

Model A2432 Manifold System

Operators
Manual



Major revisions of this manual will be indicated by a new revision level. Minor corrections or additions may be made at any time without changing the revision level. Changes made to this manual causing the new revision are documented in the Manual Backdating section of this manual.

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Note:

Shipping this instrument out of the U.S.A. may require an export license. Contact the factory for more information.

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Safety

Manual Safety Conventions

Warnings and Cautions are used throughout this manual, appearing before the procedure or step to which it applies. A Warning indicates a personnel safety hazard. It calls attention to a procedure, which if not correctly performed or adhered to, could result in injury or possibly death. Do not proceed beyond a warning until the conditions are fully understood and met. A caution indicates an equipment safety hazard and calls attention to a procedure, which if not correctly performed or adhered to, could result in damage to the counter. Do not proceed beyond a caution until the conditions are fully understood and met.

A triangle with exclamation point indicates a general safety hazard and a triangle with lightning bolt indicates an electrical safety hazard.



Electrical Safety

To reduce the risk of electric shock, do not expose to rain or moisture.



WARNING

Failure to use this instrument in a manner intended by Pacific Scientific Instruments may circumvent the protection provided by this instrument, resulting in personal injury or loss of life.

Laser Safety

This particle counter contains a laser-based sensor that is a Class 1 product (as defined by 21 CFR, Subchapter J, of the Health and Safety Act of 1968) when used under normal operation and maintenance. The manual contains no procedures for service of internal parts within this unit. Service should be performed only by factory-authorized personnel.

The particle counter has been evaluated and tested in accordance with EN 61010-1:1993, "Safety Requirements For Electrical Equipment For Measurement, Control, and Laboratory Use" and IEC 825-1:1993, "Safety of Laser Products".



WARNING

The use of controls, adjustments, or performance of procedures other than those specified within this manual may result in exposure to invisible (infrared) radiation that can quickly cause blindness.

Electrostatic Safety

Electrostatic discharge (ESD) can damage or destroy electronic components. Therefore, all work inside the particle counter should be done at a static-safe workstation. A static-safe workstation can be created by doing the following:

Use a grounded conductive table mat and resistor-isolated wrist-strap combination

Earth-ground all test instruments to prevent a buildup of static charge



Using a wrist strap without an isolation resistor will increase the severity of an electrical shock.

Unpacking and initial inspection

Before opening the shipping container, inspect it and immediately notify the carrier of any signs of damage for possible insurance adjustment purposes. If the container is intact, carefully open and unpack the contents and compare each item with the shipping list to assure receipt of all listed materials. Report any missing or surplus items to a Pacific Scientific Instruments representative.

Return Shipping / Chemical Handling

Should it become necessary to return the unit to the factory for any reason, you must first **contact your local service representative or Customer Service for return authorization instructions**. After you have received a **Return Authorization** number, follow the shipping instructions provided below.

1. **U.S.A.:** Contact your local service representative (visit "Service and Support" at www.particle.com) or Customer Service at (800) 866-8854 for mailing information. You may also FAX Customer Service at (541) 474-7414.
2. **International:** Contact the nearest overseas representative listed on the back cover of this manual. In Canada, contact Technical Support at (800) 866-7889 for the phone number of your local agent. Everywhere else, visit our website at www.particle.com/sales1.htm and click on your area for contact information.
3. Use the original container or carton and packing materials whenever possible.
4. If the original container and packing materials are not available, wrap the unit in "bubble pack" plastic; surround with shock-absorbent material and place in a double-wall carton.
5. Seal container or carton securely. Mark "Fragile" and enter Return Authorization number in an unmarked corner. All shipments will be returned if the Return Authorization number does not appear on the box.
6. Return unit to your contact point in step 1 above.

Pacific Scientific Instruments Service Centers

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Central	Midwestern	Factory
964 N. 21st Street, Suite H Newark, OH 43055 TEL 740 366 5068 FAX 740 366 7619	555 Tollgate Road, Suite E Elgin, IL 60123 TEL 847 888 3600 FAX 847 888 3789	481 California Avenue Grants Pass, OR 97526 TEL 541 479 1248 800 866 7889 FAX 541 479 3057
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Introduction

The manifold system consists of a particle counter, manifold, manifold controller, and allows a single particle counter to sample up to 32 different locations. Each sample location is connected to the manifold by tubing up to 30 meters in length; and two tubes (one for sample and one for return air) are connected between the manifold and the counter. The manifold routes the air from each location to the particle counter in turn. An external vacuum pump maintains a constant airflow in the system.

A manifold system can scan in any predetermined sequence through any or all manifold ports in any order, skipping the unused ports. The counter and manifold are usually positioned outside the cleanroom and may be left unattended to execute the programmed sampling routine, reducing the need for monitoring personnel to intrude into the cleanroom to collect count data.

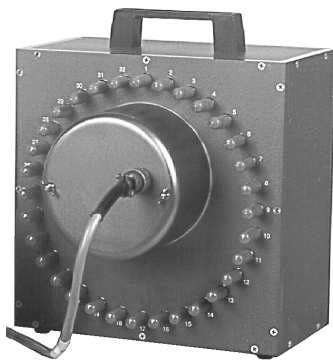
The control of the entire system may be assigned to a computer creating a control hierarchy wherein the Manifold is powered, programmed, and controlled by a Manifold Controller, the Manifold Controller is controlled by the Particle Counter, which is controlled by the computer, making the sampling process automatic.

Particle Counter



Four different particle counters are available for use as part of the manifold system, models A2100, A2200, A2400 and A2408. All four have two, four, five, or six particle-size channels, but have different minimum size sensitivity. The counter's internal vacuum pump draws a 1 cfm sample column from the manifold sample tube. A built-in printer provides a printout of all data, present or past. For complete details on operating the counter and for a complete list of specifications, refer to the operating guide you received with the counter.

Manifold



The 32-port manifold has been designed for operation only with the particle counters listed above. The manifold/counter system provides for random sampling at up to 32 locations through sample tubes. The manifold is the rotary type requiring an external vacuum pump to maintain a constant purge air flow during 32-port operation. This flow, approximately two to three cfm, occurs in all idle tubing. Purging is accomplished by allowing purge time for each port before counting begins.

Manifold Controller



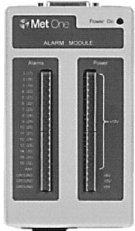
The manifold controller houses the control, display, and alarm electronics for controlling the manifold. It displays sample sequence information and allows programming of the manifold sampling sequence as well as providing interface with the optional alarm relay module.

Accessories

You can order several accessories to tailor the system to your needs. These accessories can be ordered from the factory during the week from 8:00 a.m. to 5:00 p.m. PT.



Vacuum Pump — provides constant air flow through the manifold .



Alarm Module — contains remote alarm contacts for up to 17 alarms (two required for monitoring alarms at all 32 ports). Part number 2081414-01



Isokinetic Probes — for use in unidirectional air flow to maximize correlation between counts and actual particle-size distribution. Sometimes called “isoprobes.”



Tubing

Hytrel with Teflon lining to minimize particle adhesion to walls.
3/8" I.D. for connecting isokinetic probes to manifold, larger quantity typical. Part number 960380
1/4" I.D. Hytrel for connecting manifold to particle counter, smaller quantity typical. Part number 960011

Applications

The A2432 Manifold System is designed to assist users in complying with various regulatory standards set by government or industry such as Fed-Std 209, ISO etc, by monitoring particulate levels at many locations within a facility. Pacific Scientific Instruments does not, however, have any responsibility or authority to inform or train its customers in the adherence to these standards. Please consult the appropriate regulations or regulatory agency to understand the applicable requirements for your facility.

Setup

The first step for a successful installation is to design a layout of the manifold system. The following example is intended to demonstrate how to set up a system in a cleanroom facility. On the facility plan in Figure 1, note the selection of each sample point on the floor plan. While not all installations will use all the examples, they are appropriate for many users. Each sampling point should collect through an isokinetic probe, which aids in collecting a sample with a representative distribution of particle sizes. The manifold system equipment should be located so that the system complies with Fed Std 209E which states: “For particles in the 0.1 to 1 μm range and for a flow rate of 0.028 m^3/min (1.0 ft^3/min) a transit tube of up to 30m may be used. For particles in the range of 2 to 10 μm the transit tube should be no longer than 3m Under these conditions, losses of small particles by diffusion and of large particles by sedimentation and impaction are predicted to be no more than 5% during transit through the tube. For most applications these tube configurations and flow conditions will be satisfactory. For special situations, more precise transit particle transit characteristics can be calculated (see B20.8).” (Fed-Std-209E, B40.2.1).

