ASAP 2460

Installation Instructions and Checklist

Rev C

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Part 1: General Information

Overview

This document describes how to install and verify operation of the ASAP 2460 Analyzer. The analyzer is available in user-specified configurations. Certain components, such as high vacuum pumps, are optional.

Installation Checklists are included following the instructions. Complete each item in the checklists as you are performing installation procedures and return the checklists to Micromeritics.

Manual Conventions

Symbols

This manual uses the following icons to identify notes of importance, warnings and cautions.

Notes contain important information pertinent to the subject matter.

Warnings contain information to help prevent actions that may cause personal injury.

Cautions contain information to help prevent actions that may damage the analyzer or components.

Organization

This manual is organized into the following parts:

- Part 1 General Information
- Part 2: Installing the Master Module
- Part 3: Installing an Auxiliary Module
- Part 4: Installation a Second Auxiliary Module
- Part 5: Master Module Installation Checklist
- Part 6: Auxiliary Module Installation Checklist
- Part 7: Second Auxiliary Module Installation Checklist
- Part 8. Signatures

Equipment Description

The ASAP 2460 surface area analyzer is comprised of a *Master Modul*e, containing two analysis ports and application software for controlling the analyzer. Up to two *Auxiliary Modules* may be purchased, increasing the system from a two-port unit to a six-port unit. A computer monitors and controls analyses, and reduces, reports and archives data for each sample.

Master Module and One Auxiliary Module

Master Module
Height

4.5 cm (37.1 in.)
Width: 38.1 cm (15.0 in.)
Depth: 59.0 cm (23.25 in.)
Weight: 117 lbs. (53 kg)

Auxiliary Module
Height: 94.5 cm (37.2 in.)
Width: 38.1 cm (15.0 in.)
Depth: 39.37 cm (15.5 in.)
Weight: 64 lbs. (29 kg)

Gas Supply
1 square foot (0.30 square meters) for each gas bottle needed for installation. For standard installation, the bottles must be within 6 feet (1.83 m) of the instrument.

Part 2. Installing the Master Module

The Master Module comes with a 99-disk, which is used to install the software.

Choose one of the following:

- If the customer purchased a Master Module only, proceed to **Installing the Vacuum Pumps** below.
- If the customer purchased one or two Auxiliary Modules, proceed to **Part 3. Installing an Auxiliary Module**, page **44** and install the Auxiliary module(s), then return to the instructions below.

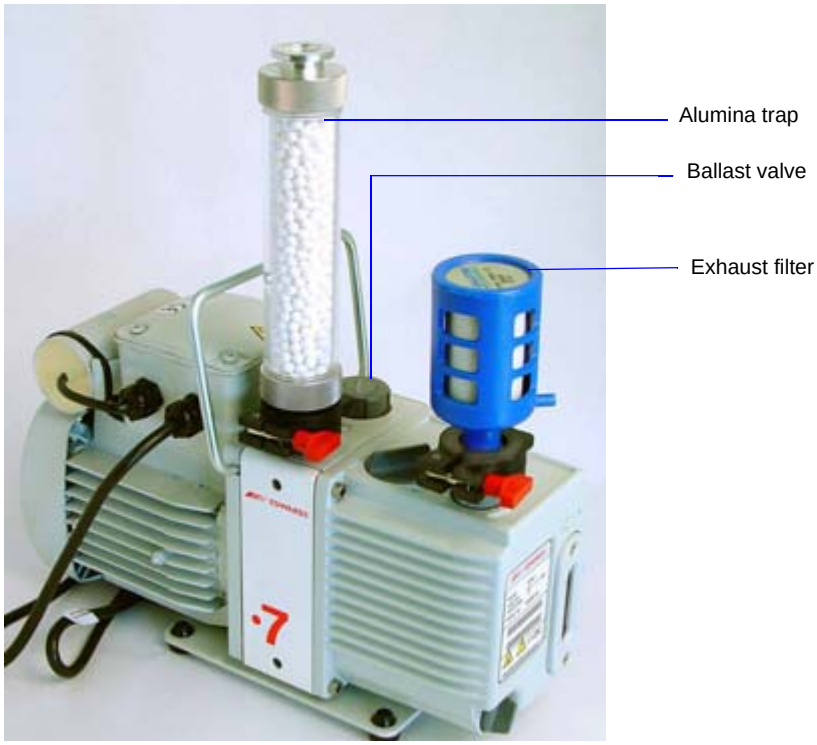
Installing the Vacuum Pumps

The analyzer can contain one of two types of vacuum pump systems: a wet system or a dry system. The analyzer is shipped to the customer equipped for the type of pump system ordered.

Never place a wet pump on an analyzer that has been equipped with a dry pump system. Doing so will void the instrument warranty.

To remove exhaust from the pump system, exhaust filters for wet pumps are included with the accessories. Dry pumps have built-in exhaust filters. In some cases, particularly when hazardous gases are used, the exhaust filters should be removed and replaced with an outside venting system.

Wet Pump Systems



Closing the Ballast Valve

The ballast valve should remain closed during operation of the analyzer. This enables the pump to obtain the best vacuum during operation.

- Ensure that the ballast valve is closed. To close the valve, turn it completely clockwise.

Adding Vacuum Pump Fluid

1. Ensure that the oil-drain plug on the front of the pump is closed (turn completely clockwise to close).

2. Remove the cap from the oil fill port on top of the pump.

3. Check oil level before adding fluid to the pump.

4. Using a funnel, add pump fluid to the Oil-fill port until the level is midway between the two indicators on the front of the pump.

Adding fluid above the midway position on the fluid level indicator may cause fluid to splash into the vacuum hoses and leak from the internal vacuum pumps.

Installing the Oil Vapor Trap

1. Use the following steps to activate the alumina to be used in the oil vapor trap:

   a.) Heat the oven between 250°C and 350°C.

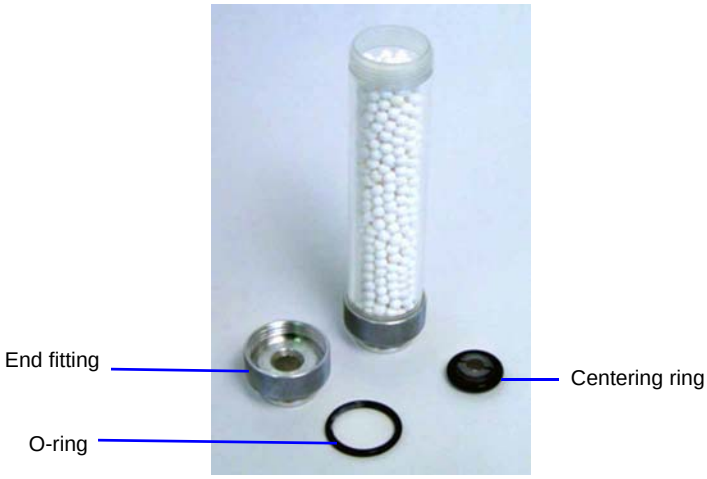
   b.) Pour about 180 grams of alumina into a glass or metal container for each trap (approximately 250 mL if a graduated beaker is used). Place the container in the oven.

   c.) Bake the alumina for two hours, then turn off the oven.

   d.) Allow the alumina to cool down slightly in the oven before pouring into the trap, but it is best to pour the alumina in the trap while it is still warm.

If you allow the baked alumina to sit in the oven too long, it will start adsorbing moisture again and may need to be activated again.

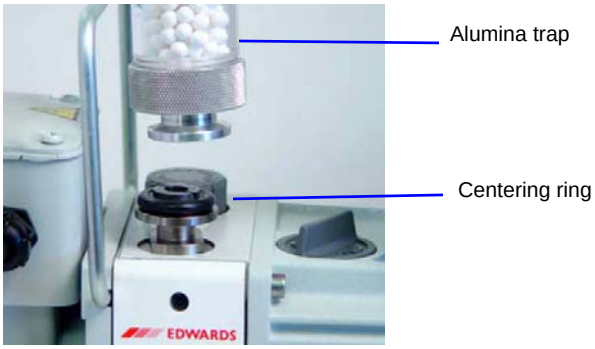
2. Remove the end fitting and O-ring from the top of the oil vapor trap.



3. Pour the activated alumina into the trap until they are leveled with the top.

4. Insert the O-ring and screw the end fitting back onto the trap and tighten securely by hand.

5. Make sure the centering ring is in place on the intake port, then place the trap on the centering ring.



6. Open the provided clamp and place it around the flange of the intake port and the flange of the trap. Swing the clamp fastening screw toward the intake port until it fits into the slot in the other half of the clamp. Tighten the wing nut securely by hand.

Installing the Vacuum Pump Exhaust Filter

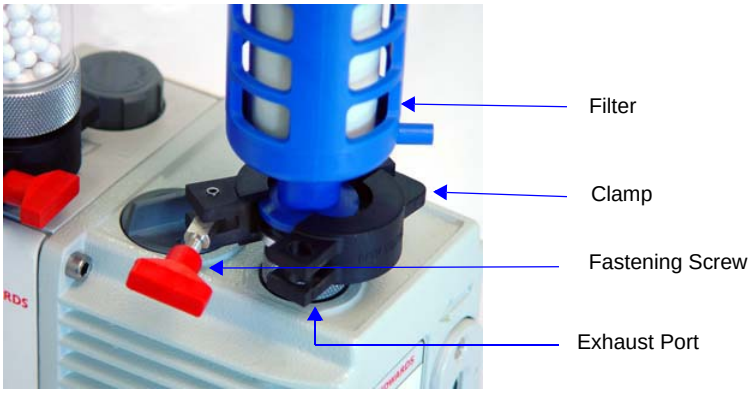
This procedure applies to oil-based vacuum pumps only.

Exhaust filters are used on the vacuum pump to minimize the release of oil vapors. The gases used are diluted substantially upon being released from the vacuum pumps. However, it may be desirable in some locations to provide a fume hood for added protection from hazardous gases and vapors released into the work area.

1. Remove the dust cover from the filter.

2. Place the exhaust filter on the centering ring.

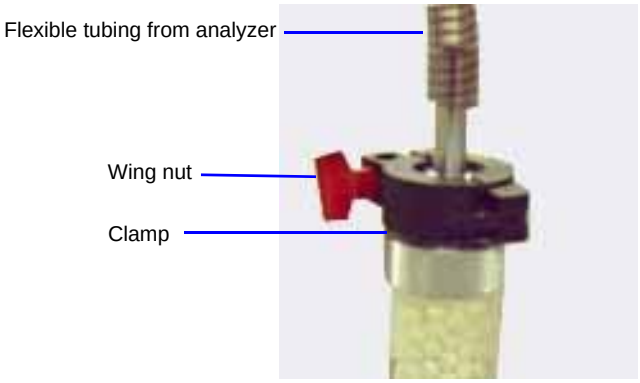
3. Open the provided clamp and place it around the flange of the exhaust port and flange of the exhaust filter. Swing the clamp fastening screw toward the exhaust port until it fits into the slot in the other half of the clamp. Tighten the wing nut securely by hand.



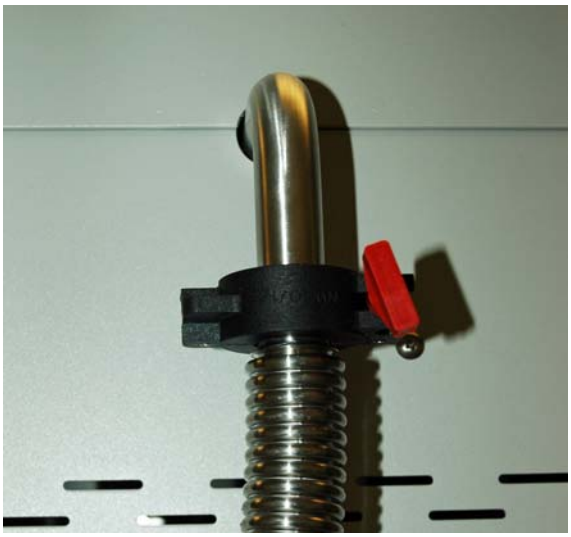
Connecting Tubing from the Analyzer to the Pump

1. Place the pump on the provided drip tray.

2. Open one of the provided clamps and place it around the flange of the oil vapor trap and the flexible tubing connector. Swing the clamp fastening screw until it fits into the slot in the other half of the clamp. Tighten the wing nut securely by hand.



3. Attach the vacuum hose to the port on the back panel of the analyzer using another clamp as described in step 2.



4. Attach the power cord to the vacuum pump.

Do not connect the vacuum pump assembly to the power source until the proper voltage selection is made. Doing so could result in electrical shock and/or damage to the assembly.

5. After verifying voltage selection, plug the pump power cord into the power source.

Dry Pump Systems

Exhaust filters are built into dry pumps to minimize the release of oil vapors. The gases are diluted substantially upon being released from the vacuum pumps. However, it may be desirable in some locations to provide a fume hood for added protection from hazardous gases and vapors released into the work area.

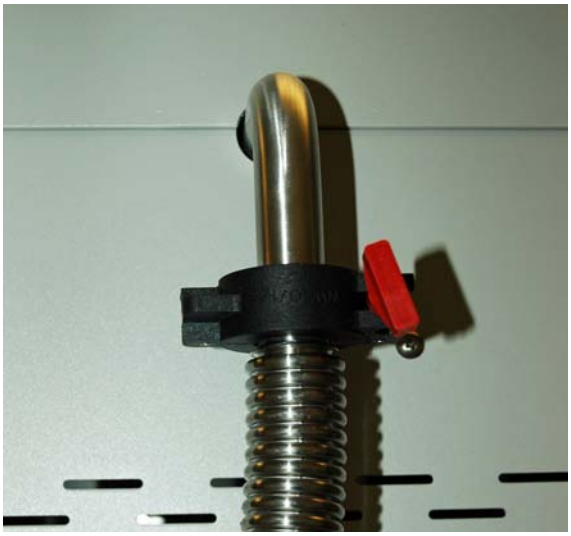
1. Measure the line voltage with a volt meter.

2. Set the pump voltage to the voltage closest to the reading on the volt meter.

3. Connect the flexible tubing to the connector on the front of the pump.

Do not connect the vacuum pump assembly to the power source until the proper voltage selection is made. Doing so could result in electrical shock and/or damage to the assembly.

4. Attach the vacuum hose to the port on the back panel of the analyzer using one of the provided clamps. Place it around the hose and the flange of the flexible tubing connector. Swing the clamp fastening screw until it fits into the slot in the other half of the clamp. Tighten the wing nut securely by hand.



5. Attach the power cord to the pump and to the power source.

Connecting Computer Cables

Connecting One Analyzer

1. Plug the Ethernet cable into the port labeled Ethernet on the rear panel of the analyzer.

2. Plug the other end of the Ethernet cable into the Ethernet port on the computer.

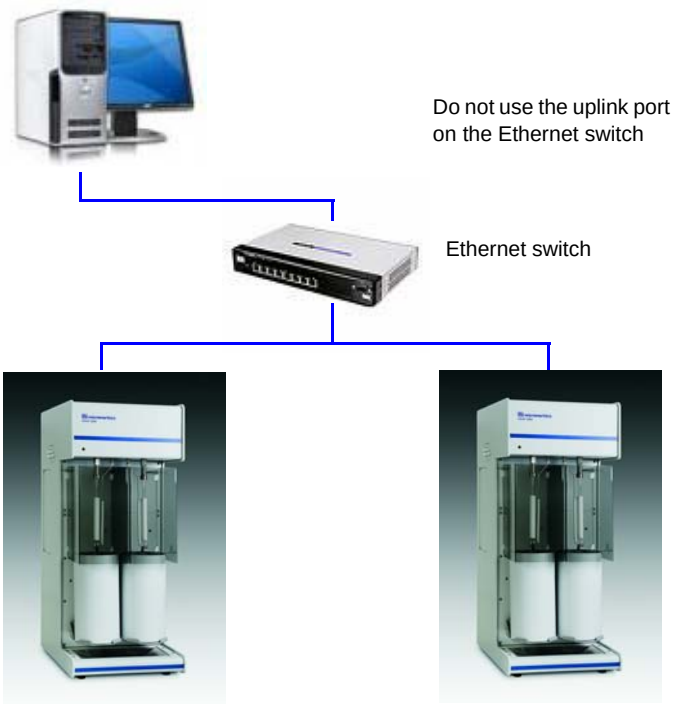
Connecting Multiple Analyzers

An Ethernet switch is required when connecting multiple analyzers to the computer.

Ethernet Switch

1. Connect the power cord of the Ethernet switch to an appropriate power outlet.
2. For each analyzer, connect an Ethernet cable from the Ethernet port on the rear of each analyzer to a numbered port on the Ethernet switch taking care not to use the uplink port on the switch.
3. Use an Ethernet cable to connect the computer to the Ethernet switch. Do not use the uplink port.
4. Ensure the power is turned on to the computer and the Ethernet switch.

The finished configuration should look similar to the following:



Attaching the Power Cable

1. Insert one end of the analyzer power cord into the input power connector on the lower portion of the back panel of the analyzer.

2. Connect the other end of the power cord into an appropriate power source.

Turning on the System

1. Place the ON/OFF switches for the computer and all peripheral devices in the ON position.

2. Turn on the pump.

3. Place the analyzer MAIN POWER switch, located on the analyzer's rear panel, in the ON position.

4. Verify that the green power indicator on the front panel is illuminated.

5. Verify that the pump is running.

Installing the Analysis Program

The following prerequisites must be completed prior to installing the software:

- Configure an Ethernet port on the computer to communicate with the analyzer.

- Attach the analyzer to the computer's configured Ethernet port and turn on the power to the analyzer.

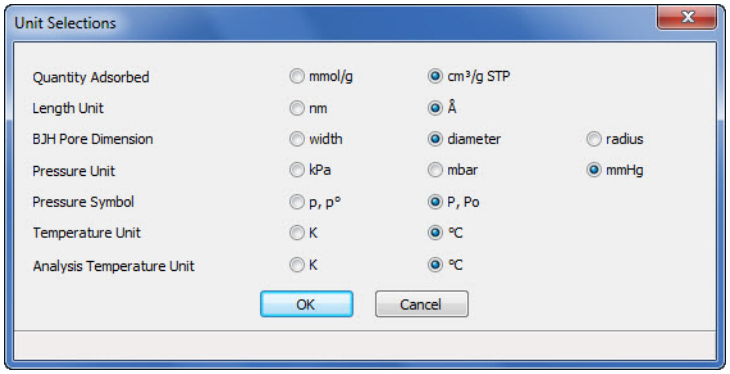
The application should not be installed on a network drive with shared access. Multiple users cannot operate the application at the same time.

If installing the MicroActive Share application, see MicroActive Share Installation Instructions, page **A-1.**

1. Turn on the computer.
2. Ensure that Microsoft Windows operating system is running.
3. Print a test page to ensure that the proper printer drivers are installed.
4. Insert the program CD into the CD-ROM drive.
5. Select **Start** from the Status bar, then **Run** from the Start menu.
6. Enter the name of the drive designator, followed by **setup**. For example: **e:\setup**
7. Click **OK;** the Installation Wizard displays. Follow the instructions on the installation windows.
8. When the installation is complete, remove the CD and advise the customer to store it in a safe place. It contains the original calibration files which may be needed at a later date.
9. Open the application by double-clicking the ASAP 2460 icon on the desktop or by opening it through the **Start** menu.

Specifying Units of Measurement

1. Select **Options** > **Data Presentation** > **Units** from the main menu. The Units Selection dialog is displayed.

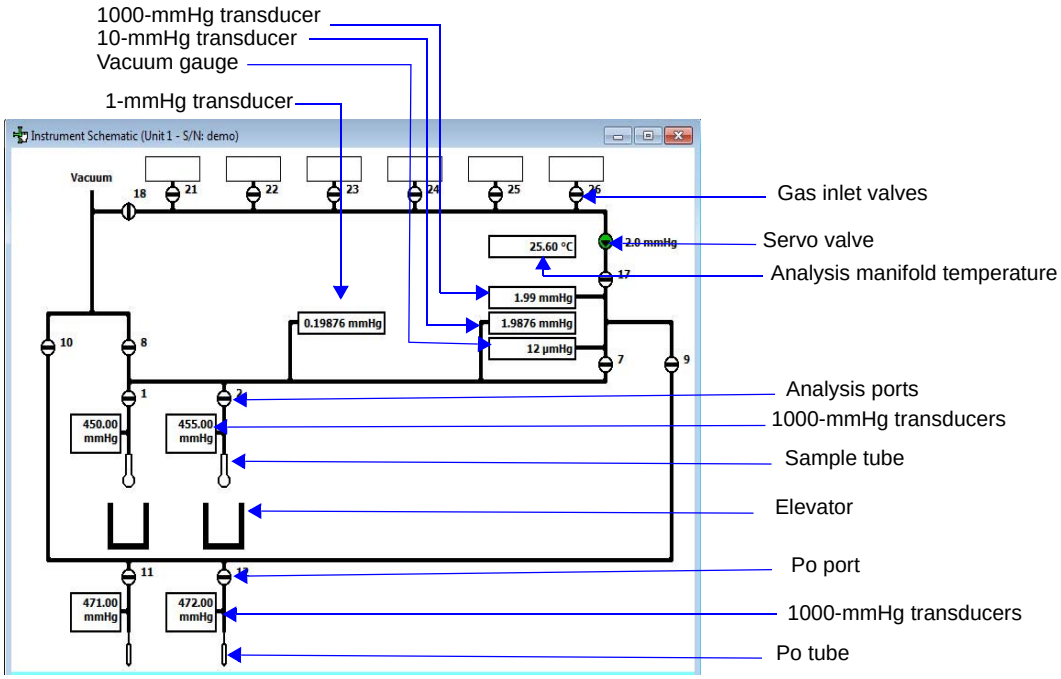


2. To select the customer’s preferred units of measurement, click on the appropriate radio buttons.

Manually Operating the System

The schematic below shows a Master Module only. The number of analysis ports shown in the schematic will match the number of ports in the customer's configuration (from 2 to 6).

1. Select **Unit [n] > Show Schematic**, if it is not already displayed.
2. Select **Unit [n] > Enable Manual Control**.



When manual control is enabled, the valve symbols change color on the monitor screen to indicate their status.


