MET ONE 237 A-B

User Manual

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Specifications

Specifications are subject to change without notice.

Specification	Details
Dimensions (W x D x H)	170.94 x 165.10 x 58.42 mm (6.7 x 11.7 x 4.5 in.)
Enclosure rating	Indoor use only
Weight	3.0 kg (6.8 lb)
Power requirements	Universal AC adapter—Input 100–240 VAC 50/60 Hz; Output +9 VDC, 3 A (+6 V with battery pack); power consumption 0.75 A maximum
Operating temperature	12 to 29 ºC (54 to 84 ºF)
Storage temperature	–40 to 71 ºC (–40 to 160 ºF)
Operating humidity	10 to 80% maximum relative humidity up to 29 ºC
Storage humidity	Up to 98% relative, non-condensing
Maximum altitude	2000 m (6560 ft)
Sample flow rate	0.1 cfm

Specification	Details
Particle size range	MET ONE 237A—0.5 and 5.0 micron (2 channel); 0.5, 0.7, 1.0 and 5.0 micron (4 channel); 0.5, 0.7, 1.0, 2.0 and 5.0 micron (5 channel); 0.5, 0.7, 1.0, 2.0, 3.0 and 5.0 micron (6 channel)
	MET ONE 237B—0.3 and 5.0 micron (2 channel); 0.3, 0.5, 1.0 and 5.0 micron (4 channel); 0.3, 0.5, 0.7, 1.0 and 5.0 micron (5 channel); 0.3, 0.5, 0.7, 1.0, 2.0 and 5.0 micron (6 channel)
Fuses	2 A, 250 V, time-delay, 5 x 20 mm
Light source	Class 1 Laser Product with a class 3B embedded laser diode source 50 mW, 780 nm. FDA Laser Accession No. 8920201-05.
Sample/hold times	1 second to 24 hours
Count alarms	1 to 9,999,999 counts
Data storage	250 samples, rotating buffer
Count cycles	Up to 100 in Auto mode
Locations	Up to 250
Output	RS232/RS485 for computer
Pump type	Carbon-vane, 0.1 cfm
Battery type	Rechargeable battery pack, NiMH, 6 V, 8 AH
Operation time	4 hours printing, 8 hours without printing
Certifications	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

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.
	Delicate internal electronic components can be damaged by static electricity, resulting in degraded performance or eventual failure.
	This symbol indicates a laser device is used in the equipment.
	This symbol identifies the location of a fuse or current limiting device.
	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. *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.*

Laser safety information

This instrument is a Class 1 laser product, CDRH Accession No. 8920201-05. Service must be done by factory-authorized personnel only.

The instrument has been evaluated and tested in accordance with EN 61010-1, "Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use" and EN 60825, "Safety of Laser Products".

Electrostatic discharge (ESD) considerations

Refer to the steps in this procedure to prevent ESD damage to the instrument:

- Touch an earth-grounded metal surface such as the chassis of an instrument, a metal conduit or pipe to discharge static electricity from the body.
- Avoid excessive movement. Transport static-sensitive components in anti-static containers or packages.
- Wear a wrist strap connected by a wire to earth ground.
- Work in a static-safe area with anti-static floor pads and work bench pads.

Product overview

The MET ONE 237 is a battery-operated, laser-based particle counter for use in a walk-around sampling routine. The instrument is used in environments where particle contamination is less than 2 million particles per cubic foot of air, such as clean rooms, medical instrument assembly and computer rooms. All of the reported counts are cumulative. For example, all 0.3 µm particles are 0.3 µm and larger in size.

Air samples move through a laser beam in the sensor. Particles in the sample scatter the light. Flashes of scattered light are converted to electrical pulses that are directly proportional to the amount of scatter. From this information, a correlation to particle size is made. The electrical pulses are counted and recorded with the date and time. When a relative humidity/temperature (RH/T) probe is used, environmental conditions are recorded.

Product components

Make sure that all components have been received. Refer to Figure 1. If any items are missing or damaged, contact the manufacturer or a sales representative immediately.