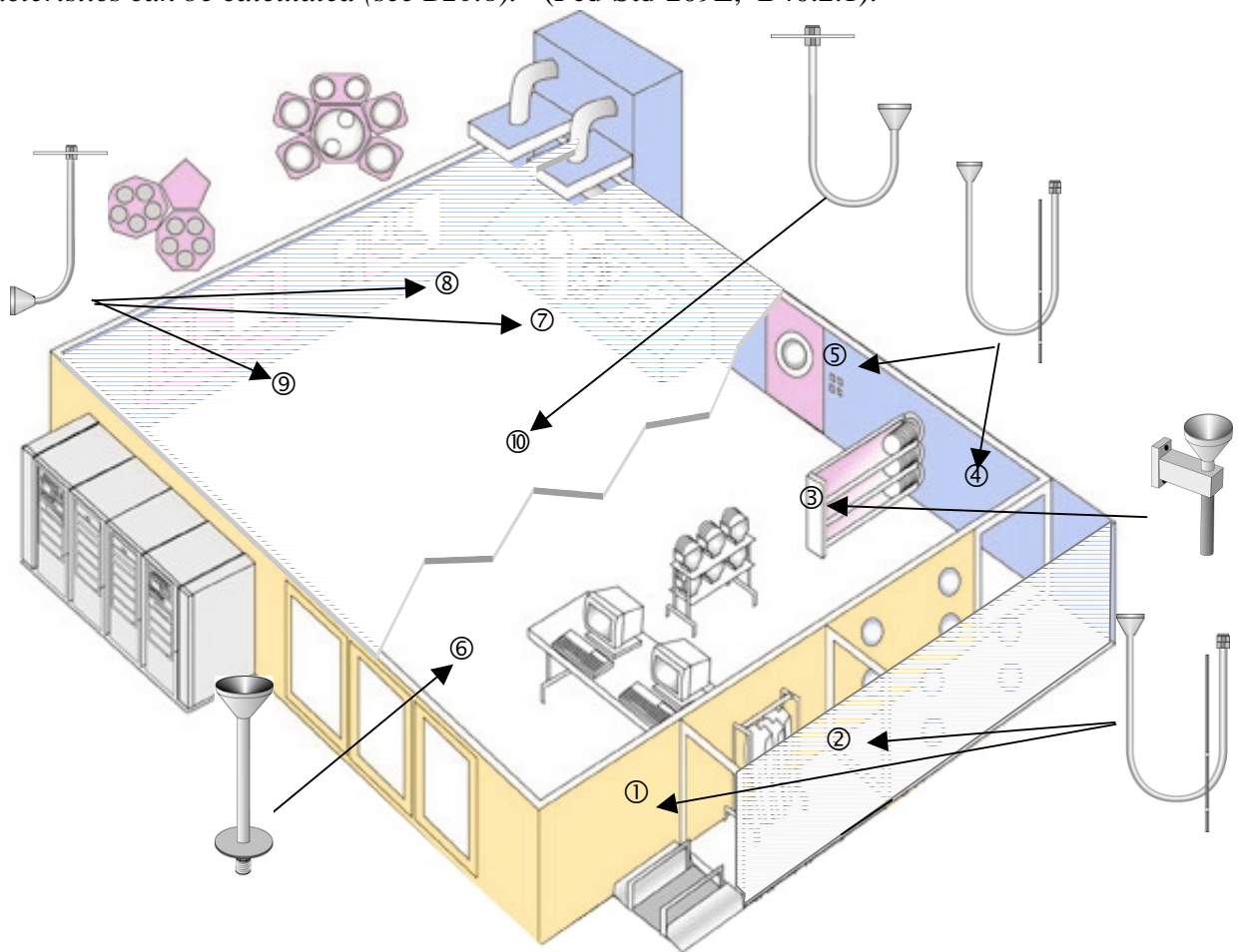


Figure 1. Sampling Points Setup Example

Sampling Point Number	Event/process monitored	Type of isokinetic probe
①,②	Gowning and cleanup	Through wall
③	Mid-room point	Direct mount
④,⑤	Access points	Through wall
⑥	General room activity	Floor mounted vertical
⑦,⑧,⑨	Workstation activity	Ceiling mounted L-hook
⑩	Background baseline	Ceiling mounted J-hook

Table 1. Sampling Points Examples

Each tubing run should be the same length, $\pm 20\%$. For example, having the manifold only 10 feet from the nearest sampling point and 90 feet from the farthest will create imbalances in the system which may adversely affect sampling.

Tubing Connections

The isokinetic probes you received with your order should be protected with plastic caps on the openings, which should remain in place until they are ready to use in order to minimize contamination. Install the isokinetic probes at the desired points, and select a position for the A2432 system equipment less than 100 feet (including vertical runs) from every sampling point. Verify that adequate power is available for this equipment, and make sure that the counter and controller front panels will remain accessible.

When the sample tubing is cut to length, cover the ends until ready to attach it to the equipment at either end, to minimize system contamination. Connect the sample tubing to the isokinetic probes and route the tubing to the manifold equipment without kinking. Any bend in the tubing can affect the particle size distribution at the particle counter because the larger particles are heavier and may drop out in bends or loops. Each bend radius should be no less than four inches and care should be taken to avoid potential kinks at any point along the tubing where it is anchored to a clip or other hold-down device. Fully support the tubing wherever possible and do not drape the tubing across any sharp cornered objects where later heat induced sagging may cause pinching or kinking.

Connect the tubing to the manifold system equipment referring to figures 2 and 3, following these steps:

1. Connect all sample tubing (3/8" I.D.) to the appropriate manifold ports. If only a few manifold ports are to be used, connect the sample tubing to ports spaced proportionately. For example, five samples should be connected to ports 1, 7, 13, 19 and 26. This will keep the airflow in the manifold balanced. Unused ports need to be left open to relieve the excess vacuum load on the pump, or the relief valve on the pump must be adjusted according to the pump manufacturers instructions. For further explanation of the airflow in the manifold, refer to the "Theory of Operation" section of this manual.

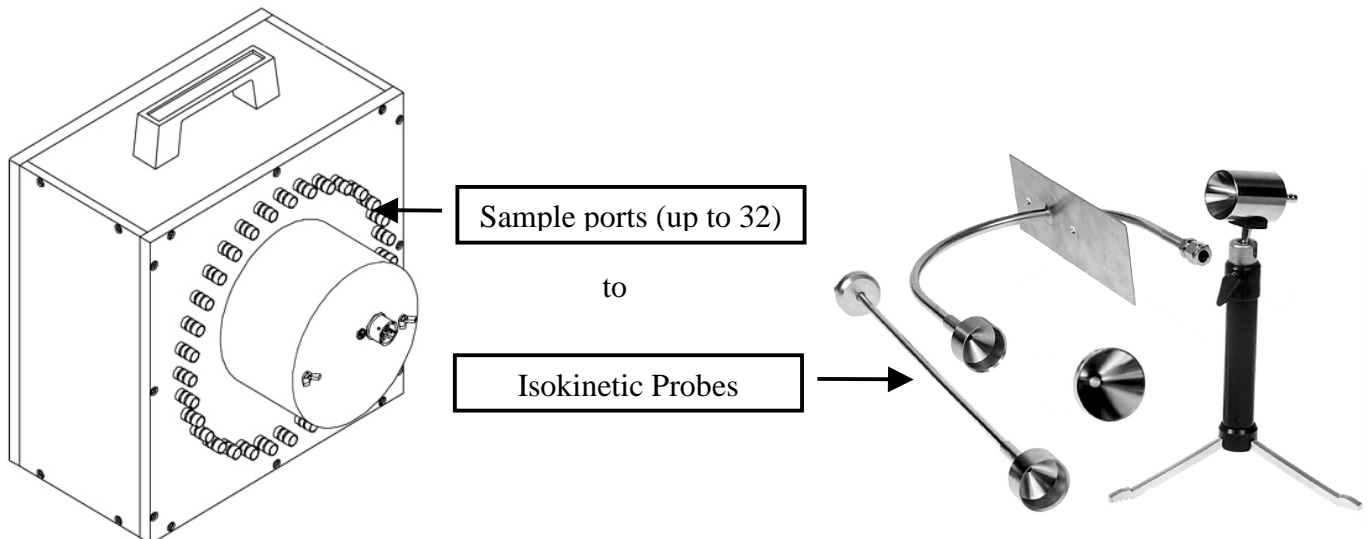


Figure 2. Manifold to Sample Point Tubing Connections

2. Attach a short piece of tubing (1/4" I.D.) between the particle counter sample inlet (on top of counter) and the manifold sample air outlet fitting (center of shroud).
3. Attach a "return air" tube (1/4" I.D.) between fitting on rear panel of particle counter and manifold.
4. Attach large hose between vacuum pump and manifold assembly exhaust outlet, leaving unused vacuum connection capped.

