PICARRO

SLiM 100
Installation and Startup Manual

semi™ S-2 CERTIFIED

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1. Introduction

This manual covers installation and startup of the **SLiM 100** product. Depending on the customer requirements during purchase process, this fixed-installation version of SLiM 100 supports up to 32 sampling ports. It can support up to four analyzers, one of which includes a broadband VOC analyzer which can detect up to 10 AMC species in the parts per billion range.

1.1 Intended Use

SLiM 100 Lithography Process Tool Monitoring System detects volatile organic compounds (VOCs) in the lithography process and 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. SLiM 100 monitors your fab conditions using integrated sensors to track AMC trends from organic compounds 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 SLiM 100 and integrated analyzers are not intended to process hazardous materials at levels higher than 25% of their TLV (Threshold Limit Value) or LEL (Lower Explosive Limit). The system is only suitable for connection of non-HPM (Hazardous Production Material) calibration and reference gases.

Figure 1: SLiM 100 Integrated System – Front Panel Closed and Opened

1.2   Key Features

SLiM 100 offers the following elements as prime advantages in AMC detection:

- **FAST SYSTEM RESPONSE:** The gas-handling hardware of the SLiM 100 system has been specifically designed to minimize the "time-to-detection" response function of the sampling system. SLiM 100's flow control hardware enables 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 SLiM 100 hardware system is complex, its GUI is simple, easy-to-use, and configurable. From the SLiM 100 user 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, SLiM 100 enables you to access all of its software features and have full system control from your desktop; you do not have to gown-up and enter the fab to modify measurement schedules and adjust measurement conditions. SLiM 100 also dynamically detects hardware connections and configures itself; you can easily validate these connections via the System page on the GUI.

- **EASY-TO-USE DATA EVALUATION TOOLS:** The SLiM 100 GUI enables you to track current conditions and to track the history of conditions. SLiM 100 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 period. This enables you to respond to AMC conditions in the moment and make improvements based on your analysis of historical trends.

- **SIMPLE RECIPE CREATION and SCHEDULING:** SLiM 100 provides **Schedule** and **Recipe Library** interfaces where you can easily schedule existing recipes (and view recipes that are currently running or scheduled), create and store new recipes, and edit existing recipes from the library.

  - **Recipe Creation Interface:** The user can create, run and store new recipes from either the Schedule or Library tabs. From the library tab, the user can also schedule, view, edit, or delete existing recipes.

    The Recipe Creation interface enables you to create, customize, save, edit, and load recipes that automate monitoring of your fab quickly and easily. From the interface, you can add ports in sequential steps, run a reference gas through the system, and execute clean cycles during recipe runs. Each time a recipe is created, it is saved in the Recipe Library for easy access to edit as needed. It also keeps track of the last active recipe and automatically recovers it in the event of a power-loss, resuming fab monitoring immediately.

  - **Recipe Scheduling Interface**: The user can add recipes to the schedule to run at a future date and time, schedule as recurring, or run a recipe immediately. It is designed so the user does not need to create and run recipes manually every time.

  - **Recipe Editing Interface:** The **View/Edit Recipe** interface enables you to open existing recipes to review and modify. This interface has the same functionality and look as the Create New Recipe interface but allows you to save the same recipe name as a different version, so the original recipe is preserved in the Recipe Library.

1.3 How SLiM 100 Works

Picarro's SLiM 100 Lithography Process Tool Monitoring System detects up to 10 volatile organic compounds (VOCs) in the lithography process, which maximizes the overall effectiveness of its AMC monitoring.

