Airnet® II 4-CH Particle Sensors

MODELS 201-4, 301-4, 310-4, 501-4, 510-4

OPERATIONS MANUAL

Airnet® II 4-Channel Particle Sensors (201-4, 301-4, 310-4, 501-4, 510-4)

Operations Manual

PARTICLE MEASURING SYSTEMS®

a **spectris** company

Airnet II 4-Channel Particle Sensors 201-4, 301-4, 310-4, 501-4, 510-4
Operations Manual

P/N 1000016470 Rev C

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Quality Statement

The Quality Policy of Particle Measuring Systems is to strive to meet or exceed the needs and expectations of our customers and to align the activities of all employees with the common focus of customer satisfaction through continuous improvement in the quality of our products and services.

Environmental Information

There are no potential means by which asbestos exposure is possible because there are no materials in the design or manufacture of the Airnet II 4-Channel Particle Sensors containing asbestos.

This equipment must be properly disposed of at end-of-life by means of an authorized waste management system. Contact our Customer Response Center at (877) 475-3317 or +1 (303) 443-7100 (International) for dismantling and disposal information.

Patent Information

U.S. and foreign patents for this equipment are pending.

Manual Conventions

WARNING
A warning in the text is used to notify the user of the potential for bodily injury or death.

CAUTION
A caution in the text is used to highlight an item that if not done, or incorrectly done, could damage the instrument and/or any materials or devices affected by the instrument.

– — NOTICE — –
A notice in the text is an instructional communication regarding requirements or policies issued by Particle Measuring Systems.

NOTE: A note in the text is used to highlight an item that is of operational importance to the user.

It is important that you observe cautions and warnings while performing the procedures described in this manual. Caution and warning labels are located on and inside the instrument to alert you to potentially hazardous conditions. Please familiarize yourself with this information.

CE and UK CA Declaration of Conformity

Application of Council Directive(s):	CE	2014/30/EU, 2014/53/EU, 2014/35/EU, RoHS 2011/65/EU, 2015/863
	UKCA	Electromagnetic Compatibility Regulations 2016, Electrical Equipment (Safety) Regulations 2016 The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012
Standard(s) to which Conformity is Declared:	EMC	EN 61326-1:2013 S.I. 2016 No. 1091
	Safety	EN61010-1: 2010, 3rd, Ed. S.I. 2016 No. 1101
	RoHS	EN 63000:2019
Manufacturer's Name:	Particle Measuring Systems, Inc.	
Manufacturer's Address:	5475 Airport Boulevard, Boulder, CO 80301 USA	
Manufacturer's Telephone/FAX:	+1 3034437100 / +1 3034496870	
Distributor's Name:	Particle Measuring Systems S.R.L.	
Distributor's Address	Via di Grotte Portella 34 00044 Frascati (Roma) ITALY	
Distributor's Telephone/FAX:	+39 06 90530130 / +39 06 9051315	
Type of Equipment:	Particle Monitoring	
Model No:	Airnet II 4-Channel 201-4, 301-4, 310-4, 501-4, 510-4	

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) and Standard(s).

Signature:		Signature:	
Full Name:	Scott MacLaughlin	Full Name:	Frank Panofen
Position:	Director of Engineering	Position:	Marketing Manager, Life Sciences
Place: Boulder	Date: May 28, 2021	Place: Rome	Date: May 28, 2021

CAUTION

All I/O cables and accessories must meet current factory specifications in order for this unit to remain in compliance with CE marking requirements. Consult the factory for details.

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Table of Contents

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List of Figures

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List of Tables

Chapter 1
Getting Started

The Airnet II 4-Channel particle sensor is a laser-optical aerosol particle sensor that accurately detects, counts, and measures particles suspended in air. This manual includes information on operating the following Airnet II 4-Channel models:

- 201-4
- 301-4 and 310-4
- 501-4 and 510-4

For ease in understanding, this entire group of Airnet II 4-Channel models is referred in the remainder of this document as Airnet II 4-Channel particle sensors. When a reference is given that ONLY pertains to one or more models in this set, that specific model (or models) is referenced.

An automated laser power control has been implemented that automatically shuts off the laser power after 10 seconds of continuous bad flow. The laser power is restored after 10 seconds of continuous good flow (good flow = specified flow ± 15%).

Airnet II 4-Channel particle sensors communicate by means of Ethernet with Facility Net[1], a software package that stores and displays particle data and allows the user to control the Airnet II 4-Channel particle sensor. The Airnet II 4-Channel particle sensor models can also communicate via Modbus TCP via the Ethernet connection. All Airnet II 4-Channel sensors can communicate via Modbus TCP when that feature is activated. All Airnet II 4-Channel models have the option of adding a dual 24 VDC input and 4-20 mA output board that can power the unit via 24 VDC and/or that can send 4-20 mA signals that can be customized for 4-20 mA-capable data systems.

Power is provided through:

- the Ethernet connection when Power over Ethernet (PoE) is being utilized,

or

- the 24 VDC input/ground connector pins when an optional 24 VDC input/4-20mA output board has been ordered.

PoE can be supplied via a PoE router or a PoE injector (P/N 1000015865).

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1. This manual references Facility Net when discussing the software used to control these Airnet II 4-Channel particle sensors. However, you can use Facility Net wherever this reference is noted.

Figure 1-1 Airnet II 4-Channel particle sensor

Class I Laser Product

The Airnet II 4-Channel particle sensors are Class 1 laser products.

WARNING
This instrument is a Class l laser product.[a] Use of controls, adjustments, or performance of procedures other than those specified here may result in hazardous radiation exposure.

a. National Center for Device and Radiological Health (formerly BRH).

Physical Description

Top

1. **Sample Inlet** – 1/4-inch ID Sample probe or tubing 1/4-inch diameter tubing.

Two LEDs are located on the top of each Airnet II 4-Channel particle sensor chassis:

2. **Status LED** – Indicates the operational status of the instrument.

When connected to Facility Net software, the LED is controlled by Facility Net's alarm settings. The failure state depends upon how the particle sensor is configured in Facility Net. When disconnected from Facility Net, you can set the unit to run the **Status LED** two distinct ways.

- Set the **Status LED** to flash green when disconnected.

- Set the **Status LED** to represent the internal state of the flow and/or laser status indication. The **Status LED** will normally remain green, except for a low flow and/or laser status error.

3. **Activity LED** – The Activity LED flashes when a particle is detected.
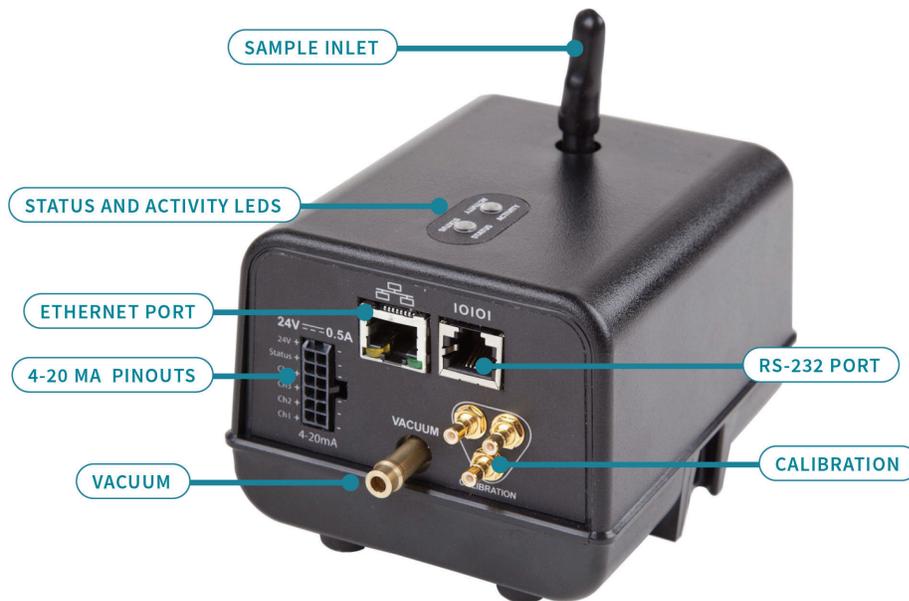
Figure 1-2 Connectors on the back of the Airnet II 4-Channel particle sensor
(Shown with 4-20 mA option)

Back

All connectors are found on the back of the unit's chassis, including:

- **Electrical Power** – Power can be provided through the 24 VDC power connector (see Figure 2-5, "24 VDC Power Connector," on page 2-5) when this option board has been purchased, or through the Ethernet connection if Power over Ethernet (PoE) is being utilized.