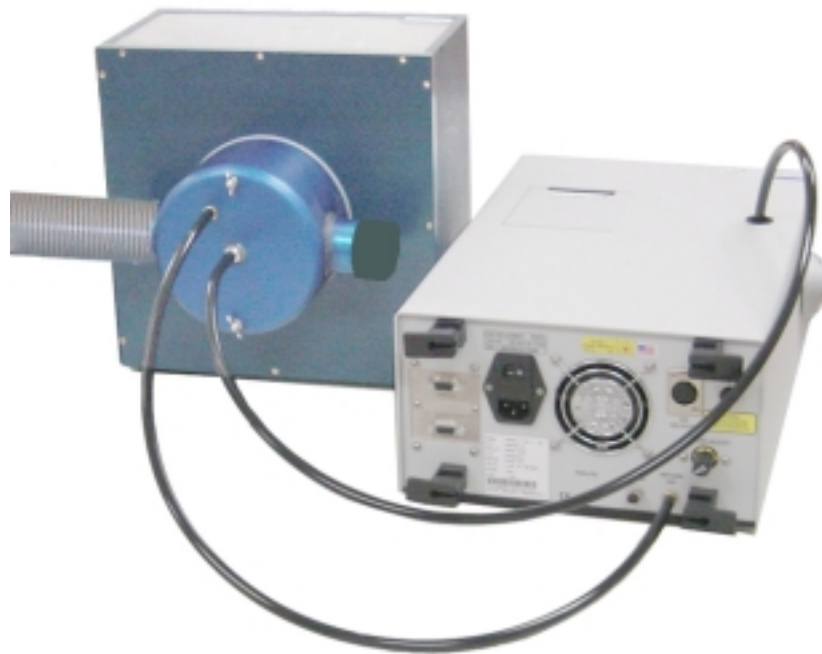
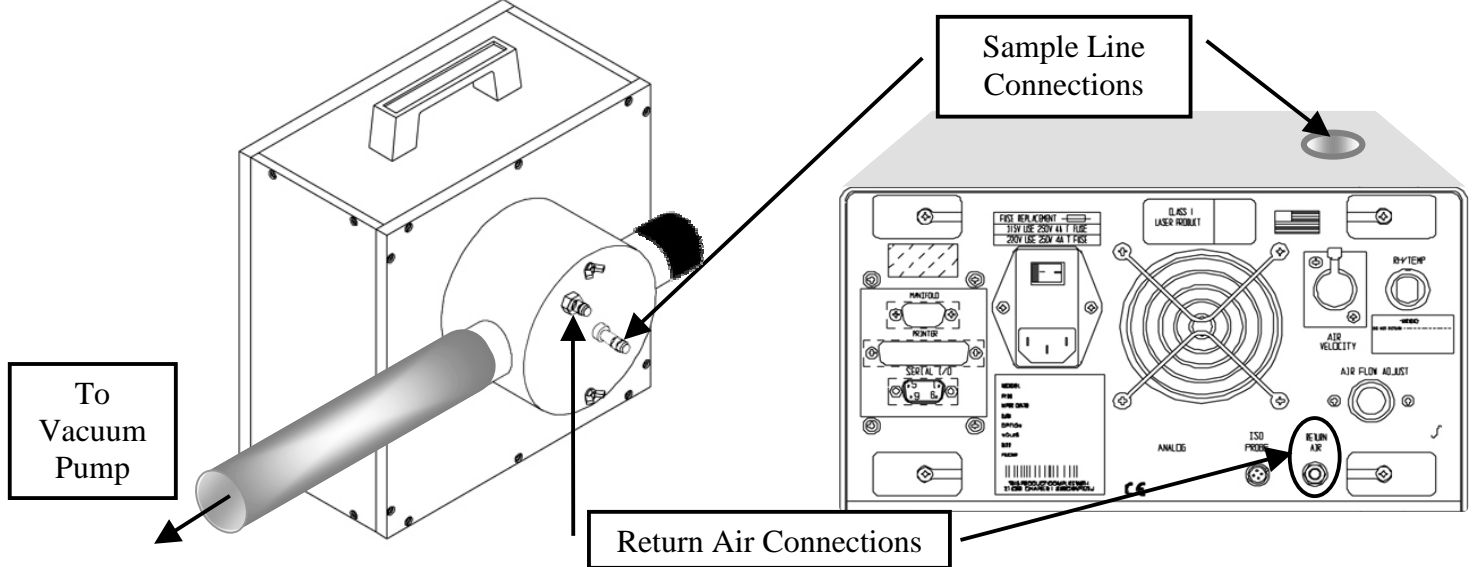


Figure 3. Manifold to Particle Counter Tubing Connections

Electrical Connections

Refer to figure 4 to make Electrical connections.

1. Connect controller cable between counter rear-panel "Manifold" connector and manifold controller rear-panel "Particle Counter" connector.
2. Connect the manifold cable between the manifold assembly and controller rear-panel connector marked "Manifold".
3. Plug the counter and manifold controller into facility power.

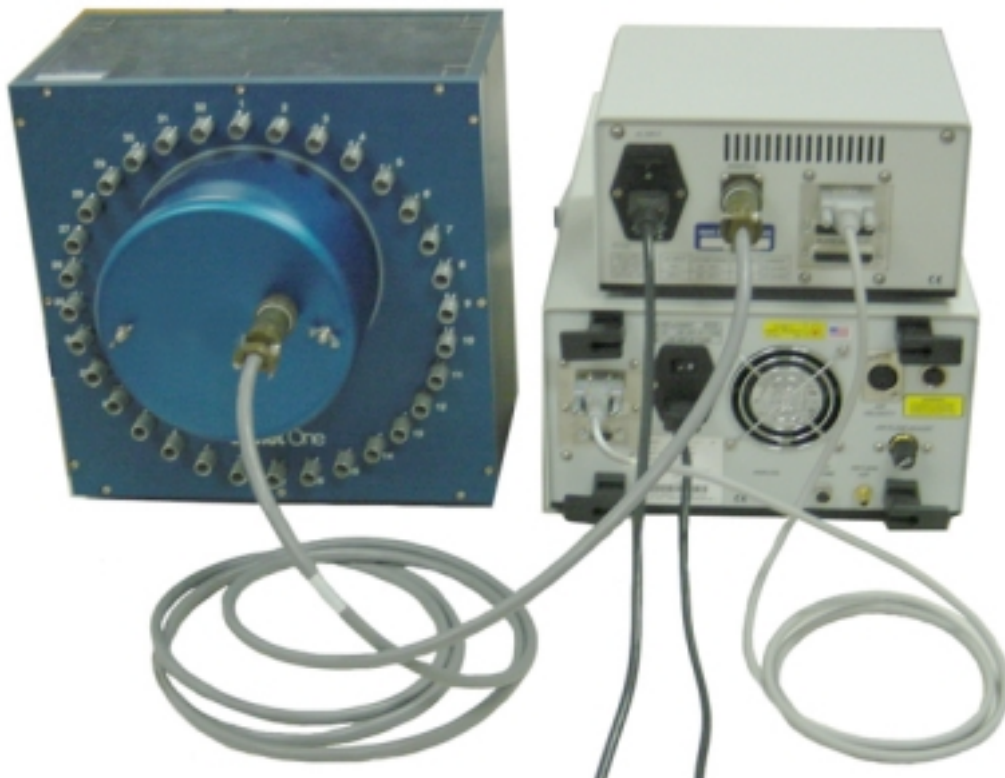
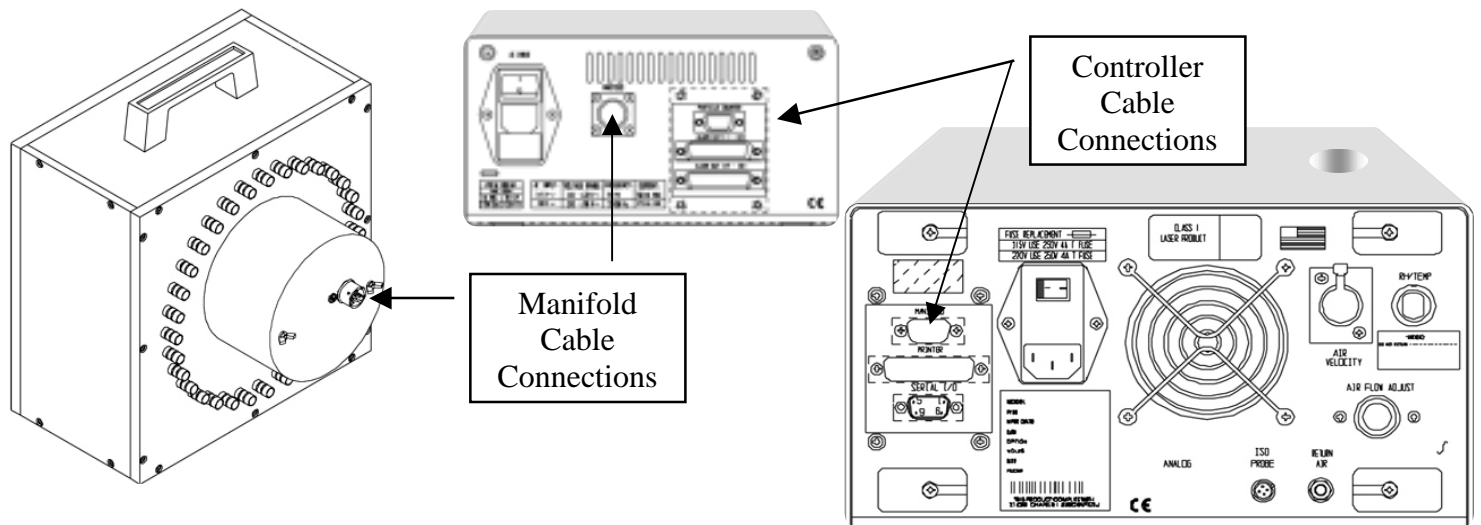