Figure 1 Components
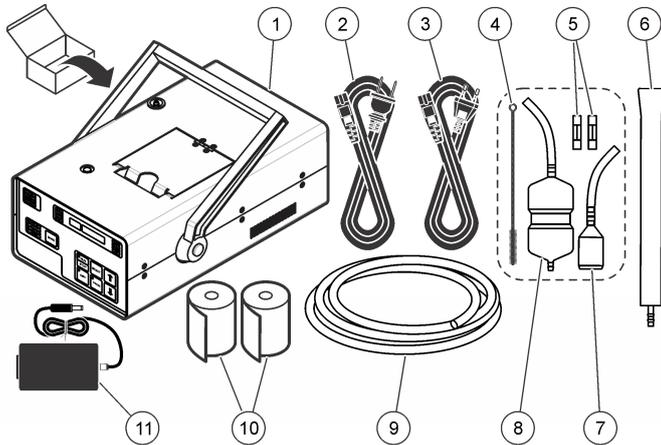
1	MET ONE 237 particle counter	**7**	Isokinetic probe, direct mount
2	115 VAC power cord, 6 ft	**8**	Purge filter
3	230 VAC power cord, 182 cm	**9**	Extension tubing for probes
4	Brush	**10**	Thermal printer paper
5	Fuses (2x)	**11**	Universal AC adapter
6	Isokenetic probe, wand style		

Installation

> **⚠ D A N G E R**
>
> Multiple hazards. Only qualified personnel must conduct the tasks described in this section of the document.

Mechanical installation

Install the isokinetic probe

Make sure that the power is off before the probe is changed or installed. Do not set the power to on until an isokinetic probe or the filter is installed. Figure 2 shows probe and filter installation.

Figure 2 Install the probe or filter
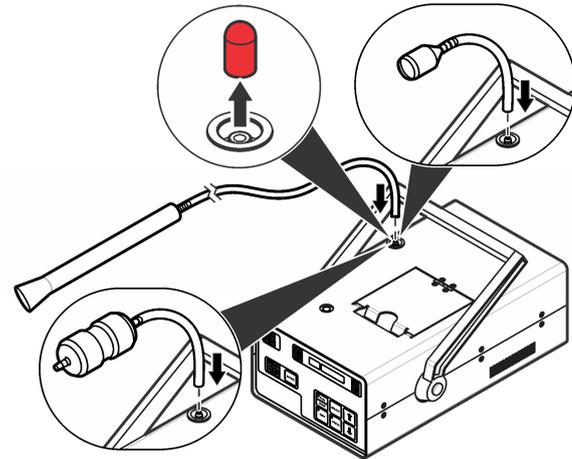
Install the printer paper

Figure 3 shows how to install the printer paper.

Figure 3 Install the thermal printer paper
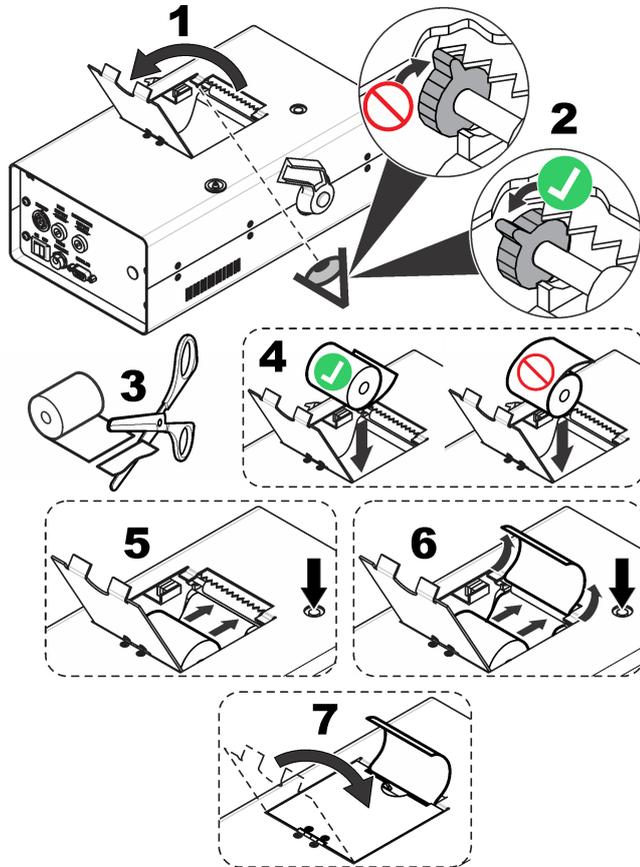
Install the optional RH/T probe

The optional relative humidity and temperature (RH/T) probe adds humidity and temperature data to the particle count data record.

1. Set the instrument power to off.
2. Attach the relative humidity and temperature (RH/T) probe connector to the back of the instrument. Refer to Figure 4.

