PICARRO

SAM-C
User Manual

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This manual is the original instruction provided in English.

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Table of Contents

List of Figures

List of Tables

1. Introduction

1.1 Intended Use

SAM stands for Sample, Analyze, Monitor.

SAM is a fully integrated Airborne Molecular Contamination (AMC) monitoring system with hardware and software working seamlessly together, enabling efficient and effective monitoring of AMCs in your fab.

AMCs can affect your final product and equipment. With contaminants coming from inside and outside the fab, it is vital to monitor and understand changes to the ambient environment. SAM monitors your fab conditions, using integrated sensors to track AMC trends in key fabrication areas; the system actively and accurately visualizes, analyzes, and stores data continuously, so you can view conditions and evaluate them according to your unique needs.

WARNING

The SAM and integrated analyzers are not intended to process hazardous materials at levels higher than 25% of their TLV or LEL. The system is only suitable for connection of non-HPM calibration and reference gases.

Figure 1: SAM-C Integrated System – Front Panel Closed and Opened

1.2 Key Features

SAM offers the following elements as prime advantages in AMC detection:

- **FAST SYSTEM RESPONSE:** The gas-handling hardware of the SAM system has been specifically designed to minimize the “time-to-detection” response function of the sampling system. SAM’s flow control hardware allows you to monitor up to 32 unique locations throughout your fab and can rapidly detect concentration changes within the various monitored environments.
- **A USER-FRIENDLY GUI:** While the SAM hardware system is complex, its GUI is simple, easy-to-use, and configurable. From the SAM interface, you can evaluate the concentration of one species or multiple species, and you can assess conditions of specific ports, multiple ports, specific instruments, multiple instruments, a bank or the entire fab. In addition, these conditions can be reproduced in both graph and tabulated forms, so you can see patterns and changes and generate reports for offline analysis and archiving.
- **MOBILE MANAGEMENT:** For network connected installations, SAM enables you to access all of its software features and have full system control from your desktop; you don’t have to gown-up and enter the fab to modify plans and adjust measurement conditions. SAM also dynamically detects hardware connections and configures itself; you can easily validate these connections via the hardware status page on the GUI.
- **EASY-TO-USE DATA EVALUATION TOOLS:** The SAM GUI enables you to track current conditions and to track the history of conditions. SAM is always monitoring and collecting concentration data on multiple species from each port in your fab. You can view a history of changes and spot trends, by species, by location, and by specified time frame. This enables you to respond to AMC conditions in the moment and make improvements based on your analysis of historical trends.
- **AUTOMATED PLAN EDITOR:** SAM’s plan editor allows you to customize, save, edit, and load plans that automate monitoring of your fab. From the editor, you can run a reference gas through the system and execute clean cycles in the middle of plans. SAM also keeps track of the last active plan and automatically recovers it in the event of a power-loss, resuming fab monitoring immediately.

1.3 How SAM Works

Picarro's SAM maximizes the overall effectiveness of its AMC monitoring equipment.

First and foremost, Picarro's SAM leverages the excellent responsiveness of Picarro's gas analyzers. Picarro analyzers effectively and rapidly respond to any change in gas concentration, up or down. Most multiport sampling systems – placed upstream of gas analyzers – decrease the overall system responsiveness. This problem is compounded with each additional meter of upstream sample tubing. If these inherent issues are unaddressed by the sampling system design, events in your fab will go unnoticed and, potentially, you may respond to conditions that may be hours, if not days, in the past.

With SAM's specialized design, Picarro has made great strides in reducing, and in some cases eliminating these effects entirely. It allows you to monitor up to 32 sample lines with high throughput and use pressurized clean and reference gases to run periodic checks on analyzer baseline and calibrations. This enables you to respond immediately to changes in your fab's environment.

In addition, SAM's software supports the monitoring system with a simple and easy-to-use GUI. You can manually control the sampling hardware and make long-term test plans that can be looped indefinitely. The software continuously collects and indexes all pertinent data and allows you to analyze it in any number of configurations. It collects and stores data by location, time frame, and species. You can also adjust plans at any time from any place, with its portable and remote application option.

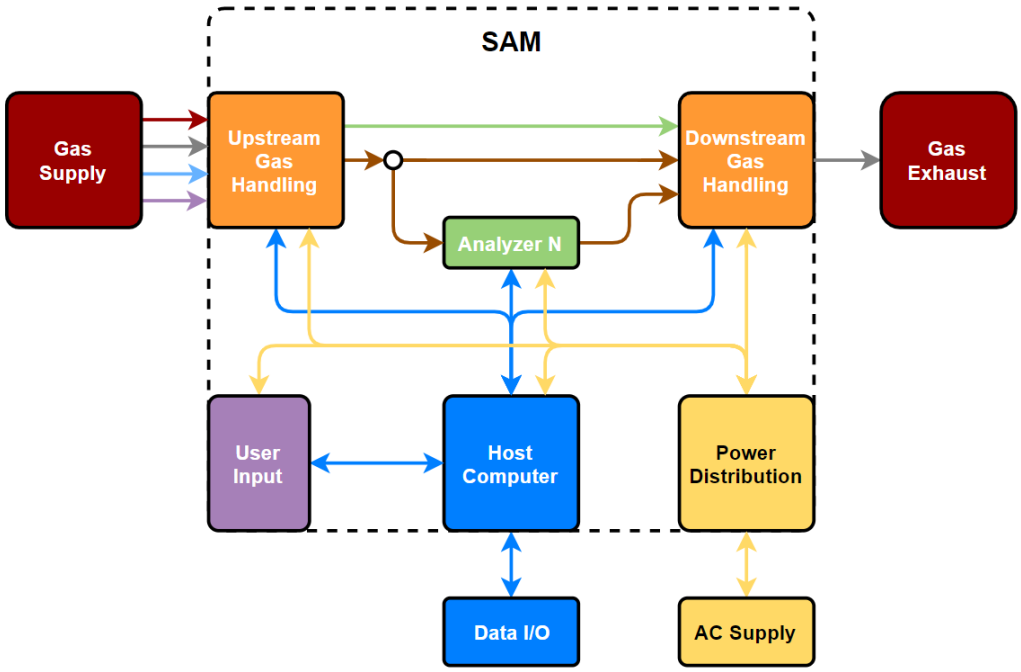


Figure 2: System Diagram

1.4 Audience and Manual Scope

This manual is designed for technicians, production managers, fab managers, and those involved in the monitoring and management of semiconductor fabrication facilities.

1.5 Manual Purpose and Organization

This manual begins with a brief introduction and then provides compliance and safety requirements and basic setup and start-up instructions. Most of the setup, installation and maintenance of SAM will be done by a manufacturer trained service partner, so the manual provides a basic hardware description and then focuses on explaining the GUI. You can advance to the GUI section and learn more on the following pages:

- **Home:** This page shows the current condition on your port setup.
  Go to page 34.
- **Setup:** This page allows you to adjust your system plans and schedule.
  Go to page 39.
- **Numerical View:** The page shows the most recent concentration values of each species in your system.
  Go to page 53.
- **Graphical View:** This page shows a graph of concentration values over time.
  Go to page 55.
- **Data Analysis:** This page shows the species concentration by channel.
  Go to page 57.
- **System Status:** This page shows the condition of the CPU, analyzers, hardware, and log messages.
  Go to page 60
- **Export Data:** This page enables you to download files into CSV format, so you can build spreadsheets and graphs.
  Go to page 64.
- **Settings Page**: This page enables you to make changes for analyzer Zero Reference Settings, Thresholds, and Date, Time & NTP Server sync.
  Go to page 67.
- **Viewer:** This page shows user data and login data. You can log in and out here.
  Go to page 76.

1.6 Equipment Ratings/Specification Table

Table 1: Equipment Rantings and Specifications

Parameter	Value
Power Ratings	220-240 VAC 50/60Hz 3.1 kW Max.
Degrees of Ingress Protection	IPx0
Environmental Range for Equipment	
Indoor Use	Indoor Use Only
Altitude	10,000 Feet Operating
Operating Temperature	10 °C to 30 °C (operating) -10 °C to 50 °C (storage)
Maximum Relative Humidity	<85% R.H. non-condensing
Mains Supply Voltage Fluctuation	Up to ±10 % of the nominal voltage
Equipment Size – Standard (H x W x D)	2012 mm x 864 mm x 1172 mm (Depth is with keyboard opened) 79 in x 34 in x 46in
Maximum Weight	351.5 kg (775 lbs.)
Sampling Line	1/2-inch OD x 3/8-inch ID UHP-PFA tubing
Communication	Ethernet remote interface
Model Numbers	SAM-C-xx-yyyy "**xx**" indicates the number of ports (08, 16, 24, or 32) "**yyyy**" consists of alpha codes which indicate the analyzer models installed in your SAM system (See Table 2 below for model code matrix). **For example:** SAM-C-32-ADGH is a 32 port system containing analyzer models SI3401, SI2108, SI5450, and SI9110.

Table 2: SAM System Analyzer Model Codes

Code	Analyzer Model	Gases Measured
A	SI3401	NH_3, HF, HCl
B	SI2104	H_2S
C	SI2205	HF
D	SI2108	HCl
E	SI2306	HF, NH_3
F	SI2103	NH_3
G	SI5450	SO_2
H	SI9110	VOC *

* **VOCs:** Acetic Acid, Acetone, D3 Siloxane, D6 Siloxane, NMP, HMDSO, IPA, PGME, PGMEA, TMS

2. Safety Information, Warnings, and Hazards

2.1 Advisory Notice – General Use

Warning

Using SAM in a manner not specified by Picarro may result in damage to SAM and render it unsafe to operate.

2.2 Warning/Information Symbols and Text Conventions

Icon notes and warnings are used throughout this manual to provide information on dangers to either yourself or to the analyzer. The purpose of these icons is to provide a visual convention to alert you important information. They indicate dangers to either the operator or to the analyzer, and other important information.

Table 3: Warning/Information Icon Types

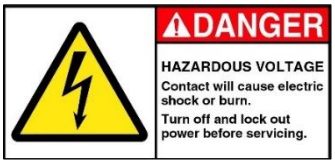
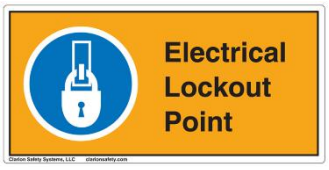
Icon	Description
 NOTE	**NOTE** is important information that you should be aware of before proceeding.
 WARNING	**LASER WARNING** alerts you of a laser danger.
 DANGER	**DANGER** indicates an imminently hazardous situation that, if not avoided, will result in death or severe injury.
 WARNING	**WARNING** indicates a potentially hazardous situation which, if not avoided, could result in death or severe injury.
 CAUTION	**CAUTION** alerts user of a potential danger to equipment or to the user.
 WARNING	**HAZARDOUS VOLTAGE** alerts user to areas that may expose a user to electrical energy that is high enough to cause injury or death.

Text Conventions

- *Italic* text identifies screen names and to emphasize important text, section reference links, or certain features.
- **Bold** text is for actions to take (such as clicking on or touching a UI button), cautions, statements, and text you should type or select in screens.

2.3 Warning Symbols on the System

The following symbols appear as labels on the SAM system as needed to indicate potential hazards.

Symbol	Meaning
	**HOT SURFACE:** This indicates easily touched surfaces that can exceed normal temperature conditions.
	**HAZARDOUS VOLTAGE:** This shows an area on the machine that when touched, may cause an electric shock or a burn.
	**ASPHYXIATION WARNING:** This indicates an area where an oxygen deficient area exists and poses a danger of asphyxiation.
	**LIVE AFTER EMO:** This indicates an area where risk of electrical shock or burn is still present, even after an EMO switch has been pressed to disconnect power.
	**ELECTRICAL LOCKOUT POINT:** This indicates the location to place an electrical lockout device to prevent accidental electrical energizing of the SAM system.
	**SEISMIC ANCHOR POINT:** Indicates seismic anchor placement locations.

2.4 Warning Label Locations

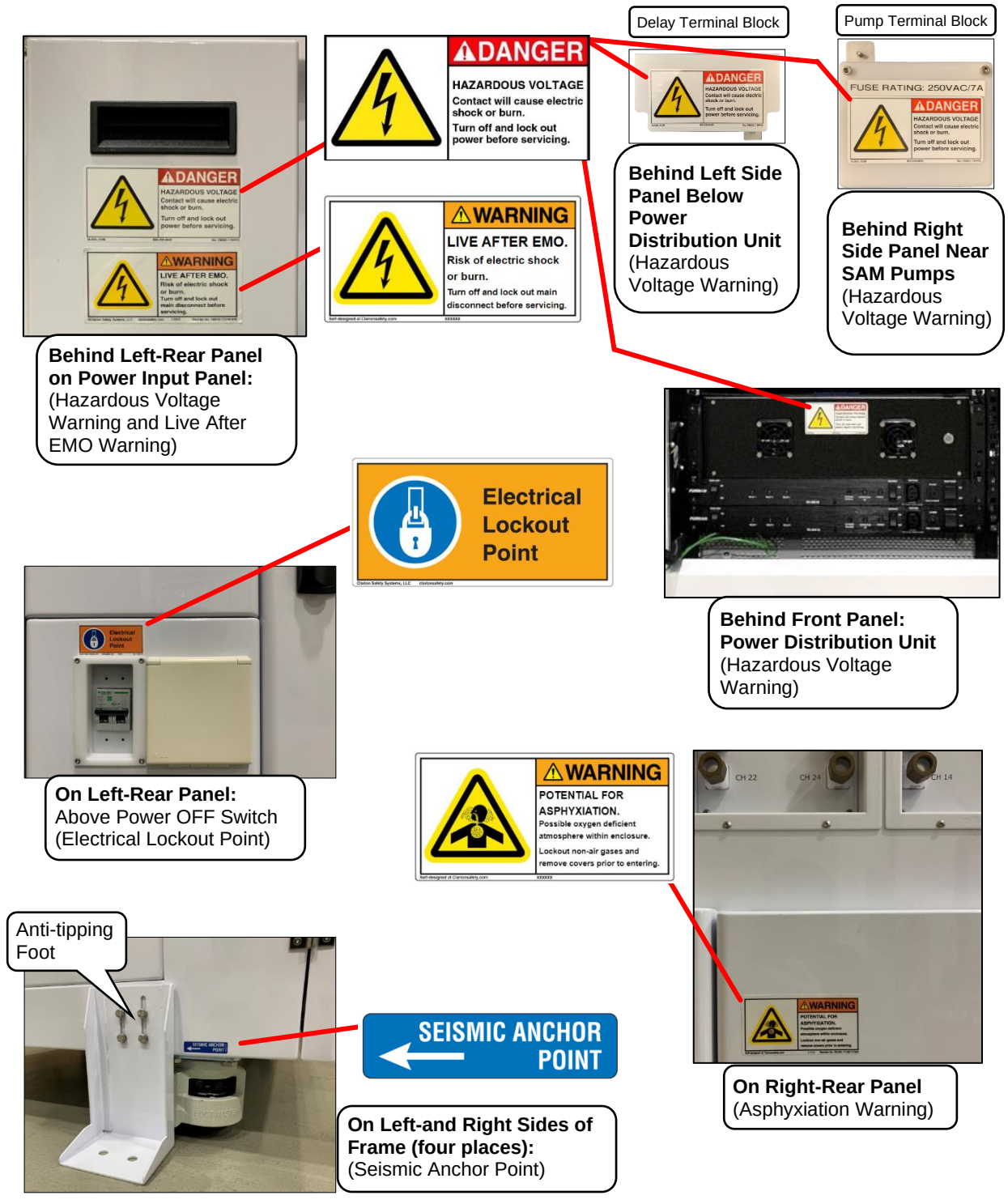


Figure 3: Warning Label Locations

2.5 Seismic Protection Provisions

To prevent the SAM unit from tipping over during a seismic event, each SAM is equipped with four anti-tipping feet. Each foot is constructed of welded 12-gauge cold rolled steel and bolted to the side of the unit with four 10 mm long stainless steel M6 hex head bolts. Each foot is anchored to the ground with two flanged stainless steel M12 hex head bolts.

The following illustrations and table define the measures that were taken to prevent the SAM from tipping over during a seismic event.

Based on the calculations of the overturning and lateral forces, each anchor bolt is subjected to a worst-case tensile force of 116.85 lbf and a lateral force of 59.1 lbf.

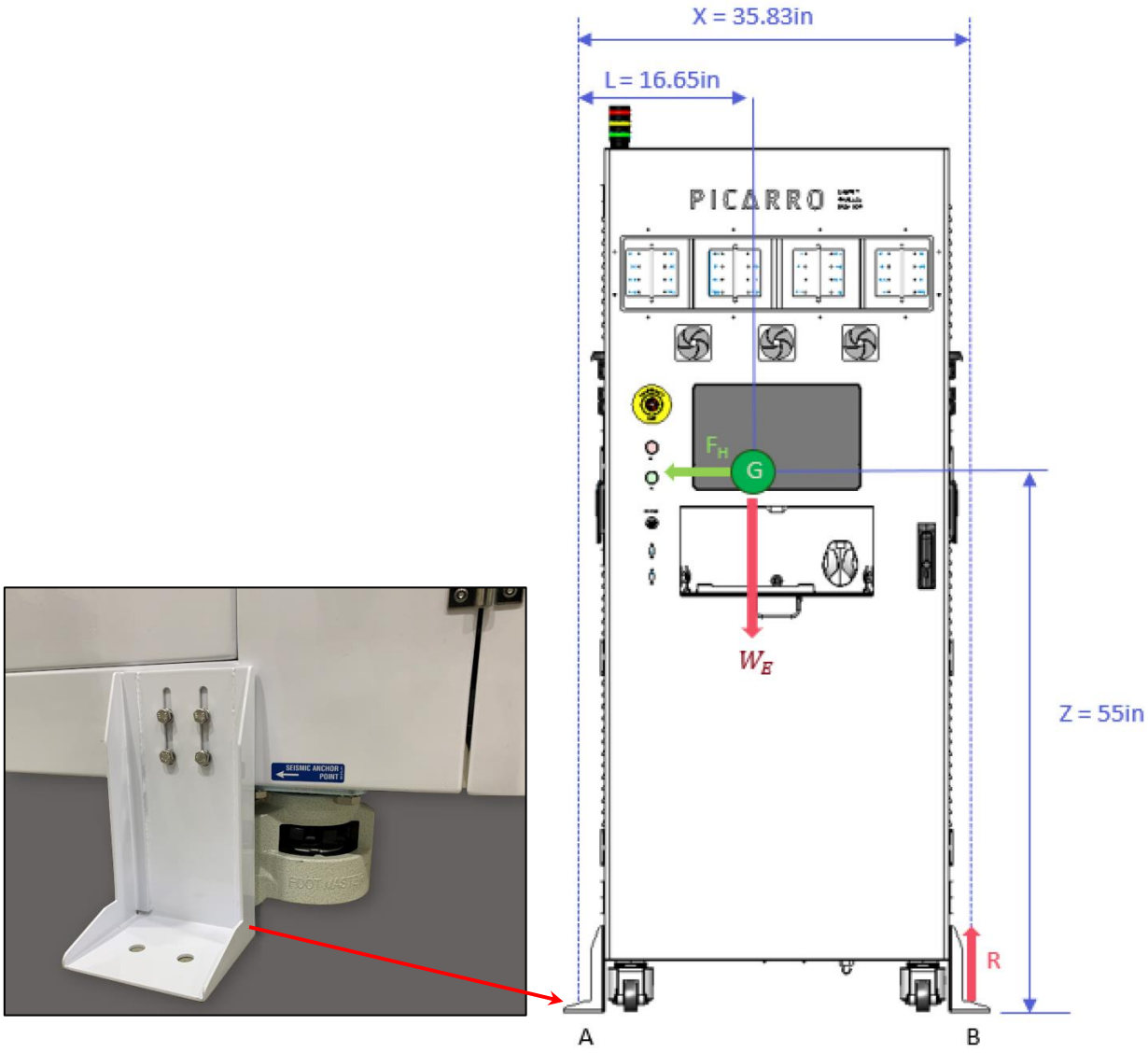


Figure 4: Anti-tipping Foot and Illustration of Overturning and Lateral Forces

Table 4: Seismic Protection Calculations

Variable	Notes	Value
W	Maximum normal operating weight of SAM-C	750 lbf
F_H	Maximum anticipated seismic horizontal force acting on SAM-C	0.63W
W_E	Effective weight of SAM-C accounting for vertical seismic force	0.74W
G	The center of gravity of SAM-C	As indicated
Z	Height of center of gravity	55 in
R	Tensile force on an anchor bolt	116.85 lbf
N	Total number of anchor bolts	8
n	Number of anchor bolts on one side of the SAM-C	4
X	Distance between two opposing sets of anchor bolts	35.83 in
L	Shortest distance from a set of anchor bolts to G	16.65 in

2.6 Environmental Impact/Suitability for Recycling

Hazardous Material Content

The European Union has identified certain substances that are considered environmentally hazardous according to the WEEE (Waste for Electrical and Electronic Equipment) and RoHS Directives. At the end of life of the instrument, the SAM system shall be dismantled, and the hazardous materials shall be identified, sort, and collected.

