

OUR PRODUCTS DEVELOP TOMORROW'S TECHNOLOGIES™

AUTOEXPLOR™

SOFTWARE USER MANUAL

For All
EXPLORAVAC™
Systems

AEX-12182025 - V 1.5.0.1

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1. OVERVIEW



Read the ExploraVAC system and this AutoExplor manual to completely familiarize yourself with the capabilities and operation of the instrument and software. Follow all safety instructions and warnings.

The Ideal Vacuum AutoExplor software is a Windows® 10 and 11, touch screen enabled application, available for all ExploraVAC™ systems. It allows an ExploraVAC system to be controlled by a computer or laptop. AutoExplor provides precise control of all test conditions and is able to confirm that test conditions are met.

For standard and Ideal Vacuum Cube ExploraVAC series systems, AutoExplor is optional and available as a basic or premium version. The user's computer or laptop is connected to the software serial port on the digital feedthrough panel at the back of the ExploraVAC system. Our part number [P1012232](#) is the correct serial to USB cable to use.

ExploraVAC MAX and UNLIMITED series systems, which have a built-in computer and touch screen monitor, include a one year premium version license of AutoExplor. The premium license must be renewed annually or it will revert to the basic version (with lifetime software license).

All AutoExplor versions allow a user to manually control devices while protecting the system. AutoExplor properly sequences pumps and automatically operates the correct valves for a given request. The user can program pressure and temperature setpoints, gas flow, and ramp rates, soak times, venting, and purging (if the system is equipped with those hardware options). The software provides real-time graphical data streaming so the user can visualize system behavior.

AutoExplor keeps track of preventive maintenance intervals and notifies the user when system service is due. For example, it notifies when scroll pump tip-seal replacements are needed and when sensor calibration is due. This helps keep the system at peak operating performance.

AutoExplor immediately informs the user if a warning or failure occurs and turns off appropriate devices. Further, it generates detailed error messages and supplies specific troubleshooting information so that the issue can be corrected as soon as possible.

The premium version of AutoExplor adds automated recipe control, data logging, and log export capabilities. Complex test recipes can be created as a step-by-step process, where each step can control the on/off state, setpoints, and ramp rates of multiple devices. One or multiple end conditions for each recipe step may be set using logical operators. The premium version allows the user to quickly generate environmental TVAC test reports from recipe data log files. Logs can be reviewed to ensure targeted process parameters are achieved. The premium version also includes AutoExplor IP Client, which gives the software the ability to be used as a host that can manage multiple external network clients, and AutoExplor API (application programming interface), which allows a scientist or programmer to integrate an ExploraVAC instrument into their existing software test suite without using AutoExplor's software interface.

The basic AutoExplor version (with lifetime software license) includes a 30 day trial with all the premium features. After 30 days it reverts to the basic software. AutoExplor can be upgraded to the premium version at any time. Minor software updates and bug fixes will be available for download when available. The premium version must be renewed annually or it will revert to the basic version. Your Ideal Vacuum sales representative is able to provide upgrade assistance.

2. DELIVERY, INSTALLATION, STARTUP & SHUTDOWN

DELIVERY:

If AutoExplor software is ordered with an ExploraVAC Standard or Cube system, the software is delivered on a USB drive along with the printed system manual included with the instrument. For ExploraVAC MAX and Unlimited systems, the software (basic or premium version) is factory installed. Purchasers of AutoExplor receive a unique software license “key”, for each ExploraVAC system. The key automatically installs with the software.

If the software or an upgrade is purchased separately, or a minor upgrade becomes available, the software and license key is delivered as a download from idealvac.com. If AutoExplor is not ordered with a system, then the included USB drive contains the AutoExplor Demo.

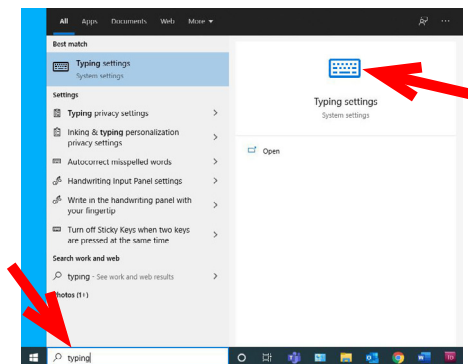
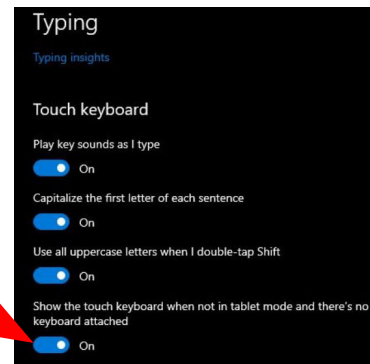


INSTALLATION ON A PC OR LAPTOP:

To install, find and **DOUBLE-CLICK** the **AutoExplor Installer.exe** or the **AutoExplor Demo Setup.exe** file. Follow the on screen prompts. An AutoExplor or AutoExplor Demo shortcut will be placed on the desktop.

For a Computer or Laptop with a Touchscreen:

Before starting AutoExplor for the first time, enter “*typing*” in the search bar to find the Typing Settings. Select Typing Settings. In the Typing window, turn on “*Show the touch keyboard...*”.



STARTUP:



On standard ExploraVAC systems where the software is installed on a computer or laptop, press or double-click the AutoExplor icon to start the program. On ExploraVAC MAX or Unlimited systems, once the system is energized (when the main power lever is on), the onboard computer turns on. Double-click the AutoExplor icon to start the software. AutoExplor’s native screen resolution is 1920 x 1080 and no scaling.

SHUTDOWN:



Press the Power icon. Once all devices turn off, exit the AutoExplor program.



Press the Exit Program icon to go to the Windows desktop.

3. HOME PAGE

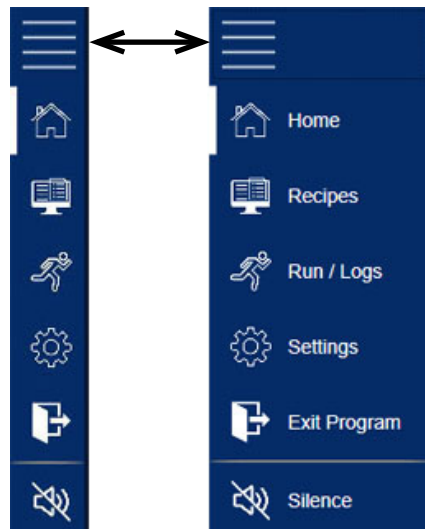


When AutoExplor starts, the Home page is presented. This page has six sections: (1) Menus and audible alarm silencer, (2) Manual Controls, (3) Setpoint Controllers and Readouts, (4) Running Graph, (5) Device Tiles, and (6) Status Bar. The user can manually control all system functions from the Home page including operating all subsystems and programming device setpoints. This page includes a live graph, device monitoring and system notifications.



3.1 HOME PAGE - MENUS

- 1 The Home page menu section allows you to navigate from one screen to another. Click the expander bars at the top of the menus to expand the section. The menu section is available on all AutoExplor pages. The speaker icon turns on and off the audible alarm.



Recipes and Run/Logs are found only in AutoExplor full version software.

3.2 HOME PAGE - MANUAL CONTROLS

2

The home page manual controls section allows you to power the system and turn subsystems on and off. When a manual control icon is pressed or clicked, that subsystem turns on. A green icon indicates that the subsystem is on. Below, the power and roughing pumps are on. Depending on system configuration, some icons may not be present. For example, the LIGHT icon is only available on ExploraVAC MAX and some UNLIMITED systems systems.



AutoExplor protects system equipment by sequencing operations. For example, if HIGH VAC is turned on, but the roughing pump (ROUGH) is not on, the software turns on the roughing pump first. Its icon turns green. The HIGH VAC icon blinks green to indicate the turbo pump is in standby mode. When the chamber's crossover pressure threshold is reached, the turbo pump gate valve opens, and the HIGH VAC icon turns green.

The ExploraVAC will not allow a subsystem to turn on, or a valve to actuate when a competing subsystem is operating. A white icon indicates that the subsystem may be engaged. A gray icon indicates that the subsystem is unavailable for selection. For example, the VENT and PURGE icons are gray when the system is in high vacuum ([Sec. 3.2.3, p. 9](#)).

3.2.1 POWER



When pressed, the POWER icon turns green. All valves remain in their normally closed states. The PLC initializes and the pressure gauge below the control panel turns on. The system enters a standby state, ready to perform a process.

If the POWER icon is pressed while any subsystems are running, the icon blinks red for up to 60 seconds. During this interval, the system systematically closes appropriate valves, turns off any devices that are on, removes power to the pump(s), then turns off the system. AutoExplor stays on.

3.2.2 ROUGH



When pressed, the ROUGH icon turns green. The roughing pump energizes, the roughing valve opens, and the chamber begins to pump down. The chamber ultimately reaches a pressure of about 2×10^{-2} Torr. The pressure gauge below the control panel displays the chamber pressure.

If the system is in roughing mode and the ROUGH icon is pressed, the roughing valve closes and the roughing pump turns off. This allows the chamber to remain under vacuum. The POWER icon remains on (green).

3.2.3 HIGH VAC (OPTION)



The HIGH VAC icon is present on turbo pump equipped systems.

If the ROUGH icon is on (green), and the roughing pressure is at or below crossover (factory set at 2 Torr), pressing the HIGH VAC icon initiates high vacuum mode and the HIGH VAC icon turns green.

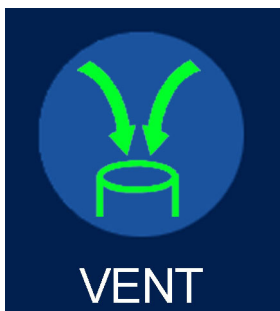
If the roughing pump is off, or the pressure is above crossover when HIGH VAC is pressed, the HIGH VAC icon blinks green indicating the system is in standby to go to high vacuum. System logic is optimized for speed and determines when the turbo pump begins spinning up during roughing.

Once the crossover pressure threshold is reached, the roughing valve closes, the foreline and gate valves open, and chamber pressure goes into high vacuum.

The ROUGH icon cannot be turned off, and neither VENT nor PURGE can be activated when the system is in high vacuum (when HIGH VAC is green).

When in high vacuum mode, turning off the HIGH VAC icon closes all valves and turns off both the turbo and roughing pumps. The chamber remains under high vacuum. Pressure will slowly rise due to seal permeation.

3.2.4 VENT



Venting is allowed only when the turbo and roughing pumps are off. If the system is in high vacuum mode, the HIGH VAC icon must be turned off before venting is possible.

If the VENT icon is pressed while either the ROUGH or PURGE icon is on, the VENT icon blinks green. The roughing pump and/or purge are turned off. Then, the vent valve is opened. Venting continues and the VENT icon remains green until it is pressed again to turn it off, one of the pump switches is activated, or the system is shut down.

When either the ROUGH or HIGH VAC icon is pressed, the vent valve closes and the selected pump sequence is initiated.

NOTE

The chamber is shipped under rough vacuum to keep it clean and must be vented before the door can be opened.

3.2.5 PURGE (OPTION)



This option allows a user to introduce high-purity, oxygen, or dry gas into the chamber instead of air. Gas pressure into the system must be regulated to no more than 250 PSIG. The system limits purge gas pressure into the chamber to 0.5 PSI, and will automatically shut off PURGE if chamber pressure exceeds +0.5 PSIG. The HIGH VAC icon must be turned off before purging is possible.

NOTE

It is recommended to evacuate the chamber prior to filling it with any kind of purge gas.

For non-pressure controlled systems, the PURGE icon behaves like the VENT icon. If the PURGE icon is pressed when ROUGH VAC or VENT is on, the PURGE icon blinks green, turns off the roughing pump or vent, then opens the purge valve. Purging continues and the PURGE icon remains green until it is turned off, or one of the pumps is activated. When either the ROUGH or HIGH VAC icon is pressed, the purge gas valve closes and the selected pump sequence is initiated. If the system has pressure control and the purge option, see pressure controller MODES ([Sec. 3.3.1, p. 13](#)).

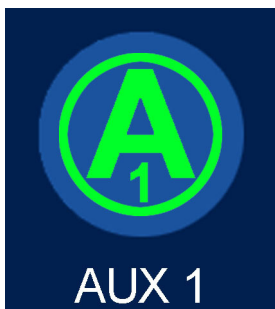
3.2.6 LIGHT



The LIGHT is available only on ExploraVAC MAX and UNLIMITED systems.

When the LIGHT icon is pressed, chamber illumination is turned on. Protected LEDs shine through the chamber door viewing port and bathe the entire interior in 5000k light. With the light on, the user can more easily examine the process or experiment in progress.

3.2.7 AUXS



There are two AUX icons (AUX 1 and AUX2). Each AUX can turn on and off a piece of outboard equipment.

Auxilliary equipment is switched through the DB15 auxilliary I/O connector on the digital feedthrough panel located on the ExploraVAC stand (Standard and MAX systems), or on the control console (Unlimited systems).

3.2.8 CUSTOM

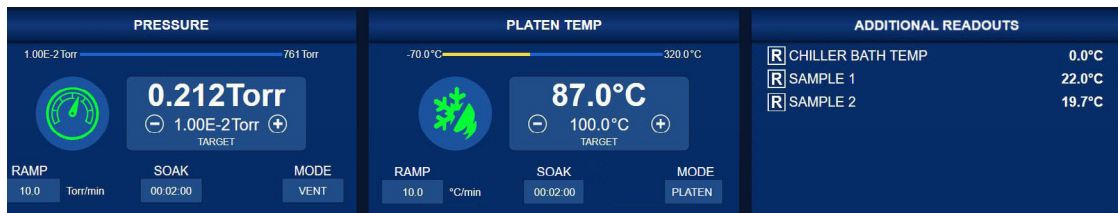
Custom icons are used when necessary to operate a user requested, non-standard option. Custom icons are named for their purpose. The function of CUSTOM icons are detailed in the customer's unique ExploraVAC manual.

3.3 HOME PAGE - SETPOINT CONTROLLERS AND READOUTS

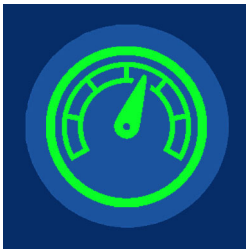
3

This home page section allows you to enter setpoints, ramp rates, and soak times for the controllable subsystems. Depending on the system, these could include pressure, gas flow, platen temperature, and chamber temperature. The Additional Readouts box, which shows data such as sample temperatures is also found here. If an ExploraVAC system has more than two controllers, the Additional Readouts box is viewed by swiping left.

When a setpoint controller icon is pressed, appropriate devices are energized and the controller icon becomes green. Below, both the pressure and platen temperature controllers are on.



3.3.1 PRESSURE SETPOINT CONTROLLER (OPTION)



PRESSURE CONTROL WORKS IN THE ROUGH VACUUM RANGE ONLY.

The pressure setpoint controller is on ExploraVAC systems equipped with the pressure control option. It could be used for altitude simulation where pressure is varied at a defined rate, or for experiments or processes which require accurate maintained pressure above the roughing pump's ultimate vacuum pressure. PLC control of smart throttling butterfly CommandValve's are used to achieve precise pressure control.

The setpoint pressure is the target pressure you want the system to obtain, then maintain for a specified duration. Once a setpoint is reached and the system settles, setpoint accuracy is $\pm 0.5\%$.

The pressure setpoint controller can have any of its parameters adjusted at any time. However, high vacuum must be turned off manually before the pressure controller can be turned on. When the pressure setpoint controller icon is pressed, the system automatically turns off venting or purging, then turns pressure control on. The pressure controller icon turns green.

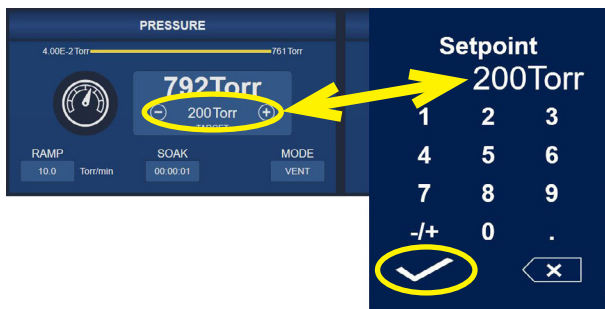
Changing the Pressure Measurement Units:

In the controller box, the largest white text displays the current pressure. Press the current value to open a window that allows the measurement units to be changed. Below, the current pressure is being changed from Torr to altitude (ft.).



Changing the Setpoint Value:

The setpoint (target) pressure value is displayed just below the current pressure. Press the current value to open a window where a new numerical pressure value is entered. Below, a new target pressure of 200 Torr is chosen. Press the **+** or **-** button to change the setpoint incrementally. Note: If a target pressure outside the system limit is entered, the pressure reverts to the closest allowable value. Press the check to accept the new value.



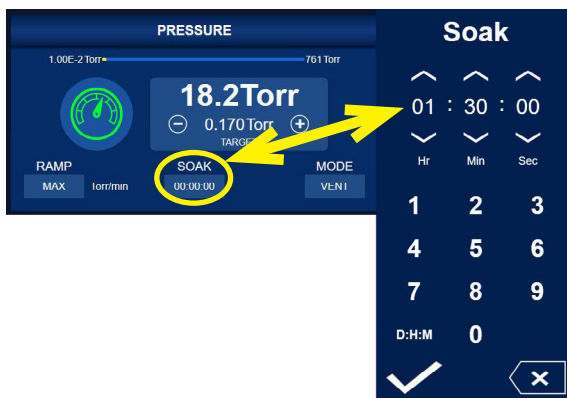
Changing the Ramp Rate:

Ramp rate is the speed at which the chamber goes from its current pressure to the desired pressure. Ramp rate is often used for altitude simulation, where a test item is subjected to faster or slower ramp rates. Ramp rate is measured in the current units/min. Press the RAMP tile at the bottom of the pressure controller box to change the ramp rate. Enter a new rate in the pop up window. The ramp rate can also be set to MAX, which forces the system to get to the setpoint pressure as quickly as possible. Where a numerical ramp rate is a linear function, the MAX rate is a curve.



Changing the Soak Duration:

Soak is the amount of time, after the setpoint pressure is reached, that the setpoint pressure is maintained. When the soak time has elapsed, valves are closed and the roughing pump is turned off. Press the SOAK tile to enter a soak time. Select the time in hours, minutes, and seconds or press D:H:M to change to days, hours, and minutes. The maximum soak duration is 99 days. If no soak time is specified, the system continues at the setpoint until it is turned off manually.



Changing the Mode:

Pressure controller MODE options depend on what other options the ExploraVAC system has (i.e., purge and/or the gas flow controller).



Systems with purge and pressure control:

If the system has purge and pressure control, three pressure control modes are available: VENT, PURGE, and ACTVPRG. The PURGE mode allows the user to use purge gas rather than vent air to maintain the chamber pressure at a setpoint higher than the roughing pump's ultimate pressure.

vent
purge
actprg

In this configuration, the system can also perform “active” purging. Unlike standard purging or venting as described above, active purging allows the roughing pump to remain pumping while simultaneously flowing purge gas into the chamber. With active purging, constant chamber pressure can be maintained to within $\pm 2\%$.

To engage active purging, select **actprg** in the pressure controller MODE popup, then enter a setpoint pressure. When the pressure setpoint controller is turned on, the roughing pump evacuates the chamber to the desired setpoint pressure. Once the setpoint pressure is reached, the system continues roughing while simultaneously flowing purge gas into the chamber. Constant chamber pressure is maintained. Turning off the ROUGH icon turns off both purging and the roughing pump. Turning off the PURGE icon alone stops active purging but leaves the roughing pump on.

Systems with purge, gas flow, and pressure control:

vent
purge
novnt

If the system has purge, the GAS FLOW controller, and the pressure controller, MODEs are VENT, PURGE, and NOVNT. When a system has mass flow controllers (MFCs) and the GAS FLOW controller, ACTVPRG is eliminated since MFCs can be more precisely controlled than a (mostly) unrestricted purge valve ([Sec. 3.3.4, p. 16](#)).

A system with all three of these options can serve multiple purposes including altitude (space) simulations as well as critical chemical processes. When NOVNT (no vent) is selected, it does not allow the vent valve to open and therefore air cannot be introduced into the chamber unrestricted, possibly contaminating a critical process. When MFCs are turned on in the GAS FLOW controller, the MODE is automatically changed to NOVNT.

Systems with gas flow and pressure control (no purge):

vent
novnt

If the system has the GAS FLOW and PRESSURE controllers, but does not have PURGE, only two pressure modes are available: VENT and NOVNT. When NOVNT (no vent) is selected, it does not allow the vent valve to open and therefore air cannot be introduced into the chamber unrestricted, possibly contaminating a critical process. Press the MODE tile to select either VENT or NOVNT. When MFCs are turned on in the GAS FLOW controller, the MODE is automatically changed to NOVNT.