Figure 4 Optional RH/T probe
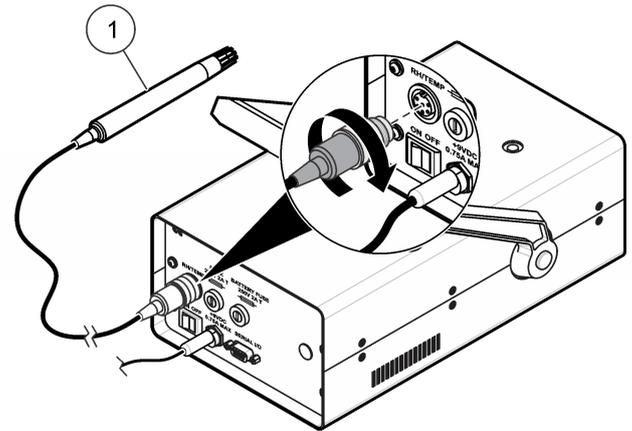
1	RH/T probe

Electrical connections

> ⚠ **WARNING**
>
> Electrical shock hazard. Externally connected equipment must have an applicable country safety standard assessment.

Figure 5 shows the electrical and communication connections on the instrument. Instruments without a built-in printer also have Analog Out and Printer connections (not shown).

Figure 5 Connections on the back panel
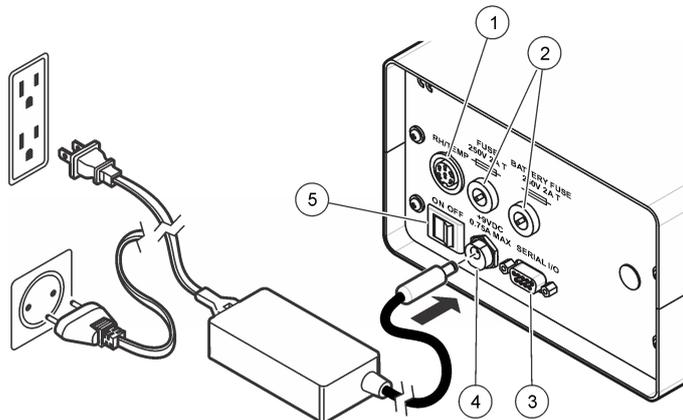
1	RH/TEMP probe connector	**4**	Power connector
2	Fuses (2x)	**5**	Power switch
3	Communication connector		

User interface and navigation

Figure 6 shows the keys, display and indicators on the front panel of the instrument. Table 1 shows the front panel features. Table 2 shows the control and mode key functions.

Figure 6 User interface
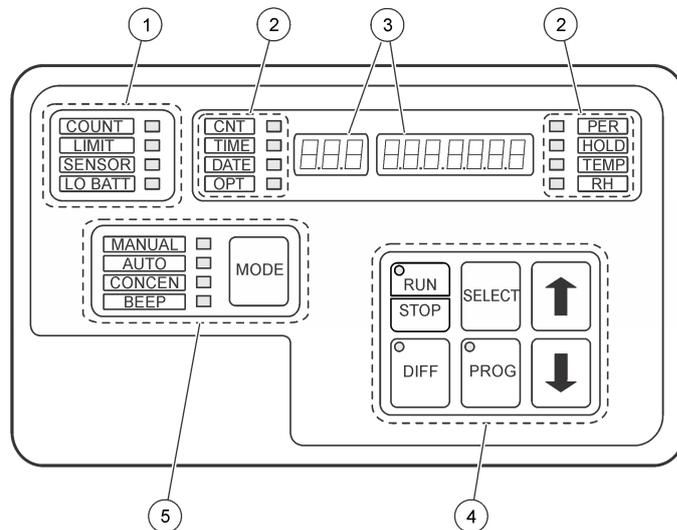
1	Status indicators	**4**	Control keys
2	Display mode indicators	**5**	Mode keys and indicator
3	LED display		

Table 1 Indicators, keys and display

Feature	Definition
Status indicators	Shows the current operation state of the instrument (count, limit, sensor, low battery)
Mode keys and indicator	Selects and shows the selected operation mode of the instrument (manual, automatic, concentration, beep)
Display mode indicators	Shows the current display mode (count, time, date, options, period, hold, temperature/relative humidity)

Feature	Definition
LED display	3-digit display shows the parameter. 7-digit display shows the value.
Control keys	Operates the instrument (run/stop, select, different, program)

