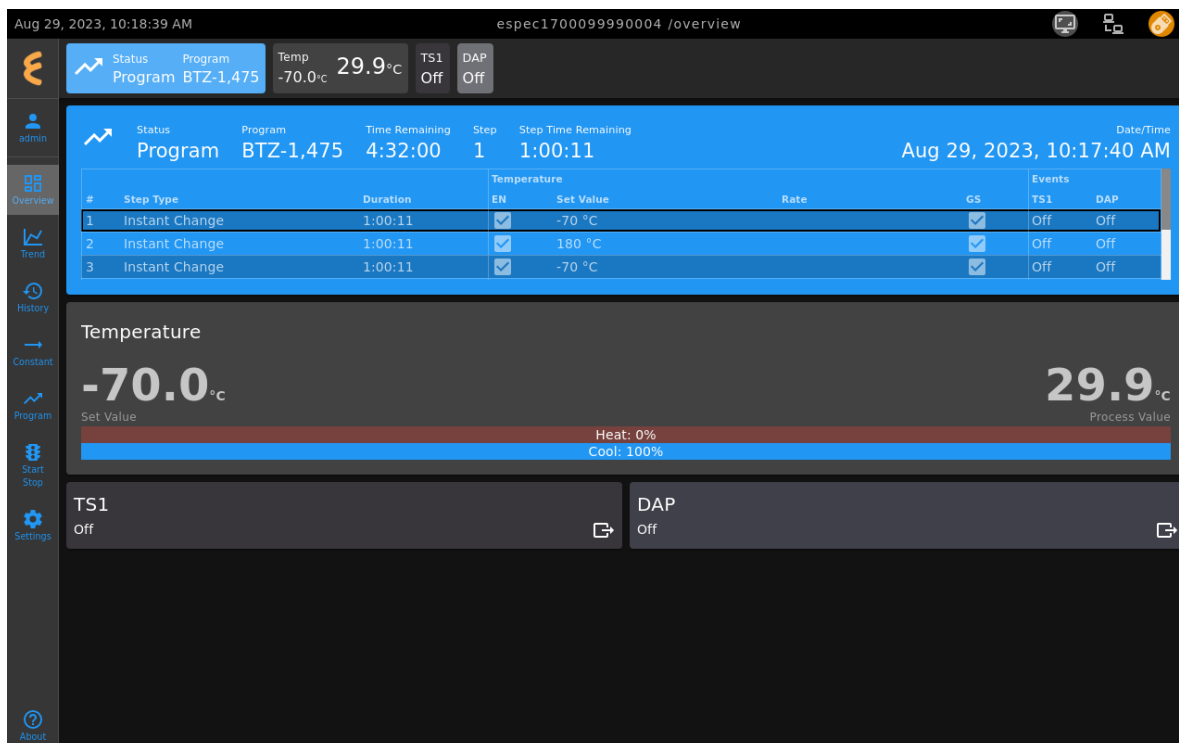


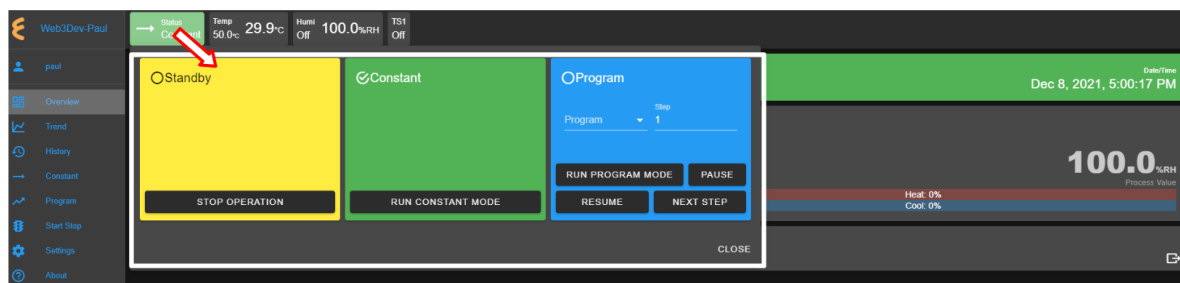
Figure 18.4: Overview page with chamber in Program mode

Only users with read-write privilege can control the chamber operation mode from within this page. Supported operation modes are **Standby**, **Constant** and **Program**. Each tab in the status bar may be accessed to apply new settings at any time. This feature enables the operator to control the chamber without having to access the **Start Stop** menu in the menu bar. The following sections detail a step-by-step procedure how to control the chamber's operating mode via the **Overview** menu for users with read-write privilege.

18.1 Standby Setting

For authorized users with read-write privilege, to set the chamber in **Standby** mode, proceed with the following steps. Initially, the chamber is operating in **Constant** mode. We wish to switch its operation mode to **Standby**.

1. Click the status tab in the status bar to access the drop-down tabs, as shown in the figure.



An alternative way to access these drop-down tabs is to click on the extended tab of the

status tab itself, as depicted in the following figure. This extended tab is available only in the **Overview** page.

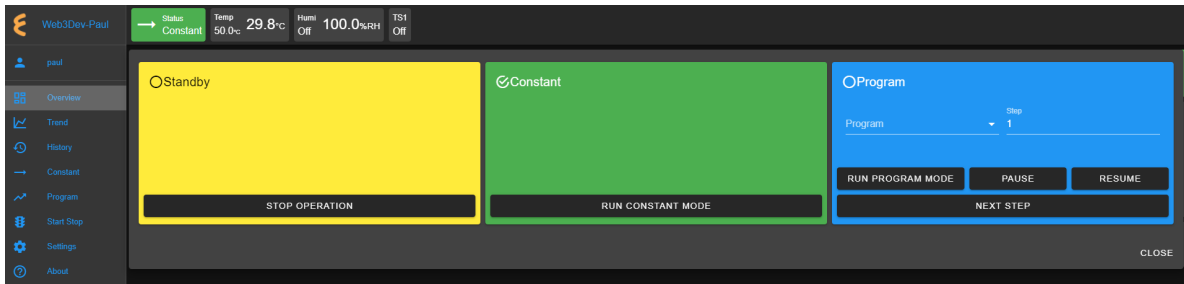


Figure 18.5: Status tab drop-down menu via the extended tab

2. Click the **Stop** button in the standby tab. EWC immediately moves to apply the operating mode to the chamber. A check mark in the **Standby** tab indicates and confirms its standby mode.
3. To close the drop-down tabs, perform one of the following action:
 - Click an empty area in the Main Display.
 - Click a different menu in the menu bar.
 - Click the status tab itself. or
 - Click the **CLOSE** button underneath the alarm tab.

18.2 Constant Setting

Suppose the chamber is in **Standby** mode. For authorized users with read-write privilege, the chamber can be set in **Constant** mode with the following steps.

1. Click the status tab in the status bar. As depicted in the following figure, the chamber is in **Standby** mode.

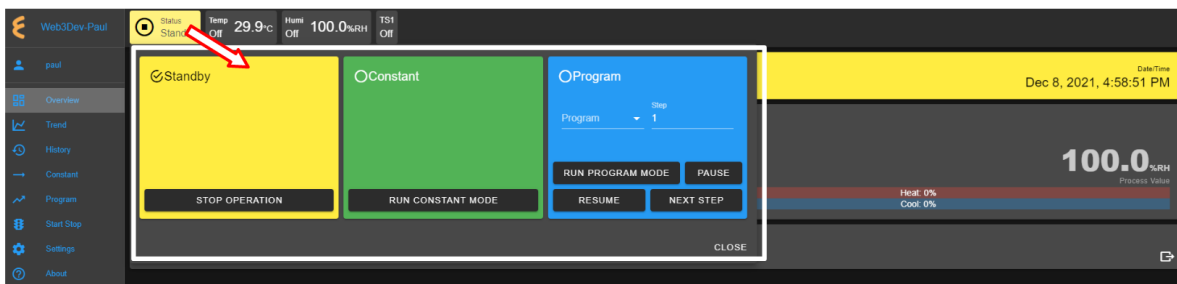


Figure 18.6: Constant mode setting

2. Click the **CONSTANT** button in the constant tab. EWC immediately moves to apply the operating mode to the chamber.
3. To close the drop-down tabs, click the **CLOSE** button in the lower-right corner (underneath the alarm tab); or the one of the alternative options mentioned above.

18.3 Program Setting

To set the chamber in **Program** mode means a profile (i.e., program) is loaded and executed.

1. Click the status tab in the status bar or the extension bar of the status tab.
2. Click the radio button in the program tab to access the program list (see the figure below).

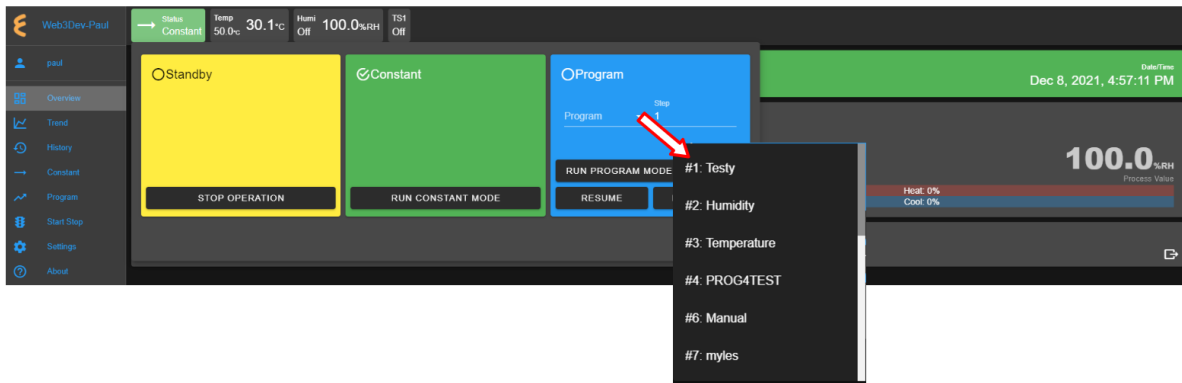


Figure 18.7: Select program to start chamber in Program mode

If no program is available for loading, the list contains slot numbers without programs, as depicted in the following figure. A program must be created first before it can be loaded for execution. Chapter 8 discusses how to create a program to control the chamber.

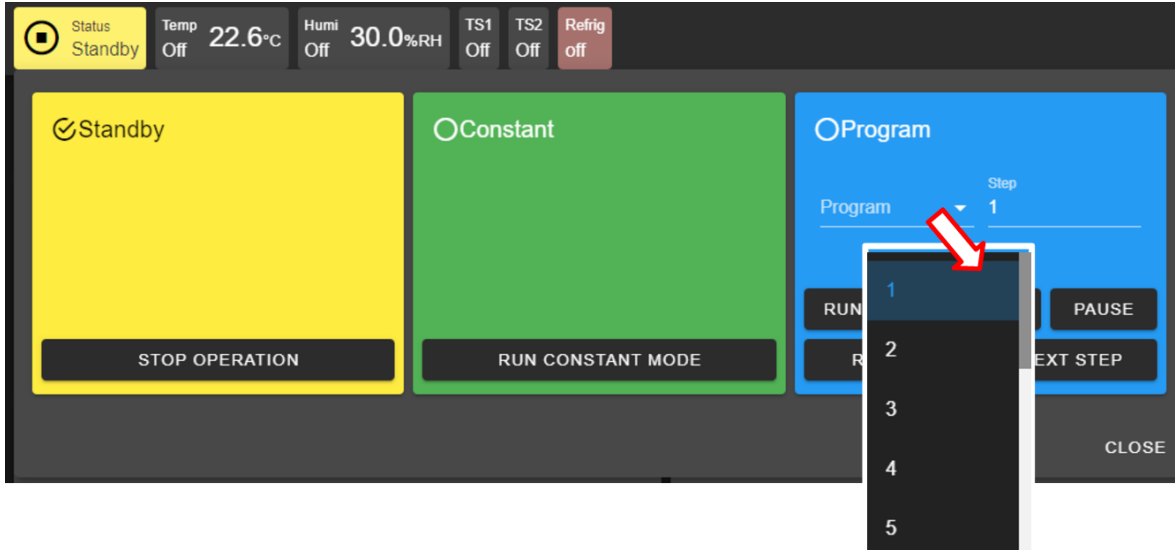


Figure 18.8: No program available for execution

3. Click to select a program from the list. Apply the scroll bar, if necessary, to select the desired program.
4. Enter a desired step number in the step field for program to start. Default start step is 1.
5. Click to select a program from the list. Apply the scroll bar, if necessary, to select the desired program.

6. Enter a desired step number in the step field for program to start. Default start step number is 1.
7. Click the **RUN PROGRAM MODE** button to execute the program. EWC immediately moves to apply the operating mode to the chamber. Note: This program tab offers a few practical methods during a program execution. The **Pause** button can be used to pause the program. Program can be resumed via the **RESUME** button. Program instruction lines can be stepped through via the **NEXT STEP** button.
8. Click the **CLOSE** button to view the status of program execution displayed in the extended tab.
9. To end or interrupt the program being executed, switch the chamber to **Standby** or **Constant** mode via the **Status** tab.

18.4 Clear Alarms

When EWC detects that the chamber is in an alarm state, it also sets itself in an alert state by displaying a list of active alarms and fault names in the red window to require an immediate action from the operator, as depicted in the following figure.

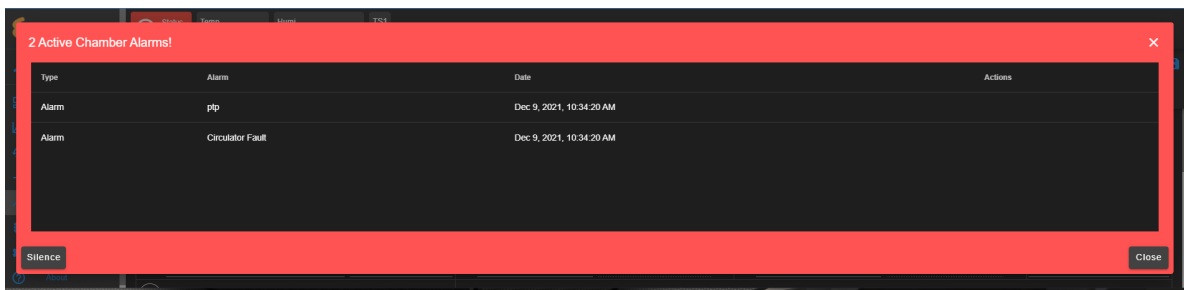


Figure 18.9: Chamber in alarm state

A repeating beep on the local computer (that runs a Web browser to control EWC) is also tripped to get the operator's attention. The **SILENCE** button can be used to turn off the beep. This alert window can be closed by clicking the **CLOSE** button or the X button. However, the alarm state still remains to be resolved as indicated by the **Status** tab in the following figure. To redisplay or expand the alarm list, click the red dot in the lower-right corner.

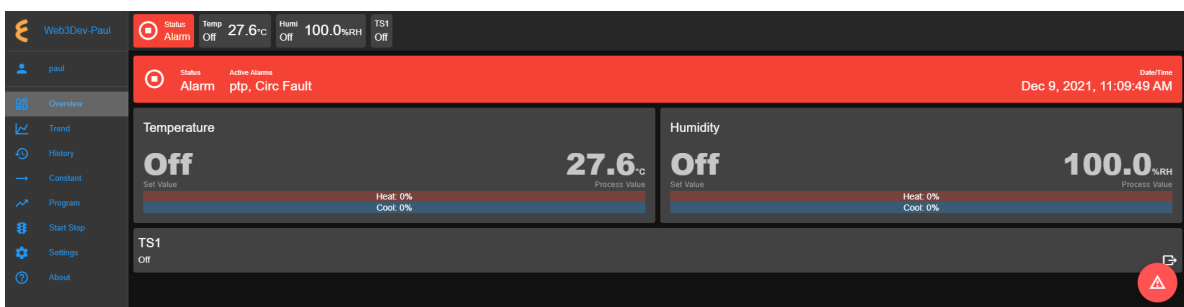


Figure 18.10: Alarm state in overview page

On a touchscreen monitor, these triggered alarms can be relisted by touching the red dot on the lower-right corner.

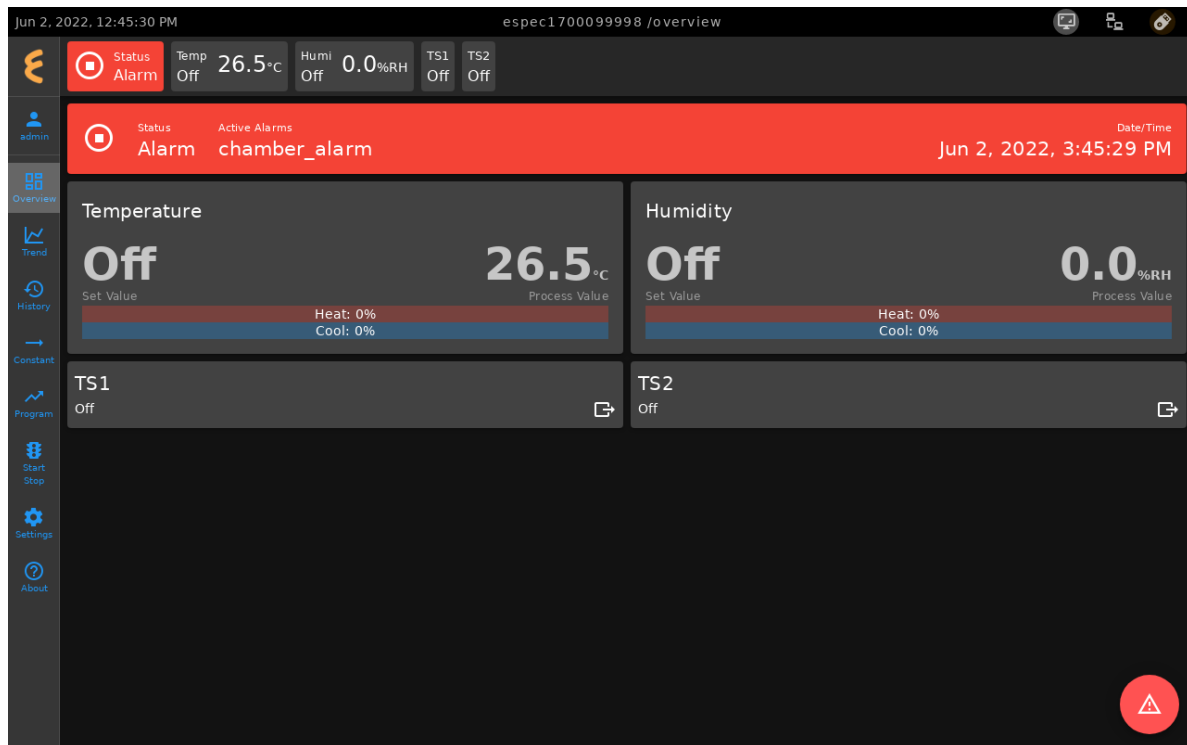


Figure 18.11: Alarm state displayed on MIMO touchscreen

In an alarm state, operation is halted until all alarms triggered by the chamber are resolved. The chamber operation mode may be switched to a constant mode, as depicted in the following figure; however, all active alarms are still unresolved, as indicated in the extended status tab. Once all alarms are cleared, EWC automatically clears all alert messages and resumes in the **Constant** mode.

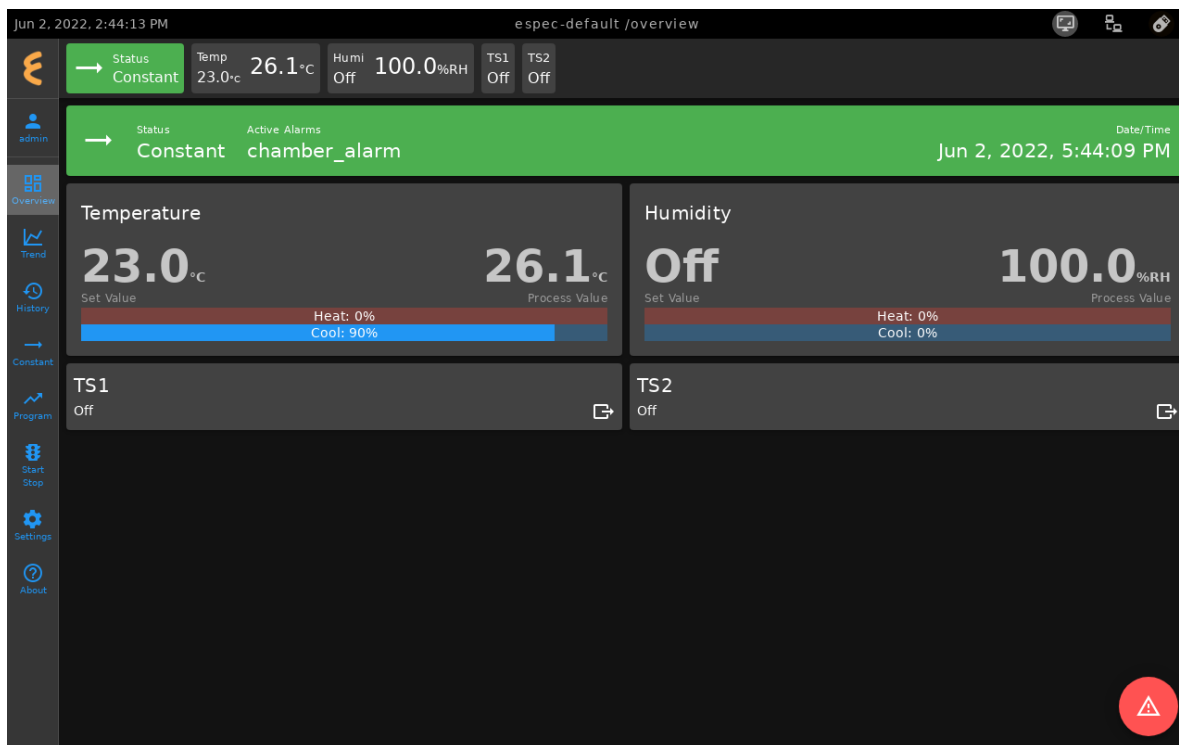


Figure 18.12: Constant mode may be switched during an alarm state

If alarms occurred during a program execution state, operation is halted in an alarm state. Once all alarms are cleared, EWC automatically clears all alert messages and resumes normal operation by switching the chamber to a **Standby** mode, as depicted in the following figure.

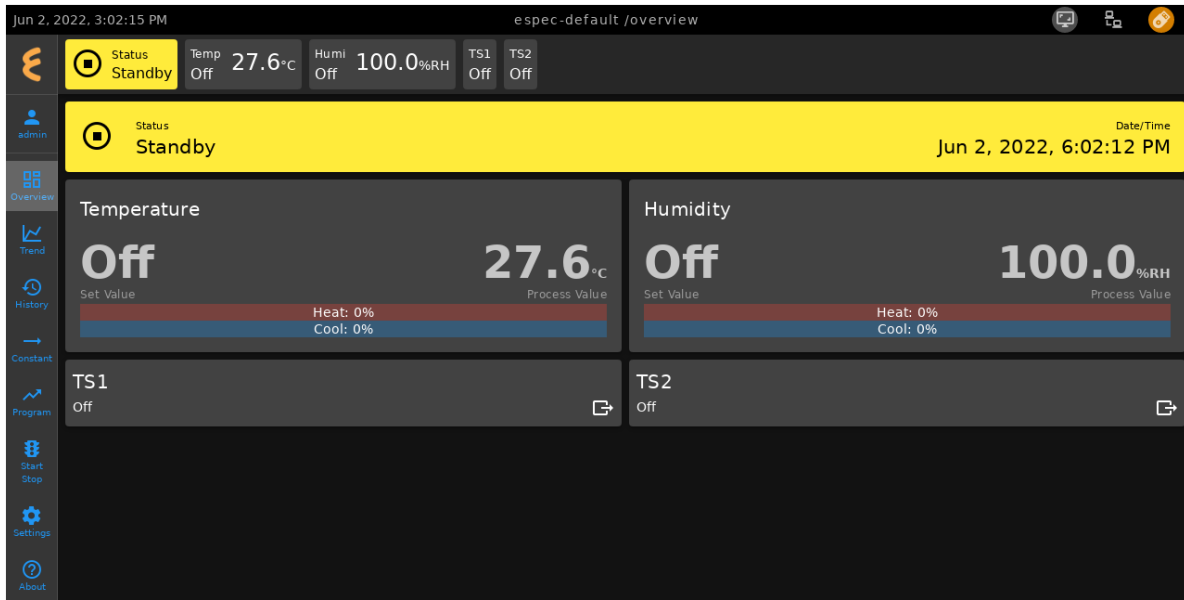


Figure 18.13: Standby mode after alarms are cleared

18.5 Temperature, Humidity or Time Signal Settings

On the **Overview** page, settings of temperature, humidity or time signals can be controlled via the tabs in the status bar or the dedicated panes in the main display area, as shown in the following figure.

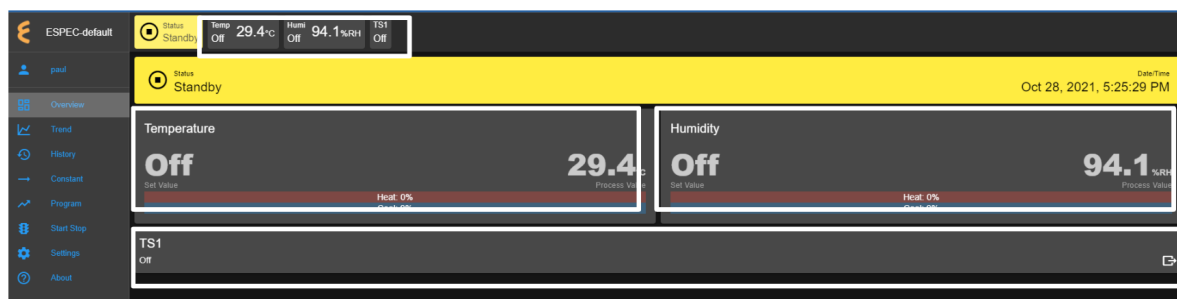


Figure 18.14: Perform settings via the main display area

18.5.1 Settings via the Status Bar

To set temperature with a new set value, complete the following steps:

1. Click the Temp tab in the status bar.
2. In the drop-down pane, click and enter new value in the Set Value field or click the up/down arrow to adjust the value, as illustrated in the following figure.

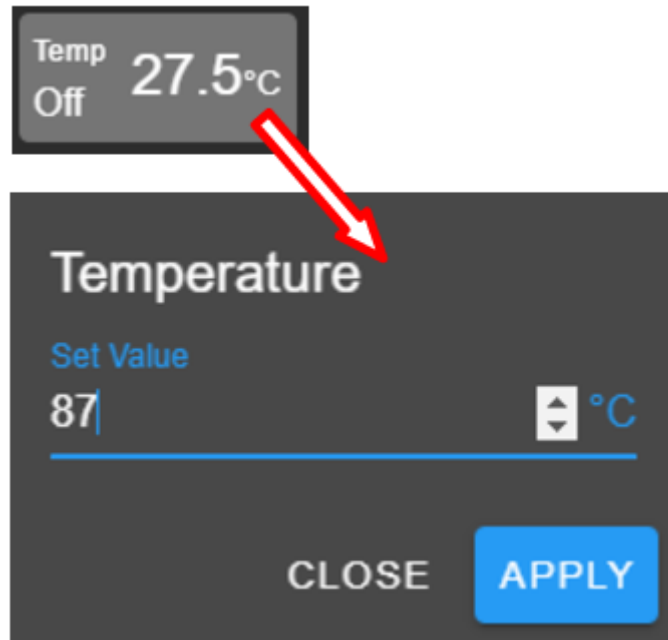


Figure 18.15: Setting new temperature value via the temp tab

3. Click **APPLY** to apply the new setting.
4. To cancel the setting, click the **CLOSE** button.

To turn on Humidity and set its value, complete the following steps:

1. Click the Humi tab in the status bar.
2. In the drop-down pane, check the box to enable humidity.
3. Click and enter new value in the Set Value field or click the up/down arrow to adjust the value, as illustrated in the following figure.

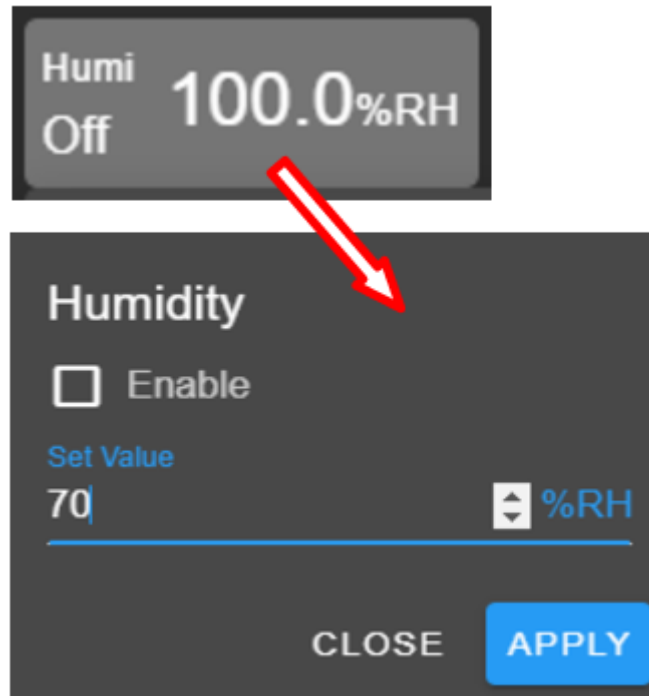


Figure 18.16: overview-humi-tab-setting-02.PNG

4. Click **APPLY** button to apply the setting.
5. To cancel the setting, click the **CLOSE** button.

The time signals in the status bar can be switched on or off individually. The following steps illustrate how to turn on TS1. The rest of the time signals, if available, can be applied using the same method:

1. Click the TS1 tab in the status bar.
2. Check the box to enable TS1.
3. Click **APPLY**.
4. To cancel the setting, click **CLOSE** (instead of **APPLY**) or click the TS1 tab itself in the status bar.

To turn off TS1, apply the following steps:

1. Click the TS1 tab in the status bar.
2. Uncheck the box to disable TS1.
3. Click **APPLY**.
4. To cancel the setting, click **CLOSE** (instead of **APPLY**) or click the **TS1** tab itself in the status bar.

18.5.2 Settings via the Dedicated Panes

With EWC, there are multiple ways to complete the same task. The dedicated panes for temperature, vibration or humidity, time signals, or refrigeration, in the main display area are actually clickable panes. These are CTA (call-to-action) panes through which new parameter settings

(such as, temperature, vibration or humidity, time signal and refrigeration) can be applied.

To apply a new setting to temperature, proceed as follows:

1. Click the Temperature pane.
2. In the input pane, click and enter new value in the Set Value field or click the up/down arrow to adjust the value, as illustrated in the following figure.

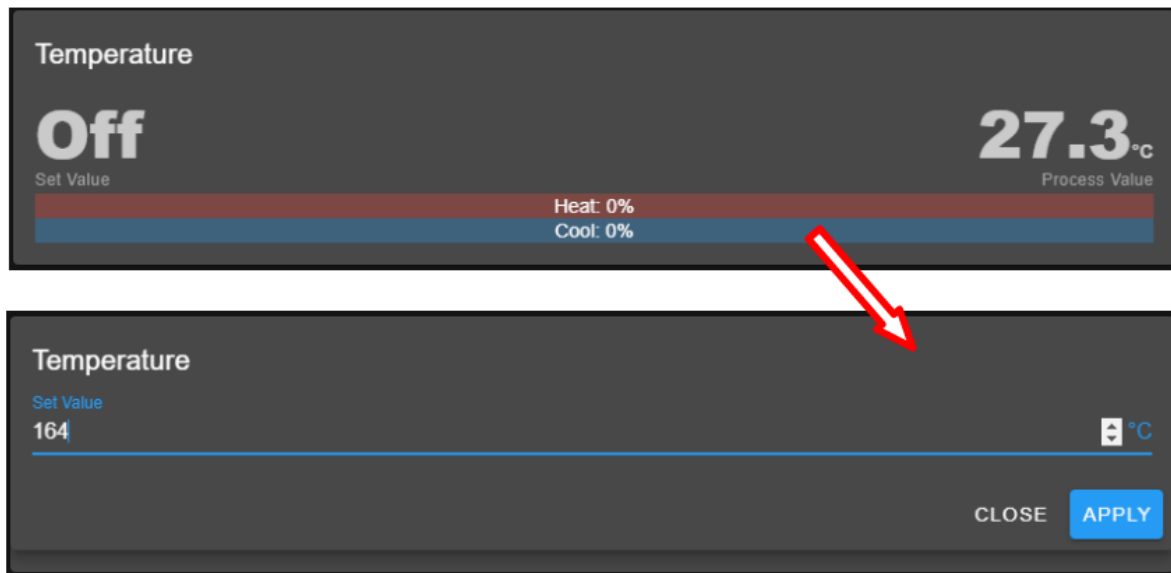


Figure 18.17: Setting new temperature value via the temperature (CTA) pane

3. Click **APPLY**. To cancel the setting, click **CLOSE** (instead of **APPLY**).

The above procedure can be applied to humidity and time signal.

CHAPTER 19

Trend

The **Trend** menu can be used by an operator to view a scatter plot of data points collected during the chamber operation. Data collection can occur in two distinct modes: **Always** and **When Chamber is on**. These two modes are selectable and configured under the **Data Logging Settings** submenu found under the **Settings** menu. Plot elements and detailed configuration of the trend graph will be discussed on **Data Logging Settings** page in the **Settings** menu.

By default, the trend graph provides a scatter plot of data points collected during the last hour. Various options of plot range of data points accumulated more than one hour can be selected. Data can be downloaded in whole or in portion to be stored on the local computer as CSV file.

19.1 Trend: Components

There are seven different groups that make up the main display of **Trend** and the scatter plot, as depicted in the following figure. The scatter plot shown in the figure is a result of the data points being collected with the chamber in program mode. Detailed descriptions of these groups based on the labels in the figure are outlined as follows:



Figure 19.1: Trend graph showing plots of current data from the chamber

1. **Trend Graph:** Data points collected from the chamber are rendered as a trend graph based on a scatter plot methodology. These data points—product temperature, air temperature, humidity, vibration, etc.—are plotted as a function of time. Temperature is displayed in degree Celsius, vibration in root-mean-square of acceleration (Grms or G), etc. The vertical y-axis represents the scale of these values. The horizontal x-axis represents the data logging runtime. Based on the default configuration, the chamber logs data points in a 10-second interval (refer to the **Data Logging Settings** submenu, under **Settings**). Depending on the type of chamber, data logging interval can be set to lower than 10 seconds. The grid scaling on both the y- and x-axes will change according to the application of the Pan/Zoom Controls buttons or the drag-and-select via the mouse and scroll wheel. Default setting can be restored by clicking the refresh button on the Web browser (not shown in the above figure).
2. **Trend Graph Manipulation Buttons:** Seven manipulation buttons are available to help manipulate and control the trend graph features and options. Detailed functionality and operation of these buttons are discussed in the following section.

3. **Snapshot of Data:** By hovering a mouse pointer on the trend graph area, a snapshot of the data at a particular time is displayed (shown in the figure). This feature allows a quick peek of the data at a certain point in time. Depending on the chamber's condition, the snapshot displays set values (SV) and process values (PV) of temperature, product or air temperature, or vibration, chamber operating mode or status, as well as program name and alarm. The contents in the snapshot are based on the selected options displayed in the legend set by the **Graph View** button of item 2 (above); and the color scheme selection under the **User Interface Settings** submenu (found under the **Settings** menu).
4. **Y-axis Label:** The y-axis displays the selected type of data points to be plotted, such as Temperature, Humidity, Vibration ,etc. These values are populated based on the selection of the **Graph View** under item 2 (above).
5. **Line Graph:** Different types or styles of graph—solid line, dashed line and color—are used to designate each type of data points in the plot to help for visualization and readability. As depicted in the figure, solid line represents process values, while dashed line represents set values with a distinctive color, as indicated in the legend (see item 7).
6. **Status:** Status of chamber operating mode is displayed along the time line on the trend graph, indicating when and how long the chamber was in specific operating mode. This feature provides a quick preview of the chamber operating status. The **Pan/Zoom button of Trend Graph Manipulation Buttons** (item 2) may be used to manipulate the display and shift the graph back into the past to view the chamber's operating mode.
7. **Legend of Trend Graph:** The legends are used to identify each item on the trend graph with color code, as well as line/dash graph, to designate the different type of data being plotted.

19.2 Trend Graph Manipulation Buttons

The following is a detailed list of the seven **Manipulation Buttons** of **Trend Graph**, item 2 in the previous figure.

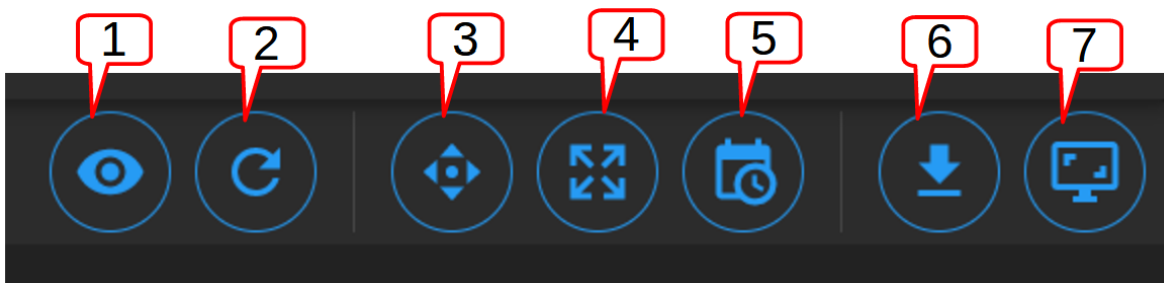


Figure 19.2: Trend Graph manipulation buttons

1. **Graph View:** Data visualization is very important. Elements or components of the trend graph are predefined by the configuration set in the **Data Logging Settings** submenu (found in the **Settings** menu). The **Customize** option depicted below allows the operator to select what to include in the trend graph to help simplify data visualization. Three different options represented by the arrows in the figure can be selected. The minimum and maximum Y range can be adjusted over the default values to help scale the graph for better

visualization; different data types can be enabled for display. The **Save** button (last arrow) can be applied to save the settings and render the graph.

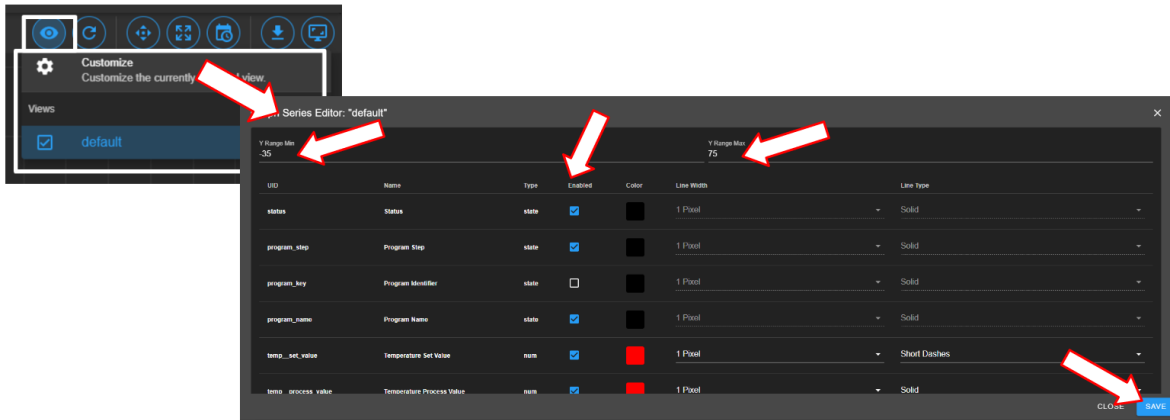


Figure 19.3: Tread graph view and custom settings

2. **Auto Refresh:** This Auto Refresh button reconstructs the graph to include data points up to the current time. Suppose a scroll wheel was applied to zoom out the trend graph that included future time which data points have not yet been sampled, as shown in the figure below.

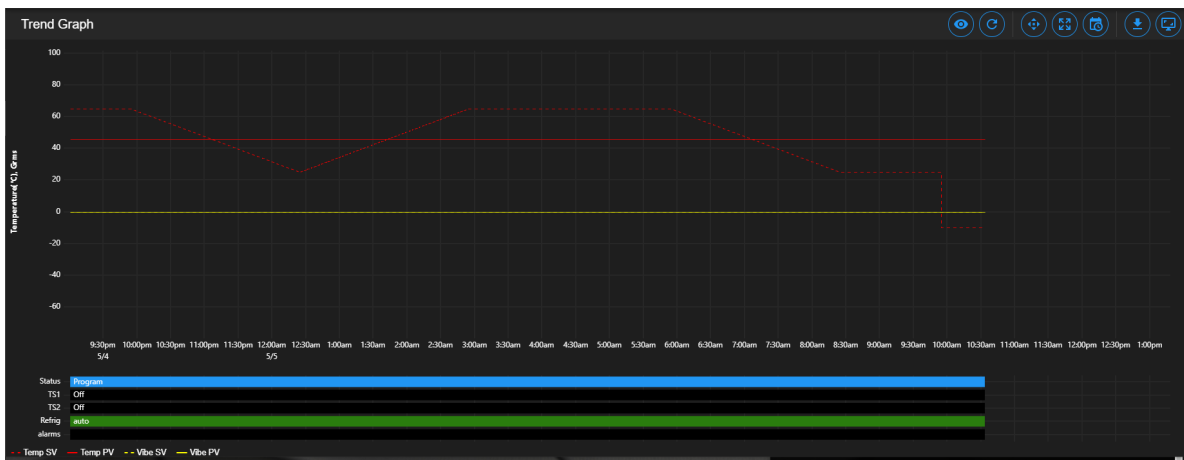


Figure 19.4: Off-scaled trend graph including future time (no data points)

The auto refresh button will rescale the graph to eliminate the gap (future time) on the right to expand and display the trend graph up to the current time.

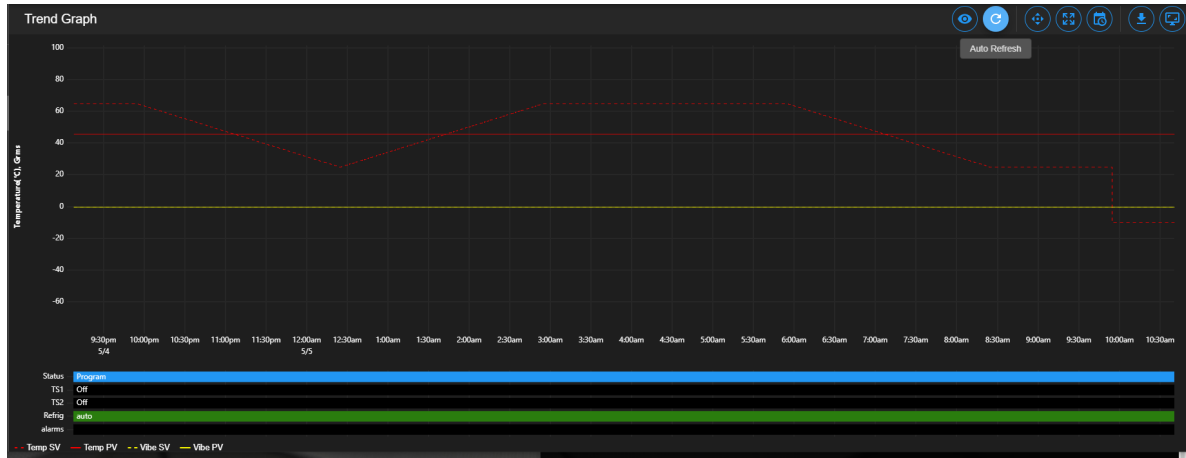


Figure 19.5: Trend graph rescaled with current time

3. **Pan/Zoom Controls:** The Pan/Zoom Controls button allows the operator to control and adjust the viewable section in the trend graph. This button presents six operation buttons to manipulate and display the trend graph as follows:

- **Zoom In:** The **Zoom In** button allows the operator to zoom into a small section of the trend graph. Depending on the degree of zooming, the display area will be confined to a small set of data points ranging between minutes to hours. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Zoom Out:** The **Zoom Out** button does the opposite by allowing the operator to zoom out on the trend graph, thereby giving the operator an expansive view of the trend graph. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Move Up:** This button allows the operator to move up the graph along the vertical axis to adjust the viewable area of the scatter plot. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Move Down:** This button allows the operator to move down the trend graph along the vertical axis with the purpose to adjust the viewable area of the scatter plot. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Move Left:** This button allows the operator to pan left on the trend graph, offering a quick preview of a plot of data points tracing back the time in hours or days. With this feature, the operator can quickly gain a preview of past data points which the operator may have missed.
- **Move Right:** This button does the opposite to **Move Left** by allowing the operator to pan right on the trend graph to the current time. To reconstruct the trend graph to contain the most recent data points, the **Auto Refresh** button allows the quickest operation.

4. **Zoom Extents:** With this button, trend graph may be provided using data points from within the last one hour, last two hours or the last six hours. To make adjustment of the trend graph based on these three selections, click on the **Zoom Extents** button, then click one of the selection from the drop-down menu.
5. **Plot Range Selectors:** Data points can be selected from start date/time to end date/time to produce a desired trend graph. Arbitrary date and time can be selected for the plot range, as depicted in the following figure.

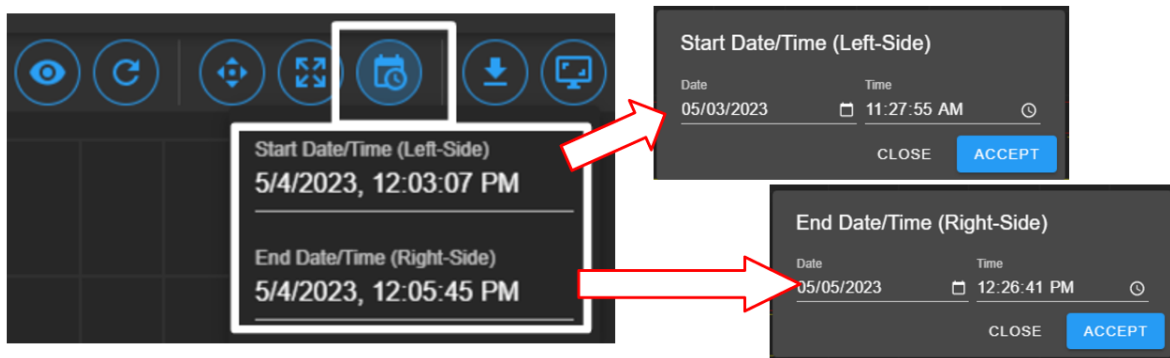


Figure 19.6: Plot range for start date/time and end date/time

To set the plot range,

- access the **Plotted Range Selectors** button.
 - access the **Start Date/Time**; edit date (m/d/y) and time (H:M:S) fields or apply the calendar and clock icons to select date/time.
 - apply **ACCEPT**
 - access the **End Date/Time**; edit date (m/d/y) and time (H:M:S) fields or apply the calendar and clock icons to select date/time.
 - apply **ACCEPT**. Note: Values of end date must be later (or greater) than start date.
6. **Download Data:** To download data and store it on the local computer, click the **Download Data** button and select **Download Current View** to download a portion of data from the displayed trend graph. To download the entire collection of data, select **Download All Data**. Data file will be stored in the Downloads folder of the local computer with filename: hostname_data_date.CSV.
 7. **Capture Screenshot/Download:** Trend graph can be captured, downloaded and stored on the local computer in PNG file, as shown in the figure.

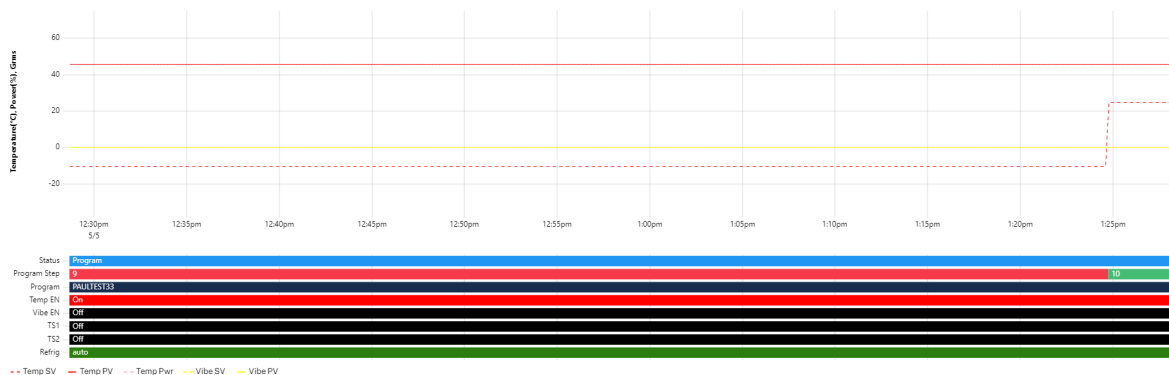


Figure 19.7: Screenshot of trend graph

19.3 How to Handle Downloaded Data File

Data points collected from the chamber are stored in CSV format. The recorded time of the data points is stored based on a UTC (or Universal Time Coordinated, previously referred to as the GMT) instead of the local time. To preserve the integrity of the CSV file and its UTC time stamp, do not rename the data file with MS Excel extension or attempt to open it directly with MS Excel. Any attempt to force open it in MS Excel will result in the wrong time conversion as shown in the following figures.

The following figure displays the CSV file which was directly opened with MS Excel. The time stamp in the first column is wrong; it is still based on UTC time stamp indicated by the arrows.

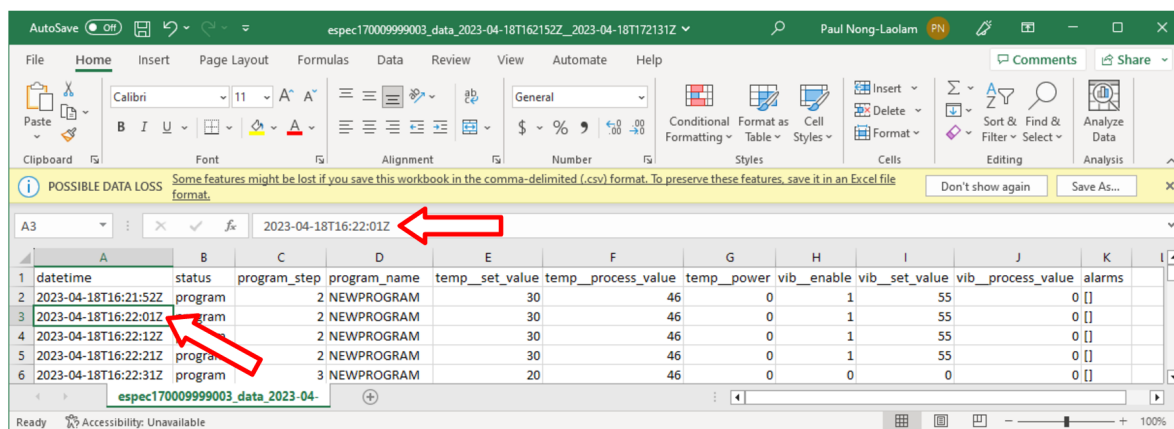


Figure 19.8: Data file improperly open in MS Excel

The following figure displays the same CSV file which was properly imported into MS Excel with the correct time stamp conversion for local time indicated by the arrows.

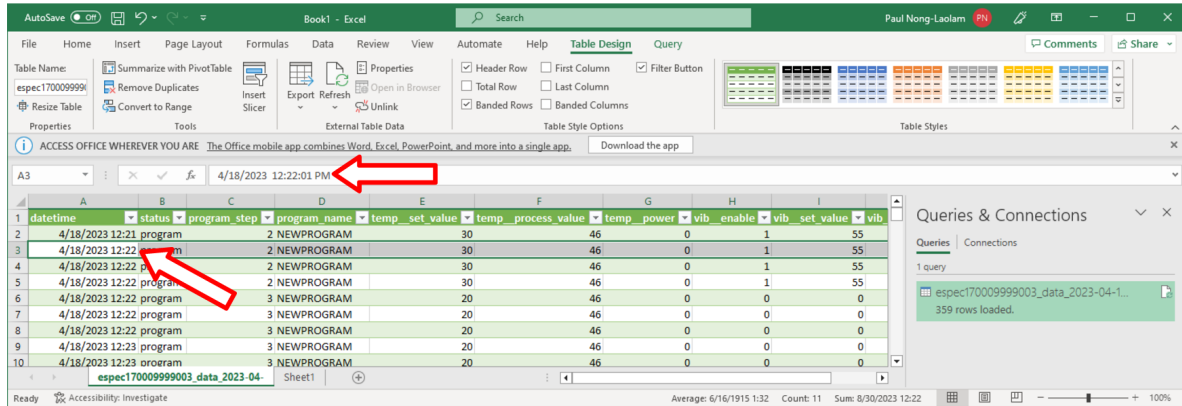


Figure 19.9: Data file properly imported into MS Excel

The proper way to handle this CSV file is to import it using the following procedure to render the correct conversion of the UTC time to the local time on all data points.

Complete the following steps:

1. Select **Trend** in the main menu bar
2. Click the **Download** button (item 6 in the previous section) to download the data (current view or entire data) in CSV file
3. Launch MS Excel and start a new blank spreadsheet
4. Click the **Data** ribbon
5. Click **From Text/CSV** (that appears under the **Home** ribbon)
6. In the **Import Data** Window explorer, open the **Downloads** folder and select the downloaded CSV file (in step 2) and click the **Import** button (in the bottom).
7. Click the **Load** button to load data into the current spreadsheet.
8. To save the current spreadsheet as Excel Workbook, click **Save As** and follow the standard steps to complete the process.

CHAPTER 20

History

The **History** page displays operation history of the chamber, its operating modes and statistics. Any alarms or alerts that were triggered during the chamber's operation are logged and displayed here. By default, history log of the chamber's operating modes, alarms or statistics from the previous week will be displayed, as depicted in the following figure. There are five important components in the **History** main display area. They are labeled and described as follows:

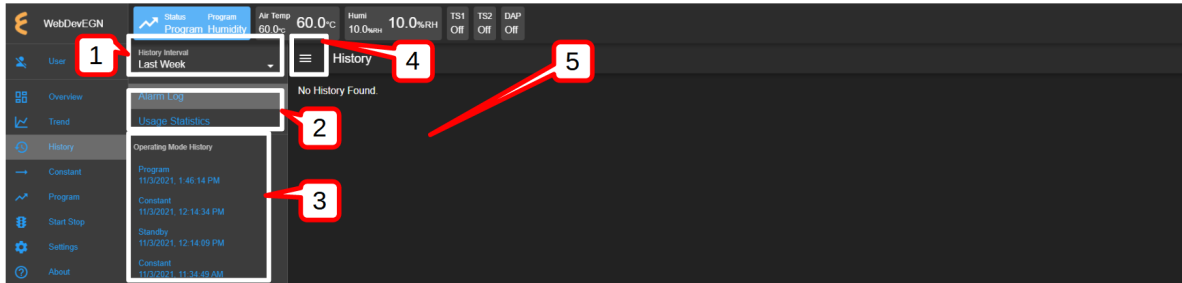


Figure 20.1: Operation history of the chamber

The nomenclature of the **History** page is described as follows:

1. **History Interval:** Display options of the operating history are: one week, two weeks, one month, three months, six months, one year or the entire period of the chamber's operation. To access the history interval, click the radio button to select the period from the list.

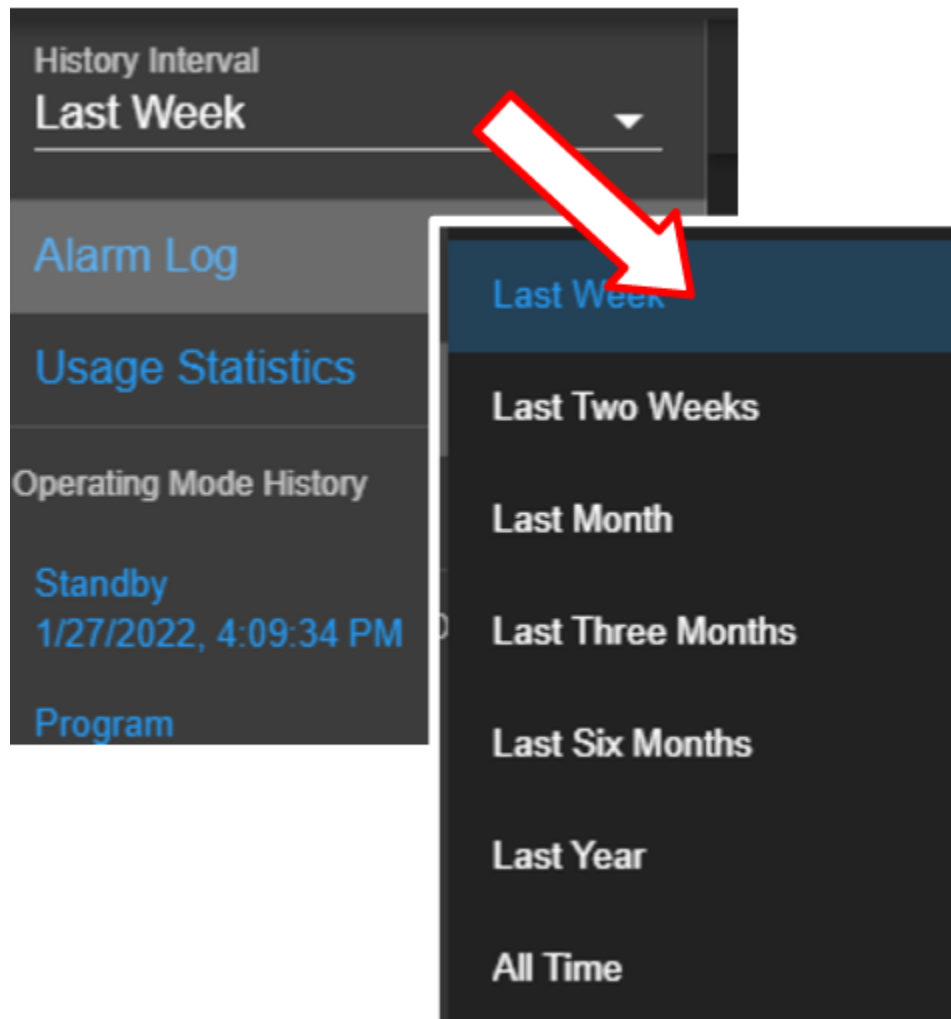


Figure 20.2: History interval and display selection

2. Alarm or Statistics Submenus:

- **Alarm Logs:** By default, alarm logs will be displayed in the main display area. The logs indicate which alarm had occurred and when they were resolved (cleared). Most recent events are listed at the top. To view detail of each log, click on its name (with its log date and time).

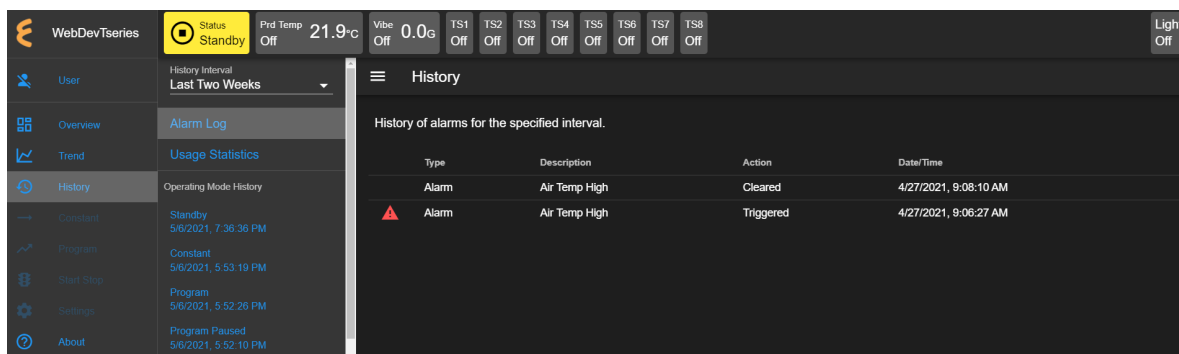


Figure 20.3: History of alarm

- **Usage Statistics:** To display the operation statistics, click on this submenu. Percentage of each operation mode based on the selection period in the **History Interval** is displayed as shown in the following figure:

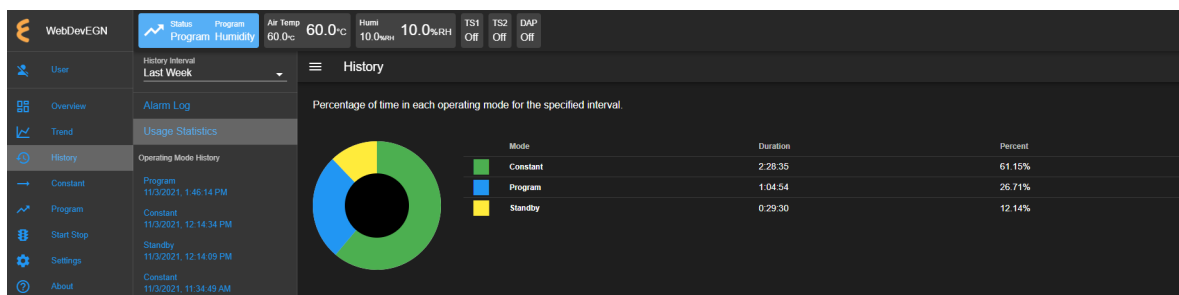


Figure 20.4: Operation statistics

Such information provides the operator a good idea of the overall performance of the chamber by identifying when and how much time it was in a certain operating mode.

3. **Operating Mode History:** A list of operating modes of the chamber is displayed here based on the option selected under the **History Interval**. Default listing is based on a one-week interval. A trend graph, identical to that produced in the **Trend** menu, based on the data points collected during the operating mode can be produced by clicking on the particular operating mode on this list, as illustrated in the following figure.

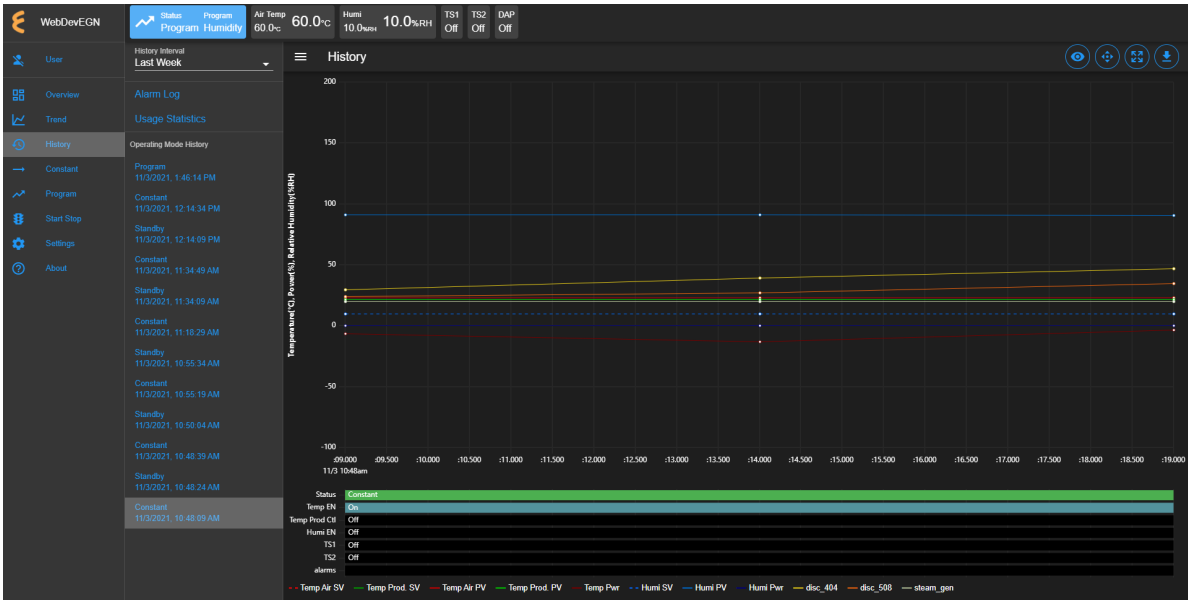


Figure 20.5: Trend graph of operating mode history

4. **Show/Hide Submenu:** To provide a larger real estate for the main display area, this Show/Hide button can be used to show or hide the **History** submenu. The following figure shows how the submenu is hidden and the main display area is expanded.

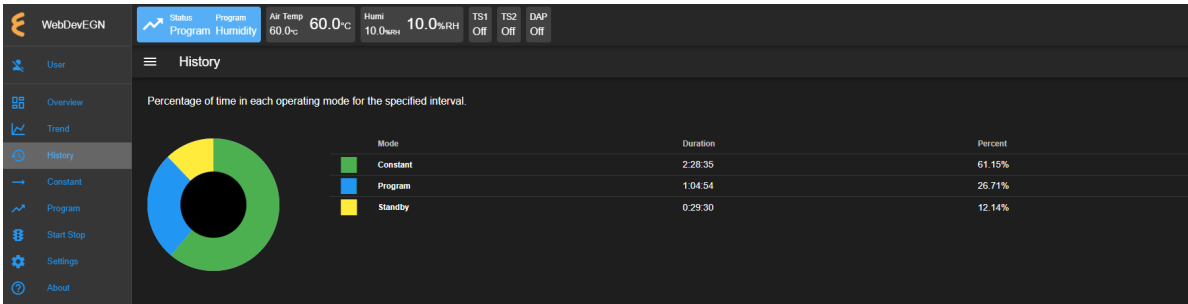


Figure 20.6: The show/hide button of the main display of the History page

5. **Main Display:** The content of the submenu page of **Alarm Log** and **Usage Statistics** is displayed here (refer to item 2, above).

CHAPTER 21

Constant

The existence of the EWC **Constant** page is such that all features and their parameters are collected and displayed in one place to control their constant mode settings. The main display of **Constant** consists of three separate CTA panes, displayed as **Temperature**, **Humidity** (or **Vibration**) and **Outputs**, as depicted in the following figure. These CTA panes provide input options to adjust the settings directly. The Humidity Range Chart is a two-dimensional graph of the current temperature-humidity relationship, displayed below these CTA panes.

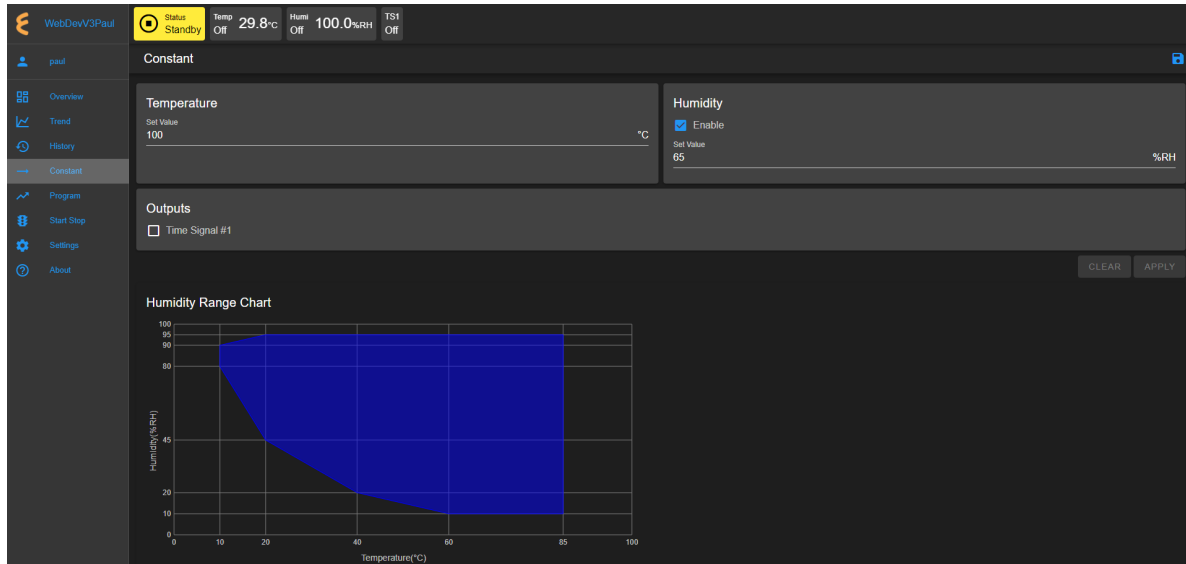


Figure 21.1: The Constant menu and its display page

The following sections describe how to configure and control each of these parameters.

21.1 Product or Air Temperature Setting

Complete the following steps to turn on or modify temperature setting:

1. Click the Set Value field and enter a new value, or click the up/down arrow to adjust the value.
2. Click the **APPLY** button or the save icon as indicated by the arrows in the following figure to apply and save the setting.

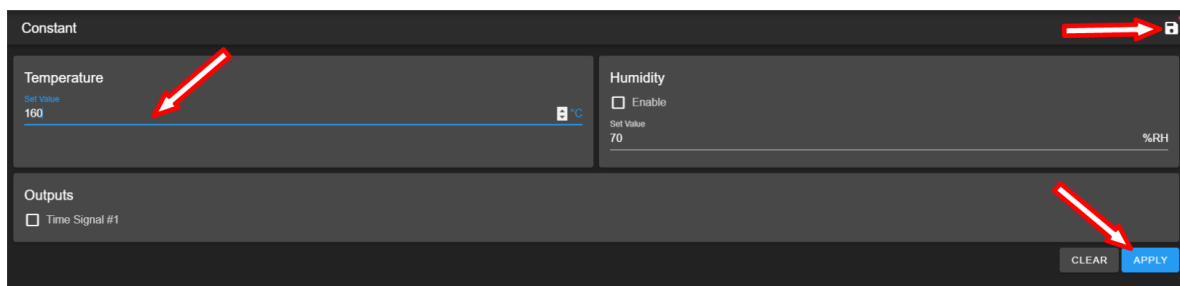


Figure 21.2: Apply new constant setting on temperature

3. To cancel the setting, click **CLEAR**. If you exit this pane by accessing a different menu in the menu bar, a warning will appear, as depicted in the following figure, which requires you to save the setting before attempting to access any other menus.

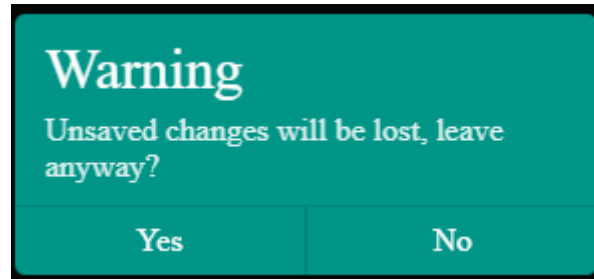


Figure 21.3: New setting must be save before exiting the pane

The new setting takes effect immediately with its new status displayed in the status bar. To reverse or cancel the setting, repeat the above steps to reset the set value and click **APPLY**.

21.2 Humidity Setting

Complete the following steps to turn on or modify humidity setting:

1. Place a check mark in the **Enable** box (refer to the above figure).
2. Click and enter new value in the Set Value field or click the up/down arrow to adjust the value.
3. Click the **APPLY** button or the save icon as indicated by the arrows in the above figure to apply and save the setting.
4. To cancel the setting, click **CLEAR**. If you exit this pane by accessing a different menu in the menu bar, a warning will appear (see above figure) which requires you to save the setting before attempting to access any other menus.

The new setting takes effect immediately with its new status displayed in the status bar. To reverse or cancel the setting, repeat the above steps to uncheck the box, reset the set value and click **APPLY**.

21.3 Time Signals Setting

Complete the following procedure to turn on output for any time signal:

1. To turn on output for **Time Signal # 1**, place a check mark in its box.
2. Repeat the above step for any time signal available in the main display area.
3. Click the **APPLY** button or the save icon as indicated by the arrows in the above figure to apply and save the setting.
4. To cancel the setting, click **CLEAR**. If you exit this pane by accessing a different menu in the menu bar, a warning will appear which requires you to save the setting before attempting to access any other menus.

The new setting takes effect immediately with its new status displayed in the status bar. To reverse or cancel the setting, repeat the above steps to uncheck the box and click **APPLY**.

It is important to note that all the parameters (temperature, humidity, vibration, time signal) in the main display can be adjusted altogether simultaneously with a single **APPLY** or save button. However, individual setting may provide security to avoid any adverse effect.

CHAPTER 22

Program

The **Program** menu allows the operator to create a program to control the chamber. All the programming features available on the supported PLC's listed in Chapter 1 (“**Introduction**”) can be composed into programs to control the chamber. The operator can: (1) open and view a program; (2) preview the output of the program; (3) edit and/or overwrite an existing program ; (4) delete program from the list; (5) rename program on the list; (6) download a program and store it on the local computer in JSON file; (7) upload a program from the local computer to EWC, and much more.

Here are some of the benefits of the **Program** menu:

- Easy to operate.
- Quick management of programs, programming or editing.
- Require less time to develop a new program or modify an existing program.
- Program Editor offers flexibility with multitasking capabilities.
- Control program operation and program end mode.
- Preview program operation before execution; operator can see exactly what the program does prior to its execution.
- Download program from EWC to the local computer for backup.
- Upload program from the local computer to EWC.

Only authorized users with read-write privilege can access and utilize the **Program** menu. The menu is grayed out, as depicted in the following figure. Access to the menu requires read-write privilege and the user log into their account to use the menu.

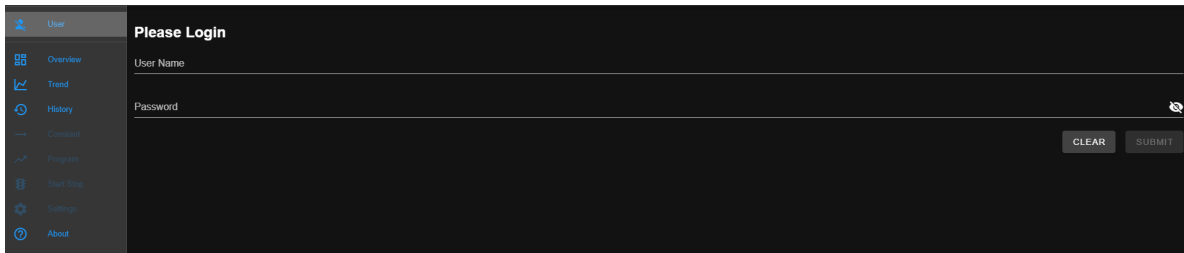


Figure 22.1: User with read-write privilege is required to operate the Program menu

22.1 List Programs

The following figure depicts a typical layout of the **Program** page with its submenu hidden. This is the default display of program list when the **Program** menu is accessed for the first time. Its UI components are numbered and explained as follows:

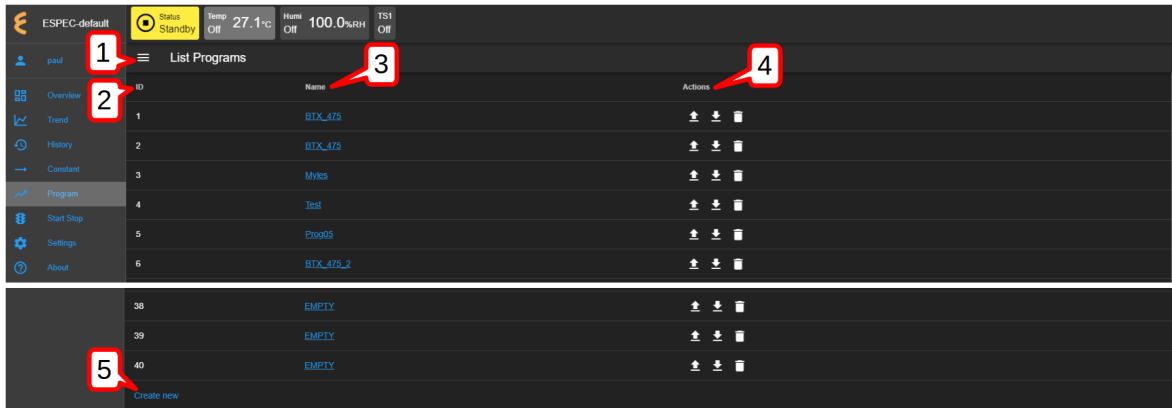


Figure 22.2: Program listing page with submenu hidden

1. **Submenu Show/Hide:** This button toggles between the “show and hide submenu” to allow the program editor utilize the entire main display area (see above figure).
2. **ID:** EWC identifies each program by its slot number stored in the PLC register. This list reflects the actual list of programs read from the F4T register. A total of 40 program slots are available, numbered from 1 to 40. The system uses a program identification code (ID) to identify each program.
3. **Program Name:** All available programs are listed under the **Name** column by program name. These programs are stored by their slot number. Any slot not yet occupied by the program is mark **EMPTY**. Users can access each program under this list by clicking on the program name, which is a clickable link. The program editor then opens up to display the program instructions. Detailed operation of the program editor is discussed in the next section. Displays the name of a program.
4. **Actions:** Three action buttons (Upload Program, Download Program, Delete) are available for managing the program under each row:
 - **Upload:** Program can be uploaded from the local computer to EWC which will then be stored in the F4T register using the slot number where the action was applied.
 - **Download:** Program can be downloaded and saved on the local computer.
 - **Delete:** A program to the left of the trash bin (where this action is applied) will be deleted. The F4T register will no longer contain this program.
5. **Create New:** This button opens the program editor for creating a new program. The **Create New** button is conveniently placed in two locations: (1) under the **ID** list and (2) in the **Program** submenu (shown in the following figure).

The following figure displays the **Program** page with its submenu unhidden. The submenu (item 2) has two operation buttons: (i) List Programs and (ii) Create New (program).

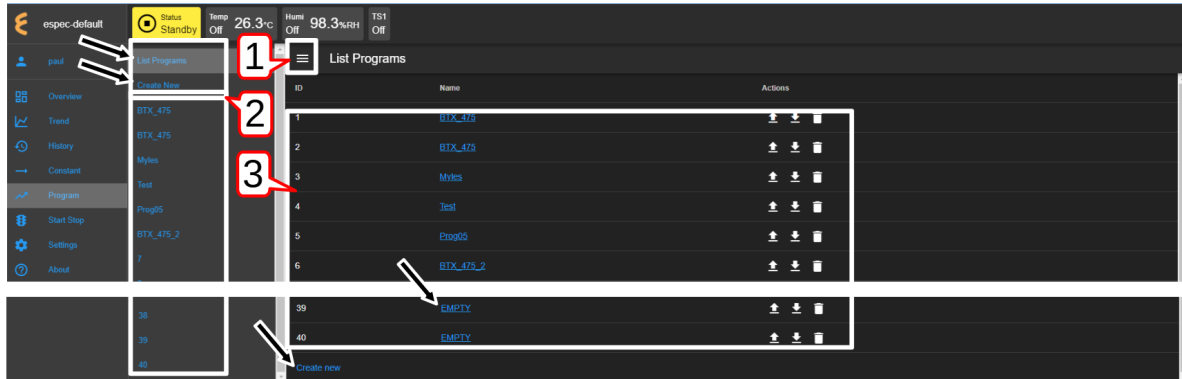


Figure 22.3: Program listing page with submenu unhidden

1. **Show/Hide:** The **Show/Hide** button can be used to hide or unhide the **Program** submenu (see item 2 below).
2. **Submenu:** This submenu has two operation buttons (indicated by the arrows): **List Programs** and **Create New** (program). All the available programs in the chamber stored in EWC are listed below these operation buttons (as shown in the above figure). With the submenu hidden, the main display has a larger real estate to display the program elements.
 - **List Programs:** The **List Programs** button offers a quick exit out of the program editor (explained in the following section). To exit out of the program editor mode, simply click this **List Programs** button. This action will cancel and exit the program editor being used to create, edit or import a program.
 - **Create New:** Similar to the **Create New** button under the **List Programs** display page (see item 3 below), this button opens the program editor with an empty template for constructing a new program. Detailed discussion is provided in the following section. A program from the local computer can also be imported into this empty template.
3. **List Programs:** This is the main display of the program list depicted in the previous figure. Click the **Show/Hide** button (see item 1) to hide the submenu and to expand the **List Programs** display page.

22.2 Create New Program

A new program can be created via one of the buttons depicted in the following figure.

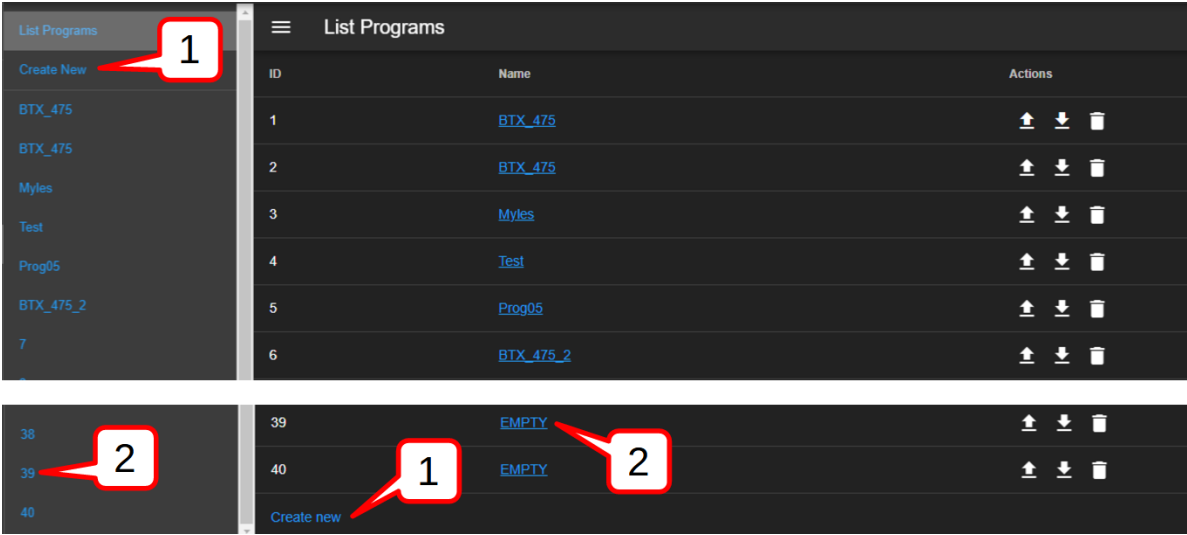


Figure 22.4: Different methods to creating a new program

Each of these buttons follows a different pattern to complete the task.

1. **Create New:** Click the **Create New** button in the submenu or under the **List Programs** in the main display to launch the program editor to create a new program. An empty template is opened for a new program, as depicted in the following figure. For the F4T chamber, this **Create New** button seems unnecessary or redundant. However, its important role is necessary for other types of chamber/controller (e.g., Typhoon HALT chambers).

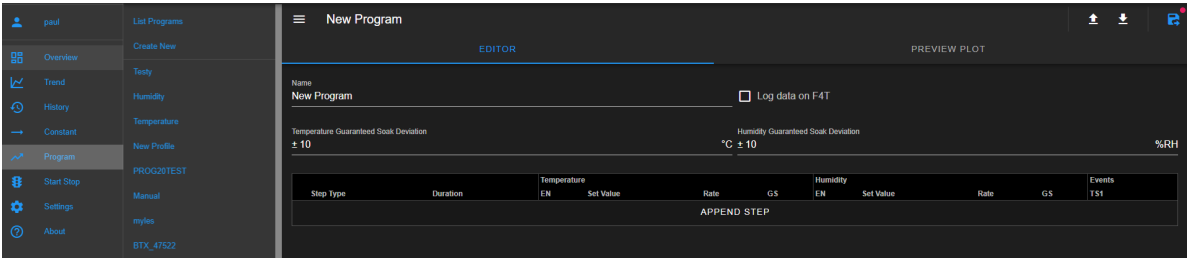


Figure 22.5: Empty template for a new program

The new program being constructed does not yet have a predefined location. For this reason, the program editor has only the **Save As** option to save the program in a specific or a desired slot number, as depicted in the following figure.

2. **EMPTY:** A new program can be created using a specific slot number. Click the slot number in the submenu or the **EMPTY** button on a desired slot number under the **List Programs** in the main display to launch the program editor to create a new program. An empty template is opened for a new program, as depicted in the previous figure.

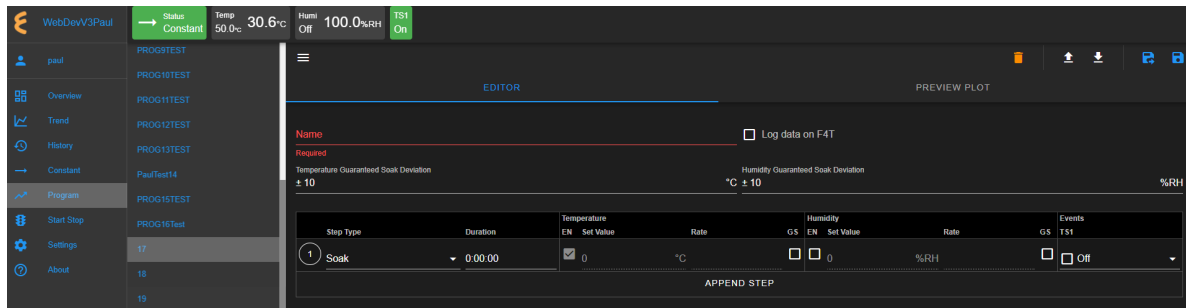


Figure 22.6: Empty template for a new program

Since the slot number has already been defined, the program editor offers two options to save the program: (1) Save As by selecting a new slot number or (2) Save (on the current slot number).

The following figure depicts the general layout of the empty template for a new program. As depicted in the following figure, slot 9 of the F4T register, as highlighted under the program list in the submenu, will be used to store the program once it is completed and saved.

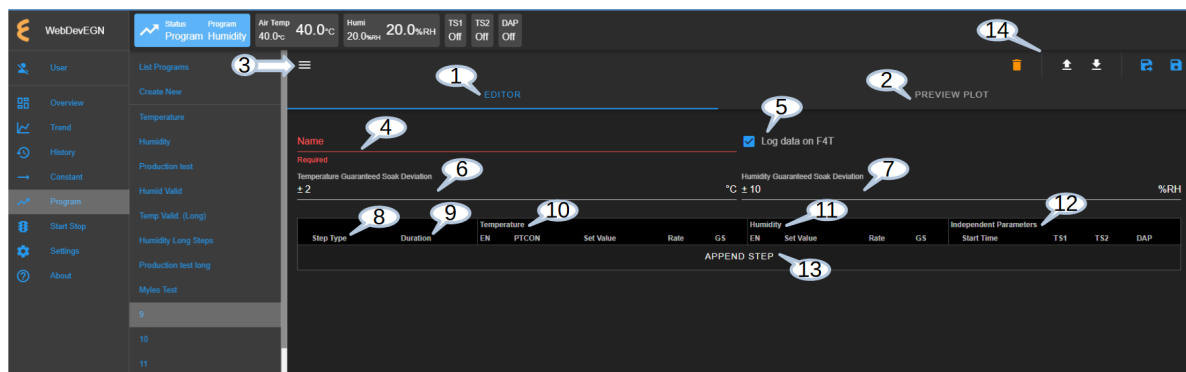


Figure 22.7: The structure and UI of the Programming Editor

The UI and components of the program editor (pictured above) are numbered and described as follows:

1. **Editor:** By default, a program is open and placed in the program editor. The program editor is highlighted in blue to indicate its active status.
2. **Preview Plot:** The output of the current program can be previewed via this button. Both the **Editor** (item 1 above) and this button can be used to toggle between the editing and previewing mode of the current program. The **PREVIEW PLOT** button is operational only when a program is loaded into the program editor or a program has been constructed in the program editor.
3. **Submenu Show/Hide:** This button toggles between the show and hide mode of the submenu. To utilize the entire main display area for the program editor, this button can be used to hide the submenu.
4. **Program Name:** An alphanumeric naming convention based on ASCII with lower- or upper-case letters applies to program name with up to 20 characters. EWC will chop and

use only the first 20 characters if more than 20 characters were entered. Program name should be kept short and descriptive. Since each program is individually stored in a unique slot in the PLC, a unique name on EWC is not necessary. However, these programs must have unique names when they are stored on the local computer. When a program name is entered into this field, this name also appears in the title bar next to the show/hide button (item 3).

5. **Log Data:** This checkbox is available for logging data on the F4T during program execution. This option applies only on an F4T with this feature, as shown in the following figure.



Figure 22.8: F4T with data logging feature

6. **Temp GS Dev:** This value determines how close the set point to the process value for the step duration timer to count down. If the temperature fluctuates outside this set point, the soak time will reset. This is to ensure (hence, guarantee) that soaking is taking place at that specific temperature for that specific amount of time. A desired value can be adjusted via the up/down arrow or via a direct input in the field. On the F4T touch screen, this is Guaranteed Soak Deviation 1.
7. **Humi GS Dev:** Similar to item 6, humidity guaranteed soak deviation can also be adjusted. On the F4T touch screen, this is Guaranteed Soak Deviation 2.
8. **Step Type:** Step type selection can be made after a step has been added to the program. The first step in a new program must be added using the **APPEND STEP** button (item 13 below). Additional steps can be added via the drop-down menu of the Step Number (explained below) or via the **APPEND STEP** button. There are seven (7) different step types available for each step in the program:

- **Instant Change:** The set point will be set instantly. EWC will determine the thresh-

old value if this set point is possible based on the chamber specification. The time and guaranteed soak have no effect on this step type.

- **Ramp Time:** The set point will be ramped to the new set point over the given duration.
 - **Ramp Rate:** The set point will be ramped to the new set point based on the set rate.
 - **Soak:** Instead of changing the set point, the program maintains the previous set point for a specified duration for this step.
 - **Wait For:** With this step type, the F4T waits until the chamber has reached the set point value before it proceeds to the next step.
 - **Go To Step:** With this feature, the program can have a loop or subroutine where instructions in a specific step (or steps) can be executed and looped through for a specified number of time. With the go-to loop, the program contains fewer lines of steps.
 - **End:** All programs must have an end step. The end statement instructs the controller what to do when the program ends. The available options for end action are: Hold Last Step, Disable Control and Constant Set Value. They apply to both temperature and humidity (as well as vibration). The chamber can also be stopped completely when the program ends; it will be set in standby mode.
9. **Duration:** The time format for duration is HH:MM:SS. If a pure numerical value is entered, EWC will convert it to HH:MM:SS. For instance, if a numerical value 15 is entered, the system treats it as 15 seconds, and the conversion in HH:MM:SS will be 00:00:15. If 66 is entered, the system converts it to 00:01:06. Similarly, if 90:00 is entered, the system renders the value to 1:30:00.
10. **Temperature:** In each step, temperature can be set via five parameters: (1) EN (2) PTCON, (3) Set Value, (4) Rate and (5) GS.
- **EN:** Enable temperature loop for this step.
 - **PTCON:** Enable Product Temperature Control (PTCON).
 - **Set Value:** This is the target temperature value. This value will be checked against the chamber's threshold value by EWC to validate the proper operating value. Consult the chamber operation manual for detail on the threshold or the upper limit the chamber can reach.
 - **Rate (C/min):** Temperature rate (measured in Celsius per minute) is determined by the program editor based on the initial temperature (specified in item 3 above) and the target value (Set Value, as described below). The rate will be determined to operate within the specifications of the chamber. Consult the chamber operation manual for detail.
 - **GS:** Enable Guaranteed Soak with the checkbox. If enabled, it prevents the duration timer from counting down until the process value is within the deviation set in item 6 (above).
11. **Humidity:** In each step, humidity can be set with four parameters:
- **EN:** Enable humidity loop for this step.
 - **Set Value:** This is the target humidity value. This value will be checked against the chamber's threshold value by EWC to validate the proper operating value. Consult the chamber operation manual for detail on the threshold or the upper limit the cham-

ber can reach.

- **Rate (%RH/min):** Humidity rate is determined by the program editor based on the initial temperature (specified in item 3 above) and the target value (Set Value, as described below). The rate will be determined to operate within the specifications of the chamber. Consult the chamber operation manual for detail.
 - **GS:** Enable Guaranteed Sock with the checkbox. If enabled, it prevents the duration timer from counting down until the process value is within the deviation set in item 7 (above).
12. **Independent Parameters:** These parameters describe the output signals of the chamber during operation. They can be controlled with a start time. Different chambers have different independent parameters. They may have different names, but they generally are labeled as TS1, TS2, etc.
- **Start Time:**
 - **TS1:** Output time signal number 1
 - **TS2:** Output time signal number 1
13. **APPEND STEP:** As shown in the previous figure, the program editor has an empty template. No instructions or steps of program have been added. To create an instruction, a new step must be created (or added). This APPEND STEP button is used to add a new step. Once a program has a step, additional steps can be added using this button or the drop-down menu of the Step Number (to be explained below). The APPEND STEP button always adds a new step as the last step in the program. By contrast, the drop-down menu of the Step Number allows a new step to be inserted above or below the current step. It also has a delete button to remove any step from the program.
14. **File Manipulation:** Five different buttons (icons) are available for file manipulation. Their action can be previewed by hovering the mouse pointer over them. They are described from left to right as follows.
- **Delete:** Click on the trash bin icon to delete the current program. This action will delete the program in the program editor and its location in the current slot number of the F4T register. A pop-up warning appears, as depicted in the following figure, to reaffirm the action.

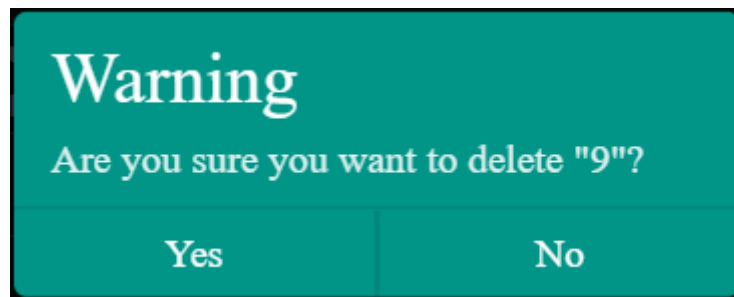


Figure 22.9: File deletion confirmation

- **Open Program:** This button imports a program file from the local computer into the program editor. EWC only accepts a program in JSON format. To ensure compatibility, the program structure should be based on the one downloaded from EWC itself (see **Download Program** below).

- **Download Program:** This button downloads the current program file and stores it on the local computer. The program is saved in JSON format using slot number as its filename (e.g., 9.json).
- **Save As:** Save the current program to a different slot number under the program list. This action brings up a program list, as depicted in the following figure, to select a new slot to hold the current program. To cancel this action, click the **CLOSE** button. **WARNING!:** A vacant slot should be selected to save the program. Otherwise, the current program will overwrite the existing one in the slot without prompting for reconfirmation, thus, destroying the program previously in that slot. The current program in a new slot still uses the same program name. To make it unique, edit item 4 (above) with a new name and apply the **Save** button (see below) to resave the program.

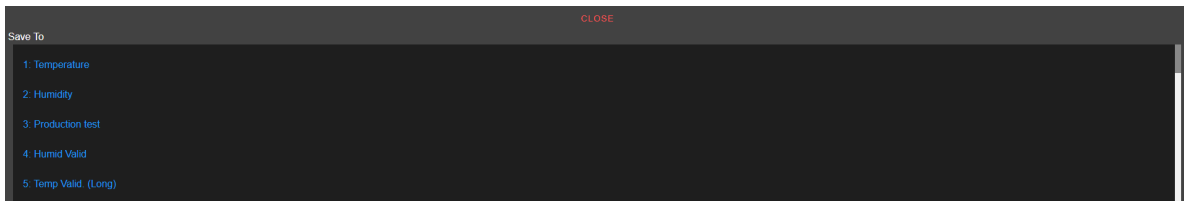


Figure 22.10: Save program to a new slot

- **Save:** This button saves the current program in the current slot on the F4T.

22.2.1 Programming: Add Program Step

The following example illustrates how to create a new program using three steps with step type **Ramp Time**, **Ramp Rate** and **End**. The duration for the ramp time is 5 minutes with the target temperature at 35 degrees C. The rate for **Ramp Rate** will be 10 degrees C/min with target value at 45 degrees C. Guaranteed soak deviation for both temperature and humidity will be set at +/-0.5 and +/- 10, respectively. A standby mode will be set when the program ends. While this sample program does not have any real practical implication, it does show how program steps and their parameters are created. New program will be selected to occupy slot 15. We begin from the main menu.

1. Click **Program** in the side bar.
2. Click **EMPTY** on slot 15 on the Program List (scroll down if necessary). To follow along with this example, slot 15 should be empty.
3. **Program Name:** Enter **PROG15TEST** in the program name field. EWC will chop and use only the first 20 characters if more than 20 characters were entered.
4. **Log Data:** Enable data logging by checking the box.
5. **Temp GS Dev:** Apply the up/down arrow to adjust the deviation value to +/-0.5 or enter the value 0.5 directly into the field.
6. **Humi GS Dev:** Adjust deviation value for humidity guaranteed soak in the same way to +/-10.
7. **Add New Step:** Click the **APPEND STEP** button. By default, **Soak** is selected as the step type. Refer to Item 8 in the previous section.

8. **Step 1:** Click **Soak** under step type and select **Ramp Time** from the drop-down menu, as indicated by the arrow in the following figure. Complete the following fields for this step:

The screenshot shows the 'PROG15TEST' editor interface. At the top, there's a 'Name' field with 'PROG15TEST' and a 'Log data on F4T' checkbox. Below this are 'Temperature Guaranteed Soak Deviation' (± 0.5 °C) and 'Humidity Guaranteed Soak Deviation' (± 10 %RH). A table lists step parameters:

Step Type	Duration	Temperature	Rate	Humidity	Rate	Events
		EN	Set Value	GS	EN	Set Value
1 Soak	0:00:00	<input checked="" type="checkbox"/>	0 °C	<input type="checkbox"/>	<input type="checkbox"/>	0 %RH

A red arrow points to the 'Soak' step type in the table. A dropdown menu is open, showing options: Instant Change, Ramp Time, Ramp Rate, Soak (highlighted), Wait For, and Go To Step. The 'Events' column shows 'TS1' with a dropdown set to 'NC'.

Figure 22.11: Adding step type

- **Duration:** Enter 0:05:00.
- **Temperature:**
 - **EN:** Enabled by default (from temperature ramp time selection).
 - **Set Value:** Enter 35 or apply the up/down arrow to adjust the value.
 - **Rate:** Greyed out. EWC sets the rate based on the initial and final temperature according to the given duration.
 - **GS:** Disable; leave the box unchecked.
- **Humidity:**
 - **EN:** Check the box to enable humidity set value.
 - **Set Value:** Enter 15 or apply the up/down arrow to adjust the value.
 - **Rate:** Greyed out. EWC sets the rate based on the set value and duration.
 - **GS:** Disable GS option with the box unchecked.
- **Events:**
 - **TS1:** Click the **NC** field (or the down-arrow) to select **On** from the drop-down menu, as depicted in the following figure.

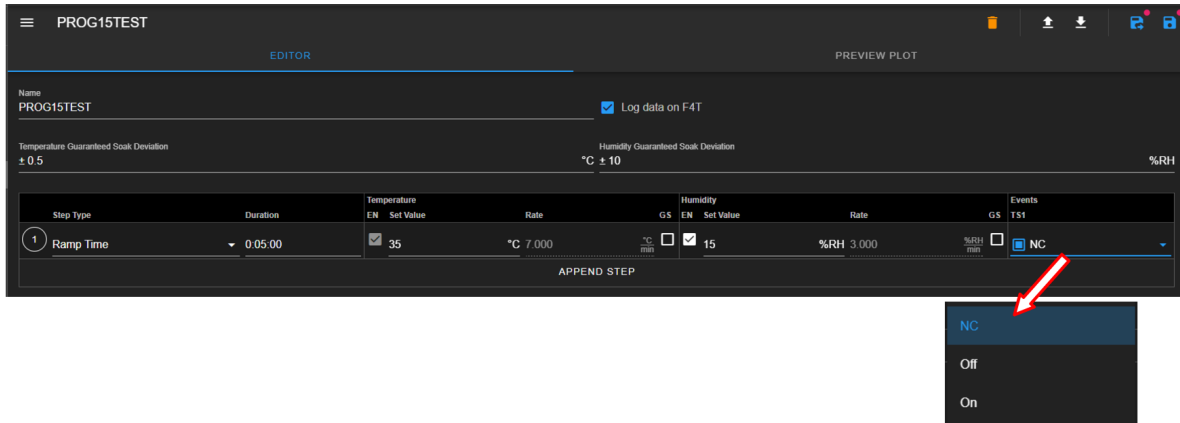


Figure 22.12: Enable time signal output.

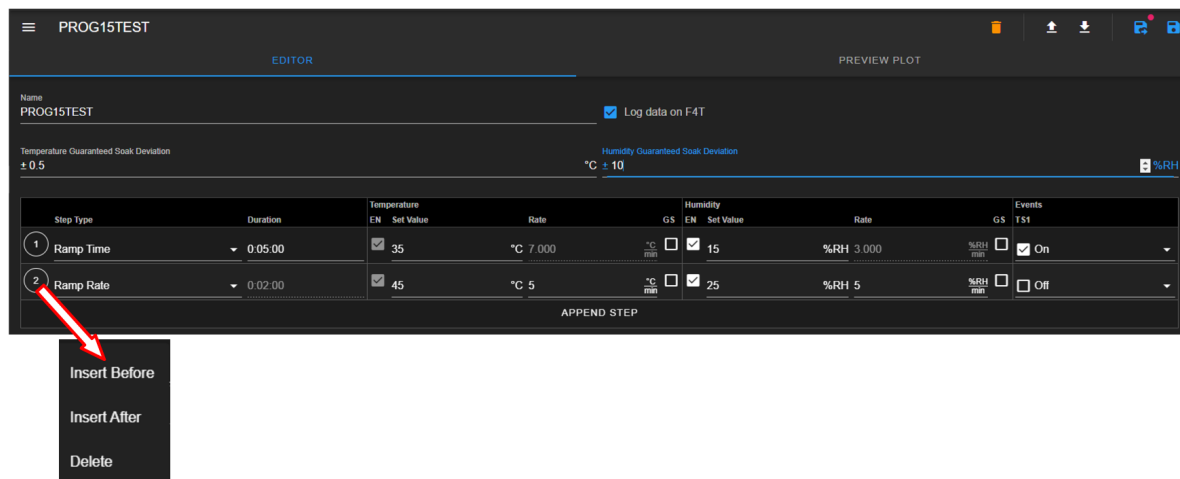
- **TS2:** If you have additional TS's, leave them as-is.

9. **Step 2:** Click **APPEND STEP**. Default step type is **Soak**. Click the **Soak** under step type and select **Ramp Rate** from the drop-down menu (refer to the previous figure, Step 8). Complete the following fields for this step:

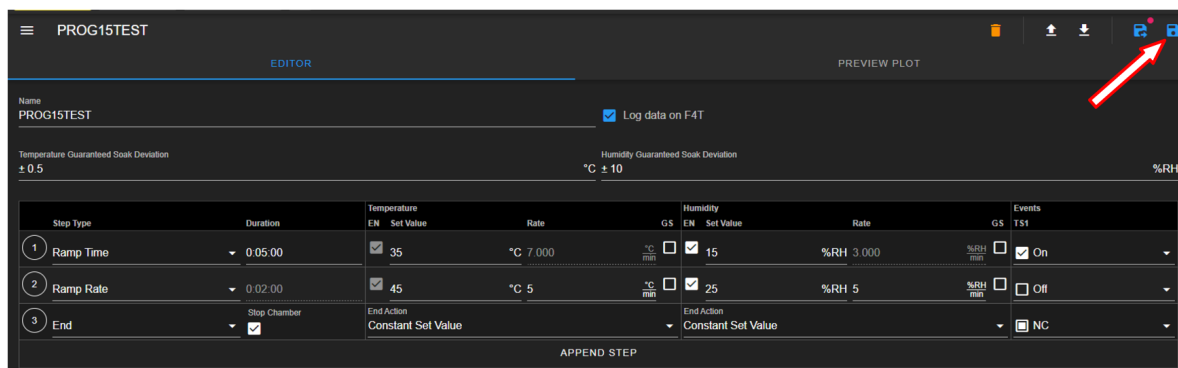
- **Duration:** Grayed out. Value to be determined by system according to the set value and rate.
- **Temperature:**
- **EN:** Enabled by default.
 - **Set Value:** Enter 45.
 - **Rate:** Enter 10.
 - **GS:** Disable; leave the box unchecked.
- **Humidity:**
 - **EN:** Check the box to enable humidity set value.
 - **Set Value:** Enter 25.
 - **Rate:** Enter 5.
 - **GS:** Disable GS option with the box unchecked.
- **Events:**
 - **TS1:** Click the **NC** field (or the down-arrow) to select **Off** from the drop-down menu.
 - **TS2:** If you have additional TS's, leave them as-is.

10. **Step 3:** Click step number 2 in the circle that precedes **Ramp Rate** on the second step. Select **Insert After** from the drop-down menu as depicted in the following figure. Click the **Soak** under step type, scroll down to the bottom of the drop-down list and select **End**.

- **End:** Place a check mark in the box under **Stop Chamber**. This option will set the chamber in **Standby** mode when the program ends. The End Action for both temperature and humidity will be defaulted to **Constant Set Value**, but the **Stop Chamber** option will overwrite these settings. No setting is required for **NC** under **Events**.



11. **Save Program:** Click the **Save** icon in the upper-right corner, as shown in the following figure. This figure also illustrates the complete program in the program template.



12. **Preview:** Click the **PREVIEW PLOT** button to preview the output of the current program (see figure below). Click the **EDITOR** button to toggle back to the editor mode. Program cannot be saved while in the preview mode. In order to save the program, navigate back to the program editor to apply the **Save** or **Save As** button.

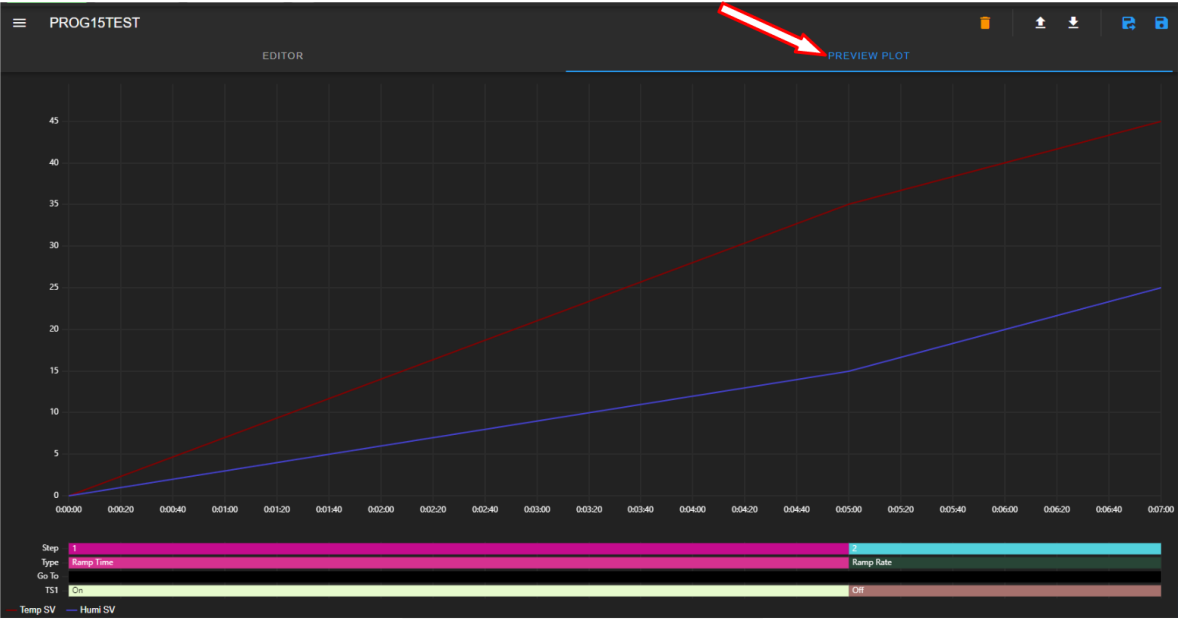


Figure 22.13: Program in preview mode

22.3 View, Edit, Save Program

This section describes how to open an existing program for viewing and editing. Changes made in the program can be updated by overwriting the program contents back in the file (using **Save**) occupying its existing slot or saving them as a new program using a new slot (with **Save As**).

22.3.1 Open Program

An existing program can be opened for viewing or editing by clicking on its name under the Name list, as shown in the following figure.

The screenshot shows the 'List Programs' window. It contains a list of programs with their names and icons. A red arrow points to the 'PROG15TEST' program.

Program Name	Icon
PROG16TEST	[Icon]
PROG13TEST	[Icon]
PaulTest14	[Icon]
PROG15TEST	[Icon]
PROG16Test	[Icon]
EMPTY	[Icon]
EMPTY	[Icon]

The program **PROG15TEST** (indicated by the arrow) that was created in the previous section will be used for illustration. It is open and displayed as follows:

Step Type	Duration	Temperature	Rate	Humidity	Rate	Events
		EN	Set Value	GS	EN	Set Value
1 Ramp Time	0.05.00	<input checked="" type="checkbox"/>	35	<input checked="" type="checkbox"/>	15	On
2 Ramp Rate	0.02.00	<input checked="" type="checkbox"/>	45	<input checked="" type="checkbox"/>	25	Off
3 End	Stop Chamber	<input type="checkbox"/>	Constant Set Value	<input type="checkbox"/>	Constant Set Value	NC

Figure 22.14: Program Editor displays an opened program in edit mode

As depicted in the upper-right in the above figure, five buttons are available for managing the program file in the program editor: **Delete**, **Open Program**, **Download Program**, **Save As** and **Save**. They will be explained in detail in the following sections.

22.3.2 Editing Program: Programming Example

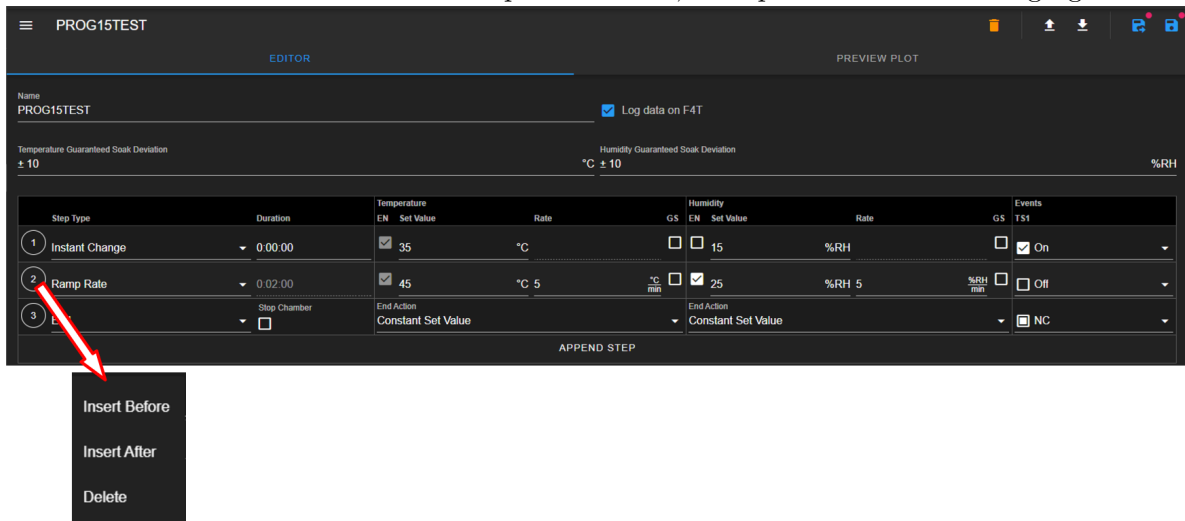
In this section, we illustrate how to edit and modify **PROG15TEST** program with additional steps, applying the available step types from the list. The structure of our new program consists of the following steps and types, with temperature and humidity guaranteed soak deviation both set at +/-10.

1. **Instant Change** to 35 degrees C.
2. **Wait For** temp to drop below 35.1 degrees C.
3. **Soak** for 30 minutes.
4. **Ramp Rate** of 2 degrees C until -15 degrees C is reached.
5. **Wait For** temp to drop below -15 degrees C.
6. **Soak** for 30 minutes.
7. **Ramp Time** of 30 minutes to 45 degrees C and 50% RH.
8. **Wait For** temp to rise higher than 45.1 degrees C and humi below 50% RH.
9. **Soak** for 30 minutes.
10. **End** stop chamber.

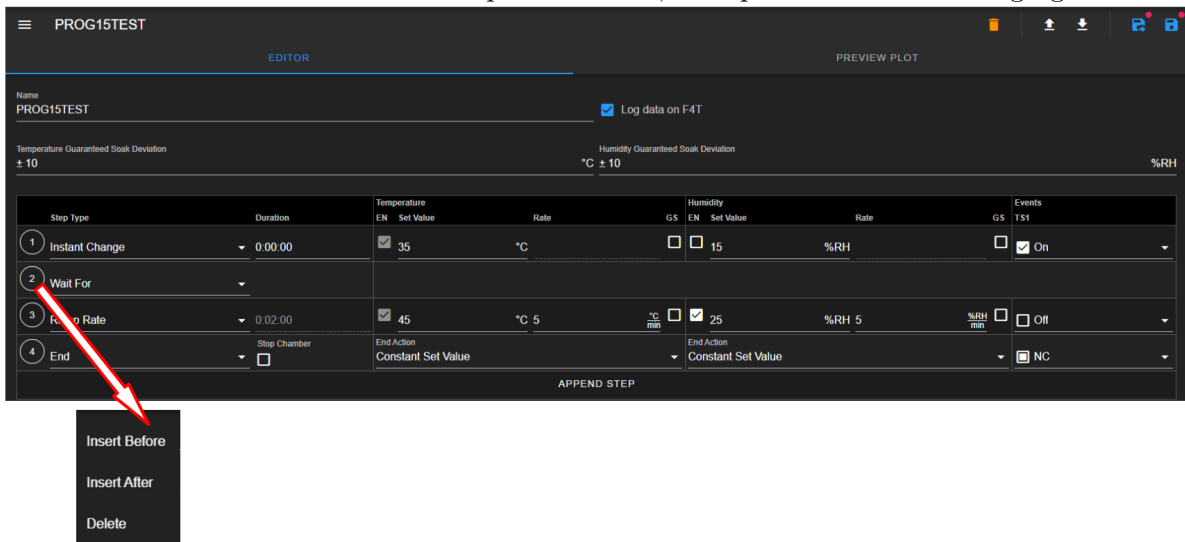
With **PROG15TEST** program open in the program editor, as shown in the previous figure, complete the following steps to modify and add additional steps with their specific step type and parameters as follows:

1. **Guaranteed Soak Deviation:** Set temperature and humidity guaranteed soak deviation to +/-10 degrees C and +/-10% RH, respectively.
2. **Step 1:** Modify step type.
 - **Step Type:** Click the down arrow and select **Instant Change**.
 - **Duration:** Reset duration time to 0:00:00.
 - **Temperature:**
 - **EN:** Check the EN box.
 - **Set Value:** Enter 35 or click the up/down arrow to adjust the value to 35.
 - **Rate:** Leave blank (empty)
 - **GS:** Leave GS box unchecked.

- **Humidity:**
 - **EN:** Leave EN box unchecked.
 - **Set Value:** Leave set value as-is or at 0.
 - **Rate:** Empty
 - **Events:**
 - **TS1:** Set to **On**.
3. **Step 2:** Inserting a new step. Click step number 2 in the circle that precedes **Ramp Rate** and select **Insert Before** from the drop-down menu, as depicted in the following figure.



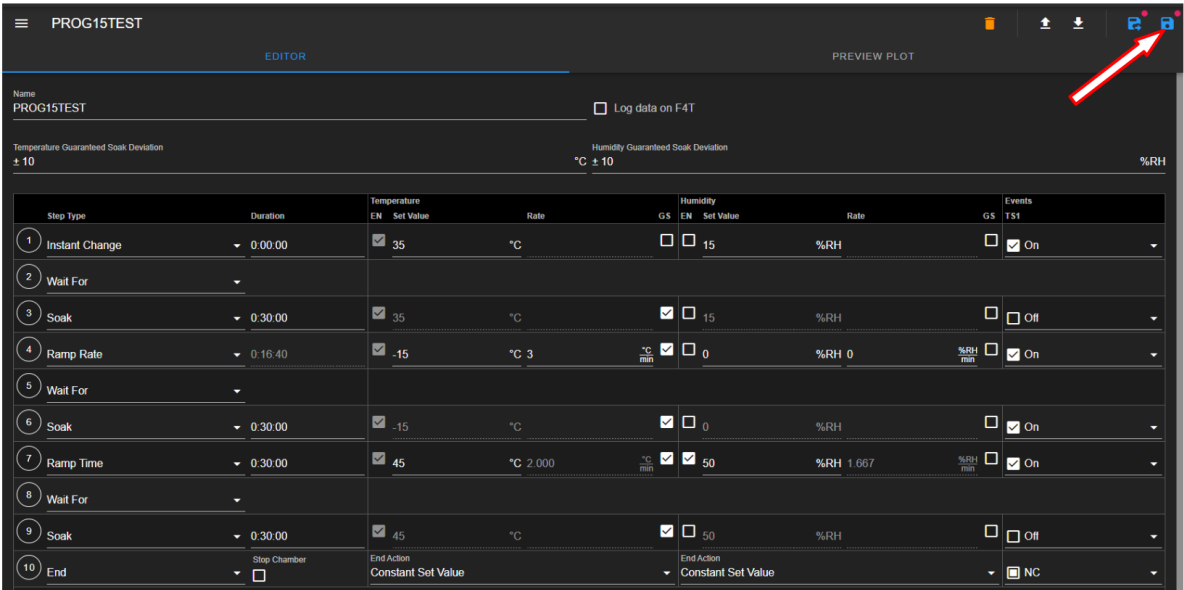
- **Step Type:** Click the down arrow and select **Wait For**. The rest of the parameters will be rendered blank.
4. **Step 3:** Inserting a new step. Click step number 2 in the circle that precedes **Wait For** and select **Insert After** from the drop-down menu, as depicted in the following figure.



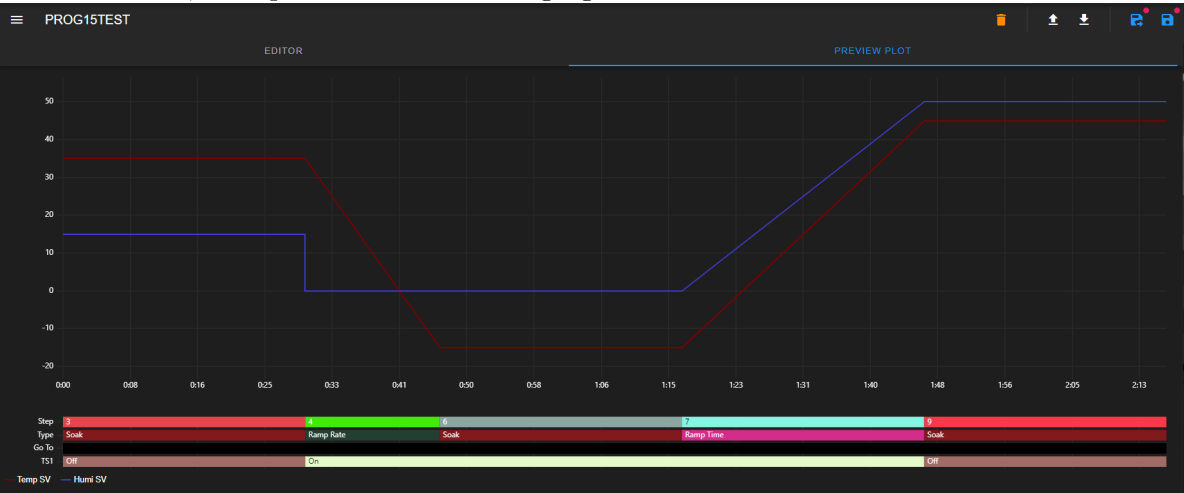
- **Step Type:** Default selection will be **Soak**.
- **Duration:** Set duration time to 0:30:00.
- **Temperature:**
 - **EN:** Enabled by default (grayed out).
 - **Set Value:** default (grayed out).

- **Rate:** default (empty)
 - **GS:** Place a check in the GS box.
 - **Humidity:**
 - **EN:** Leave EN box unchecked.
 - **Set Value:** Grayed out; default value from previous setting.
 - **Rate:** Empty (grayed out).
 - **Events:**
 - **TS1:** Set to **Off**.
5. **Step 4:** Modifying the current step.
- **Step Type:** Leave the step type as **Ramp Rate**.
 - **Duration:** Grayed out (to be determined by EWC on temperature set value and rate).
 - **Temperature:**
 - **EN:** Confirm that **EN** is enabled.
 - **Set Value:** Enter -15 or apply the up/down arrow to adjust the value to -15.
 - **Rate:** Enter 3 or apply the up/down arrow to adjust the value to 3.
 - **GS:** Place a check in the GS box.
 - **Humidity:**
 - **EN:** Leave EN box unchecked.
 - **Set Value:** Enter 0.
 - **Rate:** Enter 0.
 - **Events:**
 - **TS1:** Set to **On**.
6. **Step 5:** Inserting a new step. Click step number 4 in the circle that precedes **Ramp Rate** and select **Insert After** from the drop-down menu.
- **Step Type:** Click the down arrow and select **Wait For** from the drop-down list. The rest of the parameters are rendered blank.
7. **Step 6:** Inserting a new step. Click step number 5 in the circle that precedes **Wait For** and select **Insert After** from the drop-down menu.
- **Step Type:** Leave the step type as **Soak** (selected by default).
 - **Duration:** Set duration time to 0:30:00.
 - **Temperature:**
 - **EN:** Grayed out.
 - **Set Value:** Grayed out.
 - **Rate:** Grayed out.
 - **GS:** Place a check in the GS box.
 - **Humidity:**
 - **EN:** Leave EN box unchecked.
 - **Set Value:** Grayed out.
 - **Rate:** Grayed out.
 - **Events:**
 - **TS1:** Set to **On**.
8. **Step 7:** Inserting a new step. Click step number 6 in the circle that precedes **Soak** and select **Insert After** from the drop-down menu.
- **Step Type:** Click the down arrow and select **Ramp Time** from the drop-down list.
 - **Duration:** Set duration time to 0:30:00.
 - **Temperature:**
 - **EN:** Enable **EN** by checking the box.

- **Set Value:** Enter 45 or apply the up/down arrow to adjust the value to 45.
 - **Rate:** Grayed out.
 - **GS:** Place a check in the GS box.
 - **Humidity:**
 - **EN:** Enable **GS** with a check mark in the box.
 - **Set Value:** Enter 45 or apply the up/down arrow to adjust the value to 45.
 - **Rate:** Grayed out.
 - **Events:**
 - **TS1:** Set to **On**.
9. **Step 8:** Inserting a new step. Click step number 7 in the circle that precedes **Ramp Time** and select **Insert After** from the drop-down menu.
- **Step Type:** Click the down arrow and select **Wait For** from the drop-down list. The rest of the parameters are be rendered blank.
10. **Step 9:** Inserting a new step. Click step number 8 in the circle that precedes **Wait For** and select **Insert After** from the drop-down menu.
- **Step Type:** Default selection will be **Soak**.
 - **Duration:** Set duration time to 0:30:00.
 - **Temperature:**
 - **EN:** Grayed out (default to previous setting).
 - **Set Value:** Grayed out (default to previous value).
 - **Rate:** Grayed out (blank).
 - **GS:** Place a check in the GS box.
 - **Humidity:**
 - **EN:** Uncheck the box.
 - **Set Value:** Grayed out (default to previous value).
 - **Rate:** Grayed out (blank).
 - **Events:**
 - **TS1:** Set to **Off**.
11. **Step 10:** This step has been pushed down while the above steps were being added.
- **Step Type:** Program is ended with **End**. Leave the Stop Chamber box unchecked. Select End Action under both temperature and humidity to **Constant Set Value** and set **TS1** to **NC**.
12. **Save Program:** To save the program, click the **Save** icon in the upper-right corner. The following section describes how to apply other buttons in this upper-right corner. The complete program is illustrated in the following figure.

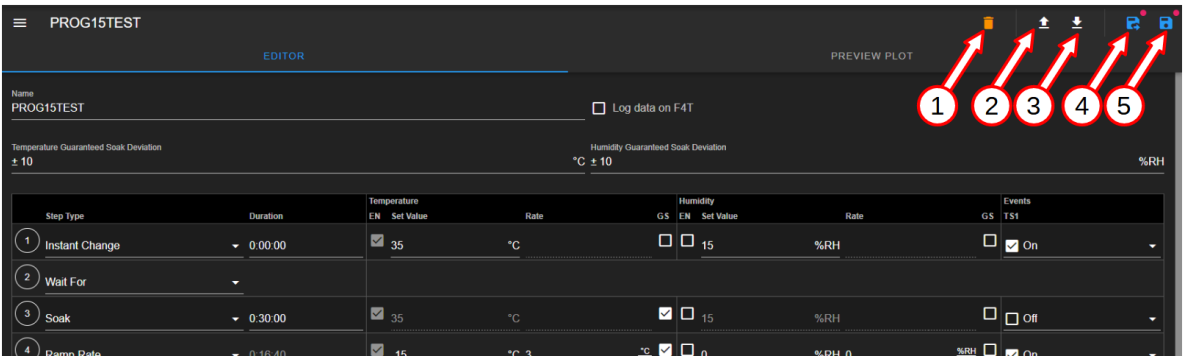


13. The above program can be previewed prior to execution by clicking on the **PREVIEW PLOT** button, as depicted in the following figure.



22.3.3 Managing Program File via the Program Editor

This section describes how to apply the five file manipulation options available in the upper-right corner of the program editor, as depicted in the following figure.



They are described as follows:

1. **Delete:** Click the trash bin icon to delete the current program in the program editor. The slot for this program on the Name list under the **List Programs** table will be rendered as **EMPTY**, since the program has been removed from the F4T register. As a safety measure, the system will prompt to confirm the action with a pop-up warning with a Yes/No option to proceed with the action. Upon completion, the system returns to the Program menu to display the programs on the Name list.
2. **Upload Program:** This button imports a program file from the local computer into the program editor. By default, the system opens the Downloads folder on the local computer to upload the program file. Navigate to the program's location, if necessary, and double-click on the desired program to import it into the program editor.
3. **Download Program:** The current program in the program editor can be downloaded onto the local computer as a backup. By default, the program will be stored in the Downloads folder, with filename based on the slot number (e.g., 15.json).
4. **Save As:** This button can be used to copy the current program to a different slot. To make the program name unique, the Name field may be edited with a new program name. This procedure thus requires a two-step process indicated by the arrows in the following figure. First, edit the program name; second, click the **Save** button and select a new slot from the drop-down list.

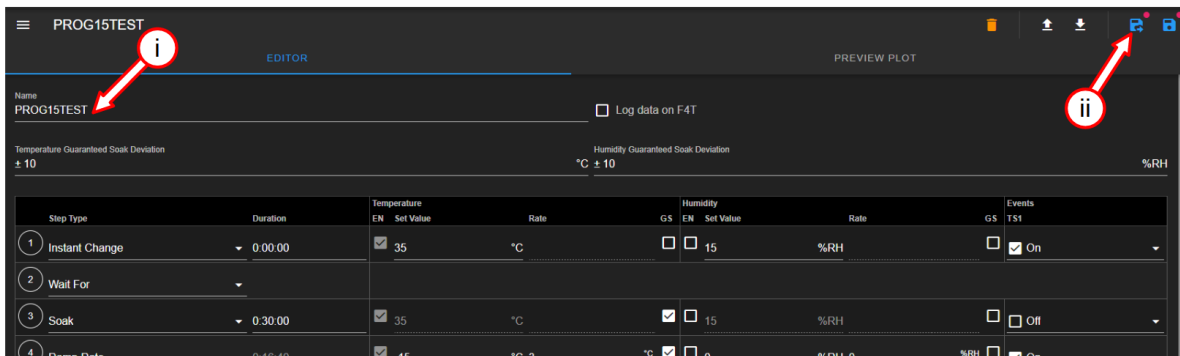


Figure 22.15: Save current program as a new file

5. **Save:** Apply this button to update the program file. To help check the editing status of the program, the program editor utilizes a red dot placed above the **Save** or **Save As** button to indicate an update yet to be saved.

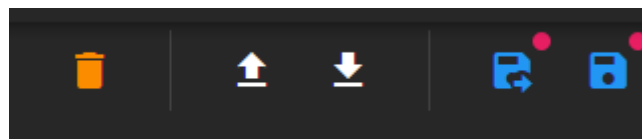


Figure 22.16: Update indicator

Navigating out of the editor without saving the update will trigger a warning prompt, as depicted in the following figure.

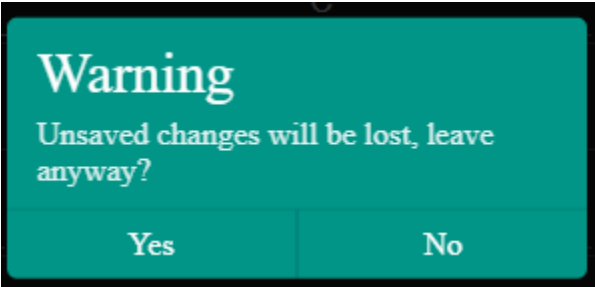
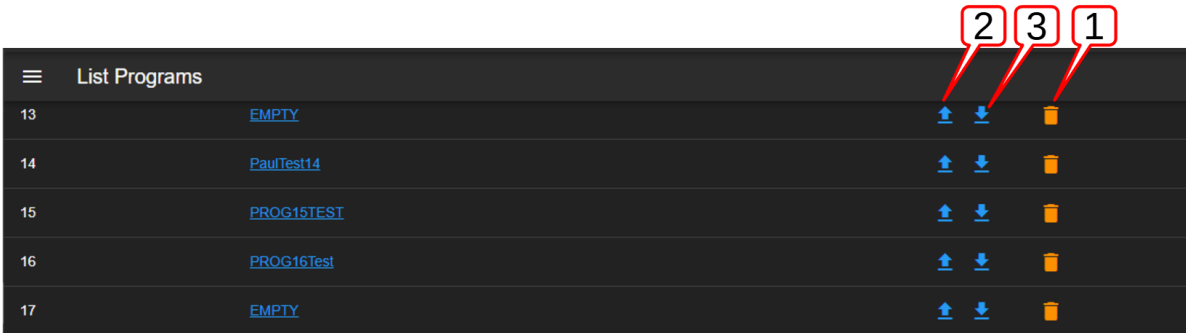


Figure 22.17: Confirm the save or discard update

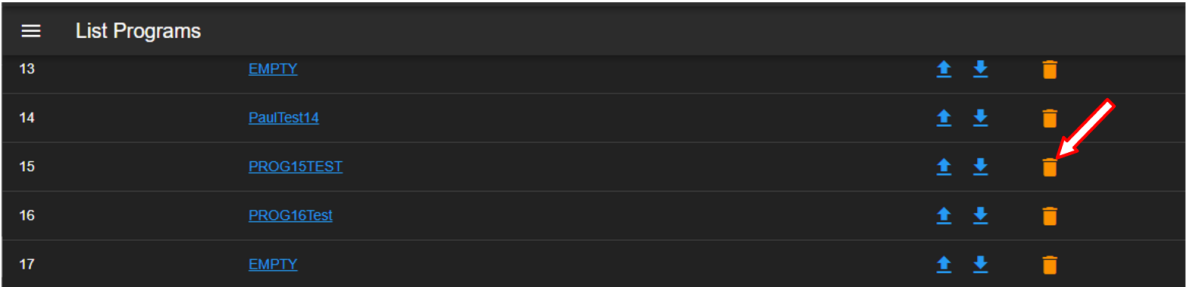
22.3.4 Managing Program File via the Name List

This section describes how to apply the three file manipulation options on the Name list, as depicted in the following figure.

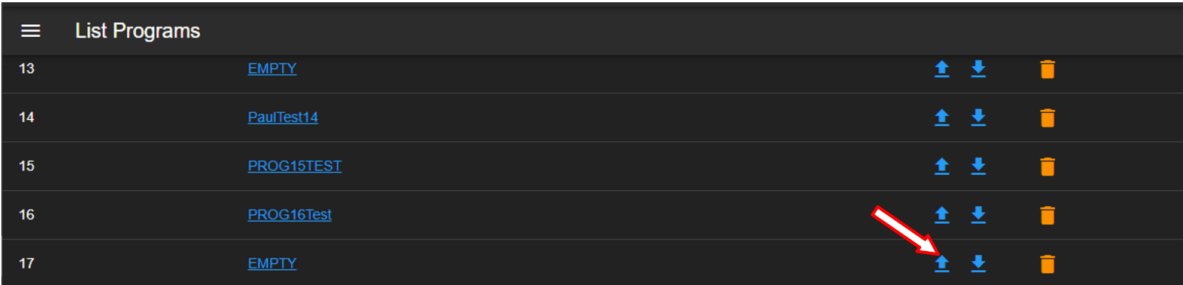







These three options are listed and described as follows:

- 1. **Delete:** To delete **PROG15TEST** from the Name list (and F4T register), click the trash bin icon as depicted in the following figure. As a safety measure, the system will prompt to confirm the action with a pop-up warning with a Yes/No option to proceed with the action. It may be necessary to apply the refresh button of the Web browser after deleting the program file from the Name list.