Figure 4. Manifold System Electrical Connections



WARNING

To avoid injury or equipment failure, the vacuum pump must be connected to facility power in accordance with local building codes. The voltage and current required by the vacuum pump are at lethal levels.

4. Wire the vacuum pump to line power that matches the requirements of the pump in accordance with local electrical codes. A wiring diagram is provided in the vacuum pump Operation Manual.
5. Check rear-panel identification label of the particle counter and manifold controller for line voltage and frequency requirements. Verify instrument compatibility with facility power.



Figure 5. System Connections (power cords not shown for clarity).

Terminology

Before configuring the A2432 Manifold System, it is important to clearly understand the terminology used to describe the system and programming. The terms listed below are used throughout this manual and are important to keep distinct.

Sampling Point – the physical place in the facility where the sample is being drawn from. Normally an Isokinetic Probe, sometimes called an “isoprobe” is installed at each sampling point.

Port Number – the actual fitting on the front of the manifold itself where the tubing from the sampling point is connected, numbered **01** through **32**.

Scan Steps – The order of programmed sequence steps set up in the Manifold Controller by the operator; up to 100 steps, numbered **00** through **99**. These steps may or may not coincide with the port number. For example, a sequence of scan steps may be programmed in which port number 07 is the first port sampled by the system. In that case, the first scan step (00) would be port 07.

Cycles – the number of samples to be drawn at each port before moving to the next scan step, programmed at the particle counter.

Locations – the number of scan steps to be used in a given sampling operation, programmed in the particle counter. Refer to Table 2 to interpret the following example:

1. A sampling operation is set up with 5 **sampling points**. The **sampling points** are connected to the Manifold at **port numbers** 01, 07, 13, 19 and 26.
2. The Manifold Controller is programmed for five **scan steps** (00-04) as shown in the table.
3. The number of **cycles** is set in the Particle Counter to 001, for one sample at each **scan step**.
4. The number of **locations** is programmed into the Particle Counter. If the number of **locations** matches the number of **ports** used and **scan steps**, each **port** will be sampled once.
5. A number of **locations** may be programmed into the particle counter which does not match the number of **ports** used or the number of **scan steps**. If the programmed number of **locations** is fewer than the number of connected **ports** and **scan steps**, some **ports** will not be sampled.
6. If the programmed number of **locations** exceeds the number of connected **ports** and **scan steps**, some **ports** will be sampled more than once.

1.	Port No.	01	07	13	19	26
2.	Scan Step No.	00	01	02	03	04
3.	Cycles = 001	1 sample	1 sample	1 sample	1 sample	1 sample
4.	No. of Locations = 005	001	002	003	004	005
5.	No. of Locations = 003	001	002	003		
6.	No. of Locations = 007	001	002	003	004	005
		006	007			

Table 2. Manifold system programming examples

Operation

Powering Up

Turn the Manifold Controller power on, then turn on the Particle Counter; DO NOT turn the vacuum pump on yet. The display on the Manifold Controller should momentarily flash “32” indicating all 32 ports are enabled and then display “01” indicating that the Manifold is currently at port 1, ready to sample. If these conditions are not met refer to the troubleshooting section of this manual.

At the Manifold, the motor should be heard as the manifold performs a “home test” and positions the internal sample pickup shoe to port 1.

Programming A Sampling Routine

Note: If the System was previously in use under external computer control, it must be released from computer control and turned off and back on before programming may begin. Programmed sampling routines should be retained in memory while power is off. To clear a previously programmed sampling routine, press in turn Local (lit); Program (lit); Enable All Ports and Enter.

Default Settings – Sampling All 32 Ports

The factory default settings for sampling parameters are as follows:

Manifold Controller:

- Ports** 01-32 enabled for sampling
- 32 scan steps** programmed (00-31)

Particle Counter:

- Cycles** set to 1, for one sample at each scan step
- Locations** set to 0 for continuous sampling
- Sample time** set to 1 minute, which draws a 1ft³ sample
- Hold time** set to 15 seconds, the minimum when using a manifold system

These settings will cause the system to begin at port 1, take a one minute sample, move to port 2 and wait 15 seconds before taking a one minute sample, move to port 3 and wait 15 seconds, etc., repeating the process indefinitely, returning to port 1 to begin a new routine after sampling port 32.

Simple Programming For Using Most, But Not All Ports

If the system is going to use most of the ports and leave only a few unsampled, simple programming consists of telling the Manifold Controller which ports to skip instead of which ports to use. Follow the steps below to create such a sampling routine.

1. At the Manifold Controller, (Figure 6) verify “Local” is lit. If not, press the “Local” button so that it is.
2. Press ↑ or ↓ until port to be skipped is displayed on two digit LED display
3. Press “Skip” button and verify “Skip” LED lights red. Pressing “Skip” again restores the port to the sampling routine
4. Repeat steps 2 and 3 for each port to be skipped
5. When ready to begin sampling, press “Remote” and verify “Remote” LED is lit.

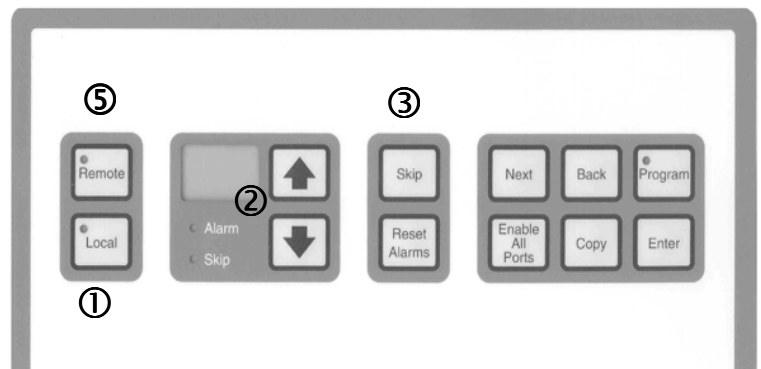


Figure 6. Manifold Controller “Skip” Programming

6. At the Particle Counter, (figure 7) press ↓ until “Cycles” LED is Lit
7. Press “Program” and verify the 3 digit LED displays CYC and the 7 digit LED displays 00i. Use the arrow keys to set the cycles to the desired number of samples taken at each port.
8. Press “Enter” to save Cycles setting, and verify 3 digit LED displays loc and the 7 digit LED displays 00i.
9. Use the arrow keys to set the desired number of locations (as previously defined in “Terminology”). Programming 000 locations will cause the sampling routine to be repeated continuously.
10. Press Enter to save the programmed sampling routine.