Table 2 Control and mode keys

Key	Name	Description
◎ RUN STOP	RUN/STOP	Starts a 6-second count cycle based on factory default settings. The red light comes on and the pump operates.
◎ DIFF	DIFF	Sets the differential count mode.
SELECT	SELECT	Select settings: Date and time, enable the printer, change the sample period, set alarm limits, set the number of sample cycles
◎ PROG	PROG	Program settings: Date and time, enable the printer, change the sample period, set alarm limits, set the number of sample cycles
↑	UP arrow	Adjust to higher values or navigate through choices

Table 2 Control and mode keys (continued)

Key	Name	Description
↓	DOWN arrow	Adjust to lower values or navigate through choices
MODE	MODE	Select the count mode

Startup

> *N O T I C E*
>
> To prevent instrument damage, use only the supplied AC adapter to charge the battery. Other adapters may have different power, current or polarity.

1. Install the isokinetic or RH/T probe (Install the isokinetic probe on page 6).
2. Set the power switch to on (Electrical connections on page 7).
3. If the LO BATT indicator light is on, charge the battery. (Charge the battery on page 14). The instrument can be operated while the battery charges.

Configuration

Configure the manual sample mode

The factory default mode of the instrument is manual mode. To put the instrument back to manual mode, push **MODE** until the MANUAL light comes on.

Change the sample period

1. Push **SELECT** until the PER light comes on and the 7-digit display shows the HH:MM:SS format.
2. Push **PROG** until the HH digits flash.

3. Push **SELECT** to select MM or SS if necessary.
4. Use the **UP** and **DOWN** arrows to set the time value.
5. Do steps 3 and 4 again if necessary.
6. Push **PROG**.

Set the printer status

Note: When the instrument operates on battery power, the printer goes off when the battery power level is low. The printer prints the message, "PRINTER DISABLED (BATTERY POWER LOW)".

1. Push **SELECT** until the OPT light comes on.
2. Use the **UP** and **DOWN** arrows to show "PRN" in the 3-digit display. The 7-digit display shows the printer status.
3. Push **PROG** until the printer status flashes.
4. Use the **UP** and **DOWN** arrows to select a status option.

Option	Description
AIr	Prints only when an alarm condition is present
ALL buF	Prints all the contents in the memory buffer
AIr buF	Prints the records in the memory buffer that have an alarm condition
OFF	No printer activity

5. Push **PROG**.

Set the date and time

1. Push **SELECT** until the TIME light comes on and the 7-digit display shows the HH:MM:SS format.
2. Push **PROG** until the HH digits flash. Use the **UP** and **DOWN** arrows to set the value in that position.
3. Push **SELECT** to move to the MM and SS positions. Use the **UP** and **DOWN** keys to set the value in those positions.
4. Push **PROG**.

5. Push **SELECT** until the DATE light comes on. Do steps 2–4 to set the date.

Set the alarm limits

1. Push **SELECT** until the CNT light comes on.
2. Push **PROG** until the left digit on the 7-digit display flashes.
3. Push **SELECT** to select the digit to change.
4. Use the **UP** and **DOWN** arrows to set the value.
5. Do steps 3–4 again to set the alarm limit value.
6. Push **PROG**.

Configure the automatic mode

To change to automatic mode, push **MODE** until the AUTO light comes on.

Set the location numbers

Each location in a test area can be assigned a number. This number shows on the report.

1. Push **SELECT** until the OPT light comes on.
2. Use the **UP** or **DOWN** arrows until the 3-digit display shows LOC. The 7-digit display shows the last number entered. (The default number is 32.)
3. Push **PROG** until the digits in the 7-digit display flash.
4. Push the **DOWN** arrow to change the location number to 1.
5. Push **PROG**.

Set the number of cycles

This value shows the number of time the instrument repeats the sample count cycle. When the number of cycles is more than one, the instrument reports an average of all the cycles for each particle size.

1. Push **SELECT** until the OPT light comes on.
2. Push the **UP** or **DOWN** arrow until the 3-digit display shows "CYC".
3. Push **PROG** until the 7-digit display starts to flash.

4. Push **SELECT** to select the digit to change.

5. Use the **UP** or **DOWN** arrow to set the number of cycles.

6. Push **PROG**.

Set the sample period and hold time

When the printer is enabled, set the hold time to 10 seconds or more. Less than 10 seconds may cause a sample record to be lost during the print cycle.

1. Push **SELECT** until the PER light comes on and the 7-digit display shows the HH:MM:SS format.

2. Push **PROG** until the HH digits flash.

3. Push **SELECT** to select MM or SS if necessary.

4. Use the **UP** or **DOWN** arrow to set the value.

5. Do steps 3–4 again to set other period values.

6. Push **PROG**.

7. Push **SELECT** until the HOLD light comes on.

8. Do steps 2–6 again to set the hold time.

Configure the concentration mode

Note: The concentration mode is not a substitute for a complete sample.