- 2. **Upload Program:** This button can be used to import a program from the local computer directly into a program slot on the Name list and F4T register. To upload (i.e., import) a program into slot 17, click on the **Upload** button, as indicated by the arrow in the following figure. Navigate to locate the desired file on the local computer and double-click it to complete the process.



List Programs			
13	EMPTY	↑ ↓	
14	PaulTest14	↑ ↓	
15	PROG15TEST	↑ ↓	
16	PROG16Test	↑ ↓	
17	EMPTY	↑ ↓	

3. **Download Program:** To download (i.e., export) a program **PROG16Test** on slot 16 (see above figure), click on the **Download** button. By default, the program file will be stored in the **Downloads** folder on the local computer using filename: 16.json.

CHAPTER 23

Start Stop

Operation modes of the chamber are grouped together in the **Start/Stop** menu to allow the operator with read-write privilege to manage the chamber. Each tab in the main display area, as depicted in the following figure, specifies the available operation mode, marked as **Standby**, **Constant** and **Program**.

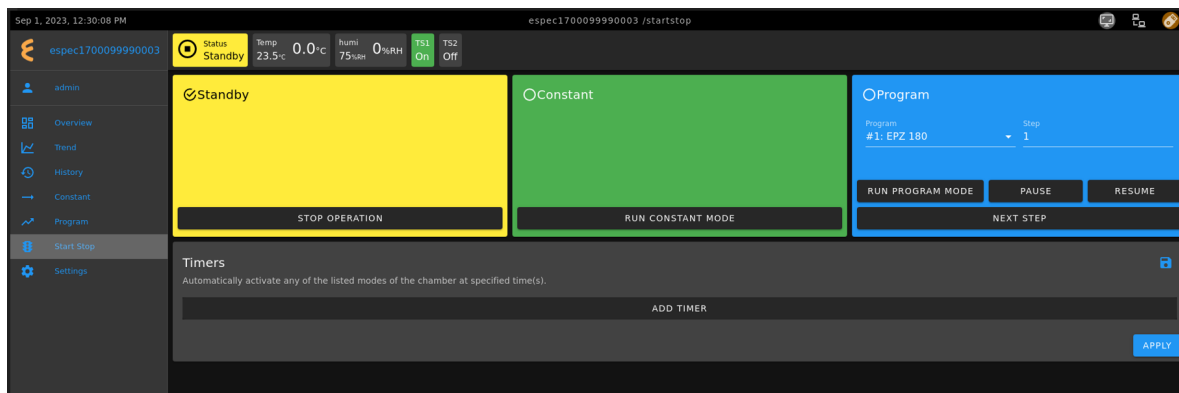


Figure 23.1: Operation modes of Start/Stop menu

While these modes may be accessed by an operator (with read-write privilege) via the **Status** tab in the status bar (from within any menu) to control the chamber operation mode at any time, the **Start/Stop** menu here provides an additional feature to automate the operation mode via a Macros feature through the application of the **Timers** in the bottom tab (to be discussed later in this part).

23.1 Standby Mode

In **Standby** mode, the chamber is off, and the status tab in the status bar displays as **Standby**. This status is also indicated by the check mark in the circle, as illustrated in the above figure.

23.2 Constant Mode

In **Constant** mode, the chamber operates using the constant configuration, and the status tab displays as **Constant**. This status is also indicated by the check mark in the circle, as depicted in the following figure.

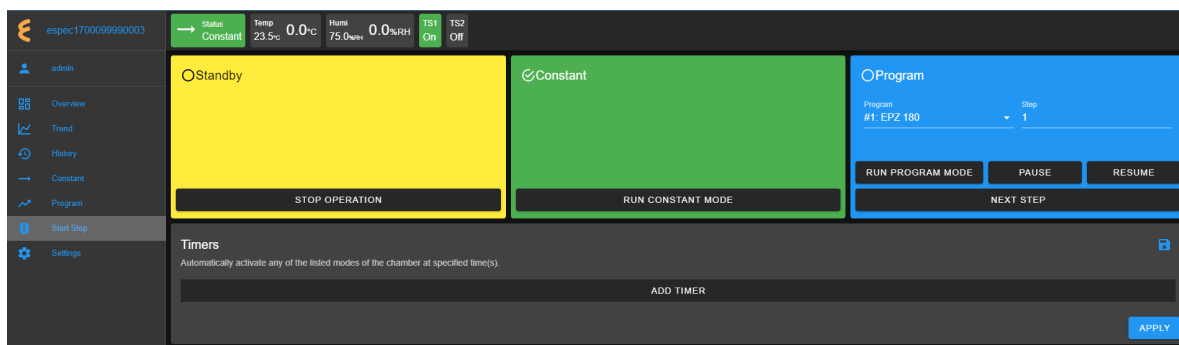


Figure 23.2: The Start/Stop menu with chamber in Constant mode

23.3 Program Mode

In **Program** mode, the chamber is carrying out instructions of the program being executed. The status tab in the status bar indicates the chamber is in **Program** mode, along with the name of the program being executed, as depicted in the following figure. This status is also indicated by the check mark in the circle in the program tab.

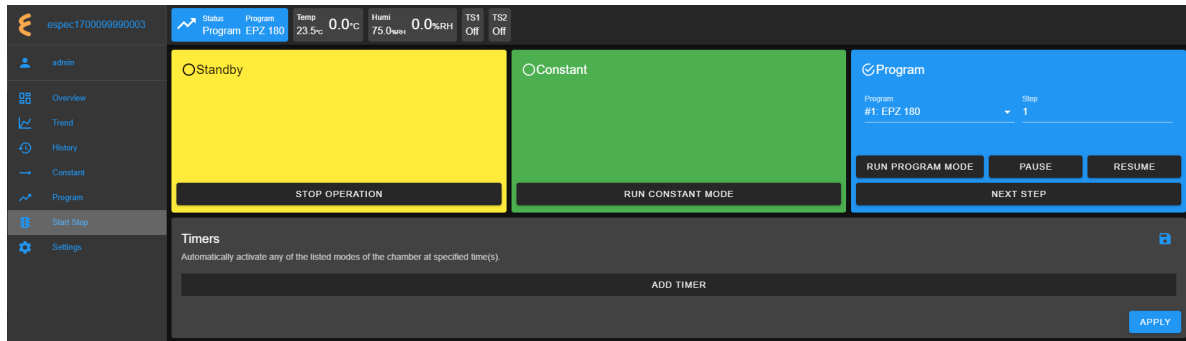


Figure 23.3: The Start/Stop menu with chamber in Program mode

23.4 Start/Stop Standby Mode

Authorized users with read-write privilege may set the chamber in **Standby** mode by clicking the **STANDBY** button in the **Standby** tab. In this mode, the chamber is in the **OFF** state. To terminate the **Standby** mode, activation of a new mode is necessary. For instance, to switch the chamber **ON** and to operate in **Constant** mode, click the **CONSTANT** button in the **Constant** tab in the main display area. EWC immediately moves to apply the operating mode to the chamber.

23.5 Start/Stop Constant Mode

Authorized users with read-write privilege may set the chamber to operate in **Constant** mode by clicking the **CONSTANT** button in the main display area. In this mode, the chamber operates by executing the constant settings in the configuration. To terminate the **CONSTANT** mode, activation of a new mode is necessary. For instance, to switch the chamber from its **Constant** mode to **Standby** mode, click the **STANDBY** button in the **Standby** tab. EWC immediately moves to apply the operating mode to the chamber.

23.6 Start/Stop Program Mode

Authorized users with read-write privilege may set the chamber to operate in **Program** mode by performing a series of operations in the **Program** tab. The following subsections describe the procedures how to run (execute) a program, pause, resume or step through the instructional steps in the program.

23.6.1 Run Program

To load and execute a program to control the chamber, complete the following steps:

1. Click the radio button in the **Program** tab to select a program from the list. Apply the scroll bar, if necessary, to search through the long list of programs, as depicted in the following figure.

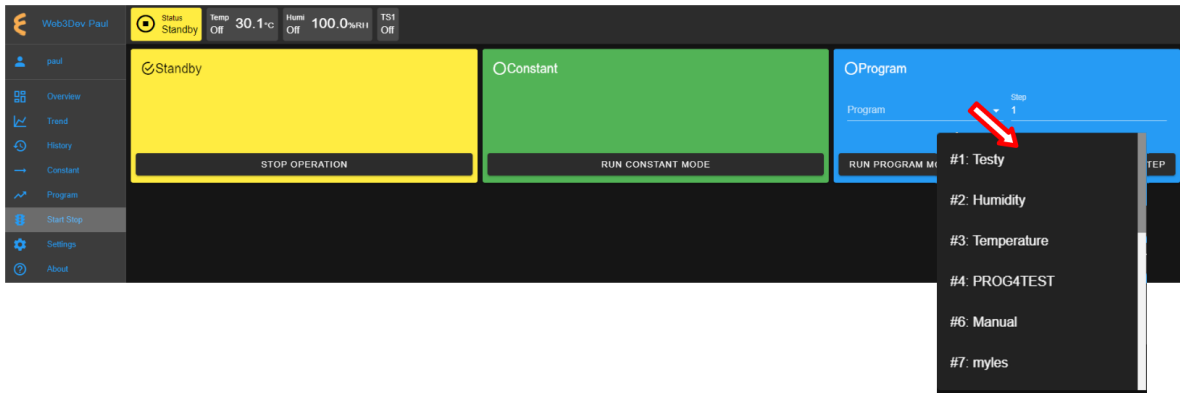
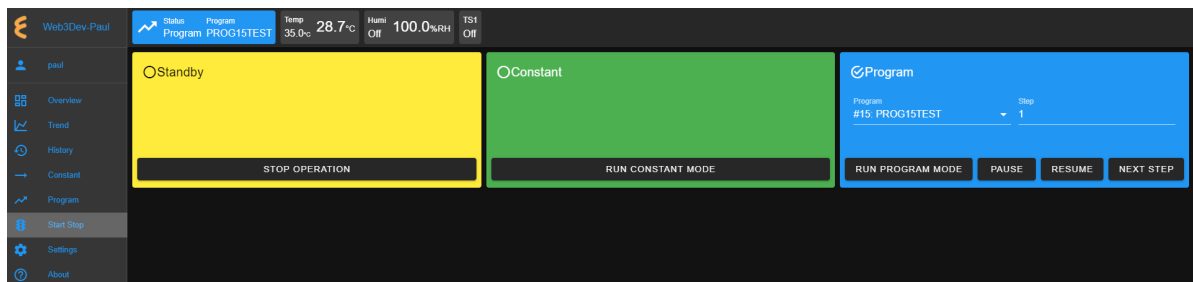


Figure 23.4: Executing a program from the Program List

2. Click to select the desired program name.
3. To start this program at a certain step, enter the step number in the **Step** field. Default setting is 1.
4. Click the **RUN PROGRAM MODE** button to execute the program. EWC immediately moves to apply the operating mode to the chamber. The **Status** tab and **Status** bar now display the program being executed, as depicted in the following figure. The **Overview** page maybe accessed to display the detail of the program being executed.



23.6.2 Pause/Resume Program

Authorized users with read-write privilege may control the chamber during program execution. **Program** mode may be interrupted and put in a “suspense mode” using the **PAUSE** button in the **Program** tab. To pause a program during execution, click the **PAUSE** button; all operations are suspended. An update notification appears in the lower-right corner. The **Paused** notification is posted in the **Status** tab.

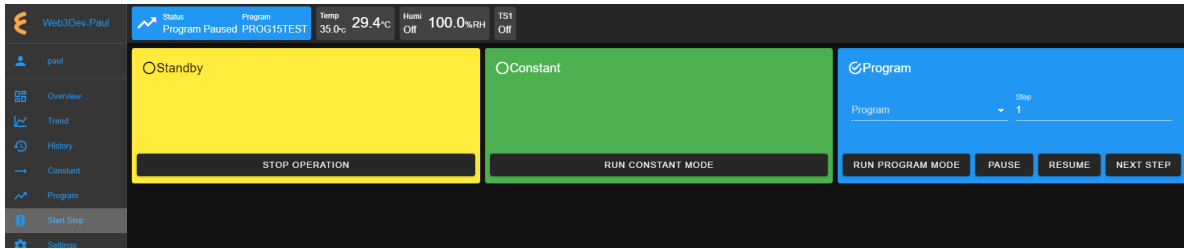


Figure 23.5: Program is being paused.

To resume the operation and continue program execution, click the **RESUME** button. The chamber will continue to operate based on instructions in the program. Program name is posted on the **Status** tab to indicate chamber is in **Program** mode and that program (name) is being executed.

23.6.3 Stepping through a Program

Without having to wait for each step in the program to complete its tasks for the entire time duration in the instruction, an operator may step through the program to study the effects of the instructions in a certain step. While the program is being executed, click the **NEXT STEP** button to execute the next step in the program. An update notification appears in the lower-right corner to confirm the action. This action may be repeated until the last step in the program is reached. The **Overview** page in combination with the extended tab maybe accessed to display the detail of the program being executed and its steps being stepped through.

23.7 Timers

The **Timers** tab provides a quick way to apply the Macro Editor to automate a simple macro action to extend the operating mode of the chamber. There are two timer types: One-time timer and repeated timer. The one-time timer or one-shot timer allows an operator to set up a single (hence, one-time) operation on the chamber, while the repeated timer permits an operator to set up a repeated operation on the chamber. The repeated timer will operate indefinitely until it is disabled. The following figure depicts these two timer types.

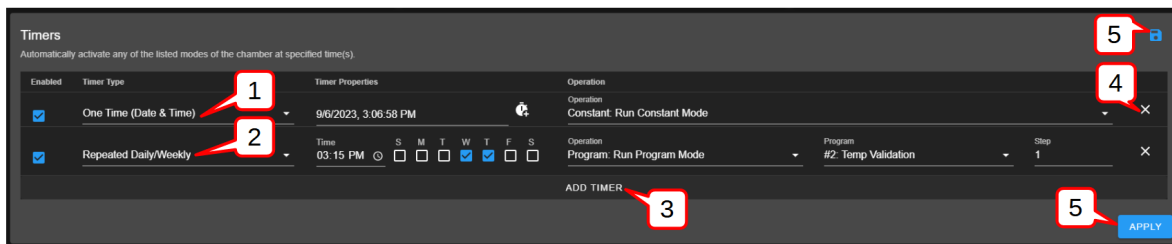


Figure 23.6: Example of one-time and repeated timer operation

1. **One-Time:** This timer fires the constant mode operation at 3:06:58 PM on 9/6/2023. The timer instruction and 3:06:58 PM must be configured ahead of time, later than the current time in order for the operation to take effect. For this reason, EWC date/time must synchronize with the current or local date/time (refer to **Date/Time Settings** under the

Settings menu for detail). The one-shot timer is date/time dependent.

2. **Repeated Daily/Weekly:** This line is added after the first line got executed. Since it is set to occur after the first line, it will trip at 3:15 PM on Wednesday and Thursday of the week (in reference to the current date/time of EWC). The action executes a program from slot 2 (also referenced by the program name). When program execution is complete, the chamber will be set in the operating mode specified by the instruction in the program. This timer type is date/time independent; the operation will recur until the timer itself is removed from the **Timers** list or disabled with the **Enabled** box unchecked.
3. **Add Timer:** A new timer can be added using the **Add Timer** button, which will be added at the bottom of the list.
4. **Remove/Delete:** Each timer can be removed using the **X** button to its right.
5. **Save/Apply:** To start the timer, the **Save** or **Apply** button must be used. The two timer instructions (depicted above) are saved under the Macro Editor called **Operation Timer 1** and **Operation Timer 2**, respectively. If the timers are edited with new instructions and saved, the system generates a new name **Operation Timer 3** for the third timer, with a numeral incremented by one per each update. If the timer instructions are all removed from the **Timers** list, and a new timer is created and saved, the system starts over with **Operation Timer 1**, with its numeral incremented by one on each new update. This information can be viewed under the **Macros** submenu (under the **Settings** menu).

23.7.1 Program Mode: One-Time Timer

A one-shot timer sets the **Timers** to fire a certain action once based on the set date and time. With this feature, a selected program can start at a certain day and time once. The running program can be paused, resumed or stopped by another (subsequent) one-shot timer. An operator can plan to stop a certain program and switch the chamber to a different mode with the one-shot timer.

The following example illustrates how to set a one-shot timer to switch the chamber from **Standby** to **Program** and execute the said program starting with step 1.

1. Log in using the **admin** account
2. Access the **Start Stop** menu
3. Touch or click the **ADD TIMER** bar
4. Select/confirm that **One Time** is selected from the drop-down list of the **Timer** type; by default, **One Time** is selected.

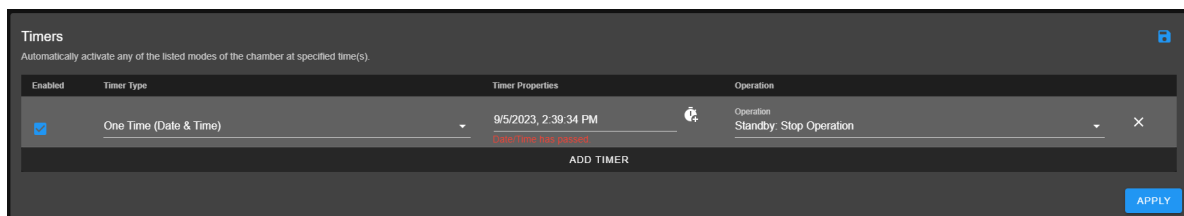


Figure 23.7: Setting a one-time automation

5. Touch or click the date/time field under the **Timer Properties** and apply the calendar and time to set the desired time. **Note:** Date and time must be ahead of the current date and time on the EWC system.

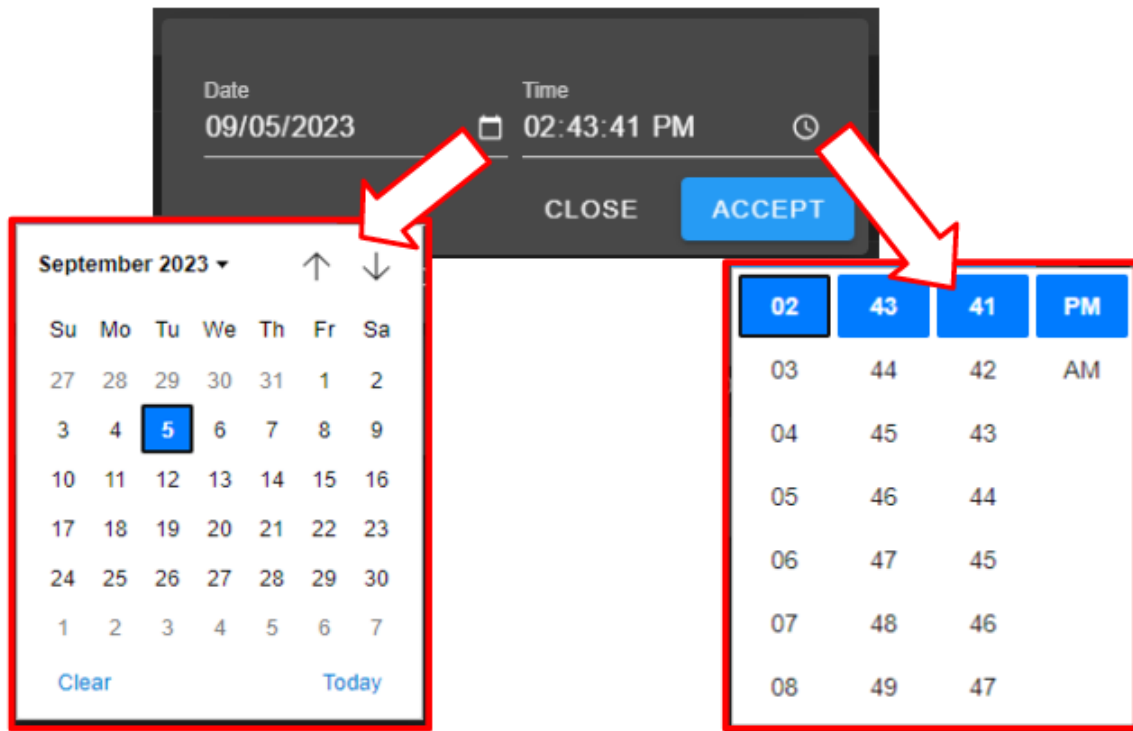


Figure 23.8: Set date/time for a one-shot action

Note: For a one-time operation, it is easier to use the Offset button (on the right of the date/time field) to adjust the future time, as depicted by the arrows in the following figure. Here, EWC will add the time to the current time to calculate when this action will fire.

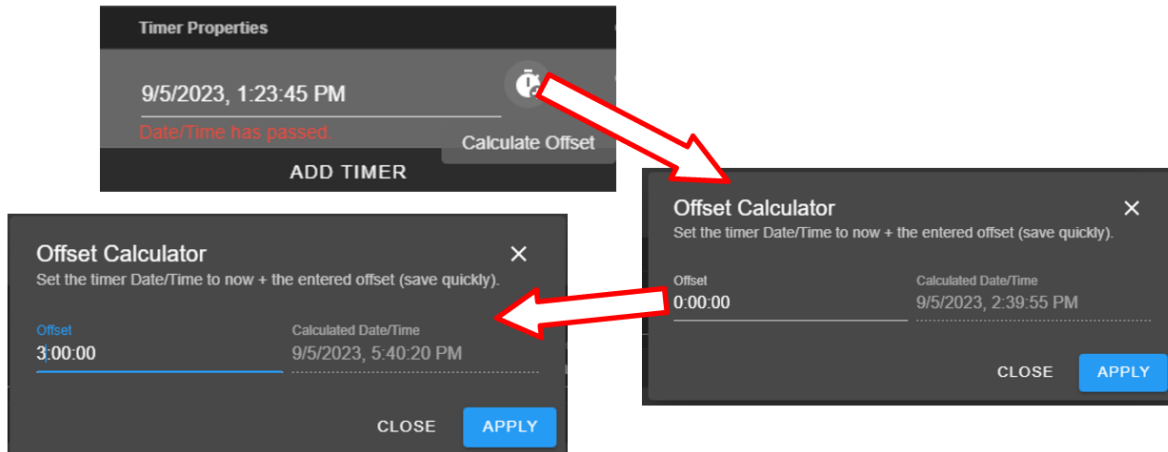


Figure 23.9: Using the time-offset calculator

6. Under **Operation**, select **Program: Run Program**
7. Under **Program**, select from name (or slot number)
8. Under **Step**, select what step to start
9. Apply the setting with the **APPLY** button

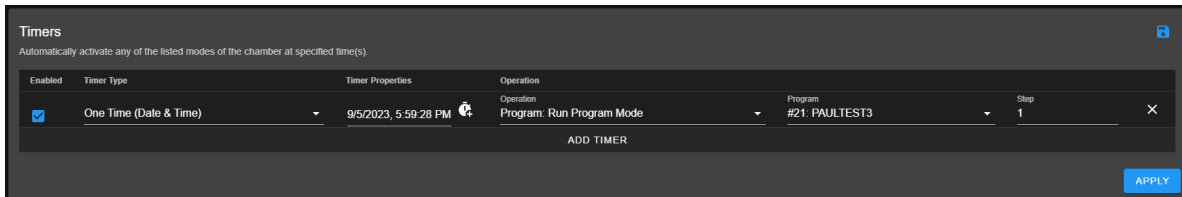


Figure 23.10: Program mode for a one-time start

Note: Both the **Save** and **APPLY** buttons provide the same effect. Either button can be used to save the settings and apply the action.

10. The program in slot 21 (as depicted in the example) will commence at 5:59:28PM (according to the EWC local time).

23.7.2 Removing or Adding a Timer

The one-shot or repeated timer can be removed from or added to the **Timers** list with the **X** or **ADD TIMER** button. Each new timer is added to the bottom of the list and takes effect after each update.

To add a new timer and use it, simply apply the **ADD TIMER** button. The following figure illustrates how a second timer is added to switch the chamber from a program mode (activated by the first timer) to **Constant**. Here, program from slot 21 gets executed (by the timer in the first line) at 1:20:15 PM, with execution time to last several hours. The timer in line 2 will switch the chamber to **Constant** mode at 2:00:00 PM.

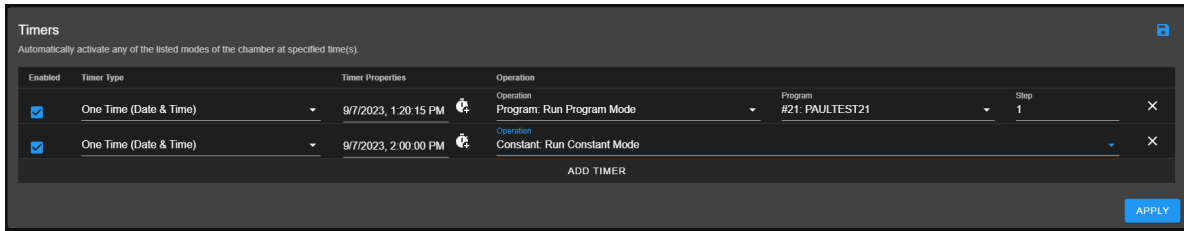


Figure 23.11: Setting additional one-shot timer after the first

Different timers on the list can be enabled or disabled using the **Enabled** box. Additional timer can be added to the **Timers** list and updated to take effect, provided the time is set for future time.

23.7.3 Constant Mode: One-Time Timer

The following example illustrates how to configure a one-shot timer to stop the current program and switch the chamber to **Constant** at a specific time. The timer is configured as a new instance with one line by itself, as depicted in the following figure. The action is instant and the program being executed will be stopped immediately; therefore, the action must be applied with care.

1. Log in using the **admin** account
2. Access the **Start Stop** menu
3. Clear all or current timer settings with the **X** button (if necessary).
4. Click or touch the **ADD TIMER** bar
5. Confirm that **One Time** is selected (or make selection from the drop-down list).
6. Click or touch the date/time field under the **Timer Properties** and apply the calendar and time to set the desired time.
7. Under **Operation**, select **Standby: Stop Operation**
8. Apply the setting with the **APPLY**. This action script is now saved in the Macros list.

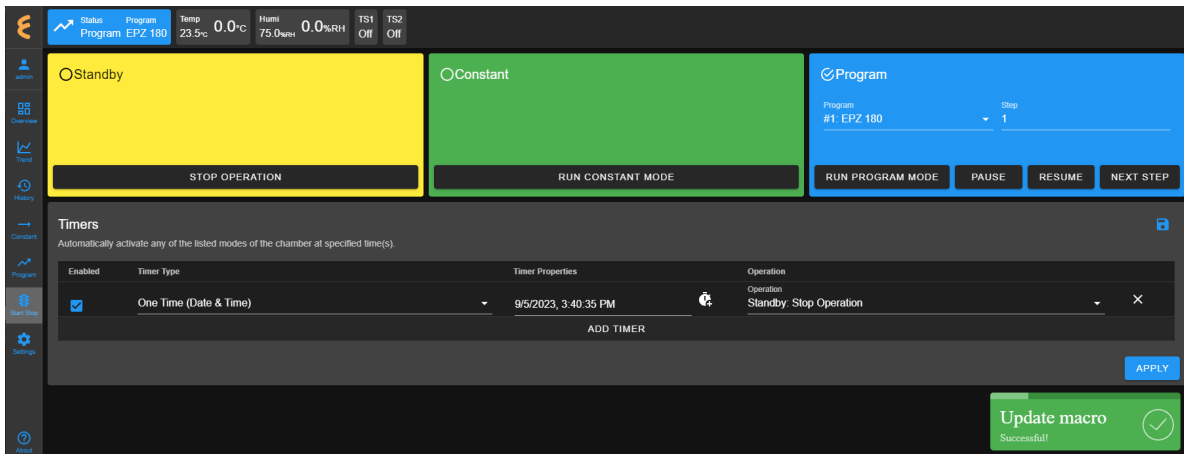


Figure 23.12: Scheduled a one-time timer to set chamber in Constant mode

- The timer is activated at the set time, as depicted in the Macros list under the Operation Timer 1 script. To view the Operation Timer 1 action, access the Settings menu and select Macros from the submenu.

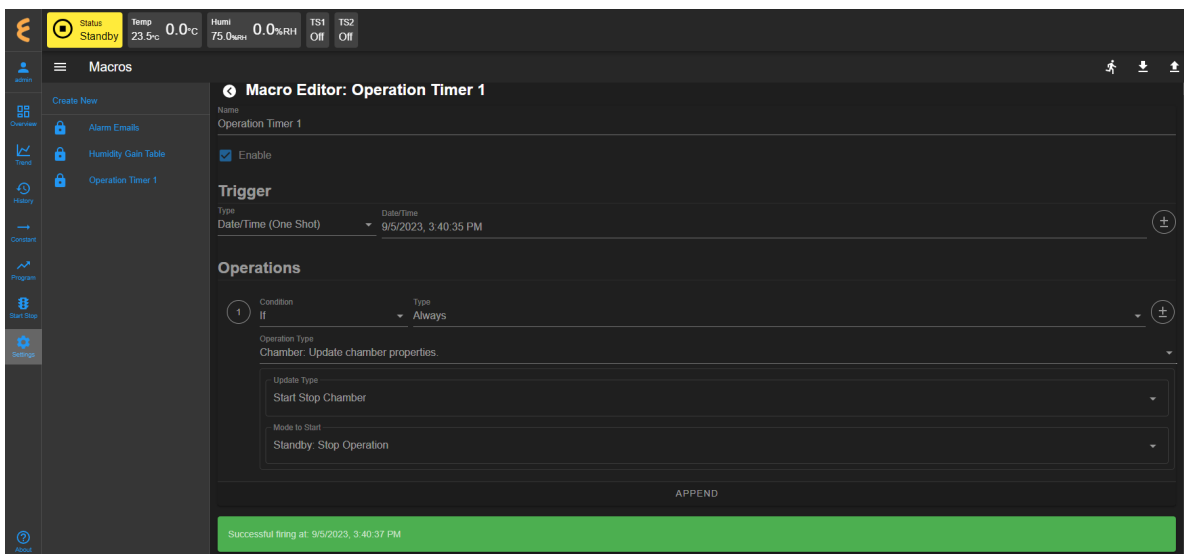


Figure 23.13: Macros action recorded on the one-time Timer

23.7.4 Program Mode: Weekly Repetition

With a weekly repeated timer, a program can start on a certain day, at a certain time. The following example illustrates how to execute a program on a weekly basis (one day during each week) at a certain time. Here, we set a program execute every Wednesday at 6:00 AM.

- Log in using the **admin** account
- Access the **Start Stop** menu
- Clear all or current timer settings with the **X** button (if necessary).

4. Touch or click the **ADD TIMER** bar
5. Under **Timer Type**, select **Repeated Daily/Weekly**
6. Edit the time to 6:00 AM
7. Check the box under W. The calendar format is Sunday(S) to Saturday (S).
8. Under **Operation**, select **Program: Run Program Mode**
9. Under **Program**, select program in the desired slot number (slot 21 and PAULTEST3 was used as an example).
10. Set and select program step 1 to begin execution.
11. Apply the setting using the **APPLY** button. The complete configuration is depicted in the following example.

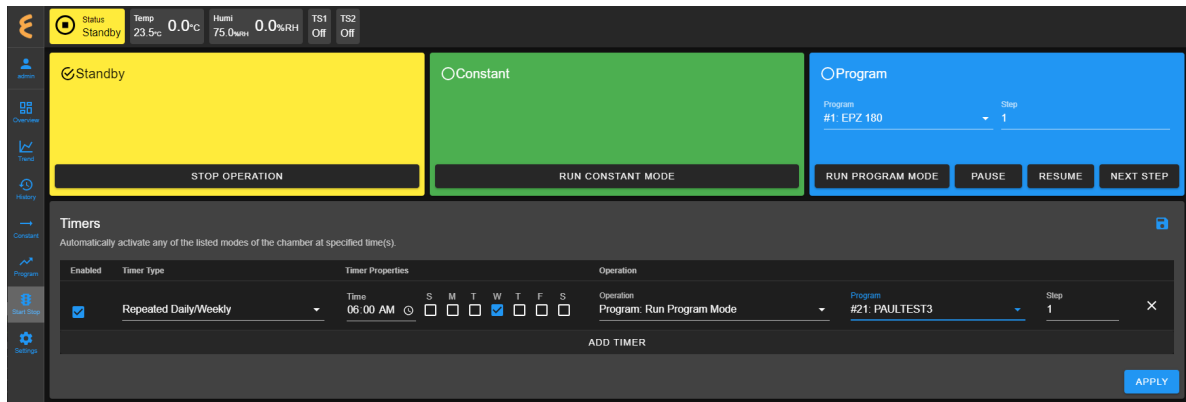


Figure 23.14: Single-day weekly timer

This timer can be disabled or enabled by manipulating the **Enabled** box. If you stop the program or switch the chamber to a different mode (such as, **Constant**), while this timer is still enabled, the selected will recur on Wednesday at 6:00 AM the following week. To disable the timer permanently, it must be removed from the list (with the X and APPLY button).

23.7.5 Program Mode: Daily Repetition

The following example illustrates how to execute a program on a daily basis, from Monday through Friday, at 9:45 AM during each week.

1. Log in using the **admin** account
2. Access the **Start Stop** menu
3. Clear all or current timer settings with the **X** button (if necessary).
4. Touch or click the **ADD TIMER** bar
5. Touch or click **Timer Type** and select **Repeated Daily/Weekly**
6. Edit the time to 9:45 AM
7. Check the boxes under M through F. The calendar format is Sunday(S) to Saturday (S).

8. Under **Operation**, select **Program: Run Program Mode**
9. Under **Program**, touch or click to select slot number and name (slot 21 and PAULTEST3 was used as an example).
10. Set and select program to begin at step 1.
11. Touch or click **APPLY** to the apply settings. The complete configuration is depicted in the following example.

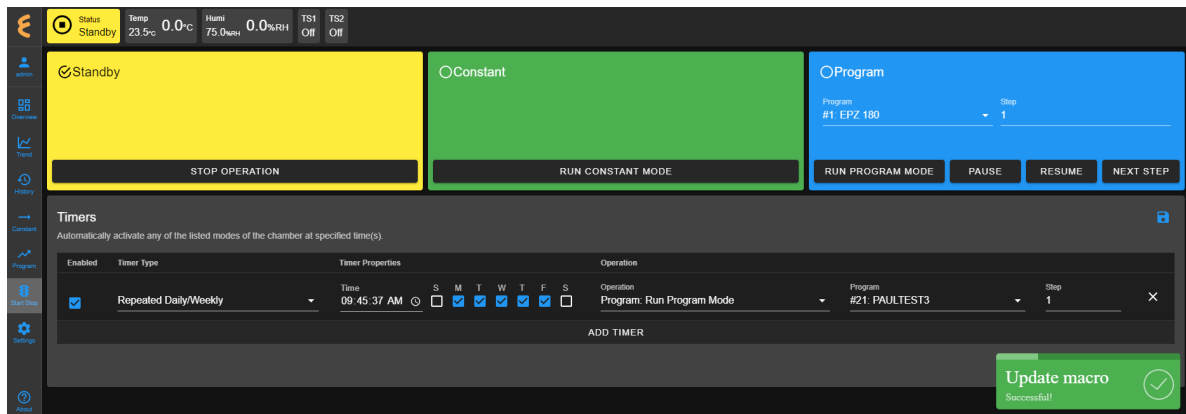


Figure 23.15: Timer setting for everyday of the week

The following trend graph is a result of the timer with its configuration set to run over the week-end. The trend graph was produced by extrapolating the data from the last three days (Friday through Sunday). It shows how program was repeated each day at 6:05 PM and ended shortly before 9:00 AM, as indicated by the status bar at the bottom of the graph. The chamber was put in a **Standby** mode until 6:05 PM, at which time the program recurred.

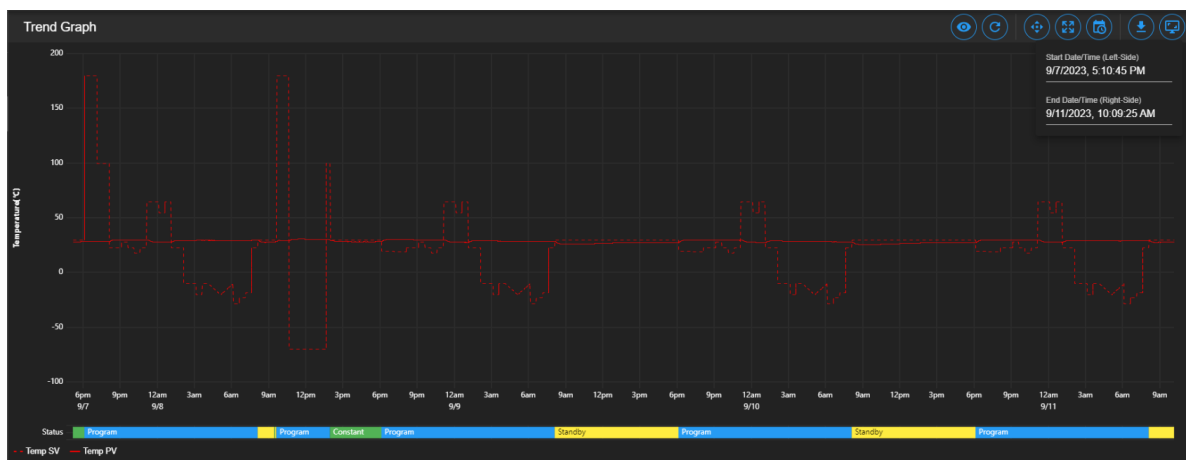


Figure 23.16: Trend graph of chamber controlled by a timer

This timer can be disabled or enabled by manipulating the **Enabled** box. If you stop the program or switch the chamber to a different mode (such as, **Constant**), while this timer is still enabled, the selected program will recur on the next day. To disable it permanently, the timer can be removed from the list (with the X and APPLY button).

23.7.6 Multiple Timers: One-Time or Repeated Daily/Weekly

The **Timers** list may contain multiple timers with different instructions for a specific operation. Multiple timers allow for sequential activations, order of script execution or specific execution via the **enabled** box selection, etc.

The following figure depicts a list of multiple timers, each with a specific function and operation, which has been prepared to execute in the top-to-bottom paradigm.

The screenshot shows a 'Timers' configuration window with the subtitle 'Automatically activate any of the listed modes of the chamber at specified time(s)'. It contains a table with four timer entries. Each entry has an 'Enabled' checkbox, a 'Timer Type' dropdown, 'Timer Properties' (Time and Day of Week), and 'Operation' (Operation, Program, and Step). The first timer is 'Repeated Daily/Weekly' at 06:05:54 PM, enabled for all days, with the operation 'Run Program Mode' for program '#21: PAULTEST21' at step 1. The second and third timers are 'One Time (Date & Time)' at 9:27:59 AM and 9:31:20 AM respectively, both with the operation 'Constant: Run Constant Mode'. The fourth timer is 'One Time (Date & Time)' at 9:36:36 AM, with the operation 'Standby: Stop Operation'. The fifth timer is 'One Time (Date & Time)' at 9:36:36 AM, with the operation 'Run Program Mode' for program '#5: Temp Validation' at step 1. An 'ADD TIMER' button is at the bottom, and an 'APPLY' button is at the bottom right.

Enabled	Timer Type	Timer Properties	Operation
<input checked="" type="checkbox"/>	Repeated Daily/Weekly	Time: 06:05:54 PM S M T W T F S: [all checked]	Operation: Run Program Mode Program: #21: PAULTEST21 Step: 1
<input checked="" type="checkbox"/>	One Time (Date & Time)	9/8/2023, 9:27:59 AM	Operation: Constant: Run Constant Mode
<input checked="" type="checkbox"/>	One Time (Date & Time)	9/8/2023, 9:31:20 AM	Operation: Standby: Stop Operation
<input checked="" type="checkbox"/>	One Time (Date & Time)	9/8/2023, 9:36:36 AM	Operation: Run Program Mode Program: #5: Temp Validation Step: 1

ADD TIMER

APPLY

Figure 23.17: Multiple sequential timer operations

Each entry in the above figure is added after the previous one (above it) has been executed. All of which are enabled by default. Only timer 1 (top line) and timer 4 (bottom line) remain in effect, since the middle two are one-shot timers. In addition, the last timer is also a one-shot timer and it will end after the program it has executed has ended. Each timer causes action to take over the previous one.

Part V

ESPEC Chamber with F4

CHAPTER 24

Overview

The **Overview** page displays the current status of the chamber and its operating mode. A user is brought to this page after logging into EWC. The following figure depicts **Overview** with the chamber in Constant as indicated in the status tab and its extension bar. This extension bar is only available in the **Overview** menu. The date/time posted in the extension bar is the date/time on the chamber/controller. While date/time stamp of data logs and Macros automated actions are based on the date/time on EWC, the controller date/time should also synchronize with that on EWC and the local device (that launched the Web browser). The date/time of EWC can be viewed under the **Settings** menu. It can also synchronize with that on the local device (to be discussed in the **Settings** menu).

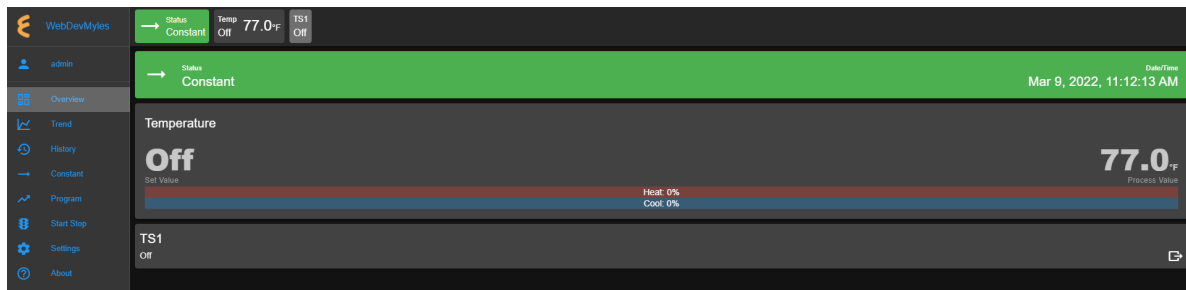


Figure 24.1: Overview page with chamber in Constant mode

The following figure depicts **Overview** showing the chamber in Program mode. Detailed information about the program, including what step is being executed, is listed in the extension bar (of the status tab). This feature provides the operator with useful information about the status of the chamber and the program.

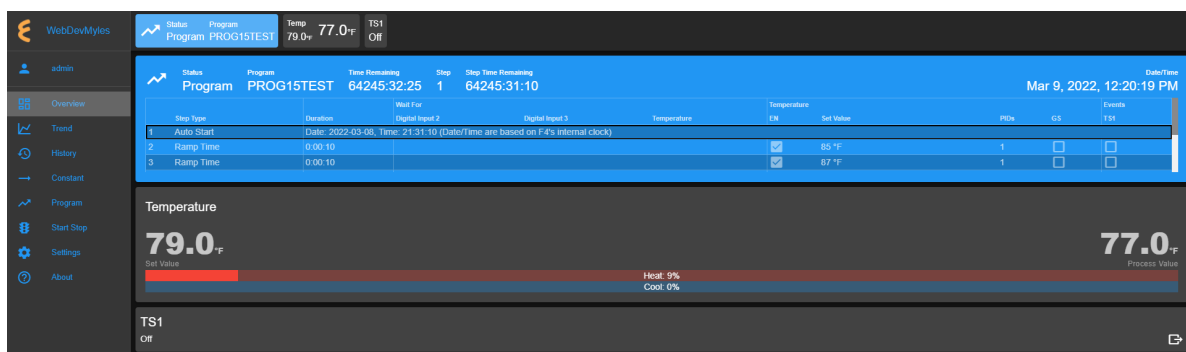


Figure 24.2: Overview page with chamber in Program mode

Only users with read-write privilege can control the chamber operation mode from within this page. Supported operation modes are **Constant** and **Program**. Each tab in the status bar may be accessed to apply new settings at any time. This feature enables the operator to control the chamber without having to access the **Start Stop** menu in the menu bar. The following sections detail a step-by-step procedure how to control the chamber's operating mode via the **Overview** menu for users with read-write privilege.

24.1 Constant Setting

Operating mode can be switched from **Program** to **Constant** or vice versa. For authorized users with read-write privilege, to set the chamber in **Constant** mode, proceed with the following steps.

1. Click the status tab in the status bar (as shown in the figure).

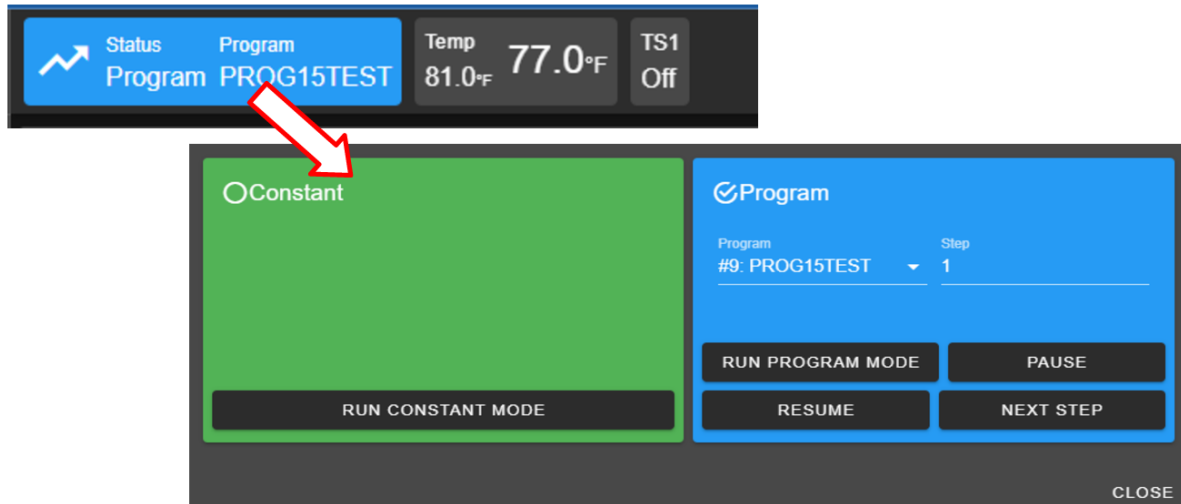


Figure 24.3: Constant mode setting

Or, click the extension bar, as shown in the figure.



Figure 24.4: Constant mode setting via extension bar

2. Click the **RUN CONSTANT MODE** button in the constant tab. EWC immediately moves to apply the operating mode to the chamber.
3. To close the drop-down tabs, perform one of the following actions:
 - Click an empty area in the Main Display.
 - Click a different menu in the menu bar.
 - Click the status tab itself, or
 - Click the **CLOSE** button of the drop-down tabs or the extension bar.

24.2 Program Setting

To set the chamber in **Program** mode means a profile (i.e., program) is loaded and executed.

1. Click the status tab in the status bar or the extension bar of the status tab.
2. Click the radio button in the program tab to access the program list (see the figure below).

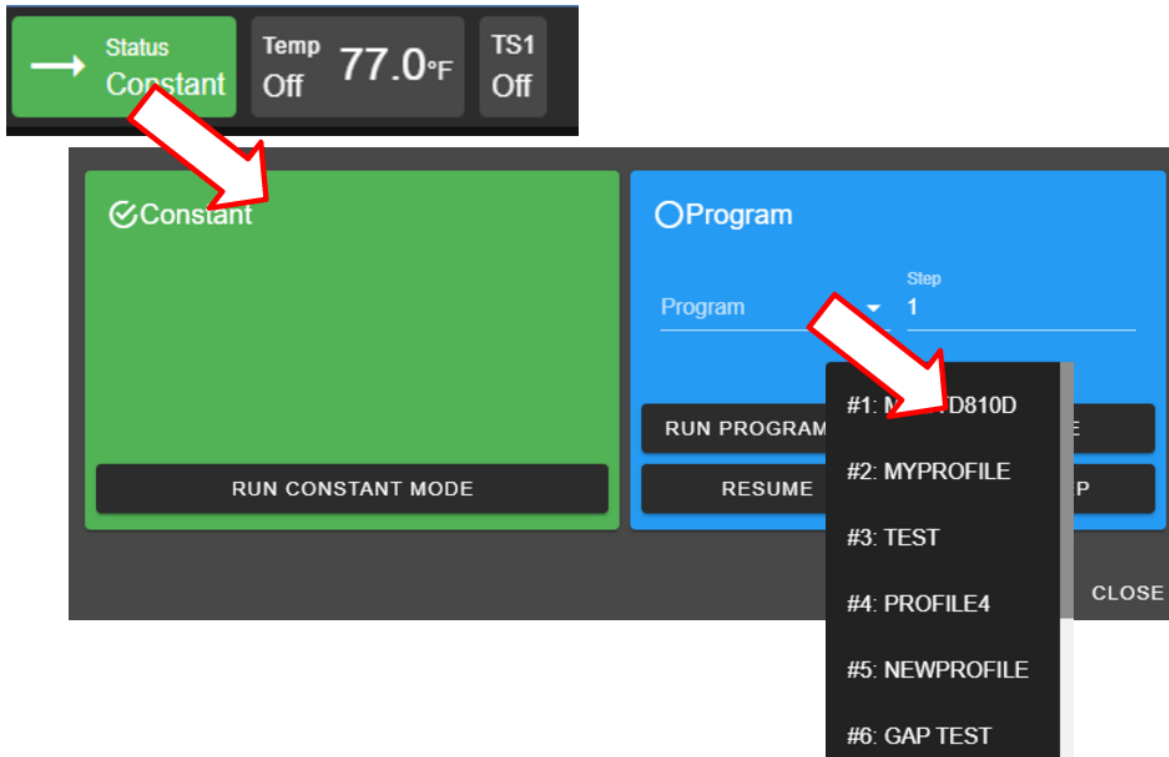


Figure 24.5: Select program to start chamber in Program mode

If no program is available for loading, the list contains slot numbers without programs, as depicted in the following figure. A program must be created first before it can be loaded for execution. Chapter 8 discusses how to create a program to control the chamber.

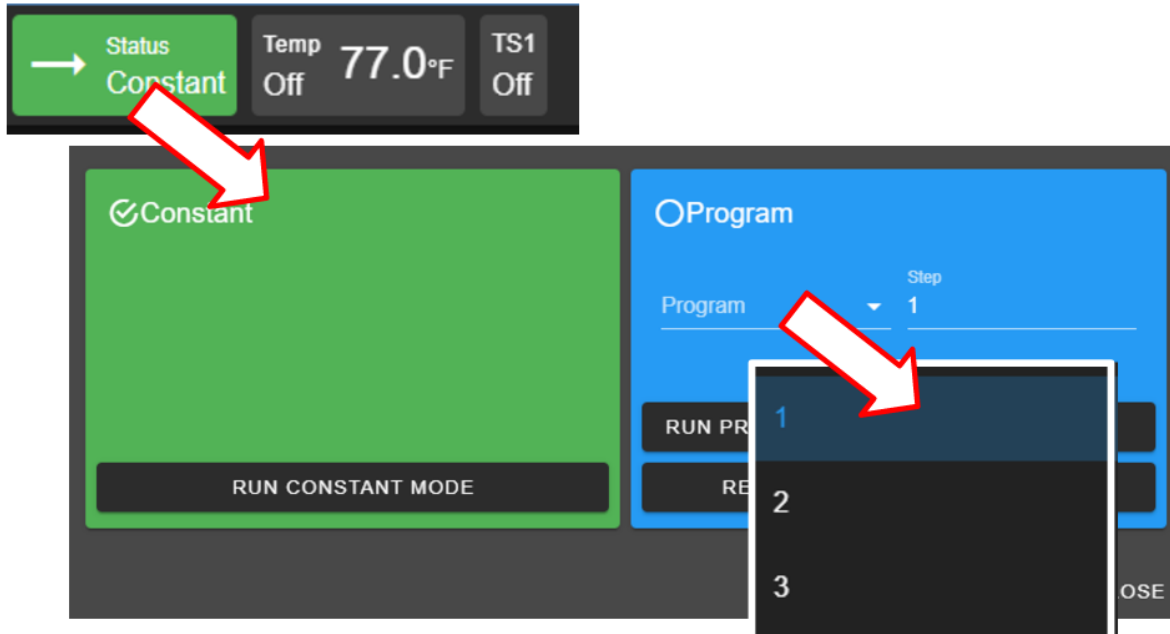


Figure 24.6: No program available for execution

3. Click to select a program from the list. Apply the scroll bar, if necessary, to select the desired program.
4. Enter a desired step number in the step field for program to start. Default start step is 1.
5. Click the **RUN PROGRAM MODE** button to execute the program. EWC immediately moves to apply the operating mode to chamber. A pop-up window appears in the lower-right corner to indicate the update. Note: This program tab offers a few practical methods during a program execution. The **Pause** button can be used to pause the program. Program can be resumed via the **RESUME** button. Program instruction lines can be stepped through via the **NEXT STEP** button.
6. Click the **CLOSE** button to view the status of program execution displayed in the status tab extension bar.
7. To end or interrupt the program execution, switch the chamber to **Constant** mode via the status tab.

24.3 Clear Alarms

When EWC detects an alarm in the chamber, it also sets itself in an alert state by displaying a list of active alarms and fault names in the red window to require an immediate action from the operator, as depicted in the following figure.

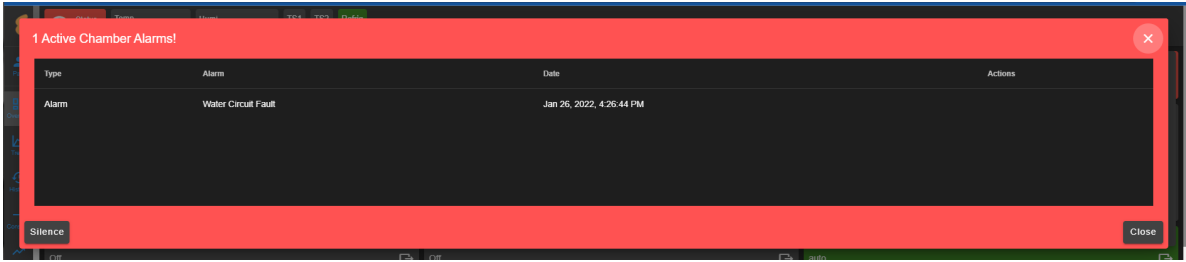


Figure 24.7: Chamber in alarm state

A repeating beep on the local computer is also tripped to get the operator’s attention. The **SILENCE** button can be used to turn off the beep. This alert window can be closed by clicking the **CLOSE** button or the X button. However, the alarm state still remains to be resolved as indicated by the **Status** tab in the following figure. To redisplay or expand the alarm list, click the red dot in the lower-right corner.

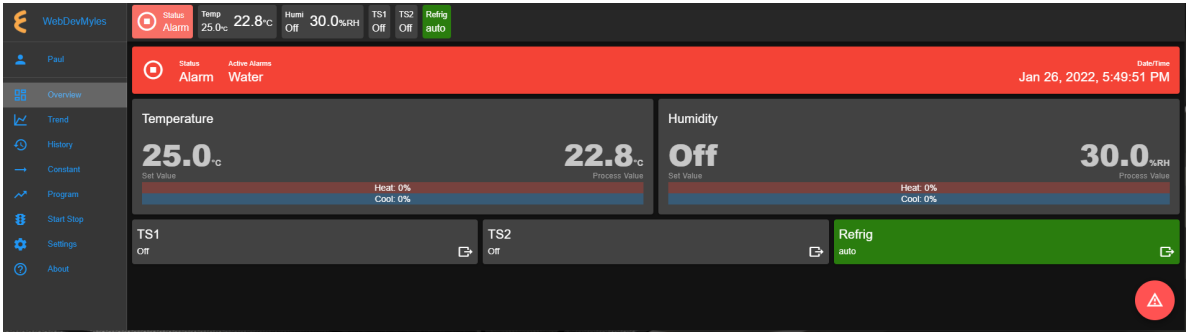


Figure 24.8: Alarm state in overview page

In an alarm state, operation is halted until all alarms triggered by chamber are resolved before EWC (and the chamber) can resume the normal operation. Once all alarms are cleared, EWC will also clear all alert messages and resume normal operation by switching the chamber to a **Standby** mode.

24.4 Temperature, Humidity or Time Signal Settings

On the **Overview** page, settings of temperature, humidity, time signals or refrigeration can be controlled via the dedicated tabs in the status bar or the dedicated panes in the main display area, as depicted in the following figure.

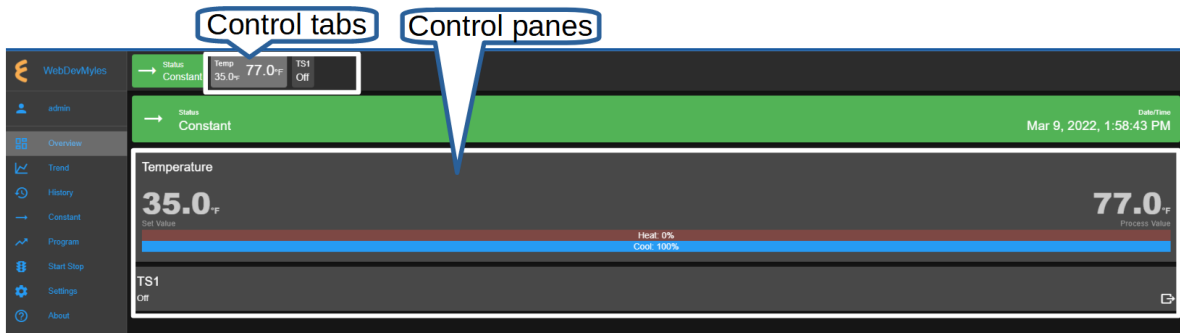


Figure 24.9: Parameter settings via control panes

24.4.1 Settings via the Status Bar

To set temperature with a new set value, complete the following steps:

1. Click the Temp tab in the status bar.
2. In the drop-down pane, click the box to **Enable** temperature, and enter new value in the Set Value field or apply the up/down arrow to adjust the value (shown in the figure).

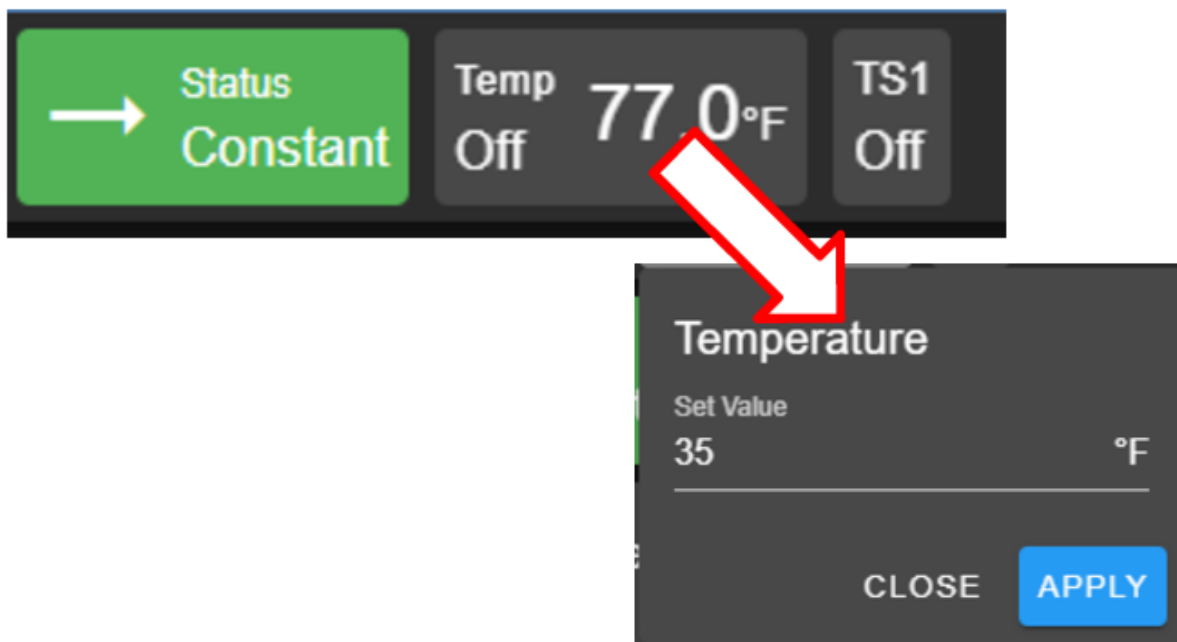


Figure 24.10: Setting new temperature value via the temp tab

3. Click **APPLY** to apply the new setting.
4. To cancel the setting, click the **CLOSE** button (or the Temp tab in the task bar).

To turn on time signal 1 (TS1), complete the following steps. Repeat the same procedure to turn on additional time signals.

1. Click the TS1 tab in the status bar.

2. Check the box to enable TS1 (shown in the figure).

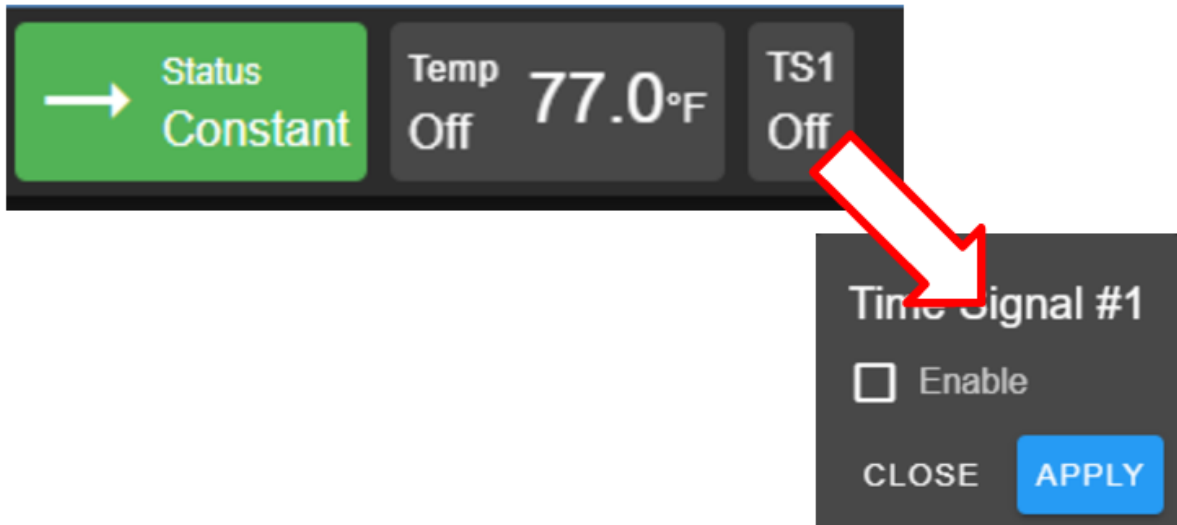


Figure 24.11: Enable or disable time signal setting

3. Click **APPLY**.
4. To cancel the setting, click **CLOSE** (instead of **APPLY**) or click the TS1 tab itself in the status bar.

To turn off TS1, apply the following steps:

1. Click the TS1 tab in the status bar.
2. Uncheck the box to disable TS1.
3. Click **APPLY**.
4. To cancel the setting, click **CLOSE** (instead of **APPLY**) or click the **TS1** tab itself in the status bar.

24.4.2 Settings via the Dedicated Panes

With EWC, there are multiple ways to complete the same task. The dedicated panes for different control parameters (such as, temperature, vibration or humidity, time signals, or refrigeration) in the main display area are actually clickable panes. These are CTA (call-to-action) panes through which new parameter settings can be applied.

To apply a new setting to temperature, complete the following steps:

1. Click the Temperature pane to access the input pane (shown in figure below).

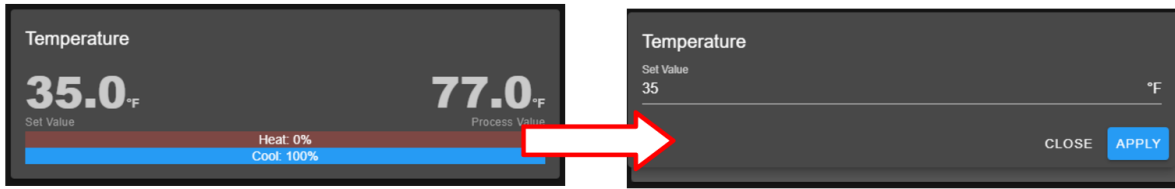


Figure 24.12: Setting new temperature value via the temperature (CTA) pane

2. In the input pane, click and enter new value in the Set Value field or apply the up/down arrow to adjust the value.
3. Click **APPLY**. To cancel the setting, click **CLOSE** (instead of **APPLY**).

The above procedure can also be applied to parameters.

CHAPTER 25

Trend

The **Trend** menu can be used by an operator to view a scatter plot of data points collected during the chamber operation. Data collection can occur in two distinct modes: **Always** and **When Chamber is on**. These two modes are selectable and configured under the **Data Logging Settings** submenu found under the **Settings** menu. Plot elements and detailed configuration of the trend graph will be discussed on **Data Logging Settings** page in the **Settings** menu.

By default, the trend graph provides a scatter plot of data points collected during the last hour. Various options of plot range of data points accumulated more than one hour can be selected. Data can be downloaded in whole or in portion to be stored on the local computer as CSV file.

25.1 Trend: Components

There are seven different groups that make up the main display of **Trend** and the scatter plot, as depicted in the following figure. The scatter plot shown in the figure is a result of the data points being collected with the chamber in program mode. Detailed descriptions of these groups based on the labels in the figure are outlined as follows:



Figure 25.1: Trend graph showing plots of current data from the chamber

1. **Trend Graph:** Data points collected from the chamber are rendered as a trend graph based on a scatter plot methodology. These data points—product temperature, air temperature, humidity, vibration, etc.—are plotted as a function of time. Temperature is displayed in degree Celsius, vibration in root-mean-square of acceleration (Grms or G), etc. The vertical y-axis represents the scale of these values. The horizontal x-axis represents the data logging runtime. Based on the default configuration, the chamber logs data points in a 10-second interval (refer to the **Data Logging Settings** submenu, under **Settings**). Depending on the type of chamber, data logging interval can be set to lower than 10 seconds. The grid scaling on both the y- and x-axes will change according to the application of the Pan/Zoom Controls buttons or the drag-and-select via the mouse and scroll wheel. Default setting can be restored by clicking the refresh button on the Web browser (not shown in the above figure).
2. **Trend Graph Manipulation Buttons:** Seven manipulation buttons are available to help manipulate and control the trend graph features and options. Detailed functionality and operation of these buttons are discussed in the following section.

3. **Snapshot of Data:** By hovering a mouse pointer on the trend graph area, a snapshot of the data at a particular time is displayed (shown in the figure). This feature allows a quick peek of the data at a certain point in time. Depending on the chamber's condition, the snapshot displays set values (SV) and process values (PV) of temperature, product or air temperature, or vibration, chamber operating mode or status, as well as program name and alarm. The contents in the snapshot are based on the selected options displayed in the legend set by the **Graph View** button of item 2 (above); and the color scheme selection under the **User Interface Settings** submenu (found under the **Settings** menu).
4. **Y-axis Label:** The y-axis displays the selected type of data points to be plotted, such as Temperature, Humidity, Vibration ,etc. These values are populated based on the selection of the **Graph View** under item 2 (above).
5. **Line Graph:** Different types or styles of graph—solid line, dashed line and color—are used to designate each type of data points in the plot to help for visualization and readability. As depicted in the figure, solid line represents process values, while dashed line represents set values with a distinctive color, as indicated in the legend (see item 7).
6. **Status:** Status of chamber operating mode is displayed along the time line on the trend graph, indicating when and how long the chamber was in specific operating mode. This feature provides a quick preview of the chamber operating status. The **Pan/Zoom button of Trend Graph Manipulation Buttons** (item 2) may be used to manipulate the display and shift the graph back into the past to view the chamber's operating mode.
7. **Legend of Trend Graph:** The legends are used to identify each item on the trend graph with color code, as well as line/dash graph, to designate the different type of data being plotted.

25.2 Trend Graph Manipulation Buttons

The following is a detailed list of the seven **Manipulation Buttons** of **Trend Graph**, item 2 in the previous figure.

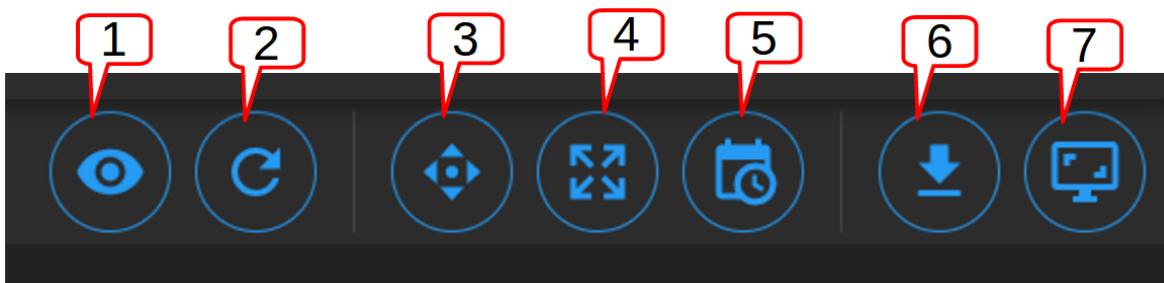


Figure 25.2: Trend Graph manipulation buttons

1. **Graph View:** Data visualization is very important. Elements or components of the trend graph are predefined by the configuration set in the **Data Logging Settings** submenu (found in the **Settings** menu). The **Customize** option depicted below allows the operator to select what to include in the trend graph to help simplify data visualization. Three different options represented by the arrows in the figure can be selected. The minimum and maximum Y range can be adjusted over the default values to help scale the graph for better

visualization; different data types can be enabled for display. The **Save** button (last arrow) can be applied to save the settings and render the graph.

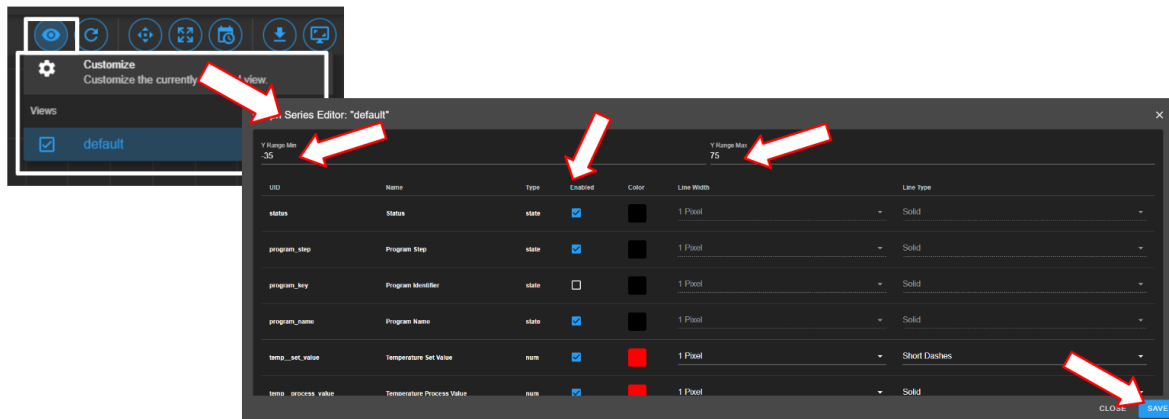


Figure 25.3: Tread graph view and custom settings

2. **Auto Refresh:** This Auto Refresh button reconstructs the graph to include data points up to the current time. Suppose a scroll wheel was applied to zoom out the trend graph that included future time which data points have not yet been sampled, as shown in the figure below.



Figure 25.4: Off-scaled trend graph including future time (no data points)

The auto refresh button will rescale the graph to eliminate the gap (future time) on the right to expand and display the trend graph up to the current time.



Figure 25.5: Trend graph rescaled with current time

3. **Pan/Zoom Controls:** The Pan/Zoom Controls button allows the operator to control and adjust the viewable section in the trend graph. This button presents six operation buttons to manipulate and display the trend graph as follows:

- **Zoom In:** The **Zoom In** button allows the operator to zoom into a small section of the trend graph. Depending on the degree of zooming, the display area will be confined to a small set of data points ranging between minutes to hours. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Zoom Out:** The **Zoom Out** button does the opposite by allowing the operator to zoom out on the trend graph, thereby giving the operator an expansive view of the trend graph. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Move Up:** This button allows the operator to move up the graph along the vertical axis to adjust the viewable area of the scatter plot. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Move Down:** This button allows the operator to move down the trend graph along the vertical axis with the purpose to adjust the viewable area of the scatter plot. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Move Left:** This button allows the operator to pan left on the trend graph, offering a quick preview of a plot of data points tracing back the time in hours or days. With this feature, the operator can quickly gain a preview of past data points which the operator may have missed.
- **Move Right:** This button does the opposite to **Move Left** by allowing the operator to pan right on the trend graph to the current time. To reconstruct the trend graph to contain the most recent data points, the **Auto Refresh** button allows the quickest operation.

4. **Zoom Extents:** With this button, trend graph may be provided using data points from within the last one hour, last two hours or the last six hours. To make adjustment of the trend graph based on these three selections, click on the **Zoom Extents** button, then click one of the selection from the drop-down menu.
5. **Plot Range Selectors:** Data points can be selected from start date/time to end date/time to produce a desired trend graph. Arbitrary date and time can be selected for the plot range, as depicted in the following figure.

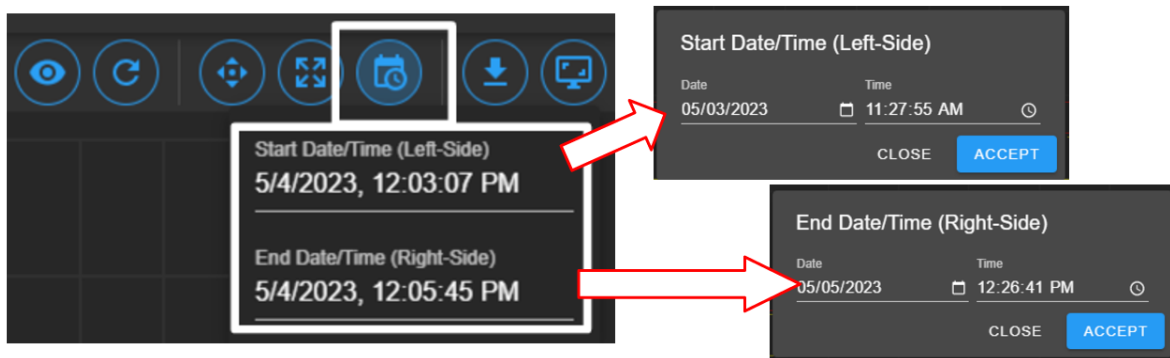


Figure 25.6: Plot range for start date/time and end date/time

To set the plot range,

- access the **Plotted Range Selectors** button.
 - access the **Start Date/Time**; edit date (m/d/y) and time (H:M:S) fields or apply the calendar and clock icons to select date/time.
 - apply **ACCEPT**
 - access the **End Date/Time**; edit date (m/d/y) and time (H:M:S) fields or apply the calendar and clock icons to select date/time.
 - apply **ACCEPT**. Note: Values of end date must be later (or greater) than start date.
6. **Download Data:** To download data and store it on the local computer, click the **Download Data** button and select **Download Current View** to download a portion of data from the displayed trend graph. To download the entire collection of data, select **Download All Data**. Data file will be stored in the Downloads folder of the local computer with filename: hostname_data_date.CSV.
 7. **Capture Screenshot/Download:** Trend graph can be captured, downloaded and stored on the local computer in PNG file, as shown in the figure.

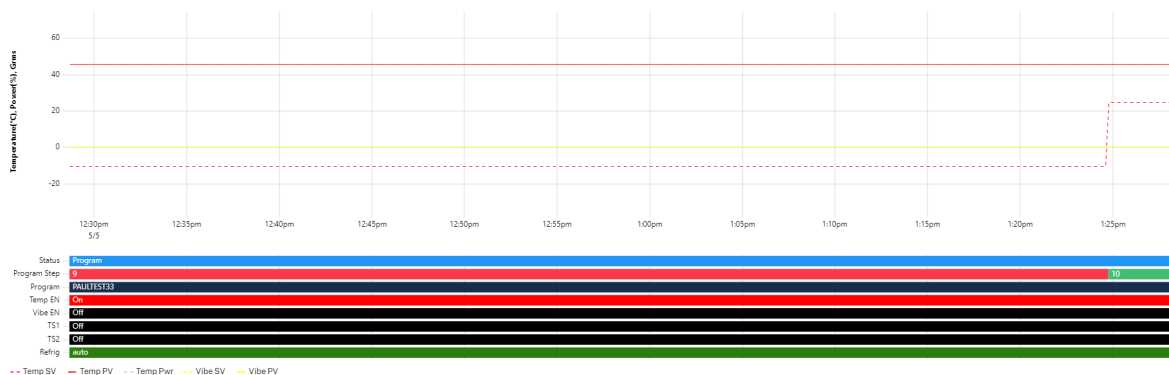


Figure 25.7: Screenshot of trend graph

25.3 How to Handle Downloaded Data File

Data points collected from the chamber are stored in CSV format. The recorded time of the data points is stored based on a UTC (or Universal Time Coordinated, previously referred to as the GMT) instead of the local time. To preserve the integrity of the CSV file and its UTC time stamp, do not rename the data file with MS Excel extension or attempt to open it directly with MS Excel. Any attempt to force open it in MS Excel will result in the wrong time conversion as shown in the following figures.

The following figure displays the CSV file which was directly opened with MS Excel. The time stamp in the first column is wrong; it is still based on UTC time stamp indicated by the arrows.

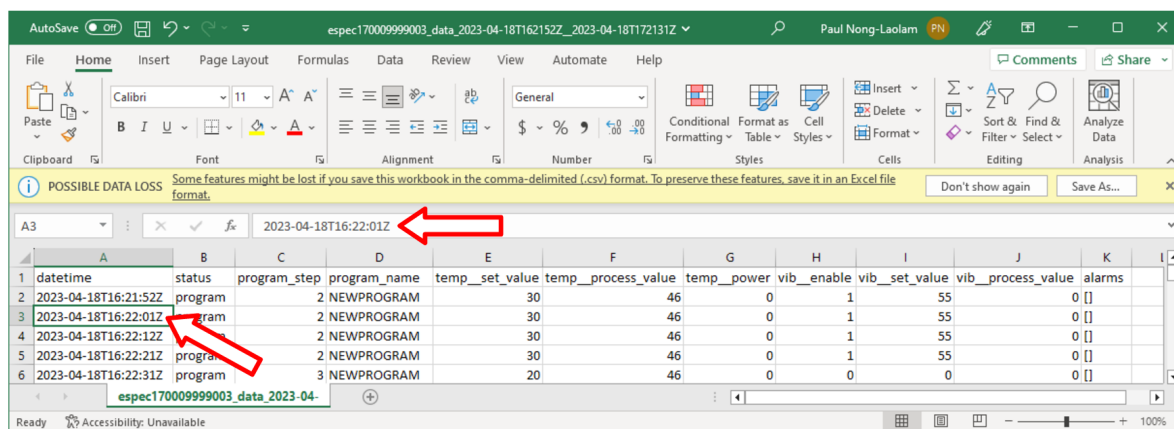


Figure 25.8: Data file improperly open in MS Excel

The following figure displays the same CSV file which was properly imported into MS Excel with the correct time stamp conversion for local time indicated by the arrows.

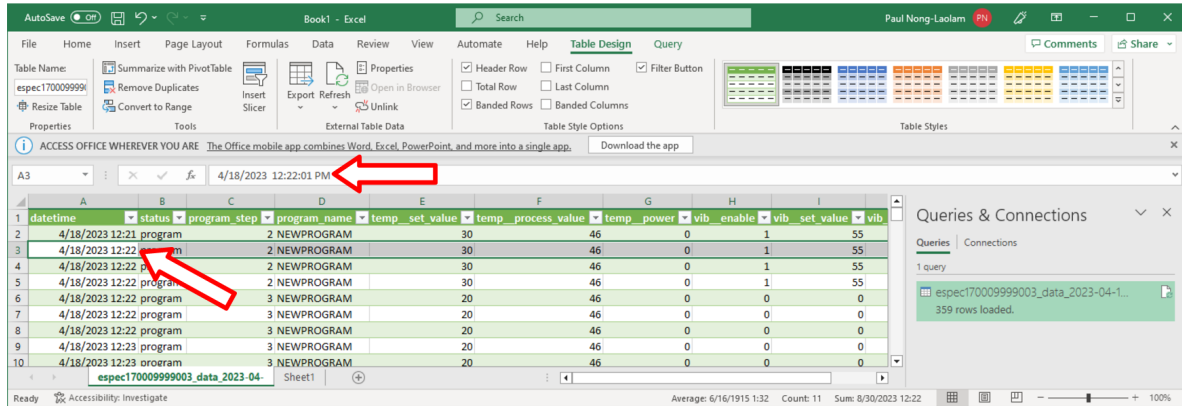


Figure 25.9: Data file properly imported into MS Excel

The proper way to handle this CSV file is to import it using the following procedure to render the correct conversion of the UTC time to the local time on all data points.

Complete the following steps:

1. Select **Trend** in the main menu bar
2. Click the **Download** button (item 6 in the previous section) to download the data (current view or entire data) in CSV file
3. Launch MS Excel and start a new blank spreadsheet
4. Click the **Data** ribbon
5. Click **From Text/CSV** (that appears under the **Home** ribbon)
6. In the **Import Data** Window explorer, open the **Downloads** folder and select the downloaded CSV file (in step 2) and click the **Import** button (in the bottom).
7. Click the **Load** button to load data into the current spreadsheet.
8. To save the current spreadsheet as Excel Workbook, click **Save As** and follow the standard steps to complete the process.

CHAPTER 26

History

The **History** page displays operation history of the chamber, its operating modes and statistics. Any alarms or alerts that were triggered during the chamber's operation are logged and displayed here. By default, history log of the chamber's operating modes, alarms or statistics from the previous week will be displayed, as depicted in the following figure. There are five important components in the **History** main display area. They are labeled and described as follows:

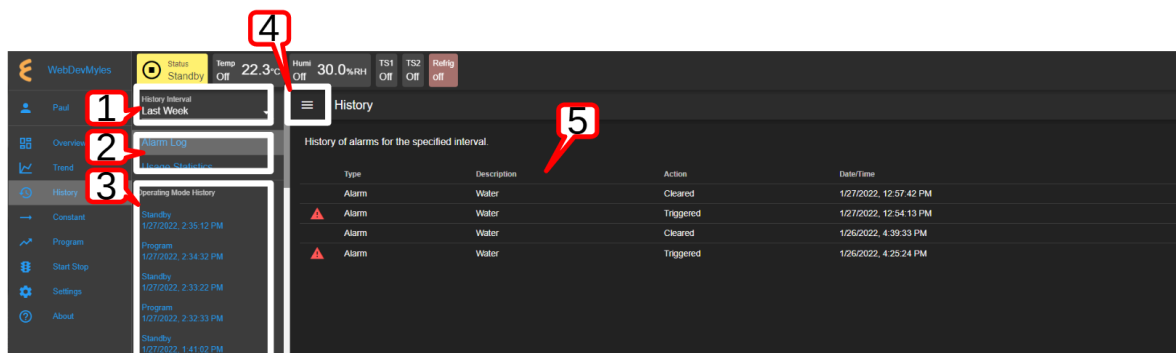


Figure 26.1: Operation history of the chamber

1. **History Interval:** Display options of the operating history are: one week, two weeks, one month, three months, six months, one year or the entire period of the chamber's operation. To access the history interval, click the radio button to select the period from the list.

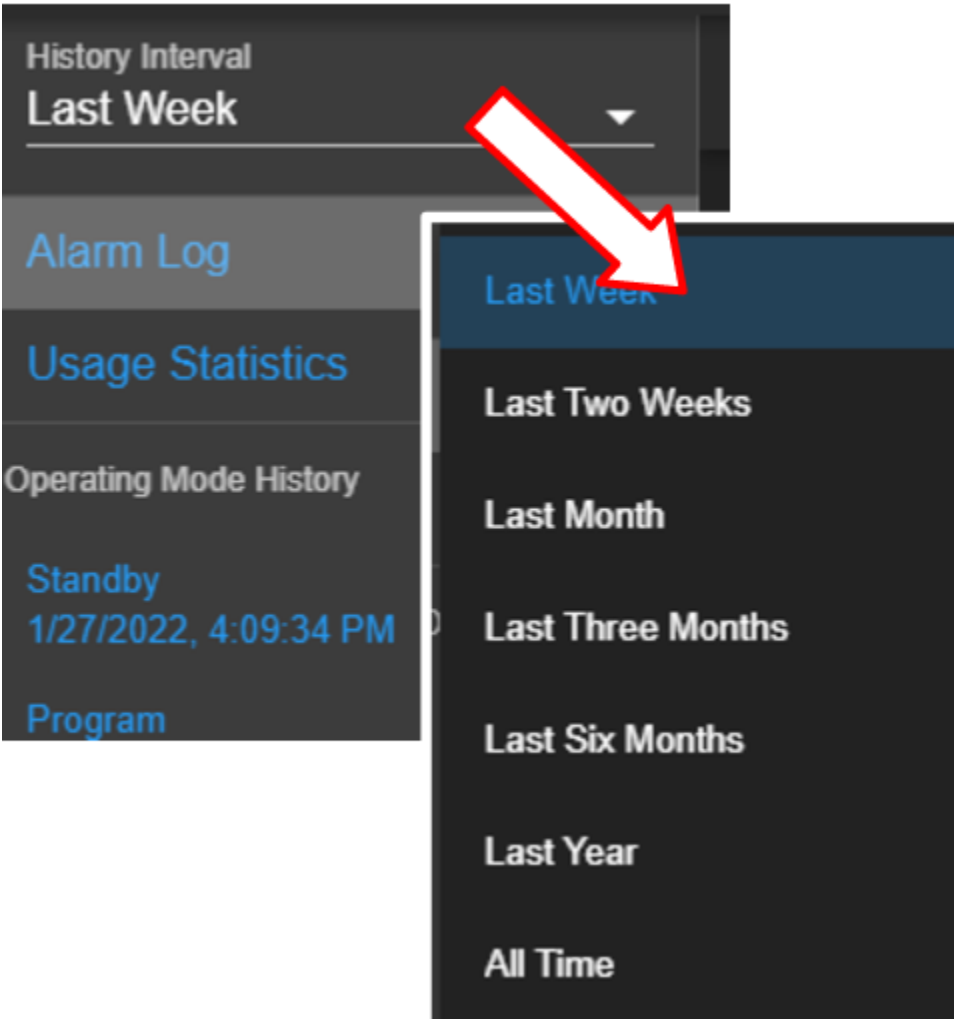


Figure 26.2: History interval and display selection

2. Alarm or Statistics Submenus:

- **Alarm Log:** By default, alarm logs will be displayed in the main display area. The logs indicate which alarm had occurred and when they were resolved (cleared). Most recent events are listed at the top. To view detail of each log, click on its name (with its log date and time).

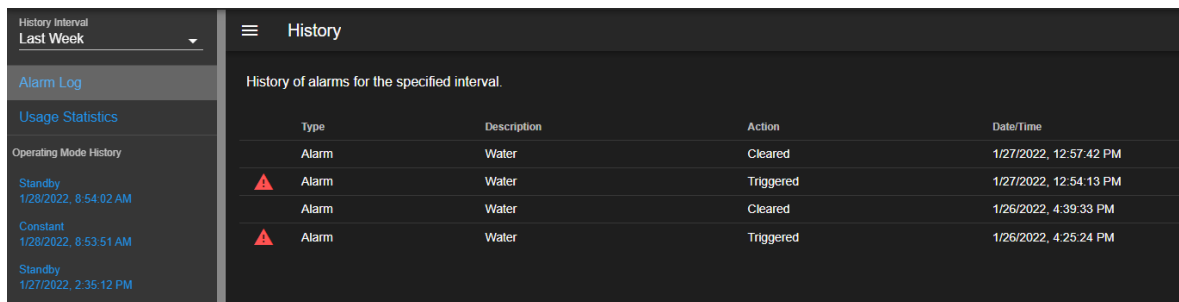


Figure 26.3: History of alarm

- **Usage Statistics:** To display the operation statistics, click on this submenu. Percentage of each operation mode based on the selection period in the **History Interval** is displayed as shown in the following figure:

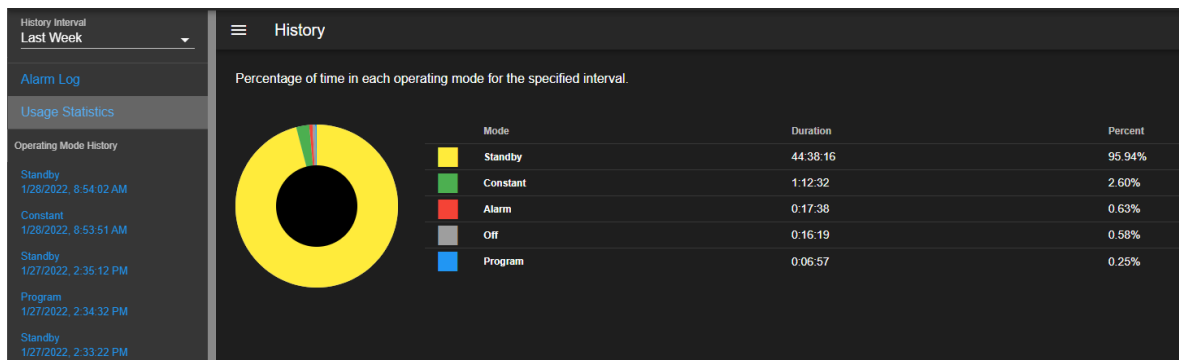


Figure 26.4: History of operation statistics

Such information provides the operator a good idea of the overall performance of the chamber by identifying when and how much time it was in a certain operating mode.

3. **Operating Mode History:** A list of operating modes of the chamber is displayed here based on the option selected under the **History Interval**. Default listing is based on a one-week interval. A trend graph, identical to that produced in the **Trend** menu, based on the data points collected during the operating mode can be produced by clicking on the particular operating mode on this list, as illustrated in the following figure.



Figure 26.5: Trend graph of operating mode history

4. **Show/Hide Submenu:** To provide a larger real estate for the main display area, this Show/Hide button can be used to show or hide the **History** submenu. The following figure shows how the submenu is hidden and the main display area is expanded.

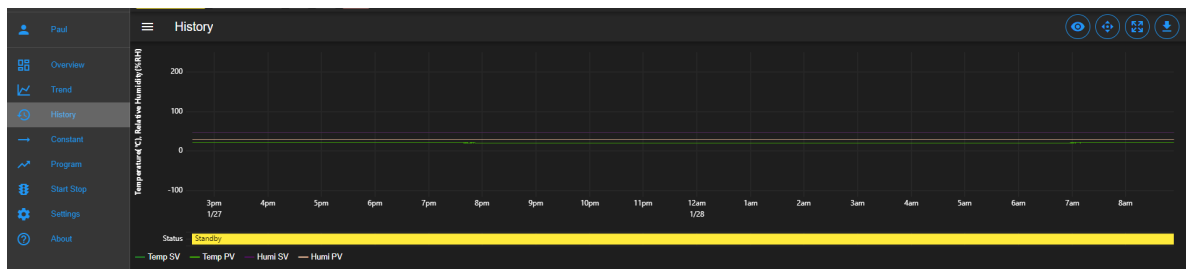


Figure 26.6: The show/hide button of the main display of the History page

5. **Main Display:** The content of the submenu page of **Alarm Log** and **Usage Statistics** is displayed here (refer to item 2, above).

CHAPTER 27

Constant

The existence of the EWC **Constant** page is such that all features and their parameters are collected and displayed in one place to control their constant mode settings. The main display of **Constant** consists of three separate CTA panes, displayed as **Temperature**, **Humidity** (or **Vibration**) and **Outputs**, as depicted in the following figure. These CTA panes provide input options to adjust the settings directly. The Humidity Range Chart is a two-dimensional graph of the current temperature-humidity relationship, displayed below these CTA panes.

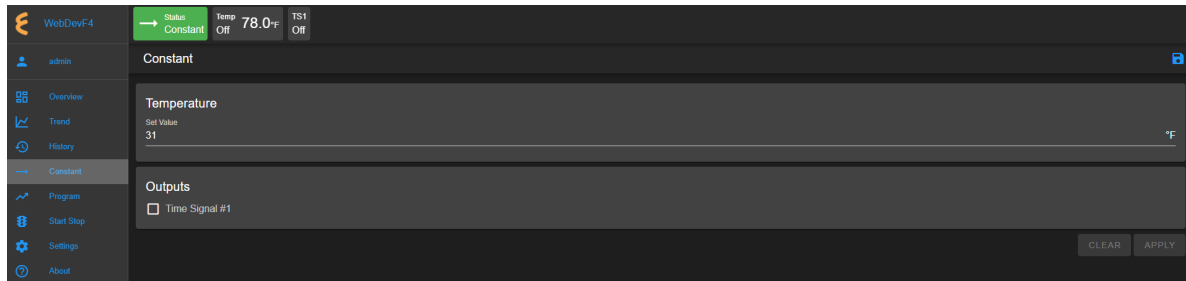


Figure 27.1: The Constant menu and its components

The following sections describe how to configure and control each of these parameters.

27.1 Product or Air Temperature Setting

Complete the following steps to turn on or modify temperature setting:

1. Enable air temperature or product temperature by checking the appropriate boxes.
2. Click the Set Value field and enter a new value, or apply the up/down arrow to adjust the value.
3. Adjust the plus/minus deviation in the appropriate fields.

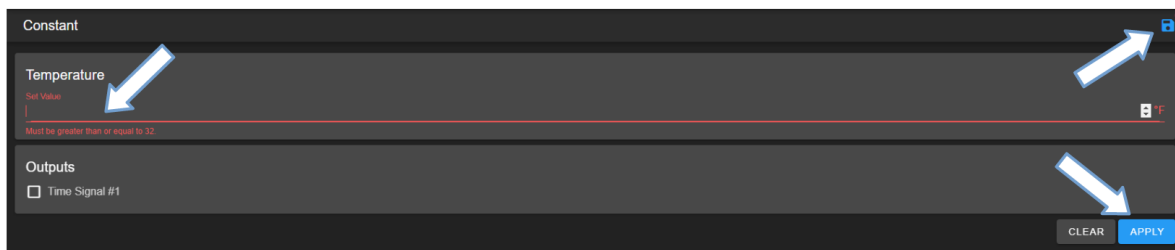


Figure 27.2: Apply new constant setting on temperature

4. Click the **APPLY** button or the **Save** icon (indicated by the arrows) to apply and save the setting. The red dot next to the **Save** icon indicates that the new setting has not been saved. If you exit this pane by accessing a different menu in the menu bar, a warning message will appear (shown in figure).

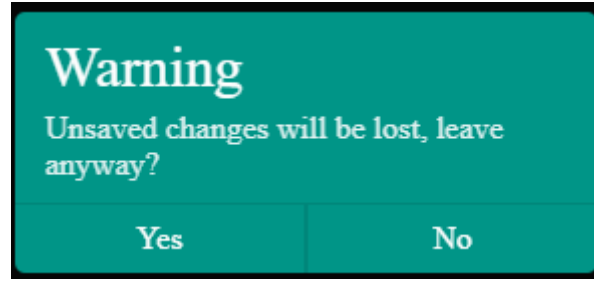


Figure 27.3: New setting must be save before exiting the pane

5. To cancel the setting, click **CLEAR**.

The new setting takes effect immediately with its new status displayed in the status bar. To reverse or cancel the setting, repeat the above steps to reset the set value and click **APPLY**.

27.2 Time Signals Setting

Complete the following procedure to turn on output for any time signal:

1. To turn on output for **Time Signal # 1**, place a check mark in its box.
2. Repeat the above step for any time signal available in the main display area.
3. Click the **APPLY** button or the save icon as indicated by the arrows in the above figure to apply and save the setting.
4. To cancel the setting, click **CLEAR**. If you exit this pane by accessing a different menu in the menu bar, a warning will appear which requires you to save the setting before attempting to access any other menus.

The new setting takes effect immediately with its new status displayed in the status bar. To reverse or cancel the setting, repeat the above steps to uncheck the box and click **APPLY**.

It is important to note that all the parameters (temperature, humidity, vibration, time signal) in the main display can be adjusted altogether simultaneously with a single **APPLY** or save button. However, individual setting may provide security to avoid any adverse effect.

CHAPTER 28

Program

The **Program** menu allows the operator to create a program to control the chamber. All the programming features available on the supported PLC's listed in Chapter 1 (“**Introduction**”) can be composed into programs to control the chamber. The operator can: (1) open and view a program; (2) preview the output of the program; (3) edit and/or overwrite an existing program ; (4) delete program from the list; (5) rename program on the list; (6) download a program and store it on the local computer in JSON file; (7) upload a program from the local computer to EWC, and much more.

Here are some of the benefits of the **Program** menu:

- Easy to operate.
- Quick management of programs, programming or editing.
- Require less time to develop a new program or modify an existing program.
- Program Editor offers flexibility with multitasking capabilities.
- Control program operation and program end mode.
- Preview program operation before execution; operator can see exactly what the program does prior to its execution.
- Download program from EWC to the local computer for backup.
- Upload program from the local computer to EWC.

Only authorized users with read-write privilege can access and utilize the **Program** menu. The user must log into their account to access the **Program** menu based on their read-write privilege, as depicted in the following figure.

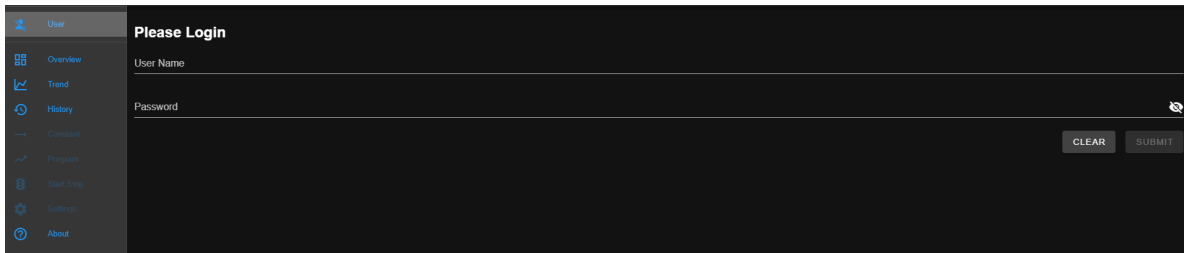


Figure 28.1: User with read-write privilege is required to operate the Program menu

28.1 List Programs

The following figure depicts a typical layout of the **Program** page with its submenu hidden. This is the default display of program list when the **Program** menu is accessed for the first time. Its UI components are numbered and explained as follows:

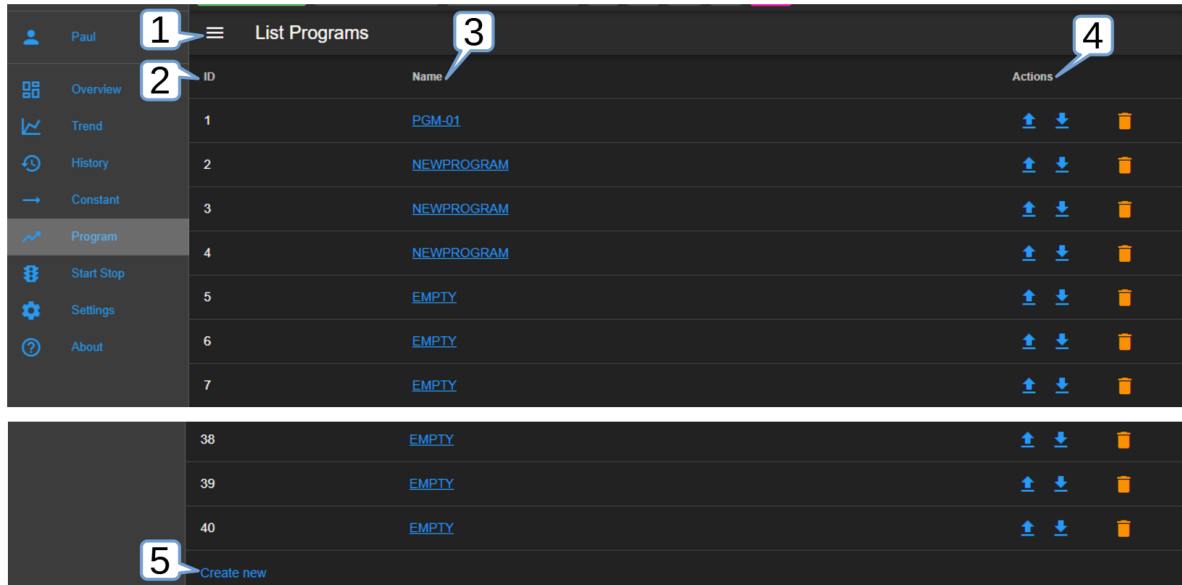


Figure 28.2: Program listing page with submenu hidden

1. **Submenu Show/Hide:** This button toggles between the “show and hide submenu” to allow the program editor utilize the entire main display area (see above figure).
2. **ID:** EWC identifies each program by its slot number stored in the PLC register. This list reflects the actual list of programs read from the PLC register. A total of 40 program slots are available, numbered from 1 to 40. Only slots 1 through 20 can be used to store profiles. The system uses a program identification code (ID) to identify each program.
3. **Program Name:** All available programs are listed under the **Name** column by program name. These programs are stored by their slot number. As such, identical program names may exist in different slots. Any slot not yet occupied by the program is marked **EMPTY**. Users can access each program under this list by clicking on the program name. The program editor then opens and displays the program instructions. Detailed operation of the program editor is discussed in the next section.
4. **Actions:** Three action buttons (Upload Program, Download Program, Delete) are available for managing the program:
 - **Upload:** Program can be uploaded from the local computer to EWC which will then be stored in the PLC register using the slot number where the action was applied.
 - **Download:** Program can be downloaded and saved on the local computer.
 - **Delete:** A program to the left of the trash bin (where this action is applied) will be deleted. The PLC register will no longer contain this program.
5. **Create New:** This button opens the program editor for creating a new program. The **Create New** button is conveniently placed in two locations: (1) under the **ID** list and (2) in the **Program** submenu (shown in the following figure).

The following figure displays the **Program** page with its submenu unhidden. The submenu (item 2) has two operation buttons: (i) List Programs and (ii) Create New (program).

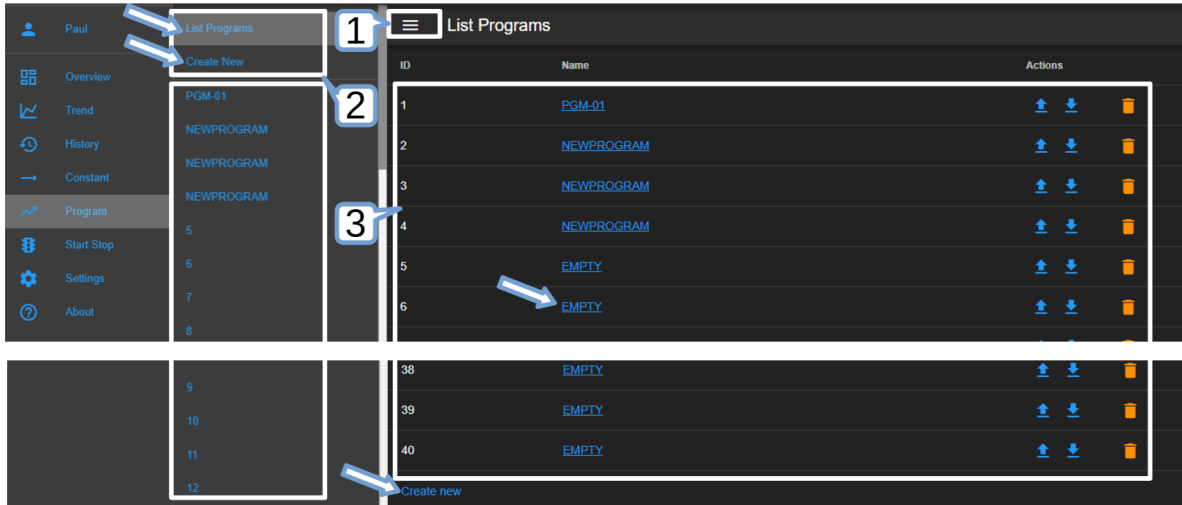


Figure 28.3: Program listing page with submenu unhidden

1. **Show/Hide:** The **Show/Hide** button can be used to hide or unhide the **Program** submenu (item 2 below).
2. **Submenu:** This submenu has two operation buttons (indicated by the arrows): **List Programs** and **Create New** (program). All the available programs in the chamber stored in EWC are listed below these operation buttons (shown in above figure). With the submenu hidden, the main display has a larger real estate to display the program elements.
 - **List Programs:** The **List Programs** button offers a quick way to exit the program editor (explained in the following section). To exit the program editor mode, click this **List Programs** button. This action will cancel and exit the program editor being used to create, edit or import a program.
 - **Create New:** Similar to the **Create New** button under the **List Programs** display page (item 3 below), this button opens the program editor with an empty template for constructing a new program. Detailed discussion is provided in the following section. A program from the local computer can also be imported into this empty template.
3. **List Programs:** This is the main display of the program list depicted in the previous figure. Click the **Show/Hide** button (item 1) to hide the submenu and expand the **List Programs** display page.

28.2 Create New Program

A new program can be created via one of the following buttons as depicted in the following figure.

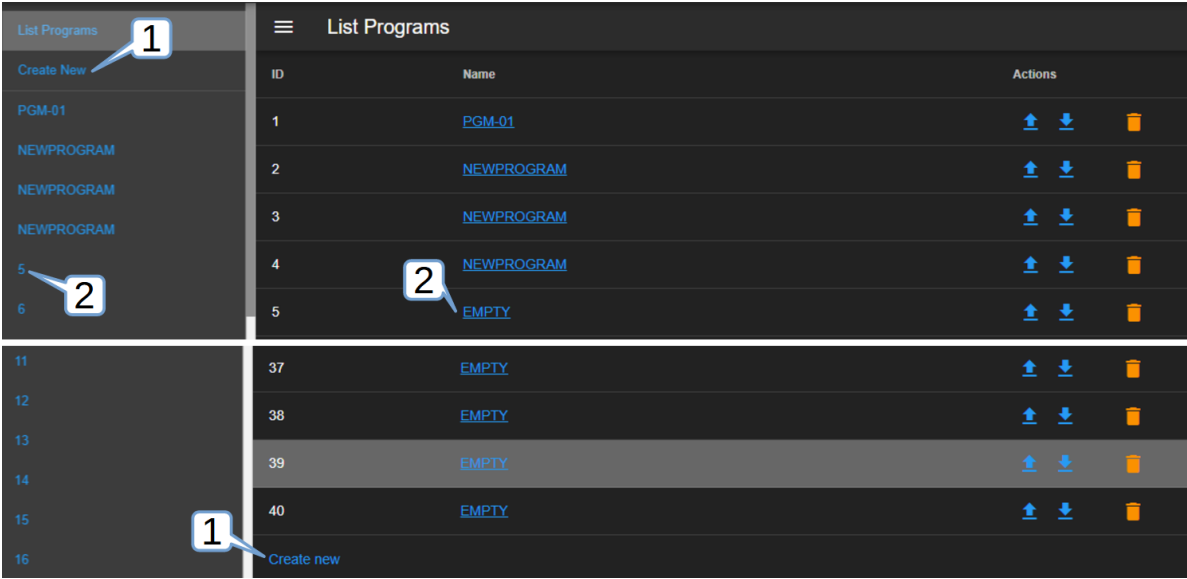


Figure 28.4: Different methods to creating a new program

Each of these buttons follows a different pattern to complete the task.

1. **Create New:** Click the **Create New** button in the submenu or under the **List Programs** in the main display to launch the program editor. An empty template is opened for a new program, as depicted in the following figure.

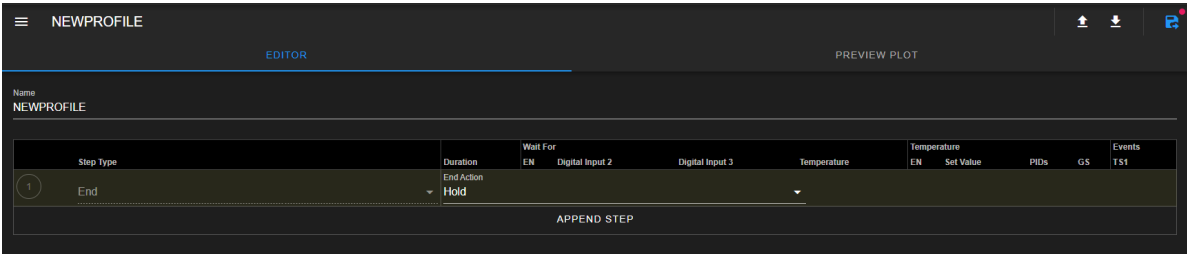


Figure 28.5: Empty template for a new program

The new program being constructed does not yet have a predefined location (i.e., slot number). The program editor therefore has only the **Save As** option to save the program in a specific or a desired slot number, as depicted in the following figure.

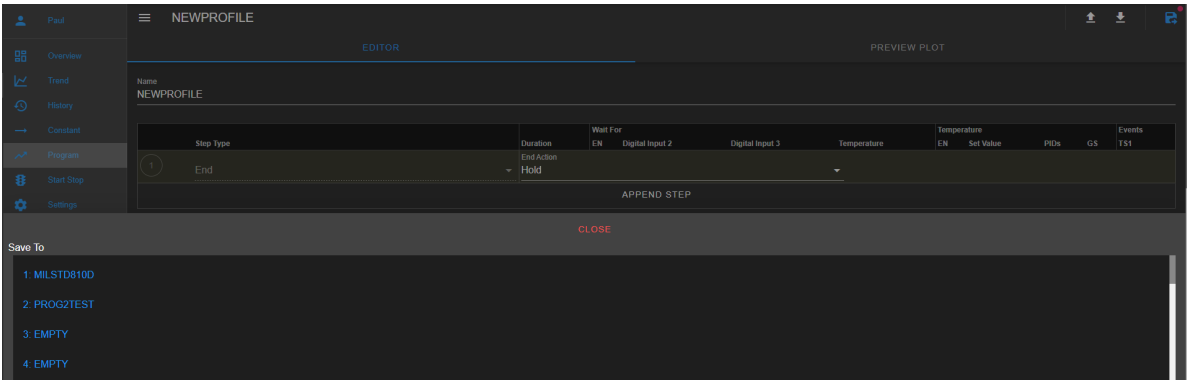


Figure 28.6: Selecting slot # to save new program

However, no matter what slot being chosen, Watlow F4 will dictate the location and it will store the program in the next vacant slot. Once saved, the new program will appear in the program list, occupying the next empty slot.

- 2. **EMPTY**: A new program can be created via the **EMPTY** button under the program list (in the submenu) or the name list in the main display. An empty template is opened for a new program, as depicted in the following figure.

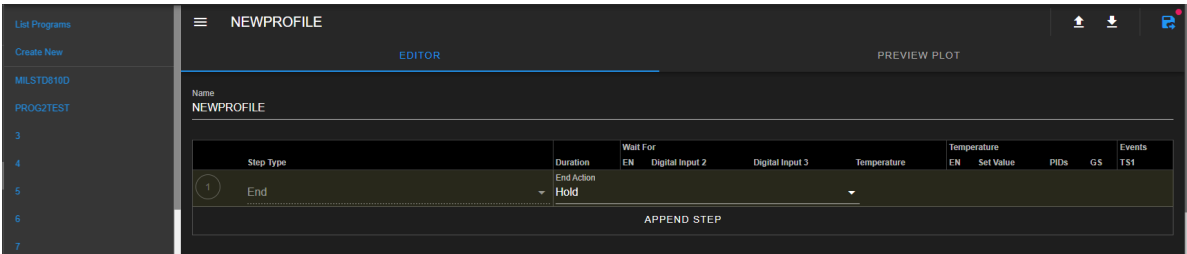


Figure 28.7: Empty template for a new program

The program editor has both **Save As** and **Save** buttons to manage the program file. However, again, Watlow F4 dictates the location of the program; no matter what slot number is chosen to store the program, F4 always stores the program in the next empty slot via the **Save As** or **Save** buttons.

The following figure depicts the general layout of the empty template for a new program. The first step has been added to illustrate its components.

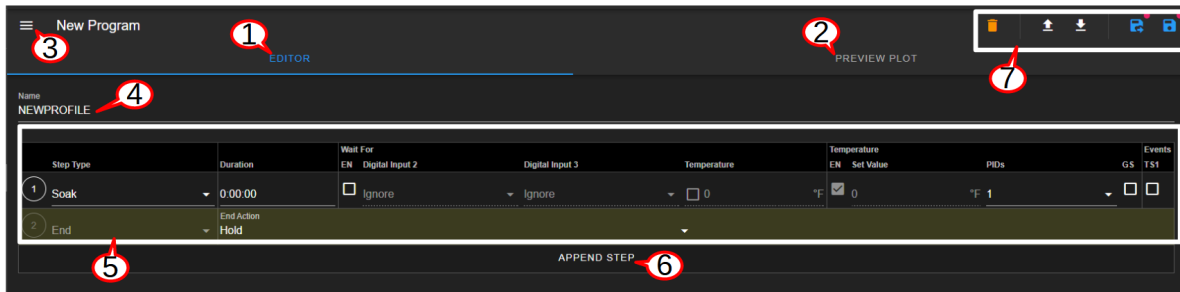


Figure 28.8: Program listing page with submenu unhidden

The UI and components of the program editor (pictured above) are numbered and described as follows:

1. **Editor:** By default, a program is open and placed in the program editor. It is highlighted in blue to indicate its active status.
2. **Preview Plot:** The output of the current program can be previewed via this button. Both the **Editor** (item 1 above) and this button can be used to toggle between the editing and previewing mode of the current program. The **PREVIEW PLOT** button is operational only when a program is loaded into the program editor or a program has been constructed in the program editor.
3. **Submenu Show/Hide:** This button toggles between the show and hide mode of the submenu. To utilize the entire main display area for the program editor, this button can be used to hide the submenu.
4. **Program Name:** An alphanumeric naming convention based on ASCII with lower- or upper-case letters applies to program name with up to 10 characters. EWC will flag a warning if more than 10 characters were entered. Program name should be kept short and descriptive. Since each program is individually stored in a unique slot in the PLC, a unique name on EWC is not necessary. However, these programs must have unique names when they are stored on the local computer. When a program name is entered into this field, this name also appears in the title bar next to the show/hide button (item 3).
5. **Program Step:** A program step contains instructions for the chamber to carry out the tasks. Depending on the type of chamber, a program step contains various components and parameters that make up an instruction within each step.
 - **Step Type:** Six available step types (Autostart, Ramp Time, Ramp Rate, Soak, Jump and End) can be used to construct an instruction. They are outlined as follows:
 - **Autostart Step:** A program featuring this step type can automatically start the execution based on day of the week or date and time.
 - **Ramp Time:** With Ramp Time, changes of the set point to a new value is down based on a chosen period of time.
 - **Ramp Rate:** With Ramp Rate, changes of the set point to a new value is down based on a chosen rate of time.
 - **Soak:** This feature maintains the set point from the previous step for a chosen time in hours, minutes and seconds.
 - **Go to Step:** This feature allows the program to jump (or **Go to**) to a certain

step within the program to repeat its execution. Watlow F4 refers to it as **Jump**.

- **End:** A program must have an end step to end and define its end action. Four different end actions are available for operation: (1) Hold, (2) Control Off, (3) All Off, and (4) Idle.
 - **Duration:** The duration specifies the length of time (measured in H:MM:SS) that the said step goes through to complete its task. EWC accepts the input value in H:MM:SS or in pure numerical value. If a pure numerical value is entered, EWC converts it to H:MM:SS. For instance, if 15 is entered, the system treats it as 15 seconds, and the H:MM:SS format therefore becomes 0:00:15. If 66 is entered, the system converts it to 0:01:06. Similarly, if 90 is entered, the system renders that value to 0:1:30.
 - **Wait For:** This is an optional feature in a program; but, when enabled, step types such as Ramp Time, Ramp Rate and Soak can be programmed to wait for a particular chamber temperature or event input condition to satisfy before this particular step begins its execution.
 - **Digital Inputs:** Options for Digital Inputs are: Ignore, On, Off.
 - **Temperature:** The desired temperature value set as a condition.
 - **Temperature:** The temperature control loop has three parameters:
 - **Set Value:** The value that the temperature must attain.
 - **PIDs:** There are five different PID numbers, though PID 1 is normally used.
 - **GS:** The Guaranteed Soak (GS) option can be enabled or disabled.
 - **Events:** Each time signal can be switched to **ON** or **OFF** for this step. Time signal (TS) operation is step dependent. Suppose TS1 is turned **ON** at step 1 and the rest of the steps do not have TS enabled. In this case, TS1 will remain “ON” for the entire program. Thus, TS may be controlled independently, step by step.
6. **Append Step:** When a program is first created via the **Create New** or **EMPTY** buttons, the program editor begins with an empty template, with no instructions or steps. To create an instruction, a new step must be created. This APPEND STEP button is used to add a new step. Once a program has a step, additional steps can be added using this button or the drop-down menu of the Step Number (to be explained below). The APPEND STEP button always adds a new step as the last step in the program. By contrast, the drop-down menu of the Step Number allows a new step to be inserted above or below the current step. It also has a delete button to remove any step from the program.
7. **File Manipulation:** Five different buttons (icons) are available for file manipulation. Their action can be previewed by hovering the mouse pointer over them. They are described from left to right as follows.
- **Delete:** Click on the trash bin icon to delete the current program. This action will delete the program in the program editor and the PLC. A pop-up warning (shown in the figure) appears to reaffirm the action.

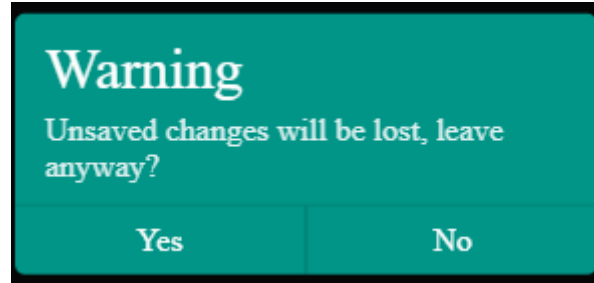


Figure 28.9: File deletion confirmation

- **Open Program:** This button imports a program file from the local computer into the program editor. EWC only accepts a program in JSON format. To ensure compatibility, the program structure should be based on the one downloaded from EWC itself (see **Download Program** below). The program is not yet saved until the **Save As** or **Save** button is applied.
- **Download Program:** This button downloads the current program file and stores it on the local computer. The program is saved in JSON format; filename is based on the hostname and slot number (e.g., hostnmae_program_9.json).
- **Save As:** This buttons stores the current program in the PLC. The action brings up a program list, as depicted in the following figure, to select a new slot to hold the current program. However, F4 will ignore the selected slot number save the program using the next empty slot available on its register regardless of what slot number has been chosen. To cancel this action, click the **CLOSE** button. **WARNING!:** A vacant slot should be selected to save the program. Otherwise, the current program will overwrite the existing one in the slot without prompting for reaffirmation, thus, destroying the program previously in that slot. The current program in a new slot still uses the same program name. To make it unique, edit item 4 (above) with a new name and apply the **Save** button (see below) to resave the program.

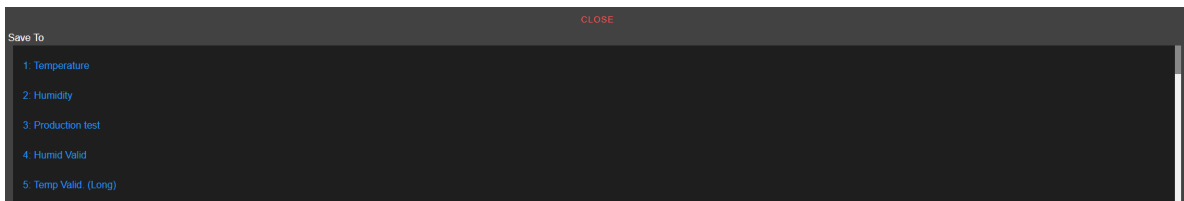


Figure 28.10: Save program to a new slot

- **Save:** This button saves the current program in the next available slot number on the F4.

28.2.1 Programming: Add Program Step

The following example illustrates how to create a new program using step types Ramp Time, Soak and Jump in the program. This example does not have any real practical implication, but it shows how the program editor provides an easy approach to constructing a program.

1. Click **Program** in the side bar.
2. Click **EMPTY** on slot 2 on the Program List. To follow along with this example, slot 2 should be empty.
3. **Program Name:** Enter **PROG2TEST** in the program name field.
4. **Add New Step:** Click the **APPEND STEP** button to add the first step.
5. **Step 1:** Complete the following fields:
 - **Step Type:** Click the down arrow and select Ramp Time from the list.
 - **Duration:** Enter 0:00:15.
 - **Wait For:** Leave this option disabled with EN box unchecked. Digital input and Temperature under this block should be grayed out.
 - **Temperature:** Confirm that EN is enabled.
 - **Set Value:** Enter 88 or apply the up/down arrow to adjust the value to 88.
 - **PIDs:** Select 1 for PIDs.
 - **GS:** Leave the box unchecked.
 - **Events:** Leave TS1 box unchecked.

The screenshot shows the 'PROG2TEST' program configuration. It features a table with columns for Step Type, Duration, Wait For (EN, Digital Input 2, Digital Input 3), Temperature (EN, Set Value, PIDs), GS, and Events (TS1). Step 1 is configured as 'Ramp Time' with a duration of '0:00:15'. The 'Wait For' section is disabled. The 'Temperature' section has 'EN' checked, 'Set Value' at 88, and 'PIDs' set to 1. The 'GS' box is unchecked. The 'Events' section has 'TS1' unchecked. Step 2 is 'End' with 'Hold' as the end action. An 'APPEND STEP' button is at the bottom.

Step Type	Duration	Wait For EN	Digital Input 2	Digital Input 3	Temperature EN	Set Value	PIDs	GS	Events TS1
1 Ramp Time	0:00:15	<input type="checkbox"/>	Ignore	Ignore	<input type="checkbox"/>	88	F 1	<input type="checkbox"/>	<input type="checkbox"/>
2 End	End Action: Hold								

Figure 28.11: Step 1 in program

6. **Step 2:** Click number 1 in the circle at the beginning of step 1 (shown in the figure below). Select **Insert After** from the drop-down menu and edit the fields with the following parameters:

The screenshot shows the 'PROG2TEST' program configuration. A red arrow points to the number 1 in the circle at the beginning of Step 1. A context menu is open, showing options: 'Insert Before', 'Insert After', and 'Delete'. The table configuration is the same as in Figure 28.11.

Figure 28.12: Inserting a program step

- **Step Type:** Click the down arrow to select Soak from the list. The rest of the parameters will be set as default.

Name PROG2TEST									
Step Type	Duration	Wait For EN	Digital Input 2	Digital Input 3	Temperature EN	Set Value	PIDs	GS	Events TS1
1 Ramp Time	0:00:15	<input type="checkbox"/> Ignore	Ignore	<input type="checkbox"/> 0	<input checked="" type="checkbox"/> 88	"F 1	<input type="checkbox"/>	<input type="checkbox"/>	
2 Soak	0:00:00	<input type="checkbox"/> Ignore	Ignore	<input type="checkbox"/> 0	<input checked="" type="checkbox"/> 88	"F 1	<input type="checkbox"/>	<input type="checkbox"/>	
3 End	End Action Hold								
APPEND STEP									

Figure 28.13: Step 1 in program

7. **Step 3:** Apply the **Insert After** button again to add Step 3 below Step 2, using Ramp Time as step type with duration of 1 minute (0:01:00), Wait For feature is disabled, with Temperature set at 93 and TS1 turned on.
8. **Step 4:** Apply the same procedure as step 3, but with Temperature set value at 95. Both steps 3 and 4 as illustrated below.

Name PROG2TEST									
Step Type	Duration	Wait For EN	Digital Input 2	Digital Input 3	Temperature EN	Set Value	PIDs	GS	Events TS1
1 Ramp Time	0:01:00	<input type="checkbox"/> Ignore	Ignore	<input type="checkbox"/> 0	<input checked="" type="checkbox"/> 88	"F 1	<input type="checkbox"/>	<input type="checkbox"/>	
2 Soak	0:01:00	<input type="checkbox"/> Ignore	Ignore	<input type="checkbox"/> 0	<input checked="" type="checkbox"/> 88	"F 1	<input type="checkbox"/>	<input type="checkbox"/>	
3 Ramp Time	0:01:00	<input type="checkbox"/> Ignore	Ignore	<input type="checkbox"/> 0	<input checked="" type="checkbox"/> 93	"F 1	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4 Ramp Time	0:01:00	<input type="checkbox"/> Ignore	Ignore	<input type="checkbox"/> 0	<input checked="" type="checkbox"/> 95	"F 1	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5 End	End Action Hold								
APPEND STEP									

Figure 28.14: Constructing Ramp Time steps 3 and 4

9. **step 5:** Apply the same procedure to add the next step using Soak as step type. Then add two additional steps using Ramp Time to decrease temperature set values to 89 and 85, respectively, with TS1 turned on for for both steps.
10. **Step 8:** We apply the **Go to Step** feature to jump to step 1 to repeat the process for three times. The End Action will be set to Hold. The complete program is illustrated as follows:

Name
PROG2TEST

Step Type	Duration	Wait For EN Digital Input 2	Digital Input 3	Temperature	Temperature EN Set Value	PIDs	Events GS TS1
1 Ramp Time	0:01:00	<input type="checkbox"/> Ignore	Ignore	<input type="checkbox"/> 32	"F 88	"F 1	<input type="checkbox"/> <input type="checkbox"/>
2 Soak	0:01:00	<input type="checkbox"/> Ignore	Ignore	<input type="checkbox"/> 32	"F 88	"F 1	<input type="checkbox"/> <input type="checkbox"/>
3 Ramp Time	0:01:00	<input type="checkbox"/> Ignore	Ignore	<input type="checkbox"/> 32	"F 93	"F 1	<input type="checkbox"/> <input checked="" type="checkbox"/>
4 Ramp Time	0:01:00	<input type="checkbox"/> Ignore	Ignore	<input type="checkbox"/> 32	"F 95	"F 1	<input type="checkbox"/> <input checked="" type="checkbox"/>
5 Soak	0:01:00	<input type="checkbox"/> Ignore	Ignore	<input type="checkbox"/> 32	"F 95	"F 1	<input type="checkbox"/> <input type="checkbox"/>
6 Ramp Time	0:01:00	<input type="checkbox"/> Ignore	Ignore	<input type="checkbox"/> 32	"F 89	"F 1	<input type="checkbox"/> <input checked="" type="checkbox"/>
7 Ramp Time	0:01:00	<input type="checkbox"/> Ignore	Ignore	<input type="checkbox"/> 32	"F 85	"F 1	<input type="checkbox"/> <input checked="" type="checkbox"/>
8 Go To Step	Profile This Program	Step 1		Count 3			
9 End	End Action Hold						
APPEND STEP							

Figure 28.15: Complete program

11. **Save Program:** Click the **Save** icon indicated by the arrow (shown in the figure) to save the program in slot number 2. The PLC will dictate the location of the program; it will place the program in the next available slot, in this case, slot 2.

≡ PROG2TEST

EDITOR PREVIEW PLOT

Name
PROG2TEST

Step Type	Duration	Wait For EN Digital Input 2	Digital Input 3	Temperature	Temperature EN Set Value	PIDs	Events GS TS1
1 Ramp Time	0:01:00	<input type="checkbox"/> Ignore	Ignore	<input type="checkbox"/> 32	"F 88	"F 1	<input type="checkbox"/> <input type="checkbox"/>
2 Soak	0:01:00	<input type="checkbox"/> Ignore	Ignore	<input type="checkbox"/> 32	"F 88	"F 1	<input type="checkbox"/> <input type="checkbox"/>
3 Ramp Time	0:01:00	<input type="checkbox"/> Ignore	Ignore	<input type="checkbox"/> 32	"F 93	"F 1	<input type="checkbox"/> <input checked="" type="checkbox"/>

Figure 28.16: Save current program

Navigating out of the editor without saving the program will trigger the following warning prompt:

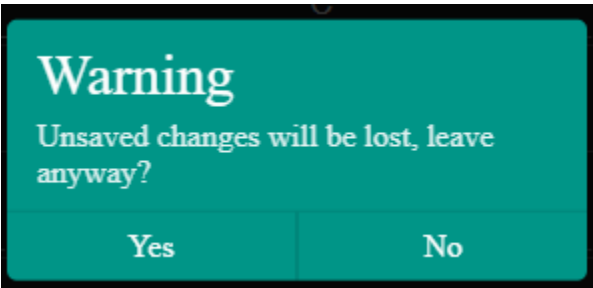


Figure 28.17: Confirm the save or discard update

12. **Preview:** Click the **PREVIEW PLOT** button to preview the output of the current program (see figure below). Click the **EDITOR** button to toggle back to the editor mode. Program cannot be saved while in the preview mode. In order to save the program, navigate back to the program editor to apply the **Save** or **Save As** button.



Figure 28.18: Program in preview mode

28.3 View, Edit, Save Program

This section describes how to open an existing program for viewing and editing. Changes made in the program can be written back to the file with **Save**. A new slot can be used for this updated program using the **Save As** option.

28.3.1 Open Program

To open a program for viewing or editing, click on its name under the Name list, as depicted in the following figure. Program **PROG2TEST** (indicated by the arrow) will be used for illustration. The **Download** (or **Delete**) button is only available if any slot under the Name list has a program in it, such as slot 1 and 2.

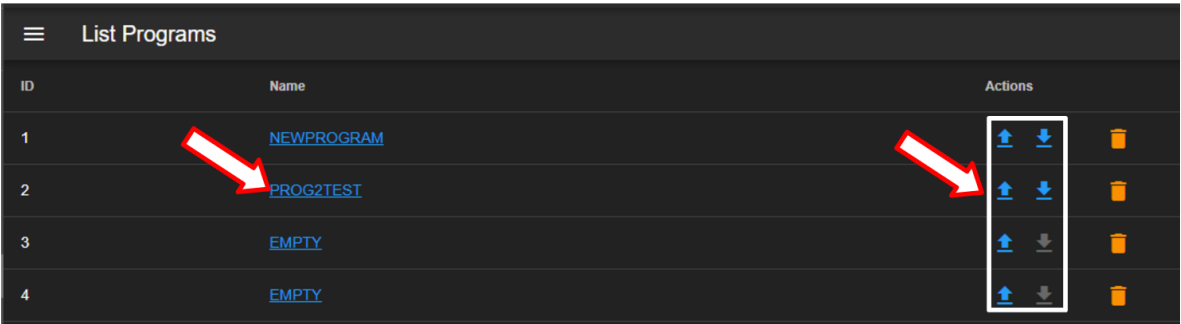


Figure 28.19: Opening a program profile

Once open, the program is placed in the program editor for editing. The file manipulation buttons (**Delete**, **Open Program**, **Download Program**, **Save As** and **Save**) offer different options to handle the program file or manipulate the program editor. These buttons will be explained in detail in the following sections.

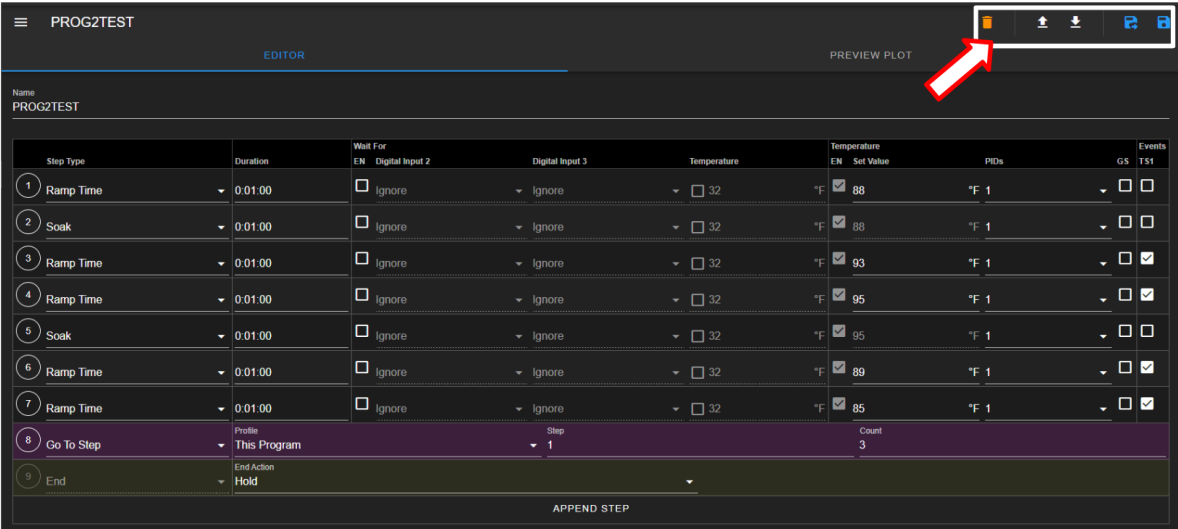


Figure 28.20: File manipulation buttons

28.3.2 Editing Program: Programming Example

This section illustrates the process of editing **PROG2TEST** program with additional steps, with the ability to autostart. To automatically execute the program, the autostart date must consist of future date.

The editing process is as follows:

1. **Step 1:** Click number 1 in the circle of Step 1 and select **Insert Before** to insert a new step above Step 1. Select **Auto Start** for Step Type; pick the future date and time to set the autostart feature as shown in the figure.

