OPERATION MANUAL

OPX 1025

Optical Mass Monitor

OPX 1025-9800

Rev. B

Met One Instruments

POWERED BY ACOEM

Met One Instruments, Inc.
200 NE Greenfield Rd.
Grants Pass, OR 97526
Telephone: (541) 471-7111
Facsimile: (541) 471-7116
metone.com

Met One Instruments

POWERED BY ACOEM

Met One Instruments, Inc. is now part of the Acoem international group of companies.

Met One Instruments has been designing and manufacturing class-leading meteorological, ambient air sensing, and air quality monitoring instrumentation since its inception in 1989. Its line of robust industrial-grade meteorological equipment, air particulate monitoring equipment, and indoor air quality monitoring systems have set the standard for the industry. Headquartered in Grants Pass, OR, Met One Instruments, Inc. is fueled by a dedicated expert team who is diligently working to advance the technology required to ensure continued improvements in human and environmental health now and for generations to come.

Acoem is committed to helping organizations and public authorities find the right balance between progress and preservation — safeguarding businesses and assets and maximizing opportunities while conserving the planet's resources. Headquartered in Limonest, France, Acoem delivers unrivaled inter-operable AI-powered sensors and ecosystems that empower our customers to make enlightened decisions based on accurate and timely information.

In 2021, Acoem acquired Met One Instruments, marking a pivotal moment when two industry leaders in the air quality monitoring sectors converged — creating a single, stronger and more future-focused provider of holistic environmental monitoring solutions. Now, Met One Instruments Powered by Acoem has opened new possibilities through an extensive offering of class leading, multi-parameter environmental monitoring and industrial reliability solutions. These integrated measurement systems, technologies, and services deliver comprehensive solutions for a range of applications, including environmental research, regulatory compliance, and industrial safety and hygiene.

For more information about Met One Instruments Powered by Acoem, please visit: metone.com

For more information about Acoem, please visit: acoem.com

Table Of Contents

Table of Tables

1. INTRODUCTION

1.1 About This Manual

This document is organized with the most important information grouped together for easy reference by the user. All OPX 1025 instrument users should read and understand the sections on installation, setup, operation, and field calibrations. Other sections with information on subjects such as diagnostics, accessories, and alternate settings should be consulted as needed. An electronic version of this manual is also available. OPX 1025 instrument operators are encouraged to study this manual to ensure correct performance, safe operation, and to prevent equipment damage.

1.2 Technical Service

This manual is structured by customer feedback to provide the required information for setup, operation, testing, maintenance, and troubleshooting the OPX 1025 instrument. Should additional support be required after consulting the documentation, please contact one of our expert technical service representatives during normal business hours of 7:00 a.m. to 4:00 p.m. Pacific Time, Monday through Friday. Product warranty information is available at https://metone.com/met-one-warranty. In addition, technical information and service bulletins are often posted on our website. Please contact us and obtain a return authorization (RA) number before sending any equipment back to the factory. This allows us to track and schedule service work and to expedite customer service.

Contact Information:	Tel:	+ 541 471 7111	Address:	Met One Instruments
	Fax:	+ 541 471 7116		200 NE Greenfield Rd.
	Web:	www.metone.com		Grants Pass, Oregon
	Email:	service.moi@acoem.com		97526 U.S.A.

NOTE: Please have the instrument serial number available when contacting the manufacturer regarding repairs or updates for a specific monitor. The OPX 1025 monitor product label lists the serial number and is located on the upper right corner of the back panel. The calibration certificate also has the serial number printed on it. The serial number will begin with a letter(s) and be followed by a unique five-digit number such as U15915.

1.3 About the OPX 1025 – Optical Mass Monitor

The Met One Instruments, Inc. model OPX 1025 is an optical mass monitor which automatically measures and records particulate matter mass concentration using optical sensing technology. The core of the instrument is an optical particle sensor that directly analyzes sampled particles.

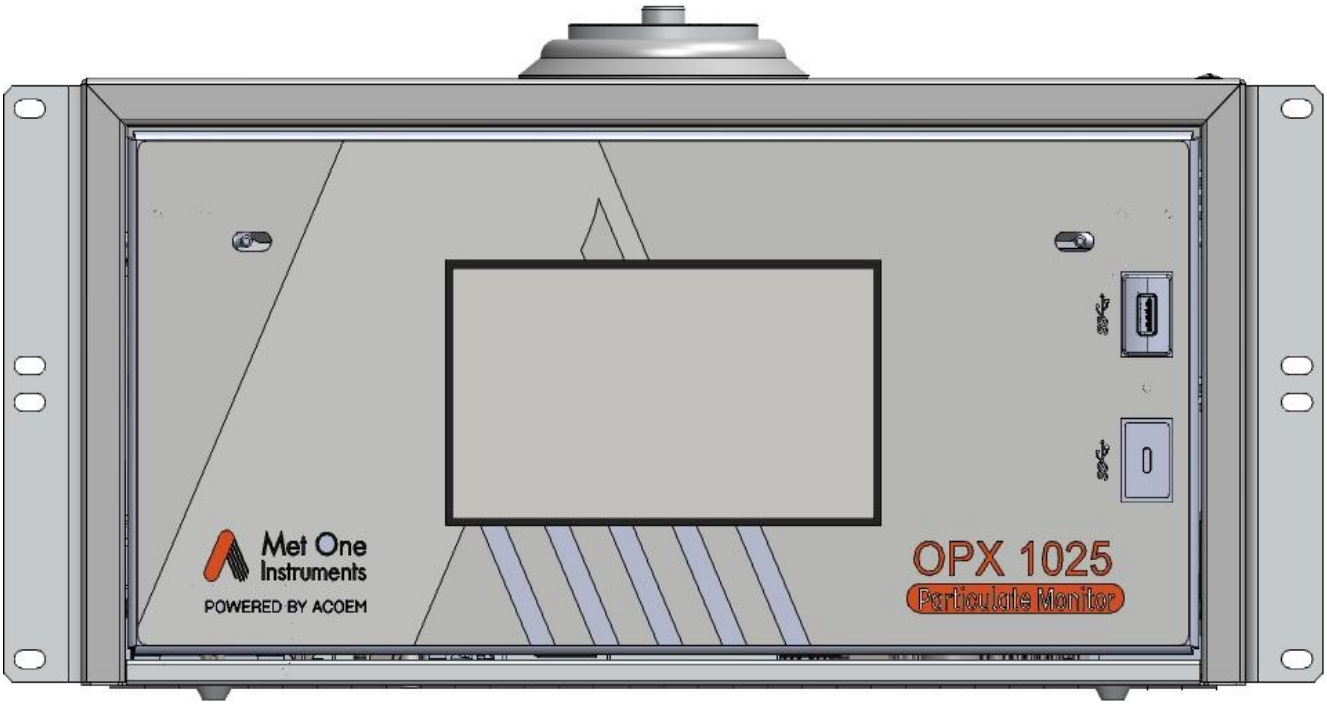


Figure 1-1 The OPX 1025 Front Panel

Using particle spectrometer technology and a polychromatic light source, the OPX 1025 analyzes individual particles as they pass through the sensor. It categorizes these particles by size based on the scattered light signature and then converts this size and count information into a total mass concentration (e.g., $PM_{2.5}$ or PM_{10}).

Ambient air is drawn into the instrument at a controlled flow rate, often through a size-selective PM10 inlet. The sampled air is conditioned by the Sample Conditioner and then drawn directly into the optical particle sensor for analysis. Unlike instruments requiring filter media, the OPX 1025 provides continuous measurements without the need for filter tape, relying solely on the real-time optical detection and calculation to determine particulate matter mass concentrations.

1.4 Safety Warnings

Electrical Warning: The OPX 1025 operates from main AC power (e.g., 100-240 VAC). Hazardous AC voltages are present inside the main instrument enclosure prior to internal DC power conversion stages.
Always disconnect the main power cord before opening the instrument enclosure or attempting to service any internal components. Failure to disconnect power can expose personnel to electrical shock hazards and risks damaging the equipment.
The OPX 1025 instrument is not weatherproof and should never be exposed to precipitation or wet conditions.

Optical Warning: The OPX 1025 employs a 1 W LED light source. Whenever the optical module is disassembled for repair, the main power switch must be turned off and the power cord disconnected in order to prevent accidental exposure to the light source.

Thermal Warning: The OPX 1025 instrument operates using a 24 Volt, 150-Watt Sample Conditioner, installed on the sample inlet. The inside of the Sample Conditioner operates at high temperatures capable of causing burns upon contact. Surfaces near the Sample Conditioner assembly may remain hot after the instrument is powered down.

Always disconnect power and allow the instrument sufficient time to cool completely before attempting internal service or handling components near the Sample Conditioner or sample path. Ensure adequate ventilation around the instrument during operation.

1.5 Acronyms

Acronym	Definition
AC	Alternating Current
AIO	All in One (referring to a weather sensor)
AT	Ambient Temperature
BP	Barometric Pressure
CSV	Comma-Separated Values (a file format)
DC	Direct Current
DNS	Domain Name System
EPA	Environmental Protection Agency
FEM	Federal Equivalent Method
FRM	Federal Reference Method
GHS	Globally Harmonized System
IP	Internet Protocol
LED	Light Emitting Diode
LPM	Liters Per Minute
OSHA	Occupational Safety and Health Administration
PCBA	Printed Circuit Board Assembly
PM	Particulate Matter (e.g., PM_{10}, $PM_{2.5}$)
PMT	Photomultiplier Tube
PWM	Pulse Width Modulation
RA	Return Authorization
RH	Relative Humidity
SBC	Single Board Computer
TSP	Total Suspended Particulate
USB	Universal Serial Bus
VAC	Volts Alternating Current
VNC	Virtual Network Computing
WD	Wind Direction
WS	Wind Speed

1.6 OPX 1025 Instrument Specifications

Table 1-1 Instrument Specifications

PARAMETER	SPECIFICATION
Measurement Range:	0.0 – 10,000+ µg/m3
Data Display Resolution:	0.1 µg/m3
Lower Detection Limit:	< 0.1 µg/m3
Measurement Interval:	10 seconds
Averaging Periods:	1m, 5m, 10m, 15m, 30m, 1h, 2h, 3h, 4h, 6h, 8h, 12h, 24h
Sample Flow Rate:	16.67 LPM*
Mass Concentration Accuracy:	Meets or Exceeds US EPA PM_{10} FEM and Class III $PM_{2.5}$ & $PM_{10-2.5}$ FEM performance requirements compared to FRM samplers
Instrument AC Power:	100 - 240VAC, 50/60Hz, 2A
Power Consumption:	Max power with Sample Conditioner on: 190W, Typical operating power: 50W
Sample Conditioner:	150 W (RH controlled to 35%)
Operating Temperature:	0 to +50°C (inside shelter)
Sample Temperature:	-30 to +50 °C
Ambient Sensor:	Model BX-597A combination AT/BP/RH digital sensor
Optional Sensor Inputs:	Digital wind speed and wind direction
Internal Data Storage:	~365 days of internal data storage
Data Download:	USB Flash Drive Port (USB-A or USB-C), and Ethernet
User Interface:	4.75” (11.2 cm) x 6.75” (17.1 cm) graphic touchscreen display
Mounting Options:	Bench top or rack mountable. A weatherproof shelter is required.
Weight:	Instrument: 31.2 lbs. (14.2 kg); Sample Conditioner: 4.2 lbs. (1.9 kg)
Instrument Dimensions:	Height: 10.5” (26.7 cm) Width: 17” (43 cm) Depth: 15.8” (40 cm).
Sample Conditioner Dimensions:	Height: 35.3” (89.7 cm) Diameter: 2.5” (6.4 cm) Installed height above instrument: 33.5” (85.1 cm)

Specifications subject to change without notice. See OPX 1025 datasheet for the latest published specs.

* All flow values are in Qa (actual volumetric conditions), not Standard conditions.

2. ASSEMBLY and DEPLOYMENT

The OPX 1025 is designed for easy setup and simple configuration for most applications. This section describes the basic assembly, setup, and start-up of the instrument.

2.1 Unpacking The OPX 1025

NOTE: Please keep all the special shipping items (box, foam packing material, etc.) used to ship the OPX 1025 Optical Mass Monitor. They should be re-used if the OPX 1025 is to be transported (changing site locations, returning to the factory, etc.). Contact Met One Instruments for replacement packing materials if necessary.

2.1.1 Shipping Damage

Any damage incurred by the equipment during shipping is the responsibility of the carrier. If any damage to the shipment is noticed before unpacking, **a claim must be filed with the commercial carrier immediately**. Follow any special unpacking instructions provided by the carrier, as all items are carefully removed from the containers and each component inspected. It is recommended to document and photograph all damaged packages and items before, during, and after unpacking them. Contact Met One Instruments to arrange for any replacement items needed.

- Carefully unpack items from the box.
- Inspect all components for damage.
- Compare all components to the packing list to ensure all items have been shipped.
- After unpacking all components/sub-assemblies, take a photo of each with labels still attached and check to make sure they match all components/sub-assemblies listed on the packing list.

2.1.2 Shipment Contents

Reviewing the OPX 1025 System Check-Off list below, check that all mandatory, standard equipment items have been included.

The typical configuration of the OPX 1025 is supplied with the following standard items and accessories listed on the next page.

OPX 1025 System Check-Off List

- OPX-1025 (**84399**)
- Region specific IEC power cord
- SigmaDust Service Kit (**84263**)
- Ambient AT/BP/RH Combination Sensor (**BX-597A**)
- Digital Sensor Cable, 25-foot Length for BX-597A (**82959-25**)
- Sample Conditioner (**84288**)
- Slip Coupler Assembly (**BX-829**)
- Short Inlet Tube (**9187**)
- Zero Count Filter Assembly (**84316**)
- Protective Inlet Cap (**770030**)
- Software Placard

The following optional accessories may be included:

- PM_{10}Sampling Inlet (**BX-802**)
- TSP Inlet (**BX-803**)
- Rack Mount Bracket Assembly (**84362**)
- Inlet System with Support Braces (**BX-801**)
  - Standard 8' length inlet tube (Customization available)
- All in One Weather Sensor (**AIO 2**)
- 30.5 Sonic Anemometer (**30.5**)

NOTE: See the accessories section at the back of this manual for more details about parts and accessories.

2.2 Site Selection and Installation

2.2.1 Unpacking, Inspection, and Evaluation Testing

If any damage to the shipment is noticed before unpacking, a claim must be filed with the commercial carrier immediately. Notify Met One Instruments after notification of the commercial carrier.

Unpack the OPX 1025 and accessories and compare them to the packing list.

It is recommended users keep the special shipping boxes and foam packing material. These boxes can be reused if the OPX 1025 needs to be returned to the factory.

2.2.2 Enclosure Selection and Temperature Control

The OPX 1025 monitor is not weatherproof. It is designed to be mounted in a weatherproof, level, low vibration, dust free, and temperature stable environment where the operating temperature is between 0 °C and +50 °C, and the relative humidity is non-condensing and does not exceed 95%. Two standard configurations are described below for providing a weatherproof location to install the OPX 1025. If the user is planning to have a non-standard mounting or enclosure configuration, please contact Met One Instruments for advice.

1. A walk-in shelter or building: these are usually semi-portable pre-fabricated shelters or portable trailers with a flat roof, or a room in a permanent building or structure. The OPX 1025 may be placed on a workbench or mounted in an equipment rack. The inlet tube of the instrument must extend up through a hole in the roof of the structure with appropriate sealing hardware. AC power must be available. Instructions for this type of installation are included in this section of this manual.

2. BX-925B/BX-925B-AC mini weatherproof enclosures: these small pre-fabricated enclosures are just big enough for the OPX 1025 and related accessories, and are installed on the ground or on the roof of a larger building. They are available with a heater (BX-925B), or with a heater and air conditioner (BX-925B-AC). These enclosures are all specified by Met One to accept the OPX 1025, and are supplied with a supplemental installation manual.

Shelter Temperature Control Notes: The air temperature inside an OPX 1025 shelter or enclosure is not required to be regulated to any specific range or set point (such as 25 °C), but is subject to the following conditions:

1. The shelter temperature must stay between 0 and 50 °C inside at all times or alarms and failures may result. Remember that the instrument and Sample Conditioner can contribute significantly to shelter heating.

2. Met One Instruments recommends monitoring the temperature inside non-air conditioned mini enclosures such as the model BX-925B. The OPX 1025 Box Temperature, which measures the temperature inside the OPX 1025, can be used for this purpose.

3. OPX 1025 users in hot climates where ambient temperatures exceed 40 °C should consider using the model BX-925B-AC air conditioned

mini shelter or an air conditioned walk-in shelter to avoid over-heating the OPX 1025.

4. The portion of the inlet tube inside of the shelter or building should always be adequately insulated. This is especially important when the equipment is operated under conditions of high ambient dew point. Otherwise, condensation could occur inside the sampling tube and/or measurement artifacts could result. If this proves to be an issue, the user may consider increasing the temperature inside the shelter to a point closer to ambient temperature. The OPX 1025 should not be placed directly in the path of an air conditioning vent.

2.2.3 Site Selection and Inlet Positioning Criteria

Met One Instruments, Inc. recommends reviewing local regulations and guidance documentation that may exist before selecting the site in which to install the OPX 1025. For example, the US-EPA provides a variety of guidance documents where site selection issues are addressed. Such guidance and regulation may provide information concerning:

1. Inlet height
2. Spacing and clearance
3. Proximity to particulate sources, both mobile and stationary
4. Additional siting criteria or considerations

These details should be considered before selecting a site.

2.2.4 Mounting Options in a Walk-In Shelter

If the OPX 1025 will be located in a walk-in shelter, it may be installed in either an equipment rack or on a bench top. Take the following into consideration when planning the installation:

- **Rear Access**: It is important to leave plenty of access to the rear of the OPX 1025 for wiring connections and maintenance. At least five inches is required. Full access to the back is recommended whenever possible. There must be adequate access to the power switch located on the back of the instrument.
- **Top Access**: It is necessary to have a minimum of four inches clearance between the top of the OPX 1025 inlet receiver and the

shelter ceiling to allow access for installing the Sample Conditioner and connecting it to the back panel.

- **Mobile Shelters:** If the OPX 1025 is installed in an equipment rack in a mobile trailer or van, additional care should be considered to ensure that the mounting hardware can withstand the additional strain.

- **Rack Modifications**: It is sometimes necessary to modify the top plate of an equipment rack to accommodate the Sample Conditioner. Up to a 4 inch diameter (100mm) hole is necessary to allow the inlet tube to extend through to the ceiling. The OPX 1025 dimensional drawings in Section 2.3 show the location of the inlet.

NOTE: The Sampler Conditioner includes a strain relief and power connection cable which must be accommodated by the mounting configuration of the rack into which it is being installed. The inlet tube should be covered with foam supplied with the BX-801 between the Sample Conditioner and the ceiling. Make sure these parts are going to fit before installing the OPX 1025.

2.2.5 OPX 1025 Installation Instructions

When installing the OPX 1025 into a shelter or structure the following issues should be taken into consideration.

- **Roof Modifications** Determine the exact location where the inlet tube will pass through the roof of the shelter. Drill a 2 ¼" or 2 ½" (60mm) diameter hole through the roof at that location. Make sure the hole is directly above where the inlet receiver is located, so the inlet tube will be perfectly vertical. A plumb weight is useful for determining where to locate the hole. Note that the inlet receiver on the OPX 1025 is located toward the front of the OPX 1025 chassis, but is centered left to right. BX-925B/925B-AC mini shelters do not require any roof drilling.

- **Waterproof Roof Flange** Apply all-weather silicone caulking around the top of the hole and install the BX-801 roof flange onto the hole. The threaded barrel of the flange is usually installed downward. Secure the flange in place with four lag bolts or self-tapping screws (not supplied). Caulk around the fasteners to prevent leaks. Apply Teflon tape to the threads of the watertight fitting, and tightly screw it into the roof flange. BX-925B/925B-AC mini shelters come with a roof flange installed, and only need the watertight fitting. Note: some users prefer to fabricate their own roof flange instead of using the

one supplied by Met One Instruments, due to factors such as heavy snow loads or a sloped roof. **Equipment damage from a leaking roof is not covered under warranty.**

- **Install Sample Conditioner and Slip Coupler** The OPX 1025 should be mounted at a height to provide adequate space between the top of the instrument and the shelter ceiling in order to install the Sample Conditioner and slip coupler assembly and easily connect to the sample tube passing through the ceiling. Carefully and fully insert the Sample Conditioner into the rubber support sleeve and over the OPX 1025 measurement cell inlet. Ensure the rubber protective sleeve on the OPX 1025 cover fits smoothly around the base of the Sample Conditioner assembly (no wrinkles or folds).

  Install the slip coupler assembly into the top of the inlet Sample Conditioner. Fully seat the inlet coupler until it engages both o-rings in the Sample Conditioner assembly. Slide the slip coupler down to expose the top of the inner tube. Center the OPX 1025 inlet beneath the roof penetration.

- **Inlet Tube Installation and Alignment** Remove the threaded cap and rubber seal from the watertight inlet tube seal assembly on the roof. This makes it easier to install the inlet tube since the rubber seal is a tight fit. Position the threaded cap and rubber seal on the inlet tube 2 to 3 feet from the lower end of the inlet tube. Lower the inlet tube through the flange assembly and lock it in place such that the tube is ¼" to ½" above the inlet coupler tube of the OPX 1025. Slide the slip coupler up over the outside inlet tube.

  It is very important for the inlet tube to be perfectly orthogonal relative to the top of the OPX 1025. The nozzle and/or slip coupler may bind if the inlet is misaligned. A simple check is to rotate the inlet tube back and forth by hand before fully tightening the roof flange seal or the OPX 1025 slip coupler set screws. If the inlet tube is straight, then the tube should rotate easily while inserted into the slip coupler. If it does not rotate, check the inlet tube for vertical alignment or move the OPX 1025 slightly.

  The BX-829 Inlet Slip Coupler Kit is a quick disconnect inlet tube accessory for OPX 1025. It allows the instrument to be removed from its installation without loosening the roof seal in areas where the seal is inaccessible. It consists of an 80687 short inlet tube and an 80688

slip coupler. The coupler can be slipped down the short tube to disconnect it from the bottom of the main inlet tube for OPX 1025 removal.

It is always recommended that the exposed portion of the inlet tube inside the shelter be insulated.

- **Sample Conditioner Electrical Connections** Connect the OPX 1025 Sample Conditioner into the Heater connection on the back of the OPX 1025.

- **Inlet Support Struts** The BX-801 inlet kit comes with two angled aluminum struts to support the inlet tube atop the roof and prevent the inlet from moving in the wind. These struts are typically fastened (90 to 120 degrees apart) to the inlet tube with a hose clamp (supplied). The bottom ends of the struts should be fastened to the roof with lag bolts (not supplied). Some installations may require different methods or hardware for supporting the inlet tube. Support the tube in the best manner available. The BX-925B and BX-925B-AC mini shelters do not require inlet tube supports.

- **Temperature Sensor Installation** OPX 1025 units are supplied with a BX-597A AT/BP/RH sensor, which attaches to the inlet tube above the roof. The sensor cable must route into the shelter to be attached to the OPX 1025. Use a waterproof cable entry point or weatherhead if the shelter has one. The BX-925B/925B-AC mini shelters have a cable entry on the side. The BX-597A sensor attaches directly to the inlet tube with a supplied U-bolt.

  Connect the cable to either of the RS485 connections on the back of the OPX 1025.

- **Inlet** The standard inlet configuration for the OPX 1025 is with a US EPA approved PM_{10} Size-Selective Inlet (i.e. Met One PN: BX-802) installed directly onto the inlet tube. This will enable correct reporting for PM_{10}, $PM_{10-2.5}$, PM_4, $PM_{2.5}$ and PM_1. A TSP inlet (i.e. Met One PN: BX-803) will only enable correct reporting for EPA $PM_{2.5}$.

2.3 Shelter and Mounting Options

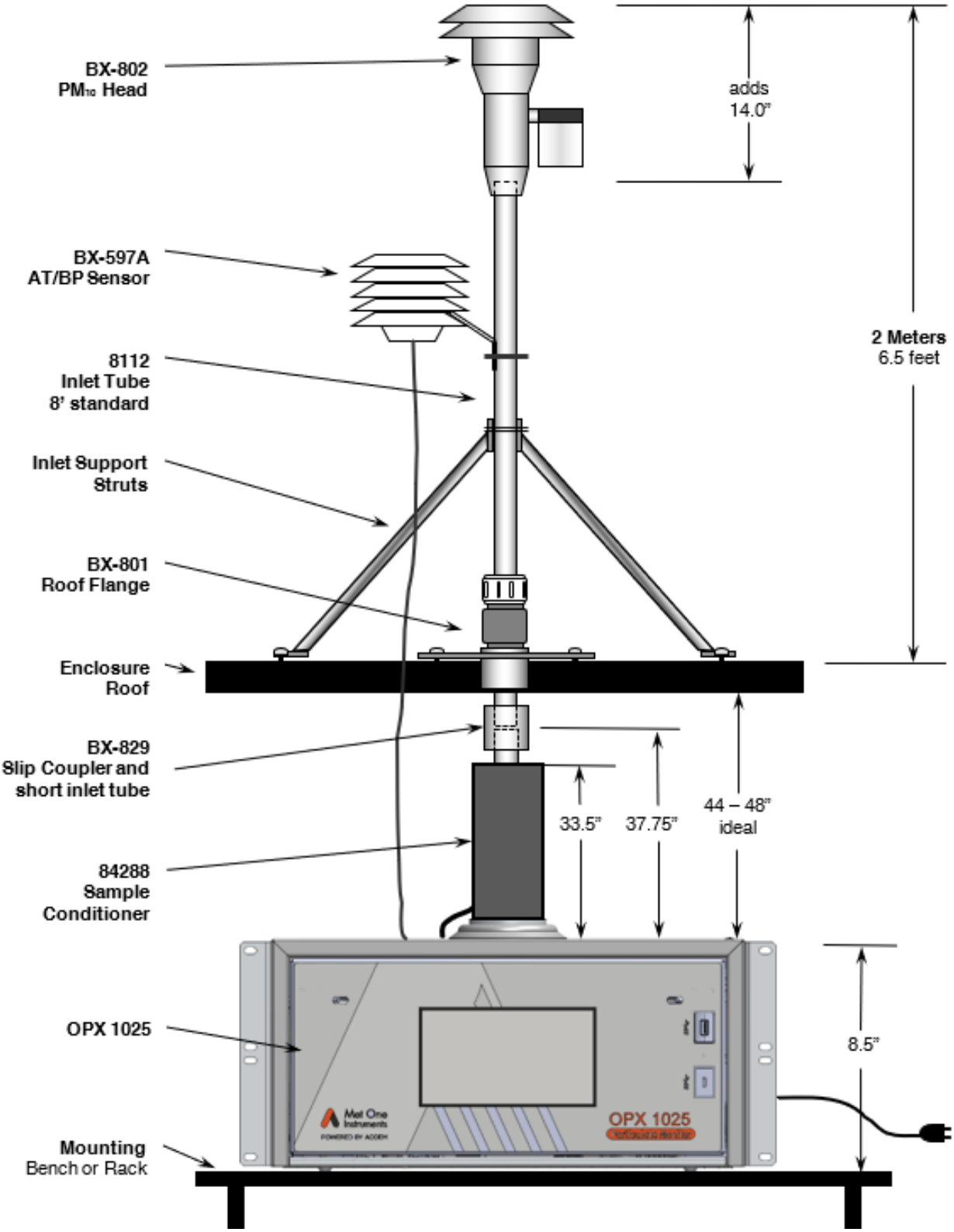


Figure 2-1 Typical OPX 1025 Installation in a Walk-in Shelter

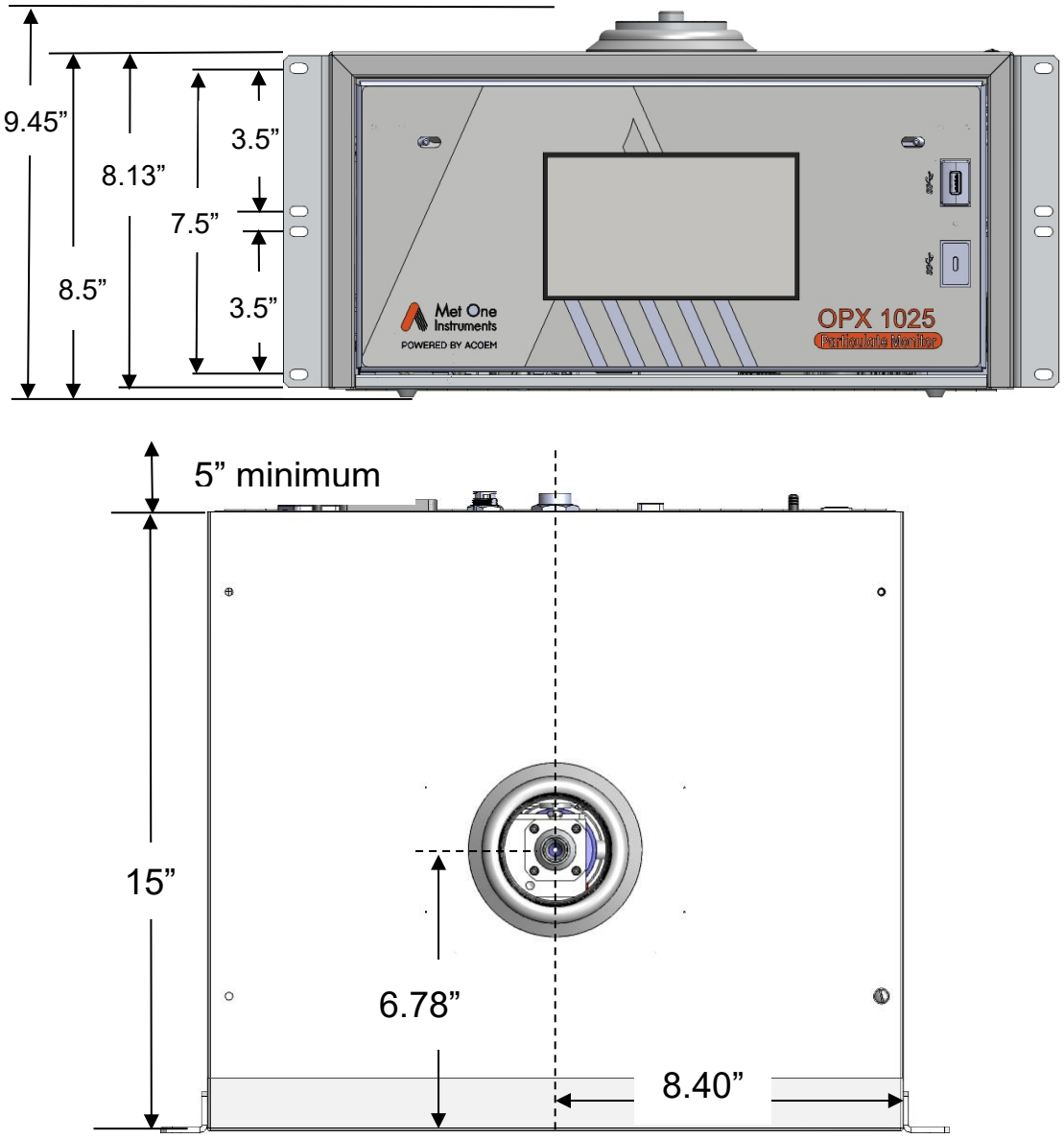


Figure 2-2 Rack Mount Spacing

The OPX 1025 must be installed in a clean, dry, weatherproof location such as a walk-in shelter, a trailer or mobile lab, a mini outdoor shelter, or in a permanent structure.

- **Instrument Temperature:** The OPX 1025 must be operated at temperatures between 0°C and 50°C.
- **Rack Mounting:** The OPX 1025 requires five rack-units of space (5U) if installed in a standard 19” equipment rack.
- **Benchtop Mounting:** The OPX 1025 may be installed on a tabletop. Make sure the mounting surface is level and that the instrument is

secured so that it won't "walk" due to vibration. Always leave adequate clearance at the back of the unit for access to the data ports, power entry, sensor, and heater connections.

2.3.1 Connect AC Power

NOTE: It is recommended to keep the power switch at the back of the unit in the OFF position until all accessories are installed.

Plug in the AC power cord (pn: 400100 or other modular AC power cable suitable for your region) to the modular power input on the back panel of the OPX 1025. The OPX 1025 will operate on 100- 240 VAC, 50/60 Hz.

3. USER INTERFACE and MENU SYSTEM

This section describes the OPX 1025 menu hierarchy, menu navigation, user interface touchscreen functions, and menu descriptions.

3.1 Menu Hierarchy

The OPX 1025 menu structure is outlined in the following table.

Table 3-1 OPX 1025 Menu Hierarchy

Menu	Sub Menu Options	Overview
SETTINGS	Sample	Modify the location ID and settings that affect sampling
	Flow Settings	Modify the standard temperature and pressure
	Digital Sensors	Modify the digital sensors connected to the instrument
	Particle Mass	Modify the settings associated with the PM measurements
	Display	Modify the display brightness
	System Clock	Modify the settings associated with the system clock
	Change Password	Change the password for the currently logged on user
	Users	Add or remove users from the system
	Units	Modify the units of measure displayed in the user interface
	Serial Port	Modify the communication settings for the serial port
	Ethernet Port	Modify the Ethernet adapter settings
	Clear Data	Clears all data previously collected
	Diagnostic Logging	Enables or disables the logging of diagnostic information for troubleshooting purposes
	Remote Access	Enables or disables the ability to remotely connect to the instrument
	Software Update	Installs a new version of the application software
	Restart System	Performs a software reboot of the application software
CALIBRATION	AT	Calibrate the ambient temperature sensor or restore default settings
	BP	Calibrate the ambient pressure sensor or restore default settings
	Flow	Calibrate the Sample Flow sensor or restore default settings
	Sensor	Check the internal sensor

INSTRUMENT TESTS	Self Test	Automatic test of the OPX 1025 subsystems
	Leak Test	Tests for Leaks using Particle counts
	Lamp Test	Tests the Lamp Current
	Sample Conditioner	Tests the Sample Conditioner
EXPORT DATA	No submenu	Export data to a USB flash drive
ALARM LOG	No submenu	View alarms and system flags, Events, and Changes
ABOUT	No submenu	Details the model and serial number, location ID, software version, firmware version, ethernet address, and calibration date

3.2 Initial Startup Sequence

When the back panel power switch is set to the ON position, the OPX 1025 will begin the boot process. The screen will remain dark for approximately thirty seconds, after which the splash screen will appear, identifying the instrument Model and boot process status.

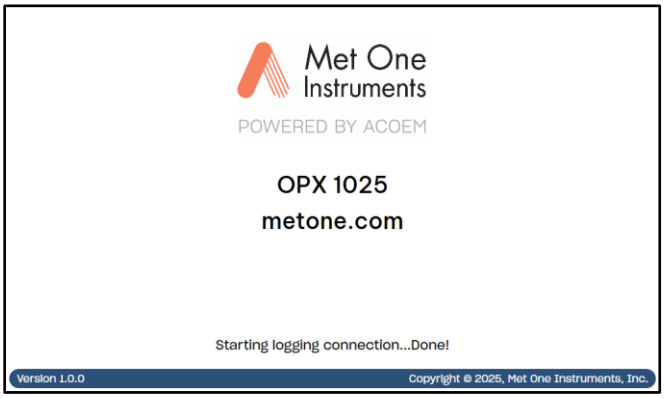


Figure 3-1 Boot Screen

3.3 User Interface and Touchscreen Display Functions

The OPX 1025 user interface consists of a color touchscreen display used to control almost all the features and functionality of the sampler.

Figure 3-2 indicates the Home page buttons for operation and navigation along with data readouts such as ambient conditions and current sample values. The section below provides an in-depth overview of the Home page.

3.3.1 Touchscreen Manipulation

The OPX 1025 color touchscreen display provides easy menu navigation and field editing. Action buttons are indicated by arrows from blue text boxes. When pressed, action buttons will lead to other menus, toggle data views, or start and stop samples. Each displayed measurement on the Home page is a button that will change the view to a line graph of the last one hour's worth of data. See **Section 3.3.2** for more details.

NOTE: The blue text boxes indicate action buttons.

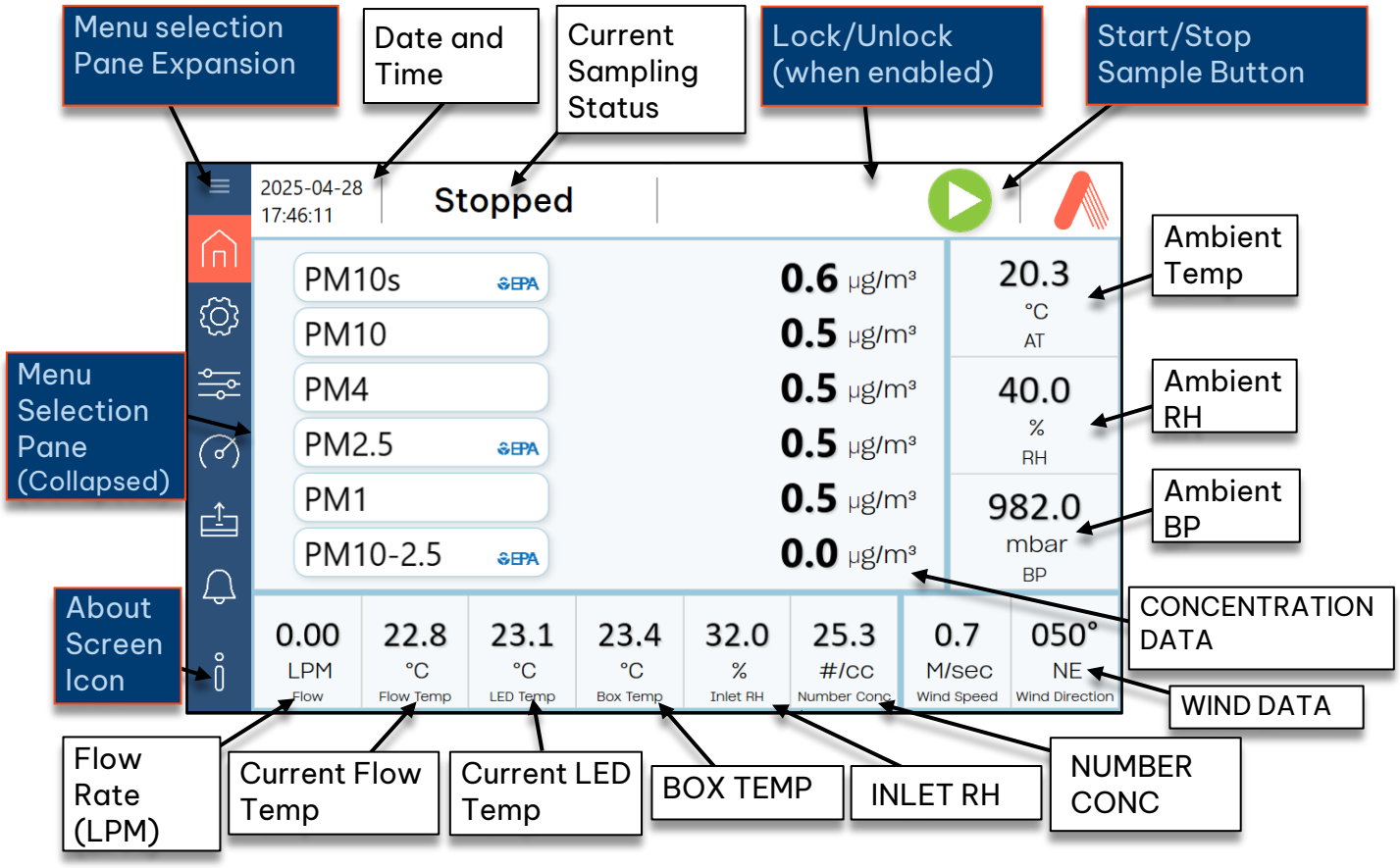


Figure 3-2 OPX 1025 Home Page Interface and Navigation

NOTE: Wind Speed and Wind Direction only appear when a compatible wind sensor is connected to the OPX 1025. The lock/unlock icon only appears when security is enabled.

3.3.2 Data View Screens

Current data can be viewed in two ways: numerical values, as shown by

Figure 3-2, or in a graph shown by **Figure 3-3**. To enter the graph view, press one of the PM items or one of the environmental data items.

Up to six data items may be added to the graph. To add an item to the graph, press the Add Item button. To close the graph and return to the numerical data display, press the Close Graph button.

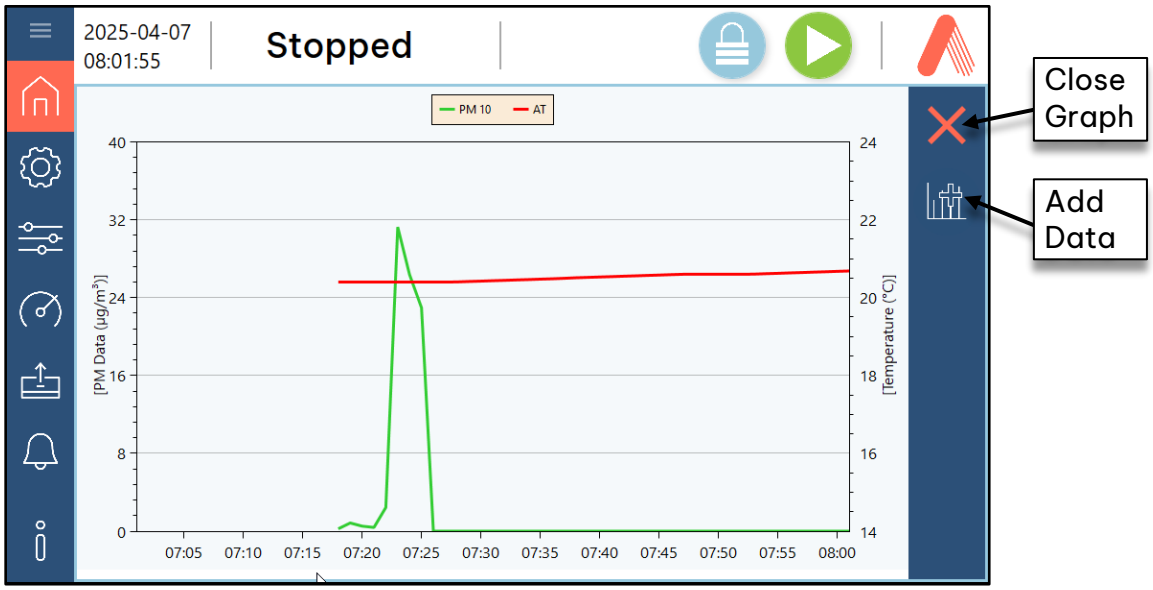


Figure 3-3 Home Screen Data Graph View

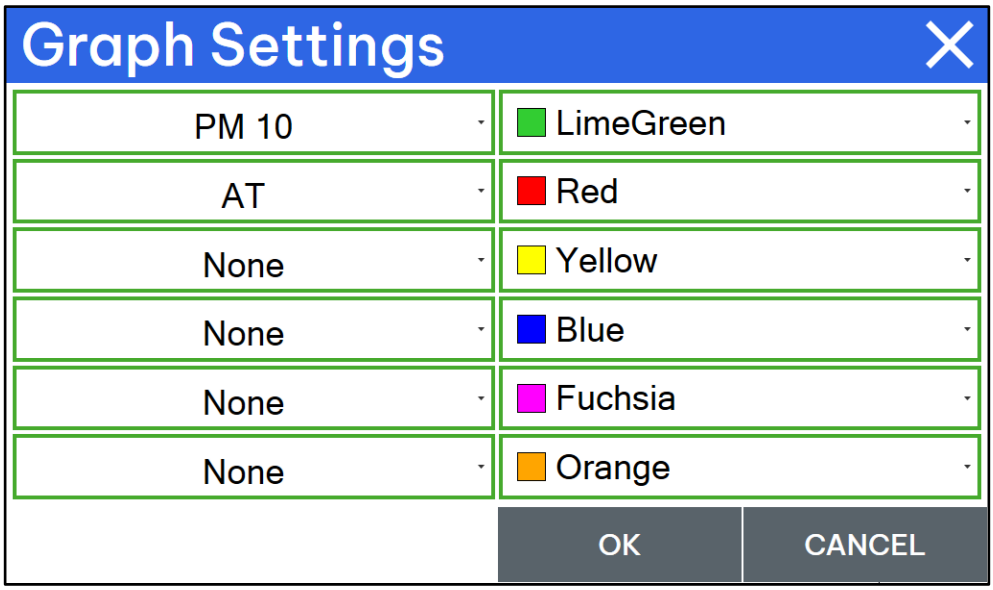


Figure 3-4 Graph Settings

3.4 User Interface Navigation

This section describes how to access menus, edit input fields, and navigate through the menu hierarchy using the touchscreen display.

3.4.1 Navigation Menu Selection Pane

The navigation menu selection pane on the left side of the screen shows a list of icons that navigate to the seven available menus. The side pane can expand to

show the icon labels by pressing the button in the upper left corner. See **Figure 3-5** below. To close the navigation menu pane icon labels, press the button again or touch anywhere on the main page.

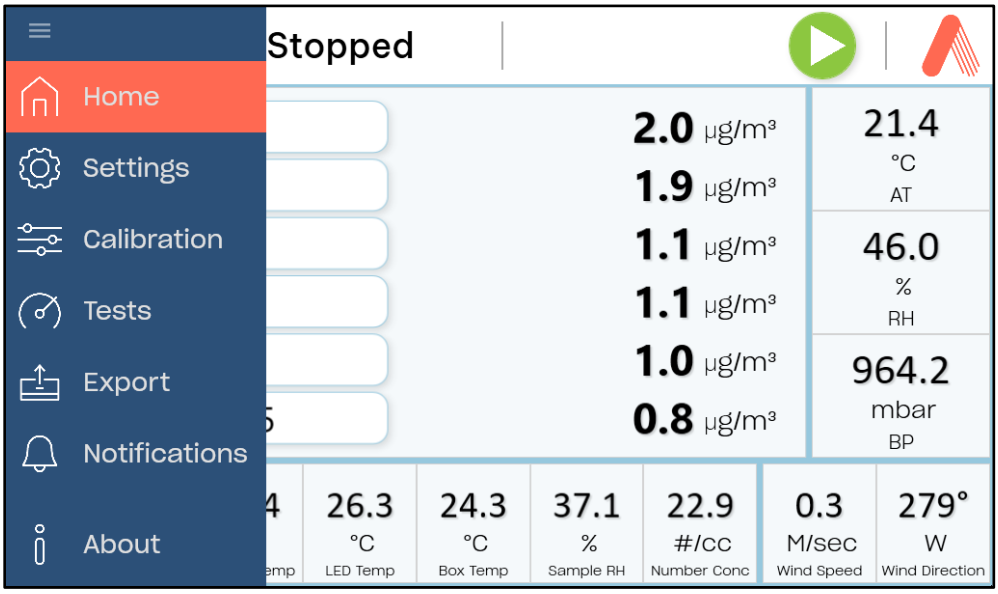


Figure 3-5 Navigation Menu Expanded

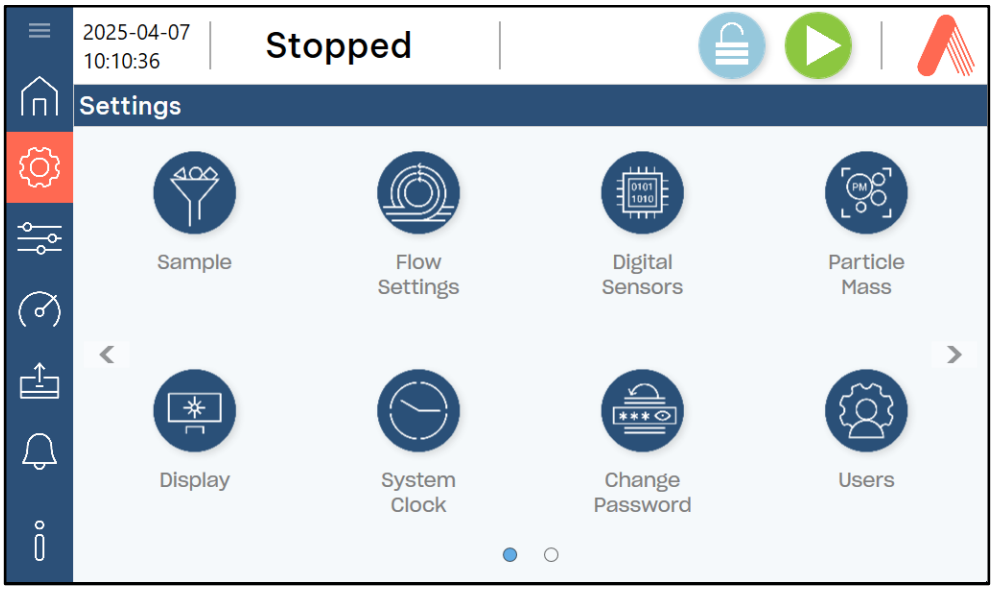


Figure 3-6 Settings Menu Selection

When a menu icon is selected from the navigation menu, it will be highlighted, and the selected page will appear on the screen, as shown in **Figure 3-6.** The selected page may be a menu, action page, or information page. The selected navigation menu label is shown at the top of the page in a blue bar for most pages.

Select a submenu by pressing on the labeled icons within the navigation menu. **Figure 3-7** is an example of what a submenu looks like.

To return to the home page from any other page, press the icon at the top of the navigation menu.

When the navigation menu is present, different menus can be selected at any time.

3.4.2 Submenu Navigation

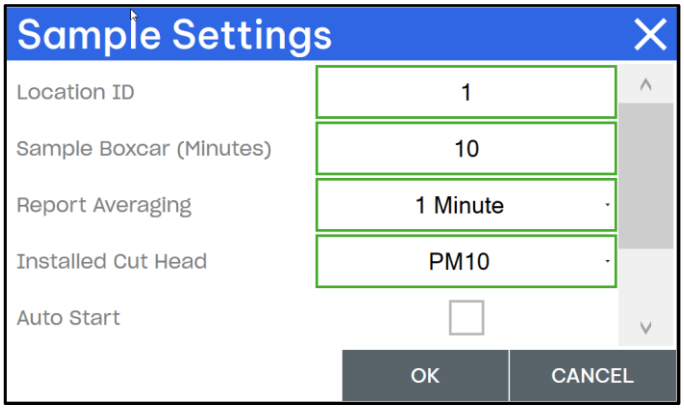


Figure 3-7 Settings Submenu Navigation

When a submenu is selected, the navigation menu will disappear. Submenus consist of input fields and drop-down menu selections.
"Location ID" in **Figure 3-7** is an example of an input field where values can be customized to user preferences. When the box outlined in green is selected, the screen will change to a keypad where users can input desired values.
"Report Averaging" is an example of a drop-down menu which provides pre-defined selectable settings.

3.4.3 Editing Input Fields

Some parameters such as the Date and Time settings require character entry. Boxes with a green outline indicate an editable field. When that field is selected, a numeric or alphanumeric keypad will appear. **Figure 3-8** shows the numeric input keypad for setting the date.

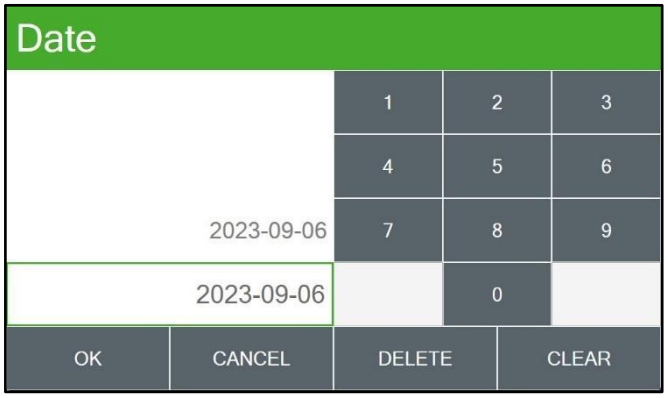


Figure 3-8 Numeric Keypad

- To edit this field, press the CLEAR button to remove the current date.
- Using the numerical keypad, key in the desired date.
- Pressing the Delete button will remove one character at a time, like the backspace key on a keyboard.

- The cancel button will return to the submenu without saving changes.
- Pressing OK will save the changes and go back to the previous screen.

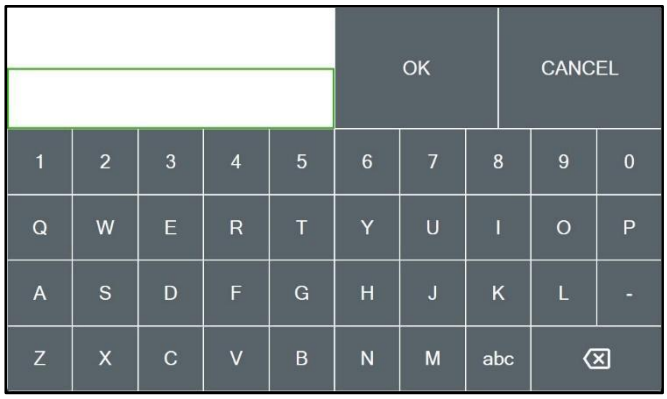


Figure 3-9 Alphanumeric Keypad

Figure 3-9 is an example of an alphanumeric keypad. This specific keypad will appear when setting up a password for Remote Access settings. The keypad functions similarly to a standard keyboard. The letter keys are capitalized by default.

- To edit this field, input any combination of eight characters by pressing the desired keys. The characters will appear in the green outlined box.
- Select the abc button to change the keypad to lowercase letters and symbols if desired. This key acts similarly to the Shift key on a standard keyboard.
- The ⌫ button will delete a single character with each press.
- The CANCEL button will return to the previous menu without saving changes.
- Press the OK button to save the current entry and go back to the previous menu.

3.5 Pages

The following sections describe the six pages and the functions of the submenus within. The submenus have specific functions to edit settings for proper configuration, operation, and calibration of OPX 1025 systems.

This section is broken up by the pages and submenus with individual explanations. The 3.X.X level shows the main menu pages, and the 3.X.X.X sections show and explain the submenus and their individual entries.

