

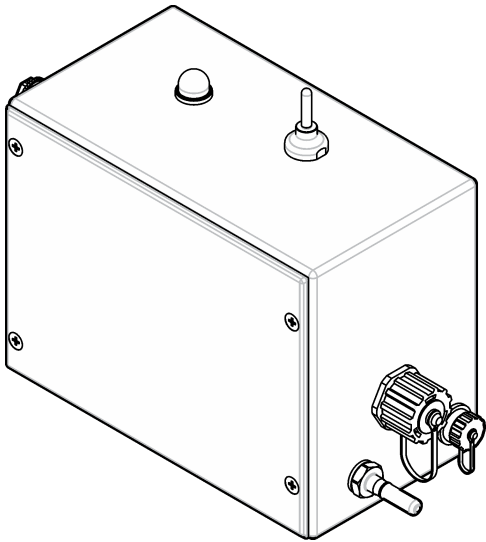
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MET ONE 7000: 7005, 7015

07/2013, Edition 1

User Manual



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Specifications

Specifications are subject to change without notice.

Specification	Details
Dimensions (W x D x H)	22.90 x 12.50 x 16.0 cm (9.02 x 4.92 x 6.30 in.)
Enclosure	316L stainless steel
Light source	Long Life Laser™ diode , Class 3B laser, assigned FDA accession number 9022243-027
Weight	3.96 kg (8.7 lb) AC models, 3.91 kg (8.6 lb) DC models
Pollution degree	2
Installation category	II
Protection class	I, IP65 (indoor use)
Power requirements	DC models: 24 VDC ± 10% (source: Class 2 limited energy, < 150 VA) AC models: 100 VAC or 230 VAC, 50/60 Hz, 25 W maximum
Power consumption (maximum)	Serial and pulse units: 7.6 W AC, 5.9 W DC; Ethernet unit: 6.9 W DC, 8.9 W AC maximum; Analog unit: 6.1 W DC, 7.9 W AC maximum
Operating temperature	5 to 40 °C (41 to 104 °F)
Storage temperature	−40 to 70 °C (−40 to 158 °F)
Humidity	Operating and storage: 5 to 95% relative humidity, non-condensing
Altitude	2000 m (6562 ft) maximum
Port sizes	Model 7005: barb fitting for 0.32 cm (1/8-in.) ID inlet tubing, 12 mm OD x 10 mm ID outlet tubing Model 7015: barb fitting for 0.64 cm (¼-in.) ID inlet tubing, 12 mm OD x 10 mm ID outlet tubing

Specification	Details
Output signal options	Pulse, analog 4–20 mA, serial RS232 with Modbus RTU or FXB communication protocol (no networking), serial RS485 with Modbus RTU or FXB communication protocol, Ethernet with ModbusTCP protocol
Data storage	1000 samples/records (oldest records are written over when the buffer is full)
Number of size channels	Standard: 2, optional: 4
Sample flow rate	Model 7005: 0.1 cfm (2.83 L/min) ± 5% Model 7015: 1.0 cfm (28.3 L/min) ± 5%
Inlet pressure	Ambient to 2.5 mm (0.1 in.) Hg vacuum
Vacuum requirement	≥ 406 mm (16 in.) Hg (542 mbar) minimum vacuum measured at each instrument with flow through all instruments.
Range	Model 7005: 0.5 µm to 10.0 µm at 0.1 cfm (2.83 L/min) Model 7015: 0.5 µm to 10.0 µm at 1.0 cfm (28.3 L/min)
Flow control	Through critical orifice with automatic solenoid shut off valve
Sensitivity	Model 7005: 0.5 µm at 0.1 cfm (2.83 L/min) Model 7015: 0.5 µm at 1.0 cfm (28.3 L/min)
Counting efficiency	Model 7005: 50% at 0.5 µm (per JIS and ISO) Model 7015: 50% at 0.5 µm (per JIS and ISO)
Coincidence loss	Model 7005 (all output options): 10% at 140,000,000 particles/m ³ (4,000,000 particles/ft ³) Model 7015 (all output options except for pulse): 10% at 20,000,000 particles/m ³ (566,000/ft ³)
False count rate	One or less in 5 minutes
Certifications	Certified to UL and CSA standards by ETL, CE

General information

In no event will the manufacturer be liable for direct, indirect, special, incidental or consequential damages resulting from any defect or omission in this manual. The manufacturer reserves the right to make changes in this manual and the products it describes at any time, without notice or obligation. Revised editions are found on the manufacturer's website.

Safety information

NOTICE

The manufacturer is not responsible for any damages due to misapplication or misuse of this product including, without limitation, direct, incidental and consequential damages, and disclaims such damages to the full extent permitted under applicable law. The user is solely responsible to identify critical application risks and install appropriate mechanisms to protect processes during a possible equipment malfunction.

Please read this entire manual before unpacking, setting up or operating this equipment. Pay attention to all danger and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

Make sure that the protection provided by this equipment is not impaired. Do not use or install this equipment in any manner other than that specified in this manual.

Use of hazard information

▲ DANGER

Indicates a potentially or imminently hazardous situation which, if not avoided, will result in death or serious injury.

▲ WARNING

Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.

▲ CAUTION





Indicates a potentially hazardous situation that may result in minor or moderate injury.

NOTICE

Indicates a situation which, if not avoided, may cause damage to the instrument. Information that requires special emphasis.

Precautionary labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed. A symbol on the instrument is referenced in the manual with a precautionary statement.

	This symbol, if noted on the instrument, references the instruction manual for operation and/or safety information.
	This symbol, when noted on a product enclosure or barrier, indicates that a risk of electrical shock and/or electrocution exists.
	This symbol indicates a laser device is used in the equipment.
	Electrical equipment marked with this symbol may not be disposed of in European public disposal systems after 12 August of 2005. In conformity with European local and national regulations (EU Directive 2002/96/EC), European electrical equipment users must now return old or end-of-life equipment to the Producer for disposal at no charge to the user. <i>Note: For return for recycling, please contact the equipment producer or supplier for instructions on how to return end-of-life equipment, producer-supplied electrical accessories, and all auxiliary items for proper disposal.</i>

Laser safety information

This instrument is a CLASS 1 LASER PRODUCT, CDRH Accession No. 9022243-027. Invisible laser radiation is present when opened. Avoid direct exposure to the beam. Service of the internal components must be done by factory-authorized personnel only.

The instrument complies with IEC/EN 60825-1 and 21 CFR 1040.10 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

Certification

Canadian Radio Interference-Causing Equipment Regulation, IECIS-003, Class A:

Supporting test records reside with the manufacturer.

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de classe A répond à toutes les exigences de la réglementation canadienne sur les équipements provoquant des interférences.

FCC Part 15, Class "A" Limits

Supporting test records reside with the manufacturer. The device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

1. The equipment may not cause harmful interference.
2. The equipment must accept any interference received, including interference that may cause undesired operation.

Changes or modifications to this equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at their expense. The following techniques can be used to reduce interference problems:

1. Disconnect the equipment from its power source to verify that it is or is not the source of the interference.
2. If the equipment is connected to the same outlet as the device experiencing interference, connect the equipment to a different outlet.
3. Move the equipment away from the device receiving the interference.

4. Reposition the receiving antenna for the device receiving the interference.
5. Try combinations of the above.

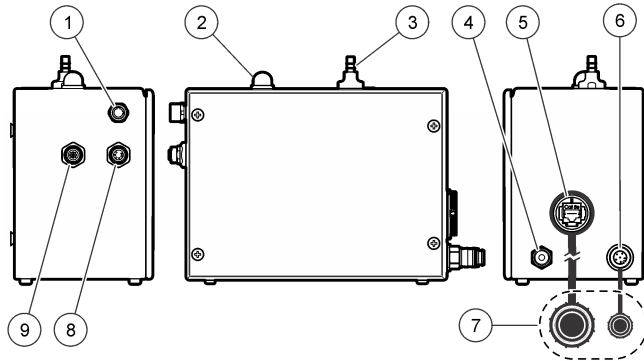
Product overview

This instrument counts airborne particles with a laser diode light source and collection optics. Refer to [Figure 1](#). Room air is pulled through the particle counter by an attached, external vacuum system.

Multiple instruments can be installed at different locations in a clean room to monitor the air quality. Count data is sent to the user-supplied central monitoring software through the applicable communication protocols. The central monitoring software is used to remotely operate the instrument.