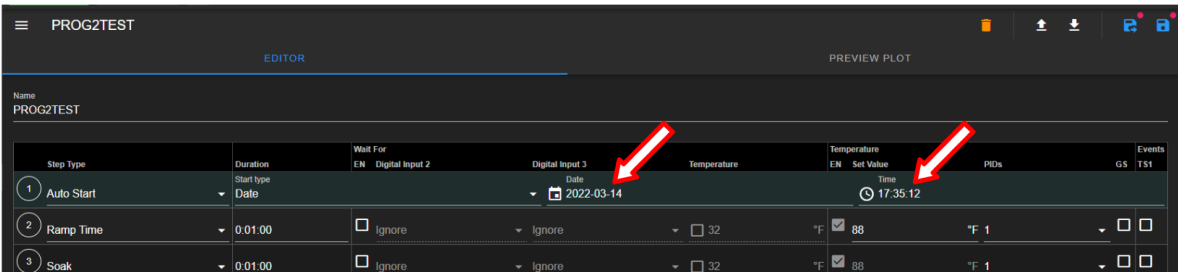


Figure 28.21: Configure autostart date and time

2. **Save Program:** This modified program can be saved back in its current slot with the **Save** button, or in the next available slot under a different name with the **Save As** button. Again, if the **Save As** button is selected, the slot list will be displayed for slot selection; however, the PLC dictates the location and it will save the new program in the next available slot. The following section describes how to utilize the file manipulation buttons in detail.

28.3.3 Managing Program File via the Program Editor

This section describes how to apply the five file manipulation options available in the program editor (upper-right corner), as depicted in the following figure.

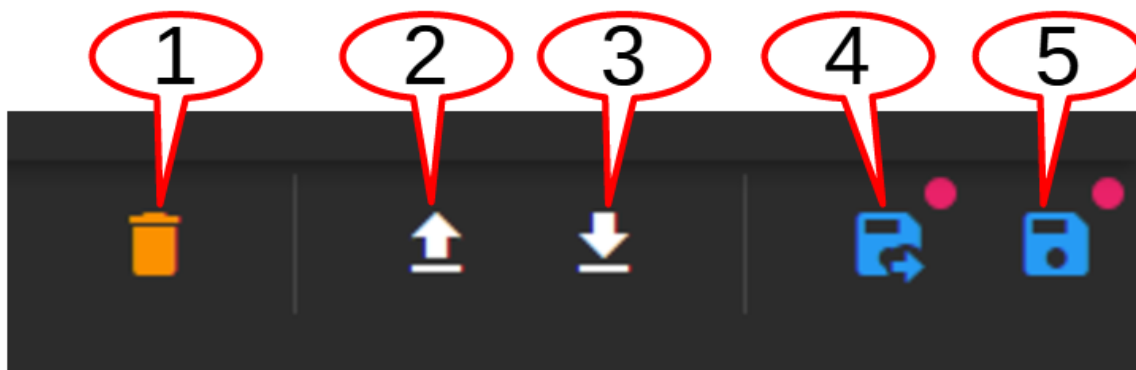


Figure 28.22: File manipulation options

They are described as follows:

1. **Delete:** The trash bin icon, when applied, deletes the current program in the program editor; that program is purged from the current slot in the PLC register, with the **EMPTY** listed under the ID list. For safety measure, the system prompts a pop-up warning with a Yes/No option. After deletion, the Program menu updates the Name list.
2. **Open Program:** This button imports a program file from the local computer into the program editor. By default, the system opens the Downloads folder on the local computer to upload the program file. The **Save** or **Save As** button must be applied to write the program onto the PLC's register (using the next available slot).
3. **Download Program:** The current program in the program editor can be downloaded onto the local computer as a backup. By default, the program will be stored in the Downloads folder. The hostname and program slot number are used as part of the downloaded filename (e.g., hostname_program_2.json).
4. **Save As:** Program in the program editor can be saved in a different slot, under a different name. To make the program name unique, the Name field may be edited with a new program name. This procedure thus requires a two-step process indicated by the arrows in the following figure. First, edit the program name; second, click the **Save** button and select a new slot from the drop-down list.

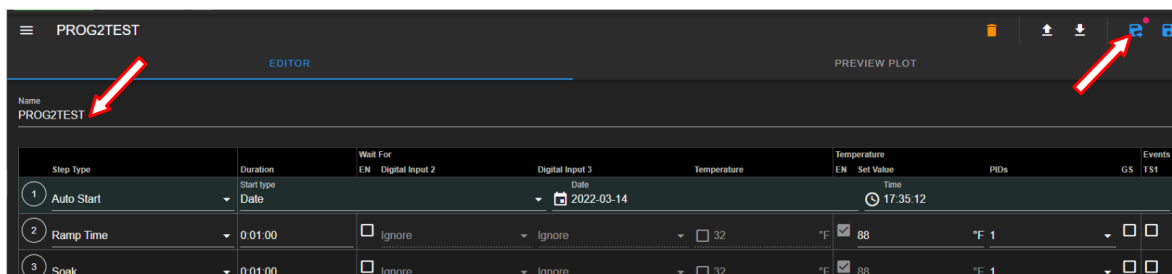


Figure 28.23: Save current program as a new file

5. **Save:** Apply this button to update the program file. To help check the editing status of the program, the program editor utilizes a red dot placed above the **Save** or **Save As** button to indicate an update yet to be saved.

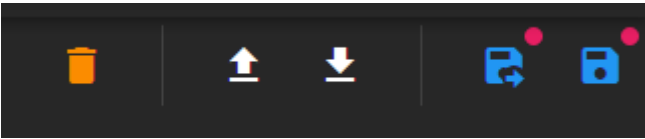


Figure 28.24: Update indicator

Navigating out of the editor without saving the update will trigger a warning prompt, as depicted in the following figure.

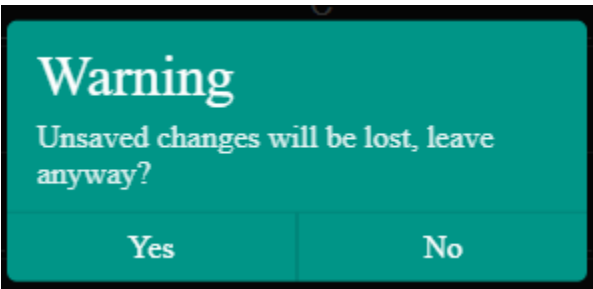


Figure 28.25: Confirm the save or discard update

28.3.4 Managing Program File via the Name List

This section describes how to apply the three file manipulation options on the Name list, as depicted in the following figure.

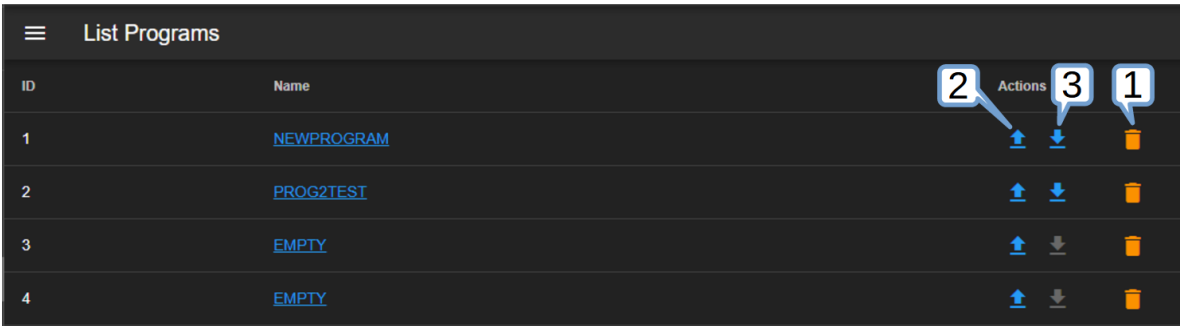
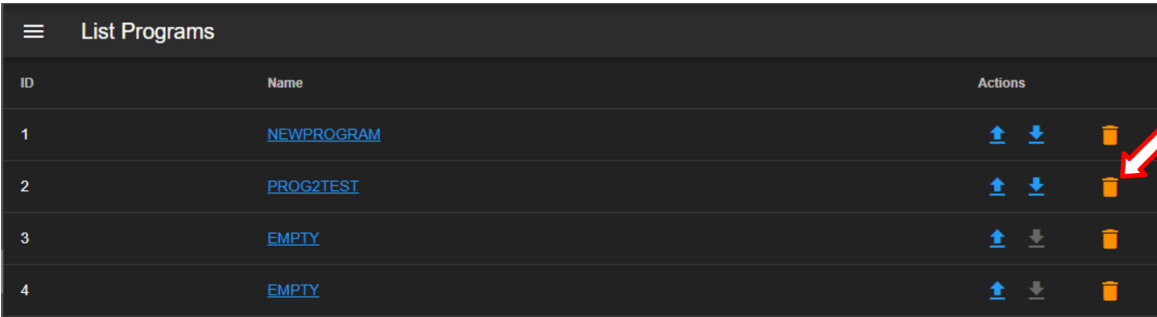


Figure 28.26: Manage programs on the Name list

These three options are listed and described as follows:

1. **Delete:** To delete **PROG2TEST** from the Name list (and the PLC register), click the trash bin icon indicated by the arrow (see figure below). As a safety measure, the system will prompt to confirm the action with a pop-up warning with a Yes/No option to proceed with the action. It may be necessary to apply the refresh button of the Web browser after deleting the program file from the Name list.







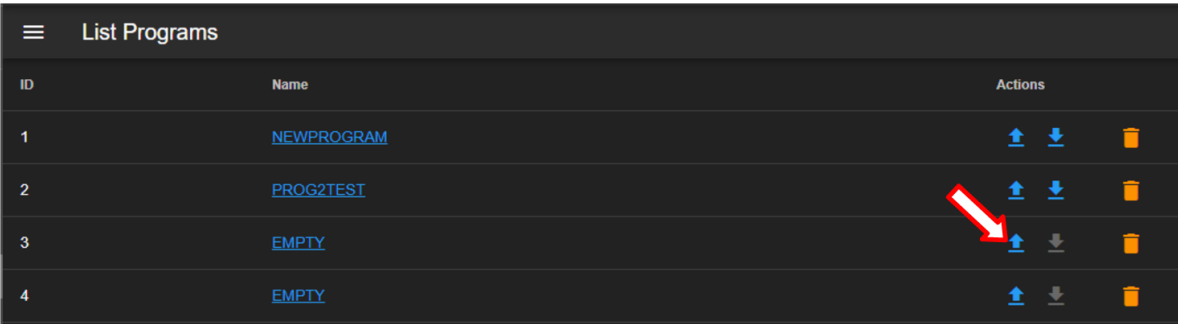
ID	Name	Actions
1	NEWPROGRAM	↑ ↓ 
2	PROG2TEST	↑ ↓ 
3	EMPTY	↑ ↓ 
4	EMPTY	↑ ↓ 

Figure 28.27: Deleting program from the Name list

2. **Upload Program:** This button can be used to import a program from the local computer directly into a program slot on the Name list and the PLC register. To upload a program into slot 3, click on the **Upload** button, as indicated by the arrow in the figure. Navigate to locate the desired file on the local computer and double-click it to complete the process.







ID	Name	Actions
1	NEWPROGRAM	↑ ↓ 
2	PROG2TEST	↑ ↓ 
3	EMPTY	↑ ↓ 
4	EMPTY	↑ ↓ 

Figure 28.28: Importing a program

3. **Download Program:** To download a program **PROG2TEST** on slot 2, click on the **Download** button (on the same row). By default, the program file will be stored in the **Downloads** folder on the local computer; filename naming convention is host-name_program2_.json.

CHAPTER 29

Start Stop

This menu allows the operator with read-write privilege to control or manage the chamber with the following operation modes: **Standby**, **Constant** and **Program**. The following figure depicts these modes displayed in the main display area as individual tabs.

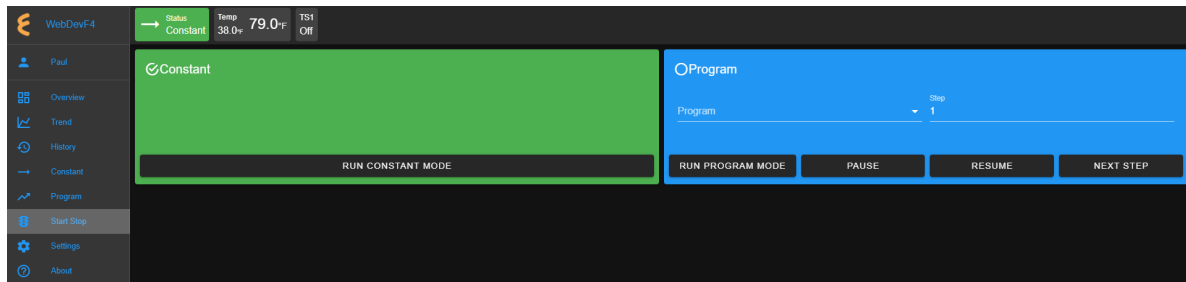


Figure 29.1: The Start/Stop menu with a Status Bar

The **Status** tab in the status bar also provides access to these modes for control and operation. Refer to the **Overview** menu for detail on how to control the chamber operating modes.

29.1 Constant Mode

In a constant mode, the chamber operates using the constant configuration. Authorized users with read-write privilege may set the chamber to operate in **Constant** mode. There are two operation modes: Constant and Program. A constant mode can thus be switched from a program mode and vice versa.

1. Click the **Start Stop** menu.
2. Click the **RUN CONSTANT MODE** button in the **Constant** tab.

Its status tab displays **Constant**. This status is confirmed by the check mark in the **Constant** tab, as depicted in the following figure.

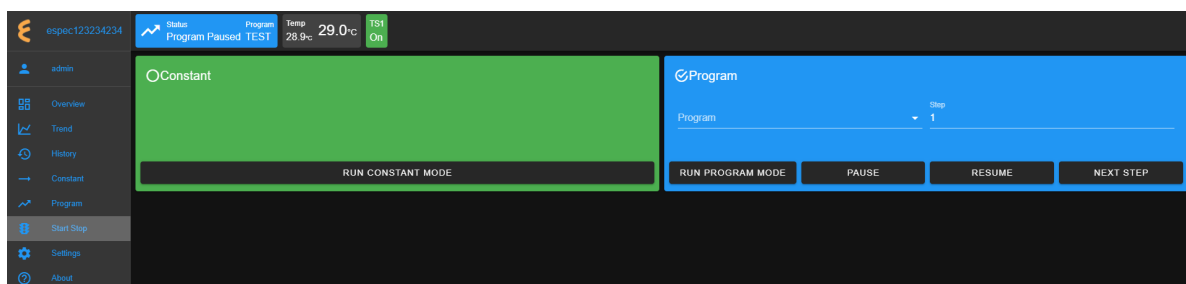


Figure 29.2: Setting a Constant mode

To terminate the **CONSTANT** mode, activation of a new mode is necessary. For instance, to switch the chamber from its **Constant** mode to **Standby** mode, click the **STOP OPERATION** button in the **Standby** tab. EWC immediately moves to apply the operating mode to the chamber.

29.2 Program Mode

In a program mode, the chamber carries out instructions of the program being executed. The status tab in the status bar posts **Program**, along with the name of the program being executed. This status is confirmed by the check mark in the Program tab, as depicted in the following figure.

Authorized users with read-write privilege may set the chamber to operate in **Program** mode by performing a series of operations in the **Program** tab. The following subsections explain how to run (execute) a program, pause, resume or step through the instructional steps in the program.

29.2.1 Run Program

A program mode can be switched from standby or constant. To load and execute a program to control the chamber, complete the following steps:

1. Click the **Start Stop** menu.
2. Click the radio button in the **Program** tab to select a program from the list (scroll down, if necessary), as depicted in the following figure.

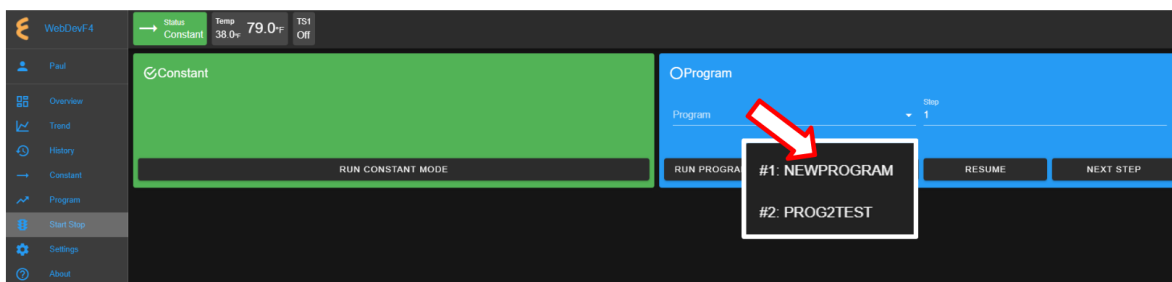


Figure 29.3: Executing a program from the Program List

3. Click to select the desired program name.
4. To start this program at a certain step, enter the step number in the **Step** field. Default setting is 1.
5. Click the **RUN PROGRAM** button to execute the program. EWC immediately moves to apply the operating mode to the chamber. The status tab and status bar now display the program being executed, as depicted in the following figure.

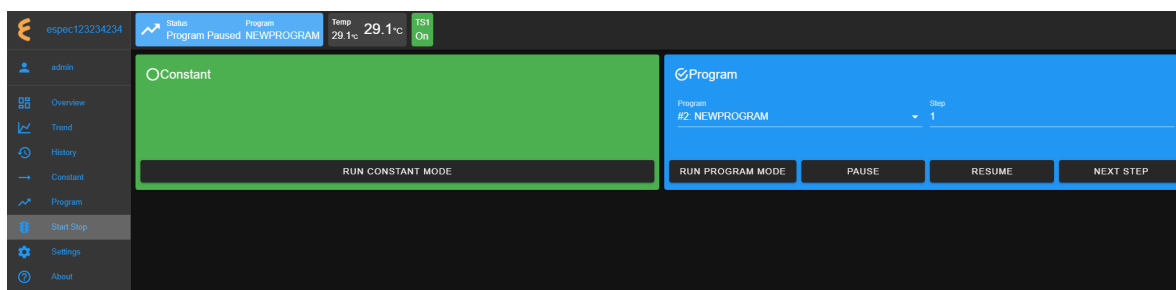


Figure 29.4: Setting a Constant mode

The **Overview** page may be accessed to display the detail of the program being executed.

29.2.2 Pause/Resume Program

Authorized users with read-write privilege may control the chamber during program execution. **Program** mode may be interrupted and put in a “suspense mode” using the **PAUSE** button in the **Program** tab. To pause a program during execution, click the **PAUSE** button; all operations are suspended. An update notification appears in the lower-right corner. The **Paused** notification is posted in the status tab.

To resume the operation and continue program execution, click the **RESUME** button. An update notification appears in the lower-right corner. The chamber will continue to operate based on instructions in the program. Program name is posted in the status tab to indicate chamber is in **Program** mode and that program is being executed.

29.2.3 Stepping through Program

Without having to wait for each step in the program to complete its tasks for the entire duration in the instruction, an operator may step through the program to study the effects of the instructions in a certain step. While the program is being executed, click the **NEXT STEP** button to execute the next step in the program. This action may be repeated until the last step in the program is reached. The **Overview** page in combination with the extended tab maybe accessed to display the detail of the program being executed and its steps being stepped through. The following figure depicts program **TempVib1** being stepped through to executing step 4.

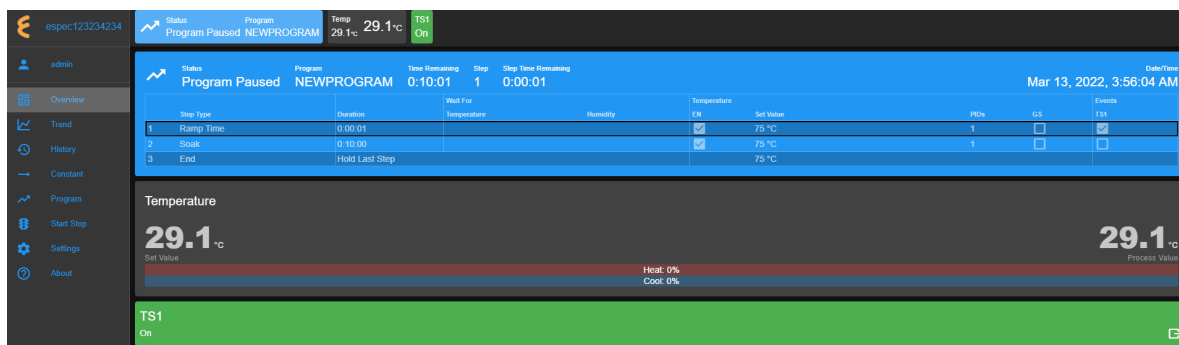


Figure 29.5: Stepping through a program

29.3 Timers

The **Timers** tab provides a quick way to apply the Macro Editor to automate a simple macro action to extend the operating mode of the chamber. There are two timer types: One-time timer and repeated timer. The one-time timer or one-shot timer allows an operator to set up a single (hence, one-time) operation on the chamber, while the repeated timer permits an operator to set up a repeated operation on the chamber. The repeated timer will operate indefinitely until it is disabled. The following figure depicts these two timer types.

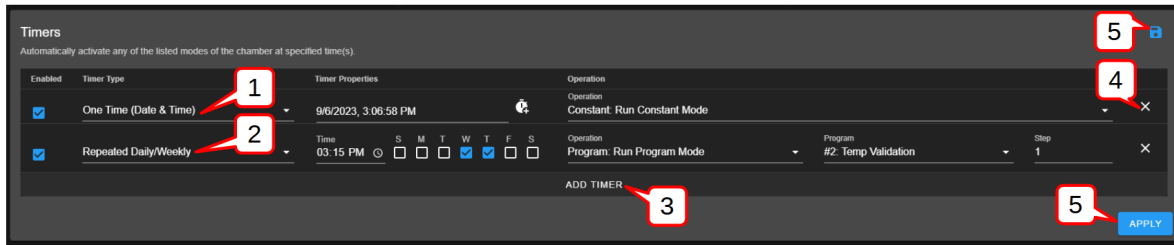


Figure 29.6: Example of one-time and repeated timer operation

1. **One-Time:** This timer fires the constant mode operation at 3:06:58 PM on 9/6/2023. The timer instruction and 3:06:58 PM must be configured ahead of time, later than the current time in order for the operation to take effect. For this reason, EWC date/time must synchronize with the current or local date/time (refer to **Date/Time Settings** under the **Settings** menu for detail). The one-shot timer is date/time dependent.
2. **Repeated Daily/Weekly:** This line is added after the first line got executed. Since it is set to occur after the first line, it will trip at 3:15 PM on Wednesday and Thursday of the week (in reference to the current date/time of EWC). The action executes a program from slot 2 (also referenced by the program name). When program execution is complete, the chamber will be set in the operating mode specified by the instruction in the program. This timer type is date/time independent; the operation will recur until the timer itself is removed from the **Timers** list or disabled with the **Enabled** box unchecked.
3. **Add Timer:** A new timer can be added using the **Add Timer** button, which will be added at the bottom of the list.
4. **Remove/Delete:** Each timer can be removed using the **X** button to its right.
5. **Save/Apply:** To start the timer, the **Save** or **Apply** button must be used. The two timer instructions (depicted above) are saved under the Macro Editor called **Operation Timer 1** and **Operation Timer 2**, respectively. If the timers are edited with new instructions and saved, the system generates a new name **Operation Timer 3** for the third timer, with a numeral incremented by one per each update. If the timer instructions are all removed from the **Timers** list, and a new timer is created and saved, the system starts over with **Operation Timer 1**, with its numeral incremented by one on each new update. This information can be viewed under the **Macros** submenu (under the **Settings** menu).

29.3.1 Program Mode: One-Time Timer

A one-shot timer sets the **Timers** to fire a certain action once based on the set date and time. With this feature, a selected program can start at a certain day and time once. The running program can be paused, resumed or stopped by another (subsequent) one-shot timer. An operator can plan to stop a certain program and switch the chamber to a different mode with the one-shot timer.

The following example illustrates how to set a one-shot timer to switch the chamber from **Standby** to **Program** and execute the said program starting with step 1.

1. Log in using the **admin** account

2. Access the **Start Stop** menu
3. Touch or click the **ADD TIMER** bar
4. Select/confirm that **One Time** is selected from the drop-down list of the **Timer** type; by default, **One Time** is selected.

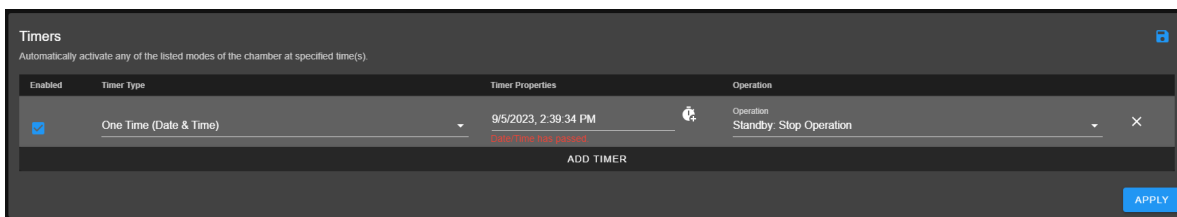


Figure 29.7: Setting a one-time automation

5. Touch or click the date/time field under the **Timer Properties** and apply the calendar and time to set the desired time. **Note:** Date and time must be ahead of the current date and time on the EWC system.

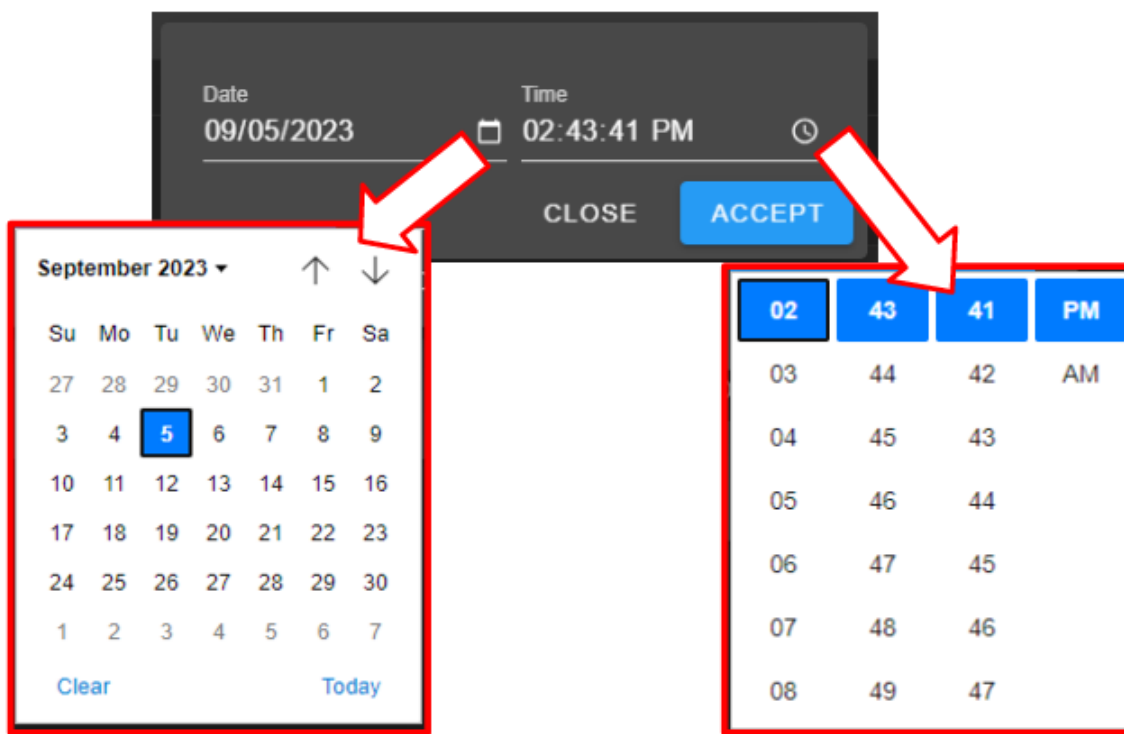


Figure 29.8: Set date/time for a one-shot action

Note: For a one-time operation, it is easier to use the Offset button (on the right of the date/time field) to adjust the future time, as depicted by the arrows in the following figure. Here, EWC will add the time to the current time to calculate when this action will fire.

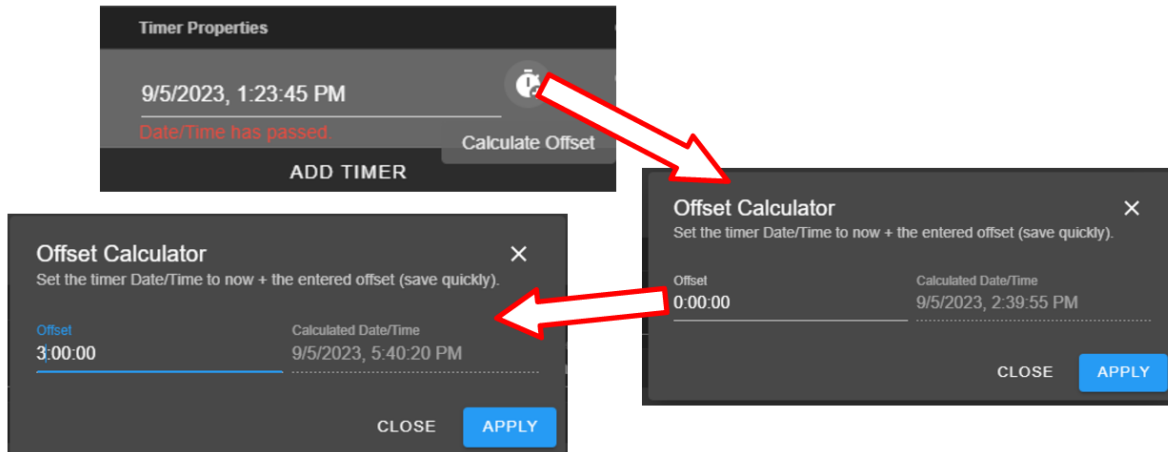


Figure 29.9: Using the time-offset calculator

6. Under **Operation**, select **Program: Run Program**
7. Under **Program**, select slot number or the associated program name
8. Under **Step**, select what step to start
9. Apply the setting with the **APPLY** button

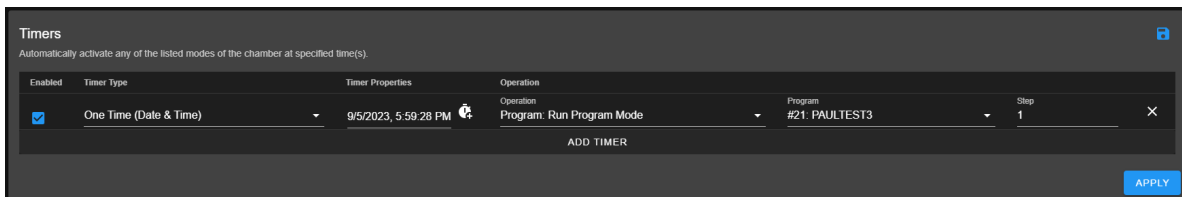


Figure 29.10: Program mode for a one-time start

Note: Both the **Save** and **APPLY** buttons provide the same effect. Either button can be used to save the settings and apply the action.

10. The program in slot 21 (as depicted in the example) will commence at 5:59:28PM (according to the EWC local time).

29.3.2 Removing or Adding a Timer

The one-shot or repeated timer can be removed from or added to the **Timers** list with the **X** or **ADD TIMER** button. Each new timer is added to the bottom of the list and takes effect after each update.

To add a new timer and use it, simply apply the **ADD TIMER** button. The following figure illustrates how a second timer is added to switch the chamber from a program mode (activated by the first timer) to **Constant**. Here, program from slot 21 gets executed (by the timer in the first line) at 1:20:15 PM, with execution time to last several hours. The timer in line 2 will switch the chamber to **Constant** mode at 2:00:00 PM.

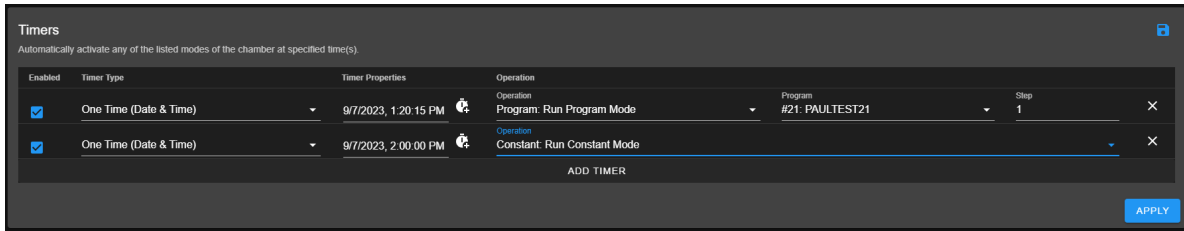


Figure 29.11: Setting additional one-shot timer after the first

Different timers on the list can be enabled or disabled using the **Enabled** box. Additional timer can be added to the **Timers** list and updated to take effect, provided the time is set for future time.

29.3.3 Constant Mode: One-Time Timer

The following example illustrates how to configure a one-shot timer to switch the chamber from **Program** to **Constant** at a specific time. The timer is configured as a new instance with one line by itself, as depicted in the following figure. The action is instant.

1. Log in using the **admin** account.
2. Access the **Start Stop** menu
3. Clear all or current timer settings with the **X** button (if necessary).
4. Click or touch the **ADD TIMER** bar
5. Confirm that **One Time** is selected (or make selection from the drop-down list).
6. Click or touch the date/time field under the **Timer Properties** and apply the calendar and time to set the desired time.
7. Under **Operation**, select **Standby: Stop Operation**
8. Apply the setting with the **APPLY** button. The timer is now saved in Macros list.

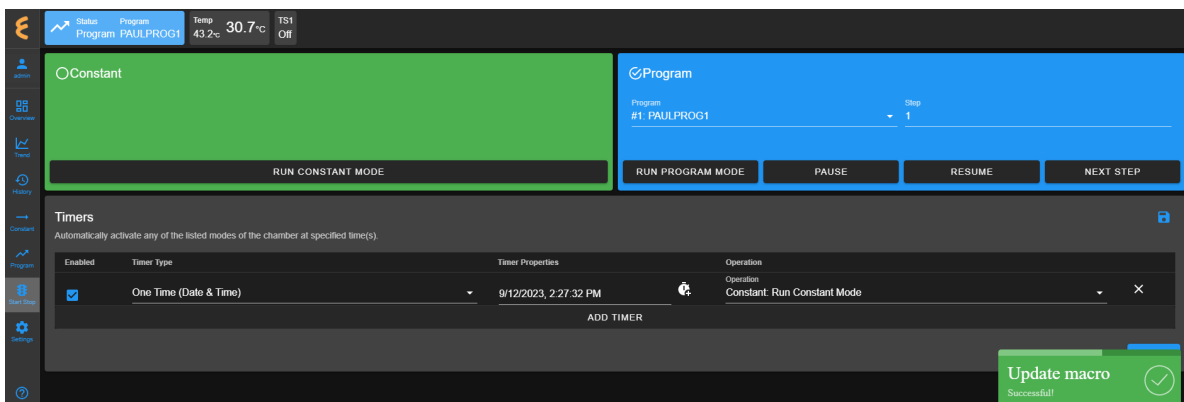


Figure 29.12: Scheduled a one-time timer to set chamber in Constant mode

9. The timer is activated at the set time, as depicted in the Macros list under the **Operation Timer 1** script. To view the **Operation Timer 1** action, access the **Settings** menu and

select **Macros** from the submenu.

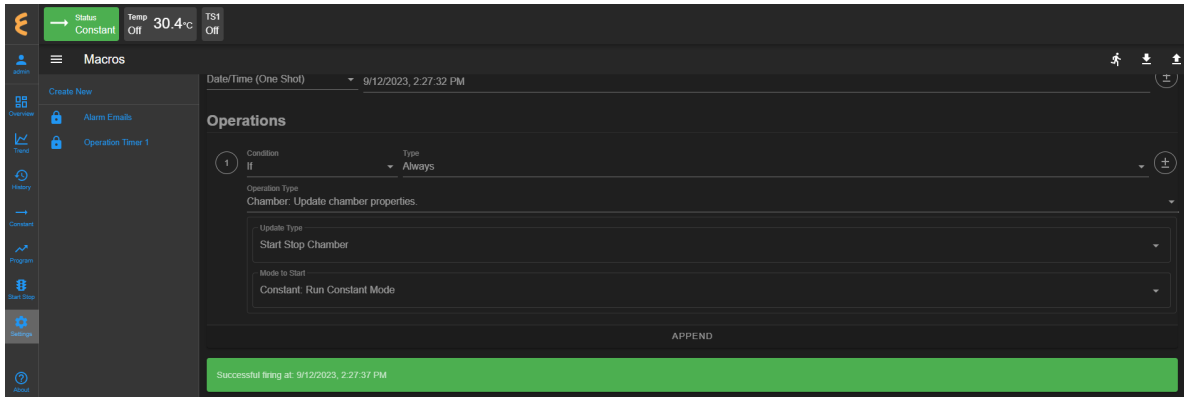


Figure 29.13: Macros action recorded on the one-time Timer

29.3.4 Program Mode: Weekly Repetition

With a weekly repeated timer, a program can start on a certain day, at a certain time. The following example illustrates how to execute a program on a weekly basis (one day during each week) at a certain time. Here, we set the program to execute every Wednesday at 2:40:25 PM.

1. Log in using the **admin** account
2. Access the **Start Stop** menu
3. Clear all or current timer settings with the **X** button (if necessary).
4. Touch or click the **ADD TIMER** bar
5. Under **Timer Type**, select **Repeated Daily/Weekly**
6. Edit the time to 2:40:25 PM
7. Check the box under W. The calendar format is Sunday(S) to Saturday (S).
8. Under **Operation**, select **Program: Run Program Mode**.
9. Under **Program**, select program in the desired slot number (slot 3 PAULPROG3 was used as an example).

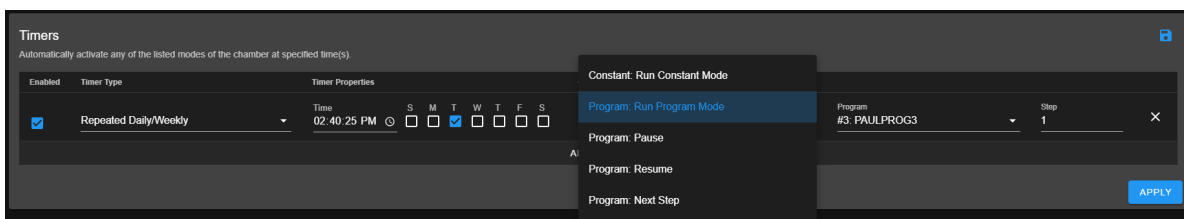


Figure 29.14: Single-day weekly timer

10. Apply the setting using the **APPLY** button. The complete configuration is depicted in the following example.

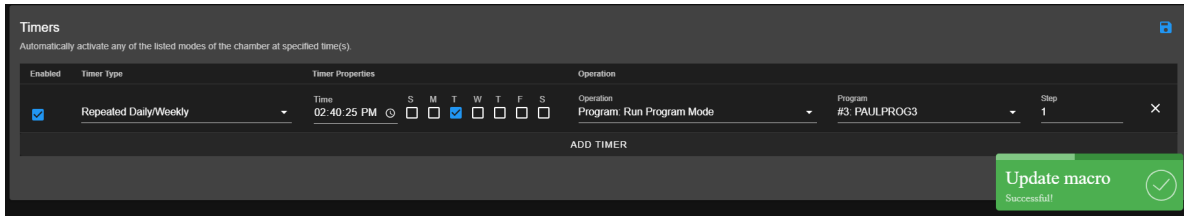


Figure 29.15: Single-day program repeated operation on F4

This timer can be disabled or enabled by manipulating the **Enabled** box. If you stop the program or switch the chamber to a different mode (such as, **Constant**), while this timer is still enabled, the program will recur on Wednesday at 2:40:25 PM the following week. To disable the timer permanently, it must be removed from the list (with the X and APPLY button).

29.3.5 Program Mode: Daily Repetition

The following example illustrates how to execute a program on a daily basis throughout the entire week starting 3:05:00 PM.

1. Log in using the **admin** account
2. Access the **Start Stop** menu
3. Clear all or current timer settings with the **X** button (if necessary).
4. Touch or click the **ADD TIMER** bar
5. Touch or click **Timer Type** and select **Repeated Daily/Weekly**
6. Edit the time to 3:05:00 PM.
7. Check the boxes under S through S. The calendar format is Sunday (S) to Saturday (S).
8. Under **Operation**, select **Program: Run Program Mode**.
9. Under **Program**, select program in the desired slot number (slot 4 and PAULPROG4 used as an example). Set and select program step 1 to begin execution.
10. Apply the settings with the **APPLY** button. The complete configuration is depicted in the following figure.

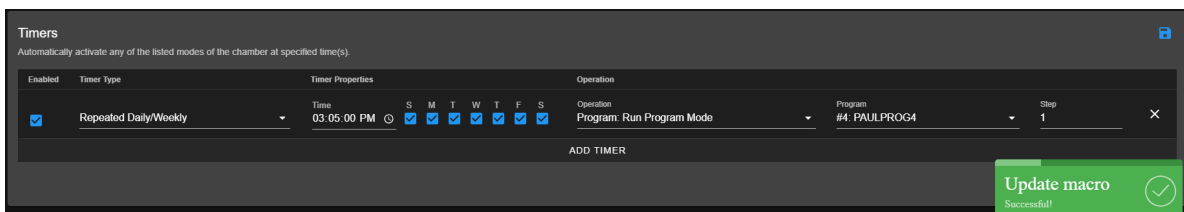


Figure 29.16: Timer setting for everyday of the week

The following trend graph illustrates a typical result of the timer, from a different chamber used for illustration, with its configuration set to run for several days. The trend graph was produced by extrapolating the data from the last three days. It shows how program was repeated each day

at 6:05 PM and ended shortly before 9:00 AM, as indicated by the status bar at the bottom of the graph. The chamber was put in a **Standby** mode until 6:05 PM, at which time the program recurred.

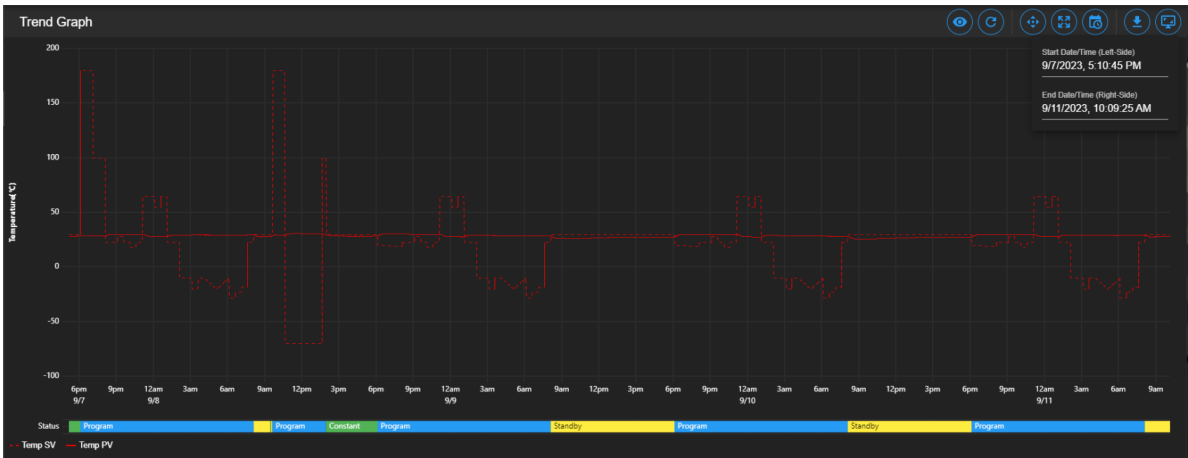


Figure 29.17: Trend graph of chamber controlled by a timer

This timer can be disabled or enabled by manipulating the **Enabled** box. If you stop the program or switch the chamber to a different mode (such as, **Constant**), while this timer is still enabled, the selected program will recur on the next day. To disable it permanently, the timer can be removed from the list (with the X and APPLY button).

29.3.6 Multiple Timers: One-Time or Repeated Daily/Weekly

The **Timers** list may contain multiple timers with different instructions for a specific operation. Multiple timers allow for sequential activations, order of script execution or specific execution via the **enabled** box selection, etc.

The following figure depicts a list of multiple timers, each with a specific function and operation, which has been prepared to execute in the top-to-bottom paradigm.

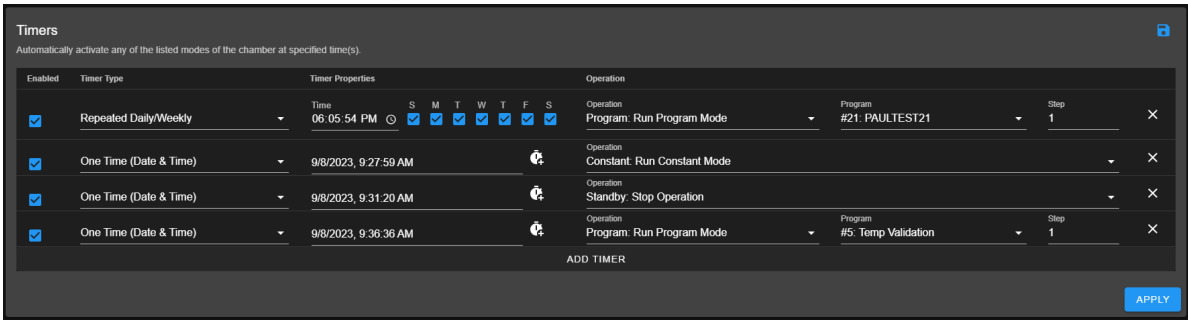


Figure 29.18: Multiple sequential timer oeperations

Each entry in the above figure is added after the previous one (above it) has been executed. All of which are enabled by default. Only timer 1 (top line) and timer 4 (bottom line) remain in effect, since the middle two are one-shot timers. In addition, the last timer is also a one-shot

timer and it will end after the program it has executed has ended. Each timer causes action to take over the previous one.

Part VI

ESPEC P300 Chamber

CHAPTER 30

Overview

The **Overview** page displays the current status of the chamber and its operating mode. A user is brought to this page after logging into EWC. The following figure depicts **Overview** with the chamber in Standby as indicated in the status tab and its extension bar. This extension bar is only available in the **Overview** menu. The date/time posted in the extension bar is the date/time on the chamber/controller. While date/time stamp of data logs and Macros automated actions are based on the date/time on EWC, the controller date/time should also synchronize with that on EWC and the local device (that launched the Web browser). The date/time of EWC can be viewed under the **Settings** menu. It can also synchronize with that on the local device (to be discussed in the **Settings** menu).

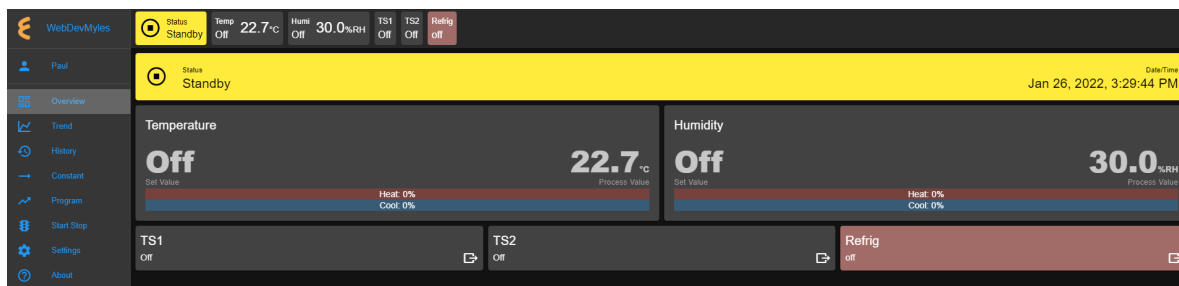


Figure 30.1: Overview page with chamber in Standby mode

The following figure depicts **Overview** showing the chamber in Constant mode.

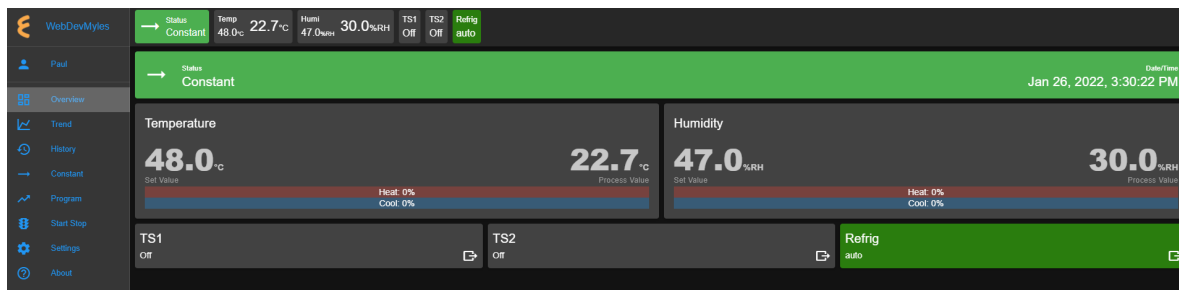


Figure 30.2: Overview page with chamber in Constant mode

The following figure depicts **Overview** showing the chamber in Program mode. Detailed information about the program, including what step is being executed, is listed in the extension bar (of the status tab). This feature provides the operator with useful information about the status of the chamber and the program.

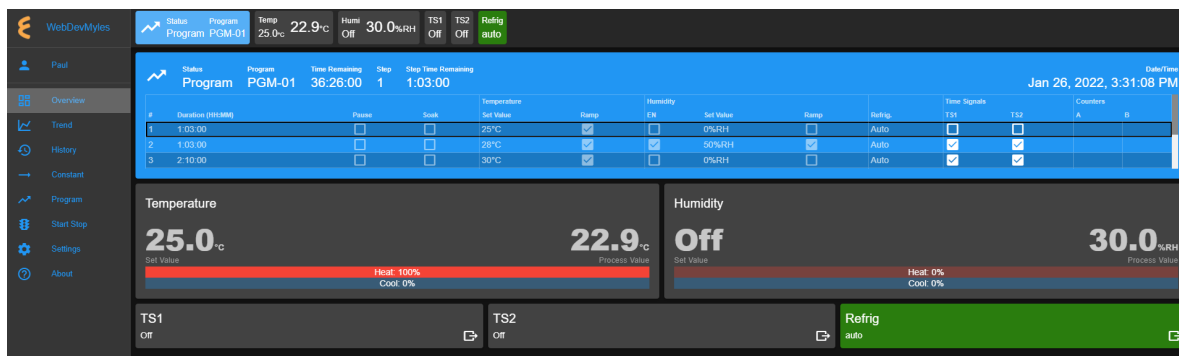


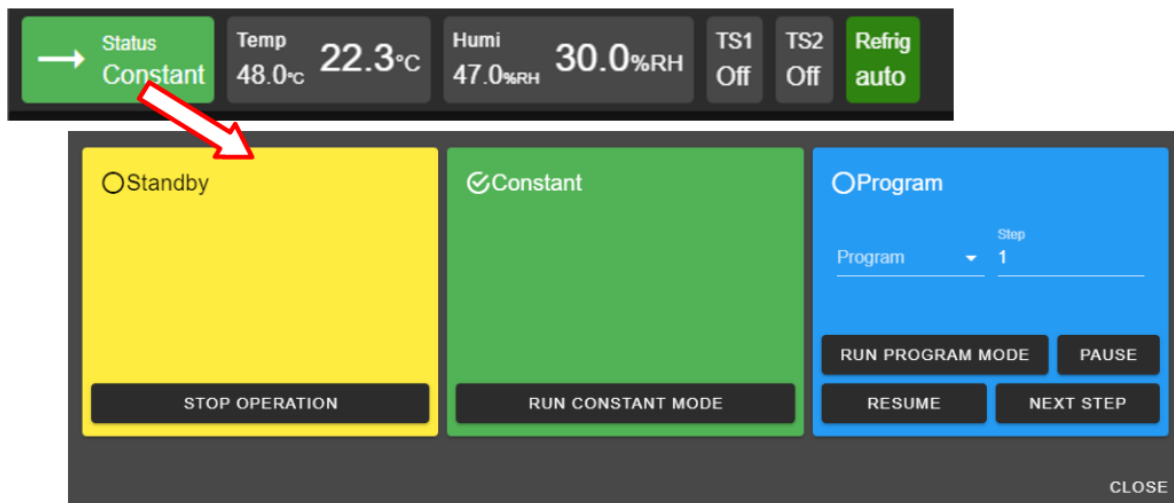
Figure 30.3: Overview page with chamber in Program mode

Only users with read-write privilege can control the chamber operation mode from within this page. Supported operation modes are **Standby**, **Constant** and **Program**. Each tab in the status bar may be accessed to apply new settings at any time. This feature enables the operator to control the chamber without having to access the **Start Stop** menu in the menu bar. The following sections detail a step-by-step procedure how to control the chamber's operating mode via the **Overview** menu for users with read-write privilege.

30.1 Standby Setting

For authorized users with read-write privilege, to set the chamber in **Standby** mode, proceed with the following steps. Initially, the chamber is operating in **Constant** mode. We wish to switch its operation mode to **Standby**.

1. Click the status tab in the status bar to access the drop-down tabs, as shown in the figure.



An alternative way to access the drop-down tabs is to click on the extended tab of the status tab itself, as depicted in the following figure. The drop-down tabs display over the extended tab, as shown in the right figure. This extended tab is available only in the **Overview** page.



Figure 30.4: Status tab drop-down menu via the extended tab

2. Click the **STOP OPERATION** button. EWC immediately moves to apply the operating mode to the chamber. A pop-up window appears in the lower-right corner to indicate the update of the operating mode. A check mark in the **Standby** tab indicates and confirms its standby mode.
3. To close the drop-down tabs, perform one of the following action:
 - Click an empty area in the Main Display.
 - Click a different menu in the menu bar.
 - Click the status tab itself. or
 - Click the **CLOSE** button underneath the alarm tab.

30.2 Constant Setting

For authorized users with read-write privilege, to set the chamber in **Constant** mode, proceed with the following steps. Suppose, initially, the chamber is operating in **Standby** mode. We wish to switch its operation mode to **Constant**.

1. Click the status tab in the status bar. As depicted in the following figure, the chamber is in **Standby** mode.

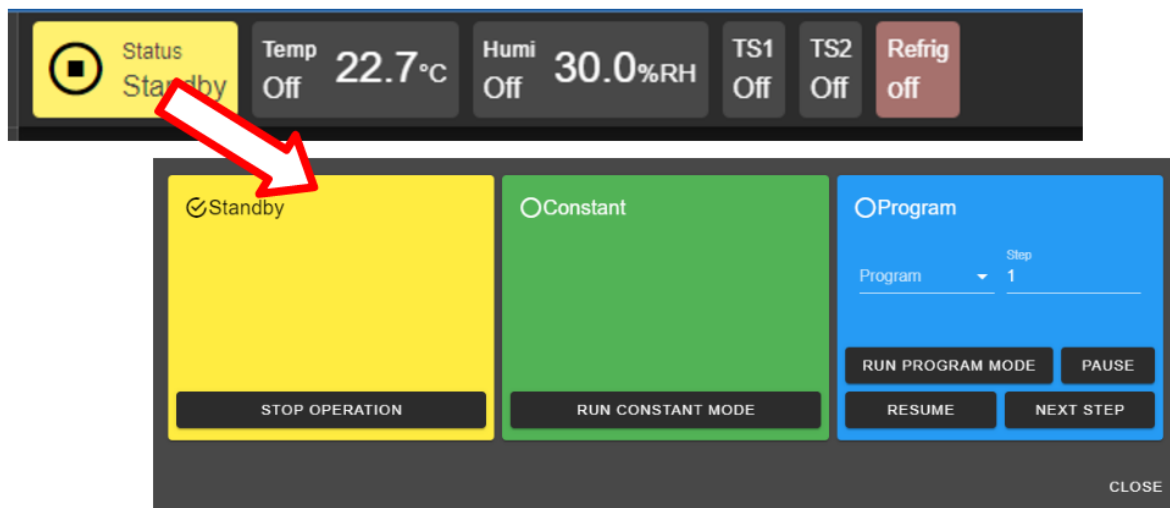


Figure 30.5: Constant mode setting

2. Click the **RUN CONSTANT MODE** button in the constant tab. EWC immediately moves to apply the operating mode to the chamber.

3. To close the drop-down tabs, perform one of the following action:

- Click an empty area in the Main Display.
- Click a different menu in the menu bar.
- Click the status tab itself. or
- Click the **CLOSE** button underneath the alarm tab.

30.3 Program Setting

To set the chamber in **Program** mode means a profile (i.e., program) is loaded and executed.

1. Click the status tab in the status bar or the extension bar of the status tab.
2. Click the radio button in the program tab to access the program list (see the figure below).

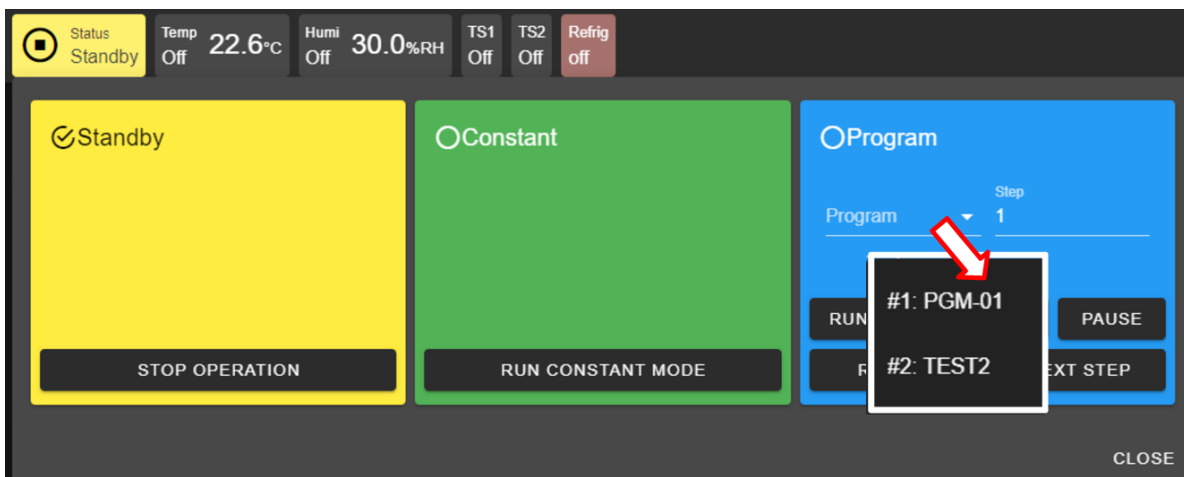


Figure 30.6: Select program to start chamber in Program mode

If no program is available for loading, the list contains slot numbers without programs, as depicted in the following figure. A program must be created first before it can be loaded for execution. Chapter 8 discusses how to create a program to control the chamber.

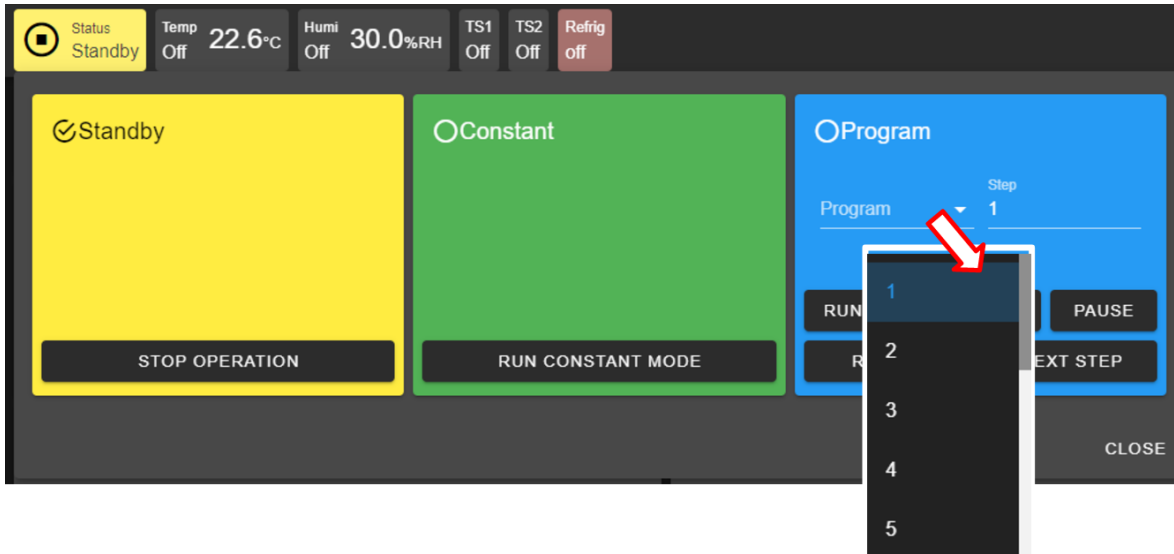


Figure 30.7: No program available for execution

3. Click to select a program from the list. Apply the scroll bar, if necessary, to select the desired program.
4. Enter a desired step number in the step field for program to start. Default start step is 1.
5. Click the **RUN PROGRAM MODE** button to execute the program. EWC immediately moves to apply the operating mode to chamber. A pop-up window appears in the lower-right corner to indicate the update. Note: This program tab offers a few practical methods during a program execution. The **Pause** button can be used to pause the program. Program can be resumed via the **RESUME** button. Program instruction lines can be stepped through via the **NEXT STEP** button.
6. Click the **CLOSE** button to view the status of program execution displayed in the status tab extension bar.
7. To end or interrupt the program execution, switch the chamber to **Standby** or **Constant** mode via the status tab.

30.4 Clear Alarms

When EWC detects an alarm in the chamber, it also sets itself in an alert state by displaying a list of active alarms and fault names in the red window to require an immediate action from the operator, as depicted in the following figure.

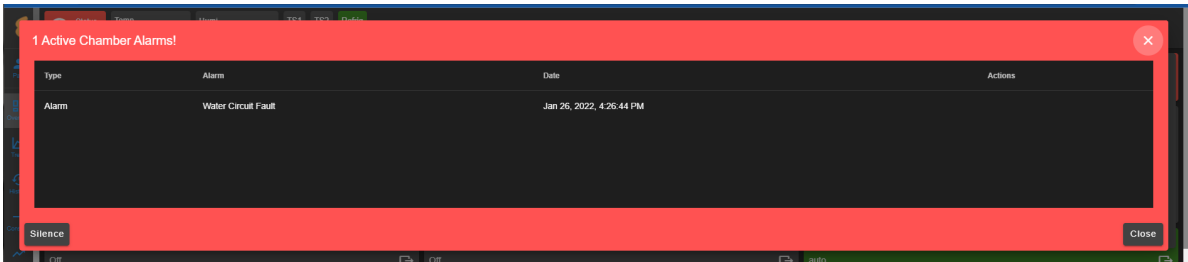


Figure 30.8: Chamber in alarm state

A repeating beep on the local computer is also tripped to get the operator’s attention. The **SILENCE** button can be used to turn off the beep. This alert window can be closed by clicking the **CLOSE** button or the X button. However, the alarm state still remains to be resolved as indicated by the **Status** tab in the following figure. To redisplay or expand the alarm list, click the red dot in the lower-right corner.

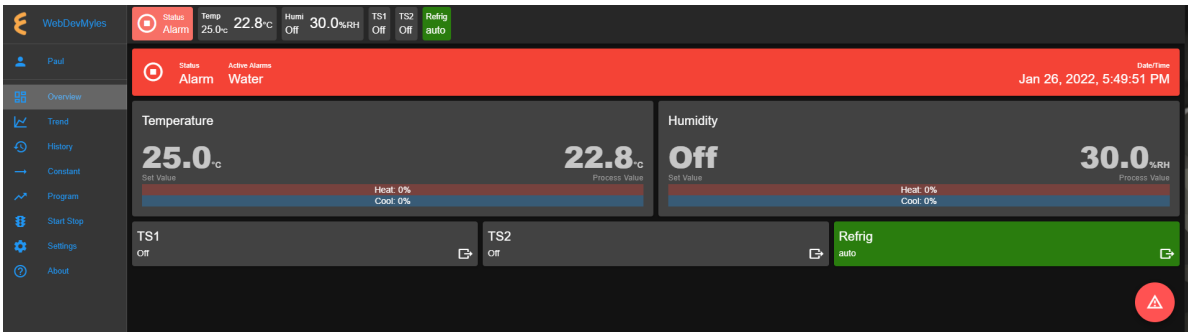


Figure 30.9: Alarm state in overview page

In an alarm state, operation is halted until all alarms triggered by chamber are resolved via the P300 (i.e., clear all alarms on the P300) before EWC (and the chamber) can resume the normal operation. Once all alarms are cleared, EWC will automatically clear all alert messages and resume normal operation by switching the chamber to a **Standby** mode.

30.5 Temperature, Humidity or Time Signal Settings

On the **Overview** page, settings of temperature, humidity, time signals or refrigeration can be controlled via the dedicated tabs in the status bar or the dedicated panes in the main display area, as depicted in the following figure.

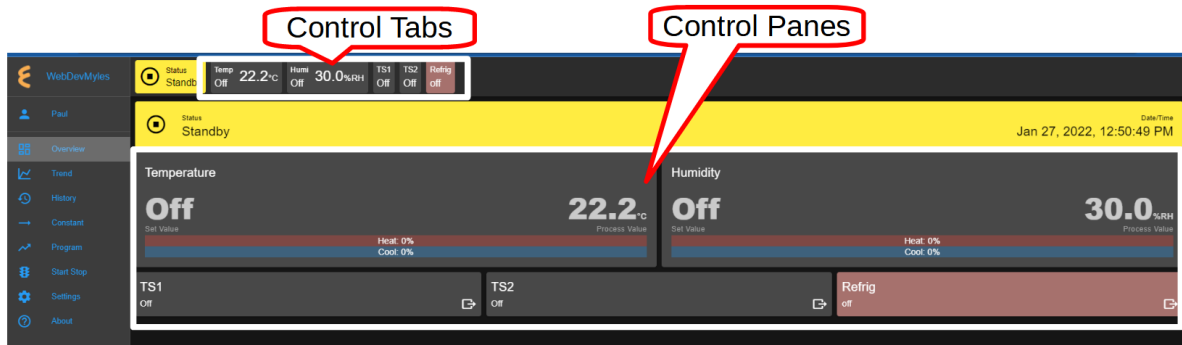


Figure 30.10: Parameter settings via control panes

30.5.1 Settings via the Status Bar

To set temperature with a new set value, complete the following steps:

1. Click the Temp tab in the status bar.
2. In the drop-down pane, click the box to **Enable** temperature, and enter new value in the Set Value field or apply the up/down arrow to adjust the value (shown in the figure).

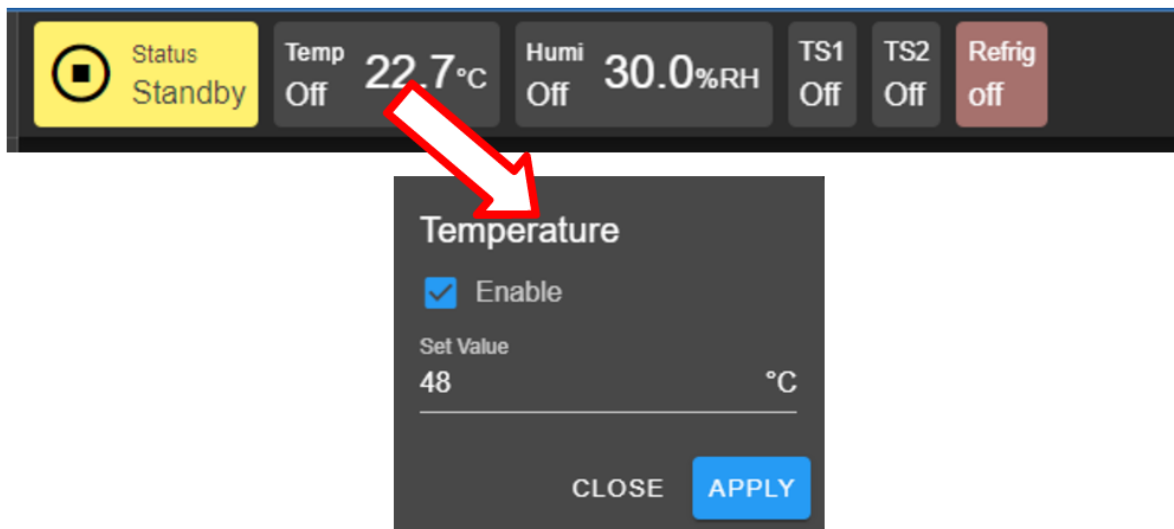


Figure 30.11: Setting new temperature value via the temp tab

3. Click **APPLY** to apply the new setting.
4. To cancel the setting, click the **CLOSE** button or the Temp tab in the task bar.

To turn on humidity and set its value, complete the following steps:

1. Click the Humi tab in the status bar.
2. In the drop-down pane, click the box to **Enable** humidity, and enter new value in the Set Value field or apply the up/down arrow to adjust the value (shown in the figure).

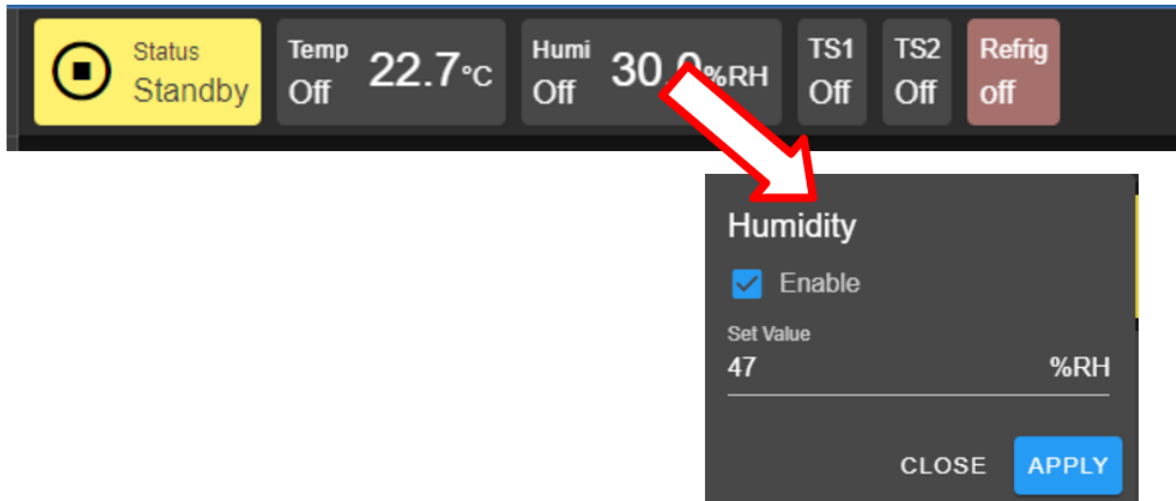


Figure 30.12: Setting new humidity value via the humi tab

3. Click **APPLY** button to apply the setting.
4. To cancel the setting, click the **CLOSE** button.

To turn on time signal 1 (TS1), complete the following steps. Repeat the same procedure to turn on additional time signals.

1. Click the TS1 tab in the status bar.
2. Check the box to enable TS1 (shown in the figure).

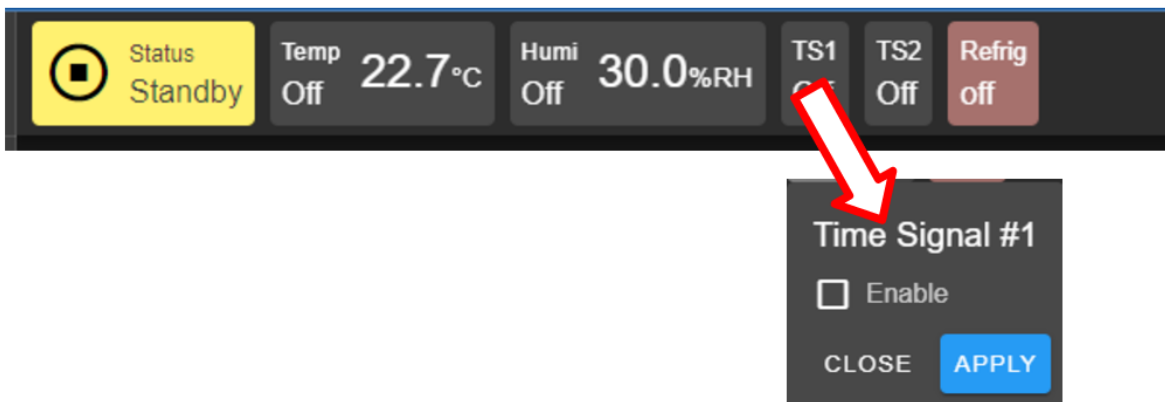


Figure 30.13: Enable or disable time signal setting

3. Click **APPLY**.
4. To cancel the setting, click **CLOSE** (instead of **APPLY**) or click the TS1 tab itself in the status bar.

To turn off TS1, apply the following steps:

1. Click the TS1 tab in the status bar.

2. Uncheck the box to disable TS1.
3. Click **APPLY**.
4. To cancel the setting, click **CLOSE** (instead of **APPLY**) or click the **TS1** tab itself in the status bar.

To turn on the refrigeration, complete the following steps:

1. Click the Refrig tab in the status bar.
2. Check the radio button to select set value from the drop-down list.

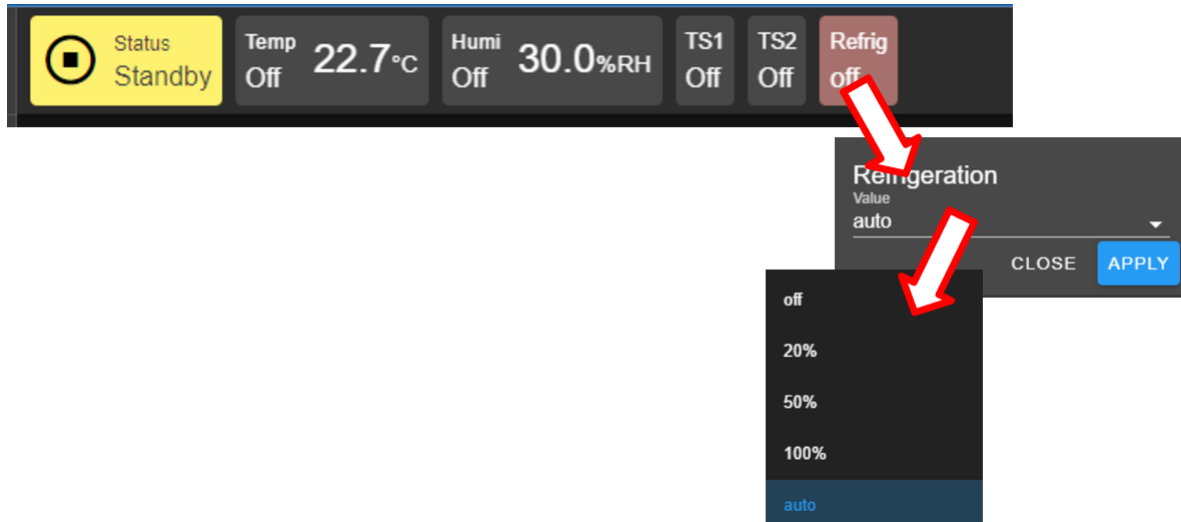


Figure 30.14: Setting refrig value

3. Click **Apply**.
4. To cancel the setting, click the **CLOSE** button.

30.5.2 Settings via the Dedicated Panes

With EWC, there are multiple ways to complete the same task. The dedicated panes for temperature, vibration or humidity, time signals, or refrigeration, in the main display area are actually clickable panes. These are CTA (call-to-action) panes through which new parameter settings (such as, temperature, vibration or humidity, time signal and refrigeration) can be applied.

To apply a new setting to temperature, complete the following steps:

1. Click the Temperature pane to access the input pane (shown in figure below).

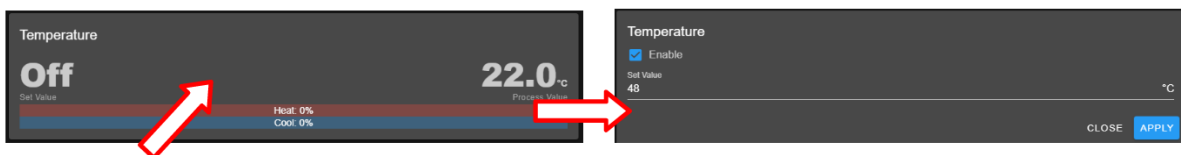


Figure 30.15: Setting new temperature value via the temperature (CTA) pane

2. In the input pane, click and enter new value in the Set Value field or apply the up/down arrow to adjust the value.
3. Click **APPLY**. To cancel the setting, click **CLOSE** (instead of **APPLY**).

The above procedure can be applied to humidity, vibration, time signal or refrigeration.

CHAPTER 31

Trend

The **Trend** menu can be used by an operator to view a scatter plot of data points collected during the chamber operation. Data collection can occur in two distinct modes: **Always** and **When Chamber is on**. These two modes are selectable and configured under the **Data Logging Settings** submenu found under the **Settings** menu. Plot elements and detailed configuration of the trend graph will be discussed on **Data Logging Settings** page in the **Settings** menu.

By default, the trend graph provides a scatter plot of data points collected during the last hour. Various options of plot range of data points accumulated more than one hour can be selected. Data can be downloaded in whole or in portion to be stored on the local computer as CSV file.

31.1 Trend: Components

There are seven different groups that make up the main display of **Trend** and the scatter plot, as depicted in the following figure. The scatter plot shown in the figure is a result of the data points being collected with the chamber in program mode. Detailed descriptions of these groups based on the labels in the figure are outlined as follows:



Figure 31.1: Trend graph showing plots of current data from the chamber

1. **Trend Graph:** Data points collected from the chamber are rendered as a trend graph based on a scatter plot methodology. These data points—product temperature, air temperature, humidity, vibration, etc.—are plotted as a function of time. Temperature is displayed in degree Celsius, vibration in root-mean-square of acceleration (Grms or G), etc. The vertical y-axis represents the scale of these values. The horizontal x-axis represents the data logging runtime. Based on the default configuration, the chamber logs data points in a 10-second interval (refer to the **Data Logging Settings** submenu, under **Settings**). Depending on the type of chamber, data logging interval can be set to lower than 10 seconds. The grid scaling on both the y- and x-axes will change according to the application of the Pan/Zoom Controls buttons or the drag-and-select via the mouse and scroll wheel. Default setting can be restored by clicking the refresh button on the Web browser (not shown in the above figure).
2. **Trend Graph Manipulation Buttons:** Seven manipulation buttons are available to help manipulate and control the trend graph features and options. Detailed functionality and operation of these buttons are discussed in the following section.

3. **Snapshot of Data:** By hovering a mouse pointer on the trend graph area, a snapshot of the data at a particular time is displayed (shown in the figure). This feature allows a quick peek of the data at a certain point in time. Depending on the chamber's condition, the snapshot displays set values (SV) and process values (PV) of temperature, product or air temperature, or vibration, chamber operating mode or status, as well as program name and alarm. The contents in the snapshot are based on the selected options displayed in the legend set by the **Graph View** button of item 2 (above); and the color scheme selection under the **User Interface Settings** submenu (found under the **Settings** menu).
4. **Y-axis Label:** The y-axis displays the selected type of data points to be plotted, such as Temperature, Humidity, Vibration ,etc. These values are populated based on the selection of the **Graph View** under item 2 (above).
5. **Line Graph:** Different types or styles of graph—solid line, dashed line and color—are used to designate each type of data points in the plot to help for visualization and readability. As depicted in the figure, solid line represents process values, while dashed line represents set values with a distinctive color, as indicated in the legend (see item 7).
6. **Status:** Status of chamber operating mode is displayed along the time line on the trend graph, indicating when and how long the chamber was in specific operating mode. This feature provides a quick preview of the chamber operating status. The **Pan/Zoom button of Trend Graph Manipulation Buttons** (item 2) may be used to manipulate the display and shift the graph back into the past to view the chamber's operating mode.
7. **Legend of Trend Graph:** The legends are used to identify each item on the trend graph with color code, as well as line/dash graph, to designate the different type of data being plotted.

31.2 Trend Graph Manipulation Buttons

The following is a detailed list of the seven **Manipulation Buttons** of **Trend Graph**, item 2 in the previous figure.

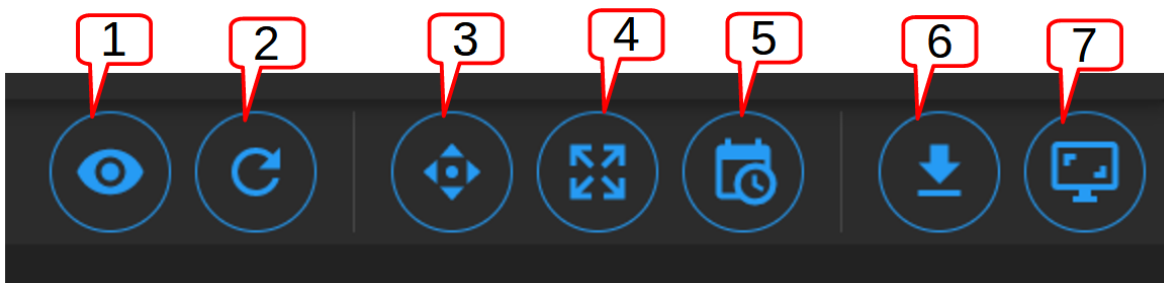


Figure 31.2: Trend Graph manipulation buttons

1. **Graph View:** Data visualization is very important. Elements or components of the trend graph are predefined by the configuration set in the **Data Logging Settings** submenu (found in the **Settings** menu). The **Customize** option depicted below allows the operator to select what to include in the trend graph to help simplify data visualization. Three different options represented by the arrows in the figure can be selected. The minimum and maximum Y range can be adjusted over the default values to help scale the graph for better

visualization; different data types can be enabled for display. The **Save** button (last arrow) can be applied to save the settings and render the graph.

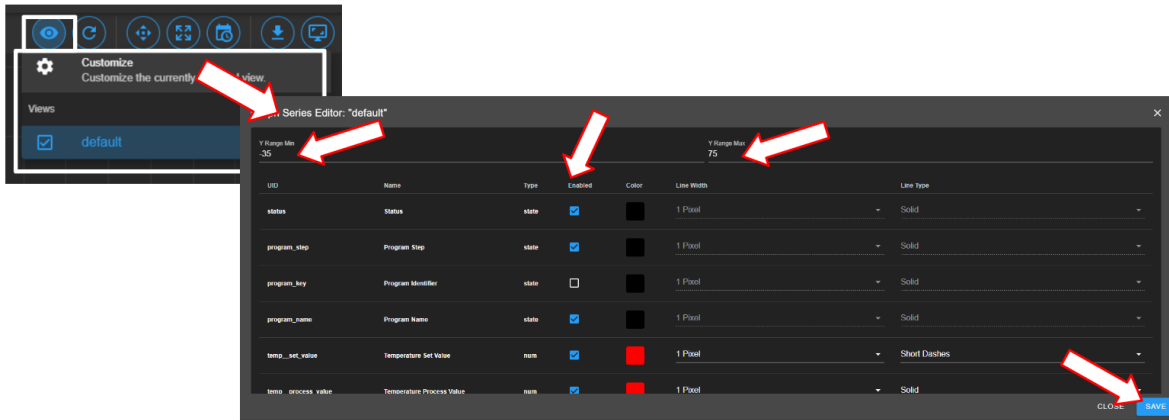


Figure 31.3: Tread graph view and custom settings

2. **Auto Refresh:** This Auto Refresh button reconstructs the graph to include data points up to the current time. Suppose a scroll wheel was applied to zoom out the trend graph that included future time which data points have not yet been sampled, as shown in the figure below.

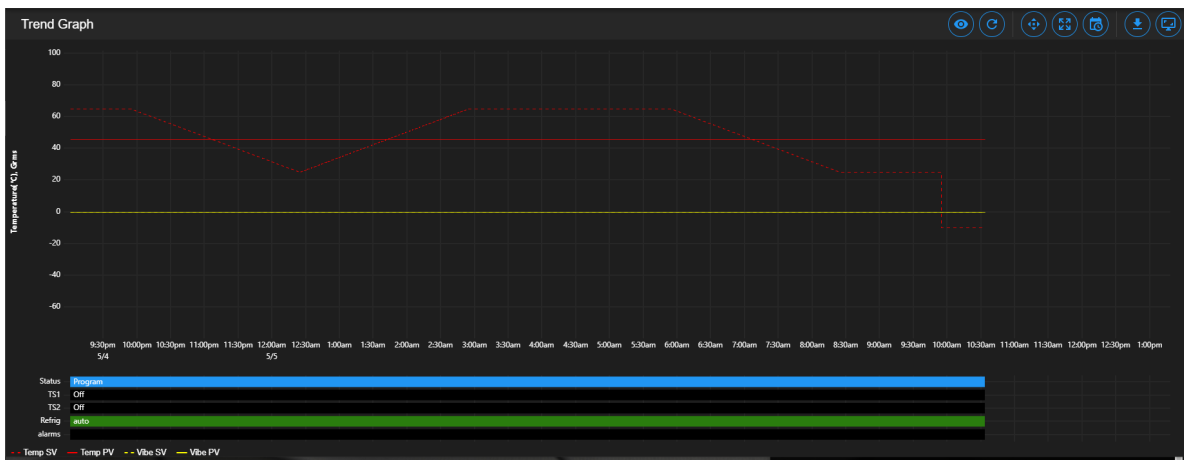


Figure 31.4: Off-scaled trend graph including future time (no data points)

The auto refresh button will rescale the graph to eliminate the gap (future time) on the right to expand and display the trend graph up to the current time.



Figure 31.5: Trend graph rescaled with current time

3. **Pan/Zoom Controls:** The Pan/Zoom Controls button allows the operator to control and adjust the viewable section in the trend graph. This button presents six operation buttons to manipulate and display the trend graph as follows:

- **Zoom In:** The **Zoom In** button allows the operator to zoom into a small section of the trend graph. Depending on the degree of zooming, the display area will be confined to a small set of data points ranging between minutes to hours. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Zoom Out:** The **Zoom Out** button does the opposite by allowing the operator to zoom out on the trend graph, thereby giving the operator an expansive view of the trend graph. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Move Up:** This button allows the operator to move up the graph along the vertical axis to adjust the viewable area of the scatter plot. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Move Down:** This button allows the operator to move down the trend graph along the vertical axis with the purpose to adjust the viewable area of the scatter plot. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Move Left:** This button allows the operator to pan left on the trend graph, offering a quick preview of a plot of data points tracing back the time in hours or days. With this feature, the operator can quickly gain a preview of past data points which the operator may have missed.
- **Move Right:** This button does the opposite to **Move Left** by allowing the operator to pan right on the trend graph to the current time. To reconstruct the trend graph to contain the most recent data points, the **Auto Refresh** button allows the quickest operation.

4. **Zoom Extents:** With this button, trend graph may be provided using data points from within the last one hour, last two hours or the last six hours. To make adjustment of the trend graph based on these three selections, click on the **Zoom Extents** button, then click one of the selection from the drop-down menu.
5. **Plot Range Selectors:** Data points can be selected from start date/time to end date/time to produce a desired trend graph. Arbitrary date and time can be selected for the plot range, as depicted in the following figure.

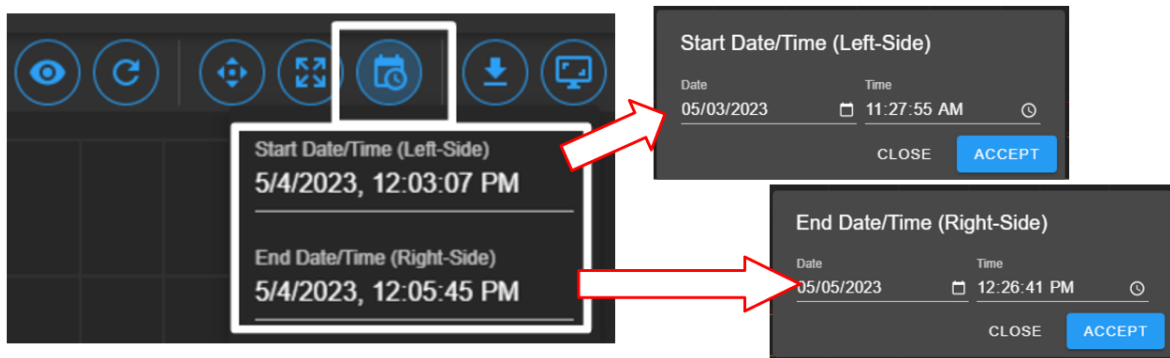


Figure 31.6: Plot range for start date/time and end date/time

To set the plot range,

- access the **Plotted Range Selectors** button.
 - access the **Start Date/Time**; edit date (m/d/y) and time (H:M:S) fields or apply the calendar and clock icons to select date/time.
 - apply **ACCEPT**
 - access the **End Date/Time**; edit date (m/d/y) and time (H:M:S) fields or apply the calendar and clock icons to select date/time.
 - apply **ACCEPT**. Note: Values of end date must be later (or greater) than start date.
6. **Download Data:** To download data and store it on the local computer, click the **Download Data** button and select **Download Current View** to download a portion of data from the displayed trend graph. To download the entire collection of data, select **Download All Data**. Data file will be stored in the Downloads folder of the local computer with filename: hostname_data_date.CSV.
 7. **Capture Screenshot/Download:** Trend graph can be captured, downloaded and stored on the local computer in PNG file, as shown in the figure.

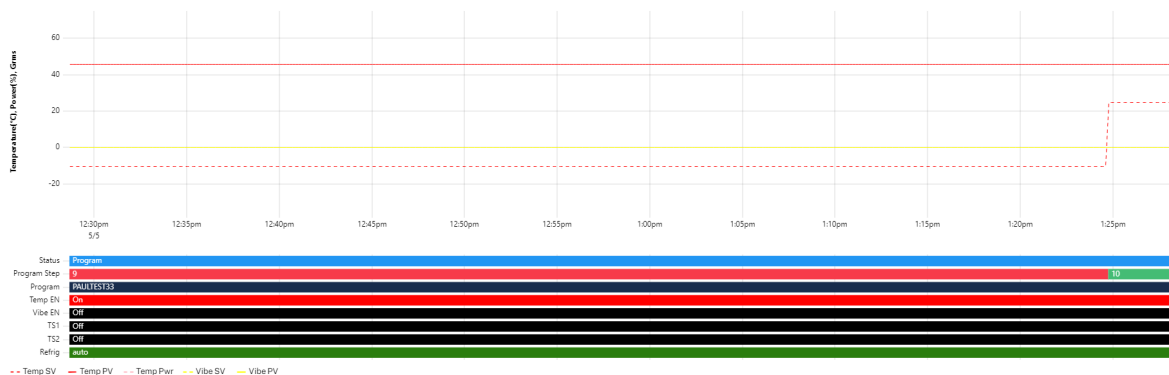


Figure 31.7: Screenshot of trend graph

31.3 How to Handle Downloaded Data File

Data points collected from the chamber are stored in CSV format. The recorded time of the data points is stored based on a UTC (or Universal Time Coordinated, previously referred to as the GMT) instead of the local time. To preserve the integrity of the CSV file and its UTC time stamp, do not rename the data file with MS Excel extension or attempt to open it directly with MS Excel. Any attempt to force open it in MS Excel will result in the wrong time conversion as shown in the following figures.

The following figure displays the CSV file which was directly opened with MS Excel. The time stamp in the first column is wrong; it is still based on UTC time stamp indicated by the arrows.

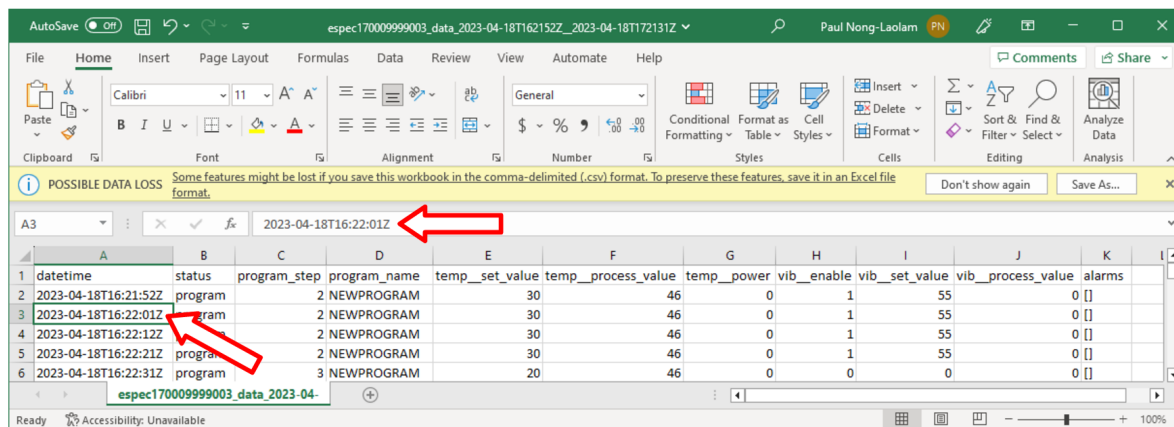


Figure 31.8: Data file improperly open in MS Excel

The following figure displays the same CSV file which was properly imported into MS Excel with the correct time stamp conversion for local time indicated by the arrows.

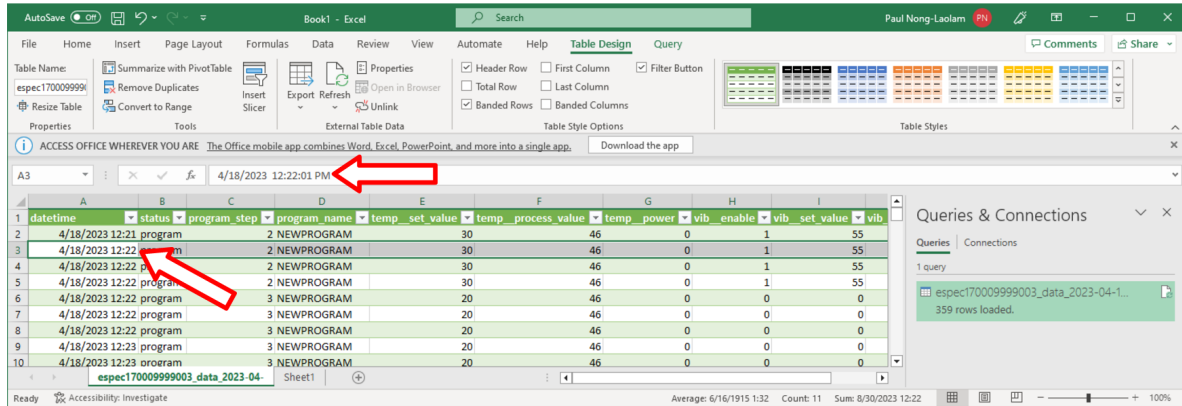


Figure 31.9: Data file properly imported into MS Excel

The proper way to handle this CSV file is to import it using the following procedure to render the correct conversion of the UTC time to the local time on all data points.

Complete the following steps:

1. Select **Trend** in the main menu bar
2. Click the **Download** button (item 6 in the previous section) to download the data (current view or entire data) in CSV file
3. Launch MS Excel and start a new blank spreadsheet
4. Click the **Data** ribbon
5. Click **From Text/CSV** (that appears under the **Home** ribbon)
6. In the **Import Data** Window explorer, open the **Downloads** folder and select the downloaded CSV file (in step 2) and click the **Import** button (in the bottom).
7. Click the **Load** button to load data into the current spreadsheet.
8. To save the current spreadsheet as Excel Workbook, click **Save As** and follow the standard steps to complete the process.

CHAPTER 32

History

The **History** page displays operation history of the chamber, its operating modes and statistics. Any alarms or alerts that were triggered during the chamber's operation are logged and displayed here. By default, history log of the chamber's operating modes, alarms or statistics from the previous week will be displayed, as depicted in the following figure. There are five important components in the **History** main display area. They are labeled and described as follows:

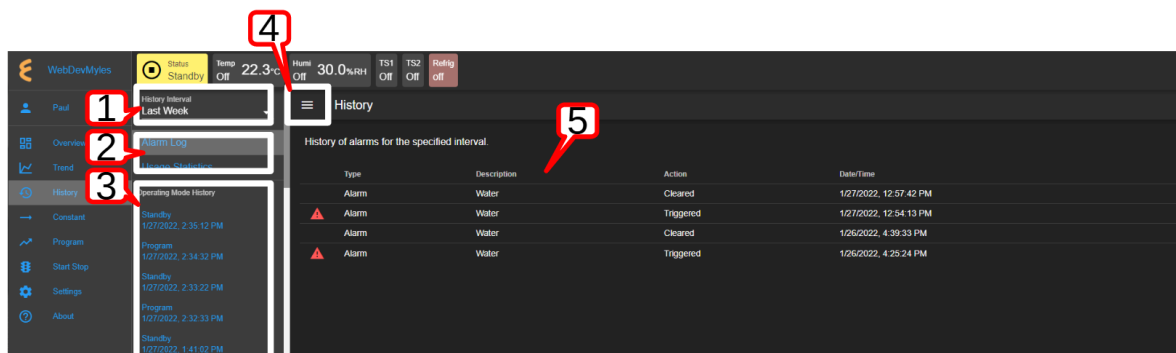


Figure 32.1: Operation history of the chamber

1. **History Interval:** Display options of the operating history are: one week, two weeks, one month, three months, six months, one year or the entire period of the chamber's operation. To access the history interval, click the radio button to select the period from the list.

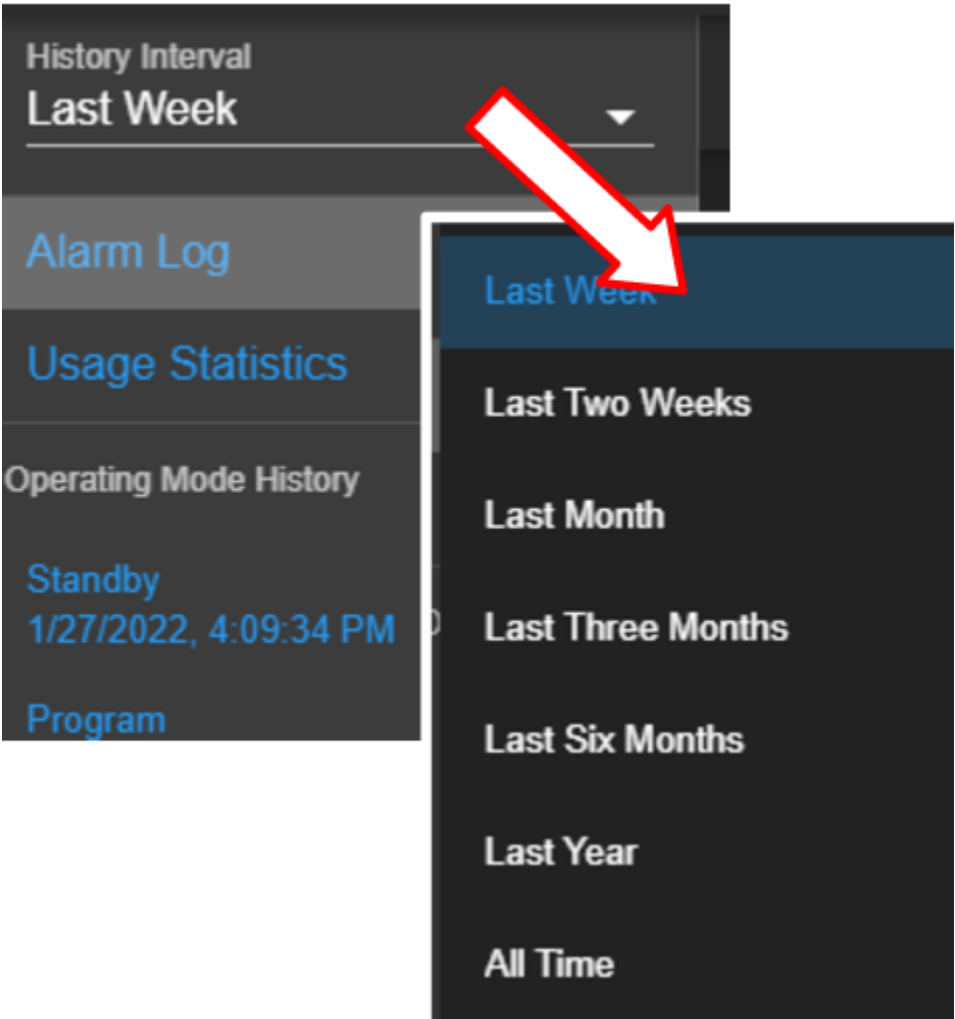


Figure 32.2: History interval and display selection

2. Alarm or Statistics Submenus:

- **Alarm Log:** By default, alarm logs will be displayed in the main display area. The logs indicate which alarm had occurred and when they were resolved (cleared). Most recent events are listed at the top. To view detail of each log, click on its name (with its log date and time).

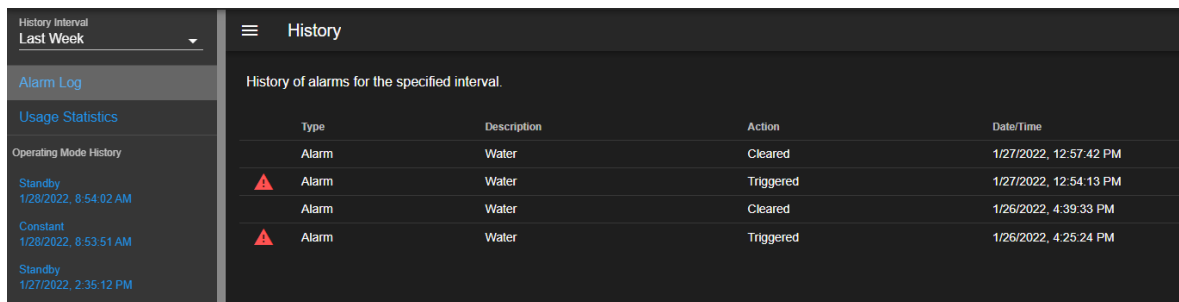


Figure 32.3: History of alarm

- **Usage Statistics:** To display the operation statistics, click on this submenu. Percentage of each operation mode based on the selection period in the **History Interval** is displayed as shown in the following figure:

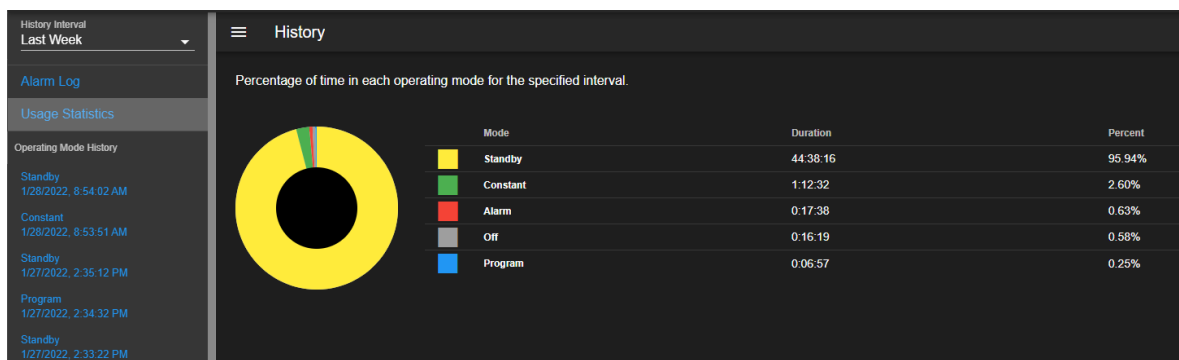


Figure 32.4: History of operation statistics

Such information provides the operator a good idea of the overall performance of the chamber by identifying when and how much time it was in a certain operating mode.

3. **Operating Mode History:** A list of operating modes of the chamber is displayed here based on the option selected under the **History Interval**. Default listing is based on a one-week interval. A trend graph, identical to that produced in the **Trend** menu, based on the data points collected during the operating mode can be produced by clicking on the particular operating mode on this list, as illustrated in the following figure.

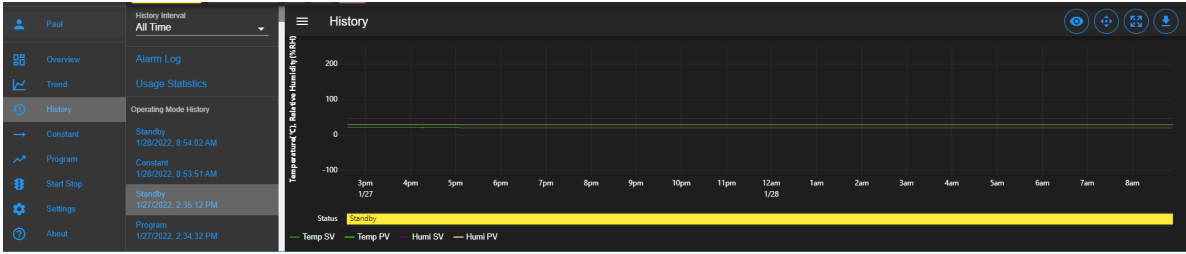


Figure 32.5: Trend graph of operating mode history

4. **Show/Hide Submenu:** To provide a larger real estate for the main display area, this Show/Hide button can be used to show or hide the **History** submenu. The following figure shows how the submenu is hidden and the main display area is expanded.

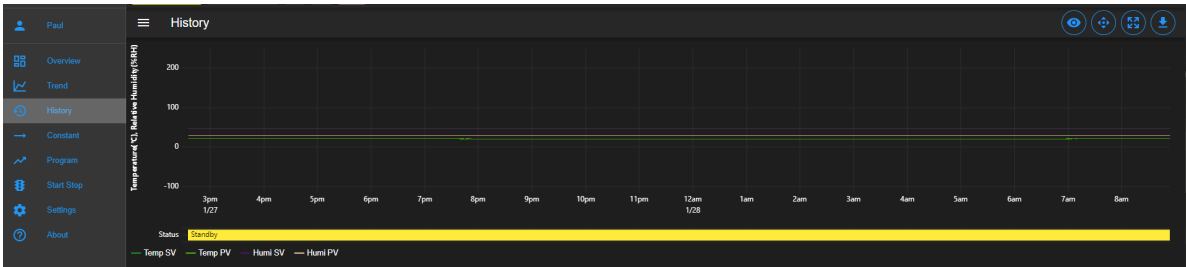


Figure 32.6: The show/hide button of the main display of the History page

5. **Main Display:** The content of the submenu page of **Alarm Log** and **Usage Statistics** is displayed here (refer to item 2, above).

CHAPTER 33

Constant

The existence of EWC **Constant** page is such that all features and their parameters are collected and displayed in one place to control their constant mode settings. The main display of **Constant** consists of three separate panes, displayed as **Temperature**, **Humidity** (or **Vibration**) and **Outputs**, as depicted in the following figure. These CTA panes provide input options to adjust the settings directly. The Humidity Range Chart is a two-dimensional graph of the current temperature-humidity relationship, displayed below these CTA panes.

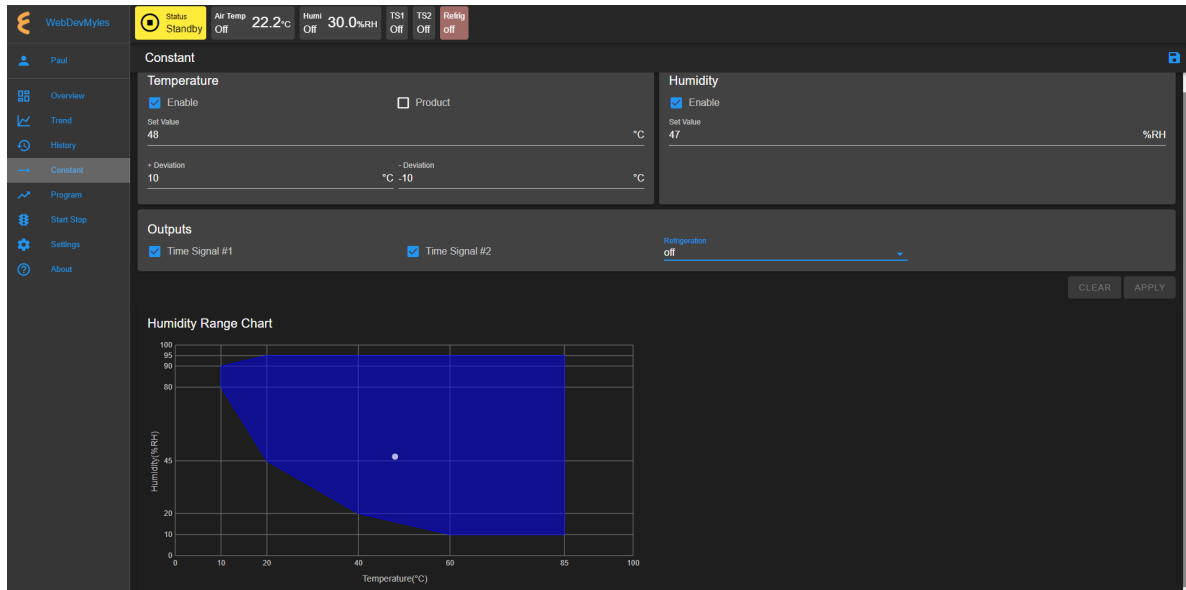


Figure 33.1: The Constant menu and its components

The following sections describe how to configure and control each of these parameters.

33.1 Product or Air Temperature Setting

Complete the following steps to turn on or modify temperature setting:

1. Enable air temperature or product temperature by checking the appropriate boxes.
2. Click the Set Value field and enter a new value, or apply the up/down arrow to adjust the value.
3. Adjust the plus/minus deviation in the appropriate fields.

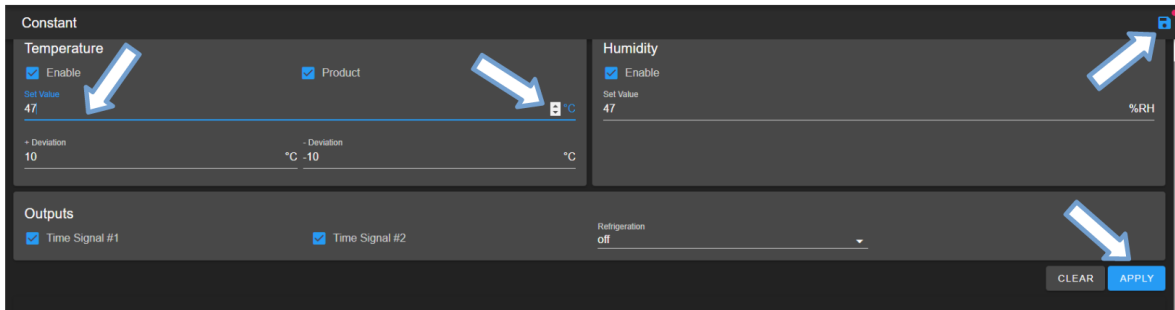


Figure 33.2: Apply new constant setting on temperature

- Click the **APPLY** button or the **Save** icon (indicated by the arrows) to apply and save the setting. The red dot next to the **Save** icon indicates that the new setting has not been saved. If you exit this pane by accessing a different menu in the menu bar, a warning message will appear (shown in figure).

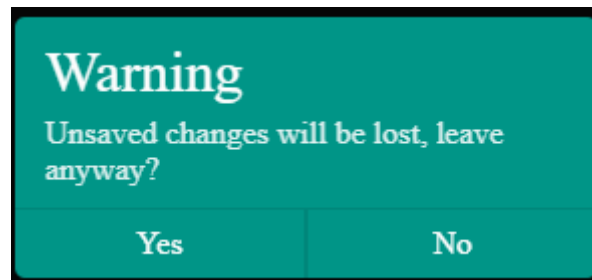


Figure 33.3: New setting must be save before exiting the pane

- To cancel the setting, click **CLEAR**.

The new setting takes effect immediately with its new status displayed in the status bar. To reverse or cancel the setting, repeat the above steps to reset the set value and click **APPLY**.

33.2 Humidity Setting

Complete the following steps to turn on or modify humidity setting:

- Enable or disable humidity with the appropriate check mark in the box.
- Click the Set Value field and enter a new value, or apply the up/down arrow to adjust the value.
- Click the **APPLY** button or the **Save** icon (indicated by the arrows) to apply and save the setting.
- To cancel the setting, click **CLEAR**. If you exit this pane by accessing a different menu in the menu bar, a warning message will appear.

The new setting takes effect immediately with its new status displayed in the status bar. To reverse or cancel the setting, repeat the above steps to uncheck the box, reset the set value and click **APPLY**.

33.3 Time Signals Setting

Complete the following procedure to turn on output for any time signal:

1. To turn on output for **Time Signal # 1**, place a check mark in its box.
2. Repeat the above step for any time signal available in the main display area.
3. Click the **APPLY** button or the save icon as indicated by the arrows in the above figure to apply and save the setting.
4. To cancel the setting, click **CLEAR**. If you exit this pane by accessing a different menu in the menu bar, a warning will appear which requires you to save the setting before attempting to access any other menus.

The new setting takes effect immediately with its new status displayed in the status bar. To reverse or cancel the setting, repeat the above steps to uncheck the box and click **APPLY**.

It is important to note that all the parameters (temperature, humidity, vibration, time signal) in the main display can be adjusted altogether simultaneously with a single **APPLY** or save button. However, individual setting may provide security to avoid any adverse effect.

CHAPTER 34

Program

The **Program** menu allows the operator to create a program to control the chamber. All the programming features available on the supported PLC's listed in Chapter 1 (“**Introduction**”) can be composed into programs to control the chamber. The operator can: (1) open and view a program; (2) preview the output of the program; (3) edit and/or overwrite an existing program ; (4) delete program from the list; (5) rename program on the list; (6) download a program and store it on the local computer in JSON file; (7) upload a program from the local computer to EWC, and much more.

Here are some of the benefits of the **Program** menu:

- Easy to operate.
- Quick management of programs, programming or editing.
- Require less time to develop a new program or modify an existing program.
- Program Editor offers flexibility with multitasking capabilities.
- Control program operation and program end mode.
- Preview program operation before execution; operator can see exactly what the program does prior to its execution.
- Download program from EWC to the local computer for backup.
- Upload program from the local computer to EWC.

Only authorized users with read-write privilege can access and utilize the **Program** menu. The user must log into their account to access the **Program** menu based on their read-write privilege, as depicted in the following figure.

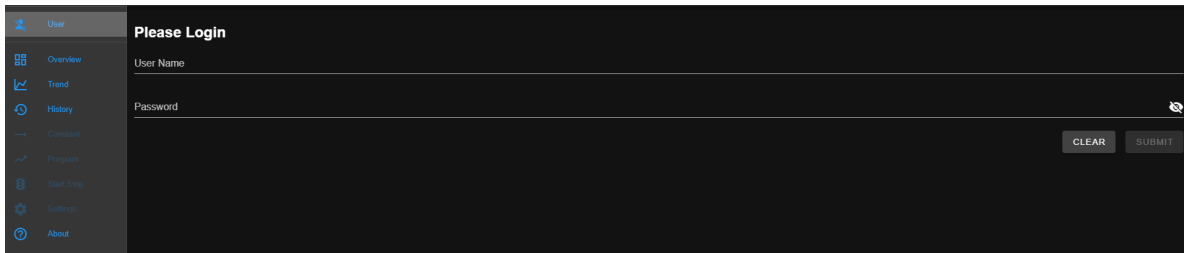


Figure 34.1: User with read-write privilege is required to operate the Program menu

34.1 List Programs

The following figure depicts a typical layout of the **Program** page with its submenu hidden. This is the default display of program list when the **Program** menu is accessed for the first time. Its UI components are numbered and explained as follows:

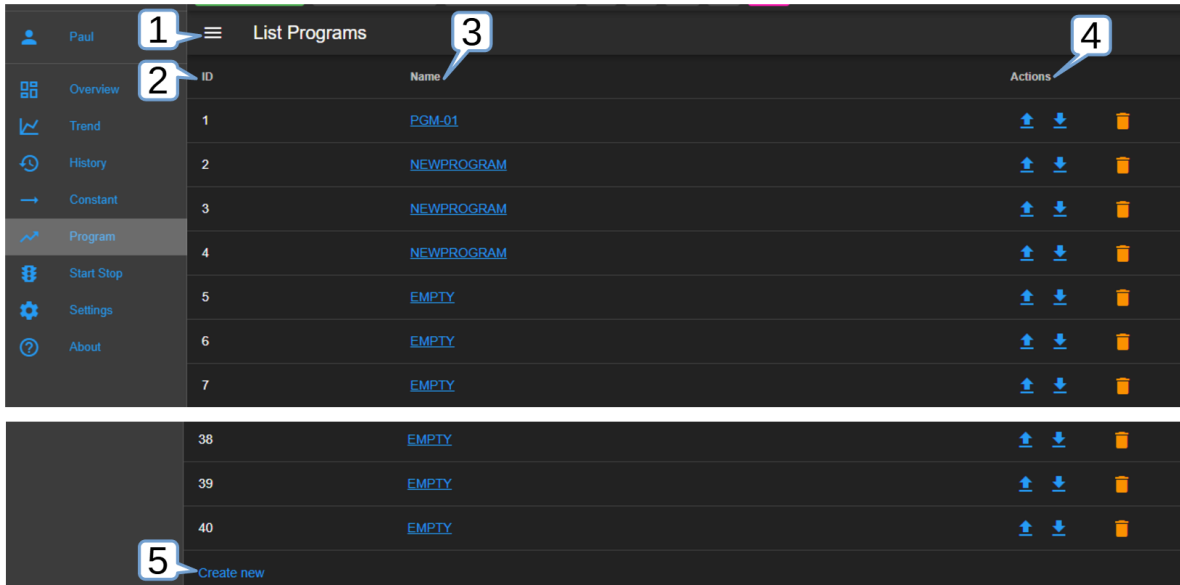


Figure 34.2: Program listing page with submenu hidden

1. **Submenu Show/Hide:** This button toggles between the “show and hide submenu” to allow the program editor utilize the entire main display area (see above figure).
2. **ID:** EWC identifies each program by its slot number stored in the PLC register. This list reflects the actual list of programs read from the PLC register. A total of 40 program slots are available, numbered from 1 to 40. The system uses a program identification code (ID) to identify each program.
3. **Program Name:** All available programs are listed under the **Name** column by program name. These programs are stored by their slot number. As such, identical program names may exist in different slots. Any slot not yet occupied by the program is marked **EMPTY**. Users can access each program under this list by clicking on the program name. The program editor then opens and displays the program instructions. Detailed operation of the program editor is discussed in the next section.
4. **Actions:** Three action buttons (Upload Program, Download Program, Delete) are available for managing the program under each row.
 - **Upload:** Program can be uploaded from the local computer to EWC which will then be stored in the PLC register using the slot number where the action was applied.
 - **Download:** Program can be downloaded and saved on the local computer.
 - **Delete:** A program to the left of the trash bin (where this action is applied) will be deleted. The PLC register will no longer contain this program.
5. **Create New:** This button opens the program editor for creating a new program. The **Create New** button is conveniently placed in two locations: (1) under the **ID** list and (2) in the **Program** submenu (shown in the following figure).

The following figure displays the **Program** page with its submenu unhidden. The submenu (item 2) has two operation buttons: (i) List Programs and (ii) Create New (program).

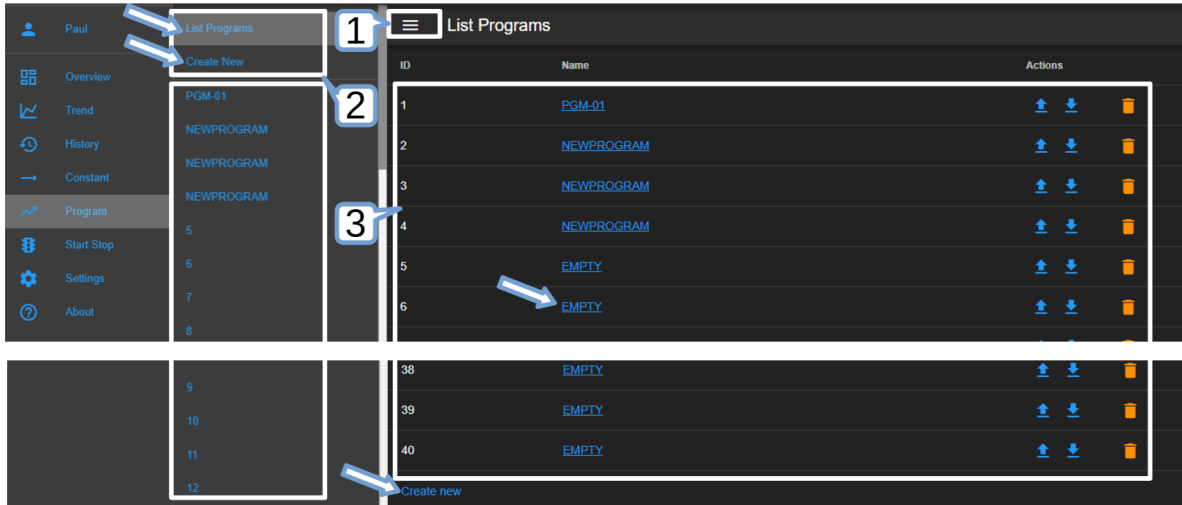


Figure 34.3: Program listing page with submenu unhidden

1. **Show/Hide:** The **Show/Hide** button can be used to hide or unhide the **Program** submenu (item 2 below).
2. **Submenu:** This submenu has two operation buttons (indicated by the arrows): **List Programs** and **Create New** (program). All the available programs in the chamber stored in EWC are listed below these operation buttons (shown in above figure). With the submenu hidden, the main display has a larger real estate to display the program elements.
 - **List Programs:** The **List Programs** button offers a quick way to exit the program editor (explained in the following section). To exit the program editor mode, click this **List Programs** button. This action will cancel and exit the program editor being used to create, edit or import a program.
 - **Create New:** Similar to the **Create New** button under the **List Programs** display page (item 3 below), this button opens the program editor with an empty template for constructing a new program. Detailed discussion is provided in the following section. A program from the local computer can also be imported into this empty template.
3. **List Programs:** This is the main display of the program list depicted in the previous figure. Click the **Show/Hide** button (item 1) to hide the submenu and expand the **List Programs** display page.

34.2 Create New Program

A new program can be created via one of the buttons depicted in the following figure.

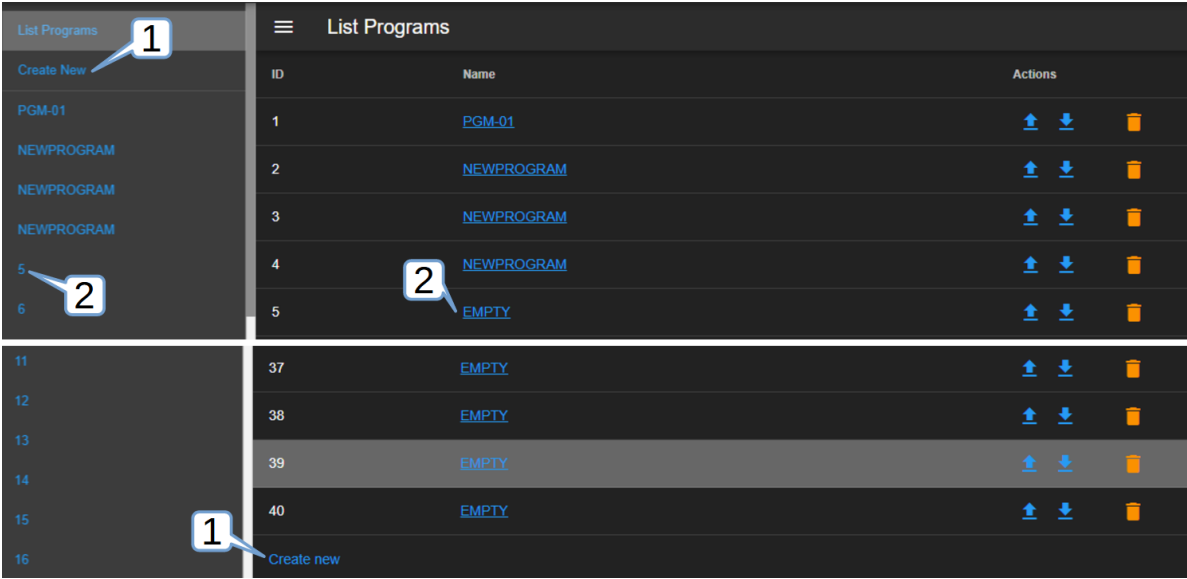


Figure 34.4: Different methods to creating a new program

Each of these buttons follows a different pattern to complete the task.

1. **Create New:** Click the **Create New** button in the submenu or under the **List Programs** in the main display to launch the program editor to create a new program. An empty template is opened for a new program, as depicted in the following figure.

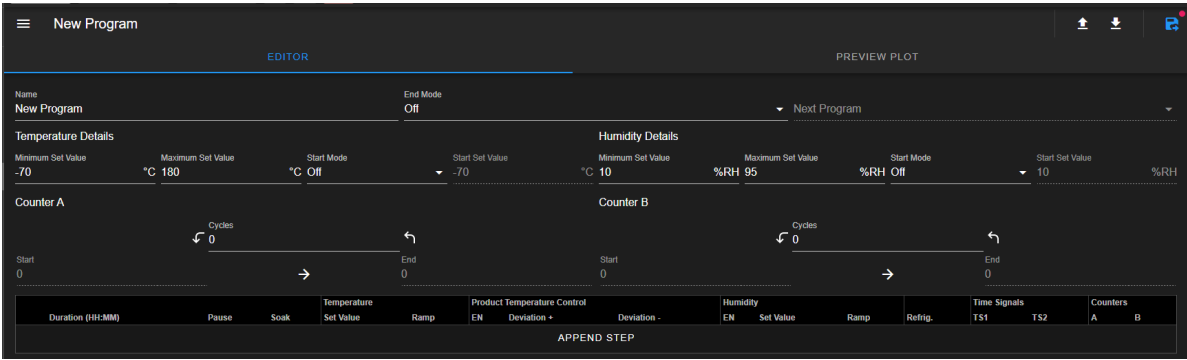


Figure 34.5: Empty template for a new program

The new program being constructed does not yet have a predefined location. For this reason, the program editor has only the **Save As** option to save the program in a specific or a desired slot number, as depicted in the following figure.

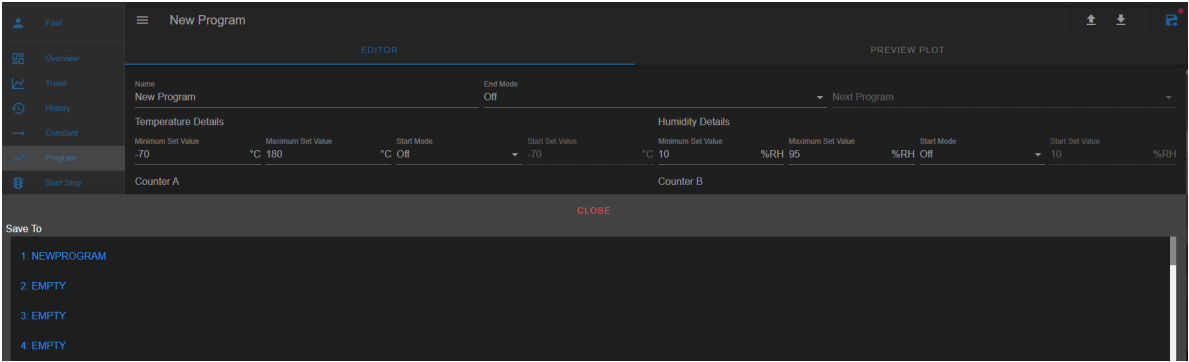


Figure 34.6: Selecting slot # to save new program

2. **EMPTY**: A new program can be created using a specific slot number. Click the slot number in the submenu or the **EMPTY** button on a desired slot number under the **List Programs** in the main display to launch the program editor to create a new program. An empty template is opened for a new program, as depicted in the previous figure.

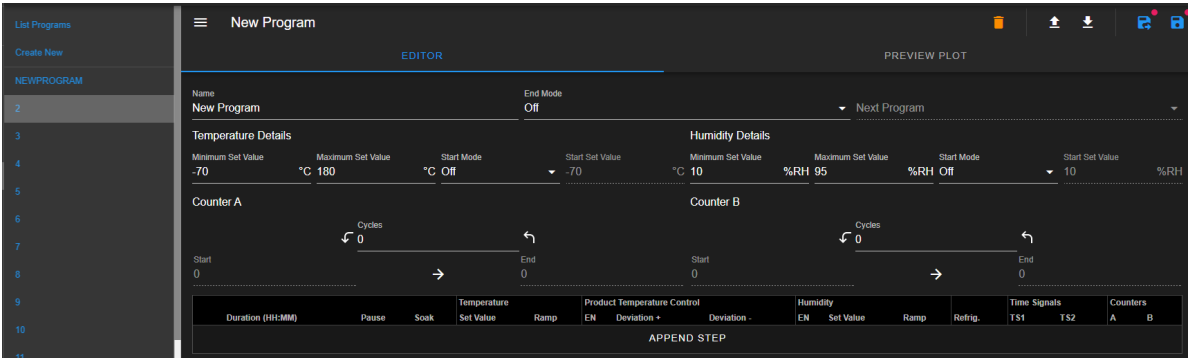


Figure 34.7: Empty template for a new program

Since the slot number has already been defined, the program editor offers two options to save the program: (1) Save As by selecting a new slot number or (2) Save (on the current slot number).

The following figure depicts the general layout of the empty template for a new program.

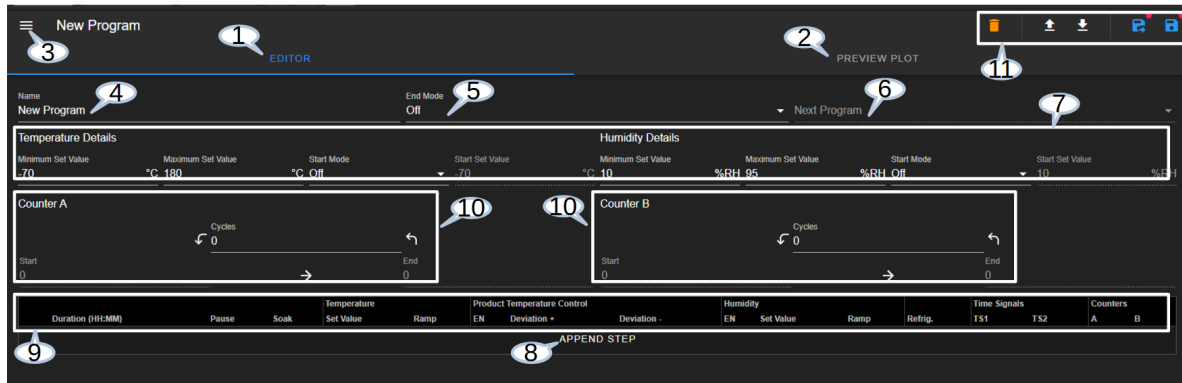


Figure 34.8: The structure and UI of the Programming Editor

Depending on the available options and features (such as temperature, product temperature, humidity, or vibration) of the P300 PLC, each template has different components, as depicted in the following figure for a vibration featured P300 (Mechanical HALT chamber).

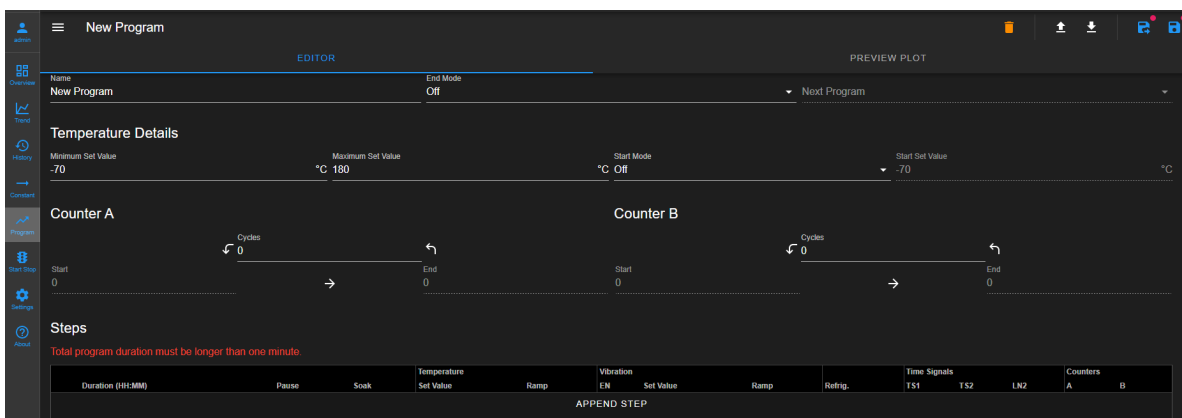


Figure 34.9: Programming template for Mechanical HALT chamber

The UI and components of the program editor (pictured above) are numbered and described as follows:

1. **Editor:** By default, a program is open and placed in the program editor. It is highlighted in blue to indicate its active status.
2. **Preview Plot:** The output of the current program can be previewed via this button. Both the **Editor** (item 1 above) and this button can be used to toggle between the editing and previewing mode of the current program. The **PREVIEW PLOT** button is operational only when a program is loaded into the program editor or a program has been constructed in the program editor.
3. **Submenu Show/Hide:** This button toggles between the show and hide mode of the submenu. To utilize the entire main display area for the program editor, this button can be used to hide the submenu.
4. **Program Name:** An alphanumeric naming convention based on ASCII with lower- or upper-case letters applies to program name with up to 15 characters. Program name should

be kept short and descriptive. Since each program is individually stored in a unique slot in the PLC, a unique name on EWC is not necessary. However, these programs must have unique names when they are stored on the local computer. When a program name is entered into this field, this name also appears in the title bar next to the show/hide button (item 3).