NOTE: If any modifications are made to the factory connector, make sure to verify the 24 VDC and GND lines before connection to the Airnet II 4-Channel unit.

NOTE: For best results, use a CAT 5 UTP cable. If PoE is used, you must use a shielded CAT 5 UTP cable or ground the unit locally.

- **Ethernet** – The UTP Ethernet connector allows the unit to communicate with Facility Net by connecting an Ethernet cable from the particle sensor to the Ethernet hub. The Airnet II 4-Channel particle sensor can also communicate via Modbus TCP or via an Ethernet connection when this feature is activated. When connected to a router or PoE brick (injector) that provides PoE the Ethernet connection will power the system also.
- **RS-232** – The RS-232 RJ-11 jack is used for configuring the unit and performing limited diagnostics.
- **Vacuum Source** – The barbed fitting allows a source of vacuum (> 12 in. Hg) to be supplied to the unit.

NOTE: Airnet II 4-CH vacuum connection is a 1/4-inch tubing connection.

- **Calibration** – Three SMB connectors are available for calibrations only and are not used for system operation.
- **Optional 24 VDC Input/4-20 mA Output** – The 12-pin Molex® connector allows a 24 VDC input power supply to power the unit, and/or outputs scaled 4-20 mA signals that transmit the following:

    - Channel 1, 2, 3, and 4 particle data

    - Instrument status

Bottom

The bottom of the Airnet II 4-Channel unit contains four tapped-thread fittings that match the countersunk screw holes on three of the four mounting brackets. These brackets are used to mount the Airnet II 4-Channel to vertical or horizontal surfaces (refer to **Positioning or Mounting the Unit** on page 2-4 for illustrations and part numbers for the brackets).

Specifications

Table 1-1   Airnet II 4-Channel particle sensor specifications

	201-4	301-4	310-4	501-4	510-4
Channel thresholds (µm)	0.2, 0.3, 0.5, 1.0	0.3, 0.5, 1.0, 5.0	0.3, 0.5, 1.0, 5.0	0.5, 1.0, 5.0, 10.0	0.5, 1.0, 5.0, 10.0
Sample flow rate[a] Alarm at 15% variation	0.1 CFM (2.8 LPM)	0.1 CFM (2.8 LPM)	1.0 CFM (28.3 LPM)	0.1 CFM (2.8 LPM)	1.0 CFM (28.3 LPM)
Maximum particle concentration[b]	$5{,}057{,}310/\text{ft}^3$	$4{,}862{,}798/\text{ft}^3$	$702{,}404/\text{ft}^3$	$7{,}437{,}220/\text{ft}^3$	$890{,}371/\text{ft}^3$
Zero count level (counts/m^3)	≤ 70.7	≤ 70.7	≤ 7.07	≤ 70.7	≤ 7.07
Counting efficiency Meets ISO 21501-4	50% ± 20% for most sensitive channel.				
	100% ± 10% at 1.5 to 2.0 times channel one size.				
Flow system	External vacuum				
Vacuum source	> 12 in Hg				
Material (chassis)	Polycarbonate (PC)				
Dimensions (L × W × H)	5.3 × 3.6 × 3.8 in (13.5 × 8.9 × 9.6 cm)				
Weight	1.6 lb (0.73 kg)				
Power	PoE 48 VDC, 0.25 A or optional 24 VDC, 0.5 A Optional POE Power Injector: Input: 100 - 240 VAC, 50 - 60Hz, 1.5 A Output: 56 VDC, 0.6 A				
Communications	• Ethernet connector requiring cable type CAT 5 UTP (shielded if PoE is utilized) • RS-232 (configuration and diagnostic tool only, no data) • Facility Net interface • Modbus TCP communication				
	Optional 4-20 mA: • four channels for particle data • one channel for instrument status				
Status indicators	• Laser and flow status: two-color LED • Activity: one-color LED				
Calibration	System is calibrated per ISO 21501-4. Optional ISO 17025 calibration available.				

a. Allow ±5 % for variations in sample flow.
b. Greater than 90% accuracy (less than 10% coincidence loss) at maximum recommended ambient concentration.

Environmental Conditions

The following environmental conditions apply to the Airnet II 4-Channel particle sensor:

Table 1-2 Airnet II 4-Channel particle sensor environmental conditions

Operating temperatures	4 – 35 °C (39 – 95 °F)
Humidity conditions	5 – 95% RH non-condensing
Storage and transportation temperature	- 10° – + 50 °C (14 – 122°F)
Maximum altitude	6,562 ft (2000 m)
Installation requirements	Indoor use only Pollution degree 2 Over voltage category I Ordinary protection (not protected against harmful ingress of moisture Optional POE Power Injector Over voltage Category II Class I Equipment (Electrical earth ground from the mains power source to the product input is required for safety.)
Laser classification	Class 1 per EN60825-1 Internally, a Class III B laser is used, per EN60825-1

Chapter 2
Unpacking and Installation

Unpacking

1. Carefully open the container and remove the Airnet II 4-Channel particle sensor.

2. Ensure that all components listed in the following section are included, and inspect each unit for any damage.

3. If any components are damaged, immediately notify the shipper and Particle Measuring Systems.

4. After you have determined that the shipment is undamaged, store the packing materials for future shipping needs. Warranties may not apply if return shipping containers are inadequate.

Shipping List

Table 2-1   Airnet II 4-Channel particle sensor shipping list

Part Name	Quantity
Isokinetic air sampler (probe)	1
"L" Type mounting bracket (or one of three alternate brackets[a])	1
Phone jack cable, RS-232[b]	1
Operations manual[c]	1
24 VDC / 4-20 mA output connectors (optional)	
Molex Micro Fit 3.0 12-pin square receptacle (optional)	1
Molex crimp pins, female (12) (optional)	12
Ferrite (optional)	1

a. You must order alternate brackets in advance.
b. Used only for configuring the Airnet II 4-Channel particle sensor.
c. For large orders with multiple units, Particle Measuring Systems may elect to limit the number of Operations Manuals included in the shipment.

Items You Need to Provide

The following items are not included, and you will need to provide:

- Ethernet cable (shielded CAT 5 UTP cable if PoE is used)
- 4-20 mA cable (necessary only if you will use 4-20 mA signal output)
- Computer
- Facility Net software
- Modbus TCP client software
- Power cables, IEC type C 13, necessary for local power

Installation

The following instructions are included to guide you through the installation process. Please pay close attention to the **NOTE**, **CAUTION**, and **WARNING** text.

Installation includes the following steps:

- Selecting an Appropriate Location
- Positioning or Mounting the Unit
- Connecting the Power Supply
- Connecting a Communications Cable
- Connecting Sample Tubing or Sample Probe (as applicable)
- Attaching Vacuum Tubing

NOTE: If installation of the Airnet II 4-Channel particle sensor will prevent access to its RS-232 port (needed for configuration), configure the particle sensor first and then install the unit. See **Setting Configuration Addresses for Ethernet** on page 3-2 or **Configuring 4-20 mA Outputs** on page 4-2.