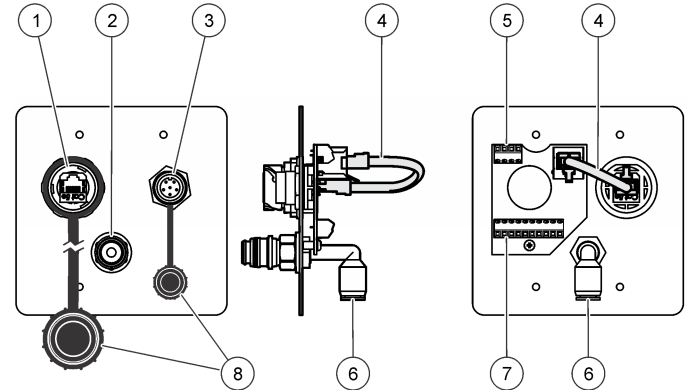
This instrument is made to be installed in areas where frequent washdown occurs. The wall plate and connectors provide sealed connections at both the wall and the instrument. Refer to [Figure 2](#).

Figure 1 Instrument overview



1 Connector for the optional light stack	6 AC or DC power input connector
2 Status indicator light (Table 1)	7 Waterproof caps (2x)
3 Sample air inlet fitting	8 Service port
4 Quick-connect vacuum fitting	9 Relative humidity (RH) and temperature sensor port
5 Communication connector, RJ-45	

Figure 2 Wallplate overview



1 Communication connector, RJ-45	5 4-pin connector
2 Quick-connect vacuum fitting	6 Slip tubing connector
3 24 VDC power input connector	7 10-pin connector
4 Communication jumper cable	8 Waterproof caps (2x)

Table 1 Status indicator light

Color	Indication	System status
Green	Flashing (3 seconds)	Normal, sampling
	On	Normal, not sampling
Blue	On	Sensor failure
	One short flash, one long flash	Air flow failure
	Flashing	Communication failure
Red	On or flashing	Count alarm

Table 1 Status indicator light (continued)

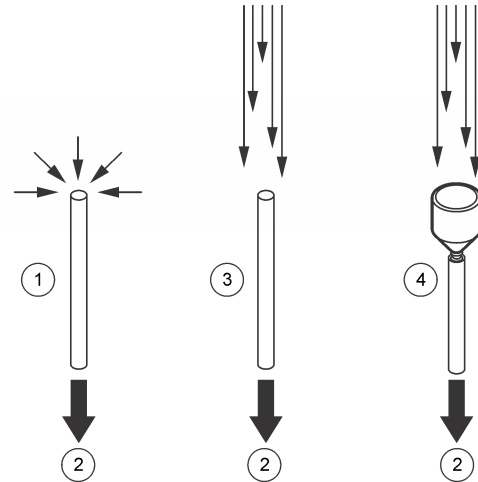
Color	Indication	System status
Yellow	On	Initialization
	Flashing	Count alert ¹
Purple	Flashing	Setup utility is being used

¹ The yellow light will only identify a count alert if configured to do so with the user-supplied central monitoring software using only ModBus protocol, not FX protocol. The count alert is not an option in the instrument configuration.

Isokinetic probe

For the best accuracy in laminar flow environments, always use the supplied isokinetic probe with this instrument. The velocity of air in the probe is similar to that of a typical vertical or horizontal laminar flow environment such as a clean room or clean hood. The supplied isokinetic probe supplies the same vertical (or horizontal) flow speed of the air in order to collect representative samples of the clean room laminar flow for the instrument. Refer to [Figure 3](#) for a comparison of sampling with and without the isokinetic probe.

Figure 3 Isokinetic probe function

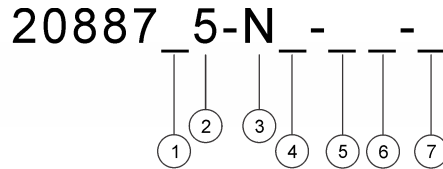


1 No probe in non-laminar air flow	3 No probe in laminar air flow—particles are missed
2 To particle counter	4 Isokinetic probe in laminar air flow—most accurate

Instrument configurations

This instrument is available in many configurations. Each configuration has a different part number. [Figure 4](#) shows the part number structure. [Table 2](#) gives descriptions of the part number codes.

Figure 4 Part number structure



1 Flow rate	5 Communication
2 Sensitivity (minimum)	6 Input power
3 Vacuum pump	7 Power cord
4 Flow measurement	

Table 2 Parameter codes

Parameter	Code	Description
Flow rate	0	0.1 cfm
	1	1.0 cfm
Sensitivity (minimum)	5	0.5 μm
Vacuum pump	N	No internal vacuum pump
Flow measurement	F	With flow measurement
	N	Without flow measurement
Communication	E	Ethernet
	S	Serial
	A	Analog 4–20 mA
Input power	D	24 VDC
	A	100–230 VAC, 50/60 Hz

Table 2 Parameter codes (continued)

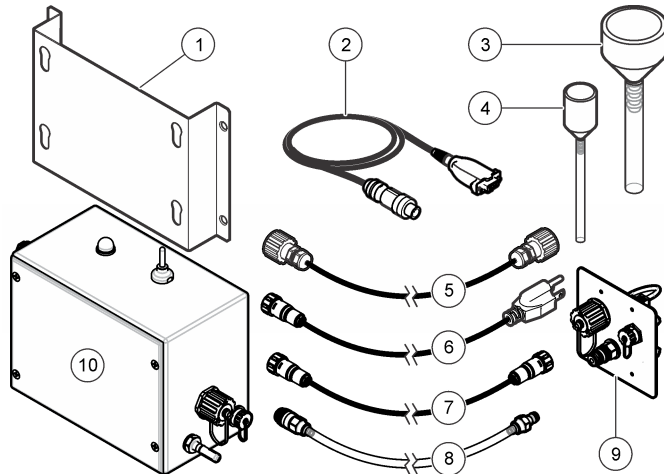
Parameter	Code	Description
Power cord	0	DC power cord
	B	Type B (North America)
	D	Type D (India)
	E	Type E (Europe)
	G	Type G (United Kingdom)
	J	Type J (Switzerland)

Example: An instrument with a 0.1 cfm flow rate, 0.5 μm sensitivity, no vacuum pump, flow measurement, RS485 communication, DC input power and a DC power cord will have the part numbers 2088705-NF-SD-0 and 20888700-485. The second part number identifies the type of serial communication (RS232 = 20888700-232, RS485 = 20888700-485 or Pulse = 20888700-PLS).

Product components

Make sure that all components have been received. Refer to [Figure 5](#). If any items are missing or damaged, contact the manufacturer or a sales representative immediately.

Figure 5 Product components



1 Mounting bracket	7 DC power cable, 1 m (3 ft) ⁵
2 Service port cable (4-pin DIN to 9-pin serial connector), 2 m (6 ft) ¹	8 Vacuum tubing, 1 m (3 ft)
3 Sample (isokinetic) probe with tube ²	9 Wall plate
4 Sample (isokinetic) probe with tube ³	10 MET ONE 7000 series particle counter
5 Communication cable, 1 m (3 ft)	11 Setup utility CD (not shown)
6 AC power cable, 1 m (3 ft) ⁴	

¹ Only one service port cable is supplied per order.

² 1.0 cfm units only

³ 0.1 cfm units only

⁴ AC units only

⁵ DC units only

Installation

⚠ WARNING



Multiple hazards. Only qualified personnel must conduct the tasks described in this section of the document.

Installation guidelines

NOTICE

Before a cleaning or disinfecting cycle is started, stop sample collection using the system software or disconnect the vacuum tubing from the quick-connect vacuum fitting on the instrument or wall plate. If the vacuum tubing is disconnected, install the waterproof cap on the quick-connect vacuum fitting. In addition, put a waterproof cap over the isokinetic probe entrance.

NOTICE

High internal temperatures cause damage to the instrument components.

- Install the instrument indoors in a clean, dry, well ventilated, temperature controlled location with minimum vibration.
- Do not operate the instrument in direct sunlight or next to a heat source.
- Install the instrument as close to the sample source as possible. Make sure that the distance is not more than 3 m (10 ft). An inlet tube length longer than 3 m (10 ft) can cause a loss of particles larger than 1 μm . If an inlet tube length longer than 3 m (10 ft) is necessary, compare the results between a portable particle counter and this instrument.
- Keep the air flow in a constant downward direction. When possible, mount the instrument directly below the sample point.
- Keep the power cable plug visible and easily accessible.
- Make sure that the power receptacle is no more than 3 m (10 ft) from the instrument.