5. **End Mode:** An end mode available from four different options can be invoked after a program has completed its execution:
 - **Off:** The chamber will be turned off at the end of the program.
 - **Standby:** The chamber will be set to operate in a **Standby** mode at the end of the program.
 - **Constant:** The chamber will be set to operate in a **Constant** mode at the end of the program.
 - **Program:** The chamber will execute the next program listed in Next Program field. In theory, the PLC can continually execute different programs sequentially if each of those programs has its End Mode set to execute the next program on the list.
6. **Next Program:** A program to be executed following the completion of the current program.
7. **Temperature/Humidity/Vibration Details:** The minimum and maximum values of temperature, humidity or vibration are shown here for reference, including their start mode and set value. These are the specification values read off by EWC from the PLC. The display of these values depends on the type of chamber. The display may consist of **Temperature Details**, **Temperature and Humidity Details** or **Temperature and Vibration Details**.
 - **Minimum/Maximum Values::** These are the minimum and maximum values allowed by the chamber.
 - **Start Mode:** Three options are available with start mode: **Off**, **Process Value** and **Set Value**. A program must consists one of these modes.
 - **Start Set Value:** If a **Set Value** was selected (in the previous item), enter a set value here by entering the value in the value field or apply the up/down arrow to adjust the value.
8. **Append Step:** As shown in the previous figure, the program editor has an empty template. No instructions or steps of program have been added. To create an instruction, a new step must be created (or added). This APPEND STEP button is used to add a new step. Once a program has a step, additional steps can be added using this button or the drop-down menu of the Step Number (to be explained below). The APPEND STEP button always adds a new step as the last step in the program. By contrast, the drop-down menu of the Step Number allows a new step to be inserted above or below the current step. It also has a delete button to remove any step from the program.
9. **Step:** A program step contains instructions (and parameters) for the chamber to carry out the tasks. Depending on the type of chamber, a program step may contain different components and parameters (associated with temperature, product temperature, humidity or vibration) outlined as follows:
 - **Duration:** The duration specifies the length of time (measured in H:MM) that the said step goes through to complete its task. EWC accepts the input value in H:MM

or in pure numerical value. If a pure numerical value is entered, EWC converts it to H:MM. For instance, if 15 is entered, the system treats it as 15 minutes, and the H:MM format, therefore, becomes 00:15. If 66 is entered, the system converts it to 01:06. Similarly, if 90 is entered, the system renders the value to 1:30.

- **Pause:** If enabled, the program will pause execution when this step completes its task.
 - **Soak:** If enabled, the step will wait until the set point(s) are reached before the duration counter starts to count down.
 - **Temperature:** The temperature control loop has two parameters:
 - **Set Value:** The value that the temperature must attain.
 - **Ramp:** If enabled, the set point will gradually change from that of the previous step to the set value of this step over the duration of this step. If disabled, the set point of the previous step will jump immediately to the set value of this step.
 - **Product Temperature Control:** This option controls the product temperature (not the air temperature).
 - **EN:** This option enables or disable the production temperature control.
 - **Deviation +:** The allowable positive deviation between the product and air temperatures (must be positive).
 - **Deviation -:** The allowable negative deviation between the product and air temperatures (must be negative).
 - **Humidity:** The humidity control loop setting.
 - **EN:** Enable or disable humidity control for this program step.
 - **Set Value:** The value that the humidity must attain.
 - **Ramp:** If enabled, the set point will gradually change from that of the previous step to the set value of this step over the duration of this step. If disabled, the set point of the previous step will jump immediately to the set value of this step.
 - **Refrig.:** This option offers configuration on the refrigeration system and its behavior during the execution of this step. It can be configured for automatic or manual cooling power percentage; it can be completely disabled.
 - **Time Signals:** Each time signal can be switched to **ON** or **OFF** for this step. Time signal (TS) operation is step dependent. Suppose TS1 is turned **ON** at step 1 and the rest of the steps do not have TS enabled. In this case, TS1 will remain “ON” for the entire program. Thus, TS may be controlled independently, step by step.
 - **Counters:** The counter can be used to repeat execution of a certain step (or set of steps) within the program. Both counter A and counter B can be set by enabling the check box in their respective column then dragging the start and end arrows to the desired step. The number of times to repeat the steps can be adjusted in the text box in each column. When the text box is checked (or selected), the number of the repeating step begins with 1.
10. **Counter A, Counter B:** The counter (or loop) feature allows a certain step (or a range of steps) to be repeated multiple times within the program. With the counter feature, a program contains fewer instructional steps, and thereby requires less coding. Two separate counters are available: **Counter A** and **Counter B**. A program may contain a loop configured to run within a loop, such as Counter A executes inside Counter B. Two loops can be configured to run separately, repeating separate set of steps (referenced by their numbers). For instance, Counter A can be configured to execute step 1 through step 3 for 5 times and Counter B can be configured to execute step 4 through step 6 for 3 times. ESPEC P300

PLC supports a maximum number of 999 cycles. Counter A or Counter B each requires three parameters to operate:

- **Start:** A value that specifies the step number to begin the loop.
 - **End:** A value that specifies the last step in the loop.
 - **Cycles:** A value that specifies the number of loops to complete the counter. The total number of loops is this number plus 1. Thus, if a program requires step 1 through step 3 to repeat three (3) times, the value for the Cycles will be 2.
11. **File Manipulation:** Five different buttons (icons) are available for file manipulation. Their action can be previewed by hovering the mouse pointer over them. They are described from left to right as follows.
- **Delete:** Click on the trash bin icon to delete the current program. This action will delete the program in the program editor and its location in the current slot number of the PLC. A pop-up warning appears, as depicted in the following figure, to reaffirm the action.

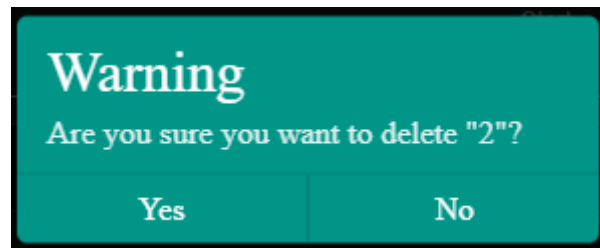


Figure 34.10: File deletion confirmation

- **Open Program:** This button imports a program file from the local computer into the program editor. EWC only accepts a program in JSON format. To ensure compatibility, the program structure should be based on the one downloaded from EWC itself (see **Download Program** below).
- **Download Program:** This button downloads the current program file and stores it on the local computer. The program is saved in JSON format using slot number as its filename (e.g., 9.json).
- **Save As:** Save the current program to a different slot number under the program list. This action brings up a program list, as depicted in the following figure, to select a new slot to hold the current program. To cancel this action, click the **CLOSE** button. **WARNING!:** A vacant slot should be selected to save the program. Otherwise, the current program will overwrite the existing one in the slot without prompting for reaffirmation, thus, destroying the program previously in that slot. The current program in a new slot still uses the same program name. To make it unique, edit item 4 (above) with a new name and apply the **Save** button (see below) to resave the program.

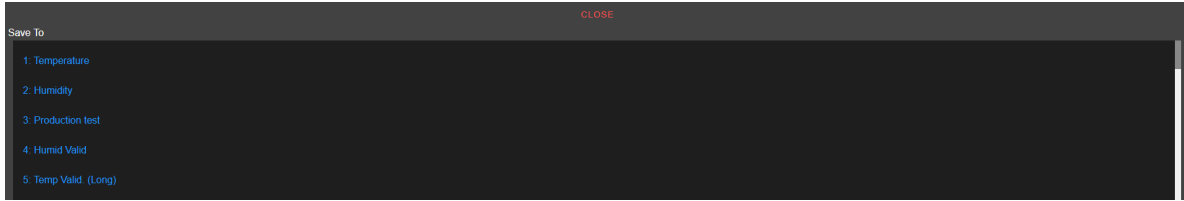


Figure 34.11: Save program to a new slot

- **Save:** This button saves the current program in the current slot on the F4T.

34.2.1 Programming: Add Program Step

The following example illustrates how to create a new program using four steps with both counters enabled to repeat these steps. Temperature and refrigeration are used to illustrate this example. The start mode for the temperature is set to Off. Each step will have its own set value as a target temperature value. The refrigeration will be set for a manual cooling power specified at 20% for the first three steps; the last step will have refrigeration power at 50%. The chamber will be turned off after the program completes its task. Counter A and Counter B will be used to demonstrate a loop running inside a loop; Counter A will between step 2 and step 3, while Counter B will loop between step 1 and step 4, thus making Counter A looping inside Counter B. All steps must be constructed before enabling these loops. Alternating time signals will be controlled. Slot 2 will be used to create this program. We begin from the main menu.

1. Click **Program** in the side bar.
2. Click **EMPTY** on slot 2 on the Program List. To follow along with this example, slot 2 should be empty.
3. **Program Name:** Enter **PROG2TEST** in the program name field.
4. **End Mode:** Set end mode to Off.
5. **Start Mode:** Set temperature start mode to off.
6. **Add New Step:** Click the **APPEND STEP** button.
7. **Step 1:** Complete the following fields for this step from left to right:
 - **Duration:** Enter 0:20.
 - **Pause:** Leave the Pause box unchecked.
 - **Soak:** Leave the Soak box unchecked.
 - **Temperature:**
 - **Set Value:** Enter 23 or apply the up/down arrow to adjust the value to 23.
 - **Ramp:** Leave the Ramp box unchecked.
 - **Refrig.:** Click the Off field or arrow button and select 20% from the drop-down list (shown in figure below).

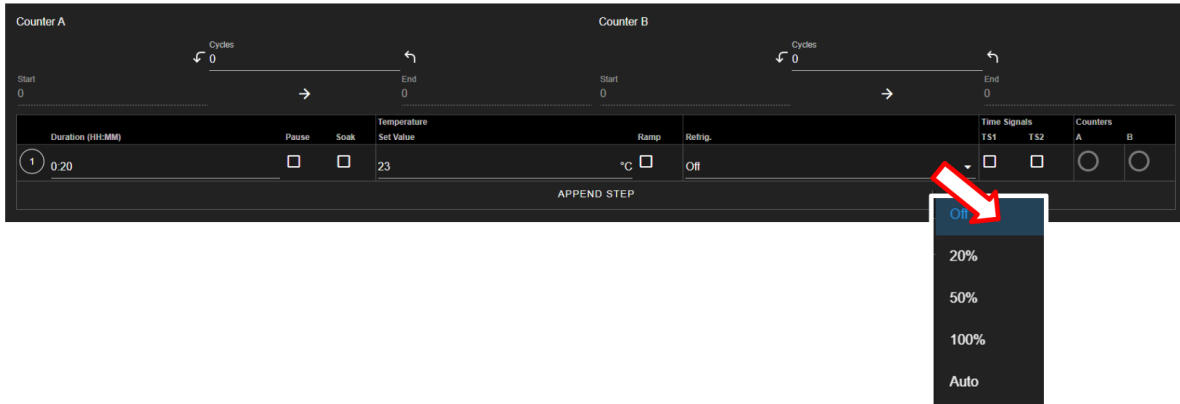
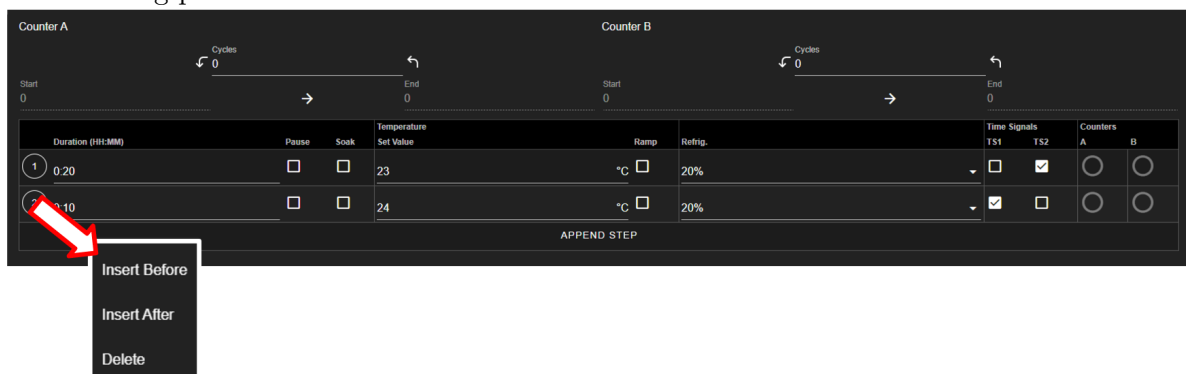


Figure 34.12: Set refrigeration with cooling power of 20%

- **Events:**
 - **TS2:** Check the TS2 box to enable time signal 2.
 - **Counters:** Loops for Counter A and Counter B can be configured once all the steps have been added.
8. **Step 2:** Click the **APPEND STEP** button to add a new step; then complete the following fields from left to right:
- **Duration:** Enter 0:10.
 - **Pause:** Leave the Pause box unchecked.
 - **Soak:** Leave the Soak box unchecked.
 - **Temperature:**
 - **Set Value:** Enter 24 or apply the up/down arrow to adjust the value to 24.
 - **Ramp:** Leave the Ramp box unchecked.
 - **Refrig.:** Click the arrow button and select 20% from the drop-down list (see above figure).
 - **Events:**
 - **TS1:** Check the TS1 box to enable time signal 1.
9. **Step 3:** Click number 2 in the circle at the beginning of step 2 (shown in the figure below). Select **Insert After** from the drop-down menu and edit the fields from left to right with the following parameters:



- **Duration:** Enter 0:10.
 - **Pause:** Leave the Pause box unchecked.
 - **Soak:** Leave the Soak box unchecked.
 - **Temperature:**
 - **Set Value:** Enter 32 or apply the up/down arrow to adjust the value to 32.
 - **Ramp:** Leave the Ramp box unchecked.
 - **Refrig.:** Click the arrow button and select 20% from the drop-down list (see above figure).
 - **Events:**
 - **TS2:** Check the TS2 box to enable time signal 2.
10. **step 4:** Click number 3 in the circle at the beginning of step 3 (see above figure). Select **Insert After** from the drop-down menu and edit the fields from left to right with the following parameters:
- **Duration:** Enter 0:10.
 - **Pause:** Leave the Pause box unchecked.
 - **Soak:** Leave the Soak box unchecked.
 - **Temperature:**
 - **Set Value:** Enter 34 or apply the up/down arrow to adjust the value to 34.
 - **Ramp:** Leave the Ramp box unchecked.
 - **Refrig.:** Click the arrow button and select 50% from the drop-down list (see above figure).
 - **Events:**
 - **TS1:** Check the TS1 box to enable time signal 1.
11. **Counters:** Both counters will be used to create a loop inside a loop structure. Counter A will loop through step 2 and step 3 twice; Counter B will loop through step 1 and step 4 once, with Counter A looping inside it.
- **Counter A:** Activate the counter by entering the cycle (loop) number, with start step and end step as follows:
 - **Cycles:** Enter 2. Note: Before Counter A begins to loop, it already completed one loop; thus, 2 plus 1 equals 3, and 2 is the number used for the cycle number.
 - **Start:** Enter 2 for step 2.
 - **End:** Enter 3 for step 3.
 - **Counter B:** Activate the counter by entering the cycle (loop) number, with start step and end step as follows:
 - **Cycles:** Enter 1. Note: Before Counter A begins to loop, it already completed one loop; thus, 1 plus 1 equals 2, and 1 is the number used for the cycle number.
 - **Start:** Enter 1 for step 1.
 - **End:** Enter 4 for step 4.

The complete loop construction for Counter A and Counter B is depicted in the following figure.

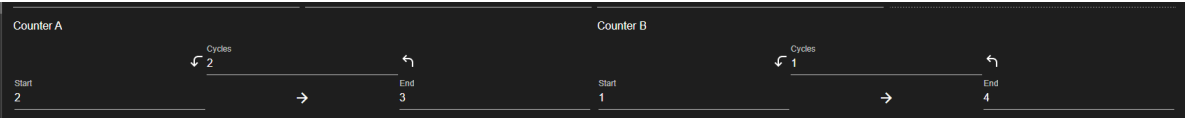


Figure 34.13: P300-counters-001.PNG

This construction also results in the activation of counters in the program structure (last column) as depicted in the following figure.

12. **Save Program:** Click the **Save** icon indicated by the arrow, as shown in the following figure, to save the program in slot number 2. This figure also illustrates the complete program in the program template.

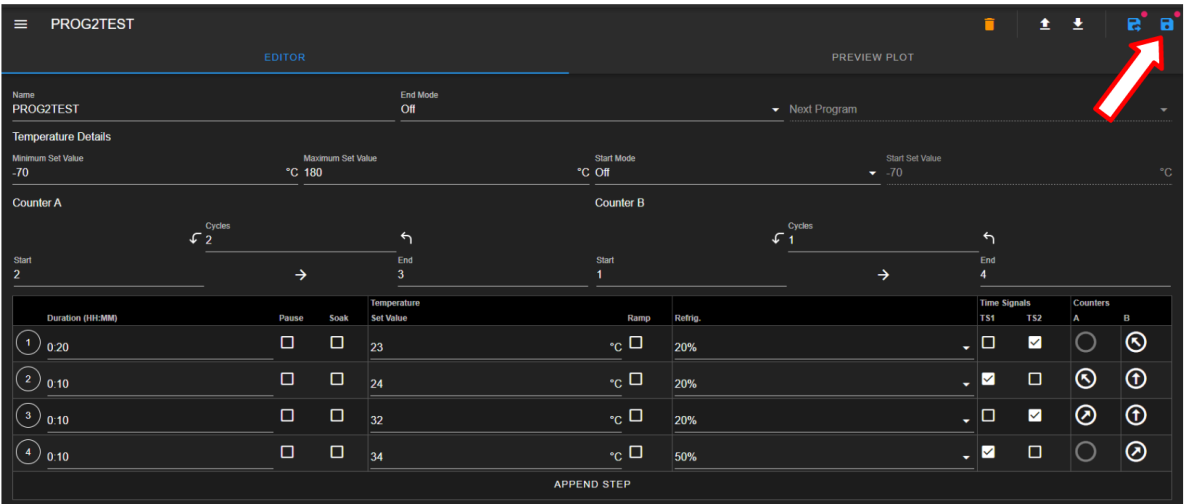


Figure 34.14: Save current program

Navigating out of the editor without saving the program will trigger the following warning prompt:

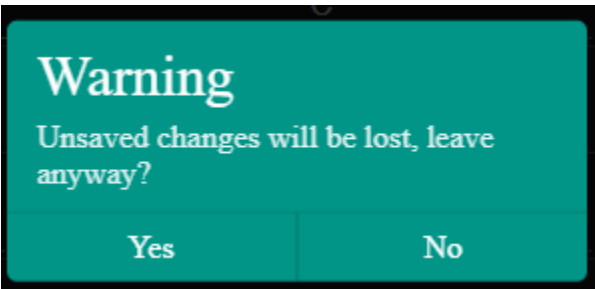


Figure 34.15: Confirm the save or discard update

13. **Preview:** Click the **PREVIEW PLOT** button to preview the output of the current program (see figure below). Click the **EDITOR** button to toggle back to the editor mode. Program cannot be saved while in the preview mode. In order to save the program, navigate back to the program editor to apply the **Save** or **Save As** button.

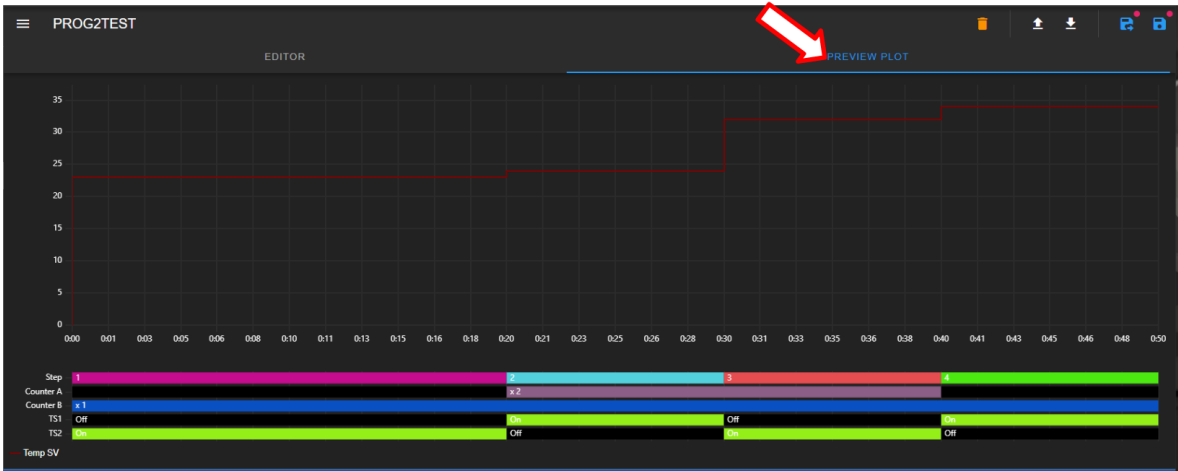


Figure 34.16: Program in preview mode

34.3 View, Edit, Save Program

This section describes how to open an existing program for viewing and editing. Changes made in the program can be written back to the file with **Save**. A new slot can be used for this updated program using the **Save As** option.

34.3.1 Open Program

To open a program for viewing or editing, click on its name under the Name list, as depicted in the following figure. Program **PROG2TEST** (indicated by the arrow) will be used for illustration. The **Download** (or **Delete**) button is only available if any slot under the Name list has a program in it, such as slot 1 and 2.

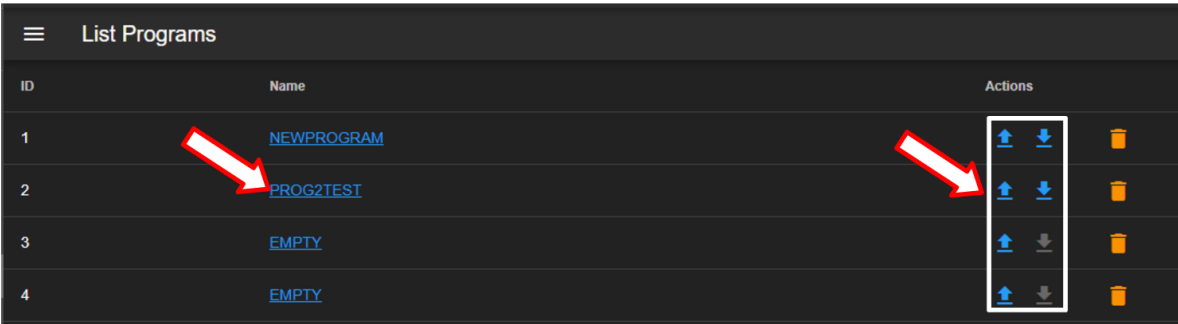


Figure 34.17: Opening a program profile

Once open, the program is placed in the program editor for editing. The file manipulation buttons (**Delete**, **Open Program**, **Download Program**, **Save As** and **Save**) offer different options to handle the program file or manipulate the program editor. These buttons will be explained in detail in the following sections.

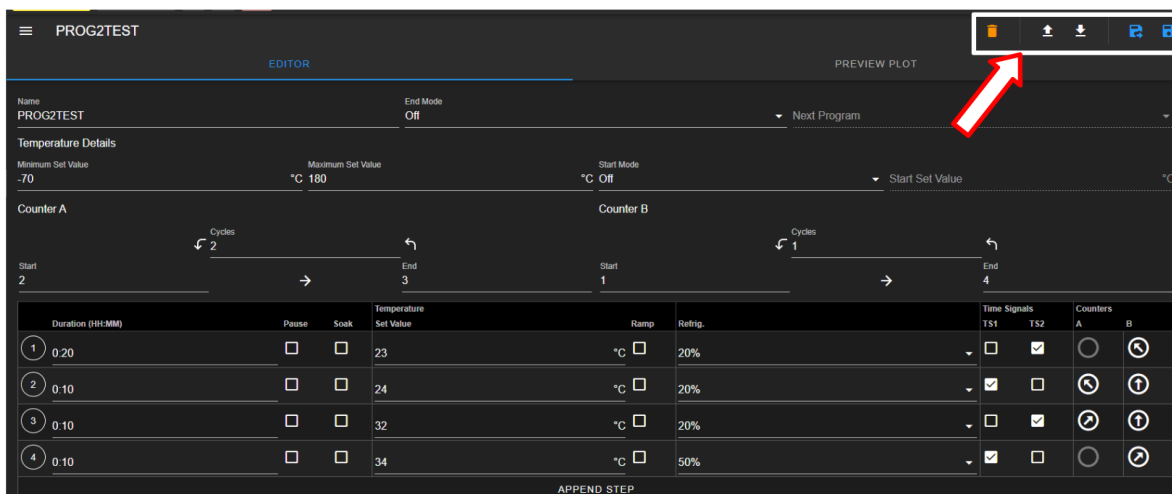


Figure 34.18: File manipulation buttons

34.3.2 Editing Program: Programming Example

This section illustrates the process of editing **PROG2TEST** program with additional steps and the ability to execute another program. The program to be executed after **PROG2TEST** completes its own execution is **NEWPROGRAM** in slot 1, as depicted in the previous figure. It contains only one step with temperature set value at 35 degrees C for the duration of 60 minutes, with refrigeration set to Auto and no time signal setting. **PROG2TEST** will consist of the following procedure:

1. **End Mode:** Set end mode to execute a new program.
2. **Temperature Start Mode:** Set temperature start mode with set value at 22 degrees C.
3. **Step 3:** Insert a new step between 2 and 3 with temperature set value of 28 with soak feature for a duration of 30 minutes. Set refrigeration to Auto with time signal 1 on 2 off. Counter A will be adjusted to include this step. Counter B will be adjusted to still include Counter A inside it.
4. **Step 6:** A new step to be added as the last step in the program with: temperature set value of 25, refrigeration of 50%, time signals 1 and 2 switched to On.

The editing process is as follows:

1. **End Mode/Next Program:** Click the End Mode field and select Program from the drop-down list (see figure below), then click the Next Program field and select the program from the drop-down list (**NEWPROGRAM** is used for example).

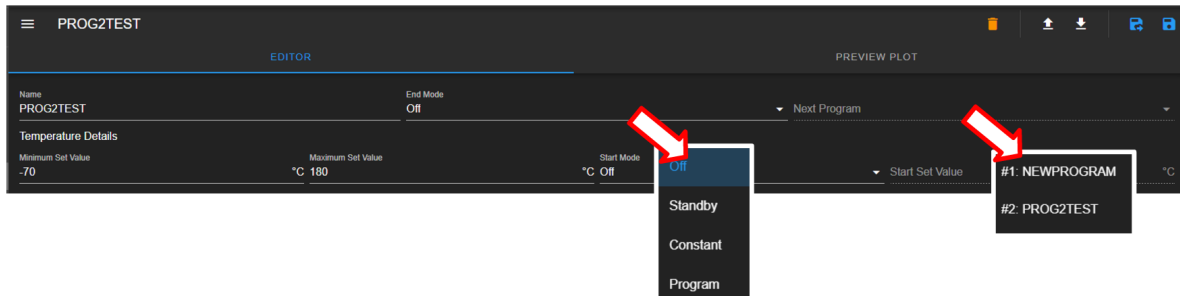


Figure 34.19: Select program to execute next

2. **Temperature Start Mode:** Click the Temperature Start Mode field and select Set Value. Apply the up/down arrow to adjust the set value to 22.

3. **Step 3:** Click number 2 in the circle at the beginning of step 2 and select **Insert After** from the drop-menu and set the parameter as follows:

- **Duration:** Enter 0:30.
- **Soak:** Enable the soak feature.
- **Temperature:**
 - **Set Value:** Enter 28.
- **Refrig.:** Select refrigeration to Auto.
- **Events:** Time signals 1 and 2 are off.

4. **Last Step:** Click the **APPEND STEP** button and set the parameters as follows:

- **Duration:** Enter 0:30.
- **Temperature:**
 - **Set Value:** Enter 28.
 - **Ramp:** Enable the ramp feature.
- **Refrig.:** Select refrigeration to 50%.
- **Events:** Time signals 1 and 2 are on.

5. **Loops:** Adjust Counter A with start step at 2 and end step at 4. Adjust Counter B with start step at 1 and end step at 5, keeping the cycle number the same.

6. The final program and its output (preview) are depicted in the following figures.



- Save Program:** The new program can be saved back in its current slot with the **Save** button. However, other options are available to manipulate the program file. It may be necessary to save it in a different slot so that the original program can be retained in the current slot. The following section describes how to utilize the file manipulation buttons in detail.

34.3.3 Managing Program File via the Program Editor

This section describes how to apply the five file manipulation options available in the program editor (upper-right corner), as depicted in the following figure.

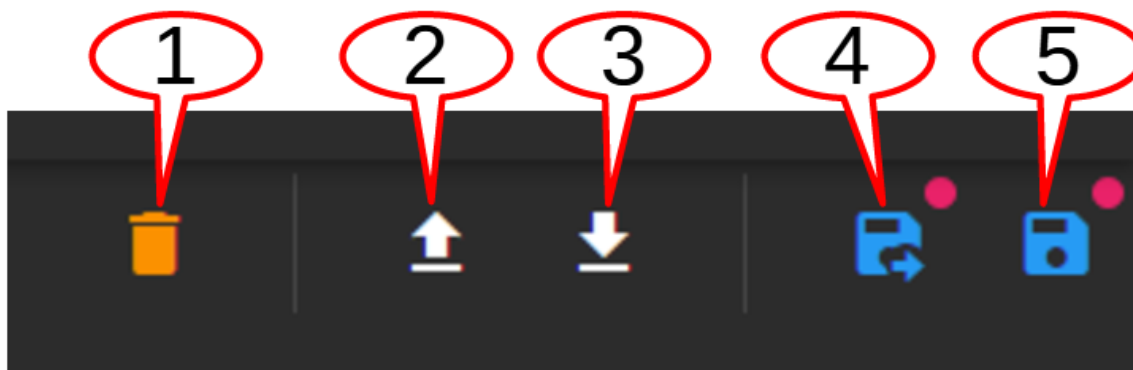


Figure 34.20: File manipulation options

They are described as follows:

1. **Delete:** The trash bin icon, when applied, deletes the current program in the program editor; that program is purged from the current slot in the PLC register, with the **EMPTY** listed under the ID list. For safety measure, the system prompts a pop-up warning with a Yes/No option. After deletion, the Program menu updates the Name list.
2. **Upload Program:** This button imports a program file from the local computer into the program editor. By default, the system opens the Downloads folder on the local computer to upload the program file.
3. **Download Program:** The current program in the program editor can be downloaded onto the local computer as a backup. By default, the program will be stored in the Downloads folder. The hostname and program slot number are used as part of the downloaded filename (e.g., hostname_program_2.json).
4. **Save As:** Program in the program editor can be saved in a different slot, under a different name. To make the program name unique, the Name field may be edited with a new program name. This procedure thus requires a two-step process indicated by the arrows in the following figure. First, edit the program name; second, click the **Save** button and select a new slot from the drop-down list.

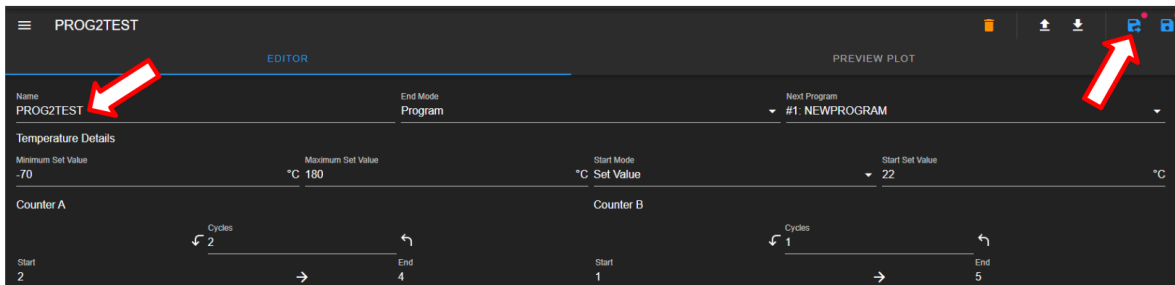


Figure 34.21: Save current program as a new file

5. **Save:** Apply this button to update the program file. To help check the editing status of the program, the program editor utilizes a red dot placed above the **Save** or **Save As** button to indicate an update yet to be saved.

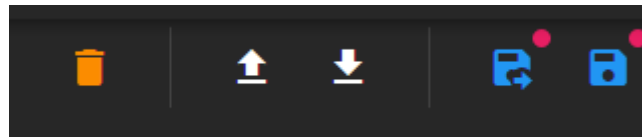


Figure 34.22: Update indicator

Navigating out of the editor without saving the update will trigger a warning prompt, as depicted in the following figure.

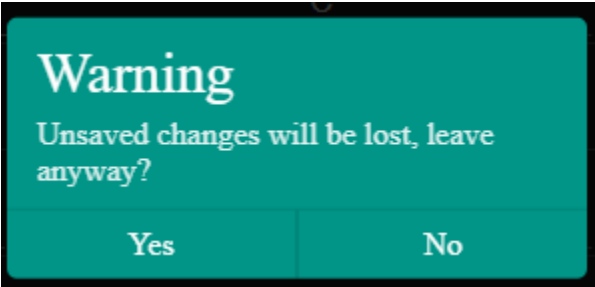


Figure 34.23: Confirm the save or discard update

34.3.4 Managing Program File via the Name List

This section describes how to apply the three file manipulation options on the Name list, as depicted in the following figure.

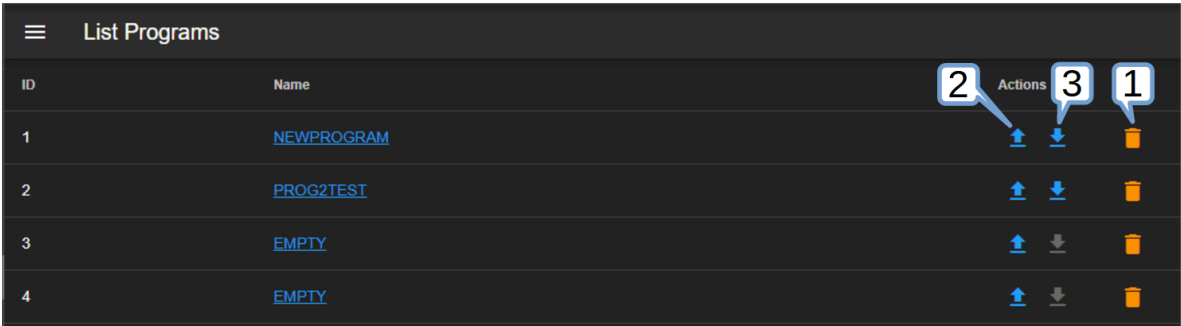


Figure 34.24: Manage programs on the Name list

These three options are listed and described as follows:

- 1. **Delete:** To delete **PROG2TEST** from the Name list (and the PLC register), click the trash bin icon indicated by the arrow (see figure below). As a safety measure, the system will prompt to confirm the action with a pop-up warning with a Yes/No option to proceed with the action. It may be necessary to apply the refresh button of the Web browser after deleting the program file from the Name list.

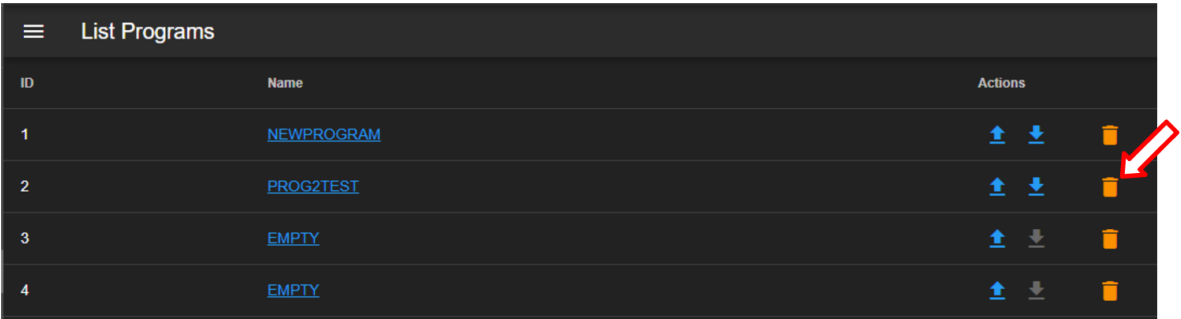
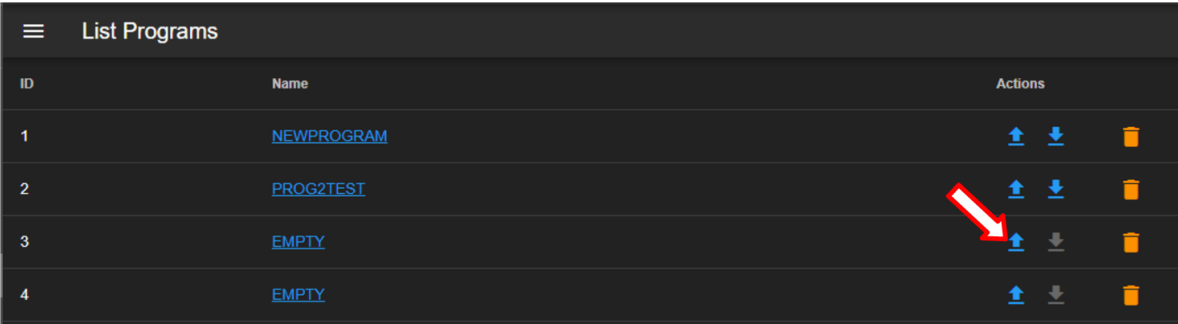


Figure 34.25: Deleting program from the Name list

- 2. **Upload Program:** This button can be used to import a program from the local computer directly into a program slot on the Name list and the PLC register. To upload a program

into slot 3, click on the **Upload** button, as indicated by the arrow in the figure. Navigate to locate the desired file on the local computer and double-click it to complete the process.















ID	Name	Actions
1	NEWPROGRAM	  
2	PROG2TEST	  
3	EMPTY	  
4	EMPTY	  

Figure 34.26: Importing a program

3. **Download Program:** To download a program **PROG2TEST** on slot 2, click on the **Download** button (on the same row). By default, the program file will be stored in the **Downloads** folder on the local computer; filename naming convention is host-name__program2__json.

CHAPTER 35

Start Stop

This menu allows the operator with read-write privilege to control or manage the chamber with the following operation modes: **Standby**, **Constant** and **Program**. The following figure depicts these modes displayed in the main display area as individual tabs.

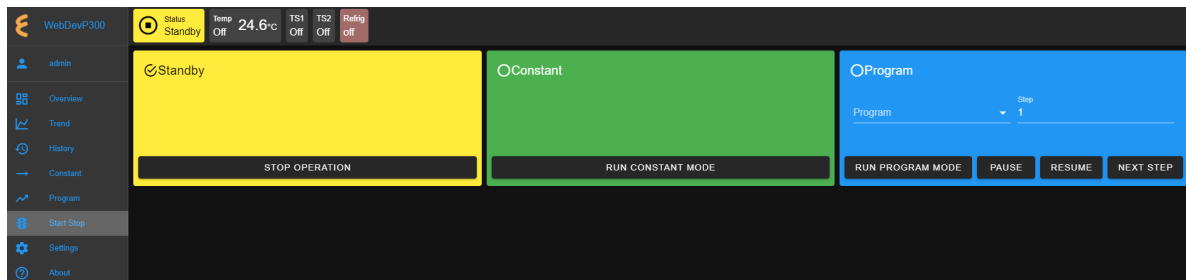


Figure 35.1: The Start/Stop menu with a Status Bar

The **Status** tab in the status bar also provides access to these modes for control and operation. Refer to the **Overview** menu for detail on how to control the chamber operating modes.

35.1 Standby Mode

In a standby mode, the chamber is off. Its status tab in the status bar displays **Standby**. This status is confirmed by the check mark in the Standby tab in the main display, as illustrated in the above figure. Authorized users with read-write privilege may set the chamber to operate in **Standby** mode.

35.1.1 Start/Stop Standby Mode

A standby mode can be switched from constant or program mode as follows:

1. Click the **Start Stop** menu.
2. Click the **STOP OPERATION** button in the **Standby** tab.

EWC immediately moves to apply the operating mode on the chamber, with a check mark in the Standby tab. Standby is also displayed in the Status tab of the status bar, as illustrated in the above figure. To terminate the **Standby** mode, activation of a new mode is necessary.

35.2 Constant Mode

In a constant mode, the chamber operates using the constant configuration. Authorized users with read-write privilege may set the chamber to operate in **Constant** mode.

35.2.1 Start/Stop Constant Mode

A constant mode can be switched from a standby or program mode as follows:

1. Click the **Start Stop** menu.
2. Click the **RUN CONSTANT MODE** button in the **Standby** tab.

Its status tab displays **Constant**. This status is confirmed by the check mark in the **Constant** tab, as depicted in the following figure.

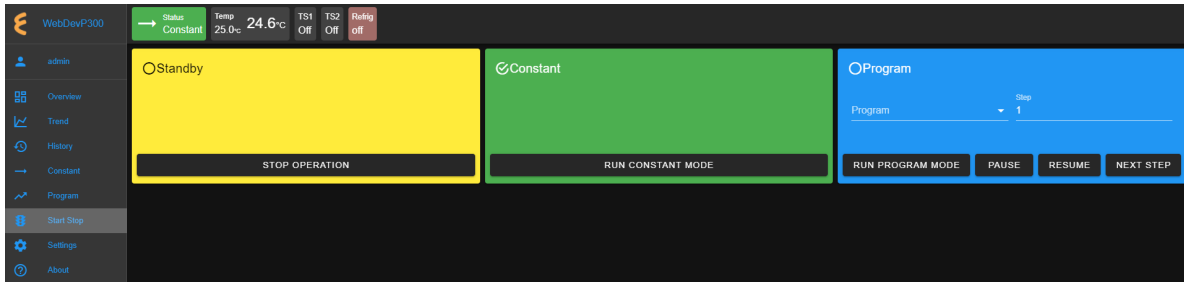


Figure 35.2: The Start/Stop menu with chamber in Constant mode

To terminate the **CONSTANT** mode, activation of a new mode is necessary. For instance, to switch the chamber from its **Constant** mode to **Standby** mode, click the **STOP OPERATION** button in the **Standby** tab. EWC immediately moves to apply the operating mode to the chamber.

35.3 Program Mode

In a program mode, the chamber carries out instructions of the program being executed. The status tab in the status bar posts **Program**, along with the name of the program being executed. This status is confirmed by the check mark in the Program tab, as depicted in the following figure.

Authorized users with read-write privilege may set the chamber to operate in **Program** mode by performing a series of operations in the **Program** tab. The following subsections explain how to run (execute) a program, pause, resume or step through the instructional steps in the program.

35.3.1 Run Program

A program mode can be switched from standby or constant. To load and execute a program to control the chamber, complete the following steps:

1. Click the **Start Stop** menu.
2. Click the radio button in the **Program** tab to select a program from the list (scroll down, if necessary), as depicted in the following figure.

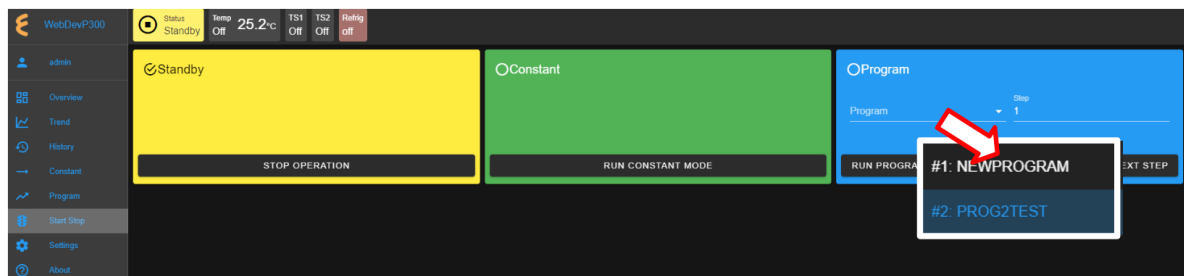


Figure 35.3: Executing a program from the Program List

3. Click to select the desired program name.

4. To start this program at a certain step, enter the step number in the **Step** field. Default setting is 0, which means to start program at step 1.
5. Click the **RUN PROGRAM** button to execute the program. EWC immediately moves to apply the operating mode to the chamber. The status tab and status bar now display the program being executed, as depicted in the following figure.

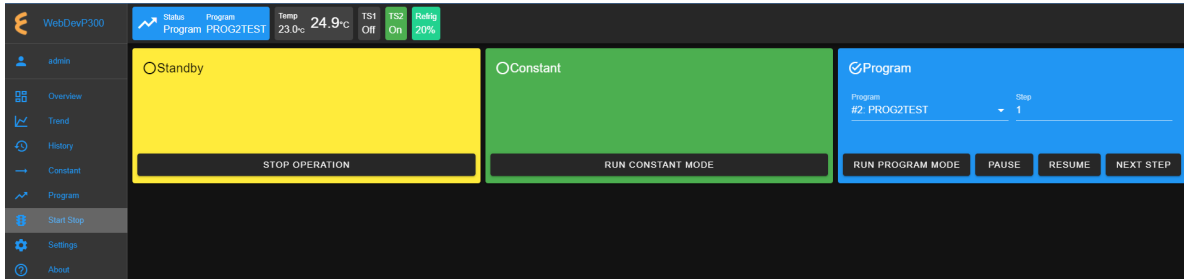


Figure 35.4: The Start/Stop menu with chamber in Program mode

The **Overview** page maybe accessed to display the detail of the program being executed.

35.3.2 Pause/Resume Program

Authorized users with read-write privilege may control the chamber during program execution. **Program** mode may be interrupted and put in a “suspense mode” using the **PAUSE** button in the **Program** tab. To pause a program during execution, click the **PAUSE** button; all operations are suspended. An update notification appears in the lower-right corner. The **Paused** notification is posted in the status tab.

To resume the operation and continue program execution, click the **RESUME** button. An update notification appears in the lower-right corner. The chamber will continue to operate based on instructions in the program. Program name is posted in the status tab to indicate chamber is in **Program** mode and that program is being executed.

35.3.3 Stepping through Program

Without having to wait for each step in the program to complete its tasks for the entire duration in the instruction, an operator may step through the program to study the effects of the instructions in a certain step. While the program is being executed, click the **NEXT STEP** button to execute the next step in the program. This action may be repeated until the last step in the program is reached. The **Overview** page in combination with the extended tab maybe accessed to display the detail of the program being executed and its steps being stepped through. The following figure depicts program **TempVib1** being stepped through to executing step 4.



Figure 35.5: Stepping through a program

35.4 Alarm Mode

An alarm mode is not an operation mode controllable by the **StartStop** menu as the previous three modes. An alarm mode occurs when the chamber is in an alarm state. When EWC detects the chamber in an alarm state, it sets itself in an alert state by displaying a list of active alarms and fault names in the red window to require an immediate action from the operator, as depicted in the following figure.

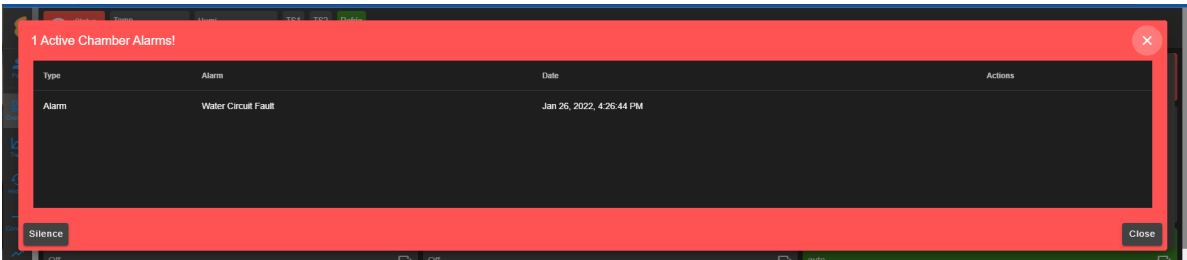


Figure 35.6: Chamber in alarm state

A repeating beep on the local computer is tripped to get the operator’s attention. The **SILENCE** button can be used to turn off the beep. The **CLOSE** or X buttons can be used to close this window. However, the alarm state still remains to be resolved as indicated by the red **Status** tab in the status bar (shown in the following figure). To redisplay or expand the alarm list, click the red dot in the lower-right corner.

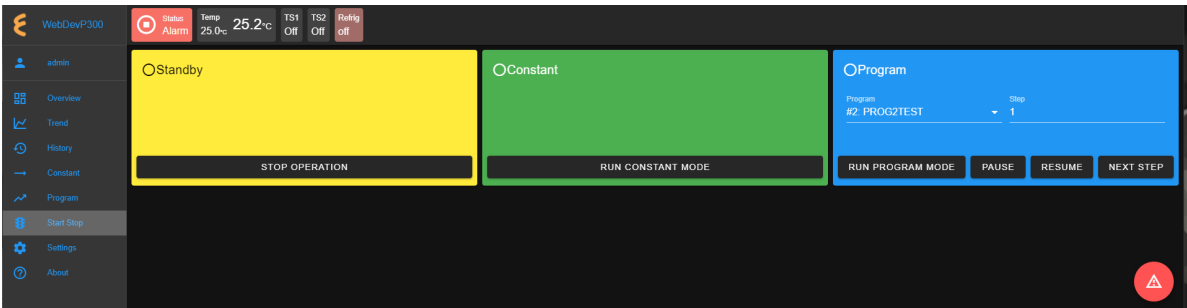


Figure 35.7: Alarm state during constant or program mode

35.4.1 Clear Alarms

The chamber is set in the **Alarm** state as a result of an alarm or alarms triggered in and by the chamber. EWC relays all alert messages to the operator for immediate action or intervention to prevent further damage to the chamber or any test products inside the chamber.

In an alarm state, all operations are halted until all alarms triggered by chamber are resolved by clearing all alarms via the PLC's HMI (see the chamber and PLC operation manual for detail). When all alarms are cleared, EWC will automatically clear all alert messages and resume normal operation by switching the chamber to a **Standby** mode.

35.5 Timers

The **Timers** tab provides a quick way to apply the Macro Editor to automate a simple macro action to extend the operating mode of the chamber. There are two timer types: One-time timer and repeated timer. The one-time timer or one-shot timer allows an operator to set up a single (hence, one-time) operation on the chamber, while the repeated timer permits an operator to set up a repeated operation on the chamber. The repeated timer will operate indefinitely until it is disabled. The following figure depicts these two timer types.

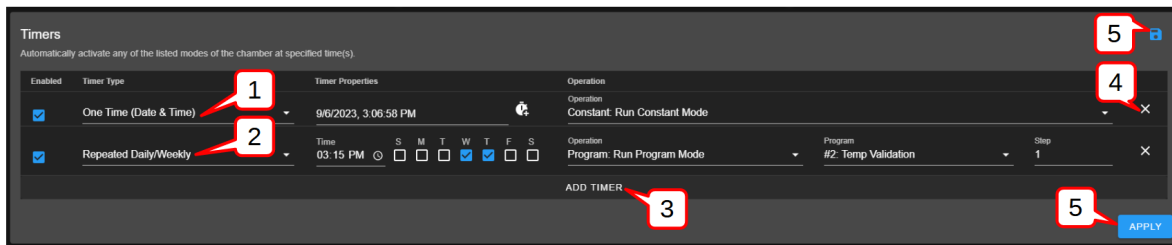


Figure 35.8: Example of one-time and repeated timer operation

1. **One-Time:** This timer fires the constant mode operation at 3:06:58 PM on 9/6/2023. The timer instruction and 3:06:58 PM must be configured ahead of time, later than the current time in order for the operation to take effect. For this reason, EWC date/time must synchronize with the current or local date/time (refer to **Date/Time Settings** under the **Settings** menu for detail). The one-shot timer is date/time dependent.
2. **Repeated Daily/Weekly:** This line is added after the first line got executed. Since it is set to occur after the first line, it will trip at 3:15 PM on Wednesday and Thursday of the week (in reference to the current date/time of EWC). The action executes a program from slot 2 (also referenced by the program name). When program execution is complete, the chamber will be set in the operating mode specified by the instruction in the program. This timer type is date/time independent; the operation will recur until the timer itself is removed from the **Timers** list or disabled with the **Enabled** box unchecked.
3. **Add Timer:** A new timer can be added using the **Add Timer** button, which will be added at the bottom of the list.
4. **Remove/Delete:** Each timer can be removed using the **X** button to its right.
5. **Save/Apply:** To start the timer, the **Save** or **Apply** button must be used. The two timer instructions (depicted above) are saved under the Macro Editor called **Operation Timer**

1 and **Operation Timer 2**, respectively. If the timers are edited with new instructions and saved, the system generates a new name **Operation Timer 3** for the third timer, with a numeral incremented by one per each update. If the timer instructions are all removed from the **Timers** list, and a new timer is created and saved, the system starts over with **Operation Timer 1**, with its numeral incremented by one on each new update. This information can be viewed under the **Macros** submenu (under the **Settings** menu).

35.5.1 Program Mode: One-Time Timer

A one-shot timer sets the **Timers** to fire a certain action once based on the set date and time. With this feature, a selected program can start at a certain day and time once. The running program can be paused, resumed or stopped by another (subsequent) one-shot timer. An operator can plan to stop a certain program and switch the chamber to a different mode with the one-shot timer.

The following example illustrates how to set a one-shot timer to switch the chamber from **Standby** to **Program** and execute the said program starting with step 1.

1. Log in using the **admin** account
2. Access the **Start Stop** menu
3. Touch or click the **ADD TIMER** bar
4. Select/confirm that **One Time** is selected from the drop-down list of the **Timer** type; by default, **One Time** is selected.

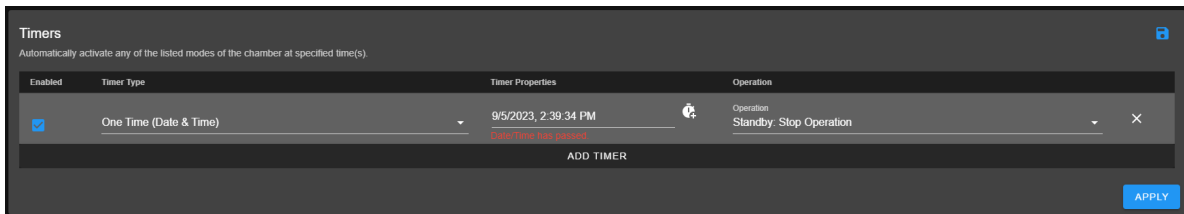


Figure 35.9: Setting a one-time automation

5. Touch or click the date/time field under the **Timer Properties** and apply the calendar and time to set the desired time. **Note:** Date and time must be ahead of the current date and time on the EWC system.

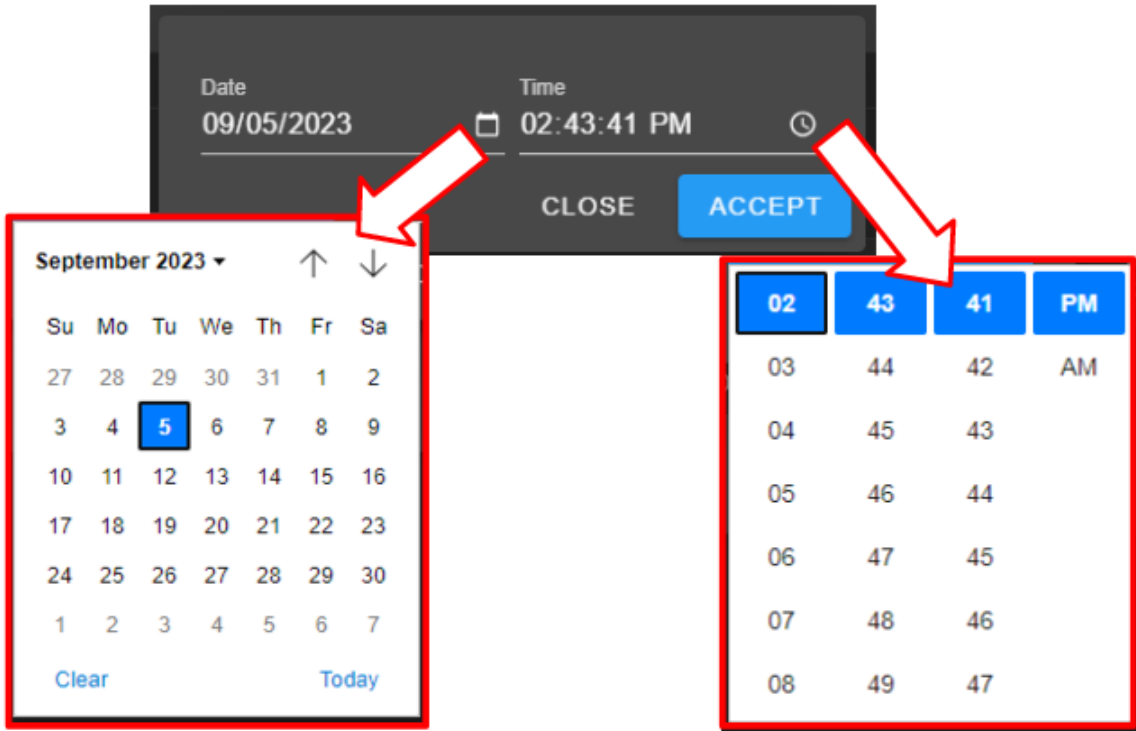


Figure 35.10: Set date/time for a one-shot action

Note: For a one-time operation, it is easier to use the Offset button (on the right of the date/time field) to adjust the future time, as depicted by the arrows in the following figure. Here, EWC will add the time to the current time to calculate when this action will fire.

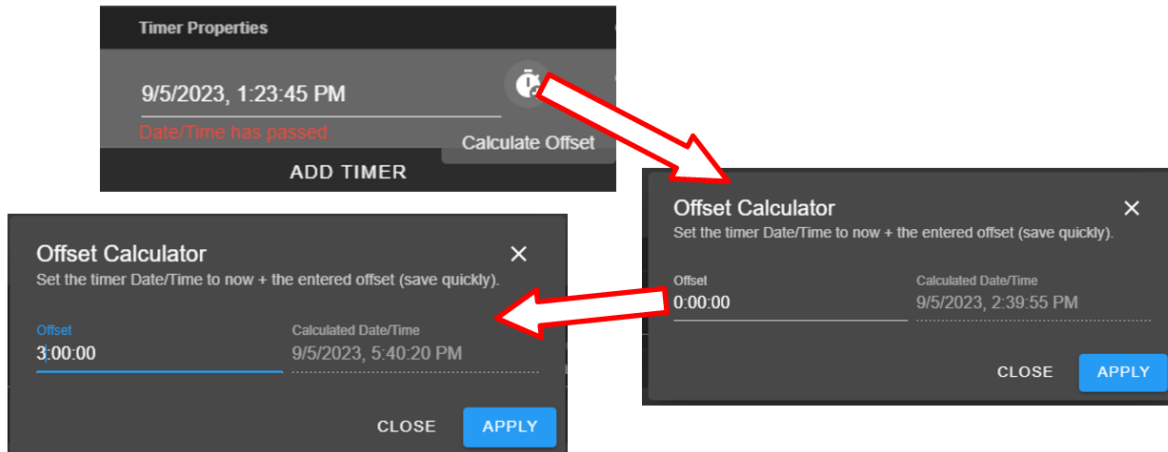


Figure 35.11: Using the time-offset calculator

6. Under **Operation**, select **Program: Run Program**
7. Under **Program**, select from name (or slot number)
8. Under **Step**, select what step to start
9. Apply the setting with the **APPLY** button

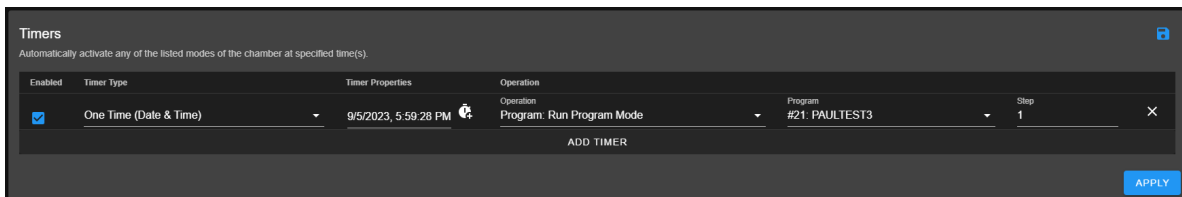


Figure 35.12: Program mode for a one-time start

Note: Both the **Save** and **APPLY** buttons provide the same effect. Either button can be used to save the settings and apply the action.

10. The program in slot 21 (as depicted in the example) will commence at 5:59:28PM (according to the EWC local time).

35.5.2 Removing or Adding a Timer

The one-shot or repeated timer can be removed from or added to the **Timers** list with the **X** or **ADD TIMER** button. Each new timer is added to the bottom of the list and takes effect after each update.

To add a new timer and use it, simply apply the **ADD TIMER** button. The following figure illustrates how a second timer is added to switch the chamber from a program mode (activated by the first timer) to **Constant**. Here, program from slot 21 gets executed (by the timer in the first line) at 1:20:15 PM, with execution time to last several hours. The timer in line 2 will switch the chamber to **Constant** mode at 2:00:00 PM.

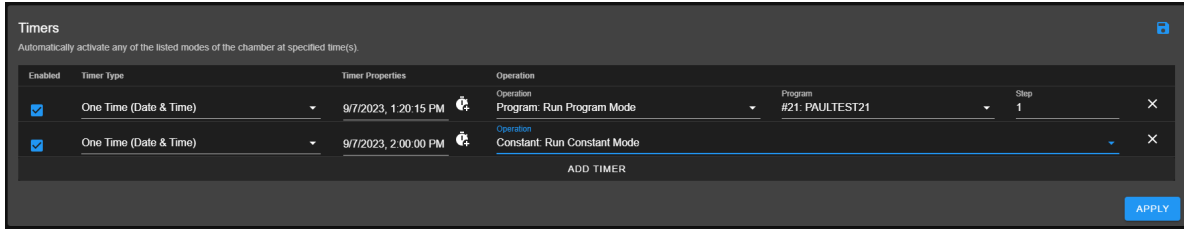


Figure 35.13: Setting additional one-shot timer after the first

Different timers on the list can be enabled or disabled using the **Enabled** box. Additional timer can be added to the **Timers** list and updated to take effect, provided the time is set for future time.

35.5.3 Constant Mode: One-Time Timer

The following example illustrates how to configure a one-shot timer to stop the current program and switch the chamber to **Constant** at a specific time. The timer is configured as a new instance with one line by itself, as depicted in the following figure. The action is instant and the program being executed will be stopped immediately; therefore, the action must be applied with care.

1. Log in using the **admin** account
2. Access the **Start Stop** menu
3. Clear all or current timer settings with the **X** button (if necessary).
4. Touch or click the **ADD TIMER** bar
5. Confirm that **One Time** is selected (or make selection from the drop-down list).
6. Touch or click the date/time field under the **Timer Properties** and apply the calendar and time to set the desired time.
7. Under **Operation**, select **Standby: Stop Operation**
8. Apply the setting with the **APPLY** button. The timer is now saved in the Macros list.

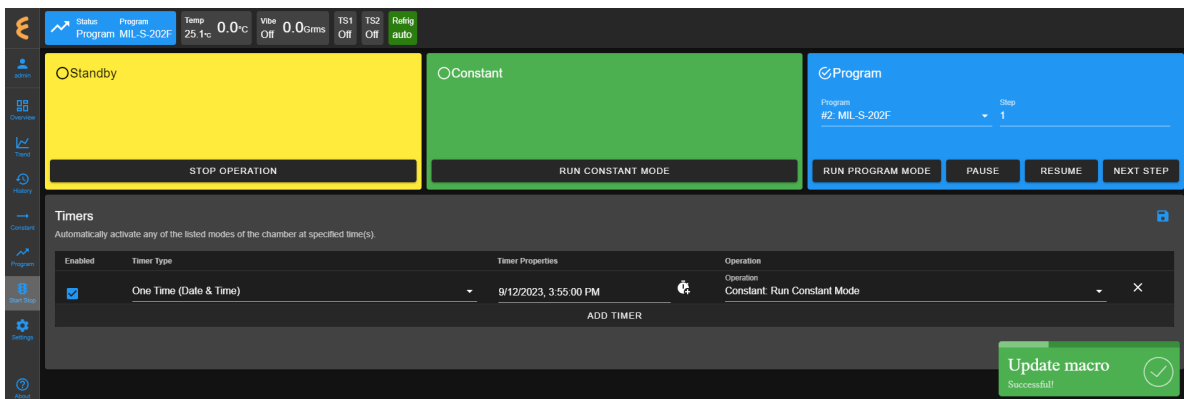


Figure 35.14: Scheduled a one-time timer to set chamber in Constant mode

9. The timer is activated at the set time, as depicted in the Macros list under the Operation Timer 1 script. To view the Operation Timer 1 action, access the Settings menu and select Macros from the submenu.

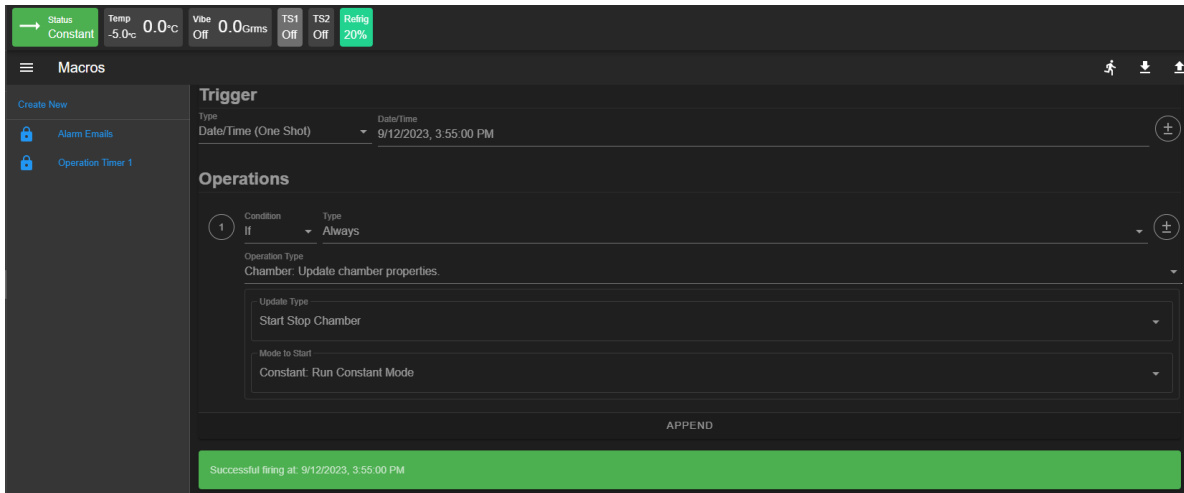


Figure 35.15: Macros action recorded on the one-time Timer

35.5.4 Program Mode: Weekly Repetition

With a weekly repeated timer, a program can start on a certain day, at a certain time. The following example illustrates how to execute a program on a weekly basis (one day during each week) at a certain time. Here, we set a program execute every Tuesday at 4:00 PM.

1. Log in using the **admin** account
2. Access the **Start Stop** menu
3. Clear all or current timer settings with the **X** button (if necessary).
4. Touch or click the **ADD TIMER** bar
5. Touch or click **Timer Type** and select **Repeated Daily/Weekly**
6. Edit the time to 4:00 PM
7. Check the box under T. The calendar format is Sunday(S) to Saturday (S).
8. Under **Operation**, select **Program: Run Program Mode**
9. Under **Program**, select program in the desired slot number (slot 8, PROGTEST8, was used as an example).
10. Set and select program step 1 to begin execution.
11. Apply the setting using the **APPLY** button. The complete configuration is depicted in the following example.

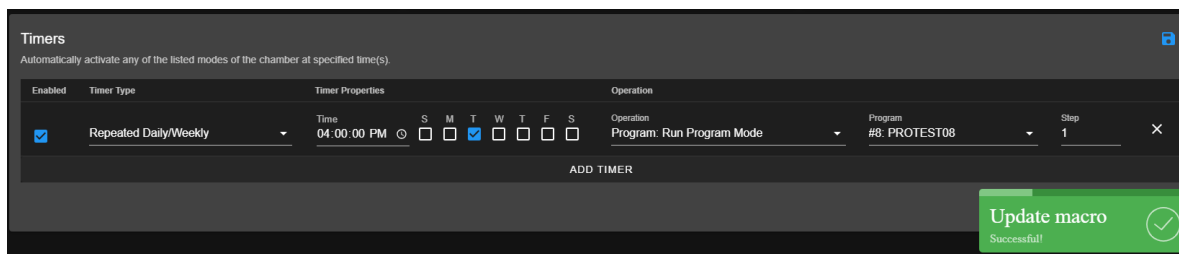


Figure 35.16: Single-day weekly timer

This timer can be disabled or enabled by manipulating the **Enabled** box. If you stop the program or switch the chamber to a different mode (such as, **Constant**), while this timer is still enabled, the selected program will recur on Tuesday at 4:00 PM the following week. To disable the timer permanently, it must be removed from the list (with the X and APPLY button).

35.5.5 Program Mode: Daily Repetition

The following example illustrates how to execute a program on a daily basis, from Monday through Friday, at 5:00 PM during each week.

1. Log in using the **admin** account
2. Access the **Start Stop** menu
3. Clear all or current timer settings with the **X** button (if necessary).
4. Touch or click the **ADD TIMER** bar
5. Touch or click **Timer Type** and select **Repeated Daily/Weekly**
6. Edit the time to 5:00 PM
7. Check the boxes under M through F. The calendar format is Sunday(S) to Saturday (S).
8. Under **Operation**, select **Program: Run Program Mode**
9. Under **Program**, select program from the desired slot number slot number (PROTEST7 from slot 8 was used as an example). Set and select program to begin at step 1.
10. Apply the settings with the **APPLY** button. The complete configuration is depicted in the following figure.

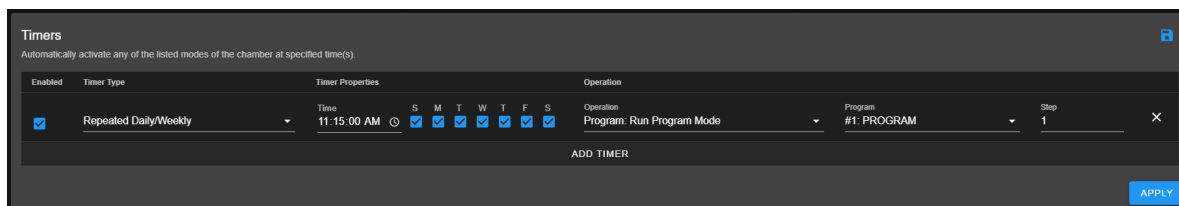


Figure 35.17: Timer setting for everyday of the week

The following trend graph is a result of the timer from a different chamber (used for illustration here) with its configuration set to run over several days. The trend graph was produced by extrapolating the data from the last three days (Friday through Sunday). It shows how program

was repeated each day at 6:05 PM and ended shortly before 9:00 AM, as indicated by the status bar at the bottom of the graph. The chamber was put in a **Standby** mode until 6:05 PM, at which time the program recurred.

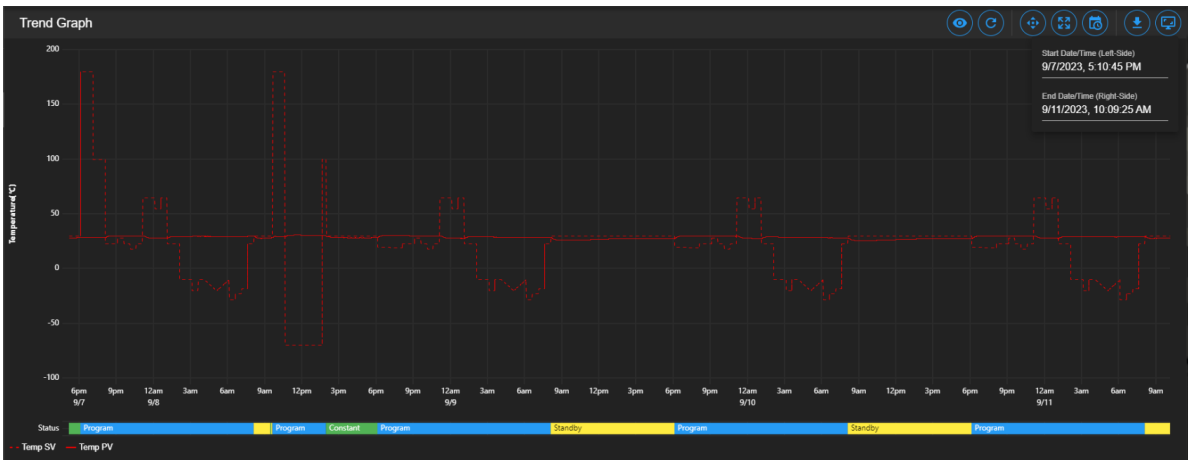


Figure 35.18: Trend graph of chamber controlled by a timer

This timer can be disabled or enabled by manipulating the **Enabled** box. If you stop the program or switch the chamber to a different mode (such as, **Constant**), while this timer is still enabled, the selected program will recur on the next day. To disable it permanently, the timer can be removed from the list (with the X and APPLY button).

35.5.6 Multiple Timers: One-Time or Repeated Daily/Weekly

The **Timers** list may contain multiple timers with different instructions for a specific operation. Multiple timers allow for sequential activations, order of script execution or specific execution via the **enabled** box selection, etc.

The following figure depicts a list of multiple timers, each with a specific function and operation, which has been prepared to execute in the top-to-bottom paradigm.

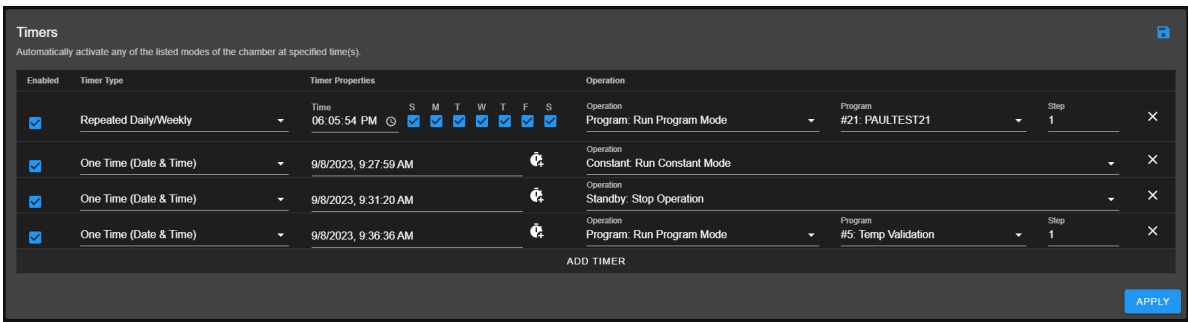


Figure 35.19: Multiple sequential timer operations

Each entry in the above figure is added after the previous one (above it) has been executed. All of which are enabled by default. Only timer 1 (top line) and timer 4 (bottom line) remain in effect, since the middle two are one-shot timers. In addition, the last timer is also a one-shot

timer and it will end after the program it has executed has ended. Each timer causes action to take over the previous one.

Part VII

ESPEC SCP220 Chamber

CHAPTER 36

Overview

The **Overview** page displays the current status of the chamber and its operating mode. A user is brought to this page after logging into EWC. The following figure depicts **Overview** with the chamber in Standby as indicated in the status tab and its extension bar. This extension bar is only available in the **Overview** menu. The date/time posted in the extension bar is the date/time on the chamber/controller. While date/time stamp of data logs and Macros automated actions are based on the date/time on EWC, the controller date/time should also synchronize with that on EWC and the local device (that launched the Web browser). The date/time of EWC can be viewed under the **Settings** menu. It can also synchronize with that on the local device (to be discussed in the **Settings** menu).

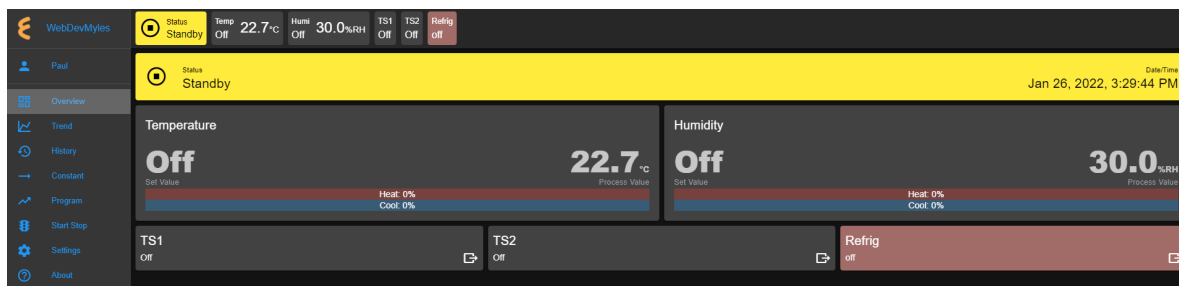


Figure 36.1: Overview page with chamber in Standby mode

The following figure depicts **Overview** showing the chamber in Constant mode.

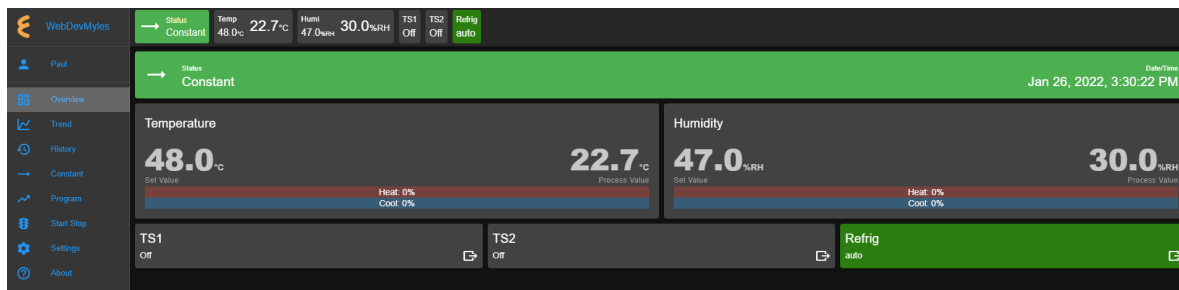


Figure 36.2: Overview page with chamber in Constant mode

The following figure depicts **Overview** showing the chamber in Program mode. Detailed information about the program, including what step is being executed, is listed in the extension bar (of the status tab). This feature provides the operator with useful information about the status of the chamber and the program.

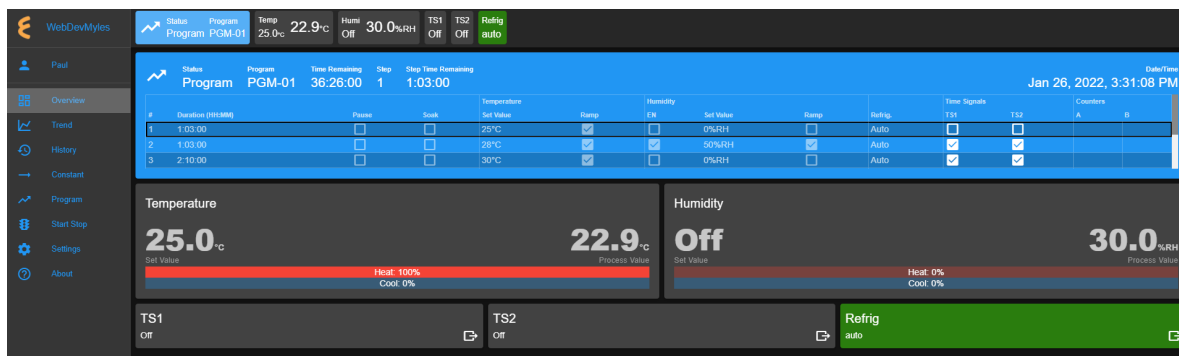


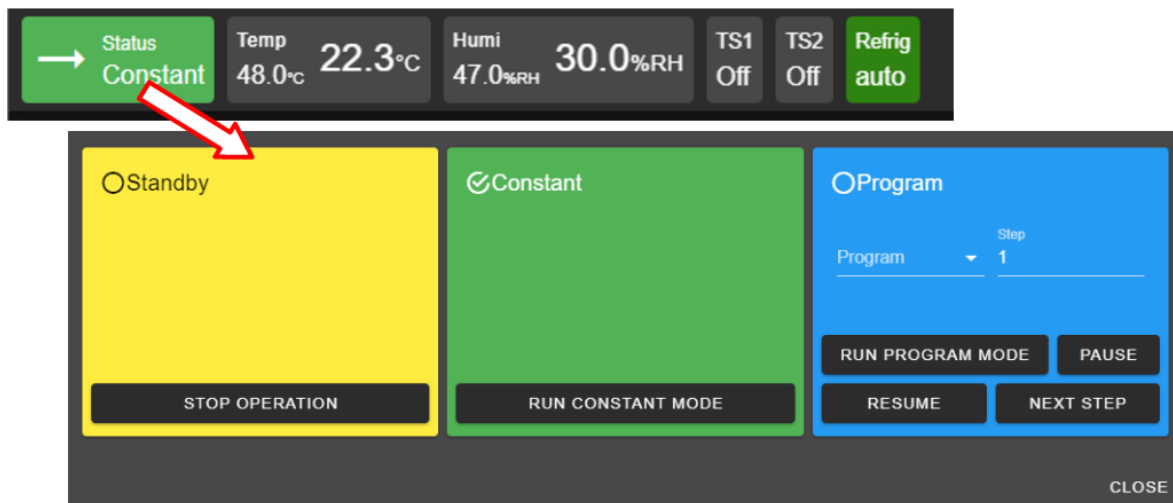
Figure 36.3: Overview page with chamber in Program mode

Only users with read-write privilege can control the chamber operation mode from within this page. Supported operation modes are **Standby**, **Constant** and **Program**. Each tab in the status bar may be accessed to apply new settings at any time. This feature enables the operator to control the chamber without having to access the **Start Stop** menu in the menu bar. The following sections detail a step-by-step procedure how to control the chamber's operating mode via the **Overview** menu for users with read-write privilege.

36.1 Standby Setting

For authorized users with read-write privilege, to set the chamber in **Standby** mode, proceed with the following steps. Initially, the chamber is operating in **Constant** mode. We wish to switch its operation mode to **Standby**.

1. Click the status tab in the status bar to access the drop-down tabs, as shown in the figure.



An alternative way to access the drop-down tabs is to click on the extended tab of the status tab itself, as depicted in the following figure. The drop-down tabs display over the extend tab, as shown in the right figure. This extended tab is available only in the **Overview** page.



Figure 36.4: Status tab drop-down menu via the extended tab

2. Click the **STOP OPERATION** button. EWC immediately moves to apply the operating mode to the chamber. A pop-up window appears in the lower-right corner to indicate the update of the operating mode. A check mark in the **Standby** tab indicates and confirms its standby mode.
3. To close the drop-down tabs, perform one of the following action:
 - Click an empty area in the Main Display.
 - Click a different menu in the menu bar.
 - Click the status tab itself. or
 - Click the **CLOSE** button underneath the alarm tab.

36.2 Constant Setting

For authorized users with read-write privilege, to set the chamber in **Constant** mode, proceed with the following steps. Suppose, initially, the chamber is operating in **Standby** mode. We wish to switch its operation mode to **Constant**.

1. Click the status tab in the status bar. As depicted in the following figure, the chamber is in **Standby** mode.

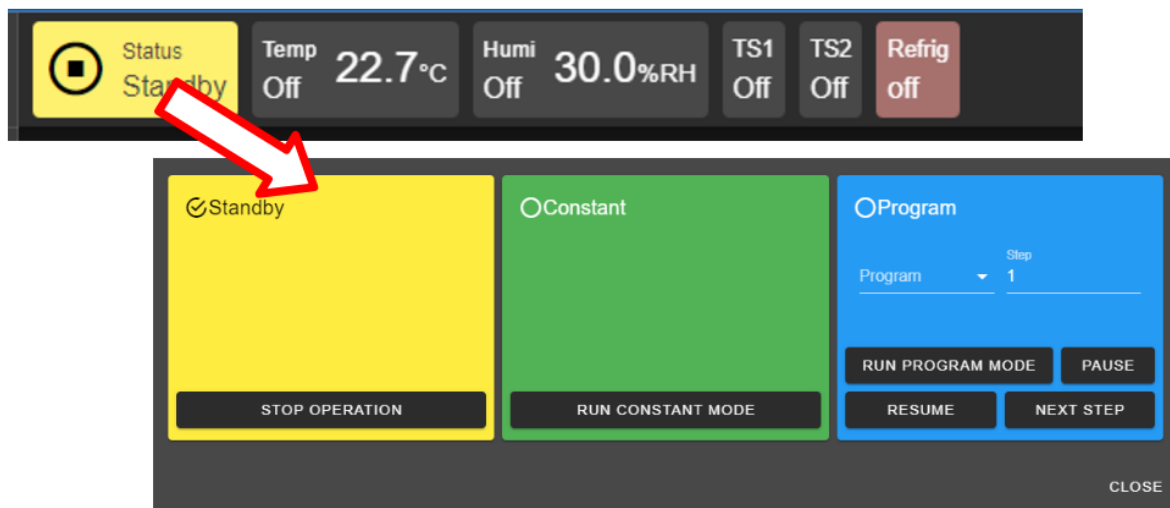


Figure 36.5: Constant mode setting

2. Click the **RUN CONSTANT MODE** button in the constant tab. EWC immediately moves to apply the operating mode to the chamber.

3. To close the drop-down tabs, perform one of the following action:

- Click an empty area in the Main Display.
- Click a different menu in the menu bar.
- Click the status tab itself. or
- Click the **CLOSE** button underneath the alarm tab.

36.3 Program Setting

To set the chamber in **Program** mode means a profile (i.e., program) is loaded and executed.

1. Click the status tab in the status bar or the extension bar of the status tab.
2. Click the radio button in the program tab to access the program list (see the figure below).

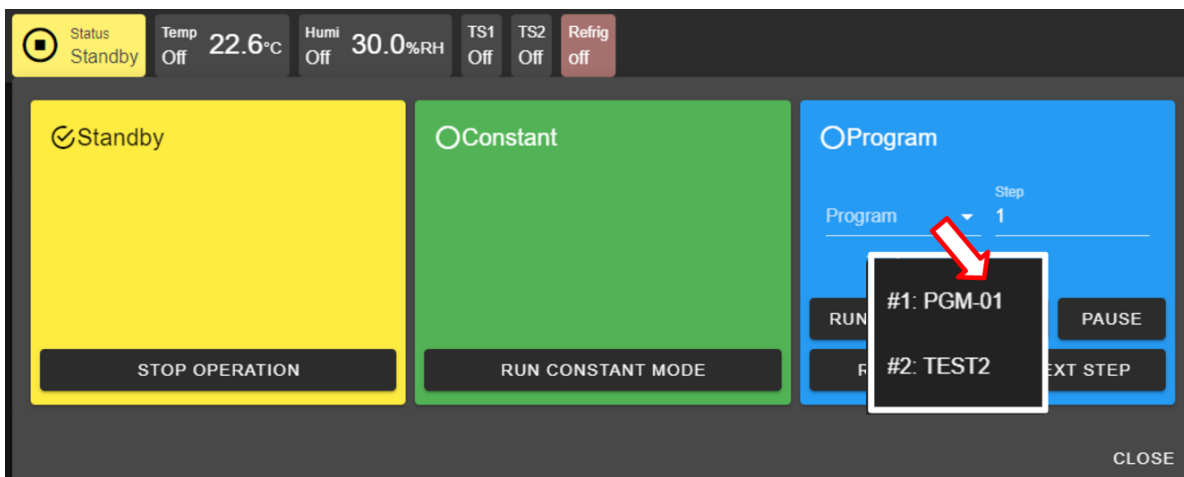


Figure 36.6: Select program to start chamber in Program mode

If no program is available for loading, the list contains slot numbers without programs, as depicted in the following figure. A program must be created first before it can be loaded for execution. Chapter 8 discusses how to create a program to control the chamber.

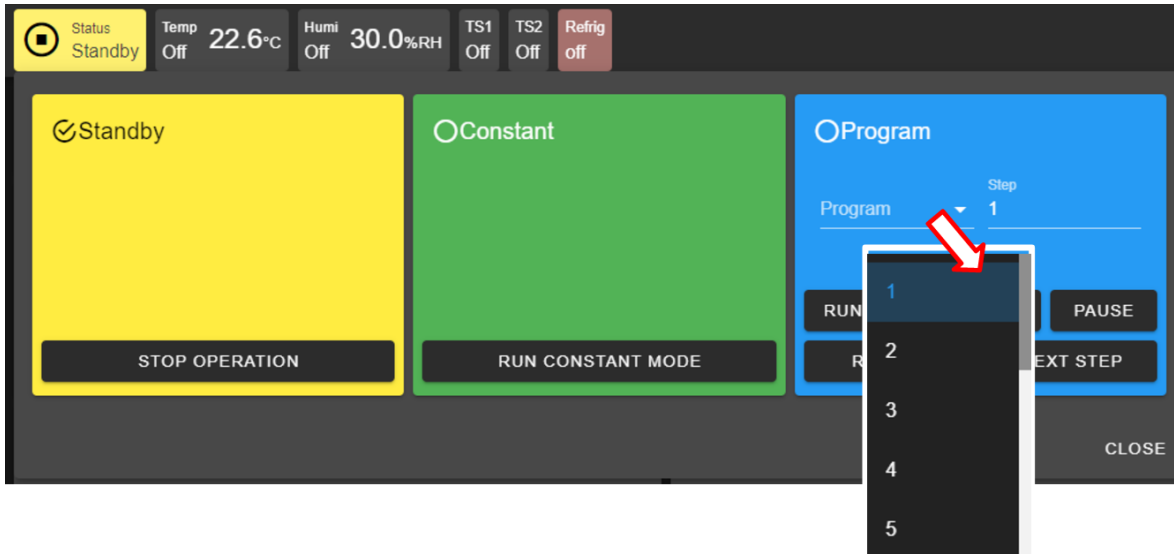


Figure 36.7: No program available for execution

3. Click to select a program from the list. Apply the scroll bar, if necessary, to select the desired program.
4. Enter a desired step number in the step field for program to start. Default start step is 1.
5. Click the **RUN PROGRAM MODE** button to execute the program. EWC immediately moves to apply the operating mode to chamber. A pop-up window appears in the lower-right corner to indicate the update. Note: This program tab offers a few practical methods during a program execution. The **Pause** button can be used to pause the program. Program can be resumed via the **RESUME** button. Program instruction lines can be stepped through via the **NEXT STEP** button.
6. Click the **CLOSE** button to view the status of program execution displayed in the status tab extension bar.
7. To end or interrupt the program execution, switch the chamber to **Standby** or **Constant** mode via the status tab.

36.4 Clear Alarms

When EWC detects an alarm in the chamber, it also sets itself in an alert state by displaying a list of active alarms and fault names in the red window to require an immediate action from the operator, as depicted in the following figure.

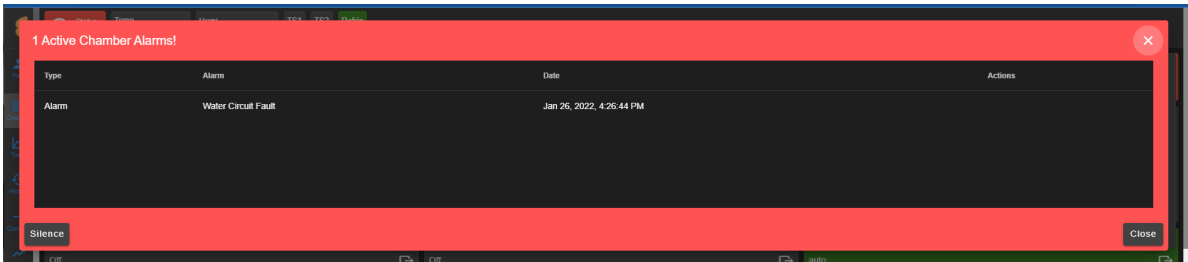


Figure 36.8: Chamber in alarm state

A repeating beep on the local computer is also tripped to get the operator’s attention. The **SILENCE** button can be used to turn off the beep. This alert window can be closed by clicking the **CLOSE** button or the X button. However, the alarm state still remains to be resolved as indicated by the **Status** tab in the following figure. To redisplay or expand the alarm list, click the red dot in the lower-right corner.

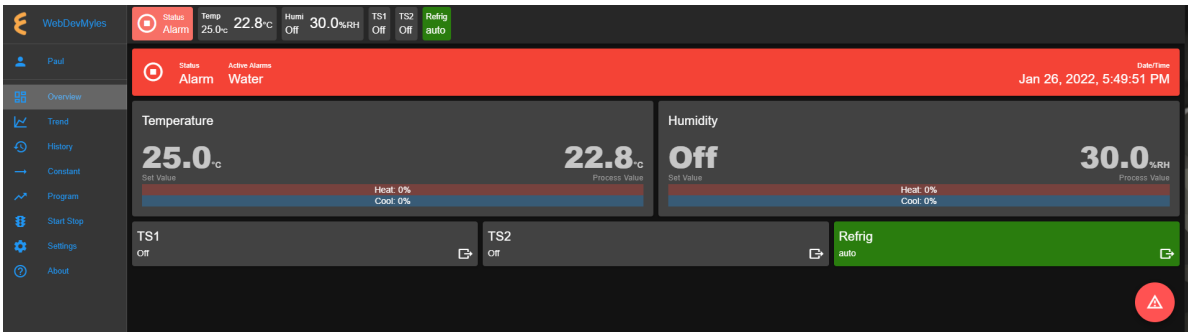


Figure 36.9: Alarm state in overview page

In an alarm state, operation is halted until all alarms triggered by chamber are resolved via the P300 (i.e., clear all alarms on the P300) before EWC (and the chamber) can resume the normal operation. Once all alarms are cleared, EWC will automatically clear all alert messages and resume normal operation by switching the chamber to a **Standby** mode.

36.5 Temperature, Humidity or Time Signal Settings

On the **Overview** page, settings of temperature, humidity, time signals or refrigeration can be controlled via the dedicated tabs in the status bar or the dedicated panes in the main display area, as depicted in the following figure.

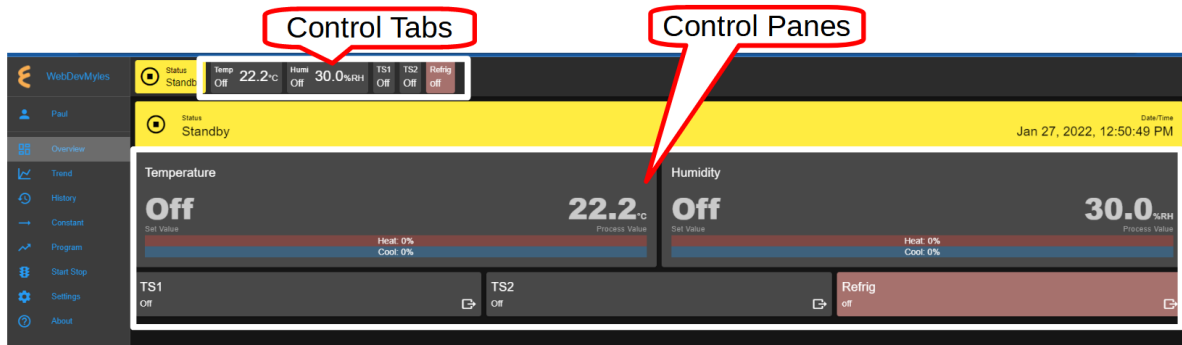


Figure 36.10: Parameter settings via control panes

36.5.1 Settings via the Status Bar

To set temperature with a new set value, complete the following steps:

1. Click the Temp tab in the status bar.
2. In the drop-down pane, click the box to **Enable** temperature, and enter new value in the Set Value field or apply the up/down arrow to adjust the value (shown in the figure).

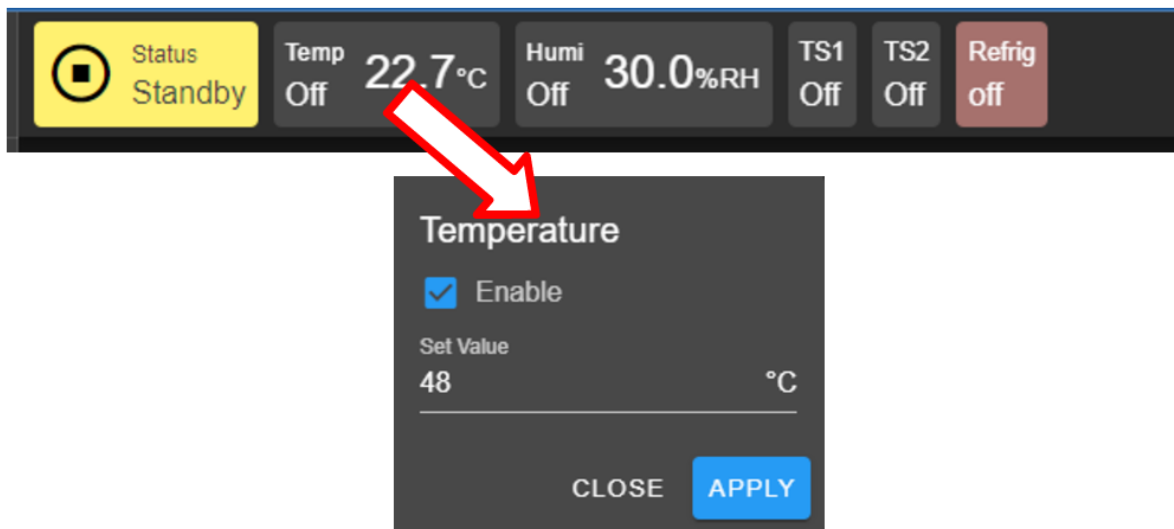


Figure 36.11: Setting new temperature value via the temp tab

3. Click **APPLY** to apply the new setting.
4. To cancel the setting, click the **CLOSE** button (or the Temp tab in the task bar).

To turn on humidity and set its value, complete the following steps:

1. Click the Humi tab in the status bar.
2. In the drop-down pane, click the box to **Enable** humidity, and enter new value in the Set Value field or apply the up/down arrow to adjust the value (shown in the figure).

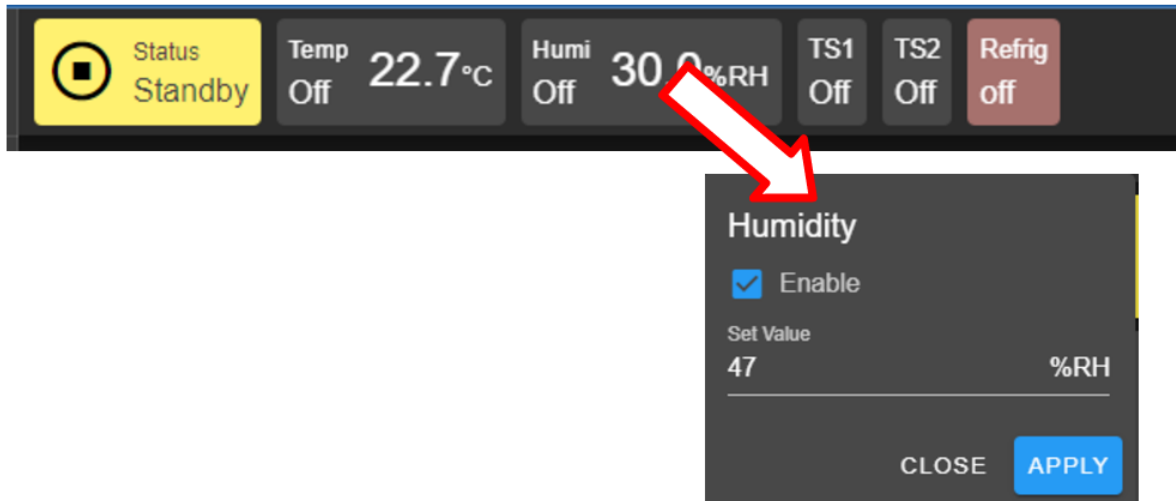


Figure 36.12: Setting new humidity value via the humi tab

3. Click **APPLY** button to apply the setting.
4. To cancel the setting, click the **CLOSE** button.

To turn on time signal 1 (TS1), complete the following steps. Repeat the same procedure to turn on additional time signals.

1. Click the TS1 tab in the status bar.
2. Check the box to enable TS1 (shown in the figure).

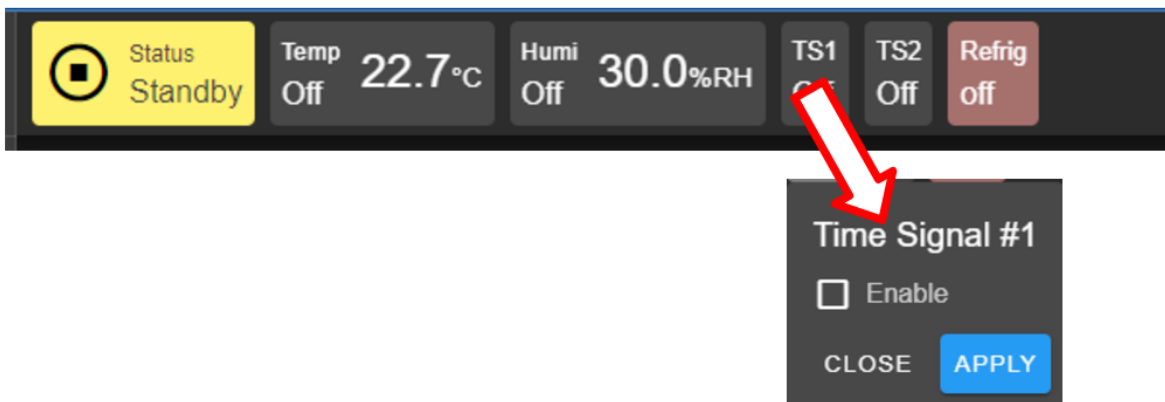


Figure 36.13: Enable or disable time signal setting

3. Click **APPLY**.
4. To cancel the setting, click **CLOSE** (instead of **APPLY**) or click the TS1 tab itself in the status bar.

To turn off TS1, apply the following steps:

1. Click the TS1 tab in the status bar.

2. Uncheck the box to disable TS1.
3. Click **APPLY**.
4. To cancel the setting, click **CLOSE** (instead of **APPLY**) or click the **TS1** tab itself in the status bar.

To turn on the refrigeration, complete the following steps:

1. Click the Refrig tab in the status bar.
2. Check the radio button to select set value from the drop-down list.

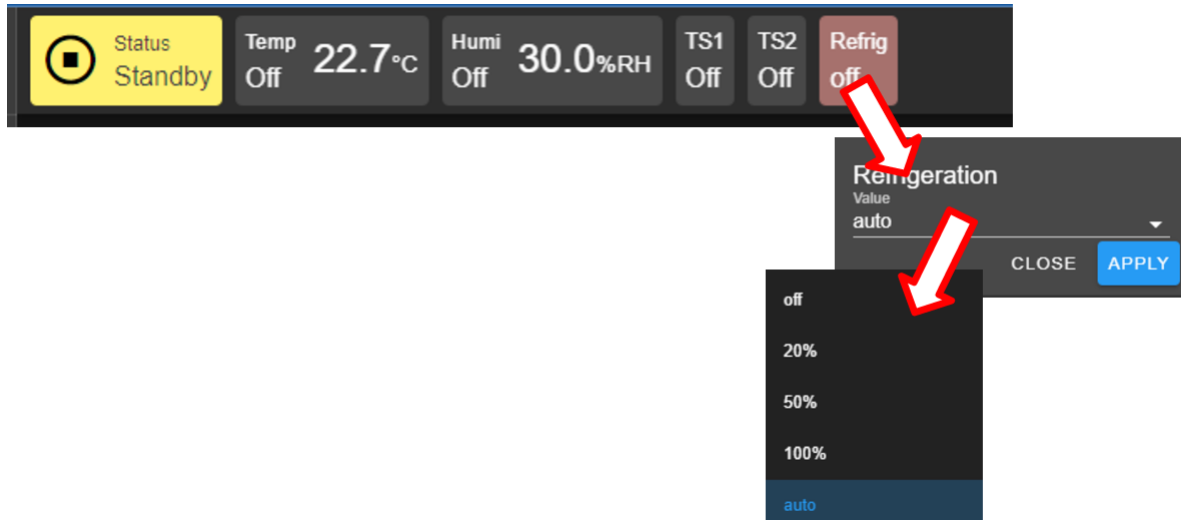


Figure 36.14: Setting refrig value

3. Click **Apply**.
4. To cancel the setting, click the **CLOSE** button.

36.5.2 Settings via the Dedicated Panes

With EWC, there are multiple ways to complete the same task. The dedicated panes for temperature, vibration or humidity, time signals, or refrigeration, in the main display area are actually clickable panes. These are CTA (call-to-action) panes through which new parameter settings (such as, temperature, vibration or humidity, time signal and refrigeration) can be applied.

To apply a new setting to temperature, complete the following steps:

1. Click the Temperature pane to access the input pane (shown in figure below).

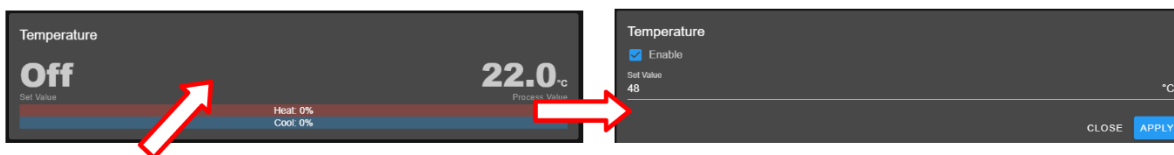


Figure 36.15: Setting new temperature value via the temperature (CTA) pane

2. In the input pane, click and enter new value in the Set Value field or apply the up/down arrow to adjust the value.
3. Click **APPLY**. To cancel the setting, click **CLOSE** (instead of **APPLY**).

The above procedure can be applied to humidity, vibration, time signal or refrigeration.

CHAPTER 37

Trend

The **Trend** menu can be used by an operator to view a scatter plot of data points collected during the chamber operation. Data collection can occur in two distinct modes: **Always** and **When Chamber is on**. These two modes are selectable and configured under the **Data Logging Settings** submenu found under the **Settings** menu. Plot elements and detailed configuration of the trend graph will be discussed on **Data Logging Settings** page in the **Settings** menu.

By default, the trend graph provides a scatter plot of data points collected during the last hour. Various options of plot range of data points accumulated more than one hour can be selected. Data can be downloaded in whole or in portion to be stored on the local computer as CSV file.

37.1 Trend: Components

There are seven different groups that make up the main display of **Trend** and the scatter plot, as depicted in the following figure. The scatter plot shown in the figure is a result of the data points being collected with the chamber in program mode. Detailed descriptions of these groups based on the labels in the figure are outlined as follows:



Figure 37.1: Trend graph showing plots of current data from the chamber

1. **Trend Graph:** Data points collected from the chamber are rendered as a trend graph based on a scatter plot methodology. These data points—product temperature, air temperature, humidity, vibration, etc.—are plotted as a function of time. Temperature is displayed in degree Celsius, vibration in root-mean-square of acceleration (Grms or G), etc. The vertical y-axis represents the scale of these values. The horizontal x-axis represents the data logging runtime. Based on the default configuration, the chamber logs data points in a 10-second interval (refer to the **Data Logging Settings** submenu, under **Settings**). Depending on the type of chamber, data logging interval can be set to lower than 10 seconds. The grid scaling on both the y- and x-axes will change according to the application of the Pan/Zoom Controls buttons or the drag-and-select via the mouse and scroll wheel. Default setting can be restored by clicking the refresh button on the Web browser (not shown in the above figure).
2. **Trend Graph Manipulation Buttons:** Seven manipulation buttons are available to help manipulate and control the trend graph features and options. Detailed functionality and operation of these buttons are discussed in the following section.

3. **Snapshot of Data:** By hovering a mouse pointer on the trend graph area, a snapshot of the data at a particular time is displayed (shown in the figure). This feature allows a quick peek of the data at a certain point in time. Depending on the chamber's condition, the snapshot displays set values (SV) and process values (PV) of temperature, product or air temperature, or vibration, chamber operating mode or status, as well as program name and alarm. The contents in the snapshot are based on the selected options displayed in the legend set by the **Graph View** button of item 2 (above); and the color scheme selection under the **User Interface Settings** submenu (found under the **Settings** menu).
4. **Y-axis Label:** The y-axis displays the selected type of data points to be plotted, such as Temperature, Humidity, Vibration ,etc. These values are populated based on the selection of the **Graph View** under item 2 (above).
5. **Line Graph:** Different types or styles of graph—solid line, dashed line and color—are used to designate each type of data points in the plot to help for visualization and readability. As depicted in the figure, solid line represents process values, while dashed line represents set values with a distinctive color, as indicated in the legend (see item 7).
6. **Status:** Status of chamber operating mode is displayed along the time line on the trend graph, indicating when and how long the chamber was in specific operating mode. This feature provides a quick preview of the chamber operating status. The **Pan/Zoom button of Trend Graph Manipulation Buttons** (item 2) may be used to manipulate the display and shift the graph back into the past to view the chamber's operating mode.
7. **Legend of Trend Graph:** The legends are used to identify each item on the trend graph with color code, as well as line/dash graph, to designate the different type of data being plotted.

37.2 Trend Graph Manipulation Buttons

The following is a detailed list of the seven **Manipulation Buttons** of **Trend Graph**, item 2 in the previous figure.

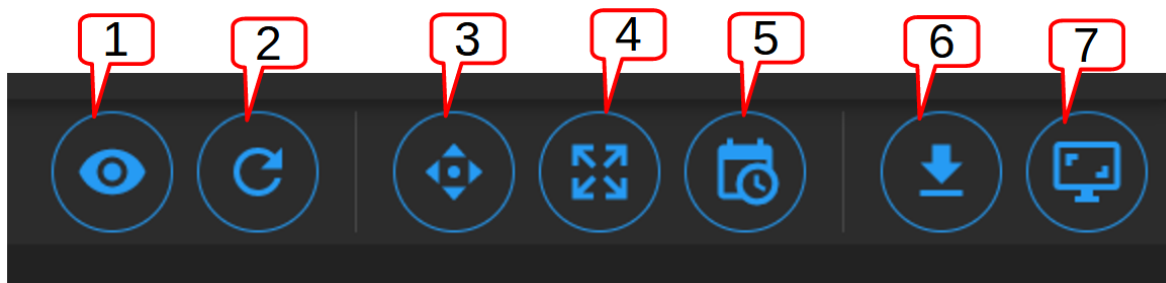


Figure 37.2: Trend Graph manipulation buttons

1. **Graph View:** Data visualization is very important. Elements or components of the trend graph are predefined by the configuration set in the **Data Logging Settings** submenu (found in the **Settings** menu). The **Customize** option depicted below allows the operator to select what to include in the trend graph to help simplify data visualization. Three different options represented by the arrows in the figure can be selected. The minimum and maximum Y range can be adjusted over the default values to help scale the graph for better

visualization; different data types can be enabled for display. The **Save** button (last arrow) can be applied to save the settings and render the graph.

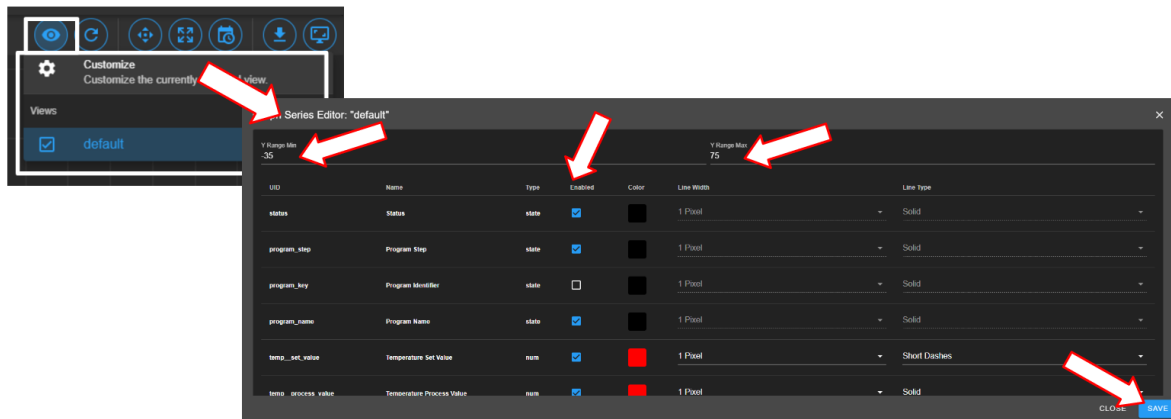


Figure 37.3: Tread graph view and custom settings

2. **Auto Refresh:** This Auto Refresh button reconstructs the graph to include data points up to the current time. Suppose a scroll wheel was applied to zoom out the trend graph that included future time which data points have not yet been sampled, as shown in the figure below.



Figure 37.4: Off-scaled trend graph including future time (no data points)

The auto refresh button will rescale the graph to eliminate the gap (future time) on the right to expand and display the trend graph up to the current time.



Figure 37.5: Trend graph rescaled with current time

3. **Pan/Zoom Controls:** The Pan/Zoom Controls button allows the operator to control and adjust the viewable section in the trend graph. This button presents six operation buttons to manipulate and display the trend graph as follows:

- **Zoom In:** The **Zoom In** button allows the operator to zoom into a small section of the trend graph. Depending on the degree of zooming, the display area will be confined to a small set of data points ranging between minutes to hours. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Zoom Out:** The **Zoom Out** button does the opposite by allowing the operator to zoom out on the trend graph, thereby giving the operator an expansive view of the trend graph. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Move Up:** This button allows the operator to move up the graph along the vertical axis to adjust the viewable area of the scatter plot. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Move Down:** This button allows the operator to move down the trend graph along the vertical axis with the purpose to adjust the viewable area of the scatter plot. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Move Left:** This button allows the operator to pan left on the trend graph, offering a quick preview of a plot of data points tracing back the time in hours or days. With this feature, the operator can quickly gain a preview of past data points which the operator may have missed.
- **Move Right:** This button does the opposite to **Move Left** by allowing the operator to pan right on the trend graph to the current time. To reconstruct the trend graph to contain the most recent data points, the **Auto Refresh** button allows the quickest operation.

4. **Zoom Extents:** With this button, trend graph may be provided using data points from within the last one hour, last two hours or the last six hours. To make adjustment of the trend graph based on these three selections, click on the **Zoom Extents** button, then click one of the selection from the drop-down menu.
5. **Plot Range Selectors:** Data points can be selected from start date/time to end date/time to produce a desired trend graph. Arbitrary date and time can be selected for the plot range, as depicted in the following figure.

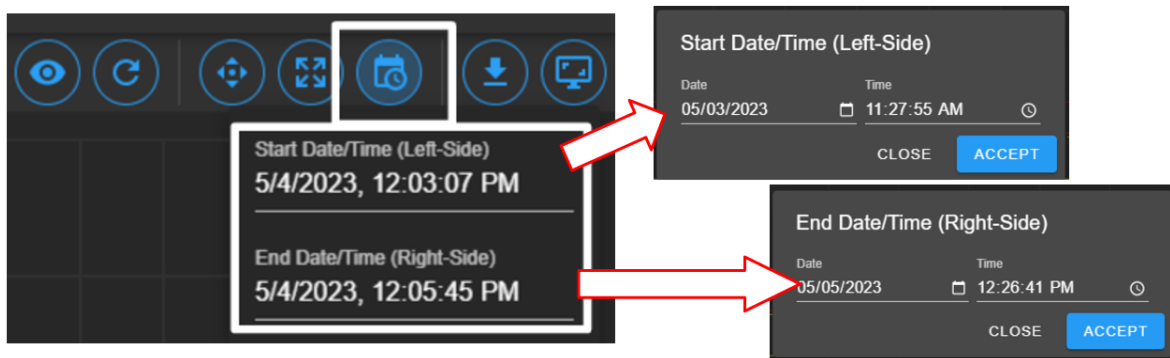


Figure 37.6: Plot range for start date/time and end date/time

To set the plot range,

- access the **Plotted Range Selectors** button.
 - access the **Start Date/Time**; edit date (m/d/y) and time (H:M:S) fields or apply the calendar and clock icons to select date/time.
 - apply **ACCEPT**
 - access the **End Date/Time**; edit date (m/d/y) and time (H:M:S) fields or apply the calendar and clock icons to select date/time.
 - apply **ACCEPT**. Note: Values of end date must be later (or greater) than start date.
6. **Download Data:** To download data and store it on the local computer, click the **Download Data** button and select **Download Current View** to download a portion of data from the displayed trend graph. To download the entire collection of data, select **Download All Data**. Data file will be stored in the Downloads folder of the local computer with filename: hostname_data_date.CSV.
 7. **Capture Screenshot/Download:** Trend graph can be captured, downloaded and stored on the local computer in PNG file, as shown in the figure.

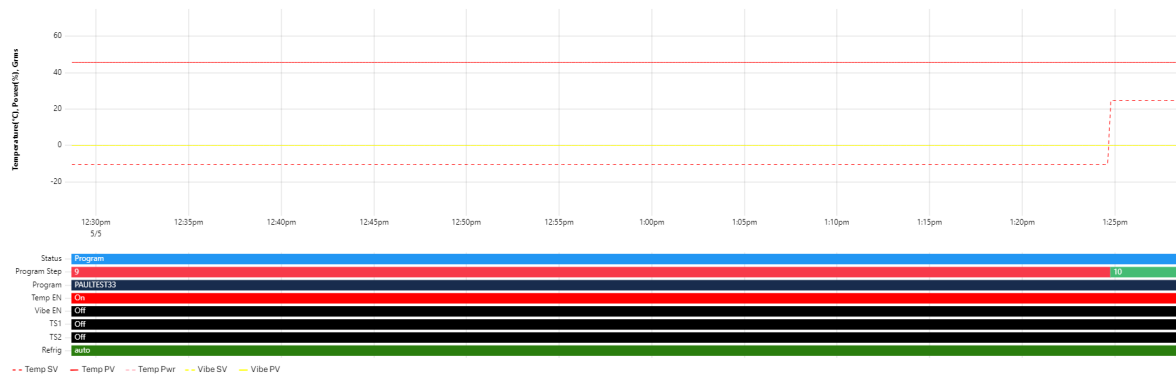


Figure 37.7: Screenshot of trend graph

37.3 How to Handle Downloaded Data File

Data points collected from the chamber are stored in CSV format. The recorded time of the data points is stored based on a UTC (or Universal Time Coordinated, previously referred to as the GMT) instead of the local time. To preserve the integrity of the CSV file and its UTC time stamp, do not rename the data file with MS Excel extension or attempt to open it directly with MS Excel. Any attempt to force open it in MS Excel will result in the wrong time conversion as shown in the following figures.

The following figure displays the CSV file which was directly opened with MS Excel. The time stamp in the first column is wrong; it is still based on UTC time stamp indicated by the arrows.

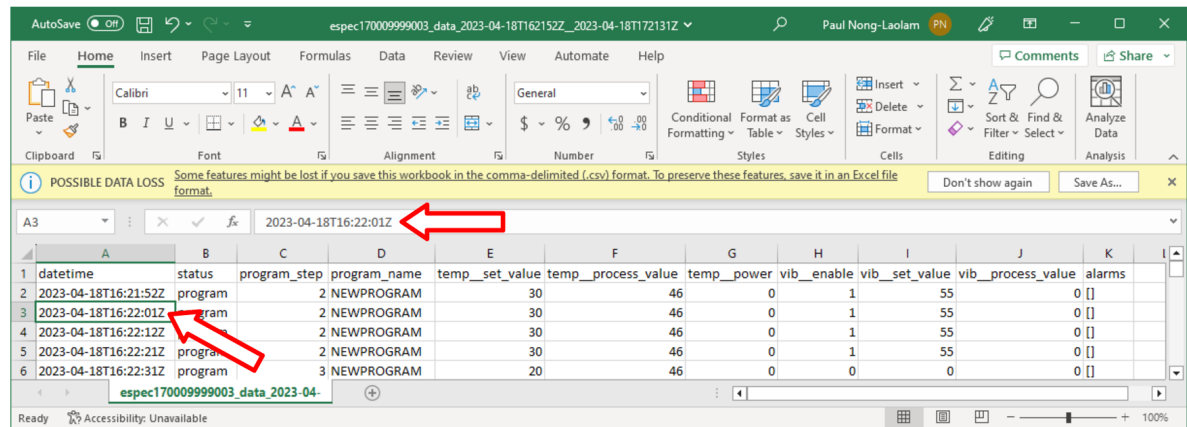


Figure 37.8: Data file improperly open in MS Excel

The following figure displays the same CSV file which was properly imported into MS Excel with the correct time stamp conversion for local time indicated by the arrows.

datetime	status	program_step	program_name	temp_set_value	temp_process_value	temp_power	vib_enable	vib_set_value	vib
4/18/2023 12:21	program	2	NEWPROGRAM	30	46	0	1	55	
4/18/2023 12:22	program	2	NEWPROGRAM	30	46	0	1	55	
4/18/2023 12:22	program	2	NEWPROGRAM	30	46	0	1	55	
4/18/2023 12:22	program	3	NEWPROGRAM	20	46	0	0	0	
4/18/2023 12:22	program	3	NEWPROGRAM	20	46	0	0	0	
4/18/2023 12:22	program	3	NEWPROGRAM	20	46	0	0	0	
4/18/2023 12:23	program	3	NEWPROGRAM	20	46	0	0	0	
4/18/2023 12:23	program	3	NEWPROGRAM	20	46	0	0	0	
4/18/2023 12:23	program	3	NEWPROGRAM	20	46	0	0	0	

Figure 37.9: Data file properly imported into MS Excel

The proper way to handle this CSV file is to import it using the following procedure to render the correct conversion of the UTC time to the local time on all data points.

Complete the following steps:

1. Select **Trend** in the main menu bar
2. Click the **Download** button (item 6 in the previous section) to download the data (current view or entire data) in CSV file
3. Launch MS Excel and start a new blank spreadsheet
4. Click the **Data** ribbon
5. Click **From Text/CSV** (that appears under the **Home** ribbon)
6. In the **Import Data** Window explorer, open the **Downloads** folder and select the downloaded CSV file (in step 2) and click the **Import** button (in the bottom).
7. Click the **Load** button to load data into the current spreadsheet.
8. To save the current spreadsheet as Excel Workbook, click **Save As** and follow the standard steps to complete the process.

CHAPTER 38

History

The **History** page displays operation history of the chamber, its operating modes and statistics. Any alarms or alerts that were triggered during the chamber's operation are logged and displayed here. By default, history log of the chamber's operating modes, alarms or statistics from the previous week will be displayed, as depicted in the following figure. There are five important components in the **History** main display area. They are labeled and described as follows:

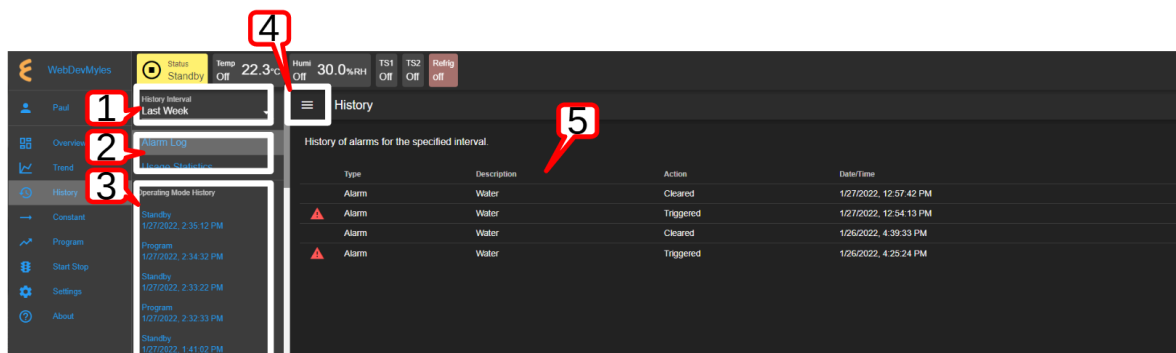


Figure 38.1: Operation history of the chamber

1. **History Interval:** Display options of the operating history are: one week, two weeks, one month, three months, six months, one year or the entire period of the chamber's operation. To access the history interval, click the radio button to select the period from the list.

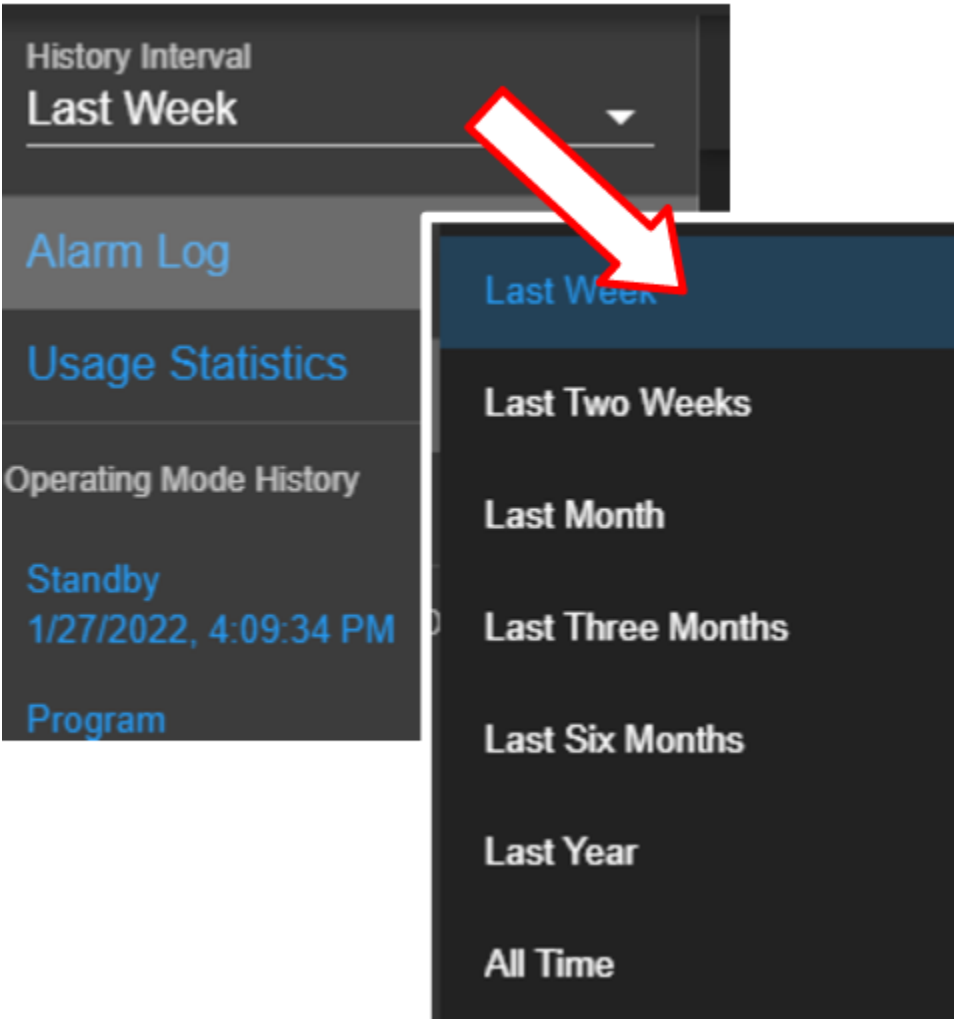


Figure 38.2: History interval and display selection

2. Alarm or Statistics Submenus:

- **Alarm Log:** By default, alarm logs will be displayed in the main display area. The logs indicate which alarm had occurred and when they were resolved (cleared). Most recent events are listed at the top. To view detail of each log, click on its name (with its log date and time).

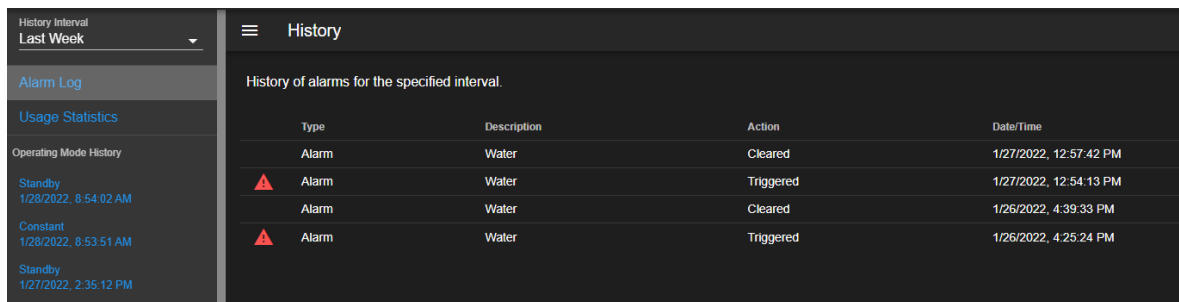


Figure 38.3: History of alarm

- **Usage Statistics:** To display the operation statistics, click on this submenu. Percentage of each operation mode based on the selection period in the **History Interval** is displayed as shown in the following figure:

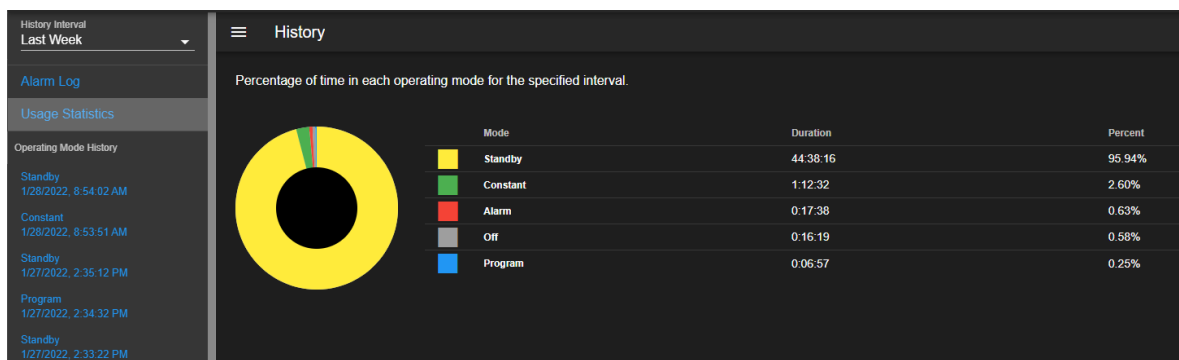


Figure 38.4: History of operation statistics

Such information provides the operator a good idea of the overall performance of the chamber by identifying when and how much time it was in a certain operating mode.

3. **Operating Mode History:** A list of operating modes of the chamber is displayed here based on the option selected under the **History Interval**. Default listing is based on a one-week interval. A trend graph, identical to that produced in the **Trend** menu, based on the data points collected during the operating mode can be produced by clicking on the particular operating mode on this list, as illustrated in the following figure.

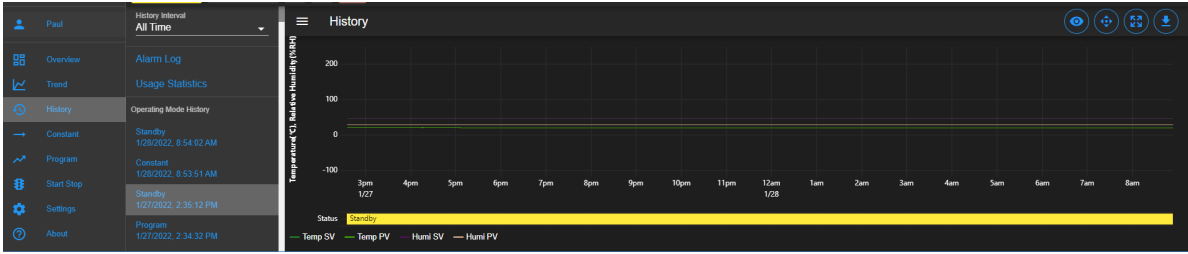


Figure 38.5: Trend graph of operating mode history

4. **Show/Hide Submenu:** To provide a larger real estate for the main display area, this Show/Hide button can be used to show or hide the **History** submenu. The following figure shows how the submenu is hidden and the main display area is expanded.

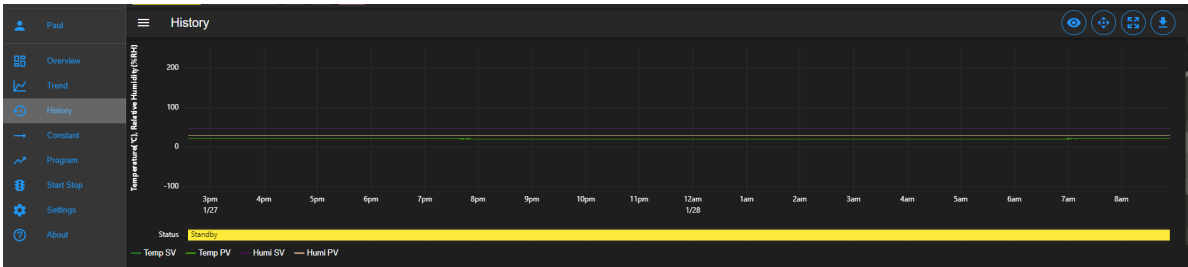


Figure 38.6: The show/hide button of the main display of the History page

5. **Main Display:** The content of the submenu page of **Alarm Log** and **Usage Statistics** is displayed here (refer to item 2, above).