3.5.1 Home Page

The OPX 1025 main sampling/operation page or Home Page is shown below in **Figure 3-10**. The current date and time are always fixed at the top line of the display on this page. The navigation menu is on the left side of the main page, as mentioned in **Section Figure** 3-54 . By default, PM concentrations are displayed in units of µg/m^3, and logged concentration values update at the end of every minute. The start/stop button is the primary method for controlling the

sampling operation of the instrument. The padlock icon will display a closed lock symbol when security is enabled and is password protected. For additional security information see section 4.1.7 .

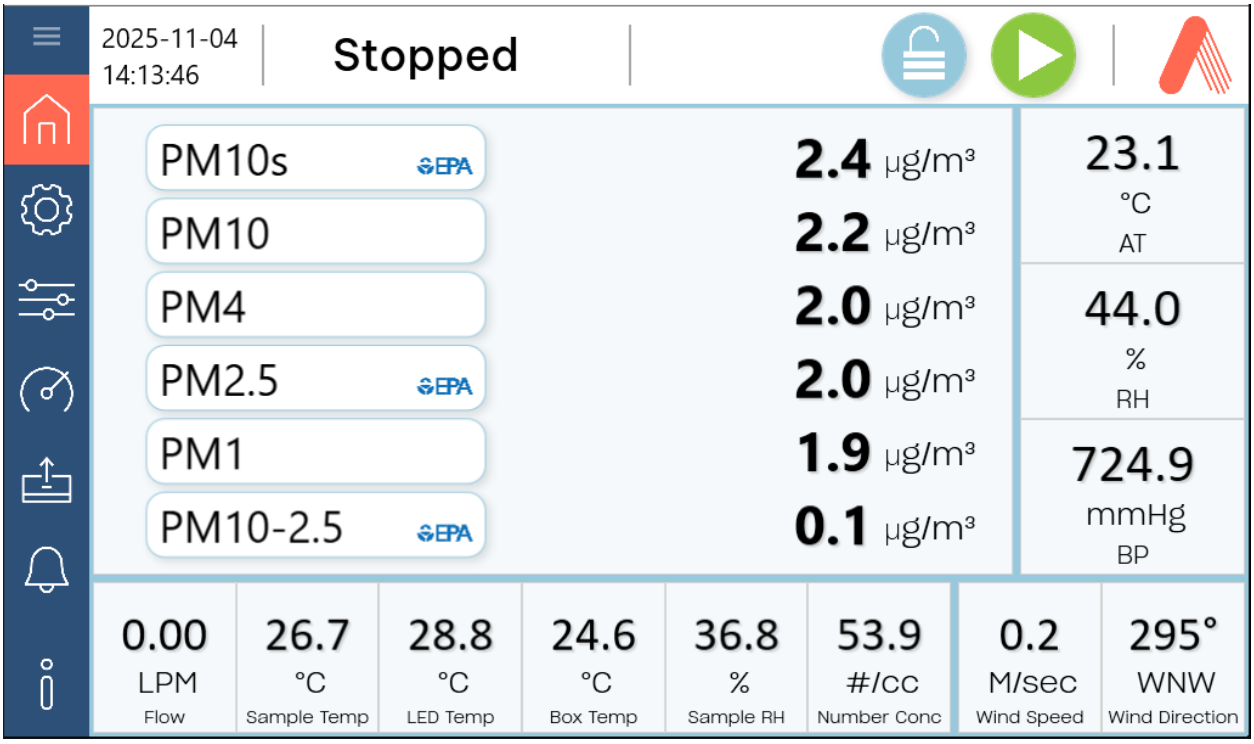


Figure 3-10 Home Page

The list below defines each of the internal sensor readings and ambient sensor readings.

- **AT:** The value for ambient temperature (°C/°F).
- **BP:** The value for ambient barometric pressure (mbar/mmHg/kPa).
- **RH:** The value for ambient relative humidity (%).

The AT, BP, and RH values all require that the BX-597A ambient combination sensor is properly connected and are required for instrument operation. These parameters are updated on the display once every second.

- **FLOW:** This value is the actual sample flow rate in liters per minute.
- **FLOW TEMP:** The temperature of the air flow measured just downstream of the optical measurement head.
- **LED Temp:** The temperature of the LED.
- **BOX Temp**: The temperature measured inside the OPX 1025 enclosure.
- **INLET RH:** The percent RH measured at the outlet of the optical sensor.

- **WS** and **WD:** WS is the measured wind speed, and WD is the measured wind direction. Both WS and WD require an optional external WS/WD sensor. Contact Met One Instruments for details.

3.5.2 Settings Page

This section describes the Settings page, its submenus, and their functions. The Settings page provides basic settings for usability and standard operation that should be modified to suit the specific needs of local monitoring programs as needed.

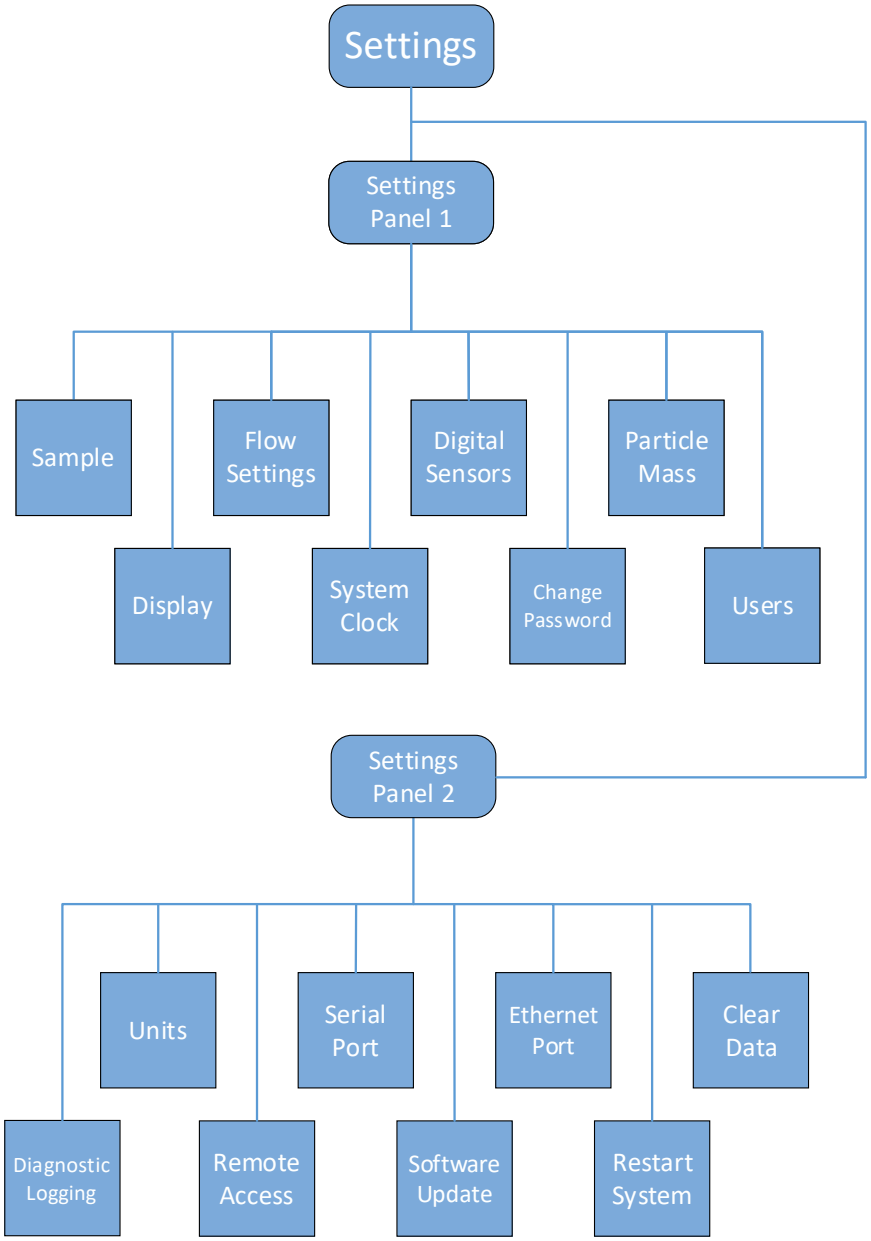


Figure 3-11 Settings Menu Structure

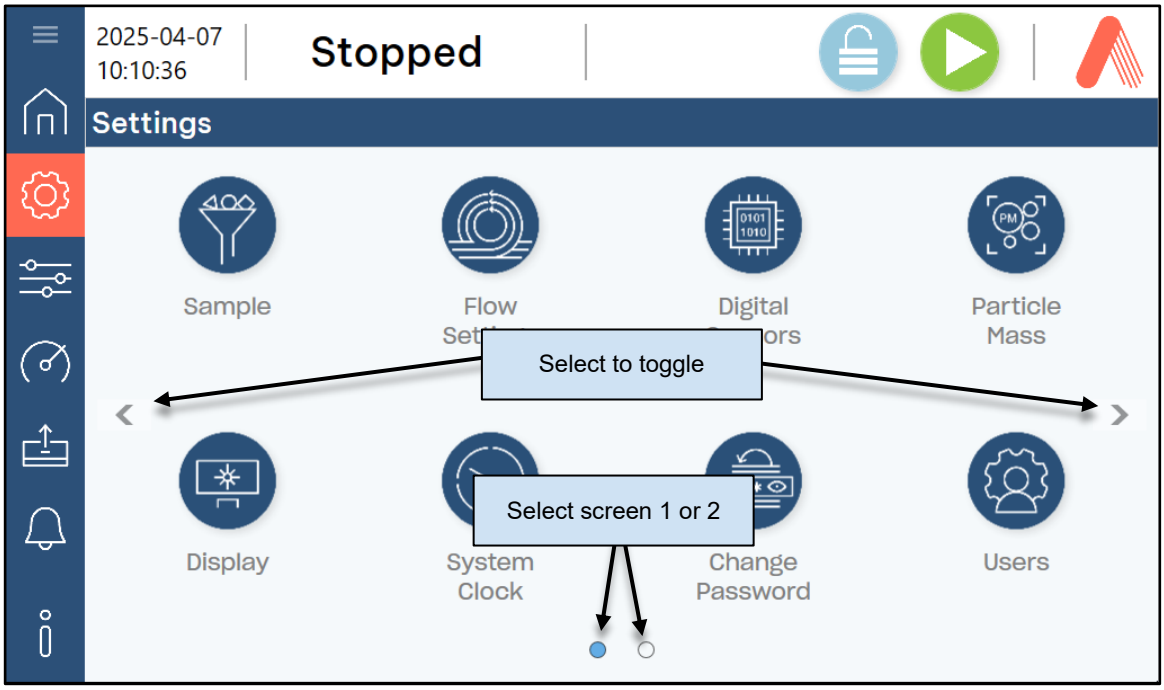


Figure 3-12 Settings Menu, Screen 1

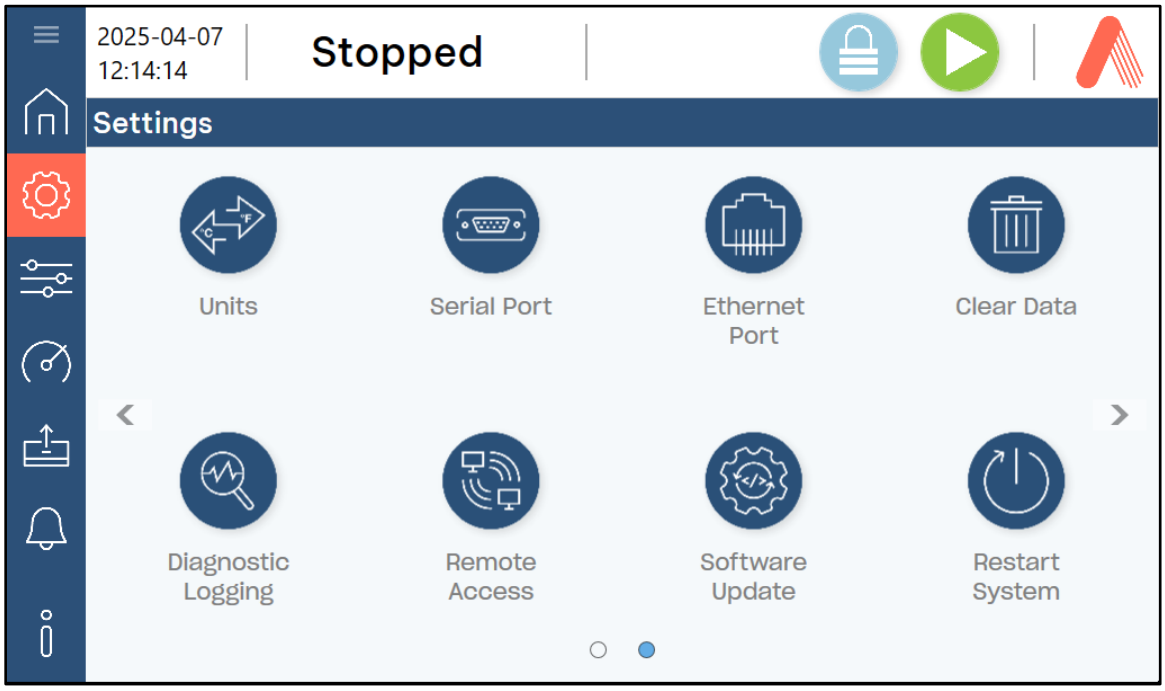


Figure 3-13 Settings Menu, Screen 2

3.5.2.1 Sample Settings Screen

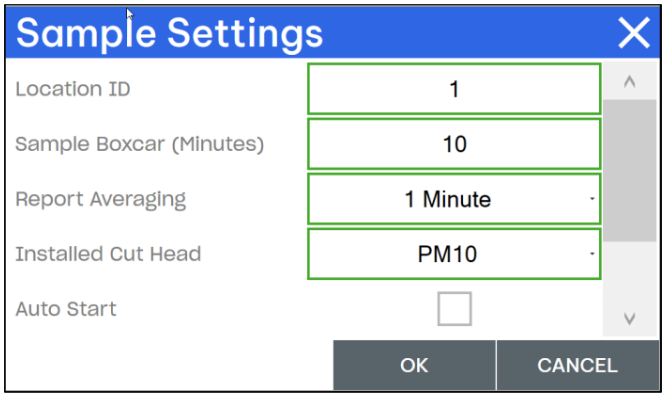


Figure 3-14 Sample Settings Screen

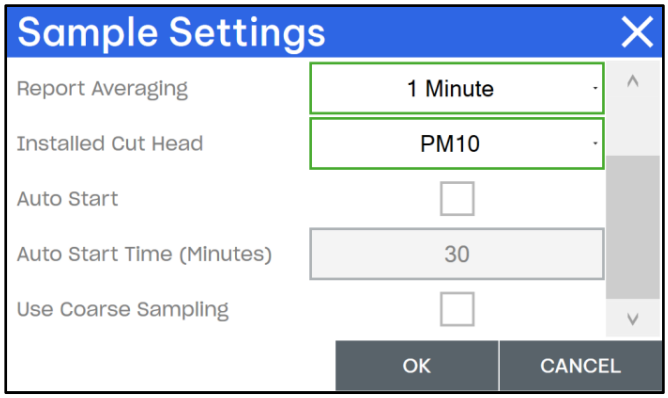


Figure 3-15 Sample Settings Screen

The SAMPLE settings screen allows users to set the Location ID of the unit, the averaging rate controlled by the Sample Boxcar, the Report Averaging, the Cut Head, the Auto Start options, and the Coarse Sampling option. The location ID is a simple ID number that will appear in the data files. It can be used as a Unit ID number in a network of multiple OPX 1025 monitors. The range is 1 to 999. The Sample Boxcar affects the averaging of the incoming particle data. It can be set from 1 to 15 minutes. The Report Averaging is used to summarize the data in the user report. Setting this value to one hour will return hourly data, whereas setting it to one minute will report one-minute averages. The Installed Cut Head selection needs to be set to the sample head (PM10 or TSP) installed at the instrument inlet. The Auto Start settings tell the instrument whether to automatically start sampling after a period of inactivity. The Coarse Sampling option displays instantaneous data values instead of an average.

3.5.2.2 Flow Settings Screen

The FLOW SETTINGS screen contains Standard Temperature and Pressure settings for calculating standard flow. Standard flow is used to calculate the PM10 measurement.

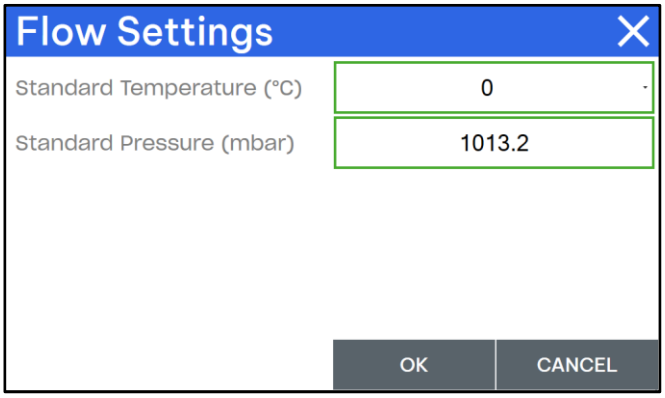


Figure 3-16 Flow Settings Screen

3.5.2.3 Digital Sensors Setup Screen

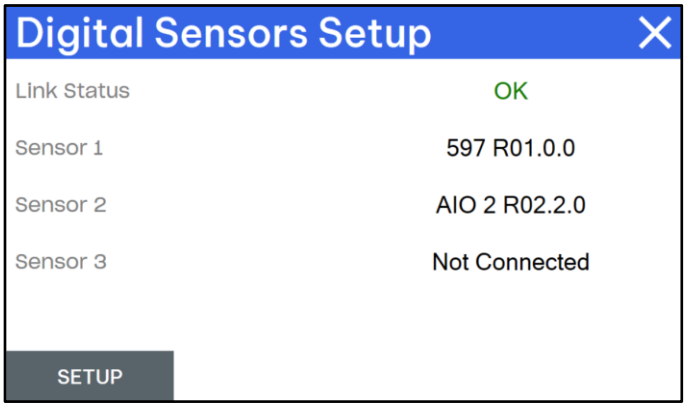


Figure 3-17 Digital Sensors Setup Screen

The DIGITAL SENSORS SETUP screen is used to configure and test the link between the OPX 1025 and ambient digital sensors. Sensor 1, 2, and 3 indicate the identification of connected sensors. **Figure 3-17** Sensor 1 shows an BX-597A and sensor 2 shows an AIO 2 is connected and working.

3.5.2.4 Measurement Setup Screen

The MEASUREMENT SETUP screen is used to configure the PM measurements displayed on the instrument. Use the ⋮ button to drag and drop items in the list to set the order they will appear on the main page. Alternatively, use the ⬆ and ⬇ to order the items. Use the EPA Certified button to enable or disable EPA certification. Only PM2.5, PM10s, and PM10-2.5 can be certified and must have a K Factor of 1.00. Disabling EPA certification will remove the EPA logo from those measurements and allow setting the K Factor. Setting a custom K Factor will allow for slight adjustments to the PM measurement. Use the Display button to show or hide the PM measurements on the main page. The PMtot option only appears if the TSP head is selected on the Sample Settings screen. (refer to section 4.1.4.4) PM10s is reported as standard flow conditions with respect to the selected options on the Sample Settings screen.

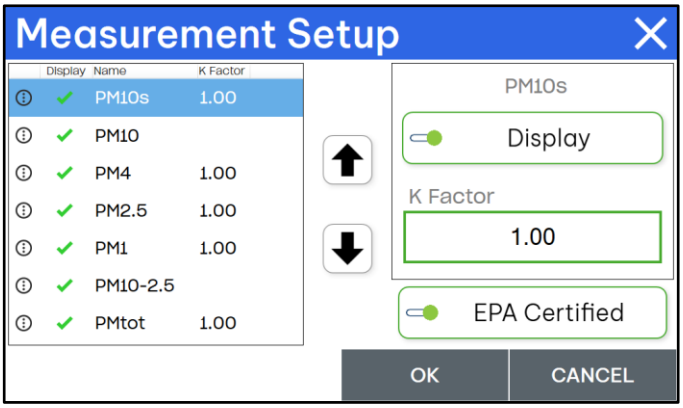


Figure 3-18 Measurement Setup Screen

NOTE: Only PM measurements that are displayed will be logged and appear in reports.

3.5.2.5 Setup Display Screen

Figure 3-19 Setup Display Screen

The SETUP DISPLAY screen is used to adjust the display brightness.

3.5.2.6 Set Clock Screen

The SET CLOCK screen is used to set the internal OPX 1025 clock. The clock is used to match data points with other collocated instruments for accuracy. Use the Date and Time settings to set the current date and time. Use the Time Zone setting to set your local region. Select the Use Daylight Savings Time option to automatically adjust the clock for daylight savings time.

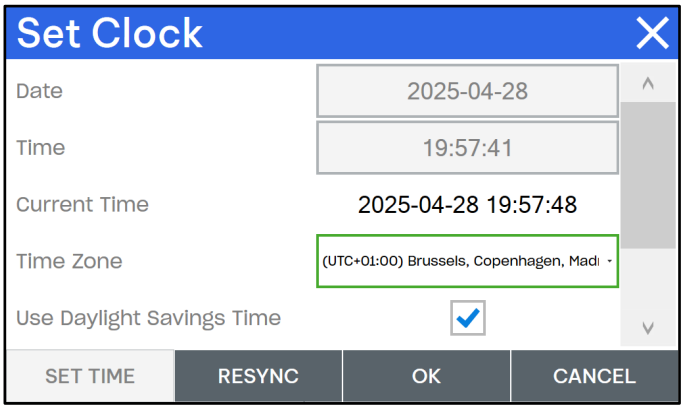


Figure 3-20 Set Clock Screen

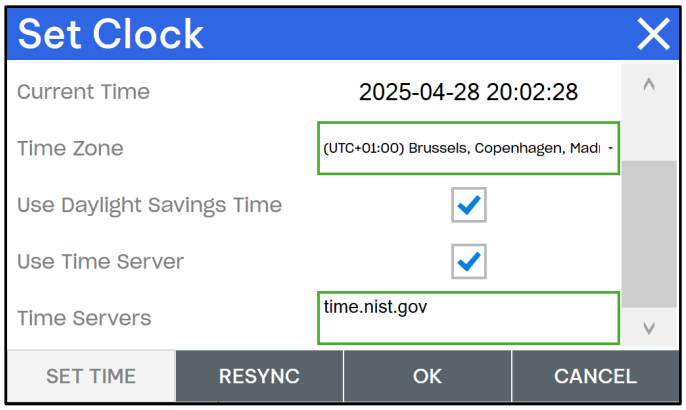


Figure 3-21 Set Clock Screen

Alternatively, enable the Use Time Server option to have the time set from a time server. Use the Time Servers setting to set at least one time server to sync with. Use the RESYNC button to force the system to sync with the Time Server. Use of this function requires an Ethernet connection to a local network time server or access to the internet for an online hosted server.

3.5.2.7 Change Password Screen

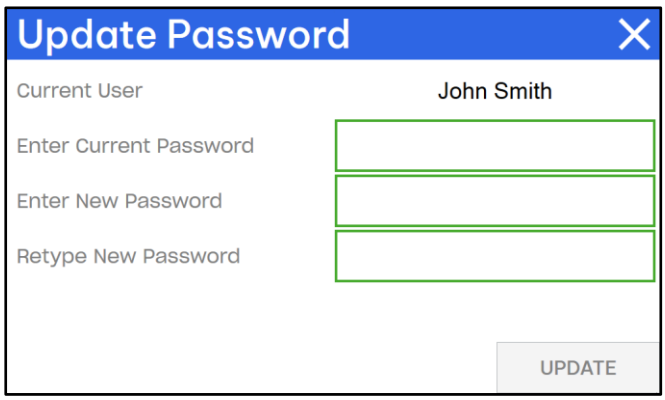


Figure 3-22 Change Password Screen

The CHANGE PASSWORD screen is used to change the password of the user that is currently logged on. The user must enter their current password and the new password twice. Passwords will not be visible when entered.

3.5.2.8 User Management Screen

The USERS screen is used to manage user access to the instrument. Use the Add button to add a new user to the instrument. Use the Edit button to modify an existing user. Use the Delete button to remove a user from the instrument. When adding or editing a user, the User Name field is used to enter a unique name. This name will be used to logon to the instrument. Use the Full Name field to enter the user's full name. This name is what will appear in the software and reports. Use the Password field to enter a password for the account. Use the Grant Admin Access option to create an administrator level user account. Use the Is Active Account to temporarily disable an account without permanently deleting it.

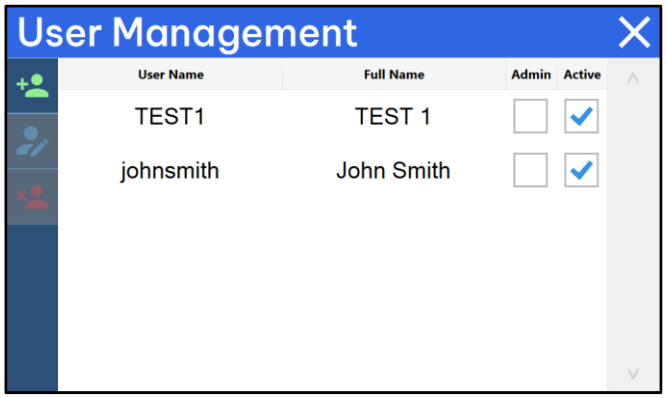


Figure 3-23 User Management Screen

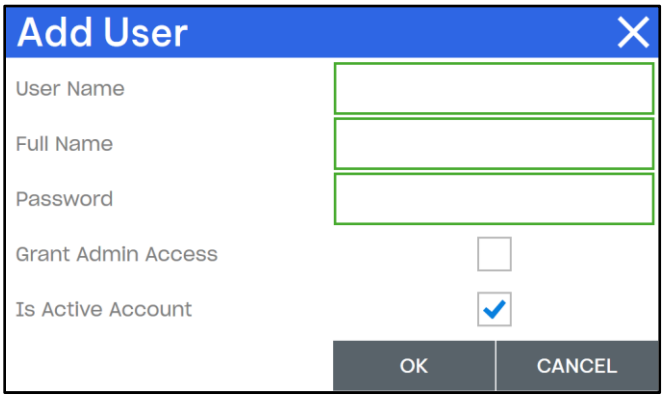


Figure 3-24 Add or Edit User Screen

NOTE: Only administrator level users have access to these screens.

3.5.2.9 Setup Units Screen

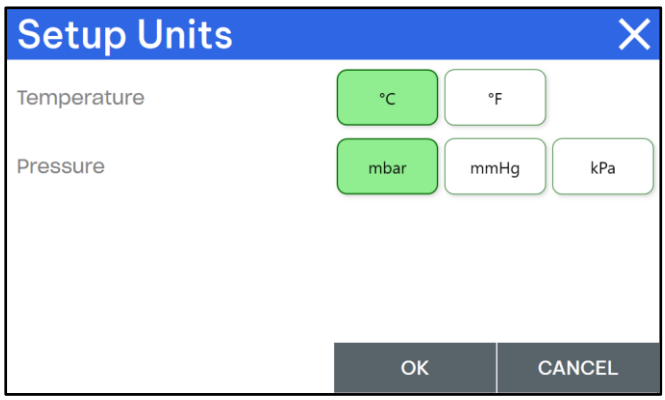


Figure 3-25 Setup Units Screen

The SETUP UNITS screen is used to change the units of measure displayed throughout the user interface. The user may select either °C or °F for Temperature, and mbar, mmHg, or kPa for Pressure.

3.5.2.10 Serial Port Setup Screen

The SERIAL PORT SETUP screen is used to configure the Baud Rate and Flow Control for the Modem Port on the back of the instrument. Use the Baud Rate to select the desired speed from the list. Use the Flow Control to select the desired flow control setting from the list.

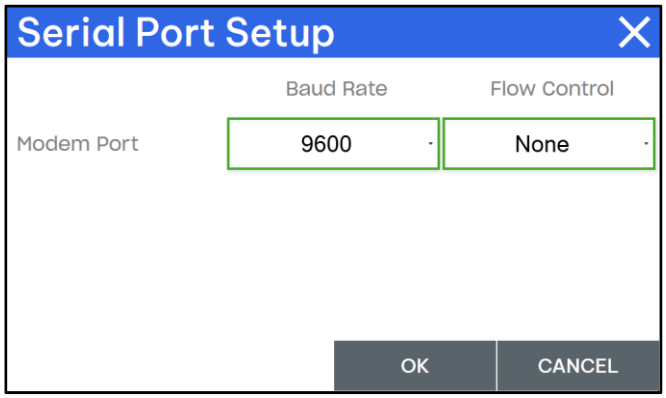


Figure 3-26 Serial Port Setup Screen

3.5.2.11 Ethernet Config Screen

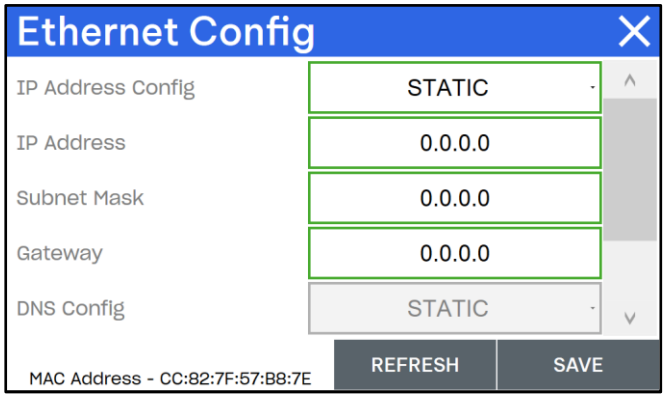


Figure 3-27 Ethernet Config Screen

The ETHERNET CONFIG screen is used to set the IP Address, Subnet Mask, Gateway, and DNS Servers to allow the OPX 1025 to communicate on a local area network using a standard Ethernet cable connected to a switch or router. It is recommended to set the IP Address Config to STATIC. The IP Address, Subnet Mask, and Gateway will need to be provided by the instrument owner's IT department. When set to AUTO, the instrument will automatically obtain its configuration from servers on the network. These values may change over time.

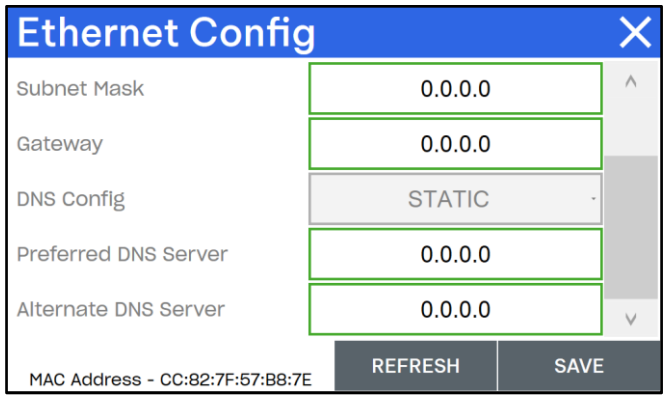


Figure 3-28 Ethernet Config Screen

3.5.2.12 Clear Memory Screen

The CLEAR MEMORY screen is used to clear/erase data from the different logs stored in the OPX 1025. Use the selection buttons to select which logs will be cleared.

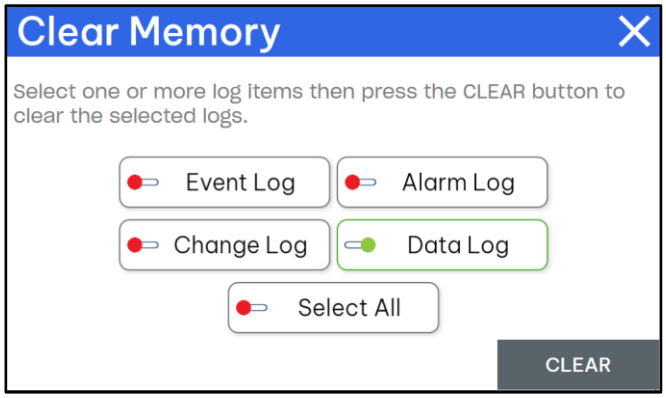


Figure 3-29 Clear Memory Screen

CAUTION: This function will permanently delete the selected files from the instrument memory!

3.5.2.13 Logging Screen

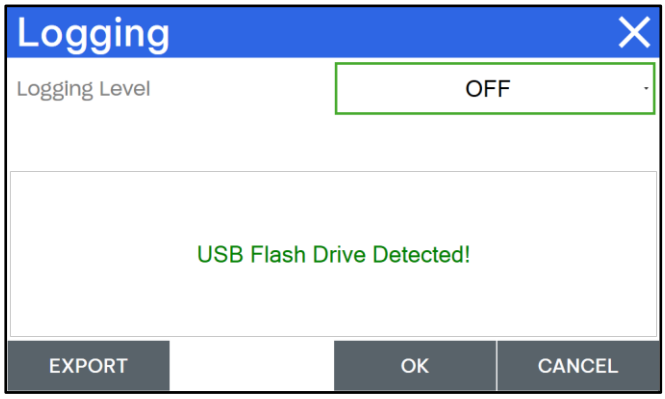


Figure 3-30 Logging Screen

The LOGGING screen is used to configure diagnostic data logging for troubleshooting purposes. This should only be accessed at the request of Met One Instruments Service personnel and should be disabled when not in use. HIGH Logging Level provides all information available, whereas LOW Logging provides less information. The Met One Service team can help decide the level needed. The Logging can be downloaded by inserting a USB flash drive into the USB port on the

front of the instrument and pressing the EXPORT button.

3.5.2.14 Remote Access Config Screen

The REMOTE ACCESS CONFIG screen is used to allow access to the OPX 1025 through the use of VNC software. Use the Remote Access selection to enable or disable the feature. Use the Set Password setting to enter a password for the connection. A password must be used for the connection. An example of compatible remote viewing software is TightVNC.

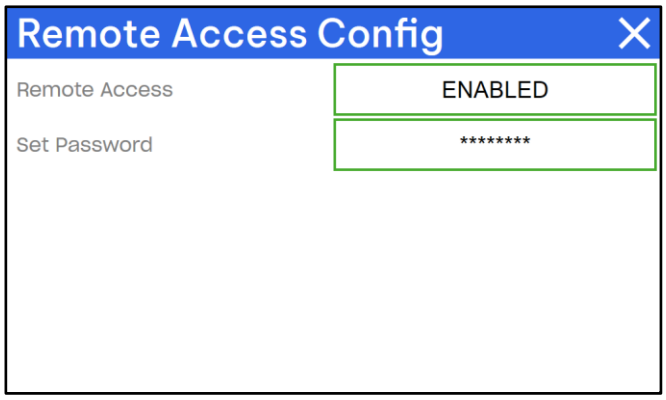


Figure 3-31 Remote Access Config Screen

3.5.2.15 Software Updater Screen

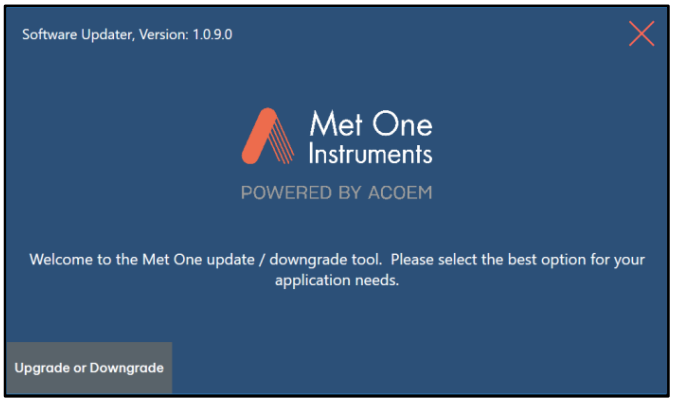


Figure 3-32 Software Updater Screen

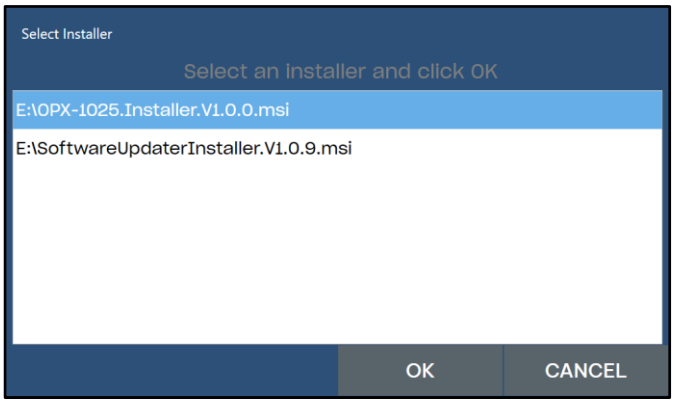


Figure 3-33 Upgrade Software Screen

The SOFTWARE UPDATER is an application used to install a new or previous version of the OPX 1025 software, or the Software Updater. The software will look for a valid .msi file on a connected USB flash drive. Use the Upgrade or Downgrade button to start the process. With a USB flash drive containing a valid .msi file connected, the software will display the installation file that was found. If more than one is found the results will be presented for selection by the user. Use the Update button to start the installation process.
In the event of a failed installation, the software will be started automatically and a prompt displayed to retry the installation again.

3.5.2.16 Restart System

This option is used to do a soft reboot when any major software changes are made.

3.5.3 Calibration Page

This section describes the Calibration page, its submenus, and their functions. The Calibration page provides the means to audit and calibrate individual measurement sensors that are vital to the operation of the OPX 1025 and to verify those calibrations as a system.

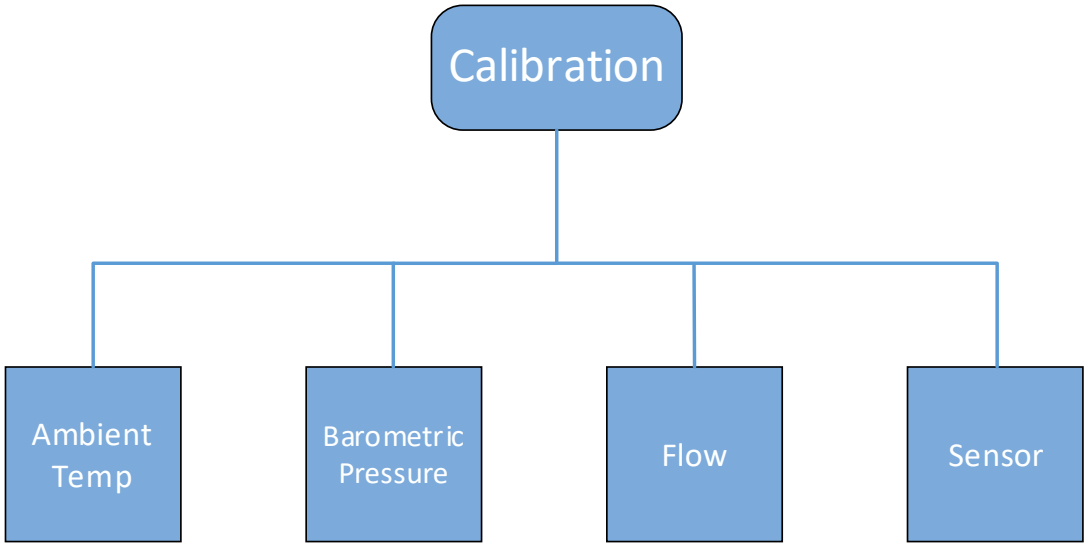


Figure 3-34 Calibration Menu Structure

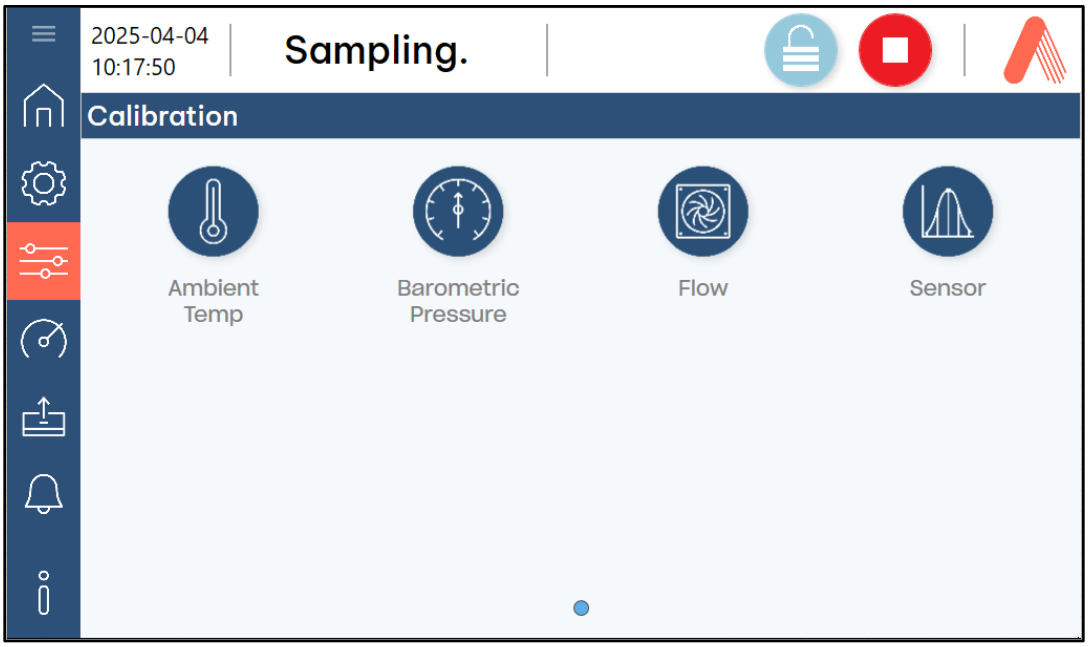


Figure 3-35 Calibration Page

3.5.3.1 Ambient Temperature Calibration Screen

The AT CALIBRATION screen is used for field audits or calibrations of the ambient temperature sensor connected to the OPX 1025.

To perform a calibration, first press on the Reference box, type in the temperature from a reference standard, then press OK. When ready for the calibration, press the CALIBRATE button. This will apply an offset to the value that is read from the sensor. Previous calibrations can be reset using the DEFAULT button.

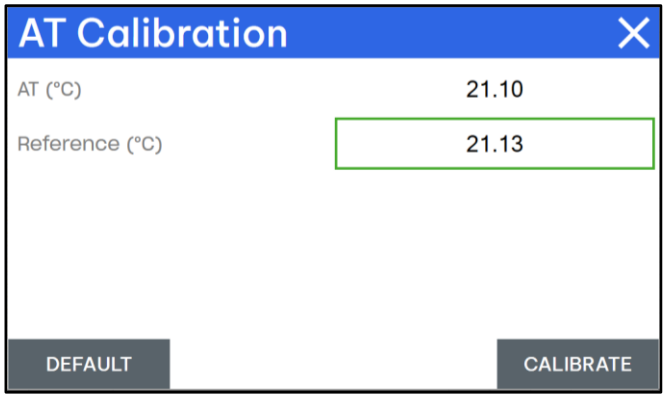


Figure 3-36 Ambient Temp. Cal. Screen

3.5.3.2 Barometric Pressure Calibration Screen

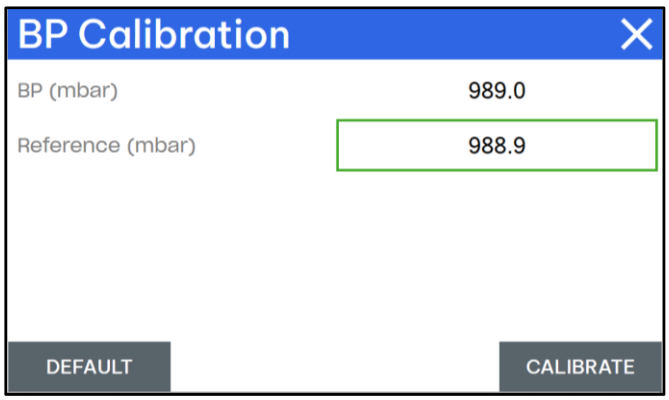


Figure 3-37 Barometric Pressure Cal. Screen

The BP CALIBRATION screen is used for field audits or calibrations of the ambient barometric pressure sensor connected to the OPX 1025. Note that the pressure will be calibrated using the current set units for pressure (mbar, mmHg, or kPa).
To perform a calibration, first press on the Reference box, type in the pressure from a reference standard, then press OK. When ready for the calibration press the CALIBRATE button. This will apply an offset to the sensor data which can be reset by pressing the DEFAULT button.

3.5.3.3 Flow Calibration Screen

The FLOW CALIBRATION screen is used for field audits or calibrations of the sample flow measurement of the OPX 1025. Ambient temperature and pressure must be checked and calibrated if necessary, and a leak test performed prior to performing a flow calibration. Before pressing the flow button in the calibration menu, ensure sampling is stopped by pressing the red stop button on the home page. Using a certified reference standard flow meter measuring in volumetric conditions, connect the meter to the instrument inlet. Ensure the audit/reference flow meter is properly zeroed before performing a flow calibration.

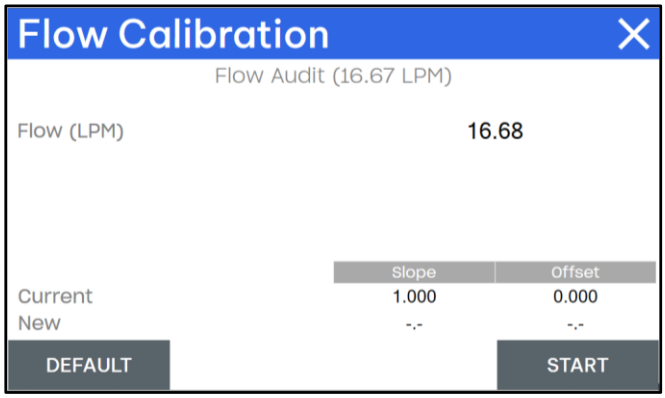


Figure 3-38 Flow Audit Screen

Upon entry to the flow calibration screen, notice the instrument is pulling vacuum. The current slope and offset are shown on the right side of the main flow calibration screen. To reset these, simply press the default button (this will clear previous calibrations).
When ready to begin a flow audit or flow calibration, press the START button.

After pressing the START button the instrument will begin to control the flow at 16.67 LPM. Wait for the flow to stabilize, press the Reference box shown in green, and a new screen will appear. Type in the Reference flow and press ok. To input the flow reference adjustment for the mid flow point press the SET button.

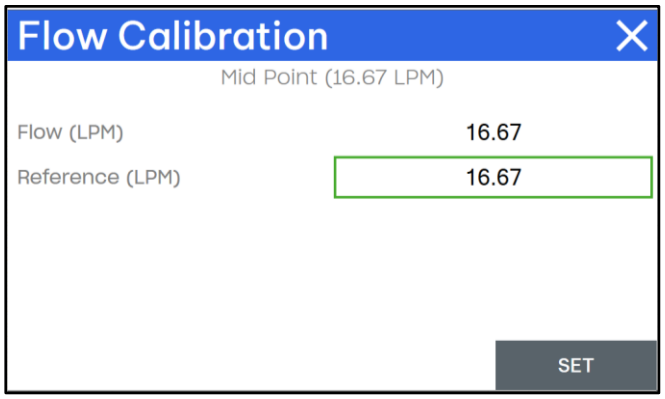


Figure 3-39 Flow Cal. Midpoint Screen

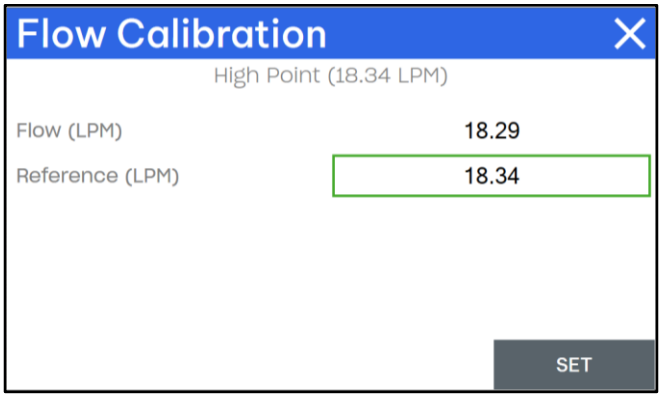


Figure 3-40 Flow Cal. High Point Screen

After pressing the set button on the Mid Point screen, the High Point screen will appear. Wait for the flow to stabilize and press the Reference box as performed in the previous screen to input the reference flow for adjustments. When the correct flow is in the reference box the flow is ready to be set (press the SET button).

Now the Low Point screen will appear. Wait for the flow to stabilize at 15.00 LPM. Follow the same previous steps and press the CALIBRATE button.

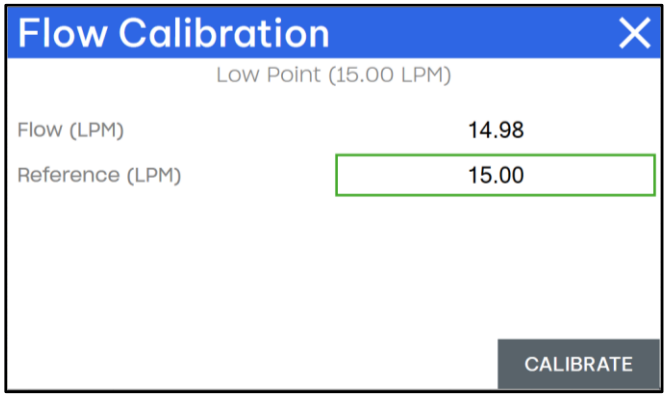


Figure 3-41 Flow Cal. Low Point Screen

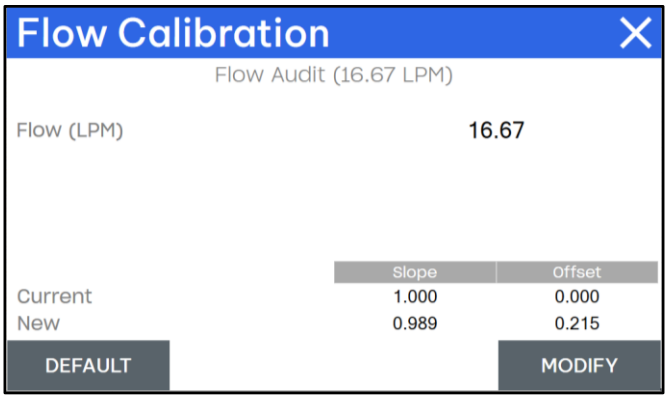


Figure 3-42 Flow Audit Screen

The last screen allows the slope and offset that the OPX 1025 previously had to be viewed, along with the new calibration. If needed, repeat the previous steps by pressing the MODIFY button. If the MODIFY button is pressed, it allows the adjustment of the individual previous cal points. If a change is not needed to a cal point, simply press the arrow to go to a different cal point.

3.5.3.4 Sensor Check Screen

The SENSOR CHECK screen is used for field audits or calibrations of the sensor in the OPX 1025. During a calibration or audit, the instrument will collect bin data while test dust is injected into the instrument's inlet. This bin data will be used to produce a histogram of the particle distribution for the test dust. While collecting data, the instrument will calculate the Peak bin for the histogram. This can be used to determine if the PMT Gain needs to be adjusted. For a detailed process explanation see section 7.3 Optical Sensor Check.

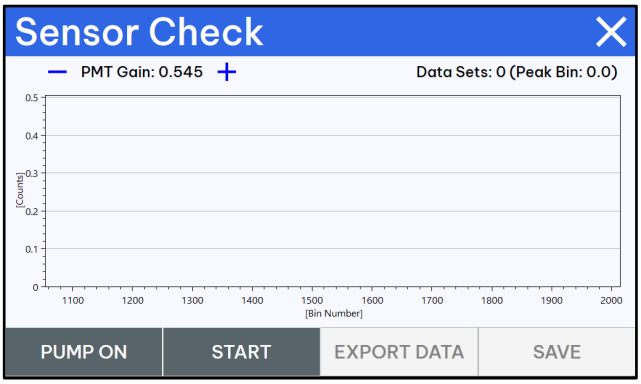


Figure 3-43 Sensor Check Screen

3.5.4 Tests Page

The OPX 1025 TESTS or INSTRUMENT TESTS menu contains a system of screens that can be used to test the electrical and mechanical subsystems for troubleshooting purposes.

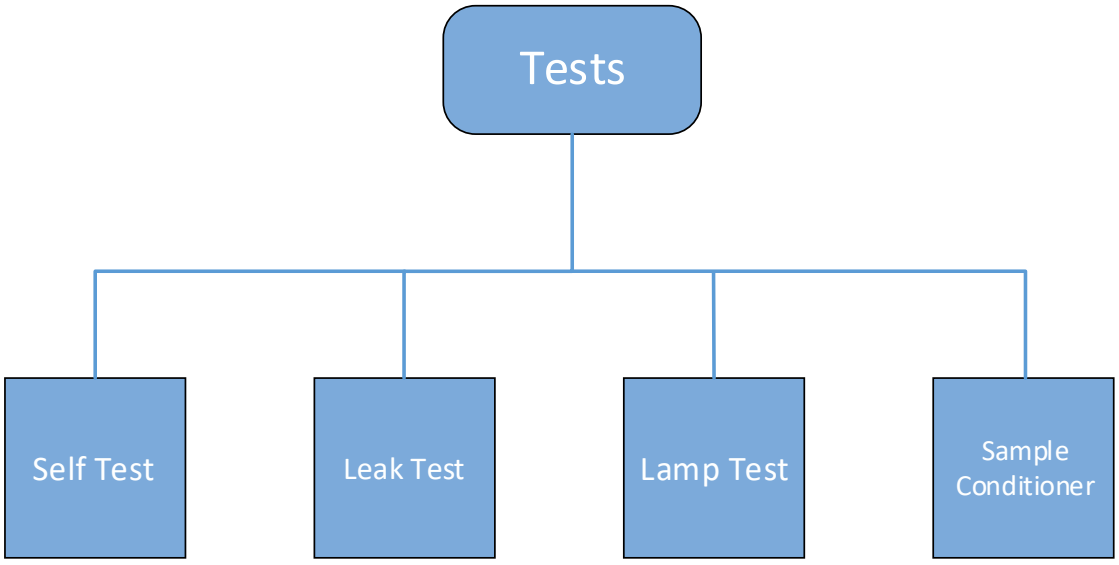


Figure 3-44 Tests Menu Structure

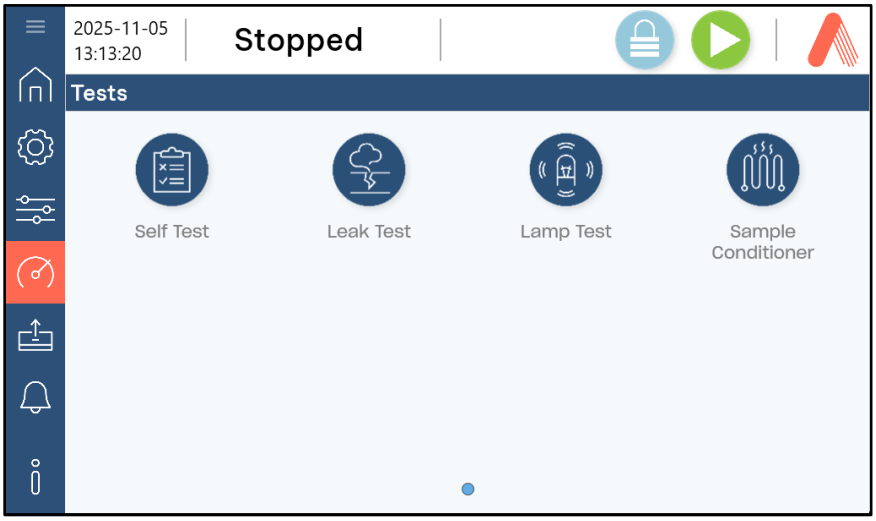


Figure 3-45 Tests Page

NOTE: The Self Test and Sampler Conditioner test cannot run while the unit is sampling; stop sampling before attempting these tests.