Concentration counts are not stored in the memory buffer. In this mode, the instrument samples and estimates the counts per cubic foot or per liter based on a time set by the user. The results update on the display every second.

1. Push **MODE** until the CONCEN light comes on.

2. Push **SELECT** until "OPT" shows on the display.

3. Push the **UP** or **DOWN** arrow until the 3-digit display shows "VOL". The 7-digit display shows one of the following options:

   • L (liter)
   • 1000 L
   • CF (cubic foot)

4. Push **PROG** until the volume units flash.

5. Use the **UP** or **DOWN** arrow to select the volume.

6. Push **PROG**.

Set the sample period

Note: Hold time is not used in concentration mode.

1. Push **SELECT** until the PER light comes on and the 7-digit display shows the HH:MM:SS format.

2. Push **PROG** until all of the display digits flash.

3. Use the **UP** or **DOWN** arrow to set the period length.

4. Push **PROG**.

Configure the beep mode

In beep mode, a single sound occurs at the count alarm limit and once at each multiple of the alarm. For example, if the alarm limit is 1000, the beep sound occurs at 1000, 2000, 3000, etc. The sound occurs for all particle size limits. For best results, set the beep mode limit for the size range to be measured and set the other size ranges to zero.

1. Push **MODE** until the BEEP light comes on.

2. Push **SELECT** until the CNT light comes on. The 3-digit display shows the particle size and the 7-digit display shows the count for that particle size.

3. Push **PROG** until the left digit on the 7-digit display flashes.

4. Push **SELECT** to select the digit to change.

5. Use the **UP** and **DOWN** arrows to set the value.

6. Push **PROG**.

Configure the optional RH/T probe

This optional probe is installed at the back of the instrument. Refer to Electrical connections on page 7.

1. Connect the probe tubing to the inlet. Connect the cable to the RH/TEMP connector at the back of the instrument.
2. Push **SELECT** until the TEMP light comes on. The 7-digit display shows the current temperature and the temperature scale.
3. Push **PROG**. The 3-digit display shows "HI" for the upper alarm limit. The 7-digit display shows the set limit and scale.
4. Push **SELECT** to move the cursor to the necessary position.
5. Use the **UP** or **DOWN** arrow to change the value.
6. Push **SELECT** until the 3-digit display shows "LO" for the lower alarm limit.
7. Push **SELECT** to move the cursor to the necessary position.
8. Use the **UP** or **DOWN** arrow to change the value.
9. Push **PROG**.
10. Push **SELECT** until the RH light comes on. The 7-digit shows the set humidity.
11. Do steps 3–9 again to set the HI and LO values for relative humidity.

Operation

About count modes

NOTICE

Only operate the instrument with a probe or filter attached.

This instrument has four count modes. The factory default mode is the manual mode. Refer to Table 3. Use the **MODE** key to change the mode.

Table 4 shows the default parameter settings for manual count mode.

Table 3 Count modes

Count mode	Description
MANUAL	Manual mode—Take one sample and stop
AUTO	Automatic mode—Sample counts are programmed. The instrument collects samples without an operator.
CONCEN	Concentration mode—A brief scan to assess contamination. Use in areas where the particle levels are not know or may be higher than the limits of the instrument.
BEEP	Beep mode—A brief scan that samples continuously. An audible alarm sounds one time when a count limit is reached, then again at multiples of the set limit.

Table 4 Parameter settings

Parameter	Default setting
Location number	000
Count mode	Manual
Alarm limits	0 (no particle count level alarms occur)
Channel 2 particle size	0.7 µm in 237A, 0.5 µm in 237B
Volume	Liters (CONCEN mode only)
Temperature	C (when the RH/T probe is attached)
RS232 mode	Normal
Baud rate	9600
Sample time	1 minute (the length of the sample period)
Hold time	1 second (the hold time between samples in AUTO mode
Program mode	Unlocked (the user can make program changes)

See the set particle sizes

The instrument monitors several particle sizes at the same time, but only one size shows in the 3-digit display.

1. Push **RUN/STOP** to start a count cycle. When the set sample period is done, the COUNT light and RUN light go off.
2. Push the **UP** and **DOWN** keys to see the different sizes.

Get a particle count in manual mode

To configure manual mode, refer to Configure the manual sample mode on page 9.