CHAPTER 39

Constant

The existence of EWC **Constant** page is such that all features and their parameters are collected and displayed in one place to control their constant mode settings. The main display of **Constant** consists of three separate panes, displayed as **Temperature**, **Humidity** (or **Vibration**) and **Outputs**, as depicted in the following figure. These CTA panes provide input options to adjust the settings directly. The Humidity Range Chart is a two-dimensional graph of the current temperature-humidity relationship, displayed below these CTA panes.

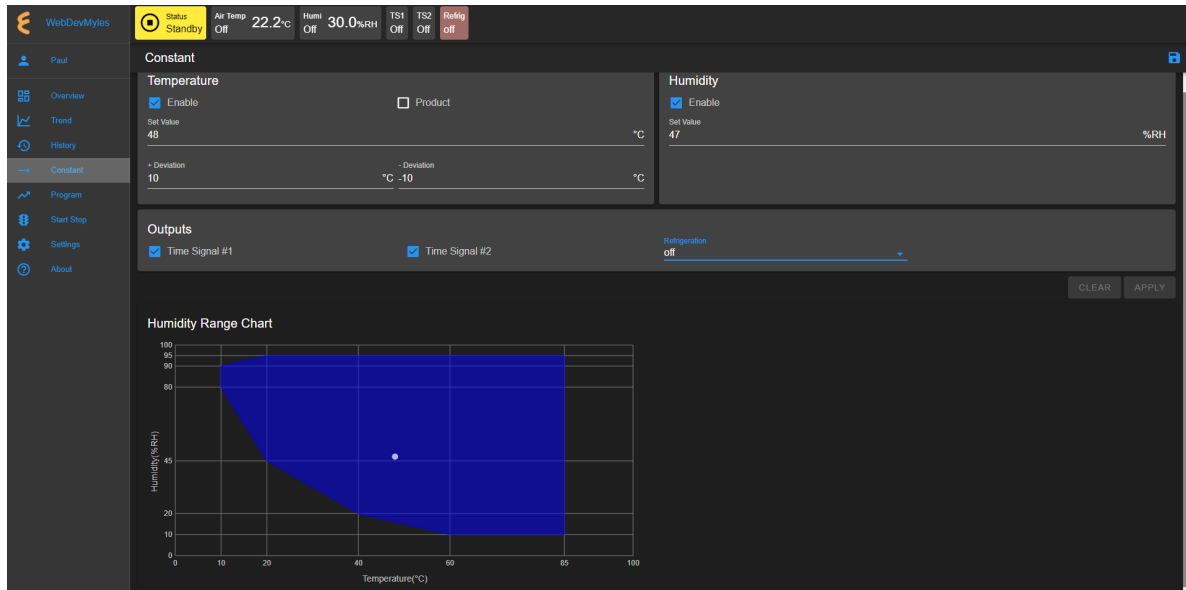


Figure 39.1: The Constant menu and its components

The following sections describe how to configure and control each of these parameters.

39.1 Product or Air Temperature Setting

Complete the following steps to turn on or modify temperature setting:

1. Enable air temperature or product temperature by checking the appropriate boxes.
2. Click the Set Value field and enter a new value, or apply the up/down arrow to adjust the value.
3. Adjust the plus/minus deviation in the appropriate fields.

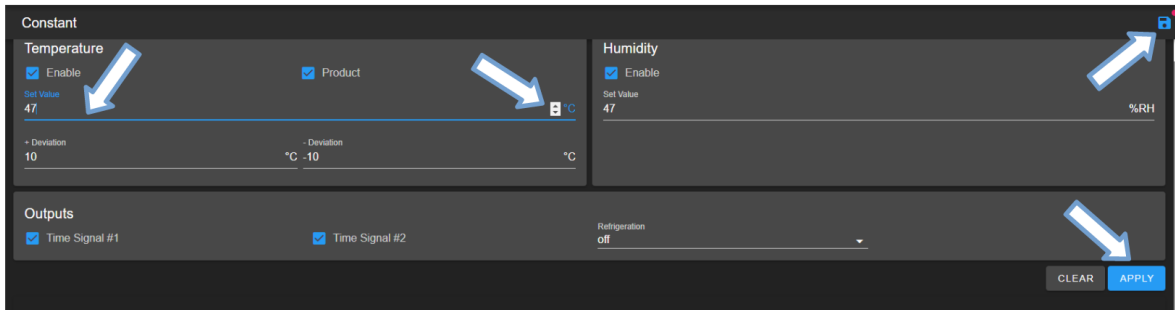


Figure 39.2: Apply new constant setting on temperature

- Click the **APPLY** button or the **Save** icon (indicated by the arrows) to apply and save the setting. The red dot next to the **Save** icon indicates that the new setting has not been saved. If you exit this pane by accessing a different menu in the menu bar, a warning message will appear (shown in figure).

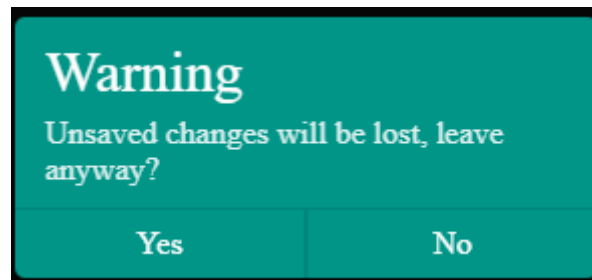


Figure 39.3: New setting must be save before exiting the pane

- To cancel the setting, click **CLEAR**.

The new setting takes effect immediately with its new status displayed in the status bar. To reverse or cancel the setting, repeat the above steps to reset the set value and click **APPLY**.

39.2 Humidity Setting

Complete the following steps to turn on or modify humidity setting:

- Enable or disable humidity with the appropriate check mark in the box.
- Click the Set Value field and enter a new value, or apply the up/down arrow to adjust the value.
- Click the **APPLY** button or the **Save** icon (indicated by the arrows) to apply and save the setting.
- To cancel the setting, click **CLEAR**. If you exit this pane by accessing a different menu in the menu bar, a warning message will appear.

The new setting takes effect immediately with its new status displayed in the status bar. To reverse or cancel the setting, repeat the above steps to uncheck the box, reset the set value and click **APPLY**.

39.3 Time Signals Setting

Complete the following procedure to turn on output for any time signal:

1. To turn on output for **Time Signal # 1**, place a check mark in its box.
2. Repeat the above step for any time signal available in the main display area.
3. Click the **APPLY** button or the save icon as indicated by the arrows in the above figure to apply and save the setting.
4. To cancel the setting, click **CLEAR**. If you exit this pane by accessing a different menu in the menu bar, a warning will appear which requires you to save the setting before attempting to access any other menus.

The new setting takes effect immediately with its new status displayed in the status bar. To reverse or cancel the setting, repeat the above steps to uncheck the box and click **APPLY**.

It is important to note that all the parameters (temperature, humidity, vibration, time signal) in the main display can be adjusted altogether simultaneously with a single **APPLY** or save button. However, individual setting may provide security to avoid any adverse effect.

CHAPTER 40

Program

The **Program** menu allows the operator to create a program to control the chamber. All the programming features available on the supported PLC's listed in Chapter 1 (“**Introduction**”) can be composed into programs to control the chamber. The operator can: (1) open and view a program; (2) preview the output of the program; (3) edit and/or overwrite an existing program ; (4) delete program from the list; (5) rename program on the list; (6) download a program and store it on the local computer in JSON file; (7) upload a program from the local computer to EWC, and much more.

Here are some of the benefits of the **Program** menu:

- Easy to operate.
- Quick management of programs, programming or editing.
- Require less time to develop a new program or modify an existing program.
- Program Editor offers flexibility with multitasking capabilities.
- Control program operation and program end mode.
- Preview program operation before execution; operator can see exactly what the program does prior to its execution.
- Download program from EWC to the local computer for backup.
- Upload program from the local computer to EWC.

Only authorized users with read-write privilege can access and utilize the **Program** menu. The user must log into their account to access the **Program** menu based on their read-write privilege, as depicted in the following figure.

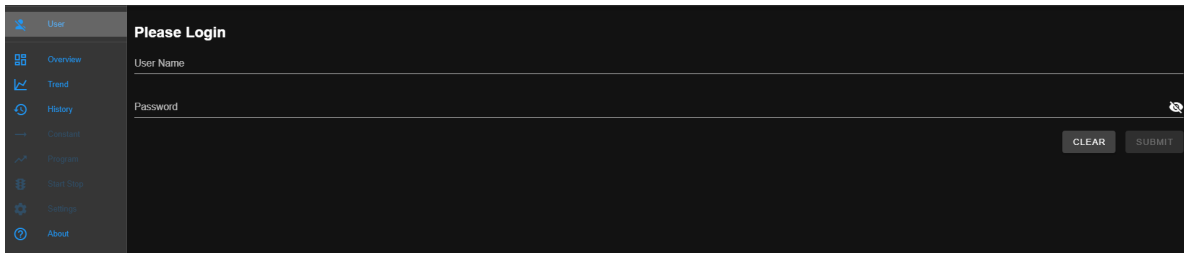


Figure 40.1: User with read-write privilege is required to operate the Program menu

40.1 List Programs

The following figure depicts a typical layout of the **Program** page with its submenu hidden. This is the default display of program list when the **Program** menu is accessed for the first time. Its UI components are numbered and explained as follows:

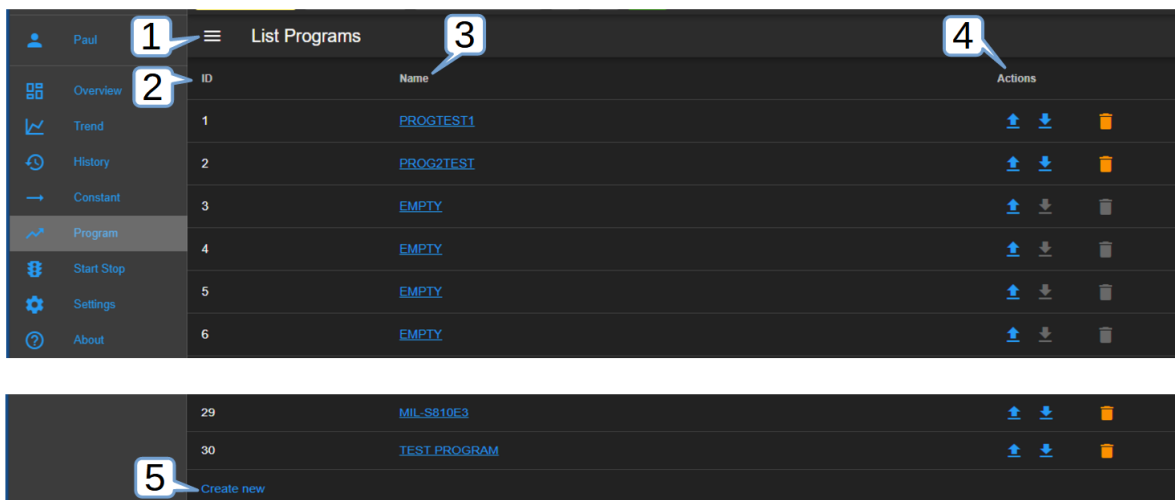


Figure 40.2: Program listing page with submenu hidden

1. **Submenu Show/Hide:** This button toggles between the “show and hide submenu” to allow the program editor utilize the entire main display area (see above figure).
2. **ID:** EWC identifies each program by its slot number stored in the PLC register. This list reflects the actual list of programs read from the PLC register. Only the first 20 (numbered from 1 to 20) are available for profile storage. The system uses a program identification code (ID) to identify each program.
3. **Program Name:** All available programs are listed under the **Name** column by program name. These programs are stored by their slot number. As such, identical program names may exist in different slots. Any slot not yet occupied by the program is marked **EMPTY**. Users can access each program under this list by clicking on the program name. The program editor then opens and displays the program instructions. Detailed operation of the program editor is discussed in the next section.
4. **Actions:** Three action buttons (Upload Program, Download Program, Delete) are available for managing the program under each row.
 - **Upload:** Program can be uploaded from the local computer to EWC which will then be stored in the PLC register using the slot number where the action was applied.
 - **Download:** Program can be downloaded and saved on the local computer.
 - **Delete:** A program to the left of the trash bin (where this action is applied) will be deleted. The PLC register will no longer contain this program.
5. **Create New:** This button opens the program editor to prepare a new program. The **Create New** button is conveniently placed in two locations: (1) under the **ID** list and (2) in the **Program** submenu (shown in the following figure).

The following figure displays the **Program** page with its submenu unhidden. The submenu (item 2) has two operation buttons: (i) List Programs and (ii) Create New (program).

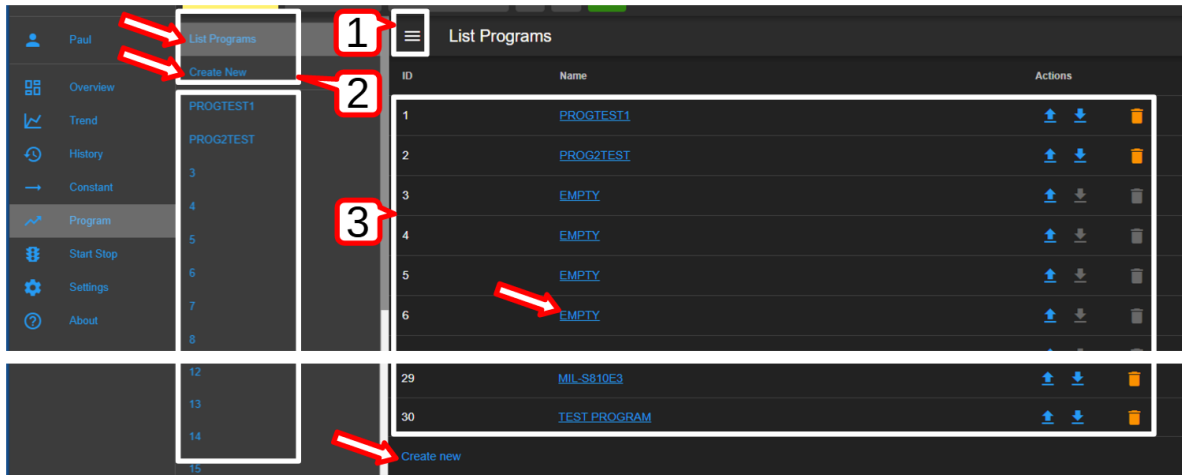


Figure 40.3: Program listing page with submenu unhidden

1. **Show/Hide:** The **Show/Hide** button can be used to hide or unhide the **Program** submenu (item 2 below).
2. **Submenu:** This submenu has two operation buttons (indicated by the arrows): **List Programs** and **Create New** (program). All the available programs in the chamber stored in EWC are listed below these operation buttons (shown in above figure). With the submenu hidden, the main display has a larger real estate to display the program elements.
 - **List Programs:** The **List Programs** button offers a quick way to exit the program editor (explained in the following section). To exit the program editor mode, click this **List Programs** button. This action will cancel and exit the program editor being used to create, edit or import a program.
 - **Create New:** Similar to the **Create New** button under the **List Programs** display page (item 3 below), this button opens the program editor with an empty template for constructing a new program. Detailed discussion is provided in the following section. A program from the local computer can also be imported into this empty template.
3. **List Programs:** This is the main display of the program list depicted in the previous figure. Click the **Show/Hide** button (item 1) to hide the submenu and expand the **List Programs** display page.

40.2 Create New Program

A new program can be created via one of the buttons depicted in the following figure.

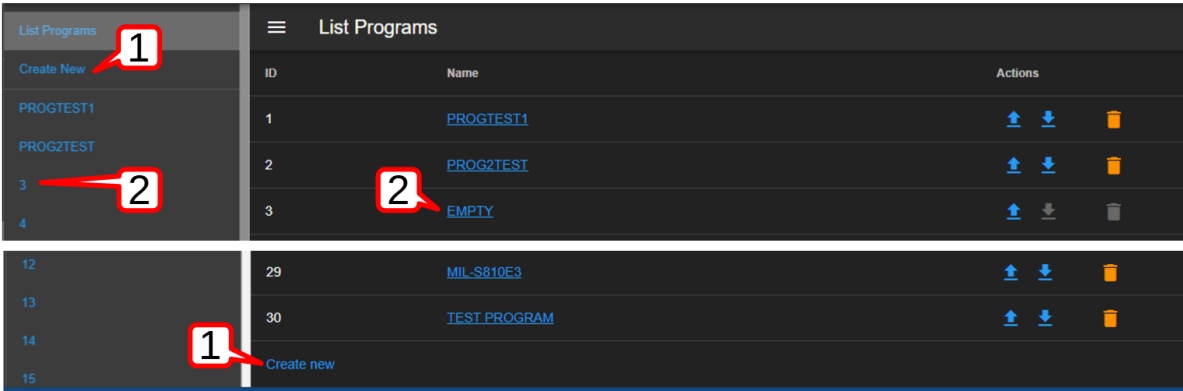


Figure 40.4: Different methods to creating a new program

Each of these buttons follows a different pattern to complete the task.

1. **Create New:** Click the **Create New** button in the submenu or under the **List Programs** in the main display to launch the program editor. An empty template is opened for a new program, as depicted in the following figure.

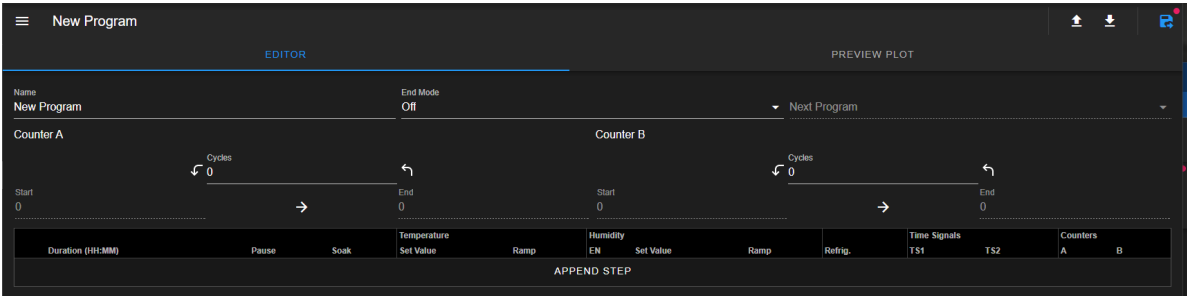


Figure 40.5: Empty template for a new program

The new program being constructed does not yet have a predefined location. For this reason, the program editor has only the **Save As** option to save the program in a specific or a desired slot number, as depicted in the following figure.

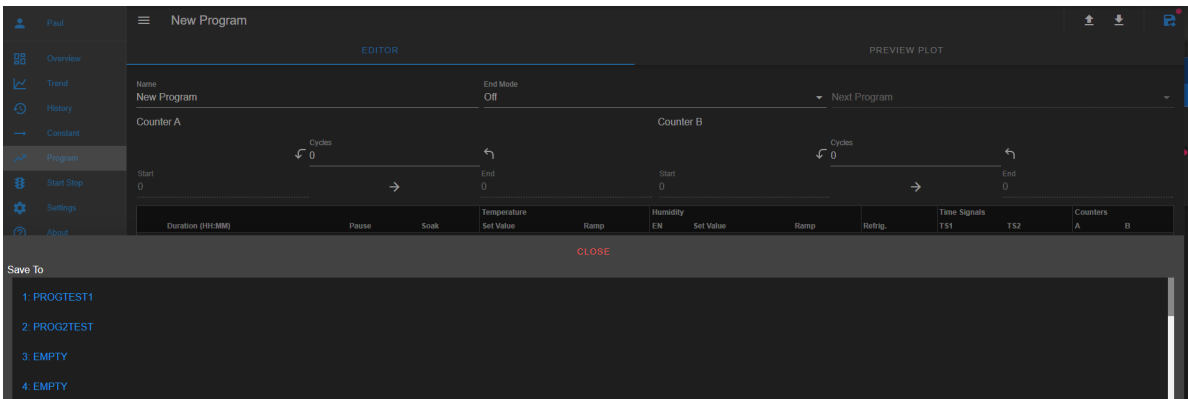


Figure 40.6: Selecting slot # to save new program

2. **EMPTY**: A new program can be created using a specific slot number. Click the slot number in the submenu or the **EMPTY** button on a desired slot number under the **List Programs** in the main display to launch the program editor to create a new program. An empty template is opened for a new program, as depicted in the previous figure.

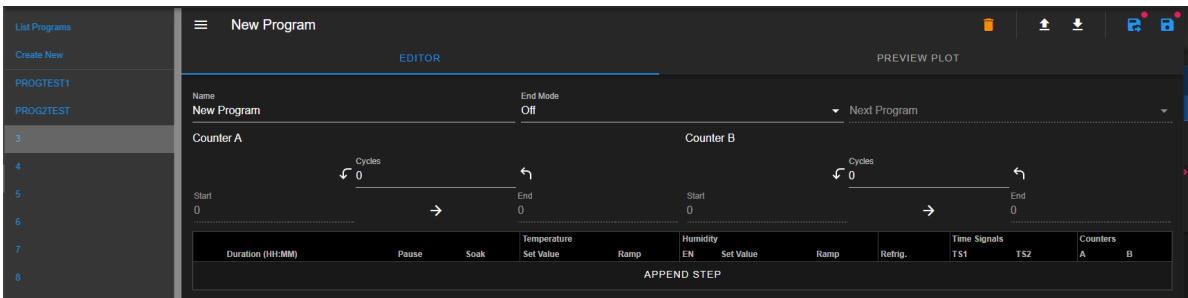


Figure 40.7: Empty template for a new program

Since the slot number has already been defined, the program editor offers two options to save the program: (1) Save As by selecting a new slot number or (2) Save (on the current slot number).

The following figure depicts the general layout of the empty template for a new program. As depicted in the following figure, slot 3 as highlighted under the program list in the submenu will be used to store the program once it is completed and saved.



Figure 40.8: The structure and UI of the Programming Editor

The UI and components of the program editor (pictured above) are numbered and described as follows:

1. **Editor:** By default, a program is open and placed in the program editor. It is highlighted in blue to indicate its active status.
2. **Preview Plot:** The output of the current program can be previewed via this button. Both the **Editor** (item 1 above) and this button can be used to toggle between the editing and previewing mode of the current program. The **PREVIEW PLOT** button is operational only when a program is loaded into the program editor or a program has been constructed in the program editor.
3. **Submenu Show/Hide:** This button toggles between the show and hide mode of the submenu. To utilize the entire main display area for the program editor, this button can be used to hide the submenu.
4. **Program Name:** An alphanumeric naming convention based on ASCII characters (lower- or upper-case letters) applies to program name containing up to 14 characters. Program name should be kept short and descriptive. When a program name is entered into this field, this name also appears in the title bar next to the show/hide button (item 3).
5. **End Mode:** An end mode available from four different options can be invoked after a program has completed its execution:
 - **Off:** The chamber will be turned off at the end of the program.
 - **Standby:** The chamber will be set to operate in a **Standby** mode at the end of the program.
 - **Constant:** The chamber will be set to operate in a **Constant** mode at the end of the program.
 - **Program:** The chamber will execute the next program listed in Next Program field. In theory, the PLC can continually execute different programs sequentially if each of those programs has its End Mode set to execute the next program on the list.
6. **Next Program:** A program to be executed following the completion of the current program.
7. **Append Step:** As shown in the previous figure, the program editor has an empty template. No instructions or steps of program have been added. To create an instruction, a new step must be created (or added). This APPEND STEP button is used to add a new

step. Once a program has a step, additional steps can be added using this button or the drop-down menu of the Step Number (to be explained below). The APPEND STEP button always adds a new step as the last step in the program. By contrast, the drop-down menu of the Step Number allows a new step to be inserted above or below the current step. It also has a delete button to remove any step from the program.

8. **Step:** A program step contains instructions (and parameters) for the chamber to carry out the tasks. Depending on the type of chamber, a program step may contain different components and parameters (associated with temperature, product temperature, humidity or vibration) outlined as follows:

- **Duration:** The duration specifies the length of time (measured in H:MM) that the said step goes through to complete its task. EWC accepts the input value in H:MM or in pure numerical value. If a pure numerical value is entered, EWC converts it to H:MM. For instance, if 15 is entered, the system treats it as 15 minutes, and the H:MM format, therefore, becomes 00:15. If 66 is entered, the system converts it to 01:06. Similarly, if 90 is entered, the system renders the value to 1:30.
- **Pause:** If enabled, the program will pause execution when this step completes its task.
- **Soak:** If enabled, the step will wait until the set point(s) are reached before the duration counter starts to count down.
- **Temperature:** The temperature control loop has two parameters:
 - **Set Value:** The value that the temperature must attain.
 - **Ramp:** If enabled, the set point will gradually change from that of the previous step to the set value of this step over the duration of this step. If disabled, the set point of the previous step will jump immediately to the set value of this step.
- **Product Temperature Control:** This option controls the product temperature (not the air temperature) if the PLC is equipped with it.
 - **EN:** This option enables or disable the production temperature control.
 - **Deviation +:** The allowable positive deviation between the product and air temperatures (must be positive).
 - **Deviation -:** The allowable negative deviation between the product and air temperatures (must be negative).
- **Humidity:** The humidity control loop setting.
 - **EN:** Enable or disable humidity control for this program step.
 - **Set Value:** The value that the humidity must attain.
 - **Ramp:** If enabled, the set point will gradually change from that of the previous step to the set value of this step over the duration of this step. If disabled, the set point of the previous step will jump immediately to the set value of this step.
- **Refrig.:** This option offers configuration on the refrigeration system and its behavior during the execution of this step. It can be configured for automatic or manual cooling power percentage; it can be completely disabled.
- **Time Signals:** Each time signal can be switched to **ON** or **OFF** for this step. Time signal (TS) operation is step dependent. Suppose TS1 is turned **ON** at step 1 and the rest of the steps do not have TS enabled. In this case, TS1 will remain “ON” for the entire program. Thus, TS may be controlled independently, step by step.
- **Counters:** The counter can be used to repeat execute a specified number of steps within the program. This option allows Both counter A and counter B can be set by enabling the check box in their respective column then dragging the start and end

arrows to the desired step. The number of times to repeat the steps can be adjusted in the text box in each column. When the text box is checked (or selected), the number of the repeating step begins with 1.

9. **Counter A, Counter B:** The counter (or loop) feature allows a certain step (or a range of steps) to be repeated multiple times within the program. With the counter feature, a program contains fewer instructional steps, and thereby requires less coding. Two separate counters are available: **Counter A** and **Counter B**. A program may contain a loop configured to run within a loop, such as Counter A executes inside Counter B. Two loops can be configured to run separately, repeating separate step numbers. For instance, Counter A can be configured to execute step 1 through step 3 for 5 times and Counter B can be configured to execute step 4 through step 6 for 3 times. ESPEC SCP220 PLC supports a maximum number of 99 cycles. Counter A or Counter B each requires three parameters to operate:

- **Start:** A value that specifies the step number to begin the loop.
- **End:** A value that specifies the last step in the loop.
- **Cycles:** A value that specifies the number of loops to complete the counter. The total number of loops is this number plus 1. Thus, if a program requires step 1 through step 3 to repeat three (3) times, the value for the Cycles will be 2.

10. **File Manipulation:** Five different buttons (icons) are available for file manipulation. Their action can be previewed by hovering the mouse pointer over them. They are described from left to right as follows.

- **Delete:** Click on the trash bin icon to delete the current program. This action will delete the program in the program editor and its location in the current slot number of the PLC. A pop-up warning appears, as depicted in the following figure, to reaffirm the action.

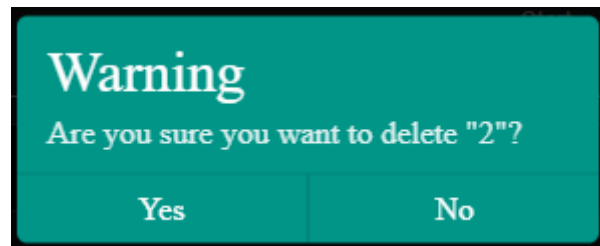


Figure 40.9: File deletion confirmation

- **Open Program:** This button imports a program file from the local computer into the program editor. EWC only accepts a program in JSON format. To ensure compatibility, the program structure should be based on the one downloaded from EWC itself (see **Download Program** below).
- **Download Program:** This button downloads the current program file and stores it on the local computer. The program is saved in JSON format using slot number as its filename (e.g., 9.json).
- **Save As:** Save the current program to a different slot number under the program list. This action brings up a program list, as depicted in the following figure, to select a new slot to hold the current program. To cancel this action, click the **CLOSE** button.

WARNING!: A vacant slot should be selected to save the program. Otherwise, the current program will overwrite the existing one in the slot without prompting for reconfirmation, thus, destroying the program previously in that slot. The current program in a new slot still uses the same program name. To make it unique, edit item 4 (above) with a new name and apply the **Save** button (see below) to resave the program.

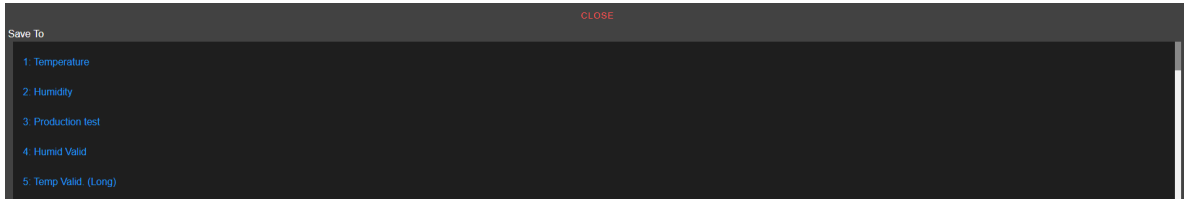


Figure 40.10: Save program to a new slot

- **Save:** This button saves the current program in the current slot on the F4T.

40.2.1 Programming: Add Program Step

The following example illustrates how to create a new program using four steps without the application of Counter A or Counter B. Temperature and humidity are illustrated this example. Time duration for each step is 30 minutes. Refrigeration will be set to auto. Humidity will be enabled for each step and set as 15, 50, 50 and 25, respectively. End mode will be set to Constant. We begin from the main menu.

1. Click **Program** in the side bar.
2. Click **EMPTY** on slot 3 on the Program List. To follow along with this example, slot 3 should be empty.
3. **Program Name:** Enter **PROG3TEST** in the program name field.
4. **End Mode:** Click End Mode field and select Constant from the drop-down list.
5. **Add New Step:** Click the **APPEND STEP** button.
6. **Step 1:** Complete the following fields:
 - **Duration:** Enter 0:30.
 - **Pause:** Leave the Pause box unchecked.
 - **Soak:** Leave the Soak box unchecked.
 - **Temperature:**
 - **Set Value:** Enter -65 or apply the up/down arrow to adjust the value to -65.
 - **Ramp:** Leave the Ramp box unchecked.
 - **Humidity:** Complete the following fields.
 - **EN:** Turn on humidity by checking this box.
 - **Set Value:** Enter 15 or apply the up/down arrow to adjust the value.
 - **Ramp:** Leave the Ramp box unchecked.
 - **Refrig.:** Leave the setting at Auto, by default.
 - **Events:**
 - **TS1:** Check the TS1 box to enable time signal 1.
 - **Counters:** Leave Counters A and B unchecked (skip it).

7. **Step 2:** Click the **APPEND STEP** button to add a new step and complete the following fields:

- **Duration:** Enter 0:30.
- **Pause:** Leave the Pause box unchecked.
- **Soak:** Leave the Soak box unchecked.
- **Temperature:**
 - **Set Value:** Enter 180 or apply the up/down arrow to adjust the value.
 - **Ramp:** Leave the Ramp box unchecked.
- **Humidity:** Complete the following fields.
 - **EN:** Turn on humidity by checking this box.
 - **Set Value:** Enter 50 or apply the up/down arrow to adjust the value.
 - **Ramp:** Leave the Ramp box unchecked.
- **Refrig.:** Leave the setting at Auto, by default.
- **Events:**
 - **TS2:** Check the TS2 box to enable time signal 2.
- **Counters:** Leave Counters A and B unchecked (skip it).

8. **Step 3:** Click number 2 in the circle at the beginning of step 2 (shown in the figure below) and select **Insert After** from the drop-down menu, and edit the fields as follows:

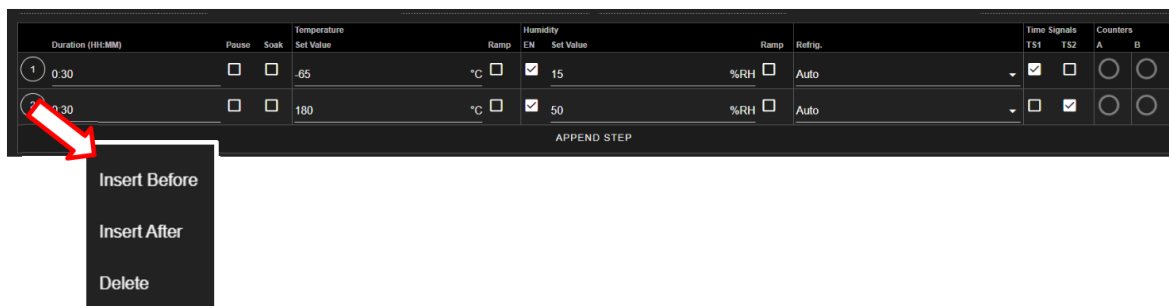


Figure 40.11: Adding a new step via the drop-down menu

- **Duration:** Enter 0:30.
- **Pause:** Leave the Pause box unchecked.
- **Soak:** Leave the Soak box unchecked.
- **Temperature:**
 - **Set Value:** Set the value to -40.
 - **Ramp:** Leave the Ramp box unchecked.
- **Humidity:** Complete the following fields.
 - **EN:** Turn on humidity by checking this box.
 - **Set Value:** Enter 50 or apply the up/down arrow to adjust the value.
 - **Ramp:** Leave the Ramp box unchecked.
- **Refrig.:** Leave the setting at Auto, by default.
- **Events:** Set both **TS1** and **TS2** to on.
- **Counters:** Leave Counters A and B unchecked (skip it).

9. **step 4:** Repeat the previous step to add the final step. The complete program is depicted as follows:

Duration (HH:MM)		Pause	Soak	Temperature Set Value		Ramp	Humidity EN Set Value		Ramp	Refrig.	Time Signals TS1 TS2		Counters A B		
1	0:30	<input type="checkbox"/>	<input type="checkbox"/>	-65	°C	<input type="checkbox"/>	<input checked="" type="checkbox"/>	15	%RH	<input type="checkbox"/>	Auto	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="radio"/>
2	0:30	<input type="checkbox"/>	<input type="checkbox"/>	180	°C	<input type="checkbox"/>	<input checked="" type="checkbox"/>	50	%RH	<input type="checkbox"/>	Auto	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>
3	0:30	<input type="checkbox"/>	<input type="checkbox"/>	-40	°C	<input type="checkbox"/>	<input checked="" type="checkbox"/>	50	%RH	<input type="checkbox"/>	Auto	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>
4	0:30	<input type="checkbox"/>	<input type="checkbox"/>	150	°C	<input type="checkbox"/>	<input checked="" type="checkbox"/>	25	%RH	<input type="checkbox"/>	Auto	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="radio"/>
APPEND STEP															

Figure 40.12: example-add-step-002.PNG

10. **Save Program:** Click the **Save** icon indicated by the arrow, as shown in the following figure, to save the program. This figure also illustrates the complete program in the program template.

PROG3TEST

EDITORPREVIEW PLOT

Name
PROG3TEST

End Mode
Constant

Next Program

Counter A

Cycles
0

Start
0

End
0

Counter B

Cycles
0

Start
0

End
0

Duration (HH:MM)		Pause	Soak	Temperature Set Value		Ramp	Humidity EN	Set Value	Ramp	Refrig.	Time Signals TS1 TS2		Counters A B		
1	0:30	<input type="checkbox"/>	<input type="checkbox"/>	-65	°C	<input type="checkbox"/>	<input checked="" type="checkbox"/>	15	%RH	<input type="checkbox"/>	Auto	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="radio"/>
2	0:30	<input type="checkbox"/>	<input type="checkbox"/>	180	°C	<input type="checkbox"/>	<input checked="" type="checkbox"/>	50	%RH	<input type="checkbox"/>	Auto	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>
3	0:30	<input type="checkbox"/>	<input type="checkbox"/>	-40	°C	<input type="checkbox"/>	<input checked="" type="checkbox"/>	50	%RH	<input type="checkbox"/>	Auto	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>
4	0:30	<input type="checkbox"/>	<input type="checkbox"/>	150	°C	<input type="checkbox"/>	<input checked="" type="checkbox"/>	25	%RH	<input type="checkbox"/>	Auto	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="radio"/>
APPEND STEP															

Figure 40.13: Save current program

Navigating out of the editor without saving the program will trigger the following warning prompt:

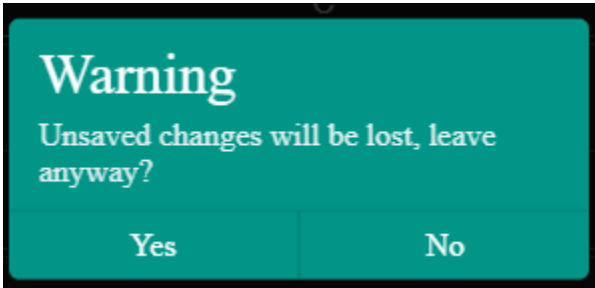


Figure 40.14: Confirm the save or discard update

11. **Preview:** Click the **PREVIEW PLOT** button to preview the output of the current program (see figure below). Click the **EDITOR** button to toggle back to the editor mode. Program cannot be saved while in the preview mode. In order to save the program, navigate back to the program editor to apply the **Save** or **Save As** button.

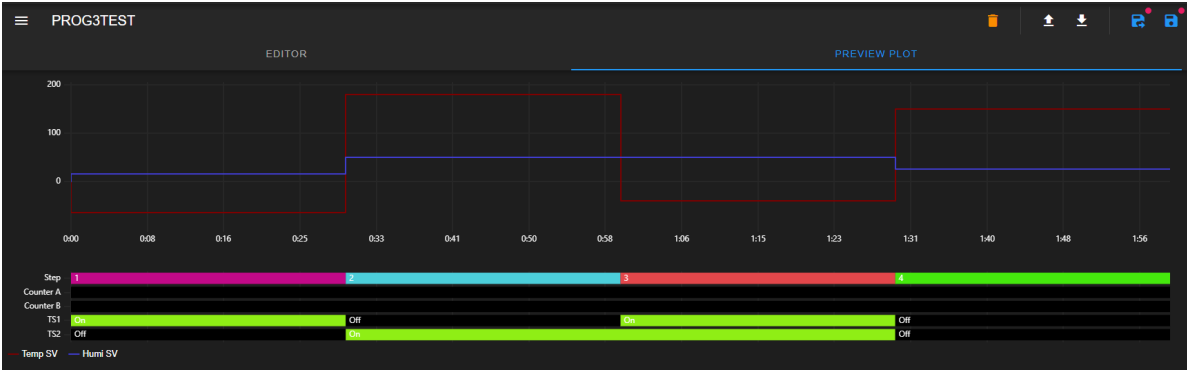


Figure 40.15: Program in preview mode

40.3 View, Edit, Save Program

This section describes how to open an existing program for viewing and editing. Changes made in the program can be written back to the file with **Save**. A new slot can be used for this updated program using the **Save As** option.

40.3.1 Open Program

To open a program for viewing or editing, click on its name under the Name list, as depicted in the following figure. Program **PROG3TEST** (indicated by the arrow) will be used for illustration. The **Download** and **Delete** buttons are grayed out (unavailable) for an empty slot under the Name list.

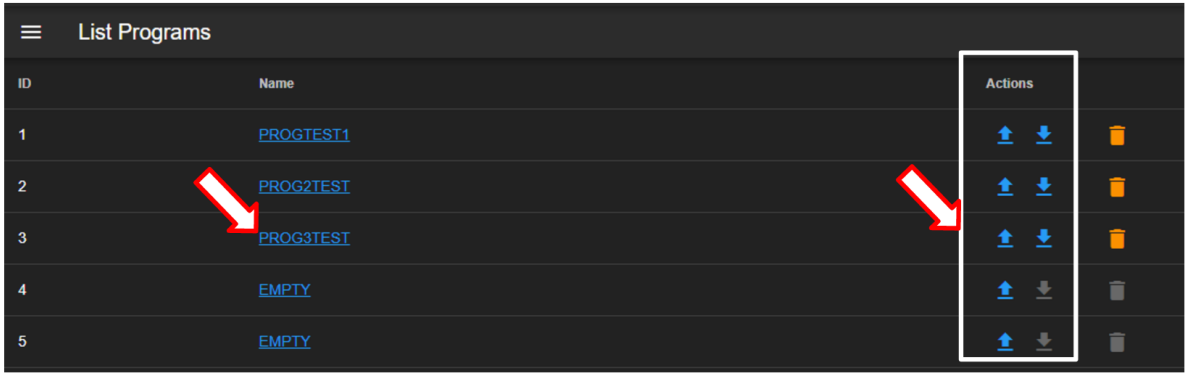


Figure 40.16: Opening a program profile

Once open, the program is placed in the program editor for editing. The file manipulation buttons (**Delete**, **Open Program**, **Download Program**, **Save As** and **Save**) offer different options to handle the program file or manipulate the program editor. These buttons will be explained in detail in the following sections.

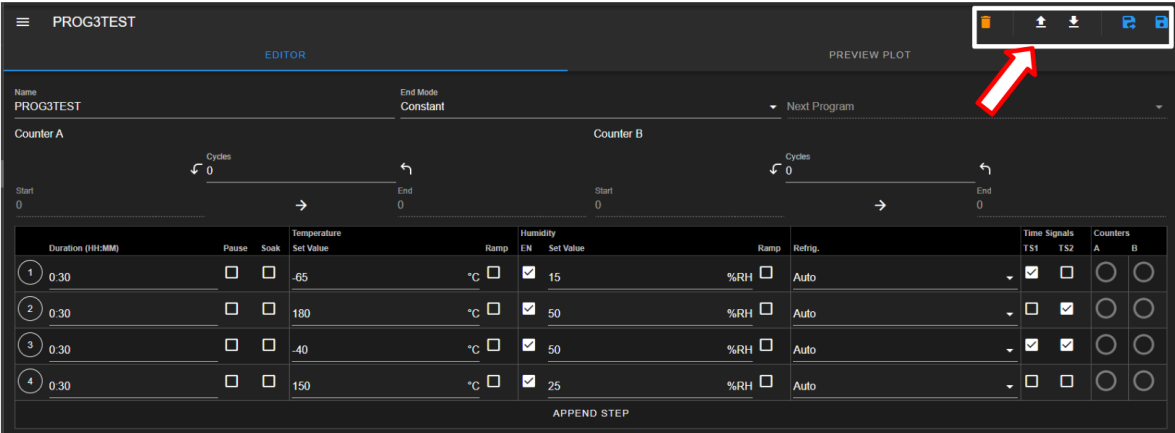


Figure 40.17: File manipulation buttons

40.3.2 Editing Program: Programming Example

This section illustrates the process of editing **PROG3TEST** program to include an application of loops with Counter A and Counter B and the ability to execute another program. The program to be executed after **PROG3TEST** has completed its own execution is **PROGTEST1** in slot 1, as depicted in the previous figure. This program has two steps but makes use of Counter A. **PROG3TEST** will consist of the following procedure:

1. **End Mode:** Set end mode to execute a new program.
2. **Next Program:** Set next program to be executed selected from slot 1.
3. **Loops:** Invoke Counter A to repeat step 2 through step 3 and cycle through twice. Invoke Counter B to repeat step 1 through step 4 and cycle through twice. Counter A loop will be executed inside Counter B.

The editing process is as follows:

1. **End Mode/Next Program:** Click the End Mode field and select Program from the drop-down list (see figure below), then click the Next Program field and select the program from the drop-down list (**PROGTEST1** in slot 1 is used for example).

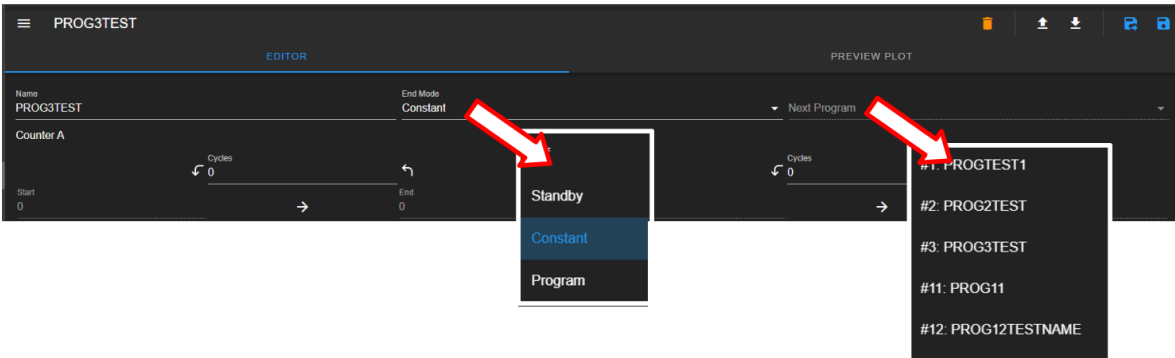


Figure 40.18: Select program to execute next

2. **Counter A:** Set Counter A loop as follows:

- **Cycles:** Enter 2 in the Cycles field or apply the up/down arrow to set the value.
- **End:** Click the up arrow to adjust the value to 3.
- **Start:** Click the up arrow to set the value to 2. Note: If a value is entered into the Start field before entering a value in the End, an error message may flag until the end step is entered.

3. **Counter B:** Set Counter B loop as follows:

- **Cycles:** Enter 1 in the Cycles field or apply the up/down arrow to set the value.
- **End:** Click the up arrow to adjust the value to 4.
- **Start:** Click the up arrow to set the value to 1. Note: If a value is entered into the Start field before entering a value in the End, an error message may flag until the end step is entered.

The complete program is illustrated as follows:

The screenshot shows the 'PROG3TEST' program editor. At the top, there are tabs for 'EDITOR' and 'PREVIEW PLOT'. Below the tabs, the program name 'PROG3TEST' is displayed, along with 'End Mode: Program' and 'Next Program: #1: PROGTEST1'. The interface is divided into two main sections: 'Counter A' and 'Counter B'. Counter A has a 'Start' value of 2 and an 'End' value of 3, with 2 cycles. Counter B has a 'Start' value of 1 and an 'End' value of 4, with 1 cycle. Below these sections is a table with 4 rows and 10 columns. The columns are: Duration (H:M:S), Pause, Soak, Temperature Set Value, Ramp, Humidity EN, Humidity Set Value, Ramp, Refig., and Time Signals (TS1, TS2). The rows represent steps 1 through 4. Step 1: Duration 0:30, Temperature -65, Humidity 15, Refig. Auto. Step 2: Duration 0:30, Temperature 180, Humidity 50, Refig. Auto. Step 3: Duration 0:30, Temperature -40, Humidity 50, Refig. Auto. Step 4: Duration 0:30, Temperature 150, Humidity 25, Refig. Auto. At the bottom of the table is an 'APPEND STEP' button.

	Duration (H:M:S)	Pause	Soak	Temperature Set Value	Ramp	Humidity EN	Humidity Set Value	Ramp	Refig.	Time Signals TS1 TS2	Counters A B
1	0:30	<input type="checkbox"/>	<input type="checkbox"/>	-65	°C <input type="checkbox"/>	<input checked="" type="checkbox"/>	15	%RH <input type="checkbox"/>	Auto	<input checked="" type="checkbox"/> <input type="checkbox"/>	<input type="radio"/> <input checked="" type="radio"/>
2	0:30	<input type="checkbox"/>	<input type="checkbox"/>	180	°C <input type="checkbox"/>	<input checked="" type="checkbox"/>	50	%RH <input type="checkbox"/>	Auto	<input type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="radio"/> <input type="radio"/>
3	0:30	<input type="checkbox"/>	<input type="checkbox"/>	-40	°C <input type="checkbox"/>	<input checked="" type="checkbox"/>	50	%RH <input type="checkbox"/>	Auto	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="radio"/> <input type="radio"/>
4	0:30	<input type="checkbox"/>	<input type="checkbox"/>	150	°C <input type="checkbox"/>	<input checked="" type="checkbox"/>	25	%RH <input type="checkbox"/>	Auto	<input type="checkbox"/> <input type="checkbox"/>	<input type="radio"/> <input checked="" type="radio"/>

Figure 40.19: Modified program

4. **Save Program:** The new program can be saved back in its current slot with the **Save** button. However, other options are available to manipulate the program file. It may be necessary to save it in a different slot so that the original program can be retained in the current slot. The following section describes how to utilize the file manipulation buttons in detail.

40.3.3 Managing Program File via the Program Editor

This section describes how to apply the five file manipulation options available in the program editor (upper-right corner), as depicted in the following figure.

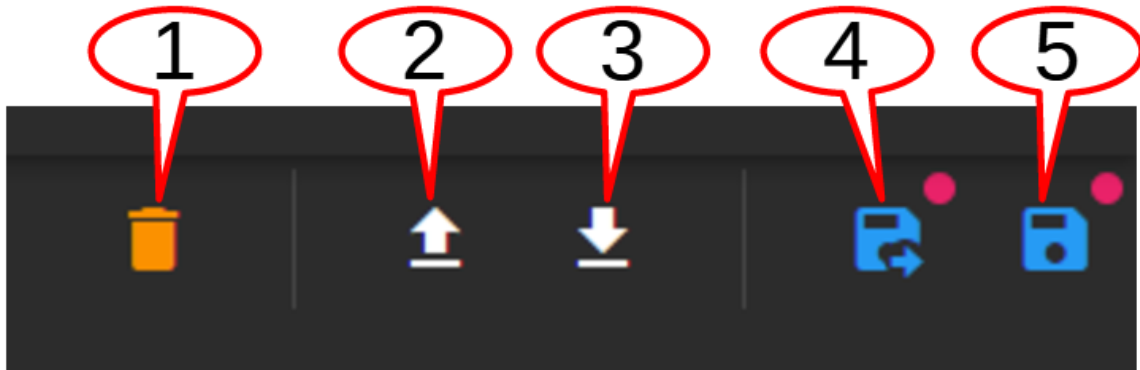


Figure 40.20: File manipulation options

They are described as follows:

1. **Delete:** The trash bin icon, when applied, deletes the current program in the program editor; that program is purged from the current slot in the PLC register, with the **EMPTY** listed under the ID list. For safety measure, the system prompts a pop-up warning with a Yes/No option. After deletion, the Program menu updates the Name list.
2. **Upload Program:** This button imports a program file from the local computer into the program editor. By default, the system opens the Downloads folder on the local computer to upload the program file.
3. **Download Program:** The current program in the program editor can be downloaded onto the local computer as a backup. By default, the program will be stored in the Downloads folder. The hostname and program slot number are used as part of the downloaded filename (e.g., hostname_program_2.json).
4. **Save As:** Program in the program editor can be saved in a different slot, under a different name. To make the program name unique, the Name field may be edited with a new program name. This procedure thus requires a two-step process indicated by the arrows in the following figure. First, edit the program name; second, click the **Save** button and select a new slot from the drop-down list.

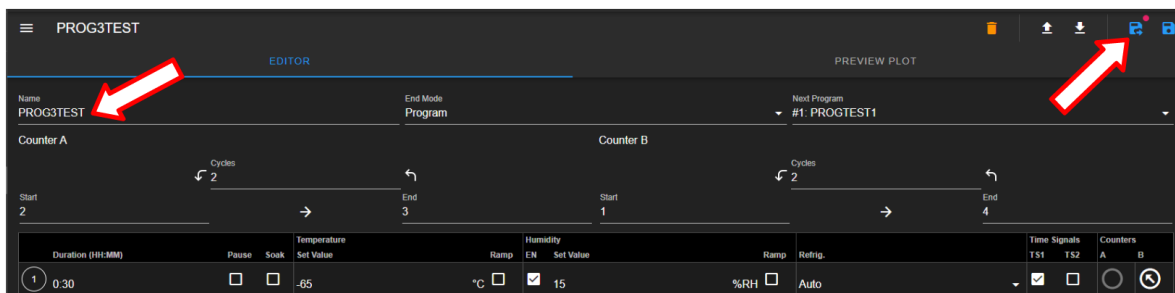


Figure 40.21: Save current program as a new file

5. **Save:** Apply this button to update the program file. To help check the editing status of the program, the program editor utilizes a red dot placed above the **Save** or **Save As** button to indicate an update yet to be saved.

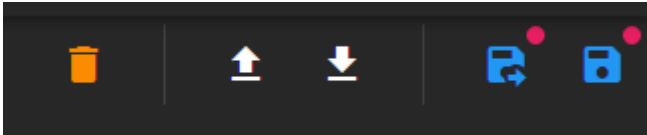


Figure 40.22: Update indicator

Navigating out of the editor without saving the update will trigger a warning prompt, as depicted in the following figure.

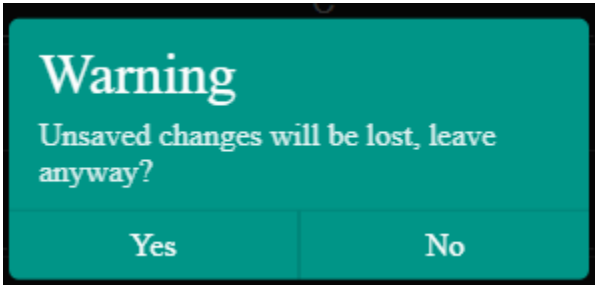


Figure 40.23: Confirm the save or discard update

40.3.4 Managing Program File via the Name List

This section describes how to apply the three file manipulation options on the Name list, as depicted in the following figure.

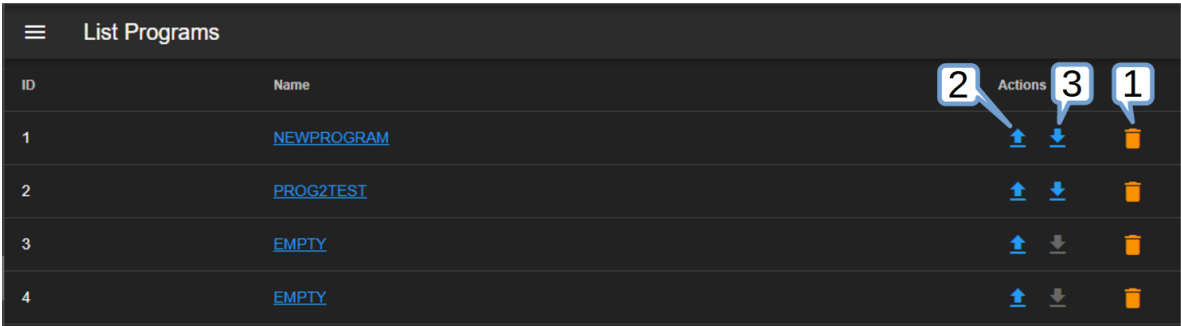
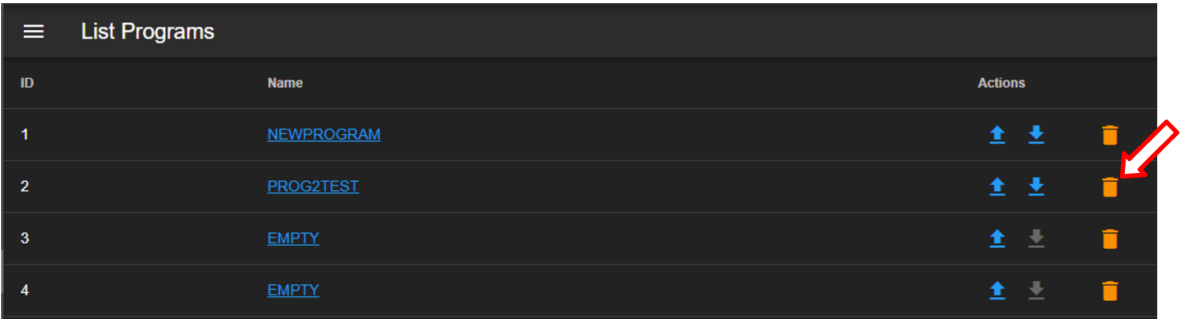


Figure 40.24: Manage programs on the Name list

These three options are listed and described as follows:

1. **Delete:** To delete **PROG2TEST** from the Name list (and the PLC register), click the trash bin icon indicated by the arrow (see figure below). As a safety measure, the system will prompt to confirm the action with a pop-up warning with a Yes/No option to proceed with the action. It may be necessary to apply the refresh button of the Web browser after deleting the program file from the Name list.







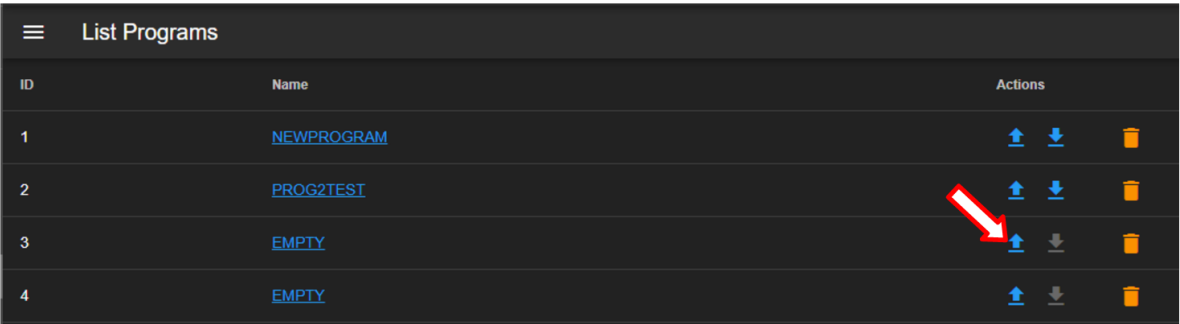
ID	Name	Actions
1	NEWPROGRAM	↑ ↓ 
2	PROG2TEST	↑ ↓ 
3	EMPTY	↑ ↓ 
4	EMPTY	↑ ↓ 

Figure 40.25: Deleting program from the Name list

2. **Upload Program:** This button can be used to import a program from the local computer directly into a program slot on the Name list and the PLC register. To upload a program into slot 3, click on the **Upload** button, as indicated by the arrow in the figure. Navigate to locate the desired file on the local computer and double-click it to complete the process.







ID	Name	Actions
1	NEWPROGRAM	↑ ↓ 
2	PROG2TEST	↑ ↓ 
3	EMPTY	↑ ↓ 
4	EMPTY	↑ ↓ 

Figure 40.26: Importing a program

3. **Download Program:** To download a program **PROG2TEST** on slot 2, click on the **Download** button (on the same row). By default, the program file will be stored in the **Downloads** folder on the local computer; filename naming convention is host-name__program2__.json.

CHAPTER 41

Start Stop

This menu allows the operator with read-write privilege to control or manage the chamber with the following operation modes: **Standby**, **Constant** and **Program**. The following figure depicts these modes displayed in the main display area as individual tabs.

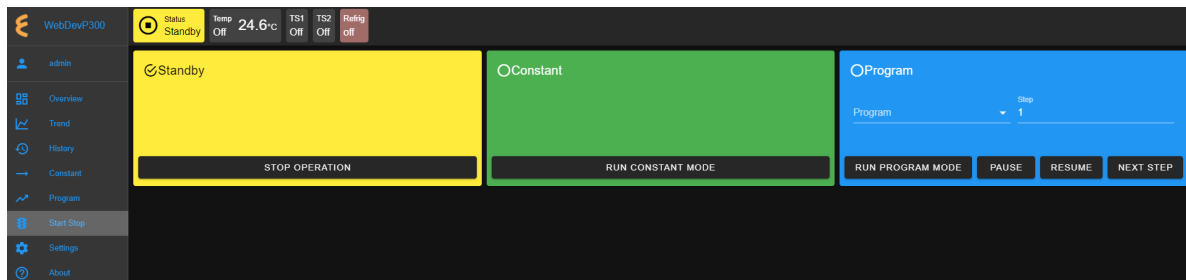


Figure 41.1: The Start/Stop menu with a Status Bar

The **Status** tab in the status bar also provides access to these modes for control and operation. Refer to Sections 4.1 through 4.5 for detail on how to control the chamber operating modes.

41.1 Standby Mode

In a standby mode, the chamber is off. Its status tab in the status bar displays **Standby**. This status is confirmed by the check mark in the Standby tab in the main display, as illustrated in the above figure. Authorized users with read-write privilege may set the chamber to operate in **Standby** mode.

41.1.1 Start/Stop Standby Mode

A standby mode can be switched from constant or program mode as follows:

1. Click the **Start Stop** menu.
2. Click the **STOP OPERATION** button in the **Standby** tab.

EWC immediately moves to apply the operating mode on the chamber, with a check mark in the Standby tab. Standby is also displayed in the Status tab of the status bar, as illustrated in the above figure. To terminate the **Standby** mode, activation of a new mode is necessary.

41.2 Constant Mode

In a constant mode, the chamber operates using the constant configuration. Authorized users with read-write privilege may set the chamber to operate in **Constant** mode.

41.2.1 Start/Stop Constant Mode

A constant mode can be switched from a standby or program mode as follows:

1. Click the **Start Stop** menu.
2. Click the **RUN CONSTANT MODE** button in the **Standby** tab.

Its status tab displays **Constant**. This status is confirmed by the check mark in the **Constant** tab, as depicted in the following figure.

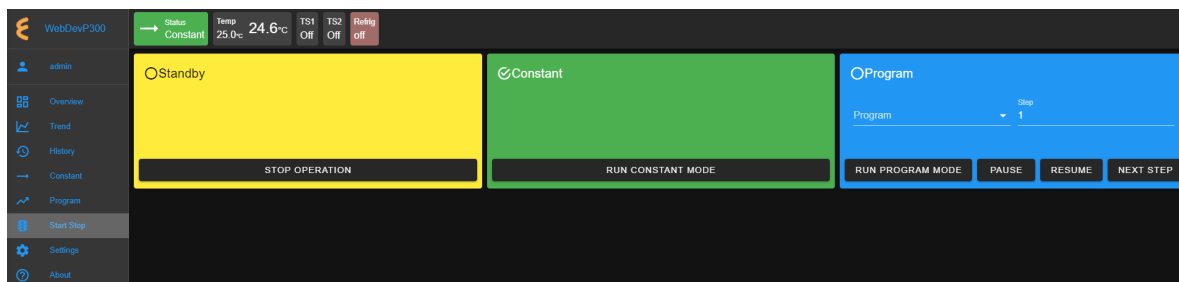


Figure 41.2: The Start/Stop menu with chamber in Constant mode

To terminate the **CONSTANT** mode, activation of a new mode is necessary. For instance, to switch the chamber from its **Constant** mode to **Standby** mode, click the **STOP OPERATION** button in the **Standby** tab. EWC immediately moves to apply the operating mode to the chamber.

41.3 Program Mode

In a program mode, the chamber carries out instructions of the program being executed. The status tab in the status bar posts **Program**, along with the name of the program being executed. This status is confirmed by the check mark in the Program tab, as depicted in the following figure.

Authorized users with read-write privilege may set the chamber to operate in **Program** mode by performing a series of operations in the **Program** tab. The following subsections explain how to run (execute) a program, pause, resume or step through the instructional steps in the program.

41.3.1 Run Program

A program mode can be switched from standby or constant. To load and execute a program to control the chamber, complete the following steps:

1. Click the **Start Stop** menu.
2. Click the radio button in the **Program** tab to select a program from the list (scroll down, if necessary), as depicted in the following figure.

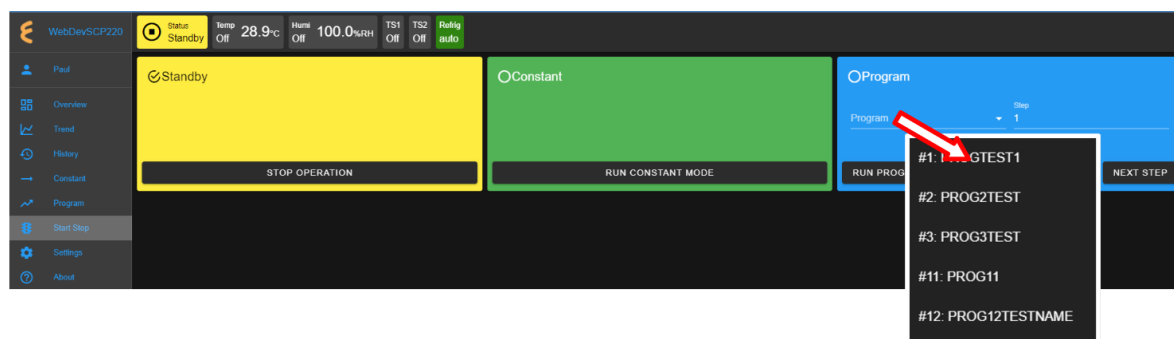


Figure 41.3: Executing a program from the Program List

- Click to select the desired program name.
- To start this program at a certain step, enter the step number in the **Step** field. Default setting is 0, which means to start program at step 1.
- Click the **RUN PROGRAM** button to execute the program. EWC immediately moves to apply the operating mode to the chamber. The status tab and status bar now display the program being executed, as depicted in the following figure.

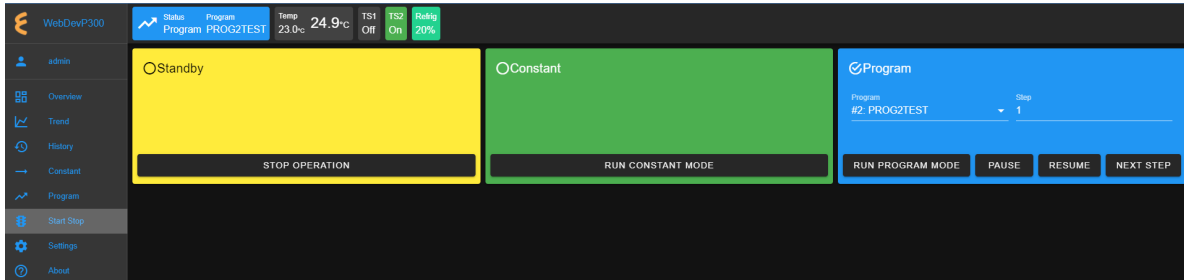


Figure 41.4: The Start/Stop menu with chamber in Program mode

The **Overview** page maybe accessed to display the detail of the program being executed.

41.3.2 Pause/Resume Program

Authorized users with read-write privilege may control the chamber during program execution. **Program** mode may be interrupted and put in a “suspense mode” using the **PAUSE** button in the **Program** tab. To pause a program during execution, click the **PAUSE** button; all operations are suspended. An update notification appears in the lower-right corner. The **Paused** notification is posted in the status tab.

To resume the operation and continue program execution, click the **RESUME** button. An update notification appears in the lower-right corner. The chamber will continue to operate based on instructions in the program. Program name is posted in the status tab to indicate chamber is in **Program** mode and that program is being executed.

41.3.3 Stepping through Program

Without having to wait for each step in the program to complete its tasks for the entire duration in the instruction, an operator may step through the program to study the effects of the instructions in a certain step. While the program is being executed, click the **NEXT STEP** button to execute the next step in the program. This action may be repeated until the last step in the program is reached. The **Overview** page in combination with the extended tab maybe accessed to display the detail of the program being executed and its steps being stepped through. The following figure depicts program **TempVib1** being stepped through to executing step 4.

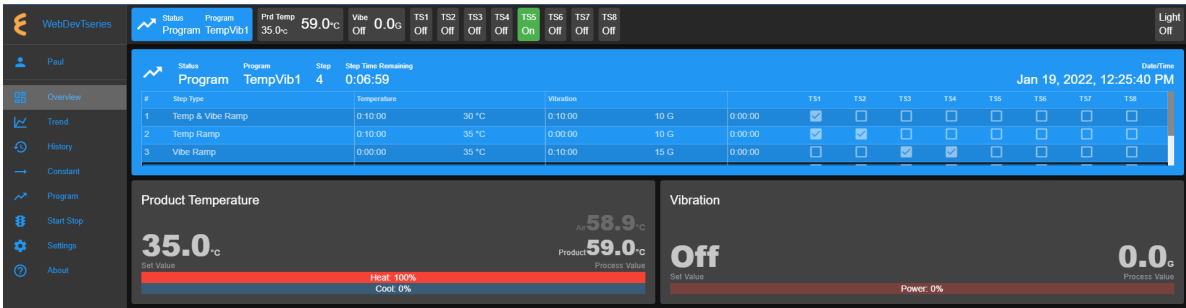


Figure 41.5: Stepping through a program

41.4 Alarm Mode

An alarm mode is not an operation mode controllable by the **Start Stop** menu as the previous three modes. An alarm mode occurs when the chamber is in an alarm state. As indicated in Section 4.4, when EWC detects the chamber in an alarm state, it sets itself in an alert state by displaying a list of active alarms and fault names in the red window to require an immediate action from the operator, as depicted in the following figure.

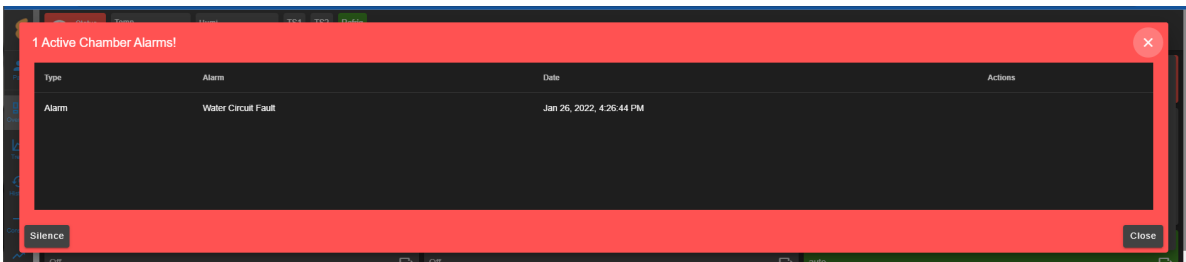


Figure 41.6: Chamber in alarm state

A repeating beep on the local computer is tripped to get the operator's attention. The **SILENCE** button can be used to turn off the beep. The **CLOSE** or X buttons can be used to close this window. However, the alarm state still remains to be resolved as indicated by the red **Status** tab in the status bar (shown in the following figure). To redisplay or expand the alarm list, click the red dot in the lower-right corner.

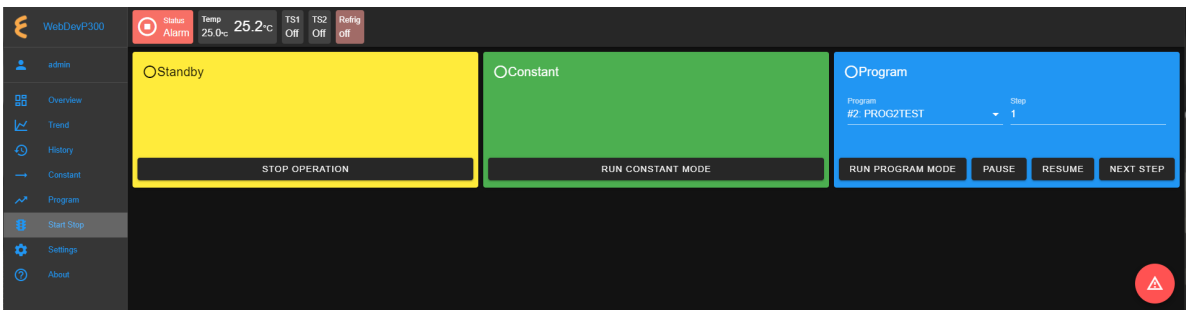


Figure 41.7: Alarm state during constant or program mode

41.4.1 Clear Alarms

The chamber is set in the **Alarm** state as a result of an alarm or alarms triggered in and by the chamber. EWC relays all alert messages to the operator for immediate action or intervention to prevent further damage to the chamber or any test products inside the chamber.

In an alarm state, all operations are halted until all alarms triggered by chamber are resolved by clearing all alarms via the PLC's HMI (see the chamber and PLC operation manual for detail). When all alarms are cleared, EWC will automatically clear all alert messages and resume normal operation by switching the chamber to a **Standby** mode.

41.5 Timers

The **Timers** tab provides a quick way to apply the Macro Editor to automate a simple macro action to extend the operating mode of the chamber. There are two timer types: One-time timer and repeated timer. The one-time timer or one-shot timer allows an operator to set up a single (hence, one-time) operation on the chamber, while the repeated timer permits an operator to set up a repeated operation on the chamber. The repeated timer will operate indefinitely until it is disabled. The following figure depicts these two timer types.

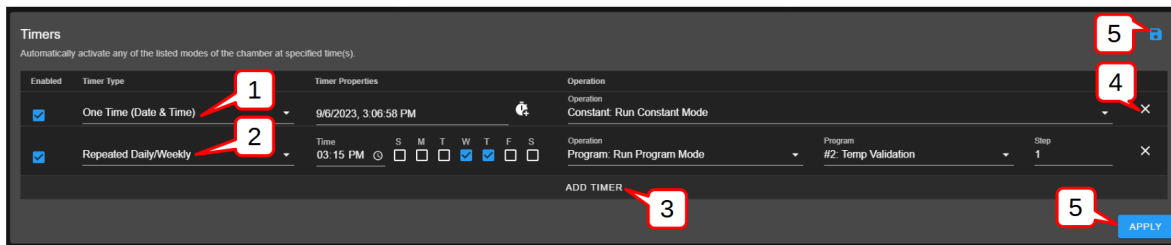


Figure 41.8: Example of one-time and repeated timer operation

1. **One-Time:** This timer fires the constant mode operation at 3:06:58 PM on 9/6/2023. The timer instruction and 3:06:58 PM must be configured ahead of time, later than the current time in order for the operation to take effect. For this reason, EWC date/time must synchronize with the current or local date/time (refer to **Date/Time Settings** under the **Settings** menu for detail). The one-shot timer is date/time dependent.
2. **Repeated Daily/Weekly:** This line is added after the first line got executed. Since it is set to occur after the first line, it will trip at 3:15 PM on Wednesday and Thursday of the week (in reference to the current date/time of EWC). The action executes a program from slot 2 (also referenced by the program name). When program execution is complete, the chamber will be set in the operating mode specified by the instruction in the program. This timer type is date/time independent; the operation will recur until the timer itself is removed from the **Timers** list or disabled with the **Enabled** box unchecked.
3. **Add Timer:** A new timer can be added using the **Add Timer** button, which will be added at the bottom of the list.
4. **Remove/Delete:** Each timer can be removed using the **X** button to its right.
5. **Save/Apply:** To start the timer, the **Save** or **Apply** button must be used. The two timer instructions (depicted above) are saved under the Macro Editor called **Operation Timer**

1 and **Operation Timer 2**, respectively. If the timers are edited with new instructions and saved, the system generates a new name **Operation Timer 3** for the third timer, with a numeral incremented by one per each update. If the timer instructions are all removed from the **Timers** list, and a new timer is created and saved, the system starts over with **Operation Timer 1**, with its numeral incremented by one on each new update. This information can be viewed under the **Macros** submenu (under the **Settings** menu).

41.5.1 Program Mode: One-Time Timer

A one-shot timer sets the **Timers** to fire a certain action once based on the set date and time. With this feature, a selected program can start at a certain day and time once. The running program can be paused, resumed or stopped by another (subsequent) one-shot timer. An operator can plan to stop a certain program and switch the chamber to a different mode with the one-shot timer.

The following example illustrates how to set a one-shot timer to switch the chamber from **Standby** to **Program** and execute the said program starting with step 1.

1. Log in using the **admin** account
2. Access the **Start Stop** menu
3. Touch or click the **ADD TIMER** bar
4. Select/confirm that **One Time** is selected from the drop-down list of the **Timer** type; by default, **One Time** is selected.

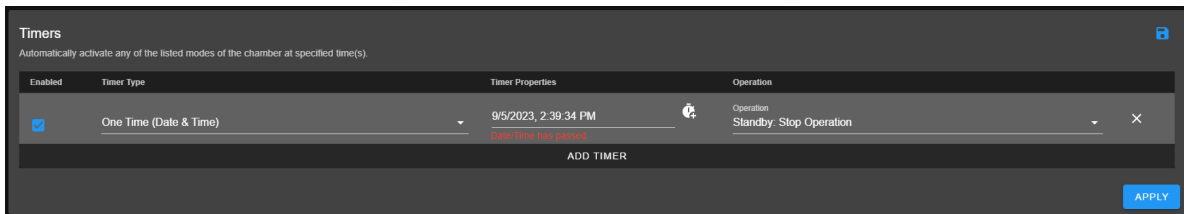


Figure 41.9: Setting a one-time automation

5. Touch or click the date/time field under the **Timer Properties** and apply the calendar and time to set the desired time. **Note:** Date and time must be ahead of the current date and time on the EWC system.

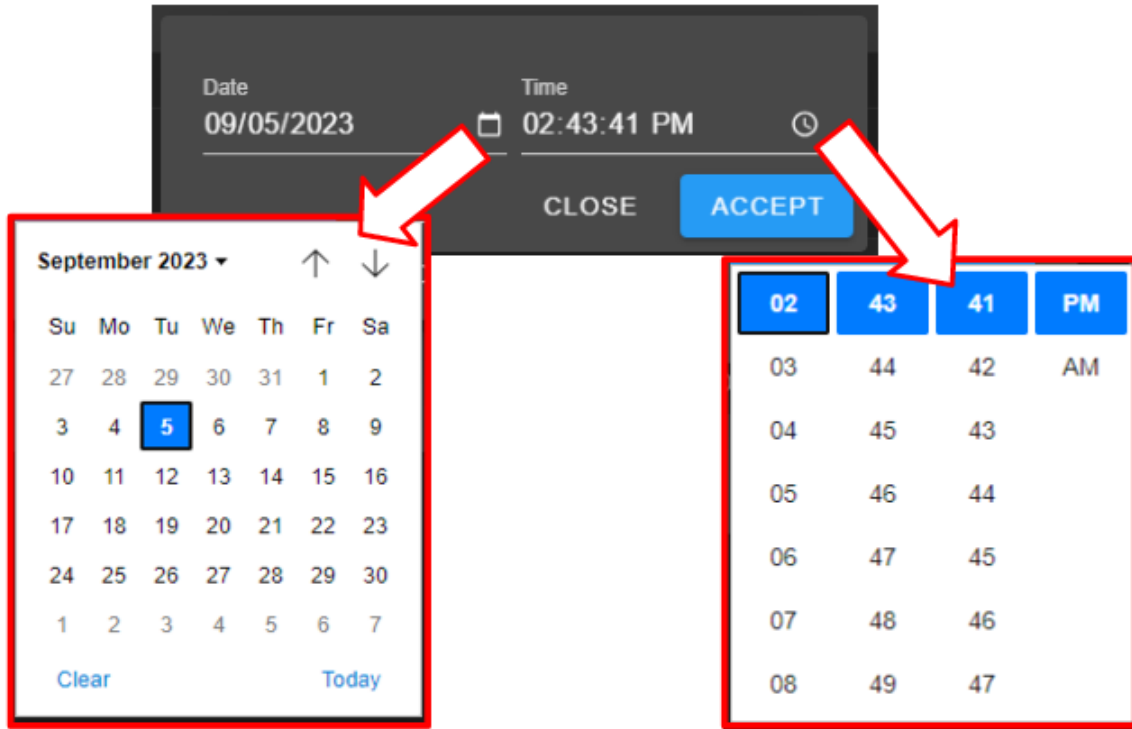


Figure 41.10: Set date/time for a one-shot action

Note: For a one-time operation, it is easier to use the Offset button (on the right of the date/time field) to adjust the future time, as depicted by the arrows in the following figure. Here, EWC will add the time to the current time to calculate when this action will fire.

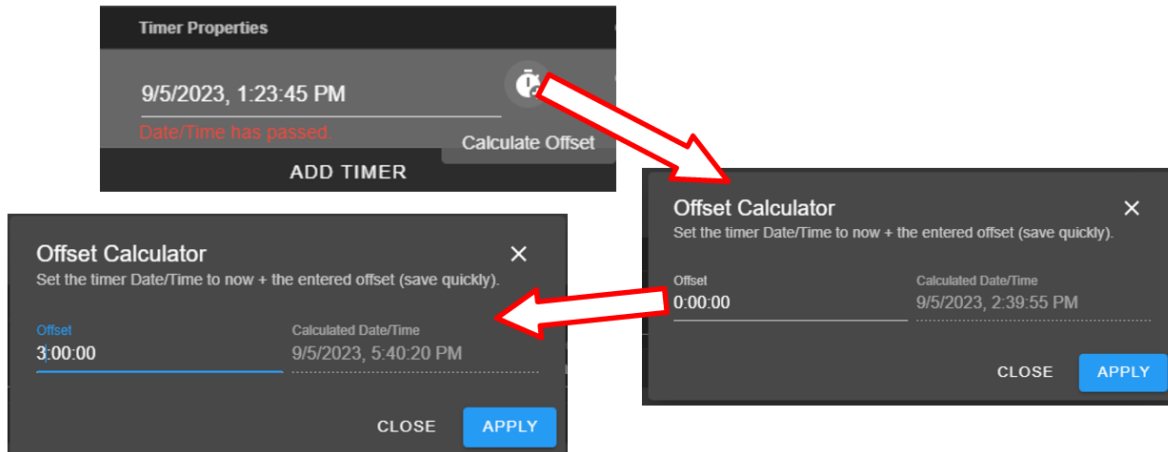


Figure 41.11: Using the time-offset calculator

6. Under **Operation**, select **Program: Run Program**
7. Under **Program**, select slot number or the associated program name
8. Under **Step**, select what step to start
9. Apply the setting with the **APPLY** button

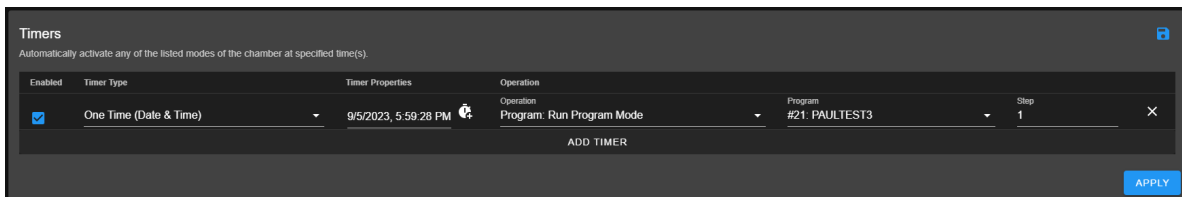


Figure 41.12: Program mode for a one-time start

Note: Both the **Save** and **APPLY** buttons provide the same effect. Either button can be used to save the settings and apply the action.

10. The program in slot 21 (as depicted in the example) will commence at 5:59:28PM (according to the EWC local time).

41.5.2 Removing or Adding a Timer

The one-shot or repeated timer can be removed from or added to the **Timers** list with the **X** or **ADD TIMER** button. Each new timer is added to the bottom of the list and takes effect after each update.

To add a new timer and use it, simply apply the **ADD TIMER** button. The following figure illustrates how a second timer is added to switch the chamber from a program mode (activated by the first timer) to **Constant**. Here, program from slot 21 gets executed (by the timer in the first line) at 1:20:15 PM, with execution time to last several hours. The timer in line 2 will switch the chamber to **Constant** mode at 2:00:00 PM.

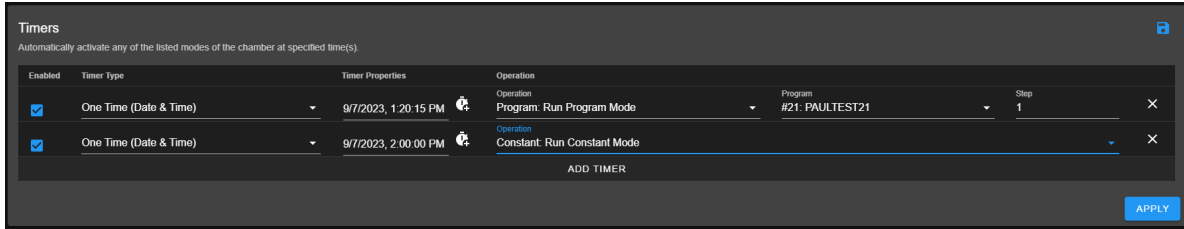


Figure 41.13: Setting additional one-shot timer after the first

Different timers on the list can be enabled or disabled using the **Enabled** box. Additional timer can be added to the **Timers** list and updated to take effect, provided the time is set for future time.

41.5.3 Constant Mode: One-Time Timer

The following example illustrates how to configure a one-shot timer to switch the chamber from **Standby** to **Constant** at a specific time. The timer is configured as a new instance with one line by itself, as depicted in the following figure. The action is instant.

1. Log in using the **admin** account
2. Access the **Start Stop** menu
3. Clear all or current timer settings with the **X** button (if necessary).
4. Touch or click the **ADD TIMER** bar
5. Confirm that **One Time** is selected (or make selection from the drop-down list).
6. Click or touch the date/time field under the **Timer Properties** and apply the calendar and time to set the desired time.
7. Under **Operation**, select **Standby: Stop Operation**
8. Apply the setting with the **APPLY** button. The timer is now saved in the Macros list.

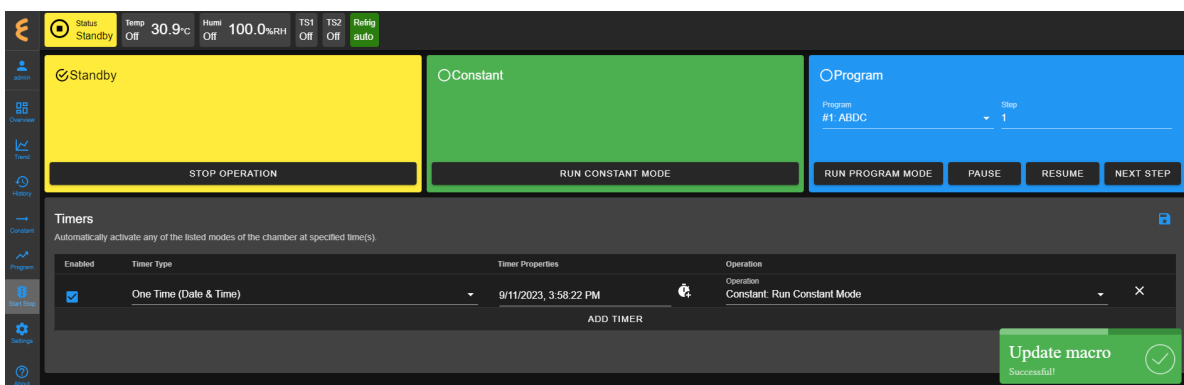


Figure 41.14: Scheduled a one-time timer to set chamber in Constant mode

9. The timer is activated at the set time, as depicted in the Macros list under the Operation Timer 1 script. To view the Operation Timer 1 action, access the Settings menu and select

Macros from the submenu.

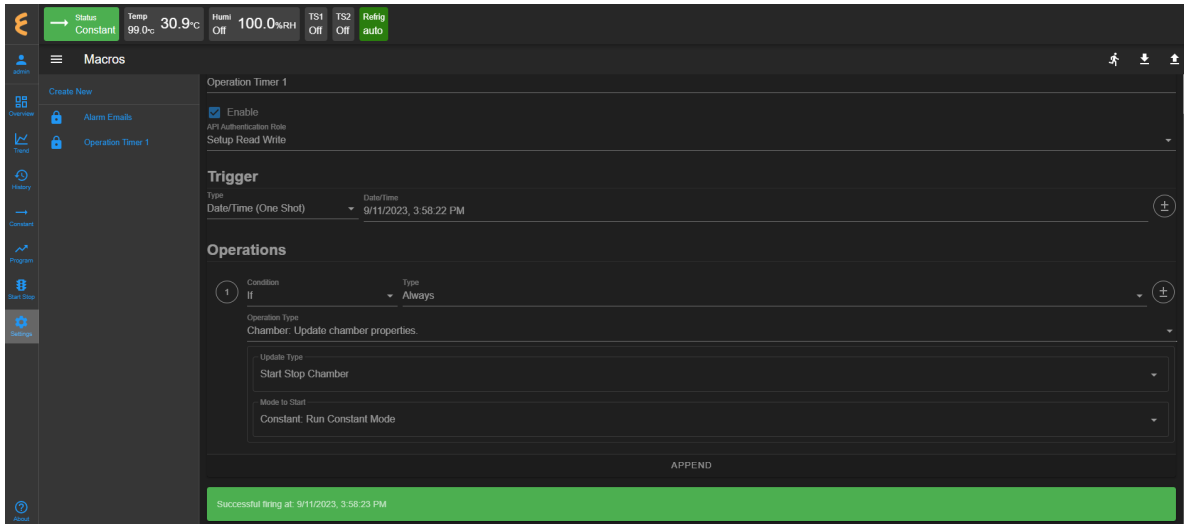


Figure 41.15: Macros action recorded on the one-time Timer

41.5.4 Program Mode: Weekly Repetition

With a weekly repeated timer, a program can start on a certain day, at a certain time. The following example illustrates how to execute a program on a weekly basis (one day during each week) at a certain time. Here, we set the program to execute every Wednesday at 6:00 PM.

1. Log in using the **admin** account
2. Access the **Start Stop** menu
3. Clear all or current timer settings with the **X** button (if necessary).
4. Touch or click the **ADD TIMER** bar
5. Under **Timer Type**, select **Repeated Daily/Weekly**
6. Edit the time to 6:00 PM
7. Check the box under W. The calendar format is Sunday(S) to Saturday (S).
8. Under **Operation**, select **Program: Run Program Mode**
9. Under **Program**, select program in the desired slot number (PAULTEST12 in slot 12 was used as an example).
10. Set program to execute at step 1.
11. Apply the setting using the **APPLY** button. The complete configuration is depicted in the following example.

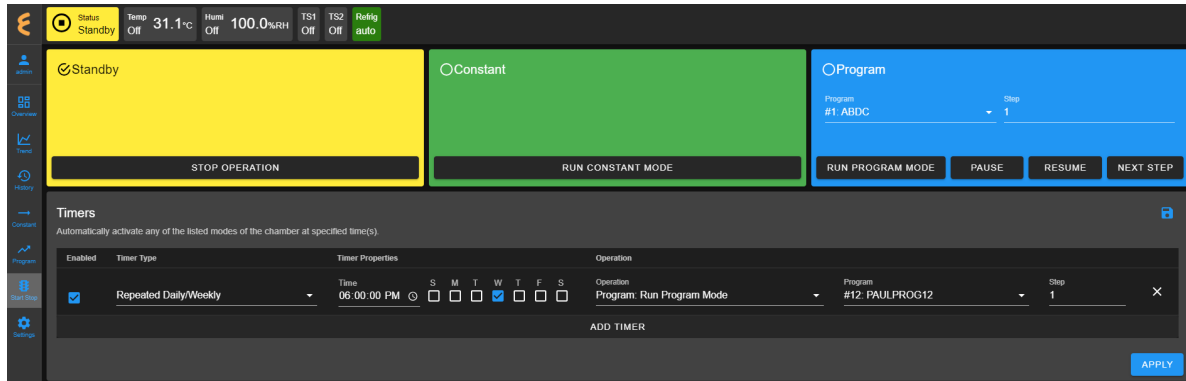


Figure 41.16: Single-day weekly timer

This timer can be disabled or enabled by manipulating the **Enabled** box. If you stop the program or switch the chamber to a different mode (such as, **Constant**), while this timer is still enabled, the selected program will recur the following week. To disable the timer permanently, it must be removed from the list (with the X and APPLY button).

41.5.5 Program Mode: Daily Repetition

The following example illustrates how to execute a program on a daily basis throughout the entire week starting 6:05:54 PM.

1. Log in using the **admin** account
2. Access the **Start Stop** menu
3. Clear all or current timer settings with the **X** button (if necessary).
4. Touch or click the **ADD TIMER** bar
5. Under **Timer Type**, select **Repeated Daily/Weekly**
6. Edit the time to 6:05:54 PM. Note: The 54-second mark was based on the running clock of the system.
7. Check the boxes under S through S. The calendar format is Sunday (S) to Saturday (S).
8. Under **Operation**, select **Program: Run Program Mode**
9. Under **Program**, select program in the desired slot number (PAULTEST21 in slot 21 was used as an example).
10. Set and select program to begin at step 1.
11. Apply the settings with the **APPLY** button. The complete configuration is depicted in the following figure.

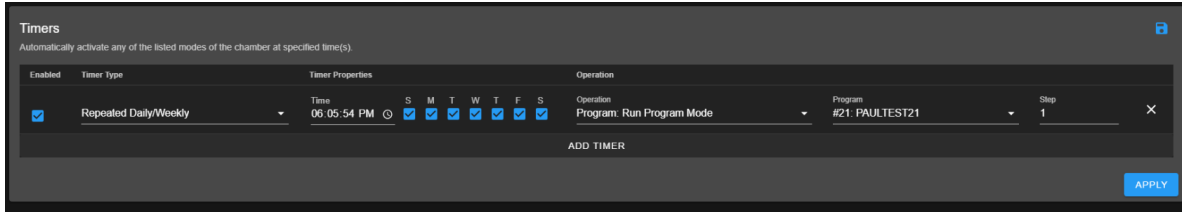


Figure 41.17: Timer setting for everyday of the week

The following trend graph is a result of the timer with its configuration set to run for several days. The trend graph was produced by extrapolating the data from the last three days (Friday through Sunday). It shows how program was repeated each day at 6:05 PM and ended shortly before 9:00 AM, as indicated by the status bar at the bottom of the graph. The chamber was put in a **Standby** mode until the selected program executes again at 6:05 PM.

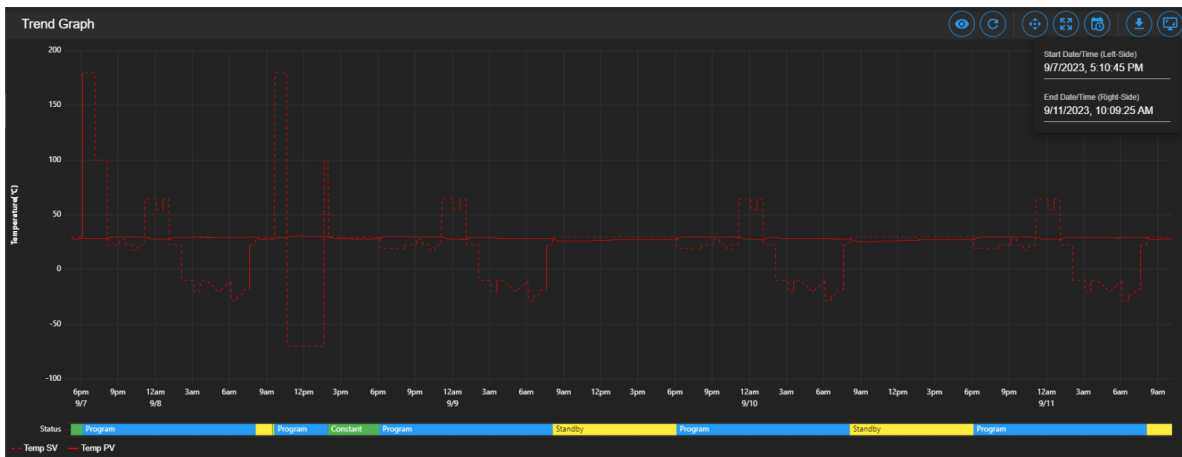


Figure 41.18: Trend graph of chamber controlled by a timer

This timer can be disabled or enabled by manipulating the **Enabled** box. If you stop the program or switch the chamber to a different mode (such as, **Constant**), while this timer is still enabled, the selected program will recur on the next day. To disable it permanently, the timer can be removed from the list (with the X and APPLY button).

41.5.6 Multiple Timers: One-Time or Repeated Daily/Weekly

The **Timers** list may contain multiple timers with different instructions for a specific operation. Multiple timers allow for sequential activations, order of script execution or specific execution via the **enabled** box selection, etc.

The following figure depicts a list of multiple timers, each with a specific function and operation, which has been prepared to execute in the top-to-bottom paradigm.

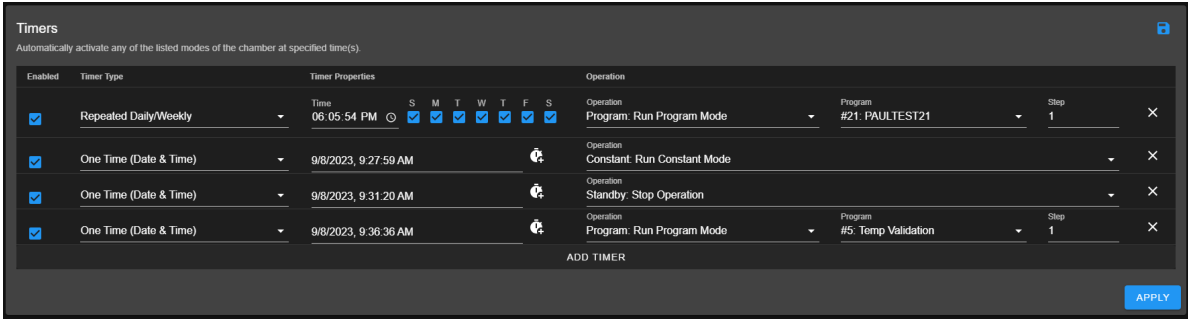


Figure 41.19: Multiple sequential timer operations

Each entry in the above figure is added after the previous one (above it) has been executed. All of which are enabled by default. Only timer 1 (top line) and timer 4 (bottom line) remain in effect, since the middle two are one-shot timers. In addition, the last timer is also a one-shot timer and it will end after the program it has executed has ended. Each timer causes action to take over the previous one.

Part VIII

ESPEC ES102 Chamber

CHAPTER 42

Overview

The **Overview** page displays the current status of the chamber and its operating mode. A user is brought to this page after logging into EWC. The following figure depicts **Overview** with the chamber in Standby as indicated in the status tab and its extension bar. This extension bar is only available in the **Overview** menu. The date/time posted in the extension bar is the date/time on the chamber/controller. While date/time stamp of data logs and Macros automated actions are based on the date/time on EWC, the controller date/time should also synchronize with that on EWC and the local device (that launched the Web browser). The date/time of EWC can be viewed under the **Settings** menu. It can also synchronize with that on the local device (to be discussed in the **Settings** menu).

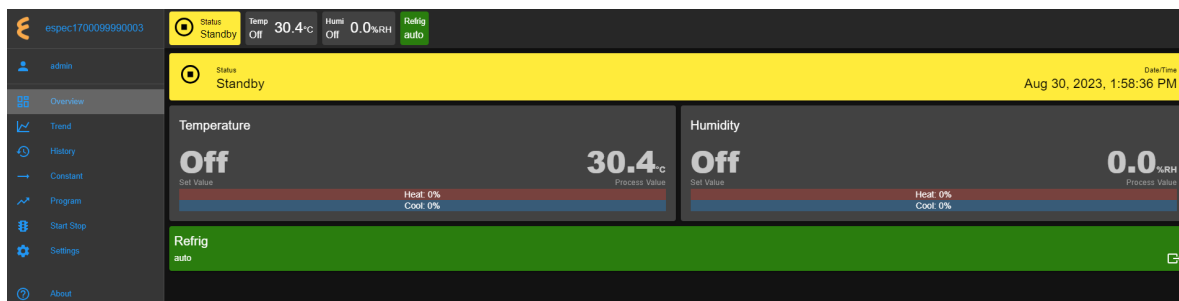


Figure 42.1: Overview page with chamber in Standby mode

The following figure depicts **Overview** showing the chamber in Constant mode.

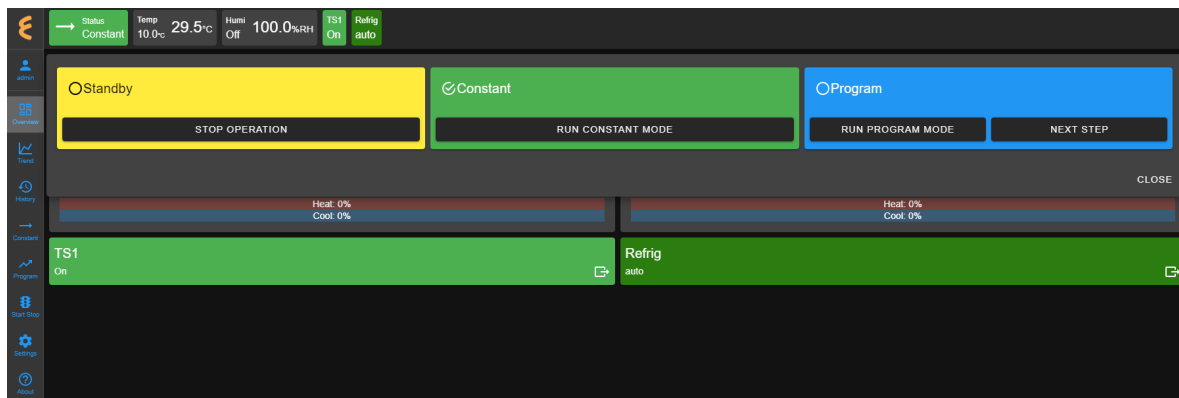


Figure 42.2: Overview page with chamber in Constant mode

The following figure depicts **Overview** showing the chamber in Program mode. Detailed information about the program, including what step is being executed, is listed in the extension bar (of the status tab). This feature provides the operator with useful information about the status of the chamber and the program.

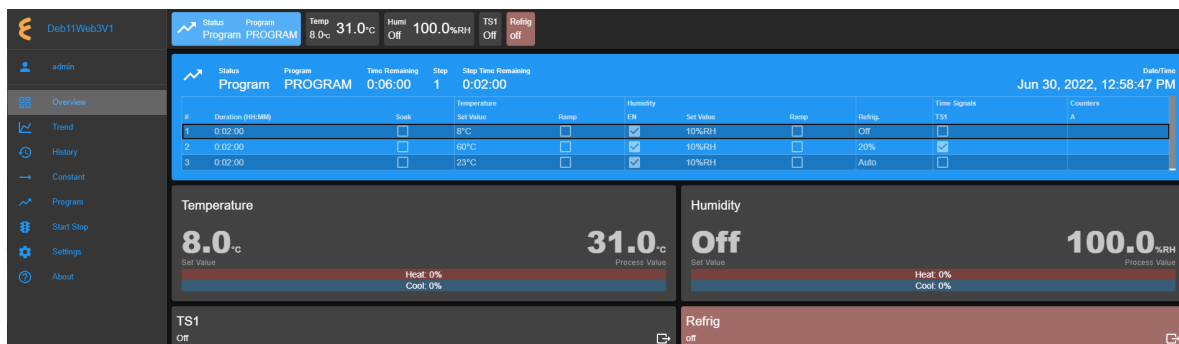


Figure 42.3: Overview page with chamber in Program mode

Only users with read-write privilege can control the chamber operation mode from within this page. Supported operation modes are **Constant** and **Program**. Each tab in the status bar may be accessed to apply new settings at any time. This feature enables the operator to control the chamber without having to access the **Start Stop** menu in the menu bar. The following sections detail a step-by-step procedure how to control the chamber's operating mode via the **Overview** menu for users with read-write privilege.

42.1 Constant Setting

Operating mode can be switched from **Program** to **Constant** or vice versa. For authorized users with read-write privilege, to set the chamber in **Constant** mode, proceed with the following steps.

1. Click the status tab in the status bar (as shown in the figure).

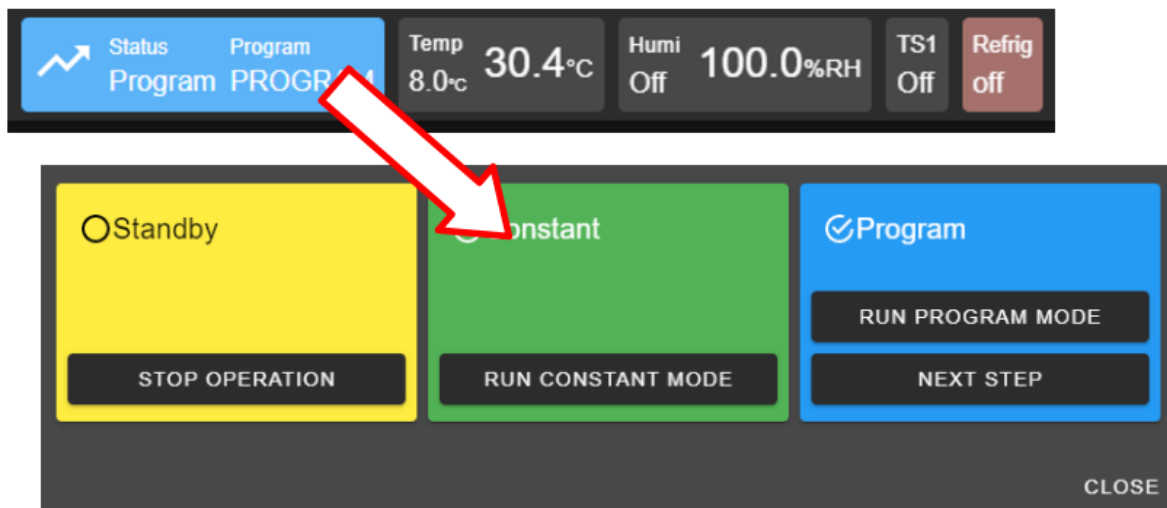


Figure 42.4: Constant mode setting

Or, click the extension bar, as shown in the figure.

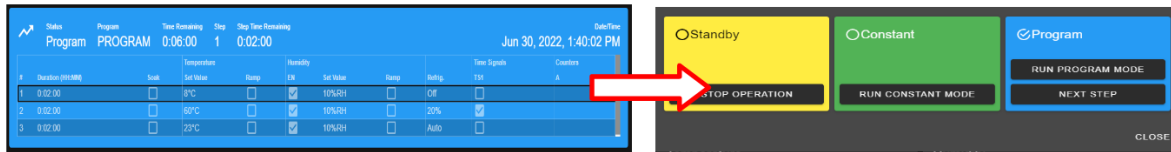


Figure 42.5: Constant mode setting via extension bar

2. Click the **RUN CONSTANT MODE** button in the constant tab. ESPEC Web Controller immediately moves to apply the operating mode to the chamber.
3. To close the drop-down tabs, perform one of the following actions:
 - Click an empty area in the Main Display.
 - Click a different menu in the menu bar.
 - Click the status tab itself, or
 - Click the **CLOSE** button of the drop-down tabs or the extension bar.

42.2 Program Setting

To set the chamber in **Program** mode means a profile (i.e., program) is loaded and executed.

1. Click the status tab in the status bar or the extension bar of the status tab.
2. There is only one profile stored on the ES102 controller. The program tab then has only **RUN PROGRAM MODE** and **NEXT STEP** (shown in the figure below).

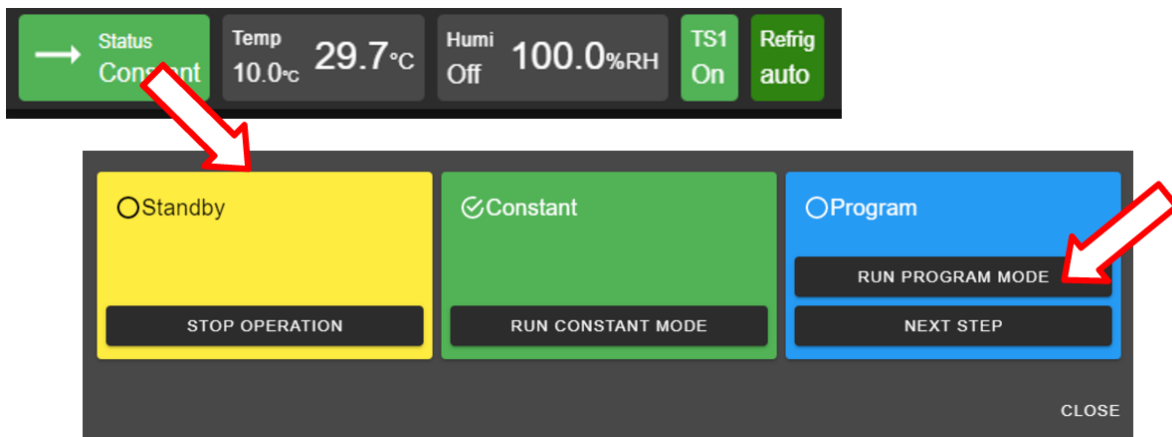


Figure 42.6: Start chamber in Program mode

3. Click the **RUN PROGRAM MODE** button to execute the program. ESPEC Web Controller immediately moves to apply the operating mode to chamber.
4. Program instruction lines can be stepped through during execution. Click the **NEXT STEP** button to skip to the next instruction line. Click the **Overview** menu or the status tab to display the program step being skipped to in the extension bar of the status tab (shown in the figure below).

Status	Program	Time Remaining	Step	Step Time Remaining	Date/Time
Program	PROGRAM	0:04:00	2	0:02:00	Jun 30, 2022, 3:39:28 PM

#	Duration (HH:MM)	Soak	Temperature	Humidity	Time Signals	Counters
1	0:02:00	<input type="checkbox"/>	8°C	<input checked="" type="checkbox"/> 10%RH	<input type="checkbox"/>	A
2	0:02:00	<input type="checkbox"/>	60°C	<input checked="" type="checkbox"/> 10%RH	<input checked="" type="checkbox"/>	
3	0:02:00	<input type="checkbox"/>	23°C	<input checked="" type="checkbox"/> 10%RH	<input type="checkbox"/>	

Figure 42.7: Program step skipped to line 2

- Click the **CLOSE** button to view the status of program execution displayed in the status tab extension bar.
- To end or interrupt the program execution, switch the chamber to **Constant** mode via the status tab.

42.3 Clear Alarms

When ESPEC Web Controller detects an alarm in the chamber, it also sets itself in an alert state by displaying a list of active alarms and fault names in the red window to require an immediate action from the operator, as depicted in the following figure.

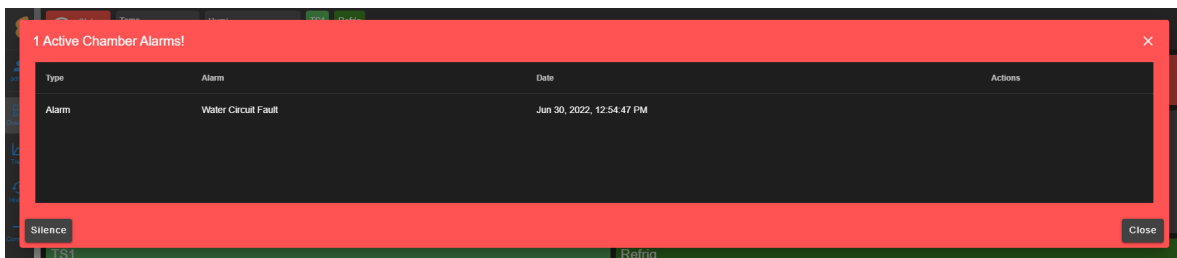


Figure 42.8: Chamber in alarm state

A repeating beep on the local computer is also tripped to get the operator's attention. The **SILENCE** button can be used to turn off the beep. This alert window can be closed by clicking the **CLOSE** button or the X button. However, the alarm state still remains to be resolved as indicated by the **Status** tab in the following figure. To redisplay or expand the alarm list, click the red dot in the lower-right corner.

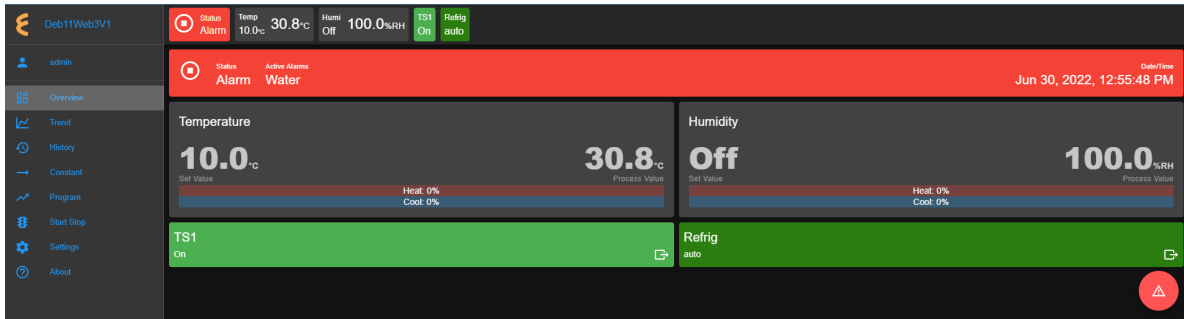


Figure 42.9: Alarm state in overview page

In an alarm state, operation is halted until all alarms triggered by chamber are resolved. Once all alarms are cleared, the Web Controller will automatically clear all alert messages and resume normal operation by switching the chamber to a **Standby** mode. Alarm in the above figure can be reset by clicking **STOP OPERATION** in the Standby tab (shown below).

1. Click the status tab in the status bar (which now displays Alarm in red).
2. Click **STOP OPERATION** in the Standby tab.

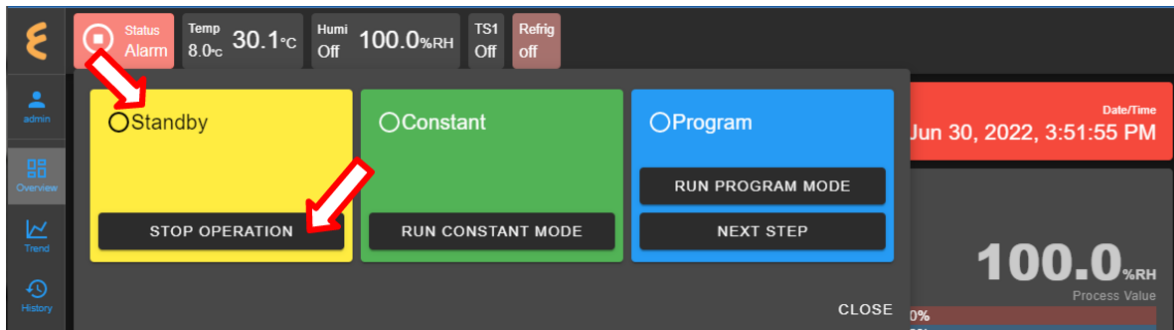


Figure 42.10: Clearing alarms

42.4 Temperature, Humidity or Time Signal Settings

On the **Overview** page, settings of temperature, humidity, time signals or refrigeration can be controlled via the dedicated tabs in the status bar or the dedicated panes in the main display area, as depicted in the following figure.

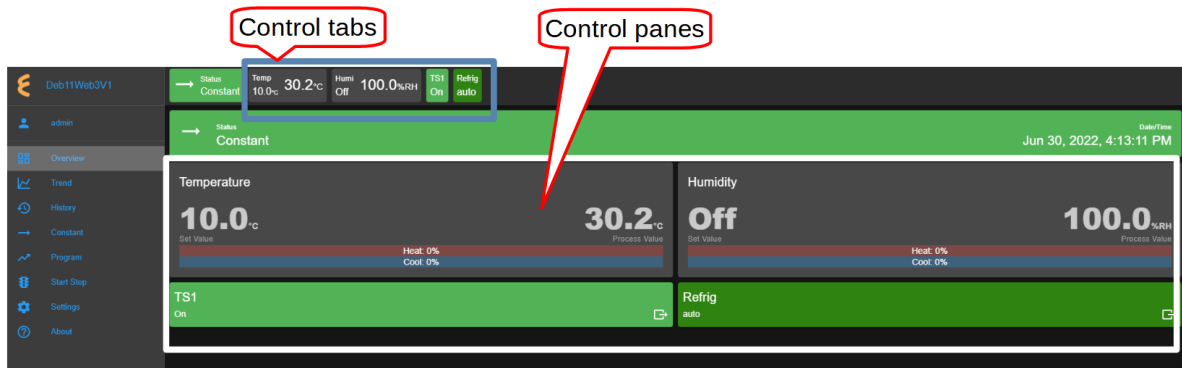


Figure 42.11: Parameter settings via control panes

42.4.1 Settings via the Status Bar

To set temperature with a new set value, complete the following steps:

1. Click the Temp tab in the status bar.
2. In the drop-down pane, click the box to **Enable** temperature, and enter new value in the Set Value field or apply the up/down arrow to adjust the value (shown in the figure).

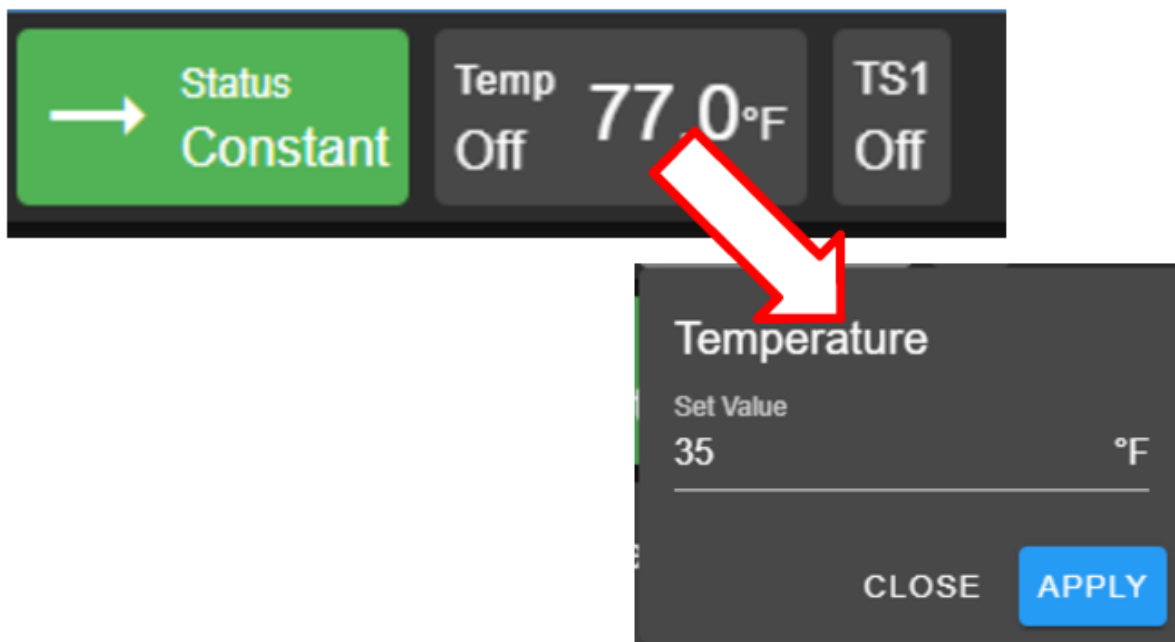


Figure 42.12: Setting new temperature value via the temp tab

3. Click **APPLY** to apply the new setting.
4. To cancel the setting, click the **CLOSE** button (or the Temp tab in the task bar).

To turn on time signal 1 (TS1), complete the following steps. Repeat the same procedure to turn on additional time signals.

1. Click the TS1 tab in the status bar.

2. Check the box to enable TS1 (shown in the figure).

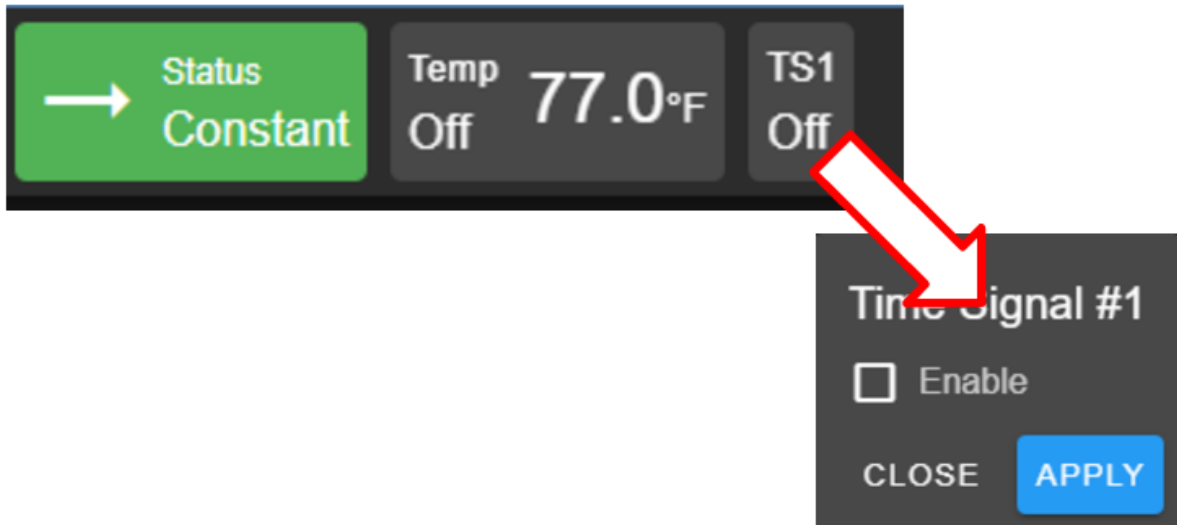


Figure 42.13: Enable or disable time signal setting

3. Click **APPLY**.
4. To cancel the setting, click **CLOSE** (instead of **APPLY**) or click the TS1 tab itself in the status bar.

To turn off TS1, apply the following steps:

1. Click the TS1 tab in the status bar.
2. Uncheck the box to disable TS1.
3. Click **APPLY**.
4. To cancel the setting, click **CLOSE** (instead of **APPLY**) or click the **TS1** tab itself in the status bar.

42.4.2 Settings via the Dedicated Panes

With ESPEC Web Controller, there are multiple ways to complete the same task. The dedicated panes for different control parameters (such as, temperature, vibration or humidity, time signals, or refrigeration) in the main display area are actually clickable panes. These are CTA (call-to-action) panes through which new parameter settings can be applied.

To apply a new setting to temperature, complete the following steps:

1. Click the Temperature pane to access the input pane (shown in figure below).

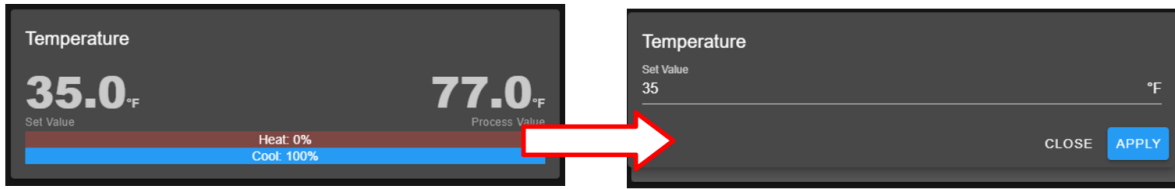


Figure 42.14: Setting new temperature value via the temperature (CTA) pane

2. In the input pane, click and enter new value in the Set Value field or apply the up/down arrow to adjust the value.
3. Click **APPLY**. To cancel the setting, click **CLOSE** (instead of **APPLY**).

The above procedure can also be applied to other parameters, such as humidity, refrigeration, time signal.

CHAPTER 43

Trend

The **Trend** menu can be used by an operator to view a scatter plot of data points collected during the chamber operation. Data collection can occur in two distinct modes: **Always** and **When Chamber is on**. These two modes are selectable and configured under the **Data Logging Settings** submenu found under the **Settings** menu. Plot elements and detailed configuration of the trend graph will be discussed on **Data Logging Settings** page in the **Settings** menu.

By default, the trend graph provides a scatter plot of data points collected during the last hour. Various options of plot range of data points accumulated more than one hour can be selected. Data can be downloaded in whole or in portion to be stored on the local computer as CSV file.

43.1 Trend: Components

There are seven different groups that make up the main display of **Trend** and the scatter plot, as depicted in the following figure. The scatter plot shown in the figure is a result of the data points being collected with the chamber in program mode. Detailed descriptions of these groups based on the labels in the figure are outlined as follows:



Figure 43.1: Trend graph showing plots of current data from the chamber

1. **Trend Graph:** Data points collected from the chamber are rendered as a trend graph based on a scatter plot methodology. These data points—product temperature, air temperature, humidity, vibration, etc.—are plotted as a function of time. Temperature is displayed in degree Celsius, vibration in root-mean-square of acceleration (Grms or G), etc. The vertical y-axis represents the scale of these values. The horizontal x-axis represents the data logging runtime. Based on the default configuration, the chamber logs data points in a 10-second interval (refer to the **Data Logging Settings** submenu, under **Settings**). Depending on the type of chamber, data logging interval can be set to lower than 10 seconds. The grid scaling on both the y- and x-axes will change according to the application of the Pan/Zoom Controls buttons or the drag-and-select via the mouse and scroll wheel. Default setting can be restored by clicking the refresh button on the Web browser (not shown in the above figure).
2. **Trend Graph Manipulation Buttons:** Seven manipulation buttons are available to help manipulate and control the trend graph features and options. Detailed functionality and operation of these buttons are discussed in the following section.

3. **Snapshot of Data:** By hovering a mouse pointer on the trend graph area, a snapshot of the data at a particular time is displayed (shown in the figure). This feature allows a quick peek of the data at a certain point in time. Depending on the chamber's condition, the snapshot displays set values (SV) and process values (PV) of temperature, product or air temperature, or vibration, chamber operating mode or status, as well as program name and alarm. The contents in the snapshot are based on the selected options displayed in the legend set by the **Graph View** button of item 2 (above); and the color scheme selection under the **User Interface Settings** submenu (found under the **Settings** menu).
4. **Y-axis Label:** The y-axis displays the selected type of data points to be plotted, such as Temperature, Humidity, Vibration ,etc. These values are populated based on the selection of the **Graph View** under item 2 (above).
5. **Line Graph:** Different types or styles of graph—solid line, dashed line and color—are used to designate each type of data points in the plot to help for visualization and readability. As depicted in the figure, solid line represents process values, while dashed line represents set values with a distinctive color, as indicated in the legend (see item 7).
6. **Status:** Status of chamber operating mode is displayed along the time line on the trend graph, indicating when and how long the chamber was in specific operating mode. This feature provides a quick preview of the chamber operating status. The **Pan/Zoom button of Trend Graph Manipulation Buttons** (item 2) may be used to manipulate the display and shift the graph back into the past to view the chamber's operating mode.
7. **Legend of Trend Graph:** The legends are used to identify each item on the trend graph with color code, as well as line/dash graph, to designate the different type of data being plotted.

43.2 Trend Graph Manipulation Buttons

The following is a detailed list of the seven **Manipulation Buttons** of **Trend Graph**, item 2 in the previous figure.

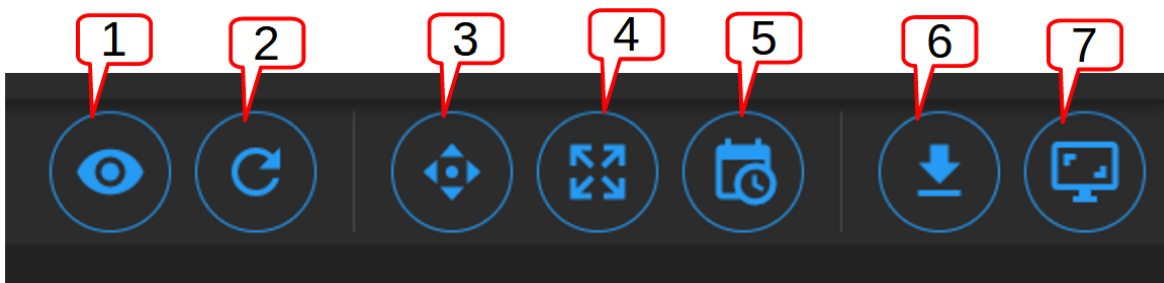


Figure 43.2: Trend Graph manipulation buttons

1. **Graph View:** Data visualization is very important. Elements or components of the trend graph are predefined by the configuration set in the **Data Logging Settings** submenu (found in the **Settings** menu). The **Customize** option depicted below allows the operator to select what to include in the trend graph to help simplify data visualization. Three different options represented by the arrows in the figure can be selected. The minimum and maximum Y range can be adjusted over the default values to help scale the graph for better

visualization; different data types can be enabled for display. The **Save** button (last arrow) can be applied to save the settings and render the graph.

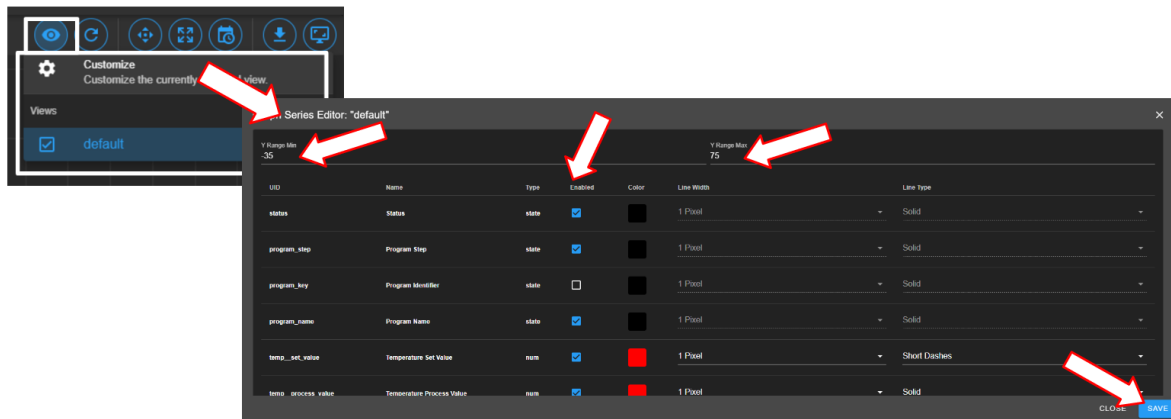


Figure 43.3: Tread graph view and custom settings

2. **Auto Refresh:** This Auto Refresh button reconstructs the graph to include data points up to the current time. Suppose a scroll wheel was applied to zoom out the trend graph that included future time which data points have not yet been sampled, as shown in the figure below.



Figure 43.4: Off-scaled trend graph including future time (no data points)

The auto refresh button will rescale the graph to eliminate the gap (future time) on the right to expand and display the trend graph up to the current time.

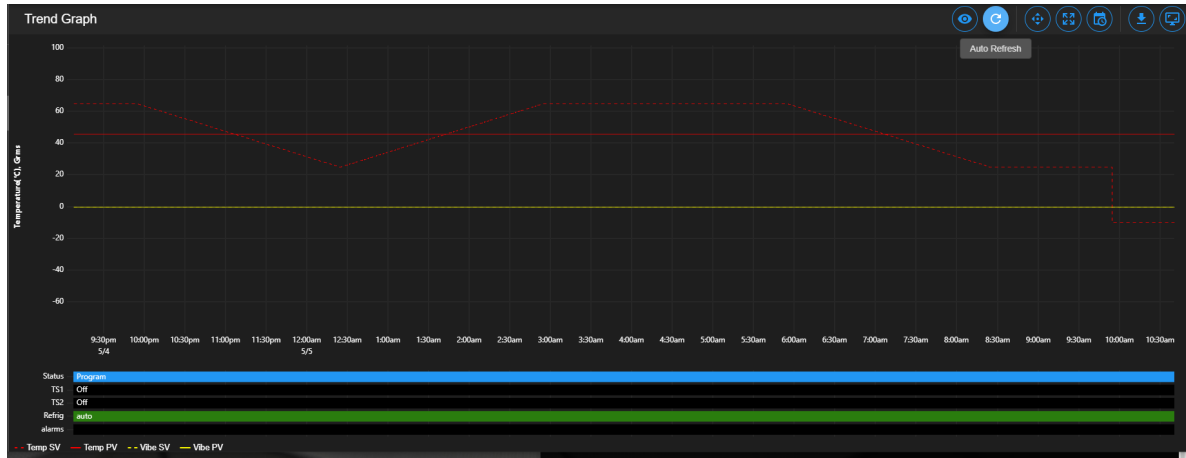


Figure 43.5: Trend graph rescaled with current time

3. **Pan/Zoom Controls:** The Pan/Zoom Controls button allows the operator to control and adjust the viewable section in the trend graph. This button presents six operation buttons to manipulate and display the trend graph as follows:

- **Zoom In:** The **Zoom In** button allows the operator to zoom into a small section of the trend graph. Depending on the degree of zooming, the display area will be confined to a small set of data points ranging between minutes to hours. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Zoom Out:** The **Zoom Out** button does the opposite by allowing the operator to zoom out on the trend graph, thereby giving the operator an expansive view of the trend graph. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Move Up:** This button allows the operator to move up the graph along the vertical axis to adjust the viewable area of the scatter plot. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Move Down:** This button allows the operator to move down the trend graph along the vertical axis with the purpose to adjust the viewable area of the scatter plot. To reset the trend graph, click the **Zoom Extents** button, select **Last Hour** from the drop-down menu, then click the **Auto Refresh** button.
- **Move Left:** This button allows the operator to pan left on the trend graph, offering a quick preview of a plot of data points tracing back the time in hours or days. With this feature, the operator can quickly gain a preview of past data points which the operator may have missed.
- **Move Right:** This button does the opposite to **Move Left** by allowing the operator to pan right on the trend graph to the current time. To reconstruct the trend graph to contain the most recent data points, the **Auto Refresh** button allows the quickest operation.