The WEEE directive sets minimum standards for recycling of electrical and electronic waste. Those standards must be met. Local practice may exceed the minimum standards.

The crossed out wheeled bin symbol represents that hazardous content is included in the equipment. The equipment and parts with hazardous content shall not be disposed of with unsorted municipal waste. It is required that electrical and electronic equipment be disposed of under separate collection.

Hazardous Material in Electronic Equipment

- Lead is typically found in solder connections including PCBA terminations.
- Mercury can be found in electronic components such as switches, and relays.
- Lead, mercury, and cadmium may be found in insulation of electrical cables.
- Hexavalent Chromium may be used as a coating on frames, screw, and fasteners.
- All parts with hazardous material shall be separated and disposed of to comply with applicable local laws and regulations including with European WEEE Directive.

Summary of Material Construction Breakdown

The following table shows the overall approximate percentage by weight of material to show suitability of recycling, based on the SAM-C-32-N configuration. The total weight of the system is approximately 570 lbs. without the analyzers.

Table 5: Summary of Material Construction Breakdown

Material	Weight (lbs.)	Percentage
Steel	233.1	40.90%
Aluminum	207.7	36.40%
Stainless Steel	68.1	11.90%
PTFE	18.8	3.30%
Plastic (Nylon)	8.2	1.40%
Brass	7.8	1.30%
Zinc Alloy	7.2	1.20%
PBT	6.8	1.20%
PFA	5	0.90%
Copper	3	0.50%
FR-4 Fiber Epoxy Resin	1.3	0.20%
Clear Polycarbonate	1	0.20%
Neoprene	0.3	0.05%
Delrin	0.2	0.04%

3. Hardware Setup Prerequisites

3.1 Personal Protective Equipment

Any protective equipment shall be used in accordance with the instructions provided by the protective equipment supplier and as appropriate to the conditions in your fab.

3.2 General Prerequisites

- **Space Requirements:** The space requirements are 850 mm width, 2110 mm depth (with doors open), and 2020 mm height.
- **Space Requirements for Service:** The SAM-C needs to have at least 1m space on the right side of the chassis for servicing. If this is not practicable, servicing will require the system to be switched off, unanchored, and rolled to a more open location.
- **Power Requirements:** SAM is designed to operate with a 220-240 VAC power supply. If only a 110-120 VAC power supply is available, then a step-up transformer is required.

  In the case of industrial field use, power the Picarro analyzer and sampling system from a clean and steady power source. Avoid intermittent electrical fluctuations or electrical power surges, as they can damage the Picarro analyzer and sampler electronics.
- **Step-up Transformer Requirements:** If required, Picarro recommends the following step-up transformer specification: 4000-Watt, 220-240 VAC, 35-Amp fuse.
- **Gas Cylinder Requirements:** Use chains and/or a cage to securely hold compressed gas cylinders in place. Be sure the setup meets safety requirements as outlined by the gas supplier as well as the health and safety codes at the installation site.
- **PFA Tubing:** Use 1/2-inch outer diameter and 3/8-inch inner diameter PFA tubes, as much as required for the sample lines. Use 3/8-inch outer diameter PFA tubes for Reference and Clean ports.
- **Ventilation:** The customer is responsible for safely venting potentially toxic exhaust from all pumps.

3.3 Clean and Reference Gases

This section applies only to users who want to supply external Clean and Reference gases to the SAM system.

Gas Supply Requirements

- Regulated to 20-25 PSIG
- Flow capacity greater than 50 SLPM
- Gas input ports are 1/2-inch OD push-to-connect fittings. Recommended tubing is 1/2-inch OD x 3/8-inch ID, PFA tubing.

Recommended Clean Gases

- House Nitrogen, N_2
- Clean Dry Air (CDA)

CAUTION

When nitrogen or any other gases that are not 100% air are connected to the system, the SAM needs to be installed in a well-ventilated location.

Doors and panels need to be opened for ventilation prior to entering SAM.

Viable Surrogate Reference Gases

- Use a CO_2 Bottle ~1% to validate NH_3 measurement.
- Use a CH_4 Bottle ~100 ppm to validate HCl measurement.
- Use Zero Air cylinder ~21% O_2 to validate HF measurement.

NOTE

The line from the Clean source must be plugged into the "CLEAN" fitting, and the line from the Reference Gas tank must be plugged in to the "REF" fitting. See Figure 5 below.

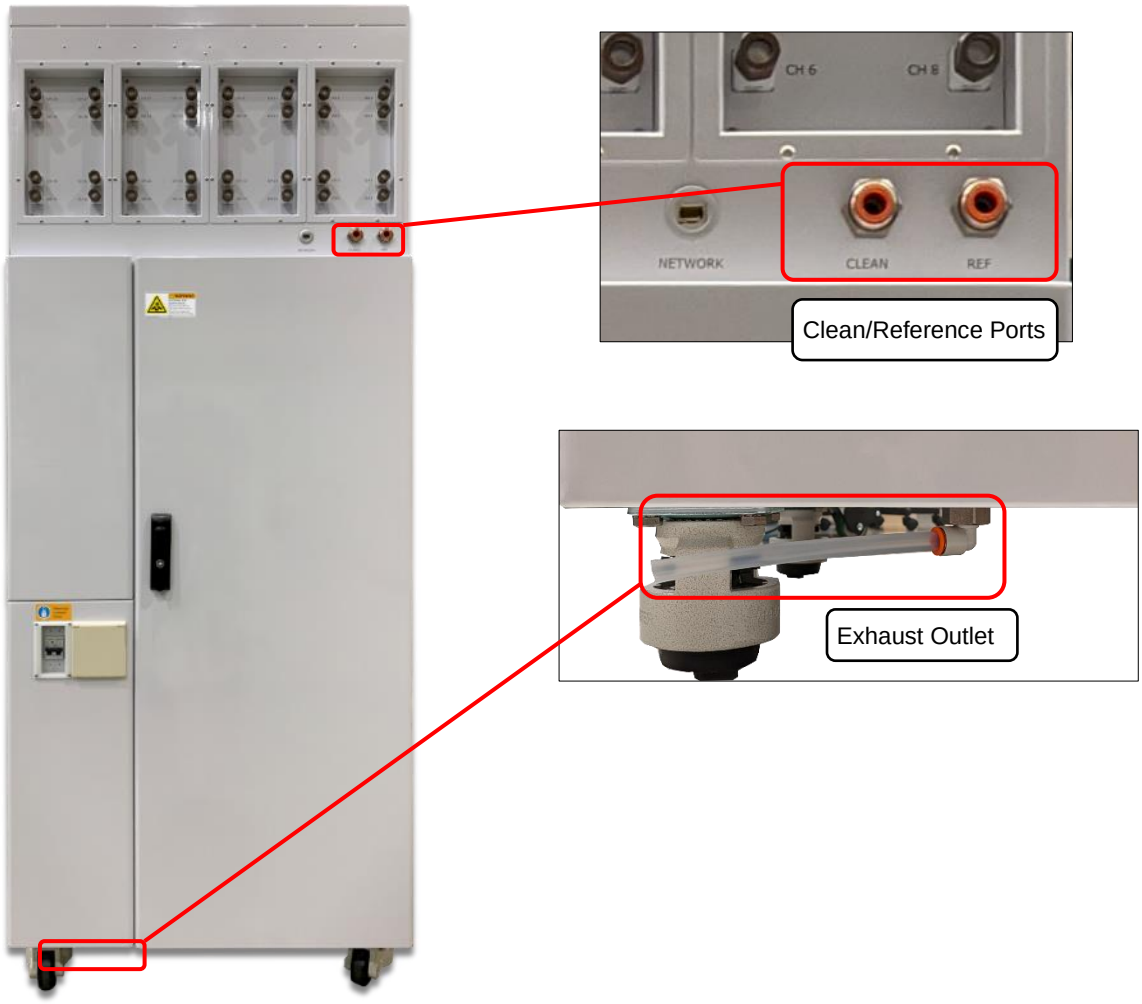


Figure 5: Clean, Reference Gas, and Exhaust Ports at Rear Panel

4. Hardware Equipment Installation

While it is likely that the SAM hardware will be installed by a manufacturer trained service partner, the following guidelines are Picarro's recommendations for installation. Be aware of your fab safety requirements during installation.

CAUTION

The safety of your overall system is the responsibility of your onsite staff.

NOTE

Short circuit current rating (SCCR) of the SAM-C is 5 kA.

4.1 Visual Inspection

A manufacturer trained service partner will install the system and perform the following visual inspection.

Prior to powering on the system, inspect the following items:

1. The sampling system's physical condition and the overall condition of the system
2. The sampling ports and pneumatic connections
3. The external pump (240V) and cooling fan
4. The emergency electric safety switch, the integrity of the wiring connections, and the switches

Figure 6: SAM System – Front Panel Door Removed

4.2 SAM Equipment – Key Components

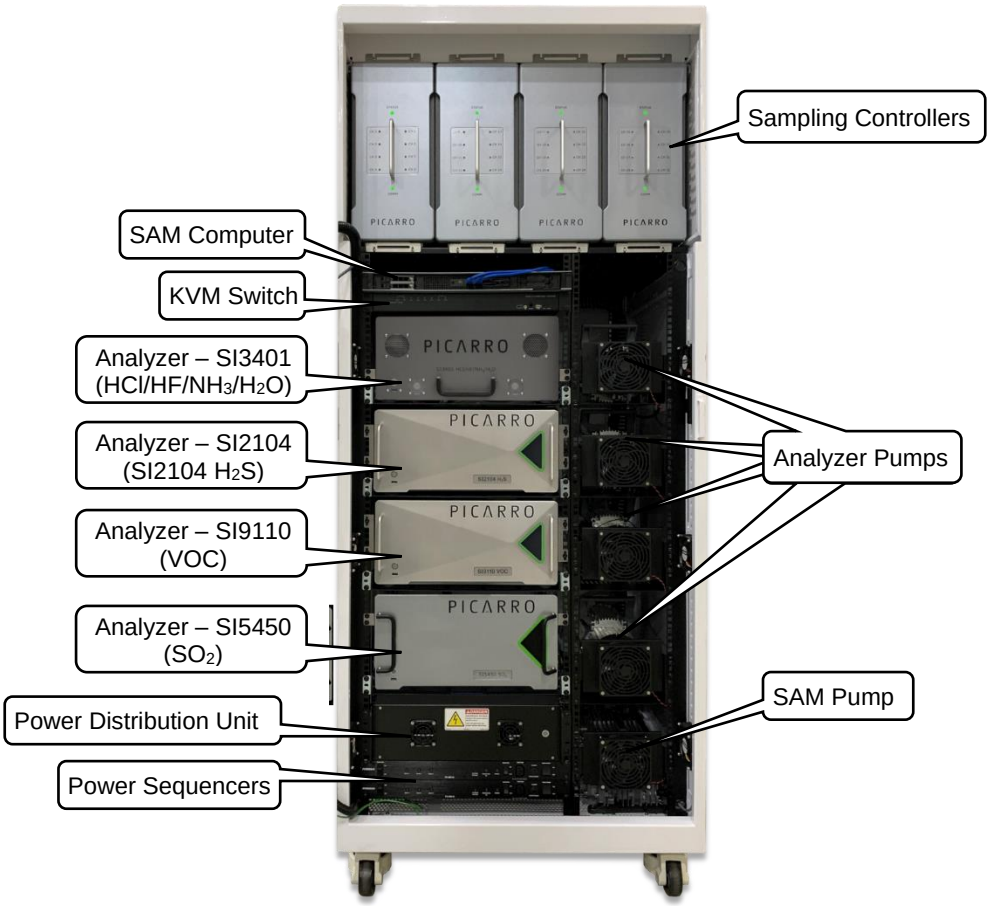


Figure 7: SAM System Components (Front View)

Figure 8: SAM System Front Panel Components

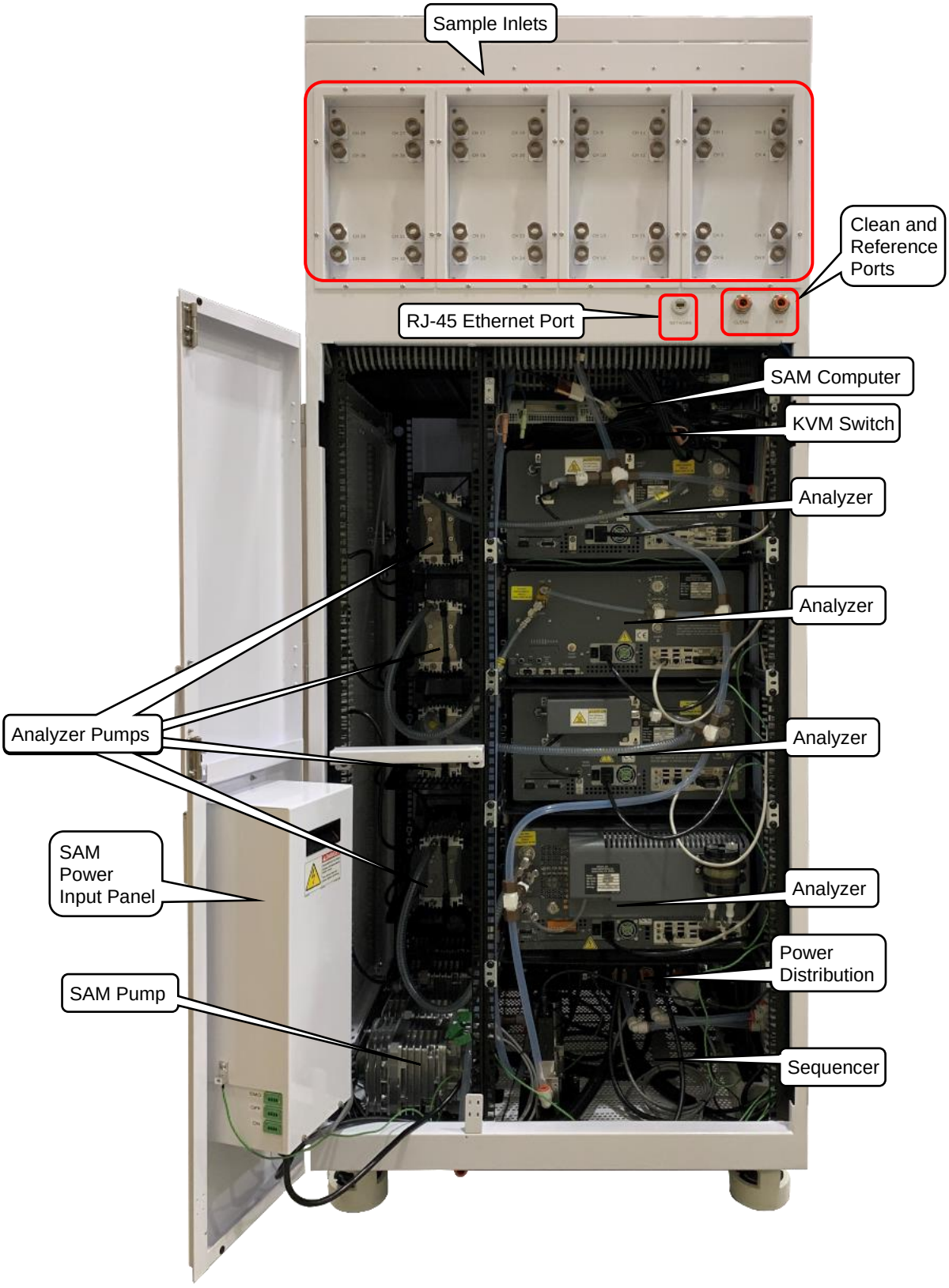


Figure 9: SAM System Components (Back View)

Figure 10: SAM Right Side View

CAUTION

The front and back doors are hinged and swing open. The side panels are NOT hinged and come off completely. A manufacturer-trained service partner should only remove them.

Figure 11: SAM Left Side View

4.3 Analyzer Installation and Setup

1. Install the front rack-mount onto the analyzer.

2. Make the following connections to the analyzer (back side) area.

3. Connect the power cord to each analyzer and ensure that the power switch is in ON position.

Note: The Power plug is locked when inserted. To remove, slide the red release tabs back and pull.

4. Connect the sample line to the sample port.

5. Connect the external pump line to the exhaust port.

6. Connect the HDMI cable plus DVI adapter (along with USB) to the DVI port.

7. Do NOT connect the USB cable to USB-3 ports on the analyzer.

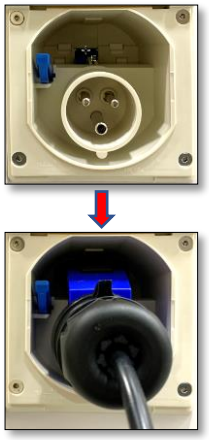
8. Connect the RJ45 ethernet cable in the network port (labeled) into one of the network sharing ports on the back side of the analyzer. Either port will work.

4.4 Electrical Connections and Startup

1. Ensure that all the power cables are seated properly. Check the sampling controller back panel, all analyzer back panels, and the external power distribution unit for the power cord connection.

2. Ensure that the EMERGENCY OFF button is in the release position.

3. Double-check that each Analyzer pump voltage is set to 240-VAC. All the Analyzer pumps are shipped with the 240-VAC setting as default.