Green = open


Yellow = closed

Use the mouse pointer to select a component. A component is selected when it is surrounded by a thin line. Each component has a shortcut menu displaying the operations available for that particular component. These menus may be accessed by right-clicking on the desired component.

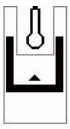
You can open and close valves, and raise or lower the elevator by using one of the following methods:

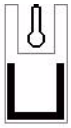
- right-click on the valve or elevator symbol to access the shortcut menu and select the appropriate action
- double-click on the valve or elevator symbol
- select the valve or elevator symbol and press the **Spacebar.**

Valve	Description
1, 2, 3, 4, 5, 6	Sample ports
7	Lower manifold isolation
8	Sample ports unrestricted vacuum
9	Po ports access
10	Po ports unrestricted vacuum
11, 12, 13, 14, 15, 16	Po ports
17	Upper manifold isolation
18	Gas inlets unrestricted vacuum
21, 22, 23, 24, 25, 26	Gas inlet port valves
Unmarked	Servo

3. Toggle the analysis valves open and closed and observe the pressure readings for appropriate change.

4. Actuate the elevators and observe that they will rise to the up position, stop during travel, and return to the down position. Verify each elevator before proceeding to the next elevator.

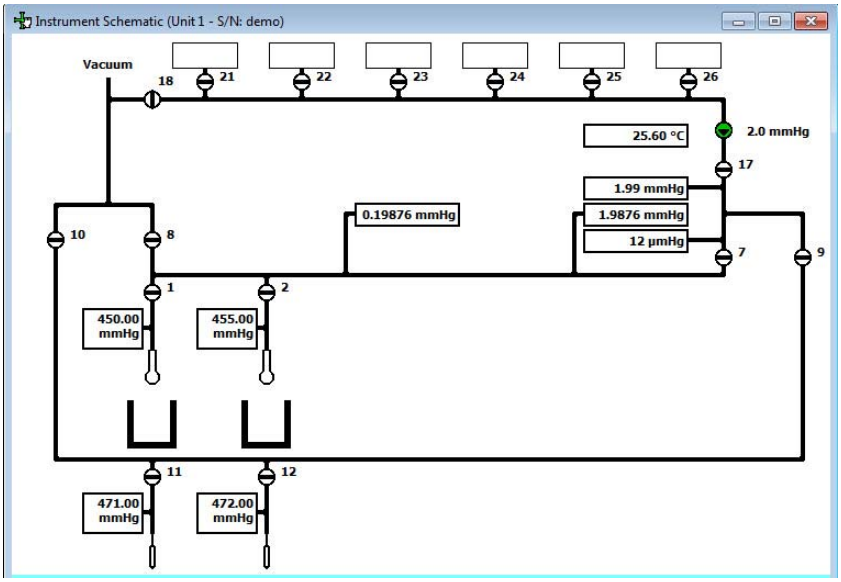
Dewar positions	The Dewar can be raised, lowered, or stopped.
	Indicates the Dewar is being raised; note the position of the arrow in the center of the Dewar symbol.
	Indicates the Dewar is being lowered; note the position of the arrow in the center of the Dewar symbol.

	Indicates the Dewar is stopped in the raised position.
	Indicates the Dewar is stopped in the lowered position.

Evacuating the Analysis Manifold

Allowing the analysis manifolds to evacuate while you prepare and connect the gas supply is beneficial in lowering outgas rates.

1. Select **Unit [n] > Show Analysis Schematic** if it is not already displayed.



Two-port system (Master Module only)

2. Select **Unit [n] > Enable Manual Control** if it is not already selected.

3. Open valves **10**, **8**, **18, 17**, **7**, and **9**.

4. Wait for the vacuum gauge reading to come down to below 10 µmHg, then wait an additional 15 minutes.

5. If Po tubes are installed, and plugs are in the sample ports, open valves **1**, **2**, **11**, and **12**. Make sure they will pull to below 10 µmHg.

6. Valves **1**, **2**, **11**, and **12** can be closed before any gas line tests are started.

Connecting Gas Lines

Connecting Gas Regulators and Inlet Lines

Use these guidelines when installing regulators and gas lines:

- Ensure that all gases needed are available and near the instrument. If the gas bottles are not located near the instrument, you will have to use gas line extenders, which may greatly affect gas quality and pressure.
- Carefully route the gas lines from the bottle to the analyzer, avoiding overlapping or entangling the gas lines. This will ensure the correct gas pressure and make maintenance easier.
- Label both ends of the gas lines before connecting for ease in identification and maintenance.
- Ensure that all gas bottles are closed before connecting them to the analyzer.

The instructions below describe a typical installation. Some configurations require additional components, such as regulator expansion kits, when one gas source will be used for several operations or when the gas bottle cannot be located close to the analyzer.

Required Components and Tools

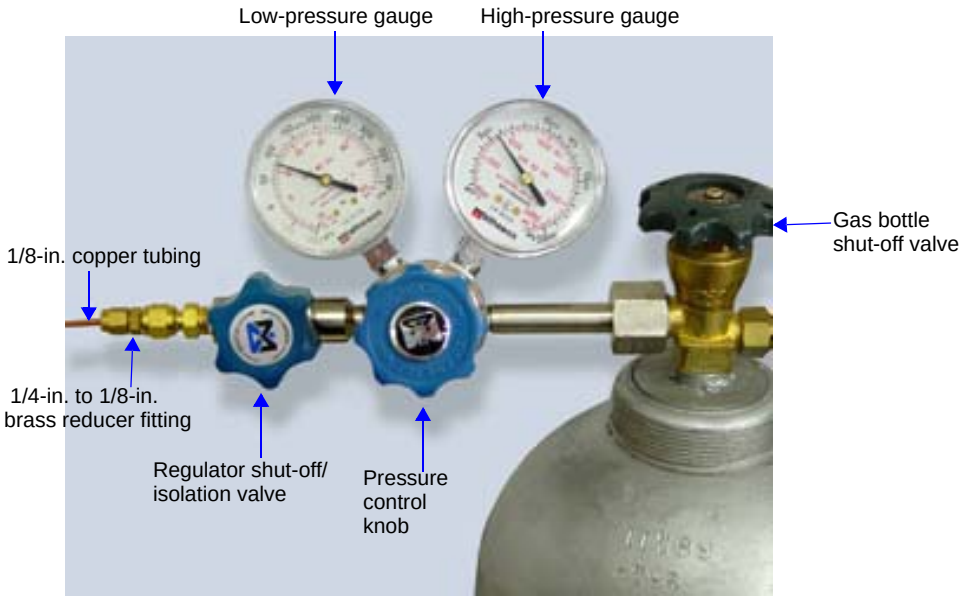
Components or Tool	Supplied By
Gas bottle for each type of gas used	Customer
Dual-stage pressure regulator assemblies for each gas supply	Micromeritics or Customer
Gas inlet line (1/8-in. copper tubing)	Micromeritics
7/16-in. wrench, 9/16-in wrench, plus a larger wrench for connecting the regulator to the gas bottle (size varies depending on the type of gas being connected).	Service Representative

Connecting a Gas Regulator to the Gas Supply

Dual-stage regulators must be used for all gas supplies.

1. Attach an appropriate dual-stage regulator to the gas supply bottle or gas line you want to connect and tighten with a wrench. Leave the gas bottle shut-off valve closed until instructed otherwise.

If an expansion kit is required, attach it to the regulator before proceeding. (Refer to the instructions included in the expansion kit.)



2. If the regulator has a 1/8-in. outlet, proceed to the next step. If the regulator has a 1/4-in. outlet, attach the reducer fitting to the outlet of the regulator shut-off/isolation valve and tighten the valve nut with a 9/16-in. wrench.

Do not overtighten the fittings. Doing so could collapse the copper tubing and cause a leak.

3. Attach the gas inlet line to the regulator, reducer fitting, or regulator expansion and tighten with a wrench.

4. Purge the regulator as follows:

It is important to purge the regulator before proceeding. This will prevent contamination of the analysis gas.

a.) Close the regulator shut-off valve by turning it fully clockwise.

b.) Turn the pressure regulator control knob fully counterclockwise.

c.) Slowly open the gas bottle valve, then quickly close the gas bottle valve.

d.) Observe the high pressure gauge. If the pressure decreases, tighten the nut connecting the regulator to the gas bottle. If the pressure is stable, proceed to step e.

If you are using hazardous gases, make sure the gas supply equipment is adequately vented to prevent purging the regulator and tubing into the lab atmosphere in the following step.

e.) Turn the pressure regulator control knob clockwise until the low pressure gauge indicates 15 psig (100 kPag). Open each regulator shut-off valve by turning it counterclockwise. Open the gas bottle shut-off valve. Flow gas for 10 to 30 seconds, then close each valve. These actions purge the regulator and gas inlet tubing.

f.) Ensure that the gas shut-off bottle valve is completely closed (turn clockwise).

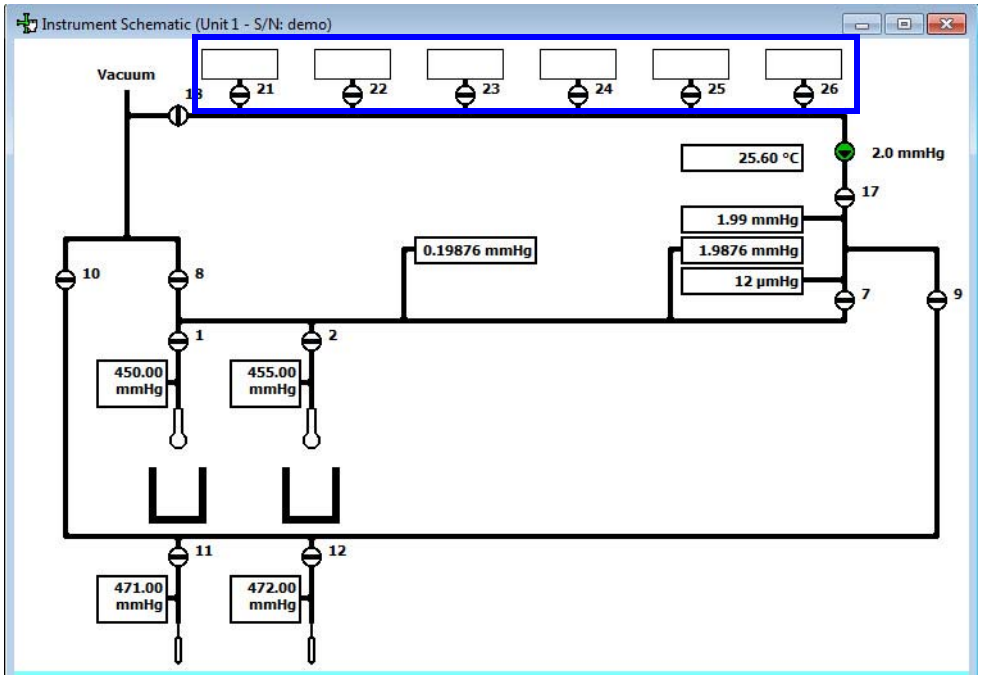
5. Repeat steps 1 through 4 for each gas supply bottle to be attached to the analyzer.

6. Proceed to the next section to connect the copper delivery tubing to the analyzer.

Connecting the Gas Delivery Tubing to the Analyzer

The gas inlet ports are located on the right side panel of the analyzer. The ports are labeled **1** through **6**.

These ports correspond to the gas inlet port valves on the instrument schematic labeled 21 through 26 (shown below).



1. Make sure the port valve is closed.
2. Remove the port plug.
3. Attach the gas line to the port.
4. Make sure any unused gas inlet ports are plugged.
5. Record the gas installed on the form in Appendix B.

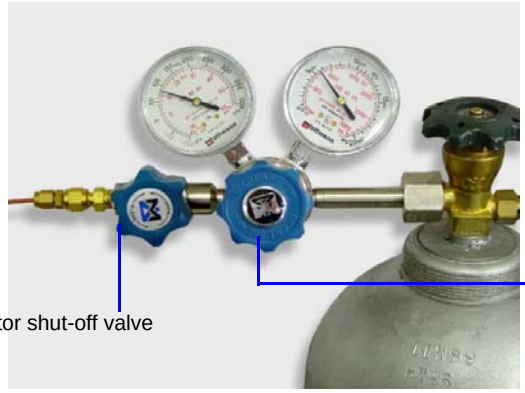
Cleaning and Verifying Gas Lines

Only evacuate the gas lines back to the tank if they are within 12 feet of the instrument. Do not perform this procedure if the gas lines connected to the instrument are longer than the 6-ft. lines that are shipped with the instrument.

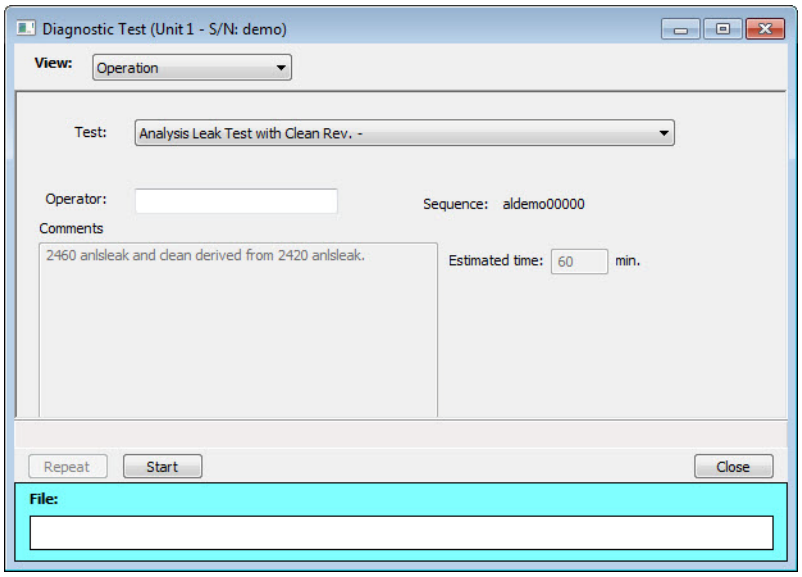
There are two methods for cleaning and verifying gas lines. One is to use the diagnostic test included in the ASAP 2460 software. The other method is to perform the test manually; this method is less time consuming, but should be used by experienced service personnel only.

Software Diagnostic Test

Before beginning, confirm that the state of the valves are as shown below. The pressure gauges will be near zero.



1. To start diagnostic testing, go to ***Unit [n]*** > ***Diagnostics*** > ***Start Diagnostics Test***.



2. Click the down arrow to the right of the **Test** field and select **Clean and Verify Gas Line # Test**. The length of time a test will run is also indicated on the screen. The **Sequence** field indicates the name of the file created as a result of this test.

3. Click **Start**.

4. Select the Port number to which the gas line is attached.

5. From the **View** dropdown list, select either **Operation**, **Instrument Log**, or **Instrument Schematic.**

6. A series of prompts display on the screen when operator response is required. Answer these prompts.

7. A popup window indicates the test is complete. Click **OK**. View the reports on the screen.

8. Click each tab and look for a reading of **Passed**. A Passed reading indicates all valves are in proper state for operation. If any test shows a **Failed** reading, refer to the following table for the location of the gas leak.

Tab	Test	If Failed status, then...
Gas Line to Inlet Port *[n]* Test 1	Gas Line to Gas Bottle Test	This test will show a reading of **Failed** if any of the other tabs has a **Failed** reading. Correct the failed connection and rerun the test.
Gas Line to Inlet Port *[n]* Test 2	Gas Line to Isolation Valve Test	Check for a leak between the gas line and the isolation valve. Correct the problem and rerun the test.
Gas Line to Inlet Port *[n]* Test 3	Isolation Valve To Bottle Leak Rate	Check for a leak between the isolation valve and the gas bottle. Correct the problem and rerun the test.

9. Click **Close** to close the test report. Click **Close** again to close the test.

10. Repeat steps 1 through 9 for each gas line attached to the instrument.

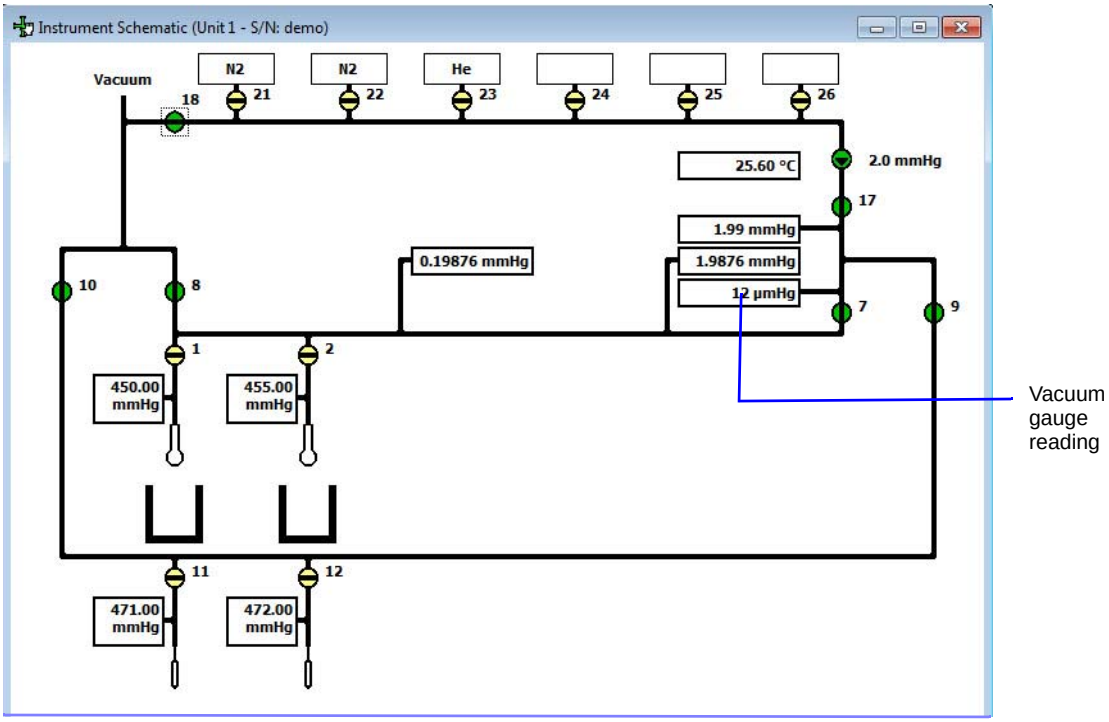
Manual Method

1. Open valves 7, 8, 9, 10, 17, 18 and the servo valve.

2. Open the port valve corresponding to the first gas line attached.

3. Wait for the vacuum gauge reading on the schematic to come down to below 10 µmHg, then wait an additional 15 minutes

4. Close the port valve.

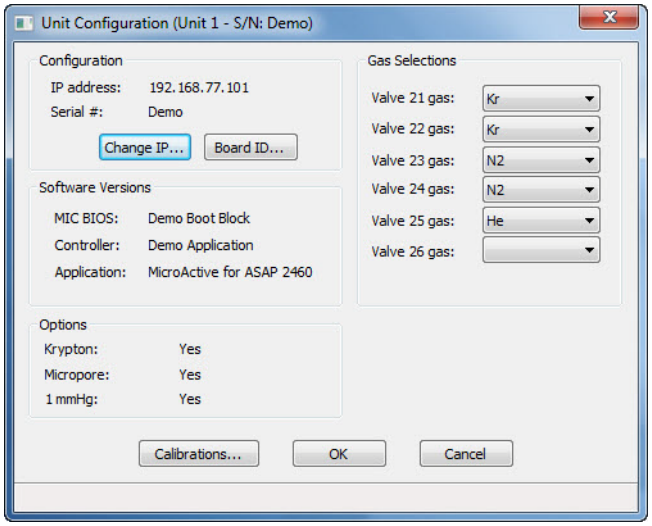


5. Perform steps 2 through 4 for any additional gas lines.

6. Close the open valves.

Specifying Gas Ports

1. Select **Unit [n] > Unit Configuration** from the main menu. The Unit Configuration dialog is displayed.



2. The ASAP 2460 program detects and displays the options enabled by the hardware in the analyzer. Check this list to ensure that the list matches the customer's hardware.

3. Click on the down-arrow at the port to which you attached a gas line and choose the appropriate gas.

4. Click **OK** to close the dialog, and then click **OK** again to close the Unit Configuration dialog.

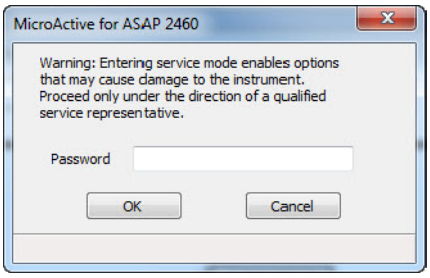
Checking System Calibration

The analyzer was calibrated at the factory, so it should not require further calibration. However, you should check calibration to make sure the values in the analysis system are close to those shown on the reference gauge.

Entering Service Test Mode

The ASAP 2460 Analysis Program must be run in Service Test Mode to perform some of the verification procedures. To enter Service Test Mode:

1. Select **Options** > **Service Test Mode** from the main menu to display the password dialog.



2. Enter **mic.key** in the Password field. Click **OK**.

Service Test Mode remains enabled until you exit it or until the ASAP 2460 application is closed.

Exiting Service Test Mode

Perform all operational verification tests in Service Test Mode. When you have finished operational verification, select **Options** > **Service Test Mode** to remove the check mark and exit Service Test Mode. You will have to enter the same password you entered to enable Service Test mode to exit it.

Verifying Vacuum Level

1. Open valves 7, 8, 9, 10, 17, 18 and the servo valve.
2. Evacuate until the vacuum gauge reading on the schematic screen is less than 10 µmHg.
3. Record the computer reading in the table titled **Verify Vacuum Level**, page **82**.
4. Backfill with nitrogen to 760 mmHg.
5. Close the valves.

Verifying Analysis Pressure Scale

This section contains instructions for verifying the pressure of each of the transducers in the customer's system configuration.