First and foremost, Picarro's SLiM 100 leverages the excellent responsiveness of Picarro's VOC and other 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 SLiM 100's specialized design, Picarro has made great strides in reducing, and in some cases eliminating these effects entirely. It enables 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, SLiM 100'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 recipes that can be looped indefinitely. The software continuously collects and indexes all pertinent data and enables you to analyze it in any number of configurations. It collects and stores data by location, time frame, and species. You can also adjust recipes at any time from any place, with its portable and remote application option.
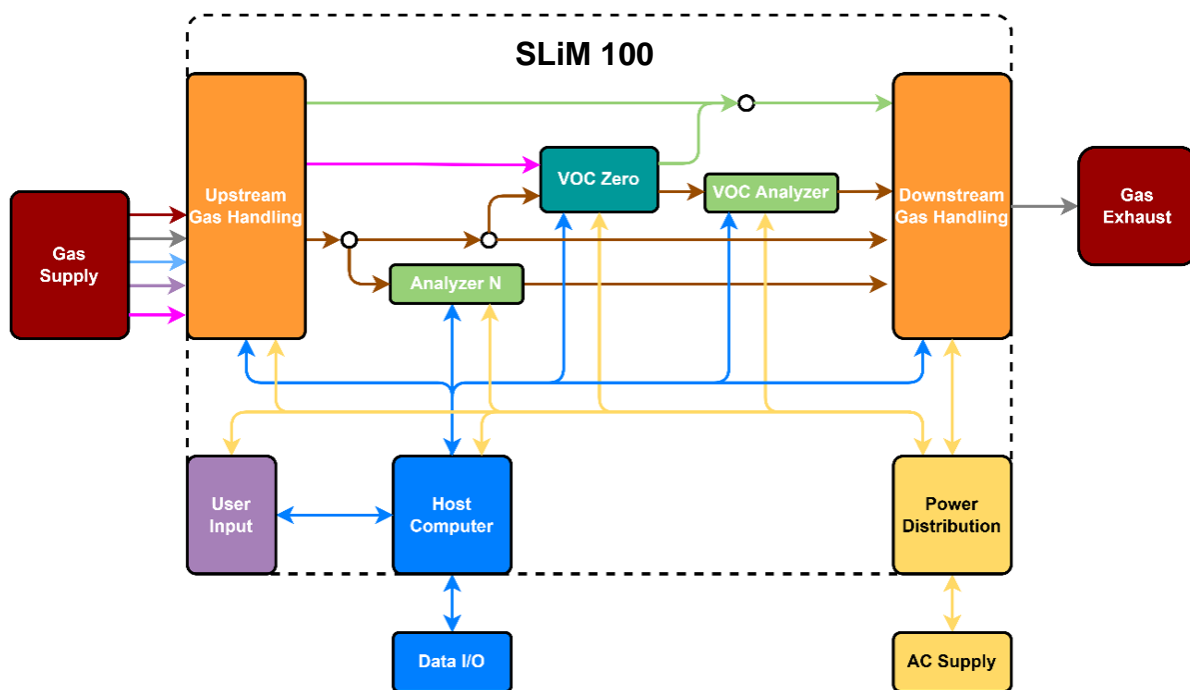

Figure 2: System Diagram

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.

The manual begins with a brief introduction and then provides compliance and safety requirements and basic setup, start-up, and shutdown instructions. Most of the setup, installation and maintenance of SLiM 100 will be done by a manufacturer-trained service partner. Once the system has been installed and started, The user will refer to the included software operation manual.

1.5 SEMI System Software

Refer to the **SEMI Vx.x System Software User Manual** (Picarro PN 40-0096) included with this system for instructions on system operation.

1.6 Equipment Ratings/Specification Table

Table 1: Equipment Ratings 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 79 in x 34 in x 46 in (Depth is with keyboard opened)
Maximum Weight	
24 Port + four analyzers:	338.8 kg (747 lbs.)
32 Port + four analyzers:	354.7 kg (782 lbs.)

Parameter	Value
Sampling Line	1/2-inch OD x 3/8-inch ID UHP-PFA tubing
Communication	Ethernet remote interface
Model Numbers	**SL100-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 SLiM 100 system (See Table 2 below for model code matrix). **For example:** SL100-32-AK00 is a 32 port system containing SI3401 and VOC analyzers.

Table 2: SLiM 100 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
K	VOC	VOC-10 *

* **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 SLiM 100 in a manner not specified by Picarro may result in damage to SLiM 100 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** indicates valuable 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 SLiM 100 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 SLiM 100 system.
	SEISMIC ANCHOR POINT: Indicates seismic anchor placement locations.

2.4   Warning Label Locations

Delay Terminal Block

Pump Terminal Block

Behind Left Side Panel Below Power Distribution Unit (Hazardous Voltage Warning)

Behind Right Side Panel Near SLiM 100 Pumps (Hazardous Voltage Warning)

Behind Left-Rear Panel on Power Input Panel: (Hazardous Voltage Warning and Live After EMO Warning)

Electrical Lockout Point

Behind Front Panel: Power Distribution Unit (Hazardous Voltage Warning)

On Left-Rear Panel: Above Power OFF Switch (Electrical Lockout Point)

Anti-tipping Foot

SEISMIC ANCHOR POINT

On Left-and Right Sides of Frame (four places): (Seismic Anchor Point)

On Right-Rear Panel (Asphyxiation Warning)

Figure 3: Warning Label Locations

2.5 Seismic Protection Provisions

To prevent the SLiM 100 unit from tipping over during a seismic event, each SLiM 100 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 SLiM 100 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