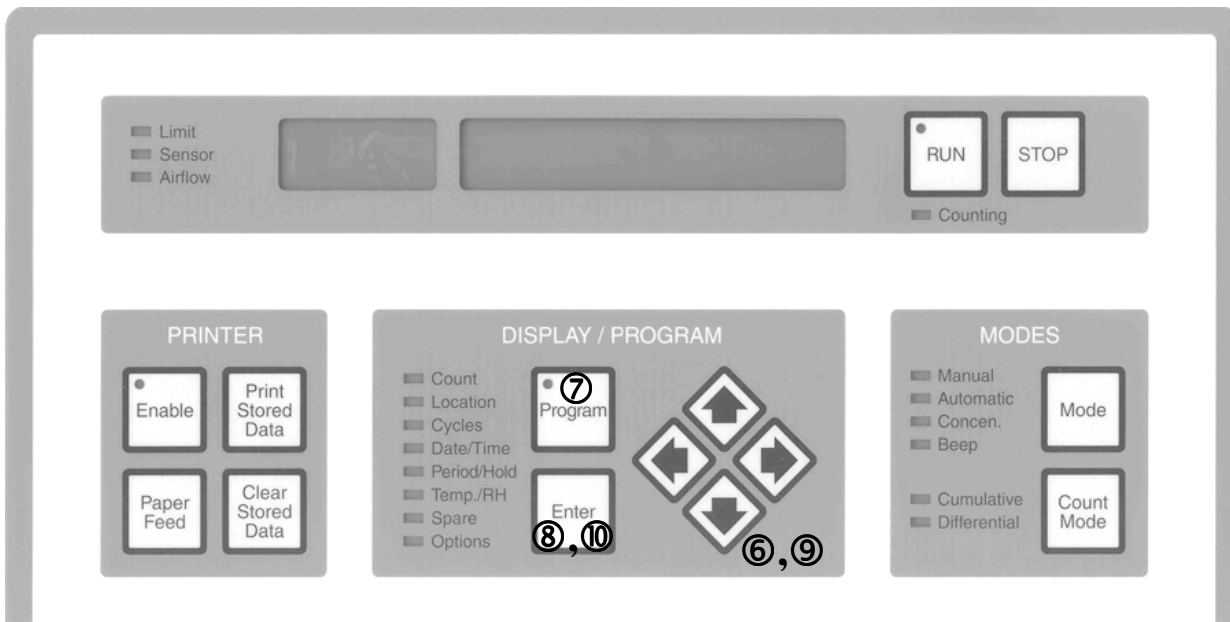


Figure 7. Particle Counter Cycle and Location Programming

Programming a Detailed Sampling Routine

To program a more complex routine tailored to specific situation requirements, use the following procedure. The example given uses the earlier example, wherein only 5 sampling points are used and they are connected to manifold ports 01, 07, 13, 19 and 26. Begin with the Particle Counter and Manifold Controller turned on and the Manifold Controller on Local mode.

1. At the Manifold Controller (Figure 8), press “Program” and verify that the 2 digit LED blinks the **scan step** number (00) briefly and then displays the **port number** (01). This indicates that the first **scan step** in the sampling routine will be **port 1**.
2. Press “Next” to save the programmed scan step and move to the next scan step. Verify the 2 digit LED blinks the next **scan step** number (01) briefly and then displays the next **port** number. The port number displayed is from the factory defaults or from a previous program.
3. Press ↑ repeatedly to display “07” in the 2 digit LED display. This sets the second **scan step** (01) to **port 7**.

4. Press “Next” and verify the display blinks the next **scan step** (02) and displays the **port number**.
5. Press ↑ until the display shows “13”
6. Repeat steps 4 and 5 for the remaining 2 **scan steps** (03 and 04) and **port numbers** (19 and 26).
7. Press “Enter” to conclude programming
8. Verify programmed sequence by repeatedly pressing ↑ and observing led display each programmed **port number** in sequence.
9. Press “Remote” and verify “Remote” LED is lit to prepare for sampling.

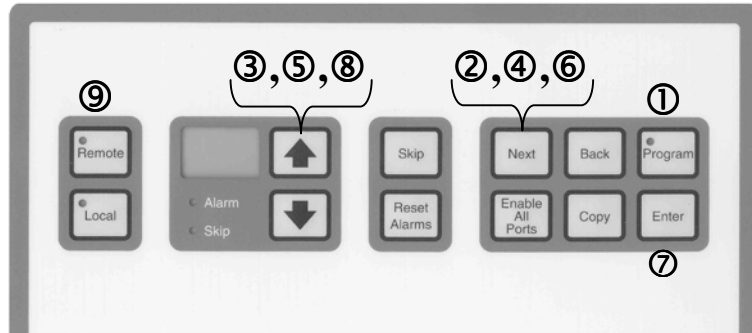


Figure 8. Manifold Controller Scan Step Programming

The steps above may be repeated and modified to include a wide variety of configurations and sequences. Port numbers need not be sampled in numerical order, and may be entered more than once in a sequence of scan steps.

The following steps describe programming the particle counter for this sampling routine.

1. At the Particle Counter (Figure 9), press ↓ until “Cycles” LED is Lit
2. Press “Program” and verify the 3 digit LED displays CYC and the 7 digit LED displays 00i. Use the arrow keys to set the cycles to 003.
3. Press “Enter” to save Cycles setting, and verify 3 digit LED displays loc and the 7 digit LED displays 00i.
4. Use the arrow keys to set the number of locations (as previously defined in “Terminology”) to 0i0.
5. Press Enter to save the programmed sampling routine.

These steps create a sampling routine wherein the system will draw **three** samples (**cycles**) from port 1, then draw three samples from port 7, then draw three samples from port 13, then draw three samples from port 19 and then draw three samples from port 26; a total of **5 scan steps**. It will then repeat the entire process before stopping, for a total of **10 locations**.

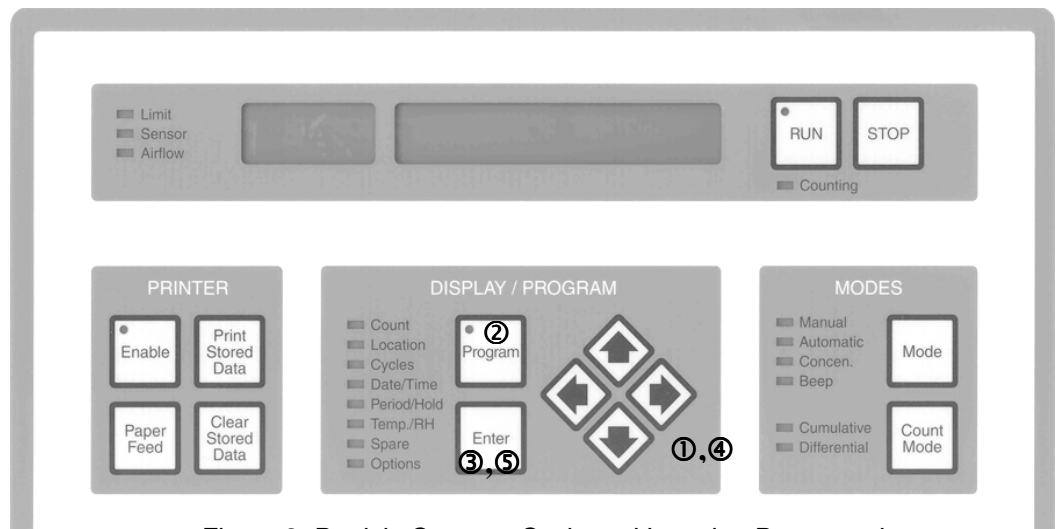


Figure 9. Particle Counter Cycle and Location Programming

Resetting the Default Sampling Routine

To restore all 32 ports to active sampling status, press in turn, “Local”; “Program”; “Enable All Ports”; and “Enter” keys.

