

WEB CONTROLLER SOFTWARE Version 3 USER'S MANUAL

- \blacksquare 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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Contents

Ι	Introduction	1
1	Introduction 1.1 How to Use this Manual	5 5 6 8 9
2	Initial Setup and First-Time Use 2.1 DHCP Network Setup 2.2 Static Network Setup 2.2.1 Small Number of Network Hosts 2.2.2 Large Number of Network Hosts 2.3 Accessing ESPEC Web Controller 2.3.1 How to Locate ESPEC Web Controller Hostname or IP address 2.3.2 Accessing ESPEC Web Controller on a DHCP Network 2.3.3 Accessing ESPEC Web Controller on a Static Network 2.4 ESPEC Web Controller and Setup Wizard	17 23 23 23 23 26 26
3	User 3.1 Login	38
II	T-Series Chamber	44
6	Overview 5.1 Standby Setting	 45 48 49 50 52 52 52 55 55 57
7	History	63
8	Constant 8.1 Product or Air Temperature Setting	69 71
v.ŝ	3 3/2022 CONTENTS	iv

	8.2	Vibration Setting	(2
	8.3	Time Signals Setting	72
9	Pro	gram	74
0	9.1		76
	9.2	-	78
	0.2		81
	9.3		84
	9.0		84
		1 0	
			85
			88
		9.3.4 Managing Program File via the Name List	90
10	Star	t Stop	92
	10.1	Standby Mode	94
	10.2	Constant Mode	94
	10.3	Program Mode	94
			95
			96
			96
			96
	10.1		97
		8	97
		7 0	98
	10.9		98 98
	10.8		90
II	E	SPEC Chamber with F4T	99
	Ove	rview 1	.00
	Ove		.00
	Ove 11.1	rview 1	. 00 103
	Ove 11.1 11.2	rview 1 Standby Setting	. 00 103 104
	Ove 11.1 11.2 11.3	rview Standby Setting	. 00 103 104 104
	Ove 11.1 11.2 11.3 11.4	rview 1 Standby Setting	. 00 103 104 104
	Ove 11.1 11.2 11.3 11.4	rview 1 Standby Setting	. 00 103 104 104 105
	Ove 11.1 11.2 11.3 11.4	rview 1 Standby Setting	. 00 103 104 104 105 106
	Ove 11.1 11.2 11.3 11.4 11.5	rview 1 Standby Setting	. 00 103 104 105 106 106
11	Ove 11.1 11.2 11.3 11.4 11.5 11.6	rview1Standby Setting1Constant Setting1Program Setting1Clear Alarms1Temperature, Humidity or Time Signal Settings111.5.1 Settings via the Status Bar111.5.2 Settings via the Dedicated Panes1Web Controller on the Network1	. 00 103 104 105 106 106 108
11	Ove 11.1 11.2 11.3 11.4 11.5	rview1Standby Setting1Constant Setting1Program Setting1Clear Alarms1Temperature, Humidity or Time Signal Settings111.5.1 Settings via the Status Bar111.5.2 Settings via the Dedicated Panes1Web Controller on the Network1	. 00 103 104 105 106 106
11	Ove 11.1 11.2 11.3 11.4 11.5 11.6	rview1Standby Setting .1Constant Setting .1Program Setting .1Clear Alarms .1Temperature, Humidity or Time Signal Settings .111.5.1 Settings via the Status Bar .111.5.2 Settings via the Dedicated Panes .1Web Controller on the Network .111 <td>.00 103 104 105 106 106 108</td>	. 00 103 104 105 106 106 108
11 12 13	Ove 11.1 11.2 11.3 11.4 11.5 11.6 Tren Hist	rview1Standby Setting	.00 103 104 105 106 108 109 .11
11 12 13	Ove 11.1 11.2 11.3 11.4 11.5 11.6 Tren Hist	rview 1 Standby Setting	.00 103 104 105 106 108 109 .11 .17
11 12 13	Ove 11.1 11.2 11.3 11.4 11.5 11.6 Tren Hist Con 14.1	rview 1 Standby Setting 1 Constant Setting 1 Program Setting 1 Clear Alarms 1 Clear Alarms 1 Temperature, Humidity or Time Signal Settings 1 11.5.1 Settings via the Status Bar 1 11.5.2 Settings via the Dedicated Panes 1 Web Controller on the Network 1 nd 1 ory 1 stant 1 Product or Air Temperature Setting 1	.00 103 104 105 106 106 108 109 .11 .17 .23 125
11 12 13	Ove 11.1 11.2 11.3 11.4 11.5 11.6 Tren Hist Com 14.1 14.2	rview 1 Standby Setting	.00 103 104 105 106 108 109 .11 .17 .23 125 126
11 12 13	Ove 11.1 11.2 11.3 11.4 11.5 11.6 Tren Hist Com 14.1 14.2	rview 1 Standby Setting 1 Constant Setting 1 Program Setting 1 Clear Alarms 1 Clear Alarms 1 Temperature, Humidity or Time Signal Settings 1 11.5.1 Settings via the Status Bar 1 11.5.2 Settings via the Dedicated Panes 1 Web Controller on the Network 1 nd 1 ory 1 stant 1 Product or Air Temperature Setting 1	.00 103 104 105 106 108 109 .11 .17 .23 125 126
11 12 13 14	Ove 11.1 11.2 11.3 11.4 11.5 11.6 Tren Hist Com 14.1 14.2 14.3	rview 1 Standby Setting 1 Constant Setting 1 Program Setting 1 Clear Alarms 1 Temperature, Humidity or Time Signal Settings 1 11.5.1 Settings via the Status Bar 1 11.5.2 Settings via the Dedicated Panes 1 Web Controller on the Network 1 ory 1 stant 1 Product or Air Temperature Setting 1 Humidity Setting 1 Time Signals Setting 1	.00 103 104 105 106 108 109 .11 .17 .23 125 126

	15.1	List Programs	30
	15.2	Create New Program	32
		15.2.1 Programming: Add Program Step	38
	15.3	View, Edit, Save Program	
		15.3.1 Open Program	
		15.3.2 Editing Program: Programming Example	
		15.3.3 Managing Program File via the Program Editor	
		15.3.4 Managing Program File via the Name List	
16	Star	rt Stop	51
10		Standby Mode	
		Constant Mode	
		Program Mode	
		Start/Stop Standby Mode	
		Start/Stop Constant Mode	
	16.6	Start/Stop Program Mode	
		16.6.1 Run Program	
		16.6.2 Pause/Resume Program	
		16.6.3 Stepping through Program	56
IV	E	SPEC Chamber with F4 18	57
17			58
	17.1	Constant Setting	60
	17.2	Program Setting	61
	17.3	Clear Alarms	63
	17.4	Temperature, Humidity or Time Signal Settings	64
		17.4.1 Settings via the Status Bar	65
		17.4.2 Settings via the Dedicated Panes	66
	17.5	Web Controller on the Network	
18	Trer	nd 10	68
19	Hist	1	73
		·	
20			79
		Product or Air Temperature Setting	
	20.2	Time Signals Setting	82
21	Prog	gram 18	83
	21.1	List Programs	85
	21.2	Create New Program	87
		21.2.1 Programming: Add Program Step	92
	21.3	View, Edit, Save Program	
	-	21.3.1 Open Program	
		21.3.2 Editing Program: Programming Example	
		21.3.3 Managing Program File via the Program Editor	
		21.3.4 Managing Program File via the Name List	
			00

22	Start Stop 20	01
	22.1 Constant Mode $\ldots \ldots \ldots$	03
	22.2 Program Mode	04
	22.2.1 Run Program	04
	22.2.2 Pause/Resume Program	
	22.2.3 Stepping through Program	05
\mathbf{V}	ESPEC P300 Chamber 20)6
0.0		
23		07 10
	23.1 Standby Setting	
	23.2 Constant Setting	
	23.3 Program Setting	
	23.5 Temperature, Humidity or Time Signal Settings	
	23.5.1 Settings via the Status Bar	
	0	
	23.5.2 Settings via the Dedicated Panes	
	23.6 Web Controller on the Network	11
24	Trend 2	18
25	History 22	23
26	Constant 22	29
20	26.1 Product or Air Temperature Setting	
	26.2 Humidity Setting	
	26.3 Time Signals Setting	
		00
27	Program 23	34
	27.1 List Programs	36
	27.2 Create New Program	38
	27.2.1 Programming: Add Program Step	44
	27.3 View, Edit, Save Program	49
	27.3.1 Open Program	49
	27.3.2 Editing Program: Programming Example	50
	27.3.3 Managing Program File via the Program Editor	52
	27.3.4 Managing Program File via the Name List	54
28	Start Stop 23	56
	28.1 Standby Mode	
	28.1.1 Start/Stop Standby Mode	
	28.2 Constant Mode	
	28.2.1 Start/Stop Constant Mode	
	28.3 Program Mode	
	28.3.1 Run Program	
	28.3.2 Pause/Resume Program	
	28.3.3 Stepping through Program	
	20.0.0 Stepping unough Flogram 22 28.4 Alarm Mode 2	
		~ -

28.4.1 Clear Alarn	18	
--------------------	----	--

VI ESPEC SCP220 Chamber

	264
29.1 Standby Setting	267
29.2 Constant Setting	268
29.3 Program Setting	268
29.4 Clear Alarms	270
29.5 Temperature, Humidity or Time Signal Settings	271
29.5.1 Settings via the Status Bar	271
29.5.2 Settings via the Dedicated Panes	273
29.6 Web Controller on the Network	
30 Trend	275
31 History	280
o o	
32 Constant	286
32.1 Product or Air Temperature Setting	288
32.2 Humidity Setting	
32.3 Time Signals Setting	
	200
33 Program	291
33.1 List Programs	293
33.2 Create New Program	
33.2.1 Programming: Add Program Step	
33.3 View, Edit, Save Program	
$33.3.1$ Open Program \dots \mathbb{D}	
33.3.2 Editing Program: Programming Example	
33.3.3 Managing Program File via the Program Editor	
33.3.4 Managing Program File via the Name List	308
	010
1	310
34.1 Standby Mode	
34.1.1 Start/Stop Standby Mode	
34.2 Constant Mode	
34.2.1 Start/Stop Constant Mode	
34.3 Program Mode	
34.3.1 Run Program	
34.3.2 Pause/Resume Program	314
34.3.3 Stepping through Program	314
34.4 Alarm Mode	315
34.4.1 Clear Alarms	316

VII Settings Menu

35	Settings	318
	35.1 Running Time Meters	320
	35.2 Network Settings	
	35.2.1 Set Hostname	
	35.2.2 Set Static Network	
	35.2.3 Set DHCP Network	
	35.3 Email Settings	
	35.3.1 Mail Sever Encryption and Password Authentication	
	35.3.2 Account Recovery Email	
	35.3.3 Setting Email Alert	
	35.4 User Interface Settings	
	35.4.1 Managing Operating Status	
	35.4.2 Managing Input/Output Status	
	35.5 Data Logging Settings	
	35.5.1 Set Data Logging Interval and Data Types	
	35.5.2 Clear Data Log	
	35.6 Date/Time Settings	
	35.7 User Settings	
	35.7.1 Add User Account	
	35.8 Macros	
	35.8.1 Macro Editor and Trigger Options	
	35.8.2 Example: A Macro Script with Alarm Alert	
	35.8.3 Example: Macro Script with Analin Alert	
	35.9 Controller Settings	
	35.9 Controller Settings	
	35.9.2 Thermocouple Calibration	
	35.9.3 Accelerometer Calibration	
	35.9.4 Diagnostic	
	35.10Chamber Interface	
	35.10.1 Simple: T-Series Chamber Interface	
	35.10.2 Simple: SCP220 Chamber Interface	
	35.10.3 Simple: ESPEC 300 Chamber Interface	
	35.10.4 Simple: Watlow F4T Chamber Interface	
	35.10.5 Watlow F4 Chamber Interface	
	35.10.6 Chamber Interface: Expert	
	35.11Firmware	
	35.11.1 Online Automatic Update	
	35.11.2 Offline Manual Update	
	35.11.2 Online Manual Optate	
	35.12Programming Interface via API Settings	
	35.12.1 Communication Protocol for ESPEC P300/SCP-220	
	35.12.2 Communication Protocol for the Watlow F4T, F4	
	35.13Server Settings	
	35.13.1 Restart Services	
	35.13.2 Reboot Server	
	35.14HMI Settings	382

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Part I

Introduction

CHAPTER 1

Introduction

This manual provides information for the use of ESPEC Web Controller, Version 3. ESPEC Web Controller is capable of communicating and controlling the following programmable logic controllers (PLCs): ESPEC P-300, SCP-220, 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.

ESPEC Web Controller is an embedded computer powered by GNU/Linux operating system based on Debian distribution. The hardware platform is an embedded UP2Board x86 architecture by AAEON. Through stack programming, this embedded computer is customized and configured 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. The system can be part of a network using its unique hostname and IP address. Thanks to the ability of a Web browser to operate from any computer on the network, operations of the chamber can be performed via the Web Controller UI remotely by authorized users. Access to ESPEC Web Controller is possible only for any device on the same network. No device outside the network can access ESPEC Web Controller, unless the network is configured to host port forwarding.

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

To guard against security breach on ESPEC Web Controller, its root filesystem is configured to permit read-only access. By nature, the GNU/Linux operating system alone is already a secure system. However, the read-only access to the system's root filesystem puts in place another layer of defense mechanisms to deny an intruder the ability to install any software or modify the system's configurations. To provide robustness in terms of stability and self-correct operation, ESPEC Web Controller 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. This feature thereby provides seamless updates and overall system management. In short, ESPEC Web Controller is robust, secure, easy to manage and operate.

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.
- v.3 3/2022

- 4. **PART IV**: ESPEC Chamber with Watlow F4 For ESPEC chamber with Watlow F4, navigate to this part for its operation manual.
- 5. **PART V**: ESPEC P300 Chamber For ESPEC chamber with P300, navigate to this part for its operation manual.
- 6. **PART VI**: ESPEC SCP220 Chamber For ESPEC chamber with SCP220, navigate to this part for its operation manual.
- 7. **PART VII**: 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.

1.2 Operating System, Software or Hardware Requirement

No software installation is required to use the Web Controller. Only a Web browser running on the local computer is needed to access the Web Controller via its IP address or hostname to control the chamber (see Chapter 2). A computer running MS Windows, Mac OS X or Linux can operate the Web Controller. A handheld device, such as a smartphone, on the same network can also access and operate the Web Controller.

1.3 Web browser Compatibility

ESPEC Web Controller 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 the Web Controller. However, due to its slow performance, the use of Microsoft Internet Explorer 11 is strongly discouraged.

1.4 ESPEC Web Controller Home Page

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

ESPEC-skilault Espec Web C	a- x +			0 - 0 ×
+ - C & Not seco	re 10.30.108/#/overview			10 4 1
ESPEC-default	Constant 38.5c 29.9c Hunti 92.5sten Off			
	→ ^{stan} Constant			Oct 28, 2021, 1:32:51 PM
12 ····	Temperature	Humidity		
	38.5. 29.			92.5
	Nil Valan Proce	States	Heat: 0% Cool 0%	Proved Villey
	TS1 or			Đ
				L.



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

Menu ba			n Display	-		
PEC-default	Standby	91.9% Off				Det 27, 2021, 7:09;46 PM
	Temperature		20.5	Humidity		1000
E.	Off	Heat one Cost One	30.5.	Un	fight the Cost (75	91.9
	TS1 of					E

Figure 1.2: Overview page for users with full access privilege

- 1. Menu bar: The menu bar provides the main operation menu of ESPEC Web Controller 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 the Web Controller 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, humidity and time signal settings.

1.4.1 ESPEC Web Controller and HMI Touchscreen

During its startup (i.e., during booting), if ESPEC Web Controller 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 monitor. The dedicated touchscreen monitor is known as Web Controller HMI (attached onto

the front of the chamber). Standard operations on the Web Controller may be performed on this HMI.

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

Mar 30,	. 2022, 9:24:57 AM		espec1600025576	joverview	r.	& Ø 📶
٤	Air Temp 39.9	9-с ^{Ниті} 20.0%ян 22.1%ян	TS1 TS2 LH DA Off Off Off Of			
*	→ ⁽⁰⁰⁰¹ Constant				Mar 30, 2022, 1:	Eats/Time 24:45 PM
F	Air Temperature		and the second se	Humidity		
(0 (P	Ar 40.0 -c 400-0	Heat: 0%		20.0 SRH	22	PENERS VALUE
-		Cool: 0%	_	_	Cool: 98%	
12	TS1 off	TS2		L H Diff	DAP D+ off	G
11.0						
					USB Media Found!	(1) 2
(1)					sdb1 MCC_SHOP09 (1	$\mathbf{\overline{\mathbf{O}}}$

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

1. Touchscreen Menu Bar: ESPEC Web Controller 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:

Mar 30.	Cons		especi600 576 /overview	Scr	een shot	2	
*	-	perature	Hu Hu ethi ethi	Address 10.30.200.222/16 10.30.200.241/28 169.254.59.6/16	MAC 00:07:32:96:39:25 00:07:32:96:39:26 00:07:32:96:39:26	Dare 17 1:24:45 F	,
					Drive La sdb1 M0		ize 9G ▲

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 Web Controller. It provides an extended operation of Web Controller 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 op-

eration), 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 Web Controller UI if an external USB storage device is plugged into the USB port (on the HMI panel) and detected by the Web Controller. To use this button, first plug in the USB device.
- Network Info: ESPEC Web Controller 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 the Web Controller with its MAC address, eth1 displays the IP address. A user on the same network may access the Web Controller UI 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 the Web Controller. 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 the Web Controller HMI, 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 the Web Controller. 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 ESPEC Web Controller detects an external USB device. It displays the device name and storage space.

1.4.2 ESPEC Web Controller Display on 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).

٤		itatus Standby	Air Temp Off	26.9	Giff	['] 100.	.0%RH	TS1 On		Distant I	2003 B	605-051 IB	A19231	ts8 Off	TS9 Off	TS10 Off					
-	0	status Stan	dby														Aug	j 17, 20	021, 1	Date :59:01	e/Time PM
	Air 1	ſempe	rature						26	•	Hum	idity									
P tuloy	O Set Va	ff						A	29	9°c	O'	ff						1	0		
Connegati Program					Heat Cool:												t 0% I: 0%				
Start Stor Start Stor Sattings	TS1 On	B	TS2 Off		TS3 Dff	1000	TS4 On	G	TS: Off	5 G	S6	₿	TS Off		G	TS8 Off	¢	TS9 Off	G	TS10 Off	G
Settings About																					

Figure 1.5: Overview page in a smaller display screen

1.4.3 ESPEC Web Controller Display on Handheld Device

ESPEC Web Controller can be accessed wirelessly via a handheld device, such as a tablet PC or a smartphone, provided the device is part of the main network that the Web Controller is connected to. Typical display of the Web Controller **Overview** page on a handheld device is depicted in the following figure.

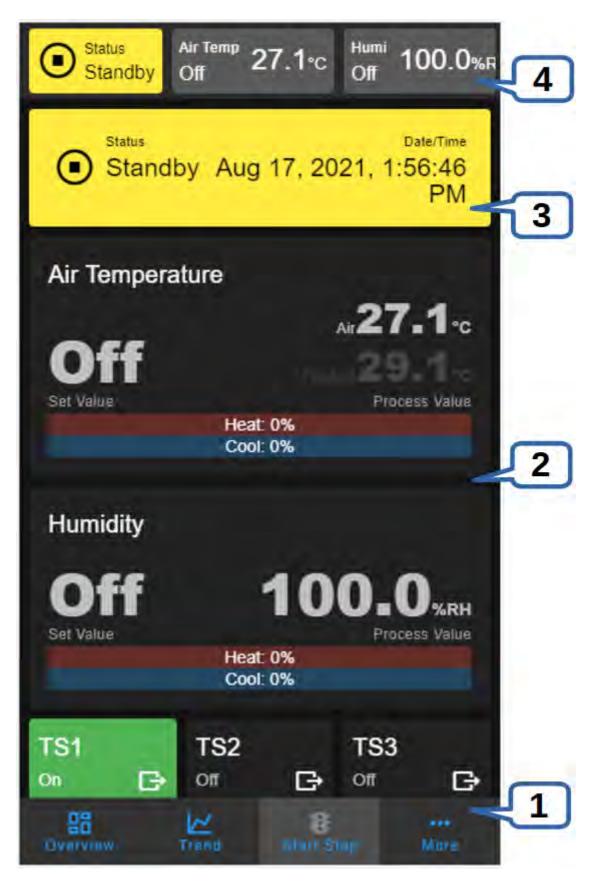


Figure 1.6: Overview page on a handheld device CHAPTER 1. INTRODUCTION | 10

- 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 will focus on the Web Controller operation 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. ESPEC Web Controller 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 Web Controller 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.

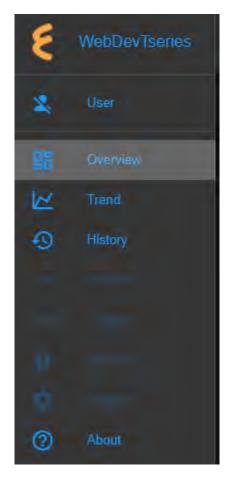


Figure 1.7: Overview page for users with limited access privilege

- **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 the Web Controller. 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 the Web Controller, 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 the Web Controller.

ESPEC Web Controller 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 may be created to set different privileges for designated users as outlined in the **User Settings** submenu un the **Settings** menu (in the menu bar).

CHAPTER 2

Initial Setup and First-Time Use

ESPEC Web Controller can be connected to a Dynamic Host Control Protocol (DHCP) network or a static network. The following sections describe how to set up the chamber and computer on these two types of network.

2.1 DHCP Network Setup

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

To connect the chamber (and Web Controller) 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.



- 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.

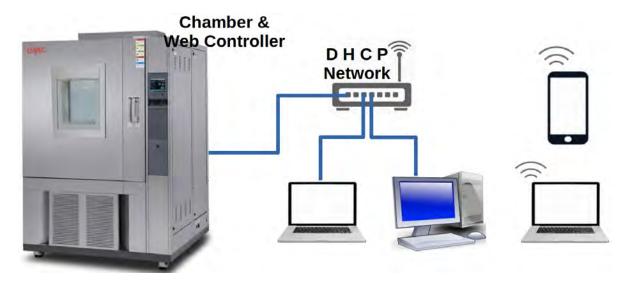


Figure 2.1: Network connection on a DHCP setup

To access and use the Web Controller 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 Setup

2.2.1 Small Number of Network Hosts

By default, ESPEC Web Controller applies DHCP to obtain an IP address from the DHCP server to join the network. If DHCP service is not available, the Web Controller 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 static network protocol occurs when ESPEC Web Controller is connected directly to a computer via a crossover cable or a network hub without DHCP service. This preconfigured network protocol is suitable for a small number of hosts on the network where the first three groups of IP address (i.e., 192.168.0) identify the network and the last group defines the host.

To set up a Class C static network, complete the following steps:

- 1. Plug an RJ-45 Ethernet cable into the Ethernet port on the chamber.
- 2. Plug the other end of the cable into the Ethernet port of the computer or into an Ethernet port of a network hub. If a network hub is used, your computer 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

Your computer must also use a Class C network protocol. Complete the following steps to configure a static IP address 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

Administrative privilege may be required to perform the configuration on your computer. Your IT department may need to get involved in the preparation for the static network setup as this could become a complicated process. The following steps apply on MS Windows 7/8/10:

- 1. Hold down the **Windows** key and press \mathbf{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 the Web Controller 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.

Irganize Disable this network device	Diagnose this connection	Rename this connection	»	
Bluetooth Network Connection Not connected Bluetooth Device (Personal Area	Local Area Connecti Unidentified network Intel(R) Ethernet	k ech	reless Network Connection (R) Dual Band Wireless-AC	12

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.

Connect using:		
Intel(R) Ethemet	Connection I218-LM	
		Configure
This connection uses t	he following items:	Coningure
Client for Mich		
QoS Packet S		
	er Sharing for Microsoft	Networks
V .4. Internet Proto	col Version 6 (TCP/IPv	(6)
	col Version 4 (TCP/IPv	territori (
and the second se	pology Discovery Map	the second se
Ink-Layer To	pology Discovery Resp	onder
	Uninstall	Properties
l <u>n</u> stall		. Tobouroe
Install Description		. Toberine
Description Transmission Contro	I Protocol/Internet Prot	tocol. The default
Description Transmission Contro wide area network p	Protocol/Internet Protocol that provides c	tocol. The default

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.

General	
	ed automatically if your network support need to ask your network administrator
Obtain an IP address auto	omatically
Use the following IP address	ess:
IP address:	192 . 168 . 0 . 84
Subnet mask:	255.255.255.0
Default gateway:	192.168.0.1
Obtain DNS server addres	ss automatically
• Use the following DNS ser	ver addresses:
Preferred DNS server:	8.8.8.8
Alternate DNS server:	8 . 8 . 4 . 4
Validate settings upon ex	Advanced.

Figure 2.5: The complete static IP config on the $\mathrm{TCP}/\mathrm{IPv4}$ connection

- 8. Click OK to close "Local Area Connection Properties" window.
- 9. Close out the Network window.
- 10. To access the Web Controller, proceed to Section 2.3.2.

2.2.2 Large Number of Network Hosts

The Web Controller can use a static IP address on a network with large number of hosts, such as Class A or B. Your IT department will need to get involved in the configuration and provide a static IP address for the Web Controller to join your company network.

2.3 Accessing ESPEC Web Controller

ESPEC Web Controller can be accessed via its hostname or its IP address. If the Web Controller is shipped with the chamber as a single unit, its hostname is **ESPECserial#** where **serial#** is the serial number of the chamber which can be found on the label affixed on the chamber panel, as depicted in the following figure. If the Web Controller is purchased separately as a U-Web kit, its hostname is **ESPEC-default**. Follow the instructions that come with the U-Web kit to set up the Web Controller to join your DHCP or static network.

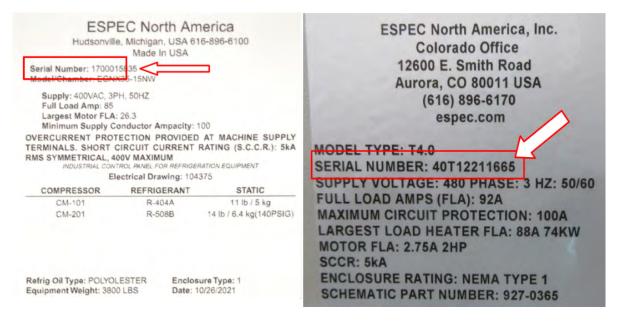


Figure 2.6: Serial number of the chamber

A new hostname can be assigned to the Web Controller via the **Settings** menu (described in Section 9.2). It is recommended that the default hostname be used during the initial setup. A new hostname may be assigned to the Web Controller after it has successfully joined the main network.

2.3.1 How to Locate ESPEC Web Controller Hostname or IP address

Looking up the hostname or IP address of ESPEC Web Controller on the network is possible via Locator utility. The software is MS Windows-based and executable on Windows 7/8/10.

Once executed, the utility scans for ESPEC Web Controllers (ver. 2.0 and higher) on the network. It displays hostname, IP address and firmware version, as depicted in the following figure. Hostname and IP address are listed as clickable links. The IP addresses are listed in the second column. To access the controller, click on its IP address. The hostname is accessible only if the computer can resolve it, in which case the hostname becomes a clickable link. The last entry in the figure also illustrates an example of a hostname which has not be resolved; and therefore, this Web Controller can only be accessed via its IP address.

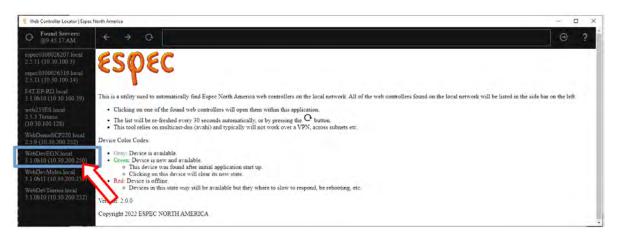


Figure 2.7: ESPEC Web Controller Locator Utility

With ESPEC P300 or Watlow F4T, another method exists via the PLC's HMI.

1. **P300 HMI**: When ESPEC Web Controller 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 the Web Controller's IP address on the P300 HMI.



Figure 2.8: The "Set LAN" screen on the P300

2. **F4T HMI**: When ESPEC Web Controller 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.

WebDev		6		1 User	WebDev +<=1 User
TEMPERATURE	off		HUMIDITY	Off 🚦	Error Alarms Message
PV:	30.5	С	PV:	95.2 %	Espec Server Hosted:
SP:	45.0	С	SP:	85.0 %,	WebDevBosch
PWR:		0% 0%	PWR:	0%	10,30.200.254
				Profile Actions	
START STOP	CHAMBER			GNAL Output GNAL Actions	

Figure 2.9: The Watlow F4T message screen

2.3.2 Accessing ESPEC Web Controller on a DHCP Network

Complete the following steps to access the Web Controller on a DHCP network for the first time.

- 1. With both the chamber and computer joined the network as described in Section 2.1, apply power to both devices.
- 2. On your computer, open a Web browser of your choice based on the list provided in Section 1.3.
- 3. Enter http://ESPECserial#.local/ in the URL address field of the Web browser, where serial# is the serial number of the chamber. For example, based on the serial number depicted in the previous figure, the hostname appears as: http://ESPEC1700015835.local/. If you cannot access your Web Controller via this method, use information in Section 2.3.1 to locate your Web Controller's IP address or hostname, and enter http://hostname.local/ or http://IP-address/ in the URL address field of the Web browser.
- 4. When ESPEC Web Controller 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 the Web Controller and wait a few minutes before accessing the Web Controller again.
- 6. If the problem persists, contact Customer Support for assistance.

2.3.3 Accessing ESPEC Web Controller on a Static Network

Complete the following steps to access the Web Controller on a static network for the first time.

- 1. With both the chamber and computer joined a static network as described in Section 2.2, apply power to both devices.
- 2. On your computer, open a Web browser of your choice based on the list provided in Section 1.3.
- 3. Enter http://192.168.0.83/ in the URL address field of the Web browser.
- 4. When the Web Controller 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 the computer uses a Class C network protocol as outlined in Section 2.2. 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 the Web Controller and wait a few minutes (three minutes) before accessing the Web Controller again.
- 6. If the problem persists, contact Customer Support for assistance.

2.4 ESPEC Web Controller and Setup Wizard

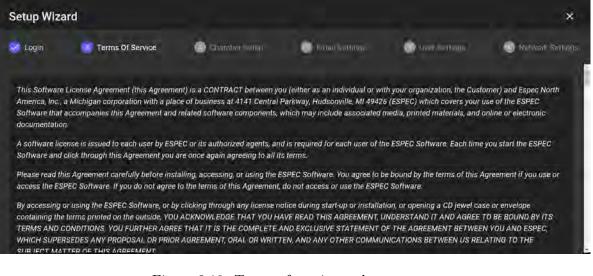
Before ESPEC Web Controller can be used for the first time, its basic settings must be confirmed and completed via the **Setup Wizard**. This process ensures that ESPEC Web Controller is configured correctly for the intended chamber, which includes the login configuration, chamber interface communication, e-mail alerts, network and administrator's password, The **Setup Wizard** page appears as follows:

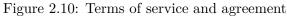
1. Login: When prompted, log in with the administrator account credentials (Section 1.5) as follows:

Setup Wiza					
1) Login	💮 Termi: Ol Service	🕕 Chamber Schup	Finall Settings	💿 User Settings	🕜 Network Setting
Please Lo	ogin				
User Name					
Password					ø

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

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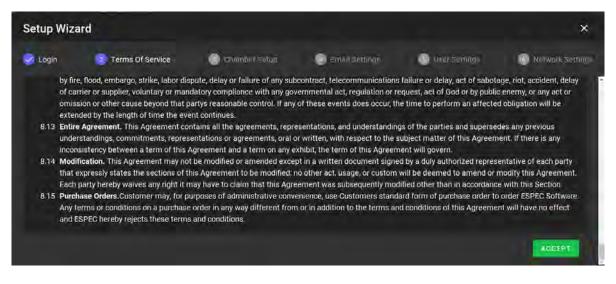


Figure 2.11: Accepting the Terms of service

If ESPEC Web Controller registration page appears as depicted in the following figure, enter the serial number of your chamber and click **REGISTER**; then, click **CLOSE** if necessary. Contact ESPEC customer service for detail about your registration.