3.5.4.1 Self Test Screen

The SELF TEST screen is used to test the main components of the measurement system with a ✓ status for correct operation or ✗ if a system did not pass.

- Digital Link
- Digital Sensors
- Flow System Operation
- Flow Temp
- LED Temp
- Box Temp

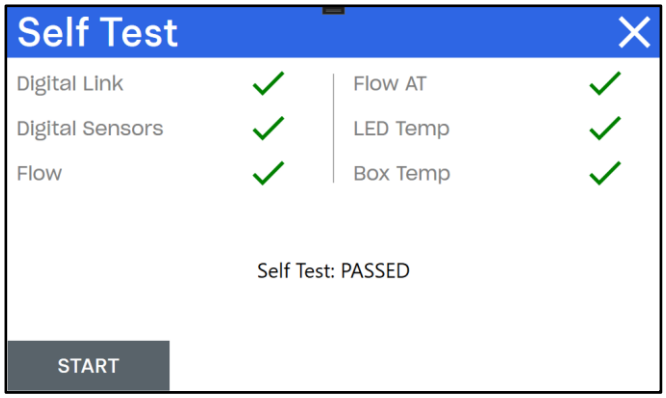


Figure 3-46 Completed Self Test Screen

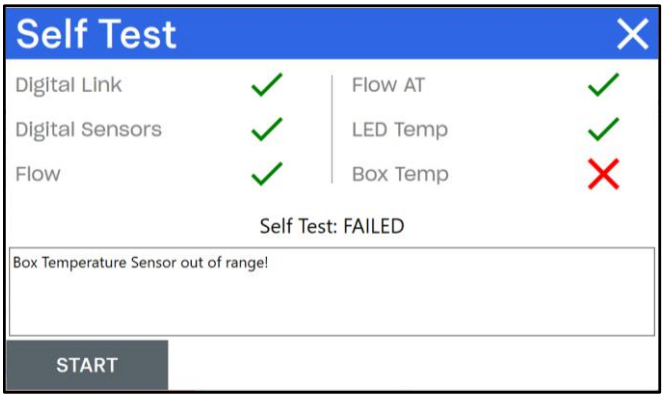


Figure 3-47 Failed Self Test Screen

Note: This test takes approximately 5 minutes. There is a progress bar, and when completed a list of all failed tests will be shown. Follow Troubleshooting steps if one of these tests fails. There may be something disconnected, or a malfunctioning part.

3.5.4.2 Leak Test Screen

The LEAK TEST screen is used to check the flow system for significant leaks that can affect performance and accuracy. This test uses particles counted as a measure for leaks above the optical detector, which is why it is important to have a Zero Count Filter placed on the inlet. The Leak Test will perform up to (3) 1-minute tests. A passing result occurs when one of the tests detects 0 particles.

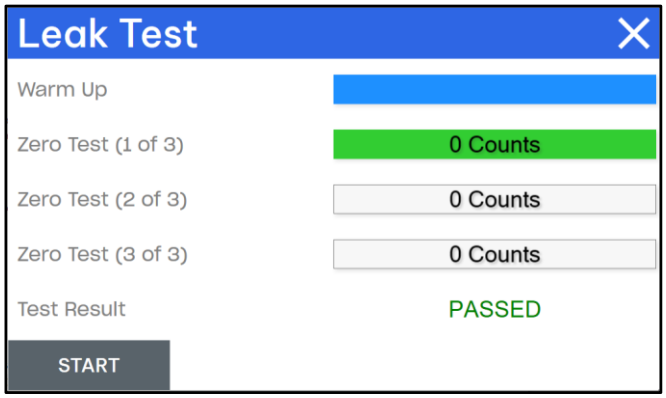


Figure 3-48 Leak Test Screen Pass

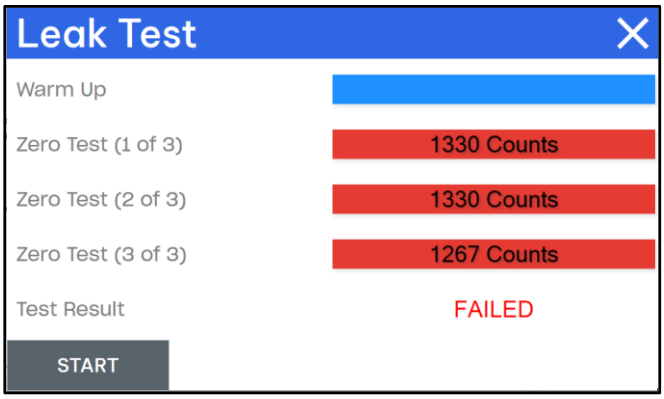


Figure 3-49 Leak Test Screen Fail

It is important to confirm the flow is stable around 16.67 before performing a leak test. This is due to the leak test only testing the upstream section of the optical chamber. If a leak is below the optics no particles will be detected. For additional details see section 6.4.12.2 Leak Check

3.5.4.3 Lamp Test Screen

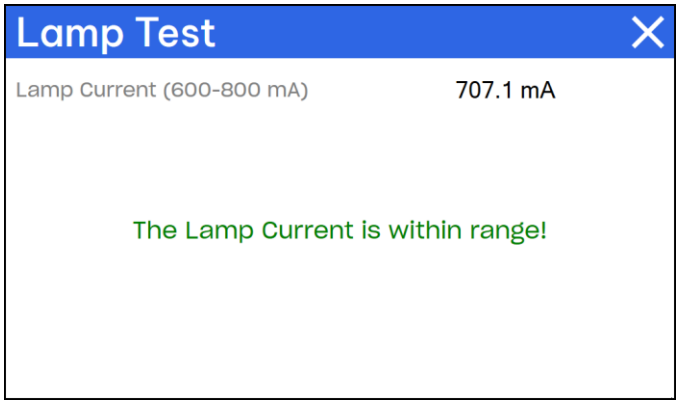


Figure 3-50 Lamp Test Screen

The LAMP TEST screen is used to test the LED.

A note will be displayed if the Lamp current is within acceptable range or not. If the lamp current is not within range, a cabling issue may exist, or the LED may have failed. The instrument needs to be sampling for the LED to be on and tested.

3.5.4.4 Sample Conditioner Test

This test will allow the user to determine if the Sample conditioner is working properly (either remote or in person).

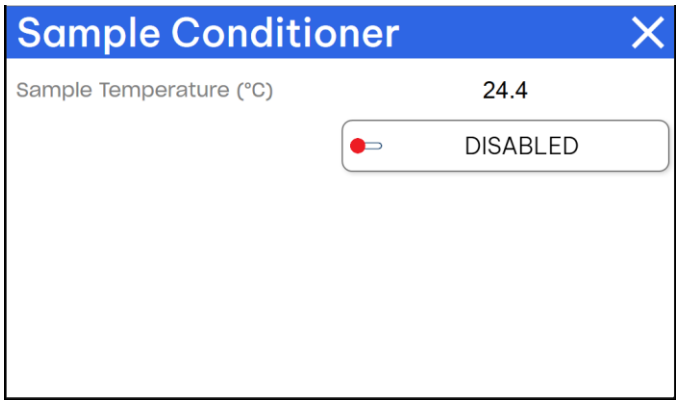


Figure 3-51 Sample Conditioner Test Screen

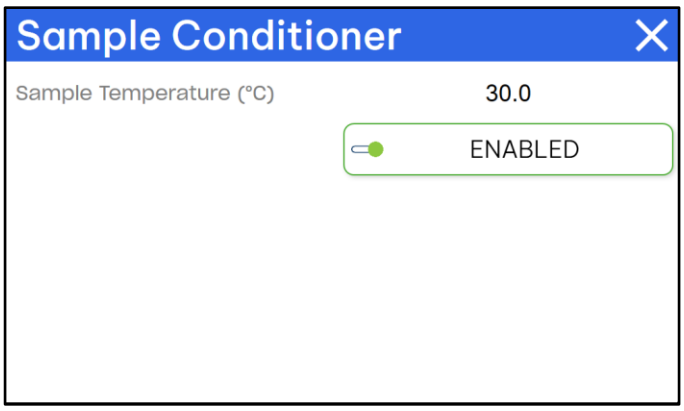


Figure 3-52 Sample Conditioner Test screen

Wait about five minutes and the flow temperature should increase. If not, ensure the Sample Conditioner is plugged in properly to the Heater connection at the rear of the instrument.

3.5.5 Export Page

The OPX 1025 can copy data files to a user-supplied USB flash drive. The USB flash drive must be inserted into the OPX 1025 USB port. The OPX 1025 USB port is located on the front of the unit. The user may export the Settings, Sample Data, Alarm Log, Event Log, and Change Log as text or CSV files.

NOTE: The flash drive needs to be formatted to FAT-32 or NTFS for compatibility.

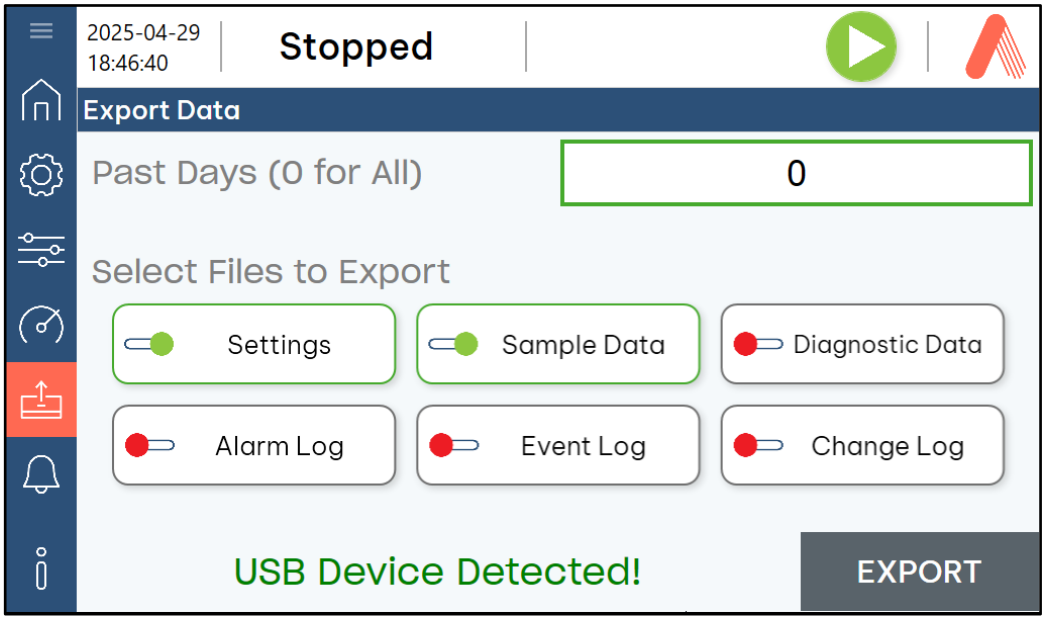


Figure 3-53 Export Data Screen

The user may specify the number of days for the export. The range will be from the current day to a chosen number of days prior to the current day. If all data is desired, enter 0 (zero). Each exported data will have the following folder directory where the files will be stored on the USB "SerialNumber/date/". Below is the following data for each export selected.

1) Settings (Listed as SETTINGS.txt, contains all instrument settings: Device information, COM settings, Device Settings/ Calibration, Ethernet settings, and encrypted Factory settings)

2) Sample Data (Listed as USER.csv, contains concentrations, connected sensor data, and status.)

3) Diagnostic Data (Listed as DIAGNOSTIC.csv, contains concentrations, bin data, connected sensor data, and status)

4) Alarm Log (Listed as ALARMS.csv, contains information on alarms that have occurred)

5) Event Log (Listed as EVENTS.csv, contains all events that have occurred)

6) Change Log (Listed as CHANGES.csv, contains all changes that were done to the instrument and the user that performed them)

3.5.6 Notifications Page

The NOTIFICATIONS page allows operators to quickly view alarms, changes, and error log entries in the OPX 1025. The screen displays the type of entry and the time and date when the notification occurred. To change the type of notifications displayed in the list, press the buttons on the left to enable the types wanted and disable the types that are not wanted.

Some notifications, such as Pressure Units, shown in **Figure 3-54** below, will provide additional information about that notification. Press the arrow on the left of the notification to display this information.

To view older alarms, drag the scroll bar or use the up and down arrows on the right side of the screen to scroll through the alarms.

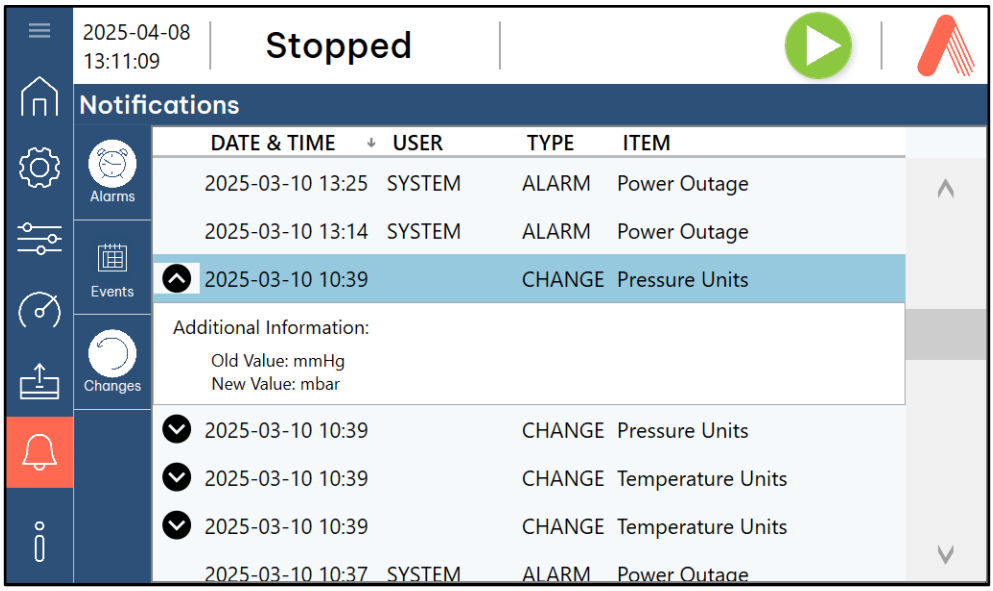


Figure 3-54 Notifications Page

3.5.7 About Page

The ABOUT page provides important identification data specific to each OPX 1025 including the following: Model, Serial Number, Location ID, software and firmware versions, IP address, and factory calibration date.

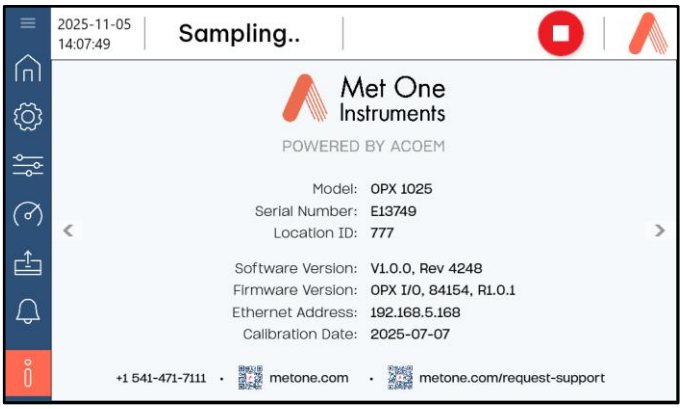


Figure 3-55 About Page

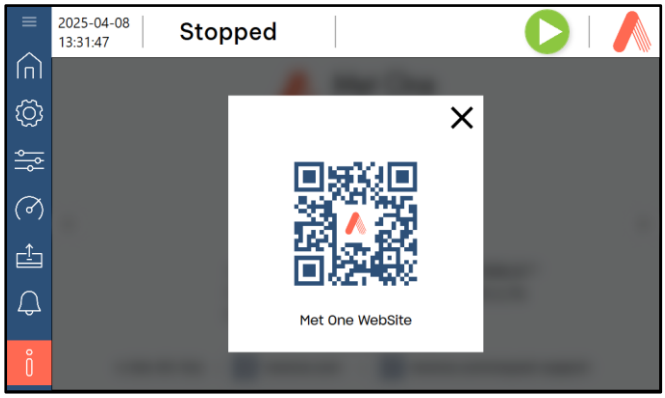


Figure 3-56 QR Code

At the bottom of the About screen, the phone number and web page addresses for Met One are provided. Press one of the addresses to display a QR code that may be scanned using a mobile device to connect directly to the website.

Press one of the arrow buttons on the left or right of the screen to view license information for tools used within the application.

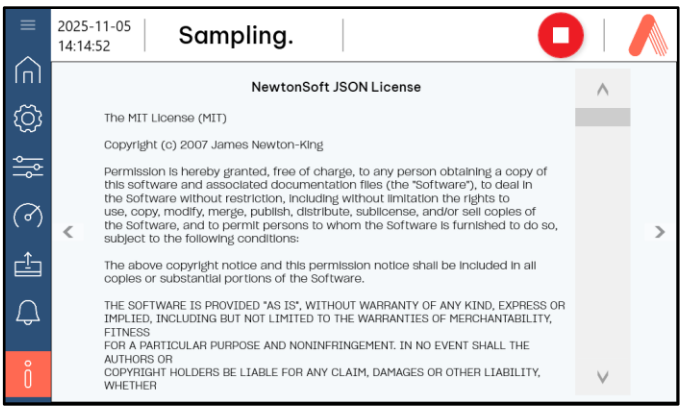


Figure 3-57 Product Licenses

4. OPX 1025 CONFIGURATION and SETUP

The sections below explain the process of configuring the OPX 1025 for operation. The factory settings provide a baseline for standard sampling conditions, but it is recommended to check local sampling requirements and adjust the OPX 1025 settings accordingly.

4.1 Settings

This section describes each settings menu in detail and how to configure the OPX 1025. Sampling requirements will vary; these instructions are guidelines and should be crosschecked with local sampling requirements.

NOTE: It is recommended to set a password to protect settings from being altered by unauthorized personnel. Setting the system password is explained below in **Section 4.1.7**

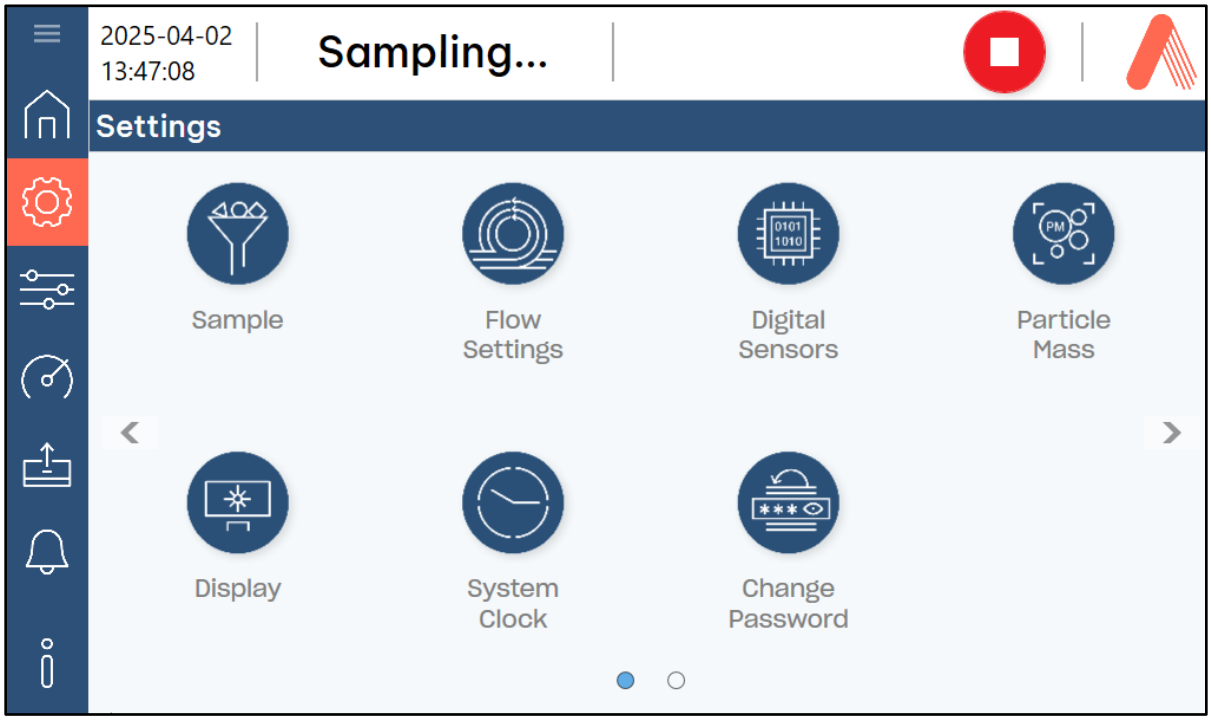


Figure 4-1 Settings Screen One

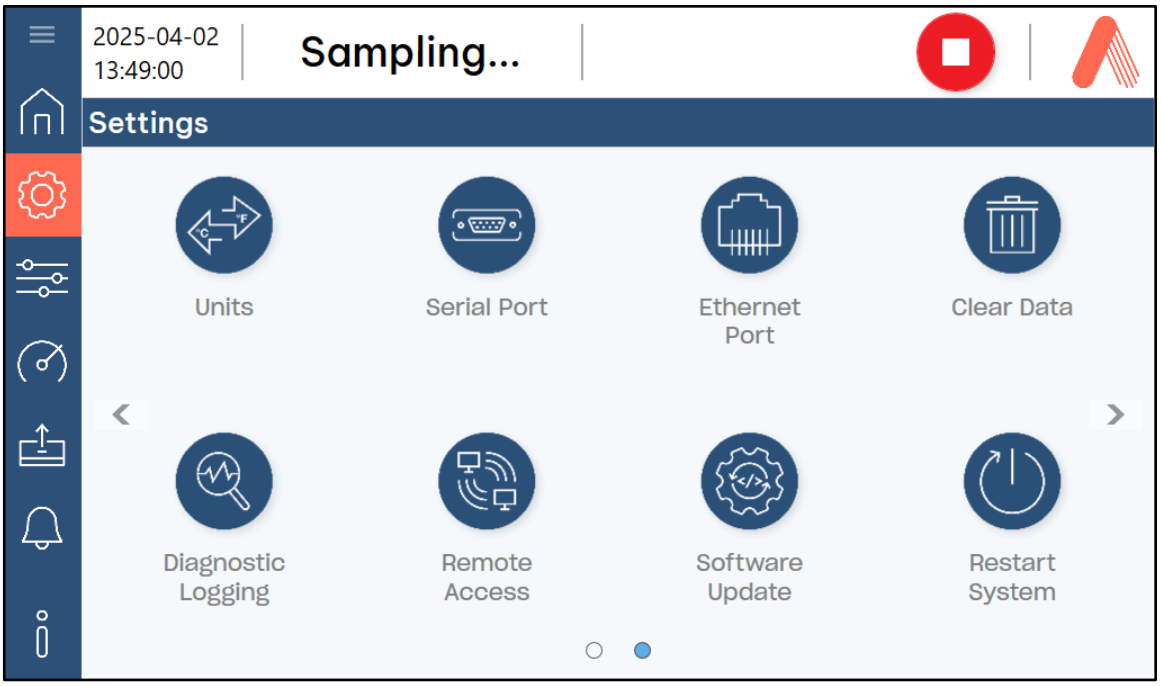


Figure 4-2 Settings Screen Two

4.1.1 Location ID and Sample Rate Configuration

The OPX 1025 Location ID, Sample Rate and other settings can be configured to user preferences and local monitoring requirements in the SAMPLE SETTINGS screen. The Location ID is a convenient way to identify data set origins when comparing multiple station's data reports. This is an optional setting that does not affect operation.

Sample Settings screen location: Navigation Bar->Settings->Sample

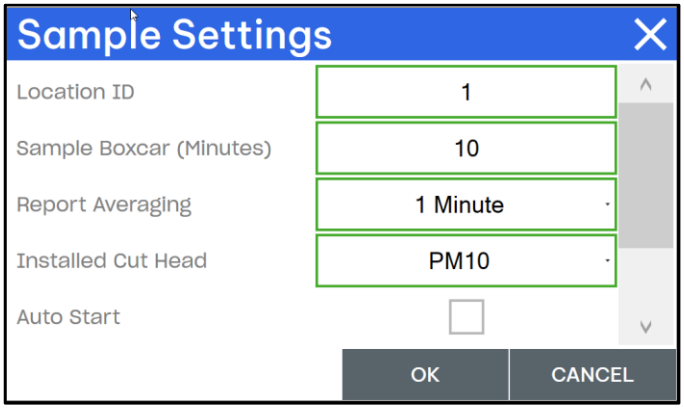


Figure 4-3 Sample Settings 1

To set the Location ID, press the box outlined in green to the right of "Location ID." See **Section 4.1.1.1** below for further instructions.

To set the Sample Boxcar, press the box outlined in green next to "Sample Boxcar". See **Section 4.1.1.2** below for further instructions.

To set the Report Averaging, press the box outlined in green next to "Report Averaging". See **Section 4.1.1.2** below for further instructions.

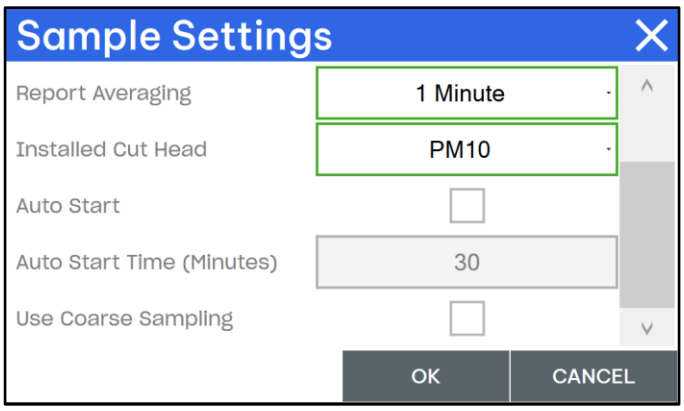


Figure 4-4 Sample Settings 2

To set the Installed Cut Head, press the box outlined in green next to "Installed Cut Head". See **Section 51** below for further instructions.

To set the Auto Start settings, press the checkbox next to "Auto Start" and the box outlined in green next to "Auto Start Time". See **Section 4.1.1.5** below for further instructions.

To set the Use Coarse Sampling, press the checkbox next to "Use Coarse sampling". See **Section 4.1.1.6** below for further instructions.

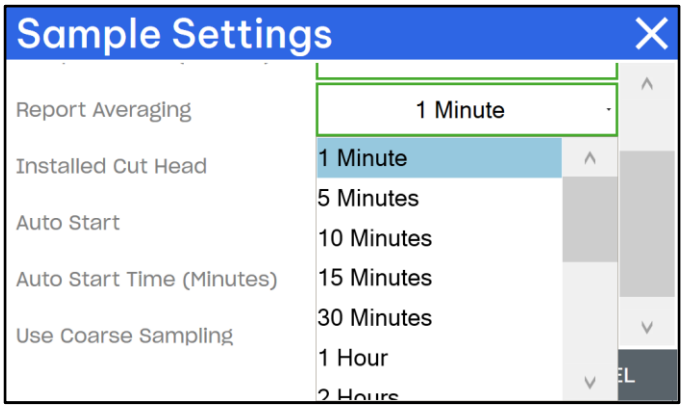


Figure 4-7 Report Averaging Drop Down List

4.1.1.1 Location ID Configuration

After the green box next to Location ID is pressed, the Location ID input screen will appear with a numerical keypad. Press any combination of numbers from 1 to 999. Press OK to accept the new ID.

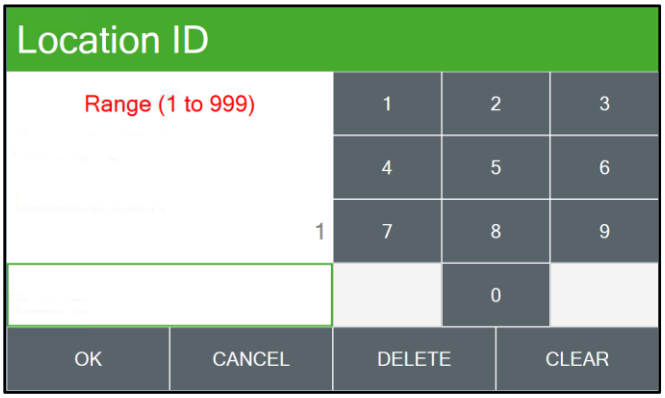


Figure 4-5 Location ID Input Screen

4.1.1.2 Sample Boxcar Configuration

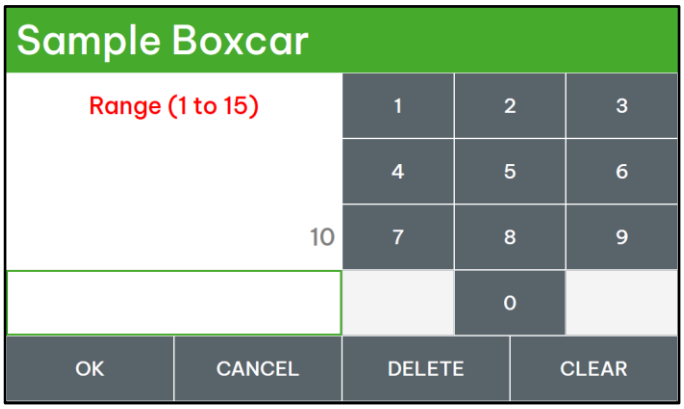


Figure 4-6 Sample Boxcar Drop Down List

After the green outlined box next to Sample Boxcar is selected input screen will appear with a numerical keypad. Press any combination of numbers from 1 to 15.

Press OK to accept the new Sample Boxcar.

4.1.1.3 Report Averaging Configuration

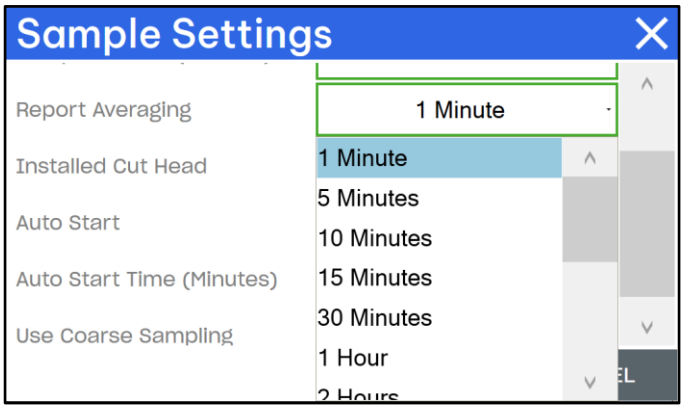


Figure 4-7 Report Averaging Drop Down List

After the green outlined box next to Report Averaging is selected, a drop-down options list will appear.

Select the preferred Report Averaging from the drop-down list by pressing on that option. Use the scroll bar to see other available options.

4.1.1.4 Installed Cut Head

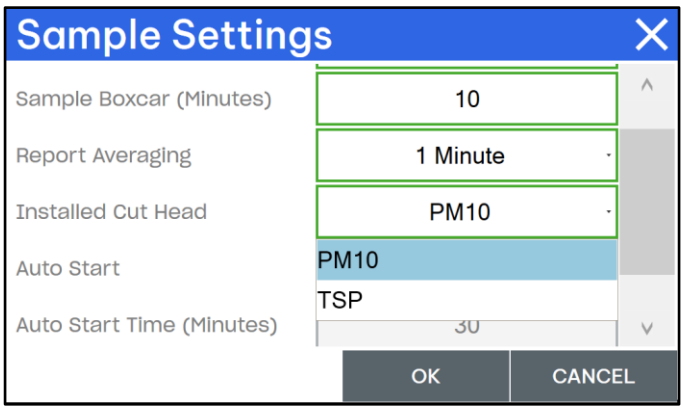


Figure 4-8 Installed Cut Head Drop Down List

Select the green outlined box next to Installed Cut Head to change the correct inlet configuration.

PM10 - EPA Designated PM_{10} inlet (BX-802)

TSP - TSP Inlet

Select the correct inlet sampling configuration from the drop-down list by pressing on that option.

NOTE: A PM_{10} sampling head must be installed for valid EPA Certified measurements of PM_{10} and $PM_{10-2.5}$. The $PM_{2.5}$ measurement is EPA certified with either the PM_{10} or TSP inlet installed.

4.1.1.5 Auto Start

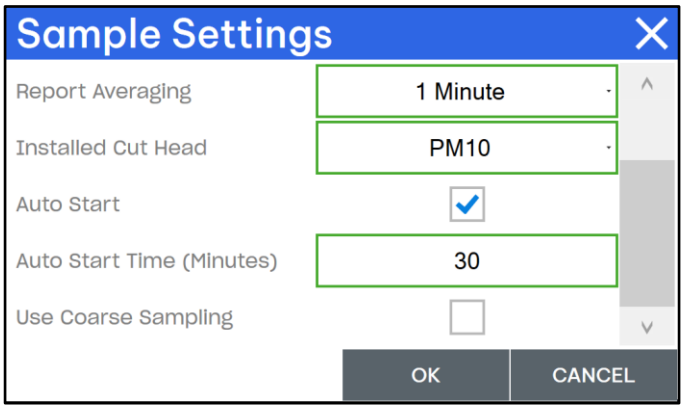


Figure 4-9 Auto Start Options

Select the checkbox next to Auto Start to enable the OPX 1025 to automatically restart after a period of inactivity.

Auto Start Time controls the delay between the last action and sample start. To change the time, select the green outlined box next to Auto Start Time. A numerical keypad will appear. Enter the desired delay time (10 - 360 minutes) using the keypad pop-up. Press OK to accept the new time.

4.1.1.6 PM Coarse Sampling

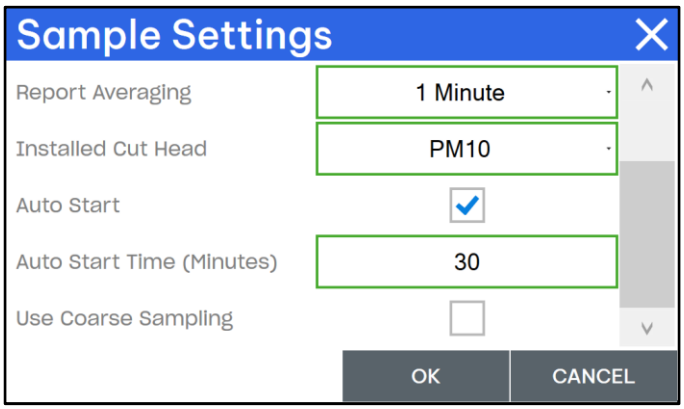


Figure 4-10 Coarse Sampling

Use the scroll bar to scroll to the bottom of the Sample Settings screen to access the Use Coarse Sampling checkbox.

Select the checkbox to enable Coarse Sampling. Ensure the checkbox is cleared to disable Coarse Sampling. When enabled, the instrument will display instantaneous data values instead of averaged.

Disabled is the default, recommended setting.

Once all changes have been made, press the OK button to save the changes and close the screen. The new settings will take effect immediately. To exit the screen without saving the changes, press the CANCEL or X button in the top right corner of the screen.

4.1.2 Flow Configuration

The OPX 1025 is configured to calculate standard sample volume from actual sample volume for reporting EPA designated PM_{10} mass concentrations.

The US EPA Standard Temperature and Pressure are 25 °C and 1013.2 mbar, respectively.

If other values for Standard temperature and pressure are required for the sampling location, set new values in the Standard Temperature and Standard Pressure fields.

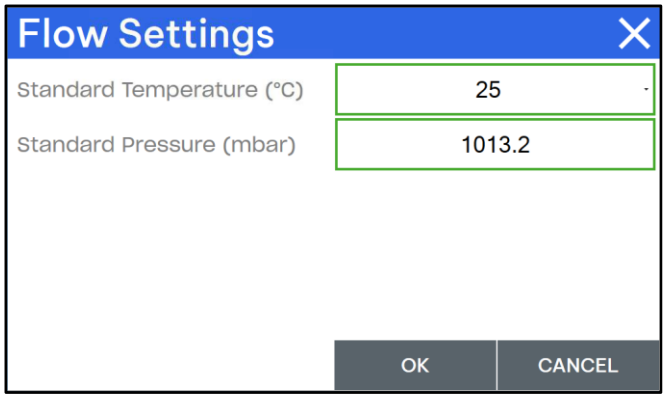


Figure 4-11 Flow Settings Options

To change the Standard Temperature setting, select the green outlined box next to Standard Temperature. A drop-down options list will appear. Select the preferred temperature from the drop-down list by pressing on that option.

To change the Standard Pressure setting, select the green outlined box next to Standard Pressure. A numerical keypad will appear. Press any combination of numbers from 1000.0 to 1100.0. Press OK to accept the new value.

Once all changes have been made, press the OK button to save the changes and close the screen. The new settings will take effect immediately. To exit the

screen without saving the changes, press the CANCEL or X button in the top right corner of the screen.

The FLOW menu location: Navigation Bar->Settings->Flow Settings.

4.1.3 Digital Sensor Configuration

This section describes how to use the DIGITAL SENSORS SETUP Screen. The OPX 1025 must have a BX-597A sensor connected and properly configured for operation. If the sensor is not present, the unit will not operate.

This section describes the process for configuring the OPX 1025 to receive data from digital sensors.

Digital Link Test screen location: Navigation Bar->Settings->Digital Sensors.

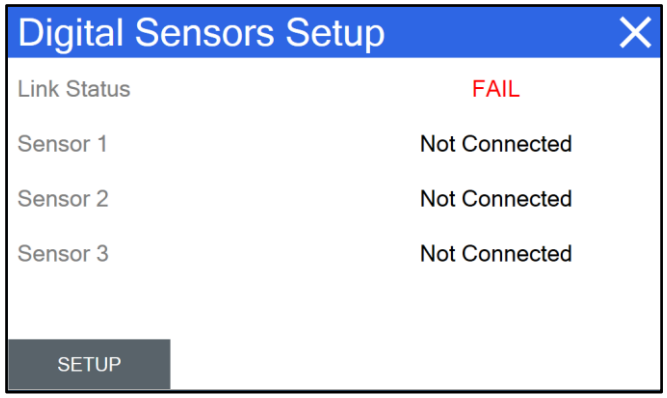


Figure 4-12 Digital Sensors Setup FAIL

When the Digital Sensors Setup screen opens, Link Status may show FAIL but should change to OK within about two seconds if the sensor is properly connected.

See Chapter 6Press the SETUP button in the lower left corner of the screen to access the Digital Sensors Setup screen.

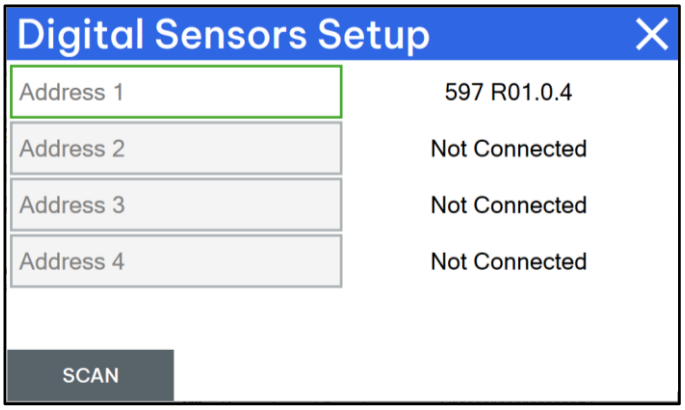


Figure 4-13 Digital Sensors Setup Screen

This sub screen displays sensor addresses, types, and firmware versions.

This screen is used to confirm all connected digital sensors are responding and reporting to the OPX 1025.

This screen is also used to scan for additional sensors that do not automatically populate; and to assign an address to each additional sensor, if needed.

Address 1 is the master sensor.

Addresses 2 & 3 are for secondary sensors.

Address 4 is for swapping sensor addresses.

WARNING: If a secondary sensor is displayed in Address 2 for a moment and then shows "Not Connected", it may be set to Address 1 and is conflicting with the master sensor. See Section 4.1.3.2 Resolving Address Conflicts for help with this issue.

4.1.3.1 Adding a Digital Sensor

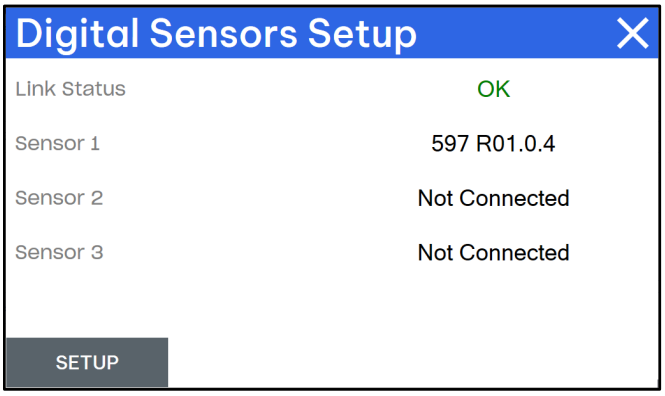


Figure 4-14 Digital Sensors Setup Screen

To add a digital sensor, connect it to the OPX 1025. After a few seconds, the sensor should be displayed in the list if its address is 1-4.

If its address is conflicting with another digital sensor, see **Section 4.1.3.2** for help with this issue.

If the digital sensor appears in the list and the address requires changing, press the SETUP button to open the address configuration view.

Press the green outlined box next to the digital sensor. The numerical keypad will appear. Enter a new address (1 to 4) and press the OK button.

On the address configuration view, the digital sensor should appear with its new address after a few seconds.

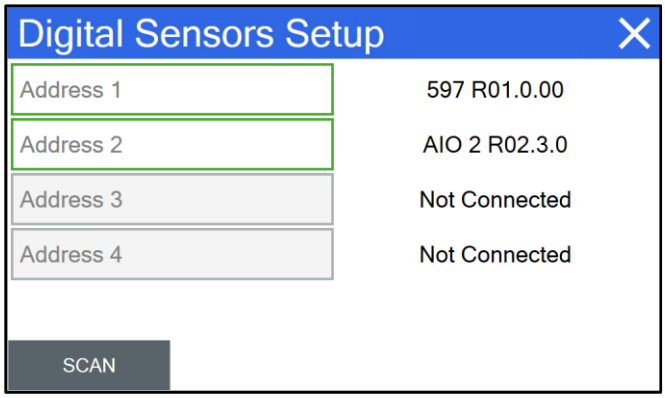


Figure 4-15 Address Configuration View

NOTE: Address 4 should only be used temporarily to swap addresses between two digital sensors.

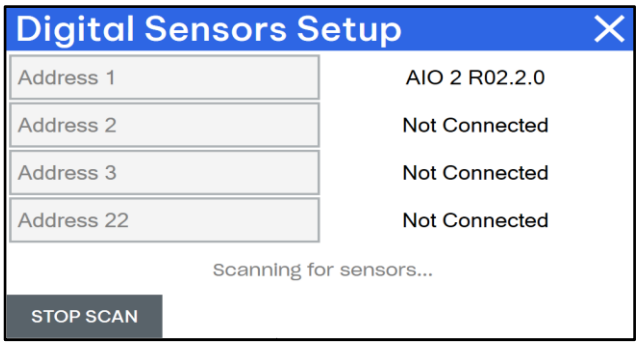


Figure 4-16 Address Configuration View

If the digital sensor doesn't appear in the list after a few seconds, it may have an address that is outside the normal range.

Press the SETUP button to open the address configuration view. Then press the SCAN button to scan for the digital sensor. The scan will look for digital sensors on addresses 4 to 99.

If the digital sensor is found, it will appear in the last position with its current address. Press the green outlined box next to the digital sensor. A numerical keypad will appear. Enter the new address and press the OK button.

On the configuration screen, the digital sensor should appear with its new address.

Press the X button in the top right corner of the screen to close it and return to the Digital Sensors Setup screen.

Press the X button in the top right corner of the screen to close it and return to the Settings screen.

4.1.3.2 Resolving Address Conflicts

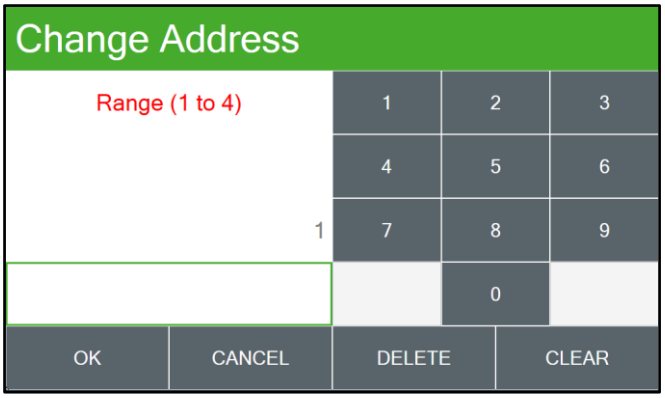


Figure 4-17 Change Sensor Address Screen

First, disconnect the master sensor. If the secondary sensor is now displayed in Address 1, press the SETUP button to open the sensor configuration view.

Press the Address 1 box outlined in green to change the address.

Set to Address 2 by pressing on the 2 Key and press OK.

The reference sensor should now be displayed in the Address 2 field.

Next, plug in the master sensor and confirm that the master sensor is now displayed as Address 1 and the secondary sensor is displayed as Address 2.

Press the X at the top right corner to go back to the main Digital Sensors Setup screen to confirm all connections (See **Figure 4-19**).

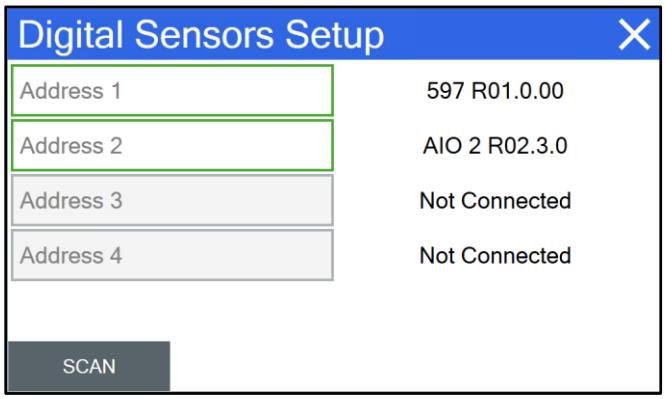


Figure 4-18 Digital Link Setup, Two Sensors

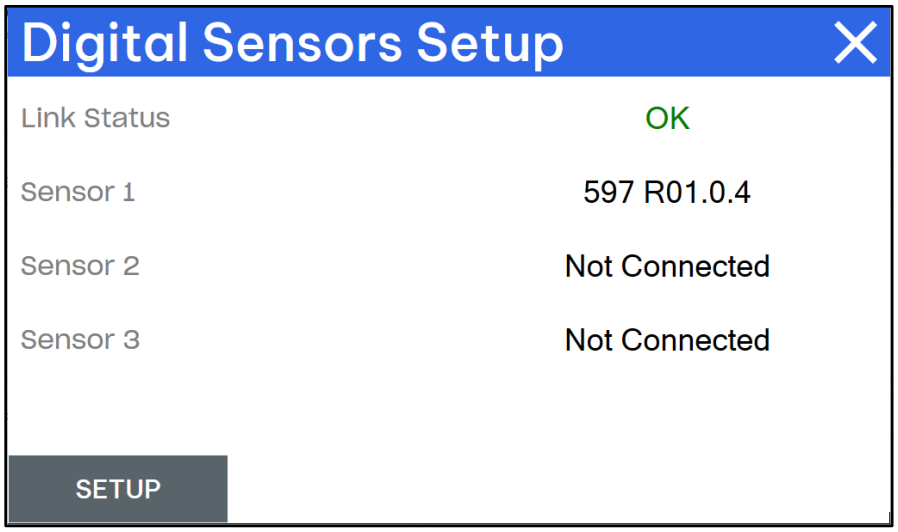


Figure 4-19 Digital Sensors Setup Confirmation

4.1.4 Particle Mass

The PARTICLE MASS screen provides a means to control which PM fractions are enabled, setting custom K-factors for individual PM fractions, the order in which the PM fractions are displayed on the Home screen, and enable/disable EPA Certification.

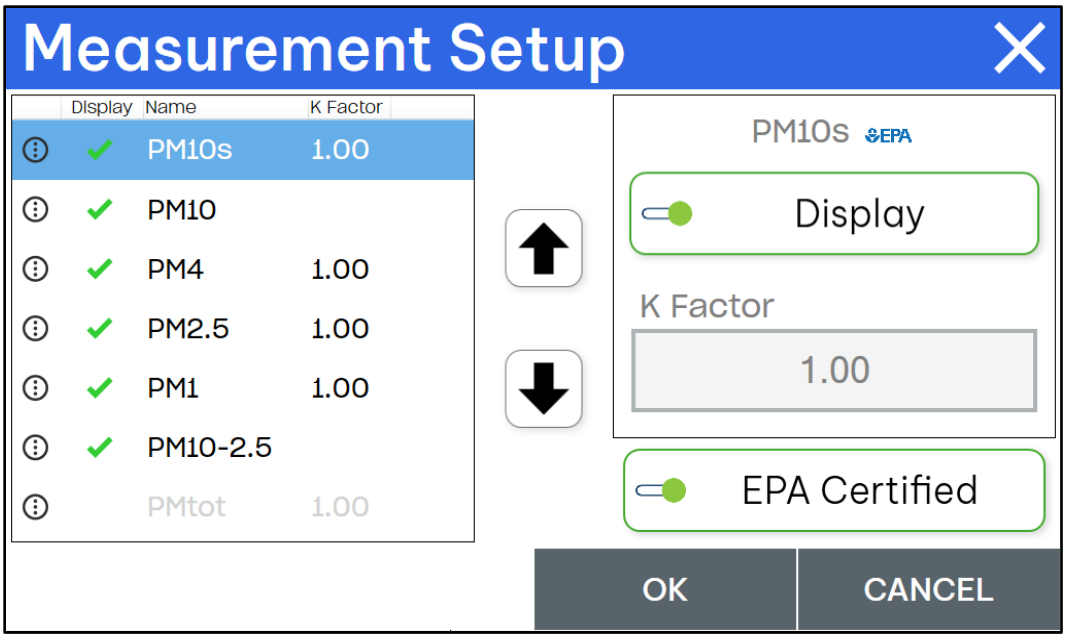


Figure 4-20 Measurement Setup

4.1.4.1 Enable or Disable a PM Measurement

To enable or disable a PM fraction, select the measurement in the left panel. In the right panel, select Enabled to toggle the measurement on or off. When Enabled is deselected (unchecked) the measurement will not be logged, displayed on the Home screen, or appear in reports.

4.1.4.2 Use a K Factor

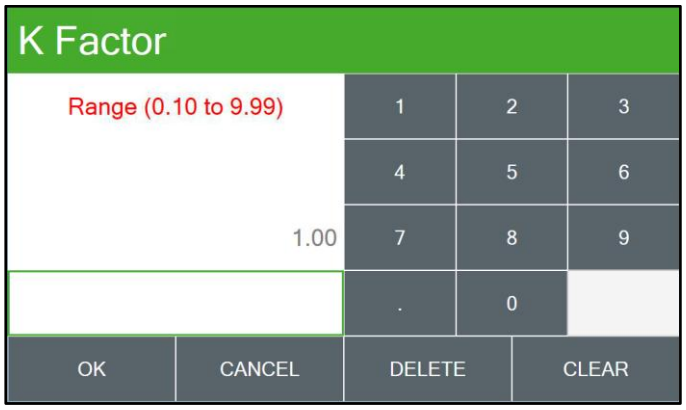


Figure 4-21 K Factor Input Screen

A custom K-factor can be used for each PM fraction. To set a K-factor for a PM measurement, select the desired measurement in the left panel. In the right panel, select the K Factor box **Figure 4-21**.

Use the numerical keypad to input the required value and press OK to save.

NOTE: Measurements that are EPA Certified (designated by the EPA symbol adjacent to the measurement name) cannot be adjusted with a K Factor unless EPA Certified is unchecked.

4.1.4.3 Measurement Order

To change the order the PM fractions are displayed on the Home screen, select a measurement to be moved in the left panel. There are two ways to change the order. Simply drag the measurement to its new position or use the up and down arrows to move the selected measurement up or down to the desired position. Data reports will not be affected.

4.1.4.4 EPA Certification

EPA Certification for PM_{10} and $PM_{10-2.5}$ is only available when a PM_{10} sampling head is installed. The $PM_{2.5}$ measurement is EPA certified with either the PM_{10} or TSP inlet installed. PM_{10}s and $PM_{2.5}$ can only be considered EPA Certified with a K Factor of 1.00.

To enable or disable EPA Certification, press the EPA Certified button. A confirmation message will appear as the K Factors may change. Press the YES button to accept the change or the NO button to cancel the change.