Required Components and Tools

Component or Tool	Supplied by
Reference pressure gauge	Service Representative
Small screwdriver	Service Representative

1000-mmHg Pressure Transducer

1. Attach a reference gauge to the last port.
2. Backfill the system to 760 mmHg.
3. If Manual Mode is not enabled, select **Unit [n] > Enable Manual Mode** to enable it.
4. Open all sample port valves.
5. Let the system vent.
6. Check the pressure at the target pressures shown in the checklist table titled **Verify Main 1000-mmHg Pressure Scale**, page **82**.

10-mmHg Pressure Transducer

Perform these procedures only if the customer's unit is equipped with a 10-mmHg transducer.

1. Close all valves except the valve for the port to which you attached the gauge. This port must remain open.
2. Wait 15 to 20 minutes for a sufficient vacuum.
3. Check the pressure at the target pressures shown in the checklist table titled **Verify 10-mmHg Pressure Scale (if installed)**, page **83**.

1-mmHg Pressure Transducer

Perform these procedures only if the customer's unit is equipped with a 1-mmHg transducer.

1. Close all valves.
2. Wait 15 to 20 minutes for a sufficient vacuum.
3. Check the pressure at the target pressures shown in the checklist table titled **Verify 1-mmHg Pressure Scale (if installed)**, page **83**.

Verifying Manifold Temperature

Required Components and Tools

Component or Tool	Supplied By
Reference Temperature gauge (temperature calibration standard)	Service Representative

1. Remove the top panel if installed.
2. Insert the thermocouple probe of the temperature gauge into the manifold probe hole as shown below.

3. Place the top panel back on the instrument.
4. Select **°C** on the gauge and allow the temperature to stabilize for 5 minutes.
5. Enter the temperature from the gauge and the temperature displayed on the computer screen in the table titled **Verify Manifold Temperature**, page **83**.

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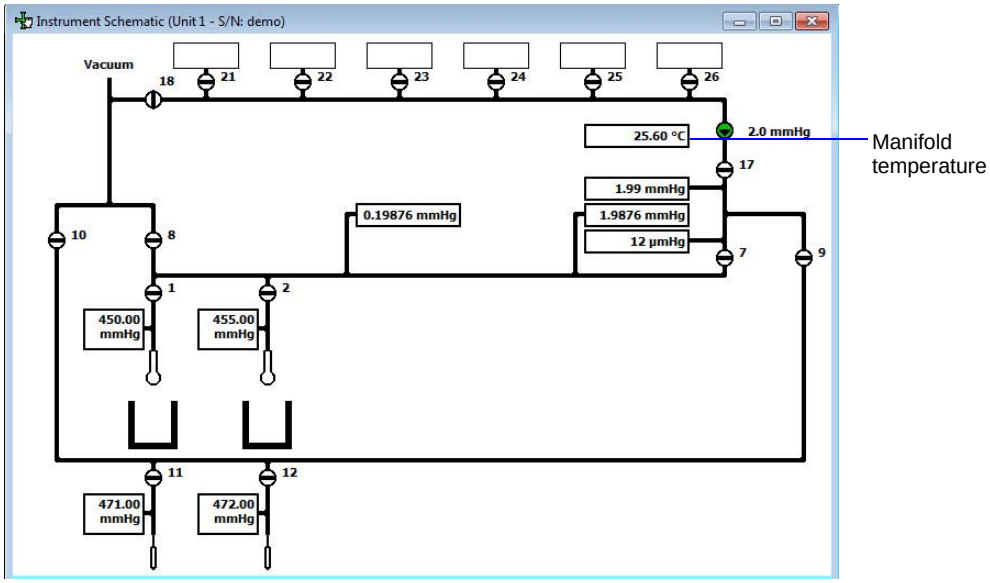


6. The value in the Difference Column must be with the limits specified in the Checklist.

Performing Analysis Tests

Blank Tube Analysis (Nitrogen)

The purpose of the Blank Tube Analysis is to test the sample manifold assembly during an automatic nitrogen analysis. The analysis conditions for this test are chosen to closely approximate the full pressure range and long run times of a full adsorption/desorption isotherm. The test typically takes between 11 to 15 hours to complete.

Required Tools and Components

Component or Tool	Supplied By
Sample Tubes for the number of ports on the analyzer	Micromeritics
Filler Rods for the number of ports on the analyzer	Micromeritics
Isothermal Jackets or the number of ports on the analyzer	Micromeritics
Dewar Dipstick	Micromeritics
Fully calibrated instrument	Service Representative
All instrument panels installed on instrument	Service Representative

Component or Tool	Supplied By
All gas inlet valves should have between 10 to 18 psig (68.9476 to 124.1056 kPag) of gas pressure applied.	Service Representative
Liquid Nitrogen	Customer

Performing a Blank Tube Analysis

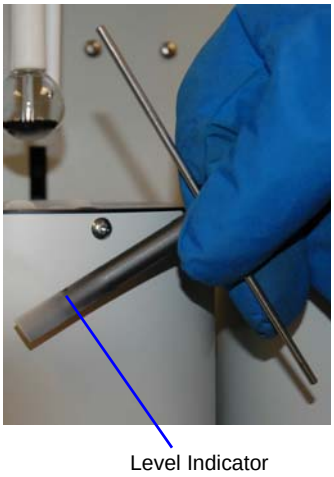
1. Insert a filler rod in the sample tube.

2. Attach the sample tube with isothermal jacket to the analysis port.

3. Repeat the procedure for the remaining analysis ports.

4. Place the dewars on the elevators.

5. Fill the dewars with liquid nitrogen and verify the level with the dewar dipstick.



6. Open valves **7**, **8**, **9**, **10**, **17**, **18** and let the system evacuate for at least 1 hour.

7. Install the shield on the analysis ports.

8. Create a sample information file for each port as follows:

   a.) Select **File > New Sample**.

   b.) Click **Replace All**.

   c.) Select **Nitrogen Blank Analysis.SMP** from the data directory, then click **Replace**.

   d.) Enter **Blank tube analysis port <number>** in the Sample field.

   e.) Enter your initials in the **Operator** field.

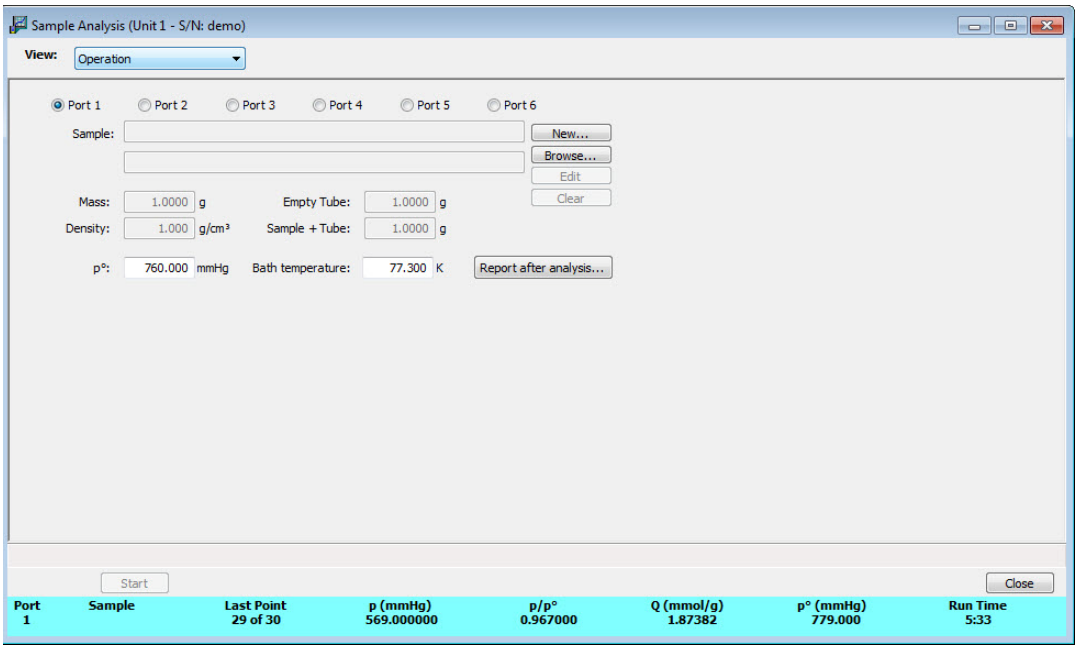
   f.) Enter the instrument's serial number in the **Submitter** field.

   g.) Click **File > Save As.**

   h.) Enter **Blank tube analysis port <number>** in the File Name field, then click **Save**.

   i.) Click **Close**.

9. Select **Unit [n] > Start Analysis.**



10. Click the **Port** number.

11. Click **Browse** and select the file you just created.

12. Click **Start**.

13. When the analysis is complete, review the printed reports. The Quantity Adsorbed data must fall within the limits shown in the next section.

14. Retain a copy of the sample information file to return to the Micromeritics Service Support Center.

15. Attach the printed reports to the Installation Checklist to be returned to Micromeritics.

Blank Tube Analysis Results

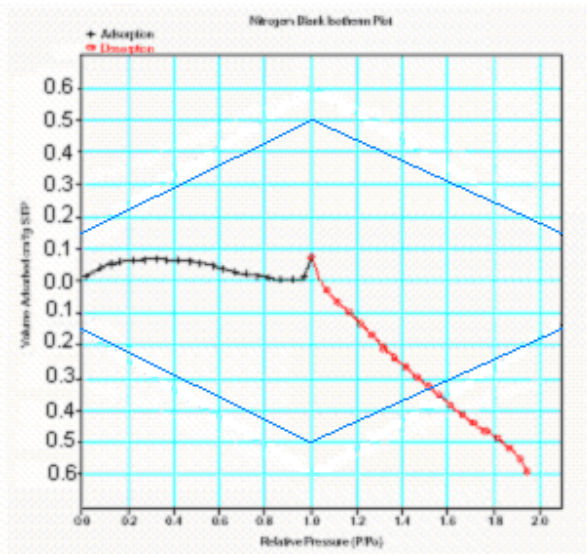
The long run time for this test is achieved through the use of a 100 second equilibration interval, and a relative pressure table with 40 to 45 target pressures. With the 100 second equilibration interval, each relative pressure point in the pressure table will add a minimum of [(100 x 10) + 100] = 1,100 seconds (each pressure point takes approximately 18 min 20 sec).

- This test is useful in detecting leaks into the analysis manifold from a gas supply valve or other valve that has pressure on it. The test can also detect atmospheric leaks into the analysis manifold from leaking plugs. It can also detect the resulting loss of gas that occurs when gas leaks out of the analysis manifold through the vacuum valve 8.

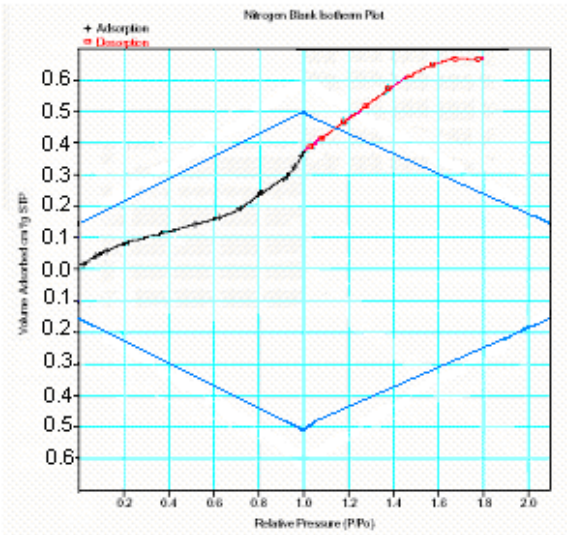
- When using the results of this test for ascertaining the presence of a leak or high outgas rate, primary focus should be given to the first and last points. A line drawn between the first and last points can best illustrate the effect of a leak or high outgas rate.

- The results from this test can provide useful insight into other aspects of the instruments performance.

Quantity adsorbed data that ends below –0.15 cc/g, indicate that gas is leaking into the manifold from a source of higher pressure. Sources of higher pressure include: the gas inlet valves, Valves 7, 9 and 17 as well as leaks from atmosphere at any of the manifold plugs, transducer connections, or associated interconnecting tubing. Adjacent analysis ports may also be at considerably higher pressures at any time during the test. Any sample port valve that is leaking, can become a source of higher pressure that could leak into any other sample port equilibrating in the lower manifold.

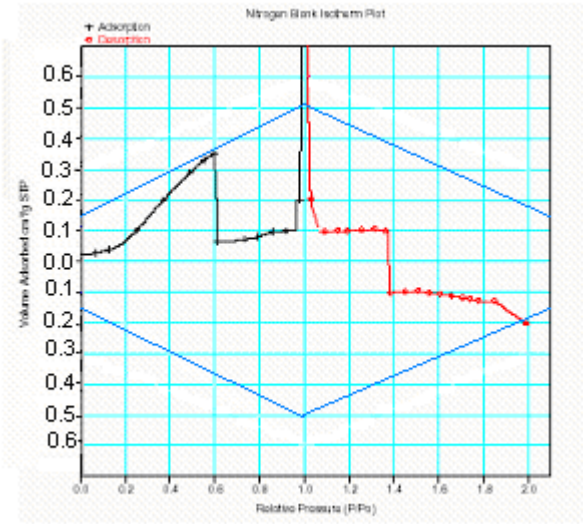


Quantity adsorbed data that ends above +0.15 cc/g, indicate that gas is leaking out of the manifold to a source of lower pressure. (i.e. Valve 8). Adjacent analysis ports may also be at considerably lower pressures at any time during the test. Any sample port valve that is leaking, can become a source of lower pressure that could remove gas from any other sample port equilibrating in the lower manifold.

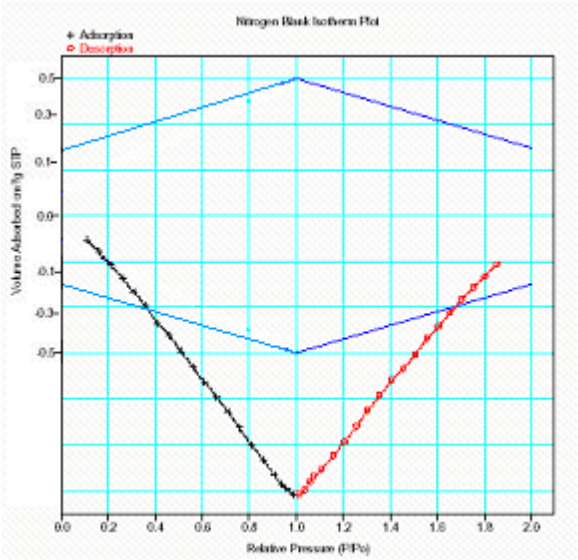


In this example, there are two unusual events. On the adsorption branch, there is a sudden drop of measured adsorption. The second event occurs during desorption, where the isotherm drops by about 0.1cm^3/g. The drops exceed the 0.05cm^3/g limit and require diagnostic work to identify the cause. It may be a leak or transducer defect.

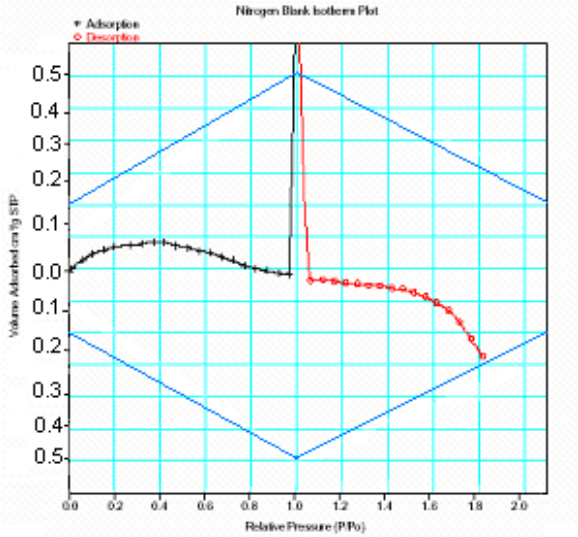
If the drops were less than 0.05cm^3/g, they would be acceptable. If another test is done, and the event does not recur, then the system is considered acceptable without repair. However, if the step still occurs, then diagnostic work is needed to identify the cause and fix it.



The upper and lower limits established for this test take into account the maximum allowable upper and lower limits for freespace error. When these upper and lower limits are plotted, the “V” shape of the unfolded isotherm illustrate how any freespace error will be added to and then taken away from the 0.0 m2/g Quantity adsorbed base line. Freespace errors can sometimes be traced to contamination in the helium gas supply, leaks into the manifold that mix with helium during freespace measurement, overfilling the analysis dewar with LN2, the lack of a filler rod, or the lack of an isothermal jacket**.**



Sometimes there will be a noticeable spike in the isotherm close to a relative pressure of 1.0. This spike does not indicate a problem. The spike is usually caused by an insignificant difference in the measured saturation pressure in the tube and the sample tube. This difference in saturation pressure will cause a spike when the sample file has a relative pressure point greater than 0.99. This spike can sometimes be avoided if the pressure table omits relative pressures greater than 0.985.



Reference Chamber Analysis (Nitrogen)

The reference chamber test is used to verify that the scale factor accuracy and linearity of the instrument are within specifications. The reference chamber test confirms that the instrument accurately measures pressures and volume. The test is performed after temperature and pressure transducers are calibrated and the nitrogen blank tube runs indicate that the instrument is free of gas leaks and other gas accounting errors. The test typically takes between 2 to 3 hours to complete.

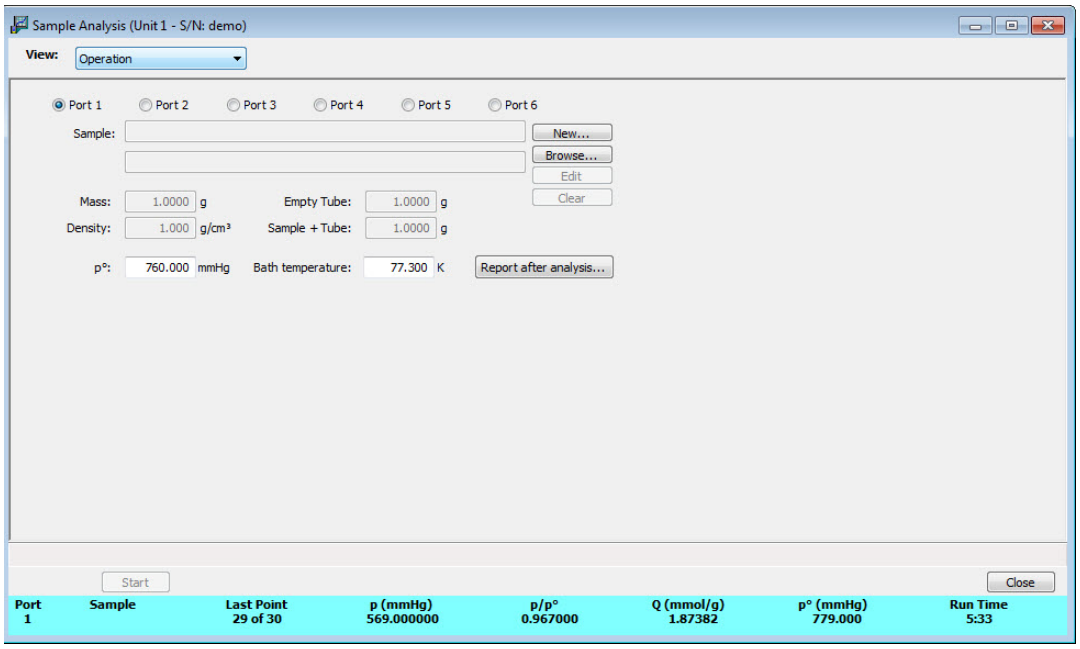
Required Components and Tools

Component or Tool	Supplied By
Reference Volume Chamber kit	Service Representative
All instrument panels installed on instrument	Service Representative
Nitrogen blank tube test must have been completed successfully	Service Representative
Crushed Ice	Customer/ Service Representative

Performing a Reference Chamber Analysis

1. Remove the sample tube from sample port 1.
2. Connect the reference volume chamber to sample port 1.
3. Evacuate the chamber for one hour.
4. Submerse the volume ball into an ice bath and allow it to equilibrate for ten minutes. Crushed ice must surround the volume ball. Add a little water to cause a thick slush to surround the volume ball. Support the ice bath properly.
5. Create a sample information file f
6. or each port as follows:
   a.) Select **File > New Sample**.
   b.) Click **Replace All**.
   c.) Select **Reference Chamber Analysis.SMP** from the data directory, then click **Replace**.
   d.) Enter the volume of the chamber you are using in the **Sample** field.
   e.) Enter your initials in the **Operator** field.
   f.) Enter the instrument's serial number in the **Submitter** field.
   g.) Click **File > Save As.**
   h.) Enter **Reference chamber analysis port <number>** in the File Name field, then click **Save**.
   i.) Click **Close**.
7. Ensure you have selected **Service Test Mode**.

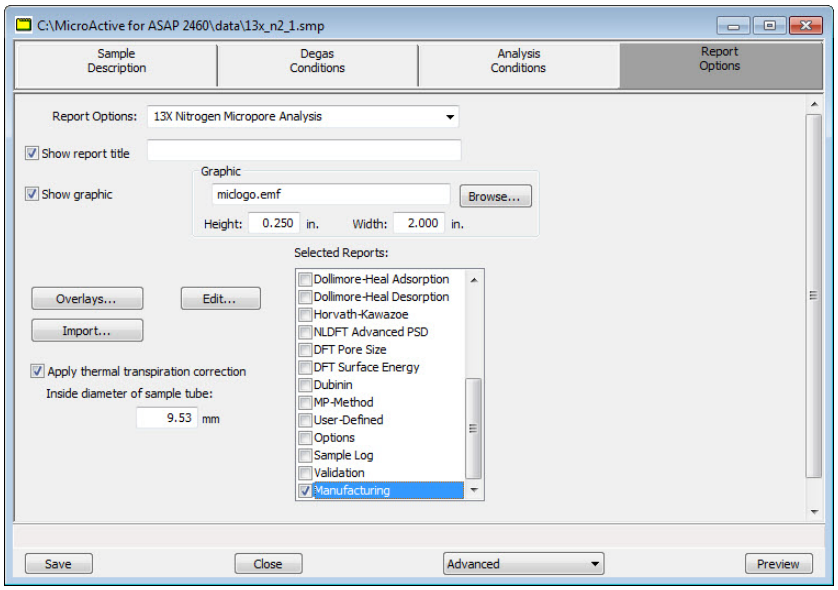
8. Select **Unit [n] > Start Analysis.**



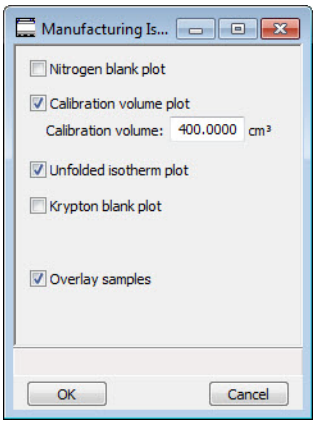
9. Click **Port 1**.