Automated Laser Power Control

Airnet II 4-Channel particle sensor units contain an automated laser power control that automatically shuts off the laser power after 10 seconds of continuous bad flow (flow rate that is ± > 15% of the specified flow rate).

The laser power is restored after 10 seconds of continuous good flow.

Detector Board Monitor

The Airnet II 4-Channel particle sensor has an automatic monitor to assure the detector board is operating correctly. In many applications the normal condition is *no particle counts being detected* for an extended period of time.

If a detector board fails and indicates no counts, this could be similar to not having any particle counts being measured. To address this unlikely but possible failure mode a monitoring algorithm is used to indicate a detector board failure. If a failure occurs it will be indicated within a certain amount of time depending upon the type of instrument being used. Those times are:

- Airnet II 201-4 – 102 minutes
- Airnet II 301-4 – 152 minutes
- Airnet II 310-4 – 68 minutes
- Airnet II 501-4 – 812 minutes
- Airnet II 510-4 – 152 minutes

This failure will be indicated identically to a laser failure. Using the serial commands will allow for specific diagnostics to indicate this was a detector board failure.

Selecting a Location

When choosing the location for the Airnet II 4-Channel particle sensor(s), consider the following to improve the utility of the unit.

Sample Point – Position the particle sensor to ensure that the sampling probe is pointed INTO the airflow you want to monitor.

CAUTION

Do NOT use the Airnet II 4-Channel particle sensor with sample tubing greater than 6 feet (1.8 m) long. Lengths greater than 6 feet can cause the following negative effect:

- A decreased flow through the sample chamber, resulting in particle counts that are too low.

Instead of using long tubing lengths, move the particle sensor closer to the sample point.

- **Accessibility** – The unit should be readily accessible for connecting and disconnecting cables, and so on.
- **Interference with existing equipment** – The unit should not interfere with access to existing or known future equipment installations.
- **Visibility** – The unit's front and top panels should be visible from a reasonable position.
- **Mounting surfaces** – The proposed mounting surface should allow mounting hardware to engage properly and should be of sufficient strength to support the unit safely.
- **Vacuum** – The unit should be located near appropriate sources of vacuum.
- **Cables** – The unit should be located near a source of grounded electrical power, an Ethernet port, and any other devices it must communicate with. Cables should reach from the unit to the connector without strain.

- **Environmental conditions** – The unit should be located in an environment consistent with its temperature, humidity, altitude, and other relevant specifications.
- **Electromagnetic interference** – The unit should be located away from strong electromagnetic fields.

Positioning or Mounting the Unit

The Airnet II 4-Channel particle sensor can be positioned so that it stands on its four feet or it can be mounted to a vertical surface with a mounting bracket that attaches to the bottom of the sensor's chassis with machine screws (provided).

The Airnet II 4-Channel particle sensor is attached to a chosen surface with one of the following four types of mounting bracket:

- A horizontal mounting bracket for attaching to a horizontal surface
- An S-shaped mounting bracket for attachment to a horizontal surface
- An L-shaped mounting bracket for attachment to a vertical surface (included as a standard)
- A dovetail mounting bracket for attachment to a vertical surface
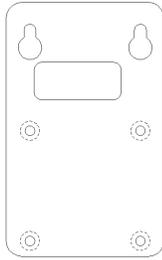
Figure 2-1 Horizontal Mounting Bracket   **Figure 2-2** "S" Type Mounting Bracket
P/N MP8876   P/N MP8877
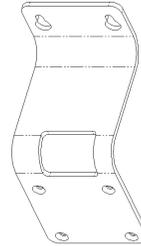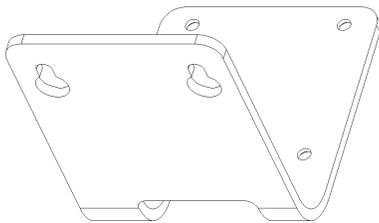
Figure 2-3 "L" Type Mounting Bracket   **Figure 2-4** Dovetail Mounting Bracket
P/N MP8865   P/N MP7872
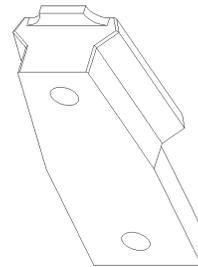
Powering the Sensor from 24 VDC

The Airnet II 4-Channel particle sensor can be powered with sources other than the Power over Ethernet (PoE). The unit may also be powered using a source of 24 VDC power (if this option was ordered) that may be connected to multiple Airnet II 4-Channel particle sensors. Ensure that the 24 VDC supply wiring is sized 18 AWG (0.75 mm^2) minimum and the supply is current limited to 8 A maximum or fused at 5A maximum.

If using a local power source a receptacle and crimp pins are available that attach to the ends of the power cable. The crimp pins are then inserted into the provided 12-pin Molex™ Micro Fit receptacle.
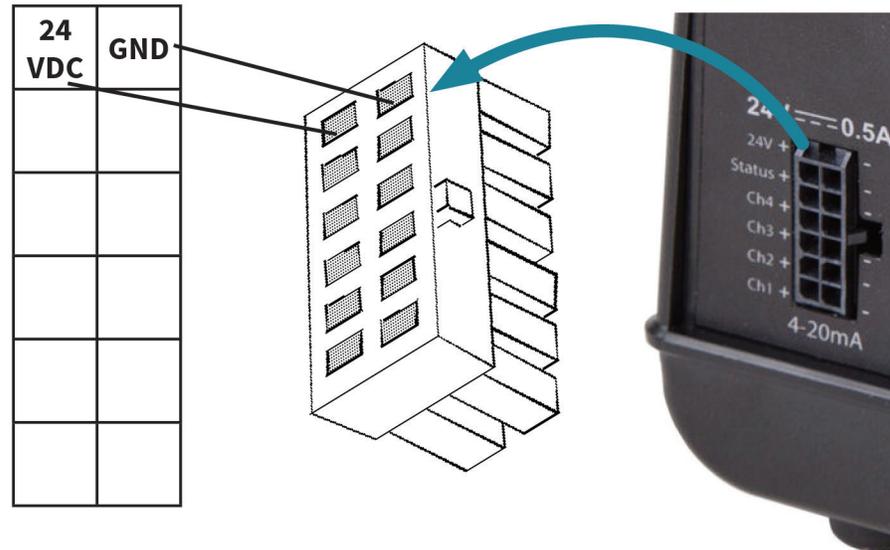
Figure 2-5 24 VDC Power Connector

Powering the Sensor from Power over Ethernet (PoE)

The Airnet II 4-Channel can be powered from a Power over Ethernet Router or Injector that conforms to IEEE 802.3af. A shielded CAT5 cable must be used or a local ground connected to the sensor for proper operation when using PoE.

Connecting the Power Supply

After the Airnet II 4-Channel particle sensor has been physically installed with its bracket, connect the sensor to an appropriate power source (PoE or optional 24 VDC). Power over Ethernet requires the use of an internet hub or power injector designed to operate with such systems, as well as the use of a CAT5 shielded cable.

After the supply cable is connected, the sensor's **Status** LED should illuminate indicating that the unit is receiving power.

If the **Status** LED does not illuminate, test the power source and the power supply. If the power source and power supply are all right, the unit may be faulty.

NOTE:	After completing the cabling for the 12-pin Molex Micro Fit connector (for 24 VDC or 4-20 mA), install the ferrite as close as practical to the connector (that will still allow you to insert and/ or remove the connector in the future).