Setup Wizard						
a Logo	Rimms Of Service			train street		1 Holoma Series
Hudsonvilla, MI 49426 (E	proment (Ins Agronosom) is a CONTRACT L SPEC) which covers your can of the ESPEC rel to mich lear by ESPEC or its addentance	Web Controller Registration Factory Life Univ	Cadaniar Optional		chapin corporation with a place of bu- lin, preliad materials, and online or o linsigh flac Agmirmaal you ien orica	lochamic documinikiliem
Pinaso haud this Agreem access or take the EGPER	unt carefully before installing, accessing, or u		(Amage 2 (1991)	Terment Verser	Software If you do not agree to the	lums of this Agronmont, on not
By accessing or using the THIS AGREEMENT, UNL	a Senation In ESPEC Software, or by cleaking through an DEFISTANTI IT AND AGREE TO BE BOUND MY PROPOSAL OR PRIOR AGREEMENT,	00.07.52.7e.3a.at 00		[UI.3 4 063 API 3 10]	1 or the balledu, YOU ACKNOWLED ATEMENT OF THE AGREEMENT D TTER OF THIS AGREEMENT	
	an onlify where Customer overs or controls in A Date mixed, with respect to specific ESPE		10.50.10		mirnus la esti	
1 I ESPEC Softwar	means the documentation polarining to the c e-mones all software programs accessed or EC to Guidenne, including any Upgrades pro				e or computer-easdable information;	in object codis (vriy, and
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21 Software Licens	and Limitations. se. Subject to all the terms and conditions of in provided with this Agreement solely for its o				ang the Term under ESPECs midlad	twai property rights to use eve
7.2 Documentation	License. Subject to all the terms and conditions a Documentation in support of Customers icon		1. (1. 17. 7. 10. 70. 10. 10. 10.		canse during the Term under ESPECs	introloctual property rights to
23 Use by Affiliate	s. ESPEC Soliware and Decumentation may b	in later by an Allindo of Cardinson records	ed then) then Allineits series on th	a but becaused for third factors and their Armone	anand	

Figure 2.12: ESPEC Web Controller Registration

- 3. Chamber Setup: Verify that the correct target chamber/PLC has been selected and the right communication protocol is configured properly. A specific chamber type can be selected from the drop-down menu under the Chamber Category option.
 - 1. Watlow F4T: The following figure illustrates how BT: Benchtop with F4T was selected as chamber category.

o Login	2 Terms Of Service	Chamber Setup	terres Sectors		Network Setting
Configure the web controller for Charter Citager BT Benchlep Chartber	the chamber here				
Model Selection	le Stage Refiguration	Chamber Communication	on Interface	Optional Features	
Controller Wallow F4T		Verlank Internal chamber network.		Low Hunddy Dry Ar Plage	
		10.30 200 240/28		Nitrogen Gas Purge Liquid Nitrogen Boost Cooling	
		Training Controller IP Address 10:30:200:242		Atonikar	

Figure 2.13: Chamber selection and configuration

Each selected chamber yields a list of model selection, communication interface and optional features. Refer to your chamber manual for the correct chamber category, model selection and operational features. With Watlow F4T, two types of communica-

tion interface are available: (1) TCP/IP and (2) Serial. Refer to your chamber manual for any optional feature which can be turned on by checking the box. Descriptions of these two communication types are outlined below. Click **ACCEPT** to apply the selection.

- 1. **TCP/IP**: The TCP/IP interface offers two options: (1) Internal LAN and (2) customer's network. Internal LAN is used as the default setting, where a network exists between ESPEC Web Controller and the F4T inside the chamber using a Class A network, with 10.30.200.241 assigned for ESPEC Web Controller IP address and 10.30.200.242 assigned for the F4T, as shown in the figure. The second option may be used if ESPEC Web Controller and chamber/F4T can (if allowed) connect to the customer's network for communication. This option requires rerouting the Ethernet cable from the F4T out to the customer's network.
- 2. Serial: The second communication interface is Serial via RS-232/RS-485. This option will require using F4T slot# 6 for the ModbusRTU serial communication module. This option will cut performance down tremendously in terms of communication speed between the the F4T and ESPEC Web Controller.
- 2. **T-Series Chamber**: The following figure illustrates how **T-Series Chamber** was selected as chamber category, with **Model Selection** T-series 2.5+ used for the configuration.

Setup Wizard					×
🕗 Login	Terms Of Service	Chamber Setup	Emul Settings	🕕 Mar Sellings	Network Setting
	nbroller for the chamber here.				
Clamber Calegory T-Sonies Chamber					
Model Selecti	on	Chamber Communication In	nterface	Optional Features	
12.5		ANI Internal chember network		 High Temperature 250C Option (Required with aspec) 	res hardware changes, consult
Vibration		hemati 121.165.141.6/24		Fiber Optic Light	
		serve # hates: 121 465 141 155			
		P1C#Adaes 121.165.119.61			
ACIE					SHIP ADDE

Figure 2.14: Chamber selection and configuration

Each selected chamber yields a list of model selection, communication interface and optional features. Refer to your chamber manual for the correct chamber category, model selection and operational features. TCP/IP is the default communication protocol for Allen Bradley PLC. Click **ACCEPT** to apply the selection.

3. ESPEC P300: The following figure illustrates how EWP: Walk-in Chamber with P300 was selected, with Model Selection type Temperature Only, Cascade Refrigeration for the configuration.

2 1. ogin	Martines Of Service	Chamber Selie	· · · · · · · · · · · · · · · · · · ·		
Configure the web controll Channel Calmery EWP Walk-in Chamber	er for the chamber here				
Model Selection		Chamber Communication In	nterface	Optional Features	
Espec P300		Seena Part IdevitiyUSB0 Baset Rain		Dry Air Purge Nitrogen Gas Purga	
		19200		Diguid Nitrogen Boost Cooling So: Additional Time Sugnals	
				Selectrible Air Speeds	

Figure 2.15: Chamber selection and configuration

For P300, communication interface type is **Serial** with baud rate of 19200. This baud rate must also be configured on the P300 (via its HMI). Its RS-232 communication must also be enabled. All of this should have been configured during testing at manufacturer's facility. Click **ACCEPT** to apply the selection.

4. **SCP220**: The following figure illustrates how **EWP: Walk-in Chamber** with SCP220 was selected for the configuration.

Setup Wizard					×
Ligin	Terms Of Service	Chamber Selap	🔘 Emal Ballinas	🔵 🧫 Sollings	👔 Network Sularya
Configure the web cor Classics Category EN: Platinum N Cham	ntroller for the chamber here				
Model Selection	on nstity, Single Stage Religeration	Chamber Communication	Interface	Optional Features	
Controller Espec SCP220		Secial Port ← /dev/ttyUSB0		Low Humidity Dry Air Purge	
		0000 FCBB -98600		Nitrogen Gas Herge	
				Liquid Milliogen Boost Cooling Six Additional Time Signats	
				Atamizei	
MEK					SHIP

Figure 2.16: Chamber selection and configuration

For SCP220, communication interface type is **Serial** with baud rate of 9600. This baud rate must also be configured on the P300 (via its HMI). Its RS-232 communication must also be enabled. All of this should have been configured during testing at manufacturer's facility. Click **ACCEPT** to apply the selection.

5. Watlow F4: The following illustrates how EWP: Walk-in Chamber with F4 was selected, with Model Selection type Temperature Only, Cascade Refrigeration for the configuration.

Setup Wizard				×
🥺 Login 🛛 🤌 Torms Ct	Service 🚺 Chamber Setup	Dimes entrate.	Charactery.	🛄 Nowtone — II no.
Configure the web controllar for the chamber to chardes calepoy EGN. Global N Chamber	ara			
Model Selection Ive U Temperature Only, Single Stage Religeratio	Inestade Type		ntional Features	
Controlles Wallow F4	semethod ❤ /dev/ttyUS80		Diy Air Purge Nilliogen Gas Purge	
	itani fibin 19200		Liquid Nilrogen Boast Cooling	
NAUTO I				BARP ADD

Figure 2.17: Chamber selection and configuration

The communication interface type is **Serial** with baud rate of 19200. This baud rate must also be configured on the PLC via its HMI. Its RS-232 communication must also be enabled. All of this should have been configured during testing at manufacturer's facility. Click **ACCEPT** to apply the selection.

- 4. Email Settings: An alert about the condition of the chamber can be notified via email. This setup page can be skipped at this point by clicking the SKIP button at the lowerright corner; it can be completed later via the Settings menu. However, if this Setup Wizard page was skipped (and other configurations are not completed), it will reappear following the next Web Controller reboot. To set up an email alert, scroll down the setup page and complete the following steps:
 - 1. Enter the recipient's email address.
 - 2. If multiple emails are required, enter one email address per line in the recipient's box.
 - 3. To test an email notification, click on the **Test** button in the lower-right corner (as shown in the following figure). **Note**: By default, the Web Controller uses SMTP Office 365 for the email protocol; but this default protocol can trace to a local network with different SMTP server as needed. For email feature to work, the Web Controller must have access to the Internet. Click **ACCEPT** to save the changes.

Setup Wizard					
👌 Login	🧭 Terms Of Service	Chamber Selsp	Email Settings	Diser Settings	🐻 Network Setting
Chamber alerts can be notified	via e-mails. Use this page to set up the e-ma	i server and add your e-mail addresses t	or eleft notifications. Enter your e-mail address in the A	Nert Addresses field and click Save	
Host	smtp office365 com	Host name o	t IP address of the mail server		
Port	587	TCP port use	d by the multi server.		
Send As	chamber_controller@espec	com The sendor o	If the estual. In many cases this must match User.		
Require Authentication		A usemano	password must be used to send the email.		
Require SSL/TLS	Ċ.	The mail serv	er connection must be started with encryption.		
User	chamber_controller@espec	com The useman	e used for authenticating with the mail server.		
Password		The passwor	d used for authenticating with the mail server		
Account Recovery E-Mail		This email is	to reset line admin account when it is reasonfigured or line pas	isword is forgotien.	

Figure 2.18: Setting e-mail alerts

5. 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 Selup	Email Settings	User Settings	Network Sellings
Update "paul"	Password				
Current Password					
New Password					
Repeat New Password	1				
Show Passwords					
ACK					SKIP ACCEP

Figure 2.19: Changing the administrator's password

6. Network Settings: In this Network setup page, the Web Controller hostname may be changed at this time. Network configuration protocol (DHCP or Static) can be applied. If a static network configuration is required, uncheck the DHCP box and enter the correct and proper IP address, Subnet Mask (or Net Mask), Gateway and DNS1. Note: If the Web Controller was accessed via its IP address (or hostname) and the IP address (or hostname) has been changed, it will require accessing the Web Controller using the new IP address (or

etup Wizard					×
Login	V Terms Of Service	Chamber Setup	Email Settings	😥 User Settings	Network Settings
		irgel network. All changes will take effect immedia en applied, it will require opening a new browser w		rebool for a new hostname to resolve. If the W	Web Controller was accessed via
Network Interface C	configuration (eth0)				
Hostname	Web3Dev-Paul		Name of the server.		
DHCP			Ged network settings automatic	a y	
IP Address	10.30,100.108		Static IPv4 Address		
Net Mask	255 255 0.0		Static subnet mask		
Galeway	10.30.0 1		Static gateway		
DNS1	10.30.30.31		Static primary domain name se	nver	
DNS2	10.30.30.23		Stalic backup domain name se	wei	

hostname). It is recommended to use the default setting during the initial setup.

Figure 2.20: Networking configuration–DHCP or Static

After the **Setup Wizard** is complete, the Web Controller displays its main home page in **Overview** mode. The Web Controller is ready for operation. Users may begin to log into the Web Controller to operate the chamber.

CHAPTER 3

User

This chapter explains how users log into ESPEC Web Controller to control and operate the chamber. The Web Controller 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 the Web Controller

To log into a specific account on ESPEC Web Controller HMI (touchscreen monitor), use the touchscreen keyboard as shown below.

Mar 31	1, 2022, 12:37:5	2 PM					ES	PEC-defa	ult /user						Ş	Ē,	ø
٤	Status Standi	Temp Oy Off	26.2 c	Humi Off	100.0%	IH Off	TS2 Off										
-	Please UserName	Logir	i														
	Pergunosi																
Ę	Password																8
2															CLEAR	SUE	TIME
	`	1	2	3	4	5	6	7		8	9	0	-	=		\otimes	
	->		q v	v	e	r	t	у]	u	1	0	p		[]]	1	1	
	얍		a	S	d	f	g	h	j	k		1	;			ų	
	1	1	Z	X	c		1	b	n	m			11	T	1	t	
0	.co	m	@											X	> [CLI	R

Figure 3.2: Log into the Web Controller 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 authentica-

tion is verified, ESPEC Web Controller 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 Web Controller 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

ESPEC Web Controller 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.

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≡ User 9	Settings														
Modifications (a	dd/remove/update) to user accounts are	made here.												
Usemame	Pessword	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 White	•	Read Write	÷	Read Write		Read Write		Read Write	*	Read Write	•	×
Paul			Read Write	•	Road Write	*	Read Write	÷	Read Write	*	Road Write	÷	Read Write	•	×
							ADD								

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

About

The last menu of ESPEC Web Controller in the menu bar is the **About** page. It provides information about ESPEC Web Controller software, its version number, terms of service to end-users, online manual, software support and download. 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 4.1: Terms of service of ESPEC Web Controller

- 1. **Terms of Service**: The **LEGAL** tab consists of a one-page view containing complete information of ESPEC Web Controller software, its usage and license. The bottom portion of this page contains a list of different modules and functions used in ESPEC Web Controller 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., ESPEC Web Controller), end-users have read, understood and accepted all the terms outlined herein.
- 2. User's Manual: ESPEC Web Controller User's Manual is available in two different formats: (1) online and (2) PDF. Item 4 (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.
- 3. Web Controller Version: This firmware version number can be used to check against the current release of ESPEC Web Controller 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.
- 4. **Support and Download Page**: If your Web Controller has access to the Internet, this link points to ESPEC website that provides support of software download and other requests.

C B especient/subject/web.com/ma/support/web.comman/	(1) ★ 上 [
ESPEC Quality is more than a word	ESPEC North America → Callus 1+616-816-6100 Frid local alse rep f ♥ in
Test Chambers Testing Services Resources Support About Us Careers Web Controller For ESPEC P-300 & SCP-220, Watkow F47 & F4 Web Controller Consult Support	۹
Upparting your existing ESEPCE from America chamber for our Web Controllers in an embodie due to be includies a RES Thui AR for easy integration with other equijonent and applications. • Includes a RES Thui AR for easy integration with other equijonent and policitoris. • Includes a RES Thui AR for easy integration with other equijonent and policitoris. • Includes a RES Thui AR for easy integration with other equijonent and policitoris. • Includes a RES Thui AR for easy integration with other equijonent and policitoris. • Includes a RES Thui AR for easy integration with other equijonent and policitoris. • Includes a RES Thui AR for easy integration with other equijonent and policitoris. • Includes a RES Thui AR for easy integration and the set of the set	SUPPORT AND SERVICE Request Support Now QuatmarkiHALT Support Chamber Care Program Web Controllers SupportUpgrades Chamber Manuals Controllers and Software HALT-HASS Solution Partners

- 5. Chamber Serial Number: The serial number of your chamber can also be found here. Chamber serial number is important for requesting customer or software upgrade.
- 6. Customer: Customer's registered name.
- 7. Shipped Firmware Version: This is the version of the firmware that was shipped with the chamber. This version can be used to check against the current version posted under item 3 to determine update options.
- 8. **Registration Date**: The registration date shows the date when this chamber was registered in ESPEC service record.

Part II

T-Series Chamber

CHAPTER 5

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 ESPEC Web Controller. The following figure depicts **Overview** showing the chamber in Standby mode, as indicated in the status tab and its extension bar. The extension bar of the status tab is only available in the **Overview** menu.

E espec-default Or Standby of 24.5°C Ver 0.0G OF			
4 m	Standby		Jul 16, 2021, 10:41:49 AM
51	Product Temperature		Vibration
	Off	Product 24.5 c	Off 0.0.
0	G	ead: 0% ook: 0%	Power Dy
	TS1 TS2		TS5 TS6 TS7 TS8 에 다 에 다 에 다 에 다
	Temp Aux 1 Temp Aux 2 Temp Au Errer C Errer C Errer	IX 3 Temp Aux 4 Temp Aux 5 Temp A C Enter C Enter C Enter	Aux 6 Temp Aux 7 Temp Aux 8 Temp Aux 9 Temp Aux 10 Vibe Aux 1 CP Fins CP Fine CP Fine CP Fine CP Fine CP Fine
	Vibe Aux 2		Door Open Door Close

Figure 5.1: Overview page with chamber in Standby mode

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

espec-default	Constant Pret Temp 24.5°C 5.00 0.0	ka off off off off off off off off		Light Off
£ (*)	→ Constant			Jul 16, 2021, 10:40:38 AM
1111		Padato 24.5 c Padato 24.5 c Faces 135	Vibration 5.0.a Se Voice Power: 7%	0.0 . Prime View
	TS1 TS2 □# ⊡ □#	TS3 TS4 G- 에 G- 에 G-	TS5 TS6 TS7 on Grow Grow	7 TS8 C+ 04 C+
	Temp Aux 1 Temp Aux 2 Temp A	Aux 3 Temp Aux 4 Temp Aux 5 Temp A C Error C Error C Error	Aux 6 Temp Aux 7 Temp Aux 8 Temp A C Ener C Ener C Diver	ux 9 Temp Aux 10 Vibe Aux 1 G Bron G VIDe TG
	Vibe Aux 2 00	Vibe Aux 3 © 05	Door Open Door	or Close

Figure 5.2: 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.

Program	n PROG11T	1 0.00:29	-										Jul 16, 2	2021, 1	0:44:34 A
. May fape								7.89		155	159	195	150	197	(118)
1 Temp Hamp 2 Division		0100	30 MG 30 MG		101.00 101.00	50 50	0.00	im 🗋	8		1000		1000		100
Product Temp						24.5	Vibra								
26.6			al: 12% ol: 0%		Product	24.5-c	5.				Power 7%	_			0.0
TS1 or	CP TS2	G	TS3 On	G	TS4	G	TS5 Off	G	TS6 ⊙≋	ej	TS G+ Off		G	TS8 Off	
Temp Aux 1	Temp Aux 2 Ener C		x 3 Temp	Aux 4	Temp Aux	5 Temp	Aux 6	Temp Aux 7		Aux 8 Œ	Temp. Errer	Aux 9	Temp Au Errer	ux 10 G	Vibe Aux
Vibe Aix 2		e	Vibe Aux	3		œ	Door	Open			C D	oor Clos	se		-

Figure 5.3: 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 ESPEC Web Controller can clear all alert messages displayed in the alarm tab in the status bar.

٤	MAR MONTH	Standby Prd Temp 49.0rc Off 0.0g Off O	152 153 154 155 156 157 158 Dif Off Off Off Off Off Off		Light Off
*	~	©Standby	OConstant	OProgram	QAlarm
E.	-			Program + 0	
				PROGRAM PAUSE RESUME	
1		STANDBY	CONSTANT	NEXT STEP	CLEAR ALARMS
•					CLOSE

Figure 5.4: Status Bar in the Overview page

5.1 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.

→ Status Conv. nt Prd Temp 23.0-c	23.4°c ^{Vibe} 0.0	G TS1 Off	ts2 Off	TS3 Off	ts4 Off	ts5 Off	TS6 Off	ts7 Off	TS8 Off
OStandby	@Constant	OProgram +			OAlar	m			
		PROGRAM	I PAL	JSE					
STANDBY	CONSTANT	NEX	T STEP		GLE	EAR ALAR	RMS		
							CLOSE	=	

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.

	10 112 112: 11			
- 6	Office (~		Dem
	atomet .	Longer Land	sarcu-	

Figure 5.5: Status tab drop-down menu via the extended tab

- 2. Click the **STANDBY** button. ESPEC Web Controller 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
 - $\bullet\,$ Click the ${\bf CLOSE}$ button underneath the alarm tab.

5.2 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.

Status Prd Temp 38 Standby Off	3.2°c ^{Vibe} 0.0g	TS1 TS2 TS3 TS Off Off Off Of	
OStandby	⊘ Constant	OProgram Step Program = 0	QAlarm
		PROGRAM PAUSE RESUME	
STANDBY	CONSTANT	NEXT STEP	CLEAR ALARMS

Figure 5.6: Constant mode setting

- 2. Click the **CONSTANT** 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 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.

5.3 Program Setting

To set the chamber in **Program** mode means a program is loaded onto the Web Controller, 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 5.7: 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 5.8: 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. ESPEC Web Controller 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.
- v.3 3/2022

5.4 Clear Alarms

When ESPEC Web Controller 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.

٤	WebDevTseries	Off 23.5 c	Vibe 0.0g 151 152 153 154 Off Off Off Off Off Off	TS5 TS6 TS7 TS8 Off Off Off Off	
*		OStandby	OConstant	OProgram	⊗Alarm
50 20	-			Program + 0	All active alarms must be cleared before operating chamber. •dyn alarms circ_fault full
1.1		STANDBY	CONSTANT	PROGRAM PAUSE RESUME NEXT STEP	CLEAR ALARMS
8					CLOSE

Figure 5.9: 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.

5.5 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 5.10: Control settings via the control panes

5.5.1 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.

2. 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.

Status Standby	Off 30.2°c	Vibe Off 0.0G	ts1 Off	ts2 Off
	Temperatu	Product °C CLOSE APPLY		

Figure 5.11: 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.

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

- 1. Click the Vibe tab in the status bar.
- 2. 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.

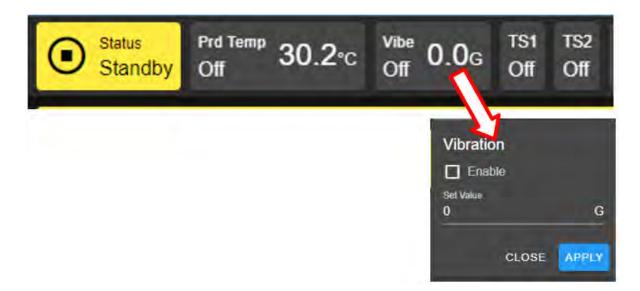


Figure 5.12: Setting new vibration value via the temp tab

- 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.

•	Status Standby	Prd Temp Off	30.2 ℃	Vibe Off	0. 0 G	TS1 Off	TS2 Off
						Tir	ne Signal #1 Enable
						С	OSE APPLY

Figure 5.13: 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.

5.5.2 Settings via the Dedicated Panes

With ESPEC Web Controller, 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.

Product Temperature			Temperature		ì
Off		Roda 28.5 -	Enable set Value	Product	
<u> </u>	Heat 0%	Fredact CO. O'S	23		-c
	Cool 0%				CLOSE APPLY

Figure 5.14: 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.

5.6 Web Controller on the Network

ESPEC Web Controller can communicate with other ESPEC Web Controllers on the same network. The hostname (with E logo) in the upper-left corner acts as a link that, when clicked, provides a list of any chamber with ESPEC Web Controller detected on the network by the local ESPEC Web Controller, as depicted in the following figure.



Figure 5.15: List of ESPEC Web Controller on the local network

This list can be opened from within any menus (not just in the **Overview** menu) by just clicking on the Web Controller hostname. Any chamber and ESPEC Web Controller on the list can be accessed directly by clicking on its hostname.

CHAPTER 6

Trend

Data points from the chamber's operation accumulated in the data log are displayed as a trend graph under the **Trend** menu, depicted in the following figure. By default, this graph provides an overview of the chamber's operation in the last one hour. Data can be downloaded in whole or in portion (refer to Item 4 below).

٤	WebDevTseries	A Progra	Program Pro	d Tempi 23.3	c ^{vibe} 0.0	G Off Off	153 IS4 I Off Off O		158 Off		1	4	4	Light Off
±	1		end Graph				2 3	7					0.	12) (±
E.	10000	-250				- /		X						
0	-	-200						5/17/2021 : - Temp SV	20 °C					
-		150						- Temp Air Py Temp Prod Vibe SV						
6		ture(°C). Vibration (Grms) 6. 01						- Vibe PV Status	0 G Standby					
٠		(CC), VIbra												
60		Temperature 65												
	5	- •												
	6	-100	255pm 5/17	3:00pm	3.05pm	3:10pm	3:15pm	320pm	3:25pm	3:30pm	3:35pm	3-10pm	3:45pm	350pm
	7	Status: Star	(10)											-
		- Temp SV	- Temp Air PV	- Temp Prod. P	V Vibe SV	- Vibe PV								

Figure 6.1: Trend graph showing plots of current data from the chamber

The main display area of the **Trend** menu is categorized into seven different groups with labels from 1 through 7. Detailed descriptions of these categories are outlined as follows:

1. **Time Frame**: This menu button shows or hides the time frame of the data points being plotted in the trend graph. As shown in the following figure, the trend graph is plotted for data points collected between 2:51 PM and 3:51 PM. That time frame is also displayed at the bottom of the trend graph, with grids at an interval of 5 minutes. To hide this time frame, click the menu button again.

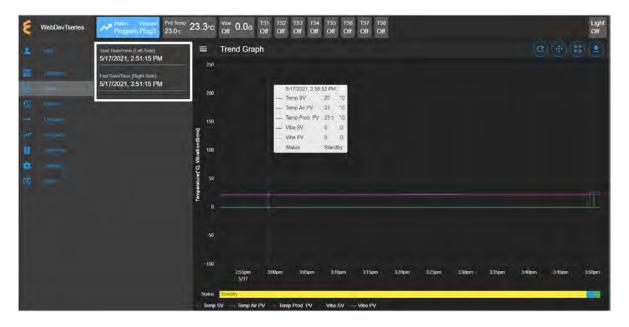


Figure 6.2: Detailed data of the Trend graph

- 2. Trend Graph: Data points collected from the chamber are rendered and displayed as a trend graph based on a scatter plot methodology. These data points represent product temperature, air temperature and/or vibration; they are plotted as a function of time. The vertical (Y) axis represents the scale of their values. Temperature is displayed in degree Celsius; vibration is displayed in root-mean-square of acceleration (Grms or G). The horizontal (X) axis represents the time scale with unit measured in a 1-second scale. Based on the default configuration, the T-series chamber logs data points in a 1-second interval. The scaling of the grid will change according to the Pan/Zoom Controls buttons application (see item 3 below). To reset the trend graph, click the Zoom Extents button (in the following figure), select Last Hour from the drop-down menu, then click the Auto Refresh button.
- 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. This feature allows a quick peak of the data at a certain point in time. Depending on the chamber's condition, the snapshot provides set values (SV) and process values (PV) of temperature, product or air temperature, or vibration, chamber's operation status and time signal status.
- 4. **Trend Graph Manipulation Buttons**: Four buttons are available to help manipulate and control the trend. This group of buttons is detailed in the following figure; their functions are described as follows:

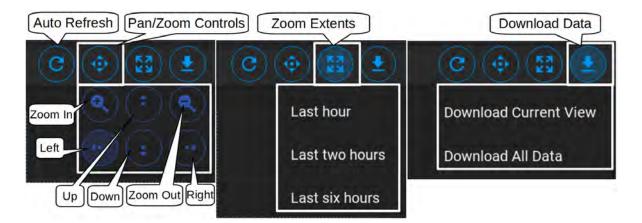


Figure 6.3: Manipulation buttons of the Trend graph

- Auto Refresh: This Auto Refresh button refreshes the trend graph; it thereby reconstructs the graph using the most recent data points which have been accumulated up to the current time.
- **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.

- 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.
- 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. Note: Only authorized users may download the data. The following error will occur if an unauthorized user attempted to download that data.



Figure 6.4: trend-graph-download-error-001a.PNG

- 5. Line Graph: Data points from Temperature (set values or process values) and vibration (set values and process values) are being plotted to produce the line graphs to visually display the operation condition of the chamber.
- 6. **Status**: Status of the operation mode of the chamber 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 **Left** button under the Pan/Zoom Controls may be used to extent further 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 to designate the different line graph (described in Item 5 above).

CHAPTER 7

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 7.1: 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.

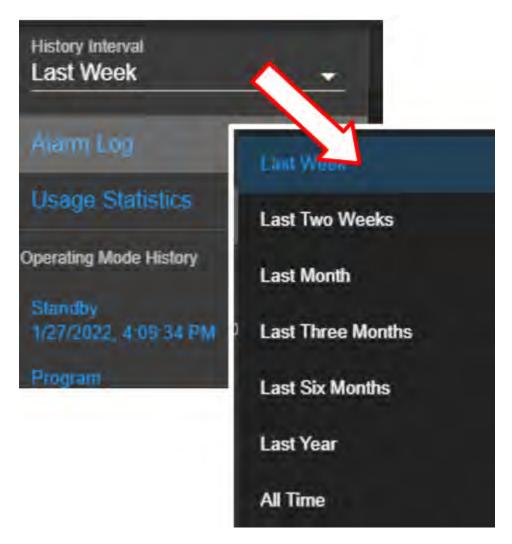


Figure 7.2: History interval and display selection

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).



Figure 7.3: 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:

٤	WebDevTseries	Status Prd Temp 21.9 c	S Off 0.0G Off Off Off Off Off Off Of	156 157 158 Off Off Off		Light Off
*		History Interval Last Two Weeks	≡ History			
88		Alarm Log	Percentage of time in each operating mode for	pr the specified interval.		
12		Usage Statistics	and the second sec			
0		Operating Made History		Mode	Duration	Percent
				Standby	225:49:05	98.96%
		concepts and the second		Constant	2:15:14	0.99%
				Program	0:05:41	0.04%
		Green LAN IVA		Alarm	0:01:43	0.01%
		THE LOCAL		Program Paused	0:00:16	0.00%
۲						

Figure 7.4: 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.

٤	WebDevTseries	Standby Prd Temp 25.9*c	View 0.0g fs1 152 753 154 153 156 157 158 Or Or	Light Off
+		Last Week -	≡ History	0
96		Atarm Log Usage Statistics	250	
_	Tribut	Operating Mode History	200	
	Constant	Contract of the total	F ¹⁹⁰	
×.		7(22021): 12:04-24 AM	12 Source of the second s	
8		7/172021, 2 Black Ind		
•		(C)(endared 7/17/7524) 2 34 32 PM	50	
0		CUMPATI STATISTICS	1.1	
		Alamo 7962024 PAPAA PM	30	
		Constant Processing Constant and		
		COSTON IN 15 TRAM	-100 10 20 30 40 50 00 10 20 30 40 50 00 10 20 30 40 50 00 10 20 30 40 60011132am 6/011134am 6/011134am	0 50 00 :10 6/30 11:15am
		Subscription of the second second	Status Program	
		Sandani assozi024, 11 †2 02 Ale	- Temp SV - Temp Av PV - Temp Prod. PV - Vibe SV - Vibe PV	

Figure 7.5: 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.

٤	WebDevTseries	Starus Off 24.4-c Vibe 0.0g TSt Off	152 TS3 TS4 TS5 TS6 TS7 TS0 Off Off Off Off Off Off Off Off		Light Off
4		≡ History			
88		Percentage of time in each operating mode for the spe	cified interval.		
	lona		Mode	Duration	Percent
			Standby	65:12:17	98.40%
-			Program	1:02:34	1.57%
٠		•	Constant	0.01:14	0.03%

Figure 7.6: 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 8

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 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.

٤.	VobDerisones	Standby Prd Temp 27.4 c Vibe 0.0 Off	TS2 TS3 TS4 TS5 TS6 TS7 TS8 Off Off Off Off Off Off Off			Light Off
4		Constant				
20	Transle Transle Founder	Temperature Crubie Ser Vision 23	Produci *C	Vibration Enable Set Value 0		
•		Outputs Time Signal #1 Time Signal #5	Time Signal #2 Time Signal #8	Time Signal #3	 Time Signal #4 Time Signal #8 	GEAT APO

Figure 8.1: The Constant menu and its components

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

8.1 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.

Constant			
Temperature Ensiste	Product	Vibration Enable Per Yole 0	
Outputs	Time Sepai #2	Time Signal #3	🔲 Time Signat #4
Time Signal #5	Time Signal #6	Timo Signal #7	🗖 Tumo Signal #8
			CLEAR

Figure 8.2: 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 8.3: 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**.

8.2 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**.

8.3 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 9

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 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 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.

2	User	Please Login	
		User Name	
kе.			
0		Password	Q
			CLEAR SUBJUT
-			
-10			
0			

Figure 9.1: User with read-write privilege is required to operate the Program menu

9.1 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 9.2: Program listing page with submenu hidden

- 1. Submenu Show/Hide: To utilize the entire main display area for the program editor, this button can be used to hide the submenu (as shown in the above figure). Click it again to reveal the submenu.
- 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, Web Controller).
- 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 under the Actions column can be used to handle programs on the list under each row. These action buttons, once activated, affect the program on the same row. These buttons are: Upload Program, Download Program and Delete.
 - Upload: Program can be uploaded from the local computer directly to the Web Controller. 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	£	Ŧ	Ē
Paul5	TempVibTest	£	±	Ē
Create new				

Figure 9.3: 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 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 9.4: 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 the Web Controller 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.

9.2 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.

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Create New	υ	Name	Actions
	TempVibTest	TempVIDTest	1 ± 1
	Test		± ± - •
	Test2		1 ± 1
	Prog3		1 ± 1
	TESTI	TESH	1 ± ±
	Prog4		1 1 1
	Paul5	TempVibTest	1 ± 1
	Create new		

Figure 9.5: Creating a new program

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



Figure 9.6: 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. In order to apply the preview mode, the program must be loaded into the program editor first, then click the **PREVIEW PLOT** button.
- 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 the Web Controller.
- 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-
- v.3 3/2022

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 the Web Controller 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 the Web Controller 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 ESPEC Web Controller system until the **Save As** button is applied. The Web Controller only accepts a program in JSON format. To ensure compatibility, the program structure should be based on the one downloaded from the Web Controller 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.