10. Click **Browse** and select the sample file you just created.

11. Click the Reports tab, then select **Manufacturing** in the Reports list.



12. Click Edit.



13. Enter the volume of the chamber, then click **OK**.

14. After the first two points have been taken, open the nupro valve, located on top of the calibration chamber.

15. When the analysis is complete, review the printed reports. The Quantity Adsorbed data must fall within the limits shown in the graph. Enter the value in the space provided on the Installation Checklist.

16. Retain a copy of the sample information file to return to the Micromeritics Service Support Center.

17. Attach the printed reports to the Installation Checklist to be returned to Micromeritics.

Reference Chamber Analysis Test Results

Gas adsorption instruments indirectly determine surface area and pore volume by changing the pressure on a sample and then measuring the number of standard cubic centimeters of gas missing from the free space in the sample tube and that part of the instrument below the sample valve. This quantity of missing gas, plotted against pressure and measured at constant temperature, is called an isotherm. Surface area and pore volume can then be calculated from the isotherm data. If an instrument is not properly calibrated, the isotherm will contain errors.

Undetected errors can disproportionately affect the BET calculation, t-plots, and calculation of pore volumes. Often these computational variations are magnified over those in the original isotherm.

- The reference chamber test verifies that the instrument accurately measures pressure, volume, and temperature.

- The reference chamber test uses the definition of a standard cubic centimeter of gas to verify the accuracy of an instrument. During the test, the reference chamber is immersed in a Dewar filled with ice and water to maintain a temperature of 0ºC (the standard temperature). The reference chamber then extracts from the instrument a known gas (nitrogen) which fills the known volume of the reference chamber. If the instrument does not report (within specified limits) the amount of gas missing from the free space, the instrument is not properly calibrated.

- The volume of a reference chamber itself is determined using a simple laboratory procedure. The empty chamber is weighed and then filled with a fluid (water or mercury) of known density. The volume of the chamber is then calculated based on the weight and density of the fluid. The procedure is repeated and the results are averaged. Using these methods, Micromeritics has attained an accuracy of chamber measurement better than ± 0.1%.

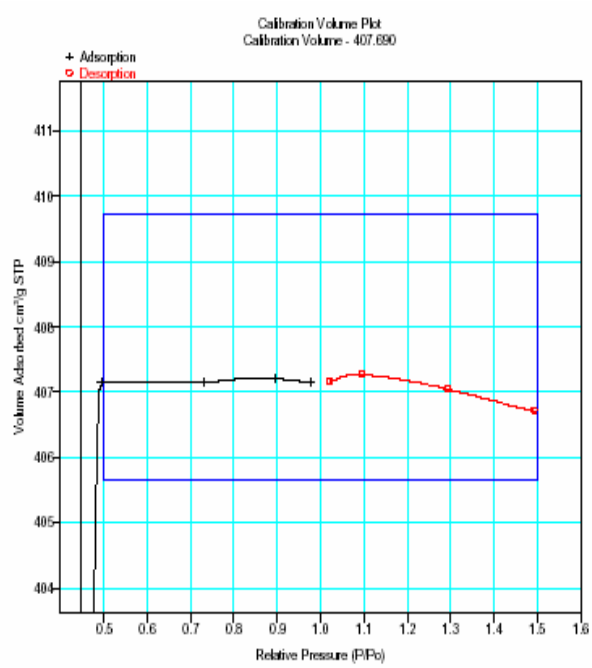
- The results of tests which rely upon the use of reference or standard materials may vary because of differences in how samples are handled, prepared and weighed. The reference chamber test removes these variables and may also be performed more quickly than tests using reference or standard materials. Micromeritics has established the reference chamber test as one of the pass/fail criteria for its gas adsorption instruments.

- The Calibration Volume Plot, shown in this section, is the graphic report produced by the instrument software when “Service Test Mode” is used.

- The Volume of the reference chamber in the illustrated test was 407.690 cc.

- This value was entered into the software and the upper and lower limits displayed in this report were automatically calculated.

- The upper and lower limits for this test were calculated by adding and subtracting 0.5% from the known volume of the reference chamber.



- The 407.690 cc chamber would have an upper limit of 409.73 cc and a lower limit of 405.65 cc.

- The upper and lower limits of this test were calculated by adding and subtracting 0.5% from the known volume of the reference chamber.

- The 407.690cc chamber would have an upper limit of 409.73cc and a lower limit of 405.65cc. The calculated data from the test is determined by taking the reported Quantity Adsorbed, and Pressure data reported between 0.5 Relative Pressure and performing the following calculation:
  Calculated Volume = Quantity Adsorbed X (760/Pressure)

- The data in the following table show how this formula manually calculates the results of the test.

Relative Pressure	Pressure	Volume Adsorbed	Calculated Data
0.4941	375.53290	201.1775	407.1411
0.7328	556.96051	298.3848	407.1607
0.8949	680.16858	364.4257	407.1983
0.9783	743.56476	398.3550	407.1599
0.9039	686.98627	368.1434	407.2701
0.7054	536.13306	287.1431	407.0421
0.5056	384.26898	205.6367	407.7044

Data are not typically used below relative pressures of 0.5. The reason for this is the slow gas flow into and out of the reference chamber, through the narrow tubing, at increasing lower pressures sometimes causes the reported calculated volume data to curve downward. This false indication is eliminated by only using data above 0.5 relative pressure. The falling slope towards the end of the runs is attributed to unknown causes.

Reference Material Analysis

Required Components and Tools

Component or Tool	Supplied By
Sample Tubes for the number of ports on the analyzer	Micromeritics
Filler Rods for the number of ports on the analyzer	Micromeritics
Isothermal Jackets for the number of ports on the analyzer	Micromeritics
Reference Material (as shipped with the accessories)	Micromeritics
Dewar Dipstick	Micromeritics
Liquid Nitrogen	Customer

Performing a Nitrogen Reference Material Analysis

1. Degas the carbon black reference material as specified on the material data sheet. The weight of the degassed samples must be obtained after degassing.

2. Attach the sample tubes to the sample ports.

3. Create a sample information file for each port as follows:

   a.) Select **File > New Sample**.

b.) Click **Replace All**.

c.) Select **D-7 Carbon Black Reference Material.SMP** from the data directory, then click **Replace**.

d.) Enter **Nitrogen Reference Port <number>** in the **Sample** field.

e.) Enter your initials in the **Operator** field.

f.) Enter the instrument's serial number in the **Submitter** field.

g.) Click **File > Save As.**

h.) Enter **Nitrogen Reference Port <number>** in the File Name field, then click **Save**.

i.) Click **Close**.

4. Select **Unit [n] > Start Analysis.**

5. Click the **Port.**

6. Select the sample information file you created, then click **Start.**

7. Fill in the reference material lot number and expected surface area in the Installation Checklist table titled **Nitrogen (N2) Standards Test**, page **84**.

8. When the analyses are complete, fill in the Measured Area in the Installation Checklist.

9. Fill in the sample file names in the Installation Checklist.

10. Retain a copy of the sample information file to return to the Micromeritics Service Support Center.

Performing a Krypton Reference Material Analysis

These instructions apply only to units with the Krypton option.

1. Degas the alumina reference material as specified on the material data sheet. The weight of the degassed samples must be obtained after degassing.

2. Attach the sample tubes to the sample ports.

3. Create a sample file for each port as follows:

   a.) Select **File > New Sample**.

   b.) Click **Replace All**.

c.) Select **Alumina Reference Material.SMP** from the data directory, then click **Replace**.

d.) Enter **Krypton Reference Port <number>** in the **Sample** field.

e.) Enter your initials in the **Operator** field.

f.) Enter the instrument's serial number in the **Submitter** field.

g.) Click **File > Save As.**

h.) Enter **Nitrogen Reference Port <number>** in the File Name field, then click **Save**.

i.) Click **Close**.

4. Select **Unit [n] > Start Analysis.**

5. Click the **Port.**

6. Select the sample information file you created, then click **Start.**

7. Fill in the reference material lot number and expected surface area in the Installation Checklist table titled **Krypton (Kr) Standards Test**, page **85**.

8. When the analyses are complete, fill in the Measured Area in the Installation Checklist.

9. Fill in the sample file names on the Installation Checklist.

10. Retain a copy of the sample information file to return to the Micromeritics Service Support Center.

Saving Calibration Changes

An instrument calibration file, including data such as system volume and vacuum level, is shipped with the ASAP 2460 program and loaded during installation of the program. If the default directories are used during installation, the calibration file is stored in the **C:\2460\hardware** directory. The file is named: **CAL<instrument serial number>.DAT**.

Generally it will not be necessary to change the data in the calibration file. However, if a condition occurs during the operational verification that requires you to change calibration data, you should save the changes in a file. Calibration data files are retained in the instrument's history file and can be reloaded in the event that the customer's calibration data becomes corrupt.

If you change calibration data, follow these steps:

1. Select **Unit [n] > Calibration> <calibration type>**. For example, **Unit [n] > Calibration > Volume** to calibrate the system volume. The calibration dialog is displayed.

2. Enter the volume on the reference gauge, then click **OK.**

3. Select **Unit [n] > Calibration > Save to File**. The Select Calibration File dialog displays.

4. A default file name is displayed in the **File name** field. The file name contains the unit serial number and a sequential number. The file name extension is .CAL.

5. Click **OK**.

6. Make a copy of the file and return it with the Installation Checklist to Micromeritics.

Verifying Operation of Auxiliary Modules

One Auxiliary Module

If you are installing only one Auxiliary Module as part of the initial ASAP 2460 system installation, proceed to **Performing a Kwikchek Test**, page **55** and follow the procedures in that section to verify that the Auxiliary Module is operating properly.

Two Auxiliary Modules

If you are installing two Auxiliary Modules as part of the initial ASAP 2460 system installation, proceed to **Performing a Kwikchek Test**, page **73** and follow the procedures in that section to verify that both Auxiliary Modules are operating properly.

Part 3. Installing an Auxiliary Module

These instructions describe how to install an Auxiliary Module when the customer has purchased an ASAP 2460 system with a Master Module and one or more Auxiliary Modules. They also describe how to add an Auxiliary Module to a customer's existing Master Module.

Master Module with Auxiliary Module

Removing Panels

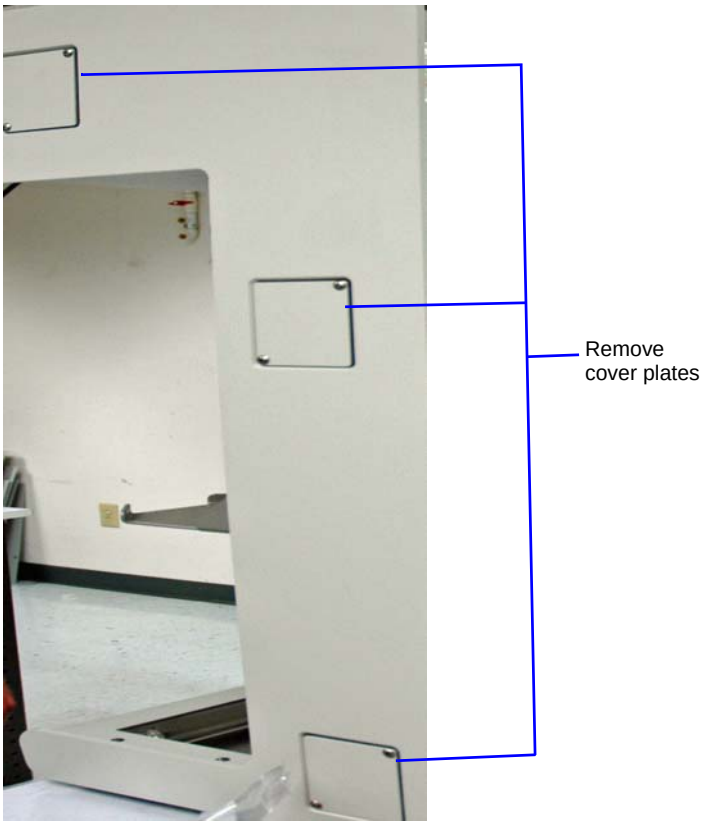
1. Ensure that the power is disconnected, any attached vacuum pump is powered off, and that the instrument manifold is at ambient pressure.

2. Attach an ESD strap to your wrist and attach the clip to the analyzer.

3. Remove the top and rear panels from the Master Module and the Auxiliary Module.

Auxiliary Module ***Master Module***

4. Remove the three cover plates from the right side panel of the Master module. Retain the cover plates and screws; they will be needed later.

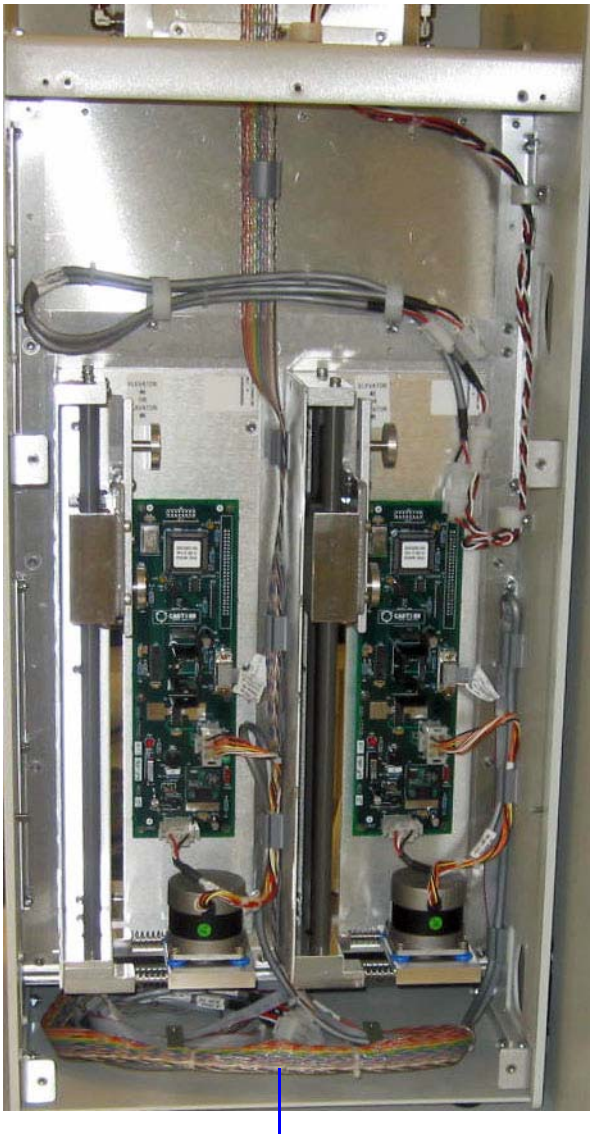


Bolting the Modules

Using the bolts supplied in the Auxiliary Module accessories kit, bolt together the Master Module and the Auxiliary Module at the three openings in the right side of the Master Module and the left side of the Auxiliary Module.

Connecting the Elevator and Port Transducer Cables

1. Unbundle the elevator communication and power cables and the port transducer cable from the back of the Auxiliary Module.

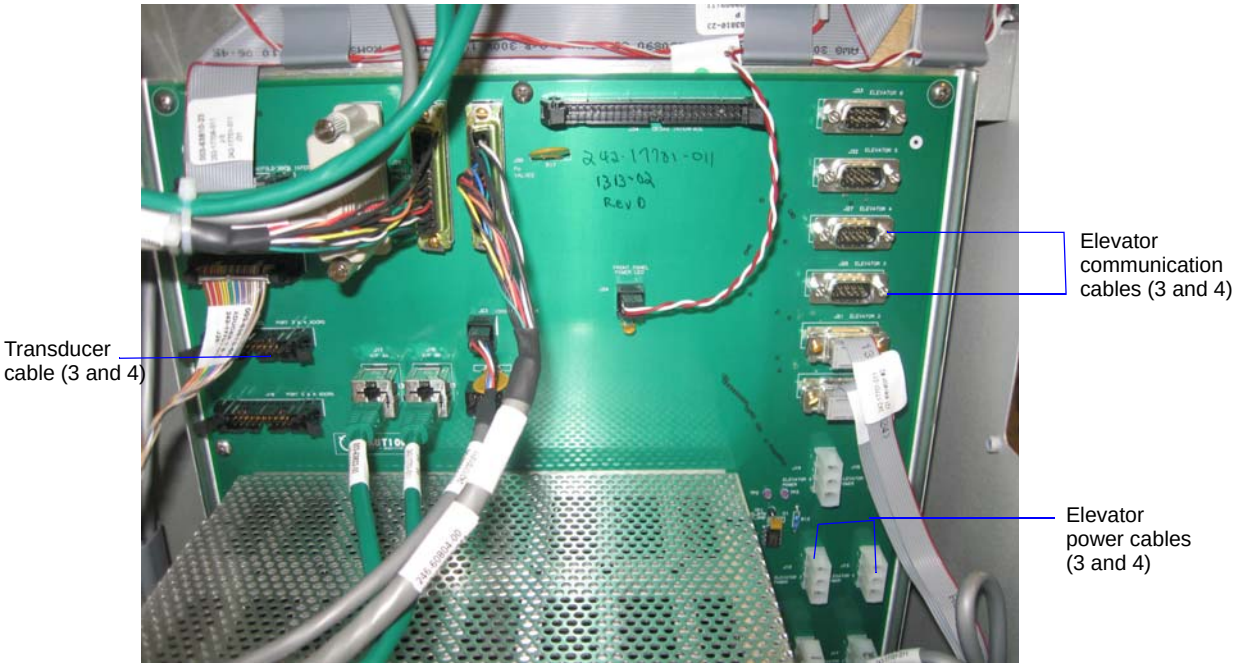


Elevator and Port transducer cables

2. Route the cables through the lower opening in the Auxiliary Module and the Master Module.

3. Connect the cables to the backplane board (P/N 242-17701-011) on the upper rear panel of the Master Module as described on the next page.

a.) Plug the two elevator communication cables into the upper connectors labeled 3 and 4.



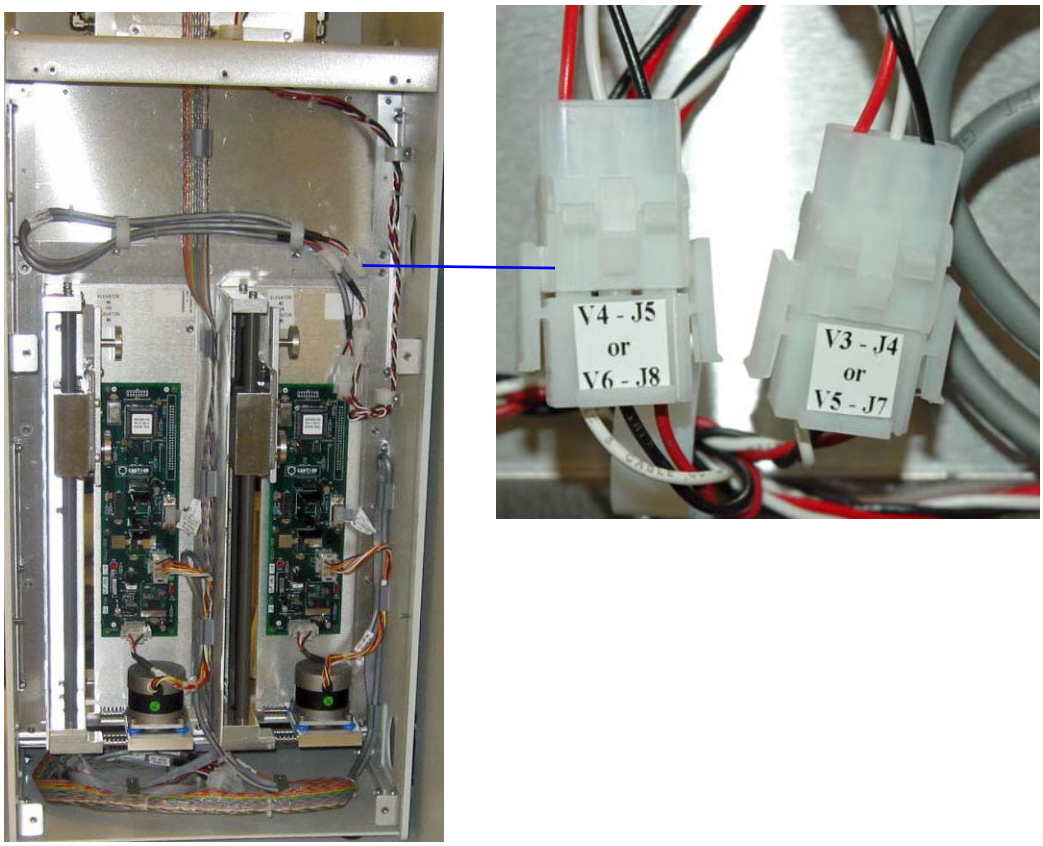
Master Module Backplane Board

b.) Plug the Elevator Power cables into the lower connectors labeled 3 and 4.

c.) Plug the Port Transducer cable into the connector labeled 3 and 4.