Connecting the Sample and Vacuum Tubing

The plumbing connections are the following:

Sample inlet	The sample inlet can be used with the sampling probe alone or with tubing and the sampling probe.
	NOTE: Ensure that the Airnet II 4-Channel particle sensor's sampling probe is pointed into the airflow to be monitored.
House vacuum source	The Airnet II 4-Channel particle sensor has a barbed vacuum fitting for connection of 1/4" ID tubing. See Figure 1-2, "Connectors on the back of the Airnet II 4-Channel particle sensor (Shown with 4-20 mA option)," on page 1-3. The vacuum source should be > 12 inches of Hg.

Chapter 3
Configuring for Ethernet

Configuration Defined

You can configure the Airnet II 4-Channel particle sensor to communicate with Facility Net, send 4-20 mA signals to a SCADA system, or both depending upon the options ordered. Before it can do either, you must configure the sensor.

Configuration is the process of making the software and communications settings that will enable the Airnet II 4-Channel particle sensor to communicate with Facility Net or other host program by means of an Ethernet network.

Airnet II 4-Channel particle sensor systems to be used with the Modbus TCP configuration must be configured for proper operation. For additional information, see Appendix B, Modbus Protocol.

> **NOTE:** The following information assumes that the user has a working knowledge of terminal emulation software such as HyperTerminal®.

When to Configure the Sensor

If it will be difficult or impossible to take a computer to the Airnet II 4-Channel particle sensor after installation, it should be configured before installation.

If access to the sensor after installation will be easy, you can configure the sensor either before or after installation.

Required Hardware and Software

- RS-232 cable
- Computer loaded with terminal emulation software

> **NOTE:** Microsoft Windows® includes a terminal emulator called HyperTerminal.
> Other terminal emulator programs, are widely available. Your IT administrator or microcomputer support person may be able to provide assistance. This setup interface is also available via TelNet, but only after the Ethernet settings are compatible with your network.

RS-232 Cable

A suitable cable (PMS-CD1995) is provided in your shipment. The wiring for this cable is as follows:

Table 3-1   RS-232 pin outs (RJ-11 jack)

Pin 1	DSR
Pin 2	**Transmit** $\rightarrow$
Pin 3	**Receive** $\leftarrow$
Pin 4	RTS
Pin 5	CTS
Pin 6	GND

NOTE: Pins 1, 4, and Pin 5 are shorted together.

Setting Configuration Addresses for Ethernet

Follow these steps to configure the Airnet II 4-Channel particle sensor to communicate with Facility Net or any compatible host program by means of an Ethernet network.

CAUTION

As with any network-capable software, do not attempt to connect the Airnet II particle sensor to a network without your network administrator's cognizance and explicit permission. The administrator will need to approve, and in most cases will issue, addresses.

To configure the Sensor:

1. Connect the Airnet II 4-Channel particle sensor to a computer that has terminal emulation software using the provided RS-232 cable.

2. Start the terminal emulation software and proceed to the COM 1 parameters dialog box.

3. Set the following communication parameters:

Table 3-2 Terminal emulator communications parameters

Baud Rate	9600
Data Bits	8
Parity	N
Stop Bits	1
Flow Control	Off
Parity Check	Off
Carrier Detect	Off

Table 3-2 Terminal emulator communications parameters

Connector	Appropriate to hardware (COM1, for example)

When communications are established with the unit, a prompt appears. Enter the Configuration commands (see "Configuration Commands" below) to set the following addresses:

4. Set the IP address.

5. Set the multicast address.

6. Set the mask address.

7. Set the gateway address.

8. Set the NTP address (see **`Set ntp ddd.ddd.ddd.ddd`** on page 3-4)

9. Enter the "write" command.

Configuration Commands

?

Displays a command summary for the selected operational mode (a summary of the information in this table).

`Sta(tus)`

Displays the following information:

- Current firmware version number
- MAC address
- IP address
- Multicast address
- Net mask
- Gateway
- NTP address
- Queue size (if used with Facility Net or Modbus)
- Connection status
- Operational mode

`Set ip aaa.bbb.ccc.ddd`

The IP address is used when communicating across networks. This command sets the address in the form of aaa.bbb.ccc.ddd. Each three-digit series is a value of 0–255, separated by a period (**.**) character. An example of a valid IP address is **010.255.000.060**.

`Set mas(k) aaa.bbb.ccc.ddd`

Sets the network mask address using a decimal notation form of aaa.bbb.ccc.ddd. Each three-digit series is a value of 0-255 separated by a period (.) character. The mask separates the network address from the host address. This address is common to all devices on the logical network. Usually the mask will be similar to 255.255.255.000. Your network administrator will tell you if you need to enter this field.

`Set mul(ticast) aaa.bbb.ccc.ddd`

The multicast address must be set when using Facility Net. This command sets the multicast address in a decimal notation form of aaa.bbb.ccc.ddd. Each three-digit series is a value of 0-255 separated by a period (.) character. This address is unique to the hardware it serves. An example of a valid multicast address is: **224.100.100.001**.

`Set gat(eway) aaa.bbb.ccc.ddd`

The gateway address is used when communicating across different networks. This command sets the gateway address in a form of aaa.bbb.ccc.ddd. Each three-digit series is a value of 0-255 separated by a period (.) character. Use gateway 000.000.000.000 if no gateway device is available on the network. An example of a valid gateway address is: **010.255.000.060**.

`Set ntp ddd.ddd.ddd.ddd`

The **set ntp** command sets the NTP server IP (Internet Protocol) address. The values **ddd** represent decimal entries for each address octet (do not use leading zeros). This setting will be saved after the **write** command is issued.

`Set que(ue) x`

When used with Facility Net, you can enter a data queue size in order to buffer data while the unit is not connected.

Setting this parameter automatically saves the value and reboots the sensor.

The value of **x** can be set anywhere between 1 and 1440. The queue size to enter depends on the specific application. In general, the value should be made large enough to minimize data loss when disconnected, but not so large as to create significant delays in the reception of real-time data when reconnected.

When a data queue size is set greater than one, the Airnet II 4-Channel particle sensor will:
- Continue sampling if it was initially started, and then disconnected
- Queue up to the number of samples defined by the queue size
- Unload the queued data in chronological order when reconnected
- Periodically delete elements of the queue for which Facility Net has received the data

When the queue size is set to one (1), the Airnet II 4-Channel particle sensor reverts to a mode where there is no data queue, the unit reboots when disconnected and parameters specific to batch processing are enabled.

`Set mod x`

The unit will run under one of three possible operational modes: PMS Operational Mode, or Modbus TCP. When shipped from the factory, the unit is in the PMS Operational Mode.

Setting this parameter automatically saves the value and reboots the sensor.
- When the value of **x** is set to zero (0), the unit will reboot into the PMS Operational Mode.
- When the value of **x** is set to two (2), the unit will reboot into Modbus TCP mode.

Select the PMS Operational Mode for use with the calibration program.

Select the Modbus TCP mode to interface to any third party Modbus TCP client. For additional information, refer to Appendix B, Modbus Protocol.

```
Set sam (ple) x y
```

This command sets the minimum sample interval to **x** seconds and the maximum sample interval (used when zero particles are detected) to **y** seconds. It is not required to set the sample interval when running the Airnet II 4-Channel particle sensor with Facility Net.

```
Write
```

Saves the most recent changes. ***You must send this command*** after setting up the instrument, or your parameters will be lost when the sensor is de-energized.

NOTE: When the programming is complete, record these settings for future reference.

Unit Serial Number:

TCP/IP Settings for the Airnet II 4-Channel Particle Sensor :

Date			
Software Version			
Set By			
MAC Address			
IP Address			
Multicast Address			
Net Mask Address			
Gateway Address			
NTP Address			

Viewing Configuration Settings

Type **sta**(**tus**) and press the **Enter** key to display the Airnet II 4-Channel particle sensor's configuration settings, software version, and connection status.