3.3.2 PLATEN TEMPERATURE CONTROLLER (OPTION)

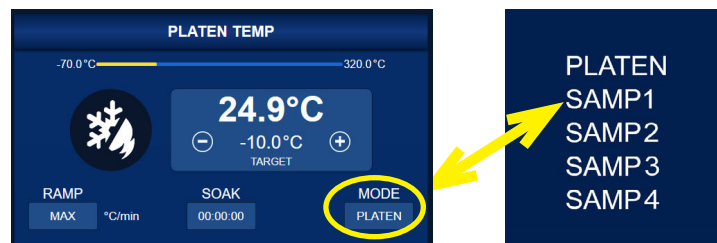


Single platen systems are controlled by the PLATEN TEMP setpoint controller. On dual platen systems, the controllers are named UPPER PLATEN and LOWER PLATEN. These controllers are used to adjust platen heating and cooling. They behave like the pressure controller. Select the current value to change the temperature units: Celsius or Fahrenheit. The ramp rate is displayed in degrees per minute. Soak time is measured the same way as the pressure controller. If no soak time is specified, the system continues at the setpoint until turned off manually.

Maximum platen heating or cooling ramp rates are dependent on the platen size, type, and power capability of the heating or cooling system used. The ramp rate can either be set to a numerical value, which changes the platen temperature linearly, or to MAX, which forces the system to get to the setpoint temperature as quickly as possible. Where a numerical ramp rate is a linear function, the MAX rate is a curve. If a target temperature outside the system limit is entered, the temperature reverts to the closest allowable value. Chamber pressure greatly effects the rate at which the platen can heat and cool.

Changing the Mode:

The PLATEN TEMP MODE is available only on ExploraVAC systems with firmware versions 1.8.3 and newer ([Sec. 7.1, p. 53](#)). The MODE field is used to select the thermocouple that the PLATEN TEMP setpoint controller uses. There are five mode options: PLATEN, SAMP1, SAMP2, SAMP3, or SAMP 4. By default, the thermocouple embedded in the platen is used by the setpoint controller (PLATEN mode). This mode works well when a test object is directly attached to the platen.

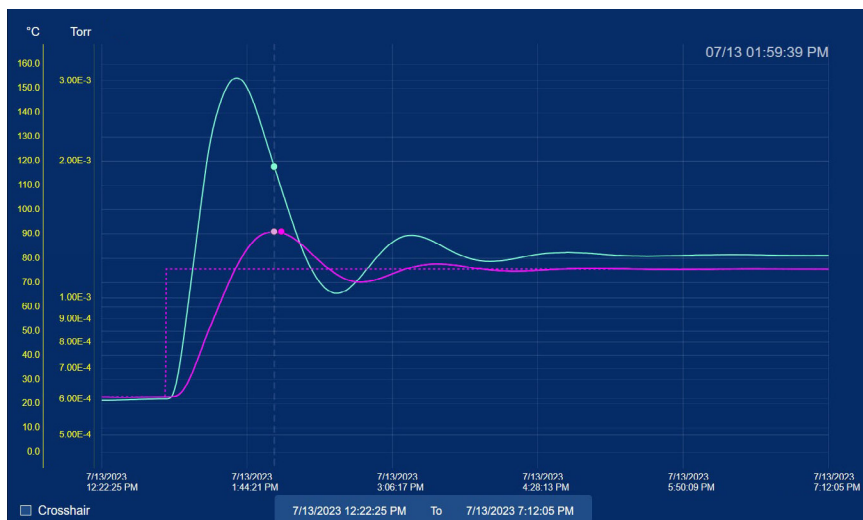


When a test object is fixtured or otherwise at some distance from the platen, the platen and test object may be at different temperatures. This can be due to the delayed heat transfer from the platen to the object, or because the object is far enough away from the platen that it stabilizes at a different temperature than the platen. This is referred to as a delayed system.

While it may be possible to experimentally determine the platen setpoint temperature required for the object to achieve the desired stable temperature, a more precise, repeatable, and faster method is to change the mode to one of the SAMP modes. Selecting the SAMP 1, 2, 3 or 4 modes changes the thermocouple used by the PLATEN TEMP controller to one of the sample thermocouples (SAMP 1 and SAMP2 correspond to the two thermocouples factory routed through the chamber feedthrough). The selected SAMP thermocouple is attached directly to the test object.

Note that when using the sample mode, if there is a significant system delay between the platen and test object temperatures, considerable temperature overshoot of the test object can occur. Suggestions are provided on the following page for how to avoid significant temperature overshoot.

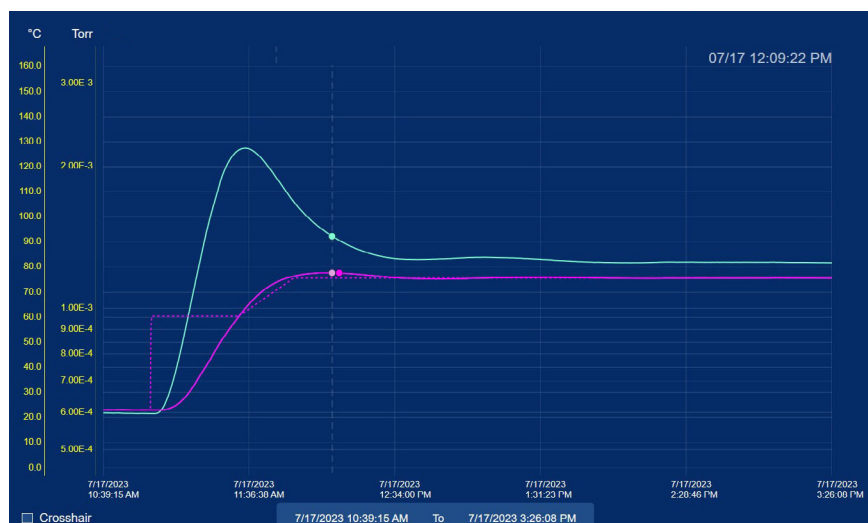
Shown below is a graph of a delayed system controlled by the “SAMP1” mode. The controller is set to the MAX rate at the desired object setpoint temperature.



The lighter line shows platen temperature. The darker line shows the test object temperature. Here, the platen continues heating at the MAX rate until the object reaches the setpoint. Because of the excess platen heat transferred to the object after the setpoint is reached, the object experiences a temperature overshoot of 15°C and it takes 3 hours for the object temperature to stabilize.

A better technique is to use AutoExplor recipes ([Chapter 4, p. 22](#)) and make at least two steps. First, ramp the temperature at the MAX rate to a setpoint lower than the object target temperature. Then, use a slower ramp rate to get to the desired temperature setpoint.

The graph below illustrates the technique. Here, the transition setpoint temperature is set at 15°C below the object’s target temperature. This is the amount of overshoot that was experienced in the example above.



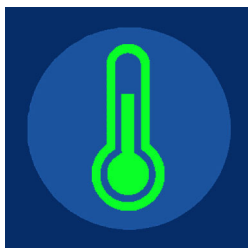
Now, the maximum platen temperature is decreased and its starts cooling much faster. This reduces and slows the amount of heat transferred into the object. The result is an overshoot of only 2°C and a temperature stabilization time of roughly 50 minutes.

NOTICE

When using the PLATEN TEMP sample mode, the platen necessarily gets hotter than the desired object setpoint temperature. Sometimes it can get significantly hotter. A poorly mounted thermocouple can cause the platen to runaway trying to heat the object to the setpoint. Make sure the sample thermocouple is well mounted and is reading correctly.

To help protect the test object, use the warning and fail limits ([Sec. 7.2, p. 54](#)) to set the maximum platen temperature at a value not to exceed a temperature that would damage the test object. This will force the platen controller to shut down in the event that the platen is running away trying to heat the sample.

3.3.3 CHAMBER TEMPERATURE CONTROLLER (OPTION)



The Chamber Temperature setpoint controller is available on ExploraVAC Cube and MAX systems with the chamber wall heating option, or on Unlimited systems with the Infrared Radiant Bakeout Lamp option. This temperature setpoint controller behaves the same way as the platen temperature controller.

The maximum chamber heating ramp rate is dependent on the chamber size, type, and power capability of the heating system used, and like the platen temperature controller, the chamber temperature ramp rate can either be set to a numerical value, or to MAX.

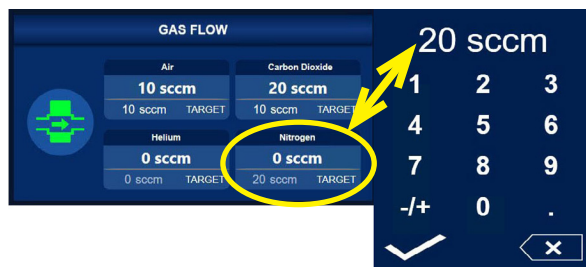
3.3.4 GAS FLOW CONTROLLER (OPTION)



The GAS FLOW controller is available on ExploraVAC MAX and UNLIMITED systems with MFC's. This controller is used to adjust the amount of gas that flows into the chamber in sccm (standard cubic centimeters per minute). The number of tiles in the controller equals the number of MFC's in the system (up to four). Each tile corresponds to a gas inlet panel connection (Gas #1 - #4) and its associated MFC. Gases are ordered left to right and top to bottom. The GAS FLOW controller behaves very similarly to the PURGE function, only much more precisely ([Sec. 3.2.5, p. 10](#)). Note that the gas settings MUST be configured prior to running AutoExplor ([Sec. 7.5, p. 57](#)).

Changing the Flow Rate:

To change the flow rate of any gas, press its tile. A window pops up where a new flow rate value is entered. Below, the nitrogen flow rate is currently zero. It is being increased to 20 sccm. Flow rate of any gas may be changed at any time.



3.3.5 ADDITIONAL READOUTS

The Additional Readouts box displays temperature and pressure data which the user cannot directly change. Readouts could include any available thermocouple temperature readings and chamber pressure readings (for systems without pressure control). Below shown is a typical Additional Readouts box with and without pressure control.

For ExploraVAC systems with more than two controllers (pressure, platen temperature, gas flow, or chamber temperature), the Additional Readouts box is normally hidden from view. Swipe left on the controllers section to reveal the Additional Readouts box. Swipe right to conceal it. SAMPLE 1 through SAMPLE 4 thermocouples can be used by the PLATEN or CHAMBER TEMP controllers ([Sec. 3.3.2, p. 14](#) and [Sec. 3.3.3, p. 16](#)).

Readout information can be used as criteria for step end conditions in recipes ([Sec. 4.4, p. 24](#)). Because readouts simply provide information, it is only possible to use readouts to set a step end condition which is either above (>) or below (<) the readout value. Note that when a sample thermocouple is selected in the PLATEN TEMP Mode, the platen temperature thermocouple becomes an additional readout.

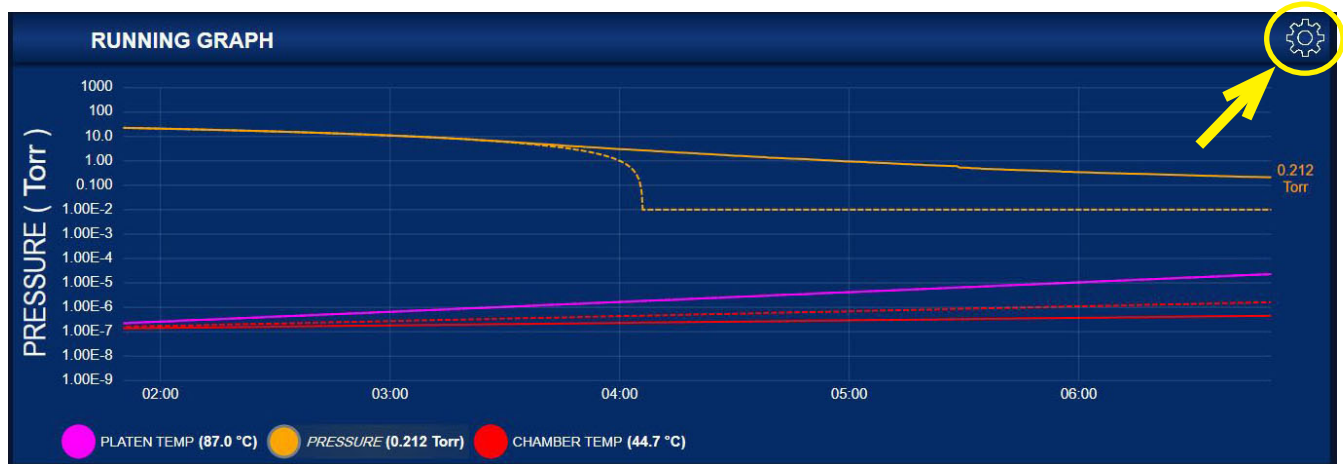
ADDITIONAL READOUTS	
[R] PLATEN TC	20.6°C
[R] SAMPLE 1	20.7°C
[R] SAMPLE 2	32.5°C
[R] SAMPLE 3	87.0°C
[R] SAMPLE 4	87.1°C

ADDITIONAL READOUTS	
[R] PLATEN TC	20.6°C
[R] SAMPLE 1	20.7°C
[R] PRESSURE	6.63E-3 TORR
[R] SAMPLE 2	32.5°C
[R] SAMPLE 3	87.0°C
[R] SAMPLE 4	87.1°C

3.4 HOME PAGE - RUNNING GRAPH

4

The Home page running graph section provides live graphical data streaming so that the user can readily visualize system and device behavior. The running graph begins plotting data as soon as the POWER icon is pressed and continues until POWER is turned off. The running graph can simultaneously show actual and target data for any available controller. Process values are shown as solid lines. Setpoint (target) values are shown as dashed lines. In the premium version of AutoExplor, the running graph is logged and saved automatically ([Sec. 6.2, p. 489, Chamber Logs](#)).



Press or click the gear in the upper right corner of the running graph section to bring up the Edit Running Graph Settings window (below). Here, the controllers which will be displayed on the running graph are selected (Displayed Datasets).

The X axis intervals and the overall time scale are also adjusted in this window. The running graph can show a maximum of one hour of data (Full Time Scale maximum is one hour).

Edit Running Graph Settings:

Displayed Datasets:

☒ CHAMBER TEMP ☒ PLATEN TEMP

☒ PRESSURE

Global X Axis Settings:

Time Division: 00:01:00

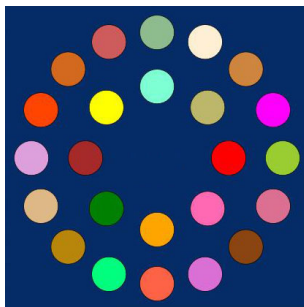
Full Time Scale: 00:05:00

Cancel Confirm

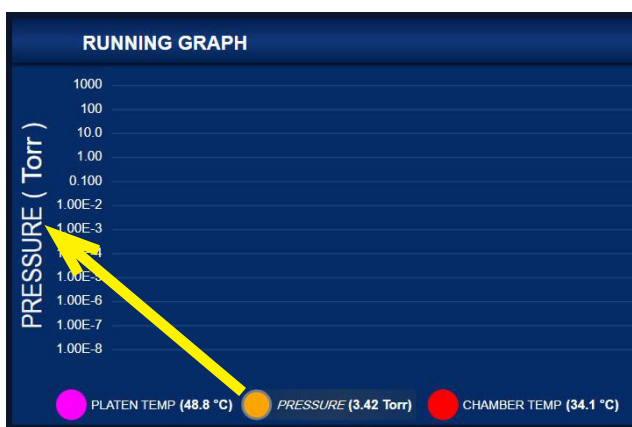
Below the graph, each displayed controller is indicated by a colored dot. The current value is shown next to its controller and also to the right of the selected controller's line on the graph.



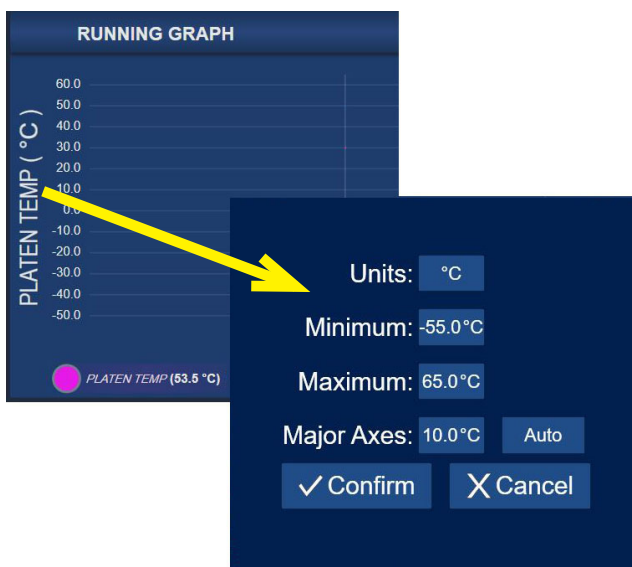
The controller's dot and graph color can be customized and changed at any time. Press and hold, or right click on a dot to bring up the color wheel and select a new dot color. The new color is instantly displayed on the running graph, as well as on the running and recipe logs (premium versions of AutoExplor only).



When a controller dot is pressed, the Y axis label and units are changed appropriately. For example, when the Pressure controller dot is selected, the Y axis label changes to “Pressure (units)” and the Y axis scale units change accordingly.



To change the Y axis label measurement units and manually adjust the Y axis scale, click or press the Y axis label to bring up a window where those values can be changed. The Y axis scale can also be changed by vertically pinching or stretching to zoom in or out (on a touchscreen), or by using the scroll wheel on a mouse. Vertical position of the graph can be changed by dragging up or down.



3.5 HOME PAGE - DEVICE TILES

- 5 The Home page Devices section is useful for monitoring devices and obtaining useful device information.

The current state of all installed system devices are displayed in this section. When a device is on or open, its icon will be green. In this example, the roughing valve, roughing pump, platen chiller, and chamber heater are all on.

The devices panel will also show service notifications, warnings, or a failure by displaying the caution symbol next to the device name.

To the right, the compressor is showing a caution symbol. Click or press the caution symbol to jump to the Notification Center page for detailed error information ([Sec. 7.3, p. 55](#)).

Each device has an associated data card which shows useful information. Press or click on any device tile to bring up its data card. This example shows the data card for the roughing pump (not running).

DEVICES

VENT VALVE	GATE VALVE	ROUGH VALVE
CLOSED	CLOSED	OPEN
ROUGH PUMP	COOLANT PUMP	COMPRESSOR
ON	OFF	OFF
TURBO	PURGE VALVE	CHAMBER HEATER
OFF	CLOSED	ON
PLATEN HEATER	PRECHILL	CHAMBER SYSTEM
ON	OFF	OFF

ROUGH PUMP

Pump Speed	0 Hz
Pump Temp	22.0 °C
Pump Controller	17.0 °C
Pump Warning Reg	0000
Pump Fault Reg	0000
Current	0.0 Amps
Voltage	293.1 Vp
Tip Seal Life	19616 Hr
Bearing Life	41516 Hr
Rough Line	5.00e2 Torr

Close

3.6 HOME PAGE - STATUS BAR

- 6 The Home page status bar section, located at the bottom of every AutoExplor screen, provides immediate system warnings, faults, alerts and service notifications. If there is more than one notification, messages will scroll on the status line. Go to the Settings - Notification Center page for more information about system notifications ([Sec. 7.3, p. 55](#)).

Status: WARNING The platen temperature has exceeded it's warning threshold.

- At the bottom left corner of every AutoExplor window is a minimize icon. Select this icon to go to the Windows desktop.

3.7 WARNINGS AND OTHER SUBSYSTEM CONDITIONS

AutoExplor provides visual feedback about the state of its subsystems and devices. As previously stated, a white icon indicates the subsystem is off and a green icon indicates the subsystem is on and functioning normally. Icons may also blink or change to other colors to indicate other subsystem status conditions, including device transitional conditions, warnings, and faults. The information in the table below describes all the possible condition codes.

Icon	Blinking Red	Blinking Green	Alternating Green/Yellow	Alternating Green/Red	Blinking Yellow	Solid Blue	Blinking Blue
Power	Powering off						
Rough	Rough turned off, pump temp too high failure	Pump not starting warning	Rough remains on, pump temp warning				
High Vac		Standby for rough crossover	Turbo spinning up	Turbo spinning gate valve closed	Turbo coasting down		
Chamber	Heating off, over temp or TC failure		Heating on, over temp warning				
Vent		Venting on standby, ion gauge still on					
Platen	Heating off, over temp or TC burnout/failure	Huber compressor warming up	Heating on, over temp warning		Huber compressor turning off		
Purge	Purge valve closed, chamber over pressure	Purge on standby, ion gauge still on					
Prechill		Prechill on, auto control turned prechill off				Prechill off, auto control turned prechill on	
Turbo Standby		On and going to standby speed	On but standby speed not getting set			Enabled while highvac is on	Enabled but standby speed not getting set
Plasma		Plasma starting, trying to stabilize					

3.8 FAULTS



AutoExplor indicates a control or device failure with a blinking red icon (with the exception of power down). Additionally, the ExploraVAC fault light blinks and an audible buzzer sounds. The buzzer can be turned off on any page by pressing the speaker icon under the menus (top left of page). Upon a fault, the effected subsystem is immediately turned off. If the fault is because a device exceeds its parameters (i.e., an over temperature situation), the fault may self-correct. If the fault is because of equipment failure, the fault persists. The effected device needs to be corrected before it functions.