1. Push **MODE** until the MANUAL light comes on.
2. Push **RUN/STOP**. The instrument operates until the set sample period expires, then stops. The instrument shows the particle sizes in the 3-digit display. The cumulative counts show in the 7-digit display.

Get a particle count in automatic mode

To configure automatic mode, refer to Configure the automatic mode on page 10.

1. Push **MODE** until the AUTO light comes on.
2. Push **RUN/STOP**. The instrument makes a set number of particle count cycles, then stops.

Get a particle count in concentration or beep mode

To configure concentration mode, refer to Configure the concentration mode on page 11. To configure beep mode, refer to Configure the beep mode on page 11.

1. Push **MODE** to select CONCEN or BEEP.
2. Push **RUN/STOP** to start the sample count.
3. Push **RUN/STOP** again to stop the sample count.

   Note: In concentration mode, longer measurement periods cause higher particulate levels to contaminate the sensor. Use shorter sample periods to find the concentration in unknown environments.

Maintenance

⚠ D A N G E R

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

Clean the instrument

⚠ D A N G E R

| ⚡ | Electrocution hazard. Remove all power from the instrument and relay connections before this maintenance task is started. |

Items to collect:

- Soft clean cloth
- Clean water or mild soap solution
- Lint-free cloth

1. Set the power switch to off.
2. Disconnect the power cord from the power outlet.
3. Use a soft cloth and water or mild soap solution to clean the instrument exterior.
4. Use a lint-free cloth to remove moisture from the exterior. Alternately, let the instrument sit for 1 hour to dry.
5. When the instrument exterior is fully dry, connect the power and set the power switch to on.

Purge and set the count to zero

1. Make sure that the instrument is off. Install the filter. Refer to Install the isokinetic probe on page 6.
2. Set the instrument on a stable surface. Attach the AC adapter/charger and connect the instrument to power. Refer to Electrical connections on page 7.
3. Toggle the power switch to on.

4. Push **MODE** to select AUTO mode.

5. Set the number of cycles to infinite. Refer to Set the number of cycles on page 10.

6. Push **RUN/STOP**. Let the instrument operate until the counts are stable at or near zero.

Charge the battery

Note: The instrument can be operated while the battery charges.

1. Set the instrument power switch to off.

2. Set the instrument on a stable surface. Attach the AC adapter/charger and connect the instrument to power. Refer to Electrical connections on page 7.

3. Put the instrument on a stand or other stable surface. To charge the battery fully, let the battery charge for a minimum of 16 hours.

Replace the fuses

⚠ DANGER

Electrocution hazard. Remove power from the instrument before doing maintenance or service activities.
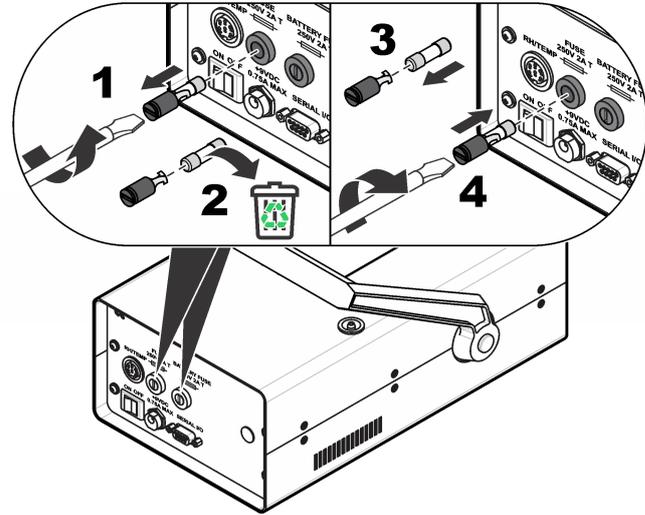
⚠ DANGER

Fire hazard. Use the same type and current rating to replace fuses.

To replace fuses, refer to Figure 7.

Figure 7 Replace the fuses

Troubleshooting

Message	Description	Solution
LO BATT	The battery charge is low.	Charge the battery (Charge the battery on page 14).
SENSOR	The sensor is contaminated. The internal sensor cannot operate within acceptable limits.	Purge the sensor (Purge and set the count to zero on page 13). *Note: If the SENSOR alarm is still on, contact technical support.*
LIMIT	The particle counts are higher than the set limits.	Make sure that the alarm limits are set to the correct levels (Set the alarm limits on page 10).