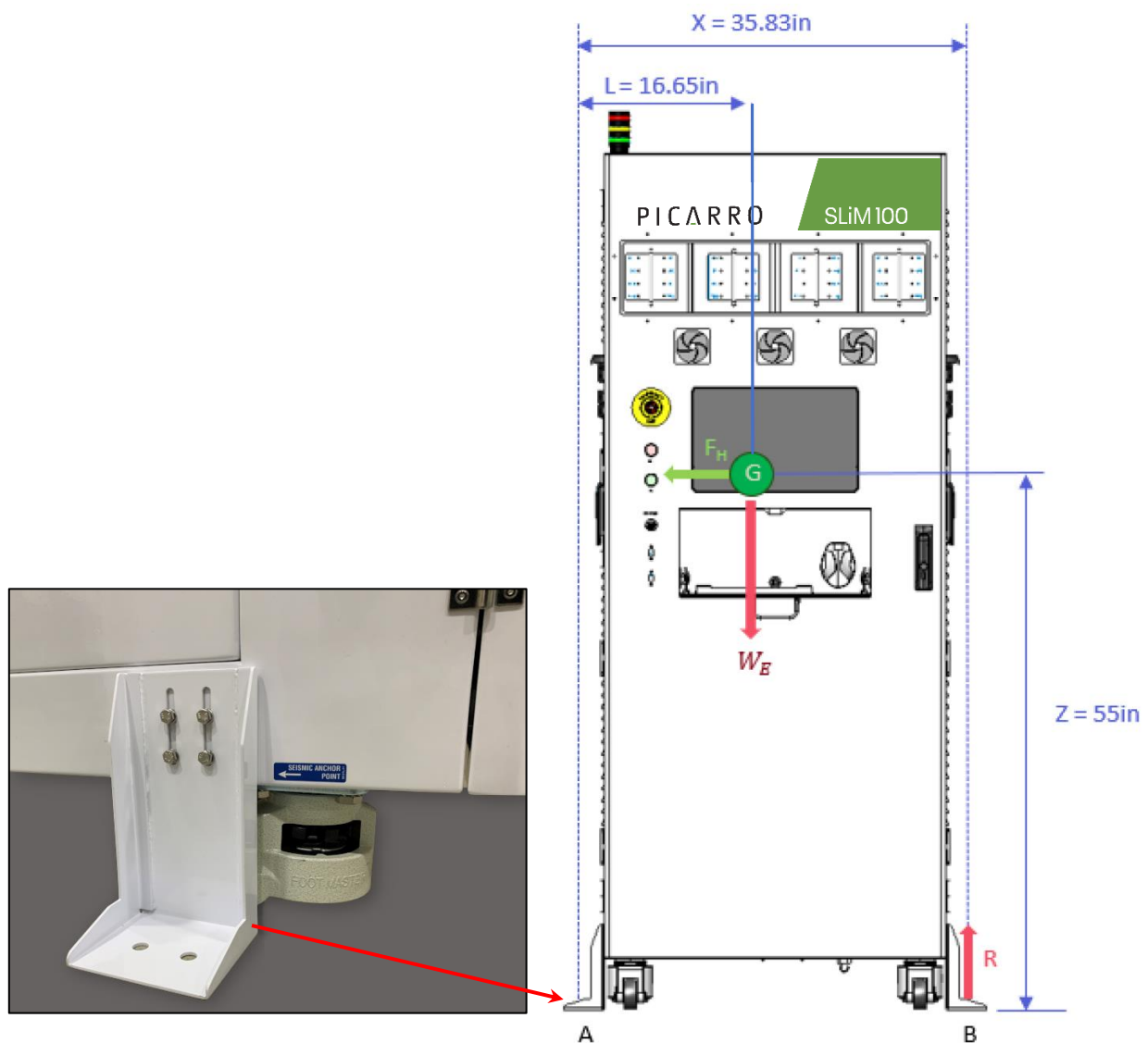| Variable	Notes	Value
W	Maximum normal operating weight of SLiM 100	750 lbf
F_H	Maximum anticipated seismic horizontal force acting on SLiM 100	0.63W
W_E	Effective weight of SLiM 100 accounting for vertical seismic force	0.74W
G	The center of gravity of SLiM 100	As indicated
Z	Height of center of gravity	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 SLiM 100	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 SLiM 100 system shall be dismantled, and the hazardous materials shall be identified, sorted, 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 SLiM 100-32 configuration. The total weight of the system is approximately 570 pounds 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 SLiM 100 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:** SLiM 100 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, Clean, and VOC Zero 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 SLiM 100 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)

VOC Zero Port Gas

- Ambient gas is supplied to the SLiM 100 for VOC Zeroing. Picarro recommends attaching the cleanest ambient air available (e.g., downstream of an air filtering system) to the VOC Zero gas inlet (see Figure 5 below for attachment point).