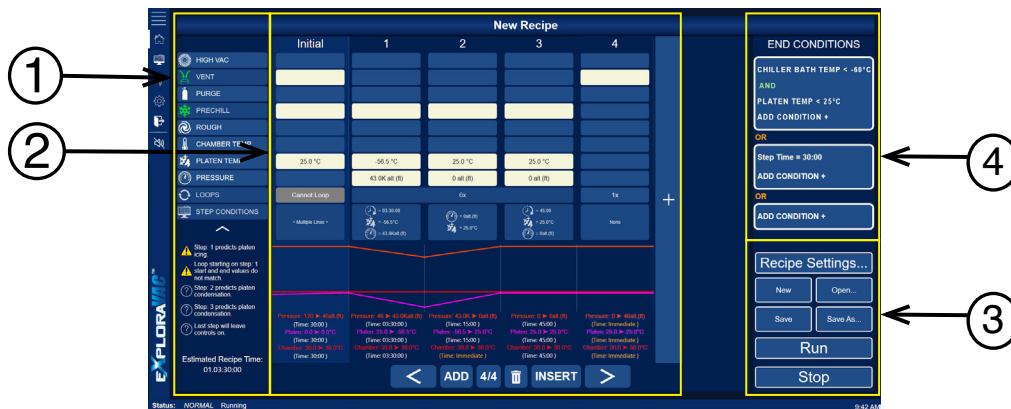
4. RECIPE PAGE (PREMIUM VERSION ONLY)



The Recipe page is available in the premium version of AutoExplor. This page allows the user to create a sequence of customized steps (a recipe) that the system will automatically execute without additional human input. Recipes can be saved, then reused to perform the same process with precision. A recipe can have an unlimited number of steps.

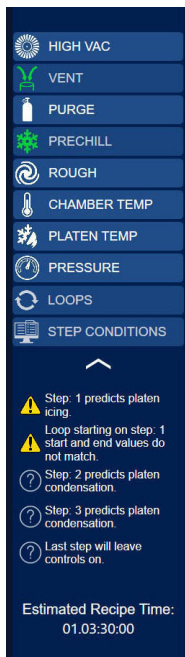
AutoExplor uses predictions based on temperature and pressure data tables generated from real systems at rough vacuum and at room temperature, in combination with user defined step conditions, to provide a rough estimate of system performance and process time. The software notifies the user of potential unexpected behavior or logic faults between recipe steps. AutoExplor predictions are estimates only. Real-world factors, such as environmental conditions or outgassing from objects, can cause actual system performance to differ substantially from predictions.

The Recipes page has four major sections: (1) Subsystems and Notifications, (2) Steps and Predictions, (3) Settings and File Management, and (4) End Conditions.



4.1 RECIPE PAGE - SUBSYSTEMS AND NOTIFICATIONS

1



The Recipe page subsystem and notifications section shows the available ExploraVAC subsystems. Select a subsystem to turn it on (its icon becomes green). A subsystem may not show a green icon, even though a step requires it to be on. For example, in an altitude simulation, if a step calls for an altitude above sea level, the ROUGH icon may not become green, even though the roughing pump must necessarily turn on since the pressure at altitude is below ambient. AutoExplor logic controls subsystems and automatically turns on and off devices as required. Note that pressure and temperature controllers in recipes work somewhat differently than those in the Home page ([Sec. 4.5, p. 26](#)).

Below the subsystem tiles, AutoExplor provides notifications, based on predictions, that inform the user of the validity of the recipe, that a step might produce an unexpected result, or that there may be a logic fault that should be corrected. Potential issues are signified by a caution sign. A caution notification may or may not warrant a modification to the recipe.

A (predicted) estimated recipe completion time is displayed at the bottom of this section. This estimate may differ considerably from actual results.

4.2 RECIPE PAGE - STEPS AND PREDICTIONS

2



The Recipe page steps and predictions section is where individual parts of the desired process are formulated. In this section, steps are added by selecting the vertical plus (+) bar to the right of the last step. Steps can also be added, inserted between steps (after the currently selected step), or deleted using the buttons at the bottom of this section. Before it can be modified, a step must be selected by pressing or clicking on its step name (at the top of the step). The background blue of the selected step will be slightly lighter than the other steps. Above, Step 1 is selected.

The Initial Step is typically used to establish preliminary system conditions and provide a controlled chamber environment before the process or simulation begins. Subsequent numbered steps perform the process.

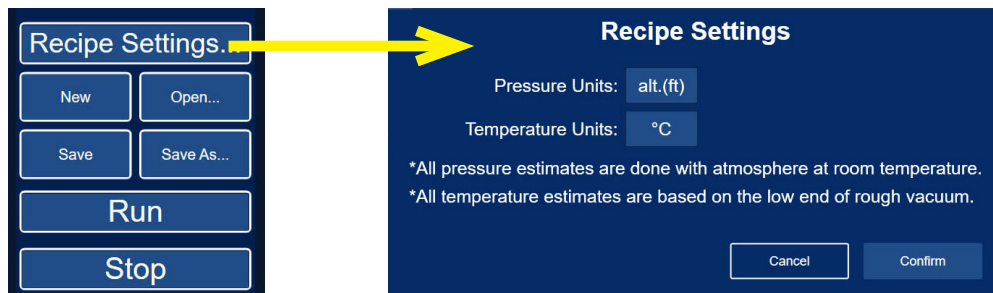
Every step must have one or more end conditions that must be met before the software can move to the next step. Multiple consecutive steps can be grouped and repeated (looped).

When building a step, select (press or click) the blue tile corresponding to the subsystem needed. The tile will turn white indicating it will be activated. Press or click a white tile to turn the subsystem off. When a controllable subsystem is selected, such as pressure or platen temperature, a popup window appears where the user defines its step end conditions. This includes a setpoint, ramp rate, and maximum allowable deviation. This differs from the subsystem section (1) SETPOINT CONDITIONS tile, in which other step end conditions, such as the duration before the step ends, are specified ([Sec. 5.1, p. 29](#)).

Below each recipe step, AutoExplor generates a graph which roughly illustrates the predicted behavior of each controllable subsystem. The software uses the previous step's settings to determine what the pressure or temperature will be when each step starts. Text at the bottom of each step shows the beginning and end values for each controllable subsystem, and each of their predicted durations.

4.3 RECIPE PAGE - SETTINGS AND FILE MANAGEMENT

3



The Recipe page settings and file management section (bottom right of screen) is used to make or save new recipes, open existing recipes, run, or stop a recipe. Recipe construction is completely independent from the chamber. New recipes can be made while a recipe is running, and recipes can be edited without changing the current state of the chamber. Recipe files are saved in the folder specified in the Log Settings menu page ([Sec. 7.4, p. 56](#)). Recipe files can be opened and run only from AutoExplor Recipes or Run/Logs menu pages. Files cannot be double-clicked in Windows to automatically open in AutoExplor.

Recipe units are selected in the Recipe Settings window (above). Always choose recipe units before starting a new recipe. Only one pressure and one temperature unit can be used throughout a recipe, but recipe units can be changed at any time. The pressure and temperature units in a recipe can be different than those in the AutoExplor home page.

4.4 RECIPE PAGE - END CONDITIONS AND CONDITIONAL BEHAVIOR

4



The Recipe page END CONDITIONS section (top right of screen) is where step end condition(s) are defined. These are the criteria needed for the recipe to proceed to the next step. Any combination of time, temperature, or pressure conditions can be used.

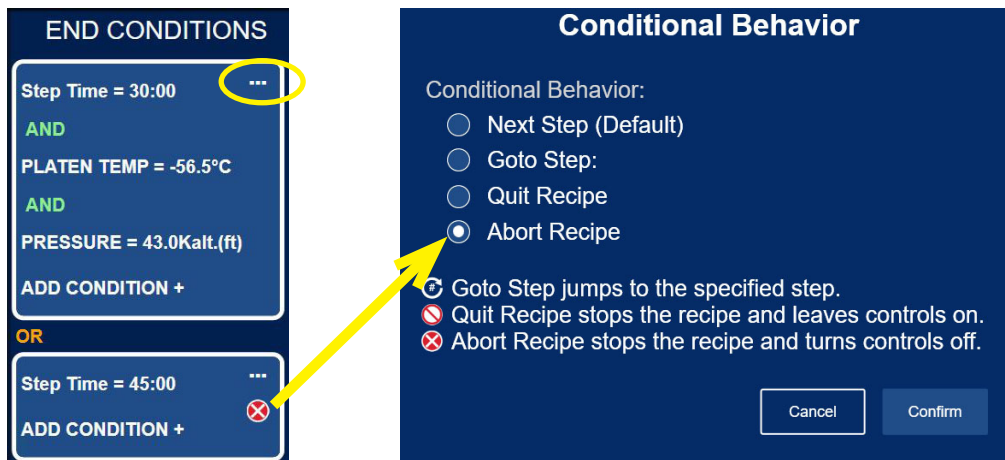
To add conditions, select the END CONDITIONS box to open the Edit Step Conditionals window. This window can also be accessed for any step by selecting STEP CONDITIONS (in the subsystem and notifications section).

The example to the left uses a non-pressure controlled system with a platen. The platen temperature setpoint is set to 25°C using the PLATEN TEMP controller ([Sec. 4.5, p. 26](#)). An additional condition is defined: the pressure must be less than 5 Torr. Because this is a non-pressure controlled system, the pressure is a readout, not a setpoint value. Therefore only logical operators (>, or <) may be used ([Sec. 3.3.5, p. 17](#)).

An alternate set of step end conditions is entered in the OR box. Here, a 30 minute step time is added. The recipe will proceed when EITHER the platen temperature and pressure meet the first requirements, OR after 30 minutes has elapsed, the alternate requirement.

In each END CONDITIONS box there is a short dashed line in the upper right corner. Clicking or pressing this dashed line brings up the Conditional Behavior window. The Conditional Behavior window has four choices that determine what happens when the condition(s) in that END CONDITION box are met: Next Step, Goto Step, Quit Recipe, and Abort Recipe.

When any but the Next Step (default) conditional behavior is specified, the END CONDITIONS box shows an indicator icon. Below, the Abort Recipe function is specified in the OR box.



Next Step:

Normally, when all the step end conditions are met, the recipe simply proceeds to the next step. It is not necessary to use the Conditional Behavior window to choose the Next Step option.

Goto Step:

 The Goto Step option forces the recipe to jump to another (user selected) step when the current step end condition is met. The jump can be to a step before or after the current step and the icon shows the jump step number. This feature can be useful for creating cyclic recipe behavior until some other criteria is met. The Goto Step function is used in the Pressure Cycling Recipe Example ([Sec. 5.2, p. 40](#)).

Quit Recipe:

 The Quit Recipe option stops the recipe at the end of the step, leaves controls in whatever state they are in at that moment, and control is transferred back to the user. By keeping controls and devices on, the chamber condition existing at the end of the step is maintained. An example of how the Quit Recipe function might be employed is if a user wanted to prepare the chamber with an initial thermal vacuum condition for a process that would begin later. The Quit Recipe function is used in the High Vacuum Chamber Prep Recipe Example ([Sec. 5.3, p. 46](#)).

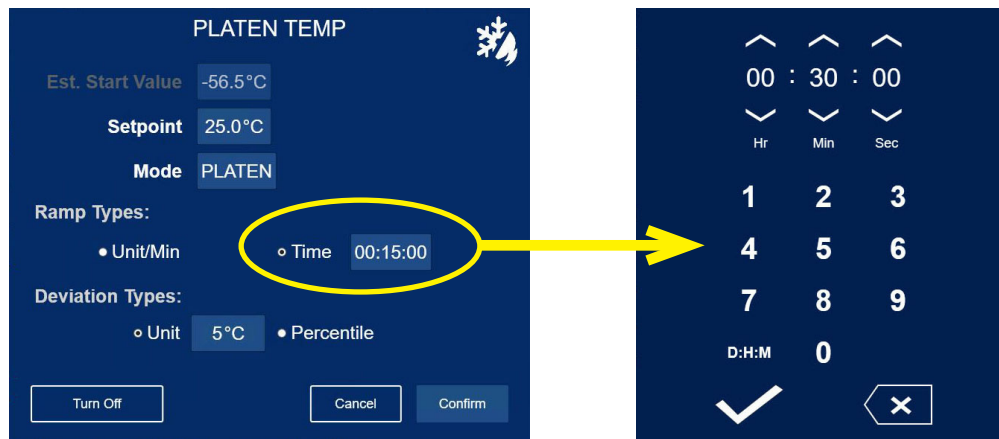
Abort Recipe:

 The Abort Recipe option differs from the Quit Recipe function in that it not only stops the recipe at the end of a step and gives back user control, it turns off all controls and devices. Even though the ExploraVAC system has many self-protection features, the Abort Recipe function can be used to enhance system protection by ensuring that a recipe is stopped before a system shutdown is initiated due to a fault. For example, if a dirty or wet process, or a vacuum leak did not allow a pressure setpoint to be reached in a reasonable time, the Abort Recipe function could stop a pump from running until it overheated. The Abort Recipe function is used in the High Vacuum Chamber Prep Simulation Example ([Sec. 5.3, p. 44](#)).

4.5 RECIPE CONTROLLERS

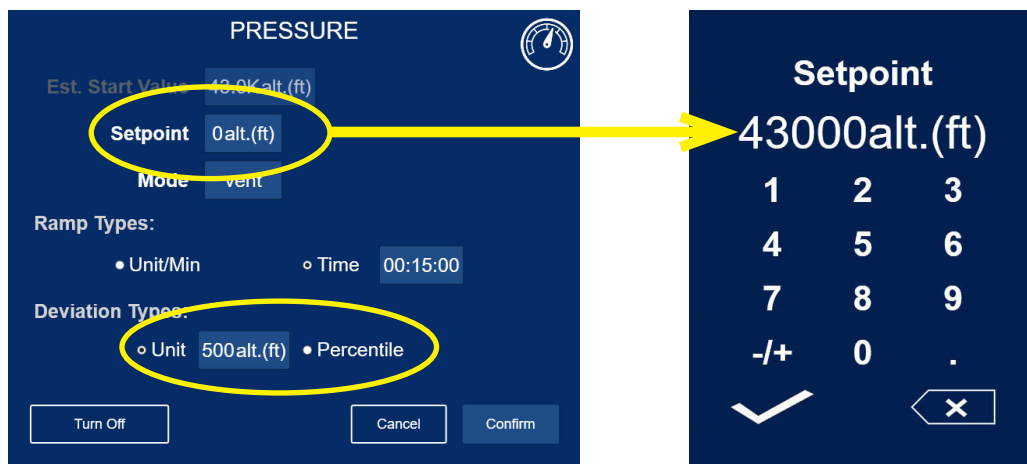
Unlike Home page pressure or temperature controllers, recipe controllers operate on individual recipe steps. Each recipe step can have its own controller values, and recipe controllers have additional features. Before starting a recipe, select the pressure and temperature units to use ([Sec. 4.3, p. 24](#)). For the examples below, pressure is in ft/min and temperature is in °C.

When a controller is selected, a window is presented where all parameters are input. Specific values are input by selecting the appropriate field. When any field is selected, a popup appears that allows data to be entered.



Each step controller provides an estimated start value. The software uses the previous step's settings to predict what the pressure or temperature will be when the next step starts.

In recipe controllers, the ramp rate can be set numerically in units/min or by a duration, where the length of time required to reach a certain setpoint can be set. To change between the two ramp types, press or click the radio button to the left of the ramp type. Time can be expressed in hours, minutes, and seconds or by days, hours, and minutes (D:H:M). Maximum duration is 99 days.



Recipe setpoint controllers also have a programmable Deviation Type field that can be set in units or a percentage of the setpoint value. This allows the user to adjust the tolerance between the requested setpoint and the actual measured value before the recipe moves to the next step. Deviation values rely heavily on the precision of the pressure and temperature gauges of the ExploraVAC. It is recommended to leave these deviations at their default settings in most cases.

5. RECIPE EXAMPLES

These recipe examples are generated using the AutoExplor Demo version and are provided to illustrate some of the important features and functions available in the premium version of AutoExplor.

Note that the Demo does not have all the features of the actual software although its predictions are based on previously collected system data. The Demo does not and cannot take into consideration several factors which would necessarily cause an actual ExploraVAC system's results to vary from the Demo's predictions:

The Demo does not consider an object in the chamber which might outgas or produce other process byproducts. It also does not account for the use of different system hardware in the actual instrument, or different environmental conditions.

The first example, Aircraft Altitude Simulation ([Sec. 5.1, p. 28](#)), demonstrates how to construct a recipe, how to use pressure and temperature controllers, how to customize ramp rates and setpoint deviations, how to specify end conditions using STEP CONDITIONS and END CONDITIONS, and how to streamline repetitive steps using the LOOP function.

The second example, Pressure Cycling Simulation ([Sec. 5.2, p. 35](#)), demonstrates how to use step end condition OR logic combined with the Goto Step conditional behavior function to create more complex recipes that can repeat steps until another criteria is met.

The third example, High Vacuum Chamber Prep Simulation ([Sec. 5.3, p. 42](#)), demonstrates how to incorporate the Quit Recipe and Abort Recipe conditional behavior functions that can be used to add system protection, or to stop a recipe at any step when certain conditions are met.

Note that ExploraVAC instruments use absolute pressure sensors. Ambient pressure at any location depends on, among other things, elevation. ExploraVAC pressure measurements are not altitude adjusted like the local weather report. However, the AutoExplor Demo assumes ambient conditions are NTP - normal pressure and temperature (NTP is defined as 760 Torr and 20°C). For more information about absolute vs. altitude adjusted pressure visit:

https://www.weather.gov/bou/pressure_definitions

5.1 AIRCRAFT ALTITUDE SIMULATION

This example simulates a recipe to test a commercial aircraft part at altitude. The simulation demonstrates how to build a recipe, how to use pressure and temperature controllers, how to set ramp rates and controller deviations, and how to use the loop function to reduce the overall number of recipe steps.

This recipe simulates an aircraft taking off from ground level, ascending to a cruising altitude of 43,000 ft. in 30 minutes and remain there for 3 hours. Then, descend and land in 15 minutes. Once on the ground, it remains for 45 minutes before repeating the entire flight cycle 6 more times.

For this simulation, the ExploraVAC system must be equipped with pressure control, a platen with electrical heater elements, and -70°C refrigerated recirculating chiller. Below is the recipe for the entire simulation. Remember to save a recipe regularly as its built.

	Initial	1	2	3	4
HIGH VAC					
VENT					
PURGE					
PRECHILL					
ROUGH					
CHAMBER TEMP					
PLATEN TEMP	25.0 °C	-56.5 °C	25.0 °C	25.0 °C	
PRESSURE		43.0K alt.(ft)	0 alt.(ft)	0 alt.(ft)	
LOOPS	Cannot Loop		6x		1x

Estimated Recipe Time: 01:02:17:14

Recipe Settings...

New Open...

Save Save As...

Run

Stop

Before beginning, go to RECIPE SETTINGS.

Change pressure to alt.(ft). Leave the default (°C) for temperature units.

Recipe Settings

Pressure Units: alt.(ft)

Temperature Units: °C

*All pressure estimates are done with atmosphere at room temperature.
*All temperature estimates are based on the low end of rough vacuum.