4. **Zoom Extents:** With this button, trend graph may be provided using data points from within the last one hour, last two hours or the last six hours. To make adjustment of the trend graph based on these three selections, click on the **Zoom Extents** button, then click one of the selection from the drop-down menu.
5. **Plot Range Selectors:** Data points can be selected from start date/time to end date/time to produce a desired trend graph. Arbitrary date and time can be selected for the plot range, as depicted in the following figure.

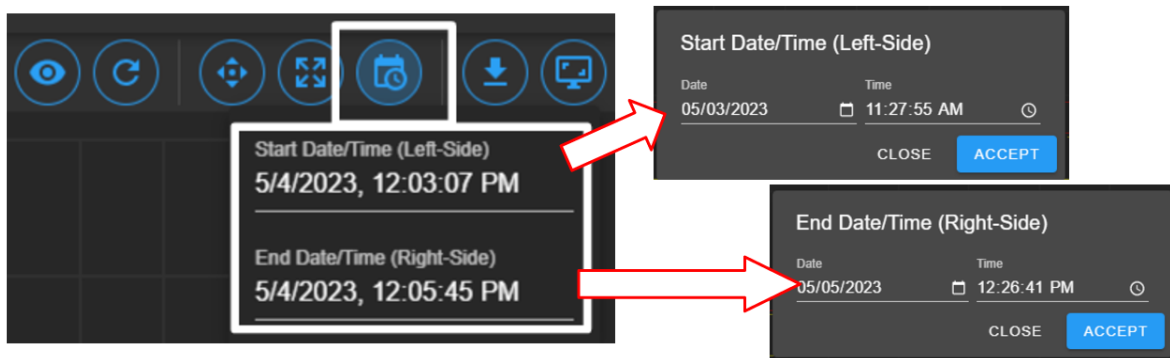


Figure 43.6: Plot range for start date/time and end date/time

To set the plot range,

- access the **Plotted Range Selectors** button.
 - access the **Start Date/Time**; edit date (m/d/y) and time (H:M:S) fields or apply the calendar and clock icons to select date/time.
 - apply **ACCEPT**
 - access the **End Date/Time**; edit date (m/d/y) and time (H:M:S) fields or apply the calendar and clock icons to select date/time.
 - apply **ACCEPT**. Note: Values of end date must be later (or greater) than start date.
6. **Download Data:** To download data and store it on the local computer, click the **Download Data** button and select **Download Current View** to download a portion of data from the displayed trend graph. To download the entire collection of data, select **Download All Data**. Data file will be stored in the Downloads folder of the local computer with filename: hostname_data_date.CSV.
 7. **Capture Screenshot/Download:** Trend graph can be captured, downloaded and stored on the local computer in PNG file, as shown in the figure.

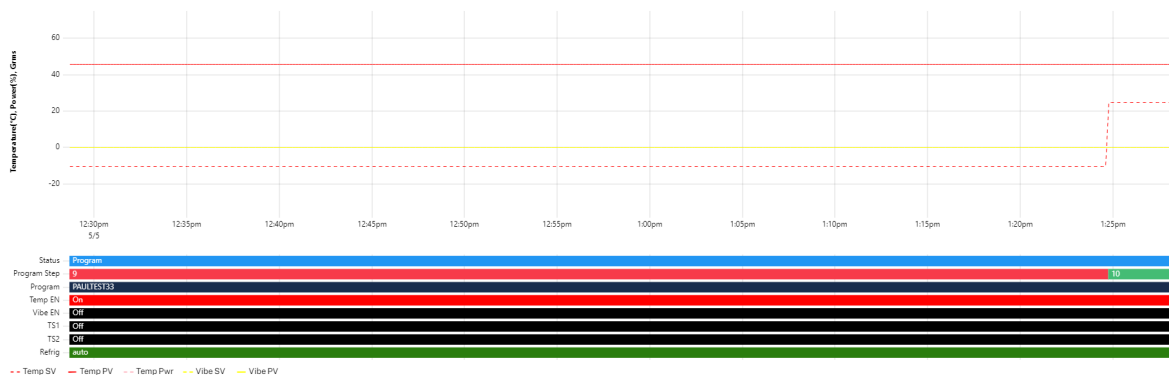


Figure 43.7: Screenshot of trend graph

43.3 How to Handle Downloaded Data File

Data points collected from the chamber are stored in CSV format. The recorded time of the data points is stored based on a UTC (or Universal Time Coordinated, previously referred to as the GMT) instead of the local time. To preserve the integrity of the CSV file and its UTC time stamp, do not rename the data file with MS Excel extension or attempt to open it directly with MS Excel. Any attempt to force open it in MS Excel will result in the wrong time conversion as shown in the following figures.

The following figure displays the CSV file which was directly opened with MS Excel. The time stamp in the first column is wrong; it is still based on UTC time stamp indicated by the arrows.

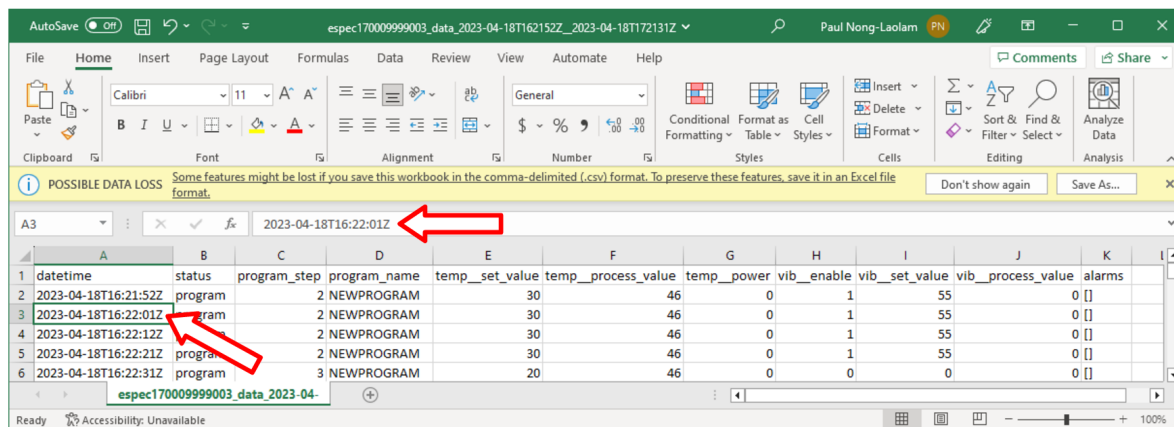


Figure 43.8: Data file improperly open in MS Excel

The following figure displays the same CSV file which was properly imported into MS Excel with the correct time stamp conversion for local time indicated by the arrows.

datetime	status	program_step	program_name	temp_set_value	temp_process_value	temp_power	vib_enable	vib_set_value	vib
4/18/2023 12:22	program	2	NEWPROGRAM	30	46	0	1	55	
4/18/2023 12:22	program	2	NEWPROGRAM	30	46	0	1	55	
4/18/2023 12:22	program	2	NEWPROGRAM	30	46	0	1	55	
4/18/2023 12:22	program	3	NEWPROGRAM	20	46	0	0	0	
4/18/2023 12:22	program	3	NEWPROGRAM	20	46	0	0	0	
4/18/2023 12:22	program	3	NEWPROGRAM	20	46	0	0	0	
4/18/2023 12:22	program	3	NEWPROGRAM	20	46	0	0	0	
4/18/2023 12:22	program	3	NEWPROGRAM	20	46	0	0	0	
4/18/2023 12:22	program	3	NEWPROGRAM	20	46	0	0	0	

Figure 43.9: Data file properly imported into MS Excel

The proper way to handle this CSV file is to import it using the following procedure to render the correct conversion of the UTC time to the local time on all data points.

Complete the following steps:

1. Select **Trend** in the main menu bar
2. Click the **Download** button (item 6 in the previous section) to download the data (current view or entire data) in CSV file
3. Launch MS Excel and start a new blank spreadsheet
4. Click the **Data** ribbon
5. Click **From Text/CSV** (that appears under the **Home** ribbon)
6. In the **Import Data** Window explorer, open the **Downloads** folder and select the downloaded CSV file (in step 2) and click the **Import** button (in the bottom).
7. Click the **Load** button to load data into the current spreadsheet.
8. To save the current spreadsheet as Excel Workbook, click **Save As** and follow the standard steps to complete the process.

CHAPTER 44

History

The **History** page displays operation history of the chamber, its operating modes and statistics. Any alarms or alerts that were triggered during the chamber's operation are logged and displayed here. By default, history log of the chamber's operating modes, alarms or statistics from the previous week will be displayed, as depicted in the following figure. There are five important components in the **History** main display area. They are labeled and described as follows:

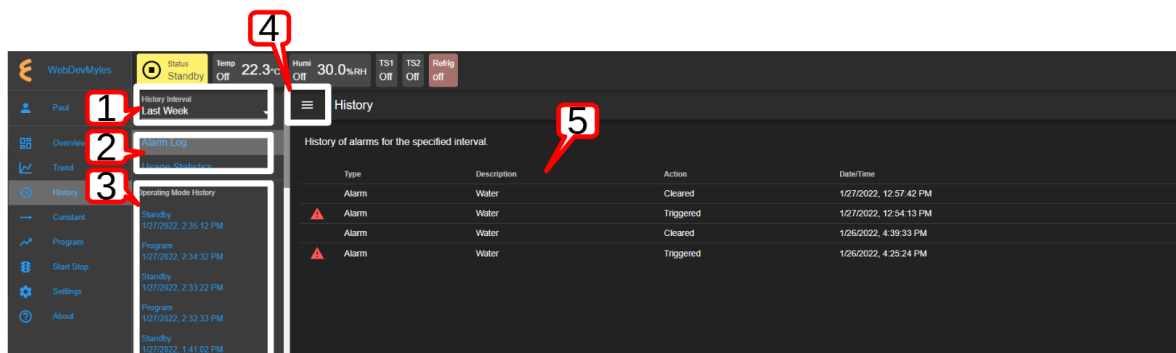


Figure 44.1: Operation history of the chamber

1. **History Interval:** Display options of the operating history are: one week, two weeks, one month, three months, six months, one year or the entire period of the chamber's operation. To access the history interval, click the radio button to select the period from the list.

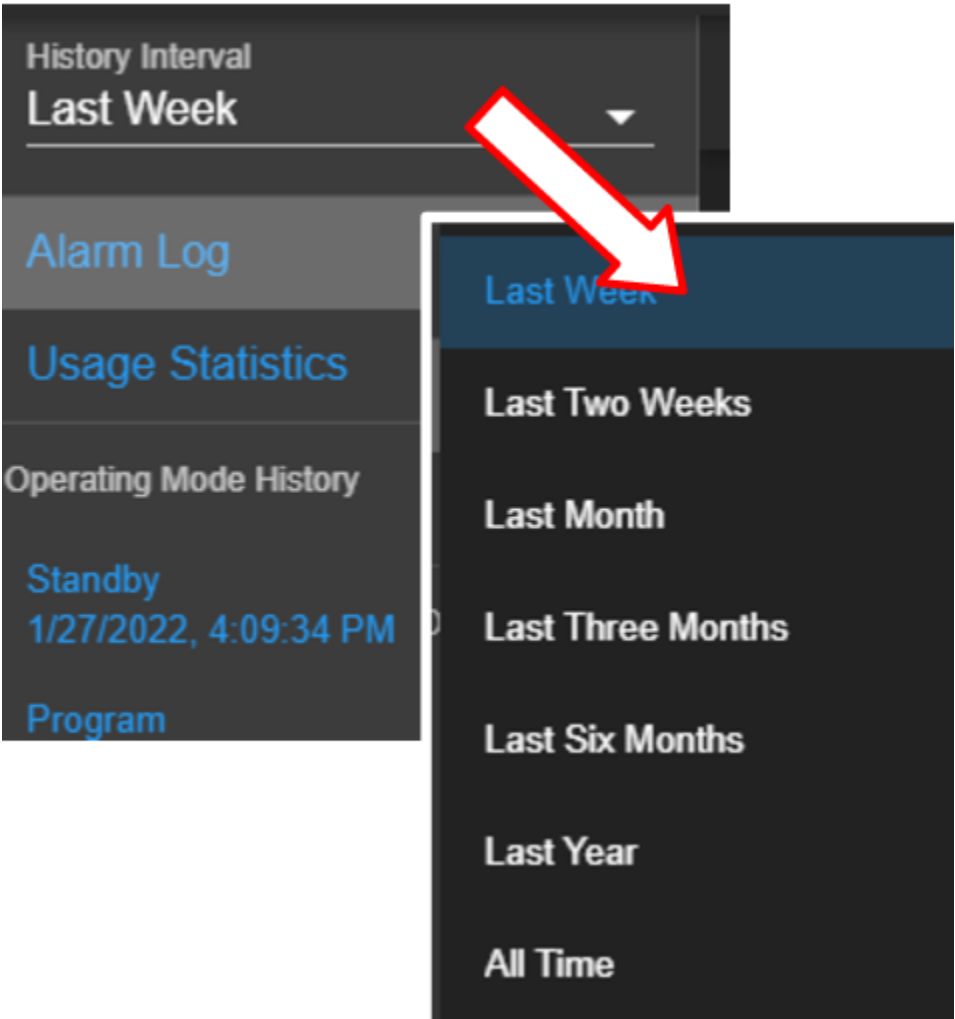


Figure 44.2: History interval and display selection

2. Alarm or Statistics Submenus:

- **Alarm Log:** By default, alarm logs will be displayed in the main display area. The logs indicate which alarm had occurred and when they were resolved (cleared). Most recent events are listed at the top. To view detail of each log, click on its name (with its log date and time).

Type	Description	Action	Date/Time
Alarm	Water	Cleared	7/1/2022, 8:28:59 AM
Alarm	Water	Triggered	7/1/2022, 8:28:40 AM
Alarm	Water	Cleared	6/30/2022, 4:11:39 PM
Alarm	Water	Triggered	6/30/2022, 4:10:59 PM
Alarm	Water	Cleared	6/30/2022, 4:05:09 PM
Alarm	Water	Triggered	6/30/2022, 4:04:39 PM
Alarm	Water	Cleared	6/30/2022, 3:52:29 PM
Alarm	Water	Triggered	6/30/2022, 3:51:30 PM

Figure 44.3: History of alarm

- **Usage Statistics:** To display the operation statistics, click on this submenu. Percentage of each operation mode based on the selection period in the **History Interval** is displayed as shown in the following figure:

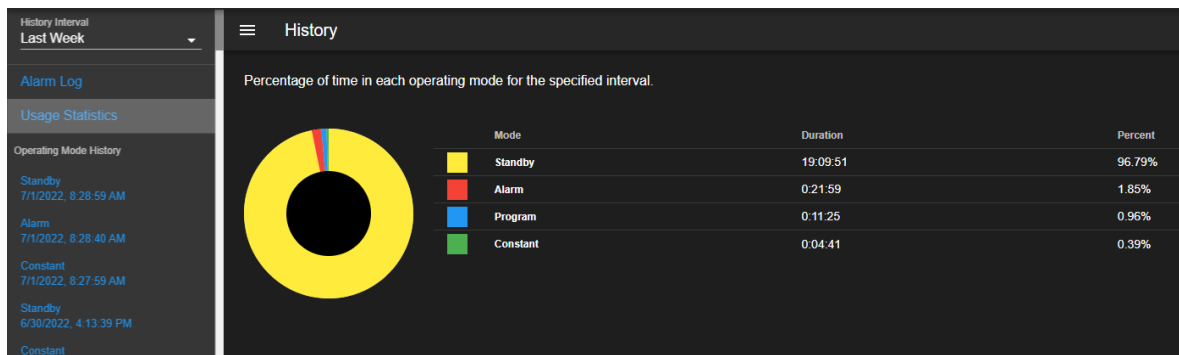


Figure 44.4: History of operation statistics

Such information provides the operator a good idea of the overall performance of the chamber by identifying when and how much time it was in a certain operating mode.

3. **Operating Mode History:** A list of operating modes of the chamber is displayed here based on the option selected under the **History Interval**. Default listing is based on a one-week interval. A trend graph, identical to that produced in the **Trend** menu, based on the data points collected during the operating mode can be produced by clicking on the particular operating mode on this list, as illustrated in the following figure.

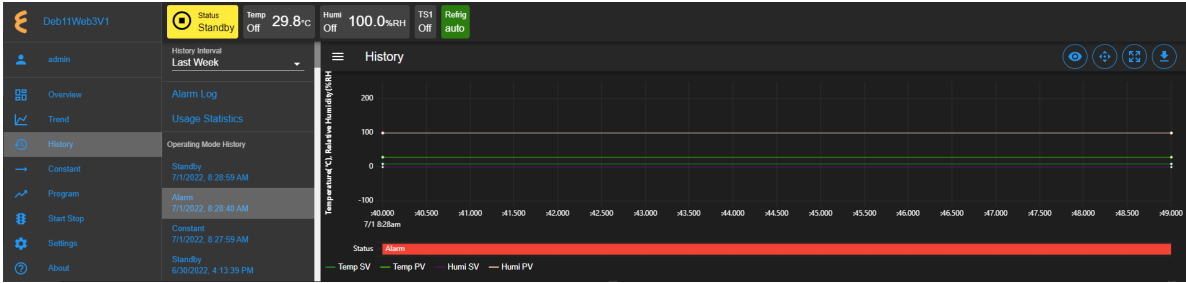


Figure 44.5: Trend graph of operating mode history

4. **Show/Hide Submenu:** To provide a larger real estate for the main display area, this Show/Hide button can be used to show or hide the **History** submenu. The following figure shows how the submenu is hidden and the main display area is expanded.

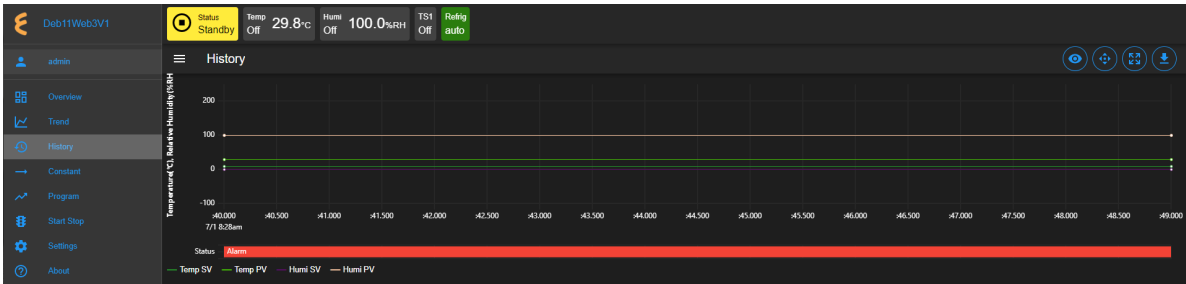


Figure 44.6: The show/hide button of the main display of the History page

5. **Main Display:** The content of the submenu page of **Alarm Log** and **Usage Statistics** is displayed here (refer to item 2, above).

CHAPTER 45

Constant

The existence of ESPEC Web Controller **Constant** page is such that all features and their parameters are collected and displayed in one place to control their constant mode settings. The main display of **Constant** consists of three separate panes, displayed as **Temperature**, **Humidity** (or **Vibration**) and **Outputs**, as depicted in the following figure. These CTA panes provide input options to adjust the settings directly. The Humidity Range Chart is a two-dimensional graph of the current temperature-humidity relationship, displayed below these CTA panes.

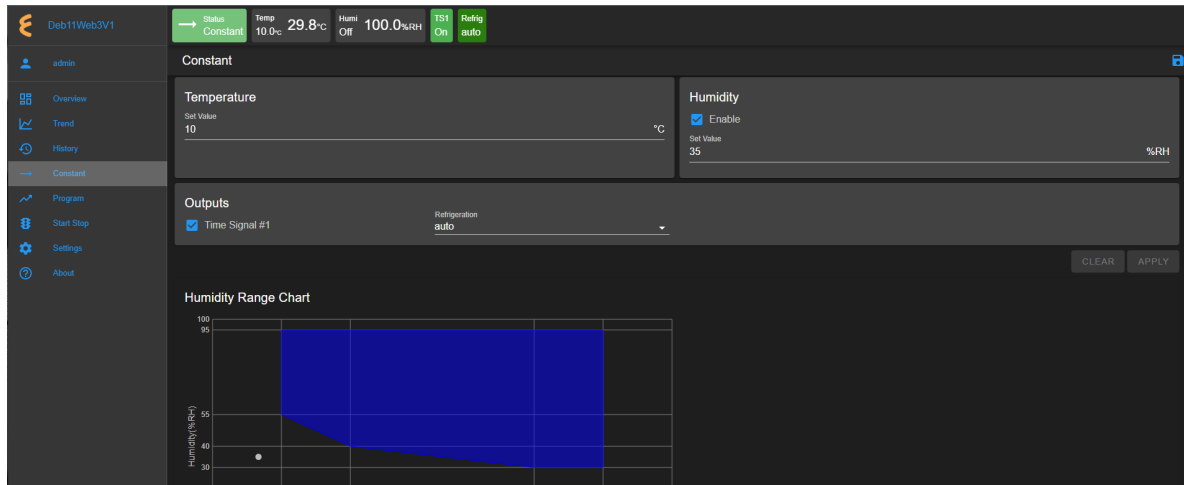


Figure 45.1: The Constant menu and its components

The following sections describe how to configure and control each of these parameters.

45.1 Product or Air Temperature Setting

Complete the following steps to turn on or modify temperature setting:

1. Enable air temperature or product temperature by checking the appropriate boxes.
2. Click the Set Value field and enter a new value, or apply the up/down arrow to adjust the value.
3. Adjust the plus/minus deviation in the appropriate fields.

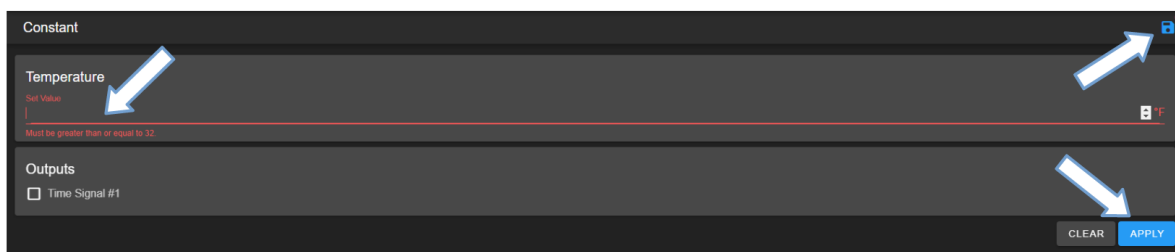


Figure 45.2: Apply new constant setting on temperature

4. Click the **APPLY** button or the **Save** icon (indicated by the arrows) to apply and save the setting. The red dot next to the **Save** icon indicates that the new setting has not been

saved. If you exit this pane by accessing a different menu in the menu bar, a warning message will appear (shown in figure).

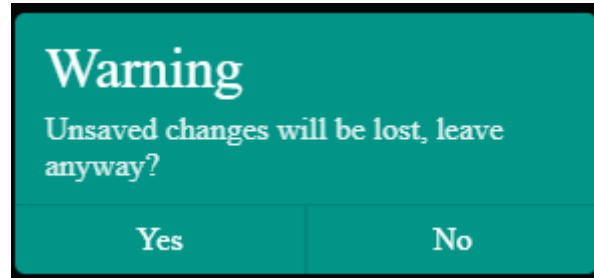


Figure 45.3: New setting must be save before exiting the pane

5. To cancel the setting, click **CLEAR**.

The new setting takes effect immediately with its new status displayed in the status bar. To reverse or cancel the setting, repeat the above steps to reset the set value and click **APPLY**.

45.2 Time Signals Setting

Complete the following procedure to turn on output for any time signal:

1. To turn on output for **Time Signal # 1**, place a check mark in its box.
2. Repeat the above step for any time signal available in the main display area.
3. Click the **APPLY** button or the save icon as indicated by the arrows in the above figure to apply and save the setting.
4. To cancel the setting, click **CLEAR**. If you exit this pane by accessing a different menu in the menu bar, a warning will appear which requires you to save the setting before attempting to access any other menus.

45.3 Refrigeration Setting

Complete the following procedure to set the refrigeration:

1. Click the refrigeration option field (see figure below).

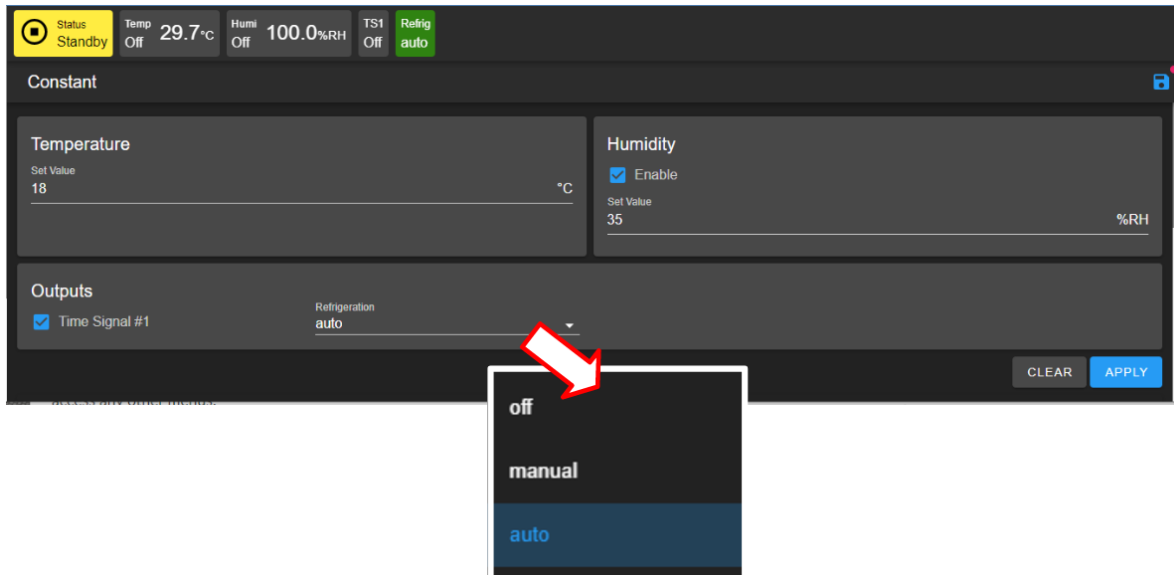


Figure 45.4: Selecting refrigeration option

2. Click to select refrigeration options on the drop-down menu.
3. Click the **APPLY** button or the save icon as indicated by the arrows in the above figure to apply and save the setting.
4. To cancel the setting, click **CLEAR**. If you exit this pane by accessing a different menu in the menu bar, a warning will appear which requires you to save the setting before attempting to access any other menus.

The new setting takes effect immediately with its new status displayed in the status bar. To reverse or cancel the setting, repeat the above steps to uncheck the box and click **APPLY**.

It is important to note that all the parameters (temperature, humidity, vibration, time signal) in the main display can be adjusted altogether simultaneously with a single **APPLY** or save button. However, individual setting may provide security to avoid any adverse effect.

CHAPTER 46

Program

The **Program** menu allows the operator to create a program to control the chamber. All the programming features available on the supported PLC's listed in Chapter 1 (“**Introduction**”) can be composed into programs to control the chamber. The operator can: (1) open and view a program; (2) preview the output of the program; (3) edit and/or overwrite an existing program ; (4) delete program from the list; (5) rename program on the list; (6) download a program and store it on the local computer in JSON file; (7) upload a program from the local computer to the Web Controller, and much more.

Here are some of the benefits of the **Program** menu:

- Easy to operate.
- Quick management of programs, programming or editing.
- Require less time to develop a new program or modify an existing program.
- Program Editor offers flexibility with multitasking capabilities.
- Control program operation and program end mode.
- Preview program operation before execution; operator can see exactly what the program does prior to its execution.
- Download program from the Web Controller to the local computer for backup.
- Upload program from the local computer to the Web Controller.

Only authorized users with read-write privilege can access and utilize the **Program** menu. The user must log into their account to access the **Program** menu based on their read-write privilege, as depicted in the following figure.

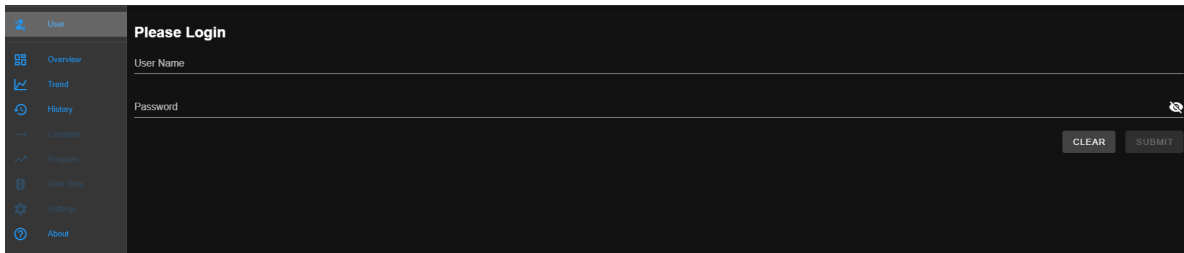


Figure 46.1: User with read-write privilege is required to operate the Program menu

46.1 List Programs

The following figure depicts a typical layout of the **Program** page with its submenu hidden. It is the default display when the **Program** menu is accessed for the first time. Its UI components are numbered and explained as follows:

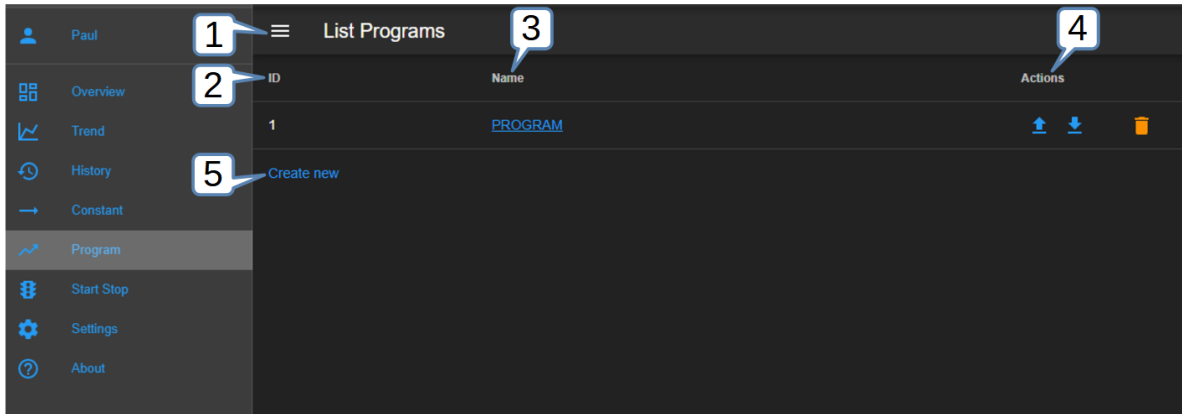


Figure 46.2: Program listing page with submenu hidden

1. **Submenu Show/Hide:** This button toggles between the “show and hide submenu”, allowing the program editor to utilize the entire main display area (see above figure).
2. **ID:** ESPEC Web Controller identifies each program by its slot number stored in the PLC register. This list reflects the actual list of programs read from the PLC register. ES102 has only one program file stored in it.
3. **Program Name:** A profile (program) is listed under this **Name** column with **PROGRAM** as its default program name. The program can be accessed by clicking on its name; its contents are displayed in the program editor. Detailed operation of the program editor is discussed in the next section.
4. **Actions:** Three action buttons (Upload Program, Download Program, Delete) are available for managing the program:
 - **Upload:** Program can be uploaded from the local computer to the Web Controller which will then be stored in the PLC.
 - **Download:** Program can be downloaded and saved on the local computer.
 - **Delete:** For ES102 with only one program stored in its register at all time, this button is inoperative. A program cannot be deleted, but it can be edited into a new one with new instructions (to be described below).
5. **Create New:** This button opens the program editor to prepare a new program. As a legacy feature, the **Create New** button is conveniently placed in two locations: (1) under the **ID** list and (2) in the **Program** submenu (shown in the following figure).

Depicted in the following figure is the **Program** submenu (item 2) with two operation buttons: (i) List Programs and (ii) Create New (program).

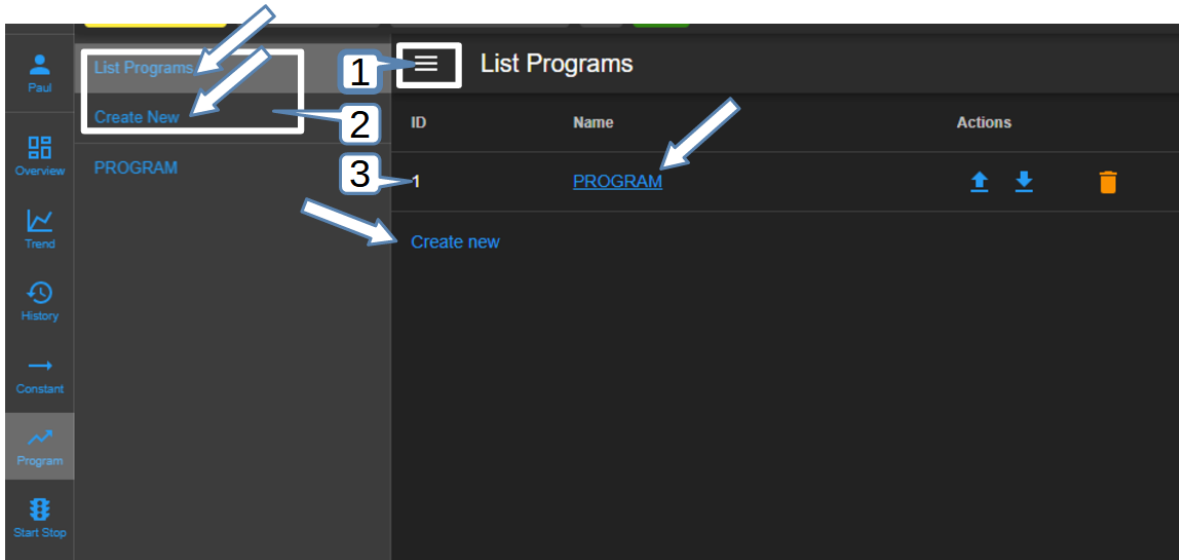


Figure 46.3: Program listing page with submenu unhidden

1. **Show/Hide:** The **Show/Hide** (hamburger) button can be used to show or hide the **Program** submenu (item 2 below).
2. **Submenu:** This submenu has two operation buttons indicated by the arrows. The available program stored in the ES102 register is listed below this submenu.
 - **List Programs:** The program editor can be exited by clicking on the **List Programs** button. It quickly cancels and exits the program editor.
 - **Create New:** This button opens the program editor with an empty template for constructing a new program. Detailed discussion is provided in the following section. A program from the local computer can also be imported into this empty template.
3. **List Programs:** This is the main display of the program list (depicted in the previous figure). Click the **Show/Hide** button (item 1) to hide the submenu and expand the **List Programs** display page.

46.2 Create New Program

A new program can be created via one of the following buttons as depicted in the following figure.

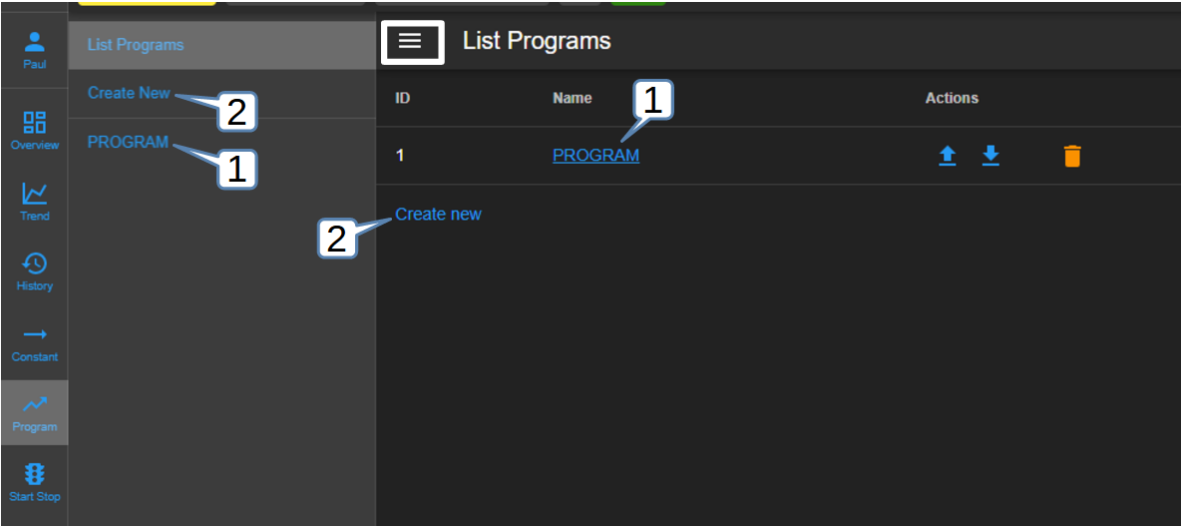


Figure 46.4: Different methods to creating a new program

Each of these buttons follows a different pattern to create a new program.

1. **PROGRAM**: A new program can be created by editing the existing program via the **PROGRAM** button. Its components will be placed in the program editor for editing. Unwanted program lines (or steps) can be removed (i.e., deleted) from the program via the **Delete** button (to be discussed in Section 8.2.1).

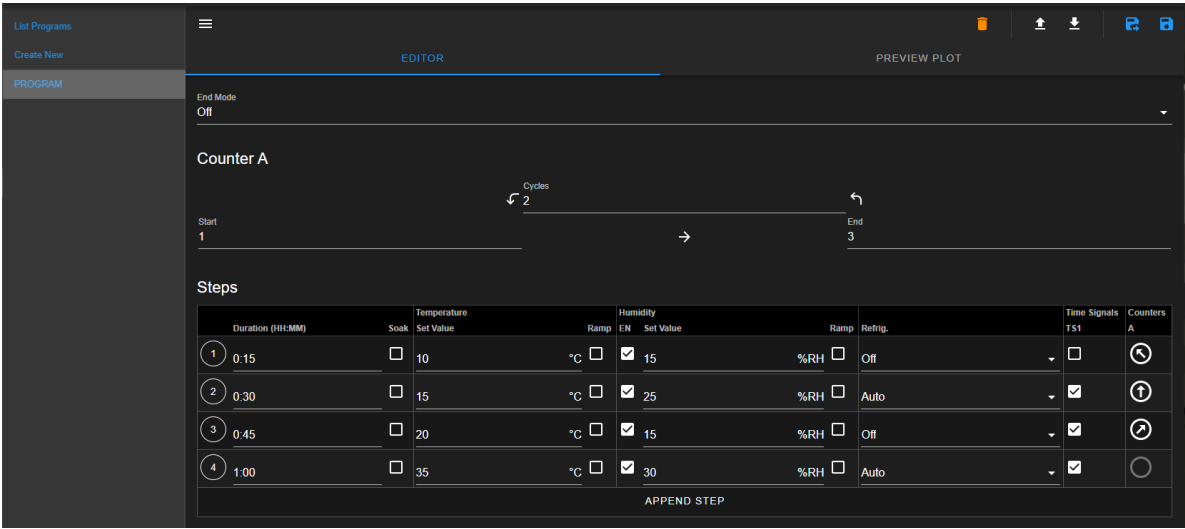


Figure 46.5: Editing existing program into a new one

The program editor has the **Save As** and **Save** buttons to manage the program file. These are legacy buttons; for ES102 they more or less operate the same way. The **Save** button, when clicked, saves the program directly into the existing slot number, while **Save As** offers a slot number to choose from (see discussion in item 2 below). But since ES102 has only one slot to store the program, there is only one slot to select. Thus, the **Save** button offers a quicker operation.

2. **Create New:** Click the **Create New** button in the submenu or under the **List Programs** in the main display to launch the program editor. An empty template is opened for a new program, as depicted in the following figure.

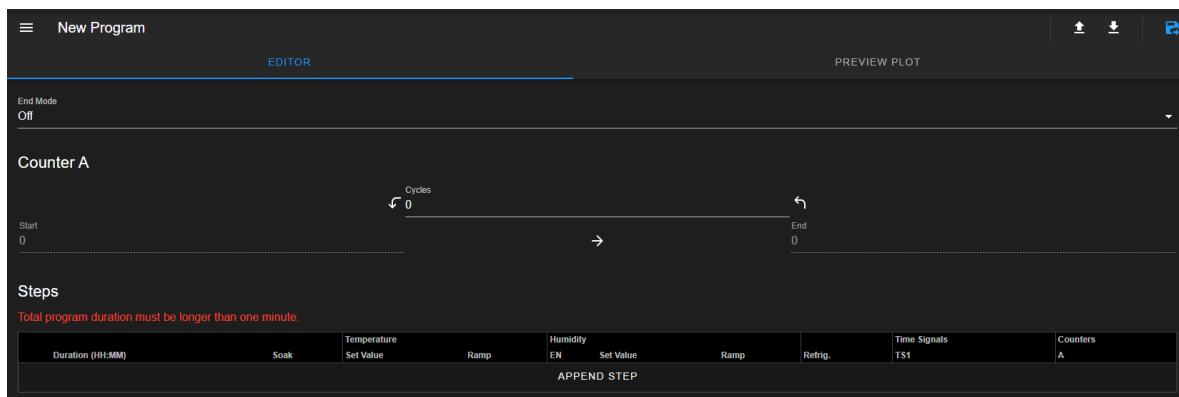


Figure 46.6: Empty template for a new program

The new program being constructed is still in the program editor buffer. The **Save As** button (upper-right corner) can be used to save it into slot 1 (as depicted below). An error message will occur if the user attempts to save an empty program (that is, empty template). Program must have at least one line of instructions for it to save successfully.

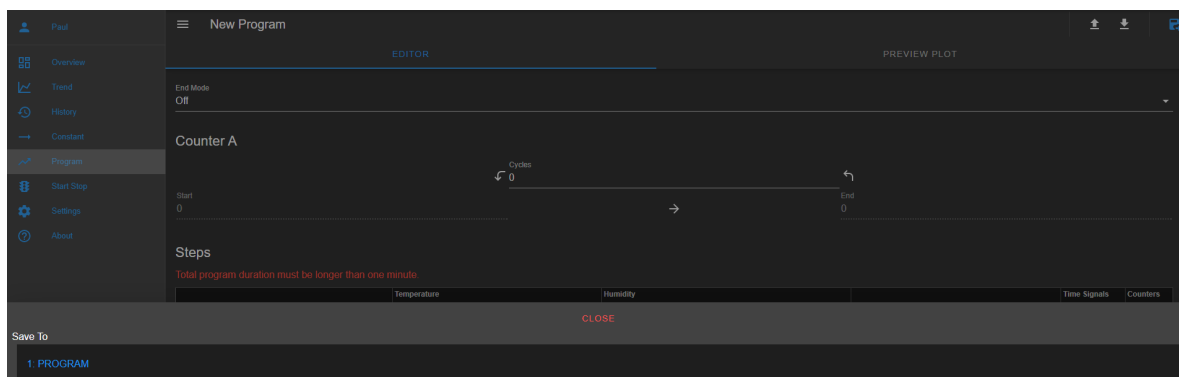


Figure 46.7: Saving new program into slot 1

The following figure depicts the general layout of the empty template for a new program when the **Create New** button is applied. The first step has been added (using the APPEND STEP button) to illustrate its components.

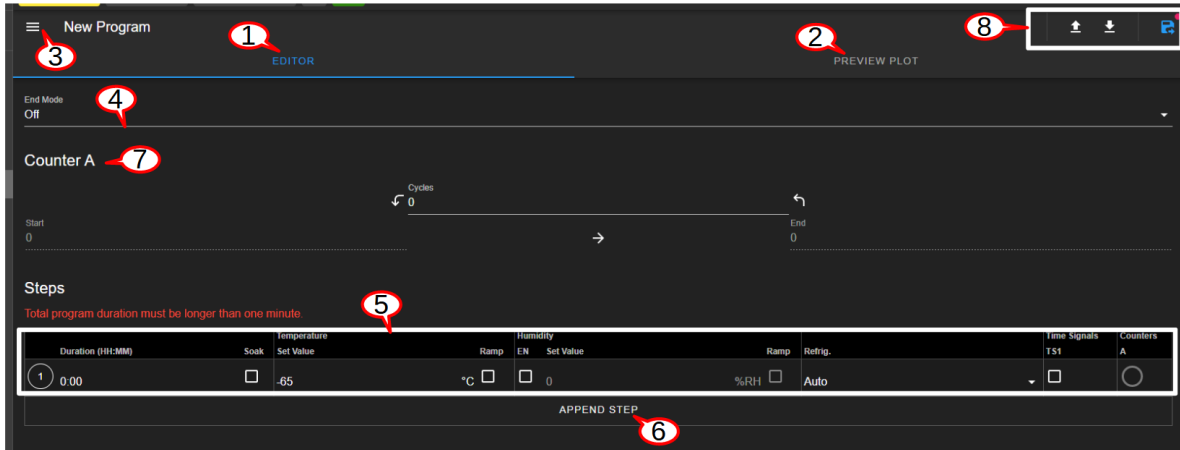


Figure 46.8: Creating new program from empty template

The UI and components of the program editor (pictured above) are numbered and described as follows:

1. **Editor:** By default, a program is opened and placed in the program editor. It is highlighted in blue to indicate its active status.
2. **Preview Plot:** The output of the current program can be previewed via this button. Both the **Editor** button (item 1 above) and the **PREVIEW PLOT** button can be used to toggle between the editing and previewing mode of the current program. The **PREVIEW PLOT** button is operational only when a program is loaded into the program editor or a program has been constructed in the program editor.
3. **Submenu Show/Hide:** This button toggles between the show and hide mode of the submenu. To utilize the entire main display area for the program editor, this button can be used to hide the submenu.
4. **End Mode:** The chamber operating mode can be set to **Off**, **Hold** or **Constant** following the completion of the program execution. The chamber will be set in the selected operating mode after the program has ended.
5. **Program Step:** A program step consists of various components and parameters that make up an instruction for the chamber to carry out each task (per step).
 - **Duration:** The duration specifies the length of time measured in hours and minutes (in format HH:MM) that the said step has to complete the temperature or humidity operation. A combination of HH:MM or pure numerical value is accepted. The conversion is always performed using the 60-minute value as a conversion factor. If a pure numerical value is entered, ESPEC Web Controller converts it to HH:MM. For instance, if 15 is entered, it will be converted to 0:15. If 66 is entered, it becomes 1:06. If 1:65 is entered, the conversion will be 2:05. A maximum acceptable value is 999:59.
 - **Soak:** This feature can be enabled for the entire duration. Note: This feature cannot be used if **Ramp** has been preconfigured for either the temperature or humidity operation.
 - **Temperature:** The temperature control loop has two parameters:
 - **Set Value:** The value that the temperature must attain.

- **Ramp:** Temperature can be increased in a constant rate via this ramp option.
Note: This feature cannot be used if **Soak** has already been enabled.
 - **Humidity:** Three parameters are available for humidity:
 - **EN:** Humidity can be disabled or enabled with this option.
 - **Set Value:** The value that the humidity must attain.
 - **Ramp:** Humidity can be increased in a constant rate via this ramp option. Note: This feature cannot be used if **Soak** has already been enabled.
 - **Refrigeration:** Refrigeration can be enabled using one of three available options: Off, Manual, Auto.
 - **Time Signals:** Time signal (TS) operation is step dependent. Suppose TS1 is turned ON at step 1 and the rest of the steps do not have TS enabled. In this case, TS1 will remain “ON” for the entire program. Thus, TS may be controlled independently, step by step.
 - **Counter A:** A subroutine consisting of at least two steps (initial and final steps) can be selected and enabled by clicking on the circle icon associated with initial step and final step. This option is available only when the Counter A has been enabled with cycle number entered in to the **Cycles** field (item 7 below). A single step can be set to repeat if the number of cycles has been entered in the Cycles field in item 7.
6. **Append Step:** When a program is first created via the **Create New** button, the program editor begins with an empty template, with no instructions or steps. To create an instruction, a new step must be created using the APPEND STEP button. Once a program has a step, additional steps can be added using this button or the drop-down menu of the Step Number (to be explained below). The APPEND STEP button always adds a new step as the last step in the program. By contrast, the drop-down menu of the Step Number allows a new step to be inserted above or below the current step. It also has a delete button to remove any step from the program.
7. **Counter A:** ES102 offers one operation loop, called Counter A, which allows step(s) to be repeated as a subroutine. The Cycles number defines the repetition. This number, when entered, turns on the counter operation, even when there is no step has been created. The first step will be set to repeat based on the Cycles number. Start and End steps can then be selected to complete the counter operation when additional steps have been created.
8. **File Manipulation:** Five different buttons (icons) are available for file manipulation. These are the legacy buttons which are operational for other chambers; they have limited operation for ES102. Their action can be previewed by hovering the mouse pointer over them , described from left to right as follows.
- **Delete:** Click on the trash bin icon to delete the current program. This action will delete the program in the program editor and the PLC. A pop-up warning (shown in the figure) appears to reaffirm the action. Since ES102 always has a program stored in the register, this button is inoperative. Any attempt to delete the existing program will cause an error message.

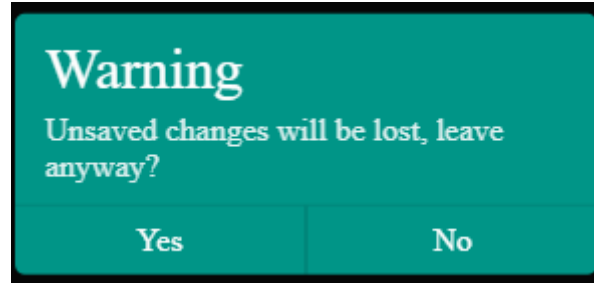


Figure 46.9: File deletion confirmation

- **Open Program:** This button imports a program file from the local computer into the program editor. ESPEC Web Controller only accepts a program in JSON format. To ensure compatibility, the program structure should be based on the one downloaded from ESPEC Web Controller itself (see **Download Program** below). The program is not yet saved until the **Save As** or **Save** button is applied.
- **Download Program:** This button downloads the current program file and stores it on the local computer. The program is saved in JSON format; filename is based on the hostname and slot number (e.g., hostnmae_program_1.json).
- **Save As:** This buttons stores the current program in the PLC. The action brings up a program list, as depicted in the following figure. To cancel this action, click the **CLOSE** button. **WARNING!:** A vacant slot should be selected to save the program. Otherwise, the current program will overwrite the existing one in the slot without prompting for reaffirmation, thus, destroying the program previously in that slot. The current program in a new slot still uses the same program name. To make it unique, edit item 4 (above) with a new name and apply the **Save** button (see below) to resave the program.

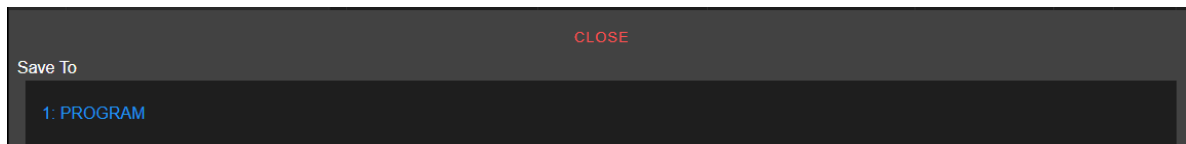


Figure 46.10: Save program

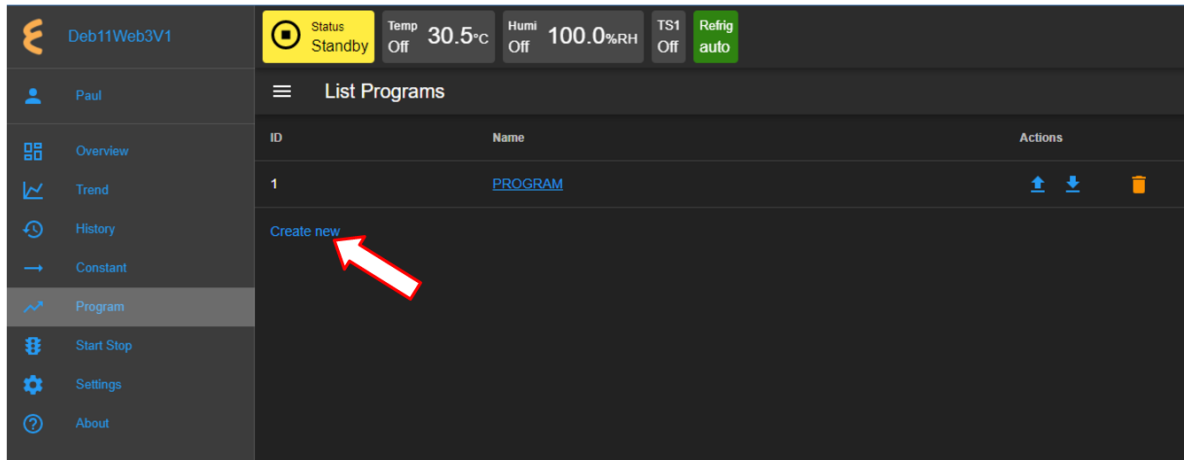
- **Save:** This button saves the current program directly in to the PLC register, overwriting the existing program.

46.2.1 Programming: Adding Steps and Parameters

The following example illustrates how to create a new program using the **Create New** button. Four simple steps will be created to consist of temperature, humidity, refrigeration, time signal and counter. We start from the main menu.

1. Click **Overview** in the side bar to start the main page.
2. Click **Program** in the side bar.

3. Click **Create New** as shown in the arrow (figure below) to start the program editor with an empty template.



4. Click the **End Mode** field to select Constant. The chamber is set to operate in Constant mode after the program has ended.
5. Click the **Cycles** value field (in Counter A); enter or apply the up/down arrow to adjust the value to 3. The program is set to repeat the selected steps (to be created) three times (a total of four, including the original executed steps).
6. **Step 1:** Click the **APPEND STEP** to add the first step; then complete the following fields for this step.
- **Duration:** Enter 0:25.
 - **Soak:** Leave the **Soak** box unchecked; temperature ramping will be used.
 - **Temperature:**
 - **Set Value:** Enter 23 or apply the up/down arrow to adjust the value 23.
 - **Ramp:** Check the box to turn on **Ramp**.
 - **Humidity:**
 - **EN:** Check the box to turn on EN. Humidity can be disabled or enabled with this option.
 - **Set Value:** Enter 25 or apply the up/down arrow to adjust the value 25.
 - **Ramp:** Check the box to turn on **Ramp**.
 - **Refrig.:** Set refrigeration to **Auto** from the drop-down menu.
 - **Time Signals:** Check the TS1 box to enable time signal 1. Note: If TS1 is not available, check the Chamber Interface (under **Settings**) to turn on TS1 or the operational manual to see if TS1 is available on your chamber.
 - **Counter A:** Click the circle to turn on Counter A. The Counter A block automatically sets End step to 1; this setting will be adjusted as additional steps are being created.

7. **Step 2:** Click the **APPEND STEP** to add the second step; then complete the following fields for this step.

- **Duration:** Enter 0:25.
- **Soak:** Leave the **Soak** box unchecked; temperature ramping will be used.
- **Temperature:**
 - **Set Value:** Enter 26 or apply the up/down arrow to adjust the value 26.
 - **Ramp:** Check the box to turn on **Ramp**.
- **Humidity:**
 - **EN:** Check the box to turn on EN. Humidity can be disabled or enabled with this option.
 - **Set Value:** Enter 25 or apply the up/down arrow to adjust the value 25.
 - **Ramp:** Check the box to turn on **Ramp**.
- **Refrig.:** Set refrigeration to **Auto** from the drop-down menu.
- **Time Signals:** Check the TS1 box to enable time signal 1. Note: If TS1 is not available, check the Chamber Interface (under **Settings**) to turn on TS1 or the operational manual to see if TS1 is available on your chamber. Skip this option if it is not available.
- **Counter A:** Leave Counter A circle unchecked.

8. **Step 3:** Click number 2 in the circle at the beginning of step 2 (shown in the figure below). Select **Insert After** from the drop-down menu and edit the fields with the following parameters:

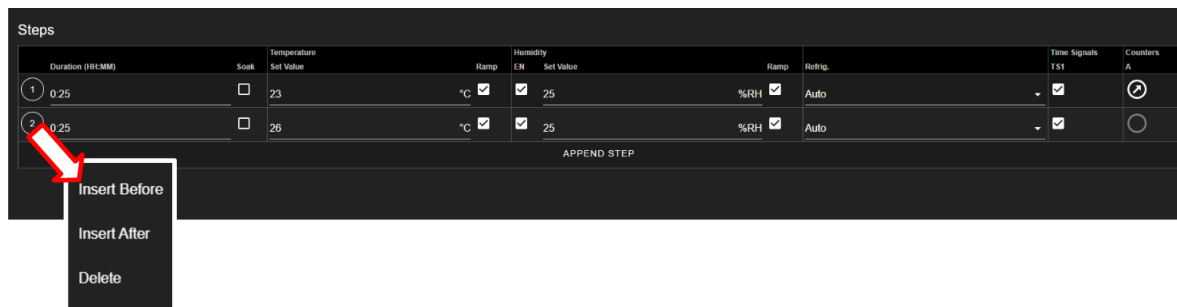


Figure 46.11: Inserting a new step

- **Duration:** Enter 0:25.
- **Soak:** Leave the **Soak** box unchecked; temperature ramping will be used.
- **Temperature:**
 - **Set Value:** Enter 28 or apply the up/down arrow to adjust the value 28.
 - **Ramp:** Check the box to turn on **Ramp**.
- **Humidity:**

- **EN:** Check the box to turn on EN. Humidity can be disabled or enabled with this option.
 - **Set Value:** Enter 25 or apply the up/down arrow to adjust the value 25.
 - **Ramp:** Check the box to turn on **Ramp**.
 - **Refrig.:** Set refrigeration to **Auto** from the drop-down menu.
 - **Time Signals:** Leave the TS1 box unchecked.
 - **Counter A:** Leave Counter A circle unchecked.
9. **Step 4:** Click number 3 in the circle at the beginning of step 3 (similar to the above figure). Select **Insert After** from the drop-down menu and repeat the procedure of item 9 and edit the fields with the following parameters: Duration: 0:45, Temperature: 30; Humidity: 50; Refrig: Auto; TS1: Enabled; Counter A: Click the circle under Counter A to select the last step as end step; set Start with a value 1 (to start from step 1). The final program is depicted as follows:

Duration (HH:MM)		Soak	Temperature Set Value	Ramp	Humidity EN	Set Value	Ramp	Refrig.	Time Signals TS1	Counters A
1	0.25	<input type="checkbox"/>	23	°C <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	25	%RH <input checked="" type="checkbox"/>	Auto	<input checked="" type="checkbox"/>	⌚
2	0.25	<input type="checkbox"/>	26	°C <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	25	%RH <input checked="" type="checkbox"/>	Auto	<input checked="" type="checkbox"/>	①
3	0.25	<input type="checkbox"/>	28	°C <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	25	%RH <input checked="" type="checkbox"/>	Auto	<input type="checkbox"/>	①
4	0.45	<input type="checkbox"/>	30	°C <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	50	%RH <input checked="" type="checkbox"/>	Auto	<input checked="" type="checkbox"/>	⌚

APPEND STEP

Figure 46.12: Sample program

10. **Save Program:** Click the **Save** icon indicated by the arrow, as shown in the following figure, to save the program.

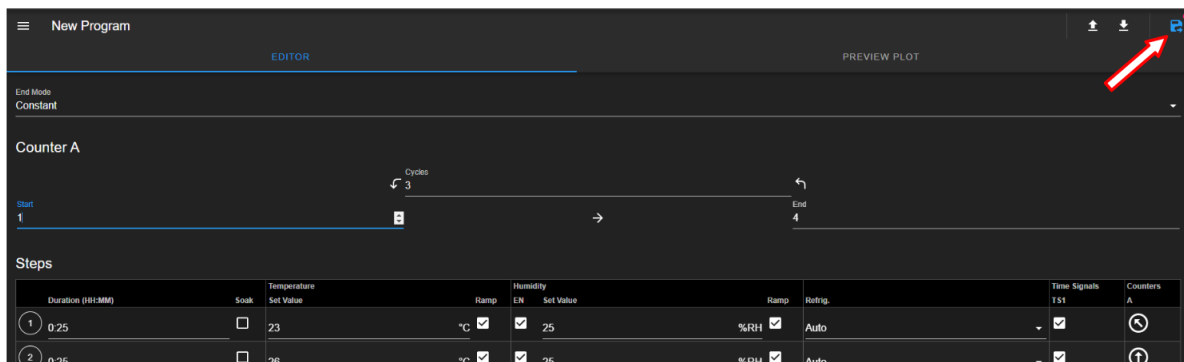


Figure 46.13: Save current program

Navigating out of the editor without saving the program will trigger the following warning:

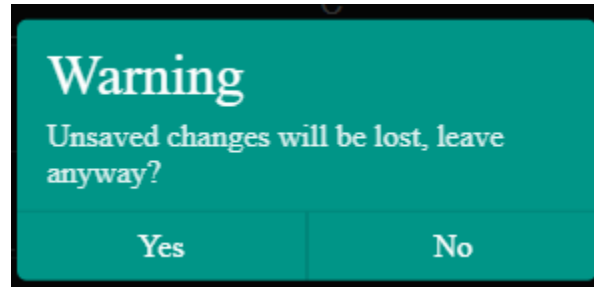


Figure 46.14: Confirm the save or discard update

11. **Program Preview:** Click the **PREVIEW PLOT** button to preview the output of the current program (see figure below). Click the **EDITOR** button to toggle back to the editor mode. Program cannot be saved while in the preview mode. In order to save the program, navigate back to the program editor to apply the **Save** or **Save As** button.



Figure 46.15: Program in preview mode

46.3 View, Edit, Save Program

This section describes how to open an existing program for viewing and for editing. Changes made in the program can be written back to the file with **Save**.

46.3.1 Open Program

To open a program for viewing and for editing, click the **PROGRAM** button under the program submenu or the Name list, as depicted in the following figure. The profile created (and stored in the ES102 register) in the previous section will be used for illustration. The **Upload Program**, **Download Program** and **Delete** buttons under the Actions column will be discussed in detail in Section 8.3.4.

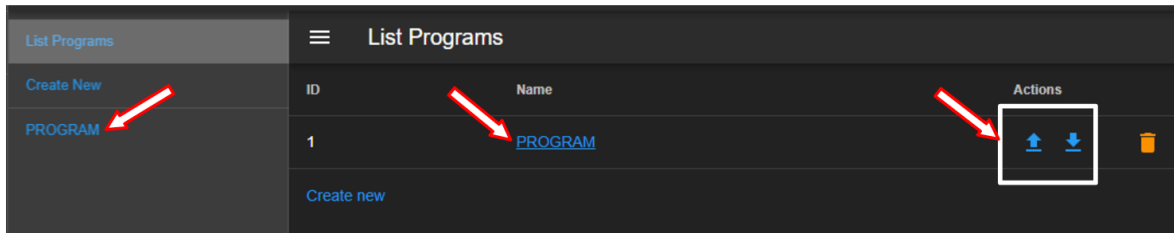


Figure 46.16: Opening a program profile

Once open, the program is placed in the program editor for viewing and for editing (see figure below). The file manipulation buttons (**Delete**, **Open Program**, **Download Program**, **Save As** and **Save**) in the upper-right corner offer different options to handle the program file or manipulate the program editor. These buttons will be explained in detail in the following sections.

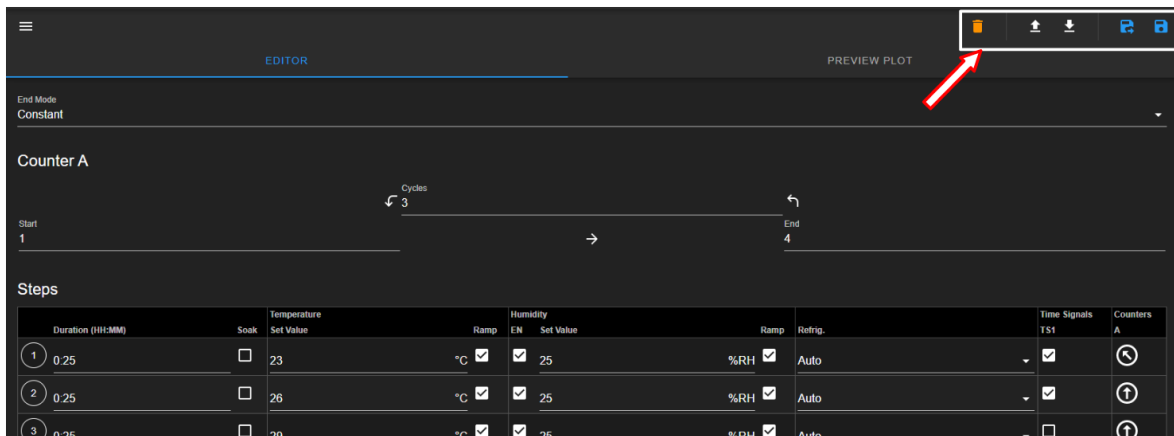


Figure 46.17: File manipulation buttons

46.3.2 Editing Program: Programming Example

This section illustrates the process of editing and modifying the existing program. End mode will be changed to **Off**. Step 4 will be removed; steps 2 and 3 will be modified with new Temp values and new refrigeration options; Counter A will be adjusted to reflect the changes with the new steps.

The editing process is as follows:

1. **End Mode:** Click the End Mode field and select **Off** from the drop-down menu.
2. **Counter A:** Click the Cycles in Counter A and adjust the value to 4. Leave the start and end steps unchanged for now; they will be adjusted by using the buttons under the Counter A in the program.
3. Click number 2 in the circle at the beginning of step 1 and select **Insert After** from the drop-down menu. Edit the fields with the following parameters:
 - **Duration:** Enter 1:15.
 - **Soak:** Check the **Soak** box to enable the feature.

- **Temperature:**
 - **Set Value:** Enter 20 or apply the up/down arrow to adjust the value 20.
 - **Ramp:** Leave the **Ramp** box unchecked. This feature can only be used exclusive to the **Soak** feature. Both cannot be used at the same time.
 - **Humidity:**
 - **EN:** Check the box to turn on EN. Humidity can be disabled or enabled with this option.
 - **Set Value:** Enter 15 or apply the up/down arrow to adjust the value 15.
 - **Ramp:** Leave the **Ramp** box unchecked. This feature can only be used exclusive to the **Soak** feature. Both cannot be used at the same time.
 - **Refrig.:** Leave the **TS1** box unchecked.
 - **Time Signals:** Leave the **Ramp** box unchecked.
4. **Remove Step 3:** Click number 3 in the circle at the beginning of circle of Step 3 and select **Delete**. Note: Steps 4 and 5 now become Steps 3 and 4.
 5. **Remove Step 3:** Click number 3 in the circle at the beginning of circle of Step 3 and select **Delete**. Program instructions should now consist of three steps.
 6. **Step 3 (Adjusting Counter A):** Click the circle under the Counters A column on Step 3 to reset the end loop. This action will adjust the number of end loop in the Counter A from 4 to 3. The final program and its new instructions are depicted in the following figure.

The screenshot shows the 'EDITOR' tab of a software interface. At the top, there are tabs for 'EDITOR' and 'PREVIEW PLOT'. Below the tabs, there's a section for 'End Mode' set to 'Off'. A 'Counter A' section shows a timeline from 'Start 1' to 'End 3' with a 'Cycles' indicator. The main part of the interface is a table titled 'Steps' with columns for Duration, Soak, Temperature, Humidity, Refrig., Time Signals, and Counters. The table contains three steps. At the bottom, there is an 'APPEND STEP' button.

	Duration (H:M:MM)	Soak	Temperature Set Value	Ramp	Humidity EN Set Value	Ramp	Refrig.	Time Signals TS1	Counters A
1	0:25	<input type="checkbox"/>	23	°C <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> 25	%RH <input checked="" type="checkbox"/>	Auto	<input checked="" type="checkbox"/>	↺
2	1:15	<input checked="" type="checkbox"/>	20	°C <input type="checkbox"/>	<input checked="" type="checkbox"/> 15	%RH <input type="checkbox"/>	Off	<input type="checkbox"/>	↑
3	0:45	<input type="checkbox"/>	30	°C <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> 50	%RH <input checked="" type="checkbox"/>	Auto	<input checked="" type="checkbox"/>	↻

Figure 46.18: Final edit of new program

7. **Save Program:** This modified program can be saved using either the **Save** or **Save As** button . The following section describes how to utilize the file manipulation buttons (in the upper-right corner) in detail.

46.3.3 Managing Program File via the Program Editor

This section describes how to apply the five file manipulation options available in the program editor (upper-right corner), as depicted in the following figure.

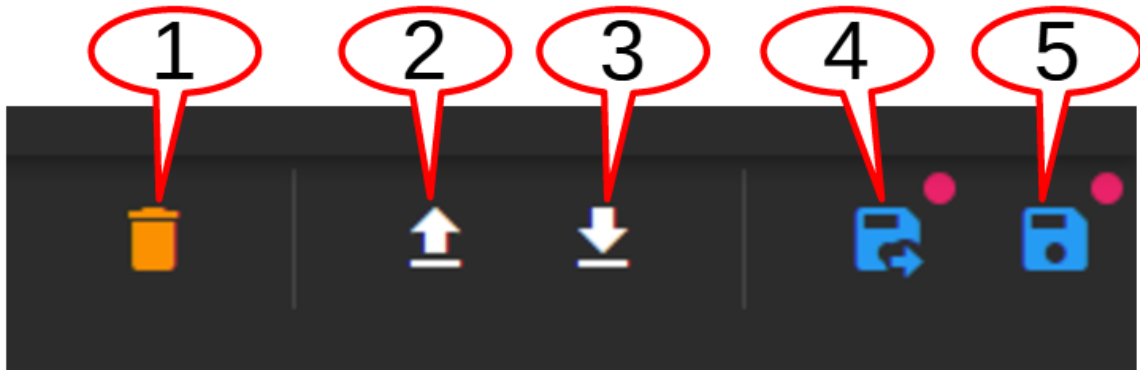


Figure 46.19: File manipulation options

They are described as follows:

1. **Delete:** This is the legacy button which has full functionality for other chambers. For ES102, this button is inoperative, since the ES102 PLC has only one program stored in its register and cannot be deleted. .
2. **Open Program:** This button imports a program file from the local computer into the program editor. By default, ESPEC Web Controller opens the Downloads folder on the local computer to upload the program file. The **Save** or **Save As** button must be applied to write the program onto the PLC's register.
3. **Download Program:** The current program in the program editor can be downloaded onto the local computer as a backup. By default, the program will be stored in the Downloads folder. The hostname and program slot number are used as part of the downloaded filename (e.g., hostname_program_2.json).
4. **Save As:** This button has the same operational feature as the **Save** button (item 5). It is also the legacy button which offers additional flexibility for other chambers to save program in a different slot. Since ES102 has only one slot, **Save As** works the same as **Save**.
5. **Save:** Apply this button to update the program file. To help check the editing status of the program, the program editor utilizes a red dot placed above the **Save** or **Save As** button to indicate an update yet to be saved.

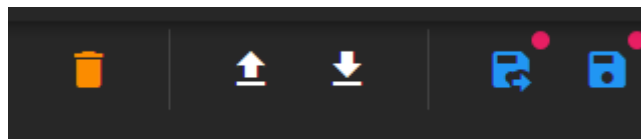


Figure 46.20: Update indicator

Navigating out of the editor without saving the update will trigger a warning prompt, as depicted in the following figure.

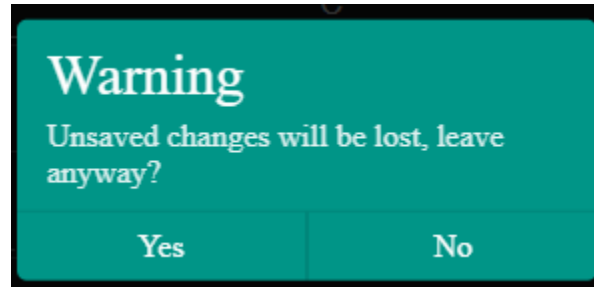


Figure 46.21: Confirm the save or discard update

46.3.4 Managing Program File via the Name List

This section describes how to apply the three file manipulation options on the Name list, as depicted in the following figure.

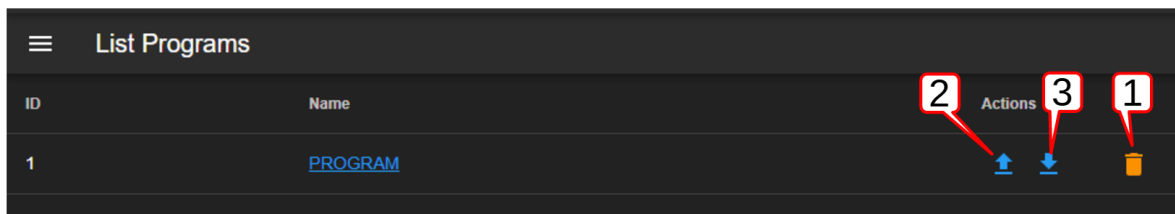


Figure 46.22: Manage programs on the Name list

1. **Delete:** This is the legacy button which offers the delete option (as its name implies) for other chambers with the ability to store multiple program files in their register. For ES102, this button is inoperative since the program file cannot be removed or deleted from its existing slot.
2. **Upload Program:** This button can be used to import a program from the local computer directly into a program slot on the Name list and the PLC register. To upload a program, click on the **Upload** button, as indicated by the arrow in the figure. Navigate to locate the desired file on the local computer and double-click it to complete the process.
3. **Download Program:** To download the current program (on the PLC and ESPEC Web Controller), click on the **Download** button. By default, the program file will be stored in the **Downloads** folder on the local computer; filename naming convention is `hostname_program2_json`.

CHAPTER 47

Start Stop

This menu allows the operator with read-write privilege to control or manage the chamber with the following operation modes: **Standby**, **Constant** and **Program**. The following figure depicts these modes displayed in the main display area as individual tabs.

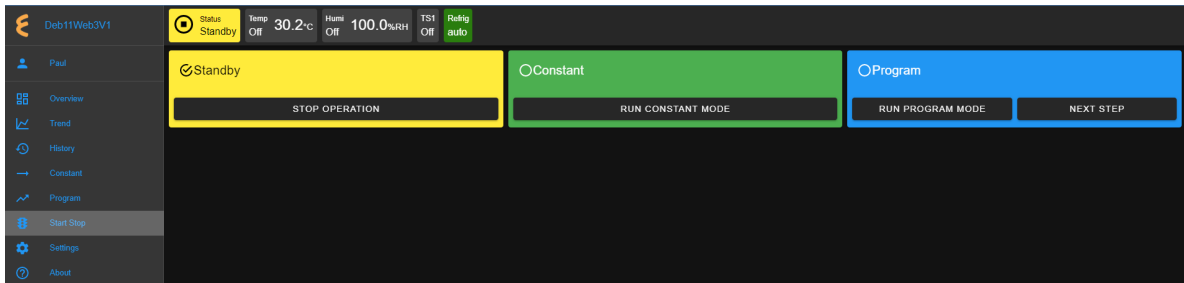


Figure 47.1: The Start/Stop menu with chamber in Standby mode

The **Status** tab in the status bar also provides access to these modes for control and operation. Refer to the **Overview** menu for detail on how to control the chamber operating modes.

47.1 Constant Mode

In a constant mode, the chamber operates using the constant configuration. Authorized users with read-write privilege may set the chamber to operate in **Constant** mode. A constant mode can thus be switched from a program mode and vice versa.

The following procedure illustrates how to switch the chamber from Standby to Constant mode:

1. Click the **Start Stop** menu (in the side bar).
2. Click the **RUN CONSTANT MODE** button in the **Constant** tab, indicated by the arrow in the figure below.

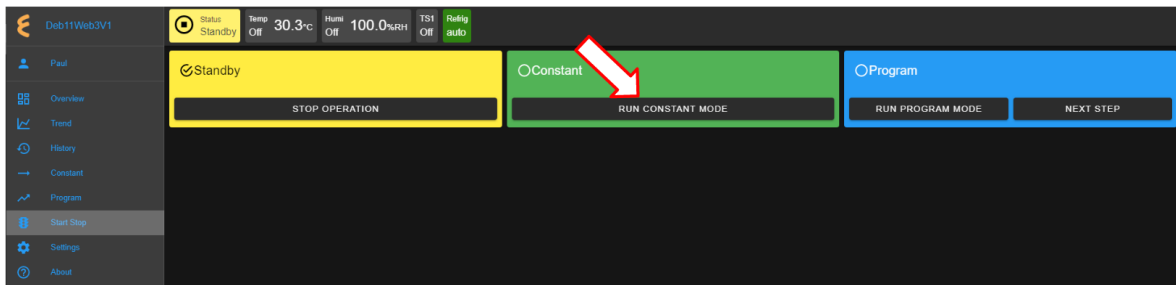


Figure 47.2: Set chamber in Constant mode

The chamber then proceeds to set its mode to **Constant**, which requires several seconds to take effect. Its status tab displays **Constant**, which is confirmed by the check mark in the **Constant** tab, as depicted in the following figure.

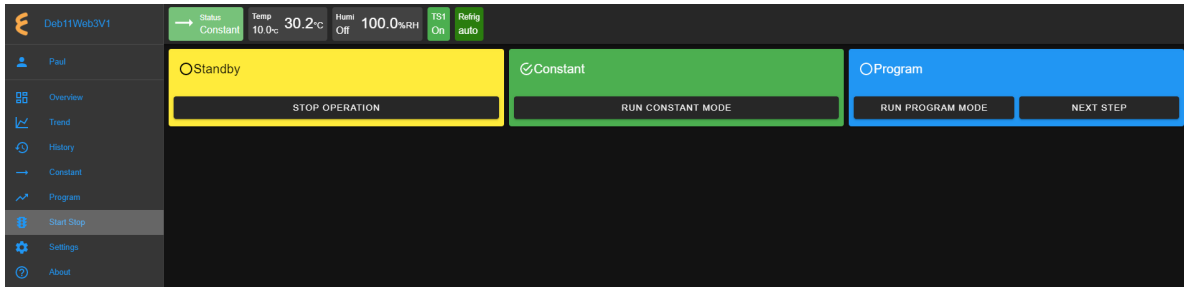


Figure 47.3: Chamber operating in Constant mode

- To terminate the **CONSTANT** mode, activation of a new mode is necessary. For instance, to switch the chamber operating mode from **Constant** to **Standby**, click the **STOP OPERATION** button in the **Standby** tab. ESPEC Web Controller immediately moves to apply the operating mode to the chamber.

47.2 Program Mode

Authorized users with read-write privilege may set the chamber to operate in **Program** mode using the run button in the **Program** tab. In a program mode, the chamber carries out instructions of the program being executed. The status tab in the status bar posts **Program**, along with the name of the program being executed. This status is confirmed by the check mark in the Program tab, as depicted in the following figure.

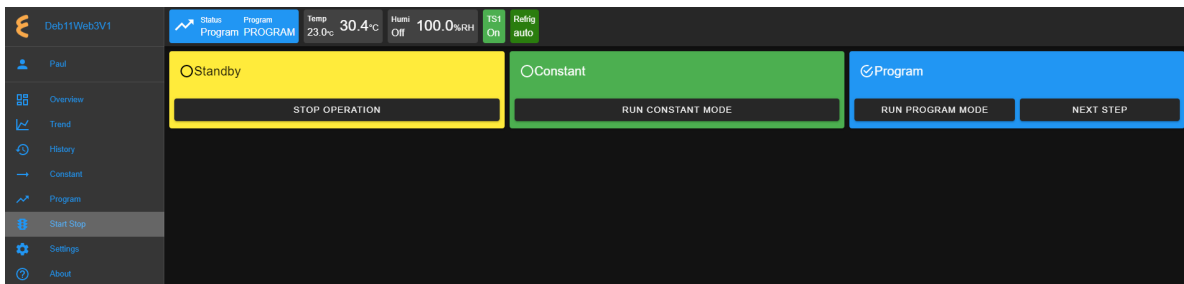


Figure 47.4: Chamber in program mode

The following subsections explain how to execute a program and step through the instructional steps.

47.2.1 Run Program

A program mode can be switched from standby or constant. To load and execute a program to control the chamber, complete the following steps:

- Click the **Start Stop** menu.
- Click **RUN PROGRAM MODE** as shown by the arrow (see figure below).

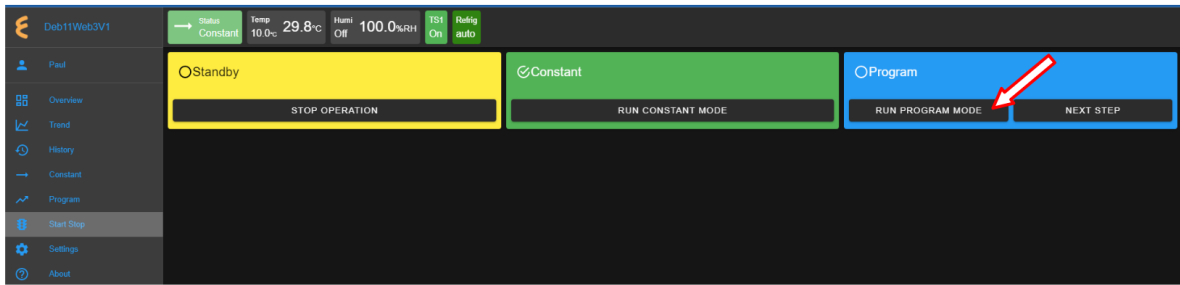


Figure 47.5: Executing a program from within Program tab

- ESPEC Web Controller immediately moves to apply the operating mode to the chamber. The status tab and status bar now display the program being executed, as depicted in the previous figure.
- The **Overview** page maybe accessed to display the detail of the program being executed, showing which step is being carried out (indicated by the black box depicted below).

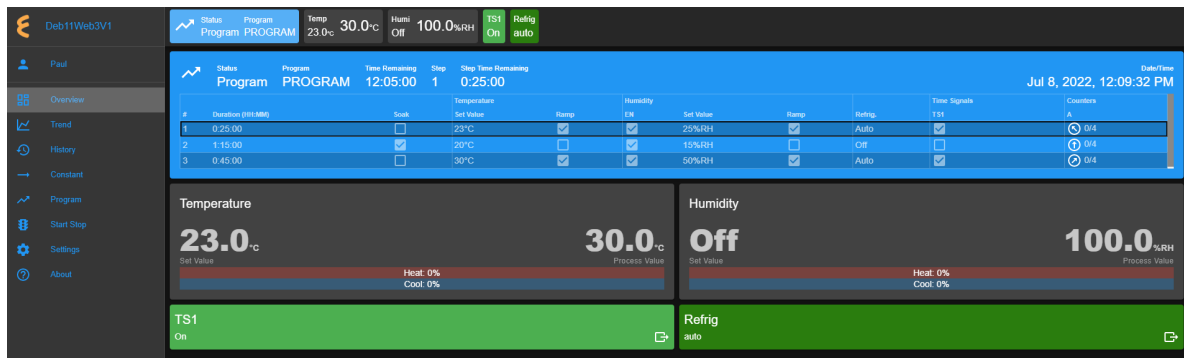


Figure 47.6: Detailed view of program during execution

47.2.2 Stepping through Program

ES102 does not offer pause or resume operation during a program execution; it only offers an option to step through a program. Without having to wait for each step in the program to complete its tasks for the entire duration in the instruction, an operator may step through the program to study the effects of the instructions in a certain step. While the program is being executed, click the **NEXT STEP** button to execute the next step in the program. This action may be repeated until the last step in the program is reached. The **Overview** page in combination with the extended tab maybe accessed to display the detail of the program being executed and its steps being stepped through.

The following figure depicts the program being stepped through to executing step 3, indicated by the black box.

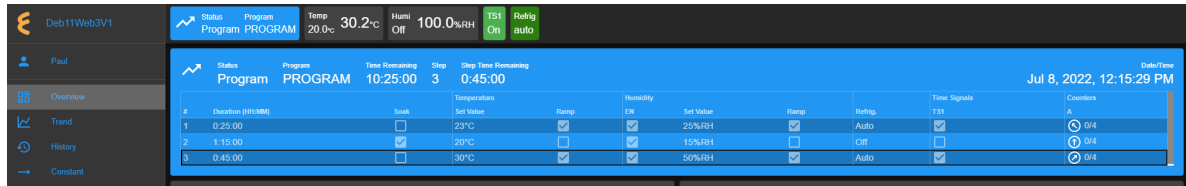


Figure 47.7: Stepping through program to execute Step 3

47.3 Timers

The **Timers** tab provides a quick way to apply the Macro Editor to automate a simple macro action to extend the operating mode of the chamber. There are two timer types: One-time timer and repeated timer. The one-time timer or one-shot timer allows an operator to set up a single (hence, one-time) operation on the chamber, while the repeated timer permits an operator to set up a repeated operation on the chamber. The repeated timer will operate indefinitely until it is disabled. The following figure depicts these two timer types. **Note:** ES102 has only one program in its profile list, thus, under the **Program** field, it will show only one program.

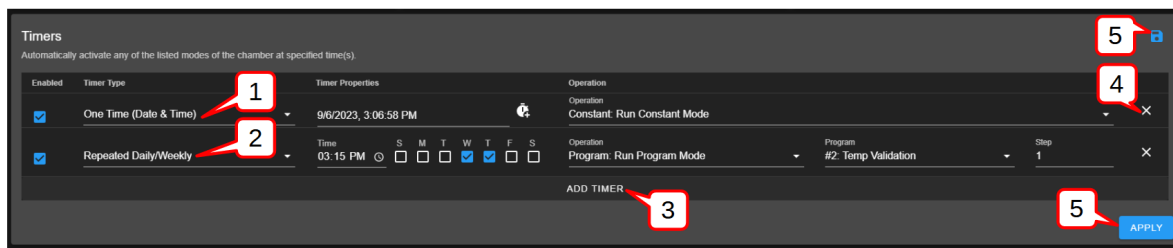


Figure 47.8: Example of one-time and repeated timer operation

1. **One-Time:** This timer fires the constant mode operation at 3:06:58 PM on 9/6/2023. The timer instruction and 3:06:58 PM must be configured ahead of time, later than the current time in order for the operation to take effect. For this reason, EWC date/time must synchronize with the current or local date/time (refer to **Date/Time Settings** under the **Settings** menu for detail). The one-shot timer is date/time dependent.
2. **Repeated Daily/Weekly:** This line is added after the first line got executed. Since it is set to occur after the first line, it will trip at 3:15 PM on Wednesday and Thursday of the week (in reference to the current date/time of EWC). The action executes a program from slot 2 (also referenced by the program name). When program execution is complete, the chamber will be set in the operating mode specified by the instruction in the program. This timer type is date/time independent; the operation will recur until the timer itself is removed from the **Timers** list or disabled with the **Enabled** box unchecked.
3. **Add Timer:** A new timer can be added using the **Add Timer** button, which will be added at the bottom of the list.
4. **Remove/Delete:** Each timer can be removed using the **X** button to its right.
5. **Save/Apply:** To start the timer, the **Save** or **Apply** button must be used. The two timer instructions (depicted above) are saved under the Macro Editor called **Operation Timer 1** and **Operation Timer 2**, respectively. If the timers are edited with new instructions

and saved, the system generates a new name **Operation Timer 3** for the third timer, with a numeral incremented by one per each update. If the timer instructions are all removed from the **Timers** list, and a new timer is created and saved, the system starts over with **Operation Timer 1**, with its numeral incremented by one on each new update. This information can be viewed under the **Macros** submenu (under the **Settings** menu).

47.3.1 Program Mode: One-Time Timer

A one-shot timer sets the **Timers** to fire a certain action once based on the set date and time. With this feature, a selected program can start at a certain day and time once. The running program can be paused, resumed or stopped by another (subsequent) one-shot timer. An operator can plan to stop a certain program and switch the chamber to a different mode with the one-shot timer.

The following example illustrates how to set a one-shot timer to switch the chamber from **Standby** to **Program** and execute the said program starting with step 1.

1. Log in using the **admin** account
2. Access the **Start Stop** menu
3. Touch or click the **ADD TIMER** bar
4. Select/confirm that **One Time** is selected from the drop-down list of the **Timer** type; by default, **One Time** is selected.

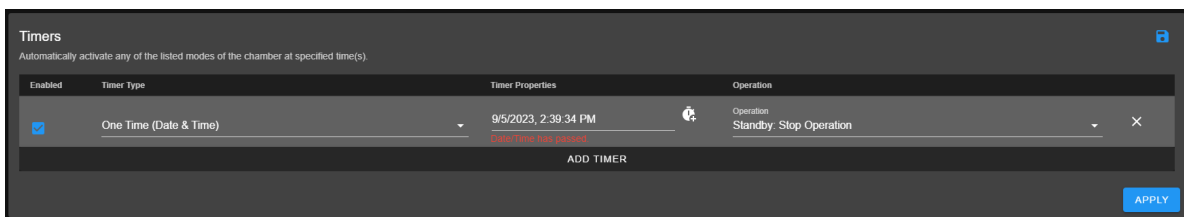


Figure 47.9: Setting a one-time automation

5. Touch or click the date/time field under the **Timer Properties** and apply the calendar and time to set the desired time. **Note:** Date and time must be ahead of the current date and time on the EWC system.

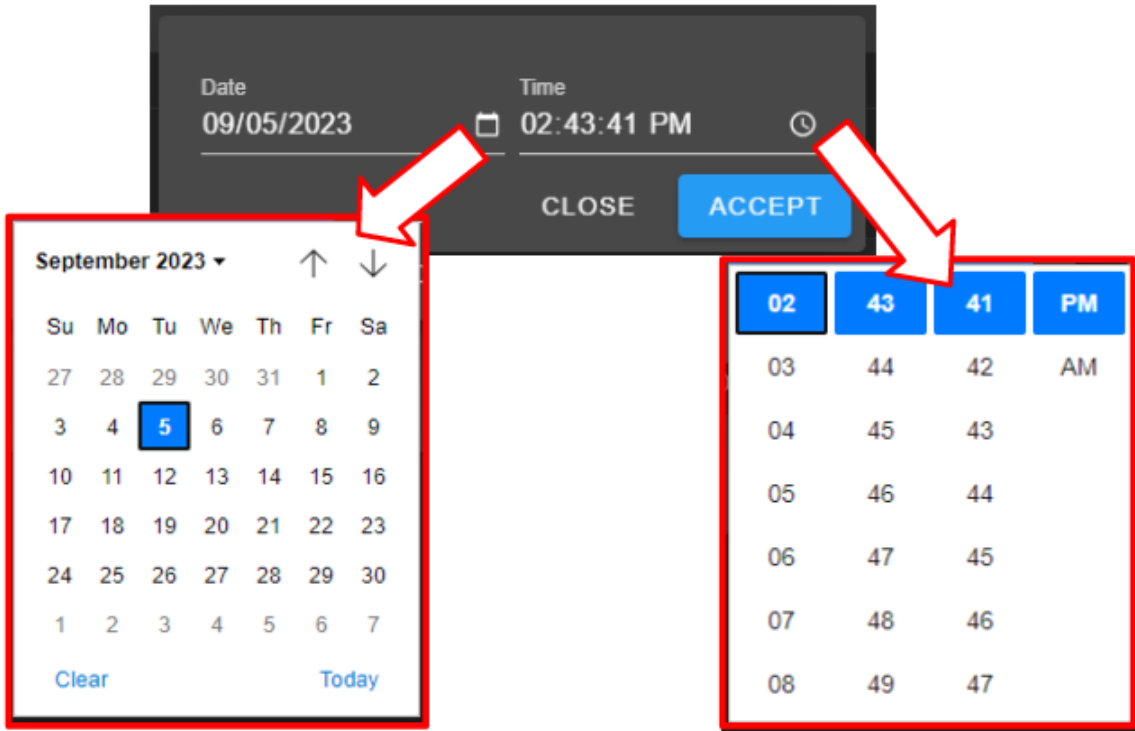


Figure 47.10: Set date/time for a one-shot action

Note: For a one-time operation, it is easier to use the Offset button (on the right of the date/time field) to adjust the future time, as depicted by the arrows in the following figure. Here, EWC will add the time to the current time to calculate when this action will fire.

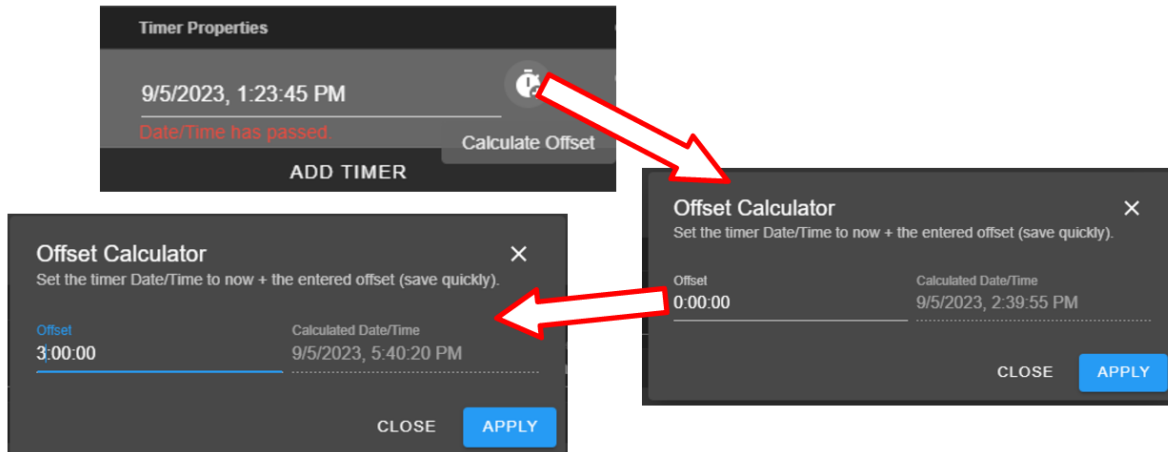


Figure 47.11: Using the time-offset calculator

6. Under **Operation**, select **Program: Run Program**
7. Under **Program**, select slot number or the associated program name
8. Under **Step**, select what step to start
9. Apply the setting with the **APPLY** button

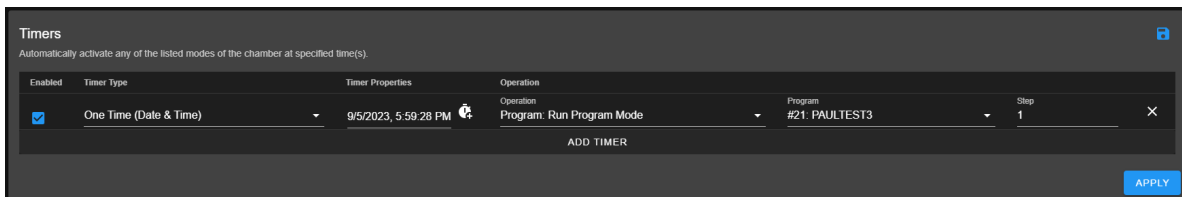


Figure 47.12: Program mode for a one-time start

Note: Both the **Save** and **APPLY** buttons provide the same effect. Either button can be used to save the settings and apply the action.

10. The program in slot 21 (as depicted in the example) will commence at 5:59:28PM (according to the EWC local time). For ES102, there is only one program listed.

47.3.2 Removing or Adding a Timer

The one-shot or repeated timer can be removed from or added to the **Timers** list with the **X** or **ADD TIMER** button. Each new timer is added to the bottom of the list and takes effect after each update.

To add a new timer and use it, simply apply the **ADD TIMER** button. The following figure illustrates how a second timer is added to switch the chamber from a program mode (activated by the first timer) to **Constant**. Here, a program executes at 1:20:15 PM, with execution time to last several hours. The timer in line 2 will switch the chamber to **Constant** mode at 2:00:00 PM.

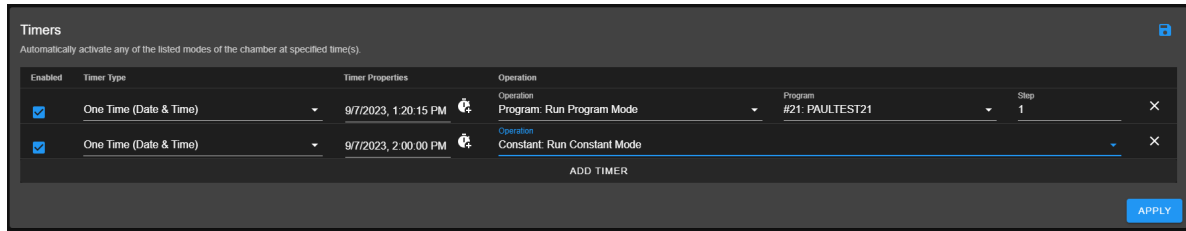


Figure 47.13: Setting additional one-shot timer after the first

Different timers on the list can be enabled or disabled using the **Enabled** box. Additional timer can be added to the **Timers** list and updated to take effect, provided the time is set for future time.

47.3.3 Constant Mode: One-Time Timer

The following example illustrates how to configure a one-shot timer to switch the chamber from **Standby** to **Constant** at a specific time. The timer is configured as a new instance with one line by itself, as depicted in the following figure. The action is instant.

1. Log in using the **admin** account
2. Access the **Start Stop** menu
3. Clear all or current timer settings with the **X** button (if necessary).
4. Touch or click the **ADD TIMER** bar
5. Confirm that **One Time** is selected (or make selection from the drop-down list).
6. Touch or click the date/time field under the **Timer Properties** and apply the calendar and time to set the desired time.
7. Under **Operation**, select **Standby: Stop Operation**
8. Apply the setting with the **APPLY** button. The timer is now saved in Macros list.

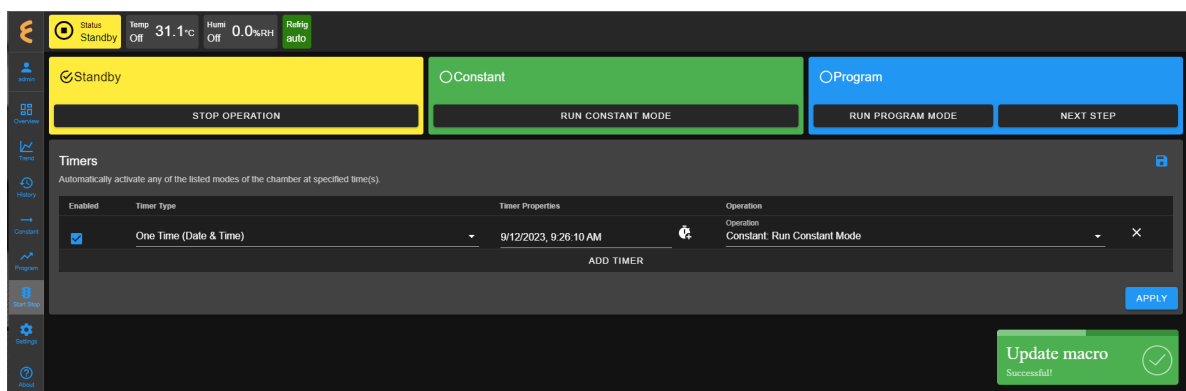


Figure 47.14: Scheduled a one-time timer to set chamber in Constant mode

9. The timer is activated at the set time, as depicted in the Macros list under the **Operation Timer 1** script. To view the **Operation Timer 1** action, access the **Settings** menu and

select **Macros** from the submenu.

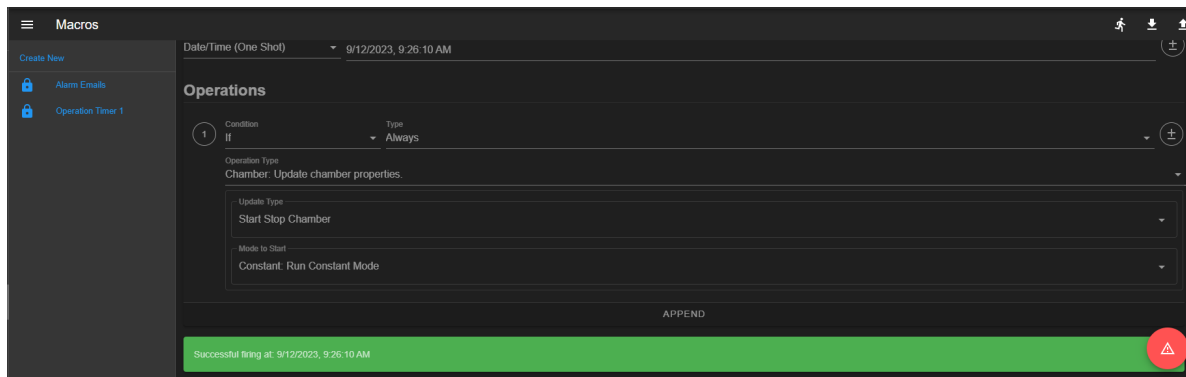


Figure 47.15: Macros action recorded on the one-time Timer

47.3.4 Program Mode: Weekly Repetition

With a weekly repeated timer, a program can start on a certain day, at a certain time. The following example illustrates how to execute a program on a weekly basis (one day during each week) at a certain time. Here, we set the program to execute every Wednesday at 9:34 AM.

1. Log in using the **admin** account
2. Access the **Start Stop** menu
3. Clear all or current timer settings with the **X** button (if necessary).
4. Touch or click the **ADD TIMER** bar
5. Under **Timer Type**, select **Repeated Daily/Weekly**
6. Edit the time to 9:34:00 AM
7. Check the box under W. The calendar format is Sunday(S) to Saturday (S).
8. Under **Operation**, select **Program: Run Program Mode**. **Note:** There are few operation options available for ES102 as depicted in the following figure.
9. Under **Program**, select program in slot 1. ES102 has only one program stored on the profile list. Set and select program step 1 to begin execution.

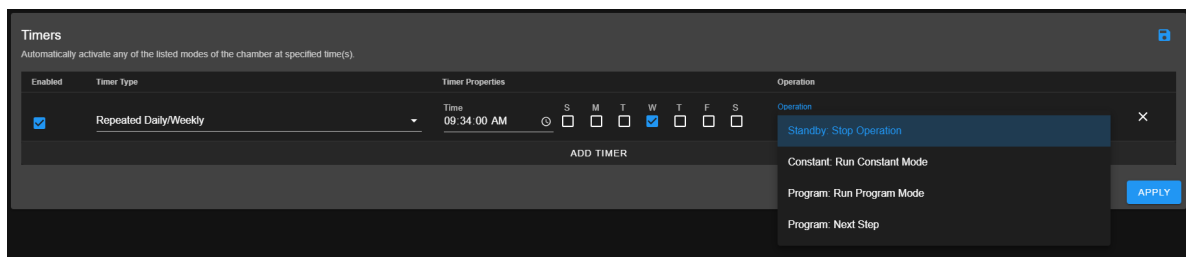


Figure 47.16: Single-day weekly timer

10. Apply the setting using the **APPLY** button. The complete configuration is depicted in the following example.

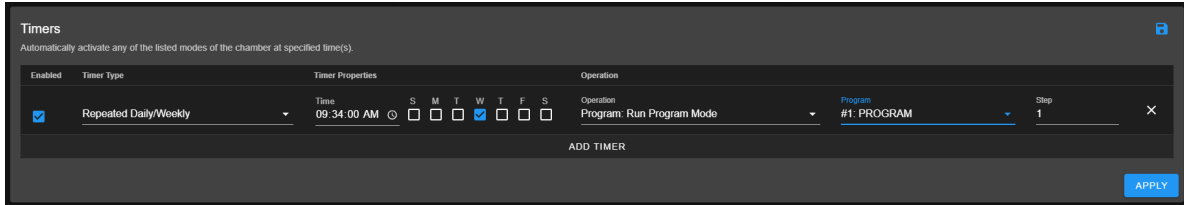


Figure 47.17: es102-prog-run-weekly-001a.PNG

This timer can be disabled or enabled by manipulating the **Enabled** box. If you stop the program or switch the chamber to a different mode (such as, **Constant**), while this timer is still enabled, the program will recur on Wednesday at 9:34 AM the following week. To disable the timer permanently, it must be removed from the list (with the X and APPLY button).

47.3.5 Program Mode: Daily Repetition

The following example illustrates how to execute a program on a daily basis throughout the entire week starting 11:15 AM.

1. Log in using the **admin** account
2. Access the **Start Stop** menu
3. Clear all or current timer settings with the **X** button (if necessary).
4. Touch or click the **ADD TIMER** bar
5. Touch or click **Timer Type** and select **Repeated Daily/Weekly**
6. Edit the time to 11:15:00 AM.
7. Check the boxes under S through S. The calendar format is Sunday (S) to Saturday (S).
8. Under **Operation**, select **Program: Run Program Mode**. **Note:** There are few operation options available for ES102 as depicted in the following figure.
9. Under **Program**, select program in slot 1. ES102 has only one program stored on the profile list. Set and select program step 1 to begin execution.
10. Apply the settings with the **APPLY** button. The complete configuration is depicted in the following figure.

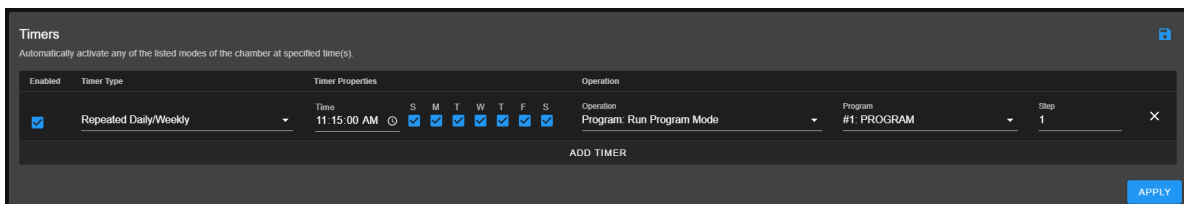


Figure 47.18: Timer setting for everyday of the week

The following trend graph is a result of the timer from a different chamber (used for illustration here) with its configuration set to run over several days. The trend graph was produced by extrapolating the data from the last three days (Friday through Sunday). It shows how program

was repeated each day at 6:05 PM and ended shortly before 9:00 AM, as indicated by the status bar at the bottom of the graph. The chamber was put in a **Standby** mode until 6:05 PM, at which time the program recurred.

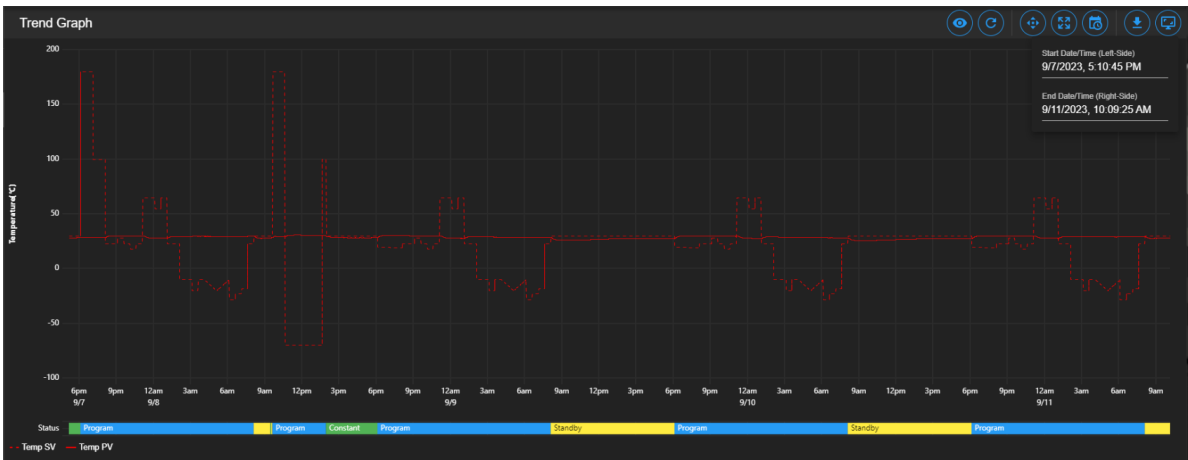


Figure 47.19: Trend graph of chamber controlled by a timer

This timer can be disabled or enabled by manipulating the **Enabled** box. If you stop the program or switch the chamber to a different mode (such as, **Constant**), while this timer is still enabled, the selected program will recur on the next day. To disable it permanently, the timer can be removed from the list (with the X and APPLY button).

47.3.6 Multiple Timers: One-Time or Repeated Daily/Weekly

The **Timers** list may contain multiple timers with different instructions for a specific operation. Multiple timers allow for sequential activations, order of script execution or specific execution via the **enabled** box selection, etc.

The following figure depicts a list of multiple timers, each with a specific function and operation, which has been prepared to execute in the top-to-bottom paradigm.

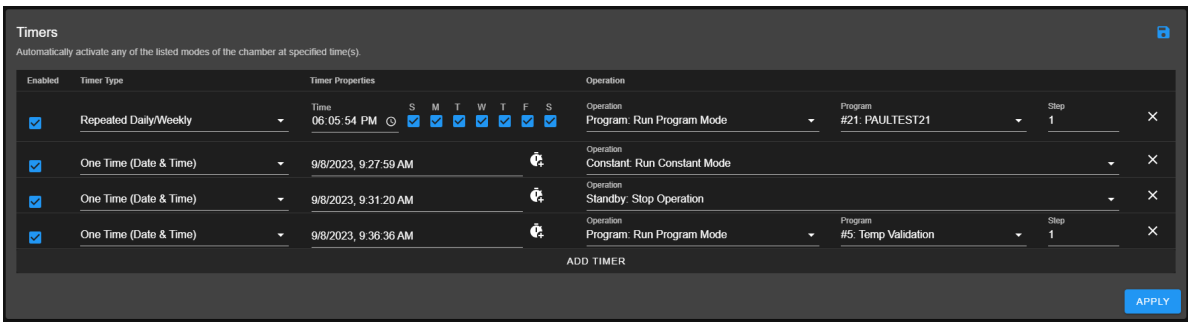


Figure 47.20: Multiple sequential timer ooperations

Each entry in the above figure is added after the previous one (above it) has been executed. All of which are enabled by default. Only timer 1 (top line) and timer 4 (bottom line) remain in effect, since the middle two are one-shot timers. In addition, the last timer is also a one-shot

timer and it will end after the program it has executed has ended. Each timer causes action to take over the previous one.

Part IX

Settings Menu

CHAPTER 48

Settings

The **Settings** menu in the menu bar is the administration page where different settings and configurations can be applied to EWC and the chamber. The administrator who manages EWC should take the necessary precautions to limit or allow users with certain privileges to access and control this menu and its submenus. Refer to **User Settings** submenu in the following section for detail on how to enforce user policy and access privileges to different users on EWC.

The **Settings** menu has thirteen (13) different submenus listed under two separate groups in the submenu bar, each with its own link to its page. To access each submenu, click **Settings** in the menu bar to bring up the submenu bar. When the **Settings** menu is accessed for the first time, it displays its submenu bar underneath the **Show/Hide** button, as depicted in the following figure.

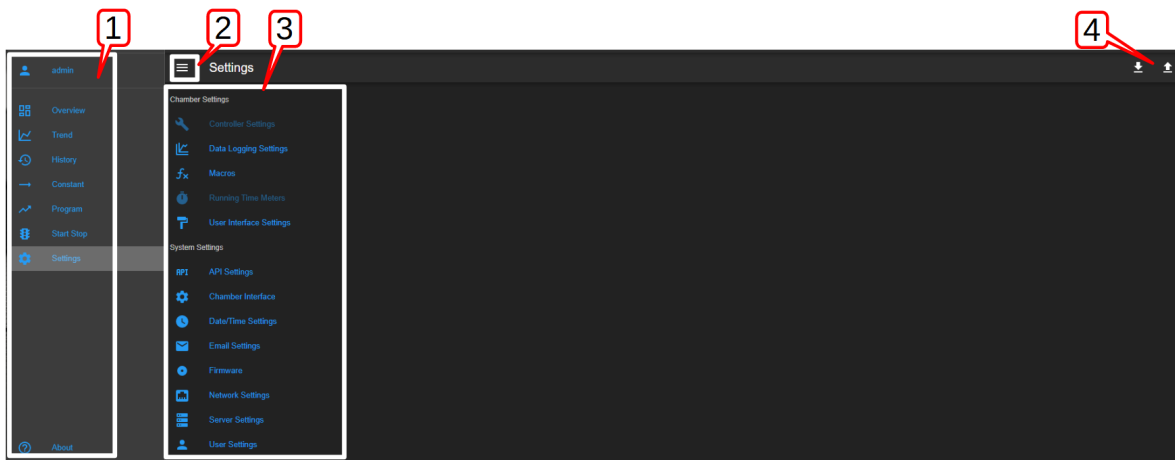


Figure 48.1: The Settings menu and its submenus

The items associated with the UI of the **Settings** menu are described as follows:

1. **Settings:** This **Settings** menu should be accessible only to the administrator or a qualified operator with administrator's privileges.
2. **Show/Hide:** This button can be used to toggle between full display and submenus accessibility.
3. **Submenu Bar:** Click the submenu name (or its icon) to manage and control its settings.
4. **System Backup:** The Export/Import (up/down arrow) buttons provide options to download or upload a full system backup.

The following subsections discuss each of these submenus in detail.

48.1 Controller Settings

Note: This submenu is available only for the T-series and P300 chambers. If this submenu is grayed out, your chamber does not support this feature. Subsections 10.1.1 through 10.1.4 are devoted for the T-series, while subsection 10.1.5 discusses the controller settings for the P300.

The **Controller Settings** submenu is only available for chambers equipped with Allen Bradley CompactLogix, ControlLogix and Micro8xx PLC series. Such chambers are referred to as T-series chambers. This submenu will be grayed out for any chamber other than the T-series chamber.

The **Controller Settings** submenu allows the operator to set different parameters of the chamber’s control features. This submenu divides into four separate tabs: **General**, **Calibrate Thermocouples**, **Calibrate Accelerometers**, and **Diagnostics**, as depicted in the following figure. The **General** tab is displayed by default, when this submenu is accessed.

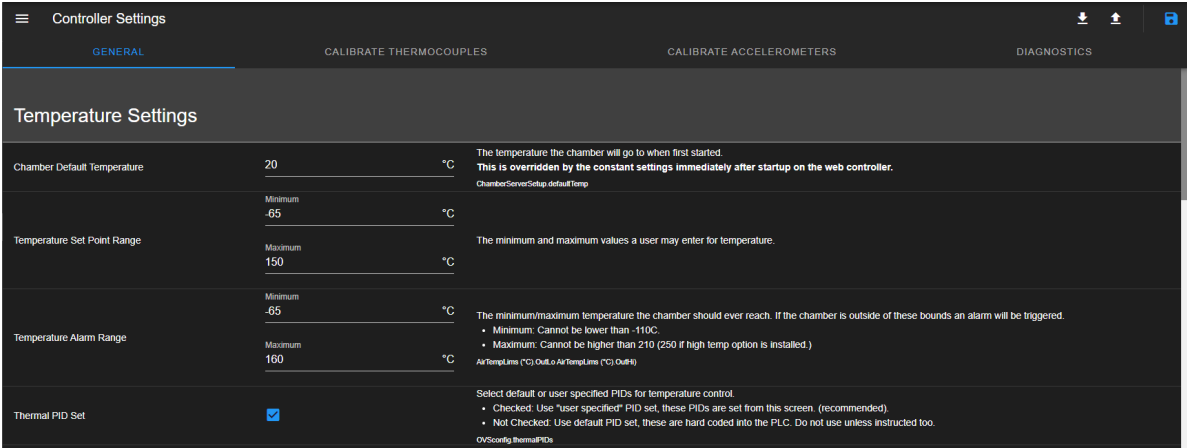


Figure 48.2: Controller settings for T-Series chambers

Under the **General** tab, different settings are available for **Temperature Settings**, **Vibration Settings** and **Misc Settings**; all of which can be browsed and configured by scrolling through Web page.

The current configuration of the chamber can be downloaded as a backup via the **Export to local file** button in the upper-right corner. The export file will be stored in the **Downloads** folder on the local computer, in JSON format (with filename as TyphoonV1.json). New settings can be performed and applied using the **Save** button in the upper-right corner. This configuration file can be uploaded back into EWC any time.

48.1.1 General

The **General** tab lists the general specifications of the chamber, such as **Temperature**, **Vibration** and other miscellaneous items. Each item is listed with description of its operation and features. With this tab, an operator can directly control and reconfigure the specifications of the chamber. As depicted in the following figure, if a user sets a temperature value higher than the specified parameter, EWC will flag the user to apply the setting below the threshold value.

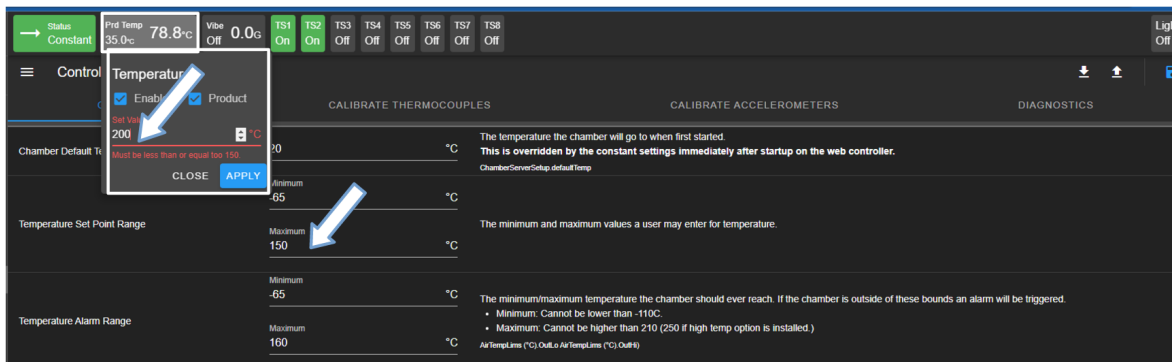


Figure 48.3: A list of the general specifications of the chamber

To apply a new configuration, perform the following steps.

1. Click the **Export to local file** button (item 1, indicated by the arrow) to download the current configuration as a backup. The configuration file will be stored in the **Downloads** folder on the local computer under the name TyphoonV1.json. This practice is a precaution measure to safeguard the original configuration in case the chamber's general configuration needs to be restored.

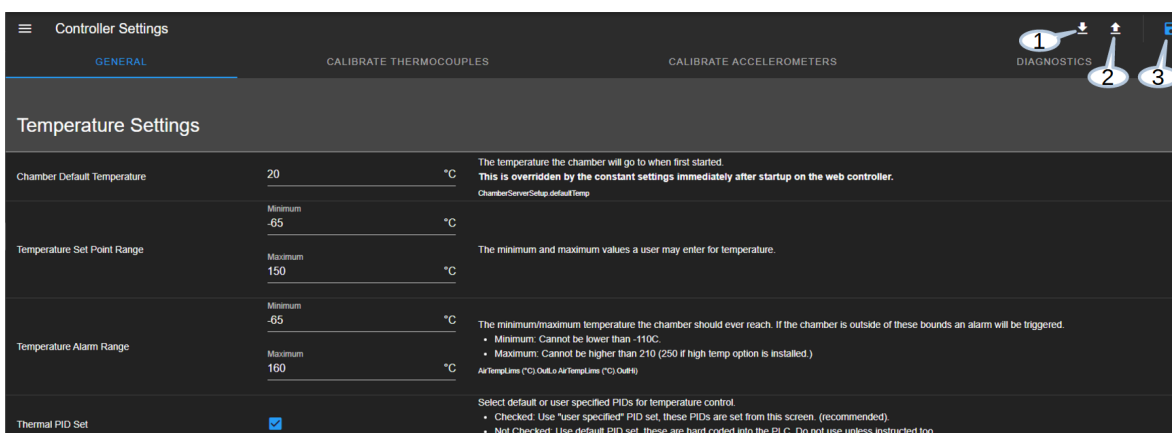


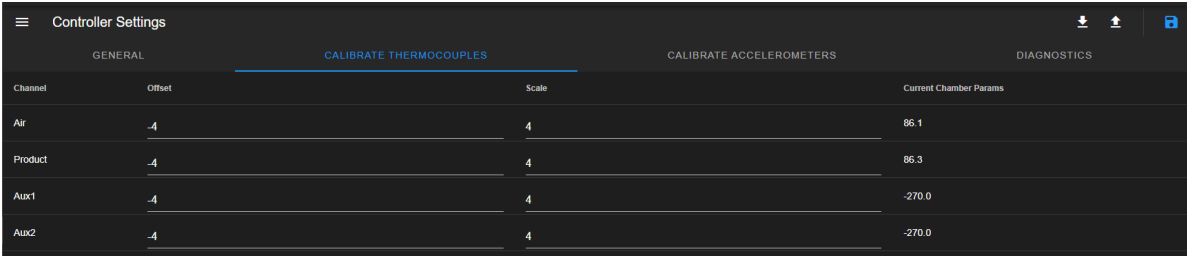
Figure 48.4: Setting options of the chamber general specification

2. Enter a new set value or click the up/down button on each line next to the parameter unit (in the middle column) to adjust the value, as shown in the above figure.
3. Scroll down the tab to apply settings to the rest of the parameters.
4. Click the **Save** button (item 3, indicated by the arrow) to save the current settings.

To load a configuration from a backup file, click the **Import** button (item 2, indicated by the arrow), then select the configuration file (in JSON) on the local computer.

48.1.2 Thermocouple Calibration

To calibrate different thermocouples settings, click the up/down button of the **Offset** and/or **Scale** columns to adjust the value.

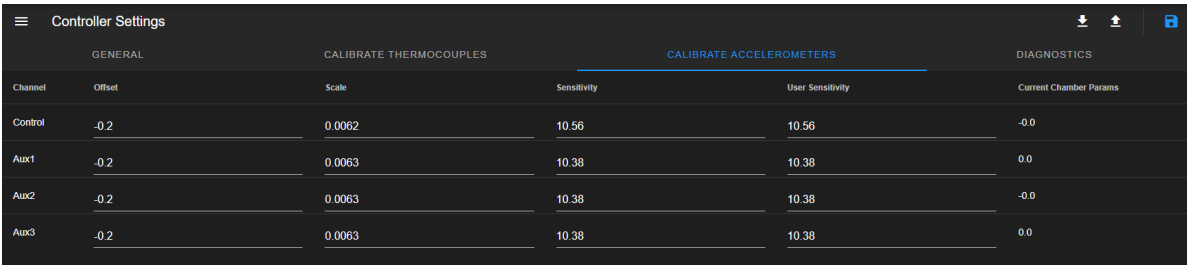


Channel	Offset	Scale	Current Chamber Params
Air	-4	4	85.1
Product	-4	4	85.3
Aux1	-4	4	-270.0
Aux2	-4	4	-270.0

Figure 48.5: The thermocouple calibration submenu

48.1.3 Accelerometer Calibration

To calibrate different accelerometer settings, click the up/down button of the **Offset** and/or **Scale** columns, **Sensitivity** and **User Sensitivity** columns to adjust the value.



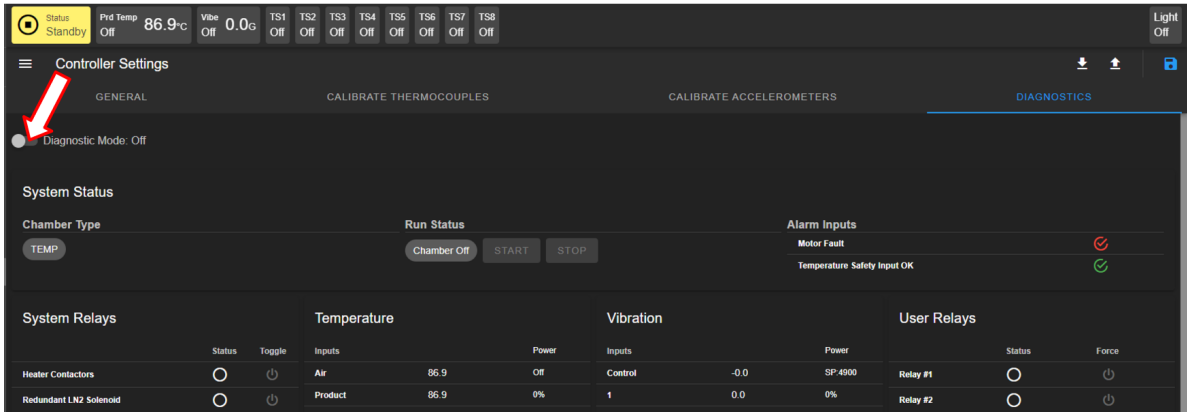
Channel	Offset	Scale	Sensitivity	User Sensitivity	Current Chamber Params
Control	-0.2	0.0062	10.56	10.56	-0.0
Aux1	-0.2	0.0063	10.38	10.38	0.0
Aux2	-0.2	0.0063	10.38	10.38	-0.0
Aux3	-0.2	0.0063	10.38	10.38	0.0

Figure 48.6: The accelerometer calibration submenu

48.1.4 Diagnostic

It may be necessary to perform a diagnostic test on the chamber after a maintenance. This tab allows an operator to perform a certain diagnostic tests on the chamber.

1. Turn on the Diagnostic Mode (indicated by the arrow). This action will enable the **START** button.



System Relays	Status	Toggle	Temperature	Inputs	Power	Vibration	Inputs	Power	User Relays	Status	Force
Heater Contactors	○	⏻	Air	86.9	Off	Control	-0.0	SF 4900	Relay #1	○	⏻
Redundant LN2 Solenoid	○	⏻	Product	86.9	0%	1	0.0	0%	Relay #2	○	⏻

Figure 48.7: The diagnostic submenu

2. Click the **START** button (indicated by the arrow) to update the diagnostic mode. A message box pops up (in the lower corner) to indicate diagnostic update process.

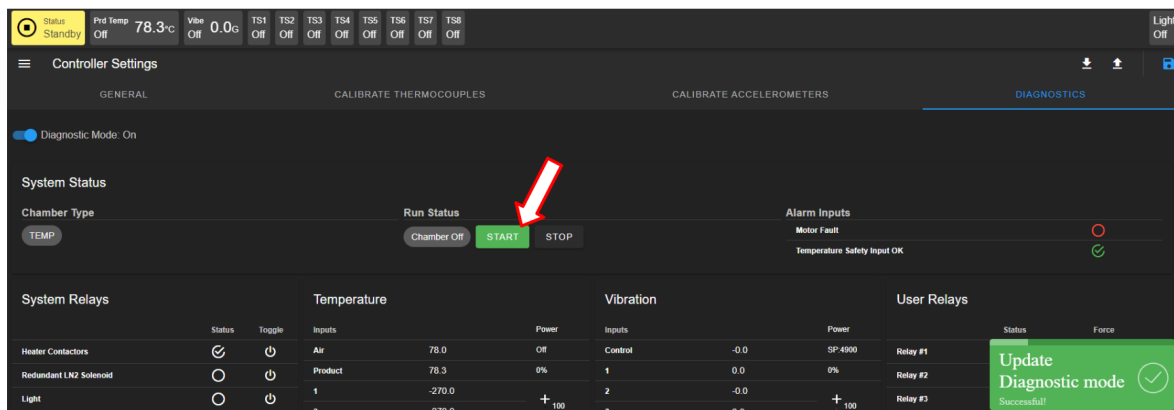


Figure 48.8: Configure a diagnostic test

- Click the **START** button (Again) to initiate the diagnostic test. The **Chamber On** button (under the Run Status tab) should turn from gray to green. Diagnostic is being performed; changes on values of different parameters will be displayed under **Temperature**, **Vibration** and **User Relays**.

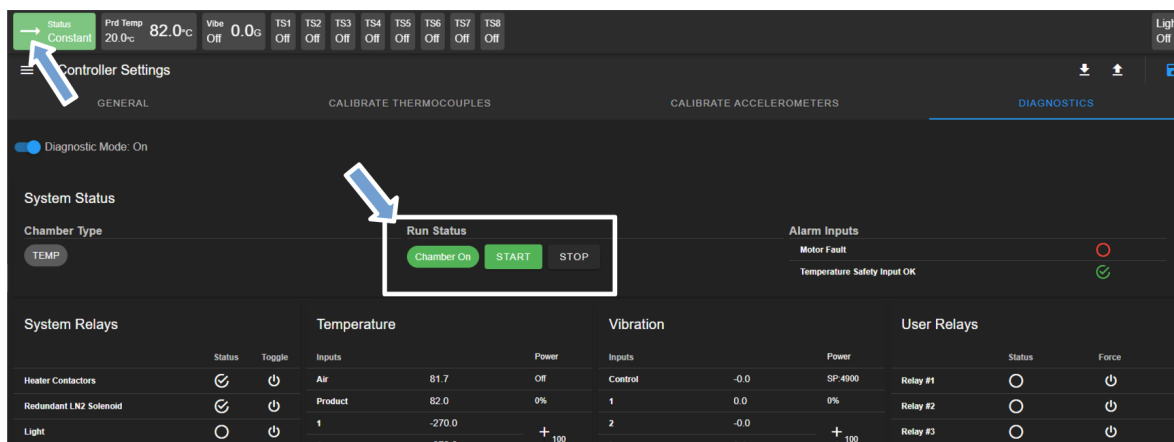


Figure 48.9: Start/stop a diagnostic test

- To terminate the diagnostic test, click the **Stop** button. The chamber will be turned off and switched back to the **Standby** mode.
- Turn off the Diagnostic Mode (see Step 1).

48.1.5 P300: Temperature and Vibration Settings

The following figure depicts two different controller settings for the P300, temperature and vibration.

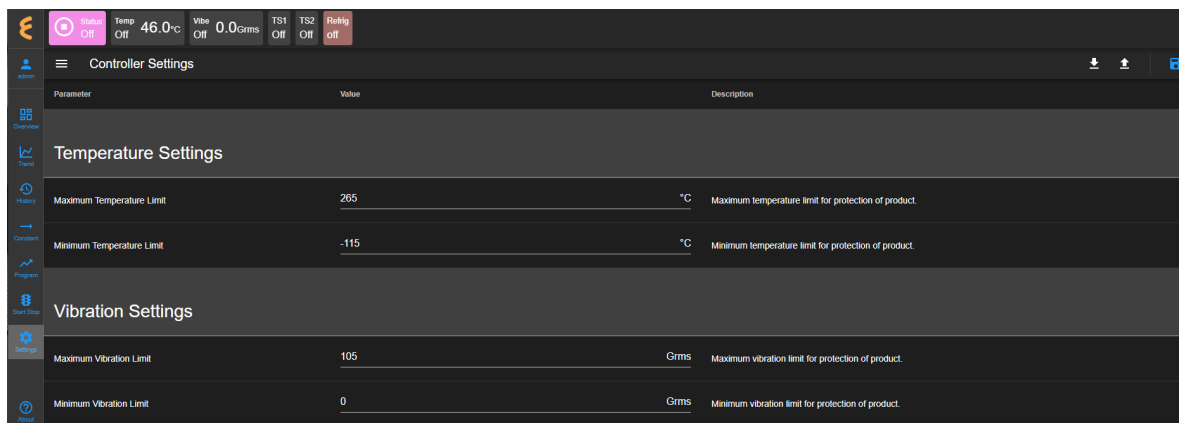


Figure 48.10: Controller settings for P300

These two parameters allow the P300 to operate within its set limits, in terms of maximum and minimum operation values. Consult the chamber operation manual for the minimum and maximum settings for each parameter.

To set the maximum and minimum values for Temperature or Vibration,

1. Enter a new maximum value in the Temperature Value field or click the spin button next to the Unit to change the value.
2. Enter a new minimum value in the Temperature Value field or click the spin button next to the Unit to change the value.
3. Enter a new maximum value in the Vibration Value field or click the spin button next to the Unit to change the value.
4. Enter a new minimum value in the Vibration Value field or click the spin button next to the Unit to change the value.
5. Click Save (upper right corner) to save the settings.
6. To download the settings, click the Export (down-arrow) button. The settings will be saved in JSON file (filename: espec.json) on the local computer. This file can be used to restore the settings using the Import (up-arrow) button.

48.2 Data Logging Settings

Contents in the trend graph discussed in the **Trend** menu are dictated by the settings on this page. Data points collected from the chamber will bear a date/time stamp of EWC, shown in the upper-left in the system bar, regardless of the date/time on the controller (see the extension bar of the status tab in **Overview**). For practical purposes, date/time of EWC should reflect the current date and local time zone.