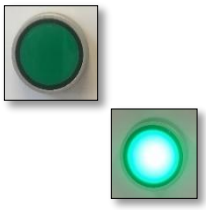


4. Connect the sampling system (220-240 VAC EU type connector) to the 220-240 VAC power supply outlet (rated 20A). If connected with a step-up transformer, connect the step-up transformer to a 110-120 VAC power supply (rated 35A) and connect the sampling system electrical connection to the step-up transformer 220-240 VAC outlet.

Note: The Inlet plug is supplied with SAM but connector on the user end is not.

5. Hardware Equipment Operation

5.1 Power Up Sequence



1. Uncoil the AC power supply cord and plug the connector into an appropriate 220-240 VAC wall socket (or step up transformer in areas with 110-120 VAC supply).
2. Press the ON switch on the front face of the SAM chassis. The power up sequence is automatic once the ON switch is pressed.

5.2 Power Down Sequence

You will shut down the following items in this order:

1. Analyzer 1, Analyzer 2, Analyzer 3, Analyzer 4 (if applicable)
2. The SAM Computer
3. The SAM Main Power Supply

Analyzer 1 - 4 – KVM Port Power Down Sequence

A KVM switch is used to toggle between the SAM and internal analyzers. You will use the keyboard hot keys to Power Down. If the hot keys are not functioning, see the note below.

1. Press the hot keys on the key board. Press [Crtl], [Crtl], [#], [ENTER] where [#] [2] - [5] for the four analyzers. You will see the analyzer GUI.
2. Follow the instructions in the Analyzer user manual to properly shut down each analyzer.
3. Repeat these steps for any additional analyzers, changing the KVM port number pressed based on KVM position.

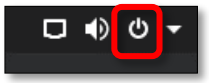
NOTE

If the hot keys are not functioning, toggle the KVM Switch manually. The Switch can be found by opening the door at the front of the SAM. Use the buttons on the front of the KVM.

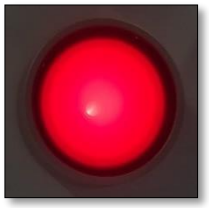
SAM Computer Power Down Sequence

4. Use the hot keys to switch to the SAM PC. Using the keyboard press [Crtl], [Crtl], [1], [ENTER]. You will see the SAM GUI.

5. Press the **cmd** key on your keyboard.



6. Scroll up to the Power button (upper-right) and press the **Power** button from the drop-down list.
7. A pop-up Window displays, click the **Power Off** button.



SAM Main Supply Power Down Sequence

8. Once the computer is shut down, press the red OFF button on the front of SAM. This turns off AC power.

5.3 SAM Emergency Off Sequence

The EMERGENCY OFF switch is located on the front left side of the SAM (Figure 12).

1. Press the switch to activate the emergency shut down sequence.
2. Once activated, all power will be cut immediately.

Figure 12: Emergency Stop Switch Location

5.4 SAM Emergency Stop Reset Sequence

1. To reset the EMERGENCY OFF switch, twist the knob clockwise (in the direction indicated) to release.
2. Check that SAM is properly connected to a suitable VAC outlet (see the SAM Power Up Sequence).

3. Press the green ON button on the front of the SAM chassis. The ON indicator should light up in green.

6. Using SAM – Basic GUI Operations

The SAM Home page is your launching point for accessing all SAM features, and it will be configured in advance according to your desired specifications. It shows the analyzer readings, the most recent species values, and the analyzer conditions. The navigation pane along its left side will advance you to each page. You can learn more about the navigation pane on the following pages. To access Home page, you must first log in to the system.

6.1 Accessing the SAM Home Page

Login

1. After system power up, the SAM login screen appears.
2. Enter your username and password.

   If a full system startup is not needed, you will be taken directly to the **SAM Home Page**. If full system startup is needed, the sequence explained below (**System Startup**) will take place *before* taking you to the home page.

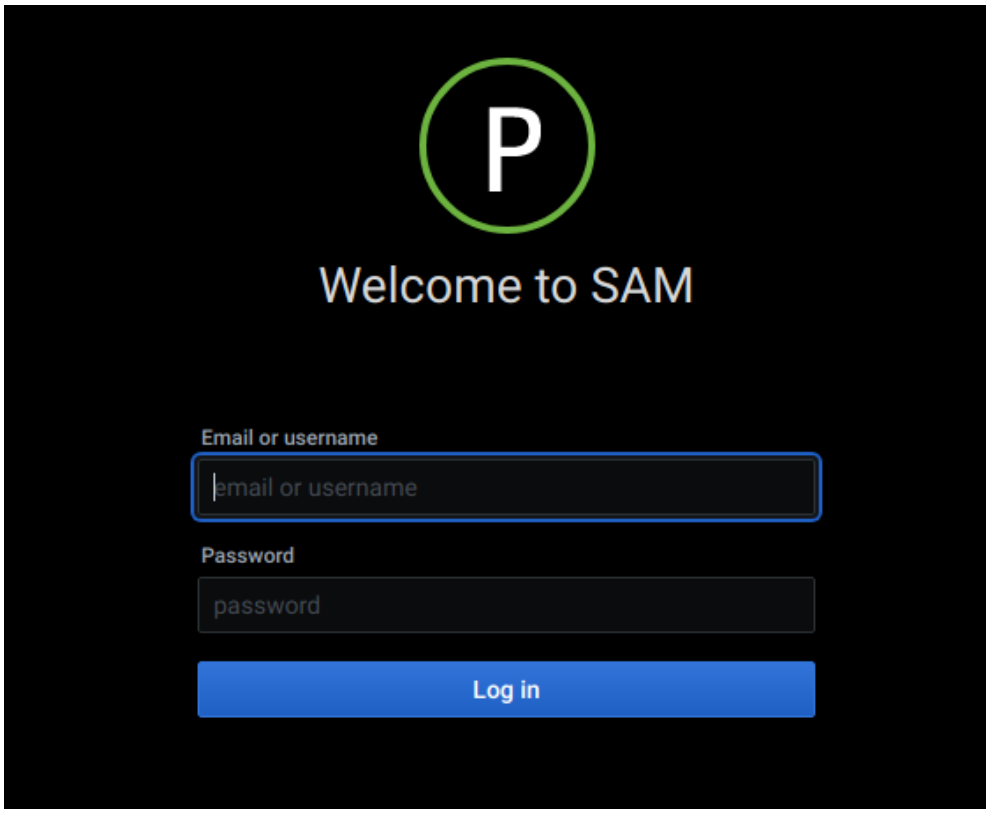


Figure 13: Login Page

System Startup

3. When SAM services are restarted, a **System Startup Status** pop-up screen will appear, showing the progression of the startup (Figure 14).

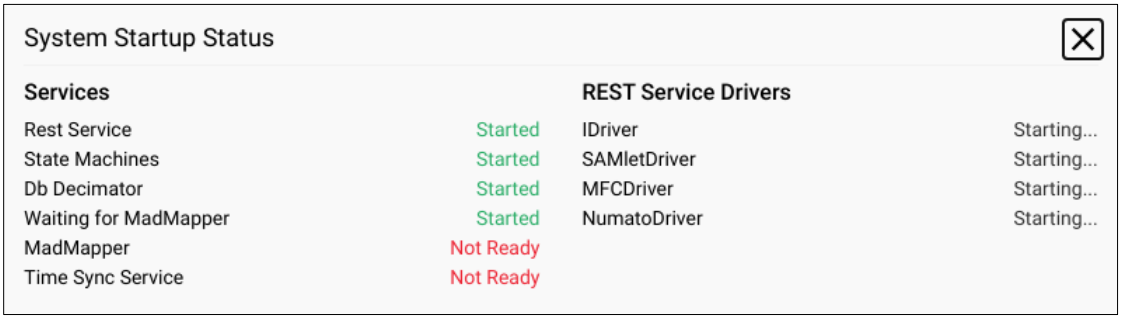


Figure 14: System Startup Status Pop-up Screen

4. If any one of the services or drivers fails during startup, the sequence will pause. If this occurs, contact Picarro Support for assistance.

5. If you wish to close the pop-up while startup is still running, click the X in the upper right corner. A **Password to close popup** screen appears. Enter a password (Figure 15) to close the screen (only certain user roles have permission to close this screen).

Figure 15: Close Pop-up Screen Password Requirement

6. Once the system startup loading has completed successfully, the startup status pop-up screen displays a **Continue** button (Figure 16).

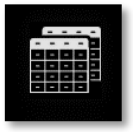
   Upon clicking **Continue** you will be advanced to **Home** page, as shown in Figure 17.

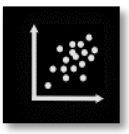
Figure 16: System Startup Status Success

Figure 17: SAM Home Page

6.2 Navigation Panel

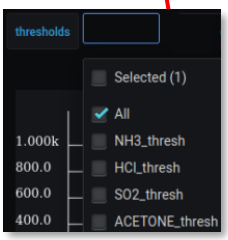
From the Home page and any page, you can navigate through SAM system by selecting the icons from the navigation panel on the left side of the screen.

Icon	Functionality
	**Home:** This icon takes you to the Home page, which shows the current condition on your port setup. This is the default page.
	**Setup:** This icon takes you to the Setup Page. You can adjust your system plans and schedule here. Go to page 41 to learn more.
	**Numerical View :** This icon takes you to the Numerical View Page. It shows the most recent values of species in your system. Go to page 53 to learn more.

Icon	Functionality
	**Graphical View :** This icon takes you to the Graphical View Page. It shows a graphical representation of the species over time. Go to page 55 to learn more.
	**Data Analysis:** This icon takes you to the Data Analysis Page. It shows the species concentration by channel. Go to page 57 to learn more.
	**System Status:** This icon takes you to the System Status Page. It shows the conditions of the CPU, the analyzers, the hardware, and log messages. Go to page 60 to learn more.
	**Export Data:** This icon takes you to the Export Data Page. It enables you to download files into a CSV format, so you can build spreadsheets and graphs. Go to page 64 to learn more.
	**Settings:** This icon takes you to the Settings Page. Here, you can make changes for analyzer Zero Reference Settings, Thresholds, and Date, Time & NTP Server sync. Go to page 67 to learn more.
	**Viewer:** This icon takes you to the Viewer Settings Page. It shows user and login data. You can log in and out here. Go to page 76 to learn more.

6.3 General GUI Page Functions

The GUI has consistent functions across most pages, which are shown and described in the following picture and callouts.

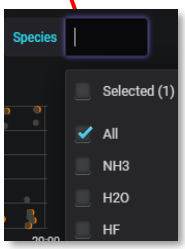


Thresholds: You can choose from the species thresholds shown. (Select **All,** or one or more species thresholds)

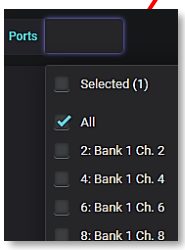
The Thresholds dropdown appears only on the Home page and Data Analysis page.

See **Thresholds Tab** section in Section **0**,

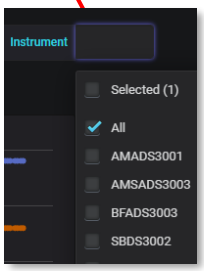
Settings Page for information on setting Warning and Alarm threshold levels for each species.



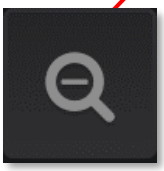
Species: You can choose from the species shown. (Select **All,** or one or more species)



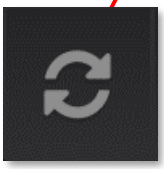
Ports: You can choose from the available ports shown. (Select **All,** or one or more ports)



Instrument: You can choose from the instruments shown. (Select **All,** or one or more instruments)

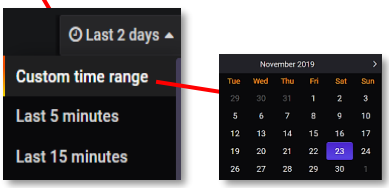


Expand: You can double the size of your chosen time frame viewed, expanding both the start and end times.



Refresh: You can refresh the data by clicking this button. You can change the refresh time interval. Refresh intervals range from 1 second to 1 day.

Change: The refresh interval is 5 seconds by default. If the time interval does not show, the system is not refreshing values.



Time Range: To change the time range viewed, you can select a preset time range or set a custom time range. To set custom, select **Custom time range** from the drop-down list. A calendar will display from which you can select specific time ranges.

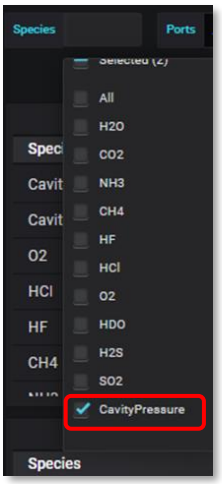
CAUTION: Do not attempt to display data spanning more than 2 days at a time. *Large amounts of data will cause system slowdown and the display to freeze.* See **Section 7, Troubleshooting** for recovery instructions if this occurs.

Figure 18: GUI Page Viewing Features

General GUI Terminology

- **Port:** The end-point where the species value is read.
- **Bank:** A collection of ports/channels in a specific area.
- **Species:** The molecule being measured.
- **Reference Gas:** The gas used to verify the calibration of the analyzer.
- **Cleaning a Bank:** This runs a clean gas through the analyzer to return it to baseline.
- **Run Plan:** This runs the plan you've established with your schedule.
- **Run Channel:** This takes measurements of a selected channel.
- **Loop Plan:** This runs your plan continuously.

View Cavity Pressure



1. To view cavity pressure, select the *Species* drop-down menu on the upper left of your page.
2. Select multiple or single. You can narrow this down to specific ports and instruments.
3. When finished making your selections, click on the screen. The new values will display.

   This can be done on the following pages:

   - Home
   - Numerical View
   - Graphical View
   - Data Analysis
   - User Data File Generator

Y Axis Conventions

To prevent overflows of characters along the Y axis outside of the displayable areas (and the displayed Y-axis numerical values then becoming truncated), the following value magnitudes are expressed along the Y axis on graphical displays as shown in the example below for the species being measured (in this case, NH3 – see the example shown in Figure 18.):

- NH3 (ppb) 0.000000001 → NH3 (ppb) 1.000n
- NH3 (ppb) 0.000001 → NH3 (ppb) 1.000µ
- NH3 (ppb) 0.001 → NH3 (ppb) 1.000m
- NH3 (ppb) 1,000 → NH3 (ppb) 1.000k
- NH3 (ppb) 1,000,000 → NH3 (ppb) 1.000M

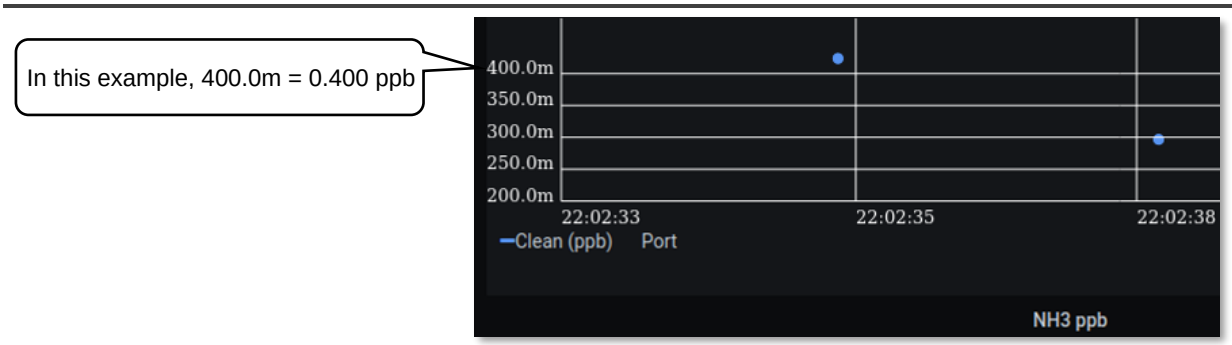


Figure 19: Numerical Magnitude Units

6.4 Setup Page

The Setup page allows the user to control all flow hardware for the SAM system. A list of available functionalities is shown in this section.

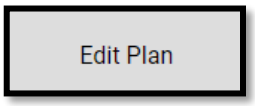
Create or Edit your Plan

1. Click the **Setup** button.

   The Setup page (Figure 20) will appear according to your default setup.

   From this page, you will choose the channels and banks within your system to monitor.

Figure 20: Setup Page



2. To create a measurement cycle, click the **Edit Plan** button in the left panel.

   A default schedule with an existing measurement plan will display (Figure 21).

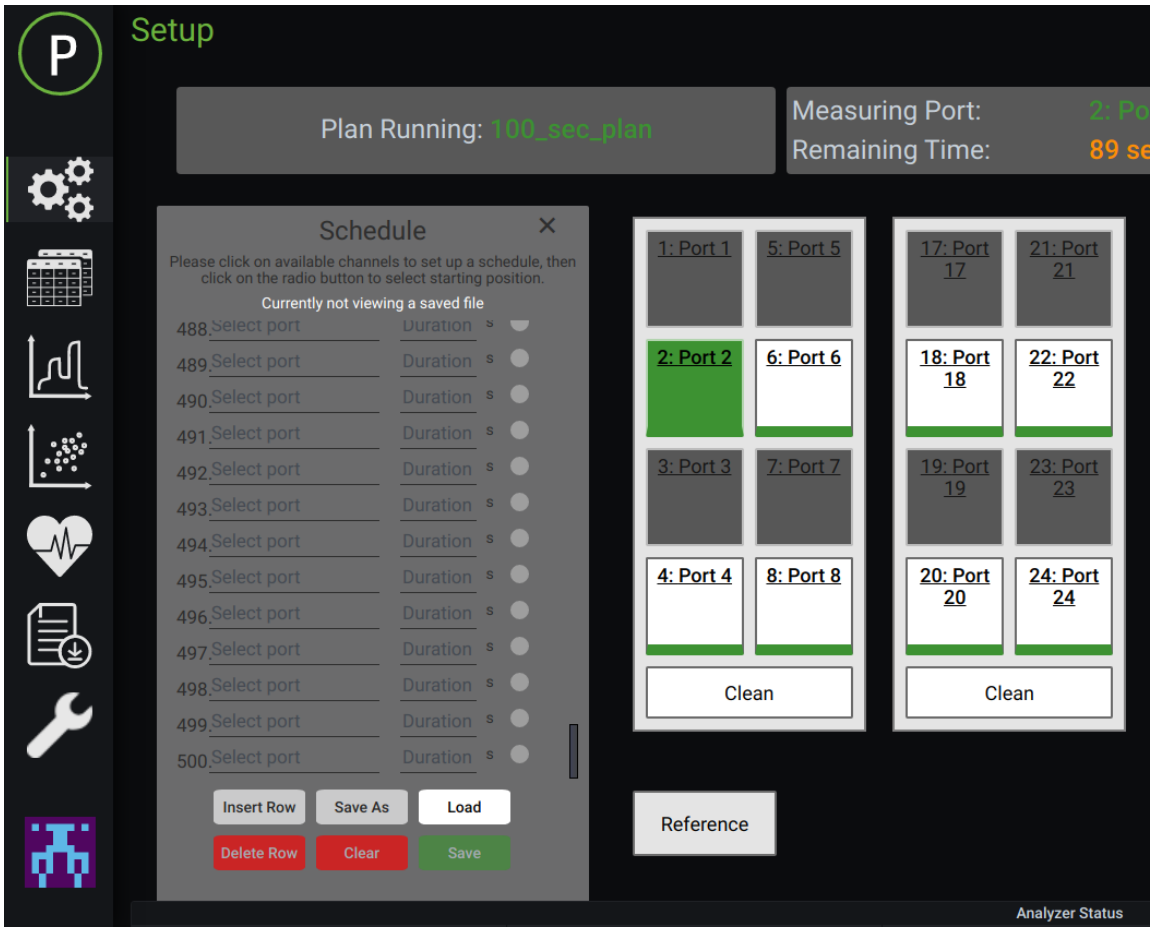


Figure 21: Schedule Screen

Available Channel

3. Clear the plan to create a new one. To do so, click the **Clear** button in the lower center of schedule panel.

The schedule screen will clear.