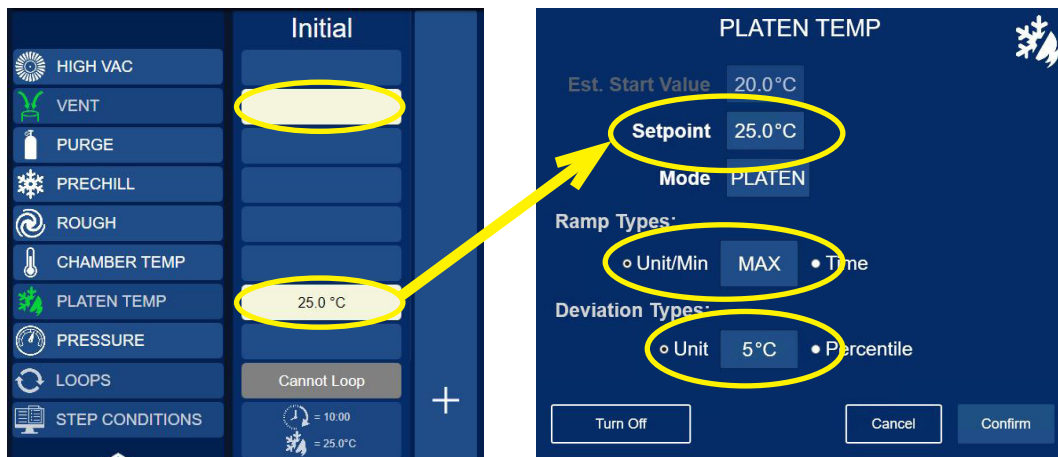
Cancel Confirm

INITIAL STEP:

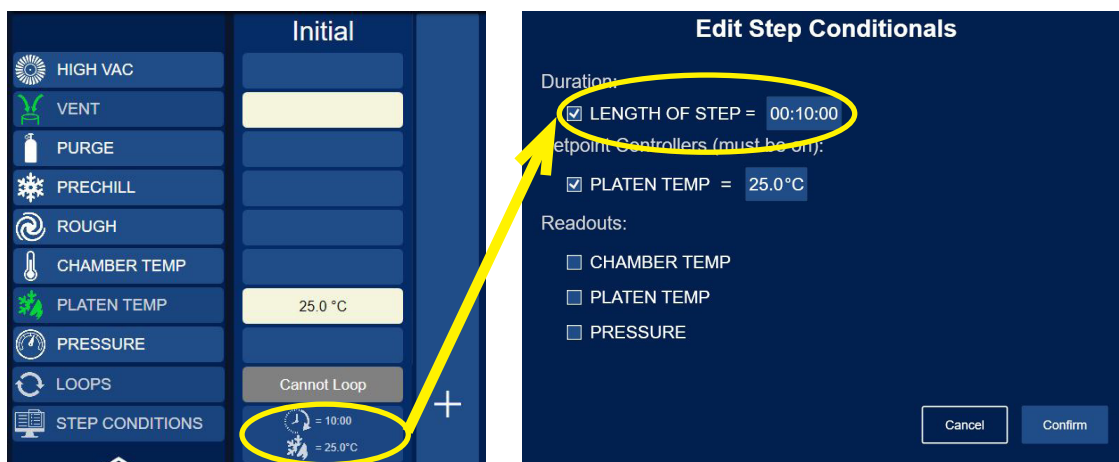
It is assumed that the chamber is close to NTP (normal temperature and pressure) to start.

In the Initial Step, press or click the VENT tile. It becomes white.

Turn on PLATEN TEMP. The PLATEN TEMP popup appears. Enter a Setpoint of 25°C, a MAX ramp rate, and a 5°C deviation (default is 0.2°C)



Press or click the Initial Step STEP CONDITIONS tile. In the Edit Step Conditionals popup, enter 10 minutes for the LENGTH OF STEP.



The increased temperature deviation (from the default value), and the 10 minute venting time ensures that the simulation begins with the chamber at “ground level” on a mild ($\approx 70^{\circ}\text{F}$) day.

When the Platen temperature is at 25°C ($\pm 5^{\circ}\text{C}$ deviation) and 10 minutes has elapsed, the recipe advances to the next step (Step 1).

Notice that controller setpoint values (i.e., PLATEN TEMP and PRESSURE) can be changed in the Edit Step Conditionals popup, but not ramp rates or deviations. Note that a Readout value (i.e., a sample thermocouple temperature) could be used as a step end criteria.

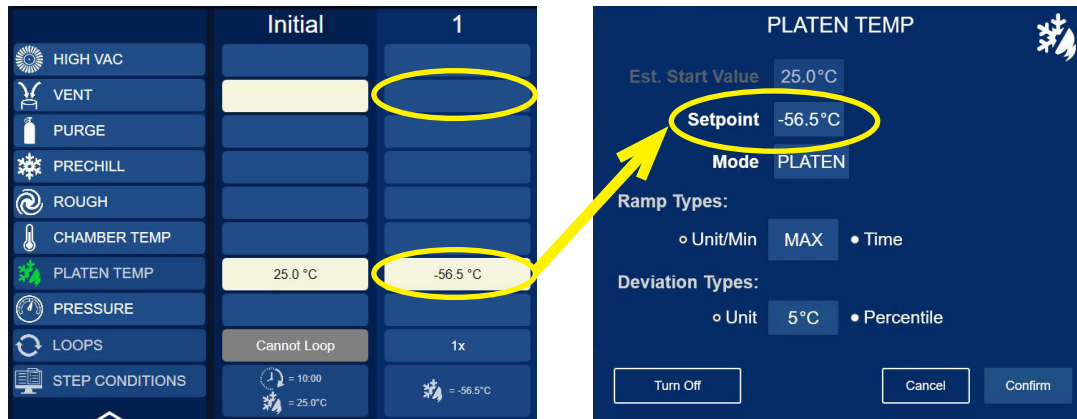
Add a step (Step 1): Press or click the large vertical “+” bar to the right of the initial step.

STEP 1:

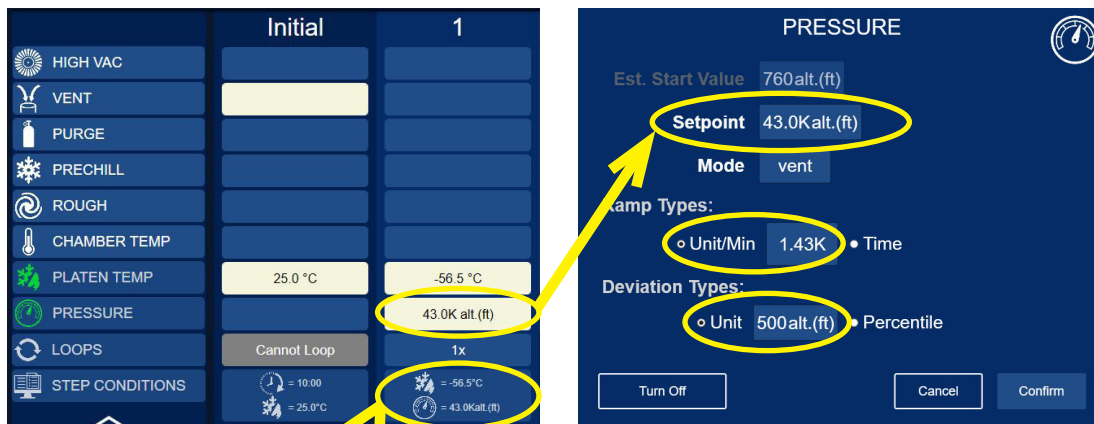
In Step 1, the aircraft is to take off and ascend to an altitude of 43,000 ft in 30 minutes.

VENT is turned off. The Step 1 VENT tile becomes blue. PLATEN TEMP remains on.

Press or click the Step 1 PLATEN TEMP tile. The PLATEN TEMP popup appears. Enter a setpoint of -56.5°C, the approximate temperature at an altitude of 43,000 ft. Notice that the ramp rate and deviation are automatically copied from the previous step.



Press or click the PRESSURE tile for Step 1. The PRESSURE popup appears. Enter a setpoint of 43,000 ft., the aircraft's cruising altitude. A calculated climb (ramp) rate of 1430 ft/min. is entered. At that rate, the aircraft reaches cruising altitude in 30 minutes. A deviation of 500 ft. is entered (allows the altitude to vary by ± 500 ft). The aircraft is to remain at cruising altitude for 3 hours.



Press the Step 1 STEP CONDITIONS tile or the END CONDITIONS box. Enter a 3-1/2 hour duration.

In this step, AutoExplor cautions that platen icing might occur. This seems reasonable as one might expect some ice to form on aircraft wings at this altitude. Ice can hinder platen performance, but is generally benign.

After 3-1/2 hours the recipe proceeds to the next step.

Add a step (Step 2).

STEP 2:

In Step 2, the aircraft is to descend and land in 15 minutes.

PLATEN TEMP and PRESSURE remain on. Press or click the Step 2 PLATEN TEMP tile.

In the popup, make the PLATEN TEMP setpoint temperature 25°C, the approximate ground level temperature. Set the Ramp Type to Time and enter 15 minutes. AutoExplor automatically calculates the necessary ramp rate (in units/min) from the step start value so that the setpoint is achieved in the required time.

The screenshot shows the main control interface on the left and the PLATEN TEMP popup on the right. In the main interface, the 'Initial' column shows PLATEN TEMP at 25.0 °C. Column '1' shows a transition to -56.5 °C. Column '2' shows a transition back to 25.0 °C, which is highlighted with a yellow circle. The PLATEN TEMP popup on the right shows the 'Setpoint' at 25.0 °C and the 'Ramp Types' set to 'Time' with a duration of 00:15:00. Both the setpoint and the time duration are circled in yellow. A yellow arrow points from the '25.0 °C' in the main interface to the 'Setpoint' field in the popup.

Press or click the Step 2 PRESSURE tile.

In the popup, make the PRESSURE setpoint 0 ft. altitude (ground level). Since both the pressure and platen temperature must have equal durations to meet their respective step end conditions simultaneously, set the PRESSURE Ramp Type to Time and enter 15 minutes. Again, AutoExplor automatically calculates the necessary ramp rate.

The screenshot shows the main control interface on the left and the PRESSURE popup on the right. In the main interface, the 'Initial' column shows PRESSURE at 43.0K alt.(ft). Column '1' shows a transition to 43.0K alt.(ft). Column '2' shows a transition to 0 alt.(ft), which is highlighted with a yellow circle. The PRESSURE popup on the right shows the 'Setpoint' at 0 alt.(ft) and the 'Ramp Types' set to 'Time' with a duration of 00:15:00. Both the setpoint and the time duration are circled in yellow. A yellow arrow points from the '0 alt.(ft)' in the main interface to the 'Setpoint' field in the popup.

AutoExplor predicts platen condensation will occur. It seems logical that the dew point will be reached and therefore condensation will form on the aircraft's cold wings when the plane is landed.

Notice that pressure and temperature recipe controllers do not have a soak time input field like the Home Page manual controls ([Sec. 3.3.1, p. 12](#)). To add a period of time after all step end conditions are satisfied where the controllers remain at their current states, add a time-only step.

Add a step (Step 3).

STEP 3:

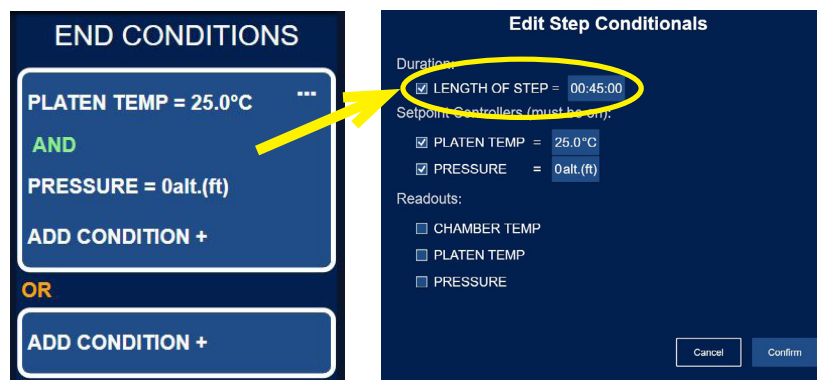
In Step 3, the aircraft is to remain on the tarmac for 45 minutes.

When Step 3 is added, Step 2 conditions (platen temp and pressure) are replicated.

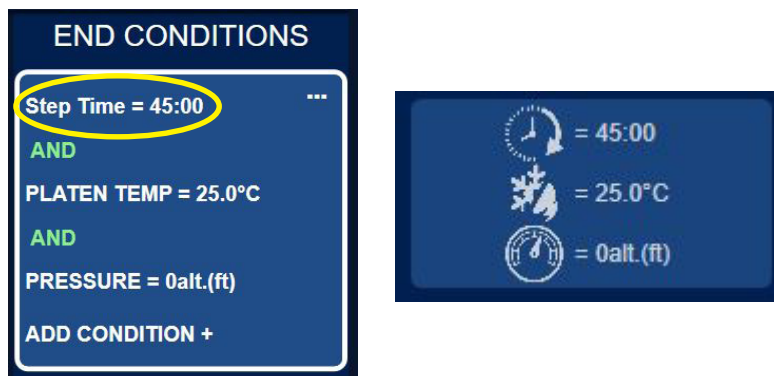
	Initial	1	2	3
HIGH VAC				
VENT				
PURGE				
PRECHILL				
ROUGH				
CHAMBER TEMP				
PLATEN TEMP	25.0 °C	-56.5 °C	25.0 °C	25.0 °C
PRESSURE		43.0K alt.(ft)	0 alt.(ft)	0 alt.(ft)
LOOPS	Cannot Loop	1x	1x	1x
STEP CONDITIONS	= 10:00 = 25.0°C	= 03:30:00 = -56.5°C = 43.0Kalt.(ft)	= 25.0°C = 0alt.(ft)	= 25.0°C = 0alt.(ft)

Press or click the END CONDITIONS box at the top right of the screen.

At the Edit Step Conditionals popup, set the LENGTH OF STEP to 45 minutes.



The Step Time is added into the END CONDITIONS box and also appears in the Step 3 STEP CONDITIONS.



Add a step (Step 4).

STEP 4:

All the recipe steps required for the basic simulation have been made.

In Step 4, the PLATEN TEMP AND PRESSURE CONTROLLERS are turned off.

The recipe ends.

	Initial	1	2	3	4
HIGH VAC					
VENT					
PURGE					
PRECHILL					
ROUGH					
CHAMBER TEMP					
PLATEN TEMP	25.0 °C	-56.5 °C	25.0 °C	25.0 °C	
PRESSURE		43.0K alt. (ft)	0 alt. (ft)	0 alt. (ft)	
LOOPS	Cannot Loop	1x	1x	1x	1x
STEP CONDITIONS	= 10:00 = 25.0°C	= 03:30:00 = -56.5°C = 43.0Kalt. (ft)	= 25.0°C = 0alt. (ft)	= 45:00 = 25.0°C = 0alt. (ft)	None

However, the simulation parameters call for the flight to be repeated 6 more times. AutoExplor’s LOOP function is used here.

USING THE LOOP FUNCTION:

AutoExplor’s LOOP function eliminates copying and pasting steps repeatedly. Any number of consecutive steps can be grouped, and an unlimited number of loop repetitions are possible.

For this Aircraft Altitude simulation, press or click the LOOPS tile of Step 1.

At the Edit Loop Parameters popup, enter the first and last steps to be grouped and the number of repetitions (cycles). In this simulation, the loop begins at Step 1 and ends at Step 3. The loop is repeated 6 times.

	Initial	1
HIGH VAC		
VENT		
PURGE		
PRECHILL		
ROUGH		
CHAMBER TEMP		
PLATEN TEMP	25.0 °C	-56.5 °C
PRESSURE		43.0K alt. (ft)
LOOPS	Cannot Loop	1x
STEP CONDITIONS	= 10:00 = 25.0°C	= 03:30:00 = -56.5°C = 43.0Kalt. (ft)

Edit Loop Parameters

Start Step: − 1 +

End Step: − 3 +

Cycles: − 6 +

Remove

Cancel

Update

	Initial	1	2	3	4
HIGH VAC					
VENT					
PURGE					
PRECHILL					
ROUGH					
CHAMBER TEMP					
PLATEN TEMP	25.0 °C	-56.5 °C	25.0 °C	25.0 °C	
PRESSURE		43.0K alt. (ft)	0 alt. (ft)	0 alt. (ft)	
LOOPS	Cannot Loop	6x			1x
STEP CONDITIONS	= 10:00 = 25.0°C	= 03:30:00 = -56.5°C = 43.0K alt. (ft)	= 25.0°C = 0 alt. (ft)	= 45:00 = 25.0°C = 0 alt. (ft)	None

Note that the recipe log stops immediately when a recipe ends ([Sec. 6.2, p. 49](#)).

Aircraft Altitude Simulation

Initial 1 2 3 4

Control / Condition	Initial	1	2	3	4
HIGH VAC					
VENT					
PURGE					
PRECHILL					
ROUGH					
CHAMBER TEMP					
PLATEN TEMP	25.0 °C	-56.5 °C	25.0 °C	25.0 °C	
PRESSURE		43.0K alt (ft)	0 alt (ft)	0 alt (ft)	
LOOPS	Cannot Loop		6x		1x
STEP CONDITIONS	= 10:00 = 25.0°C	= 03:30:00 = -56.5°C = 43.0Kalt.(ft)	= 25.0°C = 0alt.(ft)	= 45:00 = 25.0°C = 0alt.(ft)	None

END CONDITIONS

Step Time = 03:30:00 ***
AND
PLATEN TEMP = -56.5°C
AND
PRESSURE = 43.0Kalt.(ft)
ADD CONDITION +

OR
ADD CONDITION +

Recipe Settings...

New Open...
Save Save As...

Run
Stop

Status: NORMAL Running

Estimated Recipe Time: 01:02:17:14

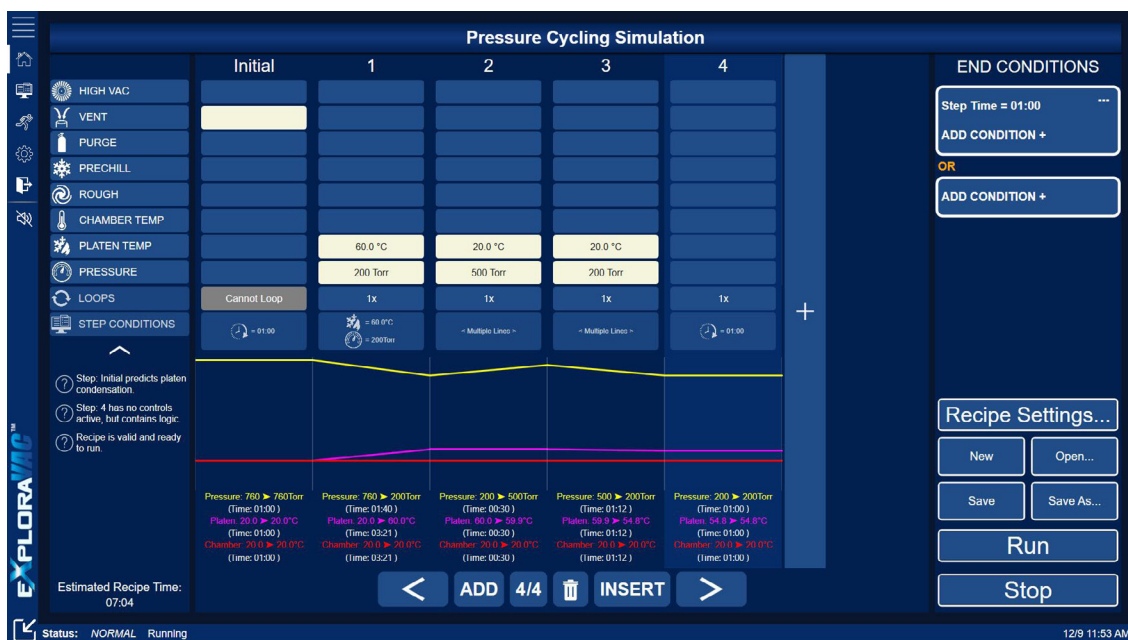
12/12 03:24 PM

5.2 PRESSURE CYCLING SIMULATION

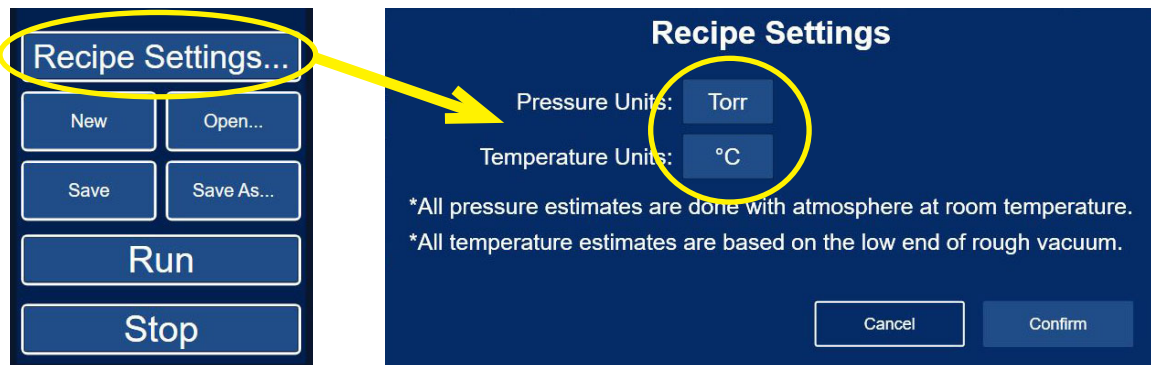
This example simulates a process where a test object is subjected to variable pressure while its temperature is steadily decreased. The simulation demonstrates the use of AutoExplor's recipe OR logic and the application of the Goto Step conditional behavior function.

It is assumed that the reader has familiarized themselves with basic AutoExplor recipe building methods including how to add steps, input controller setpoints, ramp rates and deviations, as discussed in the previous Aircraft Altitude Simulation example ([Sec. 5.1, p. 28](#)).