- The supply pressure is defined by the ambient pressure local to the SLiM 100 unit's installation location.

⚠️ **CAUTION**

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

Doors and panels need to be opened for ventilation prior to entering SLiM 100.

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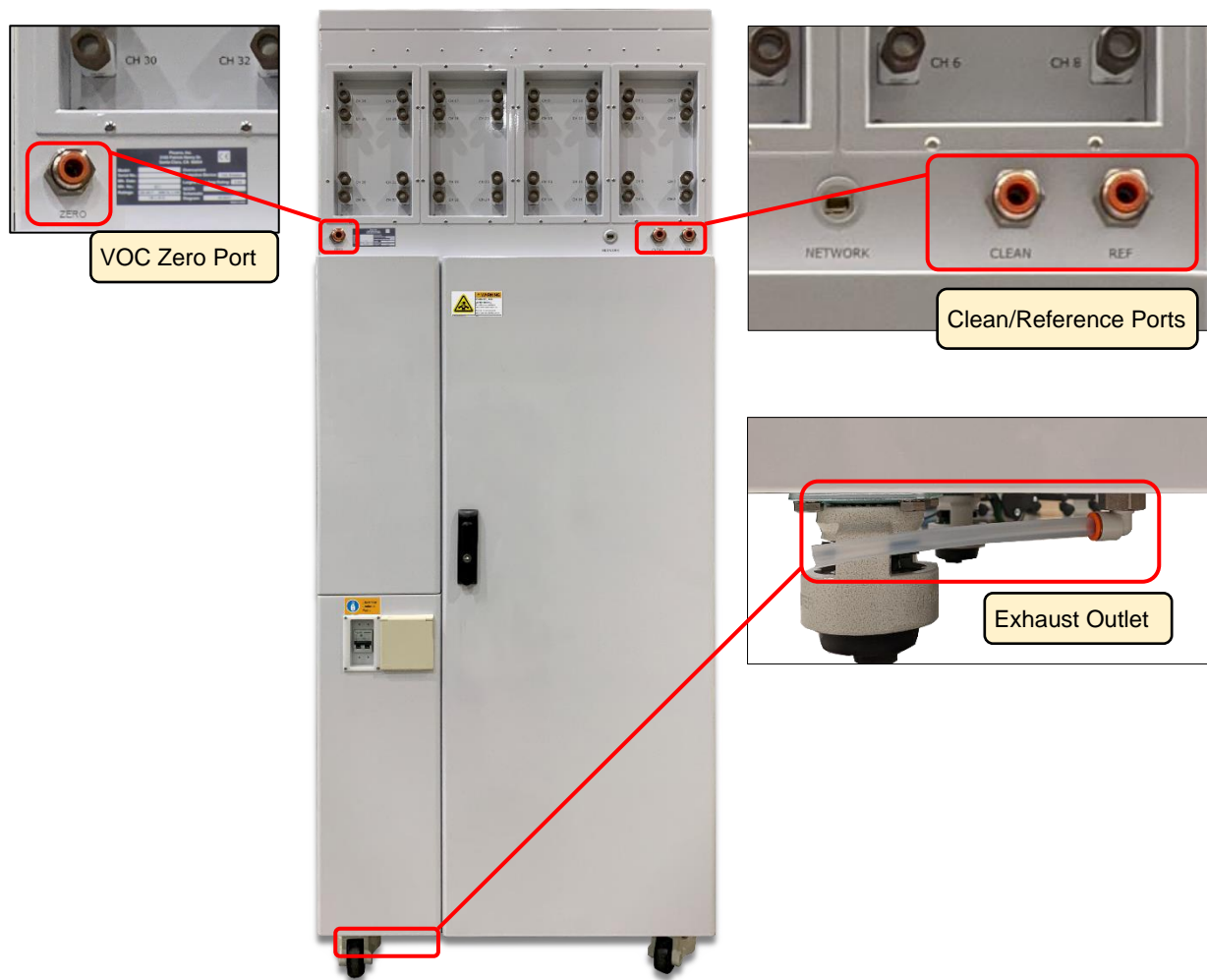
Figure 5: VOC Zero, Clean, Reference Gas, and Exhaust Ports at Rear Panel

4. Hardware Equipment Installation

While it is likely that the SLiM 100 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 SLiM 100 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 analyzer pumps (240V) and cooling fan