4. To add to the plan, click on a line in the schedule and then click on an available channel. *Available channels are shown in white (unavailable channels are grayed out)*.

A line in the schedule will fill when you click on the channel.

5. Enter the measurement duration in seconds only. (You must enter the duration.)

6. Repeat steps 4 and 5 for as many channels as you like. The maximum number of measurements that can be taken is 500.

NOTE

The location of the blue radio button determines where the plan begins. Before you save your plan, ensure that the blue radio button is in the appropriate location.

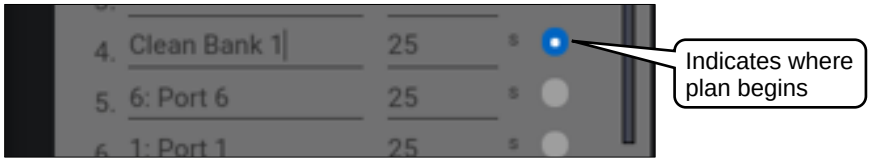
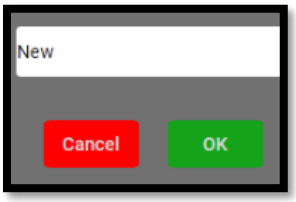
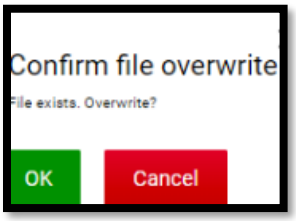


Figure 22: Blue Radio Button Showing on the Schedule Screen

7. When ready, save your plan by clicking the **Save** button (Figure 21 above).



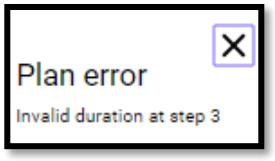
8. Name, rename, or save over an existing plan.



9. Save the file by clicking **OK**. If you are overwriting an existing file, a window will pop up asking you to confirm the overwrite. Respond as appropriate.

NOTE

If you do not enter data properly into the system (for example, you do not enter the duration), the system will not let you save the file. You will receive a Plan error notice as shown below:



10. Adjust as needed.

11. Click **OK**. Close the schedule.

12. Start the plan by clicking the **Run Plan** button (Figure 20: Setup Page).

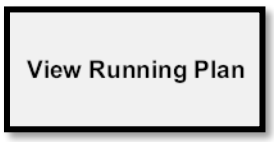
Note: If the Run Plan button is grayed out, it is because the current schedule is not properly defined and needs to be edited.

13. Click the **Edit Plan** button, make changes as needed, and click **Save**.

14. Close the schedule page, and then click the **Run Plan** button.

15. Once you've completed your plan, you can click the **Loop Plan** button, to loop your plan indefinitely.

Click the **Standby** button to stop running the plan.



16. When you click the **View Running Plan** button, you can see the plan that is currently running as shown below in Figure 23. Pressing cancel returns you to the Setup/Command Panel.

Note that the View Running Plan button is only visible when a plan is running. Otherwise the button is not visible on the Setup page.

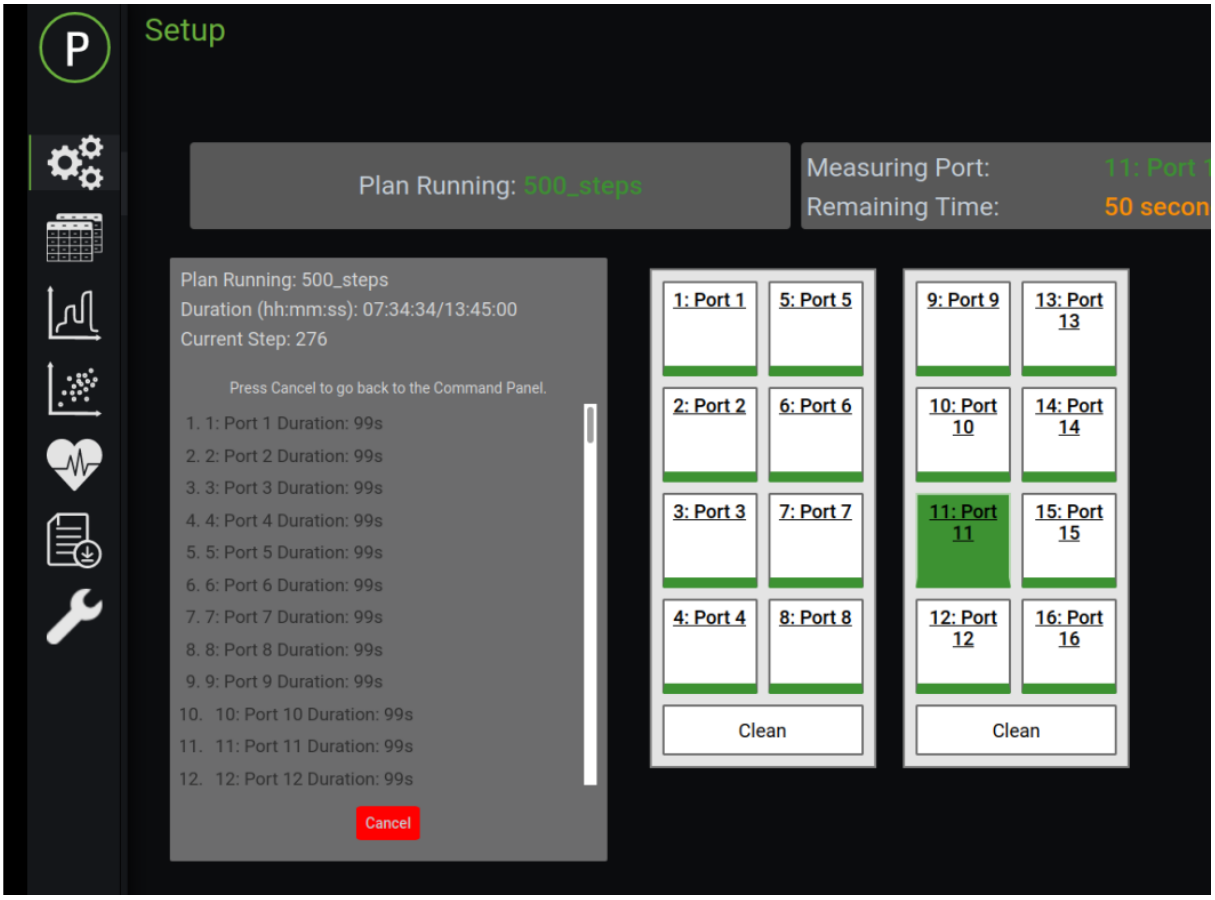


Figure 23: View Running Plan Displayed

Clean a Bank

When you click the **Clean** button, you will be cleaning the manifold and all paths between the manifold and the analyzer. The system will deliver clean gas through the analyzer pathways to return the analyzer to baseline. To do so, a clean gas must be connected to the clean port according to the requirements outlined in ***Section 3.3, Clean and Reference Gases***.

To clean a bank, perform the following steps:

1. Click on the **Setup** button.

   The Setup page will appear according to your default setup.
2. Click the **Clean** button at the bottom of the bank you'd like to clean. When the bank is cleaning, the bank will be highlighted in blue (Figure 24 below).
3. To stop the Clean cycle, select **Standby**. The bank border will return to the default color.

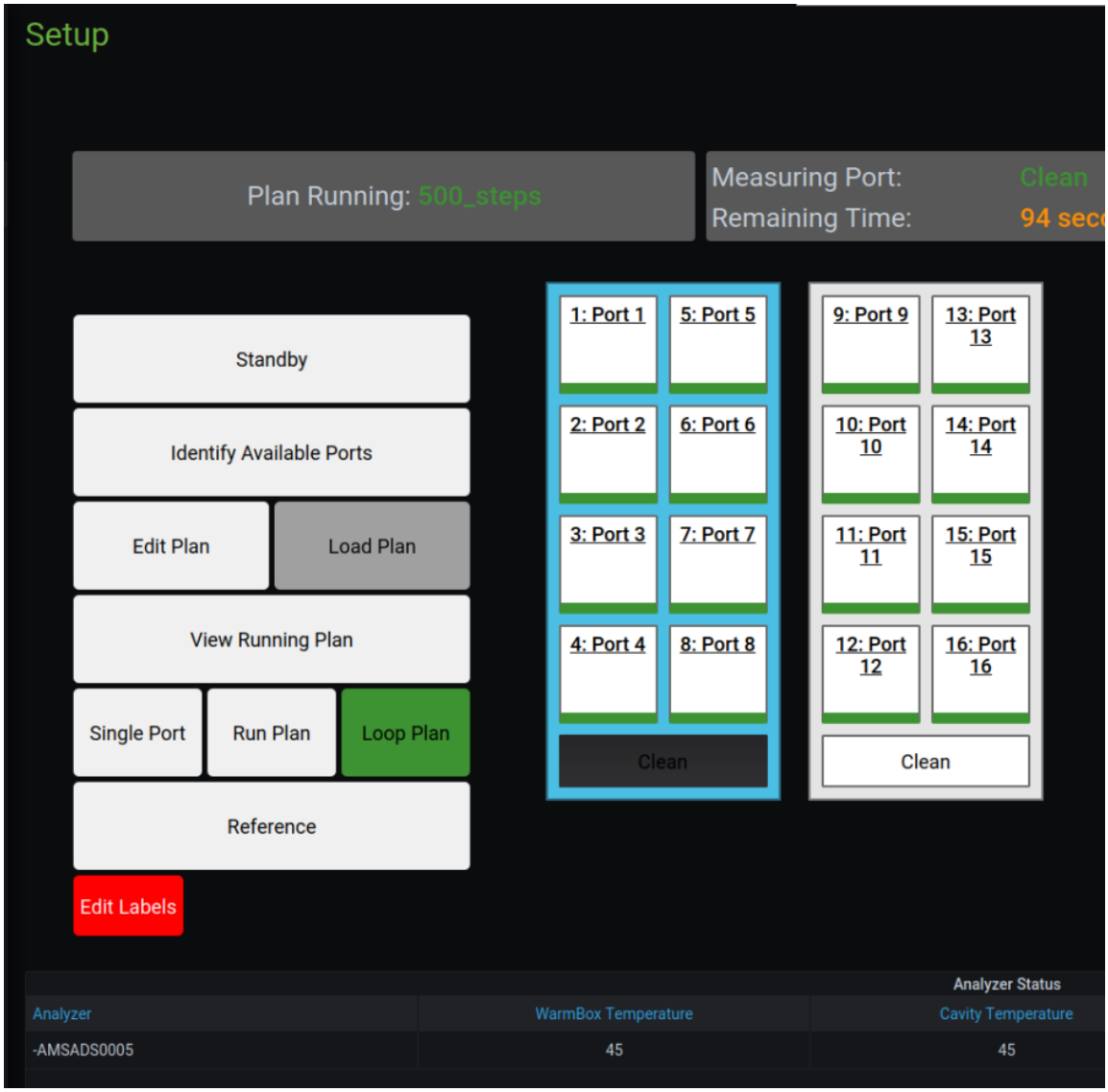
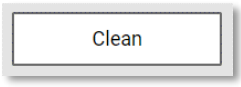


Figure 24: Cleaning a Bank (Highlighted in Blue)

4. You can also clean a bank as part of a plan. To do so, click on the **Edit Plan** button.
5. Click on a line in the schedule



6. Click the **Clean** button and add a duration to the schedule. **Save** your plan. Click the **OK** button.

7. Click the **Run Plan** button or the **Loop Plan** button.

Measure a Reference Gas

When you measure with a reference gas, you will deliver a reference gas through the analyzer pathways to verify the calibration of the analyzer. To do so, a reference gas must be connected to the Reference port according to the requirements in ***Section 3.3, Clean and Reference Gases***

To measure a reference gas, perform the following steps:

1. Click on the **Setup** button.

   The Setup page will appear according to your default setup

2. Click the **Reference** button at the bottom of the bank (Figure 25) to manually activate the reference gas valve.

   All banks will be highlighted yellow while reference gas is flowing.

   You can also run a reference gas as part of a plan.

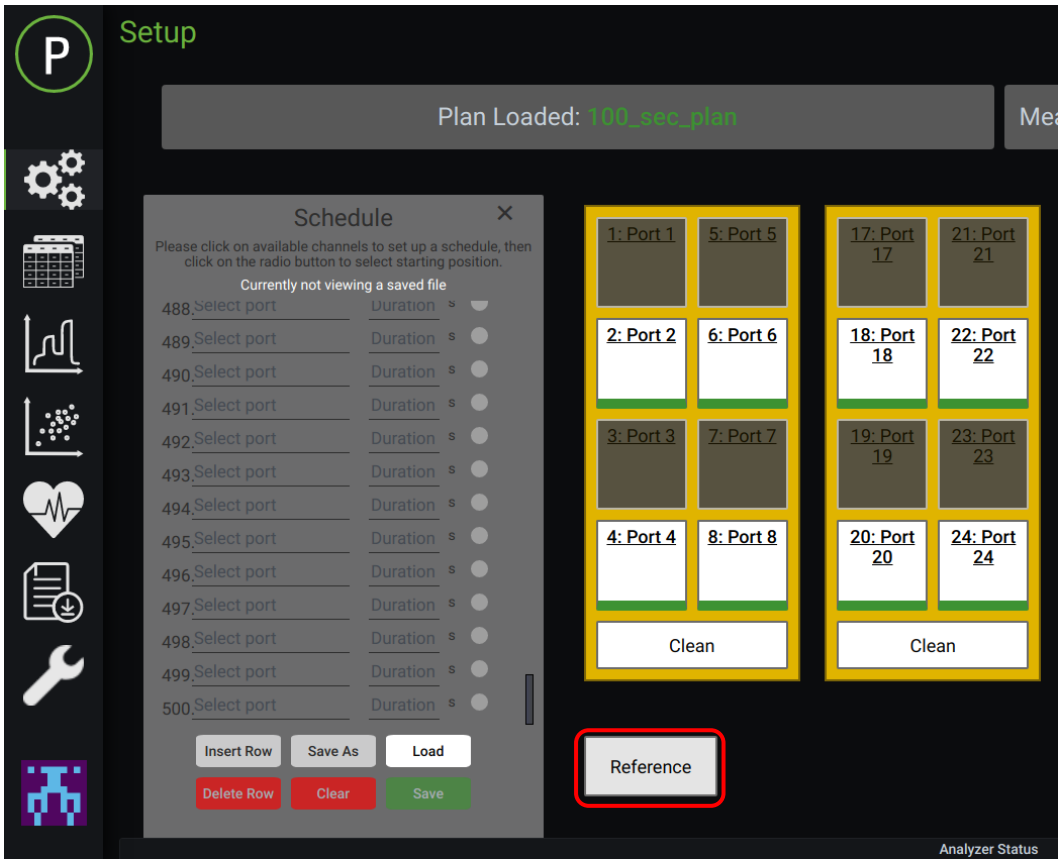


Figure 25: Measuring Reference Gas for Calibration Verification

Identify Available Ports

Identify Available Ports cycles through all the available ports in the system and determines the appropriate flow rate for each port. This automatically runs during system startup. Identify Available Ports should also be run whenever a user changes a sampling tube.

To find available ports use the following steps:

1. Click on the **Setup** button.

   The Setup page will appear according to your default setup

2. Click the **Identify Available Ports** button.

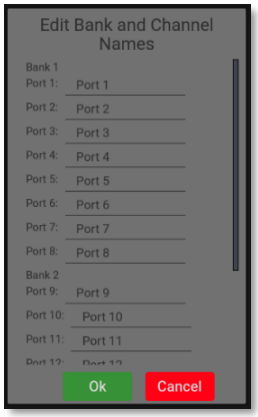
   When a bank is undergoing available port identification, it will be highlighted green. The adjacent bank shown below is awaitng port identification and will be highlighted green after the first bank is completed.

Figure 26: Identify Available Ports Activated

Edit Labels

1. To change the label of your channels, click on the **Edit Labels** button. **Note:** This button is grayed out and not functional while a plan is running. However, the user can click the Standby button to activate the Edit Labels button.

   Note that the label is plan-specific. That is, if the user begins to make a new plan, the default will appear.



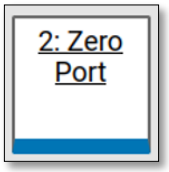
2. Under the **Edit Bank** and **Channel Names** menu, enter a new name or many new names.
3. Click the **Ok** button.

Zero Reference Settings Applications

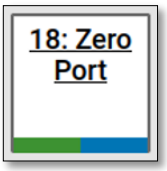
When a Zero Reference port is assigned for use with either a SI9110 or SI5450 analyzer, the following measurement plan applications become available. For further details on configuring Zero Reference Settings, see ***Zero Settings Tab*** in ***Section 6.10, Settings Page*.**

The figure below shows a typical Zero Reference port assignment. In this example, the Zero Reference port is applied to Port 2, identified by a blue band in the port status box. See below for additional zero port states within a measurement setup.

Figure 27: Zero Settings Applied to a Port

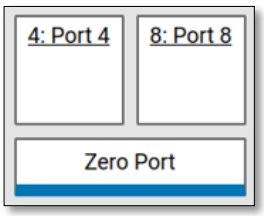


1. **Zero Port** is assigned to a port which is enabled but is not part of a measurement plan. (Blue band at bottom of port status box indicates zeroing is applied to that port.)

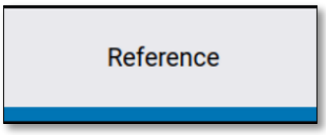


2. **Zero Port** is assigned to a port which is enabled and is part of a measurement plan.

3. **Zero Port** is assigned to a port and the port is disabled and not in a measurement plan.



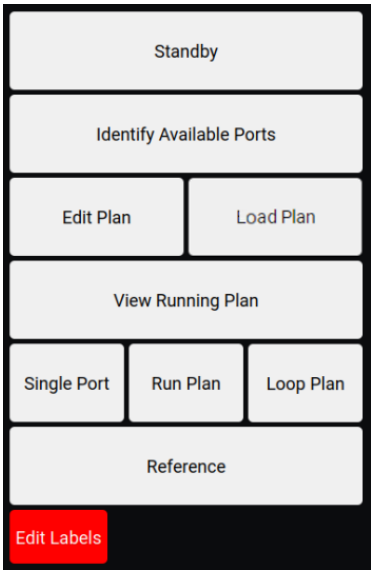
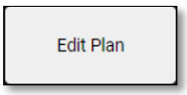
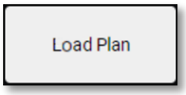
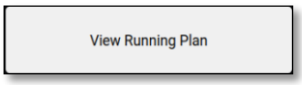
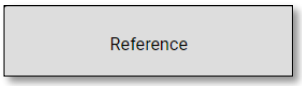
4. **Zero Port** is assigned to a clean input on a manifold bank.