This recipe begins with the system at ambient temperature and pressure. The platen temperature is increased to 60°C and the pressure decreased to 200 Torr. The pressure is then oscillated between 500 and 200 Torr while the platen temperature is ultimately reduced to 20°C. When the platen reaches 20°C the recipe ends. For this simulation, the ExploraVAC system must be equipped with pressure control and a heated and cooled platen. Below is the entire recipe.



Before beginning, go to RECIPE SETTINGS at the bottom right of the screen. Set Pressure Units to Torr and Temperature Units to °C (the defaults).

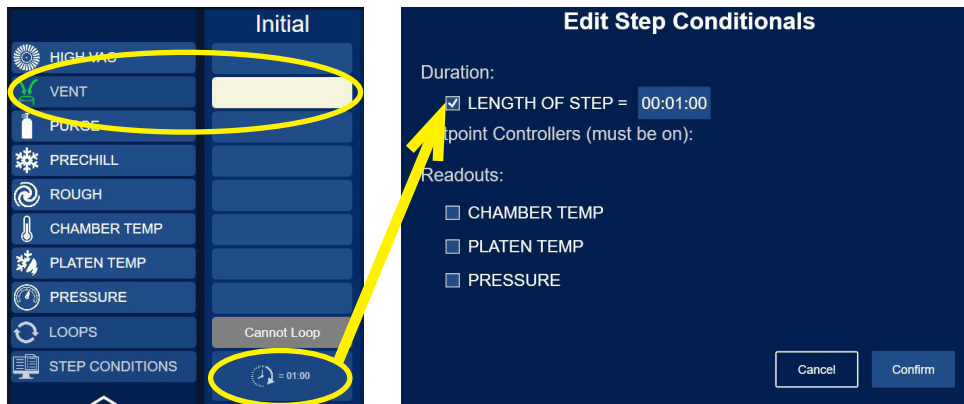


INITIAL STEP:

In the Initial Step, turn on the VENT tile.

Select STEP CONDITIONS and set the LENGTH OF STEP to one minute. This ensures that the chamber pressure is at ambient atmosphere before starting the cycling process. After one minute has elapsed (the Initial Step end condition), the recipe proceeds to Step 1.

Note that the Edit Step Conditionals popup allows only setpoints and readout thresholds to be input. Controller ramp rates and deviations can not be changed in this popup.



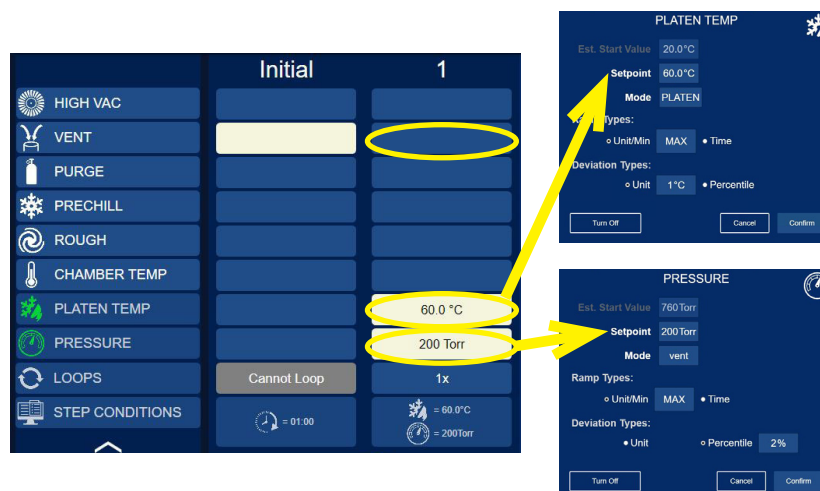
Add a new step (Step 1).

STEP 1:

At Step 1 turn off the VENT tile.

Turn on the PLATEN TEMP tile. In the PLATEN TEMP popup set the setpoint temperature 60.0°C, and the ramp rate to MAX. Arbitrarily set the deviation to 1°C.

Turn on the PRESSURE tile. In the PRESSURE popup set the pressure to 200 Torr, the ramp rate to MAX, and leave the deviation at 2% (default).



Note that only in the individual controller popups (i.e., PLATEN TEMP and PRESSURE), can ramp rates and deviations be changed. Compare this to the Edit Step Conditionals popup (above) where only setpoints and readout thresholds can be changed.

STEP 2:

In Step 2, set the PLATEN TEMP to 20°C and the PRESSURE to 500 Torr. The ramp rates and deviations settings are automatically copied from Step 1.

	Initial	1	2
HIGH VAC			
VENT			
PURGE			
PRECHILL			
ROUGH			
CHAMBER TEMP			
PLATEN TEMP		60.0 °C	20.0 °C
PRESSURE		200 Torr	500 Torr
LOOPS	Cannot Loop	1x	1x
STEP CONDITIONS	01:00	60.0°C 200 Torr	< Multiple Lines >

The Step 2 END CONDITIONS box in the top right of the screen now includes both the PLATEN TEMP and PRESSURE setpoints in the first box. Currently, Step 2 is set to end when the PLATEN TEMP reaches 20°C, AND the Pressure reaches 200 Torr.

END CONDITIONS

PLATEN TEMP = 20.0°C

AND

PRESSURE = 500Torr

ADD CONDITION +

OR

ADD CONDITION +

Now, AutoExplor's OR logic is used to set up two possible Step 2 end conditions: EITHER the recipe proceeds when the platen temperature target is met, OR it proceeds when the the target pressure is met.

USING OR LOGIC:

Press or click on the END CONDITIONS box.

In the Edit Step Conditionals popup, deselect (uncheck) the PRESSURE controller.

Leave PLATEN TEMP checked.

END CONDITIONS

PLATEN TEMP = 20.0°C

AND

PRESSURE = 500Torr

ADD CONDITION +

OR

ADD CONDITION +

Edit Step Conditionals

Duration:

☐ LENGTH OF STEP =

Setpoint Controllers (must be on):

☒ PLATEN TEMP = 20.0°C

☐ PRESSURE =

Readouts:

☐ CHAMBER TEMP

☐ PLATEN TEMP

☐ PRESSURE

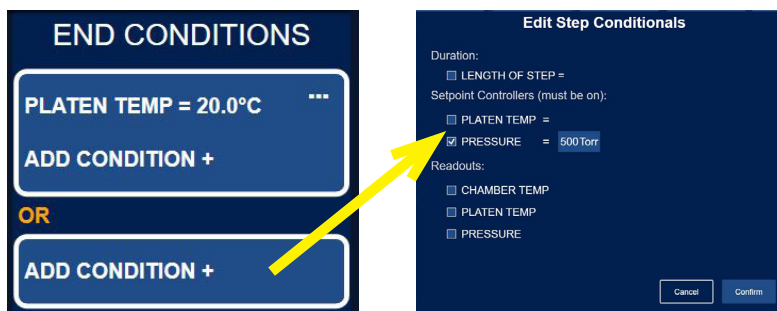
Cancel Confirm

Now there is only the PLATEN TEMP in the END CONDITIONS box.

Press or click the OR box.

In the Edit Step Conditionals popup, deselect the PLATEN TEMP controller.

Leave PRESSURE checked.



Step 2 will now end when EITHER the Platen Temperature reaches 20°C, OR when the Pressure reaches 200 Torr.



The first time Step 2 is run, it will end when the pressure target is reached since it will take less time for the chamber to vent from 200 to 500 Torr than for the platen temperature to decrease from 60°C to 20°C.

When Step 2 ends (the first time), the PLATEN TEMP will still be cooling towards the 20°C setpoint.

Add a step (Step 3).

STEP 3:

In Step 3, the PLATEN TEMP setpoint is kept at 20°C. The PRESSURE target is set to 200 Torr.

	Initial	1	2	3
HIGH VAC				
VENT				
PURGE				
PRECHILL				
ROUGH				
CHAMBER TEMP				
PLATEN TEMP		60.0 °C	20.0 °C	20.0 °C
PRESSURE		200 Torr	500 Torr	200 Torr
LOOPS	Cannot Loop	1x	1x	1x
STEP CONDITIONS	= 01:00	= 60.0°C = 200Torr	< Multiple Lines >	< Multiple Lines >

Similar to Step 2, the Step 3 END CONDITIONS box initially has both the PLATEN TEMP AND the PRESSURE setpoints in it.

END CONDITIONS

PRESSURE = 200Torr

AND

PLATEN TEMP = 20.0°C

ADD CONDITION +

OR

ADD CONDITION +

Just like in Step 2, AutoExplor's OR logic must be applied to this step's end conditions so that the recipe can proceed when only one of the controller setpoints is reached, not both.

Separate the step end conditons (use the same method as in [Sec. 5.2, Step 2, p. 37](#)..

END CONDITIONS

PLATEN TEMP = 20.0°C

ADD CONDITION +

OR

PRESSURE = 200Torr

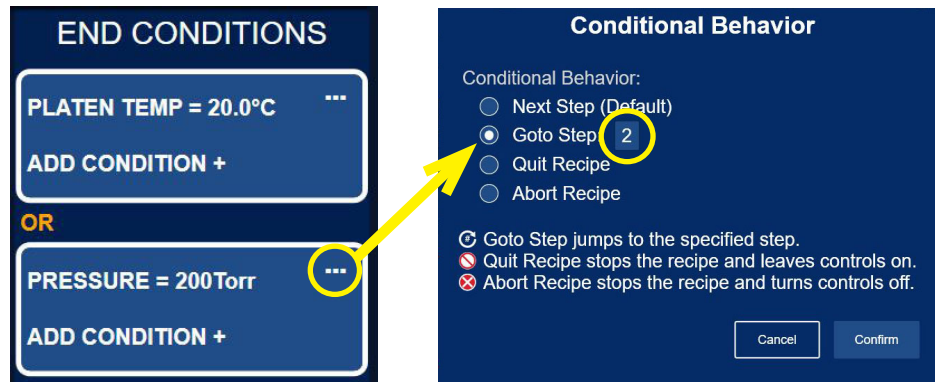
ADD CONDITION +

USING THE GOTO STEP FUNCTION:

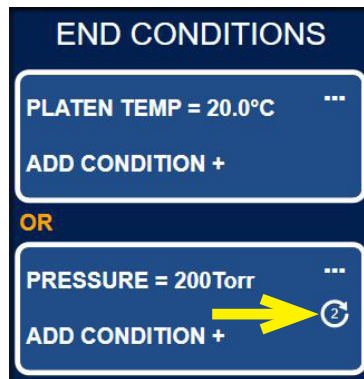
Press or click the short dashed line in the upper right corner of the OR box.

In the Conditional Behavior popup, select the Goto Step option.

Fill in the Goto Step field with a “2”.



The OR Box shows the Goto circular arrow icon with a “2” inside it.



The recipe will now jump back to Step 2 if the pressure reaches 200 Torr before the platen temperature reaches 20°C. Alternatively, if the platen temperature reaches 20°C before the pressure reaches 200 Torr, the recipe will go on to the next step.

The combination of using OR logic in the end conditions of Steps 2 and 3, combined with the use of the Goto Step function in Step 3, makes the recipe continually cycle between Steps 2 and 3. The pressure oscillates between 200 and 500 Torr until the platen temperature finally reaches the 20°C setpoint. When it does, the pressure will be somewhere between 200 and 500 Torr, and the recipe will move on to the next step.

Add a step (Step 4).

STEP 4:

At Step 4, the PLATEN TEMP and PRESSURE controllers are turned off and the recipe ends.

The Pressure Cycling Simulation recipe is complete.

The following page shows the completed recipe steps and each step's end conditions along with the recipe log graph which illustrates how this simulation behaves.

Below are shown all the recipe steps along with each step's end conditons.

	Initial	1	2	3	4
HIGH VAC					
VENT					
PURGE					
PRECHILL					
ROUGH					
CHAMBER TEMP					
PLATEN TEMP		60.0 °C	20.0 °C	20.0 °C	
PRESSURE		200 Torr	500 Torr	200 Torr	
LOOPS	Cannot Loop	1x	1x	1x	1x
STEP CONDITIONS	= 01:00	= 60.0°C = 200Torr	< Multiple Lines >	< Multiple Lines >	= 01:00

END CONDITIONS

Step Time = 01:00
ADD CONDITION +
OR
ADD CONDITION +

END CONDITIONS

PLATEN TEMP = 60.0°C
AND
PRESSURE = 200Torr
ADD CONDITION +
OR
ADD CONDITION +

END CONDITIONS

PLATEN TEMP = 20.0°C
ADD CONDITION +
OR
PRESSURE = 500Torr
ADD CONDITION +

END CONDITIONS

PLATEN TEMP = 20.0°C
ADD CONDITION +
OR
PRESSURE = 200Torr
ADD CONDITION +

END CONDITIONS

ADD CONDITION +

Below, in the Pressure Cycling Simulation recipe log graph, the recipe begins with the chamber venting. After one minute, the platen temperature is increased to 60°C and the pressure is lowered to 200 Torr (Step 1). The recipe cycles pressure between 500 and 200 Torr three times (Steps 2 and 3) while the platen temperature is constantly lowered towards its target setpoint of 20°C. The recipe ends when the platen reaches its 20°C setpoint (Step 4). The pressure at the end of the recipe is just over 200 Torr.



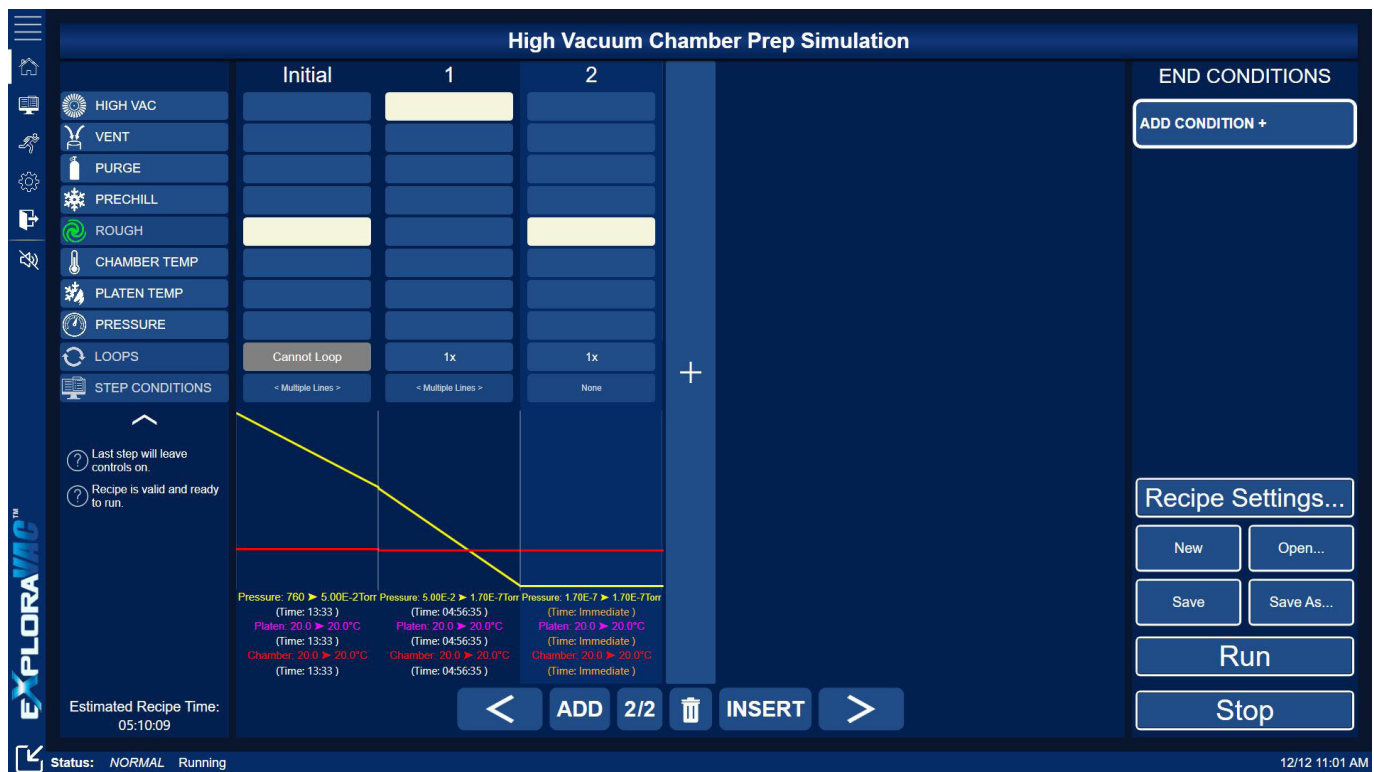
For more detailed information about AutoExplor logs, go to [Chapter 6, p. 48](#).

5.3 HIGH VACUUM CHAMBER PREP SIMULATION

This example simulates a process where the chamber is prepped for a future experiment in the high vacuum regime. The simulation demonstrates the application of AutoExplor's Quit Recipe and Abort Recipe conditional behavior functions.

It is assumed that the reader has familiarized themselves with the basic and some of the more advanced AutoExplor recipe building methods as discussed in the Aircraft Altitude Simulation example ([Sec. 5.1, p. 28](#)), and the Pressure Cycling Simulation example ([Sec. 5.2, p. 35](#)).

This recipe begins with the system at ambient temperature and pressure. The chamber is roughed, then the high vacuum turbo pump is turned on. If and when the chamber reaches high vacuum, the pumps continue operating and the chamber remains at high vacuum for an indefinite time. If there is a leak which would not allow the chamber to achieve high vacuum, the recipe is stopped and the pump is turned off to protect it. For this simulation, the ExploraVAC system must have the high vacuum option (a turbo pump) installed. The pressure control option is not required. Below is the entire recipe.

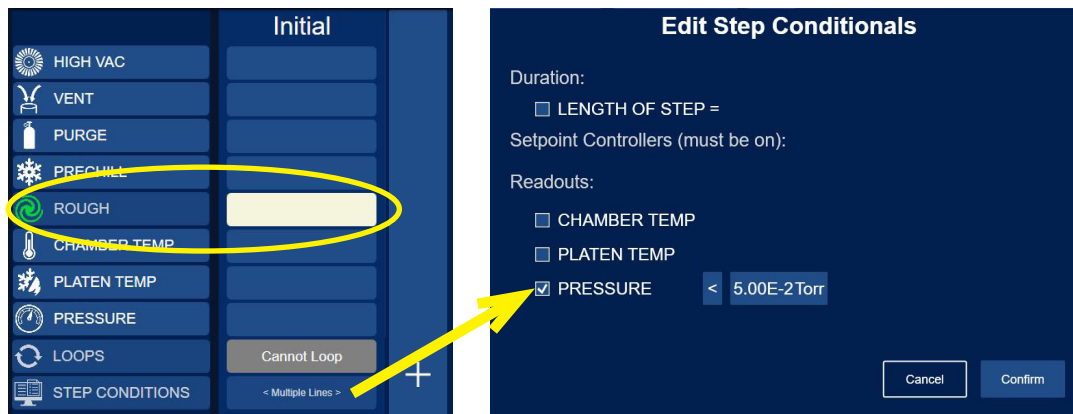


Before beginning, check that the RECIPE SETTINGS are set to the defaults (Torr and °C).

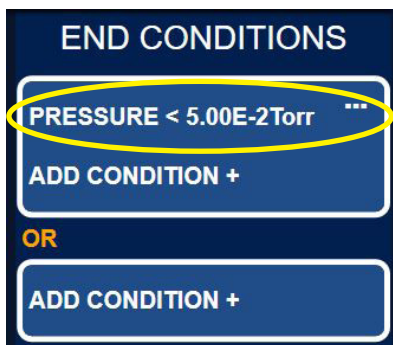
INITIAL STEP:

Turn on ROUGH.

Select STEP CONDITIONS and set the PRESSURE readout to less than 50 mTorr. This ensures that the chamber pressure is below the high vacuum crossover pressure threshold and that the high vacuum pump can be turned on safely in the following step. Note that AutoExplor logic would not allow the turbo pump to turn on before the pressure threshold was met at any rate.



Once the pressure readout threshold value has been entered, the END CONDITIONS box shows the pressure step end requirement.



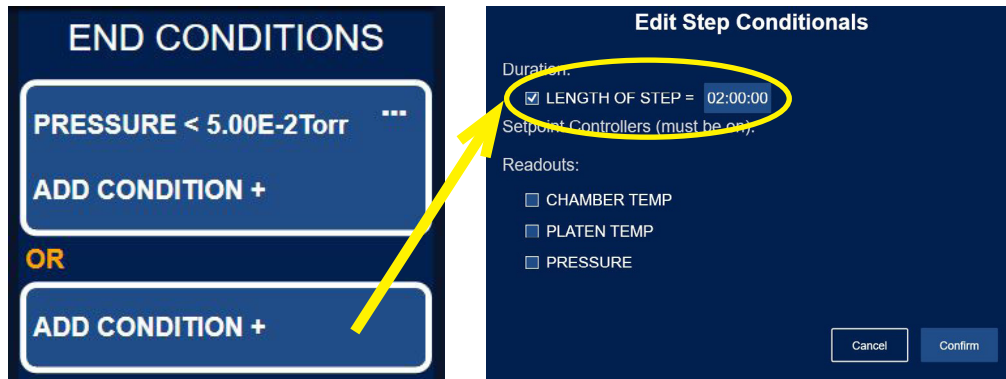
If the chamber or a vacuum line develops a leak, the roughing pump would run continuously at close to ambient pressure. It would eventually overheat, possibly cause decreased pump longevity or damage, and cause a system fault and shutdown.