NOTE: A PM_{10} sampling head must be installed for valid EPA Certified measurements of PM_{10} and $PM_{10-2.5}$. After installing a PM_{10} sampling head on the inlet select "PM 10" for the Installed Cut Head in the Settings -> Sample settings menu (see **Section 4.1.1.3)**

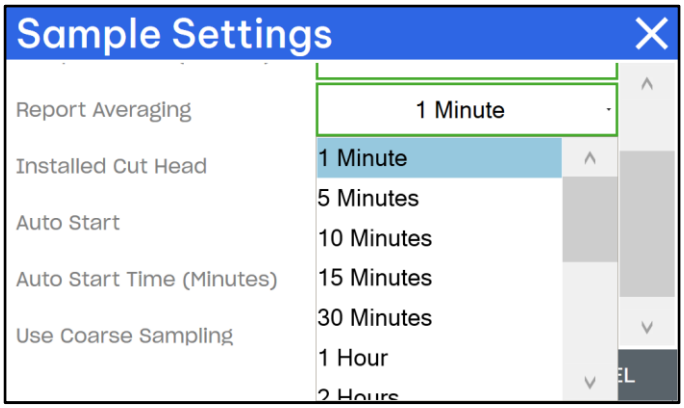


Figure 4-7 Report Averaging Drop Down List

After the green outlined box next to Report Averaging is selected, a drop-down options list will appear.

Select the preferred Report Averaging from the drop-down list by pressing on that option. Use the scroll bar to see other available options.

The Particle Mass menu location: Navigation Bar->Settings->Particle Mass.

4.1.5 Display Configuration

The SETUP DISPLAY screen is used to adjust the display brightness to accommodate local conditions.

Setup Display screen location: Navigation Bar->Settings->Display (see **Section 3.1 Menu Hierarchy**)

Figure 4-22 Display Configuration

To change the screen brightness, press on the green perpendicular brightness indicator and drag it across the horizontal track bar.

Press in the general position of the track bar to quickly change brightness.

The brightness percentage will be displayed on the right of the brightness track bar.

4.1.6 Setting the Clock

The SET CLOCK Screen is used to set the internal OPX 1025 clock. The clock is used to match data points with other collocated instruments for accuracy.

Set Clock screen location: Navigation Bar->Settings->System Clock (see **Section 3.1 Menu Hierarchy**).

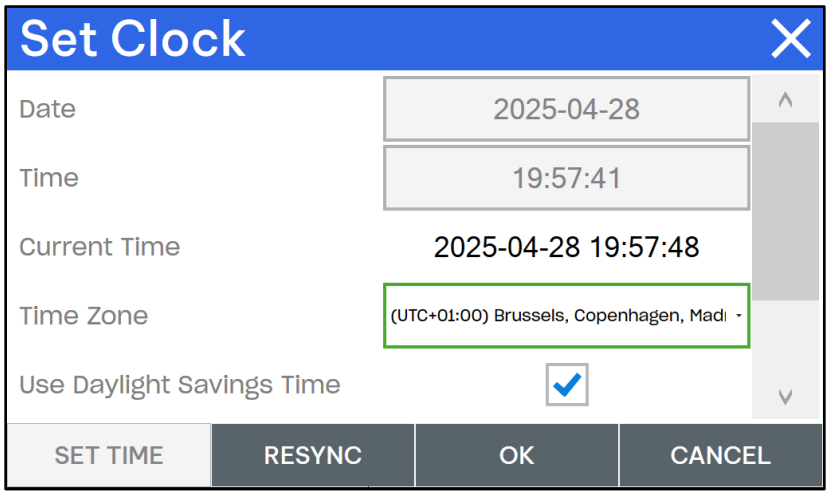


Figure 4-23 Set Clock Screen 1

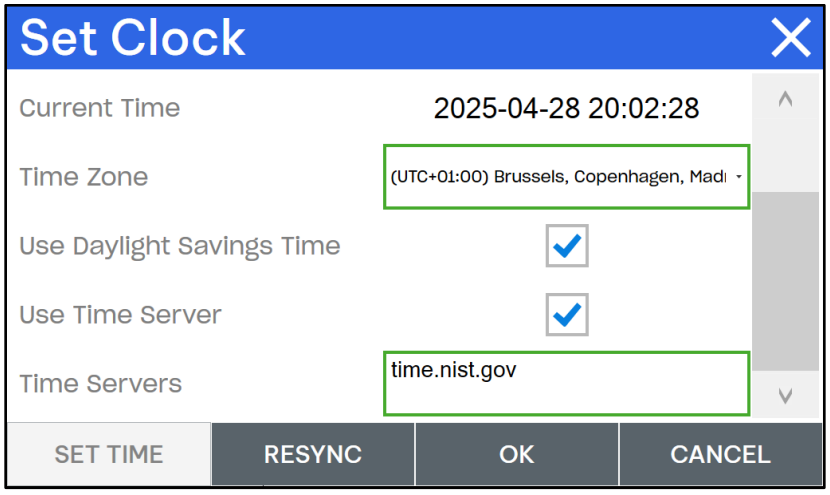


Figure 4-24 Set Clock Screen 2

4.1.6.1 Setting the Date

Press on the green outlined box next to Date from the set clock screen shown in **Figure 4-23 Set Clock Screen 1**.

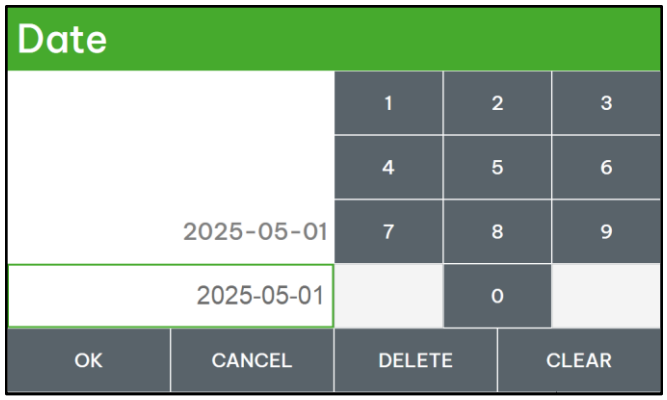


Figure 4-25 Date Input Screen

In this screen, the date is set using the keypad.

Press the CLEAR button at the bottom right corner of the screen to remove the current date.

Type in the new current date, YYYY-MM-DD, using the keypad.

If digits need to be removed, use the DELETE key to remove one digit at a time from right to left.

If all the digits need to be removed, press the CLEAR button.

Press the OK button to accept the new date.

When ready to apply the date and time changes in the instrument, press the SET TIME button on the Set Clock screen.

4.1.6.2 Setting the Time

To set the time, press on the green outlined box next to "Time" from the Set Clock screen seen in **Figure 4-23 Set Clock Screen**.

In this screen, the Time is set using the keypad.

Press the CLEAR button at the bottom right corner of the screen to remove the current time. Type in a time, HH:MM:SS, slightly ahead of the current time using the keypad.

If digits need to be removed, use the DELETE key to remove one digit at a time from right to left.

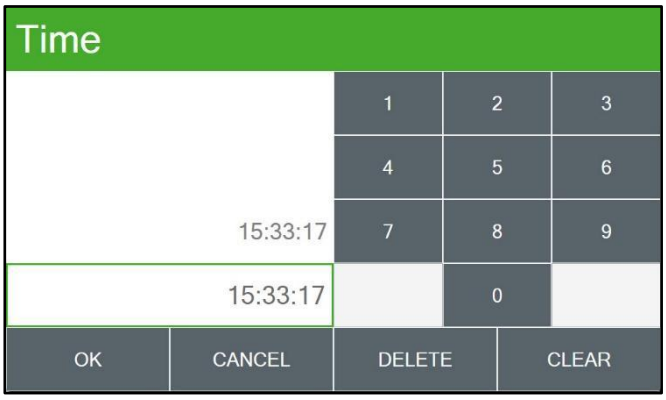


Figure 4-26 Time Input Screen

If all the digits need to be removed, press the CLEAR button.

To save the new time, press the OK button.

When ready to apply the date and time changes in the instrument, press the SET TIME button on the Set Clock screen.

4.1.6.3 Setting the Time Zone

To set the current time zone, press the green outlined box next to Time Zone. A list of available time zones will appear. Use the scrollbar to scroll through the list until the correct time zone is found. Press the desired time zone.

4.1.6.4 Automatically Adjust for Daylight Savings Time

To have the instrument automatically adjust the clock for seasonal daylight savings time changes, press the box next to Use Daylight Savings Time. This option will only be available for time zones that observe daylight savings time.

NOTE: When daylight savings time ends, the clock will be adjusted backwards causing the data to have overlapping timestamps. It is recommended to always use standard time for the instrument to ensure the data has unique timestamps.

4.1.6.5 Using a Time Server

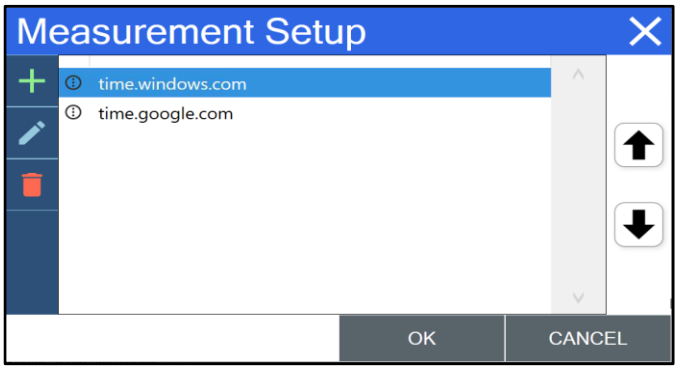


Figure 4-27 Time Server Screen

The instrument time can also be automatically managed by using an internet time service. To enable this feature, select the box next to Use Time Server. See Figure 4-24

If the time server in the Time Servers window is correct, simply exit the Set Clock screen.

To change the time server, press in the green highlighted box next to Time Servers. See Figure 4-24. The Time Servers Setup screen will appear.

To add a new time server, press the button. A keyboard screen will be displayed. Enter the new time server address and press the OK button. The new time server will appear at the bottom of the list.

To edit a time server, first select the time server in the list. Then press the button. A keyboard screen will be displayed. Modify the time server address and press the OK button. The updated time server address will appear in the list.

To remove a time server, first select the time server in the list. Then press the button. The time server will be removed from the list.

The OPX 1025 can use multiple time servers to keep its clock in sync. To set the order of the time servers in the list, press and drag the ⋮ icon to move the time server. Alternatively, use the ⬆ and ⬇ buttons to move the selected time server up or down in the list.

When finished editing the time servers list, press the OK button to return to the Set Clock screen. Alternatively, press the CANCEL button or the X button in the top right corner of the screen to discard the changes and return to the Set Clock screen.

When finished making changes to the Set Clock screen, press the OK button to save the changes and close the screen. The changes will take effect immediately. To discard the changes and close the screen, press the CANCEL button or the X button in the top right corner of the screen.

NOTE: Except for setting the time and date, which happen immediately, all other changes won't take effect until the OK button has been pressed. If syncing with a time server, allow 10 to 30 seconds for the clock to update. If it still hasn't updated after about 1 minute, use the RESYNC button to force a time server update.

4.1.7 System Password

The CHANGE PASSWORD screen is used to change the password (0 - 20 characters) of the currently logged in user and the mechanism for enabling or disabling security in the OPX 1025. Security is disabled by default. This allows access to all the functions in the instrument. If the password is set for the default Administrator account, this will enable security and will be required to login to use the instrument.

Set Password screen location: Navigation Bar->Settings->Change Password.

4.1.7.1 Enabling Security

The default password is " " (blank). This disables security and allows full access to all the password-controlled functions. If the password is changed, it will subsequently be required for access to these screens.

To enable security, press the Change Password button on the Settings page. The Update Password screen will appear.

Press the green outlined box next to Enter New Password. The keyboard screen will appear. Enter a new password (1 to 20 characters) and press the OK button. In the keyboard and the Update Password screens, the password will be replaced with the dot character to keep it secure.

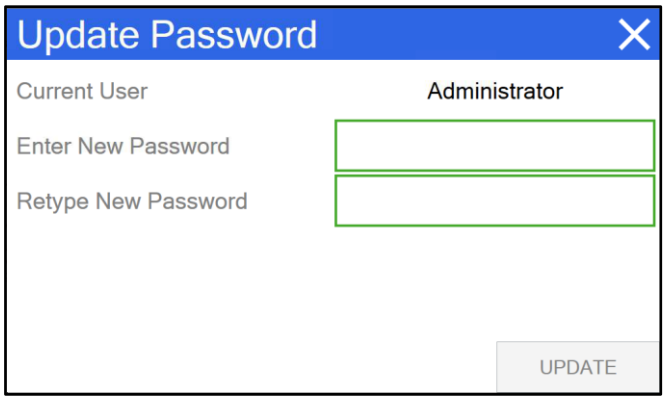


Figure 4-28 Update Password Screen - Security Disabled

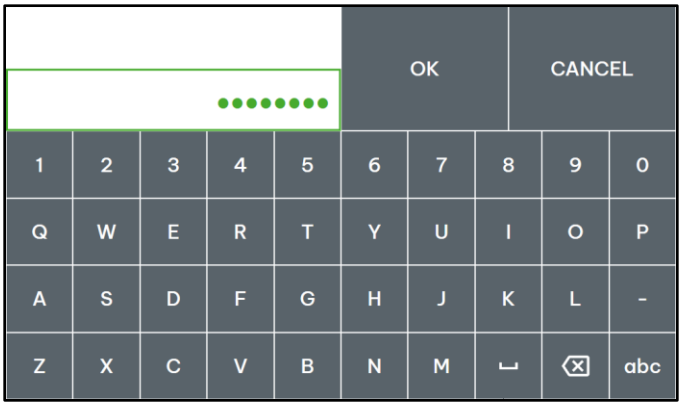


Figure 4-29 Password Keyboard Screen

Press the green outlined box next to the Retype New Password. The keyboard screen will appear. Enter the same password that was used in the previous step and press the OK button.

If the two passwords match, press the UPDATE button to accept the password and enable security. A message will appear confirming that security should be enabled.

If the two passwords do not match, a message will appear on the screen and the UPDATE button will be grayed out. Enter one or both of the passwords again until allowed to continue.

Once a valid password has been set, security will be enabled and the user will be automatically logged in. At this point, there is only one user account (Administrator).

To make any change to the OPX 1025, a valid user account must be logged in.

Figure 4-30 Passwords Don't Match

NOTE: The default user account is User Name: "Admin" and the password that was set during the previous step.

4.1.7.2 Disabling Security

If security is no longer needed, it can be disabled by clearing the password for the Administrator account.

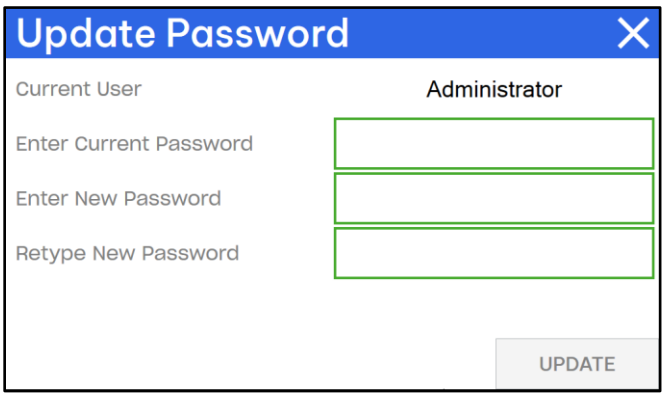


Figure 4-31 Update Password Screen - Security Enabled

To do this, first login to the Administrator account. Then press the Change Password button on the Settings menu.

Press the green outlined box next to Enter Current Password and enter the password for the Administrator account.

Leave both the New Password boxes blank and press the UPDATE button. A message will appear confirming security will be disabled.

4.1.7.3 Logging In

When Security settings are enabled, a padlock will be displayed in the upper right of the display.

If a User is logged in the padlock will be "unlocked" . If all users are logged out, the padlock will be "locked" .

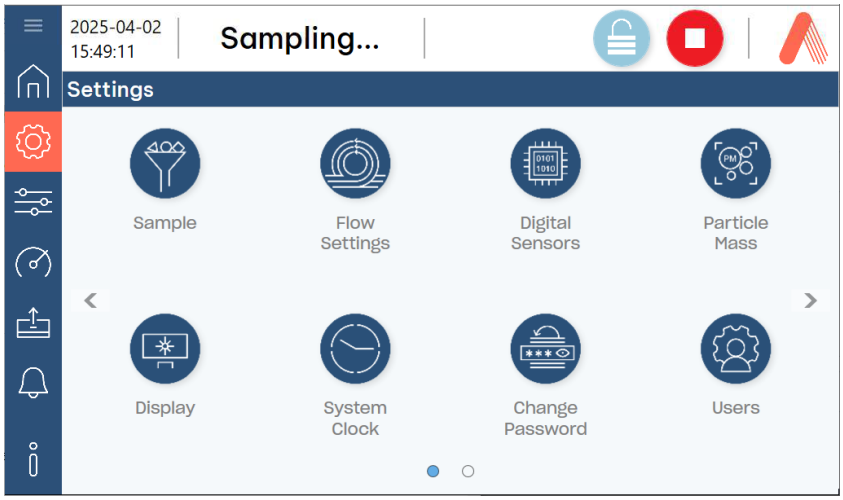


Figure 4-32 Security Enabled, User Logged In

To login, press the padlock button from any of the main pages. The User Login screen will appear.

Press the green outlined box under User Name and enter a user name.

Press the green outlined box under Password and enter the password associated with the user name entered previously.

Press the LOGIN button to login.

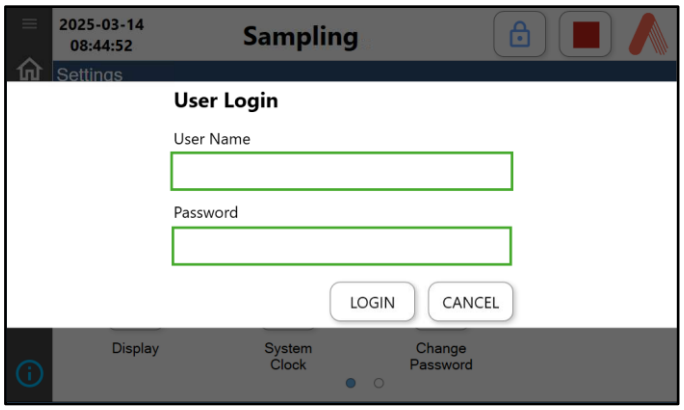


Figure 4-33 User Login Dialog

If the login was successful, the padlock button will change to an "unlocked" image. If the unlocked padlock is pressed it will log the user out.

NOTE: All logins will expire after 10 minutes of inactivity and will lock out activity in the protected screens (Settings, Calibration and Tests). Access can be restored by logging in with a User or Administrator profile.

4.1.7.4 Changing a Password

When security is enabled, any user may change their password. The user must be logged in first.

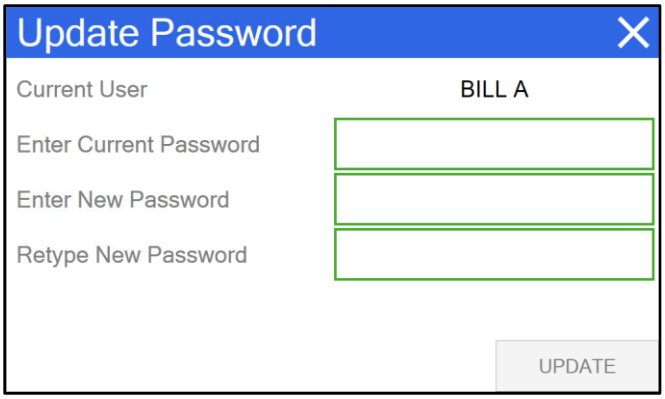


Figure 4-34 Update Password Screen

To change the password for the currently logged in user, press the Change Password button on the Settings page. The Update Password screen will appear.

Press the green outlined box next to Enter Current Password. Enter the current password in the keyboard screen and press the OK button.

Repeat the process for the Enter New Password and Retype New Password fields entering a new password.

Press the UPDATE button to accept the new password.

4.1.7.5 Password Recovery

Should the password ever be lost or forgotten, a user with administrator privileges can reset the password on any administrator or non-administrator account, with the exception of the ADMIN account, which cannot be updated except when logged in with the ADMIN profile.

If the primary ADMIN password is lost or forgotten, the Met One Instruments service department can assist in password reset (see **Section 1.2** for contact information).

4.1.8 Configuring Users

When Security is enabled, and the system is unlocked with an administrator account, the Settings menu will contain the additional item "Users".

To perform any user account management, log into an account with Administrator access (the base administrator account's user name is ADMIN, not case sensitive) and select Users.

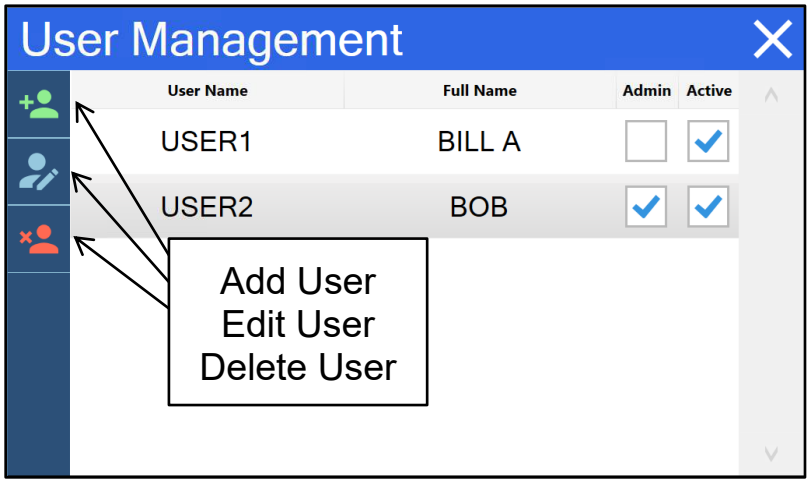


Figure 4-35 User Management Screen

This screen enables an administrator to Add a User, Edit an existing User or Delete an existing User.

The User menu location: Navigation Bar->Settings->Users.

To add a User, select the Add User icon. Complete the User Name, Full Name and Password fields. Select Grant Admin Access if appropriate.

To edit a User profile, select the user then select the Edit User icon. The Edit User screen is identical to the Add User screen.

To delete a User profile, select the user then select the Delete User icon. Select Yes on the confirmation screen to delete the user, or NO to NOT delete the User.

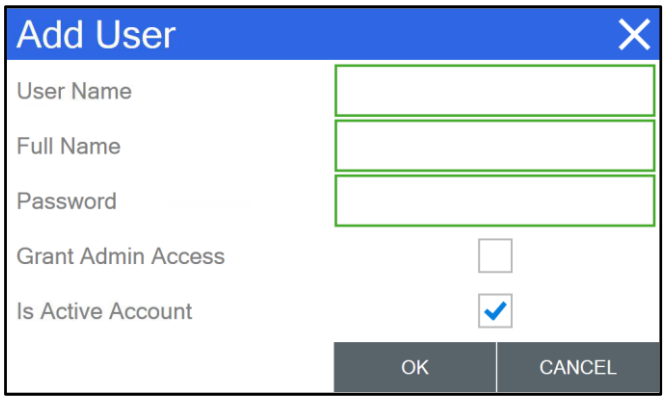


Figure 4-36 Add New User

4.1.9 Units of Measurement Configuration

To change units of temperature or pressure, navigate to the Setup Units screen.

Setup Units screen location: Navigation Bar->Settings (page 2)->Units.

The current selections for temperature and pressure are indicated by green highlighted boxes. To change the units of temperature or pressure, press the desired button, which will become highlighted green, then press the OK button to confirm or the CANCEL button to keep the original selections.

When a selection is made, the primary screen temperature and pressure values and downloadable data will reflect the change.

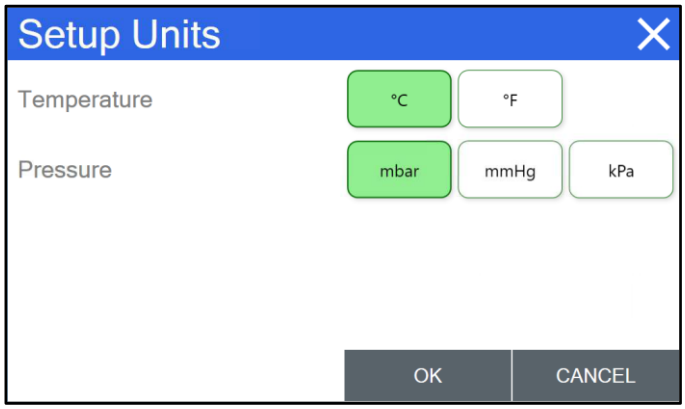


Figure 4-37 Setup Units Configuration

4.1.10 Clear Memory

The OPX 1025 memory stores sample data, alarms, event data, and a change log. Each can be cleared individually, or multiple files can be cleared simultaneously. It is recommended, but not required, to clear data and alarms when moving an instrument to a different site or after major service has been performed.

Data should be downloaded and saved before clearing memory. As seen in **Figure 4-38 Clear Memory Screen**, when memory is cleared, it will be permanently deleted from the instrument's memory.

CLEAR MEMORY menu location: Navigation Bar->Settings (page 2)->Clear Data (see **Section 3.1 Menu Hierarchy**).

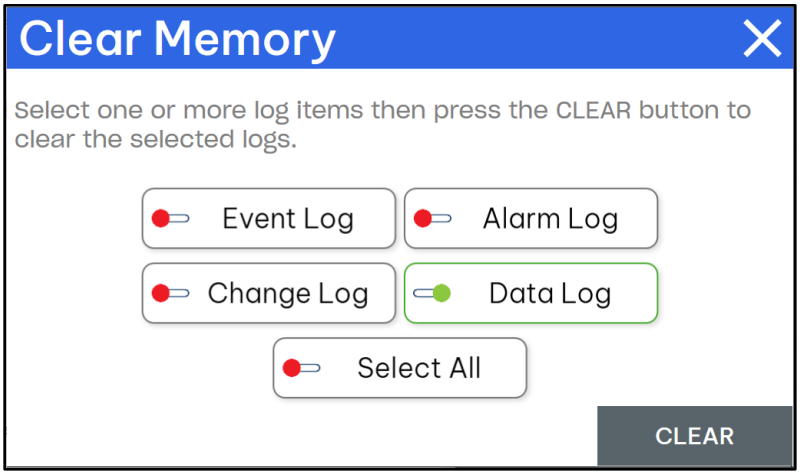


Figure 4-38 Clear Memory Screen

The Data Log is selected by default in the Clear Memory screen. Select the log files to be cleared. Multiple presses of a log file button will toggle between selected or de-selected.

Press the CLEAR button to delete the selected data log files.

A prompt will appear after pressing the CLEAR button to confirm that data will be permanently deleted.

4.1.11 Diagnostic Logging

The DIAGNOSTIC LOGGING screen allows the user to capture additional data that may be useful when troubleshooting issues with the OPX 1025.

NOTE: This screen is used for diagnostic purposes and should remain off unless requested by Met One Instruments service personnel.

Logging screen location: Navigation Bar->Settings (page 2)->Diagnostic Logging (see **Section 3.1** Menu Hierarchy).

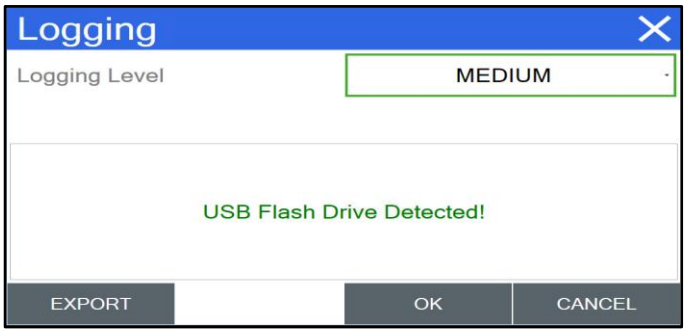


Figure 4-39 Logging Level

To select the amount of information to capture, press the green outlined box next to Logging Level to activate the dropdown options list. Select the desired level as instructed by Met One Instruments service personnel.

The following options are available

- OFF - Disables logging

- LOW - Captures errors only
- MEDIUM - Captures errors and certain process information
- HIGH - Captures all MEDIUM level data and detailed process information every second

NOTE: Setting the Logging Level to HIGH will generate large diagnostic logs. This should only be used at the request of Met One Instruments service personnel and should be turned off when no longer needed. Diagnostic logging will not affect the storage limit of sample data.

To export the diagnostic log data, insert a USB flash drive into either of the front panel USB ports (Type A or C) and select the EXPORT button. The diagnostic log data should be provided to Met One Instruments for review.

4.1.12 Remote Access

This section provides steps to set up the remote access behavior after powering on the instrument and how to set a password for remote access.

Navigate to: Navigation Bar->Settings (page 2)-> Remote Access (see **Section 3.1 Menu Hierarchy**).

To enable or disable Remote Access, press the green outlined box next to "Remote Access" to toggle the remote access state. When the box is pressed, the status will change between the following options.

ENABLED: Remote access is available for use at any time.

DISABLED: Remote access is turned off. This setting can be used to close a remote session or block access for new remote sessions.

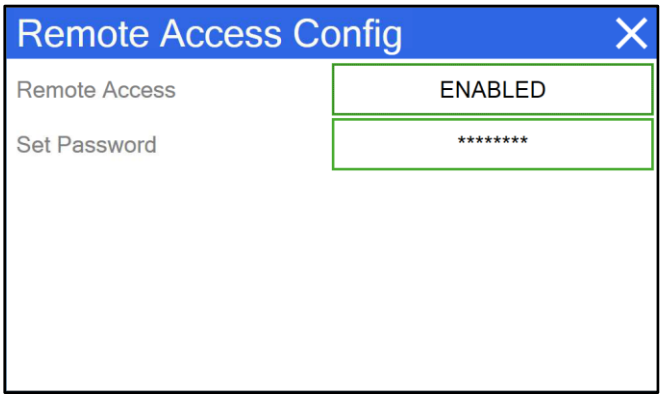


Figure 4-40 Remote Access Config Screen

To set the Remote Access Password, press the green outlined box next to Set Password. The keyboard screen will appear. Select any combination of letters and numbers, up to eight characters. Press the OK button to set the password.

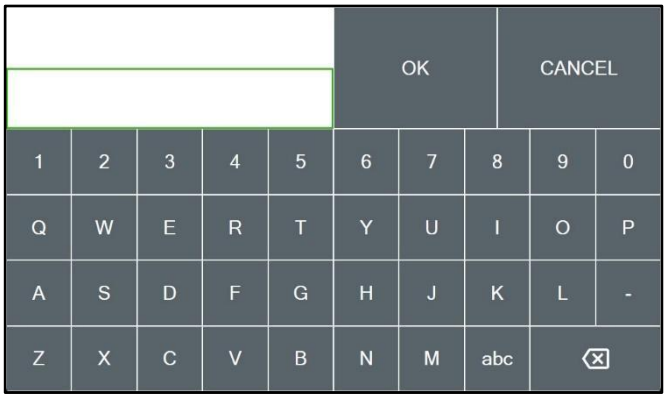


Figure 4-41 Remote Access Password Input Screen

To access the instrument remotely, a VNC client application must be used, like UltraVNC or TightVNC. From a PC connected to the same network as the OPX 1025, run the VNC client application. Input the IP address of the OPX 1025 and the password set in the Remote Access screen. The IP address can be found on the About page or in the Ethernet Config screen.

The OPX 1025 operates on the standard VNC port of 5900 (TCP). In most cases, it is not necessary to specify the port when making a VNC connection.

Once connected, the same user interface that's displayed on the OPX 1025 should be seen. Navigating the interface can be accomplished using the computer's mouse.

WARNING: Using a VNC client, creates a mirror of the instrument's display making it possible for multiple users to interact with the instrument simultaneously and possibly causing undesirable results. Make sure no one else is using the instrument prior to making a remote connection.

NOTE: If Remote Access is not needed, it is recommended that it be disabled to prevent unauthorized individuals from accessing the instrument.

4.1.13 Software Update

The SOFTWARE UPDATE screen is used to upgrade (or downgrade) the internal software for the OPX 1025. Software updates are available by request through the Met One Service department. Please have the instrument serial number and software version when software requests are made. Load the provided software upgrade onto a USB flash drive in the root directory.

Upgrade Software screen location: Navigation Bar->Settings (page 2)-> Software Update (see **Section 3.1 Menu Hierarchy**).

Plug the USB flash drive into the front panel USB port.

Go to the Software Update screen to launch the Software Updater. Press the Upgrade or Downgrade button on the lower left corner of the screen.

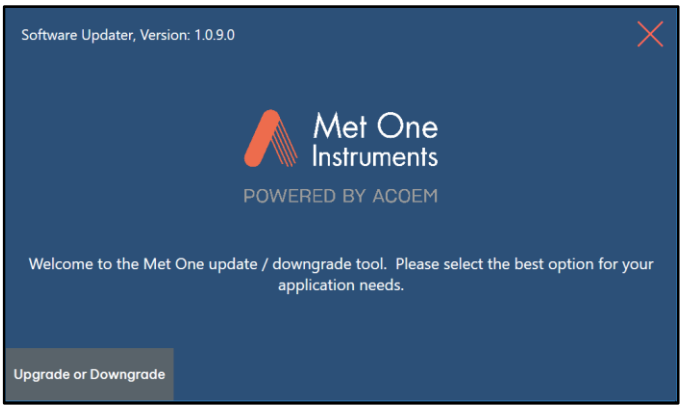


Figure 4-42 Upgrade Software

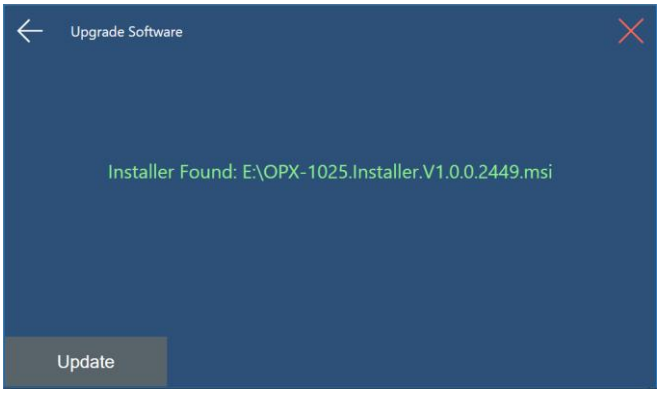


Figure 4-43 Installer Found

If proper software is loaded onto the USB flash drive, the screen will show the software name and version.

Press the Update button on the lower left corner of the screen.

When the process is finished, unplug the USB device. The system will automatically restart.

NOTE: In the unlikely event the update fails, the Software Updater will automatically launch on the next restart. Options will be provided for repairing or installing the OPX 1025 software.

4.1.14 Restart System

Use the Restart System function to perform a soft restart of the OPX 1025.

Restart System menu location: Navigation Bar->Settings (page 2)->Restart System (see **Section 3.1 Menu Hierarchy**).

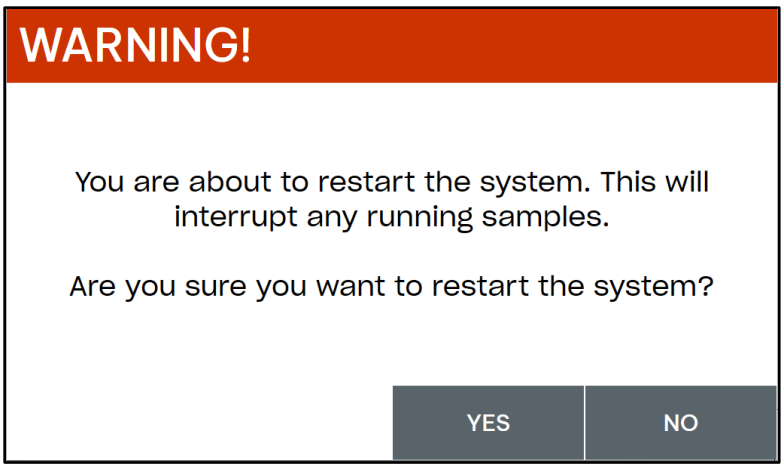


Figure 4-44 Restart Confirmation Screen

When the Restart System item is selected, a confirmation message will be displayed. Select YES to restart the system or NO to cancel.

4.2 Communication Settings

The OPX 1025 can be configured to have its data polled over a network connection if available at the sample site. This section describes the procedures for setting serial port and ethernet communication settings.

4.2.1 Serial Port Configuration

The SERIAL PORT SETTINGS screen is shown below, in **Figure 4-45**. These settings affect the configuration for the "Serial Comm."

Serial Port Settings screen location: Navigation Bar->Settings (page 2)->Serial Port.

NOTE: The default settings are 9600 (Baud Rate) and NONE (Flow Control).

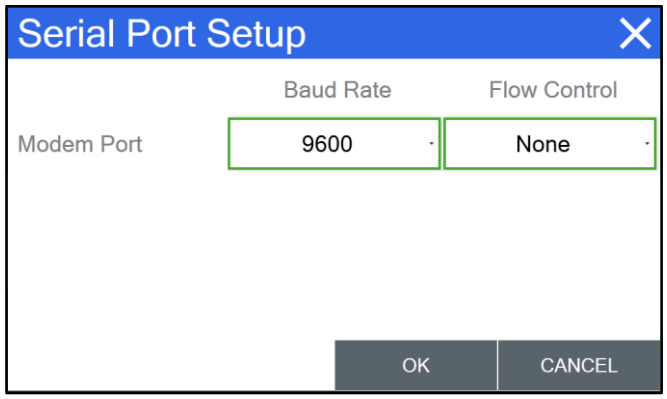


Figure 4-45 Serial Port Settings Screen, Main

The BAUD RATE setting is the data transfer rate for the serial data output. Downloading large data files will take longer at low baud rates, so set it to the fastest rate supported by the data collection system.

The FLOW CONTROL setting is set to NONE for most standard RS-232 serial port applications.

To set the Baud Rate, press on the green outlined box below "Baud Rate." A dropdown options list will provide all the Baud Rate setting options.
Press on one of the numerical options to make a selection. The dropdown list will close, and the chosen setting will be displayed.

The value can be set to 9600, 19200, 38400, 57600, or 115200 baud.

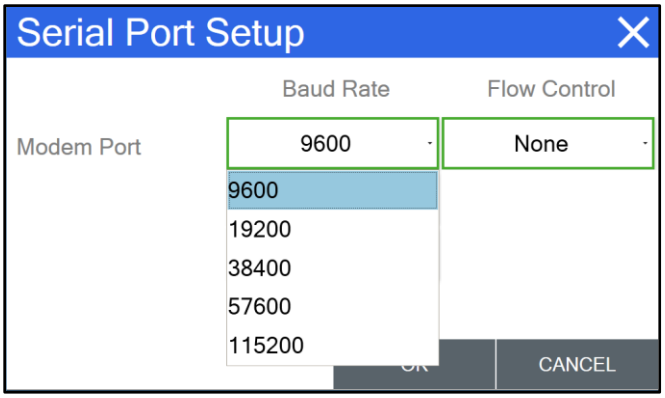


Figure 4-46 Baud Rate Dropdown List

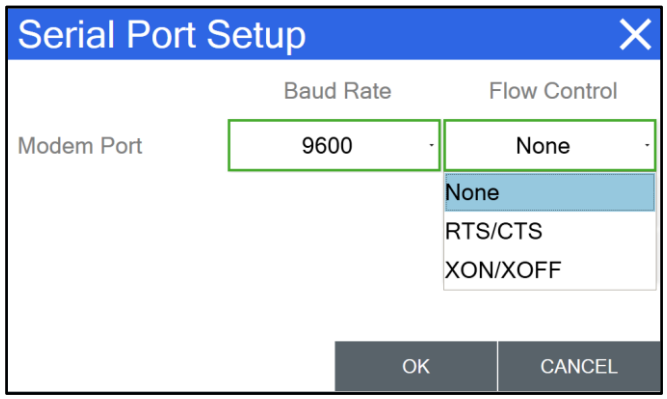


Figure 4-47 Flow Control Dropdown List

The Flow Control setting should be left at NONE except for special circumstances specified by the owner's IT department.

4.2.2 Ethernet Configuration

The Ethernet Configuration screen is used to set the IP Address, Subnet Mask, and Gateway to allow the OPX 1025 to communicate on a local area network using a standard Ethernet cable connection to a switch or router. It is

recommended to set the IP address config to **STATIC.** The static IP address needs to be provided by the instrument owner's IT department.

Ethernet Config screen location: Navigation Bar->Settings (page 2)->Ethernet Port.

4.2.2.1 Ethernet Cable Connection

Figure 4-48 shows the location of the ethernet port at the back of the OPX 1025. This is where the ethernet cable needs to be connected to use the instrument's networking capabilities.

Figure 4-48 Ethernet Connection Port

4.2.2.2 Auto IP Configuration

To use auto configuration, press on the green outlined box next to IP Address Config to activate the dropdown options list. Select the AUTO option. The dropdown list will close, and the selection will now show in the box.

Press the SAVE button to save the changes to the OPX 1025.

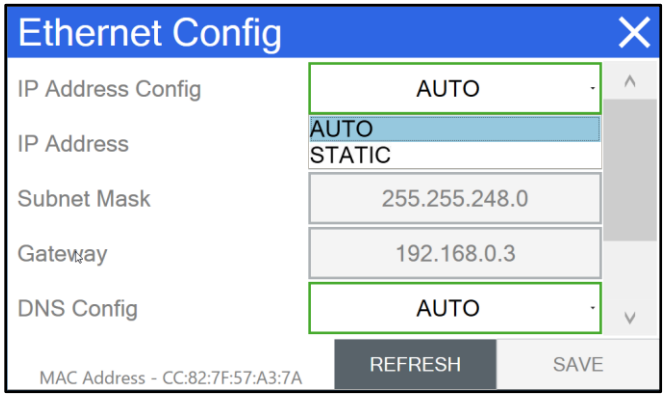


Figure 4-49 IP Config Dropdown

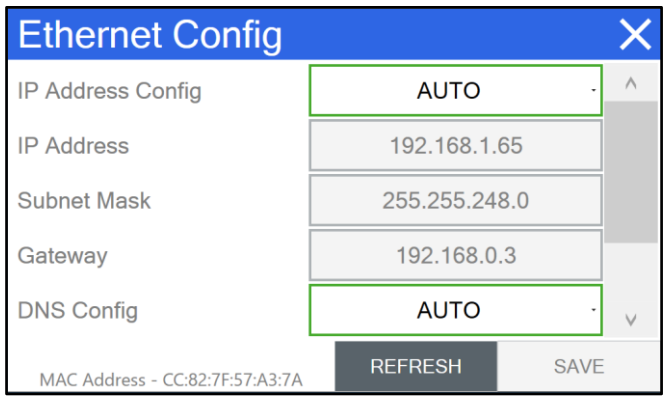


Figure 4-50 IP Config Auto

The AUTO selection will cause the instrument to be assigned a dynamic IP address, provided by the network. The IP Address, Subnet Mask, and Gateway will automatically populate.

The AUTO setting is not recommended for long-term remote use.

If the IP address, Subnet Mask, and Gateway do not automatically update after a few seconds, press the REFRESH button at the bottom of the screen. The Ethernet config information will update.

4.2.2.3 Static IP Configuration

To manually configure the Ethernet settings, press the green outlined box next to IP Address Config to activate the dropdown options list. Select the STATIC option. The dropdown list will close, and the selection will now show in the box.

This selection allows the user to manually set the IP Address, Subnet Mask, and Gateway. This information needs to be provided by the network administrator or authorized IT department personnel.

The STATIC setting is recommended for long-term remote use.

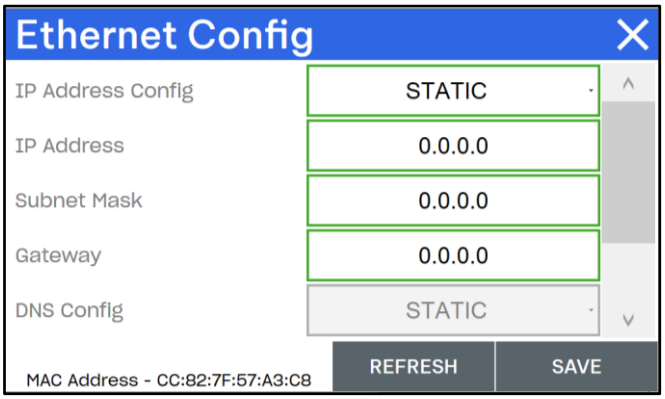


Figure 4-51 Static IP Config Screen

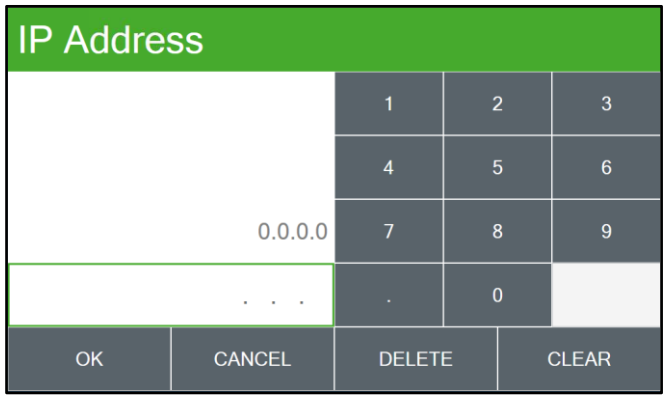


Figure 4-52 Static IP Input Screen

Press the green box next to the IP Address to access the IP Address input screen.

Use the numeric Keypad to type in the static IP address.

Press the OK button to save the entry.

Repeat the steps above to set the Subnet Mask and Gateway.

When a static IP Address, Subnet Mask, and Gateway are set, press the SAVE button at the bottom right corner of the Ethernet Config screen as shown by **Figure 4-52 Static IP Input Screen**.

4.2.2.4 DNS Configuration

When the IP Address Config is set to STATIC, the DNS Config is forced to STATIC, as well. This allows the user to manually set the Preferred DNS Server and Alternate DNS Server, if needed.

Press the green box next to either of the DNS Servers to access the input screen.

Use the numeric keypad to type in the address.

Press the OK button to save the entry.

Contact the local IT department for the network's DNS Server addresses.

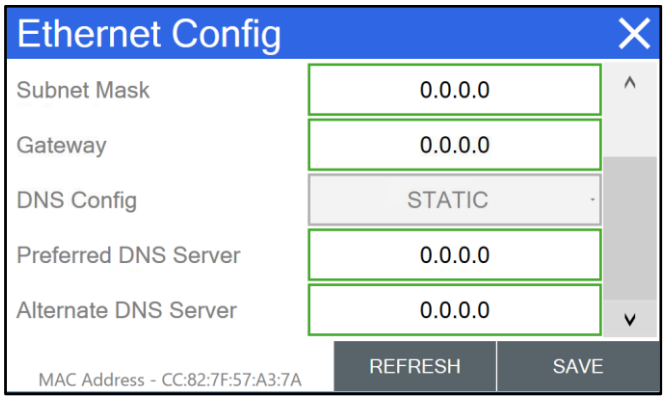


Figure 4-53 DNS Config Screen

5. OPX 1025 OPERATING PROCEDURES

This section explains the initial startup procedures, how to start and stop samples and the system warmup procedure.

IMPORTANT: The OPX 1025 is factory calibrated, but it is recommended to calibrate the ambient (BX-597A) sensor and flow sensor (**Sections 7.1 and** before deployment.

5.1 Initial Startup

The steps in this section should be performed for the initial startup or after moving the OPX 1025 to a different sample site location.

5.1.1 System Verification

It is vital to perform a system verification check before operating the OPX 1025 to ensure that all major systems function properly.

5.1.1.1 Self Test

As stated in **Section** 4.1.1.6 the Self Test function is used to activate an automatic test of most of the OPX 1025 subsystems in order to verify that the instrument is in operational condition.

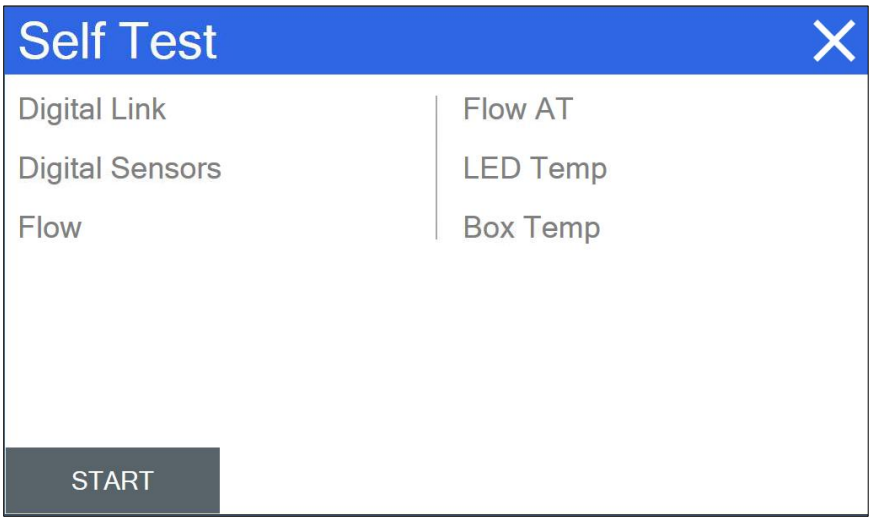


Figure 5-1 Self Test Screen

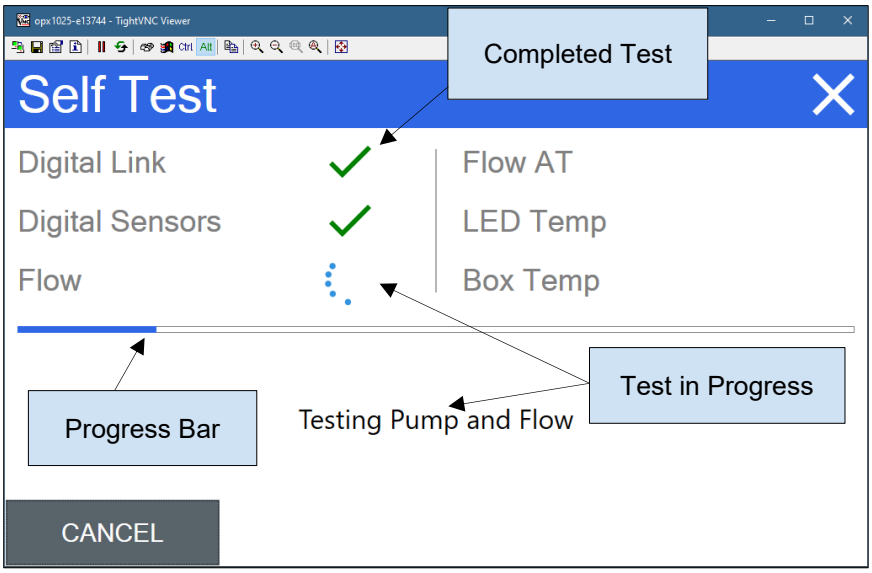


Figure 5-2 Self Test In Progress

The Self Test will take approximately 5 minutes to complete.
If all function tests pass, continue to the sections below.

If any of the function tests fail, see the appropriate section in **Chapter** 6 to diagnose and correct the issue.

5.2 Ambient Sensor Calibration

See **Section 7.1 BX-597A Digital Ambient Sensor Field Calibration** for this procedure.

5.3 Leak Check

See **Section 6.4.12.2 Leak Check** for this procedure.

5.4 Flow System Audit or Calibration

See **Section 7.2 Flow Sensor Field Calibration** or **Section 7.2.1 Audit-Only Flow Checks** for these procedures.

5.5 Sensor Field Calibration Check

See **Section 7.3** for this procedure.

5.6 Starting and Stopping a Sample

This section explains the process for starting a sample run, the warmup period, and stopping or pausing a sample.

When the back panel power switch is turned on, the OPX 1025 will boot up and display a splash screen identifying the instrument.

Figure 5-3 Boot-up Splash Screen

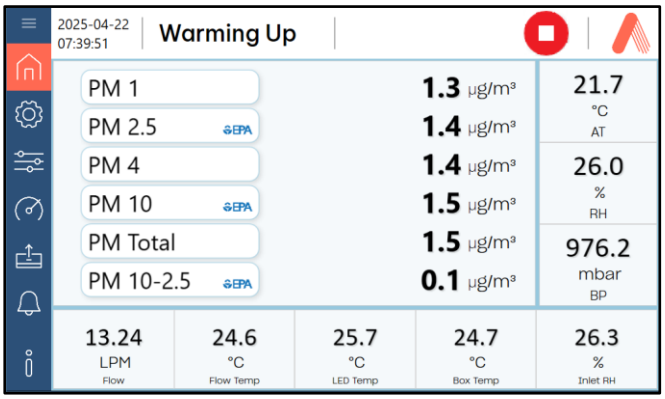


Figure 5-4 Warmup Phase of Start Up

When the bootup sequence has finished, the OPX 1025 will automatically begin sampling.
When the OPX 1025 is Warming Up, as shown in Figure 5-4, data saved to the files should be considered invalid. This data is automatically flagged with a status of 256 during the warmup period.

5.6.1 Starting a Sample

If sampling has been stopped and needs to be started, press the green START button in the upper right corner of the home screen. When pressed, the sample initiation process will begin. This button will turn red and become a STOP sample button during sampling.

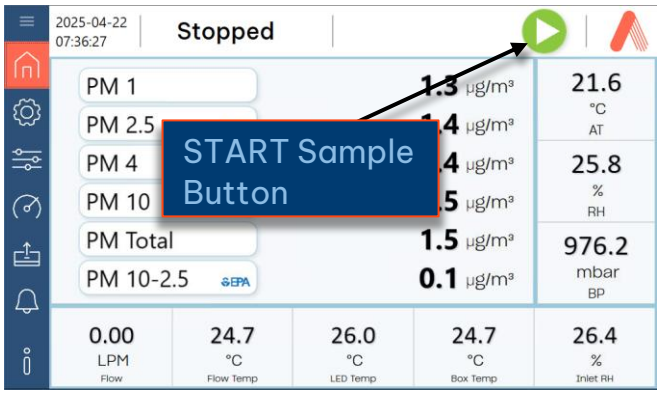


Figure 5-5 Start Sample, Home Screen

5.6.2 Warmup Period

After powering up and sampling has begun, the OPX 1025 requires a short period of time, usually 1 to 15 minutes, to warm up and produce valid data. The warmup period is a function of the stability of the LED temperature. "Sampling" will be displayed instead of "Warming Up" when the LED temperature has stabilized.