5. **Zero Port** is assigned to the reference port button.

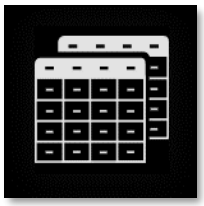
Setup Panel Functions

The Setup panel has many different options for managing your fab and the SAM.

Main Panel	Button	Purpose
		**Standby:** This button is highlighted green when the analyzers are not monitoring the sample lines.
		**Identify Available Ports:** Cycles through all the available ports in the system and determines the appropriate flow rate for each port.
		**Edit Plan:** This button enables you to edit your plan or plans.
		**Load Plan:** This button enables you to load an existing plan.
		**View Running Plan:** This button enables you to view the plan that is currently running without making edits.
		**Single Port:** This button enables you to sample from a single port. Select Single Port and then the port you want to measure. Both will be highlighted green until you select another port or Standby. **Run Plan:** This button enables you to run the plan. It is highlighted green when selected. **Loop Plan:** This button enables you to loop the plan indefinitely.
		**Reference:** This button allows the user to deliver a reference gas to all analyzers to verify analyzer measurement performance. *All banks will be highlighted yellow while reference gas is flowing.* Refer to ***Section 3.3, Clean and Reference Gases*** to set up a reference gas line.
		**Edit Labels:** This enables you to change the names of channels. **Note:** This button is grayed out and not functional while a plan is running. However, the user can click the **Standby** button to activate the Edit Labels button.

6.5 Numerical View Page

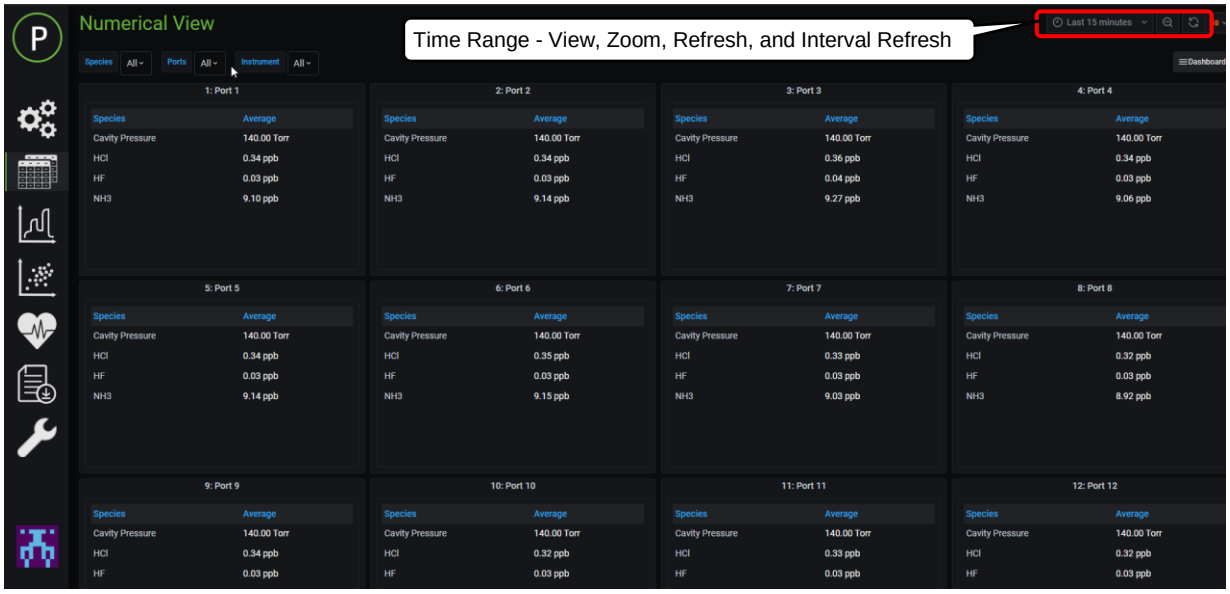
From the Numerical View page, you can see the current conditions in the channels and banks that you have chosen to monitor.



1. Click the **Numerical View** button. The Numerical View page will display (Figure 28). It will show the last value read from each port.

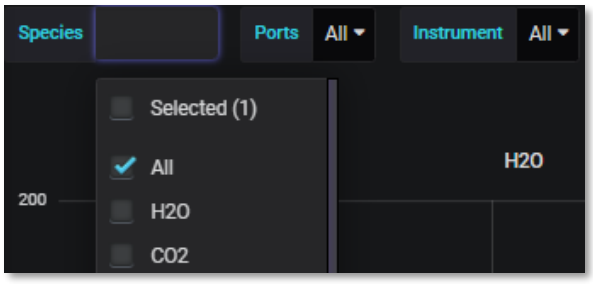
   Each reading includes units of measurement.

   The refresh interval is five seconds by default. If you don't see values, you might need to adjust the time frame viewed.



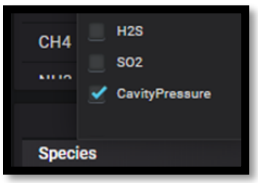
The numerical values will be displayed for the species in each channel.

Figure 28: Numerical View Page

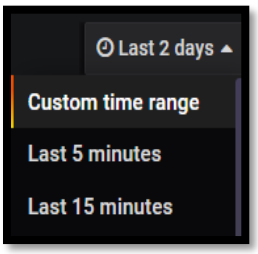


2. Select port, species, or instruments from drop-down list, on the upper left of the screen.
3. Select multiple, single, or all.

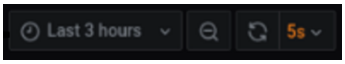
   When finished, click on the screen. The new values will display.



4. From the species drop-down list, you can also select cavity pressure.



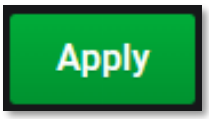
5. To change the time range viewed, select Custom time range from the drop-down list on the upper right of your screen (Figure 28).



Calendars will display.

6. Choose the time frame, start and end.

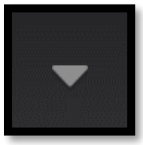
CAUTION*:** Do not attempt to display data spanning more than 2 days at a time. Large amounts of data can cause system slowdown and the display to freeze. See ***Section 7, Troubleshooting for recovery instructions should this occur.



7. Click **Apply**. It will show the last value read within the time frame you've selected.

8. To double the size of your chosen time frame, click the **Zoom** button (Figure 28). This will expand the time range outward, affecting both the start and end times.

9. Click the **Refresh** button to refresh the values.



10. Click the drop-down arrow to see or change the Refresh Interval.

The available refresh intervals are: Off, 1, 2, 5, 10, 30 second(s), 1, 5, 15 minutes, 1, 2 hour(s), and 1 day.

6.6 Graphical View Page

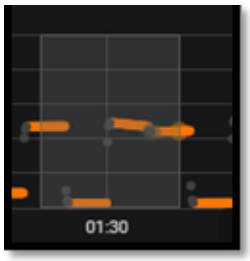
This Graphical View page shows the species values over time in graphic form. You can adjust the values shown by port, species, or time frame.

View Graphical View

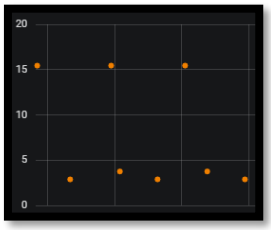
1. Click the Graphical View button.

   The concentration values will show (Figure 29).

Figure 29: Graphical View Page



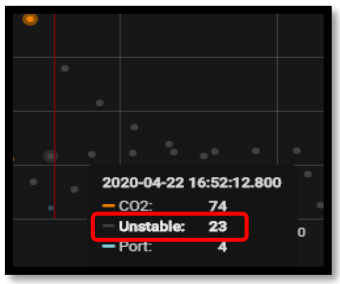
2. To get a closer view of values shown, select an area of the screen.



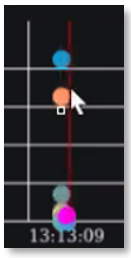
The graph will update to display only the portion selected.

You can also view values for individual data points by placing the cursor over any single point. The following data will be displayed:

- The date and time of the point that your cursor is over
- The species that are nearest that date and time
- The value of that species in PPB, as appropriate.



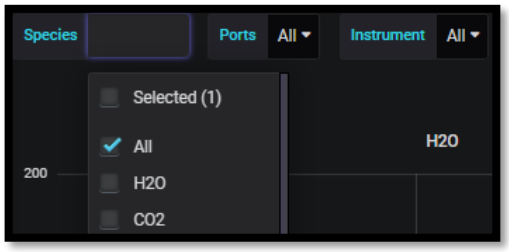
Any points colored as grey will be indicated as unstable points.



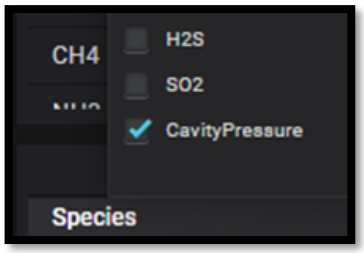
3. To get a detailed list of concentration values in a particular area of displayed data, click once in the area of interest and release. A red vertical bar will appear in that area of the screen. The user can slide the bar to the left or right to view specific data at specific times along the x-axis of the Port being viewed.

   A list of concentration values for all relevant species corresponding to the location of the red vertical bar will display.

Change the Ports, Species or Instruments Shown



1. Select port, species, or instruments from the drop-down menu, on the upper left of the screen.
2. Select multiple, single, or all.
3. When finished, click on the screen. The new values will display.

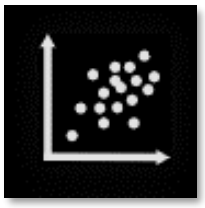


4. From the species drop-down menu, you can also select cavity pressure.

6.7 Data Analysis Page

The Data Analysis page shows the chemical name and gas concentration by channel.

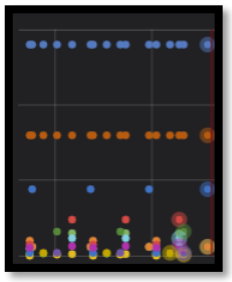
View the Data Analysis Page



1. Click the **Data Analysis** button. This shows the following data:
   - Species Values (Each species has an assigned color for ease of identification.)
   - The Vertical shows the Species Concentration (Y)
   - The Horizontal shows the Time Frame (X)

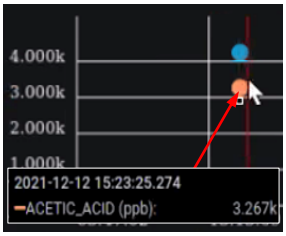
Figure 30: Data Analysis Page

2. To get a closer view of values shown, select an area of the screen.



The graph will update to display only the portion selected.

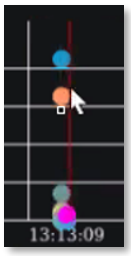
You can view values for individual data points by placing the cursor over any single point.



The following data will be displayed:

- Date and time of the point that your cursor is over
- Species that are nearest that date and time
- Concentration value of that species

Any points colored as grey will be indicated as unstable points (not shown here – see example in ***Section 6.6***).



3. To get a detailed list of concentration values in a particular area of displayed data, click once in the area of interest and release. A red vertical bar will appear in that area of the screen. The user can slide the bar to the left or right to view specific data at specific times along the x-axis of the Port being viewed.

A list of concentration values for all relevant species corresponding to the location of the red vertical bar will display as shown in Figure 31 below.

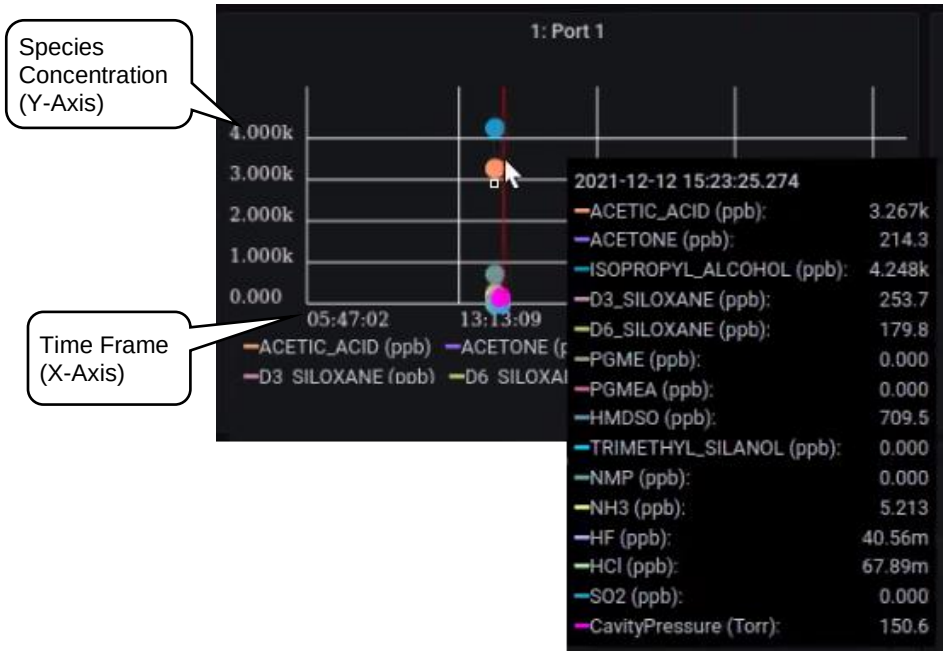
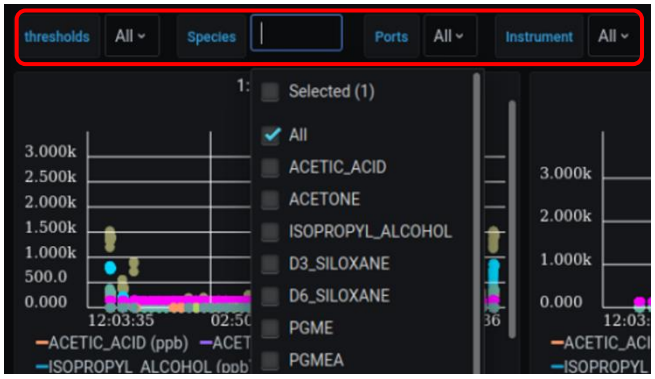
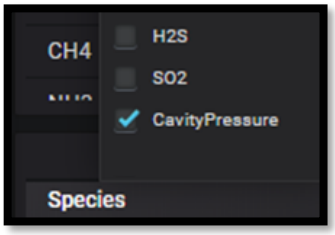


Figure 31: Close Up View of Concentration Values

Change Thresholds, Species, Ports, or Instruments Shown



1. Select the thresholds, species, ports, or instruments from the drop-down lists, on the upper left of the screen.
2. Select multiple, single, or all.
3. When finished, click on the screen. The new values based on the selections made will display.



4. From the species drop-down list, you can also select cavity pressure.

6.8 System Status Page

The System Status page shows the status of the analyzers, the SAM CPU, disk usage, memory usage, the connected hardware, and log messages.

View System Status

1. Click the System Status button.

   The System Status page displays.

   The first half of the page shows the status of the CPU Usage (memory), RAM, CPU Temp (temperature), Disk 1, Disk 2, and Memory Usage. The second half of the page shows the analyzer condition, the log data, and the connected hardware.

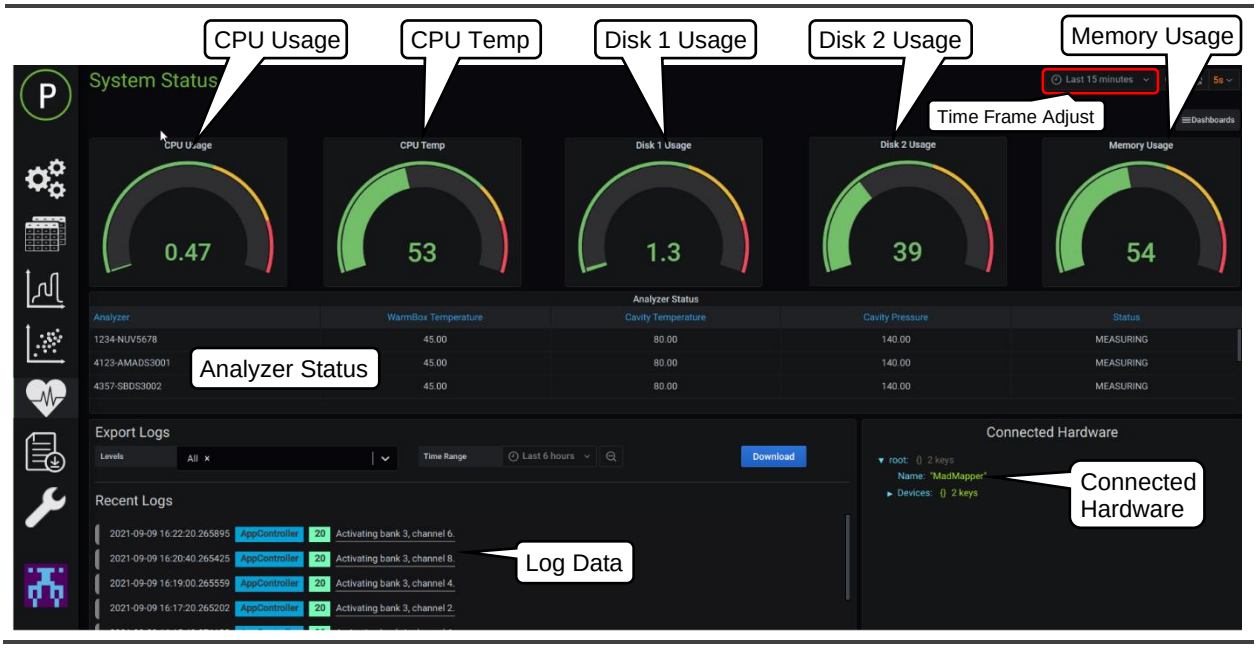
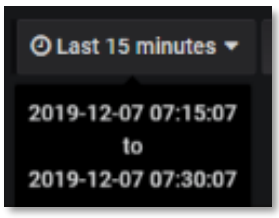


Figure 32: System Status Page



2. To adjust the time frame viewed, select values from the Custom time range drop-down list on the upper right of your screen.

   Note: The system status page is primarily for viewing system conditions, not for managing them.

View Analyzer Status

This Analyzer Status section shows the warm box temperature, the cavity temperature, the cavity pressure, and the measuring status.

Analyzer	WarmBox Temperature	Cavity Temperature	Cavity Pressure	Status
1234-NUV5678	45.00	80.00	140.00	MEASURING
4123-AMADS3001	45.00	80.00	140.00	MEASURING
4357-SBDS3002	45.00	80.00	140.00	MEASURING

Figure 33: Analyzer Status

In general, the analyzer hardware conditions should be in following ranges:

- **Warm Box Temp**: 44.95 - 45.05 °C
- **Cavity Temp:** 44.95 - 45.05 °C or 79.9 - 80.1 °C (analyzer dependent)
- **Cavity Pressure:** 133 – 147 Torr
- **Status:** MEASURING/WARMING. If the values listed here are not in their appropriate range, the analyzer section will read WARMING. If in range, it will read MEASURING.