Here, the Abort Recipe function can be used to safeguard the roughing pump.

USING THE ABORT RECIPE FUNCTION:

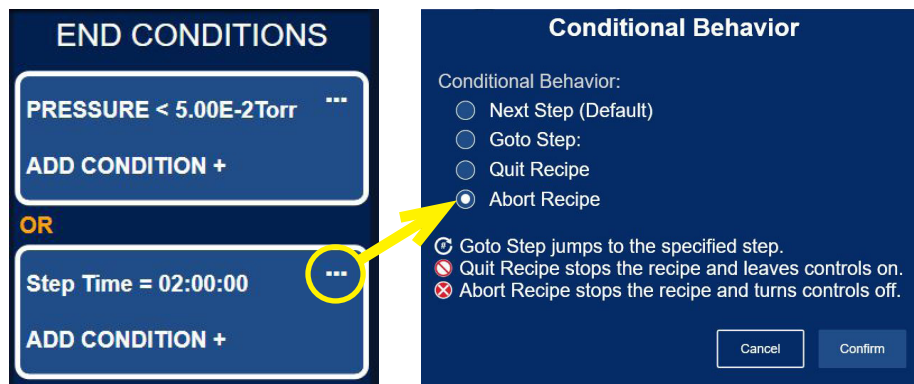
Click or press the OR box.

In the EDIT STEP CONDITIONALS popup, enter 2 hours for the LENGTH OF STEP.



Press or click the short dashed line in the upper right corner of the OR box.

In the Conditional Behavior popup, select the Abort Recipe option.



The OR Box shows the Abort Recipe red “X” icon.



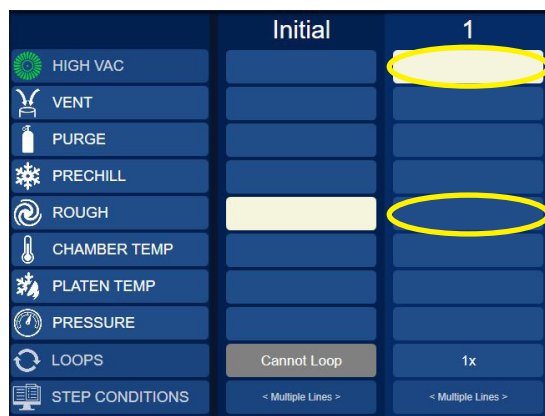
Now, the Initial Step END CONDITIONS require the roughing pump pressure to reach < 50 mTorr within two hours. Two hours should be long enough for the pump to get to the threshold pressure. If, in two hours, the chamber has not reached the threshold pressure, it means that there is a leak somewhere in the system. In that case, the Abort Recipe function ends the recipe and turns off controllers and devices (i.e., roughing pump) thereby protecting the pump from overheating.

Add a step (STEP 1):

STEP 1:

At Step 1 turn off ROUGH and turn on the HIGH VAC control.

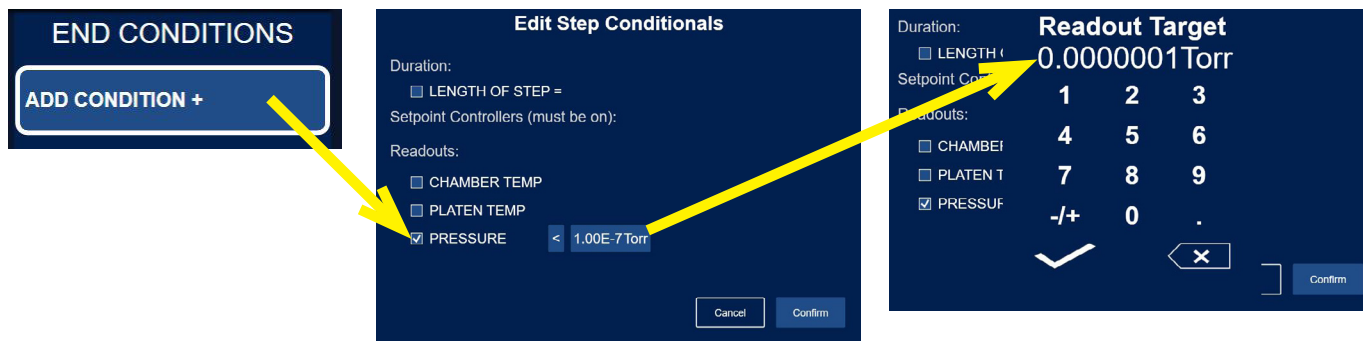
Note that even though the ROUGH (a controller) is turned off, the roughing pump (a device) will remain on when HIGH VAC is on.



Press or click the END CONDITIONS box.

In the Conditional Behavior popup, enter $<10^{-7}$ Torr for the readout pressure.

Type ".0000001" Torr in the Readout Target popup.



Once the pressure readout threshold value has been entered, the END CONDITIONS box shows the pressure step end requirement.



When the pressure threshold value of $<10^{-7}$ Torr is achieved, the simulation calls for high vacuum to be maintained indefinitely.

Here, the Quit Recipe function can be used to stop the recipe now while maintaining high vacuum.

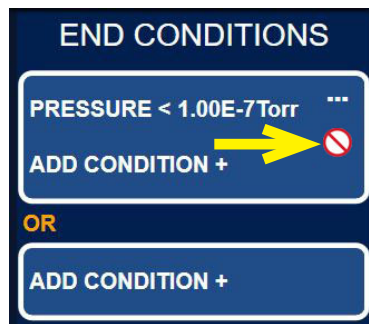
USING THE QUIT RECIPE FUNCTION:

Press or click the short dashed line in the upper right corner of the OR box.

In the Conditional Behavior popup, select the Quit Recipe option.



The OR Box shows the Quit Recipe red and white “no” icon.



When the high vacuum pressure reaches the 10^{-7} Torr threshold, the Quit Recipe function stops the recipe at Step 1 and gives back manual system control. Unlike the Abort Recipe function behavior, the Quit Recipe function stops the recipe but keeps everything on as it is. Here, the roughing and high vacuum pumps remain on until they are turned off or until another recipe is run.

The roughing pump is protected in the Initial Step. Add a similar step end condition in this step to protect the high vacuum pump.

Click or press the OR box.

In the EDIT STEP CONDITIONALS popup, enter 14 hours for the LENGTH OF STEP.



Now, after 14 hours, the recipe will advance to the next step unless the pressure reaches the target threshold, leaving high vacuum and roughing pumps on (Quit Recipe).

END CONDITIONS

PRESSURE < 1.00E-7Torr

ADD CONDITION +

OR

Step Time = 14:00:00

ADD CONDITION +

Add a step (Step 2).

STEP 2:

At Step 2 HIGH VAC is turned off and ROUGH is turned on. No end conditions are specified.

The recipe ends.

If, after 14 hours, the high vacuum pressure threshold is not met, there must be a leak in the high vacuum line. The recipe turns off the high vacuum pump, but keeps the roughing pump on.

Here is the entire High Vacuum Chamber Prep Simulation recipe.

High Vacuum Chamber Prep Simulation

HIGH VAC

VENT

PURGE

PRECHILL

ROUGH

CHAMBER TEMP

PLATEN TEMP

PRESSURE

LOOPS

STEP CONDITIONS

Initial

1

2

Cannot Loop

1x

1x

< Multiple Lines >

< Multiple Lines >

None

END CONDITIONS

ADD CONDITION +

Recipe Settings...

New

Open...

Save

Save As...

Run

Stop

Pressure: 760 ▶ 5.00E-2Torr (Time: 13:33)

Platen: 20.0 ▶ 20.0°C (Time: 13:33)

Chamber: 20.0 ▶ 20.0°C (Time: 13:33)

Pressure: 5.00E-2 ▶ 1.70E-7Torr (Time: 04:56:35)

Platen: 20.0 ▶ 20.0°C (Time: 04:56:35)

Chamber: 20.0 ▶ 20.0°C (Time: 04:56:35)

Pressure: 1.70E-7 ▶ 1.70E-7Torr (Time: Immediate)

Platen: 20.0 ▶ 20.0°C (Time: Immediate)

Chamber: 20.0 ▶ 20.0°C (Time: Immediate)

Estimated Recipe Time: 05:10:09

< ADD 2/2 INSERT >

Status: NORMAL Running

12/12 11:01 AM

6. RUN/LOGS PAGE (PREMIUM VERSION ONLY)

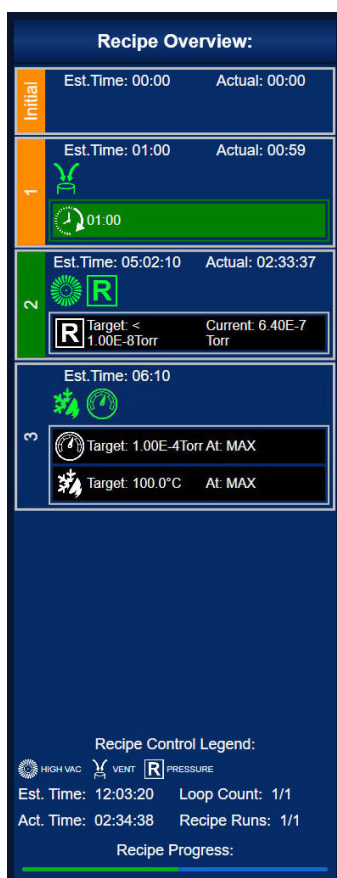


The Run/Logs page is available in the full version of the AutoExplor software. This page has three distinct sections: (1) Recipe Overview, (2) Log Graphs, and (3) File Management.



6.1 RECIPE OVERVIEW

1



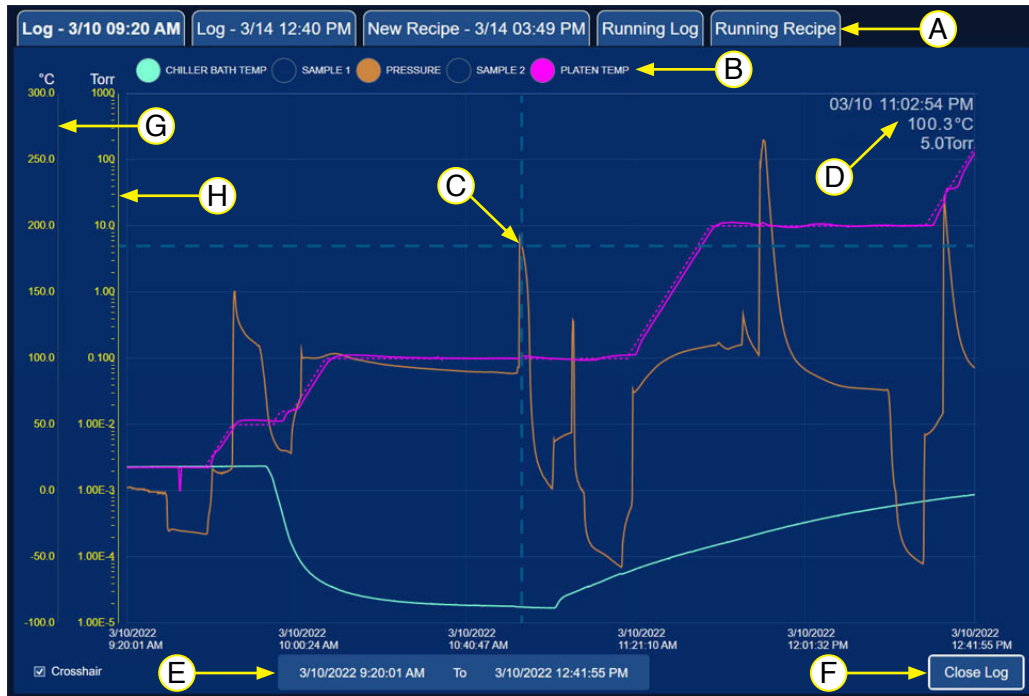
The recipe overview section displays a synopsis of each step of the currently running recipe in individual step blocks. Each step block shows pertinent step information including:

- Estimated and actual step times.
- Subsystems and readouts used, or to be used for that step (indicated by green device or readout icons).
- Each readout and setpoint controller's target step condition(s) and its current value. Green indicates the condition(s) have been met, black indicates the condition(s) are not yet met.
- The step's completion status with a vertical colored bar on the left of the step block. An orange bar indicates the step has finished. A green bar indicates it is the currently active step. A blue bar indicates the step has not yet started.

At the bottom of this section, the software calculates the total estimated process time for the recipe and shows a progress bar. It also shows the actual process time from the start of the recipe and how many times the recipe has run in the current session.

6.2 LOG GRAPHS

2



In premium versions of AutoExplor, the software creates and automatically stores three different data log types: Chamber, Recipe, and Device. These logs are saved as .CSV files and can be opened in Microsoft Excel® or any other application that can open comma separated files.

The three log types are saved in **C:\Users\Public\Documents\IdealVac\Logs** by default. The storage location can be changed by the user ([Sec. 7.4, p. 56](#)).

CHAMBER LOGS:

Chamber logs contain all the raw data that makes up the running graph in the home page. The data set includes not just the raw data, but also events, such as when a device controller turns on or off. A new chamber log is generated every time the ExploraVAC is turned on. Data is continuously collected until the instrument is turned off.

RECIPE LOGS:

When a new recipe file is created, it is stored in the "RecipeLog-New Recipe" folder. When a recipe is run, a new recipe log folder ("RecipeLog_Name of Recipe") is generated. Data collection starts when the recipe run button is pressed (from either the Recipes or Run/Logs page), and continues until the recipe is finished. The actual log file (.csv) is stored in the recipe folder and is named with the recipe name, start date, and time which distinguishes each individual run.

DEVICE LOGS:

Device logs collect data card information about all the different devices in the system. This information can be useful for diagnosing a system issue. Device Log data cannot be graphed.

It is not necessary to choose which of the three log types will be created. All three log types are automatically generated unless deselected in the Settings/Log Settings page ([Sec. 7.4, p. 56](#)).

LOG GRAPH PARTS: (refer to the log graph image on the previous page).



Multiple log graphs can be opened simultaneously and each has a selectable tab at the top of the page. In the example above from the previous page, the graph of the 3/10 09:20 AM stored log is currently displayed (bold tab).

Any number of saved logs can also be opened and graphed. Each log graph will have a tab with the start date and time. In the example above, two stored log graphs are open.

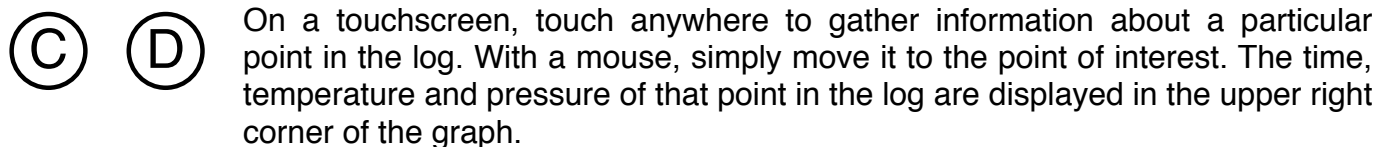
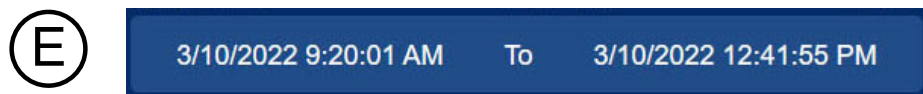
The New Recipe tab shows a graph of a recipe which has run, but the recipe has not been saved.

The Running Log tab shows a graph of the live chamber data stream (chamber log). It is similar to the Running Graph on the Home page. It differs in that it shows the complete chamber log as compared to the Home page running graph which shows just the last hour.

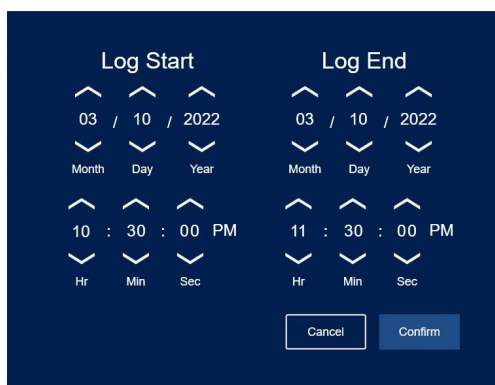
The Running Recipe tab shows live stream data from the currently running recipe.



Controllers and readouts that can be graphed are shown below the tabs (**A**). Select a dot to turn the associated graph line on and off. This makes it easy to choose only the desired information. Above, the sample readouts are turned off. Press and hold, or right click on a dot to select a new dot and graph line color.

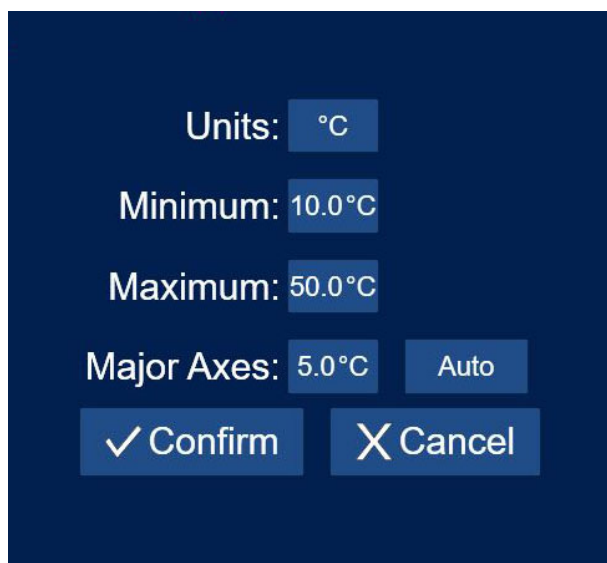


Below the graph, the beginning and ending log time is shown. When this field is selected, a popup appears (below) that allows the time period shown on the graph to be changed. This is useful to be able to examine more closely only a small part of a lengthy log. Both the start and end times can be changed. Below, the period between 10:30 and 11:30 PM is chosen.



F The close log button closes the log that is currently showing.

G **H** When either the vertical temperature or pressure scale is selected, a window appears that allows you to change axis units, overall scale and scale divisions.



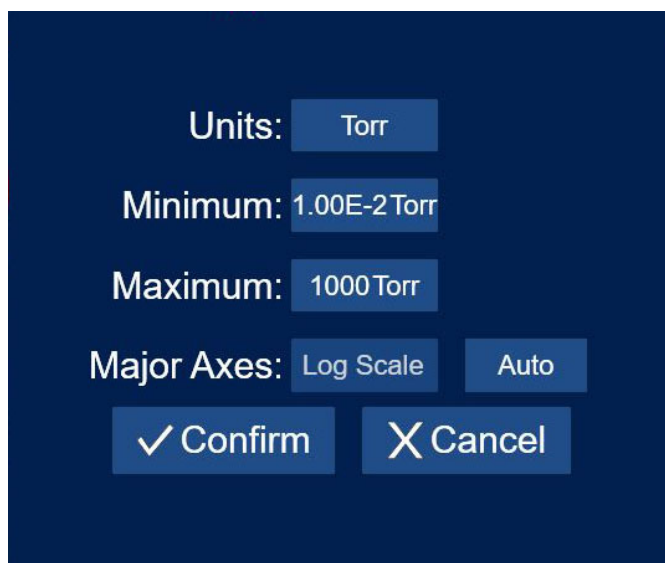
Units: °C

Minimum: 10.0°C

Maximum: 50.0°C

Major Axes: 5.0°C Auto

✓ Confirm X Cancel



Units: Torr

Minimum: 1.00E-2 Torr

Maximum: 1000 Torr

Major Axes: Log Scale Auto

✓ Confirm X Cancel

OTHER WAYS TO SCALE THE LOG GRAPH:

When a log file is graphed, the X axis time is scaled to fit the screen. The Y axis is scaled to fit the data. In addition to being able to rescale a log graph using the aforementioned methods, a log graph can be rescaled by zooming or dragging to achieve the desired results.

On a Touch Screen:

The horizontal and vertical scales can be adjusted by pinching or stretching to zoom from any desired part of the graph. Swiping makes the entire graph move in the swiped direction.

With a Mouse:

On a PC or laptop, the mouse always starts at the crosshair location. Use the scroll wheel to zoom the graph in and out from the crosshair location. Click and drag the mouse to move the graph towards and away from the crosshair. To constrain the graph horizontally, hold down the SHIFT key while scrolling. To constrain the graph vertically, hold down the CTRL key while scrolling.

6.3 FILE MANAGEMENT

3



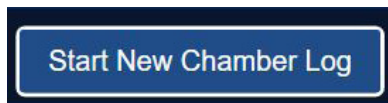
The file management section is where the user can load and run previously saved recipes. Note that recipes cannot be edited in the logs page (only in the recipe page).