Connecting Magnelatch Valve Cables

1. Unbundle the magnelatch valve cables from the back of the Auxiliary Module.

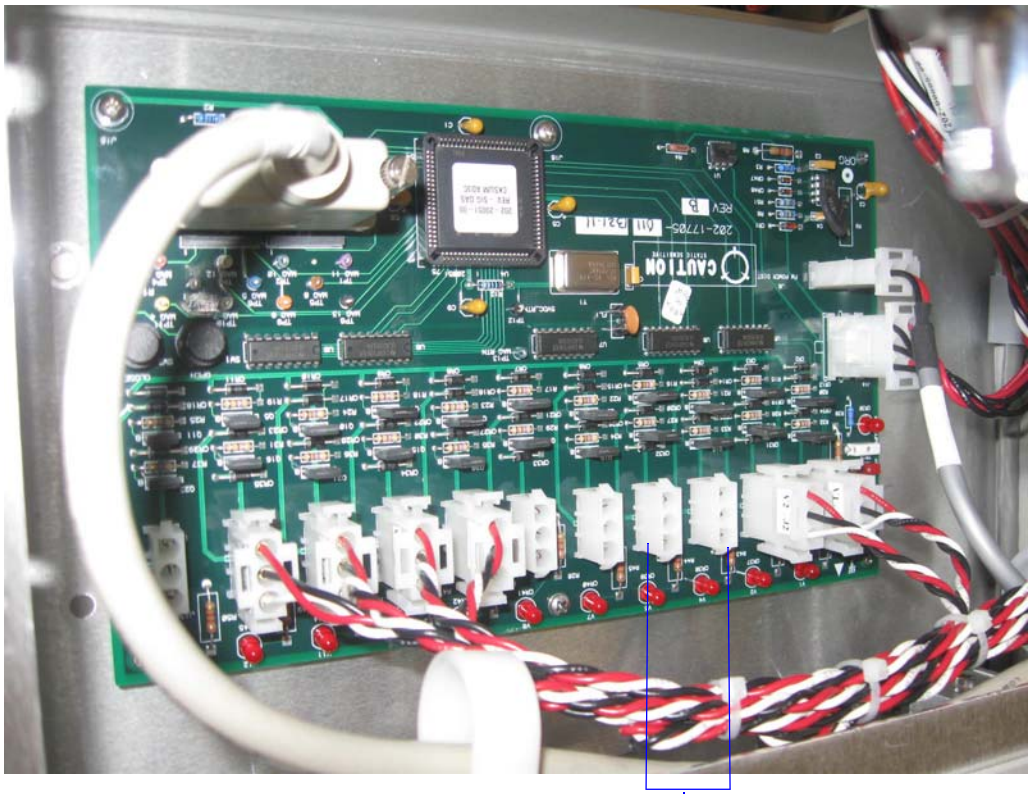


Auxiliary Module

2. Remove the upper front panel cover from the Master Module.

3. Route the cables through the middle opening in the Auxiliary Module and the Master Module.

4. Plug the cables into the connectors labeled J4 and J5 on the Magnelatch Driver board (P/N 202-17705-011) located on the upper panel of the Master Module.

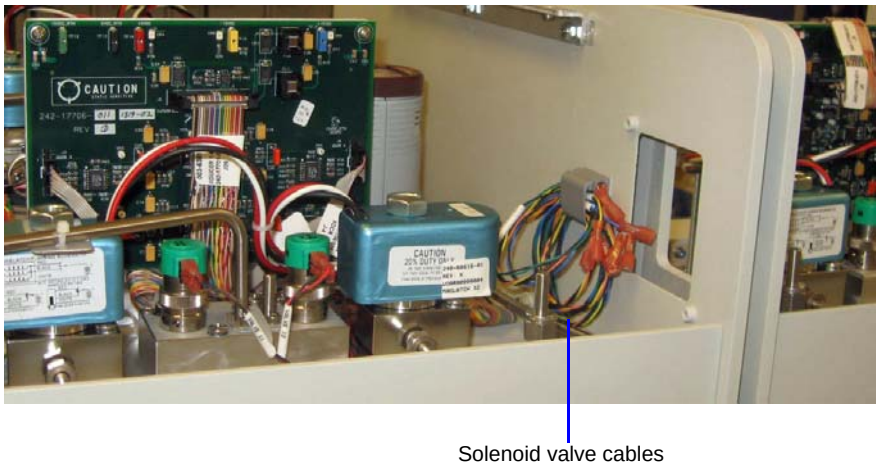


Magnelatch valve connectors
(J4 and J5)

Master Module Magnelatch Valve Board

Connecting Solenoid Valve Cables

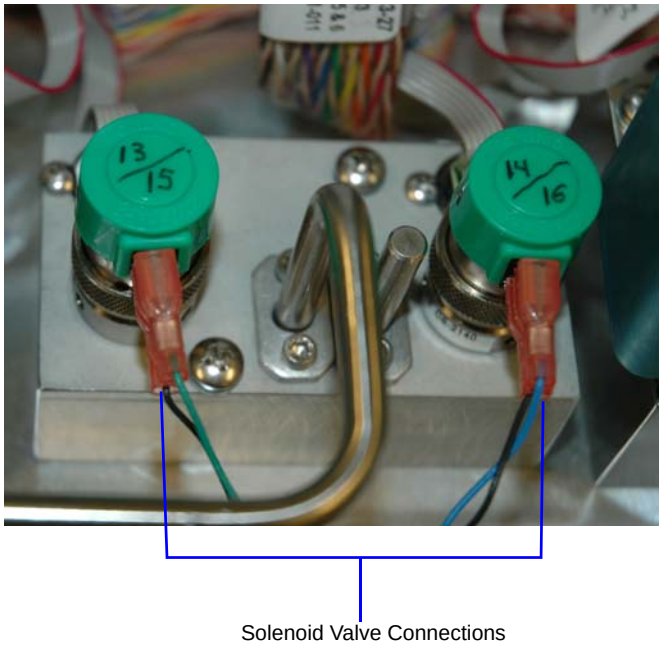
1. Unbundle the solenoid valve cables from the right side of the Master Module. Locate the cables labeled 13 and 14.



Master Module

2. Route the cables through the upper opening in the Master Module and the Auxiliary Module.

3. Plug the cables into the solenoid valves labeled 13/15 and 14/16 on the Auxiliary Module



Auxiliary Module Solenoid Valves

Connecting Plumbing

1. Locate the plumbing components shipped with the instrument.

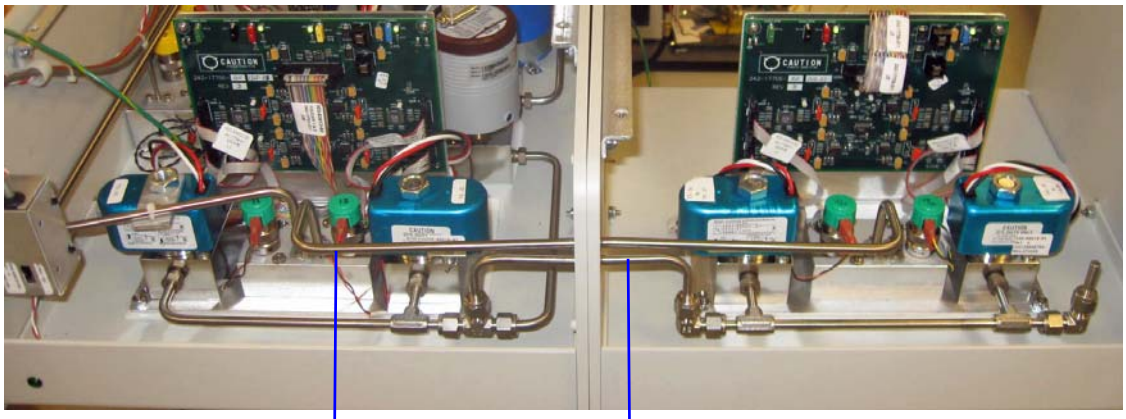
1. Remove the plugs from the plumbing ports on both the Master Module and the Auxiliary Module.

2. Slide the Po tubing through the upper opening in the Master and Auxiliary Modules.

3. Attach an O-ring to each end of the tubing and connect to both ports.

4. Slide the sample port valve tubing through the upper opening in the Master and Auxiliary Modules.

5. Attach a front and back ferrule to each end of the tubing and connect to both ports.



Po port tubing
(Use O-ring at each port)

Sample port tubing
(Use front and back ferrules at each port)

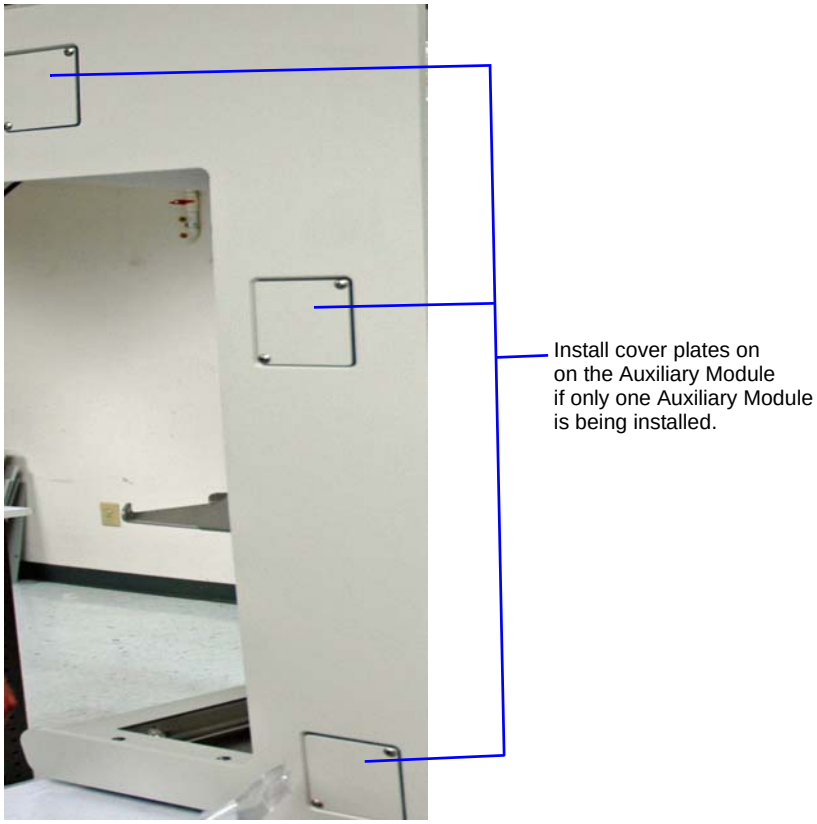
Replacing Panels

1. Replace all panels on both the Master Module and the Auxiliary Module except the upper front panel of the Master Module.

2. Choose one of the following:

   - If a second Auxiliary Module is to be installed, do install the side panel cover plates. Proceed to **Part 4. Installing a Second Auxiliary Module**, page **63**.

   - If a only one Auxiliary Module is being installed, use the side panel cover plates and screws removed from the Master Module to cover the three openings on the right side of the Auxiliary Module.



Verifying Operation

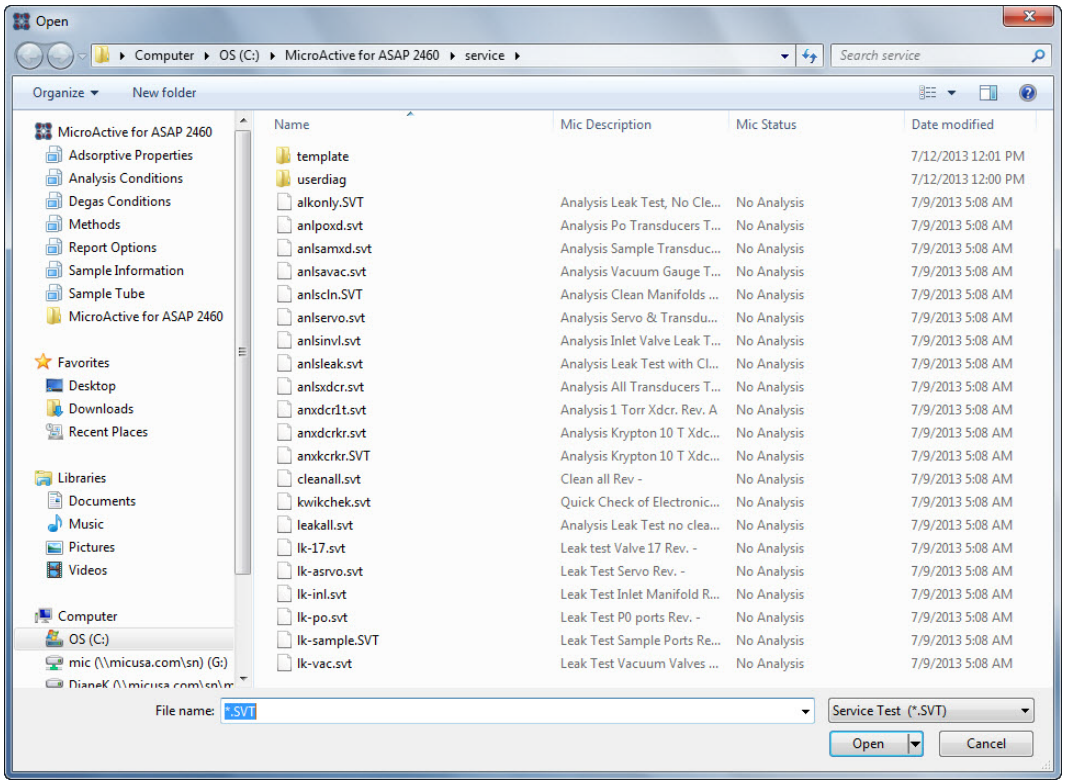
Choose one of the following:

- If this is an initial ASAP 2460 system installation, go to **Installing the Vacuum Pumps**, page **3**.
- If you are adding one Auxiliary Module to an **existing** ASAP 2460 Master Module, continue with the instructions below.
- If you will be adding a second Auxiliary Module during this installation, go to **Part 4. Installing a Second Auxiliary Module**, page **63**.

Performing a Kwikchek Test

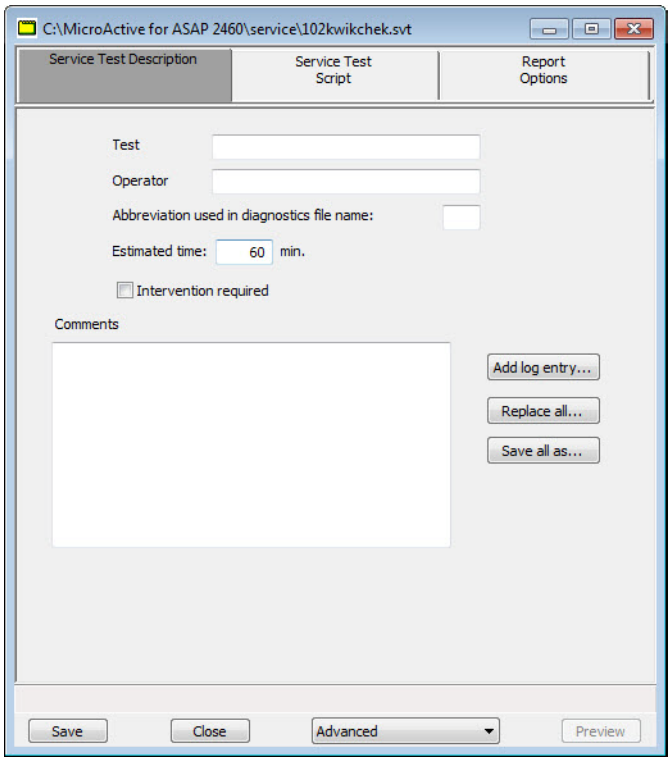
This test takes about 20 minutes to complete.

1. Enter Service Test Mode. (Refer to **Entering Service Test Mode**, page **25**.)
2. Select **Unit [n] > Service Test > Options**. The Open window displays.

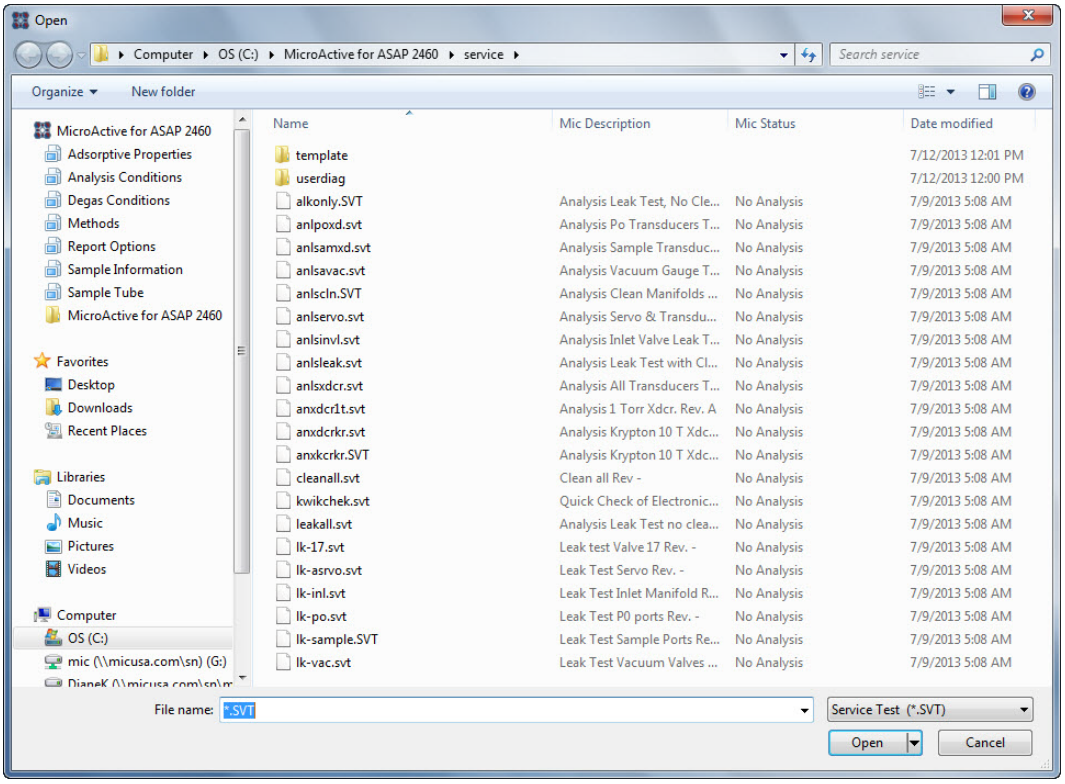


3. In the **File name** field enter: **<serial number>kwikchek.svt**. For example: **102kwikchek.svt**

4. Click **Open**, then click **OK**. The Service Test window displays.



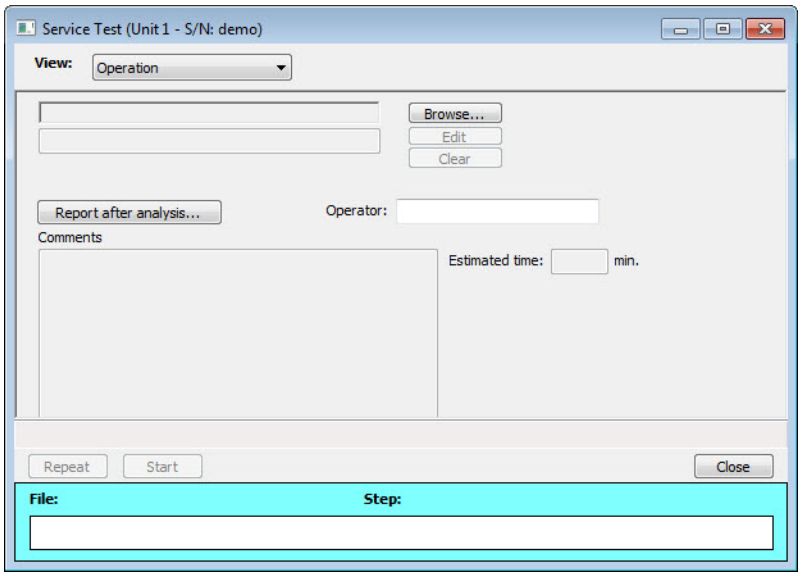
5. Click **Replace all.** The Open window displays.



6. Select **Kwikchek.svt**, then click **Replace.**

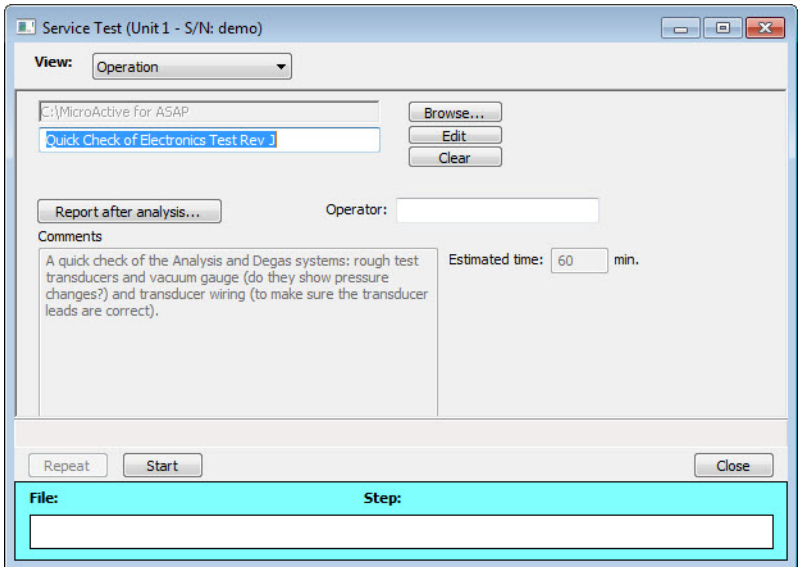
7. Click **Save**, then **Close**.

8. Select **Unit [n] > Service Test > Start Analysis**. The Start Analysis window displays.



9. Click **Browse**. The Open Window displays.

10. Click the file you created, then click **Open.**



11. Click **Start.**

12. When the test is complete, all wiring elements should have a PASSED result.

This test does not test the elevator wiring. Be sure you check the elevator operation during the next topic Operating System Components.