9.2.1 Programming: Add Program Step

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.

iamu TempVib1								
itat Temperakan 23		~c (Sian) Vitendase D			Evel Made G Turn cha	mber off	
Step Type	Temperature Duration	Rate	Set Value	Vibration Duratión	Rate	Set Value	USR Gulputs Time	151 152 153 154 155 156 157 15
1 comp & Vibe Ramp	- 0.10.00	0.70	- <u>*C</u> 30	°C 0.10.00	1.00	g 10	G 1 0.00.00	
				APPEND STEP	.			
21				h				
Insert Befor	e				V			
Insert After								

Figure 9.7: Adding or Inserting a program step

8. **Program Preview**: The Web Controller 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.

=	TempVib1			1	±.	e
		CDITOR:				
	10					
	0 80800 00020	00040 DE100 D0120 00140 DE200 00220 00240 00300 D6320 06340 D0400 D0420 054	40 164500 164520 92546 96660 166620 92646 92760 92720 92740 92860 92820 9264	0.0900	0.09.20 0.094	0 0:1000
	Step 1					
	The Delig & Vice	Rano				_
	Go To					
	151					
	TS2 OH TS3 OH					
	TS4 Off					
	T\$5 OF					
	TS6 Off					
	TS7 Off					
	TS8 0/					
Temp	SV Vibe SV					

Figure 9.8: Preview of the program output

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



Figure 9.9: 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.

9.3 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**).

9.3.1 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.

≡ List Programs		
D	Name	Actions
TempVib1	Tempvint	± ± 💼
TempVibTest	TempVidTest	± ± =
Test		1 ± 1
Test2		±.±. 👘

Figure 9.10: 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 9.11: 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.

9.3.2 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).

ues .							PREVIEW PLOT			
empVib1										
tart Temperature 3		•o 0	bet Worklan)			End Made G Turn che	mber off.			
Siap Type	Temperature Duration	Rate	Set Value	Vibration	Rate	Set Value	USR Outputs Time	151 1	52 753 754 75	55 T56 T57 T5
1 Temp & Vibe Ramp	- 0 10 00	0.70	-c 30	°C 0.10:00	1.00	-9 min 10	6 0 0000			
2) Temp Ramp	- 0 10 00	0.50	nn 35	*C 0 00 00	Intinito	<u>0</u> 10	0 00 00	21		
3 Vibe Ramp	🔶 0:00:00	Infinite		°C 0.10.00	0.50	<u>6</u> 15	G (1) 0 00 00			
Dwell	+ 0.10.01		16 35	"C 0.10.01	0.00		a 🕐 00 00	01		
				APPEND STEP				1		
								nsert Befo	re	
								nsert After		
								Delete		

Figure 9.12: 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.

								PREVIEW PLOT		± R B
Kame TempVib1										
Start Temperature 23			*C 0	art Vibration			End M G Turn	iose chamber off.		
Shep Type		Temperature Duration	Rate	Set Value	Vibration Duration	Rate	Set Value	USR Outputs Time	TS1 TS2 T	53 754 755 756 757 758
Temp & Vibe Ramp	-	0.10.00	0.70	-c 30	*C 0 10 00	1.00	G 10	G 🕕 0.00.00		
2 Temp Ramp	÷	0.10.00	0.50	* <u>C</u> 35	•c 0.00.00	Infinde	<u>8</u> 10	6 1 0.00.00		
3 Vibe Ramp	÷	0.00.00	Infinito	10 min 35	-C 0:10:00	0.50	S 15	G 🛈 0.00.00	00	
(4) Dwell	÷	0 10 01			°C 0:10:01			G 🕐 0 00 00	001	
								2 0.05.00	001	
6 Go To Step		Go To Step Step 2			Go To Step Count					
					APPEND STEP					

Figure 9.13: 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 9.14: An output preview of the Sample Program

9.3.3 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. :

≡ TempVib1	enna						PREVIEW PLOT	11111
Name TempVib1								
Thad Temperature 23		•c 0	lart VBrutter			Civid Massis Gi Turn charr	iber off.	2345
Step Type	Temperature Derablee	Hate-	Set Value	Watation	Rate	Set Value	USR Outputs Time	151 152 153 154 155 154 157 158
Temp & Vibe Ramp	+ 0:10.00	0.70	뜵 30	°C 0 10:00	1.00	<u>-</u> 10	G (1 0.00:00	2000000
2 Temp Ramp	+ 0.10.00	0.50	놂 35	°C 0.00.00	latinita		G 0 00000	
3 Vibe Ramp	• 0.00.00	intinito	¹⁰ .36	10.10.00	0.50	0 15	G (1 01000	
Dwell	• 0.10.01			°C 0.10:01		畜牧	G (1) 0:00:00	0000000
				APPEND STEP				

Figure 9.15: 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.

≡ TempVib1		шлон						PREVIEW PLOT	• • • • • • •
lame TempVib1									
Starf Temperature 23			"C 0	art Westion			End Mode G Turn che	mber off.	
Step Type		npèrature ration	Rate	Set Volue	Vibration	Rate	Set Value	USR Outputs Time	TS1 TS2 TS3 TS4 TS5 TS6 TS7 TS
Temp & Vibe Ramp	+ 0.1	10:00	0.70	- <u>c</u> 30	*C 0:10:00	1.00	0 min 10	G (1) 0:00:00	2000000
2 Temp Ramp	- 0.1	10:00	0.50	in 35	•C 0:00:00	Inlinito	<u>응</u> 10	G (1) 0.00.00	
3 Vibe Ramp	+ 0.0	00-00	Infinite	<u>15</u> 35	-C 0.10.00	0.50	0 min 15	G 🛈 0.00.00	
Dwell	+ 01	10:01		 45	°C 0.10.01			G (1) 0.00.00	
								0 05 00	
5 Go To Step	− Ste	To Step op 2			Go Ta Step Count				
					APPEND STEP				

Figure 9.16: 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 9.17: Update indicator

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

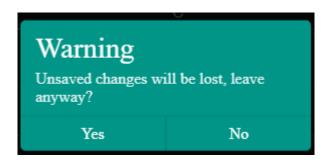


Figure 9.18: Confirm the save or discard update

The T-series chamber does not store any program in the controller. All programs displayed in the **List Programs** submenu are stored in the Web Controller. When an operator runs the program, the Web Controller 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 the Web Controller for execution, they can be exported (item 3 above) to the local computer as backups.

9.3.4 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.

≡ List Programs	0.00	
ID	Name	2 Actions 3 1
TempVib1	TempVibi	1 i i i i i i i i i i i i i i i i i i i
TempVibTest	TempVibTest	1 1 👘
Test		(🔹 🛓) 💼 🚬
Test2		1 ± 1

Figure 9.19: 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.

\equiv List Programs		
ID	Name	Actions
TempVib1	TempVib1	L 🖆 🛓 🔰 L
Test		1 1
Test2	Test2	主 🛓 Delete
Prog3	Exc3	± ± 📋

Figure 9.20: Deleting program from the Name list

Warning						
Are you sure you want to delete "Test"?						
Yes	No					

Figure 9.21: Confirm deletion

2. Upload Program: This button can be used to import a program from the local computer directly into the Web Controller (onto 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.

≡ List Programs		
ю	Name	Actions
TempVib1	TempVib1	1 ± 1
Test		±± 📋
Test2	Test?	1 ± ± 🚺
Prog3	Pros	± ± 💼

Figure 9.22: 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 10

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 10.1: 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.

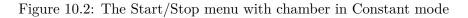
10.1 Standby Mode

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.

10.2 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.

٤	Nelfordine	Constant Pro Temp 23.2 c Voe 0.0 cm	157 153 154 155 156 157 158 On Off Off Off Off Off Off		Light Off
÷.,		OStandby	Constant	OProgram	OAlarm
98.				Program + 0	
14				Program + 0	
				PROGRAM PAUSE RESUME	
		STANDBY	CONSTANT	NEXT STEP	CLEAR ALARMS
		-			
• •	4				



10.3 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.

٤		Program TempVeht 25.2 26.3 C Off 0.0	0G CH CH CH CH CH CH CH CH		Light
۰.		OStandby	OConstant	© Program	OAlam
gR				TenetVibit - 0	
142				TempWb1 - 0	
				PROGRAM PAUSE RESUME	Distance of the local distance of the local distance of the
	~	STANDBY	CONSTANT	NEXT STEP	CLEAR ALARMS
	-				

Figure 10.3: The Start/Stop menu with chamber in Program mode

10.4 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.

٤	WebDevTseries	Off Status Off 36.2	Light Off		
*		OStandby	OConstant	OProgram	⊘Alarm
				Shira Program + 0	All active alarms must be cleared before operating chamber.
				Program	Air temperature limit high fault
		STANDBY	CONSTANT	PROGRAM PAUSE RESUME NEXT STEP	CLEAR ALARMS
~	(mightin)	STANDOT	CONSTRAT	PRODIVIM PROSE RESUME REATOTER	ULEAN ALANMS
0	-				
•					-
1					Alum: Air temperature limit high fault

Figure 10.4: 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 10.5: Managing chamber alarms in the Start/Stop menu

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

10.5 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. ESPEC Web Controller immediately moves to apply the operating mode to the chamber.

10.6 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. ESPEC Web Controller immediately moves to apply the operating mode to the chamber.

10.7 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.

10.7.1 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.

@Standby	OConstant	OProgram	OAlarm
STANDBY	CONSTANT	PROGRAM TSeriesTEST	T CLEAR ALARMS
		Test Test2	
		Prog3	

Figure 10.6: 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. 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 following figure. The **Overview** page maybe accessed to display the detail of the program being executed.

٤	Million Local	Program Tempe 45.5% Vibe 0.0	G 011 152 153 154 155 156 157 158 011 011 011 011 011 011 011 011 011		Light Off
۰.		OStandby	OConstant	©Program	OAlarm
28				People TempVb1 + 0	
۳.				TempWitt + 0	
-00				PROGRAM PAUSE RESUME	
-		Concession of the local division of the loca			
~	-	STANDBY	CONSTANT	NEXT STEP	CLEAR ALARMS
•					

Figure 10.7: Program being executed

10.7.2 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.

٤	Withinst	Program Prused TempVint 24.4c	Mee 0.0g 153 152 153 154 155 156 157 158 Off Off Off Off Off Off Off Off Off Off		Light Off
*		OStandby	OConstant	©Program	OAlarm
198		Contraction of the second s	(particular second sec	Trades Bet	
歴				TempVib1 + 0	
				and the second s	
-				PROGRAM PAUSE RESUME	
1	**	STANDBY	CONSTANT	NEXT STEP	CLEAR ALARMS
۰					
0					

Figure 10.8: Program is paused, all operations susspended

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.

10.7.3 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 10.9: Stepping through a program

10.8 Clear Alarms

The chamber is set in the **Alarm** state as a result of an alarm or alarms triggered in and by the chamber. ESPEC Web Controller 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.

Part III

ESPEC Chamber with F4T

CHAPTER 11

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 ESPEC Web Controller. The following figure depicts **Overview** showing the chamber in Standby mode, as indicated in the status tab and its extension bar. The extension bar of the status tab is only available in the **Overview** menu.

ESPEC-default	Standby Dit 27.2-c file	n 100.0%RH Off				
2	Standby					Doct 27, 2021, 1:46:21 PM
111	Temperature Off	Heat 0% Cost 0%	27.2.	Humidity	Heat 175 Cool 05	100.0
11	TS1 of					B

Figure 11.1: Overview page with chamber in Standby mode

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

ESPEC-default	Donstant Tenso 27.3 °C Off 100.0 %RH Off				
÷	→ ^{Same} Constant				Oct 27, 2021, 2:01:44 PM
0 m	Temperature 38.2.	27.3.	Humidity Off		100.0
111	Ser Vision Taking Takin		pill Amer	Heat 0% Coat 0%	
•	TS1 of				G

Figure 11.2: 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.

5 PC	Program BTX	475 15:10:00 1	:00:00							Oct 27, 202	1, 2:09:50 PM
				-	-						Longer .
	1 Instant Change	1.0(100	2	78 °C			-	10 %/8/			CH.
	(Y Instant Charge	1.0000		100 °C		2	- 10	10 19RH		2	
	T Instant Prances	10000	10	101.YC		Π	m	10 %/26	_	'n	like .
	Temperature					Humidity					
	70.0.				28.0.	Off				9	98.6
			Heat 100% Cool: 0%						Heat 0% Cool 0%		

Figure 11.3: 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 sta-

tus 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.

11.1 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.

(IIII) Provident	Tornstant So D- 29.8-c Ott 100.0x8H Oft							
	OStandby	©Constant	OProgram					
) (Pragram		-			
			RUN PROGRAM MODE	PAUSE	RESUME			
	STOP OPERATION	RUN CONSTANT MODE		NEXT STEP				
					CLOSE			
	1 1 1 1 1	OStandby stop operation	OStandby StOP OPERATION RUN CONSTANT MODE	OStandby Stop operation Stop operatio	OStandby STOP OPERATION STOP OPERATION AUN CONSTANT MODE OProgram Program Program Progr			

Figure 11.4: Status tab drop-down menu via the extended tab

- 2. Click the **Stop** button in the standby tab. ESPEC Web Controller 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.

11.2 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 11.5: Constant mode setting

- 2. Click the **CONSTANT** 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, click the **CLOSE** button in the lower-right corner (underneath the alarm tab); or the one of the alternative options mentioned above.

11.3 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).

	OStandby	Constant	OProgram	_	Dec 8, 2021, 4:57:11 PM
			RUN PROGRAM MODE #1: Testy		100.0
	STOP OPERATION	RUN CONSTANT MODE	#2: Humidity #3: Temperatu	IFB	G
9,			#4: PROGATE	st	

Figure 11.6: 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.

Status Off 22.6*c Off 30.0	I%RH Off Off off	
⊗Standby	()Constant	OProgram Program RUN PAUSE
STOP OPERATION	RUN CONSTANT MODE	R 2 EXT STEP 3 CLOSE
		5

Figure 11.7: 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. ESPEC Web Controller 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.

11.4 Clear Alarms

When ESPEC Web Controller 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.

v.3 3/2022

	Alarmi	Date	i.cim
ive Chamber Ala	ptp	Dec 9, 2021, 10 34 29 AM	
m	Circulator Fault	Dec 9, 2021, 10:34:29 AM	

A repeating beep on the local computer is also tripped to get the operator's attention. The **SI-LENCE** 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.

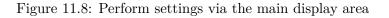
E Insurior	Contraction of the second seco						
* -	Alarm ptp, Circ Fault					Dec 9, 2021, 11:09:49 AM	
111	Temperature Off	Head OK Cool 1%	27.6.		Head DN Cost DN	100.0	
0 0 0	TS1 or		-			S	

In an alarm state, operation is halted until all alarms triggered by chamber are resolved via the F4T (i.e., clear all alarms on the F4T) before the Web Controller (and the chamber) can resume the normal operation. 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.

11.5 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.

Standby			Oct 28, 2021, 5:25:29 PM
Temperature Off	29.4	Humidity Off	94.1
TS1			



11.5.1 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 11.9: 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 11.10: 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.

11.5.2 Settings via the Dedicated Panes

With ESPEC Web Controller, 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 pa-

v.3 3/2022

rameter 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.

Temperature Off		27.3.
Y	Heat: 0%	
	Cool. 0%	N
Temperature		- 1 N -
164		
104		10
		CLOSE APPLY

Figure 11.11: Setting new temperature value via the temperature (CTA) pane

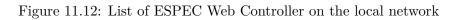
3. Click **APPLY**. To cancel the setting, click **CLOSE** (instead of **APPLY**).

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

11.6 Web Controller on the Network

ESPEC Web Controller can communicate with other ESPEC Web Controllers on the same network. The hostname (with E logo) in the upper-left corner acts as a link that, when clicked, provides a list of any chamber with ESPEC Web Controller detected on the network by the local ESPEC Web Controller, as depicted in the following figure.

* *** (1000)		Dec 10, 2021, 2:21:09 PM
		27.6
	Freed bits	27.6.
tst or		Đ



This list can be opened from within any menus (not just in the **Overview** menu) by just clicking on the Web Controller hostname. Any chamber and ESPEC Web Controller on the list can be accessed directly by clicking on its hostname.

CHAPTER 12

Trend

Data points from the chamber's operation accumulated in the data log are displayed as a trend graph under the **Trend** menu, depicted in the following figure. By default, this graph provides an overview of the chamber's operation in the last one hour. Data can be downloaded in whole or in portion (refer to Item 4 below).

	Trend Graph 2	3		4 2 3 3 3
		11/3/2021, 1, 17, 24 PM		
	150	Temp Ak SV 23 1C		
		- Temp Prod SV 21 *C		
		- Temp As PV 23 *C - Temp Prod PV 211 *C		
2		- Tamp Pun D # 5		
	100	** Hum 5V 15 SAH		
		- Humi PV 0.3 SHIT		
-		- Ham Par 0 to		
	50	- dac_404 01.2		
- 5 👔		- dec_508 94.0		
		- stear_ger 21.2		
Ę.		- Status Constant		
1		- Temp EN On 10		
ŧ		- Temp Prod Cit Cit 1C		
-		- Huel EX OF SRH		
	-50	- T51 ON		
		- 152 Of		
		- alarma		
	-101			
	1255pm 1.05pm 1.05pm 1.05pm 1.0	Syan 125yan 125yan	130pm 135pm	tidgen 1dSpm 1dS
6	Status Constant			
	p Prod Cit Of			
	HumiDI Off			0-
	781 04			

Figure 12.1: Trend graph showing plots of current data from the chamber

The main display area of the **Trend** menu is categorized into seven different groups with labels from 1 through 7. Detailed descriptions of these categories are outlined as follows:

1. **Time Frame**: This menu button shows or hides the time frame of the data points being plotted in the trend graph. As shown in the following figure, the trend graph is plotted for data points collected between 1:07 PM and 2:06 PM. That time frame is also displayed at the bottom of the trend graph, with grids at an interval of 5 minutes. This graph will continue to update and propagate through the progression of time in a 5-minute interval. To hide this time frame, click the menu button again.

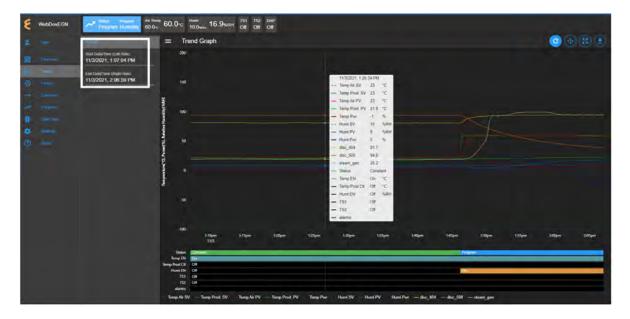


Figure 12.2: Detailed data of the Trend graph

- 2. Trend Graph: Data points collected from the chamber are rendered and displayed as a trend graph based on a scatter plot methodology. Depending on the chamber type and feature, these data points represent product temperature, air temperature, humidity and/or vibration; they are plotted as a function of time. The vertical (Y) axis represents the scale of their values. Temperature is displayed in degree Celsius; humidity in percentage as %RH, vibration in root-mean-square of acceleration (Grms or G). The horizontal (X) axis represents the time scale measured in a 1-second unit. The scaling of the grid will change according to the Pan/Zoom Controls buttons application (see item 3 below). To reset the trend graph, click the Zoom Extents button (in the following figure), select Last Hour from the drop-down menu, then click the Auto Refresh button.
- 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. This feature allows a quick peak of the data at a certain point in time. Depending on the chamber's condition, the snapshot provides set values (SV) and process values (PV) of temperature, product or air temperature, humidity or vibration, chamber's operation status and time signal status.
- 4. **Trend Graph Manipulation Buttons**: Four buttons are available to help manipulate and control the trend. This group of buttons is detailed in the following figure; their functions are described as follows:

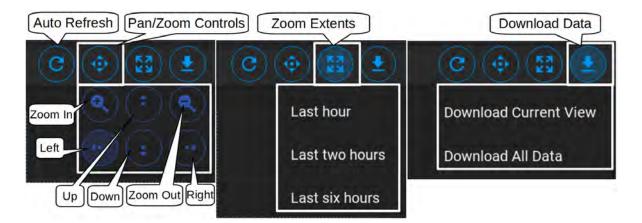


Figure 12.3: Manipulation buttons of the Trend graph

- Auto Refresh: This Auto Refresh button refreshes the trend graph; it thereby reconstructs the graph using the most recent data points which have been accumulated up to the current time.
- **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.
- **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 adjust-

ment 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.

- 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.
- 5. Line Graph: Data points from Temperature (set values or process values) and vibration (set values and process values) are being plotted to produce the line graphs to visually display the operation condition of the chamber.
- 6. **Status**: Status of the operation mode of the chamber 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 **Left** button under the Pan/Zoom Controls may be used to extent further 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 to designate the different line graph (described in Item 5 above).

CHAPTER 13

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 13.1: 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.

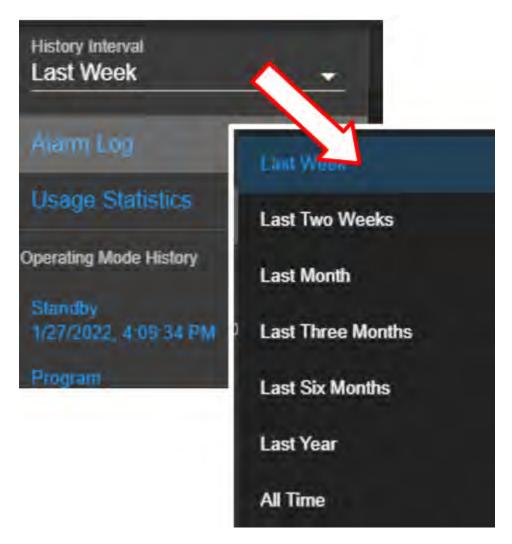


Figure 13.2: History interval and display selection

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).



Figure 13.3: 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 13.4: 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.

٤	WebDevEGN	Air Ten Program Humidity 60.0-	temp 60.0-c Humi 10.0-scH 51 152 DAP Dec 60.0-c Humi 10.0-scH 61 0H 0H 0H	
		History Interval Last Wook +		0.00
			200	
		Operating Mode Hedary	10	
			3	
			28 A	
8				
			50°	
		FIDERED () HI HE HE AN		
			94000 84500 180000 18500 11000 11500 12000 12200 12200 13000 13500 14600 14500 15000 15500 16500 16500 17200 TV/1148am	17.500 18.000 18.500 11
			Suita Desleri Teng IN Gr	
		1000 1404	Temp Priod Cit Off Hums IN Off	
			151 OH 152 OH	
			na on on one of the second secon	
			Temp Air SV Temp Pred. SV Temp Air PV Temp Pred. PV Temp Puer Humi SV Humi PV	

Figure 13.5: 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.

E WebDev	EGN Program Humidity 60.00	0+c Hemi 10.0%RH 0ff 0ff 0ff			
2					
88 m	Percentage of time in each operating mo	ode for the specified interval.			
Mer Tring		Non	Duration.	Percent	
O Prav		Constant	2.28.35	61.19%	
		Program	1.04.54	26.71%	
At them		Standby	0:29:30	12.14%	
1 in 1					
o					
00 - 100					

Figure 13.6: 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 14

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 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.

<u>~~</u>	Humidity Emables ter Vale 65.	%R0
4 0 Temperature (*0)		

Figure 14.1: The Constant menu and its display page

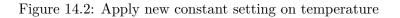
The following sections describe how to configure and control each of these parameters.

14.1 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.

Constant	> B
Temperature	Humidity Funde www. 70 #484
Outputs Time Signal #1	LIEAR APPER



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.

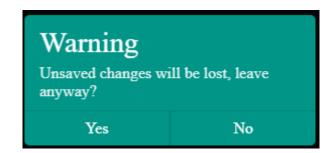


Figure 14.3: New setting must be save before exiting the pane

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**.

14.2 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**.

14.3 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.

Program

CHAPTER 15

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 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.

2 0	her	Please Login	
28 . 0		User Name	
12 m			
10 H		Password	0
			CLEAR SUBALT
() N			

Figure 15.1: User with read-write privilege is required to operate the Program menu

15.1 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:

ESPEC-delaut	Standby of 27.1 c	тыя 100.0-ын от	
± - 1		3	4
2	-		Raine Contraction of the second se
e		BILLIO	111
0	2		2.2.8
	3		111
0.000	- 4		
	5		111
Ø -		anțes	2.2.1
	35	- Marci	111
-	- 59		2.2.2
5	140		
	Disease -		

Figure 15.2: Program listing page with submenu hidden

- 1. Submenu Show/Hide: To utilize the entire main display area for the program editor, this button can be used to hide the submenu (as shown in the above figure). Click it again to reveal the submenu.
- 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 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 under the Actions column can be used to handle programs on the list under each row. These action buttons, once activated, affect the program on the same row. These buttons are: Upload Program, Download Program and Delete.
 - Upload: Program can be uploaded from the local computer to the Web Controller 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 15.3: 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 the Web Controller 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.

15.2 Create New Program

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

List Pageare			
Crusts New	ID	Name	Actions
B1%_475	1	<u>BTX 475</u>	1 1 T
BTX_476 Myles	2	<u>BTX_475</u>	1 1 T
Text	3	Myles	± ± =
Progli5	4		± ± 1
877,_475_2	5	Prog05	± ± 1
7	6	<u>BTX_475_2</u>	± ± 1
*	39	EMPTY	t t î
2	40 1	EMPTY 2	± ± =
40	Create new		

Figure 15.4: 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).

4	-	-		-						10.00		ŧ	Ŧ	5
28														
кe.			Name New Program					🔲 Log data	on F4T					
	Contain		Temperature Guarantied Soak Devia ± 10	lun -			•c -	lumidity Guaranti 10	red Soak Devia	lion				%RH
~		PRIDG20TEST	The second se											
8					Temperat				Humidity			Events		
•			Stop Type	Duration	DI	Set Value	APPEND	STEP	D4	Set Value	Rate	151		

Figure 15.5: 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.

٤	WeitunyVallaul	Constant 50.0c 30.6h	с ол 100.0% кн								
\$		MONTEST	=							ŧ	8.8
98		ENERGITERS									
W.		PROMETEET	Name				Log data on F4T				
0		PHOPELITE	Regard								
-	(Sended)	Paulitanti	Temperature Guaranteed Seak Det ± 10	witten			Humidity Duaranteed Souk Deviation *C ± 10				%RH
1		PRODISTED									
		PROGRE	Step Type	Dutation	Temperature EN Sof Value	Rate	Humidity GS EN Set Value	Sale	GS TS1		
*			1 Soak	- 0.00.00	SI 0				00	Off	+
0						APPI	END STEP				
		-									

Figure 15.6: 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 15.7: 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. In order to apply the preview mode, the program must be loaded into the program editor first, then click the **PREVIEW PLOT** button.
- 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. The Web Controller

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 the Web Controller 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 15.8: 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. The Web Controller will deter-

mine the threshold 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, the Web Controller 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) PT-CON, (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 the Web Controller 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 the Web Controller 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 (%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 15.9: File deletion confirmation

• **Open Program**: This button imports a program file from the local computer into the program editor. The Web Controller only accepts a program in JSON format. To ensure compatibility, the program structure should be based on the one downloaded from the Web Controller 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 15.10: Save program to a new slot

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

15.2.1 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. The Web Controller 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.
- v.3 3/2022

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:

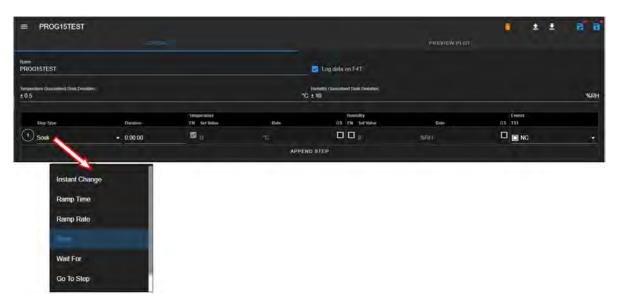


Figure 15.11: Adding step type

- **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. ESPEC Web Controller 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. ESPEC Web Controller 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.

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≡ PROG15TEST						Ň	±	±	5, 8,
					PREVIEW PLOT				
PROG15TEST				🛃 Log data on F4T					
Temperature Gasteritied Sout Deviator ± 0.5				Frumatity Guaranteet Sauk Deviator *C. ± 10					%RH
Siep Type	Duration	Temperature EN Set Value	Rate	Humidity G.S. EN Set Value	Rate	GS	Eventa TS1		
Ramp Time	- 0:05:00	S 35	*C 7.000	🚔 🗖 🗹 15	%RH 3.000		NC		*
and the second s			Â	PPEND STEP			1		
						ie:	e		
						ог			
						On			

Figure 15.12: 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.

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ROGISTEST				Log data on F#T				
emperature Guaranteed Scali Deviation 0.5				C 10				.
Step Type	Dritation	Temperature EN Set Value	Rate	Humidity GS EH Set Value	Rate		Eventa TS1	
1 Ramp Time	- 0.05.00	35	*C 7.000	<u>≥</u> 🗆 🖬 15	SRH 2 000	- 191	✓ On	
Ramp Rafe	- 0.02.00	B 45	°C 5	<u>≅</u> □ ⊇ 25	%RH 5	5401 D	0	
			APPI	END STEP				
Insert Before								
Insert After								

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.

■ PROG15TEST								± ±	e e
						PREVIEW PLOT			1
Name PROG15TEST				🛃 Log dala on	IF4T				
Temperature Guaranteed Soak Deviato				Humidity Guaranteed *C ± 10	Soux Devlation				%R8
Step Type	Duration	Teroperature EN Set Value	Rate		Humidity EN Set Value	Rate		Events TS1	
1 Ramp Time	- 0.05.00	M 35	°C 7 000	÷ 🖬	✓ 15	%RH 3.000	sant 🖬	🗹 On	÷
2 Ramp Rate		SI 45	*C 5	놂 🗆	25	%RH 5		I Off	
3 End	Stop Chamber	End.Action Constant Set Value			End Action Constant Set Value				
			AP	PEND STEP					

12. **Preview**: The above program can be previewed before execution by clicking on the **Preview Plot** button as depicted in the following figure. To toggle back to the editor mode, click on **EDITOR**.



15.3 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**).

15.3.1 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 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:

≡ PROG15TEST								±	÷	8 8
						PREVIEW PLOT				
Name PROG15TEST				🔽 Log dala o	n F4T					
Seventiare Guaranteed Soak Devution ± 0.5				Humidity Giusrantees *C ± 10	d Soulk Deviation					%RI
Sitep Туре	Duration	Temperature EN Set Value	Rate		Humidity EN Set Value	Rate	65	Events TS1		
1 Ramp Time	+ 0.05.00	⊠ ₃₅	°C 7 000	<u>*</u>	IS 15	%RH 3.000	subr C	🔽 On		
2 Ramp Rate	■ 0.02.00	45	*C 5	<u>*e</u> 🗖	25	%RH 5				
3 End	Biop Chamber	End Action Constant Set Value			End Action Constant Set Value					
			AP	PEND STEP						

Figure 15.13: 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.

15.3.2 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.

■ PROG15TEST								±	e,
						PREVIEW PLOT			
PROG15TEST				🛃 Log dala on	F4T				
angerature Guurunteed Soak Deviation 10				Humotity Clubrantenid 5 *C ± 10	Sook Deviation				36
Step Type	Duration	Temperature EN Set Value	Raie		Humedity EN Set Value	Rate	GS	Events T\$1	
1 Instant Change	- 0.00.00	35	°C		D 15	SRH		🖂 On	
Ramp Rale	• 0.02.00	I 45	*C 5		25	SRH 5	SARH 🔳	0	
0	Blop Charlori	End Action Constant Set Value			End Action Constant Set Value			NC	
			APP	END STEP					

- **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.

≡ PROG15TEST							1	٠	8 8
	80170 P				PREVIEW PLOT				
Name PROGISTEST				🗾 Log dabi en F41					
Temperatum Guaranned Soak Deviation ± 10				Hamiltony Counterment South Develops *C: ± 10					%RI
Step Type	Duration	Temperature EN Set Value	Rate	Hannidity GS EN Set Value	Rate	GS T	ents		
1 Instant Change	- 0.00.00	I 35	°C.		%RH	0	On		
2 Wait For	+								
3 R o Rate	÷ 0.02-00	I 45	*C 5	🚆 🗖 🗹 25	%RH 5	<u>1001</u>) on		4
(End	Step Chardier	End Action Constant Set Value		End Action Constant Set Value		• 1	NC		
			A	PEND STEP					

- Step Type: Default selection will be Soak.
- **Duration**: Set duration time to 0:30:00.
- Temperature:

Delete

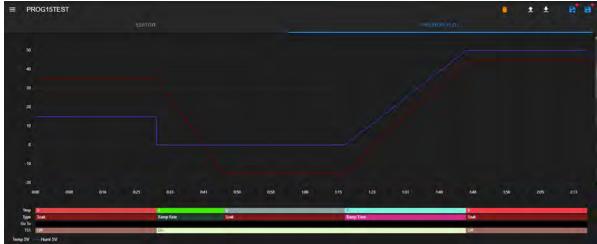
- **EN**: Enabled by default (grayed out).
- Set Value: default (grayed out).

- **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 the Web Controller 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 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.