4. The emergency electric safety switch, the integrity of the wiring connections, and the switches

Figure 6: SLiM 100 System – Front Panel Door Removed

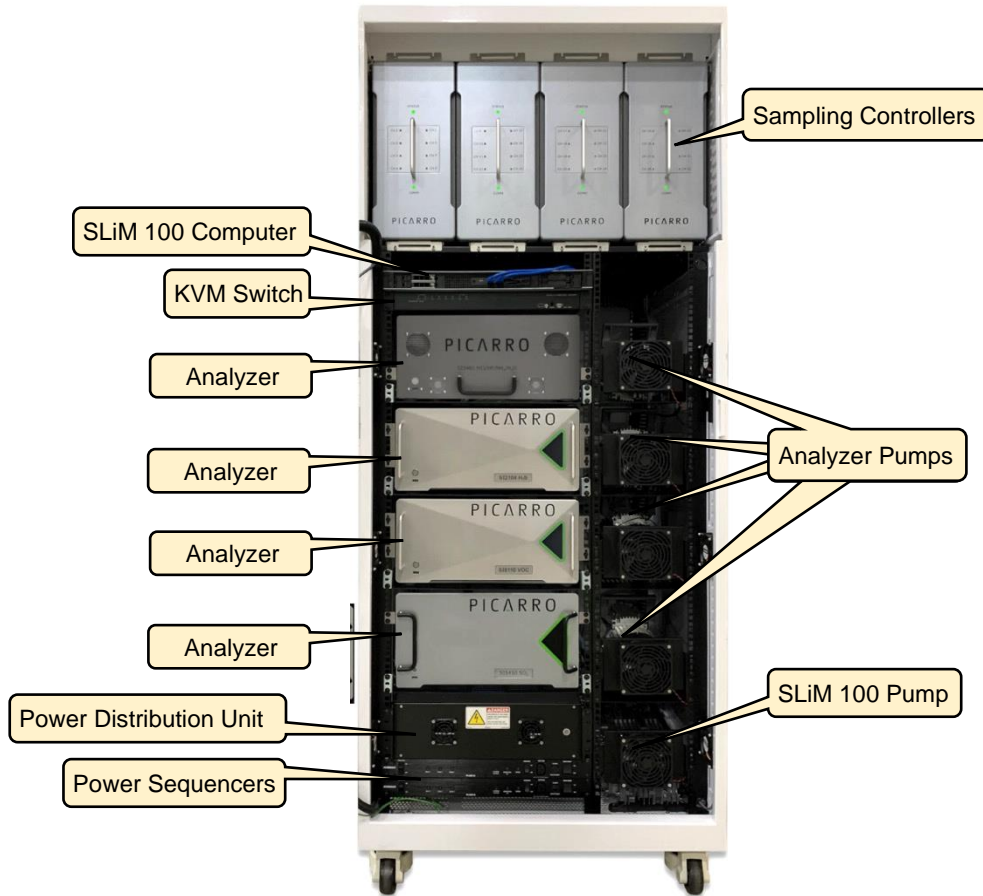## 4.2 SLiM 100 Equipment – Key Components

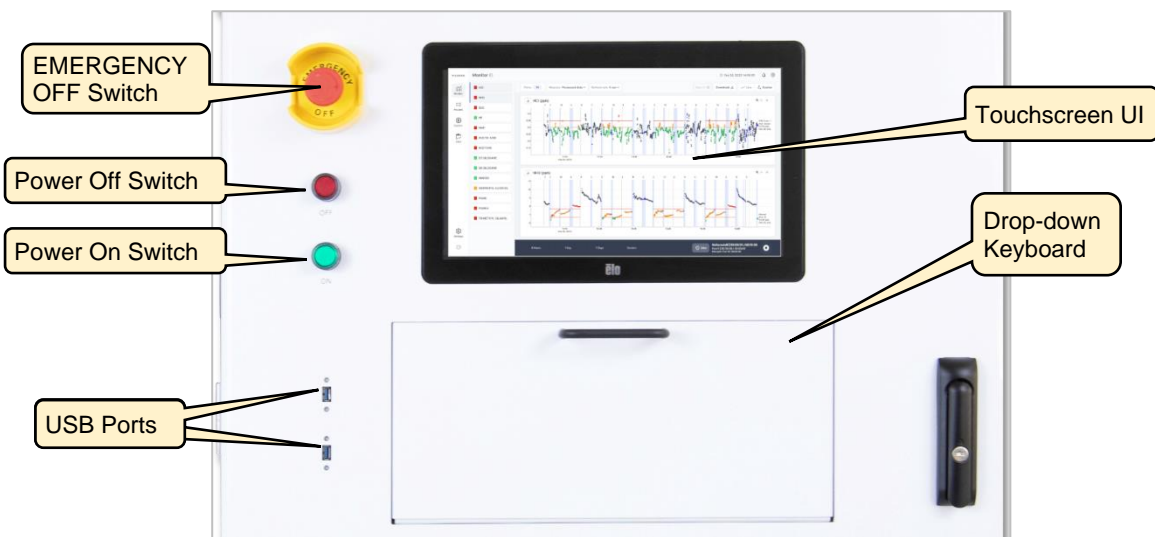*Figure 7: SLiM 100 System Components (Front View)*