Vacuum system guidelines

- Put the vacuum pump in a central location. There must be sufficient vacuum for all instruments in the network.

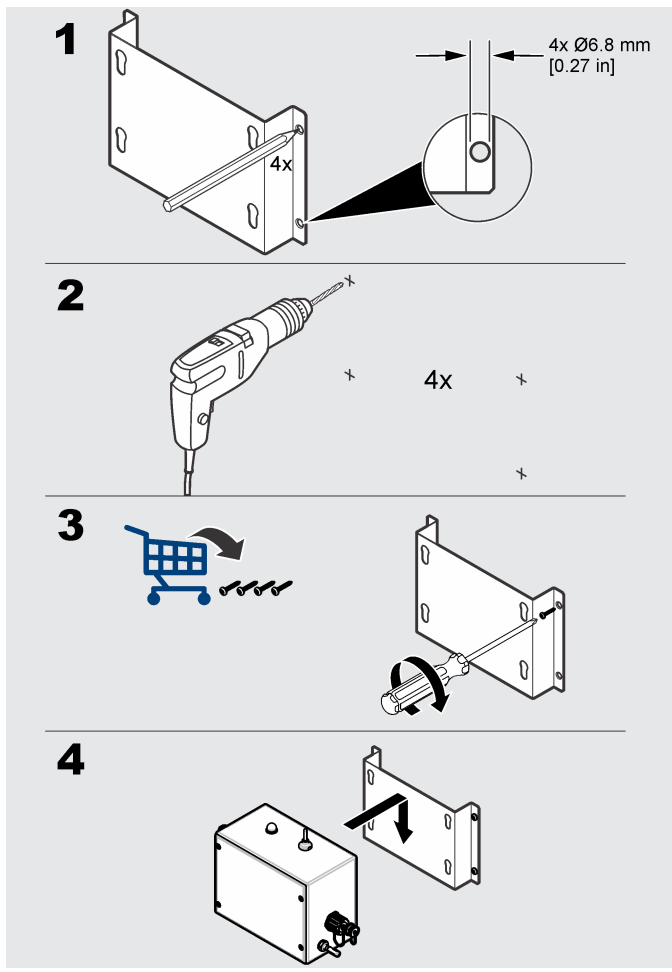
- Use a distribution manifold that keeps vacuum loss to a minimum. Typical materials used for vacuum distribution include brazed copper pipe, schedule 80 PVC pipe or tubing such as Cobolite®.
- Use short tubing lengths to supply the vacuum from the distribution manifold to the individual instrument.
- Keep the number of junctions, elbows and the tubing length from the vacuum source to the instruments to a minimum to keep the vacuum loss in the system to a minimum.

Mechanical installation

Instrument mounting

Install the instrument on a flat wall as shown in the illustrated steps in [Figure 6](#). Wall mounting hardware is supplied by the user.

Figure 6 Wall mounting



Install the wall plate

1. Install the wall plate on the wall with applicable mounting hardware. Mounting hardware is supplied by the user. Refer to the illustrated steps in [Figure 7](#).

Note: Installation of the wall plate onto a standard 2-gang electrical box is recommended. Refer to the illustration on the left side of [Figure 7](#). A 2-gang electrical box (US) supplies easy termination of wiring (RS-485 daisy chain, DC power, Ethernet connection) and vacuum with an auto shut off quick disconnect.

2. Connect one end of the supplied vacuum tubing to the quick-connect vacuum fitting on the instrument. Connect the other end to the quick-connect vacuum fitting on the wall plate. Refer to [Figure 8](#).
3. Connect one end of the supplied communication cable to the communication connector on the instrument. Connect the other end to the communication connector on the wall plate. Turn the cable caps on each end to tighten for a waterproof connection. Refer to [Figure 8](#).

Figure 7 Install the wall plate

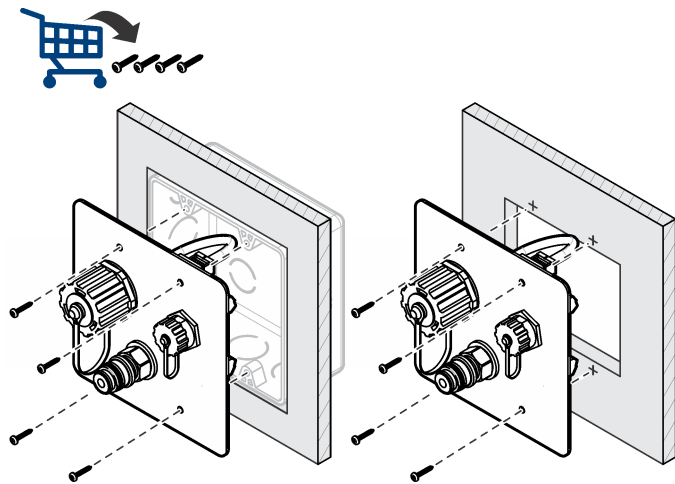
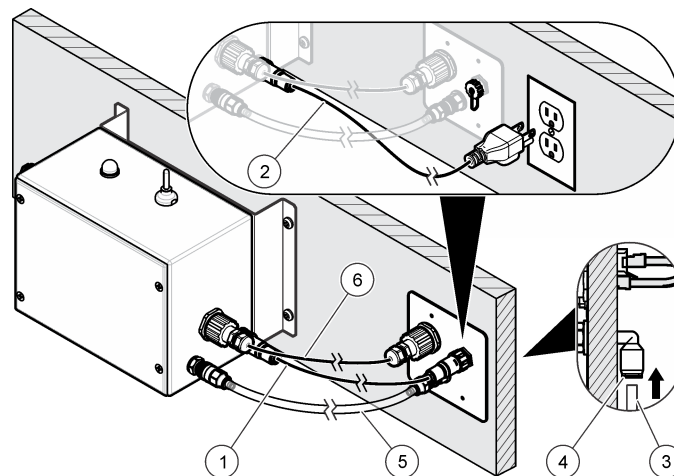


Figure 8 Wall plate connections



1 DC power cable	4 Slip tubing connector
2 AC power cable	5 Vacuum tubing
3 Vacuum tubing from the external vacuum system	6 Communication cable

Install the sample probe

Refer to [Sample probe guidelines](#) on page 12 before the installation to prevent contamination of the instrument and to get a representative sample of the area. The position of the sample (isokinetic) probe is important for count accuracy.

Sample probe options

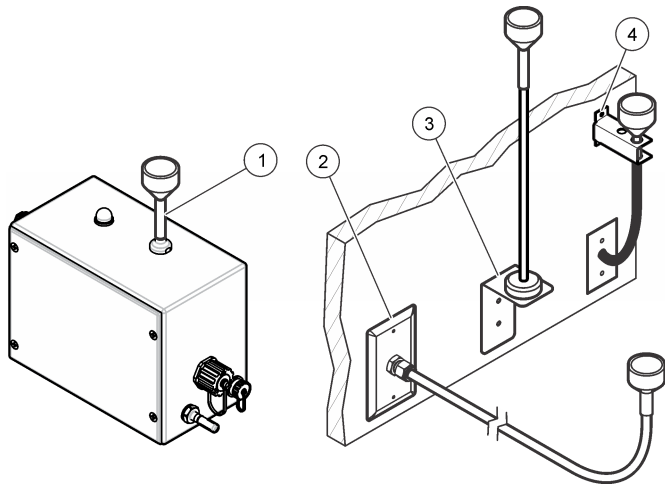
Optional kits are available for sample probe installation. Refer to [Figure 9](#).

- **Direct mount**—No kit is necessary. The sample probe is installed on a short piece of tubing directly on top of the sample air inlet fitting on

the instrument. Use direct mount installation when the instrument can be put in the location where the sample is collected. Use the direct mount installation to keep particle loss to a minimum.

- **Wall mount, 90 degree**—The probe is connected to a stainless steel tube (90 degree) and a wall bracket.
- **T-type wall bracket**—The sample probe is installed in a wall bracket. The tubing is cut to connect the probe to the counter.
- **Vertical wall mount**—The sample probe is connected to a stainless steel tube and bracket. The tubing is cut to connect the isokinetic probe to the instrument.

Figure 9 Sample probe installation options



1 Direct mount	3 Vertical wall mount
2 Wall mount, 90 degree	4 T-type wall bracket

Sample probe guidelines

NOTICE

Do not use this instrument to monitor air that contains vapors from drying adhesives or other chemicals. These vapors can permanently coat the sensor optics or other internal parts.

NOTICE

Do not use this instrument to monitor air that contains vapors with corrosives. These vapor will quickly cause permanent damage to the optics or electronics of the counter.