■ PROG15TEST					PREVIEW PLOT		* *	1
Name PROG15TEST				Log data on F4T				
Resperature Guaranteed Stack Deviation E 10				Humidity Gaanatiwid Scall Deviation				%R
Step Type	Duration	Tempiratiure EN Set Value	Ratu	Humidity GS EN Set Value	Rahe	GS	Events TS1	
1 Instant Change	- 0.00.00	SI 35	°C		%RH	0	On On	+
2) Wait For								
3 Soak	+ 0.30.00	Z 35	10	🔽 🗖 15	SRI	C	l 🗆 off	4
Ramp Rate	- 0.16.40	-15	*C 3		%RH 0		On 🔽 On	
5 Wait For	- 40							
6) Socik	+ 0:30:00	2 -15		∠ □ ₀	SRH	<u>i</u>	I 🖂 On	-
7) Ramp Time	÷ 0.30.00	S 45	*C 2.000	<u></u>	%RH 1.667	<u>Mai</u>	0n 🗹	3
8 Wait For								
9 Soak	• 0:30:00	🖾 ₄₅ .		☑ 🗖 50	SRH	C	0 of	
10 End	Stip Chambér	Ent Action Constant Set Value		End Action Constant Set Value			NC.	

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



15.3.3 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.

■ PROG15TEST					PREVIEW PLOT	111	11
PROG15TEST				Log data on F4T.		1 23	4 5
imperature Guaranteed Sonk Devenor : 10				Fernanty Guarantiest Sour Deviation			%R)
Step Type	Duration	Temperature EN Set Value	Rate	Nomidity GS EN Sitt Value	Rate	GS TS1	
1 Instant Change	- 0:00:00	35			%RH	🗆 🔽 On	
2 Wait For							
3 Soak	- 0:30:00	I 35		✓ □ 15			
(4) Remon Pate	- 0:16:30	S 15	Y 3	× 🗹 🗆 o	SPH 0	589 0 21 00	-

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.

= PROG15TEST	EDITOR				PREVIEW PLOT		, e' a
Notes PROGISTEST				Log data on F4T		(i	
Temperature Guaranteed Snick Deviation ± 10				Hamility Gastanteed Scale Deviation *C. ± 10			SURH
Step Type	Duration	Tomperature EN Set Value	Rate	Humidity GS_EN Set Value	Rate	Events GS TS1	
1 Instant Change	- 0.00.00	M 35	°C	D D 15	%RH	🗖 🔽 Ón	-
2 Wait For							
3 Sosk	- 0.30.00	S 35		✓ □ 15			
(4) Remo Date	- naean	Ø 15	10.3	± 🗹 🗖 n	NOH 0		

Figure 15.14: 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 15.15: Update indicator

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

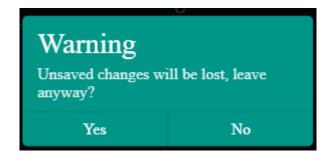


Figure 15.16: Confirm the save or discard update

15.3.4 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.

		231
≡ List Pro	ograms	
13	EMPTY	± ±
14	Paultast14	1 1 I
15	PROG15TE\$T	1 🛎 🛓 🖉 👘
16	PROG16Tes	1 🖄 🛓 👘
17	EMPTY	± ± =

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.

≡ List Prog	grams	1000
13	EMPTY	± ± =
14	Paultest14	±± •/
15	PROGISIEST	± ± 📫
16	PROG16Test	± ± 💶
17	EMPTY	± ±

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.

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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 16

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.

٤	Version Parts	Off 30.31c Off 100.05cH Off				
(#.)		⊗Standby	OConstant	OProgram		
-				Program	+ 1	
0						
-		STOP OPERATION	RUN CONSTANT MODE	RUN PROGRAM MODE	PAUSE RESUME	NEXT STEP
1	**					
100						

Figure 16.1: 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.

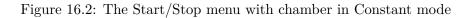
16.1 Standby Mode

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.

16.2 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.

E weather that	Tend Generations 50.0-c 27.9-c ^{Mater} 00 100.0-xee ¹⁵⁵ 0m					
4	OStandby	©Constant	OProgram			
23 · · · · · · · · · · · · · · · · · · ·						
la ren			Program + 1			
<u>ی اور اور اور اور اور اور اور اور اور اور</u>						
	STOP OPERATION	RUN CONSTANT MODE	RUN PROGRAM MODE PAUSE RESUME NEXT STEP			
2						
•						



16.3 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.

٤	Weith Day Prof.	Program Program Program Program Provide STEEST 35 Dec 27.8 cc Off 100.0 %Ret Off		
÷		OStandby	OConstant	⊗Program
				Present Sins #15 PROG15TEST + 1
3 0				
-		STOP OPERATION	RUN CONSTANT MODE	RUN PROGRAM MODE PAUSE RESUME NEXT STEP
2	-			
•	-			
Ő,	-			

Figure 16.3: The Start/Stop menu with chamber in Program mode

16.4 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. ESPEC Web Controller immediately moves to apply the operating mode to the chamber.

16.5 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. ESPEC Web Controller immediately moves to apply the operating mode to the chamber.

16.6 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.

16.6.1 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.

	andby	OConstant	OProgram	
Second Second				A
	STOP OPERATION	RUN CONSTANT MODE	RUN PROGRAM M	#1. Testy
				#2 Humidity
-				#3: Temperature
-			_	#4 PROG4TEST
				#6 Manual
				#7 myles

Figure 16.4: 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. 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 following figure. The **Overview** page maybe accessed to display the detail of the program being executed.

Kan Dev Peak	Program PRD015FEST 35.0- 28.7~ Off 100.0%sH 0ff						
±	OStandby	OConstant	⊗Program				
-			Property Strep #15 PROG15TEST + 1				
12 mm							
-0 mm							
	STOP OPERATION	RUN CONSTANT MODE	RUN PROGRAM MODE PAUSE RESUME NEXT STEP				
2							
0							
ă —							

16.6.2 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.

٤	Web/Dev Park	Program Pausad PROGISTEST 35.0c 29.4c Of	100,0%RH 08	
*		OStandby	OConstant	©Program
88				Program - 1
1				- The second sec
		STOP OPERATION	RUN CONSTANT MODE	RUN PROGRAM MODE PAUSE RESUME NEXT STEP

Figure 16.5: 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.

16.6.3 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.

Part IV

ESPEC Chamber with F4

CHAPTER 17

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 ESPEC Web Controller. The following figure depicts **Overview** showing the chamber in Constant mode, as indicated in the status tab and its extension bar. The extension bar of the status tab is only available in the **Overview** menu.



Figure 17.1: 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.

-	1 Pri		EST 64245:3		64245:31:10					Mar 9, 20	22, 12:20:19 P
				West For Digital Report 2	C Hard Lange	to and the second s					
	1 Auto 3 2 Ramp		ale 2022-00-06, 19m	: 21.31.10 (De	le/Time are based on F4's interna	el chock)		25.11			
	3 Ramp		00.10				2	at if	1	ŭ	iii iii
	No.										
	Temperat	ure									
	79.	0.									77.0
	Cel Vise	_				Heat 9% Cool 0%					

Figure 17.2: 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.

17.1 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).

Status Program Temp Program PROG15TEST 81.0⋅F	TS1 Off	
OConstant	Program Program #9: PROG15TEST + 1	99
RUN CONSTANT MODE	RUN PROGRAM MODE	PAUSE NEXT STEP
RUN CONSTANT MODE	RESUME	CLOSE

Figure 17.3: Constant mode setting

Or, click the extension bar, as shown in the figure.

3 3000 3000 3000 70	Notation Date Message Date Message	
A Parto Kon		NEXT STEP

Figure 17.4: Constant mode setting vis 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.

17.2 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).

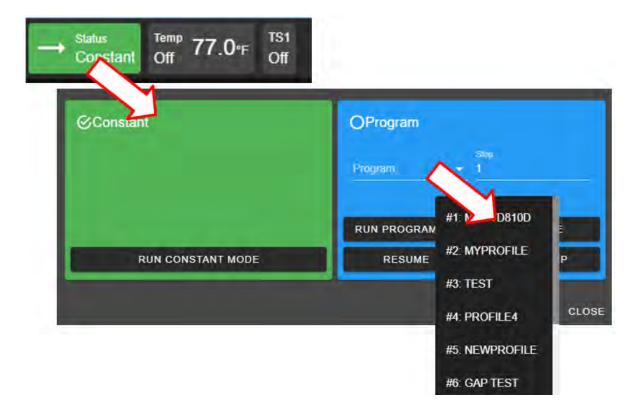


Figure 17.5: Select program to start chamber in Program mode

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.

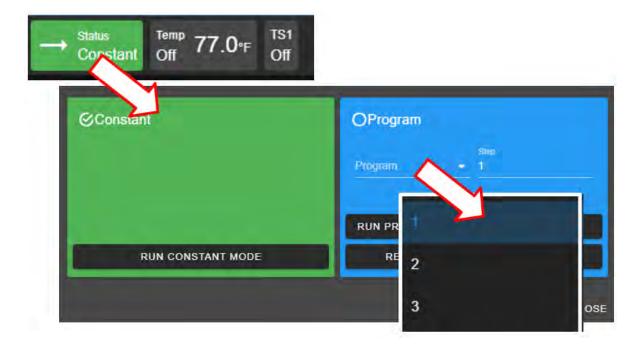


Figure 17.6: No program available for execution

- 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. ESPEC Web Controller 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.

17.3 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.

1 Active Chamber Alarms!		
Type Alarm	Cide	Actions
Alarm Water Circuit Fault	Jan 26, 2022, 4:26:44 PM	
Silence		Close

Figure 17.7: Chamber in alarm state

A repeating beep on the local computer is also tripped to get the operator's attention. The **SI-LENCE** 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 17.8: Alarm state in overview page

In an alarm state, operation is halted until all alarms triggered by chamber are resolved via the PLC before the Web Controller (and the chamber) can resume the normal operation. 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.

17.4 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.

£	Control tabs Control panes	
٤	→ State Constant 35.0= 77.0 7 151 Off	
±	Constant	терения Мат 9, 2022, 1:58:43 РМ
10	Temperature 35.0-r	77.0.
28		Test on
•	TS1 cet	B

Figure 17.9: Parameter settings via control panes

17.4.1 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).

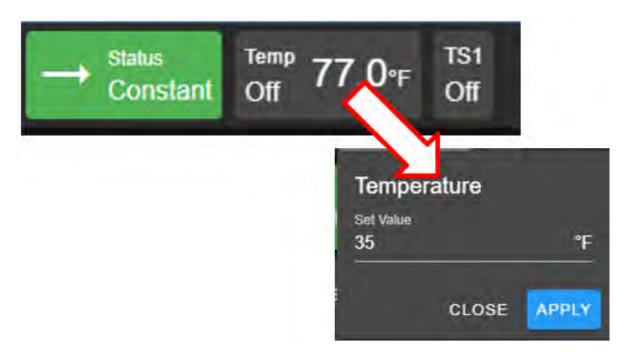


Figure 17.10: Setting new temperature value via the temp tab

- 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 17.11: 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.

17.4.2 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).

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Figure 17.12: 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.

17.5 Web Controller on the Network

ESPEC Web Controller can communicate with other ESPEC Web Controllers on the same network. The hostname (with E logo) in the upper-left corner acts as a link that, when clicked, provides a list of any chamber with ESPEC Web Controller detected on the network by the local ESPEC Web Controller, as depicted in the following figure.

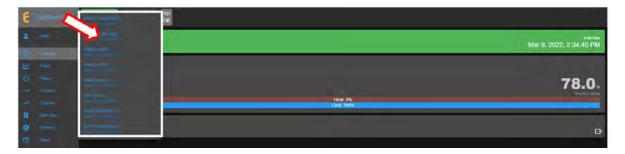


Figure 17.13: List of ESPEC Web Controller on the local network

This list can be opened from within any menus (not just in the **Overview** menu) by just clicking on the Web Controller hostname. Any chamber and ESPEC Web Controller on the list can be accessed directly by clicking on its hostname.

CHAPTER 18

Trend

Data points from the chamber's operation accumulated in the data log are displayed as a trend graph under the **Trend** menu, depicted in the following figure. By default, this graph provides an overview of the chamber's operation in the last one hour. Data can be downloaded in whole or in portion (refer to Item 4 below).



Figure 18.1: Trend graph showing plots of current data from the chamber

The main display area of the **Trend** menu is categorized into seven different groups with labels from 1 through 7. Detailed descriptions of these categories are outlined as follows:

1. **Time Frame**: This menu button shows or hides the time frame of the data points being plotted in the trend graph. As shown in the following figure, the trend graph is plotted for data points collected between 2:29 PM and 3:29 PM. That time frame is also displayed at the bottom of the trend graph, with grids at an interval of 5 minutes. This graph will continue to update and propagate through the progression of time in a 5-minute interval. To hide this time frame, click the menu button again.



Figure 18.2: Detailed data of the Trend graph

2. Trend Graph: Data points collected from the chamber are rendered and displayed as a trend graph based on a scatter plot methodology. These data points represent product temperature, air temperature and/or vibration; they are plotted as a function of time. The vertical (Y) axis represents the scale of their values. Temperature is displayed in degree Celsius; vibration is displayed in root-mean-square of acceleration (Grms or G). The horizontal (X) axis represents the time scale with unit measured in a 1-second scale. Based on the default configuration, the Typhoon chamber logs data points in a 1-second interval. The scaling of the grid will change according to the Pan/Zoom Controls buttons application (see item 3 below). To reset the trend graph, click the Zoom Extents button (in the following figure), select Last Hour from the drop-down menu, then click the Auto Refresh

button.

- 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. This feature allows a quick peak of the data at a certain point in time. Depending on the chamber's condition, the snapshot provides set values (SV) and process values (PV) of temperature, product or air temperature, or vibration, chamber's operation status and time signal status.
- 4. **Trend Graph Manipulation Buttons**: Four buttons are available to help manipulate and control the trend. This group of buttons is detailed in the following figure; their functions are described as follows:

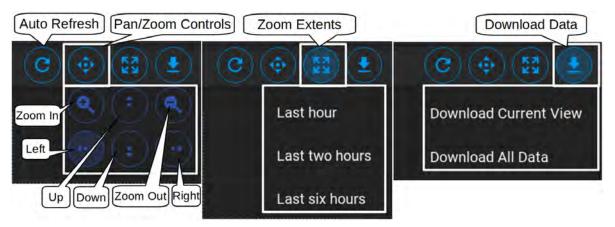


Figure 18.3: Manipulation buttons of the Trend graph

- Auto Refresh: This Auto Refresh button refreshes the trend graph; it thereby reconstructs the graph using the most recent data points which have been accumulated up to the current time.
- **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.
- 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.
- 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.
- 5. Line Graph: Data points from Temperature (set values or process values) and vibration (set values and process values) are being plotted to produce the line graphs to visually display the operation condition of the chamber.
- 6. Status: Status of the operation mode of the chamber 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 Left button under the Pan/Zoom Controls may be used to extent further 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 to designate the different line graph (described in Item 5 above).

CHAPTER 19

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:

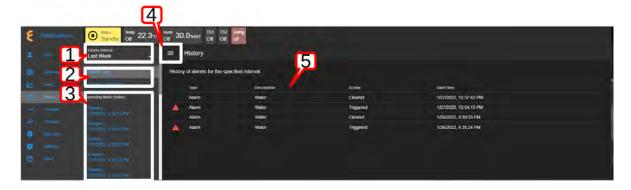


Figure 19.1: Operation history of the chamber

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.

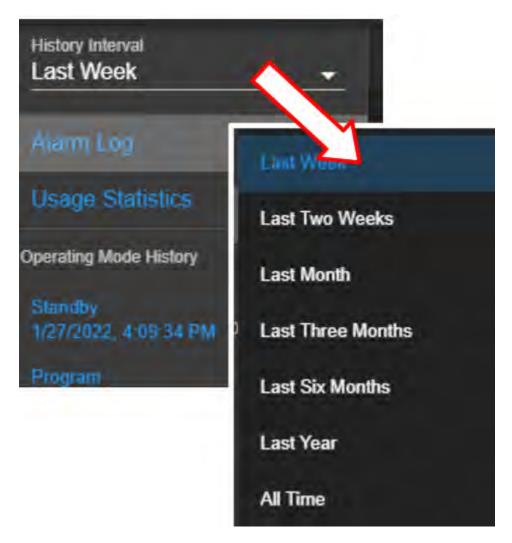


Figure 19.2: History interval and display selection

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).

History Interval Last Week -	≡ History			
Alarm Log	History of alarms for the sp	pecified interval.		
Usage Statistics	Туре	Description	Action	Date/Time
Operating Mode History	Alarm	Water	Cleared	1/27/2022, 12:57:42 PM
Standby	Alarm	Water	Triggered	1/27/2022, 12:54:13 PM
1/28/2022, 8:54:02 AM	Alarm	Water	Cleared	1/26/2022, 4:39:33 PM
Constant 1/28/2022, 8:53:51 AM	🛕 Alarm	Water	Triggered	1/26/2022, 4:25:24 PM
Standby 1/27/2022, 2:35:12 PM				

Figure 19.3: 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:

History Interval Last Week +				
	Percentage of time in each op	erating mode for the specified interval.		
Neggo Statistics		Mode	Duration	Percent
Operating Mode History		Standby	44:38:16	95.94%
Standay 0200/022-55402-6M		Constant	1.12.32	2.60%
		Alarm	0.17.38	0.63%
		on	0:16:19	0.58%
Standby: 1/27/2022, 2:35:12 PM		Program	0:06:57	0.25%
54m3by 1/27/2022 (2:31-22-44)				

Figure 19.4: 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 19.5: 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 19.6: 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 20

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.

E WebDevE4	Hank Off 78.07 78.07	
4	Constant	
El Concomo Les Tants D Tants	Temperature for Vision 31	*
8	Outputs Trave Signal #1	
•		Lr

Figure 20.1: The Constant menu and its components

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

20.1 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.

Constant	
Temperature	
and the process of a second se	8
Outputs Time Signal #1	
	CLEAR APPLY

Figure 20.2: 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 20.3: 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**.

20.2 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.

Program

CHAPTER 21

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.

2	Uner	Please Login	
28		User Name	
0		Password	0
-			CLEAR SUBALT
G			
0			

Figure 21.1: User with read-write privilege is required to operate the Program menu

21.1 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:

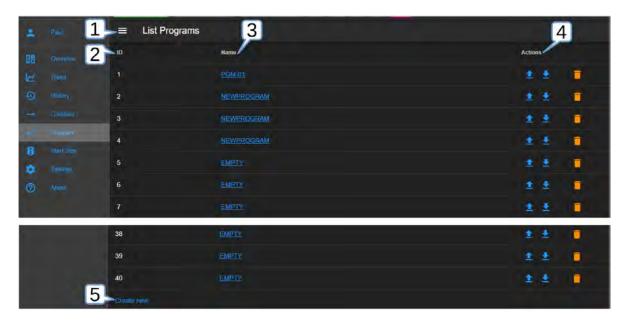


Figure 21.2: Program listing page with submenu hidden

- 1. Submenu Show/Hide: To utilize the entire main display area for the program editor, this button can be used to hide the submenu (as shown in the above figure). Click it again to reveal the submenu.
- 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. 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) under the Actions column can be used to manage each program on the list under each row. These action buttons, once activated, affect the program on the row where the buttons were applied. They are described as follows:
 - Upload: Program can be uploaded from the local computer to the Web Controller 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).

1 That Shares	1 💷 List	Programs	
Distance Provention		Name	Асбоня
At Deal	2	EGMEOT	1 1 I
thingy thingy	2		± ± 1
- Conter -	3	NEWEROGRAM	± ± =
A logarit	314		± ± =
Constate Constate	5	EMPTY	± ± =
Almai	6	ENERY BARRY	± ± =
0			
	38	EMPTY	± ± 📑
10	39	EMPTY	± ± 📲
77	40	EMPTY	1 1 i
	Creale new		

Figure 21.3: 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 the Web Controller 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.

21.2 Create New Program

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

100 Property 1	≡ List Programs				
Cross here	D	Name	Actio	15	
Fisher	4	PGM-01	1	±.	1
MENIPROCEMM MENIPROCEMM	2	NEWPROGRAM	1	±.	
NEWFROGRAM	3	NEWPROGRAM	1	±.	
~	4 2	NEWPROGRAM	1	±	1
2	5	EMPTY	1	٠.	10
Ħ.	37	EMPTY	±	<u>*</u>	
12 14	38	EMPTY	±	٠	1
÷	39	CRAIL CONT.			
1	40	EMPTY	1	1	
· -	Create new				

Figure 21.4: 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 Pro-grams** in the main display to launch the program editor. An empty template is opened for a new program, as depicted in the following figure.

					PREVIE				±	± 1
Neme NEWPROFILE										
Stiep Type	Duration	Wait Fo	e Digital Input 2	Digital Input 3	Temperature	Tem	serature Set Value	PIDs		Events TS1
End End	End Action Hold									
			APPEND STEP							

Figure 21.5: 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.

± ~	≡ N	IEWPROFILE	ureat					PICEVIE	WIRLOT	t	.± 8
	Name NEWPRO	DFILE									
		Ship Type (mil)		Duration End Adium - Hold	West P E.N.	or Digital input 7	Digital input 3	Temperature	Temperature 214 Set Viter		Evenis TST
						APPEND STEP					
Save To 1 MILSTD8100 2 PROG2TEST											1

Figure 21.6: 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.

Conferences Constitute		EDHTDH PREVIEW PLOT FILE See Type Duttoon EM Capital logut 2 Daptal logut 2 Dapta	
	Name NEWPROFILE		
	See Type	Duration EN Digital Input 2 End Action	
		APPEND STEP	

Figure 21.7: 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.

≡ New Program	1						1 8 8 8
);						
Step Type	Darston	Wath For LNF Digital Root 2	Digital input 0	Temporature	Temperature EN Set Value	PIDs	Events GS-151
🕦 Soak	+ 0.00.00	La Ignore	+ Ignore	T 🗖 9	+ 12 n	πt	. 00
End	End Adam - Hold						
6			APPEND ST	ep <u>6</u>			

Figure 21.8: 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. In order to apply the preview mode, the program must be loaded into the program editor first, then click the **PREVIEW PLOT** button.
- 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. The Web Controller 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 the Web Controller 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. The Web Controller accepts the input value in H:MM:SS or in pure numerical value. If a pure numerical value is entered, the Web Controller 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.

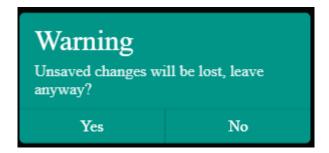


Figure 21.9: File deletion confirmation

- **Open Program**: This button imports a program file from the local computer into the program editor. The Web Controller only accepts a program in JSON format. To ensure compatibility, the program structure should be based on the one downloaded from the 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_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 21.10: Save program to a new slot

• Save: This button saves the current program in the next available slot number on the F4.

21.2.1 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.

v.3 3/2022

- 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.

PROG2TEST								
Step Type	Duratio	ion	Wait For EN Digital Input 2	Digital Input 3	Temperature	Temperature EN Set Value	PDs	GS TS1
1 Ramp Time	+ 0.00	15	Ignore	+ Ignore	- D0	-F 🖾 88	7F 1	.00
() End	- Hold							
				APPEND STEP				

Figure 21.11: 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:

🖓 🖓 🚓 🕹 🗴 0 000 15 🗖 legnore - tignore + 🗌 0 🕫 🛍 88	-
	*1 • 🗆
End Asian +	
Insert Before Append Step	
Insert After	

Figure 21.12: 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.

		Wait For			Temperature		Even
Step Type	Duration	EN Digital Input 2	Digital leput 5	Temperature	EN Set Value	PIDs	GS TS1
1) Ramp Time	+ 0.00.15	🗖 Ignore	- Ignore	* 🗖 0	-F 🖾 88	TF 1	
2) Soak	• 0.00.00	Ignore	- Ignore	- 0	rF 🖬 88		
	Find Action + Hold						

Figure 21.13: 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.

Step Type	Duration	Walt For EN Eligital Input 2	Digital liquit 5	Temperature	Temperature EN Set Value	PIDs	GS TS1
1) Ramp Time	+ 0.01.00	Ignore	👻 lgnore.	* 🗖 0	-F 🖾 88	TF 1	
2) Soak	- 0.01.00	Ignore	- Ignore	- 🗆 0	+F 🖾 88	ŦÌ	
3 Ramp Time		Ignoro	+ Igriora	- 🗖 õ	-F 🖾 93	1F 1	. 🗆 🗹
4) Ramp Time		Ignore	👻 Ignoré	+ 🗖 0	-F 🖾 95	1F 1	. 🗆 🗹
	End Action - Hold						

Figure 21.14: 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:

		Wait For			Temperature		Eves
Step Type	Duration	IN Digital leput 2	Digital lepel 3	Temperature	EN Set Value	PIDs	GS T51
1 Ramp Time:	- 0.01:00	Ignore	+ Ignore	- 🔲 32	-F 🖾 88	7F 1	- 00
2 Soek	+ 0.01.00	Ignore	+ Ignore	+ 🗋 32	~F 🖾 88	'F 1	. 00
3 Ramp Time	+ 0.01.00	Ignore	- Ignore	* 🖾 32	-F 🖾 93	T I	. 🗆 🗹
Ramp Time	+ 0.01.00	Ignore	- Ignore	+ 🖸 32	-F 🖾 95	7F 1	. D 🗹
5 Soak	+ 0.01.00	Ignore	■ Ignore	+ 🖬 32	+F 🖾 95	°F 1	. 00
6 Ramp Time		Ignore	- Ignore	• 🔲 32	-F 🖾 89	1F 1	. 🗆 🗹
7 Ramp Time	- 0.01:00	Ignore	→ Ignara	- 🔲 32	-p 🖾 85	1 1	. 0 🗹
Bo To Step	✓ Profile This Program		Step • 1		Count 3		
	End Action						

Figure 21.15: 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	EUTOR	3			PREVIEW PLOT	•	1 1 P B
Name PROG2TEST							
Step Type	Duration	Wait For EN Digital Input 2	Digital leput 3	Temperature	Tersperature EN Set Value	PIDs	Events GS TS1
1 Ramp Time	+ 0.01.00	ignore ignore	+ Ignora	+ 🛛 32	r ⊠ 88	% 1	.00
Soak	• 0.01.00	ignore	- Ignore	• 🖂 32	-F 🗹 80		
(3) Ramp Time	+ 0.01.00		- Ignore	- П 2	F 🖾 93	1E 1	. 🗆 🗹

Figure 21.16: Save current program

Navigating out of the editor without saving the program will trigger the following warning prompt:



Figure 21.17: Confirm the save or discard update

12. **Preview**: The above program can be previewed before execution by clicking on the **Preview Plot** button as depicted in the following figure. To toggle back to the editor mode, click on **EDITOR**.



Figure 21.18: Program in preview mode

Note: Program cannot be saved while in the **Preview Plot** mode. In order to save the program, navigate back to the program editor and click **Save** or **Save As**.

21.3 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.

21.3.1 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 21.19: 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.

						1	: ± 😝
Dynalism	Wait For EN Digital Input 2	Digital Input 3	Tempyrature			PIDs	GS TS
+ 0:01:00	Ignore	 Ignore 	÷ □ 32		88 88	TF 1	
+ 0:01:00	Ignore	+ Ignoro	- 🖂 32		BB 88		. 00
+ 0.01.00	Ignore	- Ignore	+ 🛛 32		S 93	*F 1	. 0 .
+ 0:01:00	D Ignore	- Ignore	+ 🖂 32		95	"F 1	. 🗆 🖬
+ 0:01:00	Ignore	÷ Ignore	* 🔲 32		95 PS	TE 1	. 00
- 0.01.00	I Ignore	+ Ignore	+ 🖂 32		2 89	1F 1	. 🗆 🖻
- 0.01.00	Ignore	 Ignore 	+ 🗆 32		2 ₈₅	1E 1	
Prolife This Program		sau ≁ 1			Count 3		
End Action - Hold							
	Duration • 0.01.00 • 0.01.00 • 0.01.00 • 0.01.00 • 0.01.00 • 0.01.00 • 0.01.00 • 0.01.00 • 0.01.00 • 0.01.00 • 0.01.00 • 0.01.00 • 0.01.00 • 0.01.00	Develop West For Child Reput Jayot 2 • 001 00 Ignare • 001 00 Ignare	Devolue West For CH Deplat News 2 Deplat News 3 • 0.01.00 1.5more + /groore • 0.01.00 - /groore + /groore • 0.01.00 - /groore + /groore • 0.01.00 - /groore + /groore • more + /groore + /groore • more + /groore + /groore • more + /	Deside West For Chill Operating 12 Degrate leged 3 Temperature • 00100 Ignarie • lignore • lignore	Desider West For Child Papel & Deptal Papel 2 Deptal Papel 3 Temperature • 001:00 Ingrave + lignore - 0.92 7F • 001:00 Ingrave + lignore + 0.92 7F • Tries Program • 1 State State State <td>Deside West For CH Depide legel 2 Depide legel 3 Temperature Temperature + 0.01.00 Ingrane + Ingrane</td> <td>Deside West For Chi Ceptal liquel 2 Deptal head 3 Temperature Emberature PCs • 00100 Ignore • Ignore</td>	Deside West For CH Depide legel 2 Depide legel 3 Temperature Temperature + 0.01.00 Ingrane + Ingrane	Deside West For Chi Ceptal liquel 2 Deptal head 3 Temperature Emberature PCs • 00100 Ignore • Ignore

Figure 21.20: File manipulation buttons

21.3.2 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.

■ PROG2TEST							± 🔤
					PREVIEW PLOT		
Name PROG2TEST							
Step Type	Duration	Walt For EN Digital legent 2	Digilai keput 3	Temperature	Temperature EN Set Value	/ PD1	Even GS TS1
1 Auto Start	Start type - Date		- 🖬 2022-03-14		Tene () 17:35:12		
2 Ramp Time	• 0:01:00	D Ignore	← lgnore	- 🗆 22	-F 🖾 88	1F 1	
3 Soek	+ 0.01.00	Ignore	+ Ignore	- 🔲 52	-F 🖾 88	11	

Figure 21.21: 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.

21.3.3 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.

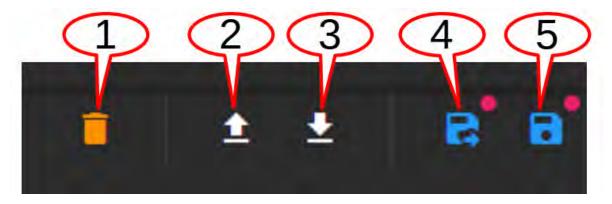


Figure 21.22: File manipulation options

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.

= PROG2TEST							1 1 8 8
/					PREVIEW PLOT		
Namo PROG2TEST							<u> </u>
Step Type	Duration	Wall For EX Digital Input 2	Digital Impet 3	Tomperature	Temperature EN Sot Value	PIDs	Eventa GS 751
1 Auto Start	Start type Date		- € 2022-03-14		O 17.35.12		
Ramp Time	• 0.01.00	Ignore		+ 🔲 32		1F-1	
3 Soak	+ 0.01.00	Lignore.	÷ Ignore	+ 🗆 🕫	-F 🜌 88	7F 1	.00

Figure 21.23: 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 21.24: Update indicator

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

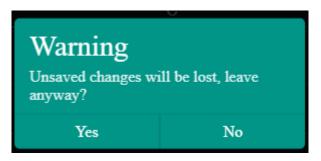


Figure 21.25: Confirm the save or discard update

21.3.4 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.

😑 🛛 List Proç	grams	and the second
1D	Name	2 Actions 3 1
4	NEWPROGRAM	<u>≥</u> <u>∔</u> <u>∔</u>
2	PROG2TEST	± ± 🔳
3	EMPTY	± ± 👔
4	EMPTY	1 ± 1

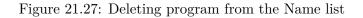
Figure 21.26: Manage programs on the Name list

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.

© ESPEC NORTH AMERICA, INC

≡ List Prog	grams	
ID	Name	Actions
1	NEWPROGRAM	± ± • •
2	PROGZIEST	± ± 📲
3	EMPTY	±(±) ■)
4	EMPTY	1 ± 1



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.

≡ List Prog	grams	
ID	Name	Actions
1	NEWPROGRAM	± ± 🗧
2	PROG2TEST	
3	EMPTY	1 ± ± 1
4	EMPTY	🔹 🛓 👘

Figure 21.28: 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 22

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.

٤	WAD-HE4	Constant Sature 79.0- F Off				
		©Constant	OProgram			
88		and the second se	Program		ma 1	
-D						-
14		RUN CONSTANT MODE	RUN PROGRAM MODE	PAUSE	RESUME	NEXT STEP
0	-					
• •						

Figure 22.1: 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.

22.1 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 **StartStop** 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.

٤	mino:101724234	Make Peggan Pausied TEST 28.9℃ 29.0℃ 181 On						
-		OConstant	⊗Program					
黯			Program	- 1				
			region					
Ø		RUN CONSTANT MODE	RUN PROGRAM MODE	PAUSE	RESUME	NEXT STEP		
	-							
۰	See.							
CD.								

Figure 22.2: 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 OPERA-TION** button in the **Standby** tab. ESPEC Web Controller immediately moves to apply the operating mode to the chamber.