Figure 8: SLiM 100 System Front Panel Components
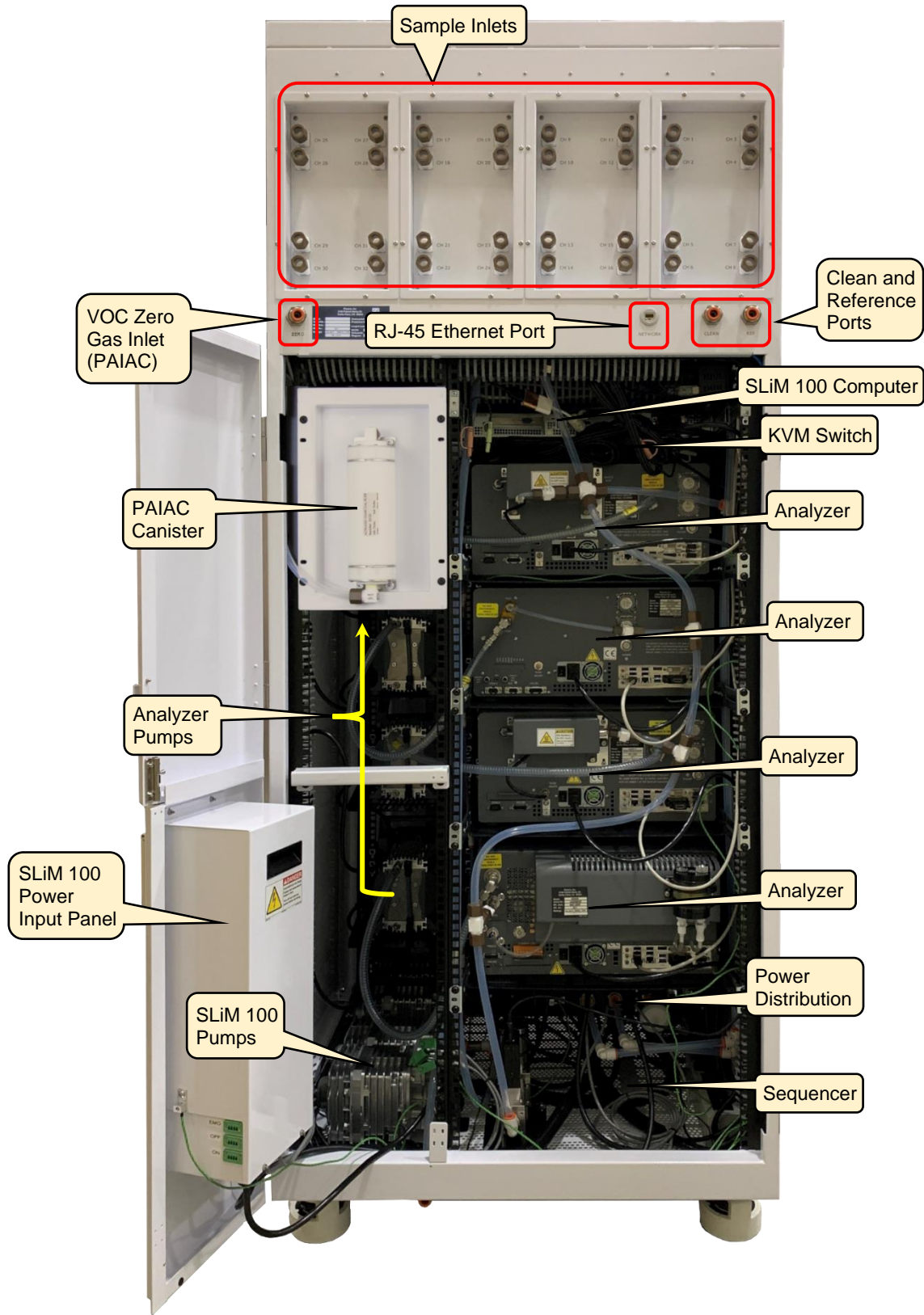
Figure 9: SLiM 100 System Components (Back View)

Sampling Controllers

Analyzer Pumps

SLiM 100 Pumps

Figure 10: SLiM 100 Right Side View

NOTE

The front and back panels are hinged for easy opening. However, the side panels are not hinged and must be removed for access. Only a manufacturer-trained service partner should remove them.