Threshold values will change with different types of instruments. They show green, when they are within tolerance; if they are white, they are not within tolerance.

View Log File Data

The log file data section shows events with the time stamp, the log course (blue), the current severity (see chart below) and the appropriate tags.

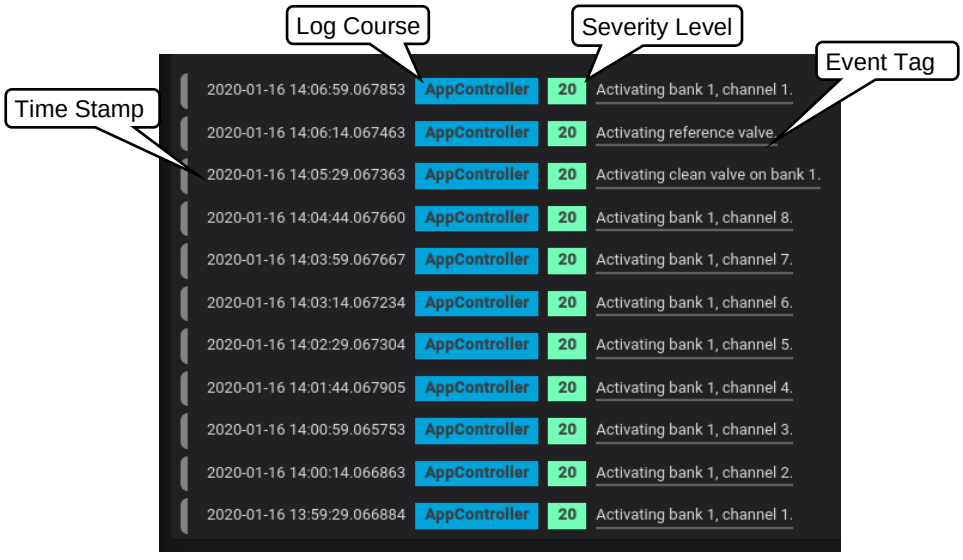


Figure 34: Log Data

Table 6: Log Data Severity Level Number and Color Meanings

Severity Number	Color	Meaning
Level 20	Green	**Info:** Any normal, expected activity, or event.
Level 30	Light Pink	**Warning:** Handled exceptions, statuses approaching thresholds, non-fatal conditions that you can continue operating in, or recover from via software control, improper user inputs.
Level 40	Rose	**Error:** Handled exceptions, you cannot recover to the normal operating state via software control, missing files, missing configuration, unintended web-socket disconnection.
Level 50	Red	**Critical:** Unhandled exception, traceback info, crash.

View Connected Hardware Status

SAM dynamically detects the hardware that is connected to its system and configures itself. Use this section to validate your connections. It shows the status of network devices and serial drivers, and their associated hardware.

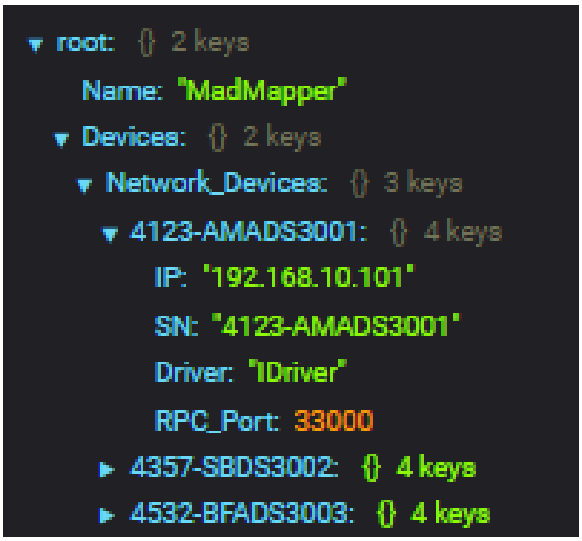


Figure 35: Network Device Status

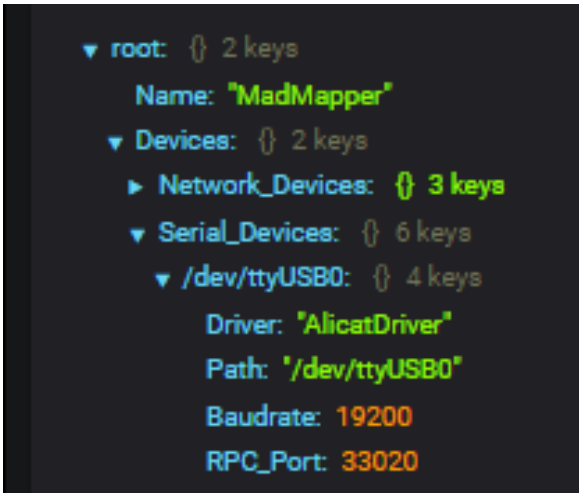


Figure 36: Serial Driver Status

6.9 Export Data Page

This Export Data page enables you to generate a spreadsheet that shows the species conditions over time.

1. Click on the Export Data button.

   The following page (Figure 37) will display.

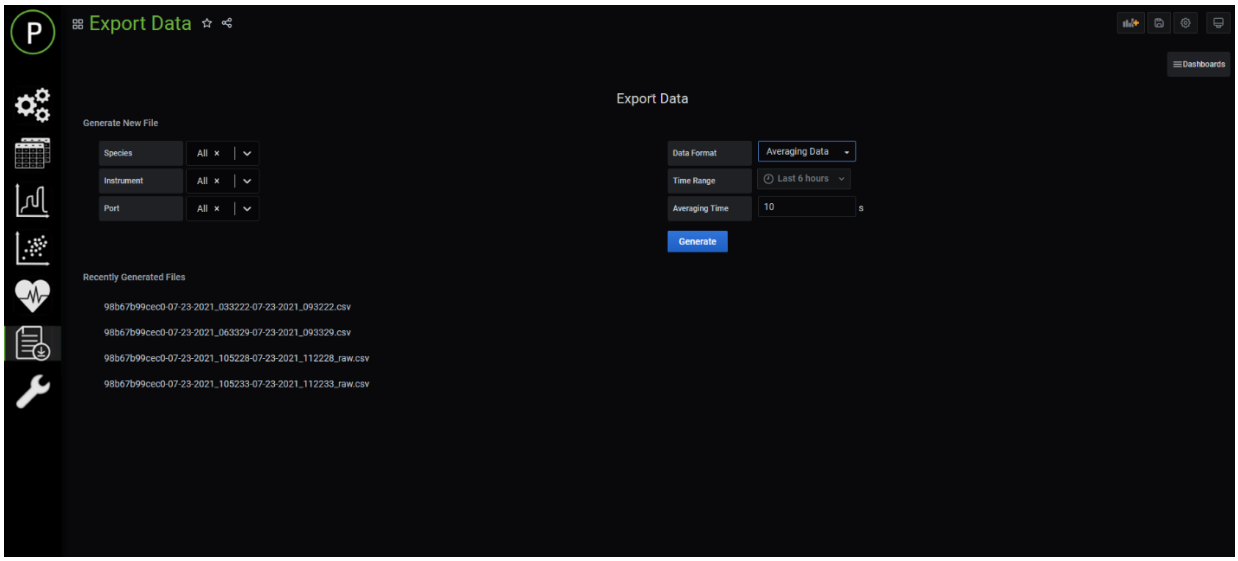
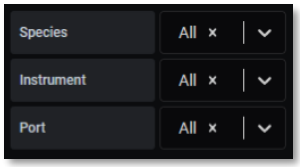


Figure 37: Export Data Page

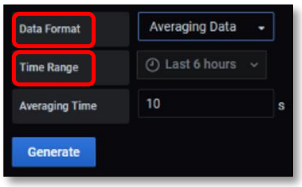


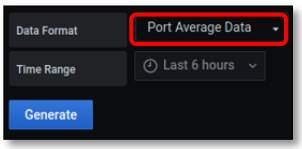
2. From the drop-down lists on the left of the page, select the **Species**, **Analyzer**, or **Port** you would like to evaluate.

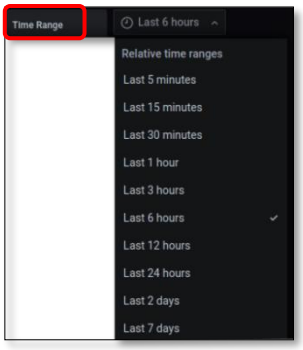
   Select one, multiple, or all.

3. From the species drop-down list, you can also select the Warm Box Temperature and Cavity Pressure.

   You can select one, multiple, or all.







4. Choose a Data Format:

Raw (all measurements), **Processed** (all measurements starting 20 seconds after a port change), **Averaging Data** (return arithmetic mean of the last n seconds of a port's measurements), and **Port Average Data (the** arithmetic mean of all the port's measurements starting 20 seconds after the port changes and including all the measurements up to when the port changes. It also includes the unknown interference flag).

5. Choose a Time Range:

You can choose a **Relative Time Range** from the drop-down list or define a custom **Absolute Time Range**.

Select **Relative Time Ranges** (shown at left) for:

- The last 5 minutes, 15 minutes, 30 minutes, 1 hour, 3 hours, 6 hours, 12 hours, 24 hours, last 2 days, or last 7 days.

Define custom **Absolute Time Range** (Figure 38 below)

- For **Processed Data, Averaging Data**, and Port Average Data, you can set a time range of 30 days or less.
- For **Raw Data**, you can set a time range of 7 days or less.

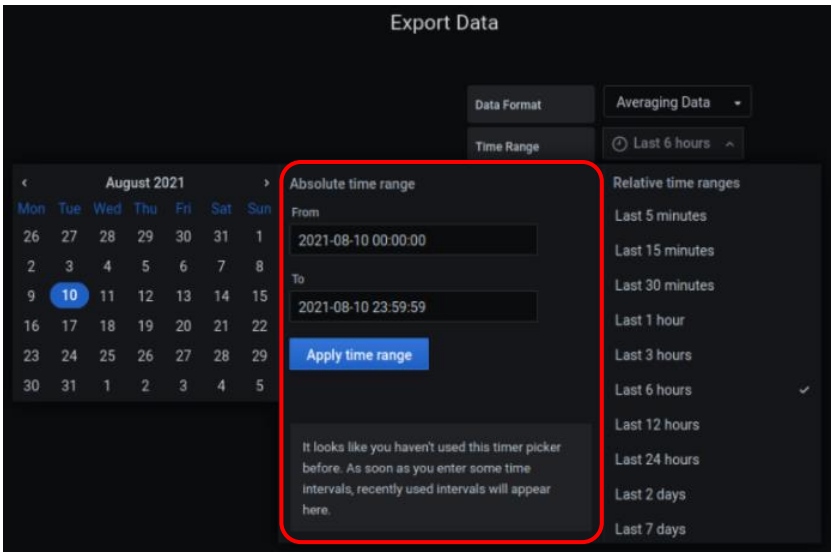
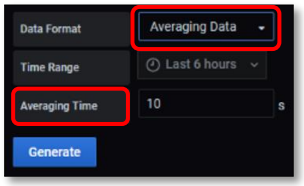


Figure 38: Setting Custom Absolute Time Range

NOTE

When Averaging Data format is selected, the user must input a Time Range and Averaging Time for downloading the Averaging data.

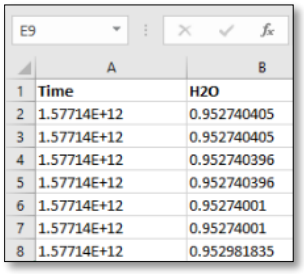


- **Minimum averaging time is 10 s.**
- **Choose an averaging time based on the smallest time duration of a step**.

Example: If a plan has a step of 100 s, you can choose an averaging time of 50 s. But if the plan has another step with a duration of 40 s only, choosing an averaging time of 50 s will give an error.

Therefore, the user must choose an averaging time based on the step with the smallest duration.

6. Click the **Generate** button. A pop-up window will show that the file successfully downloaded.



	A	B
1	Time	H2O
2	1.57714E+12	0.952740405
3	1.57714E+12	0.952740405
4	1.57714E+12	0.952740396
5	1.57714E+12	0.952740396
6	1.57714E+12	0.95274001
7	1.57714E+12	0.95274001
8	1.57714E+12	0.952981835

The file will download to your downloads folder. It will be in a Comma Seperated Value (CSV) file format.

The file will show:

- The **Timestamp** in Epoch time, that is the seconds from Jan 1, 1970.
- The **Species** in the appropriate value format and the species' units of measurement.
- The **Plan Name** next to the **Port Number.**

NOTE

These files are also temporarily saved to the SAM system; they will be purged from the SAM system when you reboot.

6.10 Settings Page

The Settings page enables the user to make changes for analyzer Zero Reference Settings, Thresholds, and Date, Time & NTP Server sync.

1. Click on the **Settings** button.

   The following page (Figure 48) will display with the Zero Settings tab active as a default.

2. Select the desired tab and make adjustments as described in the following sections.

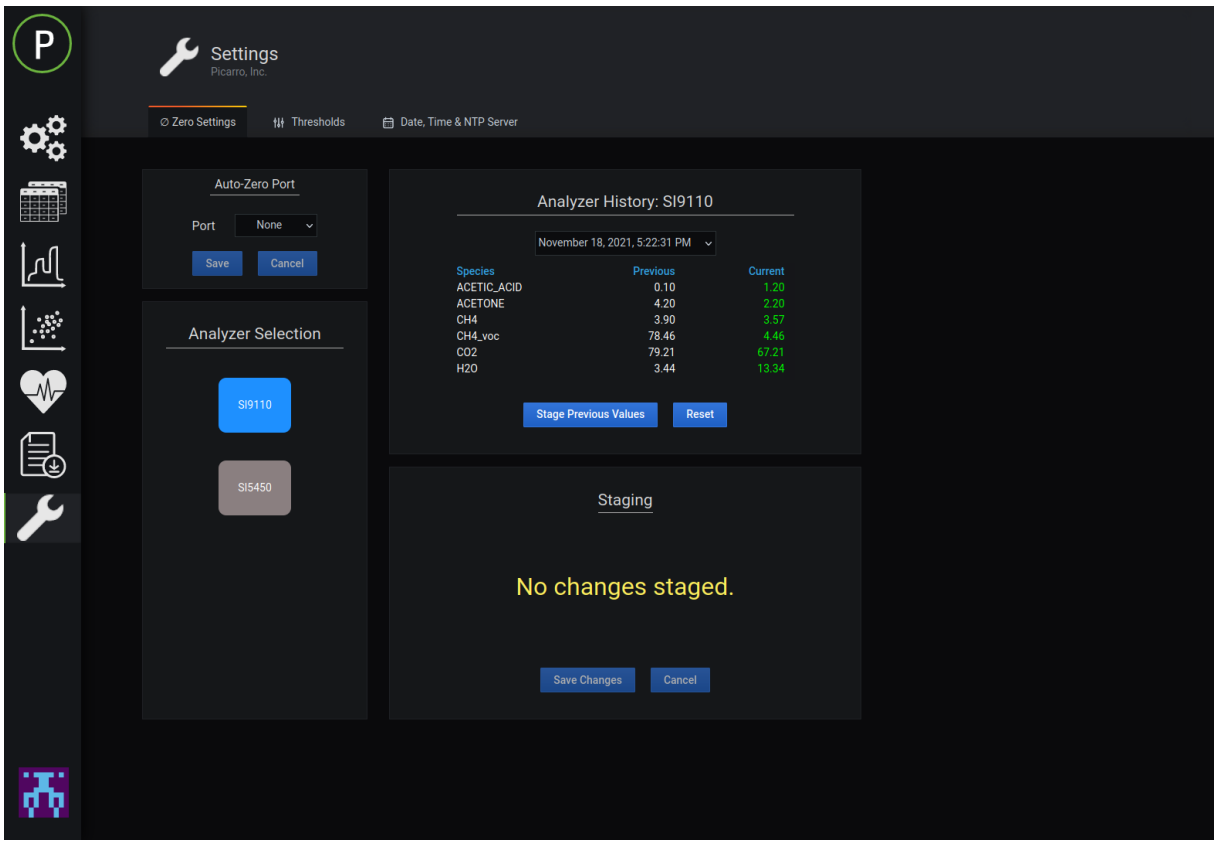
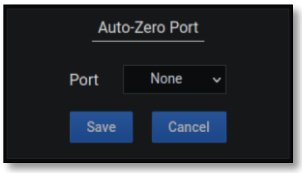
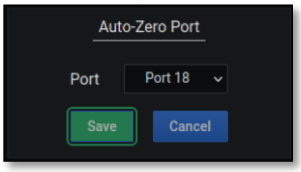


Figure 39: Settings Page – Default View – Zero Settings Tab Active

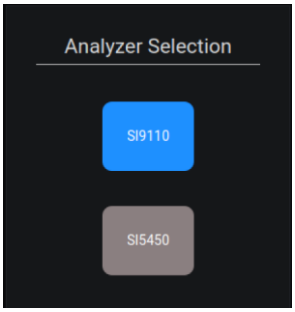
Zero Settings Tab

Selecting the Zero Settings tab enables the user to set up the Zero feature for compatible analyzers (the SI9110 and SI5450, if equipped). It is here the user can assign any individual SAM port as the Zero port. The data collected from the Zero port corrects data from all other ports for possible analyzer drift. This page also provides a utility for resetting the zero offset or staging previous historical offset values. The following steps describe the actions that can be taken with this tab::



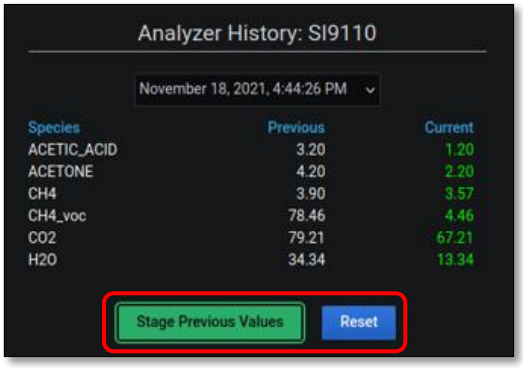


1. From the **Auto-Zero Port** section, select the port number you would like to associate as the Zero Referencing port).
2. Click on the **Save** button to save the port assignment. A notification appears on the Settings page indicating a successful save. **Cancel** will revert the port selection to "None".



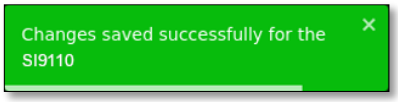
3. In the **Analyzer Selection** panel, select the desired analyzer for resetting **Auto-Zero.**

   In the example to the left, the **SI9110** is selected.
4. In the **Analyzer History SI9110** panel, the user can select either **Stage Previous Values** or **Reset**.



Clicking on **Stage Previous Values** copies the historical zero offset values selected from the Date drop-down to the **Staging** panel:

5. In the Staging panel, click **Save Changes** to apply the offset values to the analyzer. Once the changes are saved, the notification below appears:



6. If **Reset** is clicked, new offset values are loaded into the staging panel.
7. Click **Save** to apply the new offset values to the analyzer.