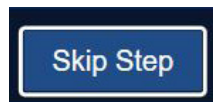
Chamber and Recipe Logs that have been generated from previously run recipes can be loaded here. Each time a recipe is run, a separate chamber and recipe log are automatically generated. The Load Log button is used to open a saved log for further examination, or to open logs from multiple runs of the same recipe for comparison.



The Start New Chamber Log button restarts the chamber log graph from the moment of reset. This can be used to separate out large amounts of irrelevant log data generated from between the time of system power up and when a manually operated process or recipe is run. The Running Graph on the home page is not restarted when the chamber log is restarted.

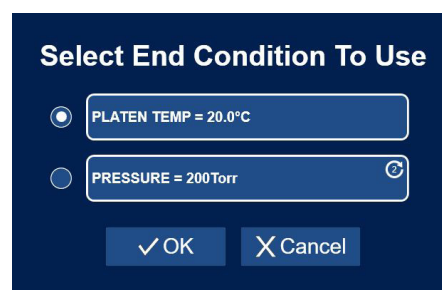


The Skip Step button is used on running recipes to instantly jump to the next recipe step. This can be useful to speed up a recipe. For example, maybe the recipe calls for certain exacting step end conditions and the user decides the step is “close enough” to proceed.



If there are multiple step end conditions defined for the current step when the Skip Step button is pressed or clicked, the “Select End Conditions to Use” popup will appear. The user must choose which end condition to use, keeping in mind the step the recipe would go to, or if the recipe would quit or be aborted.

Below, the PLATEN TEMP option will advance the recipe to the next step. The PRESSURE option will send the recipe to Step 2 because it has the Goto Step function in it ([Sec. 4.4, p. 25](#)).

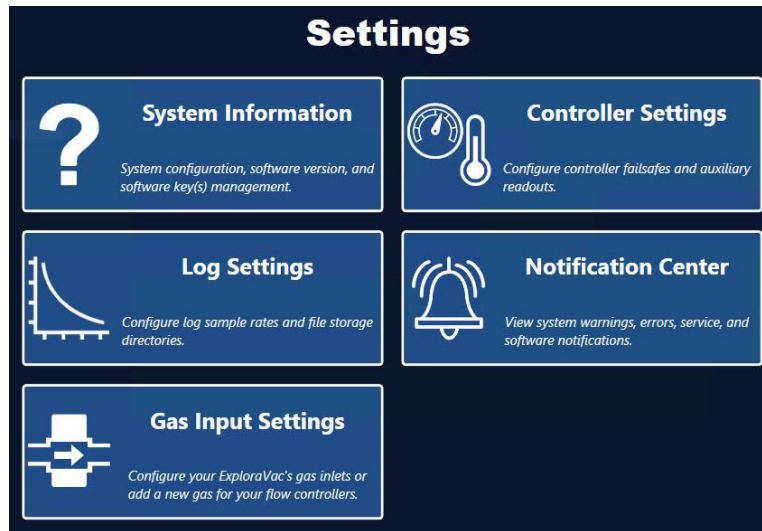


7. SETTINGS PAGE



The AutoExplor Settings page is where system information, including notifications, various adjustable hardware limits, and log data capture frequencies are located.

There are five main sections: System Information, Controller Settings, Notification Center, Log Settings, and Gas Input Settings. Log Setting are available only in the full version of AutoExplor. Gas Input Settings are only available if the system has MFCs. Press or click one of the tiles to access the information.



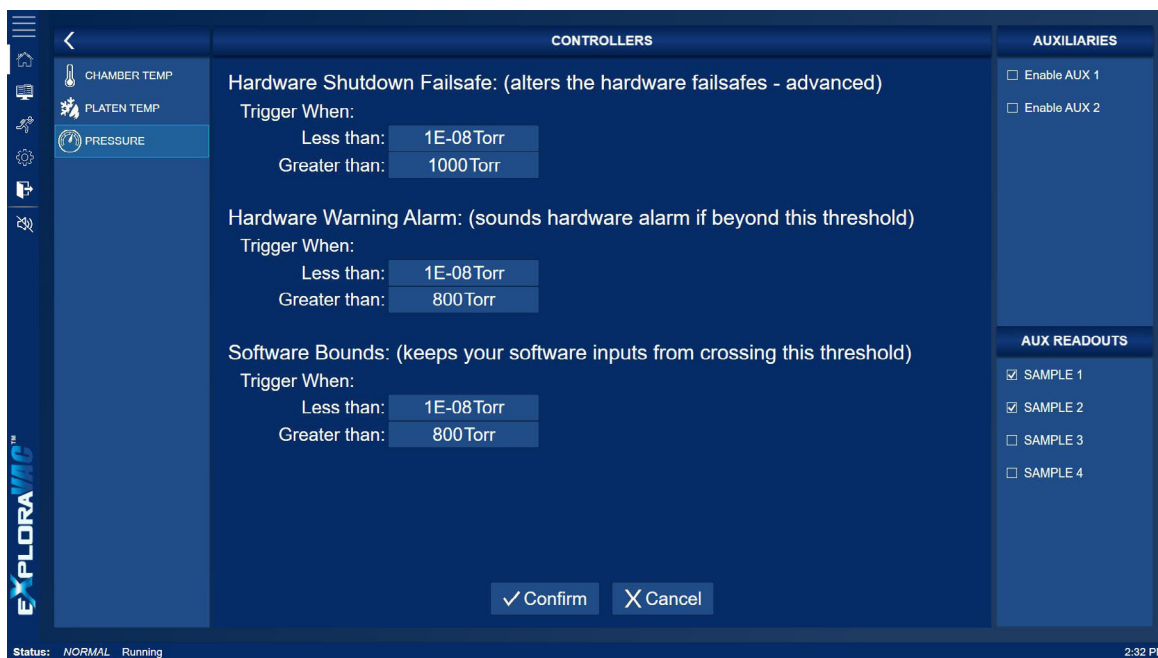
7.1 SYSTEM INFORMATION

When System Information is pressed or clicked, it brings up a window that displays important instrument information, such as serial number, manufacture date, firmware version, and software version. It also has a list of all devices and readouts installed on the instrument. The software key is shown here (login to idealvac.com or contact us for upgrades). The Incoming Network Connections block is for interacting with AutoExplor remotely ([Chapter 8, p. 59](#)).



7.2 CONTROLLER SETTINGS

The Controller Settings page is available on systems with one or more setpoint controllers installed. In this page, each controller's limit may be configured to protect the system or possibly a process. Each limit or trigger can be adjusted according to the user's requirements. In no case can the user set a limit outside of the safe hardware working limits of the ExploraVAC system or its components (refer to the s User Manual).



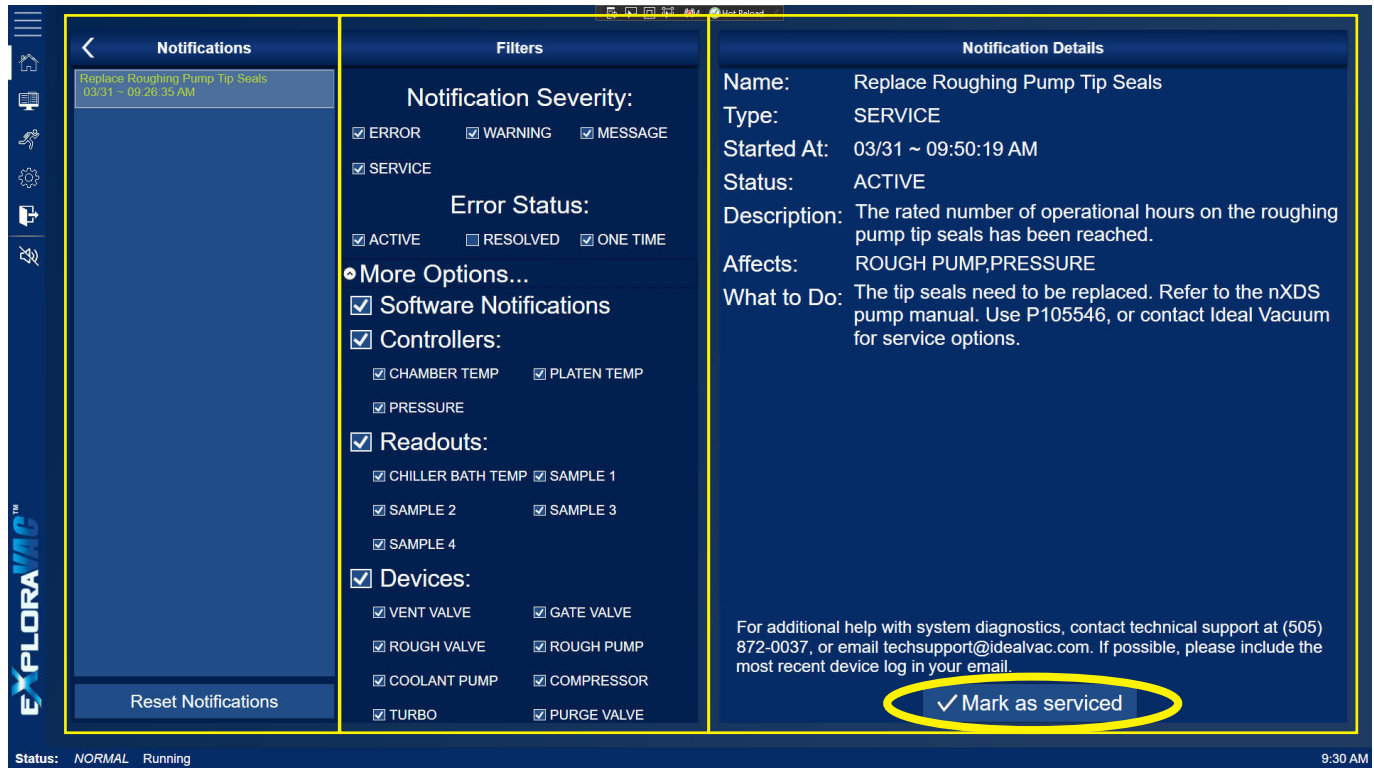
In the example above, the pressure controller is selected in the top left of the screen. This brings up all the pressure controller safeguards in the screen center.

In the top right of the screen, Auxiliaries can be enabled. The number of auxiliaries available (up to 2) is dependent on system configuration. Auxiliaries are used by the user for switching external equipment on and off. Auxilliaries are connected through the DB-15 Aux port on the digital feedthrough panel at the back of the ExploraVAC cabinet.

On the bottom right of the page are a list of all the available Auxilliary Readouts on the system (typically thermocouples) Readouts can be turned on and off from this page. Those readouts that are checked are active. In the basic version of AutoExplor, these readouts are read-only. Their readout values can be viewed in the Additional Readouts on the Home page ([Sec 3.3.5, p. 17](#)). In the premium version of AutoExplor, these readouts can also be used to set recipe end step conditions, either through the Step Conditions tile or the End Conditons box.

7.3 NOTIFICATION CENTER

When the Notification Center field is pressed or clicked, it brings up a window that displays important system and device information. The software supplies system service notifications, warnings and alerts. The screen is divided into three sections: Notifications, Filters, and Notification Details.



Notifications are listed in order of occurrence in the left panel. Warnings are shown in yellow, faults in red/orange, and service messages in green.

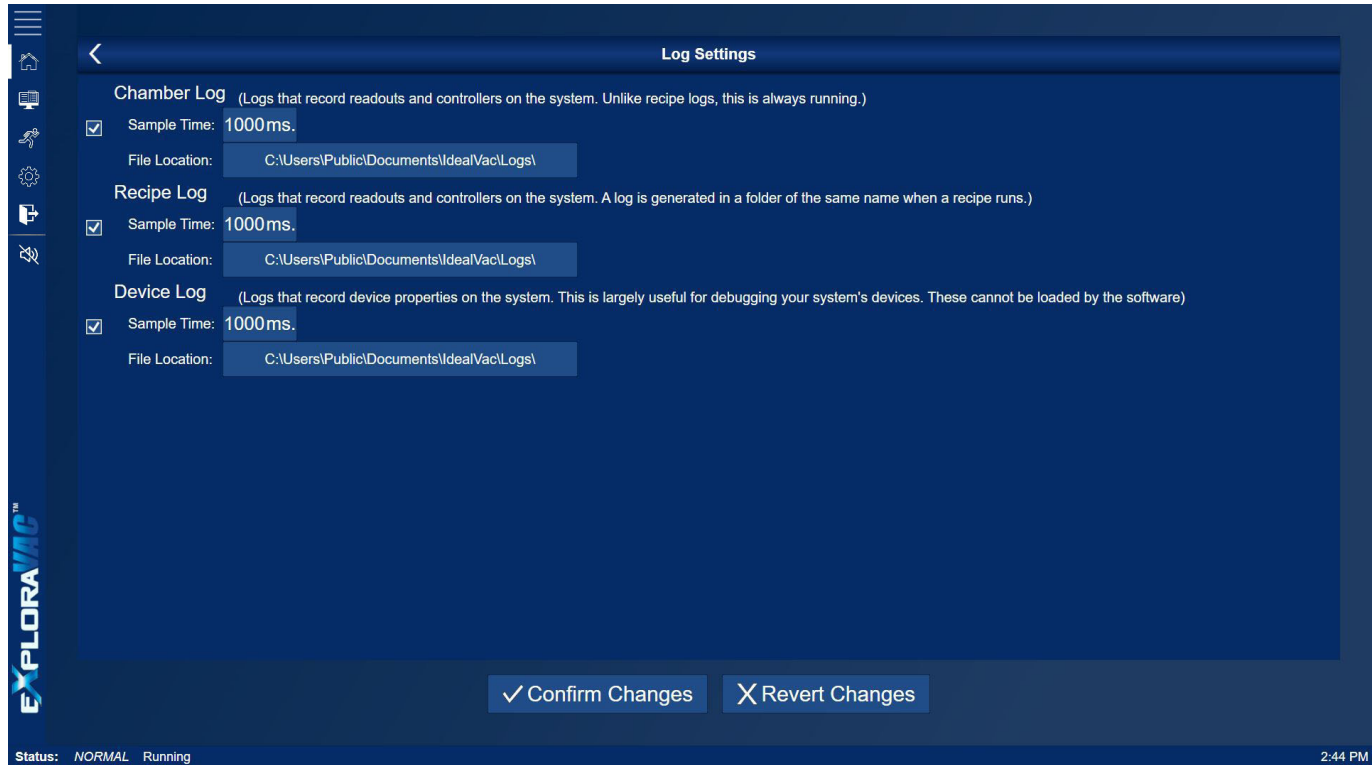
When any notification on the left is clicked or pressed, details about it are displayed on the right in the Notification Details panel. The severity, status, effected components, and the action needed to correct the issue are supplied.

The software keeps track of service intervals and creates a notification when the system requires maintenance. When the required maintenance has been completed, the user informs the software by checking the “Mark as serviced” box. This resets the service counter for that item and the notification is removed. If a maintenance notification repeats or continues after being serviced, there may be another issue causing it, such as a bad sensor. In that case, the reason should be diagnosed and corrected as soon as possible. Also refer to the ExploraVAC User Manual, Sec. 4.13 Faults, and Sec. 4.14 Warnings and Other Subsystem Conditions.

The user chooses the type of notifications that are shown in the Filters center panel. Notification types can be turned on and off so that only the notifications important to the user are displayed. For example, if a warning self-corrects, the user may not want to see that notification.

7.4 LOG SETTINGS

When Log Settings is pressed or clicked, it brings up a window where the user can select any or all of the three log types that are generated (chamber, recipe and/or device). The frequency with which the software collects and saves data points can also be varied (sample time). This page is also where the directory for saving any of the logs can be changed.



The minimum sample time is 200 ms. The maximum is unlimited.

The sample time for any log can be changed while the system is on, or a recipe is processing. This feature might be of interest to the user who wants to collect a lot of data at one point in a process, but doesn't want or need a large volume of data elsewhere. For example, the user might set the starting sample rate to 200 ms. Then, after one minute, might change the rate to 5000 ms.

7.5 GAS INPUT SETTINGS

ExploraVAC systems with MFCs have the Gas Input Settings page.

Before running the system, gases must be connected to the gas inlet panel either on the back of the ExploraVAC or the control console. Once gas lines are connected, enter the gas type for each port in the gas input settings page (below).

NOTE

The AutoExplor **POWER** button must be off in order to configure gas inlet settings.

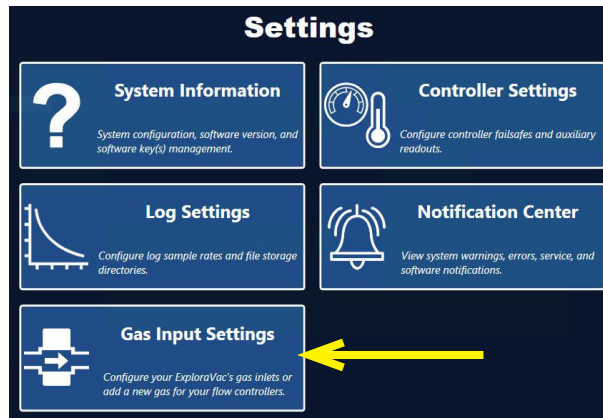
NOTE

Gas settings cannot be changed when remotely accessing AutoExplor via the API or IP Client.



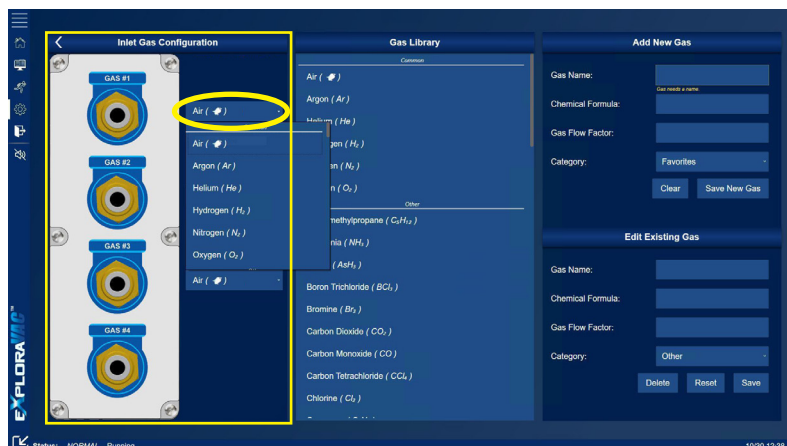
Select the Settings page from the menus at the top left of the screen.

In the Setting page, select Gas Input Settings.



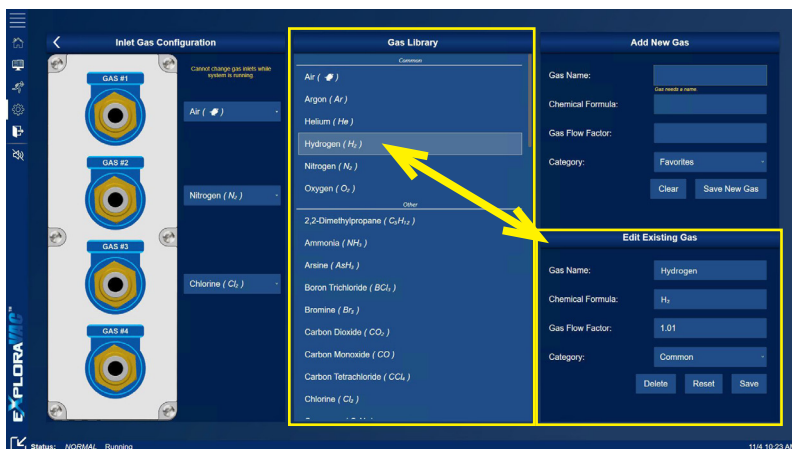
When the ExploraVAC system is started for the first time, all ports connected to MFCs are configured as air by default. Select the tile to the right of the gas port to be configured. Select the gas species from the drop down list. Below, the top gas panel inlet port (Gas #1) is being configured.

Do this for all available ports. Below, this example is configured with only 3 MFCs. So, Gas #4 does not have a tile.

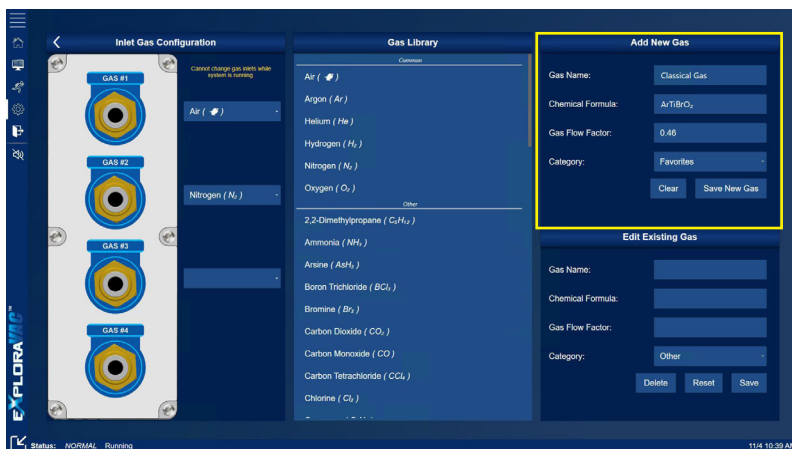


All gases known to AutoExplor are listed in the Gas Library section in the center of the page. If the selected gas is known to AutoExplor, the correct [gas correction factor for thermal-based Mass Flow \(GCF\)](#) is applied to accurately calculate the actual gas flow.