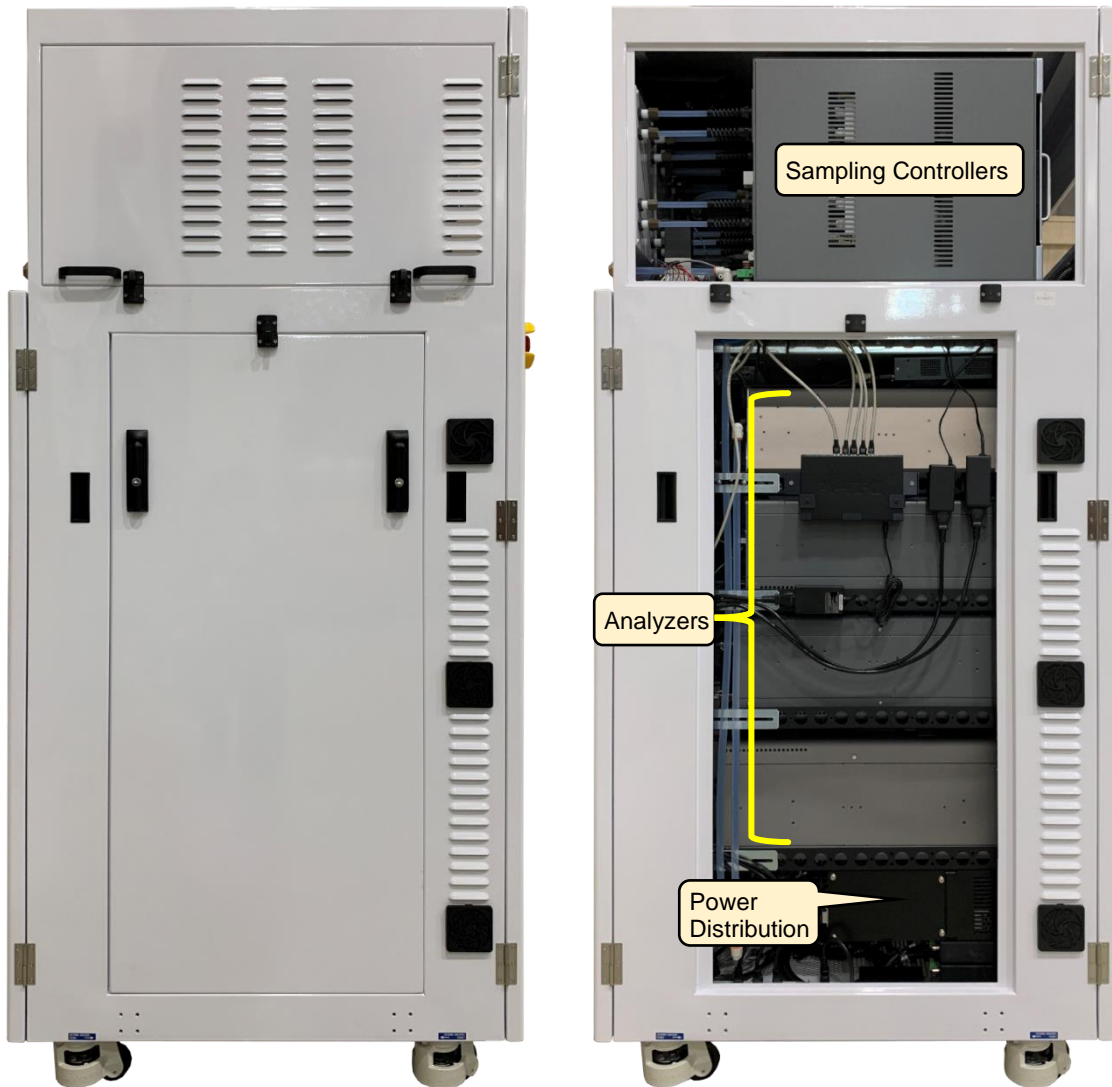*Figure 11: SLiM 100 Left Side View*

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 locks when inserted. To remove, slide the red release tab 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 connecting with a step-up transformer, connect the 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 SLiM 100 but the connector on the user end is not.

Caution: Ensure that the step-up transformer provides a ground connection to the SLiM 100. Picarro recommends consulting an electrician if there is any doubt on how to connect the transformer for safe operation."

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 SLiM 100 chassis. The power up sequence is automatic once the ON switch is pressed.

5.2 Power Down Sequence

Power Down sequence requires shutting down items in the following order.

- Analyzer 1, Analyzer 2, Analyzer 3, Analyzer 4 (as applicable)

- The SLiM 100 Computer

- The SLiM 100 Main Power Supply

The analyzers and SLiM 100 Computer can be shut down either from the User interface (the primary method) or from the keyboard and KVM switch using hot keys (the alternative method).