WARNING: It is essential for the instrument to fully warm up and systems to equilibrate before performing any audits, calibrations, or sampling.

5.6.3 Stopping a Sample

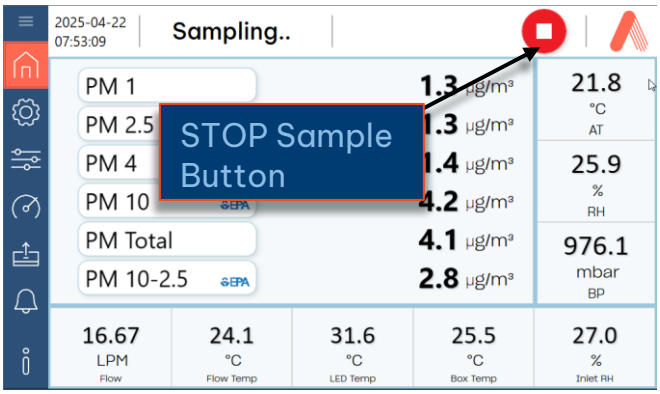


Figure 5-6 Stop Sample, Home Screen

The OPX 1025 is a continuous measurement instrument. To stop the OPX 1025's current sample, press on the red STOP Sample button in the upper right corner of the Home screen.

When the STOP sample button in the Home screen is pressed, the OPX 1025 will ask the user to confirm if the sample should be stopped. If confirmed, the OPX 1025 will stop immediately.

6. MAINTENANCE and TROUBLESHOOTING

This section provides information about routine maintenance of the OPX 1025 and for performing more detailed diagnostic tests if a problem is encountered. The instrument generates error messages on the display or in the data log if a failure or other problem is detected. Many times, there is a simple solution. Persistent errors often signify a failure that will require investigation.

6.1 Recommended Periodic Maintenance

Table 6-1 OPX 1025 Maintenance Schedule shows the Met One Instruments recommended period for routine maintenance items. Some of these items may need to be performed more frequently depending on local conditions. Local monitoring program administrators may need to review these items and establish SOPs appropriate for local applications.

Table 6-1 OPX 1025 Maintenance Schedule

Maintenance Item	Minimum Period
Leak Test	Monthly
Bottom Optical Chamber Cleaning	Monthly
Temperature, Pressure, and Flow audits	Monthly
Clean PM10 Inlet Head (BX-802)	Monthly
SigmaDust Check	3 Months
Clean Optical Sensor Assembly	6 Months
Blower Filter	Yearly
Coin Cell Battery	As Required
Replace O-Rings	As Required
Replace Blower	As Required
Replace Main Flow Sensor	As Required
Source LED Replacement	As Required

6.1.1 Factory Service

Factory service primarily consists of optical system cleaning, optics/detector checks, and a calibration check and recalibration if needed, against a factory standard. As-found calibration checks can also be requested. Contact the Met One technical service department to schedule service. A Return Authorization number must be obtained before the unit is returned. See **Section 1.2** for Met One contact details.

6.2 OPX 1025 Error and Alarm Event Descriptions

The OPX 1025 contains a system of error and alarm codes that are used to alert the operator to any problems with the unit. The errors appear on the display and are stored in the digital alarm log with the time and type of error. Corresponding alarm codes are stored in the data array.

The Status field is reported in data files by a numeric code. The Status field includes alarm codes and other status flags to indicate the state of the instrument at the time the data was collected. If multiple statuses are generated for a single data record, the reported status value is the sum of the status codes. The general status codes are described in **Table 6-2**. Certain alarm events may not be posted to the data array if an alarm condition terminates operation before the end of a sample. Please consult the Alarm Log for more detailed information when an error is encountered.

WARNING: Before performing any services that require disassembly of the OPX 1025, turn off and unplug the instrument from power.

Table 6-2 Status Codes

Code	Description	Causes	Corrective action
0	**No Alarm**	System fully functional	None
1	**Power Failure**	Caused by a power cycle or a microprocessor reset.	Power off/on event logged. Ensure unit is supplied with stable power.
2	**SPI Link Failure**	Communication to the sensor failed	Power the instrument off and back on. If the problem persists, contact a qualified service technician for assistance.
4	**Digital Sensor Link Failure**	Digital sensor link failure after 10 seconds of no communication with the BX-597A sensor.	1. Ensure the BX-597A sensor connection on back of OPX 1025 is correct. 2. Ensure the BX-597A sensor connector is plugged in securely on bottom of BX-597A. 3. Possible faulty BX-597A. Obtain factory replacement.

8	**Flow Failure**	Failure when the flow is 10% out of regulation for more than one minute, or when the flow is 5% out of regulation for more than five minutes. Pump PWM over 90% for 5 minutes or more. 1. Internal filter clogged. 2. Failed blower. 3. Failed flow sensor.	1. Perform flow audit and allow system to regulate flow. 2. Clean PM10 inlet head. 3. Clean or replace Internal filter. 4. Replace blower and recalibrate flow. 5. Replace flow sensor and recalibrate flow.
16	**Sensor Range**	A sensor is outside its designated limits. Check error log for abbreviation WS, WD, AT, RH, BP, FLOW, or LED T.	1. Default and recalibrate sensors. 2. AIO equipped: if WS, WD, AT, RH or BP, replace AIO. 3. BX-597A equipped: if AT, RH or BP, replace BX-597A. 4. If FLOW, LED T, refer to qualified service technician.
32	**Reserved**	N/A	N/A
64	**Reserved**	N/A	N/A
128	**Reserved**	N/A	N/A
256	**Warmup**	Occurs during normal operation when a sample is started to indicate data was collected while the instrument was warming up.	Typically none. If the warmup period persists for more than 20 minutes, contact a qualified service technician for assistance.
512	**PC Link Down**	Communication between the OPX 1025 software and the rest of the instrument has failed.	Power the instrument off and back on. If the problem persists, contact a qualified service technician for assistance.
1024	**PM Calculation Error**	The PM measurement calculation failed.	Typically, this indicates a bad reading of the particle counts, ambient temperature, or barometric pressure. 1) Ensure no other errors are present such as the SPI Link, Digital Sensor Link, or PC Link. 2) Ensure the Digital Sensor is properly connected. 3) Ensure valid readings are coming from the Digital Sensor.

			4) Default and recalibrate sensors.
2048	**Maintenance**	Environmental data is always being collected even when not actively sampling. In addition, most maintenance activities can be performed while actively sampling. The Maintenance status flag indicates a maintenance event was in process at the time this data was collected.	N/A
4096	**Not Sampling**	This status flag indicates the instrument was not actively sampling when this data was collected.	N/A
8192	**Factory Test Mode**	This status flag indicates the instrument was put into a special mode by factory personnel for test or troubleshooting purposes.	This is not a typical situation. If the instrument collects data with this status code, contact a qualified service technician for assistance.

Sensor Outside Range Alarm Events: This alarm occurs if one of the BX-597A sensor parameters registers a value outside of its measurement range, indicating a possible sensor failure. It is intended to filter out and catch full-scale readings that can occur from the ambient sensors.

Table 6-3 Sensor Out of Range Alarms

Sensor	Minimum	Maximum
AT Sensor	-50.0 C	70.0 C
BP Sensor	500 mbar	1100 mbar

6.3 Basic Problem Causes/Solutions

The following table contains information on some of the more common OPX 1025 problems that may be encountered, and some steps to identify and remedy the problems. Met One Instruments welcomes user suggestions for new items to include in this section of future manual revisions.

Table 6-4 Common Problems and Solutions

Problem:	**The instrument doesn't appear to be powering on or starting.**
Cause/Solution:	• Confirm the power supply and power cord are properly connected to a reliable electrical outlet. • Confirm the power switch on the back panel is in the ON position. • The touchscreen display should come on any time power is applied and the power switch is in the ON position. • The OPX 1025 should start sampling within two minutes after power-up. • After using the STOP SAMPLE function, sampling will resume after 10 to 360 minutes if enabled. • The display will go dark after 30 min of inactivity. Touch the screen to activate the display.
Problem:	**Flow failures or low flow.**
Cause/Solution:	• Make sure the blower exhaust is not blocked. • DEFAULT the flow sensor calibrations and recalibrate the flow. If corrupted flow calibration parameters are entered into the flow calibration, it may appear that the flow system is not working. • Verify the AT and BP sensor function and calibration. Failed ambient sensors will affect the flow. • Check the internal filter. High levels of contamination buildup can cause excessive pressure drop across the filter, preventing the blower from properly regulating flow. • The sample blower itself may eventually fail and need to be replaced. It should last at least two years under normal conditions.
Problem:	**Leak check failures**
Cause/Solution:	• Check the push-to-connect tubing fittings inside the instrument. • Verify the Sample Conditioner is properly installed and both O-Rings are fully engaged. • Verify the Zero filter is properly installed and both O-Rings are fully engaged. Note: nothing down-stream of the optical sensor module is leak tested during the leak test procedure.
Problem:	**Field Calibration Particle failures**
Cause/Solution:	• A Calibration Audit Failure can occur if the Field Calibration Particulate has become contaminated. • A Calibration Audit Failure can occur if too little or too much particulate is introduced into the system.

6.4 System Maintenance

6.4.1 Cleaning BX-802 PM_{10} Impactor

It is important to clean the BX-802 to prevent other particles and dirt that have built up on the surface from being passed through the optical assembly, resulting in false counts. Cleaning should be done on a monthly basis. Refer to the BX-802 manual provided or contact Service if needed. Nitrile gloves are optional for disassembly and maintenance of the system except for optical cleaning where it is strongly recommended to keep oils from being deposited on the lenses.

Tools and Materials:

- Screw Driver, Phillips
- Cotton Swabs (wood handle)
- Microfiber Wipes (dry and lint free) "non-abrasive wipes"
- IPA (Isopropyl Alcohol) 70% or better
- Hex Wrenchs (3/32", 3/16", 1/16")
- Nut driver or socket (3/8", 5/16")
- Canned Air (Compressed gas duster for electronics)
- Powder free Nitrile Gloves (keeps oils off optics)

6.4.2 Cleaning Bottom Optical Chamber

1. Remove the RH/AT Sensor assembly by gently pulling out of the lower optical chamber and set to the side (Note the orientation of the lower hex key in reference to the OPX 1025)

2. Loosen the swivel lock screw until it pops out (Threads will no longer be in contact with the housing)

3. Remove the air tubing connection from the bottom chamber.

4. Swing out the swivel lock and remove the bottom chamber

5. Remove the bottom cap of the bottom optical chamber for the cleaning process The cap is removed by pulling it down.

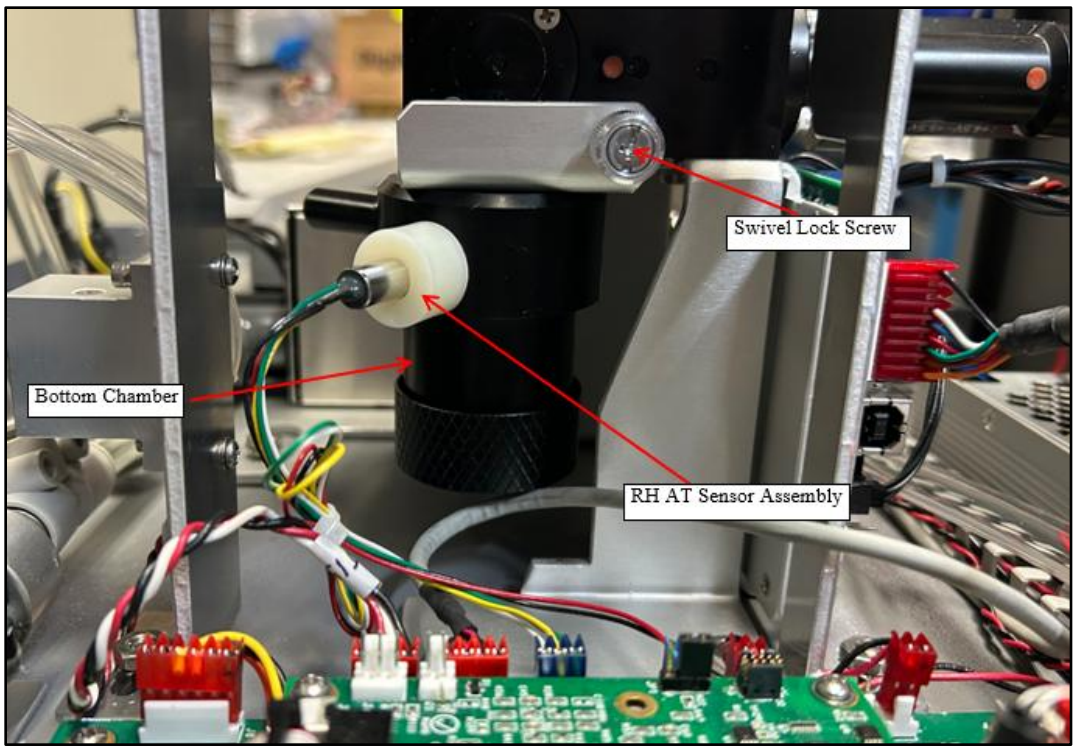


Figure 6-1 Removing Bottom Chamber

6. The RH/AT sensor may be cleaned using canned air and spraying, so the air is not directly hitting the sensor (hold canned air at four to six inches distance, and have the RH/AT IC pointing at about a 45-180 degree position from the air direction)

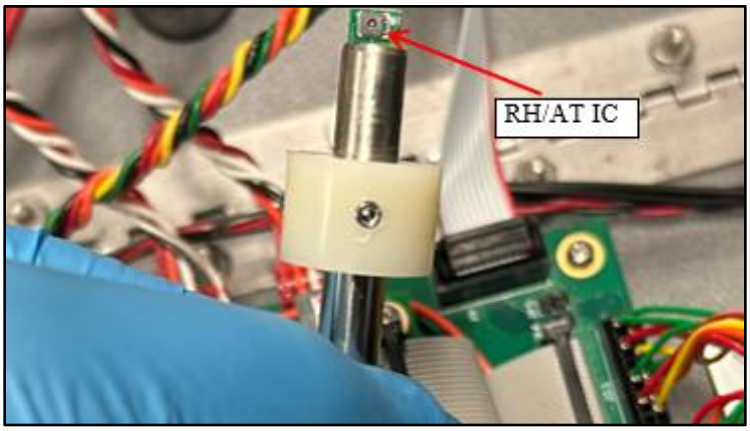


Figure 6-2 RH/AT Sensor

NOTE: The RH/AT sensor output may become inconsistent if debris or moisture gets in the RH/AT IC.

7. Clean the Cap using alcohol and microfiber wipes

8. Clean the lower chamber using a wipe with alcohol and all hard-to-reach places with cotton swabs

9. Blow off any lint or wetted places with canned air before reassembly

Figure 6-3 Lower Chamber and Cap

10. Reassemble in reverse order, and orient the RH/ AT sensor so the hex key is facing the bottom of the OPX 1025

6.4.3 Cleaning Optical Assembly

To ensure high quality measurements, the recommended cleaning interval for the optical assembly is every 6 months; more frequent cleaning may be needed if large particle concentrations are regularly encountered.

1. Remove Power and sensors from the back panel (disconnect the AC plug in the back of the unit)

2. Remove the Sample Conditioner and top cover, and open the front of the unit to ease access to the optical chamber

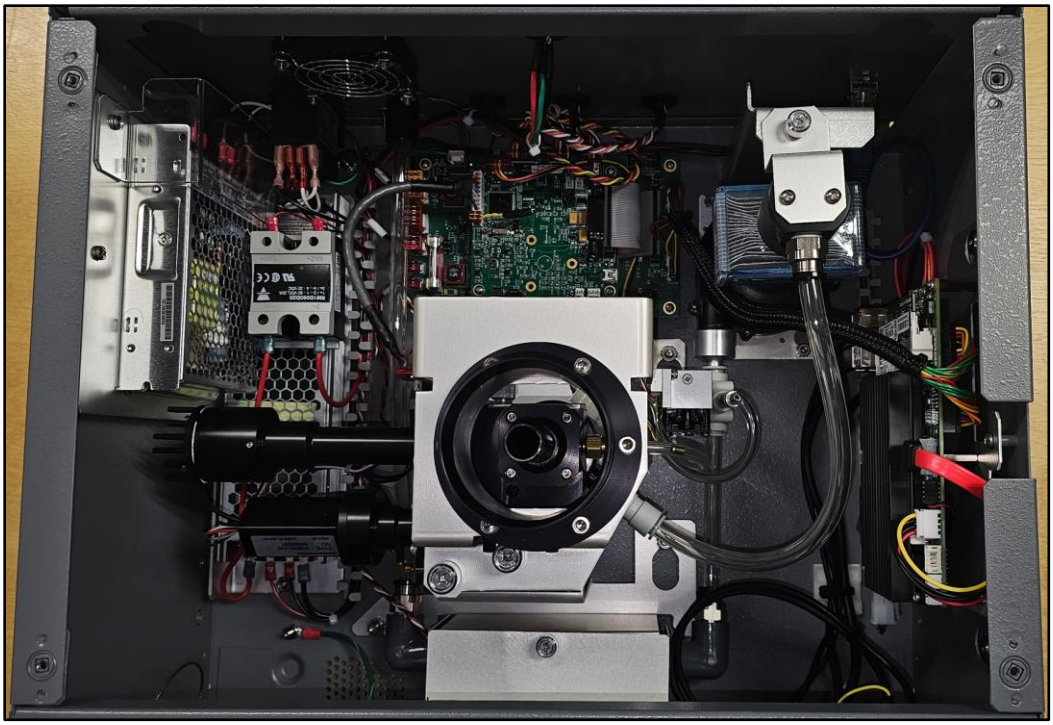


Figure 6-4 Opened Unit

3. Disconnect/Remove Parts to get to the Optical Assembly
4. Disconnect the purge flow tubes and the exhaust tube on the optical assembly

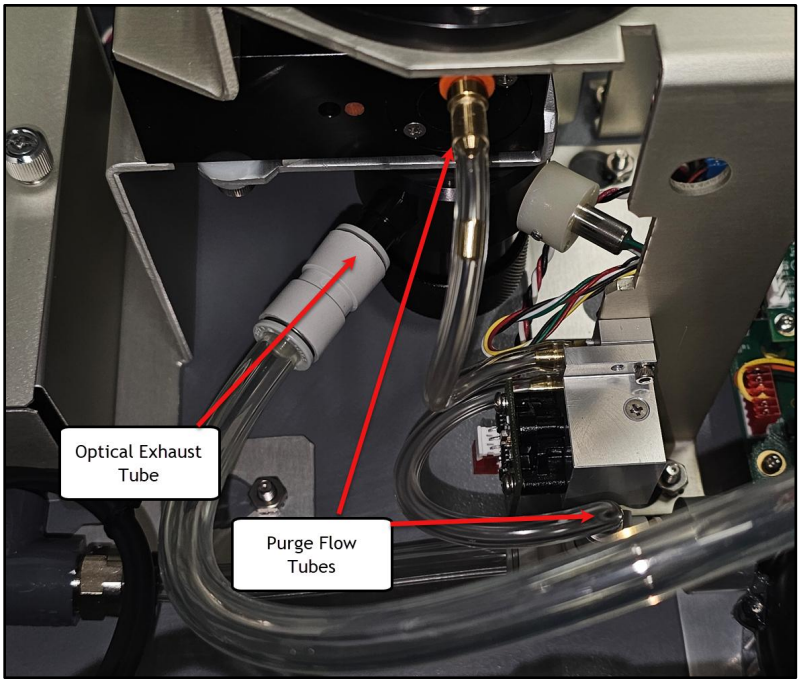


Figure 6-5 Tube disconnects

5. Remove purge flow connector from 82180-2 PCBA

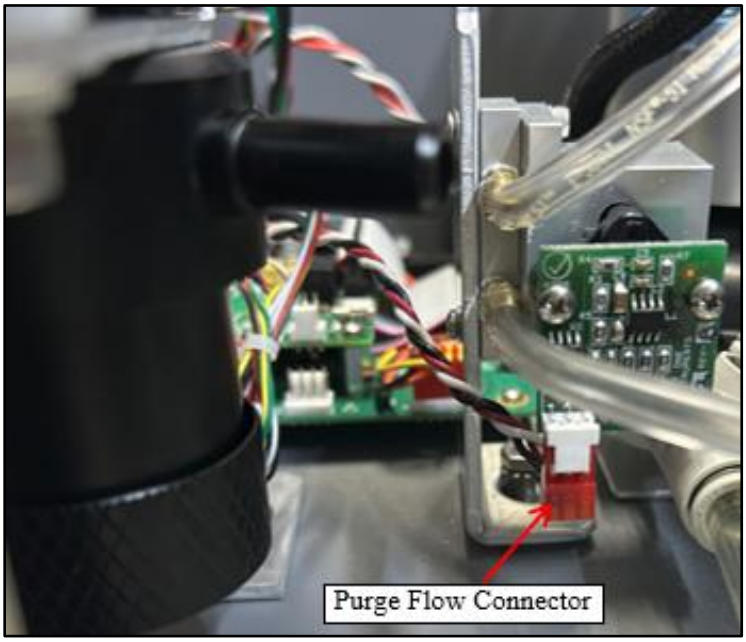


Figure 6-6 Purge flow disconnect

6. Remove the RH/AT Sensor from the bottom chamber by gently pulling it out

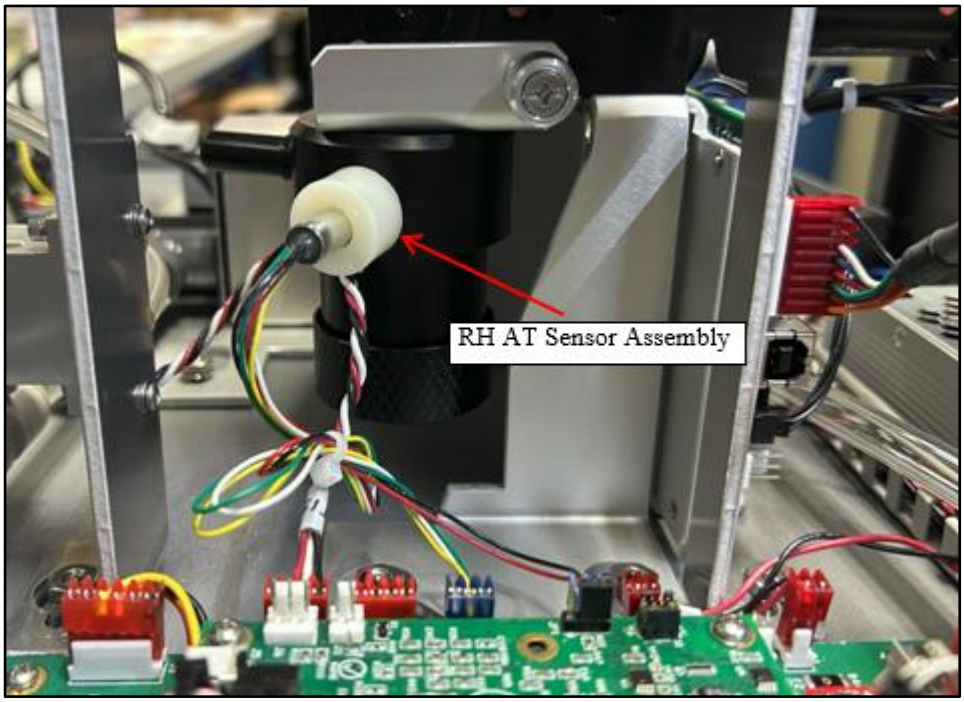


Figure 6-7 RH/AT Sensor Removal

NOTE: Try not to touch RH/AT IC located at the tip of the RH/AT Sensor Assembly.

7. Top Bracket Removal

a) Loosen the two captive screws shown in the picture below on the left (when completely loose they will pop out and threads will no longer be in contact with the middle chamber)

b) Loosen the two nuts using a 3/8" Nut driver or socket as shown in the picture below on the right

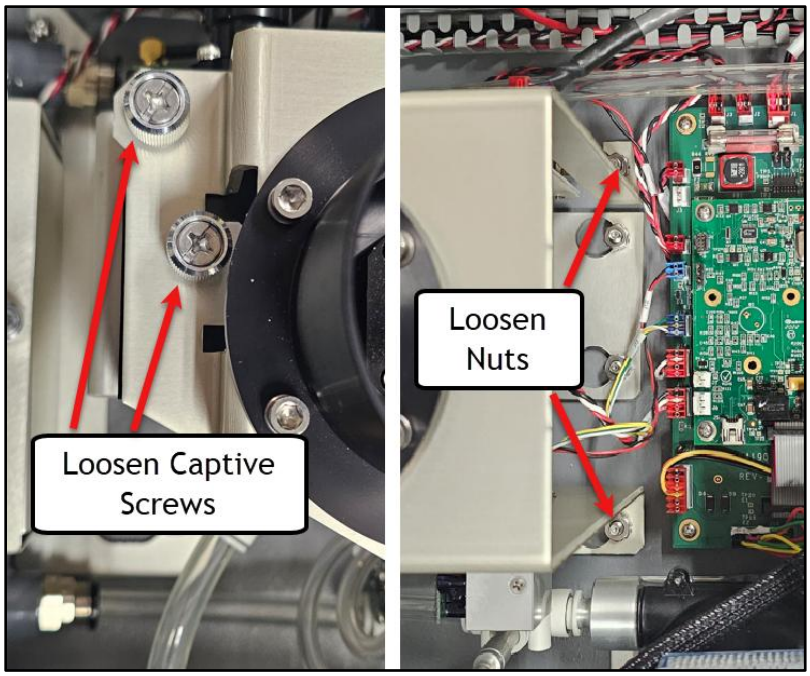


Figure 6-8 Optical Sensor Mount Removal Prep

c) Gently remove the top bracket from the assembly, and place aside

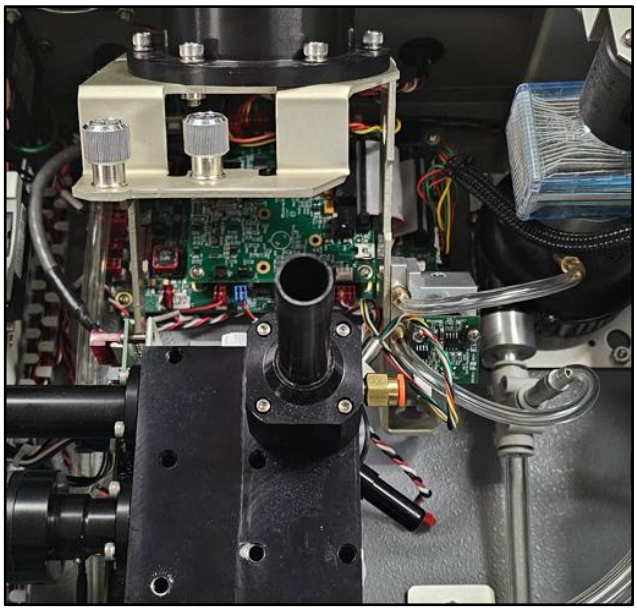


Figure 6-9 Optical Sensor Removal

8. Optical Chamber Breakdown (Inlet, Middle, and Bottom)

6.4.3.1 Inlet Chamber

1. Remove Inlet Chamber hex bolts using 3/32” hex wrench as shown below

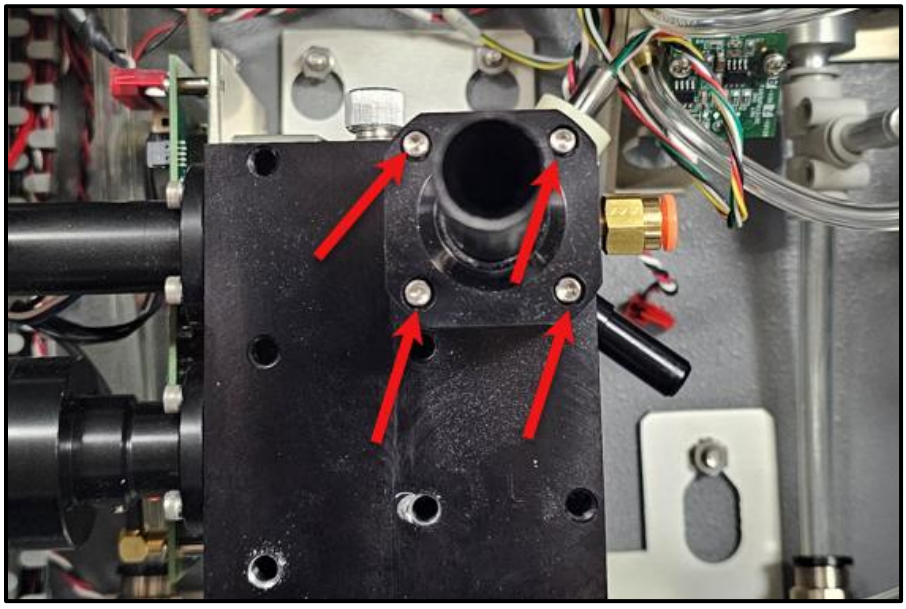


Figure 6-10 Inlet Chamber Removal Prep

2. Remove Inlet Chamber and inlet coupler

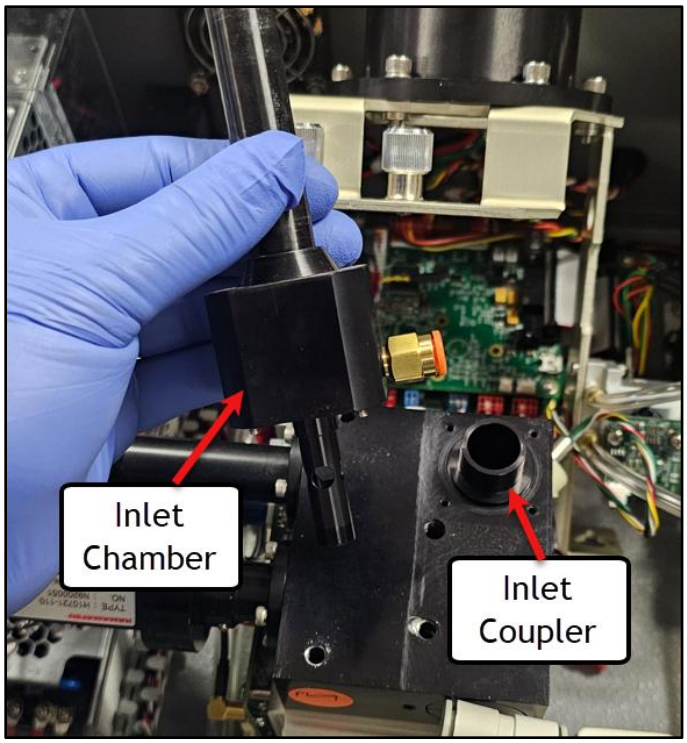


Figure 6-11 Inlet Chamber Removal

NOTE: Stay clear from touching or scratching the optics! As an additional precaution, nitrile gloves should be worn to prevent any oils from getting on the optical lenses

6.4.3.2 Remove bottom chamber

1. Loosen the spring-loaded bolt shown below, it is all the way loosened when it pops out and feels springy

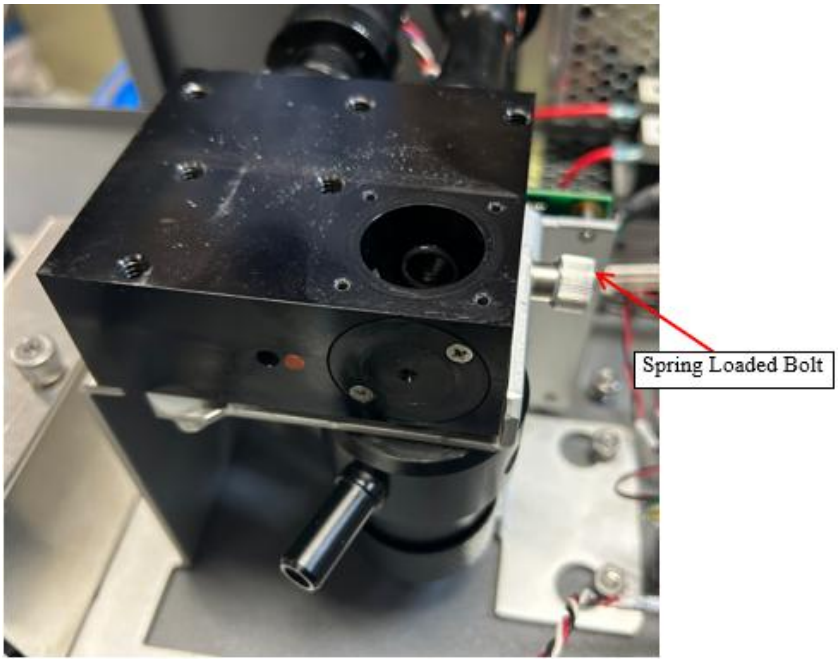


Figure 6-12 Bottom Chamber Removal Spring loaded bolt

2. Pull on the Swivel Lock to access the bottom Chamber, it will pivot on the rotation point

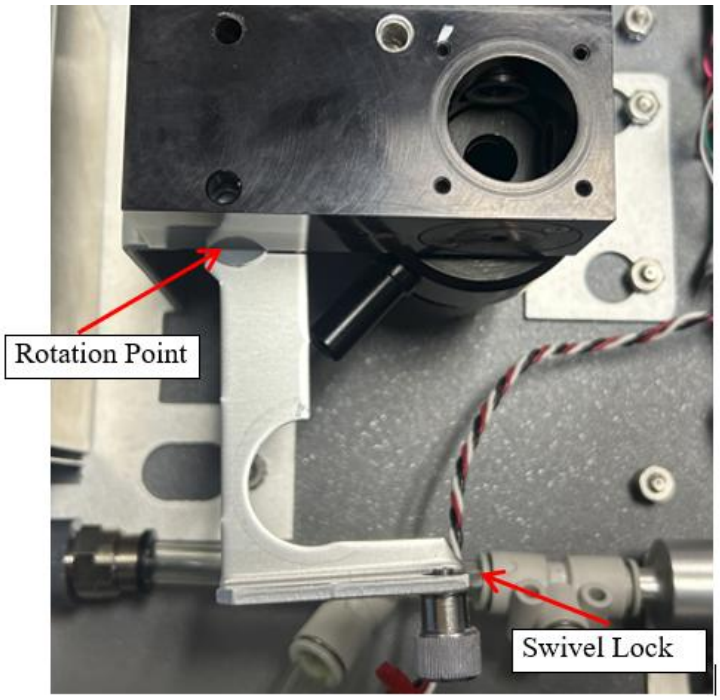


Figure 6-13 Bottom Chamber Removal, Swivel Lock

3. Remove the Bottom Chamber by gently pulling it off the middle optic chamber

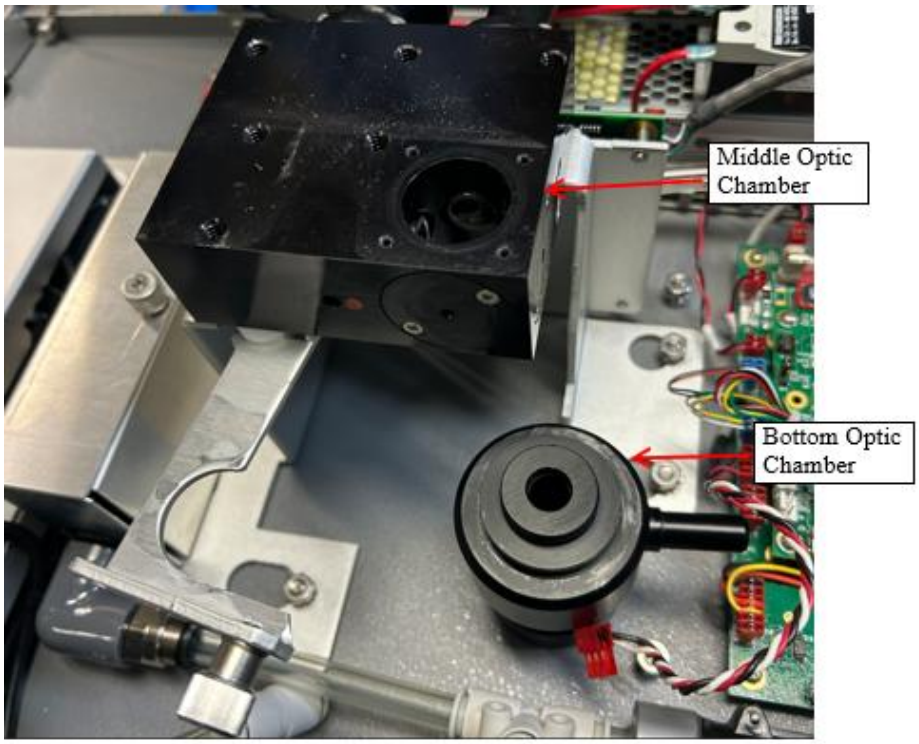


Figure 6-14 Bottom Optical Chamber Removal

4. Remove Bottom Chamber Cap (Secured by O-Rings)

Figure 6-15 Bottom Chamber Dissassembly

6.4.3.3 Clean optical chamber (3 parts: Top, Middle and Bottom)

Cleaning the Top Chamber

1. Clean Inlet Chamber using microfiber wipes and cotton swabs in the hard-to-reach places (alcohol permitted)
2. Clean Inlet Coupler using microfiber wipes and alcohol
3. Blow off any wetted areas or any lint that may remain

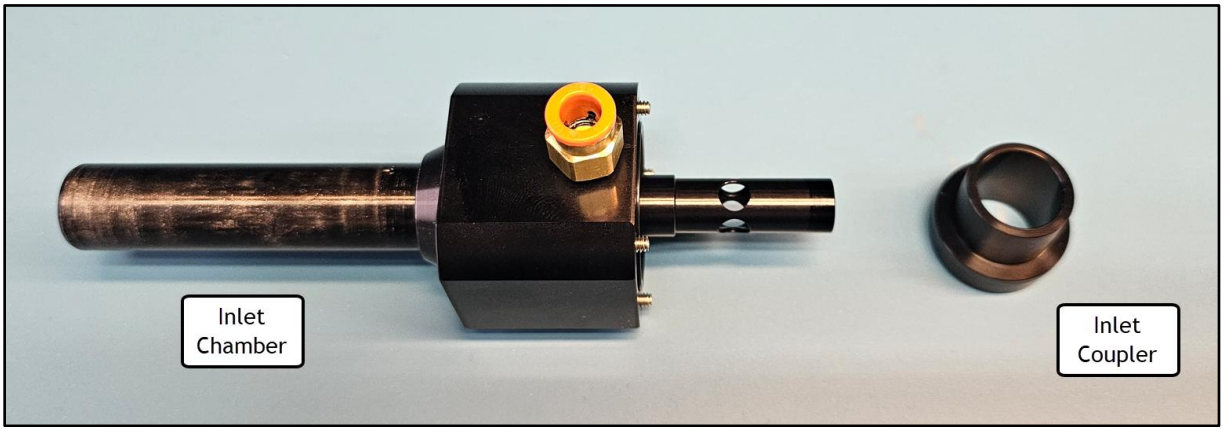


Figure 6-16 Inlet Chamber and Coupler

Cleaning the Bottom Chamber

4. The RH/AT sensor may be cleaned using canned air and spraying so the air is not directly hitting the sensor (hold canned air at some

distance, and having the IC pointing at about a 45-180 degree position from the air direction)

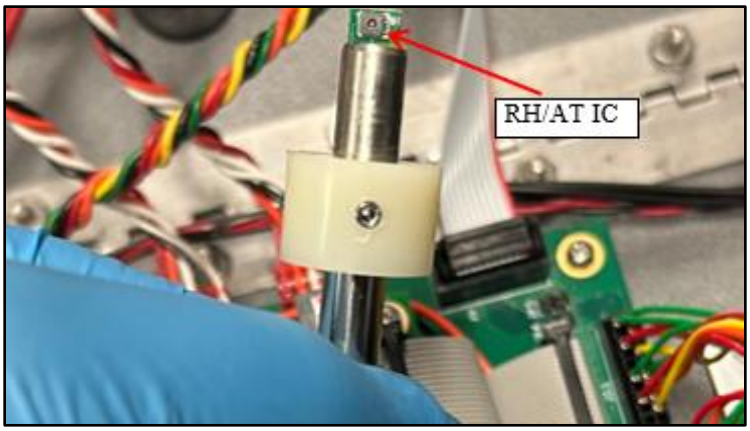


Figure 6-17 RH/AT Sensor

NOTE: The RH/AT sensor output may become inconsistent if debris or moisture gets in the sensor

5. Clean the Cap using alcohol and microfiber wipes
6. Clean the lower chamber using wipes with alcohol and all hard-to-reach places with cotton swabs
7. Blow off any lint or wetted places with Canned air before assembly

Figure 6-18 Lower Chamber and Cap Cleaning

Cleaning the Middle Chamber

NOTE: User should wear nitrile gloves to prevent any finger oils from getting on the optical assembly throughout this process

8. Use canned air to remove any loose dust and dirt
9. Clean off all surfaces in the middle chamber
10. Clean off lenses with wipes and cotton swabs (may use alcohol if needed), Blow off any lint or wetted areas if alcohol was used with canned air

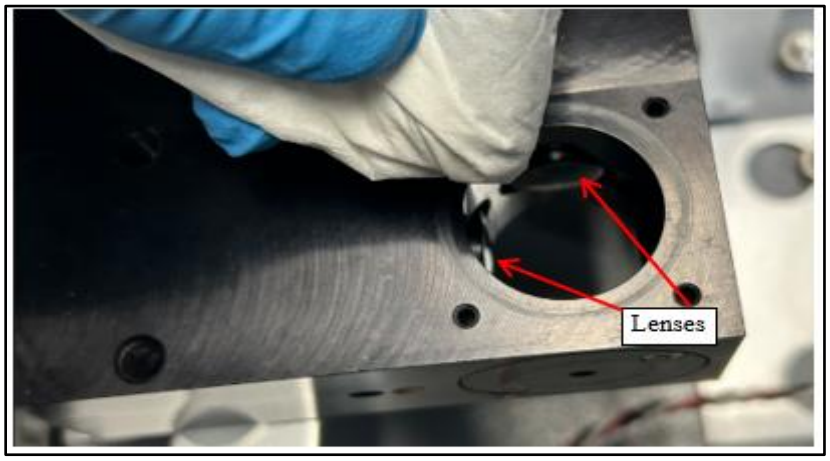


Figure 6-19 Middle Optical Chamber Cleaning

NOTE: It is important to keep the optics free of oil or debris for proper operation

6.4.3.4 Optical Chamber Reassembly

Reassembly the Optical chamber

1. Screw bottom cap on the bottom chamber
2. Align the bottom chamber with the middle chamber and slip in past the O-ring fitting (**Note the position of the exhaust**)

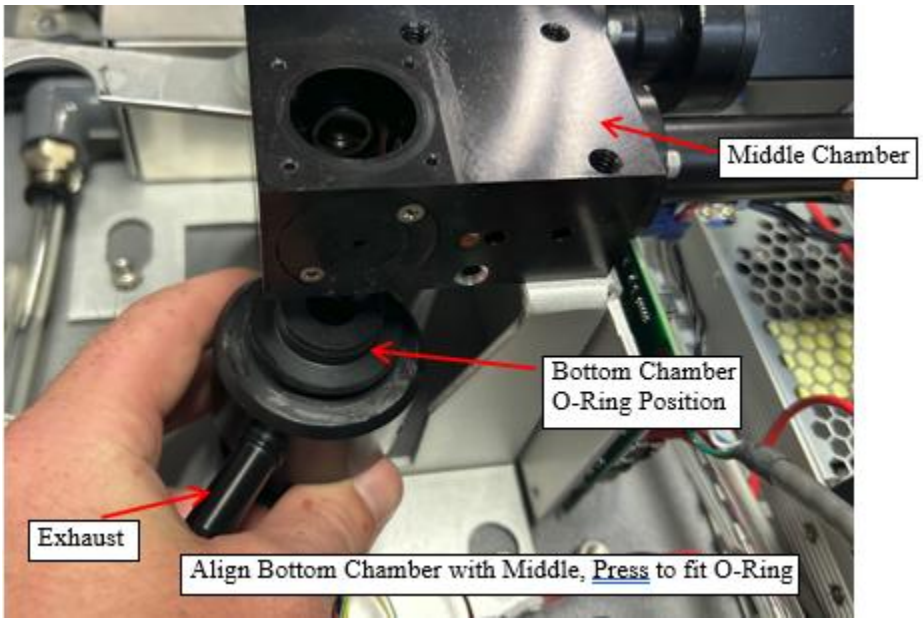


Figure 6-20 Connecting Bottom Chamber to Middle Chamber

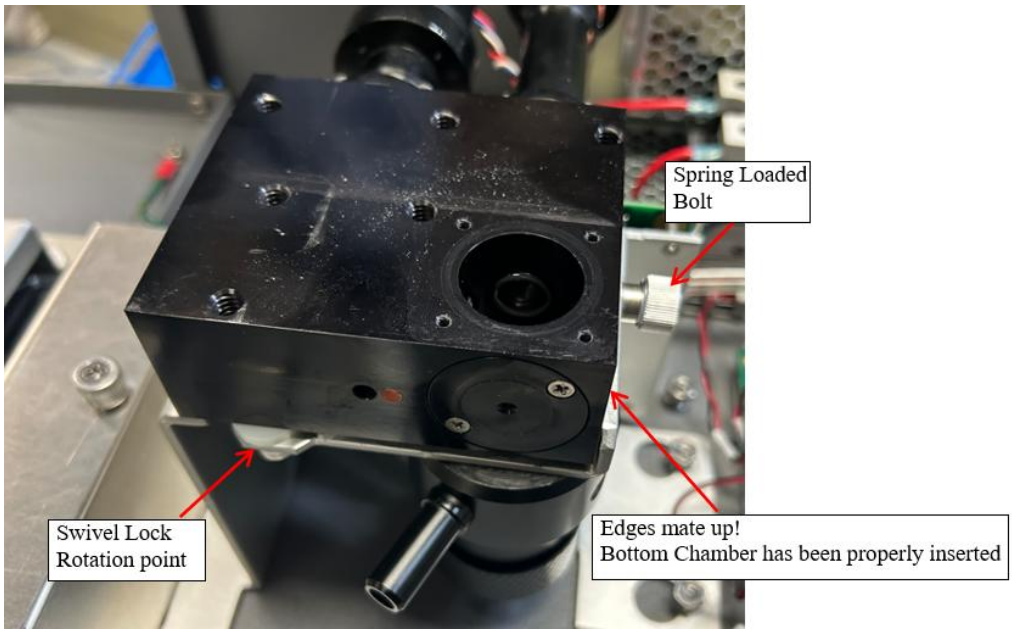


Figure 6-21 Locking Bottom Chamber in Place

3. Lock in the Bottom Chamber by sliding over the Swivel Lock and tightening the spring loaded bolt
4. Place Top coupler in middle chamber
5. Set Top Chamber on Top Coupler and tighten down hex head bolts (note the orientation)

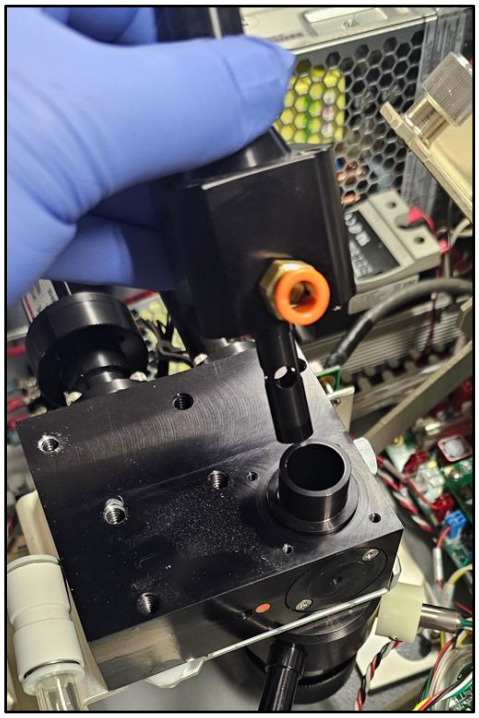


Figure 6-22 Top Chamber Assembly

6. Put bolts in and tighten with 3/32” hex wrench to secure the top chamber

Put the top bracket back on

7. Set the top bracket down gently over the mounting points, avoid any wires that may be in the way
8. Slide the bracket under the mounting nuts
9. Set Captive screws in the middle chamber, wait to fully tighten

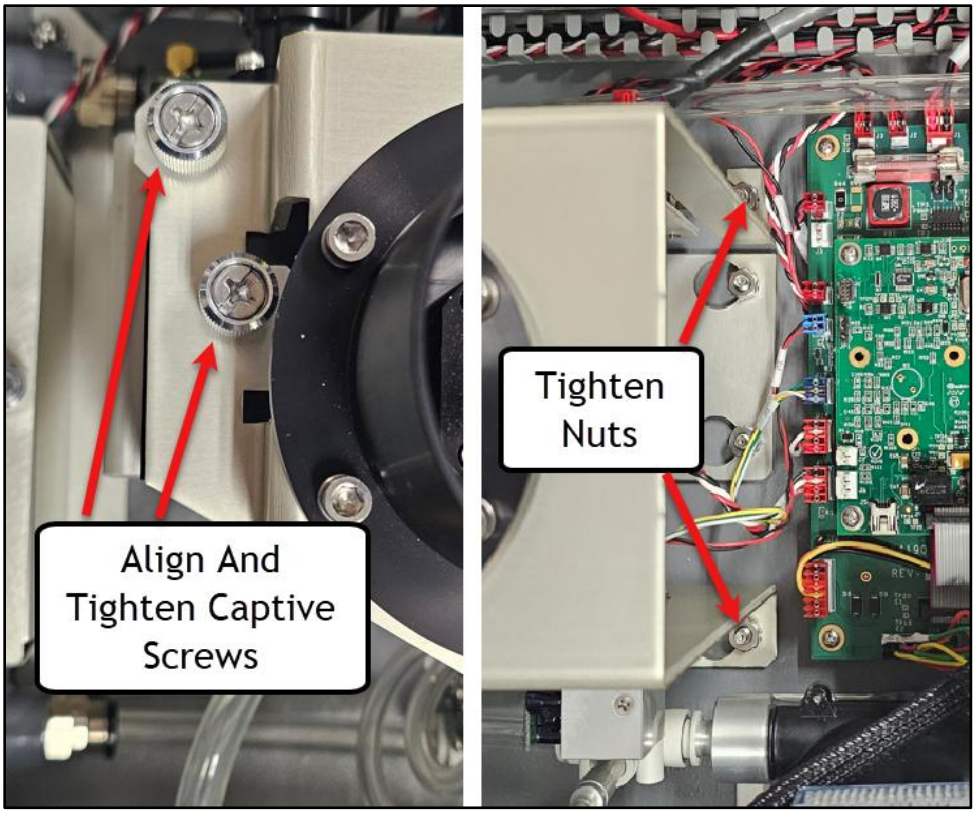


Figure 6-23 Optical Sensor Mounting Assembly

10. Set Sample Conditioner on the inlet, and move around the top bracket as needed to enable the Sample Conditioner to slide in and out with ease.
11. Tighten the captive screws on the top bracket and the nuts that mate to the bottom of the chassis.

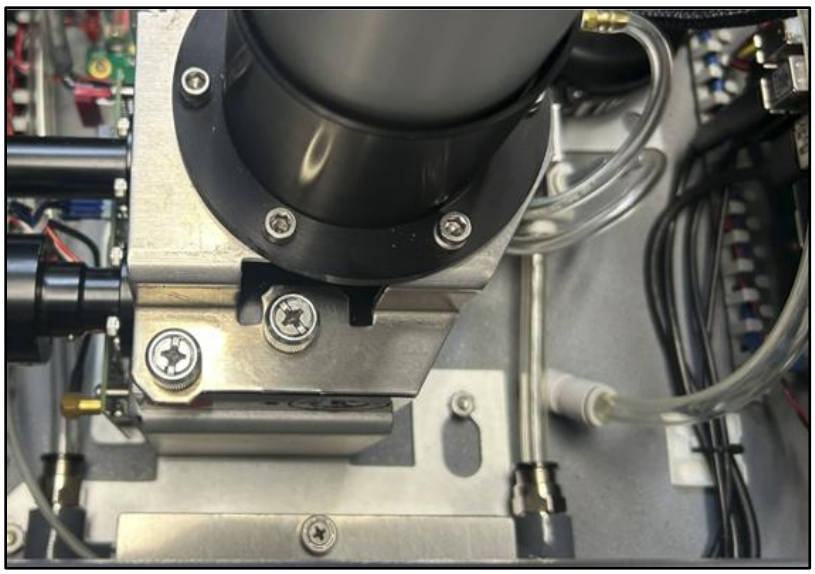


Figure 6-24 Optical Assembly Mount Alignment Assembly

Assemble the remaining tubes and connector

12. Put the RH/AT Sensor in the bottom chamber fitted hole. Push the RH/AT sensor so it is flush with the chamber and position the small hex key facing down.