22.2 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.

22.2.1 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 **StartStop** 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.

٤	-	Cimetani 38 0v 79.0+ Cit	
÷		@Constant	OProgram
88			
ke-			
w.		RUN CONSTANT MODE	RUN PROGRA #1: NEWPROGRAM RESUME MEXT STEP
1			
	-		#2: PROG2TEST
۰	-		
0			

Figure 22.3: 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. 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 following figure.

٤		Program Paused NEWPROGRAM 29 to 29.1 to 0n			
*		OConstant	@Program		
			IZ NEWPROGRAM		
Đ Đ					
		RUN CONSTANT MODE	RUN PROGRAM MODE P	AUSE	RESUME NEXT STEP
• 0	11				

Figure 22.4: Setting a Constant mode

The **Overview** page maybe accessed to display the detail of the program being executed.

22.2.2 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.

22.2.3 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.

•	-	~	Program Paused	NEWPROGRAM	0:10:01 1	0:00:01			Mar 13,	2022, 3:56:04 AM
					Non Pro-					
			Flamp Time	0:00:01			100	75 °C		2
		-	Siduar End	D. 10:00 Hold Land Skip				75 °C 75 °C		
			9.1 _{°c}							29.1
							icat: 0% Cool: 0%			

Figure 22.5: Stepping through a program

Part V

ESPEC P300 Chamber

CHAPTER 23

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 ESPEC Web Controller. The following figure depicts **Overview** showing the chamber in Standby mode, as indicated in the status tab and its extension bar. The extension bar of the status tab is only available in the **Overview** menu.



Figure 23.1: Overview page with chamber in Standby mode

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

 VokDextiylet z set 	Constant 48.0 22.7 c	14/11 152 Handing 47 (Dates) 30.0% PH Off Off auto				_{تعمر} Jan 26, 2022, 3:30:22 PM
1	Temperature 48.0.	Heat DS. Coar Ds	22.7.	Humidity 47.0 _{NRH}	Heat 0% Cool 0%	30.0 ₅₈₄
8 0 0	TS1 on	TS B⇒ or	2	Ģ	Refrig auto	B

Figure 23.2: 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 23.3: 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 sta-

tus 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.

23.1 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.

→ Status Constant ^{Temp} 22.3°	с 47.0 _{%RH} 30.0%RH Оff	TS2 Refrig Off auto	
OStandby	⊗Constant	OProgram Program -	i.
STOP OPERATION	RUN CONSTANT MODE	RUN PROGRAM M	IODE PAUSE
STOP OPERATION	RUN CONSTANT MODE	RESUME	NEXT STEP

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 23.4: Status tab drop-down menu via the extended tab

- 2. Click the **STOP OPERATION** button. ESPEC Web Controller 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.
- v.3 3/2022

- Click the status tab itself. or
- Click the **CLOSE** button underneath the alarm tab.

23.2 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.

O Status Starsby Off 22.7∘c	SO Okou	TS2 Retrig Off off
Standby	OConstant	OProgram Program = 1
STOP OPERATION		RUN PROGRAM MODE PAUSE RESUME NEXT STEP
		CLOSE

Figure 23.5: Constant mode setting

- 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 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.

23.3 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 23.6: 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 23.7: 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. ESPEC Web Controller 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.

23.4 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 23.8: Chamber in alarm state

A repeating beep on the local computer is also tripped to get the operator's attention. The **SI-LENCE** 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.

	Salice Address Alarm Water			Jan 26, 2022, 5:49:51 PM
* + • F	Temperature 25.0-c	22.8	Humidity Off	30.0
• -	TS1 or	TS2 G→ orr	Refrig C+ auto	Đ

Figure 23.9: 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 the Web Controller (and the chamber) can resume the normal operation. 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.

23.5 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.

	C	ontrol Tabs	(Control Pan	es	
٤ ک	Stands Off 22.2 c Off	30.0%RH Of Of				
2	Standby					Jan 27, 2022, 12:50:49 PM
e	Temperature			Humidity		1.000
	Off		22.2.	Off		30.0
2 mm		Heat DN, Cost DN,			Heat ON- Cost DN-	
	TS1 of		TS2 ce	G	Reing of	G

Figure 23.10: Parameter settings via control panes

23.5.1 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).

Off Status Off 2	2.7∘с ^{Ниті} 30.0%Rн Оff	TS1 TS2 Refrig Off Off off
	Temperature	
	Set Value	rc
	CLOSE APPI	

Figure 23.11: 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 stask 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).

	Humidity	
	Set Value 47	%RH

Figure 23.12: 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).

Status Standby	^{Temp} 22.7∘c	Humi Off 30.0%RH	TS1 TS2 Refrig Off off
			Time Signal #1
			CLOSE APPLY

Figure 23.13: 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.

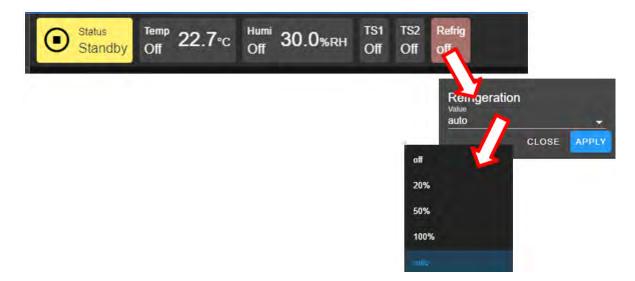


Figure 23.14: Setting refrig value

- 3. Click Apply.
- 4. To cancel the setting, click the **CLOSE** button.

23.5.2 Settings via the Dedicated Panes

With ESPEC Web Controller, 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 23.15: 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.

23.6 Web Controller on the Network

ESPEC Web Controller can communicate with other ESPEC Web Controllers on the same network. The hostname (with E logo) in the upper-left corner acts as a link that, when clicked, provides a list of any chamber with ESPEC Web Controller detected on the network by the local ESPEC Web Controller, as depicted in the following figure.



Figure 23.16: List of ESPEC Web Controller on the local network

This list can be opened from within any menus (not just in the **Overview** menu) by just clicking on the Web Controller hostname. Any chamber and ESPEC Web Controller on the list can be accessed directly by clicking on its hostname.

CHAPTER 24

Trend

Data points from the chamber's operation accumulated in the data log are displayed as a trend graph under the **Trend** menu, depicted in the following figure. By default, this graph provides an overview of the chamber's operation in the last one hour. Data can be downloaded in whole or in portion (refer to Item 4 below).

<pre>(1)</pre>	(2)	3	4
E Manager O Standay Car 22.4-c Arr 30.1	Owner Off Off off		
🛓 👝 🧮 Trend Graph			
93 Per 20		1(27)(2)(2), (2 40) 42 FM	
Q		- Temp SV 45 °C - Temp PV 22.4 °C - Humi SV 47 SRH	
5		Humi PV 35 5/801 Diskin Standay	
			100 00 00 00 00 00 00 00 00 00 00 00 00
mq215 mq215	235pm 225pm 236pm 2315		125pm k00pm k05pm
7 States Streety — Timp SV — Timp PV — Hani SV — Hani P		Sandhy	

Figure 24.1: Trend graph showing plots of current data from the chamber

The main display area of the **Trend** menu is categorized into seven different groups with labels from 1 through 7. Detailed descriptions of these categories are outlined as follows:

1. **Time Frame**: This menu button shows or hides the time frame of the data points being plotted in the trend graph. As shown in the following figure, the trend graph is plotted for data points collected between 2:29 PM and 3:29 PM. That time frame is also displayed at the bottom of the trend graph, with grids at an interval of 5 minutes. This graph will continue to update and propagate through the progression of time in a 5-minute interval. To hide this time frame, click the menu button again.



Figure 24.2: Detailed data of the Trend graph

2. Trend Graph: Data points collected from the chamber are rendered and displayed as a trend graph based on a scatter plot methodology. These data points represent product temperature, air temperature and/or vibration; they are plotted as a function of time. The vertical (Y) axis represents the scale of their values. Temperature is displayed in degree Celsius; vibration is displayed in root-mean-square of acceleration (Grms or G). The horizontal (X) axis represents the time scale with unit measured in a 1-second scale. Based on the default configuration, the Typhoon chamber logs data points in a 1-second interval. The scaling of the grid will change according to the Pan/Zoom Controls buttons application (see item 3 below). To reset the trend graph, click the Zoom Extents button (in the fol-

lowing figure), select ${\bf Last}$ Hour from the drop-down menu, then click the ${\bf Auto}$ Refresh button.

- 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. This feature allows a quick peak of the data at a certain point in time. Depending on the chamber's condition, the snapshot provides set values (SV) and process values (PV) of temperature, product or air temperature, or vibration, chamber's operation status and time signal status.
- 4. **Trend Graph Manipulation Buttons**: Four buttons are available to help manipulate and control the trend. This group of buttons is detailed in the following figure; their functions are described as follows:

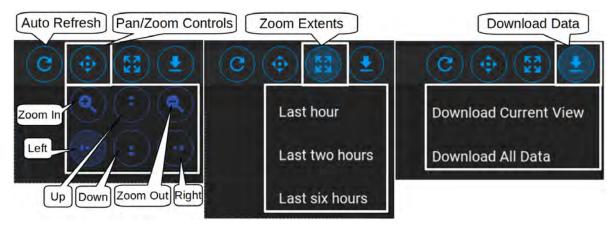


Figure 24.3: Manipulation buttons of the Trend graph

- Auto Refresh: This Auto Refresh button refreshes the trend graph; it thereby reconstructs the graph using the most recent data points which have been accumulated up to the current time.
- **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.
- **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.
- 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.
- 5. Line Graph: Data points from Temperature (set values or process values) and vibration (set values and process values) are being plotted to produce the line graphs to visually display the operation condition of the chamber.
- 6. Status: Status of the operation mode of the chamber 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 Left button under the Pan/Zoom Controls may be used to extent further 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 to designate the different line graph (described in Item 5 above).

CHAPTER 25

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:

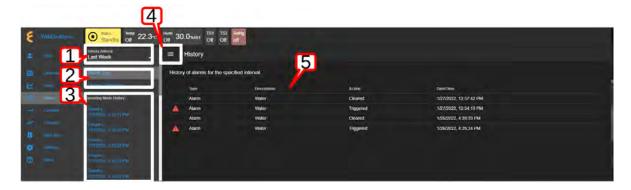


Figure 25.1: Operation history of the chamber

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.

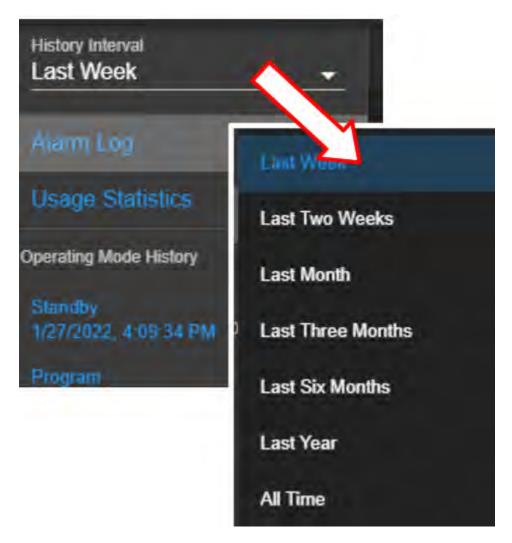


Figure 25.2: History interval and display selection

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).

History Interval Last Week -	≡ History			
Alarm Log	History of alarms for the sp	ecified interval.		
Usage Statistics	Туре	Description	Action	Date/Time
Operating Mode History	Alarm	Water	Cleared	1/27/2022, 12:57:42 PM
Standby	Alarm	Water	Triggered	1/27/2022, 12:54:13 PM
1/28/2022, 8:54:02 AM	Alarm	Water	Cleared	1/26/2022, 4:39:33 PM
Constant 1/28/2022, 8:53:51 AM	Alarm	Water	Triggered	1/26/2022, 4:25:24 PM
Standby 1/27/2022, 2:35:12 PM				

Figure 25.3: 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:

History Interval Last Week -	≡ History			
	Percentage of time in each op	erating mode for the specified interval.		
		Mode	Duration	Percent
Operating Mode History		Standby	44:38:16	95 94%
Standay 1020/022-554/02-64		Constant	1.12.32	2.60%
		Alarm	0.17.38	0.63%
		оп	0:16:19	0.58%
Standby 1/27/2022, 2:36:12 PM		Program	0:06:57	0.25%
54mdby 1/37/2022 (3.11/22) (41				

Figure 25.4: 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 25.5: 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 25.6: 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 26

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.

E WOOden Myters	O Standby Off 22.2-C: Off 30.0-set TS1 TS2 Refer	
£	Constant	
	Temperature Humidity	
-BB Ownerse	Contile Product Z Enable	
12 1-1	Ser Vale 48 **C 47	-
-0. may	49 "C 4/	SiRH
	+ Densiant Densiant 10 *C -10 *C	
1 -		
B. makes	Less des	
	Outputs	
0	🔁 Time Signal #1 💆 Time Signal #2. oft —	
-		5344 (444)
	Humidity Range Chart	
	Temperature(*C)	

Figure 26.1: The Constant menu and its components

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

26.1 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.

Constant Temperature Enable	Product	Humidity Enskie Ser Yawa 47	SRH
• Devlation 10	-Develope *C -10	°C	
Outputs	📮 Time Signal #2	Peringenaam Off	
			CLEAR APPLY

Figure 26.2: 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).

Warning Unsaved changes wi anyway?	ill be lost, leave
Yes	No

Figure 26.3: 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**.

26.2 Humidity Setting

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

- 1. Enable or disable humidity with the appropriate check mark in the box.
- 2. Click the Set Value field and enter a new value, or apply the up/down arrow to adjust the value.
- 3. Click the **APPLY** button or the **Save** icon (indicated by the arrows) 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 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**.

26.3 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 27

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.

2	Uner	Please Login	
28		User Name	
0		Password	0
-			CLEAR SUBART
-			
G			
0			

Figure 27.1: User with read-write privilege is required to operate the Program menu

27.1 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:

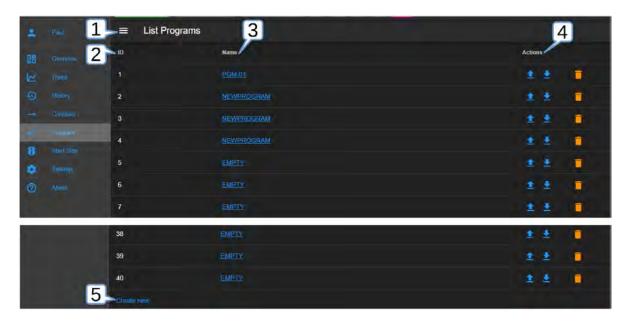


Figure 27.2: Program listing page with submenu hidden

- 1. Submenu Show/Hide: To utilize the entire main display area for the program editor, this button can be used to hide the submenu (as shown in the above figure). Click it again to reveal the submenu.
- 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. 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) under the Actions column can be used to manage each program on the list under each row. These action buttons, once activated, affect the program on the row where the buttons were applied. They are described as follows:
 - Upload: Program can be uploaded from the local computer to the Web Controller 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

e the Salaria	1 💷 Lis	it Programs	
Cremina Dressel		Name	Actions
PGB41		EGM-01	1 1 I
Die Hinkey	2		± ± 🚦
- Control of Control	3	NEWEROGRAM	2 2 1
d insert B Senter	314		± ± =
and a second	5	EMPTY	11
Almal 0	6	EMPTY	± ± =
	38	EMPTY	± ± 👘
	39	EMPTY	1 1 (1
-	40	EMPTY	± ± 🕴
	Create new		

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

Figure 27.3: 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 the Web Controller 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.

27.2 Create New Program

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

100 Property 1	≡ List Programs				
Cross here	D	Name	Actio	15	
Fisher	4	PGM-01	1	±.	1
MENIPROCEMM MENIPROCEMM	2	NEWPROGRAM	1	±.	
NEWFROGRAM	3	NEWPROGRAM	1	±.	
~	4 2	NEWPROGRAM	1	±	1
2	5	EMPTY	1	٠.	10
Ħ.	37	EMPTY	±	<u>*</u>	
12 14	38	EMPTY	±	٠	1
÷.	39	CRAIL CONT.			
1	40	EMPTY	1	1	
· -	Create new				

Figure 27.4: 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 Pro-grams** 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.

New Program				End Mode Off					👻 Next P	rogram					
Temperature Details Meanant Sel Value -70	Maximum Sel Value *C 180	*c	Start Mode Off		isten Ser Ve 70		Humidity Details Meanane Set Value 10	%RH S	Vaximum Set Water 95	%RH (taert Model Off		riaart Xart Qualan		SiR
Counter A	€ 0			4			Counter B		€ 0			4			
Start Ö			>				Start Ö			÷		End			
	Pause	Soak	Temperature Set Value	Ramp	Produ	ct Temperature Control Deviation +	Deviation -	Humid	Set Value	Ramp	Retrig.	Time Signals		Counters A	в

Figure 27.5: 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.

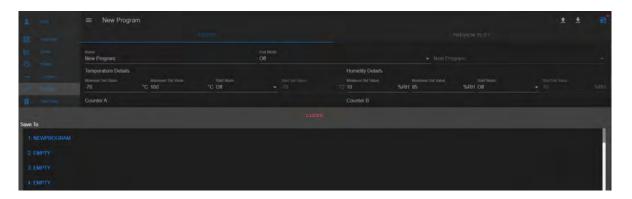


Figure 27.6: Selecting slot # to save new program

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 Pro-grams** 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 27.7: 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 2 as highlighted under the program list in the submenu will be used to store the program once it is completed and saved.



Figure 27.8: 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. In order to apply the preview mode, the program must be loaded into the program editor first, then click the **PREVIEW PLOT** button.
- 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 the Web Controller 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 the Web Controller 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. The Web Controller accepts the input value in H:MM or in pure numerical value. If a pure numerical value is entered, the Web Controller 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 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.
- 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 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 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 27.9: File deletion confirmation

- **Open Program**: This button imports a program file from the local computer into the program editor. The Web Controller only accepts a program in JSON format. To ensure compatibility, the program structure should be based on the one downloaded from the Web Controller 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.





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

27.2.1 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 27.11: 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:

	¢ 0		4		ç	Cyclinii O	ب			
	÷		tua D	Mart O		÷	or o			
Duration (191.3MM)	Paulo	Soak	Temperaturi Sel Vatur	Ramp	Reling		Time Si TS1	prials TS2	Crumters	
0.20	D		23	•c 🗖	20%		. 🗆		0	0
110			24	-c 🗆	20%		÷ 🗹		0	0
				APPEND STEP						

- **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 27.12: 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.

■ PROG2TEST							REVIEW PLOT	•	1	ŧ	
Name PROG2TEST			End Mode Off			• Next Prog	TWN.			2	
Temperature Details Misimum Set Vaue -70	"C 18	uumum Set 30	Value	Start Mede			Start Suit Value 🗢70				
Counter A	сулні 2		5	Counter B		Cyces		5			
Slari 2	÷		End 3	that 1			÷	End. 4			
Duration (/8EMM)	Paulo	Soak	Temperature Set Value	Ramp	Refrig.			Time Se TS1	gosäts. 192	Counters	
1 020			23	•c 🗆	20%					0	0
2 0.10	ä		24	-c 🗆	20%					0	1
3 0.10	0		32	*c 🗆	20%					\odot	1
4 0:10			34	-c 🗆	50%					0	\odot
				APPEND STEP							

Figure 27.13: Save current program

Navigating out of the editor without saving the program will trigger the following warning prompt:

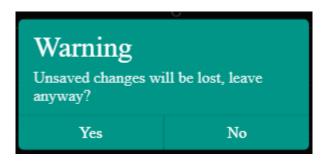


Figure 27.14: Confirm the save or discard update

13. **Preview**: The above program can be previewed before execution by clicking on the **Preview Plot** button as depicted in the following figure. To toggle back to the editor mode, click on **EDITOR**.

	PRO	S2TE	зт																	5								±. 1	±.	8	1
							DITOR														N	ene									
	30																														
	25																														
	30																														
	10																														
	0.00	-001	0403	005	0:06	008	0:10	Q 11	013	015	0.16	018	020	021	023	025	0.26	028	080	031	033	935	036	038	0.40	041	043	0.45	0.46	0.48	
s	tep 1													_	_	_		_	-	_	_	_	_	_							
	n B x1 TST Off													_				_	0	_						-	-	_	_	_	
mp i	152 🗾												OI						-						0e						

Figure 27.15: Program in preview mode

Note: Program cannot be saved while in the **Preview Plot** mode. In order to save the program, navigate back to the program editor and click **Save** or **Save As**.

27.3 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.

27.3.1 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.

≡ List Pro	ograms	
ID	Name	Actions
1	NEWEROGRAM	
2	PROGZIEST	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
3	EMPTY	1 ± 1
4	EMETY	2 A

Figure 27.16: 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.

■ PROG2TEST							REVIEW PLOT		±	*	8
Nama PROG2TEST			End Mode Off			+ Next Progr	um 🖌				
Temperature Details Unimum Set Volue 70	"C 18	somon Set 30	Value	Ebat Mode *C Off			★ Start Set Value				
Sounter A	F 2		4	Counter B		€ 1		ħ			
iturt 2	÷		End 3	Star 1			÷	End 4			
Duration (HILMIN)	Pause	Soek	Temperature Set Value	Ramp	Refrig.			Time S TS1	ignals 152	Counter	8
0 020			23	•c 🗖	20%			. 🗆		0	0
2 0.10	0		24	*c 🗆	20%			. 🗹		0	•
3 0.10	0		32	-c 🗆	20%			. 0	2	\odot	•
0.10			34	-c 🗆	50%			. 🗹		0	0
				APPEND STEP							

Figure 27.17: File manipulation buttons

27.3.2 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 dropdown list (see figure below), then click the Next Program field and select the program from the drop-down list (NEWPROGRAM is used for example).

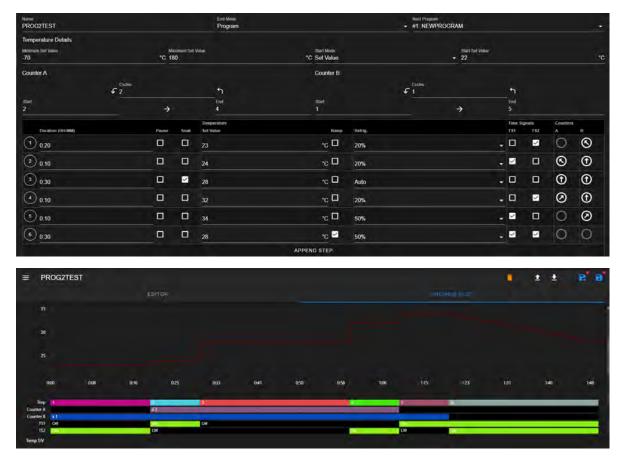


Figure 27.18: Select program to execute next

- 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.

v.3 3/2022

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7. 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.

27.3.3 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.

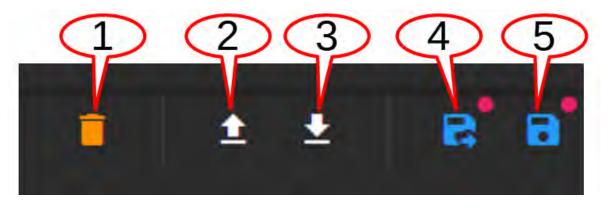


Figure 27.19: File manipulation options

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 27.20: 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 27.21: Update indicator

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



Figure 27.22: Confirm the save or discard update

27.3.4 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.

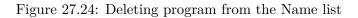
≡ List Program	ns	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1
10	Name	2 Actions 3 1
ì	NEWPROGRAM	<u>}</u> ± ± ↓
2	PROG2TEST	± ± 👘
3	EMPTY	1 E E
4	EMPTY	±± 1

Figure 27.23: 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.

≡ List Prog	grams	
ю	Name	Actions
1	NEWPROGRAM	** •/>
2	PROGRIEST	± ± 🚽
3	EMPTY	1 (± 1) (=)
4	EMPTY	1 🗄 🖉 🖬



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.

≡ List Progra	ms	
ID	Name	Actions
4	NEWEROGBAM	± ±, =
2	PROG2TEST	1 ± ± 1
3	EMPTY	1 ± 1
4	EMPTY	1 1 I

Figure 27.25: 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 28

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.

٤	Standby Off 24.6 c Off Off of			
*	⊗Standby	OConstant	OProgram	
88 12		and the second second second	Program	.7
0			_	
-	STOP OPERATION	RUN CONSTANT MODE	RUN PROGRAM MODE	PAUSE RESUME NEXT STEP
0				
0 (0)				

Figure 28.1: 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.

28.1 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.

28.1.1 Start/Stop Standby Mode

A standby mode can be switched from constant or program mode as follows:

- 1. Click the **StartStop** menu.
- 2. Click the **STOP OPERATION** button in the **Standby** tab.

ESPEC Web Controller 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.

28.2 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.

28.2.1 Start/Stop Constant Mode

A constant mode can be switched from a standby or program mode as follows:

- 1. Click the **StartStop** 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.

٤	Visib Deve 500	Constant Temp 24.6°C Off Off Off		
÷		OStandby	©Constant	OProgram
25				Pingenn + 1
				- topon
•		STOP OPERATION	RUN CONSTANT MODE	RUN PROGRAM MODE PAUSE RÉSUME NEXT STEP
2				
	-			
۰	-			
0	-			

Figure 28.2: 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 OPERA-TION** button in the **Standby** tab. ESPEC Web Controller immediately moves to apply the operating mode to the chamber.

28.3 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.

28.3.1 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 **StartStop** 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.

٤	Weilberg 10	Off Off Off Off		
÷		©Standby	OConstant	OProgram
46				
E.				Toom I
Ð.				
-		STOP OPERATION	RUN CONSTANT MODE	RUN PROGRAM #1: NEWPROGRAM
×.				
				#2: FROC21ES I
۰				
co-				

Figure 28.3: 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. 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 following figure.

E	Program PROGRATEST 23.0-c 24.9-c Off Off 270		
4 ~	OStandby	OConstant	©Program
RE Louise			Process #2 PROG2TEST + 1
0		the second se	
	STOP OPERATION	RUN CONSTANT MODE	RUN PROGRAM MODE PAUSE RÉSUME NEXT STEP
	-		
• • •			

Figure 28.4: The Start/Stop menu with chamber in Program mode

The **Overview** page maybe accessed to display the detail of the program being executed.

28.3.2 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.

28.3.3 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.

٤		~;	tatus Program Yoginam Temph	Ab1 35.0-c	59.0-c	Off 0.0g	TS1 TS Off O	2 153 II OII	Off O	S TS6 Off	TS7 TS8 Off Off										Ligh
		~	stan Program	nere TempVib1		0:06:59												Jan 19,	2022,	12:25:40	PM
						Temperature															
ler.	(inst	1	Temp & Vibe R	mp.		0.10.00				0.100			0.69180	2						0	
		2													-						
		a	Vibe Ramp			0.00101				0.100			0 (6) (6)			23	2		0		
		Prod	uct Temper	ature							.58.9.	Vibration	n								
•		3	5.0.			Heat 100	~			Pro	59.0		F							0.0	
						Heat 100 Cool: 01						Eler Upture				Powe	n 0%				

Figure 28.5: Stepping through a program

28.4 Alarm Mode

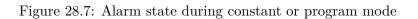
An alarm mode is not an operation mode controllable by the **StartStop** menu as the previous three modes. An alarm mode occurs when the chamber is in an alarm state. When ESPEC Web Controller detects the chamber in an alarm state, it sets itself in an alert state by displaying a list of active alarms and fault names in the red window to require an immediate action from the operator, as depicted in the following figure.

1 Active Chamber /	Alarms!		8
Type	Alem	Dule	Actions
Alarm	Water Circuit Fault	Jan 26, 2022, 4:26:44 PM	
Silence			Close

Figure 28.6: Chamber in alarm state

A repeating beep on the local computer is tripped to get the operator's attention. The **SI-LENCE** 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.

	Alarm 25.0 25.2 c Off Off of	and the second se	
	OStandby	OConstant	OProgram
			AZ PROGZTEST + 1
			#2 PRO521EST + 1
	STOP OPERATION	RUN CONSTANT MODE	RUN PROGRAM MODE PAUSE RESUME NEXT STEP
o —			



28.4.1 Clear Alarms

The chamber is set in the **Alarm** state as a result of an alarm or alarms triggered in and by the chamber. ESPEC Web Controller 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, the Web Controller will automatically clear all alert messages and resume normal operation by switching the chamber to a **Standby** mode.

Part VI

ESPEC SCP220 Chamber

CHAPTER 29

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 ESPEC Web Controller. The following figure depicts **Overview** showing the chamber in Standby mode, as indicated in the status tab and its extension bar. The extension bar of the status tab is only available in the **Overview** menu.



Figure 29.1: Overview page with chamber in Standby mode

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

 VokDextiylet z set 	Constant 48.0 22.7 c	14/11 152 Handing 47 (Dates) 30.0% RPH Off Off audio				_{تعمر} Jan 26, 2022, 3:30:22 PM
1	Temperature 48.0.	Heat DS. Coar Ds	22.7.	Humidity 47.0 _{NRH}	Heat 0% Cool 0%	30.0 ₅₈₄
8 0 0	TS1 on	TS B⇒ or	2	Ģ	Refrig auto	B

Figure 29.2: 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 29.3: 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 sta-

tus 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.

29.1 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.

→ Status Constant ^{Temp} 22.3°	с 47.0 _{%RH} 30.0%RH Оff	TS2 Refrig Off auto	
OStandby	⊗Constant	OProgram Program -	i.
STOP OPERATION	RUN CONSTANT MODE	RUN PROGRAM M	IODE PAUSE
STOP OPERATION	RUN CONSTANT MODE	RESUME	NEXT STEP

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 29.4: Status tab drop-down menu via the extended tab

- 2. Click the **STOP OPERATION** button. ESPEC Web Controller 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.
- v.3 3/2022

- Click the status tab itself. or
- Click the **CLOSE** button underneath the alarm tab.

29.2 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.

Star sby Off 22.7 c	KI Iwpu	TS2 Refrig Off off
Standby	() Constant	OProgram Program = 1
STOP OPERATION	RUN CONSTANT MODE	RUN PROGRAM MODE PAUSE RESUME NEXT STEP
		CLOSE

Figure 29.5: Constant mode setting

- 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 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.

29.3 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 29.6: 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 29.7: 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. ESPEC Web Controller 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.

29.4 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 29.8: Chamber in alarm state

A repeating beep on the local computer is also tripped to get the operator's attention. The **SI-LENCE** 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.

	Salice Address Alarm Water			Jan 26, 2022, 5:49:51 PM
111)	Temperature 25.0-c	22.8	Humidity Off	30.0
• -	TS1 or	TS2 G→ orr	Refrig C+ auto	Đ

Figure 29.9: 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 the Web Controller (and the chamber) can resume the normal operation. 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.

29.5 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.

	C	ontrol Tabs	(Control Pan	es	
٤ ک	Stands Off 22.2 c Off	30.0%RH Of Of				
2	Standby					Jan 27, 2022, 12:50:49 PM
e	Temperature			Humidity		1.000
	Off		22.2.	Off		30.0
2 mm		Heat DN, Cost DN,			Heat ON- Cost DN-	
	TS1 of		TS2 ce	G	Reing of	G

Figure 29.10: Parameter settings via control panes

29.5.1 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).

Off Status Off 2	2.7∘с ^{Ниті} 30.0%Rн Оff	TS1 TS2 Refrig Off Off off
	Temperature	
	Set Value	rc
	CLOSE APPI	

Figure 29.11: 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 stask 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).

	Humidity	
	Set Value 47	%RH

Figure 29.12: 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).

Status Standby	^{Temp} 22.7∘c	Humi Off 30.0%RH	TS1 TS2 Refrig Off off
			Time Signal #1
			CLOSE APPLY

Figure 29.13: 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.

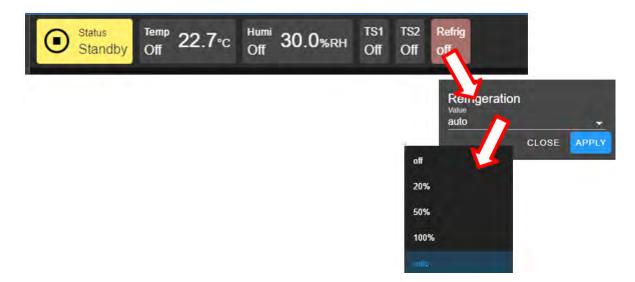


Figure 29.14: Setting refrig value

- 3. Click Apply.
- 4. To cancel the setting, click the **CLOSE** button.

29.5.2 Settings via the Dedicated Panes

With ESPEC Web Controller, 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 29.15: 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.

29.6 Web Controller on the Network

ESPEC Web Controller can communicate with other ESPEC Web Controllers on the same network. The hostname (with E logo) in the upper-left corner acts as a link that, when clicked, provides a list of any chamber with ESPEC Web Controller detected on the network by the local ESPEC Web Controller, as depicted in the following figure.



Figure 29.16: List of ESPEC Web Controller on the local network

This list can be opened from within any menus (not just in the **Overview** menu) by just clicking on the Web Controller hostname. Any chamber and ESPEC Web Controller on the list can be accessed directly by clicking on its hostname.