If this command does not produce any kind of activity on the display screen:
*   the terminal emulator may be set up incorrectly, or
*   the cable may be improperly connected or faulty.

Connecting the Ethernet Cable

The Airnet II 4-Channel particle sensor communicates with Facility Net software by means of a CAT 5 UTP Ethernet cable. The sensor is designed to work best with a CAT 5 UTP cable. Other types of Ethernet cable may produce excess noise. Your Information Systems Manager, Network Administrator, or other appropriate computer support personnel may be able to assist in procuring a cable or fabricating a custom-length cable.

After physically attaching the Airnet II 4-Channel particle sensor to a network, Facility Net, or Modbus TCP client will find the sensor available on the network. Based on your configuration, refer to the *Facility Net Operations Manual*.

Chapter 4
4-20 mA Signal Configuration / Operation

Overview

The Airnet II 4-Channel particle sensor has an option to be ordered with the ability to transmit five 4-20 mA signals. One signal communicates instrument status and the other four signals transmit particle data from the four particle channels. This data is typically collected and processed by a SCADA system.

> **NOTE:** The Airnet II 4-Channel particle sensor can output data to Facility Net software while it also outputs 4-20 mA signals to a SCADA system.

4-20 mA Outputs

The instrument status signal is not controllable by the user.

Table 4-1   Summary of 4-20 mA Channel thresholds

First signal output	Channel 1 particle data
Second signal output	Channel 2 particle data
Third signal output	Channel 3 particle data
Fourth signal output	Channel 4 particle data
Fifth signal output	Instrument status

Each channel is capable of driving a grounded load of 400 ohms or less. All grounds are common and are common to the internal analog ground of the sensor.

Table 4-2 4-20 mA Channel thresholds

Channel	201-4	301-4	310-4	501-4	510-4
1	0.2 µm	0.3 µm	0.3 µm	0.5 µm	0.5 µm
2	0.3 µm	0.5 µm	0.5 µm	1.0 µm	1.0 µm
3	0.5 µm	1.0 µm	1.0 µm	5.0 µm	5.0 µm
4	1.0 µm	5.0 µm	5.0 µm	10.0 µm	10.0 µm

Table 4-3 4-20 mA factory preset status levels

Current	Flow Status	Laser Status
8 mA	OK	OK
12 mA	OK	Bad
16 mA	Bad	OK
20 mA	Bad	Bad

The signals are output through a 12-pin Mini-Fit® connector plug located on the sensor's rear panel.

Configuring 4-20 mA Outputs

Configuring the 4-20 mA outputs is the process of setting parameters to define the collection of the particle data, and to enable the data collection system to correctly interpret this data.

First, establish communications with the Airnet II 4-Channel particle sensor, and then use software commands to configure the sensor.

NOTE: The following information assumes that the operator has a working knowledge of terminal emulation software such as HyperTerminal.

Required Hardware and Software

- Computer loaded with HyperTerminal, or other terminal emulation software
- RS-232 configuration cable (provided in your shipment). Wiring for this cable is as follows:

Table 4-4 RS-232 pinouts
(RJ-11 Connectors on the Airnet II 4-Channel particle sensor)

Pin 1   DSR

Pin 2   **Transmit** $\rightarrow$

Pin 3   **Receive** $\leftarrow$

Pin 4   RTS ⌐

Pin 5   CTS ⌐

Pin 6   GND

NOTE: Windows includes a terminal emulator called HyperTerminal. Other terminal emulator programs are widely available. Your IT administrator or microcomputer support person may be able to provide assistance.

Establishing HyperTerminal Communications

>> To set HyperTerminal for communications with the sensor

1. Connect the Airnet II 4-Channel particle sensor to a computer with the provided RS-232 cable.

2. If the computer is not running, start it and open your terminal emulation program.

3. Proceed to the COM1 parameters dialog box.

4. Set the following communications parameters, and press **Enter**.
    A prompt (>) will appear on the computer display.

Table 4-5 Terminal emulator communications parameters

Baud Rate	9600
Data Bits	8
Parity	N
Stop Bits	1
Flow Control	Off
Parity Check	Off
Carrier Detect	Off
Connector	Appropriate to hardware (COM1, for example)

5. At the prompt (>), enter the appropriate commands to set the parameters for your 4-20 mA application. Record your parameters for future reference. (A list of available commands are described in the following section.)

Unit Serial Number:

Viewing Configuration Settings

Typing `sta(tus)` and then pressing the **Enter** key results in a display of the Airnet II 4-Channel particle sensor's configuration settings, software version, and connection status.

If typing `status` or `?`, and then pressing the **Enter** key, does not produce any activity on the display screen:
•   the terminal emulator may be set up incorrectly, or
•   the cable may be improperly connected or faulty.

Configuration Commands

The following commands are available to use when setting 4-20 mA signal parameters.

?

Displays a command summary (a summary of the information in this table).

sta(tus)

If in PMS Operational mode, displays the current firmware version number, MAC address, IP address, Multicast address, Net mask, gateway, and connection status. It will also display current 4-20 mA parameters if that option was selected.

set sam(ple) x y

This function sets the minimum sample interval to x seconds and the maximum sample interval (used when zero particles are detected) to y seconds.

This value is stored in permanent memory and is used by the instrument when it starts. This value can be changed by means of the Ethernet interface (Facility Net). However, when the Airnet II 4-Channel particle sensor is de-energized, the value set by the Ethernet interface is replaced by the value in permanent memory. When the 4-20 mA option is used, it always runs by the first sample interval.

set cum(ulative) n

This function selects between cumulative and differential data for the first four configurable 4-20 mA outputs if that option is available.

If n equals 1, the data is cumulative and represents the number of particles detected that are larger than the size specified for the channels.

If n equals 0, the data is differential and represents the number of particles detected that are between the sizes specified for each output channel.

set eos n

If n is set to 1 then the data in each channel is updated only at the end of each sample interval and is held constant for the duration of the subsequent sample interval. If n is equal to 0, the 4-20 mA channels are updated approximately every 100 milliseconds.

set raw n

If n is 1, the data in each channel is simply the number of particles detected. If n is 0, the data is normalized by dividing the counts by the volume sampled. The output units are counts per cubic foot.

set sca(le) n,n,n,n

This value defines the scaling of the first four 4-20 mA channels. This value corresponds to 20 mA at the output. The lower end of the range is always defined so that 4 mA corresponds to zero. The units of this value are defined by the settings entered by the **cum** and the **raw** commands. The first n applies to channel 1. The second n applies to channel 2, etc.

write

Saves the most recent changes. ***You must send this command*** after completing the instrument setup, or your parameters will be lost when the sensor is de-energized.

Adjusting the 4-20 mA Outputs

The 4-20 mA outputs can be adjusted to compensate for normal variations in the electrical components. The 4-20 mA outputs are only guaranteed to be within +/- 0.2 mA (1% full scale) without any adjustment.

Each of the five 4-20 mA outputs can be adjusted separately. A current meter must be connected to the 4-20 mA output to be adjusted.

To adjust a 4-20 mA output, connect to the setup interface of the sensor:

1. Issue the command `current adjust`.

2. The operator will be prompted for the index of the 4-20 mA output to be adjusted (Output Channels 1-5 are indexed 0-4). The offset and scale factors for the selected output will be set to 0 and 1 respectively.

3. The sensor will now apply 4 mA to the selected output. The operator will be prompted to enter the actual reading as measured by the current meter. This will calculate the appropriate offset factor to be applied to that output.

4. The sensor will now apply 20 mA to the selected output. The operator will be prompted to enter the actual reading as measured by the current meter. This will calculate the appropriate scale factor to be applied to that output.

5. The operator will be prompted to enter "`y`" to accept the channel adjustment. If accepted, the new offset and scale factors will be saved. Whether accepted or not, the unit will reboot and restart normal operation.