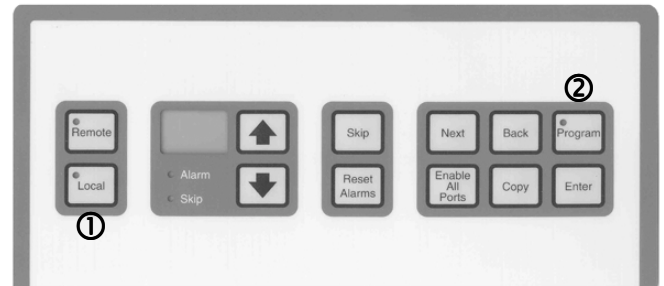
To completely reset the manifold controller to factory default settings and clear the memory of all programming, turn the power switch on the rear of the controller to the off position, and, while holding down the “Program” key, turn it back on.

Setting Alarm Limits

The alarm limits for the various particle size channels in the Particle Counter may be copied into the Manifold Controller memory so that each sample point may have unique count alarm limits. Figure 10 and the following example demonstrates the steps to set alarm limits for the system, using the sampling routine previously described under “Programming a Detailed Sampling Routine.”

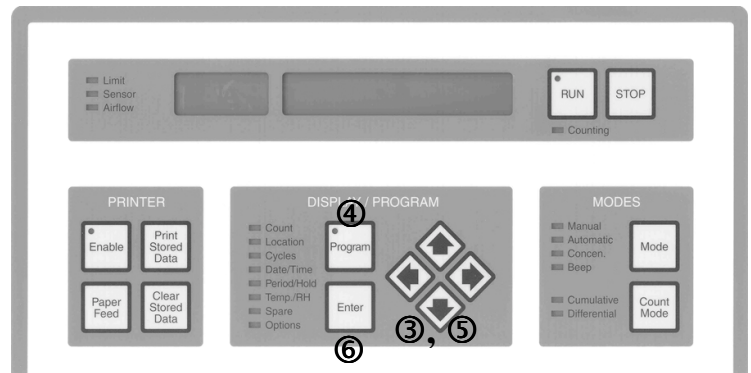
At the **Manifold Controller**:

1. Press “Local” key, verify LED is lit. Two digit display will briefly blink the first scan step (00) and then display the associated port number (01)
2. Press “Program” key, verify LED is lit.



At the **Particle Counter**: Verify the counter is displaying the particle size range in the 3 digit LED and is not running.

3. Press ← or → keys to display the desired size range.
4. Press “Program” to display alarm limits for the selected size range.
5. Use the four arrow keys to set the digits to the desired alarm limit.
6. Press “Enter” to save settings.
7. Repeat steps 3 – 6 for each desired size range



At the **Manifold Controller**:

8. Press “Copy” key to copy alarm limits from the Particle Counter to the Manifold Controller for that scan step and port number
9. Press “Next” key to advance to the next scan step (01) and port number (07) in the sample routine. Note: The “Back” key may be pressed to return to a previous scan step.
10. Repeat steps 3 – 9 for the remaining scan steps and press “Enter” when all alarm settings have been copied.

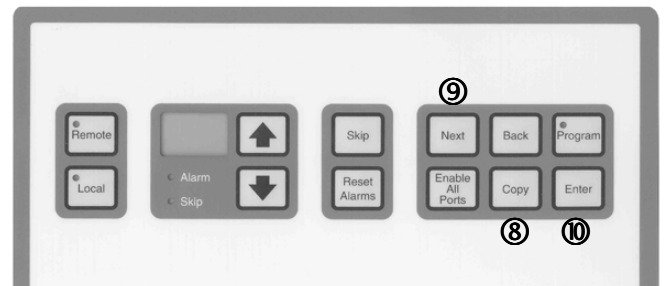


Figure 10. Copying Alarm Limits

If programming of alarm limits in all 32 ports is desired, each port may be selected in turn by using the ↑ or ↓ keys on the manifold controller instead of the “Next” and “Back” keys. To view the Alarm settings for the sampling routine after copying is complete, select the desired scan step using

the ↑ and ↓ keys at the Manifold Controller. At the Particle Counter, use the four arrow keys to display the desired size range, then press and hold the “Enter” key to display the alarm setting for that size range.

Starting The Sampling Routine

Once the sampling routine has been satisfactorily programmed and the desired alarm limits are copied, the system is ready to operate. Ensure Manifold Controller is in Remote and Particle Counter is in Automatic mode. Turn on the Vacuum Pump supplying vacuum to the manifold system and press “Run” on the Particle Counter. The Manifold will begin sampling from the first programmed port and proceed through the sampling routine until it is complete.

Using the Alarm Module Option

Each alarm module provides a remote alarm contact for up to 17 alarms (16 port alarms plus an "Any" alarm when one or more port alarms are on). The alarm output signals are available through a connector on alarm module and provide latched outputs that are triggered by count alarms. The alarm module also provides +12 V @ 2 A and +5 V @ 2 A to power relays for alarm-driven devices when a count alarm is detected. Two alarm modules are required for simultaneously monitoring all 32 ports.

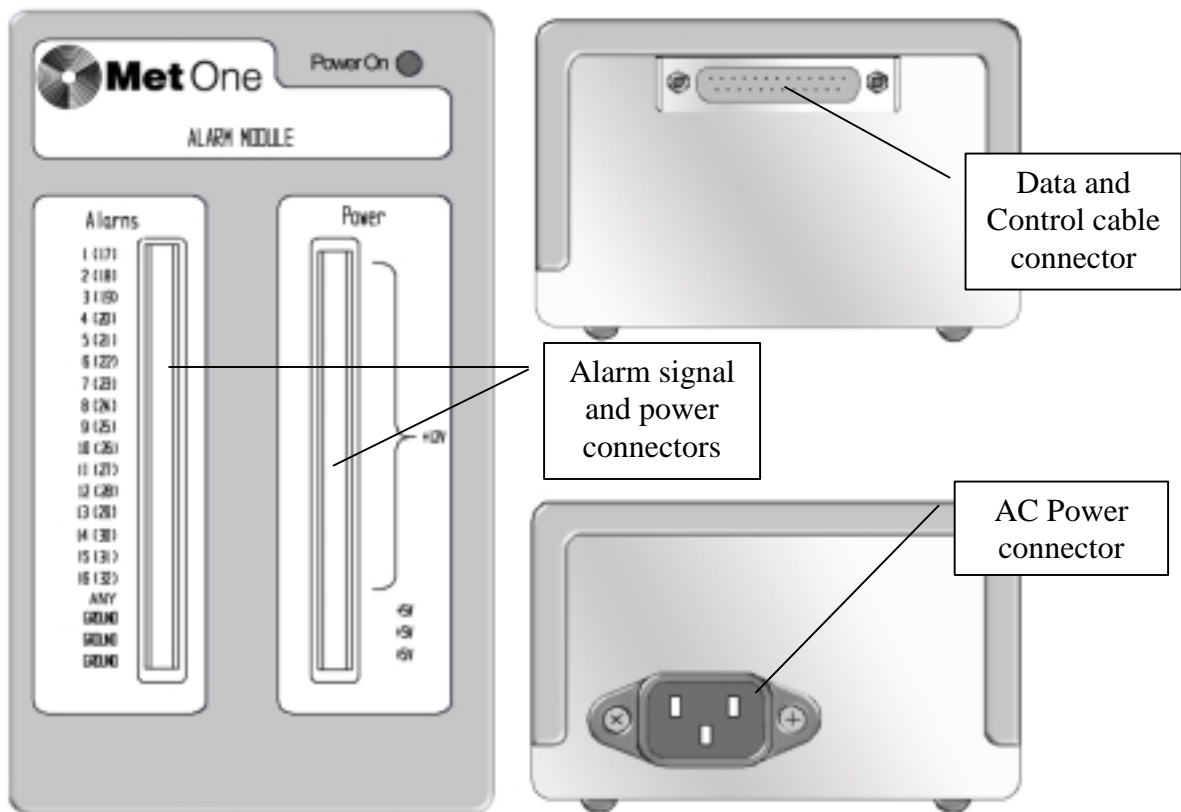


Figure 11. Alarm Module Connections

Using figures 11 and 12, connect the alarm module as follows:

1. Connect ribbon cable supplied with the alarm module from 25-pin connector on alarm module to 25-pin "Alarm Out" connector (either 1 thru 16 or 17 thru 32) on rear panel of the manifold controller.
2. Connect the alarm device between the applicable "+" voltage and the desired alarm number output (1 to 16, or 17 to 32 if so connected).
3. Connect AC power cable from alarm module to facility power outlet.