CHAPTER 30

Trend

Data points from the chamber's operation accumulated in the data log are displayed as a trend graph under the **Trend** menu, depicted in the following figure. By default, this graph provides an overview of the chamber's operation in the last one hour. Data can be downloaded in whole or in portion (refer to Item 4 below).

<pre>(1)</pre>	(2)	3	4
E Manager O Standay Car 22.4-c Arr 30.1	Owner Off Off off		
🛓 👝 🧮 Trend Graph			
93 Per 20		1(27)(2)(2), (2 40) 42 FM	
Q		- Temp SV 45 °C - Temp PV 22.4 °C - Humi SV 47 SRH	
5		Humi PV 35 5/801 Diskin Standay	
			100 00 00 00 00 00 00 00 00 00 00 00 00
mq215 mq215	235pm 225pm 236pm 2315		125pm k00pm k05pm
7 States Streety — Timp SV — Timp PV — Hani SV — Hani P		Sandhy	

Figure 30.1: Trend graph showing plots of current data from the chamber

The main display area of the **Trend** menu is categorized into seven different groups with labels from 1 through 7. Detailed descriptions of these categories are outlined as follows:

1. **Time Frame**: This menu button shows or hides the time frame of the data points being plotted in the trend graph. As shown in the following figure, the trend graph is plotted for data points collected between 2:29 PM and 3:29 PM. That time frame is also displayed at the bottom of the trend graph, with grids at an interval of 5 minutes. This graph will continue to update and propagate through the progression of time in a 5-minute interval. To hide this time frame, click the menu button again.



Figure 30.2: Detailed data of the Trend graph

2. Trend Graph: Data points collected from the chamber are rendered and displayed as a trend graph based on a scatter plot methodology. These data points represent product temperature, air temperature and/or vibration; they are plotted as a function of time. The vertical (Y) axis represents the scale of their values. Temperature is displayed in degree Celsius; vibration is displayed in root-mean-square of acceleration (Grms or G). The horizontal (X) axis represents the time scale with unit measured in a 1-second scale. Based on the default configuration, the Typhoon chamber logs data points in a 1-second interval. The scaling of the grid will change according to the Pan/Zoom Controls buttons application (see item 3 below). To reset the trend graph, click the Zoom Extents button (in the fol-

lowing figure), select ${\bf Last}$ Hour from the drop-down menu, then click the ${\bf Auto}$ Refresh button.

- 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. This feature allows a quick peak of the data at a certain point in time. Depending on the chamber's condition, the snapshot provides set values (SV) and process values (PV) of temperature, product or air temperature, or vibration, chamber's operation status and time signal status.
- 4. **Trend Graph Manipulation Buttons**: Four buttons are available to help manipulate and control the trend. This group of buttons is detailed in the following figure; their functions are described as follows:

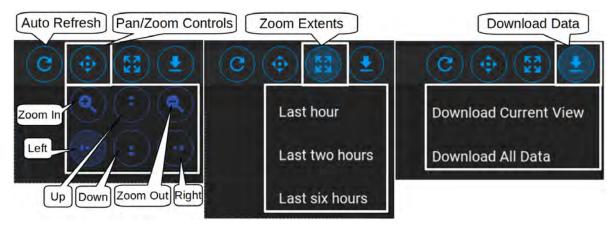


Figure 30.3: Manipulation buttons of the Trend graph

- Auto Refresh: This Auto Refresh button refreshes the trend graph; it thereby reconstructs the graph using the most recent data points which have been accumulated up to the current time.
- **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.
- **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.
- 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.
- 5. Line Graph: Data points from Temperature (set values or process values) and vibration (set values and process values) are being plotted to produce the line graphs to visually display the operation condition of the chamber.
- 6. Status: Status of the operation mode of the chamber 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 Left button under the Pan/Zoom Controls may be used to extent further 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 to designate the different line graph (described in Item 5 above).

CHAPTER 31

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:

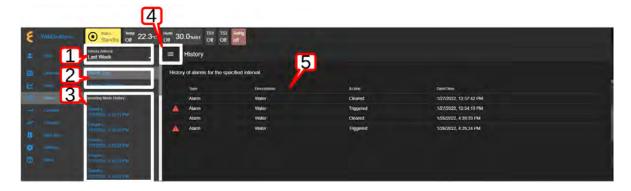


Figure 31.1: Operation history of the chamber

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.

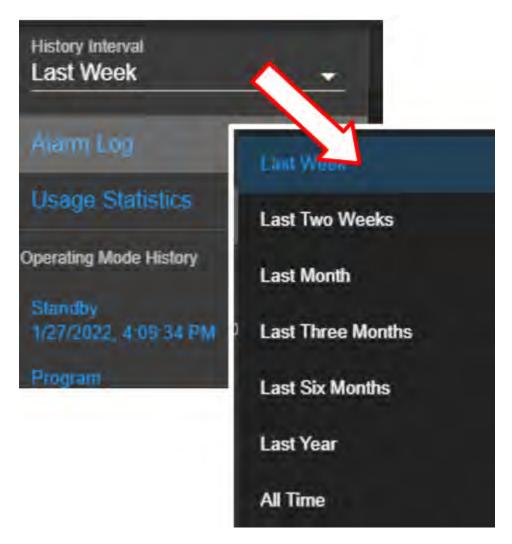


Figure 31.2: History interval and display selection

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).

History Interval Last Week -	≡ History			
Alarm Log	History of alarms for the sp	pecified interval.		
Usage Statistics	Туре	Description	Action	Date/Time
Operating Mode History	Alarm	Water	Cleared	1/27/2022, 12:57:42 PM
Standby	Alarm	Water	Triggered	1/27/2022, 12:54:13 PM
1/28/2022, 8:54:02 AM	Alarm	Water	Cleared	1/26/2022, 4:39:33 PM
Constant 1/28/2022, 8:53:51 AM	🛕 Alarm	Water	Triggered	1/26/2022, 4:25:24 PM
Standby 1/27/2022, 2:35:12 PM				

Figure 31.3: 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:

History Interval Last Week -	≡ History			
	Percentage of time in each op	erating mode for the specified interval.		
		Mode	Duration	Percent
Operating Mode History		Standby	44:38:16	95 94%
Standay 1020/022-554/02-64		Constant	1.12.32	2.60%
		Alarm	0.17.38	0.63%
		оп	0:16:19	0.58%
Standby 1/27/2022, 2:36:12 PM		Program	0:06:57	0.25%
54mdby 1/37/2022 (3.31/22141)				

Figure 31.4: 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 31.5: 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 31.6: 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 32

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.

E WOOden Myters	O Standby Out 22.2-c: Met 30.0-set TS1 TS2 Refer	
£	Constant	
	Temperature Humidity	
-BB Ownerse	Contile Product Z Enable	
12 1-1	Ser Vale 48 **C 47	-
-0. may	49 "C 4/	SiRH
	+ Denvisori 10 *C -10 *C	
1 -		
8 miles	Less des	
	Outputs	
0	🔁 Time Signal #1 💆 Time Signal #2. oft —	
-		5344 (444)
	Humidity Range Chart	
	Temperature(*C)	

Figure 32.1: The Constant menu and its components

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

32.1 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.

Constant Temperature Enable	Product	Humidity Enskie Ser Yawa 47	SRH
• Devlation 10	-Develope *C -10	°C	
Outputs	📮 Time Signal #2	Peringenaam Off	
			CLEAR APPLY

Figure 32.2: 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).

Warning Unsaved changes will be lost, leave anyway?					
Yes	No				

Figure 32.3: 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**.

32.2 Humidity Setting

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

- 1. Enable or disable humidity with the appropriate check mark in the box.
- 2. Click the Set Value field and enter a new value, or apply the up/down arrow to adjust the value.
- 3. Click the **APPLY** button or the **Save** icon (indicated by the arrows) 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 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**.

32.3 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.

Program

CHAPTER 33

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.

🙎 Der	Please Login	
	User Name	
	y Password	8
		CLEAR SUBAUT
		Based Factors

Figure 33.1: User with read-write privilege is required to operate the Program menu

33.1 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:

1 Piel	1 = List Prog	ırams 3	4
-	2 "	Name	Actions
Trens	4		1 1 I
	2		1 1 I
+ Correct	3		1 ± = =
AP Home	4	EMPTY	± ± =
Sellegi			± ± =
O Ates	6	EMPTY	± ± = =
	29	MIL-581073	± ± -
	30	TEST PROGRAM	1 ± ± 1
	5 Creatil new		

Figure 33.2: Program listing page with submenu hidden

- 1. Submenu Show/Hide: To utilize the entire main display area for the program editor, this button can be used to hide the submenu (as shown in the above figure). Click it again to reveal the submenu.
- 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. 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) under the Actions column can be used to manage each program on the list under each row. These action buttons, once activated, affect the program on the row where the buttons were applied. They are described as follows:
 - **Upload**: Program can be uploaded from the local computer to the Web Controller 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).

± ··· > 1	😑 🛛 List F	Programs	
ES Denne Denne Kon	io -	Name	Actions
	1	PROGIESTI	± ± 1
O II-	2		1 ± ± 1
- Creat	3		12.21.1
3	1	EMPTY	2 ± 1
Content Sector	5	EMPTY	1 ± 1
0	6		± ± _ #
2	29	MILSEIDES	± ± -
	30	TEST PROGRAM	1 1 I
	Create new		

Figure 33.3: 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 the Web Controller 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.

33.2 Create New Program

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

ultime 1	≡ List Pr	ograms	
Craft from	10	Name	Actions
PROSTERIT	4	PROGTESTI	± ± 💼
minutes	2	PROGIZEST	1 A A
2	3	2 EMPTY	1 ± 1
-	29	MIL_\$610E3	1 1 1
1	30	TEST PROGRAM	1 ± 1 ± 1 1
	Create new		

Figure 33.4: 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 Pro-grams** 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 33.5: 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.

* *	■ New Program	EDITOR							PREV	IEW PLIOT		ŧ	ŧ	e,
E -	tiani New Program			End Mode Off										÷
6 -	Counter A					Count	tor B	¢ o						
0 better														
0 -	Convaliant (19 c 2007)	Pause	Stat	Temperature Set Value	flamp	Humedity EN	Set Villag	Rang	Testrig.	Tame Signals TS1	TR			
Save To														
3 EMPTY														
4 EMPTY														

Figure 33.6: 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 Pro-grams** 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.

	■ New Program								±	± .	8 8
							PREVIEW F				
	Name New Program		End Mode Off			+ No	xt Program				
	Counter A				Counter B						
1		Cycles 0	5			<i>د</i> و ا			5		
	start D	÷			start O		÷		Ked 0		
	Duration (ISI-MM)	Pause Soak	Temperature Set Value	Ramp	Humidity EN Set Value	Ramp	Refrig	Time Signals TS1	T\$2	Countr	B
	A DESCRIPTION OF THE OWNER OWNER OF THE OWNER OWNER OWNER OWNER OWNER OWNER OWNER OWNER OWNE			AP	PEND STEP						

Figure 33.7: 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 33.8: 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. In order to apply the preview mode, the program must be loaded into the program editor first, then click the **PREVIEW PLOT** button.
- 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 (loweror 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. The Web Controller accepts the input value in H:MM or in pure numerical value. If a pure numerical value is entered, the Web Controller 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 33.9: File deletion confirmation

- **Open Program**: This button imports a program file from the local computer into the program editor. The Web Controller only accepts a program in JSON format. To ensure compatibility, the program structure should be based on the one downloaded from the Web Controller 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.

Save To	1.0000
1. Tempendule	
2. Humdity	
G Production test	
4. Humid Valid	
S. Termo Validi (i (reg)	

Figure 33.10: Save program to a new slot

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

33.2.1 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 33.11: 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.
- \bullet $\mathbf{Events}:$ Set both $\mathbf{TS1}$ and $\mathbf{TS2}$ 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:

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			Temperature		Hum					Signals	Counti	
Duration (HH:MM)	Pause	Soak	Set Value	Ramp	EN	Set Value	Ranp	Refing	151	152	A	в
1 0.30			-65	•c 🗆	~	15	%RH 🗆	Auto	+ 🗹		0	0
2 0:30	10		180	•c 🗆		50	_{%RH} 🛛	Auto	. O		0	0
3 0.30			-40	•c 🗆	~	50	_{%RH} 🗆	Auto	- 🗹	~	0	0
 0:30 			150	-c 🗆		25	_{%RH} 🗆	Auto	- 0		0	0
						APPEND STEP						

Figure 33.12: 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										EVIEW PLOT	•	1	ŧ	-
Name PROG3TEST				End Mode Constant				÷.	Next Progra					
Counter A	€ 0			÷1			Counter B	ç	Cysel 0		÷			
Swit D			÷	End 10			n			÷	End U			
Duration (HH:MM)	Pause	Soak	Temperature Set Value	Ramp	ilum EN	idity Set Value		Ramp	Refrig.			Time TS1	lignals TS2	Counters A B
0 030			-65	•c 🗆	Y	15		_{%RH} 🗆	Auto			2		00
2 0.30			180	•c 🗖	Y	50		%RH 🗖	Auto					00
3 0:30			-40	*c 🗖	~	50		_{%RH} 🗆	Auto					00
0.30			150	-c 🗆		25		%RH 🗆	Auto					00
						APPEN	ID STEP							

Figure 33.13: Save current program

Navigating out of the editor without saving the program will trigger the following warning prompt:

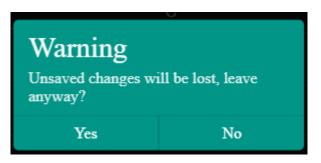


Figure 33.14: Confirm the save or discard update

11. **Preview**: The above program can be previewed before execution by clicking on the **Preview Plot** button as depicted in the following figure. To toggle back to the editor mode, click on **EDITOR**.

≡ PROG3TEST												± ±	8.6
		molt											
200													
100													
200 0.08	016	025	0.33	D41	050	0.58	105	145	123	101	140	148	1.56
Step 1								-					
Counter II TS1 Une TS2 CH		CH.								Off			
Temp SV Humi SV					-								

Figure 33.15: Program in preview mode

Note: Program cannot be saved while in the **Preview Plot** mode. In order to save the program, navigate back to the program editor and click **Save** or **Save As**.

33.3 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.

33.3.1 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 33.16: 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.

											PREVIEW PLOT		1			
Name PROG3TEST				End Mode Constant						Next	Processm					
Counter A	€ 0			41				Counter B	¢	Cycles O		ħ				
Start D			÷					Start ()			÷	ene D				
Duration (Hit:MN)	Pause	Soak	Temperature Set Value		Ramp	Ham	Nity Set Value		Ram	Retto	g.		Time: TS1	Signata TS2	Countie A	п. 0
0 30			-65		•c 🗆	V	15		%RH 🛛	Auto	1	÷			0	C
2 0.30			180		•c 🗖	~	50		%ян 🗖	Auto					0	C
3 0.30			-40		•c 🗆		50		%88Н 🗖	Auto)			\checkmark	0	C
(0.30	D	0	150		•c 🗆	\leq	25		56RH 🗆	Auto			0		0	C
							APPEN	ID STEP								

Figure 33.17: File manipulation buttons

33.3.2 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 dropdown 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 33.18: 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:

■ PROG3TEST									PI	REVIEW PLOT		Ż	ŧ		e e
Name PROG3TEST				End Mede Program					Next Program #1: PROG						
Counter A	¢2		*	ش تەط ع			Counter B	ç	cyclet. 2	<i></i>	<u>د</u>				
Z Distation (191:5004)	Pause	Soak	Temperature Set Value	3 Ramp	itun IN	idity Set Value	- <u></u>	Ramp	Refing.	7	-	Tene	Signals TS2	Counter	n
1 0.30			65	-c 🗆	~	15		%RH 🗆	Auto			. ⊻		0	0
0 30			180	-c 🗆		50		%RH 🗆	Auto					0	•
3 0.30			-10	-c 🗆	~	50		%RH 🗆	Auto			2	2	\oslash	\odot
0.30	0		150	•c 🗆	~	25		%RH 🗆	Auto					0	\odot
						APPEN	ND STEP								

Figure 33.19: 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.

33.3.3 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.

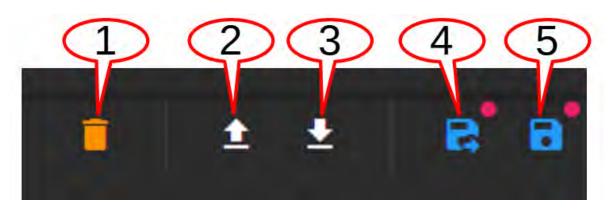


Figure 33.20: File manipulation options

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.

■ PROG3TEST														±	ŧ	7	e i
Name PROG3TEST					Enti Made Program						Next Pringram	TEST1		4	/	6	
Counter A									Counter B								
	€ 2				*1					ç	Cyclin 2		5				
Start 2			÷	•	End 3				Start. 1			÷	End 4				
Duration (101: MM)	Pe	use Sol		nperature I Value		Harep	Hum	dity Sel Value		Raing	Roling.			Time Si TS1	gnats TS2	Counter	в.
1 0.30	C		-65	5		•c □	~	15		%RH	Auto			N		0	0

Figure 33.21: 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 33.22: Update indicator

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

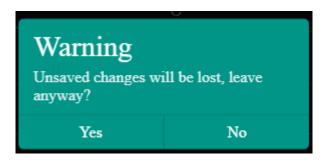


Figure 33.23: Confirm the save or discard update

33.3.4 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.

≡ List Pro	grams	and the second se
Ø	Name	2 Actions 3 1
i,	NEWEROGRAM	¥ £ 🕴
2	PROG2TEST	1 ± 1
3	EMPTY	1 E 1
4	EMPTY	🛓 🛎 🛛 🧰

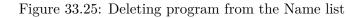
Figure 33.24: Manage programs on the Name list

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.

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≡ List Prog	grams	
ID	Name	Actions
1	NEWPROGRAM	± ± • •
2	PROGZIEST	± ± 📲
3	EMPTY	±(±) [■)
4	EMPTY	± ± =



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.

≡ List Prog	grams	
ID	Name	Actions
1	NEWPROGRAM	± ± 🗧
2	PROG2TEST	
3	EMPTY	1 ± ± 1
4	EMPTY	🔹 🛓 👘

Figure 33.26: 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 34

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.

٤		Standby Def 24.6-c Off Off off					
*		⊗Standby	OConstant	OProgram			
88 1				Program			
9		STOP OPERATION	RUN CONSTANT MODE	RUN PROGRAM MODE	PAUSE	RESUME	NEXT STEP
-		STUP OF ENALYON	NUN CONSTRAT MODE	AUN PRUGRAM MODE	PRUSE	RESUME	REATGREE
0							
9	-						

Figure 34.1: 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.

34.1 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.

34.1.1 Start/Stop Standby Mode

A standby mode can be switched from constant or program mode as follows:

- 1. Click the **StartStop** menu.
- 2. Click the **STOP OPERATION** button in the **Standby** tab.

ESPEC Web Controller 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.

34.2 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.

34.2.1 Start/Stop Constant Mode

A constant mode can be switched from a standby or program mode as follows:

- 1. Click the **StartStop** 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.

٤	Visib Deve 500	Constant Temp 24.6°C Off Off Off		
÷		OStandby	©Constant	OProgram
25				Pingenn + 1
				- topon
•		STOP OPERATION	RUN CONSTANT MODE	RUN PROGRAM MODE PAUSE RÉSUME NEXT STEP
2				
	-			
۰	-			
0	-			

Figure 34.2: 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 OPERA-TION** button in the **Standby** tab. ESPEC Web Controller immediately moves to apply the operating mode to the chamber.

34.3 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.

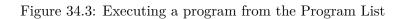
Authorized users with read-write privilege may set the chamber to operate in **Program** mode by performing a series of operations in the **Program** tab. The following subsections explain how to run (execute) a program, pause, resume or step through the instructional steps in the program.

34.3.1 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:

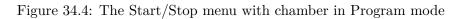
- 1. Click the **StartStop** menu.
- 2. Click the radio button in the **Program** tab to select a program from the list (scroll down, if necessary), as depicted in the following figure.

	Standby of 28.9°c of 100.0% 0.0		
	ØStandby	OConstant	OProgram
			#1:1-GTEST1
	STOP OPERATION	RUN CONSTANT MODE	RUN PROG #2: PROG2TEST
-			#3: PROG3TEST
100			#11 PROG11
			#12 PROG12TESTNAME



- 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. 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 following figure.

E	Program PRODUZTEST 23.0-c 24.9-c 0t 0s 20%		
1	OStandby	OConstant	CProgram hume has a2 PR052TEST + 1
•	STOP OPERATION	RUN CONSTANT MODE	RON PROGRAM MODE PAUSE RESUME NEXT STEP
• • •			



The **Overview** page maybe accessed to display the detail of the program being executed.

34.3.2 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.

34.3.3 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.

٤		~	taan Program Program Temp	ri Prd Temp Wabi 35.0%	59.0-c	off 0.0g	TSI TS Off Of	2 153 1 Off	TS4 TS Off Of		157 TS8 Off Off									Li O
		~	ties Program	TempVib		0:06:59	÷											Jan 19,	2022,	Den/Ta 12:25:40 PM
		100				Temperature														
les.	inst.	1000	Temp & Vibe I	Ramp.		0.10.00				0.10.00			0.00.00	2			C1			D
		2													-					
		3	Vibe Ramp			0.001011				0.1010			0 (00) (0)	0		2	8		0	
			luct Tempe	rature							.58.9-	Vibration								
• 20		3	5.0.			Heat 10 Cool 01				Prod	100000 View	Off				Powe				0.0

Figure 34.5: Stepping through a program

34.4 Alarm Mode

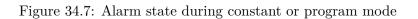
An alarm mode is not an operation mode controllable by the **StartStop** menu as the previous three modes. An alarm mode occurs when the chamber is in an alarm state. As indicated in Section 4.4, when ESPEC Web Controller detects the chamber in an alarm state, it sets itself in an alert state by displaying 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.

1 Active Chamber	Alarms!		8
Type	Nem	Daler	Actions
Alarm	Water Circuit Fault	Jan 26, 2022, 4-26-44 PM	
Silence			Close

Figure 34.6: Chamber in alarm state

A repeating beep on the local computer is tripped to get the operator's attention. The **SI-LENCE** 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.

Vieta(wo P309	Alarm 25.0 25.2 C Off Off all		
	OStandby	OConstant	OProgram
			AZ PROSZTEST + 1
	STOP OPERATION	RUN CONSTANT MODE	RUN PROGRAM MODE PAUSE RESUME NEXT STEP
a the			
• •			



34.4.1 Clear Alarms

The chamber is set in the **Alarm** state as a result of an alarm or alarms triggered in and by the chamber. ESPEC Web Controller 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, the Web Controller will automatically clear all alert messages and resume normal operation by switching the chamber to a **Standby** mode.

Part VII

Settings Menu

CHAPTER 35

Settings

The **Settings** menu in the menu bar is the administration page of ESPEC Web Controller where different settings and configurations can be applied to the Web Controller and the chamber. The administrator who manages this Web Controller 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 for detail on how to enforce user policy and access privileges to different users on this Web Controller.

The **Settings** menu has thirteen (13) different submenus listed 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 35.1: 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 in the menu bar should be accessible to only the system administrator or a qualified operator with administrator's privileges.
- 2. Show/Hide: This is the Show/Hide button for the submenu bar. This feature allows the submenu page to be displayed in a larger real estate when the submenu bar is hidden. As depicted in the above figure, other submenus can be accessed only when the submenu bar is unhidden. Thus, this button can be used to toggle between full display and submenus accessibility.
- 3. Submenu Bar: Click the submenu name or its icon to access and display its page.

The following subsections will be devoted to discuss each of these submenus.

35.1 Running Time Meters

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).

				and the second se
	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 35.2: 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.

35.2 Network Settings

The **Network Settings** page allows the operator (i.e., administrator) to manage the network settings. As depicted in the following figure, the **Network Settings** page shows the network settings of the Web Controller, its hostname and the type of network configuration it uses. By default, the Web Controller applies DHCP for its network configuration, with a dynamic IP address assigned by the DHCP server. As depicted in the following figure, it has been configured to use a static network protocol, which can be verified by the unchecked box of DHCP.

Network Settings		
		s will take effect immediately, howaver, if may require some time or even a reboot for a new hostname to resolve. If the Web Controller wa it will require opening a new browser with its new bostname (or IP address)
etwork Interface Co	nfiguration (eth0)	
Hostname	WebDevTseries	Name of the server.
DHCP	•	Get network settings automatically
IP Address	10 30 200 232	Static IPv4 Agaress
Net Mask	255 255 0 0	Static subnet maak
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 35.3: The network configuration page

The Web Controller hardware has two Ethernet ports designated as **eth0** and **eth1**. Each of

them has its unique function. **eth0** is used to join the main network, while **eth1** is reserved for internal networking, such as communication with the Allen Bradley or Watlow F4T PLC.

Current N	letwork Status				
	IPv4 Address	IPv4 Netmink	PvG Address	IPv6 Netmasa	MAC
ema	10,30 200,232	255 255 0 0			00.07.32 7b 3a a1
eth1	121.165.141.155 169.254.213.60	255 255 255 0 255 255 0 0	fe80_8dae.9796 a2f2 6bb8	64	00:07:32:7b:3a.a2

Figure 35.4: Network setting on the Web Controller hardware

The following subsections outline the procedure to set a new hostname or IP address.

35.2.1 Set Hostname

A unique and descriptive hostname for the Web Controller 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.

■ Network Setting	ngs	\rightarrow
		virk. All changes will take effect immediately, however, it may require some time or even a rebool for a new hostname a new hostname (or IP address) has been applied, it will require opening a new browser with its new hostname (or IP
Network Interface (Configuration (eth0)	
Hostname	Mort be a vale function	Name of the server.
DHCP	۵	Get network settings automalically
IP Address	10 30 100 108	Static IPV4 Address

Figure 35.5: Changing a hostname on the Web Controller

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 ESPEC Web Controller 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 took more than several minutes, as depicted in the following figure. A new Web browser (or tab) needs to be open to access ESPEC Web Controller via its new hostname.

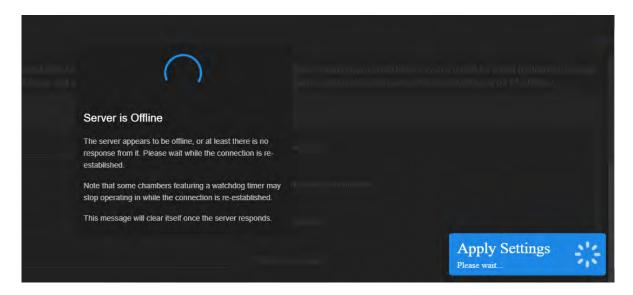


Figure 35.6: Apply static network setting

35.2.2 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.

ESPEC Web Controller will validate the new network configuration for the correct format and class type before it applies the settings to take effect. If successful, ESPEC Web Controller applies the settings immediately, as depicted in the above figure. It will then try to resolve and refresh the Web page.

If ESPEC Web Controller was accessed via its now old IP address, it may not be able to resolve and refresh the Web page, if the **Server is Offline** message took more than several minutes. A new Web browser (or tab) needs to be open to access ESPEC Web Controller via its new IP address.

35.2.3 Set DHCP Network

If the Web Controller has been configured to use a static IP address, to revert it back to DHCP, enable the DHCP box with a check mark and click the **Save** button. The system moves immediately to apply the setting. The **Server is Offline** message appears while the Web Controller 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) needs to be open to access ESPEC Web Controller via its hostname.

35.3 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			1	•
Chamber alerts can be notified via e	e-mails. Use this page to set up the e-mail server and add y	our e-mail addresses for alert notifications. Enter your e-mail address in the Alert Addresses 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	8	A usemame/password must be used to send the email.		
Require SSL/TLS		The mail server connection must be stanted with encryption.		
User	chamber_controller@espec.com	The username used for authenticating with the mail server.		
Password		The password used for authenticaling with the mail server.		
Account Recovery E-Mail		This small is to reset the admin account when if is misconsigured or the password is forgetten.		
Recipients		The users the email will be sent los. One address per line:		

Figure 35.7: Options of e-mail settings page

35.3.1 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 (in the upper-right corner). To set up a password authentication for the mail server, enter the password in the **Password** field and apply the **Save** button (in the upper-right corner).



Figure 35.8: Configure encryption and password authentication

35.3.2 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 (in the upper-right corner). A one-time password will be sent to this e-mail address to recover the administrator's account.



Figure 35.9: Configure administrator's account recovery

35.3.3 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). If multiple e-mails are required, enter one e-mail address per line in the recipient's box.
- 2. To test an e-mail notification, click the **Test Email** button in the upper-right corner (as shown in the following figure). **Note**: The Web Controller uses SMTP Office 365 for the e-mail protocol. Therefore, the Web Controller must have access the Internet in order for the e-mail notification to operate.

≡ Email Settings			S 8
Liter	chamber_controller@espec.com	The usemanie uned for authenticaning with the mail server.	Test Mail Save
Password		The password used for authenticating with the mail server.	Save
Account Recovery E-Mail	1	This email is to reset the admin account when it is misconfigured or the password is torgotten.	
Recipients		The users the small will be sent foo One address per line	

Figure 35.10: 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).

35.4 User Interface Settings

ESPEC Web Controller, version 3.0, is very customizable. Its UI can be configured or personalized to suite the operator's preferences with features and color decorations. 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. As shown in the figure, 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 displayed in the **Status** bar is also based on the color defined on the list in the bottom pane.

Program Ter	npVib1 Prd Temp 49	0.8°c off 0.0G	1 752 753 754 755 756 Off Off Off Off Off	757 758 Off Off					Ligh Off
User Inte	rface Settings								
Operating Sta	utus Display Setti	ngs							
uio			Name			Color		Actions	
standby			Standby						
constant			Constant						
program			Program						
of			OT						
atarm			Alarm						
Add Missing Er	ιέγ							+	
nput/Output I	Display Settings.								
UID	Name	Custom Name			Visibility Status	Visibility Overview	Format		
time_signal_1	Time Signal #1	Full	Short				On Color & Text	Off Color & Test	
time_signal_2	Time Signal #2	Full	Short	in.			On Color & Test	Off Color & Text	

Figure 35.11: Customizable UI

The User Interface Settings submenu allows the operator to manage the operating status color as well as input/output text description. As depicted in the following figure, the operator can adjust a different display color for the operating status, or remove it completely using the trash bin icon under the Actions list (last column). Any operating status color not defined on the list, the system will apply a default color setting (forest green).

35.4.1 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.

erating Status Display Settings				
ø	Name	Color	Actions	
tandby	Stainoby			
onstant	Constant		(i) (i)	
rogram	Program			
	on			
lam	Alam			
dd Missing Entry			+	

Figure 35.12: 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.

35.4.2 Managing Input/Output Status

The available input/output status names (particularly, the time signals) are based on the chamber configuration. As depicted in the following figure, there is only one time signal (**TS1**); its color displayed in the status bar corresponds to that defined under the format column in the following figure.

uvoutput	Display Settings							
uin	Name	Custom Name			Visibility Status	Visibility Overview	Format	
time_signal_1	Time Signal #1	Fall	Short	1			On Color & Test	Off Color & Test

Figure 35.13: 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. Again, new settings can be saved by applying the **Save** button in the upper-right corner. The **Restore Defaults** button (trash bin icon) can be used to revert the configuration to default setting.

35.5 Data Logging Settings

ESPEC Web Controller makes it possible to collect data from the chamber at a desired interval. This submenu allows the operator to specify the data logging interval, set the trend graph to include a desired set of data types (temperature, humidity, etc.) and in what color they should be plotted in, when to collect data points (all the time or only when the chamber is on).

The default data logging interval (or frequency) is 10 seconds; data collected at all times as indicated by the **Always** key word under the **Log data when** selector, as depicted in the following

figure. Another option beside **Always** is **When Chamber is on**, accessible from the drop-down menu. The data types to be included in the trend graph are selected with a check mark in their respective box, as shown in the figure.

■ Data Logging	Settings								
Data logging setti Configure how often and									
Logging Period 10					Log data when Seconds Always				
Trend graph view: Select what data is show		as well as what colo	r il will be						
Views default									
Y Range Met -100					Y Flamper Miss 250				
Data Series	Тури	Enabled	Color	Live Width			Line Type		
Status	state	2		1 Pixel		*	Solid	,	Ł
program_step	state	Ō		1 Pixel		*	Solid		
program key	state			1 Pixel			Solid		

Figure 35.14: Options of data log setting

Two buttons (delete data log and save settings) are available for managing the data log file and its settings on this submenu. They are described in the following section.

35.5.1 Set Data Logging Interval and Data Types

To configure a new data logging interval and select different data types for the trend graph, complete the following steps.

- 1. Enter the frequency number in the field of **Logging Period** or apply the up/down arrow next to the **Seconds** mark, as depicted in the following figure, to adjust the frequency number.
- 2. Click and select **Always** or **When Chamber is on** option from the drop-down menu under the **Log data when**. Default setting is **Always**.