- Laminar flow—Install at least one sample probe for every 2.3 m² (25 ft²) of surface area.
- Turbulent flow—Install at least two sample probes in each clean room.
- Make sure that the sample (isokinetic) probe points to the direction of flow. Refer to [Figure 3](#) on page 7.
- Keep the sample probe a minimum of 30 cm (12 in.) from loose materials, dust, liquids and sprays.
- Keep the sample probe a minimum of 30 cm (12 in.) from potential contamination sources such as an instrument exhaust fan.
- Do not use this instrument to monitor air that contains the substances shown in [Table 3](#).

Table 3 Contaminants

Substance	Damage
Powders	Contaminates the sensor and causes incorrect results or instrument failure
Liquids	Contaminates the internal optics of the sensor and changes the calibration of the instrument Note: Liquids can be in the air in the form of oil droplets.
Smoke	Contaminates the sensor

Install the tubing

Use tubing hooks or cable ties to hold the tubing and prevent a bend in the tubing. A bend in the tubing will decrease the air flow and cause the problem that follows:

- A decrease in air inlet flow can cause particles to collect on the interior walls of the tubing. The particles will not be counted. The collected particles can release at random, which will cause spikes in the count level.

Items to collect:

- Air inlet tubing—Hytrek® (recommended) Bevaline, Tygon® or equivalent
- Vacuum tubing—Bevaline, Tygon or equivalent (minimum of 20 in. Hg vacuum rating)
- Tubing hooks or cable ties

1. Cut the air inlet tubing to a length sufficient to connect the instrument to the sample probe. Keep the tube length to a minimum. Make sure that the length is not more than 3 m (10 ft).
2. Cut the vacuum tubing to connect the vacuum source to the slip tubing connector on the back side of the wall plate. Keep the tube length to a minimum.
3. Put a cover on the tube ends to make sure that unwanted material does not go in the tubes during installation.
4. Attach the tubing with hooks or cable ties at intervals that are not more than 1.2 m (4 ft) apart. Make sure that the tubing has a minimum bend radius of 10 cm (4 in.) so air flow is not decreased.
5. Connect the air inlet tubing to the air inlet fitting on the instrument. Connect the other end of the tubing to the supplied sample probe.
6. Push the vacuum tubing into the slip tubing connector on the back side of the wall plate. Refer to [Figure 8](#) on page 11. Do not connect the other end to the vacuum until the room is ready for sampling.

Electrical installation

Wiring safety information

⚠ WARNING



Electrocution hazard. Make sure that there is easy access to the local power disconnect.

NOTICE

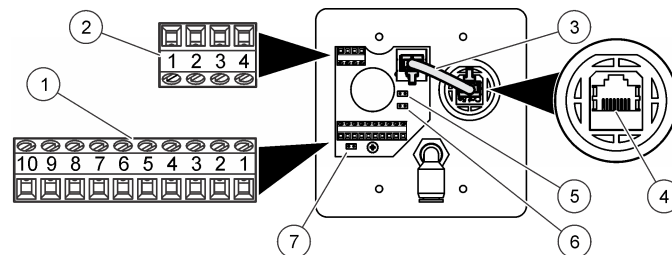
Always disconnect power to the instrument before electrical connections are made.

Obey all safety statements while connections are made to the instrument.

Wiring overview

[Figure 10](#) shows the cable and wiring connections on the back of the wall plate.



Figure 10 Wall plate (back view)



1 10-pin connector	5 JP2
2 4-pin connector	6 JP3
3 Communication jumper cable ¹	7 JP1
4 RJ-45 connector to connect to facility Ethernet hub	

¹ Not used when the RJ-45 connector is connected to directly (item 4).

Connect to power

⚠ DANGER	
	Electrocution hazard. Do not connect AC power directly to a DC powered instrument.
⚠ DANGER	
	Electrocution hazard. If this equipment is used outdoors or in potentially wet locations, a Ground Fault Circuit Interrupt (GFCI/GFI) device must be used for connecting the equipment to its main power source.

1. For AC models:

- a. Push the 3-pin connector on the supplied power cord into the power input connector on the instrument. Refer to [Figure 8](#) on page 11.
- b. Tighten the locking ring on the connector to make a waterproof seal.
- c. Push the plug on the other end of the power cord into an electrical outlet with earth ground.

Make sure that the output voltage of the electrical outlet does not exceed 230 VAC.

2. For DC models:

- a. Push the 6-pin connector on one end of the supplied power cord into the power input connector on the instrument. Refer to [Figure 8](#) on page 11.
- b. Tighten the locking ring on the connector to make a waterproof seal.
- c. Push the 6-pin connector on the other end of the power cord into the 24 VDC power input connector on the wall plate. Refer to [Figure 8](#) on page 11.
- d. Tighten the locking ring on the connector to make a waterproof seal.
- e. Connect an external power source (24 VDC) to the 24 VDC input power terminals on the 10-pin terminal on the back of the wall

plate. Refer to [Figure 10](#) on page 13 and [Table 4](#) for wiring information.

Make sure that the output voltage of the external power source does not exceed 28 VDC.

The maximum number of instruments that can connect to one external power source can change with the communication option. Contact technical support for more information.

Table 4 10-pin connector wiring

Pin	RS485 unit	RS232 unit	Pulse unit	Ethernet unit	Analog unit
1	RS485 A	—	Ch 1+	—	24 VDC external loop power source
2	RS485 B	—	Ch 1–	—	—
3	RS485 A	RS232 TX	Ch 2+	—	—
4	RS485 B	RS232 RX	Ch 2–	—	—
5	—	—	—	—	—
6	—	—	Status +	—	—
7	—	—	Status –	—	—
8	Common (shield ground)				
9	Unit main power (+24 VDC, 1 A maximum)				
10	Common				

Install serial communications

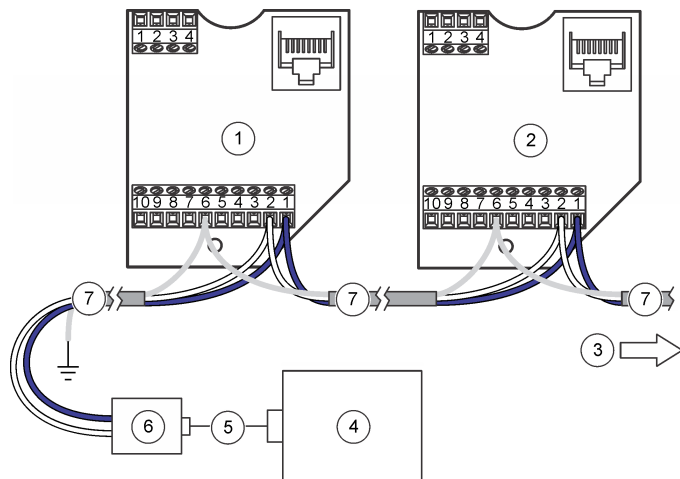
Refer to [Figure 10](#) on page 13 and [Table 4](#) on page 14 to connect an instrument with serial communication (RS485, RS232 or pulse).

Network wiring

Up to 32 instruments (12 K load each) can be included in a RS485 (EIA-485) network with RS485 Modbus or FXB communication. Use a high-grade wire for serial communications such as Belden 9841. The manufacturer recommends that the length of the network is not more than 1200 m (3937 ft).

Figure 11 shows a typical network wiring diagram.

Figure 11 Network wiring



1 Wall plate 1	5 Cable
2 Wall plate 2	6 RS232 (or USB) to RS485 converter
3 To additional wall plates	7 Network cable
4 PC	

Connect to the Ethernet

Connect the wall plate of instruments with Ethernet communication to an Ethernet standard 10Base-T or 100Base-T network. Make sure that the wiring is applicable for the speed of the network to prevent intermittent problems. For this instrument, Ethernet standard 10Base-T is sufficient to transmit data and is more tolerant of installation errors.

- Length—100 m (328 ft) maximum, single wire length (repeaters can be used to increase the distance)

- Repeaters—4 (maximum)
- Connector type—RJ45 (standard Ethernet wiring convention T-568B)

Connect the analog outputs

Connect instruments with the analog output feature to a data acquisition system. Refer to Figure 10 on page 13 and Table 5 for wiring information.

When a +24 VDC power supply is used, the power supply can also be used as the 4–20 mA loop power source if there is sufficient output for the loop. Refer to Figure 12. Figure 13 shows the maximum limit of total loop resistance (load and wiring combined) that is allowed.