Two panes for data logging are available to support the configuration (as depicted in the following figure). They are described as follows:

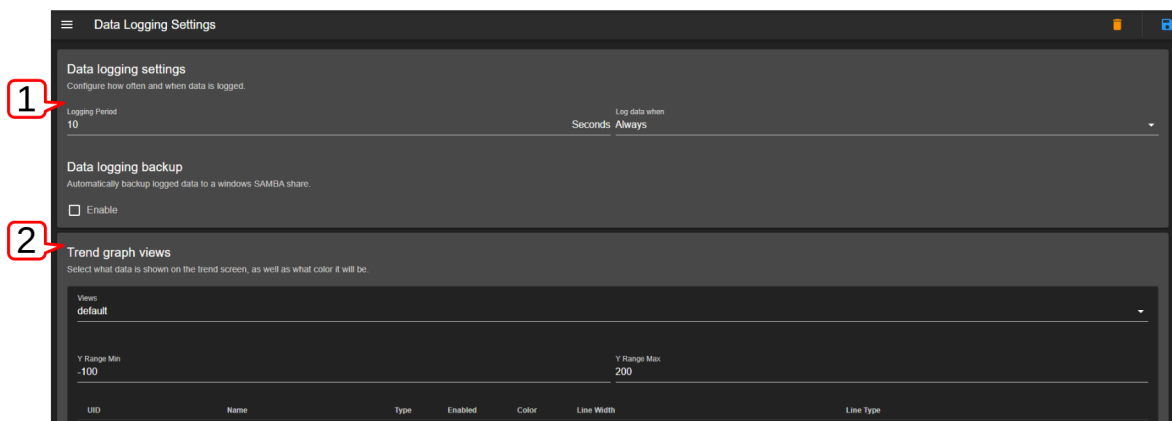


Figure 48.11: Options for data logging

1. **Data Logging Configuration/Settings:** Data logging is controlled by the logging frequency and chamber operating mode. By default, logging frequency occurs at a 10-second interval. An arbitrary value can be set but the setting is limited to the response of the chamber for a frequency less than 10 seconds. Two operating modes control data logging: **Always** and **When Chamber is on**. The following section discusses in detail how to set logging frequency and operating mode. Data logs can be archived via a Samba technology that allows file sharing between two different platforms (such as, Linux and MS Windows or Linux and Mac). Our EWC is already configured to use Samba to transfer and store logged data. Samba configuration on the target platform is the responsibility of the user.
2. **Trend Graph Views:** Data points and types (such as, temperature, humidity, etc.) can be manually selected to appear in the trend graph. Selection can be made based on the check mark placed in their respective boxes (shown in the following figure). Color decoration can be selected for plot legends. Different logs for a trend graph can be created. Detailed steps for these settings are discussed in the following sections.

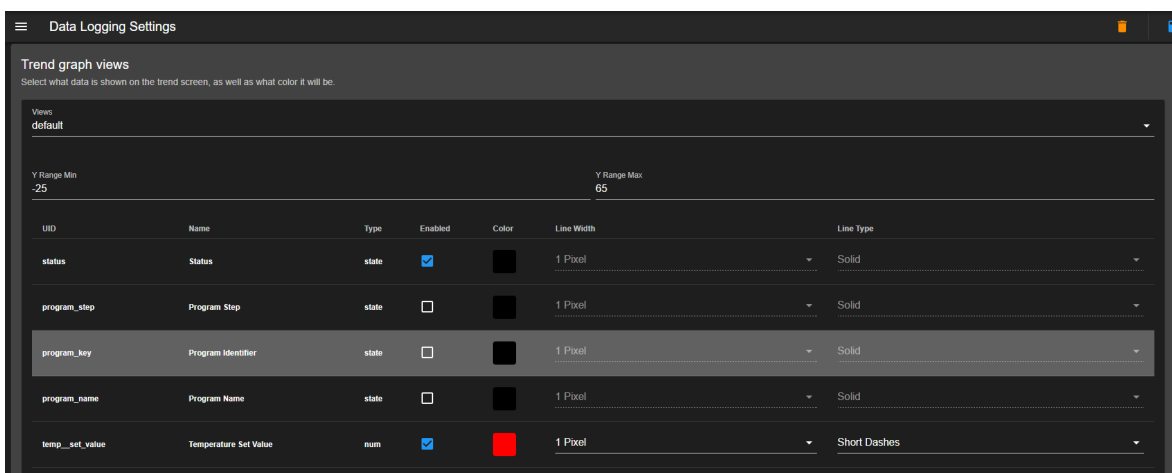


Figure 48.12: Data type and color options

48.2.1 Setting Logging Interval and Operating Mode

To set a new data logging frequency and operating mode, complete the following steps.

1. Log in as admin (or into an account with access privilege to the **Settings** menu).
2. Access **Data Logging Settings** page from the **Settings** menu
3. Enter a new frequency value in the **Logging Period** field (indicated by the arrow) or click the spin button next to the **Seconds** unit to set a new value.
4. Click and select **Always** or **When Chamber is on** as shown by the arrow. Default setting is **Always**.

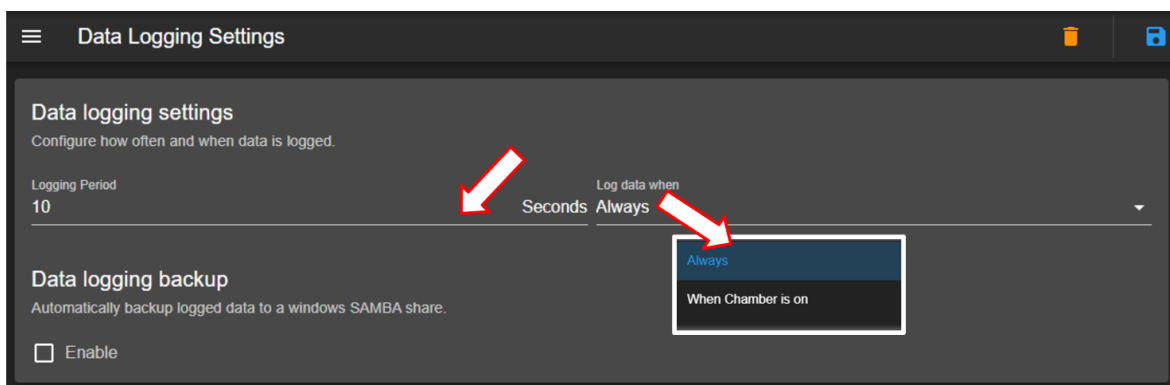


Figure 48.13: Setting options for data logging

Note: If the operating mode **When Chamber is on** is selected, data logging only occurs when the chamber is on. This setting can dramatically change the behavior of the trend graph in the **Trend** menu.

5. Click the **Save** button (upper-right corner) to save the settings.
6. To delete current setting, click the trash bin icon.

48.2.2 Data Backup via Samba

To set data logging backup using Samba, you must first configure or create a Samba share on your computer or server. Then complete the following steps:

1. Turn on Samba with the check mark in the box to enable the feature.
2. Set the backup frequency via the drop-down. Three options are available: (1) Once per day, (2) Once per hour, and (3) every 5 minutes.
3. Enter the correct path to the shared folder on your server with the complete credentials (username and password).

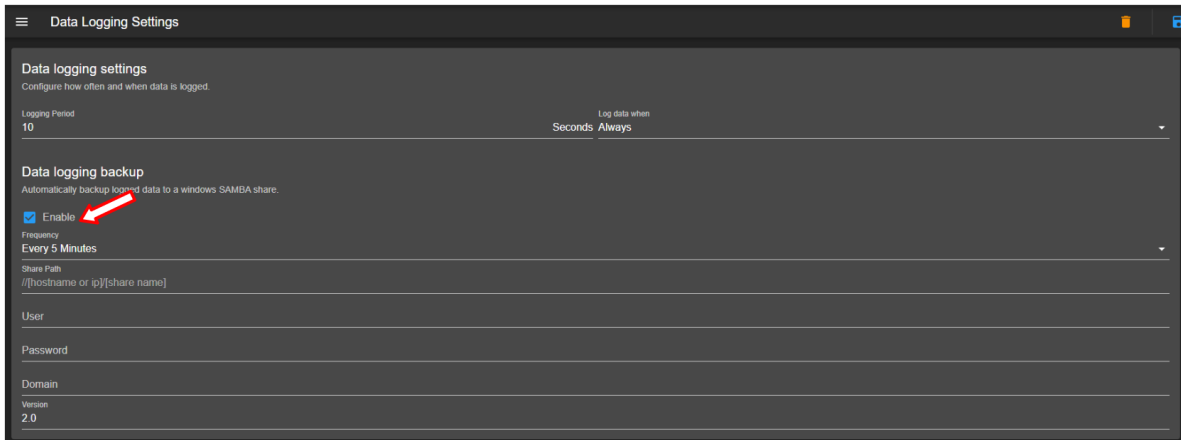


Figure 48.14: Setting up Samba for data backup

4. Click the **Save** button (upper-right corner) to save the settings.

48.2.3 Trend Graph View Options

Trend graph contents can be controlled via several options that include the type of data, color for legend and plot range. These settings can be stored in different view options with unique view names to represent different trend graphs.

The following steps outline the procedure to create a new log view (called **Log1**) for a trend graph to include data type (Temp and Vibration) with set and process values, chamber status, program name, step number, refrigeration and set the appropriate y-range for display. Only five items to be enabled and included in the trend graph.

1. Click **Views** and select **Create New View** (shown by the arrow)
2. Enter **Log1** in the **New view name** field
3. Click the check mark on the right to accept the name.

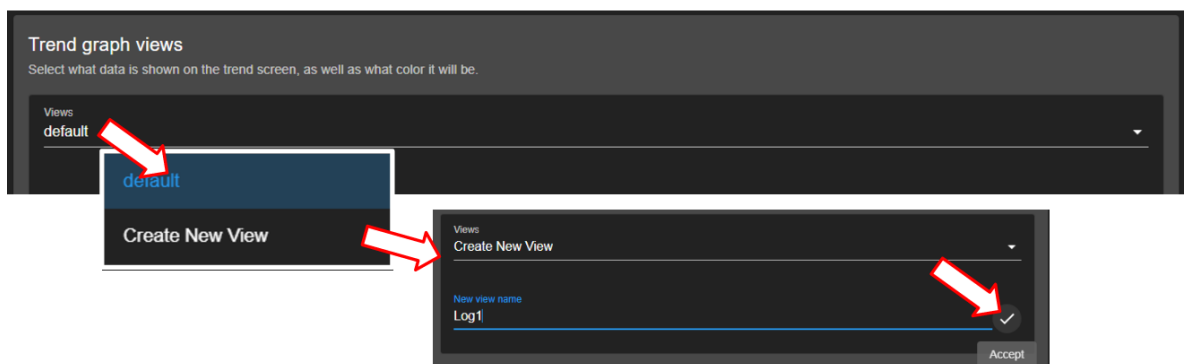


Figure 48.15: Creating a new log view for Trend graph

4. Set the min and max values for the y-range to -25 and 65, respectively.
5. Enable Status, Program Step, Program Name, Temperature set and process values, vibra-

tion set and process values, and refrigeration with the check marks in their boxes. Scroll down the page to enable all of them (as shown in the figure). Color picker, line width and line type for the selected data will be based on the default setting.

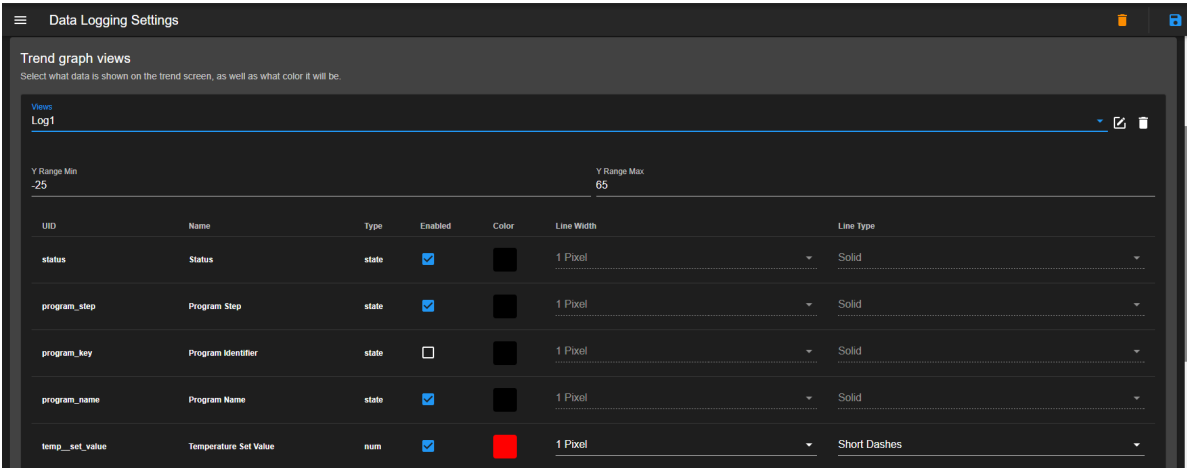


Figure 48.16: Selection of data types for a trend graph

Note: View name can be edited or removed using the trash bin or pen icons to the right of **Log1**.

6. Click the color picker to select a desired color for each data type.
7. Click the **Save** button at the upper-right corner.
8. Access **Trend** on the menu bar.
9. Click the **Graph View** icon (see figure)



Figure 48.17: Selecting trend view option

10. Click **Customize** then select **Log1**.

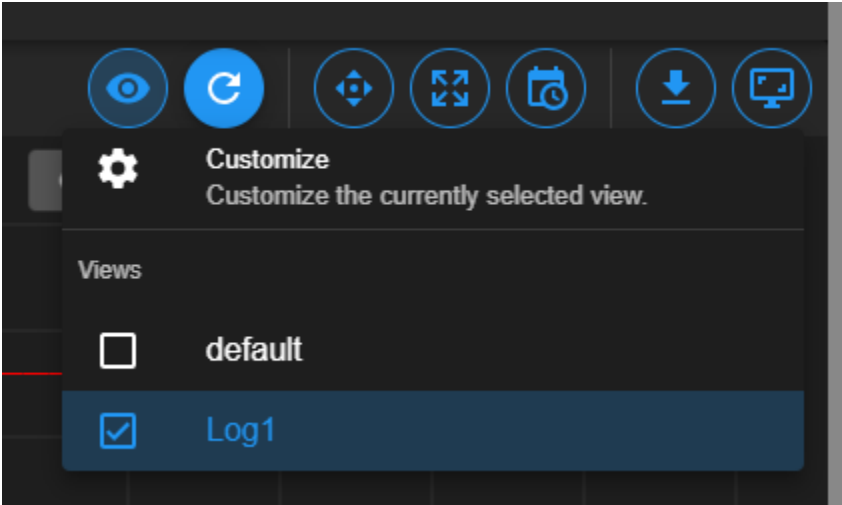


Figure 48.18: Select custom view Log1

11. Trend graph now displays the custom view **Log1**.

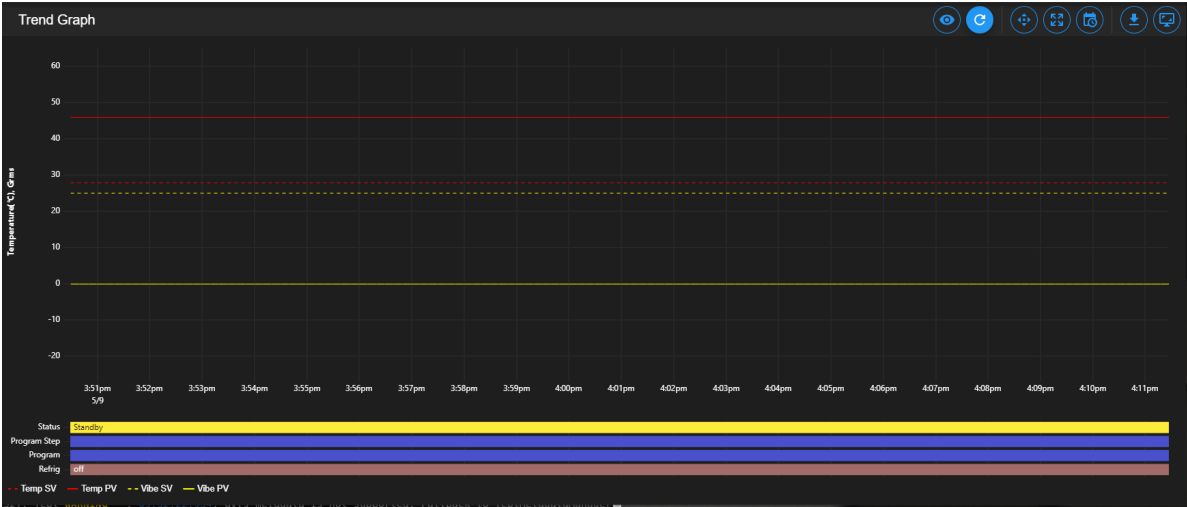


Figure 48.19: Trend graph view of Log1

48.2.4 Clear Data Log

It may be necessary to start a new data log. Click the **Trash bin** to clear the current log. A warning dialog box appears to reconfirm the action with a Yes/No option to proceed.

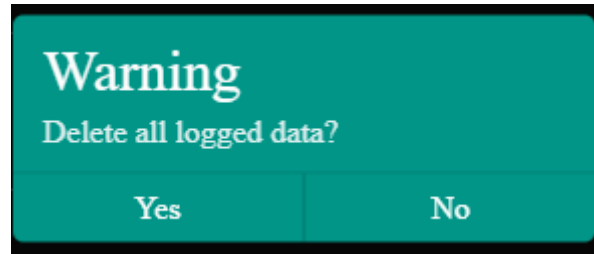


Figure 48.20: Confirm to delete current data log

The structure of data log will be deleted from the data file immediately after confirmation. EWC moves to prepare a new data log in the file with another pop-up warning (depicted in the following figure).

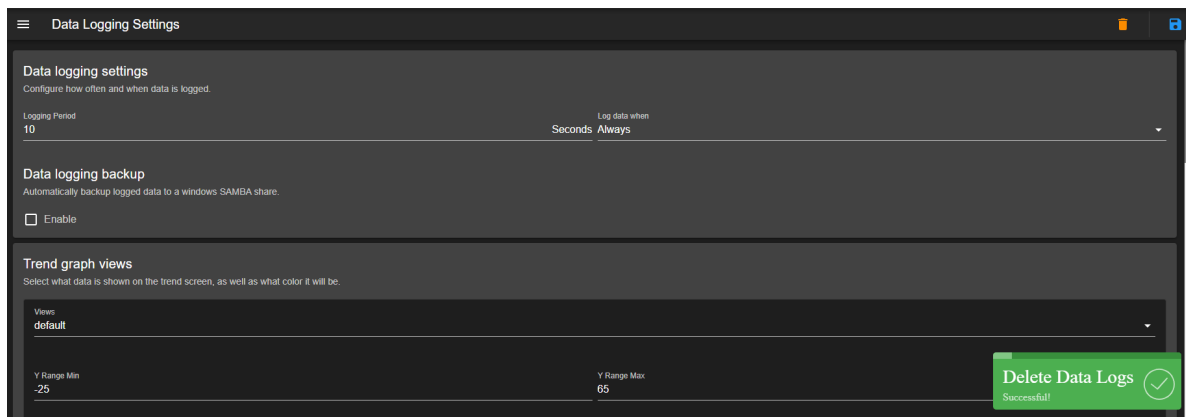


Figure 48.21: Deleting data from log file

Once data begins to accumulate, a trend graph can be produced. Refer to the **Trend** menu in the menu bar for detail on the trend graph.

48.3 Macros

Frequently used tasks can be automated by creating and running macros. Macros are a series of scripted commands and instructions grouped together to accomplish a certain task. These scripted commands can be triggered automatically by the state of the chamber or by an authorized operator through a manual manipulation. Automated tasks through macro-scripted actions can range from sending e-mail notification about test completion to synchronization of operation between multiple chambers.

The following figure depicts the **Macros** setup page with a default scripted action called **Alarm Emails**. The lock symbol indicates that the contents of the **Alarm Emails** script cannot be modified, since it was generated by EWC.



Figure 48.22: Macros main display page

The submenu of **Macros** consists of four main operation buttons for managing and manipulating the macro scripted profiles:

1. **Create New:** A new macro script can be created via this **Create New** button.
2. **List of Macro Actions:** A list of all macro scripted profiles on the system. Click on its name to display its contents in the macro editor page (item 3).
3. **Macro Scripts:** The first macro script on the list (item 2) is listed in the main display by default. Its contents can be viewed using the macro editor (main display).
4. **Import from local file:** A macro scripted profile can be imported from the local computer. Apply this button to import a macro profile from the local computer. The macro editor will be launched to display the contents of the profile. The **Save As** button needs to be applied to save the imported profile; its name will appear under the list of macro actions (item 2).

NOTE: Many operations associated with the macros require that EWC has access to the Internet.

48.3.1 Macro Editor and Trigger Options

A macro script can be created to contain various trigger options. The **Create New** button, when clicked, launches the macro editor, within which the operator can compose the macro scripts to set different alert and trigger options. The components of the macro editor are listed as follows:

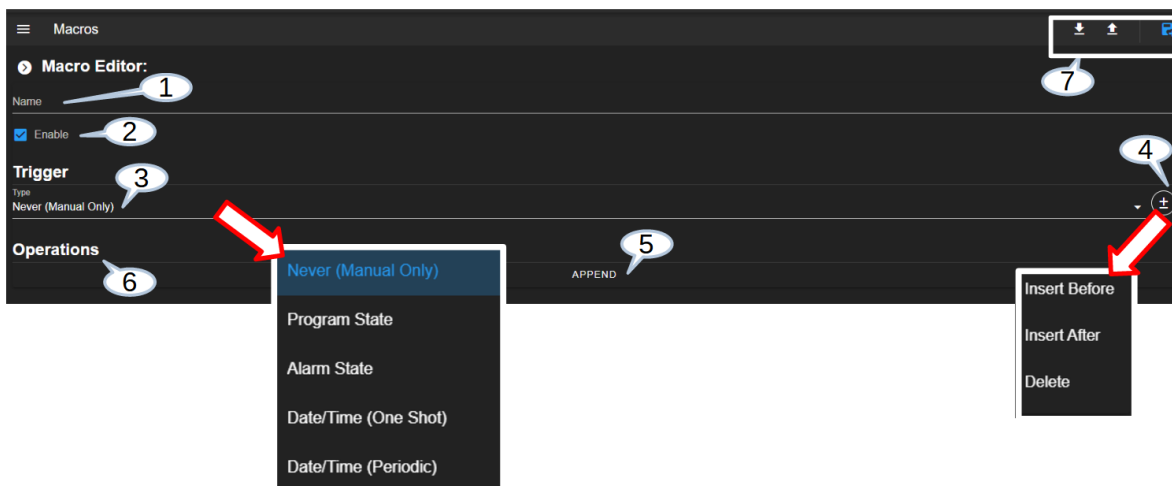


Figure 48.23: Macro trigger modes/options

1. **Name:** A macro has a unique name to identify its action or task.
2. **Enable:** The macro action can be enabled or disabled. When enabled, trigger will take effect based on the chamber condition specified in the macro script.
3. **Trigger:** A macro may be triggered by any of the following types:
 - **Always:** The macro will run every time. This type of trigger is not recommended.

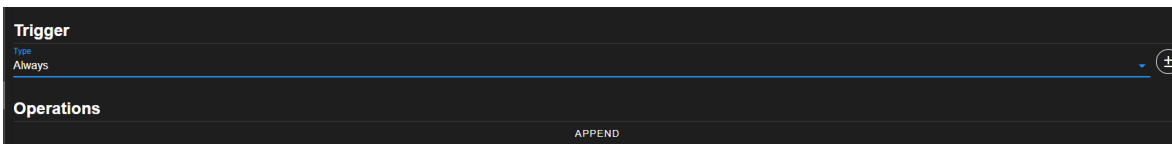


Figure 48.24: Trigger mode with always option

- **Never (Manual Only):** The macro must be manually triggered by an authorized operator or an API request.

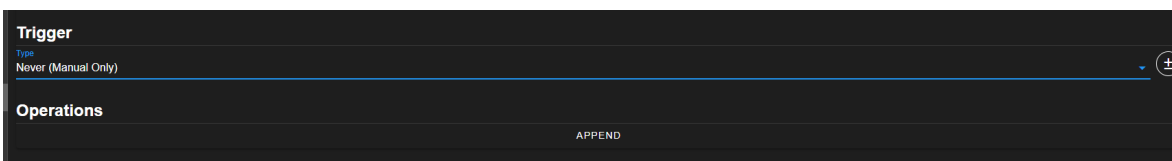


Figure 48.25: Trigger mode with manual

- **Program State:** The macro script will run when an execution state in the selected program has changed based on the parameters listed in the following figure.

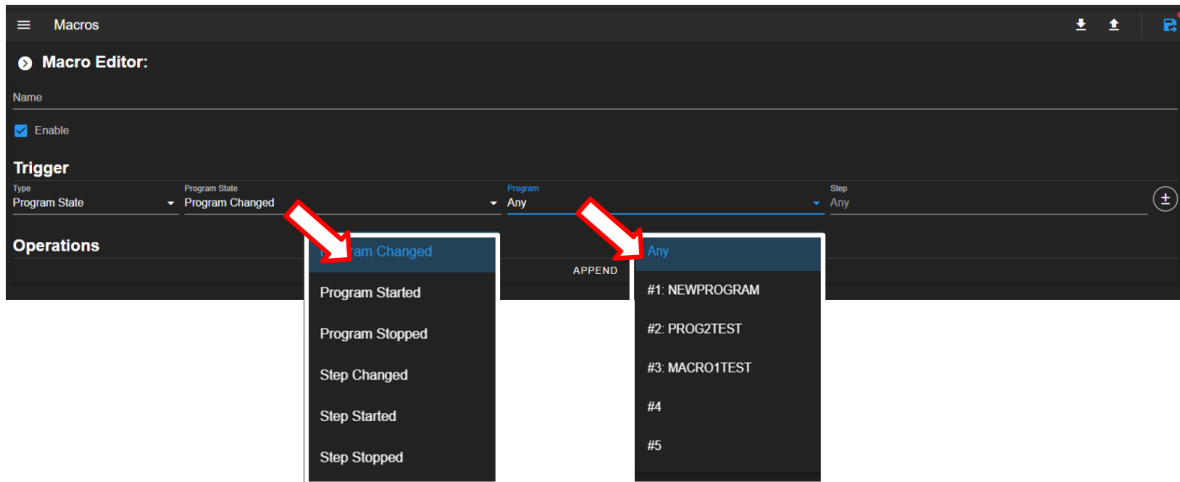


Figure 48.26: P300-macro-prog-state-001a.PNG

- **Program State:** Under the Program State options (drop-down menu in the above figure), a trigger alert can happen when there is a change in the program execution (designated as Program Changed), when a program has started or stopped (Program Started, Program Stopped); or a step within the executed program has changed (Step Changed), or a step has started or stopped (Step Started, Step Stopped). All of these options can be incorporated into the Program State trigger type.
- **Program:** A specific program may be selected to trigger the effect if the condition is met. If **Any** (default setting) is selected, any program will cause the trigger effect if the trigger condition during execution is met.
- **Step Number:** A specific step in the selected program can be used to trip the trigger effect if the condition is met, such as when step 5 in the selected program has completed its execution.
- **Alarm State:** The macro will run when the state of an alarm has changed. The parameters that specify the alarm state are listed in the drop-down menu shown in the following figure. The alarm list is chamber and PLC dependent.

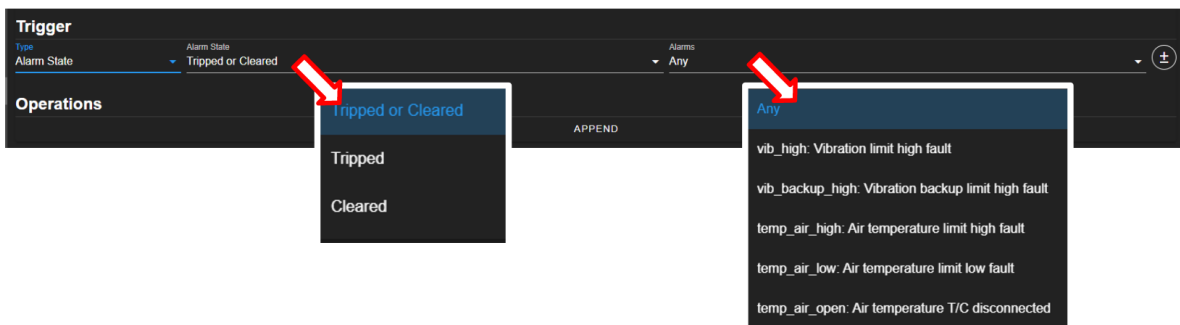


Figure 48.27: Trigger alarm options

- **Date/Time Trigger:** The macro will run at a specified time or date and time with periodic operation. When the date/time matches the configured “Month”, “Day of the

Month”, “Year”, “Day of the Week”, “Hour”, “Minute”, and “Second” the macro will fire. This operation can be configured for a one-time trigger or a periodic trigger, as depicted in the following figures.

The top screenshot shows a 'Trigger' configuration window. Under the 'Type' dropdown, 'Date/Time (One Shot)' is selected. The 'Date/Time' field is set to '3/2/2022, 11:30:49 AM'. Below this is an 'Operations' section with an 'APPEND' button.

The bottom screenshot shows a 'Trigger' configuration window. Under the 'Type' dropdown, 'Date/Time (Periodic)' is selected. Below this are several dropdown menus: 'Month' (Any), 'Day of the Month' (Any), 'Day of the Week' (Any), 'Hour' (Any), 'Minute' (Any), and 'Second' (Any). Below these is an 'Operations' section with an 'APPEND' button.

- Additional trigger types can be selected from the trigger list that include time signals, loop temperature, custom expression and logical operations. All of which have the same programming or scripting paradigm based on specific parameters and trigger conditions. A single macro script can be created to monitor a list of programs, their status or conditions, using a set of complex logical operations selected from the list of trigger types (such as, **and**, **or**, **not**).
4. **Multiple Trigger Types:** Additional trigger types can be added via the (+/-) button, with options to insert additional trigger type using **Insert Before** or **Insert After** buttons. Trigger type can be removed from the list via the **Delete** button.

The screenshot shows a 'Trigger' configuration window with three triggers listed. The first trigger is 'Alarm State' with 'Alarm State' selected and 'Tripped or Cleared' as the condition. The second trigger is 'Program State' with 'Program State' selected and 'Program Changed' as the condition. The third trigger is 'Date/Time (One Shot)' with 'Date/Time' selected and '2/16/2022, 4:01:49 PM' as the date/time. Each trigger has a +/- button to its right.

Figure 48.28: Three trigger types in macro script

5. **APPEND:** The action or actions of the trigger (item 3, above) can be implemented in the body of the **Operations** template. The **APPEND** button can be applied to add and compose the trigger operations. The components of the trigger operations are outlined as follows:

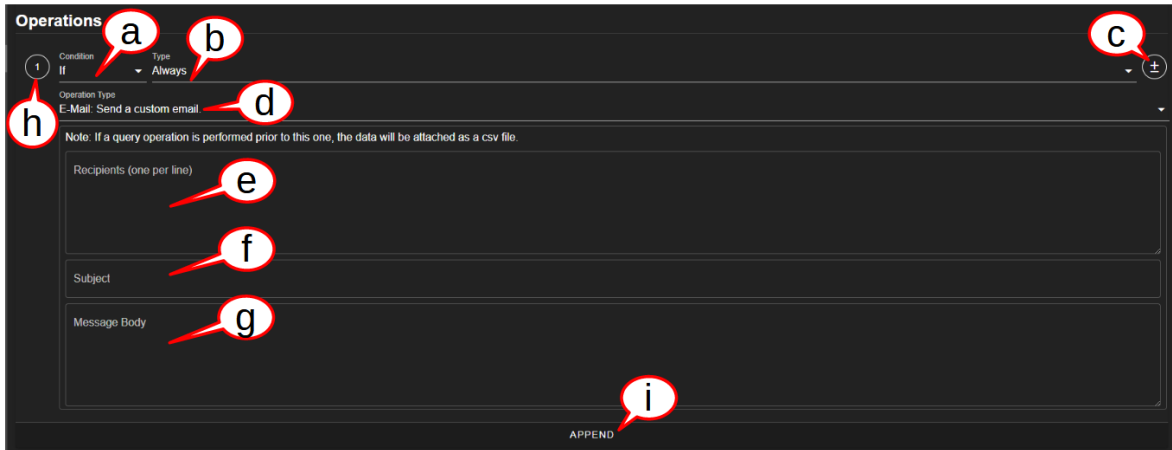


Figure 48.29: Components of trigger operations

- a. **Conditional Statement:** The conditional statements of trigger operations consist of **If**, **Else If**, **Else** and **Wait For**. These conditional statements can be used to check the type(s) of trigger operation.
 - b. **Type of Condition:** The type of trigger used in the conditional statement.
 - c. **Additional Conditions:** additional conditions can be added via (+/-) button. The available options are: Insert Before (current type), Insert After (current type), Delete.
 - d. **Alert Method:** Available alert methods for the trigger operation. Default option is: Mail: Send a custom e-mail.
 - e. **E-mail Address:** The operator's e-mail address in this block will be used to send an alert e-mail. Multiple e-mail addresses can be used, one e-mail address per line.
 - f. **Subject title:** A descriptive subject title is important in an alert e-mail.
 - g. **Message:** The message in the e-mail should be brief and descriptive.
 - h. **Manage Trigger Operations Steps:** With this button, management of trigger operations steps is possible with the **Insert After**, **Insert Before** or **Delete** options.
 - i. **Add Trigger Operations Step:** The **APPEND** button appends an additional step at the bottom of the step list.
6. **Operations:** Components of the trigger **Operations** are outlined in the previous and the following figure. The default operation type is **E-Mail: Send a custom email**. Different operation types can be selected from the list. Each selected type is used in the conditional statement to trip the operation. Multiple types can be implemented by applying the (+/-) button. The operation type thus consists of three fields: (1) who to send the alert, (2) subject of the alert, (3) message of the alert. Multiple operations can be added using the **APPEND** button to create additional or multiple operations.

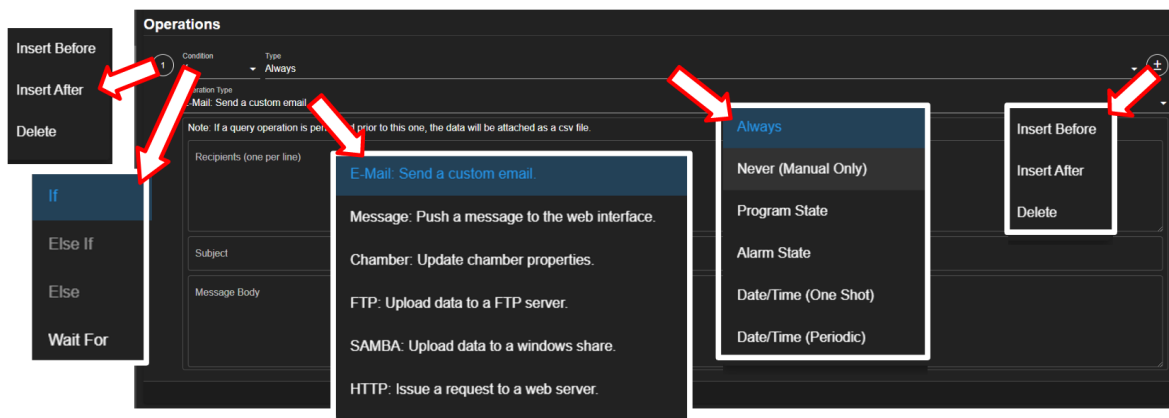


Figure 48.30: Options of trigger components

7. **File Manipulation:** Three file manipulation options are available in the main macro editor when the **Create New** option is applied. These are **Export to local file**, **Import from local file** and **Save**.

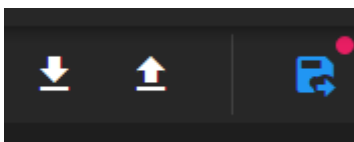


Figure 48.31: File manipulation buttons

After the macro script has been composed and saved, additional options are available as follows:

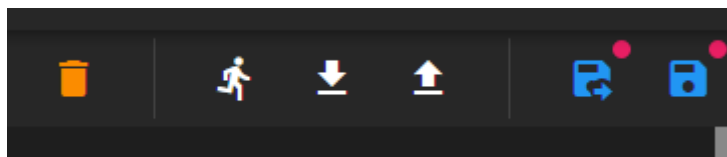


Figure 48.32: File manipulation options for macro editing

The current macro script can be deleted from the macro editor with the **Delete** button (trash bin). A warning appears to reconfirm the action.

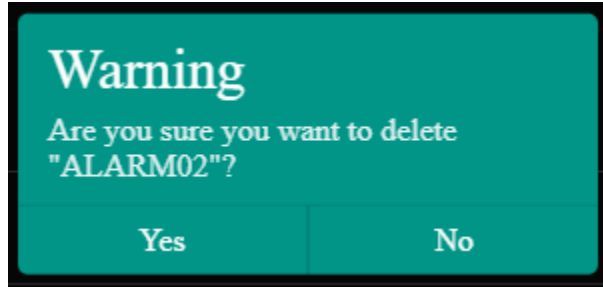


Figure 48.33: Reconfirm the deletion of macro script

This script can be invoked to test its operation by applying the **person** icon. If the macro operation involves sending out an alert e-mail, the recipient on the e-mail list will immediately receive the e-mail alert. EWC can send out e-mail alerts only if it has access to the Internet because, by default, it uses SMTP Office 365 for the email protocol.

48.3.2 Example: A Macro Script with Alarm Alert

The following example illustrates a simple macro script to send out an e-mail alert when the chamber trips an alarm (any alarm). In order for the macro setup to work, EWC must have access to the Internet. The procedure for this example is outlined as follows:

1. Click **Macros** in the **Settings** submenu.
2. Click **Create New**.
3. Click the Name field in the macro editor, enter **ALARM01** for the macro name. Confirm that the trigger is enabled (with its box checked).
4. Click the type field under the **Trigger** type and select **Alarm State** from the list (as shown).

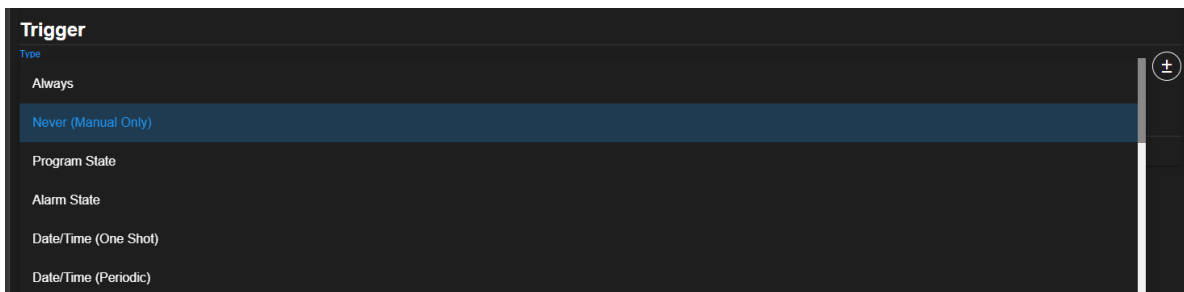


Figure 48.34: Select Alarm State type from the list

5. Click the **Alarm State** field and select **Tripped** from the drop-down list as its parameter (as shown).

Figure 48.35: Set trip parameter for the Alarm State

6. Confirm that **Any** is selected under the Alarms option. The complete selection type, state and alarms options is depicted below.

Figure 48.36: Parameters of alarm trigger type

7. Click **APPEND** to add the operations instructions.
8. Confirm that the logic **If** is selected by default to check the condition, and the condition type **Always** is select. This is to ensure that an alert will be sent out whenever an alarm is tripped.
9. Confirm, under the Operation Type, that “E-Mail: Send a custom email” has been selected.
10. In the **Recipients** block, enter the operator’s e-mail address. Multiple e-mail addresses can be used, with one e-mail address per line.
11. Enter the subject title of the e-mail in the **Subject**.
12. Enter the message to be included in the e-mail in the **Message body** box.
13. Click the **Save** button. The macro list now has the macro script listed by its file name. If you attempt to exit the macro editor (by clicking on other submenus or menus), a warning message will appear (as shown below).

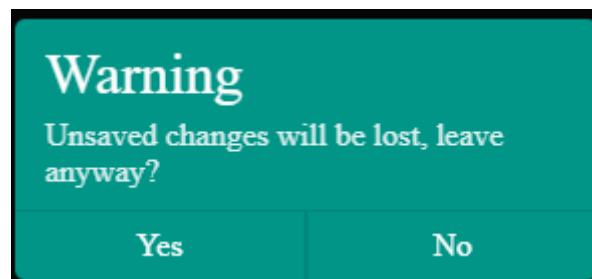


Figure 48.37: Macro script must be save before exiting the pane

14. To test the macro script, click the **person** icon. The operator should receive an e-mail alert from EWC.

The complete macro script is depicted in the following figure.

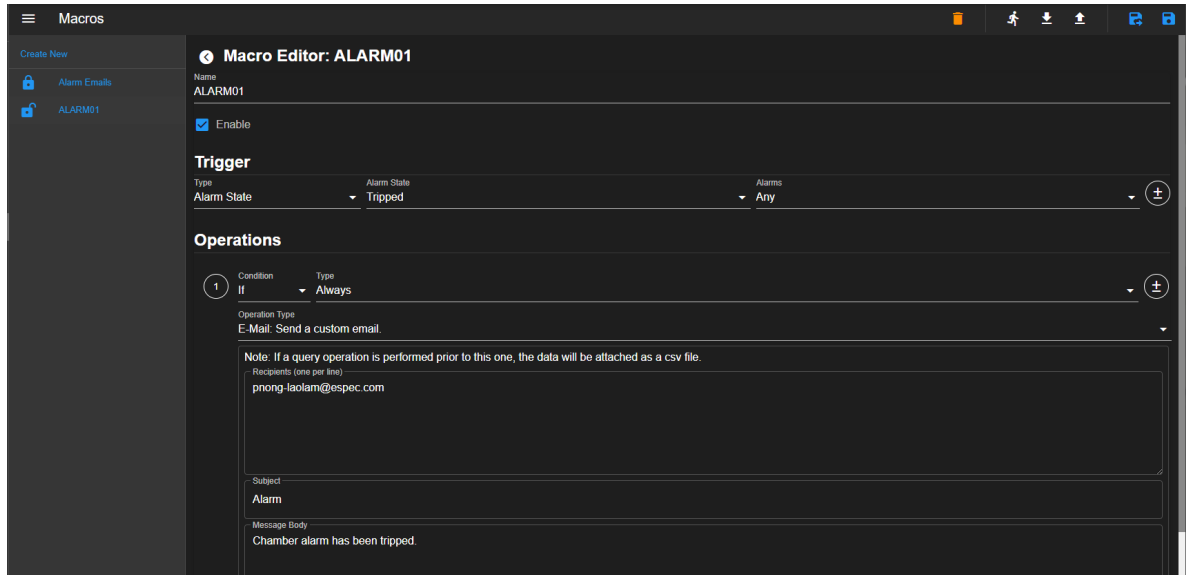


Figure 48.38: Macro profile with Alarm alert

48.3.3 Example: Macro Script with Program State and Alarm Alert

Here is an example of the use of two logical **Or** conditions of the trigger type to monitor two specific programs (**PROGTEST001** and **PROG3TEST**) and trigger the e-mail operation. Two logical **If** conditions monitor the program state and alarms; an alert is sent out accordingly. The first **If** condition is set up to monitor the program activity; the second **If** condition monitors any alarm occurrences. Note: This sample macro script is presented to illustrate the flexibility of the macro editor. There are numerous ways to achieve the same the task noted here.

To construct the macro script, proceed as follows:

1. Click **Create New** on the **Macro** submenu.
2. Click the Name field and enter **ALARM02**.
3. Confirm that the trigger is enabled (with its box checked).
4. Under **Trigger**:
 - Click the Type field and select **Program State** from the drop-down list.
 - Click the Program State field and select **Program Started** from the drop-down list.
 - Click the Program field and select **PROG2TEST** on slot 2. NOTE: **PROG2TEST** must be made available on the program list.
 - The last option on step number is set as default for the trigger to apply at any step.
 - Click the (+/-) and select **Insert After** to add a new trigger type, as shown in the figure.

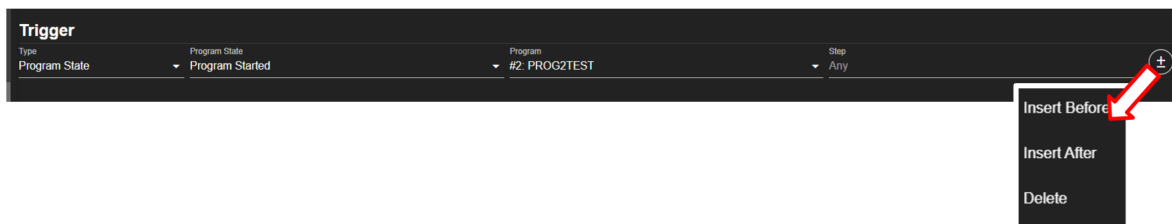


Figure 48.39: Inserting additional trigger type

- Click the Type field and select **Or** from the drop-down list.
- Click the Type field and select **Program State** from the drop-down list.
- Click the Program State field and select **Program Started** from the drop-down list.
- Click the Program field and select **PROG3TEST** on slot 3. NOTE: **PROG3TEST** must be created and is available on the program list.
- The last option on step number is set as default for the trigger to apply at any step.
- Apply the (+/-) button to add two more trigger type steps to contain the logical **Or** and **Alarm State** as depicted in the following figure which depicts the complete configuration of the conditional statements in the trigger logic:

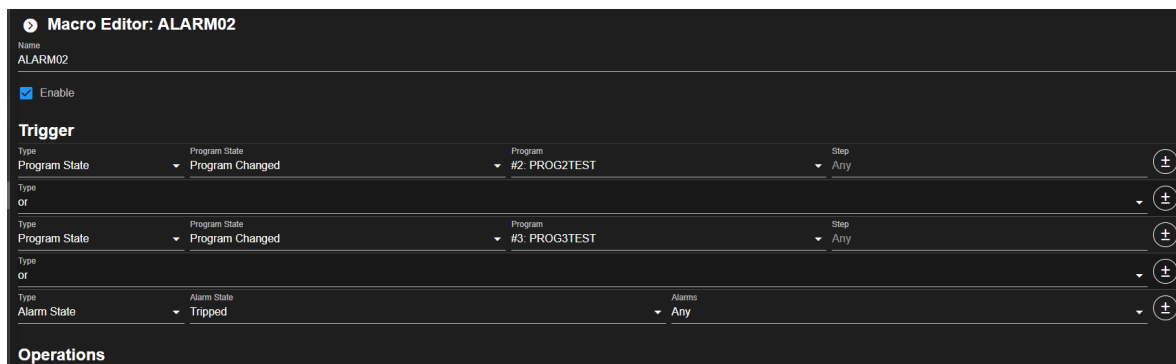


Figure 48.40: Trigger setup logic

5. Click **APPEND** under the **Operations** block to create the first step of the trigger operation.
 - Confirm that **If** condition is selected (by default).
 - Click the Type field and select **Always** from the list. This is to ensure that an e-mail alert will be sent out if the state of a specified program occurs.
 - Confirm that **E-Mail: Send a custom email** is selected (by default) for Operation Type.
 - Enter the recipient's e-mail address in the Recipients block, one e-mail address per line.
 - Enter subject title in the Subject block.

- Enter a brief message in the Message Body block. The complete configuration is illustrated as follows:



Figure 48.41: Conditions for trigger actions

6. Click the operation step number (number 1 in the circle, as shown below) and select **Insert After** to add a new step to the trigger operation.



Figure 48.42: Inserting additional step of trigger operation

- Confirm that **If** condition is selected (by default).
- Click the Type field and select **Alarm State** from the list.
- Click the Program State field and select **Tripped** from the list.
- Confirm that **Any** is selected by default under the Alarms field; it is to ensure any alarm will trigger this action.
- Confirm that **E-Mail: Send a custom email** is selected (by default) for Operation Type.
- Enter the recipient's e-mail address in the Recipients block, one e-mail address per line.
- Enter subject title in the Subject block.
- Enter a brief message in the Message Body block to indicate alarm has been tripped. The complete configuration is illustrated as follows:

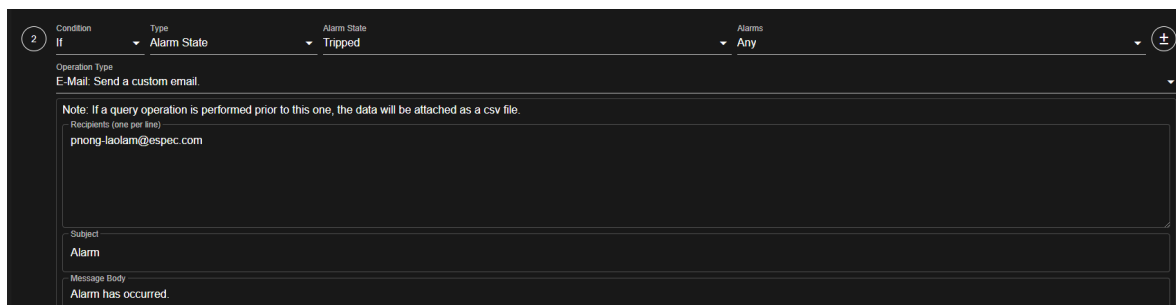


Figure 48.43: Conditions for step trigger operation

7. Click **Save** to save this macro scripted profile.
8. **Testing the Macro Script:** Click the **person** icon to test and run the macro script.
 - If the run is successful (that is, no errors are found in the script), a **Successful** message appears and an e-mail alert is sent to the recipient(s) listed in the Recipients block.

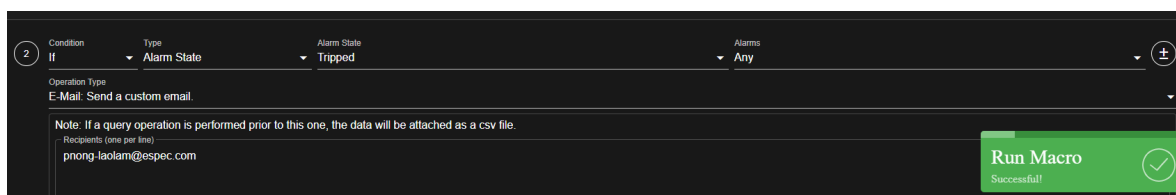


Figure 48.44: A macro script ran successfully

- If the run failed, an error message appears as shown below. The macro script does not work.

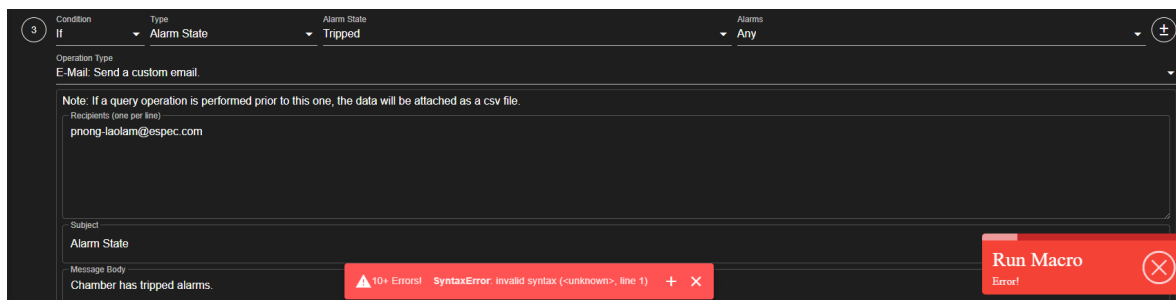


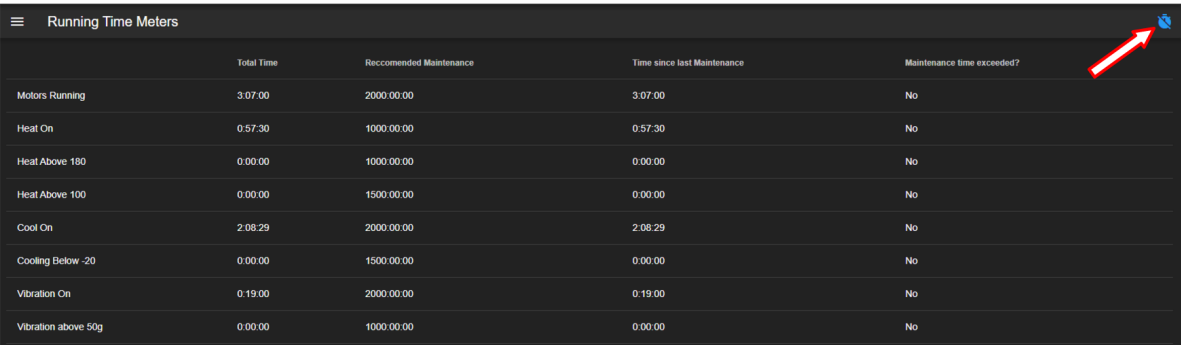
Figure 48.45: A macro script failed, errors found in the script

48.4 Running Time Meters

Note: This submenu is available only for the T-series chambers. If it is grayed out, your chamber does not support this feature.

Available only for the T-series chambers, the **Running Time Meters** page provides a list of the operating condition of the hardware components or devices installed inside the chamber. The

following figure depicts the **Running Time Meters** submenu with the submenu bar hidden by applying the **Show/Hide** button (item 2 in the previous figure).



	Total Time	Recommended Maintenance	Time since last Maintenance	Maintenance time exceeded?
Motors Running	3:07:00	2000:00:00	3:07:00	No
Heat On	0:57:30	1000:00:00	0:57:30	No
Heat Above 180	0:00:00	1000:00:00	0:00:00	No
Heat Above 100	0:00:00	1500:00:00	0:00:00	No
Cool On	2:08:29	2000:00:00	2:08:29	No
Cooling Below -20	0:00:00	1500:00:00	0:00:00	No
Vibration On	0:19:00	2000:00:00	0:19:00	No
Vibration above 50g	0:00:00	1000:00:00	0:00:00	No

Figure 48.46: The running time meters of hardware devices in the chamber

By analogy, the list shows the odometer of all the devices. It shows how long each device has been in operation (i.e., running) listed under the **Total Time** column. It shows the recommended maintenance when each device has reached its recommended total runtime. It also shows the history of maintenance or service on each device, as well as its past due maintenance interval. Such information serves to provide the life expectancy of each device.

To reset the total runtime for each device after service or maintenance, click the **Reset** button in the upper-right corner indicated by the arrow.

48.5 User Interface Settings

EWC, Version 3.3, is very customizable. Its UI can be configured with features and color decorations to meet the operator’s personal preferences. The following figure depicts the UI and its current setting that displays a list of the operating mode, its name and color in the top pane, input/output display setting in the bottom pane. The current operating mode is **Program**, as depicted in the **Status** tab, with the color based on the one defined on the Operating Status Display Settings list. The input/output **TS1** signal in the **Status** bar is also based on the color defined on the list in the bottom pane.

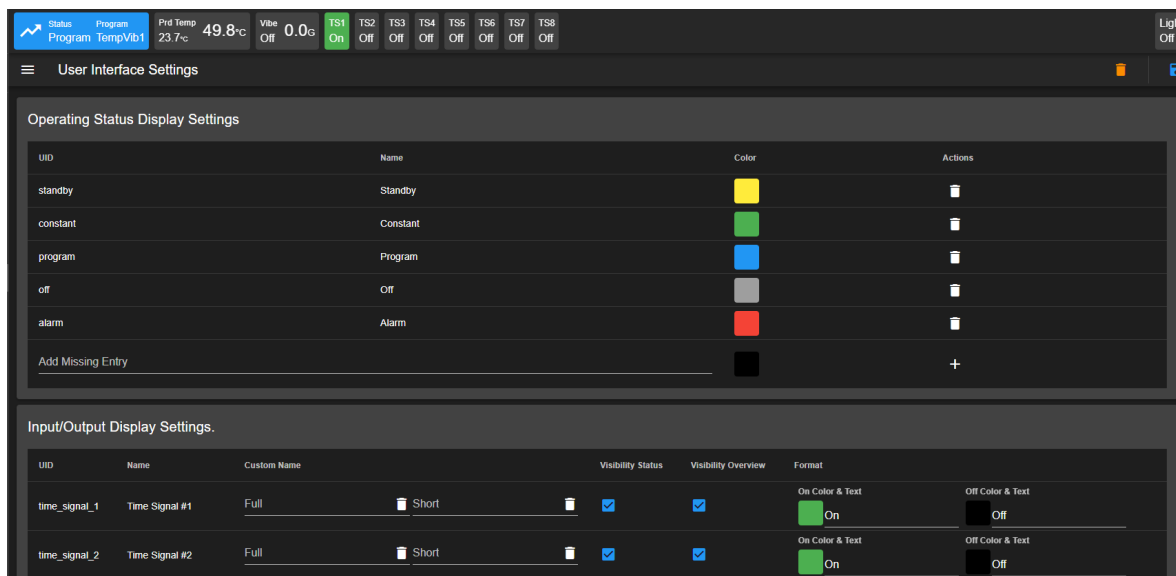


Figure 48.47: Customizable UI

With the **User Interface Settings** submenu, the operator can manage the operating status color and input/output text description. Different display color can be adjusted or removed completely using the trash bin icon under the **Actions** list (last column). Any undefined color will get a default color of forest green.

48.5.1 Managing Operating Status

To add and define a color for a specific operating status, complete the following steps:

1. Click the **Add Missing Entry** field and enter ID name under the UID list (first column).
2. Click the color icon (under the Color list) to pick and select a desired color.
3. Click the + button under the **Actions** list.
4. To cancel the current setting, click the trash bin (**Restore Defaults**) indicated by the arrow in the upper-right corner. This action will revert the operating status colors to their default settings.
5. To apply the current setting, click the **Save** button in the upper-right corner.
6. Repeat the process for a different UI and apply the **Save** button again.

To define a new color for a specific operating status, complete the following steps:

1. Click the color icon for a desired operating status name and select a desired color.
2. To cancel the current setting, click the trash bin (**Restore Defaults**) indicated by the arrow in the upper-right corner. This action will revert the operating status colors to their default settings.
3. To apply the current setting, click the **Save** button in the upper-right corner.
4. Repeat the process for a different UI and apply the **Save** button again.

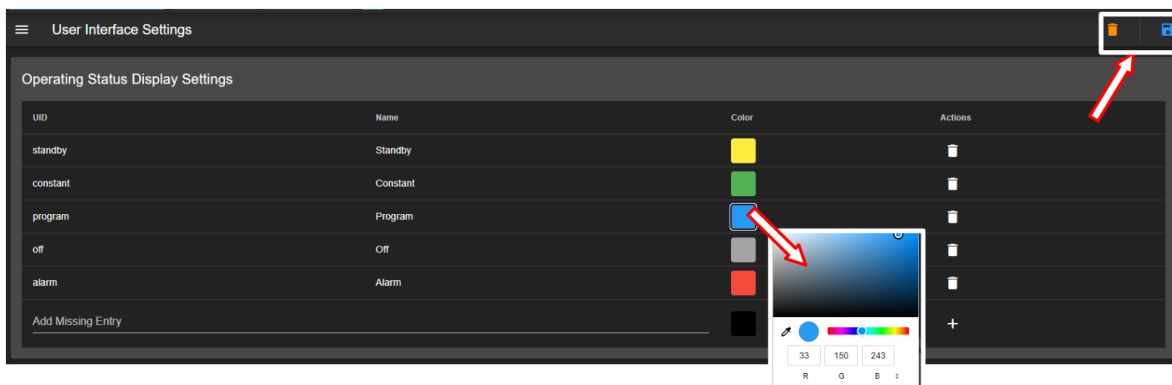


Figure 48.48: Personalize the Operating Status for the user interface

Note: There are only five predefined operating status modes: **Standby**, **Constant**, **Program**, **Alarm** and **Off**. The ID code for them are standby, constant, program, alarm and off, respectively.

48.5.2 Managing Input/Output Status

The available input/output status names (particularly, the time signals) are based on the chamber configuration. According to the following figure, **TS1** in the status bar uses the color defined under the format column.

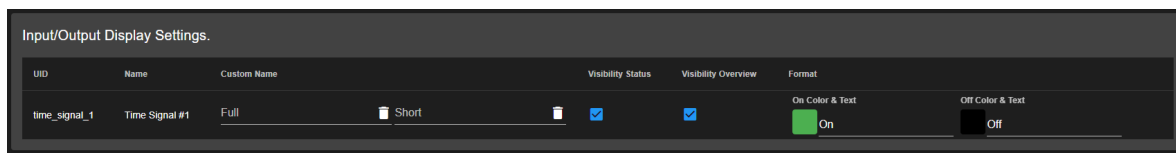


Figure 48.49: Personalize the input/output of the user interface

The default on/off colors for the time signal are green/black, respectively. These on/off colors can be customized by selecting a desired color from the color panel. The name of the time signal can also be customized to something more descriptive by editing the Custom Name field both for Full or Short. The short name is used and displayed in the status bar. New settings require the **Save** button be applied to take effect. The **Restore Defaults** button (trash bin icon) reverts the configuration to its default setting.

48.6 API Settings and Programming Interface

EWC offers several interfaces for other application software to read or write the parameters from or to the target chamber. One such method is the API (Application Programming Interface) front-end application with two separate methods: General and Delimited ASCII.

With the GENERAL setting, RESTful API can be quickly configured via the authentication mode and a direct controller access, using the **No Authentication** and **Enable** settings, respectively. Default communication priority level is 6.

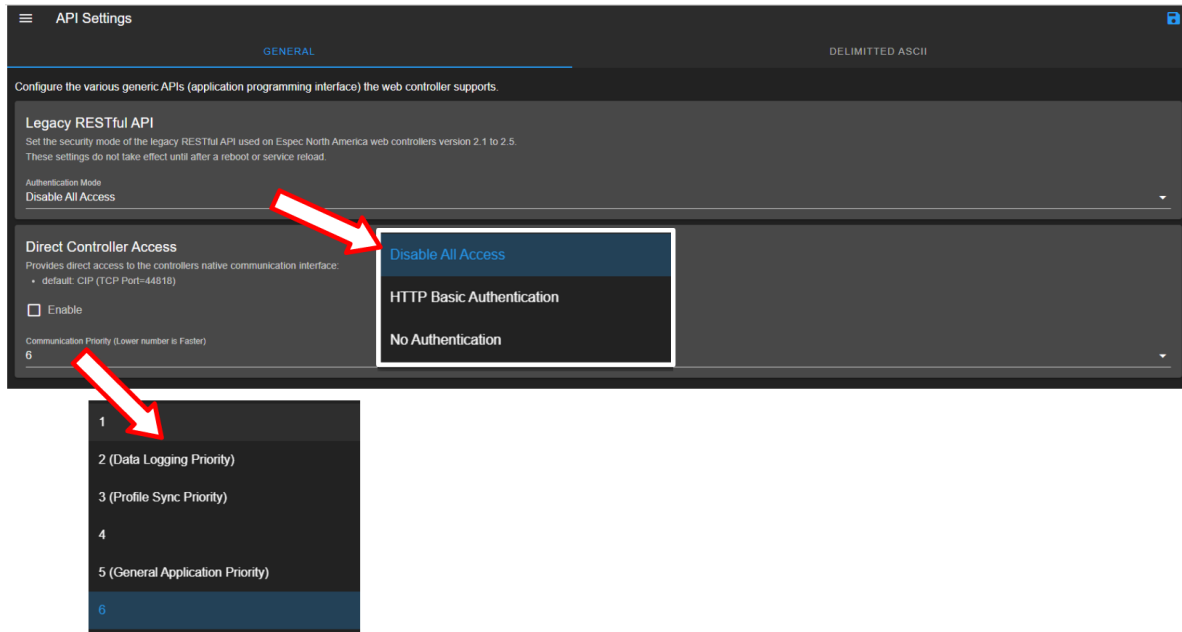


Figure 48.50: api-general-settings-001a.PNG

The **DELIMITED ASCII** configuration supports the text command application based on ASCII commands. Different rules and syntax settings apply to provide the correct ASCII commands, as depicted in the following figure.

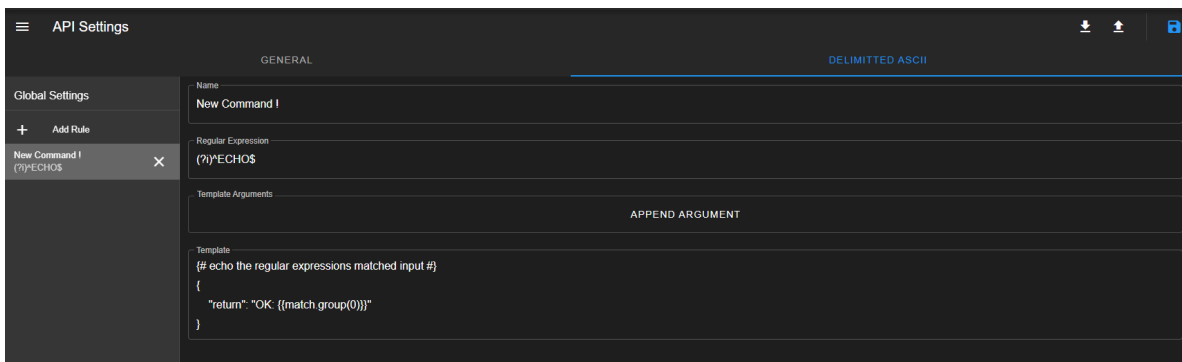


Figure 48.51: api-delimitier-001.PNG

48.6.1 Communication Protocol for ESPEC P300, SCP220, ES102

Direct communication with ESPEC P300, SCP220 or ES102 controller via raw data through EWC can be achieved using the raw TCP protocol. The TCP forwarder listens for a raw TCP stream on port 10001. Through this method, native commands of P300, SCP220 or ES102 can be issued directly at the text terminal. One practical method for this communication is through the use of a terminal emulator called PuTTY installed on the operator's PC running GNU/Linux, Mac OS or MS Windows.

There are two types of data transmission exist for this protocol:

1. **Command Data:** The command data consists of two types: (1) Monitor commands and (2) Setting commands. The monitor commands are used to monitor the conditions of the chamber, while the setting commands are used to change or configure the settings of the chamber.
2. **Response Data:** The response data are basically data returned (responded) by the controller in response to the command data.

The command data issued at the text terminal on the host computer has specific syntax and semantics based on a two-component format: command data and delimiter. The response data sent from the controller also contains a two-component format: response data and delimiter. The delimiter is the carriage return (CR) character followed by a line feed (LF), abbreviated as CRLF. Refer to the “P300, SCP220 or ES102 Controller Communications Option Manual” for complete details on them.

1. The command data consists of the following format: [command data][delimiter]
 - [command data] is any command found in the “P300, SCP220 or ES102 Controller Communications Option Manual”.
 - [delimiter] is CRLF. The effect of pressing the Enter key on the keyboard produces the CRLF on the terminal.
 - Example: MON?
2. The response data consists of the following format: [response data][delimiter]
 - [response data] can be any of the following:
 1. If the command data is issued to query for a data, response data consists of data in the format outlined in the “P300, SCP220 or ES102 Controller Communications Option Manual”.
 2. If the command data is issued to set a parameter, response data (if set command was successful) consists of “OK: [command data]”, where [command data] is the command that prompted the response.
 3. If there was an error executing the command, the response data will be “NA: [error message]”. Error messages and their meanings are listed in the “P300, SCP220 or ES102 Controller Communications Option Manual”. There is a time-out on the interface protocol request. If the target controller takes too long to respond to the command data, an error message “NA: SERIAL TIMEOUT” will appear. If this type of error reoccurs, double check the status of the target chamber and the TCP forwarder on EWC or restart PuTTY.
 - [delimiter] is CRLF.
3. The interface will timeout after one hour of no activity.

48.6.2 Configuring PuTTY for Raw Data Communication

The following procedure illustrates how to launch and set up PuTTY (installed on MS Windows 10) to communicate with ESPEC P300, SCP220 and ES102.

1. Log into EWC as **admin**.
2. Obtain its IP address (refer to **Network Settings** under the **Settings** menu).
3. Click the **API Settings** submenu under the **Settings** menu.
4. Enable the **Direct Controller Access** by checking the box (indicated by the arrow in the figure below).

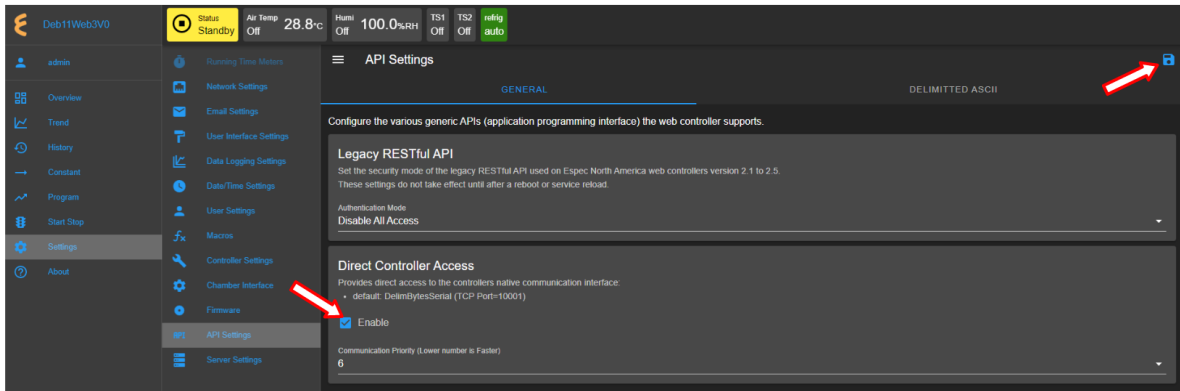


Figure 48.52: Enable direct access for raw communication

5. Apply the **Save** button.
6. Reboot EWC (refer to the “Server Settings” section on how to reboot the system).
7. Launch PuTTY and enter the following parameters in the appropriate fields illustrated in the figure below.
 1. Enter EWC IP address (10.30.100.96 shown as example).
 2. Enter 10001 for Port number.
 3. Click to select **Raw** for communication.
 4. Click **Open** to initiate communication.

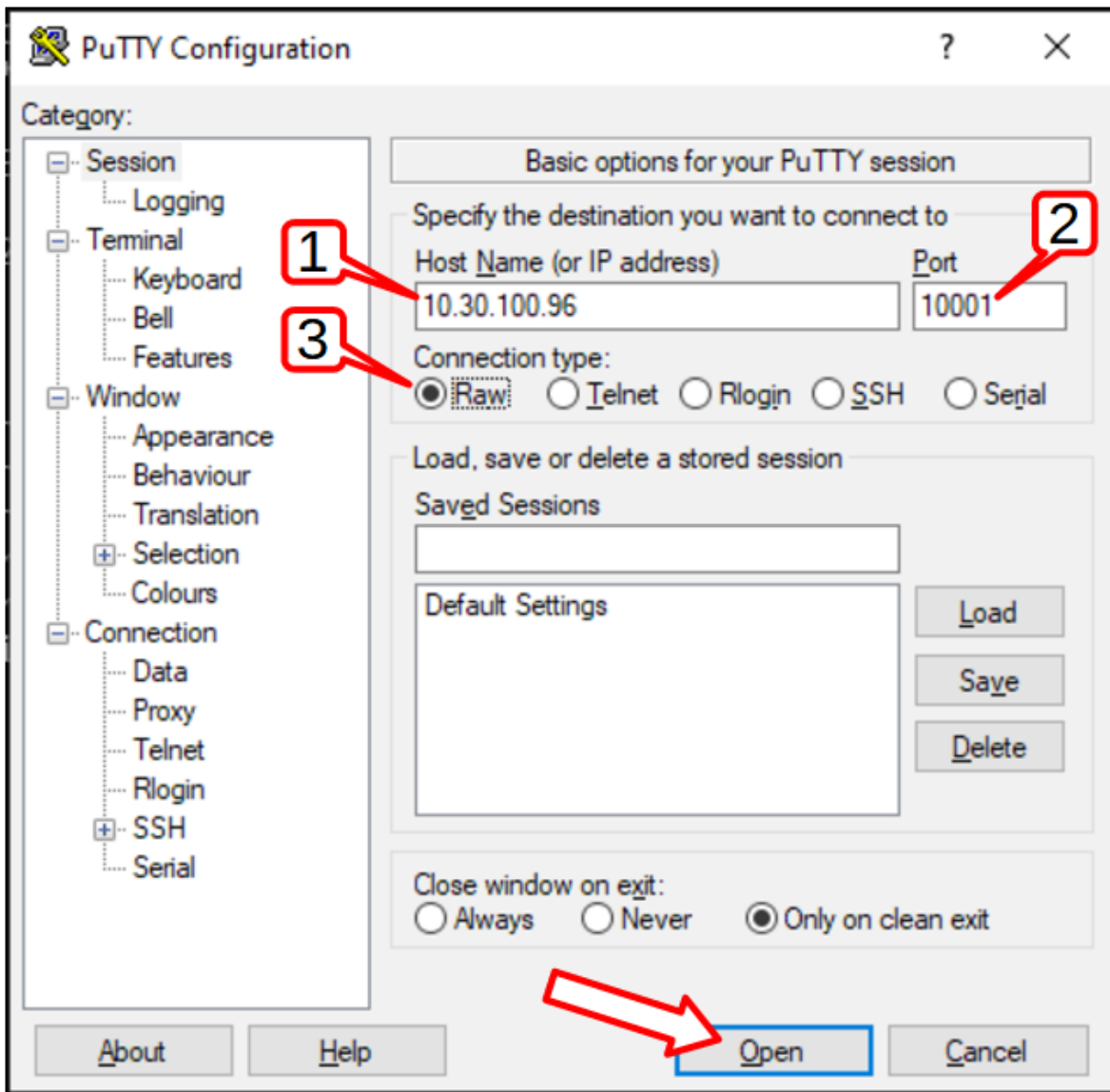
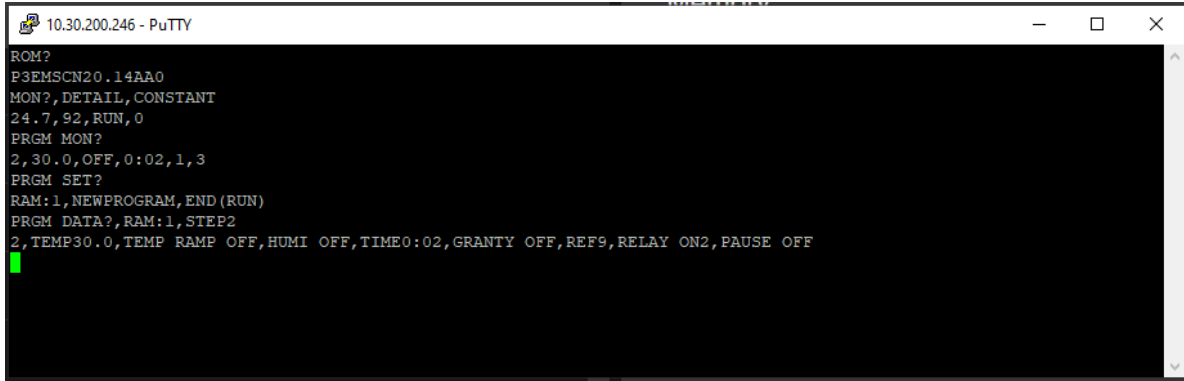


Figure 48.53: PuTTY setup for raw TCP communication

48.6.3 Examples of Command and Response Data

The following examples illustrate the use of a command data issued on ESPEC P300, SCP220 and ES102, respectively.

1. **ESPEC P300:** The following figure illustrates five command data issued sequentially at the PuTTY terminal to read values from the P300. All command data are followed by the question mark (?). These command data are: ROM?, MON?, PRGM MON?, PRGM SET? and PRGM DATA?. The MON? and PRGM DATA? commands were issued with their appropriate options and parameters (as indicated in the command line).




```

10.30.200.246 - PuTTY
ROM?
P3EMSCN20.14AA0
MON?,DETAIL,CONSTANT
24.7,92,RUN,0
PRGM MON?
2,30.0,OFF,0:02,1,3
PRGM SET?
RAM:1,NEWPROGRAM,END(RUN)
PRGM DATA?,RAM:1,STEP2
2,TEMP30.0,TEMP RAMP OFF,HUMI OFF,TIME0:02,GRANTY OFF,REF9,RELAY ON2,PAUSE OFF

```

Figure 48.54: Command data and response data on P300

2. **ESPEC SCP220:** The following figure illustrates six command data issued sequentially at the PuTTY terminal to read values from the SCP220. All command data are followed by the question mark (?). These command data are: ROM?, MON?, TEMP?, PRGM MON?, PRGM DATA? and RUN PRGM MON?. The PRGM DATA? commands was issued with its appropriate parameters (as indicated in the command line).



```

10.30.200.237 - PuTTY
ROM?
EMLC      5.00
MON?
28.7,100,STANDBY,0
TEMP?
28.7,0.0,175.0,-65.0
PRGM MON?
NA:CONT NOT READY-2
PRGM DATA?,RAM:1,STEP2
2,TEMP0.0,TEMP RAMP OFF,HUMI40,HUMI RAMP OFF,TIME10:00,GRANTY OFF,REF9
RUN PRGM MON?
NA:CONT NOT READY-2

```

Figure 48.55: Command data and response data on SCP220

3. **ESPEC ES102:** The following figure illustrates five command data issued sequentially at the PuTTY terminal to read values from the ES102. All command data are followed by the question mark (?). These command data are: ROM?, CONSTANT SET?, RUN PRGM?,

and PRGM DATA? The CONSTANT SET? and PRGM DATA? commands were issued with their appropriate options and parameters (as indicated in the command line).



```

10.30.200.238 - PuTTY
ROM?
JSC-S      2.10
CONSTANT SET?,TEMP
10.0,ON
CONSTANT SET?,HUMI
35,ON
RUN PRGM?
TEMP23.0 GOTEMP23.0 HUMI OFF TIME0:00 REF9
PRGM DATA?,PGM:1,STEP2
2,TEMP15.0,TEMP RAMP OFF,HUMI25,HUMI RAMP OFF,TIME0:30,GRANTY OFF,REF9,RELAY ON1

```

Figure 48.56: Command data and response data on ES102

48.6.4 Communication Protocol for the Watlow F4T

The communication protocol provided for the Watlow F4T is Modbus TCP port 502. Due to its slow performance, the Modbus TCP interface is not recommended to use for communicating with EWC. The Watlow F4T's own Modbus TCP interface should be used instead.

PuTTY can be used to communicate with Watlow F4T directly via its Modbus TCP port 5025 or via EWC using TCP port forwarding through the same port number (5025). The following procedure outlines the steps to configure PuTTY to communicate with Watlow F4T through TCP port forwarding via EWC. This protocol allows Watlow F4T to be communicated via the raw SCPI commands. This protocol requires that Watlow F4T firmware version be at least 03:06:011 which was released in May 2017. Our ESPEC Chamber is equipped with F4T with its current firmware version (at least 04:07). Thus, communication via SCPI protocol is possible.

Launch PuTTY and enter the following parameters in the appropriate fields illustrated in the figure below.

1. Enter IP address of EWC, with 10.30.100.96 shown as example.
2. Enter 5025 for Port number.
3. Click to select **Raw** for communication.
4. Click **Open** to initiate communication.

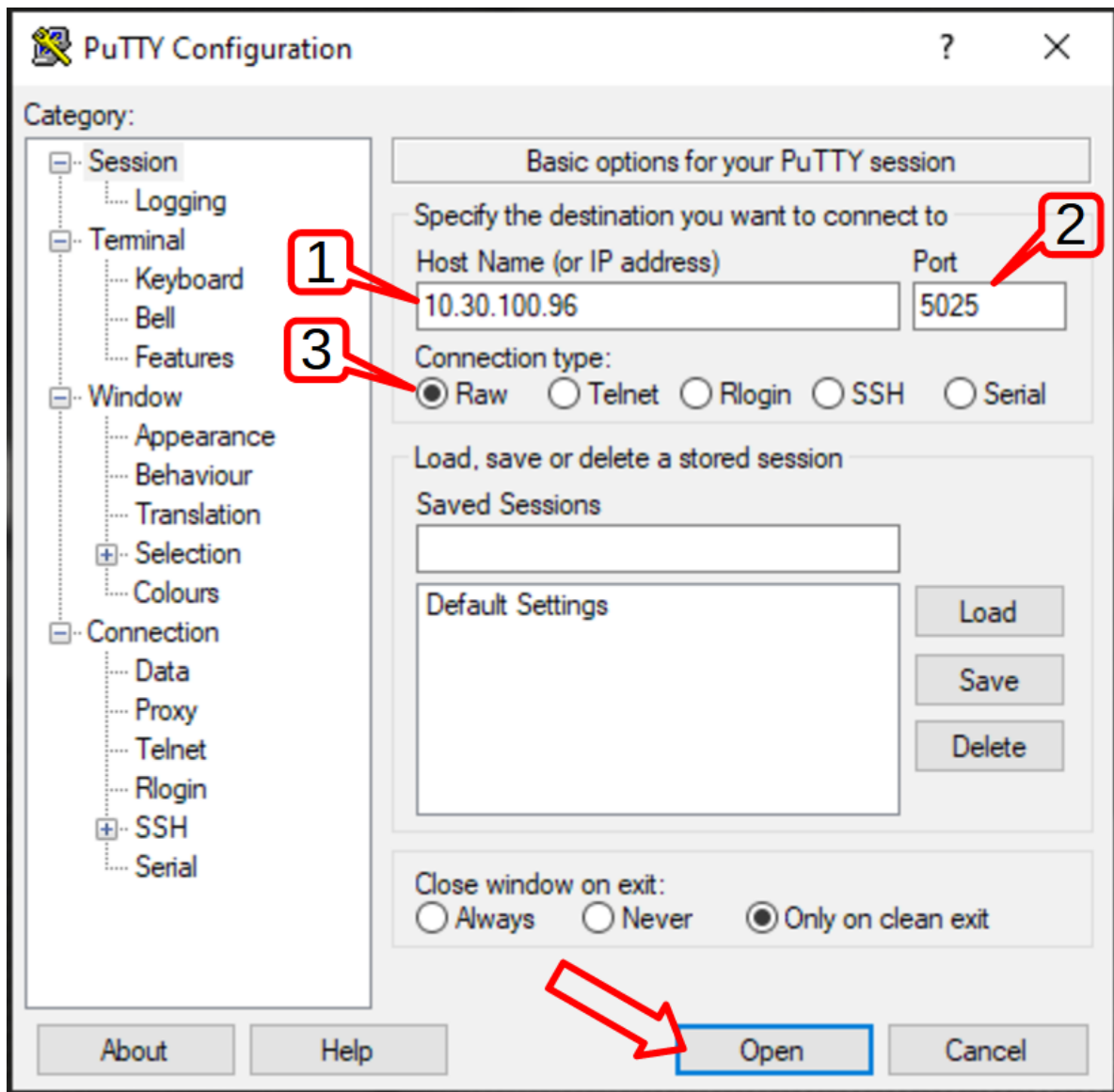
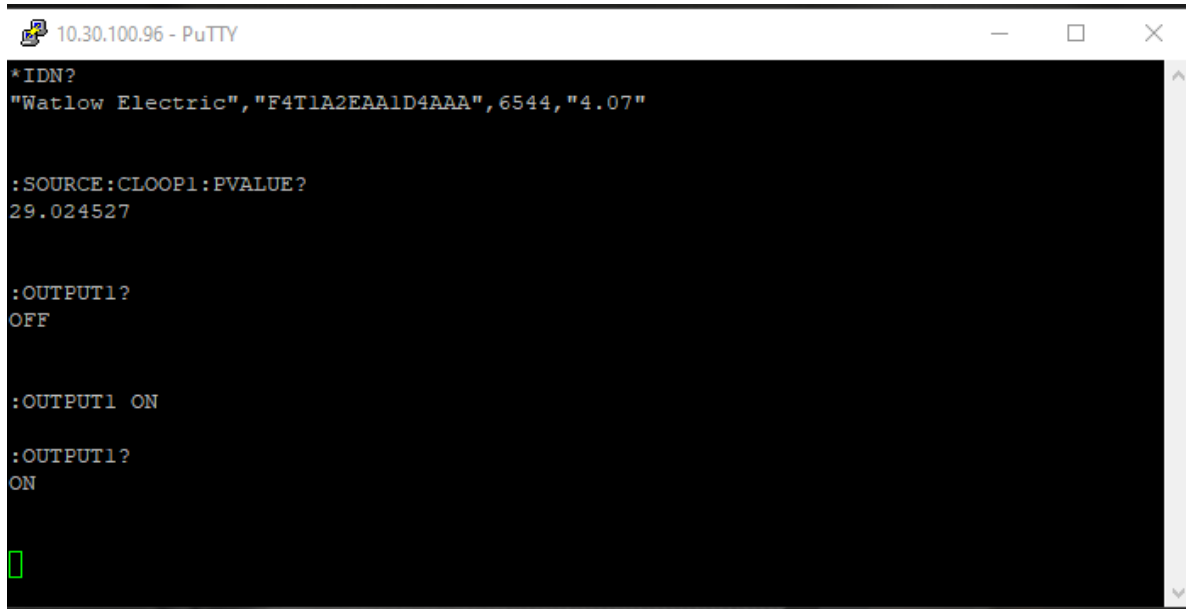


Figure 48.57: PuTTY setup for raw TCP communication

The following figure illustrates four command data issued sequentially at the PuTTY terminal to read values from Watlow F4T and one command to set a value (or parameter) on Watlow F4T. All query commands are followed by the question mark (?). They are: *IDN?, :SOURCE:CLOOP1:PVALUE?, :OUTPUT1? and set command :OUTPUT1 PARAM (that is, :OUTPUT1 ON). For details on the use of SCPI and its raw commands, visit Watlow.com website.



```

10.30.100.96 - PuTTY
*IDN?
"Watlow Electric","F4T1A2EAA1D4AAA",6544,"4.07"

:SOURCE:CLOOP1:PVALUE?
29.024527

:OUTPUT1?
OFF

:OUTPUT1 ON

:OUTPUT1?
ON

```

Figure 48.58: Six SCPI commands issued to F4T

48.7 Chamber Interface

The **Chamber Interface** submenu plays a crucial role in the configuration of EWC and chamber for control and operation. Configuration involves selecting the right chamber category, model type and controller, as well as any optional features available for the said chamber. Next, a proper communication protocol between the chamber and EWC must be established. The type of controller dictates the type of communication protocol.

1. **TCP/IP Interface:** TCP/IP protocol is the default communication interface for a T-series chamber or a chamber equipped with Watlow F4T. The following figures depict a typical configuration of the T-Series and F4T chambers.

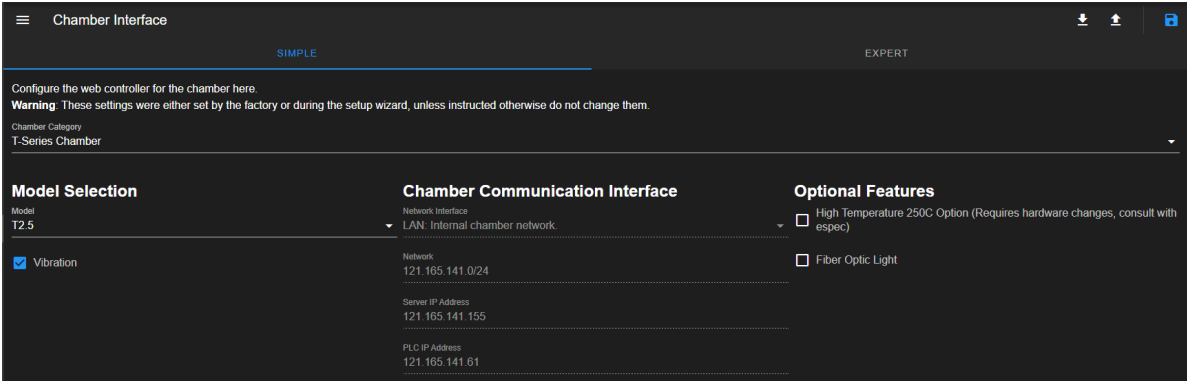


Figure 48.59: Chamber configuration and communication protocol

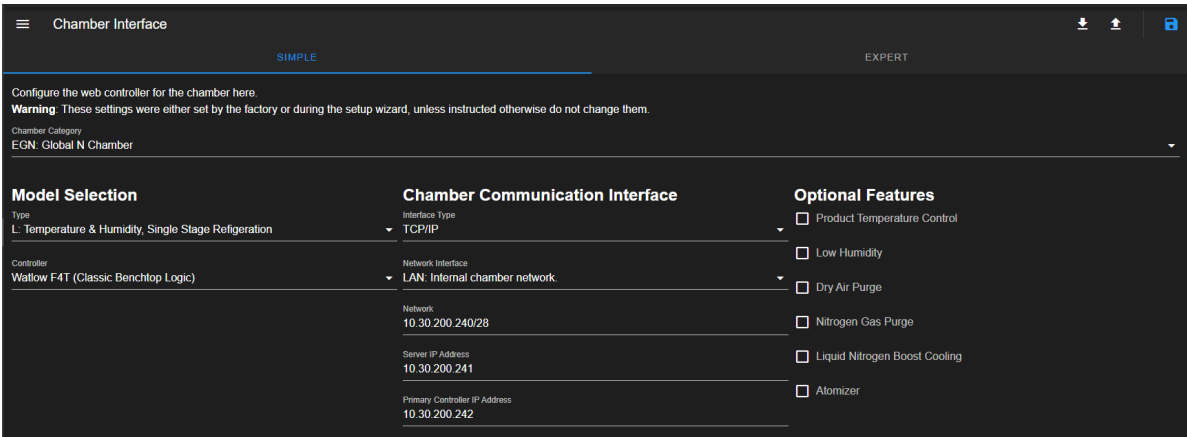


Figure 48.60: Chamber configuration and communication protocol

2. **Serial Interface:** For a chamber equipped with ESPEC SCP220, ES102 or Watlow F4, default communication interface is the serial RS-232; default communication interface for ESPEC P300 is RS-485, but RS232C can also be used for communication. The following figures depict a typical configuration for a chamber equipped with ESPEC SCP220, ES102 or Watlow F4 via the serial RS-232 interface and RS485 for P300.

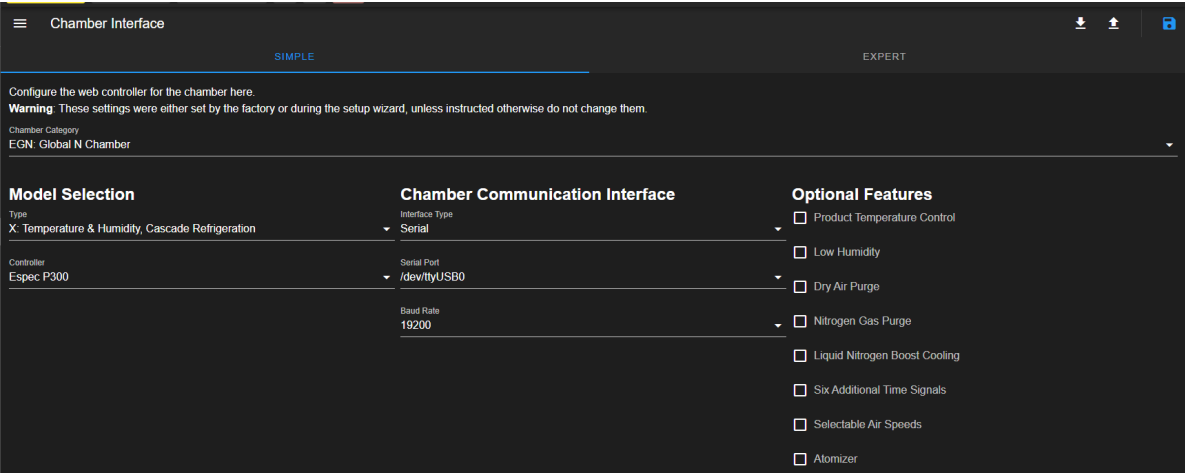


Figure 48.61: Chamber configuration and communication protocol

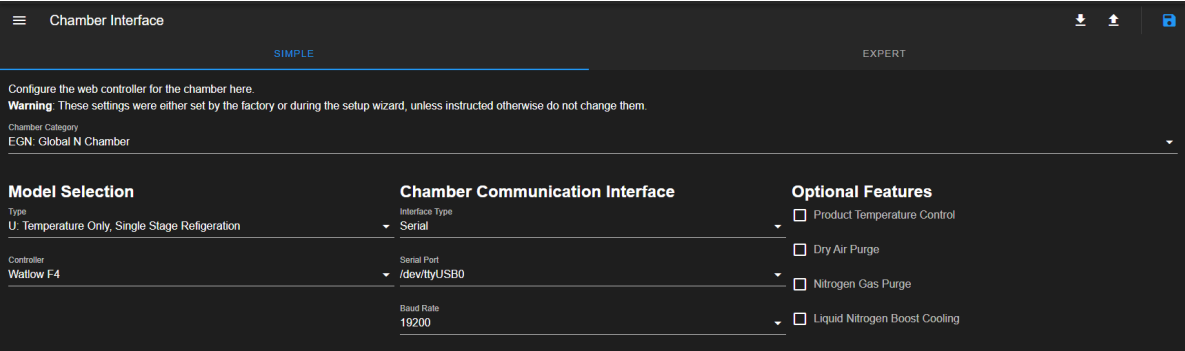


Figure 48.62: Chamber configuration and communication protocol

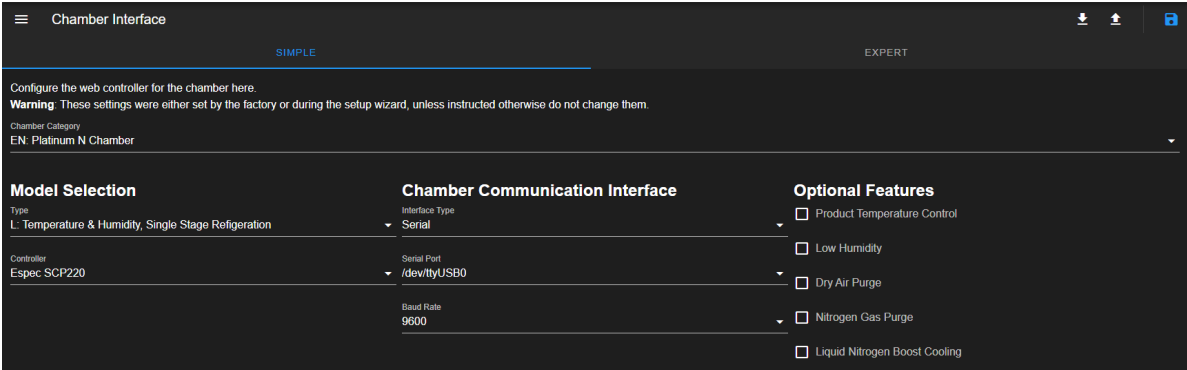


Figure 48.63: Chamber configuration and communication protocol

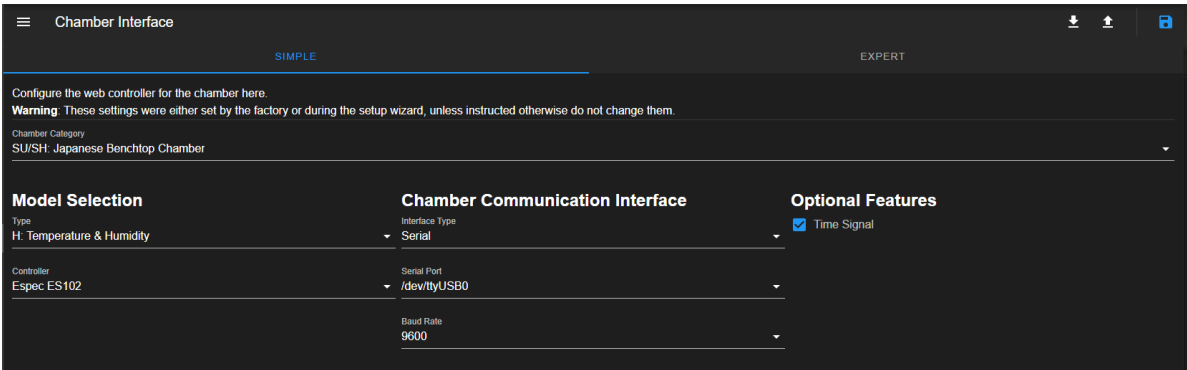


Figure 48.64: Chamber configuration and communication protocol

The following figure depicts a configuration for an F4T chamber via a serial interface.

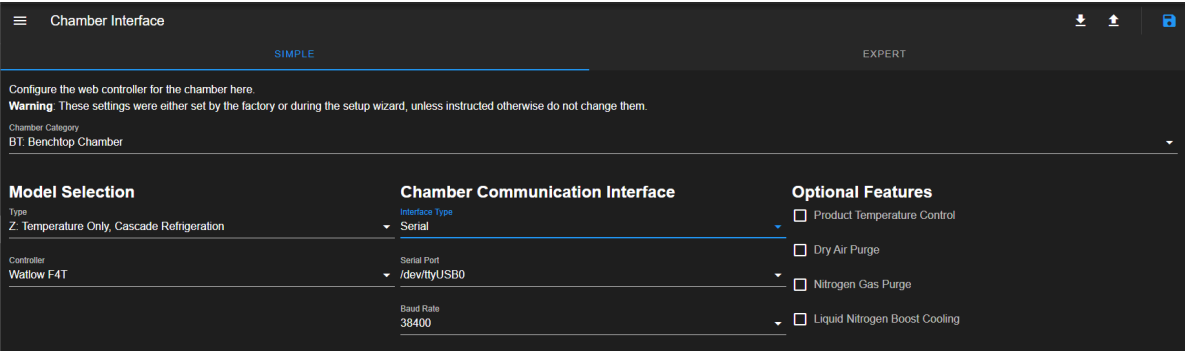


Figure 48.65: Configuration via serial interface

Two options are available for interface configuration: **Simple** and **Expert**. The settings depicted in the above figure are based on the **Simple** option; they were completed at the facility during testing. This configuration can be confirmed during the **Setup Wizard** procedure (as outlined in Section 2.4) when EWC operates for the first time with the chamber. For this reason, there is generally no need to configure the settings, unless a new setting is required.

The following subsections outline the different configuration procedure for all PLCs supported by EWC. Select the appropriate subsection that applies to your chamber and PLC.

48.7.1 T-Series Chamber Interface: Simple Configuration Option

Under the **Simple** option, communication between the chamber and EWC is configured through three predetermined parameters: (1) Chamber Category, (2) Chamber Model and Controller, (3) Communication Interface. They are depicted in the following figure.

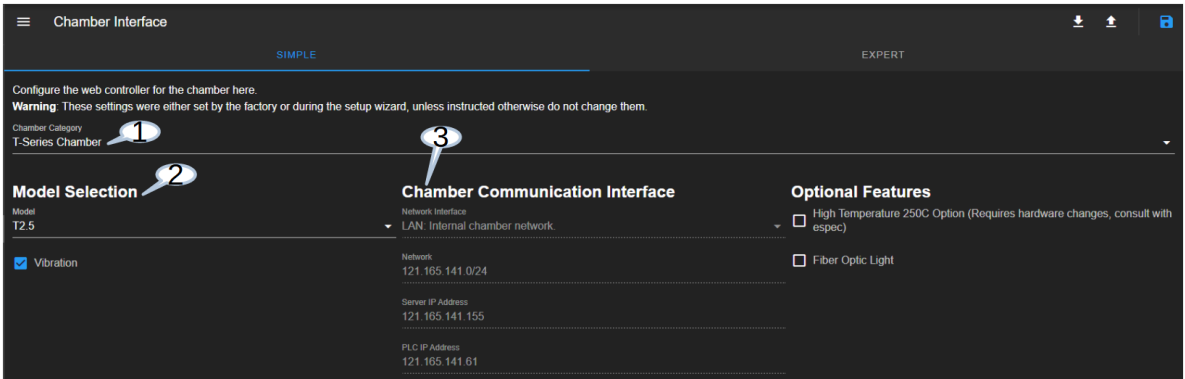


Figure 48.66: Configuration parameters

Refer to your documentations that were shipped with the chamber to obtain information for these parameters. They are required to successfully configure EWC to control your chamber.

1. **Chamber Category:** Click the text field under **Chamber Category** to access a drop-down list, as depicted in the following figure. Select your chamber category from the list that matches the one described in your chamber manual.

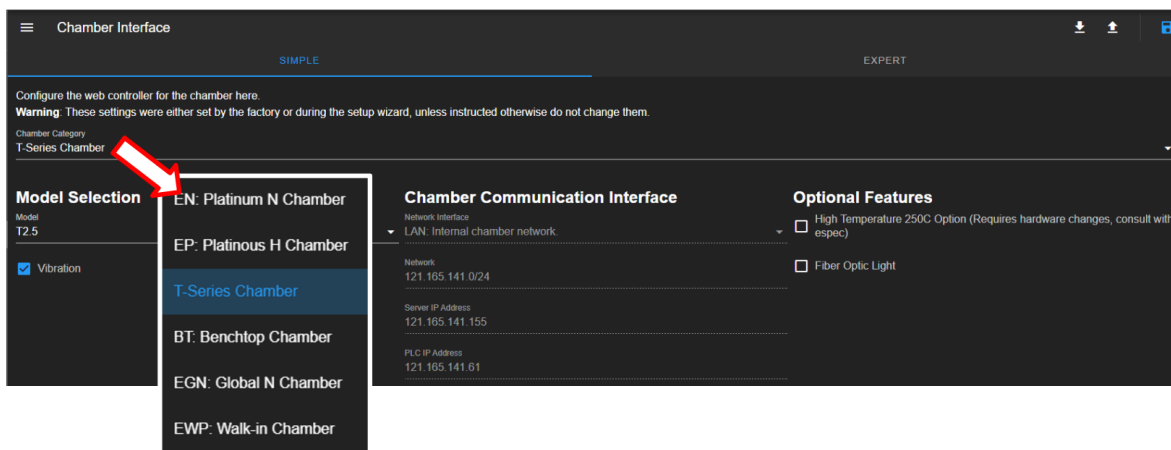


Figure 48.67: Chamber category selection

2. **Model Selection:** Click the text field under **Model** to access a drop-down list, as depicted in the following figure. Select your chamber model from the list that matches the one described in your chamber manual.

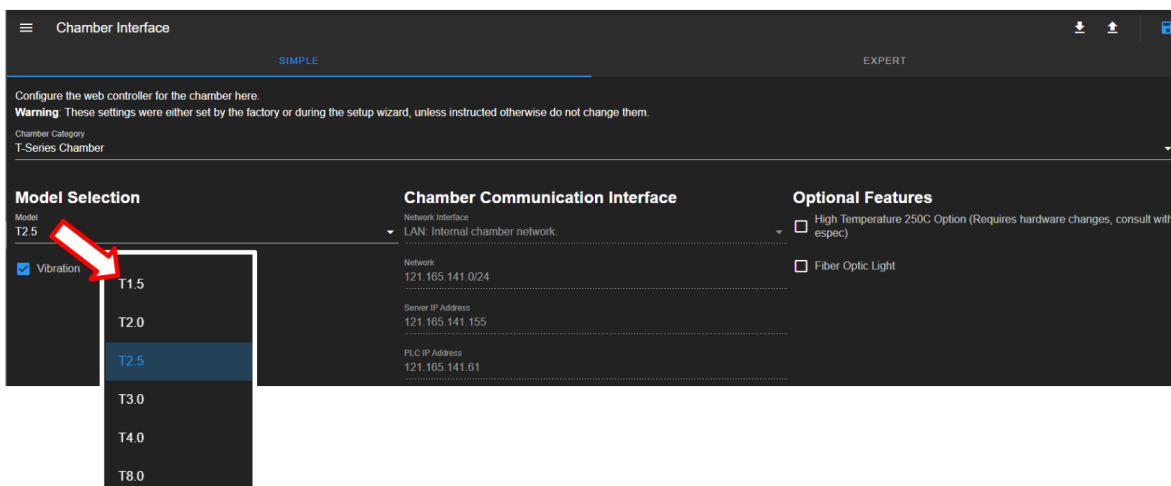


Figure 48.68: Model type and controller configuration

3. **Communication Interface:** By default, EWC applies TCP/IP to communicate with the T-Series chamber using a set of predefined network parameters, as shown in the following figure. An internal network (based on 121.165.141.0/24) was set up for this communication with an IP address of 121.165.141.156 assigned to EWC and 121.165.141.61 to the Allen Bradley PLC.

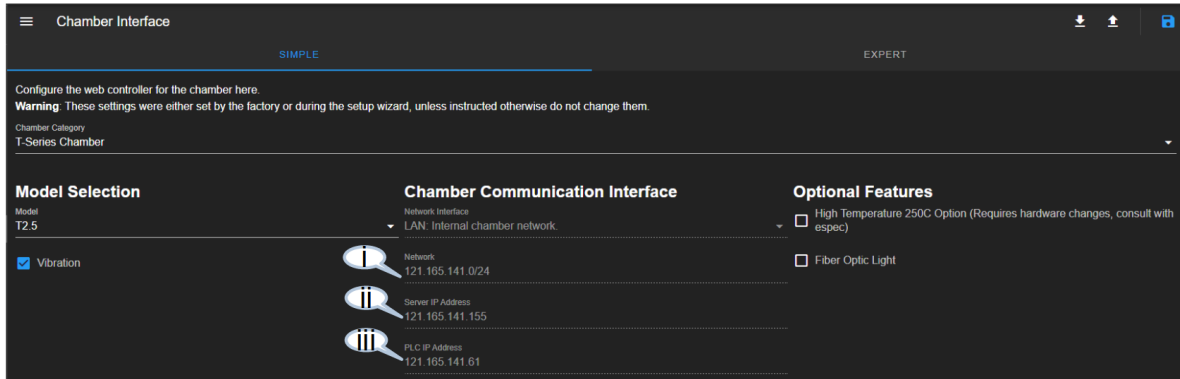


Figure 48.69: Predefined network parameters

The predefined parameters of the chamber communication interface, based on the above figure, are described as follows:

- i. **Internal Network:** This is the internal network that exists between EWC and the chamber. It is statically configured using Class A network protocol.
- ii. **Server IP Address:** This is the IP address of EWC. It is statically configured as 121.161.141.155. The Ethernet port designated for this network is labeled as **eth1**. Refer to the following diagram on the EWC hardware.
- iii. **PLC IP Address:** This is the IP address of the Allen Bradley PLC, statically configured as 121.165.1141.61.

EWC hardware has two Ethernet ports; each is predefined and configured for a specific network connection, as depicted in the following figure. **eth1** is preconfigured for internal network between EWC and PLC; **eth0** is preconfigured to connect EWC to the main network. Thus, during network troubleshooting, these two ports must have the correct cables plugged into them. To help identify **eth0** (when the EWC hardware is enclosed in a box), use the HDMI port as a reference; **eth0** is adjacent to it.



Figure 48.70: Ethernet ports on EWC hardware

The following figure depicts the two IP addresses used by EWC for the two Ethernet ports designated in the above figure.

Current Network Status				
	IPv4 Address	IPv4 Netmask	IPv6 Address	MAC
eth0	10.30.200.232	255.255.0.0		00:07:32:7b:3a:a1
eth1	121.165.141.155	255.255.255.0	fe80::8dae:9796:a2f2:6bb8	00:07:32:7b:3a:a2
	169.254.213.60	255.255.0.0		

Figure 48.71: Ethernet ports of EWC

4. **Save Settings:** There are three options to manage the chamber interface configuration (shown in the figure).

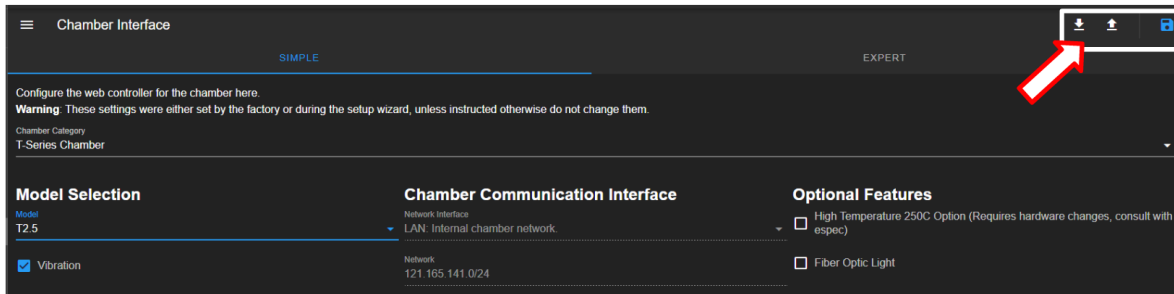


Figure 48.72: Manipulating interface settings

- **Export to Local File:** Click the down-arrow button to download the current settings for backup. The configuration file (in yaml) will be stored on the local computer with filename: chamber_interface_1.yaml.
- **Import from Local File:** Click the up-arrow button to import a configuration file from the local computer. To apply the new settings from this file, click the **Save** button.
- **Save Settings:** After modifying the parameters in the expert option, click the **Save** button to apply the current settings.

48.7.2 SCP220 Chamber Interface: Simple Configuration Option

Under the **Simple** option, communication between the chamber and EWC is configured through three predetermined parameters: (1) Chamber Category, (2) Chamber Model and Controller, (3) Communication Interface. They are depicted in the following figure.

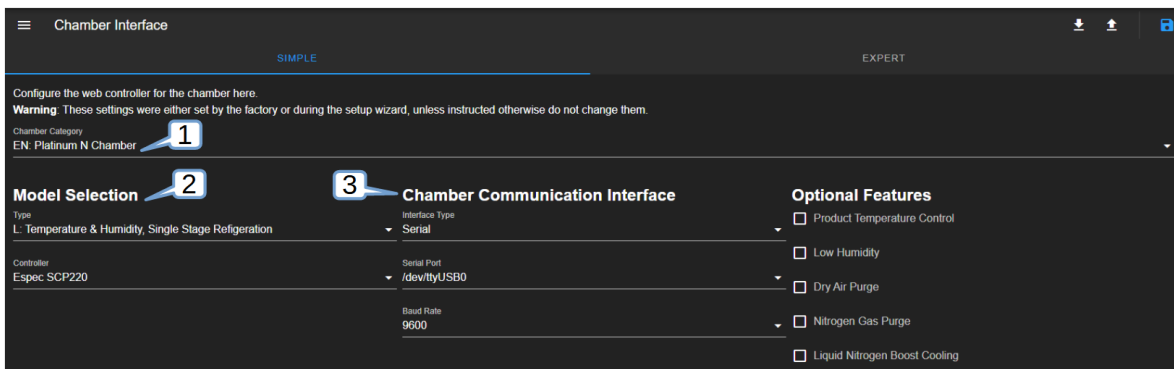


Figure 48.73: Configuration parameters

Refer to your documentations that were shipped with the chamber to obtain information for these parameters. They are required to successfully configure EWC to control your chamber.

1. **Chamber Category:** Click the text field under **Chamber Category** to access a drop-down list, as depicted in the following figure. Select your chamber category from the list that matches the one described in your chamber manual.

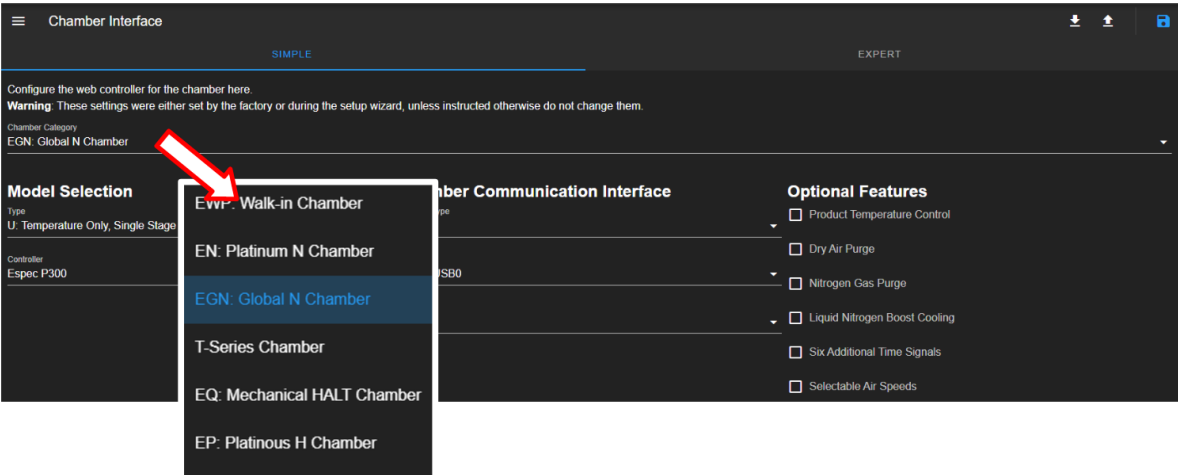


Figure 48.74: Chamber category selection

2. **Model Selection:** Click the text field under **Model** to access a drop-down list, as depicted in the following figure. Select your chamber model from the list that matches the one described in your chamber manual.

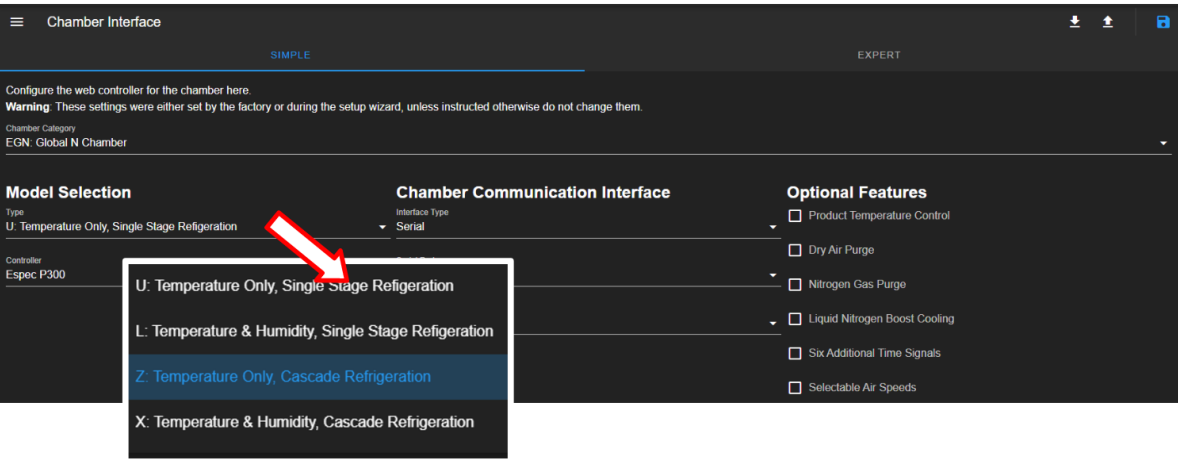


Figure 48.75: Model type and controller configuration

3. **Communication Interface:** Default communication protocol between EWC and SCP220 PLC is RS232 via Serial interface (as depicted in the following figure). The only predefined parameter for this protocol is the serial baud rate at 9600.

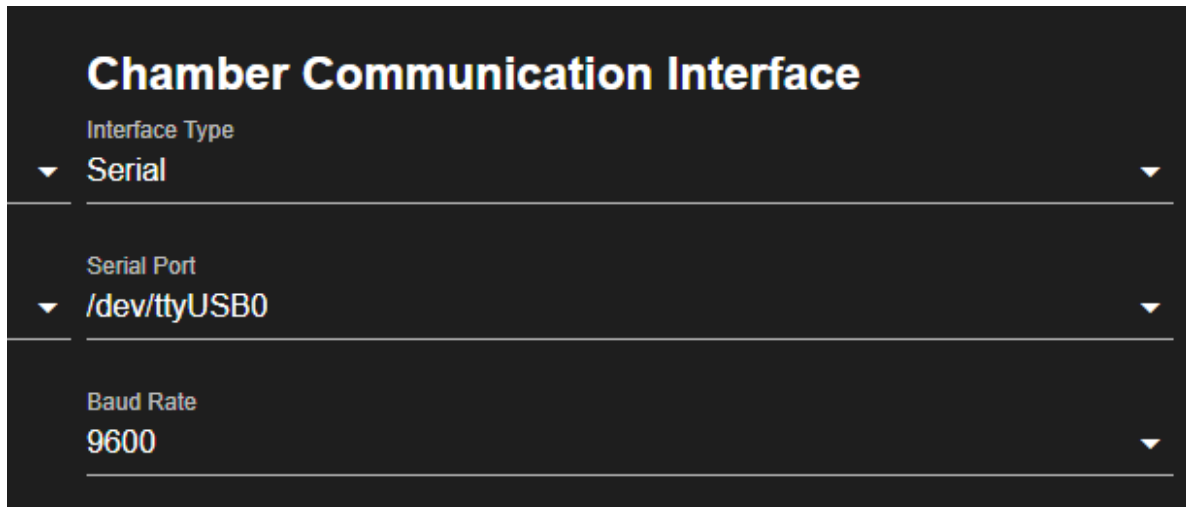


Figure 48.76: Predefined serial comm. parameters

EWC will automatically select and configure a serial port designated as `/dev/ttyUSB0` (or `/dev/ttyUSB1`) for its interface.

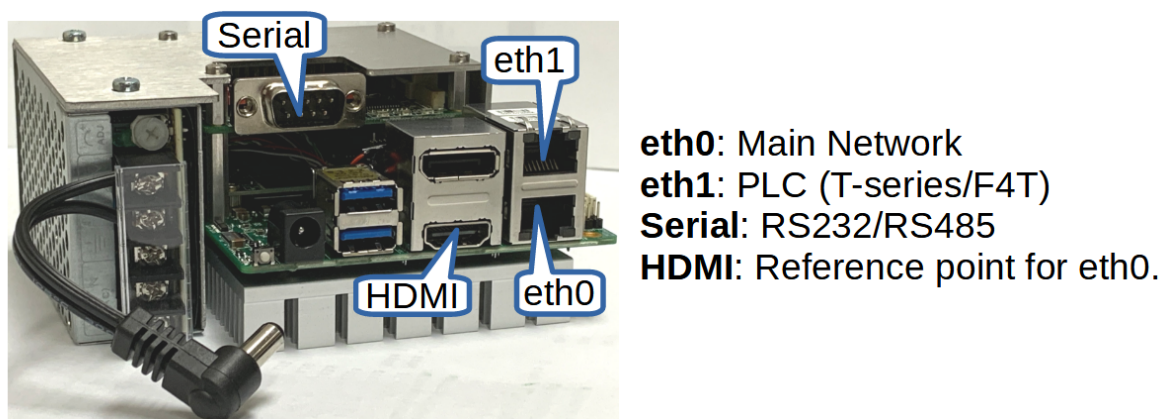


Figure 48.77: RS232 via Serial interface

4. **Save Settings**: Three options are available for managing the chamber interface configuration. These are **Export to local file**, **Import from local file** and **Save**, as depicted in the figure.

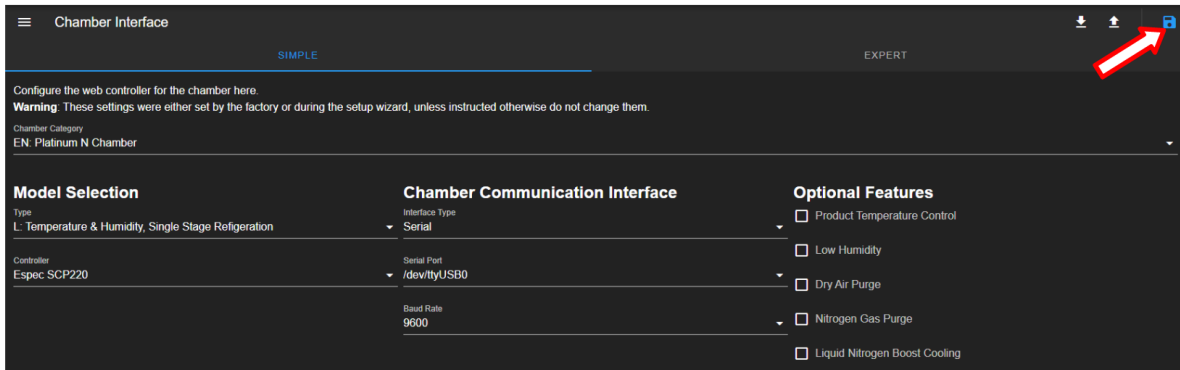


Figure 48.78: Manipulating interface settings

- **Export to Local File:** Click the down-arrow button to download the current settings for backup. The configuration file (in yaml) will be stored on the local computer with filename: chamber_interface_1.yaml.
- **Import from Local File:** Click the up-arrow button to import a configuration file from the local computer. To apply the new settings from this file, click the **Save** button.
- **Save Settings:** After modifying the parameters in the expert option, click the **Save** button to apply the current settings.

48.7.3 ESPEC P300 Chamber Interface: Simple Configuration Option

Under the **Simple** option, communication between the chamber and EWC is configured through three predetermined parameters: (1) Chamber Category, (2) Chamber Model and Controller, (3) Communication Interface. They are depicted in the following figure.

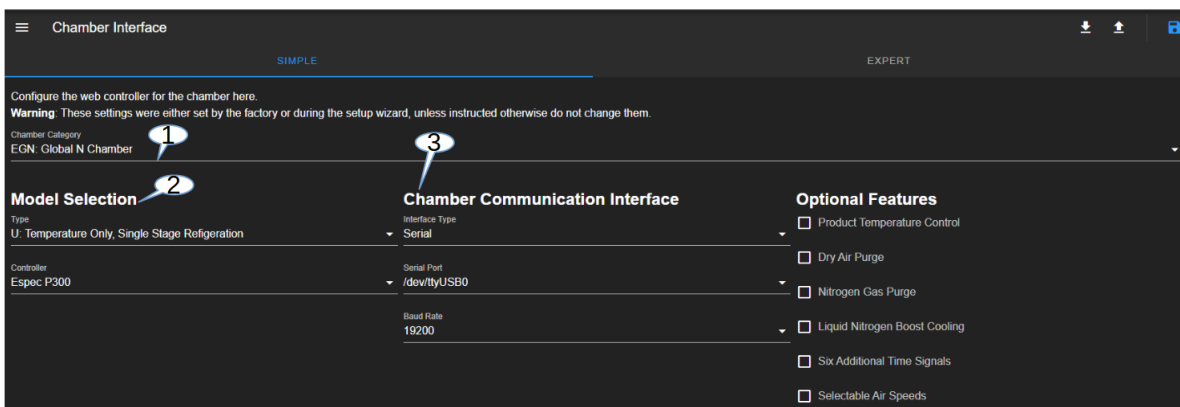


Figure 48.79: Configuration parameters

Refer to your documentations that were shipped with the chamber to obtain information for these parameters. They are required to successfully configure EWC to control your chamber.

1. **Chamber Category:** Click the text field under **Chamber Category** to access a drop-down list, as depicted in the following figure. Select your chamber category from the list that matches the one described in your chamber manual.

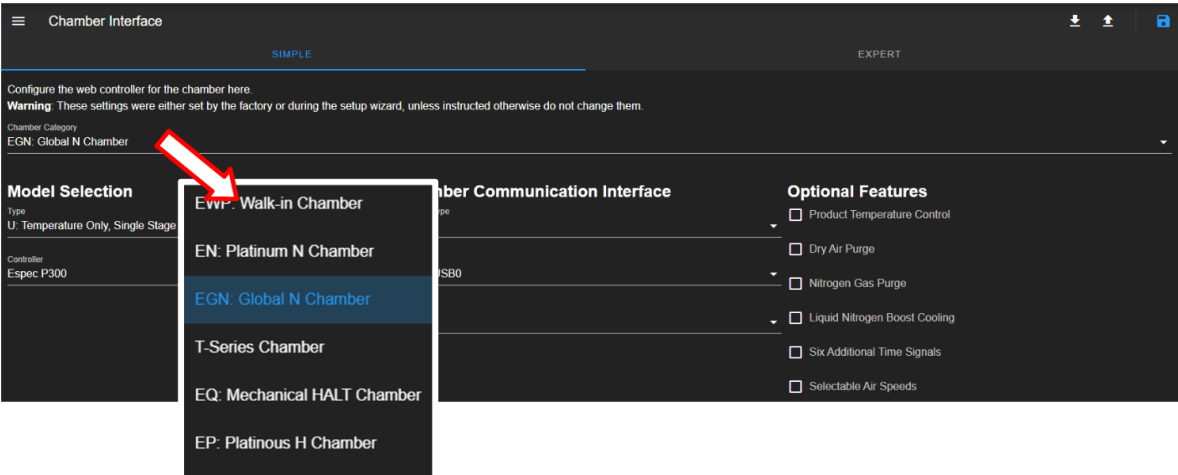


Figure 48.80: Chamber category selection

2. **Model Selection:** Click the text field under **Model** to access a drop-down list, as depicted in the following figure. Select your chamber model from the list that matches the one described in your chamber manual.

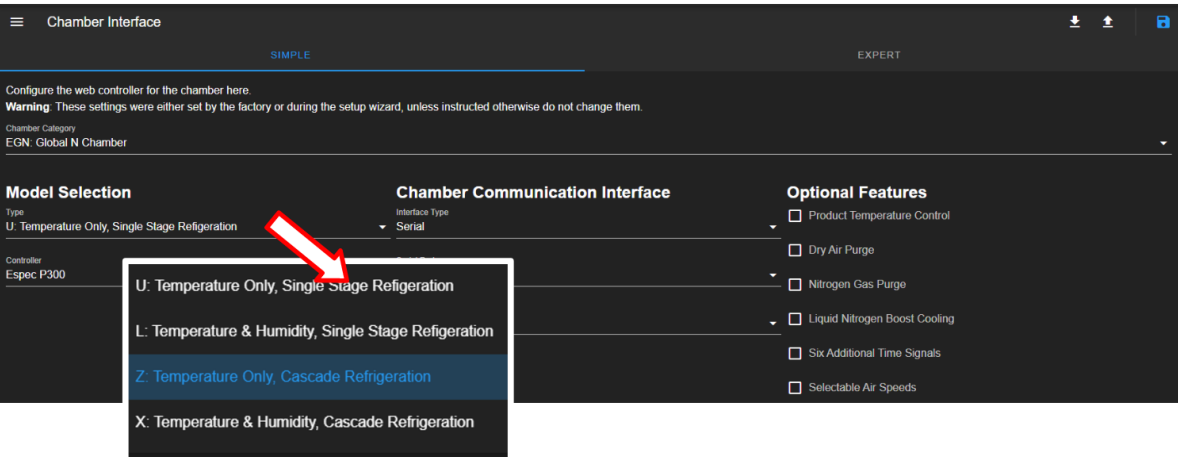


Figure 48.81: Model type and controller configuration

3. **Communication Interface:** Default communication protocol between EWC and P300 PLC is RS485 via Serial interface. The only predefined parameter for this protocol is the serial baud rate at 19200.

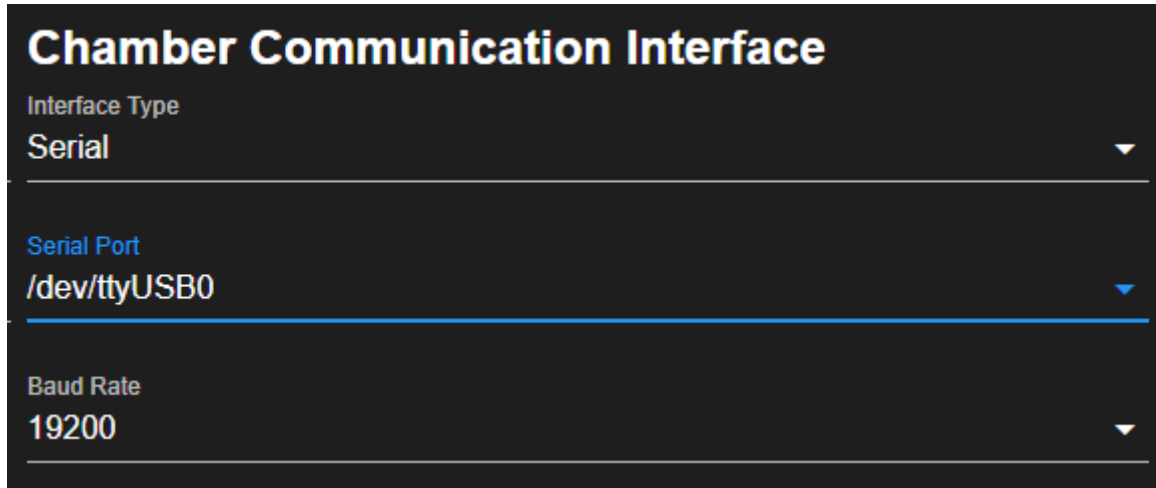
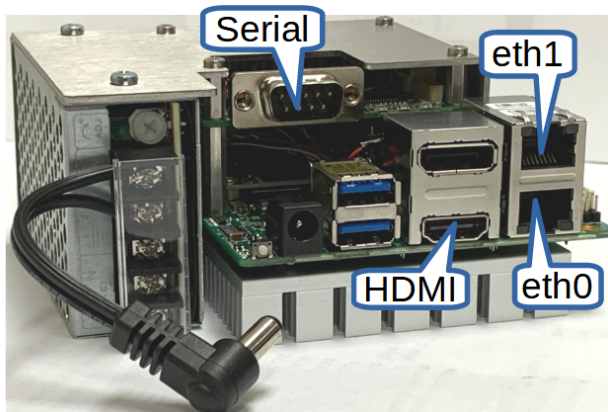


Figure 48.82: Predefined serial comm. parameters

EWC will automatically select and configure a serial port designated as `/dev/ttyUSB0` (or `/dev/ttyUSB1`) for its interface.



eth0: Main Network
eth1: PLC (T-series/F4T)
Serial: RS232/RS485
HDMI: Reference point for eth0.

Figure 48.83: RS485 via Serial interface

4. **Save Settings:** Three options are available for managing the chamber interface configuration. These are **Export to local file**, **Import from local file** and **Save**, as depicted in the figure.

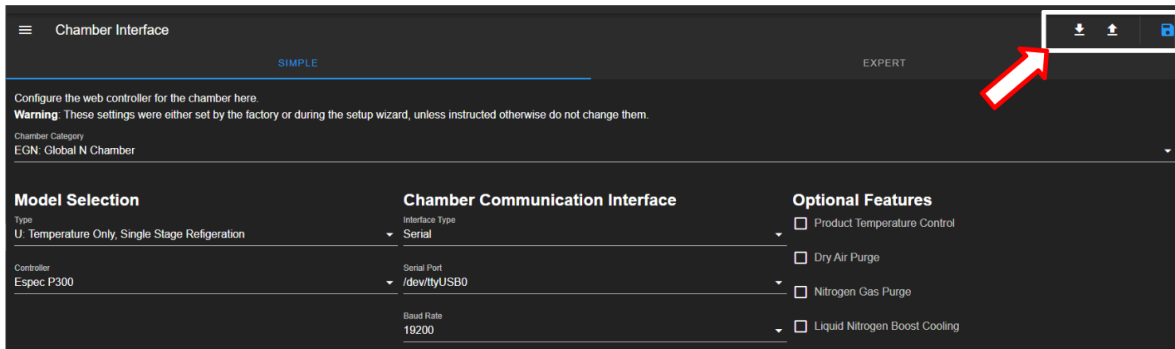


Figure 48.84: Manipulating interface settings

- **Export to Local File:** Click the down-arrow button to download the current settings for backup. The configuration file (in yaml) will be stored on the local computer with filename: chamber_interface_1.yaml.
- **Import from Local File:** Click the up-arrow button to import a configuration file from the local computer. To apply the new settings from this file, click the **Save** button.
- **Save Settings:** After modifying the parameters in the expert option, click the **Save** button to apply the current settings.

48.7.4 ESPEC ES102 Chamber Interface: Simple Configuration Option

Under the **Simple** option, communication between the chamber and EWC is configured through three predetermined parameters: (1) Chamber Category, (2) Chamber Model and Controller, (3) Communication Interface. They are depicted in the following figure.

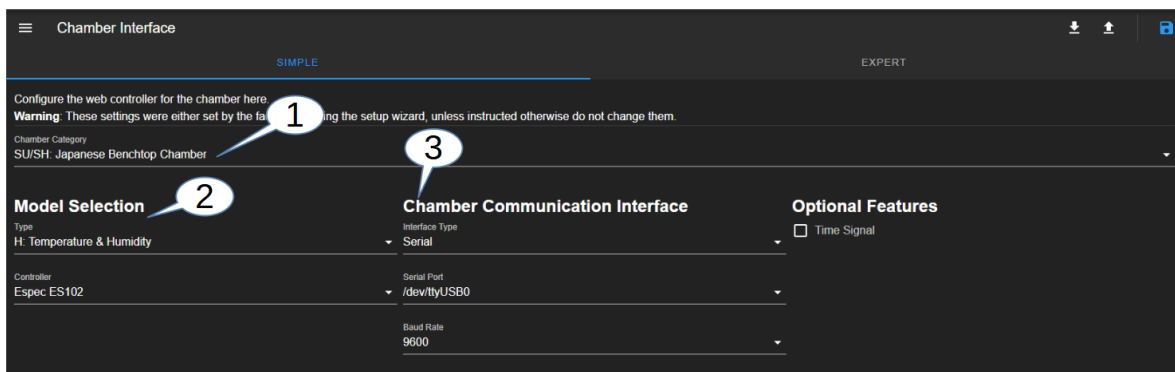


Figure 48.85: Configuration parameters

Refer to your documentations that were shipped with the chamber to obtain information for these parameters. They are required to successfully configure EWC to control your chamber.

1. **Chamber Category:** Click the text field under **Chamber Category** to access a drop-down list, as depicted in the following figure. Select your chamber category from the list that matches the one described in your chamber manual.