Connecting 4-20 mA Outputs to a SCADA Data Collection System

To connect to a SCADA data collection system, build a cable that will allow connection of the Airnet II 4-Channel particle sensor to the SCADA system's 4-20 mA input. The cable must be compatible with the 12-pin Molex Micro Fit 3.0 connector plug located on the rear of the sensor. The following pins are used on the connector.

Table 4-6   Airnet II 4-Channel particle sensor 4-20 mA connector pins

Pin	Function
6	24 VDC
5	Current output for Status
4	Current output for Channel 4
3	Current output for Channel 3
2	Current output for Channel 2
1	Current output for Channel 1
12	Ground (24 VDC return)
11	Ground (status return)
10	Ground (Channel 4 return)
9	Ground (Channel 3 return)
8	Ground (Channel 2 return)
7	Ground (Channel 1 return)
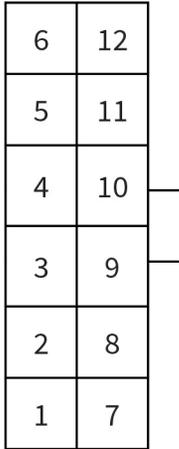
Instrument connector view

1. After completing the cabling for the 12-pin Molex Micro Fit connector, install the ferrite as close as practical to the connector (that will still allow you to insert and/or remove the connector in the future).

2. Connect the cable from the Airnet II 4-Channel particle sensor's 4-20 mA output to the data collection system's input.

3. Set up the data collection system to correctly interpret the sensor's 4-20 mA output.

Chapter 5
Maintenance and Performance Checks

There is nothing within the Airnet II 4-Channel particle sensor that is user-serviceable. You can, however, clean the sensor's housing and repair or replace cables and cable connectors.

Cleaning the Sensor's Housing

The Airnet II 4-Channel particle sensor is housed in a sturdy Polycarbonate housing and should provide many years of trouble-free performance. Periodically it may be helpful to wipe the case with a clean, lint-free cloth moistened with deionized water or a mild cleanser.

Cable Connectors

Occasionally a cable connector may be damaged through an accident. The RS-232 and UTP Ethernet connections are somewhat fragile. If a connector is damaged, be careful not to aggravate the problem by forcing a cable into a damaged connector. A Particle Measuring Systems Service Representative can repair or replace damaged connectors.

Performance Checks

Complete the following procedures to verify that your instrument is operating properly.

Airflow Rate Check

The sample flow is factory-set using a critical orifice and is not adjustable. If the flow drops by 15%, there may be a blockage in the critical orifice or inlet jet.

The following instrument(s) will be needed:
- A 0.1 CFM ±5% flow meter for models 201-4, 301-4, 501-4
- A 1.0 CFM ±5% flow meter for models 310-4, 510-4

To check the air flow rate:

1. Disconnect all sample tubing and sample probes.

2. Connect the unrestricted test flow meter to the sample inlet fitting.

3. Run a sample and monitor the flow meter readings. The measured flow should be the following:

- Models 201-4, 301-4, 501-4: 0.085 to 0.115 CFM (±5%)
- Models 310-4, 510-4: 0.085 to 1.15 CFM (±5%)

Background Count Check

Perform this check upon installation or when suspected contamination or noise-induced counts may be causing inaccurate data. Background counts can be caused by power line transients, cosmic ray particles, or RFI or EMI noise counts. Externally induced counts are the exception; the only way to verify externally induced counts is to perform this procedure.

To perform this procedure, you will need an absolute filter rated at less than 0.2 micron (effective to 0.1 micron in air).

>> To perform a background count check:

1. Locate the Airnet II 4-Channel particle sensor to where it will normally be used.

2. Remove the isokinetic sample horn.

3. Place the 0.2 micron absolute filter and inlet tubing adapter in series with the sample inlet flow tube.

4. Run six 10-minute samples.

5. Verify that background count rates average less than ten counts per ten minutes when using the specified filter.

6. Return the instrument to normal operation by removing the filter from the sample line.

Chapter 6
Troubleshooting

Use this chapter to help troubleshoot issues with the Airnet II 4-Channel particle sensor, such as power issues, communication messages, errors, leaks, and particle and transient-induced counts.

Troubleshooting Matrix

Problem	Symptoms	Possible Cause	Try...
No power	No lights or No communications	Power supply not connected to a power source	Check the seating of the power supply cable in the unit. Verify that the power supply is plugged in.
		Electrical power source fault	Check the electrical outlet for power, including any power strips or surge protectors.
		Power supply faulty	Try a different power supply.
		If using PoE	Verify power is being supplied
Communications not established – Facility Net displays "Communications Error".	Unable to view data from working sensor	Ethernet cable problem	Replace the Ethernet cable that connects the sensor to an Ethernet hub.
		Unit not configured correctly	Re-configure the unit. First check the sensor's IP Address and the computer's IP Address.
		Computer hardware or software problem	Substitute a computer with known good Ethernet capability. Refer to your computer's Ethernet card documentation to correct the fault.
Laser status error	Bad laser status indication	Laser dead or detector failure	Check status response for detector failure messages.

Airflow Rate Errors

As a result of the performance check procedure (see **Chapter 5** Maintenance and Performance Checks), the flow rate at the sensor's inlet should be the following:

- 0.1 CFM for models 201-4, 301-4, 501-4: 0.085 - 0.115 CFM (±5 %)
- 1.0 CFM for models 310-4, 510-4: 0.85 -1.15 CFM (±5 %)

A flow rate error greater than 15 % (±5%) indicates that maintenance is required.

Low flow could be due to an obstructed orifice, leaks or insufficient vacuum.

A minimum of 12 inches of Hg vacuum is required at the Airnet II 4-Channel particle sensor's critical orifice to provide the required sample flow rate. If the flow rate is still low after determining that there is sufficient vacuum, perform the following procedure.

Isolating and Repairing Leaks

To isolate and repair leaks:

1. Remove the top and bottom halves of the instrument.

2. Run samples.

3. While a sample is running, use a bulb syringe to blow a small amount of smoke around the possible leak paths and watch for an increase in the number of counts.

The following locations are possible leak paths:

- Where the inlet jet meets the body of the sample block
- Around the laser diode
- Around the photodiode
- Around the laser window
- Around the beam dump
- Around the mirror plug

4. If a leak is suspected around the inlet jet, remove the jet and O-ring, clean lubricate and/or replace parts.

5. Reassemble the unit.

6. If a leak is suspected around the laser diode or photodiode, contact Particle Measuring Systems for assistance.

Particle-Induced Counts

If background counts are too high, it is usually due to contamination within the isokinetic sampling horn.

To clean the isokinetic sampling horn:

1. Remove both the isokinetic sampling horn and jet and flush both with a cleaning solvent (alcohol, acetone, and so on).

2. Dry the isokinetic sampling horn and the jet using clean pressurized air.

3. Replace the jet and horn. Make sure to line up the alignment indicators.

Transient-Induced Counts

Line transients (RFI or EMI noise counts) are generally subtle and unique to a certain installation. If these counts are suspected, call your Particle Measuring Systems representative.

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Appendix A
TCP/IP Protocol: A Brief Overview

NOTE: This information is provided to help Airnet II 4-Channel particle sensor users who are not familiar with TCP/IP protocol understand more about the sensor configuration process. It is not a substitute for the guidance of your network administrator.

TCP/IP's Network Layer

TCP/IP's **Internet Protocol** or IP is designed to interconnect packet-switched communication networks to form an internet.