Instruments with the analog output feature send a 4–20 mA signal that is proportional to the number of counts in a given sampling time. The analog outputs are updated at the end of each sample period. A data acquisition system receives the signal. Instruments with the analog output feature can have two or four channel sizes. Analog units cannot be used in a network configuration.

Use the setup utility software to set the maximum number of counts that correspond to the 20 mA signal. Refer to [Configure the instrument](#) on page 18.

When power is applied, the analog outputs on the channels is 4 mA. When power is removed or there is a sensor failure or flow failure, the analog output on the channels is less than 2 mA. If a channel is disabled by the user, the channel output is less than 2 mA. Any signal less than 4 mA (zero count value) causes a negative number in the data acquisition system which identifies that there is a problem with the signal from the instrument.

Configure the central monitoring software to alarm on any signal less than 4 mA (zero count value) to get a sensor, flow or power loss alarm as necessary.

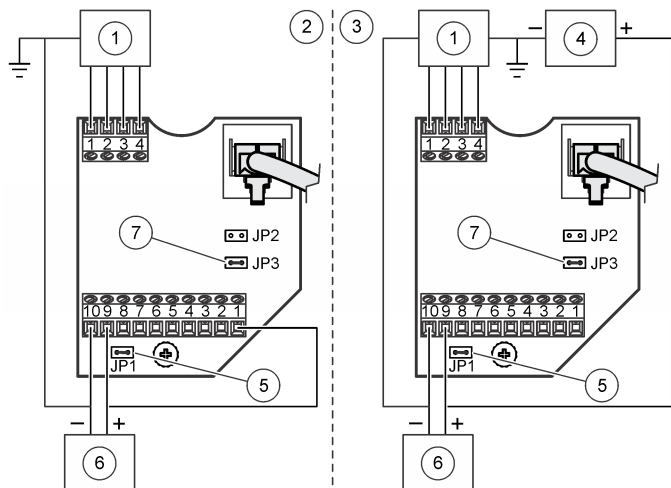
Table 5 4-pin connector wiring

Pin	Description
1	Channel 1
2	Channel 2

Table 5 4-pin connector wiring (continued)

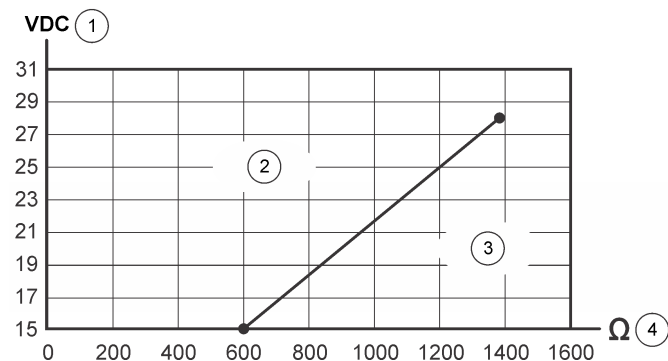
Pin	Description
3	Channel 3
4	Channel 4

Figure 12 Common power and loop supply



1 Data acquisition system	5 Jumper installed across JP1
2 Common power and loop supply	6 24 VDC power supply
3 Separate power and loop supply	7 Jumper installed across JP3
4 24 VDC loop supply	

Figure 13 Maximum limit for current loop operation



1 Loop supply voltage	3 Outside the operating range (below line)
2 Acceptable operating range (above line)	4 Maximum limit of total loop resistance

Startup

Clean the exterior surfaces

NOTICE

Never spray the instrument directly with liquid or a vaporous hydrogen peroxide (VHP) stream. When liquid solutions get into the counter flow path or electronics, sensor damage occurs.

NOTICE

Do not allow disinfecting chemical vapor to get into the instrument enclosure and come in contact with the instrument electronics.

Wipe the exterior surfaces with a lint-free tissue made moist with isopropyl alcohol (IPA). The sample (isokinetic) probe can be autoclaved for cleaning.

Before a clean room wash down, set the external vacuum source to off and cover the isokinetic probe.

Clean the interior surfaces

Use a zero count filter to remove contaminants such as particles, lint or dust from the interior surfaces of the instrument and the air inlet tubing. When the count goes to zero, the interior surfaces and inlet air tubing are clean.

Items to collect: zero count filter

1. Attach the zero count filter to the air inlet tube.
The zero count filter prevents any external particles from going in the instrument.
2. Start sample collection and operate the instrument for at least 30 minutes. Refer to [Manual operation](#) on page 23.
3. Monitor the room air in 5-minute intervals and continue until the particle count is 0–1.
Optional: To record the data, set the Sample Timing: Sample setting to 5 minutes. Refer to [Configure the instrument](#) on page 18.
4. If the particle count does not go to 0–1 after nine or ten 5-minute sample periods, purge the instrument overnight. Refer to [Purge the instrument](#) on page 17.

Purge the instrument

Do a purge to get a particle count of 0–1. Typically, a purge is done before a test to make sure that there is a baseline reference for the instrument.

1. Remove approximately 2.5 cm (1 in.) of tubing from the sample probe-end of the air inlet tube to remove any stretched or scored section.
2. Attach a zero count filter to the air inlet tube.
3. Operate the instrument for 24 hours.

4. If a particle count of 0–1 is not shown after 24 hours, identify if the source of the particles is the air inlet tubing.
 - a. Install the zero count filter directly on the air inlet fitting.
 - b. Operate the instrument for another 15 minutes.
 - c. Monitor the room air for 5 minutes and record the results. Do this step up to four times until the particle count is 0–1 in a 5-minute sample.
 - d. If a particle count of 0–1 is shown, the air inlet tubing is the source of the particles. Replace the air inlet tubing.
 - e. If the particle count does not go to 0–1, contact technical support.

Operation

Configuration

For initial configuration, connect the instrument to a PC.

After initial configuration, change the configuration settings as necessary by direct connection to a PC or through a ModbusTCP connection. For configuration through a network, only the LAN settings can be changed. Refer to [Configure the LAN settings through a network](#) on page 20.

Connect to a PC

Items to collect:

- Setup utility CD
- Service port cable
- PC with Windows® 2000 Professional, Windows XP Professional, Windows Vista (32-bit), Windows 7 (32-bit or 64-bit in XP emulation mode)
- USB to RS232 adapter if the PC does not have a RS232 port

1. Make sure that Microsoft .Net Framework is installed on the PC. If not installed, open the dotnetfx.exe file on the setup utility CD and install the application.
Note: The user must be logged on to the PC as an Administrator.
2. Copy and paste the SetupUtility.exe file from the setup utility CD to the PC.
3. Connect the Service port cable to the Service port on the instrument and a COM port on the PC.

Configure the instrument

Use the setup utility software to configure the parameters kept on each instrument. When power is applied to the instrument, it looks for a new configuration. If a new configuration is not found, the previously saved configuration is used.

1. Open the SetupUtility.exe file that is installed on the PC to start the setup utility program.
2. Select the Basic Setup tab.
3. Find the Port field on the right side of the window. Select the COM port on the PC to which the instrument is connected.
4. Click **Read Instrument**. The utility reads the data that is saved on the instrument.
5. Make sure that the data in the Instrument Information section is correct (model number, communication option, firmware version and communication address, if applicable).
6. In the General section, select the settings.

Option	Description
Count Mode	<p>Sets the count mode. Does not affect the analog output of analog units.</p> <p>Differential—The particle counts shown for each channel are the counts for each channel size.</p> <p>Cumulative (default)—The particle counts shown for each channel are the counts for each channel size plus the larger channel sizes. For example, if the channel is 0.3 μm, particles that are 0.3 μm and larger in size are included in the count.</p>

Option	Description
Sample Timing: Sample	Sets the length of time for each sample (default = 00:01:00 = 1 minute).
Sample Timing: Hold	Sets the length of time that data collection stops after samples are taken (default = 00:00:00).
Count Cycles	Sets the number of samples taken before data collection stops and the hold time starts (0 = continuous sampling).
Slave Address/Location ID	Do not change (default = 1).
Comm Timeout	Sets the number of seconds after a communication failure before a communication (Comm) alarm occurs. To disable communication alarms, set to 0. For instruments with the analog output feature, set to 0.
Location Name	Sets a unique identifier for the instrument.
System Date/Time	Sets the date (YYYY/MM/DD) and time (HH:MM:SS, 24-hour format).
Moving Cumulative Counts	Sets the number of sample counts for Channel 1 or Channel 2 that are added together and shown in Channel 3 and Channel 4. Channel 3 shows the cumulative counts for Channel 1. Channel 4 shows the cumulative counts for Channel 2.
Store Partial Records	Enables partial sample data to be saved to the buffer. Partial sample data occurs when a sample is stopped before it is completed.
Temp Units °C	Changes the temperature units from Fahrenheit (default) to Celsius.
Remote LCD	Not available (disabled)
Count Alarms	Sets the minimum number of particles for each channel that will trigger a count alarm. To see the channel sizes, select the Data Display tab. Refer to Figure 16 on page 24.