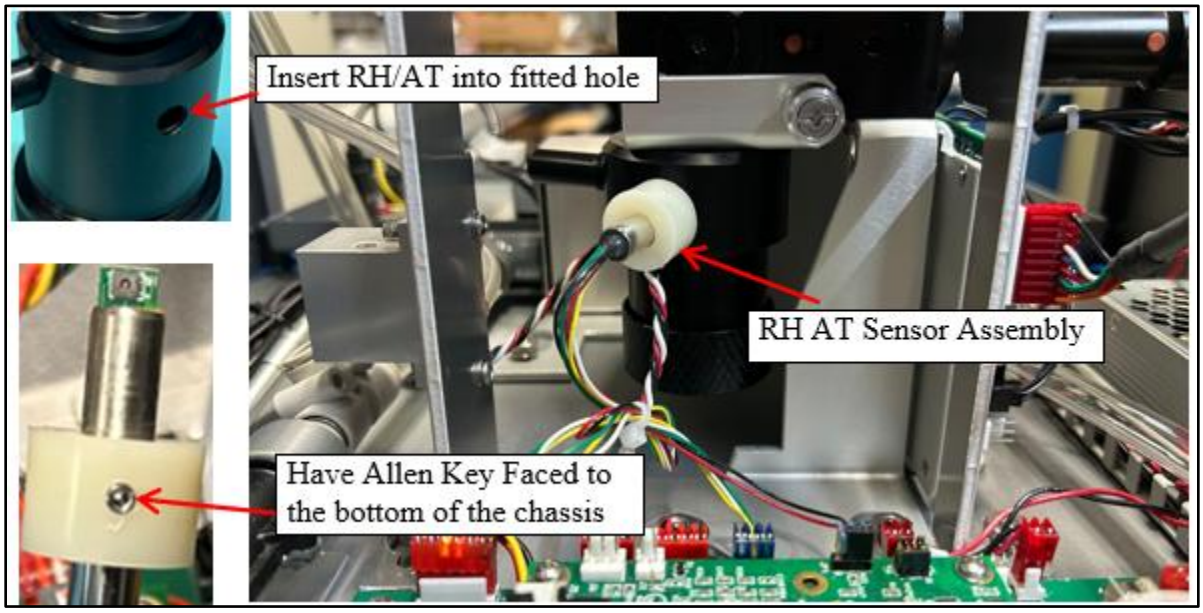


Figure 6-25 RH/AT Sensor Assembly

13. Connect Purge flow cable to the 82180-2 PCBA

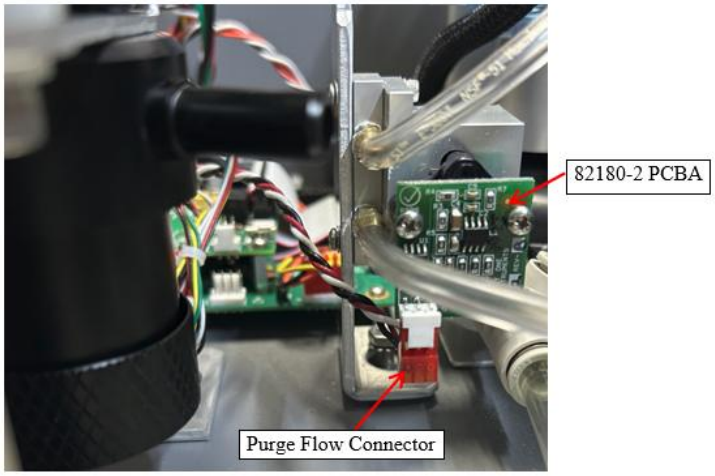


Figure 6-26 Purge Flow Connect

14. Connect the Optical exhaust and purge flow tube fittings

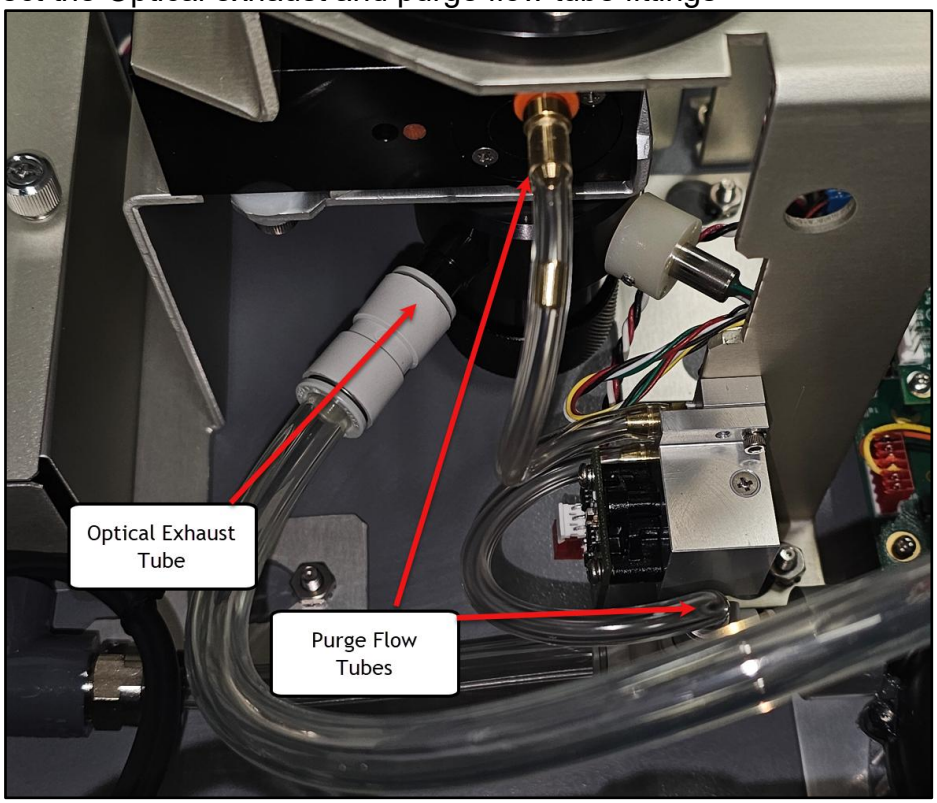


Figure 6-27 Flow Tube Connections

6.4.3.5 Confirming and finalizing

- Close the front of the unit
- Connect BX-597A or equivalent
- Apply power and begin sampling
    - Confirm flow stabilization
- Put top enclosure on and set up for measurement
- Perform field calibration audit with Field Calibration particles

6.4.4 Blower Replacement

The blower should be replaced if the instrument can no longer maintain a flow rate of 16.67 LPM. It is important that the 84190 is confirmed to be working properly (PWM or Pulse Width Modulation), cable 84196 is OK, flow restriction remains normal (from factory), and 24V power is being supplied.

1. Remove power to avoid electrical shock.
2. Remove Sample Conditioner, and top to gain access to the Blower.
3. Remove the additional parts:

Blower inlet tube, Exhaust tube, SBC RS-232 COM Cable to 84190 (x2), filter and filter cap

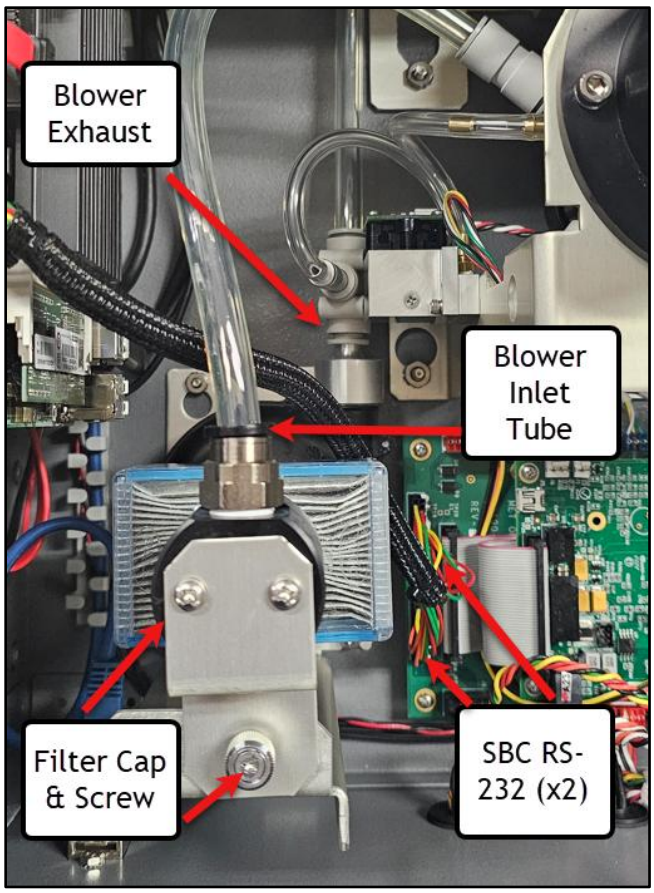


Figure 6-28 Mechanical and Electrical Disconnect for Blower Replacement

4. Disconnect Ethernet Cable from RJ-45 Panel Mount, loosen the two nuts on the blower mount

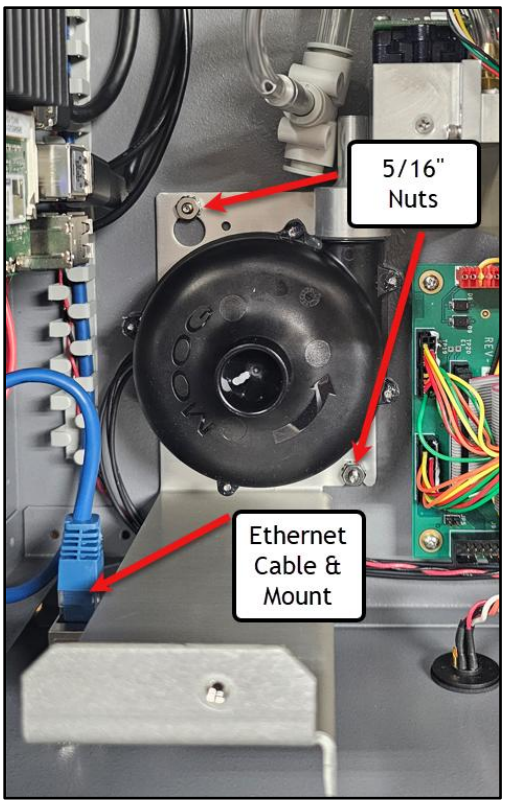


Figure 6-29 Blower Mount Removal

5. Slide the blower mount and pull off the threaded studs
6. Remove the Blower Cable, there is a tab on the bottom of the connector that will need to be pressed
7. Remove the top Blower to filter coupler and set aside

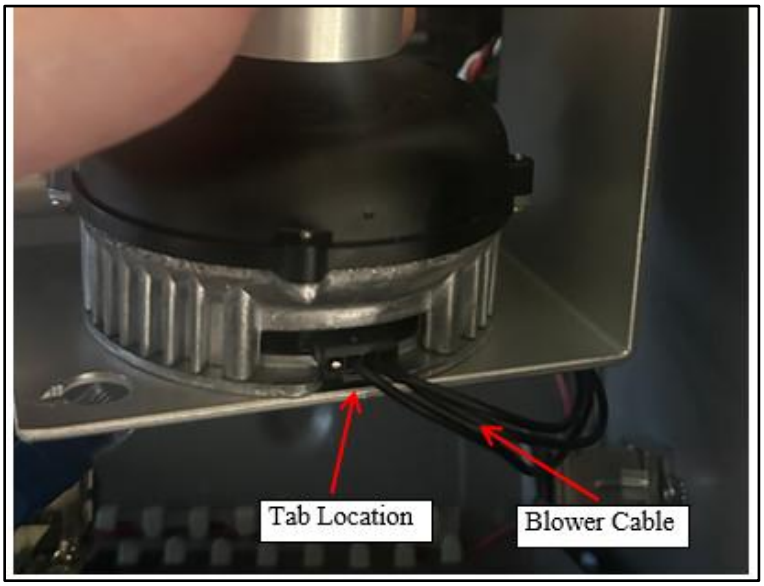


Figure 6-30 Blower Cable Disconnect

8. Remove the three screws on the bottom of the blower mount and swap out with the new blower

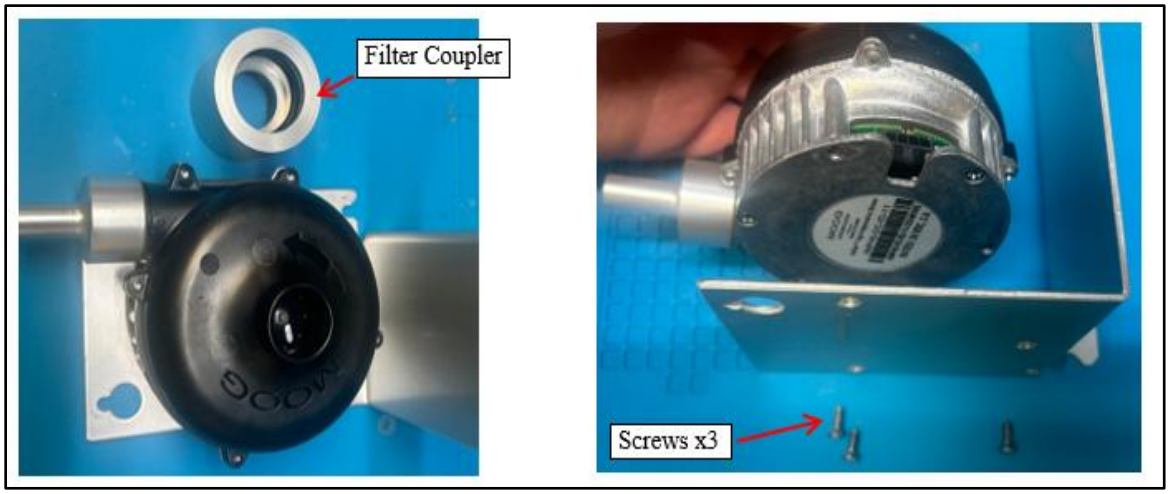


Figure 6-31 Blower Replacement

9. Attach the new blower to the blower mount and secure with the three screws

10. Place the filter coupler on the new blower

11. Place the Blower and mount back in the chassis of the OPX 1025, connect Blower to the power cable disconnected in Step 6

12. Place Blower back on threaded studs and secure into place by tightening the two 5/16” nuts

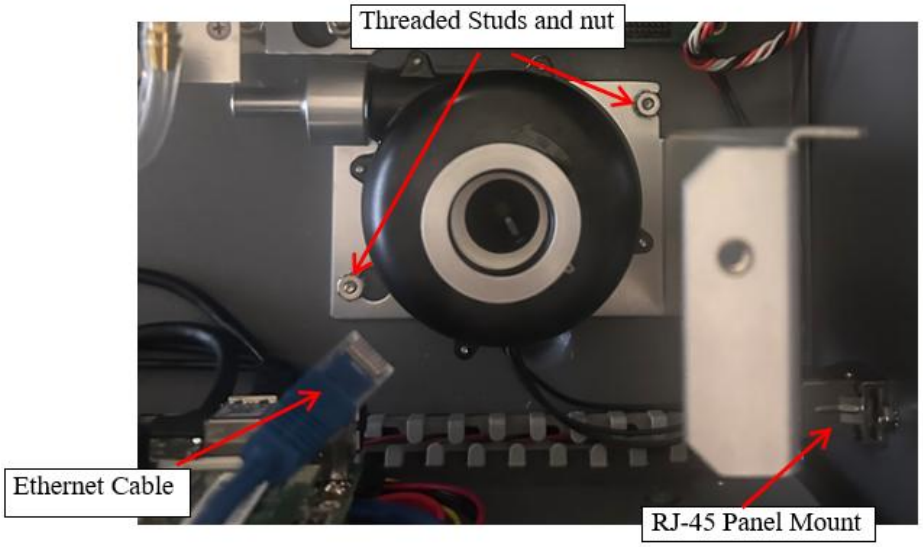


Figure 6-32 Blower Mounting

13. Connect Ethernet cable back to RJ-45 panel mount
14. Place filter and cap back on blower and secure with filter mount screw
15. Reconnect flow tubes (Optical exhaust port goes to the upper pisco fitting of the filter, connect flow T pisco fitting to the blower exhaust
16. Connect SBC RS-232 cable back to the 84190 PCBA (Connector with Silver marking goes to J11)

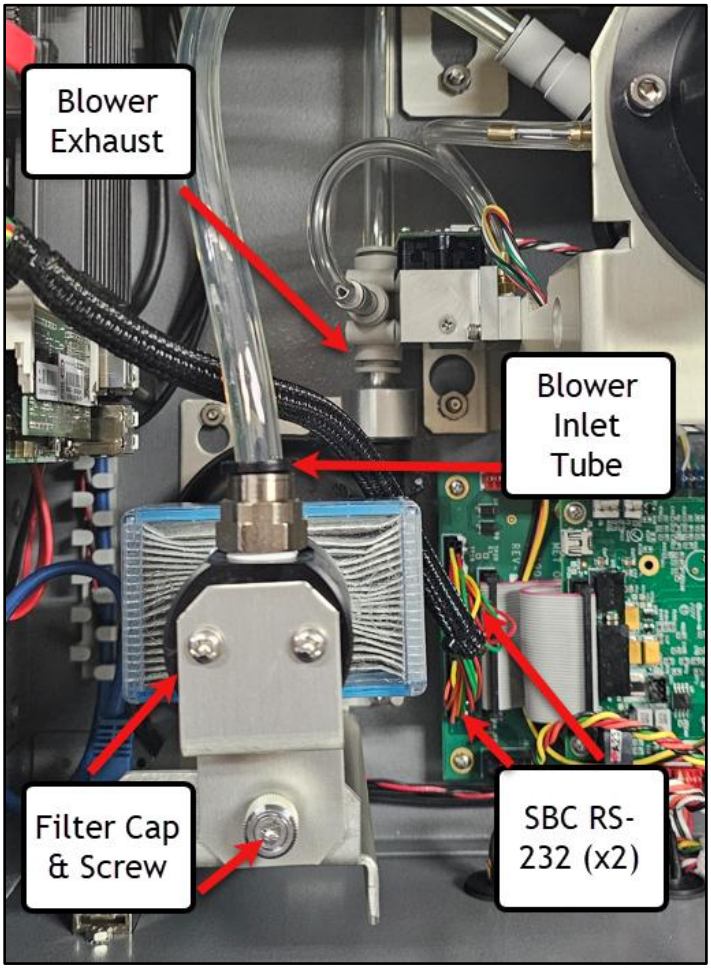


Figure 6-33 Blower Mechanical and Electrical Assembly

6.4.5 Changing Blower Filter

The Blower filter is used to keep the rotary vanes clean and is connected between the optics exhaust and the Blower (pulling a vacuum). This filter should be replaced when it looks dirty or when flow cannot regulate at 16.67 lpm.

1. Disconnect Power from the instrument
2. Remove the Sample Conditioner and top of the enclosure to get access to the Blower filter
3. Remove the tube from the pisco fitting that connects to the filter
4. Unscrew the filter cap screw
5. Pull to remove filter and filter mount adaptors

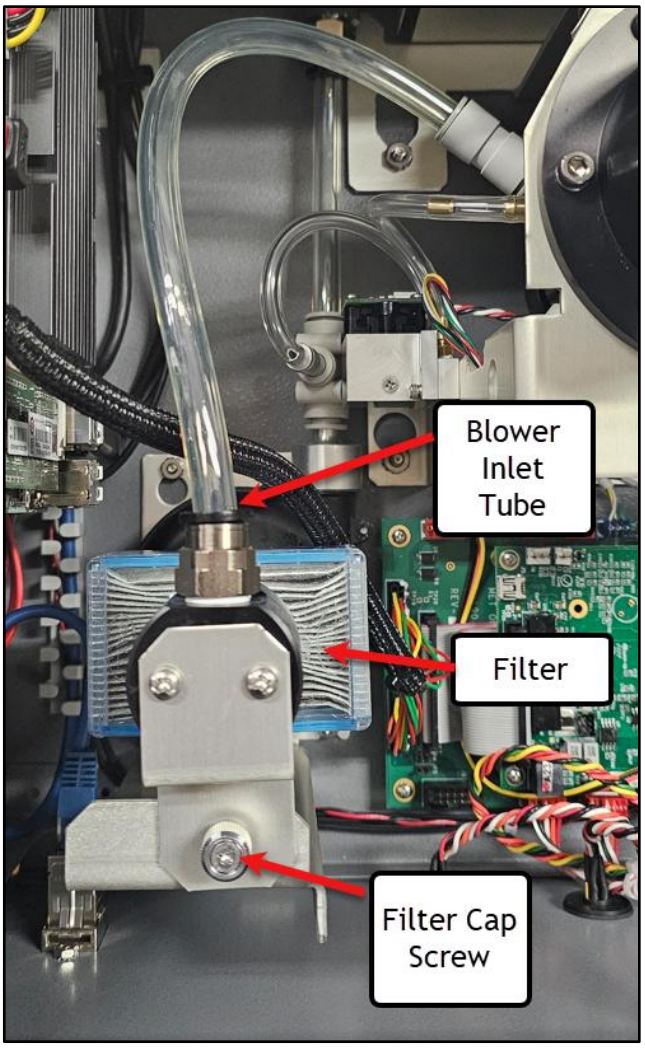


Figure 6-34 Blower Filter Replacement

6. Replace all O-Rings if they look like they have been damaged, and service as needed. The O-Rings will come with the O-Ring filter kit and the vacuum grease. With fingers (gloves optional) apply a thin full coating of vacuum grease to the O-Rings before placing in the grooves.

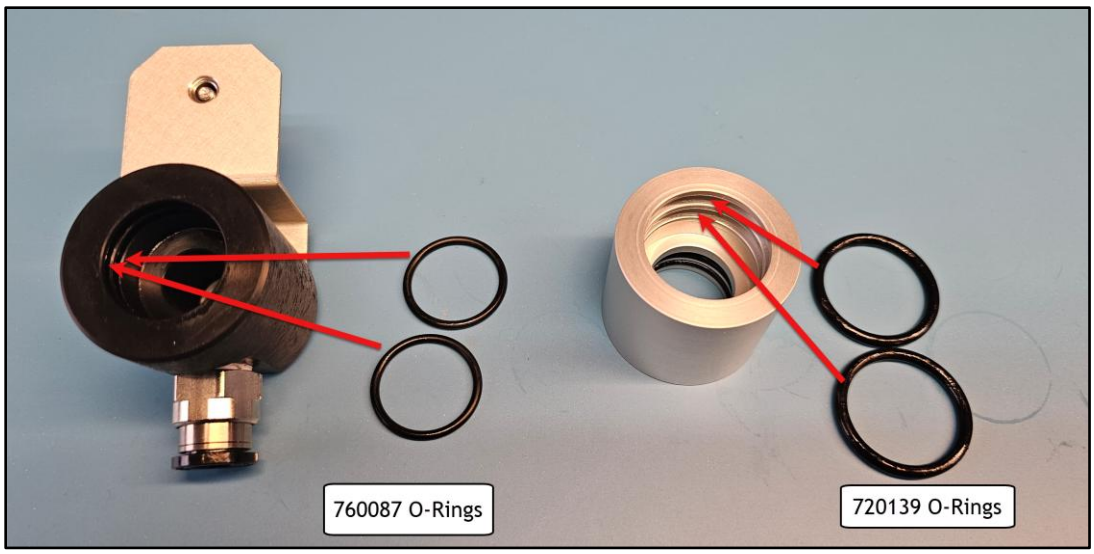


Figure 6-35 Blower Filter O-Ring Replacement

Change out filter with a new one (press filter back on the filter mount)

NOTE: The Filter has two different sized ends and is designed so the filter is always assembled in the proper orientation.

7. Press the filter assembly on the blower, screw down the filter mount and press the tube back into the pisco fitting

6.4.6 LED Replacement

The LED may need replaced if there is no LED current reported in the LED current test screen. Confirm there is a good connection on the black 4 wire cable that connects the sensor PCBA to the LED board. Follow steps below for replacement.

1. Remove power, Sample Conditioner, and top off of unit to gain access to the LED Assembly
2. Disconnect the LED Cable
3. Using a 1/16" hex wrench, loosen the 2 screws

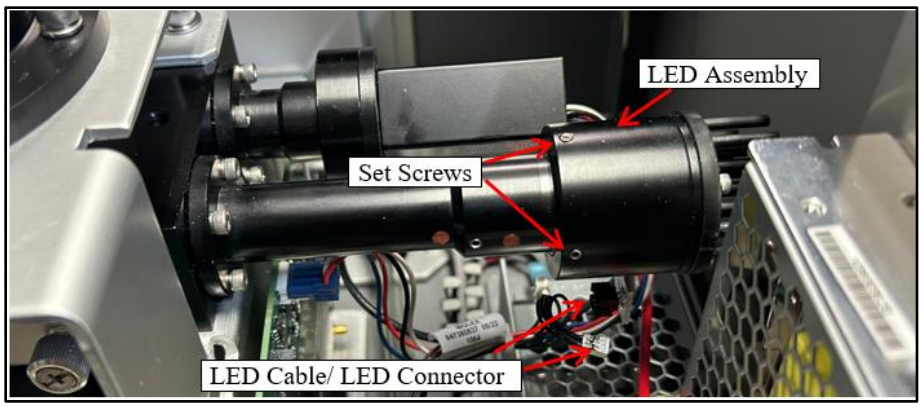


Figure 6-36 LED Assembly Removal Parts

4. Twist and remove the LED Assembly (may take a bit of force)
5. Swap with the new LED assembly, loosen up the mounting screws

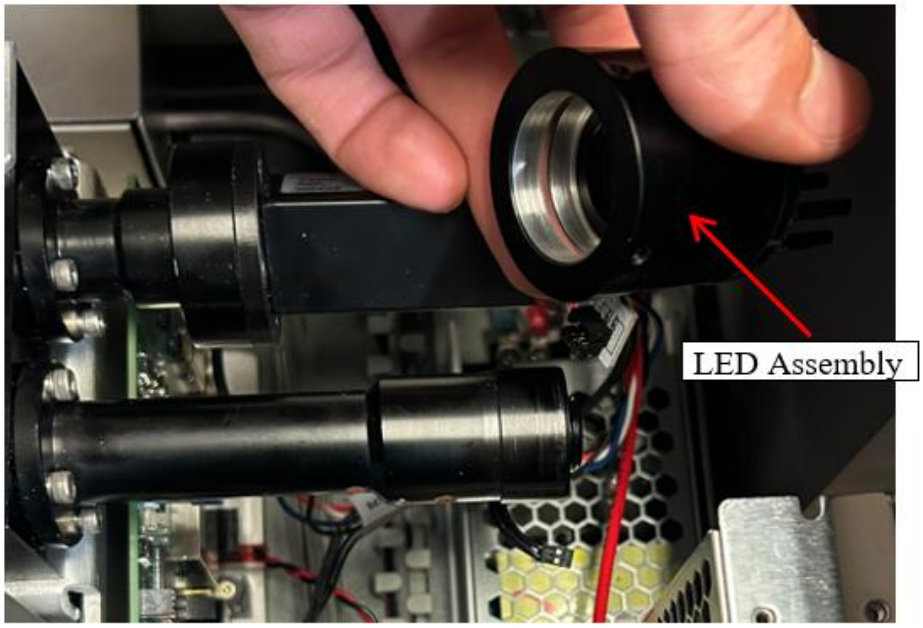


Figure 6-37 LED Assembly Removal

6. Plug in the LED Connector, the orientation is important and connector on the cable and connector on the PCBA are polarized

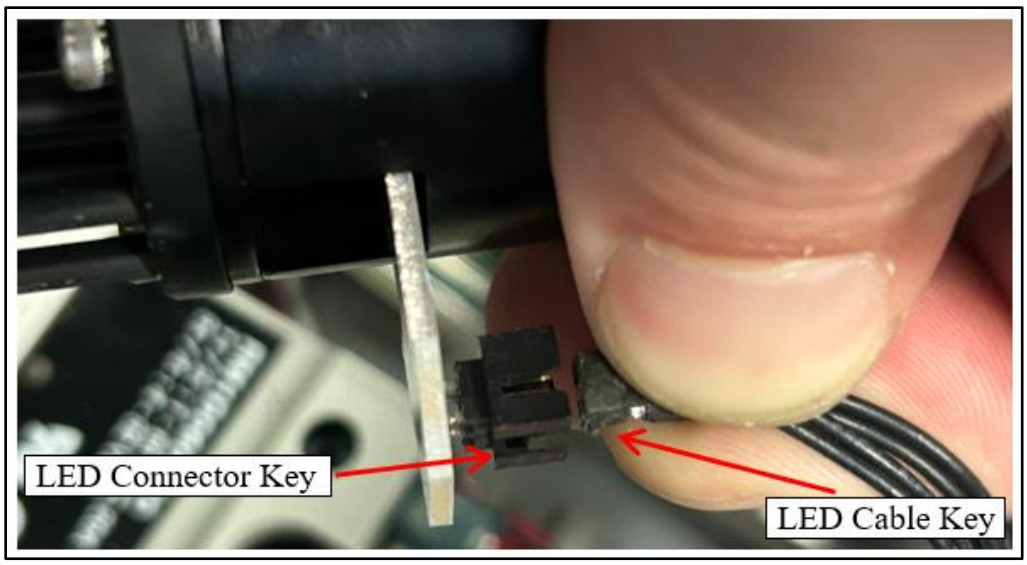


Figure 6-38 LED Cable Key Orientation

7. Slide the LED Assembly on the Optics assembly
8. Rotate so one screw is pointing to the top of the chassis and the other is pointing towards the rear panel

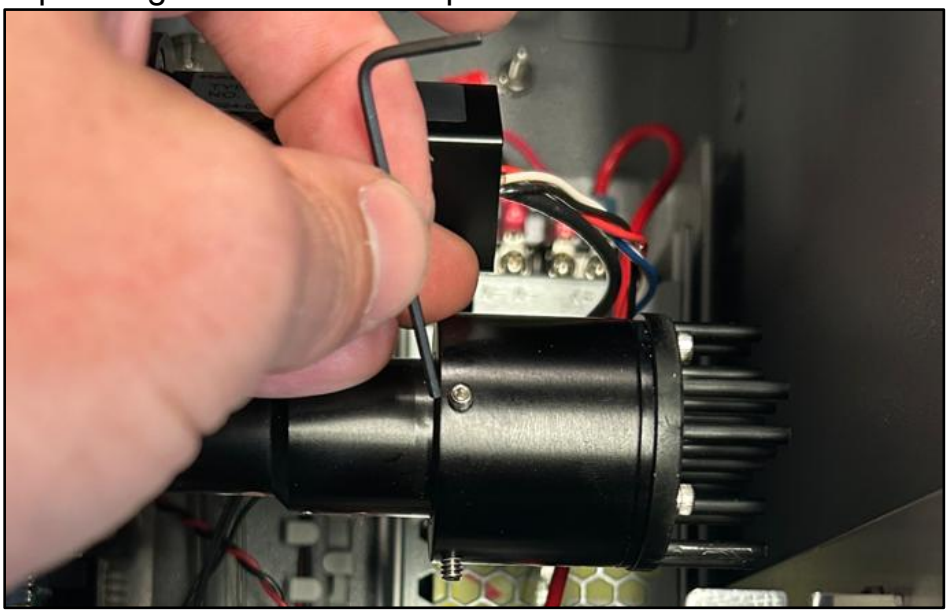


Figure 6-39 LED Assembly Position

9. Tighten down the set screws
10. Install the top of the enclosure , power up unit
11. Confirm the LED Temperature (shown on home page) and LED Current (Lamp Test) are nominal

6.4.7 Fan Replacement

The fan should be replaced if it stops working. The fan will only turns on when the box temperature exceeds a temperature threshold of 20°C, or a calculated dew point limit has been detected in the software. Confirm the fan is working by feeling air exiting the rear panel where the fan is mounted.

1. Disconnect power from the instrument.
2. Remove the Sample Conditioner and top of the enclosure .
3. Pull Exhaust tube for easy access to the fan.
4. Remove back panel (4x screws), lay down as shown in figure 6-40.

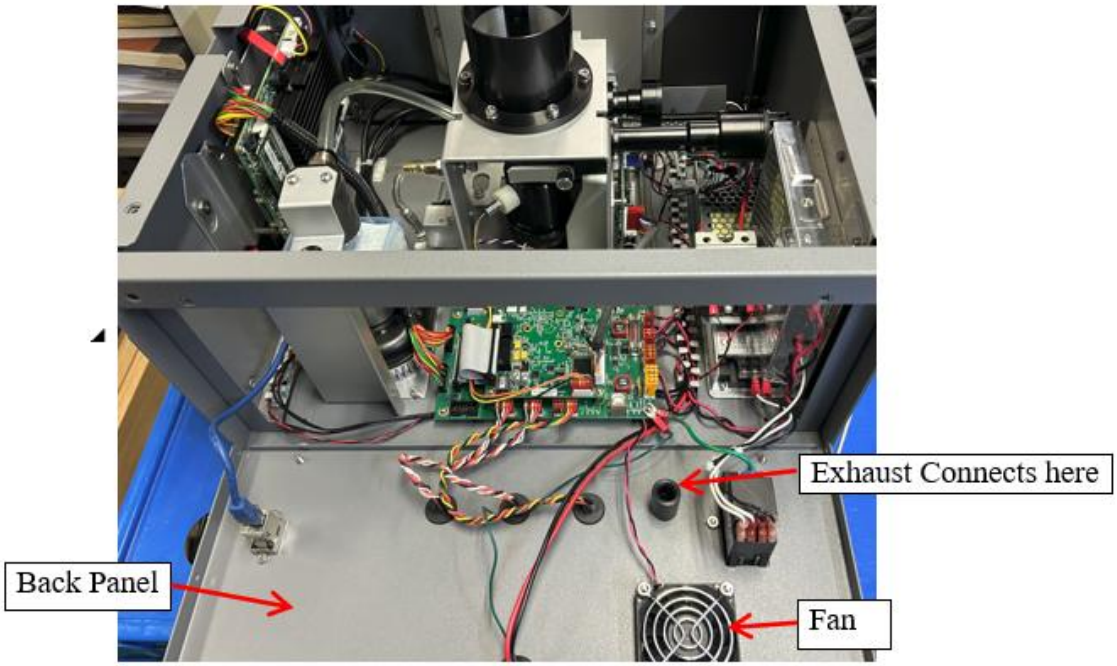


Figure 6-40 Opened Back Panel For Fan Replacement

5. Disconnect Fan Connector (J21 on 84190 PCBA).
6. Remove 4 screws mounting 84190 Board Stack to Chassis (The Fan wire runs under the PCBA).

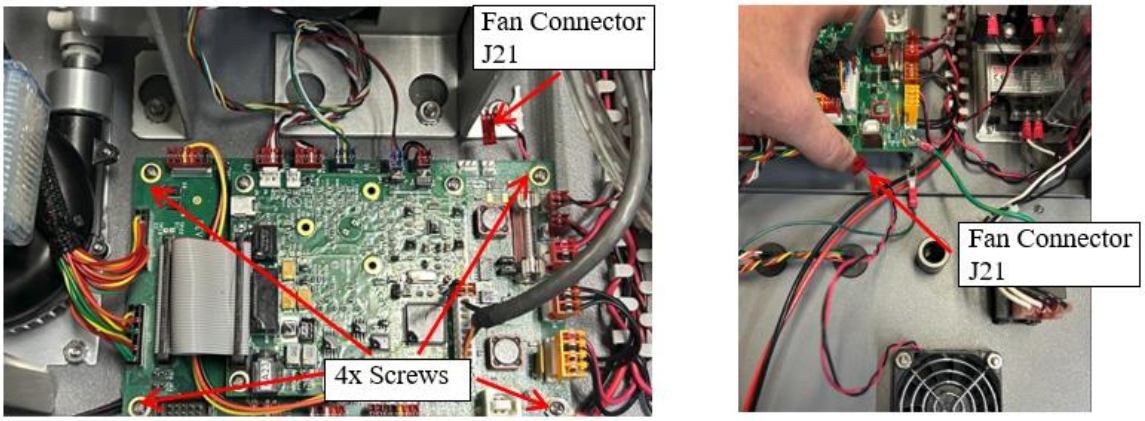


Figure 6-41 Fan Connector Removal

7. Pull the fan wire out from under the 84190 PCBA.
8. Remove 4 screw and 4 nuts securing the fan to the rear panel.

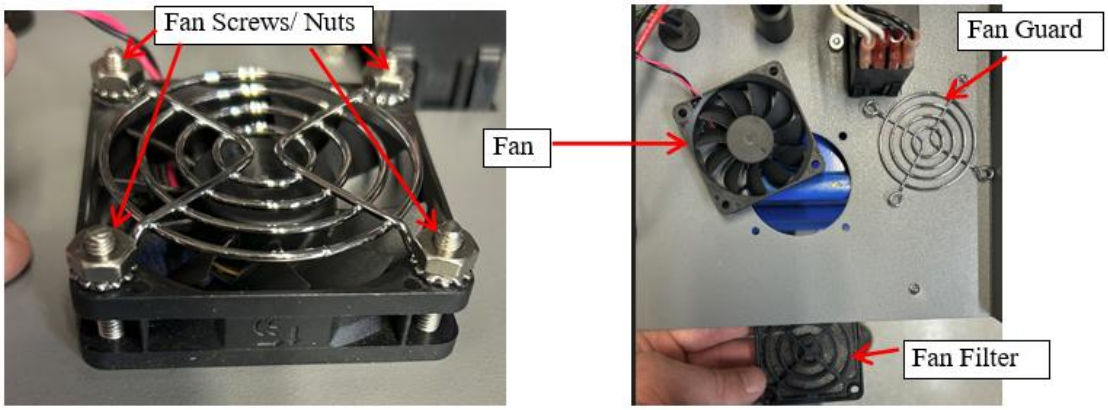


Figure 6-42 Fan Removal

9. Replace with new fan; put the fan filter on the outside of the instrument with the fan and fan guard on the inside. If needed blow off any dust or debris from the filter before reassembly with canned air.
10. Feed fan wire under the 84190 PCBA and plug in to J21.

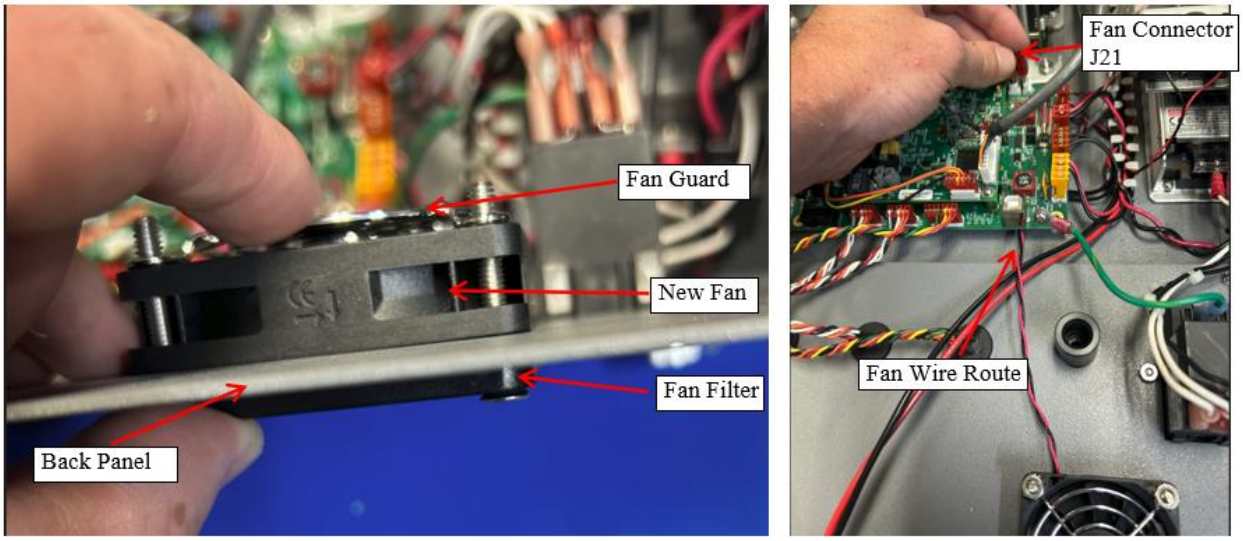


Figure 6-43 Fan Assembly

11. Secure the 84190 PCBA to the chassis (watch for wires and don't forget the Chassis Ground connections).
12. Double check connections and look for pinched wires.
13. Secure the back panel on the unit using the 4 screws.
14. Reconnect the exhaust tube to the port on the rear panel.
15. Install the top of the enclosure, apply power and confirm fan operations.

NOTE: The fan needs to meet the Box Temperature or dewpoint requirement to turn on.

6.4.8 Coin Cell Replacement

The coin cell should be replaced when the instrument is no longer tracking time correctly when powered off. This will only be apparent when it is not connected to a network or not referencing a time database.

1. Remove power to avoid electrical shock.
2. Remove the Sample Conditioner and top of the enclosure to gain access to the Single Board Computer.
3. Remove the following connections:

5. HDMI, Display USB Power, USB – Type C, USB to Type A, Power from the Single board computer
6. The optical exhaust tube, if needed

7. Ethernet RJ45 connector
8. SBC Power
9. RS-232 COMs from 84190 PCBA (Note where the silver marked Connector goes to 84190 J11)

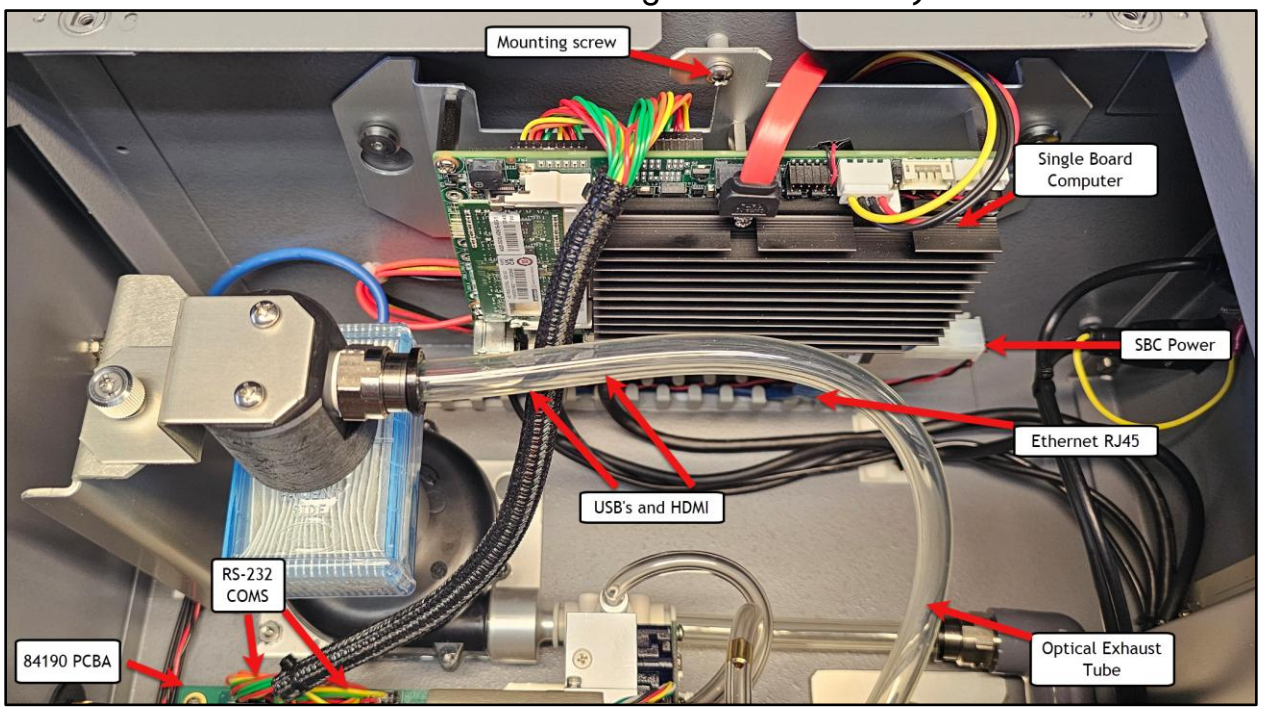


Figure 6-44 SBC Removal of Connections

4. Remove the single board computer from the chassis (slide toward the top of the instrument to disengage the button tabs).
5. Gently remove the battery from the SBC as it is adhered with a double sided adhesive strip. Avoid using metal tools with removal to prevent scratching or damaging the SBC.
6. Gently disconnect coin cell battery from SBC.

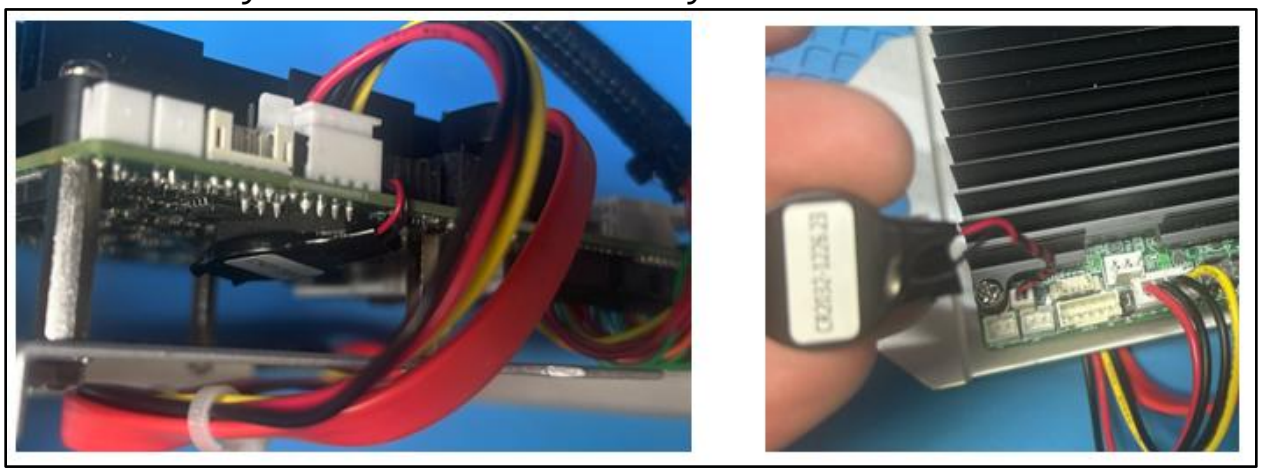


Figure 6-45 Coin Cell Removal

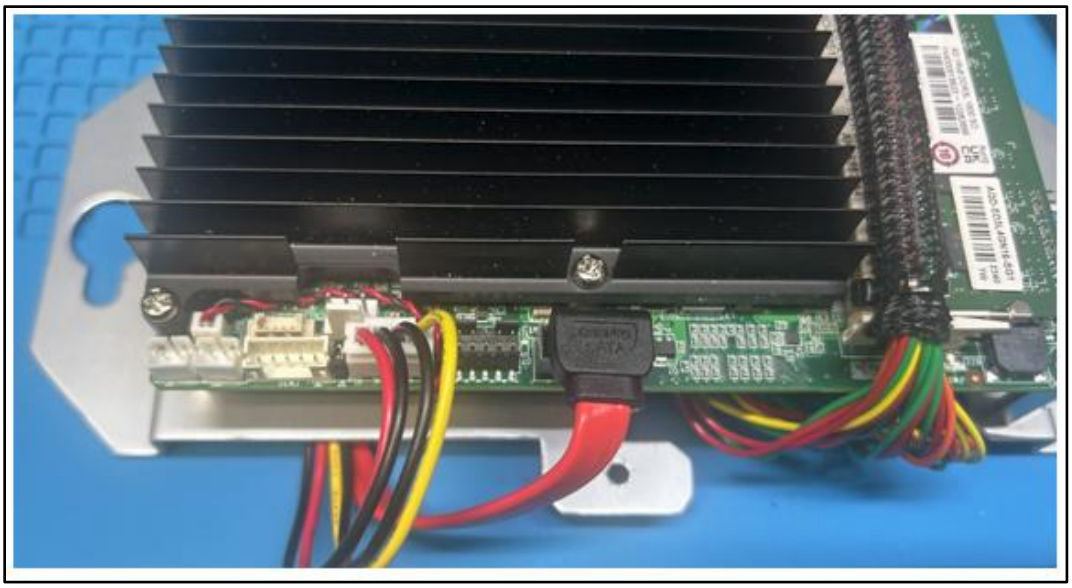


Figure 6-46 Coin Cell Assembly

7. Connect and route the coin cell replacement to the SBC with the adhesive strip supplied with the new battery. Adhere the new battery in the same location the original was placed.
8. Place SBC back inside of the chassis and wire USB connections as shown below (SBC is rotated 90 degrees for easy connections).

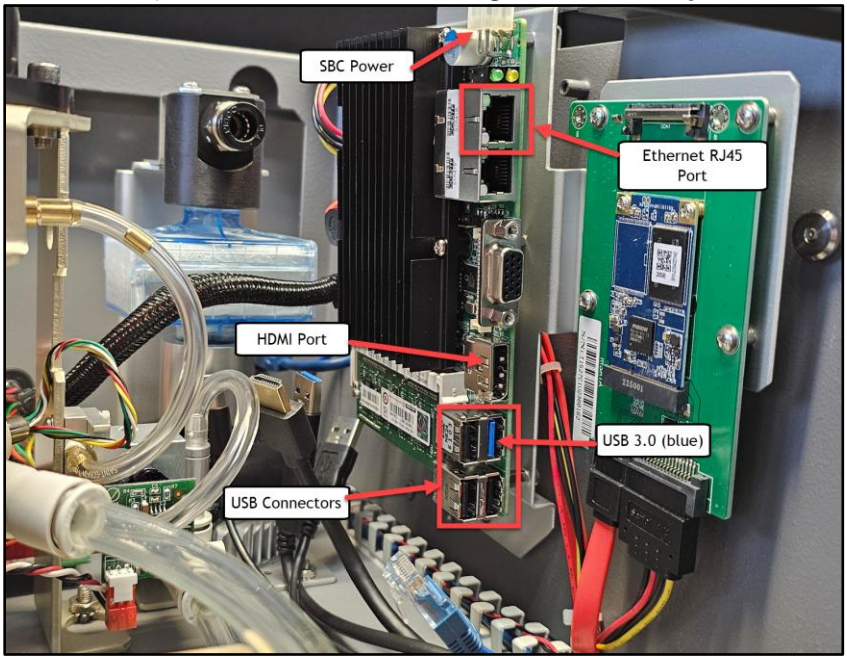


Figure 6-47 SBC Connections & Assembly

9. Place SBC on button tabs, connect Ethernet RJ45 to SBC.

10. Connect power to SBC.
11. Connect RS-232 from the SBC back to the 84190 PCBA (Silver marked connector needs to go to J11).
12. Fasten down SBC chassis screw using a Phillips screwdriver.
13. Connect the optical exhaust tube if it was disconnected.
14. Place top of the enclosure back on the instrument and apply power, confirm proper operations .

6.4.9 Optical Sensor Replacement

The optical sensor should be replaced if the optical lenses have been damaged beyond repair. The sensor will come pre-calibrated for particle measurements. Service may be able to rebuild the current sensor to its standard specifications.

1. Disconnect Power from the instrument
2. Remove the Sample Conditioner and top of the enclosure for access to the Optical sensor
3. Remove Optics exhaust tube and purge air tube.

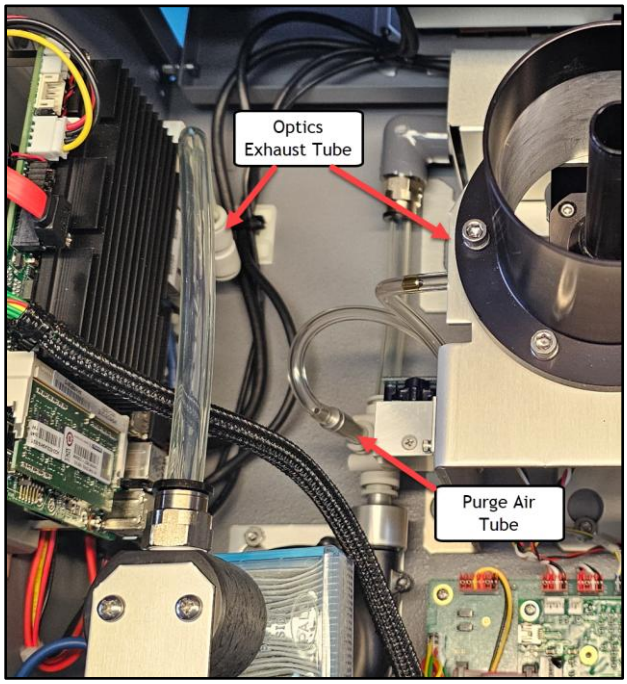


Figure 6-48 Purge and Optical Exhaust Tube

4. Remove the following cables that attach to the 84190 PCBA and 84200 PCBA 84190 (J15 “Purge Flow”, J12 “AT”, J13 “RH”, J3 “Sensor Power”) and 84200 (J8 “SPI COM”)

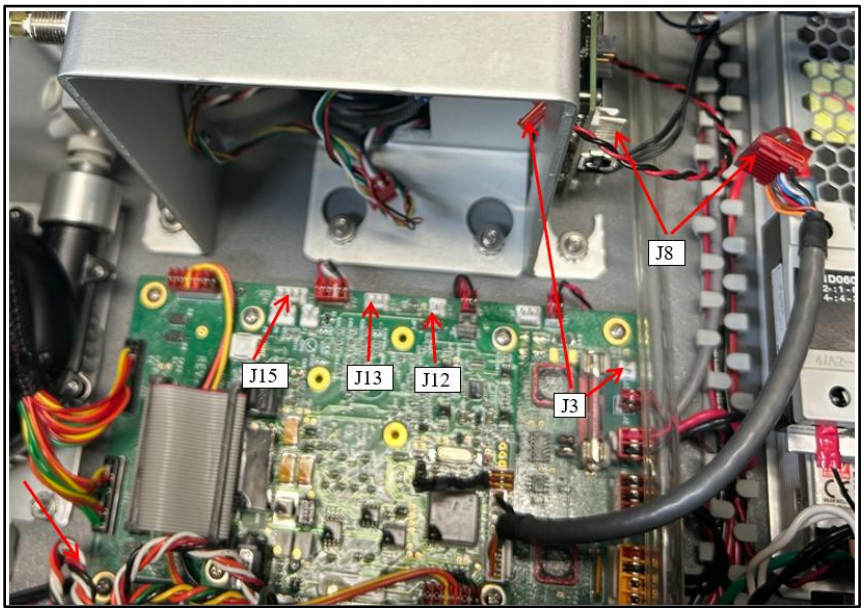


Figure 6-49 Cables

5. Loosen the six 3/8” nuts that secure the sensor to the chassis
6. Slide Sensor toward the back panel and remove the Optical sensor

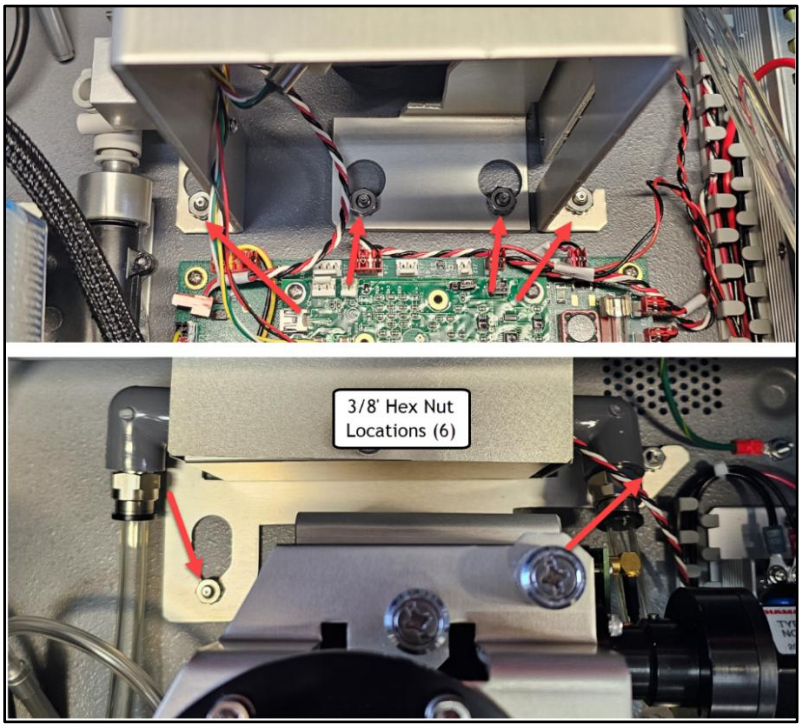


Figure 6-50 Hex Nut Locations

7. Disconnect the power cable from the 84200 sensor PCBA (connected to J4) and set aside as this will go on the new sensor board

8. Remove the RH/AT sensor, keep clean from debris and oils, set aside as this will go on the new optical sensor assembly. See section 6.4.3.3 Clean optical chamber (3 parts: Top, Middle and Bottom) for the procedure.