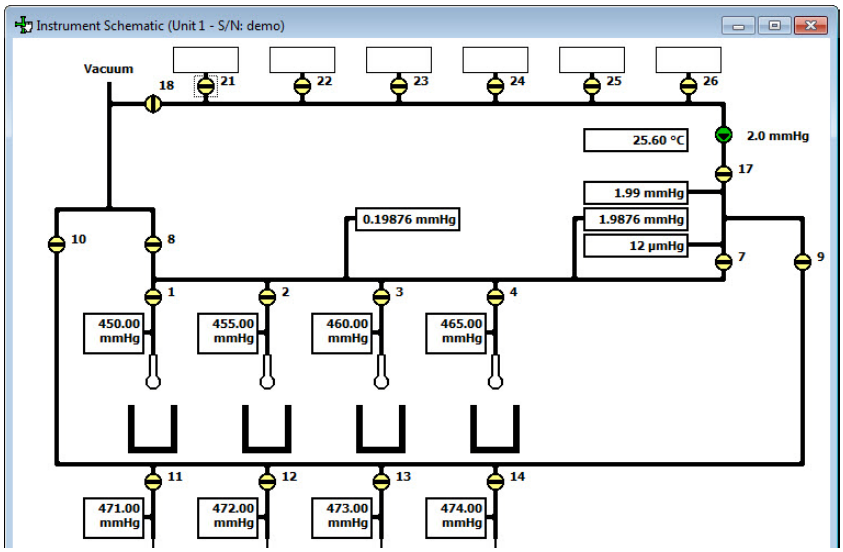
Operating System Components

- If the Auxiliary Module is being installed as part of an initial ASAP 2460 system (Master Module and one Auxiliary Module), this procedure has already been performed during operational verification of the Master Module. Proceed to the next topic below.
- If the Auxiliary Module is being added to an existing ASAP 2460 system (Master Module) follow the instructions in **Manually Operating the System**, page **15**. Then proceed to the next topic below.

Evacuating the System

- If the Auxiliary Module is being installed as part of an initial ASAP 2460 system (Master Module and two Auxiliary Modules), this procedure has already been performed during operational verification of the Master Module. Proceed to the next topic.
- If the Auxiliary Module is being added to an existing ASAP 2460 system (Master Module and one Auxiliary Module) follow the instructions below.

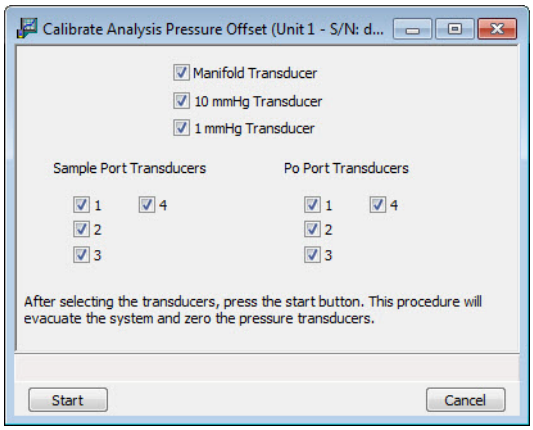
1. Start the ASAP 2460 software.
2. Select **Unit [n] > Enable Manual Control**.



3. Open all valves and evacuate for 30 minutes or until the vacuum gauge reading on the schematic screen is less than 10 µmHg.

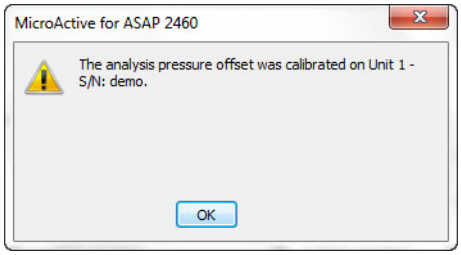
Zeroing the Pressure Transducers

1. Select **Unit [n] > Calibration > Pressure Offest**.



2. Select all transducers, then click **Start.**

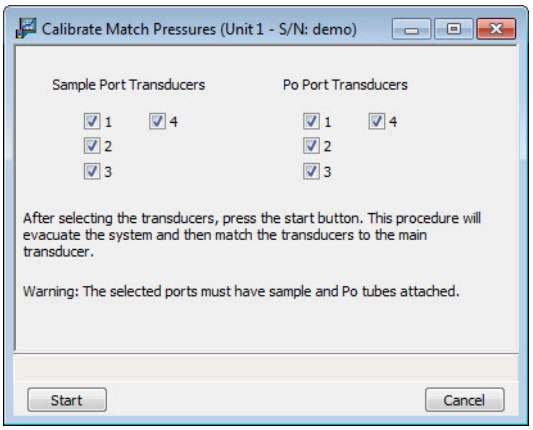
3. The following message is displayed when the procedure is complete.



4. Click **OK**.

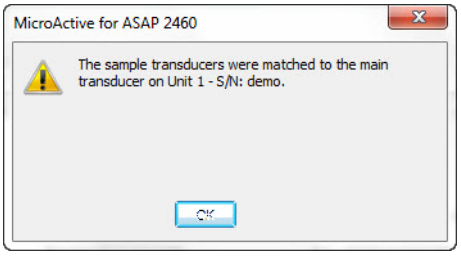
Matching Transducers to the Master Transducer

1. Select **Unit [n] > Match Transducers**.



2. Select all transducers, then click **Start.**

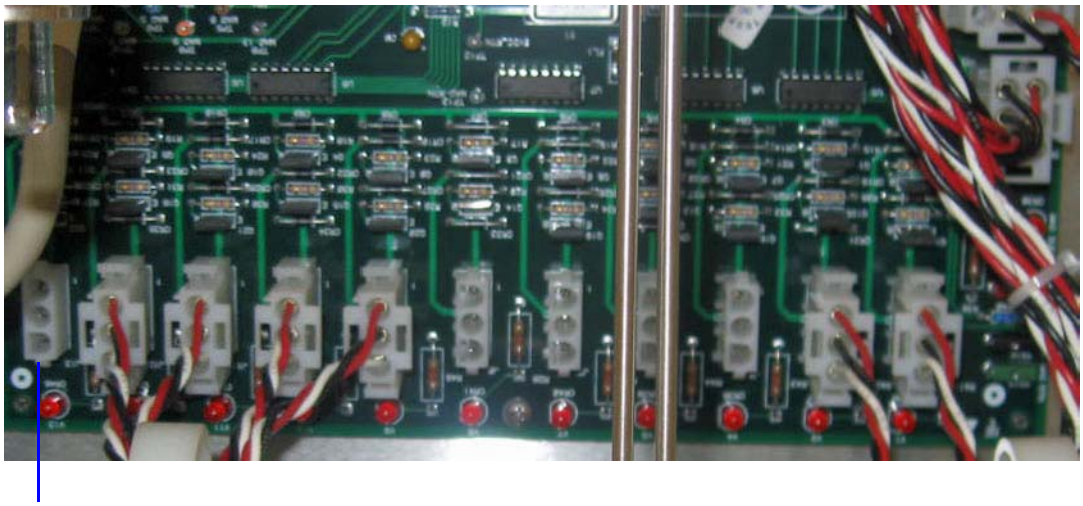
3. The following message is displayed when the procedure is complete.



4. Click **OK**.

Calibrating System Volume

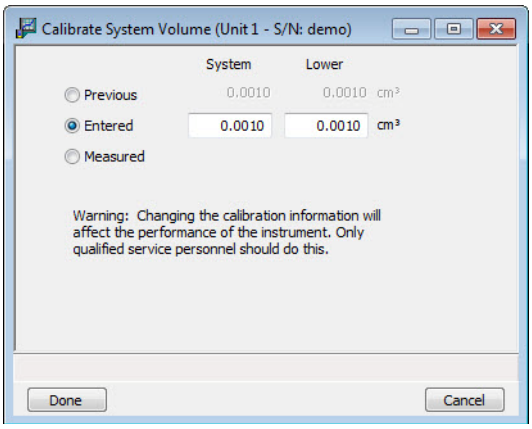
1. Plug the volume chamber cable into the connector labeled **J13** on the Magnelatch Driver Board (P/N 202-17705-011), which is located on the front of the Master Module.



Volume chamber connector (J13)

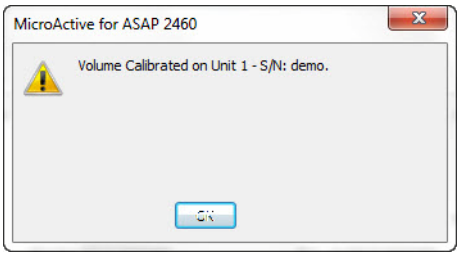
Master Module Magnelatch Valve Board

2. Attach the volume chamber to sample port 1.
3. Open the sample port 1 valve and pull a vacuum on the chamber for at least 20 minutes.
4. Totally pack ice around the chamber and allow it to equilibrate for another 10 minutes.
5. Select **Unit [n] > Calibration > Volume**.



6. Click the **Entered** button and enter the volume on the volume chamber.
7. Click **Done**.

8. The following message is displayed.



9. Click **OK**.

10. Remove the volume chamber.

11. Replace the upper front panel on the Master Module.

Performing a Reference Chamber Analysis

- If the Auxiliary Module is being installed as part of an initial ASAP 2460 system (Master Module and one Auxiliary Module), this procedure has already been performed during operational verification of the Master Module. Operational verification is complete.

- If the Auxiliary Module is being added to an existing ASAP 2460 system (Master Module), perform a reference chamber analysis as described in **Reference Chamber Analysis (Nitrogen)**, page **35** to complete operational verification.

Part 4. Installing a Second Auxiliary Module

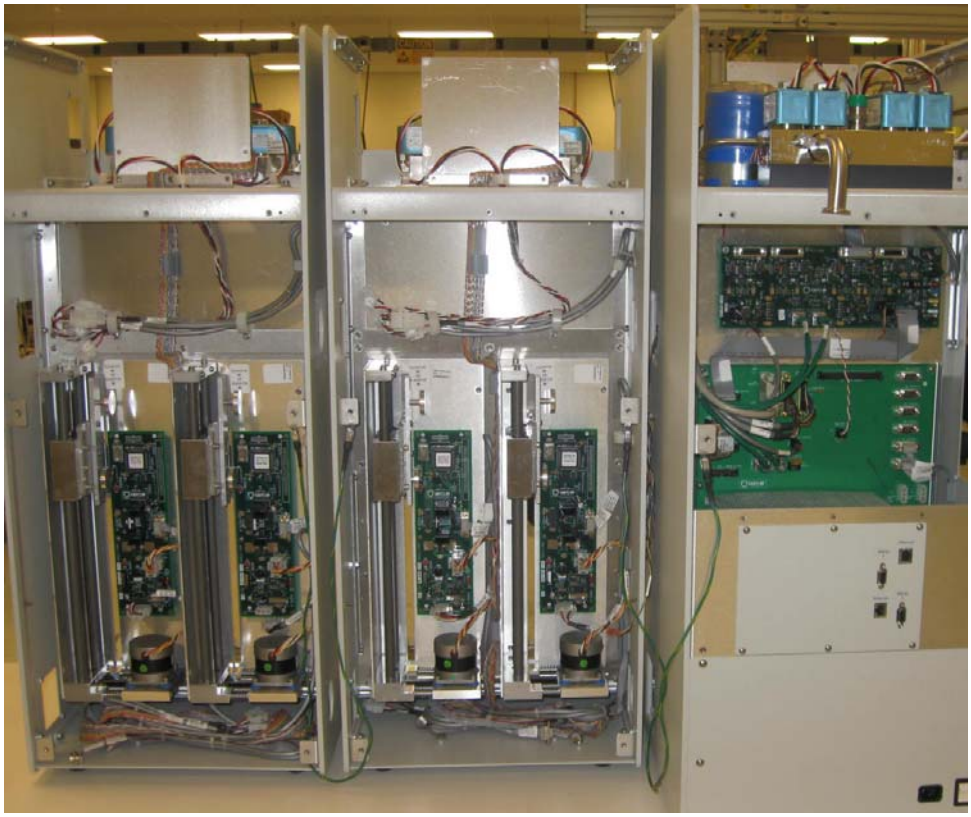
These instructions describe how to install a second Auxiliary Module when the customer has purchased an ASAP 2460 system with a Master Module and two Auxiliary Modules. They also describe how to add a second Auxiliary Module to a customer's existing configuration of a Master Module and one Auxiliary Module.

Master Module with Two Auxiliary Modules

Removing Panels

1. Attach an ESD strap to your wrist and attach the clip to the analyzer.
2. Remove the top and rear panels from the Master Module and both Auxiliary Modules.
3. If the Auxiliary Module is being added to an existing system, remove the side panel cover plates from the right side panel of the Auxiliary Module.

   If this is an initial installation, the Auxiliary Module will have no side panel cover plates.

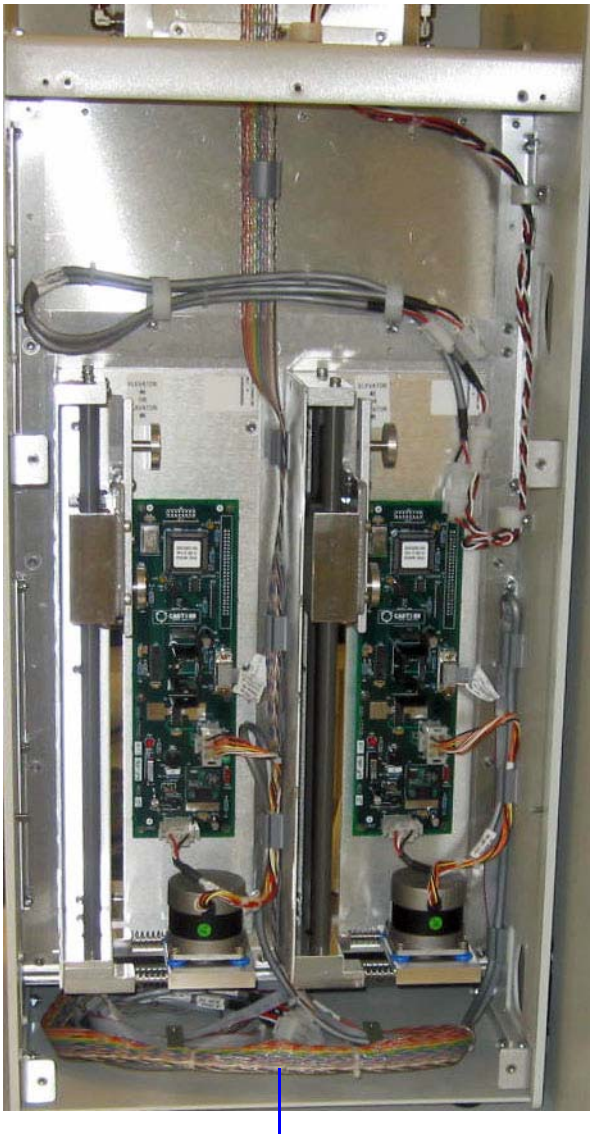


Bolting the Modules

Using the bolts supplied in the Auxiliary Module accessories kit, bolt together the right side of the first Auxiliary Module and the left side of the second Auxiliary Module.

Connecting the Elevator and Port Transducer Cables

1. Unbundle the elevator communication and power cables and the port transducer cable from the back of the second Auxiliary Module.

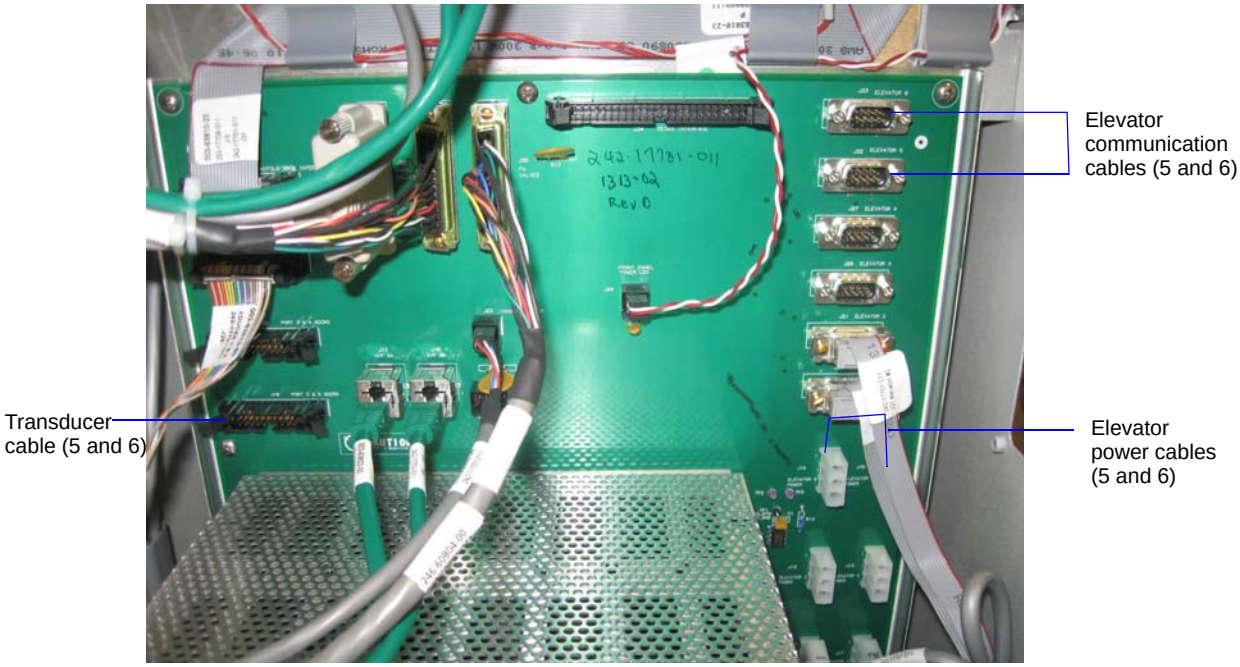


Elevator and Port transducer cables

2. Route the cables through the lower opening in the second Auxiliary Module, the first Auxiliary Module, and then the Master Module.

3. Connect the cables to the backplane board (P/N 242-17701-011) on the upper rear panel of the Master Module as described on the next page.

a.) Plug the two elevator communication cables into the upper connectors labeled 5 and 6.



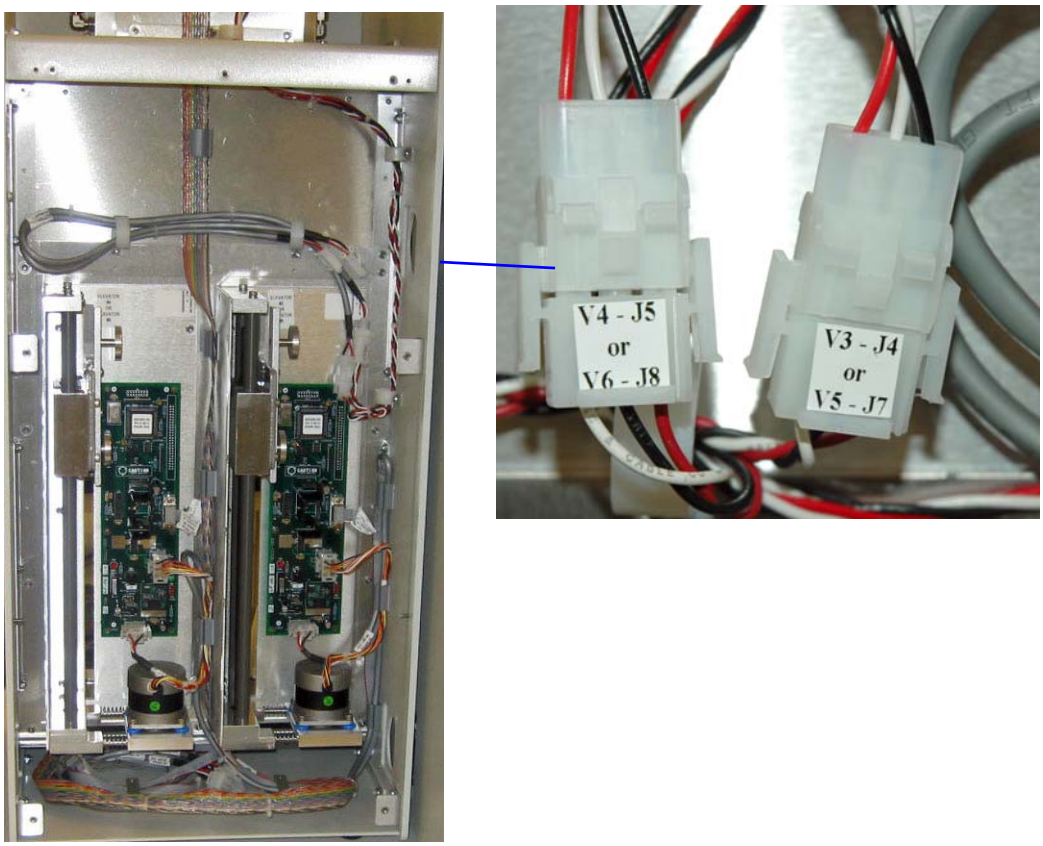
Master Module Backplane Board

b.) Plug the Elevator Power cables into the lower connectors labeled 5 and 6.

c.) Plug the Port Transducer cable into the connector labeled 5 and 6.