Interference Flags

When zeroing an SI9110, an additional calculation is performed on the stored port-average data to determine its validity; e.g., whether or not an unknown molecular interferent is negatively affecting the measurement accuracy. The value of the Interference Flag is calculated at the end of each port measurement. The flag value cannot be seen in any visual display and is only available from the **Port Average** data export function. Flag definitions are given below:

- 0 = OK; no interference at this data point
- 1 = Interference is probable at this data point
- -1 = Insufficient information to flag whether this data point has interference or not.

Below is an example of SI9110 exported data output illustrating the interference flag column (int_flag) and flag states for Trimethyl Silanol.

The interference flag applies to all species supported by the SI9110 Analyzer. If an unknown interference species is detected, the interference flag pertains to all species concentration values during that port run.

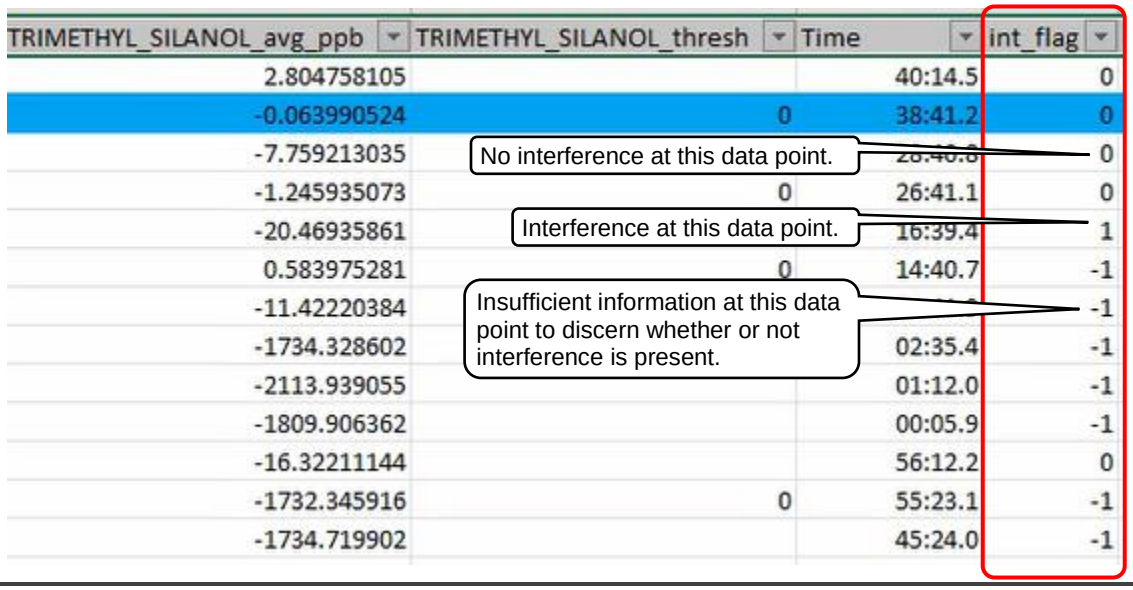


Figure 40: SI9110 Example Exported Data Showing Interference Flag States

Thresholds Tab

The thresholds feature allows users to find values that exceed ideal values by highlighting those values in graphs, tables and exported data with animations, alternative colors, and a new column in the exported data.

The user is given two possible thresholds to enter; per port and per species: a **warning** and an **alarm**.

- When a warning threshold is exceeded, it will be denoted by an orange blinking point on graphs, orange text in tables, and a value of 1 in exported data.
- When an alarm threshold is exceeded, it will be denoted by a red blinking point on graphs, red text in tables, and a value of 2 in exported data.

Threshold setup starts with the **Settings** page and clicking on the **Thresholds** tab; the users will be greeted with the following page (Figure 41).

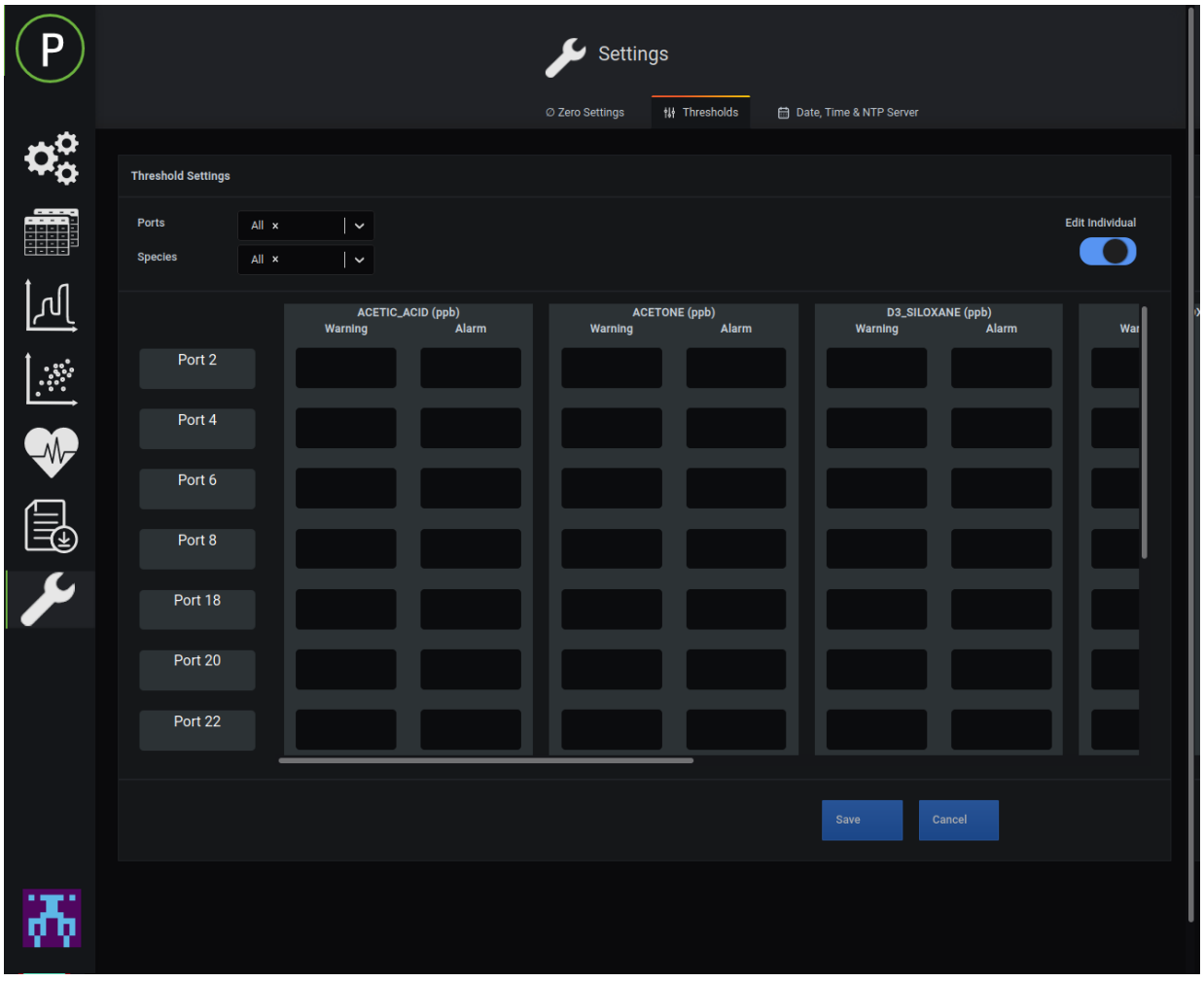


Figure 41: Settings Page – Thresholds Tab Active – Default View

For the exported data, a new column is provided for each species labeled SPECIES_thresh (e.g., ACETIC_ACID_thresh) to report whether a point exceeded a threshold at the time of recording.

Users have the ability to specify thresholds on a port by port basis for each species. They also have the ability to filter species and ports with the filter dropdowns as shown in Figure 42.

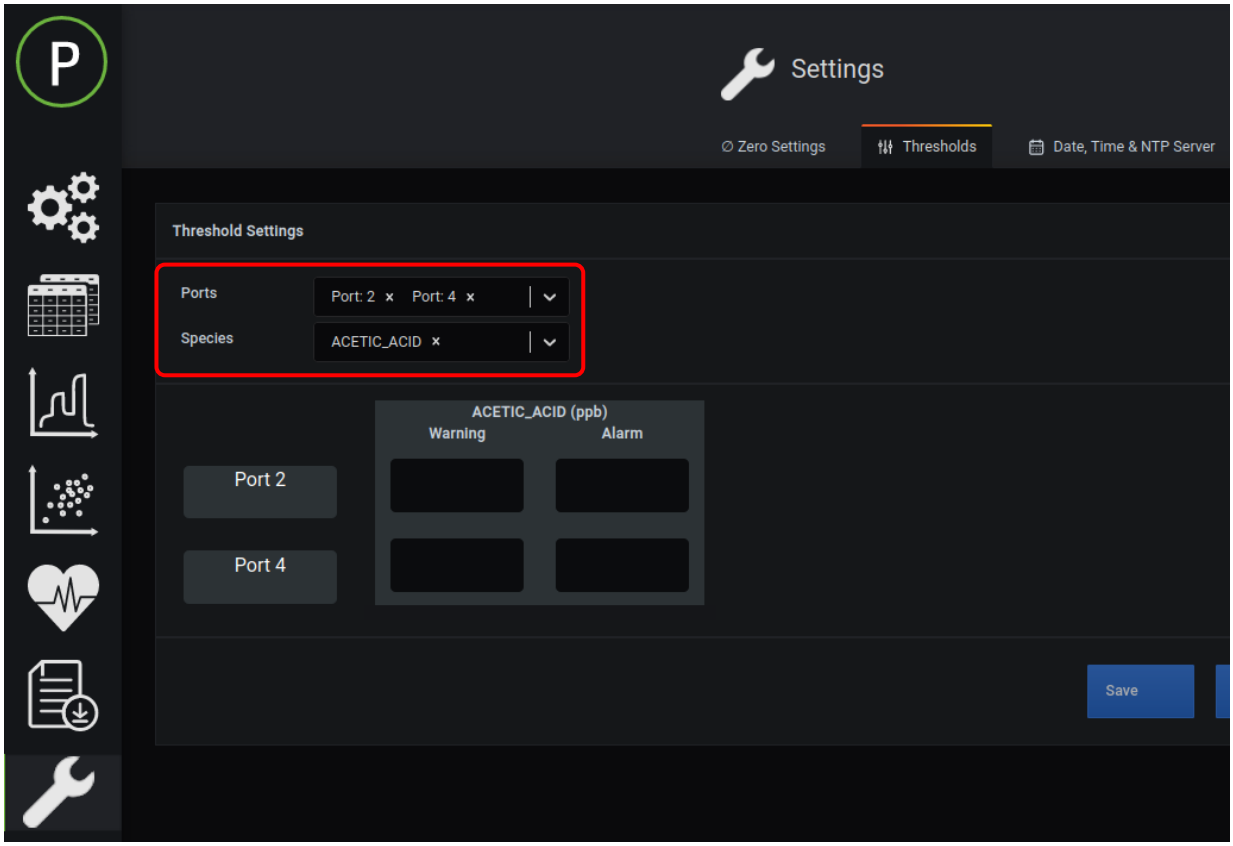


Figure 42: Filtering Threshold by Port and Species

Users can also specify the thresholds for the entire species on a global level by deselecting the slider labeled: **Edit Individual** as shown in Figure 43. Here you will notice that the Port selection filter is no longer available, but the Species filtering dropdown still is. Here you can select all or any number of individual species for setting thresholds.

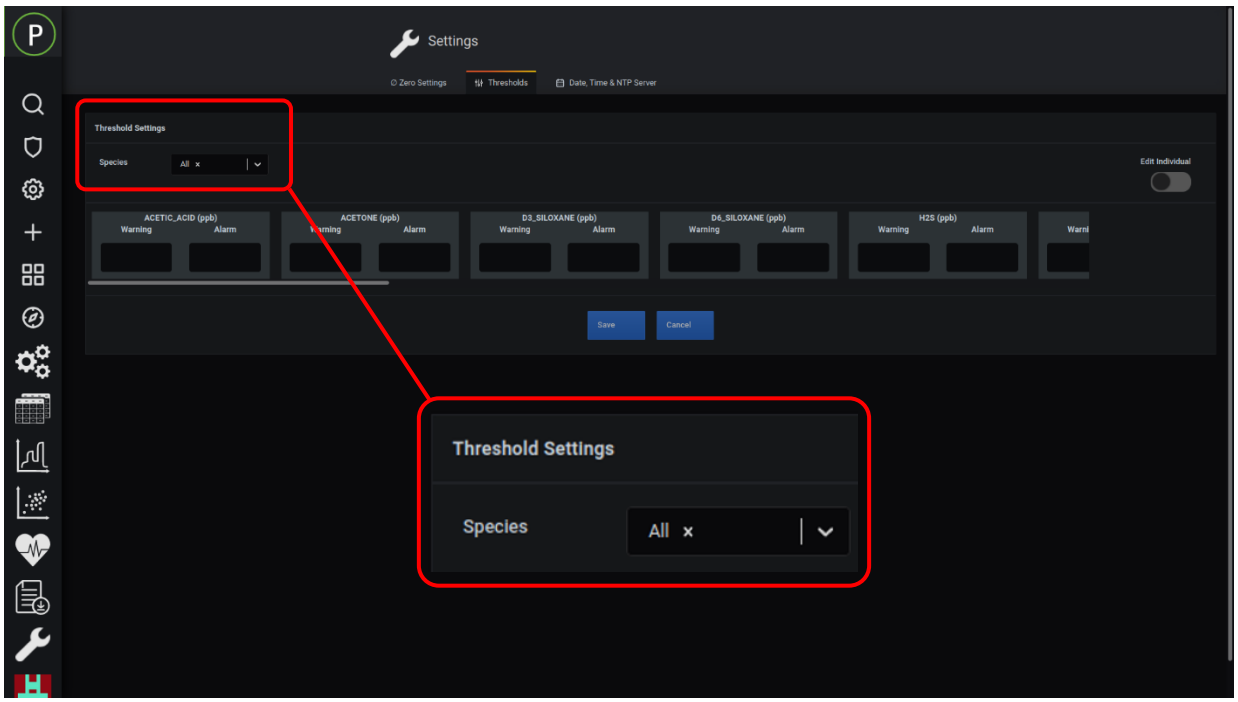


Figure 43: Setting Thresholds on Global Level

Example Settings:

Suppose a user saves thresholds with a warning value of 1 and an alarm value of 2 as shown in Figure 44.

Each point in the data graph that exceeds its corresponding threshold will be reflected by a blinking orange or red animation (only if there are less than 10k points in the graph that have exceeded the thresholds). See the example in Figure 45.

Figure 44: Example – Threshold Warning and Alarm Levels Set for Acetic Acid

How Exceeded Thresholds are Presented to User

Exceeded Thresholds in Graphs:

Each point in the data analysis graph that exceeds its corresponding threshold will be reflected by a blinking orange or red animation (only if there are less than 10k points in the graph that have exceeded the thresholds).

Figure 45: Example D3_SILOXANE Data Analysis – Thresholds Exceeded

Exceeded Thresholds in Tables:

Each number in a data table that exceeds its corresponding threshold will be reflected by orange or red colors (Figure 46).

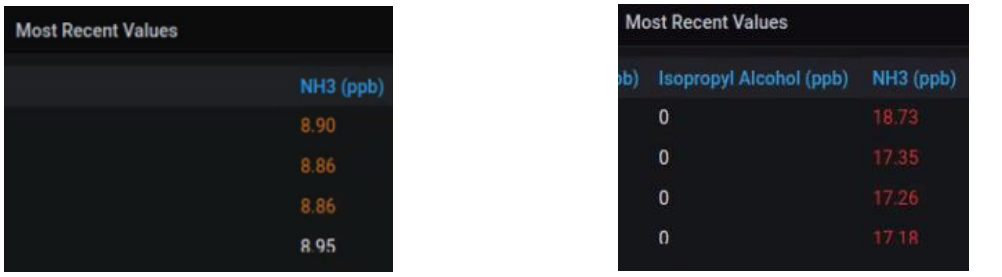


Figure 46: Thresholds Exceeded in Numerical Data

Exceeded Thresholds in Exported Data

Each point in an exported data file that exceeds its corresponding threshold will be reflected by an added Threshold column as shown below. In this example, the column is labeled "ACETIC_ACID_thresh". The values are defined as: 0 = No alarm (no color), 1 = Warning (**orange** color), 2 = Alarm (**red** color) as shown above in Figure 46.

ACETIC_ACID_ppb	ACETIC_ACID_thresh	ACETONE_ppb	ACETONE_thresh	Analyzer	CavityPressure_Torr
0.903976315	0			SI3401	140
2.32351438	1			SI5450	140
25.93044718	2			SI2108	140
				SI5450	140

Figure 47: Exceeded Thresholds Presented in Exported Data

Date, Time, & NTP Server Tab

Selecting the **Date, Time & NTP Server** tab enables the user to set the Date and Time to the Server and to sync with the NTP Server. It has 2 Modes – **Time Sync Enabled** or **Time Sync Disabled**.

- **Time Sync Enabled:** Time cannot be changed but it can be synced to 4 NTP Servers, 4 fields are given where the user can input an IP Address or Domain Name and sync the time to the server.
- **Time Sync Disabled:** This mode allows one to make changes to the time and date and does not sync the time to the NTP Server.

CAUTION

Do not change clock (Set Date/Time) to an arbitrary time in the past or in the future. Large changes in time can cause system to malfunction.

Do not change the clock while Analyzers are running. Shut down all Analyzers before changing the clock on the SAM. *See Section 5.2, Power Down Sequence*.

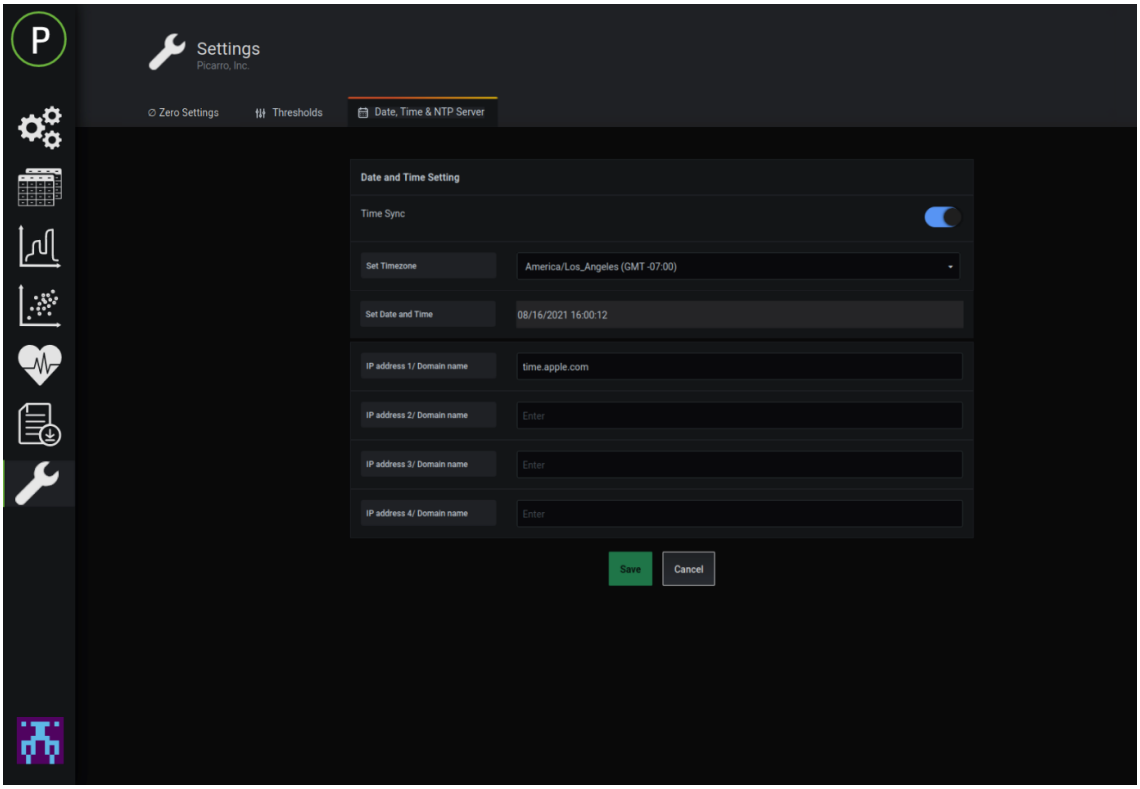


Figure 48: Date/Time/NTP Server Settings Tab

CAUTION

Do NOT enable the Automatic Date & Time from the Home Page OS settings panel (see Figure 49 below).