In summary, the IP protocol's main functions are:

- Provide the basic unit for data transfer
- Addressing
- Routing
- Fragmentation of datagrams

Ping

TCP/IP systems can use a utility named *PING* (Packet InterNet Groper) to test station and network integrity. The TCP/IP-32 add-on protocol for *Microsoft Windows for Workgroups 3.11* includes a *PING* function that must be run from a *Windows* DOS window.

To use the Windows TCP/IP PING:

1. With Windows running, open a DOS window by double-clicking on the MS-DOS Prompt icon.

2. At the DOS prompt, type PING <IP ADDRESS> (using the address of the device for which you wish to test your computer's LAN communications).

The *PING* utility will report whether or not the other device responded, and what the response time was.

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Appendix B
Modbus Protocol

Communications with the Airnet II can be done via Modbus TCP. The following Modbus register map has comments and notes to help with its intended use.

Modbus Overview

The map contains three sections:

1. Input registers – Read only information for ID and data collection
2. Holding registers – Read/Write parameters for configuring the device
3. Coils – Read/write individual bits to control the device

The supported functions include:

1	Read Coils
5	Write Single Coil
15	Write Multiple Coils
4	Read Input Registers
3	Read Holding Registers
6	Write Single Holding Register
16	Write Multiple Holding Registers
23	Read/Write Multiple Holding Registers
22	Mask Write Holding Register

- Any registers accessed but not defined will generate an address error.
- Spare coils/registers will "set" without error and always return a zero value.
- Registers set with invalid data will return a function error.

There is a setting available that toggles the interpretation of selected dual-register values. These values can be interpreted as integer representations of floating point numbers with a fixed scaling factor or as IEEE-754 floating point representations of that value. Refer to the register map to determine which register pairs have this feature applied. This setting can be made in the setup interface, and saved in non-volatile storage, or set real-time via a coil.

Input Registers

The input registers are in two sections: Configuration & Data

The configuration section contains:

- Map Version
- Firmware Version
- Product Name
- Flow and Volume Scale Factors
- Flow Rate
- Number of channels (Particle & Analog)
- Particle channel sizes

The scale factors are values representing the power of 10 associated with the fixed scaling of that parameter in the map. The channel sizes are in two registers representing integer nanometers.

The data section starts with configuration information – Calibration date and serial number. This allows for a single contiguous read when this particular information is desired along with the regular sample data. If not desired, then skip this section and begin reading at register 30212.

The Device Status register contains all the Coil bits for convenience. The host can use this to check for data availability, for example.

The Device State register is a single register in which the **LSByte** is a state value and the **MSByte** is an associated sub-state value.

The time stamp set of registers is a "time_t" value.

The Data Packet Status is two registers for growth. 3 bits are used.

Flow Rate and Volume are in CF. These can be read either as integer values with fixed scales or as Floats. The float mode is recommended to get best accuracy.

The location register is not utilized. It is intended for manifold systems (if applicable).

The number of channels and analogs varies across instruments by the purchased options.

Table B-1   Input register – configuration

Input Registers		Description (Configuration)	Comment	Notes
30001	ushort	Modbus Map Version	Version 1.00 (Static 100)	
30002	ushort	Sensor Firmware Version	Firmware version (*100)	
30003	string	Product Name: Char 00, 01	Serial Number	
30004	string	Product Name: Char 02, 03	Serial Number	
30005	string	Product Name: Char 04, 05	Serial Number	
30006	string	Product Name: Char 06, 07	Serial Number	
30007	string	Product Name: Char 08, 09	Serial Number	

Table B-1 Input register – configuration (Continued)

Input Registers		Description (Configuration)	Comment	Notes
30008	string	Product Name: Char 10, 11	Serial Number	
30009	string	Product Name: Char 12, 13	Serial Number	
30010	string	Product Name: Char 14, 15	Serial Number	
30011	ushort	Scale: Flow Rate	Multiplier in fixed: Flow Rate	3 (1000)
30012	ushort	Scale: Volume	Multiplier in fixed: Volume	4 (10000)
30013	ushort	Flow Rate (high)	Flow * 10 Scale cfm	Float Mode
30014	ushort	Flow Rate (low)	Flow * 10 Scale cfm	Float Mode
30015	ushort	Number of Particle Channels	Variable across types	2 or 4 fixed
30016	ushort	Number of Analog Channels	Variable across types	0
30017	ushort	Channel 1 Size (high)	nanometers	
30018	ushort	Channel 1 Size (low)	nanometers	Type
30019	ushort	Channel 2 Size (high)	nanometers	
30020	ushort	Channel 2 Size (low)	nanometers	Type
30021	ushort	Channel 3 Size (high)	nanometers	
30022	ushort	Channel 3 Size (low)	nanometers	Type or N/A
30023	ushort	Channel 4 Size (high)	nanometers	
30024	ushort	Channel 4 Size (low)	nanometers	Type or N/A

Table B-2 Input register – data packet

Input Registers		Description (Data Packet)	Comment	Notes
30201	ushort	Calibration Date (Month)	Calibration Date	
30202	ushort	Calibration Date (Day)	Calibration Date	
30203	ushort	Calibration Date (Year)	Calibration Date	
30204	string	Serial Number: Char 00, 01	Serial Number	
30205	string	Serial Number: Char 02, 03	Serial Number	
30206	string	Serial Number: Char 04, 05	Serial Number	
30207	string	Serial Number: Char 06, 07	Serial Number	
30208	string	Serial Number: Char 08, 09	Serial Number	
30209	string	Serial Number: Char 10, 11	Serial Number	
30210	string	Serial Number: Char 12, 13	Serial Number	
30211	string	Serial Number: Char 14, 15	Serial Number	

Table B-2 Input register – data packet (Continued)

Input Registers		Description (Data Packet)	Comment	Notes
30212	ushort	Device Status (high)	Device Status Mask	
30213	ushort	Device Status (Low)	Device Status Mask	
30214	ushort	Device State	Device State	
30215	ushort	Number of data samples in queue	Number of samples in queue	
30216	ushort	Time Stamp (high)	time_t	
30217	ushort	Time Stamp (low)	time_t	
30218	ushort	Sample Time (high)	Seconds * 100	Float Mode
30219	ushort	Sample Time (low)	Seconds * 100	Float Mode
30220	ushort	Data Packet Status (high)	Bit Mask	
30221	ushort	Data Packet Status (low)	Bit Mask	
30222	ushort	Flow Rate (high)	Flow * 10 Scale cfm	Float Mode
30223	ushort	Flow Rate (low)	Flow * 10 Scale cfm	Float Mode
30224	ushort	Volume (high)	Volume * 10 Scale cf	Float Mode
30225	ushort	Volume (low)	Volume * 10 Scale cf	Float Mode
30226	ushort	Location	Location value	n/a
30227	ushort	Number Particle Channels	Variable across types	2 or 4 fixed
30228	ushort	Number Analog Channels	Variable across types	0
30229	ushort	Particle Channel 1 (high)	Cumulative Raw Ch1	
30230	ushort	Particle Channel 1 (low)	Cumulative Raw Ch1	
30231	ushort	Particle Channel 2 (high)	Cumulative Raw Ch2	
30232	ushort	Particle Channel 2 (low)	Cumulative Raw Ch2	
30233	ushort	Particle Channel 3 (high)	Cumulative Raw Ch3	N/A for 2 Channel
30234	ushort	Particle Channel 3 (low)	Cumulative Raw Ch3	N/A for 2 Channel
30235	ushort	Particle Channel 4 (high)	Cumulative Raw Ch4	N/A for 2 Channel
30236	ushort	Particle Channel 4 (low)	Cumulative Raw Ch4	N/A for 2 Channel

Holding Registers

For Airnet II, any change to the Holding registers creates a new configuration and so stops the unit if sampling. The new configuration, when completely defined, will be run on the next start-up.

The real-time clock is set via a "time_t" value.