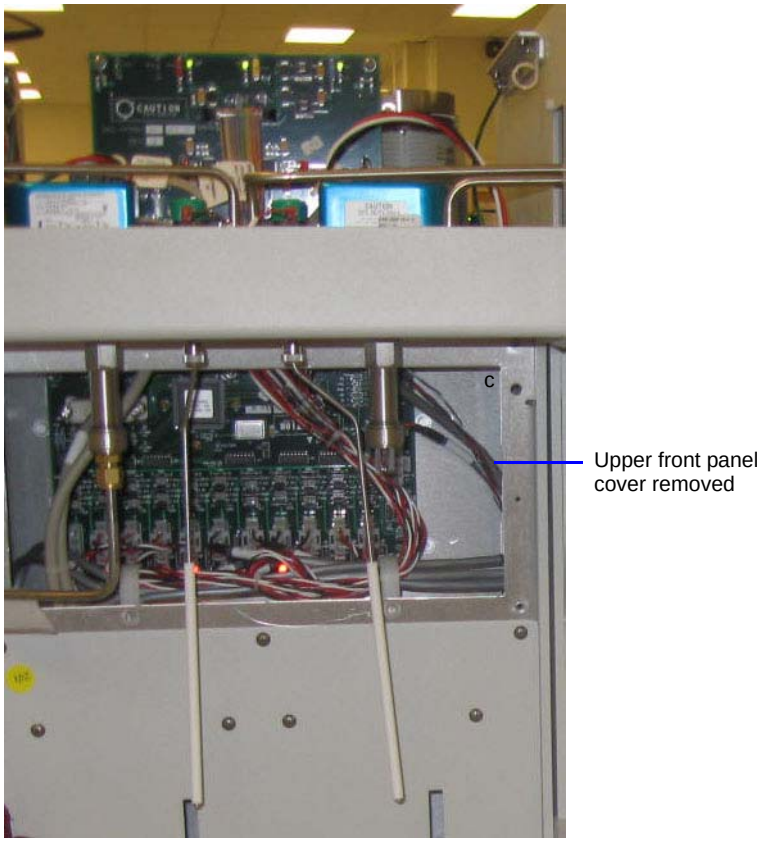
Connecting Magnelatch Valve Cables

1. Unbundle the magnelatch valve cables from the back of the second Auxiliary Module.



Auxiliary Module

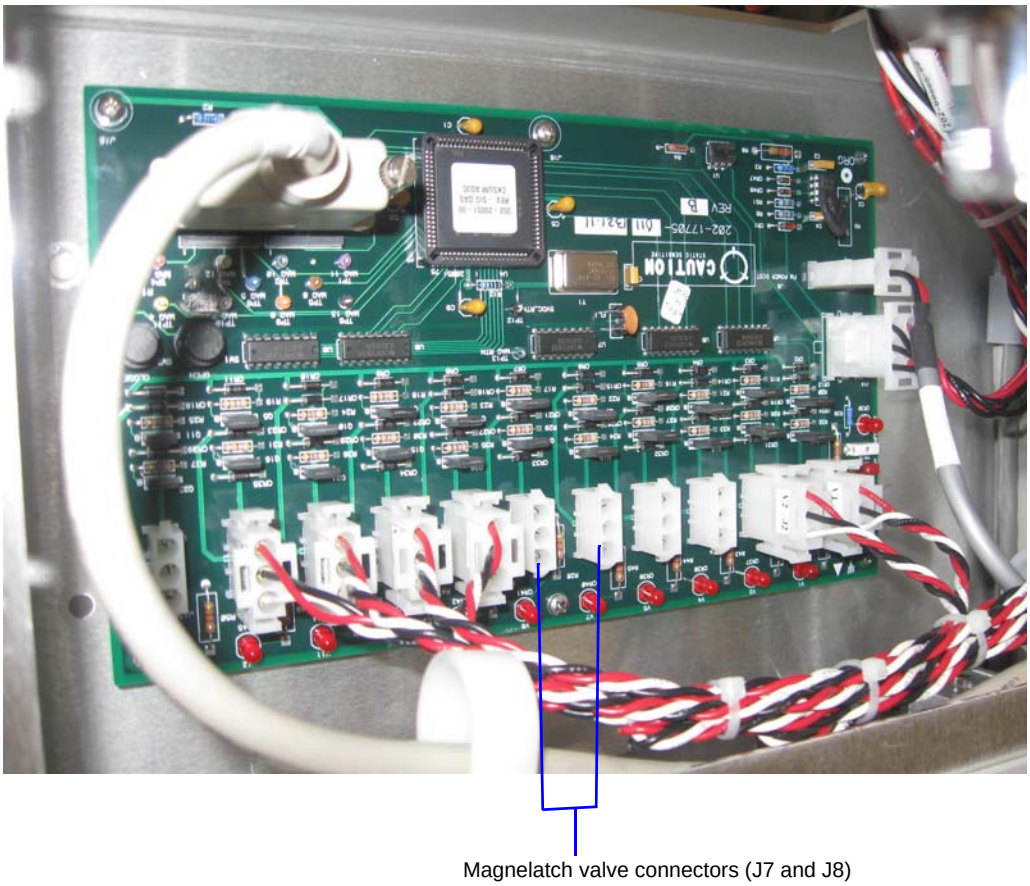
2. Remove the upper front panel cover from the Master Module if it is not already removed.



Master Module

3. Route the cables through the middle opening in the second Auxiliary Module, the first Auxiliary Module, and then the Master Module.

4. Plug the cables into the connectors labeled J7 and J8 on the Magnelatch Driver board (P/N 202-17705-011) located on the upper panel of the Master Module.



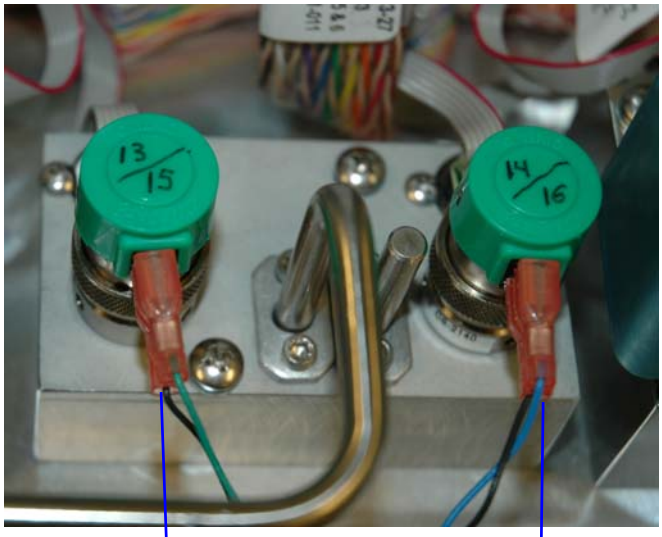
Master Module Magnelatch Valve Board

Connecting Solenoid Valve Cables

1. Unbundle the solenoid valve cables from the right side of the Master Module. Locate the cables labeled 15 and 16.

2. Route the cables through the upper opening in the Master Module, the first Auxiliary Module, and then the second Auxiliary Module.

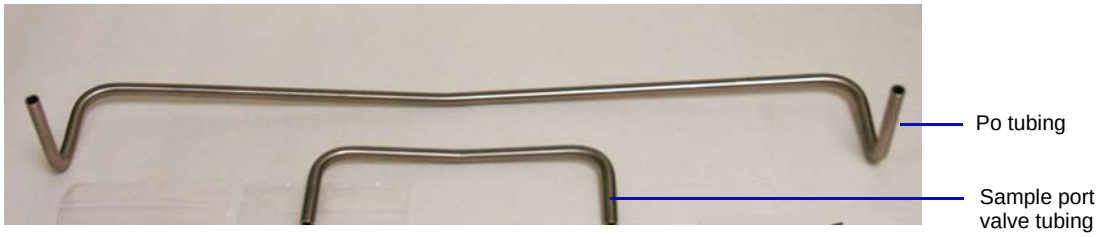
3. Plug the cables into the solenoid valves labeled 13/15 and 14/16 on the Auxiliary Module



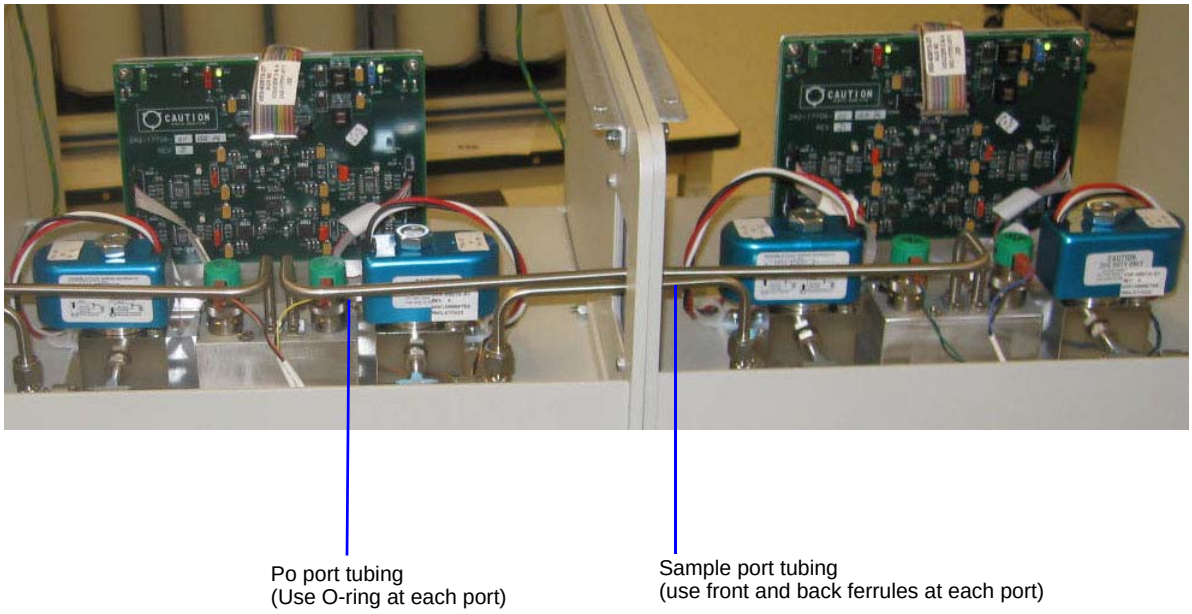
Auxiliary Module Solenoid Valves

Connecting Plumbing

1. Locate the plumbing components shipped with the instrument.



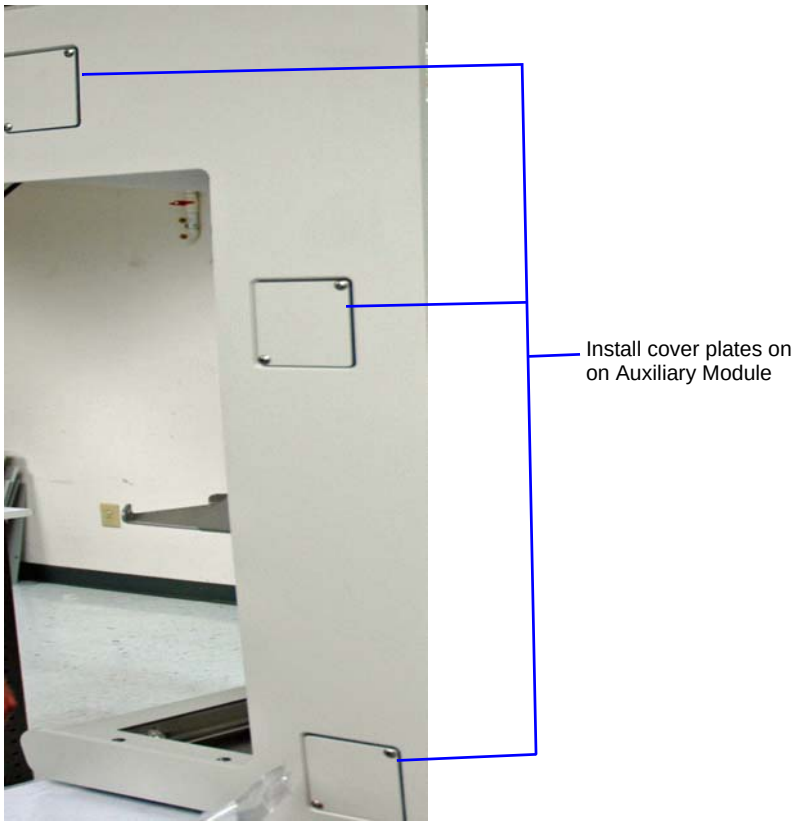
2. Remove the plugs from the plumbing ports on both the Auxiliary Modules.
3. Slide the Po tubing through the upper opening in the first and second Auxiliary Modules.
4. Attach an O-ring to each end of the tubing and connect to both ports.
5. Slide the sample port valve tubing through the upper opening in the first and second Auxiliary Modules.
6. Attach a front and back ferrule to each end of the sample port tubing and connect to both ports.



Replacing Panels

1. Replace all panels on the Master Module and Auxiliary Modules except the upper front panel of the Master Module.

2. Use the side panel cover plates and screws removed from the Master Module or the first Auxiliary Module (if one was installed prior to this installation) to cover the three openings on the right side of the second Auxiliary Module.



Verifying Operation

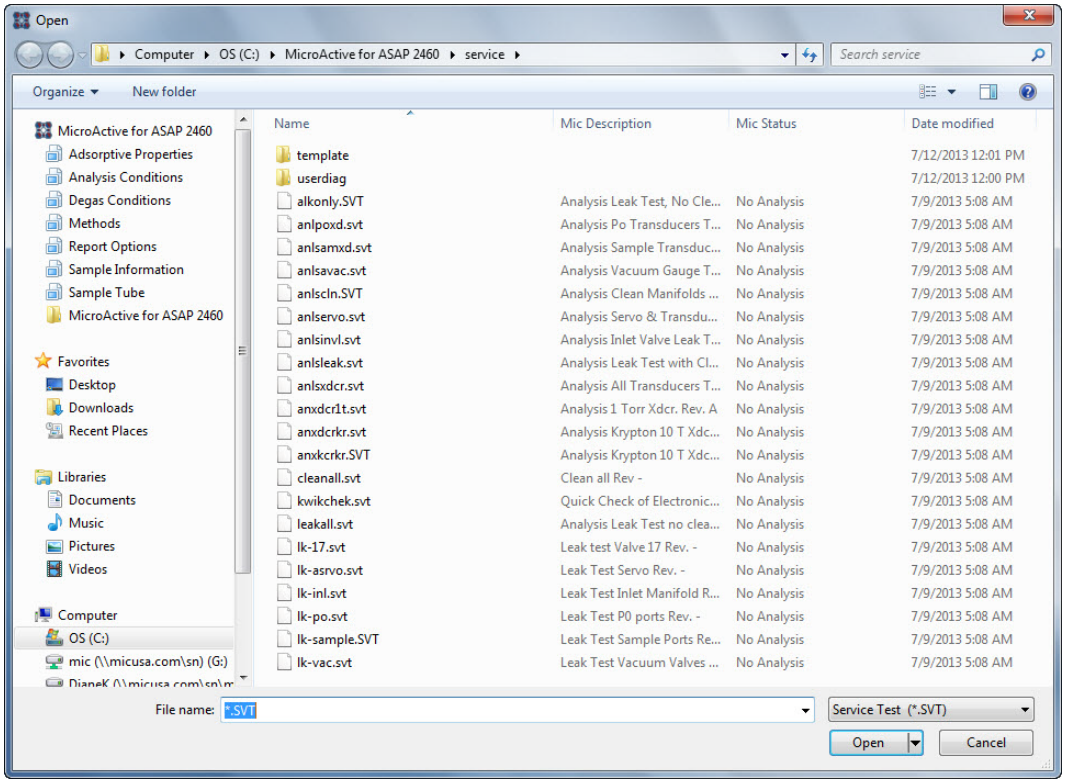
Choose one of the following:

- If this is an initial ASAP 2460 system installation, go to **Installing the Vacuum Pumps**, page **3**.
- If you are adding a second Auxiliary Module to an existing ASAP 2460 system, continue with the instructions below.

Performing a Kwikchek Test

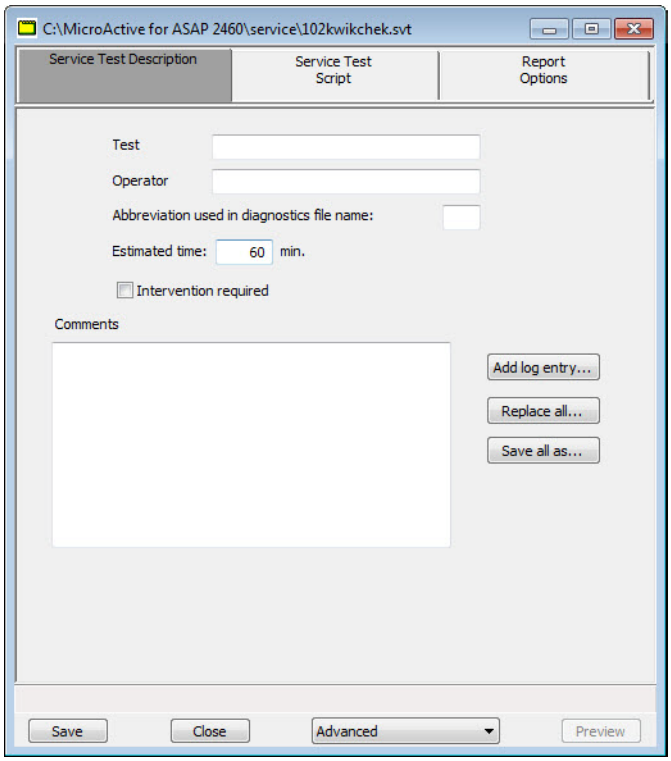
This test will take about 20 minutes.

1. Enter Service Test Mode. (Refer to **Entering Service Test Mode**, page **25**.)
2. Select **Unit [n] > Service Test > Options**. The Open window displays.

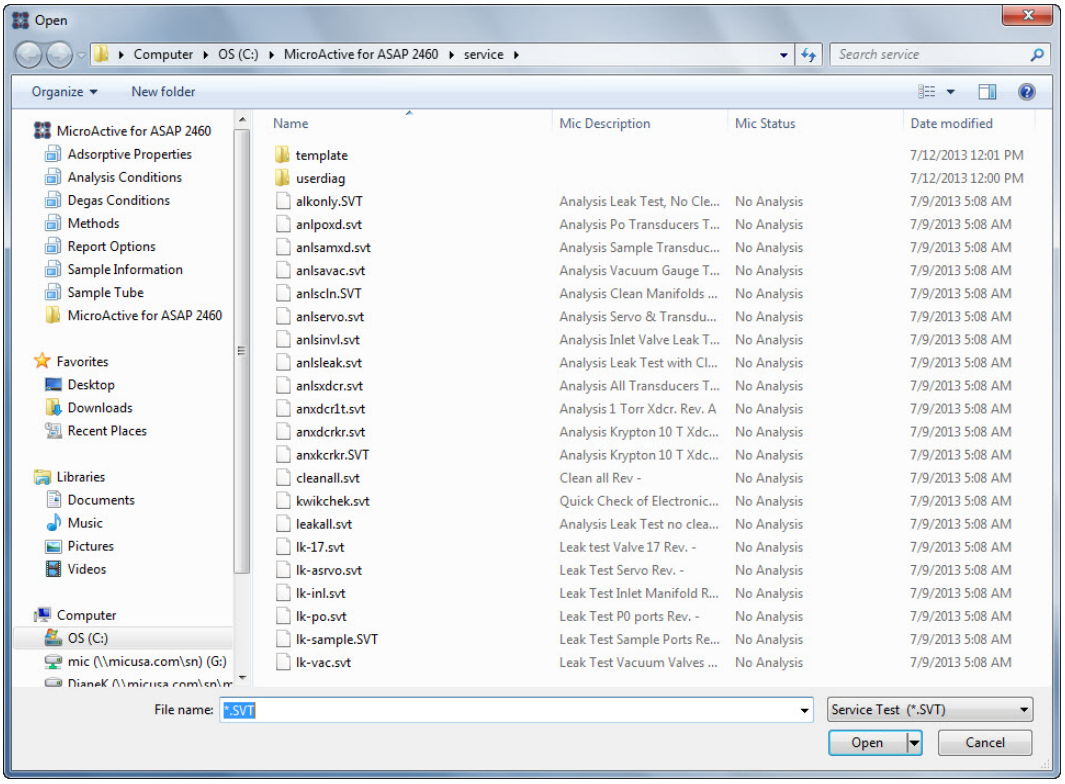


3. In the **File name** field enter: **<serial number>kwikchek.svt**. For example, **102kwikchek.svt**.

4. Click **Open**, then click **OK**. The Service Test window displays.



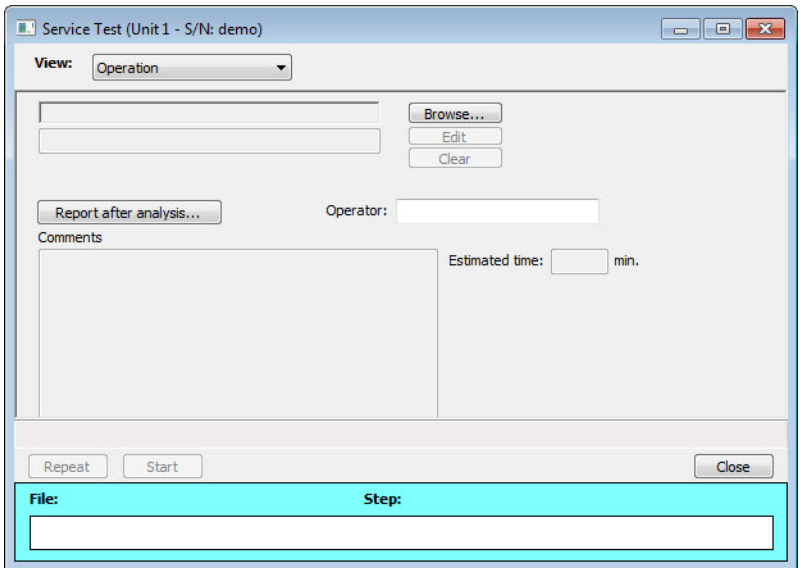
5. Click **Replace all.** The Open window displays.



6. Select **Kwikchek.svt**, then click **Replace.**

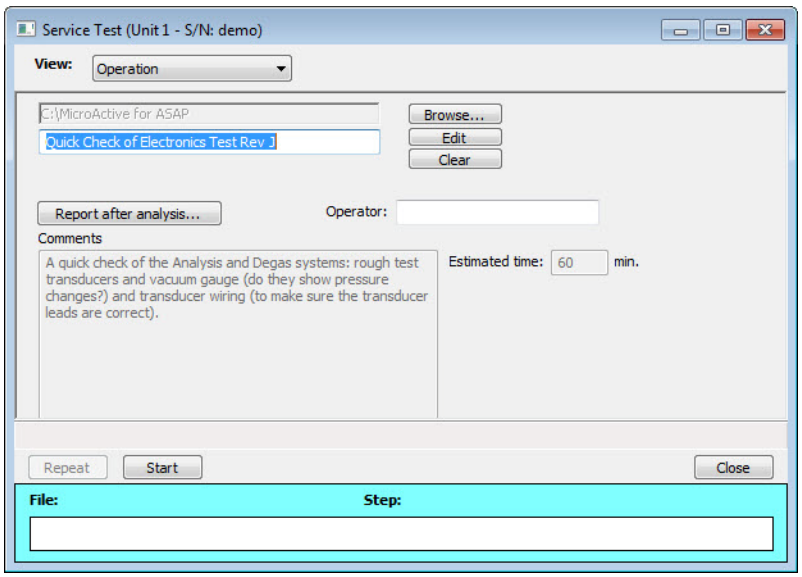
7. Click **Save**, then **Close**.