Powering Down Analyzers and SLiM 100 PC via User Interface

1. At the bottom of the user interface Navigation Panel, click the **Power** button.

2. A pop-up window displays. Click the **Shutdown** button.

3. This shuts down each analyzer one at a time, then shuts down the SLiM 100 computer. Once this is done, to power the system back up, you will need to follow section *5.1*, *Power Up Sequence*.
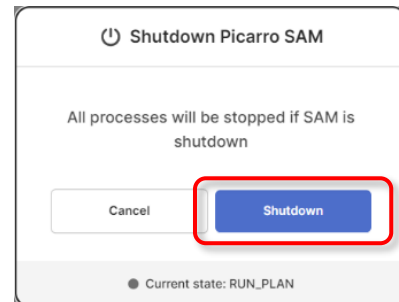
NOTE

Refer to the SEMI Vx.x System Software User Manual (Picarro PN 40-0096) for full system operation instructions.

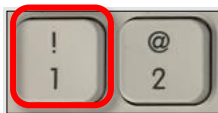## Powering Down Analyzers and SLiM 100 PC via KVM Switch and Keyboard

If the need arises to shut the analyzers and SLiM 100 PC down without using the user interface, use the following steps.

Analyzer 1 - 4 – KVM Port Power Down Sequence

A KVM switch is used to toggle between the SLiM 100 and internal analyzers. You will use the keyboard hot keys to Power Down.
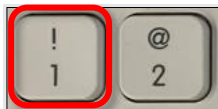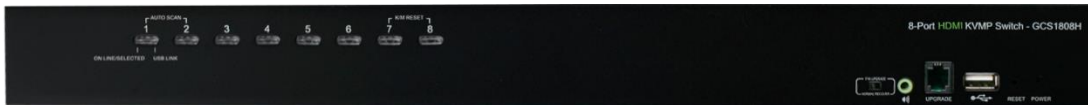
(Press twice)

1. Press the hot keys on the key board. Press [Ctrl], [Ctrl] (Control button is pressed twice in succession), [#], [ENTER] where [#] is [2] - [5] for the four analyzers. As you proceed, each individual analyzer GUI will appear, from which you can shut each one analzyer.

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 SLiM 100. Use the buttons on the front of the KVM.

SLiM 100 Computer Power Down Sequence

4. Use the hot keys to switch to the SLiM 100 PC. Using the keyboard press [Crtl], [Crtl] (Control button is pressed twice in succession), [1], [ENTER]. You will see the SLiM 100 computer GUI.

5. Press the **cmd** key on your keyboard. This brings up the SLiM 100 computer desktop.

6. On the desktop, 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.
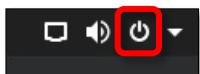
SLiM 100 Main Supply Power Down

Once the SLiM 100 computer is shut down, press the red **OFF** button on the front of SLiM 100. This turns off AC power to the rest of the system.

5.3   SLiM 100 Emergency Off Sequence

The EMERGENCY OFF switch is located on the front left side of the SLiM 100 (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
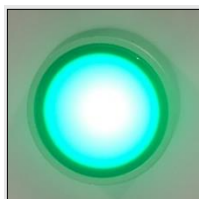
5.4   SLiM 100 Emergency Stop Reset Sequence

1. To reset the EMERGENCY OFF switch, twist the knob clockwise (in the direction indicated) to release.

2. Check that SLiM 100 is properly connected to a suitable VAC outlet (see the SLiM 100 Power Up Sequence).

3. Press the green ON button on the front of the SLiM 100 chassis. The ON indicator should light up in green.

6. SLiM 100 SEMI System Software User Manual

For SLiM 100 user interface operation instructions, refer to the manual, ***SEMI Vx.x System Software User Manual*** (Picarro PN 40-0096) included in your SLiM 100 shipment.

7. Troubleshooting

Prior to beginning any troubleshooting, first read the following notes and warnings. After that, refer to **Table 6: Problem Troubleshooting** below for a listing of typical problems that may arise. Each problem provides inspection areas and indicators that may give clues to what the cause is and the corrective action to take.

WARNING

All troubleshooting that requires opening system panels shall be done by a manufacturer-trained service partner.

WARNING

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.

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Table 6: Problem Troubleshooting

Problem/Issue	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.
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.

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.

8.1 Preventive Maintenance and Replacement of Consumable Materials

PAIAC Replacement

Picarro recommends that the VOC Zeroing PAIAC canister be replaced every 6 months.

Fan Assemblies and Pumps

Fans: Picarro recommends that cooling fan assemblies be replaced every 2 years.

Pumps: SLiM 100 pumps cannot be rebuilt on-site. Picarro recommends pump replacement every 2 years to avoid system downtime.