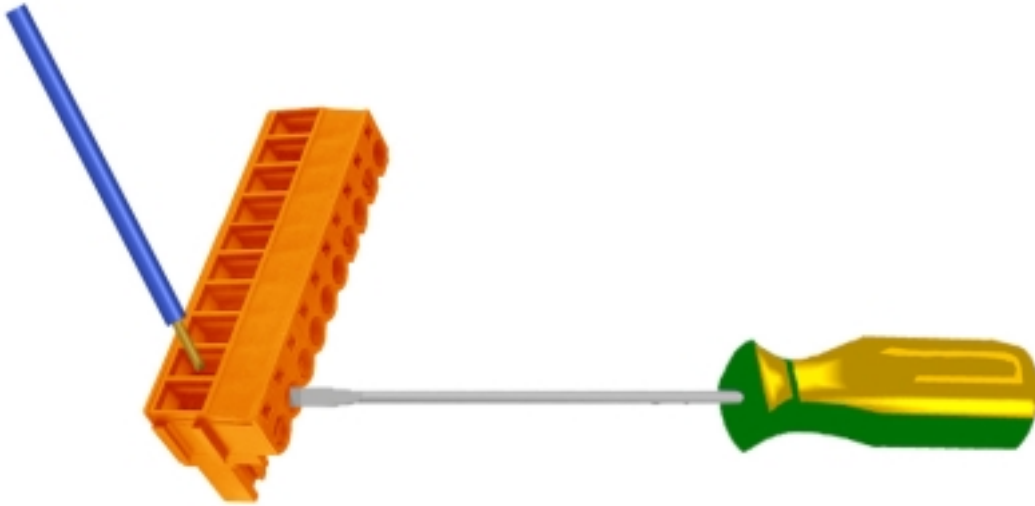


Figure 12. Alarm Connector Plug Wiring

To acknowledge (turn off) a remote alarm, press the "Reset Alarms" key on the manifold controller. On some older manifold controllers, it may be necessary to press, in order, "Local," "Reset Alarms," and "Remote."

Maintenance and Troubleshooting

Troubleshooting Common Problems

- Symptom:** Manifold Controller displays “FF” when turned on.
Probable Cause: No communication between Manifold and Controller. Ensure cable is properly connected.
- Symptom:** Unable to achieve 1.0 cfm sample flow at the particle counter with rear panel flow adjustment valve.
Probable Cause: Reversed “Sample” and “Return Air” tubing connections at the manifold. Refer to figure 3 for proper connections.
- Symptom:** Particle Counter will zero count alone, but manifold system will not.
Possible cause: Internal coupling shoe worn. Refer to Coupling Shoe Inspection procedure below.

Manifold Cleaning and Maintenance

Contaminants (dirt, dust, fibers, etc.) may build up inside the cavity of the manifold after prolonged use. The manifold should be cleaned once a year during normal operation or more frequently if used in extremely dirty environments. Within the Manifold, the coupling shoe should be inspected for wear once a year. Refer to Figure 11 for cleaning and Figure 12 for coupling shoe.

1. Remove two wing nuts that hold rear-panel shroud in place then carefully remove shroud and set aside (tubing may be left attached to inlet and outlet fittings; vacuum hoses may be left attached).
2. Remove 12 hex-head cap screws holding front panel to manifold body.
3. Gently pull front panel straight out and away from manifold .
4. Using clean, oil-free compressed air, blow out any dust or fibers.
5. Locate coupling shoe then inspect the four standoffs that hold shoe away from front panel. These standoffs should be about 0.05 inch in depth. If significantly less than 0.05 inch, replace coupling shoe. Parts may be ordered from the factory
6. If replacing coupling shoe, take care to not over tighten the four mounting screws. Tighten only 1/8 turn past the seating of the screw.
7. When completed, reassemble in reverse order.

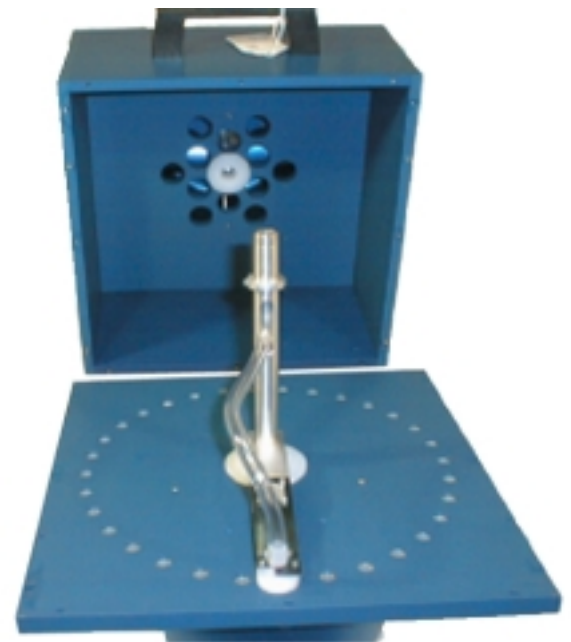


Figure 13. Manifold Cleaning

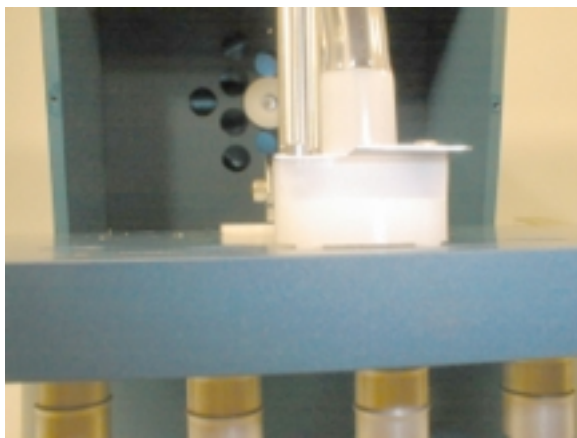


Figure 14. Coupling Shoe

Reference Information

Manifold Sample Flow

The manifold operates as shown in figure 11 .

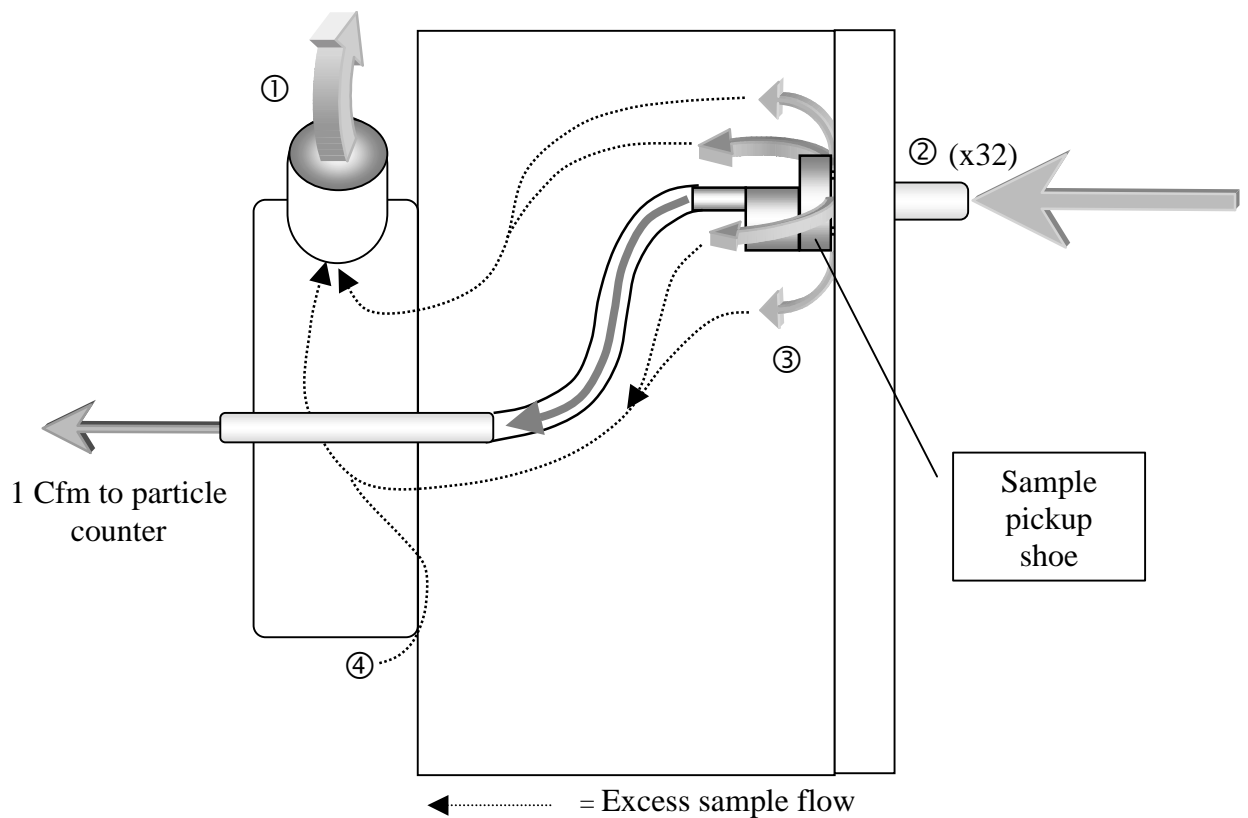


Figure 15. Manifold Theory of Operations

The external vacuum pump provides between 40-80 in/ H₂O vacuum at the large fitting on the rear of the manifold ① . This vacuum produces a 2-3 cfm flow rate at each of the 32 manifold ports ② . The particle counter only draws 1 cfm through the sample line and selected port via the sample pickup shoe ③ , allowing the excess sample to flow around the pickup shoe. This positive pressure and flow around the pickup shoe is what prevents ambient air from being sampled by the counter. Any ambient air that enters the manifold system ④ will be drawn into the external vacuum pump rather than the Particle Counter because of the dominant flow pattern in the internal cavity.