8. Select **Unit [n] > Service Test > Start Analysis**. The Start Analysis window displays.



9. Click **Browse**. The Open Window displays.

10. Click the file you created, then click **Open.**



11. Click **Start**.

12. When the test is complete, all wiring elements should have a PASSED result.

This test does not test the elevator wiring. Be sure you check the elevator operation during the next topic Operating System Components.

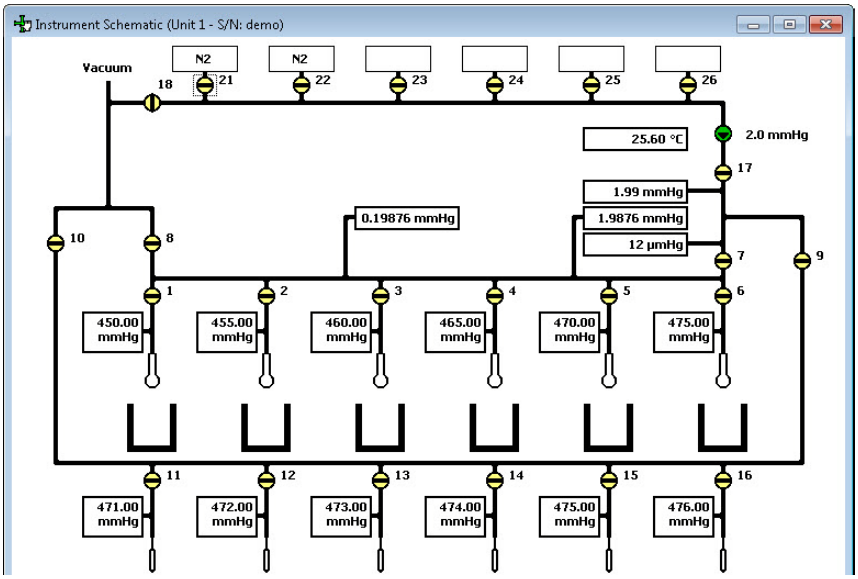
Operating System Valves

- If the Auxiliary Module is being installed as part of an initial ASAP 2460 system (Master Module and one Auxiliary Module), this procedure has already been performed during operational verification of the Master Module. Proceed to the next topic below.
- If the Auxiliary Module is being added to an existing ASAP 2460 system (Master Module) follow the instructions in **Manually Operating the System**, page **15**. Then proceed to the next topic below.

Evacuating the System

- If the Auxiliary Module is being installed as part of an initial ASAP 2460 system (Master Module and two Auxiliary Modules), this procedure has already been performed during operational verification of the Master Module. Proceed to the next topic.
- If the Auxiliary Module is being added to an existing ASAP 2460 system (Master Module and one Auxiliary Module) follow the instructions below.

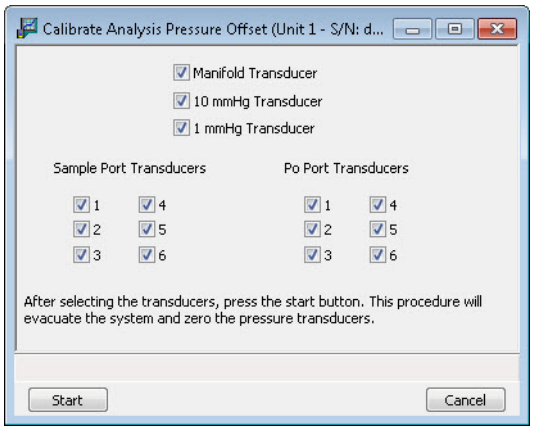
1. Start the ASAP 2460 software.
2. Select **Unit [n] > Enable Manual Control**.



3. Open all valves and evacuate for 30 minutes.

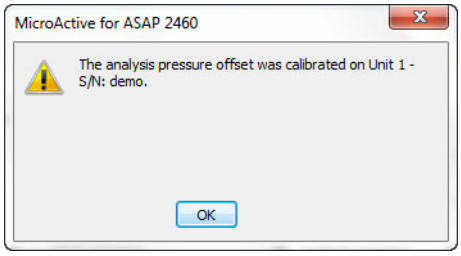
Zeroing the Pressure Transducers

1. Select **Unit [n] > Calibration > Pressure Offest**.



2. Select all transducers, then click **Start.**

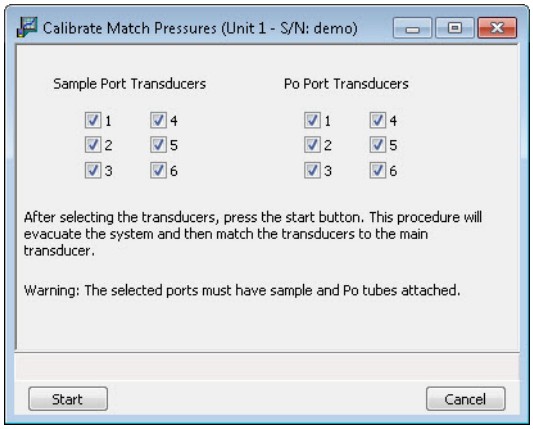
3. The following message is displayed when the procedure is complete.



4. Click **OK.**

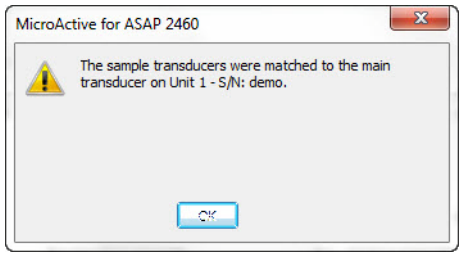
Matching Transducers to the Master Transducer

1. Select **Unit [n] > Match Transducers**.



2. Select all transducers, then click **Start.**

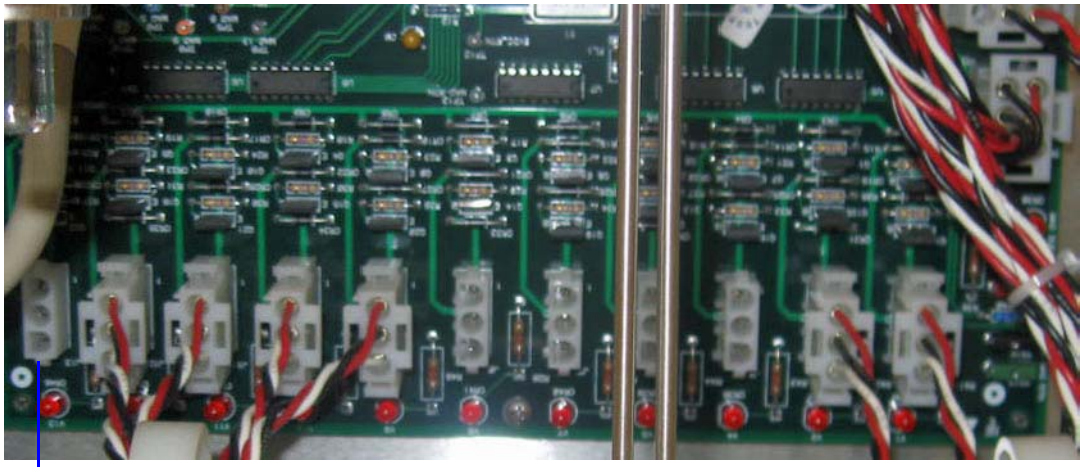
3. The following message is displayed when the procedure is complete.



4. Click **OK.**

Calibrating System Volume

1. Plug the volume chamber cable into the connector labeled **J13** on the Magnelatch Driver Board (P/N 202-17705-011), which is located on the front of the Master Module.



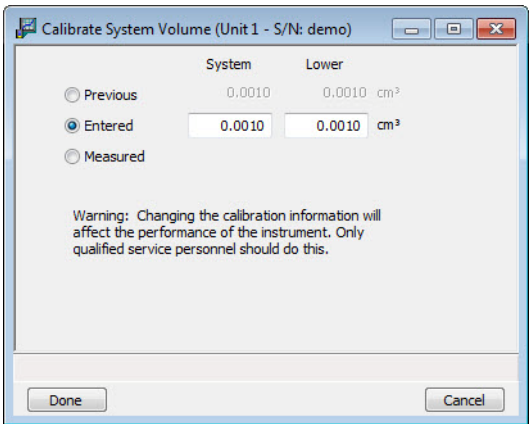
Master Module Magnelatch Valve Board

2. Attach the volume chamber to sample port 1.

3. Open the sample port 1 valve and pull a vacuum on the chamber for at least 20 minutes.

4. Totally pack ice around the chamber and allow it to equilibrate for another 10 minutes.

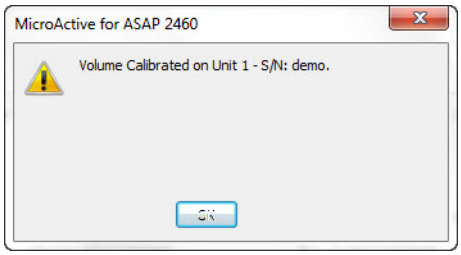
5. Select **Unit [n] > Calibration > Volume**.



6. Click the **Entered** button and enter the volume on the reference gauge.

7. Click **Done**.

8. The following message is displayed.



9. Click **OK.**

10. Remove the volume chamber.

11. Replace the upper front panel on the Master Module.

Performing a Reference Chamber Analysis

- If the Auxiliary Module is being installed as part of an initial ASAP 2460 system (Master Module and two Auxiliary Modules), this procedure has already been performed during operational verification of the Master Module. Operational verification is complete.
- If the Auxiliary Module is being added to an existing ASAP 2460 system (Master Module or Master Module and one Auxiliary Module), perform a reference chamber analysis as described in **Reference Chamber Analysis (Nitrogen)**, page **35** to complete operational verification.

Part 5. Master Module Installation Checklist

Unpacking and Inspection

Pre-Installation Checklist reviewed prior to installation?	YES___ NO___
Packing list checked, all accessories included?	YES___ NO___
Instrument unboxed?	YES___ NO___
Instrument placed on work bench or table?	YES___ NO___

Setting up the Analyzer

Prepare and Install Vacuum Pump

Wet Pump

Oil placed in vacuum pump reservoir?	YES___ NO___
Alumina prepared?	YES___ NO___
Alumina trap installed?	YES___ NO___
Mist arrestor or vent exhaust attached (if needed)	YES___ NO___

Dry Pump

Flexible tubing attached?	YES___ NO___
Vent exhaust attached (if needed)?	YES___ NO___
Correct voltage selected?	YES___ NO___

Attach External Cables

Ethernet cable been attached to the instrument and the computer?	YES___ NO___
Power cable attached to instrument and power source?	YES___ NO___

Install the Software

Analysis program installed?	YES___ NO___
Unit configuration verified?	YES___ NO___
Units of measurement entered?	YES___ NO___

Evacuate the System

Valves opened to allow system to evacuate? YES___ NO___

Connect Gas Supply to the Analyzer

Regulators attached to gas bottles? YES___ NO___

Gas lines attached to the analyzer? YES___ NO___

Gas lines cleaned and verified? YES___ NO___

Gases specified in the software? YES___ NO___

Check System Calibration

Service Test mode entered? YES___ NO___

Verify Vacuum Level

Computer Reading <10 µmHg

OK? YES___ NO___

Verify Main 1000-mmHg Pressure Scale

Target (mmHg)	Standard	Instrument	Difference	± Limit
250				0.5 mmHg
700				0.5 mmHg
750				0.5 mmHg

OK? YES___ NO___

Verify 10-mmHg Pressure Scale (if installed)

Target (mmHg)	Standard	Instrument	Difference	± Limit
3				0.5 mmHg
5				0.5 mmHg
8				0.5 mmHg

OK? YES___ NO___

Verify 1-mmHg Pressure Scale (if installed)

Target (mmHg)	Standard	Instrument	Difference	± Limit
~0.8				±0.005 mmHg
~0.5				±0.005 mmHg
~0.3				±0.005 mmHg

OK? YES___ NO___

Verify Manifold Temperature

Temperature Gauge	Instrument	± Limit
		± 2ºC

OK? YES___ NO___

Blank Tube Analysis

In the following tables, enter values for the number of ports in the customer's instrument configuration (from two to six).

Port	Expected Surface Area	Measured Area	Sample File Name:	OK Y or N
1				
2				
3				
4				
5				
6				

Reference Chamber Analysis

Reference Volume cc	Difference	Sample File Name:	OK Y or N
	(maximum difference = ±10.0%)		

Nitrogen (N2) Standards Test

In the following tables, enter values for the number of ports in the customer's instrument configuration (from two to six).

Port	Lot No.	Expected Surface Area	Measured Area	Sample File Name:	OK Y or N
1					
2					
3					
4					
5					
6					

Krypton (Kr) Standards Test

In the following tables, enter values for the number of ports in the customer's instrument configuration (from two to six).

Port	Lot No.	Expected Surface Area	Measured Area	Sample File Name:	OK Y or N
1					
2					
3					
4					
5					
6					

Part 6. Auxiliary Module Installation Checklist

Unpacking and Inspection

Pre-Installation Checklist reviewed prior to installation?	YES___ NO___
Packing list checked, all accessories included?	YES___ NO___
Instrument unboxed?	YES___ NO___
Instrument placed on work bench or table?	YES___ NO___

Installing the Auxiliary Module

Instrument panels removed?	YES___ NO___
Master and Auxiliary Modules bolted together?	YES___ NO___
Elevator and Port Transducer cables connected?	YES___ NO___
Magnelatch valve cables connected?	YES___ NO___
Solenoid valve cables connected?	YES___ NO___
Plumbing connected?	YES___ NO___
Instrument panels replaced?	YES___ NO___

Verifying Operation

Kwikchek test performed?	YES___ NO___
System valves operated?*	YES___ NO___
System evacuated?*	YES___ NO___
Pressure transducers zeroed?	YES___ NO___
Transducers matched to the master transducer?	YES___ NO___
System volume calibrated?	YES___ NO___
Reference chamber analysis performed?*	YES___ NO___

*If the Auxiliary Module is being installed as part of an initial ASAP 2460 system, which includes installation of the Master Module, these procedures are performed as part of the Master Module Operational Verification and need not be performed again.

Part 7. Second Auxiliary Module Installation Checklist

Unpacking and Inspection

Pre-Installation Checklist reviewed prior to installation?	YES___ NO___
Packing list checked, all accessories included?	YES___ NO___
Instrument unboxed?	YES___ NO___
Instrument placed on work bench or table?	YES___ NO___

Installing the Auxiliary Module

Instrument panels removed?	YES___ NO___
Master and Auxiliary Modules bolted together?	YES___ NO___
Elevator and Port Transducer cables connected?	YES___ NO___
Magnelatch valve cables connected?	YES___ NO___
Solenoid valve cables connected?	YES___ NO___
Plumbing connected?	YES___ NO___
Instrument panels replaced?	YES___ NO___

Verifying Operation

Kwikchek test performed?	YES___ NO___
System valves operated?*	YES___ NO___
System evacuated?*	YES___ NO___
Pressure transducers zeroed?	YES___ NO___
Transducers matched to the master transducer?	YES___ NO___
System volume calibrated?	YES___ NO___
Reference chamber analysis performed?*	YES___ NO___

*If the second Auxiliary Module is being installed as part of an initial ASAP 2460 system, which includes installation of the Master Module and first Auxiliary Module, these procedures are performed as part of the Master Module Operational Verification and need not be performed again.

Part 8. Signatures

Installer *(Please print)*

Name:	Signed:
Position:	Date:
Company:	Field Service Report Number:

Customer Representative *(Please print)*

Name:	Signed:
Position:	Date:
Company:	Field Service Report Number:

Final Documentation

In order to provide consistent instrument service, Micromeritics retains records of installation, operational verification, and calibration data in its Service Support Center in Norcross, Georgia, USA. After completing the installation process, representatives of Micromeritics who install instruments are required to send the following documents to Micromeritics for inclusion in the customer's instrument history.

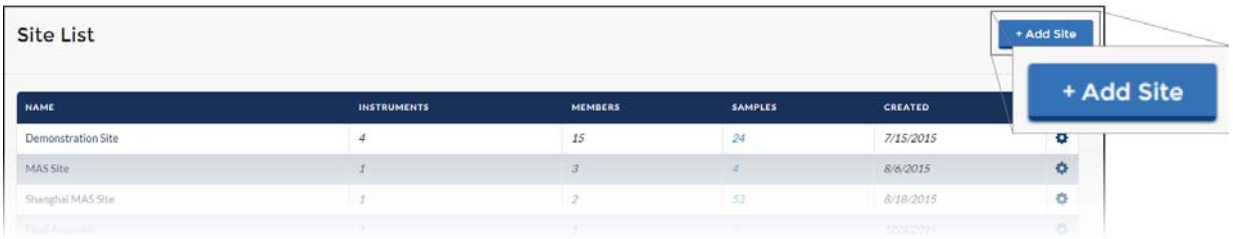
- Completed Field Service Report
- Completed and signed, ASAP 2460 Installation Checklist
- Blank Tube Analysis Sample Files
- Reference Material Analysis Sample Files

A. MicroActive Share Installation Instructions

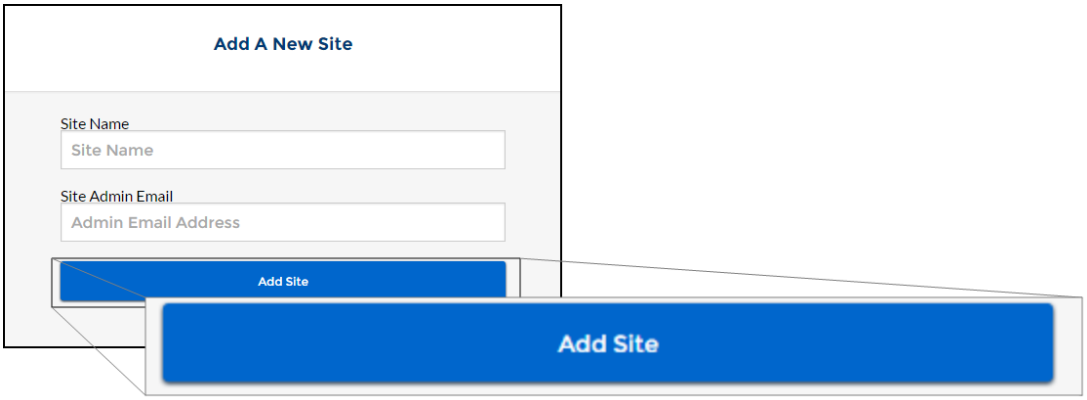
1. Contact the Micromeritics Service Department for MicroActive Share website login instructions.

2. Log in to the MicroActive Share website.

3. Click + **Add Site**.



4. In the *Add a New Site* window, enter a site name that is short, but detailed — such as: Jones Lab at ABC University. For the site admin e-mail, enter the e-mail address of the owner of the instrument. The owner is responsible for inviting all other members to MicroActive Share. Click **Add Site**.



5. On the *Site Administration* window, click + **Add** Instrument.

6. Complete the *Add Instrument* window using the following field requirements:

Field	Enter.....

Instrument Name	Enter a descriptive name for the instrument.
Serial Number	Serial number of the instrument.
Model ID	This field has a required format. It must contain only the first three numbers of the instrument model followed by the letter 'S' — for example: Type of Instrument: — Enter Model ID: 3500 3Flex — 350S 2460 ASAP — 246S 2020 ASAP — 202S 2060 ASAP — 206S
Installed Date	Defaults to the current date.
Address	The location of the instrument.
Technician	Defaults to the technician's email address.

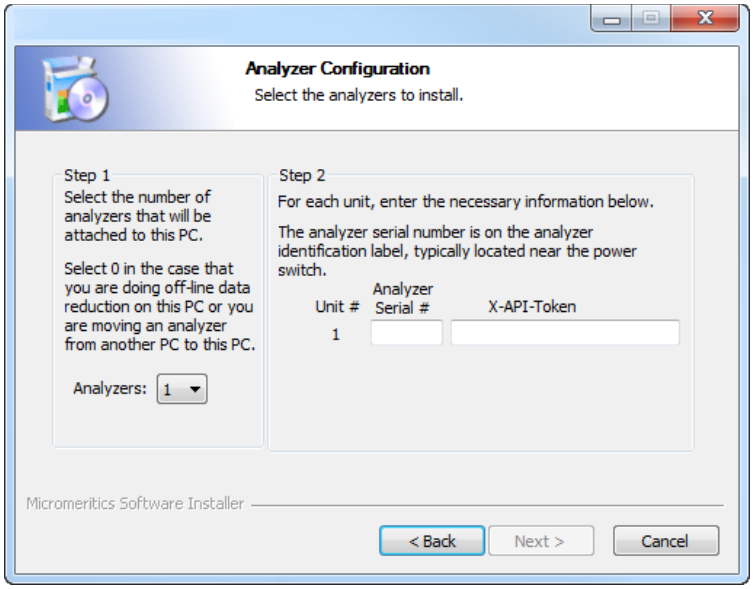
7. Click **Add Instrument**.

8. Select the gear icon to the right of the new instrument and select *Edit*.

9. Double click the *API Token* field and copy the token to the clipboard. This token will be pasted into the *Analyzer Cofiguration* window during the desktop application installation. Minimize the MicroActive Share window.

10. Begin the desktop application installation following the instructions included in this document. Follow the installation steps until the *Analyzer Configuration* window displays. Enter the

instrument serial number and paste the API Token into the *X-API Token* field. Complete the application installation instructions following the window prompts.



11. Open the desktop application and log in using the technician username and password provided previously.

12. Log off and close the MicroActive Share URL.

B. Gas Connections

Port	Valve	Gas
1	21	
2	22	
3	23	
4	24	
5	25	
6	26	