There may be occasions when the user wishes to modify one of the gases in the library. In this case, the user selects the gas to modify from the Gas Library list (center of page). That gases information is automatically entered into the Edit Existing Gas section in the lower right of the page. In this section, the user can modify all gas parameters according to their requirements. When the Save button is pressed, the edited gas overwrites the original gas.



If the user wishes to use a gas not in the list, it may be added to the library from the Add New Gas section in the upper right of the page. The new gas may be named, its chemical formula and its GCF is entered. If the gas is not identified, or a GCF is not entered, by default it is treated like air. The new gas can be saved into one of three categories: Favorites, Common, and Other. The default setting is “Favorites.” When the Save as New button is pressed, the new gas is added to the Gas Library. Favorites are displayed at the top of the list.



Edited and new gases that are saved remain in the gas library when the PlasmaVAC system is shut down and restarted. If AutoExplor is updated, gas library changes persist. If AutoExplor is uninstalled and reinstalled, the gas library reverts to the original library and user changes are lost.

8. USING AUTOEXPLOR REMOTELY

There are two ways to access the ExploraVAC remotely via AutoExplor. The first, recommended for most users, is by using the Windows Remote Desktop application. Remote Desktop allows a user to take full control of the ExploraVAC's computer. The second is by using AutoExplor's built-in networking feature, which provides control only to the AutoExplor application running on the ExploraVAC.

The AutoExplor host software is always on the computer directly connected or mounted to the ExploraVAC. The client is always a user running AutoExplor remotely. The host is the machine to which the user connects.

Considerations for using Windows Remote Desktop (Recommended)

- Allows full control of the remote computer including the ability to access other applications running on the remote machine.
- Provides easy access to copy and paste AutoExplor logs.
- There are lots of online resources and IT administrators know how to use it.
- It is a free feature in Windows.
- The remote computer may need to be added to a local domain.
- Only one user may access the remote computer at a time.
- The use of Remote Desktop may be considered a security risk in some workplaces.

Considerations for using AutoExplor's Built-In Networking

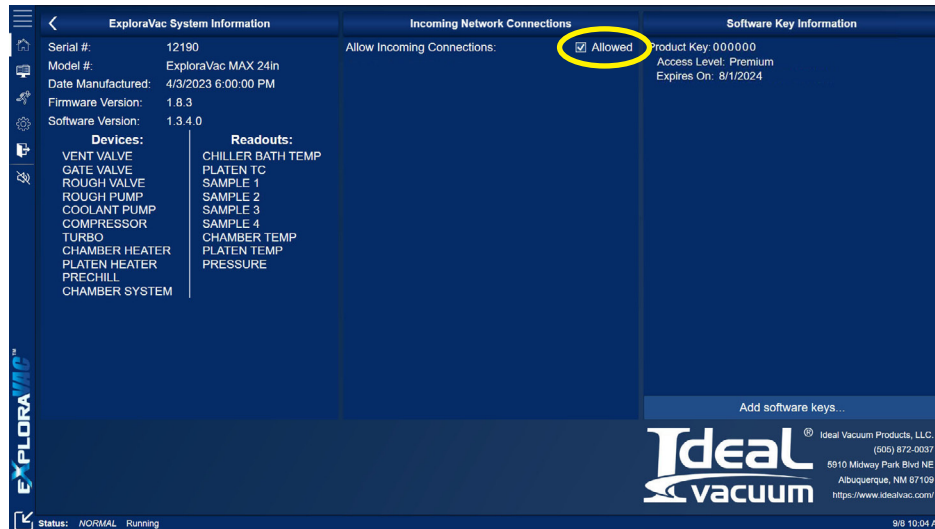
- AutoExplor premium feature only.
- Allows multiple people to monitor the ExploraVAC simultaneously.
- Allows any client to take control of the ExploraVAC and manipulate it remotely.
- Does not require that the host computer is part of a local domain.
- Does not require any additional Windows settings on the host machine.
- Remote client logs are only generated on the remote machine while connected (host machine will always log).
- No other applications or settings can be accessed or changed on the host machine.

8.1 ENABLING AUTOEXPLOR NETWORKING

On the computer directly connected to an ExploraVAC (the host machine):

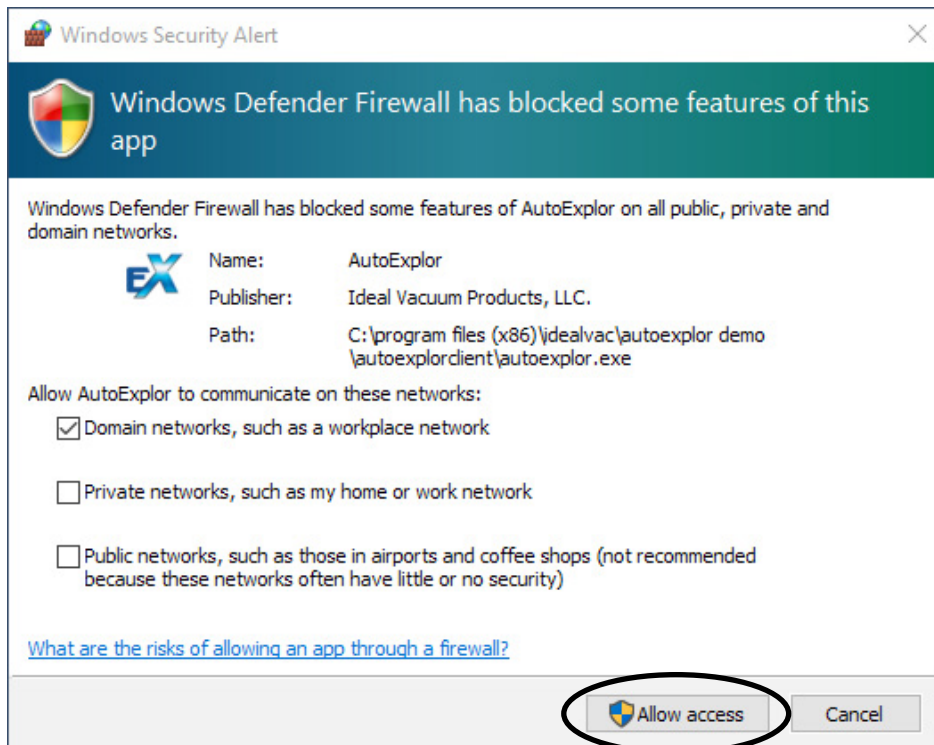
Go to Settings -> System Information.

Check “Allow Incoming Connections.”



The first time “Allow Incoming Connections” is checked, Windows will bring up a window indicating that the Windows Defender Firewall has blocked AutoExplor.

Click “Allow access”. Administrative access privileges are needed.

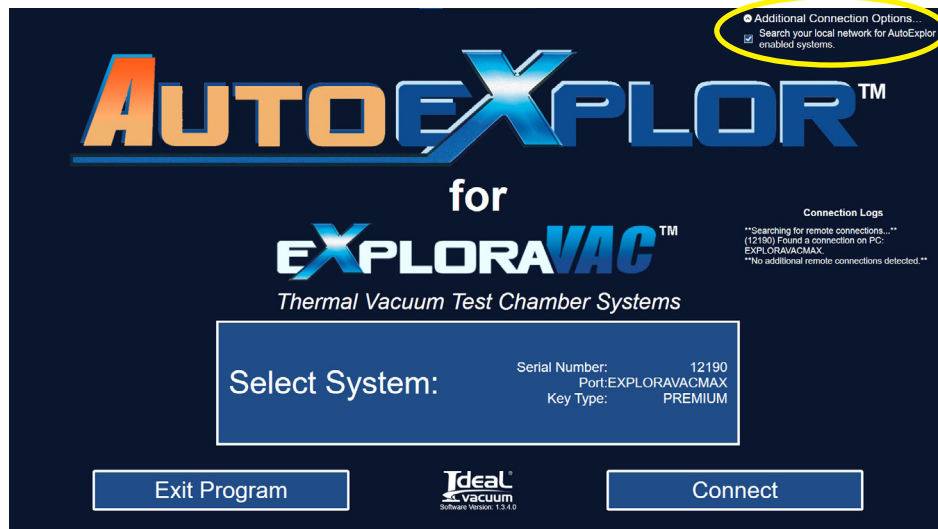


The host is now set up and will allow a client (remote) AutoExplor program to connect to it.

8.2 CONNECT REMOTELY TO THE HOST

When the client (remote) AutoExplor program is first started, select “Additional Connection Options” at the top right of the AutoExplor splash screen.

At the drop down, check the “Search local network for AutoExplor enabled systems” box.



It will take several seconds to find the available system(s) on the network.

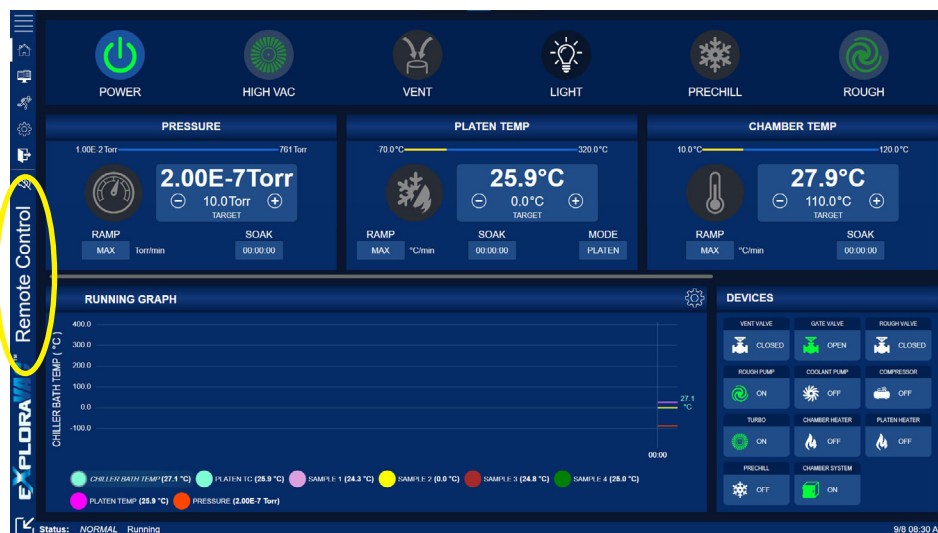
If there is more than one available system on the network, the large central splash screen box will read “Select System:” Click the box for a popup to select from the list of available systems.

Press the Connect button.

If there is only one system on the network, it will be chosen automatically.

Press the Connect button.

The AutoExplor Home screen appears. On the left, the screen shows “Remote Control”. This indicates that the client has “Read Only” privileges and cannot manage the ExploraVAC system.

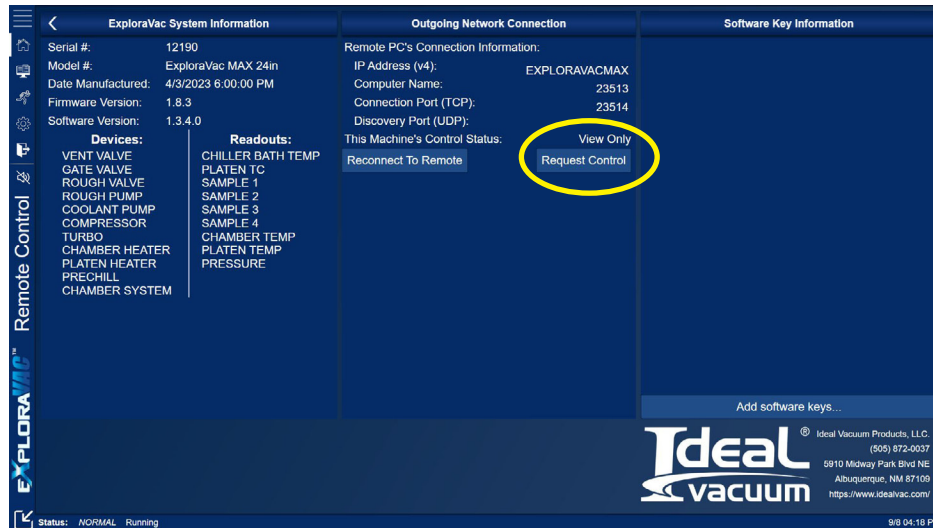


8.3 MANAGE EXPLORAVAC REMOTELY

When the AutoExplor client connects to the host software, it is initially permitted only to monitor whatever the system is doing (read only). Once connected, the “Incoming Network Connection” field in the System Information page changes to “Outgoing Network Connection”.

In order for the client to be able to take control of the ExploraVAC, a request must be sent to the host. Go to Settings -> System Information -> Outgoing Network Connection.

Press the “Request Control” button. If no other client has control, the requesting client takes control of the ExploraVAC system.



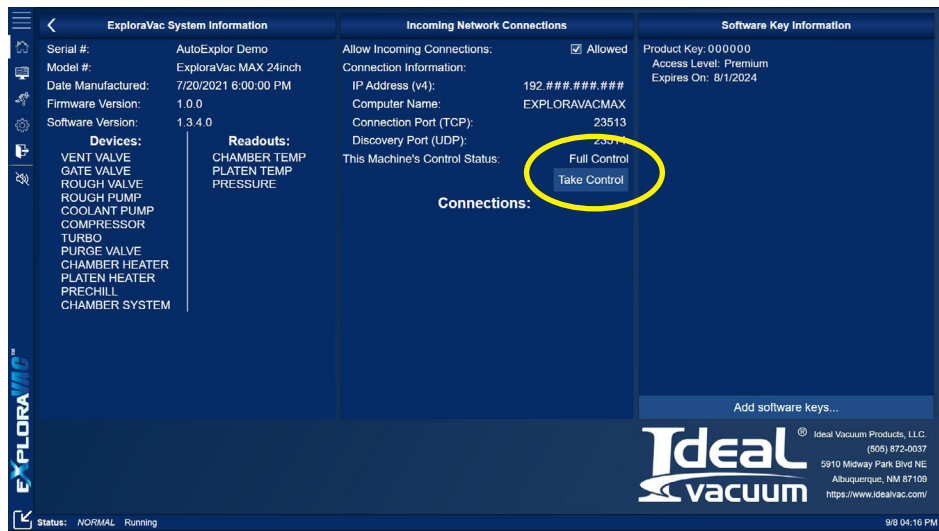
Only one user at a time can have remote control and remote control can only be taken while the host has control. If another client already has control, a popup appears indicating that the request for control cannot be granted. Therefore, it is important that once a remote user has completed their task, that control is given back to the host (relinquished) so that another user can remote in.



If the remote connection to the host is lost, the connection can be re-established by pressing the “Reconnect to Remote” button.

Only the host can take control back from a client. A client cannot take or request control from another client.

From the host, press the “Take Control” button.



Any remote or client connections that exist are shown in the host’s Incoming Network Connections field. Remote clients cannot see existing connections.

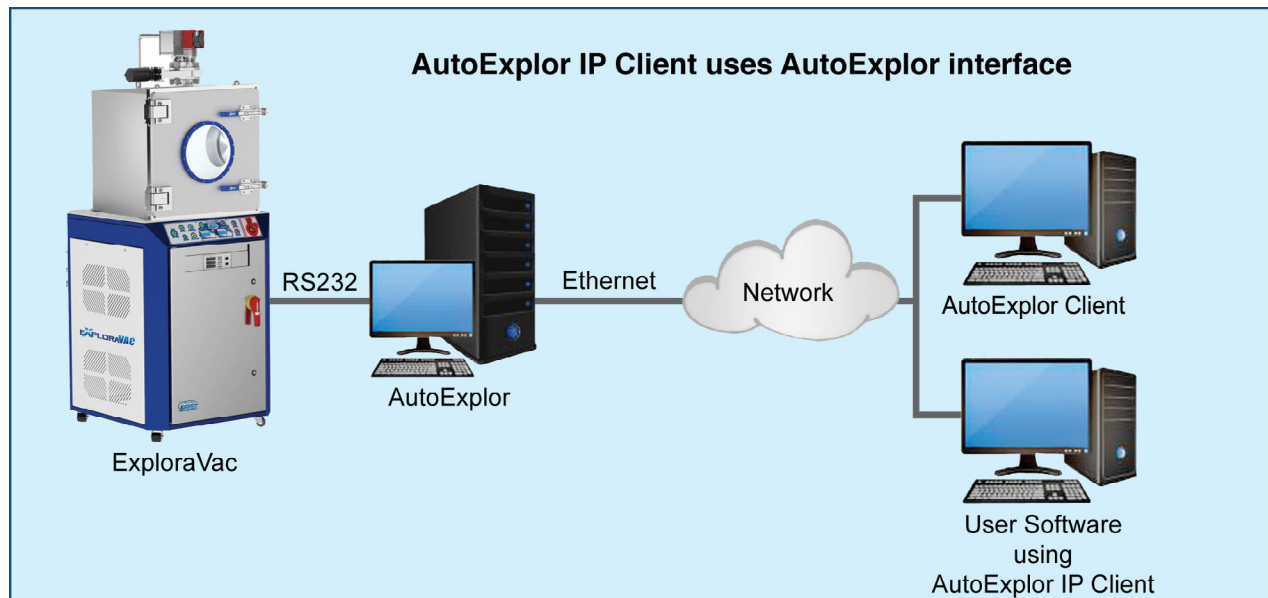
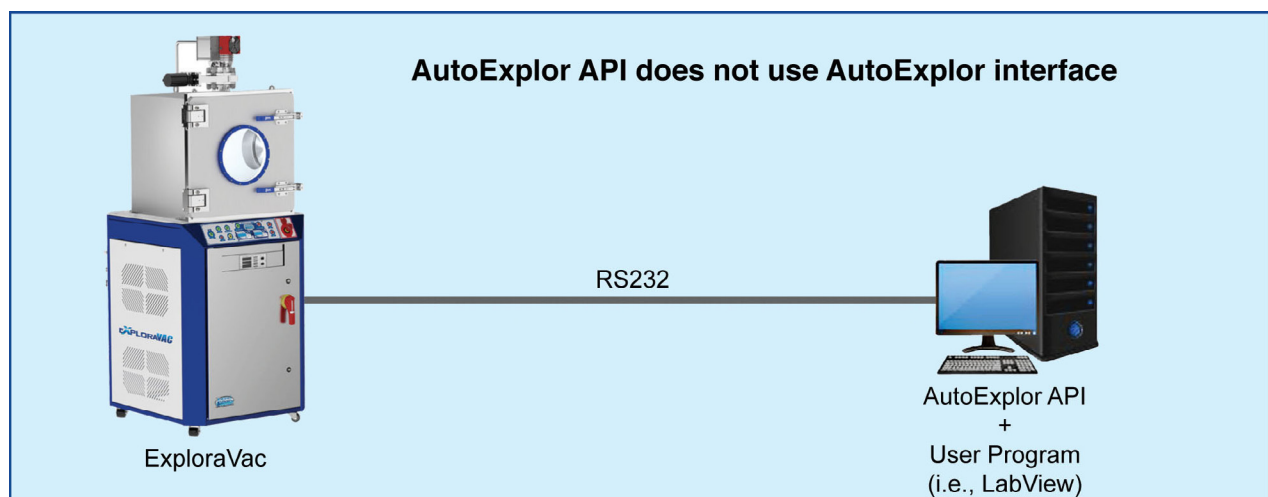
9. EXTENDING AUTOEXPLOR CAPABILITIES

There are two interfaces available which extend the capabilities of AutoExplor: AutoExplor IP Client and AutoExplor API. The structure and commands of the AutoExplor IP Client and AutoExplor API are largely the same. AutoExplor IP Client helps advanced users to start building client software to interface with AutoExplor, since clients cannot access the ExploraVAC instrument directly. AutoExplor API allows advanced users to integrate an ExploraVAC instrument into their existing software test suite without using AutoExplor's interface.

Documentation for both the IP Client and API are provided in the printed and digital materials delivered with the ExploraVAC instrument and on any computer on which AutoExplor is installed.

The premium version of AutoExplor is required to be able to use AutoExplor IP Client or AutoExplor API. They can be used with any ExploraVAC system (Standard, Cube, MAX, or UNLIMITED). Note that IP Client and the API are installed with the AutoExplor software, and are preinstalled on the internal ExploraVAC MAX or UNLIMITED computer. On MAX and UNLIMITED instruments, the ExploraVAC's internal computer becomes the host when using IP Client or the API.

NETWORK DIAGRAM EXAMPLES





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