Data Logging	Settings					
Data logging setti Configure how often and						
Lopping Fermil			Seco	nds Aways		
Trend graph views						
View default	2					
Y Range Min -100	*			Y Range Max		
Data Series	Туре	Enabled	Color Line Willin		Line Type	
Status	stato		1 Pixel	*	Solid	t
program_step	stato		1 Pixel		Solid	
program_key	state		1 Pool	÷.	Solid	

Figure 35.15: Configure data log setting

- 3. Enable any data series and type under the **Enabled** box list.
- 4. Click the color picker to select a desired color for each data type.
- 5. Select the **Line Width** for a desired number of pixels.
- 6. Select the **Line Type** in solid or dash.
- 7. Click the **Save** button at the upper-right corner.

35.5.2 Clear Data Log

It maybe necessary to start a new data log. To clear the current log, click the **Trash bin** in the upper-right corner. A warning dialog box appears to reconfirm the action with a Yes/No option to proceed.

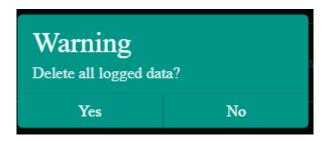


Figure 35.16: Confirm to delete current data log

The data log will be deleted immediately after confirmation. ESPEC Web Controller creates a new data log file, which in turn produces a warning sign, as depicted in the following figure.

≡ Data Logging	g Settings								
Configure how offen and Logging Period	when data is logged				Seconds	Log data tellem Always			*
Trend graph view Select what data is show		; as well as what colo	r it will be.						
default									-
Y Range Min -100						Y Range Max 250			
Dala Series	Type	Enabled	Color	Line Width			Line Type		
Status .	state			1 Pixel			Solid		
program_step	state	0		1 Pixel			Solid	Delete Data Log	s ⊘

Figure 35.17: deleting-data-log-file-001.PNG

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.

35.6 Date/Time Settings

To keep an accurate data log, it is important to have the correct date and time on the Web Controller and the chamber, since this is where data is being collected and logged. By default, the Web Controller date/time is configured to synchronize using the Network Time Protocol (NTP) server provided by the Debian network time pool, as depicted in the following figure.

■ Date/Time Settings	E Contraction of the second
Server - Network Time Protocol (NTP) Server In order to keep automatically keep an accurate date time on the Web Controller server, its datortime can be kept synchron NTP server is used, the Web Controller will randomly select one to use during system startup.	azid with a specific NTP server. A desired NTP server may be added into the list below to costrol the server dateitime. It more than one
NTP Sarwr #1 0.debian.pool.nlp.org	×
NTP Server #2 1.debian.pool.ntp.org	×
NTP Server #3 2.debian.pool.ntp.org	×
NTP Server #4 3.debian.pool.ntp.org	×
	APPEND

Figure 35.18: Using a different Network Time Protocol (NTP)

If the Web Controller 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, you may point the Web Controller to use that NTP server. If your network does not have an NTP server, you may synchronize the Web Controller with the date/time of the local device (your PC or laptop), as depicted in the following figure.



Figure 35.19: Date/time setting on the Web Controller

This **Date/Time Settings** page offers two ways to synchronize the date/time of the Web Controller and the chamber. If your network allows access to the Internet, then the Web Controller should be using the right date/time matched to your local time.

To set up the Web Controller to use a local NTP server or NTP server other than the default Debian pool, complete the following steps.

- Edit and enter the hostname or IP address of the local NTP server to occupy the top line. Note: The Web Controller synchronizes its date/time using the first NTP server on the list-the top line. Therefore, a desired NTP server must be entered in the top line. If the APPEND button is used, the new NTP Server will be added at the bottom, and the Web Controller may not get to use it if the top ones are operational. However, the APPEND button may be used if all the existing NTP Server lines were deleted (with the X button). Refer to the following figure for the configuration procedure.
- 2. Confirm that the first (top) line begins with 0.IP-address or 0.hostname. Refer to the existing format in the figure. If the desired NTP server is listed at the top, it may not be necessary to delete the rest of the lines. They can be used as a reference.
- 3. Click the **Save** button in the upper-right corner to save the current settings.



Figure 35.20: Editing the NTP for custom setting

If the NTP server is not available, the date/time of the Web Controller can be configured to synchronize with the local date/time of the PC/laptop. This synchronization will take place automatically by the Web browser that was used to access the Web Controller from the PC/laptop.

The date/time of the Web Controller can also be configured manually. Complete the following steps to edit or configure the date/time:

1. Click the date/time field under **Current Server Date/Time**, indicated by the arrow depicted in the following figure, to bring up the calendar and time.

- 2. Make the necessary adjustments
- 3. Close the date/time calendar.
- 4. Click the **APPLY** button on the right.
- 5. Click the **Save** button in the upper-right corner.

To synchronize the date/time of the Web Controller with that of the local device (i.e., PC/laptop), click on the **APPLY** button on the right of the **Device Date/Time** field.



Figure 35.21: Apply date/time setting on the Web Controller

35.7 User Settings

The **User Settings** submenu allows the system administrator to manage user accounts and access privileges on the Web Controller. The layout of the **User Settings** is depicted in the following figure.

Userbace Password	Repeat Password	OverviewTrend		Start Stop		Fedures		Constant		Program		Settings	
Guest (No user bgued in)		Read Only	*	No Access	*								
admin		Read Write	•	Read Write	•	Read Write	•	Read Write	+	Read Write	+	Read Write	÷
Paul		Read Write		Read Write		Read Write	4	Read Write		Read Write		Read Write	-

Figure 35.22: 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.

٠																
		Modifications (add/remove/up	date) to user ad	counts are made	here.											
-		Username Pessword	Repeat Password	OverviewTrend		Start Stop		Features		Constant		Program		Settings		
		Guest (No user logged in)		Read Only		No Access	•									
0	Destingting.	admin		Read Write		Read Write	÷	Read Write		Read Write		Read Write	÷	Read Write		×
h A		Paul		Read Write	÷	Read Write		Read Write		Read Write	÷	Read Write	•	Read Write	•	×
•								ADD								

Figure 35.23: The UI of the User Settings submenu with Show/Hide button activated

- 2. Username: All accounts with username on the Web Controller 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 the Web Controller. 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.

35.7.1 Add User Account

Complete the following steps to create/add a new user account. Refer to the following pictorial diagram for detail.

Usename	Password	to user accounts are Repeat Password	Overview Trend		Start Slop		Features		Constant		Program		Settings		5
Username	Password	Negleat Cassword	Overview frond.		start stop		reatures		Constant		Program		semilas		
Guest (No user k	ogged in)		Read Only	•	No Access	*	No Access		No Access		No Access		No Access	*	
idmin			Read Write	-	Read Write		Read Write	÷	Read Write		Read Write	*	Read Write	-	×
'aul			Read Write	÷	Read Write	÷	Read Write	*	Read Write	•	Read Write	*	Read Write		×
			Nederana		No Access	*	No Access	•	No Access	•	No Access	•	No Access	*	×
1	<u> </u>		Read Only				ADD								
2	3	4	Read Write			15									

Figure 35.24: 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.

35.8 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 the Web Controller.



Figure 35.25: 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 the Web Controller has access to the Internet.

35.8.1 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 35.26: 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.

Trigger Fine Aways		~ (±)
Operations	APPEND	

Figure 35.27: Trigger mode with always option

• Never (Manual Only): The macro must be manually triggered by an authorized operator or an API request.

Trigger Never (Manual Only)	~ (±)
Operations	APPEND

Figure 35.28: 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.

≡ Macros				± ± 🔒
Macro Editor:				
Name				
Enable				
Trigger Trie Program State + Program Che	anged	- Any	Step Any	t
Operations		APPEND		
	Program Started	#1 NEWPROG	GRAM	
	Program Stopped	#2 PROG2TES	ST	
	Step Changed	#3: MACRO1T	EST	
	Step Started	#4		
	Step Stopped	#5		

Figure 35.29: 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 35.30: 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.

Trigger Type Date/Time (One Shot)	Date/Time 3/2/2022, 11:30:49 AM						
Operations			Арре	ND			
Trigger Date/Time (Periodic)	Month - Any	Day of the Month	Day of the Wisek	Hitar - Any	- Any	Second - Any	• (±
Operations			Арре	ND			

- 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.



Figure 35.31: 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:

Constant Type	(±
Noto: If a quary operation is performed prior to this one, the data will be attached as a csv file.	
Recipientis (one per line)	
Subject	
Mossage Body	
APPEND	

Figure 35.32: Components of trigger opprations

- 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 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-mail should be brief and descriptive.
- h. Manage Trigger Operations Steps: With this button, management of trigger operations steps is possible with the Inset 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.

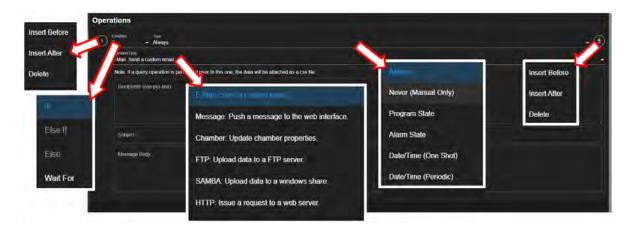


Figure 35.33: Options of trigger components

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.

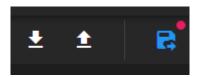


Figure 35.34: File manipulation buttons

After the macro script has been composed and saved, additional options are available as follows:



Figure 35.35: 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.

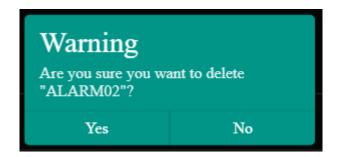


Figure 35.36: Reconfirm the deletion of macro script

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. ESPEC Web Controller 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.

35.8.2 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, the Web Controller 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).

Trigger	
Nways	٣
Program Stale	
Alarm State	
Date/Time (One Shot)	
Date/Time (Periodic)	

Figure 35.37: 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 35.38: 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.

Trigger			
Trigger Type Alarm State	Alam State ✓ Tripped	Atams Any	• (±)
Operations		APPEND	

Figure 35.39: 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 35.40: 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 the Web Controller.

				🖣 🕸 🛎 😫 🛤
Sam be B Sam (see C Alam)	Macro Edi Name ALARM01	itor: ALARM01		
	Enable Trigger Tree Alarm State	Nem State ▼ Tripped	Adens. ★ Any	• (±
	Operation Type	⊺ype • Always 1 a custom omail.		•
	Note: If a q Receiver (priorig-lac	uery operation is performed prior to this one, the data w	l be atlached as a csv file.	
	Alarm Message Bo Chambor	ay alarm has been tripped.		

The complete macro script is depicted in the following figure.

Figure 35.41: Macro profile with Alarm alert

35.8.3 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 35.42: 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:

Macro Edit Name ALARM02	tor: ALARM02			
🗹 Enable				
Trigger				
Type Program State	Fregram State	+ #2 PROG2TEST	camp ⊷ Any	£
Type or				• ±
tor⊨ Program State	Program State Program Changed	Program + #3: PROG3TEST	skip ≁ Any	£
Type Of				• ±
Type Alarm State	Atami State. - Tripped	Ataens ✔ Any		• ±
Operations				

Figure 35.43: 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 35.44: 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.

	Operations	
	Concense Tapi II - Always	• 🗄
-	E-Mail Send a custom email	
Insert Berore	Note if a query operation is performed prior to this one, the data will be attached as a csy file. Requiring tom be the	
Insert After		
Delete		

Figure 35.45: 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 35.46: Conditions for step trigger operation

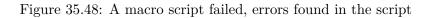
- 7. Click **Save** to save this macro scripted profile.
- 8. Testing the Macro Script: Click the person icon to test and run the macro script.
 - If the run is successful (that is, no errors are found in the script), a **Successful** message appears and an e-mail alert is sent to the recipient(s) listed in the Recipients block.

2	Consilion II	Type ← Alarm State	Auen Stan - Trippod	Alarma - Arty	• ±
	Decision Type E-Mail: Send a c Note: If a query		prior to this one, the data will be attached as a csv file.		
	Receients (one p priong-laolarr	per line) n@espec.com			Run Macro

Figure 35.47: A macro script ran successfully

• If the run failed, an error message appears as shown below. The macro script does not work.

Conation Type If - Alarm State	Allow State ← Tripped	Alarma - Any	- (±
Operation Type E-Mail: Send a custom email.			
Peoplents (one per line)	rior to this one, the data will be attached as a csv file.		
pnong-laolam@espec.com			



35.9 Controller Settings

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.

v.3 3/2022

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.

■ Controller Settings GEWERAL		E THERMOCOUPLES	CALIBRATE ACCELEROMETERS	DIAGNOSTICS	±	8
GENERAL		E INERMOGOUPLES	CALIBRATE AUGELEROME JERS	UNGNUSTICS		
Temperature Settings						
Chamber Default Temperature	20		mber will go to when first started re constant settings immediately after startup on the web controller. #			
Temperature Set Point Range	Mikeimuso -65 	*C The minimum and maxim	num values a user may enfer for temperature.			
Temperature Alarm Range	Minimum -65 Maximum 160	Minimum: Cannot be	higher than 210 (250 if high temp option is installed.)	ounds an alarm will be triggered.		
Thermal PID Set		Checked: Use "user	sched PIDs for temperature control. specified* PID set, these PIDs are set from this screen. (recommended), fault PID set, these are hard coded into the PLC. Do not use unless instructed for	20.		

Figure 35.49: 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 lo**cal 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 the Web Controller any time.

35.9.1 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, the Web Controller will flag the user to apply the setting below the threshold value.



Figure 35.50: 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.

	CALIBRA	TE THERMOCOUPLES	CALIBRATE ACCELEROMETERS	
Temperature Settings				
Chamber Default Temperature	20		e chamber will go to when first started. By the constant settings immediately after startup on the web controller. Aufing	
Temperature Set Point Range	Maximum 65 Maximum 150	*C The minimum and *C	naximum values a user may either for temperature.	
Temperature Alarm Range	Attenuars -65 Maxtmum 160	Minimum Can	main temperature the chamber should ever reacti. If the chamber is outside of these bour of be lower than -110C not be higher than 210 (250 if high temp option is installed.) withingtam (*0) 0xH0	nds an alann will be linggered.
Thermal PID Sel		Checked Use	er specified PIDs for temperature control. Inter specified PIDs at, these PIDs are set from this screen. (recommended) Ise default PID set, these are hard coded into the PLC. Do not use unless instructed too.	

Figure 35.51: 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.

35.9.2 Thermocouple Calibration

To calibrate different thermocouples settings, click the up/down button of the **Offset** and/or **Scale** columns to adjust the value.

≡ Control	ler Settings			± ± 8
			CALIBRATE ACCELEROMETERS	DIAGNOSTICS
Channel	Offset	Scale		Current Chamber Params
Ar	4	4		86.1
Product	-4	4		86.3
Auxt	4	4		-270.0
Aux2	4	4		-270.0

Figure 35.52: The thermocouple calibration submenu

35.9.3 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.

≡ Co	ntroller Settings				± ± 🗄
	GENERAL	CALIBRATE THERMOCOUPLES			
Chancel	Other	Şcalır	Sensionity	User Sensitivity	Current Chamber Params
Control	-0.2	0 0062	10.56	10.56	-0.0
Auxt	-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 35.53: The accelerometer calibration submenu

35.9.4 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.

Standby Off 86.9	c Vibe 0.0	G TS1 Off	TSZ TS3 Off Off	TS4 TS5 Off Off	TS6 Off	TS7 TS Off Of	E I								Ligh
■ Controller Settings													٠	1	
GENERAL			CALIB	RATETH	EBMOGO				CALIBRATE ACCE	LEROMETERS					
Diagnostic Mode Off															
System Status															
Chamber Type					Run Stat	tus				Alarm Inputs					
TEMP					Chambe	r Off	1748:1			Motor Fault				8	
										Tomperaturo Safety	Input OK		(3	
System Relays			Temper	ature				Vibration			User Relay	5			
	Status	Topple	Inputs				Power	Inputs		Power		Status		Force	
Heater Contactors	0		Air		86.9		OR .	Control	-0.0	SP.4900	Rolay #1	0			
Redundant LN2 Solenoid	0		Product		86.9		0%		0.0	0%	Rolay #2	0			

Figure 35.54: 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.

Off 78.3 c	vee Off 0.0g	TS1 TS2 Off Off	153 154 155 Off Off Off	156 157 158 Off Off Off							Light Off
■ Controller Settings GENERAL				THERMOGOUPLE			LIBRATE ACCELERON	ALTER#			* 8
Diagnostin: Mode. On											l
System Status					1						
Chamber Type				Run Status Chamber Off	START STOP			ilarm inputs Motor Fault Temperature Salety In	put OK		<mark>o</mark> ©
System Relays	Status	Topple	Temperature		Power	Vibration		Pawer	User Relays	Status	Force
Heater Contactors	ø	U	Ă	78.0	or	Control	-0.0	SP:4900	fielay #1	_	
Redundant LN2 Solencid	õ	Ċ	Product	76.3	0%		0.0	0%	Rolay #2	Update Diagnostic n	node 🕢
Light	0	¢	1	-270.0	+ 100	3	-00 00	+ 100	Relay #3	Successful	node 🕖

Figure 35.55: Configure a diagnostic test

3. 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**.

Constinut Prd Temp 82.0	on Off	06 ^{TS1} Off	152 153 154 Off Off Off	185 196 187 18 Off Off Off O	8 1							Light Off
Controller Settings											± :	: 8
GENERAL.			CALIBRATE	THERMOCOUFLES		CALIBRATE ACCELEROMETERS			DIAGNOSTICS			
Diagnostic Model On												
System Status												
Chamber Type			-	Run Status				Alarm Inputs				
TEMP				Chander On	START STO	•		Motor Fault			00	
								Temperature Salety	Input OK			
System Relays			Temperatur	e		Vibration			User Relay	s		
	Status	Topple	Inputs		Power	Inputs		Power		Status -	Forc	
Heater Contactors	S	Ċ	Air	81.7	0#	Control	-0.0	SP:4900	Relay #1	0	Ċ	
Redundant LN2 Solenoid	8	¢	Product	82.0	0%		0,0	0%	Relay #2	0	Ċ	
Light	0	Ċ	1	270.0	+ 100	2	-0.0	+,,,0	Relay #3	0	Q	

Figure 35.56: Start/stop a diagnostic test

- 4. To terminate the diagnostic test, click the **Stop** button. The chamber will be turned off and switched back to the **Standby** mode.
- 5. Turn off the Diagnostic Mode (see Step 1).

35.10 Chamber Interface

The **Chamber Interface** submenu plays a crucial role in the configuration of ESPEC Web Controller 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 ESPEC Web Controller 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.

	SIMOLE	EXPERT	± ±	8
Configure the web controller for the chamber here. Warning: These settings were either set by the fact Chamber Calleger T-Series Chamber	ory or during the setup wezard, unless instructed otherwise do not change them.			
Model Selection Model T2.5	Chamber Communication Interface Nation Interface - LNN Internet chamber network.	Optional Features	uires hardware changes, consult	t with
Vibration	Matanet. 121 105 141 0/24 Incese IP Address 121 105 141 155	Fiber Optic Light		
	PLD # Adabia 121 185 141 61			

Figure 35.57: Chamber configuration and communication protocol

≡ Chamber Interface	± ±						
SHIDLE		EXPERT					
Configure the web controller for the chamber here. Warning: These settings were either set by the factory or during th Crumer Campon EGN: Global N Chamber					-		
Model Selection Type L'temperature & Humidity, Single Stage Refigeration	Chamber Communication Interface	Optional Features					
Contrainer Watlow F4T (Classic Benchtop Logic)	Network intristace LAN: Internal chamber network.	Low Humidity					
	Network 10,30,200,240/28	Nitrogen Gas Purgel					
	Server IP Address. 10.30 200 241	Liquid Nitrogen Boost Cooling					
	Premery Controller IP Address 10 30 200 242	Alomizer					

Figure 35.58: Chamber configuration and communication protocol

2. Serial Interface: For a chamber equipped with ESPEC P300, SCP220 or Watlow F4, default communication interface is the serial RS-232 or RS-485. The following figures depict a typical configuration for a chamber equipped with ESPEC P300, SCP220 or Watlow F4 via the serial RS-232 interface.

Chamber Interface				•	±	
SIMPLE Configure the web controller for the chamber here. Warning These settings were either set by the factory or during	the setup wize	ard, unless instructed otherwise do not change them	EXPERT			
Chamber Category EGN: Global N Chamber						•
Model Selection		Chamber Communication Interface	Optional Features Product Temperature Control			
Controller Espec P300	÷	Senat Port /dev/thyUSB0	Low Humidity Dry Air Purge			
		Baud Ran- 19200	Nitrogen Gas Purge			
			Liquid Nitrogen Boost Cooling Six Additional Time Signals			
			Selectable Air Speeds			
			Atomizer			

Figure 35.59: Chamber configuration and communication protocol

	EXPERT	± ±	8
g the setup wizard, unless instructed otherwise do not change them.			
Chamber Communication Interface	Optional Features		
Seria Port - AdevittyUSB0 toxit taak	Dry Air Purge Nitrogen Gas Purge Discont Cooling		
	g the setup wzard, unless instructed otherwise do not change them Chamber Communication Interface restance Type Serial Serial Mew/ItyUSB0	ng the setup wzard, unless instructed otherwise do not change them.	In the setup wizerd, unless instructed otherwise do not change them:

Figure 35.60: Chamber configuration and communication protocol

			± ±	
53M00 E		EXPERT		
Configure the web controller for the chamber here. Warning: These settings were either set by the factory or during th Chamber Calegory EN Platnum N Chamber	e setup wizard, unless instructed otherwise do not change them.			
Model Selection Type L: Temperature & Humidity, Single Stage Religeration	Chamber Communication Interface Matter Type - Social	Optional Features		
Controller Espec: SCP220	Setial Port ✔ /devrttyUS80	Low Humidity		
	Tuesd Role 9600	🗸 🔲 Nitrogen Gas Purge		
		Liquid Nitrogen Boost Cooling		

Figure 35.61: Chamber configuration and communication protocol

The following figure depicts a configuration for an F4T chamber via a serial interface.

≡ Chamber Interface			2	±	
		EXPERT			
Configure the web controller for the chamber here. Warning: These settings were either set by the factory or dur Chamber Caligory BT: Benchlop Chamber	ing the setup wizard, unless instructed otherwise do not change them.				
Model Selection Type 2. Temperature Only, Cascade Refrigeration	Chamber Communication Interface	Optional Features			
Centralier Wallow F4T	Samil Port • /dewrthyUSB0	Dry Air Purge Diy Air Purge Div Air Purge Nitrogen Gas Purge			
	Basis Palin - 38400	💂 🔲 Liquid Nitrogen Boost Cooling			

Figure 35.62: 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 the Web Controller 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 ESPEC Web Controller. Select the appropriate subsection that applies to your chamber and PLC.

35.10.1 Simple: T-Series Chamber Interface

Under the **Simple** option, communication between the chamber and ESPEC Web Controller is configured through three predetermined parameters: (1) Chamber Category, (2) Chamber Model and Controller, (3) Communication Interface. They are depicted in the following figure.

Chamber Interface			± ± 🕫
3	IMPLE	EXPERT	
Configure the web controller for the chamber here. Warning: These settings were either set by the factory Chamber Campey T-Series Chamber	or during the setup wzard, unless instructed otherwise do not change them.		4
Model Selection	Chamber Communication Interface	Optional Features	uires hardware changes, consult with
Z Vibralion	Mittion 121:105:141:0/24	Fiber Optic Light	
	server IP Address 121 165 141 155		
	PLC#P.464 121 105 141 01		

Figure 35.63: Configuration parameters

Refer to your documentations that were shipped with the chamber to obtain information for these parameters. They are required to successfully configure ESPEC Web Controller to control your chamber.

1. **Chamber Category**: Click the text field under **Chamber Category** to access a dropdown list, as depicted in the following figure. Select your chamber category from the list that matches the one described in your chamber manual.

■ Chamber Interfa	ICE ISIMPLE	EXPERT	Ŧ	2	8	
Configure the web controller Warning: These settings we Charter Califory T-Series Chamber		up wizard, unless instructed otherwise do not change them.				
Model Selection	EN: Platinum N Chamber	Chamber Communication Interface Metrode Admines - LANI Intermet chamber network.	Optional Features	es hardware chan	peis, com	sult with
Vibration	EP: Platinous H Chamber	Referenti 1211 185 141 0/24 server IP-Adams	Fiber Optic Light			
	BT: Benchtop Chamber	121 185 141 155 PLC # Antenn 121 185 141 81				
	EGN: Global N Chamber	LET HAR PETER				
	EWP: Walk-in Chamber	2 g				

Figure 35.64: 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.

Chamber Interface					ŧ	1	B
		izard, unless instructed otherwise do not change them.					
Chamber Category T-Series Chamber							+
Model Selection		Chamber Communication Interface Memory Interface - LAN, Internal chamber retevork.	Optional Features High Tompeneture 250C Option (Requires hardware changes, consul espec)				sult with
Vibration T1.5		Naturals 121 165 141 0/24	Fiber Optic Light				
T2.0		Narver IP Admini 121.105.141.155					
12.6		PLC IP Address 121,165,141,01					
T3.0							
T4.0							
T8 0							

Figure 35.65: Model type and controller configuration

3. Communication Interface: By default, ESPEC Web Controller 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 ESPEC Web Controller and 121.165.141.61 to the Allen Bradley PLC.

■ Chamber Interface	Same	EXPERT	÷	±	B
Configure the web controller for the chamber here. Warning: These settings were either set by the lack Chamber Cangery T-Series Chamber	ary or during the setup wizard, unless instructed otherwise do not change them				
Model Selection	Chamber Communication Interface	Optional Features High Temperature 250C Option (Features) espec)	quires hardware char	ges, con	isult with
2 Vibration	Henrot 121 105 141.024 Sinver (FA43700) 121 105 141 105 121 105 141 105 FLD (FA4300) FDL (FA4300) FDL (FA4300)	Tribar Optic: Light			

Figure 35.66: Predefined network parameers

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 the Web Controller and the chamber. It is statically configured using Class A network protocol.
- ii. Server IP Address: This is the Web Controller IP address. 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 Web Controller hardware.
- iii. **PLC IP Address**: This is the IP address of the Allen Bradley PLC, statically configured as 121.165.1141.61.

ESPEC Web Controller 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 Web Controller and PLC; **eth0** is preconfigured to connect the Web Controller 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 Web Controller hardware is enclosed in a box), use the HDMI port as a reference; **eth0** is adjacent to it.

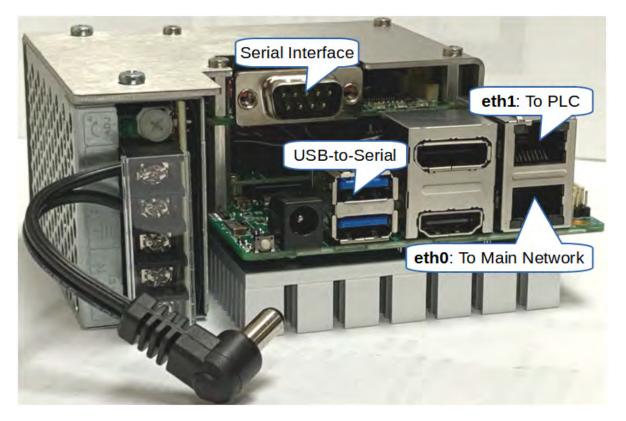


Figure 35.67: Ethernet ports on Web Controller hardware

The following figure depicts the two IP addresses used by ESPEC Web Controller for the two Ethernet ports designated in the above figure.

Current N	letwork Status				
	IPv4 Address	IPv4 Netmask	e ^p yő Address	(Py5 Netmask	MAC
eth0	10.30.200.232	255 255 0.0			00 07 32 7b 3a at
etht	121 165 141 155 169 254 213 60	255 255 255 0 255 255 0 0	1e80 .8dae 9796 a212 6bb8	64	00 07 32 76 3a a2

Figure 35.68: Ethernet ports of ESPEC Web Controller

4. Save Settings: There are three options to manage the chamber interface configuration (shown in the figure).

Chamber Interface	sure -	EXPERT
Configure the web controller for the chamber here. Warning These settings were either set by the factor Chamber Callegery T-Series Chamber	ry or during the setup wozard, unless instructed otherwise do not change them.	· · · · · · · · · · · · · · · · · · ·
Model Selection T25	Chamber Communication Interface	Optional Features - Isgh Temperature 250C Option (Requires hardware changes, consult with - espec)
Vibration	Helman 121,105,141,0/24	Elber Optic Light

Figure 35.69: 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.

35.10.2 Simple: SCP220 Chamber Interface

Under the **Simple** option, communication between the chamber and ESPEC Web Controller is configured through three predetermined parameters: (1) Chamber Category, (2) Chamber Model and Controller, (3) Communication Interface. They are depicted in the following figure.

Chamber Interface			*	1	
120000 E		EXPERT			
Configure the web controller for the chamber here. Warning These settings were either set by the factory or during the Commiss Campon EN Platinum N Chamber	he setup wizard, unless instructed otherwise do not change them				÷
Model Selection 2	Chamber Communication Interface	Optional Features			
Costraior Espec SCP220	taina Port ◆ /devittyUSB0	Low Humidity			
	Radie 9000	🚽 🔲 Nitrogen Gas Purge			
E		Liquid Nitrogen Boost Cooling			

Figure 35.70: Configuration parameters

Refer to your documentations that were shipped with the chamber to obtain information for these parameters. They are required to successfully configure ESPEC Web Controller to control your chamber.

1. Chamber Category: Click the text field under Chamber Category to access a dropdown list, as depicted in the following figure. Select your chamber category from the list that matches the one described in your chamber manual.

Chamber Interface	START		EXPERT	ŧ	*	8
Configure the web controller for the Warning: These settings were either Dianter Catigory EGN: Global N Chamber		ss instructed otherwise do not change them.				÷
Model Selection Type U Temperature Only, Single Stage Conteme Expec P300	Evvr: Walk-in Chamber EN: Platinum N Chamber ECN: Global N Chamber T-Series Chamber EQ: Mechanical HALT Chamber EP: Platinous H Chamber	hber Communication Interface	Optional Features Product Temperature Cantrol Dry Air Punge Dry Air Punge Liqued Nitrogen Bacest Cooling Soc Adational Timo Signals Soc Adational Timo Signals Selectable Ait Speeds			

Figure 35.71: 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.

≡ Chambe	er Interface		EXPERT	-	1	1	8
) controller for the chamber here estimas were either set by the factory or during the setup wizard, u	niess instructed otherwise do not change them.					
Model Selector Type U. Temperature O		hamber Communication Interface	Optional Features				
Cureofire Espec P300	U: Temperature Only, Single Stage Refige		Dry Air Purge Nitrogen Gais Purge Liquid Nitrogen Boost Cooling				
	2. Temperatura Only, Gascada Raingerat		Sus Additional Time Signals				
	X: Temperature & Humidity, Cascade Ref	rigeration					

Figure 35.72: Model type and controller configuration

3. Communication Interface: Serial interface is the default communication protocol between ESPEC Web Controller and SCP220 PLC. The only predefined parameter for this protocol is the baud rate, setting at 9600.

	Chamber Communication Interface	
•	Interface Type Serial	-
	Serial Port	
-	/dev/ttyUSB0	•
	Baud Rate	
	9600	-

Figure 35.73: Predefined serial comm. parameers

ESPEC Web Controller 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.

Chamber Interface		EXPERT	* *
Configure the web controller for the chamber here. Warning These settings were either set by the factory or during Content Category EN: Plathum N Chamber	the setup wizard, unless instructed otherwise do not change them.		
Model Selection Type L Temperature & Humidity, Single Stage Refigeration	Chamber Communication Interface Interface Type • Senal	Optional Features	
Controller Espec SCP220	benef heri V ridevithyUS80 Eand Role	Low Humidity Dry Air Purge	
	9600	Iltrogen Gas Purge Liquid Ntrogen Boost Cooling	

Figure 35.74: 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.

35.10.3 Simple: ESPEC 300 Chamber Interface

Under the **Simple** option, communication between the chamber and ESPEC Web Controller is configured through three predetermined parameters: (1) Chamber Category, (2) Chamber Model and Controller, (3) Communication Interface. They are depicted in the following figure.

Chamber Interface	E I	EXPERT	± ±	8
Configure the web controller for the chamber here. Warming These settings were either set by the factory or durt Contract Engraphy EGN Global N Chamber	ing the setup wizard, unless instructed otherwise do not change them.			
Model Selection	Chamber Communication Interface	Optional Features		
Controller Espai: P300	zineu Port - /devrth/USBO Kanaf fote 19200	Dry Air Purge Dry Air Purge Dry Cas Purge Different Gas Purge Different Goost Cooling		
		Six Additional Time Signals		

Figure 35.75: Configuration parameters

Refer to your documentations that were shipped with the chamber to obtain information for these parameters. They are required to successfully configure ESPEC Web Controller to control your chamber.

1. Chamber Category: Click the text field under Chamber Category to access a dropdown list, as depicted in the following figure. Select your chamber category from the list that matches the one described in your chamber manual.