The sample interval and Hold/Tare times are single registers for number of seconds to process. This should make it easy for the host to set.

Table B-3 Holding registers

Holding Registers		Description (Setup)	Comment
40001	ushort	Real Time Clock (high)	time_t
40002	ushort	Real Time Clock (low)	time_t
40003	ushort	Sample Interval	Seconds
40004	ushort	Hold/Tare Time	Seconds
40005	ushort	Repeat Count	Repeat Count

Coils

1   The data collection coil will enable/disable sampling. It will start a sequence of samples if the repeat count has been set.
Read & Write: 1 = Sampling Enabled, 0 = Sampling Disabled

2   The data available coil is used to both inform the host that data is now available and to delete the next queued data packet (if desired).
Read: 1 = Data Available, 0 = No Data Available
Write: 0 = Delete queued data element

3   The data clear coil will delete all data in the queue.
Write: 1 = Delete all queued data

4   The reset sensor coil will reset the sensor.
Write: 1 = Reset Sensor

5 & 6   The Green and Red LED (usually a single dual-color LED) can be set/read independently.
Read & Write: 1 = LED on, 0 = LED off

7   The external alarm does not exist on the Airnet II

8   The IEEE float control will change the appropriate registers (refer to the map) from a dual-register integer with fixed scaling to a dual-register IEEE-754 Float representation. This value can also be set into non-volatile storage via the setup interface ("set instrument float n" – where n=1 on or n=0 off).
Read & Write: 1 = Float mode enabled, 0 = Float mode disabled

9 – 32   Spare.

Table B-4 Coils

Coils	Description (Coils)		Comment	
00/01	Data Collection	On/Off	Sampling Control	
00/02	Data Available	Yes/No	Data Available/Queue Control	
00/03	Data Clear	Toggle	Data Queue Delete	
00/04	Reset Sensor	Toggle	Reset control	
00/05	Status LED: Green	On/Off	Status LED: Green Control	
00/06	Status LED: Red	On/Off	Status LED: Red Control	
00/07	External Alarm	On/Off	External alarm	n/a
00/08	IEEE-754 Float	On/Off	Modbus Float representation	
Spare	24 spare coils		Reserve "common" coils	
00/33	Set Digital Output 1	On/Off		option 2
00/34	Set Digital Output 2	On/Off		option 2
00/35	Set Digital Output 3	On/Off		option 2
00/36	Set Digital Output 4	On/Off		option 2
00/37	Set Digital Output 5	On/Off		option 2

Data Packet Processing

The unit can provide real-time data or queued data or both. There is only one section of Input registers assigned for data to handle this information.

If the unit is setup to queue data then the data shown is the oldest data in the queue. The data available coil bit will be set if there is data in the queue. The data available bit can be cleared in which case that data element shown is popped-off of the queue. If there is more data in the queue, the new data will be shown and the data available coil bit will be set. If there is no more data in the queue, the data available bit will only be set again once the next sample is completed.

If the queue is set to one, then the data shown is always the last data processed and is representative of real-time data only. Since the queue is circular - the next sample will replace the single one in the queue.

Queued data will always be available - even when not sampling.

If there is no data available - the input registers will yield zeros. This is done instead of generating an execution exception so that the customer can simply read the data packet, along with the Device Status, in one command.

Associated Values for Specific Registry Entries

Table B-5 Associated values for specific registry entries

Device Status Entries	0x0001	Data Collection	Matches the common coil settings
	0x0002	Data Available	
	0x0004	Data Clear	
	0x0008	Reset	
	0x0010	Green Status	
	0x0020	Red Status	
	0x0040	External Alarm	
	0x0080	IEEE Float mode	
Device State Entries (LSByte)	0	Idle	
	1	Sampling	
	2	Maintenance	
	3	Error	
Device SubState Entries (MSByte)	0	Idle	n/a
	0	Sampling	n/a
	1	Sampling	Tare
	0	Maintenance	n/a
	1	Maintenance	Calibration
	0	Error	n/a
Data Packet Status Entries	0x0001	Laser Good	
	0x0002	Flow Good	
	0x0004	Hardware Good	

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Appendix C
International Precautions

WARNING

This instrument is designated as a Class 1 laser product and complies with US 21 CFR 1040.10 and EN 60825-1. Use of controls, or adjustment, or performance of procedures other than those specified in this manual may result in hazardous radiation exposure.

AVERTISSEMENT

Cet appareil est classé comme produit laser de Catégorie 1 et est conforme aux normes US 21 CFR 1040.10 et EN 60825-1. L'utilisation de commandes, de réglages ou l'exécution de procédures autres que celles spécifiées dans le présent document peut provoquer une exposition à des radiations dangereuses.

WARNUNG

Bei diesem Gerät handelt es sich um ein Laserprodukt der Klasse 1, welches den Normen US 21 CFR 1040.10 und EN 60825-1 entspricht. Das Justieren der Lasereinheit, das Verändern des Gerätes oder Einsatzbereiche, die nicht den Vorgaben dieser Anleitung für das Gerät entsprechen, können dazu führen, dass gefährliches Laserlicht austritt.

ATTENZIONE

Lo strumento è classificato come prodotto laser di Classe 1 e rispetta l'US 21 CFR 1040.10 e l'EN 60825-1. L'uso dei comandi o la regolazione dello strumento, o l'esecuzione delle procedure con metodi non conformi a quanto specificato in questo manuale posso provocare una pericolosa esposizione alle radiazioni.

ADVERTENCIA

Este instrumento está catalogado como producto láser de Clase 1 y cumple con las normativas US 21 CFR 1040.10 y EN 60825-1. El uso de controles o el ajuste o la realización de procedimientos que no sean los especificados en este manual pueden provocar la exposición a radiación pveligrosa.

Hazard Symbols

The meaning of hazard symbols appearing on the equipment is as follows:

Symbol	Nature of Hazard
	Attention, consult accompanying documents.
	Dangerous High Voltage
	Warning – Laser radiation! Avoid exposure to beam.

Symboles de risque

Des symboles représentant les risques sont placés sur l'appareil. Leur signification est la suivante:

Symbole	Nature du risque
	Attention, consulter les documents d'accompagnement
	Danger Electricite
	Avertissement – Rayonnement laser ! Éviter toute exposition au faisceau.

Warnschilder

Die, an dem Gerat angebrachten Warnschilder haben folgende Bedeutungen:

Symbol	Gefahrenart
	Achtung! In den beiliegenden Unterlagen nachschlagen
	Achtung Hochspannung
	Warnung – Laserstrahlung! Nicht in den Strahl blicken.

Simboli di pericolo

Il significato dei simboli di pericolo che appaiono sugli strumenti il seguente:

Simbolo	Natura del pericolo
	Attenzione. Consultare i documenti allegati
	Tensione Pericolosa
	Avvertenza – Radiazione laser! Evitare l'esposizione ai raggi.

Simbolos de peligro

Los simbolos de peligro que aparecen en el equipo significan:

Símbolo	Naturaleza del Peligro
	Atención, consultar los documentos adjuntos.
	Peligro alto voltaje.
	Advertencia – ¡Radiación láser! Evite exponerse al rayo.

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Appendix D
有毒或有害的物质和元素

Part Name 部件名称	有毒或有害的物质和元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴联苯醚 (PBDE)
电源供应	X	O	X	O	O	O
印刷电路装配	X	O	X	O	O	O
光学元件	X	O	X	O	O	O
激光	X	O	X	O	O	O
机械部件	X	O	X	O	O	O
电缆	X	O	X	O	O	O
O: 表示用于部件的所有同族物质中所含的有毒或有害物质低于SJ/T11363-2006规定的限度要求。 X: 表示用于部件的至少一种同族物质中所含的有毒或有害物质高于SJ/T11363-2006规定的限度要求。						

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