Set to factory settings

Use this procedure to:

- Set the instrument to factory settings
- Start the microprocessor again
- Remove intermittent fault conditions
- Clear the count data stored in the buffer

This feature will also change the location value to 32 and may disable some serial communication.

1. Set the power switch to off.
2. Push and hold **MODE** while the power switch is set to on. Release **MODE** when the instrument beeps once.
   The 3-digit display shows dEF. The 7-digit display show the number and revision of the EPROM.
3. Push the **DOWN** arrow to start normal operation. Program the operating parameters as necessary. Refer to Configuration on page 9.

Pump troubleshooting

The vacuum pump cannot be replaced or serviced by the user. If the pump does not operate or has an unusual sound or vibration, contact technical support.

Replacement parts and accessories

⚠ W A R N I N G
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.

Replacement parts

Description	Item no.
Isokinetic probe, wand style	203015-3
Isokinetic probe, direct mount	2080613
Purge filter	2080442
AC adapter (115 V to 230 V)	2088440
AC power cord (115 V)	VP623501
AC power cord (220 V)	VP623500
Fuse, 250 V T-2A, SLO BLO	590815

Accessories

Description	Item no.
Thermal printer paper	460519
Relative humidity/temperature probe	2080825
High-pressure diffuser	2080732-6
RS485 converter	2082383-2
Clean room printer paper	460521
PortAll software	2084045-02
Serial cable, standard 9-pin	2082197-1
Carrying case	2080879

Appendix

Data analysis for ISO 14644

ISO 14644 is the governing standard for clean rooms. Data is downloaded to PortAll software to make sure that there is compliance to the standard.

Connect to a computer

Use RS232 or RS485 serial data communications for computer connections. Connect to the computer with a terminal program, such as Windows HyperTerminal®, and a standard 9-pin serial cable. Refer to Figure 8.

- Use RS232 for communication between one particle counter and one computer.
- Use RS485 for communication between one computer and up to 64 particle counters.

1. Connect to the computer with a standard 9-pin serial cable. Figure 8 shows the pin designations for communication with a factory data collection system. To order the cable, refer to Replacement parts on page 15.

   Note: A standard serial cable can also be used with the PortAll software adapter.

2. Set up the computer with a terminal program, such as Windows HyperTerminal®. Refer to the operation instructions included with the software.

Figure 8 Pin designations for data communication systems
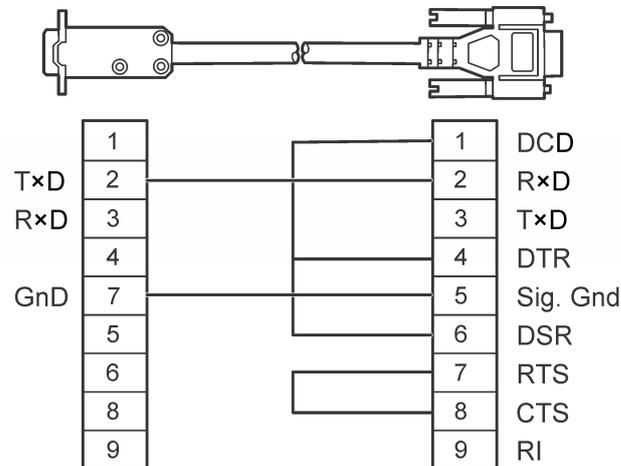
Communication protocols

The particle counter has fixed parity and protocol, shown in the list that follows.

- Baud rate 9600
- Eight data bits
- One stop bit
- No parity

Table 5 describes the ASCII commands used by the particle counter.

Table 5 ASCII commands supported by the counter

| ASCII command	Description
a Auto:	When the "a" command is used, the counter is put in the Auto mode.
b Manual:	When the "b" command is used, the counter is put in the Manual mode.
c Start Counting (computer controlled):	The counter starts counting without waiting for an even second boundary (quick start). Counting continues until stopped by the computer. The computer must control the count cycle.
d Start Counting (counter controlled):	The counter starts counting and controls the count cycle based on the counter setting for a period.
e Stop Counting:	The counter immediately stops counting without waiting for an even second boundary.
C Clear Buffer:	The rotating buffer is erased.
D Send Number of Records:	The counter sends the number of records in the rotating buffer.
E Send EPROM Revision:	The counter sends the EPROM number and revision level.
M Mode Request:	The counter sends the present mode. If counting, a "C" is sent. If holding, a "H" is sent. If stopped, an "S" is sent.
T Identify Model:	The counter sends a 4-character model number (for example, 227A).
A Send Record:	The next record in the rotating buffer is sent. When the rotating buffer is empty, a "#" is sent. Each record is erased from the buffer as it is sent. If no count cycles have been completed since the counter was turned on, a "#" is sent. The record cannot be sent until the current count cycle is complete.
R Resend Record:	The last record sent is sent again. Records sent prior to the last record have been permanently erased.