Chamber Interface	SIMOLE		EXFER1	*	±	8
Configure the web controller for the Warning. These settings were either Dianter Cativon EGN: Global N Chamber	chamber bern r sel by the factory or during the setup wizard, unle	ess instructed otherwise do not change them.				-
Model Selection	Evvr. Walk-in Chamber	ber Communication Interface	Optional Features			
Coribolar	EN: Platinum N Chamber		Dry Air Purge			
Espec P300	EGN Global N Chamber	1550	Millogen Gas Purge			
			Liquid Nitrogen Boost Cooling			
배동!이! 이 배.	T-Series Chamber		Soc Additional Time Signals			
	EQ: Mechanical HALT Chamber		Selectable Air Speeds			
	EP: Platinous H Chamber					

Figure 35.76: 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.

≡ Chambo	er Interface		EXPERT	4	±	
	controller for the chamber here etilings were either set by the factory or during the setup wizard, c	unkess instructed otherwise do not change them				
Model Select Type U: Temperature Of		hamber Communication Interface	Optional Features			
Controller Espec P300	U: Temperature Only, Single stage Refige		Dry Air Purge Dry Air Purge Nitrogen Gas Purge Liquid Nitrogen Boost Cooling			
	2 Temperatura Dnty, Cascada Reingeral		Six Additional Time Signals			
	X: Temperature & Humidity, Cascade Ref	frigeration				

Figure 35.77: Model type and controller configuration

3. Communication Interface: Serial interface is the default communication protocol between ESPEC Web Controller and P300 PLC. The only predefined parameter for this protocol is the baud rate, setting at 19200.

Chamber Communication Interface	
Interface Type	
Serial	•
Serial Port	
/dev/ttyUSB0	-
Baud Rate	
19200	•

Figure 35.78: Predefined serial comm. parameers

ESPEC Web Controller 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.

Chamber Interface		EXPERT	± 8
Configure the web controller for the chamber here. Warning: These settings were either set by the factory or durin Chamber Calegory EGN: Global N Chamber	g the solup wzard, unless instructed otherwise do not change them.		÷
Model Selection Type U Temperature Only, Single Stage Religeration	Chamber Communication Interface Interface Strutt	Optional Features	
Controller Espec P300	sama Pont ← /dov/thyUSB0	Dry Air Purge	
	Baad Rate 19200	+ 🔲 Liquid Nifragen Floord Gooling	

Figure 35.79: 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.

35.10.4 Simple: Watlow F4T Chamber Interface

Under the **Simple** option, communication between the chamber and ESPEC Web Controller is configured through three predetermined parameters: (1) Chamber Category, (2) Chamber Model and Controller, (3) Communication Interface. They are depicted in the following figure.

Chamber Interface		EXPERT	1	1	B
Configure the web controller for the chamber here.	the setup wizard, unless instructed otherwise do not change them.				
Model Selection	Chamber Communication Interface	Optional Features			
Contream Watlow F4T (Classic Benchlop Logic)	teinuor intertace ✓ LAN: Internai chamber network.	Low Humidity			
	Network 10.30.200.240/28	Nitrogen Gas Purge			
	Barred IP Adden: 10.30 200.241	Liquid Nitrogen Boost Cooling			
	Pennary Controller IP Address 10:30:200:242	Alomizei			

Figure 35.80: Configuration parameters

Refer to your documentations that were shipped with the chamber to obtain information for these parameters. They are required to successfully configure ESPEC Web Controller to control your chamber.

1. **Chamber Category**: Click the text field under **Chamber Category** to access a dropdown list, as depicted in the following figure. Select your chamber category from the list

Chamber Interface			EXPERT	± ±	
Configure the web controller for Warning: These settings were a Chamber Calagory EGN: Global N Chamber		o wizard, unless instructed otherwise do not change them.			
Model Selection Type L. Temperature & Humidity, Sir	EGN-Global N Chamber EP: Platinous H Chamber	Chamber Communication Interface Metrics Type • TCP/IP	Optional Features Product Temperature Control		
Controller Watlow F4T (Classic Benchtop	EQ: Mechanical HALT Chamber	Network Internal chamber network.	Low Humidity		
	T-Series Chamber	Network 10 30 200 240/28	Nitrogen Ges Purge		
	BT. Benchtop Chamber	Sovver IP Address 10.30.200.241	Liquid Nitrogen Boost Cooling		
	EN: Platinum N Chamber	Premary Controller II" Address 10 30 200 242	Atomizer		

that matches the one described in your chamber manual.

Figure 35.81: 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.

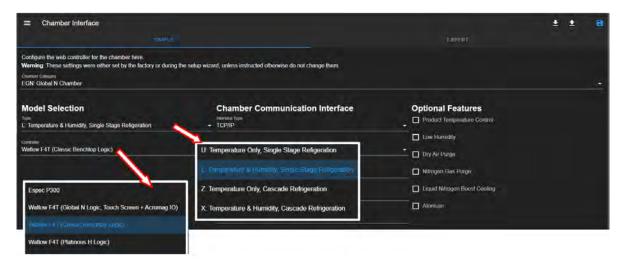


Figure 35.82: Model type and controller configuration

3. Communication Interface: By default, ESPEC Web Controller applies TCP/IP to communicate with Watlow F4T using a set of predefined network parameters, as shown in the following figure. An internal network was set up for this communication with an IP address of 10.30.200.241 assigned to ESPEC Web Controller and 10.30.200.242 to the F4T.

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Model Selection Tipe L. Temparature & Humidity, Single Stage Refigeration	Chamber Communication Interface	Optional Features
Controller Wattow F4T (Classic Benchtop Logic)	Vetwork Internace • LAN: Internal chamber network.	Low Humidity Dry Air Purge
Internal Network	Network 10.30.200.240/28 IP addr of Web Ctrl	Nifrogen Gas Purge
	10.30.200.241 IP addr of F4T	Liquid Nitrogen Boost Cooling
	Primary Controller IP Address 10 30 200 242	Alomizer

Figure 35.83: Predefined network parameers

ESPEC Web Controller 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 Web Controller and PLC; **eth0** is preconfigured to connect the Web Controller 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 Web Controller hardware is enclosed in a box), use the HDMI port as a reference; **eth0** is adjacent to it.

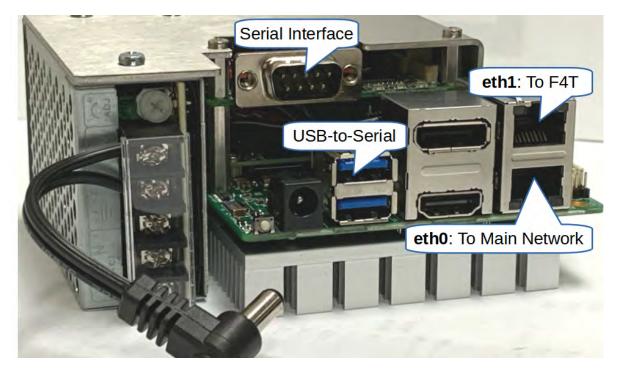


Figure 35.84: Ethernet ports on Web Controller hardware

The following figure depicts the two IP addresses used by ESPEC Web Controller for the two Ethernet ports designated in the above figure.

IDVA A	ddress	iPv4 Netmask	IPv6 Address	IPv6 Netmask	MAC
	AUIESS	In the Installation	IF TO AND USS	OF TO PERMAN	
n o 10.30	100,108	255.255.0.0			00:07:32:7b:3a:a1
	.100.108	255 255 0 0			00:07:32:76:3a:a1



• 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 ESPEC Web Controller, 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).

	2014/212			EXPERT	± ± =
Conligure the web controller for the chamber here Warning. These satisfies were either set by the lack Durner Camper EGN Global N Chamber	ary or during the se	tup wizard, unless instructed other	wese dio not change them.		<u> </u>
Model Selection ^{Type} L Temperature & Humidity, Single Stage Refigeration	in the second se	etterface Type - TCP/PP	nunication Interface	Optional Features	
Currenter Wattow F4T (Classic Benchlop Logic)	Serial	LAN: Internal chamber ne Reteors 10.30.200.240/28	LAN Internition Champbern (relived in	Dry Air Purge	
		Server II" Address 10 30 200 241 Firmery Controller II" Address 10 30 200 242	WAN: Customers network.	Liquid Nitrogen Boost Cooling Alumizer	

Figure 35.86: Communication interface configuration

- Network Interface: If ESPEC Web Controller 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 ESPEC Web Controller and the F4T. This option requires a reconfiguration of the network setup with both ESPEC Web Controller 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 downlaod 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.

35.10.5 Watlow F4 Chamber Interface

Under the **Simple** option, communication between the chamber and ESPEC Web Controller is configured through three predetermined parameters: (1) Chamber Category, (2) Chamber Model and Controller, (3) Communication Interface. They are depicted in the following figure.

		CXPURT	
Configure the web controller for the chamber here. Warning: These settings were either set by the factory or durn Chamber Calipoy EGN: Global N Chamber	ng the setup wzerd, unless instructed otherwise do not change them.		
Model Selection 20	Chamber Communication Interface	Optional Features	
Contenter Watlow F4	senaiPos ► /devittyUS80	Dry Air Purge Thitrogen Cas Purge	
	Based Rate 19200	Liquid Nitragen Boost Cooling	

Figure 35.87: Configuration parameters

Refer to your documentations that were shipped with the chamber to obtain information for these parameters. They are required to successfully configure ESPEC Web Controller to control your chamber.

1. **Chamber Category**: Click the text field under **Chamber Category** to access a dropdown list, as depicted in the following figure. Select your chamber category from the list that matches the one described in your chamber manual.

Chamber Interface			EXPERT	* *
Configure the web controller for the Marning: These settings were either Stanter Calegory EGN: Global N Chamber	chamber here r set by the factory or during the setup wizard, unle	ss instructed otherwise do not change them.		
Model Selection 170 1. Temperature Only, Single Stage 1910-000 1910-000	Evvr- Walk-in Chamber EN: Platinum N Chamber	hber Communication Interface	Optional Features Product Temperature Control Dry Air Purge	
ispec P300	EGN Global N Chamber	500	Herogen Gas Purge Liquid Nitrogen Boosi Cooling	
	T-Series Chamber		Sor Additional Time Signals	
	EQ: Mechanical HALT Chamber EP: Platinous H Chamber			

Figure 35.88: 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.

≡ Chambo	er Interface		EXPERT	4	±	
	controller for the chamber here etlings were either set by the factory or during the setup wizard, c	unkess instructed otherwise do not change them				
Model Select Type U: Temperature Of		hamber Communication Interface	Optional Features			
Controller Espec P300	U: Temperature Only, Single stage Refige		Dry Air Purge Dry Air Purge Nitrogen Gas Purge Liquid Nitrogen Boost Cooling			
	2 Temperatura Dnty, Cascada Reingeral		Six Additional Time Signals			
	X: Temperature & Humidity, Cascade Ref	frigeration				

Figure 35.89: Model type and controller configuration

3. Communication Interface: Serial interface is the default communication protocol between ESPEC Web Controller and F4 PLC. The only predefined parameter for this protocol is the baud rate, setting at 19200.

Chamber Communication Interface	
Interface Type	
Serial	-
Serial Port	
/dev/ttyUSB0	-
Baud Rate	
19200	-

Figure 35.90: Predefined serial comm. parameers

ESPEC Web Controller 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.

Chamber Interface SIMPLE		EXPERT	1 1	8
Configure the web controller for the chamber here. Warning These settings were either set by the factory or durin Crumer Category EGN Global N Chamber	ig the setup weard, unless instructed otherwise do not change them.			
Model Selection Tree U Temperature Only, Single Stage Religeration	Chamber Communication Interface	Optional Features		
Controller Wallow F4	sunat Port ← //dev/th/USB0	Dry Air Purge Differen Gas Purge		
	Band Rate 19200	💂 🗌 Liquid Nitrogen Broost Cooling		

Figure 35.91: 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.

35.10.6 Chamber Interface: Expert

The expert menu 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 ESPEC Web Controller 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. ESPEC Web Controller 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 35.92: Configuration file of Expert setting option

2. Watlow F4T: The following figure illustrates the Expert configuration of an F4T chamber.

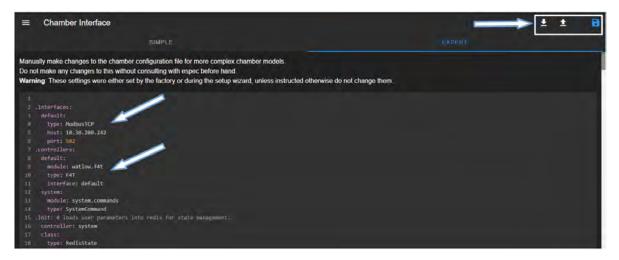


Figure 35.93: Configuration file of Expert setting option

3. Watlow F4: The following figure illustrates the Expert configuration of an F4 chamber.

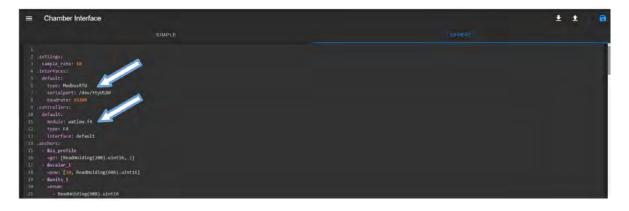


Figure 35.94: Configuration file of Expert setting option

4. **ESPEC P300**: The following figure illustrates the **Expert** configuration of a P300 chamber.



Figure 35.95: Configuration file of Expert setting option

5. **ESPEC SCP220**: The following figure illustrates the **Expert** configuration of an SCP220 chamber.

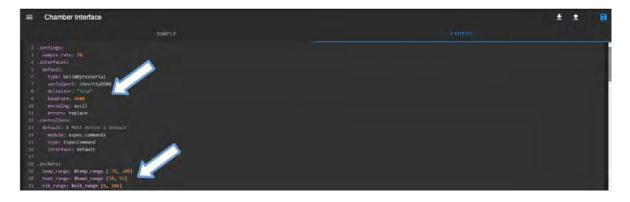


Figure 35.96: Configuration file of Expert setting option

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.

35.11 Firmware

ESPEC Web Controller is designed with the ability to continually receive improvements in the form of a Firmware Update to provide bug fixes and software upgrade with new features. Firmware update follows one of two approaches (as depicted in the following figure): (1) Automatic Firmware Updates, (2) Offline (Manual) Firmware Updates.

= Firmware Update		
Automatic Firmware Updates		-
	o to function properly the it must be able to make get requests to https://hosted.mender.io.	
Automatic Firmware Update: Turn on or off the automatic update feat		
Remote Management Service: Turn on or off the remote management		
 This provides Espec with a secure remate connection to the web co 		
 This provides espec with a secure remain connection to the web construction. The "Automatic Firmware Update" must also be enabled for this to a 		
	ire prior to doing so. It may be best to only enable this when working with Espec to resolve issues.	
If access to https://hosted.mender.io is not possible or unwanted updates r	must be installed manually but no other functionality will be loss.	
C Automatic Firmware Update	Remote Management Service	
Offline Firmware Updates		
Upload and apply a new limmware revision. Note that this will take a lew mi	inutes and the web controller will be rebooled upon a successful update.	
	Drag and drop to start Firmwore Update	
	Upload a file to start Upgrade	

Figure 35.97: Firmware update options

ESPEC Web Controller has been carefully designed to be robust and stable. It incorporates a mechanism that prevents interruption to the work flow during a software update. Technically, the system keeps two versions of the software:

- 1. Current version of the operating firmware.
- 2. Previously installed version.

If, for some reasons, firmware update failed, the system reverts to using its previous version known to be in the stable state, until the update issue is resolved. ESPEC Web Controller will switch its operation to run on the new firmware immediately after a successful update. All data logging files and configurations will be brought over to operate on the new firmware. The operator may not even notice the changes in the internal system.

35.11.1 Online Automatic Update

Automatic firmware update allows ESPEC to link to the Web Controller remotely to perform a software update. Mender.io service is employed to handle the firmware update. The customers and their IT department have complete control and freedom to dictate the use of this service. Should they decide to use this service, they will need to complete the following steps:

- 1. Check the Automatic Firmware Update box.
- 2. Check the **Remote Management Service** box.
- 3. Click **Save** in the upper-right corner to apply and save the setting, as illustrated in the following figure. **Note**: In order for the automatic update service to work, the Web Controller must have access to the Internet.



Figure 35.98: Automatic update configuration

35.11.2 Offline Manual Update

The Offline Manual Update can be used if the Automatic Update is undesirable. 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. Drag-and-drop the package in the white box as shown in the following figure. Or, click the **Upload a file to start Upgrade** and select the Firmware Update package on the local computer.

fline Firmware Updates oad and apply a new firmware revision. Note t	that this will take a few minutes and the web controller will be rebooted upon a successful update.	
	Drag and drop to start Firmware Update	
	or which to belief a file from your computer	
	Upload a file to start Upgrade	

Figure 35.99: Manual update configuration

3. Once an update package has been loaded, the system begins to install the new firmware, as shown in the following figure.

Offline Firmware Updates Upload and appy a new firmware revision. Note that this will take a tew minutes and the web controller will be rebooted upon a successful update.	
ingençembi 2.5.10 menular	
52.4788391777507%	
Installing Artifact of size 6720016588	
Rollback Firmware The system keeps the most recent two installed firmware versions, using the follback feature will boot the inactive firmware version. The system stips from the factory with two copies of the next recent limware version, web controller.	A Firmware update is available. installation will begin when the chamber is not in size. Clear Clear HULLDAUR

Figure 35.100: System moves to perform firmware update

4. Click **REBOOT** indicated in the figure to restart the system.



Figure 35.101: Firmware update is complete

35.11.3 Rollback Firmware

The Web Controller can rollback its firmware to the previous stable state by clicking on the **ROLLBACK** button as depicted in the following figure.



Figure 35.102: Rollback a firmware update

35.12 Programming Interface via API Settings

ESPEC Web Controller 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.

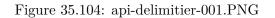
With the GENERAL setting, RESTful API can be quickly configured via the authentication mode and a direct controller access, using the **No Authentication** and **Enable** settings, respectively. Default communication priority level is 6.

		DELIMITTED ASCII	
Configure the various generic APIs (application programming interface) the web controller supports		
Legacy RESTful API Set the security mode of the legacy RESTful API used on Eaglec North Amen These settings do ket faive effect until after a reboot or solvice result Automatismit Mon Disable All Access	ka web controllers version 2.1 fo 2.5.		
Direct Controllar Access Plovates dates access to the controllers native communication interface + default (2P (TCP Pool+4818) Enable: Communication Product, ower native is 6-ment δ	Disable All Access HTTP Basic Authentication No Authentication		*
1 2 (Data Logging Priority) 3 (Profile Sync Priority) 4 5 (General Application Priority) 6			

Figure 35.103: 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.

			ŧ	±	8
	GENERAL				
Global Settings	Name New Command I				
+ Add Rule	Regular Expression				
New Command I	(2)/ECHOS				
	Template Arguments	APPEND ARGUMENT			
	Template (# ocho the regular expressions matched input #) { "return". "OK: ((match group(0)))" }				



35.12.1 Communication Protocol for ESPEC P300/SCP-220

Direct communication with the P300/SCP-220 via raw data through the Web Controller can be achieved using the raw TCP protocol. The TCP forwarder listens for a raw TCP stream on port 10001. To establish communication, with PuTTY terminal emulator installed on your MS Windows system and launched, enter the hostname or IP address of the Web Controller in the Host Name field and set 10001 for port communication, as depicted in the following figure.

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Category:		
E Session	Basic options for your Pu	TTY session
	Specify the destination you want to	connect to
Terminal Keyboard	Host Name (or IP address)	Port
Bell	webdevscp220	10001
Features ⊒-Window Appearance	Connection type: Raw Telnet Rlogin	🔘 SSH 🕥 Sei

Figure 35.105: PuTTY setup for raw TCP communication

Two types of data transmission exist in this protocol: Command data and Response data.

- 1. **Command Data**: The command data consists of two types: Monitor commands and 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, such as temperature and humidity.
- 2. **Response Data**: The response data are basically data returned (responded) by the controller in response to the command data.

The command data sent from the computer to the controller has a specific syntax 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.

A brief overview of these two data types is outlined below. Refer to the "P300 or SCP-220 Controller Communications Option Manual" for complete details on them.

- 1. The command data format will be as follows: [command data][delimiter]
 - [command data] is any command found in the "P300 or SCP-220 Controller Communications Option Manual".
 - [delimiter] is CRLF. The effect of pressing the Enter key on the keyboard produces the CRLF on the terminal.
- 2. Each command will return a Response in 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 will return the data in the format described in the "P300 or SCP-220 Controller Communications Option Manual".
 - 2. If the command data is issued to set a parameter in the controller, response data will return "OK: [command data]" where [command data] is the command that prompted the response.
 - 3. If there was an error executing the command, the controller will return "NA: [error message]". Error messages and there meanings are listed in the "P300 or SCP-220 Controller Communications Option Manual". In addition to the error messages listed in the manual, this interface also adds the error message "NA: SE-RIAL TIMEOUT" when the chamber Controller takes too long to respond to the command data.
 - [delimiter] is CRLF.
- 3. The interface will timeout after one hour of no activity.

The following figure illustrates the use of a command data to display the ROM information of the controller and its temperature setting. As shown in the figure, to monitor the ROM of the controller, type "ROM?" (or "rom?") and press Enter. To monitor the temperature setting, type "TEMP?" (or "temp?") and press Enter.



Figure 35.106: Example of PuTTY command data and response data

35.12.2 Communication Protocol for the Watlow F4T, F4

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 the Web Controller. The Watlow F4T's own Modbus TCP interface should be used instead.

35.13 Server Settings

The **Server Settings** page is the "flight control center" for ESPEC Web Controller, 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 ESPEC Web Controller maintain a smooth operation. Different services are categorized and grouped as tabs in the service bar, as shown in the following figure.



Figure 35.107: Server settings control center

By default, the **Server Settings** page displays the server's (that is, ESPEC Web Controller's) hardware resources that include CPU, primary storage (RAM) and secondary storage (disk) utilization, as depicted in the following figure. A list of different services (i.e., processes) is displayed under the **Processes** window. These processes can be browsed through via the scroll bar.

Processor		Memo	ny						1	Storage							
Utilization	17.3%		Percent Used	Total	Used	Tree	Shared	Butler + Cache	Available	Device	Mount	File System	Mode	Total	Used	Real	Percent Used
Clock Speed	800.0Minz	Memory	45,1%	1.8G	630.7M	816.4M	64.7M	404.8M	1.05	/dev/mmcbik0p2		ext4	RO	5.4G	2.0G	3.1G	39.2%
Temperature: Physical id 0	46°C	SWAP	0%	2.0G	0.0	2.0G				/dev/mmcbik0p1	/boot/efi	viat	RW	233.3M	16.5M	216.8M	7.1%
femperature: Core 0	46°C									/dev/mmcbik0p4	/data	ext4	RW	15.6G	44.714	14.8G	0.3%
Temperature: Core 2	46°C									/dev/sda1	/appdata	ext4	RW	4.96	2.0G	2.6G	44%
Processes																	
Name 🖞	User	CPU	Memory		Command												
agetty	root	0.00%	0.09%	1.8M	In Fairs In cash	v -noclear th	of lines										

Figure 35.108: Server settings main display page

As mentioned in Chapter 1 (Introduction), ESPEC Web Controller is powered by GNU/Linux based on a Debian distribution. The system applies two separate root partitions to provide a convenient update of the firmware. The table under **Storage** (in the above figure) lists the partitions and their current usage. The system is kept secured with the root partition (called /) mounted as read-only, designated as **RO**. Depicted in the table is the first root partition with /dev/mmcblk0p2 as its device name. The second root partition (inactive and thus not listed) uses /dev/mmcblk0p3 as its device name; the partition will be used to perform a system update (as discussed in the previous section under **Firmware**). 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.

The processes listed under the **Processes** window are those currently running to support ESPEC Web Controller and its operations. The following figure depicts a specific service under the **SER-VICE INIT** tab. It is a service responsible for initiating and maintaining connection with the chamber and ESPEC Web Controller API (application programming interface), as indicated by the arrow. The rest of the services (designated by tabs) in the service bar each have their job to perform; their role can be viewed by clicking the specific tab.



Figure 35.109: Initialization service

Over time, disruption to these services may occur which will require restarting ESPEC Web Controller to bring all services back to normal operation. Sometimes, a certain set of services (called daemons) running in the background may get interrupted or hung and must be restarted to bring the effected services 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 ESPEC Web Controller's performance, these issues are collected and stored as **service logs**. These logs can be downloaded via the **Download Service Logs** button.
- 2. **Restart Services**: If any service got hung, it can be restarted individually by selecting the effected service (i.e., tab) and clicking the **Restart Services** button.
- 3. **Reboot Server**: Rebooting ESPEC Web Controller will be the last resort when individual services cannot be restarted via option 2.

35.13.1 Restart Services

ESPEC Web Controller has a list of different services or 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 the Web Controller.

When an error has occurred, ESPEC Web Controller 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.

E //miles/	OT State. An Tenue Error-c: View ErrorG TS1 TS2 TS3 TS4 TS6 TS6 TS7 T32 OR CON CONCECTOR Error	Law
÷	O Error	
1 1	Air Temperature	
	Off Erro	
	TS1 TS2 TS3	ricovinadal + X TS6 TS7 TS8

Figure 35.110: Operation error on Web Controller

The pop-up error message can be expanded (via the + button) to reveal detail of the actual error, as depicted in the following figure; it indicated the Web Controller has lost communication with the chamber, and thus, this error must be resolved before the Web Controller can resume its operation.



Figure 35.111: Expanded view of detailed error messages

The Server Settings page is the place to look for the culprit. A list of different services are

displayed in the service bar. The **Service Broker**, whose job is to monitor the communication status between ESPEC Web Controller and the chamber, has reported a communication error, as depicted in the following figure.



Figure 35.112: Communication error between Web Controller and chamber

This error causes a chain reaction (ripple effect) on other daemons, such as **Service Profiler**, **Service Init**, **Service Sampler**, **Service Macros**. It prevents ESPEC Web Controller from "controlling" the chamber. The **Service Network** tab shows that network connection has become **inactive** (or dead), as depicted in the following figure.

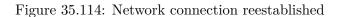


Figure 35.113: Network communication was disconnected

The issue illustrated here is caused by a loss of network connection. To re-establish network connection between the Web Controller and the chamber, complete the following steps:

- 1. Check for loose Ethernet connection between ESPEC Web Controller and the chamber.
- 2. ESPEC Web Controller will reestablish connection with the chamber automatically, as depicted in the following figure.

٤	NODev Teenes	O Tanua Standby Off 22.2℃ Viet 0.0g TS1 TS2 TS3 TS4 TS5 TS4 TS5 TS4 TS5 TS6 TS7 TS8	Light Off
4		≡ Server Settings	0 0
		SERVICE SERVIC	RVICE
	-	Incomparison of the second process of the se	
0 .	Note	[MPT 0 = 2022-01-21-17-40-39 expecting to poler tanders] Connected to device 1. (EXClement/Cangle 3). Encapsial distributions (EX-Balance) 2010. Vendor 2011. Vendor 2012 Advention/Adve Bender, Device 3-14. Device 5/1	a : None, P



ESPEC Web Controller now resumes its operation, as indicated by the status bar as **Standby**.

If the above procedure did not work, the services effected by the lost of communication need to be restarted. Complete the following steps:

- 1. Click the **SERVICE INIT** tab in the service bar.
- 2. Click the **Restart Services** button indicated by the arrow.

≡ Ser	ver Settings												± ৩ ৩
	SERVICE	SERVICE	SERVICE APPDATA	SERVICE RTM	SERVICE MACROS	SERVICE BROKER	SERVICE COMMAND STREAM	SERVICE SAMPLER-LIMIT	SERVICE	SERVICE PROFILE-SYNC	SERVICE NETWORK	SERVIC UWSG	Services
Loaded: lo Active acti Main PID: 1 Tasks: 2 (I CGroup: /s	nit.service - "Cha aded (/var/www/ ve (running) sinc 8633 (python) imit: 4915) ystem.slice/espe 633 venv/bin/pyt	especapi/os/sy ce Fri 2022-01. capi-init servic	stemd/especapi 21 16:34:56 UT	i init service; en C; 1h 34min ag		reset: enabled							

Figure 35.115: Restarting network service

3. The **SERVICE INIT** is the **especapi-init.service** (i.e., initialization service) responsible for setting up a service available for bridging the chamber with the Application Programming Interface (especAPI) and chamber initialization. It also reinitializes other daemons, such as **Service Profiler**, **Service Sampler**, **Service Macros**. The new message appeared under each tab indicates that the daemon has been started and chamber initialization process is complete. Communication between the Web Controller and chamber has been established, as depicted in the following figures.

≡ s	erver Settings											±	00
SERVER	SERVICE	SERVICE	SERVICE	SERVICE RTM	SERVICE MACROS	SERVICE BROKER	SERVICE COMMAND-STREAM	SERVICE SAMPLER-LIMIT	SERVICE	SERVICE PROFILE-SYNC	SERVICE NETWORK	SERVICE UW\$GI	SERVICE
Stopped *	Chamber initialzati Chamber initialzation hamber initialzation	on service for e	specapi.".										
	022-01-21-18/17/4 022-01-21-18-17-4												

Figure 35.116: Initialization service completed



Figure 35.117: Macros service also restarted

- 4. Network communication has been established. The Web controller can now resume its operation.
- v.3 3/2022

In most cases, restarting a network connection is all that is needed to get the Web Controller and chamber working again. It is rare that other services become corrupted and stop working for no reason. However, if the situation arises, these services can be restarted with the **RESTART SERVICES** button (as outlined above).

35.13.2 Reboot Server

Sometimes, certain services may stop working and refuse to respond to the restart request. In this case, rebooting ESPEC Web Controller is the only option to bring the entire system back to normal operation.

complete the following steps:

1. Click the **Reboot Server** button.



Figure 35.118: Rebooting ESPEC Web Controller

2. Reboot action will commence as depicted in the following figure.

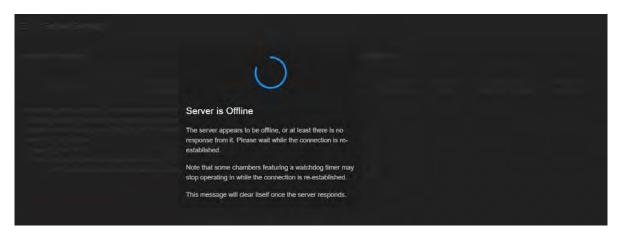


Figure 35.119: Reboot the Web Controller

3. If ESPEC Web Controller is not back online, after 3-5 minutes, refresh the Web page or open a new Web browser to access ESPEC Web Controller on the new page. Upon refreshing the Web page, ESPEC Web Controller is back online.



Figure 35.120: Service broker in normal operation

35.14 HMI Settings

The **HMI Settings** submenu is available only when ESPEC Web Controller 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 monitor. This submenu is not visible on the **Settings** submenu when accessed via a Web browser on the local computer.

Mar 31,	, 2022, 12:36:04 PM		ESPEC-de	fault /settings	/hmi 📮 🗄 🔗
٤	Status Temp 26.2 of	Off 100.	0 _{%RH} tsi tsi Off Off		
-		≡ нміз	Settings		国 (* P
nie.	Marwork Settinge	Configure the	various settings specifi	c to the chaml	per mounted touch interface. 1223
	Email Sattings	Time Zone	America/Detroit		Time zone used by on the touch interface only.
M	P Deer Interface Settings	Time Zone	America/Detroit		Time zone used by on the touch interface only.
Ð	Data Lopping Settings	Language		÷	Language used by the touch interface only.
	3 Date/Time Settings				
	🔔 User Settings	Display Timeout	15 minutes	-	Amount of time with no user interaction to wait before shutting off the display.
1		Automatic			Automatically login with the 'localhost' user account. This account is
	Controller Settings	Login	On		only usable from the HMI.
and Unit	🔅 Chamber Interface				
	O finnware				
		~			
0	Lerver Semings				
Acc	📮 HM Salling				

Figure 35.121: HMI setting options

The **HMI Settings** submenu has three manipulation buttons or options; they are described as follows:

- 1. **Terminal**: This option is for Manufacturer's use only.
- 2. **Restart Application**: Click the cycle icon to cancel and clear any 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 settings are available for configuration: Time Zone, Language, Display Time-

out and Automatic Login. These four settings have specific descriptions to support their functionality as depicted in the following figure. Each setting can be configured using the available options from the drop-down menu and via the on-screen keyboard, as shown below.

Mar 30,	2022, 1:13;41 PM Status Standby	← → Q /settings/hmi > ×	🖗 🗄 🥝
4	≡ HMI Set	tings	E 0 🖻
88	Configure the va	rious settings specific to the chamber mounted touch interface.	
en inter	Time Zone	America/Detroit Time zone used by on the touch interface only.	
0	Language	Language used by the touch interface only.	
-	Display Timeout	15 minutes • Amount of time with no user interaction to wait before shutting off t	he display.
1 B	Automatic Login	On Automatically login with the 'localhost' user account. This account i HMI.	s only usable from the
	1	2 3 4 5 6 7 8 9 0 - =	
ø	->>	qwertyuiop[1 1
	Ŷ	asdfghjkl;'	¢J
	Û	z x c v b n m , . /	Û
	.com	@ [2]	CLR

Figure 35.122: Using on-screen keyboard

ESPEC Web Controller Software, Version 3 USER'S MANUAL

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