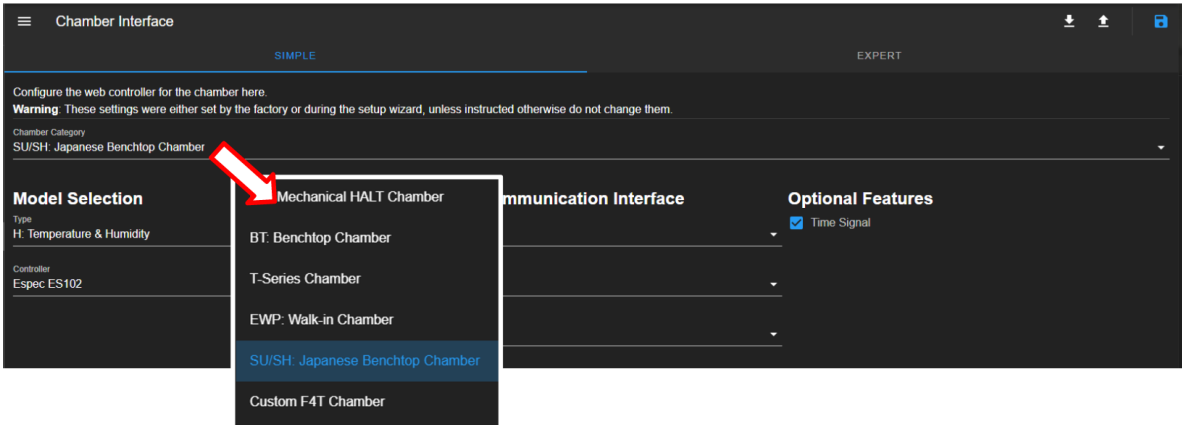


Figure 48.86: Chamber category selection

2. **Model Selection:** Click the text field under **Model** to access a drop-down list, as depicted in the following figure. Select your chamber model from the list that matches the one described in your chamber manual.

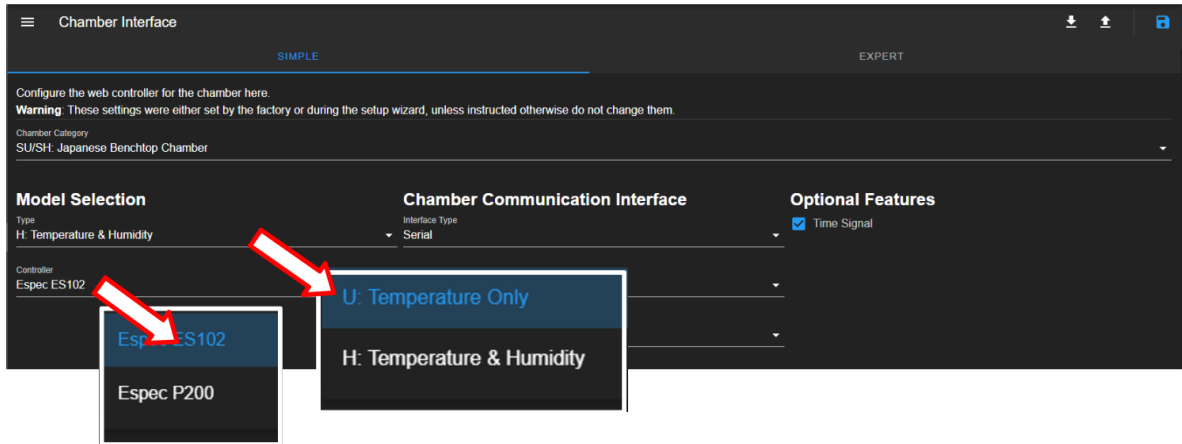


Figure 48.87: Model type and controller configuration

3. **Communication Interface:** Default communication protocol between EWC and ES102 PLC is RS232 via Serial interface (as depicted in the previous figure). The only predefined parameter for this protocol is the serial baud rate at 9600.

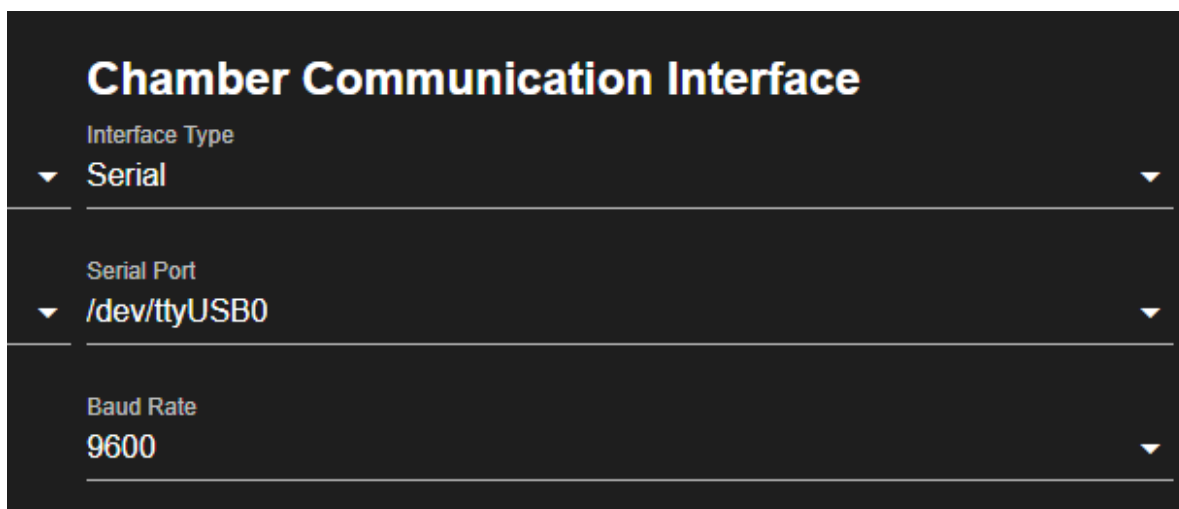


Figure 48.88: Predefined serial comm. parameters

EWC will automatically select and configure a serial port designated as `/dev/ttyUSB0` (or `/dev/ttyUSB1`) for its interface.

4. **Save Settings:** Three options are available for managing the chamber interface configuration. These are **Export to local file**, **Import from local file** and **Save**, as depicted in the figure.

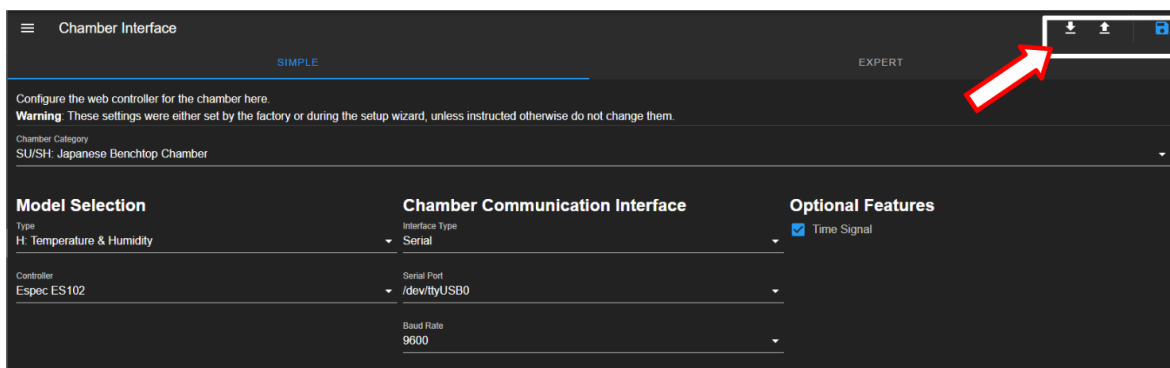


Figure 48.89: Manipulating interface settings

- **Export to Local File:** Click the down-arrow button to download the current settings for backup. The configuration file (in yaml) will be stored on the local computer with filename: `chamber_interface_1.yaml`.
- **Import from Local File:** Click the up-arrow button to import a configuration file from the local computer. To apply the new settings from this file, click the **Save** button.
- **Save Settings:** After modifying the parameters in the expert option, click the **Save** button to apply the current settings.

48.7.5 Watlow F4T Chamber Interface: Simple Configuration Option

Under the **Simple** option, communication between the chamber and EWC is configured through three predetermined parameters: (1) Chamber Category, (2) Chamber Model and Controller, (3) Communication Interface. They are depicted in the following figure.

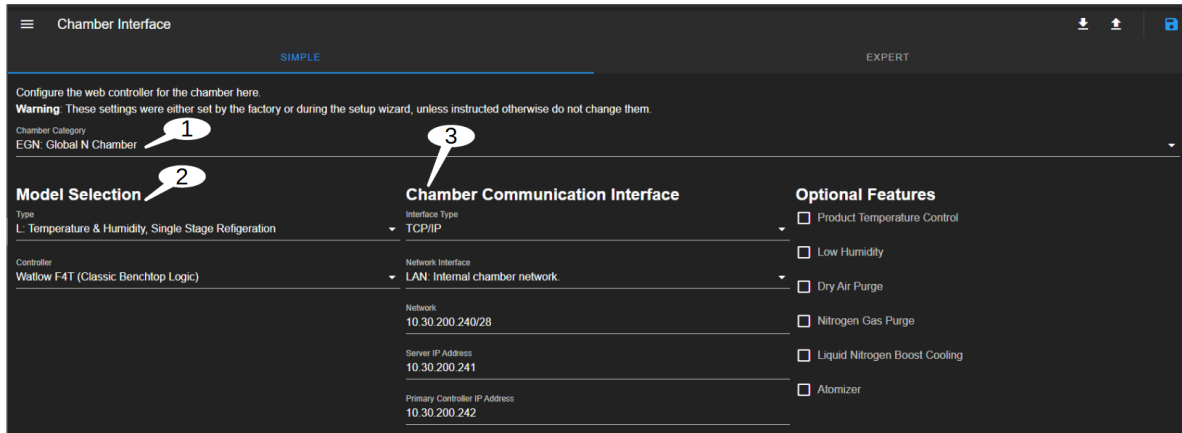


Figure 48.90: Configuration parameters

Refer to your documentations that were shipped with the chamber to obtain information for these parameters. They are required to successfully configure EWC to control your chamber.

1. **Chamber Category:** Click the text field under **Chamber Category** to access a drop-down list, as depicted in the following figure. Select your chamber category from the list that matches the one described in your chamber manual.

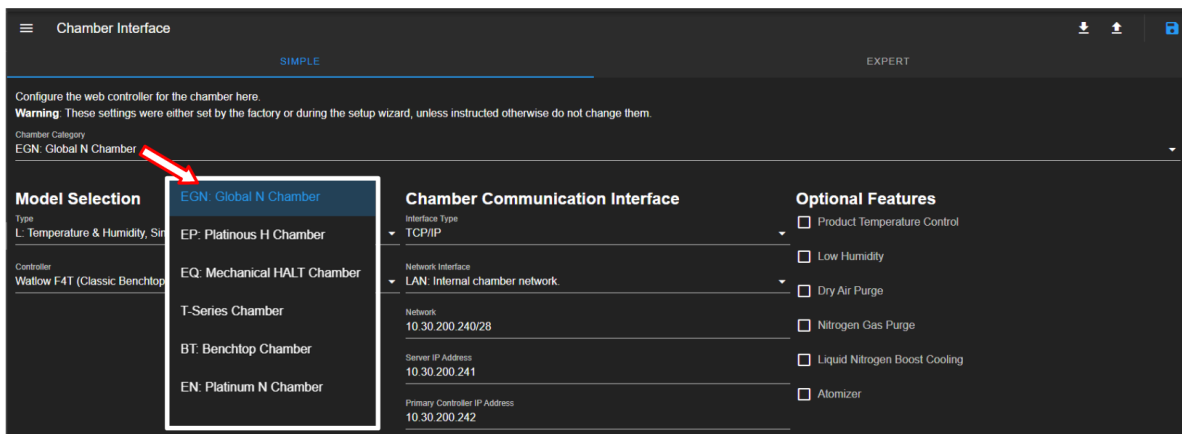


Figure 48.91: Chamber category selection

2. Model Selection:

- **Type:** Click the text field under **Type** to access a drop-down list, as depicted in the following figure. Select your chamber type from the list that matches the one described in your chamber manual.
- **Controller:** Click the text field under **Controller** to access a drop-down list, as depicted in the following figure. Select your controller type from the list that matches

the one described in your chamber manual.

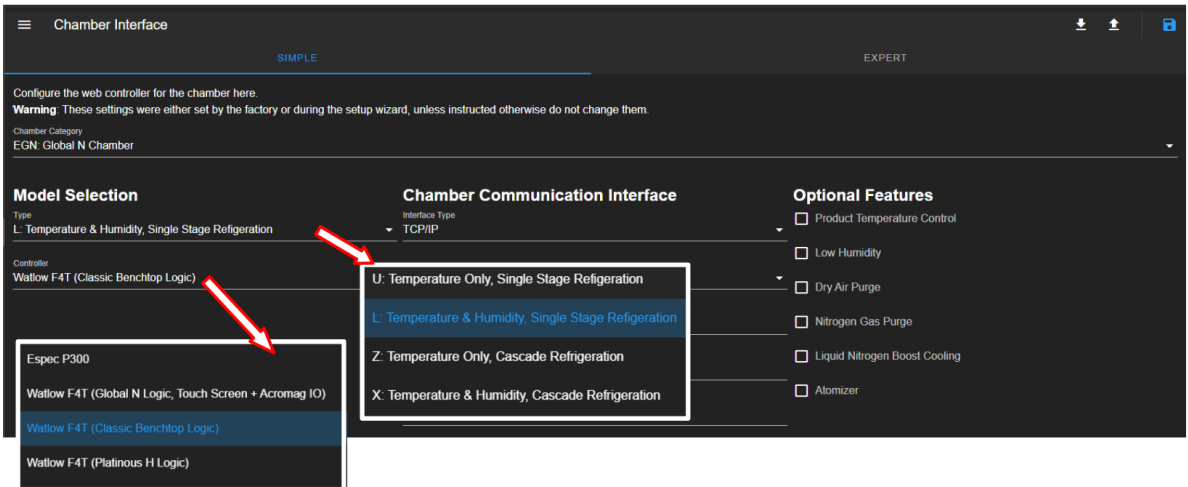


Figure 48.92: Model type and controller configuration

3. **Communication Interface:** Default communication between EWC and F4T PLC is TCP/IP connected via port **eth1** as depicted in the following figure. This internal network was set up for this communication with 10.30.200.241 as IP address assigned to EWC and 10.30.200.242 to the F4T.

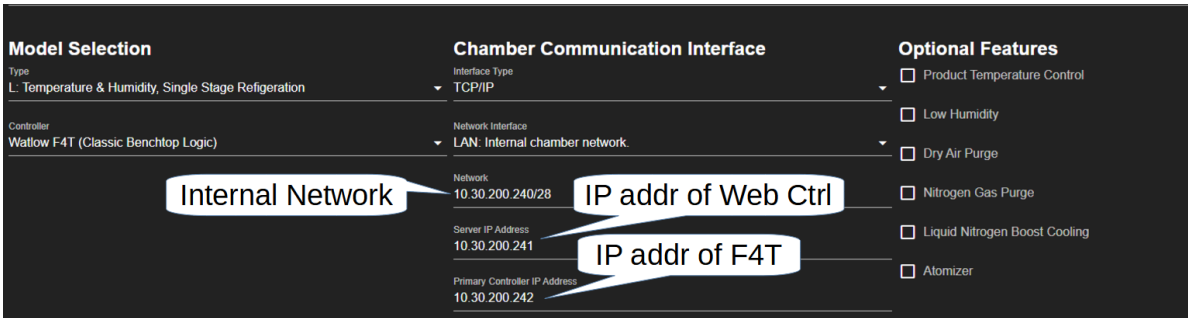
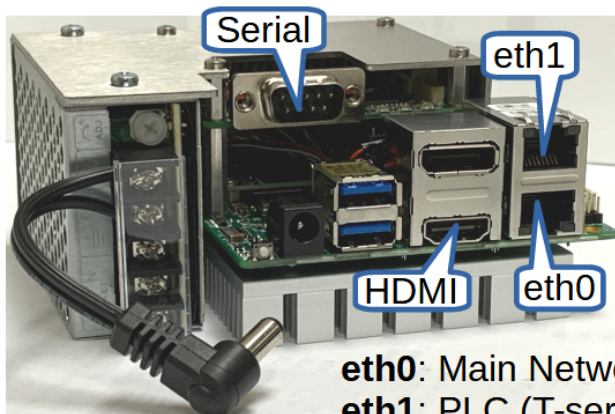


Figure 48.93: Predefined network parameters

EWC hardware has two Ethernet ports; each is predefined and configured for a specific network connection, as depicted in the following figure. **eth1** is preconfigured for internal network between EWC and PLC; **eth0** is preconfigured to connect EWC to the main network. Thus, during network troubleshooting, these two ports must have the correct cables plugged into them. To help identify **eth0** (when the EWC hardware is enclosed in a box), use the HDMI port as a reference; **eth0** is adjacent to it.



eth0: Main Network
eth1: PLC (T-series/F4T)
Serial: RS232/RS485
HDMI: Reference point for eth0.



Figure 48.94: Ethernet ports on EWC hardware

The following figure depicts the two IP addresses used by EWC for the two Ethernet ports designated in the above figure.

Current Network Status				
	IPv4 Address	IPv4 Netmask	IPv6 Address	MAC
eth0	10.30.100.108	255.255.0.0		00:07:32:7b:3a:a1
eth1	10.30.200.241	255.255.255.240		00:07:32:7b:3a:a2

Figure 48.95: Ethernet ports of EWC

- **Interface Type:** It is to be emphasized that TCP/IP is the default communication protocol. There is no need to make any selection for the interface type, except to confirm that TCP/IP has been selected. If your chamber uses a serial interface for communication with EWC, and the chamber manual specifies such information, then make sure to select **Serial** from the drop-down list. Confirm also that the F4T has the right settings for ModbusRTU protocol (via Settings, Network and Modbus).

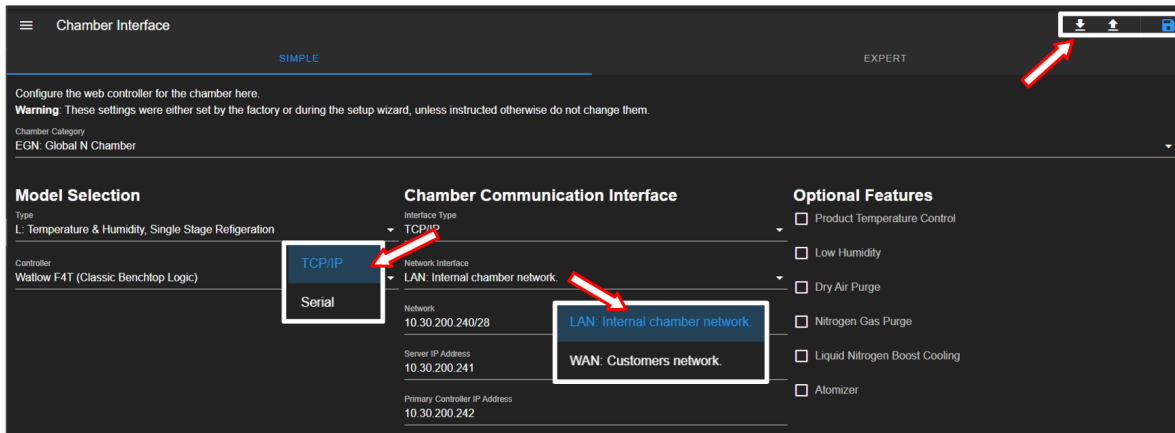


Figure 48.96: Communication interface configuration

- **Network Interface:** If EWC uses TCP/IP as the default communication, then LAN is the default selection. The WAN option is a configuration where the internal network does not exist between EWC and the F4T. This option requires a reconfiguration of the network setup with both EWC and F4T part of the (customer's) main network. This setup may require assistance from ESPEC customer support.
4. **Save Settings:** There are three options to manage the chamber interface configuration, as depicted in the upper-right corner.
- **Export to Local File:** Click the down-arrow button to download the current settings for backup. The configuration file (in JSON) will be stored on the local computer.
 - **Import from Local File:** Click the up-arrow button to import a configuration file from the local computer.
 - **Save Settings:** To update the current setting, click the **Save** button.

48.7.6 Watlow F4 Chamber Interface

Under the **Simple** option, communication between the chamber and EWC is configured through three predetermined parameters: (1) Chamber Category, (2) Chamber Model and Controller, (3) Communication Interface. They are depicted in the following figure.

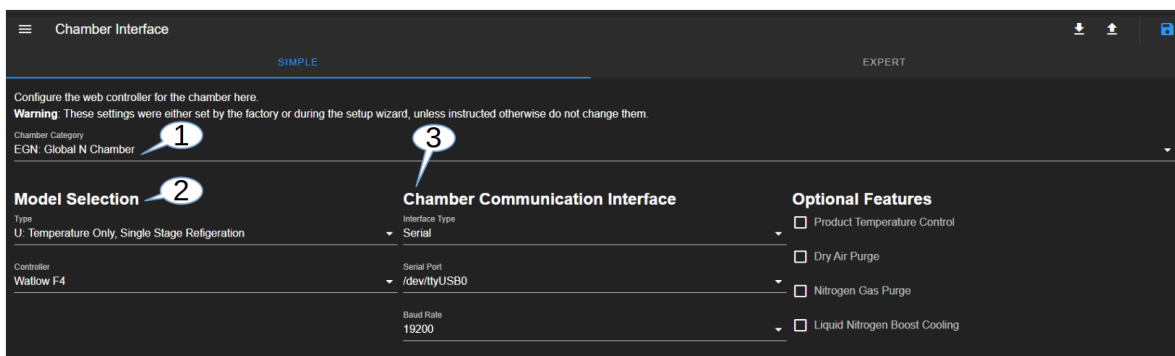


Figure 48.97: Configuration parameters

Refer to your documentations that were shipped with the chamber to obtain information for these parameters. They are required to successfully configure EWC to control your chamber.

1. **Chamber Category:** Click the text field under **Chamber Category** to access a drop-down list, as depicted in the following figure. Select your chamber category from the list that matches the one described in your chamber manual.

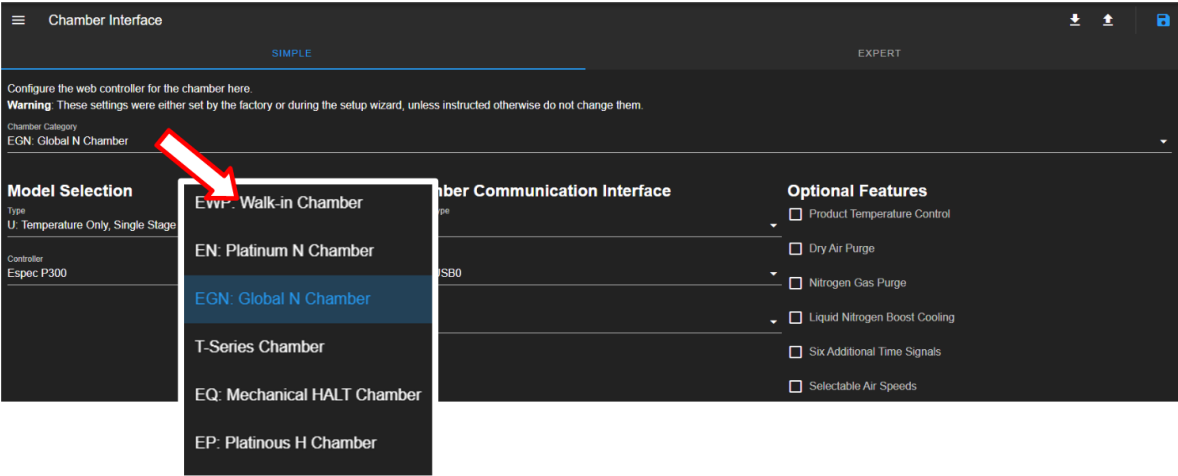


Figure 48.98: Chamber category selection

2. **Model Selection:** Click the text field under **Model** to access a drop-down list, as depicted in the following figure. Select your chamber model from the list that matches the one described in your chamber manual. Under **Controller**, select Watlow F4.

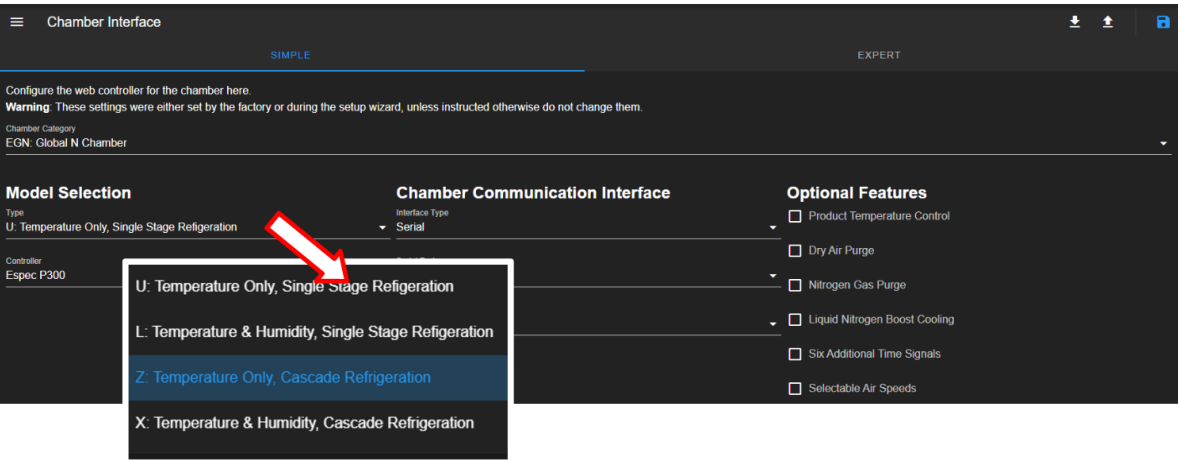


Figure 48.99: Model type and controller configuration

3. **Communication Interface:** Serial interface is the default communication protocol between EWC and F4 PLC. The only predefined parameter for this protocol is the baud rate, setting at 19200.

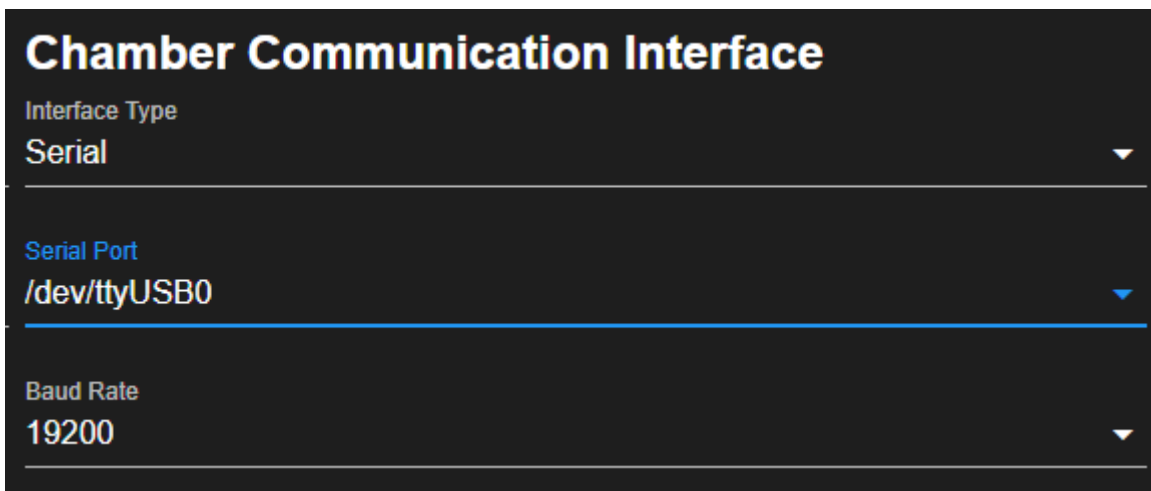


Figure 48.100: Predefined serial comm. parameters

EWC will automatically select and configure a serial port designated as `/dev/ttyUSB0` (or `/dev/ttyUSB1`) for its interface.

4. **Save Settings:** Three options are available for managing the chamber interface configuration. These are **Export to local file**, **Import from local file** and **Save**, as depicted in the figure.

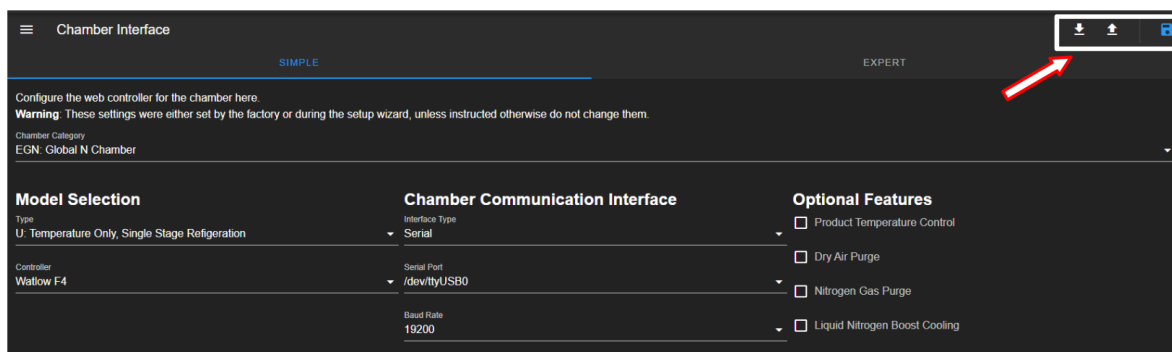


Figure 48.101: Manipulating interface settings

- **Export to Local File:** Click the down-arrow button to download the current settings for backup. The configuration file (in yaml) will be stored on the local computer with filename: `chamber_interface_1.yaml`.
- **Import from Local File:** Click the up-arrow button to import a configuration file from the local computer. To apply the new settings from this file, click the **Save** button.
- **Save Settings:** After modifying the parameters in the expert option, click the **Save** button to apply the current settings.

48.7.7 Chamber Interface: Expert Configuration Option

The list of settings in the expert option is a configuration that was applied using the settings in the simple option. All settings initially applied in the simple option were stored in the expert list. Once applied and stored in the expert list, the settings shown in the simple option may not reflect the actual configuration between the chamber and EWC. Therefore, the correct interface and chamber settings must be examined in the list of the expert option.

The expert option offers flexibility for customizing the interface configuration for the intended chamber. Only an operator with knowledge of the PLC configuration and the **yaml** syntax should modify the settings. Knowledge of the PLC features and its I/O modules is required to successfully configure EWC to connect to and use the chamber. The expert option consists of a list or set of parameters structured in **yaml** syntax, as depicted in the following figure. EWC scans this file and parses the parameters to apply the settings for chamber operation.

Refer to the specific item that applies to your chamber and PLC.

1. **T-Series:** The following figure illustrates the **Expert** configuration of a T-series chamber.

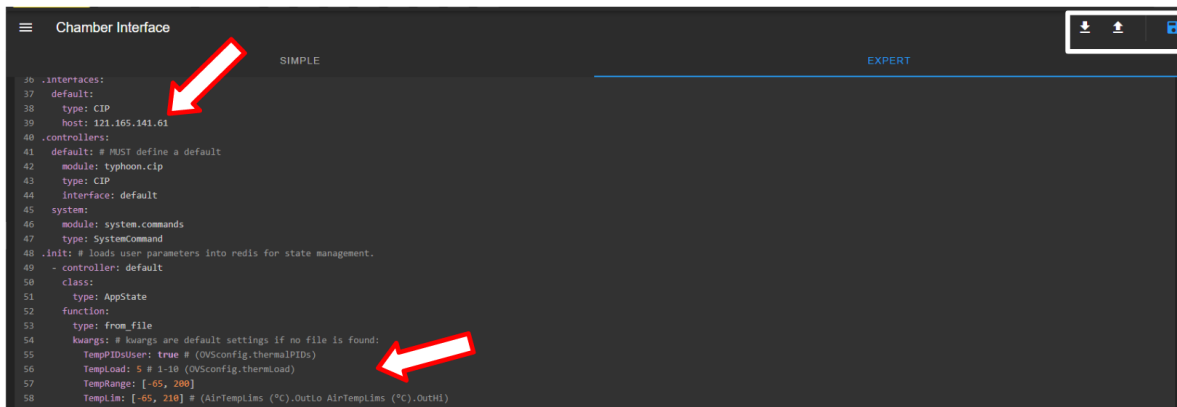


Figure 48.102: Configuration file of Expert setting option

2. **Watlow F4T:** The following figure illustrates the **Expert** configuration of an F4T chamber.

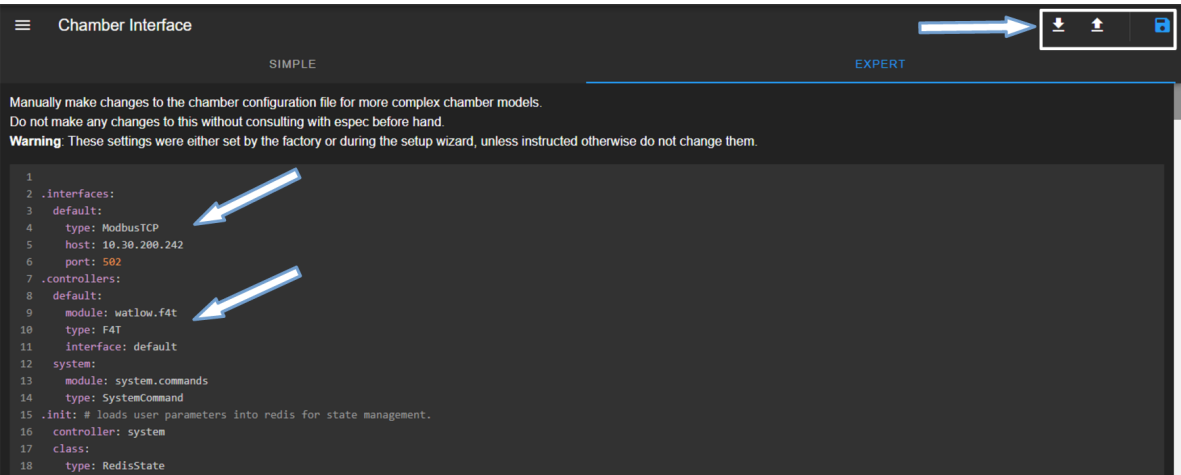


Figure 48.103: Configuration file of Expert setting option

3. **Watlow F4:** The following figure illustrates the **Expert** configuration of an F4 chamber.

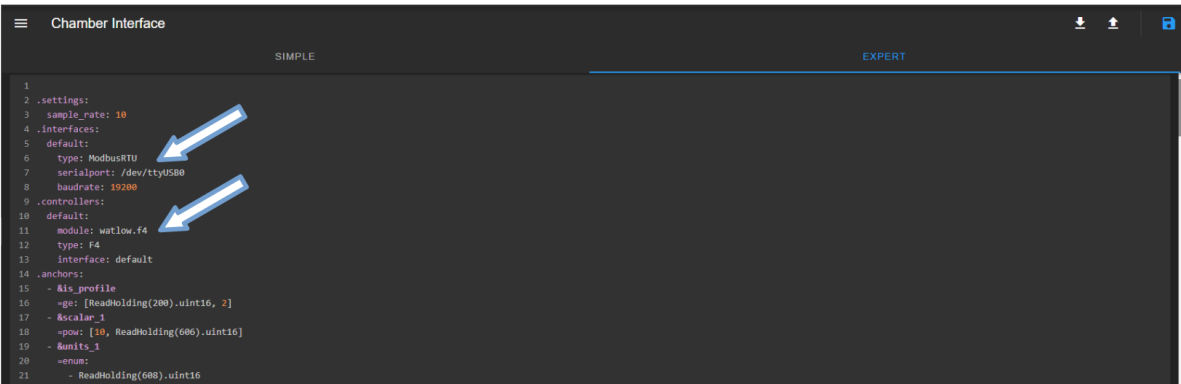


Figure 48.104: Configuration file of Expert setting option

4. **ESPEC P300:** The following figure illustrates the **Expert** configuration of a P300 chamber.

```

2 .settings:
3   sample_rate: 10
4 .interfaces:
5   default:
6     type: DelimBytesSerial
7     serialport: /dev/ttyUSB0
8     delimiter: "\n\n"
9     baudrate: 19200
10 .controllers:
11   default: # MUST define a default
12     module: espec.commands
13     type: EspecCommand
14     interface: default
15     address: 1
16 .anchors:
17   temp_range: &temp_range [-70, 100]
18   humi_range: &humi_range [10, 95]
19   vib_range: &vib_range [0, 100]
20 .network: #read/write network settings to P300 HMI, used by init daemon.
21   type: control #display
22   address:
23     _list: ReadIpSet.address
24     _update: WriteIpSet.address

```

Figure 48.105: Configuration file of Expert setting option

5. **ESPEC SCP220:** The following figure illustrates the **Expert** configuration of an SCP220 chamber.

```

2 .settings:
3   sample_rate: 10
4 .interfaces:
5   default:
6     type: DelimBytesSerial
7     serialport: /dev/ttyUSB0
8     delimiter: "\n\n"
9     baudrate: 9600
10    encoding: ascii
11    errors: replace
12 .controllers:
13   default: # MUST define a default
14     module: espec.commands
15     type: EspecCommand
16     interface: default
17
18 .anchors:
19   temp_range: &temp_range [-70, 100]
20   humi_range: &humi_range [10, 95]
21   vib_range: &vib_range [0, 100]

```

Figure 48.106: Configuration file of Expert setting option

The contents in this yaml file begins with the sample rate configuration and the type of interface used for communication, indicated by the arrow. The list continues with all the available features and specifications of the chamber that include temperature, humidity and vibration range.

Custom configuration can follow any one of these two methods:

1. **Content Modification:** Modify the contents of the yaml file, with an appropriate yaml syntax and data structure. For the new settings to take effect, click the **Save** button.
2. **Uploading Yaml File:** Click the **Import** button to upload the yaml configuration file from the local computer. The contents of this file must follow the syntax and data structure of **yaml**.

It is important to have a backup of the original yaml file listed on this page. Click the **Export** button (down-arrow) in the upper-right corner to download the yaml file to store on the local computer. This file can be used to quickly restore the chamber interface settings.

48.8 Date/Time Settings

To keep an accurate date/time of the data log, it is important to have the correct date/time on EWC (and the chamber). Data log will bear a date/time stamp used by EWC. By default, the date/time on EWC is configured to synchronize using the Network Time Protocol (NTP) server provided by the Debian network time pool. Based on this setting, the synchronization can only occur if EWC has access to the Internet.

If EWC does not have access to the Internet, the NTP server of the Debian network time pool does not work; and its date/time will be out of sync. If your network, isolated from the Internet, has its own NTP, EWC can be instructed to use that NTP server. If your network does not have an NTP server, you may synchronize the date/time manually or with that of the local device (your PC or laptop). We outline these procedures as follows:

48.8.1 Local NTP Server

This setup procedure is useful for EWC that is isolated from the Internet and an alternative NTP server is available to provide date/time synchronization. EWC synchronizes its date/time using the NTP server directive on the first line (top line) of the list (as depicted in the following figure). Therefore, a desired NTP server must occupy the top line.

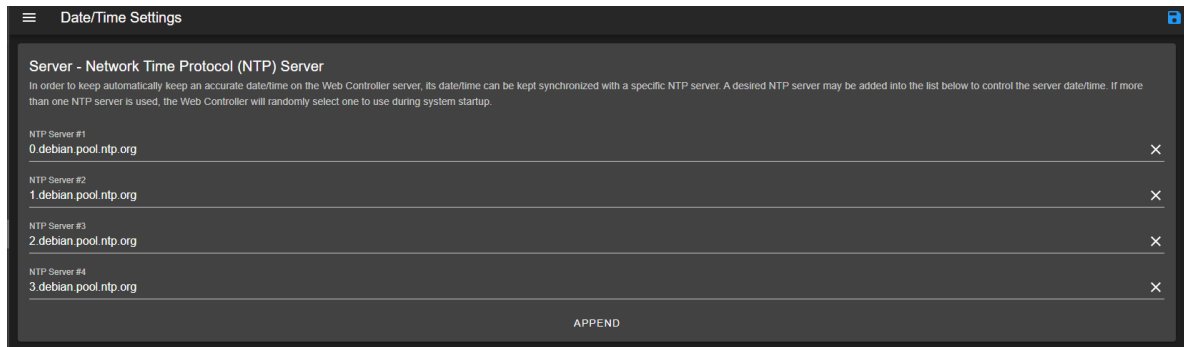


Figure 48.107: Directives for NTP Server

Complete the following steps to set up EWC to use a local NTP server:

1. Log in as admin
2. Click (or select) **Settings** in the menu bar
3. Click (or select) **Date/Time Settings**
4. Edit the hostname or IP address of the local NTP server to occupy the top line (using the **NTP Server # 1** field), with the exact format in that field. For example, 0.IP-address will be 0.10.30.200.222; for hostname, it will be 0.mylocalTserver.com, etc.
5. Click the **Save** button in the upper-right corner to save the current settings.

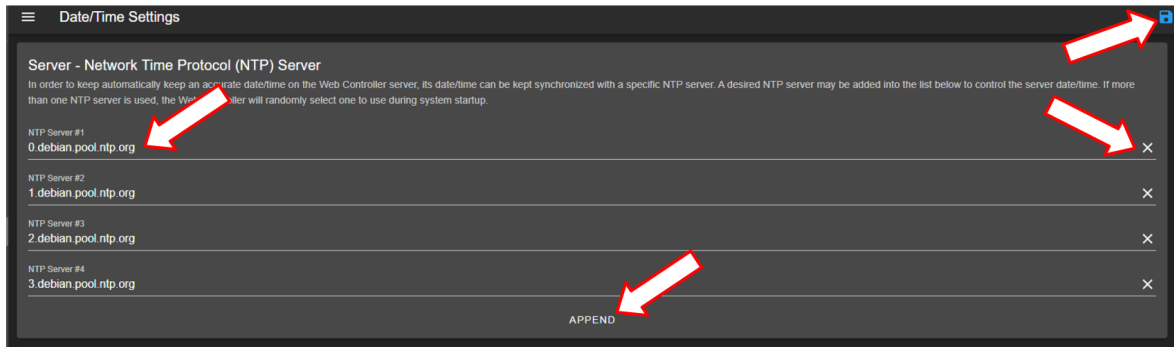


Figure 48.108: Editing the NTP server directive for local timer server

Note: The X or APPEND buttons indicated by the arrows can be used to delete/remove or add a new directive. A new directive will be added to the bottom of the list. This option may be useful for archiving or saving the original directive in the top line.

48.8.2 Manual Date/Time Configuration

The date/time of EWC can also be configured manually. Complete the following steps to edit the date/time on EWC:

1. Log in as admin
2. Click (or select) **Settings** in the menu bar
3. Click (or select) **Date/Time Settings**
4. Scroll down the page to **Server - Date/Time** and click or select the date/time field under **Current Server Date/Time**.

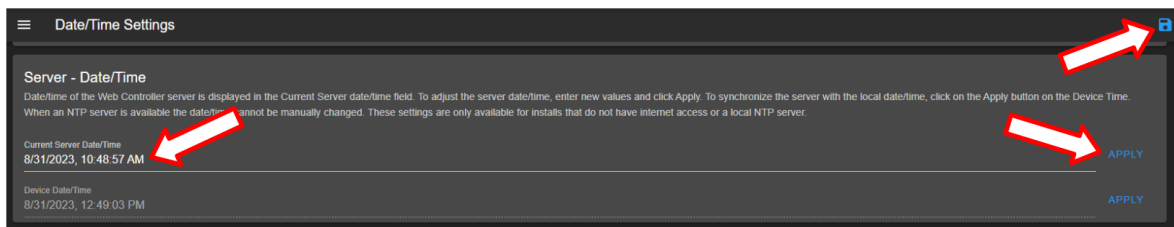


Figure 48.109: Apply date/time setting on EWC

5. Make the necessary adjustments using the drop-down calendar and time as depicted in the following figure.

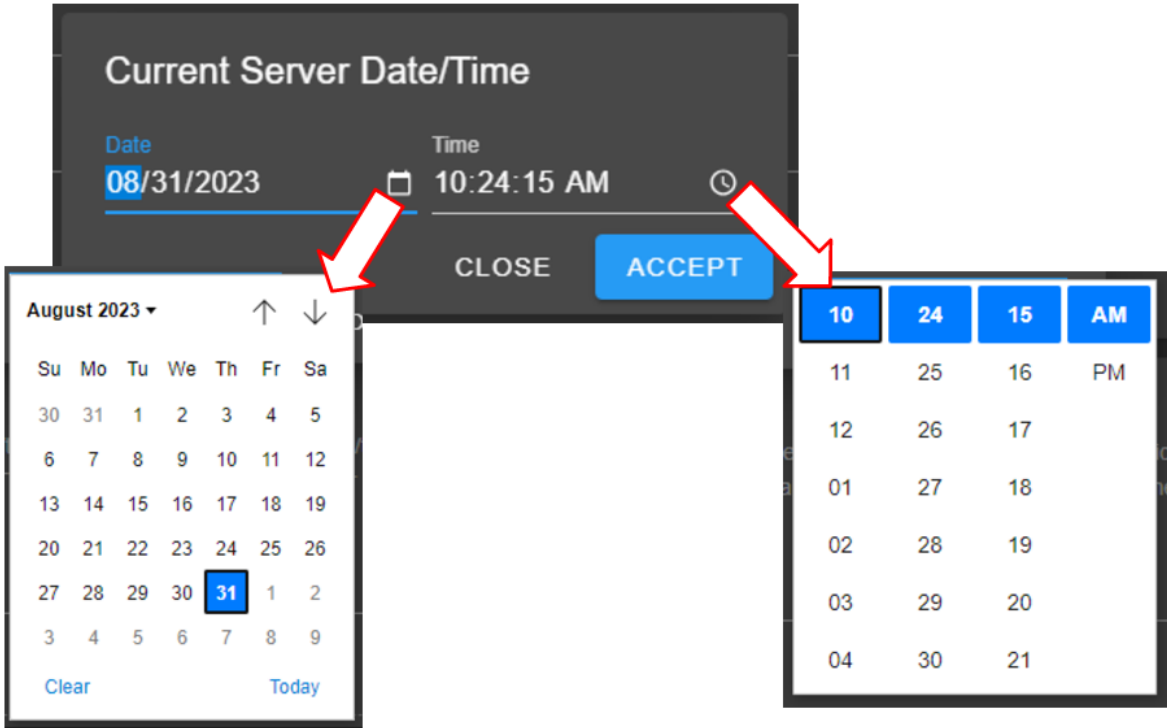


Figure 48.110: Manually editing date/time on EWC

Note: On a touchscreen system, the calendar and time adjustment is depicted as follows:

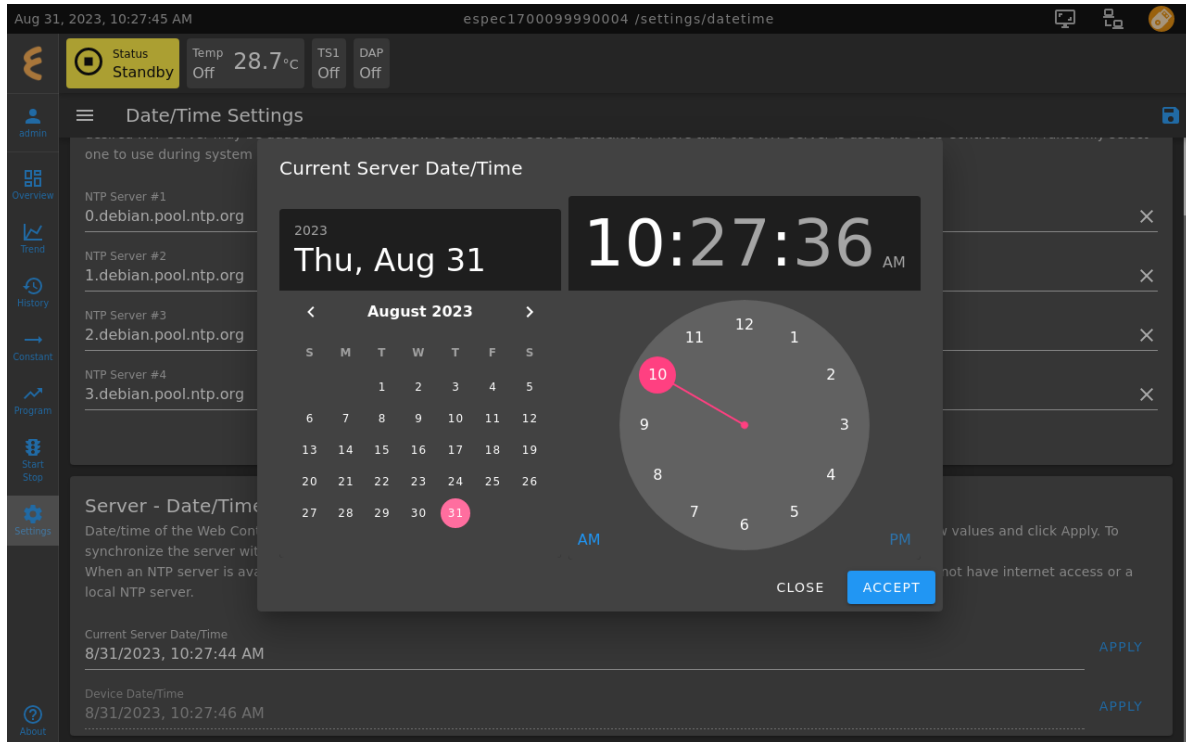


Figure 48.111: Manually editing date/time on EWC

6. Close the date/time calendar.
7. Click the **APPLY** button on the right.
8. Click the **Save** button in the upper-right corner, as indicated by the arrows in the figure of step 4.

48.8.3 Automatic Synchronization

If a local NTP server is not available and EWC does not have access to the Internet, such as a standalone system (custom F4T or T-series chamber), the date/time of EWC can be configured to synchronize with the local date/time of your laptop/PC (provided it has the correct current date and time). This synchronization will take place automatically via the Web browser that was used to access EWC from the said laptop/PC.

1. Set up a simple static network system to consist of chamber and laptop/PC, as illustrated below. Refer to the **Initial Setup** for detail.

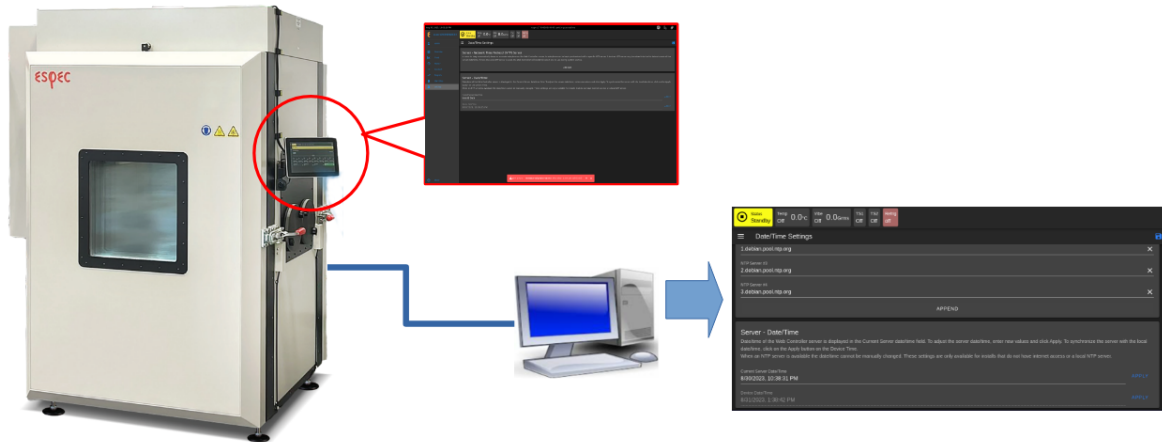


Figure 48.112: Synchronize EWC date/time on local device

Note: The above figure also illustrates a scenario with a chamber equipped with its default touchscreen HMI, where date/time synchronization cannot be applied (indicated **Invalid Date** in the **Current Server Date/Time** field).

2. Access EWC via its hostname or IP address (192.168.0.83 or a static IP address assigned to it).
3. Log in as admin
4. Click (or select) **Settings** in the menu bar
5. Click (or select) **Date/Time Settings**
6. Scroll down the page to **Server - Date/Time**.
7. Confirm that date/time under the **Device Date/Time** field is current and correct.
8. Click the **APPLY** button on the right.
9. click Save.

48.9 Email Settings

The **Email Settings** submenu provides a few practical features. It includes setting email encryption, password authentication, administrator's account recovery and alert via email about the operating condition(s) of the chamber. By default, the mail server is configured without a password authentication or encryption.

Email Settings

Chamber alerts can be notified via e-mails. Use this page to set up the e-mail server and add your e-mail addresses for alert notifications. Enter your e-mail address in the AlertAddresses field and click Save.

Host	smtp.office365.com	Host name or IP address of the mail server.
Port	587	TCP port used by the mail server.
Send As	chamber_controller@espec.com	The sender of the email. In many cases this must match User.
Require Authentication	<input checked="" type="checkbox"/>	A username/password must be used to send the email.
Require SSL/TLS	<input type="checkbox"/>	The mail server connection must be started with encryption.
User	chamber_controller@espec.com	The username used for authenticating with the mail server.
Password	<input type="password"/>	The password used for authenticating with the mail server.
Account Recovery E-Mail	<input type="text"/>	This email is to reset the admin account when it is misconfigured or the password is forgotten.
Recipients	<input type="text"/>	The users the email will be sent too. One address per line.

Figure 48.113: Options of e-mail settings page

48.9.1 Mail Sever Encryption and Password Authentication

To set up the mail server connection with encryption, place a check mark in the **Require SSL/TLS** box and apply the **Save** button (indicated by the arrow). To set up a password authentication for the mail server, enter the password in the **Password** field and apply the **Save** button again.

Email Settings

Require Authentication ☒ A username/password must be used to send the email.

Require SSL/TLS ☐ The mail server connection must be started with encryption.

User chamber_controller@espec.com The username used for authenticating with the mail server.

Password The password used for authenticating with the mail server.

Account Recovery E-Mail This email is to reset the admin account when it is misconfigured or the password is forgotten.

Figure 48.114: Configure encryption and password authentication

48.9.2 Account Recovery Email

To set up the administrator's account recovery, enter the e-mail address in the **Account Recovery E-Mail** field and apply the **Save** button (indicated by the arrow). A one-time password will be sent to this e-mail address to recover the administrator's account.

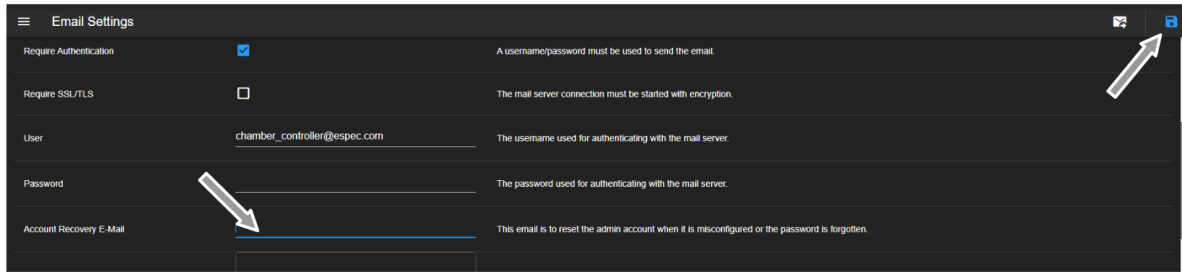


Figure 48.115: Configure administrator's account recovery

48.9.3 Setting Email Alert

To set up e-mail alert to receive notification of the operating conditions of the chamber, complete the following steps:

1. Enter the recipient's e-mail address in the **Recipients** box (indicated by the arrow). Multiple e-mails can be used in the **Recipients** box with one e-mail address per line.
2. To test an e-mail notification, click the **Test Email** button (shown in the following figure). **Note:** EWC uses SMTP Office 365 for the e-mail protocol and therefore it must have access the Internet in order for the e-mail notification to operate.

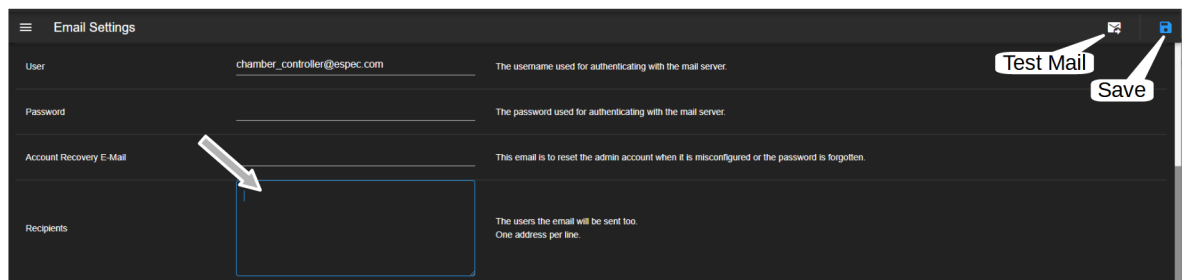


Figure 48.116: Setting up email alert for single or multiple recipients

3. To save the settings, click the **Save** button in the upper-right corner (as shown in the above figure).

48.10 Firmware

EWC is designed with the ability to continually receive improvements in the form of a firmware update to provide bug fixes and firmware (software) upgrade with new features. Firmware update applies one of two approaches:

1. Automatic Firmware Updates,
2. Offline Firmware Updates (Manual).

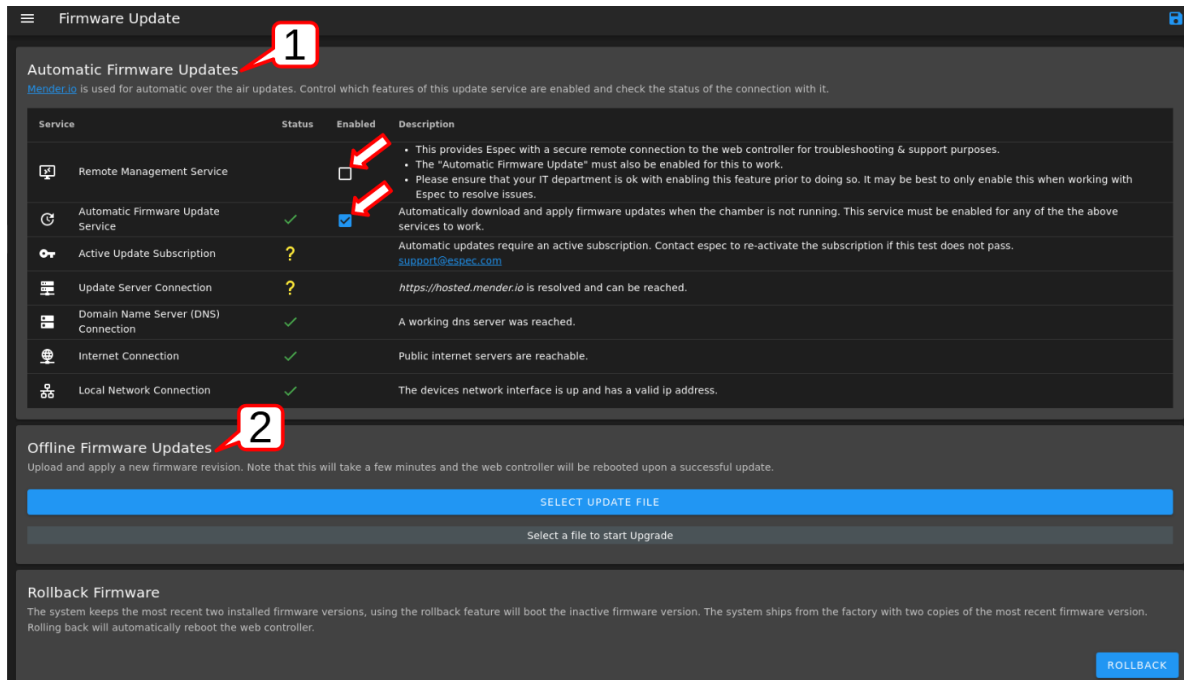


Figure 48.117: Firmware update options

EWC has been carefully designed to be robust and stable, incorporating a mechanism to protect its operation during a firmware update. Technically, the system keeps two versions of the firmware: (1) Current version of the operating firmware, (2) Previously installed version.

EWC switches its operation on the new firmware immediately after a successful update. All configuration and data logging files will be brought over to operate on the new firmware. The transition is so subtle, mostly taking place internally, that the operator may not even notice the changes in the system. If firmware update fails, the system reverts to its previous version known to be in the stable state until the update issue is resolved.

48.10.1 Automatic Update and Remote Management Service

Each EWC has a unique registration number based on the chamber serial number which is used to identify each EWC for an automatic firmware update through the cloud service provider called Mender. The process provides remote service support with risk tolerant and efficient over-the-air updates. Automatic firmware update is enabled by default with the check mark in the box (depicted in the previous figure). It can be turned off by removing the check mark and saving the settings with the **Save** button (upper-right corner).

The remote management service, disabled by default, is a feature that allows ESPEC software engineering team to access and troubleshoot your EWC remotely through Mender. This feature requires enabling **Automatic Firmware Update Service** which in turn requires that EWC has access to the Internet as indicated in the previous figure.

Customer and their IT department have complete control and freedom to dictate the use of Mender cloud service and remote management service. Should they decide to use the service, they must enable it as follows:

1. EWC must have access to the Internet.
2. Log into EWC as **admin**.
3. Access the **Firmware** submenu under **Settings**.
4. Enable the Remote Management Service (by checking the “Enable” box).
5. Click the **Save** button (in the upper-right corner) to apply the setting.
6. Reboot EWC (refer to the “Server Settings” section on how to reboot the system).

48.10.2 Offline Manual Update via HMI

For a standalone system (e.g., T-series and Custom F4T chambers with a touchscreen), disconnected from a network or the Internet (see the following figure), automatic update via the cloud service cannot be completed.

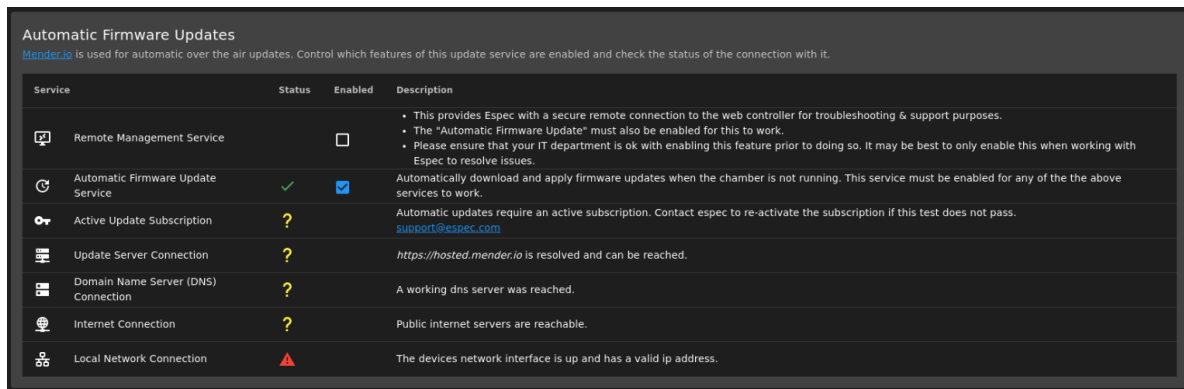


Figure 48.118: Firmware update on an isolated system

For such a system, the following procedure must be performed:

1. Set the chamber in Standby mode.
2. Obtain Firmware Update Package from ESPEC and store it on a USB device.
3. Plug the USB device (from step 2) into the USB port of EWC, located at the base of the touchscreen (or at the base of its arm).
4. Select the **Settings** menu, then select **Firmware** submenu.
5. Touch the blue bar with “SELECT UPDATE FILE” (in the **Offline Firmware Updates** panel), as indicated by the arrow in the figure.

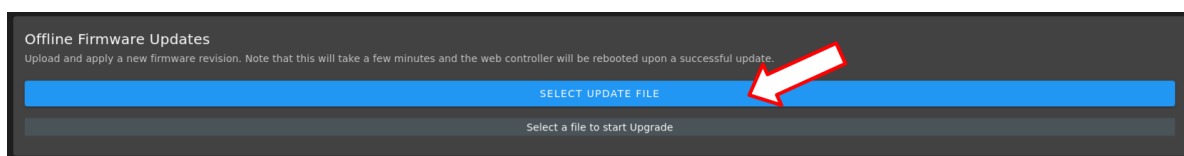


Figure 48.119: Update package via the blue bar

6. A list of files on the USB device is displayed. Locate and select (touch) the package with **.mender** extension and confirm its name is listed under the **File Name** field (see arrow), then apply the update using the **OPEN** button.

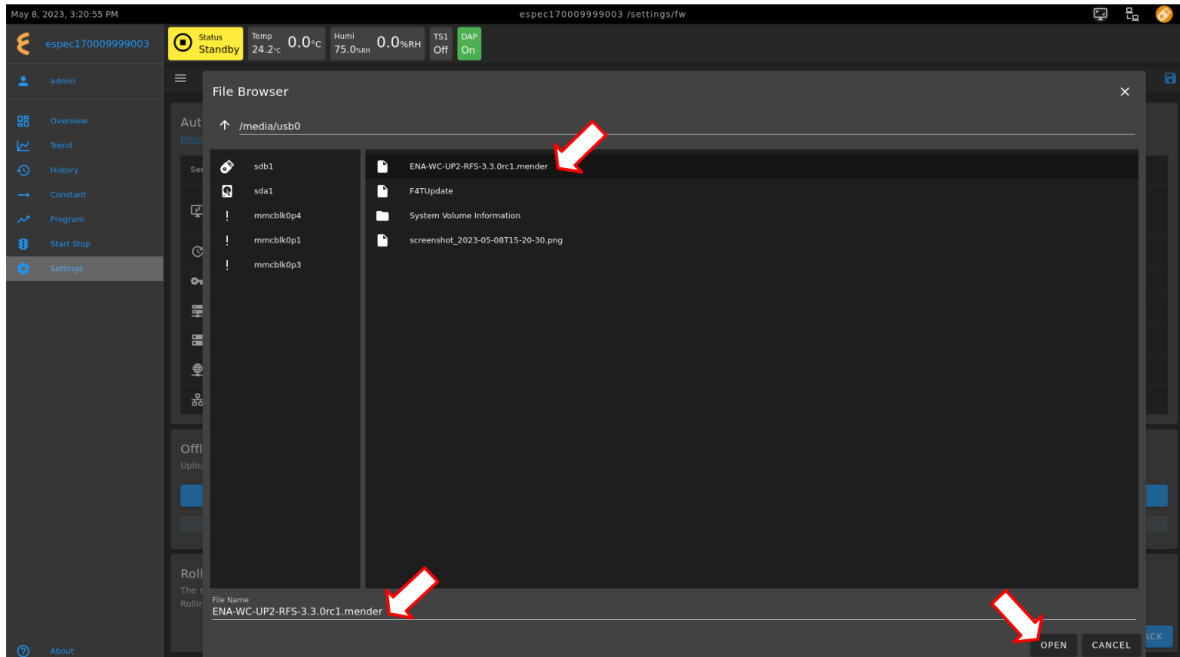


Figure 48.120: Select and proceed to apply firmware update

7. The system begins to upload the update file which will take several minutes.
8. When update is complete, reboot the system with the **REBOOT** button.

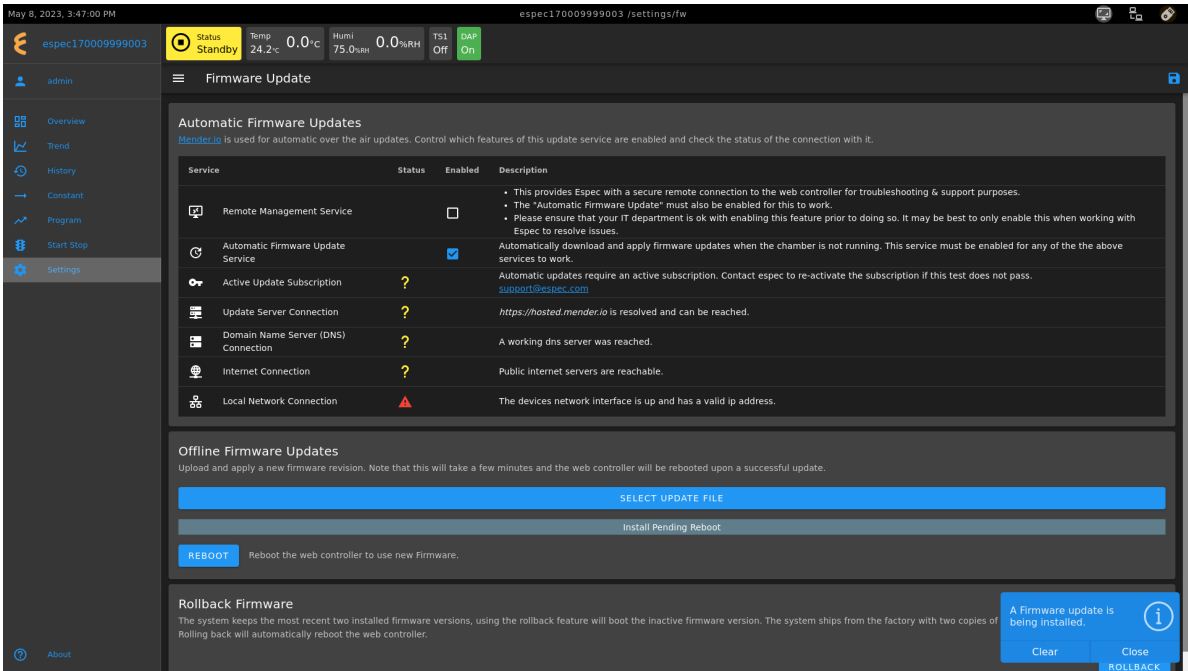


Figure 48.121: firmware update is complete

9. Your EWC has been updated. Its new firmware version can be found under the **About** menu.

48.10.3 Offline Manual Update via Local Network

For a system on the local network without access to the Internet, firmware update is still possible. This situation is depicted in the following figure.

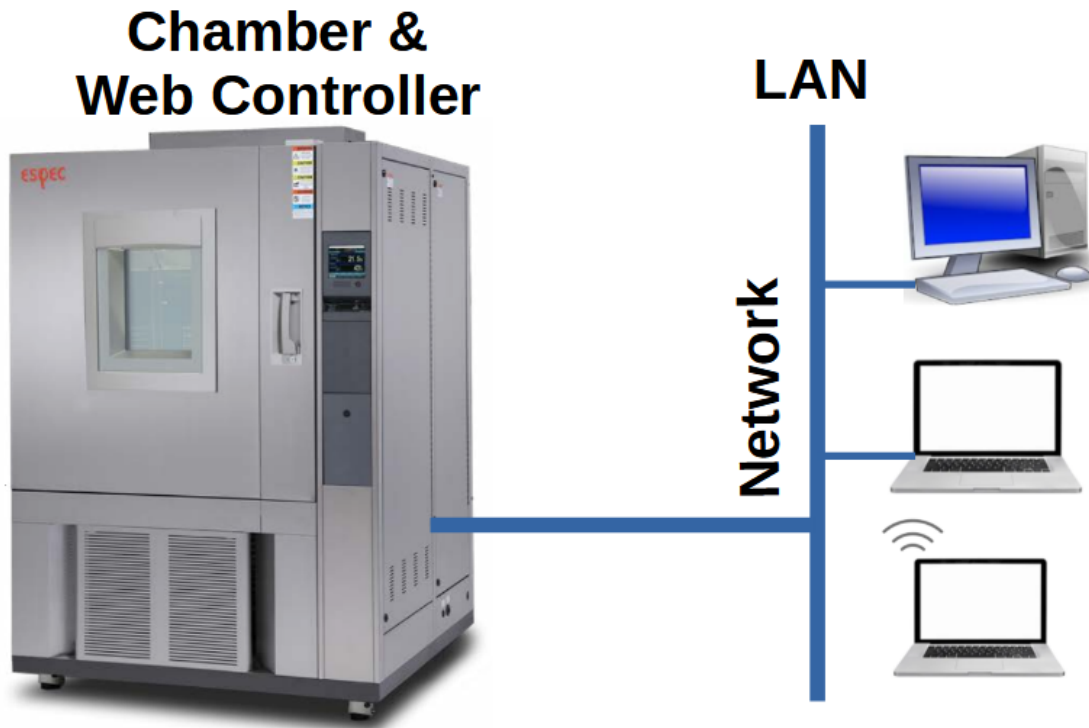


Figure 48.122: Manual firmware update from a PC

Complete the following steps to apply the manual firmware update:

1. Obtain Firmware Update Package from ESPEC and store it on the local computer.
2. Access EWC from the local PC (Step 1) and log in as the administrator.
3. Click **Settings** on the menu bar.
4. Click **Firmware** in the submenu.
5. Drag-and-drop the package in the white box (indicated by the arrow), or click the white box and browse through a folder for the package on the local computer.

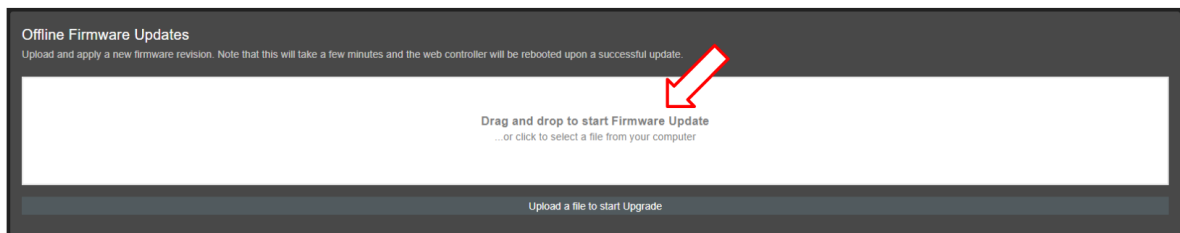


Figure 48.123: Manual update configuration

6. Once an update package has been loaded, the system begins to install the new firmware, as shown in the following figure.

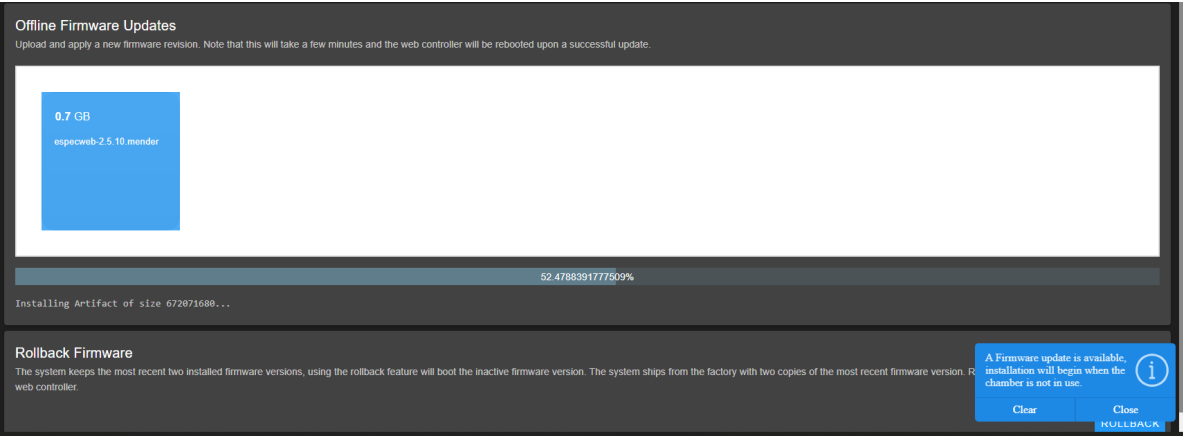


Figure 48.124: System moves to perform firmware update

7. Click **REBOOT**, as indicated in the figure, to restart the system.

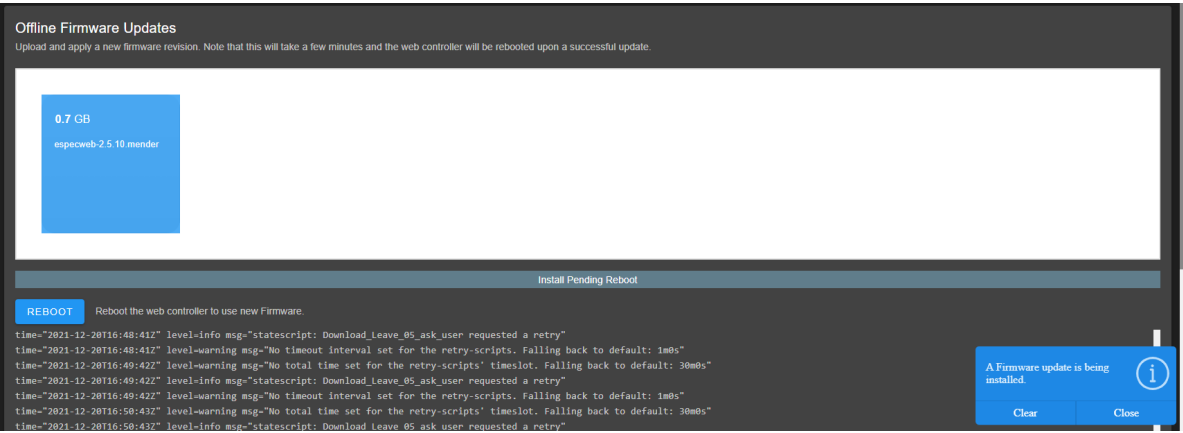


Figure 48.125: Firmware update is complete

48.10.4 Rollback Firmware

EWC can rollback its firmware to the previous stable state by clicking on the **ROLLBACK** button as depicted in the following figure.

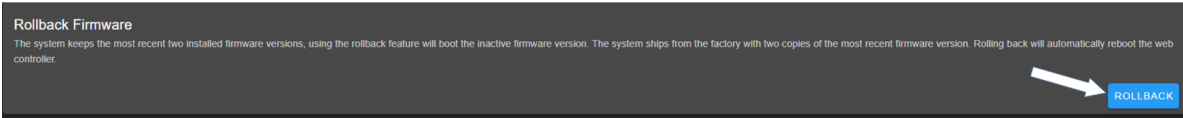


Figure 48.126: Rollback a firmware update

48.11 HMI Settings

The **HMI Settings** submenu is available only when EWC detects a monitor (touchscreen or non-touchscreen) directly connected to its HDMI or video display port during its startup (i.e., during

booting). The following figure depicts the **HMI Settings** submenu displayed on the detected touchscreen. This submenu is not visible on the **Settings** submenu when accessed via a Web browser on a local computer (on the local network).

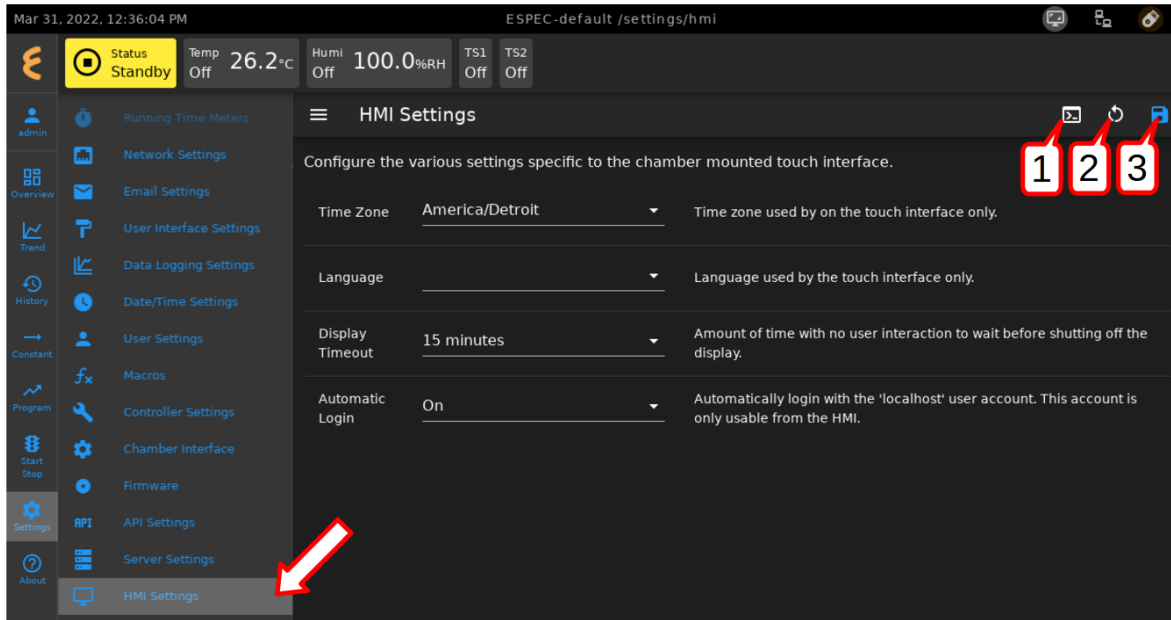


Figure 48.127: HMI setting options

The **HMI Settings** submenu has three manipulation buttons or options on the upper-right corner, described as follows:

1. **Terminal:** This option is currently disabled for security reasons.
2. **Restart Application:** Click the refresh icon to apply or clear changes on the HMI setting and restart the UI application.
3. **Save:** Click the **Save** button to save changes on the current settings.

Four different HMI setting options are available for configuration:

1. Time Zone,
2. Language,
3. Display Timeout
4. Automatic Login

These four options have specific description to support their functionality. as depicted in the following figure, via the drop-down menu and via the on-screen keyboard.

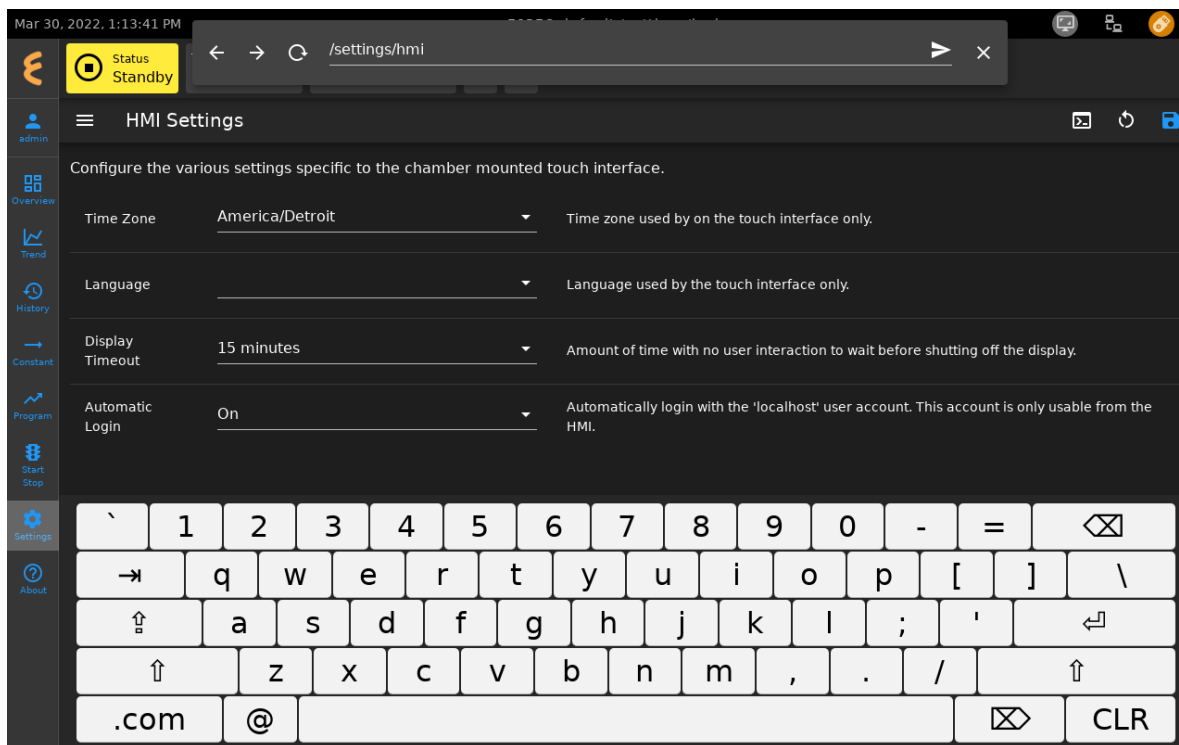


Figure 48.128: Using on-screen keyboard

48.12 Network Settings

The **Network Settings** page allows the administrator to manage network settings on EWC. This page consists of three separate panes to display the specific network information and settings of the system. They are listed and described as follows.

Network Interface Configuration (eth0): The first pane displays network information of EWC, its hostname, network type and configuration. As depicted in the following figure, this EWC is part of a DHCP network, as confirmed by the check mark in the DHCP box and the IP address listed in the second pane (below) under the **eth0** column.

If EWC is not part of a DHCP network and is not using a static networking protocol, EWC will use its fallback static network protocol with IP address 192.168.0.83 (appears in the IP address field and in the second pane under **eth0**). A PC connected directly to **eth0** via a cross-over cable or a network hub can access EWC using the same subnet. If EWC is not connected to any network or its **eth0** is unplugged, the **eth0** entry in the second pane will be empty. The DHCP check mark remains in the box to indicate that EWC is ready to join a DHCP network (if available).

Network Interface Configuration (eth0)

Hostname	espec17000999003	Name of the server
DHCP	<input checked="" type="checkbox"/>	Get network settings automatically
Fallback static network settings, used when DHCP lease fails. See next section for current network status.		
IP Address	192.168.0.83	Static IPv4 Address
Net Mask	255.255.255.0	Static subnet mask
Gateway	192.168.0.1	Static gateway
DNS1	192.168.0.1	Static primary domain name server
DNS2	8.8.8.8	Static backup domain name server

Figure 48.129: Fallback static network information of EWC

The following figure shows how EWC uses a static network protocol. The DHCP box is unchecked and its static network information is displayed in the IP address field in the first pane and under **eth0** in the second pane.

Network Interface Configuration (eth0)

Hostname	espec17000999003	Name of the server
DHCP	<input type="checkbox"/>	Get network settings automatically
IP Address	10.30.200.237	Static IPv4 Address
Net Mask	255.255.0.0	Static subnet mask
Gateway	10.30.0.1	Static gateway
DNS1	10.30.30.31	Static primary domain name server
DNS2	10.30.30.23	Static backup domain name server

Figure 48.130: Static network information and setting of EWC

Current Network Status: The EWC hardware (Up2Board) has two Ethernet ports, labeled as **eth0** and **eth1** each is preconfigured for a specific network function; **eth0** is preconfigured to join the main network while **eth1** is reserved for an internal network connection with a PLC (e.g., T-series or F4T). Thus, this pane displays the network status for both ports. While the first pane (above) already displays enough information for EWC and its **eth0**, this pane displays the MAC address of each port, which can be used to confirm or set up a network connection. As shown in the figure, **eth1** is unused, designated by the special-use case of 169.254.213.60 assigned by an interface.

Current Network Status		
	eth0	eth1
IPv4 Address	10.30.100.41	169.254.213.60
IPv4 Netmask	255.255.0.0	255.255.0.0
IPv4 Gateway	10.30.0.1	
IPv6 Address		
IPv6 Netmask		
DNS	10.30.30.31 10.30.30.23 10.30.30.21	10.30.30.31 10.30.30.23 10.30.30.21
MAC	00:07:32:7b:3a:a1	00:07:32:7b:3a:a2

Figure 48.131: EWC with no internal network

For an internal network connection with Watlow F4T, **eth1** contains network information as depicted in the following figure.

Current Network Status		
	eth0	eth1
IPv4 Address	10.30.100.41	10.30.200.241 169.254.213.60
IPv4 Netmask	255.255.0.0	255.255.255.240 255.255.0.0
IPv4 Gateway	10.30.0.1	
IPv6 Address		
IPv6 Netmask		
DNS	10.30.30.31 10.30.30.23 10.30.30.21	10.30.30.31 10.30.30.23 10.30.30.21
MAC	00:07:32:7b:3a:a1	00:07:32:7b:3a:a2

Figure 48.132: EWC and internal network

DHCPD Output Logs: The third pane is for network debugging purposes. Generally, it displays information produced by the output logs of the dhcpd system service to determine network lease or connection issues.

<p>DHCPD output logs</p> <p>Useful for debugging DHCP lease problems.</p>

Figure 48.133: network-settings-dhcpd-001.PNG

48.12.1 Network Information on a Standalone System

For a standalone system, such as the T-series and custom F4T chamber, no network setting is required. The first pane shows its fallback network setting. However, with its DHCP enabled (default from the factory), the system can readily join a DHCP network as soon as it detects one.

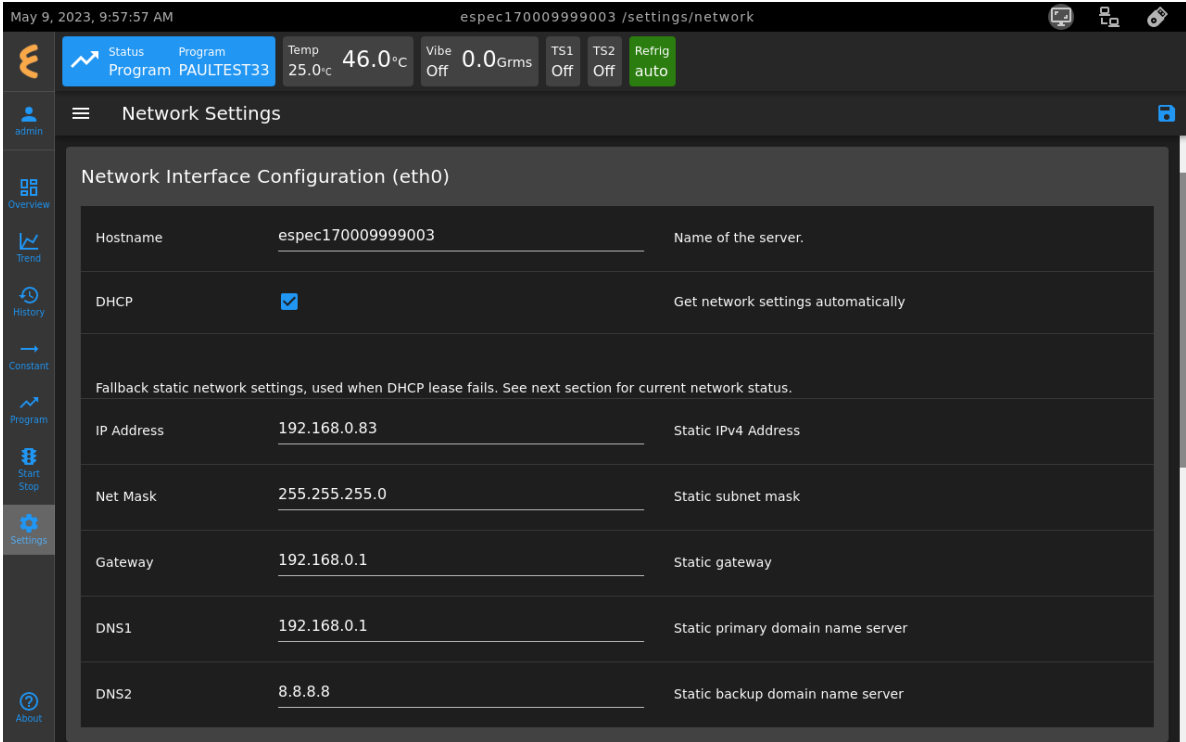


Figure 48.134: No network setting for a standalone system

The second pane does confirm the network status of EWC as a standalone system with no IP address listed under the **eth0** column.

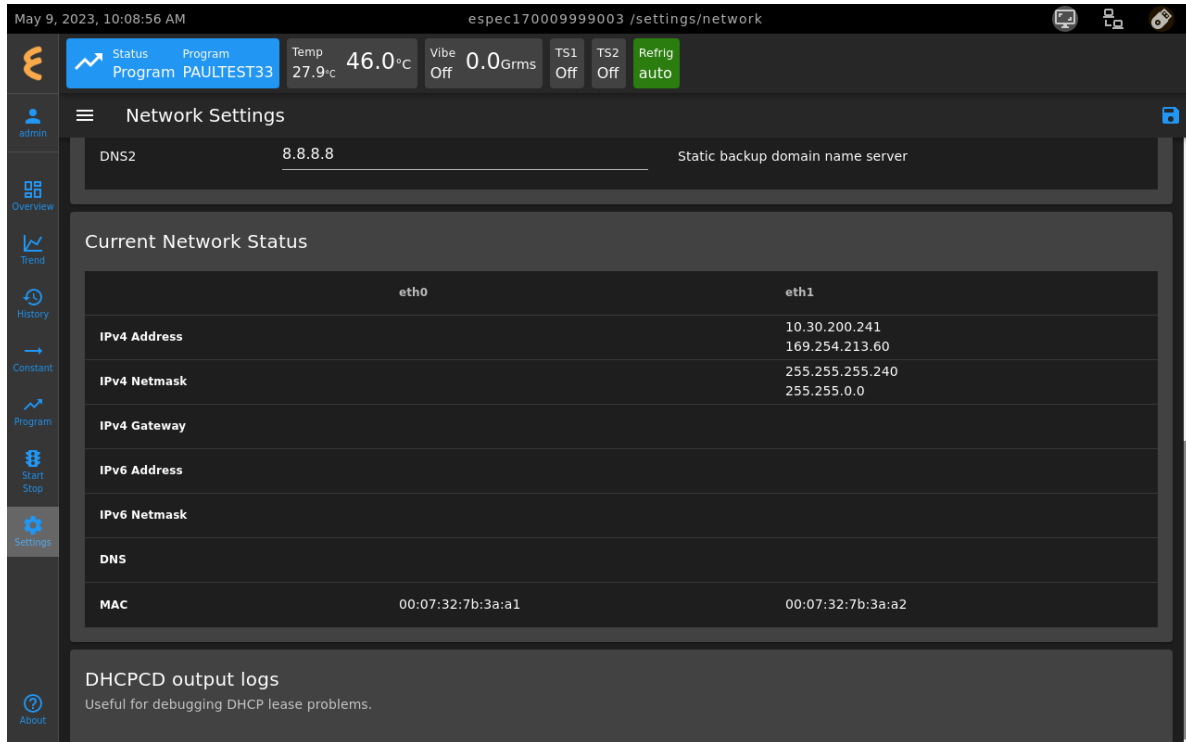


Figure 48.135: No network confirmation

48.12.2 Set Hostname

A unique and descriptive hostname for EWC may be configured by editing the **Hostname** field. Complete the following steps to set a new hostname:

1. Click **Hostname** field.
2. Delete the existing hostname.
3. Enter a desired hostname (using alphanumeric).
4. Click the **Save** button as shown in the following figure.

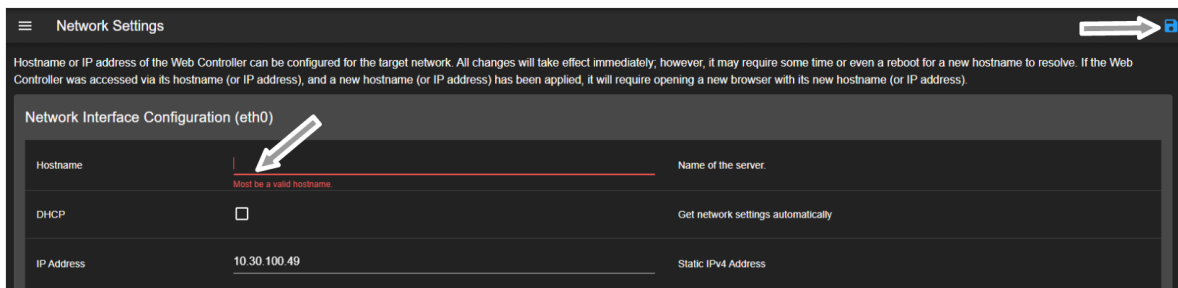


Figure 48.136: Changing a hostname on EWC

The setting will take effect immediately after the **Save** button is applied. It will then try to resolve and refresh the Web page. However, if EWC was accessed via its now old hostname, it may not be able to resolve and refresh the Web page. If the **Server is Offline** message (shown

in the figure) took more than several minutes, a new Web browser (or tab) is required to access EWC via its new hostname.

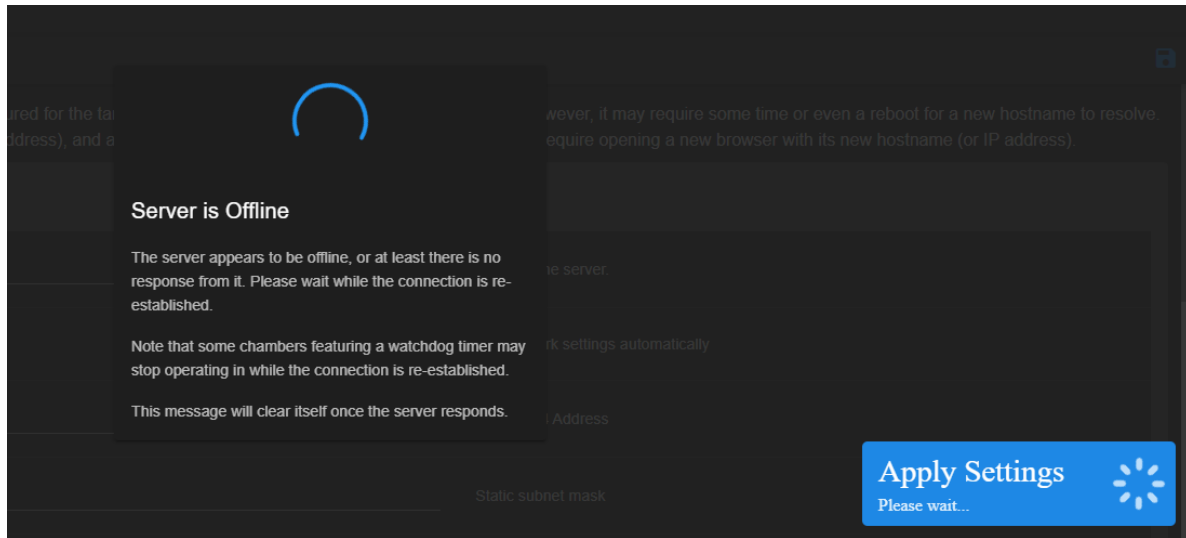


Figure 48.137: Apply static network setting

48.12.3 Set Static Network

A static network configuration can be accomplished by unchecking the DHCP box and entering a desired IP address and its static protocol settings, which includes the appropriate Subnet Mask (or Net Mask), Gateway and DNS values specific to the Network Class (such as, Class A, B or C).

1. Uncheck the DHCP box.
2. Enter a desired IP address.
3. Enter the appropriate Net Mask.
4. Enter the appropriate Gateway.
5. Enter the appropriate DNS1 and DNS2.
6. Click **Save** to apply the setting.

EWC first validates the new settings before it applies them. after validation, EWC immediately applies the new settings. It will then try to resolve and refresh the Web page. If EWC was accessed via its IP address (which is now obsolete), it may not be able to resolve and refresh the Web page. If the **Server is Offline** message took more than several minutes, open a new Web browser (or tab) and navigate to EWC via its new IP address (step 2 above). The following figure depicts an example of a static network setting.

Network Interface Configuration (eth0)

Hostname	espec17000999003	Name of the server:
DHCP	<input type="checkbox"/>	Get network settings automatically
IP Address	10.30.200.237	Static IPv4 Address
Net Mask	255.255.0.0	Static subnet mask
Gateway	10.30.0.1	Static gateway
DNS1	10.30.30.31	Static primary domain name server
DNS2	10.30.30.23	Static backup domain name server

Figure 48.138: EWC and its static network setting

WARNING!: EWC has and uses its own predefined static IP network (called fallback static network) based on a Class C configuration. If you decide to stop using the above static network setting, it is highly recommended to reset the fallback static IP address to EWC's predefined setting. To do this, complete the following procedure to revert EWC back to its fallback IP address:

1. Check the DHCP box.
2. Enter 192.168.0.83 in the IP address field.
3. Click **Save** to apply the setting.

This configuration will ensure two things: 1. When EWC connects to a DHCP network, it will be able to join it with a new leased IP address assigned by the DHCP server. 2. When EWC connects directly to a PC, it will use its expected fallback static IP address (192.168.0.83).

48.12.4 Set DHCP Network

If EWC has been configured to use a static IP address, as shown in the following figure, it is possible to revert the setting back to DHCP.

Network Settings

Hostname or IP address of the Web Controller can be configured for the target network. All changes will take effect immediately, however, it may require some time or even a reboot for a new hostname to resolve. If the Web Controller was accessed via its hostname (or IP address), and a new hostname (or IP address) has been applied, it will require opening a new browser with its new hostname (or IP address).

Network Interface Configuration (eth0)

Hostname	WebDevTseries	Name of the server:
DHCP	<input checked="" type="checkbox"/>	Get network settings automatically
IP Address	10.30.200.232	Static IPv4 Address
Net Mask	255.255.0.0	Static subnet mask
Gateway	10.30.0.1	Static gateway
DNS1	10.30.30.31	Static primary domain name server
DNS2	10.30.30.23	Static backup domain name server

Figure 48.139: Reverting static network setting to DHCP

Complete the following steps:

1. Enable the DHCP box with a check mark.
2. Click the **Save** button.

The system moves immediately to apply the setting. The **Server is Offline** message appears while EWC tries to resolve and refresh its Web page. If the **Server is Offline** message took more than several minutes, a new Web browser (or tab) is required to access EWC via its host-name.

48.12.5 Fallback Static IP

As discussed in the **Initial Setup and First-Time Use** section, EWC applies a DHCP protocol as its default setting. In the absence of a DHCP server, EWC falls back to use its preconfigured static IP address based on Class C network protocol:

- **IP Address:** 192.168.0.83
- **Subnet Mask:** 255.255.255.0
- **Gateway:** 192.168.0.1

However, if your EWC has been configured to use a static IP address, as described in the previous section, when connected to any network (static or DHCP), EWC will continue to use the static IP address previously configured by you. That is why it is important to revert your EWC back the DHCP mode before moving it to a new network so that if or when it connects to any network, it will be able to join a DHCP network or use its fallback static IP address.

48.13 Server Settings

The **Server Settings** page is the “flight control center” for EWC, where the entire set of operations and system processes can be monitored, managed and controlled. This page contains a long list of different groups of services to support EWC maintain a smooth operation. Different services are categorized as tabs in the service bar (indicated by the arrow in the figure).

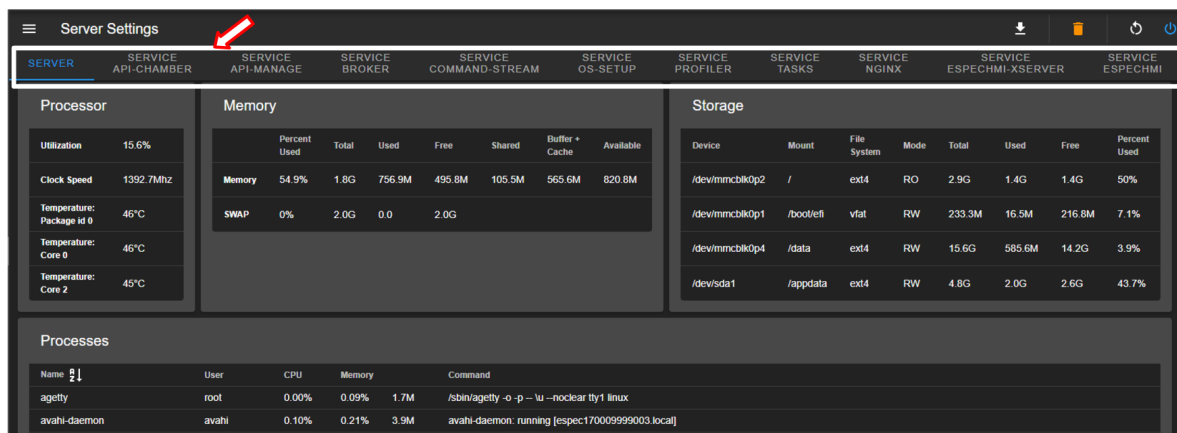


Figure 48.140: Server settings control center

By default, the **Server Settings** page displays the **Server** tab (see the following figure) that provides the status of hardware and software resources of EWC, grouped into five separate panes: (1) **Processor**, (2) **Memory**, (3) **Storage**, (4) **Processes** and (5) **Miscellaneous**.

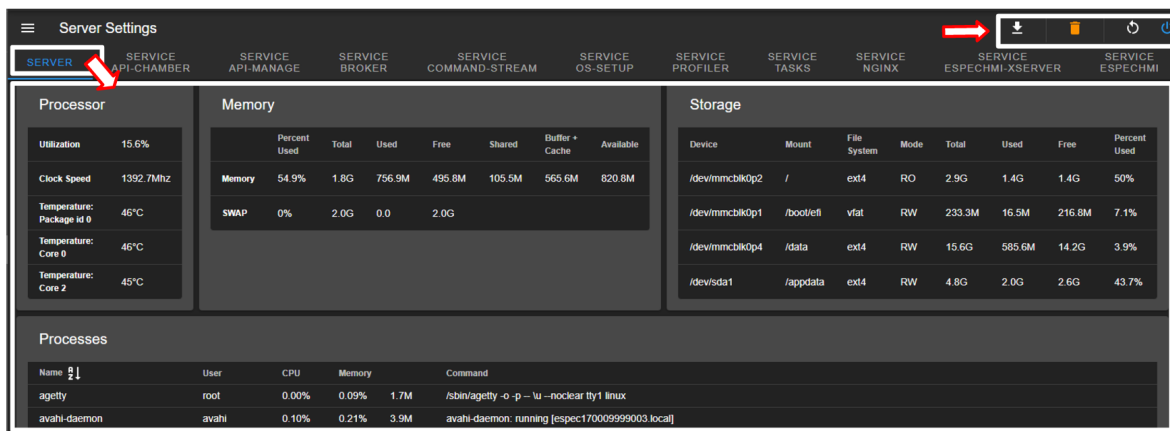


Figure 48.141: Server settings main display page

The **Processor** pane provides a quick summary of the CPU clock speed, its status and current utilization. Available physical memory (called RAM) displayed in the **Memory** pane can be used to assess EWC's performance if it suddenly becomes non-responsive.

Information about the embedded system and EWC itself is revealed in the **Storage** pane which lists the partitions and their current usage. The embedded system is kept secured with the root partition (called /) mounted as read-only, designated under the Mode column as **RO**. The first root partition being used by the embedded system is **/dev/mmcblk0p2**. The second root partition (inactive and thus not listed) uses **/dev/mmcblk0p3** as its device name. This partition will be used to perform a system update to switch EWC to run on it upon a successful update; and the process perpetuates between **/dev/mmcblk0p2** and **/dev/mmcblk0p3** indefinitely for as long as update requires.

Data collected from the chamber will be stored on a separate storage device with 8GB of storage capacity mounted as **/appdata**. An operator can use this information to determine when the logged data will use up all the available storage space and when it should be deleted to free up storage space. EWC also monitors the size of the data file to ensure there is always enough storage space for it.

A list of different services (i.e., processes) is depicted under the **Processes** pane, showing all currently running processes that are supporting EWC and its operations. All of which are being managed (or controlled) by the services in the SERVICE tab. The **Miscellaneous** pane keeps a log of EWC operation, such as uptime or downtime.

The second tab in the service bar is **SERVICE API-CHAMBER**. This tab (indicated by the arrow) manages a process called wsgi which is responsible for defining a standard interface for communication between an application or framework and a web server. It basically defines an API interface to support other protocols.

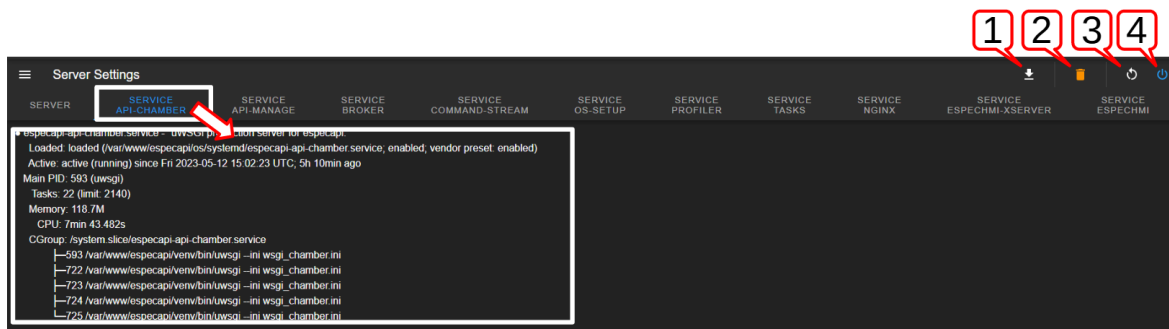


Figure 48.142: Initialization service

Over time, disruption by various conditions may affect these services. Sometimes, a certain set of services (called daemons) running in the background may get interrupted or hung and must be restarted to bring them back to normal operation. Individual services that hang can also be restarted. To help manage these services, the **Server Settings** page has three buttons (indicated by the arrow in the upper-right corner) labeled and described as follows:

1. **Download Service Logs:** To help the operator determine issues related to the performance of EWC, these issues are collected and stored as **service logs**. To download **service logs**, click the **Download Service Logs** button. The log file (named **response.html**) will be stored in the Downloads folder which can be viewed using a Web browser, as depicted in the following figure.

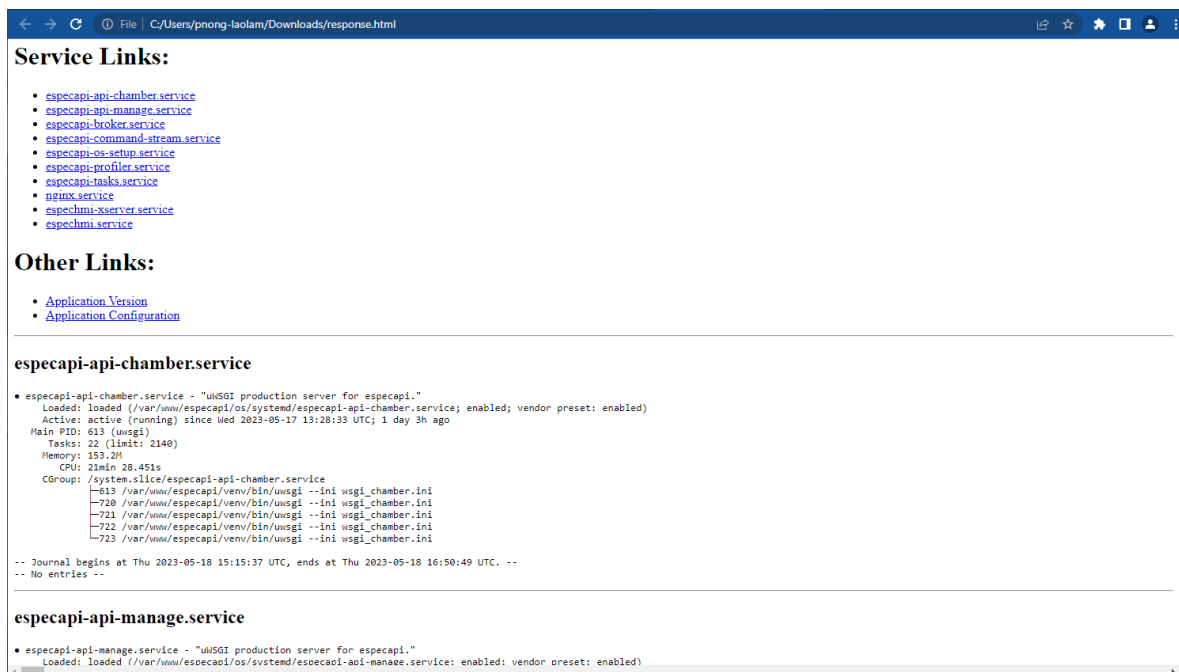


Figure 48.143: Service logs of embedded system

2. **Factory Reset:** This button will reset EWC to its factory setting.
3. **Restart Services:** If any service got hung, this button can restart all the affected services

by initiating all services in the proper order to restore operation.

4. **Reboot Server:** Rebooting EWC will be the last resort when individual services cannot be restarted in the proper order to restore operation.

48.13.1 Restart Services

EWC has a list of different services (called daemons) running in the background to manage the overall operation of the system. These daemons caused by various conditions may stop running to provide the service, such as losing connection with the chamber. When that happens, that particular daemon responsible for maintaining connection to the chamber can be restarted without rebooting EWC.

When an error has occurred, EWC flags that error message in the status bar and a pop-up error message at the bottom of the main display, as depicted in the following figure.

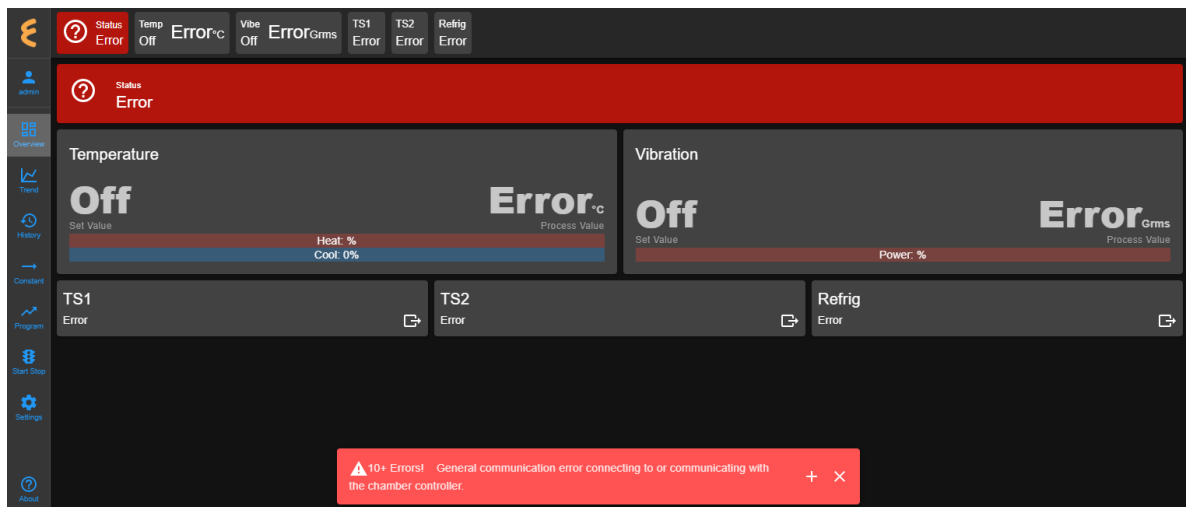


Figure 48.144: Operation error on EWC

The pop-up error message can be expanded (via the + button) to reveal detail of the actual error. As depicted in the following figure, EWC has lost communication with the chamber; this error must be resolved before EWC can resume its operation.

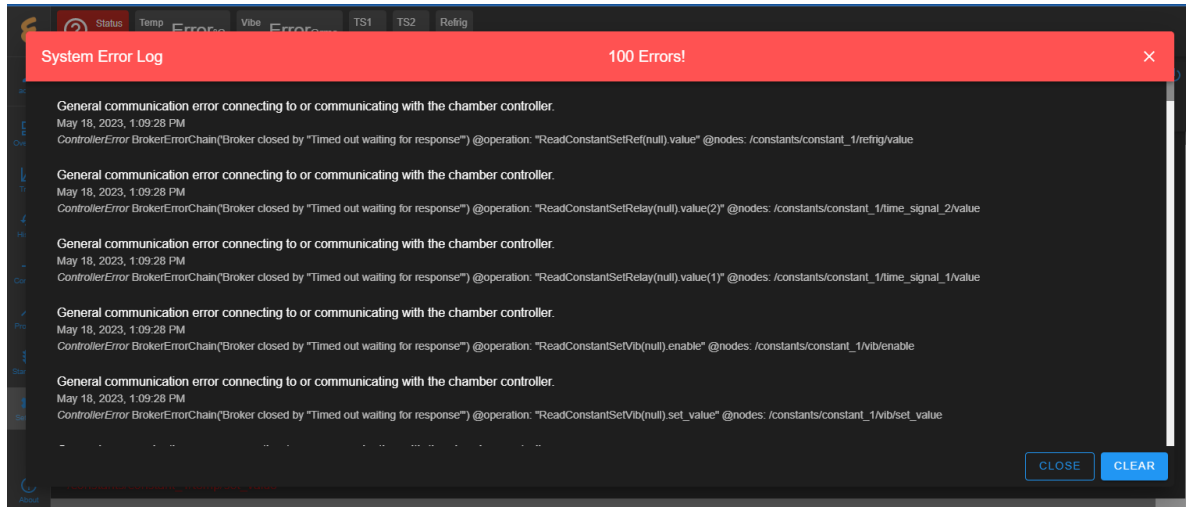


Figure 48.145: Expanded view of detailed error messages

The **Server Settings** page is the place to look for the culprit.

1. Log in as admin.
2. Click **Settings** in the menu bar.
3. Click **Server Settings** under the **System Settings** group in the submenu.
4. Click each tab in the service tab to view any error messages.

The **SERVICE BROKER**, whose job is to monitor the communication status between EWC and the chamber, has reported a communication error, as depicted in the following figure.

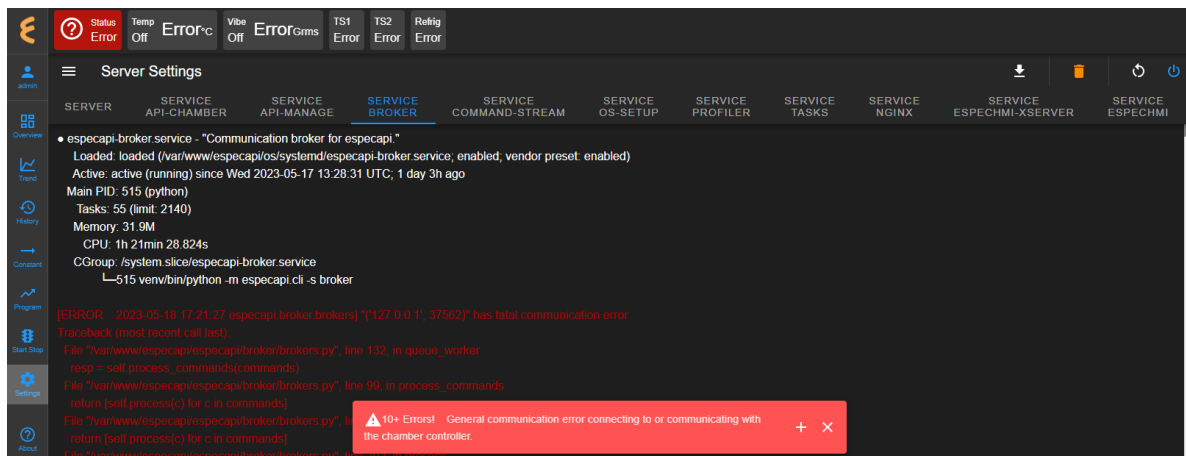


Figure 48.146: Communication error between EWC and chamber

This error causes a chain reaction on other daemons, such as **SERVICE API-CHAMBER** which prevents EWC from “controlling” the chamber, **SERVICE TASKS** which monitors and manages different tasks. The error message reported by the **SERVICE BROKER** indicated a timed out error. That error was echoed in the **SERVICE API-CHAMBER**, as depicted in the following figure.

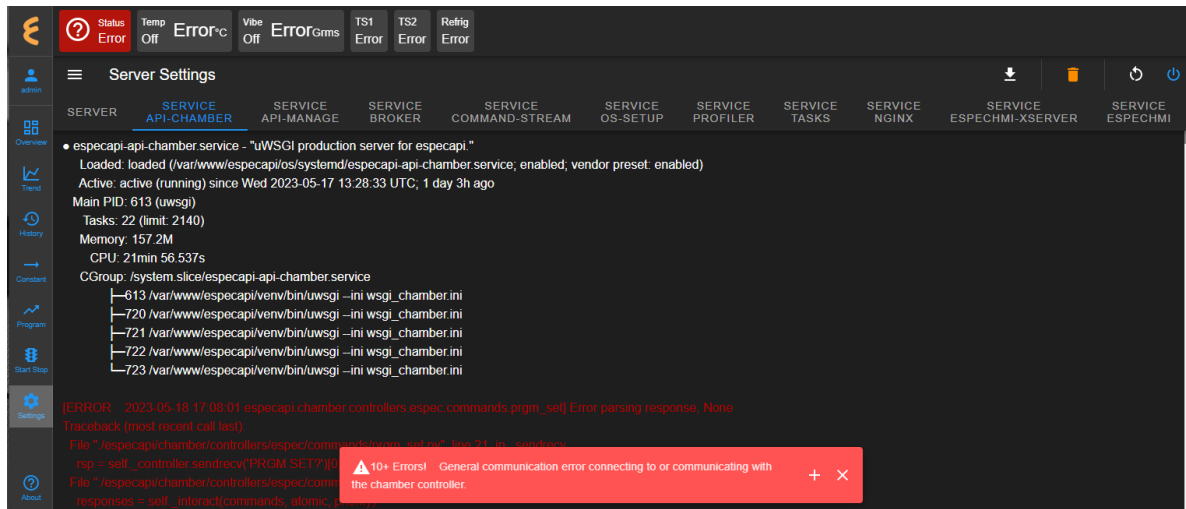


Figure 48.147: EWC and chamber communication was disrupted

The issue illustrated here is caused by a loss of communication/cable connection. To re-establish communication between EWC and the chamber, complete the following steps:

1. Check for loose cable connection between EWC and the chamber.
2. EWC will reestablish connection with the chamber automatically, as depicted in the following figure.

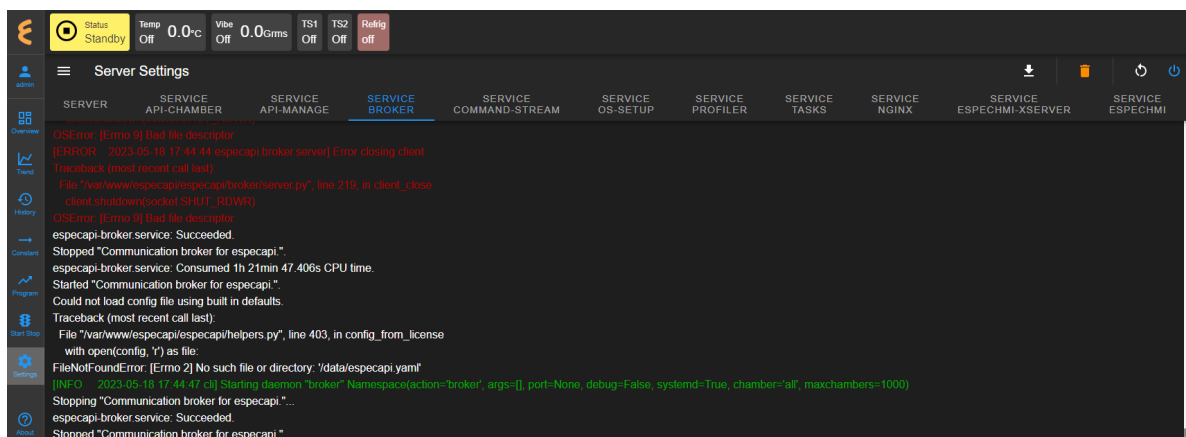


Figure 48.148: Cable connection reestablished

Depending on the type of chamber (such as T-series) EWC resumes its operation in **Standby** mode; other may resume according to the status of the chamber itself.

If the above procedure did not work, the affected services need to be restarted by applying the **Restart Services** (cycle) button in the upper-right corner. In most cases, for a system such T-series or F4T chamber, restarting a network connection is all that is needed to get EWC and chamber working again. It is rare that other services become corrupted and stop working for no reason.

48.13.2 Reboot Server

Sometimes, certain services may stop working and refuse to respond to the restart request. In this case, rebooting EWC is the only option to bring the entire system back to normal operation.

The following procedure is an example of restarting EWC on the T-series chamber.

1. Click the **Reboot Server** button and click Yes.

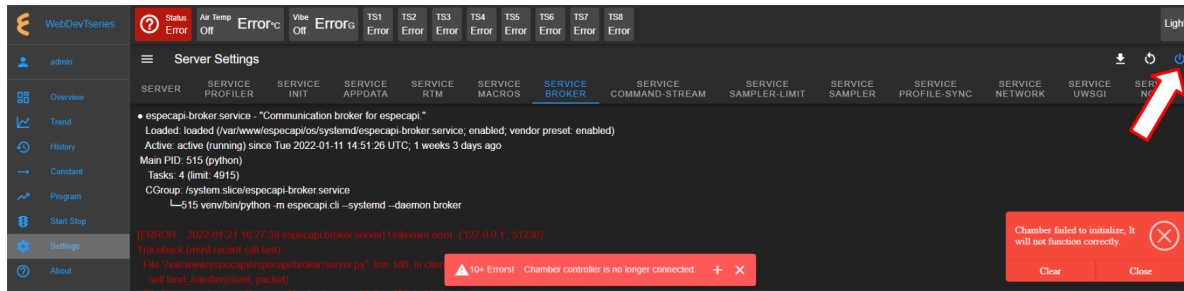


Figure 48.149: Rebooting EWC

2. Reboot action will commence as depicted in the following figure.

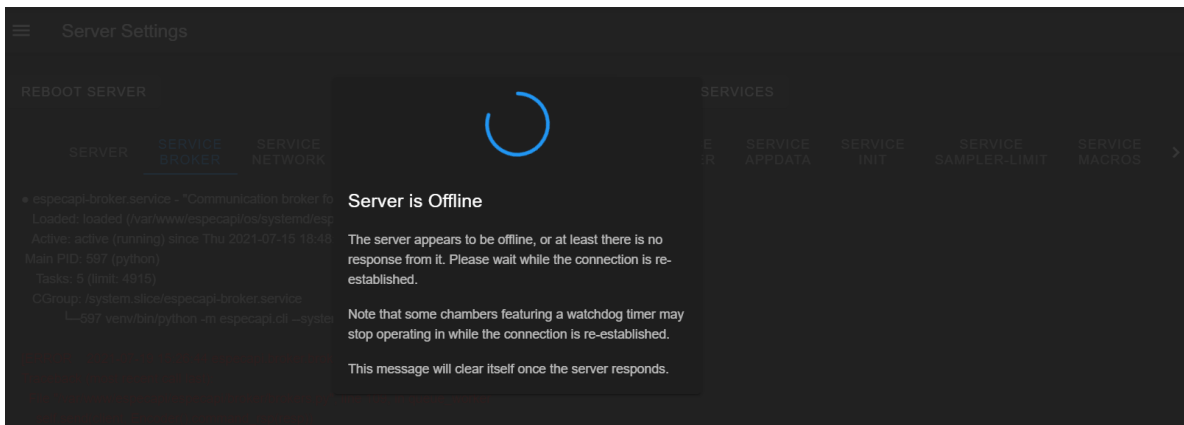


Figure 48.150: Reboot the EWC

3. If EWC is not back online, after 3-5 minutes, refresh the Web page or open a new Web browser to access EWC on the new page. Upon refreshing the Web page, EWC is back online.

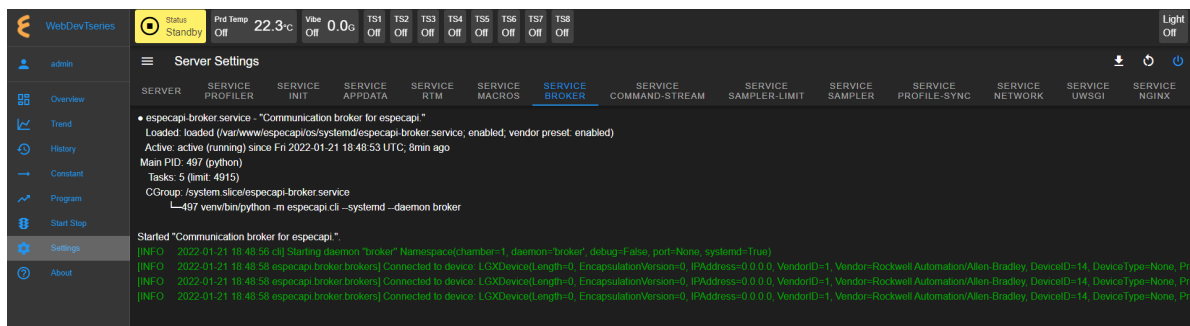


Figure 48.151: Service broker in normal operation

48.14 User Settings

The **User Settings** submenu allows the system administrator to manage user accounts and access privileges on EWC. The layout of the **User Settings** is depicted in the following figure.

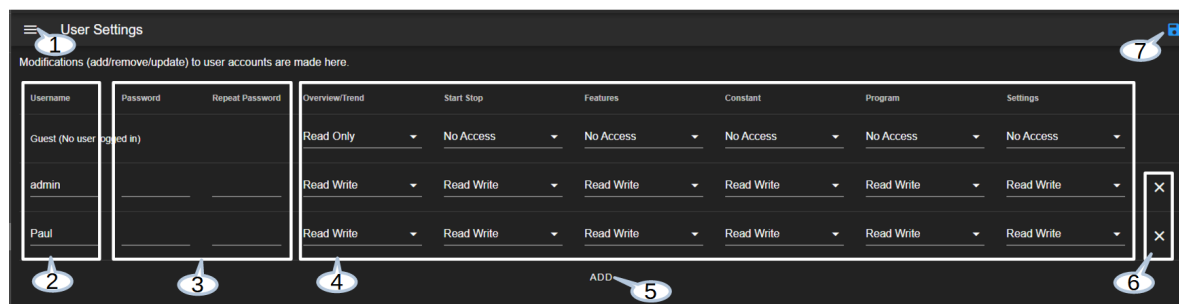


Figure 48.152: The nomenclature of the User Settings submenu

The UI and nomenclature of the **User Settings** are described as follows:

1. **Show/Hide:** The Show/Hide button can be used to show or hide the **Settings** submenu. As illustrated in the above figure, the **Settings** submenu is hidden. Click this button to show the submenu in order to access other submenus from the list, as depicted in the following figure.

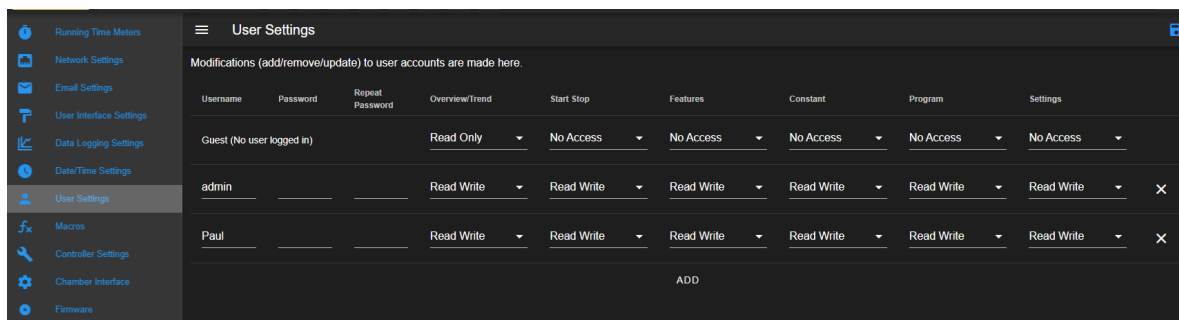


Figure 48.153: The UI of the User Settings submenu with Show/Hide button activated

2. **Username:** All accounts with username on EWC are listed here.

3. **Password:** The password field(s) can be used to reset a password or create a password for a new account (to be explained below).
4. **Access Privileges:** Different privileges can be assigned to each account on EWC. These policies are applied to the accessibility on the menus in the menu bar. A user can be granted access to these menus as **No Access**, **Read Only** and **Read Write**.
5. **ADD:** The ADD button can be used (by the administrator) to add/create a new account.
6. **Delete:** To delete a user account, click the trash bin to the right of that user account (on the same row).
7. **Save:** Use this button to save the current settings as well as new accounts just created.

48.14.1 Add User Account

Complete the following steps to create/add a new user account. Refer to the following pictorial diagram for detail.

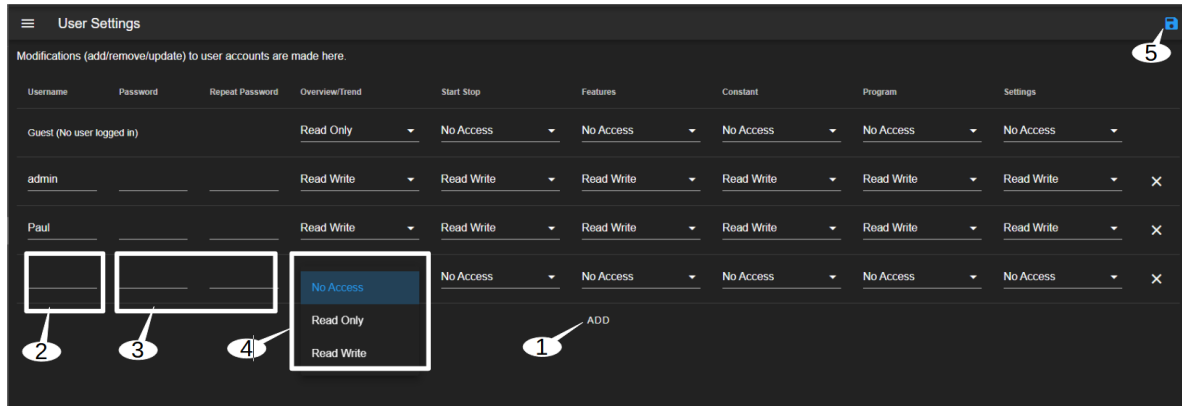


Figure 48.154: Creating or Adding a new user account

1. **ADD:** Click the **ADD** button (shown in the above figure).
2. **Username:** Enter username under the **Username** column.
3. **Password:** Enter the password for this user in the **Password** fields (twice).
4. **Access Privileges:** Click and select access privilege (No Access, Read Only, Read Write) for each menu. Repeat the process for the rest of the menus.
5. **Save:** Click the **Save** button at the upper-right corner to save the settings.

This new account will be available for use immediately after the **Save** button is applied.

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****This is the final page of the document.****

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