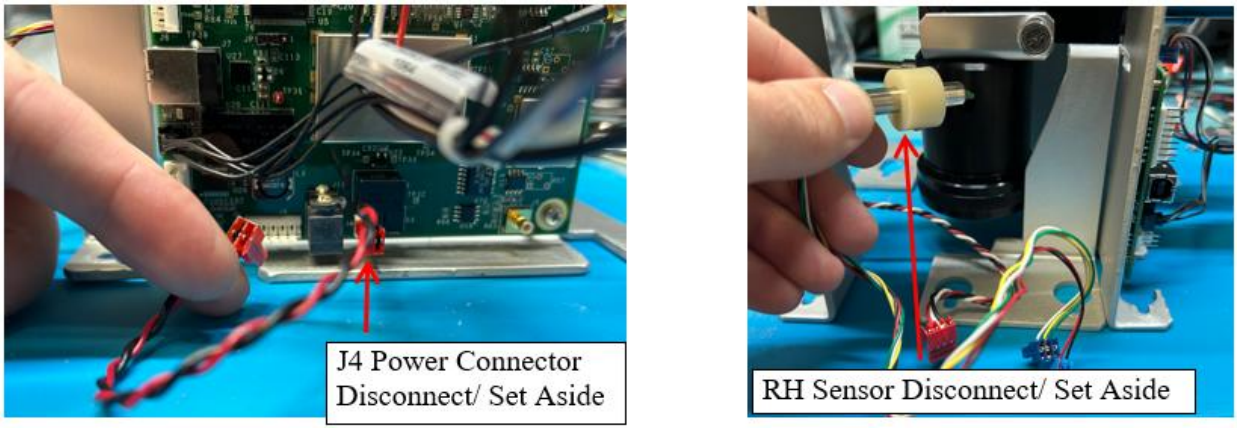


Figure 6-51 J4 Power Connector/RH Sensor Disconnect

9. Connect power cable to the new Optical Sensor on J4

10. Put RH/AT sensor in the bottom cup on the new Optical Sensor; align the hex bolt so it is facing downwards

11. Slide the sensor under the 6 nuts and tighten them down

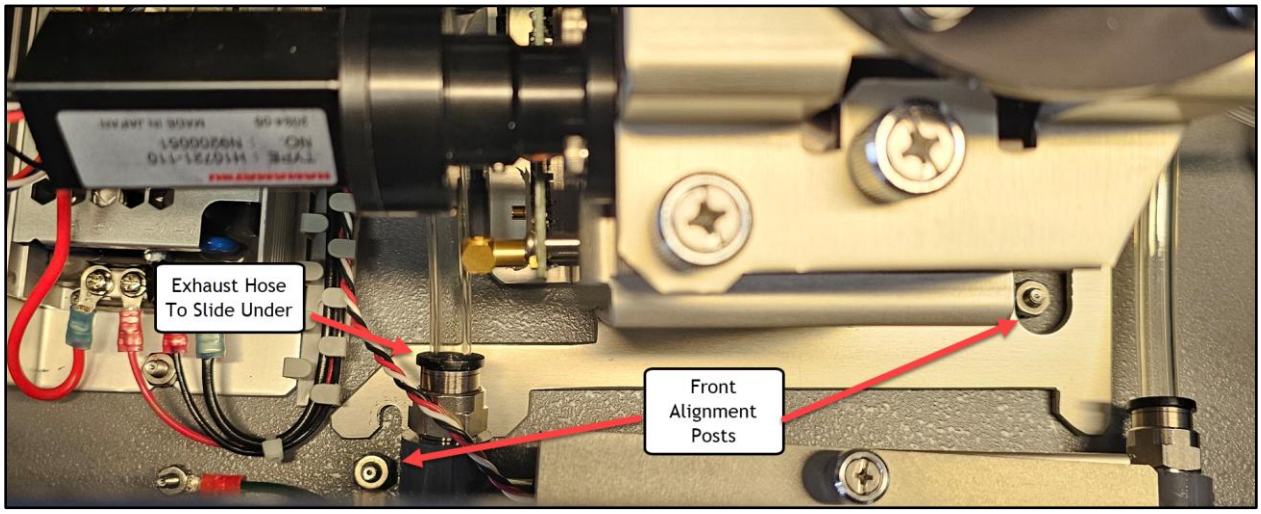


Figure 6-52 Optical Sensor Orientation

12. Connect all wires that were previously removed in Step 4

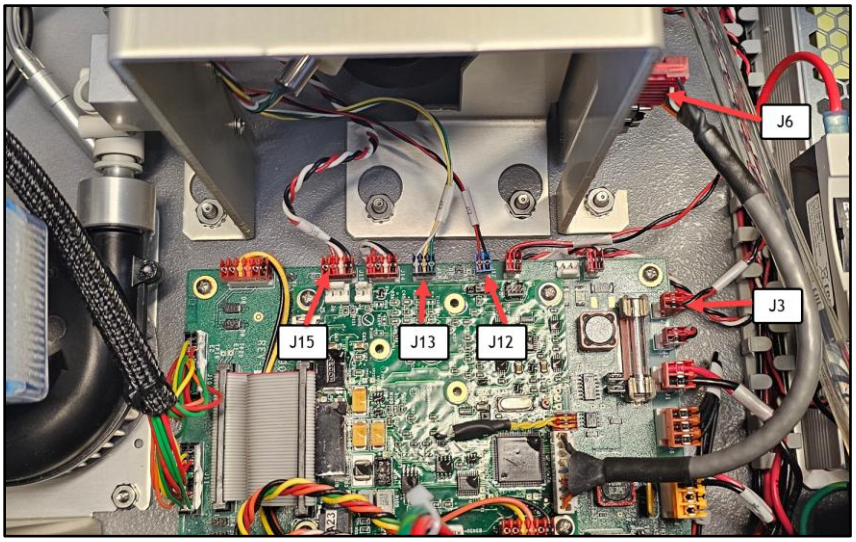


Figure 6-53 Cable Connections

13. Reconnect the Optical exhaust and Blower Exhaust tubes

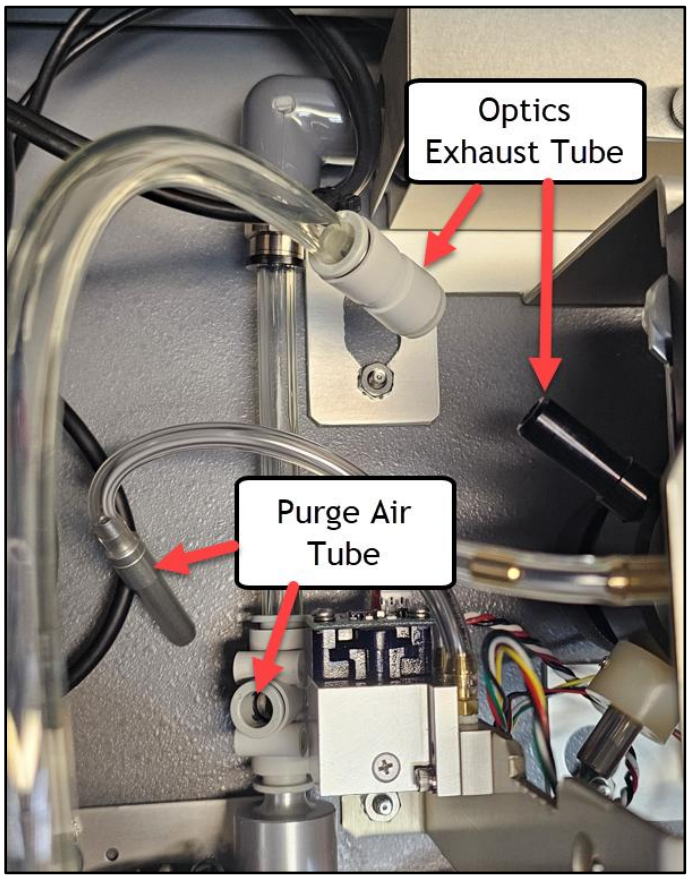


Figure 6-54 Optical Exhaust/Blower Exhaust

14. Inspect all connections
15. Put the top of the enclosure and Sample Conditioner on, and check the instrument for proper operation

NOTE: It is recommended that a full Flow audit is performed, then proceed to a SigmaDust check.

6.4.10 Replacing Flow Sensor

The flow sensor is used to monitor the flow to maintain 16.67 LPM. If the flow sensor requires increasingly frequent flow audits, or does not maintain a stable flow rate, then it is recommended to replace. The steps below will show how to replace the flow sensor.

1. Remove the inlet tube, Sample Conditioner and the top panel, and .open front panel to facilitate access to the flow sensor

2. Loosen the PEM screw until it pops up, then remove the shield.

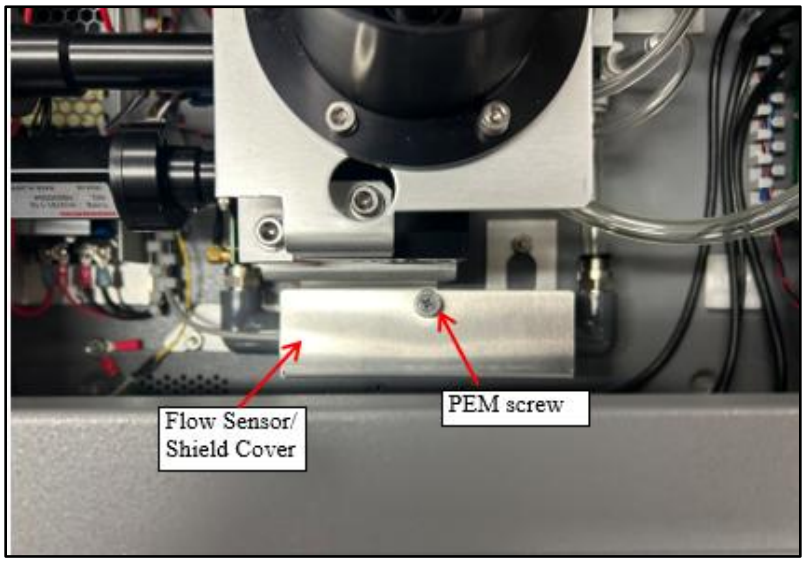


Figure 6-55 Flow Sensor Access

3. Remove Tygon tube from flow sensor pisco fittings.

NOTE: It is recommended to remove the Tygon tubing from the end opposite the flow sensor. This helps ease the process when disconnecting the tubing from the flow sensor.

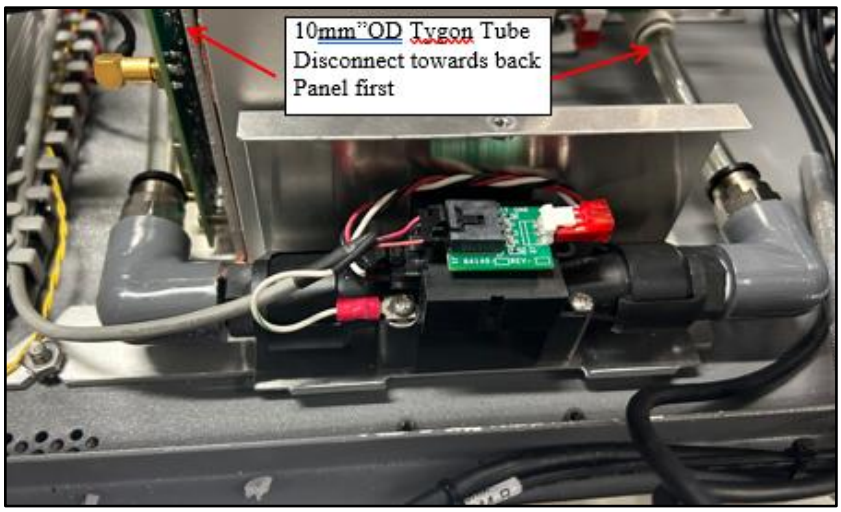


Figure 6-56 Tube Disconnects

4. Remove screws securing the flow sensor.

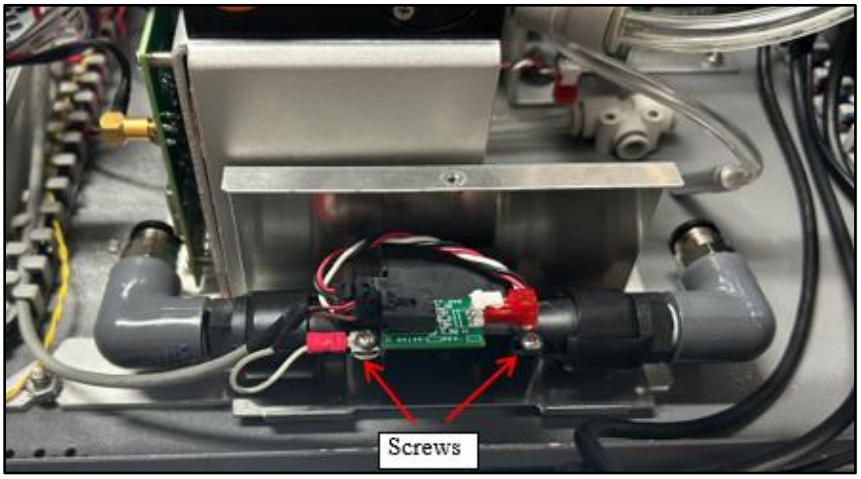


Figure 6-57 Flow Sensor Screws Removal

5. Disconnect the flow sensor cable from the filter board and shield lug from the mounting screw.

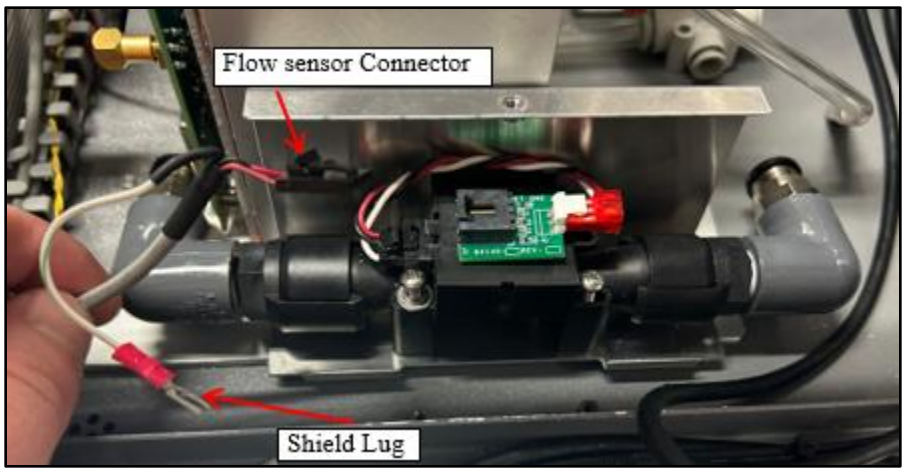


Figure 6-58 Flow Sensor removal

6. Replace the Flow sensor with the new one.

7. Place the new flow sensor in the proper orientation.

NOTE: There is an arrow on the bottom of the sensor showing the flow direction; the arrow should be pointing as shown in picture below.

8. Tighten the two screws to secure the flow sensor in place.

NOTE: Make sure the flow sensor is not interfering with the PCB on the left, this is done by sliding the sensor all the way to the left (towards the exhaust)

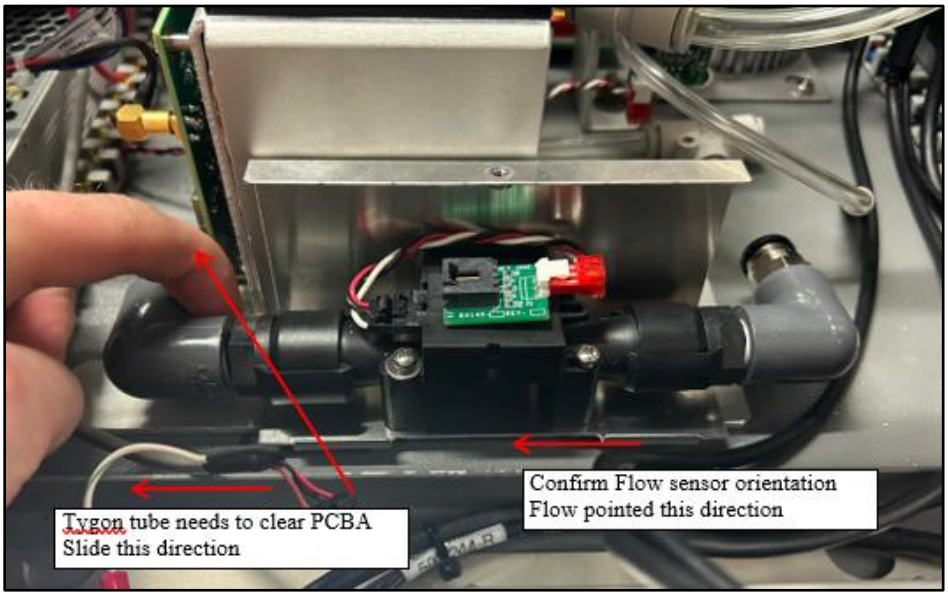


Figure 6-59 Flow Sensor Assembly

9. Attach the flow sensor cable to the new flow sensor filter PCBA. Attach the shield lug to the screw, then secure the flow sensor (maintain the clearance for the flow tube).

10. Put the shield cover back on, make sure the flow sensor cable goes in the cable slot so it does not get pinched.

11. Secure the shield by tightening the PEM screw.

12. Reconnect the 10mm Tygon tubes back to the flow sensor and connections towards the back panel.

13. Test the flow is working properly and perform a flow calibration.

6.4.11 RH/AT Sensor Replacement

The RH sensor should be replaced if the Filter RH or Filter AT no longer read consistently within +/-5% or the instrument generates a range warning that cannot be resolved after troubleshooting and cleaning maintenance. It is recommended this is replaced for accurate data (the RH/AT sensor controls when the Sample Conditioner turns on and off).

1. Remove Power to avoid electrical shock.

2. Remove the Sample Conditioner and top of the enclosure to get access to the RH / AT Sensor.

3. Disconnect RH Sense (J13), AT Sense (J12), and sensor from optical cup (simply pull the sensor away from the cup).

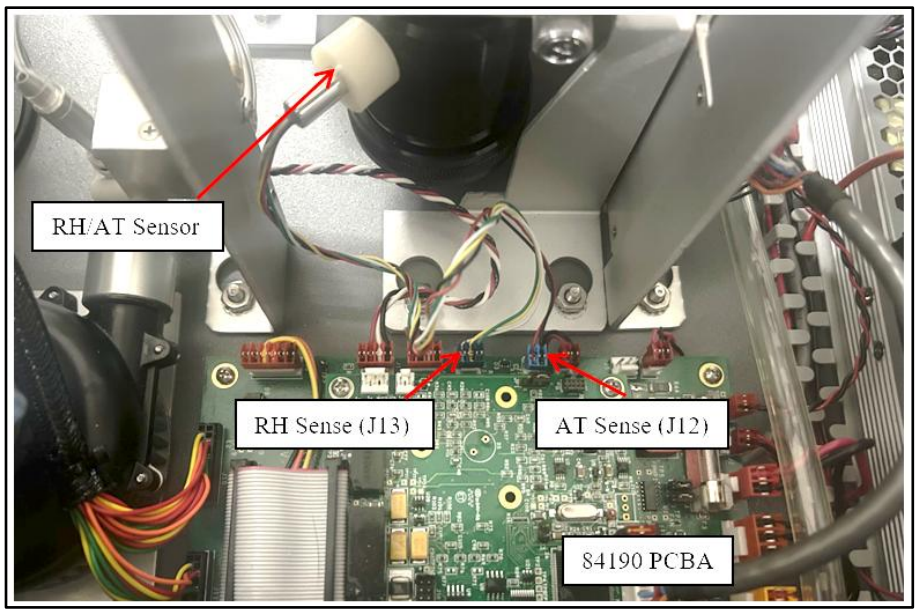


Figure 6-60 Filter RH AT Sensor Removal

4. Place new sensor in sensor housing so the hex key is pointed down towards the bottom of the chassis.

5. Connect RH Sense (J13, 3 pin connector) and AT Sense (J12, 2 pin connector).

6. Put the enclosure lid back on and apply power. Confirm the AT and RH sensor is working properly.

6.4.12 Sample Conditioner and Slip Coupler O-Ring Replacement

The Sample Conditioner and Slip coupler O-rings should be replaced when the O-rings look damaged or cracked. Follow the steps below for changing the coupler O-rings. When removing the O-rings a small flat head screwdriver or pick set is recommended. Take care to avoid scratching or gouging the O-ring groove.

1. Remove the Sample Conditioner and slip coupler from the OPX 1025 and inlet tube.
2. Slide the slip coupler off the lower inlet (connects to the top of the Sample Conditioner).
3. Remove the smaller inlet tube from the Sample Conditioner and set aside.

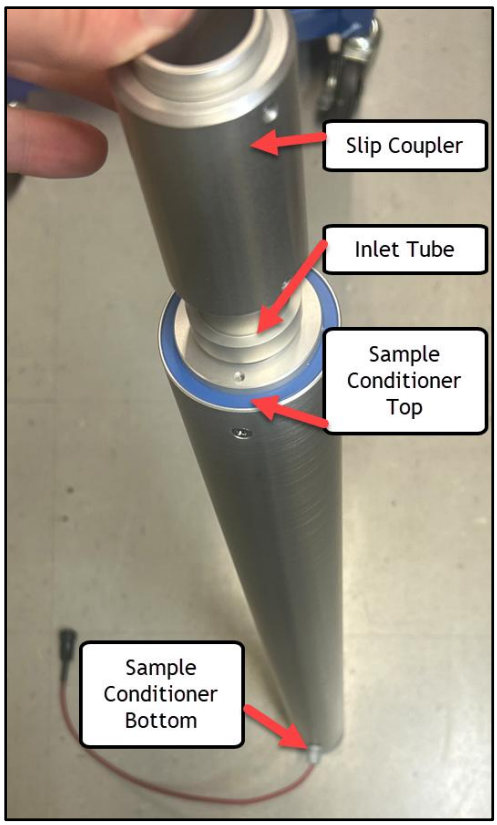


Figure 6-61 Sample Conditioner and Slip Coupler

4. Remove the four O-Rings from the Slip Coupler.
5. Remove the two O-Rings at the top of the Sample Conditioner.
6. Remove the two O-Rings at the bottom of the Sample Conditioner.

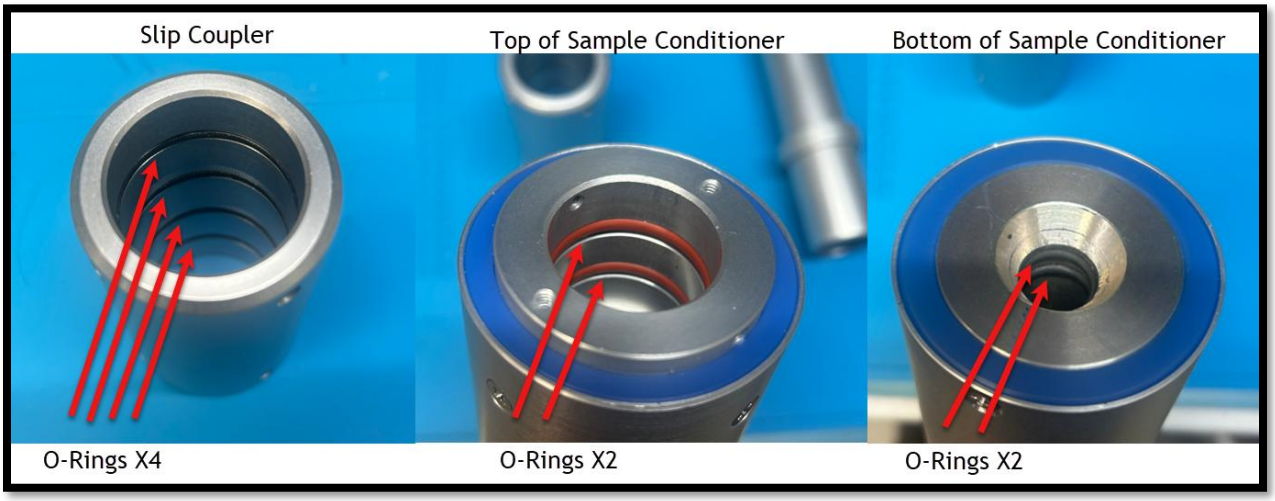


Figure 6-62 Slip Coupler and Sample Conditioner O-Ring Location

7. With fingers (gloves optional) apply a thin full coating of Vac Grease (supplied with the O-rings) directly to the O-rings before placing them in the grooves.
8. Place the O-rings in the corresponding groove for the slip coupler (x4), the top of the Sample Conditioner (x2), and the bottom of the Sample Conditioner (x2)
9. Reassemble the Sample Conditioner and coupler in to place

6.4.12.1 OPX 1025 Flow System

The flow control system is a critical component of the OPX 1025 measurement. Below is a simplified diagram to assist in understanding this system.

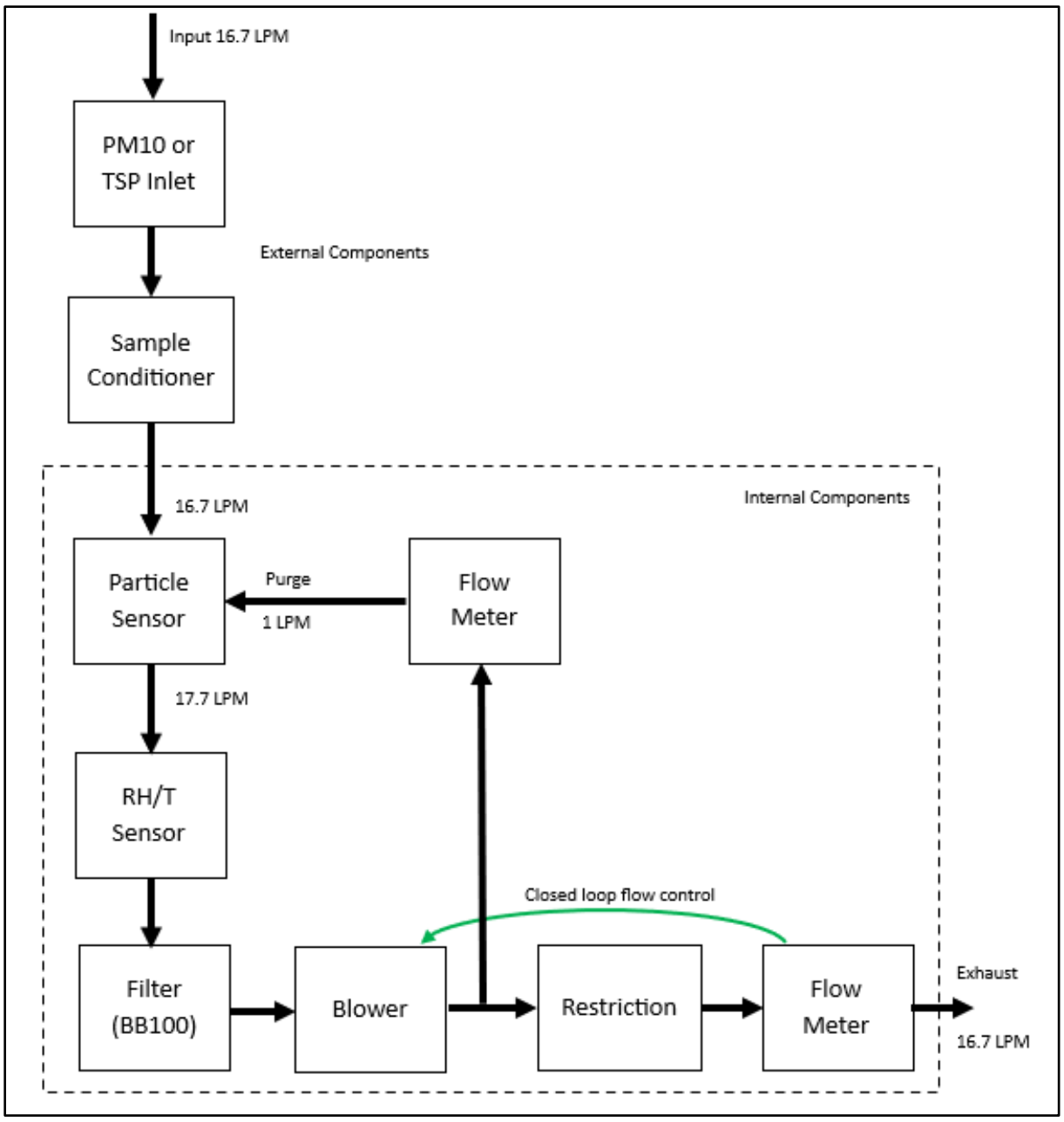


Figure 6-63 OPX 1025 Flow System Diagram

The following flow control descriptions refer to the flow system shown in **Figure 6-63.**

Airflow Path:

1. Ambient air is drawn into the instrument at 16.67 LPM through a BX-802 PM_{10} or TSP sampling inlet, through a down tube and the Sample Conditioner before entering the OPX 1025 sensor.
2. From the sensor, air is filtered ahead of the Blower to protect it as well as the flow meter.

3. The Blower is controlled via a feedback loop from the main flow sensor.

4. The Sheath/Purge flow is split off the exhaust from the blower and returns to the sensor where it runs along the outside of the sample air nozzle to prevent particulate matter from deviating from the sample stream and depositing on the optics.

6.4.12.2 Leak Check

The OPX 1025 flow contains an easy to maintain flow system (see **Section 6.4.12.1 OPX 1025 Flow System**). To perform a leak test, remove the inlet sampling head and replace with the Zero Count Filter (84316). Navigate to the TEST MENU > LEAK TEST menu. The FLOW value is the output from the internal flow sensor.

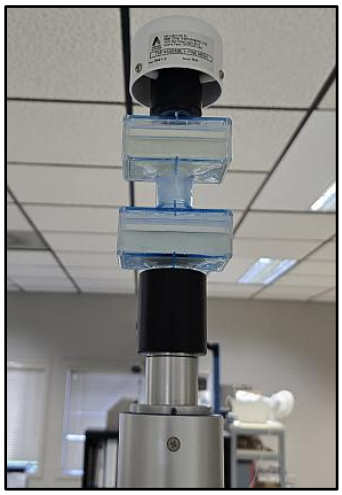


Figure 6-64 Leak Check Zero Count Filter

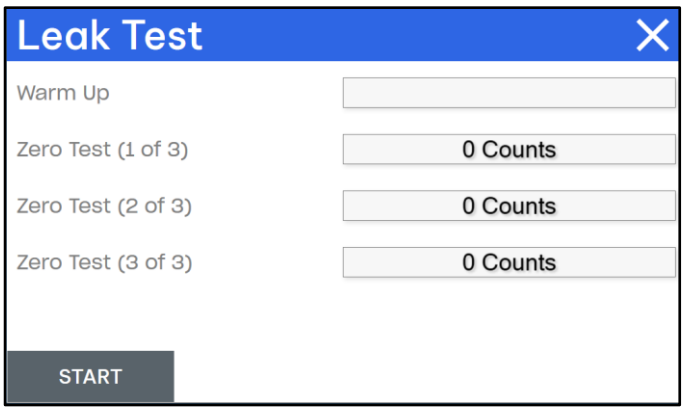


Figure 6-65 Leak Test Main

Press START to start the leak test.

A reminder to install the Zero Count Filter will be presented. After acknowledging the reminder prompt, the blower will turn on and the unit will enter Warm Up.

Up to 3 Zero Count tests will be performed, until a full 1-minute test passes with zero counts. A successful test will result in a PASSED Test Result (see **Figure 6-66).** Select the X in the upper right of the screen to exit or select START to restart the Leak Test.

A Leak Test can fail if the Sample Conditioner is not correctly seated on the inlet, if the Zero Count Filter assembly is not correctly seated in the Sample Conditioner, or if there are leaks in any of the inlet tubing, allowing particles to enter the system during the test.

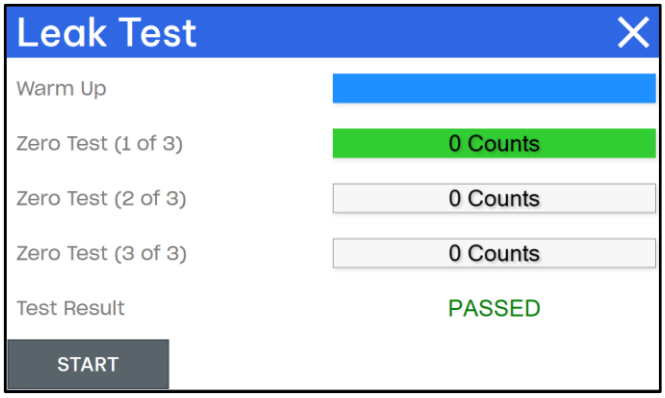


Figure 6-66 Successful Leak Test

Reconnect the inlet sampling head and resume sampling operations, or other maintenance, as required.

6.4.12.3 Flow Verification

To perform a flow verification test (or Flow Audit), follow the flow calibration steps in **Section 7.2 Flow Sensor Field Calibration** below without making any changes to flow settings. See **Section 7.2.1 Audit-Only Flow Checks**.

NOTE: Perform a leak check and verify the temperature and pressure sensors before performing a flow verification or calibration, as these systems can affect the flow.

7. CALIBRATION PROCEDURES

NOTE: Before performing any calibrations, be sure the instrument has completed the warmup period, see **Section 5.6.2** for warmup information.

The OPX 1025 has a system of calibration menus which allow the operator to audit or calibrate various system parameters for optimal performance. It is recommended that airflow control parameters (AT, BP, FLOW) be audited monthly and calibrated as necessary during continuous operation. The exact frequency may vary depending on local conditions and the data validation requirements established by the sampling program administrator.

To perform any calibrations, a standard or reference device such as Met One's SWIFT 25.0 is needed.

The OPX 1025 temperature and pressure calibrations should always be checked before a flow calibration is performed, since the flow calculation is dependent on these parameters. The model BX-597A ambient AT/BP/RH combination sensor must be fully functional and properly connected.

CALIBRATION MENU location: Navigation Bar.

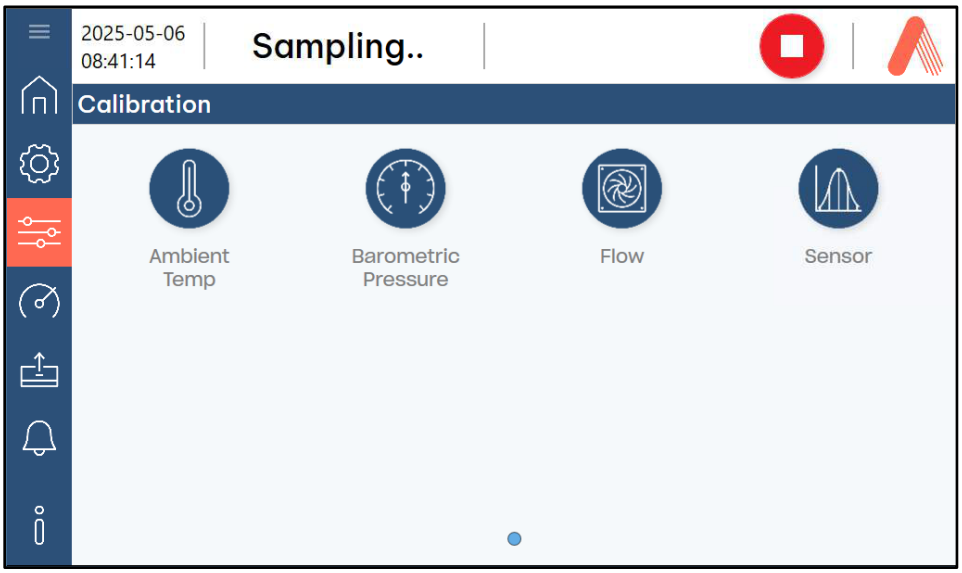


Figure 7-1 Calibration Menu

If the system password is set, it will need to be entered to access the CALIBRATION menu (see **Section 4.1.7**).

7.1 BX-597A Digital Ambient Sensor Field Calibration

The subsections below provide instruction on how to perform a field calibration for the BX-597A digital combo sensor. The BX-597A provides ambient temperature, pressure, and relative humidity readings. Only temperature and pressure can be field calibrated. The sensor will need to be sent to the Met One service team for a humidity calibration. When calibrating in the field, co-locate the reference device and allow ample time for the unit to equilibrate temperature.

NOTE: The DEFAULT button can be pressed to reset all previous field calibrations. If difficulty is encountered during calibration, select the DEFAULT button and perform the calibration again.

7.1.1 Temperature Calibration

AT Calibration screen location: Navigation Bar>Calibration>Ambient Temp.

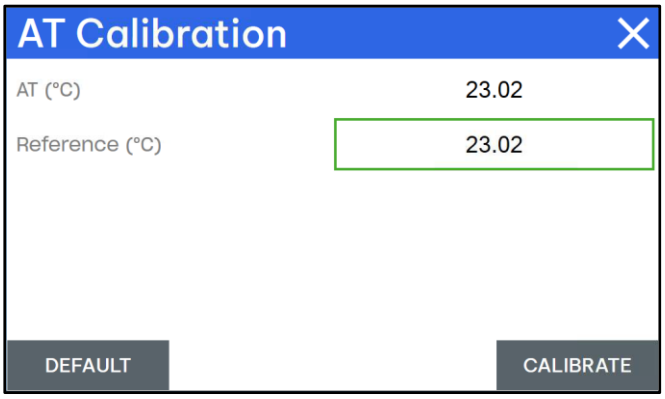


Figure 7-2 AT Calibration Main Screen

The AT parameter is the current reading from the BX-597A temperature sensor. The Reference field box, outlined in green, is where the correct value from the traceable temperature standard should be entered, if necessary.

To enter a correction value, press on the green outlined box next to Reference.

To correct the AT reading, enter the value shown on the reference sensor using the numeric keypad and then press OK to return to the AT Calibration screen (**Figure 7-2**). Press the CALIBRATE button in the bottom right corner. The AT value should change to match the Reference value when CALIBRATE is pressed.

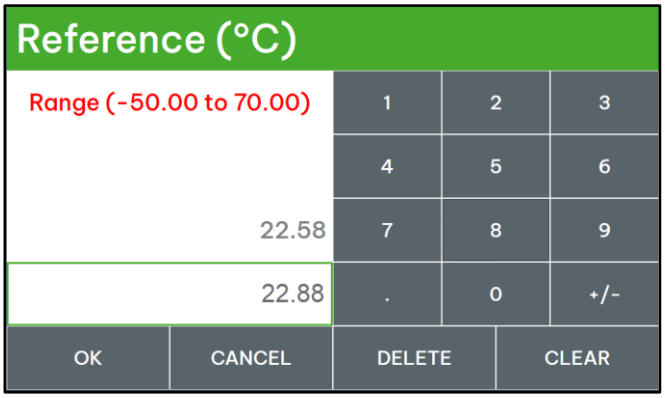


Figure 7-3 AT Reference Input Screen

7.1.2 Barometric Pressure Calibration

The BP parameter is the current reading from the BX-597A pressure sensor. The Reference field is where the correct value from the traceable pressure standard should be entered, if necessary.

NOTE: The DEFAULT button can be pressed to reset all previous field calibrations. If difficulty is encountered during calibration, select the DEFAULT button and perform the calibration again.

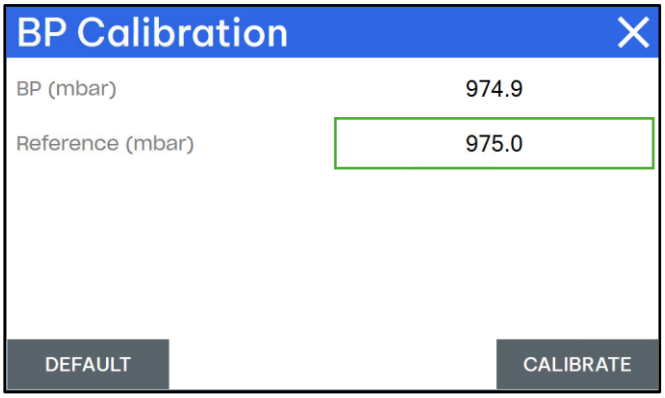


Figure 7-4 BP Calibration Main Screen

The BP parameter is the current reading from the BX-597A pressure sensor. The Reference field box, outlined in green, is where the correct value from the traceable barometric pressure standard should be entered, if necessary.

To enter a correction value, press on the green outlined box next to Reference.

To correct the BP reading, enter the value shown on the reference sensor using the numeric keypad and then press OK to return to the BP Calibration screen (**Figure 7-4**). Press the CALIBRATE button in the bottom right corner. The BP value should change to match the Reference value when CALIBRATE is pressed.

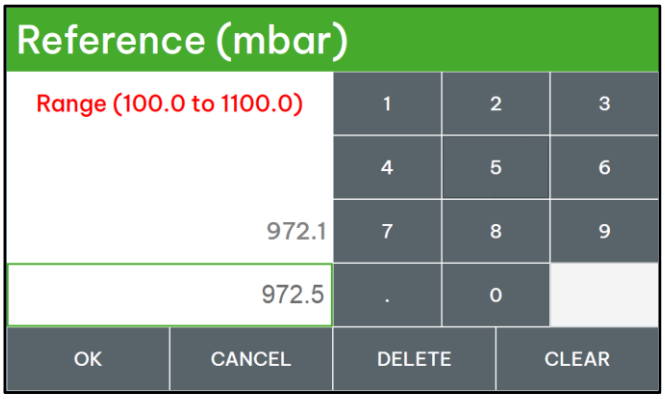


Figure 7-5 BP Reference Input Screen

7.2 Flow Sensor Field Calibration

This section provides steps to perform a sample flow audit and three point flow calibration. The calibration target points are 16.67, 18.34, and 15.00 liters per minute.

NOTE: The OPX 1025 temperature and pressure calibrations should always be checked before any flow calibrations are performed; the flow calculation is dependent on these parameters. The model BX-597A ambient AT/BP/RH combination sensor must be fully functional and properly connected.

The temperature, pressure, and leak status must be checked before performing a flow calibration. See **Section 3.** for more details on these prerequisites.

Flow calibration requires a traceable flow audit calibration device, and traceable standards for temperature and pressure. The Met One Swift 25.0 or similar particulate sampler flow calibrators work well. Attach the flow meter to the OPX 1025 sample inlet.

Flow screen location: Navigation Bar>Calibration>Flow.

NOTE: Sampling must be stopped before a flow calibration can be performed. A notification will be displayed if sampling is in progress when entering the Flow Calibration screen.

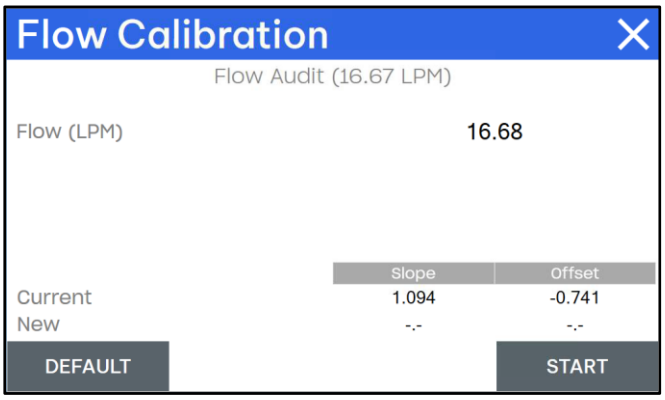


Figure 7-6 Zero Flow Sensor Screen

The Flow Calibration Flow Audit screen can be used to audit the flow rate of the OPX 1025 without changing any settings. The blower will start and regulate to the 16.67 lpm sample flow rate. The measured flow will be displayed in the field to the right of "Flow (LPM)." Compare this value to the value on the flow Reference. If they are within ± 4%, recalibration is not necessary. Press the X in the top right corner to exit the Flow Audit screen.

To start the Flow Calibration select START.

IMPORTANT CALIBRATION NOTES:

The OPX 1025 employs a three Point flow calibration. No adjustments are made to the flow calibration until all three points have been entered and calibration is complete.

All flow values are in Q_a (actual volumetric conditions), not Standard conditions.

The first Flow Calibration point is the Mid Point (16.67 LPM) calibration.

When the flow has stabilized, press the green outlined box next to “Reference (LPM)” to input the flow value from the reference standard.

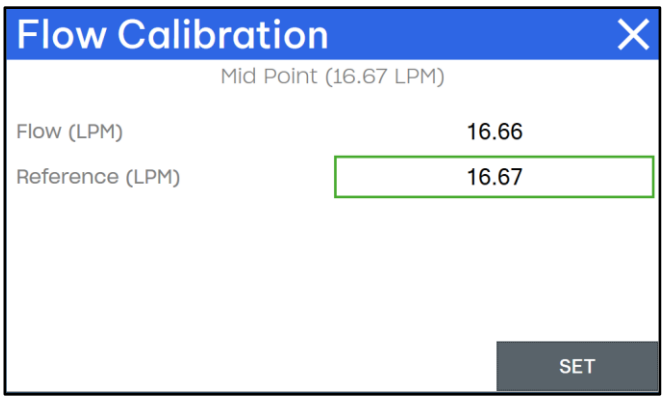


Figure 7-7 Mid Point Calibration Screen

The REFERENCE field is where the correct flow value from the traceable flow meter should be entered.

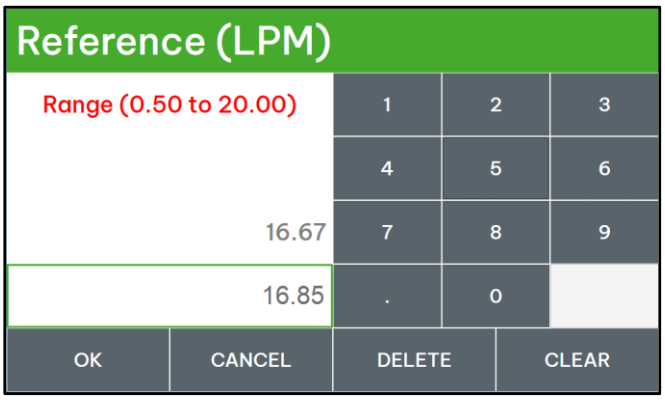


Figure 7-8 Flow Standard Value Input

Enter the value shown on the reference meter in the REFERENCE field and then press OK to go back to the Mid Point FLOW CALIBRATION screen.

Press the SET button. The flow calibration process will advance to the High Point (18.34 LPM) calibration.

The High Point (18.34 LPM) calibration screen will adjust the blower to 18.34 LPM.

When the flow has stabilized, press the green outlined box next to “Reference (LPM)” to input the flow calibration value from the standard device.

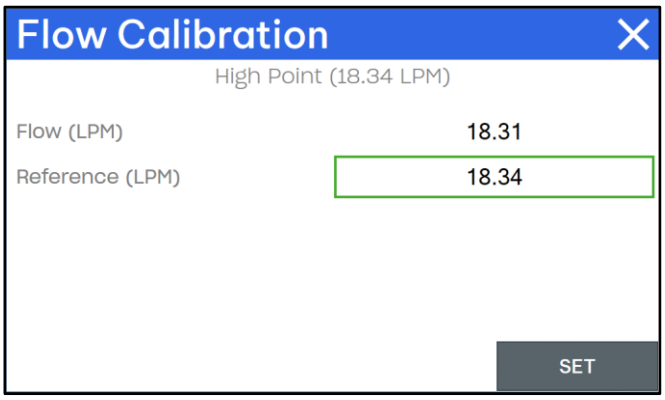


Figure 7-9 High Point Calibration Screen

The REFERENCE field is where the correct flow value from the traceable flow meter should be entered.

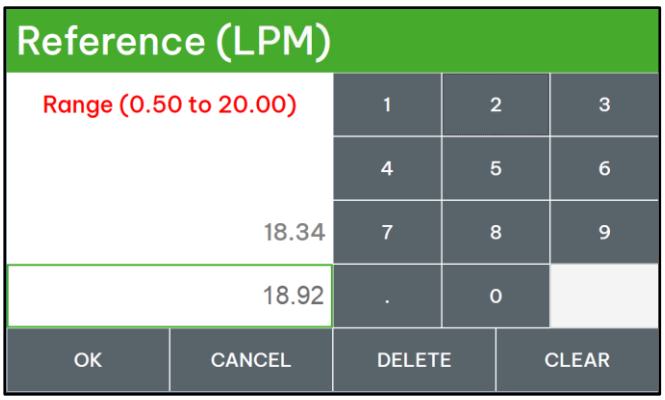


Figure 7-10 Flow Standard Value Input

Enter the value shown on the reference meter in the REFERENCE field and then press OK to go back to the High Point FLOW CALIBRATION screen.

Press the SET button. The flow calibration process will advance to the Low Point (15.00 LPM) calibration.

The Low Point (15.00 LPM) calibration screen will adjust the blower to 15.00 LPM.

When the flow has stabilized, press the green outlined box next to "Reference (LPM)" to input the flow calibration value from the standard device.

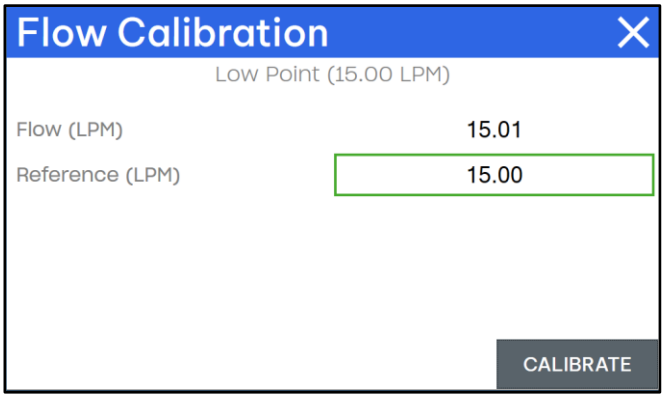


Figure 7-11 Low Point Calibration Screen

The REFERENCE field is where the correct flow value from the traceable flow meter should be entered.

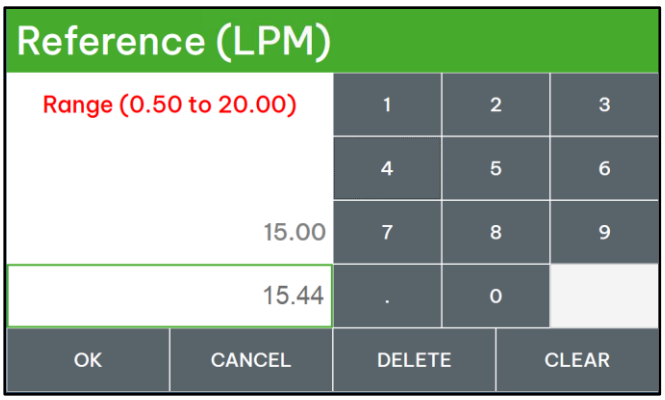


Figure 7-12 Flow Standard Value Input

Enter the value shown on the reference meter in the REFERENCE field and then press OK to go back to the Low Point FLOW CALIBRATION screen.

Press the CALIBRATE button. The flow calibration process will advance to the Flow Audit screen and will regulate to 16.67 lpm.

If the value shown on the reference meter matches the value shown in the Flow Audit screen ± 4%, the flow calibration is complete.

Press the X in the upper right corner to exit the flow calibration.

If the value shown on the reference meter does not match the value shown in the Flow Audit screen ± 4%, select the MODIFY button to repeat the flow calibration process.

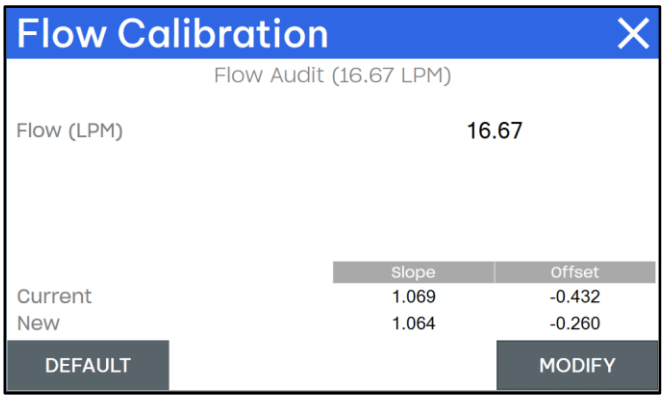


Figure 7-13 Flow Audit Screen

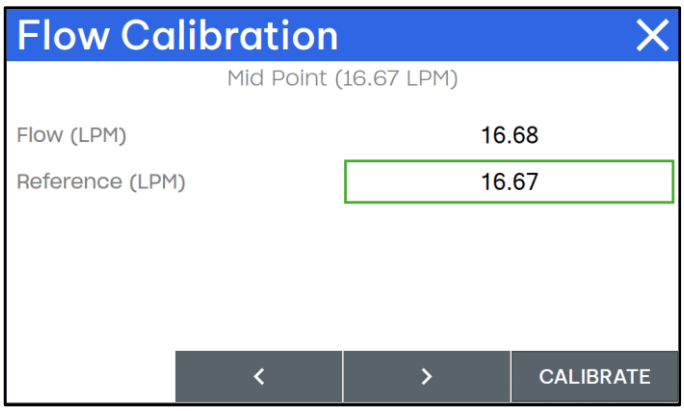


Figure 7-14 MODIFY screen for Mid Point Calibration

If the value shown on the reference meter matches the value shown in the Flow Audit screen, select the button to advance through the Mid, High, and Low calibration points. Select to review the previous point or return to the Audit menu.