If the OS *Automatic Date & Time* in this panel is enabled, the SAM system will no longer synchronize its time with external servers, nor will it serve its time to the Analyzers. To avoid this issue, make your time settings using the *Date, Time, & NTP Server* feature on the *Settings* page (shown above in Figure 48).

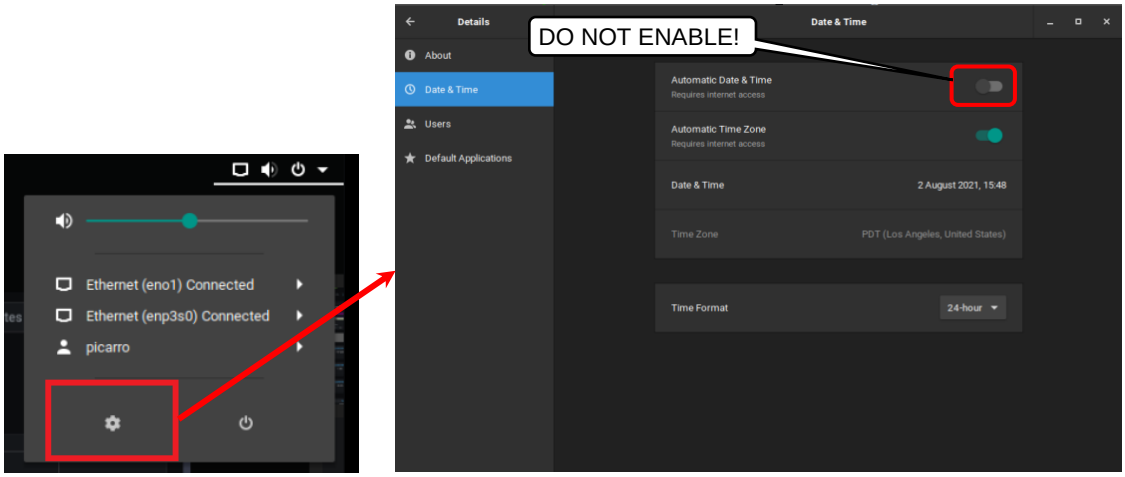
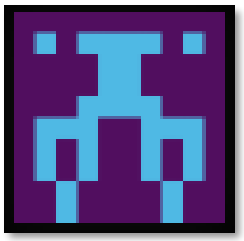


Figure 49: OS Date/Time – Leave Automatic Date & Time OFF

6.11 Viewer Settings Page

From the Viewer Settings page, you can edit your profile, change your password, view keyboard shortcuts, and sign out.

Change Your Settings



1. Click the **Viewer** icon on the navigation panel.

   The following page will display.
2. Make adjustments, and click the **Save** button when done.
3. You must place your cursor over the Viewer icon on the navigation panel to select and open the keyboard shortcuts panel or to sign-out.

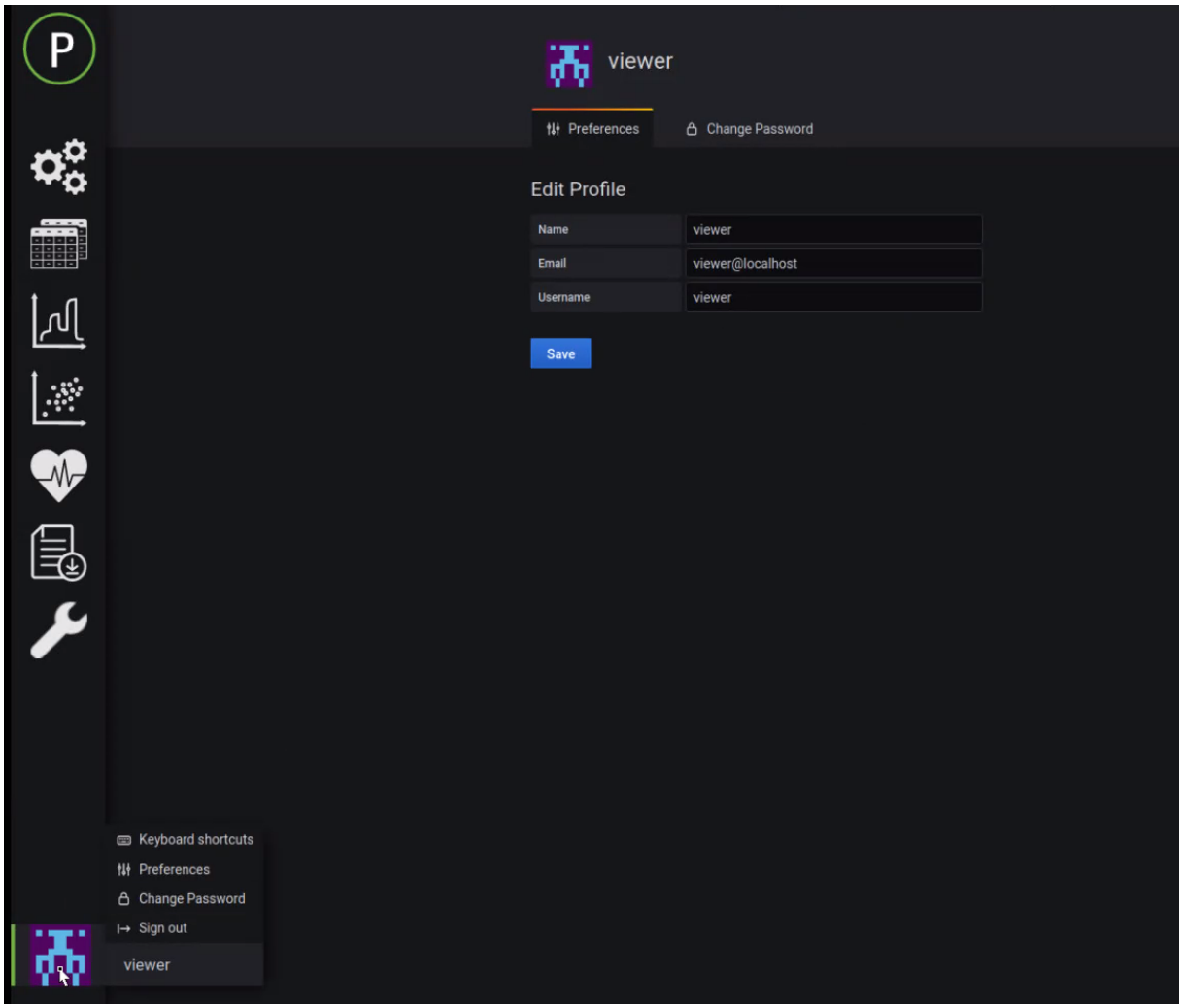


Figure 50: Viewer Setting Page

Change Password Tab

When entering a new password, it is important to use the guidelines below for secure password creation.

1. Click on the **Change Password** tab.

   The **Change Your Password** dialogue will appear (Figure 51).

2. Change your password following the criteria listed below.
3. Enter the **Old password**.
4. Set a **New password** with 20 characters or fewer in length with the following requirements:
   a. No common names or dictionary words
   b. No sequences of more than 4 digits in a row
   c. Include at least one character from at least 3 of these categories:
      - Uppercase letter
      - Lowercase letter
      - Numbers
      - Special character
5. Re-enter the new password in the **Confirm password** field
6. Click **Change Password** to update the password.

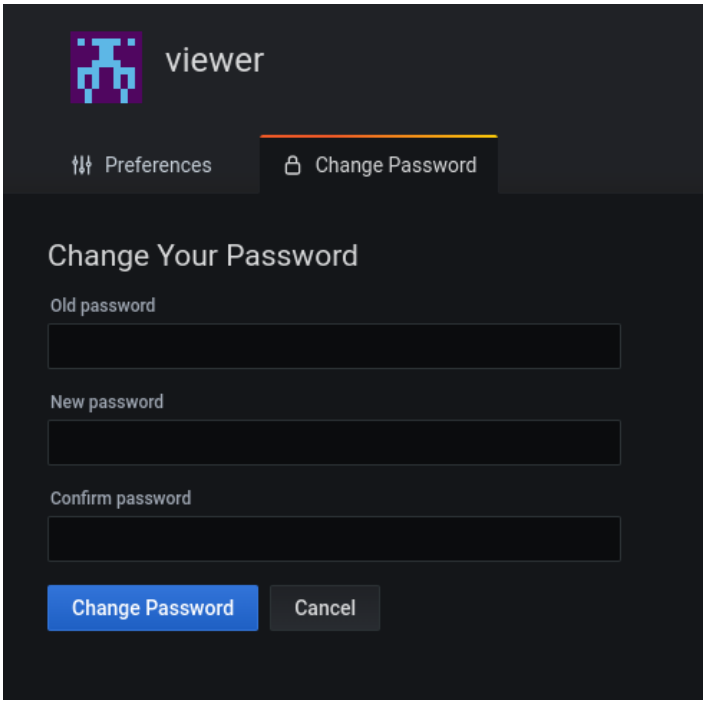


Figure 51: Change Password Dialog

7. Troubleshooting

NOTE

Pressurized clean and reference gases may leak. Any isolation valves at the supply must be shut off, and doors and panels need to be opened for ventilation prior to entering.

CAUTION

Lockout of electrical power and/or compressed gas supplies need to be verified using multimeter/pressure gauge (as applicable).

CAUTION

The system must be shut off or individual modules switched off and unplugged prior to opening any panels for service.

WARNING

Regulatory Employer and Facility Procedures (such as NFPA 70E), must be followed by any personnel conducting troubleshooting in energized areas. Only trained and authorized personnel are allowed to perform troubleshooting in energized areas.

CAUTION

Noise levels between 70 dBA and 75 dBA have been measured when the panels are removed. Simple troubleshooting should take no more than 30 minutes.

WARNING

After the EMO switch is engaged and the system power is cut, the following components remain LIVE: circuit breaker, surge protector, line filter, 24VDC, 2.2A power supply.

Table 7: Problem Troubleshooting

Problems/Issues	Inspection/Indications	Corrective Action
Valve not switching between lines	Valve	Check the power connection and USB connection.
	Indicator light	
Slow response	Gas Leak	Check that the sample lines are connected properly.
	Tube blockage	Check the sample line for any blockage.
	Pump operation degraded	Check to see if the sample pump is functioning by feeling for exhaust.
	Operation sequence	Check that the operation sequence has been defined adequately and is running.

Problems/Issues	Inspection/Indications	Corrective Action
No power	Electrical cable connection	Check the breaker at the back of the SAM. The circuit breaker can be probed through the cover with 1.5 mm diameter test probe tips. Check that the EMERGENCY OFF switch is not engaged. Check the integrity of the power connection on all sampling boxes.
Keyboard not functioning	Keyboard USB connection	Ensure that only the keyboard USB is connected to the KVM unit and that all other USBs are connected to the rack integrated PC.
Mouse not functioning	Mouse USB connection	Ensure that only the mouse USB is connected to the KVM unit and that all other USBs are connected to the rack integrated PC.
Unpopulated GUI Screen (See Figure 52 below)	In rare cases, the front end might have issues communicating with the backend resulting in screens that are stuck in an unpopulated state as shown in Figure 52.	Press F5 on the keyboard.
System slows down, display screen freezes (see Figure 52 below)	In cases where too much data is requested, the frontend can hang and become unresponsive.	Repeatedly press **option + F4** (or **option + fn + F4** depending on the state of the fn lock) until arriving at a screen that looks like that shown in Figure 53**.** Click on the Picarro  icon located in the upper left corner of the screen (Figure 53).

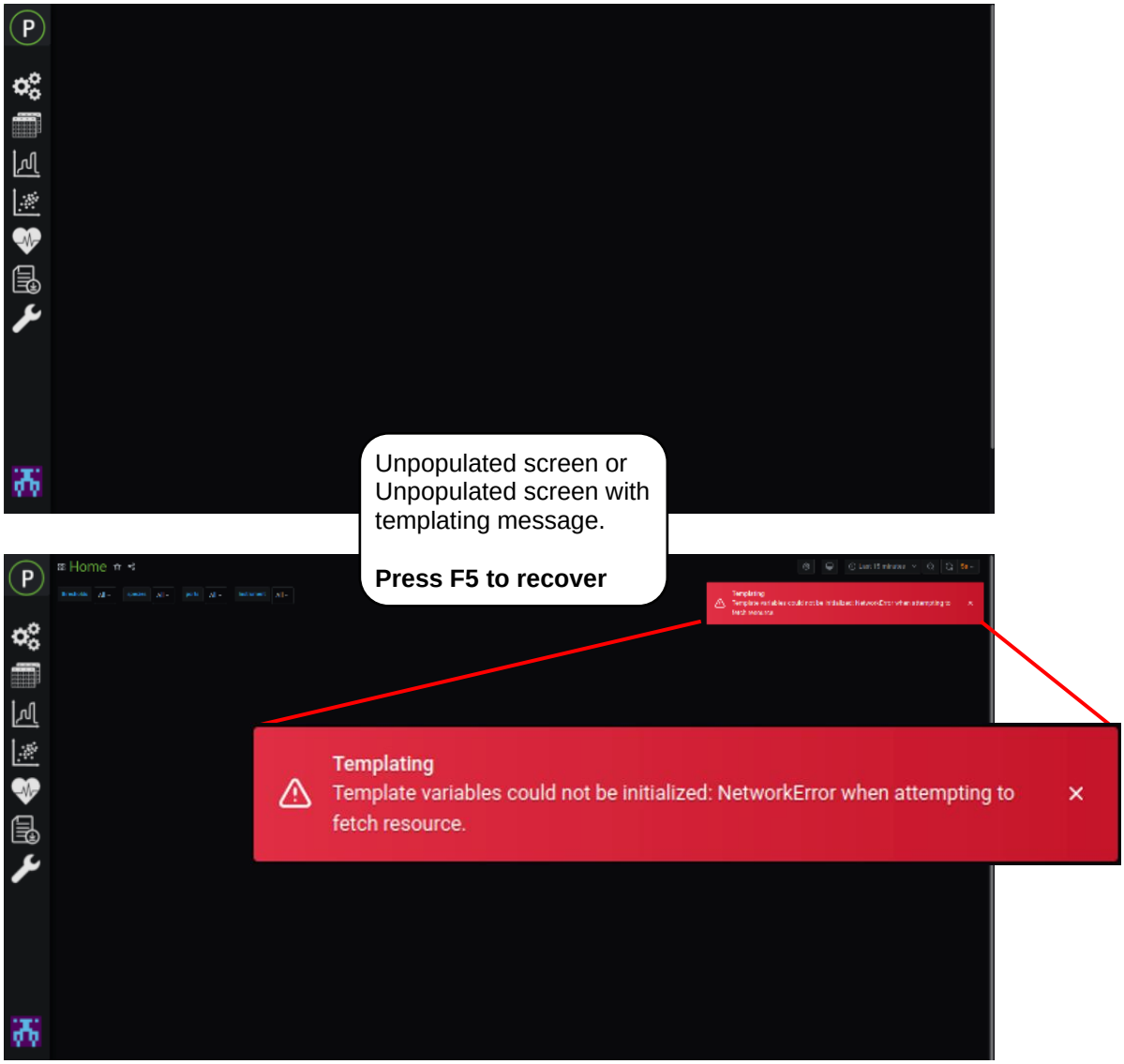


Figure 52: Troubleshooting Unpopulated Screen

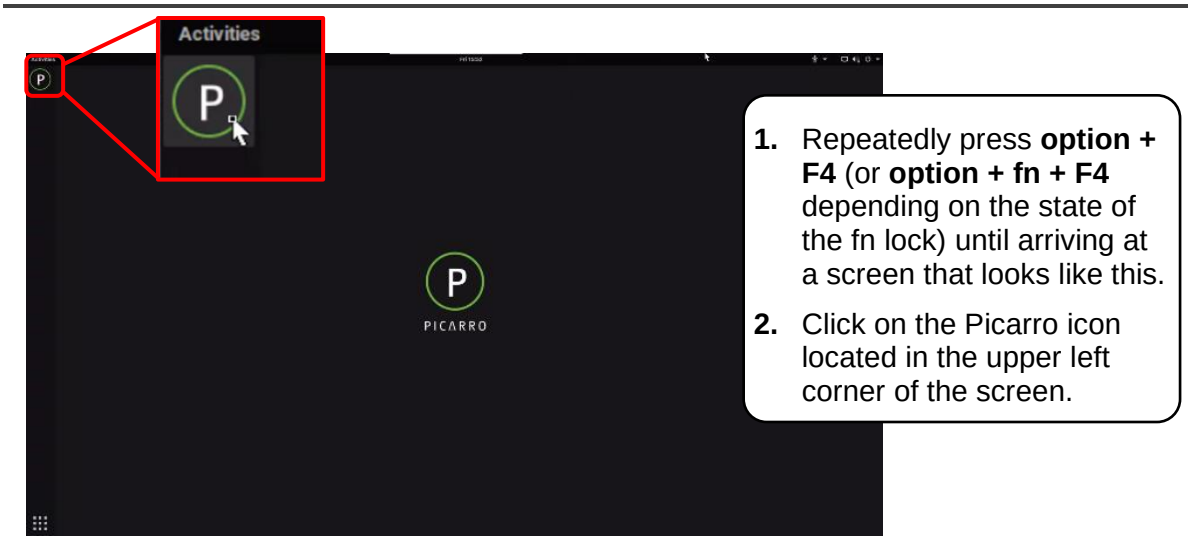


Figure 53: Recovering from System/Display Freeze

8. Equipment Maintenance and Service

All service and maintenance shall be done by a manufacturer trained service partner. There are no customer serviceable parts on this system. Please contact your manufacturer trained service partner to schedule service calls, and trained personnel will perform any required service or maintenance.

9. Replacement of Consumable Materials

There are no customer serviceable parts on this system.