Option	Description
Sample Mode	<p>Sets the sample mode.</p> <p>Auto—Sample data collection starts automatically when power is applied to the instrument.</p> <p>Manual—Sample data collection does not start automatically when power is applied to the instrument. Sample data collection must be started manually. Refer to Manual operation on page 23.</p> <p>Note: Ethernet units with analog output cannot be set to Manual because there is no bi-directional communication with the central monitoring software. These units always start in Auto mode.</p>
Flow Units	<p>Sets the air flow units. Options: CFM (cubic feet per minute) or LPM (liters per minute).</p>

- If an optional external light stack is connected to the instrument, use the Diagnostics section to set the status indicator light to flash or not flash for one of the colors to identify that the wiring is correct.

Note: It is not possible to save the diagnostic settings and they have no effect on the instrument operation.

- For units with analog output, change the settings for the 4–20 mA analog output in the Analog section.

Option	Description
Full Scale	<p>Sets the particle count for each channel that corresponds to a 20 mA output signal (default = 1000). A zero particle count corresponds to a 4 mA output signal.</p> <p>Note: Count alarms are not reported to the central monitoring software. Configure the central monitoring software to trigger count alarms as necessary.</p>
Output State	<p>Sets the output state. Set to Normal for normal operation.</p> <p>Zero—Holds the output at 4 mA.</p> <p>Span—Holds the output at 20 mA.</p>

- For serial communication (RS485 units only), change the communication setting in the Serial section. Options: FXB, Modbus, R48XX Compatibility, FXB1. If Modbus is selected, enter the slave address. When the address is 31 or less, use the DIP switches on

the bottom of the instrument to set the address. Refer to [RS485 serial output with Modbus RTU protocol](#) on page 21.

Note: If an address of 32 or higher is entered, the DIP switch setting are ignored and the entered value is used.

- For pulse communication (RS485 units only), select the channel size for the Channel 2 pulse output in the Pulse section (default = Count Channel 2). The Channel 1 pulse output always corresponds to the Channel 1 particle size.
- For Ethernet communication (Ethernet units only), refer to [Configure the Ethernet settings](#) on page 19.
- Click **Save Settings** to save the changes.

Configure the Ethernet settings

- For Ethernet units, change the Ethernet settings in the Ethernet section. The Ethernet settings should only be changed by a network professional.

Option	Description
MAC	<p>Media access control—Shows the unique permanent hardware address (read-only)</p>
DHCP/APIPA	<p>Enables or disables static or dynamic IP addressing by connection to a DHCP server (default = disabled). When enabled, the instrument gets an IP address and subnet mask automatically when power is applied.</p> <p>If a DHCP server is not available, the instrument uses APIPA for an IP address and subnet mask.</p> <ul style="list-style-type: none"> APIPA IP address range: 169.254.0.0 to 169.254.255.255 Subnet mask: 255.255.0.0 (Class B network)
IP Address	<p>For static IP addresses, each LAN-based instrument must have a unique IP address. Range: 169.254.0.0 to 169.254.255.255 (default = 169.254.1.2).</p>
Subnet Mask	<p>Instruments of the same type that communicate with a single software package (i.e., FMS) use the same subnet mask (default = 255.255.0.0). Range: 0 to 255, integer only.</p>

Option	Description
Server Port	ModbusTCP server listen port (default = 502). Range: 0 to 65535, integer only.
Client Port	Not available (disabled)
Gateway	Router or access point to another network (default = 169.254.1.5)
Remote Server IP	Not available (disabled)
Ethernet Protocol	Sets the Ethernet protocol to Modbus or FXB.

2. Click **Save Settings** to save the changes.

Configure the LAN settings through a network

1. In the setup utility software, select the **LAN Setup** tab. The software looks for LAN instruments. The LAN instruments found are shown.
2. Select an instrument to show the LAN instrument settings.
3. Change the LAN settings. Refer to the options table in [Configure the Ethernet settings](#) on page 19.
4. Click **Save Settings** to save the changes.

Do an analog output test

For instruments with the analog output feature, do an analog output test.

1. Connect the analog outputs to the load resistors of the data acquisition system.
Note: As an alternative, install a set of load resistors with 0.1% accuracy and at least 0.25 W capability across the analog output. Load resistor values of 100, 250 or 500 ohms are typically used.
2. Let a tiny amount of particles flow through the instrument to get a count in the test channel.
Note: One method to get counts is to use a zero count filter, and put a pin-hole in the tubing that is between the filter and the instrument.

3. On the Basic Setup tab of the setup utility software, temporarily set:
 - Count Cycles—1
 - Sample Timing: Hold—10 seconds or more
4. Click **Save Settings**.
5. Select the Data Display tab, then click **Monitor** if shown so the data shown can update continuously as each sample is taken.
6. Click **Sample** if shown to start sample collection.
7. When the Status value changes from "Count" to "Stop", measure the voltage across the load resistors for each channel. Also note the counts shown in the display for each channel.
8. Use the equation that follows to calculate the expected voltage from the counts shown. Make sure that the measured and calculated voltages agree.

$$\text{Voltage} = (((\text{SC} \div \text{FC} \times 16) + 4) \div 1000) \times \text{RL}$$

Where:

SC = sample count at the end of the sample period

FC = full-scale channel count. Refer to the analog settings in the setup utility software.

RL = value of the load resistor in ohms

The expected output voltage when the full-scale channel count is 1000 with a 100, 250 and 500-ohm resistor is shown in [Table 6](#).

9. To do the test again, do steps 7–8.
10. For units with a flow monitor, temporarily remove the central vacuum from the instrument.
11. While a flow alarm is active, measure the voltage across the load resistors for each channel.
12. Use the equation that follows to calculate the expected voltage. Make sure that the measured and calculated voltages agree.

$$\text{Voltage} = < (0.002 \times \text{RL})$$
 Where: RL = value of the load resistor in ohms
 Example: for a 100-ohm resistor, the voltage should be less than 0.20 V.

13. On the Basic Setup tab, change the settings back to the previous values.

14. Click **Save Settings**.

Table 6 Output voltage with 100, 250 and 500-ohm resistors

Sample count	100 Ω	250 Ω	500 Ω
0	0.40 V	1.00 V	2.00 V
100	0.56 V	1.40 V	2.80 V
200	0.72 V	1.80 V	3.60 V
300	0.88 V	2.20 V	4.40 V
400	1.04 V	2.60 V	5.20 V
500	1.20 V	3.00 V	6.00 V
600	1.36 V	3.40 V	6.80 V
700	1.52 V	3.80 V	7.60 V
800	1.68 V	4.20 V	8.40 V
900	1.84 V	4.60 V	9.20 V
1000	2.00 V	5.00 V	10.00 V

RS485 serial output with Modbus RTU protocol

⚠ DANGER	
	Electrocution hazard. Remove power from the instrument before this procedure is started.

Instruments with the RS485 Modbus communication option use industry-standard Modbus RTU protocol. In this communication mode, a series of registers hold data about measurement results and operation parameters.

When a ModbusTCP connection is made, the user can use all the configuration options in the Modbus register map. Refer to the company website for the Modbus register map. Write drivers to communicate with the instrument through these registers with the Modbus RTU protocol.

The RS485 serial network circuit supplies communications for a maximum of 32 instruments and a control computer. Only one instrument can transmit data at a time. Each instrument must have a unique instrument address.

1. Remove power from the instrument.
2. Remove the cover and find the DIP switch. Refer to the illustrated steps in [Figure 14](#). Make sure that the cover is installed correctly to keep the equipment seal and environmental rating.
3. Change the DIP switch setting to select a unique network address for the instrument. Refer to [Table 7](#).

Note: Address 0 can only be used with FXB protocol. Address 0 is reserved for use as a broadcast address for Modbus RTU. If address 0 is set with Modbus protocol, the instrument will use address 1.