Resetting Manifold Controller

This procedure clears the manifold controller's memory and restarts its microprocessor. All programmed instructions such as the sample sequence will be erased. Reset the manifold controller memory to the default (original factory) settings by pressing and holding the "Program" key while you turn power switch to on.

Scan Table Downloading Format

The scan table contains the information for setting the sampling sequence of the manifold. Up to 100 steps can be contained in the table that is transferred from a computer through the RS232 port to the manifold controller. A null modem nine-pin computer cable is required to connect the two units. Using "ProComm" or "Windows Terminal" and communications set at 1200 baud, 8 data bits, 1 stop bit, and no parity, send the following string to the manifold controller:

```
scan_XX_XX_XXCR
```

where: (scan) = command; must be lower case
(_) = space (20 hex)
(XX) = port number
(CR) = carriage return (0D hex)

Changing "Home" Test Frequency

A "home" test is built into the manifold controller that automatically checks the manifold's station readout with the mechanical port the manifold is actually on. Misalignment may be caused by power failure, excessive vibration, or loose cable connections. The problem is normally corrected by pressing the counter's ON key or by resetting the counter. Refer to particle counter's Operating Guide for resetting procedure.

Switches internal to the manifold controller can be set to change how often the "home" test is performed. The factory setting is for a "home" test after every eight port changes. Below are all the combinations presently available:

<u>SW3</u>	<u>SW2</u>	<u>SW1</u>	<u>number of ports per home test</u>
off	off	off	1
off	off	on	2
off	on	off	4
off	on	on	6
on	off	off	8 (factory setting)
on	off	on	10
on	on	off	12
on	on	on	14

Specifications:

A2432 System

(excluding particle counter - refer to particle counter operating guide)

Environment (Operating):

Temperature	12 to 41°C (55 to 105°F)
Humidity	10 to 85% relative, non-condensing

Environment (Storage):

Temperature	-40 to 71 °C (-40 to 160 °F)
Humidity	Up to 98% relative, non-condensing

Manifold

Number of Ports	32
Sample Tubing	1/2" O.D., 3/8" I.D.
Size	12" wide x 12.5" high x 16" deep (30.5x31.8x40.6 cm)
Weight	26.9 lbs. (12.2 kg.)

Manifold Controller

Power	100 W; 100-115, or 220-240 VAC (specify); 50-60 Hz
Size	9.1" wide x 4.8" high x 8.1" deep (23.1x12.2x20.6 cm)
Weight	6.7 lbs. (3.1 kg.)
Program Cycle	Up to 100 steps

Particle Counter

The counter you have selected is identical to the standard counter except that a return air fitting is installed on back panel and a different EPROM is installed. Additional / altered specifications are:

Data Storage	400 samples, rotating buffer
Hold Time	15 seconds minimum when manifold is attached
209E Calculations	On stored data
3-Digit Display	Displays the port number (when Location light is on)

Alarm Module

Interface	+5 V, digital
Power	50 W, 100, 115, or 230 VAC (specify), 50-60 Hz
Outputs	17 alarms (16 individual port alarms + "Any" alarm ["Any" is off if no ports are in alarm]) Sink = 0.5 amps per alarm channel Source = +12 V, @ 2.0 amps, +5 V @ 2 amps
Size	4.4" wide x 2.8" high x 7.4" deep (11.2x7.1x18.8 cm)
Weight	1.5 lbs. (0.7 kg.)

DECLARATION of CONFORMITY

We,

Pacific Scientific Instruments
481 California Avenue
Grants Pass, Oregon 97526

declare under sole responsibility that the

**A2432 Manifold System , part number 2083049 consisting of:
32-Port Manifold, Part Number 2080359
Manifold Controller, Part Number 2083032**

conforms to Directive 89/336/EEC for Electromagnetic Compatibility and Directive 73/23/EEC for Low Voltage. Compliance was demonstrated to the following specifications as listed in the official Journal of the European Communities:

EN 50081-1:1992 Emissions:


EN 55011 :1991 Class A Radiated
EN 55011 :1991 Class A Conducted

EN 50082-1:1992 Immunity:

IEC 801-2 Electrostatic Discharge
IEC 801-3 RF Radiated
IEC 801-4 Fast Transients

EN 61010-1:1993 Safety, General Requirements

Pacific Scientific Instruments
October 22, 1996 _____
Director
(Place and date of issue)


R. W. Ferguson-Engineering Director
(Name/signature of authorized person)

Warranty

Pacific Scientific Instruments ("Seller") warrants that the Products will operate substantially in conformance with Seller's published specifications, when subjected to normal, proper and intended usage by properly trained personnel, for a period of one (1) year from the date of shipment to Buyer (the "Warranty Period"). Seller agrees during the Warranty, provided it is promptly notified in writing upon the discovery of any defect and further provided that all cost of returning the defective Products to Seller are prepaid by Buyer, to repair or replace, at Seller's option, defective Products so as to cause the same to operate in substantial conformance with said specifications. Replacement parts may be new or refurbished, at the election of Seller. All replaced parts shall become the property of Seller. Lamps, fuses, bulbs and other expendable items are expressly excluded from the warranty under this Section. Seller's sole liability with respect to equipment, materials, parts or software furnished to Seller by third party suppliers shall be limited to the assignment by Seller to Buyer or any such third party supplier's warranty, to the extent the same is assignable. In no event shall Seller have any obligation to make repairs, replacements or corrections required, in whole or in part, as the result of (i) normal wear and tear, (ii) accident, disaster or event of force majeure, (iii) misuse, fault or negligence of or by Buyer, (iv) use of the Products in a manner of which they were not designed, (v) causes external to the Products such as, but not limited to, power failure or electrical power surges, (vi) improper storage of the Products or (vii) use of the Products in combination with equipment or software not supplied by Seller. If Seller determines that Products for which Buyer has requested warranty services are not covered by the warranty hereunder, Buyer shall pay or reimburse Seller for all costs of investigating and responding to such request at Seller's then prevailing time and materials rates. If Seller provides repair services or replacement parts that are not covered by the warranty provided in this Section, Buyer shall pay Seller therefore at Seller's then prevailing time and materials rates. ANY INSTALLATION, MAINTENANCE, REPAIR, SERVICE, RELOCATION OR ALTERATION TO OR OF, OR OTHER TAMPERING WITH, THE PRODUCTS PERFORMED BY ANY PERSON OR ENTITY OTHER THAN SELLER WITHOUT SELLER'S PRIOR WRITTEN APPROVAL, OR ANY USE OF REPLACEMENT PARTS NOT SUPPLIED BY SELLER, SHALL IMMEDIATELY VOID AND CANCEL ALL WARRANTIES WITH RESPECT TO THE AFFECTED PRODUCTS. EXCEPT AS EXPRESSLY PROVIDED IN THIS SECTION, SELLER DISCLAIMS ALL WARRANTIES, WHETHER EXPRESS OR IMPLIED, ORAL OR WRITTEN, WITH RESPECT TO THE PRODUCTS, INCLUDING WITHOUT LIMITATION ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. SELLER DOES NOT WARRANT THAT THE PRODUCTS ARE ERROR-FREE OR WILL ACCOMPLISH ANY PARTICULAR RESULT.