If a calibration point needs to be modified, adjust it as described above, and select CALIBRATE.

Advance to the Audit menu.

If the value shown on the reference meter matches the value shown in the Flow Audit screen ± 4%, flow calibration is complete.

7.2.1 Audit-Only Flow Checks

The Flow Calibration Flow Audit screen can be used to audit the flow rate of the OPX 1025 without changing any settings. The blower will start and regulate to the 16.67 lpm sample flow rate. The measured flow will be displayed in the field to the right of "Flow (LPM)." Compare this value to the value on the flow Reference. If they are the same within ± 4%, recalibration is not necessary. Press the X in the top right corner to exit the Flow Audit screen.

7.3 Optical Sensor Check

7.3.1 Sensor Check Overview

The Sensor Check screen allows the user to see a histogram chart to view data for a set BIN range, as well as adjust the PMT gain. The following specifies the various components of the sensor check.

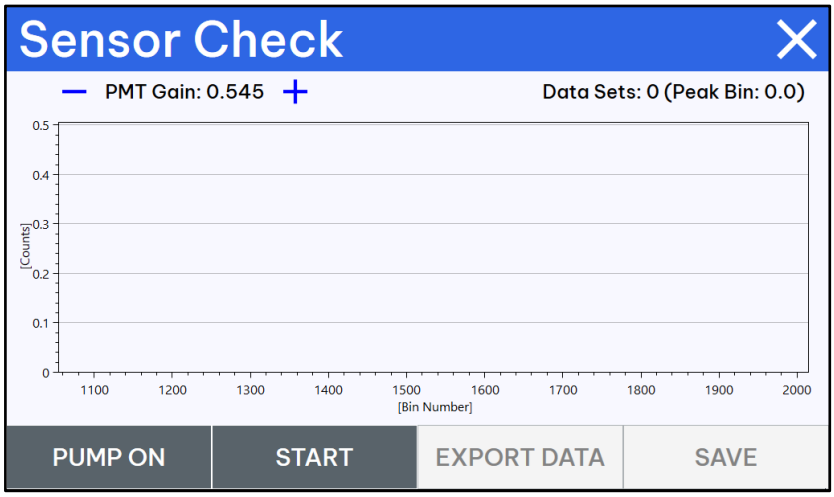


Figure 7-15 Sensor Check Settings

PMT Gain: changes the sensitivity of the PMT; it is recommended that the gain only be adjusted to center the peak to the specified bin associated with the SigmaDust. Only minor changes will be required.

Peak Bin: Indicates the peak center point, recommended to place this at the specified SigmaDust Bin for the Calibration particle batch size.

Bin Number: Total span view on the histogram chart.

Data Sets: Number of 10 second sets that have accumulated.

PUMP OFF: This will turn the Pump off or on, depending on the operation mode of the pump.

START: This will automatically turn the pump on and will begin charting BIN data based on the particle sizes being measured.

EXPORT DATA: Exporting can only be done after a sensor chart has been established. A CSV file will be generated (Connect a flash drive to the USB port on the front panel of the instrument).

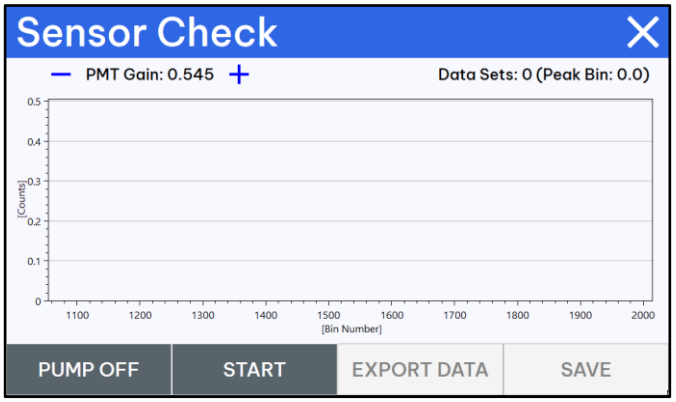


Figure 7-16 Sensor Check Histogram

NOTE: **EXPORT DATA** allows the sensor check data to be exported to a USB flash drive. Only required if requested by the Met One Service team.

Changes to the PMT gain will only persist when the save button is selected. Leaving the Sensor Check screen without a save will prompt the user to verify that the changes will be lost or to return to the Sensor Check screen.

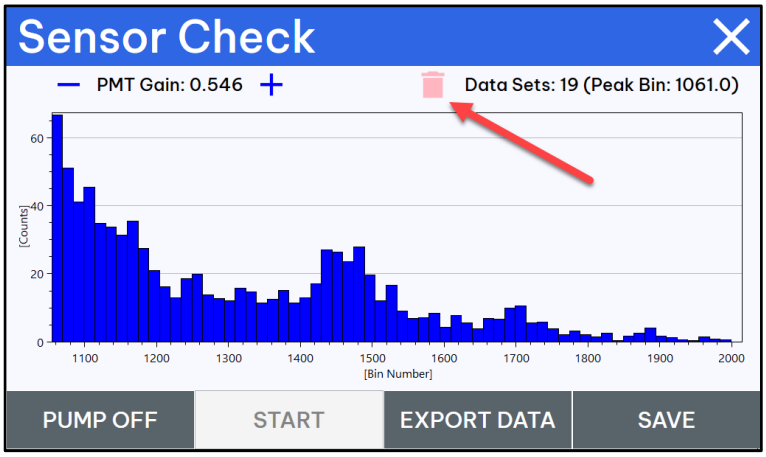


Figure 7-17 Sensor Check Histogram (Ambient Air)

Delete Sets: Once data sets have been collected a pink trash icon appears. Selecting this button will prompt the user to clear all the data sets to begin again. This is useful if room air was sampled or SigmaDust needs to be recollected.

7.3.2 SigmaDust Setup

The SigmaDust is a uniform silica particulate used to check and adjust the OPX 1025. This SigmaDust has a known effect on the particle counter's light detector (PMT). By comparing the actual reading to what's expected, the PMT's gain can be adjusted for drift in the detector response, ensuring accurate measurements.

IMPORTANT NOTE: The SigmaDust has an expected shelf life of 2 years. It should be stored in a sealed container at room temperature and away from light.

7.3.3 Sensor Check Procedure

Before beginning a sensor check, a flow audit and/or calibration should also be performed before beginning the OPX sensor check.

1. Enter the Sensor Check screen

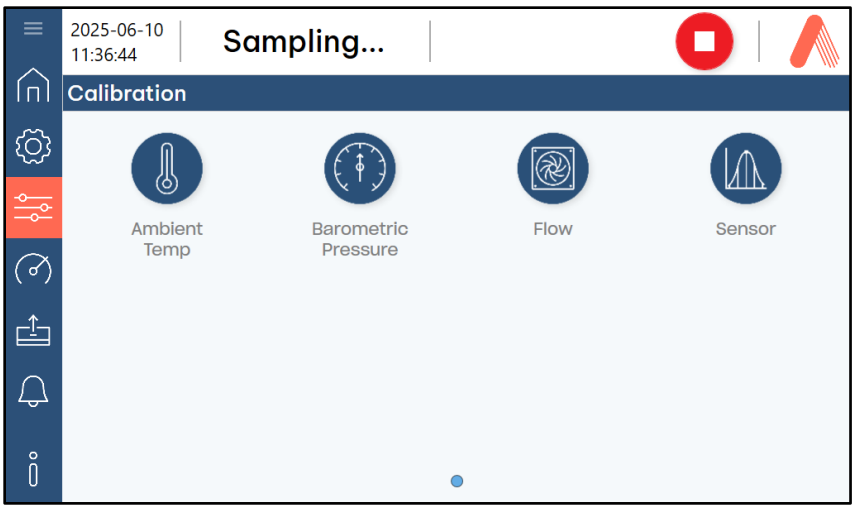


Figure 7-18 Calibration Tab

Figure 7-19 SigmaDust Bottle

Figure 7-20 SigmaDust Adapter Installed on the Sample Conditioner

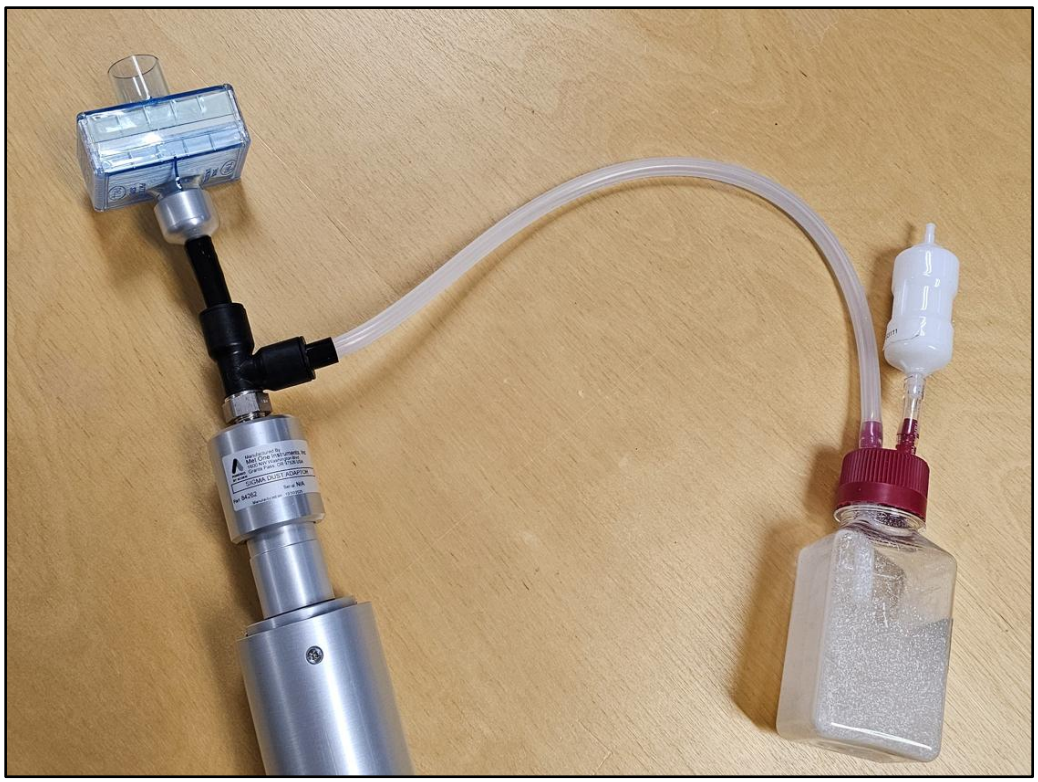


Figure 7-21 SigmaDust Bottle Connected to the SigmaDust Adapter

2. Connect the SigmaDust Bottle tubing to the SigmaDust Adapter by sliding the flexible bottle tubing inside the stiff tubing of the inlet port on the Adapter.

3. Press START on the Sensor Check screen to begin collecting data.

4. Agitate the SigmaDust bottle to disturb the particles, allowing them to enter the sensor. As the particle number increases, a distinct peak should become apparent. The distribution on the screen will update every 10 seconds.

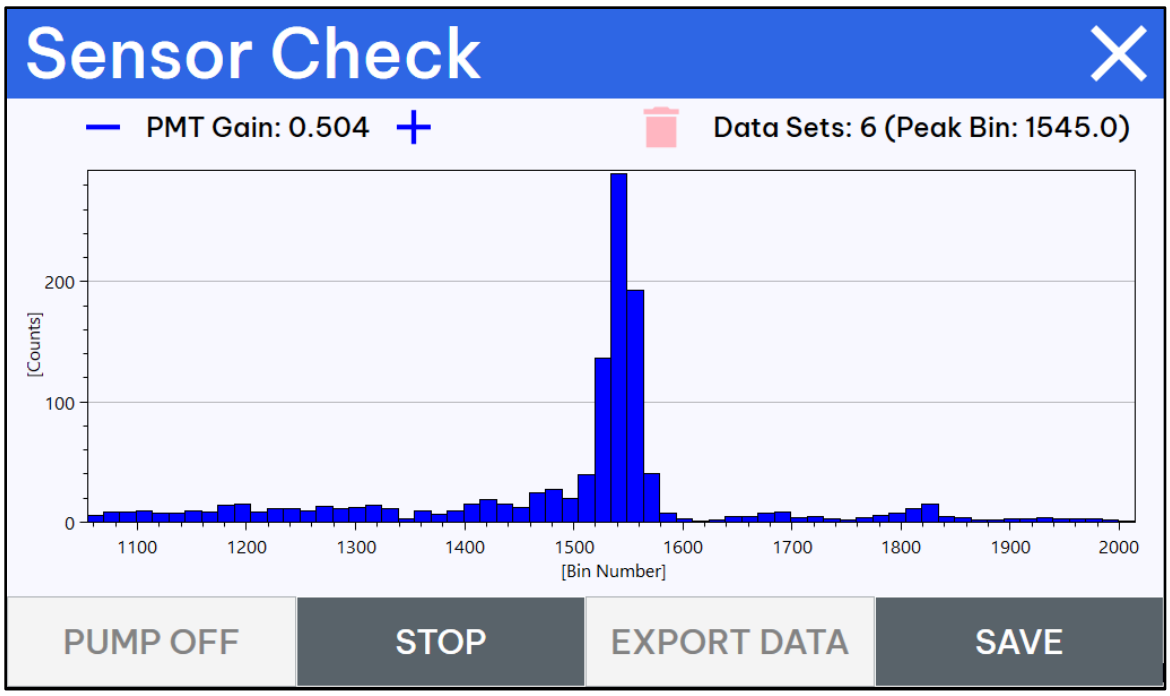


Figure 7-22 Typical SigmaDust Peak (Bottle Peak indicated 1544)

5. A target value of 50 or more counts provides sufficient signal to calculate the peak bin location

6. Select the delete icon to clear the screen and restart data collection as needed after PMT adjustments to acquire a new distribution.

7. If the peak is greater than 10 bins from the bottle's specified Peak, then it is recommended by Met One to adjust the PMT Gain. Tune the peak to match the value on the SigmaDust bottle by adjusting the PMT Gain. Increase the value to move to a higher bin value, decrease the value to move to a lower bin value. Only minor adjustments should be required. The + and – buttons are used to change the PMT Gain.

8. When the PMT adjustment is complete, use the save button to save the Sensor Calibration. Pressing the at the top right of the screen will exit.

NOTE: To export the data, if requested by the Met One Service team for example, insert a USB flash drive into the USB port on the front panel and select EXPORT DATA.

NOTE: SigmaDust has a GHS classification in accordance with the OSHA Hazard Communication Standard (29 CFR 1910.1200) listed as "Not a hazardous substance or mixture according to the Globally Harmonized System (GHS)." It is not recommended to breathe the SigmaDust. If inhaled: after inhalation, move to fresh air. In case of skin contact: Rinse skin with water. CAS No. 7631-86-9

7.3.4 Troubleshooting

Problem:	**Bin counts too low.**
Cause/Solution:	• Perform flow calibration and check for leaks. • Agitate the SigmaDust bottle harder to encourage the SigmaDust to aerosolize. • The SigmaDust may not be dispersing properly ➢ Confirm the SigmaDust has not been exposed to moisture. If this is suspected, replace the SigmaDust. Met One part number: 84261 Note: Always store in a sealed container in a cool, dry and dark location.

Problem:	**Bin peak seems to wander.**
Cause/Solution:	• Potentially contaminated SigmaDust. • Bin counts may be too low.

8. DATA RETRIEVAL

This section describes the methods used to retrieve data files from the OPX 1025. The instrument communication ports include the serial RS-232 "MODEM" port, Ethernet port, a USB type A port, and a USB type C port. The ports are used for digital data transfer and can be used with a local computer, digital data logger, or with a remote network connection.

8.1 Exporting Data to a USB Flash Drive

Exporting data from the OPX 1025 to a flash or thumb drive is the recommended way to retrieve data for convenience.

Export Data screen location: Navigation Bar->Export.

The OPX 1025 can copy data files to a user-supplied USB flash drive. This drive must be inserted into one of the USB ports located on the front of the instrument.

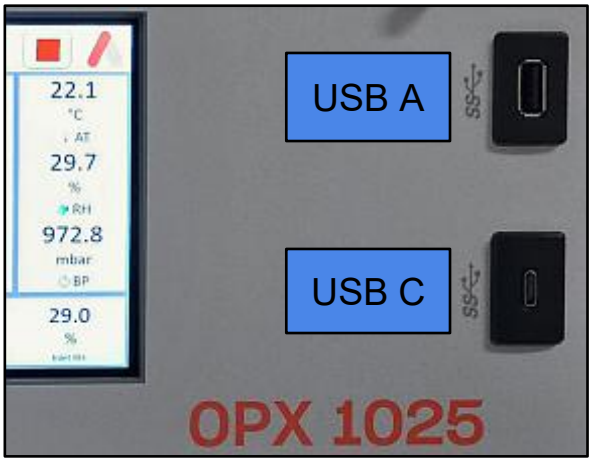


Figure 8-1 USB Port Location

The Export Data Page is where data ranges are selected, the type of export file and the file download status.

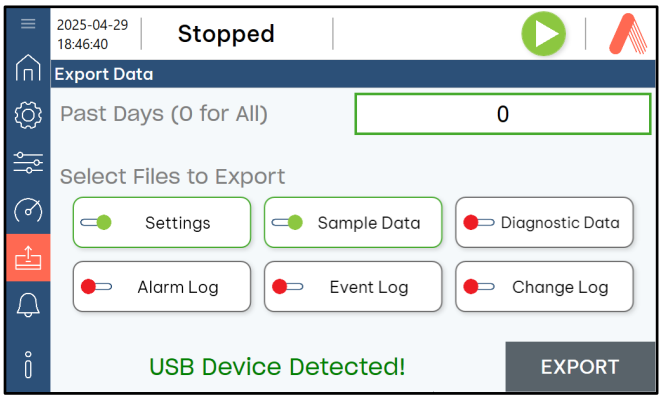


Figure 8-2 Export Data Page

Past Days (0 for ALL): The number of days of data to be exported.

Files to Export: The user-selectable files to be exported.

To select the number of days of data to export, press the green outlined box next to PAST DAYS. (See **Figure 8-3**).

To select which files will be exported, press each button to toggle it on or off. (See **Figure 8-4**).

Use the numeric keypad to select a number of days between 1 and 999. 0 will export all stored data.

Press OK to save the selection and to go back to the main EXPORT DATA screen shown in Figure 8-3.

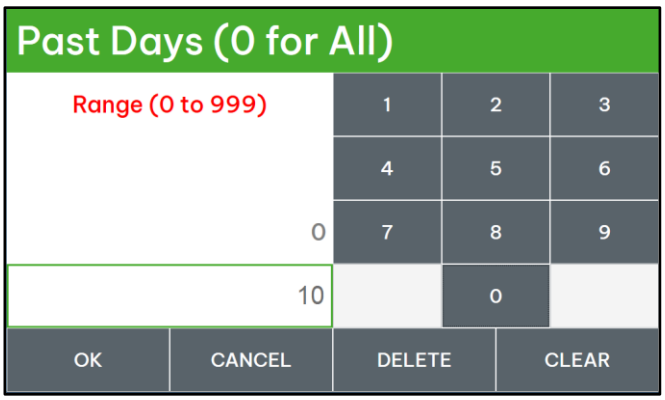


Figure 8-3 Data Export Days

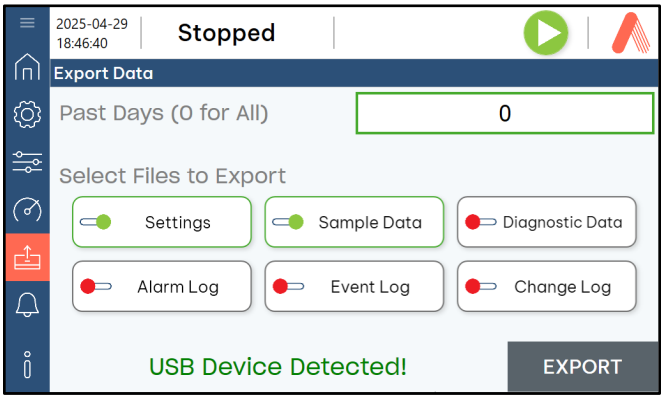


Figure 8-4 Files Drop Down Options

Press each file button to toggle it on or off. Only files that are toggled on (green indicator) will be exported.

Details explaining each file are below.

When all selections are made, press the EXPORT button to export the files to the USB flash drive.

SETTINGS: Selecting this option downloads the Settings file. This file contains the current setting for each parameter in the instrument.

SAMPLE DATA: Selecting this option downloads the User file. This file contains the averaged data values for a specified period. The Averaging Period may be set in the Sample setup screen on the Settings page.

DIAGNOSTIC DATA: Selecting this option downloads the Diagnostic file. This file contains the raw data values captured by the instrument that are used to calculate the mass.

ALARM LOG: Selecting this option downloads the Alarm Log file. This file contains all the alarms that have occurred over the specified period.

EVENT LOG: Selecting this option downloads the Event Log file. This file contains all the events that have occurred over the specified period.

CHANGE LOG: Selecting this option downloads the Change Log file. This file contains all the changes that have occurred over the specified period.

When all selections are made, press the EXPORT button to export the files to the USB flash drive. A progress screen will appear showing the progress of the export. Exporting large amounts of data may take several minutes to complete.

When the export is complete, the USB flash drive can be removed and plugged into a computer to view the exported data files.

8.2 Digital Communications and Data Retrieval

This section describes the methods used to retrieve digital data files through one of the communication ports on the OPX 1025. The OPX 1025 has the following ports: SERIAL COMM, and ETHERNET. These ports may be used with a computer, laptop, modem, or digital data logger. The data can be accessed through these ports and simple user commands can be sent to the OPX 1025 using a terminal program or by using the free Comet software available from the Met One Instruments website.

This section provides information on the different methods for retrieving or downloading data using a local computer or over a network. Each sub section provides information about each connection type that the OPX 1025 can communicate over.

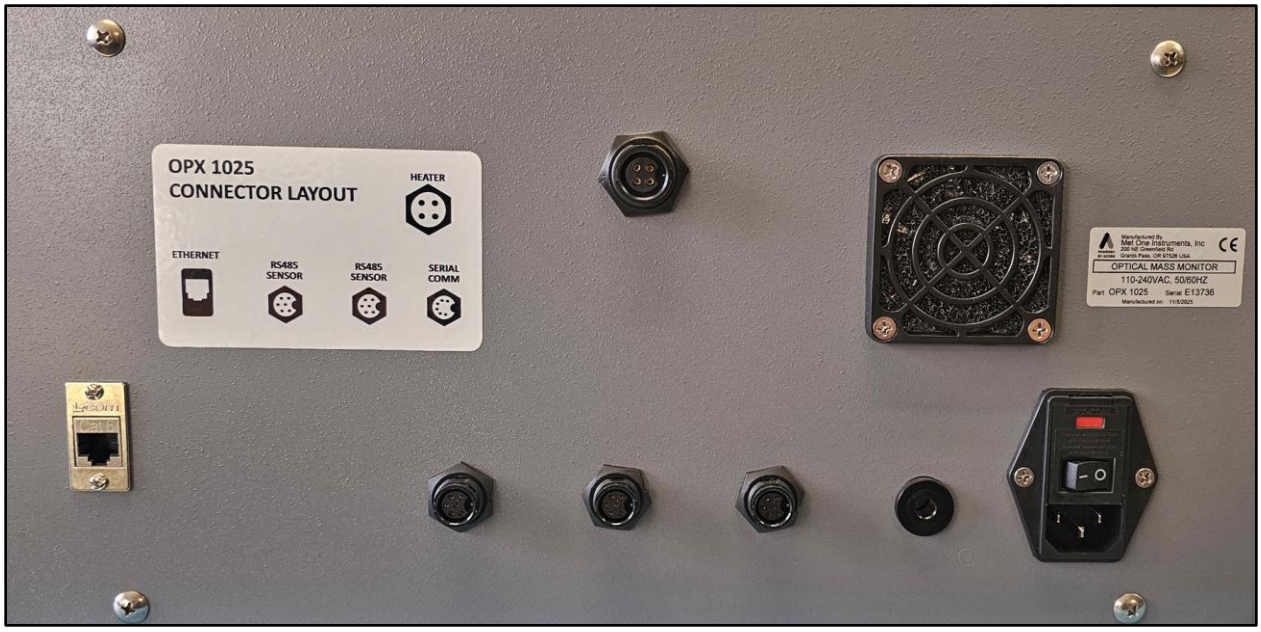


Figure 8-5 Rear Panel Data Connections

8.2.1 Ethernet Connection

The Ethernet connection can be used for local networks and remote communications with the OPX 1025 if internet is available at the sample site. See **Section 4.2.2 Ethernet Configuration** for details on setting up the IP Address for Ethernet Communications. The Ethernet communication speed for this port is the fastest and most efficient way to retrieve data.

8.2.2 Serial Comm Connection

The Serial Comm Connection is used to connect the OPX 1025 to a network modem for polling data wirelessly. The communication speed for this port is low to moderate. The connection details are as follows:

Default Baud Rate: 9,600
Data Bits: 8
Parity: None
Stop Bits: 1
Flow Control: None

8.3 OPX 1025 Data Output and Data Examples

The OPX 1025 outputs user files, settings files, alarm files, event files, and change files. The raw format of these stored files is *.txt text (SETTINGS) files or *.csv comma separated values format (user, alarm, event, and change files) for import into a spreadsheet program.

8.3.1 Settings File

The settings file contains most of the setup menu parameters for the OPX 1025. This file should be reviewed periodically to ensure that no settings have been incorrectly changed. It also serves as a good data validation record. An example of an OPX 1025 settings text file is shown in **Figure 8-6**.

```
OPX 1025 Settings Report
2025-11-07 16:06:18
Station, 777, E13749

           OPX 1025, 84392, V1.0.0, Rev 4248
    Firmware Version, OPX I/O, 84154, R1.0.1
   Sensor FW Version, OPX Sensor, 84203, R1.0.0
    Digital Sensor 1, AIO 2 R02.3.2

    Calibration Date, 2025-07-07
       Serial Number, E13749
         Location ID, 777
       Sample Boxcar, 10 Minutes
    Report Averaging, 1 Minute
            Cut Head, PM10
          Auto Start, Off
     Auto Start Time, 30 Minutes
     Coarse Sampling, Off
Standard Temperature, 25
   Standard Pressure, 1013.2
   EPA Certification, On
  Display Brightness, 61%
         Time Server, On
           Time Zone, (UTC-08:00) Pacific Time (US & Canada)
Use Daylight Savings, On
       User Security, Off
   Temperature Units, C
      Pressure Units, mbar
           Baud Rate, 9600
        Flow Control, None
          IP Address, 192.168.5.168
         Subnet Mask, 255.255.248.0
             Gateway, 192.168.0.3
         MAC Address, CC:82:7F:57:A3:C8
       Logging Level, MEDIUM
       Remote Access, On
            USB Days, 0
            PMT Gain, 0.504

     Name,    Offset,     Slope
     Flow,     0.000,     1.000
       AT,     0.000,     1.000
       BP,     0.000,     1.000

Time Server List
         Time Server, time.google.com,0x1
         Time Server, time.windows.com,0x9

     Name, Displayed,    User K
    PM10s,       Yes,      1.00
     PM10,       Yes,         -
      PM4,       Yes,      1.00
    PM2.5,       Yes,      1.00
      PM1,       Yes,      1.00
 PM10-2.5,       Yes,         -
```

Figure 8-6 Settings File Example

The settings file also contains encrypted Factory Settings, not shown, at the end of the Settings file report.

8.3.2 Alarm Log File

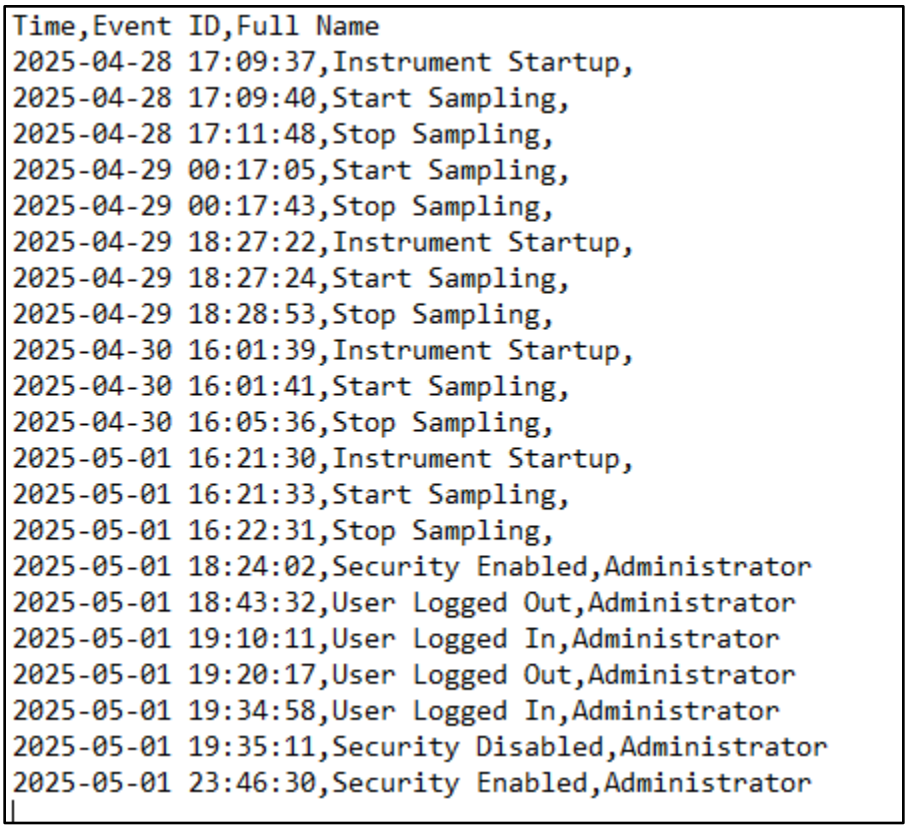
The OPX 1025 alarm log contains the date, time, and type of each alarm or error encountered during data collection.

```
Time,Alarm ID,Alarm Description
2025-02-04 13:15:26,Power Outage,
2025-02-05 08:18:40,Power Outage,
2025-02-05 08:32:00,Power Outage,
2025-02-05 09:08:46,Power Outage,
2025-02-05 09:56:34,Power Outage,
2025-02-05 10:02:29,Power Outage,
2025-02-05 10:05:46,Power Outage,
2025-02-05 10:08:51,Power Outage,
2025-02-05 10:21:23,Power Outage,
2025-02-05 10:54:14,Power Outage,
2025-02-05 11:36:28,Power Outage,
2025-02-05 13:12:16,Power Outage,
2025-02-05 13:31:04,Power Outage,
2025-02-05 13:38:57,Power Outage,
2025-02-05 15:15:42,Power Outage,
2025-02-05 15:38:13,Power Outage,
2025-02-05 15:54:46,Power Outage,
2025-02-06 08:54:56,Power Outage,
2025-02-06 09:07:35,Power Outage,
2025-02-06 15:59:38,Power Outage,
2025-02-07 07:50:29,Power Outage,
2025-02-07 08:09:59,Power Outage,
2025-02-07 08:45:25,Power Outage,
2025-02-07 09:00:43,Power Outage,
```

Figure 8-7 Alarm Log Report

8.3.3 Event Log File

The OPX 1025 event log contains the date, time, event ID, and the full name of the user who performed that event.



```
Time,Event ID,Full Name
2025-04-28 17:09:37,Instrument Startup,
2025-04-28 17:09:40,Start Sampling,
2025-04-28 17:11:48,Stop Sampling,
2025-04-29 00:17:05,Start Sampling,
2025-04-29 00:17:43,Stop Sampling,
2025-04-29 18:27:22,Instrument Startup,
2025-04-29 18:27:24,Start Sampling,
2025-04-29 18:28:53,Stop Sampling,
2025-04-30 16:01:39,Instrument Startup,
2025-04-30 16:01:41,Start Sampling,
2025-04-30 16:05:36,Stop Sampling,
2025-05-01 16:21:30,Instrument Startup,
2025-05-01 16:21:33,Start Sampling,
2025-05-01 16:22:31,Stop Sampling,
2025-05-01 18:24:02,Security Enabled,Administrator
2025-05-01 18:43:32,User Logged Out,Administrator
2025-05-01 19:10:11,User Logged In,Administrator
2025-05-01 19:20:17,User Logged Out,Administrator
2025-05-01 19:34:58,User Logged In,Administrator
2025-05-01 19:35:11,Security Disabled,Administrator
2025-05-01 23:46:30,Security Enabled,Administrator
```

Figure 8-8 Event Log Report

8.3.4 Change Log File

The OPX 1025 change log contains the date, time, the full name of the user who made the change, the parameter changed, the action performed, the old value, and the new value. Not all fields will be used depending on the type of change made and the sensitivity of the data. For example, a password change will be logged but the old and new passwords will not.

```
Time,Full Name,Parameter,Action,Old Value,New Value
2025-02-14 08:49:42,,Use Coarse Sampling,Item Modified,False,True
2025-02-14 08:53:44,,Use Coarse Sampling,Item Modified,True,False
2025-03-06 10:37:50,,BP Offset,Item Modified,0.000,2800.000
2025-03-06 10:38:54,,BP Offset,Item Modified,2800.000,0.000
2025-03-06 10:39:15,,BP Offset,Item Modified,0.000,-1200.000
2025-03-06 10:39:23,,BP Offset,Item Modified,-1200.000,0.000
2025-03-06 10:39:30,,BP Offset,Item Modified,0.000,-200.000
2025-03-06 10:41:09,,AT Offset,Item Modified,0.000,-0.200
2025-03-06 10:46:49,,Standard Temperature,Item Modified,,0
2025-03-06 10:47:08,,Standard Temperature,Item Modified,0,20
2025-03-06 10:47:25,,Standard Temperature,Item Modified,20,0
2025-03-06 11:37:24,,Temperature Units,Item Modified,°C,°F
2025-03-06 11:37:44,Administrator,Changed Password,Item Modified,,
2025-03-06 11:37:51,,Temperature Units,Item Modified,°F,°C
2025-03-06 11:39:25,,Changed Password,Item Modified,,
2025-03-06 11:40:27,Administrator,Changed Password,Item Modified,,
2025-03-06 11:41:18,,Temperature Units,Item Modified,°C,°F
2025-03-06 12:58:28,,Changed Password,Item Modified,,
2025-03-06 13:01:02,,Temperature Units,Item Modified,°F,°C
2025-03-06 13:36:18,Administrator,Changed Password,Item Modified,,
2025-03-06 13:37:19,,Changed Password,Item Modified,,
2025-03-06 13:37:24,,Temperature Units,Item Modified,°C,°F
2025-03-06 13:37:45,Administrator,Changed Password,Item Modified,,
2025-03-06 13:37:50,,Temperature Units,Item Modified,°F,°C
2025-03-06 13:40:27,Administrator,TEST 1 - ADDED,Item Added,,
2025-03-06 14:57:29,,Changed Password,Item Modified,,
```

Figure 8-9 Change Log Report

8.3.5 User File

The top of the OPX 1025 user file contains the header information for the file. The first line contains the name of the report, the second line contains the time stamp at which the report was requested, and the third line contains the Location ID and the serial number of the device.

Below the file header are the csv column header names which describe the data from each field. Below is a description for each header.

Time is the date and time for the data record at the end of the sample.

PMx(µg/m³) is the reported particle mass for the indicated particle size (PM1, PM2.5, PM4, PM10, etc.). Only PM10s is calculated using Standard flow conditions. All other PM values are calculated using Actual (volumetric) flow.

Number Conc(#/cc) is the total number concentration for the sample period.

AT(C), RH(%) and **BP(mbar)** are the average ambient temperature, relative humidity and barometric pressure for the sample period. These readings are from the BX-597A AT/BP/RH sensor. AT and BP will be reported in the user selected units.

WS(m/s) and **WD(Deg)** are the average wind speed and wind direction values from the optional WS/WD sensor for the sample period.

Flow(lpm) is the average sample flow rate for the sample period.

LED Temp(C), Flow Temp(C), and **Box Temp(C)** are the average temperatures for the sample period measured at different points in the instrument. All values will be reported in the user selected units.

Inlet RH(%) is the average relative humidity at the inlet for the sample period.

Status is the alarm status (see **Section 6.2**).

8.3.6 Diagnostic File

The top of the OPX 1025 diagnostic file contains the header information for the file. The first line contains the name of the report, the second line contains the time stamp at which the report was requested, and the third line contains the Location ID and the serial number of the device.

Below the file header are the csv column header names which describe the data from each field. Below is a description for each header.

Time is the date and time for the data record at the end of the sample.

Accum. Period is the accumulation period for the sample period (typically 60 seconds).

PMx(µg/m³) is the reported particle mass for the indicated particle size (PM1, PM2.5, PM4, PM10, etc.). Only PM10s is calculated using Standard flow conditions. All other PM values are calculated using Actual (volumetric) flow.

Number Conc(#/cc) is the total number concentration for the sample period.

AT(C), RH(%) and **BP(mbar)** are the average ambient temperature, relative humidity and barometric pressure for the sample period. These readings are from the BX-597A AT/BP/RH sensor. AT and BP will be reported in the user selected units.

WS(m/s) and **WD(Deg)** are the average wind speed and wind direction values from the optional WS/WD sensor for the sample period.

Flow(lpm), Standard Flow(slpm), and **Purge Flow(lpm)** are the average sample flow, sample flow at standard conditions, and purge flow for the sample period.

LED Temp(C), Flow Temp(C), and **Box Temp(C)** are the average temperatures for the sample period measured at different points in the instrument. All values will be reported in the user selected units.

Inlet RH(%) is the average relative humidity at the inlet for the sample period.

Light Noise(V) is a factory sensor health diagnostic measured during the sample period.

Sample Conditioner PWM(%) is the percentage of time the Sample Conditioner was on during the sample period.

LED Current(mA) is the average LED current measured during the sample period.

Bin Data(total counts) is the total number of particle counts collected during the sample period for each particle size.

Status is the alarm status (see **Section 6.2**).

8.4 Terminal Utility Data Retrieval and Communications

The OPX 1025 supports a system of ASCII based terminal commands and Escape commands that can be used to manually collect data records or to remotely change some of the settings in the instrument through the communication ports. These commands can be manually sent to the instrument through Comet, using the terminal tab, or other terminal emulators. They can also be programmed into a digital data logger or similar automated system. Most of these functions are intended primarily for use with advanced or remote data collection systems and are not usually used for routine data collection purposes. There are two modes through which the 7500 protocol commands can be used. The data can be retrieved through the RS 232 port on the back of the instrument and setting up the baud rate. The baud rate is configurable by the settings menu -> serial port screen. Alternatively the user can access the terminal by connecting with the device by using the IP address (when Ethernet is connected and configured) and using port 7500.

8.4.1 User Communication

In the User Communication (or Terminal) mode, commands are issued by entering a letter or number command and then pressing the Enter, <cr>, key. The <Esc> key is not used when sending commands in this mode.

Press the Enter key three times to enter User Communication mode. An asterisk character appears confirming that the OPX 1025 has entered the mode and that the instrument is ready for a new command. Commands will be echoed

back from the instrument and an asterisk will appear after a command has completed.

To issue one of the commands listed in

Table 8-1 Terminal Mode and Escape Commands**,** type the command listed and press the Enter key. The command will run and display the requested information or current setting, as appropriate.

For example, to view the current date and time setting type DT followed by the Enter key. The current date and time will be reported. The sequence would appear like this:

DT<cr>
DT 2025-01-18 08:00:00<cr><lf>

To change a setting, the typical sequence is to type the command, press the space bar one time, enter the new value in the same format that is displayed when checking the setting, and then pressing the Enter key.

Continuing the example above, to change the date setting type DT, space, and then the current date and time in YYYY-MM-DD HH:MM:SS format followed by the Enter key. A confirmation of the new date and time will be reported. The sequence would appear like this:

DT 2025-02-28 09:00:00<cr>
DT 2025-02-28 09:00:00<cr><lf>

Pressing <Esc> or Q<cr> will exit terminal mode.

For a detailed listing of all commands and their formats, consult the OPX 1025 7500 document (contact the Met One Instruments service department. See **Section 1.2**).

Some commands have a "-$" at the end of its description. The -$ means that extra parameters are required to complete the command. To retrieve a list of the available parameters, type in the command, a space, then a question mark, and press Enter. Example: PU ? will produce "0-mbar, 1-mmhg as options. If "PU 0" is entered, the pressure units will change to mbar.

Some commands with the -$ will provide the current setting. For example if DT ? is entered, the current date and time will be shown. To set a different date enter DT YYYY-MM-DD HH:MM:SS and press enter to change the date and time. YYYY= the current year. MM = the current month. DD = the current day. HH = the current hour. MM = the current minute. SS = the current second. Put together, the command will look like "DT 2025-01-01 12:00:00".

Table 8-1 Terminal Mode and Escape Commands

COMMAND	DESCRIPTION
H or ?	Help Menu
#	Get MetRecord Revision
1	Request settings report
2	Request All data report
3	Request New data report
4	Request Last data record
7	Request alarm report
C	Clear data log file – $
Q or X	Quit user communication mode
CA	Clear alarm log file – $
DS	Report data log channel descriptors– $
DT	Get/Set the date and time of the real time clock – $
ID	Get/Set location ID or address – $
NW	Report network operational status
OP	Get operation state – $
PR	Print report – 0-Settings, 1-User, 2-Alarm, 3-Factory Diagnostic
PT	Get/Set protocol type - $
PU	Get/Set pressure units - $
QH	Report Data Record Header
RQ	Get live data (same format as 4 command)
RV	Report Model/Part/Revision
SB	Get/Set baud rate – $
ST	Get/Set sample time – $
TU	Get/Set temperature units - $
UN	Get/Set units - $
CEL	Clear event log file - $
RBP	Get/Set reference BP - $
RCL	Report change log file
REL	Report event log file
RFT	Get/Set reference temperature - $
STDT	Get/Set standard temperature – $
USER	User login – $
IPCONFIG	Report the IP configuration

Table 8-2 shows the commands associated with editable settings, along with the default value for the setting and the settable range:

Table 8-2 User Editable Settings

DESCRIPTION	RANGE	DEFAULT	COMMAND
Location ID	1 – 999	1	**ID**
Protocol Type	0=7500	0	**PT**
Pressure Units	0=mbar, 1=mmHg, 2=KPa	0	**PU**
Serial port baud rate (Current Port)	5=9600, 6=19200, 7=38400, 8=57600, 9=115200	N/A	**SB**
Sample Period	0=1min, 1=5min, 2=10min, 3=15min, 4=30min, 5=1hour, 6=2hours, 7=3hours, 8=4hours, 9=6hours, 10=8hours, 11=12hours, 12=24hours	2	**ST**
Temperature Units	0=C, 1=F	0	**TU**
Units	Refer to the OPX 1025 7500 document	N/A	**UN**
Standard Temperature	0=0C, 1=20C, 2=25C	0	**STDT**

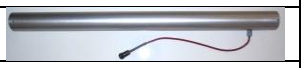
9. PARTS and ACCESSORIES

The following parts are available from Met One Instruments for maintenance, replacement, service, and upgrades. If unsure about a part, please contact the technical service department. Some of these parts may require technical skills or special instructions before use or installation.

Table 9-1 Parts and Accessories

Description	Part Number	Graphic
SigmaDust Span Check Kit	84263	
SigmaDust Adaptor Assembly	84262	
Blower Assembly	84373	
Cotton-Tipped Applicators, nozzle cleaning, 100 pack Solon #362	995217	
Flow Sensor, Mass, 0-20 LPM, Internal Assembly	80324-2	
Cable, AC Power, USA	400100	
Cable, AC Power, EU	400104	
Cable, AC Power, UK	400112	

Cable, AC Power, AUS	400123	
Volumetric Flow Calibration Kit Flow, Temp, and Pressure Reference Standard Met One recommended flow meter	Swift 25.0	
Zero Count Filter Assembly	84316	
Ambient Temperature, Pressure, RH Combination Sensor	BX-597A	
RS-485 Sensor Cable for BX-597A, and 598 (25 feet)	82959-25	
All in One Weather Sensor (AT, BP, RH, WS, WD)	AIO 2	
30.5 Sonic Anemometer	30.5	
RS-485 Sensor Cable for AIO 2/30.5 (25 feet)	10968-25	
RS-232 Com Cable (10 feet)	82459	
PM_{10} Size-Selective Inlet	BX-802	

Replacement O-Ring Kit for BX-802 (PM-10)	8965	
TSP Inlet	BX-803	
Coin Cell Battery Assembly	84260	
RH / AT Sensor Assy Replacement	84265	
Replacement Fan	84193	
LED Replacement Assembly	83213	
Optical Sensor Replacement	84317	
Zero Filter and O-Ring Replacement Kit	84397	
Blower Filter and O-Ring Replacement Kit	84378	
Optical O-Ring Kit Includes all O-Rings that would need to be replaced associated with the optical chamber	84380	
O-Ring Kit for Sample Conditioner and Slip Coupler	84379	
Sample Conditioner Replacement	84288	
Small inlet and slip coupler Replacement	BX-829	
Kit, OPX 1025 Optical Exhaust Tube & Quick Connect.	84381	

10. PRINCIPLES of OPERATION

This Section details the principles and operational steps involved in determining particle mass concentration using the light scattering data acquired by the OPX 1025. The process begins with the controlled intake and conditioning of ambient aerosol and culminates in reporting mass concentrations for various Particulate Matter (PM) designations. The operational flow can be summarized in the following stages:

1. **Sample Intake:** Ambient aerosol is drawn into the instrument through a PM_{10} size-selective inlet or a TSP inlet.
2. **Aerosol Conditioning:** The sampled aerosol is conditioned based on ambient sampling conditions using a Sample Conditioner.
3. **Light Scattering Data Acquisition:** Collection of raw light scattering signals from the conditioned aerosol using the optical particle spectrometer of the OPX 1025.
4. **Particle Count and Size Binning:** Conversion of scattering signals into discrete particle counts within defined size intervals.
5. **Particle Size Distribution Determination:** Generation of a statistical representation of the number of particles as a function of their size.
6. **Individual Particle Volume Calculation:** Determination of the volume of particles within each size bin, assuming a spherical morphology.
7. **Individual Particle Mass Determination:** Calculation of the mass of individual particles based on their volume and a particle density algorithm.
8. **Mass Concentration Calculation:** Determination of the total mass of particles within each size bin.
9. **PM Designation Reporting:** Aggregation of mass concentrations across relevant size bins to report values for PM_{10}, $PM_{2.5}$, $PM_{10-2.5}$, PM_4, and PM_1.

Each of these stages is described in detail in the following sections.

Step 1: Sample Intake

- The OPX 1025 is equipped with a PM_{10} size-selective inlet. This inlet is designed to aerodynamically remove particles with an aerodynamic diameter greater than 10 micrometers (μm) with a d50 size cut at 10um.

The inlet requires a flow rate of 16.67 lpm which, in the OPX 1025, is maintained by the suction side of a blower/pump controlled by a PWM with direct feedback from the flow meter inside the instrument. Optionally, the instrument can also be operated with a TSP inlet (also at 16.67 lpm) and the d50 size cut is applied via software for each PM value.

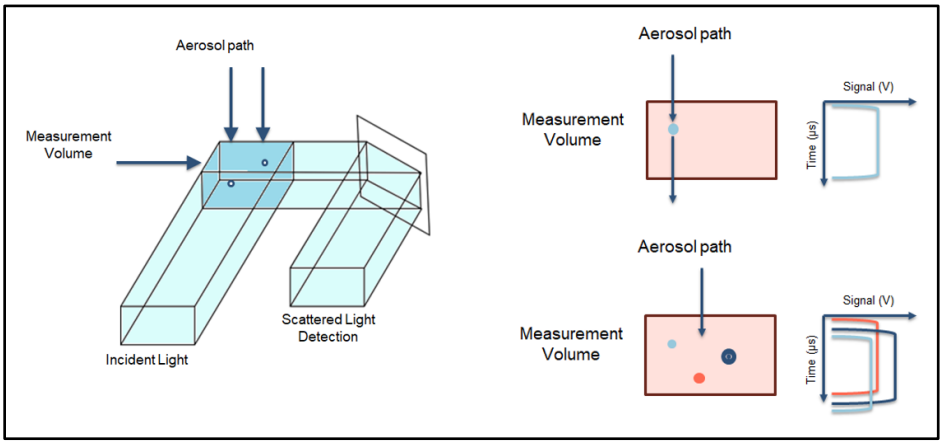
Step 2: Aerosol Conditioning

- The OPX 1025 utilizes a Sample Conditioner to condition the aerosol stream. This conditioning is performed based on the prevailing ambient sampling conditions (e.g., temperature, humidity). The Sample Conditioner may be used to control the temperature and the relative humidity of the aerosol sample stream. This conditioning step can be crucial for ensuring consistent particle sizing by the OPX as particle size can be influenced by the amount of associated water vapor. The specific conditioning parameters are dynamically adjusted based on real-time ambient measurements.

Step 3: Collect Light Scattering Data

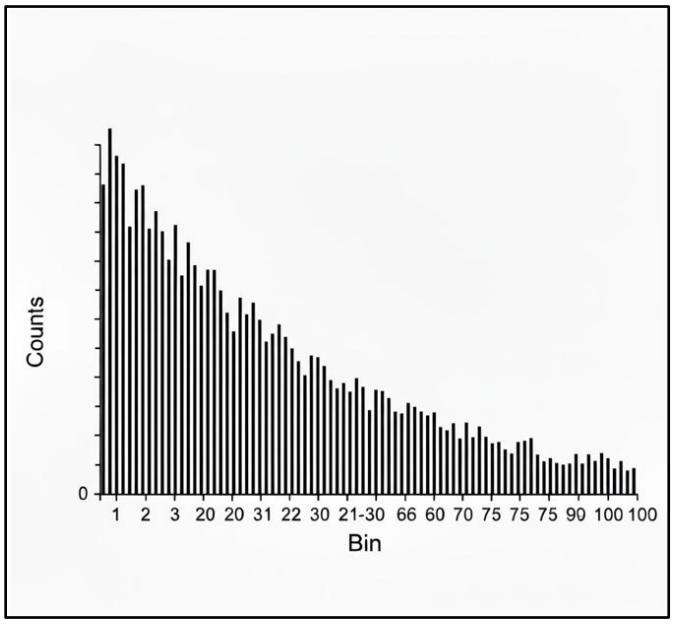
- Light illuminates the particles passing through the detection volume of the OPX 1025. The scattered light from individual particles is detected by a photomultiplier tube from 85°-95°.

- The collection and analysis of the light scattering signals allows the OPX 1025 to categorize each detected particle into a specific size bin. This categorization is based on pre-established calibration curves that relate the characteristics of the scattered light (e.g., intensity, pulse shape) to the size of the particle. The output of this step is a set of particle counts in different size bins, representing the number of particles detected within each defined size range during the sampling period.



Step 4: Convert Particle Counts to Size Distribution

- The particle size distribution is a representation of the number or concentration of particles as a function of their size. This can be presented as a histogram, a table, or a mathematical function. It provides a comprehensive characterization of the particulate matter in the sampled air, indicating the relative abundance of particles of different sizes (i.e., dD/dN).



Step 5: Calculate Particle Volume

To determine the mass of the particles, their volume is calculated based on the size information derived from the light scattering data. The instrument assumes a spherical shape for these calculations.

- **Formula:** For spherical particles, the volume (V) of a particle with radius (R) is given by:

  $$V = \frac{4}{3}\pi R^3$$

  For each size bin, a representative radius (e.g., the midpoint or geometric mean radius of the bin) is used to calculate the average volume of particles within that size range.

Step 6: Determine Particle Mass

The mass of particles within each size bin is then determined using the calculated volume and defined particle densities.

- **Formula:** The mass (m) of a single particle is calculated by multiplying its volume (V) by the particle density (ρ):

$$m = V \, x \, \rho = \frac{4}{3}\pi R^3 \, x \, \rho$$

Step 7: Calculate Mass Concentration

The mass concentration for each size bin is calculated by combining the number of particles in that bin with the estimated mass of a single particle of that size.

- **Formula:** The mass concentration (C) for a specific size bin is given by:

$$C = N \, x \, m = N \, x \left(\frac{4}{3}\pi R^3 \, x \, \rho\right)$$

where N is the number of particles detected in that specific size bin. To obtain the mass concentration in units of μg/m3, the total mass across all relevant size bins is summed and normalized by the volume of air sampled by the instrument.

Step 8: Report Mass Concentration by PM Designation

The final stage involves aggregating the mass concentrations calculated for individual size bins to report values for specific Particulate Matter (PM) designations, which are defined by their aerodynamic diameter. The OPX 1025 utilizes the particle size distribution and the calculated mass in each size bin to determine the mass concentrations for the following PM fractions:

- **PM_{10}:** The total mass concentration of particles with an aerodynamic diameter less than or equal to 10 μm at Standard Conditions.
- **$PM_{2.5}$:** The total mass concentration of particles with an aerodynamic diameter less than or equal to 2.5 μm at Local Conditions.

- **$PM_{10-2.5}$ (Coarse Fraction):** The mass concentration of particles with an aerodynamic diameter greater than 2.5 μm and less than or equal to 10 μm. This is calculated by subtracting the $PM_{2.5}$ mass concentration from the PM_{10} mass concentration at Local Conditions.
- **PM_4:** The total mass concentration of particles with an aerodynamic diameter less than or equal to 4 μm at Local Conditions.
- **PM_1:** The total mass concentration of particles with an aerodynamic diameter less than or equal to 1 μm at Local Conditions.

The OPX 1025 reports the calculated **mass concentrations for PM_{10}, $PM_{2.5}$, $PM_{10-2.5}$, PM_4, and PM_1**, providing a comprehensive assessment of the inhalable particulate matter in the sampled environment according to established regulatory and scientific definitions.