Figure 14 DIP switch location

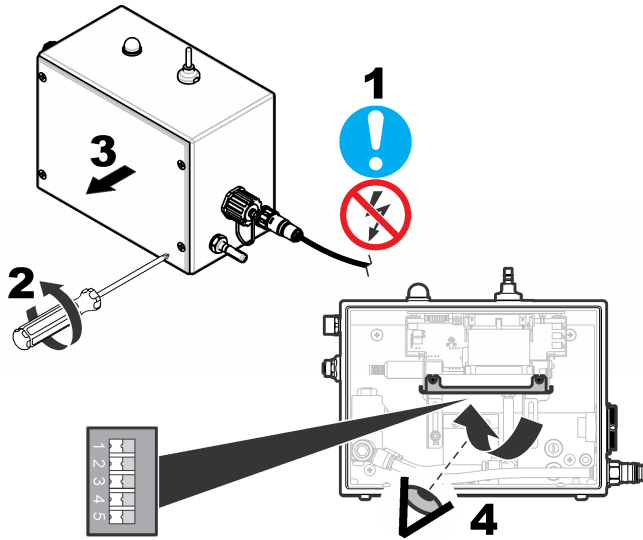


Table 7 DIP switch settings for network address

Network address	1	2	3	4	5
0	Off	Off	Off	Off	Off
1	On	Off	Off	Off	Off
2	Off	On	Off	Off	Off
3	On	On	Off	Off	Off
4	Off	Off	On	Off	Off
5	On	Off	On	Off	Off
6	Off	On	On	Off	Off

Table 7 DIP switch settings for network address (continued)

Network address	1	2	3	4	5
7	On	On	On	Off	Off
8	Off	Off	Off	On	Off
9	On	Off	Off	On	Off
10	Off	On	Off	On	Off
11	On	On	Off	On	Off
12	Off	Off	On	On	Off
13	On	Off	On	On	Off
14	Off	On	On	On	Off
15	On	On	On	On	Off
16	Off	Off	Off	Off	On
17	On	Off	Off	Off	On
18	Off	On	Off	Off	On
19	On	On	Off	Off	On
20	Off	Off	On	Off	On
21	On	Off	On	Off	On
22	Off	On	On	Off	On
23	On	On	On	Off	On
24	Off	Off	Off	On	On
25	On	Off	Off	On	On
26	Off	On	Off	On	On
27	On	On	Off	On	On
28	Off	Off	On	On	On
29	On	Off	On	On	On

Table 7 DIP switch settings for network address (continued)

Network address	1	2	3	4	5
30	Off	On	On	On	On
31	On	On	On	On	On

RS485 serial output with FXB protocol

Instruments with the RS485 FXB communication option use industry-standard FXB protocol. Refer to the company website for FXB protocol information.

Pulse communication

Instruments with the pulse communication option send an 8- μ s pulse signal when a particle is detected. Refer to [Figure 15](#). An external pulse counter or data acquisition system receives the pulse signal and counts the pulses as particles.

Instruments with pulse communication have two pulse output channels (Ch 1 and Ch 2). Channel 1 sends a pulse signal when the Channel 1 particle size is detected. Channel 2 sends a pulse signal when the channel size that is selected by the user is detected.

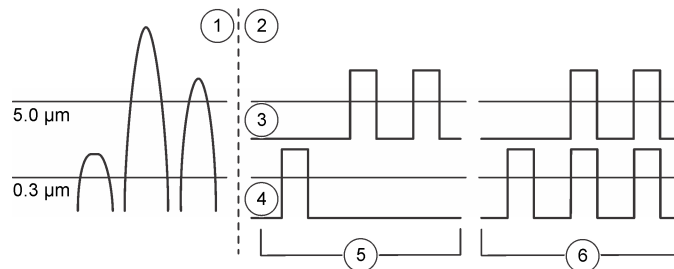
Pulse communication includes a status output signal that goes from low to high when there is an active alarm. Pulse communication cannot be used in a network configuration.

Set the network address for pulse communication instruments to 1. Refer to [Table 7](#) on page 22.

The pulse signal can be sent in one of two count modes:

- **Differential mode** (default)—A signal is sent on Channel 1 when a particle is between the first and the second channel size thresholds. A signal is sent on the Channel 2 when a particle is larger than the user-selected channel size threshold.
- **Cumulative mode**—A signal is sent on Channel 1 when a particle is larger than the first or second channel size threshold. A signal is sent on Channel 2 when a particle is larger than the user-selected channel size threshold.

Figure 15 Differential versus cumulative count mode example



1 Pulse signal sent from counter	4 Channel 1
2 Data transfer in differential versus cumulative mode	5 Differential count—one 0.3 μ m and two 5.0 μ m particles
3 Channel 2	6 Cumulative count—three 0.3 μ m and two 5.0 μ m particles

Manual operation

Use the setup utility software with a direct PC connection or over a LAN connection to manually operate the instrument.

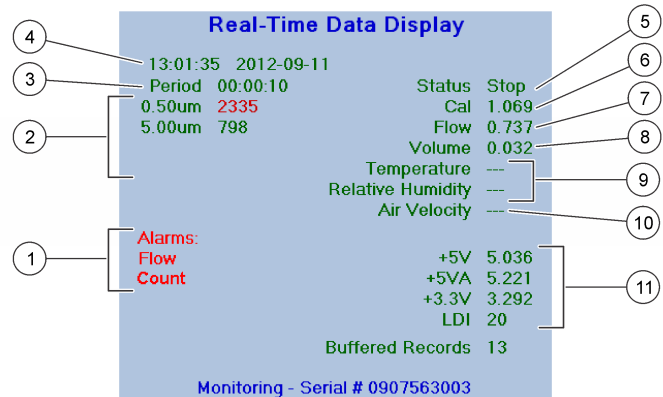
1. Open the SetupUtility.exe file to start the setup utility software.
2. Select the Data Display tab. Refer to [Figure 16](#) for the data shown.
3. Use the buttons to operate the instrument.

Note: The buttons change depending on the system status.

Option	Description
Monitor	Shows the updated data continuously in real time.
Stop Monitor	Stops changes to the data shown.
Sample	Starts sample collection. Samples are taken according to the settings on the Basic Setup tab. Changes the instrument to active mode if in inactive mode.
Stop Count	Stops sample collection.

Option	Description
Active Mode	Sets the internal laser to on. Enables alarms.
Inactive Mode	Sets the internal laser to off. Disables alarms.
Display Buffered Data	Shows the data from the last sample completed. Updates as each sample is completed.
Download Buffer	Saves a copy of the data records in the buffer to the PC as a text (CSV) file.
Erase Buffer	Erases all data records from the buffer.

Figure 16 Real-Time data display



1 Active alarms (Sensor, Flow, Comm, Count ¹)	7 Air flow (cfm or L/min)
2 Channel sizes and particle counts	8 Air volume collected for the sample (cfm or L/min)
3 Sample time	9 Values from the optional relative humidity (RH) and temperature sensor
4 Last sample start time and date	10 Not available
5 System status	11 Cal voltage—identifies the cleanliness of the sensor optics
6 Service use only	

¹ When a count alarm occurs, the high particle count is shown in red.

Calibration

The instrument cannot be calibrated by the user. Contact the manufacturer for instrument calibration. Refer to the label on the instrument for the calibration due date.

Maintenance

▲ CAUTION

Personal injury hazard. Only qualified personnel should conduct the tasks described in this section of the manual.

NOTICE

Do not disassemble the instrument for maintenance. If the internal components must be cleaned or repaired, contact the manufacturer.

Maintenance schedule

Table 8 shows the recommended schedule of maintenance tasks. Facility requirements and operating conditions may increase the frequency of some tasks.

Table 8 Maintenance schedule

Task	1 year
Replace the inlet tubing on page 25	X
Calibration on page 25	X

Replace the inlet tubing

Replace the air inlet tubing regularly to prevent organic growth or inorganic particle contamination on the tube walls. Contamination can result in false high particle counts.

The manufacturer recommends that the air inlet tubing of typical FMS installations in life science and pharmaceutical manufacturing clean rooms be replaced at least once a year.

Install a firmware update

A firmware update can be installed by a user. However, the manufacturer recommends that firmware updates are installed by an authorized service representative.

A firmware update is installed with a direct PC connection or over a LAN connection.

Procedure notes:

- A TCP/IP connection is necessary to install a firmware update over a LAN connection.
- Bootloader V1.3 or newer is necessary to install a firmware update over a LAN connection. Use a local PC and the Service port to install Bootloader V1.3 or newer on the instrument as necessary.