Table 5 ASCII commands supported by the counter (continued)

ASCII command	Description
h Standby Mode:	The counter goes into a mode that turns off the air pump and shuts down the sensor to conserve power and reduce equipment wear.
g Active Mode:	The counter goes into a mode that prepares it for counting. The air pump turns on to purge the air path.
l Local Mode:	The counter is set to offline (for factory test purposes).
U Universal Select:	The counter responds to all commands after receiving this command. Functions only when one counter is connected at a time. Any counter select command (128 through 191) disables the Universal Select command. Enable this command again by turning off power to the unit and then turning it on.
128-191 Counter Select:	The counter responds to all subsequent commands when a number is sent that matches the select code (128 through 191). The counter is deselected or made unresponsive to computer commands by selecting another counter.

Data record format

A data record is a series of ASCIII characters. The position of the character specifies the meaning of the character. The length of the record changes with the number of data points available from the counter. Each data point is preceded by a 3-character tag that shows the type of data that follows in the next six characters. Figure 9 shows an example of a data record.

Figure 9 Example of a serial communications data record
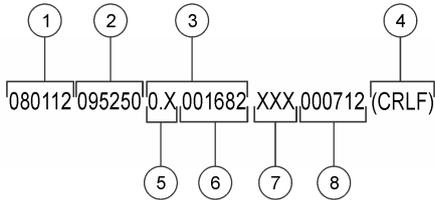
|		
1 Date	**5**	Particle size
2 Time	**6**	Particle count
3 Channel	**7**	Tag (R/H, TMP, Checksum, LOC)
4 End message	**8**	Value

Use the PortAll software

The clean room classification standards FS 209E and ISO 14644-1 require specific particle count measurements and calculations to verify the cleanliness level of a clean room or clean area. PortAll software generates clean room verification results from the particle counter measurement data.

Configure the particle counter for PortAll

1. Set the printer to disabled. Refer to Set the printer status on page 10.
2. Set the location number to a value between 0 and 31. Refer to Set the location numbers on page 10.
3. Toggle the power off and then on.
4. Connect the particle counter to the computer. Refer to Figure 10.

Figure 10 Connect the particle counter to the computer

1 Computer	**3**	9-pin serial cable
2 PortAll adapter	**4**	Particle counter
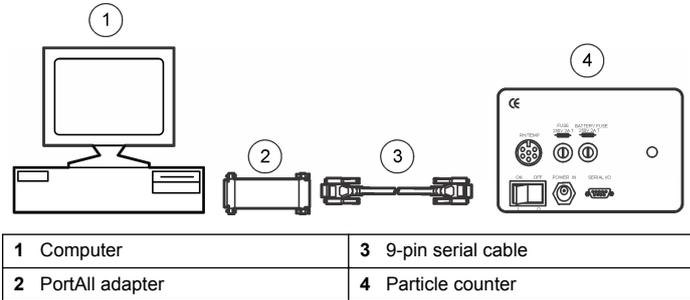
Operate the particle counter with PortAll software

For ISO 14644–1, normalize the data in the PortAll software to counts per cubic meter. For FS209E, normalize the data in the PortAll software to counts per cubic foot. Refer to the *PortAll Software User Manual* for more information.

1. Clear the particle counter memory before the start of a sample sequence that is used to classify a clean room or clean area. Refer to Set to factory settings on page 15.
2. Set the location. Refer to Set the location numbers on page 10.
3. Set the sample time to use for calculation of the sample volume at each location. (Sample time x instrument flow rate = sample volume.) PortAll software does not have access to the instrument flow rate.
4. Set the sample period and data. Refer to the PortAll user manual and Change the sample period on page 9.

   • In the particle counter, set the sample period to 1 minute (0.1 cubic feet). In the PortAll software, select Normalized Data (counts x 10).
   • In the particle counter, set the sample period to 10 minutes (1.0 cubic feet). In the PortAll software, do not select Normalized Data.

5. Collect the samples from one location.

6. Before the particle counter is connected to the PortAll software, set the instrument address in the PortAll software with a value of 0 to 31. For most instruments, the location number is the serial port address.

7. Do steps 1–6 for each location.