Items to collect:

- Setup utility CD
 - Firmware update file
1. For a local PC connection, connect the service port cable to the Service port and the PC.
 2. Open the SetupUtility.exe file on the supplied CD to start the setup utility software.
 3. Make sure that the setup utility software is version 2.0.0.8 or newer. Contact the manufacturer for other versions.
 4. For a LAN connection, make sure that the instrument is selected in the instrument list on the LAN Setup tab of the setup utility software.
 5. Make sure that the firmware version shown in the Instrument Information section is version 2.11 or newer.
 6. Click **Update Firmware**.
 7. Select the firmware update file, then click **Open** and **OK**.

The installation starts. The status of the firmware update shows below the Update Firmware button. The status indicator light on the instrument flashes yellow to show update activity. A confirmation message shows when the firmware update is complete.

8. If an error message is shown, make sure that the instrument has power and is connected to the correct port on the PC.
9. If a power loss occurs before the firmware update is complete:
 - a. Do step 2, then 6–7 again.
 - b. When the message “Waiting for instrument reply” is shown, remove and then apply power to the instrument within 30 seconds.
 - c. If the setup utility is not able to complete the firmware update, contact technical support.

Troubleshooting

Problem	Possible cause	Solution
Communication failure	The communication wiring is not correct.	Examine the system for loose wiring/cables or incorrect connections.
	The instrument is not configured.	Configure the instrument. Refer to Configure the instrument on page 18.
	There is an intermittent connection problem.	Use the CRTS (communication reliable test software) to find the problem if the FXB communication protocol is used.
Flow failure	A cap is on the sample probe.	Remove the cap from the sample probe.
	There are bends in the tubing.	Examine the tubing for bends that may cause an air flow restriction.
	There is a tubing leak.	Examine the tubing and fittings for leaks.
	The vacuum pump has failed.	Repair the vacuum pump.


Problem	Possible cause	Solution
Count alarm ¹	There are high particle counts in the room.	Troubleshoot the process to identify the source of the particles.
	The probe is too near to the source of the contamination.	Change the position of the probe.
	The sensor may be contaminated.	Refer to Sensor decontamination on page 26.
Sensor failure	The sensor is contaminated.	Purge the instrument. Refer to Purge the instrument on page 17.

¹ A count alarm becomes inactive when the next sample starts.

Sensor decontamination

1. Use a portable particle counter to confirm the particle count measured by the instrument.
If the particle count is similar, the problem is caused by the process and not the instrument.
2. If the particle count is less, clean the internal components. Refer to [Clean the interior surfaces](#) on page 17.
3. Do a purge to get a particle count of 0–1. Refer to [Purge the instrument](#) on page 17.
4. If the particle count does not go to 0–1, contact technical support.

Replacement parts and accessories

⚠ WARNING	
	Personal injury hazard. Use of non-approved parts may cause personal injury, damage to the instrument or equipment malfunction. The replacement parts in this section are approved by the manufacturer.

Note: Product and Article numbers may vary for some selling regions. Contact the appropriate distributor or refer to the company website for contact information.

Table 9 Replacement parts

Description	Item no.
AC power cord, 2 m (6 ft), North America	2088665-B
AC power cord, 2 m (6 ft), India	2088665-D
AC power cord, 2 m (6 ft), Europe	2088665-E
AC power cord, 2 m (6 ft), United Kingdom	2088665-G
AC power cord, 2 m (6 ft), Switzerland	2088665-J
Cable, service port (4-pin DIN to 9-pin serial), 2 m (6 ft)	2088676-01
Kit, cords for wall plate connection, DC, 1 m (3 ft) cord length	2088767-03-DC
Kit, cords for wall plate connection, DC, 1.8 m (6 ft) cord length	2088767-06-DC
Kit, cords for wall plate connection, DC, 2.7 m (9 ft) cord length	2088767-09-DC
Kit, cords for wall plate connection, DC, 3.7 m (12 ft) cord length	2088767-12-DC
Kit, cords for wall plate connection, AC, 1 m (3 ft) cord length	2088767-03-AC ¹
Kit, cords for wall plate connection, AC, 1.8 m (6 ft) cord length	2088767-06-AC ¹
Kit, cords for wall plate connection, AC, 2.7 m (9 ft) cord length	2088767-09-AC ¹
Kit, cords for wall plate connection, AC, 3.7 m (12 ft) cord length	2088767-12-AC ¹
Kit, wall plate assembly	2088624-01
Kit, setup, configuration (includes service port cable)	2088757-01
Sample probe, isokinetic, stainless steel, 2.8 L/min (0.1 cfm), 1/8-in. barb	2080416-1

Table 9 Replacement parts (continued)

Description	Item no.
Sample probe, isokinetic, stainless steel, 28 L/min (1.0 cfm), 1/4-in. barb	2082646-2
Setup kit, configuration (includes service port cable, manual and setup utility CD)	2088757-01
Ship kit, standard, for AC unit (includes mounting bracket, wall plate, connectors, cords and 2.8 L/min (0.1 cfm) isokinetic probe)	2088747-01
Ship kit, standard, for DC unit (includes mounting bracket, wall plate, connectors, cords and 2.8 L/min (0.1 cfm) isokinetic probe)	2088747-02
Ship kit, standard, for AC unit (includes mounting bracket, wall plate, connectors, cords and 28 L/min (1.0 cfm) isokinetic probe)	2088747-03
Ship kit, standard, for DC unit (includes mounting bracket, wall plate, connectors, cords and 28 L/min (1.0 cfm) isokinetic probe)	2088747-04
Mounting bracket, raised	2088680

¹ AC power cord not included. Order AC power cord separately.

Table 10 Accessories

Description	Quantity	Item no.
4-channel output option, firmware, 0.5/1.0/5.0/10.0	1	2088601-15
Bracket, to mount an external light stack and isokinetic probe	1	2088480
Bracket, wall, to mount an external light stack	1	2088482
Bracket, to mount relative humidity/temperature probe	1	2088517

Table 10 Accessories (continued)

Description	Quantity	Item no.
Cable, external LED light stack connector, 4 m (13 ft), stainless steel/polyvinyl chloride (PVC)	1	460-400-7004
External light stack, stainless steel without cable	1	2088396-01
Filter, zero count, 1.0 cfm, 1/4-in. tube	1	203813-3
Filter, zero count, 0.1 cfm, 1/8-in. tube	1	2088667
Mounting bracket, narrow	1	2088634
Power supply, 24 VDC, 5.0 A	1	230-300-0001
Sample probe, extended, vertical wall mount, stainless steel, 2.8 L/min (0.1 cfm), 30.5 cm (12 in.), 1/4-in. barb	1	2080999-1
Sample probe, extended, vertical wall mount, stainless steel, 2.8 L/min (0.1 cfm), 40.6 cm (16 in.), 1/4-in. barb	1	2080999-2
Sample probe, extended, vertical wall mount, stainless steel, 2.8 L/min (0.1 cfm), 30.5 cm (12 in.), 1/8-in. barb	1	2080999-5
Sample probe, extended, vertical wall mount, stainless steel, 2.8 L/min (0.1 cfm), 40.6 cm (16 in.), 1/8-in. barb	1	2080999-6
Sample probe, extended, vertical wall mount, stainless steel, 28 L/min (1.0 cfm), 30.5 cm (12 in.)	1	2080999-3
Sample probe, extended, vertical wall mount, stainless steel, 28 L/min (1.0 cfm), 40.5 cm (16 in.)	1	2080999-4
Sample probe with external light stack bracket, extended, vertical wall mount, stainless steel, 2.8 L/min (0.1 cfm), 30.5 cm (12 in.)	1	2080999-7, -11

Table 10 Accessories (continued)

Description	Quantity	Item no.
Sample probe with external light stack bracket, extended, vertical wall mount, stainless steel, 2.8 L/min (0.1 cfm), 40.5 cm (16 in.)	1	2080999-8, -12
Sample probe with external light stack bracket, extended, vertical wall mount, stainless steel, 28 L/min (1.0 cfm), 30.5 cm (12 in.)	1	2080999-9
Sample probe with external light stack bracket, extended, vertical wall mount, stainless steel, 28 L/min (1.0 cfm), 40.5 cm (16 in.)	1	2080999-10
Sample probe, mounting kit, T-type wall	1	2082644-3
Sample probe, mounting kit, wall 90 degrees, for 28 L/min 1.0 cfm probe only	1	2082366-1
Sensor, relative humidity (RH) and temperature, with cable	1	2088674-01
Tubing, sample, Hytrel lined 1/4-in. ID	3 m (10 ft)	960011
Tubing, sample, Tygon 1/8-in. ID	3 m (10 ft)	960024

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